BUNKER HILL PEOPLE MOVER AND PERIPHERAL PARKING SYSTEM

TRAFFIC FEASIBILITY STUDY

FOR

THE COMMUNITY REDEVELOPMENT AGENCY

OF THE

CITY OF LOS ANGELES

NOVEMBER 1973

vtn consolidated inc.
ENGINEERS ARCHITECTS PLANNERS
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November 8, 1973

Mr. Richard G. Mitchell, Administrator
The Community Redevelopment Agency of
The City of Los Angeles
727 West Seventh Street, Suite 400
Los Angeles, California 90017

Dear Mr. Mitchell:

VTN is pleased to submit herewith the Final Report of the Bunker Hill Peripheral Parking and People-Mover System Traffic Feasibility Study.

During the course of the study, contact was maintained with various local, state and federal agencies who have jointly participated in the CRA Peripheral Parking Program. The interaction between the consultant team and the public agencies resulted in an extremely satisfactory arrangement for developing, evaluating and recommending solutions to the matters of terminal location and design criteria for the Westside and Eastside Peripheral Parking Terminals.

This report contains a summary of the site location evaluation process and the traffic feasibility analyses for the terminals. Factors included were access, impacts on existing traffic and land use, and convenience and attractiveness to prospective users. Recommended are necessary improvements associated with development of the eastside and westside facilities.

We are pleased to have had the opportunity of working with the CRA on this important and far-reaching project. The effort has been rewarding in terms of the participation between the staffs of the Community Redevelopment Agency and VTN in working toward the ultimate completion of the Bunker Hill Redevelopment Project and its component elements.

Sincerely,

RW Holdsworth

Raymond W. Holdsworth
Director, Transportation Planning

Michael Schneider
Project Manager

MS:cm

enclosure

THE COMMUNITY REDEVELOPMENT AGENCY

OF THE

CITY OF LOS ANGELES

PERIPHERAL PARKING PROGRAM

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The major conclusions resulting from this study regard the feasibility of the peripheral parking/people mover system proposed by the Community Redevelopment Agency. Determinations of feasibility are based on the traffic-related impacts associated with development of the eastside and westside satellite parking facilities, designed to accommodate CBD-bound commuters primarily destined for Bunker Hill. The study investigated freeway and arterial carrying capacities, site compatability, and other factors connected with the ultimate feasibility of the overall system as well as its component subsystems. This included evaluation of possible improvements which would be necessitated by building of the peripheral parking structures and people mover guideway. The study findings, for each of the two proposed terminal facilities, are as follows:

Westside Terminal — It is recommended that the westside peripheral parking facility be constructed at the site northwest of the intersection of Glendale and Beverly Boulevards. This location, adjacent to the Hollywood Freeway, is capable of accepting the increased traffic load which will be generated by the garage, with the implementation of several improvements. These include:

- Metering of the Hollywood Freeway ramps at appropriate interchanges, and eventual widening of the Freeway through Hollywood.

- Widening of Glendale Boulevard to accommodate the expected PM peak flows exiting the garage. Such widening should be accomplished between the garage and the Hollywood Freeway.

- Signalization at the intersection of Glendale Boulevard and the garage driveway in the vicinity of Court Street.

- Signing, channelization, roadway striping and parking prohibitions to be implemented as required in connection with terminal development.

Eastside Terminal – It is recommended that the eastside peripheral parking facility be developed at the proposed location between Los Angeles and San Pedro Streets and Third and Fourth Streets. While in-depth investigation has shown that certain potential sites east of the Los Angeles River may help "unload" the bridge crossings, it is recommended that peripheral parking facilities east of the River constitute a "second generation" of garages designed to serve more specifically individual corridors of approach to the CBD.

The garage, developed at its proposed site, will be operationally feasible with only minor improvements. These include signing, roadway striping, and similar measures to promote safe and efficient traffic flow. The surrounding arterial street network has sufficient excess peak-hour capacity to accommodate the locally heavy garage-generated traffic.

INTRODUCTION

INTRODUCTION

The purpose of this report is to evaluate the traffic aspects of the Community Redevelopment Agency's proposed peripheral parking concept for the Bunker Hill Redevelopment Project. The draft report, together with preliminary recommendations, were reviewed by the Department of Traffic, City of Los Angeles, and Department of Transportation of the State of California. The study findings were discussed with the City Engineers' Office of the City of Los Angeles, the Southern California Rapid Transit District, the Southern California Association of Governments, and other agencies. The result of this extended and iterative review process was general agreement on the location of the proposed peripheral parking structures and the capability of the existing street system to serve these sites.

The traffic investigative process raised questions about other aspects of the overall program. At the westerly terminal, these involved a possible bus interface along the Hollywood Freeway and an extension of the people-mover to the southerly terminus of the Glendale Freeway. The rolling topography and critical traffic/street relationships in the area suggested the need for a site feasibility study. This investigation was completed in May 1973 and the results were incorporated in this traffic study. With regard to the proposed eastside terminal location, questions were raised by the Departments of Traffic and Engineering of the City of Los Angeles about the feasibility of relocating the terminal site easterly of the Los Angeles River from its proposed site west of the River. These questions, and others brought out during the review process, were investigated during the course of the study. The findings and recommendations relating to the peripheral parking program are included in this report.

The report itself is composed of two distinct sections. The first part serves to determine a site for a peripheral parking facility to the west of Bunker Hill. Included is a detailed analysis of traffic feasibility and proposed terminal design criteria. The second section is a similar analysis of traffic implications for the satellite parking facility proposed to be located east of the Bunker Hill complex. While the west and east side analyses are not necessarily symmetrical in terms of methodology and analytical approach, each provides a detailed study of traffic-related factors and implementation strategies associated with the particular site.

BACKGROUND

BACKGROUND

The Community Redevelopment Agency of the City of Los Angeles has expressed interest in developing a viable peripheral parking system to serve the projected parking needs of the Bunker Hill Redevelopment Project. Previous work by Barton-Aschman Associates, Inc.,[1] indicated that such satellite parking facilities are necessary given the expected office and retail development within the Bunker Hill Project boundaries. Specifically, the excess street capacity in the vicinity of Bunker Hill is not sufficient to accommodate the amount of traffic expected to be generated by the ultimate retail and office expansion; therefore, some parking must be provided at offsite locations. A system of peripheral parking facilities, linked to Bunker Hill by "people-movers" (i.e., small, automated, tracked vehicles) is a means by which this on-site parking deficit may be alleviated.

The classical concept of peripheral parking for downtown areas and central business districts is based on the notion that traffic bound for the central business district (CBD) might be "intercepted" by a conveniently located garage facility en route. Where many downtown-oriented trips originate in suburban areas and approach the CBD by means of freeways, the objective of a peripheral parking facility is to attract a proportion of these trips and alter the CBD entry mode from personal vehicles to automated people-movers. The attraction to drivers may be based on lower parking rates, less traffic congestion, minimization of time from parking to final destination, or a combination of these factors.

The Bunker Hill peripheral parking concept is somewhat different from the classical concept of off-site parking. While the classical concept assumes a "free-market" parking system in which drivers freely trade cost for convenience to determine their own parking location,[2] the Bunker Hill concept assumes a more restricted market. That is, the satellite terminals are expected to be considered an extension of the Bunker Hill Project and, as such, will be

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[1]Studies performed by Barton-Aschman Associates, Inc., include *Proposed People-Mover System Developed in Conjunction with the Bunker Hill Satellite Parking Program*, April 1970, and *Programs for Transportation and Parking, Bunker Hill Urban Renewal Project*, May, 1970.

[2]See *A Peripheral Parking Program: Central City - Los Angeles*, Wilbur Smith and Associates, May 1972.

constructed in conjunction with the development of Bunker Hill and will be essentially for the tenants of the Project. There will be no significant trade-offs for drivers to consider; instead, the goal of the Bunker Hill peripheral parking program will be to create overall travel times approximately equal for those parking on-site and those parking off-site. This is expected to be possible due to the increased congestion and corresponding delays normally encountered in parking in the central business district.

The parking deficit which is anticipated to occur in Bunker Hill can be largely alleviated with the implementation of this type of peripheral parking system. The estimated ultimate parking space deficit expected to occur at Bunker HIll is in the neighborhood of 7,000 to 9,000 parking places. Thus, a satellite parking system would need to handle this quantity of vehicles. The program considered by the Community Redevelopment Agency during the Bunker Hill Project planning envisions an east-west people-mover system with two 4,000-car garages, one located to the west and the other to the east of Bunker Hill. The westside facility would be the larger of the two, expanded to include maintenance and storage facilities for the people-mover system as well as minor retail and commercial services. (It should be noted that a site utilization study for the westside terminal was performed to determine the best configuration for the various functions to be included at the site.) The eastside terminal, in its proposed location adjacent to Little Tokyo, would comprise a street-level commercial activity center for the convenience of users as well as neighborhood shoppers. Each site will require approximately 8 to 10 acres to accommodate the parking demand, assuming a parking density of 100 vehicles per acre and four- or five-story structures. The westside terminal, however, will require additional acreage for the people-mover storage and maintenance facilities. The possibility of rooftop development and the incorporation of other such community-oriented amenities should be investigated in conjunction with detailed design studies of the peripheral parking terminals.

The objective of this type of peripheral parking system is to intercept traffic bound for Bunker Hill for either direction. In the future, the system could form the initial phase of a major peripheral parking system for the entire CBD, with a complex collection/distribution arrangement involving other terminals and garages as well as regional mass transit. A CBD people-mover system, in fact, has been included in the Southern California Rapid Transit

Districts' corridor study and associated proposals for extensive mass transit improvements in Los Angeles.

The function of this study, then, is to locate these two initial 4,000-car garages at appropriate sites and to determine if such sites are feasible in terms of traffic considerations. Factors to be included in this analysis are freeway and surface street access, impacts on existing traffic, convenience and attractiveness to prospective users, compatibility with abutting land uses, suitability with regard to proposed Community Plans, and improvements necessary for implementation.

WESTSIDE TERMINAL SITE EVALUATION

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WESTSIDE TERMINAL SITE EVALUATION

The analytical evaluation process for the CRA westside terminal complex consisted of two stages. The first stage involved site selection, while the second involved traffic analysis of the selected sites. Figure 1 schematically indicates the steps followed in the analytical process.

Review of Alternative Terminal Locations: Site Selection

The site selection process for the CRA westside satellite parking facility involved a series of iterations. Initially, several constraints were developed to limit the scope of the search for acceptable sites. The first iteration served to narrow the list of possible locations to conform with the list of constraints that follow:

1. The site should have reasonable access to the Hollywood Freeway, which carries a high percentage of traffic from the north and west to the CBD.

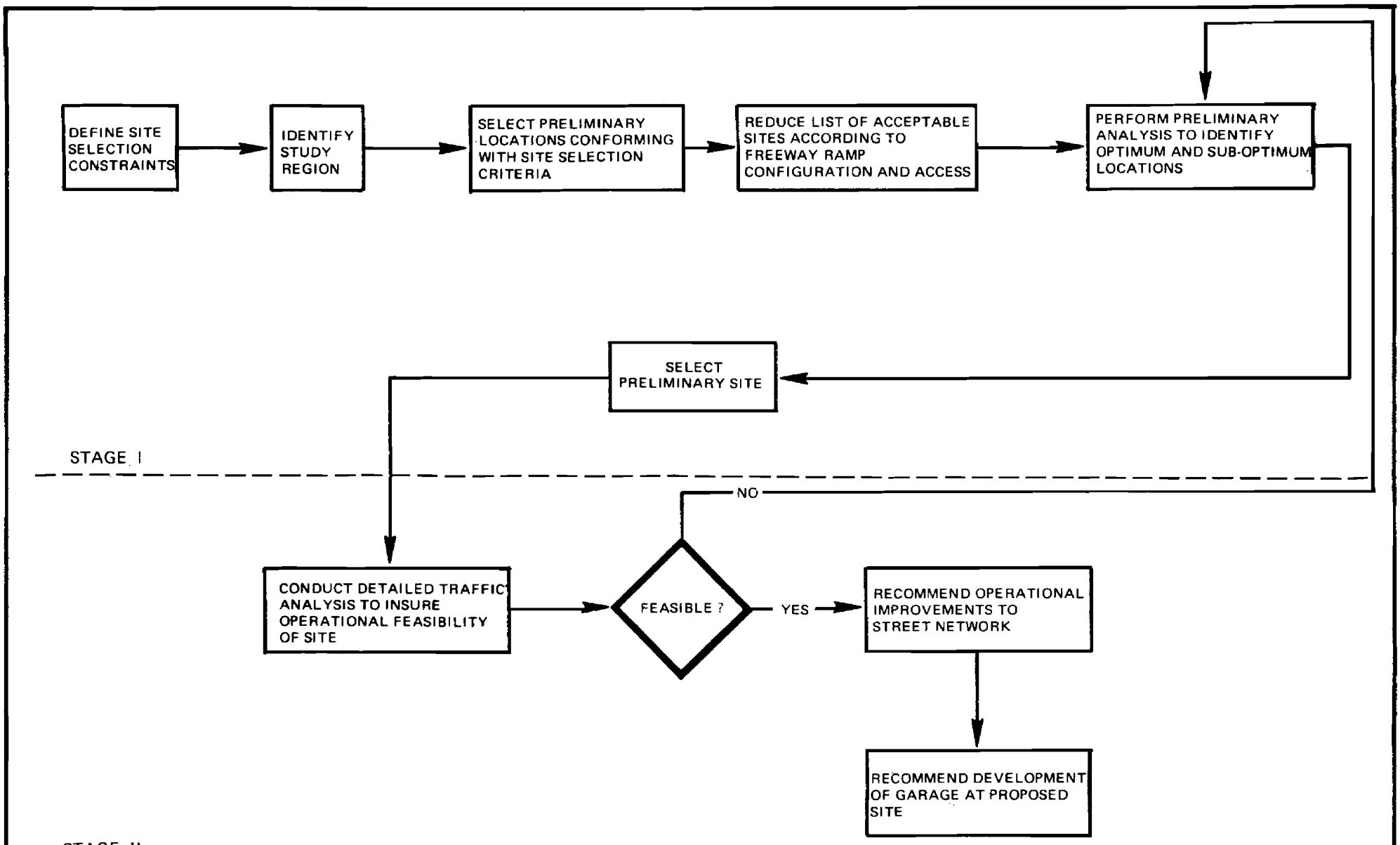
2. The site should be feasible to acquire in terms of existing land usage; for example, intensive commercial use is presumably less feasible to acquire than vacant land and single-family or other low-density residential use.

3. The site should be located to take optimum advantage of the existing ramp configuration of the Hollywood Freeway.

4. The site should be located in such a manner to create a minimum of disruption to existing traffic flow on the nearby arterial and collector street network.

5. The site ideally should be as close as possible to Bunker Hill in order to reduce construction and land acquisition costs of the people-mover.

6. The site should be chosen to minimize adverse environmental impacts on the surrounding community.



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SITE SELECTION AND ANALYSIS PROCESS
WESTSIDE TERMINAL

FIGURE 1

Using these constraints, a phycial description of the geographical area to be surveyed for possible terminal locations was developed. This area was parallel and adjacent to the Hollywood Freeway, between Vermont Avenue and the "stack" (four-level interchange). In conformity with the site selection constraints, the search was limited to this area for the following reasons:

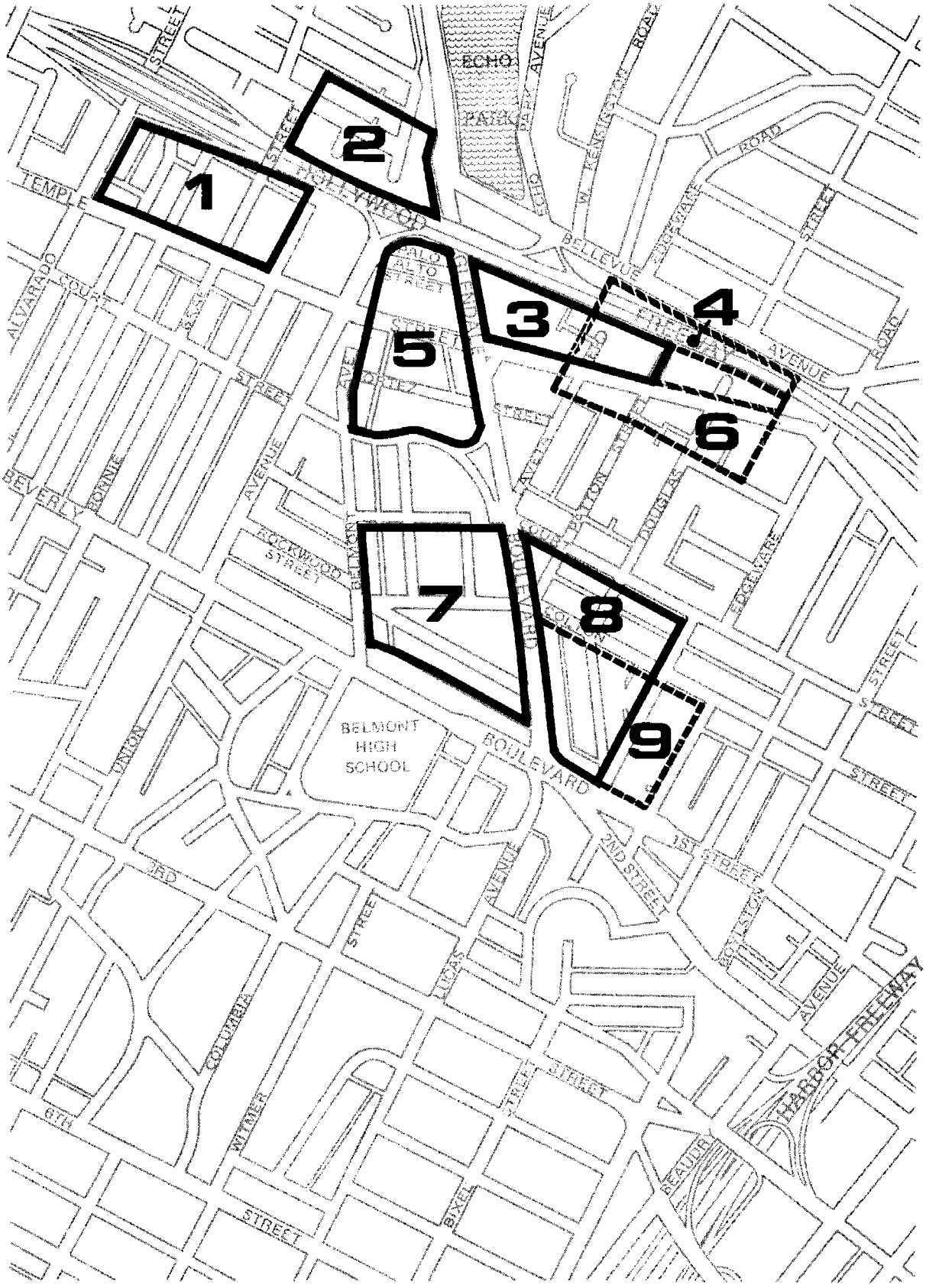
1. To locate west of Vermont Avenue would incur an unsatisfactory trade-off between decreased land costs and increased people-mover construction and land acquisition costs;

2. To intercept a number of trips from the north and west en route to Bunker Hill, a location adjacent to the Hollywood Freeway is desirable; and

3. There are areas within this region where the land use is acceptable for garage siting, both in terms of acquisition feasibility and compatability of usage.

The next iteration in the site selection process consisted of identifying several generalized sites within the region; these preliminary locations are illustrated in Figure 2. In selecting these sites, an additional criterion was developed to improve the traffic utility of the terminal location. Glendale Boulevard and Alvarado Street both have access to the Golden State Freeway and Glendale Freeway north of Echo Park. For this reason, the additional criterion called for a terminal location adjacent to Glendale Boulevard and/or Alvarado Street, due to increased freeway accessibility for traffic originating in the eastern and northern San Fernando Valley and using the Golden State/Glendale Freeway.

Following preliminary site identification, the subsequent iteration involved consideration of the entrance/exit ramp configuration of the Hollywood Freeway. This Freeway, with existing ramp volumes, is shown in Figure 3. Since the freeway itself is already operating at or near design capacity during peak periods, it was considered crucial that traffic generated by the terminal complex create minimal disruption at freeway/surface-street interchanges. While a certain amount of delay is to be expected in using a freeway access route in the peak



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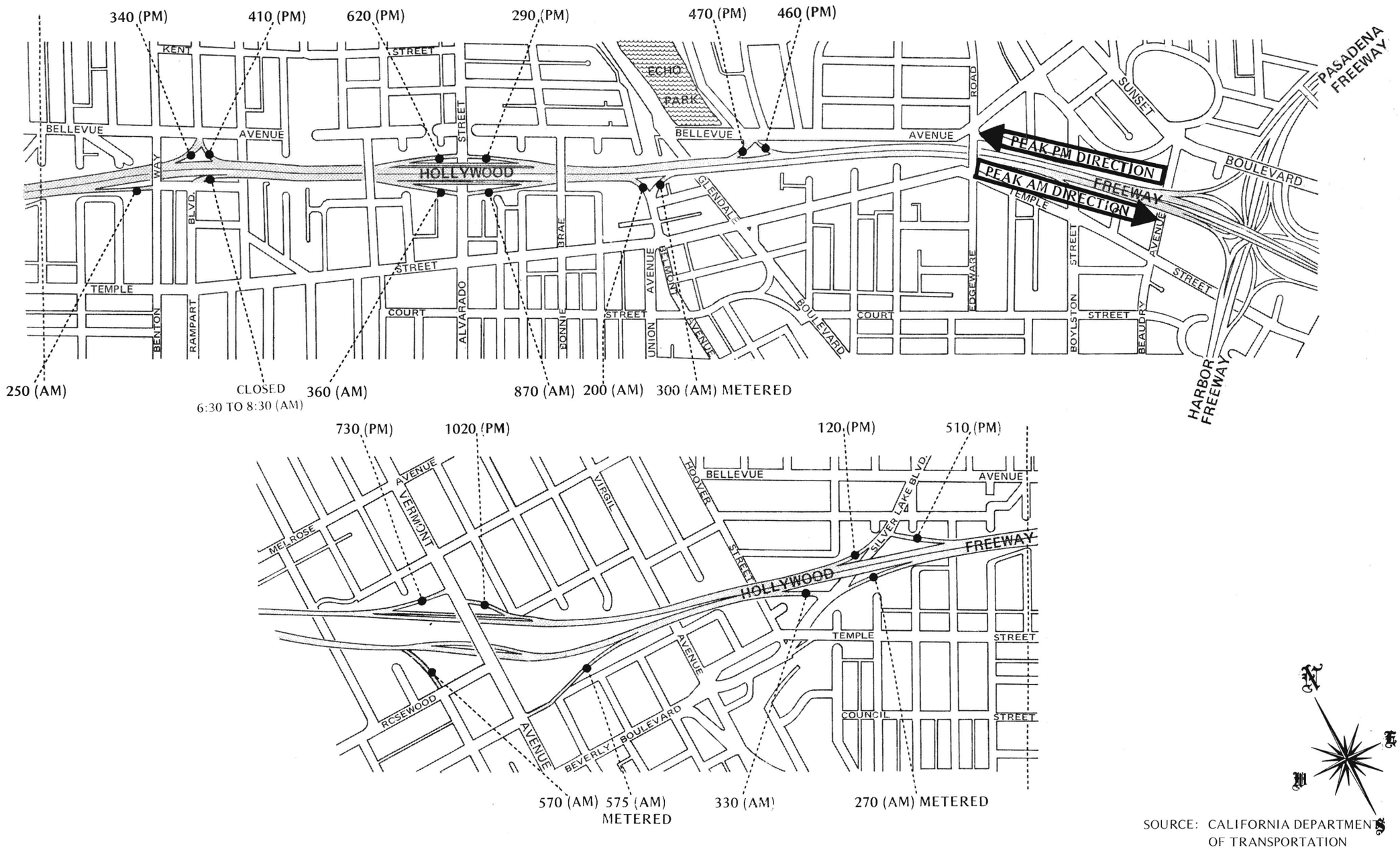
PRELIMINARY TERMINAL COMPLEX SITES

Figure 2



SOURCE: CALIFORNIA DEPARTMENT OF TRANSPORTATION

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PEAK HOUR VOLUMES HOLLYWOOD FREEWAY RAMPS

Figure 3

direction during the peak hour, good utilization of the existing street and ramp pattern can significantly reduce or eliminate delay caused by conflicting movements, such as left turns against opposing traffic flow. Often, to accomplish such design, it is necessary to favor either inbound or outbound movement to or from a traffic generator. That is, the specific location of the facility and its ingress/egress pattern - especially when superimposed upon an existing street network - determines whether flow *to* the facility or *from* the facility will experience minimum delay due to a reduction in traffic conflicts. In the context of freeway ramp configuration, this "directional favoritism" becomes apparent if, for example, terminal traffic were to use an arterial street with a diamond interchange for exiting and entering the Hollywood Freeway. With this type of ramp system, a left turn is necessary to either exit or enter the freeway. In cases where the left turn is required to be made on the arterial street, delay due to opposing traffic will be encountered. In this way, the location of the traffic generating facility with respect to the freeway and its ramp configuration is a very important consideration. (It should be noted that for purposes of this study, it was assumed that no new ramp facilities would be constructed on the Hollywood Freeway.)

Thus, a decision was necessary as to whether morning terminal-bound or evening home-bound traffic would be favored in locating the westside terminal complex. Generally, in designing parking facilities, the home-to-work trip is often considered more crucial than the work-to-home trip. This is because the worker is usually under pressure to arrive at work on time, while the arrival time of the evening home-bound trip is not as critical. Studies performed at shopping centers have shown that shoppers, for example, place more importance on the lack of delay during ingress than egress. A valid assumption based on this knowledge might be that generally the trip *away* from home - to most destinations, including work - is more time dependent to the tripmaker than the trip *to* home. While annoyance based on delay is associated with trips of all types, delay on trips with specific arrival times is perhaps the least tasteful to the motorist. Thus, if a trade-off became necessary, it was decided that the location of the terminal complex should be such to minimize ingress delay at the sacrafice of some egress delay.

Using the morning and evening peak-hour ramp volumes on the Hollywood Freeway as shown in Figure 3, the various sites were evaluated according to ingress and egress, that is,

according to the ease with which motorists might gain access to the terminal from the Hollywood Freeway and from adjacent surface streets. In addition, the alternative sites were evaluated on the basis of land use suitability (i.e., acquisition potential and compatability of usage) and on the required people-mover alignment from each site to the Bunker Hill area. Numbers were assigned to each of the sites shown in Figure 2 to quickly ascertain the relative attractiveness of the various sites. This rating is shown in Table 1. The rating scale has higher numbers representing more acceptable conditions for terminal development. This matrix, of course, was not the result of a fixed analytical procedure, but rather an overall subjective evaluation of the acceptability of each site according to the criteria set forth. As such, it was used only as a guide for further analysis.

According to Table 1, sites 5, 7, 8 and 9 have the highest composite rating based on ingress and egress, land use suitability, and people-mover alignment. Previous discussion indicated that ease of ingress was to be valued more than ease of egress due to work time arrival presures; therefore, while sites 8 and 9 have high ratings on egress due to the absence of left-turn movements, sites 5 and 7 have the best ingress potential due to their location on Belmont Avenue, immediately accessible to the inbound Hollywood Freeway via the existing Belmont off-ramp. These two sites are illustrated in greater detail in Figure 4.

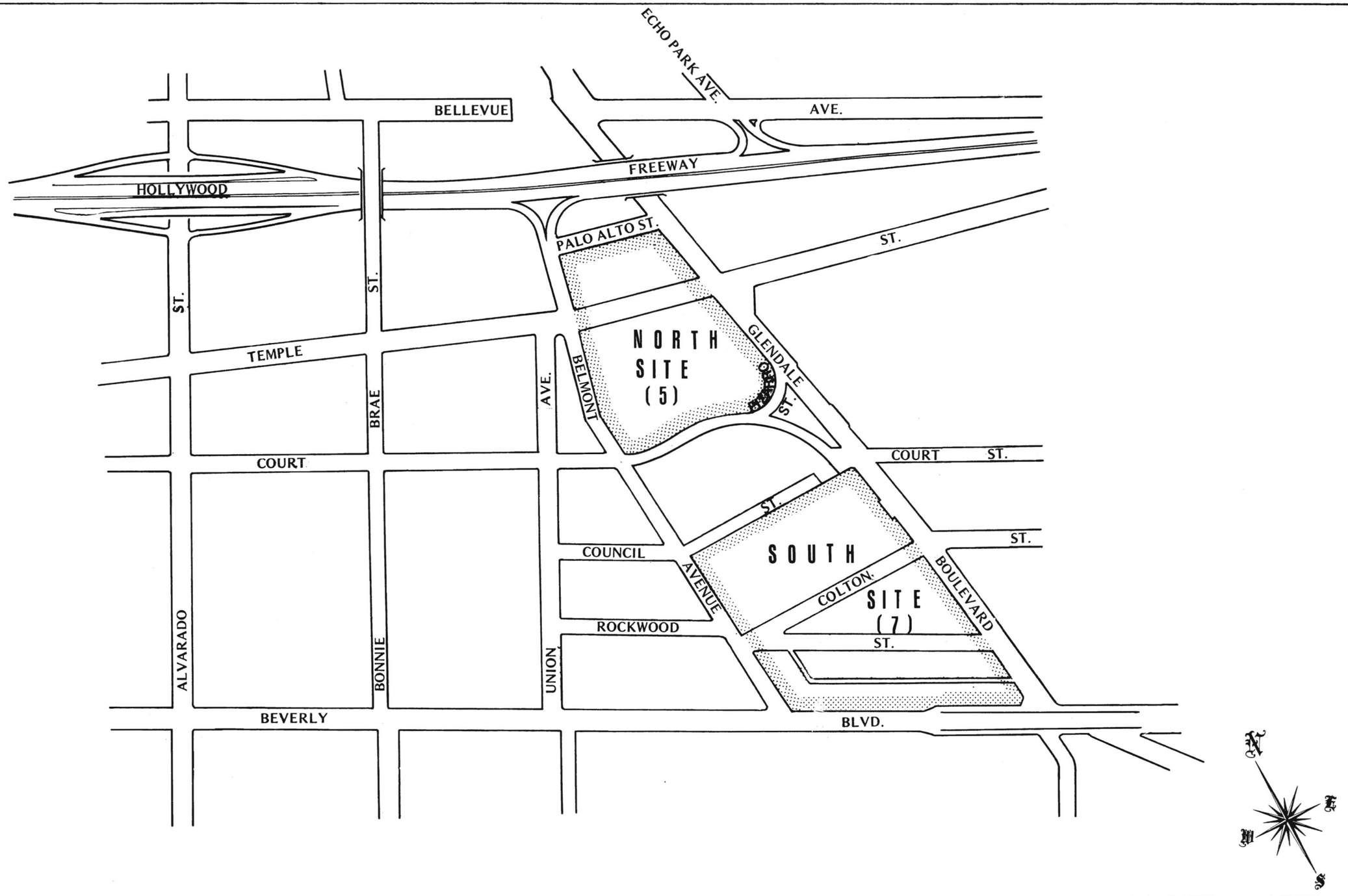
A preliminary traffic analysis of sites 5 and 7 indicated that, with certain operational improvements, both sites could be made to work. However, site 5 must span Temple Street and, in addition, it would be necessary to acquire considerable commercial property. More importantly, the very close proximity of this site to the Hollywood Freeway raises the serious question - often debated among traffic engineers - of location of prime traffic generators immediately adjacent to freeways. Many contend that such a location is poor due to the lack of "escape routes" from the facility. That is, a location farther from freeway entrance and exit ramps allows those not using the freeway to avoid further congesting the access to the freeway. It is usually wise, therefore, to provide a means for non-freeway traffic to use routes which are not used by traffic desiring to gain access to the freeway. In this context, it was determined that site 7 appears to have the greatest potential for development as a peripheral parking and transportation terminal facility for Bunker Hill.

TABLE 1

SITE LOCATION RATING

Site	Ingress (a.m.)	Egress (p.m.)	Land Use Compatibility	People Mover Alignment	Total
1	5	2	1	2	10
2	2	4	2	2	10
3	3	4	2	3	12
4	2	3	1	3	9
5	5	4	3	3	15
6	3	3	2	3	11
7	4	4	4	4	16
8	3	5	2	5	15
9	3	5	2	5	15

LEGEND: 5 - High suitability for site development.
1 - Low suitability for site development.



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PROPOSED SITES FOR WESTSIDE TERMINAL COMPLEX

Figure 4

It should be noted, however, that although site 7 is the optimum location for development of the westside terminal, there may be certain conditions under which the development of site 5 would be advantageous. Specifically, if the FHWA Fringe Parking Program, which permits use of Highway Department funds for construction of peripheral parking facilities, is considered, site 5 may be more likely to receive a larger proportion of highway funding due to its closer location to the Hollywood Freeway. It may be argued that such a location would intercept more freeway traffic and therefore qualify for greater FHWA support than site 7. Another possible condition affecting site selection is transit interface, which is fully discussed in the following section.

Transit Impact on Site Selection

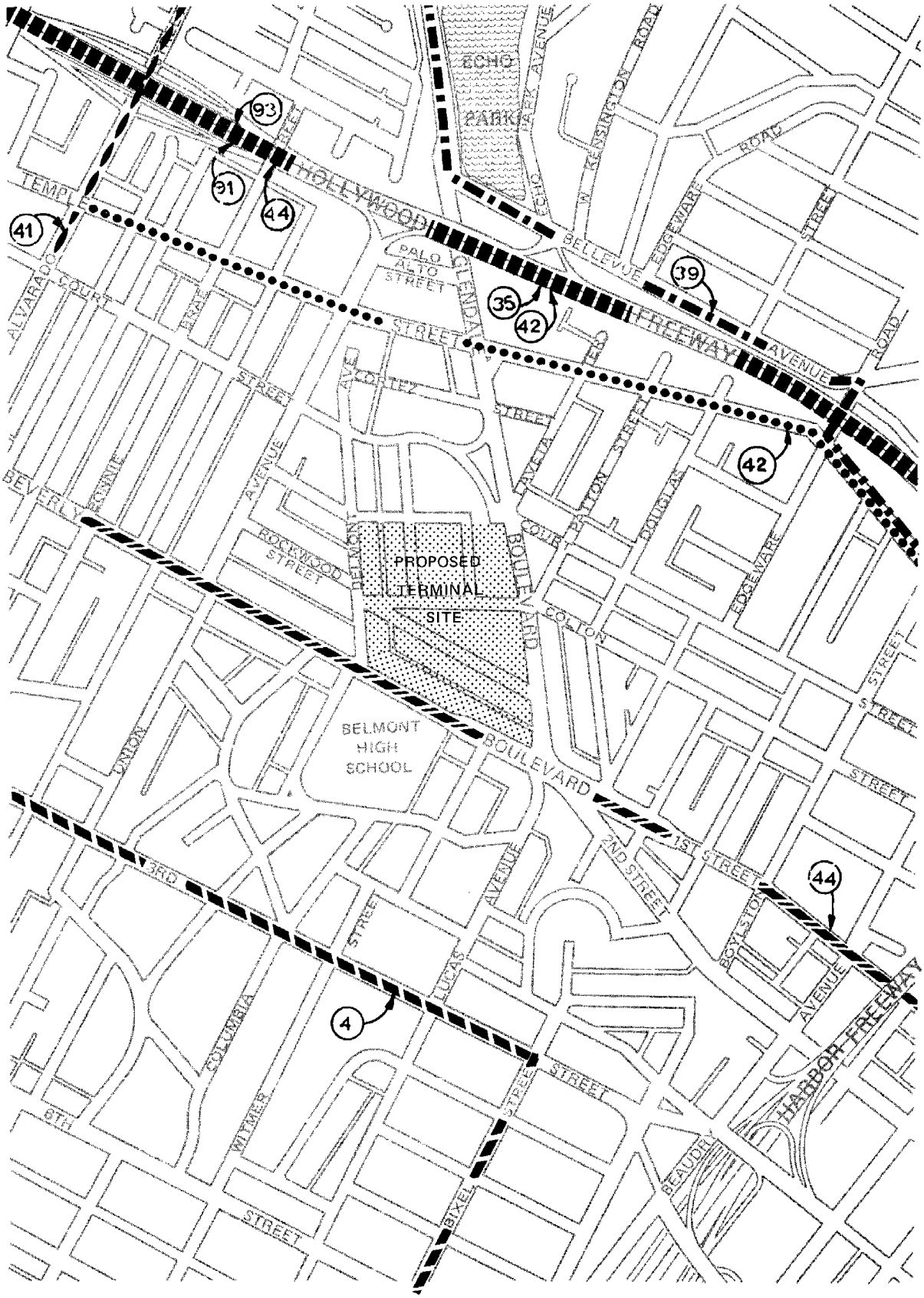
Inasmuch as the westside facility is proposed to be a terminal serving other transport modes in addition to automobiles, the possibility of including "bus intercept" to further reduce traffic in Bunker Hill was investigated together with prevailing traffic conditions. Figure 5 shows the existing Southern California Rapid Transit District bus routes in the vicinity of the terminal site; Table 2 indicates the type of service provided and route origin. It is quite feasible that certain of these lines could directly serve the westside terminal by means of bus bays. In this way, buses destined for the Bunker Hill area could unload passengers at the terminal and these commuters could then enter the CBD via the people-mover. Thus, the satellite garage intercept strategy would be applied to buses as well as cars, further expanding upon the role fo the peripheral parking facility as a regional transportation terminal serving commuters destined for Downtown/Bunker Hill.

The possible use of site 7 by buses was studied jointly by SCRTD and VTN. It was found that buses using Beverly Boulevard and possibly some Temple Street buses could use a stop at the site, but that the location was too far south to be used by express freeway buses. The SCRTD recommended that if site 7 were selected, provisions be made for extension of the people-mover northerly to a possible future station along the Hollywood Freeway. This option would permit freeway bus passengers to gain access to the people-mover system prior to entering the congested downtown area and thereby provide operating economies to SCRTD.

TABLE 2

SCRTD BUS ROUTES

Route Number	Type of Service	Route Origin
35	Hollywood Freeway; express	Encino/Tarzana
39	Glendale Boulevard/Bellevue Avenue; local	Burbank
41	Alvarado Street; local	Echo Park
42	Temple Street; local	Hollywood
42	Hollywood Freeway; express	Hollywood
44	Beverly Boulevard; local	Beverly Hills
44	Hollywood Freeway; express	Hollywood
91	Hollywood Freeway; express	Los Feliz
93	Hollywood Freeway; express	Van Nuys



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SCRTD BUS ROUTES IN VICINITY OF WESTSIDE TERMINAL

Figure 5

Concept design studies of a combined bus/parking facility at site 5 did not indicate such a multi-use facility to be a viable alternative. A bus volume of 150 to 200 per hour entering the terminal plus 2,000 automobiles creates serious internal circulation problems. Bus passengers should be delivered directly to the people-mover platform, which means possible interference with pedestrians walking from their automobiles. Another problem with a combined bus/automobile terminal results from both buses and automobiles using a single freeway ramp or two ramps within close proximity.

The possibility of a combined automobile/bus westside terminal has not been completely ruled out, but at this stage of the analysis, it was determined to proceed with the investigation of site 7, including the potential for extension of the people-mover line to the Hollywood Freeway.

System Expansion Impact on Site Selection

The bus/people-mover relationship raised the question of other possible extensions of the westside line. The location of the primary terminal, of course, has a major impact on the flexibility of the system in terms of accommodating future extensions of the people-mover line. In this context, possible future extensions were briefly examined in order to provide input to the site selection process.

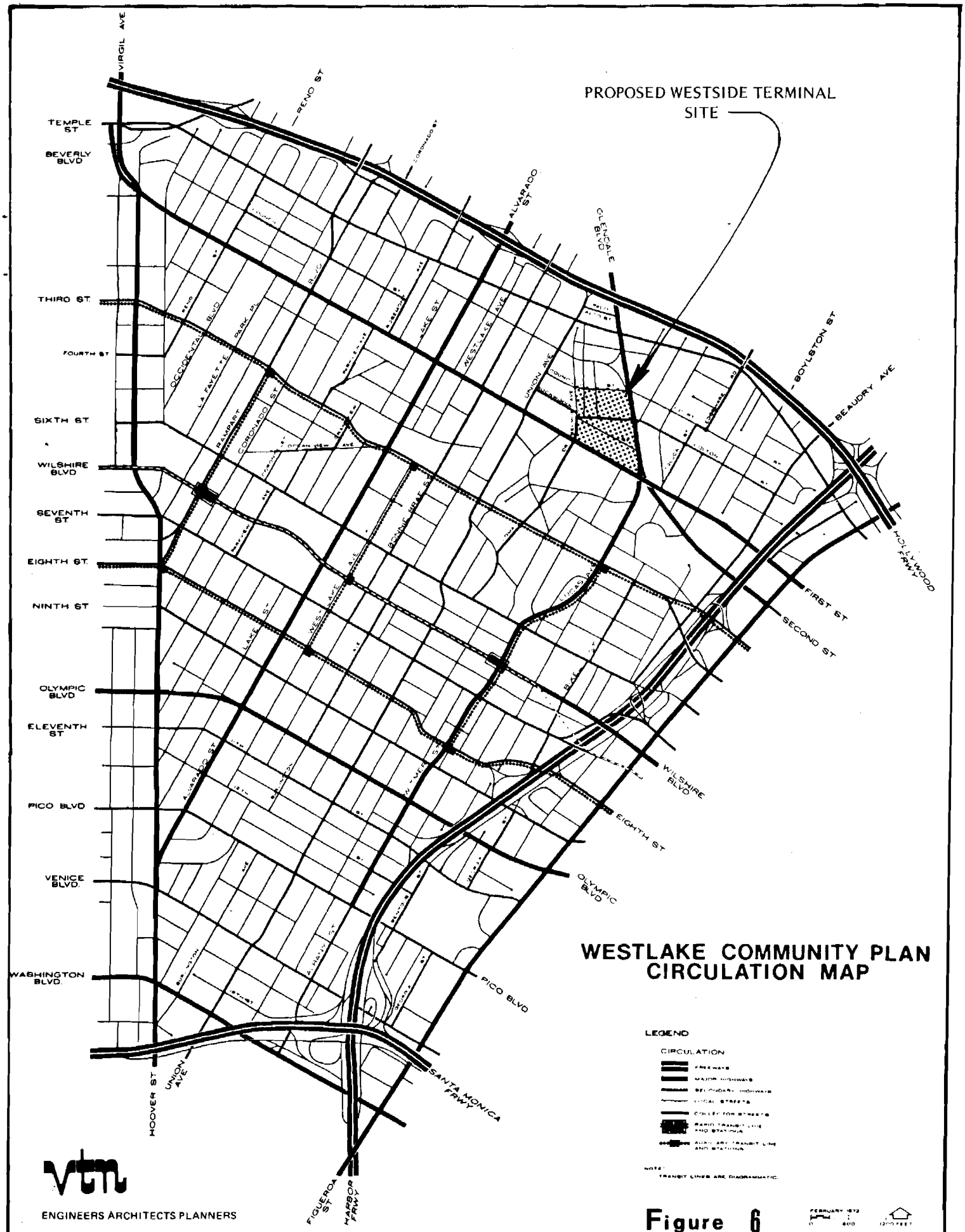
One possible extension of the line which has been discussed involves a vehicle intercept station at the southerly terminus of the Glendale Freeway to capture commuters using the Golden State/Glendale Freeway corridor for access to the CBD. The Glendale Freeway presently terminates at Alvardo Street, State Highway 2, approximately 2 miles north of site 7. This route carries a morning inbound movement of 1,500 to 1,800 vehicles per hour, many destined for downtown Los Angeles. An automobile intercept at this location might have a significant positive impact of relieving freeway and local street congestion in central Los Angeles. The role of this site, however, in a total multi-modal plan is beyond the scope of this investigation. This subject is raised herein to insure proper consideration in the design of the people-mover system including intermediate stations. A Glendale Freeway terminal might warrant a redesign of site 7 to permit a bypass of this station during morning and evening peak periods.

A second possible extension, a connection between the Hollywood Freeway and the westside terminal, was presented to District 7 of the State of California Department of Transportation. Such a proposal could be a major element in the current study by the Department for expanded bus service along the Hollywood Freeway. The possibility of the Department constructing a bus interface along the freeway and the people-mover extension financed by a UMTA capital grant has been discussed but not investigated. The very limited investigation of people-mover extensions served to reinforce the selection of site 7. This location appears to be well suited as the westerly terminus of a base-line system appropriately designed to accommodate likely future extensions.

Traffic Analysis of the Proposed Terminal Site

During the preliminary feasibility study of site 7, it was found that the *Westlake Community Plan* authored by the Los Angeles Planning Department proposed termination of Belmont Avenue south of Temple Street (making Belmont a local street) and subsequent development of Union Avenue as a secondary highway with access to the Hollywood Freeway via the present interchange at Belmont Avenue. The circulation system proposed in connection with the Westlake Plan is illustrated in Figure 6; this system has received endorsement from the Los Angeles Traffic Department.

In light of the proposal to provide access from the Hollywood Freeway to Union Avenue in place of Belmont, as presently exists, a thorough investigation of these two alternate approaches to terminal site 7 was conducted. It was found that either access route would be acceptable in terms of traffic operational feasibility, and that Union Avenue, as a proposed secondary highway, would be more appropriate for accommodating garage traffic than Belmont Avenue which is essentially residential in character. Thus, it was assumed for purposes of this study that the Planning Department's recommendation to terminate Belmont Avenue south of Temple Street and connect Union Avenue with the Freeway would be implemented. However, it should be pointed out that in the event this recommendation is *not* implemented, garage access via Belmont Avenue will certainly be a viable alternate.



WESTLAKE COMMUNITY PLAN CIRCULATION MAP

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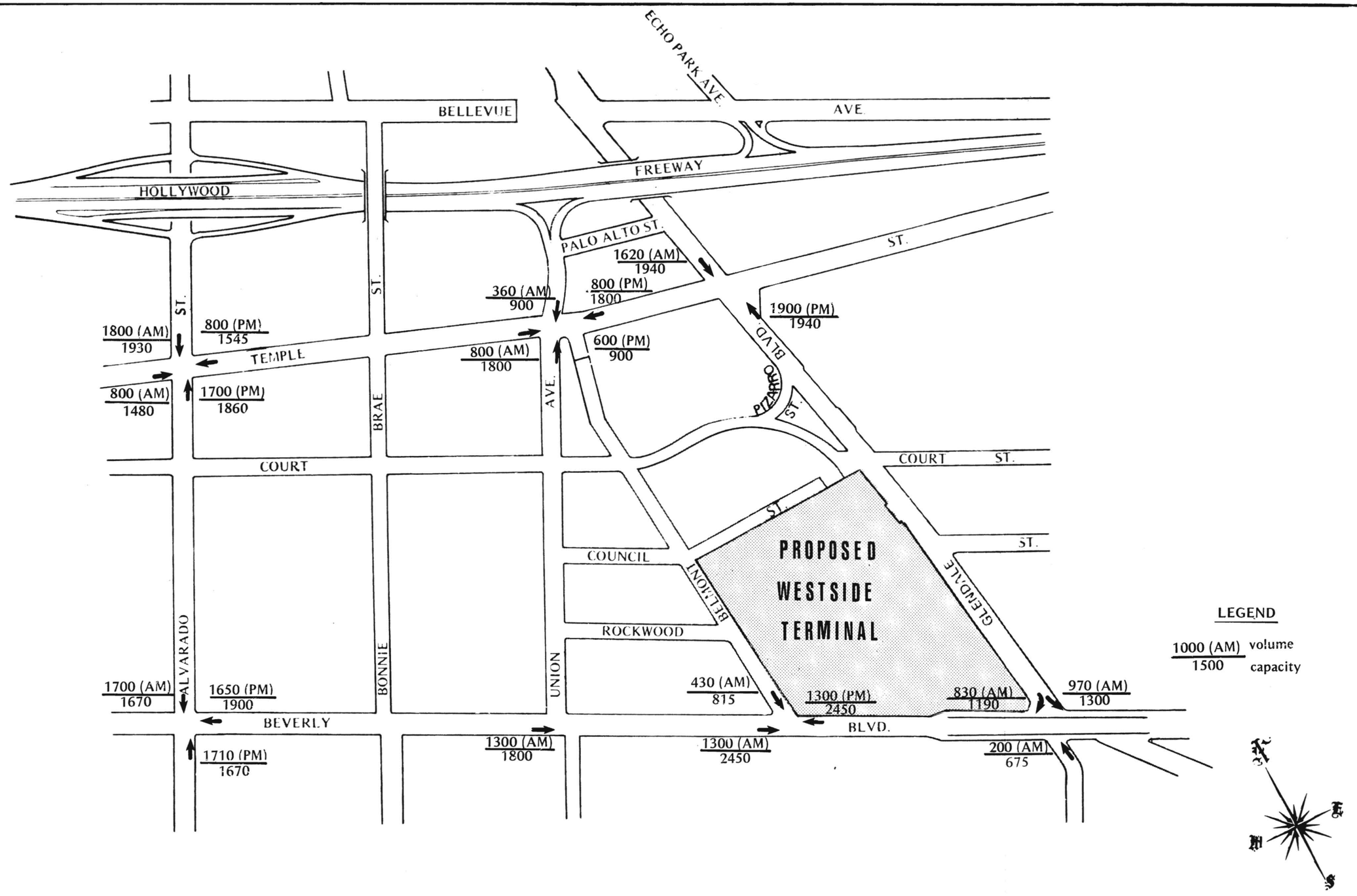
Figure 6

A detailed traffic analysis was conducted to determine the operational feasibility of site 7. This section will serve to describe the analysis that was conducted and present conclusions regarding the traffic feasibility of the site for development of the westside terminal complex. First, a summary of existing conditions in the vicinity will be presented, and this will be followed by a discussion of the projected traffic demands anticipated to result from the development of the satellite parking facility. Other considerations regarding future traffic operation, such as additional planned development in the vicinity and the circulation element of the proposed Westlake Community Plan, will be summarized and placed in the context of a general traffic flow pattern for the terminal site. The projected demand was tested against the capacity of the surrounding street and freeway network for the morning and evening peak hours; the conclusions derived from this comparison, together with a description of the methods used in testing, will be presented. Finally, recommendations and suggested courses of action will be listed for development of implementation strategies.

Existing Conditions — The site proposed for development of the terminal complex, as shown in Figure 7, is bounded by Glendale Boulevard on the east, Council Street on the north, Belmont Avenue on the west, and Beverly Boulevard on the south. The area is predominantly residential, mostly single-family dwellings, although some multiple dwelling units are present. There are also a number of vacant parcels. The site encompasses some 15 acres, much of which is hilly, with grades in excess of 10 percent. The site has sufficient acreage to be developed as envisioned; that is, in addition to parking, there will be space available for storage and maintenance facilities associated with the people-mover system, as well as retail and commercial services.

The traffic conditions in the vicinity are those of a typical outlying commercial/residential district: uncrowded during the daytime and evening but extensively used during peak weekday travel hours. Figure 7 also shows the existing peak-hour volumes and capacities of the arterial network surrounding the terminal site. (It should be noted that this analysis used level of service "D" to compute capacity figures. The *Highway Capacity Manual* defines this level of service as "approaching unstable flow, with tolerable operating speeds being maintained though considerably affected by changes in operating conditions . . . drivers have little freedom to maneuver." This level of service is considered typical for peak-hour



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EXISTING PEAK HOUR VOLUMES AND CAPACITIES

Figure 7

movement in outlying mixed commercial/residential districts in major metropolitan areas.) It is apparent that the surface street network has excess capacity, although the Hollywood Freeway does not.

Projected Conditions: Trip Distribution to the Westside Garage — The volume and directional distribution of traffic that will ultimately be attracted to the Westside Peripheral Parking Terminal was projected on the basis of a series of assumptions about the nature of anticipated traffic demands. These assumptions are as follows:

1. It was assumed that most of the traffic which will use the Hollywood Freeway to get to the Westside terminal will be traffic that would otherwise use the Hollywood Freeway to get to the CBD in the absence of the peripheral parking facility. That is, while any new downtown development may attract new traffic, the terminal itself cannot be considered a generator of new traffic in the context of the overall regional system. Instead, the terminal should be thought of as a generator of *local* traffic: those downtown commuters using the garage will simply be terminating their CBD-oriented trip short of downtown. Thus, regional traffic patterns will not be significantly altered as a result of terminal development - only *local* patterns. It should be pointed out, however, that a complex system of intercept and peripheral parking garages and connecting linkages could change regional travel patterns significantly; such changes, of course, would depend on the ultimate location of other terminals and the type of linkages between these terminals and the central core.

2. It was assumed that half of the total vehicular capacity of the garage will be filled and emptied during the morning and evening peak hours, respectively. Thus, for purposes of calculating garage-generated traffic volumes, it will be assumed that 2,000 cars will enter the facility during the morning peak hour and 2,000 will be discharged during the evening peak hour. This pattern of garage activity is based on reported experience of similar commuter-oriented garages in downtown Los Angeles.

3. It was assumed that the existing patterns of street and freeway ramp usage in the vicinity of the proposed westside terminal will be altered on a commuter preference basis in order to accommodate the additional local traffic generated by the parking facility. For example, a certain proportion of the traffic currently using the Echo Park on-ramp to the Hollywood Freeway in the evening will seek other routes to the Freeway once the terminal is developed. Commuters, of course, tend to make use of the route that provides the greatest utility in terms of distance, time, and convenience. The presence of a local traffic generator of the magnitude of the proposed peripheral parking facility will cause existing commuters using routes in the vicinity to choose other routes which provide greater utility. The assumption of such behavior on the part of the present commuters will allow the calculated capacity of streets and freeway ramps to be the constraint on travel patterns of garage traffic. Thus, a proportion of existing traffic will be assumed to use alternate routes to avoid the terminal facility.

Using the above assumptions as a basis for calculation, an assessment was made of previous origin-destination and parking studies[3] in order to project a rational directional distribution of peak-hour trips to the Westside terminal. The assumed peak-hour generation of 2,000 vehicles was distributed over the freeway and arterial network on the basis of travel patterns determined from exhibited commuter behavior. This assumed directional distribution is illustrated in Figure 8.

Projecting this trip distribution onto the street network results in volume and capacity figures as shown in Figure 9. It should be noted that the volume figures represent existing *plus* projected garage-generated traffic. It can be seen that, with certain exceptions, the street network has excess capacity sufficient to accommodate the increased volume associated with the development of the peripheral parking terminal facility.

Traffic Flow Patterns — The site selected for development of the Westside terminal encourages a circular flow pattern to and from the Hollywood Freeway. This Freeway,

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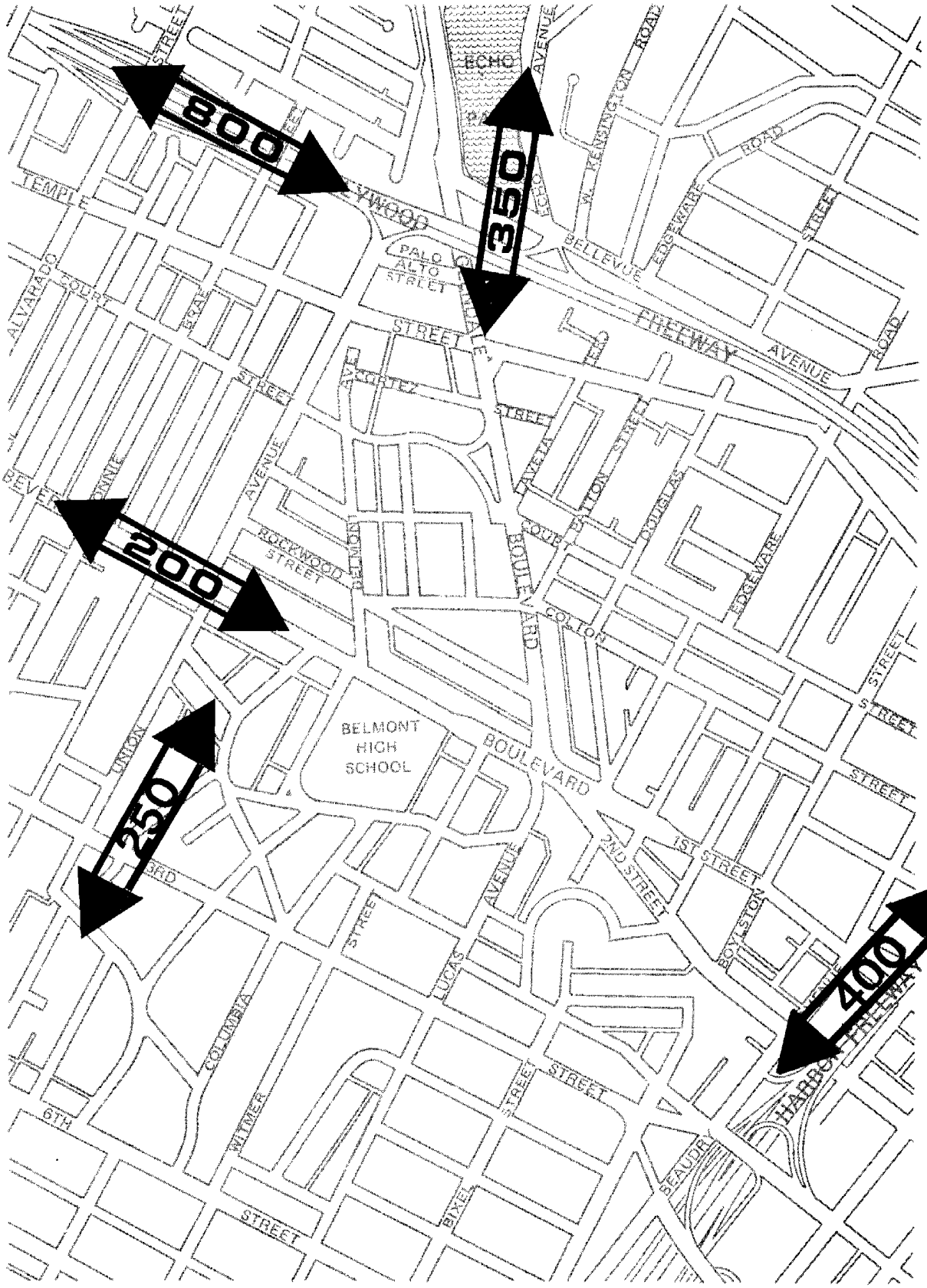
[3]See Barton-Aschman, *op. cit.* 1970; Los Angeles Department of Traffic, *Dispersed Parking Facilities for Bunker Hill Area*, April 1970, and Wilbur Smith and Associates, *op. cit.*, 1972.



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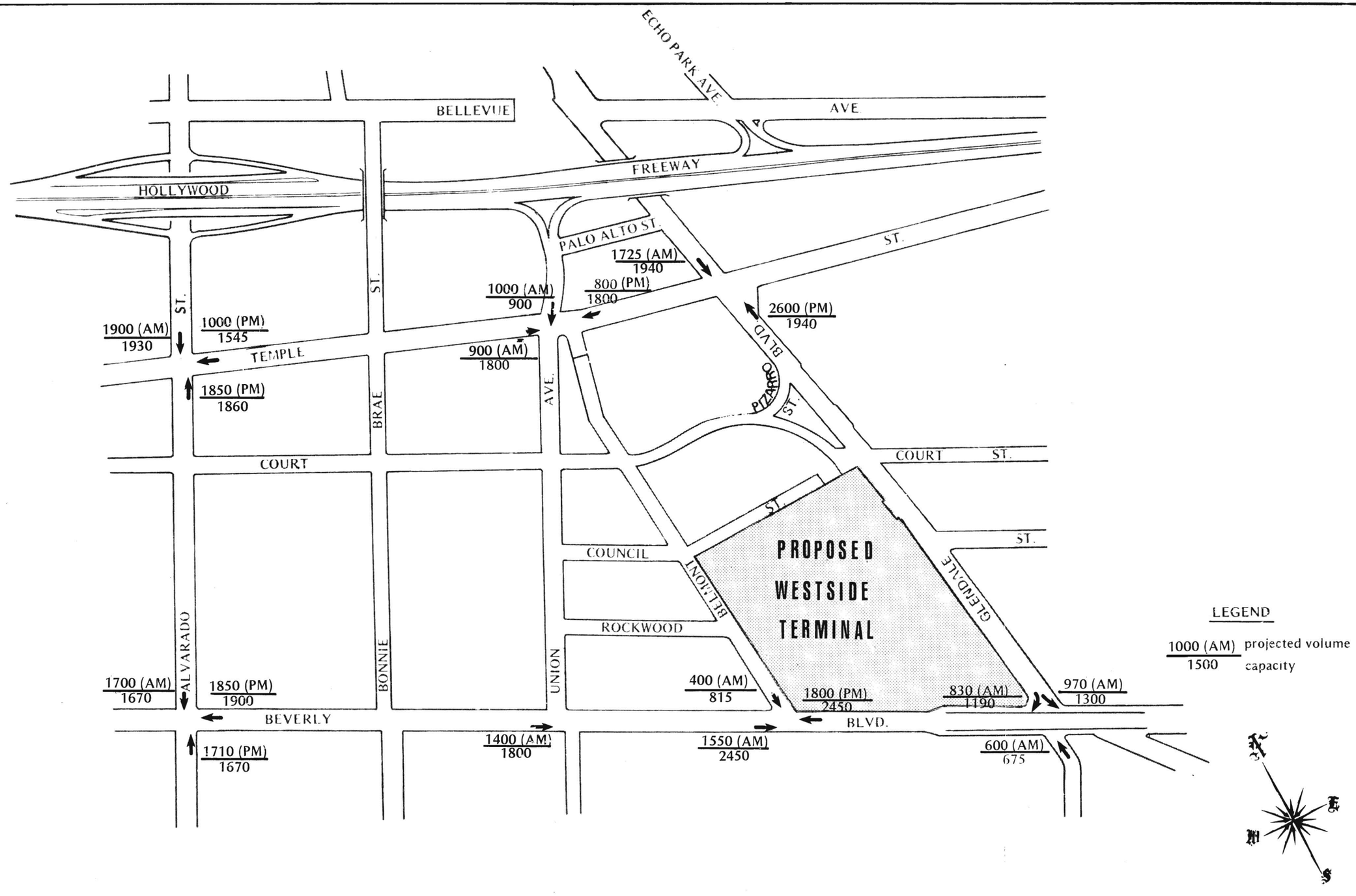
DIRECTIONAL DISTRIBUTION OF TRIPS TO WESTSIDE TERMINAL COMPLEX

Figure 8



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PROJECTED PEAK HOUR VOLUMES AND CAPACITIES

Figure 9

according to Figure 8, is projected to be the largest single corridor in terms of carrying traffic to the terminal. The entrance and exit ramp configuration to and from the Hollywood Freeway favors ingress to the garage over egress. Traffic destined for the terminal exits the Hollywood Freeway at Union Avenue (presently Belmont) and proceeds south over lightly traveled routes to the terminal. Traffic from the terminal proceeds north on Glendale Boulevard and enters the Freeway via the Echo Park on-ramp. This section will serve to systematically analyze the projected traffic flows as indicated in Figure 9, and point out those locations where some form of improvement may be necessary for implementation. Morning peak-hour movement will be discussed first, followed by a discussion of evening peak flow.

The California Department of Transportation has a number of plans and proposals for the Hollywood Freeway. Currently, the Freeway Operations Group is metering several on- and off-ramps during peak periods. Plans for the future include metering of all necessary ramps and widening of the Freeway from three to four lanes through Hollywood to increase capacity. Meetings have been held with the Freeway Operations Group to discuss the significance of the metering and widening program with regard to the Westside terminal; the metering rates recommended at ramps adjacent to the terminal are compatible with State programs. The widening of the Hollywood Freeway, which has been budgeted and is planned for completion by 1976-77, will increase freeway capacity although not necessarily improve flow conditions.

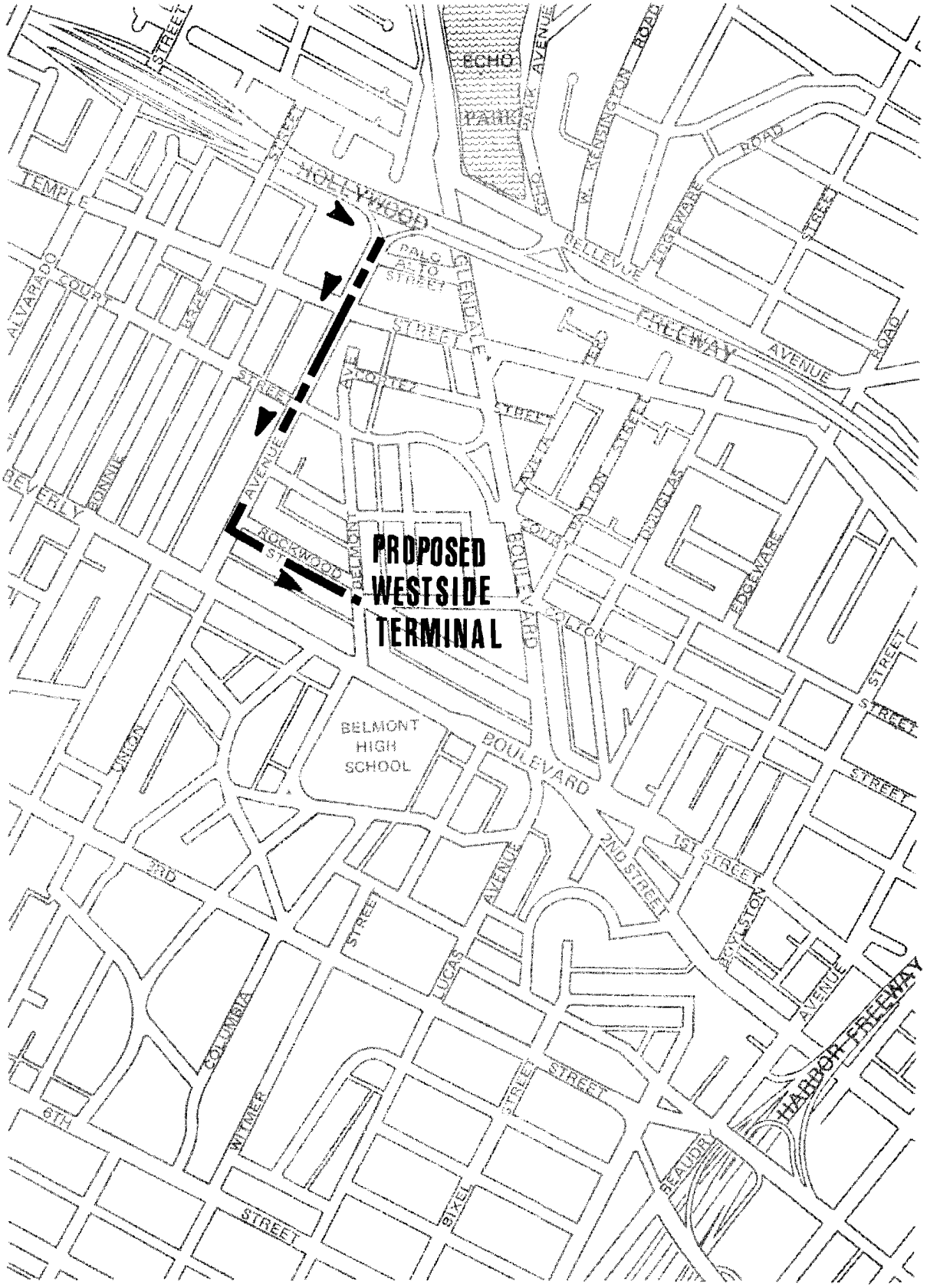
The directional trip distribution (Figure 8) showed that the heaviest concentration of vehicle-trips to the garage in the morning will be via the inbound Hollywood Freeway. Approximately 800 vehicles will be exiting the Freeway at Union Avenue during the peak hour. California Department of Transportation figures indicate that this will create a combined total of 1,000 peak-hour trips using this off-ramp. To determine if this volume of exiting vehicles might create weaving difficulties with the approximately 870 peak-hour vehicles currently entering the Freeway upstream at Alvarado Street, a weaving analysis (as documented in the Highway Capacity Manual) was performed. This analysis indicated that weaving *is* possible given the geometric and volumetric constraints, although it is recommended that the southbound Alvarado Street on-ramp be metered at about 600 vehicles per hour to insure operational feasibility.

After exiting the Hollywood Freeway, terminal-bound traffic will proceed south on Union Avenue. Future plans for the vicinity include the development of a Ross-Loos 150-bed hospital/clinic northwest of the intersection of Temple Street and Union Avenue. While the overall daily traffic generation of this medical facility may be quite high, it is anticipated that peak-hour demands will be relatively low due to the unique nature of hospital work shifts, outpatient visits, and visiting hours. In addition, no access will be provided to Union Avenue from the hospital parking lot. Thus, it is not expected that the Ross-Loos facility will have a significant effect on morning peak-hour flow to the peripheral parking terminal.

Terminal-bound commuters using Union Avenue can reach their destination by either of two routings illustrated in Figures 10 and 11. Method 1 assumes that during the morning peak hour the 800 vehicles using the Hollywood Freeway will proceed south on Union Avenue to Rockwood Avenue, turn east, and proceed across Rockwood directly into the garage. Method 2 alternatively assumes a "filtering" process whereby terminal-bound vehicles will use Court Street, Council Street, and Rockwood Avenue to reach Belmont Avenue, and enter the garage at the Belmont/Rockwood entrance. Since only one street (Rockwood Avenue) would be affected by traffic using method 1, it is recommended that this approach be adopted and left-turn provisions from Union Avenue to Rockwood Street be installed to insure its effectiveness.

Surface street traffic from the west and south will, for the most part, approach the terminal on Union Avenue and Beverly Boulevard. Left turns from Beverly into the garage can be accomplished because of the light outbound flow of traffic along Beverly Boulevard in the morning.

Traffic from the south using the Harbor Freeway can exit at 3rd Street and proceed west to Lucas, turn north and enter the terminal from an entrance on Beverly Boulevard just west of Glendale. An investigation of signal timing at the intersection of Lucas Avenue, Beverly Boulevard/2nd Street, and Glendale Boulevard has indicated that there is sufficient green time for northbound traffic on Lucas to cross Beverly Boulevard, even with the expected volume increase generated by the terminal. Traffic from the north using the Harbor Freeway will take advantage of a route similar to that used by Harbor Freeway traffic from the south, exiting at 2nd Street and proceeding west to the terminal.



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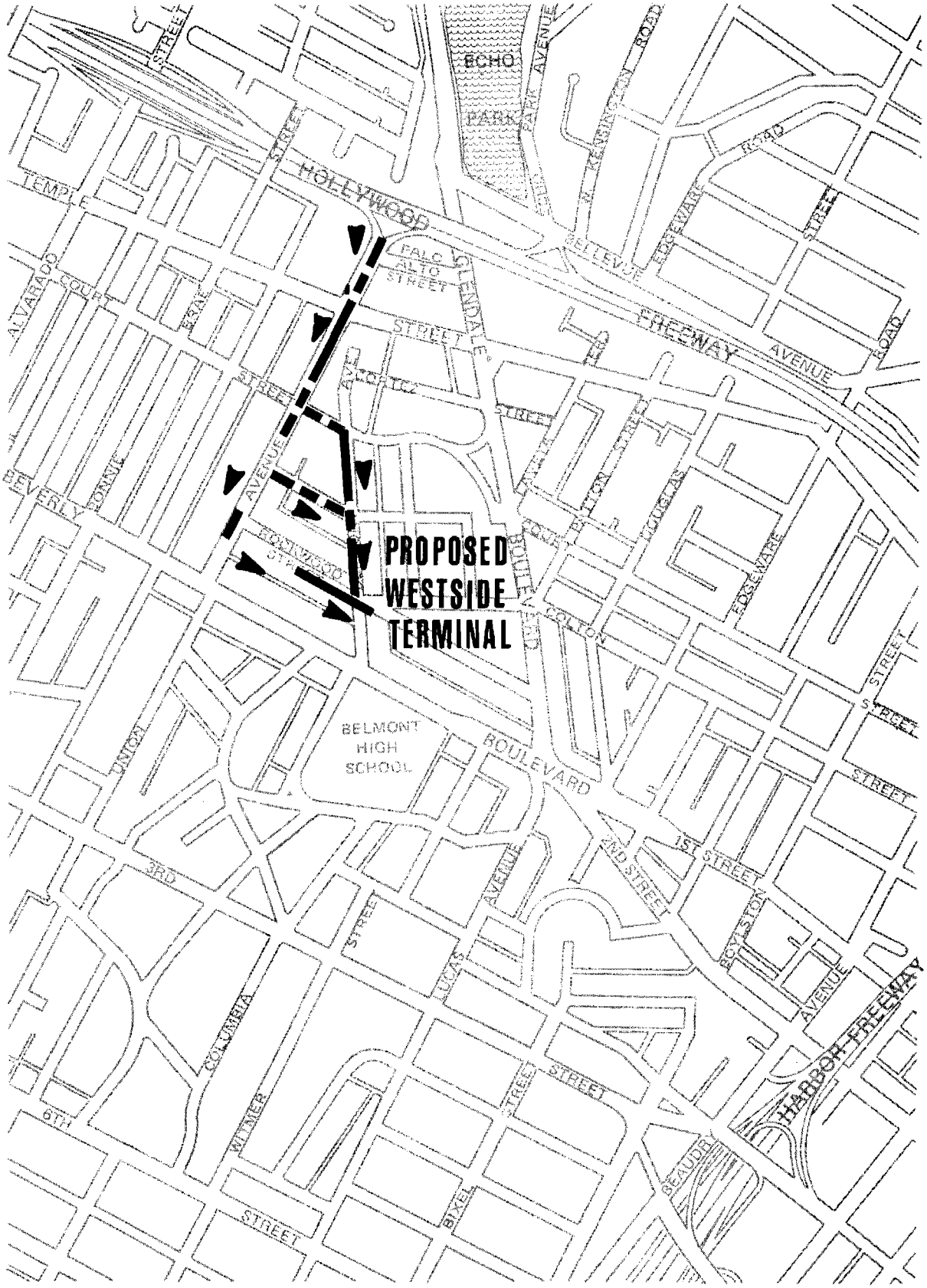
UNION AVENUE ACCESS TO WESTSIDE TERMINAL

METHOD 1

Figure 10



ENGINEERS ARCHITECTS PLANNERS

UNION AVENUE ACCESS TO WESTSIDE TERMINAL

METHOD 2

Figure 11

Traffic from the Golden State and Glendale Freeways will approach the terminal along Glendale Boulevard. Since a right turn is necessary to enter the facility from Glendale Boulevard southbound, no foreseeable problems arise with this movement. Deceleration bays and right-turn lanes can be provided as part of the garage development.

Figure 9 has shown that, during the evening peak hour, problems will occur on Glendale Boulevard, which is currently operating almost at capacity in the northbound direction, and on the outbound approach to the Hollywood Freeway. Traffic taking the Freeway uses the Union Avenue off-ramp for access to the terminal in the morning, but in the evening, this home-bound traffic will use Glendale Boulevard, Bellevue Avenue, and the Echo Park on-ramp. The additional terminal traffic will place Glendale Boulevard above capacity, thus requiring some type of improvement. While other outbound ramps are available (e.g. Alvarado Street), they are heavily used and require left turns through a diamond interchange. To be sure, some traffic will choose other routes; however, this analysis assumed that 600 of the 800 vehicles which use the Union Avenue ramp in the morning will use the Echo Park Avenue ramp in the evening via Glendale Boulevard. Even with some diversion of traffic to other ramps, it is evident that Glendale Boulevard will have to be improved to facilitate the additional traffic demand. Possible improvements are recommended in the following section.

Traffic leaving the terminal with destinations other than the Hollywood Freeway will not encounter difficulties, nor will existing traffic be seriously inconvenienced. Surface street traffic bound for the south and west will leave the terminal via Beverly Boulevard and Glendale Boulevard which, while carrying heavy outbound volumes, still maintain excess capacity sufficient to accommodate terminal traffic. Motorists using the Harbor Freeway can take 2nd Street to the Freeway ramps, again moving opposed to peak flow.

Terminal Accessibility and Network Improvements

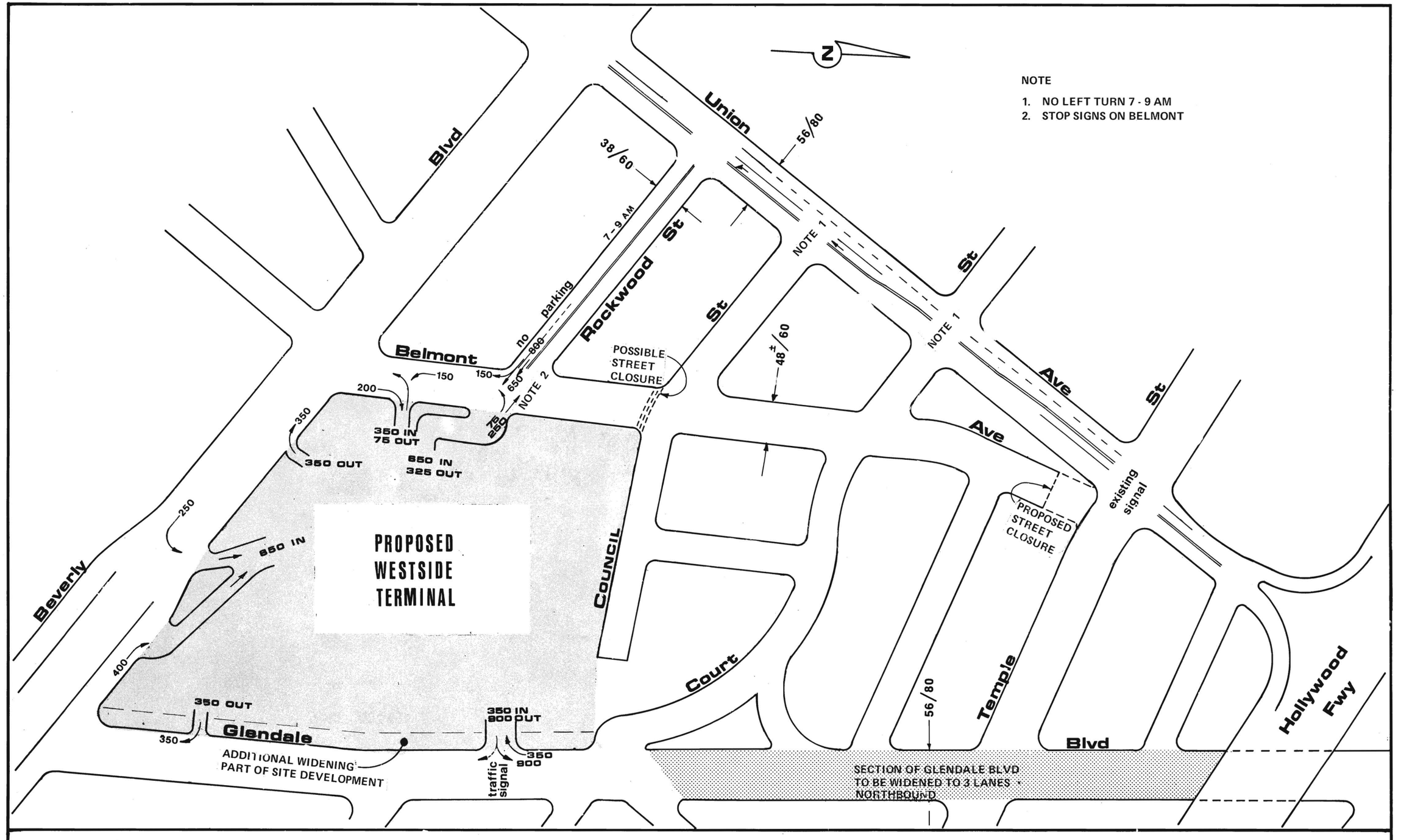
The proposed terminal site, according to volume/capacity analysis and other criteria, is feasible in terms of traffic considerations. However, this feasibility is contingent upon certain improvements and design elements considered necessary for development.

Figure 12 shows a possible ingress/egress configuration for the terminal, including projected peak-hour ingress/egress demands. Roadway re-striping will be necessary on Union Avenue and Beverly Boulevard to facilitate channelization for left turns. The southern exit from the garage on Glendale Boulevard is proposed to be an exit only, with left turns to northbound Glendale Boulevard prohibited. Specifically, Union Avenue should be striped to provide two southbound lanes with morning peak-hour left-turn restrictions, except at the intersection with Rockwood Street. It is not necessary, however, to post parking restrictions nor does it seem necessary to install any new signals to facilitate morning flow. Rockwood Street, proposed as the access route between Union Avenue and the garage entrance on Belmont, will need certain modification, including the possibility of parking prohibition on the south side of the roadway and roadway re-striping where necessary.

Specific design details regarding ingress, egress and driveway configuration, while not final, have been proposed and are illustrated in Figure 12. This recommendation is based on an extensive site utilization/preliminary design study performed by VTN's architectural and structural engineering groups. During the course of this study various possible garage designs, incorporating maintenance, storage and administration facilities for the people movers system, were reviewed and evaluated with the aim of developing the "best" plan for eventual site utilization.

The major factor that appears to affect site feasibility is the lack of capacity on Glendale Boulevard northbound during the evening peak. A related issue is the fact that 600 to 800 vehicles wishing to enter the outbound Hollywood Freeway via Glendale Boulevard and Bellevue Avenue will have to turn left from the terminal to northbound Glendale Boulevard in the path of heavy outbound flow. Both of these problems can be sufficiently alleviated if the improvements shown in Figure 12 are implemented.

First, it is proposed that a new signal be installed on Glendale Boulevard at the north garage exit just south of Court Street. This signal would provide a break in traffic to allow exiting garage traffic to proceed north on Glendale Boulevard. This signal, due to its location (approximately midway between Beverly Boulevard and Temple Street), could improve traffic flow on Glendale Boulevard by helping to produce a "regulated," progressive flow of traffic.



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PROPOSED ACCESS TO WESTSIDE TERMINAL

Figure 12

The second improvement is a direct result of the fact that an additional 600 to 800 vehicles will enter the Glendale Boulevard flow during the PM peak hour from the north garage exit. To accommodate this increased load, it is proposed that Glendale Boulevard be widened from two lanes to three lanes in the northbound direction to increase capacity north of the terminal location. This widening can be accomplished in several ways.

Study has shown that, if necessary, Glendale Boulevard can be widened from the northerly garage exit at Court Street to north of the Hollywood Freeway overcrossing, allowing three northbound lanes to pass under the Freeway. This improvement can be accomplished by either (1) implementing the full City standard right-of-way of 100 feet and widening the roadway to 80 feet curb-to-curb, or (2) utilizing the existing right-of-way of 80 feet and widening the roadway to 64 feet curb-to-curb. In either case, three northbound lanes could be provided from the terminal to Bellevue Avenue.

An additional improvement might involve the reconstruction of the ramp from eastbound Bellevue Avenue to the northbound Hollywood Freeway. The turn involved is presently about 110°; reconstruction could lessen the turning angle, with a probable improvement in traffic flow. Another improvement might be to prohibit left turns from westbound Bellevue Avenue to the northbound Hollywood Freeway. This would eliminate conflicts between eastbound and westbound traffic on Bellevue desiring to enter the Freeway via the Echo Park on-ramp.

Conclusions and Recommendations

It is recommended that the westside terminal complex be located at site 7, northwest of the intersection of Glendale and Beverly Boulevards. With certain improvements, detailed below, this site is considered to be the most feasible location for terminal development with regard to traffic operation, people-mover alignment, and expansion potential. While specific details regarding the design of the terminal have been left tentative, this study has concluded that the site chosen for development is one that can work, in conjunction with the following recommendations:

1. It is recommended that the Alvarado Street on-ramp to the south-bound Hollywood Freeway be metered during the morning peak period at a level of approximately 600 vehicles per hour.

2. It is recommended that the Echo Park on-ramp to the northbound Hollywood Freeway be considered an extension of the CBD, and, in this context, either operate without metering or, if metered, at a level of about 900 vehicles per hour during the evening peak period.

3. It is recommended that Glendale Boulevard be improved in the following ways:

   a. Widen from two to three northbound lanes between the terminal and the Hollywood Freeway; and

   b. Signalize at the intersection of the northerly terminal exit, with timing for appropriate coordination with upstream and downstream signals.

4. It is recommended that Union Avenue, Beverly Boulevard and Glendale Boulevard be re-striped and signed in connection with terminal development to promote efficient ingress and egress, with channelization where necessary.

5. It is recommended that the Hollywood Freeway be widened from three to four lanes through Hollywood in accordance with proposed plans of the California Department of Transportation.

6. It is recommended that further consideration be given to possible extensions of the people-mover system to the Hollywood Freeway and/or the Glendale Freeway terminus.

EASTSIDE TERMINAL SITE EVALUATION

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EASTSIDE TERMINAL SITE EVALUATION

The analytical process for evaluation of the Eastside Peripheral Parking Terminal was conducted in a slightly different manner than the Westside analysis. Rather than evaluating and rating a number of potential terminal sites, the location of the eastside garage was treated initially as an assumption, using the site proposed by the Community Redevelopment Agency between Third and Fourth Streets and Los Angeles and San Pedro Streets, west of the Los Angeles River.

Subsequent to detailed traffic analysis of the proposed eastside site, the Los Angeles Department of Traffic suggested that sites *east* of the Los Angeles River be examined for potential development of the peripheral parking facility. The Department's concern was prompted by the over-capacity condition during peak hours of the bridges crossing the Los Angeles River. Together, CRA and VTN staff undertook an additional evaluation to determine if, in fact, any potential site east of the River could be used for terminal development.

Review and Evaluation of Potential Sites East of Los Angeles River

Initially, the entire shaded area in Figure 13 was examined. Existing land use and zoning were investigated and are shown in Figures 14 and 15, respectively. This investigation, in conjunction with a field study of the area, revealed that locations east of the Santa Ana Freeway corridor would be impractical for garage development. This determination was based on a number of criteria, including the presence of parks, public housing projects, dense residential neighborhoods, and the lack of good freeway and surface street access. Furthermore, to find a suitable location east of the Santa Ana Freeway would require locating the garage much beyond the area shown; this would be at a distance from Bunker Hill too far to be practical in terms of people-mover alignment costs. Thus, the study area was reduced to incorporate that region between the Los Angeles River and the Santa Ana Freeway.

Twelve preliminary sites east of the River were selected for evaluation as shown in Figure 16. Field investigation of these sites was conducted noting that eight of the locations

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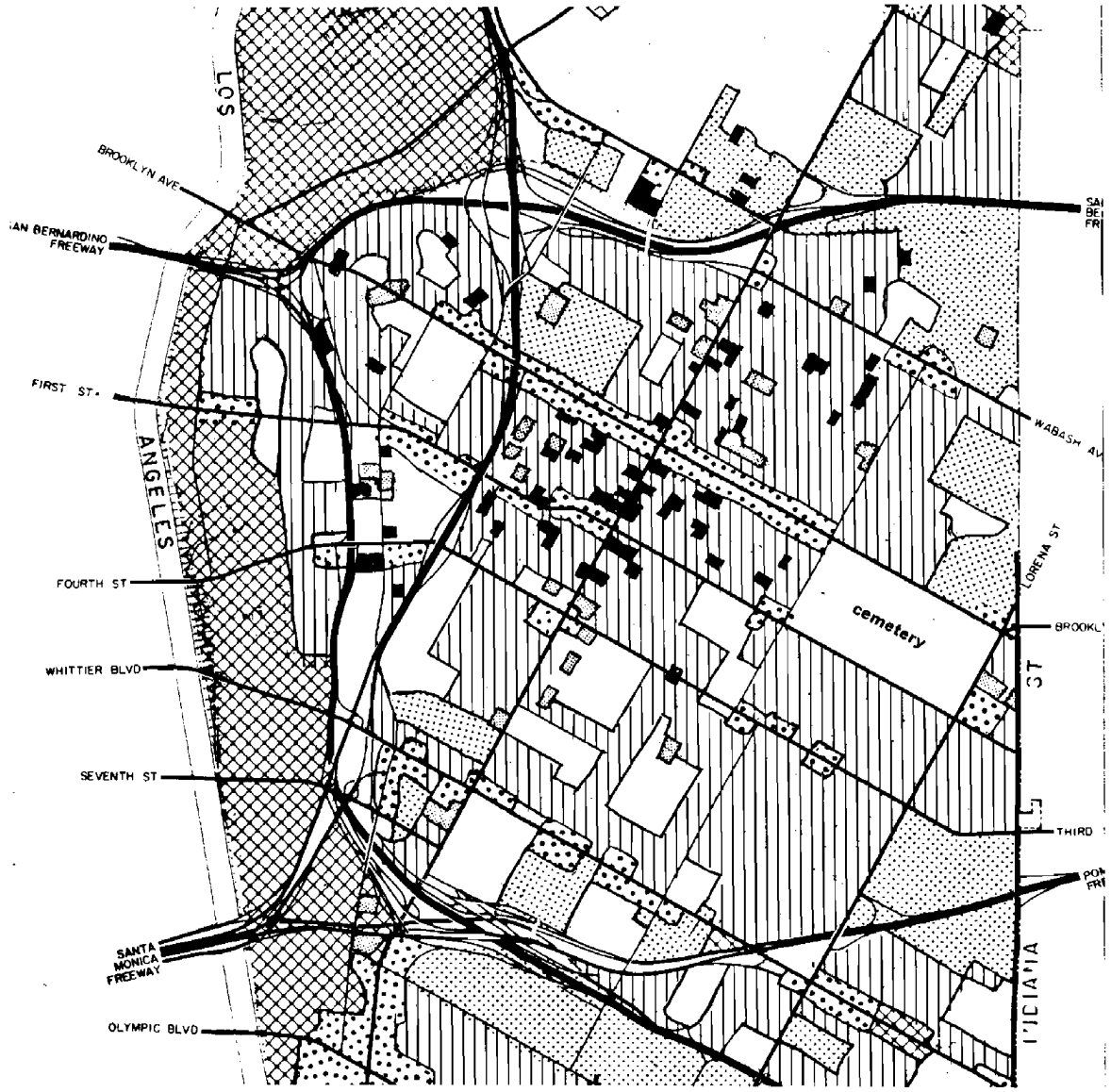
EAST SIDE STUDY AREA

Figure 13



SOURCE: CRA

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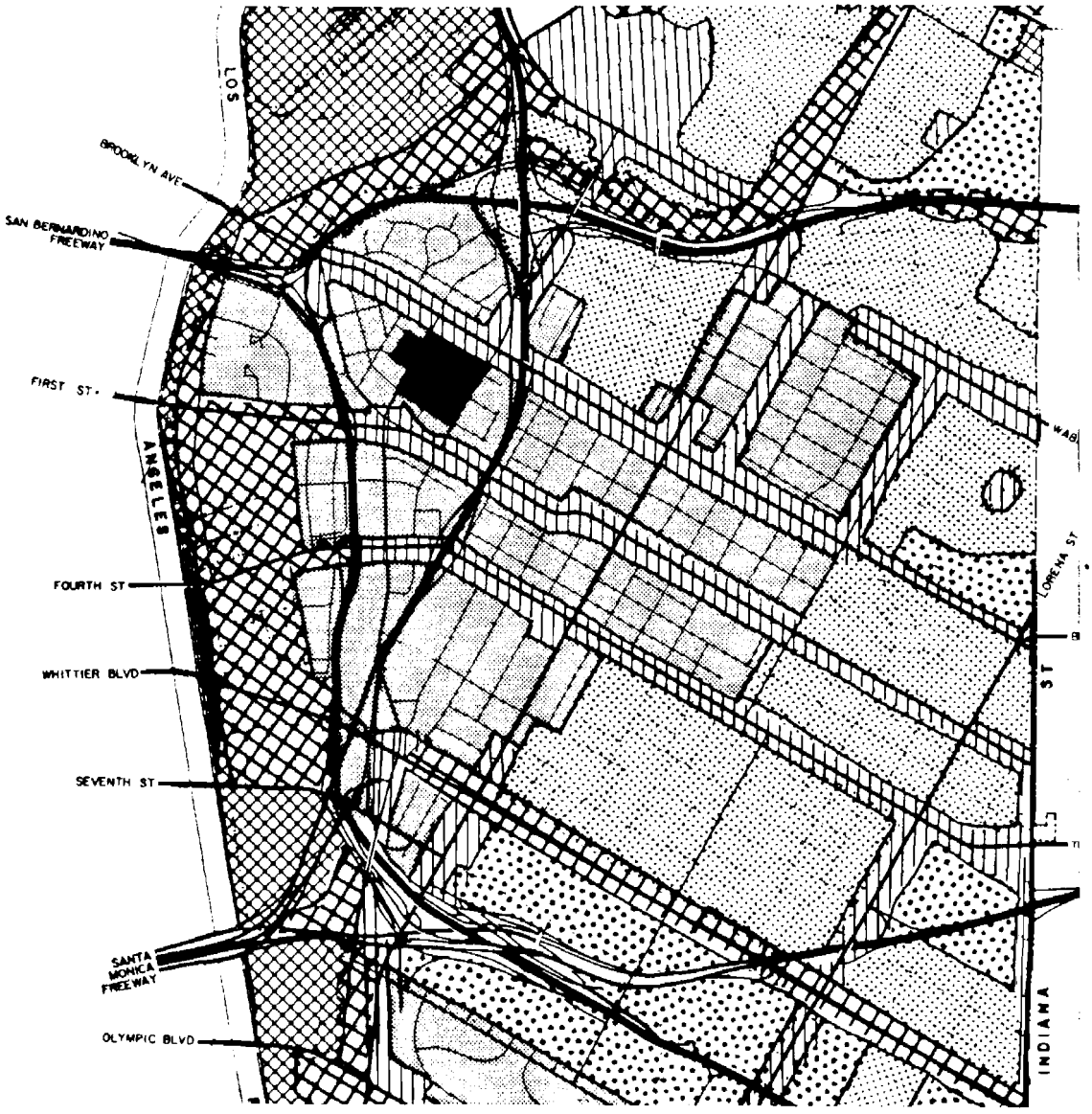
EAST SIDE LAND USE

Figure 14



LEGEND

- R 1 SINGLE
- R 2 SINGLE & TWO FAMILY
- R 3 MULTIPLE DWELLING
- R 4 MULTIPLE DWELLING
- R 5 MULTIPLE DWELLING
- C 1 & C 2 COMMERCIAL
- M 1 & M 2 LIMITED & LIGHT INDUSTRIAL
- M 3 HEAVY INDUSTRIAL

SOURCE: CRA

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EAST SIDE
EXISTING ZONING
Figure 15

required construction of the garage using air rights over the River. Sites 3 through 8 are bounded by First Street on the north and Seventh Street on the south and centered around Fourth Street, as shown in Figure 17. This area appeared to be the most acceptable for an alternate garage site since it is centrally located (serving a number of corridors), and people-mover alignment costs would be reasonable for this stage of development. (Sites 1, 2, and 9 through 12 will be discussed later.)

A garage in this area is expected to generate an additional 2,000 vehicles during the peak hour, similar to the westside terminal. The generalized origin of the majority of traffic destined for a garage in this area is from the east; however, traffic using the San Bernardino and Pasadena Freeways, for example, may actually approach the garage from the north (via Mission Avenue and Alamdea Street). Similarly, traffic approaching on other freeways (e.g., Pomona, Santa Monica, Golden State, Harbor) will use the CBD outer freeway loop and connecting arterial streets in such a way to minimize travel time. Garage access during the morning peak hour, as shown in Figure 17, is via First, Fourth, Sixth, and Seventh Streets crossing the Los Angeles River.

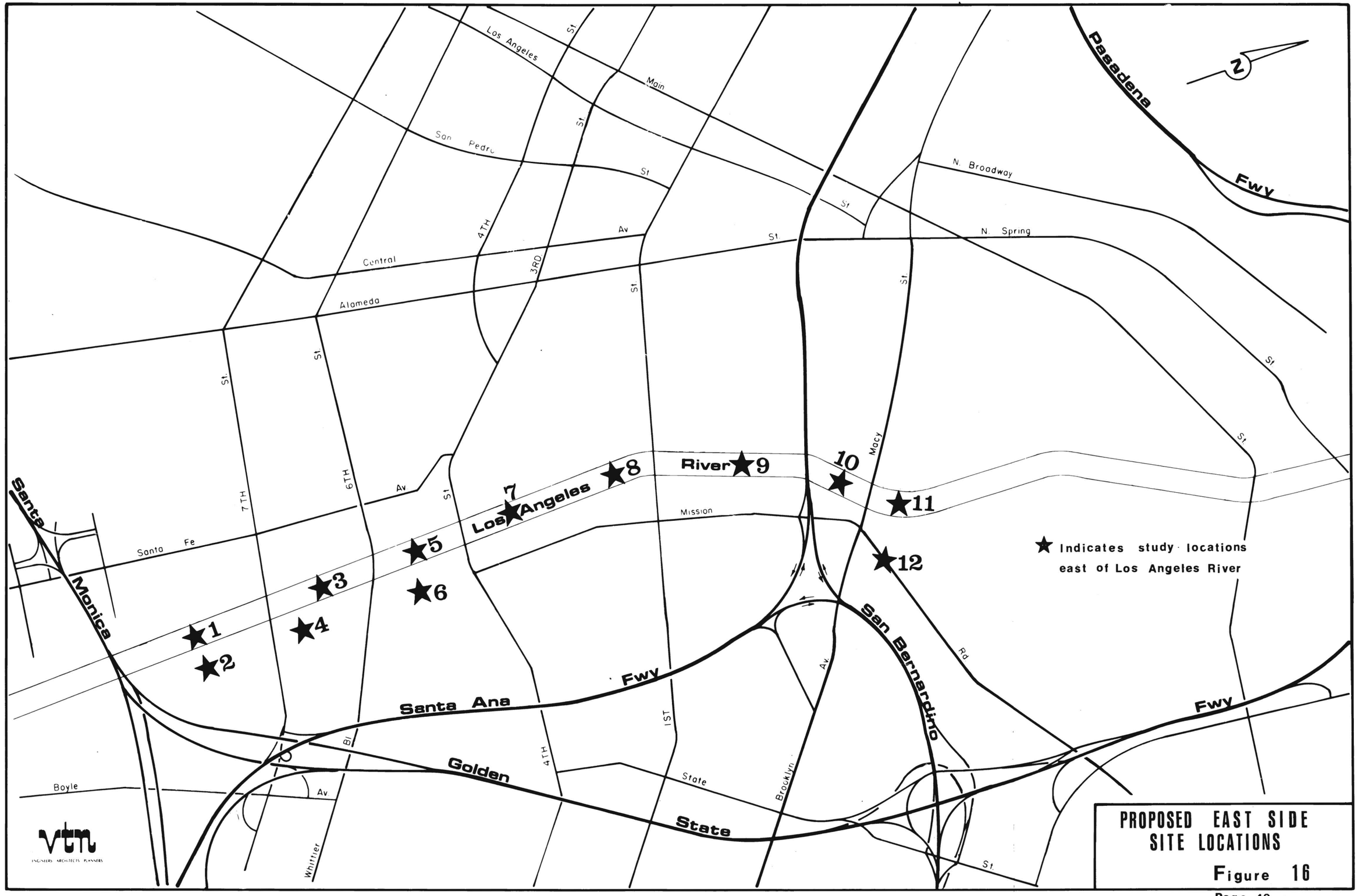
The *Los Angeles River Screenline Study* for 1965-1971, distributed by the Los Angeles Traffic Department in September 1972, indicates that each of these bridges is operating with volumes exceeding capacity (level of service "C") in the peak direction during the peak hour. Table 3 illustrates the volume and capacity figures for 1971 according to the *Screenline Study*.

Bridge Crossing	Capacity*	Peak-Hour Directional Volume	Volume/Capacity Ratio
1st Street	1,200	1,300	1.08
4th Street	1,800	1,890	1.05
6th Street	1,200	1,500	1.25
7th Street	1,200	1,370	1.14

* Capacity assumed level of service "C".
(Source: Los Angeles Traffic Department)

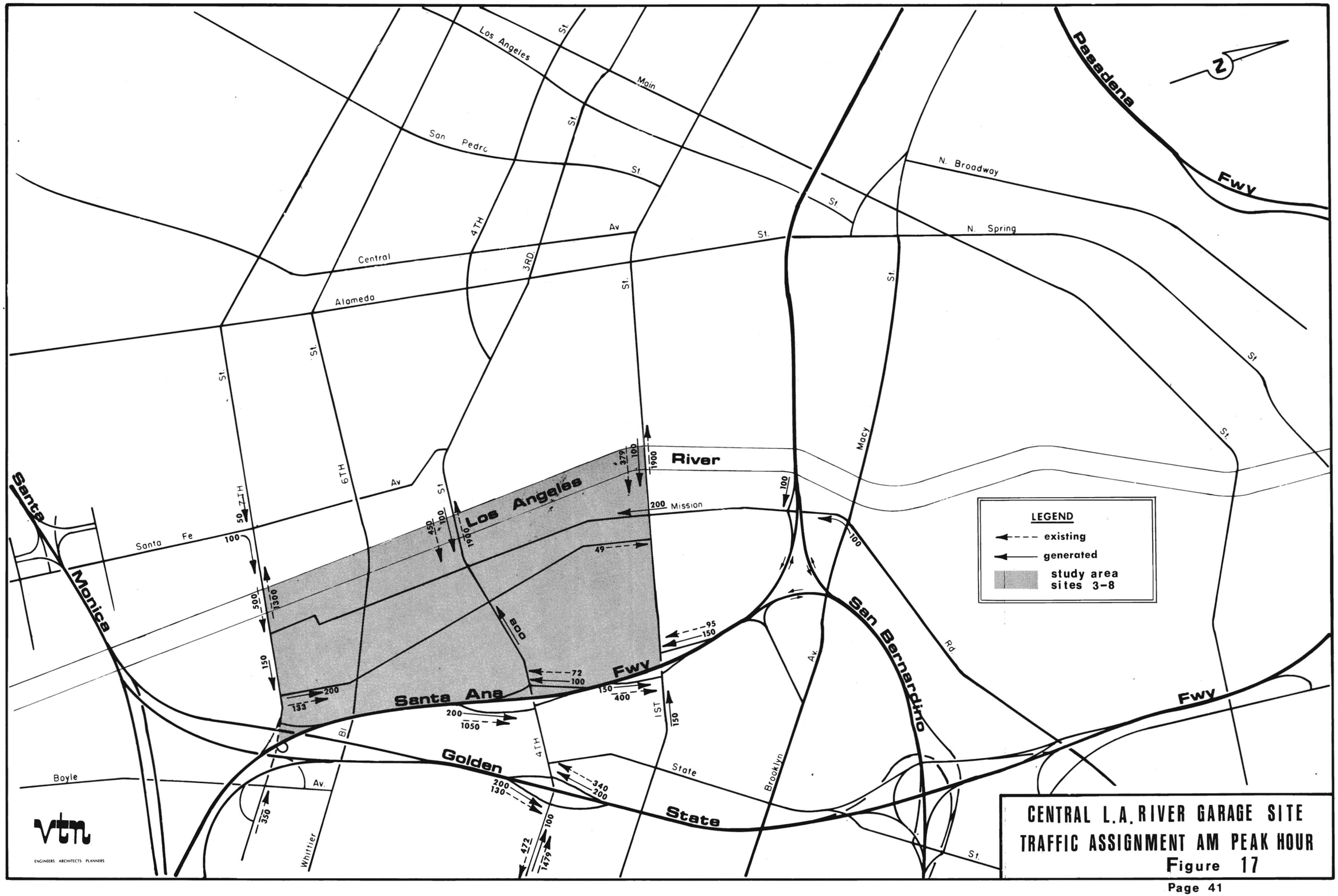
TABLE 3

PEAK-HOUR VOLUMES AND CAPACITIES
LOS ANGELES RIVER BRIDGE CROSSINGS



PROPOSED EAST SIDE SITE LOCATIONS

Figure 16



CENTRAL L.A. RIVER GARAGE SITE
TRAFFIC ASSIGNMENT AM PEAK HOUR
Figure 17

To determine the generated impact on the above mentioned streets of a garage located in this area (sites 3 through 8), the morning peak-hour traffic assignments were developed and are also shown in Figure 17. Fourth Street is projected to receive an additional 800 vehicles inbound as compared to 300 that would be generated by the proposed eastside site bounded by Third and Fourth Streets and Los Angeles and San Pedro Streets. Therefore, sites 3 through 8 would not alleviate the existing over-capacity situation on the Fourth Street Bridge, but would present an even less desirable situation than that created by the site proposed by CRA.

The generalized origin of the majority of traffic destined for sites 9 and 10 would be from the north and east (via Mission Avenue, Macy Street, San Bernardino and Golden State Freeways). Additional traffic from the south would have access utilizing the CBD outer freeway loop and various surface streets. These sites, however, are quite close to the on-off ramps from the Santa Ana/Hollywood Freeway. As pointed out in the westside terminal analysis, location of major generators in immediate proximity to existing freeway access usually results in limited escape routes and unnecessary mixing of freeway- and non-freeway-oriented traffic. This, combined with the fact that a garage located south of Macy Street would add over 1,000 vehicles to the Macy Street/Mission Road intersection (most of the vehicles either turning left or proceeding straight through), served to eliminate these sites in favor of sites 11 and 12.

By means of the preceding analysis, the contending sites were narrowed to the two generalized locations shown in Figure 18. The "north location" comprises sites 11 and 12, while the "south location" includes sites 1 and 2. Due to the fact that basic traffic access is similar, the analysis did not distinguish between the two specific sites within these locations. Further study would be necessary to fully define the site boundaries and specify precise land acquisition areas.

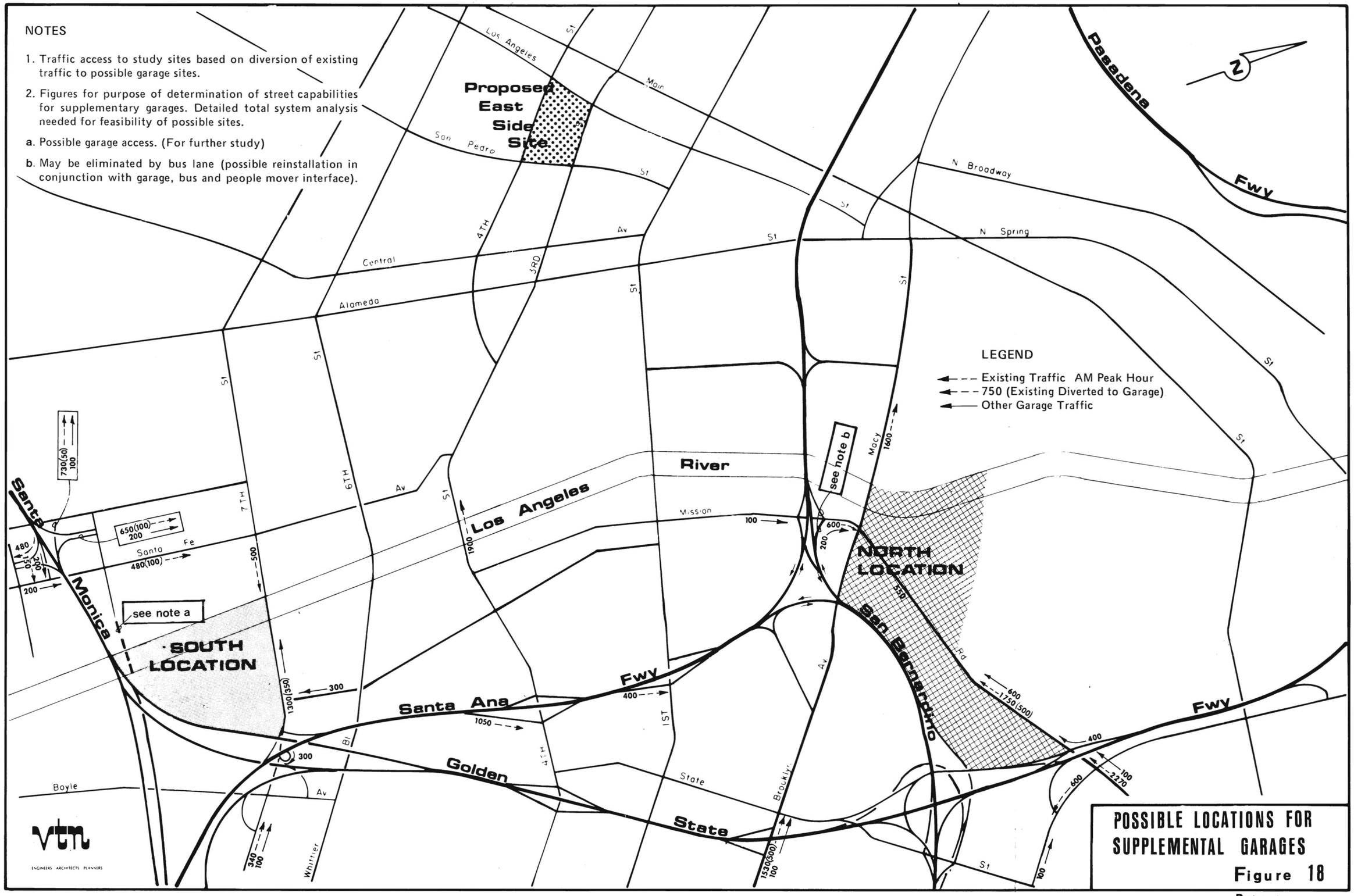
The north location (Mission Road/Macy Street vicinity) appears to be a fairly good site. The area is presently occupied primarily by auto wrecking yards. A garage established in this general area would serve those commuters originating east and northeast of the CBD, via the San Bernardino and Golden State Freeways, respectively. Additional surface street access would be via Mission Boulevard and Brooklyn Avenue. This site also could be combined

NOTES

1. Traffic access to study sites based on diversion of existing traffic to possible garage sites.
2. Figures for purpose of determination of street capabilities for supplementary garages. Detailed total system analysis needed for feasibility of possible sites.

a. Possible garage access. (For further study)

b. May be eliminated by bus lane (possible reinstallation in conjunction with garage, bus and people mover interface).



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POSSIBLE LOCATIONS FOR SUPPLEMENTAL GARAGES

Figure 18

easily with the existing bus system on the San Bernardino Freeway and the express busway project of SCRTD and CALDOT.

The south location was also found to be satisfactory and would serve primarily the areas east and southeast of downtown via the Pomona and Santa Ana Freeways. Other non-freeway traffic would have access to the site via Seventh Street from the east and Santa Fe Avenue from the south.

As previously stated, both the north and south locations serve specific "corridors" and would not attract traffic from all areas. These garages would not generate their full complement of vehicles but would direct a large portion of vehicles off the adjacent street and freeway systems, as indicated in Figure 18. From a traffic standpoint alone, the existing street systems for both the north and south locations could support the additional traffic with minor modifications. It should be noted, however, that although the additional traffic could be accommodated by these locations, a further study of the total network should be conducted to determine the parking demand for possible garages at these locations.

In comparing both the north location and the south location to the proposed downtown garage site, it becomes clear that the outlying sites do more to reduce traffic in the central core area. The whole concept of peripheral parking, of course, is based on the concept of "intercepting" vehicle-trips destined for the CBD. The mode of transport from each successive tier of peripheral garages to the CBD, however, is dependent upon the respective distances to downtown from the garage. The people-mover or PMT systems envisioned for the Bunker Hill garages may not be especially cost-effective over long distances; until a number of such systems have been developed and thoroughly evaluated, buses or other mass transportation systems appear more appropriate for longer distances. Therefore, while the construction of peripheral parking facilities farther from the central core is more acceptable in terms of traffic, such garages are not necessarily the first phase in an overall coordinated effort to "ring" the CBD with peripheral "park-and-ride" facilities.

In terms of downtown traffic, the Los Angeles Department of Traffic is accurate in maintaining that garage locations farther from the central core are more desirable. This is

fairly obvious: vehicles are intercepted farther from their downtown terminus. However, it is important that the eastside peripheral parking garage be thought of in two contexts: (1) as the first step in a coordinated peripheral parking program for Los Angeles, and (2) as a supplementary garage to provide for the parking deficit anticipated to occur at Bunker Hill.

It seems reasonable, with regard to the first context, to approach the overall peripheral parking program phasing with a concept whereby the "closer-in" peripheral facilities are constructed initially, followed by facilities in more outlying locations. The reasoning behind this is that the outlying garages become more specifically associated with individual corridors of approach to the CBD. Thus, the two recommended locations east of the River essentially serve separate corridors. It may be a wiser course of action to first concentrate on alleviating the downtown/Bunker Hill parking deficit, and subsequently begin serving specifc corridors. The multi-directional accessibility of the proposed eastside garage (Third and Fourth Street site) is a definite plus in this regard. By initially locating *deficit* parking in outlying areas, the ability to draw efficiently from more than one corridor dimishes.

The primary conclusion that resulted from this post-study exercise was that the two general locations east of the River selected for potential garage development are feasible and, in fact, have better potential for the unloading of the bridges than the initially selected sites. However, these sites would require about four times more right-of-way and guideway distance than the proposed sites between Los Angeles, San Pedro, Third and Fourth Streets. In addition, these sites would not efficiently serve those commuters using other corridors to approach the CBD. It is recommended, therefore, that these sites be incorporated in a second-generation of peripheral parking in Los Angeles, at a time when a more outlying tier of facilities - designed to serve specfic corridors rather than broader directional demands - is considered for implementation. For purposes of the immediate parking deficit expected to be associated with development of downtown/Bunker Hill, the closer-in site appears to be more favorable in light of the long-term expectations for peripheral parking in Los Angeles.

Traffic Analysis of Proposed Terminal Site

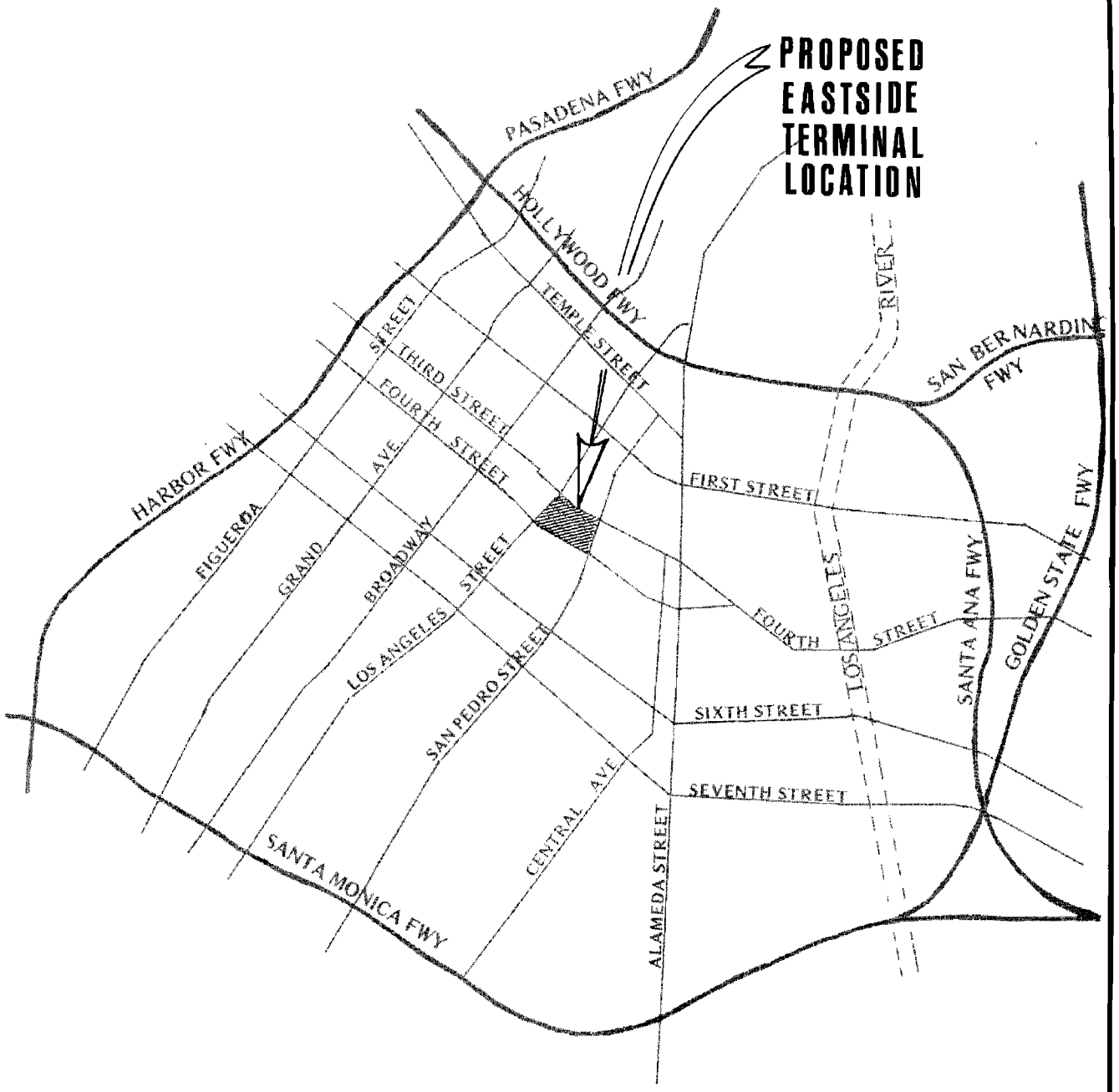
The following sections will describe the analysis that was conducted and present conclusions regarding the traffic feasibility of the proposed downtown eastside terminal complex. This

site was determined to have the greatest potential for development as a peripheral parking and transportation terminal facility for Bunker Hill. It should be noted, however, that although the downtown site is the presently preferred site with regard to increased assessibility and decreased people-mover alignment costs, the "north" and "south" locations east of the River should be considered for possible inclusion in the second generation of peripheral parking garages.

Description of Proposed Terminal Location – The site proposed for development of the eastside terminal complex is bounded by Third Street on the north, San Pedro Street on the east, Fourth Street on the south, and Los Angeles Street on the west. Land use in the area is presently mixed retailing and light industry with much land devoted to parking. The specific site proposed for development is at the northern section of the downtown garment district. The site is not immediately adjacent to any freeways; however, it is directly served by arterials with freeway access.

The eastside terminal location is shown in Figure 19. It was selected to intercept vehicles bound for Bunker Hill from the east and to a lesser extent from the north and south. Thus, an important assumption was that a majority of commuters using the eastside terminal would use the Santa Ana, San Bernardino, and Pomona Freeway corridors in approaching the CBD. As is expected to be the case with the westside facility, the eastside terminal will not generate significant new traffic to the freeway system; terminal-bound vehicles would use the same corridors to approach Bunker Hill if all parking were provided on-site rather than at peripheral parking facilities. However, the presence of the terminal *will* affect the arterial street network linking it with the freeway system. Therefore, this study took the form of a feasibility study of the operational impacts of the terminal on the surrounding street network. An investigation was made of the capacity of the streets adjacent to the terminal and of the principal arterial feeders; this investigation was primarily oriented to the east and north as a result of the assumption of commuter origin. A directional distribution of peak-hour trips was assigned to the arterial network on the basis of travel time and delay studies. Existing capacity was compared with projected traffic demand to determine the feasibility of the proposed site for terminal development.

Existing Conditions – An inventory of street capacities and existing volumes was conducted



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VICINITY MAP 19

Figure

as an integral aspect of this study. In order to calculate capacities, information regarding signal timing, street widths and other geometric data was collected from the Los Angeles Traffic Department. Together with these data, the capacity calculations made use of the following assumptions:

1. No adjustments were made for any construction or temporary restrictions which would otherwise limit capacity for short periods.

2. A standard 10-percent left and right turn was assumed.

3. Frequency of buses was determined from schedules published by the Southern California Rapid Transit District.

4. Signal timing and percentage splits for intersections with actuated equipment was estimated based on existing volumes.

5. Trucks were assumed to comprise 2 percent of total volume, based on random peak-hour counts.

6. The peak-hour factor was assumed to be 0.9 for the entire CBD.

7. The percentage green time for each approach was taken as the combination of both green and amber time.

8. All streets were assumed to have peak-period parking restrictions.

Capacity, as defined in the *Highway Capacity Manual*, is the maximum number of vehicles which has a reasonable expectation of passing over a given section of a lane or roadway in one direction during a given time period under prevailing roadway and traffic conditions. Traffic flow has been quantified for different levels of service, varying from A (free flow) to E (unstable flow or capacity). For the eastside analysis, level of service C was used in determining design capacity. This level of service is better than normal for central business districts which usually experience congestion and level of service D or E. Briefly, level of service C is a flow condition in which drivers are able to move through most intersections

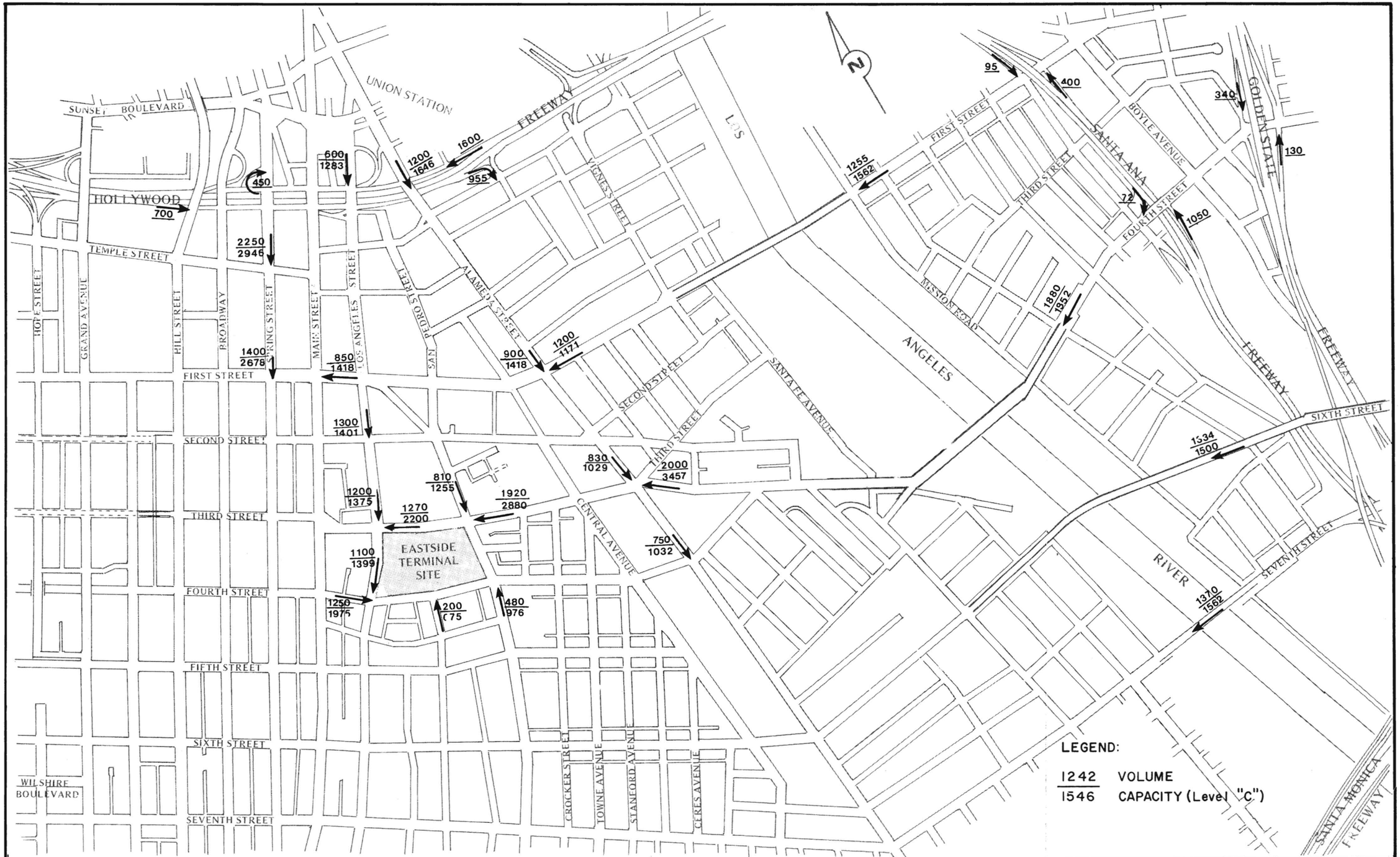
without waiting for more than one red signal indication, although queues may occasionally develop due to turning vehicles and other factors. It should be noted that were level of service "D" used in this analysis, the volume/capacity ratio would be even lower than by using level of service "C".

The measure of efficiency used in this study was the volume/capacity ratio. This technique compares existing or projected traffic volumes to calculated intersection capacity in order to determine how "loaded" a particular intersection approach is or will be. A volume/capacity ratio greater than unity indicates that an approach is fully loaded and operating beyond capacity for a given level of service.

Existing volumes and capacities were examined in two stages. First, the streets providing direct ingress and egress to the terminal were studied, followed by the arterials having access to the eastside freeways. Figures 20 and 21 show the morning and evening peak-hour volume/capacity ratios for streets adjacent to the terminal and for the outlying arterial network. Freeway ramp volumes are also indicated for those ramps likely to be used by motorists destined for the terminal.

Review of the existing volume/capacity ratios shows that, in general, the street network studied has excess capacity, especially on the streets immediately adjacent to the terminal site. Most streets can accommodate considerably more traffic and still operate at level of service C or better. While figures provided by the California Department of Transportation indicate that the freeways in the area are all operating at or near capacity, it is evident that the arterials serving the area, as well as certain freeway ramps, can absorb a considerable amount of additional traffic during peak hours.

In addition to the capacity analysis, a travel time and delay study was conducted on the arterials connecting the eastside freeways to the terminal site. The floating car method was used, and runs were made during the morning, evening, and off-peak periods. Basically, the floating car method of estimating travel time involves a driver and timekeeper; the driver attempts to match the general flow of traffic, changing lanes when necessary to avoid delays, while the timekeeper records time between predetermined links along a route. This investigation was undertaken for two reasons: (1) to determine which arterial routes from



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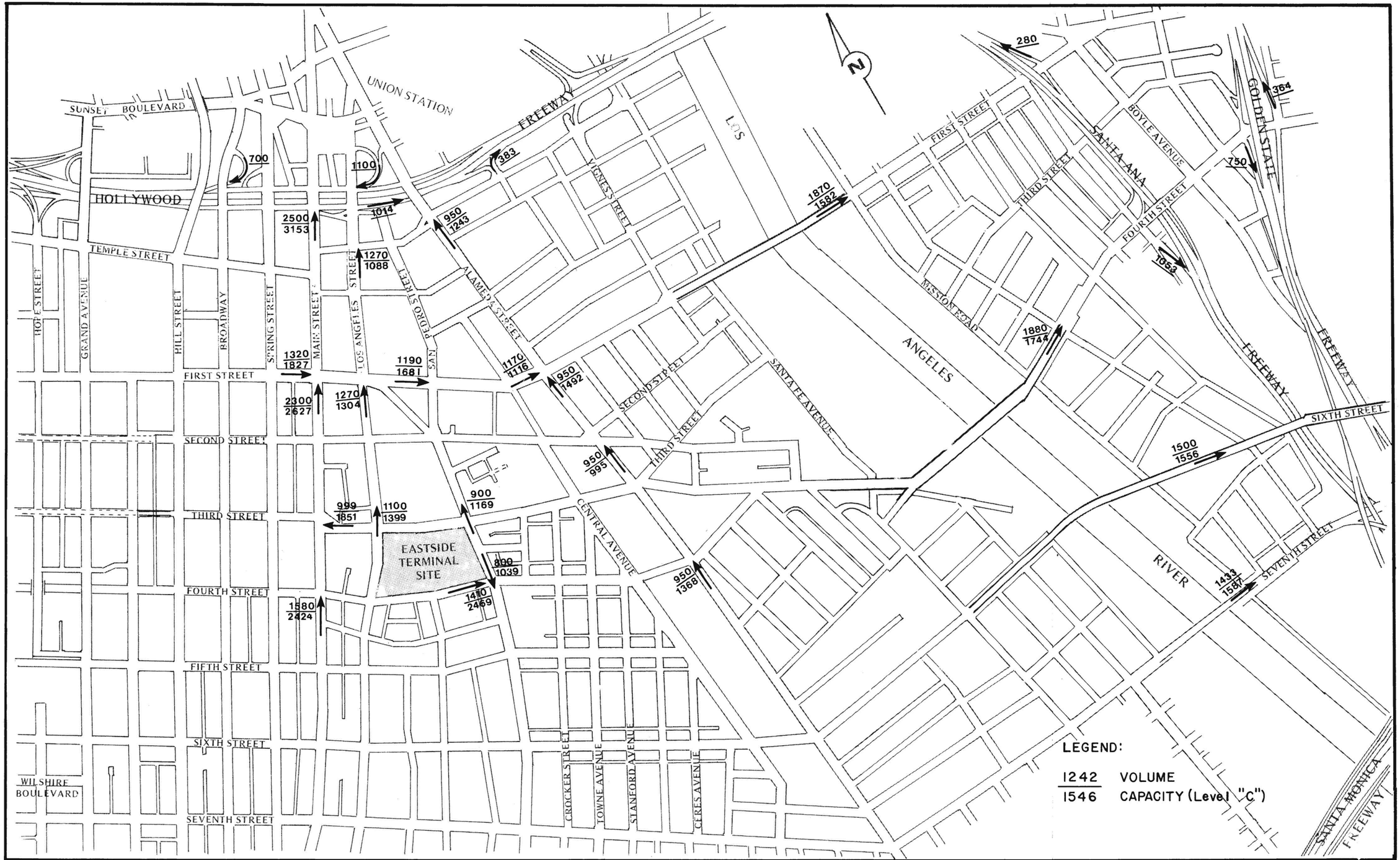
EXISTING VOLUMES AND CAPACITIES EASTSIDE ARTERIALS
A.M. PEAK HOUR

Figure 20



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EXISTING VOLUMES AND CAPACITIES EASTSIDE ARTERIALS
P.M. PEAK HOUR

Figure 21

the surrounding freeways to the terminal site were best in terms of travel time, and (2) to assess quantitatively the relative attractiveness of parking at the eastside terminal and using the proposed people-mover versus parking directly at the Bunker Hill development.

The results of the travel time study were significantly different for the off-peak and peak periods. During the off-peak, the travel time to Bunker Hill from the Santa Ana Freeway was less than the travel time to the eastside terminal site, excluding the additional time which would be required to ride the people-mover from the terminal to Bunker Hill. During peak travel hours, however, the situation was different. For example, using the interchange at the Santa Ana Freeway and Seventh Street as "time zero," travel time during the morning peak hour to the terminal was measured at 5.3 minutes as compared to 9.4 minutes to Bunker Hill. A similar ratio holds during the evening peak hour. Although this study cannot reach the conclusion that total peak-hour travel time to Bunker Hill will be less via the eastside terminal and people mover, it does show that the commuter entering the CBD from the east and parking in the terminal has over four minutes to park and ride the people mover in order to be competitive with the time involved for a commuter parking directly at Bunker Hill. Of course, travel times within the CBD could conceivably increase dramatically as a function of intensified development in the central core.

Trip Distribution to Eastside Terminal — The same basic assumptions that were used in the westside analysis were applied to the eastside analysis. Specifically, it was assumed that 2,000 vehicles would enter or exit the terminal during the peak hour, and that these vehicles would choose the shortest time path from origin to destination.

The generalized origin of the majority of traffic destined for the eastside terminal is from the east; however, traffic using the San Bernardino and Pasadena Freeways, for example, may actually approach the terminal from the north (via the Hollywood Freeway and Spring or Alamdea Streets). Similarly, traffic approaching on other freeways (e.g., Pomona, Santa Monica, Golden State, Harbor) will use the CBD outer freeway loop and connecting arterial streets in such a way to minimize travel time. Thus, traffic will approach the terminal via arterials from virtually all directions, with the streets from the north and east carrying 35 percent each and the streets to the south and west carrying 15 percent each. The directional

distribution, therefore, is categorized according to arterial loading, and is illustrated in Figure 22 and tabulated in Table 4. It should be noted that the projected distribution from the freeways to the various arterial feeders resulted from the speed and delay study. Minimum time paths were developed from each freeway interchange to the terminal site, and these were used to determine a probabilistic estimate of commuter route choices.

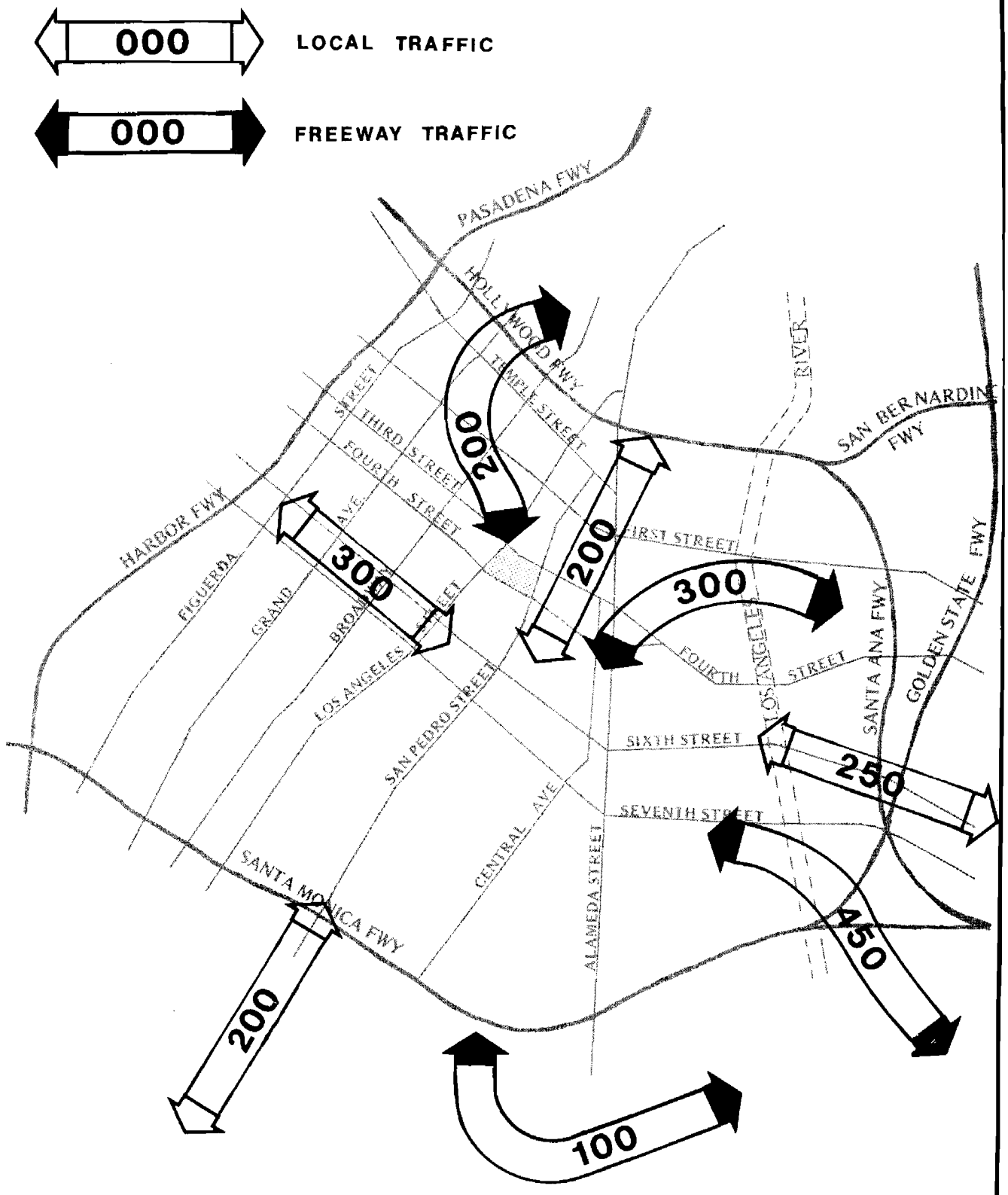
Projected Traffic Conditions – The peak-hour vehicle-trips were assigned to the street network for both inbound (morning) and outbound (evening) traffic in order to determine whether the excess capacity is sufficient to accommodate the additional traffic. The assignment, in general, attempted to route commuters in and out on the same streets; however, certain factors (e.g., one-way streets, freeway ramp configurations) caused slight modifications in the traffic routings. The morning and evening peak-hour assignments are shown in Figures 23 and 24, respectively.

A final volume/capacity investigation was conducted using projected arterial traffic volumes (existing plus terminal-generated traffic). The results of this investigation are shown in Tables 5 and 6. It is seen that the critical capacity-restraining intersections, in general, can accommodate the terminal traffic and remain within level of service C; volume/capacity (V/C) ratios vary from 0.48 to 1.04 in the morning peak hour and from 0.58 to 1.04 in the evening peak hour. Only one exception exists - Los Angeles Street at Third Street - and this intersection has a V/C ratio of 0.90 if capacity is calculated using level of service D. Thus, it can be concluded that in terms of the capacities of the surrounding street network, the eastside terminal is feasible for development at the proposed location. In addition, the capacities on most of the arterials are such that the traffic approaching from the west could be redistributed to the other directions of approach without exceeding their capacities.

Preliminary Design Concepts

Several preliminary designs of possible configurations for the eastside terminal were developed. These are shown in Figure 25 and 26, which indicate successive iterations in eastside terminal design. The following basic factors were included in developing these preliminary design concepts:

1. Total cost of the primary terminal building and associated structures.



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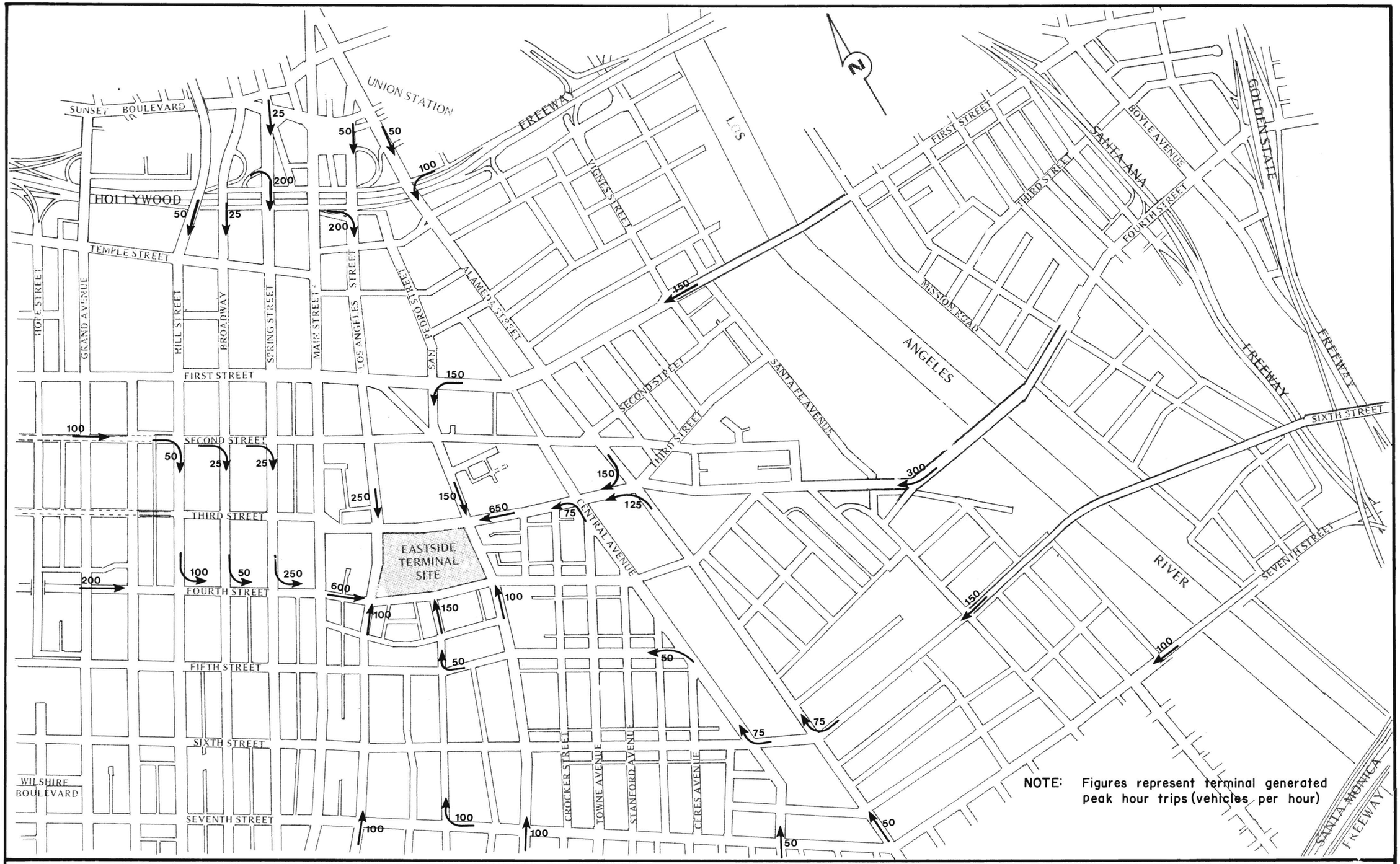
DIRECTIONAL DISTRIBUTION OF PEAK HOUR TRIPS TO EASTSIDE TERMINAL

Figure 22

TABLE 4

DIRECTIONAL DISTRIBUTION OF PEAK-HOUR TRIPS

TRAFFIC ORIGIN	PERCENTAGE	PARKING DEMAND
From the North		
W/B Hollywood Freeway to Spring Street	10%	200
W/B Hollywood Freeway to Los Angeles and Alameda Streets	10%	200
E/B Hollywood Freeway to Los Angeles Streets	5%	100
Local Traffic: Hill, Broadway and Spring Streets	5%	100
Local Traffic: Alameda and Los Angeles Streets	5%	100
Subtotal	35%	700
From the West		
Fourth Street	10%	200
Second Street	5%	100
Subtotal	15%	300
From the South		
Local Traffic: San Pedro Street	5%	100
Local Traffic: Los Angeles Street	5%	100
Santa Monica Freeway to Central Avenue and Alameda Street	5%	100
Subtotal	15%	300
From the East		
Santa Ana Freeway & Pomona Freeway to 7th Street	5%	100
Santa Ana Freeway to 4th Street	12.5%	250
Santa Ana Freeway to 1st Street	5%	100
Local Traffic: 1st Street, Whittier Boulevard/ 5th Street, and 4th Street	12.5%	250
Subtotal	35%	700
TOTALS	100%	2,000



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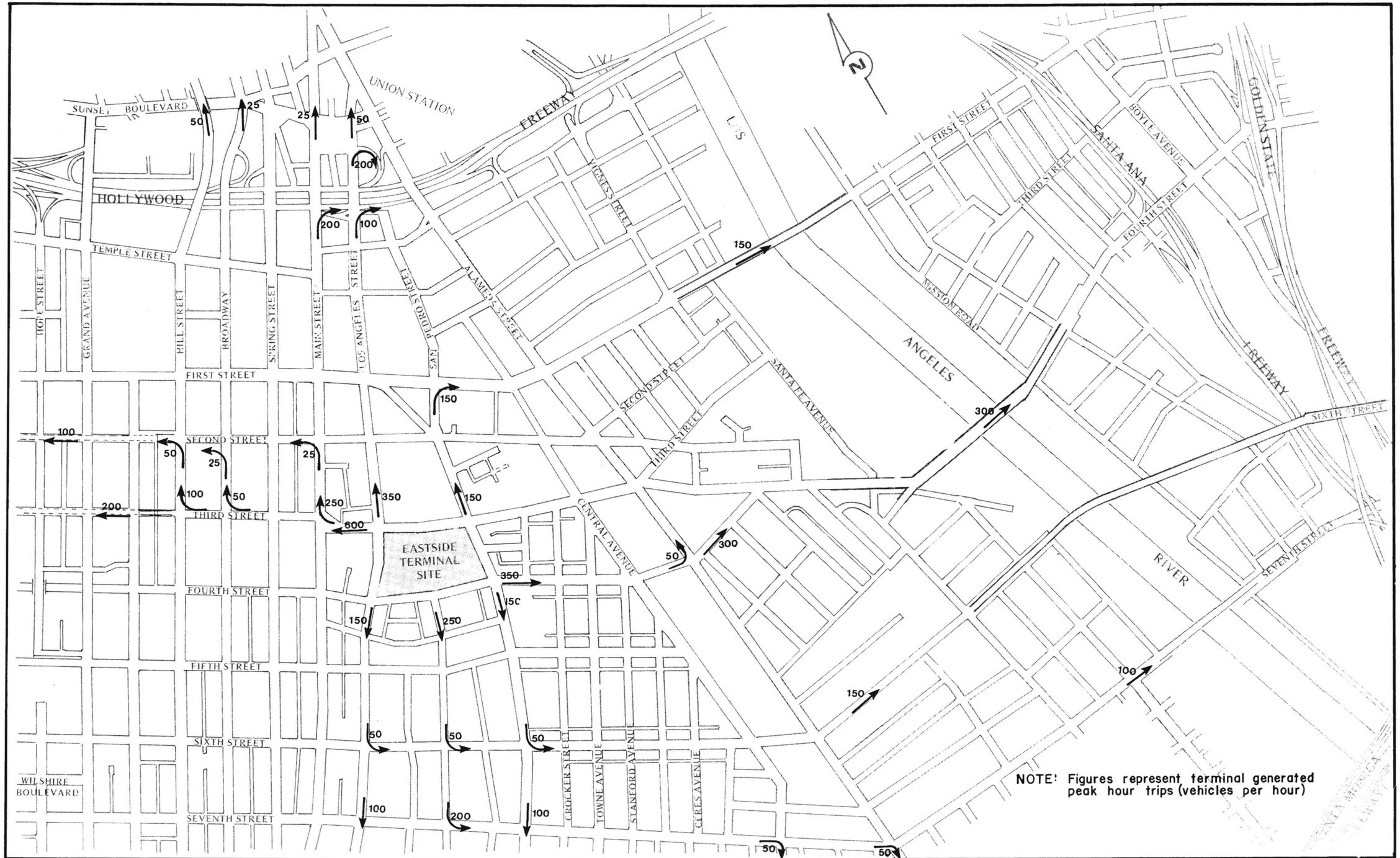
EASTSIDE TERMINAL TRAFFIC ASSIGNMENT
A.M. PEAK HOUR

Figure 23



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EASTSIDE TERMINAL TRAFFIC ASSIGNMENT P.M. PEAK HOUR

Figure 24

TABLE 5

PROJECTED VOLUME/CAPACITY RATIOS
AM PEAK HOUR

Intersection Approach	Existing Volume (vph)	Additional Volume (Terminal-Generated) (vph)	Total Projected Volume (vph)	Capacity "C" Level (vph)	Projected Volume/ Capacity (vph)
S/B Los Angeles @ 3rd St.	1200	250	1450	1395	1.04
S/B San Pedro @ 3rd St.	810	150	960	1255	0.70
N/B Los Angeles @ 4th St.	600	100	700	1450	0.48
N/B San Pedro @ 4th St.	480	100	580	976	0.59
N/B Wall St. @ 4th St.	200	150	350	675	0.52
W/B 3rd St. @ San Pedro	1920	650	2570	2880	0.89
E/B 4th St. @ Los Angeles	900	600	1500	1975	0.76

TABLE 6

PROJECTED VOLUME/CAPACITY RATIOS
PM PEAK-HOUR

Intersection Approach	Existing Volume (vph)	Additional Volume (Terminal-Generated) (vph)	Total Projected Volume (vph)	Capacity "C" Level (vph)	Projected Volume Capacity Ratio
N/B Los Angeles @ 3rd St.	1100	350	1450	1399	1.04
N/B San Pedro @ 3rd St.	900	150	1050	1169	0.90
S/B Los Angeles @ 4th St.	660	150	810	1399	0.58
S/B San Pedro @ 4th St.	660	150	810	1039	0.78
S/B Wall @ 4th St.	300	250	550	675	0.81
W/B 3rd St. @ Los Angeles	1360	600	1960	2200	0.89
E/B 4th St. @ San Pedro	1410	350	1760	2469	0.71

2. Efficiency of internal garage circulation, including both vehicular/non-vehicular and horizontal/vertical movement.

3. Accessibility of the people-mover to local pedestrian traffic (e.g. Little Tokyo).

4. Possibility of future eastward extension of the people-mover to Central City East and the proposed Industrial Freeway.

5. Inclusion of commercial/retail and other associated uses for the ground floor of the terminal.

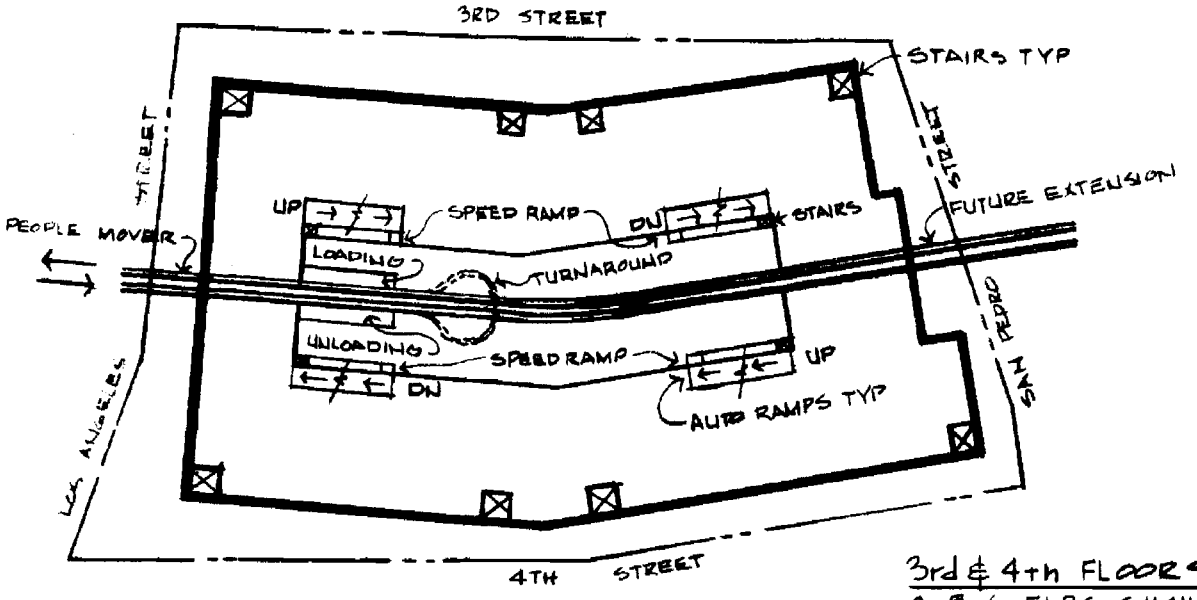
6. Minimization of the overall time necessary from point of terminal entry to boarding of the people-mover.

7. Suitability of the terminal design for rooftop development of public recreational and/or other uses.

Scheme "A" was developed initially. In this concept, the people-mover alignment essentially bisects the terminal with access through a central "utility" area housing automobile speedramps, elevators, and the people-mover loading/unloading facility. Disadvantages were found to exist, however, in several respects. The people-mover would prove to be an impedance to movement between the two sections of the garage on those floors through which the alignment passed, creating inefficiences in internal circulation. In addition, local pedestrian traffic would be required to enter the garage to use the people-mover to Bunker Hill.

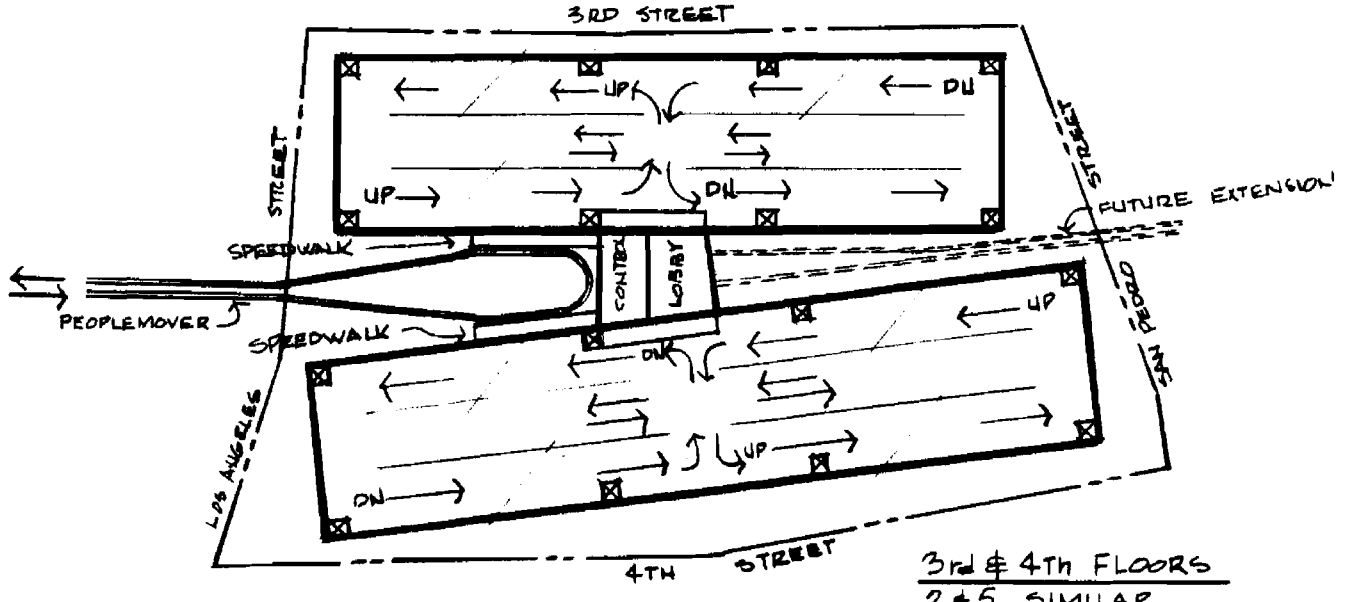
Scheme "B" evolved from the initial concept, but was rejected due to the higher costs associated with two separate structures. Again, no external linkages would be provided for pedestrian and non-garage users of the people-mover, and the discontinuity between the two structures would restrict efficient rooftop utilization.

Scheme "C" was tested as an altogether different approach, with the garage having a smaller cross-section and eight rather than five or six stories. Commercial activity would be provided at separate on-site buildings, and high-rise apartments would also be included on the site.



3rd & 4th FLOORS
2, 5, 6 FLRS SIMILAR
NO PEOPLE MOVER

SCHEME "A"



3rd & 4th FLOORS
2 & 5 SIMILAR
NO PEOPLE MOVER

SCHEME "B"

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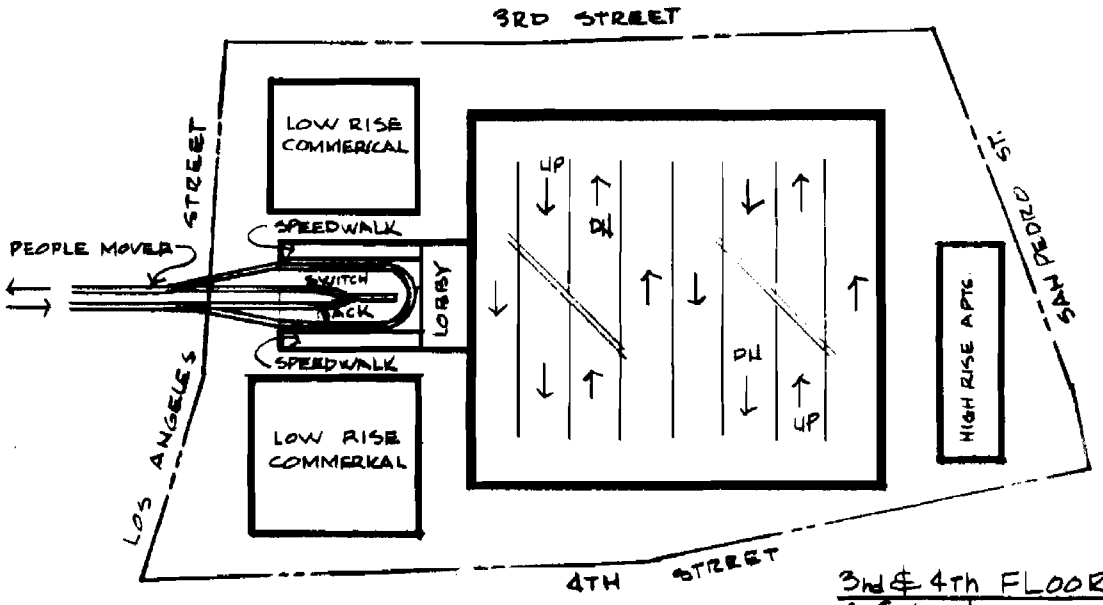
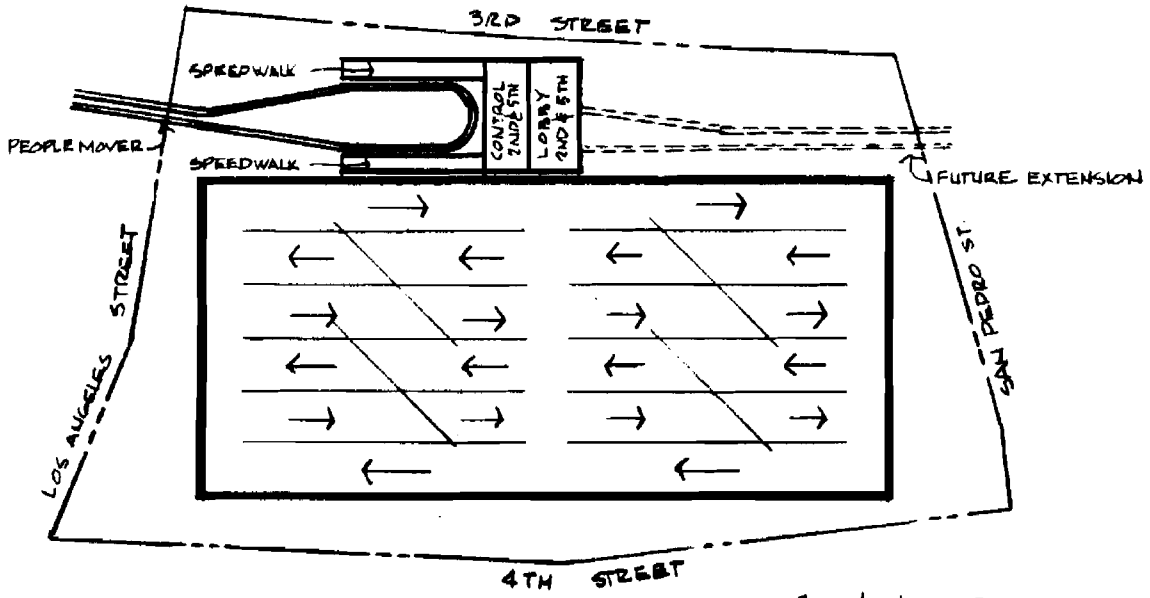
PRELIMINARY DESIGN CONCEPTS
EASTSIDE TERMINAL

Figure 25



3rd & 4th FLOORS
2, 5, 6, 7 & 8 FLOORS SIM.
NO PEOPLE MOVER

SCHEME "C"



3rd & 4th FLOORS
2ND & 5TH SIMILAR
NO PEOPLE MOVER

SCHEME "D"

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ENGINEERS ARCHITECTS PLANNERS

PRELIMINARY DESIGN CONCEPTS
EASTSIDE TERMINAL

Figure 26

Several immediate disadvantages are apparent here, including the lack of means for future extension of the people-mover. Moreover, the presence of residential units would tend to complicate traffic circulation patterns at the terminal (unless all residents used non-automobile transit to work destinations).

The final concept, and one that appears to be workable at the present time, is shown in Scheme "D". The cost of this configuration is less than the other three, since the garage itself could be built as a simple structure. The people-mover lobby would be north of the main garage building, allowing both future extension and easy access for local pedestrians. Circulation within the garage would not be impeded, and various ramp and loop configurations would be incorporated to smooth the flow of vehicles between street level and the various floors in the garage. It should be pointed out that the people-mover station is located at the third and fourth levels, so that ingress/egress from the garage to Third Street would be facilitated.

As pointed out earlier, this preliminary design work was done to illustrate various ways in which the terminal could be built. While Scheme "D" appeared to be the optimum among those shown, it is important to note that much design work will have to be undertaken to determine the final configuration at the best site utilization strategy for the eastside terminal complex. However, this analysis *has* shown that the site in question is certainly feasible for development, and it is therefore recommended that in-depth design and site utilization studies be conducted using the area bounded by Los Angeles, San Pedro, Third and Fourth Streets as the site for the eastside terminal.

Conclusions and Recommendations

It is recommended that the eastside peripheral parking facility be developed at the proposed location between Los Angeles and San Pedro Streets and Third and Fourth Streets. While in-depth investigation has shown that certain potential sites east of the Los Angeles River may help "unload" the bridge crossings, it is recommended that peripheral parking facilities east of the River constitute a "second generation" of garages designed to serve more specifically individual corridors of approach to the CBD.

The garage, developed at its proposed site, will be operationally feasible with only minor improvements. These include signing, roadway striping, and similar measures to promote safe and efficient traffic flow. The surrounding arterial street network has sufficient excess peak-hour capacity to accommodate the locally heavy garage-generated traffic.