FINAL REPORT

PREPARED UNDER CONTRACT TO
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL DEPARTMENT

By Barton-Aschman Associates, Inc.
in Association with
Jefferson Associates, Inc.

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1. INTRODUCTION

This report presents the results of a technical analysis of the possible effects of future rail extensions on Starter Line passenger volumes and travel pattern characteristics. By focusing on the travel demand impacts of these extensions, design of the physical and operational aspects of the system can consider the evolving nature of Starter Line service.

This analysis of future rail system extensions represents a first and logical step in the detailed examination of various assumptions and future conditions related to Starter Line travel demand. In the preliminary engineering effort, additional variables will be examined in order to quantify the resulting travel demand impacts on both the physical and operational designs. These analyses will examine variables such as the future cost of operating a private automobile and alternative transit fare structures. Alternative concepts will be tested with respect to the background feeder bus and auto access opportunities at each of the Starter Line stations. In addition, as the preliminary engineering design proceeds, it may be necessary to test one or more alternative station locations or adjustments in the extent of rail lines or alignment. Finally, the analysis of system operating concepts may, depending upon the level of service and passenger capacity implications, require re-estimation of travel demand values.

ANALYSIS CONTEXT

Seven rail system options were analyzed in this study, encompassing up to eight additional rail corridors in the Los Angeles County area. The amount of rail technology offered in these options ranged from 18.6 miles in the Starter Line network (Option I) to nearly 150 miles in the full system network (Option VI). A subsequent addition to the technical analysis was the consideration of Option VII, a modest eight-mile Starter Line beginning at Union Station and terminating at Wilshire Boulevard and Fairfax Avenue.

The eight additional corridors, included in one or more of the options, were:

- Corridor A, West Los Angeles
- Corridor B, El Monte

- Corridor C, San Fernando Valley
- Corridor D, South Los Angeles
- Corridor E, Century Freeway
- Corridor F, Santa Ana Freeway
- Corridor G, Los Angeles International Airport
- Corridor H, Eagle Rock

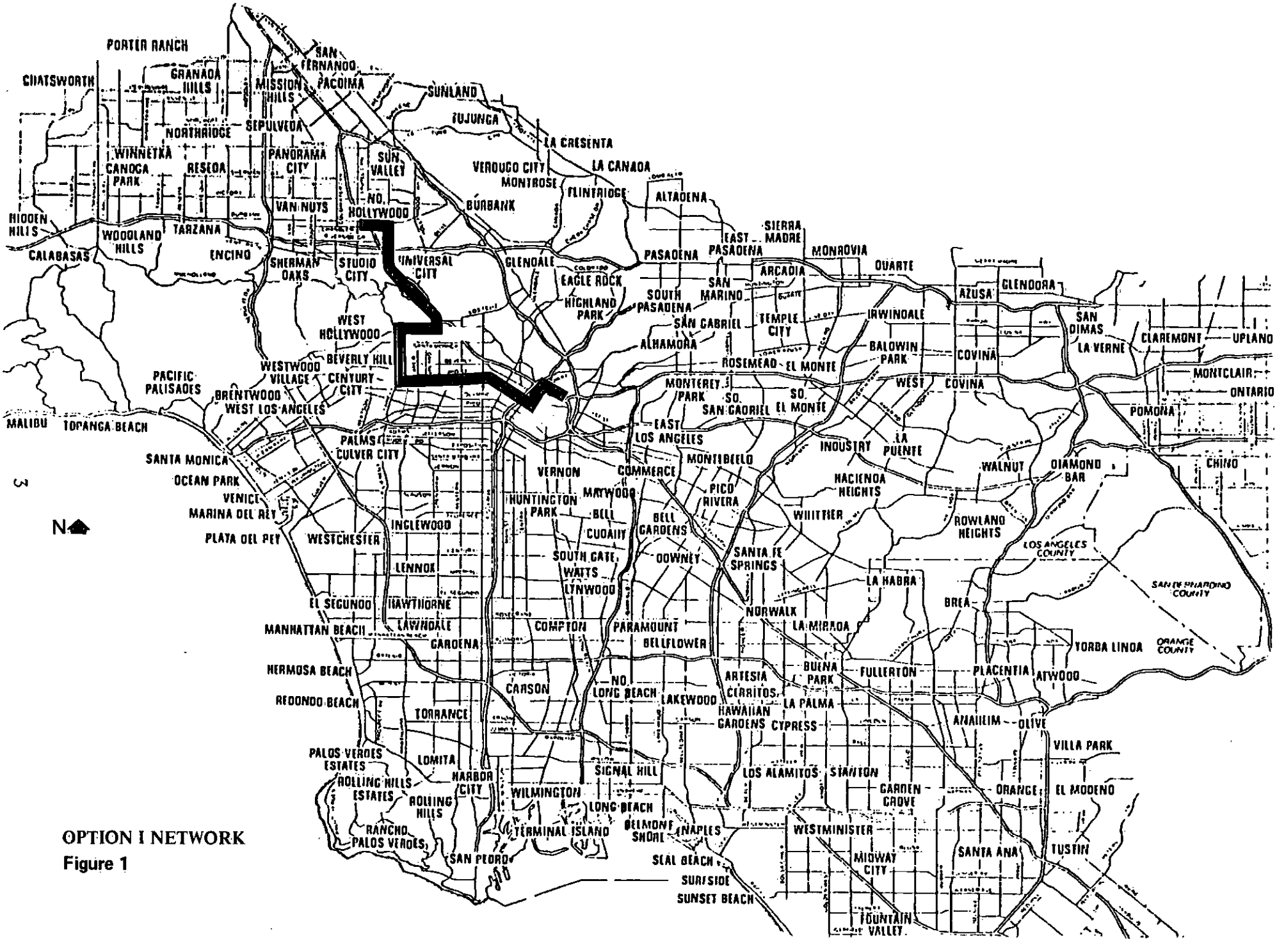
Figures 1 through 7 show, in abstract form, the corridor make-up of each of the seven options. With the exception of Option III, which excluded the West Los Angeles corridor, Options I through VI progressively add one or more corridors to ultimately form the 150-mile rail system in Option VI. By defining the options in this incremental manner, evolutionary changes in both the magnitude and function of each Starter Line station can be clearly understood. For example, in Option I, the basic Starter Line option -- Union Station -- functions as a major transfer point for San Bernardino busway passengers boarding the rail system for travel to destinations in the downtown or mid-Wilshire areas. However, in Option II, with Corridor B or the El Monte extension in place, the rail operating plan provides direct service from the El Monte Corridor stations to the downtown and mid-Wilshire area, eliminating the need to transfer at Union Station.

ANALYSIS SEQUENCE

The technical analysis of each of the seven system options was subdivided into three major phases. First was the design of each system concept including specification of a rail operating plan and definition of the background feeder bus and auto access opportunities. This route and service level definition was developed in concert with the SCRTD Bus Planning Department in order to integrate the Sector Improvement Program concept with the rail system and, while still offering the local service function, provide the maximum level of feeder service to each rail system station. Also included in this design effort was the implementation of a series of specialized station and line coding procedures, documented in Appendix A.

The second major step in the analysis sequence was to generate regional travel demand volumes for each of the system options through execution of the LARTS travel demand model sequence. In particular, it was the LARTS modal choice model which was executed for each rail system option, using as basic input the distribution of person-trip travel for each of the individual model system trip purposes. These travel demand forecast outputs were the major product of the study effort and are illustrated and summarized in detail in Chapter 4. By assuming a constant person-trip distribution for each rail option network, the difference in system-wide patronage and, specifically, in rail system use was directly related to the presence and level of the rail service provided.

The third and final step in the analysis sequence was to develop preliminary mode-of-arrival estimates for the Starter Line stations, assuming unconstrained parking availability both in terms of space and user cost. Formal parking



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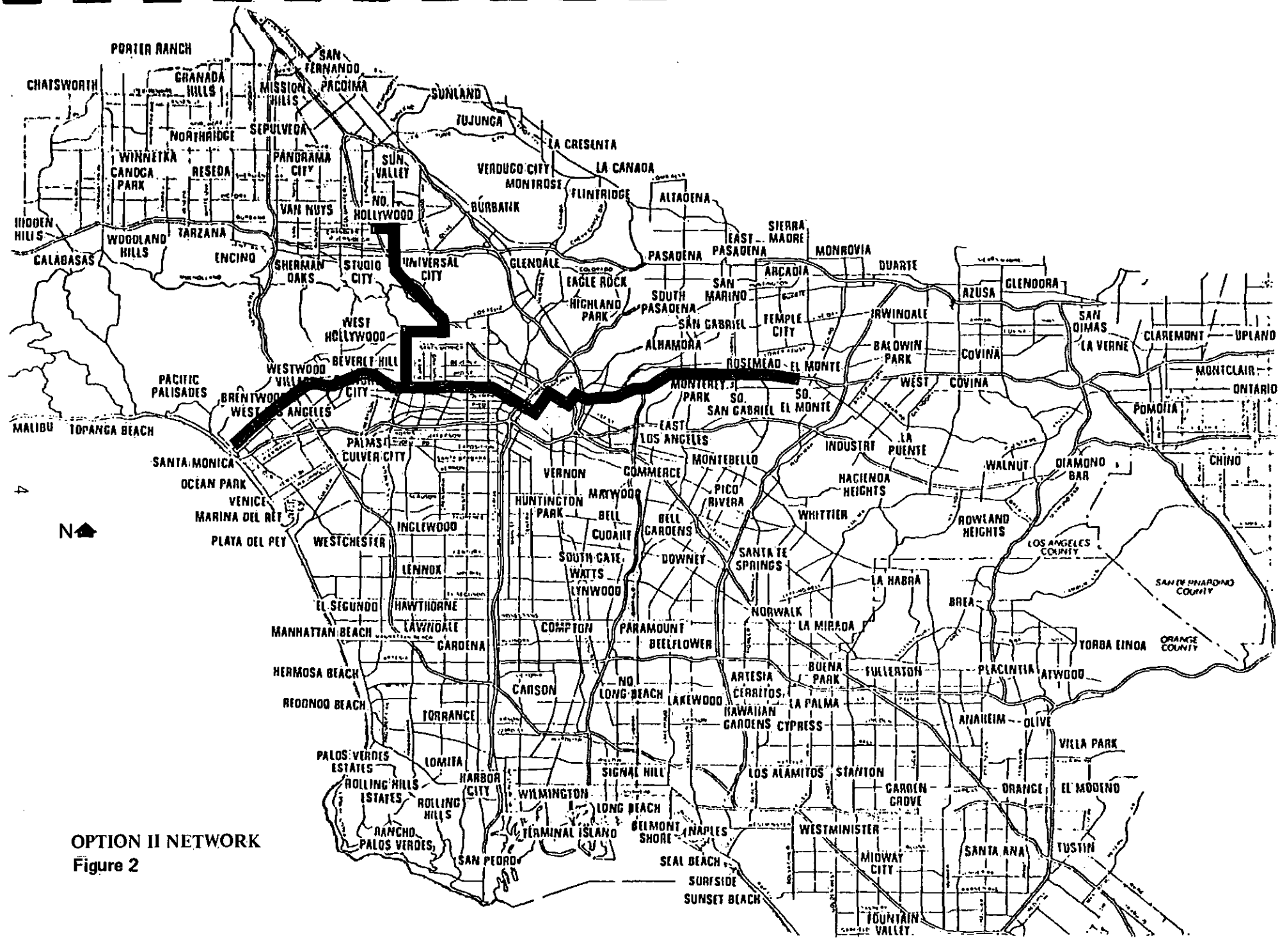
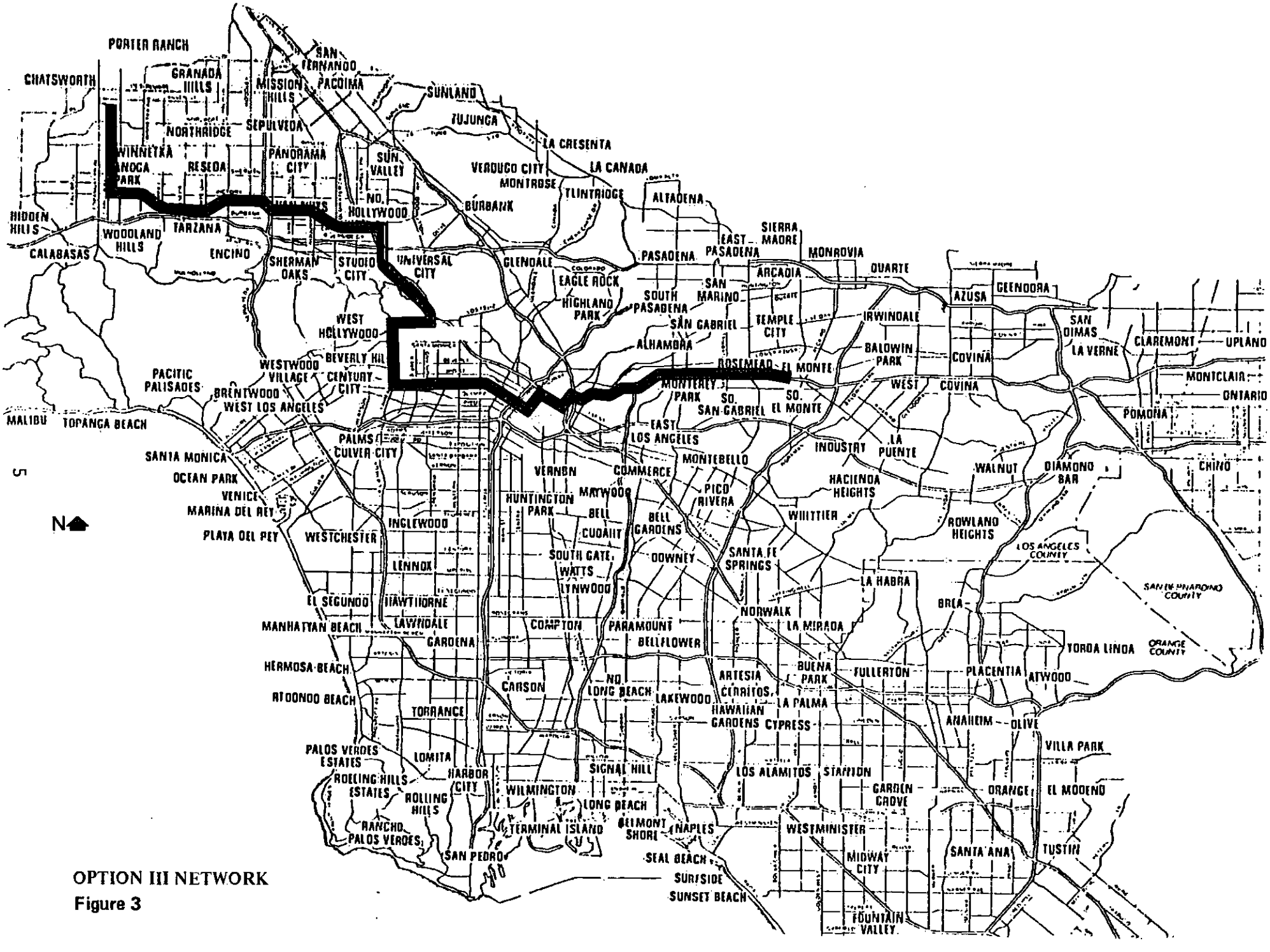
OPTION I NETWORK

Figure 1

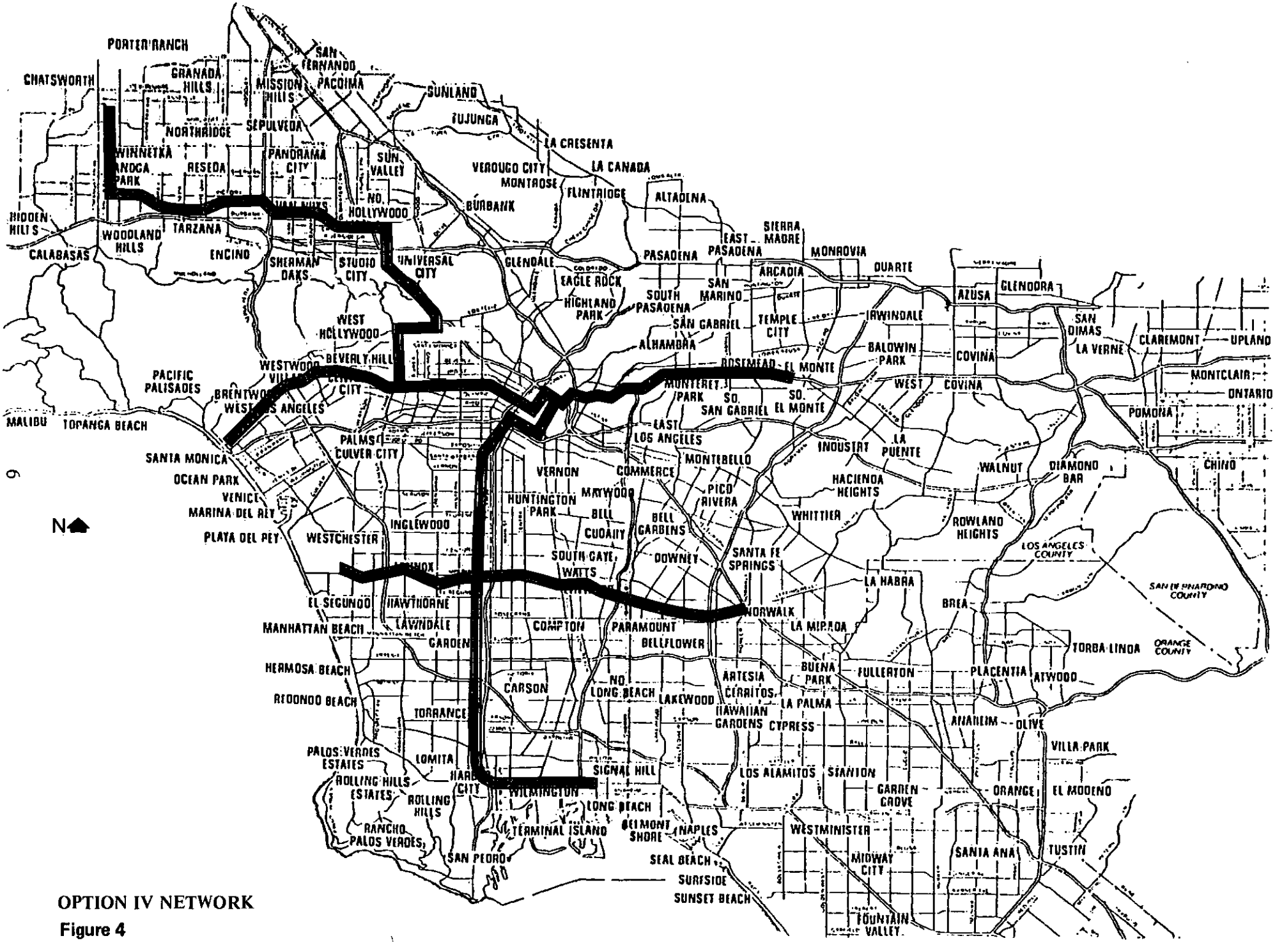


OPTION II NETWORK
Figure 2



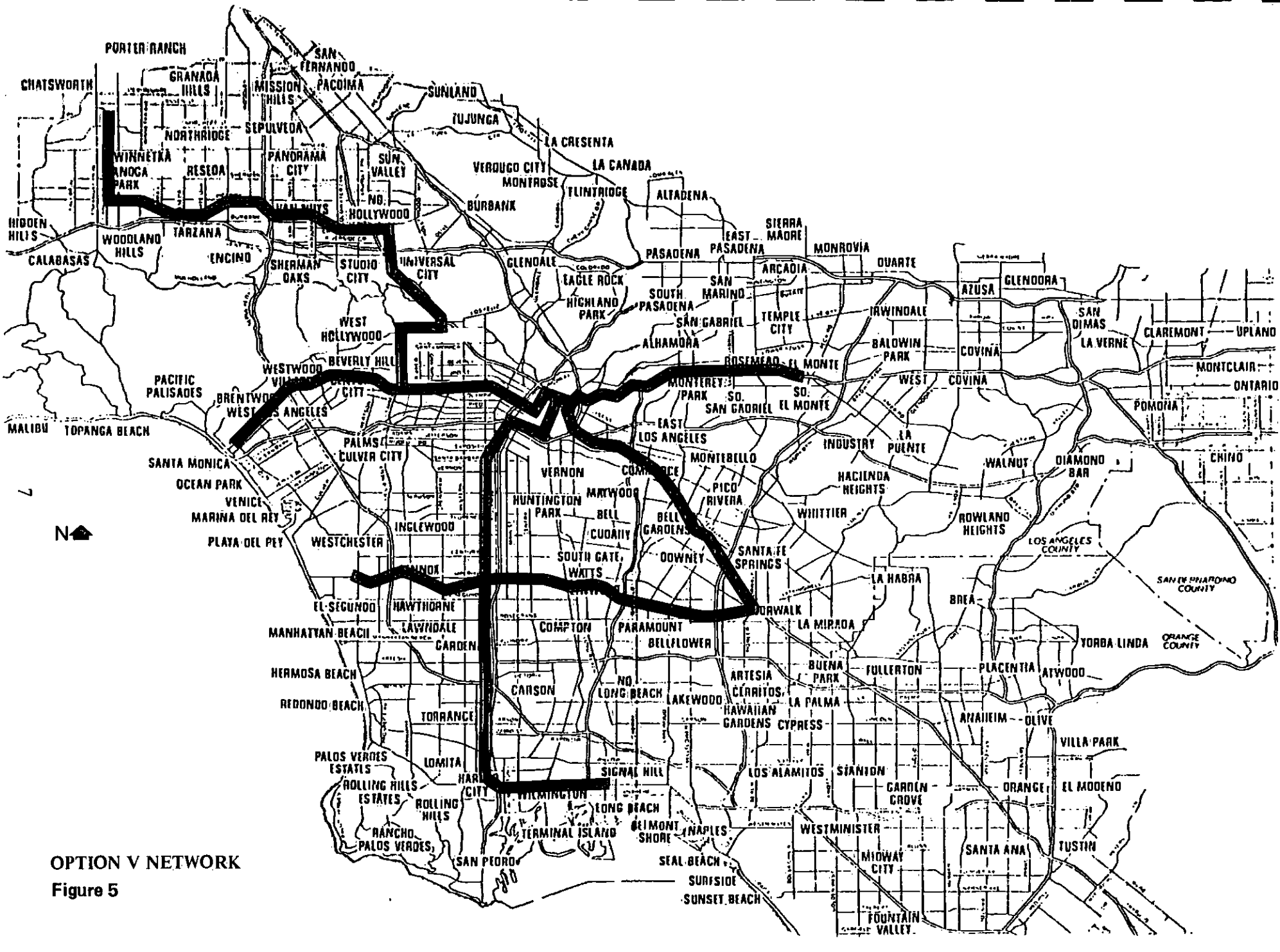
OPTION III NETWORK

Figure 3



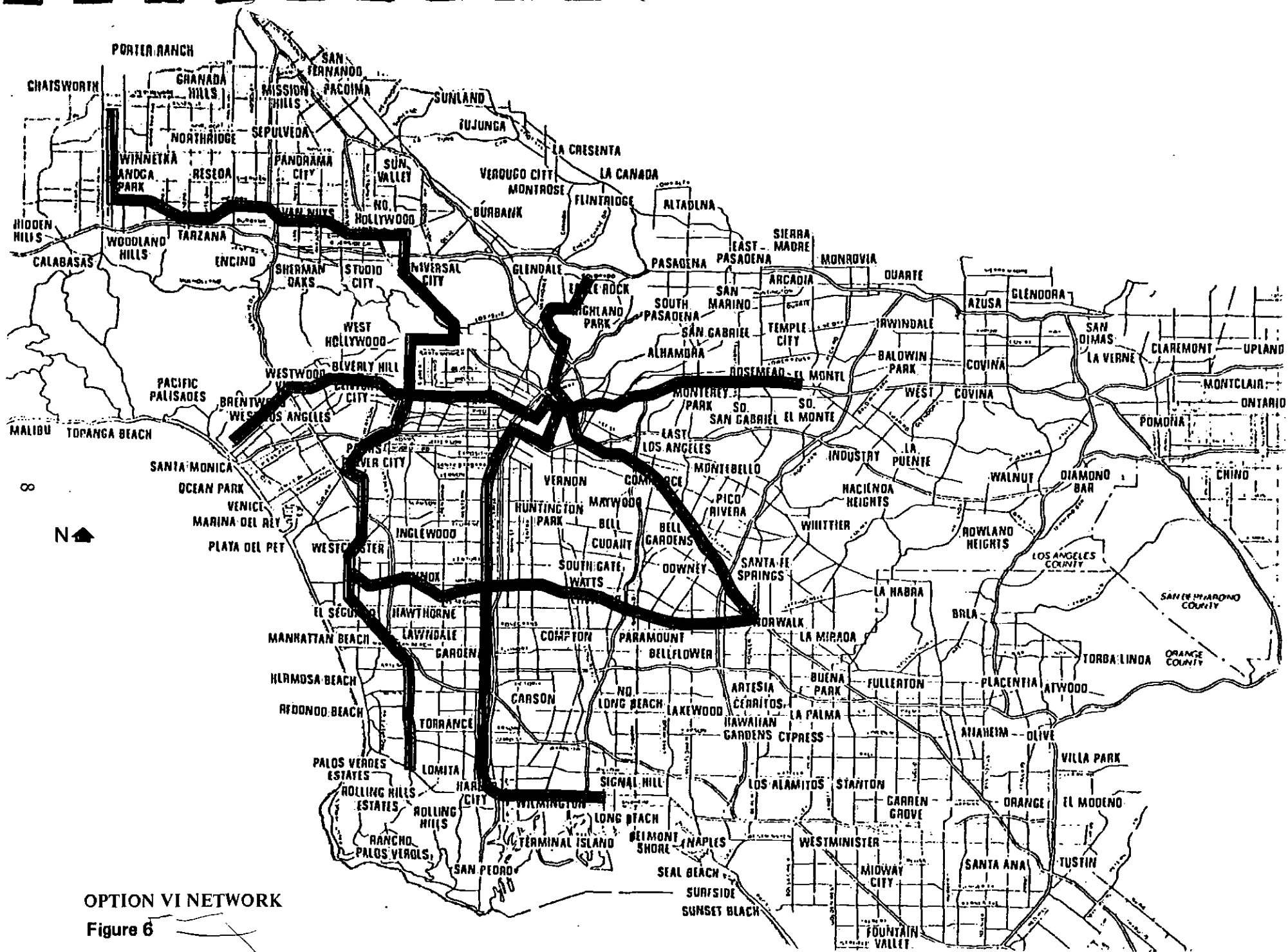
OPTION IV NETWORK

Figure 4



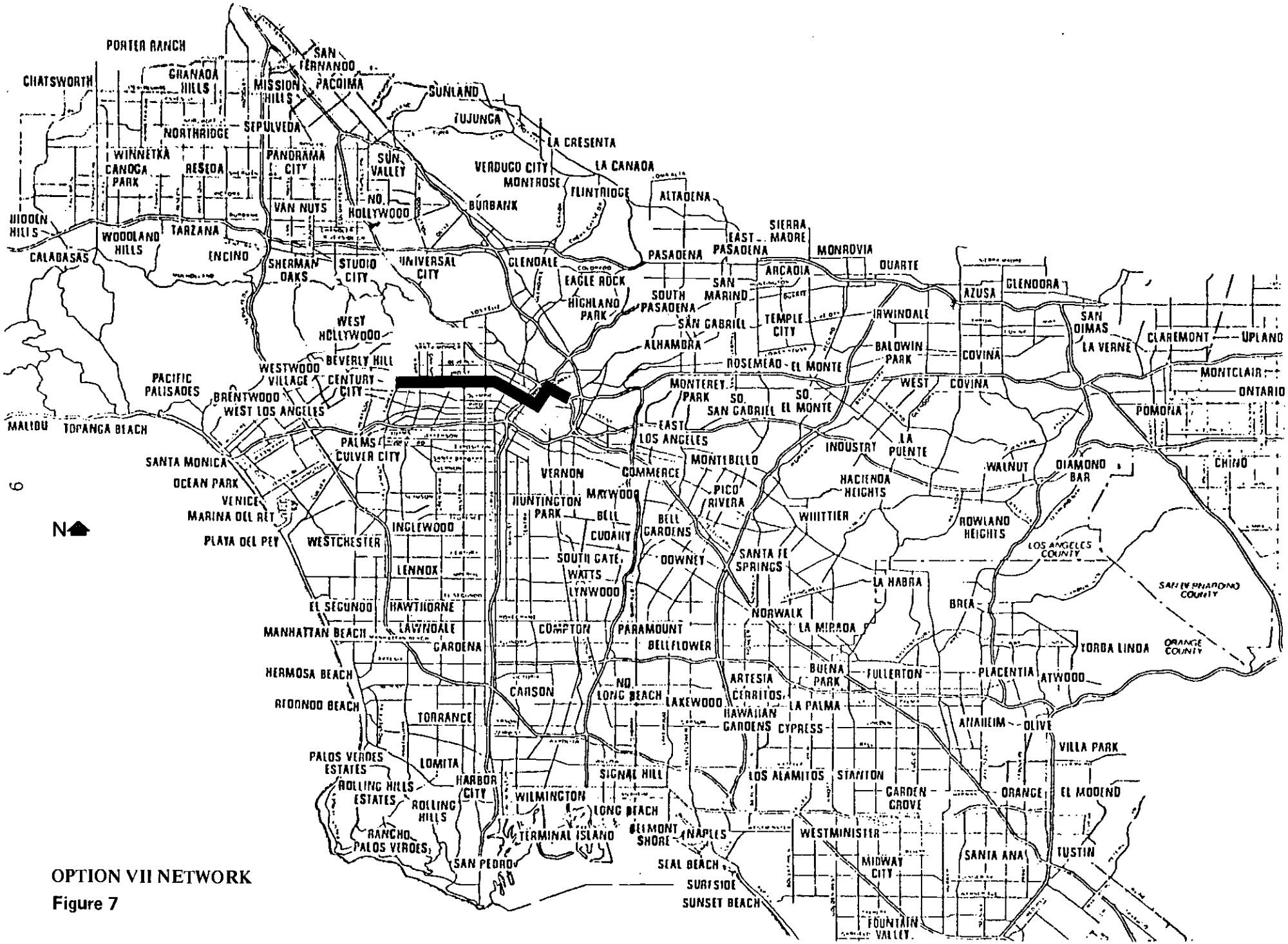
OPTION V NETWORK

Figure 5



OPTION VI NETWORK

Figure 6



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OPTION VII NETWORK

Figure 7

opportunities were limited, however, to four major Starter Line stations, North Hollywood, Universal City, Hollywood Bowl, and Fairfax and Beverly. Implicit in the mode-of-arrival projections was the assumption that limited off-site parking and kiss-n-ride would occur at all other stations and could be subtracted from the feeder bus estimates. Although the mode-of-arrival model estimates are preliminary in this regard, the model structure and inputs are now available to iteratively recycle the model to balance the level of bus service with demand and simultaneously analyze the impact of alternative station designs and parking space limitations on the magnitude and behavior of auto access arrivals.

REPORT ORGANIZATION

The remainder of this report is presented in three chapters. Chapter 2 documents the design and construction of the seven rail option networks, outlining the assumptions and operating characteristics inherent in each option with respect to the rail operating plan and the magnitude and orientation of supporting feeder bus service.

Chapter 3 provides a brief description of the travel demand model methodology, including the estimation of automobile operating costs and transit fare policy, two important inputs to the mode choice model. The chapter concludes with a description of the mode-of-arrival model which was used to develop the preliminary station access volume estimates.

Finally, Chapter 4 documents the results of the travel demand model forecasts, separating the results into regional summaries, Starter Line corridor results, and a separate analysis of tourist and visitor travel. It concludes with a presentation of the preliminary mode-of-arrival estimates.

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OPTION NETWORK DESIGN DESCRIPTION

This chapter documents the design and construction of the computerized networks for each of the seven Starter Line extension options. It provides the basic reference material needed to analyze the patronage forecast information generated by the regional travel demand model sequence. The design process was focused on the background feeder bus system. In the design effort, applicable Sector Improvement Program (SIP) routes were carefully tailored to serve each of the rail system stations defined in each of the nine transportation corridors. In addition to the feeder bus system design, a rail operating plan was prepared (by SCRTD) for each option and, together with the system operating characteristics (described in Appendix A), was used to calculate Level-of-Service information for system route.

The network development process was initiated with a review and update of the 1995 LARTS low capital transit system. This refined low-capital network served as the departure point for preparation of the Option I Starter Line network. A description of that effort is presented in the first two sections of this chapter. In the third section, the specification of routes and express service levels for the busway facilities in the Harbor/Century and Santa Ana Freeway alignments is presented.

The design and construction of each option network was performed in a modular fashion (i.e., by corridor) to insure coding accuracy and to provide the capability to define other alternative option concepts that could combine any number of the other eight regional corridors to form a logical extension of the Starter Line system. The actual construction of network options was, therefore, a mechanical process of combining individual corridor designs to create a specific option.

Also included in this discussion is a delineation of the planning and policy assumptions that provided the basic criteria upon which the Section Improvement Program route modifications, deletions, and additions were made. It also provides a statement of basic planning principles that can be used to guide future analyses of the interface between the background bus system and the Starter Line rail system.

MODIFICATION OF THE 1995 LOW-CAPITAL TRANSIT NETWORK

Prior to review of the Sector Improvement Program and non-SCRTD local (municipal) routes, a number of basic mechanical coding revisions were made to

the 1995 low-capital network to increase the network's accuracy and more appropriately reflect the level of service provided by the individual system routes.

In the 1995 low-capital system, a series of park-n-ride freeway express routes was provided from a number of lots in the region. In most cases, these routes operated either directly from the park-n-ride facility or traveled on the arterial street system before reaching the freeway. Travel on the freeway was in mixed flow operation with a final destination to either the central business district or other major activity center. The coding of the freeway portion of these routes (primarily for computer plotting purposes), however, reflected an operational pattern of stops at a number of major intermediate (transfer) points. Unfortunately, the inclusion of these intermediate points provided the opportunity for a transfer to other non-freeway routes. For this reason, the intermediate nodes were removed in this step.

The zonal (centroid) walk and auto connections also were recoded during this phase by the CALTRANS network coding staff to be consistent with previous coding conventions as defined in prior long-range planning efforts. These coding conventions limit the amount of walk access to transit to only those zones within no more than one-half mile of a system route. It also limited the auto connections to formal park-n-ride lots within a radius of eight travel miles. Auto connections also were provided for zones in which transit service was not within the maximum one-half mile walking distance.

A third, mechanical, coding revision not implemented in the basic Option I network was incorporation of the most recent bus routing and service plan for the Orange County Transit District Service Area. The coding process to incorporate these changes was ongoing at the time, and due to time constraints, could not be included in the final version of Option I. However, given the focus of the analysis on the Los Angeles County area, the impact of these revisions on Starter Line station use was assumed to be relatively minor.

The basic underlying bus system in all option networks was SCRTD's Sector Improvement Program (SIP) as originally presented and approved by the board on February 27, 1979. Two subsequent revisions to those planned routes which were reflected in the basic background system are the revisions approved on September 28, 1979, and the set of final revisions approved in June, 1980. These two SIP revisions exclude several routes shown in the initial version due to community objections or to various operating problems such as the unintended use of narrow streets or the lack of adequate layover space. The final revision (in June, 1980) also included several lines which were placed on a temporary hold status in order to reduce costs of the full plan. The decision at that time was to phase the full implementation plan over several years, starting with the initial service changes that were already in place by June, 1980. As a result of these revisions, the Sector Improvement Program is considered a route-specific master plan. It does represent the latest thinking on bus route planning and is, therefore, the most appropriate information for projecting bus

routes in 1995 which, with minor modifications, will interface effectively with the planned rapid transit system.

All of the Sector Improvement Program routes included in the 1995 low-capital network were reviewed and adjusted where necessary, to be compatible with the latest SIP revisions as of June, 1980. Table 1 provides a summary of the coding modifications required to properly represent the Sector Improvement Program route system. In general, most of these revisions were minor and in only three cases were routes completely removed.

The final step in the detailed review of the 1995 low-capital transit network was to analyze the routes of each operator within Los Angeles County and to update those coded routes to reflect the most recent schedule revisions as published by each of the respective operators as of August, 1980. Table 2 presents the results of this review, summarized by individual transit property. The changes for these non-SCRTD routes were generally more comprehensive than the Sector Improvement Route modifications.

BUS ON-FREEWAY CONCEPT

CALTRANS (District 7) with technical assistance from SCRTD, is investigating the feasibility of constructing a high-occupancy vehicle lane for both express bus and carpool vehicles in the right-of-way of three freeway facilities: the Harbor, Century, and Santa Ana Freeways. The freeway transit concept, like the Starter Line, represents one of four elements of the Regional Transportation Development Plan (RTDP). For this reason, it was given special attention in the refinement of the 1995 low-capital transit network. The design of the bus-on-freeway routes was subdivided into two separate components. The first was comprised of the Harbor and Century freeway corridors which operate in concert to provide a high level of bus service to downtown Los Angeles; the second was the Santa Ana Freeway corridor which operates in a manner similar to the Harbor and Century, but is an operationally and physically separate facility.

The design and subsequent coding of these routes involved a substantial amount of interaction with the SCRTD Bus Planning Department and the Transit Branch of CALTRANS' District 7 office. The conceptual definition of transit freeway service was first translated into a definition of specific station locations and physical access restrictions where full directional ramps were not considered feasible. Route configurations were defined in relation to the location and level of service to be provided from each service area and station location. The most crucial aspect of the freeway transit design was the service concept. Buses were routed to collect passengers along major arterial right-of-ways, accessing the high-occupancy vehicle lanes at specific guideway locations, and operate in the exclusive lane to the central business district, stopping at each intermediate station to both board and alight any transferring passengers.

REVISED SECTOR IMPROVEMENT PROGRAM ROUTES

SYSTEM LINE NUMBER	UTPS LINE NUMBER MODE	UTPS LINE NUMBER LINE	DESCRIPTION
S-3	4	3	Reroute at San Diego Freeway and Sunset Blvd. Interchange
S-4	4	4	Recode to use Santa Monica Blvd. rather than Hollywood Blvd.
S-16	4	9	----------
S-34	4	21	DELETE
S-41	4	26	----------
S-42	4	27	----------
S-45	4	29	----------
S-48	4	32	----------
S-50	4	33	Route extended from Del Amo Blvd. to San Pedro on Avalon to replace Route 810 (re-structured) for Bus-On-Freeway
S-65	4	40	Reroute on Figueroa from Olive Street
S-70	4	41	Extend to El Monte Station
S-81	4	45	Extend route circulation for Santa Anita Fashion Center
S-88	4	49	----------
S-101	4	56	Reroute to Wilshire Blvd. from 7th Street near Alvarado
S-103	4	58	----------
S-110	4	64	----------
S-111	4	65	----------
S-112	4	66	----------
S-119	4	70	Reroute to Intersection of Imperial Highway & Alameda
S-174	4	95	----------
S-177	4	98	----------
S-180	4	99	----------
S-181	4	100	----------
S-183	4	101	----------
S-185	4	102	----------
S-200	4	103	----------
S-201	4	104	----------
S-209	4	109	----------
S-210	4	110	----------
S-212	4	111	Extend on La Brea to Manchester Blvd.
S-214	4	112	----------
S-217	4	113	----------
S-220	4	114	----------
S-221	4	115	----------
S-232	4	119	Terminate at LAX (replaced by Santa Monica Route #3A)
S-233	4	120	Delete (replace by Culver City #3)
S-255	4	126	----------
L-306	4	133	----------
L-309	4	135	----------
L-310	4	136	----------
L-317	4	140	----------
L-346	4	145	----------
L-371	4	146	----------
L-375	4	148	----------
X-405	5	47	Extend to Rosemead Blvd. via New York Drive, Altadena Drive, Foothill Blvd.
X-410	5	5	----------
X-425	6	49	Through Routed in CBD with Harbor Bus-On-Freeway Route
X-426	5	16	----------
X-429	5	18	----------
X-430	5	19	----------
X-434	5	20,21	Reroute to Flower, Temple, Alameda
X-436	5	22	----------
X-437	5	23	Reroute to Grand, 9th, Flower, Temple to Union Station
X-439	5	24	----------
X-455	5	29	----------
X-475	5	60	----------
X-525	5	49	----------
X-560	5	69	----------
802	5	93,94	DELETE
877	4	181	DELETE
S-2*	4	2	Reroute at San Diego Freeway and Sunset Blvd. Interchange
S-120*	4	71	Extend Route to Brea Mall

*Modification not significant in network terms, therefore, no coding changes were implemented.

COMPANY	SYSTEM LINE NUMBER	UTPS LINE NUMBER MODE	UTPS LINE NUMBER LINE	DESCRIPTION
Commerce (2)	Red	6	1	Recode Route
	Blue	6	2	----------
	Green	6	3	----------
	Yellow	6	4	----------
Culver City (3)	CC-1	6	7	Extend Route to include turnaround at Washington & Fairfax
	CC-2	6	8	----------
	CC-3	6	9	----------
	CC-4	6	10	----------
	CC-5	6	11	----------
Gardena (4)	G-1	6	100	Recode Route
	G-2	6	14	Extend Route to complete loop at Imperial Hwy & Western Avenue
	G-3	6	15	Recode Route
	G-4	6	16	Recode Route
Long Beach (5)	LB2B	6	23	----------
	LB5A	6	27	----------
	LB5B	6	28	Recode Route
	LB6	6	29	----------
	LB7	6	30	----------
	LB9A	6	32	----------
	LB9B	6	33	----------
	LB11A	6	37	Northern end of route extended on Clark Street
	LB11B	6	38	----------
	LB11C	6	39	DELETED
Montebello (6)	Blue - 10	6	50	Terminate at Atlantic Blvd.
	Grey - 20	6	51	----------
	Red - 30	6	52	Terminate at Atlantic Blvd.
	Red - 35	6	53	Terminate at Atlantic blvd.
	Yellow - 40	6	54	Extend west to L.A. Downtown
	Yellow - 45	6	55	Extend eastern end to La Merced
	Yellow - 50	6	56	Extend west to L.A. Downtown and east to Norwalk Blvd.
	Green - 60	6	57	----------
	Green - 70	6	58	----------
Norwalk (7)	Red	6	62	----------
	Blue	6	63	----------
	Green	6	64	----------
Santa Monica (8)	SM-1	6	71	----------
	SM-2	6	72	----------
	SM-3A	6	73	Route extended from Marina Del Rey to LAX
	SM-3B	6	74	DELETED
	SM-5	6	75	Extend on San Vicente north of Wilshire
	SM-7	6	76	----------
	SM-8A	6	77	DELETED
	SM-8B	6	78	----------
	SM-9A	6	79	----------
	SM-9B	6	80	DELETED
	SM-10E	6	5	Express coding in mixed - flow freeway
	SM-10W	6	12	Express coding in mixed - flow freeway
	SM-11	6	81	----------
	SM-12A	6	82	----------
	SM-12B	6	83	DELETED
	SM-13	6	84	----------
	SM-14	6	85	----------
Torrance (9)	T-1N	6	196	Recode Route
	T-1S	6	197	Recode Route
	T-2N	6	198	Recode Route
	T-2S	6	199	Recode Route
	T-3	6	90	Recode Route
	T-4	6	91	Recode Route
	T-5	6	92	Recode Route
	T-8	6	93	Recode Addition

The development of routes and service levels for both the Harbor and Century freeway corridors was based upon a SCRTD technical memorandum of August 10, 1980[1] and modified as a result of the joint work effort between the SCRTD Bus Planning Department and CALTRANS' Transit Branch. As indicated earlier, these two corridors were always considered to function in concert with direct connections available between the Harbor and Century freeway lanes at their intersection. Tables 3 and 4 list the station locations and applicable node numbers for each corridor facility.

All 10 routes within these two corridors were oriented toward the central business district and were derived from existing Sector Improvement Program routes. Figure 8 graphically depicts these routes. As shown in that figure, the route coverage provided by these lines is rather comprehensive in nature and provides a high level of service entering the central business district. The interface of these routes with the Downtown People-Mover Convention Center station was of particular importance to the People-Mover Authority and was jointly agreed upon by that authority, the SCRTD Bus Planning Department, and the CALTRANS Transit Branch. Table 5 summarizes each of the Harbor-Century routes and places them into one of three categories:

1. Routes that terminate at the Convention Center terminal.
2. Routes that interface the Convention Center terminal but continue.
3. Routes that completely bypass the terminal.

The Santa Ana Freeway express bus service, much simpler in concept and operation, consisted of three basic sector improvement program routes: the 757, 758, and the 800. A list of the Santa Ana Freeway transitway station locations and applicable node numbers is presented in Table 6.

PLANNING POLICY ASSUMPTIONS

As indicated earlier, the Sector Improvement Program (SIP) formed the basic building block for the development of an integrated bus feeder/distribution system. The modification of SIP routes was based upon a set of planning and operating concepts described in more detail below.

Projected Frequency of Service

Several SIP routes were eliminated under the assumption that the Starter Line would divert a sufficient number of passengers to make it feasible to eliminate these lines. The specific routes involved are discussed in the next section.

The level of service assumed for the SIP bus network consisted of the peak period and off-peak headways (time interval between buses) as defined in November, 1979. This frequency of service amounts to a 10 to 20 percent increase in frequency of service over the (existing) June, 1980, service levels.

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[1] Harbor Freeway and I-105 Freeway Transitway Line Haul Service Concepts," August 10, 1978, SCRTD Bus Planning Department.

Table 3
HARBOR FREEWAY TRANSITWAY STATION LOCATIONS

Station Node Number	Local Node Number	Location
—	3376	Figueroa & Adams
7720	3192	Exposition
7721	4149	Slauson
7722	4157	Manchester
7723	4602	Rosecrans
7724	4601	Artesia
7725	4608	Carson
7726	5006	Pacific Coast Highway
7727	4990	San Pedro

Table 4
CENTURY FREEWAY TRANSITWAY STATION LOCATIONS

Station Node Number	Local Node Number	Location
—	4421	Sepulveda & Imperial
7700	4434	Aviation
7701	4000	Hawthorne
7702	4021	Crenshaw
7703	4153	Vermont
7704	4126	Avalon
7705	4142	Wilmington
7706	4184	Long Beach Boulevard
7707	4717	Long Beach Freeway
7708	4695	Lakewood
7709	7576	I-605 Freeway
—	4771	Studebaker

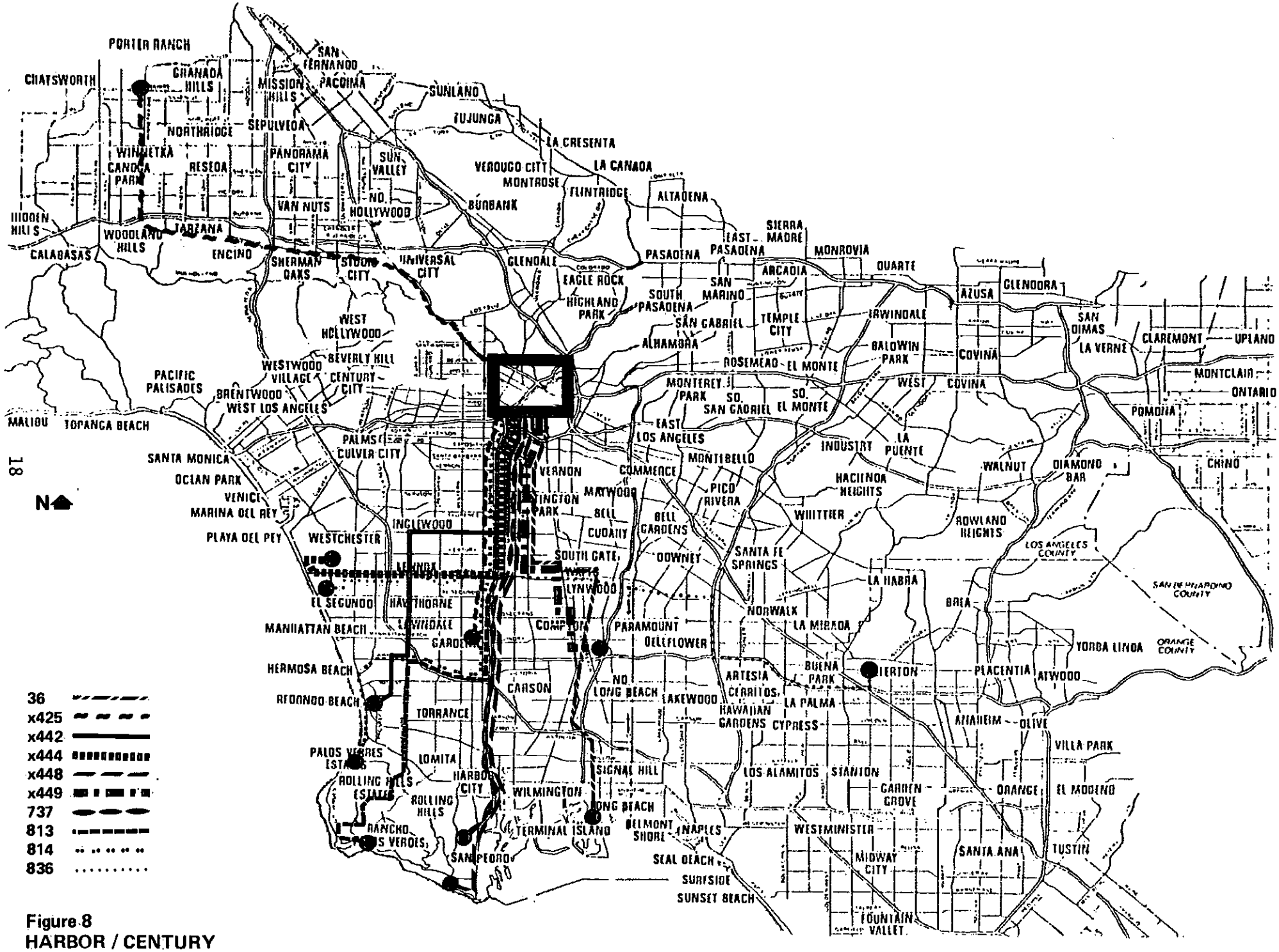

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Figure 8
HARBOR / CENTURY
BUS-ON-FREEWAY ROUTES

Table 5
HARBOR/CENTURY FREEWAY TRANSIT ROUTES AND DPM STATION INTERFACE

Harbor/Century Freeway Routes	Route Description	DPM Convention Center Terminal (Buses/Hour) Terminate*	Thru	Bypass
36	Long Beach Boulevard, Century Freeway, Harbor Freeway, CBD		6	
X425	Reseda Boulevard, Hollywood Freeway, CBD, Harbor Freeway		4	
X442	Inglewood Avenue, Manchester Boulevard, Harbor Freeway, CBD		6	
X444	LAX, Imperial Highway, Harbor Freeway, CBD		3	
X448	Pacific Avenue, Harbor Freeway, CBD		4	
X449	Compton, Century Freeway, Harbor Freeway			3
737	San Pedro, Harbor Freeway, CBD	2		
813	Hawthorne Boulevard, San Diego Freeway, Harbor Freeway, CBD	2		
814	Redondo Beach, San Diego Freeway, Harbor Freeway, CBD		4	
836	El Segundo, Century Freeway, San Gabriel Freeway, Artesia Freeway, Fullerton			6
		4	27	9

*Note: These runs represent 13 percent of total runs terminating at DPMCC. Santa Monica Freeway bus routes represent 12 percent of total trips terminating at DPMCC. Total = 25 percent.

Table 6
SANTA ANA FREEWAY TRANSITWAY STATION LOCATIONS

Station Node Number	Local Node Number	Location
7710	3598	Atlantic
7711	4288	Lakewood
7712	4826	Norwalk
7713	7566	Valley View
7714	5926	Fullerton
7715	5966	Euclid
7716	6165	Harbor Boulevard
7717	6208	Katella
7718	6253	Garden Grove
7719	6233	Main Street
7728	6242	Main Street Park-n-Ride

Some adjustments in service levels, both increases and decreases in frequency of service, will be considered in subsequent analyses as a result of the rail station boarding and alighting volumes generated by the travel demand model forecasts. These bus schedule adjustments will occur in two categories: (1) reductions in frequency of service for bus lines which parallel the rail line, and (2) increases in frequency of service for bus routes which serve as feeder routes to rail service.

The manner in which certain lines may receive increased frequency of service is referred to as "shortline operation." This means that supplemental service would operate over the portion of a line having high ridership for feeder trips to and from the rail station. Assuming the feeder ridership demand is limited to short distances on either side of a rail station, these supplemental bus trips will turn back at these points rather than operate to the regular end of the bus route. This type of analysis will occur as part of the capital and operating cost analysis.

SIP Route Modifications By Service Area

In general, SIP route modifications were based on the following criteria: (1) eliminate bus lines duplicating rapid transit service, (2) provide the opportunity for operating cost savings, and (3) provide rider time savings where comparative paths between the rail line and parallel bus routes (taking into account transfer times between bus and rail) favor use of rail. The modifications were as follows:

1. San Fernando Valley local and express routes serving Hollywood and downtown Los Angeles.

   a. Local Lines: In most instances where local service terminated in Hollywood or downtown Los Angeles, the lines were rerouted to terminate at the North Hollywood or Universal City Station. An example is SIP Line 150 (Ventura Boulevard) which instead of terminating in Hollywood was rerouted into the Universal City Station.

   b. Express Lines: All of these lines, mostly from the West San Fernando Valley area, currently terminate in downtown Los Angeles. They were rerouted into the North Hollywood or Universal City Stations. One express bus line was, however, retained on the Hollywood Freeway between downtown Los Angeles and Universal City. A frequency of 15 minutes between buses all day was assumed in order to provide convenient service to the existing three well-patronized Hollywood Freeway bus stops at Alvarado, Vermont, and Western.

2. Local and limited lines serving stations in Hollywood and West Hollywood. Most of these lines are major trunk routes between downtown Los Angeles and the west side.

a. Local Lines: All of the Starter Line rail stations such as Hollywood/Hollywood Bowl, Hollywood/Cahuenga, Fairfax/Santa Monica, and Fairfax/Beverly are adjacent to major bus lines carrying significant numbers of daily riders. Very few route changes were made specifically to accommodate rapid transit. It is intended that some lines which interface with rapid transit stations will be modified to include supplementary short line service for short distances on either side of the station to accommodate feeder trips. Examples of these SIP routes include Line 1, Hollywood Boulevard, and Line 4, Santa Monica Boulevard. Both of these routes will interface with one or more stations. Examples of additional short line service include additional service on Line 1 from Century City to the Fairfax/Santa Monica Station. On Line 4, short line service additions were planned to serve the Fairfax/Santa Monica Station from West Los Angeles on the west and East Hollywood on the east.

   Several other lines terminating in Hollywood but not serving downtown Los Angeles were extended to either the Hollywood Bowl or Hollywood/Cahuenga Station. For example, Line 210, the Crenshaw Boulevard route, was extended to the Hollywood/Cahuenga Station.

b. Limited Lines: Within the SIP, limited lines are those operating along standard city streets usually in conjunction with a companion local line stopping at only certain bus stops to allow passengers to board or alight. These stops usually are points where transfers can be made to other routes.

   In the SIP, several limited lines were established in the West Hollywood-Mid-Wilshire area to provide faster service between those areas and downtown Los Angeles particularly during peak periods. With inauguration of rapid transit service, rider time savings on those routes would be eliminated. In several cases, the lines parallel to the rail corridor were eliminated. An example of this was Line 306, the West Third Street Limited. Several other routes were terminated at the nearest rapid transit station. An example of this change was Line 303, the Santa Monica Boulevard Limited which starts in the City of Santa Monica and terminates at the Santa Monica/Fairfax Station rather than continuing on to downtown Los Angeles.

3. Local and limited services along Wilshire Boulevard and intersecting thoroughfares between Fairfax and the Los Angeles Central Business District.

   a. Major changes in this area reflect service reductions due to direct competition along North Fairfax Avenue and Wilshire Boulevard between bus and rapid transit service. Also, on lines crossing Wilshire Boulevard, it is intended that additional shortline service might be added to reflect increased ridership from persons traveling to the rapid transit line (i.e., feeder function).

Significant reductions in service were made in bus service on Fairfax Avenue and on Olympic Boulevard. Half of the planned SIP service (every other trip) was eliminated north of Wilshire Boulevard along Fairfax Avenue. Similarly, in the case of Olympic Boulevard, half of the base service was eliminated east of Fairfax in order to route half of the trips north on Fairfax to terminate at the Fairfax Rail Station.

With respect to Wilshire Boulevard, the SIP routes provide for three separate line numbers to replace the present three alternate routes on the existing Line 83. The rail-modified SIP bus network provides that only one of the three Wilshire Boulevard routes (SIP Line 20 - Santa Monica - LA CBD) continue to operate to downtown Los Angeles. The other two lines (SIP Line 21 - from Westwood - and SIP Line 22 -from Century City) terminate at the Fairfax Rail Station. The effect of the cutback of SIP Lines 21 and 22 to Fairfax Rail Station is to reduce service on Wilshire Boulevard east of Fairfax by approximately two thirds of what it would be with the operation of all three SIP Lines (20, 21, and 22) into downtown Los Angeles.

One other SIP route received service reductions in the Wilshire area. The 8th Street line (SIP Line 27) was reduced approximately 50 percent for base service.

Two SIP routes were eliminated in the mid-Wilshire area due to their proximity to the Wilshire Rail Line: SIP Line 18 on West 6th Street and SIP Line 25 on West 7th Street.

It is likely that SIP routes which intersect rail stations on such streets as LaBrea Avenue, Crenshaw Boulevard, and Western Avenue will receive supplemental shortline service for short distances on either side of Wilshire Boulevard, at least during the peak periods, if not during the base period.

b. Limited Service: With respect to the discussion of limited routes between Los Angeles and West Hollywood as detailed in the previous section, limited lines on Wilshire and Olympic were handled in the following manner:

Limited service from Santa Monica and Brentwood was terminated at the Wilshire/Fairfax Station. Limited Line 311 on Olympic Boulevard from Century City to downtown Los Angeles was cancelled.

c. Qualifications to Service Cuts in Wilshire Area: Further analysis is needed to determine whether proposed reductions in frequency of service are warranted on Wilshire Boulevard, east of Fairfax and on Fairfax Avenue, north of Wilshire after start of rail operations. The bus feeder function on these two route segments may require as much service as would be the case without the rail line. The substantial

increases in total transit ridership may require high bus volumes to serve a portion of these new transit riders who will access the rail line via a bus feeder mode.

4. Central City Stations. Most route changes in downtown Los Angeles were based on the impact of the Downtown People-Mover project. The only sigificant changes caused by the rapid transit line were made to those El Monte Busway routes serving the mid-Wilshire area. The mid-Wilshire busway lines were terminated at 7th and Flower Streets. An example of these service changes is the current Bus Lines 487-489-491, which are shown to be terminated at the 7th and Flower Rail Station.

   Bus route changes involving both the Downtown People-Mover (DPM) and the Wilshire Rail line require careful further study. The current bus route plan for the DPM under study will also help clarify the manner in which bus routes should interface with the downtown rail stations.

CORRIDOR/OPTION DESCRIPTIONS

Based upon the planning policy criteria described above, modifications to Sector Improvement Program routes were developed for each corridor. Table 7 illustrates the correspondence between each of the rail extension corridors and the six network options. Option VII, not shown in that table, tested a modified Starter Line beginning at Union Station and terminating at Wilshire Boulevard and Fairfax Avenue. With few exceptions, each Sector Improvement Program route was affected by only one corridor. Implicit within the option definition is the fact that the Sector Improvement Program route modifications made to a corridor are consistent within individual options; in other words, if a route were modified to interface with a West Los Angeles station in Option II, it would operate in that manner for all options in which West Los Angeles was to function as a rail corridor.

Tables 8 through 17 document the route-by-route modifications implemented within each corridor. Those tables indicate each route that was reviewed for the corridor and a description of the action (if any) taken. One of three possible actions was taken for each Sector Improvement Program route. No change made may be specified if the route should not logically or physically interface with the station. The route may have been deleted if it operates in parallel or direct competition with the rail line. The route may have been modified slightly to interface with the station by either terminating it at the station point or rerouting it to serve the station and then continue on its existing route. A systematic coding process, along with some specifically developed programs for this purpose, was used to identify and summarize routes which had any possibility of interfacing or serving station locations within one or more rail corridors.

Table 7
CORRIDOR/OPTION CORRESPONDENCE

Corridor	I	II	III	IV	V	VI
Starter Line	X	X	X	X	X	X
West Los Angeles (A)		X		X	X	X
El Monte (B)		X	X	X	X	X
San Fernando Valley (C)			X	X	X	X
South Los Angeles (D)				X	X	X
Century Freeway (E)				X	X	X
Santa Ana Freeway (F)					X	X
Los Angeles International Airport (G)						X
Eagle Rock (H)						X

OPTION I - STARTER LINE CORRIDOR

SYSTEM LINE NUMBER	UTPS LINE NUMBER MODE	UTPS LINE NUMBER LINE	STATION INTERFACE	DESCRIPTION OF ACTION (IF REQUIRED)
S-1	4	1	2, 3, 13, 14	----------
S-2	4	2	2, 3	----------
S-3	4	3	2,3	----------
S-4	4	4	2, 3, 13	Reduce headway to 10 minutes (peak)
S-14	4	8	12	----------
S-18	4	10	3	Terminate at Francisco Street
S-20	4	11	5 - 11	Reduce headway to 15 minutes (peak)
S-21	4	12	11	Terminate at Wilshire & Fairfax Station
S-22	4	13	11	Terminate at Wilshire & Fairfax Station
S-25	4	14	4	Terminate at 7th & Flower Station
S-26	4	15	5, 14	Terminate at Wilshire & Alvarado Station
S-27	4	16	9	Extend to Wilshire & Crenshaw Station; reduce headway to 15 minutes (peak)
S-28	4	17	2, 3	Reduce headway to 10 minutes (peak)
S-30	4	18	2, 3	----------
S-31	4	19	2, 3	----------
S-33	4	20	2, 3	----------
S-35	4	22	1, 2, 3	Extend to Union Station
S-37	4	23	1	Extend to Union Station
S-38	4	24	1	Extend to Union Station
S-42	4	27	1	----------
S-45	4	29	2, 3	----------
S-46	4	30	2, 3	----------
S-47	4	31	1	Extend to Union Station
S-48	4	32	1, 4	Extend to Union Station
S-50	4	33	2	----------
S-51	4	34	2	----------
S-53	4	35	3	----------
S-55	4	36	1	Extend to Union Station
S-56	4	37	1	Extend to Union Statinn
S-58	4	38	4	----------
S-60	4	38	4	----------
S-75	4	43	2	----------
S-80	4	44	2	----------
S-81	4	45	2	----------
S-87	4	48	2	----------
S-88	4	49	2	----------
S-94	4	53	2	Insert special walk link from 1st & Broadway Station to 1st & Spring (3582)
S-96	4	54	3	----------
S-101	4	56	5	----------
150	4	76	16	Terminate at Universal City Station
152	4	78	16	----------
159	4	85	16,17	Reroute thru Universal City Station
S-180	4	99	14	----------
S-181	4	100	14	----------
S-183	4	101	17	Reroute thru Lankershim & Chandler Station
S-200	4	103	5	----------
S-201	4	104	6	Terminate at Wilshire & Vermont Station
S-202	4	105	2, 4	----------
S-204	4	106	6	----------
S-206	4	107	7	----------
S-207	4	108	8	----------
S-209	4	109	8	Terminate at Wilshire & Western Station
S-210	4	110	9, 14, 15	Terminate at Hollywood Bowl Station
S-212	4	111	10, 14, 15	----------
S-214	4	112	10, 14	----------
S-217	4	113,118 (II only)	11 - 14	----------
L-303	4	132	2, 3, 13	Terminate at Fairfax & Santa Monica Station
L-306	4	133	11	Reroute onto Fairfax, Terminate at Wilshire & Fairfax Station
L-308	4	134	11	Terminate at Wilshire & Fairfax Station
L-309	4	134	11	Terminate at Wilshire & Fairfax Station
L-310	4	136, 137	11	Terminate at Wilshire & Fairfax Station
L-311	4	138	-	DELETED
L-315	4	139	1	Extend to Union Station
L-317	4	140	1, 2, 3	Extend to Union Station
L-320	4	141	2	----------
L-371	4	146	6	----------
L-373	4	147	8	----------
L-375	4	148	9, 15	----------

OPTION I - STARTER LINE CORRIDOR (Continued)

SYSTEM LINE NUMBER	UTPS LINE NUMBER MODE	UTPS LINE NUMBER LINE	STATION INTERFACE	DESCRIPTION OF ACTION (IF REQUIRED)
X-411	5	6	17	----------
X-412	5	7	17	Terminate at Lankershim & Chandler Station
X-420	5	10	17	Terminate at Lankershim & Chandler Station
X-421	5	12	17	Terminate at Lankershim & Chandler Station
X-422	5	13	16	Terminate at Universal City Station
X-426	5	16	17	Terminate at Lankershim & Chandler Station
X-427	5	17	16	Terminate at Universal City Station
X-429	5	18	14	Terminate at Hollywood & Cahuenga Station
X-430	5	19	1, 4	Terminate at Union Station
X-434	5	20,21	1, 4	Terminate at Union Station
X-436	5	22	-	Terminate at DPM Convention Center Station
X-437	5	23	-	Terminate at DPM Convention Center Station
X-439	5	24	1, 4	Terminate at Union Station
X-475	5	60	1	----------
X-525	5	49	16	----------
X-455	5	29	4	----------
480	5	61,62	1, 2, 4	Terminate at 7th & Flower Station
482	5	164	1	Terminate at Union Station
483	5	4, 65	1	Terminate at Union Station
484	5	67, 68	1, 2	----------
485	5	14,70	1	Terminate at Union Station
486	5	71,72	1	Terminate at Union Station
487	5	73,74	1, 2, 4	Terminate at 7th & Flower Station
488	5	75,76	1	Terminate at Union Station
489	5	77,78	1, 2, 4	Terminate at 7th & Flower Station
490	5	79,80	1, 2	----------
491	5	81,82	1, 2, 4	Terminate at 7th & Flower Station
492	5	83,84	1, 2, 4	Terminate at 7th & Flower Station
493	5	85,86	1, 2, 4	Terminate at 7th & Flower Station
494	5	87,88	1, 2, 4	Terminate at 7th & Flower Station
496	5	15	1	----------
716	5	40,41	16	Terminate at Universal City Station
755	5	52,53	4	----------
760	5	95,96	1, 2, 4	Terminate at 7th & Flower Station
762	5	30	1	Terminate at Union Station
764	5	116,117	1, 2, 4	Terminate at 7th & Flower Station
820	5	99,101	3	----------
SM-10	6	5,12	4	----------
X-425*	6	49	16	----------
X-444*	6	6	1, 2	----------
X-442*	6	69	1, 2	----------
X-449*	6	59	2	----------
36*	6	86,87	4	----------
737*	6	60,61	-	Terminate DPM Convention Center Station
757*	6	17,18	4	Terminate at 7th & Flower Station
758*	6	45,46	4	Terminate at 7th & Flower Station
800*	6	47,48	4	Terminate at 7th & Flower Station
813*	6	65	-	Terminate at DPM Convention Center Station
814*	6	66, 67	1, 2	Terminate at Union Station

OPTION II - WEST LOS ANGELES CORRIDOR (A)

SYSTEM LINE NUMBER	UTPS LINE NUMBER MODE	UTPS LINE NUMBER LINE	STATION INTERFACE	DESCRIPTION OF ACTION (IF REQUIRED)
S-1	4	1	22	----------
S-3	4	3	21	----------
S-3A	4	21	21	Short line service from Laurel & Sunset following the S-3 Route to the Wilshire & Beverly Drive
S-4	4	4	22	----------
S-14	4	8	22	----------
S-16	4	9	21	Extend to Wilshire & Beverly Drive Station
S-20	4	11	20-21, 24-26	----------
S-21	4	12	-	DELETED
S-22	4	13	-	DELETED
S-28	4	17	22	----------
S-33	4	20	28	Extend route north on Ocean Avenue to Wilshire and then east on Wilshire, terminating at the Lincoln Blvd. Station
S-105	4	59	20	----------
S-221	4	115	20	Reroute through the Wilshire and La Cienega Station
L-306	4	133	-	DELETED
L-308	4	134	-	DELETED
L-309	4	135	-	DELETED
X-429	5	18	23, 24	----------
X-430	5	19	23, 24	----------
X-434	5	20	28	Terminate at Wilshire & Lincoln Blvd. Station
X-560	5	69	22, 23, 24	----------
X-561	5	46	23, 24	----------
SM-1	6	71	23, 24	----------
SM-2	6	72	23 - 28	----------
SM-3A	6	73	28	----------
SM-5	6	75	22, 25	Reroute north on Avenue-of-the-Stars to terminate at the Santa Monica Blvd. Station
SM-7	6	76	28	Continue north on Lincoln to Wilshire Blvd., west to Ocean Avenue, south to junction of existing route
SM-8B	6	78	23, 24	----------
SM-9A	6	79	28	Extend route on Wilshire to Lincoln, west on Montana to 7th St., then resume existing route
SM-10	6	5,12	-	DELETED
SM-11	6	81	27	Restructure route to use 26th Street rather than 20th Street
SM-13	6	84	24	Extend route north on Westwood Blvd. to Wilshire Blvd. Station
SM-14	6	85	24	Reduce headway from 30 to 10 minutes
CC-3	6	9	24	Extend north on Westwood Blvd. to Wilshire Blvd. Station

SYSTEM LINE NUMBER	UTPS LINE NUMBER MODE	UTPS LINE NUMBER LINE	STATION INTERFACE	DESCRIPTION OF ACTION (IF REQUIRED)
S-70	4	41	55	----------
S-75	4	43	55	Extend to Santa Anita Avenue Station & reduce headway to 15.0 minutes
S-175	4	96	54, 55	Reduce headway to 15.0 minutes
S-250	4	122	50	----------
S-252	4	124	50	Reroute through Golden State Freeway Station
S-253	4	125	50	Extend to Golden State Freeway Station
S-255	4	126	50	Extend to Golden State Freeway Station
S-260	4	130	52	Reroute through Atlantic Blvd. Station
L-330	4	142	55	----------
424	4	149	53, 54	Reroute through Rosemead Blvd. Station
431	4	150	53	Reduce headway to 15 minutes
433	4	151	55	Reduce headway to 15 minutes
435	4	152	55	Reduce headway to 15 minutes
446	4	158	55	Reduce headway to 30 minutes
829	4	172	54	----------
X-475	5	60	51, 52, 55	----------
480	5	61,62	55	Terminate at Santa Anita Avenue Station
482	5	164	55	Terminate at Santa Anita Avenue Station
483	5	4,65	51	Terminate at Long Beach Freeway Station
484	5	37,38,67,68	55	Terminate at Santa Anita Avenue Station
485	5	14,70	51	Terminate at Long Beach Freeway Station
486	5	71,72,165	55	Terminate at Santa Anita Avenue Station
487	5	73,74	53	Terminate at Del Mar Station
488	5	75,76,166	55	Terminate at Santa Anita Avenue Station
489	5	77,78	-	DELETED
490	5	79,80	55	Terminate at Santa Anita Avenue Station
491	5	81,82	55	Terminate at Santa Anita Avenue Station
492	5	83,84	55	Terminate at Santa Anita Avenue Station
493	5	85,86,163	55	Terminate at Santa Anita Avenue Station
494	5	87,88	55	Terminate at Santa Anita Avenue Station
496	5	15	55	Terminate at Santa Anita Avenue Station
760	5	95,96	55	Terminate at Santa Anita Avenue Station
762	5	30	55	Terminate at Santa Anita Avenue Station
764	5	116,117	55	Terminate at Santa Anita Avenue Station
MB-20	6	51	53	Terminate at Del Mar Station
MB-70	6	58	53	Terminate at Del Mar Station

Table 11
OPTION III - SAN FERNANDO VALLEY CORRIDOR (C)

SYSTEM LINE NUMBER	UTPS LINE NUMBER MODE	UTPS LINE NUMBER LINE	STATION INTERFACE	DESCRIPTION OF ACTION (IF REQUIRED)
S-97	4	55	32	Reroute north Van Nuys Blvd. and terminate at Van Nuys & Oxnard Station
151	4	77	37-39	Extend to Topanga Canyon and north to Canoga & Plummer
152	4	78	38	----------
153	4	79	36	----------
154	4	80	32	----------
156	4	82	34	----------
157	4	83	33	----------
159	4	85	31	----------
160	4	86	30	----------
161	4	87	37	Extend route north on Topanga Canyon to Canoga & Sherman Way Station
163	4	89	37	----------
164	4	90	33, 34, 36	----------
166	4	92	39	Extend north on Topanga Canyon to Canoga & Plummer Station
168	4	93	39	Extend north on Topanga Canyon to Canoga & Plummer Station
169	4	94	37	Extend south on Topanga Canyon to Canoga & Sherman Way Station
S-183	4	101	30	Extend north on Laurel Canyon to Chandler Avenue Station
X-420	5	10	30-32	----------
X-421	5	12	30-32	----------
X-422	5	13	-	DELETED
X-425	6	49	35	----------
X-426	5	16	30, 31	----------
X-427	5	17	-	DELETED
X-560	5	69	32	----------
X-561	5	46	32	----------
716	5	40,41	-	DELETED

Table 12
OPTION IV - SOUTH LOS ANGELES CORRIDOR (D)

SYSTEM LINE NUMBER	UTPS LINE NUMBER MODE	UTPS LINE NUMBER LINE	STATION INTERFACE	DESCRIPTION OF ACTION (IF REQUIRED)
S-1	4	1	60	----------
S-2	4	2	60	----------
S-3	4	3	60	----------
S-28	4	17	60	----------
S-30	4	18	60, 61	----------
S-31	4	19	60, 61	----------
S-33	4	20	61	Reroute to Pico & Figueroa Station & then resume on Venice Blvd.
S-35	4	22	60	----------
S-37	4	23	62	----------
S-38	4	24	63	----------
S-40	4	25	64	----------
S-41	4	26	64	----------
S-42	4	27	64	----------
S-44	4	28	61, 62, 63, 68	Extend west on Rosecrans to Vermont & Rosecrans Station
S-45	4	29	60, 68	Extend west on Rosecrans to Vermont & Rosecrens Station
S-46	4	30	60,68	Extend west on Rosecrans to Vermont & Rosecrans Station
S-47	4	31	73	Reroute through Harbor Fwy & Pacific Coast Hwy Station
S-55	4	33	73	Extend west to Harbor Fwy & Pacific Coast Hwy Station
S-56	4	37	69	Extend west on Artesia to Vermont & Artesia Station
S-60	4	39	74	----------
S-65	4	40	61	----------
S-70	4	41	61	----------
S-96	4	54	60	----------
S-101	4	56	62	----------
S-102	4	57	63	----------
S-103	4	58	64	----------
S-109W	4	62	65	----------
S-114	4	67	66	----------
S-115	4	68	66	----------
S-122	4	72	67	Reroute north on Vermont to Century Fwy & Vermont Station
S-142	4	75	74	Reroute north on Pacific Avenue/Pacific Coast Hwy to Long Beach Blvd. Station
S-200	4	103	63, 64	Extend west on Santa Barbara to Vermont & Santa Barbara Station
202	4	105	60	----------
S-204	4	106	64, 65, 66, 67	----------
S-206	4	107	68	Extend east on Rosecrans to Vermont & Rosecrans Station
S-232	4	119	75	----------
S-260	4	130	74	----------
L-315	4	139	64	----------
L-317	4	140	-	DELETED
L-371	4	146	64-67	Increase headway to 15 minutes
840	4	174	68	----------
842	4	175	70	Extend southwest on 190th Street to Vermont & 190th Street Station
846	4	176	69	Reduce headway to 30 minutes
849	4	177	71-73	Reroute on Pacific Coast Hwy & Terminate at Harbor Fwy Station
X-430	5	19	61	----------
X-436	5	22	61	----------
X-437	5	23	61	----------
X-439	5	24	61	----------
G-1	6	200	60	Terminate at Rosecrans & Vermont Station
G-2	6	14	67-69	Reroute through Artesia & Vermont Station
LB-1A	6	20	74	----------
LB-1B	6	21	74	----------
LB-5A	6	27	74	----------
LB-5B	6	28	74	----------
LB-6	6	29	74	Reroute on Pacific Coast Hwy to Long Beach Blvd. Station
T-1	6	196,197	60,69,70,71	----------
T-2	6	198,199	67	Reroute through Pacific Coast Hwy & Long Beach Blvd. Station
813*	6	65	68	Terminate at Vermont & Rosecrans Station
814*	6	66,67	68	Terminate at Vermont & Rosecrans Station
X-442*	6	69	66	Terminate at Vermont & Manchester Station
737*	6	60,61	-	DELETED
X-448*	6	19	-	DELETED
X-425*	6	49	61	Terminate Hollywood Freeway leg at Pico & Figueroa

Table 13
OPTION IV - CENTURY FREEWAY CORRIDOR (E)

SYSTEM LINE NUMBER	UTPS LINE NUMBER MODE	UTPS LINE NUMBER LINE	STATION INTERFACE	DESCRIPTION OF ACTION (IF REQUIRED)
S-40	4	25	101	----------
S-48	4	32	104	Extend south on Avalon to Avalon & Century Freeway Station
S-50	4	33	104	----------
S-51	4	34	104	----------
S-55	4	36	105	Reroute on Wilmington Avenue to Wilmington & century Freeway Station
S-56	4	37	105	----------
S-60	4	39	106	----------
S-117	4	69	107	Extend East to Long Beach & Century Freeway Station
S-119	4	70	101, 106, 107	Extend East to Long Beach & Century Freeway Station
S-120	4	71	67, 100, 101, 105, 109	Reroute south on Studebaker to San Gabriel & Century Freeway Station
S-122	4	72	67, 104, 105	Reroute thru Wilmington & Century Freeway Station
S-123	4	73	107	Extend East on El Segundo to Long Beach & Century Freeway Station
S-210	4	110	102	----------
S-214	4	112	101	----------
S-225	4	116	100	Reroute west on Imperial Hwy to Aviation & Century Freeway Station
S-226	4	117	100	Reroute west on Imperial Hwy to Aviation & Century Freeway Station
L-315	4	139	101	----------
L-320	4	141	104	----------
L-346	4	145	67, 100, 101, 105	----------
L-375	4	148	102	----------
827	4	171	109	----------
829	4	172	108	----------
861	4	178	101	Extend north on Hawthorne to Hawthorne & Century Freeway Station
X-455	5	29	107	Terminate at Long Beach & Century Freeway Station
N-1	6	62	108	Reroute on Rosecrans to Lakewood & Century Freeway Station
LB-28	6	23	108	Extend on Downey & Rosecrans to Lakewood & Century Freeway Station
LB-5	6	27,28	106	Extend north on Long Beach Blvd. to Long Beach Blvd. & Century Freeway Station
LB-6	6	29	107	Extend north to Long Beach & Century Freeway Station
LB-7	6	30	107	Extend to Long Beach & Century Freeway Station
LB-11A	6	37	108	Extend north to Long Beach & Century Freeway Station
836*	6	68	-	DELETED
X-444*	6	6	-	DELETED
X-449*	6	59	104	Reroute north on Avalon and terminate at Avalon & Century Freeway Station
36*	6	86,87	107	Terminate at Long Beach & Century Freeway Station

*Indicates bus-on-freeway routes in the Century Freeway Corridor.

Table 14
OPTION V - SANTA ANA FREEWAY CORRIDOR (F)

SYSTEM LINE NUMBER	UTPS LINE NUMBER MODE	UTPS LINE NUMBER LINE	STATION INTERFACE	DESCRIPTION OF ACTION (IF REQUIRED)
S-103	4	58	111	Extend to Paramount & Santa Ana Freeway Station
S-256	4	127	110	Extend to Atlantic Blvd. & Santa Ana Freeway Station
S-258	4	128	110	----------
S-259	4	129	110	Extend south on Atlantic to Santa Ana Freeway Station
S-260	4	130	110	----------
825	4	170	112	Reroute on Imperial Hwy to Norwalk & Santa Ana Freeway Station
831	4	173	111	----------
801	5	91,92	111, 112	Reroute on Imperial Hwy to Norwalk & Santa Ana Freeway Station and terminate at Paramount & Santa Ana Freeway Station
C-1	6	1	100	----------
C-2	6	2	110	----------
C-3	6	3	111	Extend to Paramount & Santa Ana Freeway Station
C-4	6	4	111	Extend to Paramount & Santa Ana Freeway Station
NW-1	6	62	112	Reroute on Imperial Hwy to Norwalk & Santa Ana Freeway Station
NW-3	6	64	112	Extend west on Imperial Hwy to Norwalk & Santa Ana Freeway Station
757*	6	17,18	112	Terminate at Norwalk & Santa Ana Freeway Station
758*	6	45,46	112	Terminate at Norwalk & Santa Ana Freeway Station
800*	6	47,48	112	Terminate at Norwalk & Santa Ana Freeway Station

OPTION VI - LOS ANGELES INTERNATIONAL AIRPORT (G)

SYSTEM LINE NUMBER	UTPS LINE NUMBER MODE	UTPS LINE NUMBER LINE	STATION INTERFACE	DESCRIPTION OF ACTION (IF REQUIRED)
S-28	4	17	80	----------
S-33	4	20	81, 82	----------
S-35	4	22	81	Extend north on Fairfax to Fairfax & Venice Blvd. Station
S-37	4	23	81	Extend north on Fairfax to Fairfax & Venice Blvd. Station
S-38	4	24	81	Extend north on Fairfax to Fairfax & Venice Blvd. Station
S-40	4	25	89	----------
S-41	4	26	89	----------
S-42	4	27	84, 85	Extend west on Century Blvd. to LAX Station
S-103	4	58	81	Extend north on Fairfax to Fairfax & Venice Blvd. Station
S-105	4	59	81	Reroute north on Fairfax to Fairfax & Venice Blvd. Station
S-109W	4	62	83	Extend north on Sepulveda to Sepulveda & Jefferson Station
S-112	4	66	85	Extend west on Century Blvd. to LAX Station
S-114	4	67	84	----------
S-115	4	68	84	----------
S-117	4	69	85	Extend west on Century Blvd. to LAX Station
S-120	4	71	85	Extend west on Century Blvd. to LAX Station
S-123	4	73	86	----------
S-210	4	110	89	----------
S-214	4	112	89	----------
S-217	4	113 118	80 - 82	----------
S-220	4	114	80, 82	----------
S-221	4	115	80, 81	----------
S-225	4	116	86, 87	----------
S-226	4	117	86, 87	----------
S-232	4	119	85, 86, 93	Extend west on Century Blvd. to LAX Station
L-310	4	136, 137	-	DELETED
L-315	4	139	89	----------
840	4	174	86, 87	----------
846	4	176	89	----------
861	4	178	88	----------
X-434	5	21	-	DELETED
X-436	5	22	-	DELETED
X-430	5	24	81	Terminate at Fairfax & Venice Blvd. Station
X-561	5	46	83 - 85	Extend west on Century Blvd. to LAX Station
T1	6	196	91 - 93	----------
T2	6	199,198	89 - 92	Reroute through Hawthorne & Sepulveda Station
T3	6	90	89, 90, 91	----------
T4S	6	91	89, 91, 92	----------
T-5	6	92	91	----------
T8	6	93	89 - 93	----------
G3	6	15	89	----------
G-4	6	16	88	Extend west on Manhattan Beach Blvd. to Inglewood Avenue Station
CC1	6	7	82	Terminate at Venice & Robertson Station
CC2	6	8	83	----------
CC3	6	9	83 - 85	Extend west on Century Blvd. to LAX Station
CC4	6	10	82, 83	Extend on Washington to Venice & Robertson Station
CC5	6	11	82	Reroute & Terminate at Venice & Robertson Station
SM-3	6	73	84, 85	Extend west on Century Blvd. to LAX Station
SM-12A	6	82	82	Extend west on Century Blvd. to LAX Station
X-442*	6	69	88	----------
813*	6	65	89 - 93	----------
814*	6	66,67	89	----------

Table 16
OPTION VI - EAGLE ROCK CORRIDOR (H)

SYSTEM LINE NUMBER	UTPS LINE NUMBER MODE	UTPS LINE NUMBER LINE	STATION INTERFACE	DESCRIPTION OF ACTION (IF REQUIRED)
S-44	4	28	41	----------
S-45	4	29	40	----------
S-46	4	30	40	----------
S-48	4	32	40	----------
S-84	4	46	40	----------
S-85	4	47	40, 43	----------
S-87	4	48	-	DELETED
S-88	4	49	42	Terminate at Eagle Rock & San Fernando Road Station
S-90	4	50	42	Terminate at Eagle Rock & San Fernando Road Station
S-91	4	51	42	Terminate at Eagle Rock & San Fernando Road Station
S-94	4	53	42	Terminate at Eagle Rock & San Fernando Road Station
S-97	4	55	40	----------
S-174	4	95	42	----------
S-175	4	96	43	----------
S-176	4	97	43	----------
S-177	4	98	44	----------
S-180	4	99	44	----------
S-181	4	100	44	----------
202	4	105	40	----------
L-338	4	144	-	DELETED
721	5	44,45	41	----------
770	5	58,59	41	----------

Table 17
OPTION VIII - WILSHIRE & FAIRFAX STARTER LINE

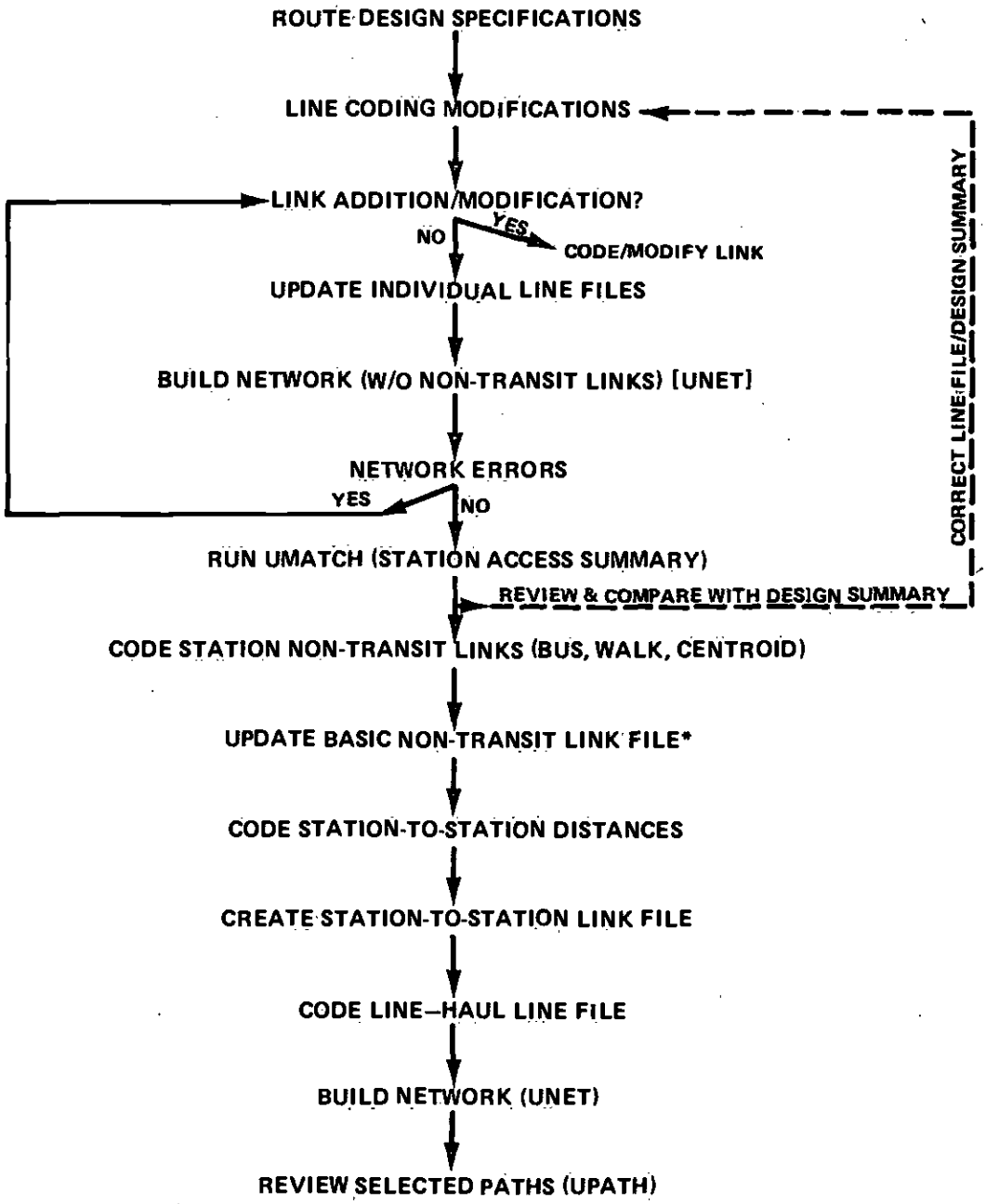
System Line Number	UTPS LINE NUMBER Mode	Line	Description of Action
5-4	4	4	Increase headway to 7.5 minutes (peak)
150	4	76	Extend on Ventura-Cahuenga-Highland to Hollywood & Vine
159	4	85	Remove Rerouting to Interface with Lankershim & Chandler Station
5-183	4	101	Remove Rerouting to Interface with Lankershim & Chandler Station
L-303	4	132	Extend West to Santa Monica Boulevard & Ocean Avenue In Santa Monica
X-412	5	7	Express on Ventura/Golden State/Pasadena Freeways to 7th & Flower Station (via Figueroa)
X-420	5	10	Hollywood Freeway Express to Vermont only
X-421	5	12	Hollywood Freeway Express to Washington & Hill Streets
X-422	5	13	Hollywood Freeway Express to Temple Street
X-426	5	16	Express on Hollywood Freeway to Highland/Rossmore, terminating at the Wilshire & Crenshaw Station
X-427	5	17	Hollywood Freeway Express to 1st & Hill Streets
X-429	5	18	Hollywood Freeway Express via Hollywood Boulevard to Venice & Broadway
716	5	40, 41	Ventura/Hollywood Freeway Express to Washington & Hill Streets

NETWORK CODING PROCESS

The mechanics of network coding and development is depicted graphically in Figure 9. The process is initiated with the route design specifications described above and documented in Tables 8 through 17. This process is a sequential set of logical and systematic steps which are followed to ensure that the network is free of coding errors and that the resulting network reflects the use of logical travel paths between individual zone pairs. Included in this logical set of steps are a number of checkpoints where summaries are automatically prepared to compare the resulting network characteristics with the original design specifications. It is also within these series of steps that specialized coding techniques and network operating assumptions as described in Appendix A are implemented and reviewed for accuracy.

In addition to the network development mechanics and coding techniques, there are a number of important coding conventions which were used in the development of each option network to provide additional identification codes which can be used in analyzing the travel demand results and in the possible development of additional alternatives.

One coding convention assigned a company number (columns 2 and 3 of the line card) to each route within the network. The correspondence between company numbers and transit properties is shown in Table 18. Also, as a result of the network coding process, several additional node numbers were used to facilitate the coding process (i.e., freeway express routes) and implement the specialized station access coding (see Table 19). For example, Union Station, which has been designated as Station 1, was assigned node number "7601" or 7600 plus the station number to designate the actual station location. Thus, 7800 plus the station number, or "7801," was used to designate the station access node for walk arrivals and departures. Finally, 7950 plus the station number, or "7951," in the case of Union Station, was used to indicate the node number for auto access arrivals. In this manner, by knowing the station number, the series of station access and station location nodes can be easily identified.



NETWORK CODING PROCESS
Figure 9

Table 18
COMPANY NUMBER DESIGNATION

Company Number	Transit Property
1	Southern California Rapid Transit District
2	Commerce
3	Culver City
4	Gardena
5	Long Beach
6	Montebello
7	Norwalk
8	Santa Monica
9	Torrance
10	Orange County Transit District
11	Riverside
12	Omnitrans (San Bernardino)
13	SCAT
14	Simi Valley
15	Thousand Oaks
16	Ventura Co.
17	CALTRANS (SCRTD) Bus-On-Freeway
18	Commuter Rail
19	Downtown People-Mover (CRA)

Table 19
NEW NODE NUMBER ASSIGNMENT TABLE

Node	Description
7556	Gardena Route #3
7557	Gardena Route #3
7558	SCRTD S-81 to account for travel time in the Santa Anita Fashion Center
7559	Commerce Route #1 Loop
7560	Hollywood Boulevard & Cahuenga Local Node for Station
7561	Turnaround for El Monte/Wilshire buses at 7th & Flower
7562	Express Link Dummy Node for X-412
7563	Express Link Dummy Node for X-415
7564	Express Link Dummy Node for X-427
7565	Express Link Dummy Node for X-434
7566	Valley View Park-n-Ride
7567	El Monte Rail Station Local Node (Station #54)
7568	Whitaker/Santa Ana Guideway Termination Node
7569	Golden State Freeway Express Node Dummy
7570	San Diego and Long Beach Freeway Express Dummy Node
7571	
7572	Express Park-n-Ride Link Dummy Node for 762
7573	Express Park-n-Ride Link Dummy Node for 764
7574	Express Link Dummy Node for 755
7575	Express Link Dummy Node for 755
7576	Local Node for I-605 and Century Bus-On-Freeway Station
7577	Artesia & San Gabriel Freeway Intersection
7578	26th & Wilshire Local Node (Station #27)
7579	Bunker Hill DPM Station Number
7580	Wilshire & Westholme Local Node (Station #23)
7581	Canoga & Flummer Local Node (Station #39)
7582	Vermont & Sepulveda Local Node (Station #72)
7583	Express Link Dummy Node for X-427 (Option VII Only)
7601-7712	Rail Rapid Station Numbers
7700-7728	Bus-On-Freeway Guideway Node Numbers
7801-7912	Rail Rapid Walk Access Node Numbers
7951-8062	Rail Rapid Auto Access Node Numbers

Note: In the Century and Santa Ana Freeway Corridors, the station numbers for bus-on-freeway and rail rapid were intentionally made the same.

The correspondence between station number and station location for all stations which are present in one or more of the seven options is shown in Table 20.

Another network coding convention used in the development of the networks was to place in unused Columns 70 and 71 of the UTPS line coding form a designation which indicates in Column 70 the applicable corridor (i.e., A-H) and in Column 71 the option number in which the route modification was first implemented (i.e., 1-7). In this manner, reference can be made to Tables 8 through 17 for any individual route to understand fully the type or magnitude of modification made to that route from the basic Option I network. Finally, Table 21 presents the correspondence between the Mode 8 UTPS line number, the rail line description, and the option(s) in which those line numbers are present.

Table 20
STATION LOCATION CORRESPONDENCE

Station Node	Local Node	Station Description
1	3533	Union Station
2	3583	1st and Broadway
3	3504	5th and Broadway
4	3481	7th and Flower
5	3302	Wilshire and Alvarado
6	3172	Wilshire and Vermont
7	3005	Wilshire and Normandie
8	3059	Wilshire and Western
9	3058	Wilshire and Crenshaw
10	2997	Wilshire and La Brea
11	3028	Wilshire and Fairfax
12	2987	Fairfax and Beverly
13	2364	Fairfax and Santa Monica
14	7560	Hollywood and Cahuenga
15	2350	Hollywood Bowl
16	2345	Universal City
17	2178	Lankershim and Chandler
20	3017	Wilshire and La Cienega
21	2886	Wilshire and Beverly Drive
22	2879	Santa Monica and Avenue of the Stars
23	7579	Wilshire and Westholme
24	2874	Wilshire and Westwood
25	2806	Wilshire and San Vicente
26	2902	Wilshire and Bundy
27	7578	Wilshire and 26th Street
28	1941	Wilshire and Lincoln
30	2304	Laurel Canyon and Chandler
31	2116	Burbank and Fulton Avenue
32	2092	Van Nuys and Oxnard Street
33	2093	Victory and San Diego Freeway
34	1829	Victory and Balboa Boulevard
35	1812	Oxnard and Reseda
36	1792	Victory and Winnetka
37	1761	Canoga and Sherman Way
38	1772	Canoga and Roscoe Boulevard
39	7581	Canoga and Plummer
40	3579	Broadway and Alpine Street
41	3531	Dodger Stadium
42	2504	Eadle Rock/San Fernando Boulevard
43	2492	Eagle Rock/York Boulevard
44	2493	Eagle Rock/Colorado Boulevard
50	3538	I-10 and Golden State Freeway
51	3721	I-10 and Long Beach Freeway
52	3743	I-10 and Atlantic Boulevard
53	3744	I-10 and Delmar
54	7567	I-10 and Rosemead Boulevard
55	3776	I-10 and Santa Anita Avenue
60	3394	Olympic Boulevard and Broadway
61	3383	Figueroa and Pico
62	3376	Figueroa and Adams
63	3199	Figueroa and Jefferson
64	3201	Vermont and Santa Barbara
65	4151	Vermont and Slauson Avenue
66	4048	Vermont and Manchester
67	4153	Vermont and Century Freeway
68	4553	Vermont and Rosecrans
69	4555	Vermont and Artesia
70	4530	Vermont and 190th Street
71	4975	Vermont and Carson
72	7582	Vermont and Sepulveda
73	5006	Harbord and Pacific Coast
74	5076	Pacific Coast Highway and Long Beach Boulevard
80	3027	Fairfax Avenue/Pico Boulevard
81	3024	Fairfax Avenue/Venice Boulevard
82	3089	Venice Boulevard/Robertson
83	3980	Sepulveda/Jefferson
84	3875	Sepulveda/Manchester
85	3880	Los Angeles International Airport
86	4435	Sepulveda/El Segundo
87	4447	Rosecrans/Aviation
88	4454	Manhattan Beach/Inglewood
89	4465	Hawthorne Boulevard/Artesia
90	4479	Hawthorne Boulevard/190th Street
91	4881	Hawthorne Boulevard/Torrance
92	4882	Hawthorne Boulevard/Sepulveda
93	4888	Hawthorne Boulevard/ Pacific Coast Highway
100	4434	Century Freeway and Aviation
101	4000	Century Freeway and Hawthorne
102	4021	Century Freeway and Crenshaw
104	4126	Century Freeway and Avalon
105	4142	Century Freeway and Wilmington
106	4184	Century Freeway and Long Beach Boulevard
107	4717	Century Freeway and Long Beach Freeway
108	4695	Century Freeway and Lakewood
109	4768	Century Freeway and San Gabriel
110	3625	Santa Ana and Atlantic Boulevard
111	4288	Santa Ana and Paramount
112	4373	Santa Ana and Norwalk

Table 21
OPERATIONS ROUTING PLANS FOR THE RAIL EXTENSION NETWORKS

UTPS LINE NUMBER	LINE DESCRIPTION	OPTIONS
1	Union Station -- North Hollywood (Starter Line)	1, 2
2	West LA (A) -- El Monte (B)	2, 4, 5, 6
3	Union Station -- San Fernando Valley (C)	3, 4
4	North Hollywood (C) -- El Monte (B)	3
5	Union Station -- South Los Angeles (D)	4, 5
6	Aviation -- San Gabriel Freeway (Century (E))	4
7	Santa Ana (F) -- San Fernando Valley (C)	5
8	Century (E) -- Santa Ana (F)	5
9	West LA (A) -- Santa Ana (F)	6
10	No. Hollywood -- LAX (G) -- Century (E)	6
11	San Fernando Valley (C) -- LAX (G)	6
12	Eagle Rock (H) -- South Los Angeles (D)	6
13	Union Station -- Wilshire/Fairfax	7

3.
TRAVEL DEMAND METHODOLOGY

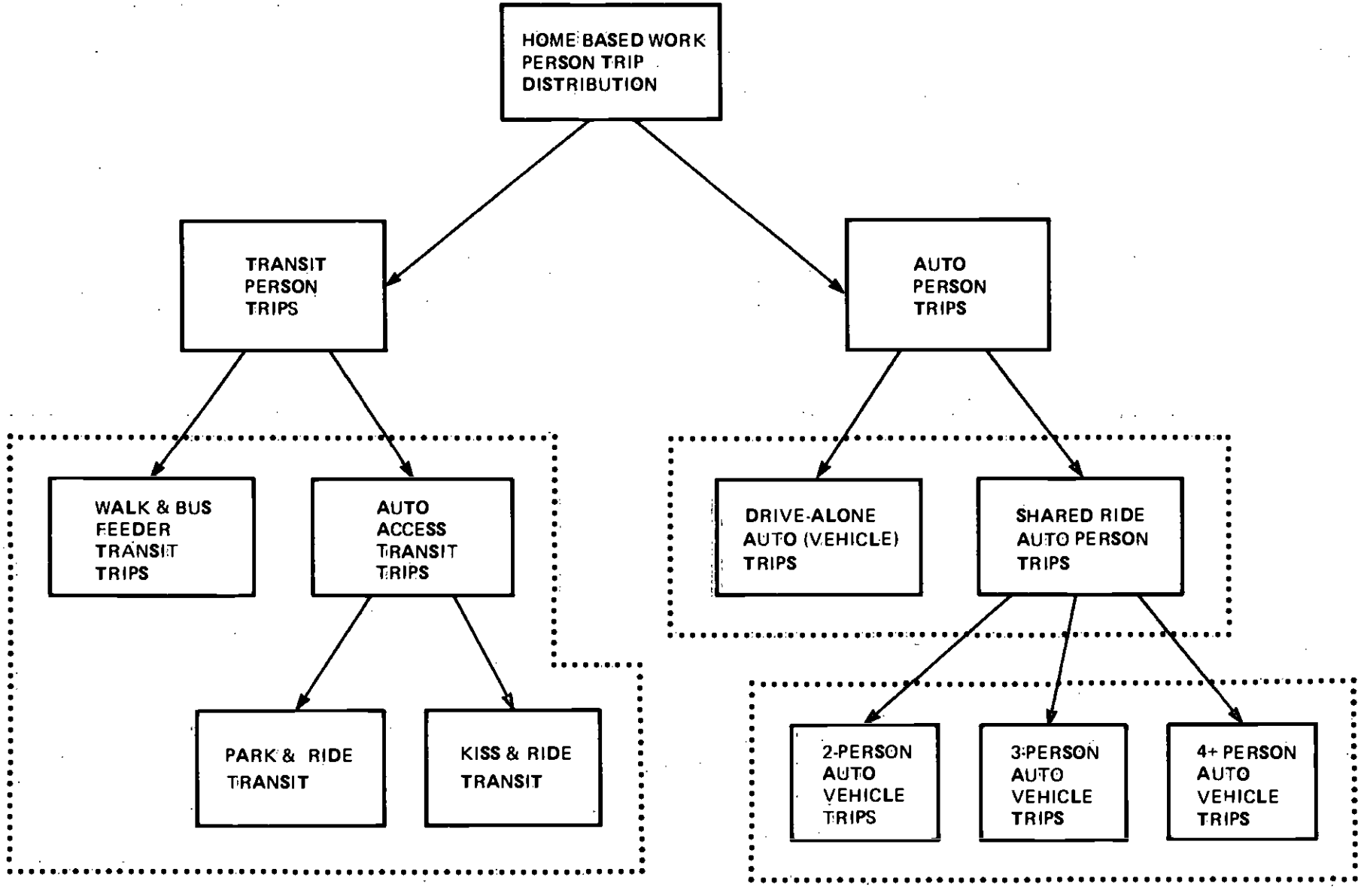
1995 REGIONAL FORECAST

Comparison of the travel demand model results presented in this study with other previous demand results (i.e., the Alternatives Analysis Study) must consider the underlying forecasting assumptions supporting each respective forecast.

As indicated in Chapter 1, the modeling process utilized in this study began with the modal choice model using as input the 1995 person-trip distributions for the home-based work, home-based nonwork, and non-home-based trip purposes prepared previously by LARTS. These person-trip distributions reflect both the socioeconomic and land-use conditions projected in the Los Angeles region for the year 1995 as well as the physical facility and level of service provided by the highway system. The key difference between these projections and those developed in previous studies is the updated 1978 edition (rather than the 1976 edition) of the Southern California Association of Governments (SCAG) long-range socioeconomic and land-use forecasts. While the 1978 version reflects a slightly lower population and economic growth for the region, the previous transit forecasts were developed for the year 1990, whereas the projections described in this report are for the year 1995. The differences in land-use and socioeconomic characteristics are not likely to be different in the aggregate and only a detailed comparison between these two versions can identify any significant differences at the individual zone level.

MODE CHOICE MODEL

A series of revisions to the LARTS mode choice models has been implemented since development of the original marginal disutility model in 1972. That basic model, which is still used as the primary mode choice model, and the more recent extensions to the model developed since that time, are shown in Figure 10. Three basic extensions or improvements have been made to the marginal disutility model to provide the capability to address the emerging variety of planning issues.



HOME–BASED WORK MODEL SPLIT STRUCTURE
Figure 10

While it was hoped that the multinominal work-trip mode-split model developed in 1976 could become the model used for primary mode-split analysis, its deficiencies relegated it to a model for disaggregating auto person-trips to drive-alone vehicle-trips and shared-ride auto person-trips. The mechanics of this application are based on a "pivot point" algorithm in which the model is used as a tool for estimating the relative change in mode shares given the introduction of shared-ride opportunities.

The second extension to the model structure occurred as part of the regional air quality planning effort. This extension utilized the Shirley Highway carpool model to disaggregate shared-ride auto person-trips generated by the combined logit model into three separate categories. It predicts the individual probabilities of two-person, three-person, and four or more person carpools.

A mode of arrival model was included in this study to estimate mode of arrival use at each Starter Line station. All of these model extensions, which function basically as a series of submode split models, build upon the initial estimate of transit and auto person-trips. They represent a significant improvement to the planning process, but will eventually be replaced with actual calibrated models at the conclusion of a current LARTS model development effort.

Perceived automobile operating cost-per-mile and the average transit passenger fares are two key inputs to the mode choice model. Because of the importance of these two variables, detailed analyses were conducted to ascertain appropriate values for use in the 1995 model runs. These technical analyses have been documented in two technical memoranda developed during the course of the project.[2] The final value assumed for automobile operating cost was 5.41 cents per mile as approved by the Modeling Task Force. This value was slightly lower than the 5.80 cents per mile suggested in Technical Memorandum No. 3 prepared for this project, but was based upon a set of logical assumptions that assumed the fuel efficiency of autos to be slightly higher than the Technical Memorandum No. 3 analyses had suggested. Because of the importance of this variable, sensitivity analysis at a later date will be conducted to ascertain the impact of this variable on Starter Line ridership.

Specification of average transit passenger fares was based upon fiscal year 1980 and 1981 information that disaggregated passenger fares into an average base boarding fare, transfer fare, and an express fare increment. Table 22 lists these fare values. The fiscal year 1981 values were used in the 1995 mode choice model analysis. Transit fares like the automobile cost-per-mile value will be included in a future analysis to ascertain the impact of different fare structures upon both system ridership and operating cost calculations.

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2 Technical Memorandum 3, Auto Operating Cost Analysis, Barton-Aschman Associates, Inc., August, 1980. Technical Memorandum 4, Transit Fare Matrix Specification, Barton-Aschman Associates, Inc., and SCRTD Metro Rail Department, October, 1980.

Table 22
AVERAGE TRANSIT PASSENGER VALUES

	(1980 Dollars) FY 1980	FY 1981
Base Boarding Fare	$0.35	$0.43
Transfer Fare	$0.02	$0.10
Express Fare Increment	$0.13	$0.19

Other modal choice model inputs such as daily and hourly parking costs, highway terminal times, and path building parameters remained unchanged from the existing LARTS 1995 values.

MODE OF ARRIVAL MODEL

An initial estimate of the mode of arrival was prepared using a model development for the Seattle, Washington, region[3] and recently applied in the Houston Alternatives Analysis. The model compares the travel times and costs for accessing Starter Line stations and estimates the "split" between feeder bus access and highway-related access.[4] The mode of arrival model is a simple bi-modal logit model that was structured to allow the application of the model to take place in the same computer program as the mode choice model. The model structure and coefficients are shown on Table 23.

The mode of arrival model requires that the user specify the parking lot or station associated with each zone or zone-to-zone interchange. Station parking lot designation is performed by the UTPS computer program USTOS, which produces a computer file showing the access station for each zone-to-zone interchange.

Since specific policy has not been established with respect to parking lot charges or size of lots, the mode of arrival model was applied in the "unconstrained mode." The following assumptions were made:

1. No parking cost is associated with any parking lot.
2. No transfer charge is associated with any feeder bus mode.
3. No travel time is associated with parking the automobile or walking from the lot to the station over the normal time associated with the feeder bus access.

The use of this "unconstrained mode" will produce the maximum estimated parking demand at the formal parking lots. Obviously, if a person could park his automobile at the front door of a transit station for free, this would produce the highest highway access demand. This maximum demand was developed in order that the SCRTD can ascertain the potential for parking demand and as an assistance to planning the location and size of the parking lots. This use of the "unconstrained mode" does not influence the basic transit estimation procedure, since the estimation of total transit trips was based upon the regional mode split model.

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3 Development and Calibration of Sub-mode Split Model, prepared by Barton-Aschman Associates, Inc., for the Metro TRANSITion Phase IV Study.

4 Highway-related access can be stratified into three classifications: (1) transit riders who drive to the parking lot, (2) transit riders who are driven to the lot in an automobile parked at the lot, and (3) transit riders who are driven to the lot in an automobile which is not parked at the lot (i.e., kiss-n-ride).

Table 23
MODE OF ARRIVAL MODEL

Probability of Choosing Feeder Bus = EXP (feeder)/1 + EXP (Feeder)

Probability of Choosing Highway Mode = 1.0 - Probability of Choosing Feeder Bus

Feeder = -0.0417* (IVTFBM-IVTHWM) - 0.10425* (WAITFBM - WAITHWM)

-0.7249* (XFERFBM-XFERHWM) - 0.084* HWYDST + 0.0* (CSTFBM - CSTHWM)

-0.2256* ACTHWM + 2.94297* INC1 + 2.5812* INC2 + 2.5812* INC3 + 1.12427* INC4

Where:

IVTFBM is the in-vehicle transit time for the feeder bus trip.

IVTHWM is the in-vehicle transit time for the highway access trip.

WAITFBM is the waiting time for the feeder bus trip.

WAITHWM is the waiting time for the highway access trip.

XFERFBM is the number of transfers for the feeder bus trip.

XFERHWM is the number of transfers for the highway access trip.

HWYDST is the total distance over the highway network (miles).

CSTFBM is the cost associated with the feeder bus trip.

CSTHWM is the cost associated with the highway access trip.

ACTHWM is the highway access time for the highway access trip.

INC1, INC2, INC3, INC4 are dummy variables (0 or 1) for the four income quartiles; for example, when the first income level probabilities are being estimated, INC1 is 1 and the other three variable values are 0.

Note: All travel times are in minutes.

Unless otherwise specified, the values of the independent variable are for the entire interchange, i.e., from origin zone to destination zone.

Cost coefficients can be obtained by specifying a "value of time" and revising the coefficient on ACTHWM.

The mode of arrival model does not stratify the highway access mode into its three major components, i.e., park-n-ride, auto-passenger, and kiss-n-ride. These components are necessary, though, to establish the size of parking lots and drop-off facilities. To "break down" the highway access mode trips into the three main components, a brief literature search was conducted to ascertain typical values for these components. The results of this search are shown on Table 24. It would appear from this data that the proportion of "kiss-n-ride" trips, with respect to all highway access trips, is fairly consistent and that an average value of 35 percent would be appropriate. The automobile occupancy of those automobiles parked in the lot would appear to be considerably lower than the average car occupancy for work trips and an average value of 1.15 persons per car would be appropriate. It is proposed, therefore, to use the following percentages to classify the highway access trips:

- Park-n-ride trips - 56.52 percent of highway access trips.
- Auto-passenger trips - 8.48 percent of highway access trips.
- Kiss-n-ride trips - 35.0 percent of highway access trips.

These percentages also allow the calculation of the required parking spaces, which is 28.26 percent of highway access trips, since each space will serve two park-n-ride trips per day assuming no turnover.

Table 24
SUMMARY OF PARK-N-RIDE EXPERIENCE

Source of Data	Mode of Arrival (Automobile Only) Percent Park-n-Ride	Percent Auto Passsenger	Percent Kiss-n-Ride	Automobile Occupancy
I-35W Corridor Phase I[1]	48.1	16.5	35.4	1.34
I-35W Corridor Phase II[1]	58.8	8.8	32.4	1.15
I-35W Corridor Phase III[1]	71.1	7.1	21.2	1.10
Milwaukee Railroad[2]	56.5	*	43.5	—
C&NW Railroad[2]	57.9	*	42.1	—
CTA Swift[2]	57.1	*	42.9	—
Cleveland West Park Station[3]	57.4	10.1	32.5	1.18
Washington, D.C. before data	72.7	**	27.3	—
Washington, D.C. after data[4]	70.8	**	29.3	—
Stadium Armory[5]	68.7	*	31.3	—
New Carrollton[5]	66.7	*	33.3	
Rhode Island Avenue[5]	58.9	*	41.1	
Silver Spring[5]	58.1	*	41.9	

* Auto passenger and kiss-n-ride combined.

** Auto drive and auto passenger data combined.

1 Final Report for the I-35W Urban Corridor Demonstration Project, Minneapolis/St. Paul, Minnesota, prepared for the U.S. Department of Transportation, Urban Mass Transportation Administration, Office of Transit Planning.

2 An Initial Chicago North Suburban Transit Improvement Program, prepared for the North Suburban Transportation Council, May, 1971.

3 Urban Mass Transit Planning, edited by Wolfgang S. Homburger.

4 Source data from the Metropolitan Washington Council for Government's survey of central area commuters. First survey was prior to the opening of the Metrorail and second survey was after the initial phase (phase IIA) of the subway was opened.

5 Data from a May, 1979, survey of Washington Metrorail riders. Stations noted have varying degrees of parking spaces available.

4.
TRAVEL DEMAND RESULTS

This chapter presents the results of the travel demand analysis conducted for seven configurations of future extensions of the SCRTD 18.6-mile "Starter Line" rail system. These results are presented in a manner that emphasizes the impacts these extensions would have on the basic Starter Line.

The major findings of this regional analysis quantify the impacts that future extensions to the Starter Line corridor would have on ridership within that corridor. By estimating the link volumes and the number of passengers boarding and alighting at each Starter Line station, basic system design work can reflect those implications before major capital expenditures have been finalized for station, guideway, and access facility construction.

The results presented here are based on five (Options II through VI) future system configurations as specified by SCRTD Metro rail staff. The alternatives range from a westward extension of the Starter Line at Wilshire and Fairfax to Wilshire and Lincoln Boulevard in Santa Monica, and an eastward extension from downtown Los Angeles to El Monte using the San Bernardino Freeway right-of-way, to a comprehensive system involving eight regional corridors serving Los Angeles County in a comprehensive manner.

Option I examined the Starter Line alone and Option VII reflected a modified Starter Line design that terminated at the intersection of Wilshire Boulevard and Fairfax Avenue. The inclusion of these options served two purposes. First, comparisons could be made with previous demand estimations conducted during the alternatives analysis, focusing on the impact of a revised regional socioeconomic forecast. Such comparisons indicate that the current analysis is consistent with earlier efforts. The analysis of these options also provides a baseline needed to judge the magnitude and reasonableness of the impacts estimated for each of the five system extension scenarios.

REGIONAL RESULTS

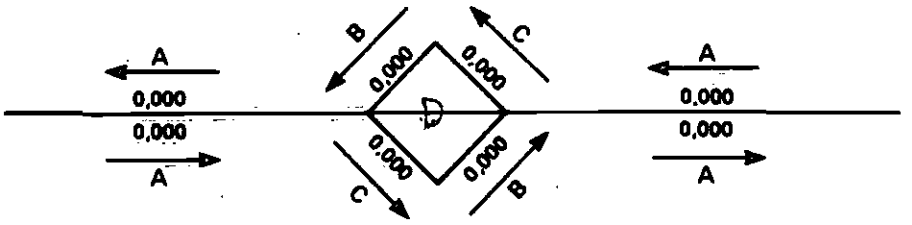
The correspondence between individual corridors and system options was summarized in Table 7, with the exception of Option VII, which is a modified version of the Starter Line.

Table 25 summarizes the aggregate regional demand results for each of the rail extension options. Rail system boardings ranged from 215,000 to nearly 1,000,000 for an average weekday. The impact of these extensions on total regional ridership, however, was expectedly less.

Rail System Volumes

Figures 11 through 17 present, in sequence, the rail operating plan, the total average daily link volumes, and the corresponding "diamond" maps for all rail corridors for each option. Whenever two or more rail routes operate in one corridor segment, volumes were summed to generate link totals for those graphics. The incremental changes in corridor volumes are rational (changing in the right direction) given the rail system designs incorporated into each option network.

The diamond maps organize patronage information in the following manner:



Where: A= One-way average daily link volume.
B= Average one-way average daily boarding volumes.
C= Average one-way average daily alighting volumes.
D= Total of average daily boarding and alighting volumes.

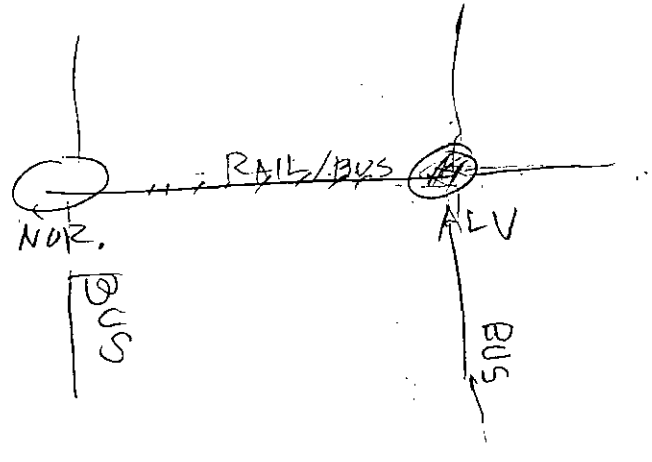
Each diamond is labeled with the location of the station. Under each station location, the node number used to represent the station in the UTPS transit networks appears in parentheses. If a station diamond is left open at a corridor end, it indicates that no rail links extend beyond it. There will be only one boarding and one alighting volume in these cases.

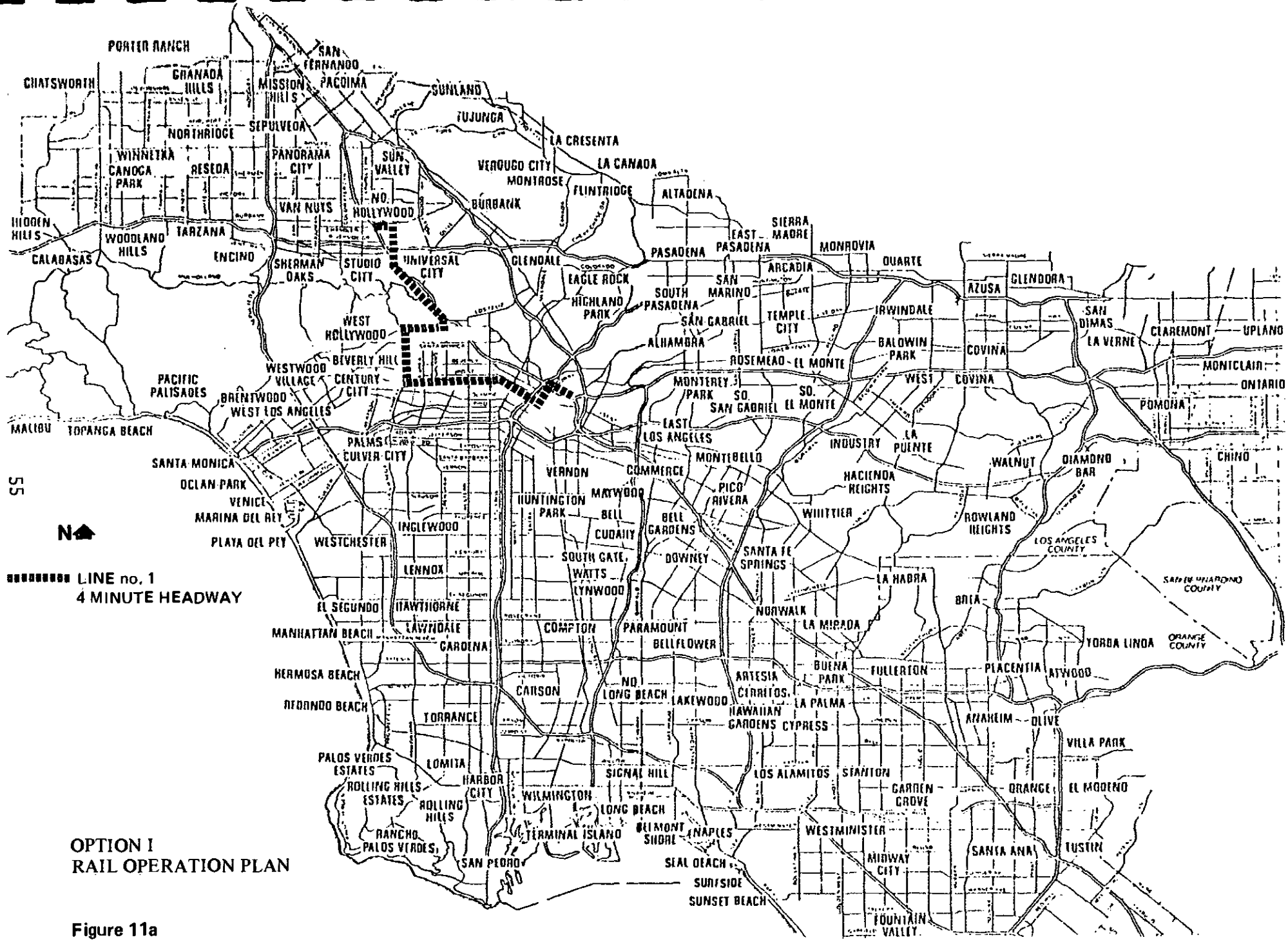
In the remainder of this section, each of the potential rail extension corridors included in one or more of the seven options is examined briefly. The corridors are discussed in the following order:

West Los Angeles Corridor
El Monte Corridor
San Fernando Valley Corridor
South Los Angeles Corridor
Century Freeway Corridor
Santa Ana Corridor
LAX Corridor
Eagle Rock Corridor

Table 25
REGIONAL TRIP SUMMARY

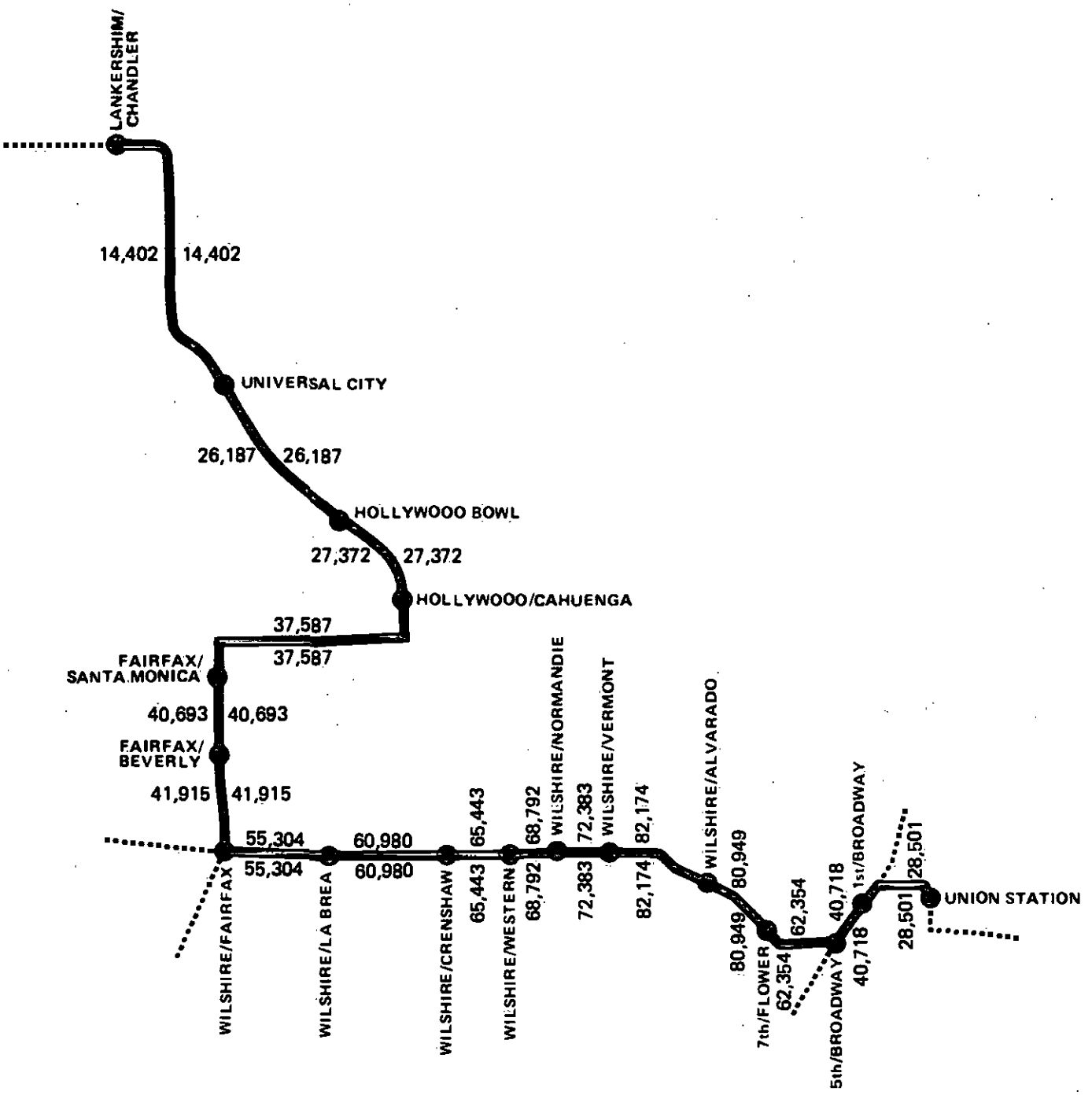
	Option						
	I	II	III	IV	V	VI	VII
Rail Passenger Trips	309,065	421,862	390,448	617,778	644,037	747,236	215,810
Boardings	309,065	437,290	392,140	752,919	807,539	993,813	215,810
Miles	1,628,208	3,031,046	2,968,732	5,872,084	6,872,084	7,718,116	721,609
Hours	41,823	74,548	70,671	138,646	154,463	175,851	21,295
Maximum Load Point	164,348	183,482	176,068	191,508	197,078	191,852	133,138
Transit Trips Total	1,389,235	1,394,840	1,403,616	1,411,791	1,421,791	1,449,636	1,379,564





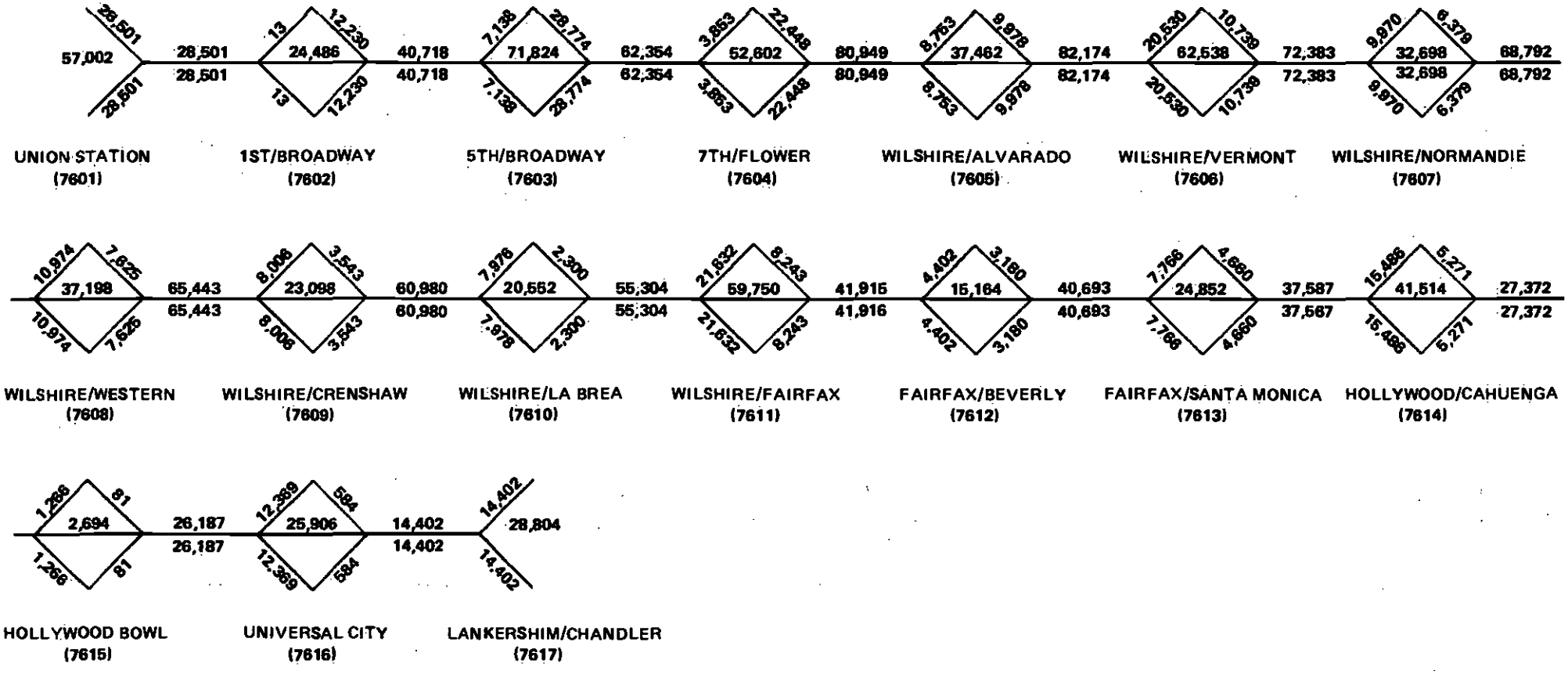
OPTION I
RAIL OPERATION PLAN

Figure 11a



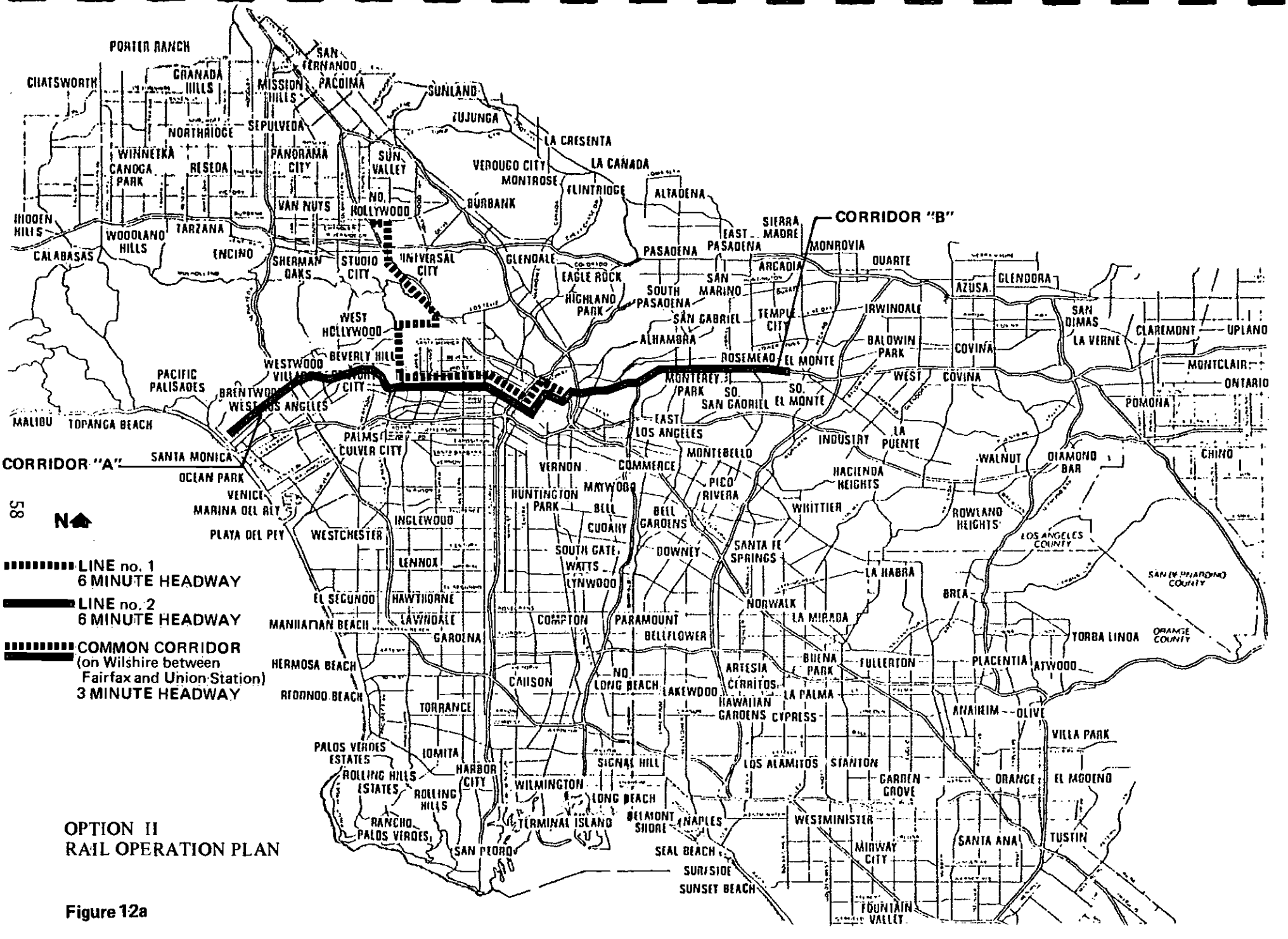
OPTION 1
STARTER LINE CORRIDOR
RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 11b



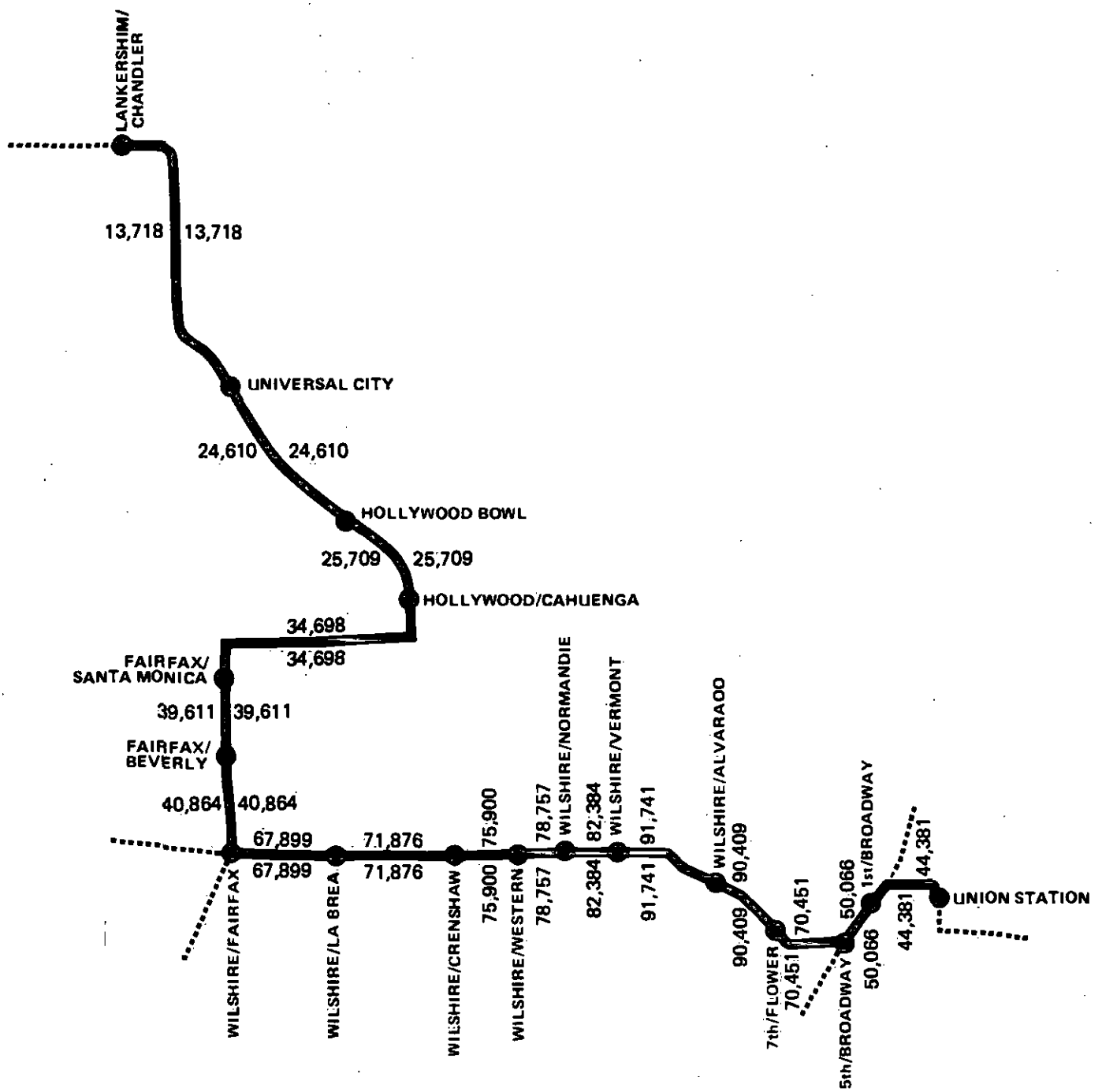
OPTION I
STARTER LINE CORRIDOR

BOARDING, ALIGHTING & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 11c



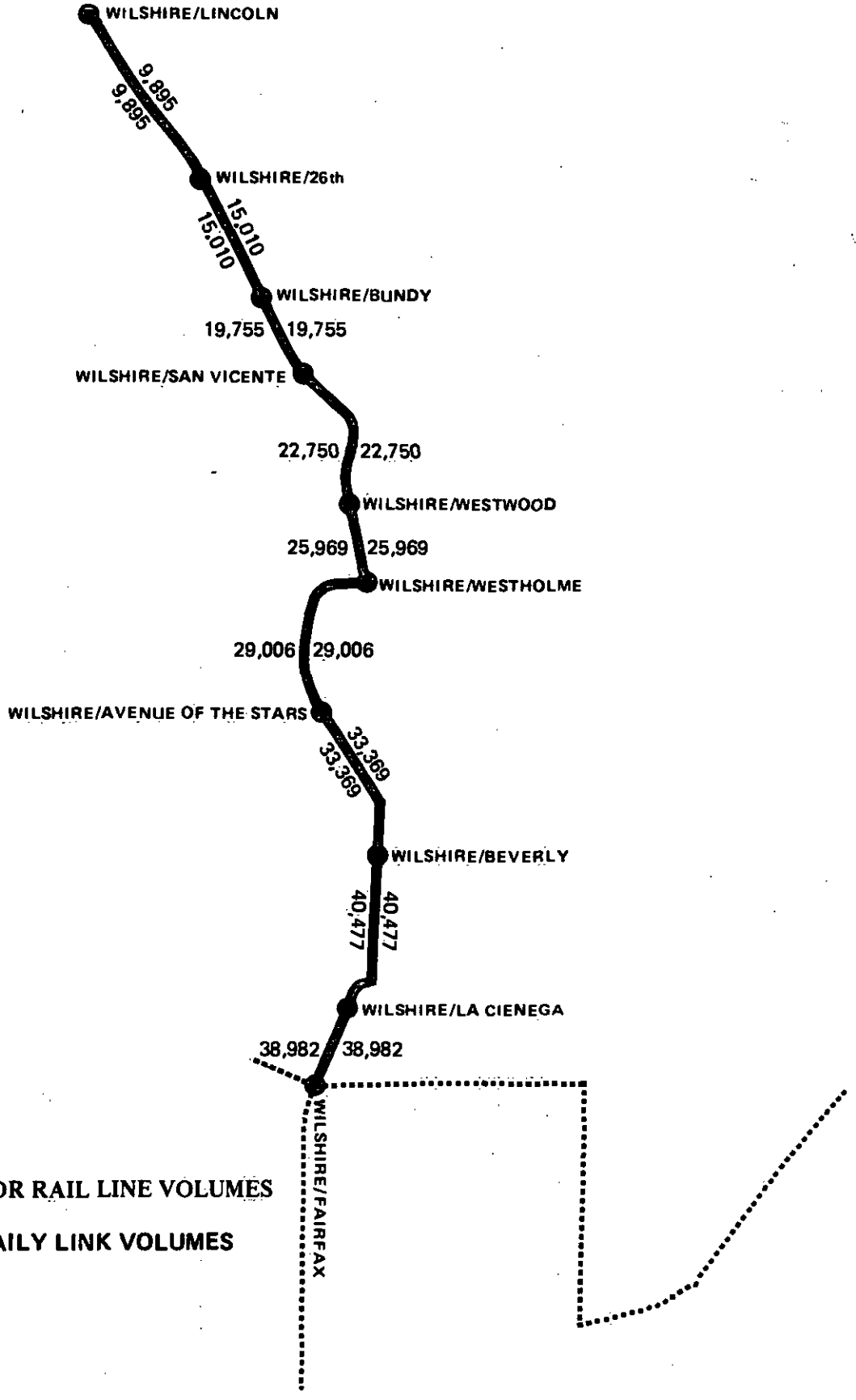
OPTION II
RAIL OPERATION PLAN

Figure 12a



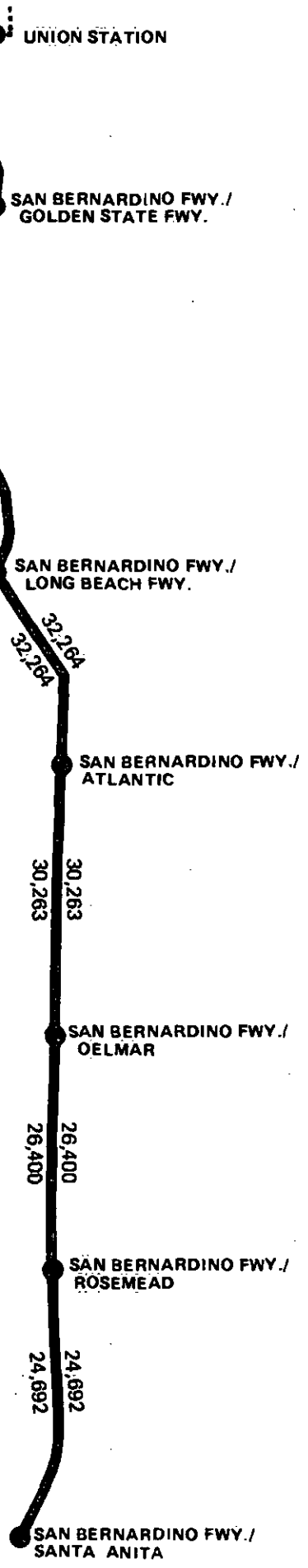
OPTION II
STARTER LINE CORRIDOR
RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 12b



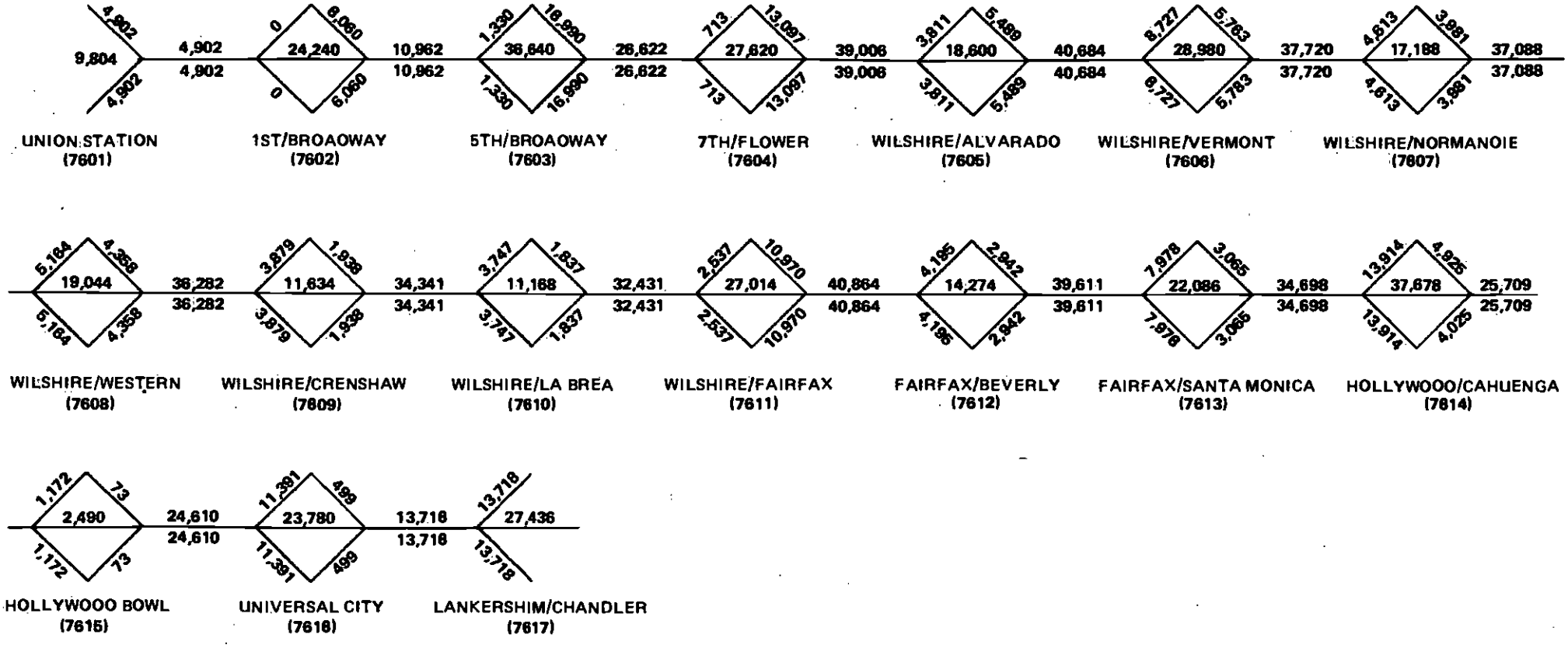
OPTION II
WEST L.A. CORRIDOR RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 12c



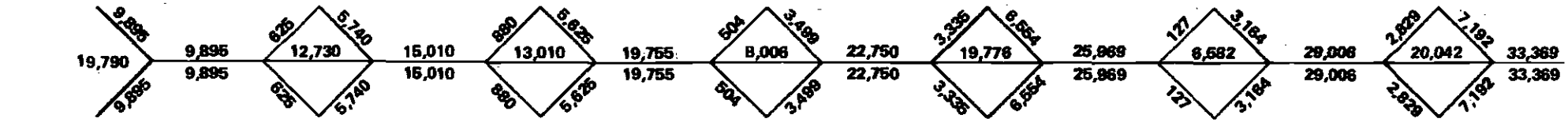
OPTION II
EL MONTE CORRIDOR RAIL LINE VOLUMES

(1995) AVERGAGE DAILY LINK VOLUMES BY DIRECTION
Figure 12d

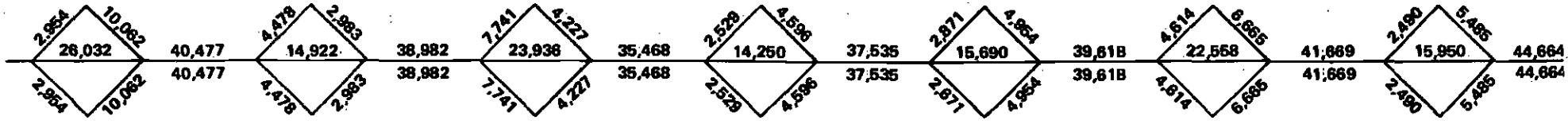


OPTION II
LINE no. 1

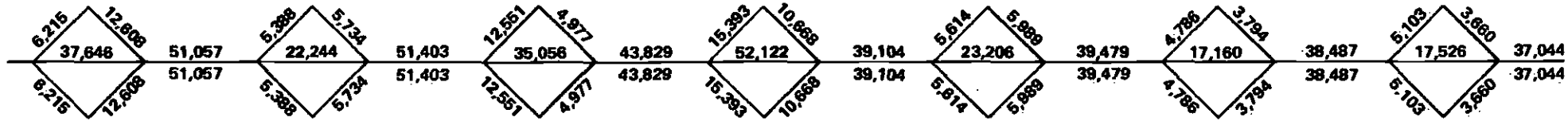
BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 12e



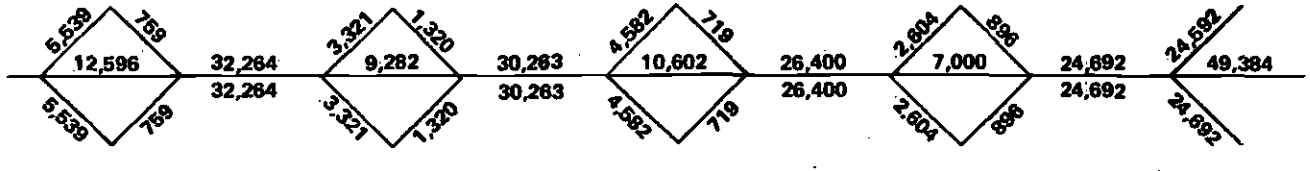
WILSHIRE/LINCOLN (7628) | WILSHIRE/26TH (7627) | WILSHIRE/BUNDY (7626) | WILSHIRE/SAN VICENTE (7625) | WILSHIRE/WESTWOOD (7624) | WILSHIRE/WESTHOLME (7623) | SANTA MONICA/AVE. OF THE STARS (7622)



WILSHIRE/BEVERLY (7621) | WILSHIRE/LA CIENAGA (7620) | WILSHIRE/FAIRFAX (7611) | WILSHIRE/LA BREA (7610) | WILSHIRE/CRENSHAW (7609) | WILSHIRE/WESTERN (7608) | WILSHIRE/NORMANOIE (7607)



WILSHIRE/VERMONT (7606) | WILSHIRE/ALVARADO (7605) | 7TH/FLOWER (7604) | 5TH/BROADWAY (7603) | 1ST/BROADWAY (7602) | UNION STATION (7601) | I-10/GOLDEN STATE FWY. (7650)



I-10/LONG BEACH FWY. (7651) | I-10/ATLANTIC BLVD. (7652) | I-10/DELMAR (7653) | I-10/ROSEMEAD (7654) | I-10/SANTA ANITA AVE. (7655)

OPTION II
LINE no. 2

BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 12f

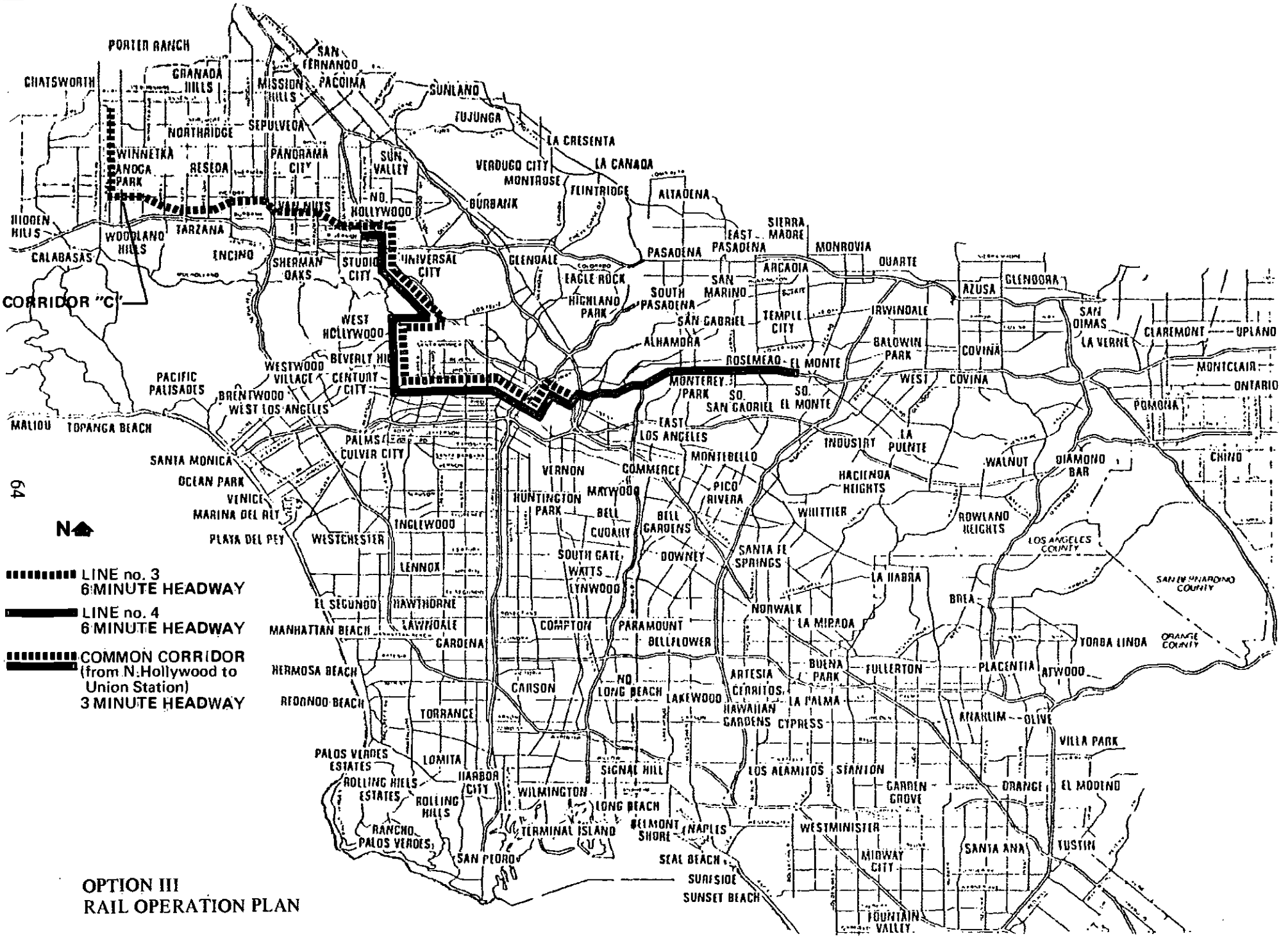
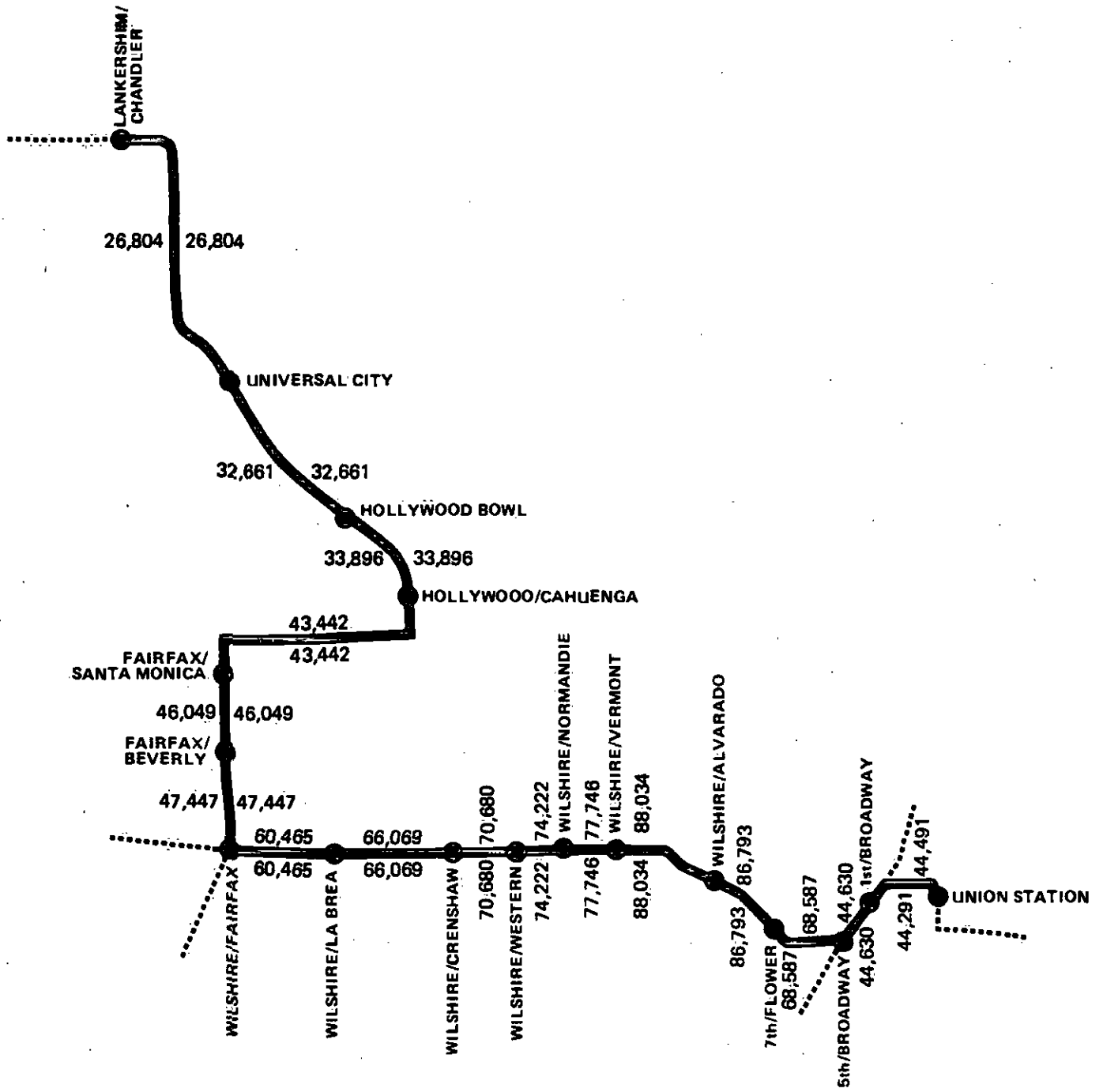
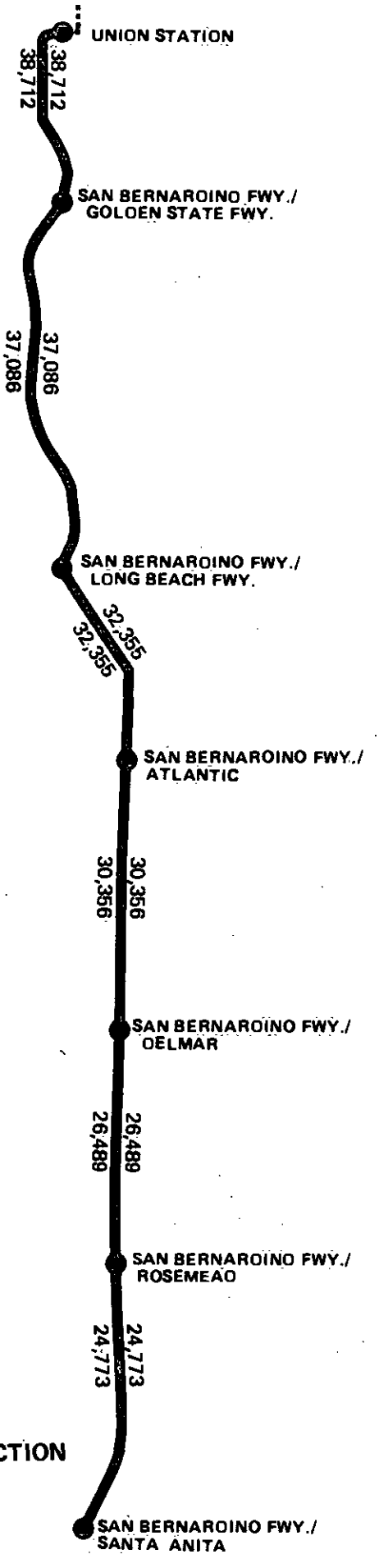

CORRIDOR "C"
N
LINE no. 3
6 MINUTE HEADWAY
LINE no. 4
6 MINUTE HEADWAY
COMMON CORRIDOR
(from N. Hollywood to Union Station)
3 MINUTE HEADWAY
OPTION III
RAIL OPERATION PLAN
PORTER RANCH
CHATSWORTH
GRANADA HILLS
MISSION HILLS
SAN FERNANDO
PACOIMA
SUNLAND
TUJUNGA
LA CRESENTA
NORTHRIDGE
SEPULVEDA
WINNETKA
CANOGA PARK
RESEDA
PANORAMA CITY
SUN VALLEY
VERDUGO CITY
MONTROSE
LA CANADA
FLINTRIDGE
ALTADENA
NO. HOLLYWOOD
BURBANK
HIDDEN HILLS
WOODLAND HILLS
TARZANA
CALABASAS
ENCINO
SHERMAN OAKS
STUDIO CITY
UNIVERSAL CITY
GLENDALE
PASADENA
EAST PASADENA
SIERRA MADRE
MONROVIA
ARCADIA
DUARTE
AZUSA
GLENDORA
EAGLE ROCK
SOUTH PASADENA
SAN MARINO
HIGHLAND PARK
WEST HOLLYWOOD
SAN GABRIEL
TEMPLE CITY
IRWINDALE
SAN DIMAS
LA VERNE
CLAREMONT
UPLAND
ALHAMBRA
BALDWIN PARK
COVINA
ROSEMEAD
EL MONTE
MONTEREY PARK
SO. SAN GABRIEL
SO. EL MONTE
WEST COVINA
MONTCLAIR
ONTARIO
POMONA
WESTWOOD VILLAGE
BEVERLY HILLS
CENTURY CITY
PACIFIC PALISADES
BRENTWOOD
WEST LOS ANGELES
MALIBU
TOPANGA BEACH
EAST LOS ANGELES
INDUSTRY
LA PUENTE
SANTA MONICA
PALMS
CULVER CITY
VERNON
COMMERCE
MONTEBELLO
WALNUT
DIAMOND BAR
CHINO
OCEAN PARK
VENICE
MARINA DEL REY
HUNTINGTON PARK
MAYWOOD
PICO RIVERA
HACIENDA HEIGHTS
BELL
BELL GARDENS
WHITTIER
ROWLAND HEIGHTS
PLAYA DEL REY
WESTCHESTER
INGLEWOOD
CUDAHY
LOS ANGELES COUNTY
SOUTH GATE
DOWNEY
SANTA FE SPRINGS
LENNOX
WATTS
LYNWOOD
LA HABRA
SAN BERNARDINO COUNTY
EL SEGUNDO
HAWTHORNE
NORWALK
BREA
MANHATTAN BEACH
LAWNDALE
COMPTON
PARAMOUNT
LA MIRADA
GARDENA
BELLFLOWER
YORBA LINDA
ORANGE COUNTY
HERMOSA BEACH
CARSON
NO. LONG BEACH
ARTESIA
CERRITOS
BUENA PARK
FULLERTON
PLACENTIA
ATWOOD
REDONDO BEACH
LAKEWOOD
LA PALMA
HAWAIIAN GARDENS
CYPRESS
ANAHEIM
OLIVE
TORRANCE
VILLA PARK
PALOS VERDES ESTATES
LOMITA
SIGNAL HILL
LOS ALAMITOS
STANTON
ROLLING HILLS ESTATES
HARBOR CITY
WILMINGTON
GARDEN GROVE
ORANGE
EL MODENO
ROLLING HILLS
LONG BEACH
RANCHO PALOS VERDES
TERMINAL ISLAND
BELMONT SHORE
NAPLES
WESTMINISTER
SAN PEDRO
SEAL BEACH
MIDWAY CITY
SANTA ANA
TUSTIN
SUNSIDE
SUNSET BEACH
FOUNTAIN VALLEY

Figure 13a



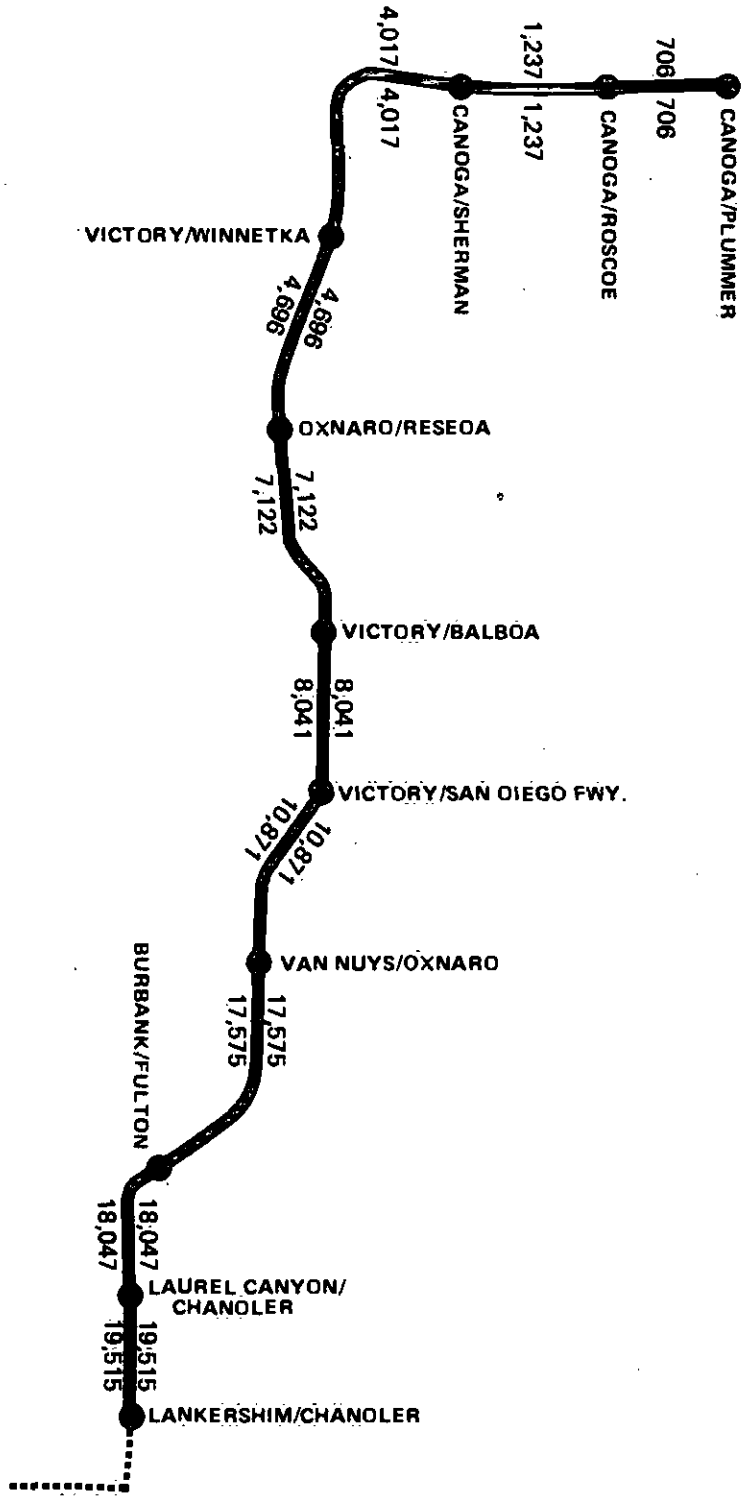
OPTION III
STARTER LINE CORRIDOR
RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 13b



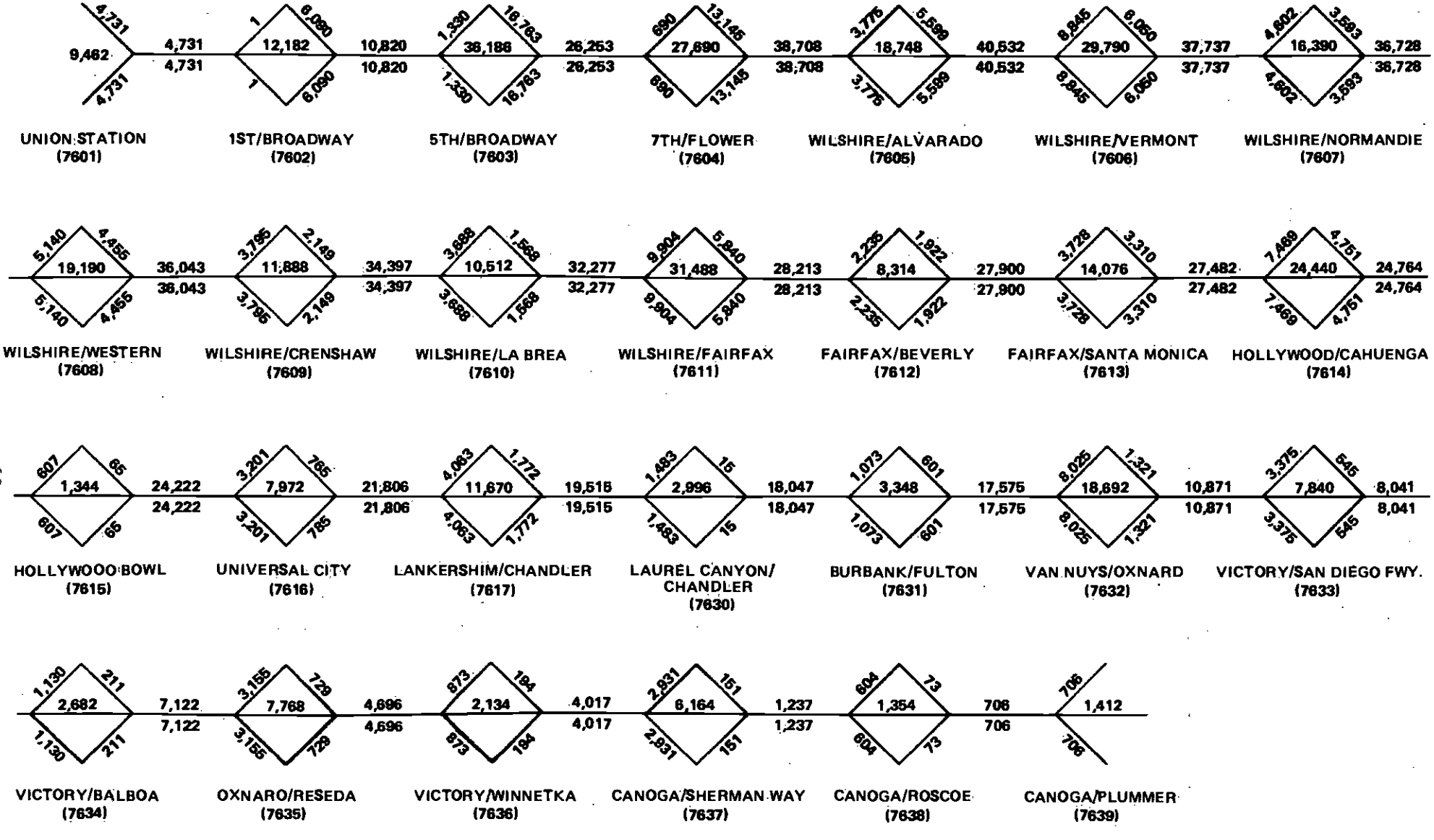
OPTION III
EL MONTE CORRIDOR RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 13c



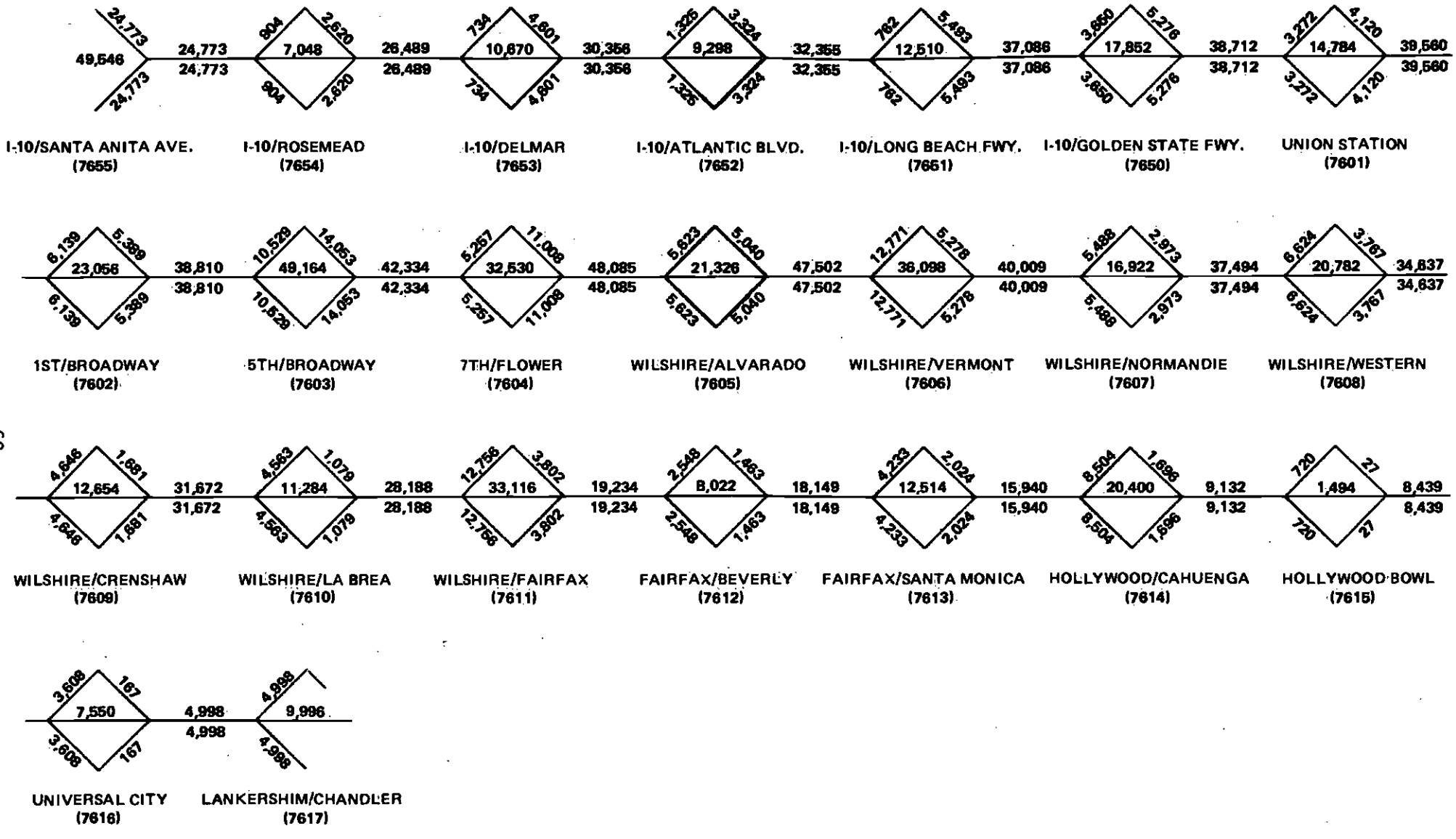
OPTION III
SAN FERNANDO VALLEY CORRIDOR RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 13d



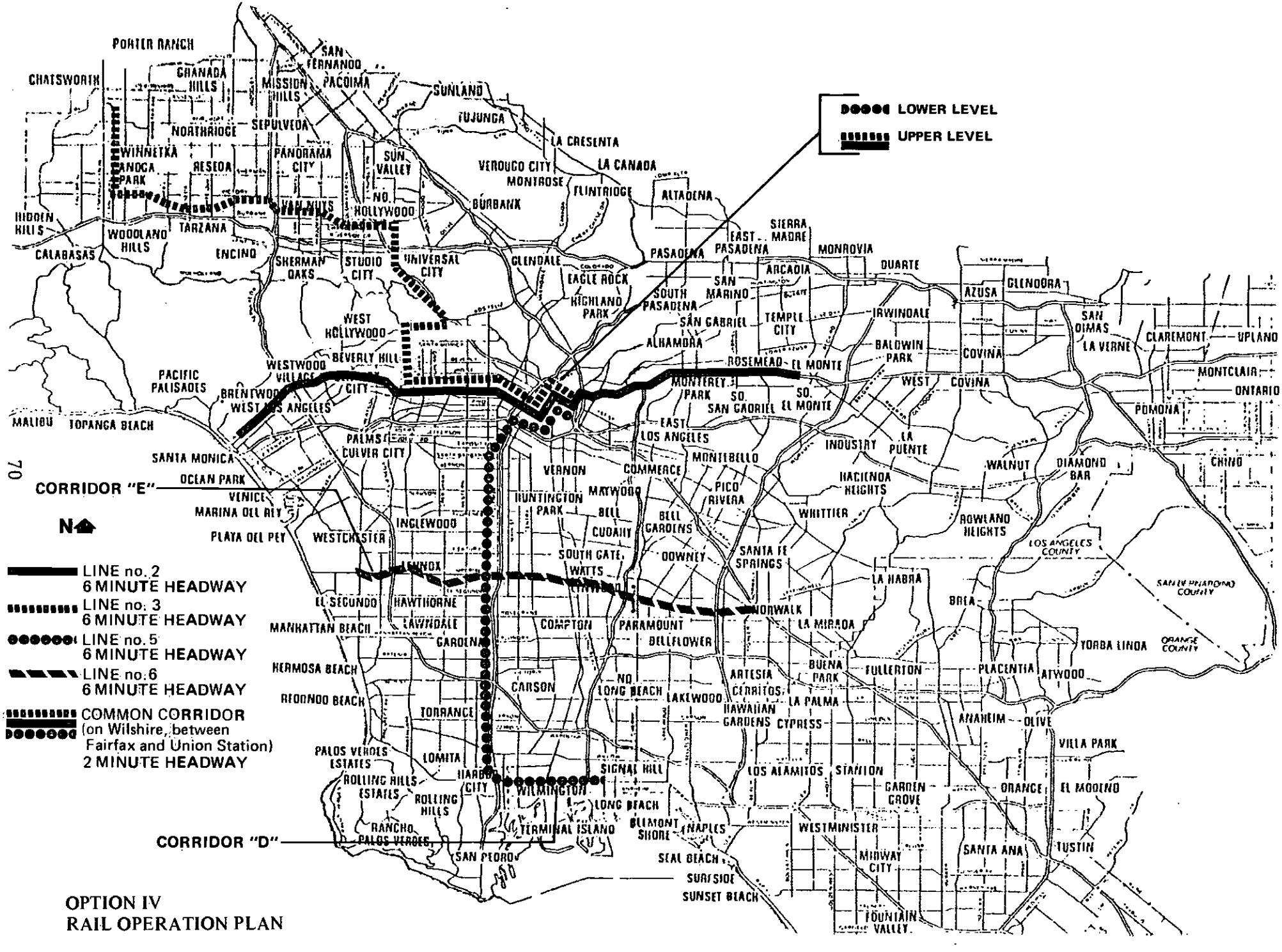
OPTION III - LINE no. 3

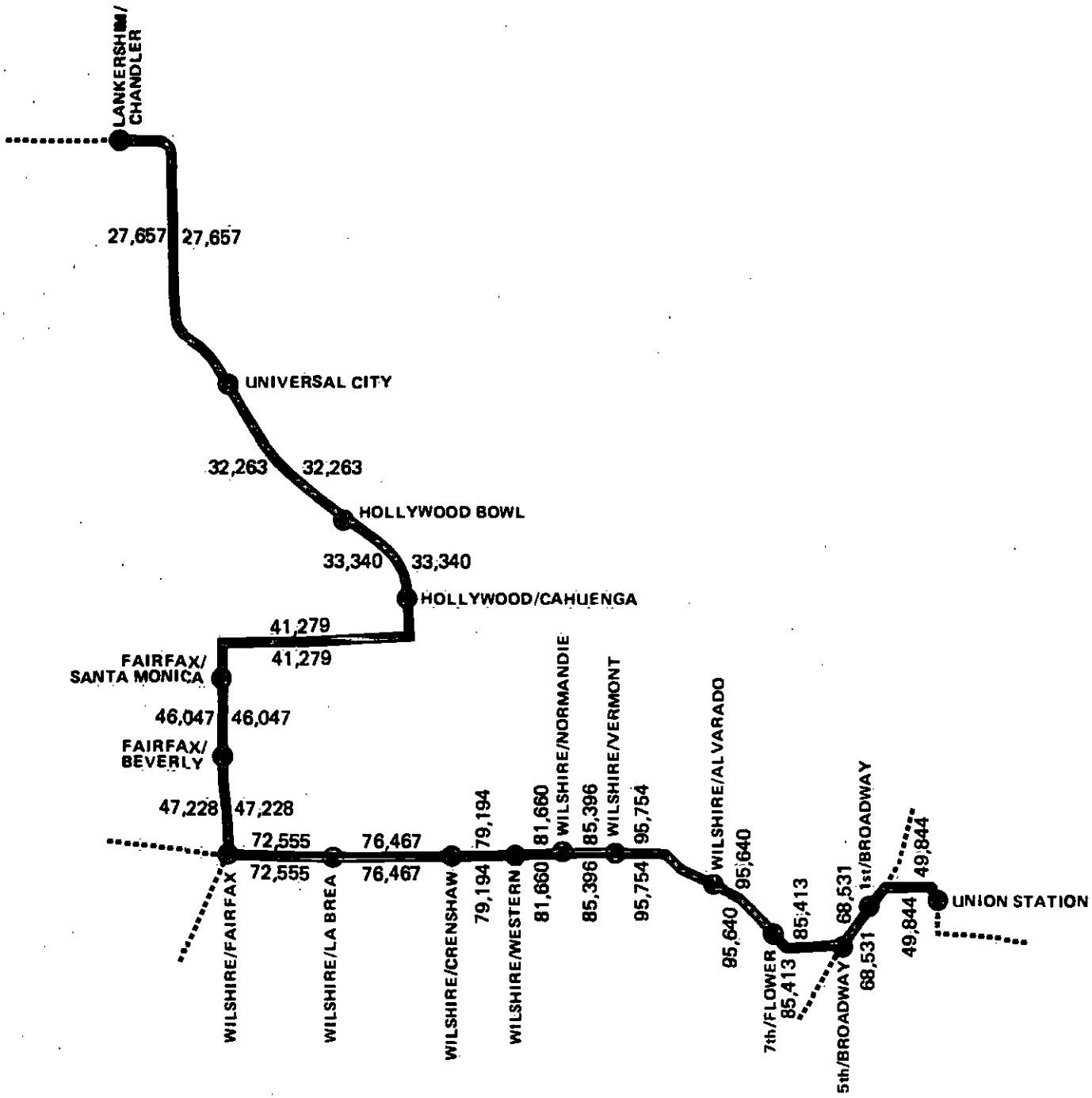
BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 13e



OPTION III
LINE no. 4

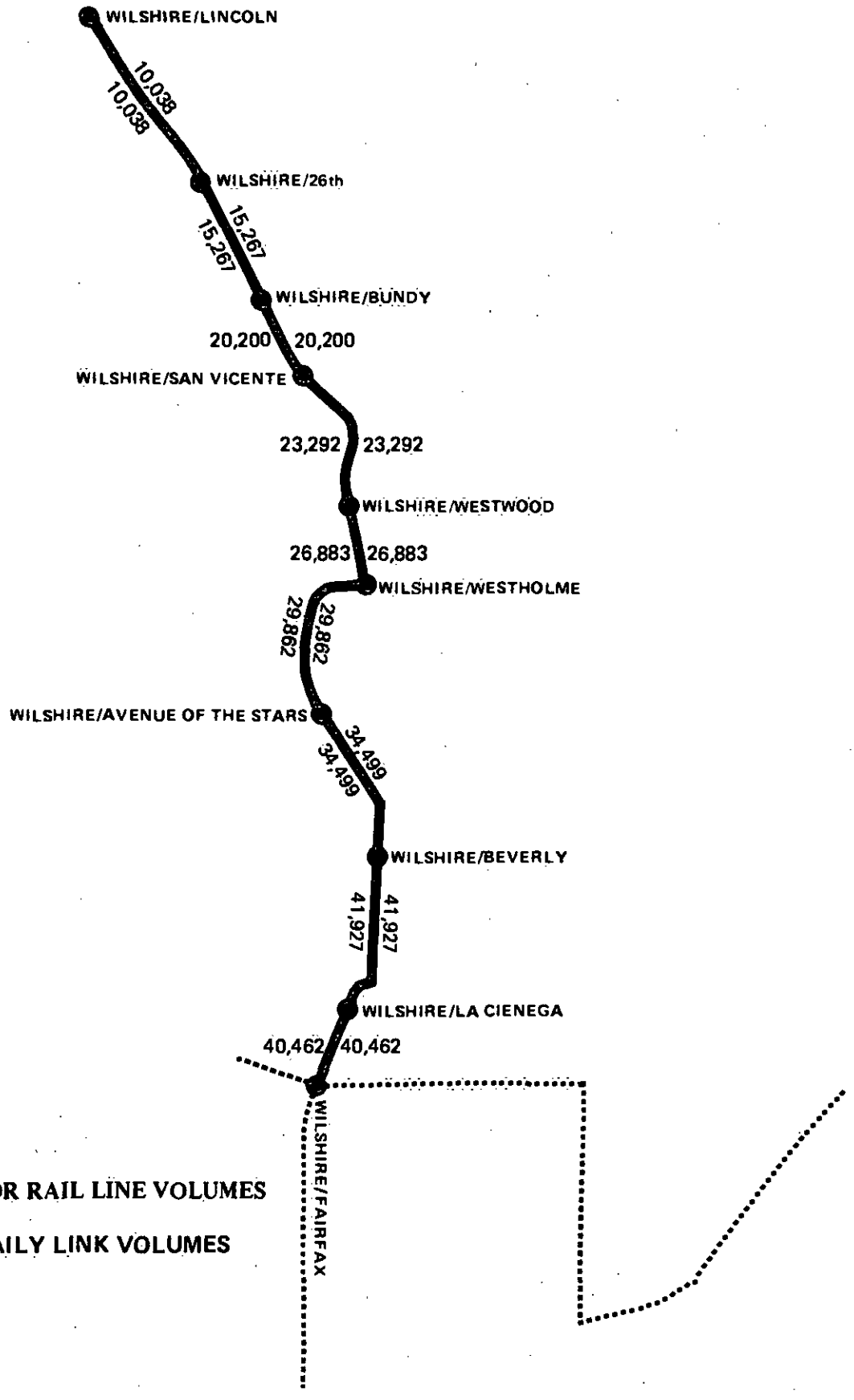
BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 13f


LOWER LEVEL
UPPER LEVEL
CORRIDOR "E"
CORRIDOR "D"
N
LINE no. 2
6 MINUTE HEADWAY
LINE no. 3
6 MINUTE HEADWAY
LINE no. 5
6 MINUTE HEADWAY
LINE no. 6
6 MINUTE HEADWAY
COMMON CORRIDOR
(on Wilshire, between
Fairfax and Union Station)
2 MINUTE HEADWAY
PORTER RANCH
CHATSWORTH
GRANADA HILLS
MISSION HILLS
SAN FERNANDO
PACOIMA
SUNLAND
TUJUNGA
LA CRESENTA
LA CANADA
FLINTRIDGE
ALTADENA
SIERRA MADRE
EAST PASADENA
MONROVIA
DUARTE
AZUSA
GLENDORA
SAN DIMAS
LA VERNE
CLAREMONT
UPLAND
MONTCLAIR
ONTARIO
POMONA
CHINO
DIAMOND BAR
WALNUT
HACIENDA HEIGHTS
ROWLAND HEIGHTS
WHITTIER
LA HABRA
BREA
YORBA LINDA
PLACENTIA
ANAHEIM
OLIVE
VILLA PARK
ORANGE
EL MODENO
TUSTIN
SANTA ANA
FOUNTAIN VALLEY
WESTMINSTER
GARDEN GROVE
STANTON
LOS ALAMITOS
CYPRESS
LA PALMA
BUENA PARK
FULLERTON
ATWOOD
ARTESIA
CERRITOS
HAWAIIAN GARDENS
LAKEWOOD
NO. LONG BEACH
LONG BEACH
BELMONT SHORE
NAPLES
SEAL BEACH
SURFSIDE
SUNSET BEACH
MIDWAY CITY
TERMINAL ISLAND
SAN PEDRO
WILMINGTON
HARBOR CITY
SIGNAL HILL
LOMITA
PALOS VERDES ESTATES
ROLLING HILLS ESTATES
ROLLING HILLS
RANCHO PALOS VERDES
TORRANCE
REDONDO BEACH
HERMOSA BEACH
MANHATTAN BEACH
EL SEGUNDO
HAWTHORNE
LAWNDALE
GARDENA
CARSON
COMPTON
PARAMOUNT
BELLFLOWER
NORWALK
SANTA FE SPRINGS
DOWNEY
SOUTH GATE
WATTS
LYNWOOD
CUDAHY
BELL GARDENS
BELL
MAYWOOD
HUNTINGTON PARK
VERNON
COMMERCE
MONTEBELLO
PICO RIVERA
EAST LOS ANGELES
INDUSTRY
LA PUENTE
WEST COVINA
COVINA
BALDWIN PARK
IRWINDALE
TEMPLE CITY
SAN GABRIEL
ALHAMBRA
SOUTH PASADENA
SAN MARINO
ARCADIA
EAGLE ROCK
HIGHLAND PARK
GLENDALE
PASADENA
ROSEMEAD
EL MONTE
SO. EL MONTE
SO. SAN GABRIEL
MONTEREY PARK
WEST LOS ANGELES
BRENTWOOD
WESTWOOD VILLAGE
BEVERLY HILLS
WEST HOLLYWOOD
UNIVERSAL CITY
STUDIO CITY
SHERMAN OAKS
ENCINO
CALABASAS
HIDDEN HILLS
WOODLAND HILLS
TARZANA
VAN NUYS
NO. HOLLYWOOD
BURBANK
VERDUGO CITY
MONTROSE
SUN VALLEY
PANORAMA CITY
RESEDA
WINNETKA
CANOGA PARK
NORTHRIDGE
SEPULVEDA
PACIFIC PALISADES
MALIBU
TOPANGA BEACH
SANTA MONICA
OCEAN PARK
VENICE
MARINA DEL REY
PLAYA DEL REY
WESTCHESTER
INGLEWOOD
PALMS
CULVER CITY
LOS ANGELES COUNTY
SAN BERNARDINO COUNTY
ORANGE COUNTY
OPTION IV
RAIL OPERATION PLAN



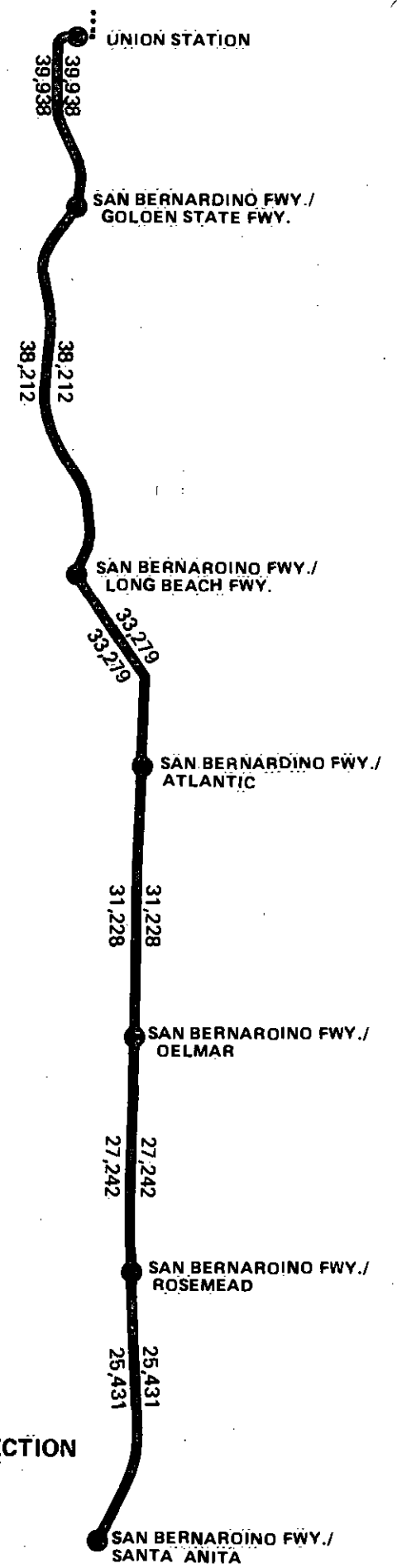
OPTION IV
STARTER LINE CORRIDOR
RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 14b



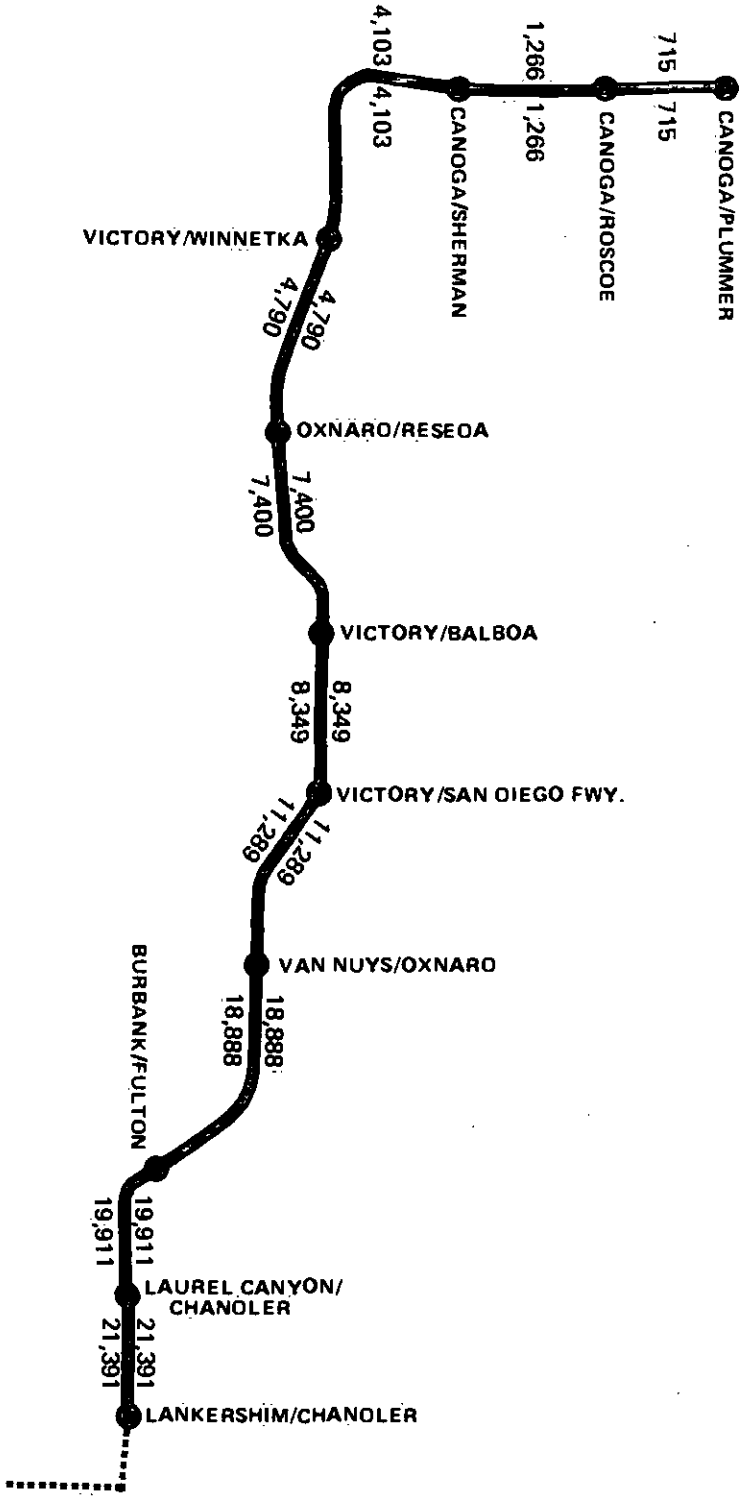
OPTION IV
WEST L.A. CORRIDOR RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 14c



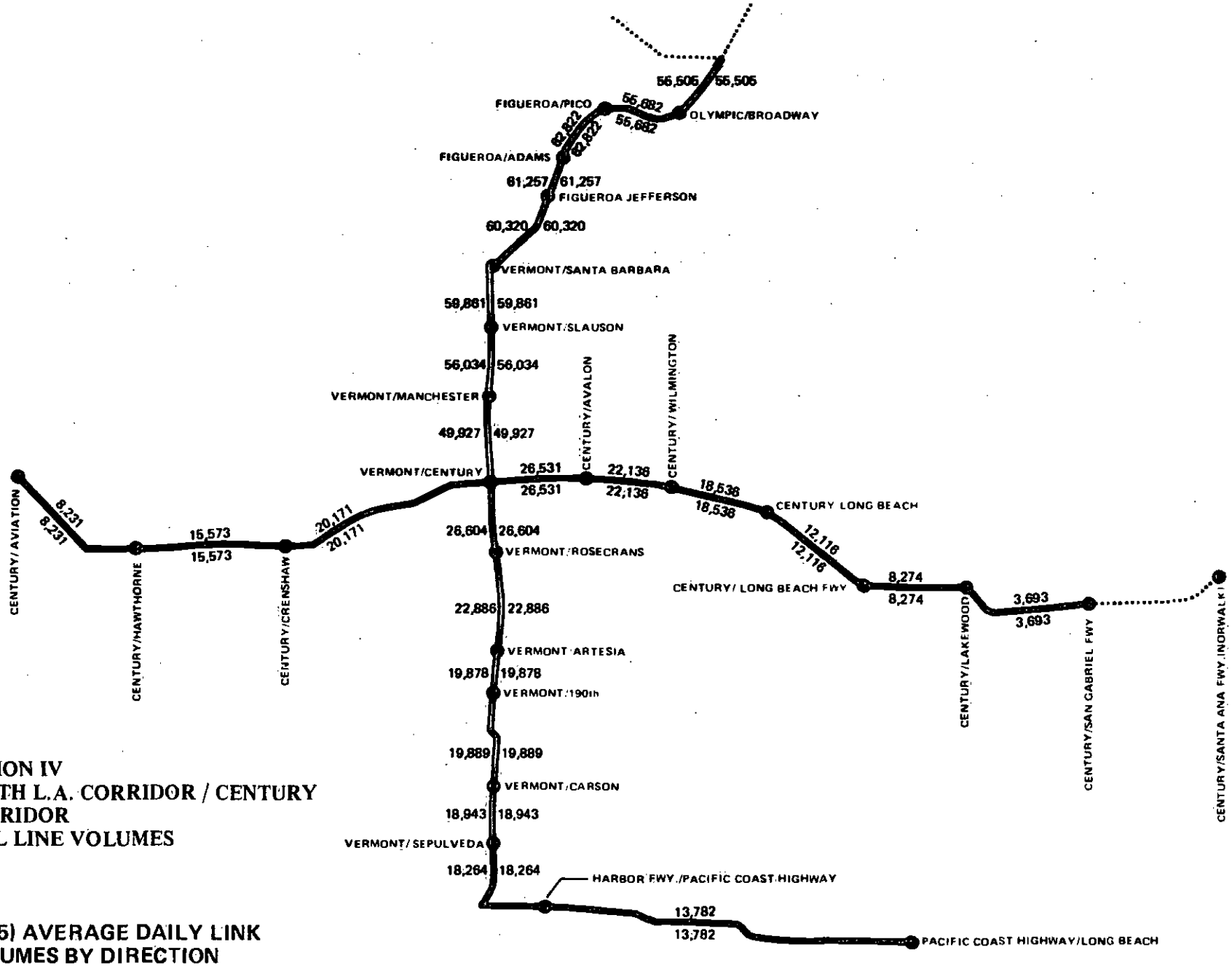
OPTION IV
EL MONTE CORRIDOR RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 14d



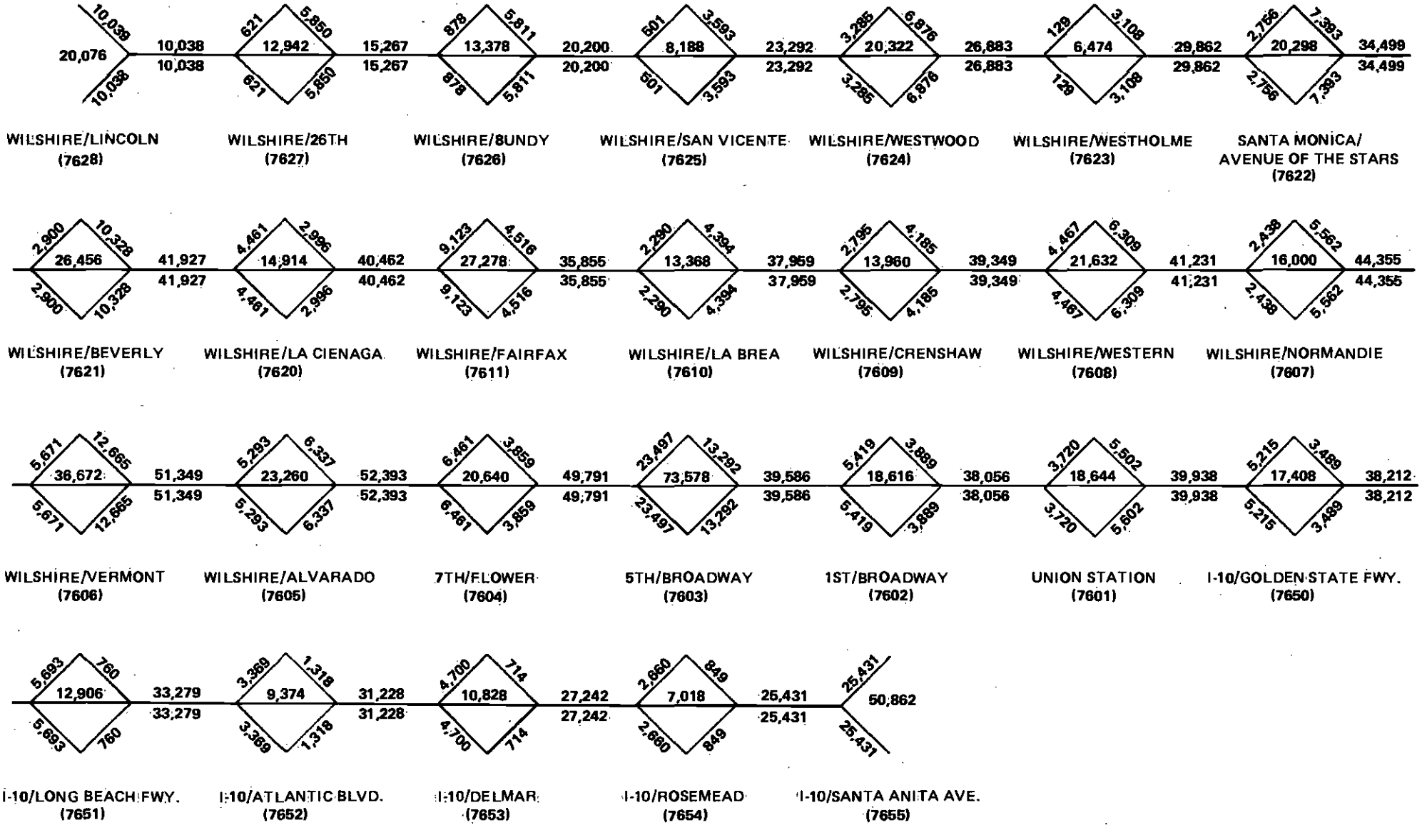
OPTION IV
SAN FERNANDO VALLEY CORRIDOR RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 14e



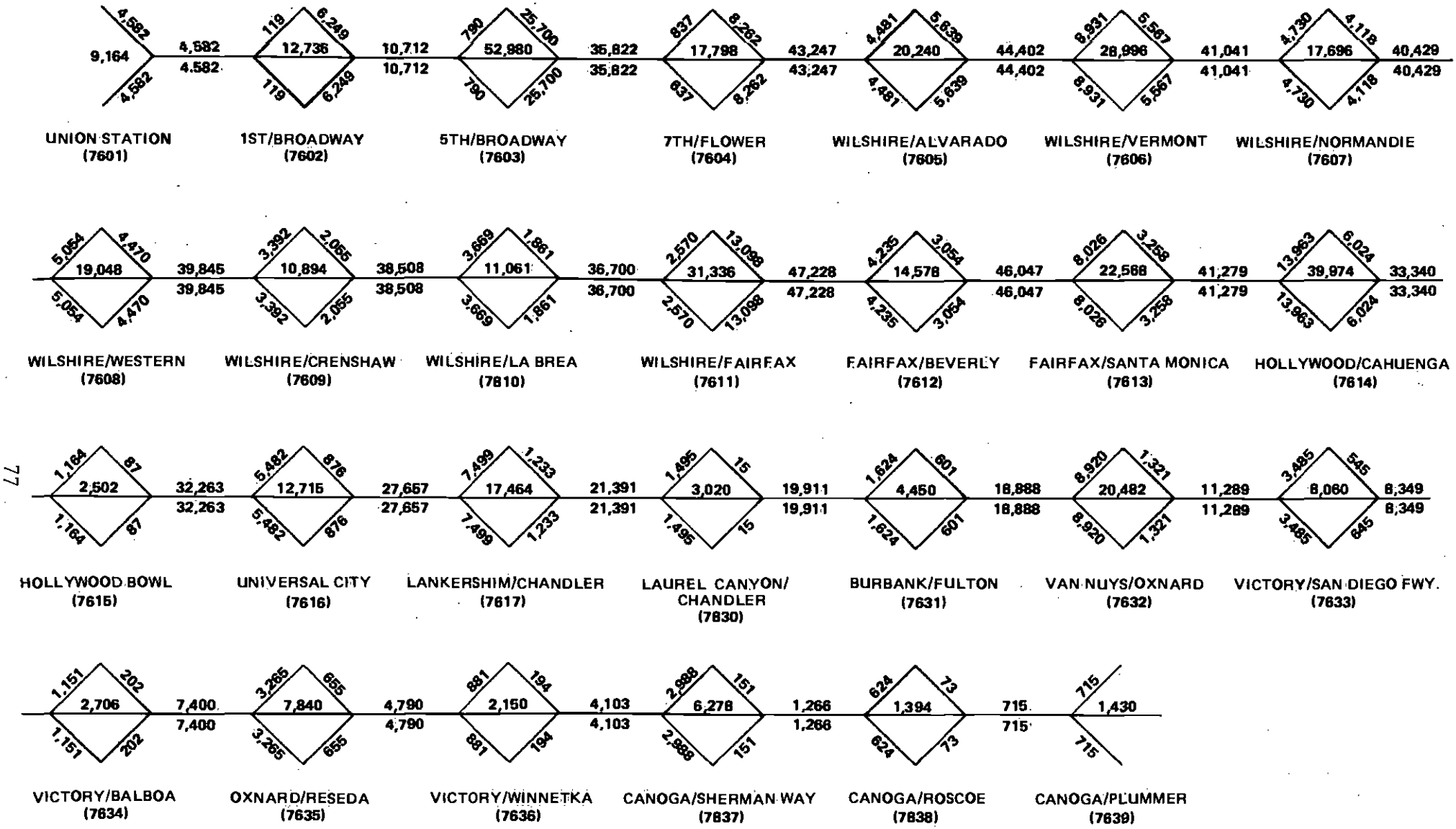
OPTION IV
SOUTH L.A. CORRIDOR / CENTURY CORRIDOR
RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 14f



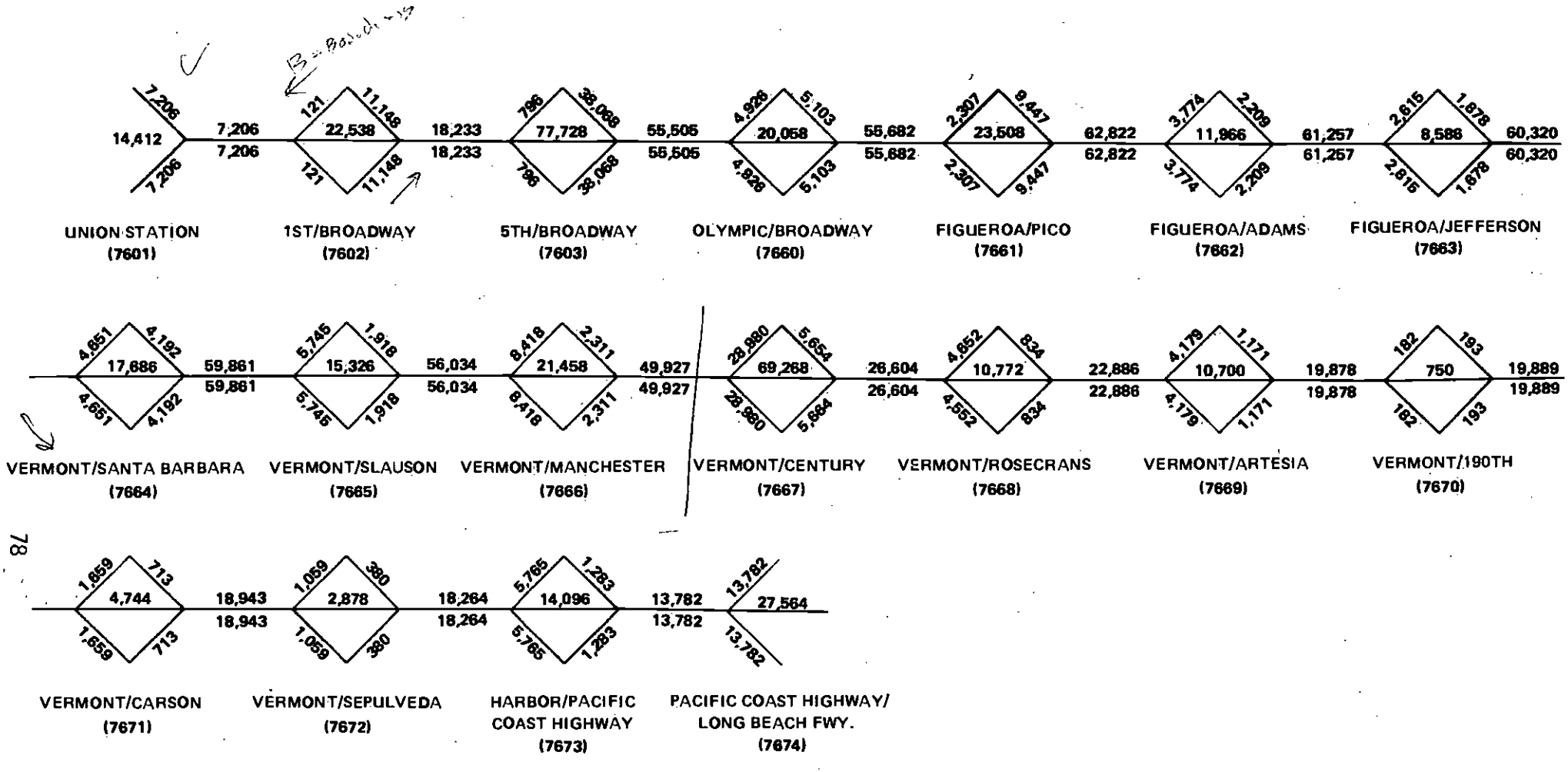
OPTION IV
LINE no. 2

BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 14g



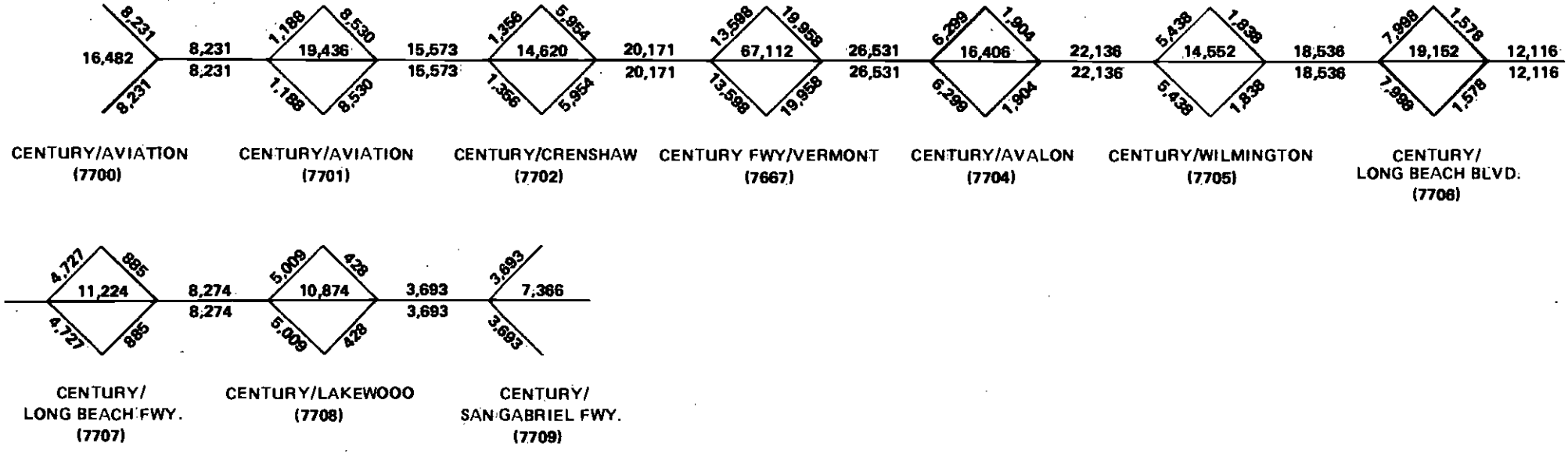
OPTION IV - LINE no. 3

BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 14h



OPTION IV
LINE no. 5

BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 14i



OPTION IV
LINE no. 6

BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 14j

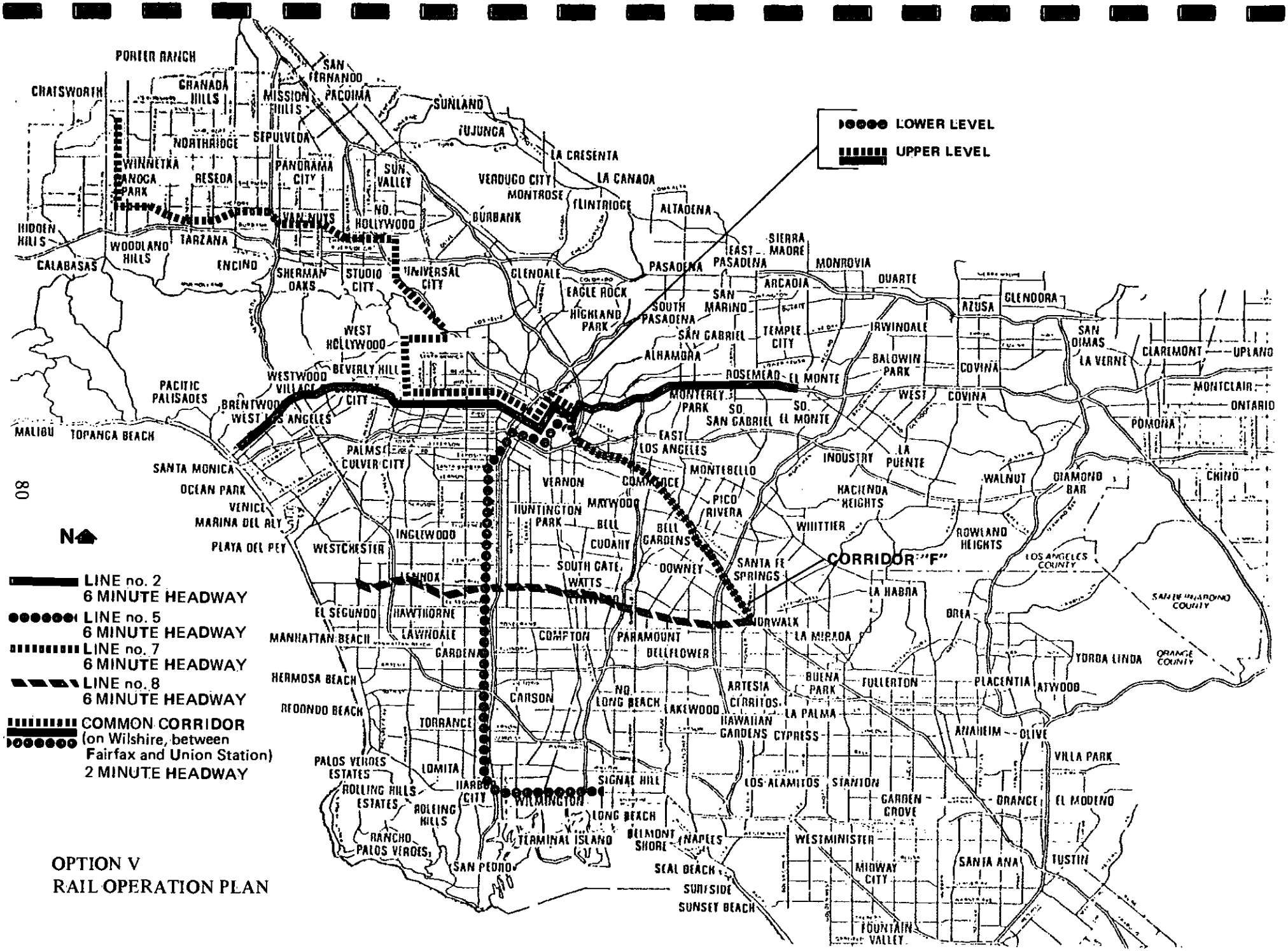
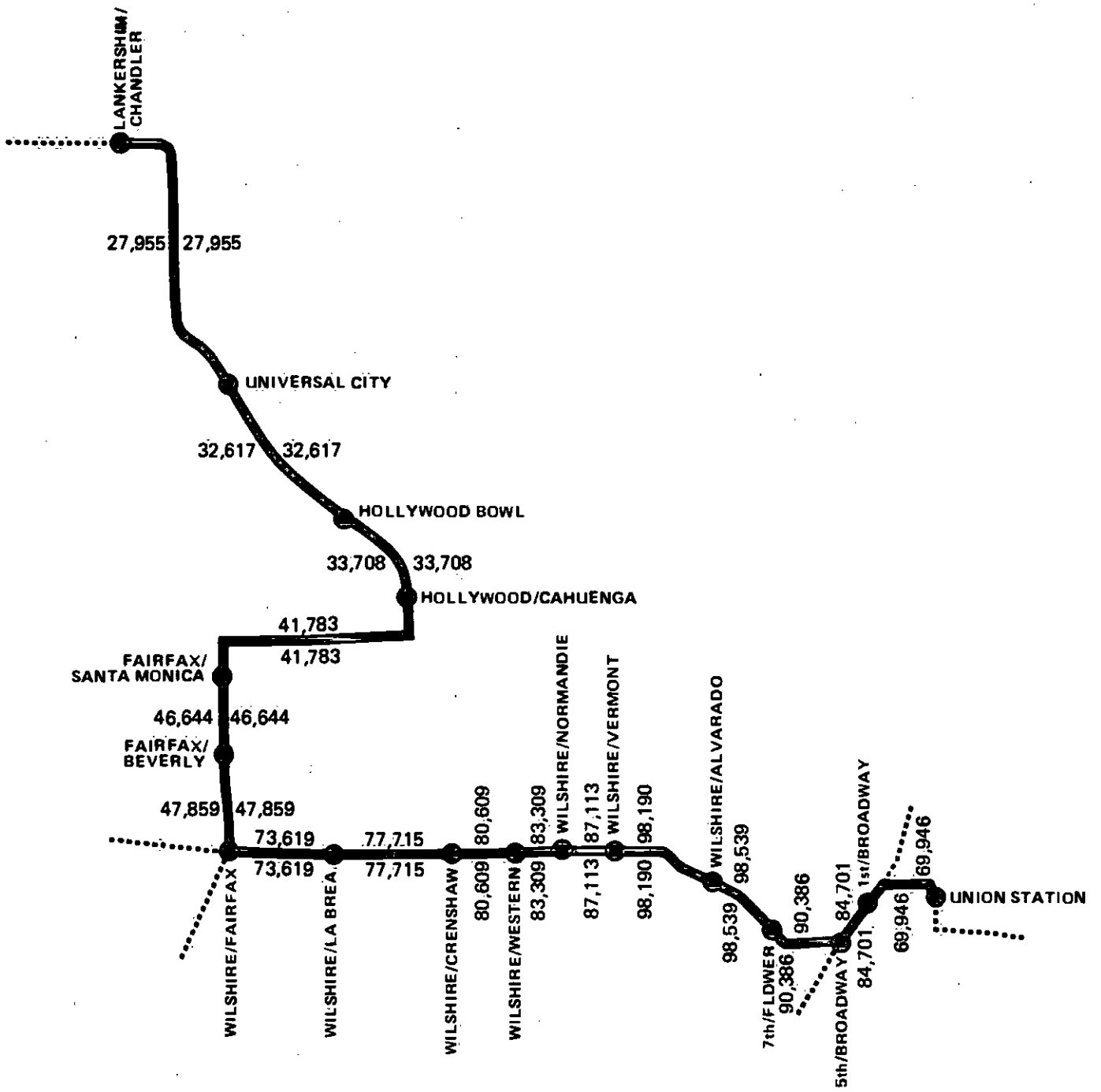
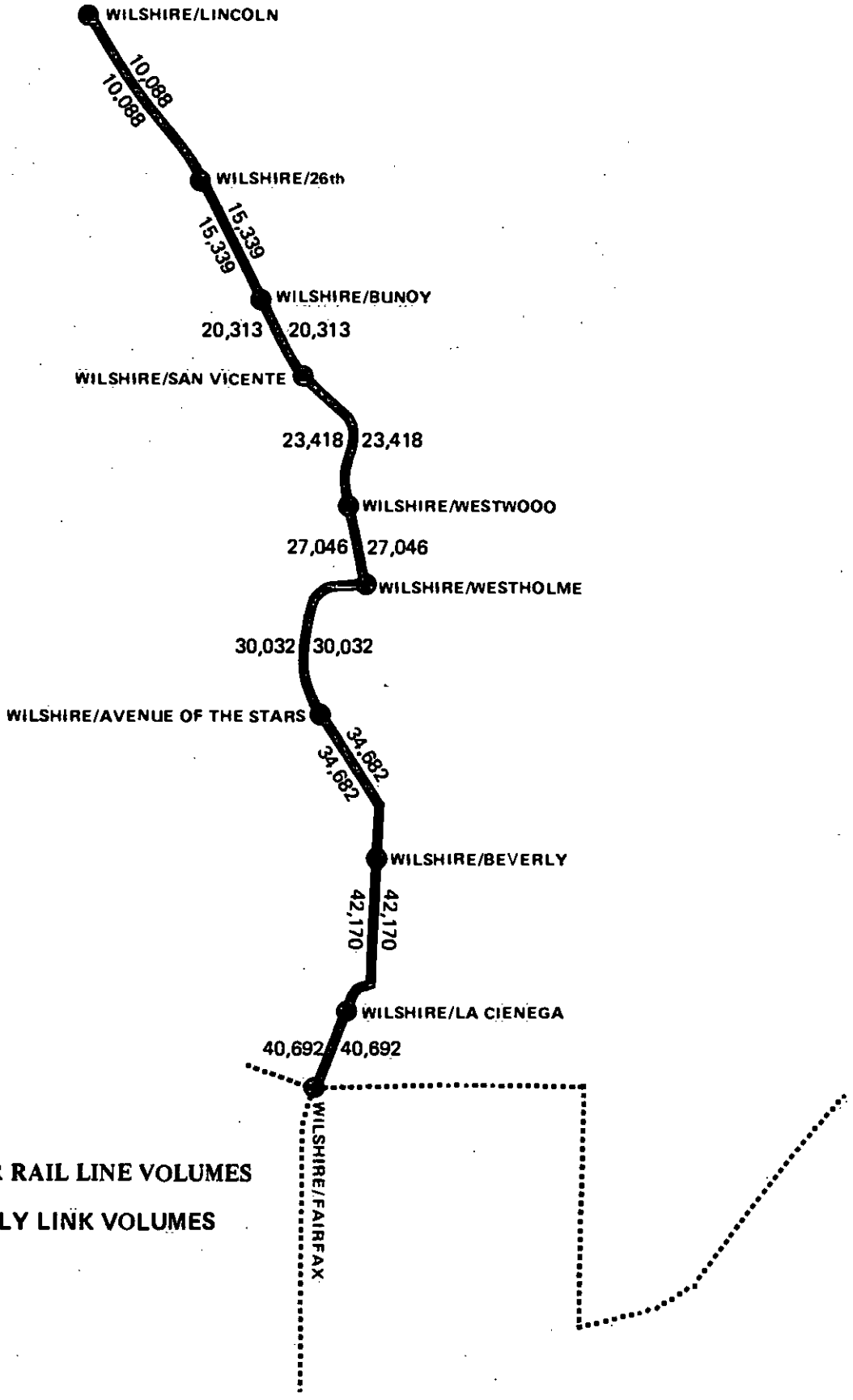

LOWER LEVEL
UPPER LEVEL
N
LINE no. 2
6 MINUTE HEADWAY
LINE no. 5
6 MINUTE HEADWAY
LINE no. 7
6 MINUTE HEADWAY
LINE no. 8
6 MINUTE HEADWAY
COMMON CORRIDOR
(on Wilshire, between
Fairfax and Union Station)
2 MINUTE HEADWAY
CORRIDOR "F"
OPTION V
RAIL OPERATION PLAN
PORTER RANCH
CHATSWORTH
GRANADA HILLS
MISSION HILLS
SAN FERNANDO
PACOIMA
SUNLAND
TUJUNGA
LA CRESENTA
NORTHRIDGE
SEPULVEDA
WINNETKA
CANOGA PARK
RESEDA
PANORAMA CITY
SUN VALLEY
VERDUGO CITY
MONTROSE
LA CANADA
FLINTRIDGE
ALTADENA
VAN NUYS
NO. HOLLYWOOD
BURBANK
HIDDEN HILLS
WOODLAND HILLS
TARZANA
CALABASAS
ENCINO
SHERMAN OAKS
STUDIO CITY
UNIVERSAL CITY
GLENDALE
EAGLE ROCK
HIGHLAND PARK
PASADENA
EAST PASADENA
SIERRA MADRE
MONROVIA
ARCADIA
DUARTE
SOUTH PASADENA
SAN MARINO
AZUSA
GLENDORA
WEST HOLLYWOOD
SAN GABRIEL
TEMPLE CITY
IRWINDALE
SAN DIMAS
LA VERNE
CLAREMONT
UPLAND
ALHAMBRA
BALDWIN PARK
COVINA
WESTWOOD VILLAGE
BEVERLY HILLS
ROSEMEAD
EL MONTE
MONTCLAIR
ONTARIO
PACIFIC PALISADES
BRENTWOOD
WEST LOS ANGELES
CITY
MONTEREY PARK
SO. SAN GABRIEL
SO. EL MONTE
WEST COVINA
POMONA
MALIBU
TOPANGA BEACH
EAST LOS ANGELES
PALMS
CULVER CITY
INDUSTRY
LA PUENTE
SANTA MONICA
VERNON
COMMERCE
MONTEBELLO
WALNUT
DIAMOND BAR
CHINO
OCEAN PARK
VENICE
MARINA DEL REY
HUNTINGTON PARK
MAYWOOD
PICO RIVERA
HACIENDA HEIGHTS
BELL
BELL GARDENS
WHITTIER
ROWLAND HEIGHTS
PLAYA DEL REY
WESTCHESTER
INGLEWOOD
CUDAHY
SOUTH GATE
DOWNEY
SANTA FE SPRINGS
LOS ANGELES COUNTY
LENNOX
WATTS
LA HABRA
SAN BERNARDINO COUNTY
EL SEGUNDO
HAWTHORNE
NORWALK
BREA
MANHATTAN BEACH
LAWNDALE
COMPTON
PARAMOUNT
LA MIRADA
GARDENA
BELLFLOWER
YORBA LINDA
ORANGE COUNTY
HERMOSA BEACH
CARSON
NO. LONG BEACH
ARTESIA
CERRITOS
BUENA PARK
FULLERTON
PLACENTIA
ATWOOD
REDONDO BEACH
LAKEWOOD
HAWAIIAN GARDENS
LA PALMA
CYPRESS
ANAHEIM
OLIVE
TORRANCE
PALOS VERDES ESTATES
LOMITA
VILLA PARK
ROLLING HILLS ESTATES
HARBOR CITY
SIGNAL HILL
LOS ALAMITOS
STANTON
GARDEN GROVE
ORANGE
EL MODENO
ROLLING HILLS
WILMINGTON
LONG BEACH
RANCHO PALOS VERDES
TERMINAL ISLAND
BELMONT SHORE
NAPLES
WESTMINISTER
SAN PEDRO
SEAL BEACH
MIDWAY CITY
SANTA ANA
TUSTIN
SUNSET BEACH
FOUNTAIN VALLEY

Figure 15a



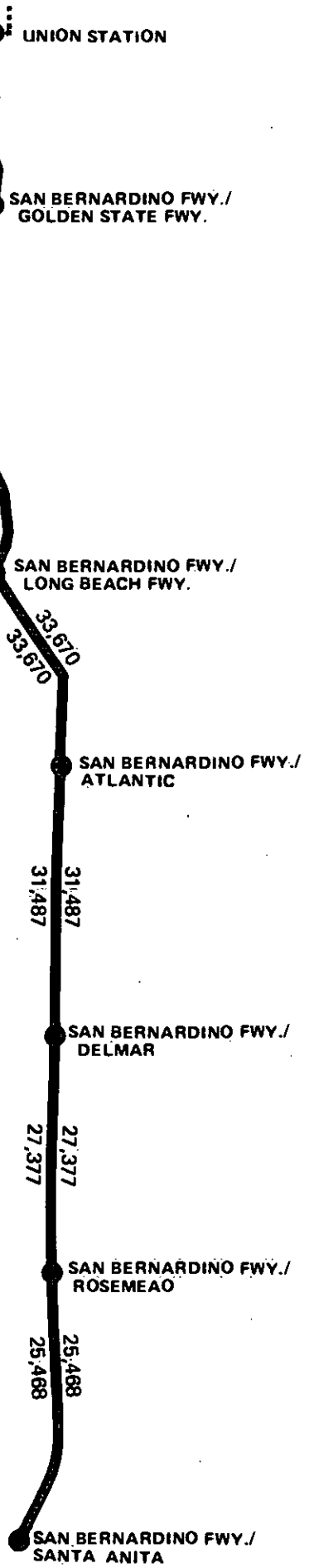
OPTION V
STARTER LINE CORRIDOR
RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 15b



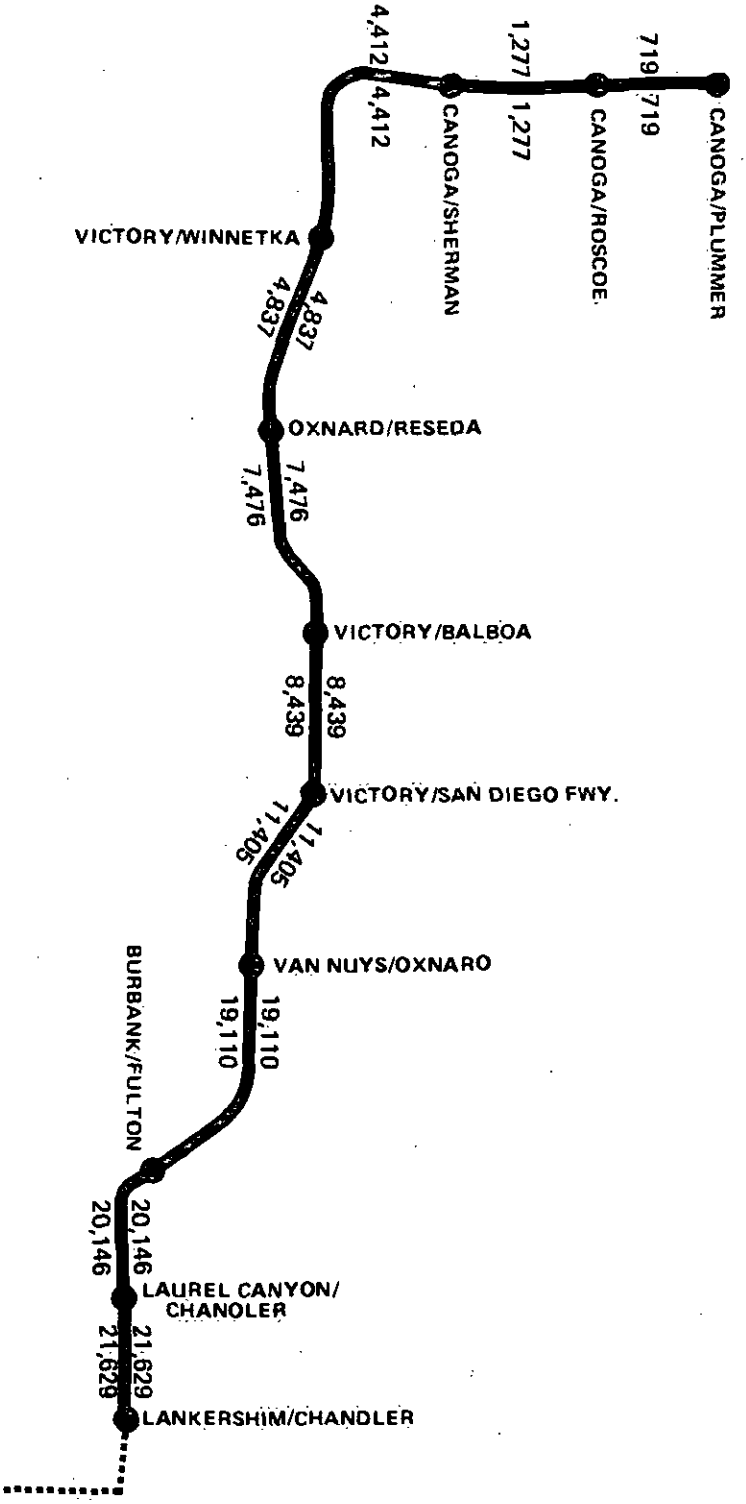
OPTION V
WEST L.A. CORRIDOR RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 15c



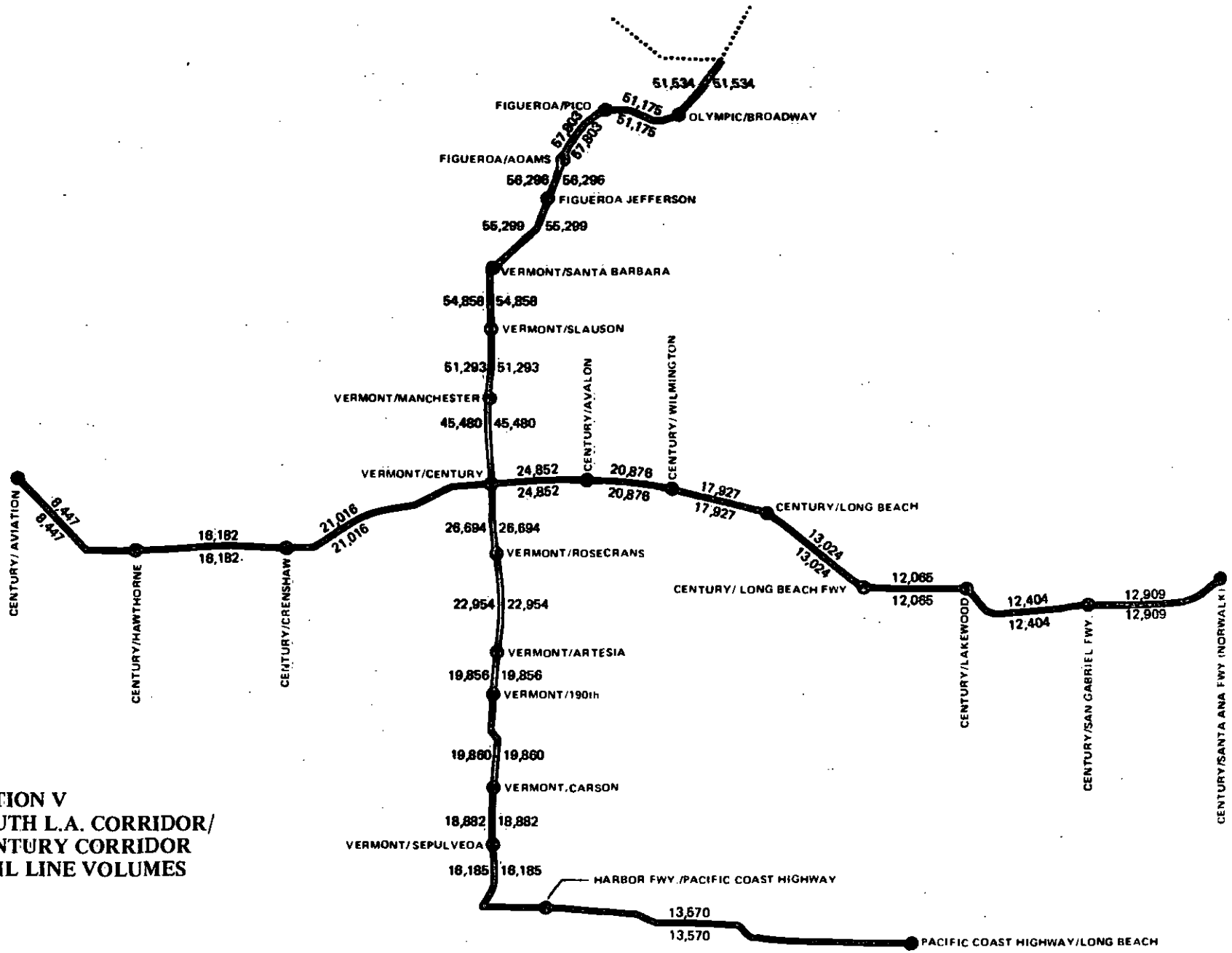
OPTION V
EL MONTE CORRIDOR RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 15d



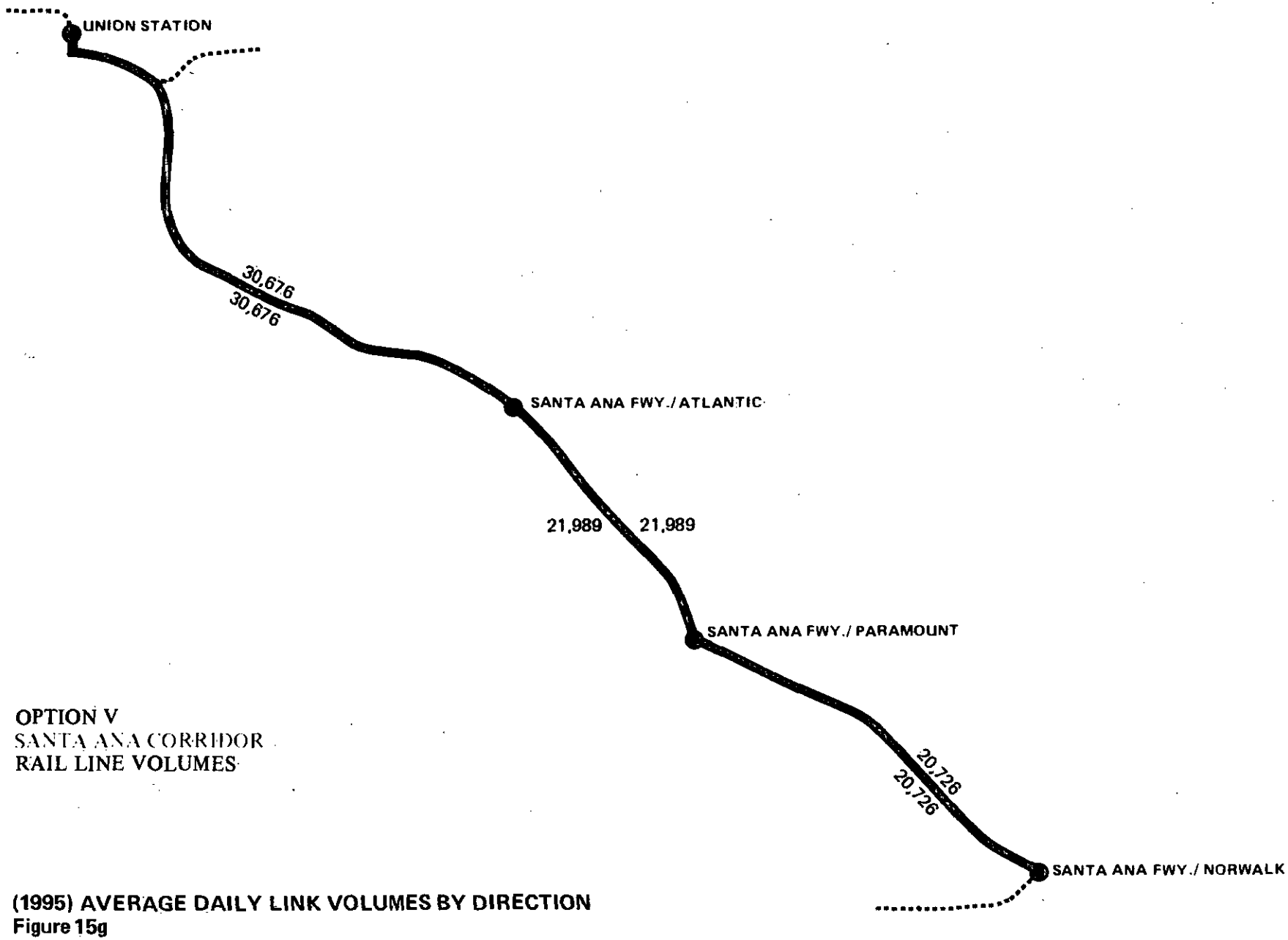
OPTION V
SAN FERNANDO VALLEY CORRIDOR RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 15e



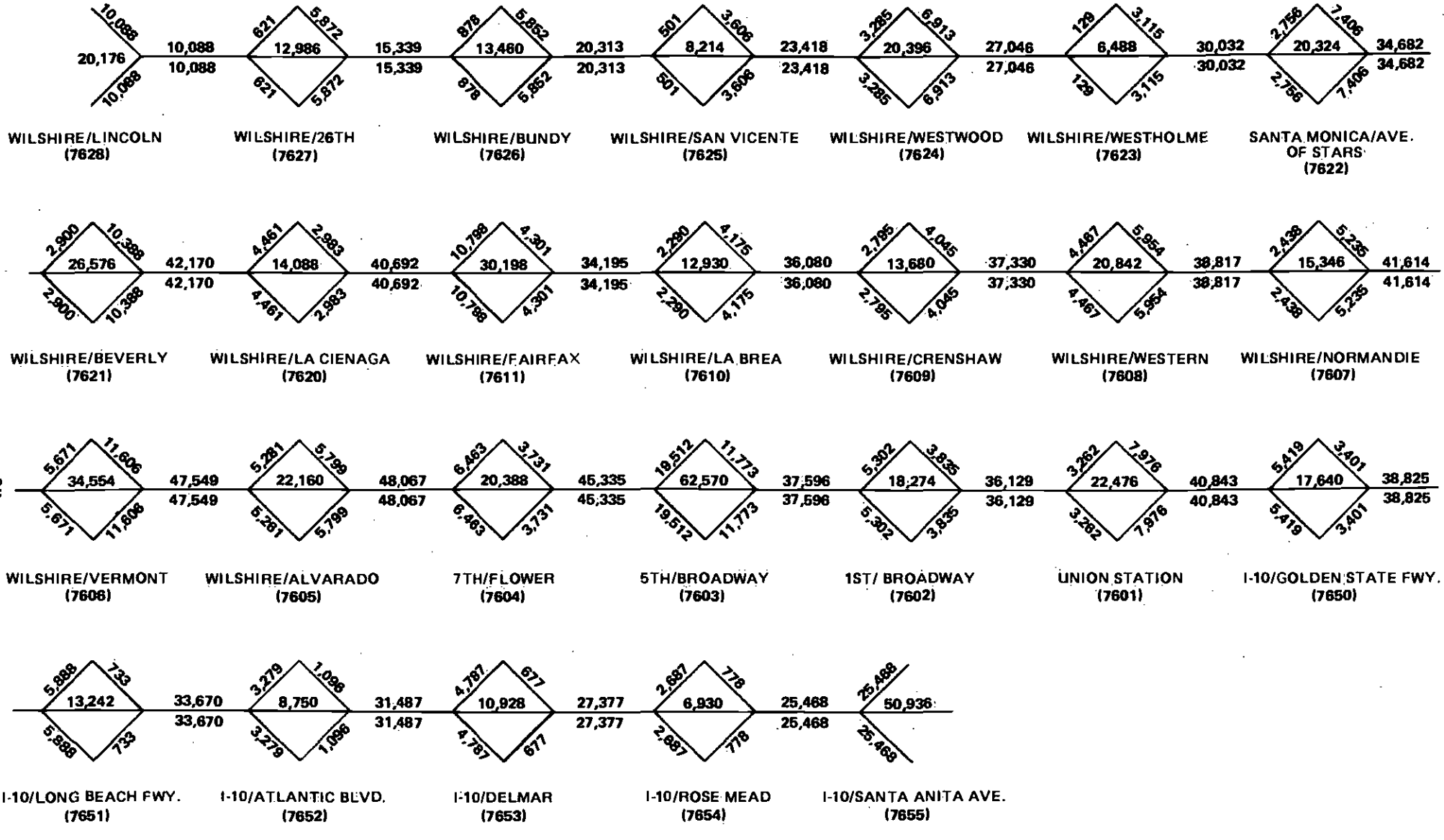
OPTION V
SOUTH L.A. CORRIDOR/
CENTURY CORRIDOR
RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 15f



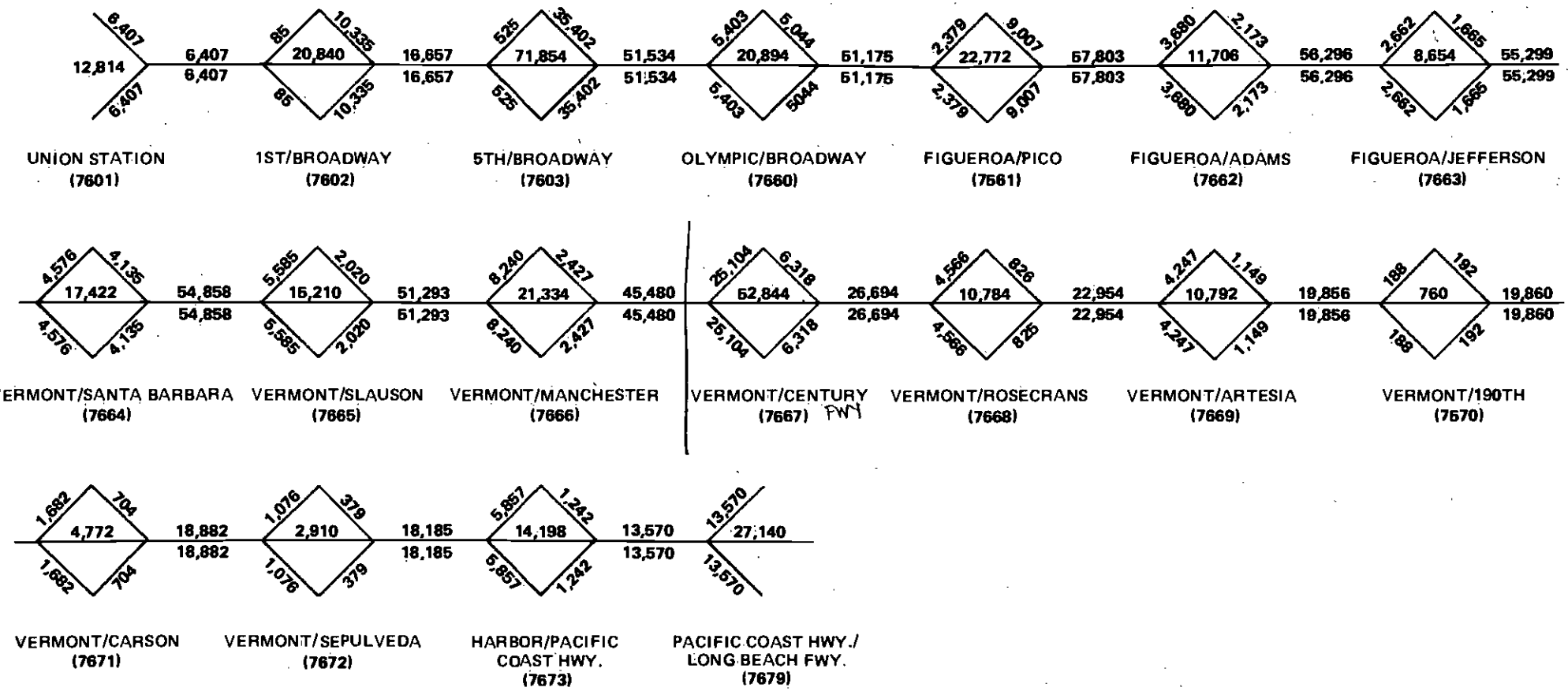
OPTION V
SANTA ANA CORRIDOR
RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 15g



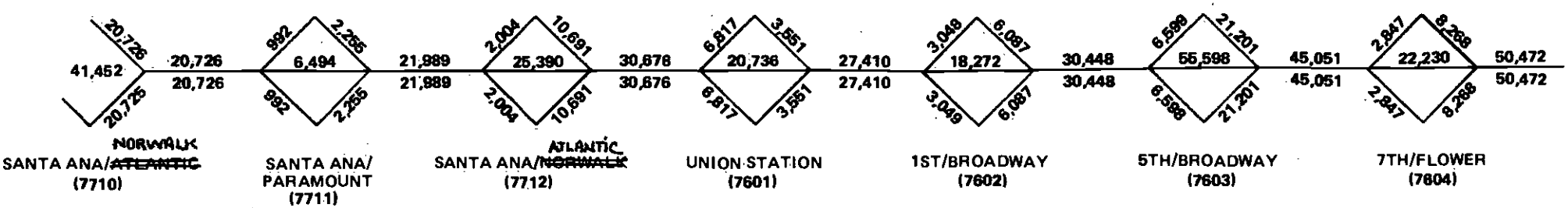
OPTION V
LINE no. 2

BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 15 h

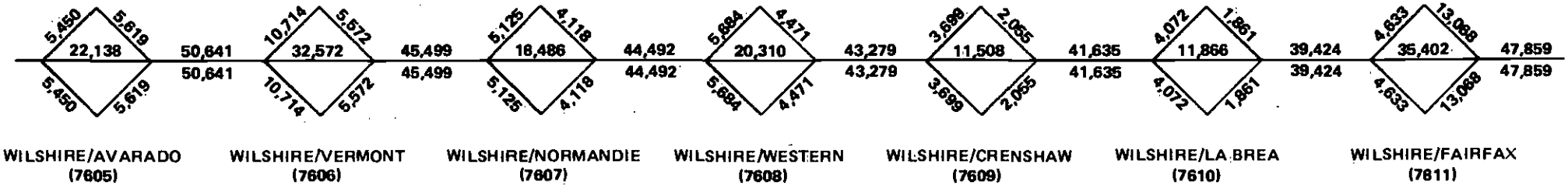


OPTION V
LINE no. 5

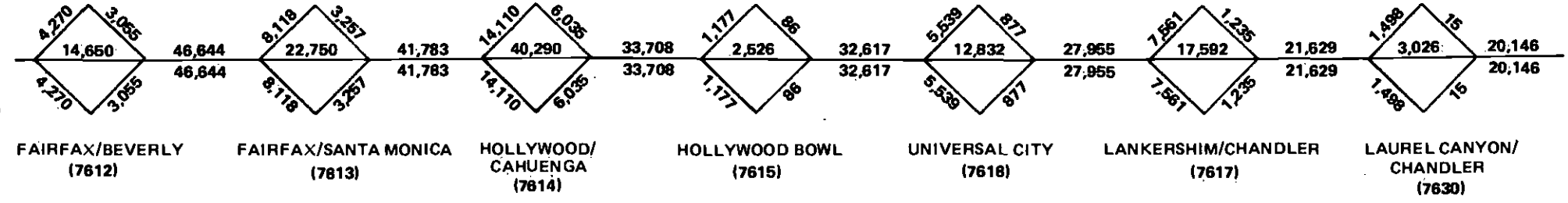
BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 15i



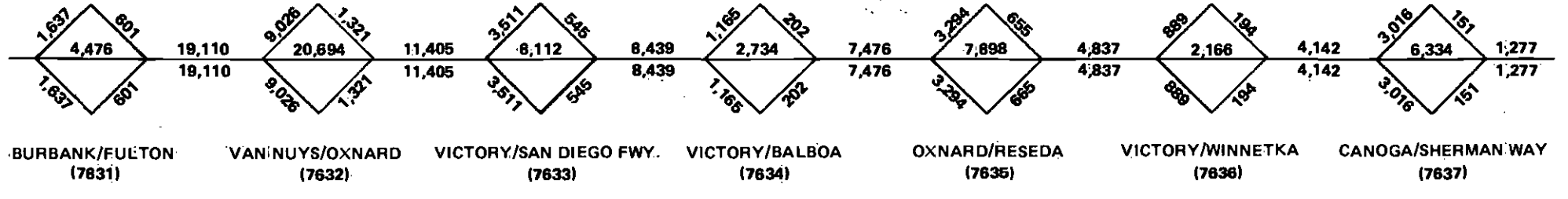
SANTA ANA/~~ATLANTIC~~ NORWALK (7710) | SANTA ANA/PARAMOUNT (7711) | SANTA ANA/~~NORWALK~~ ATLANTIC (7712) | UNION STATION (7601) | 1ST/BROADWAY (7602) | 5TH/BROADWAY (7603) | 7TH/FLOWER (7604)



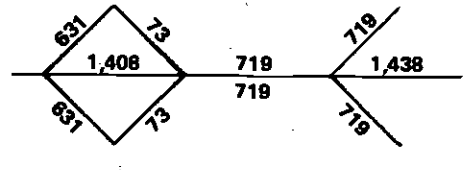
WILSHIRE/AVARADO (7605) | WILSHIRE/VERMONT (7606) | WILSHIRE/NORMANDIE (7607) | WILSHIRE/WESTERN (7608) | WILSHIRE/CRENSHAW (7609) | WILSHIRE/LA BREA (7610) | WILSHIRE/FAIRFAX (7611)



FAIRFAX/BEVERLY (7612) | FAIRFAX/SANTA MONICA (7613) | HOLLYWOOD/CAHUENGA (7614) | HOLLYWOOD BOWL (7615) | UNIVERSAL CITY (7618) | LANKERSHIM/CHANDLER (7617) | LAUREL CANYON/CHANDLER (7630)



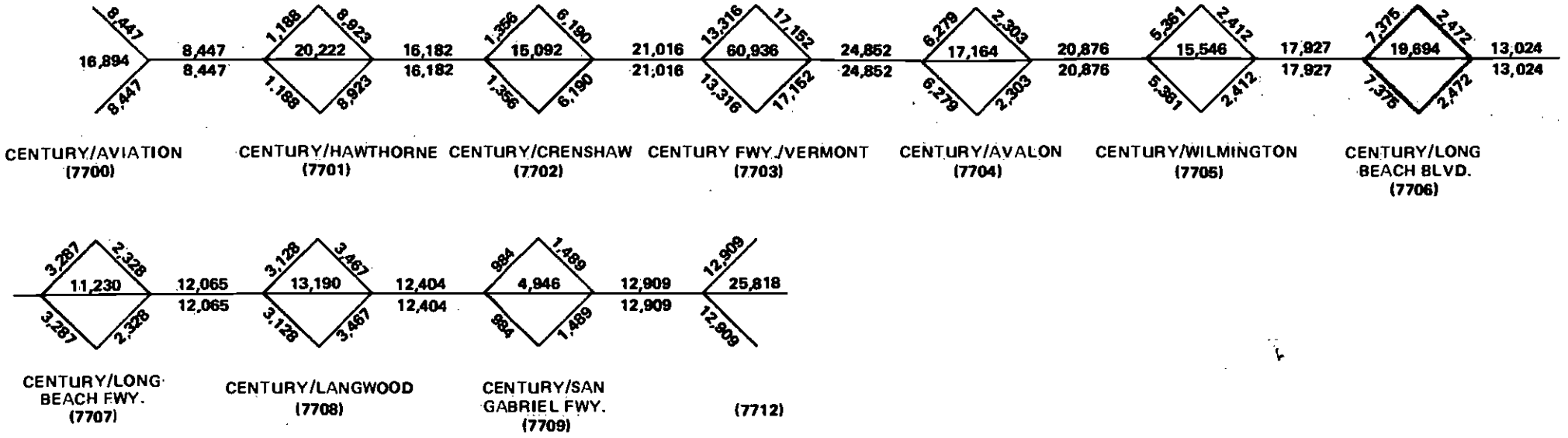
BURBANK/FULTON (7631) | VAN NUYS/OXNARD (7632) | VICTORY/SAN DIEGO FWY. (7633) | VICTORY/BALBOA (7634) | OXNARD/RESEDA (7635) | VICTORY/WINNETKA (7636) | CANOGA/SHERMAN WAY (7637)



CANOGA/ROSCOE (7638) | CANOGA/PLUMMER (7639)

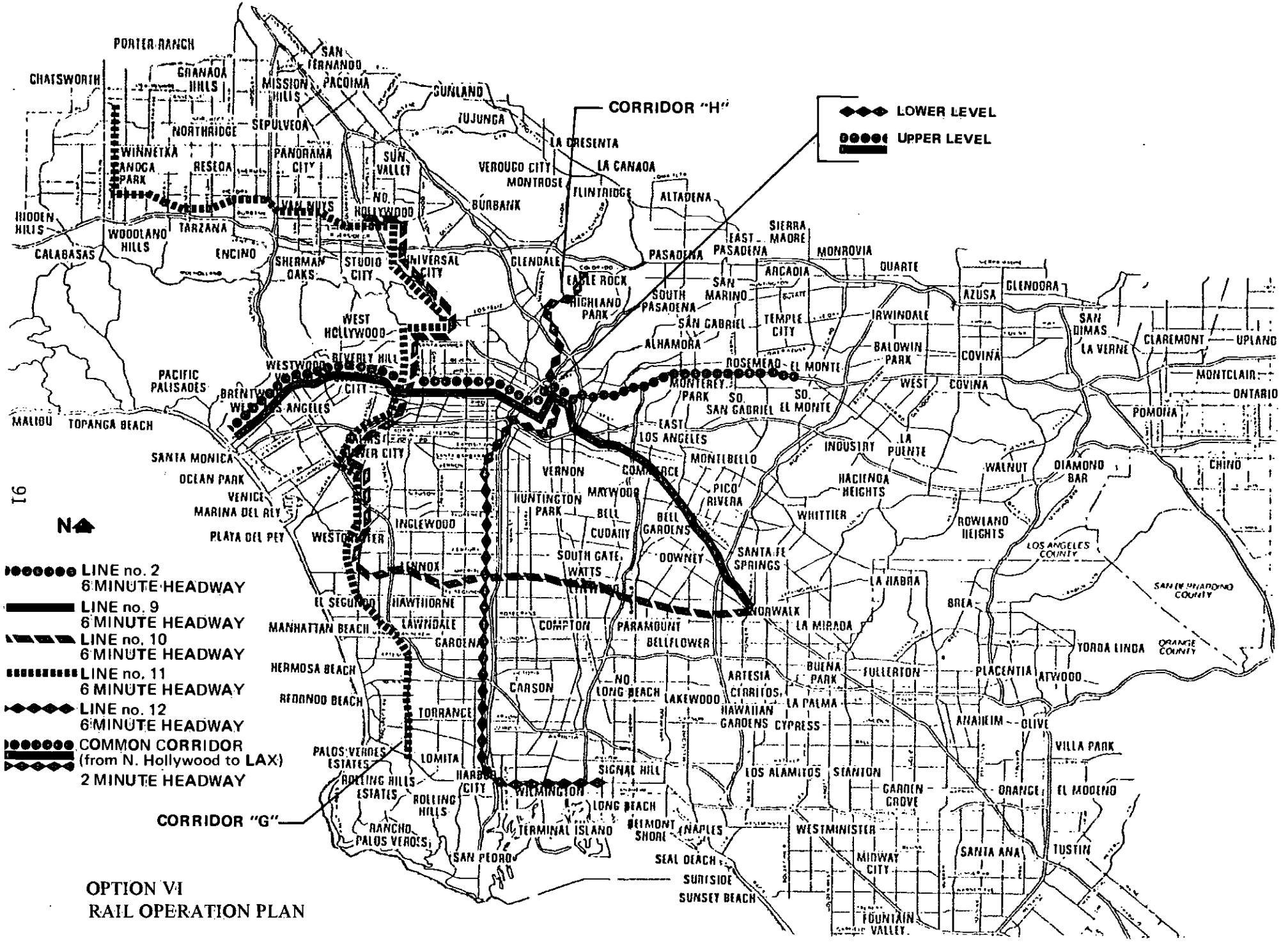
OPTION V
LINE no. 7

BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 15j

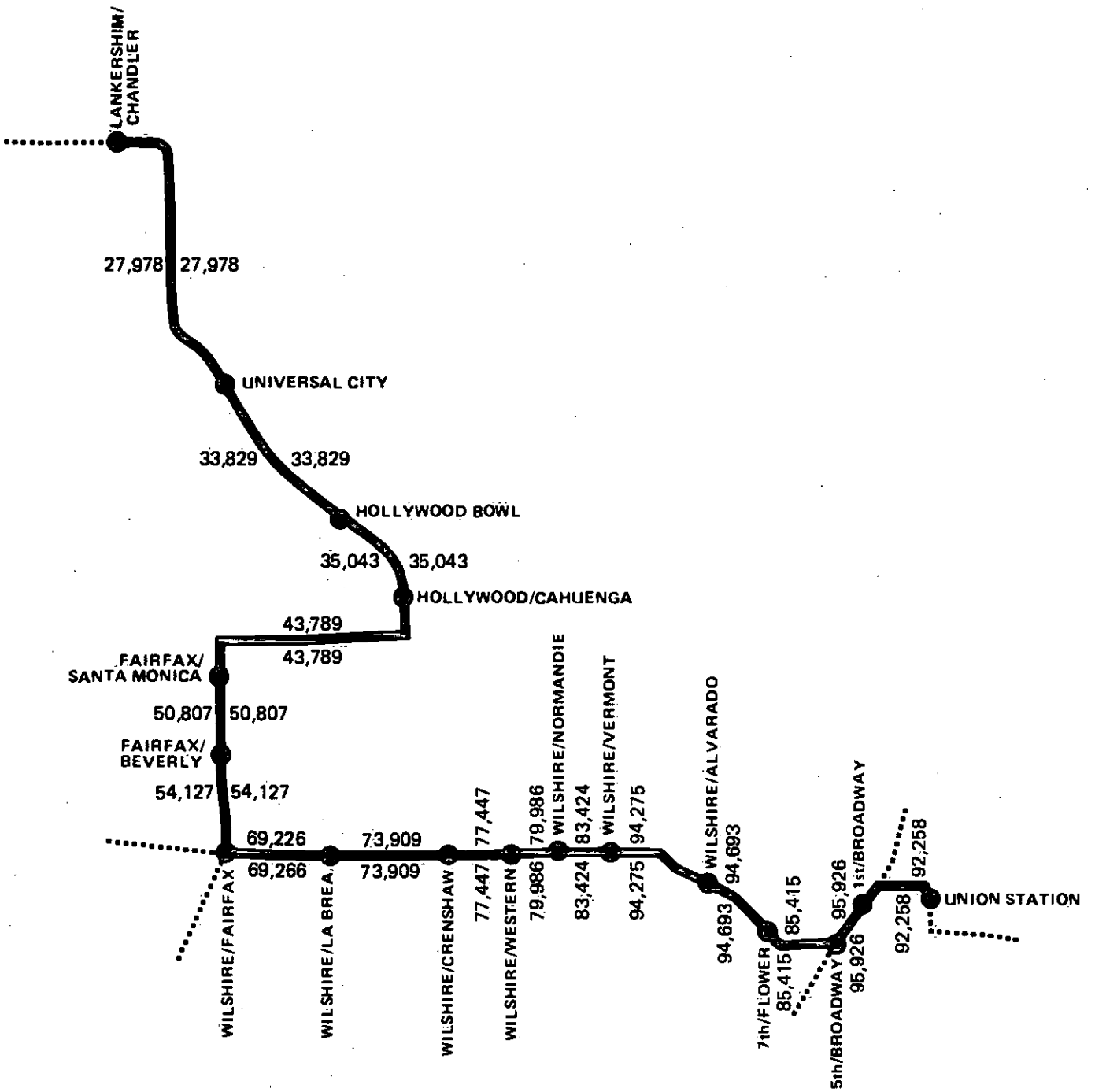


OPTION V - LINE no. 8

BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 15k

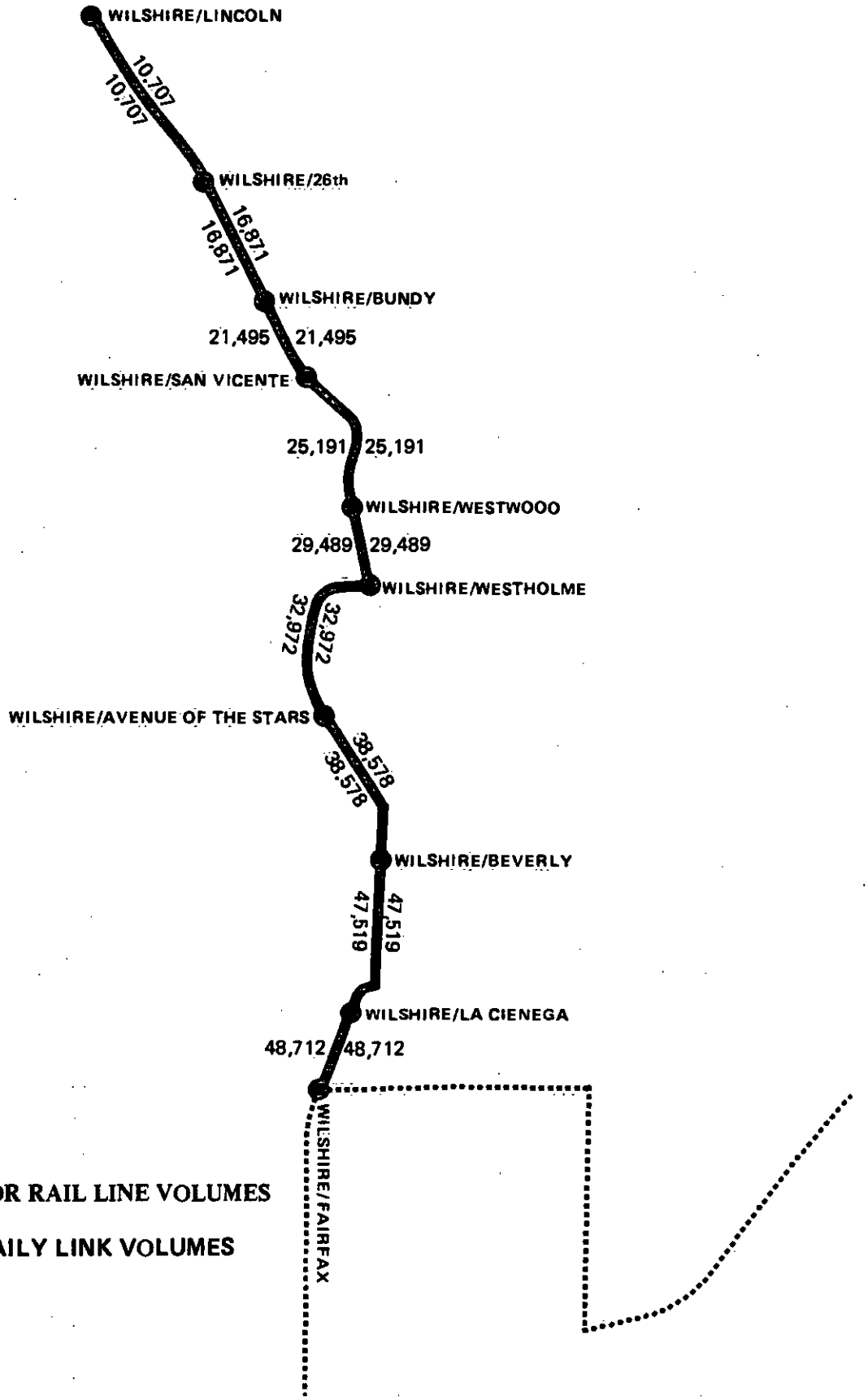


OPTION VI
RAIL OPERATION PLAN



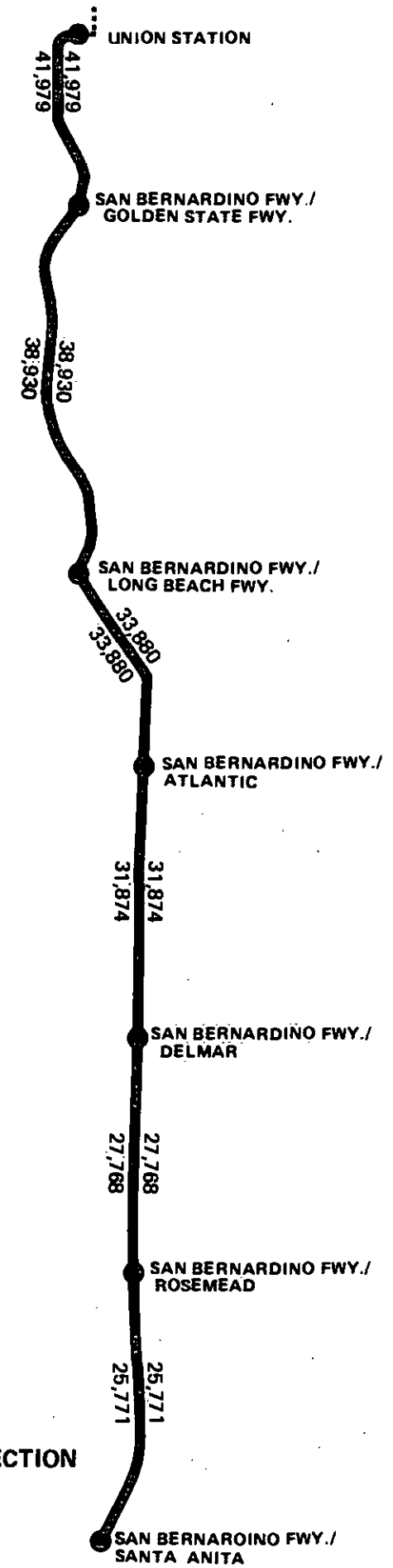
OPTION VI
STARTER LINE CORRIDOR
RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 16b



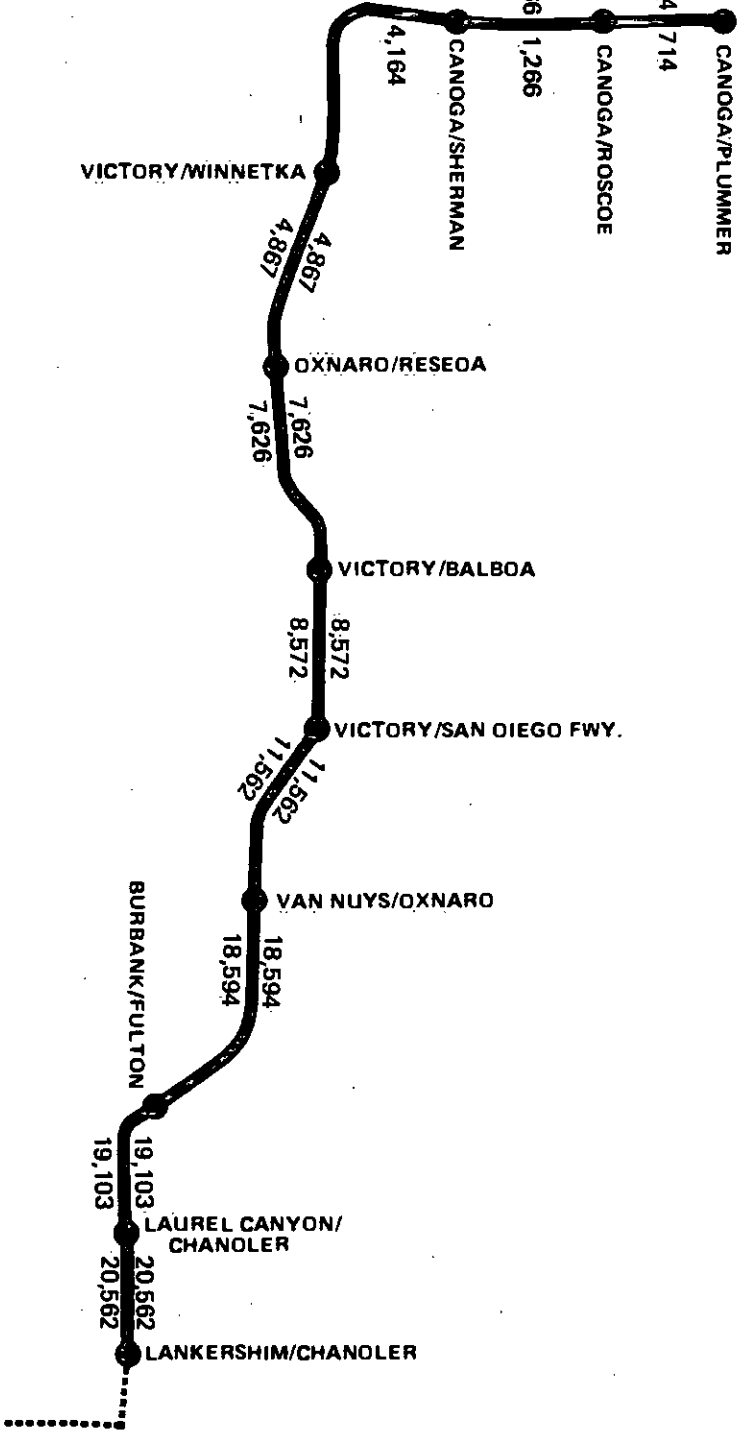
OPTION VI
WEST L.A. CORRIDOR RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 16c



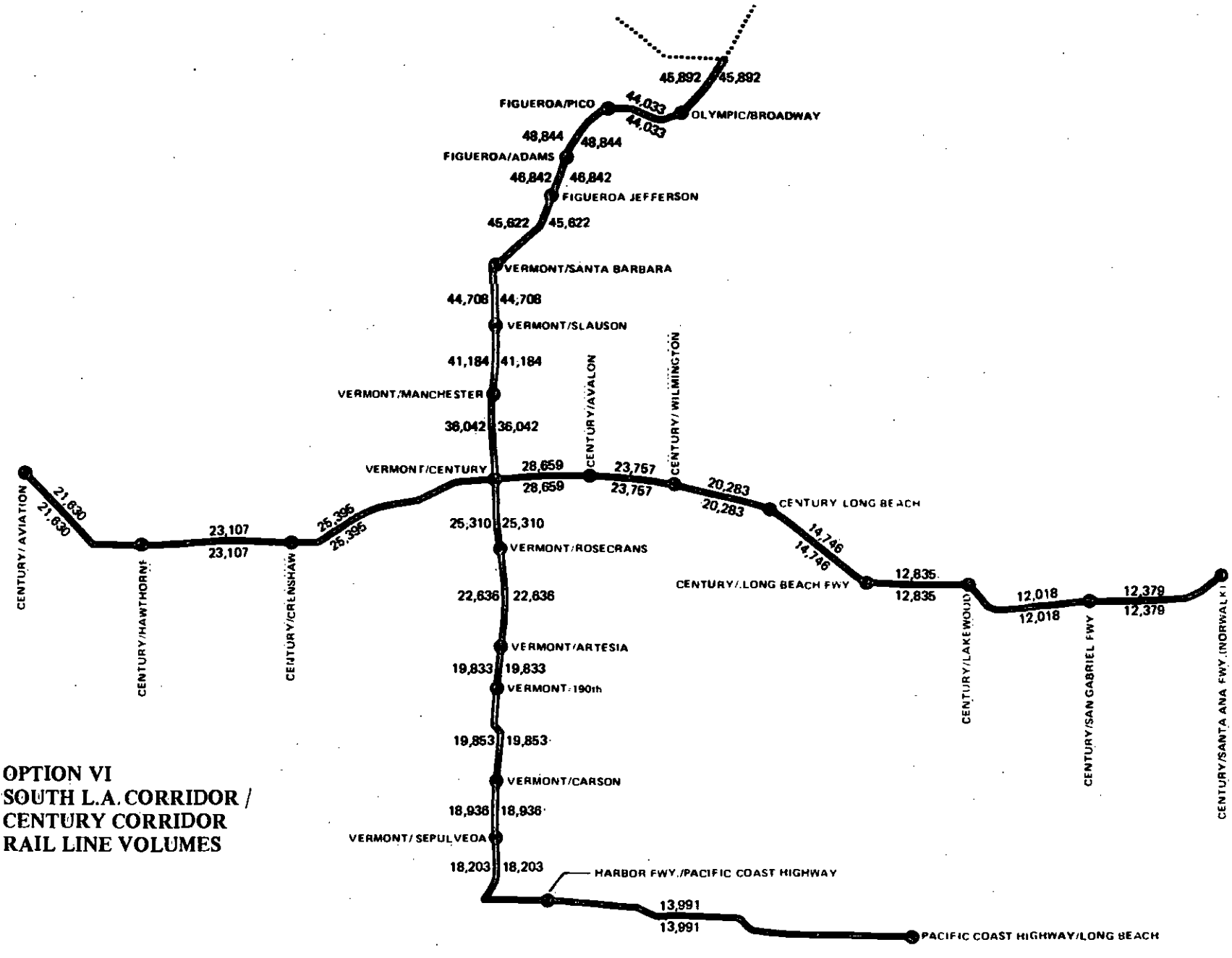
OPTION VI
EL MONTE CORRIDOR RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 16d



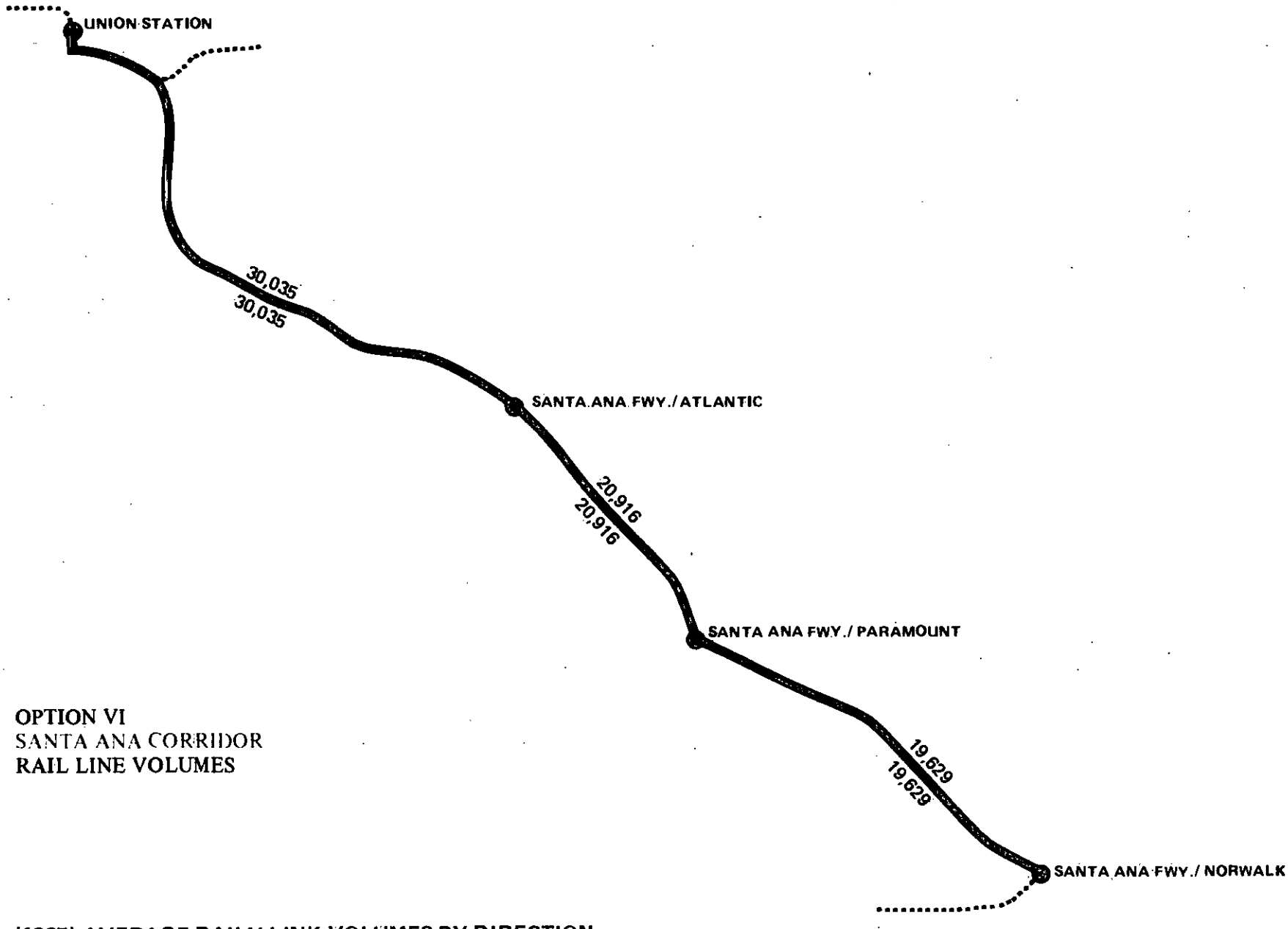
OPTION VI
SAN FERNANDO VALLEY CORRIDOR

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 16e



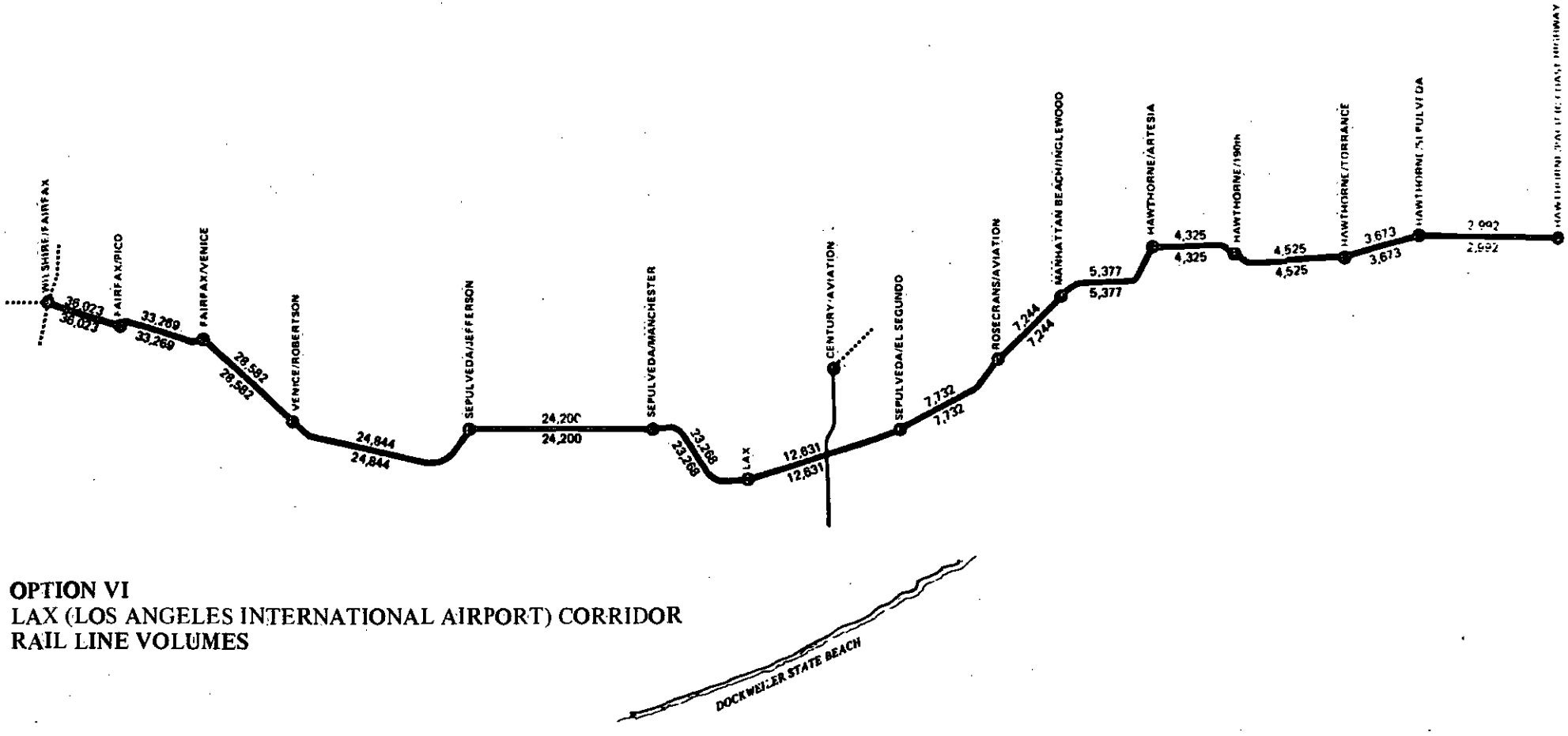
OPTION VI
SOUTH L.A. CORRIDOR / CENTURY CORRIDOR RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 16f



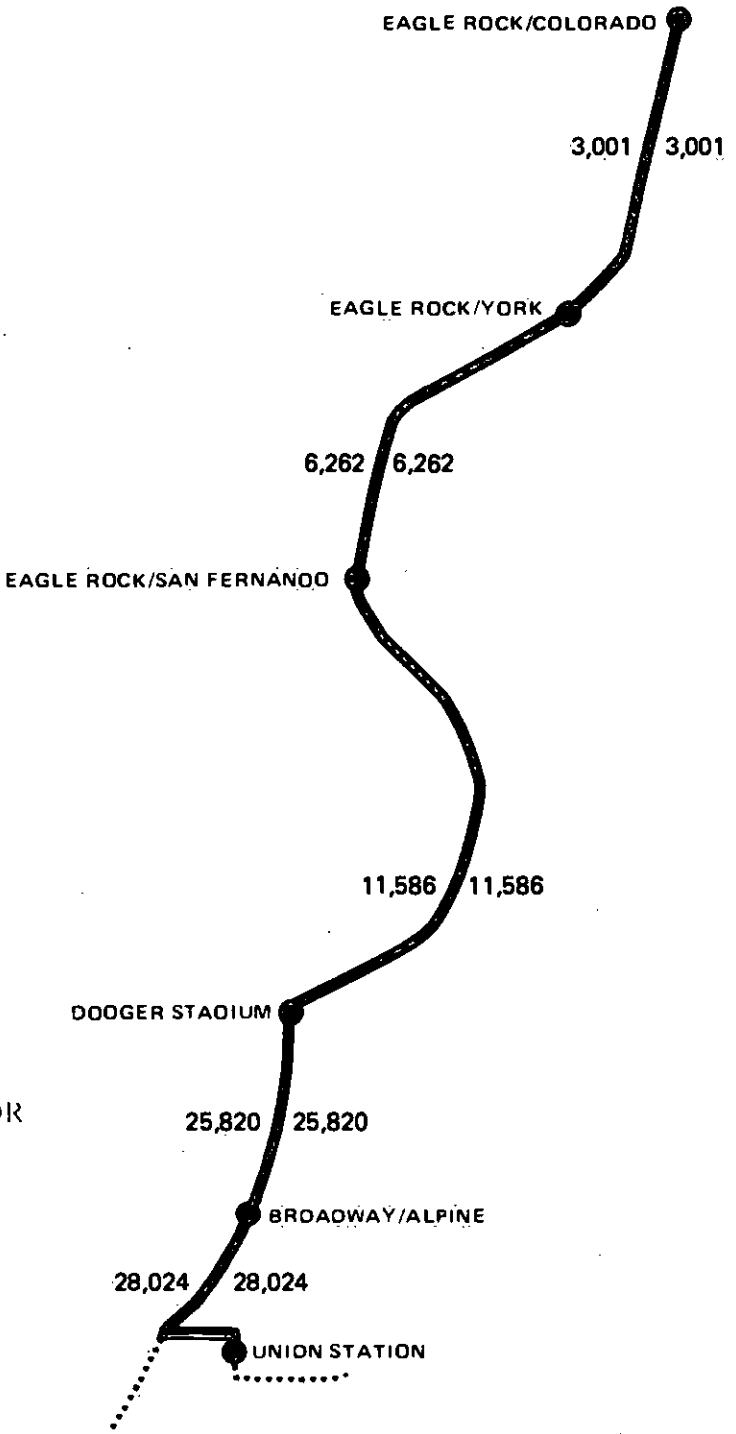
OPTION VI
SANTA ANA CORRIDOR
RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 16g



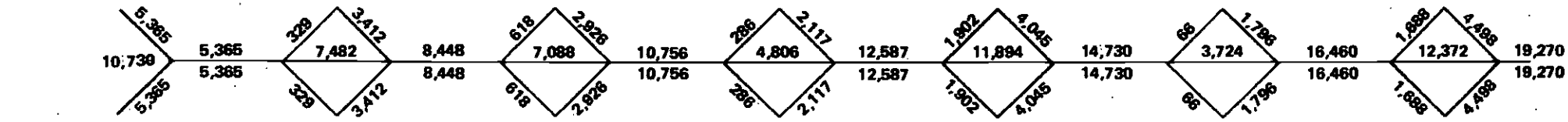
OPTION VI
LAX (LOS ANGELES INTERNATIONAL AIRPORT) CORRIDOR
RAIL LINE VOLUMES

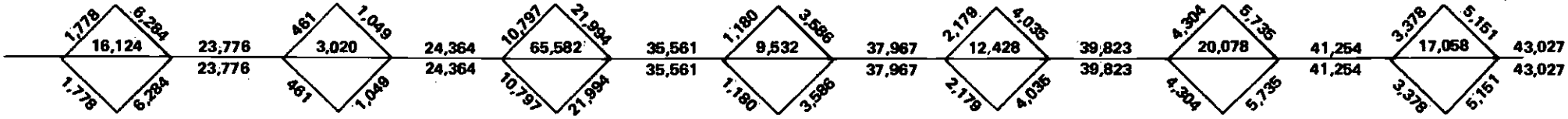
(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 16h

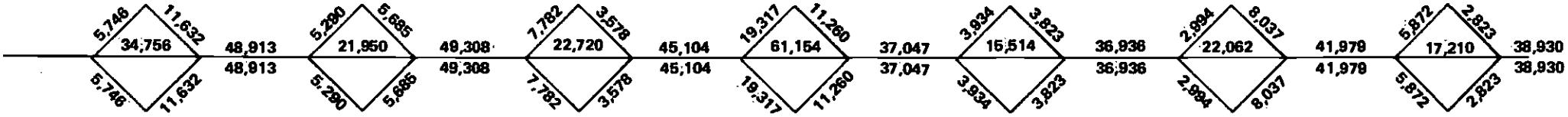


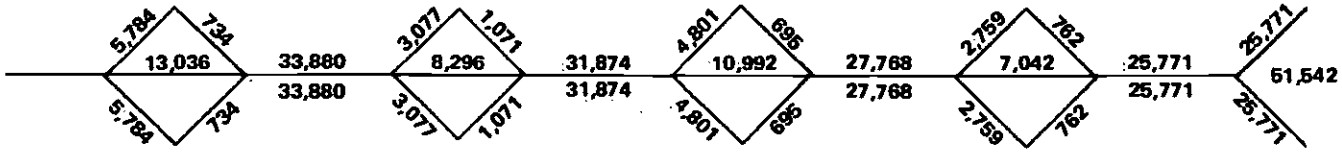
OPTION VI
EAGLE ROCK CORRIDOR
RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 16i



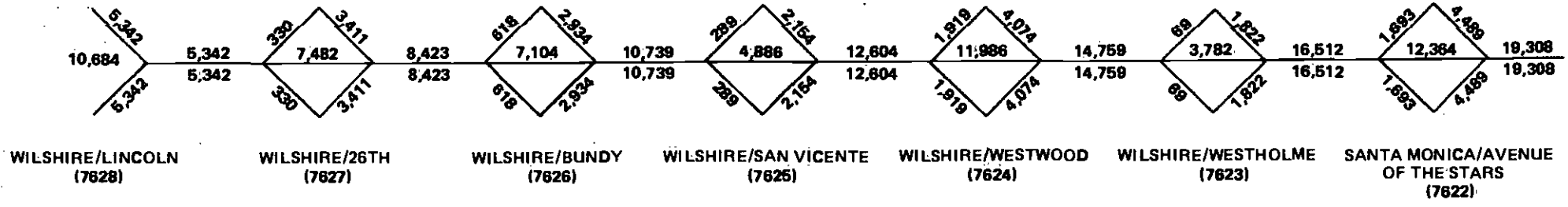


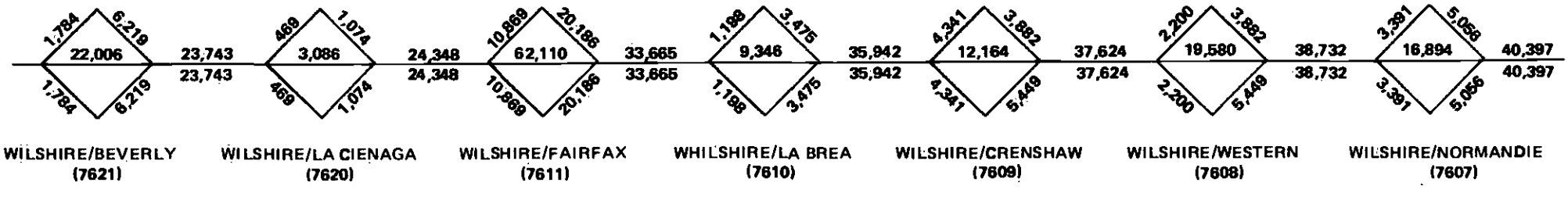


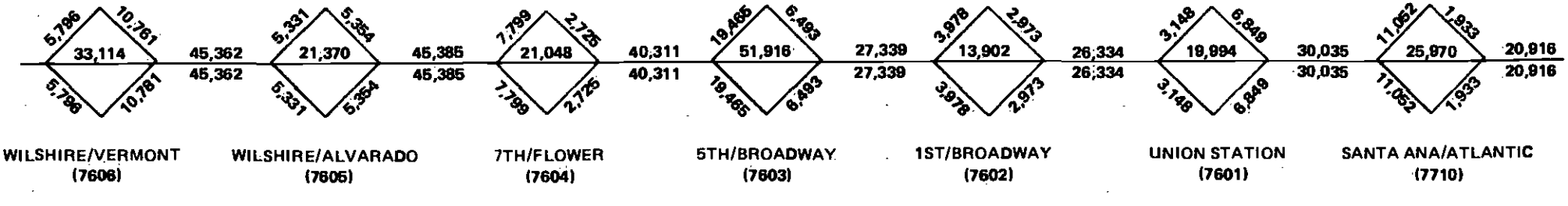


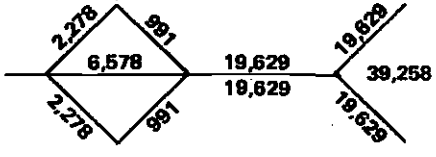
OPTION VI
LINE no. 2

BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 16i



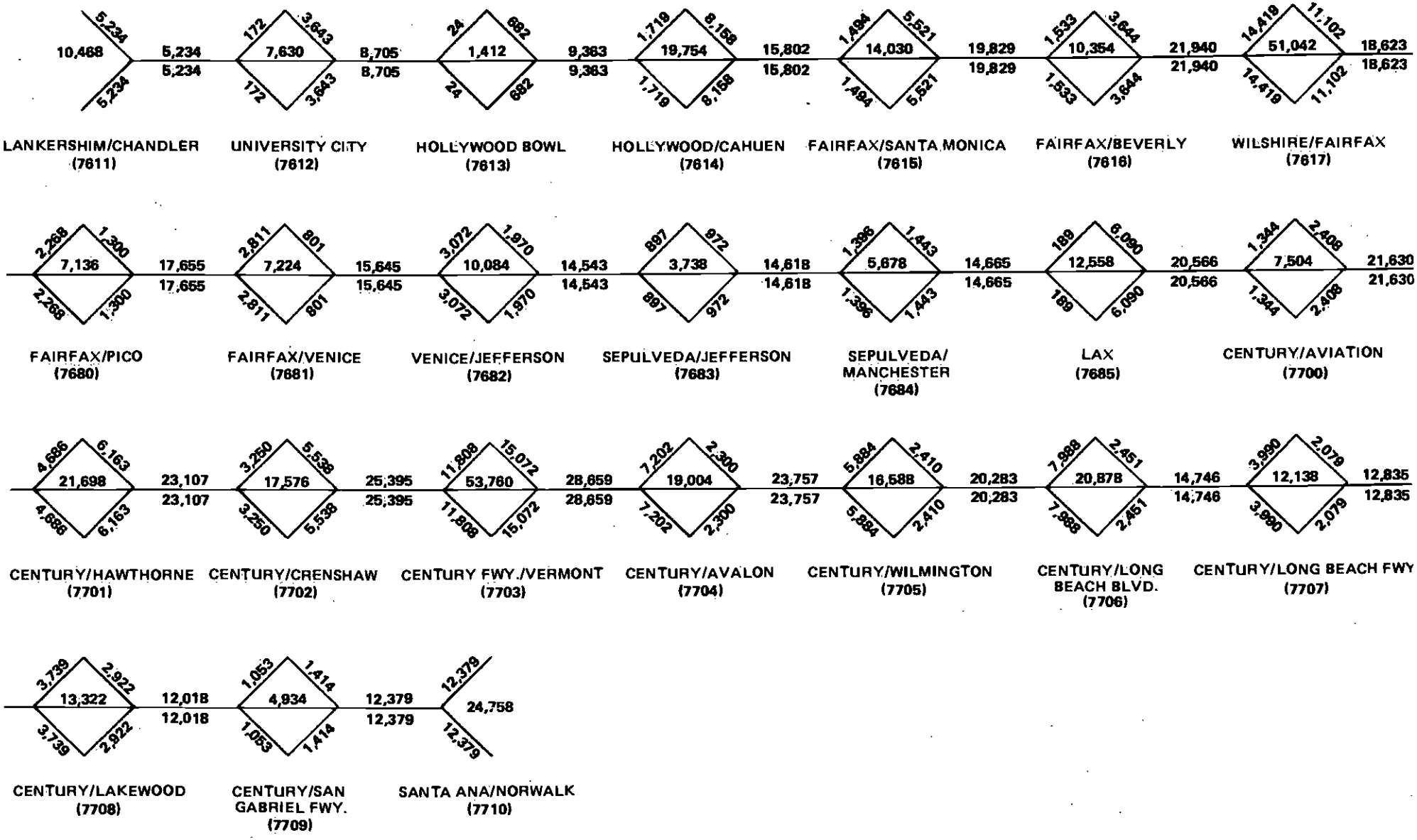






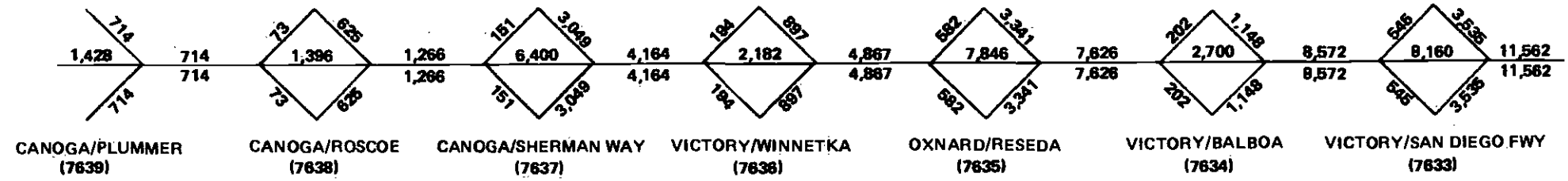
OPTION VI - LINE no. 9

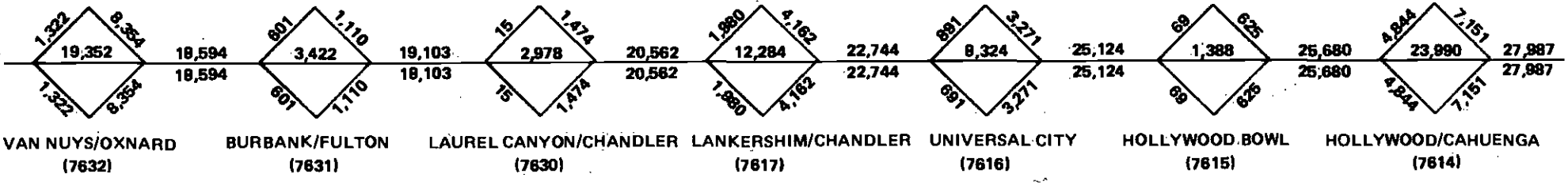
BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 16k

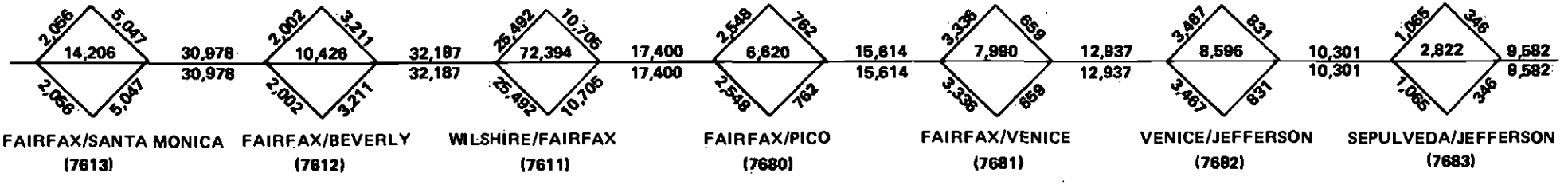


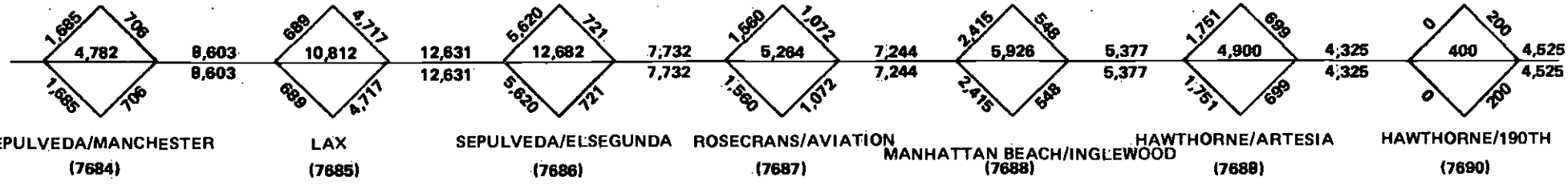
OPTION VI - LINE no. 10

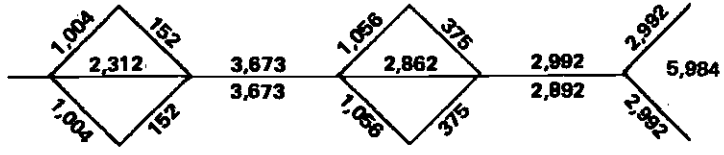
BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 16I





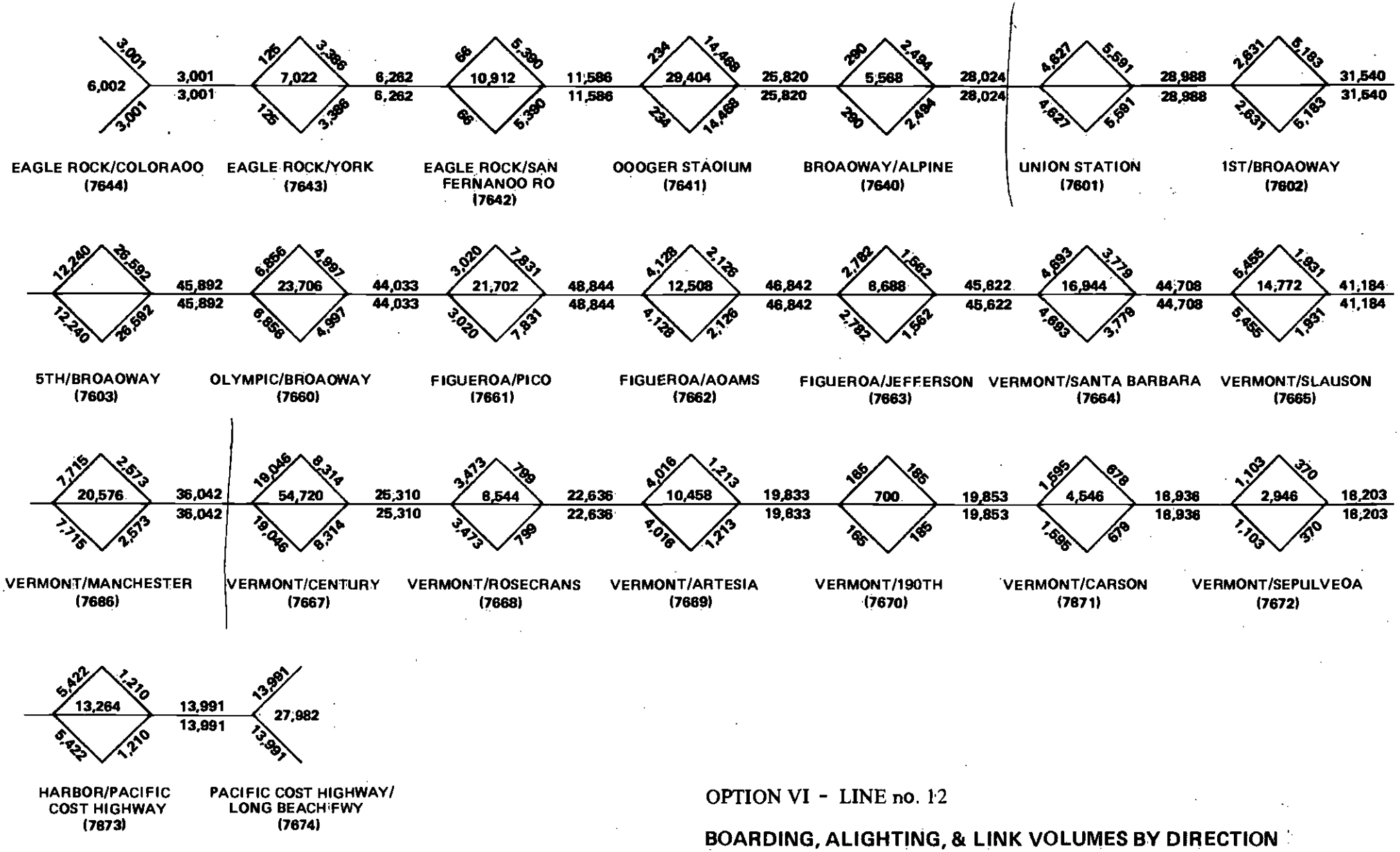






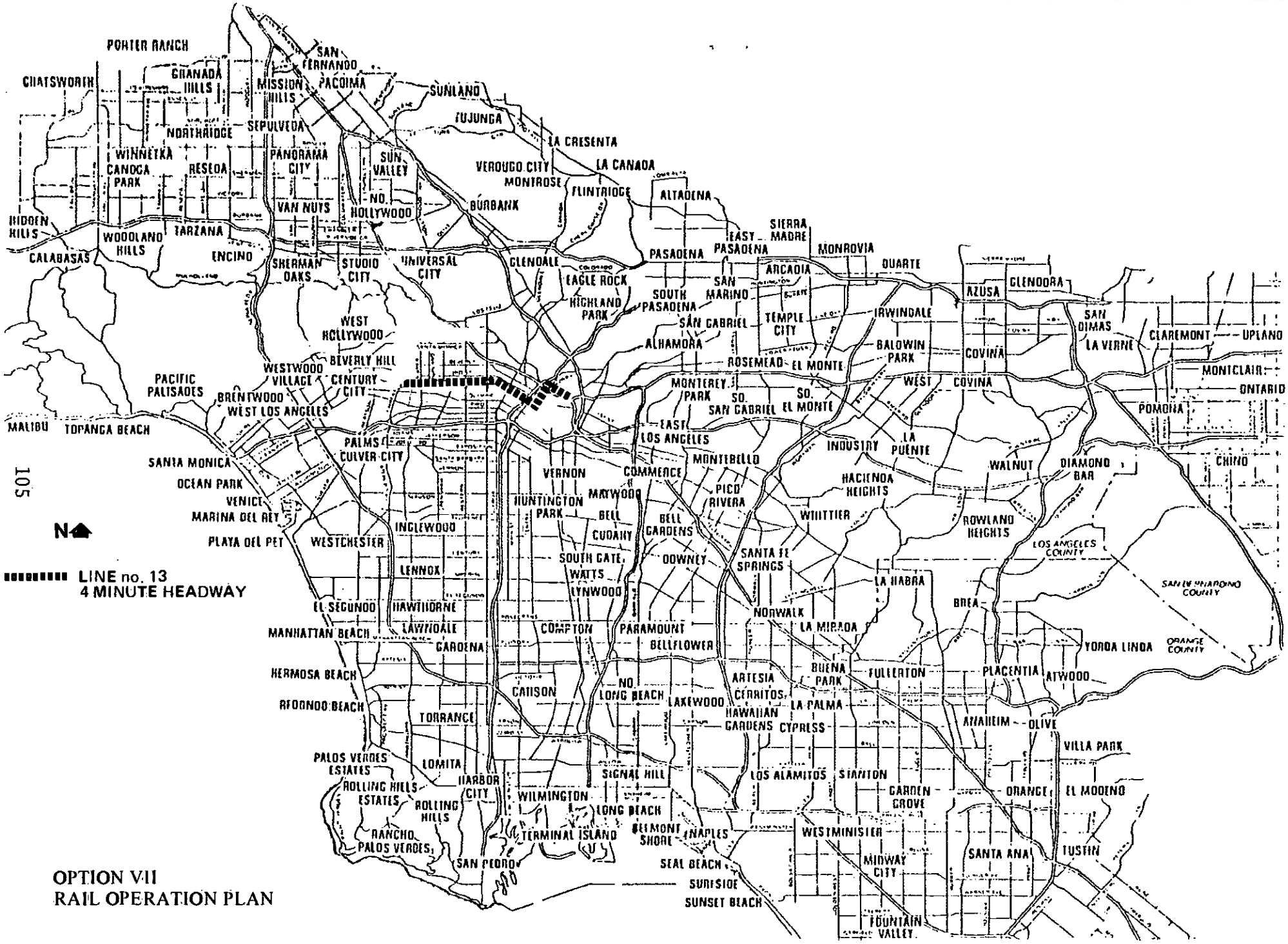
OPTION VI - LINE no. 11

BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 16m



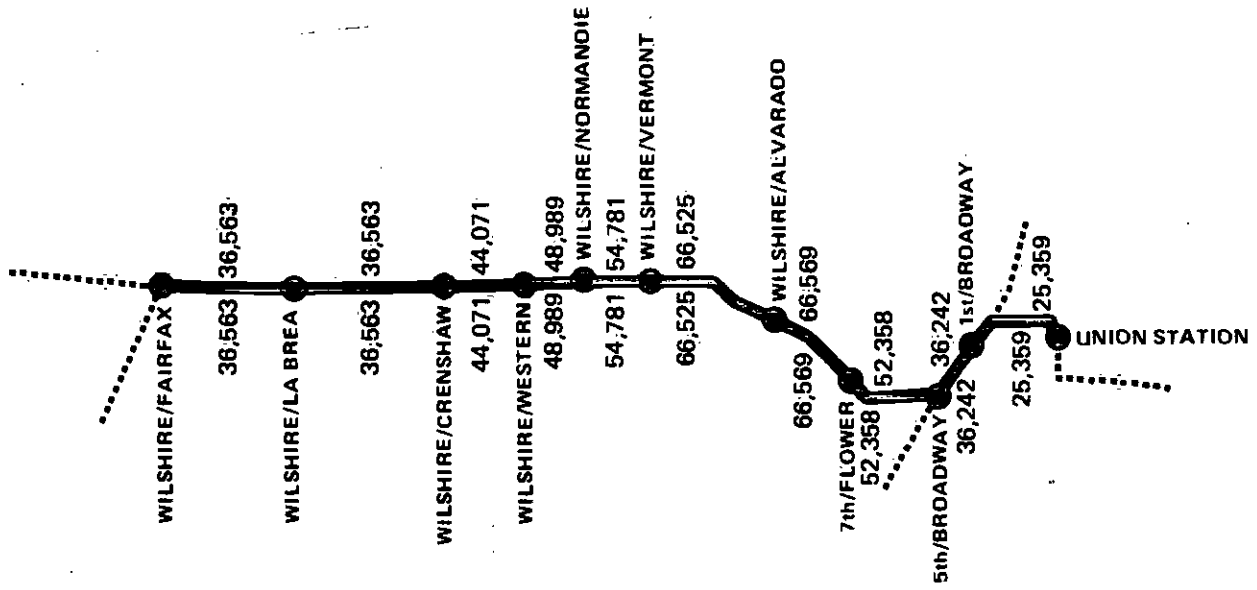
OPTION VI - LINE no. 12

BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 16n



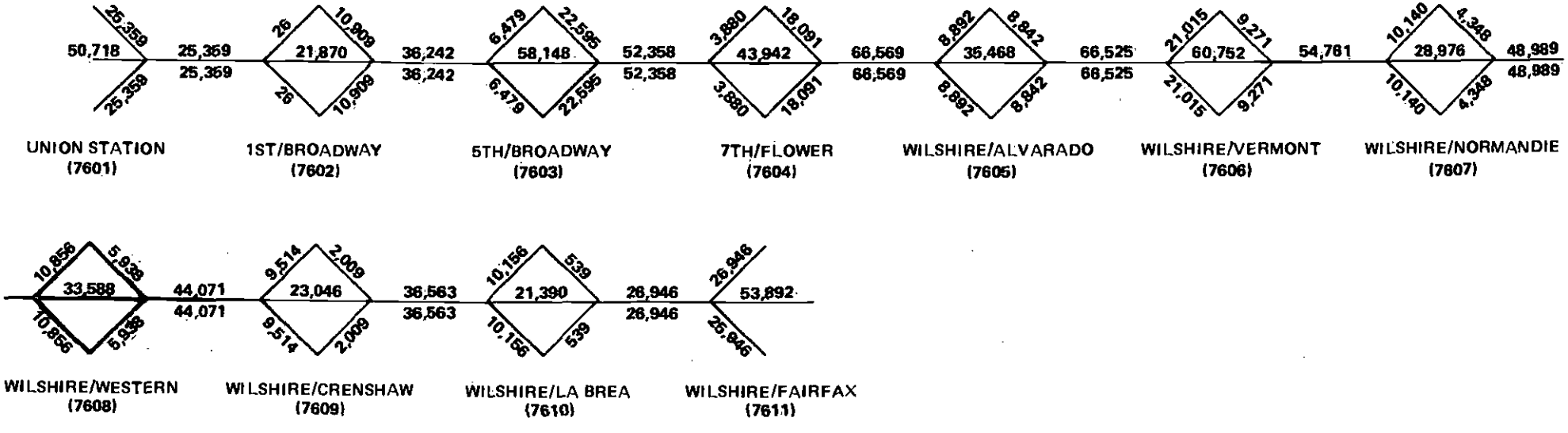
OPTION VII
RAIL OPERATION PLAN

Figure 17a



OPTION VII
STARTER LINE CORRIDOR
(MODIFIED)
RAIL LINE VOLUMES

(1995) AVERAGE DAILY LINK VOLUMES BY DIRECTION
Figure 17b



OPTION VII
LINE no. 13

BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 17c

West Los Angeles Corridor

Appearing in Options II, IV, V, and VI, the West Los Angeles corridor extends rail service west from Wilshire/Fairfax to Wilshire/Lincoln in Santa Monica. The highest one-way average daily volume occurs between La Cienega and Beverly on Wilshire for Options II, IV, and V. The maximum patronage volume occurs between Fairfax and La Cienega for Option VI. The maximum link load remains stable across Options II, IV, and V, varying slightly from 80,954 in Option II up to 84,340 in Option V. These options add rail corridors to the system without affecting the West Los Angeles maximum load point (MLP) to a large extent. With the addition of the LAX corridor in Option VI, the West Los Angeles MLP moves east one link and average daily corridor volume increases greatly to 97,424. Patronage numbers increase along the entire West Los Angeles corridor as other corridors are added to the rail network. This increase is slight, however.

These numbers suggest that patronage on a West Los Angeles extension to the Starter Line would be related to patronage levels in the priority corridor. Ridership does not vary significantly with the addition of new extension corridors. Adding the LAX corridor proves to be an exception. It does increase West Los Angeles ridership. The addition of the LAX corridor corresponds to a drop in patronage along the South Los Angeles corridor. This implies that trips along the LAX corridor will shift from South Los Angeles to Wilshire when the LAX corridor is added.

El Monte Corridor

The extension of service east from Union Station along the El Monte Busway alignment appears in Options II through VI. In all cases, patronage is highest close to the CBD and declines as it moves eastward. The daily volume estimates remain very stable across the options. Located between Union Station and the Golden State Freeway on the San Bernardino Freeway, the MLP volume varies from a low of 76,974 in Option II to 83,958 in Option VI. No clear relationship is evident between El Monte volumes and the inclusion of other corridors in the rail network. Adding the South Los Angeles and Century Freeway corridors seems to boost the El Monte patronage, but only by a very small amount. This low sensitivity to additional corridors indicates that El Monte users travel predominatly to destinations served by the Starter Line.

San Fernando Valley Corridor

Service is provided west from Lankershim/Chandler to Canoga/Plummer in Options III through VI. As expected, the highest estimated patronage occurs near the Starter Line, between Lankershim/Chandler and Laurel Canyon/Chandler. The variation in corridor volumes across options is small. Average daily corridor volumes vary between 39,030 in Option III to 43,258 in Option V for the MLP. Link volumes all along the corridor are also stable among options.

The volumes estimated for the San Fernando Valley corridor indicate that it is not a strong corridor. In all cases, link volumes fall below 10,000 from Oxnard/Reseda to the western corridor terminus. The line seems especially weak in the portion running north along Canoga. However, the patronage characteristics of transit users in this corridor will be evaluated in greater detail.

South Los Angeles and Century Freeway Corridors

Options IV, V, and VI include a rail corridor running south from 5th/Broadway along Vermont to the Pacific Coast Highway and east to the Long Beach Freeway. With 15 stations, it is the largest extension being considered. Since the Century Freeway corridor is always present together with the South Los Angeles corridor, it also will be considered here. It runs east from Aviation to the San Gabriel Freeway between Century Boulevard and Rosecrans. In Options V and VI, it is extended east to link up with the Santa Ana corridor at Norwalk.

The largest passenger volumes in the South Los Angeles corridor occur between Figueroa/Pico and Figueroa/Adams in all options. The volume declines as the total number of rail extensions increases. Option IV displays an MLP daily volume of 125,644. The number declines for Options V and VI, being 115,606 and 79,688, respectively. The presence of the LAX corridor in the west (Option VI) will draw some ridership from South Los Angeles. In the east, inclusion of rail in the Santa Ana corridor and linking the Century Freeway rail to it (Options V and VI) produces a similar effect.

Link volumes in the South Los Angeles corridor decline somewhat across options just as do the MLP numbers. This statement is true for those links north of the Century Freeway intersection point with Vermont Avenue. Below this intersection link volumes remain virtually constant for Options IV, V, and VI. This implies that changes in corridor volumes north of the interchange will be related to changes in the configuration of the Century Freeway corridor.

Link volumes along the Century Freeway corridor and their variation from option to option confirm this. West of Vermont, corridor volumes are similar in Options IV and V. In Option VI, the volumes increase significantly as the LAX corridor is added to the system. A similar increase occurs at the eastern end of the Century Freeway corridor. Connecting it to the Santa Ana rail alignment (Options V and VI versus Option V) nearly triples the average daily volume between Lakewood and the San Gabriel Freeway.

Both increases indicate that reduced travel times created by the LAX and the Santa Ana corridors make them an attractive alternative to using the Vermont alignment for the line-haul portion of travel. This will tend to draw some of the "marginal" trips in Option IV from the South Los Angeles corridor.

Santa Ana Freeway Corridor

Appearing in Options V and VI, the Santa Ana corridor assumes provision of rail service from Union Station to Norwalk along the general alignment of the Santa Ana Freeway. It appears slightly stronger in Option V than VI, though the corridor volumes are very similar. The daily link volumes at the MLP are 61,352 and 60,070, both occurring between Union Station and Santa Ana/Atlantic. The addition of the LAX and Eagle Rock corridors differentiates Option VI from V. At this stage, these corridors do not exhibit any strong relationship to the Santa Ana corridor; its use is affected only slightly.

LAX Corridor

The Los Angeles International Airport corridor (LAX) is included in the Option VI network only. Connecting with the Starter Line at Wilshire/Fairfax, it extends generally south, past the airport and down to Hawthorne/Pacific Coast Highway. The MLP occurs between Wilshire/Fairfax and Fairfax/Pico with an estimated daily corridor volume of 72,046. Link volumes decrease as one moves down the corridor and drop under 50,000 below Sepulveda/Jefferson. Below the Century Freeway alignment, average daily volumes do not total much more than 15,000. Below Hawthorne/Artesia, volumes remain below 10,000.

Eagle Rock Corridor

The final potential rail extension being considered is the Eagle Rock corridor. Tied into Union Station, this line runs north past Dodger Stadium.

Adding five stations to the rail system, its MLP is located between Union Station and Broadway/Alpine. The calculated average daily volume at that point is 56,048. The line remains relatively strong to Dodger Stadium, after which patronage drops off sharply.

TRANSIT TRAVEL IN THE STARTER LINE CORRIDOR

The levels of potential rail system development reviewed above will have varying impacts on patronage levels in the Starter Line corridor. Of particular concern are link volumes and entering and exiting volumes for stations in the priority corridor. The latter is especially relevant. Understanding the relationship between possible future rail system extensions and the passenger volumes each will generate in Starter Line stations provides information that can be considered during station design work.

Basic information on Starter Line patronage is presented by option below. First, the calculated passenger loadings by line are summed to present corridor level boardings, alightings, and link volumes. Total station activity levels are next summarized and discussed in some detail. Again, all information is presented in terms of average 24-hour volumes. This information is then extended with a discussion of conversion factors to generate peak-hour and peak 20-minute volumes from the 24-hour summaries.

Total Patronage Levels in the Corridor

Starter Line corridor diamond map summaries are presented in Figures 18 through 24, which illustrate average 24-hour link volumes, boardings, and alightings. All information is directional. In addition, the total boardings and alightings at each station have been summed for both directions and added together. This figure provides an indication of the relative strength of each station in the corridor in terms of rail trip ends. After presenting this information on the diamond maps, it is presented in tabular form to facilitate comparisons.

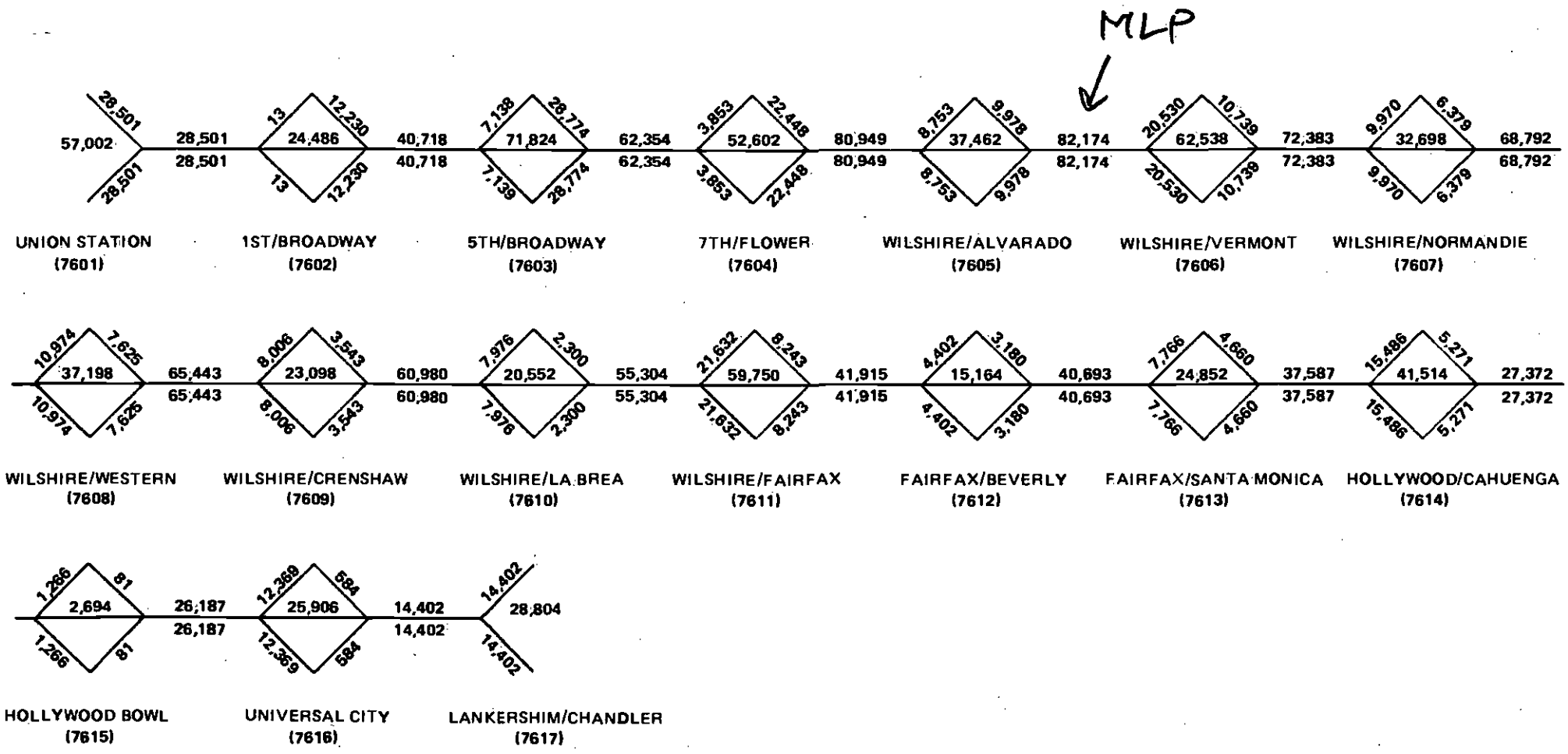
The priority corridor MLP generally occurs near or in the western portion of the CBD. Using Option I (Starter Line only) as a base reference, its MLP occurs between Wilshire/Vermont and Wilshire/Alvarado with an average two-way volume of 164,348. Options II, III, and IV have the same MLP location with volumes of 183,482, 176,068, and 191,508, respectively. These numbers represent 11.6, 7.1, and 16.5 percent increases over the Option I MLP.

The MLP occurs one link east for Options V and VII, between 7th/Flower and Wilshire/Alvarado. With a 19.9 percent increase over Option I's MLP, Option V has a two-way average daily maximum volume of 197,078. Option VII, representing a scaled-back version of the Starter Line, has an MLP of 133,138, a 19 percent decrease from the highest Starter Line volume.

Option VI not only has a high MLP, but it occurs further east than in any other option, between 1st/Broadway and 5th/Broadway. The expected two-way average daily volume at this point is 191,852. While this option has the maximum extent rail system, its MLP is slightly lower than Option V's. Additional analysis reveals that this result need not be inconsistent. The additional corridor in Option VI, LAX, provides opportunities for trip-making that do not require travel in the priority corridor. In fact, its presence could draw some trips away from the Starter Line by providing a less circuitous route (in terms of total trip cost) for some trip movements.

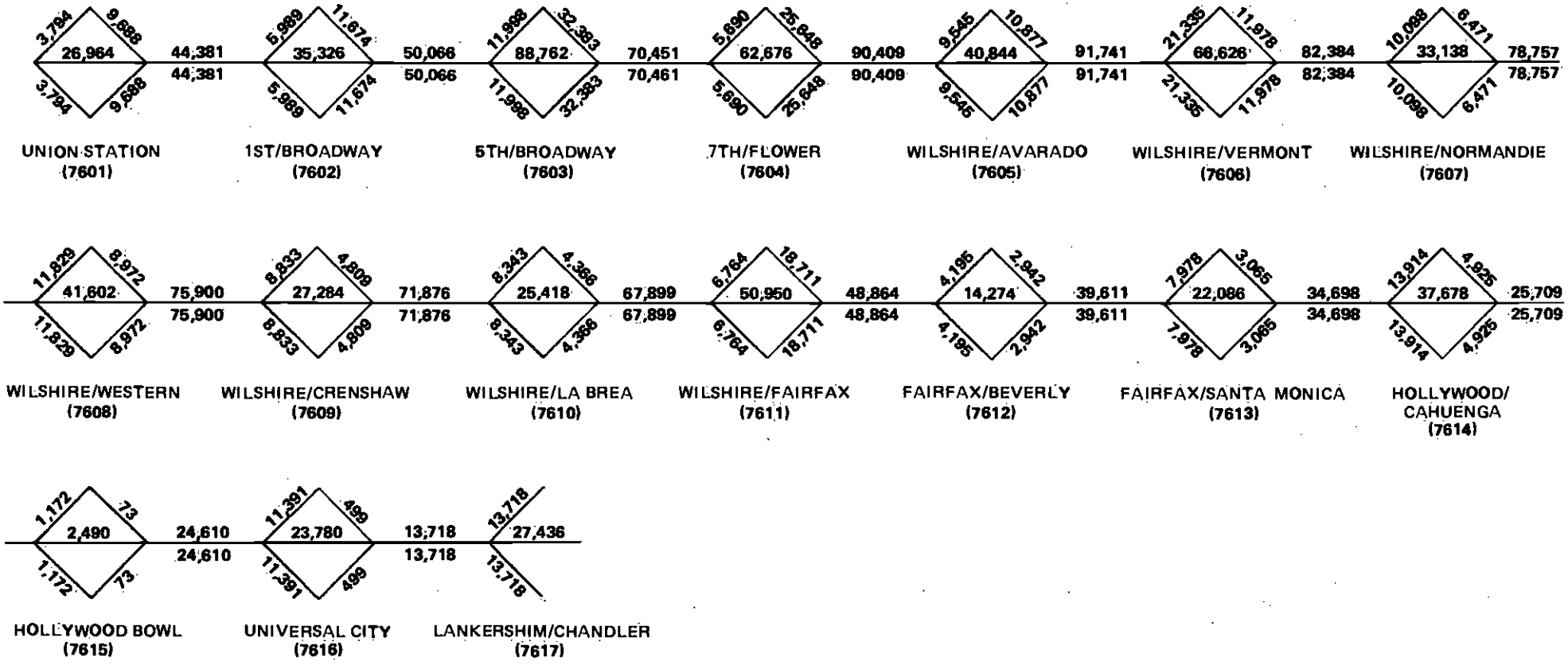
Table 26 summarizes the 24-hour entering and exiting average volumes for the Starter Line stations for all options. This information highlights the potential for increased patronage levels at stations if rail extensions to the Starter Line are built.

While most stations will experience increases in entering and exiting traffic, Union Station experiences quite the opposite. For Options II through V, these volumes are much lower than those projected for the Starter Line only. This changes only with very large rail systems such as those making up Options V and VI. As corridors are added to the system, fewer transfers to rail will be required at Union Station. The boarding point of a rail trip (or rail portion of a trip) will be closer to the trip origin or destination. The same holds true for the alighting point.



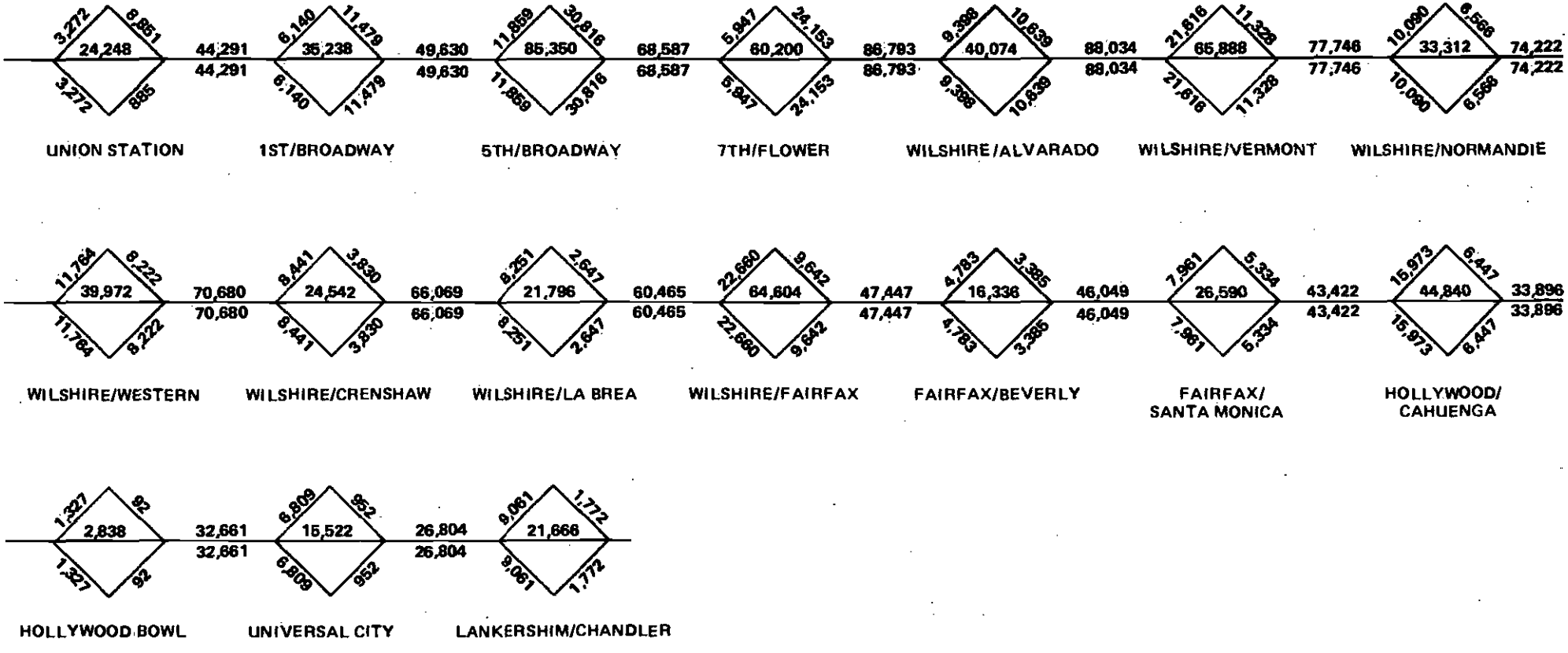
OPTION I
PRIORITY CORRIDOR

BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 18



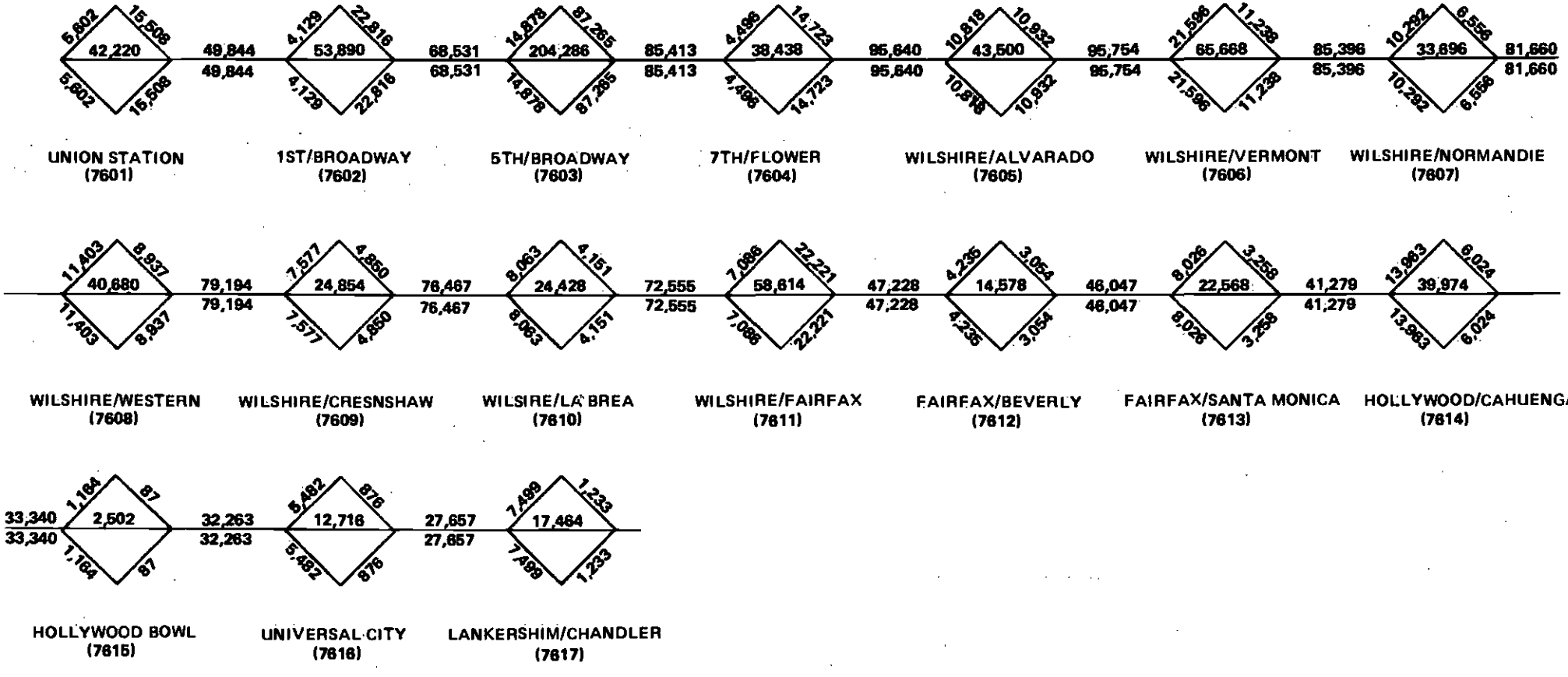
OPTION II
PRIORITY CORRIDOR

BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 19



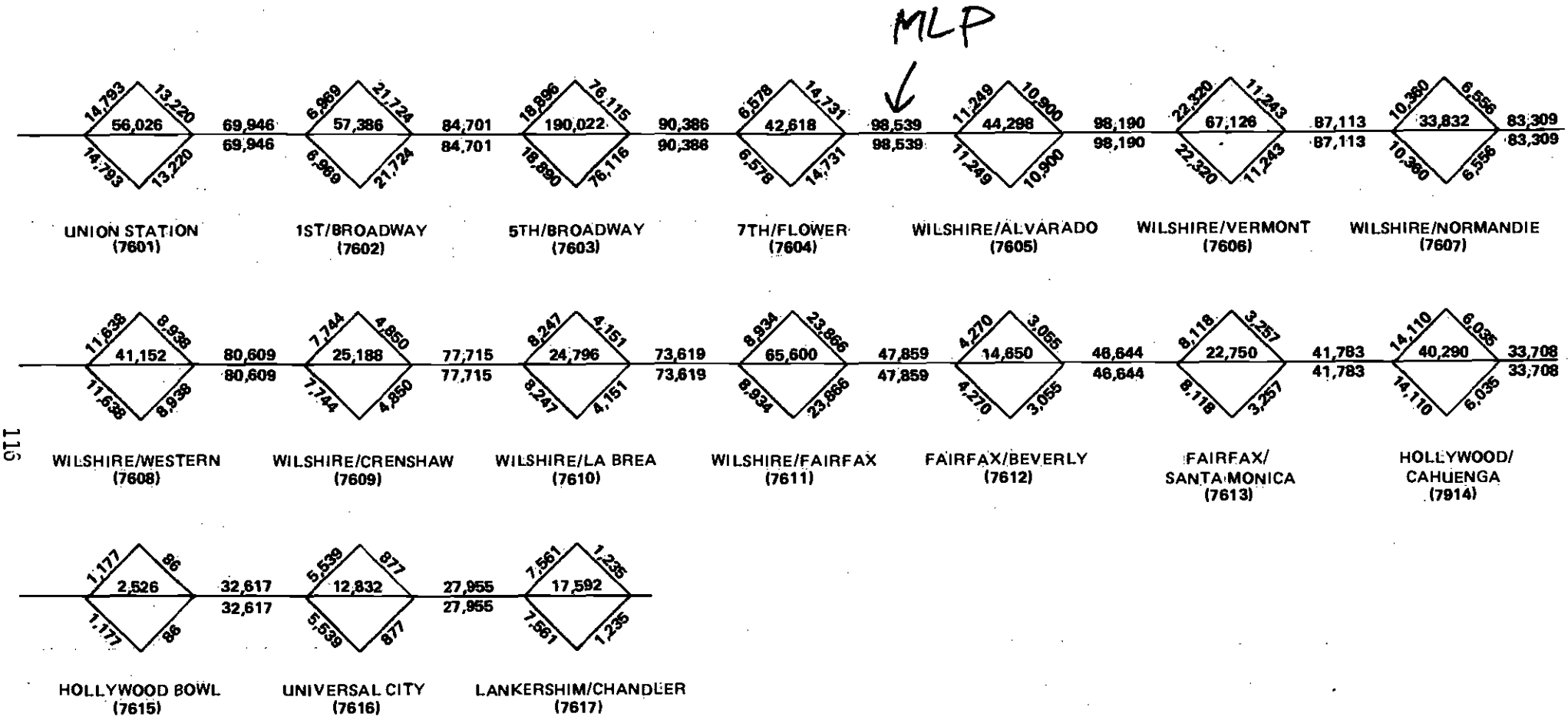
OPTION III
PRIORITY CORRIDOR

BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 20



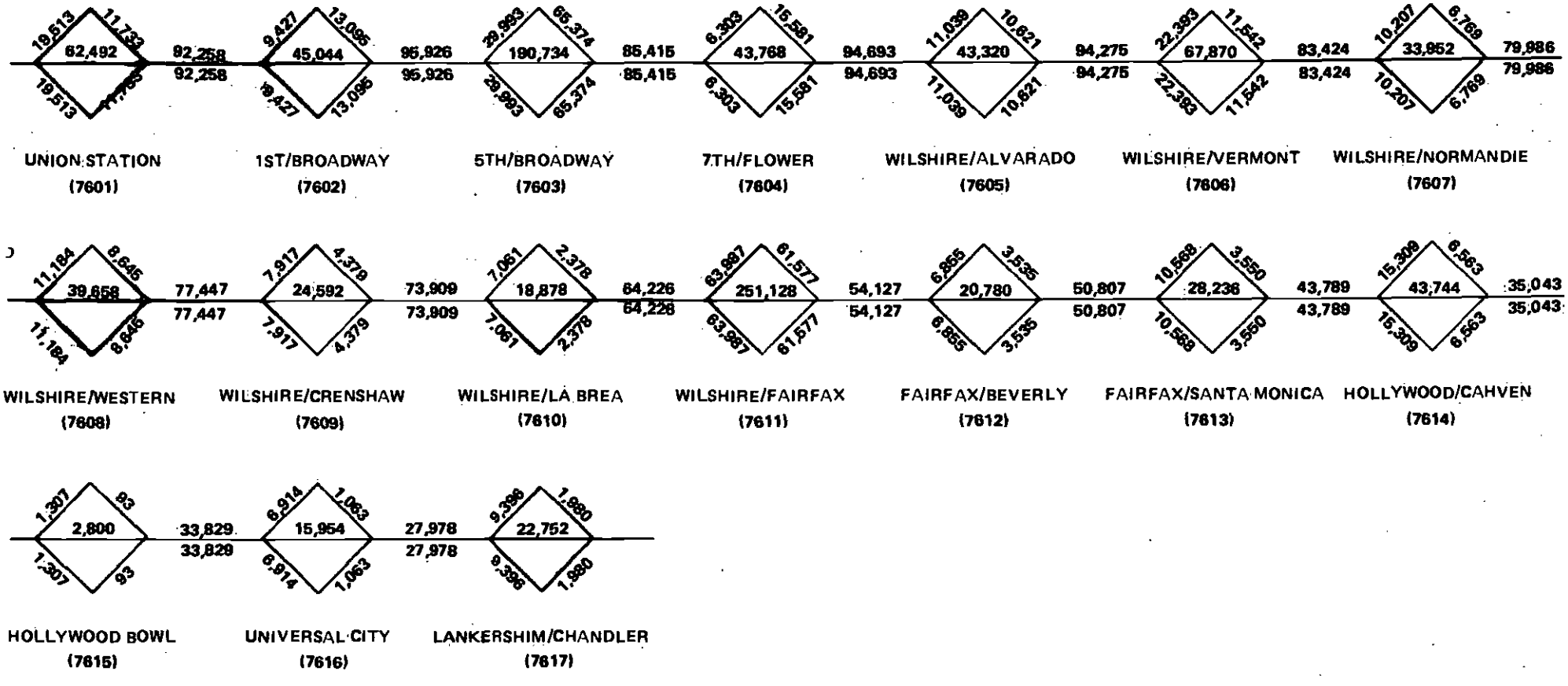
OPTION IV
PRIORITY CORRIDOR

BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 21



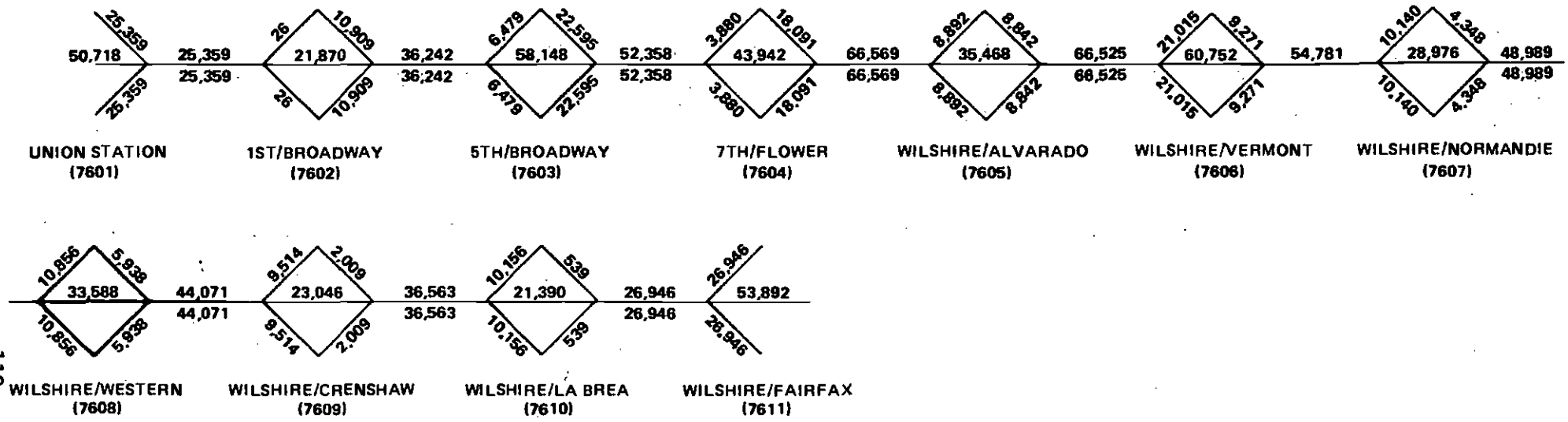
OPTION V
PRIORITY CORRIDOR

BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 22



OPTION VI
PRIORITY CORRIDOR

BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 23



OPTION VII
PRIORITY CORRIDOR

BOARDING, ALIGHTING, & LINK VOLUMES BY DIRECTION
(1995) AVERAGE DAILY VOLUMES
Figure 24

Table 26
24-HOUR ENTERING AND EXITING RAPID TRANSIT STATION VOLUMES FOR THE STARTER LINE

Station Location	Option I	II	III	IV	V	VI	VII
Union Station	57,002	26,964	24,246	40,220	56,026	62,492	50,718
1st/Broadway	24,486	35,326	35,238	53,890	57,386	45,044	21,870
5th/Broadway	71,824	88,762	85,350	204,286	190,022	190,734	58,148
7th/Flower	52,602	62,676	60,200	38,438	42,618	43,768	43,942
Wilshire/Alvarado	37,462	40,844	40,074	43,500	44,298	43,320	35,468
Wilshire/Vermont	62,538	66,626	65,888	65,668	67,126	67,870	60,752
Wilshire/Normandie	32,698	33,138	33,312	33,696	33,832	33,952	28,976
Wilshire/Western	37,198	41,602	39,972	40,680	41,152	39,658	33,588
Wilshire/Crenshaw	23,098	27,284	24,542	24,854	25,188	24,592	23,046
Wilshire/La Brea	20,552	25,418	21,796	24,482	24,796	18,878	21,390
Wilshire/Fairfax	59,750	50,950	64,604	58,614	65,600	251,128	53,892
Fairfax/Beverly	15,164	14,274	16,336	14,578	14,650	20,780	-
Fairfax/Santa Monica	24,852	22,086	26,590	22,568	22,750	28,236	-
Hollywood/ Cahuenga	41,514	37,678	44,840	39,974	40,290	43,744	-
Hollywood Bowl	2,694	2,490	2,838	2,502	2,526	2,800	-
Universal City	25,906	23,780	15,522	12,716	12,832	15,954	-
Lankershim/Chandler	28,804	27,440	21,666	17,464	17,592	22,752	-

The higher numbers generated for Options V and VI relate to the total level of service offered by their full extent rail systems. While transfers to rail are not required at Union Station by these networks, an offsetting factor is at work. These rail systems increase transit service relative to the constant level of service for highway trips to the extent that they attract more riders to transit. These additional transit trips compensate for the reduced traffic at Union Station that occurs as a result of the loss in transfer volume resulting from the extensive rail systems. Based on this, Union Station will not experience an increase in boarding and alighting volumes under anything other than the most vigorous rail scenarios.

Many of the stations along the Wilshire portion of the priority corridor exhibit modest increases in use as new corridors are added to the rail network. Two stations, however, have large increases in volume with new additions to the rail system. They are 5th/Broadway and Wilshire/Fairfax. This occurs as a function of the rail operating plans assumed in the options analyzed. In both cases, the operating plan establishes these stations as interface points for rail lines passing through different service sheds.

The Wilshire/Fairfax station illustrates this point clearly. In Option II, for example, the only way to travel from the Fairfax portion of the Starter Line to the West Los Angeles extension by rail is to transfer at Wilshire/Fairfax. This case is emphasized in Options IV and V with the addition of the San Fernando Valley corridor. The addition of the LAX corridor in Option VI increases the number of transfers at Wilshire/Fairfax.

Placing numbers on the entering and exiting volumes for Wilshire/Fairfax indicates the importance of expanding this station location. The Option I 24-hour entering and exiting total volume is 59,750. This is exceeded by all other option estimates except Option II. Options III, IV, and V all indicate similar or increasing volumes at the station. Given that additional corridors eliminate the "end of the line" nature of Wilshire/Fairfax, these numbers indicate that it will be a strong station under a variety of rail system configurations. The estimated patronage at this station for Option VI (251,128) exceeds station volume estimates for all other stations under a maximum extent rail scenario.

The growth potential of the 5th/Broadway station exceeds even that of Wilshire/Fairfax. Twenty-four-hour entering and exiting volumes exceed the Starter Line-only estimate (71,824) in all cases. The inclusion of the South Los Angeles corridor in Options IV, V, and VI causes very large increases in station use.

Table 27 supports the assertion that 5th/Broadway grows in importance as more corridors are added. With only the Starter Line (Option I), 11.5 percent of priority corridor boardings and alightings occur there. For options with South Los Angeles, the proportion of station activity occurring at 5th/Broadway never drops below 20 percent, double that in the first option.

Table 27
PERCENT OF 24-HOUR ENTERING AND EXITING RAPID TRANSIT STATION VOLUMES FOR THE STARTER LINE

Station Location	Option I	II	III	IV	V	VI	VII
Union Station	.092%	.043%	.039%	.061%	.078%	.065%	.117%
1st/Broadway	.040	.056	.057	.078	.076	.047	.051
5th/Broadway	.115	.141	.137	.227	.250	.200	.135
7th/Flower	.085	.100	.097	.055	.056	.046	.102
Wilshire/Alvarado	.061	.065	.064	.063	.058	.045	.082
Wilshire/Vermont	.101	.106	.106	.095	.088	.071	.141
Wilshire/Normandie	.053	.053	.053	.049	.045	.036	.067
Wilshire/Western	.060	.066	.064	.059	.054	.041	.078
Wilshire/Crenshaw	.037	.043	.039	.036	.033	.026	.053
Wilshire/Los Angeles Brea	.033	.041	.035	.035	.033	.020	.050
Wilshire/Fairfax	.097	.081	.104	.085	.086	.263	.125
Fairfax/Beverly	.025	.023	.026	.021	.019	.022	-
Fairfax/Santa Monica	.040	.035	.043	.033	.030	.030	-
Hollywood/Cahuenga	.067	.060	.072	.058	.053	.046	-
Hollywood Bowl	.004	.004	.005	.004	.003	.003	-
Universal City	.042	.038	.025	.018	.017	.017	-
Lankershim/Chandler	.047	.044	.035	.025	.023	.024	-

Peak-Hour and Peak 20-Minute Factor Analysis

To determine a peak-hour and a peak 20-minute factor to apply to the 24-hour, two-directional volumes generated by the regional travel demand models, a special analysis was conducted using information gathered by the Bus Planning Department.[5] The analysis reviewed recent computer profiles of bus patrons in the Wilshire Boulevard and Hollywood Express Bus (to downtown) corridor. The data gathered included passengers on-board at the peak point of each line for the A.M. and P.M. peak hours as well as the peak A.M. and P.M. 20-minute period. The data also was summarized to estimate the total all-day volumes on those lines by direction.

Table 28 summarizes the peak-hour and peak 20-minute factor calculations for bus routes within the Wilshire corridor measured at the CBD cordon. Routes included in that summary also considered the applicable San Bernardino busway lines which circulate through the downtown area and terminate on Wilshire Boulevard either at Western Avenue or Wilton Place. These routes were included because the regional 24-hour demand forecasts indicated that a substantial number of Starter Line users, destined for the mid-Wilshire area, had transferred from San Bernardino busway lines.

Two rather striking facts should be noted in the table. First, on a (two-way) non-directional basis, the percent of peak-hour passengers represents a rather small percentage. This stems from the fact that this particular corridor exhibits a more stable and continuous all-day ridership. The second fact, of equal importance to corridor ridership, is that the peak period volumes are evenly balanced in both directions with approximately 55 percent of the volume occurring in an eastbound direction and 45 percent traveling westbound.

These results can be contrasted with those in Table 29. Table 29 presents similar information for Hollywood Freeway express routes which provide peak-hour service to downtown Los Angeles. In this latter case, the resulting values indicate a more traditional pattern of a higher peak-hour percentage and a more accentuated directional split.

Combining totals from both of these two tables and deriving from those values an overall percentage to convert the 24-hour two-way directional volumes to peak-hour one-directional volumes results in a value of 7.3 percent. This value, however, reflects current bus ridership and does not account for the higher peaking concentrations which normally occur on heavy rail systems. Previous work conducted during the alternatives analysis phase indicated that comparable peak-hour statistics from other systems can range anywhere from 10 to 12 percent of the total daily two-way volume. Recognizing fully that the Wilshire corridor is unique, given the extremely well-balanced flow in both directions (which was also evidenced in the regional travel demand forecast outputs displayed in a "production" and "attraction" format), the selection of a reasonable peak-hour factor for this corridor should range somewhere between the present value and values typically found in other rail systems. For this

[5] Update of Passenger Volume Estimates - Rapid Transit, SCRTD Bus Planning Department, February 18, 1981.

$$P/B_{(AVERAGE)} = \frac{4580 + 1497}{\left[(34,680 + 35,212) + (7,313 + 6549)\right]_{122}} = \frac{4580 + 1497}{69,892 + 13,862} = \frac{6077}{83,754} = 7.26\%$$

$P/B_{WILSHIRE} = \frac{4580}{69,892} = 6.55\%$, SAY: 6.6%; $P/B_{Hollywood} = \frac{1497}{13,862} = 10.8\%$ SAY: 7.3% (AVE)

Table 28
PEAK-HOUR AND PEAK 20-MINUTE FACTORS FOR WILSHIRE CORRIDOR TRANSIT LINES AT THE CBD CORDON

Route	INBOUND PASSENGERS A.M. Peak	A.M. 20-Min.	Total	OUTBOUND PASSENGERS A.M. Peak	A.M. 20-Min.	Total
3	1,172	451	5,759	887	110	4,481
4	324	109	5,713	1,405	470	6,109
26	1,429	628	8,370	241	87	8,211
44	715	332	4,870	579	325	4,889
83	940	326	9,968	490	130	10,931
760	—	—	—	85	39	129
762	—	—	—	74	36	97
764	—	—	—	50	27	62
481	—	—	—	138	80	303
	4,580 (C)	1,846	34,680 (A)	3,949 (D)	1,304	35,212 (B)

Note: Total A.M. peak-hour percent of daily ridership:

Inbound = 13.2 %
Outbound = 11.2 %
Non-Directional = 12.2

Total A.M. peak 20-minute percent of peak-hour ridership:

Inbound = 40.3
Outbound = 33.0
Non-Directional = 37.0

Table 29
PEAK HOUR AND PEAK 20-MINUTE FACTORS FOR HOLLYWOOD FREEWAY EXPRESS ROUTES

	INBOUND PASSENGERS			OUTBOUND PASSENGERS		
Route	A.M. Peak	A.M. 20-Min	Total	A.M. Peak	A.M. 20-Min	Total
35	523	244	3,502	727	293	3,731
42X	64	37	134	—	—	—
91X	244	95	366	—	—	—
93	478	238	3,068	210	80	2,818
123	38	—	38	—	—	—
716	150	64	205	—	—	—
	1,497	678	7,313	937	373	6,549

Note: Total A.M. peak-hour percent of daily ridership:

Inbound = 20.5 %
Outbound = 14.3 %
Non-Directional = 17.6 %

Total A.M. peak 20-minute percent of peak-hour ridership:

Inbound = 45.3
Outbound = 39.8
Non-Directional = 43.2

reason, a mid-range or nine percent value has been chosen to develop (in Table 30) peak-hour values for each maximum load point forecasted in each of the Starter Line corridor options.

Combining the values shown in Tables 28 and 29 for the peak 20-minute period, a weighted value of 38 percent was calculated to estimate the proportion of the peak-hour ridership occurring in the peak 20-minute period. This value is indicative of those typically found elsewhere and has been used directly in the estimation of peak 20-minute values shown in Table 30.

ANALYSIS OF SPECIAL GENERATORS

This section describes the potential for additional system ridership created by special generators located along or near the Starter Line, that is, riders not included in the normal modeling process. The primarily tourist- or entertainment-oriented special generators vary in their activity patterns, i.e., the time of day in which peak activity occurs, daily attendance volumes, and nature of operation. Daily attendance volumes for special generators along the Starter Line range from 1,300 persons at CBS Television City, to nearly 30,000 persons at Universal Studios. It follows that the variability in use patterns may affect the operation of the rail system.

Description of Special Generators

The locations of special generators along or near the proposed Starter Line are shown in Figure 25. The following discussion describes the nature of operation, e.g., tourism vs. entertainment, annual and daily attendance volumes, and the average number of activity days per year. Special generators described include:

- Los Angeles County Music Center
- Los Angeles County Art Center
- The Farmers Market
- CBS Television City
- The Hollywood Bowl
- Universal Studios

Summary data for the above are presented in Table 31.

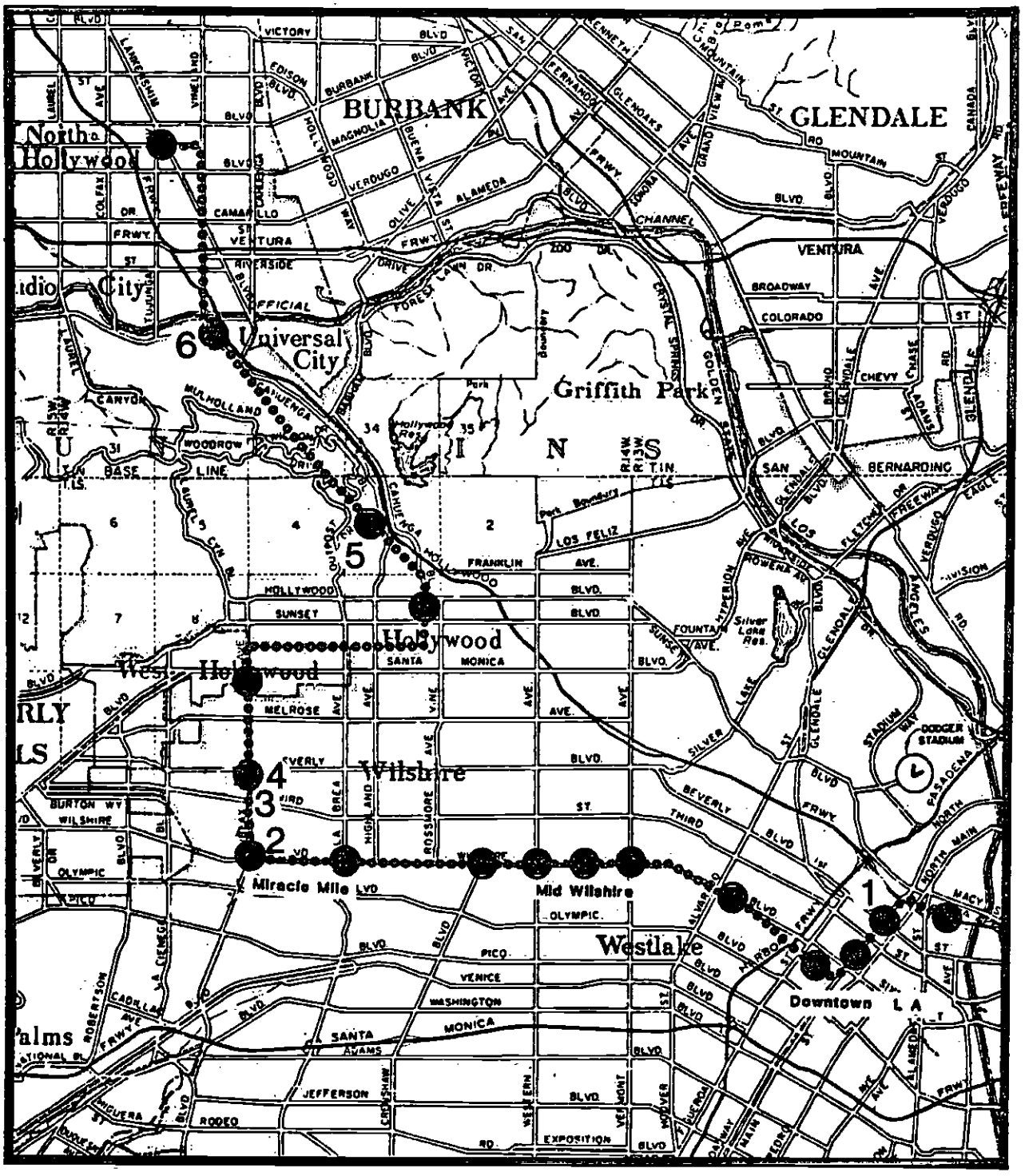
Los Angeles County Music Center

The Los Angeles County Music Center is a major focal point for the performing arts in metropolitan Los Angeles. The Music Center consists of the Dorothy Chandler Pavilion, the Mark Taper Forum, and the Ahmanson Theater. Total seating capacity for the three theaters is approximately 6,010 persons. Annual attendance at all theaters and facilities can reach 1.6 million persons.

Among the 13 resident, non-profit corporations comprising the Music Center are the Los Angeles Philharmonic Association, the Music Center Opera

Table 30
STARTER LINE PEAK-HOUR AND PEAK 20-MINUTE VOLUME ESTIMATES

Option	24-Hour Maximum Load Point	Peak Hour Value	Peak 20-Min. Value
I	164,348	14,791	5,620
II	183,482	16,513	6,275
III	176,068	15,846	6,021
IV	191,508	17,236	6,550
V	197,078	17,737	6,740
VI	191,852	17,267	6,561
VII	133,138	11,982	4,553



1. LOS ANGELES COUNTY MUSIC CENTER
2. LOS ANGELES COUNTY ART CENTER
3. FARMERS MARKET
4. CBS TELEVISION CITY
5. HOLLYWOOD BOWL
6. UNIVERSAL STUDIOS

Figure 25 SCRTD STARTER LINE AND LOCATIONS OF SPECIAL GENERATORS

Table 31
SPECIAL GENERATOR ATTENDANCE DATA

Special Generator	Average Attendance Per Event or Day	Average No. of Days of Activity Per Year	Total Yearly Attendance
L.A. County Music Center[1]	4,500[2]	Variable	1.6 million
L.A. County Art Center/ Page Museum	1,600	310	497,449
Farmers Market	9,500	315	3.0 million
CBS Television City	1,300	362	Up to 300,000
Hollywood Bowl			
In-Season	12,300	71	871,600
Off-Season	2,300	240	549,000
Universal Studios	Up to		
In-Season	30,000	92	3.8 million
Off-Season	8,000	271	

(1) Includes the Forum, Ahmanson Theater, and Dorothy Chandler Pavilion.

(2) Assumes 75 percent of capacity per event.

Association, and the Center Theater Group. Special events held regularly at the Music Center include the Academy Awards and various civic and private events.

Activities are often held seven days a week distributed evenly throughout the mid-day and evening. Daily tours begin at 10:00 A.M., matinees at 2:30 P.M., and muscial performances in the early evening. Development of large crowds coincides with the starting and ending times of the evening events.

Attendance volume generally varies with the popularity of the booking. Daily attendance averages 4,500 persons based on an occupancy rate of 75 percent capacity. Tourism and dining activities can increase peak daily attendance to 5,000 persons.

Los Angeles County Art Center

The Los Angeles County Art Museum is located along the Starter Line near the intersection of Fairfax Avenue and Wilshire Boulevard. The Art Center is a complex of three major buildings: the Ahmanson Gallery, Frances and Armand Hammer Wing, and the Leo S. Bing Center. Facilities include several art galleries, the Bing Theater for Special Programs, an art rental gallery, and art research and slide libraries. Operating hours are Tuesday through Friday, 10:00 A.M. to 5:00 P.M., weekends until 6:00 P.M., 310 days per year. Attendance patterns during the day are variable and highly dependent upon individual pace. Development of large crowds as in the Music Center is relatively uncommon.

Attendance at the Art Center varies with the attractiveness of the exhibitions. Recent yearly attendance ranged from 497,440 persons in 1980, to over 2.5 million persons during the world-famous King Tutankhamen exhibition in 1978. Typical daily attendance averages 1,600 persons.

Farmers Market

The Farmers Market is an established major tourist and retail center located along the Starter Line on Fairfax Avenue. The Farmers Market contains numerous specialty shops, stores, and retaurants and is a major retailer of market goods such as meat and produce to the local community. The market is strongly tourist-oriented.

The market is open 315 days of the year and attracts roughly three million people annually. High attendance periods coincide with holiday weeks and summer months, when up to 20,000 people may visit per day. Average daily attendance is about 9,500 persons. The somewhat unstructured and personal use characteristics of the Farmers Market do not lead to distinct peak periods of crowd flow.

CBS Television City

CBS Television City is a major tourist attraction located along the Starter Line on Fairfax Avenue. Several popular television programs are taped daily throughout the year, but especially during the taping season, which begins in mid-September and continues until spring. Two shows per day are taped during the season, and tourists often acquire complimentary tickets. Tourists and sightseers arrive in the morning and usually stay at Television City throughout the afternoon.

Television City is open seven days a week all year, except during major holidays. Peak attendance is generated during the taping season, summer months, and holiday weeks. Over 300,000 persons are estimated to visit Television City each year. Daily attendance averages approximately 1,300 persons, not including tourists. An additional 800 to 1,000 tourists per day are common during peak months.

Hollywood Bowl

The Hollywood Bowl is a major performing arts center and tourist attraction of the Los Angeles Metropolitan area, located along the northern section of the Starter Line. It is one of the largest natural amphitheaters in the world, with a 17,000 seating capacity and is also the summer home of the Los Angeles Philharmonic. The Bowl and its surrounding facilities provide year-round entertainment, tourist-oriented, and special event activities. Yearly activity patterns are distinguished by a "Bowl" season in summer, and a "off-season" for the remainder of the year.

Activity during the Bowl season begins in July and continues through mid-September, six days a week. Daily activity includes the morning Open House Theater, tourism, and evening performances in the amphitheater and the adjacent John Anson Ford Theater.

Including tourists, nearly 875,000 people were attracted to the Hollywood Bowl during the two and one-half month season of 1980. This represents a daily attendance of about 12,500 people.

Before and after Bowl season, special events attracted nearly 550,000 people over the remaining nine months of the year, leading to a daily attendance of 2,300 persons.

Universal Studios

Universal Studios is located along the Starter Line in Universal City and serves as both a major tourist attraction and a production center for movies and television. Tours are conducted seven days a week during daylight hours except on major holidays. Similar to the Hollywood Bowl, annual attendance patterns are characterized by seasonal variations. Summer months and holiday weeks

are particularly heavy periods. Annual attendance averages approximately 3.8 million persons.

In-season tour attendance can average 23,000 persons per day from June 1 through August 31. Upon completion of the 5,000-seat amphitheater in 1982, daily attendance volume could increase to 30,000 persons.

Off-season activity averages considerably less than the in-season at 8,000 persons per day. Attendance at any time of the year rarely falls below 4,000 persons per day.

Special Generator Patronage Impacts on BART and WMATA

The following paragraphs briefly summarize the patronage effects of tourist and entertainment special generators on BART and WMATA. In addition, BART service adjustment guidelines for the Oakland Coliseum, and WMATA operational procedures for handling crowd flows at RFK Stadium are presented.

Coliseum Impact on BART Patronage

BART provides access to numerous performing arts and cultural attractions in the San Francisco Bay Area. The most widely recognized landmark served by BART, however, is the Oakland-Alameda County Coliseum Complex. The complex is comprised of a stadium and enclosed arena. The Coliseum BART station and its connecting walkway provides direct pedestrian access.

The most significant impact of the Coliseum on BART patronage occurs during off-peak hours (mid-evenings and weekends). Extra trains are routinely added to handle crowds at professional sporting events and weeknight or weekend recreational/entertainment activities.

BART service adjustments are based on estimates of crowd size and the time of day that peak activity occurs. The BART service adjustment formula assumes that 15 percent of the Coliseum attendance will use BART for access. Extra trains are occasionally required when projected Coliseum patronage conflicts with commute operations or when crowd sizes exceed regular BART service capacity. BART service adjustment guidelines for specified crowd sizes are presented in Table 32. BART scheduling personnel also consider the nature of the special event prior to initiating service adjustments. Events that attract youth, such as rock concerts, may involve higher levels of service adjustments.

BART data on trips at the Coliseum Station compared with the BART system for average weekdays and weekends are presented in Table 33. Table 33 shows that professional football games can increase total station trips by 300 percent on weekdays and 600 percent on Sundays. Total BART system trips increase nine percent on weekdays to nearly 17 percent on weekends. When events are held at both the stadium and arena, trips at the Coliseum Station can increase 425 percent and by 10 percent for the BART system.

Table 32
BART SERVICE ADJUSTMENT GUIDELINES FOR SPECIAL COLISEUM EVENTS

Crowd Estimate	BART Patrons	PAX North	TRNS North	Consist @108/Car	Extra Consists	PAX South	TRNS South	Consist @108/Car	Extra Consists
2K	300	200	2	3		100			
4	600	400	2	3		200			
6	900	600	2	3		300			
8	1,200	800	2	4		400			
10	1,500	1,000	3	4		500			
12	1,800	1,200	3	4		600			
14	2,100	1,400	3	4	1-4	700			
16	2,400	1,600	3	4	1-5	800			
18	2,700	1,800	3	4	2-4	900			
20	3,000	2,000	3	4	2-5	1,000			
22	3,300	2,200	3	4	2-6	1,100			
24	3,600	2,400	3	4	2-7	1,200			
26	3,900	2,600	3	4	2-7	1,300			
28	4,200	2,800	3	5	2-7	1,400	3	4	
30	4,500	3,000	3	5	2-7	1,500	3	5	
32	4,800	3,200	3	5	3-7	1,600	3	5 @115/car	
34	5,100	3,400	3	5	3-7	1,700	3	5	
36	5,400	3,600	3	6	3-7	1,800	3	6	
38	5,700	3,800	3	6	3-7	1,900	3	6	
40	6,000	4,000	3	6	3-7	2,000	3	6	
42	6,300	4,200	3	7	3-7	2,100	3	7	
44	6,600	4,400	3	7	3-7	2,200	3	7	
46	6,900	4,600	3	7	3-7	2,300	3	7	
48	7,200	4,800	3	7 @ 115/car	4-7	2,400	3	7	
50	7,500	5,000	3	7	4-7	2,500	3	7	1-7
52	7,800	5,200	3	7	4-7	2,600	3	7	1-7
54	8,100	5,400	3	7	4-7	2,700	3	7	1-7
56	8,400	5,600	3	7	4-7	2,800	3	7	1-7

Source: BART Scheduling Department, 1981.

Table 33
COLISEUM PATRONAGE IMPACTS ON THE COLISEUM STATION AND BART SYSTEM FOR AVERAGE DAYS

	Coliseum			Total System		
		Increase			Increase	
Typical Average Weekday	Total Trips	Trips	Percent	Total Trips	Trips	Percent
w/o event	2,500	—	—	158,900	—	—
w/football	10,000	7,500	300.00	172,500	13,600	8.6
w/baseball or basketball	3,400	900	36.0	161,300	2,400	1.5
w/concert or other	3,400	900	36.0	161,100	2,200	1.4
w/2 events	4,200	1,700	68.0	164,400	5,500	3.5
Typical Average Saturday						
w/o event	1,400	—	—	63,000	—	—
w/football	6,500	5,100	364.3	74,200	10,700	16.8
w/baseball or basketball	2,100	700	50.0	67,800	4,300	6.8
w/concert or other	3,000	1,600	114.3	71,400	7,900	12.4
w/2 events	3,600	2,200	157.1	66,900	3,400	5.3
Typical Average Sunday						
w/o event	800	—	—	38,600	—	—
w/football	5,600	4,800	600.0	42,700	4,100	10.6
w/baseball or basketball	2,200	1,400	175.0	41,200	2,600	6.7
w/concert or other	1,800	1,000	125.0	41,500	2,900	7.5
w/2 events	4,200	3,400	425.0	42,500	3,900	10.1

Source: BART Research Department, March, 1981.

Patronage Effects of RFK Stadium and the Capital Mall Area on WMATA Rail Service

The WMATA metro rail system provides access to numerous special generators in the core area of Washington, D.C. (Figure 26). For the most part, major service adjustments to handle peak loads of these special generators are not required. Patronage at RFK Stadium and Capital Mall Area occasionally involves service adjustment. The RFK Stadium is served by the Stadium-Armory Station, and the Mall Area is served by 10 metro rail stations.

Events at RFK Stadium rarely require major service adjustments. No direct pedestrian walkway from the Stadium-Armory Station to the stadium exists; however, the design of the station emphasized efficient handling of large crowd flows. The considerable walking distance from the Stadium to the rail station results in lower crowd volumes through the station directly to the trains.

WMATA rail operations assume a modal split by transit of 20 percent, and adjust the number of trains or train lengths accordingly. Crush loads are further accommodated by center boarding platforms that allow boarding in either direction, thereby facilitating crowd dispersal. Platform overcrowding is further averted by the capability of passengers to board any train headed in their direction (as opposed to waiting for a specific train, as in BART), for later transfer at cross-over stations.

Patronage impacts on WMATA rail service are further minimized by the following system characteristics. The Stadium-Armory Complex is served by two rail lines (Blue and Orange) that effectively double the level of service into the core area and into eastern Washington, D.C. Extra trains are easily added from a third track east of the Stadium-Armory Station, and from a trainyard at the end of the Orange (new Carrollton) Line.

The mall area includes the Lincoln Memorial, Washington Monument, and other attractions. Up to 250,000 people may be attracted to the Mall for special events, such as Independence Day celebrations. The 10 rail stations and associated feeder bus systems adequately accommodate partons of the Mall with regular service.

Ridership Potentials

This section relates information presented in the two previous sections to ridership potentials. The primary characteristics of special generators potentially affecting ridership on the Starter Line include daily attendance volume and the time interval in which the majority of the activity is generated. Discussion of other factors such as parking space availability, bus collection and distribution systems, pedestrian access links, gasoline prices, and Metro Rail marketing strategies is not presented as they are topics beyond the scope of

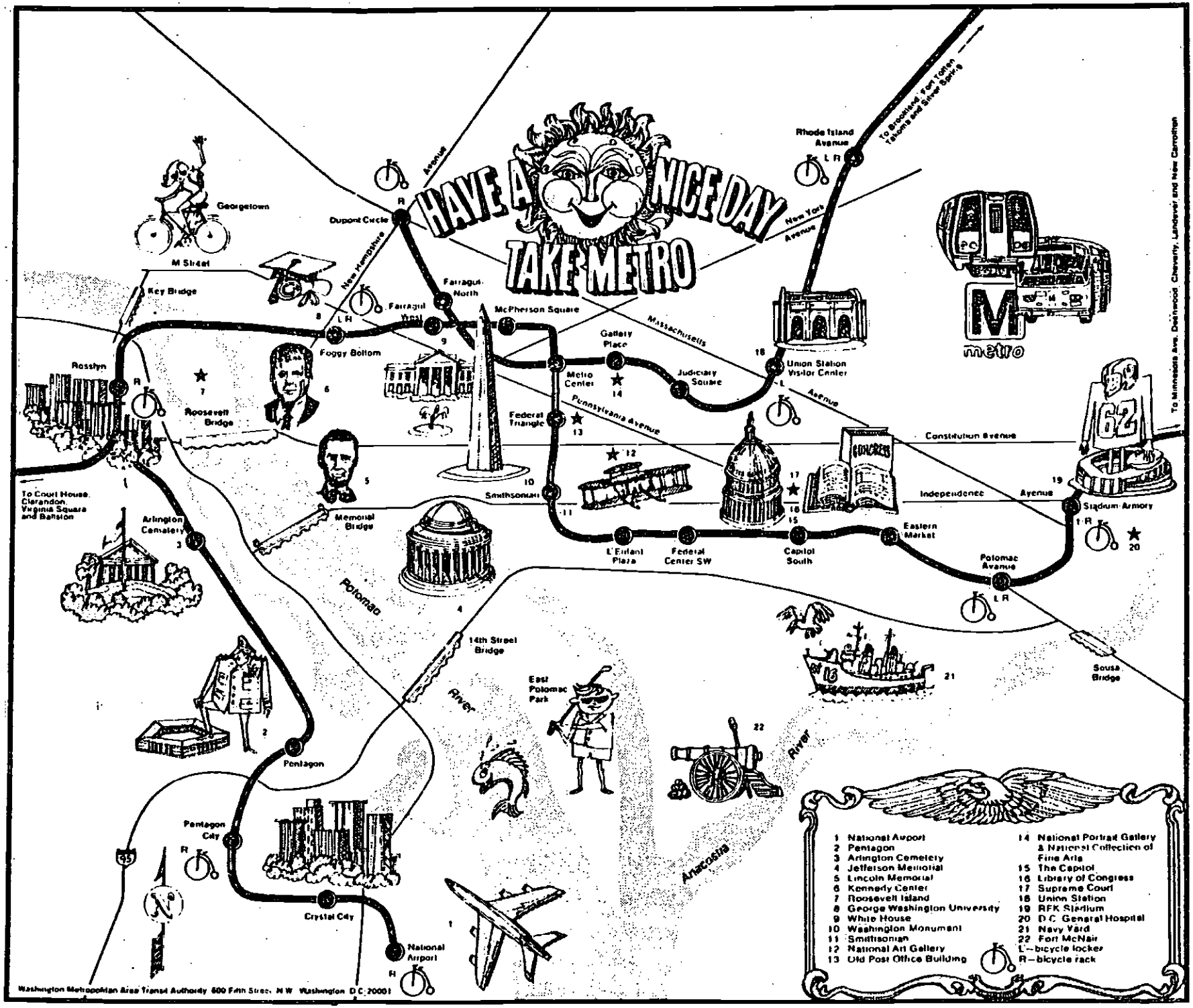


Figure 26 SPECIAL GENERATORS OF DOWNTOWN WASHINGTON D.C.

this study. The following discussion establishes a generous range of ridership potentials based upon WMATA and BART criteria, attendance volumes, and activity patterns. Non-model ridership estimates and an assessment of the special service needs of each special generator are summarized in Table 34.

Los Angeles County Music Center

Most of the activity at the Music Center coincides with the evening performances at the three theaters. During these periods, up to 5,000 persons may be in attendance. Because of the comparatively precise nature of the starting and ending times of Music Center events, movement of large crowds to rail stations could occur. Based upon a rail patronage estimate range of 15 to 25 percent, roughly 750 to 1,250 persons would be expected to use the Starter Line for access. Twenty-five percent rail patronage for the Music Center seems unlikely, however, as the generally more affluent patrons of the high culture Music Center would be more apt to use private autos.

Los Angeles County Art Center

Art Center patronage impacts on SCRTD rail service would depend greatly on the attractiveness of the exhibition. Rare or unique exhibitions have generated large attendance volumes in the recent past. The convenient location of the Art Center along the Starter Line could conceivably become an incentive for visitors and tourists who might otherwise use private autos.

Recent 1980 attendance figures reflect a modest daily attendance of 1,600 persons. Although there is a theater and other organized attractions, use patterns are individualized and variable. The corresponding additional rail patronage estimate of 240 to 400 persons distributed evenly during mid-day off peak hours would have a negligible effect on rail service.

Farmers Market

Assessment of additional rail patronage impacts of Farmers Market is complicated by the lack of distinct starting/ending times of daily events and subsequent crowd movements. Further, the duration of visits, exit patterns, relative composition of tourists and local customers, and the contribution of special bus tours to daily attendance have yet to be determined.

Patronage impacts would occur during the dinner hours and the peak hour 6:30 P.M. closing time, Monday through Saturday. Under worst-case conditions, up to 9,500 people could exit the facilities, of which 1,400 to 2,400 persons could be expected to use the Starter Line.

Mass exits have not been observed at closing times, and are considered only remote possibilities. The extent of Starter Line use generated by Farmers Market would therefore be substantially less. Because a portion of this travel estimate does include trips accounted by the model, the estimate has been reduced by one-half.

Table 34
SPECIAL GENERATOR RIDERSHIP POTENTIAL

Special Generator	Operating Schedule	Primary Activity Period*	Peak Season	Potential Daily Ridership On Starter Line (Persons)	Assessment
L.A. County Music Center	Mon-Sun, 10-12 A.M.	Mid-day to Evening	Variable	750-1,250	Potential Service Adjustment
L.A. County Art Center	Tu-Fri, 10-5 Wkend, 10-6	Mid-day	Variable	240-400	No Impact on Service
Farmers Market	Mon-Sat, 9-6:30 P.M.	Mid-day and P.M. Rush	Summer and Holiday weeks	700-1,200	No Impact on Service
CBS Television City	Mon-Sun, 9-5	Mid-day and P.M. Rush	Sept.-March Summer	200-325	No Impact on Service
Hollywood Bowl	Tues-Sun, variable hours	Mid-day to Evening	July-mid-Sept.	350-3,100	Potential Service
Universal Studios	Mon-Sun, 8-6	Mid-day and Evening	June-Aug.	2,000-7,500	Potential Service Adjustment
			TOTAL:	4,240-13,775	

*A.M.-P.M. Rush = 7-9 A.M., 4-7 P.M.
Mid-day = 9 A.M. - 4 P.M.
Evening = 7 P.M. - 1 A.M.
Night = 1 A.M. - 5 A.M.

CBS Television City

The predominantly tourist-oriented activity pattern of CBS Television City suggests that patrons will utilize personal automobiles or special tour buses for access. A site review at the facility confirmed this pattern. However, the close proximity of Television City (within walking distance) to the Fairfax/Beverly Station could result in minor rail patronage.

Although crowds could develop upon completion of taping sessions, the 200 to 325 persons that would use the Starter Line over the course of a day would have no impact on rail service.

Hollywood Bowl

The year-round series of special events at the Hollywood Bowl will result in patronage impacts on the Starter Line. The summer Bowl season, in particular, presents the greatest ridership potential. As shown in Table 31, a daily average of over 12,000 people visit the Hollywood Bowl during the summer season. Actual ridership on the Starter Line would vary with the nature of the special event. That is, events appealing to the recreation-oriented youth, such as pop and rock concerts, could result in greater Starter Line ridership than events which cater to older, less transit-dependent patrons.

If 15 to 25 percent of the average daily attendance used the Starter Line for access, this would result in patronage of 1,850 to 3,100 persons.

Off-season activity would involve little service adjustment to accommodate the estimated 350 to 600 persons of the 2,300 daily attendance that might use the Starter Line. Special events such as circuses or high school graduations, however, may require minor service adjustments such as longer trains.

Universal Studios

The estimated total annual attendance of 3.8 million persons presents the greatest ridership potential among special generators along the Starter Line. In addition, the location of Universal Studios may attract comparatively more riders as it could serve either as a starting or terminating point for tourists visiting other attractions along the Starter Line.

The gross daily summer attendance of up to 30,000 persons[6] would exceed 10 percent of the total weekday system patronage. The 5,700 to 8,700 additional potential passengers would be distributed evenly over the mid-day period, with possible large crowds developing during the late afternoon peak period. Such levels would be accommodated by normal weekday service (up to 17,820 passengers per hour); however, overcrowding could result during Saturdays (9,900 passenger rush-hour capacity) and Sundays (6,930 passenger rush-hour capacity). Service adjustments in the form of additional or longer trains may be required during the weekend summer months.

[6] Upon completion of amphitheater in 1982.

Of the 8,000 person daily off-season attendance, the estimated 2,000 people that would use the Starter Line would not necessitate service adjustments. Special events at the amphitheater could generate large evening crowds; however, crowd estimates up to 5,000 normally do not result in BART service changes.

Actual rail patronage generated by Universal Studios could ultimately differ widely from the preceding estimates. Competition presented by special bus tours, private autos, and/or non-coordination of rail schedules with studio activity patterns, could result in lower rail patronage.

Summary

The development of additional (non-model) ridership potentials for special generators as presented in this section provides an estimate of the proportion of visitor and tourist patrons that are likely to use the Starter Line for travel. Additional ridership would range approximately from 4,000 to 14,000 persons.

The potential ridership to major special generators such as Universal Studios, the Hollywood Bowl, or the Music Center, suggests that the associated rail station designs consider these potentials. These special generators also may affect the operation of the rail system during mid-day and evening off-peak hours, and thus require service adjustments to accommodate increased patronage.

Ultimate patronage impacts resulting from these special generators could be influenced by such factors as schedule timings and average speeds, fare structures, parking availability, and local transit-feeder connections at rail stations, as well as SCRTD marketing strategies to attract tourists from private autos and tour buses.

MODE OF ARRIVAL ESTIMATES

The extension of the travel demand estimation process discussed in Chapter 3 contained a formal model to estimate the potential mode of arrival at Starter Line stations where formal parking facilities were to be available. For the Starter Line, these stations were defined as the three most northerly stations, North Hollywood, Universal City, and the Hollywood Bowl, plus one additional station along the Fairfax alignment at Beverly Boulevard (CBS Television City). A summary of the results of the mode of arrival estimates for each of the non-central business district stations is shown in Table 35. As indicated earlier in this report, these estimates are based upon the assumption that an unlimited amount of parking space is available at each station and that no special travel time or cost is associated with parking at any of the four formal parking locations.

Also shown in Table 35 is a preliminary estimate of the number of parking spaces required at each of the four formal parking locations based upon two key

Table 35
OPTION I STARTER LINE MODE-OF-ARRIVAL ESTIMATES
24-HOUR TOTAL DAILY INBOUND (ONE-WAY) DIRECTIONAL VOLUMES

Station	Walk	Feeder Bus	Park-n-Ride Trips	Auto-Passenger Trips	Kiss-n-Ride Trips	Total	Parking Space Requirements
Wilshire & Alvarado	2,649	4,556	—	—	—	7,205	
Wilshire & Vermont	2,937	10,260	—	—	—	13,197	
Wilshire & Normandie	2,306	2,313	—	—	—	4,619	
Wilshire & Western	1,582	6,738	—	—	—	8,320	
Wilshire & Crenshaw	253	6,055	—	—	—	6,308	
Wilshire & LaBrea	644	4,168	—	—	—	4,812	
Wilshire & Fairfax	171	7,995	—	—	—	8,166	
Fairfax & Beverly	1,388	1,403	1,118	166	684	4,759	654
Fairfax & Santa Monica	2,928	3,532	—	—	—	6,460	
Hollywood & Cahuenga	2,317	5,970	—	—	—	8,287	
Hollywood Bowl	317	340	25	4	15	701	15
Universal City	560	1,634	4,575	678	2,799	10,246	2,754
North Hollywood	948	1,567	4,432	657	2,712	10,316	2,614

assumptions: first, that work trips compose 45 to 50 percent of the arrivals, with no turnovers during the course of the day, generating one space for each vehicle; and second, that a turnover rate of approximately four was correct to calculate off-peak (or non-work) space requirements.

The total arrivals shown for each Starter Line station in Option I are generally zero to five percent different than those estimated in the regional travel demand model run. The reason for this difference is threefold. First, when the model compares a zone's opportunity to access the system either as a direct walk, feeder bus, or an auto access trip, the station chosen may be different if a feeder bus or a private auto is used. Second, in some cases, particularly in the far west area of San Fernando Valley, where a Hollywood express bus is available to downtown, the choice of a bus would eliminate use of the Starter Line and conversely the choice to access transit as an auto driver or auto passenger would directly access the line. Third, only home-based arrivals are considered by the model. For example, A.M. station off-movements, which become P.M. ons are not included.

A final observation stemming from the execution of the mode of arrival model deals specifically with the function of Union Station. Union Station and the Option I regional results exhibited a rather substantial amount of transfer volume from San Bernardino busway to the Starter Line for destinations in the central business district and mid-Wilshire area. Due primarily to the nature of the travel path finding algorithm contained in the urban transportation planning system (UTPS) package, the opportunity to allocate only a portion of the busway riders entering Union Station to the Starter Line while others would remain on the bus destined either to their central business district destination or a possible transfer at the 7th and Flower Station is not possible. The logical assumption for these purposes would be that approximately 50 percent would choose to board the Starter Line at the Union Station and therefore, the total number of boardings on the Starter Line in Option I could be revised to show a total ridership of approximately 285,000 daily riders, as opposed to the approximately 300,000 daily value suggested by the regional travel demand mode results. Only a very detailed analysis of movements at Union Station considering the Starter Line, San Bernardino busway routes, and the Downtown People-Mover System can more accurately estimate ridership patterns at Union Station.

Appendix A
TRANSIT NETWORK CODING TECHNIQUES AND OPERATING ASSUMPTIONS

DRAFT

TECHNICAL MEMORANDUM 2
TRANSIT NETWORK CODING TECHNIQUES AND OPERATING ASSUMPTIONS

Prepared Under Contract To

Southern California Rapid Transit District

Metro Rail Department

Prepared By

Barton-Aschman Associates, Inc.

In Association With

Jefferson Associates, Inc.

August, 1980

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LIST OF FIGURES AND TABLES

INTRODUCTION

This working paper outlines a specific transit network coding technique for the Metro Rail Project Patronage Analysis. In general, this technique is similar to the coding techniques described in the UTPS "Network Development Manual"[1] with some modifications required by the specialized mode-of-arrival model and other modifications required to provide summarized data for the patronage analysis. This Technical Memorandum is composed of three sections. The first section describes the general coding of local, non-guideway, transit routes. This coding is very similar to the procedure described in the UTPS manual and is primarily included to provide a "bridge" between this report, the UTPS manual, and the current LARTS Procedures. The second section describes a special access coding method used by the mode-of-arrival model. This access coding allows the model structure to distinguish between walk and highway access within any given zone. The third section describes the coding requirement and assumptions for guideways, e.g., express bus routes and rapid rail links. Some of these requirements are made in order to also allow special data summaries or to provide flexibility in specifying station access times or costs.

Although this memorandum describes the method of coding the transit networks, it is emphasized that the coding of the transit networds is <u>not</u> strictly a mechanical process; a great deal of subjective judgment is required in the design, development and

[1] "Network Development Manual," UMTA Transportation Planning System (UTPS), U.S. Department of Transportation, Urban Mass Transportation Administration, Office of Transit Planning, Planning Methodology and Technical Support Division, Washington, D.C., August 1, 1974.

checking of the transit networks. The transit network should adequately portray two essential items of information, which are:

- The transit travel time components and costs observed by the transit rider. In order to estimate the transit ridership, the mode choice model must have adequate data on transit travel times and costs.

- The transit travel times observed by the transit operator. The operating cost and fleet requirements will be significantly affected by the transit travel time, and the coded transit networks will assist greatly in determining these travel times.

In addition to the specific network coding techniques described in this memorandum, the coding of the corridor option networks for this study must be consistent. The links, and access times which are the same for the various corridor alternatives must be mapped and coded using consistent travel times and costs.

NORMAL TRANSIT ROUTE CODING

The local transit routes embodied within the SCRTD Sector Improvement Program (SIP) should be added as accurately as possible. Since the transit network is for 1995, it will be difficult to determine precise transit speeds or minor route deviations such as the end of route loops. Minor aggregation of route coding will be used when the loss of accuracy is minor. Local transit route speeds are influenced primarily by the number of bus stops and passengers and only secondarily by traffic flow and speeds. Therefore, local transit speeds will be more a function of area location rather than highway conjestion. The set of local transit speeds to be used is as follows:

1. CBD streets - 8 miles per hour.
2. Urban streets - 14 miles per hour.
3. Suburban or rural streets - 20 miles per hour.
4. Express routes in mixed-flow freeway traffic-35 miles per hour.

With these speeds, it is anticipated that local transit routes will have average speeds ranging from 10 to 15 miles per hour. Minor variations in the above speeds are applicable when unusual highway conditions or transit "loadings" are obvious. The Sector Improvement Program will be used as the standard for all local transit routes.

The peak hour headways for local transit routes will be based upon the Sector Improvement Program specifications. For the initial "cut" of peak hour headways for the corridor options, the headways will range from 7.5 to 30 minutes. The demand forecast results will eventually be revised using the results of the mode choice runs, and it is anticipated that this revision will consist primarily of revising the headways, although some "cut-back" routes may be established. Headway values for the various corridor alternatives will be established in the following manner:

1. Headways for the transit routes which do not feed the guideway will the same as the SIP network. In the case of routes which compete with the guideway, the network design will either remove the route or reduce the headway to a base policy headway.

2. For feeder routes, the headways will be established on the basis of the anticipated demand at the station. Normally for routes which are in the SIP network and have been adjusted slightly to feed the guideway station, the headway should be equal or better than the base system headways. In the absence of demand information, headways will generally remain the same as the SIP.

For coding purposes, off-peak headways should be three times the peak hour headways. As the study progresses, this peak to base ratio of 3.0 may be adjusted to reflect the estimated demand. All routes should have minimum policy headways, regardless of the demand. These policy headways will be 15 minutes in the regional core and 30 minutes in the outer areas (i.e. San Fernando Valley). All routes in the SIP or bus-on-freeway program, for example, for which off-peak or base headways have been specified should be used.

ACCESS LINK CODING

The mode-of-arrival model is fairly unique in that the model allows traffic analysis zones to be specified in three different ways: (1) zones in which all the access to and from the transit system can be made by walking (2) zones in which all access to and from the transit system must be made by some other mode than walking (i.e., highway access) and (3) zones in which some people can access the transit system by walking while others will require highway access (park-ride or kiss-ride).

The access link coding begins with ascertaining if all the persons in a zone can walk to the transit routes or if no one can walk to the transit system. In the first case (all walk), the centroid node should be connected to the appropriate transit routes using a simple walk link with the appropriate average time, typically, either 2.5 or 5.0 minutes depending upon the distance (1/8 or 1/4 mile). In the second case (all highway), the centroid node should be connected to the appropriate transit route(s) using a simple highway link. For highway link connections, the link should connect to a transit route where parking is appropriate. Normally, this will be at guideway stations where it has been ascertained that parking will be provided. When it is infeasible to connect a highway link to a guideway station, the connection should be made to the nearest trunk line route (i.e., a route with a good headway destined for a major activity center). Estimation of the highway distance and time is based upon the actual travel time derived from the LARTS roadway network. In general, highway connections to a station or a major transfer location should not exceed a distance of 7 miles and a zone centroid should not contain more than two auto connections. Most zone centroids within an 8-mile radius of the CBD will not contain auto connections. A final restriction on auto connections will be to prohibit connections across a freeway facility.

It is important for the mode-of-arrival model to be able to distinguish between walking time and highway access time. The method of distinguishing these times is to have a separate non-transit mode code for these links. For the patronage analysis study these codes are:

Code	Access Description
3	Walk access link
2	Highway access link

The walk access link will always be coded as a two-way link (i.e., the person can walk both to and from the transit route). The highway access link will be coded as a one-way link, from the zone to the transit route. Since the demand modeling is performed on a "production-attraction" basis, this coding simply means that a person may use an automobile to go from his home area (zone) to the transit route, but may not use an automobile to go from the transit route to the non-home end of his trip.

The dual access zones require special coding techniques. These zones have been named PWD zones (for "partial walk designated" zones) and at least one walk link and one highway access link are required for these zones. Normally, coding these two types of access links would mean that the transit paths and travel times are always calculated via the highway access link, since that path would be the faster of the two. One of two techniques, therefore, is required which will allow both paths (i.e., the walk path and the highway path) to be calculated by the UTPS programs. The first technique consists of coding two links for each access path. One link is the modal link (i.e., highway or walk), while the other link is a special mode called a PWD link. An example of this type of access maping and coding is shown on Figure 1. For the highway access combination, both links should be coded one-way outbound and the time associated with the PWD link must be zero. For the walk access, the links should be coded as two-way links, with the inbound (i.e., to the centroid) PWD link always given a travel time of zero minutes. The outbound direction of the PWD link should be coded as one minute. The highway and walk links should be coded with the actual travel time required to made this access movement. Oue to the structure of the model, the walk time should never be more than 5.0 minutes, and only in unusual cases should it be less than 2.5 minutes (i.e. in the CBD). The one-minute times associated with the PWD links is not true travel time, but instead "flags" which informs the model how to determine the percent of people who can walk to the transit system or station.

The second alternative technique is to build two separate networks, one with walk connectors and the other with only auto connectors, thereby eliminating the need for PWD links. The latter technique is the likely one to be used in this study given the lack of available node numbers present in the base network.

Although not an integral part of network coding, the calculation of percent walk directly to a designated station also needs to be developed. The purpose is to ascertain the percent of the persons in the zone who can walk directly to these routes,

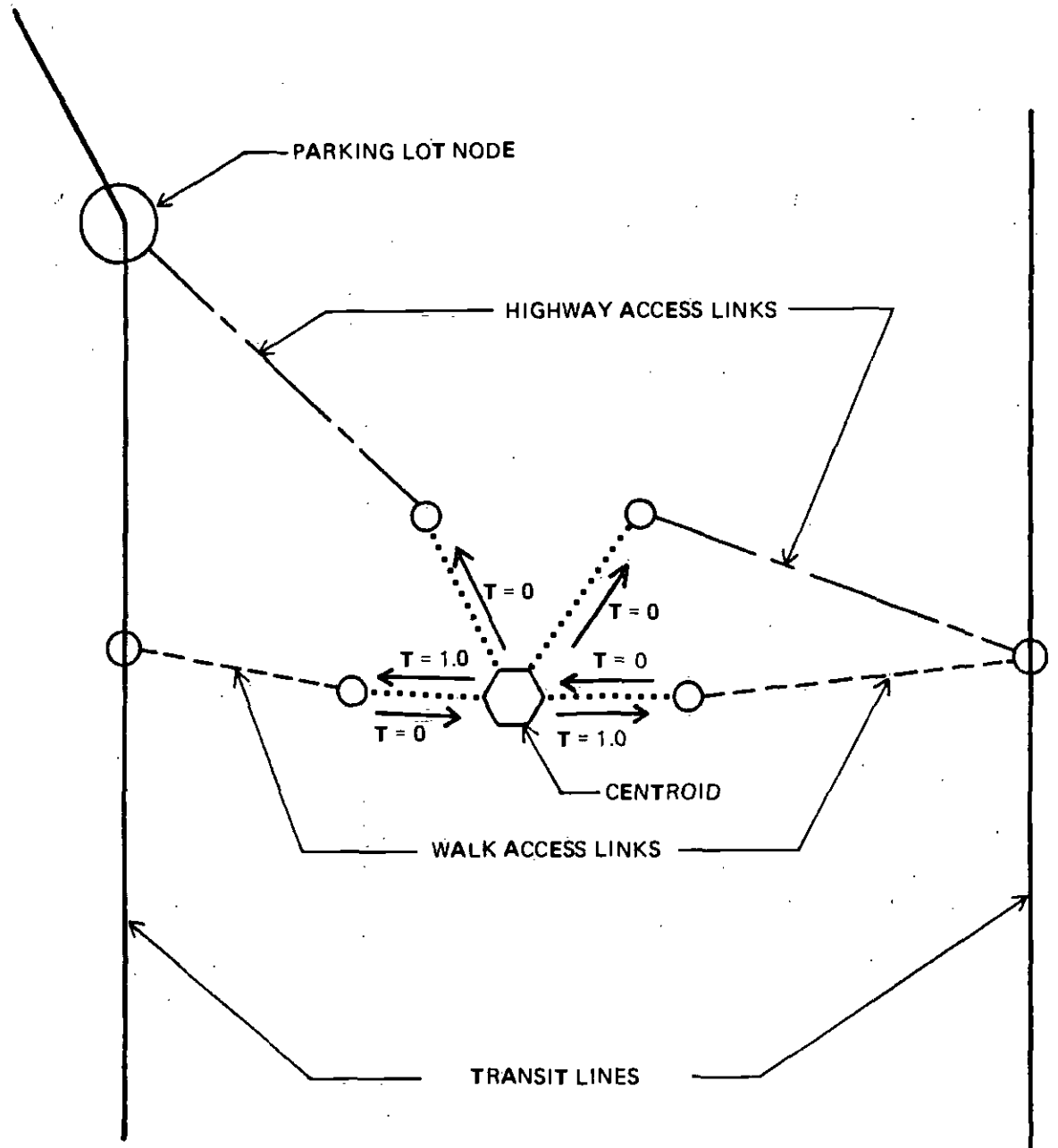

Figure 1
EXAMPLE CODING FOR A PWD ZONE

that is those who are within one-half of a mile of the line-haul station. This calculation may be a little imprecise since it is difficult to ascertain the residential density fluctuation within the zone and the local street patterns. A pure geometric calculation, modified by some subjective judgment, is an adequate methodology for performing this determination of percent walk.

Because the issue of park-and-ride versus feeder bus access to guideway stations is critical, some pure walk zone access connections will have to be changed to PWD pr dia; access connections within the 8-mile CBD radius. This coding change will definitely affect the primary mode choice estimates, and as such, will only be included for use by the mode-of-arrival model.

Using this coding technique (mode-of-arrival), both the LARTS-compatable and dual-access path files can be constructed from the network by invoking specific combinations of the transfer prohibition parameter (NOX option) available in the UPATH program, or building separate networks.

GUIDEWAY OPERATING CHARACTERISTICS

The normal guideway coding is performed in the same general manner as the coding of the local transit routes. There are three areas where guideway coding differs. These areas are:

1. The guideway speed should be calculated with more precision than local bus speeds. Guideway speeds depend upon the type of sub-mode (e.g., conventional rail or express bus), the station spacing, the vehicle waiting times at the station (the dwell time), and the guideway geometrics.

2. Guideway station access is an important aspect in the demand estimation phases. It is possible to have substantial walk times and parking costs at guideway stations. For example, LARTS currently codes a 4-minute access time from a station parking facility to reach the guideway platform.

This section will address these two areas. In all other areas of coding, the guideway should be treated in a similar manner to the local bus coding conventions.

Guideway Speeds

The maximum (or cruising) speed and acceleration rate for guideway vehicles can vary substantially. Some typical velocity parameters are shown on Table 1. For modern conventional rapid rail vehicles, the velocity measures appear to be capable of a cruise speed of 80 miles per hour with acceleration and deceleration rates of 4.4 feet per second squared. New in-service vehicles (Washington, Atlanta, PATH) have cruise speeds of 70 to 75 miles per hour, but the experimental vehicles (specified by UMTA) have cruise speeds of 80 miles per hour. The acceleration/deceleration rates for most modern vehicles are 4.4 ft./sec.,^{2} but the new Chicago Boeing Vertol vehicle's rate is 4.69 ft./sec.^{2}.

Cruise speeds and acceleration/deceleration rates are the primary components to estimate travel time between stations. The geometrics of the guideway also have a significant effect on average speed (i.e., the grades and curves on the guideway). The estimation of speeds, considering the guideway geometrics, is beyond the scope of the current effort, and once the guideways are designed sufficiently that grades and curves can be specified, then the calculation of average running time between stations could be incorporated in future analyses. The following discussion on speeds assume that geometrics are not a consideration.

Average speed between guideway stations is a function of dwell time, cruise speed, and acceleration/deceleration rates. This average speed can be calculated using the formula:

$$V\ (Ave) = VS/(V^2/2a + V^2/2d + VT + S)$$

where:

V (Ave) is average station to station speed (ft./sec.)
V is cruise (top) speed (ft./sec.)
a is acceleration (ft./sec.^{2})
d is deceleration (ft./sec.^{2})
T is dwell time in stations (seconds)
S is the distance between stations (feet)

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[2]"Transportation and Traffic Engineering Handbook," Institute of Traffic Engineers, page 221.

TABLE 1

SUMMARY OF GUIDEWAY VEHICLE PARAMETERS

Typical Conventional Rail Parameters

Vehicle Name	Maximum Velocity (miles per hour)	Service Acceleration ($ft./sec.^2$)	Service Deceleration ($ft./sec.^2$)
Atlanta SFB Metrocar	70	4.4	4.4
State-of-the-Art Car (SOAC)	80	3.96-4.4	3.96-4.69
USA Advanced Concept Train (ACT-I)	80	4.4	4.4
Chicago-Boeing Vertol Cars	70	4.69	4.69
BART Cars	80	4.4	4.4
PATH PA-3 Cars	70	3.67	4.4
WMATA	75	4.4	4.4

*Information obtained from the LEA Transit Compendium

Using this formula, the speed and time between stations can be fairly quickly calculated. The relationship between station spacing, dwell time, and average speed is shown graphically on Figure 2 and Figure 3 for conventional rail, and express bus respectively. It is recommended that the network coding use the following parameters for calculating guideway speeds.

Transit Mode	Cruise Speed (miles per hour)	Acceleration ($ft./sec.^2$)	Deceleration ($ft./sec.^2$)
Conventional Rail	70	4.4	4.4
Bus	55	2.93	2.93

The average speed for each individual station to station pair can be obtained using the formula shown above or Figure 2 and Figure 3. However, to avoid error, a computer program will be written to calculate the speeds. The final factor to estimate guideway speeds is the dwell time. Normally, dwell time is a function of the number of boarding and alighting passengers. For level loading vehicles, such as conventional rail, an average of approximately two seconds per passenger per door lane is an acceptable value[2]. For the starter transit line, we anticipate six car trains with three doors per car and two door lanes per door. This means each train can load or unload 18 passengers per second (6 x 3 x 2/2). With approximately 3.5 minute headways, or 18 trains per hour, this results in 324 passengers per second of dwell time. These parameters should provide the ability to ascertain the dwell time within an acceptable degree of accuracy. It is recommended that dwell times be calculated to the nearest 5 seconds with a minimum of 10 seconds and a maximum of 30 seconds. This results in the following dwell times:

Peak Hour Passengers (Boarding and alighting)	Estimated Dwell Time (seconds) Two Minute Headways	Four Minute Headways
0 - 3,240	10	10
3,240 - 4,860	10	15
4,860 - 6,480	10	20
6,480 - 8,100	15	25
8,100 - 9,720	15	30
9,720 - 12,960	20	30
12,960 - 16,200	25	30
16,200 +	30	30

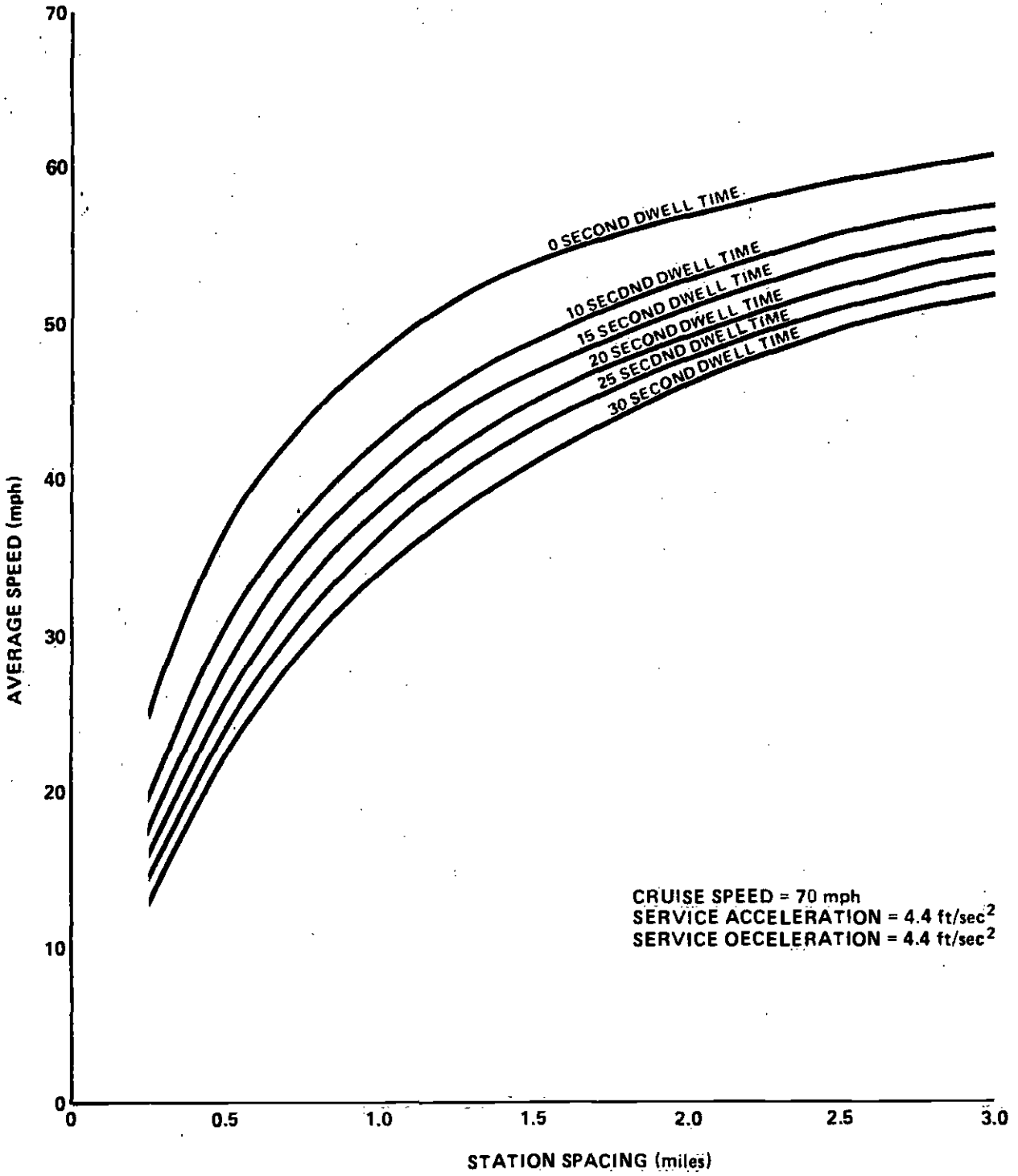


Figure 2
AVERAGE RAIL TRANSIT SPEEDS

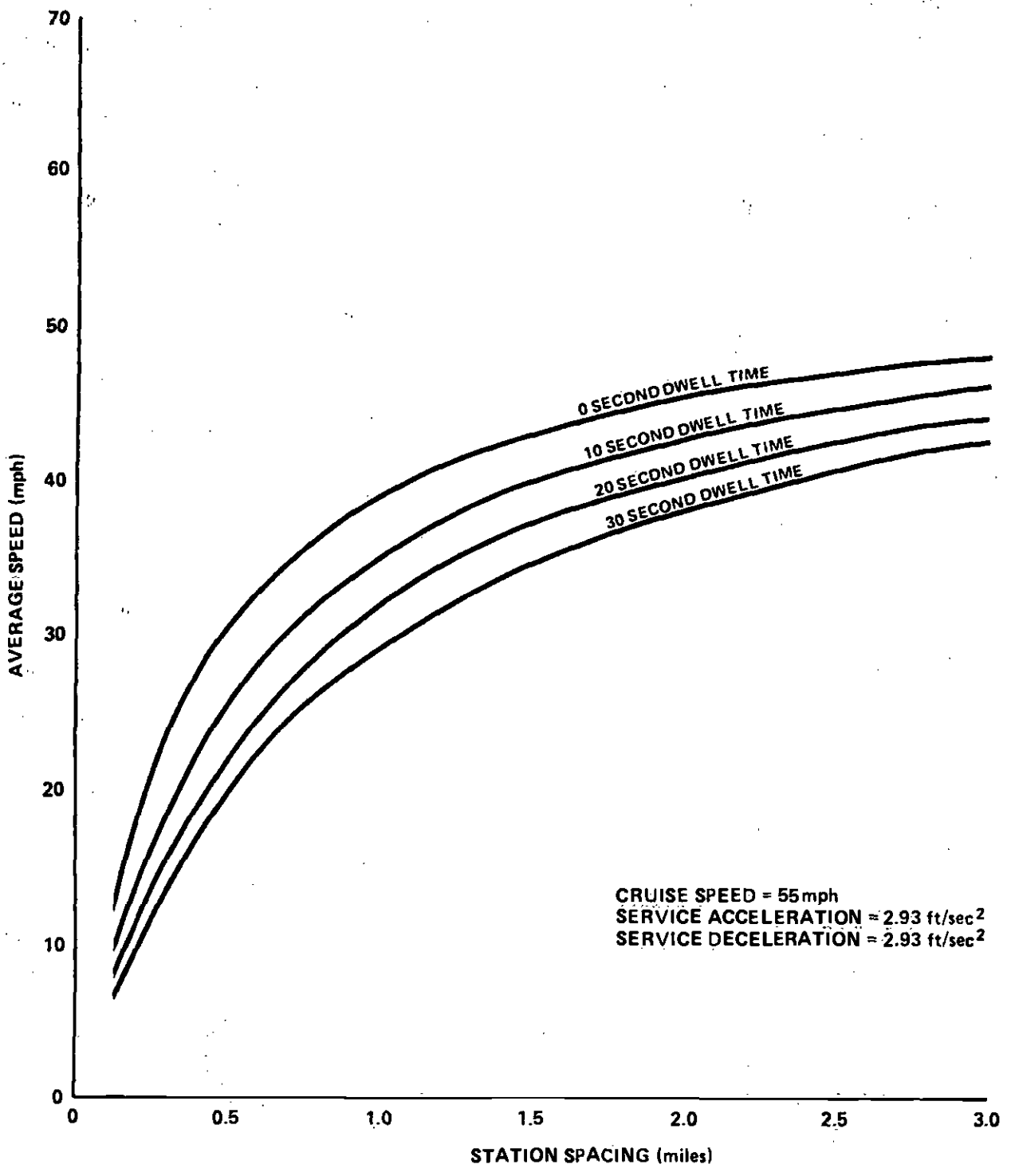


Figure 3
AVERAGE EXPRESS BUS SPEEDS

Table 2 presents dwell time calculations for the starter line stations based upon the previous alternatives analysis results which should closely parallel the Option I Network.

For future option stations with substantial train-to-train transfers, the dwell time should be increased substantially. Express bus dwell times normally take 2 to 3 seconds per passenger per door lane for loading and 1.5 to 2.5 seconds for alighting. For all non-starter line stations and all express bus stations an average dwell time of 20 seconds will be used in the absence of preliminary demand information.

Station Access Coding

There will be three potential access modes to guideway rail stations: (1) feeder bus; (2) highway access; and (3) walk access. The mix of these access modes are important criteria in preliminary station design and in "sizing" the feeder bus fleet. It is, therefore, important that the demand analysis summarize the access volumes effectively. There may also be special travel times and costs associated with accessing a guideway station; for example, a station parking cost or a long walk from the feeder bus stop to the guideway station. For these reasons, it is recommended that station access links be coded as shown on Figure 4. Essentially, this procedure is to code a separate access link from the access mode to the guideway station node. These links would be coded as mode 3 links (walk) and initially travel time of zero minutes will be used.

SUMMARY

The coding of transit networks for the Metro Rail Project Patronage analysis study provides two essential items of information for the study; transit travel times and costs as they will be observed by the potential transit rider and system operating times and distances which could be used to calculate the fleet operating cost. The network, therefore, must be prepared in such a manner that not only person travel times can be calculated, but also that the data may be summarized in an orderly and efficient manner. Since the main objective of the study is to be able to evaluate the impact of several corridor options, consistency is an essential element in the mapping and coding of these networks.

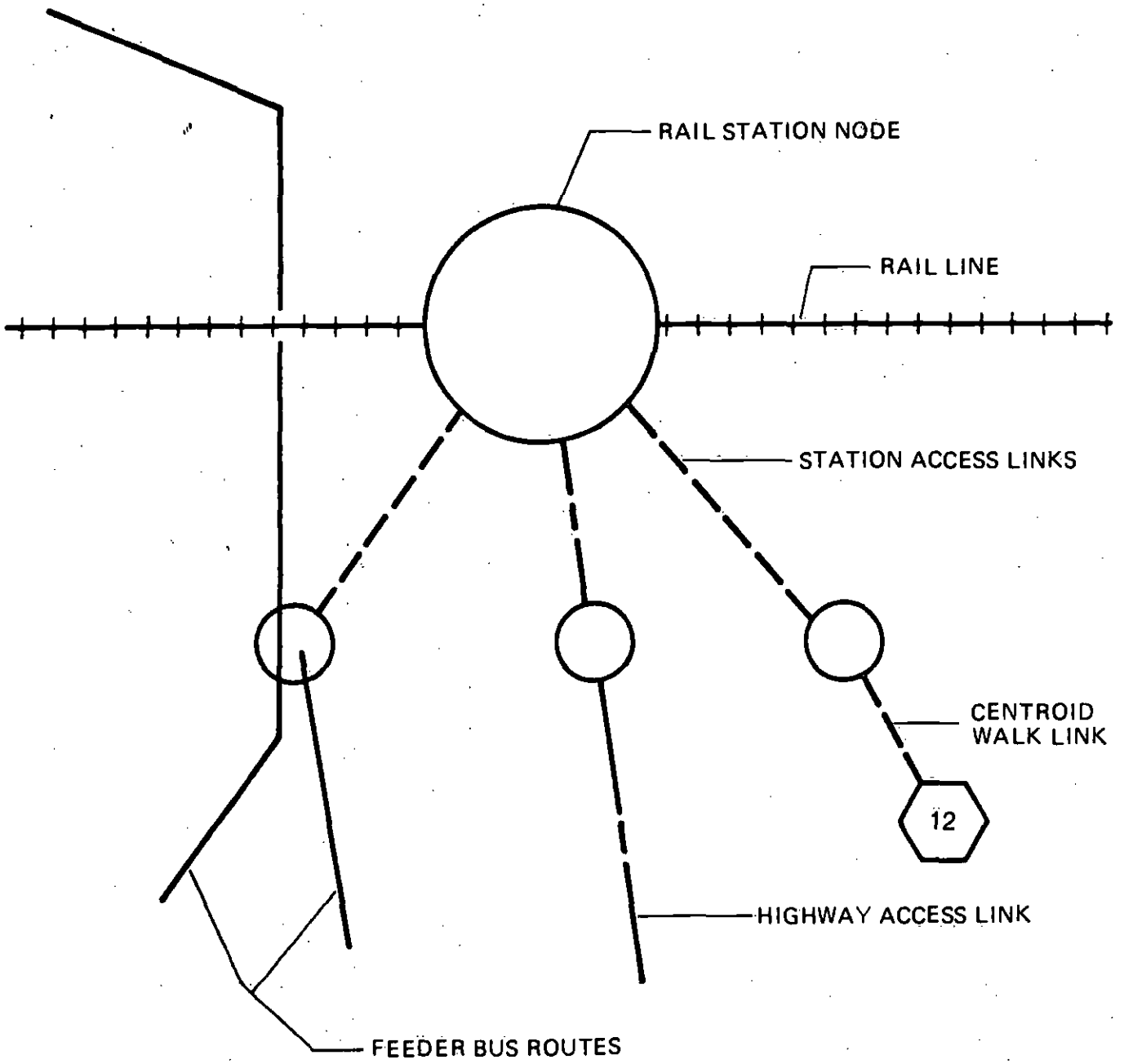
TABLE 2

STARTER LINE STATION DWELL TIME ESTIMATES

STATION	A.M. PEAK HOUR ENTERING	EXITING	TOTAL	ESTIMATED DWELL TIME
UNION STATION[1]	4,346	1,045	5,391	20
CIVIC CENTER	3,464	2,718	6,182	20
5TH & SPRING	1,604	2,645	4,249	15
7TH & FLOWER	2,913	6,666	9,579	30
7TH & ALVARADO	2,041	4,640	6,681	25
WILSHIRE & VERMONT	1,888	2,482	4,370	15
WILSHIRE & NORMANDIE	1,733	1,894	3,627	15
WILSHIRE & WESTERN	2,124	2,090	4,214	15
WILSHIRE & LABREA	1,154	1,134	2,288	10
WILSHIRE & FAIRFAX	2,570	2,786	5,356	20
FAIRFAX & BEVERLY	1,228	1,581	2,809	10
FAIRFAX & SANTA MONICA	886	896	1,782	10
HOLLYWOOD & CAHUENGA	1,826	3,167	4,993	20
HOLLYWOOD BOWL	585	117	702	10
UNIVERSAL CITY	5,847	2,938	8,785	30
NORTH HOLLYWOOD[1]	5,290	1,404	6,694	25

SOURCE: Alternatives Analysis and Environmental Impact Statement Report on Transit System Improvements in the Los Angeles Regional Core, Appendix I, Technical Analysis, Figures 7-23.

[1]For the starter line only, dwell time at these stations are zero.



TYPICAL RAIL (ON–LINE) STATION ACCESS

Figure 4
EXAMPLE OF STATION ACCESS CODING

For access links, the correct mode codes are essential, while for transit routes, a consistency in the use of mode codes will greatly assist in the preparation of summary data. The networks will be coded with the following mode codes:

Mode Code	Description of Link
1	PWD flag link (or not used)
2	Highway access link
3	Walk link
4	Local transit routes (SCRTD)
5	Express routes (SCRTD)
6	Local and express routes, DPM, Bus-On-Freeway, Commuter Rail
7	Local and express routes (DCTD)
8	Rail rapid transit (SCRTD)