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SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

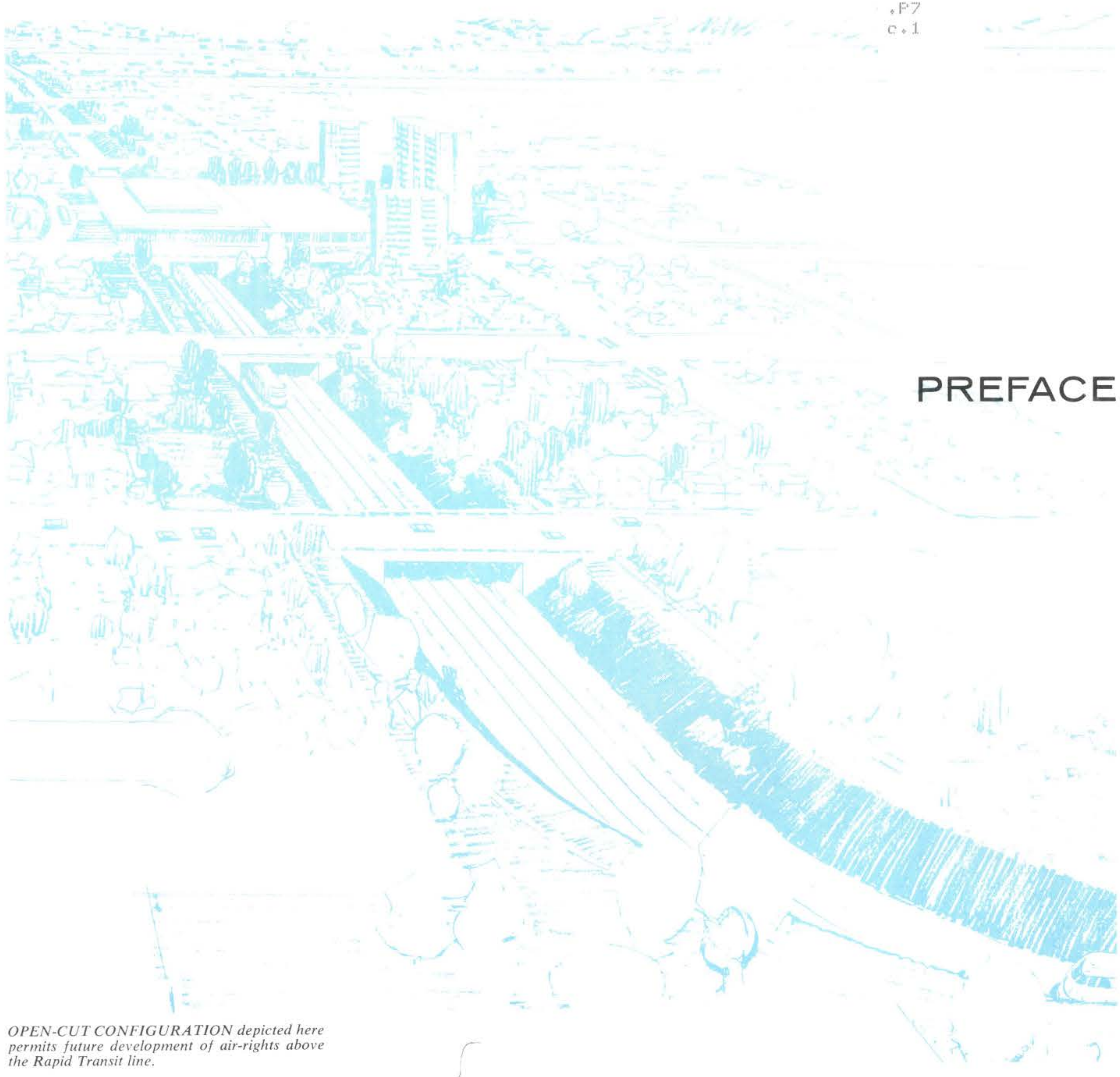
PRELIMINARY REPORT
October 1967

A PRELIMINARY REPORT

to the people of the Los Angeles metropolitan area regarding a first-stage system of Rapid Transit, prepared in accordance with the provisions of the Southern California Rapid Transit District Law (Statutes of 1964, as amended) by the Directors and staff of:

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

The preparation of this report has been financed in part through a mass transportation technical study grant from the U.S. Department of Housing and Urban Development under the provisions of Section 9 of the Urban Mass Transportation Act of 1964 as amended by Public Law 89-562, 89th Congress, 1966.



OPEN-CUT CONFIGURATION depicted here permits future development of air-rights above the Rapid Transit line.

PREFACE

Transportation shapes every civilization. It is a key factor in the continued growth or gradual decline of cities. In this civilization, Southern California is in many ways unique for its scores of interlocked communities—its extended land mass studded with areas of highly concentrated activity on the one hand and widely dispersed residential developments on the other. The need to link them with fast, economical, dependable transportation is obvious—if the unique character of our region is to be retained.

Historically, the Pacific Electric Railway, once the largest inter-urban rail system in the United States, contributed largely to the shape of the far-flung and complex Southern California population pattern. For decades the PE's 1200-mile network was the transportation catalyst that converted vast agricultural areas into a heterogeneous, interdependent metropolitan complex.

The decline and end of the Pacific Electric as a public transportation system was brought about by the automobile and the inability of the Pacific Electric to take advantage of technological improvements. Failure to provide for the grade separations necessary to isolate PE tracks from the proliferating flow of automobile traffic made it impossible for the system to move people with speed or efficiency. Conversely, the automobile, with its expanding network of streets and highways and finally freeways, built with massive federal and state tax support, seemed to be the answer to regional mobility.

Wherever the automobile went, rails disappeared. Public transportation became bus service—only. Congestion was cured by constructing more freeways.

However, despite this justly-famous and justly-lauded freeway network, mobility for automobile commuters and riders of public transportation alike began to develop as an acute problem about ten years ago. Mounting land values and the influx of new millions of residents engaged in new and multitudinous activities, stimulated the urban areas to grow vertically into multi-story, high-density complexes. The metropolis was maturing rapidly, at a pace and on a scale that prompted planners and observers to conclude that the end result would surely overshadow even the portentious past.

With this concentration of activity and densifying of employ-

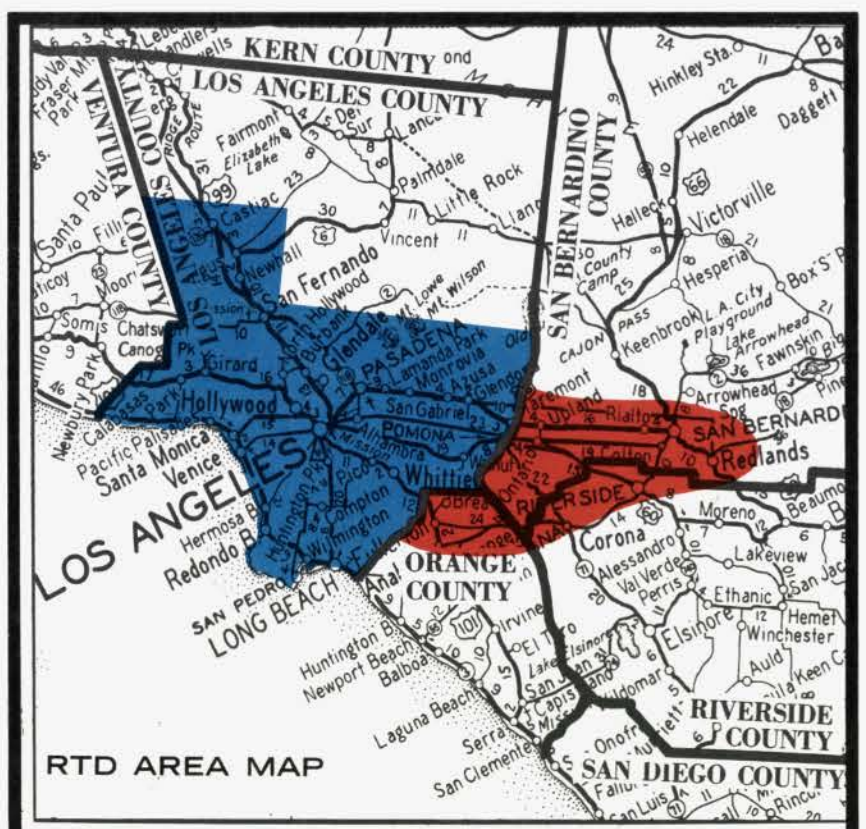
ment and commerce, came a still further deployment of residential communities. The distances between home and work expanded with each passing year. Commuting within a fifty-mile radius of the urban core today involves literally millions of person-trips daily.

When it was built the Pacific Electric served a total population of less than a million; yet it shaped the face of the city. Main corridors of peak hour movement still roughly paralleled the abandoned PE tracks, re-enforcing the patterns laid down by topography and travel needs since indian days. But millions are travelling now. The necessity for adequate mass transit through these corridors has existed for seventy years; it still does. The degree of need multiples annually.

Unless an efficient, dependable system of public transportation to supplement and complement the freeway system is provided for peak hour, commuter movement, millions of people may soon have to move back into the city or start over in a new job in the suburbs.

Area of District's **Rapid Transit** responsibility and jurisdiction.

Service area of **RTD buses**—into Orange, Riverside and San Bernardino Counties



RTD AREA MAP

ROLE OF THE RTD

The public agency responsible for all but a fraction of the public transportation in Los Angeles County is the Southern California Rapid Transit District. Its legislature-given responsibility is two-fold. It includes operation of 77 percent of existing bus transportation in the area as well as the planning, construction, and the operation of a future system of mass rapid transit.

In recognition of this dual task, the District board of directors adopted the following statement of policies and objectives:

"The basic responsibility of the Southern California Rapid Transit District is to determine and meet unfilled Mass Rapid Transit and public transportation needs within the District.

"To fulfill this basic responsibility, in the best interests of all the people and in close coordination and cooperation with local, state, and federal authorities, the following objectives are established.

"1. **Fill the role of active leadership in mass public transportation,** further establishing the District as the recognized responsible agency which is the prime source of mass public transportation knowledge and operating expertise in Southern California, the State of California, and the nation.

"2. **Maximize present mass public transportation service . . .** emphasizing the 'public service' nature of the District's responsibility by effectively seeking ways to overcome financial and jurisdictional limitations.

"3. **Develop, build and operate an over-all mass Rapid Transit system coordinated with a comprehensive and integrated surface transportation network**... together to meet the mobility needs of the entire community."

At present the RTD operates some 1500 buses on 112 lines over 2280 miles of one-way routes in four counties, Los Angeles, Orange, San Bernardino and Riverside. The system carries more than 200,000,000 riders annually, with farebox revenues exceeding $45,000,000 and annual mileage more than 55,000,000 bus-miles.

LEGISLATIVE MANDATE

In discharging the Rapid Transit element of its dual responsibility, the District is following the mandate of the legislation creating it. Section 30001 states:

> "There is an imperative need for a comprehensive mass rapid transit system in the Southern California area, and particularly in Los Angeles County. Diminution of congestion on the streets and highways in Los Angeles will facilitate passage of all Californians motoring through the most populous area of this state and will especially benefit domiciliaries of that county who reside both within and without the Rapid Transit District.
>
> "It is, therefore, necessary . . . to establish such Transit District governed by representatives of the governmental agencies in the Southern California area so that there will be sufficient power and authority to solve the transportation problems in the Southern California area and to provide the needed comprehensive mass rapid transit system."

Southern California Rapid Transit District (RTD) was created in 1964 by the California Legislature as the successor to the Los Angeles Metropolitan Transit Authority, also a state-created agency. In 1958, the MTA had purchased the assets of the two major privately-operated public transportation companies in the area with the proceeds of a $40,000,000 revenue bond issue and consolidated the operations into a coordinated mass public transportation system.

RTD BOARD OF DIRECTORS

In converting the MTA into RTD, it was the intention of the legislature to make the agency more responsive to the community by providing more direct local representation on the board of directors. The seven-man MTA board was appointed by the Governor. On the 11-man RTD board, one director is appointed by each of the five Los Angeles county supervisors, two are named by the Mayor of the City of Los Angeles and confirmed by the city council, and the remaining four are chosen by a City Selection Committee representing the other cities in the county, by custom one director from each Rapid Transit corridor.

District boundaries, and the limits of its Rapid Transit development authority, are the same as the boundaries of Los Angeles County—with the areas of Los Angeles National

Forest, Antelope Valley and Catalina and San Clemente Islands excluded. (See map) The RTD does, however, operate buses outside its designated District territory—in Orange, Riverside and San Bernardino Counties.

In creating the District, as in the case of the MTA, the legislature provided no source of operating revenue other than the farebox. For Rapid Transit construction financing, however, the act creating the District empowered it to levy a property tax—subject to approval by 60 percent of the electorate voting on a ballot proposition proposing such a tax to fund a bonded indebtedness.

Neither the MTA nor the District was given funds with which to conduct Rapid Transit engineering and planning until 1966 when, during the special session of the legislature, $3,600,000 in state tidelands oil revenue was allocated by Senate Bill 2 (1966, 1st Extraordinary Session) to the District for this purpose.

REPORT REQUIRED

It had been, nevertheless, the clear intent of the legislature that RTD accomplish this task. The law establishing the District states. (Section 30636)

"**As soon as practicable after the effective date of this part, the board shall cause a preliminary report to be made** as to a rapid transit service and system which shall include:

"(a) **The estimated cost** of the proposed acquisition, and construction and all incidental expenses connected therewith.

"(b) **The probable sources of income** from the system and the estimated amount thereof.

"(c) **The estimated cost of maintenance and operation** thereof.

"(d) **The proposed method or methods of financing.**

"(e) **Any other information deemed pertinent,** including, without limitation, a preliminary sketch or sketches, plan or plans or design of stations, platforms, terminals, structures and facilities constituting a method of rapid transit, ...the proposed locations thereof and the proposed routes of the system.

"The District shall, in connection with the studies necessary to determine the possible routes and locations for the said facilities, confer with the appropriate local governing bodies and other agencies that may be affected thereby and with their technical and planning personnel, obtaining where available any master or general plan in the affected areas.

COMMUNITY COMMENTS

"The District shall give written notice of the preliminary report to each affected city or county that it may, within a period prescribed by the District (which period shall not be less than sixty (60) days), submit comments or evidence as to the effect that the design, location and routes of said facilities would have in their areas, including, without limitation, the effect upon property values, state and local facilities, and city street and county highway traffic.

"When sufficient information has been accumulated to permit intelligent discussion, the District shall publicize and hold such public meeting or meetings as may be reasonably necessary to acquaint interested individuals, officials and civic or other groups with the studies made and the information developed and to obtain their views with respect to the preliminary report.

"Using the information developed the District shall then prepare a final report containing the foregoing subdivisions (a) to (e) and such other matters deemed pertinent, including, without limitation, the information obtained at conferences and meetings, the relationship between all proposed routes and locations of such facilities and any master or general plans of the affected local agency or agencies and any information submitted by affected cities or counties pursuant to this section. The final report shall conclude with a recommendation as to the routes, location and design of such facilities."

The document, of which this preface is a part, is the Preliminary Report by the Southern California Rapid Transit District to each affected city and county, as required by law, and to the people of the Los Angeles metropolitan area who will benefit from the proposed Rapid Transit system and who will, likewise, bear the cost of its construction.

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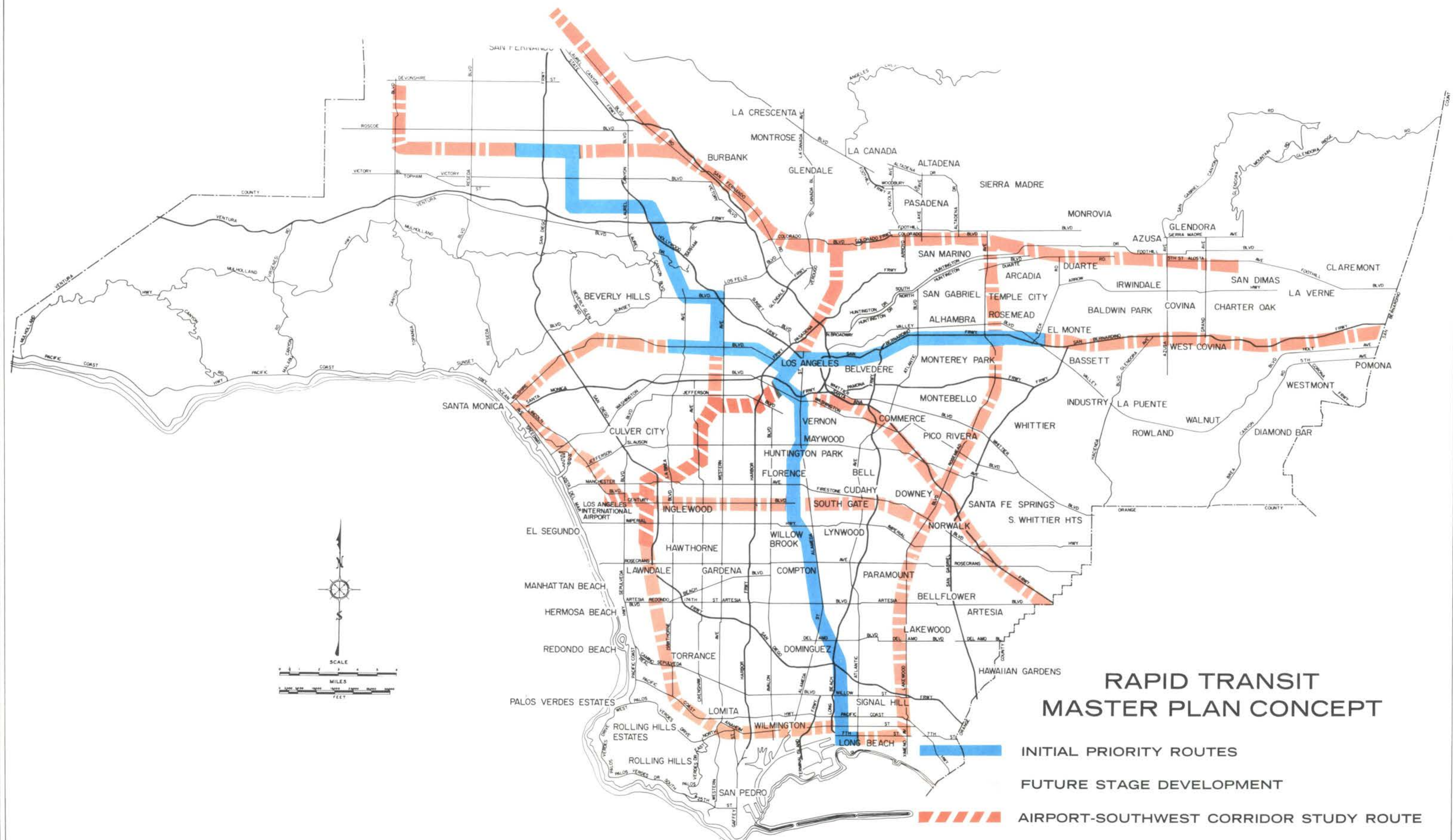

RAPID TRANSIT
MASTER PLAN CONCEPT
INITIAL PRIORITY ROUTES
FUTURE STAGE DEVELOPMENT
AIRPORT-SOUTHWEST CORRIDOR STUDY ROUTE
SCALE
MILES
FEET
N
S
LA CRESCENTA
MONTROSE
LA CANADA
ALTADENA
BURBANK
GLENDALE
SIERRA MADRE
PASADENA
MONROVIA
GLENDORA
AZUSA
SAN MARINO
DUARTE
ARCADIA
CLAREMONT
SAN DIMAS
IRWINDALE
LA VERNE
SAN GABRIEL
TEMPLE CITY
ROSEMEAD
BALDWIN PARK
COVINA
CHARTER OAK
ALHAMBRA
EL MONTE
BEVERLY HILLS
WEST COVINA
POMONA
LOS ANGELES
BELVEDERE
MONTEREY PARK
BASSETT
WESTMONT
SANTA MONICA
MONTEBELLO
INDUSTRY
LA PUENTE
VERNON
COMMERCE
WHITTIER
WALNUT
CULVER CITY
MAYWOOD
PICO RIVERA
ROWLAND
DIAMOND BAR
HUNTINGTON PARK
FLORENCE
BELL
CUDAHY
DOWNEY
LOS ANGELES INTERNATIONAL AIRPORT
INGLEWOOD
SOUTH GATE
SANTA FE SPRINGS
S. WHITTIER HTS
NORWALK
EL SEGUNDO
WILLOW BROOK
LYNWOOD
HAWTHORNE
MANHATTAN BEACH
LAWNDALE
GARDENA
COMPTON
PARAMOUNT
BELLFLOWER
HERMOSA BEACH
ARTESIA
LAKEWOOD
REDONDO BEACH
TORRANCE
DOMINGUEZ
HAWAIIAN GARDENS
PALOS VERDES ESTATES
LOMITA
SIGNAL HILL
ROLLING HILLS ESTATES
WILMINGTON
LONG BEACH
ROLLING HILLS
SAN PEDRO
SAN FERNANDO

RTD-6

SUMMARY AND FINDINGS

THIS PRELIMINARY REPORT, to and for the people of the Los Angeles metropolitan area, is a step in the continuing process by which Southern California Rapid Transit District carries out its legal responsibility to develop a plan for a Rapid Transit system which, in coordination with a new network of feeder coaches and other augmented bus service, is specifically designed to meet the expanding public transportation needs of this dynamic urban complex for many decades to come.

THE INITIAL, PRIORITY-PHASE SYSTEM described in this report is an integral part of a total Master Plan Concept for public transportation which will ultimately be needed to assure adequate mobility in this metropolitan area.

THE RAPID TRANSIT SYSTEM proposed for the community, in its initial stage, is a 62-mile network of dual-rail, computer-controlled, ultra-modern electric cars; operating on grade-separated exclusive rights-of-way in subway, on skyways or at ground level (depending on the character of the area traversed); and designed primarily to relieve rush-hour freeway congestions by providing fast, smog free, safe, economical and dependable commuter service between areas of greatest commuter need and areas of greatest employment concentration.

THE ROUTES link the San Gabriel Valley, the San Fernando Valley and the South Central Region as far as Long Beach with each other and with areas of concentrated employment and population within the urban core – including the Wilshire Corridor, Hollywood, the Central Business District and the Southeast industrial area, a region which now contains 45 per cent of all job locations in Los Angeles County.

- More than 54 per cent of the present population of Los Angeles County lives within three miles of these priority-system routes.
- More than 65 per cent of all job locations in Los Angeles County are served by these routes.
- More than 500,000 jobs are within walking distance of proposed Rapid Transit stations.

A FEEDER BUS NETWORK covering more than 300 miles of additional route, including an expanded bus system throughout the area, will make public transportation readily accessible to most residents of the District.

- Rapid Transit stations in suburban areas will have spacious parking areas.
- More than 1,000,000 passengers will ride public transportation daily in 1980.

CONSTRUCTION COST of the 62-mile system, with its 45 stations, will be $784,864,000 – at today's prices. The 475 Rapid Transit cars will cost $102,172,000; rights-of-way, $130,500,000; new feeder buses, $6,000,000; retirement of bus system bonds, $31,500,000; contingencies, $139,713,000.

ESCALATION and inflation, which can have substantial impact on the total cost of the project over the period before construction is completed, is difficult to estimate. Costs could go up or down. But computed on presently observed trends, the escalation factor would add $377,453,000 – making the total estimated cost for the project: $1,571,702,000.

NEEDS & BENEFITS related to Rapid Transit derive basically from the fact that streets and freeways *alone* cannot meet mobility needs of (1) commuters or (2) people dependent on public transportation.

- 16.7 percent of Los Angeles County households have *no car;* 51.8 percent have *only one.*
- By 1980, the Division of Highways estimates thousands of commuters will not be able to get on the freeways that serve the urban core, unless relieved by Rapid Transit.
- Excess demand over capacity of the 1980 freeways serving the urban core is estimated as high as 225,000 commuters – a $1.5 billion payroll which represents $5 million a year in sales taxes and $115 million in property taxes to the suburban areas. At least 40 percent of all income generated in the suburbs is *directly* related to urban core employment.
- 25 percent of rush hour trips on freeways and traffic arteries parallel to Rapid Transit routes will be diverted to Rapid Transit, Coverdale & Colpitts estimates.
- Every trip made by Rapid Transit instead of by auto is a contribution to the reduction of smog – at least 85 percent of which comes from automobile exhaust.
- Better utilization of land because of Rapid Transit would result in higher valuations sufficient to create $100 million annually in future taxes in the Central City area *alone.*

(See Page RTD-19 for more indications of Rapid Transit needs and benefits.)

ALTERNATE FINANCING METHODS, several of which require additional legislative authority to be available for voter consideration, are outlined in detail in this report. Cost to individual taxpayers depends, of course, on the method of financing approved by the voters. But for comparative purposes, if the system were to be constructed with bond service costs met entirely from property taxes, the additional tax on a $20,000 home would be $2.78 the first year, rising gradually to a **maximum** of $20.35 the sixth year and reducing annually thereafter. On the other hand, for example, if a four percent sales tax on gasoline were applied to the construction cost, the amount of necessary supplemental tax on a $20,000 home would be nothing for six years, a **maximum** of $7.17 the eighth year, declining each year thereafter.

AN AIRPORT-SOUTHWEST ROUTE as a possible addition to the first-stage Rapid Transit system is also currently being studied by District engineers and consultants – in view of the mounting traffic congestion in the vicinity of International Airport and the need to provide closer access to Rapid Transit facilities for residents of the Southwestern section of the metropolitan area.

OPINIONS AND DESIRES of the public and their elected officials will be actively sought by the District, after issuance of this and a subsequent Final Report, through a series of public meetings, hearings and conferences as prescribed by District law. From this procedure will evolve a Rapid Transit proposal to be offered for voter approval – a proposition which will reflect broad community desires and needs regarding (1) the amount of Rapid Transit system to be built initially; (2) the precise design and location of the system; and (3) the most feasible method of publicly financing its construction.

INTRODUCTION

From the day it was apparent that El Pueblo de Nuestra Senora la Reina de Los Angeles was destined to become a city, the growing problem of providing adequate public transportation has been the subject of much concern—and many studies. But from a practical standpoint, it was not until the creation of the Los Angeles Metropolitan Transportation Authority (MTA), succeeded in 1964 by the Southern California Rapid Transit District (RTD), that the issue was deeply and professionally examined by a public agency which had been specifically created to deal with and solve the problem.

Although provided with no public tax funds for the purpose, the MTA invested some $2,000,000 from operating revenue in a program of penetrating and significant studies which, with competent up-dating, are still valid and make a valuable contribution to contemporary planning.

Collectively these studies, conducted by highly respected and fully qualified consulting engineering firms, (1) identified within the metropolitan area the broad travel corridors of greatest and most immediate needs, (2) analyzed and selected the most modern and efficient concept of Rapid Transit from among all types operating or planned throughout the world, and (3) investigated and determined approximate patronage and revenue levels, operating expenses, construction and equipment costs and the economic feasibility of the contemplated system.

The studies made it apparent that, although the people and the economy of the metropolitan area would benefit substantially from a system of grade-separated, rail rapid transit, the anticipated operating revenues, while ample to more than meet operating expenses, would not produce sufficient net to amortize construction costs—even for an abbreviated so-called "backbone route" which in running from El Monte to West Los Angeles penetrated only the most populous parts of the county.

Public fund financing to meet the public need would be required, as it has been for virtually every urban area in the world that has constructed Rapid Transit.

In establishing the RTD to replace the MTA, the state legislature took notice of this fact and authorized 60 per cent voter-approved bond financing of Rapid Transit construction.

Escalating bus operating costs and a reluctance to increase fares made it financially impossible for the RTD to aggressively continue the Rapid Transit planning and engineering begun under MTA until the special legislative session of 1966 allocated $3,600,000 in state tideland oil funds for this purpose.

In the fall of 1966, when the state-appropriated funds became available, the District announced the launching of two simultaneous programs, designed between them to be a major factor in the implementation of the District's announced statement of policy and objectives.

Program I is essentially an in-depth investigation of over-all public transportation needs of the entire metropolitan area, working closely with the Los Angeles Regional Transportation Study (LARTS) and the Transportation Association of Southern California (TASC). Specific objectives include:

- (1) defining the potentials and priorities for future Rapid Transit routes beyond the initial priority system including, specifically, a route to International Airport;
- (2) developing service improvements in present surface transportation;
- (3) consideration of secondary distribution loops in major destination areas;
- (4) examining feasibility of exclusive bus lanes in streets and freeways, and utilization of existing rail lines for expedited commuter service.

Progress in the implementation of Program I has been lately stimulated by the allocating of $975,000 in matching federal funds from the Department of Housing and Urban Development. Specifically the federal funds are applied to activities under Program II (see below), with the net result that certain funds which otherwise would have been spent under Program II are freed for application to Program I.

The other concurrent program, Program II, is funded by the $3,600,000 of tideland oil funds allocated by the legislature. It will complete the preliminary engineering and planning for the initial priority segments of a Rapid Transit system for the Los Angeles metropolitan area. It was the announced aim of Program II that the preliminary planning, engineering and facility design be completed to a sufficient degree and level that:

- (1) construction costs can be reliably determined, financing requirements can be accurately defined and an appropriate method of construction financing can be developed;
- (2) operating revenues and expenses can be fairly estimated;
- (3) all affected communities and government agencies can relate the proposed system to their own activities; and, most important;
- (4) the public will know exactly what the District proposes to build, what it will cost and, in the case of any proposed bond issue, how it will be financed—in order that the electorate may make an informed decision at the polls.

To provide the supplementary and complementary manpower, experience and professional expertise required by a planning and engineering project of this magnitude and importance, the District contracted with a number of professional consulting firms to accomplish specific portions of the work, under the direction of the District professional staff. Included are:

Kaiser Engineers of Oakland and the Los Angeles architectural and engineering firm of Daniel, Mann, Johnson and Mendenhall (DMJM) associated together into a Joint Venture to accomplish the route selection, station location, and other engineering and planning associated with the design and function of the proposed physical facilities—and their cost.

A 50-year-old firm, Kaiser Engineers, is world-renowned for participation in the design and construction of many major projects. More recently, their specifically-created task force which specializes in the field of Rapid Transit has been retained by the National Capital Transportation Agency (Washington, D.C.), Port Authority Trans-Hudson Corp., Bay Area Rapid Transit District, City of Montreal, City of Baltimore and others.

DMJM, organized in 1949 and headquartered in Los Angeles, has assembled within its staff all the essential disciplines of planning architecture, engineering and systems. In the transportation field, for a variety of clients, including the City of Baltimore and Oahu Transportation Agency, the firm has participated in the development of rapid transit and urban systems, vehicle system analysis and development, planning and economics, and architectural design.

M. A. Nishkian & Company, Long Beach-based engineering firm has undertaken route planning, together with civil, structural, electrical and mechanical engineering, for the Airport-Southwest Corridor project. Currently under contract to the Los Angeles Department of Airports for traffic planning and street design work at Los Angeles International Airport, the Nishkian organization has undertaken numerous engineering programs for local and State government agencies in California, as well as for federal government agencies and private industry throughout the nation and overseas. These have included major programs in the area of civil, mechanical, chemical, electrical, structural, architectural, hydraulic, petroleum, and automation as well as nuclear engineering.

Coverdale & Colpitts (C&C), of New York City, was retained to formulate traffic and revenue data. C & C has analyzed and reported on mass Rapid Transit situations in most of the major cities where Rapid Transit is in operation. In the past 15 years they have undertaken 178 separate studies involving 73 railroads in the United States and abroad. As a result of their reputation in urban and mass Rapid Transit problems, their reports are universally accepted and are used by bond houses, and bond buyers, as a major contribution to the successful completion of numerous bonding programs.

Stone & Youngberg, municipal financing consultants headquartered in San Francisco, is reviewing the plan of the District staff for public financing of the first phase of Rapid Transit construction. For the past thirty years, Stone & Youngberg has been engaged as financing consultants on more than 500 public improvement projects involving every method of financing available to California communities.

"A fundamental and compelling objective of the entire engineering and planning program," began the official District statement that described the implementation of the project, "is to provide for adequate, meaningful dialog with each affected community—to the end that final Rapid Transit plans are determined in the light of individual community needs and desires, coordinated with the best possible plans to meet the public transportation needs of the entire, inter-dependent metropolitan area."

To accomplish this objective, the program was launched with a community-wide meeting of city officials, administrators and technical staffs from each of the cities directly affected by the proposed Rapid Transit routing. District officials outlined the scope of the two-year planning and engineering project, explained the involvement of the individual cities, and outlined the nature of the local data and information that would be required from the individual cities as the planning and engineering progressed.

This general meeting was followed up with a series of engineer-to-engineer meetings between District task force teams and their professional counterparts on the staffs of each of the cities involved. Local conditions were studied and local planning concepts were obtained to be factored into the District Rapid Transit route planning, station placement, and system configuration.

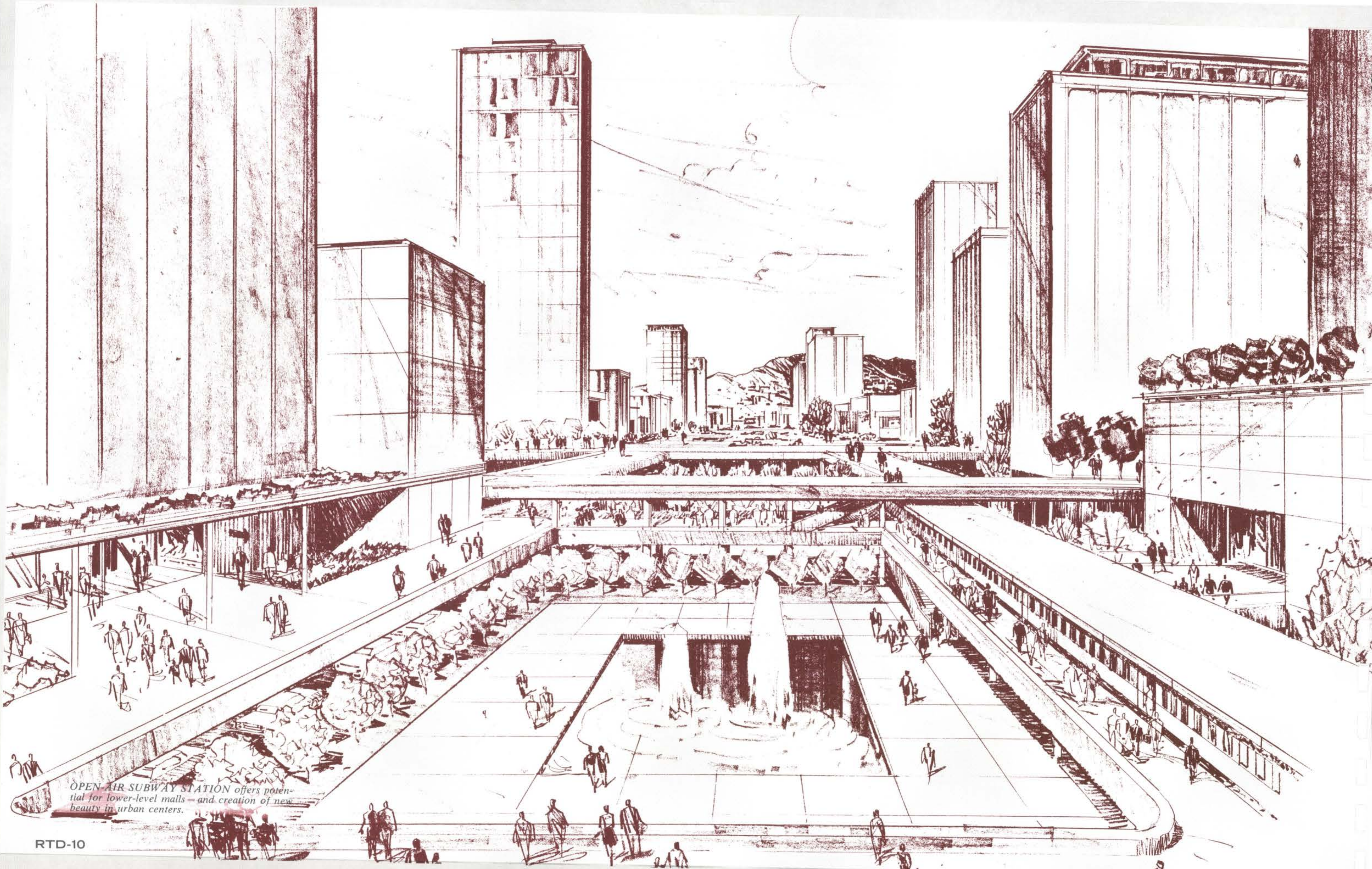
Alternate specific route alignments and station locations were developed, joint meetings with city engineers and planners in each basic corridor were held and widely publicized — with the alternate routings explained and local comments and judgments requested and received. The net result of this series of informational exchanges with the affected cities—as often as weekly, in some cases—is that the Rapid Transit route alignments and station locations recommended by the District in this Preliminary Report reflect substantial input from the entire community.

In addition to full cooperation from the technical and planning staffs of the affected cities, the District proposal also benefited from valuable input from many community civic organizations, particularly the Citizens Advisory Council on Public Transportation, and from such regional-planning groups as Transportation Association of Southern California (TASC) and Los Angeles Regional Transportation Study (LARTS).

After the issuance of this Preliminary Report, well-publicized informational meetings will be held throughout the District area — so that the District proposal, in its preliminary form, will be thoroughly understood by the general public as well as the officials of the affected cities. Provisions will be made to receive the comment and suggestions of the public; engineering teams from the District and its consultants will formally meet with city officials to receive official comment and suggestion.

When this data from the community has been received, analyzed and factored into the planning, a Final Report will be issued by the District in the spring of 1968. This will be followed, according to District law by hearings as requested by the cities desiring them and by additional informational activities to make certain that the public is aware of the District's proposal as reflected in the Final Report.

Again, community reaction, official and unofficial, will be received, analyzed and accommodated into the plans before they are officially finalized in anticipation of a construction bond financing proposal—to be submitted to the electorate in November 1968.



OPEN-AIR SUBWAY STATION offers potential for lower-level malls – and creation of new beauty in urban centers.

PRELIMINARY REPORT

BASIC PURPOSE OF RAPID TRANSIT

- One element essential to the development of a dynamic metropolitan area and the continued well-being of all its citizens is **adequate transportation**—the flexibility of private transportation balanced by the efficiency of public transportation.
- Two clearly established growth-characteristics of the Los Angeles metropolitan area are: (1) an increasing concentration of employment within the vertically-expanding urban core and (2) the continued outward spreading of single-family residential development, on the one hand, and on the other, the clusters of high-rise, multi-family dwelling units near transportation arteries.
- Problems of home-to-work travel via private automobile have been intensified by these patterns of metropolitan development. The result: (1) rush hour commuter trips growing ever-longer in time and distance; (2) congestion and delays which, with projected population and travel growth, can become intolerable to the public and stultifying to the economy; and (3) the ever-worsening problem of smog, at least 85 percent of which is produced from automobile exhaust gases, according to the Los Angeles County Air Pollution Control District.
- Mushrooming rush hour commuter travel requires public transportation which will efficiently, economically and dependably **move people instead of cars,** supplementing planned and existing freeway capacity in areas of concentrated residence and employment.
- That is the basic purpose of the priority-phase Rapid Transit system proposed in this Preliminary Report by Southern California Rapid Transit District, the public agency reponsible for public transportation. It is neither proposed nor contemplated that Rapid Transit would replace the automobile as the major provider of mobility. Rapid Transit, as described in this Report, is designed to substantially improve the availability, performance and dependability of public transportation for millions of people who **must** use it and for additional millions who on many occasions will **prefer** to use it.

The concentration of employment within the urban core area is expected to increase—even faster than the forecast population expansion. Between 1960 and 1964, 70 percent of all office space constructed in Los Angeles County was within this central area. By 1980, the excess of employment over workers in the urban core is predicted to reach 714,000.

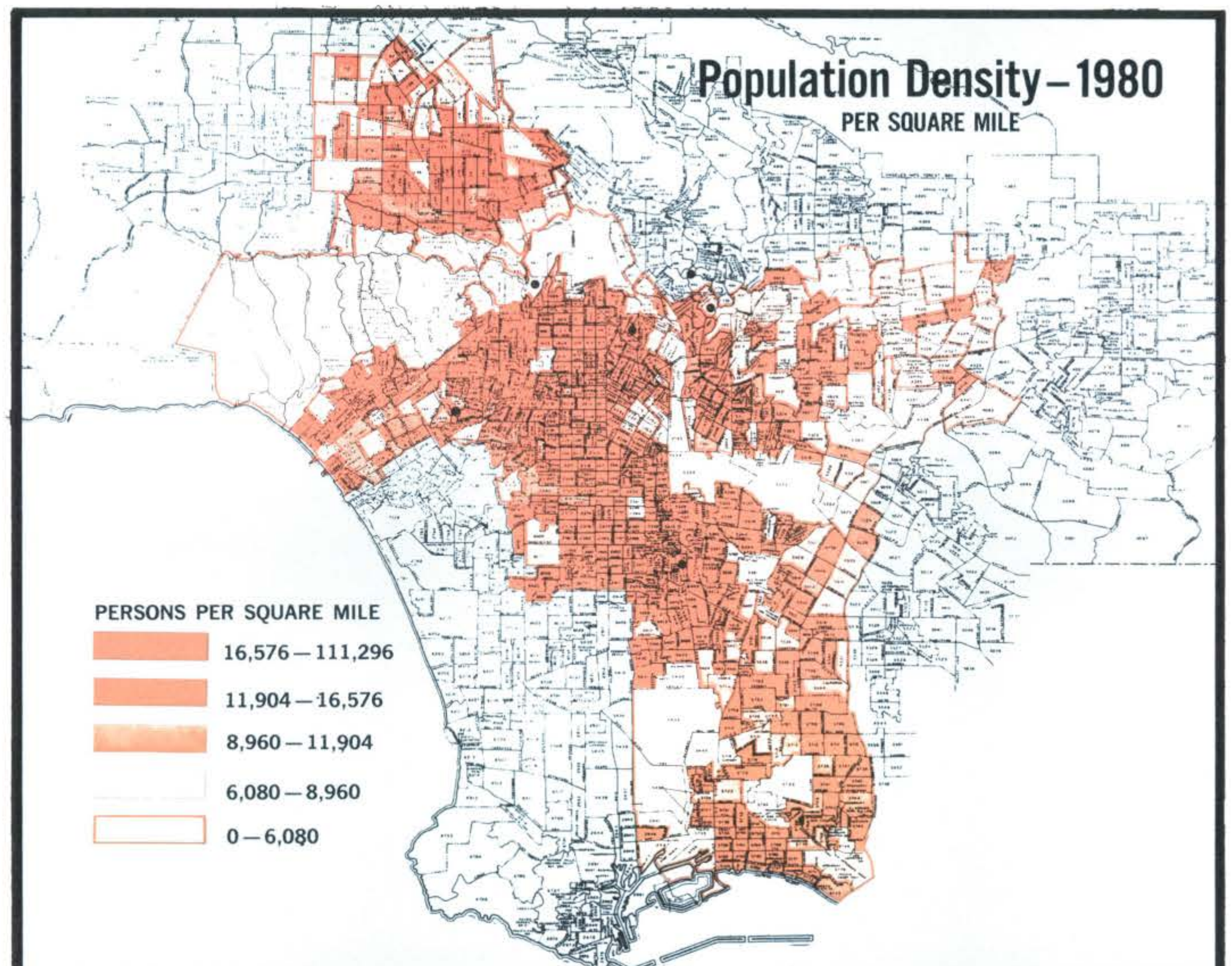
With this urban core as the heart of regional employment, commerce and financial activity, mobility **within, to** and **through** this vital area is essential. It is becoming increasingly evident that streets and freeways alone cannot provide this internal mobility.

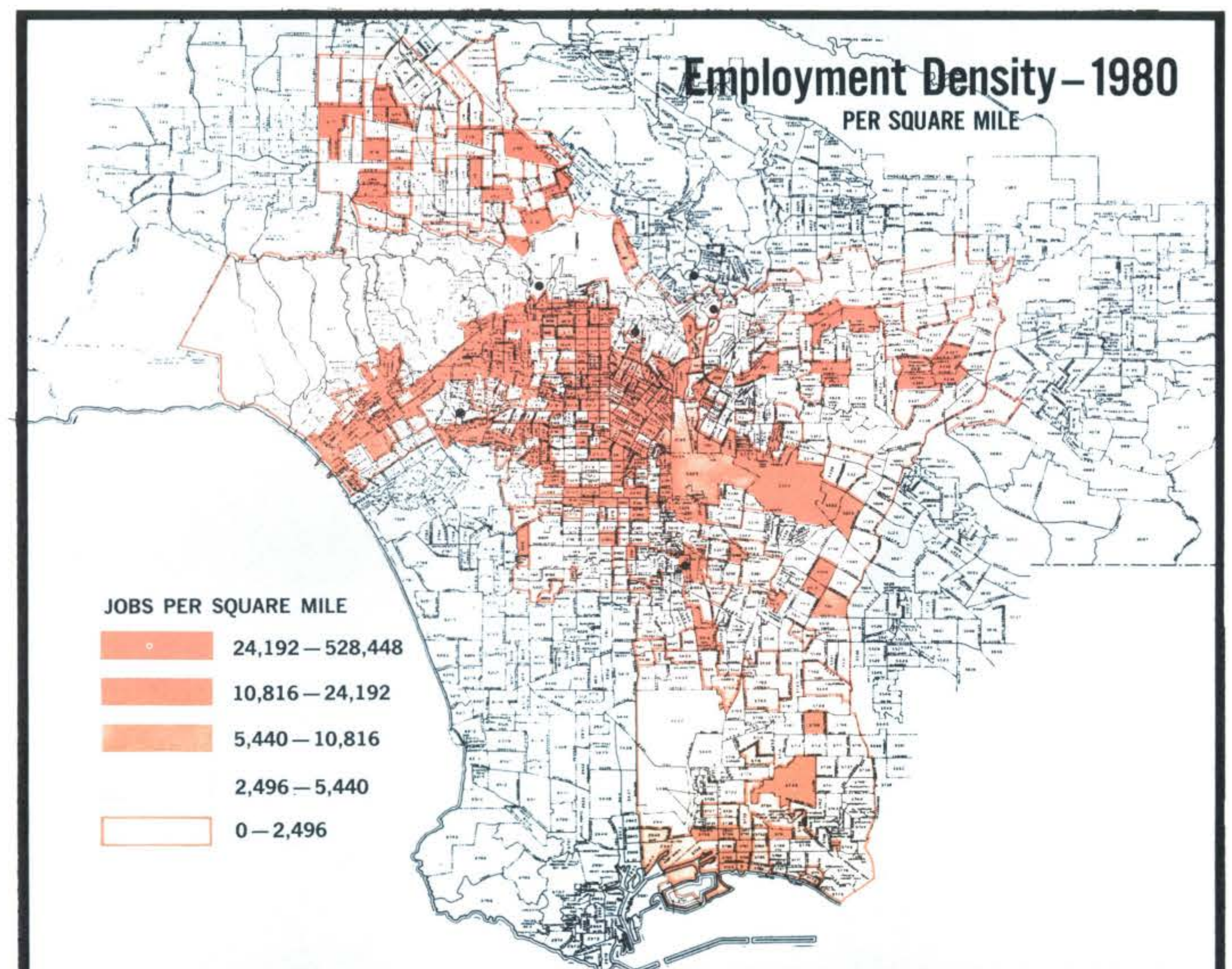
The streets and freeways constructed to serve this metropolitan heart are already strained by over-capacity traffic in the lengthening rush hour periods, city planners and freeway experts agree. And as the burden is intensified by additional population, automobiles and employment-concentration, the overload can be expected to virtually destroy the effectiveness of that part of the freeway system that is within this concentrated urban core.

The State Division of Highways estimates that traffic on virtually every freeway serving the urban core will be "very heavy" by 1980. "Very heavy," by Division of Highways definition means that an 8-lane freeway is carrying 200,000 cars and trucks daily, with thousands of other vehicles unable to get on it. Double-decking these freeways cannot substantially improve their ability to serve that area, unless surface streets are also double-decked to accept the additional traffic load. Clearly it is the function of public transportation to serve such an area of employment and commercial concentration.

But public transportation, choked in the same traffic congestion as are private cars, cannot offer the speed, economy and dependability that commuters require. To meet the problem of congestion — as well as the problem of distance — public transportation in this metropolitan area needs a grade-separated, exclusive right-of-way network: Rapid Transit.

The public transportation system proposed in this Preliminary Report is a bi-modal system. It combines the safety, efficiency, economy and dependability of grade-separated, electrically-powered, high-speed Rapid Transit cars, with the flexibility and adaptability of an expanded network of modern buses—designed not only to deliver and distribute passengers to and


Population Density – 1980
PER SQUARE MILE
PERSONS PER SQUARE MILE
16,576 – 111,296
11,904 – 16,576
8,960 – 11,904
6,080 – 8,960
0 – 6,080


Employment Density – 1980
PER SQUARE MILE
JOBS PER SQUARE MILE
24,192 – 528,448
10,816 – 24,192
5,440 – 10,816
2,496 – 5,440
0 – 2,496

from all parts of the high-speed, smog free, rail system but also to expand the level of public transportation in sections of the region not directly touched by the first-phase Rapid Transit routes.

The first-phase routes are part of an evolving Master Plan for public transportation (see map Page 6) being developed by the RTD in conjuction with studies now under way by TASC, LARTS and the Division of Highways, as well as other region-wide planning by the Southern California Association of Governments (SCAG) and the professional planners of the county and the various cities of the area. The routes under study are those which (1) are clearly of most immediate urgency and (2) would obviously be an integral and essential part of the eventual Master Plan for public transportation.

THE RAPID TRANSIT SYSTEM

Reduced to basics, the RTD proposes that the community build, as its first-phase Rapid Transit system, a 62-mile network of dual-rail, high-speed, computer-controlled ultramodern electric cars — operating on grade-separated, exclusive right-of-way in subways, on skyways or at road level (depending on the character of the area traversed) — and linking the residential areas of greatest population concentration with the areas of greatest employment concentration.

In selecting a Rapid Transit system specifically to meet local requirements and situations, every type of system known to be operative — or planned — throughout the world was carefully studied and measured against the yard-stick of Southern California needs and conditions. Every known drawing-board scheme or experimental system was investigated and considered.

The modern, dual-rail, steel wheel vehicle was ultimately selected because it is efficient, safe, comfortable, and reliable, with many years of proven operational experience. It is available — and the need in Los Angeles is immediate.

So-called monorail systems, both suspended and bottom-supported, are found to have switching problems, higher initial vehicle and trackwork costs, acceleration and deceleration limitations, and no major features superior to dual-rail. The Seattle and Tokyo installations of this type offer only point-to-point service and were not designed as heavy-duty, high-capacity, urban systems.

The most promising experimental system offering the best chance for a major scientific "breakthrough" is a vehicle supported on a thin film of air and propelled by a linear induction motor. In anticipation of further successful developments in this field, the fixed facilities of the system proposed for the Los Angeles area (representing about 80 percent of total system cost) are specifically designed to be convertible to the air-cushion vehicle, should it become feasible and available.

THE ROUTES (See map, Page 17)

The first-phase, high-priority routes recommended for initial construction are designed to link three major areas of population expansion and growth projection — San Gabriel Valley, San Fernando Valley, and the South Central area all the way to Long Beach — with the employment and population concentrations within the urban core. These include the Wilshire Corridor, Hollywood, the Central Business District and the southeast industrial area, the region which now contains 45 percent of all employment in Los Angeles County.

SAN GABRIEL VALLEY ROUTE:

Begins, in subway, east of Alameda Street and runs under Macy Street to Mission Road. There it emerges from subway and continues, at level, in the old Pacific Electric right-of-way, entering the center dividing strip of the San Bernardino Freeway just east of Cal State College. The route remains in the median strip as far as Baldwin Avenue in El Monte, where it leaves the free-

way on the PE right-of-way and continues via skyway structure to the terminal station just east of Peck Road.

Selection of this route assumes the eventual availability of the Pacific Electric rights-of-way, including that in the median strip of the freeway. Alternates to this routing which were studied included detailed studies of a strip immediately adjacent to and north of the freeway — which would necessitate the purchase of several hundred homesites—a route generally following Mission Road, and a line in East Los Angeles in the vicinity of Brooklyn Avenue.

The freeway median strip was selected mainly on the basis of adequate potential passenger service, least community disruption and lower acquisition and construction cost.

Stations (see map) are located about 1½ miles apart and are designed to serve the County Hospital, L.A. State College, and permit convenient access north and south, as well as from the communities east of El Monte.

SAN FERNANDO VALLEY ROUTE:

From its beginning on Sherman Way just east of Balboa Boulevard to the entrance to the tunnel under the Hollywood Hills at Universal City, the system operates across the Valley on skyway structure — except for a short tunnel under Van Nuys Airport. In amply-wide Sherman Way, Van Nuys Boulevard and Chandler Boulevard, the skyway structure is located in the street or in the center strip. The portion that parallels Lankershim Boulevard would require the purchase of private right-of-way along the east side, behind the commercial frontage.

The route emerges from the Hollywood Hills in subway in the vicinity of La Brea and Selma, continuing eastward under Selma with station exits and entrances providing close access to both Hollywood and Sunset Boulevards. It turns southward near the Hollywood Freeway, just east of Western Avenue and emerges into open-cut in private right-of-way to be acquired along the east side of Wilton Place. It goes into subway to join the Wilshire Boulevard segment near Western Avenue.

SOUTH CENTRAL ROUTE:

Begins in subway in the downtown area near Seventh and Main Streets, runs eastward in Seventh to east of Alameda where it turns south, emerging from subway south of the Santa Monica Freeway and continuing on skyway structure along the Santa Fe Railroad right-of-way through the city of Vernon and in the center strip of Pacific Boulevard through Huntington Park. At Florence Avenue, the skyway turns southwest in private right-of-way to join the route of the proposed Industrial Freeway at Firestone Avenue. It runs at grade in the median of the freeway, through Watts and through Compton; then it follows the right-of-way of the Pacific Electric in skyway structure to the east side of the Los Angeles River. Here it turns south, at grade, to Ocean Boulevard in Long Beach and into subway to a terminal east of Pine Avenue.

CENTRAL AREA AND WILSHIRE CORRIDOR

Joins the San Gabriel Valley segment in subway under Macy Street at Union Station, and runs westward to Broadway, then south to Seventh to a major interchange with the South Central segment. It continues under Seventh westward to Hoover Street, and from there westward under Wilshire to a terminal at Fairfax Avenue.

Stations in this area of high destination-concentration are spaced about a half-mile apart at major intersections.

THE SYSTEM: IN GENERAL

The entire system covers 62 miles, of which 18 are in subway, 20 at grade, three in open cut and 21 in skyway structure. There are 45 stations.

More than 54 per cent of the present population of Los Angeles County lives within three miles of these routes.

More than 65 per cent of all job locations in Los Angeles County will be served by proposed Rapid Transit routes.

It is estimated that 300,000 passengers will ride on the system on an average weekday in 1980 — or some 93,000,000 passengers annually. Of these, 65,000,000 would be diverted annually from automobile transportation.

A feeder bus network of more than 300 miles will be established to serve the system with service on present bus routes to be augmented, as necessary.

By 1980, the public transportation network in the metropolitan area — buses and Rapid Transit — will carry one million passengers on an average weekday and more than 325 million annually.

STATIONS

RTD Rapid Transit stations will be the most modern in the world. Swift and unimpeded passenger flow at all hours will be assured through such modern conveniences as automatic equipment to speed fare collection, and fast and convenient escalators to carry passengers to and from skyway and subway levels.

In addition, easy and convenient connections will be provided with the Rapid Transit District's feeder bus facilities. Provisions are made for park 'n ride and kiss 'n ride travelers. Generous parking areas will be provided at suburban stations with additional parking facilities to be provided as patronage warrants.

Stations are capable of accommodating several thousand passengers at a time. District criteria requires that passage through a station — from train to street — be accomplished in not more than 30 seconds. Accommodations can be tailored to handle the morning "to work" flow as well as the evening "homebound" surge. Automatic fare handling equipment will accommodate cash or tickets, including monthly tickets which will further simplify the commuter's routine.

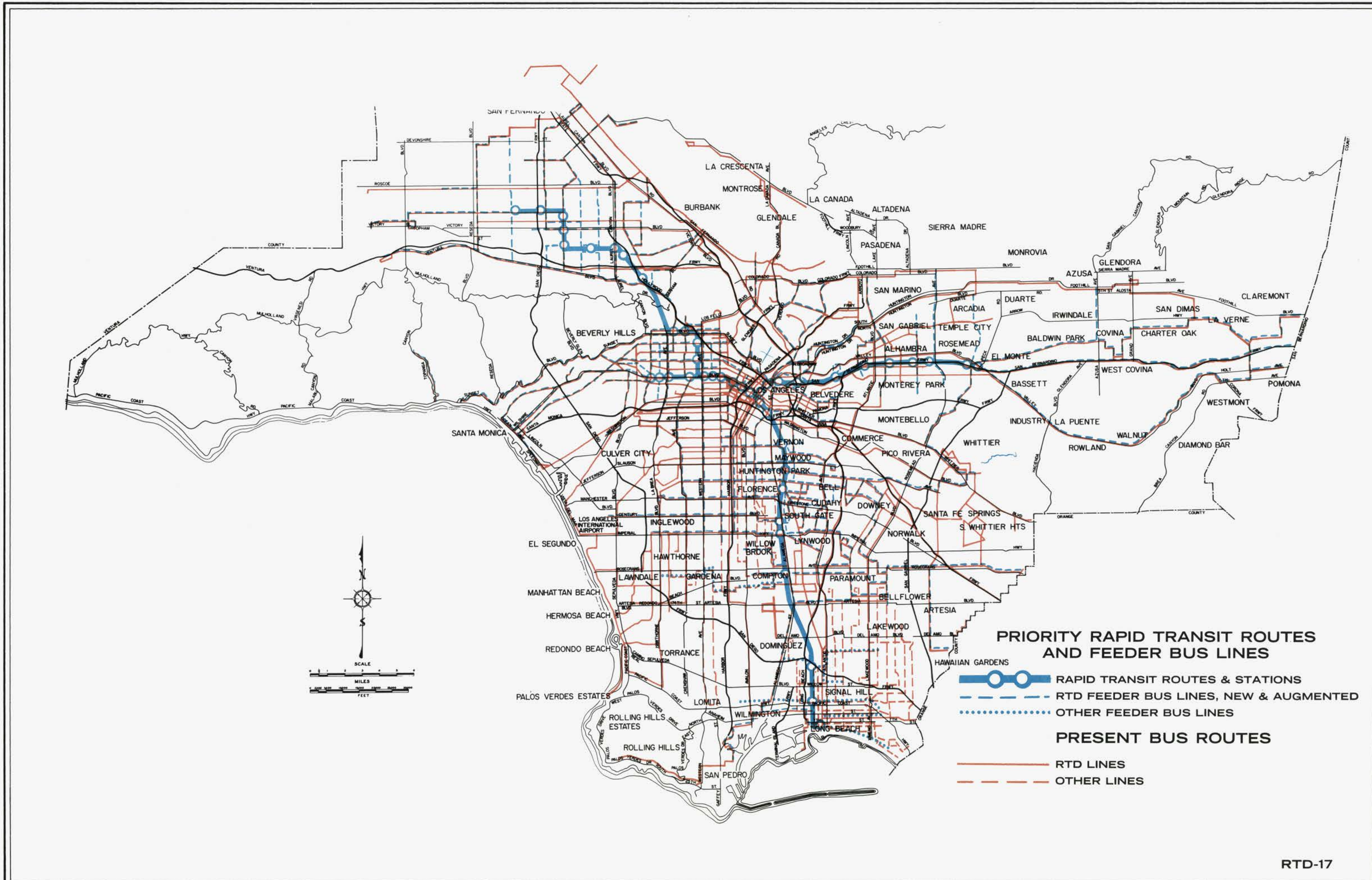
SKYWAYS

Skyway structures traverse both private rights of way, and medians of public streets.

Passengers riding the trains in skyway service will be afforded a spectacular view of the surrounding area from seats approximately 41 feet above ground level.

At the same time, surface traffic and pedestrians will retain an unobstructed view of signs and displays at offices and business establishments in either side of the skyway structure.

A minimum clearance of 28 feet to the bottom of the aerial structure will be maintained between stations when located in public streets.


PRIORITY RAPID TRANSIT ROUTES AND FEEDER BUS LINES
RAPID TRANSIT ROUTES & STATIONS
RTD FEEDER BUS LINES, NEW & AUGMENTED
OTHER FEEDER BUS LINES
PRESENT BUS ROUTES
RTD LINES
OTHER LINES
SCALE
MILES
FEET
SAN FERNANDO
LA CRESCENTA
MONTROSE
BURBANK
GLENDALE
LA CANADA
ALTADENA
SIERRA MADRE
PASADENA
MONROVIA
AZUSA
GLENDORA
CLAREMONT
SAN MARINO
ARCADIA
DUARTE
IRWINDALE
SAN DIMAS
LA VERNE
SAN GABRIEL
TEMPLE CITY
ROSEMEAD
BALDWIN PARK
COVINA
CHARTER OAK
ALHAMBRA
EL MONTE
WEST COVINA
POMONA
BEVERLY HILLS
LOS ANGELES
BELVEDERE
MONTEREY PARK
BASSETT
WESTMONT
MONTEBELLO
INDUSTRY
LA PUENTE
WALNUT
SANTA MONICA
WHITTIER
ROWLAND
DIAMOND BAR
COMMERCE
VERNON
CULVER CITY
PICO RIVERA
MAYWOOD
HUNTINGTON PARK
BELL
FLORENCE
CUDAHY
DOWNEY
SOUTH GATE
SANTA FE SPRINGS
LOS ANGELES INTERNATIONAL AIRPORT
INGLEWOOD
S. WHITTIER HTS
NORWALK
EL SEGUNDO
LYNWOOD
WILLOW BROOK
HAWTHORNE
LAWNDALE
GARDENA
COMPTON
PARAMOUNT
MANHATTAN BEACH
BELLFLOWER
ARTESIA
HERMOSA BEACH
LAKEWOOD
REDONDO BEACH
DOMINGUEZ
TORRANCE
HAWAIIAN GARDENS
PALOS VERDES ESTATES
SIGNAL HILL
LOMITA
ROLLING HILLS ESTATES
WILMINGTON
LONG BEACH
ROLLING HILLS
SAN PEDRO
RTD-17

SUBWAYS

Unique coloring and lighting are among features to be coordinated into subway stations, which offer great challenge to Rapid Transit planners from an environmental standpoint.

Where possible, access will be gained to the subways from open plazas, malls and commercial establishments. The various passenger concourses, mezzanines, balconies and other Rapid Transit traveler areas will be served by escalators originating in wide sidewalks to speed entry.

Congestion will be avoided at corners, store location entrances and other access points.

Simplified transfering will be provided between feeder bus and subway trains by coordinating subway station and bus stop locations.

OPEN CUT AND SURFACE

Open cut configurations offer an opportunity for providing Rapid Transit service in depressed alignments while permitting future community development in air rights above the track.

Although the cost is obviously less, the need for grade separation from surface traffic precludes "on-grade" Rapid Transit construction except in specialized situations.

Where rights-of-way parallel existing barriers – as in the case of freeway medians or the Los Angeles River – surface or on-grade configuration can be employed.

LANDSCAPING & AESTHETICS

Architectural design of stations and way structures will relate to the aesthetic needs and character of individual communities. Landscaping of open-cut and private rights-of-way will provide greenbelt and parkway areas.

TRANSIT VEHICLE

The Transit vehicle chosen for the Los Angeles system will reflect the most advanced thinking and technology to provide the type of system that will have the greatest appeal and service to the public – both today and in the future.

Trains are designed to provide the ultimate in passenger comfort in seating, air conditioning and lighting, while complying with the maximum operating criteria for dependable, high-speed, safe service.

Electrically-propelled, smog-free lightweight trains, capable of 75-mile-an-hour maximum speeds and 40-mile-an-hour average speeds (including station stops) with steel wheels operating on steel rails, most effectively meet the requirements of speed, safety, quietness, automation, operational flexibility and economy.

Eight-car trains will provide for a capacity of 1,000 passengers and can be spaced 90 seconds apart during rush hours in the central area and three minutes apart in suburban areas. In off-peak hours, trains would run at 10 minute intervals during the day and every 15 minutes in the evening hours.

CONTROL AND COMMUNICATION

Automatic train operation will be provided continuously through a computer placed aboard the train and connected with a master control center.

Data for train control will be transmitted between wayside equipment and computers on the trains. The on-board computers keep the trains spaced at safe distances apart and bring trains to smooth, accurately positioned stops in stations. A computer in the master control center will keep a check on the position of each and every train in the system, compare their movements with predetermined schedules and make necessary adjustments in train movements to take care of special situations.

The control system will insure safe operation at high speeds with frequent service, on-time scheduling and guaranteed spacing of trains.

AUTOMATIC FARE COLLECTION

Passengers entering the Rapid Transit station concourses will find cash sale vending machines.

Upon deposit of the fare, the machine will disburse magnetically imprinted plastic cards. Insertion of these cards in automatic turnstiles will permit access to the station at the point of origin. At the destination point where cards are inserted into the exit turnstiles, automatic computers will calculate the fare required, deduct it from the balance on the card, and allow the passengers to exit.

YARDS AND SHOPS

The District will construct a main shop facility for the overhaul, inspection and maintenance of the Rapid Transit vehicles, automatic train control and fare collection equipment.

Four storage yards will also be established for the dispatch of trains in and out of service to meet peak and off-peak hour requirements, storage of vehicles not in operation, and daily washing, servicing and inspection.

USE OF SYSTEM

Coverdale & Colpitts estimates 327 million rides in 1980 on the combined bus and transit system, over a million rides on weekdays. Of these, 93 million will be on Rapid Transit – 65 million of which would be diverted from autos, including 54 million during peak congestion hours on freeways.

FARE SCHEDULE AND ESTIMATED REVENUES

The proposed Rapid Transit fare structure provides for the same minimum adult fare (30¢) as on the present bus system for rides up to five miles. Fares for longer rides are based on a declining rate per mile – with the fare for the maximum 43-mile trip between the Long Beach and San Fernando Valley terminal being $1.05.

A table of one-way fares and travel times between representative stations is below:

	Time in minutes	Fare	Cost by auto at 10¢ per mile not including parking
Fairfax Ave. to Civic Center	16	$ .40	$ .80
El Monte to Cal State LA	13	.45	.90
San Fernando Valley Terminal to Wilshire & Western	29	.75	1.80
Watts to Central Business Dist.	12	.45	.79
Compton to Vernon	11	.45	.78
Alhambra (Fremont) to Union Station	7	.30	.58
Long Beach Terminal to Hollywood (Vine Street)	41	.90	2.97

Rapid Transit passengers beginning or completing their trip by feeder bus would not pay an additional bus fare. They would be charged, by present rates, five cents for a transfer for the first two miles and eight cents per zone thereafter.

Based on this fare structure and the indicated level of patronage, gross passenger revenue for the combined bus and Rapid

Transit system is estimated by Coverdale & Colpitts to be $88.8 million in 1980. Other revenue (advertising, concessions, parking fees (25¢ all day), etc.) would add $2.7 million. Total estimated 1980 system revenue: $91.5 million.

Operating expenses, based on 1967 wage and cost levels, for the combined systems are estimated to be $64.4 million, plus a 10 percent annual reserve for replacement of $9 million, or a total expense of $73.4 million.

It is reasonable to assume that 1980 wage and cost rates will be well in excess of the 1967 level on which this estimate is based. Some of these higher costs may be absorbed by the District from its revenues, perhaps $10 million in all. Therefore, it is estimated that system revenues, after meeting all operating expenses, would be sufficient to provide approximately $8.1 million per year for construction bond retirement.

COST OF SYSTEM

Preliminary estimates of the cost of the proposed 62-mile Rapid Transit system have been developed by the consulting engineers.

Because of the scope of the project – and the fact that construction will not be completed until approximately seven years after voter approval of the method of financing construction bonds – escalation comprises a substantial portion of the eventual total cost. The cost of wages, materials and equipment has been rising steadily—as much as seven per cent annually in recent years. This means that every year's delay in starting construction may add as much as $100 million to the cost of the project.

The cost of the project and the method of financing the cash requirements must be carefully adjusted to conform with the construction schedule – which, in this instance, is considered to run from 1969 to 1976.

Costs	
Construction	$ 784,864,000
475 Rapid Transit Cars	102,172,000
Right-of-way*	130,500,000
Retiring MTA bonds	31,500,000
Additional Feeder Buses	5,500,000
Contingencies	139,713,000
Escalation (1967 to 1976)	377,453,000
TOTAL to be financed	$1,571,702,000

*Does not include $69,000,000 which would be added to right-of-way and construction costs in the event railroad rights-of-way are not available.

AIRPORT–SOUTHWEST CORRIDOR

Because of mounting traffic congestion in the vicinity of International Airport and the projections of rapidly increasing public use of these facilities, study of the feasibility of a Rapid Transit line connecting the airport with the proposed Downtown Air Terminal is being given priority consideration. Engineering contracts have been let for the detailed study of an Airport-Southwest Corridor Route as a possible part of the initial phase of Rapid Transit construction. Matching funds received from the federal Department of Housing and Urban Development have speeded this study.

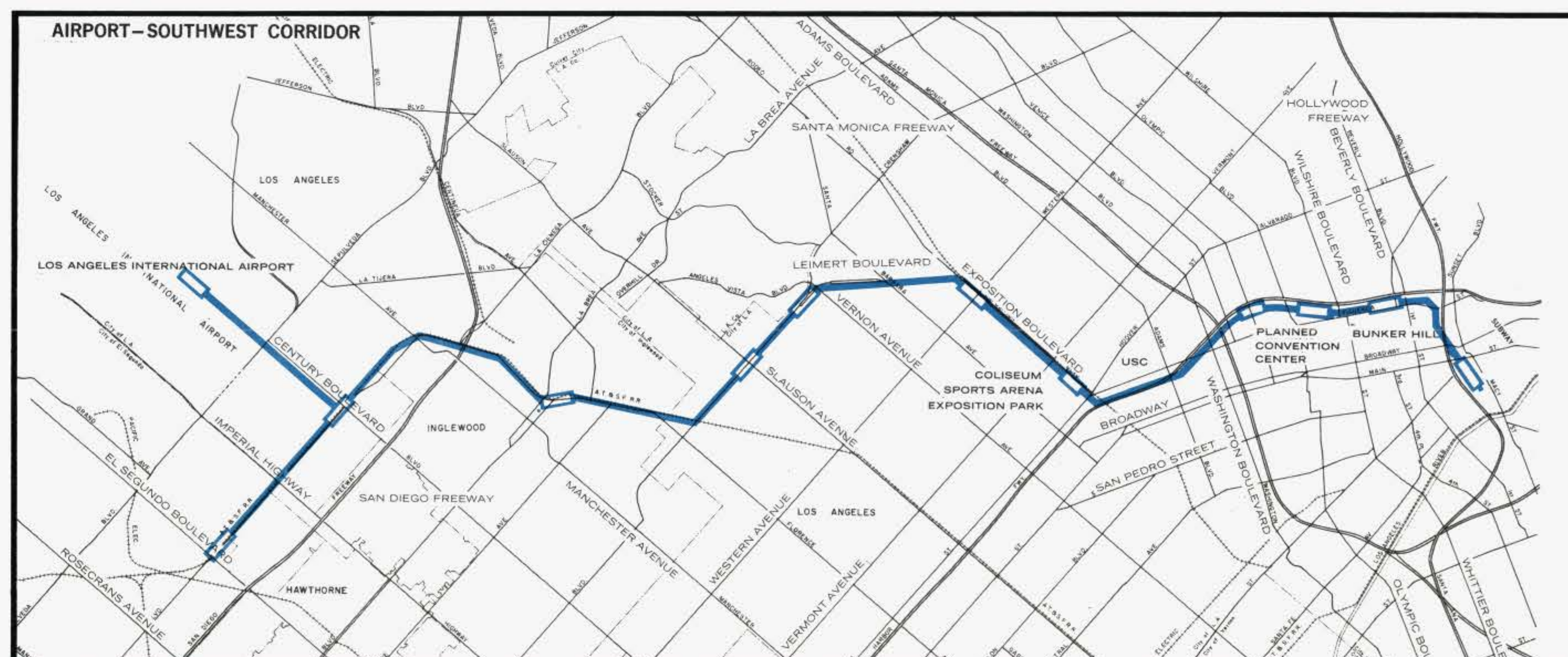
Such a Rapid Transit route, in addition to providing an alternate means for travelers, visitors and employees to reach the airport, would also be designed to serve the Convention Center, Coliseum-Sports Arena area, Exposition Park and the University of Southern California, and would provide access to Rapid Transit facilities for residents of the Inglewood, Torrance and South Bay areas.

The District commenced its study of the estimated cost of the acquisition and construction and of incidental expenses connected with the Airport-Southwest Corridor line after the studies had been commenced on the four-corridor first phase system. At this time, going forward with the Airport-Southwest Corridor line appears feasible from an engineering standpoint, but detailed costs of the acquisition of right-of-way and construction and other costs or expenses are not yet in a definitive status.

Revenue from the Airport-Southwest Corridor line will come from a special service for airport passengers traveling on a point to point basis between L. A. International Airport and the proposed airlines terminal in the Union Station area, and, in addition, from separate local service which will be provided at important intervening locations.

Maintenance and operation costs of the line as proposed on the map attached hereto would be comparable to the maintenance and operation costs already developed for the skyline structures and stations constituting the overhead rail structures for the four-corridor system. Although studies of patronage have not been completed, it is anticipated that the line should produce revenue sufficient to meet its cost of maintenance and operation.

Construction cost is estimated to be in the range of $375,000,000, assuming substantial use of aerial structures and public rights-of-way.



The proposed method or methods of financing this line could be the same as those proposed for the four-corridor system. However, because of the special service proposed for air line passengers and the interest of the Airport Commission, additional financing sources may be available. Such sources could include part of the funds proposed for the airport development, special taxes relating to air line passengers, financial assistance from the air lines, federal aid and similar sources.

At this time, it is proposed that the Airport-Southwest Corridor line, since it will be compatible with the four-corridor system, will be in plan and design as to stations, terminals, structures and facilities not unlike those facilities pictured or described in this Report.

Planning in regard to this line and the possible routes and locations of facilities are proceeding in conferences with the appropriate local governing bodies and other agencies that may be affected or interested, taking into consideration any available master or general plans for the areas affected by the route.

THE NEED & THE BENEFITS

● The urban core of the Los Angeles Metropolitan area contains most of the region's **basic industry.** Forty-five percent of **all** jobs in Los Angeles County are in the urban core, but only 30 percent of the workers – creating an army of at least 432,000 commuters who drive to the urban core daily and return to their homes to spend their paychecks. Economists say that each commuter creates a job-and-a-half in his home community.

At least 40 percent of all income generated in the suburbs is DIRECTLY related to employment located in the urban core. Rapid Transit will protect this source of suburban income.

● Freeways alone will not – and were not intended – to provide the commuter mobility to keep the economic heart of the area, the urban core, healthy. The Division of Highways is reported as stating that by 1980 thousands of commuters will not be able to even get on the freeways that serve this congested inner area.

Rapid Transit will permit the freeways to fill their important transportation role.

● At least 10 million square feet of land in the Central City area alone will be better utilized when there is Rapid Transit – increasing future assessed valuation by at least $1 billion, equal to $100 million a year in future tax receipts.

It will cost Los Angeles County taxpayers less to build Rapid Transit than not to build it.

● High-employment industries seek to centralize. When inadequate transportation curtails this, these industries find a more favorable urban area in which to locate – or re-locate. Economists predict that, if mobility deficiencies projected for the local urban core are not met; the growth of new job opportunities may be diminished by as much as 20 per cent. This could create a loss of the productivity and the spending power of 100,000 jobs.

Rapid Transit will prevent this loss of jobs—and will stimulate the addition of more.

● Excess demand over capacity of the 1980 freeway network serving the urban core is estimated as high as 225,000 commuters – an annual payroll up to $1.5 billion. To the suburban areas, this represents as much as $5 million a year in sales taxes and $115 million in real estate taxes.

Rapid Transit will make this additional payroll and these new taxes available to the suburban areas.

The proposed Rapid Transit Systems will serve:

66% of all jobs in manufacturing
76% of all jobs in finance, insurance and real estate
68% of all jobs in government
87% of all jobs in wholesaling
64% of all jobs in construction
78% of all jobs in transportation, communication and utilities

Continued mobility and accessibility is essential to the employment growth predicted for these basic industries within the urban core – mobility that Rapid Transit must provide.

Every citizen whose paycheck, customers, suppliers, patrons or constituents are affected by these basic industries has a personal stake in Rapid Transit.

● The money to build the system, in contrast to many other taxes, will be spent almost entirely in the local area for wages, materials and services to local businessmen and workers – and thus returned to the community in the form of new income – more than 40 million man-hours, for example, during construction.

Money to operate the system – wholly derived from patrons' fares – will provide a continuing source of new income and wages for the area.

Rapid Transit will create new jobs.

PERSONS USING THE RAPID TRANSIT SYSTEM . . .

either by necessity or through choice, would benefit from such advantages as:

- **Reduced home-to-work travel time,** with the savings invested in family activities; personal recreational, educational and cultural pursuits; or in civic or community affairs.
- **Reduced travel costs** — as much as 75 percent compared with the cost of driving, parking and maintaining an automobile. Eliminating home-to-work travel can save as much as $70 a year in re-classified car insurance alone.
- **Increased safety** — from 1964 through 1966 there were 20,280 collisions involving injuries on Los Angeles County freeways. On Rapid Transit facilities operated by New York Transit Authority during the same period there were 17 — and the system carried over four billion passengers. On Los Angeles County freeways — 489 fatalities in those three years alone; on the New York Transit Authority system — *not one fatality in 39 years.*
- **Increased job opportunity** — in addition to the hundreds of new jobs adequate mobility will make possible. Rapid Transit will greatly expand the number of jobs workers can get to — particularly those dependent on public transportation.

TRAVELERS *NOT* USING RAPID TRANSIT . . .

would benefit from:

Increased freeway efficiency. There are nearly two million person-trips daily estimated on the freeways and traffic arteries that parallel the proposed Rapid Transit routes. Of these, 25 percent of the rush hour trips would be diverted to Rapid Transit, Coverdale & Colpitts estimates. The District Engineer of the Division of Highways estimated that even a 10 percent diversion would result in more efficient freeway operation.

Increased freeway construction. By making unnecessary the building of additional freeways (beyond the 1980 Master Plan) within the Central Area — where freeway costs can be triple the average — Rapid Transit would free highway funds for many miles of new freeways in the peripheral areas — where they are most effective.

Reduced traffic congestion on surface streets. Diversion of a substantial percentage of commuter travel to Rapid Transit will reduce the volume of traffic on neighborhood surface streets which serve the freeway on-ramps and off-ramps, particularly in the school-travel hours and late afternoon shopping hours.

BENEFITS OF RAPID TRANSIT TO THE COMMUNITY

Business and industry, seeking West Coast expansion, will chose an urban area with adequate transportation.

Enlarged general tax base, through more efficient use of land space; higher intensity development in urban centers; increased evaluation of urbanized area — with attendant reduction of the share of the tax burden on single-family residences.

Multiply effect and use of public-provided educational, cultural and recreational facilities, reducing need for additional tax investment in this field.

Smog reduction: Every trip made by Rapid Transit instead of by auto will make a contribution to the reduction of smog — at least 85% of which is caused by automobile exhaust.

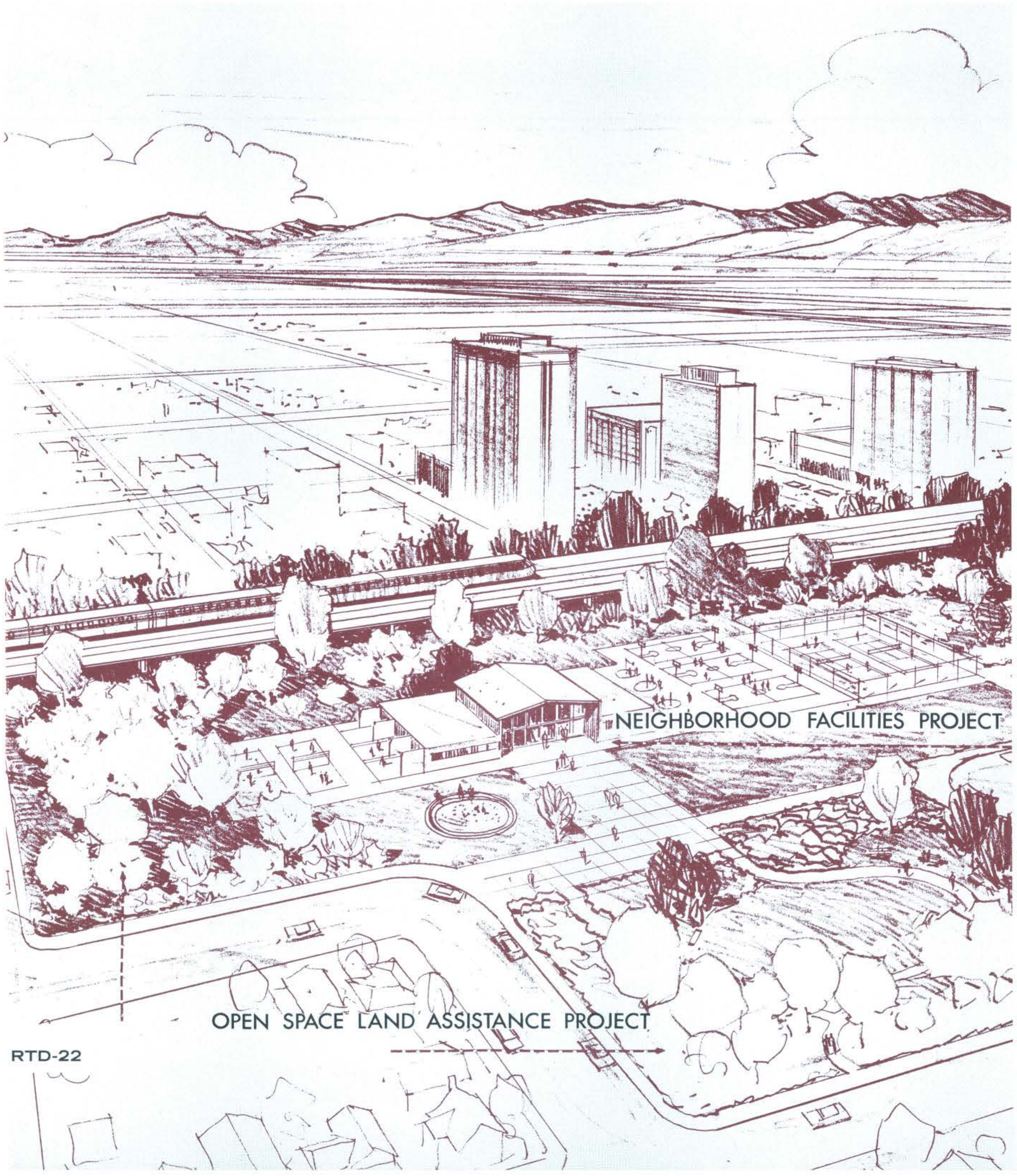
Increased area productivity through increased area mobility.

Increased job availability for unemployed and under-employed and a compensating reduction in tax-supported welfare programs.

Continued flexibility of residential choice — enabling families to live near mountains, beaches and similar attractive environments.

Rapid Transit would be a stand-by alternate method of travel, if legal restrictions in the use of automobiles became necessary — on either a temporary or permanent basis.

Proposals are already being made to solve the traffic congestion and smog problems by restricting, by law, the use of automobiles and freeways. As these problems mount, through mushrooming population and vehicular use, these pressures will increase.



NEIGHBORHOOD UP-GRADING, through cooperation with renewal and development agencies and projects, can be stimulated by Rapid Transit stations in under-developed areas.

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

TABLE OF CONTENTS

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.

graphed 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.

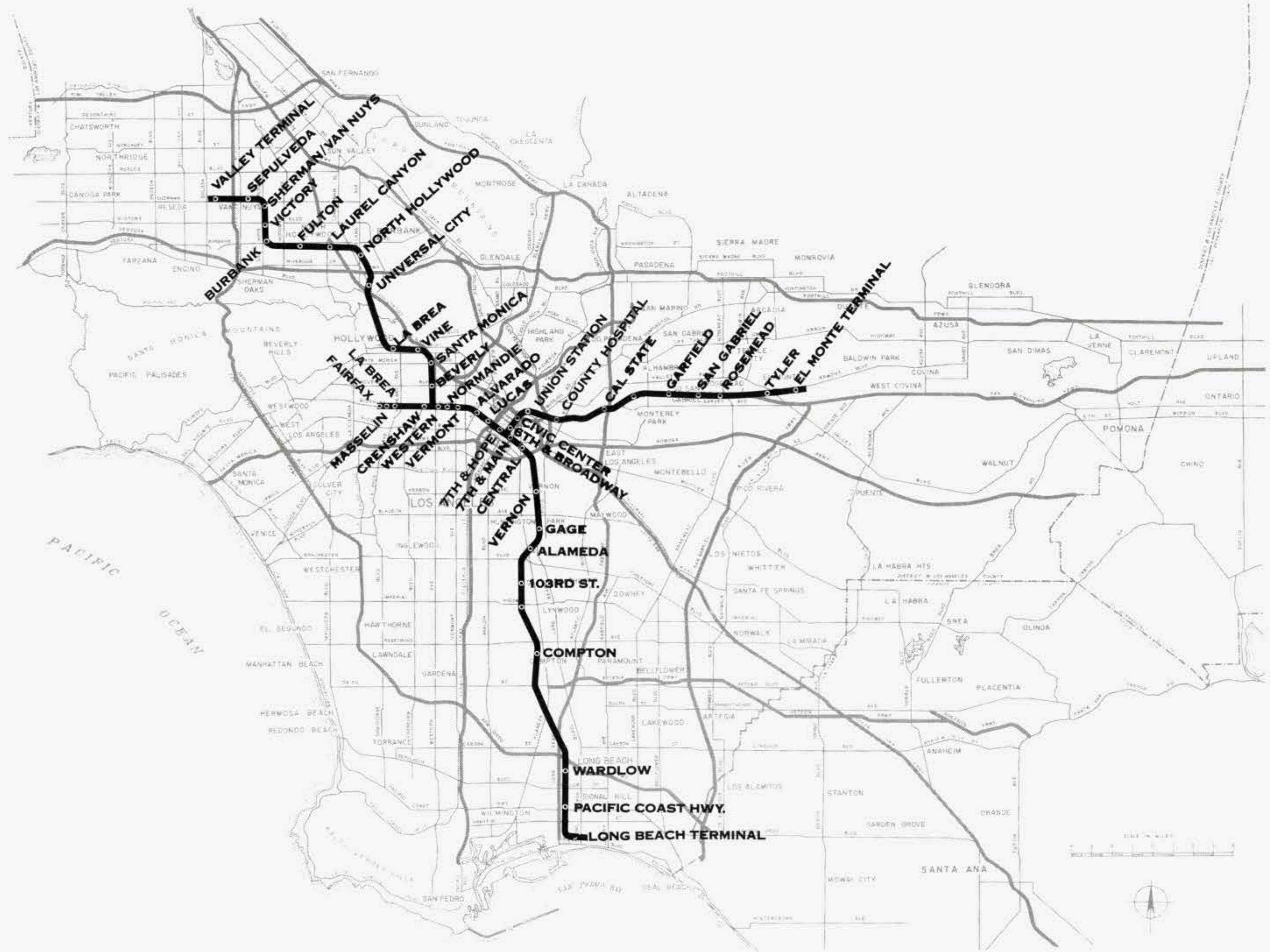
‡ Includes 20 sec. dwell time at each station.

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 (columns)

	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 (columns)

	BALBOA TERMINAL	SEPULVEDA	SHERMAN-VAN NUYS	VICTORY	BURBANK-VAN NUYS	FULTON	LAUREL CANYON	NORTH HOLLYWOOD	UNIVERSAL CITY	LA BREA (SFV)	VINE	SANTA MONICA	BEVERLY
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 (columns)

	EL MONTE TERMINAL	TYLER	ROSEMEAD	SAN GABRIEL	GARFIELD	FREMONT	CAL STATE	COUNTY HOSPITAL
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
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

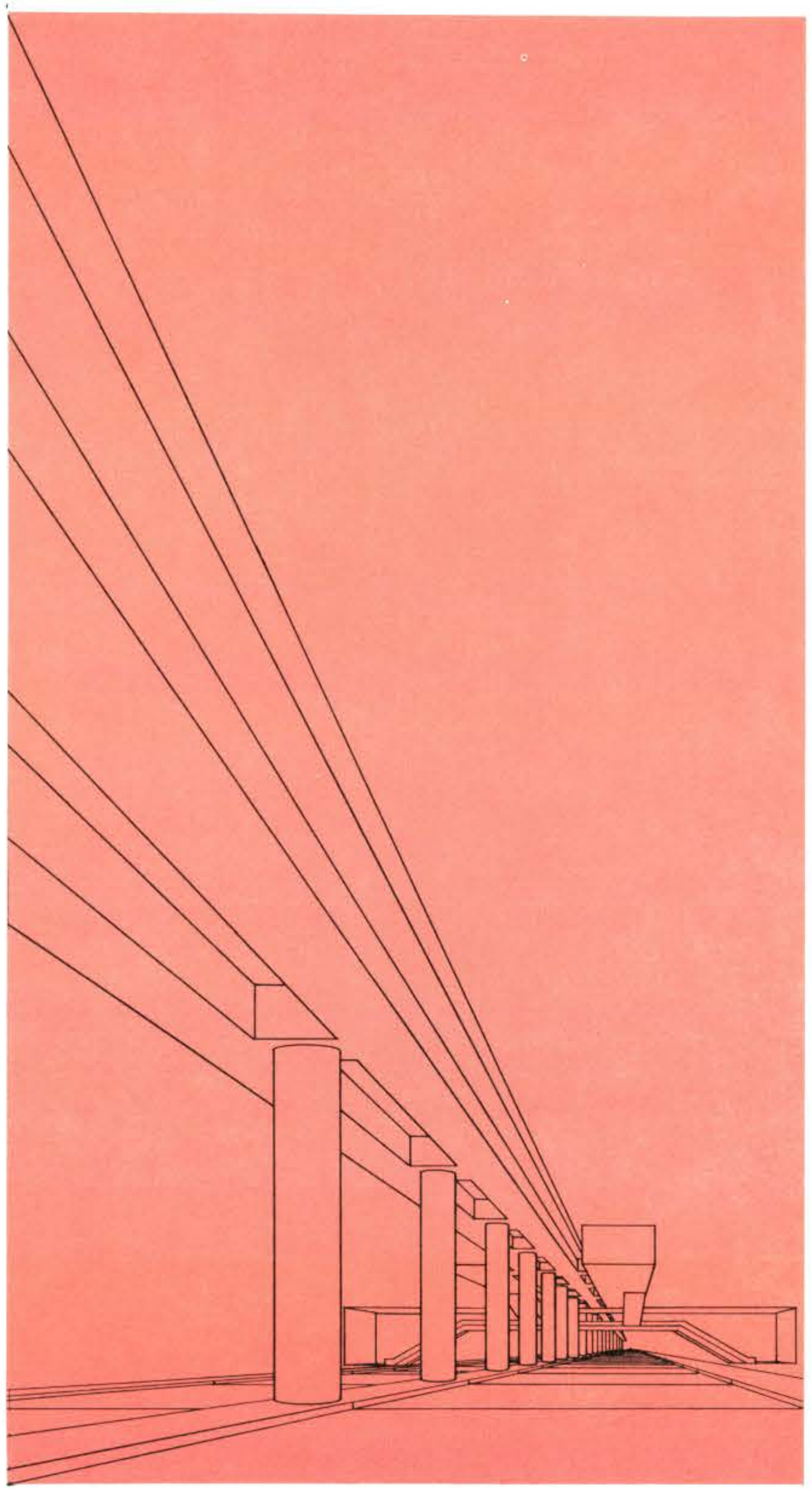
LONG BEACH CORRIDOR (columns)

	LONG BEACH TERMINAL	PACIFIC COAST HWY.	WARDLOW	COMPTON	IMPERIAL HWY.	103RD ST.	ALAMEDA	GAGE	VERNON	7TH & CENTRAL	7TH & MAIN
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
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
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.

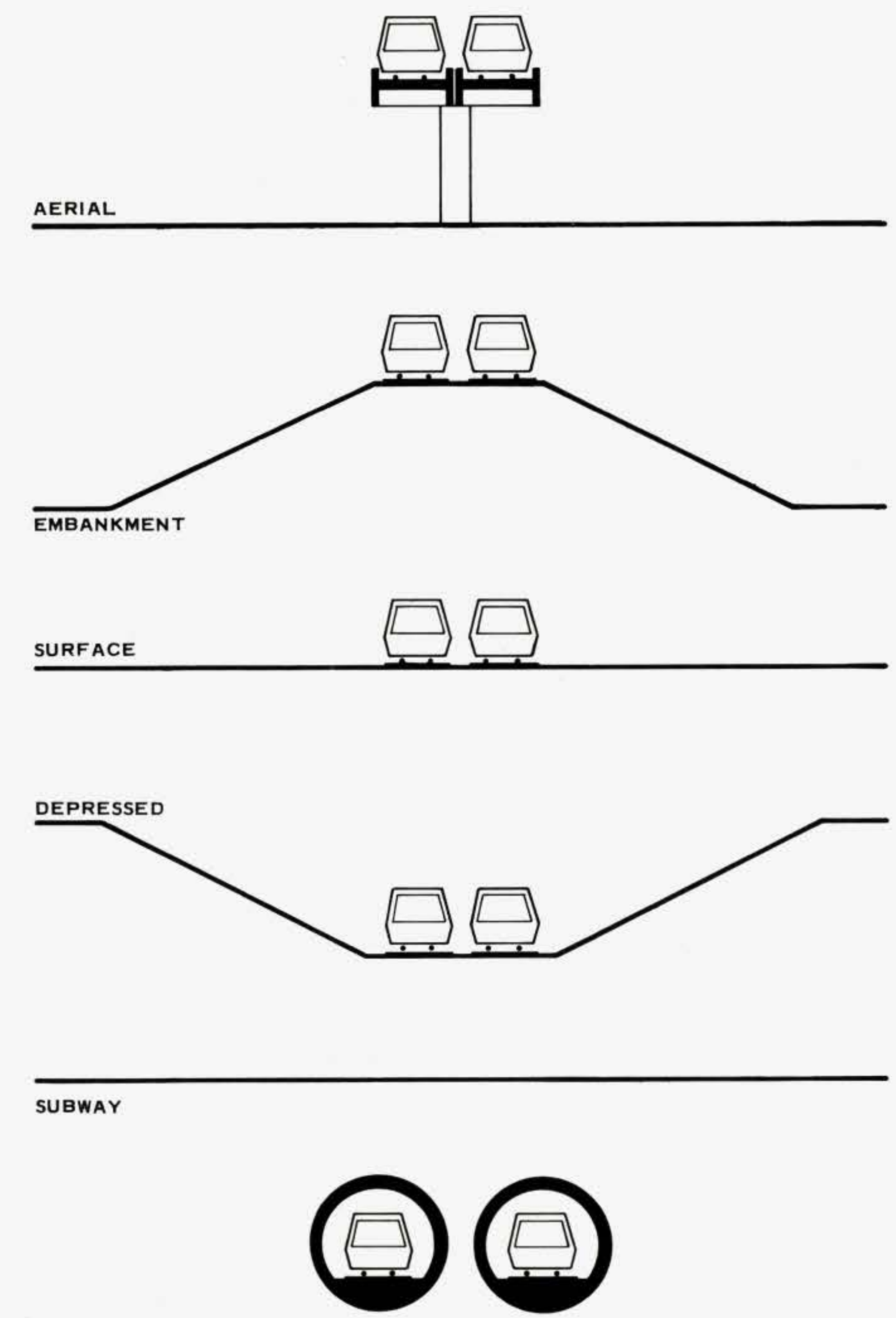
ROUTE CONFIGURATION CONSIDERATIONS

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

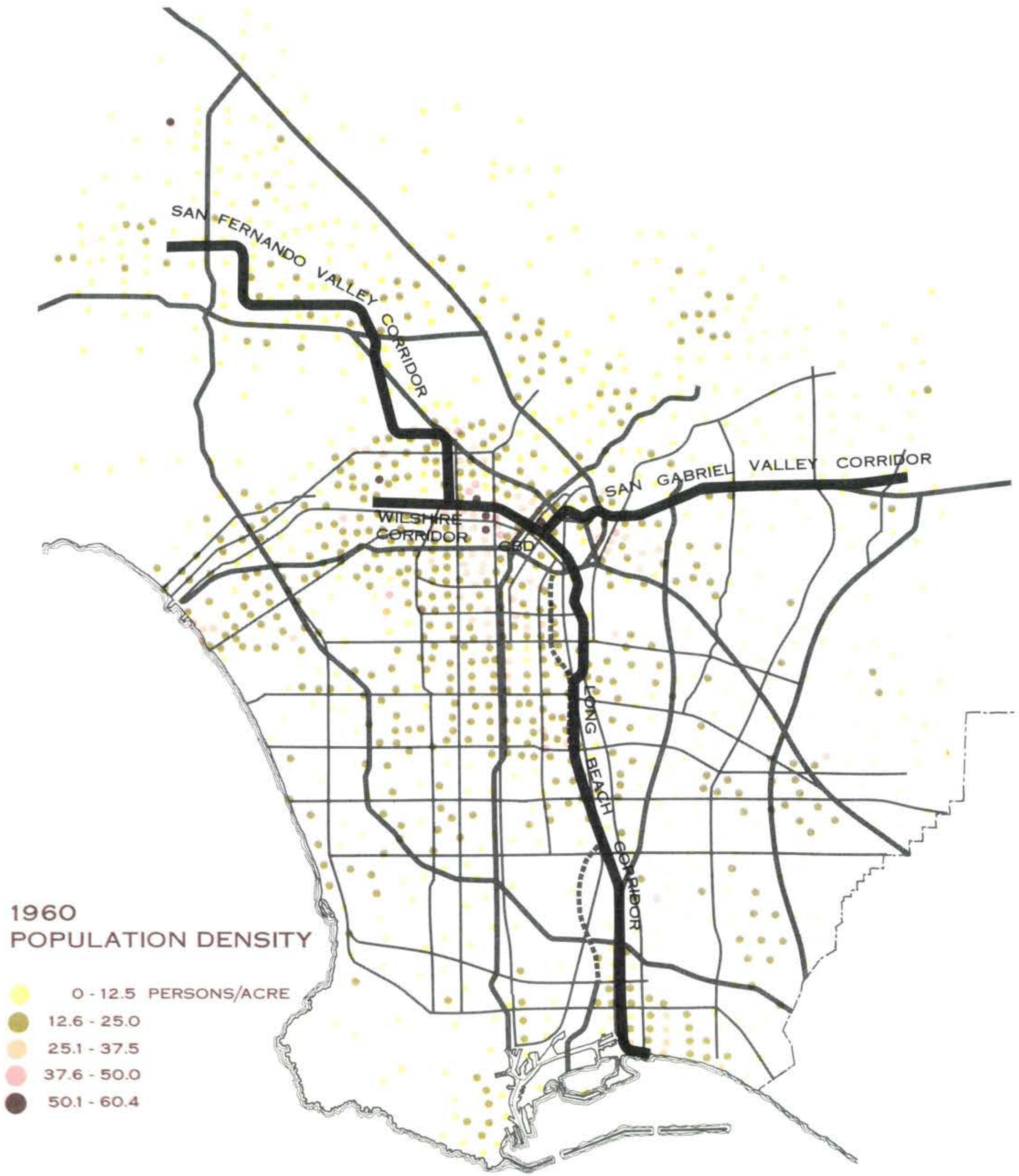
A distinct pattern has developed in the metropolitan area of Los Angeles wherein population and employment have concentrated in the central area, becoming less dense as distance from the CBD increases. Historically, this concentration in the central area has continued to increase in density while also 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.

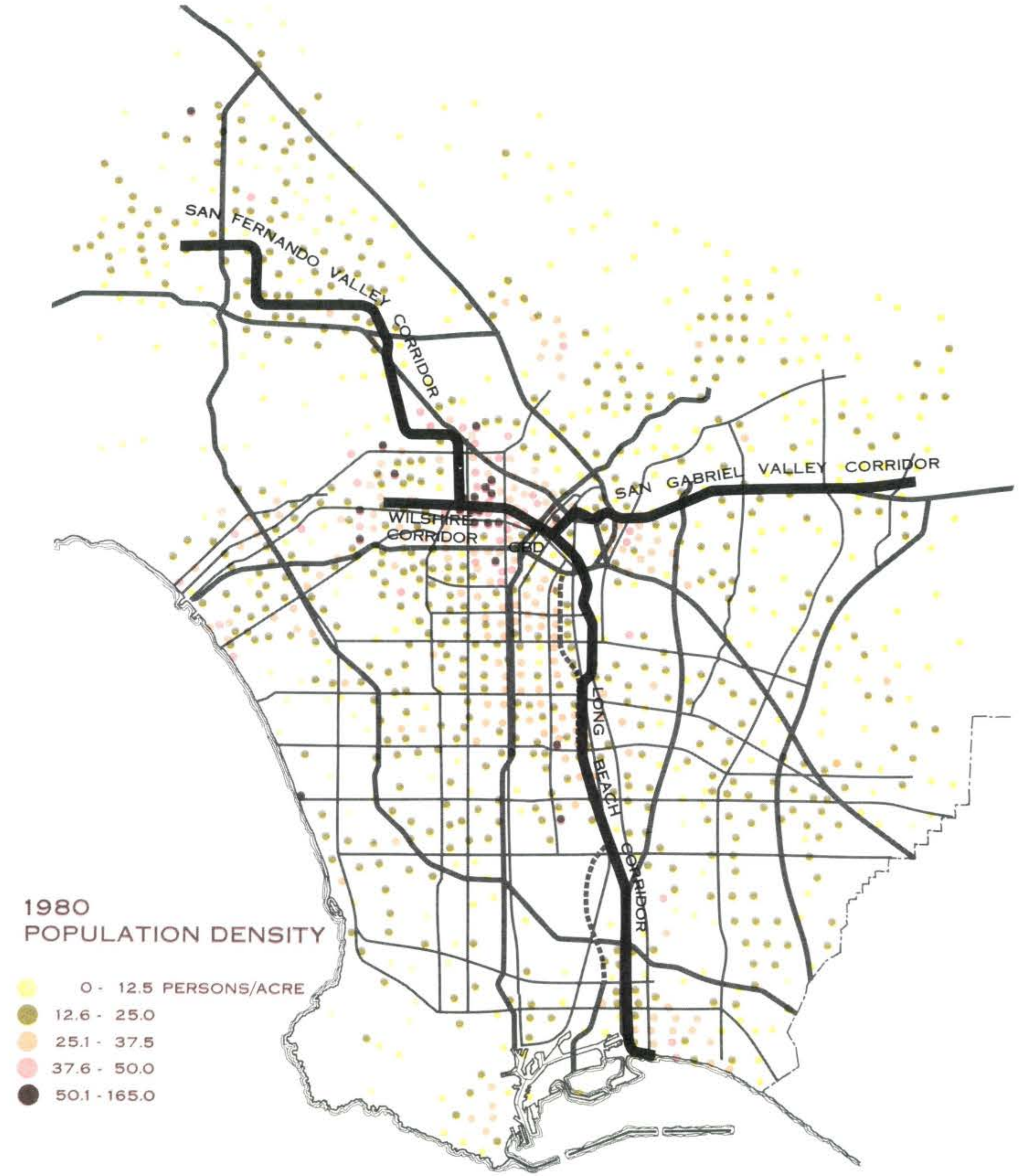
The projected population and employment patterns for 1980 indicate a trend toward relatively higher concentration for both residential and industrial areas. Labor-oriented industries will replace land-oriented industries within the corridor as the areas of concentration expand around the central core.

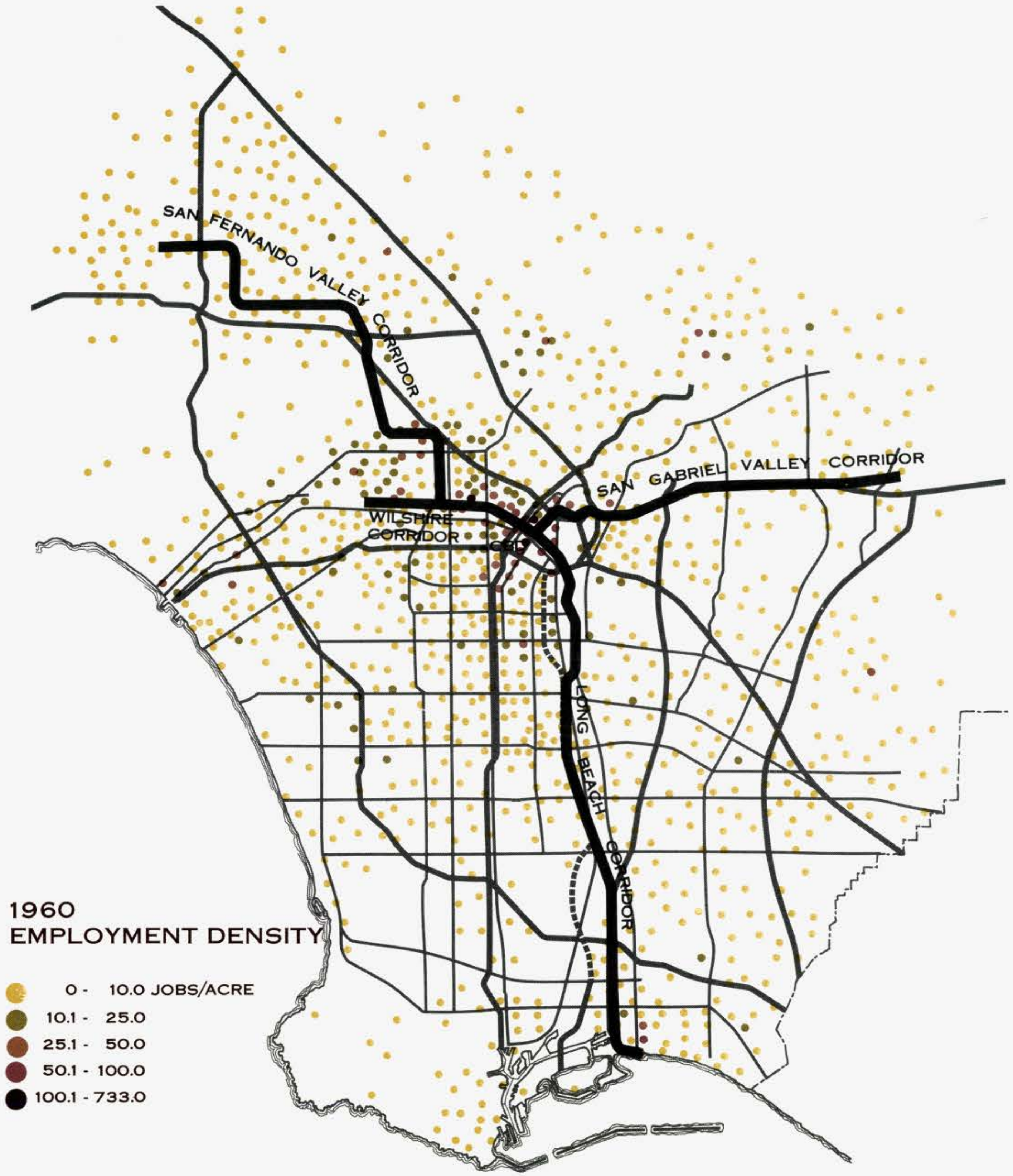
These projected distributions are reflective of LARTS[1] data and do not include the redistributive effect of transit.

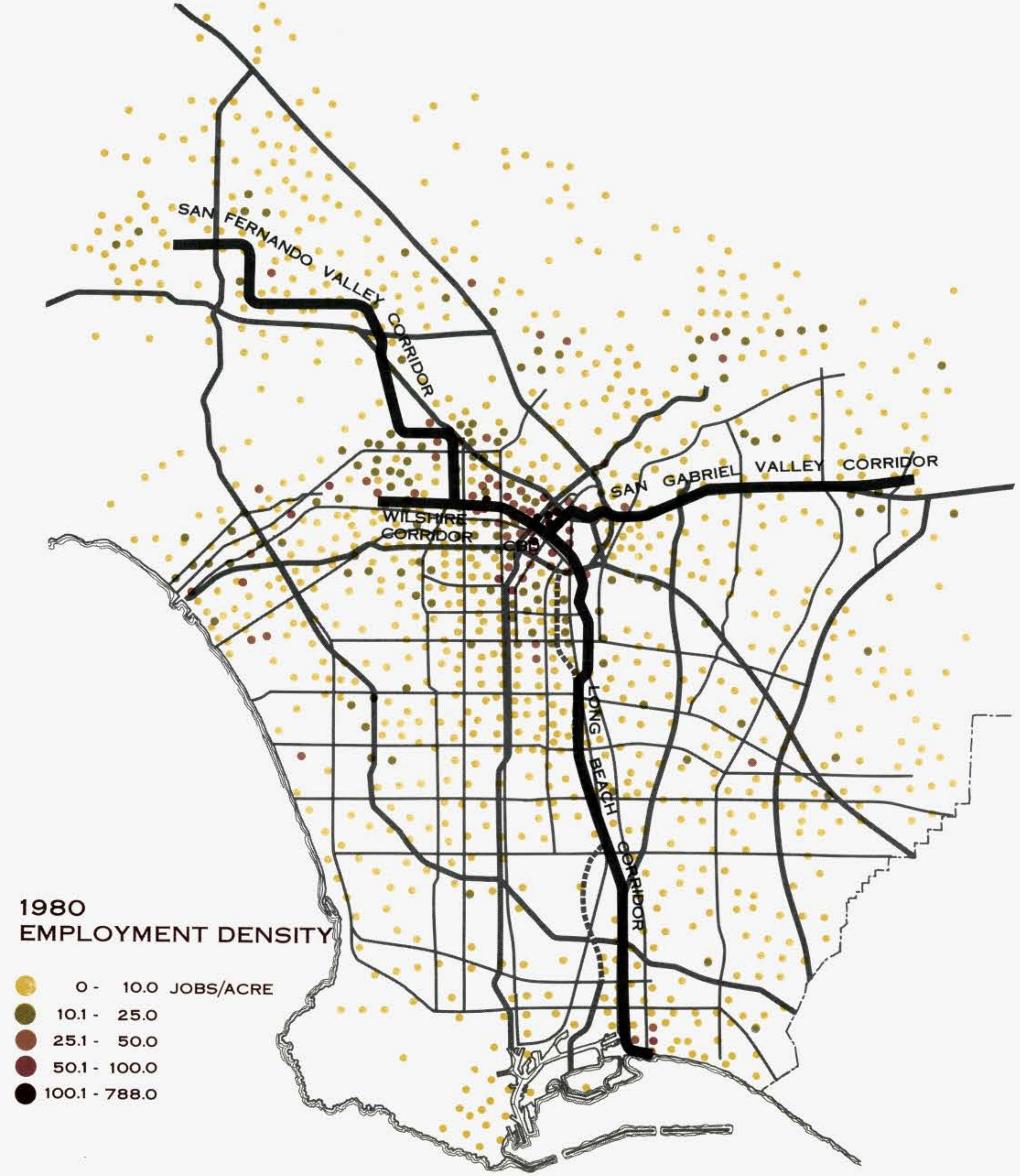
Substantial multiple residential development, together with increased commercial and employment activity, may be expected to occur around the station areas which would tend to increase the density patterns in those areas served by the transit lines.

[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

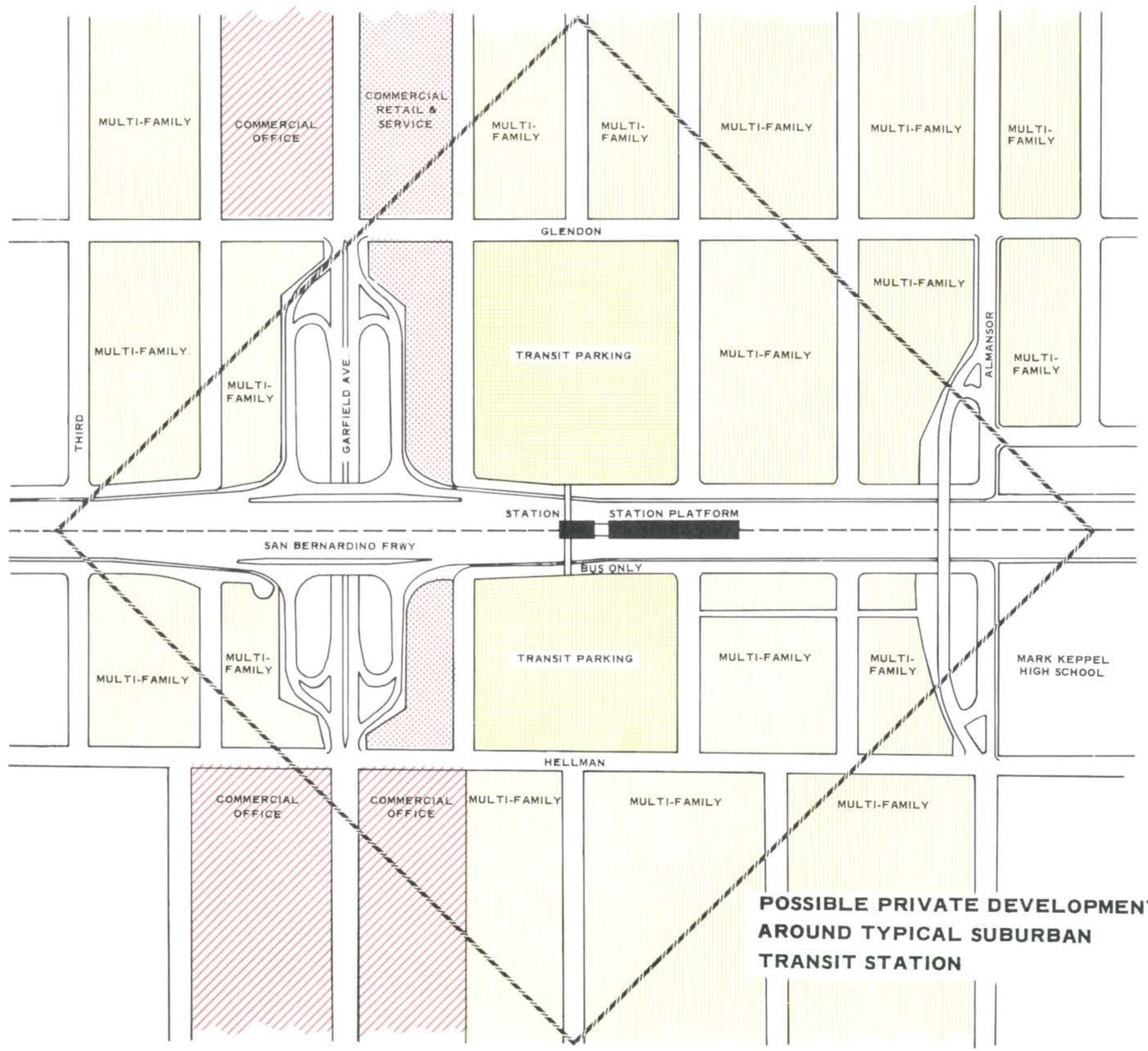
The impact patterns around suburban transit stations will be cyclical in nature. Multi-family development immediately adjacent to the station will occur first and then will gradually spread out if local zoning permits. A demand for convenience retail and personal services, and professional offices in 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.

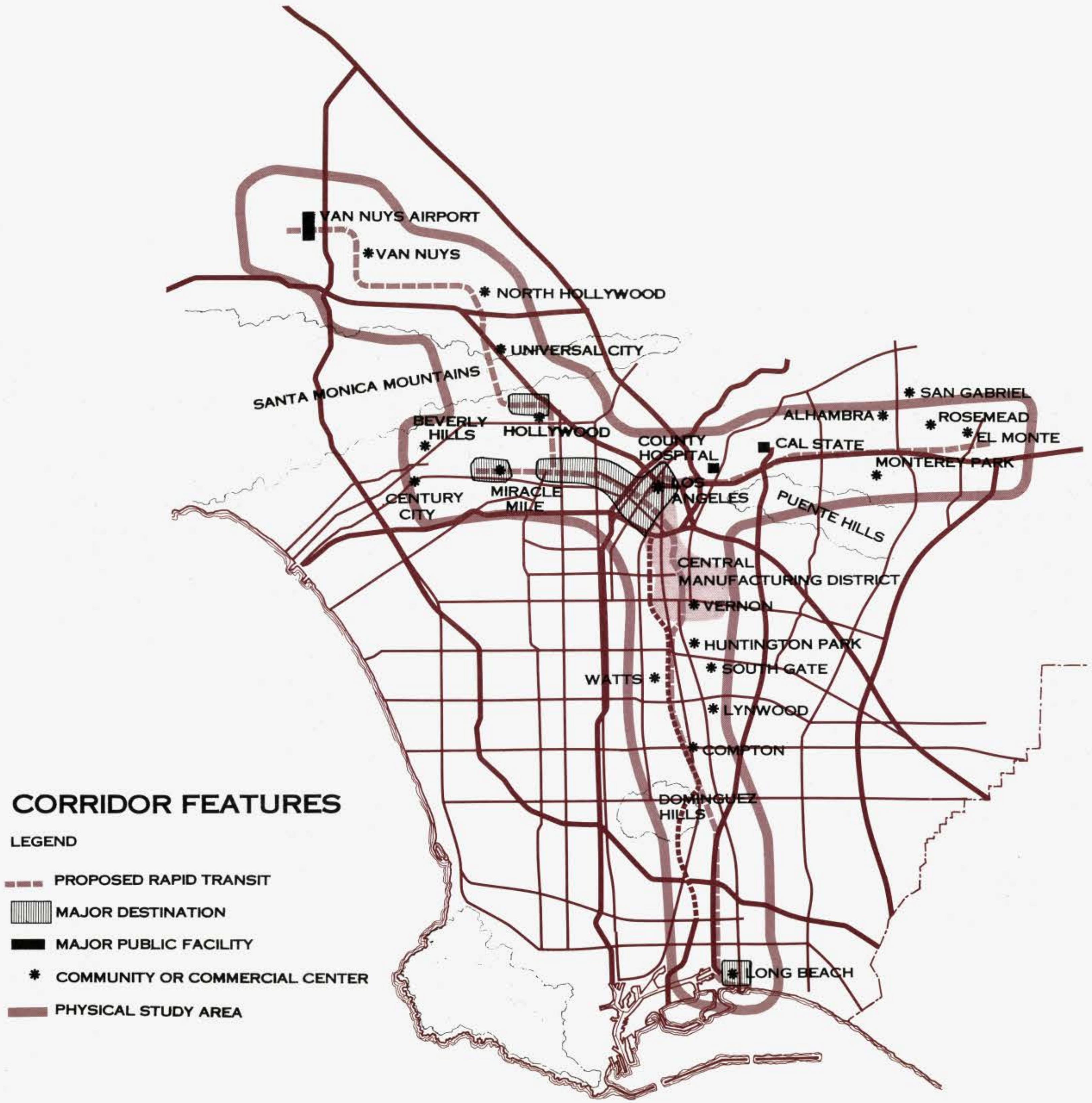
In an already deteriorating residential neighborhood, the impact of the transit facility may create regeneration and result in an area-wide renewal. Where the process of land-use regeneration is already underway, the transit station can increase and accelerate it.

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



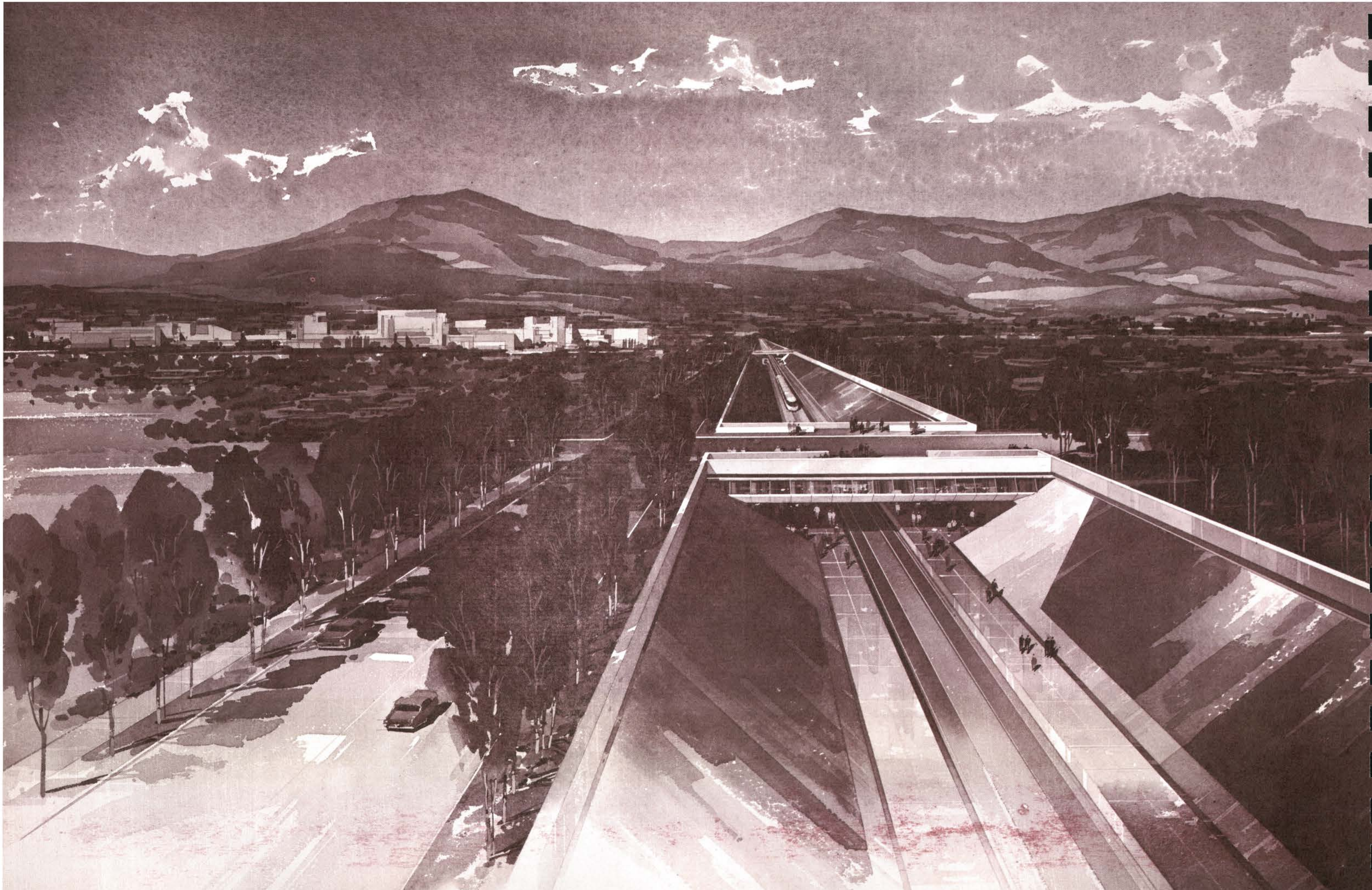
Hollywood District and Wilshire Boulevard, will vary significantly from the outlying suburban neighborhoods. These stations will typically serve as destination stations for office and commercial buildings or as origin stations for high density residential development within walking distance. Some patronage 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.



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)

	1960	1980	% Increase
CENTRAL CITY*			
Population	61,400	67,800	11
Jobs	314,000	450,000	43
COMMERCIAL CORE**			
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.

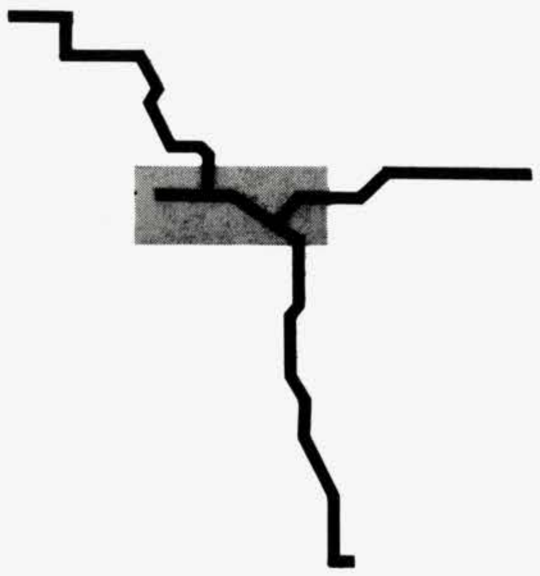
The transit station at Union Station will provide an interchange point between railway facilities and the rapid transit system. The Civic Center station will serve the large and active Civic Center complex and the north part of the commercial core. The Sixth and Broadway, Seventh and Main and Seventh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

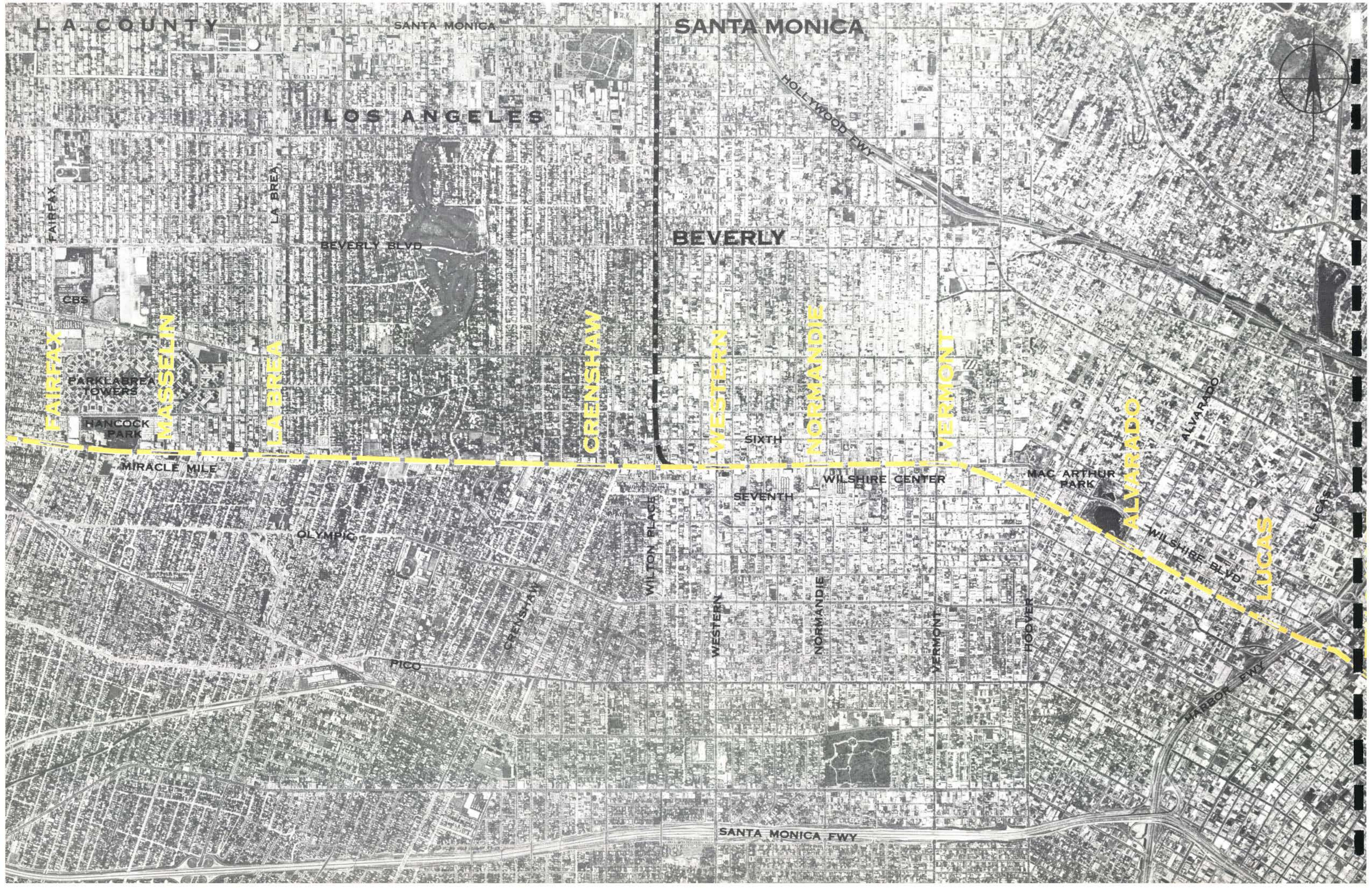
LEGEND

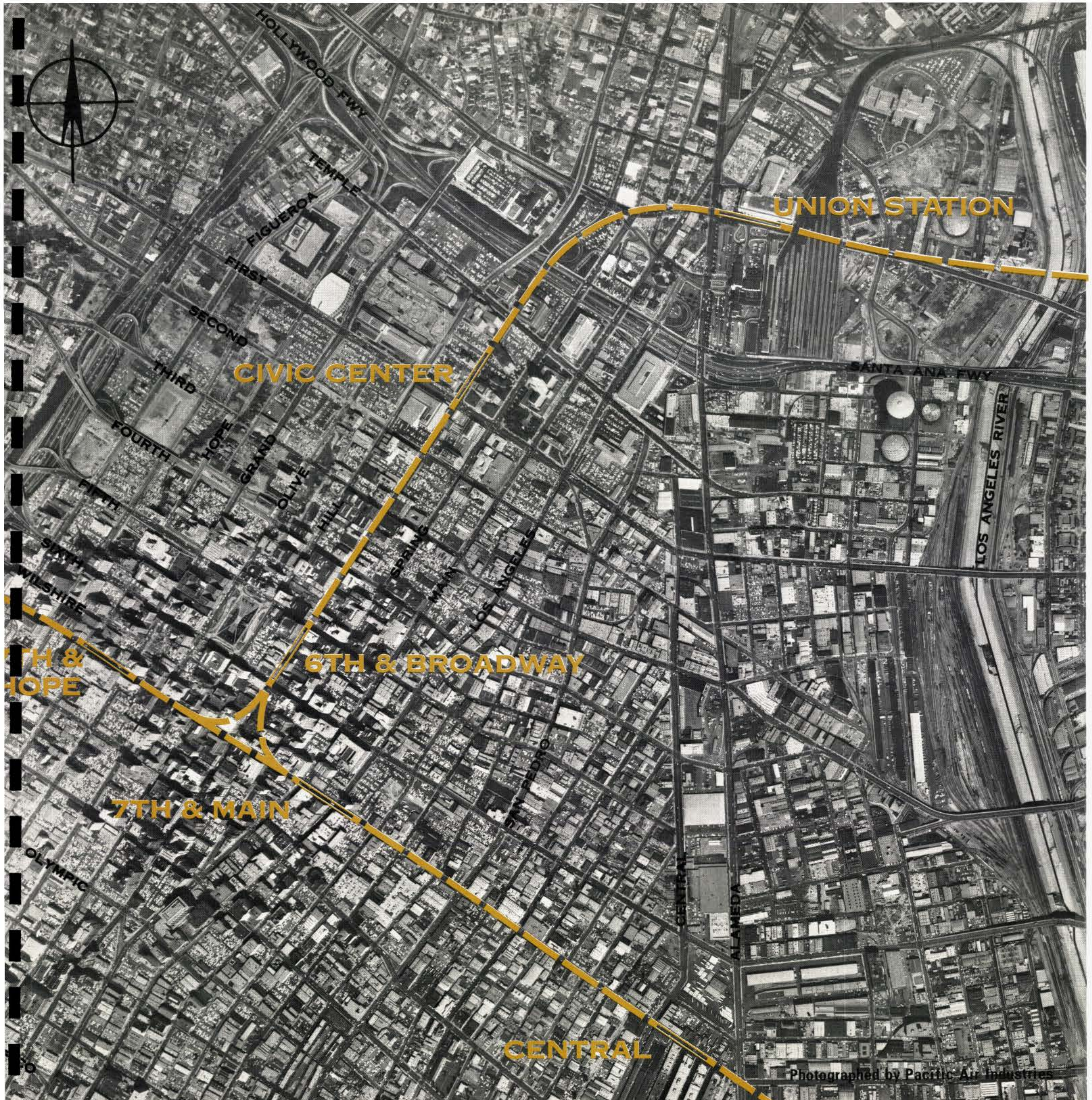
SUBWAY

OPEN CUT

SCALE 1" = 2000'




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

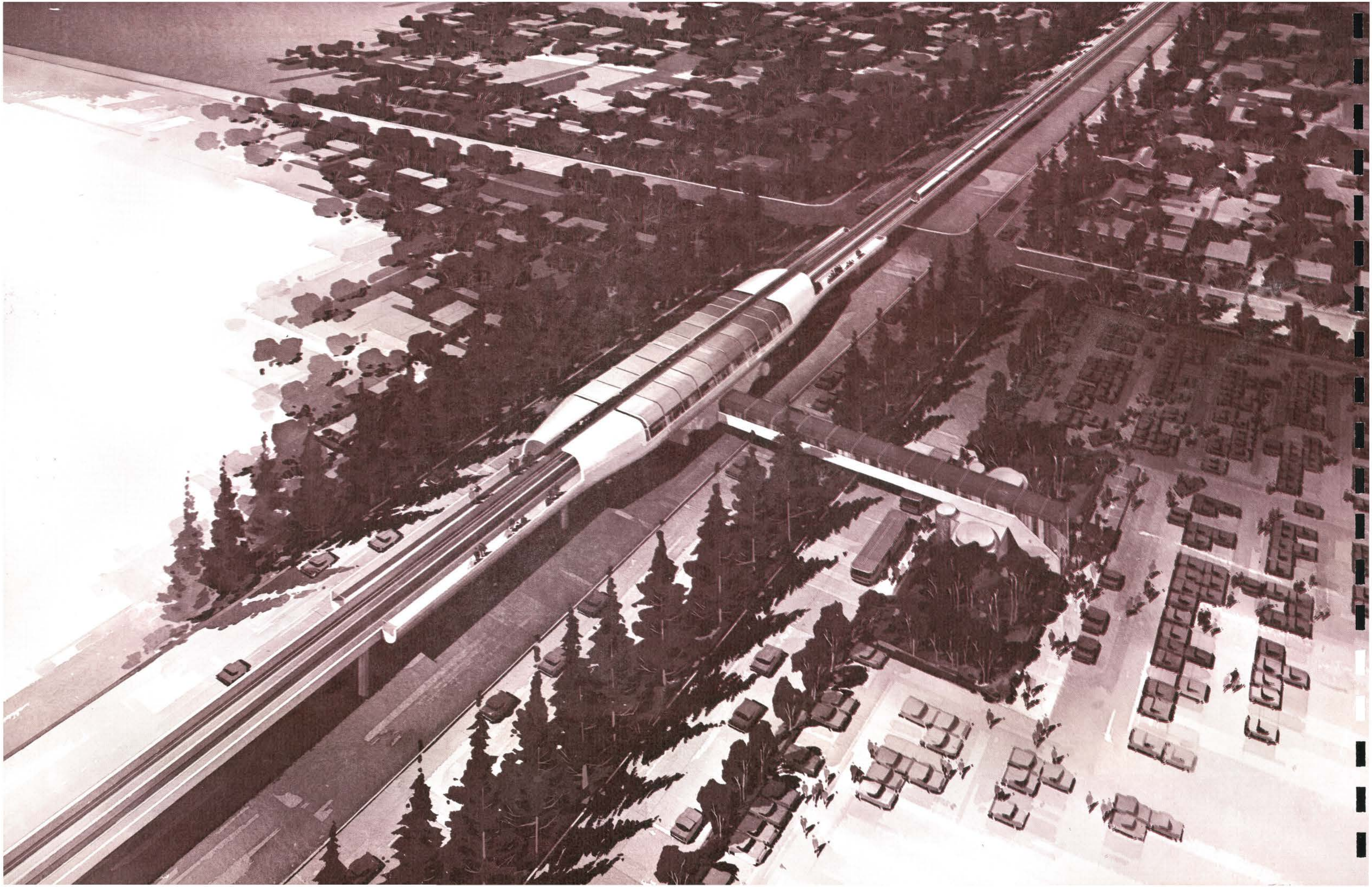


CENTRAL BUSINESS DISTRICT

SCALE 1″ = 1000′

WILSHIRE CORRIDOR
INTRACORRIDOR TIME TABLE

STATION	DISTANCE BETWEEN STATIONS (MILES)	ACCUMULATED 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

	1960	1980	% Increase
ECONOMIC STUDY AREA*			
Population	611,000	942,000	54
Jobs	284,000	373,000	31
WITHIN ONE MILE OF SELECTED ROUTE			
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.

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

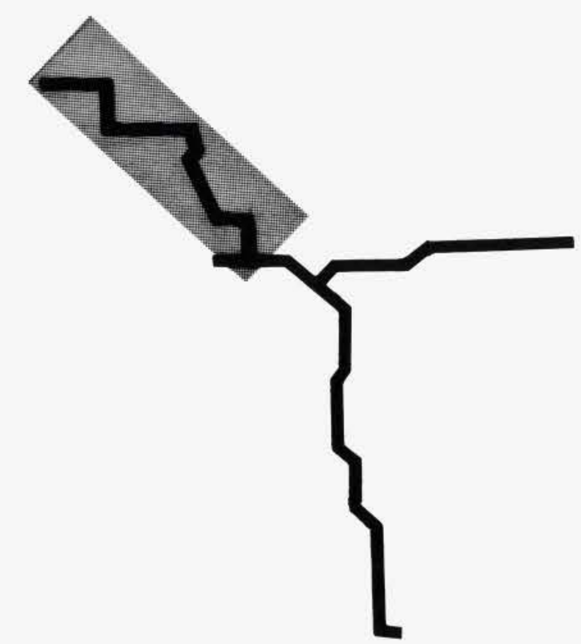
LEGEND

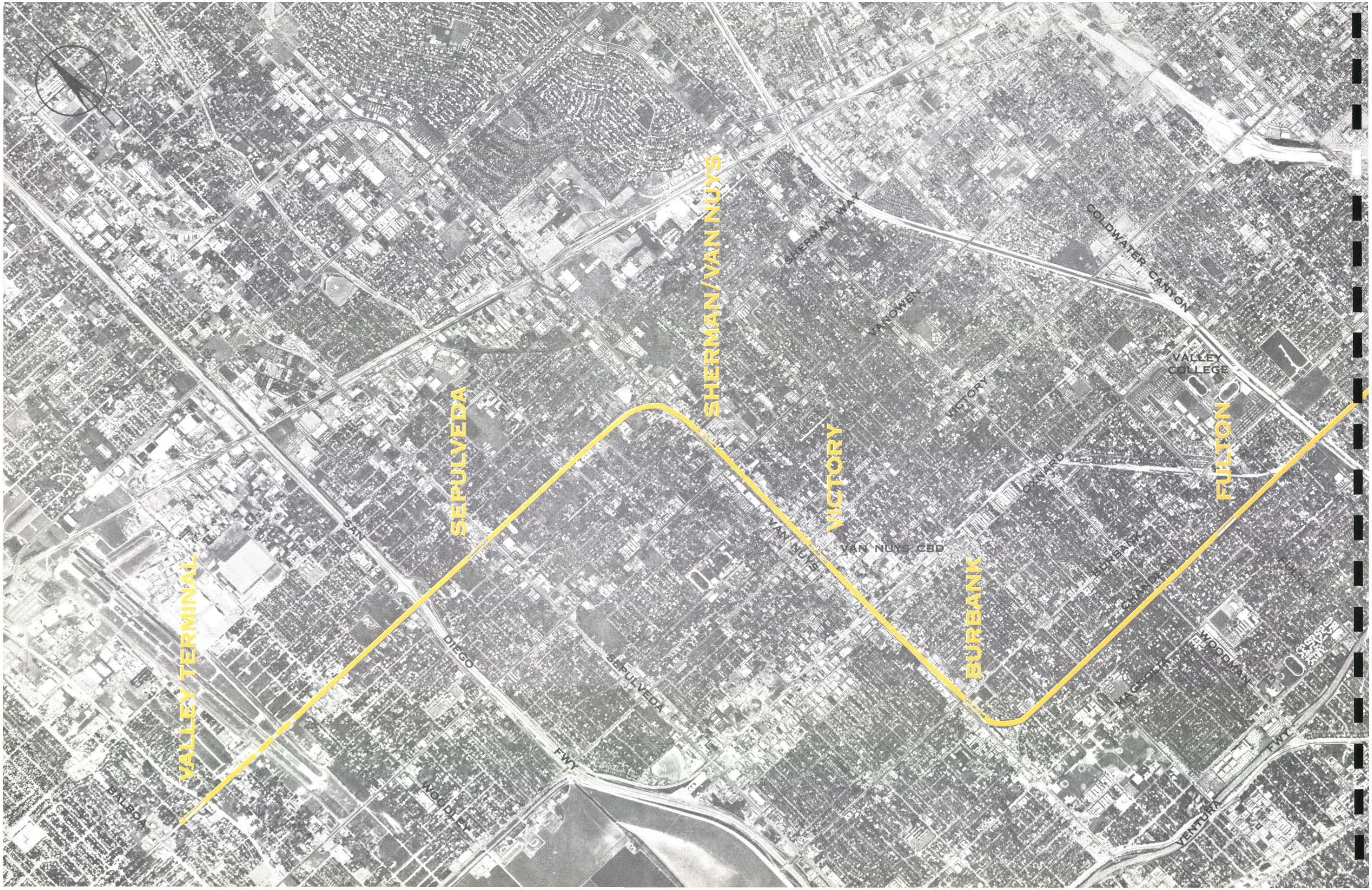
SUBWAY

OPEN CUT

AERIAL

SCALE 1" = 2000'




VALLEY TERMINAL
SEPULVEDA
SHERMAN/VAN NUYS
VICTORY
BURBANK
FULTON
SAN
DIEGO
FWY
SEPULVEDA
VAN NUYS
VAN NUYS CBD
SHERMAN WAY
VANOWEN
VICTORY
OXNARD
BURBANK
CHANDLER
MAGNOLIA
WOODMAN
COLDWATER CANYON
VALLEY
COLLEGE
VENTURA
FWY
BALBOA
WOODLEY


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

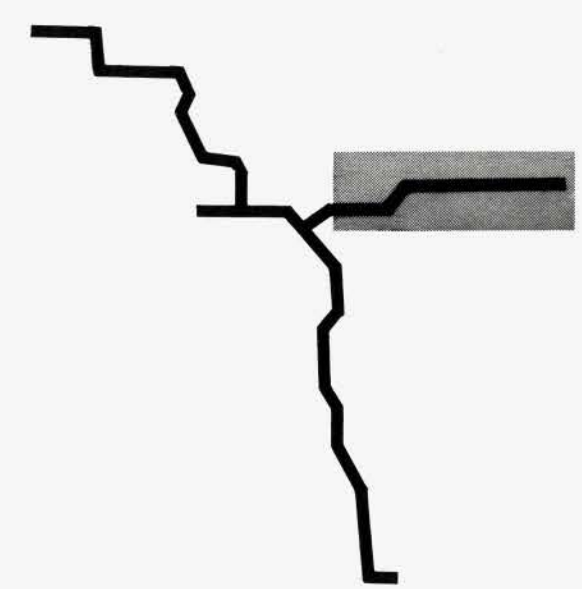
LEGEND

SUBWAY

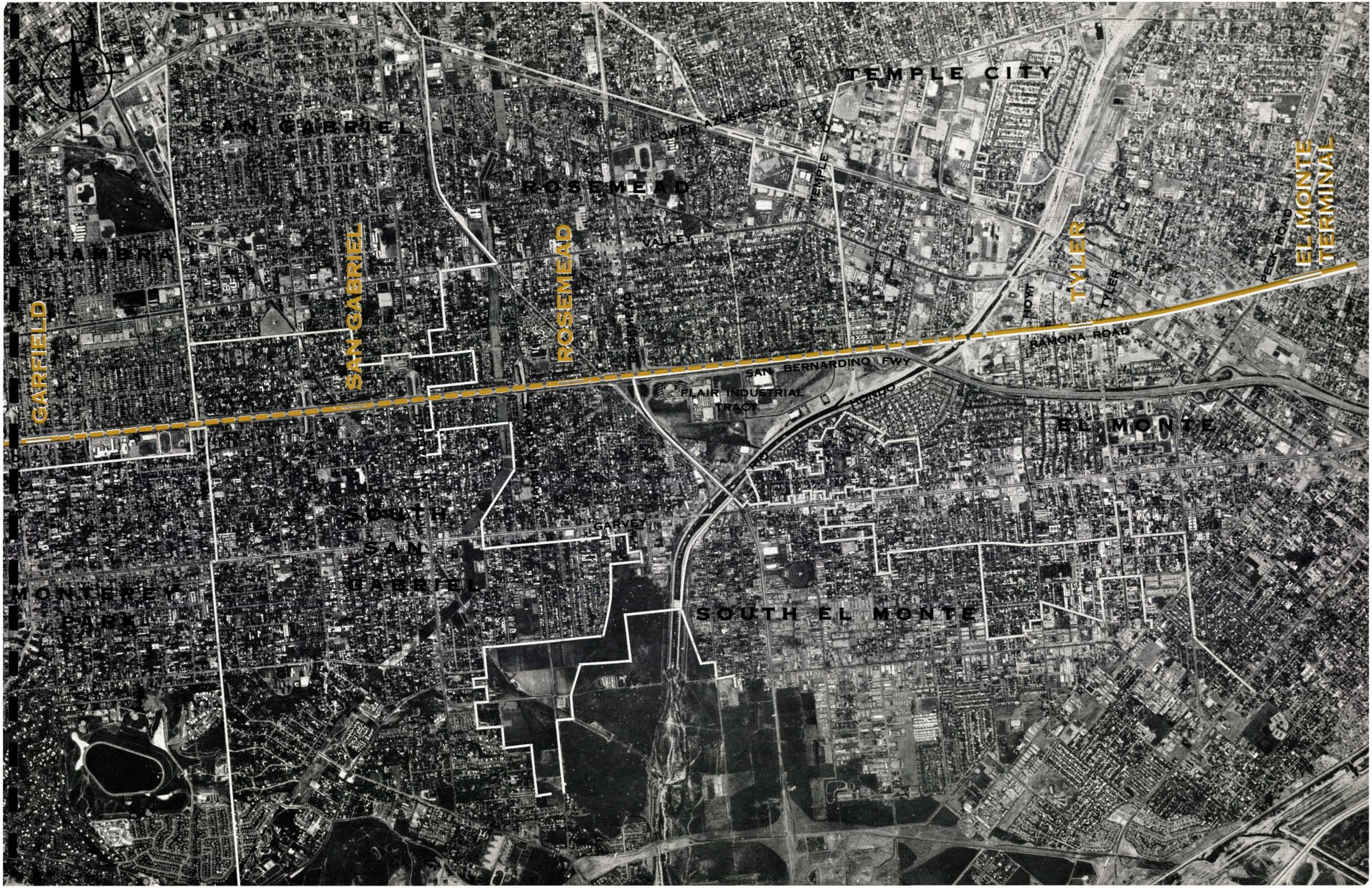
ON-GRADE

AERIAL

SCALE 1" = 2000'



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


TEMPLE CITY
SAN GABRIEL
LOWER AZUSA ROAD
ROSEMEAD
VALLEY
ALHAMBRA
GARFIELD
SAN GABRIEL
ROSEMEAD
TYLER
TYLER
EL MONTE TERMINAL
PECK ROAD
RAMONA ROAD
SAN BERNARDINO FWY
PLAIR INDUSTRIAL TRACT
EL MONTE
SOUTH SAN GABRIEL
GARVEY
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		—		—
PACIFIC COAST	2.05	2.05	2m22s	2m22s
WARDLOW	1.93	3.98	2m34s	4m56s
COMPTON	5.36	9.34	5m41s	10m37s
IMPERIAL	2.24	11.58	2m51s	13m28s
103RD STREET	1.23	12.81	2m00s	15m28s
ALAMEDA	1.74	14.55	2m24s	17m52s
GAGE	0.94	15.49	1m41s	19m33s
VERNON	1.66	17.15	2m19s	21m52s
7TH & CENTRAL	2.39	19.54	3m00s	24m52s
7TH & MAIN	0.78	20.32	1m33s	26m25s
7TH & HOPE	0.56	20.88	1m19s	27m44s

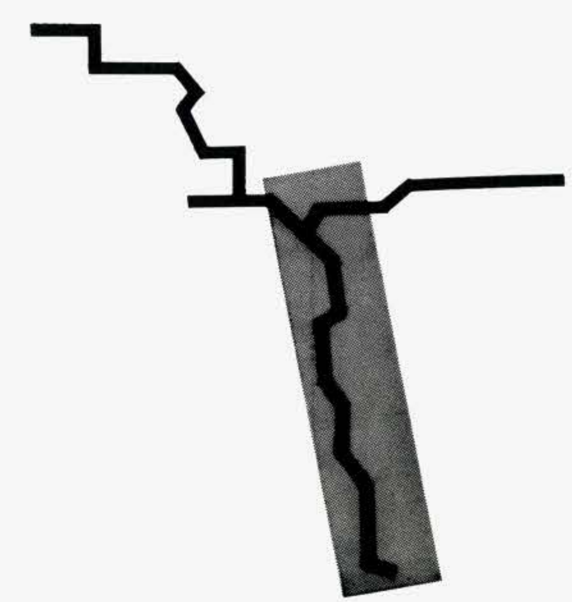
LEGEND

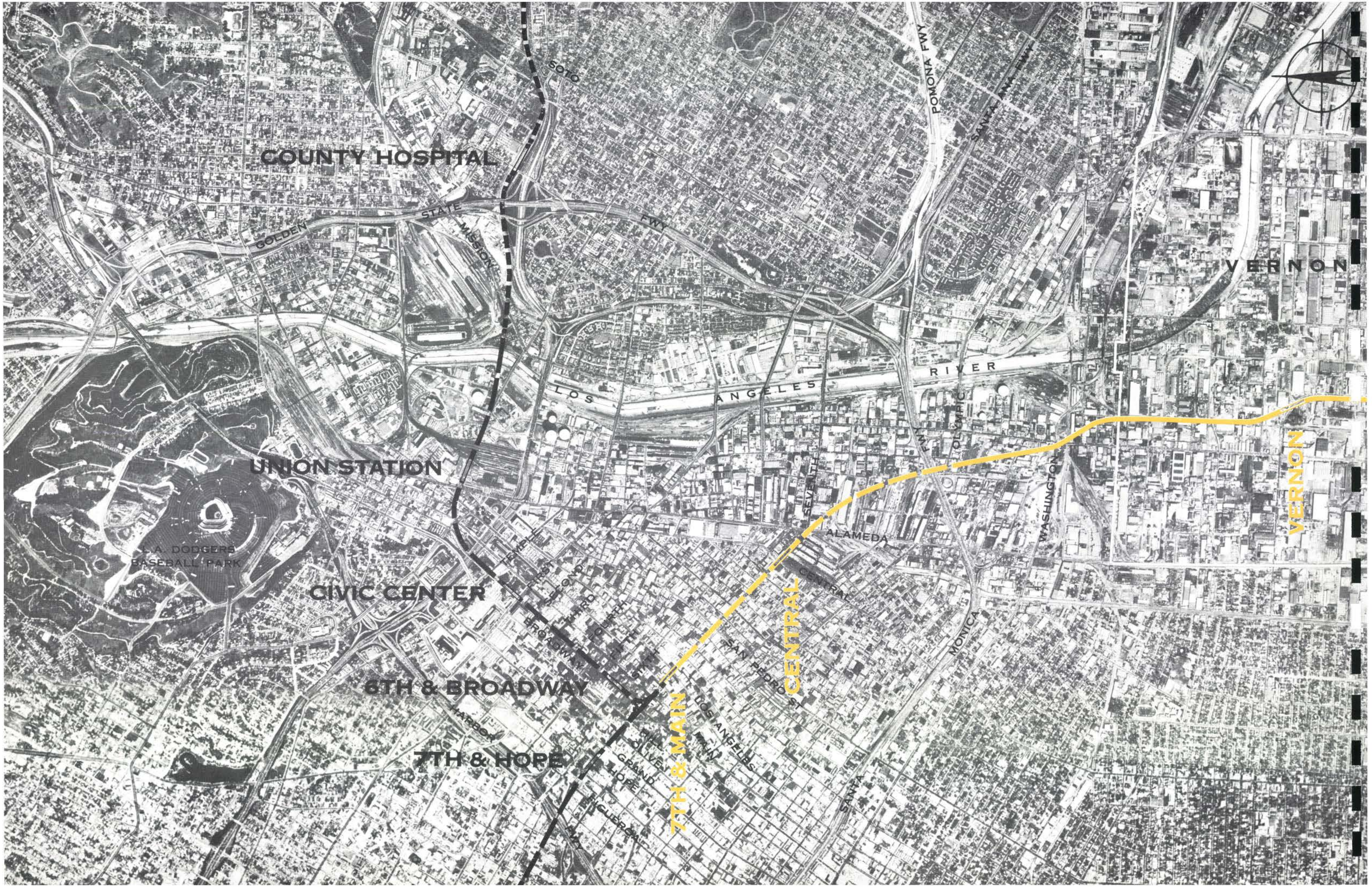
SUBWAY

AERIAL

ON-GRADE

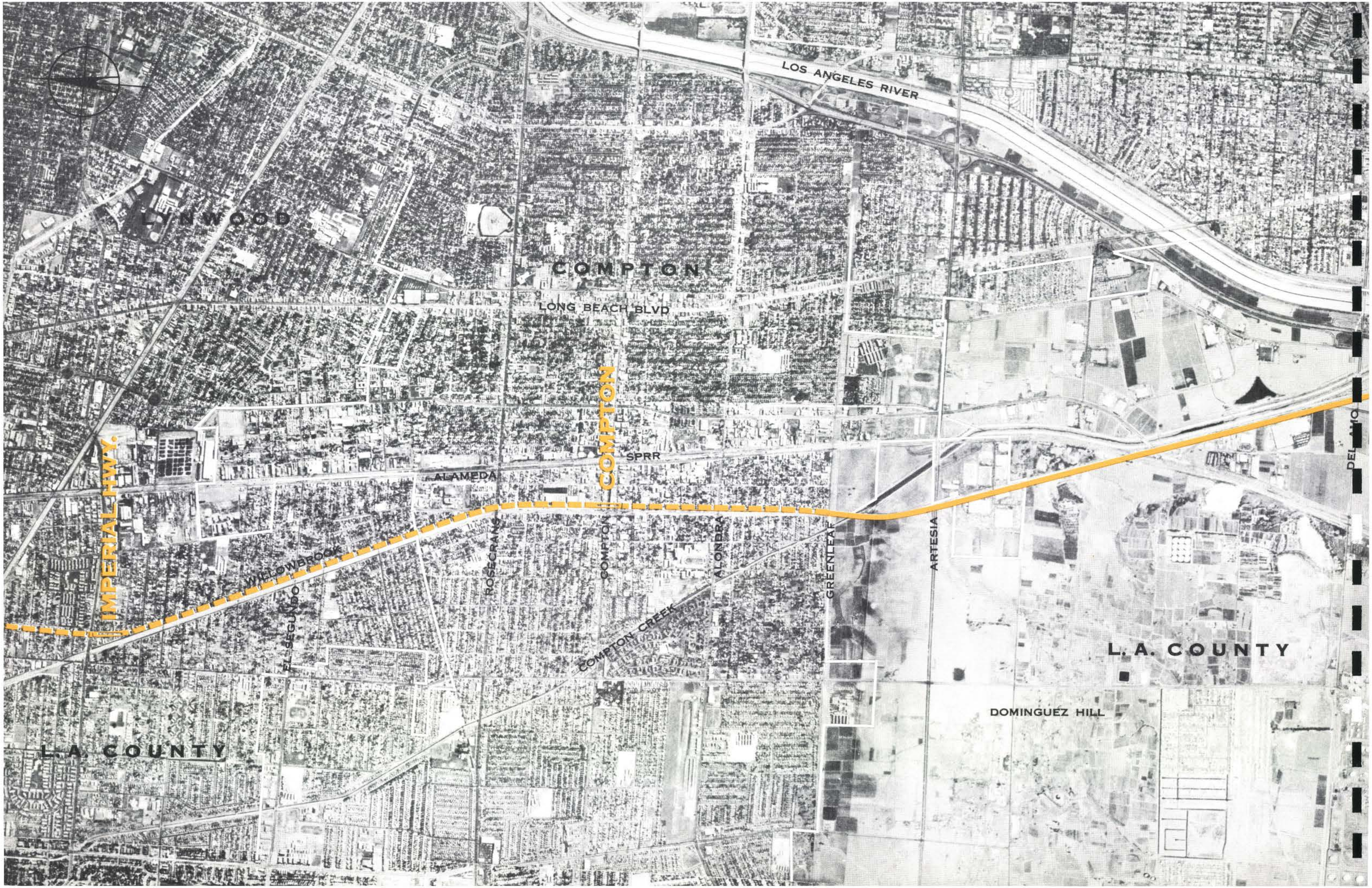
SCALE 1" = 2000'

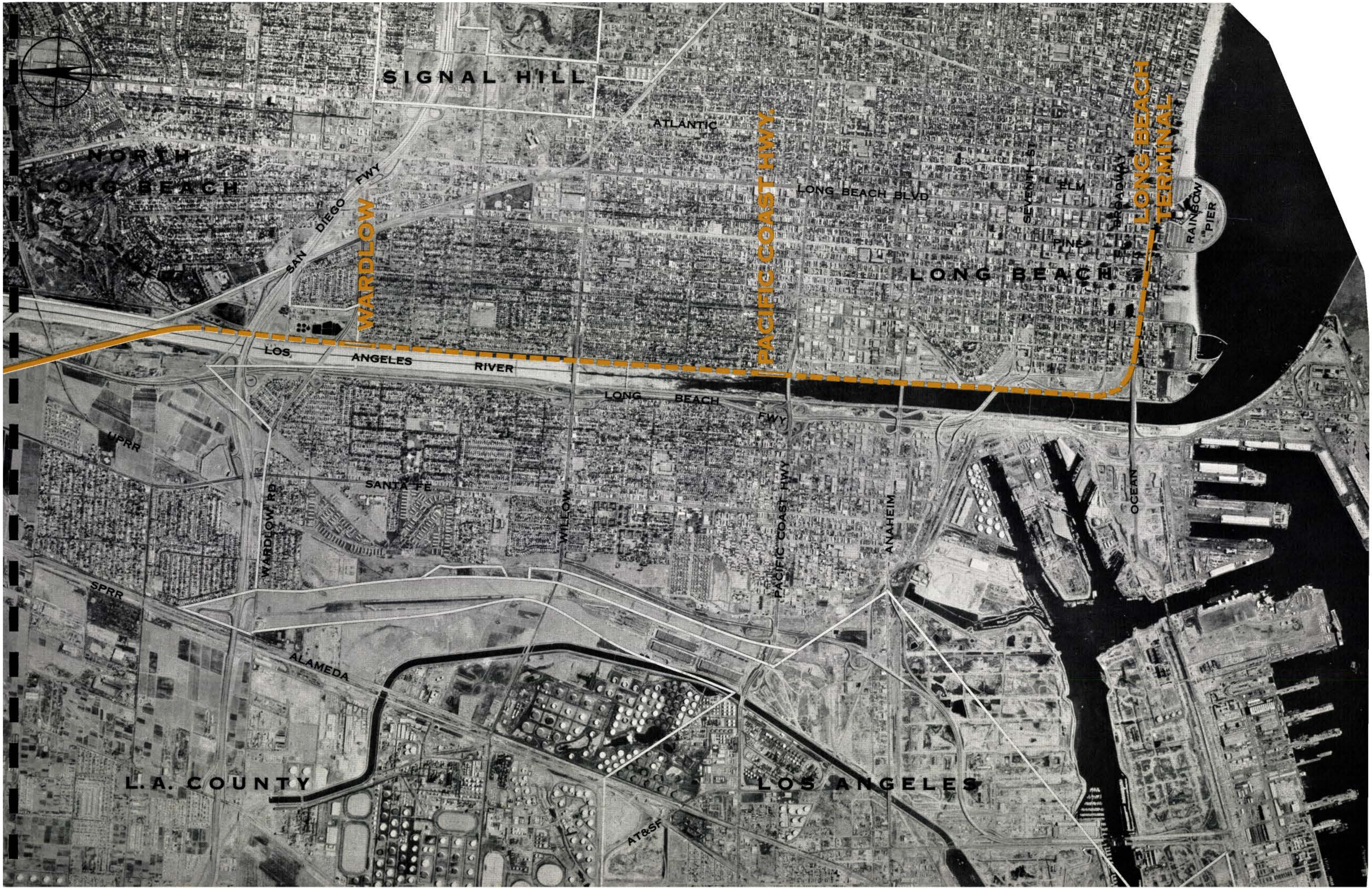




SOTO
COUNTY HOSPITAL
POMONA FWY
SANTA ANA FWY
GOLDEN
STATE
FWY
MISSION
VERNON
LOS
ANGELES
RIVER
OLYMPIC
FWY
UNION STATION
SEVENTH
WASHINGTON
VERNON
ALAMEDA
L.A. DODGERS
BASEBALL PARK
CIVIC CENTER
CENTRAL
CENTRAL
BROADWAY
SAN PEDRO ST
MONICA
6TH & BROADWAY
HARBOR
LOS ANGELES
7TH & HOPE
7TH & MAIN
OLIVE
GRAND
HOPE
FIGUEROA
SANTA

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


LOS ANGELES RIVER
LYNWOOD
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
NORTH LONG BEACH
ATLANTIC
SAN DIEGO FWY
WARDLOW
PACIFIC COAST HWY.
LONG BEACH BLVD
SEVENTH ST
ELM
BROADWAY
PINE
LONG BEACH TERMINAL
RAINBOW PIER
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
8

Loading Platform of Typical Aerial Station

TRANSIT FACILITIES

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.

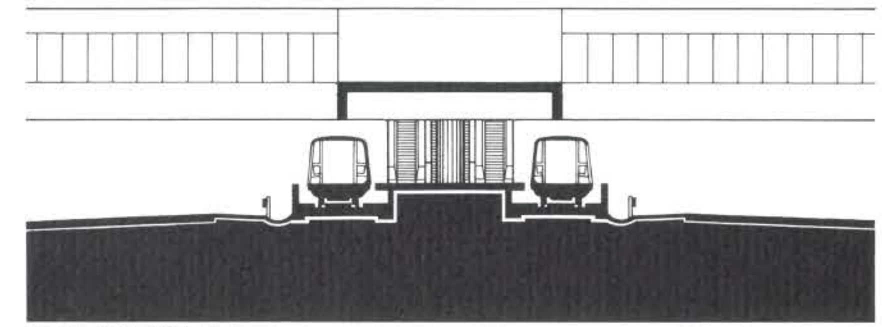
The arrangements of entrances and exits with respect to station platforms can have a considerable effect on the time required to load and unload trains. For a given train length and number of passengers to be loaded, loading time will depend upon the distribution of passengers along the platform, the 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

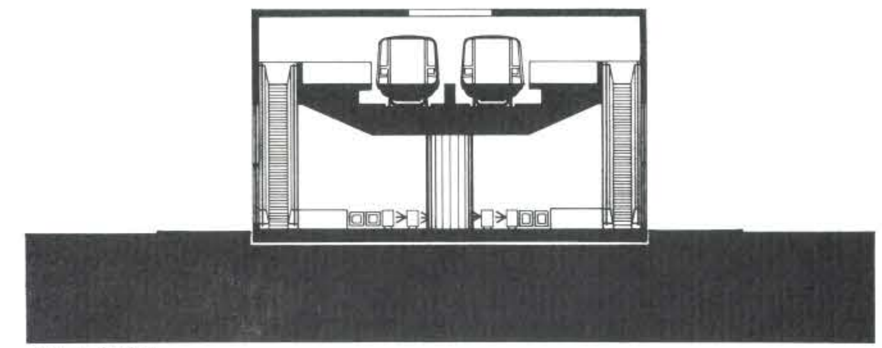
Four basic station configurations have been developed:

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.

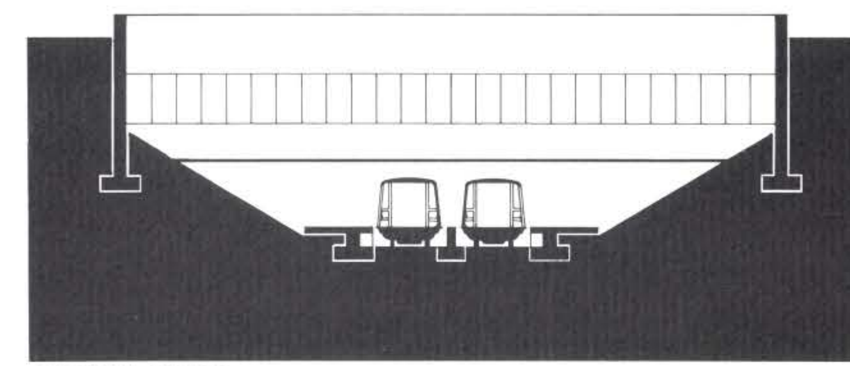
Aerial Stations—This configuration provides a means of overhead grade separation on private rights-of-way and medians of public streets. Predominant use of this configuration will occur in the San Fernando Valley, Long Beach and San Gabriel Valley Corridors.



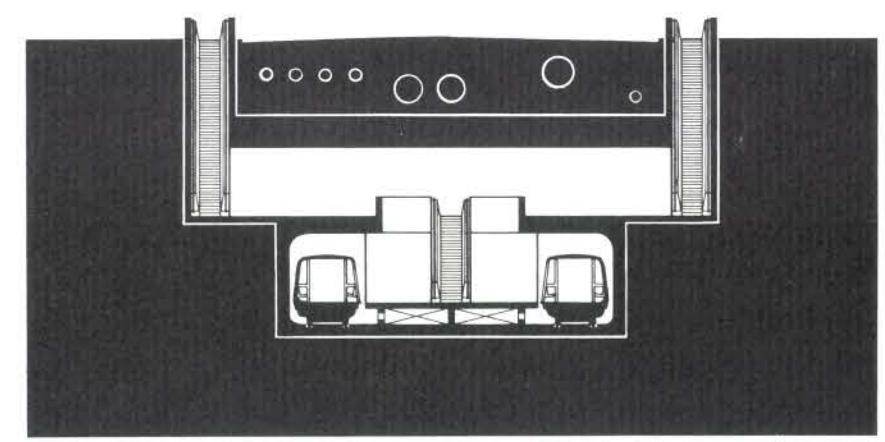
ON-GRADE



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.

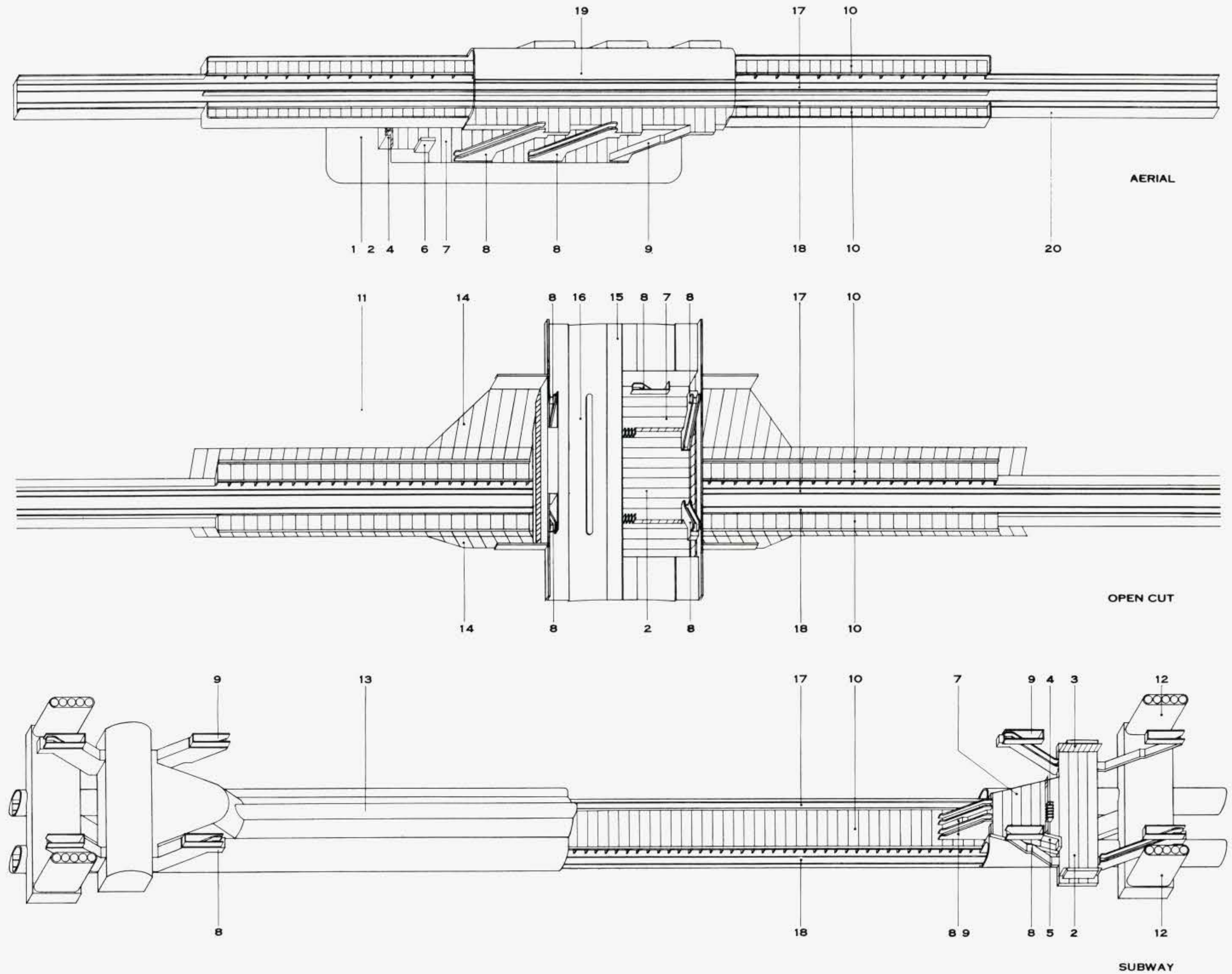
Side-loaded platforms are preferred for aerial and at-grade stations because:

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,

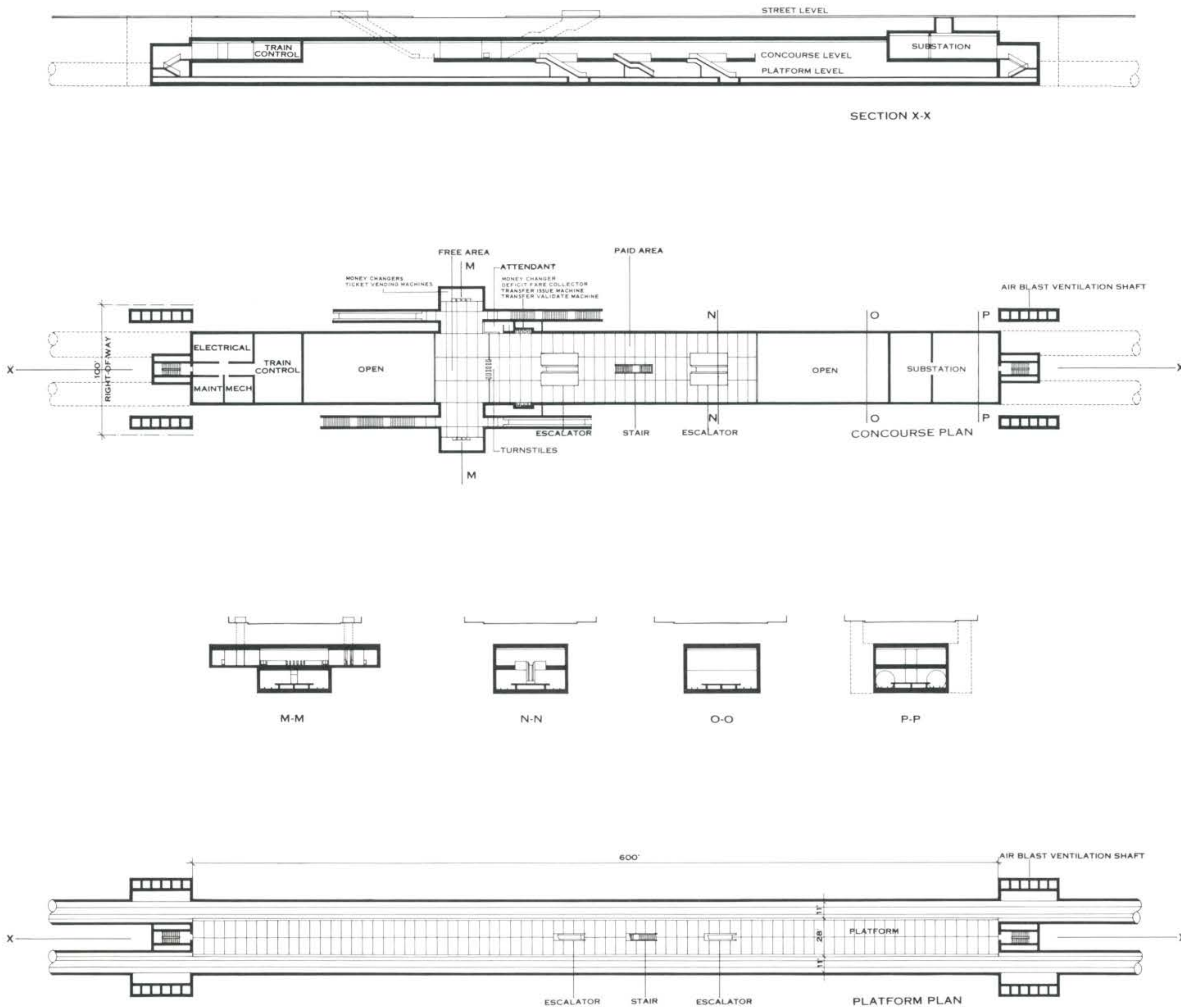
They are structurally more feasible in a street median where a single column support is necessary.



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,

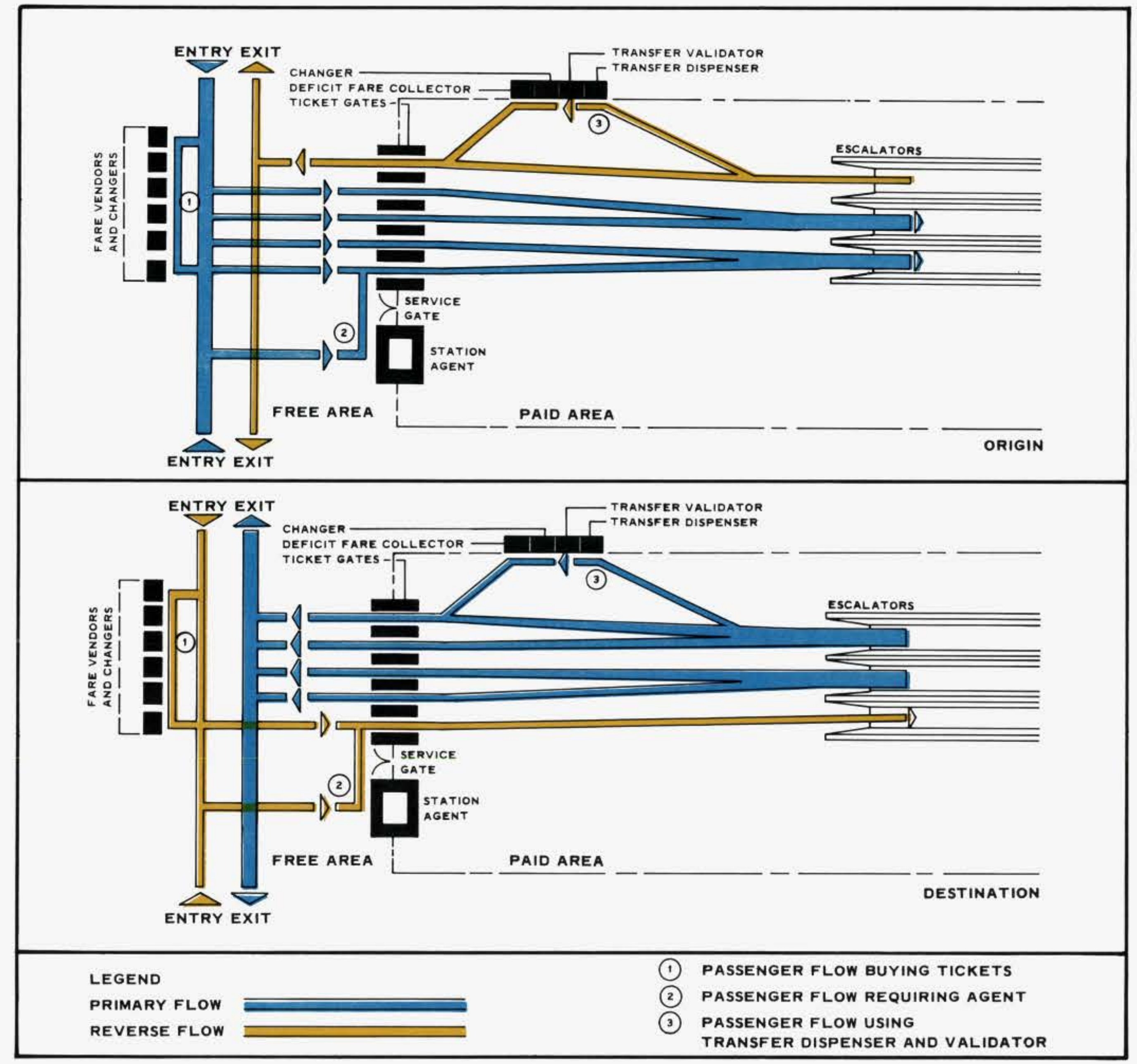
Result in the shortest average walking distance for passengers, either boarding or alighting.

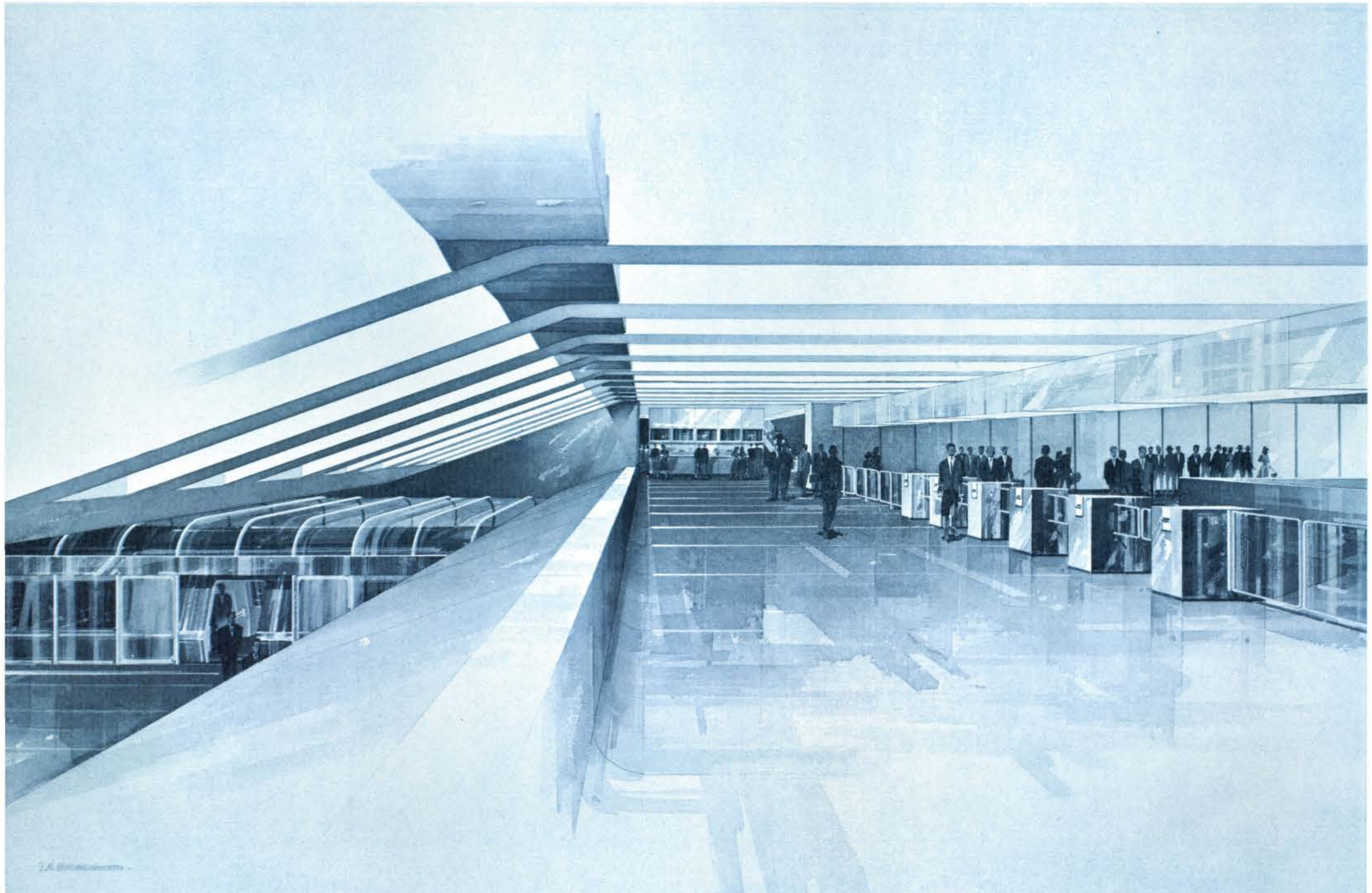
FARE COLLECTION

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

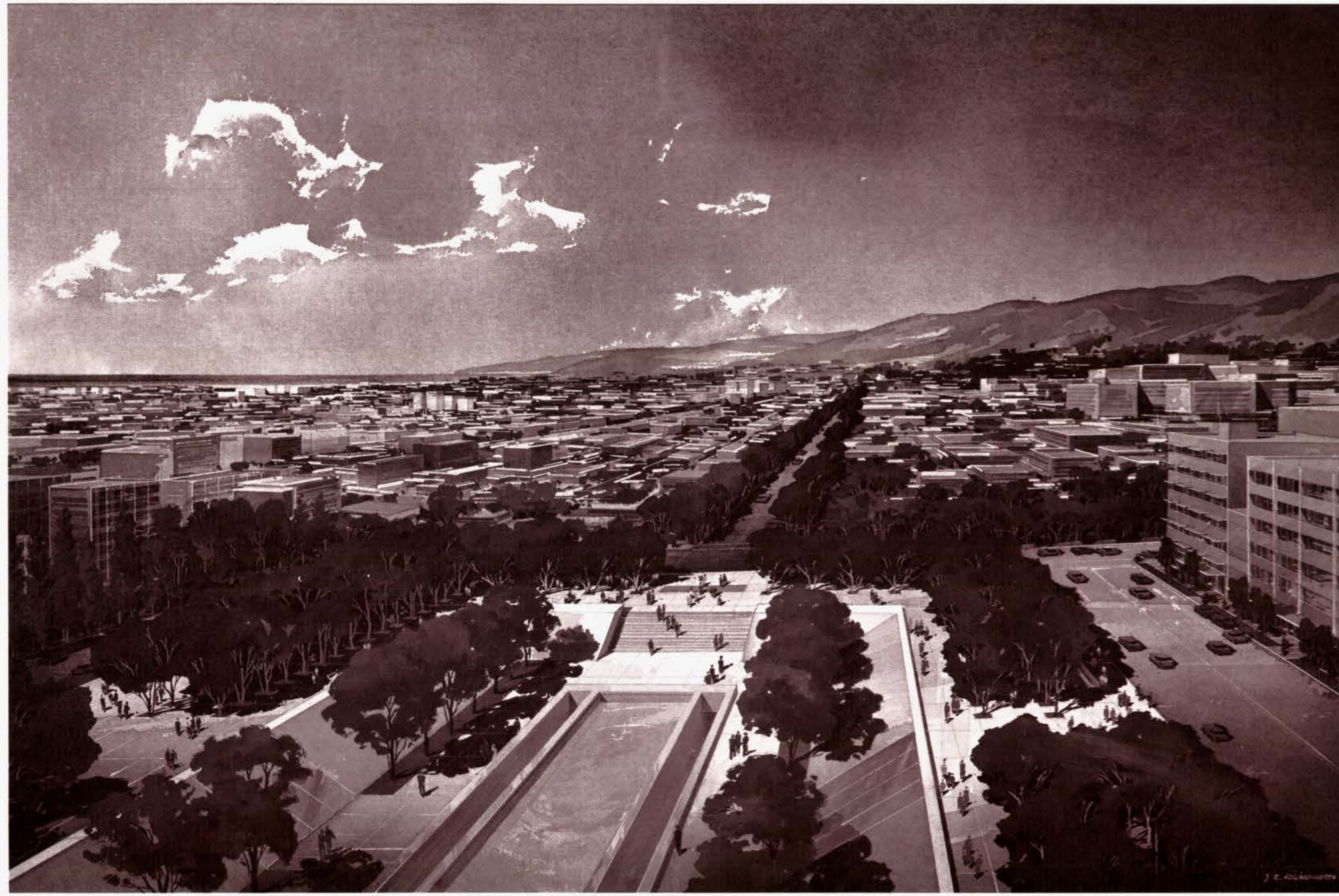
Passengers will arrive and depart from the station in four basic ways. In order of priority, related to convenience and directness of routing, they are:

- 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

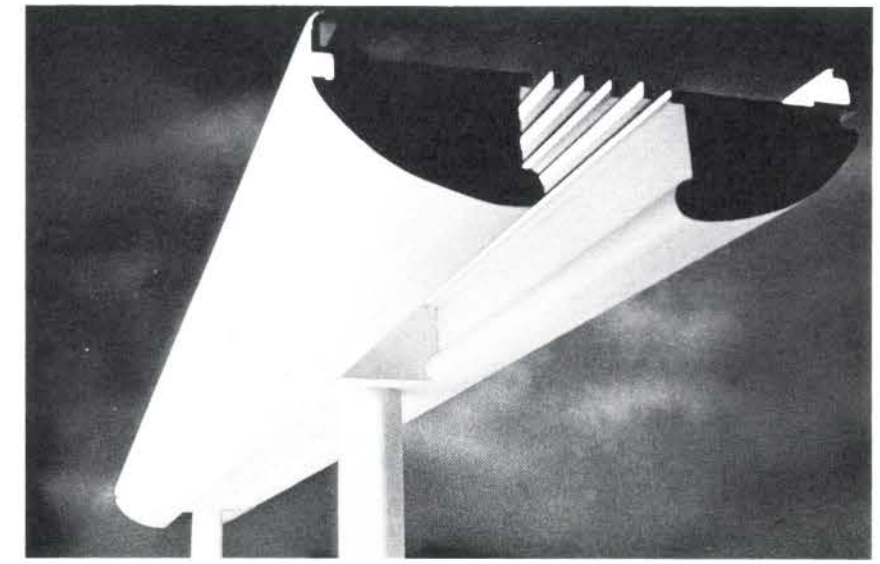
Although none of the proposed alignments cross active faults or fault zones, it is extremely important to provide for the effects of earthquakes in the Los Angeles area, which is designated Zone 3, the most critical of the zones of probability established by the Uniform Building Code. In order to assure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

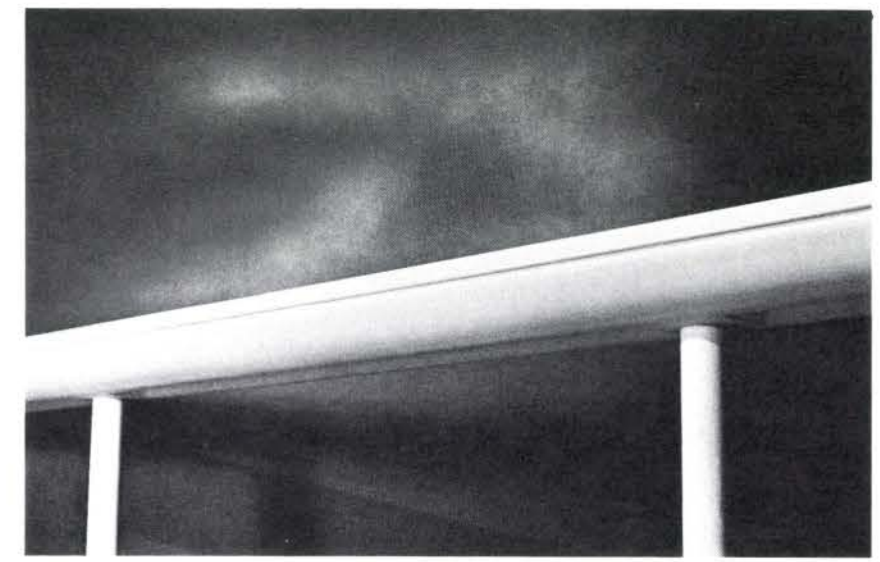
WIND LOADS

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

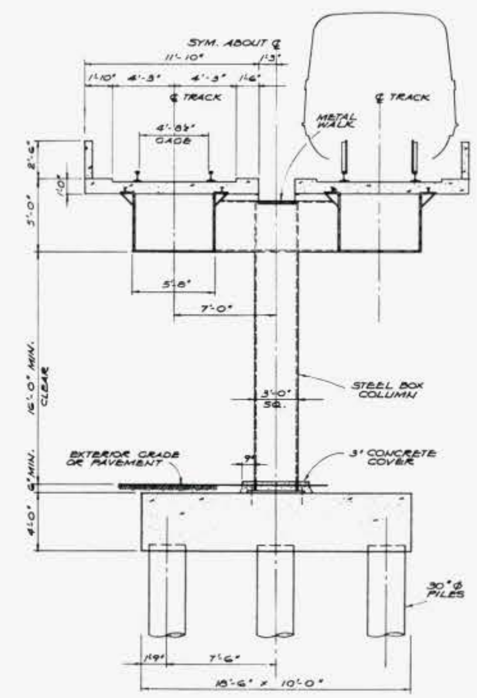
Single column support has been adopted for the extent of the aerial structure except where an unusual span or load condition occurs. The accompanying drawings illustrate various approaches to the single column concept. Further study is proceeding, however, to determine the optimum solution.

CONSTRUCTION MATERIALS

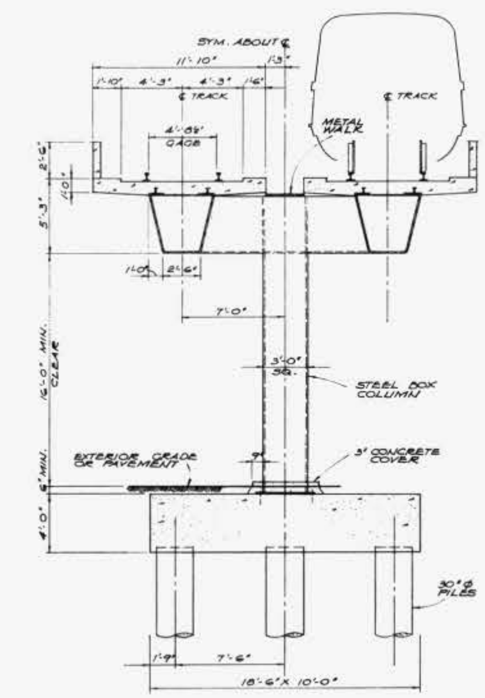
Final material selection for the girders of the aerial structure must await the analytical determination noted above. However, they will probably be either prestressed concrete or composite sections of steel and concrete. The columns and support arms will be either reinforced concrete or structural steel. 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

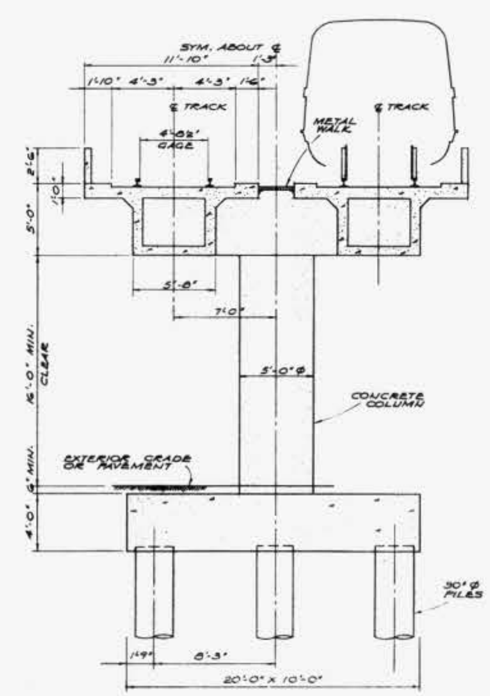
Where tunnels extend beneath or close to existing building foundations, it is often necessary to underpin or support such foundations during construction. In general, if a tunnel is located under buildings three stories or less in height, no underpinning is required if the depth from the bottom of the 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.



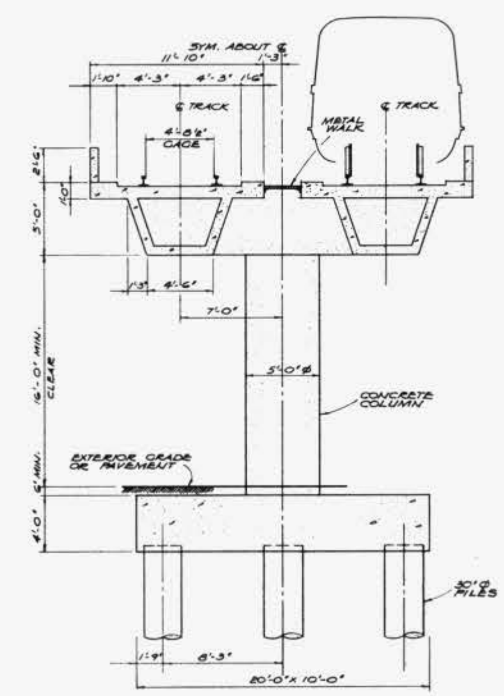
AERIAL WAY STRUCTURE
COMPOSITE RECTANGULAR GIRDERS



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.

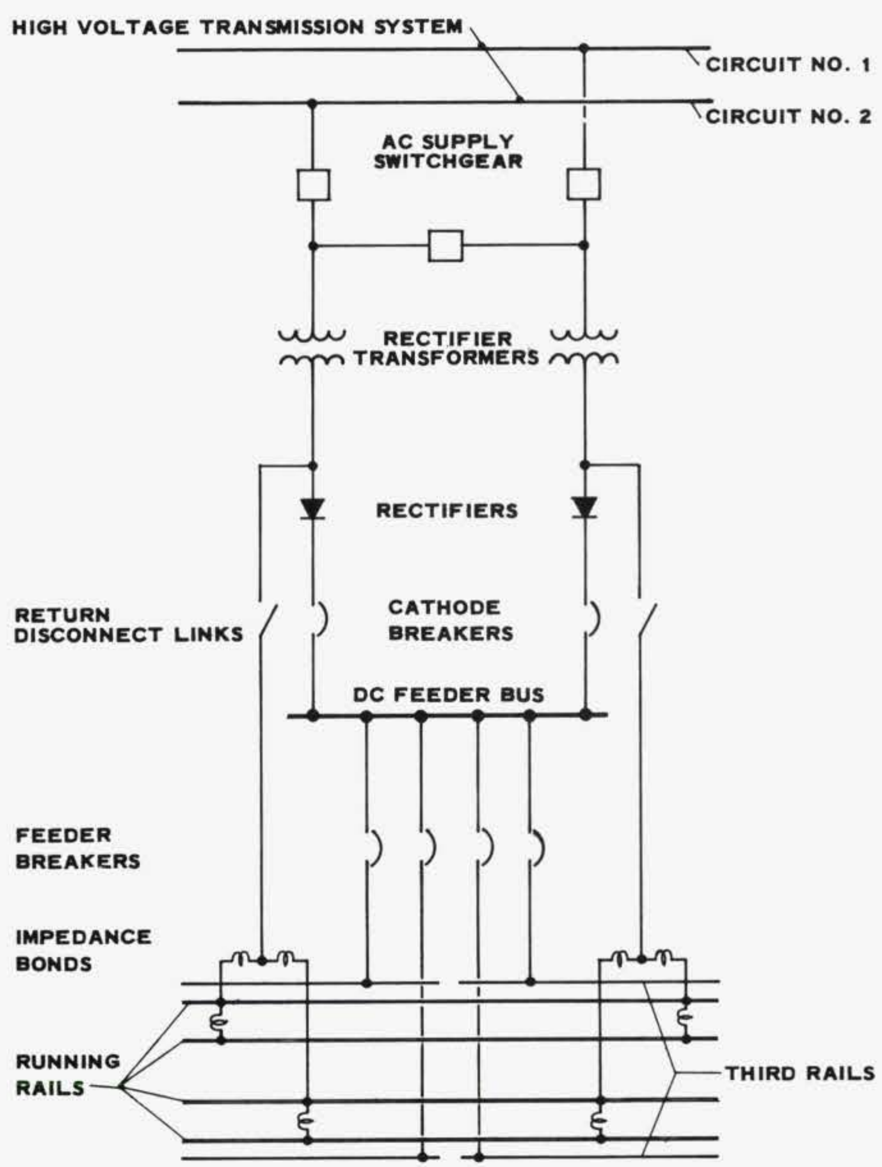
MAIN SHOP FACILITY

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.

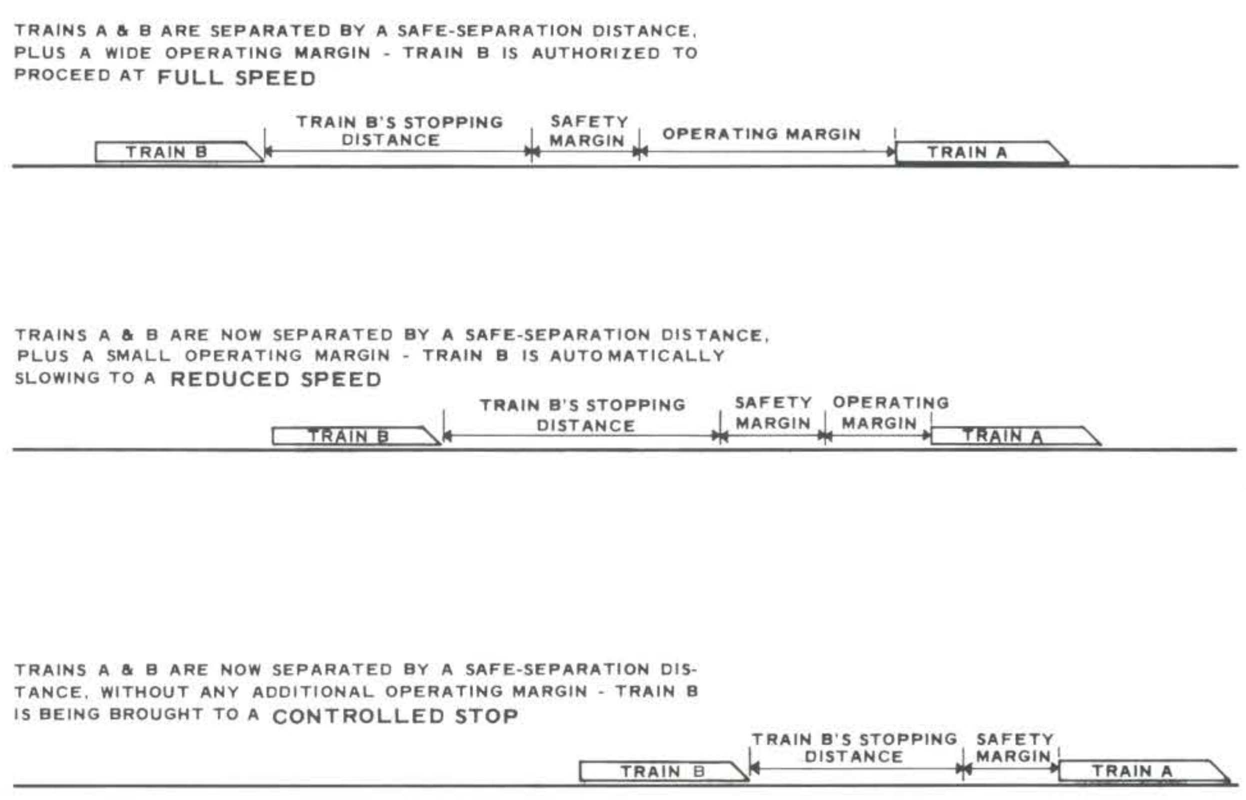
The route is completely clear.

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.

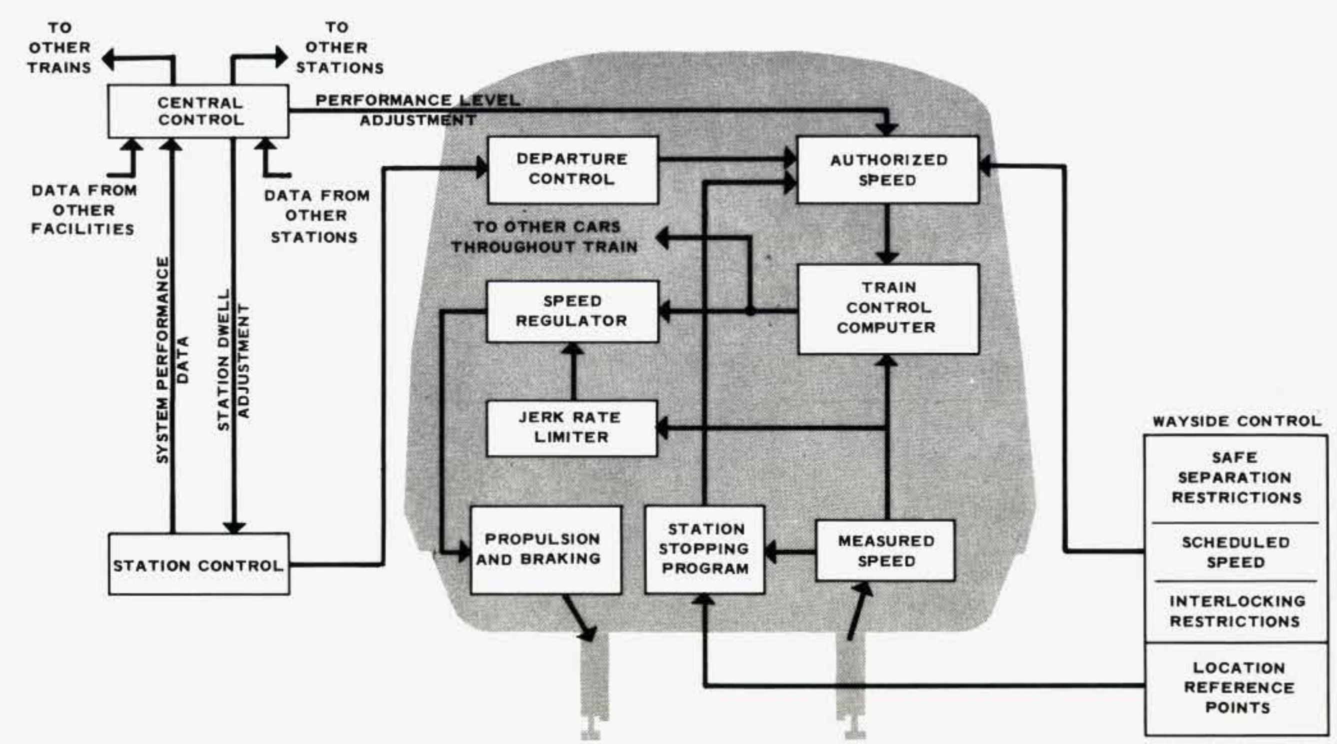
Rate of change of acceleration will not exceed one-and-one-half miles per hour per second per second.

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),

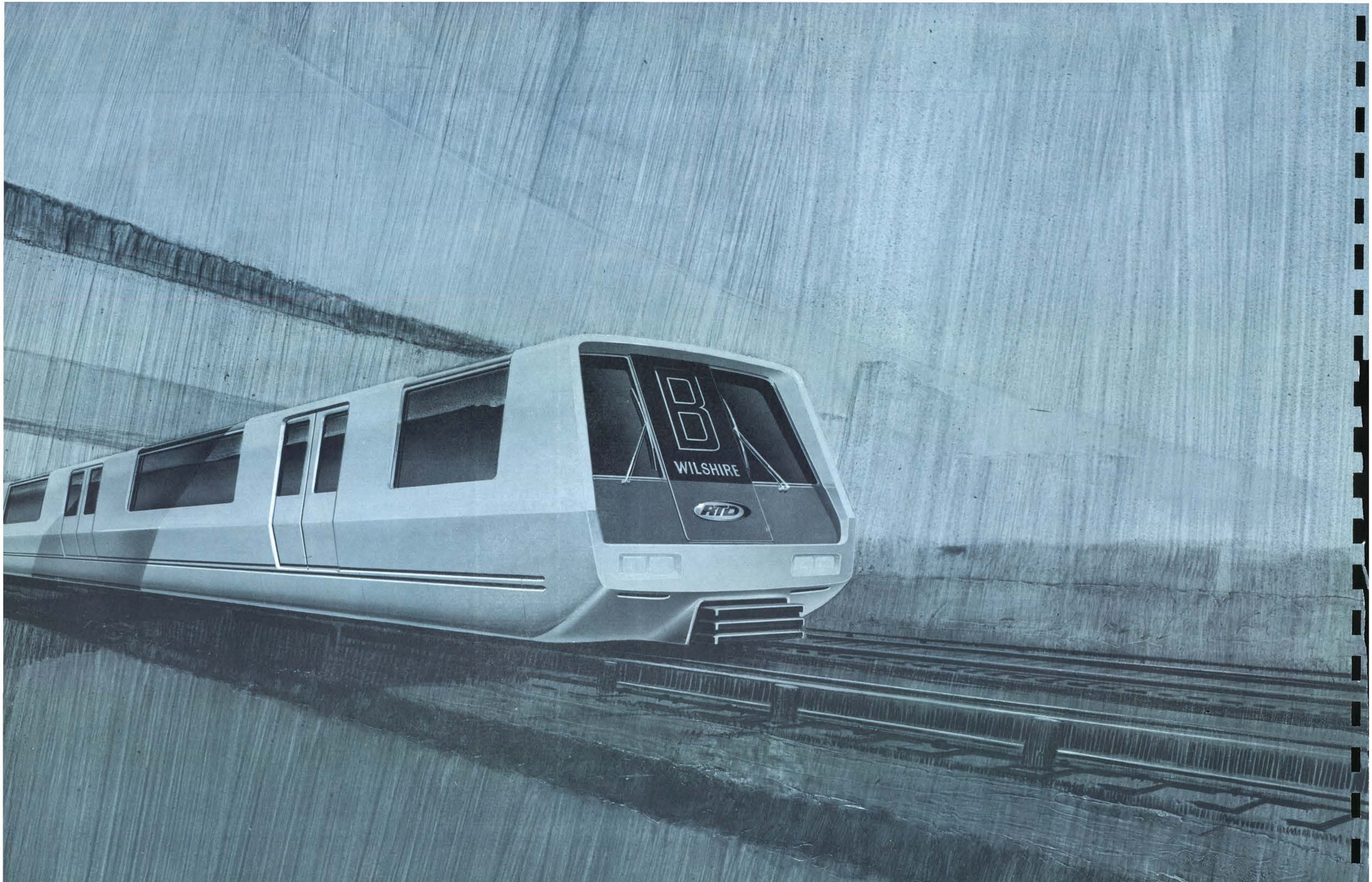
Top-supported suspended vehicle (monorail).

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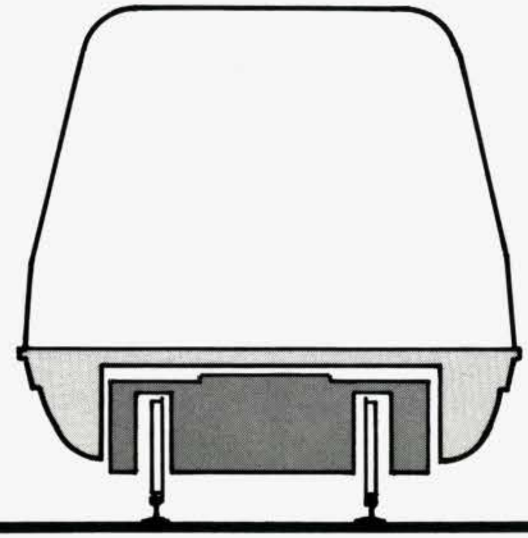
For example, a study of new transportation technology reveals that a promising concept for the future generation of vehicle systems is one supported on a thin film of air and propelled by a linear induction motor. This concept, referred to as the tracked air cushion vehicle, has certain inherent features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

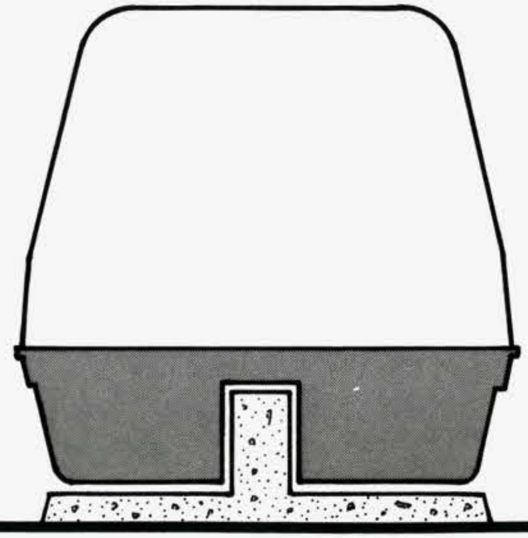
The elimination of wheels, bogies and conventional motors can effect a reduction in vehicle height and weight which can result in savings of operating costs. Fewer moving parts should be the cause of reduced maintenance costs of vehicles. A significant savings in the maintenance of roadbed is also a 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.

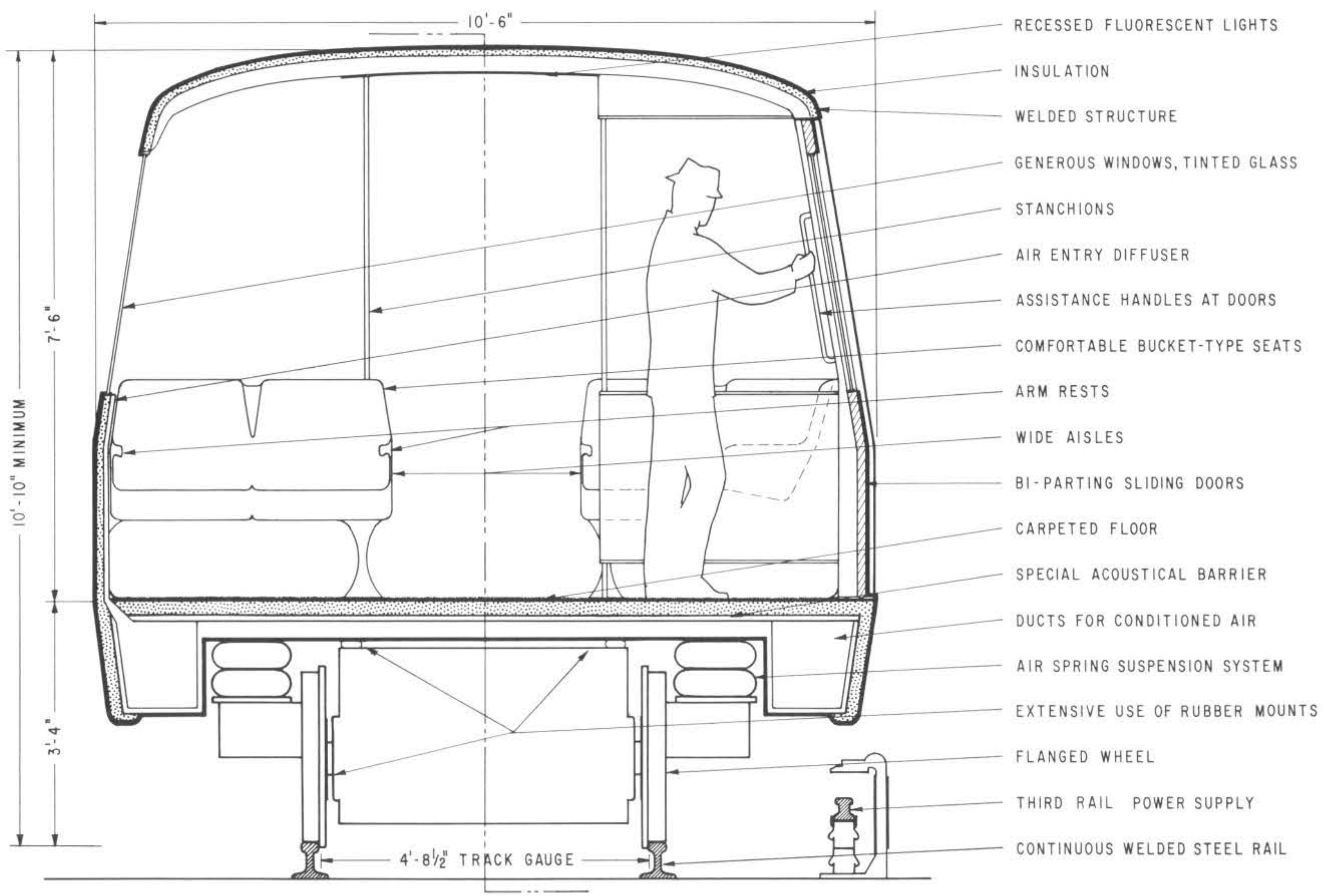
It is considered most significant that the fixed facilities required for the tracked air cushion vehicle system are somewhat similar to the basic fixed facilities of the steel rail, flanged wheel system. If the feasibility of this new concept should be proven in the future, the existing transitways, 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.

Escalation

The estimate of cost is based on 1967 prices and construction conditions. The development of a reliable cost estimate for a large project requiring a minimum of eight years from today to construct is a complex task. In addition to increasing wages and prices, other factors such as taxes, interest rates, work conditions, rules and regulations, etc., affect the cost of construction. Based on the best possible judgment of future anticipated trends related to construction work, which results from intensive study and thorough analysis, an allowance for escalation of construction costs of seven percent per annum, compounded, has been provided.

Rolling Stock

Costs of the vehicles plus costs of the control and communication equipment, which is an inherent part of each car, and an allowance for escalation.

ESTIMATE OF COSTS
(In Millions of Dollars)

1.	Structures and Roadbeds	$346.2
2.	Stations	187.2
3.	Electrification	67.5
4.	Control and Communication	43.1
5.	Utility Relocation	9.2
6.	Underpinning	20.6
7.	Yards and Shops	20.8
8.	Project Management, Engineering, Construction Management and District Pre-Operating Expense	90.3
9.	Contingency	117.7
10.	Escalation on Construction	336.4
	Subtotal	$1,239.0
11.	Vehicles (Includes Controls and Escalation)	134.0
	TOTAL	**$1,373.0**

SUMMARY OF CASH FLOW
(In Millions of Dollars)

	TOTAL	7/68 to 7/69	7/69 to 7/70	7/70 to 7/71	7/71 to 7/72	7/72 to 7/73	7/73 to 7/74	7/74 to 7/75
Total Construction (Excluding Vehicles)	$ 902.6	$7.5	$52.1	$149.0	$211.3	$226.6	$165.5	$ 90.6
Escalation on Construction	336.4	0.5	7.6	33.6	65.7	91.3	82.9	54.8
Sub-total (Construction)	$1,239.0	8.0	59.7	182.6	277.0	317.9	248.4	145.4
Vehicles	134.0	0	0	6.0	0.9	32.6	64.7	29.8
GRAND TOTAL	**$1,373.0**	**$8.0**	**$59.7**	**$188.6**	**$277.9**	**$350.5**	**$313.1**	**$175.2**

COVERDALE & COLPITTS

CONSULTING ENGINEERS

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(212) 943-7400

CABLE ADDRESS: COVERCOL

September 28, 1967

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

Gentlemen:

In accordance with the terms of our contract of November 15, 1966, we submit herewith our report on preliminary estimates of passenger traffic, revenues and expenses for the rapid transit system proposed by the Southern California Rapid Transit District.

We wish to express our appreciation to the District's Board and staff for their cooperation and assistance throughout the course of this study.

Respectfully submitted,

Coverdale & Colpitts
Consulting Engineers

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PRELIMINARY ESTIMATES OF TRAFFIC, REVENUES AND EXPENSES

The following is our report setting forth our preliminary estimates of passenger traffic, revenues and expenses for the rapid transit system proposed for study by the Southern California Rapid Transit District and for its bus system.

DESCRIPTION OF SYSTEM PROPOSED BY DISTRICT

The rapid transit system proposed by the District will consist of four grade-separated rail routes to serve the Wilshire, San Gabriel Valley, San Fernando Valley and Long Beach travel corridors, and will have terminals located at Wilshire Boulevard and Fairfax Avenue, El Monte, Balboa Boulevard & Sherman Way, and Long Beach. Common trackage will be shared by trains from each of the four routes along the Wilshire Boulevard corridor between the Los Angeles Central Business District (CBD) and Western Avenue.

The District plans to supplement the rapid transit system with an extensive feeder bus network comprised of new routes and revisions to existing routes. This feeder system will effectively extend the service area of the rapid transit system throughout a large portion of Los Angeles County.

The rapid transit system will have 62 route miles and 45 stations which will result in an average system-wide station spacing of 1.4 miles. The station locations have been tailored so as to serve conveniently areas of greatest potential passenger volume and still permit a high average train speed. The average distance between stations ranges from 1.9 miles on the Long Beach corridor to 0.7 miles on the Wilshire corridor. Average speeds, including station stop time, will vary among the corridors according to the average station spacing and will range from 45 miles per hour in the Long Beach corridor to 28 miles per hour in the Wilshire corridor.

Headways in the peak periods will be as close as 1½ minutes in the common Wilshire corridor and 3 minutes on the branches. In the midday period, headways on each of the branches of the system will be 10 minutes, and in the evening it will be 15 minutes.

Full operation of the system is scheduled to begin July 1, 1975.

LOS ANGELES METROPOLITAN AREA

The Los Angeles Standard Metropolitan Statistical Area, which consists of Los Angeles County, had an estimated population of 7,044,000 as of April 1, 1967, and is the second largest metropolitan area in the country. The tremendous increase in population in this area in the last two decades is well-known, and further growth in population is expected in the future as shown by the most recent estimate of the Los Angeles County Regional Planning Commission, which forecasts a population of 9,000,000 in 1980. This is an increase of almost 2,000,000 persons in the next thirteen years. This increase itself is larger than the 1967 population of all but the twelve largest metropolitan areas in the country. The existence of a rapid transit system in the area, in our opinion, will have a significant effect on the population growth and economic development along the proposed rapid transit routes.

SERVICE AREA

The service area of the proposed system will extend throughout and beyond the corridors themselves through establishment of a feeder bus system to supplement the existing District bus system, many of whose present lines will also serve as feeders. It is planned that parking lots will be provided near stations, thus further broadening the area served by the rapid transit system. Our analysis shows that 60% of the total population of Los Angeles County lives within this service area.

Total employment in Los Angeles County in 1965 averaged 2,800,000. Employment estimates made by LARTS for 1965 for each census tract were analyzed to determine the amount of employment within approximately a 2-mile band along the proposed rapid transit lines, and it was found that nearly 900,000 persons had places of employment within this band. This indicates that a significantly high proportion of the total County work force can be conveniently served by the rapid transit system.

ESTIMATED PASSENGER VOLUMES

Our preliminary estimate is that there will be 327,000,000 rides in 1980 on the District's rapid transit and bus systems combined. This is equivalent to over 1,000,000 rides on an average weekday. These estimates include both originating and transfer rides and are based on the assumption that current bus passenger volume will not change by 1980, other than as affected by the rapid transit system.

The proposed rapid transit system will serve an estimated 93,000,000 passengers annually, which is equivalent to 300,000 passengers on an average weekday. A rapid transit system carying 300,000 passengers per day will serve a real need and have a genuine impact on the Los Angeles area. Approximately 70 percent of the passengers will ride during the morning and afternoon peak hours.

Approximately 65,000,000 of the 1980 estimated rides will be diverted from freeways and local streets, principally within the congested urban core area. About 54,000,000 of the automobile trips being diverted occur in the peak hours when freeway and highway congestion is at its greatest. This is a diversion to rapid transit of 25% of the potential automobile trips within the service area during the morning and afternoon peak hours.

The map in Exhibit 1 shows the estimated passenger flow on the proposed system on an average weekday in 1980. The width of the flow line is proportional to the volume of passengers. The map indicates the importance of the core of the region as an area of trip attraction.

SELECTION OF THE FOUR CORRIDORS

Over the period of several years our firm has developed extensive data on travel patterns in the Los Angeles area. We have studied the economic development of the area, and considered its future growth and how it would affect passenger traffic on a rapid transit system. In 1958-59 we conducted three comprehensive origin-destination surveys within the Los Angeles area. The results of these surveys revealed twelve travel corridors having the heaviest volumes of travel.

PRELIMINARY ESTIMATE OF PASSENGER FLOW ON PROPOSED SCRTD RAPID TRANSIT SYSTEM

1980 AVERAGE WEEKDAY

COVERDALE & COLPITTS
CONSULTING ENGINEERS
140 BROADWAY
NEW YORK, NEW YORK 10005

EXHIBIT 1


PRIORITY RAPID TRANSIT ROUTES
AND FEEDER BUS LINES
RAPID TRANSIT ROUTES & STATIONS
RTD FEEDER BUS LINES, NEW & AUGMENTED
OTHER FEEDER BUS LINES
PRESENT BUS ROUTES
RTD LINES
OTHER LINES
SAN FERNANDO
LA CRESCENTA
MONTROSE
LA CANADA
BURBANK
GLENDALE
ALTADENA
SIERRA MADRE
PASADENA
MONROVIA
AZUSA
GLENDORA
SAN MARINO
ARCADIA
DUARTE
CLAREMONT
SAN DIMAS
LA VERNE
IRWINDALE
SAN GABRIEL
TEMPLE CITY
ROSEMEAD
ALHAMBRA
BALDWIN PARK
COVINA
CHARTER OAK
EL MONTE
WEST COVINA
BEVERLY HILLS
LOS ANGELES
BELVEDERE
MONTEREY PARK
BASSETT
POMONA
WESTMONT
SANTA MONICA
MONTEBELLO
INDUSTRY
LA PUENTE
WALNUT
VERNON
COMMERCE
WHITTIER
ROWLAND
DIAMOND BAR
CULVER CITY
MAYWOOD
PICO RIVERA
HUNTINGTON PARK
FLORENCE
BELL
CUDAHY
DOWNEY
SOUTH GATE
SANTA FE SPRINGS
LOS ANGELES INTERNATIONAL AIRPORT
INGLEWOOD
S. WHITTIER HTS
NORWALK
EL SEGUNDO
WILLOW BROOK
LYNWOOD
HAWTHORNE
LAWNDALE
GARDENA
COMPTON
PARAMOUNT
MANHATTAN BEACH
BELLFLOWER
HERMOSA BEACH
ARTESIA
LAKEWOOD
REDONDO BEACH
TORRANCE
DOMINGUEZ
HAWAIIAN GARDENS
PALOS VERDES ESTATES
SIGNAL HILL
LOMITA
ROLLING HILLS ESTATES
WILMINGTON
LONG BEACH
ROLLING HILLS
SAN PEDRO
SCALE
MILES
FEET

EXHIBIT 2

Each of these corridors was analyzed in detail, and from these analyses the four corridors now under study were recommended as being the most promising routes for the first phase rapid transit system. The selection of these four corridors was based on the following criteria:

1. *Potential passengers per mile of corridor.*
2. *Profile of potential passenger volume.*
3. *Length of passenger trips.*
4. *Population and economic growth, and land use.*
5. *Availability of rights-of-way.*
6. *Competitive highway facilities.*

Additional origin-destination surveys were taken in 1961-62 from which detailed passenger estimates were made for the proposed backbone route to serve the Wilshire and San Gabriel Valley corridors.

DEVELOPMENT OF RAPID TRANSIT PASSENGER ESTIMATES

In our current study for the proposed 62-mile system, we have used the results of our prior studies as a basis for preliminary passenger estimates. Our first task was to adjust previous studies to reflect current conditions. We have done this by using the most recent information on population, employment trends and economic developments in Los Angeles.

From the detailed community inventories made by the Los Angeles Regional Transportation Study (LARTS), we have been able to determine precisely what changes have occurred in population and employment since 1958 and 1962 in the area tributary to each of the 45 stations. Other economic indicators also have been used, such as traffic counts on freeways and highways, building activity and retail sales. Application of these indicators has permitted us to update previous studies to the year 1967.

The next task was to estimate what traffic patterns will exist in 1980 when the proposed rapid transit system is scheduled to be in full operation. Our estimates of 1980 travel patterns are based upon two major premises: First, the area will continue to grow and travel volumes will increase as a result. Second, the presence of rapid transit in the community will have an impact on area growth that would not occur if rapid transit were not present.

As a starting point in making 1980 projections, we utilized the 1980 detailed forecast by census tracts of population and employment prepared by LARTS and the Los Angeles County Regional Planning Commission. The expected growth for each of the 45 stations' tributary area was calculated. These forecasts, however, do not include the effect that rapid transit would have on the local economy in 1980.

Our approach to assessing the impact of rapid transit was to consider separately the CBD and the four corridors that comprise the system. We have reviewed available statistical data and analytical material bearing on this matter. We have made visual inspections of the tributary areas. We have obtained the views of a considerable number of individuals in the private sector who have a responsible interest in the economic development of Los Angeles, as well as the views of the several governmental agencies which have vital interest in the area's future.

Our findings are that the proposed rapid transit system can be expected to stimulate employment and commercial development in the areas served. The increased employment will in turn have an impact on the residential areas within the corridors.

The most significant factor influencing the number of persons who will change from their existing modes of travel via bus or automobile to travel via rapid transit is the savings in travel time. Other important factors are comparable out-of-pocket travel costs, trip length, convenience, comfort and safety. To the extent these factors are quantitative they have been considered in estimating the diverted traffic.

We have done extensive driving throughout the area and have recorded travel times in both peak and off-peak periods. We have estimated future automobile travel times taking into consideration new freeways planned for 1980 as well as the increased volumes of freeway traffic as forecast by the State Division of Highways. We estimate that auto travel times via freeway in the Long Beach and the San Fernando Valley corridors will be longer than those currently experienced. However, travel times on arterial streets have been assumed at 1967 conditions. To the extent that greater traffic congestion on arterial streets increases travel times by 1980, there will be a corresponding increase in auto trips diverted to the rapid transit system in addition to those included in our estimate.

The estimated passenger volumes are predicted on convenient access to and from the stations as has been provided for in the plan. For those passengers beyond walking distance, a feeder bus system of approximately 250 route miles will be established to supplement the existing District bus service; parking lots will be provided at 22 stations; and convenient facilities for drop off and pick up by automobile will be made available.

The map in Exhibit 2 shows the proposed rapid transit lines, tentative routings showing the extent of feeder bus lines and the existing bus lines of the District and other operators that will also serve as feeders. Such existing bus lines will have increased frequency of service and capacity to accommodate the higher levels of riding.

PROPOSED RAPID TRANSIT FARE SCHEDULE

A fare schedule for the proposed rapid transit system has been developed to attract the maximum patronage as well as to provide sufficient revenues for the District to meet its operating and maintenance expenses. The proposed fare schedule is necessarily related to the fare schedule of the present bus system, inasmuch as both the rapid transit and bus systems will be needed to serve the same areas.

The proposed rapid transit fare schedule provides for the same minimum adult fare as on the bus system. Based on the bus fare in effect in August 1967, this would be a fare of 30¢ for rides up to five miles in length, which would be 6 cents per mile. Fares for rides of longer distances are based on a declining rate per mile to reflect the relative fixed and variable costs per passenger. The fare for the maximum length trip of 43 miles between the Long Beach and San Fernando terminals would be $1.05 which would amount to 2½ cents per mile. System-wide the fare would average approximately 45¢.

One-way adult fares for representative trips based on the August 1967 fare schedule are shown in the table below:

Wilshire Terminal to Civic Center	40 cents
El Monte Terminal to 6th & Broadway	65
San Fernando Valley Terminal to 7th & Hope	85
Long Beach Terminal to Civic Center	85
Alhambra (Garfield) to 6th & Broadway	45

Hollywood (Vine) to 6th & Broadway	40
Watts (103rd St.) to Civic Center	45
Compton to Vernon	45
Rosemead to Western & Wilshire	65

Rapid transit passengers will be able to transfer to and from feeder buses without paying an additional 30¢ base fare. However, they would pay a transfer charge of 5¢ for bus trips of less than two miles and an additional 8¢ for each zone thereafter, in accordance with the bus fare structure in effect in August 1967.

We recommend that a fee of 25¢ for all day parking be charged only for those parking spaces most convenient to the station entrances and that the remainder be free.

RAPID TRANSIT OPERATING AND MAINTENANCE EXPENSES

A tentative train schedule has been prepared by the District's staff based on the preliminary estimates of 1980 passenger volumes. The tentative Plan of Operation provides for maximum train lengths of eight (8) cars having maximum loads of 1,000 passengers per train, minimum headways of 90 seconds, and hours of operation from 5:00 A.M. to 1:00 A.M. Except for the peak period, the Plan provides a seat for all passengers.

The schedule indicates a requirement of 475 cars, including spares, and operation of 27.5 million car miles in 1980.

The operating and maintenance expenses have been estimated jointly by the Joint Venture and us, in cooperation with the District's staff, as order-of-magnitude values for purposes of this Preliminary Report. These estimates are consistent with detailed estimates prepared for previous Los Angeles rapid transit studies, and with operating rapid transit systems elsewhere. The estimates are based upon August 1967 wage and cost levels applied to 1980 service requirements. The costs of maintenance of equipment, maintenance of way, structures and parking lots, conducting transportation, power and general and administrative expenses are estimated to be $17.5 million. This is a cost of 64 cents per car mile.

EFFECT OF RAPID TRANSIT SYSTEM ON BUS SYSTEM

The proposed rapid transit system will affect the operations of the existing bus system by diverting passengers from existing trunk bus lines to the rapid transit and by attracting new passengers to the proposed feeder bus system. Preliminary estimates indicate that the number of added feeder bus rides will exceed the loss of rides diverted from trunk bus lines to rapid transit. It is estimated that about 184 buses, in addition to those released by diversion of bus passengers to rapid transit, will be required for the feeder bus system.

CONSOLIDATED REVENUES AND EXPENSES FOR RAPID TRANSIT AND BUS SYSTEMS

The preliminary estimates of financial results of operation of the combined bus and rapid transit systems in 1980 are shown in the accompanying table. All revenues and expenses are based on fare schedules, wage rates and cost levels in effect in August 1967.

PRELIMINARY ESTIMATE OF 1980 FINANCIAL RESULTS OF OPERATION OF THE SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT (AT 1967 FARE AND COST LEVELS)

	Millions of Dollars
Passenger Revenues	$88.8
Other Revenues	2.7
Total Revenues	$91.5
Operating and Maintenance Expenses	$64.4
Reserve for Replacements	9.0
Total Expenses	$73.4
Partial Provision for Escalation of Cost Levels by 1980	10.0
Total Expenses, including Provision for Escalation	$83.4
NET REVENUES AVAILABLE FOR DEBT SERVICE	**$ 8.1**

Passenger revenues of the District in 1980 have been estimated at $88.8 million based on the August 1967 bus fare schedule and on the rapid transit fare schedule described previously.

Other revenues from such sources as parking, advertising and concessions have been estimated at $2.7 million at 1967 rate levels.

Operating and maintenance expenses for the bus system have been estimated at August 1967 wage and cost levels to reflect the additions resulting from the new feeder bus system and the savings on those bus lines from which passengers will be diverted to rapid transit. Consolidating these bus expense estimates with the rapid transit operating and maintenance expense estimates results in 1980 estimated expenses of $64.4 million, based on August 1967 wage and cost levels.

It is recommended that a reserve for replacement of equipment and facilities be established. The purpose of this reserve will be to insure the availability of funds for the District to make necessary replacements so that its rapid transit and bus systems can be operated in an efficient manner. We believe that approximately 10% of revenues will provide sufficient funds to make necessary replacements. In 1980 this will amount to $9 million.

It is reasonable to assume that by 1980 wage rates and other costs will rise from the August 1967 levels on which these estimates are based. Some of these anticipated higher costs can be absorbed by the District from its revenues and we suggest that $10 million be used for this purpose. This will moderate any fare increase that may be required by 1980 so that the fare rise will be less than the rise in cost levels.

Thus, estimated net revenues available for debt service will amount to $8.1 million in 1980. It is planned that the system will be in full operation by July 1, 1975. Net revenues available for debt service for each of the first six years of operation are estimated as follows:

Year Ending June 30	Millions of Dollars
1976	$5
1977	6
1978	7
1979	8
1980	8
1981	8

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October 6, 1967

Mr. Dale W. Barratt, General Manager
Southern California Rapid Transit District
1060 South Broadway
Los Angeles, California 90015

Dear Mr. Barratt:

Pursuant to our letter of August 14, 1967, we have at your request reviewed the section entitled, "Methods of Financing Construction", of your preliminary report on the First Stage Rapid Transit Program. Accordingly, we have discussed drafts of the section with District staff and have suggested minor changes. We did not assist, however, either in planning the financing program or in organizing its presentation.

The basic projections of the cost of the system and of its future revenues and expenses have been prepared by SCRTD's consulting engineers. Assuming these data, we have examined Tables I to IX and find that the methods used and conclusions reached are reasonable.

In particular, the forecasts made of the District's assessed valuation appear to be conservative. A linear projection was used for the basic Los Angeles County assessed valuation which assumes annual increments less than the actual average increment since 1950/51. The assessed valuation forecast for 1980/81 of $23,122,000,000 represents an annual rate of increase of only 2.6% over the 1967/68 assessed valuation of $16,573,000,000.

The estimates used for gasoline sales tax proceeds involve some assumptions which may be less conservative, but in our opinion the amounts projected are reasonable.

The estimates of annual debt service appear to be conservative. The interest rate of 4-1/2% seems a reasonable expectation, on the average, over the next eight years. All bonds are assumed to be issued at the beginning of the year in which the proceeds are needed, and no account has been taken of interest earnable during construction.

The maturity schedules proposed in Tables V, VII and IX each represent, necessarily, only one alternative out of the many practical, and some variation may be desired. For example, the maximum 40.69¢ tax rate shown for 1974/75 in Table V could be reduced somewhat by a different choice of bond maturities. On the whole, however, the maturities chosen seem satisfactory.

It has been assumed that federal grants totaling $67,006,000 will be received by the District. If none of these funds is received, an increase in the annual tax rate of less than 2¢ per $100 would be sufficient to compensate for the loss.

From the basic assumptions, the conclusion seems justified that the program can be financed with a maximum District tax rate of 40¢ per $100 assessed valuation. Federal and state support that is proposed could reduce the indicated maximum to below 6¢ per $100.

We hope that our review and comments have been of help to you and the District in the preparation of your report and look forward to working with you in the future.

Sincerely,

STONE & YOUNGBERG

James Saffran

James S. Saffran

JSS:sed

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

FIRST STAGE RAPID TRANSIT PROGRAM METHODS OF FINANCING CONSTRUCTION

SECTION I

LEGAL PROVISIONS FOR FINANCING CONSTRUCTION

Southern California Rapid Transit District operates under authority of the Southern California Rapid Transit District Law, Part 3, Division 10 (commencing with Section 30000) of the California Public Utilities Code.[1] The District was created in 1964 to be the successor of the Los Angeles Metropolitan Transit Authority. The District's Board of Directors is composed of eleven members; five appointed by the Board of Supervisors of Los Angeles County; four by a City Selection Committee composed of the representatives of all 75 cities in the District, excluding the City of Los Angeles; and two members by the City of Los Angeles. The District's territory includes all of the area in Los Angeles County south of the San Gabriel Mountains and excluding the Santa Catalina and San Clemente Islands. The District was created by legislative act based upon legislative findings declaring an imperative need for a comprehensive mass rapid transit system in Los Angeles County with authority to operate in a multi-governmental area and with power to solve the transportation problems in the Southern California area. The District was granted the power of eminent domain and the right to issue bonds financed in whole or part by public funds. In the case of certain types, the bonds must be approved by 60% vote of the electors in the District. The District's powers to finance a rapid transit system were extended at the 1967 Legislative Session by the enactment of Chapter 1215, Statutes 1967 (SB 598).

[1] The District law was amended and Part 17 (commencing with Section 37001) of the Revenue and Taxation Code relating to special taxes was added by Chapter 1215, Statutes 1967 (SB. 598), which becomes effective November 8, 1967. These amendments are considered now in effect for the purpose of this report.

The District law authorized the financing of rapid transit construction and other capital facilities through the issuance of several types of bonds defined in the law (Section 30706). The bonds and other obligations permitted by the District law are of the following types: (1) bonds financed primarily by a real property tax (Sections 30900-30914); (2) back-up bonds financed by revenues including transit funds or special taxes and backed up by a real property tax (Sections 30703.1, 30802 (b), 30900-30914); (3) limited tax bonds financed by any sources other than a real property tax (Sections 30920-30923); (4) revenue bonds financed by operating revenues (Sections 30930-30932); (5) equipment trust certificates financed by operating revenues (Sections 30940-30944); and (6) improvement districts bonds dependent upon real property tax financing (Sections 30960-30970). All the bonds ("bonds" in the language of the District law) are issued pursuant to Sections 30900-30914 of the District law.

Preliminary studies conducted by Los Angeles Metropolitan Transit Authority, the predecessor of the District, found that a regional rapid transit system for the Los Angeles area although capable of meeting operation and maintenance expenses, could not produce net earnings sufficient to permit financing on a self-liquidating revenue bond basis. The current engineering studies of the first stage regional system conducted for the District by Coverdale & Colpitts and Kaiser Engineers — Daniel, Mann, Johnson & Mendenhall, a Joint Venture, have affirmed this conclusion. All systems now being built or planned in other metropolitan areas are necessarily being developed with financial assistance from public funds, and improvements and extensions of older existing systems are being similarly financed.

The District's first stage rapid transit system is estimated by Coverdale & Colpitts to provide some net revenue, projected at $8,000,000 per annum by the year 1978-79, available for debt service.

The District is especially empowered to accept transit funds, contributions or loans from the Federal Government, the State of California or any public agency for the acquisition, construction, maintenance or operation of transit facilities and the District may enter into cooperative agreements with the State of California or any public agency for the development of or operation, jointly or otherwise, of transit facilities (Sections 30701-30706). Transit funds looked to as a possible source of financing are broadly defined in Section 30703.1 with special provision for handling funds such as might be received under the alternative methods of financing discussed below or other similar legislation which may be introduced in the 1968 Session of the legislature. Although legislation was introduced in 1967 (see Note 1, supra) to permit the District to levy special taxes of various kinds, the Revenue and Taxation Code, Part 17 (commencing with Section 37001) does not yet authorize any special district taxes directly for back-up bonds, (2) above, or limited tax bonds, (3) above.

Financing of the system with provision for application of net revenues and one or more of the sources of public funds described is most appropriately provided by back-up bonds (Sections 30703.1, 30802 (b), 30900-30914). This form of bond is ac'aptable to the utilization of any special tax or public fund aid which legislation may provide, provides security to enable the District to market the bonds at the most favorable interest rate, and relieves the requirement of revenue coverage applicable to bonds not having the security of property tax back-up.

The total indebtedness of the District in all forms may not exceed the aggregate of 15% of the assessed value of all real and personal property in the District

TABLE I

Projected Assessed Valuation of Property Subject to Taxation and Southern California Rapid Transit District Debt Limit (In $1,000's)

Year	Assessed Valuation	District Debt Limit
1967-68 (Actual)	$16,573,000	$2,486,000
1968-69	17,077,000	2,562,000
1969-70	17,581,000	2,637,000
1970-71	18,084,000	2,713,000
1971-72	18,588,000	2,788,000
1972-73	19,092,000	2,864,000
1973-74	19,596,000	2,939,000
1974-75	20,099,000	3,015,000
1975-76	20,603,000	3,090,000
1976-77	21,107,000	3,166,000
1977-78	21,611,000	3,242,000
1978-79	22,114,000	3,317,000
1979-80	22,618,000	3,393,000
1980-81	23,122,000	3,468,000

Table I shows the actual assessed valuation of real and personal property in the District for the fiscal year 1967-68, the estimated assessed valuations for years 1968-69 to 1980-81, and the District's borrowing limit at 15% of assessed valuation as of each of those years. The assessed valuation is a conservative projection of the trend observed during the years 1950-1966. The total estimated cost of the system proposed by the District, $1,571,702,000, is well within the borrowing limit of the District at current assessed valuation.

SECTION II

COST OF SYSTEM TO BE FINANCED

Table II sets forth the annual cash requirements for construction of the system over the anticipated construction period of 1969 to 1975 inclusive. In this table system construction includes an amount of $31,500,000 for the retirement of District revenue bonds outstanding as of March 1, 1969. This bond issue, by means of which the District's surface system was financed, must under the terms of its indenture be refunded in any financing of the District rapid transit system.

TABLE II

Construction Cash Requirements (In $1,000's) Fiscal Years Beginning July 1

Year	Amount
1/1/69 - 6/30/69	$ 39,498
7/1/69 - 6/30/70	79,649
7/1/70 - 6/30/71	228,566
7/1/71 - 6/30/72	337,884
7/1/72 - 6/30/73	380,515
7/1/73 - 6/30/74	327,249
7/1/74 - 6/30/75	178,341
Total	$1,571,702

As reported by Joint Venture Engineering Consultants

Under the Urban Mass Transit Act of 1964, the United States Department of Housing and Urban Development is empowered to make capital grants to assist in the development of mass transit systems. Among recent grants made under this program are $33,000,000 to the Massachusetts Bay Transportation Authority for development of the South Shore rapid transit line, $45,900,000 to the City of Chicago for construction of rapid transit in the Dan Ryan and John F. Kennedy expressways and $23,000,000 to the City of New York representing 50% of the cost of new rapid transit cars. Grants under this program are subject to appropriation of funds by the Congress. The experience of other urban areas indicates that some measure of financial assistance from this program will be available to the District under the rapid transit development plan proposed. For the purpose of this report such assistance is estimated at a 50% participation in the cost of rolling stock for the system. Table II-A reflects the cost of the system to be financed by the District on this basis.

TABLE IIa

District Financing Requirement
Federal Capital Grant Estimated at 50% of Rolling Stock Cost
(In $1,000's)

Year	Construction Cash Requirement: Total	Estimated Federal Grant	District Net Requirement
1/1/69 - 6/30/69	$ 39,498	$ —	$ 39,498
7/1/69 - 6/30/70	79,649	—	79,649
7/1/70 - 6/30/71	228,566	2,996	225,570
7/1/71 - 6/30/72	337,884	443	337,441
7/1/72 - 6/30/73	380,515	16,319	364,196
7/1/73 - 6/30/74	327,249	32,329	294,920
7/1/74 - 6/30/75	178,341	14,919	163,422
Total	$1,571,702	$67,006	$1,504,696

SECTION III

FINANCING AVAILABLE UNDER EXISTING DISTRICT POWER

While system revenues as estimated by Coverdale & Colpitts will meet all maintenance and operation costs of the system and will make adequate provision for the replacement of rolling stock and other equipment of limited useful life, they will not alone permit financing of the construction cost. The District therefore proposes that financing be in the form of bonds with general property tax backing authorized and issued under the provisions of the District law described above. Such bond financing will assure the lowest ultimate financing cost for the system, particularly with respect to interest cost.

While the District is empowered by the Law to finance construction on a 50-year term, a shorter financing term, while requiring higher annual debt service payments, will result in a substantially lower total cost of financing. A financing term of 40 years is proposed as appropriate to the useful life of the facilities to be constructed. Table III reflects the estimated service lives of the components of the system. It should be noted that the provision for depreciation included in the calculation of financial results of operation by Coverdale & Colpitts will provide for the replacement of rolling stock out of system revenues, and maintenance of rail and track structures, also provided for, in effect renews these elements of the system from revenues.

TABLE III

Estimated Useful Life of Major Facilities

	Years
Tunnels	60
Aerial Structures	40
Trackage	20
Stations — Subway	60
Stations — Aerial	40
Electronic Equipment such as Fare Collection— Automatic Train Control	15
Machinery and Equipment	12
Power System Components	20
Rolling Stock	25

Source — Engineering Consultants
K. E.-D. M. J. M. — Joint Venture

Table IV sets forth estimated net revenues to be generated by system operations and available for application to debt service for the years 1976 to 1980 as reported by Coverdale & Colpitts.

TABLE IV

Estimated Net Revenue Available for Debt Service
(In $1,000's)

Year	Net Available for Debt Service
7/1/75 - 6/30/76	$5,000
7/1/76 - 6/30/77	6,000
7/1/77 - 6/30/78	7,000
7/1/78 - 6/30/79	8,000
7/1/79 - 6/30/80	8,000
7/1/80 - 6/30/81	8,000

As reported by Coverdale & Colpitts

Table V summarizes a projected financing of the proposed system by bonds to be retired from net revenues and general property taxes, issued for terms of 40 years from date of issue at an estimated interest rate of 4½%. The table assumes the issuance and sale of bonds during each year of the construction period 1969-1975 in amounts sufficient to meet annual construction fund requirements. Debt service, combining payments of interest and principal, is assumed in equal annual amounts over the term of each issue of the bonds. The amount of net revenues applied to debt service is as estimated by Coverdale & Colpitts with the remainder of debt service requirements being met from general property tax. The tabulation shows the estimated general property tax rate required within the District to provide for debt service under this plan for the years 1969-70 through 1980-81. Beyond the year

TABLE V

Estimated Source of Debt Service. General Property Tax Supplementing Net Revenues.
4½% Bonds, Maturity 40 Years from Issue. Provision for Interest and Principal at Level Annual Debt Service.
(In $1,000's)

Period	District Financing Requirement	Bonds Issued: Year	Bonds Issued: Cumulative	Debt Service	Source of Funds: Net Revenue	Source of Funds: Property Tax	Estimated Assessed Valuation	Property Tax Rate per $100	Annual Tax $20,000 Home
1/1/69 - 6/30/69	$ 39,498	$120,000	$ 120,000	$ 3,261	$ ——	Note (a)			
7/1/69 - 6/30/70	79,649	——	120,000	6,521	——	$ 9,782	$17,581,000	5.56¢	$ 2.78
7/1/70 - 6/30/71	225,570	225,000	345,000	18,749	——	18,749	18,084,000	10.37¢	5.19
7/1/71 - 6/30/72	337,441	340,000	685,000	37,225	——	37,225	18,588,000	20.03¢	10.02
7/1/72 - 6/30/73	364,196	370,000	1,055,000	57,332	——	57,332	19,092,000	30.03¢	15.02
7/1/73 - 6/30/74	294,920	300,000	1,355,000	73,635	——	73,635	19,596,000	37.58¢	18.79
7/1/74 - 6/30/75	163,422	150,000	1,505,000	81,787	——	81,787	20,099,000	40.69¢	20.35
7/1/75 - 6/30/76				81,787	5,000	76,787	20,603,000	37.27¢	18.64
7/1/76 - 6/30/77				81,787	6,000	75,787	21,107,000	35.91¢	17.96
7/1/77 - 6/30/78				81,787	7,000	74,787	21,611,000	34.61¢	17.31
7/1/78 - 6/30/79				81,787	8,000	73,787	22,114,000	33.37¢	16.69
7/1/79 - 6/30/80				81,787	8,000	73,787	22,618,000	32.62¢	16.31
7/1/80 - 6/30/81				81,787	8,000	73,787	23,122,000	31.91¢	15.96

Note (a) — Debt service included in 1969-70 tax levy.

1980, annual debt service would remain at the 1980 level until the bonds issued in 1969 mature at the end of their 40-year term, after which time annual debt service would decline during the following six (6) years until all bonds have been retired. Assessed valuation of property subject to taxation in the District has not been projected beyond 1980. It is anticipated, however, that the valuation will continue on an upward trend with the result that required annual tax rates will continue to decline in subsequent years.

SECTION IV

ALTERNATIVE METHODS OF FINANCING

Experience in other cities has established that the construction of a rapid transit system has a decided effect upon the assessed valuation of properties. The increase in assessed valuation, while great in the vicinity of stations, is significant generally throughout the metropolitan area. This effect is enhanced by the provision of adequate parking at stations and the development of feeder bus services, which extend and increase the direct impact of rapid transit upon the accessibility, and in turn the assessed valuation, of property some distance from stations.

In selecting a method of public fund support for the financing of rapid transit, however, benefits to other than the property tax base of the district should be considered. A rapid transit system, functioning as an element of a balanced transportation system for the region, will benefit the motor vehicle user by sharing the burden of movement of people. Rapid transit travel is heavily concentrated in the peak commuting hours when demand upon the highway system is most critical. The majority of rapid transit trips also are expected to move in those parts of the region where traffic concentrations upon highways and streets are highest. The development of rapid transit will in effect provide a choice of travel means, particularly during the critical hours and in the critical areas. The traffic relief thus afforded will make traffic space available for remaining trips made by motor vehicle by necessity or by choice. The development of the rapid transit system and its connecting and feeder bus services will also provide an efficient stand-by or occasional use service for the many residents of the area who may not be regular riders, as an alternative to the private vehicle.

In view of these benefits to the traffic and transportation system, proposals have been advanced which would provide for a contribution to the financing of rapid transit by calling upon transportation-related tax sources.

The "State and Local Transportation Development Act" (Assembly Bill No. 2092) introduced in the 1967 Session of the California State Legislature proposed the removal of the present exemption of gasoline from the state and local sales tax on a statewide basis. Under this bill the portion of the sales tax on gasoline which would normally be received by the state (4%) would be returned instead to the individual transit districts and counties within which the tax was collected for the financing of rapid transit development where such systems are approved by the voters, or for other transportation-related improvements as determined by the counties. The local portion of the sales tax (1%) would be returned under this bill to the municipalities, and to the counties with respect to sales in unincorporated areas, for local uses related to transportation needs as determined by the local jurisdictions.

The gasoline sales tax bill was passed by the State Assembly in the 1967 Legislative Session but failed of passage in the Senate. The subject matter of this legislation was referred to interim legislative study. Other similar sources of financial assistance have been suggested, such as an increase in the present in lieu tax on motor vehicles. Such a tax at 1% would produce about the same amount of capital financing aid as

TABLE VI

Proposed "State and Local Transportation Development Act" Estimated Funds Which Would Be Available to District (In $1,000's)

Period	Amount
1/1/69 - 6/30/69	$18,764
7/1/69 - 6/30/70	38,693
7/1/70 - 6/30/71	39,859
7/1/71 - 6/30/72	41,025
7/1/72 - 6/30/73	42,191
7/1/73 - 6/30/74	43,357
7/1/74 - 6/30/75	44,522
7/1/75 - 6/30/76	45,688
7/1/76 - 6/30/77	46,854
7/1/77 - 6/30/78	48,020
7/1/78 - 6/30/79	49,186
7/1/79 - 6/30/80	50,352
7/1/80 - 6/30/81	51,517

TABLE VII

Estimated Source of Debt Service. General Property Tax Supplementing Net Revenues and 4% Sales Tax on Gasoline. 4½% Bonds Maturing 40 Years from Date of Issue. Interest Only 1968-69 to 1974-75, Level Debt Service 1975-76 to Maturity. (In $1,000's)

Fiscal Year	District Financing Requirement	Gasoline Sales Tax To Construction	Bonds Issued: Year	Bonds Issued: Cumulative	Source of Debt Service: *Total	Source of Debt Service: Gasoline Sales Tax	Source of Debt Service: Net Revenue	Source of Debt Service: Property Tax	Estimated Assessed Valuation	Property Tax Rate per $100	Annual Tax $20,000 Home
1/1/69 - 6/30/69	$ 39,498	$14,498	$ 25,000	$ 25,000	$ 563	$ 563					
7/1/69 - 6/30/70	79,649	34,649	45,000	70,000	3,150	3,150					
7/1/70 - 6/30/71	225,570	25,570	200,000	270,000	12,150	12,150					
7/1/71 - 6/30/72	337,441	2,441	335,000	605,000	27,225	27,225					
7/1/72 - 6/30/73	364,196	——	365,000	970,000	43,650	43,650					
7/1/73 - 6/30/74	294,920	——	295,000	1,265,000	56,925	56,925					
7/1/74 - 6/30/75	163,422		163,000	1,428,000	64,260	47,590		$16,670	$20,099,000	8.29¢	$4.15
7/1/75 - 6/30/76					80,214	45,688	$5,000	29,526	20,603,000	14.33¢	7.17
7/1/76 - 6/30/77					80,214	46,854	6,000	27,360	21,107,000	12.96¢	6.48
7/1/77 - 6/30/78					80,214	48,020	7,000	25,194	21,611,000	11.66¢	5.83
7/1/78 - 6/30/79					80,214	49,186	8,000	23,028	22,114,000	10.41¢	5.21
7/1/79 - 6/30/80					80,214	50,352	8,000	21,862	22,618,000	9.67¢	4.84
7/1/80 - 6/30/81					80,214	51,517	8,000	20,697	23,122,000	8.95¢	4.48

*7/1/69-6/30/75, interest only.
Effective 7/1/75, annual provision for principal and interest at level debt service.

the gasoline sales tax. It is anticipated that this or similar legislation will be introduced in the 1968 Session.

It is not possible prior to the interim legislative study and introduction in the 1968 Session to finalize the exact form of legislation that may finally be adopted. The results of the interim study may produce desirable revisions of the Transportation Fund concept in AB 2092 and similar legislation so as to be more acceptable to the Legislature and more responsive to the legal and financial problems of the District.

Table VI shows the estimated funds which would be available to the Southern California Rapid Transit District under the State and Local Transportation Development Act. Under the provisions of this Act as it was before the Legislature, approval by the voters of a District rapid transit financing proposal which applied these funds to debt service would commit the tax proceeds to that purpose for the term of the financing.

Table VII summarizes the effect of the financing of the District's rapid transit program by the use of system net revenues and the revenues which would be made available by the gasoline sales tax measure, supplemented by a general property tax in the district. The general financing plan outlined in this table assumes the issuance of 4½% bonds maturing 40 years from the date of issue. During the construction period, gasoline sales tax funds will be used to meet interest payments on bonds outstanding, and any such funds remaining after payment of interest will be applied directly to meeting a portion of construction costs. During the period 1969-1972, $77,158,000 in construction costs are estimated to be met from such funds, thus reducing the required total bond issue by that amount. In the year 1975-76 and subsequent years to the final maturity date, provision is made for principal and interest on the basis of level annual debt service.

Under this financing plan, no property tax would be required until the year 1974-75, and the maximum property tax rate estimated to be required would be 14.33¢ per $100 of assessed valuation in the district in the year 1975-76. By the year 1980-81, the indicated rate required will be reduced to 8.95¢ per $100. Projections of assessed valuation and of the proceeds of the sales tax on gasoline have not been made beyond the year 1980. It is expected, however, that the rising trend of each will continue beyond that date with a consequent continuing decline in the general property tax rate required under this plan.

Additional sources of support for the capital financing of the system have been under consideration by the State Legislature. One such proposal, contained in Senate Bill 1412, introduced in the 1967 Session, would appropriate State tidelands oil funds to aid in financing Southern California Rapid Transit District's system construction. Such direct State financial participation in the financing of rapid transit in the Los Angeles area follows a precedent set in the appropriation of State bridge tolls to the San Francisco Bay Area Rapid Transit District. By this action the State concern with problems of urban transportation was given legislature recognition, and funds available from a regional source were appropriated to aid in the solution. The bill to apply tidelands oil revenues to rapid transit construction in Los Angeles was not passed by the 1967 Session; however it represents one of the approaches which should receive consideration in the development of an effective and equitable financing program.

Table VIII summarizes the estimated annual funds which would be available from the proposed gasoline sales tax and an appropriation of State tidelands oil funds at $20,000,000 per year for ten years.

TABLE VIII

Estimated Total Tax Funds Which Would Be Available "State and Local Transportation Development Act" and Proposed State Tidelands Oil Funds (In $1,000's)

Period	Transportation Development Act	Tidelands Oil Funds	Total
1/1/69 - 6/30/69	$18,764	$ ——	$18,764
7/1/69 - 6/30/70	38,693	20,000	58,693
7/1/70 - 6/30/71	39,859	20,000	59,859
7/1/71 - 6/30/72	41,025	20,000	61,025
7/1/72 - 6/30/73	42,191	20,000	62,191
7/1/73 - 6/30/74	43,357	20,000	63,357
7/1/74 - 6/30/75	44,522	20,000	64,522
7/1/75 - 6/30/76	45,688	20,000	65,688
7/1/76 - 6/30/77	46,854	20,000	66,854
7/1/77 - 6/30/78	48,020	20,000	68,020
7/1/78 - 6/30/79	49,186	20,000	69,186
7/1/79 - 6/30/80	50,352		50,352
7/1/80 - 6/30/81	51,517		51,517

Table IX illustrates the effect of a financing which would utilize this combination of public funds support. The property tax rate of 5.94¢ per $100 of assessed valuation needed to supplement this financing in the year 1980-81 can be expected to decrease in subsequent years as the result of an increasing assessed valuation.

TABLE IX

Estimated Source of Debt Service. General Property Tax Supplementing Net Revenues, Gasoline Sales Tax and Tidelands Oil Funds. 4½% Bonds Maturing 40 Years from Date of Issue. Interest Only 1968-69 to 1974-75, Level Debt Service 1975-76 to Maturity. (In $1,000's)

Period	District Financing Requirement	Tax Funds to Construction	Bonds Issued		Source of Debt Service				Estimated Assessed Valuation	Property Tax Rate per $100	Annual Tax $20,000 Home
			Year	Cumulative	*Total	Gas Sales Tax and Oil Funds	Net Revenues	Property Tax			
1/1/69 - 6/30/69	$ 39,498	$14,498	$ 25,000	$ 25,000	$ 563	$ 563					
7/1/69 - 6/30/70	79,649	54,649	25,000	50,000	2,250	2,250					
7/1/70 - 6/30/71	225,570	50,570	175,000	225,000	10,125	10,125					
7/1/71 - 6/30/72	337,441	37,441	300,000	525,000	23,625	23,625					
7/1/72 - 6/30/73	364,196	24,196	340,000	865,000	38,925	38,925					
7/1/73 - 6/30/74	294,920	9,920	285,000	1,150,000	51,750	51,750					
7/1/74 - 6/30/75	163,422	8,422	155,000	1,305,000	58,725	58,725					
7/1/75 - 6/30/76					73,250	68,250	$5,000	$ ——			
7/1/76 - 6/30/77					73,250	67,250	6,000	——			
7/1/77 - 6/30/78					73,250	66,250	7,000	——			
7/1/78 - 6/30/79					73,250	65,250	8,000	——			
7/1/79 - 6/30/80					73,250	55,852	8,000	9,398	$22,618,000	4.16¢	$2.08
7/1/80 - 6/30/81					73,250	51,517	8,000	13,733	23,122,000	5.94¢	2.97

*7/1/69 - 6/30/75, interest only.
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