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Report on  
GEOMETRIC DESIGN  
PROPOSED BEVERLY HILLS FREEWAY  
for  
BEVERLY HILLS CITY COUNCIL

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April 1964

DE LEUW, CATHER & COMPANY • ENGINEERS • SAN FRANCISCO

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April 22, 1964

Honorable Leonard Horwin  
Mayor of the City of Beverly Hills  
and Members of the City Council  
City of Beverly Hills  
California

Gentlemen:

It is with great pleasure that we submit to you herewith our final report on our alignment studies, geometric design and estimates of cost for the proposed Beverly Hills Freeway.

Our report concludes that a freeway is urgently needed in a generally east-west direction in the Beverly Hills area. Secondly, we conclude that a freeway through the City of Beverly Hills and along the Santa Monica Boulevard right-of-way, fully depressed and concealed as indicated in your City Council Statement of Policy, is both practical and feasible. As a matter of fact, the preferred freeway presents certain advantages over the several alternative geometric designs which we investigated.

During the course of our assignment, we enjoyed splendid working relationships with numerous public agencies and private organizations. Principal among these are the Beverly Hills Improvement Association, Mr. Irving Stone, Chairman; the Western Freeway Council, and other community associations. Additionally, we wish to acknowledge the excellent cooperation afforded us by Mr. Edward T. Telford and his staff at the District office of the California Division of Highways. As you know, your Department of Public Works and traffic and planning consultants have made available to us their full resources.

Following formal presentation of this report, we will be pleased to meet with you for further detailed discussions at your convenience. We sincerely appreciate this opportunity of serving you on what we consider to be an assignment of unusual importance.

Very truly yours,

DE LEUW, CATHER & COMPANY

  
H. E. Lloyd  
Chief Engineer

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## INTRODUCTION

For a number of years the residents and business people in the area south of Hollywood and west of Los Angeles have been concerned over tentative plans for a freeway, generally following an east-west route from the Vermont district westerly to Santa Monica. The communities which have been most particularly concerned are Beverly Hills, Bel Air, Brentwood Park, Pacific Palisades, and Santa Monica, although the route involves a number of neighborhood communities within the Los Angeles area.

Shortly after World War II, the California Division of Highways and various communities began informal discussions concerning the preliminary location of a freeway route serving the above areas. The adoption of the freeway plan for the Greater Los Angeles area in the late 1940's and the later expansion of this plan to include new freeway routes as well as Federal interstate routes resulted in the establishment of a general area through which the proposed freeway would pass.

Studies commenced by the California Division of Highways some four years ago and by affected city governments and community associations finally resulted in the establishment of two separate and roughly parallel corridors. One of these corridors involves a freeway route beginning at the Hollywood Freeway between Vermont and Western Avenues and extending westerly through the South Hollywood district in the vicinity of Melrose Avenue, passing through the Beverly Hills residential areas north of Santa Monica Boulevard, Bel Air, and other communities to the west, and terminating at a point approximately where Sunset Boulevard intersects the San Diego Freeway at Sepulveda Boulevard. The second major corridor involves a freeway location commencing at the same point at the Hollywood Freeway and extending westerly in the vicinity of Beverly Boulevard to Santa Monica Boulevard in Beverly Hills. From this point, the freeway would turn southwest and would generally follow Santa Monica Boulevard, over any of several alternative routes or combination of routes to a point of termination roughly in the vicinity of Santa Monica Boulevard and the San Diego Freeway.

During 1963, it was announced that public hearings would be held by the California Division of Highways leading to the adoption of a freeway route through the area, which hearings would be held sometime in 1964. Because of the uniqueness of the areas through which the freeway would

pass, and because of the special physical and operational problems encountered, the City of Beverly Hills and numerous residential property owner's and business men's associations decided to engage special consultants to study in detail all of the special conditions attendant upon this freeway.

Early in 1963, the Beverly Hills City Council commenced discussions concerning its desires with respect to the freeway location, design, and traffic service characteristics. These meetings were followed by public hearings which culminated in the adoption of a statement of policy of the City Council with respect to the Beverly Hills Freeway at its meeting of November 5, 1963. Applicable sections of this policy are included in this report as an Appendix.

Among others, De Leuw, Cather & Company were engaged late in 1963 to undertake special engineering studies including, but not limited to, the following:

- a determination of the most feasible freeway route or "corridor" from the point of view of traffic service and accessibility
- correlation and analyses of estimates of construction cost for specific alternative freeway designs
- preparation of estimates of cost for a freeway generally along Santa Monica Boulevard conforming to the requirements of the Beverly Hills City Council statement of policy described above
- a determination of user benefit of the preferred freeway route, incorporating the conditions of the Beverly Hills City Council statement of policy
- a general discussion of the merits of the favored route in terms of all of the criteria under consideration, including traffic service, disruption to abutting properties, preservation of community standards and including aesthetic considerations.

This report is supplemented by reports of traffic consultants, economic consultants and land use planning consultants, each dealing with particular aspects of the freeway location and design. Because of the specific nature of the project, we have limited our investigations necessarily to questions included within the scope of our assignment, including service to the community, traffic demand, capacity, and economic justification as hereinafter described.

## FREEWAY JUSTIFICATION

Our initial studies generally involved the determination of the most practicable corridor or general route location. The California Division of Highways had for some time investigated two principal corridors, as mentioned above, and we confirmed that these were the two most logical corridors in terms of traffic service, conformance with the area freeway master plan, existing topographical controls, and on the basis of economic considerations.

### Service to Community

Our studies of the traffic data made available by the State Division of Highways, including traffic volume counts, screen-line checks, origin-destination studies and land use and developmental plans, indicate that a freeway is definitely justified within the general area under study. The communities between Hollywood and East Santa Monica are without direct freeway service and, as a matter of fact, the City of Beverly Hills is more than two miles from the nearest freeway. Moreover, population trends and projections, and present plans and programs for the development of land in the general area of the proposed freeway indicate that a freeway will be urgently needed to serve present and additional population within the next ten years.

Our studies of the early Los Angeles Metropolitan Area Origin-Destination Studies, recent screen line traffic volume studies and examination of the preliminary findings of the current Los Angeles Metropolitan Area Origin-Destination Study indicate that the predominant transportation need will be in an east-west direction through the area under study.

In addition to providing additional traffic capacity through the corridor, a freeway in this general location would free existing surface street facilities for continuing use by local vehicle trips. Of primary consideration is the elimination of commercial vehicle trips from city streets. The greatly increased safety provided by freeways as opposed to surface streets is a matter of record.

### Traffic Demand

As indicated in the special report of the City of Beverly Hills' traffic consultant, the 1963 east-west traffic through the Beverly Hills area approximates 283,000 vehicle trips per day in both directions across the La Cienega screen line. These vehicles are all accommodated on surface streets between, and including, Pico Boulevard and Sunset Boulevard. Further analyses of the traffic consultants indicate that east-west streets are now operating at or above practical capacity during peak hours. Additional traffic capacity is currently being provided by means



of the prohibition of curb parking, the use of off-center lane movement during peak hours, traffic signal modernization and coordination, and other similar operational devices. The provision of additional traffic capacity by physical means such as street widening is out of the question both from an economic and practical point of view, and would at best only provide interim relief.

Studies of the State Division of Highways and others with regard to population increase in the areas to be served by the proposed Beverly Hills Freeway indicate that the east-west vehicular traffic can be expected to increase by approximately 65 per cent by 1990. We conclude that it would be virtually impossible to provide the needed additional traffic capacity by improved surface street facilities. Because of the unique travel habits of motorists in the Los Angeles area, whose average trip lengths far exceed those in any other area in the world, it would be uneconomic in any event to expand surface street facilities to accommodate the additional traffic volumes.

#### Roadway Capacity

To demonstrate the insufficient capacity provided by east-west surface streets in the Beverly Hills area with a typical example, Santa Monica Boulevard presently has a peak hour traffic capacity of 1800 vehicles in one direction; and Sunset Boulevard has a peak hour capacity of 1300 vehicles in one direction. The 1962 observed traffic volumes on Santa Monica Boulevard and Sunset Boulevard during a typical peak hour approximated 2340 and 1750 vehicles, respectively, which represents 33 per cent excess traffic volume over practical capacity.

This situation of excess volume over practical capacity generally occurs on most east-west streets throughout the length of the proposed freeway route and is in some cases more severe than as described above. It is fairly obvious that surface streets, even with both operational and physical improvements where possible and feasible, cannot indefinitely continue to cope with the increasing traffic demand.

#### Economic Considerations

Principal among the economic benefits to the community are the reduced cost of freeway travel vs. travel on city streets; a reduction in accidents and their cost; and lower motor vehicle operating costs on freeways as opposed to surface streets. Indirectly, the communities along the freeway route will benefit considerably by savings in the cost of physical and operational improvements of surface streets and street maintenance. Direct benefits to the communities in terms of savings to users occasioned by the existence of a freeway will be the subject of later discussions in this report.

In summary and conclusion, we consider that a freeway is urgently needed through the area in question based upon all the above general criteria -- service to community, traffic demand, roadway capacity and economic considerations. Moreover, it is our conclusion that from the point of view of traffic demand, vehicle trip characteristics and expected population increase, the proposed freeway corridor is well located with respect to the area which it serves.

## PROPOSED FREEWAY CORRIDORS

The California Division of Highways studies of several alternative route locations through the area, as discussed above, resulted in the preliminary selection of two principal corridors shown on Exhibit 1, as follows:

### Red Corridor

The red route commences at Ardmore Avenue just south of Melrose Avenue on elevated alignment, and passes under Melrose Avenue slightly west of the RKO and Paramount Studios. From that point, the freeway continues westerly on depressed alignment north and parallel to Melrose Avenue and becomes elevated again just west of Fairfax Avenue. The freeway would continue on elevated alignment west across Santa Monica Boulevard and would pass under Doheny Drive and Arden Drive in the city of Beverly Hills. At Maple Drive the freeway would again become elevated and would continue over Sunset Boulevard at Alpine Drive. The freeway would continue on an alternatively depressed and elevated alignment through the northwest residential areas of Beverly Hills, Bel Air, Holmby Hills and Westwood, and would terminate at an interchange with the San Diego Freeway at Sunset Boulevard, with a pair of through ramp connections extending westerly into the community of Brentwood.

### Blue Corridor

The blue route as studied by the State Division of Highways and others generally involves several alternatives or combinations of routes. Basically, the Division of Highway's blue route corridor involves commencing the freeway at Ardmore Avenue with a variable depressed and elevated alignment westerly to Santa Monica Boulevard. The basic blue route then follows Santa Monica Boulevard southwesterly on either elevated, depressed, or at-grade construction to the San Diego Freeway at approximately Santa Monica.

Some variations of the blue route alignment involve a freeway location through Beverly Hills along Santa Monica Boulevard except for the portion in the vicinity of the three churches. In that case, one of the

alternatives involves a freeway route to the north of the churches. In the area to the west of Century City, one of the alternative alignments involves a location along Santa Monica Boulevard and another in the area of Ohio Avenue north of the Mormon Temple. A third location west of Century City would involve a route several hundred feet to the south and parallel to Santa Monica Boulevard. All of the proposed blue route locations west of Beverly Hills, as studied by the Division of Highways, would involve elevated construction. The blue route would terminate at an interchange with the San Diego Freeway, except for a possible extension southwesterly along Ohio Avenue.

One of the combination routes through Beverly Hills studied by the Division of Highways involves an alignment along Santa Monica Boulevard, with the freeway covered for a portion of the route. This configuration is known as the T-1 route.

Combinations of the red route and the blue route could be achieved by a connection between segments of the two routes in the vicinity of the east Beverly Hills city limit. Three such connections have been suggested by the Division of Highways; one along Santa Monica Boulevard, one just north of Santa Monica Boulevard, and one somewhat south of Santa Monica Boulevard. In all cases the red route would be utilized east of Santa Monica Boulevard and the blue route west of Santa Monica Boulevard.

#### Estimates of Cost

The following table summarizes the cost estimates of the Division of Highways for the red route, the basic blue route, and the blue route combination -- including the T-1 route, respectively.

<u>State Route</u>	<u>Cost Estimate</u>					<u>User Benefit</u> (Savings in 20 yrs.) (\$ Million)
	<u>Length</u> (Miles)	<u>Con-</u> <u>struction</u>	<u>Right</u> <u>of</u> <u>Way</u>	<u>Total</u>		
Red	10.1	33	135	168	600	
Basic Blue	10.1	46	133	179	609	
Broken green						
Broken blue (T-1 Route)						
Brown A and Red	9.4	56	142	198	609	

The above table also includes the user benefits for the three routes in terms of savings to motorists over a twenty year period. It will be noted that the savings to motorists are somewhat greater over the blue route

(\$609,000,000) than the red route (\$600,000,000). This is a function largely of the greater traffic service and traffic volumes accommodated by the blue route alignments. It should be noted that the above cost estimates are as developed by the Division of Highways and do not include the cost estimates for the "white route" as determined by De Leuw, Cather & Company, which will be discussed later in this report. The following table presents a comparison of the land required in addition to the existing street rights-of-way which would be permanently used for the various routes.

<u>State Route</u>	<u>La Cienega Blvd. to Doheny Drive</u>	<u>Doheny Drive to Century City</u>	<u>Century City to San Diego Freeway</u>	<u>Total</u>
Red	165 Acres	65 Acres	33 Acres	263 Acres
Blue	53	43	26	122
Brown A				
Broken blue (T-1)				
Broken green	31	26	37	93

The questions of savings to the community by the alternative routes in terms of removal of property from the tax rolls, family units eliminated from the community and similar criteria, is included in the reports of the other consultants.

#### EVALUATION OF PROPOSED FREEWAY CORRIDORS

In accordance with the scope of our assignment, we evaluated the two principal proposed freeway corridors in terms of traffic service -- including both traffic volumes and points of access, user benefits, and preliminary estimates of construction and right-of-way costs. The Division of Highways had performed thorough analyses with regard to traffic service and cost estimates, and we utilized their findings and data in our analyses. With respect to the blue route, however, we evaluated the traffic service characteristics and developed the user benefit analyses since so many alternative route segments were involved. For purposes of our analyses of the blue route, we used a combination of the State's broken green, broken blue (T-1), brown A and red route east of La Cienega Boulevard, which is shown on Exhibit 2, and which we have called the "combination" route.

#### Traffic Service

From the point of view of traffic service, there is no significant difference between the State's red and blue corridors east of La Cienega Boulevard. However, the red corridor would carry considerably less

traffic than the blue corridor as it proceeds through Beverly Hills and Bel Air and approaches the San Diego Freeway. The blue corridor on the other hand, because of its location through a heavily populated area west of La Cienega Boulevard, would accommodate 21 to 49 per cent more traffic than the red corridor, assuming adequate access and egress facilities.

In particular, the two principal traffic generators along the blue corridor are the Beverly Hills Central Business District, including the new hotel and shopping complex at Santa Monica Boulevard and Wilshire Boulevard, and Century City -- which at present is rapidly developing into a major traffic generator. Additionally, the blue corridor intersects Wilshire Boulevard which in turn is a major traffic artery serving new high-rise residential developments west of the Los Angeles Country Club.

### Benefits

The table in the previous section of this report includes figures on benefits to users of the proposed Beverly Hills Freeway. In addition to the increased user benefits of the blue corridor over the red corridor, other benefits include the following:

- disruption of existing surface streets. The red route involves the termination of significantly more existing surface streets than the blue corridor.
- provisions for cross-freeway traffic. The blue corridor provides a far greater number of streets crossing the freeway, particularly in the heavily developed areas through which the freeway passes, and provides greater traffic capacity across the freeway
- relief of surface street traffic. By virtue of its location through the heavily developed areas of Beverly Hills and to the west, the blue corridor provides more direct access for a greater number of motorists, relieving both parallel streets and those serving as access streets to the freeway
- termination considerations. Terminating in the vicinity of Santa Monica Boulevard and the San Diego Freeway, the blue corridor provides better access and traffic service than the red corridor for residents of the City of Santa Monica and for trips beginning or ending in the Santa Monica business district.

There are numerous additional benefits, both tangible and intangible, which are considered in the reports of the other consultants.

Estimates of Cost

The preliminary cost estimate for the combination blue route (broken green, broken blue (T-1), brown A and red) is approximately 18 per cent greater than the red route. The combination route, however, would carry far greater traffic volumes than the red route in the area west of La Cienega Boulevard. This fact alone more than justifies the slight additional cost of the combination route.

Preferred Route Alignment

We consider that either the red or blue route corridors would serve equally satisfactorily in the areas east of La Cienega Boulevard, although there appears to be some minor advantages favoring the red route alignment through this area. For purposes of this discussion, therefore, we will consider only the blue route alignment west of La Cienega Boulevard.

In consideration of the several criteria which we used in determining the preferred alignment, this discussion will be limited to considerations of the white route, which follows the blue combination (broken green, broken blue (T-1), brown A) alignment, but with a geometric configuration differing from the State's preliminary design as hereinafter discussed.

**PREFERRED FREEWAY ALIGNMENT**

Standard California Division of Highways geometric design criteria have been utilized throughout our design studies. We conformed to the Beverly Hills City Council statement of policy, however, with respect to aesthetic design criteria, and for the most part, the section of freeway through Beverly Hills conforms to this policy.

Geometric Design Criteria

Design Speed in Miles per Hour

Through roadways	70
Turning roadways	50
Ramps	30

Minimum Sight Distance

Through roadways	600
Turning roadways	350
Ramps	200

Minimum Radius of Horizontal Curves in Feet

Through roadways	1750
Turning roadways	850
Ramps	300

Maximum Superelevation in Feet Per Foot

General	0.07
Absolute on ramps	0.10

Maximum Profile Grade

Through roadways	Desirable	3 per cent
	Maximum	6 per cent
Ramps		6 per cent

Minimum Vertical Clearance in Feet 15

Roadway Cross Sections in Feet

Traffic Lane	12
Right Shoulder	10
Left Shoulder (8 lanes or more)	8
Left Shoulder (4 and 6 lanes)	5
Median (including right shoulders)	22

Geometric Design - Robertson Boulevard to Century City

Exhibit 3 indicates the general alignment of the white route from Century City east to Robertson Boulevard. The freeway would generally proceed east from Century City as depressed construction, except that the freeway would rise almost to grade at approximately the west Beverly Hills city limit, to pass over the large Moreno Drive storm drain. The depressed freeway would be concealed from a point just west of Wilshire Boulevard to a point near Arden Drive, a distance of 6,700 feet. As indicated on Plate 3, we have shown the freeway on the brown A alignment, however, we acknowledge that the freeway could be constructed along the brown B or alternative alignments in this area providing a connection to the red route freeway in the vicinity of La Cienega Boulevard. The brown A alignment involves the acquisition of no single family residences as compared to the alternatives and, as a matter of fact, does not require any property acquisition north of Santa Monica Boulevard.

Essentially, the white route through the city of Beverly Hills is similar to one of the alternatives studied by the Division of Highways with the exception that we have shown some variations in profile grades, ramp and interchange configuration, and we have indicated a somewhat greater length of freeway in concealed construction.

Access to Beverly Hills for east-bound vehicles on the freeway would be via ramp EP, as shown on Exhibit 3. This ramp provides access in an east-bound direction on the south Santa Monica frontage road at approximately Century Park east. The converse ramp, providing access to the freeway for west-bound vehicles leaving Beverly Hills, is indicated as ramp PW originating from the intersection of Century Park east, and the north or west-bound Santa Monica frontage road. The great advantage of this particular ramp location is that traffic to and from Beverly Hills does not conflict with traffic entering or leaving the freeway originating from, or destined to, the Century City area. This is achieved by use of two braided connections, one just east of Avenue of the Stars, and one just west of Century Park east, as indicated on Exhibit 3.

The severe congestion at the intersection of Wilshire Boulevard and Santa Monica Boulevard would be significantly reduced with the proposed white route freeway in existence. Although the freeway itself would absorb much of the through traffic from the surface street system, this intersection will present great problems because of the orientation of the two streets with respect to one another. We believe that the intersection can be made to operate more efficiently by the use of the two "right-left" turn lanes, as indicated on Exhibit 3. Vehicles bound in a northwesterly direction on Wilshire Boulevard, instead of turning left on Santa Monica Boulevard, would turn half right on Walden Drive to the west-bound Santa Monica Boulevard frontage road, then left and through the intersection. The converse is true for vehicles traveling on Wilshire Boulevard in a southeasterly direction. A "right-left" turn lane is provided for these vehicles to turn half-right from Wilshire Boulevard and then left in an east-bound direction on Santa Monica Boulevard. The principal efficiency in the proposed intersection design lies in its ability to accommodate all turning movements with a two-phase traffic signal installation rather than a three-phase operation as at present.

From Wilshire Boulevard easterly, it will be noted that all streets crossing Santa Monica would be continuous to Rexford Drive; east of Rexford Drive, Foothill Road, Palm Drive, and Hillcrest Road would be continuous across Santa Monica Boulevard.

Exhibit 4 presents a sectional perspective looking west near the churches, showing the freeway covered with a landscaped parking area. Exhibit 5 presents two sections of the concealed freeway showing the relationship between the existing buildings, the freeway and its exhaust air fan rooms. The Santa Monica Boulevard frontage roads for local traffic, and the railroad are also indicated thereon. A third section shows an alternative position for the railroad and fan rooms which may have some advantages.



## Description of Concealed Freeway

The structural sections shown on Exhibit 5 involve standard bridge construction. Because of the complex stage construction simple spans with self-supporting abutments are used. In general, prestressed girders as indicated, or steel girders can be used to advantage, providing space between the girders for the intake and exhaust ducts, minimizing the depth of construction. Concealed underground fan rooms are desirable from the standpoint of aesthetics. With the provision of three fan rooms per block as indicated on Exhibit 6, the fan and duct sizes are reduced and greater flexibility of fan operation is possible. Exhaust air and intake air would be vented through metal grilles located in the Santa Monica frontage roads, as commonly used in subway construction.

We have indicated the area over the concealed freeway as being used for landscaped parks or off-street parking lots. Parking is greatly needed here, particularly in the areas adjacent to the churches and the central business district between Wilshire Boulevard and the Post Office.

## Operating Characteristics of Concealed Freeways

We conducted special research relating to operating characteristics of tunnels and covered freeways. Included in our studies were several tunnels within California and numerous tunnels and covered freeway sections throughout the United States. Our principal studies were directed toward the questions of traffic capacity, vehicular requirements, accident history and such questions as noise, vibration, emergency requirements, and driver psychology.

Numerous agencies and organizations -- including the American Bridge, Tunnel and Turnpike Association, U. S. Bureau of Public Roads and the California Division of Highways have for a number of years maintained detailed records concerning the operating conditions of tunnels. It appears that the three major areas of difference between tunnels and open freeways involve ventilation, drainage, and lighting. So far as the question of drainage is concerned, the proposed Beverly Hills section of concealed freeway is well above the ground water table, and seepage presents no problem. Water entering the concealed freeway section from the portals can easily be disposed of.

We find that tunnels over 500 feet in length require special lighting; in consideration of the time required for adjustment of the human eye from daylight to artificial lighting conditions. This situation is easily overcome, however, by the use of high intensity lighting transition zones. This, and the other operating details of the concealed freeways, are discussed as follows:

- a. Capacity - The following table indicates the capacities of several existing tunnels in California:

<u>Location</u>	<u>Length in Feet</u>	<u>Number of Lanes</u>	<u>Peak Month 1963 ADT</u>	<u>1963 Peak Hour Volume</u>	<u>Design Capacity V. P. H.**</u>
Sepulveda Blvd. Airport Tunnel	1,900	6	52,000	6,450	6,400
Pasadena Fwy. Tunnel, L. A.	750+460	8	103,000	8,000	8,000
Golden Gate Fwy. Tunnel US 101	1,000	6*	63,000	4,850	5,500
Yerba Buena Island Tunnel, S. F.	540	8 or 9*	127,000	10,500	9,600
Alameda, Posey Tube		2*	33,700	2,800	2,300
Oakland, Caldecott Tunnel	3,000	4*	56,000	5,250	4,200

\*Before recent improvements

\*\*Based on 10 per cent trucks with 2/3 peak direction distribution

It will be noted that the actual observed peak hour volumes greatly exceed, in most instances, the practical capacity as computed from the Bureau of Public Roads Highway Capacity Manual.

- b. Speed - There is every indication that vehicle speeds in tunnels or concealed freeways approximate those on open freeways of similar geometric configuration. As a matter of fact, there is undoubtedly a smaller range between high and low speeds in tunnel sections because of the elimination of driver distractions.
- c. Lighting - We consider that adequate illumination in tunnels or concealed freeways is of primary importance, and we have included an allowance in our freeway design for a higher level

of illumination than California State Standards. During day-time hours, it is particularly important that the range between normal daylight outside the covered freeway section and the artificial lighting in the covered section be as low as possible; also the question of transition is particularly important and we have allowed for an even higher level of lighting at the portals.

- d. Ventilation - To exhaust combustion gas and control the concentration of carbon monoxide within safe limits, we have included extensive mechanical ventilation in our design. Ventilation is principally accomplished by the use of underground fan rooms connected to the covered section of freeway by a system of air ducts and registers. Exhaust air would be filtered to remove visible smoke particles and odors. The full capacity of the fans provides for movement of six cubic feet of air per minute for each square foot of traveled way. The design control would be under the condition when all vehicles were stopped in the tunnel -- presumably with engines idling. The schematic arrangements for the ventilation system are shown on Exhibits 5 and 6.
- e. Emergency Requirements - The emergency warning system for the section of concealed freeway would include traffic control signals approaching the entrance portals. The signals would be actuated before carbon monoxide concentrations reach dangerous proportions and could also be manually operated by traffic officers if required. Under such conditions, traffic would be diverted from the freeway to the two Santa Monica Boulevard one-way frontage roads to bypass the concealed freeway section.

An emergency telephone system would be provided throughout the concealed freeway section at regular intervals for such conditions as stalled vehicles, accidents and fire. Emergency exits for pedestrians would be provided from the concealed freeway section to the streets above at approximately 400-foot intervals. These would be operated by means of one-way locking doors, opening from the freeway side only. High pressure fire hydrants with hoses, and CO<sub>2</sub> fire extinguishers would be provided within the covered freeway section at regular intervals.

- f. Accoustical Considerations - The ventilation fan ducts would be provided with accoustical lining to reduce exhaust air sounds to the street above. Additionally, it would be possible to treat the inside of the freeway itself accoustically to minimize traffic noise. However, in our studies of other tunnels, we have found that traffic noise does not present a particular problem.

- g. Driver Psychology - There has been considerable discussion with respect to the question of driver psychology in tunnels. Specifically, it has been suggested that driving in tunnels may contribute to any one of several phobias, especially claustrophobia. We can find no information, however, to substantiate this position.
- h. Traffic Accidents - Our studies of traffic accidents in tunnels leads to the conclusions that tunnels and enclosed freeways may be somewhat safer than open freeways, particularly so far as rear-end collisions are concerned. Because of the lack of conclusive data, however, we consider that tunnels are at least no less safe than open freeways.

Cost Comparison - Division of Highways T-1 Route and White Route

We have compared the estimate of cost of the route developed by the Division of Highways' broken blue or partial tunnel alignment with the white route as developed by De Leuw, Cather & Company. The Division of Highways route is the one closest to the route which we have presented herein and includes a section of covered freeway through Beverly Hills. That alignment, however, is planned for elevated rather than depressed construction beginning at the west Beverly Hills city limit and for this reason, the costs are somewhat at variance in that area. The following table summarizes the construction cost estimates for the concealed freeway alignment between the east and west city limits of Beverly Hills as shown on Exhibit 3.

<u>Item</u>	<u>White Route</u>
Roadway Construction Cost	\$ 5,643,000
Structure Cost	24,106,000
Lighting, Ventilation, and Filtration, Initial Cost	<u>3,677,000</u>
Total Construction Cost	\$33,426,000
Right-of-Way and Utility Relocation Cost	<u>29,354,000</u>
Total Cost of Route	\$62,780,000

Annual operation costs of \$401,000 would be required for lighting, ventilation, and filtration.

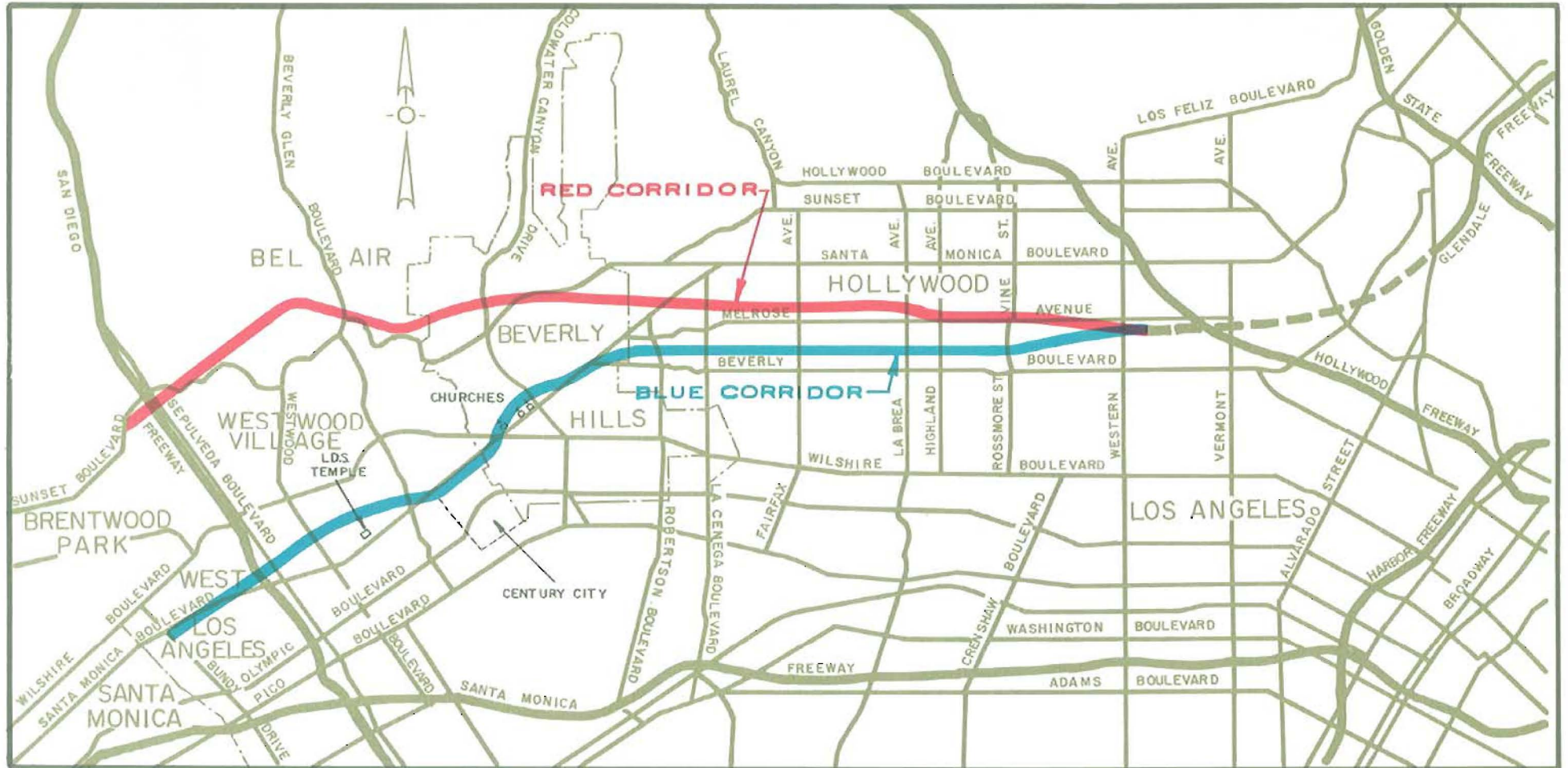
There is some indication that an additional saving of approximately \$1,440,000 can be made if the area above the freeway, between the cross streets, is designed for a 100-lb. per square foot live load to accommodate passenger car parking lots.

The cost for the partially concealed T-1 freeway as studied by the Division of Highways along this alignment totals \$49,400,000 or \$13,380,000 less than the preferred alignment.

In summary, we consider that the preferred freeway route through the City of Beverly Hills as described above, is entirely feasible from every point of view. The route offers superior traffic service and generally falls within the Beverly Hills City Council Statement of Policy with one minor exception: the inclusion of a pair of access ramps at the East Beverly Hills city limits. The preferred geometric configuration, involving a fully concealed freeway presents several advantages over an open freeway and fully satisfies all of the stated requirements.

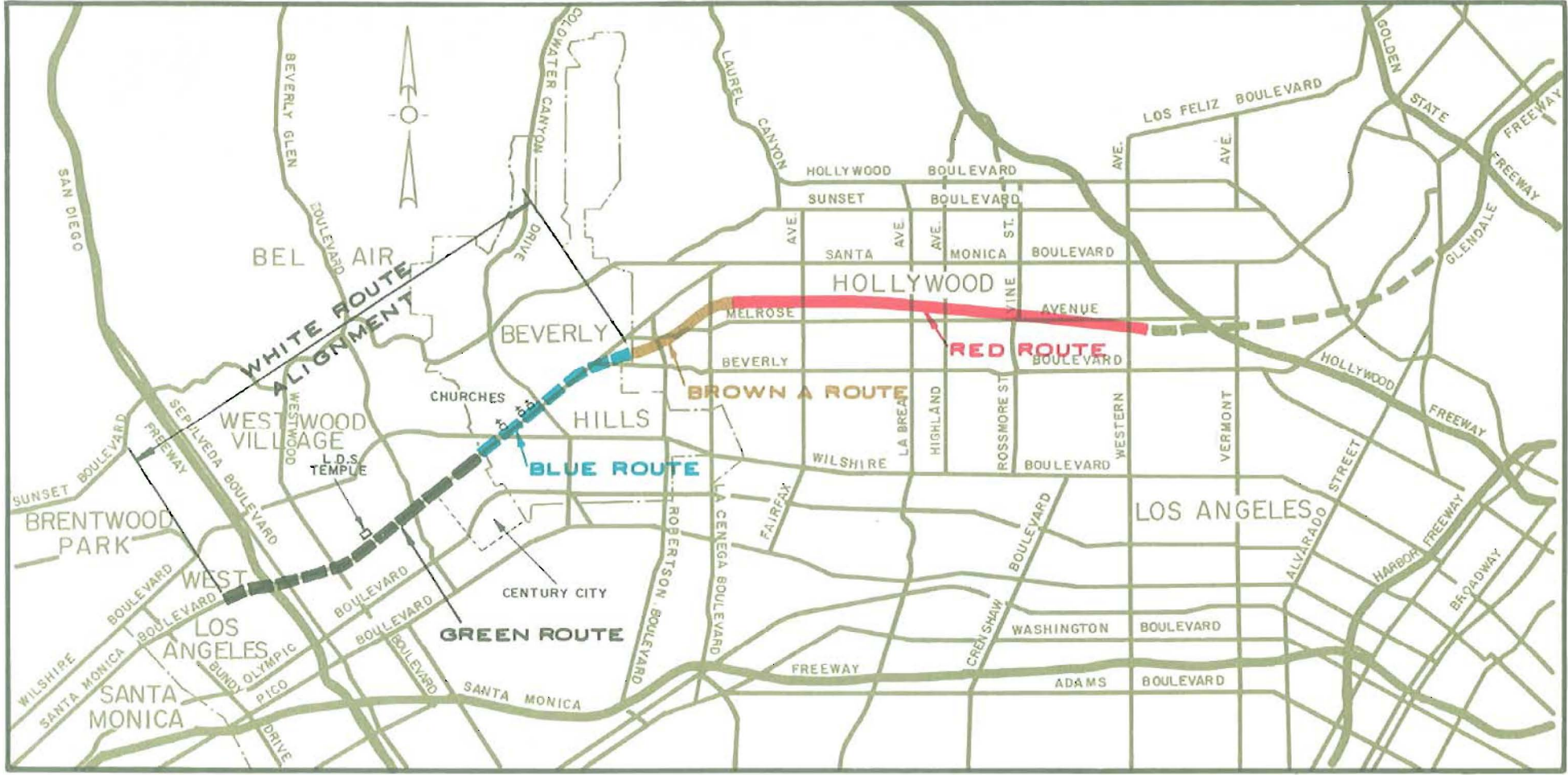
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EXHIBITS



LOCATION OF ALTERNATIVE  
RED AND BLUE FREEWAY CORRIDORS

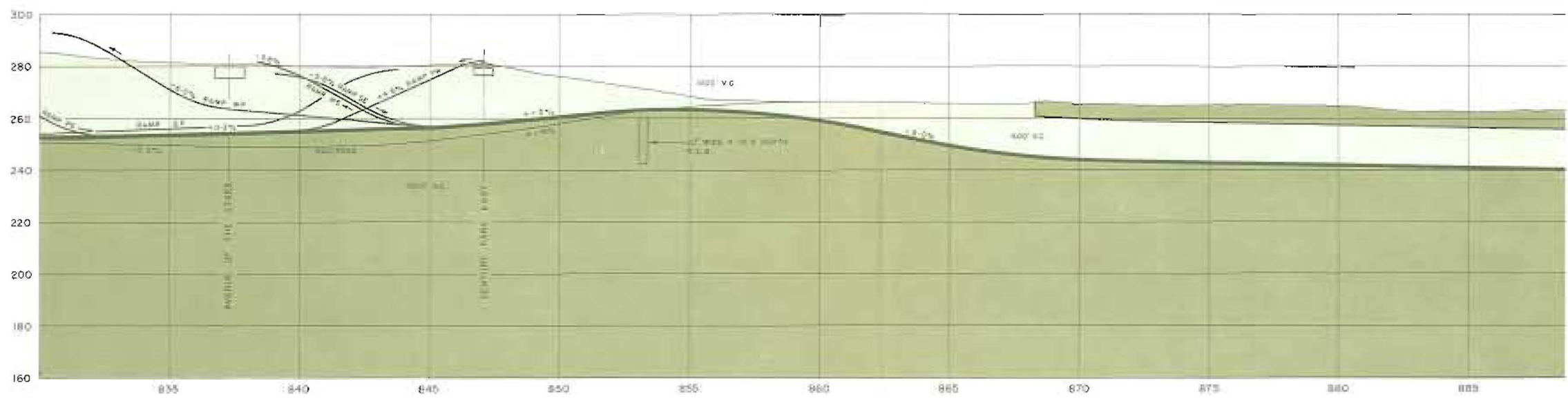
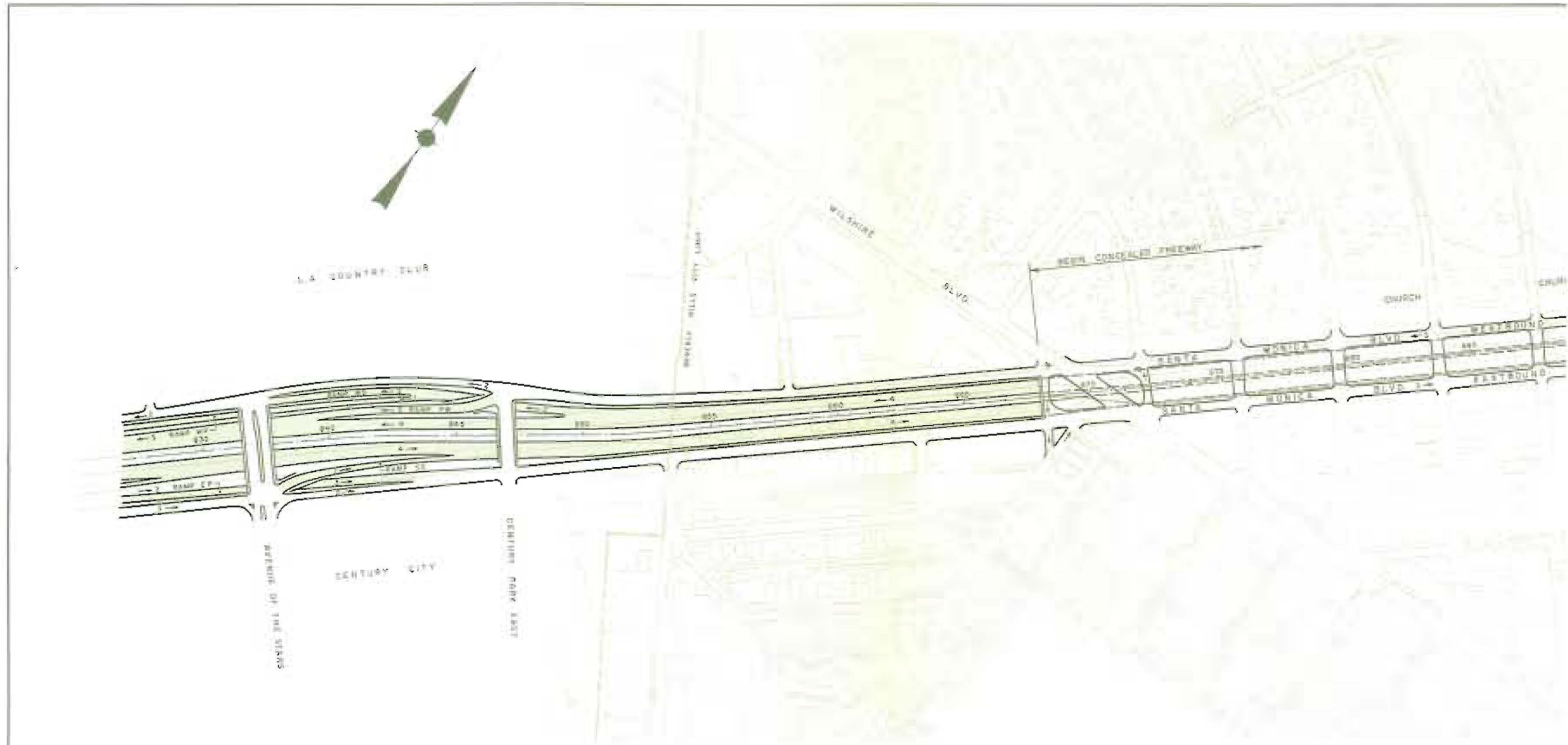
PROPOSED BEVERLY HILLS FREEWAY

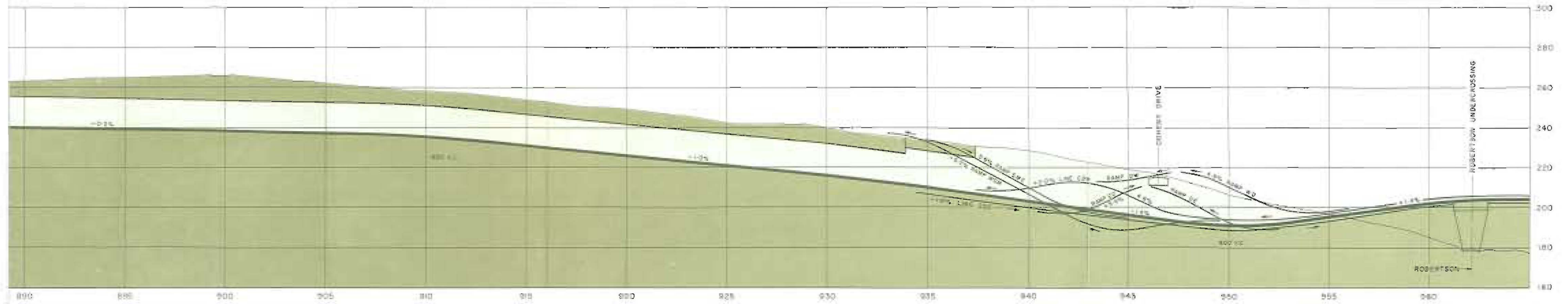
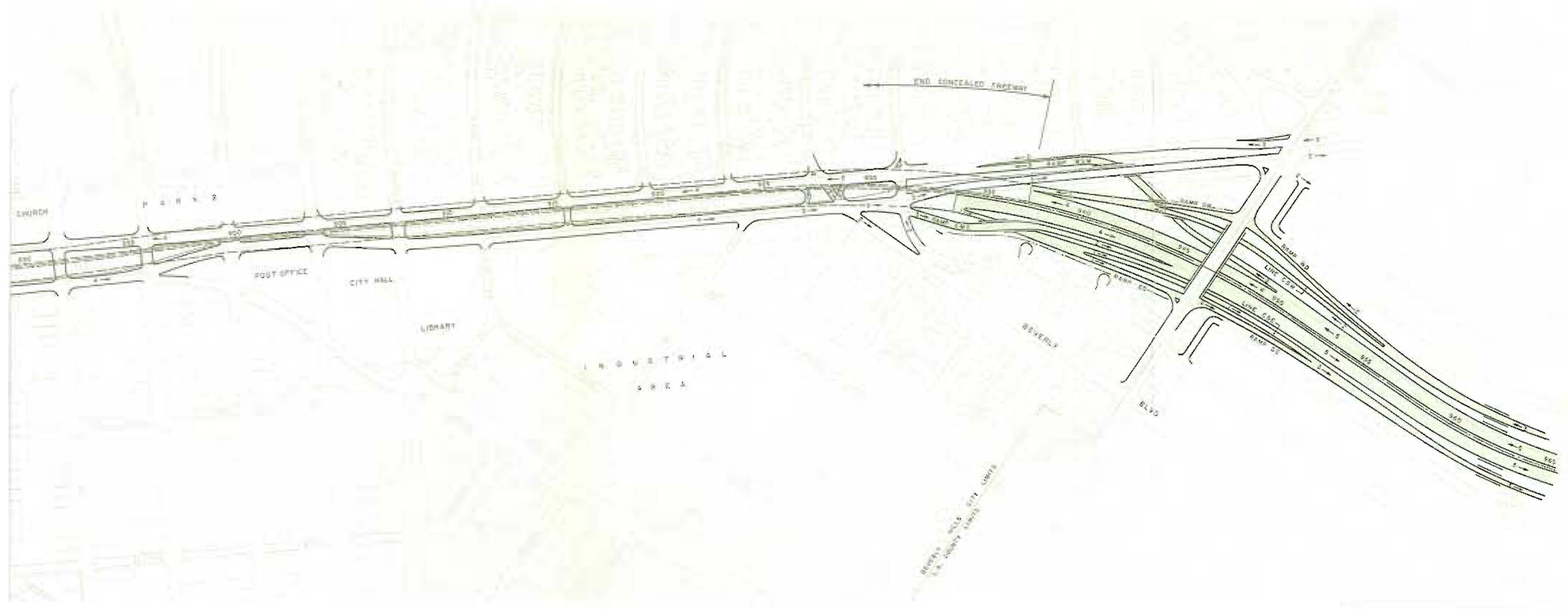


### LOCATION OF WHITE ALTERNATIVE ALIGNMENT

PROPOSED BEVERLY HILLS FREEWAY





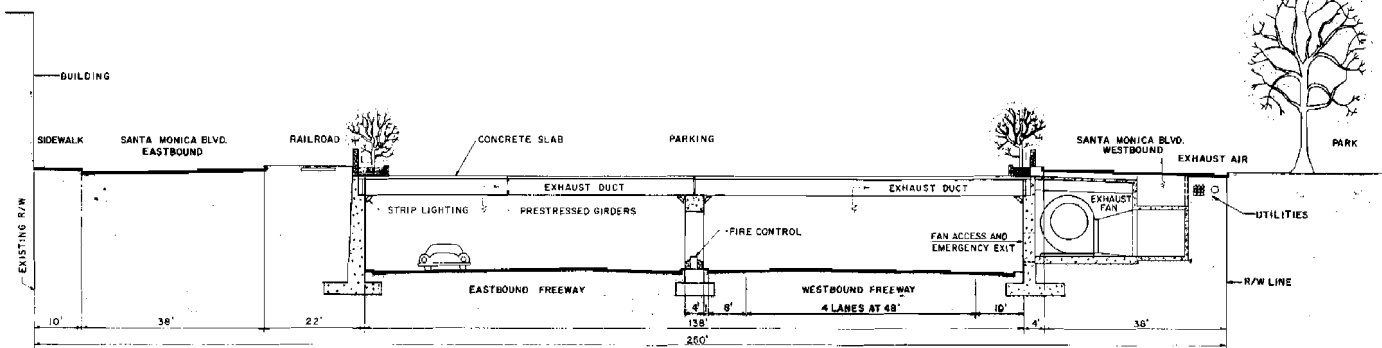


PLAN & PROFILE  
CENTURY CITY TO ROBERTSON BLVD.  
PROPOSED BEVERLY HILLS FREEWAY

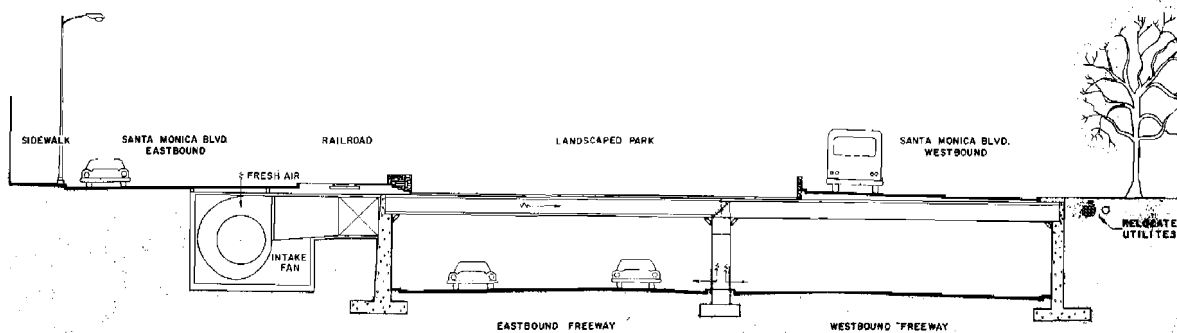
DE. LEW. CATHER & COMPANY CONSULTING ENGINEERS



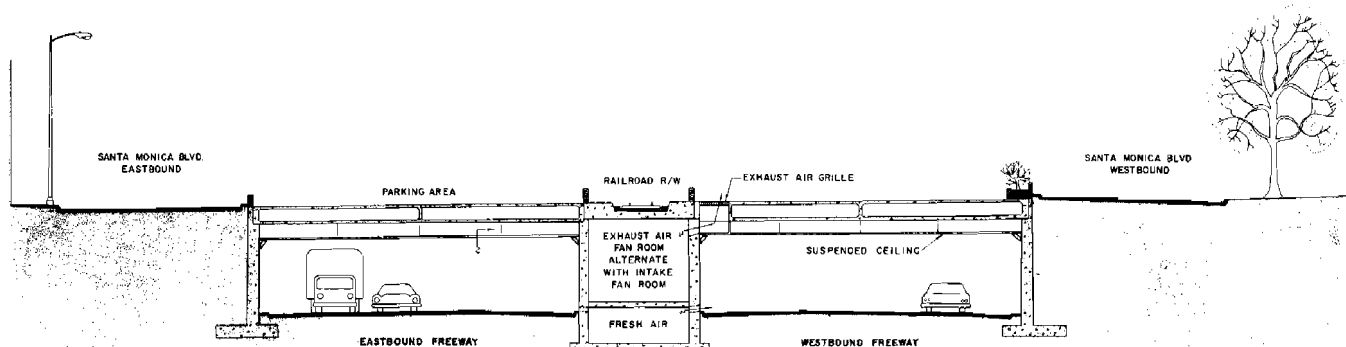
SECTIONAL PERSPECTIVE LOOKING  
WEST NEAR RODEO DRIVE  
SHOWING THE FREEWAY COVERED  
WITH LANDSCAPED PARKING AREA



SECTION LOOKING WEST AT CAMDEN DRIVE SHOWING THE FREEWAY COVERED WITH A LANDSCAPED PARKING AREA AND SANTA MONICA BLVD. SERVING AS A LOCAL ONE-WAY STREET ON EACH SIDE.

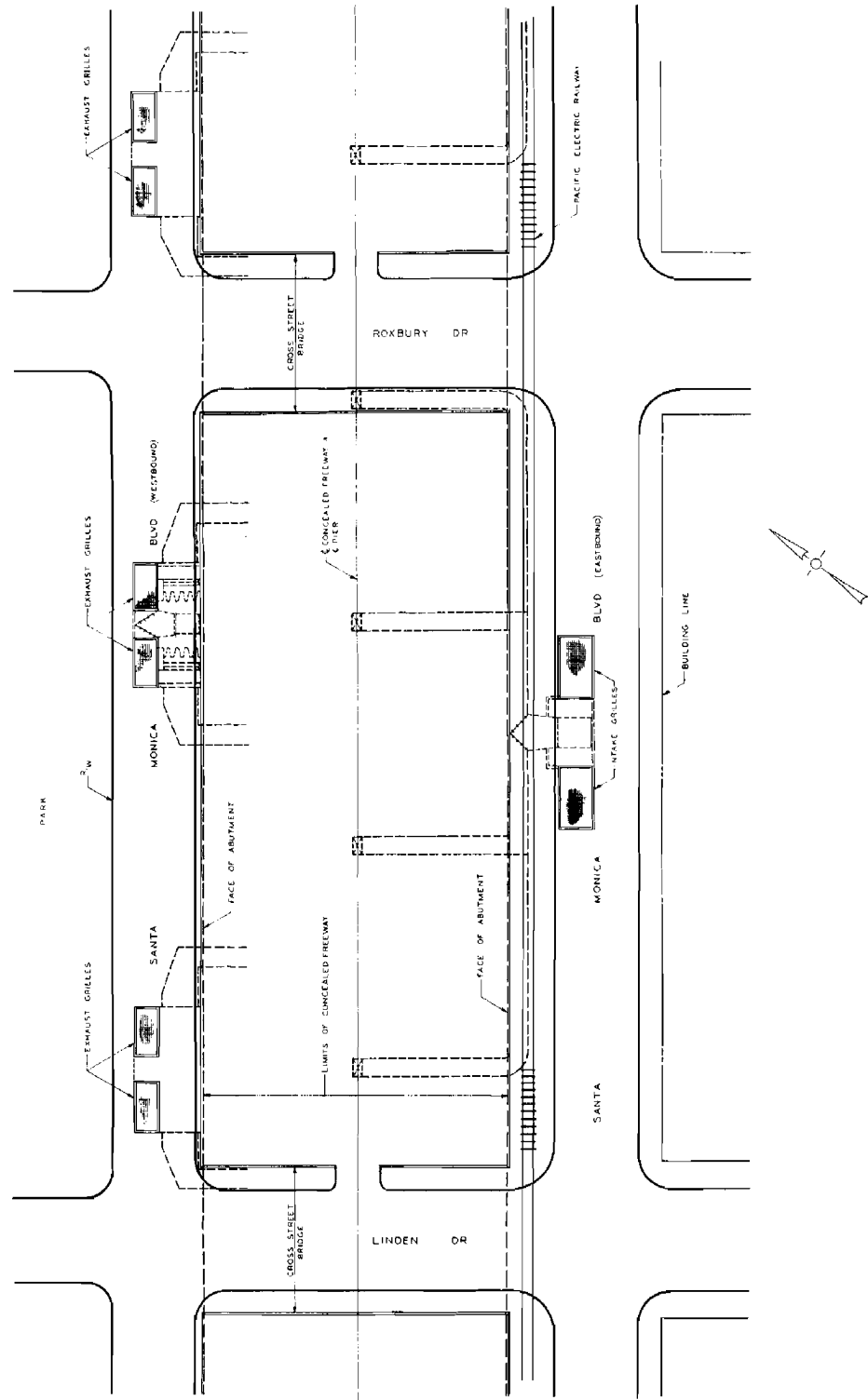


SECTION LOOKING WEST AT ELM DRIVE SHOWING WESTBOUND SANTA MONICA BLVD. LOCATED OVER THE FREEWAY TO REDUCE RIGHT OF WAY REQUIREMENTS.



SECTION AT CAMDEN DRIVE SHOWING A POSSIBLE ALTERNATIVE DESIGN WITH THE VENTILATION FAN ROOMS CENTERED BETWEEN THE FREEWAY ROADWAYS.

TYPICAL SECTIONS OF CONCEALED FREEWAY  
PROPOSED BEVERLY HILLS FREEWAY



TYPICAL BLOCK PLAN OF  
UNDERGROUND VENTILATION SYSTEM

PROPOSED BEVERLY HILLS FREEWAY

DE LEUW, CATHER & COMPANY CONSULTING ENGINEERS

APPENDIX

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## APPENDIX

### APPLICABLE SECTIONS OF STATEMENT OF POLICY ADOPTED BY THE CITY COUNCIL OF BEVERLY HILLS WITH RESPECT TO POSSIBLE BEVERLY HILLS FREEWAY

Adopted at Formal Council Meeting November 5, 1963

- 1) Such project must not take any single family residences in Beverly Hills nor remove, destroy or reduce any of its parks, nor interfere with its churches or schools. We find as a fact that it is entirely possible if a freeway is constructed through Beverly Hills, to construct a complete freeway of four driving lanes in each direction, plus emergency storage lanes on each side and median strips, while adhering to the foregoing statement of principle. This is only possible, however, if such freeway is constructed along Santa Monica Boulevard, or along Santa Monica Boulevard from the westerly boundary of Beverly Hills and through the so-called industrial area of Beverly Hills east of the City Hall to the easterly boundary of Beverly Hills. We further find that if such freeway is constructed along Santa Monica Boulevard as contemplated in one of the alternative routes designated by the Division of Highways for hearing, the preservation of the entire park area along that Boulevard will be an indispensable part of the buffer between freeway and single family residences.
  
- 2) Such freeway must be depressed at least twenty feet below the surface throughout Beverly Hills, excepting only to the extent absolutely necessary to get under or over Federal storm drains. In this connection, we find that if such freeway is constructed along Santa Monica Boulevard for its entire length or along Santa Monica Boulevard and through the industrial and apartment house district lying between Santa Monica Boulevard and Burton Way as contemplated in several of the alternative routes of the Division of Highways, the only interfering storm drain would be at Moreno Drive and that if such freeway rises to go over this drain, it is not necessary and definitely not desirable for the rise to commence until west of Wilshire Boulevard. It is indispensable for the protection of the essential interests of Beverly Hills, that such freeway be so depressed, from the easternmost limit of Beverly Hills at Doheny Drive, at least to the westerly side of Wilshire Boulevard. We further find that suitable measures by way of acoustical baffle and appropriate landscaping must be taken if such rise occurs west of Wilshire Boulevard, to protect the nearby apartment house areas and the Beverly Hills High School on Moreno Drive against increase of volume of noise incident to the freeway grade which would then exist along Santa Monica Boulevard. It is further apparent that such freeway if constructed along Santa Monica Boulevard must go under Wilshire Boulevard, to adequately protect adjoining single family residences. We find also that this would improve the intersection at Wilshire and Santa Monica Boulevards by separating the major portion of east-west through traffic from the flow of

local movements at that important intersection.

- 3) To comply with the principles in Points 1) and 2) above, such freeway would necessitate the covering of a substantial portion of the route by what is known as cut-and-cover method. We further find that as yet we have not had demonstrated any sufficient guarantee against projection into the surrounding residential neighborhoods of the noise volume and fumes incident to a very heavily travelled freeway such as we find the Beverly Hills Freeway would be. Therefore, to the extent that such route is in the vicinity of single family residences or churches, it must be totally covered and pass below Wilshire Boulevard and Doheny Drive. This means that the route must be totally covered to the extent that it follows Santa Monica Boulevard. We further find that we have not been shown any evidence that a properly designed and lighted covered freeway increases the incidence of accidents or offers any significant inconvenience to drivers on such freeway. We find that the extra cost, if any, of such covered freeway is a proper expenditure of the State of California rather than the City of Beverly Hills, bearing in mind that the freeway will principally serve through traffic rather than traffic originating or ending in Beverly Hills, and bearing in mind further that such cover is indispensable to protect the interests of Beverly Hills while accommodating at the same time the interests of the communities benefited by the through traffic.
- 4) The City must not be divided, and therefore, all Beverly Hills streets essential to the movement of local traffic must continue to run without obstruction at surface grade. This means that all north-south streets called for on the City's General Plan and Central Business District Studies would bridge the freeway at existing surface grade. The principle stated in Point 2) is an additional factor in preventing the appearance of division of the City.
- 5) The freeway must not destroy or limit the usefulness of any existing streets or highways in the City. This means that provision must be made for retaining at surface adequate lanes for east and west bound local traffic. This would have result of freeing the surface lanes for local traffic, and have the effect of diverting to the freeway below, the noise and other undesirable aspects of the heavy through traffic.
- 6) We are opposed to freeway on or off ramps inside Beverly Hills, because of the complications they introduce in choice of acceptable routes and design of routes, the traffic and traffic congestions which they may generate, and because we feel surface routes when relieved of the through freeway traffic below, should furnish reasonably easy access and ingress to Beverly Hills.
- 7) There should be maximum attention to the design of walls, ramps, abutments and landscaping of any freeway through Beverly Hills, so as to maximize its beauty to persons driving through and screen its existence by landscaping and otherwise, from surrounding surface.



8) In general, the selection of route, design and manner of construction should be based on long range benefits to the community rather than short range benefits related to convenience in time or cost of construction.

We find, however, that by proper scheduling and cooperation between the Division of Highways and the City of Beverly Hills, in the event of construction of a Beverly Hills Freeway, the inconveniences and disruptions incident to construction can, and should be, held to a minimum.