MASTER PLAN OF HIGHWAYS

COUNTY OF LOS ANGELES

REGIONAL PLANNING DISTRICT

1941

VOLUME 1

COUNTY OF LOS ANGELES

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A COMPREHENSIVE REPORT

on the

MASTER PLAN OF HIGHWAYS

for the

LOS ANGELES COUNTY
REGIONAL PLANNING DISTRICT

VOLUME I

THE PLAN AND ITS PREPARATION

THE REGIONAL PLANNING COMMISSION
LOS ANGELES COUNTY REGIONAL PLANNING DISTRICT
1941

THE REGIONAL PLANNING COMMISSION

June 18, 1941

Honorable Board of Supervisors
County of Los Angeles
California

Gentlemen:

On February 27, 1940 your honorable body adopted the Master Plan of Highways of the Los Angeles County Regional Planning District.

The present report is intended to make the details of that Plan available to officials and to the general public for reference, and to outline a reasonable and practical means for putting this Master Plan into effect. Volume II will treat of the means of execution in detail. It will analyze in detail the cost of completing the highways proposed in the Plan, during a reasonable period of time, the legal means available or needed and the funds that can be expected during the period of development, to the end that a definite policy may be established for the efficient expenditure of highway funds.

A comprehensive transportation plan, now in preparation, will further amplify some of the implications of the Highway Plan leading to a desirable coordination of various transportation facilities.

Respectfully,

Wm J. Fox

Chief Engineer

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OFFICE OF THE BOARD OF SUPERVISORS OF THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA,

TUESDAY, FEBRUARY 27th, 1940.

The Board met in regular session. Present: Supervisors Roger W. Jessup, Chairman presiding, Wm. A. Smith, Gordon L. McDonough, John Anson Ford and Oscar Hauge; and L. E. Lampton, Clerk, by Genevieve O'Bannon, Deputy Clerk.

IN RE MASTER PLAN OF HIGHWAYS FOR THE COUNTY OF LOS ANGELES AND FOR LOS ANGELES COUNTY REGIONAL PLANNING DISTRICT: ORDER ADOPTING PLAN.

This being the time regularly fixed by order of this Board adopted on February 13th, 1940, for hearing on the proposed adoption of the "Master Plan of Highways for the County of Los Angeles," and the "Master Plan of Highways for the Los Angeles County Regional Planning District," as adopted by the Regional Planning Commission on February 7th, 1940, and as submitted to this Board by said Commission on February 7th, 1940; and due notice of said hearing having been published as required by law, said matter is called up; an opportunity is given for any person present to be heard and the Board is addressed by Frank Lanterman, Fenton Knight, Chas. R. Rollin, Silas M. Cain, and others; and on motion of Supervisor McDonough, unanimously carried, it is ordered that the Board of Supervisors of the County of Los Angeles hereby adopts as the Master Plan of the County of Los Angeles that certain Highway Plan shown on maps on file in the office of this Board entitled "The Master Plan, Metropolitan Area, County of Los Angeles, Highway Plan," and "The Master Plan, North Portion, County of Los Angeles, Highway Plan."

And it is further ordered that the Board of Supervisors of the County of Los Angeles hereby adopt as the Master Plan of the Los Angeles County Regional Planning District that certain Highway Plan shown on maps on file in the office of this Board entitled respectively, "The Master Plan, Metropolitan Area, County of Los Angeles, Highway Plan" and "The Master Plan, North Portion, County of Los Angeles, Highway Plan."

And it is further ordered that the action herein taken by this Board in approving said Master Plan of Highways be certified by the Clerk of this Board on said document and on each of said maps; it being hereby declared that said Master Plan of Highways is established to conserve and promote the public health, safety and general welfare.

The foregoing order was adopted by the Board of Supervisors of the County of Los Angeles, State of California, on February 27th, 1940, and is entered in the Minutes of said Board.

L. E. LAMPTON, County Clerk of the County of Los Angeles, State of California, and ex-Officio Clerk of the Board of Supervisors of said County.
By: Alice Burks (Signed)
Deputy.

RECOMMENDATIONS

(1) That the Master Plan be strictly adhered to in the future acquisition, widening and construction of all highways within the Region.

(2) That the basis for financing all acquisition and construction shall include the funds derived under State Law from the motor vehicle fuel tax and from motor vehicle licenses.

(3) That the State statutes governing the distribution of motor vehicle and gasoline tax funds be so amended as to provide that as a condition precedent to the allocation of any such funds to any political subdivision of the State, such subdivision shall have adopted a Master Plan of Highways in accordance with the Planning Act of the State of California and that such funds shall be expended only upon highways included in such Master Plan.

(4) That State Legislation be sought to provide for the creation of a county-wide Highway Authority charged with the custody of all highway funds, and their expenditure in accordance with the Master Plan and a sound priority program based on actual traffic needs.

(5) That the county-wide Highway Authority be empowered to use motor vehicle and gasoline tax funds for the acquisition of highway rights of way.

(6) That a reasonable proportion of highway funds shall be lawfully devoted to adequate research and study of safety, traffic conditions and highway needs.

(7) That traffic needs beyond the scope of this Highway Plan be met by the adoption of a Master Plan of Freeways and construction of such Freeways together with development of highways, wherever practicable, with divided roadways, separated intersections and like facilities to expedite traffic flow.

(8) That it be the policy of the Board of Supervisors to adopt as official plans, upon recommendation of The Regional Planning Commission, precised sections of the Master Plan of Highways, and to provide by ordinance for the fullest protection of individual alignments in unincorporated portions of the County.

(9) That each incorporated city within the Region be urged to adopt a Master Plan of Highways and precised official plans based thereon, in accordance with the procedure set forth in the Planning Act of the State of California.

(10) That the officials of the cities and the county, with the cooperation of state officials, establish the maximum possible legal protection of rights-of-way and traffic capacity of highways by means of planning and zoning, and jointly resist all efforts to nullify such protection.

(11) That the Board of Supervisors, Planning Commissions and other public officials endeavor to promote public interest in and understanding of the Master Plan, so as to assure the continued cooperation of all concerned.

INTRODUCTION

PURPOSE OF THIS REPORT

The Regional Planning Commission has previously published, in 1929 and 1931, partial reports on two sections of the Regional Plan of Highways for Los Angeles County. The complete Master Plan of Highways is here presented for the first time. Of greater significance, the status of the present plan differs materially from that of those earlier portions. Those sections had been approved by resolutions of the Regional Planning Commission, the Board of Supervisors, and the City Councils of twenty-six cities. On December 22, 1936, the Board of Supervisors had, by resolution, adopted the plan for the entire county as the Official Regional Plan of Highways for Los Angeles County.

In 1937, however, the California legislature amended the California Planning Act, Statutes 1937, Chapter 665,—"An act to provide for the establishment of master and official plans in cities, cities and counties, and for the creation of regional planning districts . . ." necessitating substantial changes in procedure. Two items are particularly important in connection with this report. The first is the requirement that "every city and county shall adopt and establish as herein provided a master plan of said city and county . . . . to conserve and promote the public health, safety and general welfare," and sets forth as one of the subjects matter of which such a plan shall consist, a "Streets and Highways Plan," "showing the general locations and widths of a comprehensive system of major traffic thoroughfares and other traffic ways and of streets and the recommended treatment thereof."

THE REGIONAL PLANNING DISTRICT

In regard to the second point, it is necessary to clarify the legal distinction, as entities for planning purposes under this Act, between the "County of Los Angeles" and the "Los Angeles County Regional Planning District." Section 2.2 of the Planning Act reads as follows:

> "For the purpose of providing State coordinated regional planning, the State Planning Board shall divide the State into regional planning districts. These districts shall be established so far as possible so as to include:
>
> "(a) Natural physiographical regions containing complete watersheds of major stream systems, together with the land upon which the waters of such watersheds are put to beneficial use;
>
> "(b) Areas having mutual social and commercial interests, as exemplified by radiating and connecting routes of transportation, by trade, and by common use of recreation areas within the region."

The State Planning Board on October 21, 1939, established the County of Los Angeles as one such Regional Planning District. The Act further provides (Sec. 2.4) that "If the regional district consists of but one county, the county planning commission for that county shall be ex officio the regional planning commission." The members of the County Commission, therefore, meet as The Regional Planning Commission of the Los Angeles County Regional Planning District at regular intervals. There are important differences in the functions of these two bodies. Many problems, such as the regulation of land subdivision, the preparation and administration of zoning in the unincorporated portions of the County are "County matters requiring detailed attention." The duties assigned by law to the

"Regional District," on the other hand, are of a more general character, with emphasis placed upon the "coordination of city plans with the county plan" and of the County Plan with that of adjacent counties and other regions of the State. Under the law it is superior to the "County" Commission and stands in a more authoritative relationship to the incorporated cities within the County than does the latter. The Planning Act provides (Section 4.6) that "The county and city commissions . . . shall accept and embody in the respective master plans under their control the features and findings of the respective regional planning commissions in matters pertaining to the regional and State welfare."

EARLY PROGRESS ON THE HIGHWAY PLAN

Long before this time, however, rapid development of highway problems in the region had been a primary factor among the forces that led to the establishment of The Regional Planning Commission in December, 1922. In May, 1923, the Board of Supervisors in a formal resolution had urged the "need of working out this system or network of highways" upon all official bodies concerned, and it became at once a major task of the new Commission.

In the years that followed much had been accomplished. A preliminary plan for a comprehensive network of through highways had been set up as a guide to subdivision activity and road construction. Many miles of right-of-way 80 and 100 feet wide had been thus secured without cost to the public by dedication along the line of planned thoroughfares, in connection with new subdivisions. Even more had been obtained, also without cost, by outright deed where no subdivision was involved. Coordination of highway construction of the forty-five incorporated cities and of the county had been undertaken with marked success.

MASTER PLAN HEARINGS

In order to realize the functions and authority implied in the establishment of a Regional Planning District it now became necessary to re-adopt these already operative plans as Master Plans under the procedure of the Planning Act. For the convenience of the public, the required hearings on Master Plans are set for both Commissions at the same time and place (since the membership is identical). But they are acted upon separately for the District and for the County. At the Highway Plan hearings maps showing the entire plan were displayed and explained to interested assemblages of officials and citizens. All suggestions and criticisms of the Plan were given serious consideration, and further refinement of detail followed. The Plan was then on February 7, 1940, formally adopted by Resolution as "The Master Plan of Highways, Los Angeles Regional Planning District." Thus, it has the endorsement of a Regional Commission, appointed by the Governor of the State and charged with consideration of its quality as a part of a state-wide plan. It was also adopted on the same day, by the Commission sitting as a County Planning Commission, as the Master Plan of Highways for the County of Los Angeles, thus preparing it for certification to the Board of Supervisors as both a local and a regional plan.

FINAL ADOPTION

The next step was to certify an attested copy of the Master Plan to the Board of Supervisors, who in their turn held a public hearing on the Plan. At that time eight large scale maps, showing in color the alignment of every feature of the proposed network of major and secondary Highways covered the walls of the hearing room. The Chief Engineer of the Commission's technical staff went over the maps in detail, answering questions and clarifying objectives. The formal resolutions of the Commission, certifying the adoption of the Plan for the Regional Planning District and for the County,

and recommending its approval by the Board, were read. The Board had also invited to appear before it official representatives of all the incorporated cities, and the absence of any opposition to the Plan demonstrated the value of the years of preparation, conference, and coordination which had preceded that important occasion.

Adoption of the Plan by the Board followed and on February 27, 1940, the Master Plan of Highways came into its well-earned legal status.

The procedure thus far, may seem to be only a matter of technical conformity to the letter of the state law, but it does differ in fact from the same operations in communities where the earlier work had not been carried as far toward completion prior to the adoption of the Planning Act. It is furthermore important to realize that none of that earlier work was wasted effort. The period of time during which the plan had an official status as a Regional Plan of Highways subjected it to the severe test of most searching examination and criticism growing out of application of the plan in countless construction projects. The value of this course was indicated by the resultant correction of a number of minor details, so as to provide a more complete harmony with local policies or with other phases of the comprehensive plan. Of even greater significance was the very small number of changes in the major features of the plan.

HOW THE MASTER PLAN OPERATES

The Master Plan is, as has been noted, an instrument clearly defined by the State Planning Act. But to accomplish its own objectives the Master Plan must go beyond a legalistic description on a piece of paper. Planning is essentially a continuing process, and constant refinement of detail in the light of changing trends and technical advances must always be made. The failure to apply this principle explains why many so-called plans have never progressed beyond the stage of fancied perfection on diagrammatic sketches. In this Region the policy has always been, not to stop with a general plan as first carefully outlined, but to proceed from such a plan as a starting point, to examine every detail in the light of field surveys and related information, and to continue the studies until there is a definite determination of what needs to be done, where and why. The aim has been and is to present, not a generalized doctrine of theoretical perfection, but a tested, practical and precisely fixed alignment for each element of the plan.

The city engineers and the city planning commissions, and all other agencies, official and unofficial, interested in the Plan are constantly brought into consultation, the Commission acting throughout as a central coordinating agency. The general public is kept constantly informed as to the progress of the Plan, through the maps which are always available for consultation, and through visual presentation of special projects and studies.

DETAILED ALIGNMENTS

Through the cooperation of the County Surveyor most of the proposed highways have been precisely surveyed and accurate maps have been prepared to show their exact alignment, curvature, and relation to existing improvements and property lines. In many cases large-scale maps are prepared by the County Surveyor, giving sufficient dimensions to make it possible for each landowner to know exactly where the lines traverse his property. References to these surveys and to building line ordinances are carefully entered upon the display maps used in the office of the Commission for the administration of the Plan. The precise or "Official Plans" contemplated by the Planning Act are therefore ready for execution as the need arises.

Many features of the Plan have, as a result of these activities, been translated into reality, and today offer working demonstrations of the value of advance planning, integrated with governmental administration.

CORRELATION WITH OTHER PLANS

The task thus completed is only a foundation. It represents but one, though a basically important phase, of the Planning Commission's work. It could not even be developed without the development in parallel of numerous other items of the comprehensive plan.* The plan of airports, for example, had to be well-advanced, and sites of future airports determined upon before fixing upon highway locations in the vicinity. Parks and parkways, recreational areas, commercial and industrial centers, cultural centers, and areas of greater or lesser density of residential use had to be studied and planned, for not only do they depend upon the location of highways in some degree, but also the proper location of highways depends upon them.

TRANSPORTATION PLANNING NECESSARY

Probably the most closely related subject in the planning field is transportation. The miles of highways, together with the vehicles upon them, constitute a large and important part of the transportation system of the region, considering both passengers and freight. They do not, however, contribute many of the controlling influences in either transportation or the spread of population and industry. Facilities for mass transportation, by rail and bus, had and still have effects of the greatest importance in the creation and maintenance of business districts, in the successful operation of industrial enterprises and in the development of residential districts.

The Master Plan of Highways will continue to be subject to some change until a positive Transportation Plan has been agreed upon and put into operation. Only when this has been done, can many problems of carrying out the Highway Plan be solved with final assurance. The Regional Planning Commission is now engaged in the compilation of the many surveys and proposals that have been made from time to time on this subject. A certain amount of original research will provide new information and bring old material up-to-date. It is hoped that the work can be completed, culminating in a comprehensive plan for organizing the transportation facilities of this region, within two years. It is contemplated that this one plan will cover mass transportation by common carriers (exclusive of steam railroads), freeways and some aspects of highway transportation not covered in the present report such as the central district parking problem.

This inter-dependence of all phases of the Master Plan needs to be borne carefully in mind also in connection with any proposed amendments to the Highway Plan as now adopted. These cannot be undertaken lightly, or considered independently of their effect upon the disposition of the other items mentioned. Any change in one element has its effect upon the rest, and must, therefore, be most carefully studied in its relationship to the whole.

PROVISION FOR AMENDMENTS

We have pointed out that planning is a continuing process, so that no plan, however arrived at, is ever really complete and final. The Planning Act (Section 5) provides that "The commission may from time to time amend, extend or add to the master plan or part thereof, as herein provided for the adoption thereof, whenever changed conditions or further studies by the commission require such amendment, extension or addition." The Commission has always held

*The Master Plan of Airports was adopted in 1941.

The Master Plan of Shoreline Development was adopted in 1941.

The Master Plan of the Civic Center was adopted in 1941 by both the County and the City of Los Angeles.

The Master Plan of Land Use, adopted in 1940, merely conforms to procedure under the present Planning Act. Its precise plans, the various sections of the Zoning Ordinance, have been in force since 1927.

The Subdivision Ordinance has been in effect since 1933, and has been regulating, among other things, the arrangement of local streets.

Other plans of the Commission which have never enjoyed the technical status of "Master Plans" are mentioned throughout this report.

that the most vital part of its work is the constant integration of the Plan with actual development, and adjustment to meet changing conditions is understood to be inevitable. But seventeen years of collaboration have produced a basic network of highway alignments, which is now quite definitely fixed and is relied upon by all concerned with the physical development of the Region and its individual communities.

It is therefore considered proper at the present time to make available through publication and wide distribution, this officially adopted Master Plan of Highways as a record of progress and a guide with which we can press forward confidently in the work of developing this great Metropolitan Area.

PLANNING TO SAVE

A good plan properly conceived and consistently followed will eliminate wasteful expenditures, through adjustment of construction to harmonize with current needs, and must result in major economies.

The carrying out of the Plan here presented will mean a substantial cash saving to the citizens of today and tomorrow. Millions are actually expended every year on highway construction. The plan proposes wise distribution of such funds in strict accordance with traffic needs, in line with present and anticipated growth, and in harmony with other physical development, so that the right dollar may be spent in the right place.

RESOLUTION OF REGIONAL PLANNING DISTRICT

WHEREAS, The Regional Planning Commission of the Los Angeles County Regional Planning District, California, has, by Resolution, (adopted on the 7th day of February, 1940) declared its intention to adopt a Master Plan of the Los Angeles County Regional Planning District, pursuant to the provisions of The Planning Act, as amended by Chapter 665, Statutes 1937, and

WHEREAS, Section 4 of the Planning Act provides for the adoption of a Master Plan of Streets and Highways showing the general location and widths of a comprehensive system of major thoroughfares and other traffic ways and of streets and the recommended treatment thereof, and

WHEREAS, The Regional Planning Commission has prepared a comprehensive Highway Plan of the entire District including the incorporated cities, which plan is shown by symbols as Major and Secondary Highways on two maps entitled respectively "The Master Plan, Metropolitan Area, County of Los Angeles, Highway Plan" and "The Master Plan, North Portion, County of Los Angeles, Highway Plan," and

WHEREAS, after due notice of the time and place thereof, published in a newspaper of general circulation in the District, a public hearing was held on the 15th day of November, 1939, to consider the adoption of a "Master Plan for the Los Angeles County Regional Planning District," at which the above-mentioned plan was publicly displayed;

NOW, THEREFORE, BE IT RESOLVED: That The Regional Planning Commission hereby adopts as the Master Plan of the Los Angeles County Regional Planning District that certain Highway Plan shown on the two above-mentioned maps entitled respectively, "The Master Plan, Metropolitan Area, County of Los Angeles, Highway Plan" and "The Master Plan, North Portion, County of Los Angeles, Highway Plan"; and

BE IT FURTHER RESOLVED: That the adoption of said Master Plan shall be certified and attested on each of the said maps by the signatures of the Chairman, the Chief Engineer, and the Secretary of the Commission, and that attested copies of the said maps be certified to the Board of Supervisors of the County of Los Angeles; and

BE IT FURTHER RESOLVED: That The Regional Planning Commission recommends that the Board of Supervisors of the County of Los Angeles approve and adopt said Master Plan after holding a public hearing as prescribed by law, and certifying their action on each copy of the maps referred to, which accompany this resolution; and

BE IT FURTHER RESOLVED: That The Regional Planning Commission recommends that the Board of Supervisors determine upon reasonable and practical means of putting into effect this Master Plan, in order that the same may serve as a pattern and guide for the orderly physical growth and development of the Los Angeles Region and as a basis for the efficient expenditure of the funds thereof relating to the subjects of the Master Plan and to conserve and promote the public health, safety and general welfare; and

BE IT FURTHER RESOLVED: That certified copies of this Resolution be transmitted to said Board of Supervisors.

I hereby certify that the foregoing is a full, true and correct copy of a Resolution adopted by the Regional Planning Commission of the Los Angeles County Regional Planning District, State of California, in regular assembly on the 7th day of February, 1940, and entered in the minutes of said Commission.

(s) Irma Ruther,
Secretary of The Regional Planning Commission of the Los Angeles County Regional Planning District, State of California.

I

THE LOS ANGELES COUNTY HIGHWAY PROBLEM

In Los Angeles County there are now over 150 square miles of land devoted to use as streets and highways. They provide nearly 13,000 linear miles of rights-of-way for traffic movements and access to property. This immense area already in public ownership is, nevertheless, inadequate in some respects, chiefly because the widths and alignments of many of the streets and highways have not been determined on the basis of a plan scientifically related to the traffic needs.

Wide highways in open country where land is cheap and plentiful streets in "paper" subdivisions where the houses are few characterize the outlying sections. In contrast, narrow, crowded streets in the older and most densely occupied sections fail to accommodate the traffic load. On these older, more heavily traveled routes old "bottle necks" and "jogs" dam up the traffic streams until they practically cease to flow. Finally, after wasteful delays these obstructions are opened up at increasingly heavy cost. Local traffic and through traffic on the same thoroughfare interfere with each other, causing more delay and accidents, while irregular patterns of local streets add much unnecessary intersection traffic to the confusion.

HIGHWAY TRANSPORTATION IS MASS TRANSPORTATION

The problem is no new one, but has been developing with increasing intensity ever since the advent of motor transportation. Today over a million motor vehicles move upon Los Angeles County streets and highways, traveling annually some eight billion miles. Collectively this vast machine for what must now be definitely recognized as "mass transportation" must represent an investment, for vehicles alone, of at least 500 million dollars.

The land used for all street and highway purposes, estimated conservatively at a minimum average value of $2000 an acre, represents a capital investment of nearly two hundred millions, and the improvements, including pavement and signals, have a present value of not less than four hundred millions of dollars.

Table 1.
STREETS AND HIGHWAYS
INVESTMENT IN EXISTING IMPROVEMENTS
Los Angeles County

	Miles		Construction Cost	
State Highways	880	@	$50,000	$ 44,000,000
Major Traffic Streets..	3,000	@	80,000	240,000,000
Local Streets	5,000	@	20,000	100,000,000
Unimproved (or low type)	4,000	@	5,000	20,000,000
	12,880			$404,000,000

ANNUAL COST

Annually we spend for new acquisitions, improvements and maintenance on the street and highway system of the County, well over $10,000,000.

Replacement of rolling stock must approximate 10%, or 50 millions of dollars annually, while the money spent for gasoline, oil, tires, and repairs on vehicles figured at 2c per mile, reaches the astonishing sum of 160 million dollars per year.

These broad facts alone are sufficient to point to the conclusion that motor transportation plays a most important part in the modern community life of Los Angeles County, and that a concerted effort to remedy present known defects and in some measure foresee and provide for future needs is imperative. In succeeding chapters of this report a closer, more detailed study

of the inadequacy of our partly completed highway system, both quantitative and qualitative will be presented, not in substantiation of the above statement, but in a sincere effort to show by careful analysis the factual bases of the Master Plan of Highways.

IMPORTANCE OF THE PROBLEM

The importance to every individual in the community of a good system of streets and highways will probably not be questioned, and is scarcely to be over-estimated. Everyone is daily affected, for better or worse, by the relative efficiency of the transportation system. He depends upon it, directly or indirectly, for every activity of his home and business life. Whether he commute from Alhambra or South Gate or be a resident of a downtown or Wilshire district apartment, he is subject to the delays and dangers of congestion and speeding cars. Whether he be a driver, a rider in public conveyance, or a pedestrian, he must face the problem of getting from home to work, from store to warehouse, from town to country and back again.

The value of real property is greatly affected by its relative accessibility. The Antelope Valley rancher, the Glendora orange grower or the Artesia dairyman must be able to send his hay, oranges or milk to market; the manufacturer in Vernon or Burbank must receive raw materials and distribute his finished product. For this transportation both farmer and manufacturer depend more and more each year upon motor vehicles which move over the public roads. If the roads are good, the savings in transportation costs are reflected in lower prices and higher standards of living for buyer and seller alike. The business man and his customer are gravely affected by the efficiency of bus and street car service; the efficiency with which delivery trucks can reach the customer's home is a factor in the prices of the retailer's goods and the patronage he earns.

COMMUNITY VALUES

The producer and the consumer are joined by means of these public rights-of-way, whether they deal in airplanes or oil, in motion-pictures or the morning newspaper. Farm to market roads must reach from thousands of farms through distributing terminals to hundreds of thousands of individual homes. The homes themselves are made of construction materials which come from many sources and are transported largely on highways from source to building site. Thus the new value created by dwelling construction is in part derived from the highways over which construction materials were transported.

The motor vehicle has greatly increased the mobility of the individual. Greater earning power and wider opportunities for the enjoyment of social activities have resulted. The resident of Compton finds employment in an airplane factory at Santa Monica, Downey or Burbank. The Glendale business man can go in for yachting if it is convenient for him to keep a boat at Long Beach or Balboa. Rural and urban life have become less differentiated, and inter-city and inter-state travel commonplace to all.

The collective value to the community of all these things is a measure of the value of our streets and highways, since without them it could not be attained.

HIGHWAYS DEFINED AND CLASSIFIED

In the larger sense, a highway may be thought of as any publicly-owned strip of land dedicated to and improved for the purpose of providing access to property, and of providing for movement of goods and persons from one place to another. This would, of course, include local streets and even alleys, and, legally, that is the case. But it is more convenient in planning, to limit the term somewhat, and to classify these "strips of land" under more specific names.

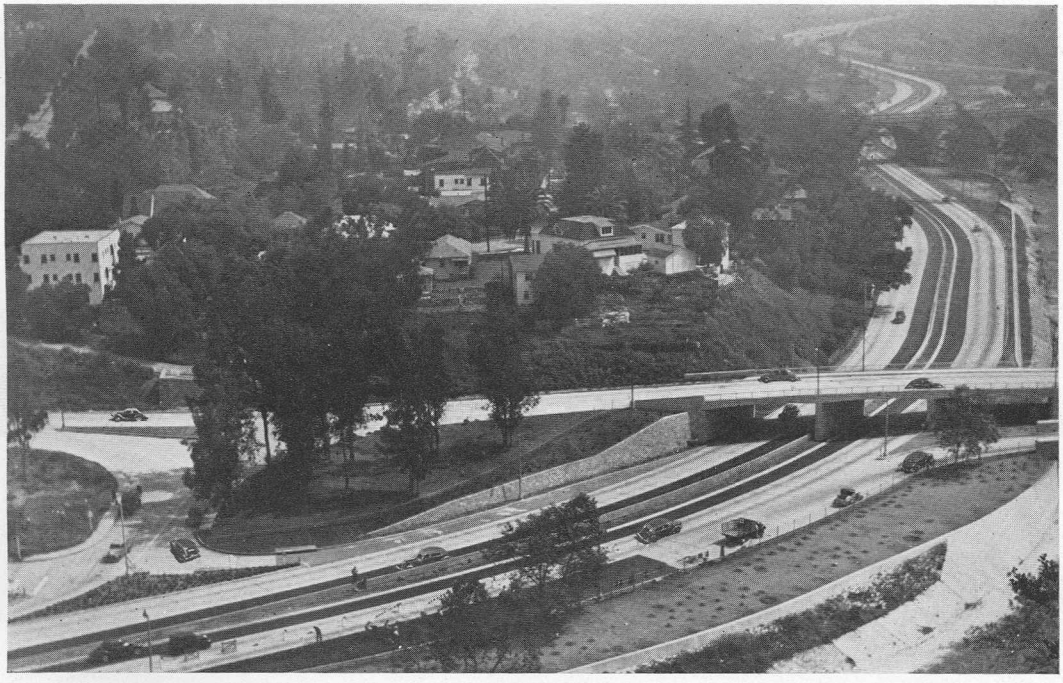
LOCAL STREETS

When the primary purpose of such a strip is to give immediate access to the land on either side, we think of it as a local street. The ideal in working out the arrangement of such streets is to reduce to a minimum, traffic other than that required for immediate access, although most local streets do accommodate some through movement.

Adequate regulation of land subdivision, combined with some measure of re-platting in certain areas, generally offers a satisfactory method of dealing with problems of minor streets and their relation to other classes of public ways. This Report has to do, not with them, but with the thoroughfares carrying heavy traffic. The Master Plan of Highways for the Los Angeles County Regional Planning District, as officially adopted by the Board of Supervisors of the County, constitutes, with regard to minor or local streets a skeleton guide, which taken together with the Subdivision Ordinance provides for an orderly development along the highways. Its importance in this respect cannot be over-emphasized, and its value while dependent partly upon the cooperation of land developers, still requires united support of those who are charged by law with the duty of carrying it out. The success throughout the past seventeen years of the Los Angeles County Regional Planning Commission in obtaining such cooperation from subdividers during the period of development of the Highway Plan has contributed much to make possible the completion and final adoption of that plan.

HIGHWAYS

The Master Plan of Highways has to do with the location and design of the ways whose primary function is to facilitate movement of large volumes of traffic from one part of the area to another. To them, the term



A Portion of the Arroyo Seco Freeway

subject to more interference with traffic flow than would the freeways. In many instances they would serve as feeders to the freeways. They would carry large volumes of traffic and extend continuously through the region, but would not provide for as fast service as the freeways.

3. A system of secondary highways, similar to major highways but designed for smaller volumes of traffic. Serving in part as feeders to the major highways and freeways they would not necessarily be continuous through the entire region and would be subject to slightly more traffic interference than the major highways. They would ordinarily serve more to provide frontage and access for abutting property than would the major highways.

Filling in the spaces between the three preceding classes, are the minor streets, composed as nearly as is practically possible into a series of sub-systems. The prime function in this case is to provide frontage to abutting property, not to carry any large volume of traffic or at any great speeds. The streets serve as feeders to and distributors from all the highways, but only rarely would they have any direct connection to freeways.

AN OUTLINE OF THE PROBLEM

The development of a plan for a system of highways adequate for the growing needs of Los Angeles County, was necessarily begun by seeking to make use, as much as possible, of highways or streets already existing in 1923. Many of the highways shown on page 76 were at that time merely local streets woefully inadequate in that they were narrow or unpaved or disconnected segments of what eventually was to become a highway. Many of the true highway routes of that time followed devious routes with sharp-angled turns, narrow bridges, inadequate directional signs and uncertain status within the incorporated cities. One typical example was Lexington-Gallatin Road, from El Monte to Downey

Slot Type Intersection on Cahuenga Freeway

which had 20 right-angle turns in a distance of 12½ miles. Portions of this old wagon road are included in several different highways in the present Master Plan, and one of these, Rosemead Boulevard, now developed has no such turns in the entire route.

After accepting this situation as a basis, the development of an adequate Highway Plan was a problem in engineering design both set and solved by a series of quite definite and calculable factors. The principles underlying this process can be set forth clearly and simply, although the application of these principles has been, because of the magnitude of the area, complex and difficult—a task that has taken a long time, and involved the combined efforts of many people.

THE ENGINEERING APPROACH

It is reported* that General John J. Carty, Chief Engineer of the New York Telephone Company had three first questions to be applied to every engineering proposal that came before him for review:

1. Why do this at all?
2. Why do it now?
3. Why do it this way?

In the case of a system of highways for Los Angeles County abundant evidence of the prime need answers the first question so broadly, and in the minds of so large a body of the public that it needs not be discussed at this point. It is sufficient to say that the need for a system being recognized, the same questions are then to be applied to the various elements that are under consideration for making up that system. In analyzing the highway problem for this region these three basic questions may be restated as follows:

1. How many highways will be required?

The answer depends upon the population to be served, the number of vehicles they use, and the resultant volume of traffic to be accommodated.

2. Where should they be placed?

Here the relationship of the highways to one another, to the communities within the Region, and to the other features of the comprehensive Master Plan for the development of the Region as a whole, are the primary considerations.

3. What kind of highways will be adequate.

This is a problem in design for various loads, and includes determination of satisfactory alignments, adequate widths, practical grades, and other characteristics of the physical improvement, as well as intended service.

4. When must they be provided?

This is a twofold question, requiring separate consideration (a) of the rate at which rights-of-way need to be acquired or widened, and (b) of the physical construction required to keep abreast of traffic needs.

5. How can they be secured?

Ways and means of financing necessary costs must here be considered. The Plan must be soundly related to the economic structure of the Region, for otherwise it will be impractical and therefore without value. Funds available for paving and other improvements, and for land acquisition, where necessary, must be analyzed, and their distribution related to the Plan on a sound basis of functional priority. Legislation affecting the execution of the Plan, both financially and from a procedural standpoint, must be studied. County-wide approval and support must be merited and secured, and administrative safeguards applied.

The Commission has studied each element of the Plan here presented from these five points of view, in order to be assured that it is necessary, well-designed, and feasible. Succeeding chapters of this Report deal more fully with the methods of analyzing the problem in each case and of arriving at the conclusions which constitute the Master Plan of Highways.

**Principles of Engineering Economy;* Grant, the Ronald Press, N. Y.; 1930.

II

HOW MANY HIGHWAYS WILL BE NEEDED?

PAVEMENT REQUIRED

Some years ago the Regional Planning Commission made an exhaustive study of conditions in a number of cities of various sizes in this region, to discover possible relationships between the existing pavement, number of automobiles and population. Referring only to arterial traffic in urban districts, and exclusive of parking space, actual measurements revealed that approximately 450 square feet of pavement were required for each registered vehicle.* At that time the width of pavement considered adequate for a line of moving vehicles was 10 feet. This area was therefore the equivalent of one such "lane" 45 feet in length, per automobile. In order to make application of this requirement independent of changes brought about by increased speed and other factors in the standard of lane width, the ratio then determined is more practically expressed in terms of "lane-miles", a lane-mile being the area of pavement required for a linear mile one lane in width. In these terms the requirement reduces to 8.5 lane-miles for each 1000 vehicles. This includes no allowance, of course, for the paving required for certain highways running to the borders of the County through open territory, and necessary passages through the mountains, where actual distance is the controlling factor.

It is of interest to compare this theoretical requirement with the actual provisions for today's traffic load. The registration, as of December 31, 1939, in Los Angeles County, totalled 1,081,031.† This would require, at the ratio established in the preceding paragraph, 9,189 lane-miles of highway pavement. Actually, these vehicles are operating today on about 8,400 lane-miles of highway (2,800 miles in the Metropolitan Area, with an average width of about three lanes). The difference of 789 lane-miles between these figures indicates a present shortage, the existence of which no one familiar with traffic conditions of today will deny. A study of the lane-density maps prepared in connection with the Commission's traffic survey indicates further that if the missing 789 lane-miles could be created by magic over night at the places where the worst "sore-spots" are indicated, many immediate problems of congestion would be solved.

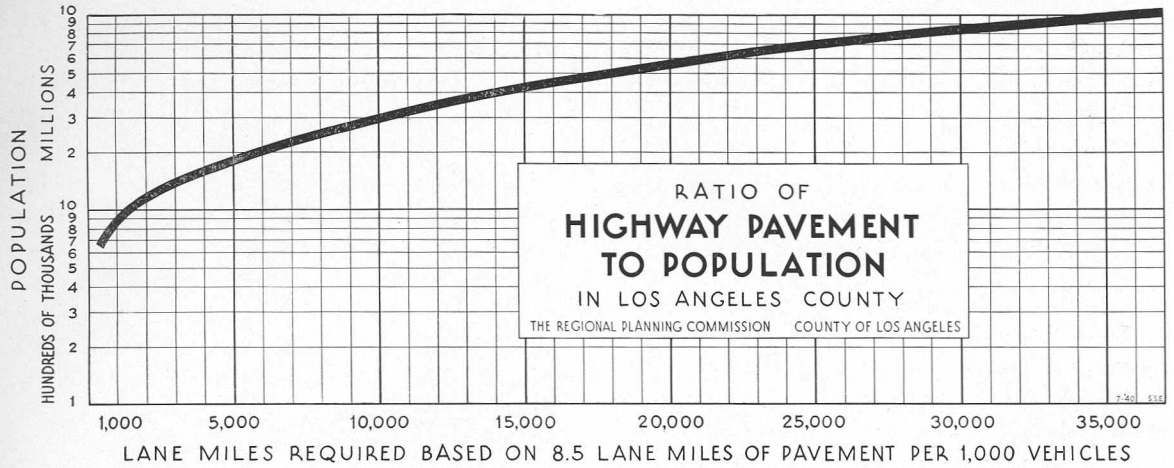
This does not mean that the peak-load congestion inherent in a system with intersections at grade, and without adequate in-town terminal facilities, would be eliminated—that is a separate problem. But it does indicate that the theoretical ratio developed in 1929 checks with actual experience ten years later. Hence we have a reliable empiric formula for determining the proper amount of highway paving for the automobiles in use at any given time. To extend this calculation into the future, an analysis of the trends of population increase and prevalence of automobile ownership is necessary. Before considering the well-known ratio of automobile ownership to population we shall first examine the more fundamental question of an estimate of future population.

POPULATION

The foremost consideration in determining highway requirements is population, for in designing a highway system, just as in designing a water system or any other general utility service, the basic requirement is a correct estimate of the number of people

*See *Long Beach-Redondo Area* Highway Report (1931), page 20.

†Fee-paid automobiles and trucks only.



that it will have to serve now and in the future.

Fifty years ago, Los Angeles County had a population of only a hundred thousand people. Since 1900 it has grown at a tremendous rate, equivalent to doubling every decade. (A 1940 population of 2,724,608 would exactly fulfill this condition). The increase during the last decade was only about 26%, but the final census figure (2,785,643) for 1940 is considerably more than sixteen times the population of 1900. Naturally such a phenomenal rate of increase cannot be expected to continue, nor indeed would it be desirable.

The rate of growth of the United States as a whole is considerably slower than in the past, and students of the subject believe the population will become relatively stationary within thirty or forty years. But migration within the nation is a factor which continues to operate, and there is every indication that for some decades a considerable addition to the population of this Region will occur.

REASONS FOR FURTHER GROWTH

Provision has been made for water-supply, through the construction of the Metropolitan Aqueduct, sufficient to meet the demands of an ultimate population of about twelve millions in Los Angeles County. Cheap electricity will contribute toward the rapid development of large scale manufacturing. The endless possibilities of a vast ocean trade with the Orient lie largely ahead. The soil is fertile and the climate favorable. Economic opportunities, in spite of the adverse effects of world-wide upsets now obscuring them, will doubtless be superior for many decades, when contrasted with areas more densely settled and less richly endowed by nature. All these things point to a continued rapid population increase.

The Regional Planning Commission has taken these factors into consideration and from a study of their implications, attempted to determine:

(a) the probable ultimate population;

(b) the probable population trend during the next fifty years;

(c) the expected annual increase during the coming decade.

Each of these phases of the population question has a particular bearing on some portion of the planning procedure. A mere statement of the ultimate number of people expected in the area is not sufficient, since the land uses that will develop with increasing population have certain limiting effects upon population densities. The land use pattern and densities in various sections further affect the location of highways which is the subject of the next chapter. Only

when the population estimates are closely related to the land use pattern can they be used with any confidence as the basis for highway planning.

The method of determining these several population estimates and their land use implications are therefore presented in considerable detail in the following paragraphs.

ULTIMATE POPULATION

In arriving at the first of these population estimates the preservation of the amenities is important, and the figure sought is not one representing the highest attainable, but rather the highest desirable one. The Commission does not desire to encourage, or to make plans for, a density of human load on the land that would defeat its primary objective of better living conditions. This sets aside at once any conception of the future metropolitan area which includes great unbroken stretches of multi-storied tenement houses, such as characterize many cities today. It is believed that even though some increase in the percentage of families accommodated in multiple dwellings is inevitable, this Region can and should remain one in which the single-family dwelling predominates. The advantages which those who live here now attain through the widespread use of the automobile must otherwise be greatly diminished.

As cities grow in size, there are economies in operation which result in advantage to the citizens until a point of diminishing returns is reached. Beyond this point the urban organization tends to become cumbersome, and there is a tendency for those who wish to preserve the amenities of home life to remove to suburban areas or satellite cities. Thus, while there has been during the last few decades a distinct movement of population from the country to the metropolitan areas, there has likewise been a distinct trend from the center to the outer edges of the metropolitan areas themselves. The 1940 census shows only slight population decreases in the center of Los Angeles, the center of Long Beach and in a few other scattered localities, some of which may be due to expansion of institutions and industries. This trend toward the periphery is perhaps less noticeable in this region, not so much because it appears at a later stage of development as because original settlement along the periphery proceeded at a faster rate and earlier than in some older regions, while the central district never reached population densities that are now declining in those older cities. In the light of other known conditions and factors, however, it is safe to say that the tendency is at least as strong here as elsewhere.

PRESERVATION OF PRESENT STANDARDS

The Commission, therefore, believes that to conform with actual events and processes it is necessary as well as desirable to provide for future population in this Region by encouraging the development of the various smaller cities and towns throughout the Region, until each reaches an optimum size, rather than by the indiscriminate and unbroken expansion of the central urban area. Each should be separated from adjacent towns by a belt of land used for agriculture, recreation, or other uses not requiring buildings.

This line of reasoning leads to the conclusion that in a calculation of the ultimate population, we should assume the extension of each of the various urban uses, in about the same proportion to the population as at present, to all of the parts of the Region which are adaptable to such use, with due allowance for these separating open strips between the various urban centers.

The left half of Table 2 which follows shows the present actual rate of absorption of land for urban purposes. To the right of these figures are given some adjusted figures which, while necessarily only approximations, will serve to indicate how these ratios would work out by extension into the future. These figures are taken from the Commission's Report on A Survey of Land Use, in which the method by which

TABLE 2. DISTRIBUTION OF LAND USES

Acres Per 1,000 Persons with Standard Densities

	Present Usage	Ultimate Requirements
Single-Family Residence	31.2	21.9
Multiple Residence	1.8	3.1
Streets and Highways	24.9	18.2
Commercial	2.7	2.6
Industrial	3.0	3.0
Utilities, Railroads, Airports	3.5	3.1
Schools and Institutions	2.7	2.4
Parks and Recreation	4.6	9.0
Other Uses	0.8	0.5
Total Used	75.2	63.8
Allowance for Vacancy	30.1	2.2
Total Urban	105.4	66.0
Population Per Urban Square Mile	6,100	9,700

they were deduced is given in greater detail.

The proposed reduction in the requirement for single-family residence land in the future is based upon two assumptions. The first is that the average density in single residence* areas (now 24) will not exceed 28 persons per acre, which is equivalent to a reduction in average lot size from 6,000 square feet to 5,000 square feet (the minimum allowed under present regulations). Secondly, it is assumed that the proportion of the total population in such dwellings will not fall below 62%.

The figure given for multiple dwellings includes a wide range of densities in the Survey—running from a use almost as light as that in the single-family dwelling area to several hundred persons per acre in the relatively small districts developed to large multi-family apartment houses. The present average net density is 103 persons per acre. It was assumed that 31%† of the future population (ultimate) might have to live in dwellings of these same widely-varying types, but that there should be sufficient allowance of land to provide for a net average density of not more than 100 persons per acre, which is equivalent to 1250 square feet per dwelling unit. It must be noted that tripling this density would only diminish the total of land needed for urban purposes by about three per cent. Nothing is gained by overcrowding.

PROPORTION FOR STREETS

As for streets, the present rate of absorption is affected by the very considerable area of the local streets which now serve vacant land and lots. This consideration is off-set to some extent by the need for greater width on highways and to allow for land to be used for a system of freeways. The rate set for the future gives a somewhat lower proportion of total urban used land than at present.

The amount of land at present used for parks and playgrounds, although it includes many recreational areas not now publicly owned, is less than half that indicated by

*In the Survey the almost negligible amount used for duplex houses was included with the single-family residence area.

†The remaining 7% being allowed for the proportion living in commercial areas, industrial areas, institutions, etc.

park officials as a minimum standard (10 acres per 1,000 persons) for a completely developed Region. The number of acres per 1,000 people for this use in the right half of the table has accordingly been increased to nine.*

The allowance for other uses, except industry, has been slightly decreased, keeping to approximately the same proportion of total urban used land, however. For the maximum development the amount of vacancy has been assumed to be reduced to only 3.4% of the whole urban area, instead of 28.6% as at present.

AVERAGE FUTURE DENSITY

Summing up then, it is indicated that a minimum of approximately 66 acres will be needed for all urban purposes for each 1,000 persons who come here to dwell. This is equivalent to an average urban density of 9,700 persons per square mile. The actual density and the proportion of land used for the various purposes would, of course, vary greatly in different parts of the metropolitan area.

Of the entire Region, over two-thirds is occupied by mountains not adapted for intensive urban use, or is included within the semi-arid Antelope Valley, north of the mountains. Only a very small proportion (one or two per cent of the population) may be expected to settle in these areas. The coastal plain (including the San Fernando Valley), with an area of 1,233 square miles, must accommodate the rest. If we set aside 133 square miles for channels, overflow lands, and lands too rugged or otherwise unadapted to urban development, there remain 1,100 square miles, which, under the conditions assumed, would be sufficient for a total population between ten and eleven million. Of course, this would mean almost complete elimination of the 400 square miles now used for agriculture in this portion of the Region.

*An additional acre per 1,000 being provided in school playgrounds.

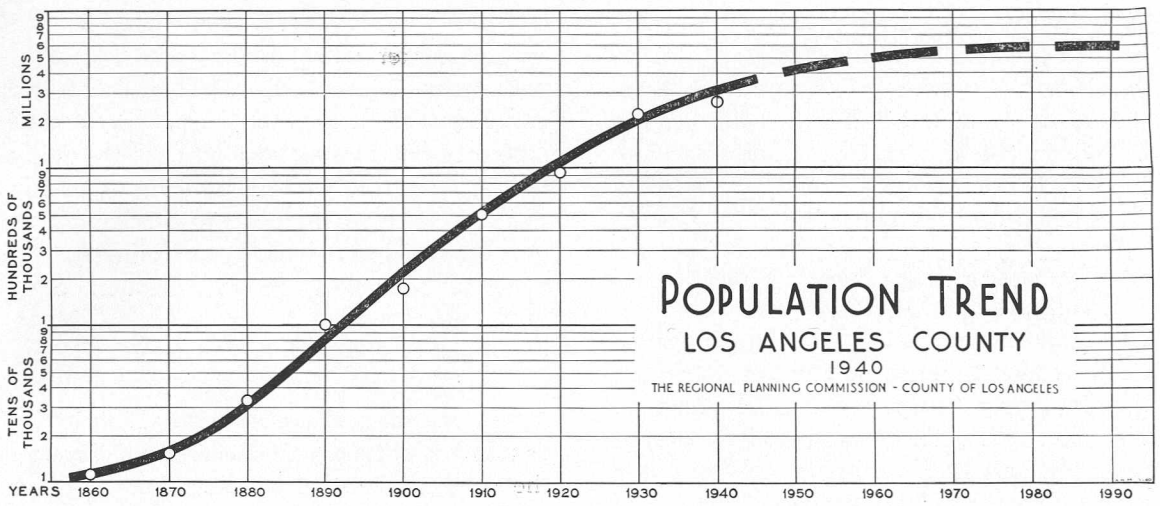
COMPLETE URBANIZATION?

It is doubtful whether such a complete displacement of all agricultural uses from this part of the Region would be desirable. Certainly it should not be thought of except as a possible eventuality in the far-distant future to which this discussion of ultimate population applies. Redistribution of present uses for better efficiency and the filling in of areas now vacant, in accordance with the Master Plan of Land Use, should provide for a century of growth without seriously diminishing the space available for agriculture. It is, however, certain that the pressure of a population increasing to figures approximating 10,000,000 would make it difficult economically to continue to hold much of this land in agricultural use. The important point here is that all of it would then be needed for urban uses, unless the ratios set forth above, and particularly the standards as to homesites, are abandoned.

THE SATURATION POINT

These calculations, based on careful estimates and established standards, serve to indicate in a general way what maximum population could be accommodated on the entire coastal plain. Even if allowance were made for considerably increased densities of residential development, the figures would be altered by only a small percentage. For example, a reduction of the average single-family dwelling lot to the objectionably low area of 3,500 square feet (per family of 3.5 persons), which would increase the net density in these residential areas by more than 50%,* only makes possible the addition of 12 to 14% to the ultimate population. Similar figures were given above for the multiple dwelling use and show that only by the sacrifice of everything that now distinguishes the Region as a good place in which to live, would the figure be materially increased.

*Above the minimum standard of 28.3 persons per acre.



The Commission sees no advantage in such an abandonment of the reasonable standards now prevailing. It prefers to adopt a policy and a Plan based upon their preservation. If these be left out of consideration, then the only upper limit that can be calculated at this time is that indicated by the available water supply, which at present normal rates of consumption would be reached at a population of approximately 11,640,000. This is the figure established as a point of "saturation" for Los Angeles County by A. L. Sonderegger, in his report to the Metropolitan Water District of Southern California*.

It is realized (and looking backward a hundred years will emphasize the point) that, since many unforeseen changes, technological, social and economic, may and probably will intervene, the uses of such an estimate of ultimate population are limited. It serves primarily to point the necessity of a periodic evaluation of the economics of our agriculture, to emphasize the importance of provision for industry, and to guide in the reservation of the necessary open spaces. Above all it helps to broaden our vision of the future, and to guard us against the stupidity of making "little" plans.

Forecast of Growth of Metropolitan Area, May 21, 1931.

Since we can in no sense be certain that a future census will not record 10,000,000 or more inhabitants in the Los Angeles Region, shall we not then courageously and boldly even lay down our plans now for at least twice the present figure?

TREND DURING THE NEXT FIFTY YEARS

As for the next fifty years, a simple calculation shows that if only an average of 65,000 new people came to the County each year, as during the past "depression" decade, it would carry the figure for 1990 to the 6,000,000 mark. This would, of course, represent a constantly decreasing rate of increase, calling in the last decade of that period for only about 10%, as contrasted with about 30% during the first decade. There appears to be ample justification for the assumption that this average growth will occur.

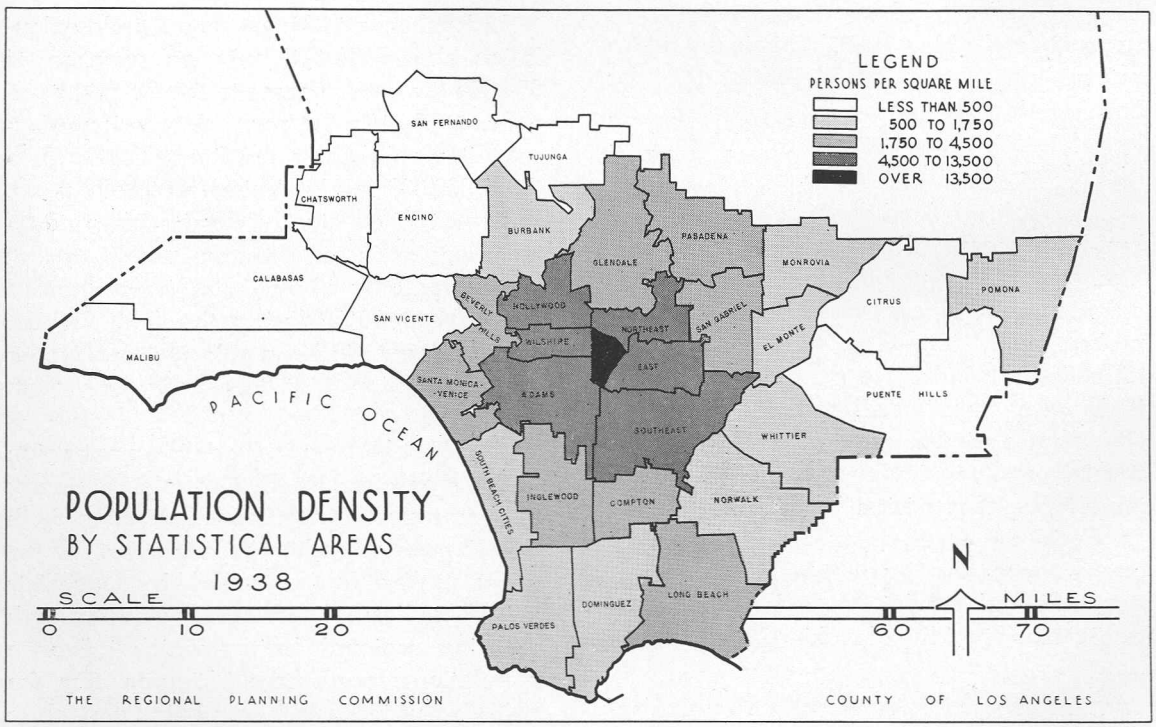
The chart here reproduced is an extension of one published by the Commission nearly ten years ago. It was based on the growth experienced in other metropolitan areas, and a study of forecasts made by specialists in this field, supplemented by staff research covering regional factors which influence population growth here. Figures from the 1940 Census indicate a population very close

to the curve, and there is every reason to believe that the trend line, as then plotted, is substantially correct. Conservatively then, it may be predicted that within the lifetime of many who are college students today, there will be some 6,000,000 people using our streets and highways.

HIGHWAYS FOR SIX MILLION

This figure of 6,000,000 people, taken with the land use pattern which it implies, is used as the reference datum against which the highway plan here presented is checked. The plan was actually produced by design methods, but it is shown in the next few paragraphs to be designed for the above conditions. The exact year in which this figure is attained is relatively unimportant. Even those who disagree as to the rate of growth will concur in the view that this estimate is sufficiently accurate to form a sound basis for planning. The program of actual highway construction can be varied from year to year and from decade to decade in accordance with the demands of the actual traffic load. On the other hand, rights-of-way to the full extent called for in the Master Plan should be acquired as rapidly as is practicable. This is true for two reasons. In the first place, early acquisition means a lesser total cost. If we delay acquiring a right-of-way until it is actually needed and have to resort to condemnation of valuable land, we pay an unnecessary penalty. Moreover "early acquisition" does not mean purchase in many cases. Much of the future right-of-way can actually be secured free of any cost to the public by strict adherence to the Highway Plan in the regulation of land subdivision, and through the establishment of building lines for the preservation of light and air. Landowners have been found most willing to cooperate, when the Plan is thoroughly understood, and action takes place before urban growth has produced high values.

The second point to be observed is that such rights-of-way as are here proposed for acquisition will incidentally serve many useful purposes, even though in some cases years may elapse before it becomes neces-



sary to pave the roadway to the maximum width. They would, as a matter of fact, be entirely justifiable simply to provide for better light and air and to break up the community into neighborhoods within which differing characteristics may be maintained. More tangibly, they are of vital importance as barriers to the spread of great conflagrations, and as refuges and avenues of escape in the event of major disaster. These points, often overlooked, deserve most attentive consideration by the various authorities.

MORE IMMEDIATE POPULATION TRENDS

The immediate past, by extension furnishes a very fair indication of trends for the immediate future.

The examination of these is necessary in the evaluation of priority programs for needed openings, widenings and construction. They can be quite definitely determined from well known indices based on records of utility connections, building permits, registered voters, and so on. Here not only the total figure but the distribution, the relative change in various parts of the county, is important.

The division of the entire County into Census Tracts, as established by the Bureau of the Census last year, makes the analysis of these trends much easier than heretofore. There are 590 such Tracts, each containing a population of from 3,000 to 8,000. They are fixed in area and are independent of changes in municipal boundary lines. The decennial count of population in these tracts can be readily supplemented by an examination of annual trends in building permits, school attendance, and other indicators.

By combining them into groups, the Region can be seen as a collection of social and economic "neighborhoods", and varying trends in each can be clearly defined. Movements of population, changing land uses, industrial developments, housing conditions, tax delinquency, vacancy, subdivision activity—these are but a few of the items in such a study of pulsations in community life.

The combined results of all these studies indicate trends in city growth and land uses, which are of the greatest value as a guide to the timeliness of highway construction and other public works in accordance with the Plan.

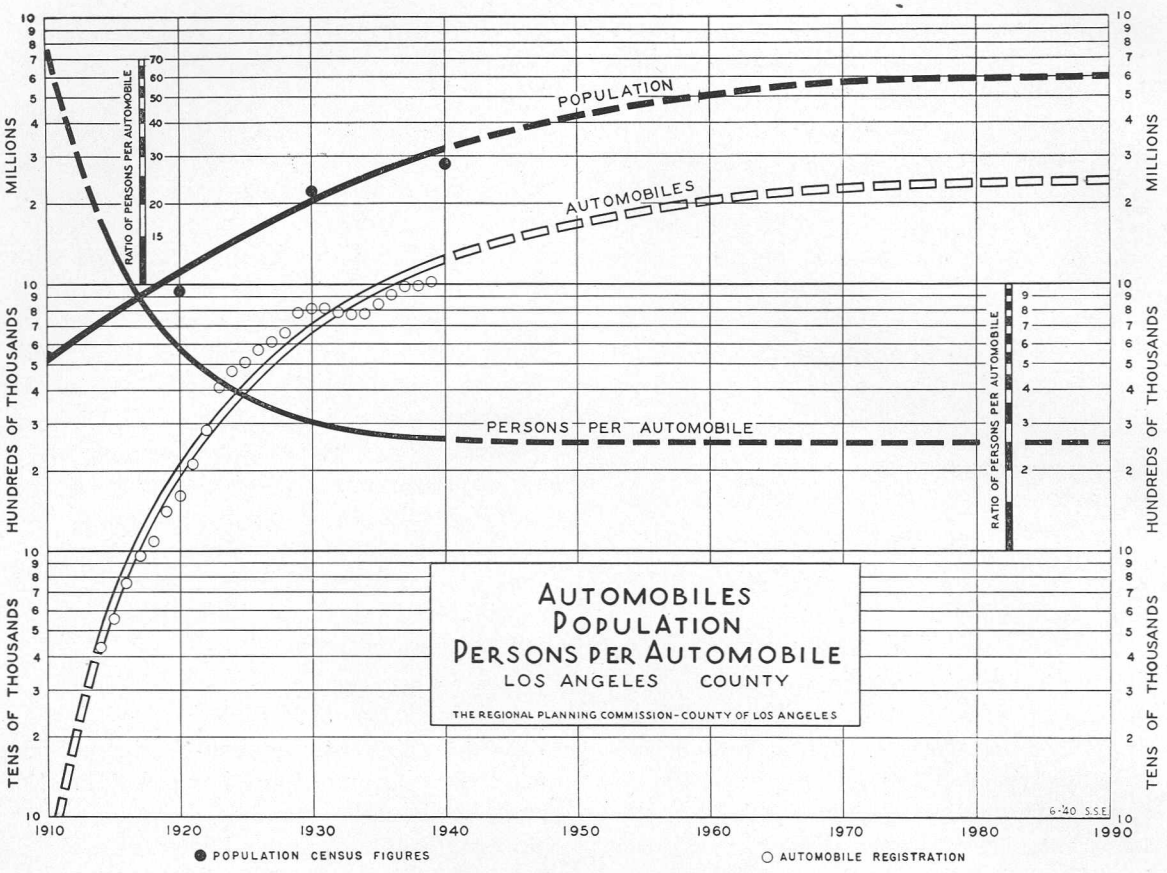
Long term study of population factors helps to prepare and check the plan itself. The continuous study of immediate trends provides a sound basis for application of planning principles to the program of carrying out that plan. Tentative short term programs can be drawn up for periods of five to ten years, and annually refined or revised to conform with the actual annual or biennial budgets of the acquisition and construction agencies.

PRESENT SHORTAGE

A final point is to be observed in connection with the question of population. So rapid has been the increase, that the present highway system has not kept pace. As a result, the Plan must include provision not only for future needs, but for past and present needs which have not been met, as existing traffic congestion vividly shows.

So serious has this situation become, that property values in certain areas have been greatly affected, and drastic remedies involving huge immediate expenditures have been suggested, in the effort to forestall economic strangulation.

With defensible estimates of population as a foundation it now becomes possible to estimate with reasonable hope of accuracy the probable number of vehicles that will be in use in Los Angeles county at various stages of development, and finally to apply the factor of lane-miles per 1,000 vehicles presented in the opening of this chapter. Determination of the number of probable vehicles for any given population is a computation much simpler than those involved in the population estimates described above.



The chart reproduced here shows the trend in the number of passenger automobiles registered, related to the population in the County of Los Angeles. The ratio of persons per passenger automobile is tending to approach 2.50 as a constant. It is probably the lowest ratio for any region in the United States, and, of course, in the world, although recent figures show that the Miami, Florida, district is approaching the same concentration. The equable climate permitting all year use, the prevalence of single-family dwellings with ample garage space, and the development of the Region coincidentally with, rather than prior to, the advent of the motor-driven vehicle, are factors in this situation. Another is the original location of the central city, many miles from the present harbor and the beach recreation areas. These things encouraged the wide spreading of the urban population with unusually great distances between home and work or recreation. This wide spread, in its turn, made more and more advantageous the use of the private automobile, until today it is looked upon as an absolute necessity to every family except in a few highly urbanized districts where common carrier service is most highly developed.

If the present ratio of persons to automobiles is maintained, it is obvious that when the population reaches 6,000,000, there will be in use here some 2,400,000 automobiles, and highways will be required in proportion. It is doubtless true that with such a population an increased tendency toward the use of public conveyances might be expected, with some consequent decrease in the demand for highways. This factor is offset to a large degree, however, by the trend toward the elimination of street cars in favor of motor-driven vehicles. The in-

dividual motor bus carries more passengers than the automobile, but it also uses the highways, travelling back and forth constantly, requiring more space, and making frequent stops. On the other hand, cheaper and more efficient automobiles than those of today are certainly a possibility. As long as adequate streets and highways are provided, the people of this Region will not readily abandon the flexible mobility of the individually owned motor car.

This must not be understood to mean that the private automobile will completely replace the common carrier. Modern transportation planning recognizes that facilities must be provided for individual as well as

TABLE 3. FEE PAID MOTOR VEHICLE REGISTRATION

LOS ANGELES COUNTY

Year	Autos	Trucks	Trailers	Motorcycles	Total
1914	42,720	.....	.....	8,550	51,270
1915	55,210	.....	.....	8,840	64,050
1916	75,650	.....	.....	10,090	85,740
1917	95,530	.....	.....	9,470	105,000
1918	107,960	.....	175	8,475	116,610
1919	139,700	.....	375	8,330	148,405
1920	160,530	11,710	1,040	6,490	179,770
1921	209,060	10,975	1,220	5,990	227,245
1922	284,870	12,440	1,690	5,460	304,460
1923	410,517	15,065	2,151	4,753	432,486
1924	465,882	66,040	4,960	3,982	540,864
1925	505,865	71,986	5,640	3,405	586,896
1926	559,684	75,768	7,789	3,164	646,405
1927	601,637	76,825	8,571	2,869	689,902
1928	650,207	78,374	8,945	2,888	740,414
1929	776,677	33,456	10,357	3,130	823,620
1930	806,264	36,264	12,026	3,289	857,843
1931	805,787	37,769	14,290	3,158	861,004
1932	772,399	37,304	17,315	2,766	829,784
1933	770,877	37,753	20,719	2,750	832,099
1934	779,915	39,510	23,068	2,766	845,799
1935	838,983	45,532	29,259	3,068	916,842
1936	907,223	49,751	34,521	3,442	994,927
1937	975,792	55,014	41,394	4,235	1,076,025
1938	979,974	56,930	44,632	4,607	1,086,143
1939	1,019,293	61,738	49,123	5,424	1,135,578
1940	1,093,290	66,834	53,023	7,214	1,220,631

Data for 1923 and subsequent years taken from biennial reports of the State Division of Highways.

Data for years 1918-1922, inclusive, computed by applying the ratio of County apportionment of fuel tax to total apportioned fuel tax, to the published State total registration.

Data for years 1914-1917, inclusive, computed by applying the ratio of County apportionment of motor vehicle fees to total apportioned motor vehicle fees, to the published State registration.

Subsequent to 1928, light trucks are classified as autos.

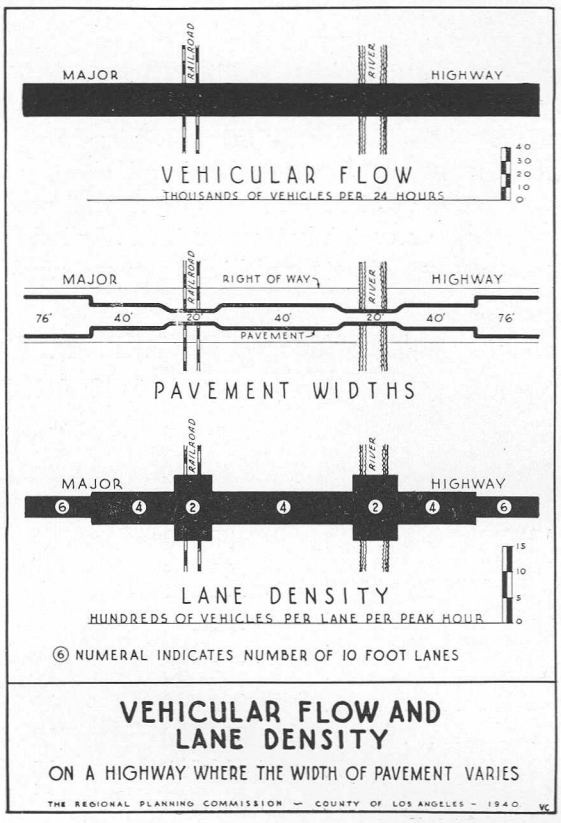
mass transportation. It is undoubtedly possible to organize common carrier service so well planned that it would be more economical than the operation of individual vehicles, and so convenient as to re-establish a riding habit that would produce sufficient business to maintain the service. In such a case mass transportation would be greatly used by business and industrial employees even though they do maintain their own automobiles for other uses.

TRAFFIC LOAD

The traffic load produced by the automobiles now in use has been extensively studied by the Commission.

Beginning in 1932, when funds were first available for this work, extensive field surveys have been made on all existing highways in the Region. Two special reports were published, in 1934 and in 1937, giving the results in tables and on maps. Full twenty-four hour counts were made at over 1,000 selected intersections in all parts of the Region, repeated at intervals in order to determine the daily, weekly, and seasonal variations in the traffic load. Constant ratios and relationships between groups of stations were discovered, checked, and made the basis of a system of half-hour counts at key points in order to keep the information up-to-date by checking annual changes and the effect of newly opened or improved routes.

It was found that for the Region as a whole the seasons of the year have relatively little effect upon the use of the automobile, although certain localities have traffic characteristics peculiar to seasonal uses, such as vacation traffic at beach or mountain resorts. Communities have varying traffic conditions depending upon the type of neighborhood and the habits of the residents. Some communities are more or less self-contained from the wage earners' standpoint while others have many commuters who travel to neighboring commercial or industrial centers for their daily work, thus creating a wide difference in traffic conditions.



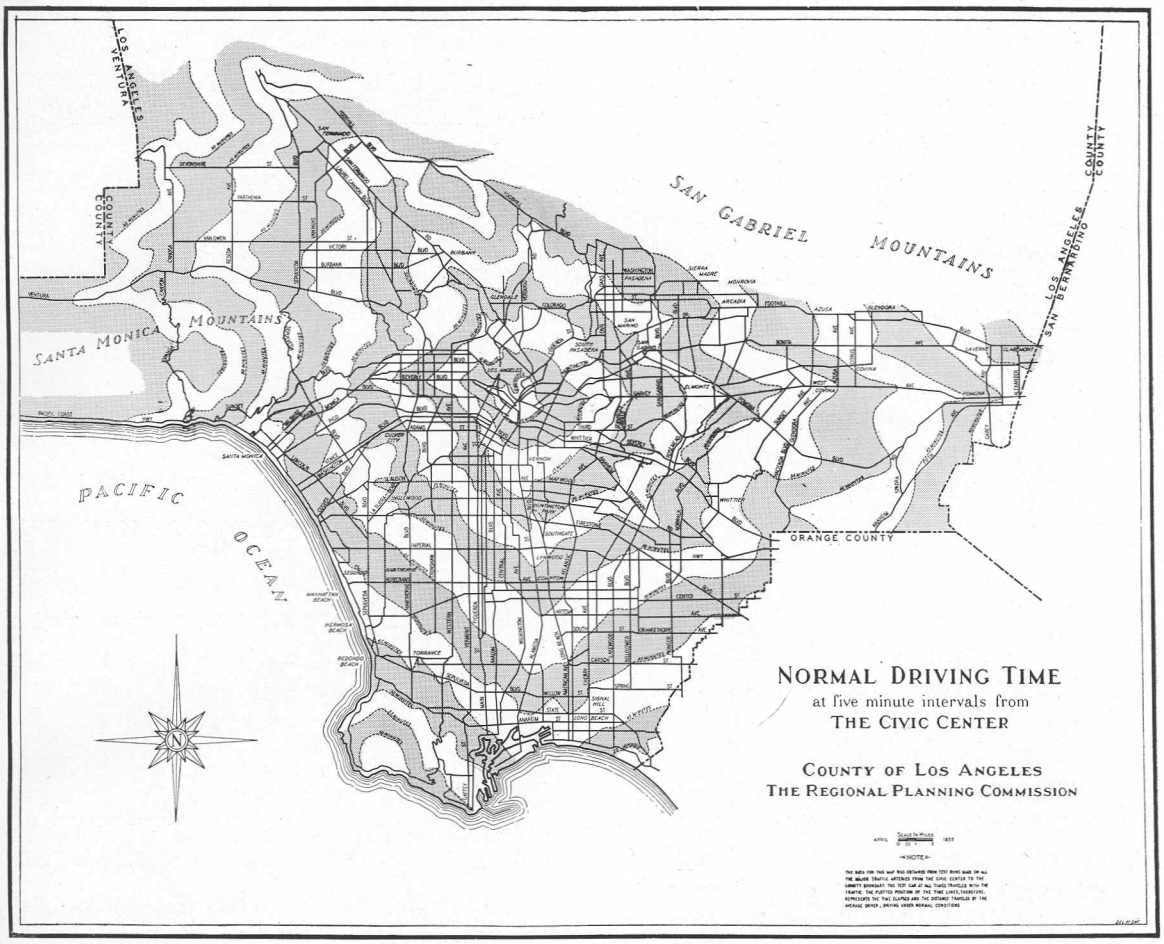
VEHICULAR FLOW AND LANE DENSITY

ON A HIGHWAY WHERE THE WIDTH OF PAVEMENT VARIES

THE REGIONAL PLANNING COMMISSION — COUNTY OF LOS ANGELES — 1940 VC

Traffic loads on Saturday and Sunday were measured separately, while that for any one of the days from Monday to Friday was proven to be a sufficient indication of the week-day movement, the variation between them being less than two per cent. Hourly fluctuations were found to be practically identical at each of the various stations in carefully defined "districts", although they differed materially as between one district and another. The total volume of traffic on each highway was compared with the number of paved "lanes" along the route, in order to obtain "lane-densities", a truer measure of actual traffic concentration.

These earlier surveys of automobile highway traffic are now to be augmented in a much more comprehensive study of all forms of mass transportation in Los Angeles County. The Commission has long realized that the attack on only one phase of the transportation problem could not produce



an entirely satisfactory solution. The effect of developing efficient common carriers would be to relieve or counteract the increasing pressure for highway facilities and the inefficient use of the personal automobile in centralized traffic. The contrary present tendency in this region toward abandonment of common carrier lines aggravates the demand for highways; even the replacement of rail lines by bus lines has this effect. The secondary, but perhaps more serious result is an increase in the difficulty of providing parking space for more automobiles at various centers of concentration.

THE TRANSPORTATION SURVEY

The Commission's comprehensive survey and study of the metropolitan transportation needs has therefore been undertaken with the intention of determining the necessary balance between common carrier and personal vehicle systems. The prime purpose of the project, which is now well begun, is the preparation of a Master Plan of Transportation. The particular objectives of this plan are:

1. To establish a balanced transportation system for economic and convenient use of all types of transportation without overloading any one facility.
2. To aid in preventing unrelated development of commercial, industrial, residential, agricultural and recreational areas.
   (a) To prevent functional inefficiency.
   (b) To prevent untimely or improperly located construction projects.

3. To provide a basis for a financial program for carrying out the public's share in the details implied above.

In scope the project will attempt to study:

1. All means of transportation now in existence or which may be deemed necessary in the future.
2. Transportation factors in the entire metropolitan area of Los Angeles County.
3. Analysis of all transportation data with regard to regional distribution of property uses, particularly industry.
   (a) Data collected under all previous surveys will be used as much as possible.
   (b) New data will be collected where necessary to supplement such old data.
4. Study of means of providing adequate cheap transportation as required by recent changes in living and working conditions and population shifts.

The first unit of work in this project consists of a further traffic survey and analysis to bring up to date not only figures for automobiles but also those for common carrier transit lines. Further units will bring up to date the commission's industrial survey of 1932, and will study needs for automobile parking relative to business enterprises, pedestrian and vehicle volumes within central business districts and traffic delays and congestion.

Adequate study of the factors in traffic delay and safety, and means of promoting the vastly more efficient common carriers must be made before final decisions can be reached regarding either highways or the other elements. The American Society of Planning Officials, in a report of its Committee on Highways and Transportation, considers some fifteen means of minor improvements on existing streets to eliminate traffic delays. Some authorities believe that these improvements will do more dollar for dollar good than will the construction of spectacular elevated highways. The need for additional expensive transportation facilities will be lessened if traffic engineering is utilized to make the best use of what exists. This need, therefore, should be measured only after improvements in traffic conditions through the application of traffic engineering have been appraised.

TABLE 4

HIGHWAY PAVEMENT REQUIRED

(Under present conditions, allowing 8.5 lane-miles per 1,000 vehicles, including trucks.†)

	Present	Future			
Population (Millions)	2.76*	4	6	8	10
Actual Persons per Passenger Automobile ..	2.71**	2.65	2.60	2.55	2.50
Actual Thousands of Passenger Automobiles	1,019**	1,510	2,310	3,140	4,000
Actual Thousands of Automobiles and Trucks.....	1,081**	1,590	2,440	3,320	4,200
Lane-Miles Required	9,189	13,500	20,700	28,200	35,700
(Lane-Miles Existing).....(8,400*)					

*Estimated for 1939—For 1940, total population was 2,785,643.

**Actual Registration (1939).

†As derived on page II—1.

Only through such comprehensive examination of all of the factors involved can the final need for highways be determined. While it is expected that the conclusions of the Transportation Survey will, in general, confirm the Master Plan of Highways, it may result in some major revisions of parts of the latter. By comparison with the earlier traffic surveys, it will probably be of greatest value, so far as the Highway Plan is concerned, in determination of the timeliness of highway improvements.

The table above will bring the various calculations discussed above into clearer focus and show what they mean in terms of future development.

In the light of these figures, the present Highway Plan, which when completed and fully paved will provide approximately

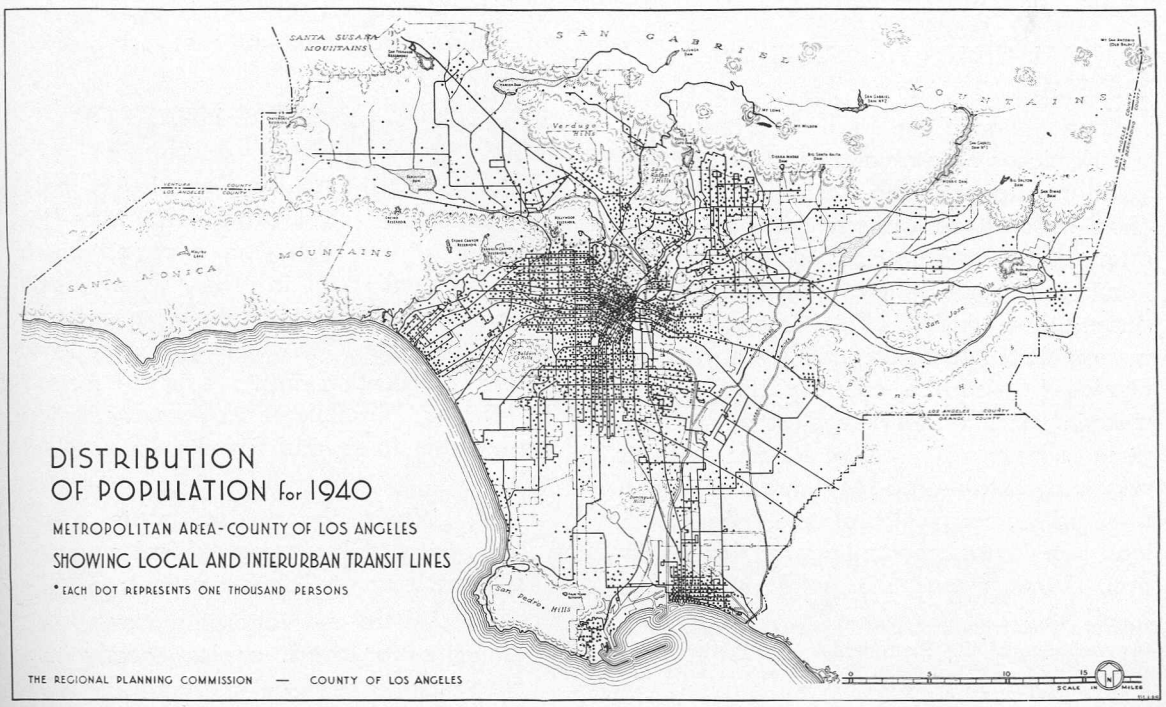
18,500 lane-miles*, is certainly not excessive. In fact, the inescapable conclusion is that as the population of the Metropolitan Area passes from four to six millions, one of two eventualities will have to be faced—a drastic reduction in the proportion of automobiles to population, or the relief of the highway system by supplemental freeways, taken and partially completed long before that time.

The latter solution is the one to be preferred, the Commission believes, since the alternative of doing without the automobiles would be a forced result following a period of increasing congestion, with related accident and delay losses which would finally induce many to abandon the advantages of private automobile ownership. The figures also point strongly to the importance of increasing highway capacities (thus reducing the ratio of lane-miles required) by better provision for uninterrupted flow, especially at intersections. Many of the latter will require a separation of grade for the center lanes.

The freeway system, of course, with its completely protected flow, would greatly reduce the total number of lane-miles necessary,* thus offering not only the most attractive solution, but, in the end, the most economical one.

*In the Metropolitan Area, which contains over 98% of the population.

*The capacity per lane of a freeway is estimated to be nearly double that of a highway, because of reduced flow at intersections on the latter. A rough estimate (based on the assumed future shortage of 2,200 lane miles) indicates that approximately 367 miles of 6-lane highway would be required. Since a freeway is approximately twice as efficient as an ordinary highway this would mean that about 184 miles of freeway would be necessary to meet the deficiency. This would be sufficient to provide about ten freeways radiating from the central district and two by-pass routes around the metropolitan area. In general, this implied arrangement conforms to various tentative designs that have been partially studied. Actually, the true lengths involved in such a system of freeways would probably exceed the figures here used because of the requirements of alignment, cross or branch connections and the geographic spread of the areas or populations to be served. This approximation is presented here only in order to indicate that a hypothetical freeway system can actually meet the traffic need revealed by the above arithmetic analysis.



III
THE LOCATION OF HIGHWAYS

Quantitative determination of the highways needed such as has just been discussed, does not alone produce a satisfactory plan. In the preparation of the Master Plan of Highways for Los Angeles County as much care has been given to the location of highways as to the design of any other elements of the community.

The design problems in this case had a tremendous range of magnitudes, from establishing the course, objectives and standards of the county-wide and even state-wide highway route, down to the relation between a particular segment of a highway and its immediate surroundings: the grade or slope of abutting land, the curve necessary to permit preservation of an historic building or the construction details necessary to provide safe interchange of traffic at the junction with another highway. Location is a complex matter of relationship to communities and special features, engineering feasibility, economic usefulness, and social values.

GENERAL CHARACTERISTICS OF THE PLAN

Examination of the Highway Plan adopted* discloses the prevalence in certain portions of straight lines, forming a regular checker-board design, while in other areas many curves and changes in direction predominate, producing a considerable apparent irregularity. This irregularity is nevertheless not occasioned by haphazard chance but on the contrary has definite meaning and certain defensible values. The general topography of the Region, with its very considerable rugged mountainous portions, alternating with relatively flat areas, was one factor, accounting for this condition. Another was the placement of the boundaries of the great Ranchos into which the land was divided by the Land Grants of a century ago. A third was the system of rectangular township lines, established by the surveys of the Federal Government, many of which became the boundaries of individual ownerships and hence the basis of a street pattern. Then, too, the alignment of the railroads, and later of the Pacific Electric System had a large effect on the pattern of development, which in turn has affected the shape of the Plan, and the frequency and direction of many of the routes.

Thus, influencing the selection of routes for the Highway Plan, and introducing many features of practical importance, were a variety of existing conditions which in turn had geographical, legal, and economic sources in varying degrees.

The whole problem of highway economics, engineering construction costs, land values, functional significance, and relative efficiency, was set up by this primary fact of an existing community of established, functioning parts.

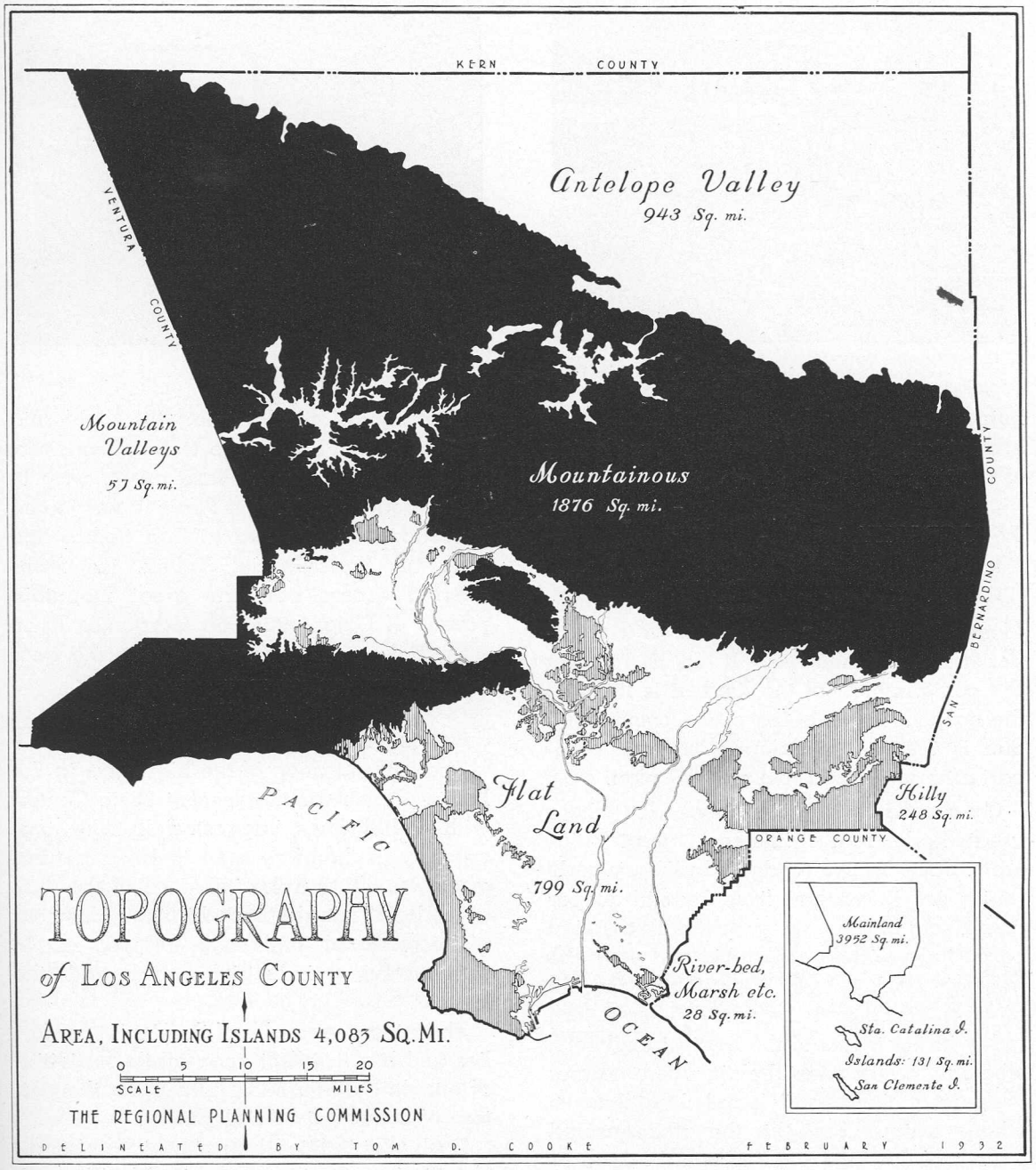
RELATION TO EXISTING RIGHTS OF WAY

The Regional Planning Commission logically began its work toward a Highway Plan in 1923 with a thorough examination of existing used roads in order, where desirable, to include them within the framework of the ultimate Plan. The proposal to so include an existing right-of-way is frequently, although not always, the correct solution, particularly in several specific cases which arise:

(1) Where the original route was one dictated by topographical necessity, such as at Cahuenga Pass;

(2) Where no alternate route is either more direct, or less costly to construct;

*It is recommended that the reader unfold the two sections of the Plan, which are in the back-cover pocket, for reference in connection with this part of the Report.



(3) Where, by securing dedications in advance of intensive development, the widening can be attained more readily and economically than upon an equal alternate;

(4) Where, by virtue of existing concentration of uses, as in our urban centers, the "main street" has assumed and will presumably continue to maintain the character of a major artery of traffic.

In the Plan here presented, only about 30% of the total length of the proposed system requires new right-of-way, the balance

Widening After Building Development is Spectacular—and Costly

being either already complete as to land acquisition, or involving only the widening of existing rights-of-way.

TOPOGRAPHY

The Highway Plan, while it is the framework for much of the detail of the whole Master Plan, is not conceived prior to or independently of the rest. It has its roots in the conformation of the land, it is fitted to the economic well-being of the community, and is therefore developed as an integral part of a comprehensive general plan.

Cross-roads generate villages, and where great trade routes intersect, great cities grow. But primitive roads and primary trade routes are themselves fixed by still deeper underlying causes, which are only clarified by a study of the geographic and even the geologic background. We still ride the old Mission Trail, and countless wheels turn today in the tracks of the earliest explorers, who entered the coastal plain where natural passes permitted, and founded settlements where nature brought the underground waters of our "unusual" stream beds to or near the surface.

Similarly railroads were built along the lines of least resistance, and our harbor is built today where it is, not because one group of men won out over another, but because the fundamental geology of the region made its development there inevitable.

The natural road joining the California Missions, from San Diego to San Francisco, traversed the present Plaza on its way to Cahuenga Pass. At the Plaza it was joined by roads from the sea at San Pedro, and from the San Gabriel Valley, the latter offering access from the great mountain passes of Cajon and San Gorgonio. Thus, even before railroads were built, the geologic formation of mountain, valley, and seacoast fixed the focal point of regional development.

The concentration of the highways in the Master Plan near the present Civic Center, with radial lines suggested by the topography is therefore seen to be a natural arrangement, and the influence of the "lay of the land" may be traced in the placement of recreational highways as well as in those serving industrial areas and the Harbor.

Thus, the geography of the Region underlies and has its effect upon all the activities of our daily life, and in turn upon the pattern of community development.

Each part is fitted by nature to perform a specific function in community life. The task of the Commission has been to visualize that function, present and future, and to set aside in appropriate measure a complete network of inter-communication lines through which the movement necessary to modern life may flow.

We play at beaches or at mountain lakes, farm the fertile plains, drill for oil where we

find it, live where we can make a living and transact business where we can conveniently meet our fellowmen. Industry thrives where raw materials and power, trade-routes and consumers may be brought together easily. And so communities arise, some destined to become great industrially or commercially, because they are soundly located and possess many basic advantages, while others with fewer advantages fulfil their proper functions by remaining local residential or agricultural centers. The first group has ever increasing demand for inter-communicating highways, proportioned to present and anticipated size; the second can never be made to develop into big commercial centers merely by the optimistic construction of "business" boulevards. Within the Los Angeles metropolitan district are examples of all variations between these two extremes. The Master Plan of Highways aims to provide for each such community highways adequate to enable it to make the best contribution to, and receive the maximum benefit from, the economic and social resources of the entire region.

DISTRIBUTION

The picture of present traffic densities shows, of course, wide variations in traffic load, with the heaviest congestion occurring near the principal centers of population and on lines joining them. The highways of the future, too, must be wider and more numerous in certain parts of the Region than in others. It has been necessary to determine what will be the location and relative importance of future population centers in order to work out this problem of distribution. In the plan, the results of this study are evident.

First to be noted is the relatively close spacing of highways at the central portion of the Metropolitan area. From this toward the seacoast south and west numerous parallel lines are provided for the heavy movement to and from the ocean shore. Lines radiate toward the passes through which connections to the north and east are possible.

Lesser centers have within them multiple lines in proportion to anticipated requirements for internal movement, and by-pass routes for through traffic are carried, where possible, around rather than through these points of concentrated development.

The successful functioning of each community and of the group which constitutes the Region depends to a very large degree upon the intricate system of transportation and communication here under consideration. In a Metropolitan Region, the provision of an adequate highway system is vital because of the long distances which separate home from workshop, school and playground. Many special studies have been made by the Commission of the average length of daily trips involved in the assembly at industrial centers of workmen coming from widely scattered homes, and of the distances traveled by shoppers at various business-centers, which indicated that here the average distances are unusually great.

RELATION TO OTHER FORMS OF TRANSPORTATION

A major consideration, too, is the relation of the Highway Plan to other means of transportation of persons and goods, including both established and future lines of movement, by rail, air, and water. The Planning Act provides for a "Transportation Plan—Showing a comprehensive transportation system, including locations of rights of way, terminals, viaducts and grade separations," which "may also include port, harbor, aviation and related facilities."

Obviously, these must all be so placed that in conjunction with the Highway Plan, the system as a whole will best serve the needs of the various parts of the Region. Once the basic Land Use Plan has been worked out, so that the predominating use (whether industrial, residential, commercial,

agricultural, or recreational) of each part is determined, the transportation requirements can be established. Tentative outlines of the entire transportation system then indicate some adjustments in the Land Use Plan, and these in turn impinge upon the outline of the transportation system. The whole is thus brought into balance, efficiently and economically serving the varied needs of travelers, merchants, farmers, industrialists, and shippers of goods.

While the Commission has made some studies of transportation problems, and the present highway plan is related to and based upon the present status of other forms of transportation, much remains to be done in this particular field. The Transportation Survey now underway is the first attempt to coordinate all of the transportation factors into one plan. Its outcome should produce a much more reliable basis for conclusions, and may therefore result in some changes in the Highway Plan, although it is believed that no major or radical change will be required. It would appear that any probable effect would be merely to defer or obviate the development of some highway routes that are deemed necessary as long as other forms of transportation remain deficient.

EFFECT OF FREEWAYS

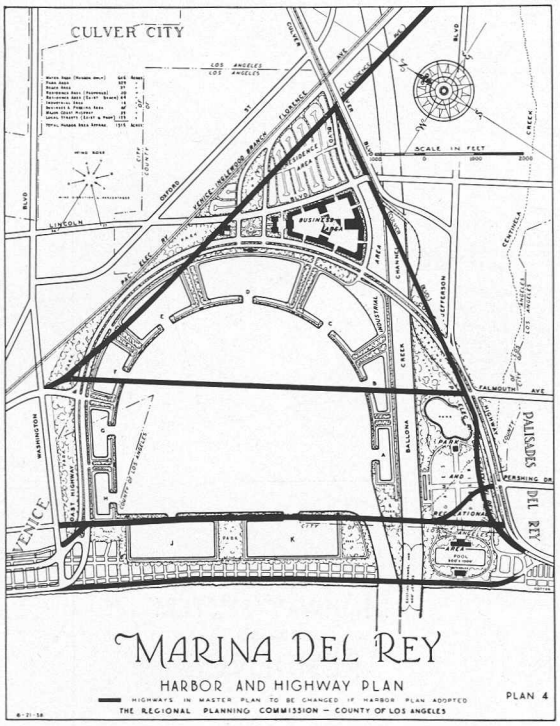
One important transportation factor which demands further consideration and gives some indication of its effects is the prospect of freeways. The highway plan can not take final form until a determination of freeway routes has been made. Probably, any changes will be more noticeable in the details of design, and in the time of development, than in the alignments in general. It is possible that certain highways, either now existing or proposed, will be converted into freeways. In a few cases the development of a freeway through a given area may render unnecessary a proposed highway in a nearby parallel location. Some highways can be expected to become feeders to the freeways and perhaps lose identity as routes through the entire region.

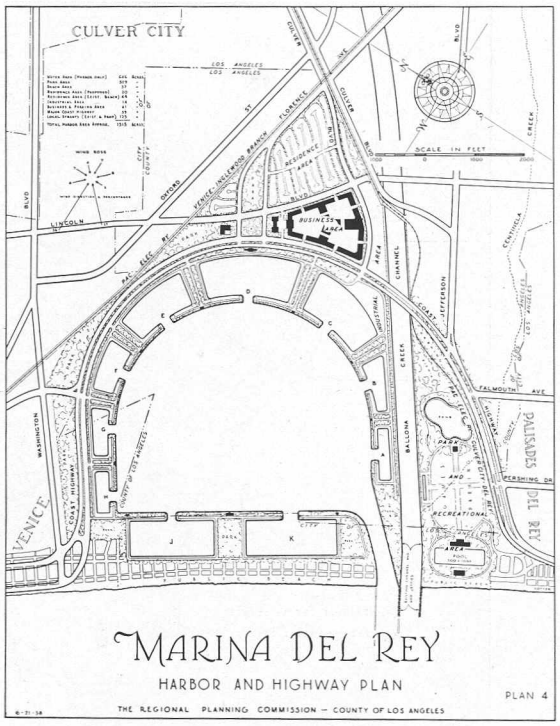
It is assumed, however, that in a majority of cases the highways will be unaffected so far as their continuity and width are concerned. As has been shown (Chapter II) the freeways will be necessary to fill a need that would not be met if all of the highways were completely developed. Even if the freeways do in a few cases reduce the load on the highways to the extent that an occasional one can be maintained at four lanes instead of six, or if a slight deviation from the planned alignment is required to make satisfactory interchange with the freeway, the general alignment pattern of the highway system will probably be undisturbed. As the freeways develop, to handle long distance traffic, the parallel highways will generally be relieved to care for an increasing load of shorter distance movements.

Thus, the overall appearance of the Master Plan of Highways will doubtless be little different after the adoption of a freeway plan. Highway planning, however, will be profoundly affected. Wider rights-of-way will be required for those highways that are to become freeways. Intersection problems will be solved by entirely different methods. Even the remaining ordinary highways which connect into the freeways will be affected in the design of entrances, exits and grade separations.

The apparent result will be therefore that at some future time the highway plan will be amended:

1. By the addition of certain new routes as freeways;
2. By the delineation of certain present routes as freeways; and
3. By alterations as necessary from time to time to insure complete coordination with a plan for all transportation facilities.



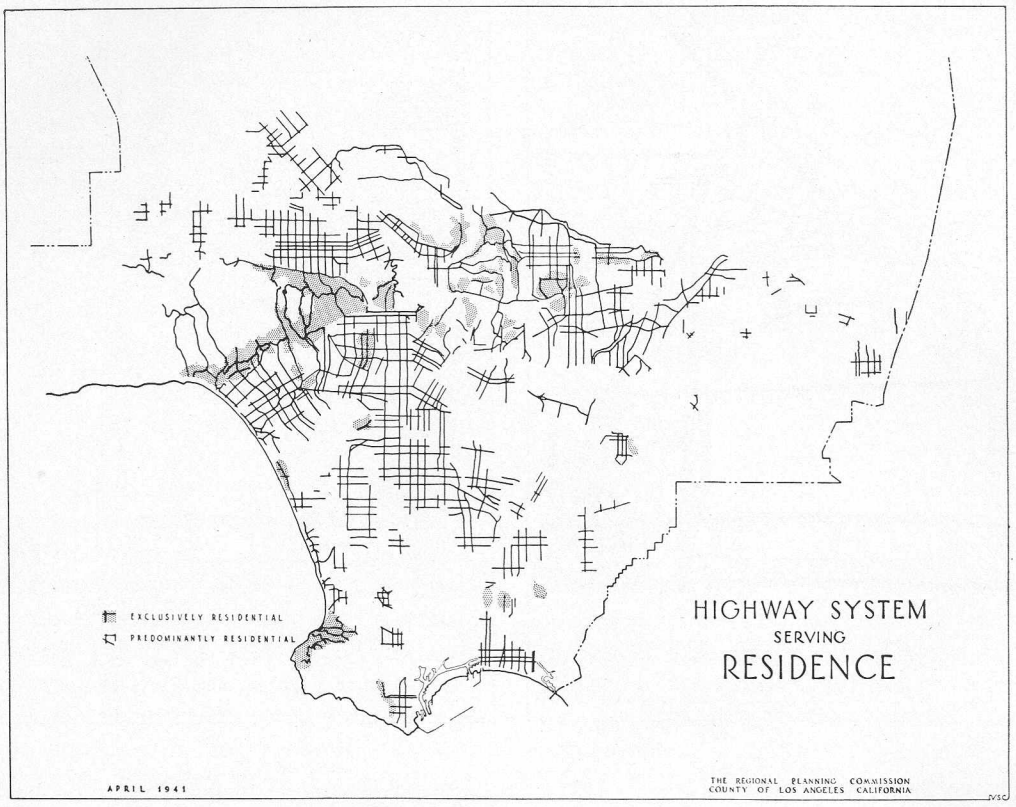


RELATION TO OTHER LAND USES

Out of a continuous consideration of these three principal factors: existing routes, topography and the pattern of communities, the actual plan of highways has been constructed. At the same time it has been necessary to consider other phases of the comprehensive plan for the development of the Region as a whole, which provides not only for industrial, residential, and commercial centers and for recreational areas, but also requires the setting aside of certain rather large parcels of land for special uses which prohibit their being traversed by a highway. Among such uses, are, for example, airports, heavy industrial areas, reservoir sites, parks, military reservations, and institutional uses, such as college campuses. This factor in the design of the highway network offers a problem requiring the best engineering skill as well as a tactful evaluation of neighborhood characteristics, for its solution. Most of these uses require considerable facility of access, and many are placed in the direct line between areas of intensive development.

This aspect of the design problem lends further emphasis to the general rule that, however important the Highway Plan may be as a basic framework, its outline must be developed, not in advance of, but concurrently with all other parts of the Plan. Enough must be known about the rest, so that the Highway Plan will not have to be constantly readjusted because of the failure to foresee these contingencies.

Proceeding upon these principles, the Commission has checked the relationship of the Highway Plan to rail terminals, airports, and the harbor. Particular attention has been paid to the proportion in which industry uses these various means of transportation. Freight movement by truck has been studied in its relation to rail movement, with a view to establishing the proper sphere of each. Equal consideration has been given to the development of all forms of transportation, so that the highways, the railroads, and the airways, can play their



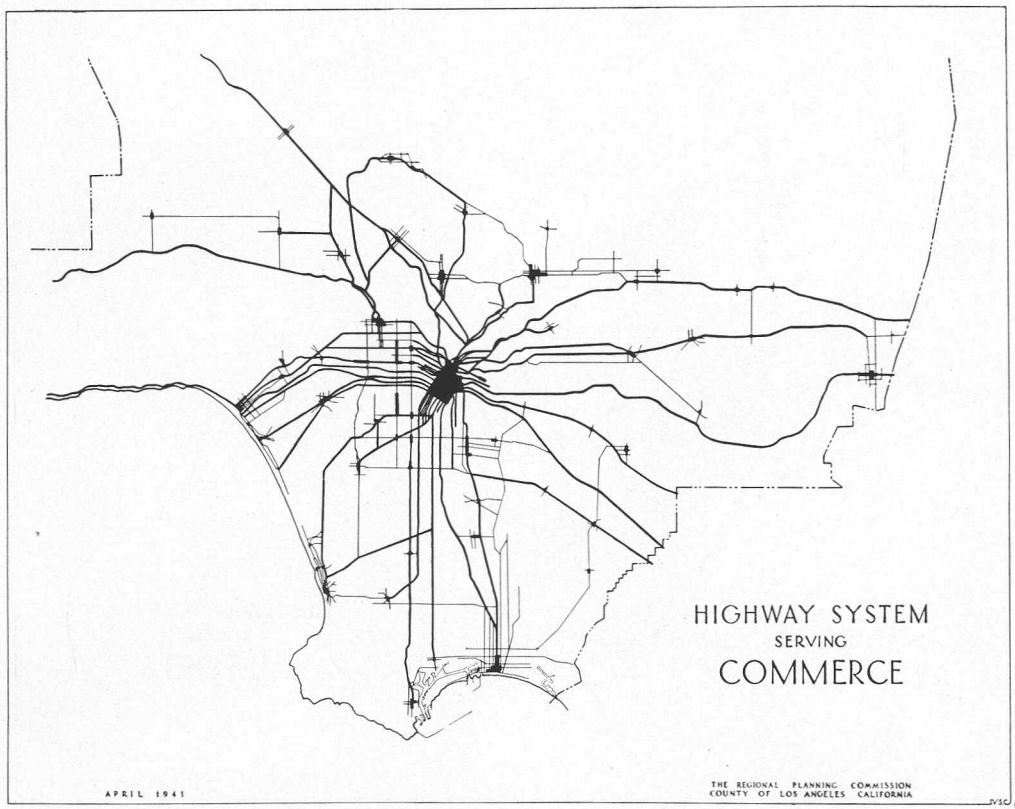
respective roles, aiding rather than competing with one another. The problem of the Commission has been to harmonize these needs, and to provide for them in such a way as to produce a maximum of efficiency with a minimum of conflicting lines of movement. Special problems arise where these lines necessarily cross one another, which are discussed in later pages of this report.

The following series of plates indicates some of the numerous aspects of the community pattern, divided up into the principal or determining land uses. The drawings in this series are to be understood as an analysis of the completed plan. The planning process in fact considered at one time all of the various divisions shown separately here.

This analysis, however, gives an intelligible check on the adequacy of highways for the different functions indicated. It further shows the relationship of the system of highways to the Master Plan of Land Use, for the several subjects of this series are elements that together determine the Land Use plan. There is, however, a considerable overlapping, since the maps used here delineate present, rather than future, land uses. This circumstance causes no difficulty because the future uses, being, in general, more intensive than the present will in most cases require not less highways than present uses.

In general, it may be said that if all of the highways shown on the various plates were superimposed upon a single map the combination would show the entire Master Plan of Highways. The reader can hardly escape noticing, however, that many individual highway routes appear in more than one of these plates.

The first map in the series shows within two classes of residential districts, only those

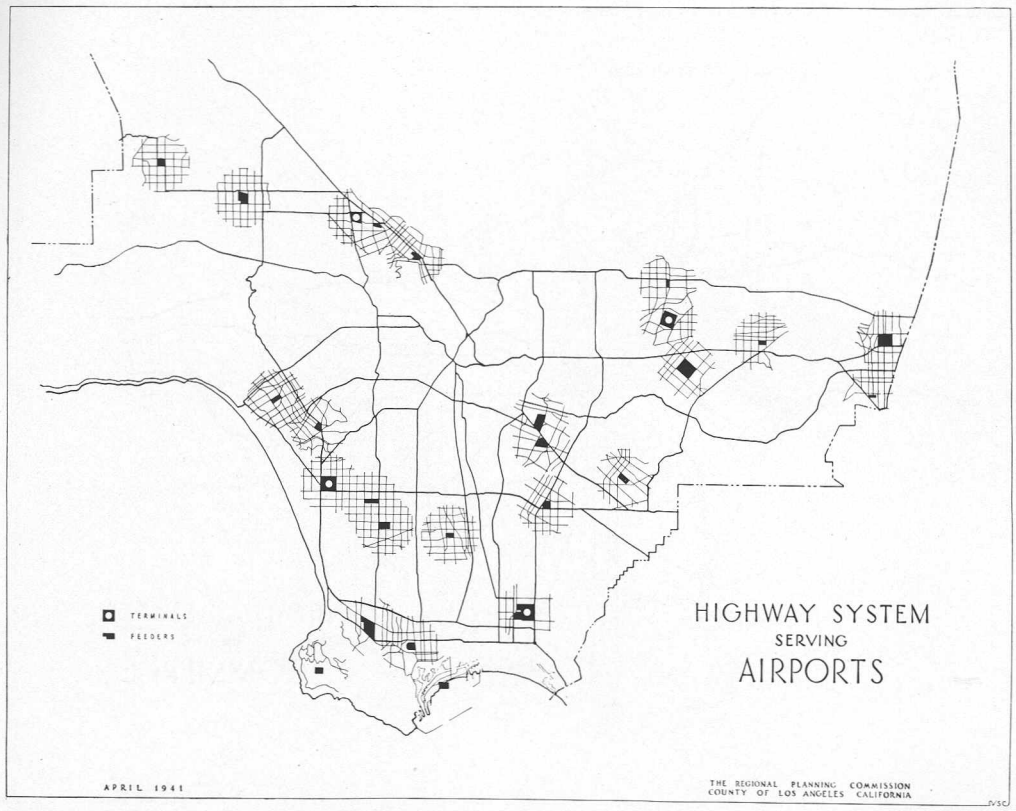


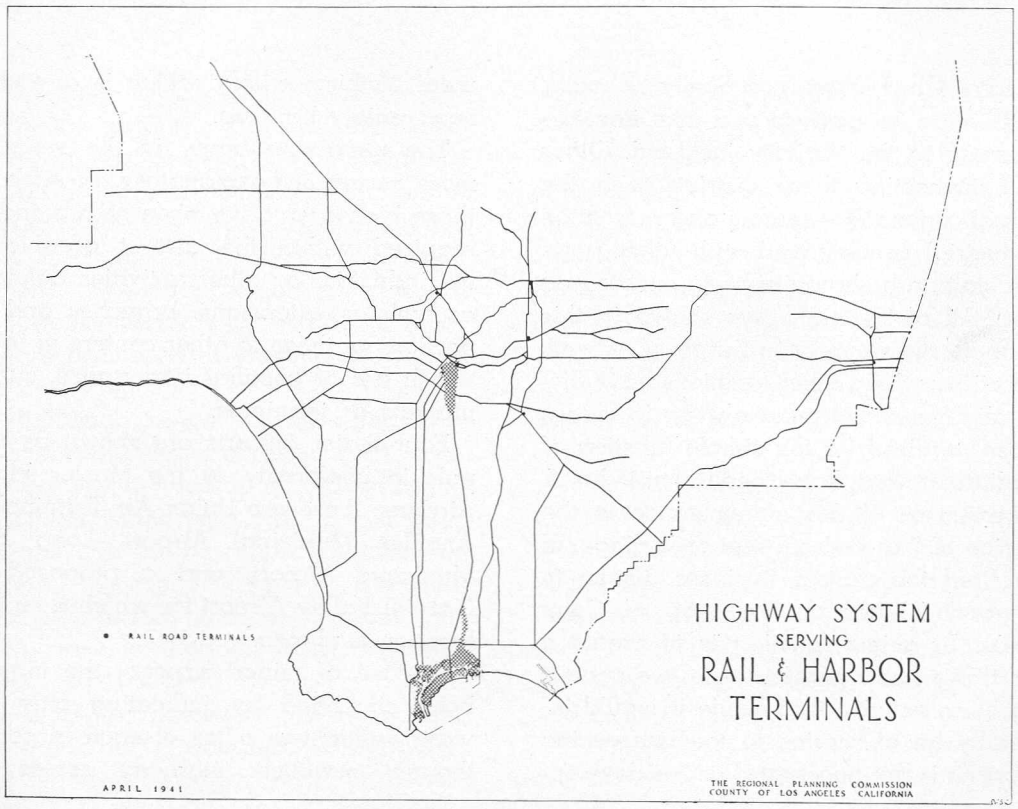
highways which have practically no other function than to open up and give immediate access to the territory included. Other routes connecting these districts with the principal commercial centers and recreation or industrial centers, and with other parts of the state, are shown only on succeeding maps. All of the highways shown in this map obviously serve other purposes as well, but portions where other functions have dictated alignment and require ways in excess of those required for the simple function of immediate access have been omitted. A clear example of this circumstance is the extension of San Pedro Street on a diagonal route from the central business district to Inglewood (shown on the map of Commerce). Its prime function is to create a direct traffic line between these two centers of business activity, and while it would incidentally be of service to the intervening territory, it is not necessary for the development of this territory which is already almost solidly built up.

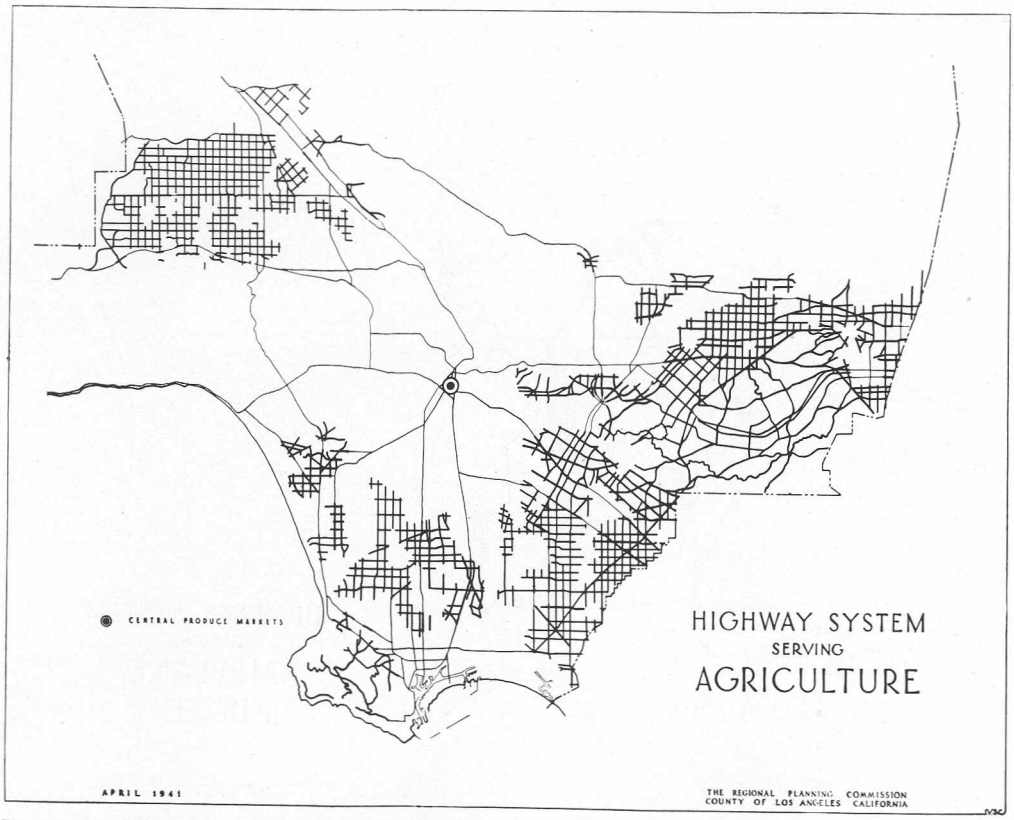
The remaining maps in the series are more nearly self-explanatory. In each case those highways have been shown that are required within the district occupied by the industries or other activities delineated as well as extensions, branches and connections of these to other centers of interest which are of peculiar importance, such as markets or terminals.

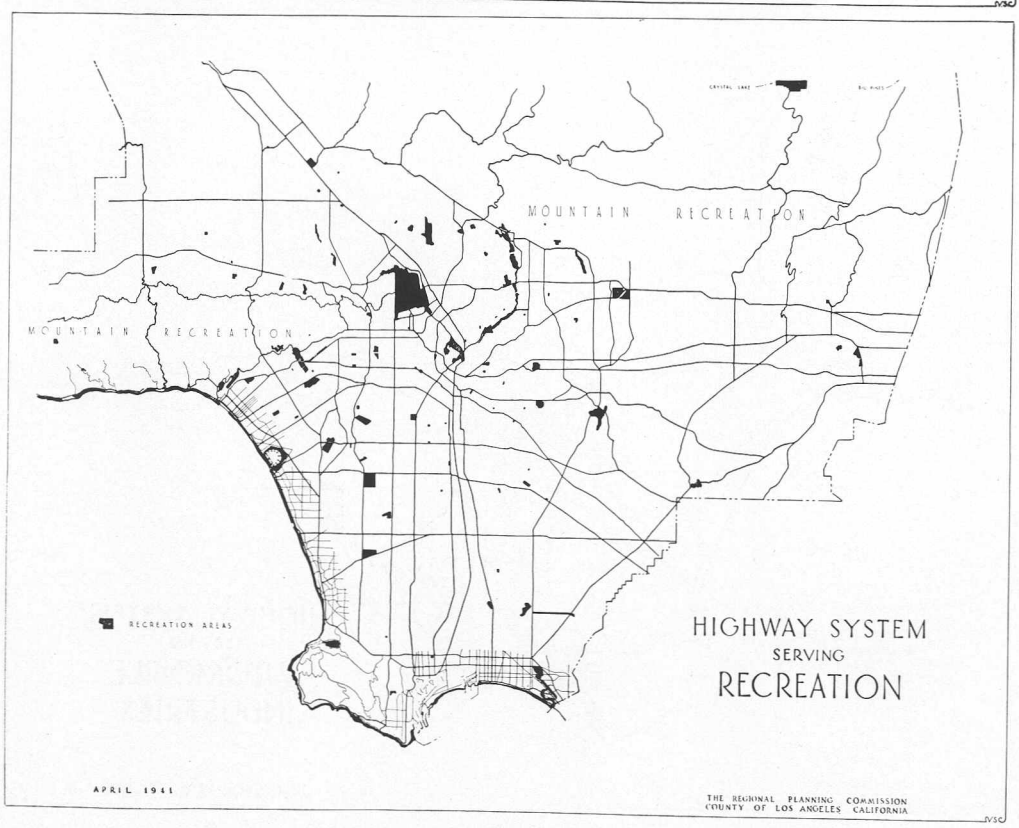
Four major airports are shown as terminals in conformity to the Master Plan of Airports; these are Union Air Terminal, Los Angeles Municipal Airport, Long Beach Municipal Airport, and a proposed San Gabriel Valley Airport for which a tentative location is shown.

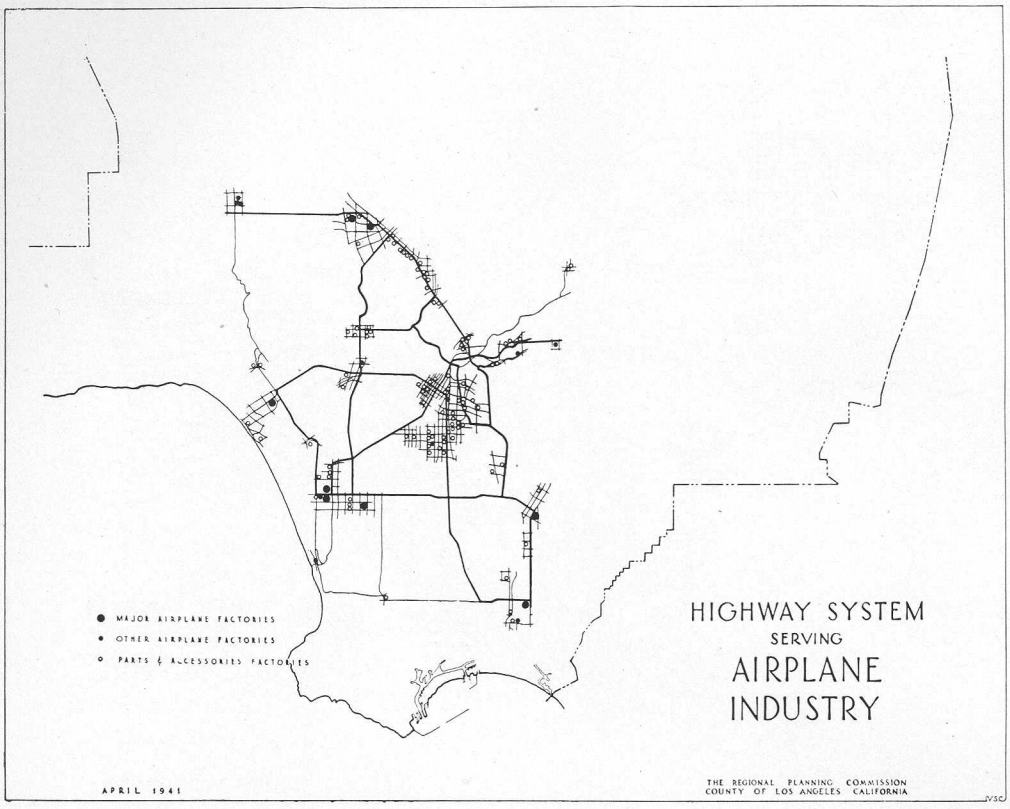
In case of minor airports, the map has been simplified by indicating only highways within two miles of each airport, although obviously highway access from

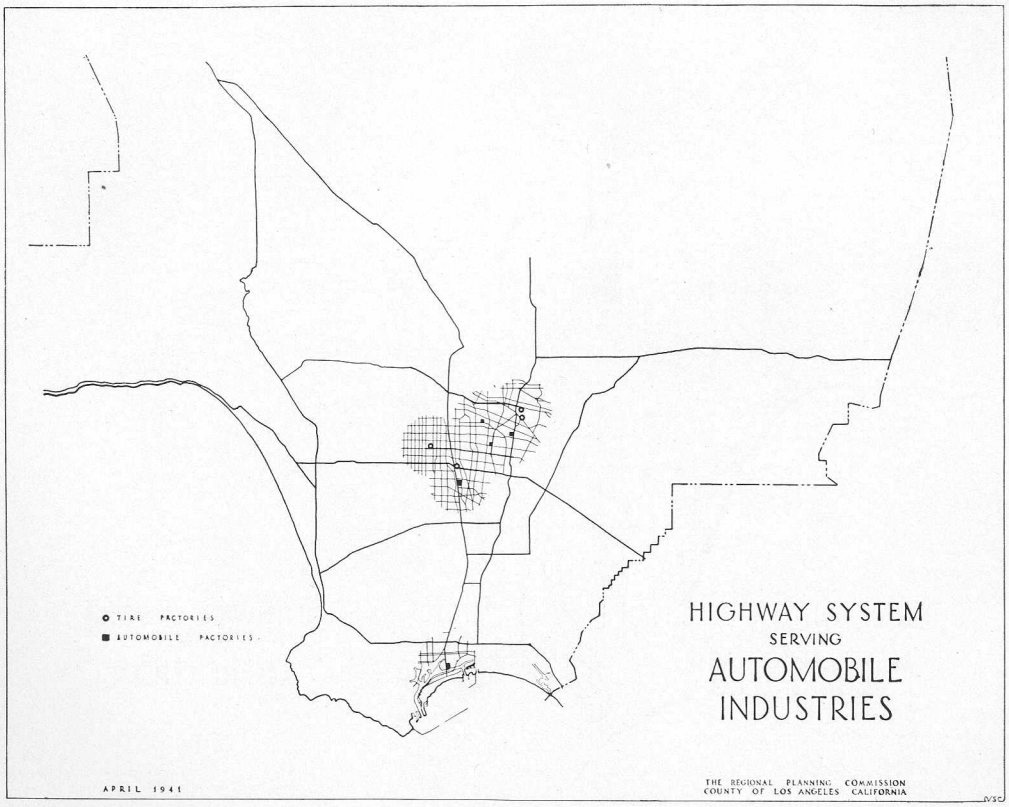

TERMINALS
FEEDERS
HIGHWAY SYSTEM
SERVING
AIRPORTS
APRIL 1941
THE REGIONAL PLANNING COMMISSION
COUNTY OF LOS ANGELES CALIFORNIA

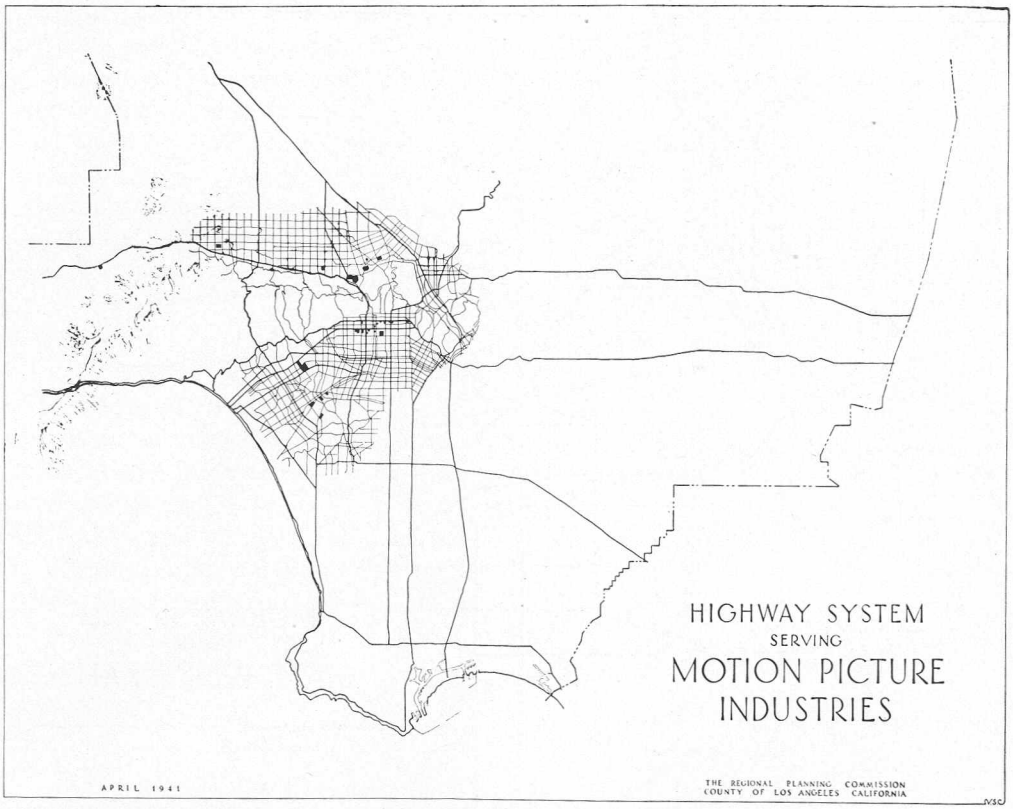

RAIL ROAD TERMINALS
HIGHWAY SYSTEM
SERVING
RAIL & HARBOR
TERMINALS
APRIL 1941
THE REGIONAL PLANNING COMMISSION
COUNTY OF LOS ANGELES CALIFORNIA

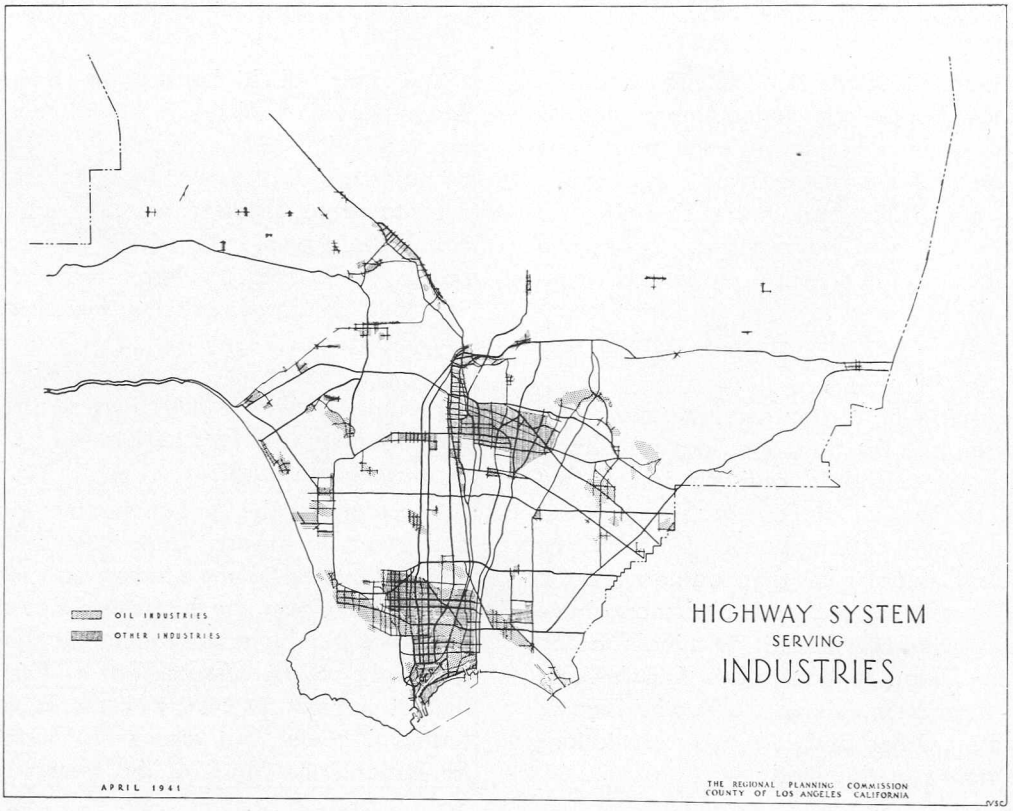

CENTRAL PRODUCE MARKETS
HIGHWAY SYSTEM
SERVING
AGRICULTURE
APRIL 1941
THE REGIONAL PLANNING COMMISSION
COUNTY OF LOS ANGELES CALIFORNIA

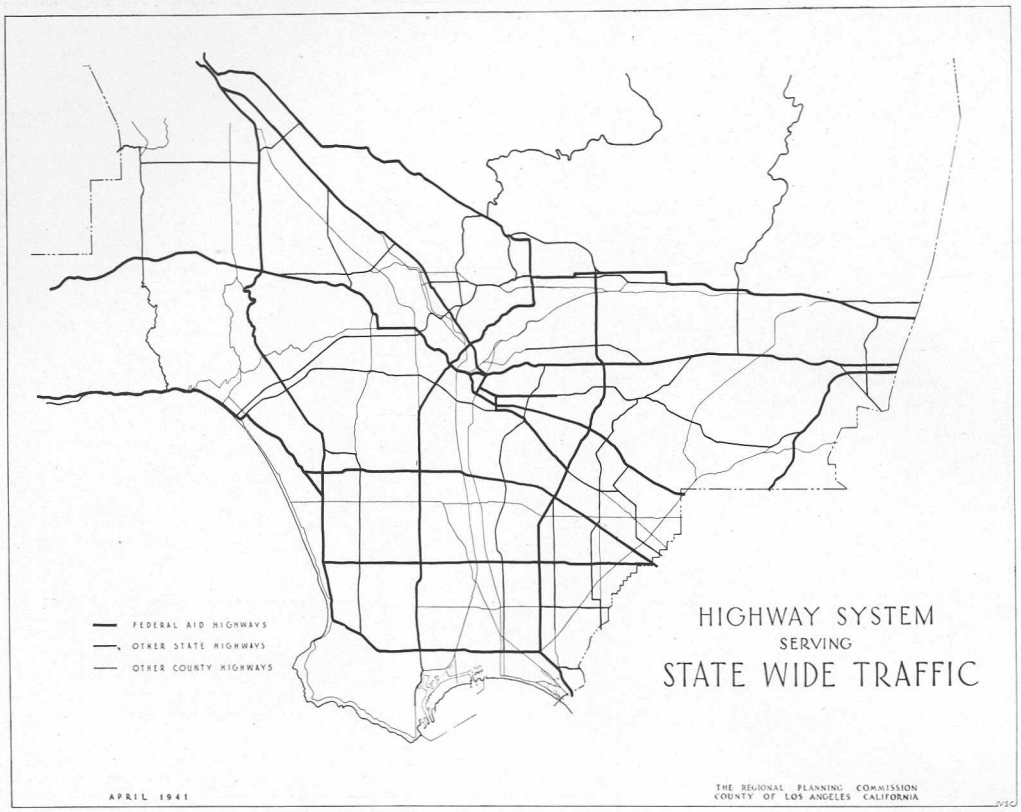

MOUNTAIN RECREATION
MOUNTAIN RECREATION
RECREATION AREAS
HIGHWAY SYSTEM
SERVING
RECREATION
APRIL 1941
THE REGIONAL PLANNING COMMISSION
COUNTY OF LOS ANGELES CALIFORNIA


MAJOR AIRPLANE FACTORIES
OTHER AIRPLANE FACTORIES
PARTS & ACCESSORIES FACTORIES
HIGHWAY SYSTEM
SERVING
AIRPLANE
INDUSTRY
APRIL 1941
THE REGIONAL PLANNING COMMISSION
COUNTY OF LOS ANGELES CALIFORNIA


TIRE FACTORIES
AUTOMOBILE FACTORIES
HIGHWAY SYSTEM
SERVING
AUTOMOBILE
INDUSTRIES
APRIL 1941
THE REGIONAL PLANNING COMMISSION
COUNTY OF LOS ANGELES CALIFORNIA


HIGHWAY SYSTEM
SERVING
MOTION PICTURE
INDUSTRIES
APRIL 1941
THE REGIONAL PLANNING COMMISSION
COUNTY OF LOS ANGELES CALIFORNIA


OIL INDUSTRIES
OTHER INDUSTRIES
HIGHWAY SYSTEM
SERVING
INDUSTRIES
APRIL 1941
THE REGIONAL PLANNING COMMISSION
COUNTY OF LOS ANGELES CALIFORNIA



other neighborhoods is of considerable importance. Routes connecting minor airports with air terminals and with each other have been omitted in order to avoid complication of the map. The fact that such routes do exist in fact will be obvious. Highways connecting to the principal trade and population centers, and to other transport terminals, have been shown only for the four major air terminals.

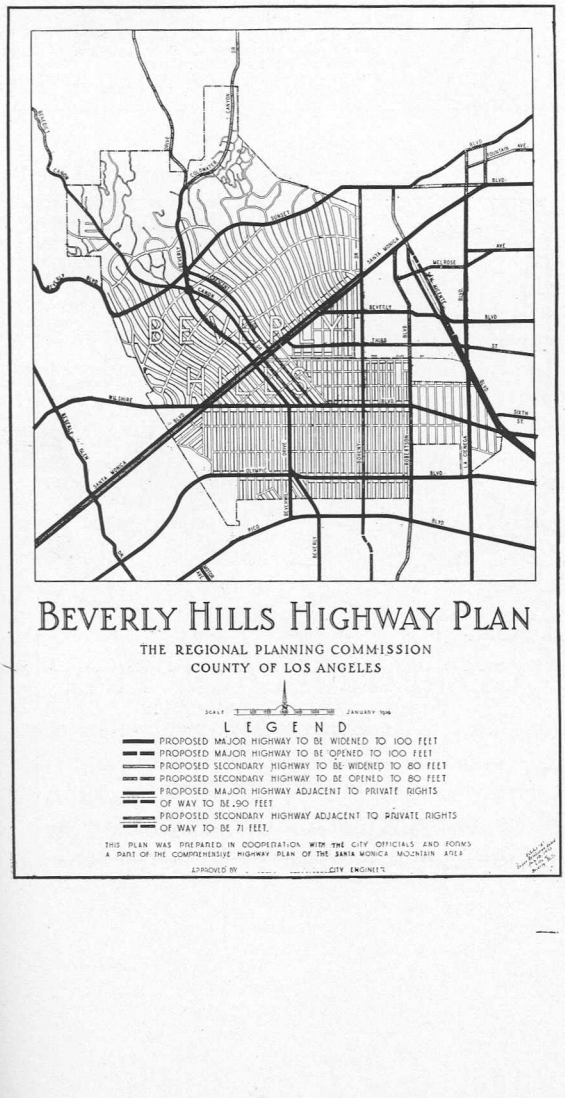
In plotting highways serving transportation terminals, the Southern Pacific Railroad stations at Glendale and Alhambra, the Santa Fe Station at Pasadena, the Union Pacific Station at East Los Angeles and the adjoining stations for the Southern Pacific and Union Pacific railroads in Pomona have been considered as rail terminals along with the Union Station in Los Angeles and the central terminals of the Pacific Electric Railway. Other outlying railroad stations are ignored in this study.

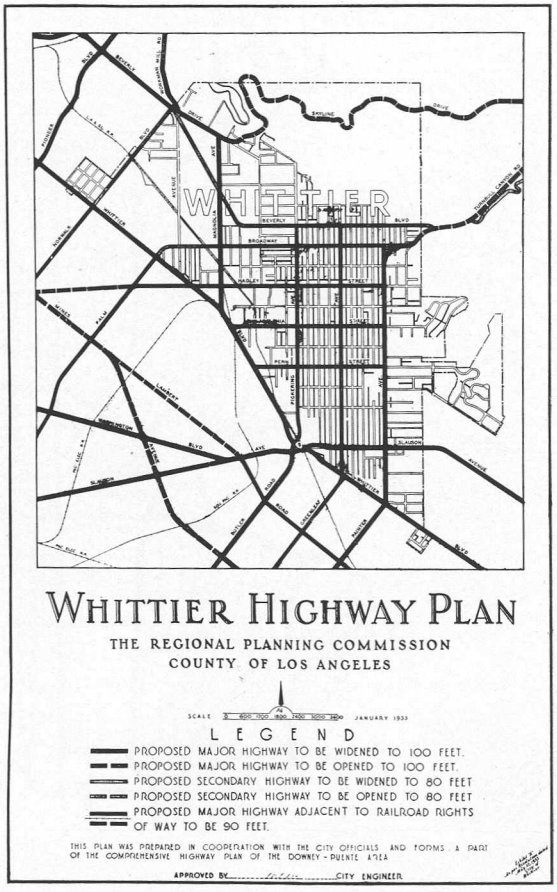
The map of highways for Recreation Areas shows all of the principal recreation areas whether public or private. It should be noted also that the mountains as a whole compose one large recreation area that cannot be shown by symbol. Several proposals for major recreation projects upon which some agreement has been reached are shown with those actually existing. In particular, the reservation of beaches, in conformity with the Master Plan of Shoreline Development, is shown here as an influence in the need for highways.

The map for the motion picture industry endeavors to present not only highways giving frontage to the studios and location "farms" but also the highways throughout the areas in which the industry's employees generally reside. Routes out of this large district connect not only with the downtown financial center but also with "locations" far beyond the limits of the map.

For the automobile, tire and aircraft factories no such attempt has been made to indicate highways relating residences of employees to the plants. Careful studies in this field several years ago showed clearly that these employees are so widely scattered throughout the entire metropolitan area that almost all highways in the plan would have to be included in this type of map.

In analyzing the needs of general industrial areas, it is necessary to consider the present petroleum extraction industry as an important factor in determining the present need for highways and their location. It is anticipated that within 50 years the oil supplies will have been so depleted that the oil fields will not continue to constitute such an important factor, but that other industrial uses will be most likely to occupy the principal petroleum producing areas.

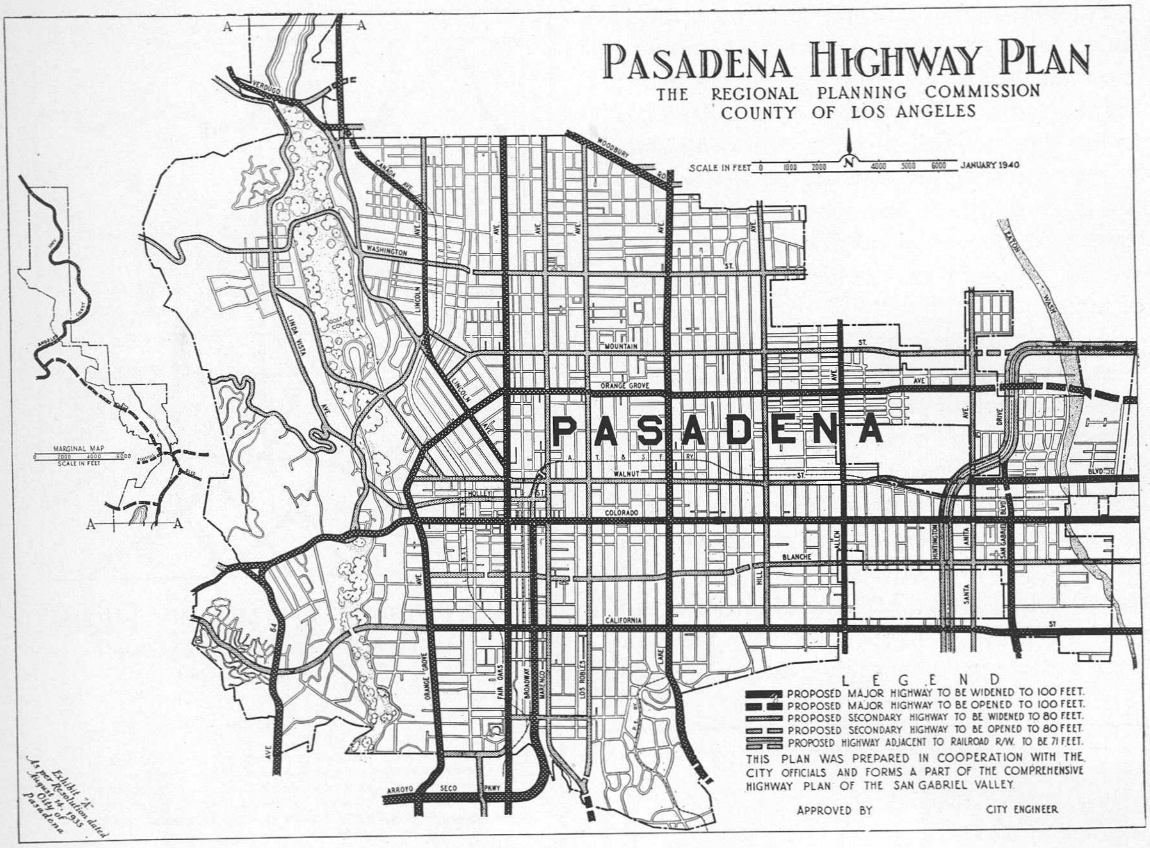


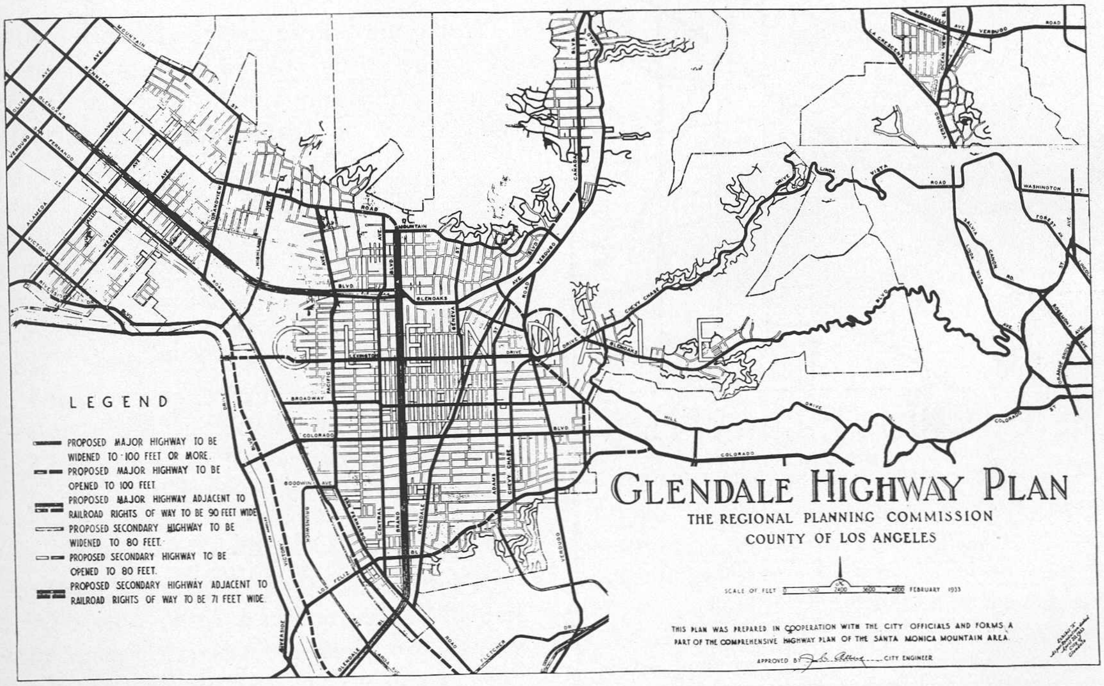


Traffic through or into the County created by forces partly outside the region is to be served principally by the routes shown on the State Wide Traffic map. The inclusion of a number of county highways in this class does not imply any actual present shortage in State Highways but suggests that completion of the partially developed State System can be made upon the framework of the Master Plan of Highways to which the County is now committed. Some apparent duplication of lines is caused by the operation of temporary State routes. Here the advantages of the proposed new routes will be readily apparent.

CITY PLANS COORDINATED

In practice, the working out of this problem of distribution has quite naturally involved the closest cooperation with planning agencies, city officials, and citizens in


PASADENA HIGHWAY PLAN
THE REGIONAL PLANNING COMMISSION
COUNTY OF LOS ANGELES
SCALE IN FEET 0 1000 2000 4000 5000 6000 JANUARY 1940
PASADENA
LEGEND
PROPOSED MAJOR HIGHWAY TO BE WIDENED TO 100 FEET.
PROPOSED MAJOR HIGHWAY TO BE OPENED TO 100 FEET.
PROPOSED SECONDARY HIGHWAY TO BE WIDENED TO 80 FEET.
PROPOSED SECONDARY HIGHWAY TO BE OPENED TO 80 FEET.
PROPOSED HIGHWAY ADJACENT TO RAILROAD R/W. TO BE 71 FEET.
THIS PLAN WAS PREPARED IN COOPERATION WITH THE CITY OFFICIALS AND FORMS A PART OF THE COMPREHENSIVE HIGHWAY PLAN OF THE SAN GABRIEL VALLEY.
APPROVED BY CITY ENGINEER
MARGINAL MAP
SCALE IN FEET


LEGEND
PROPOSED MAJOR HIGHWAY TO BE WIDENED TO 100 FEET OR MORE.
PROPOSED MAJOR HIGHWAY TO BE OPENED TO 100 FEET.
PROPOSED MAJOR HIGHWAY ADJACENT TO RAILROAD RIGHTS OF WAY TO BE 90 FEET WIDE
PROPOSED SECONDARY HIGHWAY TO BE WIDENED TO 80 FEET.
PROPOSED SECONDARY HIGHWAY TO BE OPENED TO 80 FEET.
PROPOSED SECONDARY HIGHWAY ADJACENT TO RAILROAD RIGHTS OF WAY TO BE 71 FEET WIDE.
GLENDALE HIGHWAY PLAN
THE REGIONAL PLANNING COMMISSION
COUNTY OF LOS ANGELES
SCALE OF FEET 0 2400 3600 4800 FEBRUARY 1933
THIS PLAN WAS PREPARED IN COOPERATION WITH THE CITY OFFICIALS AND FORMS A PART OF THE COMPREHENSIVE HIGHWAY PLAN OF THE SANTA MONICA MOUNTAIN AREA.
APPROVED BY CITY ENGINEER

the various communities concerned. Some years ago several of the incorporated cities in the County prepared quite satisfactory plans for the highways within their borders; yet they suffered because adjoining territory under a different political jurisdiction had no plan, or a plan not correlated with theirs. These inconsistencies tended to totally defeat the efforts of the community which planned well. When the Regional Planning Commission was created, the principle purpose was that the whole Region be planned and developed as one great commonwealth, so as to avoid these disappointments.

The peculiar conformation of municipal boundaries, with intervening unincorporated strips, so that many of the lines of heaviest traffic pass in and out of incorporated areas repeatedly, have made this coordination especially necessary. Specific provision for it is made in the last paragraph of Section 4 of the Planning Act, which says:

> "The commission may prepare and adopt all or any part of the master plan or any subject thereof for all or any part of the city, county or region; provided, however, that master regional plans shall be coordinated with similar plans of adjoining regions and that master county and city plans within each region shall be coordinated so as to fit properly into the master plan for the region."

There is no feature of the present report in which the Commission takes greater pride than in the results secured in this particular phase of its work. The cooperation of city officials in this task has been extremely gratifying.

By making minor alterations in their plans, or by securing through the efforts of The Regional Planning Commission necessary adjustments of the planning in adjacent territory, these officials have assisted in making possible the well integrated Plan here presented. The adoption of the Plan on a Regional basis has now enabled them to draw from it the fullest advantages. They are in a position to carry on their highway development programs in an orderly, economic, and efficient manner, knowing that each element of it is an integral part of a project that has united support from end to end. A number of individual city plans are reproduced here as examples of the manner in which this problem has been handled.

COST FACTORS

Finally, it remains to note that in the selection of the routes wherever a choice between two alternatives presented itself, the factor of relative cost was constantly kept in mind so as to permit the utmost economy, consistent with provision for the urgent needs of a modern growing community. Certain alignments, ideal in theory, were felt to be impractical because of excessive cost. In other cases, minor changes have been made, in order that the individual properties might not be too severely affected, with resultant expense to the public. It has been possible, in numerous cases, to arrange for the free dedication of land for needed right-of-way, by reasonable adjustment of highway alignment, so as to permit of a better subdivision of adjacent lands. (In other cases, where this was not feasible, firm adherence to the Plan has resulted in mutually advantageous collaboration of adjoining owners of odd-shaped parcels.)

In the rugged portions of the County, where too straight an alignment would require heavy cuts and fills, or a series of bridges and tunnels, such a solution has been avoided except where extremely heavy traffic offered economic justification. Particularly, in highways of a recreational character, has this been the case. Here the less costly solution often coincides with the Commission's desire to avoid marring natural scenic attributes, and to provide, within the limits of safety, for the pleasant qualities of a winding road.

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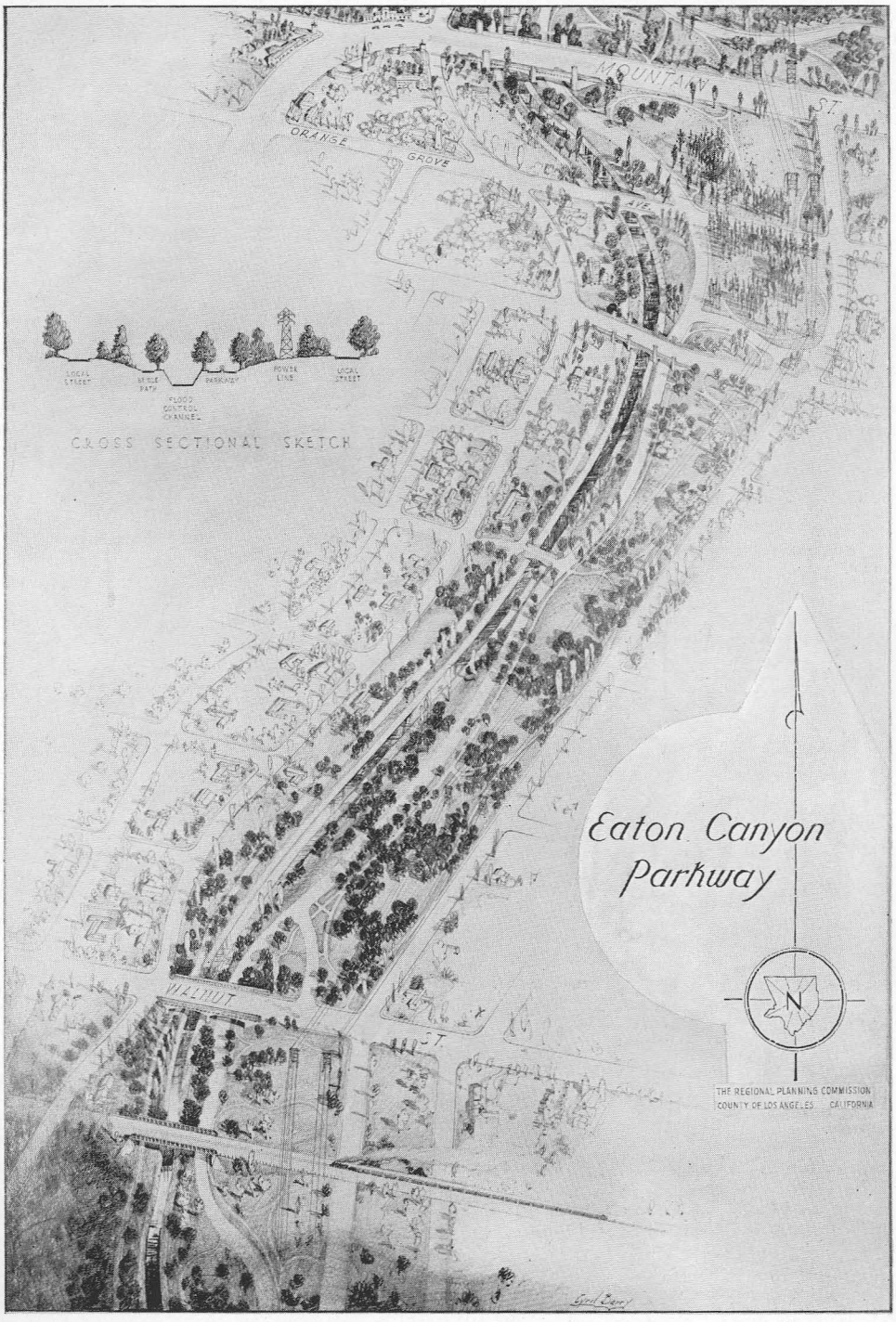
ORANGE GROVE
MOUNTAIN ST.
CROSS SECTIONAL SKETCH
Eaton Canyon Parkway
WALNUT ST.
THE REGIONAL PLANNING COMMISSION
COUNTY OF LOS ANGELES CALIFORNIA

IV
WHAT KIND OF HIGHWAY WILL BE ADEQUATE?

The relation of highway routes has been described as a system for meeting a need determined by the major geographic and land use features of the region. In establishing these routes in detail the Regional Planning Commission has made constant study of the more intimate relationship between specific parts of individual highways and the adjacent land and traffic loads. From these detailed studies in design standards have been derived which have been applied, with minor variations, even to preliminary proposals for alignments of the routes themselves. This approach, considering details within and adjacent to the right-of-way as well as direction and extent, has adapted the basic elements through a continuous evolution as conditions of traffic within the region have altered.

INFLUENCE OF THE AUTOMOBILE

A generation ago, when "automobiling" was a sport and a hobby of the well-to-do, the highway engineer was but little concerned with it as a factor in road building technique. His efforts were largely directed toward the development of as much mileage as possible of graded "hard" roads to get the citizens "out of the mud." A fifteen-foot gravelled or paved road, winding its tortuous path through the hills or jogging around off-set section corners was adequate for the traffic demands and within the resources of the public agencies then charged with road building and maintenance.

But today the problem has become one of high-speed transportation of persons and goods, and the proper design of the roadway surface, with due regard for safety, economy, and efficiency, is much more complex. The phenomenal growth of automobile transportation from 1910 to 1930 made demands for greater width of pavements, higher standards of curvature, sight-distance, and super-elevation, since they affect safe movement at the operating speeds and volume of traffic now prevailing. Oddly enough the increasing use of automobiles which created the new problem also provided a means for the solution. The invention of the gasoline tax in 1917 provided funds increasing with the use of the highways, sufficient in general to meet the new demands. First put into practice in Oregon in 1919*, the general acceptance of this form of tax almost immediately established a policy of making automobiles literally "pay as they go." It further made possible a steady rise in construction standards and efficiency of construction methods to keep pace with improved performance of the vehicles.

Adoption of the first gasoline tax by California in 1923, and the formation of the Regional Planning Commission that same year constituted something more than mere coincidence. Los Angeles County's problems of growth which forced the creation of the Commission may not have been caused by the advent of the automobile, but the latter was in any case one of the most powerful factors and certainly accounted for the peculiar form of those problems and their early incidence in this region. The highway problem, involving, as has been mentioned, many municipal jurisdictions, was the prime motive leading to the establishment of the Commission.

At this time the Commission was forced to concern itself almost exclusively with the broad problem of routes, in order to direct

*_The Administration of the Gasoline Tax in the United States;_ F. G. Crawford; Municipal Administration Service, New York; 1932.

possible highway expenditures into permanently correct alignments. Nevertheless, with its meager staff it found time to establish tentative standards for details in design; widths of right-of-way and intersection studies. The standard of 90-foot width for major highways was quickly increased to 100 feet.

STANDARDS

For the first few years of its existence the Commission was forced to devote its time to these two primary questions of route and width. Decisions had to be made in case of imminent projects or subdivisions long before the general solution had been found. Shortly, however, the staff was organized to undertake the study of details underlying the general standards, and while it is true that the basic feature, the right-of-way width has not changed materially since 1924, all of the various highway standards now in effect rest upon a solid basis of true relation to need.

The basic feature of the design of each specific highway is, of course, the width of the right-of-way.

A right-of-way that is wide enough to accommodate changes will prove economical in the long run. A narrow pavement can easily be widened, if the land needed is publicly-owned; but a narrow pavement in a narrow right-of-way through a built-up district is a serious problem indeed.

The highways in the Plan are segregated into "major" and "secondary" highways. In general, the Major Highway is required to have a right-of-way at least 100 feet wide, so as to accommodate three moving lanes of traffic in each direction, while the Secondary Highway is to be at least 80 feet wide and accommodate two moving lanes in each direction. This is only a broad distinction, however, and there are some special cases where greater or lesser widths are indicated, particularly where a rail line runs between the two halves of a highway. These general standards have been carefully determined by long study of the component parts as described in the following paragraphs.

WIDTH OF LANE

The necessary width of a travelled lane of highway depends upon the width of the widest vehicle* in common use, plus an allowance for a safe interval in passing. At the high speeds customary today, the latter is of increasing importance, and common practice now calls for a width of eleven or twelve feet, where a few years ago a width of ten or even nine feet was acceptable.

Allowance, too, must be made for the tendency of motorists to avoid the extreme edge of the pavement†, and the desire to keep clear of curbs, walls, railings, or parked vehicles or those issuing from driveways. For these reasons, the outermost lane should have the greater width. On divided highways, the inner lane also requires extra width, to allow for clearance at the edge of the dividing strip and because of the greater speed. Good practice also suggests the widening of lanes on all but the easiest curves (especially where there is no transition curve), in order to reduce the tendency of drivers to encroach on other lanes.

NUMBER OF LANES

The ultimate number of travelled lanes required is determined by the part the high-

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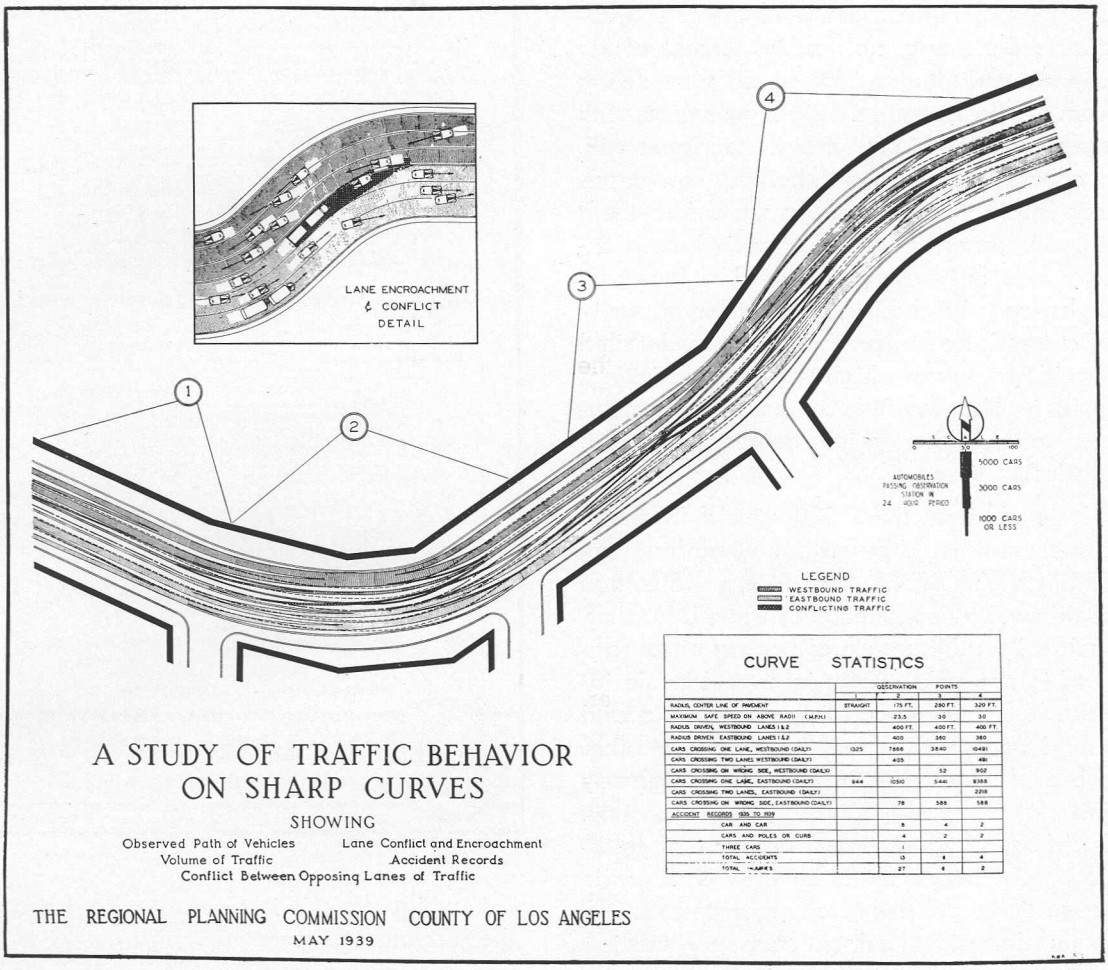
*Magnitude of investment in highways, and the difficulties in changing pavements already built have required universal state regulation limiting the width of vehicles so as not to render existing highways more unsafe.

†Note: Investigations conducted by the Bureau of Public Roads showed that drivers on state highways kept at an average more than 4 feet from the edge of the pavement, and observation in the Westchester parkways indicates that only a small percentage of the drivers keep within an outer 10-foot lane unless required to do so by density of traffic. The encroachment from one lane to another materially reduces the average speed and therefore the capacity of the driveway. The Park Commission is, therefore, seriously considering the adoption of 12-foot outer lanes and 10-foot inner lanes in the design of future parkway drive pavement.

(*Design and Structure of Through Roads for Fast Traffic*, by L. G. Holleran, in Engineering News Record, August 21, 1930.)



way in question is to play in the whole Plan, which furnishes an indication of the volume of traffic it will have to accommodate. There should ordinarily be an even number of lanes, as the "middle lane for passing only" has proven a frequent source of head-on collisions, in spite of the improved methods now used in signs and marking. Four lanes (two for each direction) allow for the segregation of fast and slow traffic, so that it is not necessary to use the left side of the road in passing. The use of the double white line, with crossing over it forbidden, followed rapidly upon the development of the four-lane highways which made it possible. It was one of those regulations whose very logic and practical value (like the original convention of driving on the right) makes them almost self-enforcing by willing acceptance. Today the principle, long advocated by planners, of actually dividing the road at the center by a raised strip or barrier, is coming into general use in highway design—a natural result of the wide use of four and six-lane pavements and the increase in normal speeds. Allowance is now commonly made for such a strip in the original design for any Major or Secondary Highway in Los Angeles County. In some cases this feature requires a wider than normal right-of-way, while in other circumstances various features within the right-of-way are adjusted.

Experience has shown that provision for more than three lanes in each direction is generally not desirable. The capacity of a

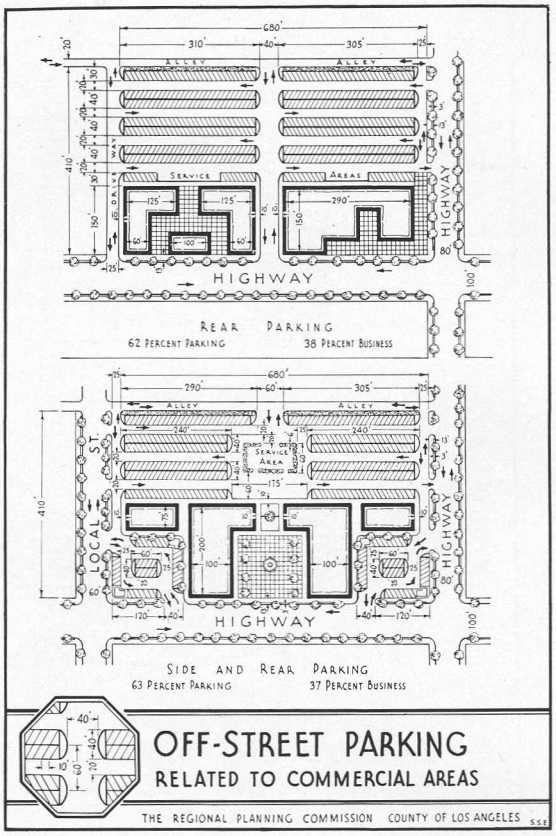
highway is not increased in direct proportion to the number of lanes because of the internal side-friction losses as cars swing from one to the other. Rigid enforcement to keep traffic within the designated lanes will, of course, increase the individual lane capacity. But in the absence of such enforcement it has been estimated* that a six-lane highway has only about 2.4 (and a four-lane highway only about 1.8) times the capacity of a two-lane highway. (A more detailed consideration of highway capacities is given in Chapter V, as a means of determining when highway improvements will be needed.)

It is obvious then that unless lane encroachment could be strictly eliminated, the addition of a fourth lane in each direction could not be economically justified. Further, such a broad expanse of paving encouraging high speeds results in considerable increased danger to crossing pedestrians, and would be unsatisfactory from various other points of view. Where a six-lane highway will not carry the load, modern practice, therefore, suggests the reduction of interference at intersections by means of grade separations, provision for separated service roads alongside for local and slow moving traffic, development of a parallel highway at some distance, or relief by the construction of a freeway.

STANDING VEHICLES

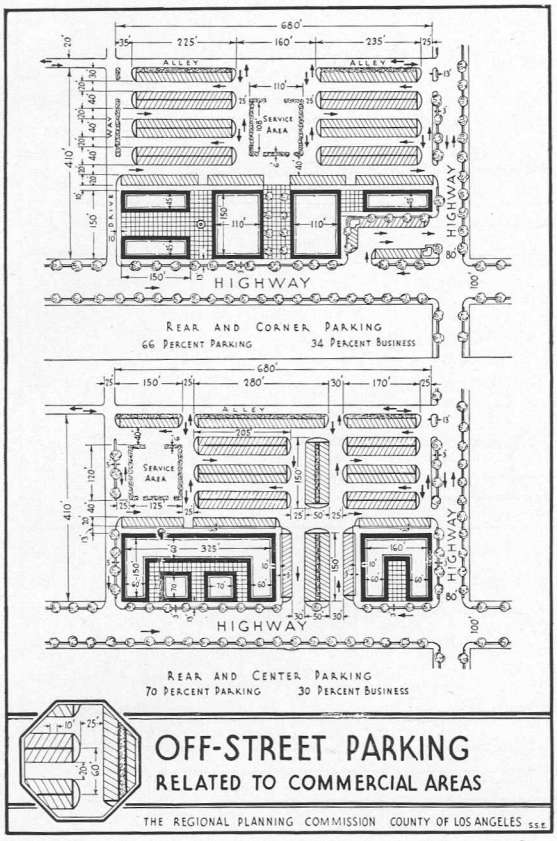
Ordinarily, provision must be made for some space to the side of the travelled roadway where vehicles may stop, either to take on or discharge passengers, or when temporarily out of order. In the open country, it is usually sufficient to provide a firm, graded shoulder for this purpose. In urban aeras, eight feet of paving nearest the curb is usually allowed for this purpose. On local streets with light pavements this is convenient and will undoubtedly be the practice for some time.

*By the American Transit Association.



On highways it is questionable whether the prevalent custom of using from 22 to 28 per cent of the total area paved as dead storage space can be economically justified.

For this reason, where there is a combination of through traffic with a certain amount of local business use, the design should include provision for service roadways, as has been done in a few cases in Los Angeles County. Better still, wherever possible the business center itself should be so designed as to be accessible from, but somewhat off the highway, with "parking" areas for customers' or delivery vehicles provided in proportion to the expected requirements. Westwood Village offers a notable example of successful development along this line. Highways do cost money to build, and it is useless to expect them to furnish value in proportion to the cost unless they are so designed and built as to serve, not the



standing vehicle, but moving traffic. It is moreover physically impossible to furnish on the highway sufficient space for convenient parking for all of the vehicles necessary within a successful business center. In general, parking being a function of business enterprises rather than of through traffic, it has proven economically feasible, as well as equitable, for business to provide off-street parking space by one means or another in proportion to its needs.

PLANTING AND UTILITIES

Related functions of highways are also considered in detail by the Regional Planning Commission in determining the overall width of rights-of-way, as well as the space necessary for appropriate planting.

Fitting the highways into their topographical settings can be accomplished by the logical use of trees and foliage along the borders. Where planting strips or parkways are required a space of at least 7½ feet on each side of the roadway is recommended to provide for tree planting. Sidewalk widths of 4 feet are deemed adequate in most residential areas. Hence, the total width required will not be less than 12 or 13 feet on each side of the travelled roadway.

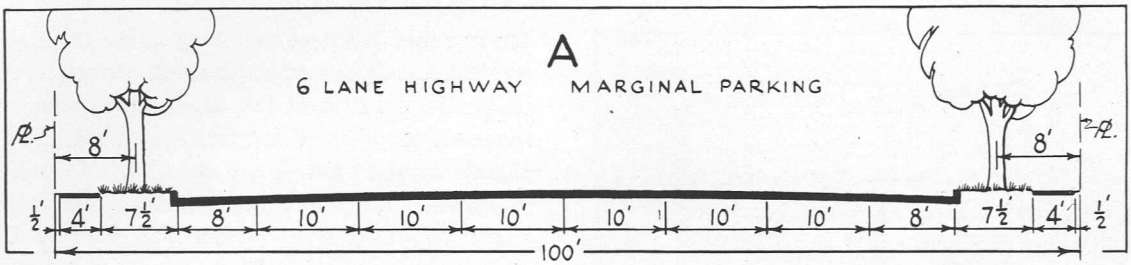
In urban areas there is an increasing tendency in modern practice to place public utilities, such as gas and water mains, and sewers in the areas on both sides of the highway between the sidewalks and curbs, in order to eliminate the necessity of cutting pavement to repair or maintain services to adjacent property.

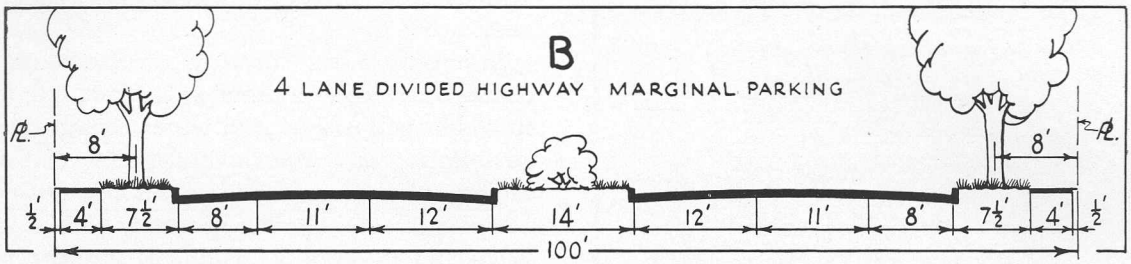
A new practice that has recently been developed by the Regional Planning Commission results in subdivisions designed with lots backing upon major traffic arteries. In these cases sidewalks may not always be necessary, but additional planting space is needed to form a sound and sight screen between the residential area and the rush of traffic.

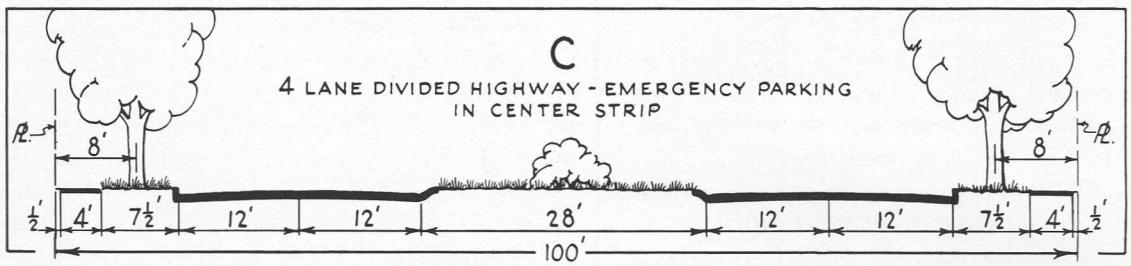
In rural areas where the development of the entire right of way is not immediately necessary, the areas along the sides of the traffic lanes are usable for emergency parking, for drainage, for utility ducts, light standards, and other services which ordinarily are part of the use of the highway right-of-way. Often it is desirable to develop footpaths, bicycle ways, or bridle paths in these roadside borders.

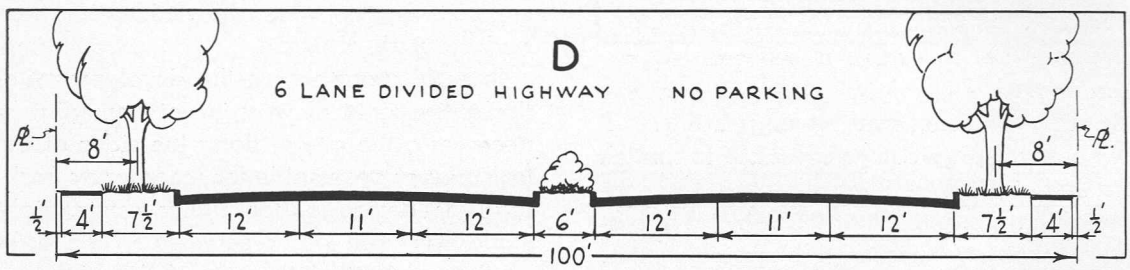
ROADSIDE DEVELOPMENT

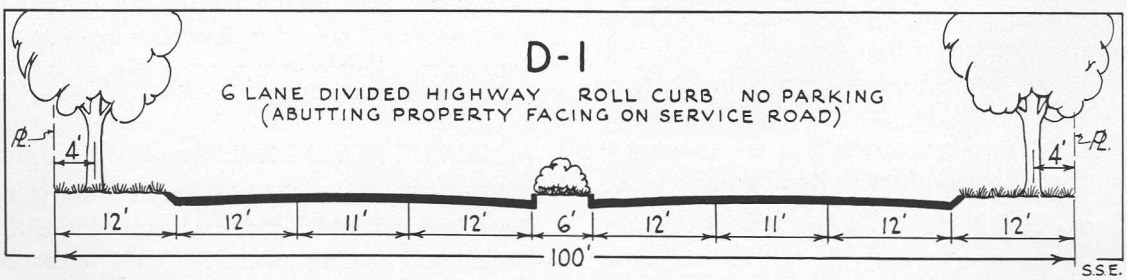
In certain areas, the highway border may be extended and used for small roadside parks and resting places. Such roadside parks are particularly desirable at view points in scenic areas, or where existing trees provide welcome shade. The use of these rest areas to off-set driving fatigue has proven a valuable factor in highway safety. Where space permits, provision may be made for their use as picnic areas. The state of Texas has pioneered in the use of

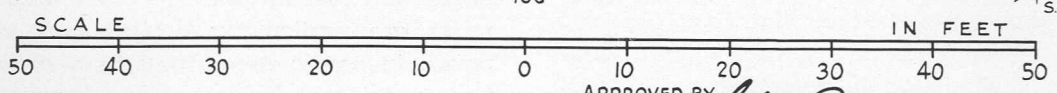












APPROVED BY

Geo. N. Jones
COUNTY ROAD COMMISSIONER

Alfred Jones
COUNTY SURVEYOR

Wm Hoy
CHIEF ENGINEER, REGIONAL PLANNING COMMISSION

STANDARD CROSS SECTIONS
MAJOR HIGHWAYS
(WITHIN 100 FEET OF RIGHT OF WAY)

JUNE 1940

THE REGIONAL PLANNING COMMISSION COUNTY OF LOS ANGELES

such parks along its highways, where they have proven highly successful, as is also the case in Michigan.

The use of trees and foliage to eliminate headlight glare aids noticeably in reducing night accidents. It has therefore been given important consideration in highway development in recent years, and is one of the most practical uses of the central dividing strip. Recent experiments by the motion picture industry with the use of foliage for its sound absorption qualities have brought new justification for roadside planting.

The details of roadside planting are, of course, left to the construction departments and their landscape engineers. The Regional Planning Commission's active interest in the subject extends only to the foresight of providing right-of-way adequate and of proper design to carry out eventual planting programs. In certain areas, where some unusual character of the adjacent development justifies such treatment, consideration of appearance factors has led to a decision that the total right-of-way width should be considerably in excess of the ordinary requirements (100 to 300 feet), so that the highway becomes in fact a parkway.

The width of the entire right-of-way is therefore seen to be determined by the sum of the following:

(a) the width and number of moving traffic lanes;

(b) in some cases, a parked vehicle lane on each side;

(c) the space required for appurtenant side uses, that is, sidewalks and planting;

(d) in some cases, a central dividing strip.

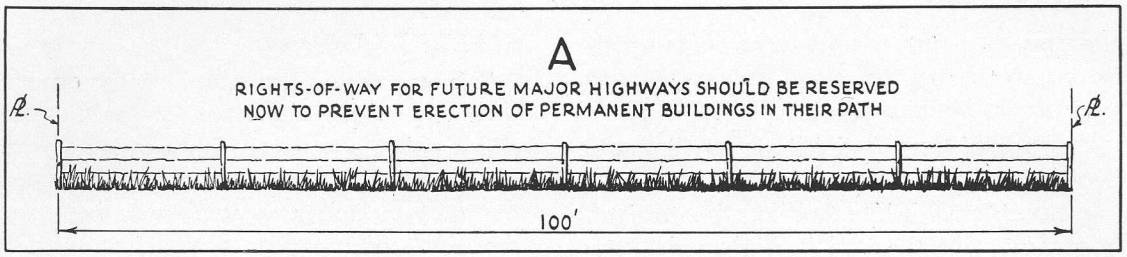
With some variations in special cases different combinations of these elements are to be accommodated within the 80-foot and 100-foot rights-of-way designated by the Master Plan of Highways.

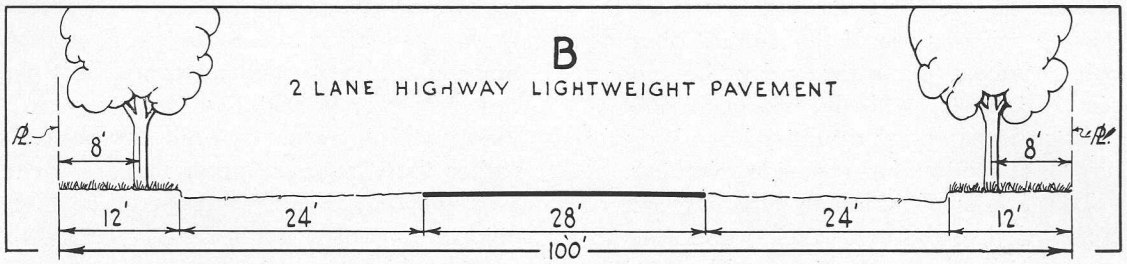
SAFETY BY DESIGN

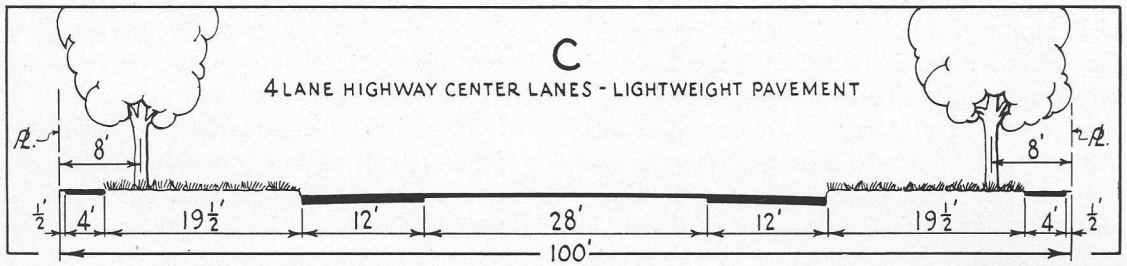
The considerations thus briefly outlined give a primary indication of the Commission's policies in determining over-all width of the right-of-way, but of more importance are certain qualities of design that affect the safety of operation of vehicles upon the highway. Traffic regulations are important in the prevention and reduction of personal injuries and property damages, but they are at best only palliative measures. In the long run safety must be built into highways rather than imposed upon them. A complete design therefore includes for each specific alignment a careful study of the elements which provide for safe operation. Where detailed alignments have not yet been determined the same criteria have nevertheless been observed through the use of general rules and standards growing out of the many detailed design studies that have been completed. The principal features of these standards will be discussed in the following paragraphs.

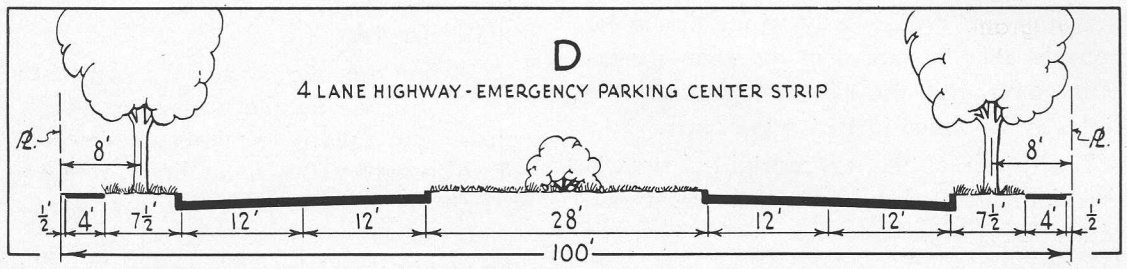
SIGHT DISTANCE

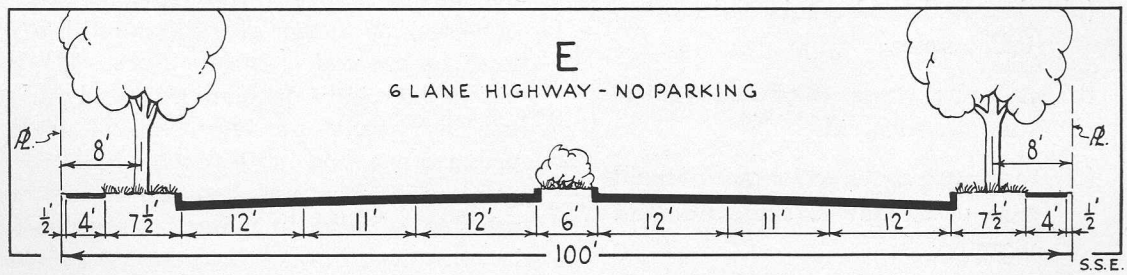
The first essential is that the curvature of the highway and the rate of changes of grade, particularly at the summit of hills, must be kept within those limits which will permit the driver a clear vision of the road for a considerable distance in advance of the moving vehicle. The faster the vehicle operates, the farther ahead a careful driver must be assured of a clear track. The Regional Planning Commission's standards set this distance at not less than 300 feet in urban areas, and not less than 1000 feet in rural areas where higher speeds are permissible. These minimum requirements have evolved through the years as performance of the automobile has changed. In the early days of the Commission when these regulations were first stated for urban subdivisions centerline radii of 100 feet were allowed. A little later 600 feet was set as the minimum for curves in outlying highways. During that period these minima tended also to be maxima. It is notable

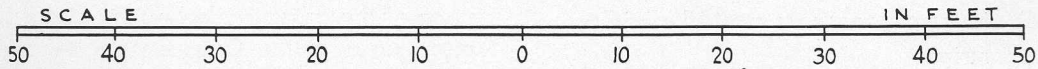












CROSS SECTIONS SHOWING PROGRESSIVE DEVELOPMENT

MAJOR HIGHWAYS

(WITHIN 100 FEET OF RIGHT OF WAY)

JUNE 1940

APPROVED BY

Geo. N. Jones
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THE REGIONAL PLANNING COMMISSION COUNTY OF LOS ANGELES

that at present the above figures are genuine minimum figures. Radii of curves in rural areas frequently range from 3000 to 6000 feet and only rarely approach the permitted 1000 feet. There are definite mathematical relationships between the speed of a car and the distance within which it can be brought to a stop. The sight distance should be substantially larger than this in order to allow time for the driver to react and apply the brakes, after sighting an obstacle.

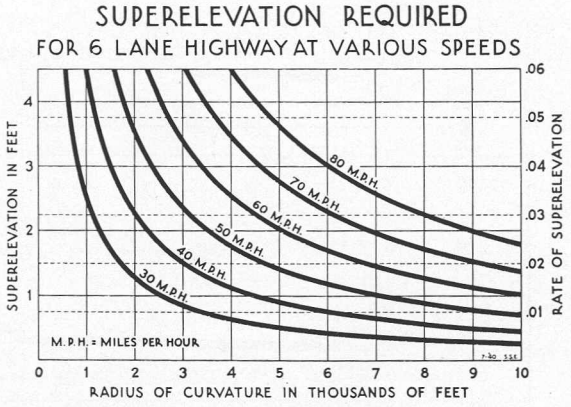
At intersections, too, the driver should be able to see far enough into the cross street to see a vehicle approaching from the right or left in time to come to a full stop before entering the intersection. This requires the use of rounded corners at street intersections to provide better visibility, and suggests some control over the height of shrubbery or buildings at the corner. In making the calculations necessary in this connection, it is of course assumed that speeds in built up areas will not be as great as those in open country and the design is modified accordingly. All of these matters have been given most careful study by the Commission and the resulting conclusions have long been employed not only in the procedure for the opening and widening of new highways but also in the regulations for the subdivision of land.

CURVATURE AND GRADES

The provision of adequate sight-distance in accordance with these principles ordinarily suffices to determine whether the grades and alignment of a projected highway are satisfactory. In mountainous territory, of course, it was necessary to plan for grades negotiable in high gear without too sharp a degree of curvature. In general, the Plan contains no curvature sharper than the minimum of 1000 feet radius. In addition to the better sight-distance thus secured, such easy curves allow for adequate superelevation without unduly affecting the appearance or drainage of the highway.

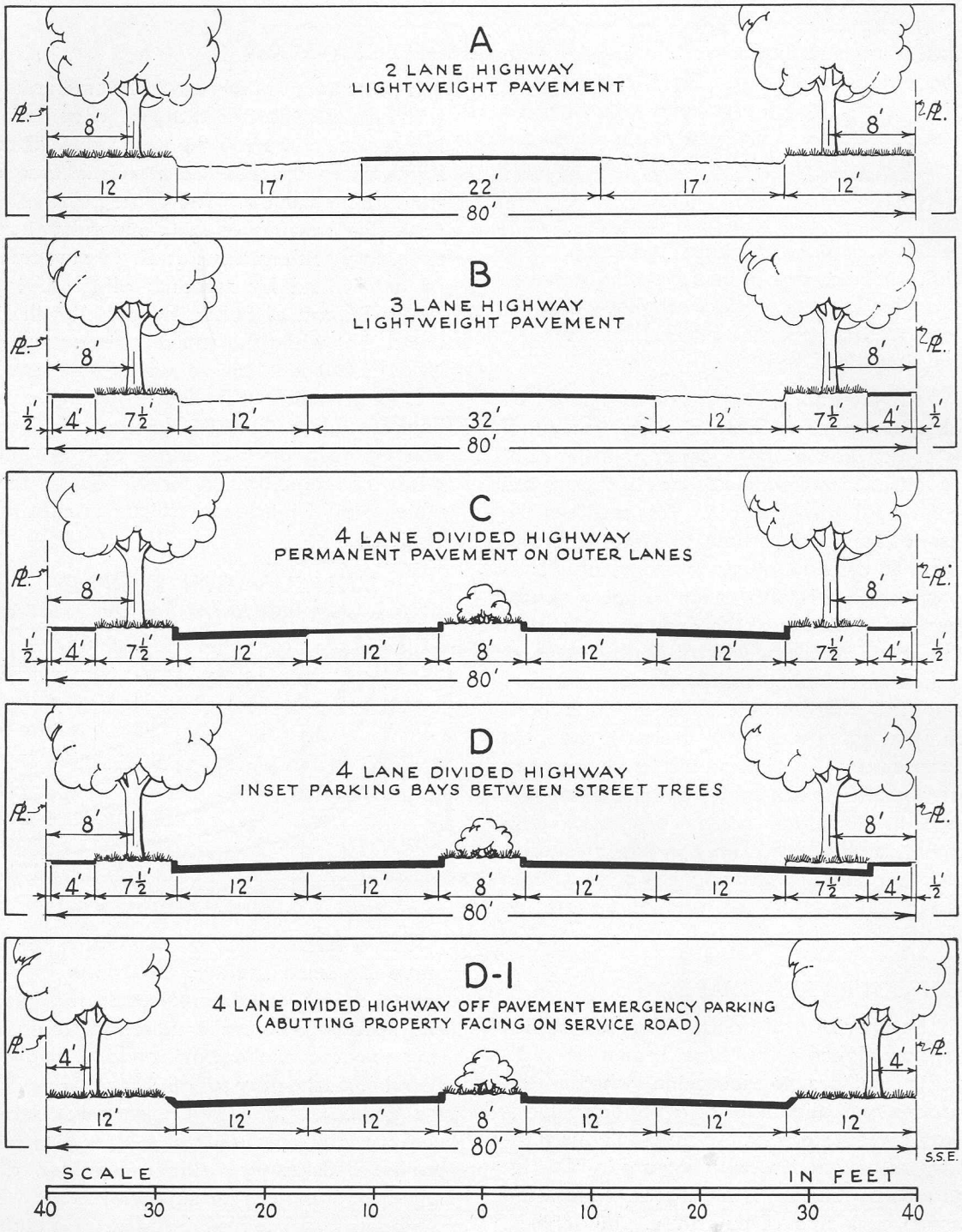
SUPERELEVATION

If customary speeds are to be maintained without discomfort or danger on curves, it is necessary to raise the outer side of the highway to offset the centrifugal force of the turning vehicle. The chart below indicates the amount of this "superelevation" necessary with various radii of curvature, as determined by research of the United States Bureau of Public Roads. It will be noted that when the radius of curvature is below 1,000 feet, the required superelevation for a vehicle travelling at 40 miles per hour would produce a difference in elevation between the two edges of a six-lane roadway amounting to more than 4.5 feet, which would introduce difficulties at intersections.



It also follows that as the radius of the curve becomes greater, the range of the correct theoretical superelevation for different speeds becomes smaller, so that for long easy curves the provision for a medium speed is satisfactory for all. For this reason the Regional Planning Commission's practice of requiring curves of long radius has proven satisfactory, without involved detailed requirements for superelevation.

Modern practice also requires, for a curve of radius less than 2000 feet, the introduction of "spiral" curves offering a gradual transition from the straight lines of the approaches. This is considered to be entirely a matter of construction detail, and is not indicated in the Master Plan of Highways.



CROSS SECTIONS SHOWING PROGRESSIVE DEVELOPMENT

SECONDARY HIGHWAYS

(WITHIN 80 FEET OF RIGHT OF WAY)

JUNE 1940

THE REGIONAL PLANNING COMMISSION COUNTY OF LOS ANGELES

APPROVED BY

Geo. N. Jones.
COUNTY ROAD COMMISSIONER

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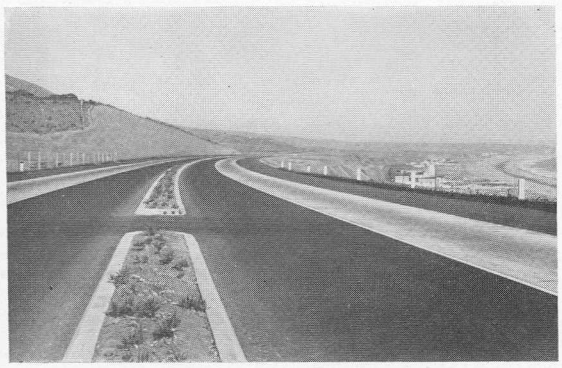
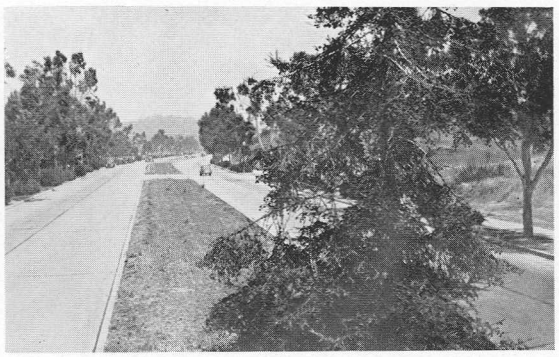
DIVIDED HIGHWAYS

Mention has already been made of the division of the roadway by a central raised barrier, planted or otherwise, so as to completely separate the traffic flowing in opposite directions. As early as the first year of its existence, in 1923 the Regional Planning Commission had recommended development of certain highway routes as parkways divided by one or more planting strips. At that time the emphasis was placed upon establishing a park-like character for the sake of aesthetic values, although the argument of increased safety was advanced as of incidental importance. By 1930 the Commission had begun to stress the safety features of dividing islands, although the first definite recommendations for division of which there is adequate record occurred in 1935. Since that time practically all studies of highway details prepared by the Commission's staff have included the principle of divided traffic. While a number of these proposals have been included in actual projects, the total is still unimpressive in comparison to the vast existing mileage of ordinary highway developments.

Where dividing strips have been used they have increased highway capacity, but their most important function is the immense contribution they make to safety of operation. They eliminate the dangers of head-on collisions and when planted reduce glare of undimmed headlights and strain upon the eyes and nerves of the driver. They eliminate U-turns except at well considered locations. They provide safety zones for pedestrians, which are particularly important on six-lane thoroughfares.



Divided Highway on the Malibu



Scenic Values Are Enhanced

They also offer a valuable means of shutting off cross-traffic from minor local streets. In these cases the driver is required to turn right into the highway, proceed along it until he reaches a break in the center strip, turn left around it, and return a short distance to the continuation of the local street. Where such maneuvering is required, it is necessary to make the center strip wide enough to permit a close turn around it without lane encroachment. In any event the dividing strip should be not less than 6 feet wide except in an approach to a structure such as a bridge or tunnel.

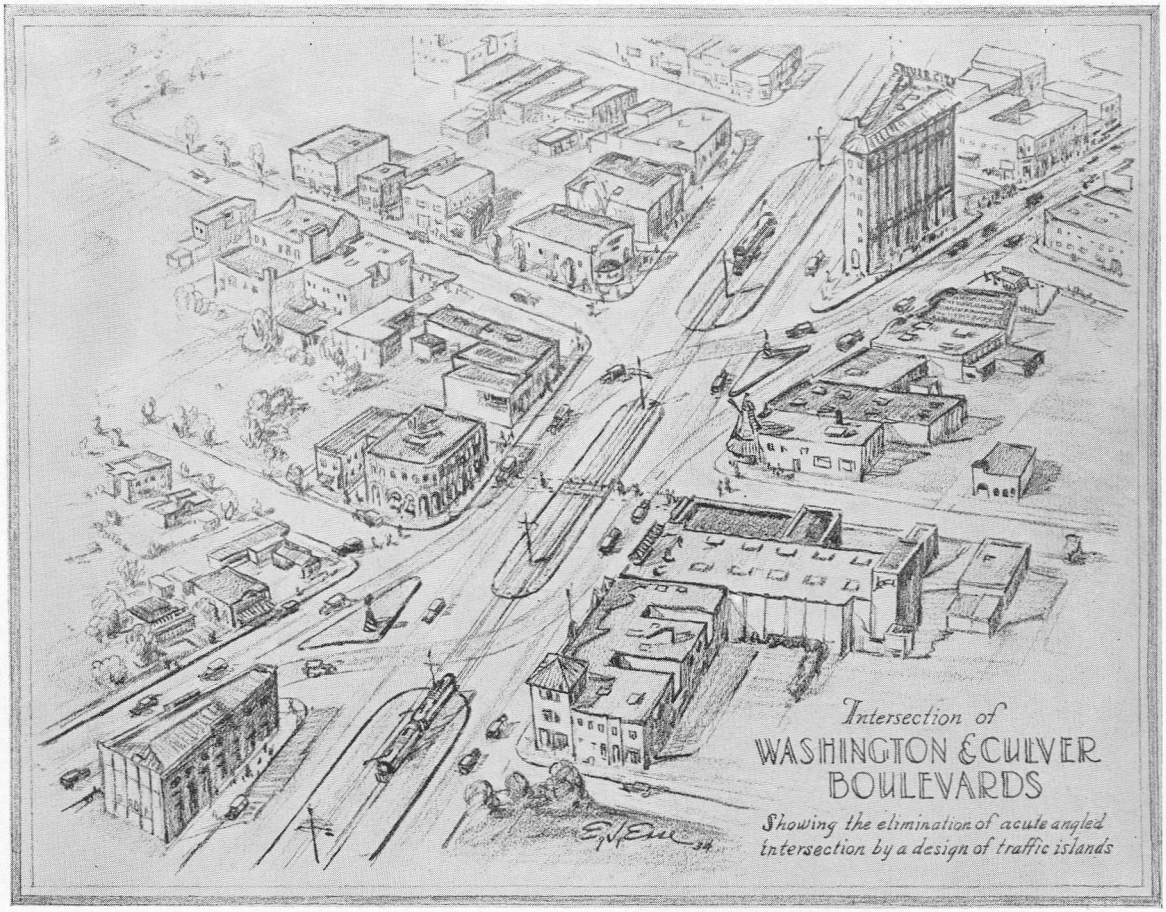
INTERSECTIONS

By far the most important division of this general question of safety is the influence upon design of the search for an adequate solution of the problem of intersections. These may in general be classified under four headings as follows:

(a) Where local streets meet highways;
(b) Where highways meet highways;
(c) Where highways meet railroads; and
(d) Where local streets meet railroads.

LOCAL STREET CROSSINGS

Increased safety of operation and greater capacity of highways can be secured by reducing as far as possible the number of



local street crossings. The greatest opportunity in this case lies in regulating subdivision design so as to provide wherever possible for long blocks parallel with the highways and for interceptor streets and service roadways. Numerous examples of this treatment throughout Los Angeles County have been brought about through the efforts of the Regional Planning Commission during the past two decades. Where the highway passes through land that is already subdivided, the reduction in the number of crossings can only be secured by the use of the method described in the discussion of divided highways. The advantage of having fixed the location of future highways in advance of subdivision development is particularly clear in this connection.

INTERSECTIONS OF HIGHWAYS

While the Highway Plan was being developed, studies were made of numerous intersections of the highways with one another and particularly of those cases where several highways converge. Each of these problems required an individual solution. Instrument surveys were made where necessary to determine the best exact alignment at these points.

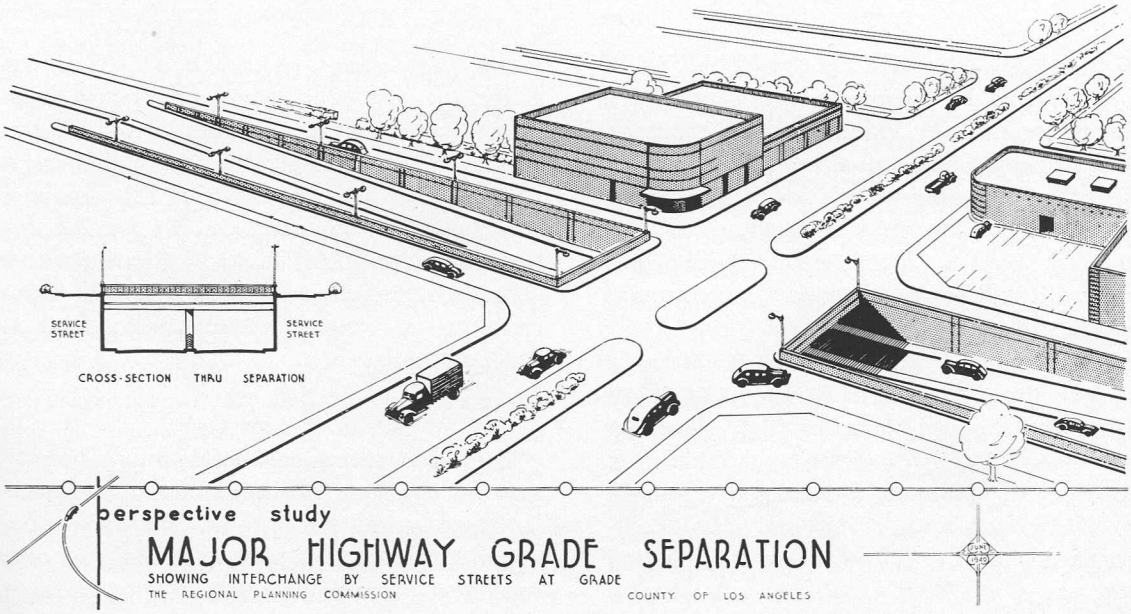
A number of typical studies of difficult and complicated highway intersections were published in the Commission's Report on Highways in the Long Beach-Redondo Area (1931) to which reference is made. Some of these have since been constructed in accordance with the plans there shown. The accompanying drawings show the results of some more recent analyses.

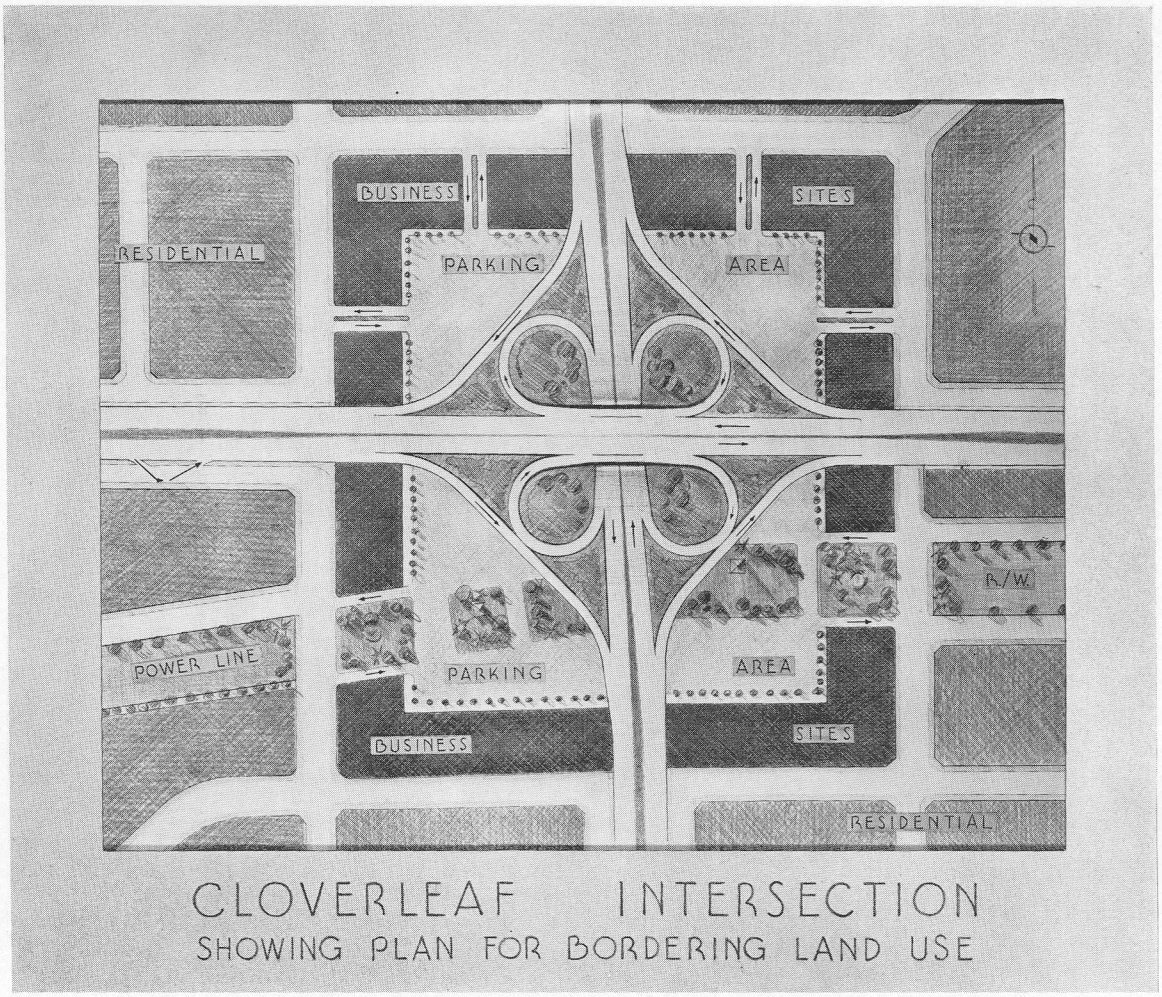
In a few places the best solution has been found in the use of a traffic circle of sufficient size to provide for distribution of traffic where a number of highways converge. In some cases the provision of traffic "islands" to channelize the movement of vehicles was indicated, while in others it has been necessary to work out a plan for a complete separation of grades. Up to the present time actual construction of grade separations has been confined mainly to the State (Major) highway routes, but there is a growing conviction that such separations will eventually be required, for at least two lanes of traffic, at practically all of the places where Major Highways intersect one another.

GRADE SEPARATIONS

When such a separation is necessary, it must be designed with care to avoid property damage and other problems out of all proportion to the benefit in relief of traffic. It may be taken as a rule that where a railroad lies adjacent to a parallel highway, and the crossing of a transverse highway and the railroad requires a separation, the separation should be designed to carry the transverse highway over or under the parallel highway as well as the railroad. Failure to observe this rule would create a blind intersection at the bottom of the cut, more dangerous than the original crossing.

Such "grade separations" at the more heavily travelled railway crossings have been a familiar development in the larger cities and on State highways for many years. The idea of the necessity for similar design of the crossing of two highways is a more recent development. General acceptance of this idea has been comparatively slow, primarily because of the apparent necessity of using large amounts of land to accommodate the so-called "clover-leaf" or "pretzel" design. When highway grade separations were first considered it seemed necessary to provide such devices for all right and left turns at every separation. Continued study indicates that there are in fact many intersections where no turns or connections need be considered, and many more where connections less elaborate than the "clover-leaf" would be satisfactory. One type, the "slot" separation, similar to the illustration on this page, has proven adequate even under fairly heavy traffic loads.





CLOVERLEAF INTERSECTION
SHOWING PLAN FOR BORDERING LAND USE

Where the traffic load on one of the highways is to be particularly favored, this development may still provide for left as well as right turns on the less favored street. Not all of the intersection delays are thus removed, but the gain in efficiency on the favored street is considered by public and authorities alike to make the improvement worth while.

Traffic checks now show that the total loss of time by delays at highway intersections is actually greater than that experienced at railway crossings. This may not appear evident off-hand because the length of each delay is relatively short compared to that required to allow for the passage of a train. But there are many more such small delays because of the much greater frequency of obstructions. This is evident from a comparison of the traffic on our busiest railroads with that of our average highways. Hence the Commission believes that expenditures for separations between intersecting Major Highways should be considered side by side with those for highway-railway separations rather than independently.

SEPARATION INCREASES CAPACITY

The reasons and conditions which control and justify them are very similar to those involved at railroad and highway crossings, namely, loss of life, property damage, and time loss. Accidents are more frequent at

highway crossings than at railroad crossings, although at the latter there are more fatalities in proportion to the number of accidents, as well as to the volume of traffic than at the former. Where two intersecting highways carry an equal volume of traffic and the crossing is controlled by signals, the capacity of the highway is reduced by as much as sixty per cent, usually more. If the traffic is heavy, it will result in congestion on both highways. The congestion could be relieved by widening the roadways, but time losses and accidents would continue. Separation of grades will not only relieve the congestion, but will also eliminate the time losses and nearly double the efficiency of the highways.

Where highways are closely built up on all sides of an intersection, it may be very difficult to increase their width on account of the resultant property damage. Separating the grades and thus accelerating the flow of traffic may postpone or eliminate the necessity for widening the roadway or the construction of a parallel route.

The solutions of these varying intersection problems frequently have resulted in major or minor changes in the alignment of one or more of the highways involved. In some cases a different alignment has resulted in entirely eliminating the original problem, while in others it has merely brought routes together in such a way as to make traffic control easier, simpler or more effective.

RAILROAD CROSSINGS

Since the region is served by both highway and rail transportation, it is inevitable that the two systems should intersect at many points. It should be equally obvious that these crossings must be a grave source of both danger and delay. These crossings may be considered as falling into three classes. First, there are those which involve only a spur track or a switching track with negligible rail movement. These can be eliminated from further consideration in connection with the Highway Plan, beyond pointing out the desirability of the eventual abandonment of such of the rail lines as are not essential.

Table 5 indicates the number and character of other rail-road crossings in the San Gabriel Valley, the only portion of the region for which studies have been completed, and which contains a majority of all railroad crossings. The second group of existing crossings includes those which involve, not the highways, as the term is used in this report, but the local street system. Where these cannot be simply eliminated by closing the street and diverting traffic to the nearest highway crossing, they must be fully protected by safety devices, with the emphasis placed upon free movement of the rail traffic.

In advocating this policy, the Commission has in mind not alone the advantages to the users of the highways. It recognizes the vital importance to the community of the railroads which are still the backbone of our commercial and industrial development and which will be able to operate much more efficiently upon completion of this program. Without these separations the major railway lines are subjected to the same delays or hazards as a local street car line through the Metropolitan Area and lose much of their value for transportation of either passengers or freight.

5 YEAR GRADE SEPARATION PLAN

The third group is composed, of course, of highway-railroad crossings. In 1931 the Los Angeles County Grade Crossing Committee made a thorough study of this problem. The Committee was composed of officials and engineers of city, county, and state governments and the General Managers of five railway lines. It included also ex-officio a representative of the State Railroad Commission. As a result of its work there was adopted at that time a Five-Year Grade Separation Plan, which was approved by the Regional Planning Commission as well as by the railroads. Many of the projects set forth in that program have since been completed. Others, not in the

TABLE 5—GRADE CROSSING ELIMINATION PROGRAM—SAN GABRIEL VALLEY—1940

Street and Highway Crossings on Main Line Railroads

	Total Crossings		To be Separated		To Be Maintained		To be Closed	
	Highways	Local Streets	Highways	Local Streets	Highways	Local Streets	Highways	Local Streets
A.T. & S.F. Ry.	53	73	4	..	49	40	..	33
S.P. R.R.	41	29	8	..	33	17	..	12
U.P. R.R.	29	20	19	7	10	5	..	8
P.E. Ry.	54	42	23	4	31	17	..	21
Total all Rail lines	177	164	54	11	123	79	..	74

first priority group, have been built where unforeseen progress on the State Highways or procedure under the Works Progress Administration required a departure from the original program. The results have more than justified the study made at that time, and the Committee is still actively cooperating with the Planning Commission in the development of recommendations for a continuous extension of this important safety program.

Where Major and Secondary Highways cross main rail lines, we must sooner or later face the necessity of eliminating the hazard at these crossings by complete separation of grades in almost every instance. The order in which these separations of grade should be constructed will, of course, depend upon relative volume of traffic, relative conditions of hazard, and other pertinent facts. Consideration must be given to the safe and expeditious movement of both rail and vehicular traffic, and to the economics of the investment required to make the separation. Consolidation of main rail lines, would, of course, enormously simplify and reduce the cost of this program.

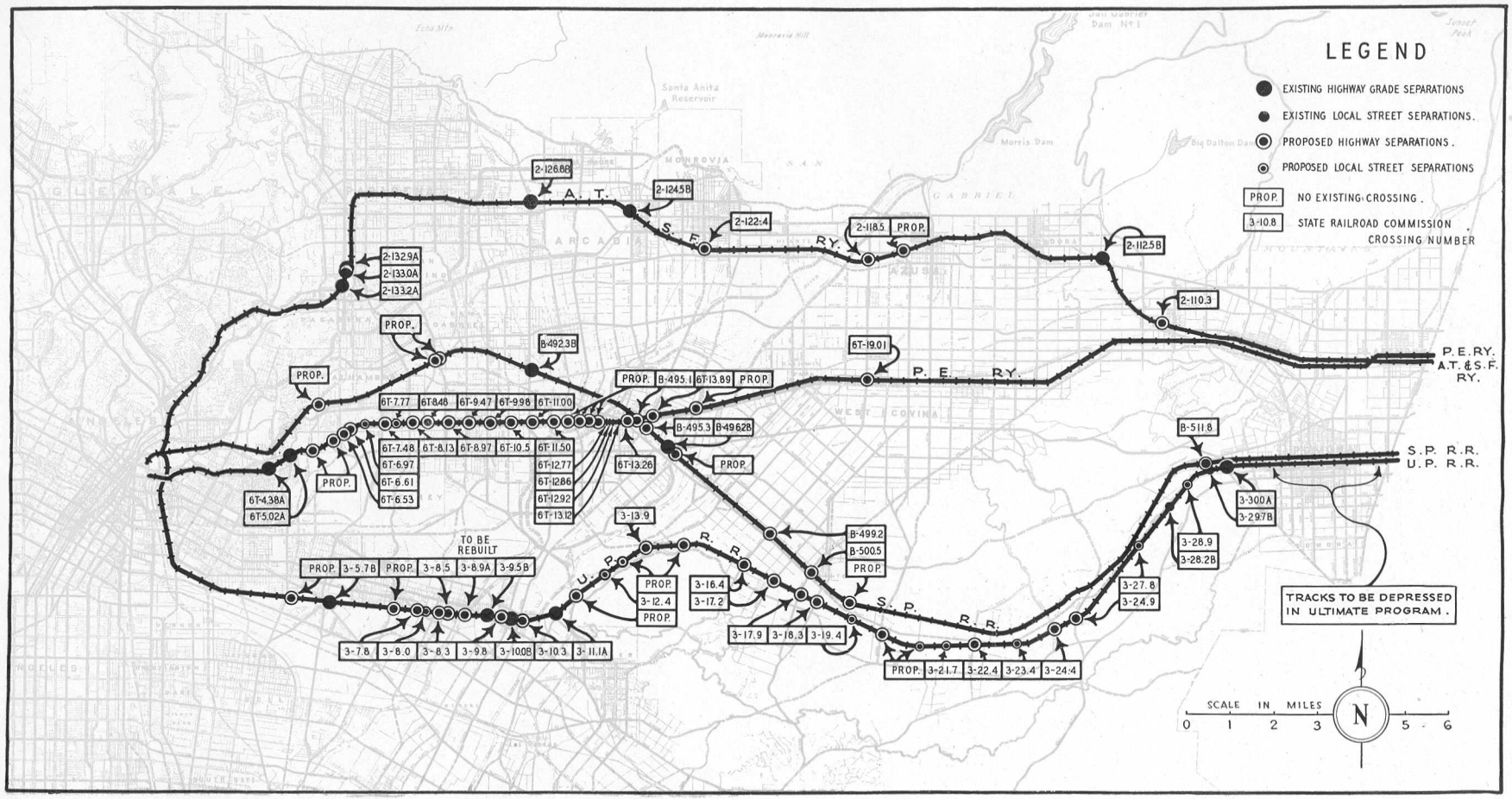
As has been pointed out above, due attention should be paid, in working out such a program, to the relative importance of separation of grades at certain intersecting Major Highways, which because of the heavier traffic in both directions may even take precedence in their economic importance over certain railway grade separations.

Where the approaches are level with clear views, the construction of an underpass may well be deferred as long as the traffic is and continues to be relatively light. At points where accidents occur frequently or where the traffic upon the highways and railroads reaches a volume such as to make the delays of waiting economically important, the project for grade separation must be given a high priority rating.

The adoption of a completed Master Plan of Highways offers a basis for the formation of a systematic Grade Separation Plan in accordance with a properly worked-out financial program. A definite amount of money should be set aside each year to carry out this program.

DEVELOPMENT OF ADJACENT LANDS

One of the most persistent and difficult problems faced by the Regional Planning Commission from the time of its organization has been a workable and equitable policy of lands fronting directly upon the miles of traffic arteries in this county. The facts regarding the overabundance of so-called business lots on major highways—the miles of vacant business properties—



San Gabriel Valley Grade Separation Plan

are well-known. The question is more than one of zoning, however.

It has frequently happened that improvements intended to promote speed, facility, and safety of travel have encouraged a type of roadside development which has produced the opposite result. The mixture of local traffic movement with through travel because of the extension of scattered business development along the highway is a serious matter. The recent experience of the State Highway Department in the development of Garvey Avenue is a well-known illustration of the loss of community value which occurs in this way. Here a fine new highway was built only a few years ago through open country to relieve congested parallel roads. It represented an investment of $1,500,000 and is now cluttered up with roadside business to such an extent as to reduce its capacity by at least 50%, according to estimates of the State Highway Department.

The heavy investment which the public has made in these thoroughfares justifies the adoption of appropriate measures to protect that investment against such a complete defeat of its purpose. This can be done only by a combination of proper design of the highway itself with effective control of the subdivision and zoning of adjacent property.

PROTECTION BY ZONING

The Regional Planning Commission has made numerous attempts to control this situation by various means. No one method has proven suitable to all of the conditions ecnountered along the course of any typical thoroughfare. One of the earliest of these attempts occurred in 1934 when the Commission procured adoption of a section of the zoning ordinance restricting the use of the borders of Garvey Avenue, from West Covina to Pomona. Limiting the use of this highway frontage to agriculture and residence only, this ordinance prevented repetition of the disastrous loss of values on the western portion of this state highway. The benefit in this case has been readily admitted by authorities and public alike, but the extension of the principle to other highways

The Park on Santa Monica Boulevard, Beverly Hills

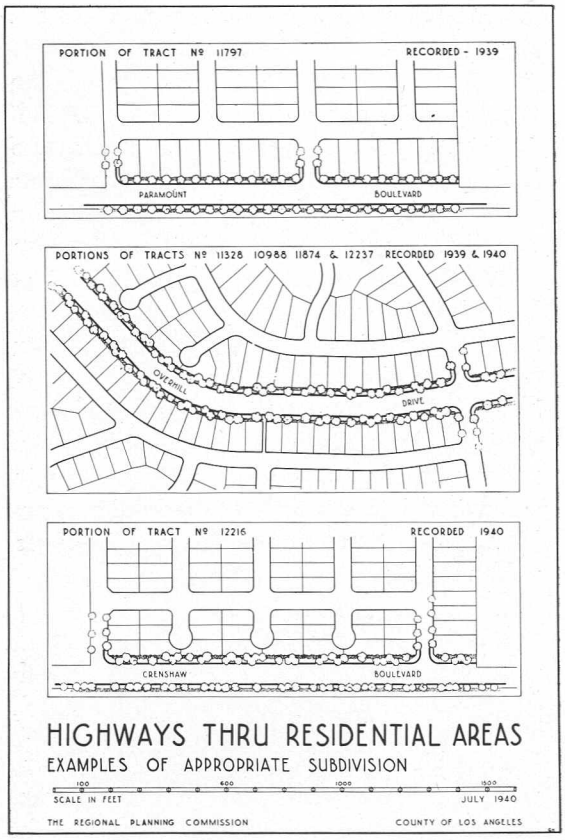
in the face of strenuous opposition has been so slow as to seem unconvincing. Nevertheless a number of miles of highways have been so protected under less publicized conditions.

Even earlier, in 1933, the Commission had made another attack on the problem when the first county subdivision ordinance was adopted. This law required that in any new subdivision lots fronting upon any major or secondary highway should be not less than 140 feet deep. Substantially greater than the minimum of 100-foot depth, required for other cases, this requirement was made for the purpose of permitting deep setbacks and front yards in order to preserve the usability of such lots for residence and multiple residence purposes.

In 1938 the Subdivision Ordinance was amended, adding the further provision that alleys must be provided at the rear of all lots fronting on highways and less than 190 feet deep. This policy insured that highway frontage property would be suitable for multiple dwelling use, having a sufficient depth (from 140 feet to 190 feet) and access to garages from the rear. Throughout this period and without any ordinance authority, the Commission also sought to influence subdividers to lay out service streets or setback parking spaces adjacent to highways in recognized business districts. Only a few such developments were attempted, however, and they offered no conclusive evidence as to the success of the method.

ELIMINATION OF ABUTTING LOTS

Frank acceptance of the problem indicated the need for still more drastic methods, however. When the city of Beverly Hills in 1930 bought all of the vacant lots along one side of Santa Monica Boulevard and Wilshire Boulevard, for a distance of nearly two miles, and developed them into a heavily planted park, a new method workable under a variety of circumstances was discovered. The heavy planting was found to form an effective screen against the noise



and confusion of the highway, which enhanced the values of adjacent residence property. Subsequently, various subdividers were induced to establish similar, but narrower, planting screen strips along various busy highways when an attempt to develop business property would have been dubious at best and might have meant failure of the subdivision financially. In every case the properties adjoining these "parks" sold for substantially greater prices than other lots in the tract, where the same land, if made into business lots fronting directly on the highway probably could not have been sold at any price.

The Commission has now made the last method a general policy for new subdivisions, to be followed in all cases where previous neighborhood development would not be adversely affected. It is further generally required that lots back on to the

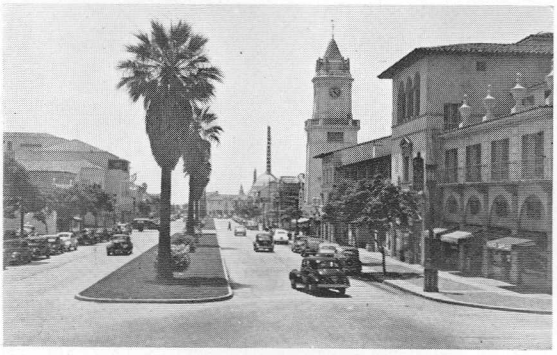
planting strip (rather than side upon it) and that no right of vehicular access is established over the planting strips. This policy together with one of creating blocks of 1000 feet in length, to reduce the number of highway intersections, is keeping numerous sections free from the constriction that usually accompanies subdivision development. The acceptance of the essential idea by subdividers has proven the method to be both sound and workable. Several examples of the application are shown on page 69. The successful use of any of these devices depending upon the subdivision process incidentally points out the necessity of having determined both the land use and highway patterns well in advance of development.

COMMERCIAL CENTERS

Where an incomplete highway passes through a major commercial center which is already highly developed with high land values and substantial buildings, widening and rebuilding can be undertaken only under extreme necessity. On the other hand, pedestrians are numerous and vehicle parking on the roadway practically unavoidable. Here the solution is one of avoidance. The congestion caused by parking can be somewhat relieved by provision of off-street parking while "through" traffic can be directed around the congested section by some by-pass route.

In another case, such as in downtown sections, the development of purely commercial traffic on the city "Main Streets" results in their classification as Major Highways regardless of the practicability of eventual widening to accommodate six lanes of traffic.

Where it is expected that small business centers will develop around the junction of important highways, the Commission has recommended provision of additional width of right-of-way for service drives and the separation of high speed and local traffic. Obviously, this procedure can generally be used only in the process of developing raw land in subdivision, as suggested above.



Divided Highway in a Business District

There are, in addition to the problems of business and residence, less troublesome considerations in areas where other uses are probable or established.

INDUSTRIAL AREAS

In industrial areas, sidewalk space is less necessary, and heavy vehicles predominate. Along a few sections, any attempt to provide for tree planting would be incongruous, but in many cases where highways merely pass through industrial districts, it is entirely feasible to apply the principle of the planting strip just described, with the property backing to the planting strip and fronting upon some other street or highway. The absence of poisonous fumes or smoke, typical of Los Angeles County industrial districts, makes it possible to maintain trees and shrubs as easily as in any other section. Even where the industry fronts on the highway, frontages are often extensive, with comparatively few driveways, and the benefits of landscaping can be enjoyed. The Goodrich Tire Co. plant on East Olympic Blvd. is an excellent example of such development by industry itself.

The traffic on industrial highways is likely to have a high proportion of slow moving vehicles and is best accommodated by the early provision of four-lane and six-lane pavements. The layout of the industrial land itself should be adapted to the use, and so arranged as to minimize the number of cross streets and railroad crossings.

The complete segregation of traffic, so that heavy trucking is given the exclusive use of a highway, while passenger vehicles only move upon a parallel route, has been given some consideration in planning highways to and from industrial areas, but no specific recommendation to this end has been made so far. It is anticipated that one or more of the highways adjoining major industrial areas with the Harbor District, and at least one through line each to the East and North will have to be designated as primarily for truck movements. The actual designation of such truck highways is, of course, a matter of traffic administration, but the necessary regulation is based largely upon the comprehensive plan.

PRESERVATION OF RECREATIONAL VALUES

The highway is not, in spite of its usefulness, a purely utilitarian device. Once used almost exclusively for necessary travel, today it also serves important recreational purposes. Not only do we use it to reach our playgrounds, but also we have come to expect to derive pleasure from the journey itself. For many of us the time of vacation is a time when we spend hours upon the highways.

To design a highway system without availing ourselves of the specialized knowledge and ability of the Landscape Architect is to fail of completely effective achievement. It has been the intention of the Commission to design individual rights-of-way and the system as a whole for a combination of utility with a pleasing appearance. To add character and beauty to the basic necessary features costs but little, for the methods of good design for safety and efficiency are themselves conducive to an intrinsic beauty. In most cases only a reasonable degree of foresightedness is necessary to accomplish the appropriate development.

More necessary than extensive plantings are policies and means of protecting the landscape values outside the right-of-way. In some places, as previously mentioned, the Commission has made effective use of zoning to establish a strip on either side of the highway in which ordinary residential and agricultural pursuits are permitted, while, except at specified locations, commercial structures are prohibited. The elimination of billboards and other signs and confusing lights has the added value of materially contributing to safety as well as to improved appearance.

Where the topography is more or less rugged, a series of curves in themselves pleasing to the eye generally proves to be the economical method of construction and maintenance. The center strip advocated for safety purposes also offers a convenient opportunity for the introduction of low shrubbery of an inexpensive and easily maintained character. In some cases the Highway Plan calls for a parkway development with additional right-of-way to be used solely for the enhancement of the recreational values inherent in the physical situation.

PROPER ROADSIDE DEVELOPMENT SAVES MAINTENANCE COST

State legislation now empowers the State Highway Commission to improve the roadways through such plantings, care, and replacements as may be required. The Division of Highways has done much excellent work in recent years planting roadside trees and covering embankments to prevent erosion of the slopes, and officials do not hesitate to say that the expense has been in trivial proportions and the results extremely satisfactory. All our highways deserve this treatment.

Beauty is not a luxury. It is a necessary part of good living conditions. More than that it is a valuable commercial asset. It pays for itself in increased self-respect, in attractiveness to visitors, and in stabilized property values. The demand for elimination of downright ugliness in our metropolitan areas is on the increase, and it is

difficult to find any valid reason why highways should not be made comfortable and pleasant, as well as safe and efficient.

SUMMARY

The factors affecting the width and number of lanes, safety provisions, recreational values, and adjustment to adjacent land uses as items in highway design have been briefly outlined. The combination of all these items leads to a determination, then, of the width of right-of-way that will be needed under any particular circumstances. The Commission has found that various combinations of them to fit specific conditions can usually be arranged to come within a standard width of 100 feet in the case of Major highways, and 80 feet in case of secondary highways.

When special circumstances, such as a railroad or a bluff skirting the highway, make the planting strip, or sidewalk (or both) unnecessary on one side, the total width may be correspondingly reduced without loss of efficiency. In other cases, such as those involving parkway development, central dividing strips or provision for a "clover-leaf" type of intersection, greater than normal widths are recommended.

Through the preparation of a complete, logical, and thoroughly tested Plan, such as that here presented, these rights-of-way can be acquired normally in advance of critical need, but only when the interest and active support of all concerned is continuously assured.

Stripped down to its bare legal essentials the Master Plan of Highways is simply a map showing one thing only; it designates the lands which are to be used (acquired if not now in public ownership) for highway purposes. It is not officially concerned with the details of the construction which is to be placed upon that land. But good planning practice goes beyond the limits of this narrow theory of what constitutes a Plan. The broad recommendations are based upon a sound design for the physical structure within the right-of-way lines chosen, as well as upon an accurate knowledge of costs, methods of financing, and budgetary limitations.

TABLE 6

STANDARD HIGHWAY CROSS-SECTIONS

Width of	Local Street	Secondary Highway	Major Highway
Right of way	60′	80′	100′
Pavement	36′	56′	76′
Divided pavement	0	2@24′	2@35′
Division Strip	0	8′	6′
Sidewalk and Planting strip	12′	12′	12′

The relation between the number of vehicles per day and the capital investment that can be justified for the installation of high-type pavement, or for re-alignment to save a mile of distance or a minute of time, becomes a definite problem in highway economics. The engineer must know the volume of expected traffic, the capacity of the highway he designs, the effect on total capacity of the speed of the individual vehicle, and how to make each dollar invested in a highway yield a maximum of safe transportation at a minmum of operating expense. He must arrive at a just balance of expenditures between the great arteries of traffic near the center of the Region, the main-travelled routes connecting it with the rest of the country, and the less highly developed but equally important highways interconnecting the parts of the region.

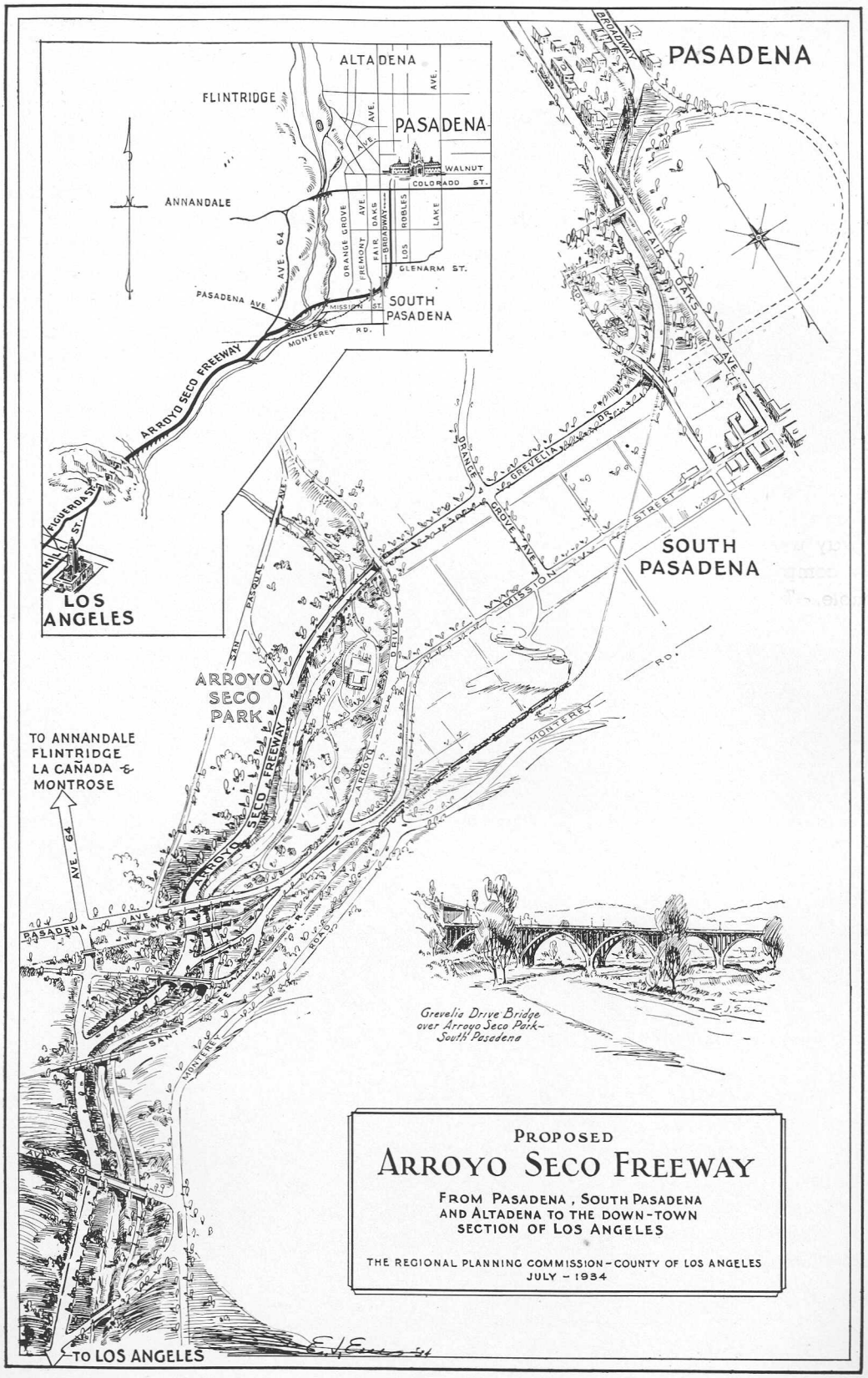
No single solution as to design fits all the requirements. Different highways serve different functions. Some are primarily for trucking movements, others for the internal business and social movements of the urban population. Still others serve principally for access to recreational areas or cultural centers. Some serve people moving into, out of, or through the Region in long-distance travel, and others accommodate mainly the daily flow inward and outward of the urban workers and shoppers, or the lighter load of traffic between sub-centers or rural areas.

It is not always practical, or necessary, to completely segregate these types of traffic, but it has proven possible, by the application of the principles of sound engineering design, to adapt each such highway to the function that has been determined to be predominant.

Further, the Commission has given constant attention to the interrelation between highway uses and adjacent land uses, and of the comprehensive Plan of the Region as a whole. The Region has been considered at all times as a single, great productive industrial enterprise, whose capacity to develop efficiently depends upon the proper arrangement and design of facilities for internal and external communication.

And all this must be done in such a way as to produce not only an efficient mechanism but also, since the Region is our home, a sightly and pleasant place in which to live. The highway itself need not be ugly, and when well conceived it will enhance, not exploit, the landscape.

Transformation from Street to Highway


ALTADENA
FLINTRIDGE
PASADENA
WALNUT
COLORADO ST.
ANNANDALE
ORANGE GROVE AVE.
FREMONT AVE.
FAIR OAKS
BROADWAY
LOS ROBLES
LAKE AVE.
GLENARM ST.
AVE. 64
PASADENA AVE.
MISSION ST.
SOUTH PASADENA
MONTEREY RD.
ARROYO SECO FREEWAY
FIGUEROA ST.
LOS ANGELES
PASADENA
BROADWAY
FAIR OAKS AVE.
ORANGE GROVE BR.
GREVELIA
ORANGE GROVE AVE.
MISSION STREET
SOUTH PASADENA
SAN PASQUAL
ARROYO SECO PARK
MONTEREY RD.
TO ANNANDALE
FLINTRIDGE
LA CAÑADA &
MONTROSE
AVE. 64
PASADENA AVE.
ARROYO SECO FREEWAY
SANTA FE
MONTEREY RD.
TO LOS ANGELES
Grevelia Drive Bridge
over Arroyo Seco Park-
South Pasadena
PROPOSED
ARROYO SECO FREEWAY
FROM PASADENA, SOUTH PASADENA
AND ALTADENA TO THE DOWN-TOWN
SECTION OF LOS ANGELES
THE REGIONAL PLANNING COMMISSION - COUNTY OF LOS ANGELES
JULY - 1934

V

HOW CAN LOS ANGELES COUNTY COMPLETE THE HIGHWAY SYSTEM PLANNED?

While the Highway Plan for the entire Region is here formally published for the first time, it has existed in substantially its present outlines for over fifteen years. Many routes, which in those first years of the Commission's existence were merely colored lines on paper, are now heavily travelled thoroughfares of increasing value to the Region. Among these are the new Foothill Boulevard, Sepulveda Boulevard, Ramona Boulevard, Colorado Street (Pasadena) extension into Huntington Drive, Rosemead Boulevard, the Garvey-Holt connection into Pomona, the Weldon Canyon cut-off, State Street through Wilmington and Long Beach, Florence Avenue, Manchester Avenue-Firestone Boulevard, Lincoln Boulevard, Roosevelt Highway, and a great many others of equal importance.

PRESENT STATUS OF THE PLAN

The present status of the work of carrying out the Plan is illustrated in the accompanying four Plates. The first shows (for the Metropolitan Portion of the Los Angeles County Regional District) those portions of the present Major* Highway Plan which were open to travel (without regard to width of either pavement or right-of-way) at the time when work on the Plan was begun (1923). The second shows, by the addition of portions which were opened to travel since that time, the present status of the Plan.

The third plate shows the portions of the Plan upon which no right-of-way has yet been acquired. It represents, then, the task (again disregarding widenings still required on existing highways) remaining to be done. The composite view in the fourth plate shows the completed network. These four plates give dramatic evidence of the immense betterment in the system of communicating thoroughfares that has resulted from the efforts expended heretofore, and of the no less striking improvement that will follow the acquisition of the relatively small portion not yet opened.

It was not possible to show in the same way the much more complex situation with reference to the widenings of existing narrow streets. But progress in this respect has been equally important, and is well known to all who have been users of the highways during the past seventeen years.

COMPLETION OF THE HIGHWAY SYSTEM

It is now proposed to give partial answers to the last two questions propounded at the end of Chapter I:

(a) When must these highways be provided?

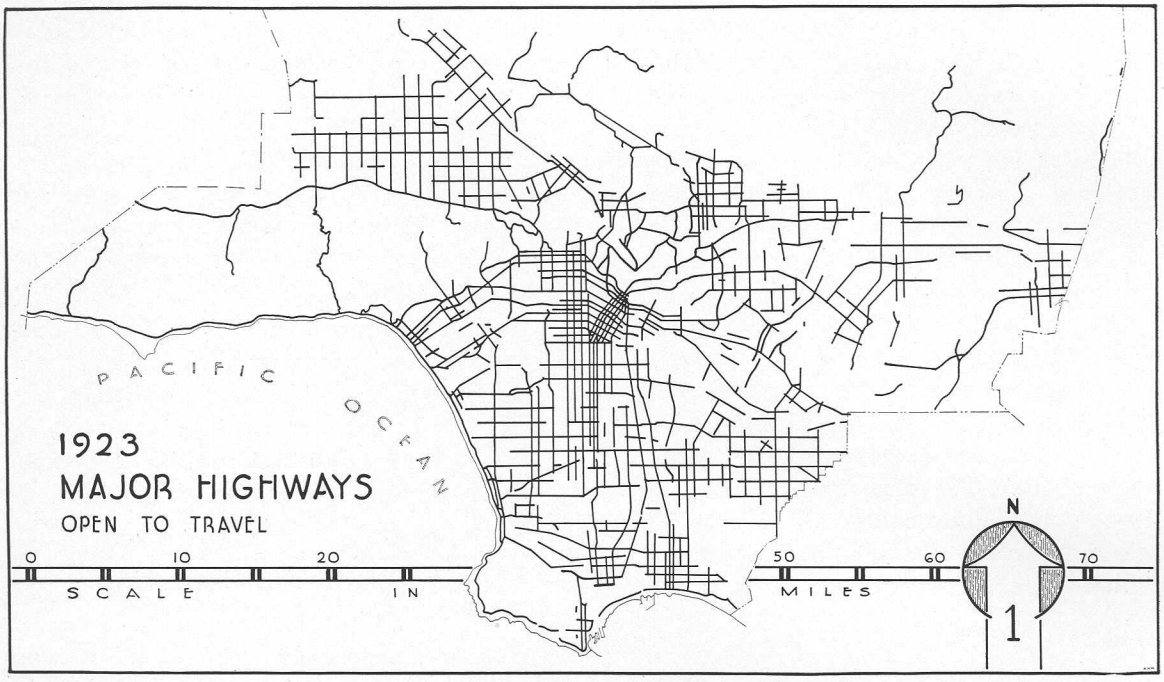
(b) How can the region pay for them?

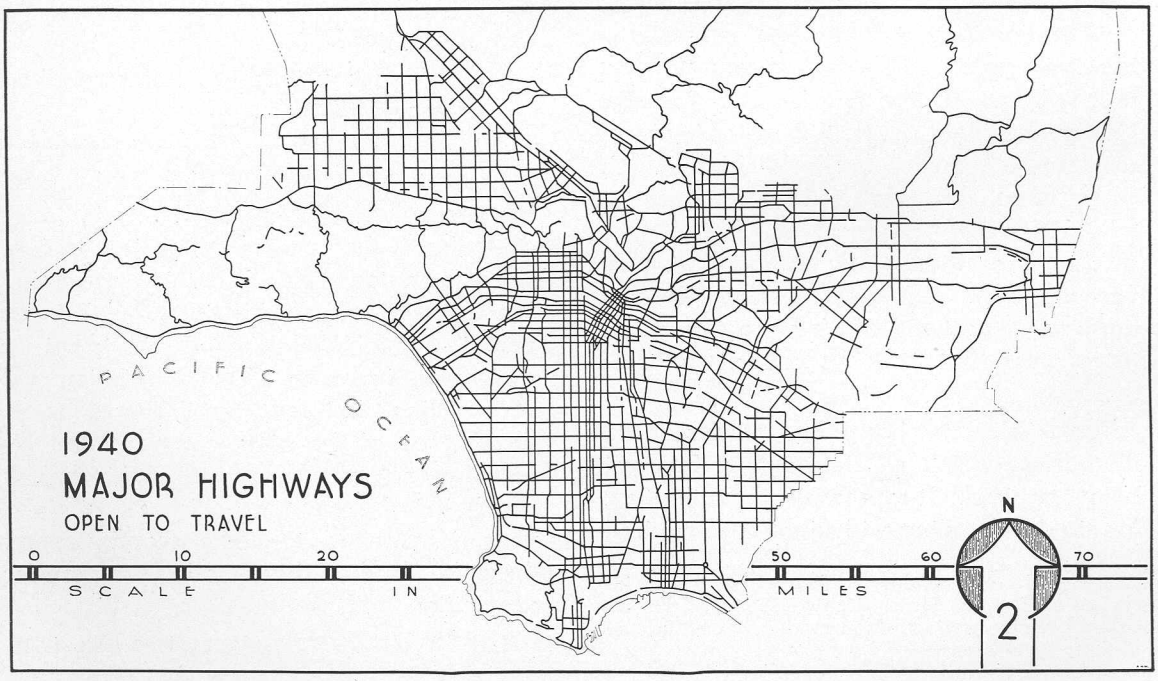
These two questions of time and financing are so completely involved with each other that it seems more convenient to consider them together. Work is now going forward to assemble and tabulate the vast amout of detailed data necessary to set up a complete inventory of the acquisition and construction that remains to be done to develop all of the highways proposed by the Master Plan. Volume II of this report, which it is hoped can be issued within a year, is planned to contain and present these data and a fairly detailed program for acquisition and construction.

The final answers to these two questions

*Some of the Secondary Highways have been included, and a few Major Highways omitted for the sake of clarity in view of the extremely small scale of these drawings.

METROPOLITAN AREA
DEVELOPMENT OF
BASED ON THE

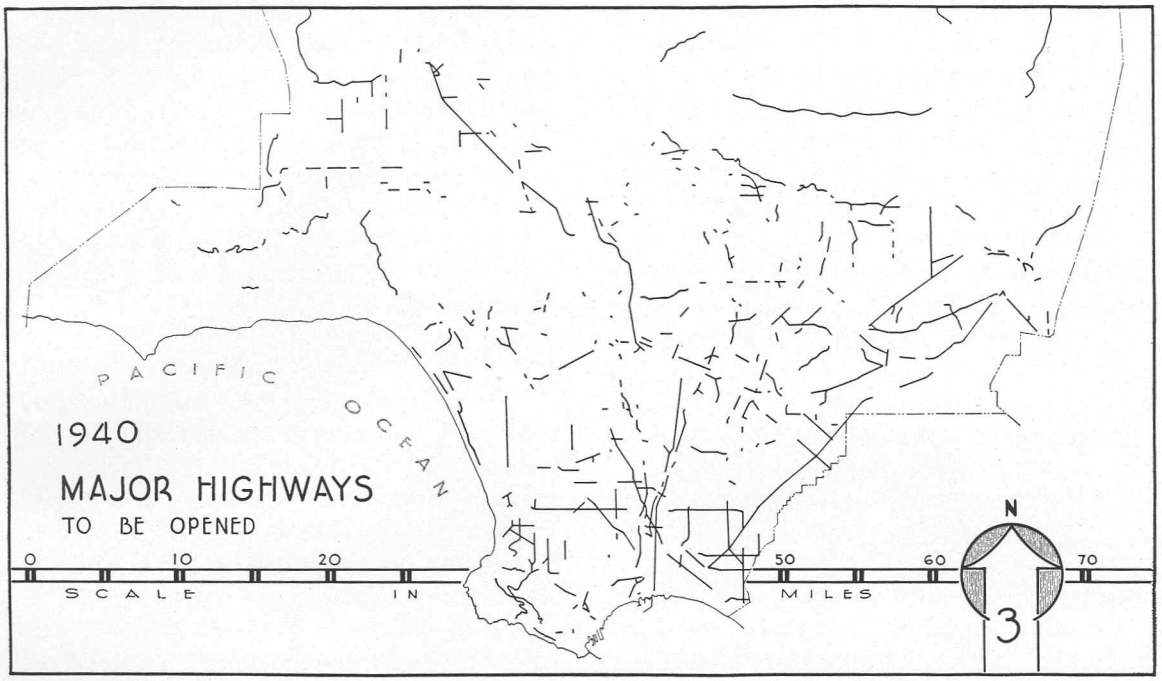


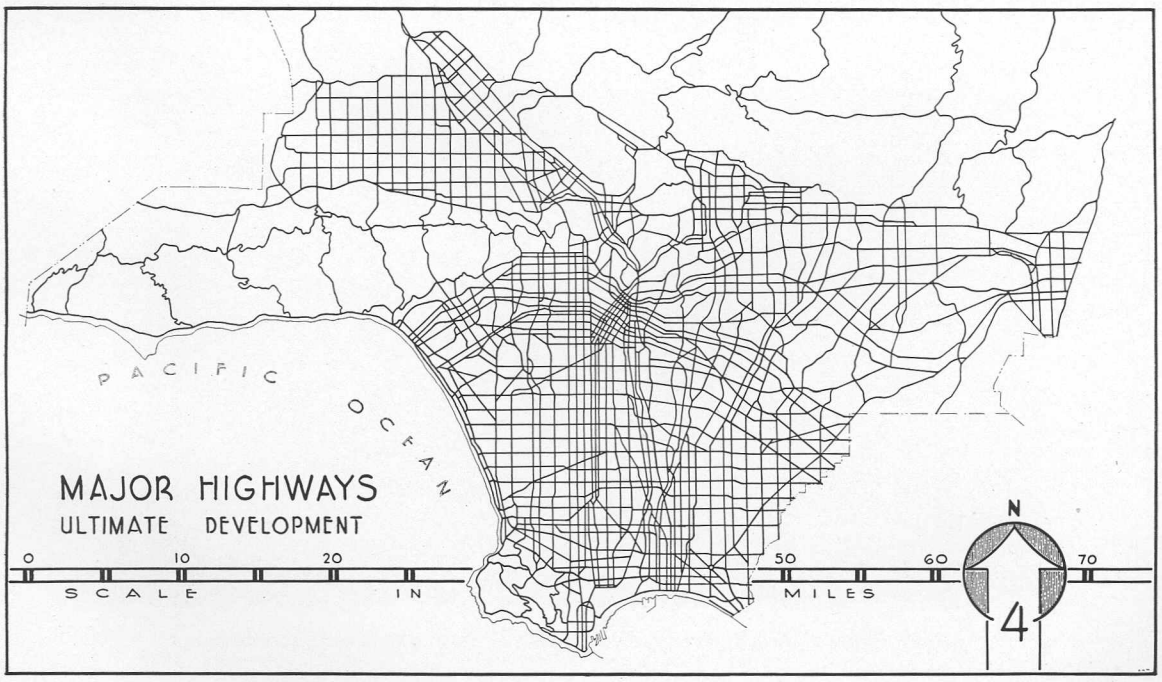


COUNTY OF LOS ANGELES

MAJOR HIGHWAYS

MASTER PLAN





will then be given in Volume II. The financing program contemplated is to be set up in such form that it can be easily and quickly brought up to date each year, and published as a brief annual supplement. Obviously many critical factors will depend on conditions changing from year to year. Population demands will probably increase fairly steadily but population shifts are sometimes sudden and must be observed from year to year. Financial ability of the region is subject to wide fluctuation with those of general business conditions and yet is notoriously affected by the necessity for carrying on work relief projects in times of low employment.

The proper form of a priority program for highway construction is therefore a statement of a very generalized long-term program subject to refinement for only a very few years in advance and subject to detailed application for only the one or two years within which available funds and community needs can be anticipated with any degree of accuracy.

FACTORS INVOLVED

The elements that have to be balanced in arriving at a plausible program of further development of highways according to the adopted plan consist on the one hand of costs and on the other hand of available resources. Considering first the matters of cost we find that these are divided into two main categories: the acquisition of land and construction of improvements, each of which is materially and independently affected by the question of timeliness and methods of procedure.

The best time for acquisition may, and frequently does, occur long before the time for any substantial improvement. Again, a construction item may sometimes be installed earlier than would otherwise be advisable because of the pressure of some related development such as a necessary storm drain, or the necessity for providing employment.

LAND ACQUISITION

The costs of acquisition of right-of-way need not be the staggering amounts that are associated with ill-advised special assessment districts. There are a number of less expensive and more equitable procedures which can be, and are, used constantly in the majority of cases.

The first of these methods is dedication of right-of-way by the land subdivider at the time the district in question begins to

Garvey Avenue at Atlantic Boulevard, 1929, Showing Set-Back Building

develop. Here the land required for a highway is still held at a low valuation. Since, moreover, with a few notable exceptions, the subdivider profits from the commitment of the city or county to improve the highway at some undetermined future date, he is ordinarily willing to dedicate the necessary land. He would need to dedicate and develop the minimum local street in any case in order to provide frontage for his lots, so that the cost to him is represented only by the difference between the width of the local street and the width of the highway.

DEDICATION AT NO COST

In this class of acquisitions the cost to the public is so low as to be entirely negligible, consisting entirely of an indeterminable and exceedingly small portion of the cost of carrying on the activities of the planning and engineering departments in particular. In this way Los Angeles County has acquired some 140 miles of right-of-way for major and secondary highways since the formation of the Regional Planning Commission in 1923. The process has been duplicated in practically all of the 45 cities in the county during most of that time, as well, although figures on such acquisition are unavailable.

This method applies to both widenings and original full width acquisition. Many of the most expensive projects have been cases of widening old streets lined by solidly built up private buildings. The widening, in subdivision of narrow country roads, before such building has occurred represents a future saving to the public of many millions of dollars. Of the 140 miles above mentioned, 75 miles is made up of widenings while 65 miles is composed of segments of full width right-of-way 80 or 100 feet wide.

PROTECTION OF RIGHTS-OF-WAY

Subdivision procedure calls attention, moreover, to one aspect of protection of the plan; under the Subdivision Map Act the planning commissions can prevent the subdivision into building lots of land within a planned right-of-way. In general under the Planning Act, the county or cities having once adopted a Master Plan of Highways can prevent misuse of proposed highway rights-of-way in certain other cases. They may prevent the construction by any public agency of such things as a school building or pumping plant, for example, within such a planned right-of-way.

A second method of acquisition results in

Garvey Avenue at Atlantic Boulevard, 1941, Small Land Cost for Widening

Sunset Boulevard, 1936.

comparatively low cost. Many miles of existing but narrow highways in Los Angeles County have been "protected" by the adoption of building setback line ordinances. In general these ordinances require that any new buildings be located not nearer to the street than the planned right-of-way lines. After the passage of some years the effect is quite noticeable, only a few old buildings extending out beyond the proposed street boundary. When the time is ripe for acquisition of the land for widening, the public is saved the high cost of condemning and demolishing or remodelling buildings or portions of them. This is a substantial saving, even in comparison to the cost of the land, in cases where the land must be bought. In many instances, however, the land is deeded at only nominal cost to the county or city, since the abutting owners are anxious to have the benefit of the improvement.

One notable example of the success achieved in using the setback line procedure is the experience on Sunset Boulevard in West Hollywood. One of the most important traffic and business streets of Hollywood, this westerly extension becomes the most important route from Hollywood to the beaches and the Coast Highway. Just west of Hollywood proper, it runs through unincorporated but very highly developed territory for a distance of slightly more than two and one half miles. A building setback line ordinance on this portion was adopted in 1928, to protect a proposed 90-foot right-of-way from any further building. While the ordinance has been materially amended by new ordinances adopted in 1935 and 1936, the essential feature of preserving a 90-foot width clear of new buildings was maintained, and there was, in fact little building construction on the frontage from 1925 to 1936.

A NEW BUSINESS DISTRICT DEVELOPS

Since that time, however, has occurred an amazing building development, creating an entirely new and unique business district of more than local importance. For purposes of analysis a small portion, but a generous and typical half-mile sample, has been studied to determine the economic effect of the observance of the building setback lines. It should be noted, at this point, that because of rather unusual conditions, the development of the new business buildings in most of the two and one half miles has been carried on under the procedure of variances from the zoning ordinance. This procedure incidentally partly accounts for the architectural excellence and distinction of the buildings, since the Commission

Sunset Boulevard, 1941

was able to impose conditions on the variances granted. More to the present point, it strengthened the application of the setback line ordinance.

In the half mile stretch from Holloway Drive westerly to Cory Avenue which is here analyzed the property had been put in a C-2 business zone and the variance procedure was not necessary. Nevertheless the development in this section is entirely comparable with the other portions of the street. Within this section the setback line as finally fixed provided (with a slight exception) for all of the widening (thirty feet) to be made on the north side of Sunset Boulevard.

In 1928 there were on the north side eighteen business buildings, and five houses. These occupied a total frontage of 750 feet, of which 390 feet were occupied by buildings, major portions of which projected into the 30-foot strip needed for widening. 225 feet were occupied by buildings of which only porches or minor sections projected, while on the remaining 135 feet the buildings were entirely back of the setback line.

SAVINGS THROUGH SETBACK LINES

By 1936 some old buildings had been removed and a number of new ones had been built. At this time there were seventeen store buildings, one building-stone yard and only three houses within this half-mile strip. While there were thus only two more buildings than before, the new ones were generally larger and more substantial than the old ones, and the entire group occupied considerably more land. Buildings removed and not replaced had had a frontage of only 110 feet, and the new ones occupied frontage of 890 feet, increasing the total building frontage by 780 feet to a total of 1530 feet. At the same time the frontage of structures projecting into the widening strip was reduced from 615 feet to 505 feet.

In the winter of 1935-36 the County of Los Angeles acquired the thirty-foot strip necessary for widening at a total cost of $47,195. Of this amount $39,395 was chargeable as damage to existing buildings which had to be remodelled or removed. If the 890 feet of new buildings had been erected within the widening strip, and if the new buildings had been of value only equal to the old ones, the damage to buildings at this time would, therefore have amounted to $140,000.

Actually, however, the new buildings are of much greater value than the old ones. A sampling of the assessed values as of 1936 shows that the value per front foot of the new buildings was approximately 4.2 times that of the old ones. The conclusion

is, therefore, that in this half mile of development the saving due to the application of the setback line amounts to at least $385,000.

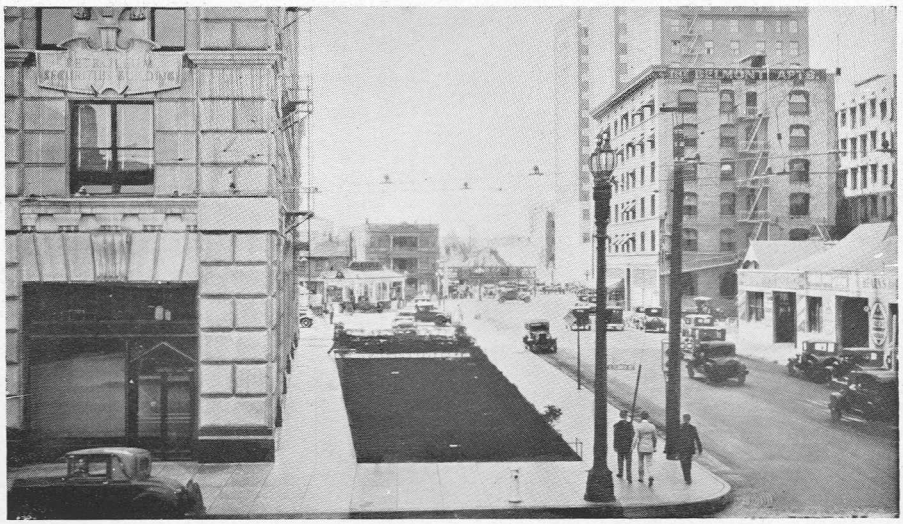
ACQUISITION BY DEED

It has been noted in the foregoing that the protection of rights-of-way is sometimes followed up by transfer of the land necessary for widening by a deed given by the private property owner to the County. This is also true in many other cases of widening or even entire rights-of-way where no setback line ordinance nor subdivision is involved. In many cases where the County has had funds available for improvement but not sufficient to cover the cost of acquisition this process has been mutually beneficial to the private property owner and the public (that is, the County) alike. The land owner has in many cases been anxious to have his property served or opened up by a highway and has therefore been willing to "give" the land to the end that the County would "give him" the desired improvement in return.

In certain cases entire rights-of-way of considerable extent have been so deeded by a single large land-owner. The most interesting case, however, is that of Durfee Avenue from the Southern Pacific Railroad east of El Monte, northeasterly to San Bernardino Road, a distance of about a mile. Several years ago seventeen different owners of acreage lying along both sides of the center line of this proposed highway agreed among themselves to deed to the county strips forty feet wide to make an eighty foot right-of-way upon which the County would gradually develop a mile long extension of the existing Durfee Avenue. It was further agreed that as the acreage was subdivided an additional 10 feet would be dedicated on each side, to make the final width one hundred feet. To date eight of the original parcels have been subdivided and have observed this latter provision. Some of the original deeds, moreover, granted a 50-foot width so that now the entire highway right-of-way is 100 feet wide, with the one exception of 300 feet of frontage where a ninety foot width remains.

SAVINGS THROUGH COOPERATION

Simultaneously a similar combination of subdivision dedication and deeds opened the remaining strip of 450 feet from the existing end of Durfee Avenue at Pomona Boulevard northerly to the Southern Pacific Railroad, with a width of 100 feet, making



Olympic Boulevard and Flower Street, 1929, Set-Back Ordinance Effective

the highway extension of a little more than a mile virtually complete. It is estimated that the saving in acquisition cost in this instance may lie anywhere between $30,000 and $100,000*, depending on the intensity of development at the time of a hypothetical acquisition.

On this right of way the County has constructed to date a medium grade pavement, twenty feet wide plus graded shoulders, to accommodate the traffic which is still of local character since no crossing over the Southern Pacific Railroad has been authorized. Once this crossing, or preferably, a grade separation, is opened, the County will be ready to proceed with final development of a high grade permanent pavement.

By this method a very useful link in the highway system is being created at only slight cost to either the abutting land owners or to the County as a whole. This procedure is being duplicated constantly in countless places throughout the County, although there are few places that present such a concise picture for any considerable length of highway. It is further to be noted that this method of "exchanging" pavement for right of way is also used extensively by the State Division of Highways, as well as by some of the cities, with comparable savings in the cost of acquisition.

*This is conservatively low. Average cost for highway condemnation over a ten years' period was $117,000 per mile.

TRANSITION OF USES

Taken together the three methods of acquisition discussed above have a larger effect than has yet been indicated. The change in the use of property from farm land or open country to highly improved city lots is a great one. It usually takes place gradually. It is, therefore, rarely desirable to accomplish the transition from country road to city highway at a single step. The essential thing is to foresee where such development is going to be needed, to formulate the Plan while the property is still undeveloped, and to adopt policies which will gradually, progressively, and economically bring about the desired results.

As a typical right of way stretches out into open rural areas, there is a time when a simple dirt road meets the needs of the occasional vehicle. There are no fences, and the fields of hay grow right up to the edges of the road. Later as more uses justify, a light 20-feet pavement accommodates safely traffic up to 500 vehicles, or

Olympic Boulevard and Flower Street, 1941, the Widening Job Completed

more, per day, shoulders are graded and drainage provided for, and perhaps some trees are planted. The existence of the Plan permits those in charge of the work to know exactly where these trees should go, so as allow for future development. As the number of people using the road grows, and little urban communities develop at intervals, traffic increases, and the time comes when there is economic justification for four lanes of heavy paving, so as to allow for a segregation of the fast-moving through traffic from local activities. (See illustrations on pages 58 and 60.)

There is constant comparison with other highways as to relative need, and when our typical route comes to the top of the priority list, this additional construction is provided for in the annual budget of the governmental agency concerned. Perhaps the decision is made at this time to establish a central planting strip to separate the traffic moving in opposite directions. Then, at the intervals where urban uses occur, additional paving is provided for parked vehicles, (or for service roadways where there are commercial uses) and curbs, gutters, and sidewalks are put in as locally needed. All this time the trees have been growing, and crops too, in the rural sections. When at last the ultimate development is economically justified and takes its place in the budgeted program, there are no buildings to condemn, no costly fragments of land to acquire, no fine old trees to remove. Even the gas, water and sewer lines are rightly* placed as, and when needed.

Everybody gains by this sensible process. The highway will have created values in the land it served, but the public will not have been forced to pay again, in condemnation suits, the very people to whom these values accrue. Frontage is still frontage, whether 20 feet forward or 20 feet further back. The farmer has been allowed to till the soil, and the suburban dweller to keep green his lawn, right up to the line of an ordinary 60-foot street, as long as they could have done under the delayed acquisition procedure.

*Modern practice calls for duplication of mains for various utilities on opposite sides of wide highways, to shorten service lines and eliminate constant cutting into heavy pavements.

PURCHASE

In spite of the great economies effected by the above procedures purchase of highway rights-of-way remains the most common method of acquisition for urgently needed highways. The operation of the other methods implies generally a gradual accretion of miscellaneous portions of right-of-way, scattered throughout the County. While subdivision dedications have added 140 miles* of major and secondary highways during the past 18 years, it has been necessary for the County (including city and state agencies) to acquire during that time many more miles of right-of-way in other locations for urgently needed construction projects.

In such cases of immediate need the necessary land must usually be bought, and the procedure of eminent domain is used. Strictly regulated by law to protect the interests of the private land owner and public agency alike this procedure is undoubtedly fair, but it obviously adds to the cost of the land acquired the expense of the court proceedings. A recent check of condemnation costs on a variety of County highway projects totalling almost two and one-half million dollars revealed that the expenses of the legal proceedings amounted to five per cent of the total cost. For example, for every thousand dollars awarded to a land owner, the cost to the County was $1,050.

In many cases, therefore, it pays both the property owner and the official agency to negotiate direct, eliminating the expense of a court action. In actual practice it has been found that needed land may sometimes be purchased by this kind of negotiation at a figure somewhat lower than appraisals made as the basis for possible condemnation suits. On the other hand, in

*In unincorporated area only.

proceeding under eminent domain there is a notable tendency for court awards to exceed these appraisals by very large amounts. The saving to the public by the practice of outright purchase is therefore believed to be materially larger than the five per cent for court costs mentioned above. This figure remains, however, as the only available measure of the saving.

Both the County Road Department and the State Highway Department have made extensive use of the practice during the past decade, and many miles of our highway rights-of-way have been acquired or widened by this process. The results of this development according to the Master Plan of Highways is graphically shown on the series of plates on pages 76 and 77.

EXCESS CONDEMNATION

Where direct negotiation fails the only course remaining, short of abandonment of the improvement project, is condemnation or eminent domain. The expense of acquisition by this means is in many cases increased by the necessity of taking only that property which is to be used exclusively for the needed improvement as planned. In thousands of cases useless or very badly damaged fragments of property are thus left along the margin of the condemned property. The "severance damage" awarded by the courts frequently exceeds the value of the land taken, and in some cases even the total value of the severed parcels. It can easily be shown that such awards are, in fact, just.

Little used in Los Angeles County up to the present is the principle of excess condemnation or extended eminent domain.* Under certain limitations the public authorities are empowered to acquire more property than the minimum actually necessary to the improvement, thus avoiding such severance damages. Such "excess" takings fall into two distinct classes:

(a) those where the public authority proposes eventually to put the excess property to some public use other than that of the specific improvement in question, and

(b) those where the public authority, having no public use for the excess land, proposes to rearrange it, following the improvement, and sell it back into private ownership.

*California Constitution, Art I., Sec. 14½; also General Laws, Act 6266.

ROADSIDE PARK ACQUISITION

In a very limited way, this process has been used for projects falling within the first class. The State Highway Division has recently acquired in San Mateo County ocean shore land marginal to the highway being developed, for permanent use of the public as park and recreation area.* While this procedure does not technically come under the provisions of California law regulating excess condemnation it is nevertheless an excellent illustration of the principle. Of great significance in this case is the certainty that the highway improvement, made at public expense, would have caused a considerable increase in the value of the shoreline property. If then the public should seek to acquire this property as park, after the highway improvement, it would have to pay the increased price caused by that improvement.

The State Highway authorities are specifically empowered to follow this particular procedure without recourse to the law of extended eminent domain. The Master Plan of Shoreline Development, recently adopted by the County of Los Angeles contemplates the application of this power by the State in the development of certain portions of the shoreline.

The more limited provision for excess condemnation for purpose of resale has not been tested in Los Angeles County as yet. It is doubtful if such resale of property

*In this case the County of San Mateo later reimbursed the State and took possession of the park land.

could be made to pay for the original improvement except in a very few, rare cases. But the process does offer a solution of the problem of high severance damage and remnants. The remnants are in many cases of such size or shape that their owners can do nothing with them. They then become, at best, tax delinquent weed patches, or worse eyesores, sometimes offering severe problems of safety, sanitation or drainage. When the public agency is able to reassemble such remnants it restores productive property to the tax rolls and eliminates a social problem. Even if the property is sold at a price only sufficient to cover the area value of the excess land, the cost of severance damages is saved and a community benefit is the by-product.

CONSTRUCTION PROBLEMS

When we come to the matter of construction the cost problems are in some respects less complex and more calculable. There are fewer variations in procedure that can be followed. Hence a long term program for construction can approximate fairly closely actual developments, even in the face of widely varying unit rates for materials, labor and mechanical methods over a period as long as fifty years. Perhaps the most convenient way to classify construction policies and procedures is to consider the work of the several jurisdictions engaged in building highways.

In California the job of building highways is given over entirely to the highway or road departments of the state, counties and cities. The State, through the Division of State Highways, Department of Public Works, is concerned exclusively with those roads which are (or are to be) officially State Highways. This means that the Division ordinarily deals only with construction projects of considerable size.

STATE HIGHWAYS

Projects undertaken are generally of considerable length rather than short links in a system of city streets. Through, state-wide traffic on these highways calls for standards of construction and safety based in general on higher speeds than those found on highways of more local character. And while the State Highway must be related satisfactorily to the abutting property, that relationship is usually not so intimate as in the case of major streets in a city.

CITY HIGHWAYS

At the other end of the scale the city street which is also a major traffic artery, possesses functions different from that of the State Highway. It must provide frontage and access to abutting property, as well as parking space for stopped vehicles. It is ordinarily not to be considered satisfactorily completed until curbs, gutters and sidewalks are provided, and the design of both its cross-section and its alignment is restricted by the values and locations of private improvements as well as by utility lines located in and under the street.

COUNTY HIGHWAYS

The County road department stands midway between these two. On the one hand its highway program must consider the large aspects of county-wide routes, actually a part of the State-wide system, and at the same time care for the neighborhood needs of the country traversed. In Los Angeles County the intimate local problems of details such as curbs and street lighting are particularly prevalent because there is such a large area of completely urbanized but unincorporated territory.

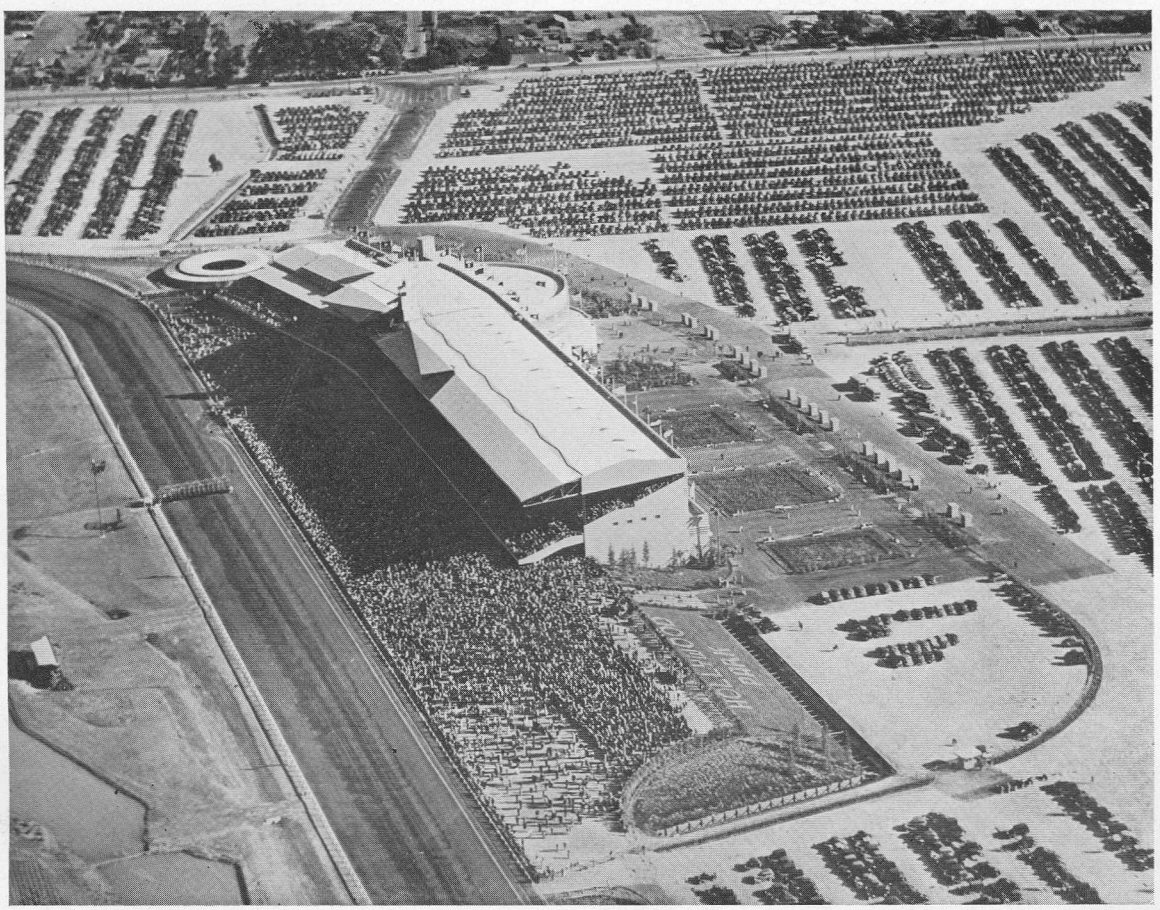
By classifying the highways in the Master Plan as State, County or City Highways, and by further classification of the character established by topography and population distribution it will be possible to determine the total cost of construction remaining to be done. To this amount must be added the amount estimated to be required for acquisition of right-of-way. It will then be necessary to estimate the resources likely to be available to the three classes of governmental jurisdictions during the ensuing fifty-year period for bringing this program

to completion. This classification and program will constitute the subject of Volume II which was mentioned at the beginning of this chapter.

HIGHWAY RESOURCES OF THE REGION

To balance the cost items considered above it will be necessary to consider the sources and amounts of funds for highway purposes available to the state, the county and the cities of the region. There is, of course, in the long run only one source for such funds: taxation. Whether it be levied by the federal government, the state, the county or the city or as a toll makes no ultimate difference. The approach to the problem of balancing such tax funds with the need will have to be two-fold. One objective of the study will be to determine what funds would be necessary to bring to completion all of the highways in the Master Plan within a specified period, of perhaps fifty years. The other objective will be to determine how much of the highway plan can be carried out in that period without increasing the amounts of money available for road building under present standards.

Historically the first source of funds for road building was the city and county taxes on real and personal property, and franchises. This source, while comparatively of less importance than formerly, is still of considerable consequence. Much of the revenue derived from this source is now



Special Events or Institutions Produce Unusual Loads on County Highways

devoted to maintenance, however, rather than to the building of new roads. For it is obvious, that with the amazing multiplication of highways and local streets following the advent of the motor car, all demanding continually higher and more costly, even if more permanent surfacing, the cost of annual maintenance has also increased relatively. In a metropolitan region such as Los Angeles it is no longer possible for the average citizen to "work out his poll tax on the road."

These two resources, having long ago proved inadequate to meet the situation other methods were devised and tried. One of these, the special assessment district, was successful in certain respects, in that a number of relatively large projects were actually carried out. Nevertheless the system as a whole was a failure and a basic defect was soon uncovered as it proved that the benefits to property upon the completion of a highway were not accurately enough calculable. It is doubtful if any large scale use will ever again be made of this method for carrying out the Master Plan of Highways for Los Angeles County.

The second device, the gasoline tax has already been discussed. (Chapter IV). Mostly administered by the State, a small portion is rebated to the counties of the state and a still smaller portion to the cities. The effect of this tax, making the motorist or truck operator pay as he goes, and, roughly at least, in proportion to how far he goes, has caused its universal acceptance as an equitable charge for the benefits accruing from the facility of the highway system.

FEDERAL AID HIGHWAYS

The early experience of state highway development under this program did not, however, completely solve the rapidly expanding problem. In 1916 and 1921, to stimulate more nearly uniform effort in the various states, Congress had set up the system of Federal Aid Roads, and since 1920 Federal Aid has been an important source of highway funds. The amounts of Federal Aid thus extended to the several states has increased substantially during that time, and has undoubtedly been of great importance in unifying not only the routes but the construction standards in various sections of the country.

Originally, these funds came from the then normal tax collections of the federal government. Eventually, however, in 1932 the federal government itself adopted a gasoline tax of one cent* per gallon. Other sources of federal funds, however, include excise taxes on motor cars and accessories, so that the motorist himself is in any case directly paying the entire bill for state and federal highways.

TOTAL RESOURCES

Considering all of these sources together, the funds available for road purposes in Los Angeles County amount to some $16,000,000 per year, as of 1940. Not all of this amount is available however, for building the unfinished highways included in the Master Plan. Certain amounts are required for building and maintaining local streets, as well as for acquisition of their rights of way in a few cases. Secondly large amounts are required for the maintenance of highways already existing. Again, a certain amount must perforce be used to carry on the "overhead" of management, equipment, storage yards, records and such engineering and survey work as is not strictly chargeable as part of the construction cost on any particular project.

Of even greater significance is a situation in some respects peculiar to Los Angeles County. From 1933 to 1935 $12,868,000 were borrowed from the State of California to meet relief costs. This is being paid back, under the agreement then made, out of the County's gas tax funds at an average rate, including interest of $1,700,000 pear year. It will not be paid out therefore until 1947.

A second factor distorts temporarily the significance of highway funds available in

*Increased to 1½ cents in 1933.

Los Angeles County. In the prosperous twenties many highway improvement projects were optimistically undertaken by means of special assessment districts. By 1932 it was clear that many of these projects had been over ambitious if not essentially ill advised.* They created a tax burden that could not be carried by a large proportion of the taxpayers during depression years. In the case of Acquisition and Improvement Act Districts, sometimes inappropriately used, the failure of a few taxpayers to meet the tax shifted the burden upon others who then were likewise unwilling to pay. Presently many of such districts were more than 50 per cent in default.

SPECIAL ASSESSMENT RELIEF

Accordingly, in 1933 the County set up a Special Assessment Relief Committee which set methodically about to work out a system of refunding the obligations of these districts. By negotiation between the holders of the bonds and a majority of the district property owners, compromises were reached. In order to thaw out the completely frozen assets of the districts the County, further, made certain appropriations (beginning that same year) to assist the tax payers by reducing the outstanding debt to a point where the remaining burden could be borne.

Funds so appropriated were derived from the County's share of gasoline tax funds. This system has been carried down to date and has now cleared a large majority of the delinquent districts. The annual appropriations during that time have varied from $460,000 to $1,717,000. Under the Committee's program the fiscal year 1941-42 will clear all of the ad valorem districts which had created the major portion of the problem.

The use of gas tax funds for this purpose is clearly defensible, and the restoration of property saddled with these assessments to active tax rolls and the lifting of liabilities that had frozen thousands of parcels of real estate, has been good for the economy of the county as a whole. The funds have in fact been used for highway improvement and have therefore not been diverted from the true purpose of the gasoline tax. Nevertheless the temporary effect is that these funds have not actually been available for genuine new construction. And while it is proper to pay now for improvements that are in many cases more appropriate now than they were when constructed, it is probable that if the money had now been available for new construction the work would have been of a different type or would have been applied in a different place.

Secondly, the improvements in many instances were more costly (and more complete) than would have been undertaken under more normal procedures. There has therefore been some small actual loss of funds for new highway construction by this process.

After making all of these deductions we find that the net amount available for highway building purposes in the cities and county of Los Angeles, is in the neighborhood of $4,000,000 per year. To this amount can be added approximately $4,000,000 per year, the average amount expended directly in this county by the State Highway Division from both State and Federal sources.

MAGNITUDE OF THE PROBLEM

The problem is not to be solved, however, by merely setting up probable funds available against the mileage remaining to be completed. It divides itself into three distinct portions:

(1) Immediate needs—to catch up with present shortages;

(2) Future needs—to keep up with population; and

(3) The further matter of freeways.

The immediate need is the most difficult portion of the problem because of the combination of two adverse factors. If efforts

*Many untimely projects were nipped in the bud in the late twenties by the Interdepartmental Petitions Committee's reviewing procedure.

are concentrated on meeting today's shortages, it is possible that failure to proceed with projects for the near future, will again result in new deficiencies after the so-considered shortage program is completed. Secondly, the available funds for the first few years will probably be abnormally low compared to the trend for the long period, due to the necessity of repaying the loan mentioned above and refinancing special assessment districts.

Further, provision for future highway facilities, can in most cases be made more economically well in advance of acute need, since early acquisition, in particular, offers considerable economies. It would seem therefore, that a logical program will seek to make up present deficiencies over a considerable period of years, while proceeding with normal expansion as determined by population demands and shifts, rather than to attempt a sudden attack on specific shortages at congestion points.

The matter is, moreover, exceedingly complex, in that it involves not merely building so many miles of new highway per year until a definite completion, but must include widenings and resurfacings, acquisition of right-of-way for widening, for bottlenecks or short gaps and for elimination of short or dangerous curves. It requires minor reconstruction of intersections to produce greater efficiency as well as heavier construction of grade separations. Until all of these items have been thoroughly surveyed and their urgency and relation to entirely new sections established it will be futile to speculate on a time-order of projects to be undertaken.

When an inventory of immediate needs and future extension in ratio to population increases is ready for creation of a program, the question of freeways must be considered. There would seem to be no doubt that a schedule of freeway construction must be begun immediately, growing to large proportions within a decade or two. The program of highways alone is affected in two ways by this assumption. First, certain highways can be deferred until after completion of a given freeway, either because the freeway would give a more efficient service to the territory traversed or because, as a feeder, an outlying highway is needed only after the freeway has tapped the territory.

Secondly, and offering greater difficulty, the use of available funds for freeways, will obviously decrease the amount that could otherwise be devoted to ordinary highways.

FOR A BALANCED PROGRAM

In order to prepare a plausible highway development program it will be necessary therefore to determine, out of probable total funds available over a 50-year period:

(a) The amounts necessary to increase the highway mileage in proportion to the population:
(b) The amount that will probably be devoted to freeways; and
(c) The amount remaining, which will be available for making up present deficiencies.

When this is done it will be possible to present to the public authorities of Los Angeles County a reasonable outline of a fifty-year program. This outline would then be filled in from year to year with short term programs based upon actual revenues and needs rather than upon theoretical projections into an uncertain future. For this annual estimate the findings and conclusions of the various traffic surveys will become of greatest value.

CONTINUED ANALYSIS

It will be necessary, of course, to maintain the traffic checks from year to year (by the means that have been developed and described in the Traffic Survey reports) in order to follow changing conditions and determine the points or sections requiring relief. Only the detailed study of actual figures and local physical conditions can reveal whether the relief can be provided best by a small scale correction of an existing deficiency, by a major construction job or

by a still larger project such as a freeway.

Such a determination depends on a study of the total and relative volumes of traffic on the highway or highways involved and the finding of congestion points as revealed by lane density studies. These items must then be considered in an analysis of alternate methods of improvement possible under the particular conditions of existing highway widths, right-of-way available, extent of area and population affected and tendencies toward changes in the composition or distribution of population. Finally all must be related to costs of possible solutions, funds available and pressure of other necessary projects.

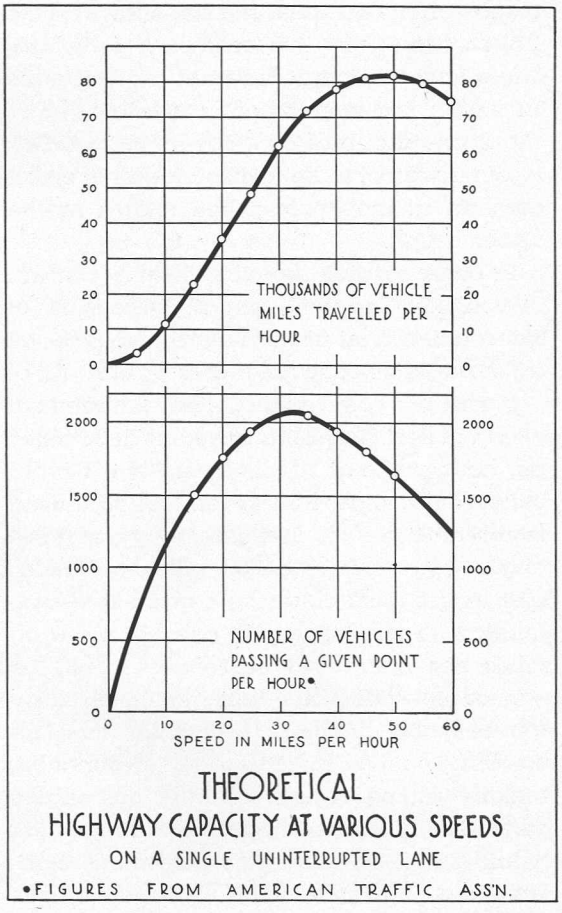
Continuing studies of trends in traffic load permit a determination, often several years in advance, of the time at which a given Highway is likely to reach capacity. The procedure for doing this is highly technical, and involves first of all a definition of terms. By "capacity" is meant the maximum number of vehicles which can be accommodated without producing such congestion as would economically justify additional pavement or other remedy.

But this volume of traffic is a variable since it depends upon the determination of the economic factors in each individual case. For the sake of finding a more calculable figure, capacity is redefined for the present purpose as "the traffic volume above which normal highway speed cannot be maintained over a considerable period of time."

CAPACITY STUDIES

Even this term needs some explanation: Capacity is determined not only by the largest number of vehicles that can be moved past a given point; of more importance to the motoring public is the condition under which the greatest number of vehicles is moved over the greatest distance. That these two quantities are found at different speeds may easily be shown by the example illustrated in the adjoining graph.

Here, a widely accepted theoretical concept is delineated in the lower diagram,



THEORETICAL
HIGHWAY CAPACITY AT VARIOUS SPEEDS
ON A SINGLE UNINTERRUPTED LANE
•FIGURES FROM AMERICAN TRAFFIC ASS'N.

showing the number of vehicles that can be moved past a given point at various average speeds on a single uninterrupted lane. This curve indicates that the maximum number of vehicles is passed at a speed of approximately 33 miles per hour. It might be understood then that the highest efficiency of the highway is reached at this speed and that the capacity is therefore 2075 cars per hour.

If, however, we consider the distance to be covered by the same cars in an hour we reach a different conclusion. Using the same figures and computing the number of car-miles per hour (that is, multiplying the number of vehicles at each speed by that speed in miles per hour) we have a set of figures showing the distances covered by each number of cars in an average hour. The

results of this computation are shown in the upper curve. In this case it is seen that while fewer automobiles pass a given point in an hour at a speed of 50 miles per hour, the entire group of cars covers more miles. In other words, more transportation is created than at the lower speed shown in the upper graph.

In order to give meaning to this concept of vehicle-miles per hour as a measure of transportation let us consider the vehicles as a fleet of taxis collecting fares at the rate of one cent per vehicle-mile. The management would collect $684.75 in one hour at 33 miles per hour, while at 50 miles per hour it could collect $820.00 per hour, even though it used fewer vehicles. Or assuming only one passenger per vehicle, at 33 miles per hour, 2075 passengers could be carried to a destination 33 miles away in one hour. At 50 miles per hour 1640 passengers could be carried to that same destination in forty minutes and another 1640 could then be carried 17 miles to some other destination, making an equivalent of 2460 passengers carried 33 miles. Thus our taxi management would find it advisable to operate this highway at a "capacity" of 82,000 vehicle-miles per hour, and at a speed of 50 miles per hour.

Measured by this criterion, the most efficient theoretical capacity, therefore, for a single lane of uninterrupted traffic would seem to be attained with 1,640 vehicles per hour travelling at a speed of 50 miles per hour.

But the example illustrated is, as mentioned, based on a purely theoretical assumption: that the safe intervals of spacing between vehicles moving at certain speeds will be observed. Whether or not these intervals are actually observed is not definitely known. Since the speed of various cars on the highway at one time deviates widely from the average of all cars, it is difficult to make such a determination. Further, there is reason to believe, as previously stated, that the addition of other lanes to the highway materially reduces the efficiency or capacity per lane, by amounts believed known. The quantitative effect of various conditions of traffic interference, such as intersections is, however, only vaguely known. It must be clearly understood, therefore, that the theoretical capacities developed above can not be expected even to be approached on real highways in actual practice. Secondly, data observed in true highway performance may show the maximum of either vehicles or vehicle-miles per hour to be reached at speeds either lower or higher than those indicated here.

MEASUREMENT OF CAPACITY

One phase of the Regional Planning Commission's present Transportation Survey proposes to examine this problem by methods which it is believed will reveal the true practices of motorists in this vicinity. The movements of vehicles over measured courses and under heavy traffic conditions will be recorded for various widths and types of highways, and under varying conditions of traffic interference. Volume counts and measurement of the average speed will be made simultaneously. Segregation of these quantities by lanes, as well as comparisons between two lane and multi-lane roadways will give checks on the relative efficiency of the various lanes in a typical roadway.

From these measurements it will be possible to learn the true relations between the number of vehicles and the speed in actual practice, for comparison similar to that in the theoretical example. A number of preliminary counts of this type have now been made, but the data collected so far have not been sufficient to warrant any conclusions in regard to capacity as measured by either speed or volume.

With this determination of the capacity in the narrow engineering sense it will then be necessary to reach some conclusions as to how much impairment of the capacity can be tolerated before expenditures are to be made for relief. After the volume of traffic

has risen to the capacity, any further increase in the traffic load will result in a decrease of the vehicles moved and vehicle miles travelled because of the lowered speed. If this decrease, below capacity, is effective for only a short period, such as five or ten minutes one day a week in summer, or during special events, probably no expensive improvement should be undertaken. But if such impairment is a matter of a half-hour to an hour, every day, the year around, the cost of the necessary improvement may be economically justified.

INDIVIDUAL APPLICATIONS

This matter would seem to be entirely one of judgment in individual cases, because of the widely divergent nature of the elements involved. For example, one problem of congestion might be relieved, at least temporarily, by some form of traffic regulation, such as prohibition of parking for short periods, while another could not be solved except by the building of a grade separation or by widening the pavement through a "bottle-neck." In a third case, the traffic load on one street might be reduced by administrative efforts to divert traffic over some already existing parallel route or by the construction of a new parallel route.

Since these alternatives range from acts of almost no cost to the most expensive types of construction, it is easily seen that no simple rule can be deduced to measure that congestion, which "would economically justify" improvements. It is hoped, however, that the capacity study undertaken may shed some further light upon this portion of the problem. In any case, the fact remains that the highway administering authorities will have to examine each problem and each section of highway as a separate problem.

RATIO OF USE

For each such section of highway with its particular characteristics, the capacity can be determined. The ratio at each such section between the number of vehicles actually carried by the Highway and the capacity at that point will give a measure of the approach to full use.

If in a given section that ratio is approaching unity at a given annual rate, the time when it will be reached is roughly calculable. Appropriate proceedings for relief should be set in motion sufficiently in advance so that the additional pavement, the widened bridge, the reduction of cross-interference, or the new parallel route, as the case may be, will be ready at that time. The advantages of such planned procedure are obvious, and economy is not the least of them.

Where capacity is already exceeded, immediate action is called for, and the relative urgency of action will be indicated by these calculations.

RESPONSIBILITY FOR DECISION

It should be clearly understood that the actual responsibility for decision upon the time and scope of these improvements rests upon the various construction departments and legislative bodies. The Regional Planning Commission functions as a central coordinating agency through which all others may come to an agreement as to the best means of action leading toward accomplishment of the plan. The extensive research and accumulated data upon which the Plan itself was based form a sound basis for these decisions.

To lead the way in working out such a selective program is by law a function of the Planning Commission. The Planning Act states (Section 5.5) that the annual report of the Commission "shall include . . . (d) A program of proposed public works, improvements, and development based on the Master Plan and . . . recommended . . . for execution during the ensuing year." The preparation of a long term program as the basis for such annual schedules will be the subject of Volume II of this report. There remains, however, one other item of procedure preliminary to a successful program of development.

ADOPTION OF THE PLAN BY CITIES

The Master Plan of Highways has been developed for the Region by the concerted action of all the cities acting through their duly constituted agency, the Planning Commission of the Regional District. It has been officially adopted by the County government. But a further and most necessary step is the formal adoption by each incorporated city of that portion which falls within its borders. The Planning Act here again marks out the path of duty.

> "Sec. 4.6. The . . . city planning commissions in the various regions shall accept and embody in the respective master plans under their control the features and findings of the respective regional planning commissions in matters pertaining to the regional and State welfare . . . . When . . . adopted by the legislative body of the . . . city . . . such features and findings shall have the same force and effect . . . and shall be carried out by the legislative bodies of such . . . cities in accordance with their police powers as provided in this act.

When this has been done by any city, the provisions of other sections of the Planning Act will come into full force, and there will exist within its boundaries the same means of insuring the protection of the Highway Plan, through subdivision control, the power to disapprove non-conforming dedications, and the review of public works programs, as now exist in unincorporated areas.

The procedure for doing this is simple and involves no controversy, since the Highway Plan is already agreed upon by all. It is merely a matter of announcing and holding public hearings before the city planning commission and the city council, followed by the adoption of appropriate resolutions. The Regional Planning Commission is ready to aid in the preparation of copies of the Plan for certification and in other details of the process, wherever such assistance is desired.

PUBLIC SUPPORT IS NECESSARY

There are two groups of unofficial organizations which are concerned with the Highway Plan and its execution—business organizations, including industry and public utilities and civic organizations such as chambers of commerce, local improvement associations, and clubs interested in human welfare. As to the first, the benefits arising out of a well considered Plan, agreed upon by governmental authorities, and strengthened by the increasing watchfulness of those public agencies charged with responsibility for it, are indeed numerous. They can adjust expansion programs, select permanent building sites and avoid wasteful removals. Their contribution involves only a fair exchange of information that is mutually beneficial and the extension of their powerful influence in support of the orderly process of planned growth. They apply its principles to their own problems, and can well encourage the same policy in respect to public works.

Civic organizations can find, in their search for ways and means of attaining their individual objectives, a vast field for useful activity in connection with the Master Plan. To study the Plan in the making, to offer helpful criticism, to carry out special researches which add to the common fund of basic information, to bring widespread attention to the value of foresight and cooperation in community development, to bring the weight of their collective support to bear upon the whole planning process—these are but a few of the ways in which they may help the Commission, and themselves.

COMMON INTERESTS

Chambers of Commerce know that prosperity depends upon the efficient operation of the community as a physical plant for productive enterprise. They lead public opinion in the demand for orderly development of highways and for the wise use of public funds so as to attain maximum results. Women's clubs are vital centers for

the crystallization of public opinion, and when selfish interests jeopardize the welfare of all, they can play an important role in solidifying support of the Master Plan. Research societies and educational and professional groups can aid in the accumulation and analysis of factual material. Contributions of this character have been made here by such organizations as the City and County Engineers Association, the Planning Congress of Los Angeles County, the City Planners Institute, the Pacific Southwest Academy and the School of Government of the University of Southern California.

Notable also for its great interest in highway planning is the far-flung Automobile Club of Southern California. Closer cooperation between this group and the official planning agencies of the Region would be productive of great advantages, and it is possible that a very considerable duplication of effort could be avoided. The interests of the motorist, are, of course, paramount in the minds of the club's technical staff, and its valued research on highway matters needs only to be integrated with other phases of the Master Plan.

The Commission has especially welcomed during the past year two new organizations which have undertaken wide activities in the planning field. One of these is The John Randolph Haynes and Dora Haynes Foundation, and the other is Town Hall. The former has undertaken a program which includes the stimulation of all planning activities, while the latter, through its Planning Section, is providing for a series of thorough discussions of, and reports on, every phase of planning, with the objective of clarifying public opinion and mobilizing support of constructive efforts to make the Master Plan an effective reality.

To all such groups the Commission offers the utmost in cooperation and in appreciation. The Master Plan of Highways would not today be extant, in the absence of their contributions to the work. It will not be effectively put into operation without their continued attention.

These organizations and these official bodies are groups of citizens. They represent many more citizens. But the Master Plan is intended to serve all the people who live, or will live, in the Region. It needs, therefore, to be understood and to be supported by every one of us, whether we belong to an association or not.

According to Section 8 of the Planning Act, "the Commission shall endeavor to promote public interest in and understanding of the Master Plan and of official plans and regulations relating thereto," and no part of its duties is more clearly vital to the Plan. For failing in this, no Plan however carefully drawn and however entrenched in mandatory provisions of law, will be truly a vital program of action and accomplishment.

THE PLAN CAN BE CARRIED OUT

The Commission believes that the Master Plan of Highways is basically sound and practical, and that adherence to it will result in better living conditions at less expense. It invites every citizen to examine its provisions and to evaluate the Plan in terms of its effect upon individual living and working conditions. Let each decide whether he prefers to pay for accidents and delays and for belated acquisitions, or to spend the same money for a smoothly operating coordinated system of Highway transportation adjusted to fit the needs of locality and traffic. Let him weigh the relative effect upon his pocketbook of blighted areas, stunted development and lessened values on the one hand and of economical construction, budgeted finances and impartial priority programs on the other.

Then if the Master Plan of Highways be found worthy of his approval, his duty as a loyal citizen will be clearly to support it wholeheartedly, and to insist that those who represent him in public office do the same. Technical leadership without community backing is of little avail, but with community leadership and technical assistance, the Master Plan can be successfully carried out.

ACKNOWLEDGMENT

The Regional Planning Commission gratefully acknowledges use of various photographs in this book as follows:

Photos on pages 36 and 73	Courtesy of the Los Angeles City Engineer
Photos on page 61	Courtesy of the Division of Highways, State of California
Photo on page 87	Courtesy of the Los Angeles Chamber of Commerce

THE MASTER

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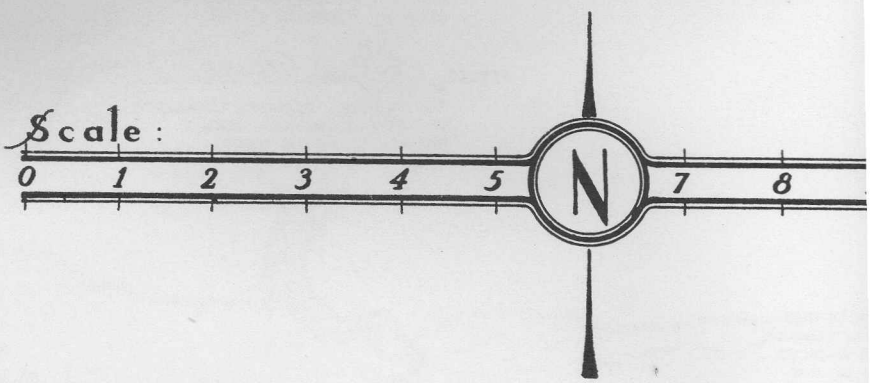

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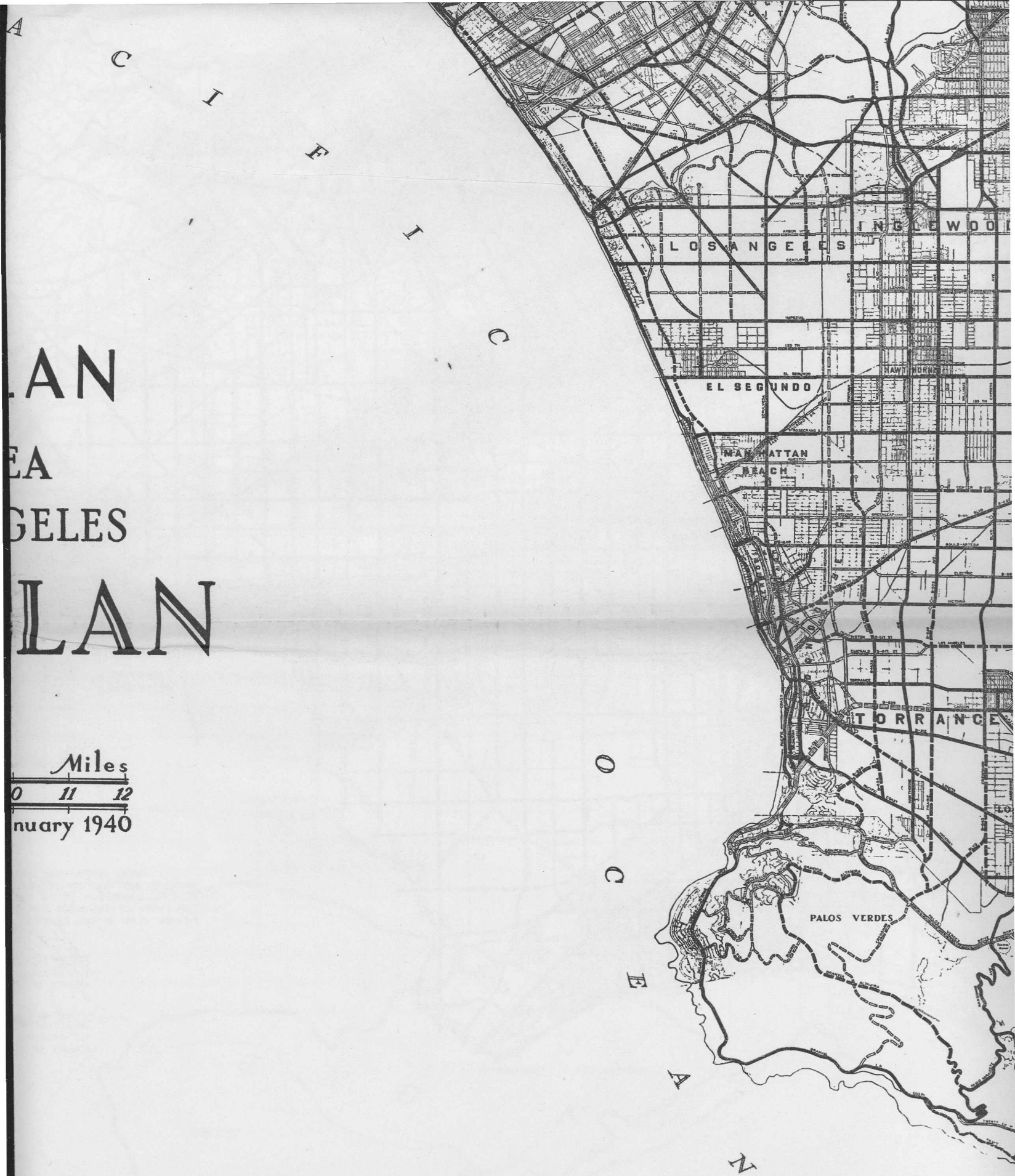

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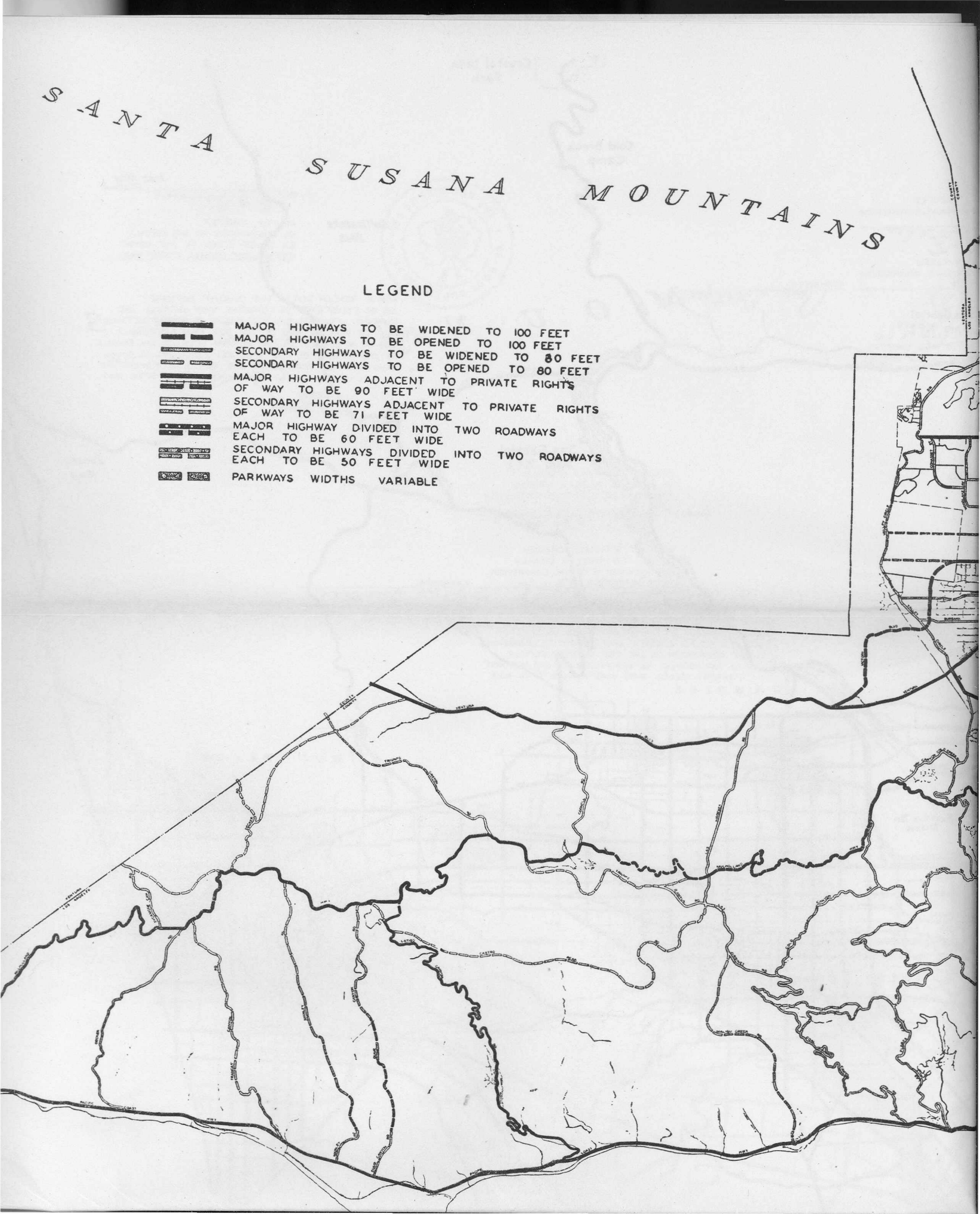
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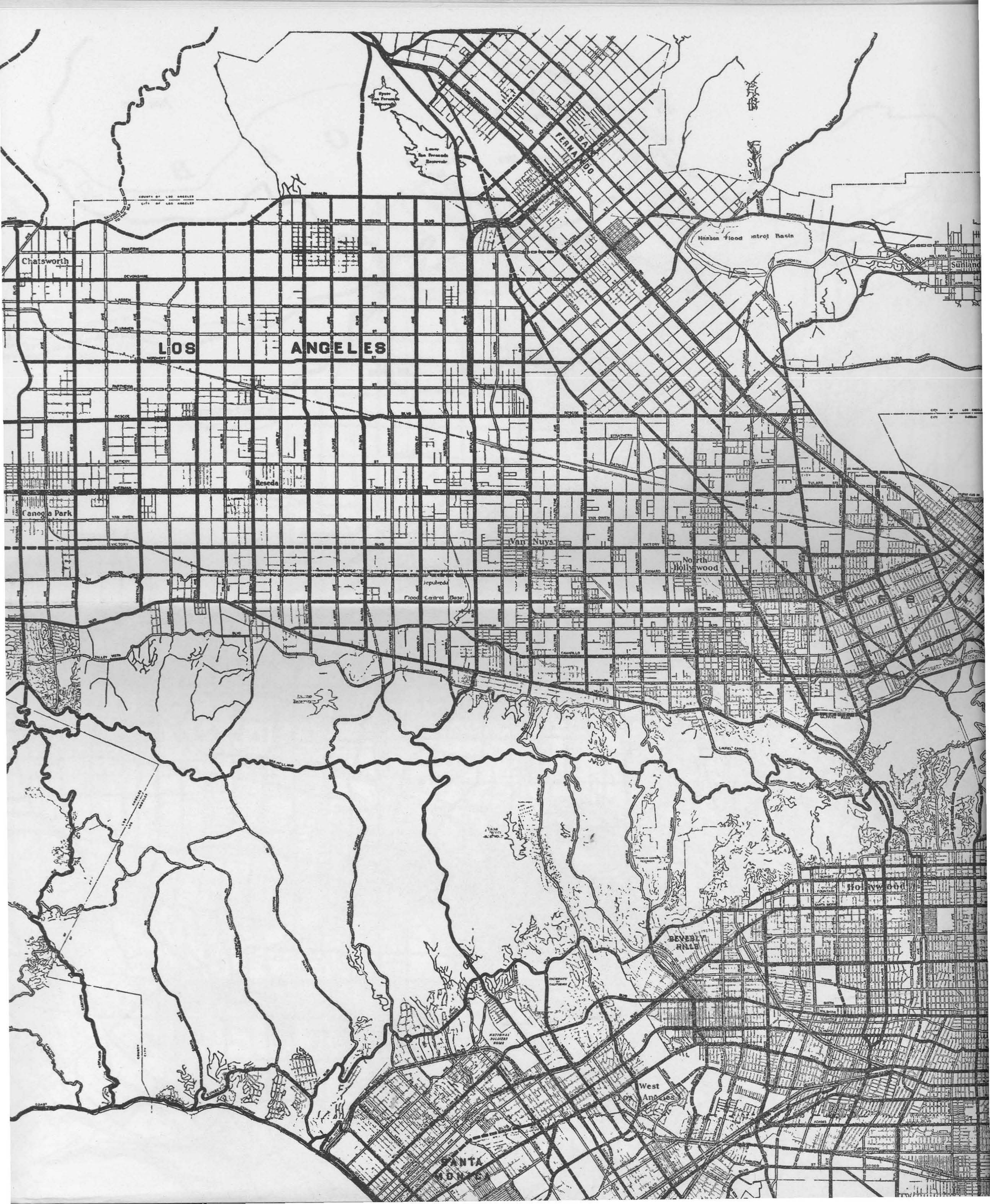
LOS ANGELES
Chatsworth
Canoga Park
Reseda
Van Nuys
North Hollywood
Hansen Flood Control Basin
Hollywood
BEVERLY HILLS
West Los Angeles
SANTA MONICA

I HEREBY CERTIFY
APPROVED AND ADOPTED
PLANNING COMMISSION OF
THIS 7TH DAY OF FEBRUARY 194
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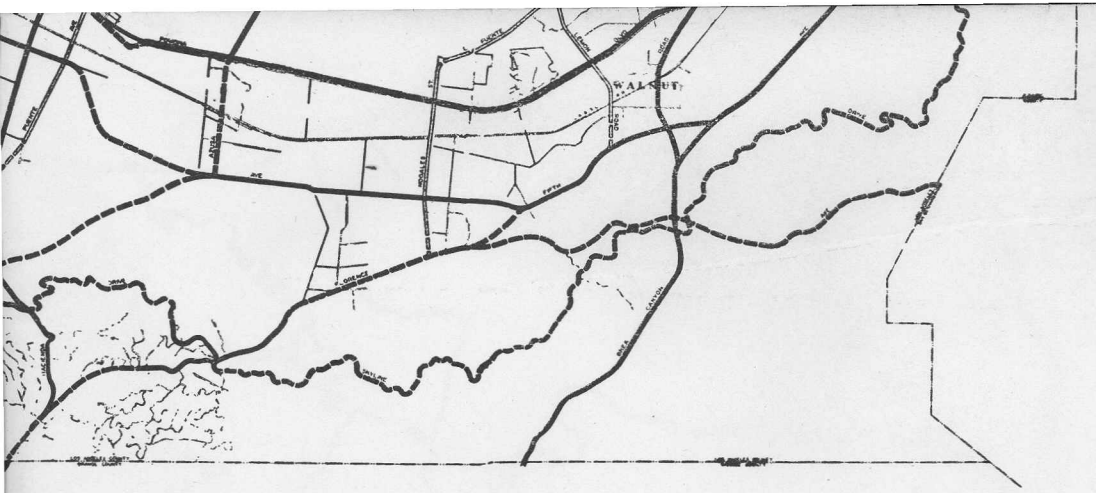

AS AMENDED
By Resolutions of

The Regional Planning Commission		The Board of Supervisors
of the District	of the County	of the County of Los Angeles
May 28, 1941	May 28, 1941	June 17, 1941

I HEREBY CERTIFY THAT THIS MASTER PLAN WAS APPROVED AND ADOPTED BY RESOLUTION OF THE REGIONAL PLANNING COMMISSION OF THE LOS ANGELES COUNTY REGIONAL PLANNING DISTRICT THIS 7TH DAY OF FEBRUARY 1940, AND IS A PORTION OF THE HIGHWAY PLAN OF THE LOS ANGELES COUNTY REGIONAL PLANNING DISTRICT.

CHIEF ENGINEER
THE REGIONAL PLANNING COMMISSION
OF THE LOS ANGELES COUNTY
REGIONAL PLANNING DISTRICT.

Ray Peeters
CHAIRMAN

ATTEST: Irma Ruther
SECRETARY
THE REGIONAL PLANNING COMMISSION
OF THE LOS ANGELES COUNTY
REGIONAL PLANNING DISTRICT

MASTER PLAN WAS
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A PORTION OF THE
LOS ANGELES.

EER
PLANNING COMMISSION
S ANGELES.

Ruther
PLANNING COMMISSION
S ANGELES

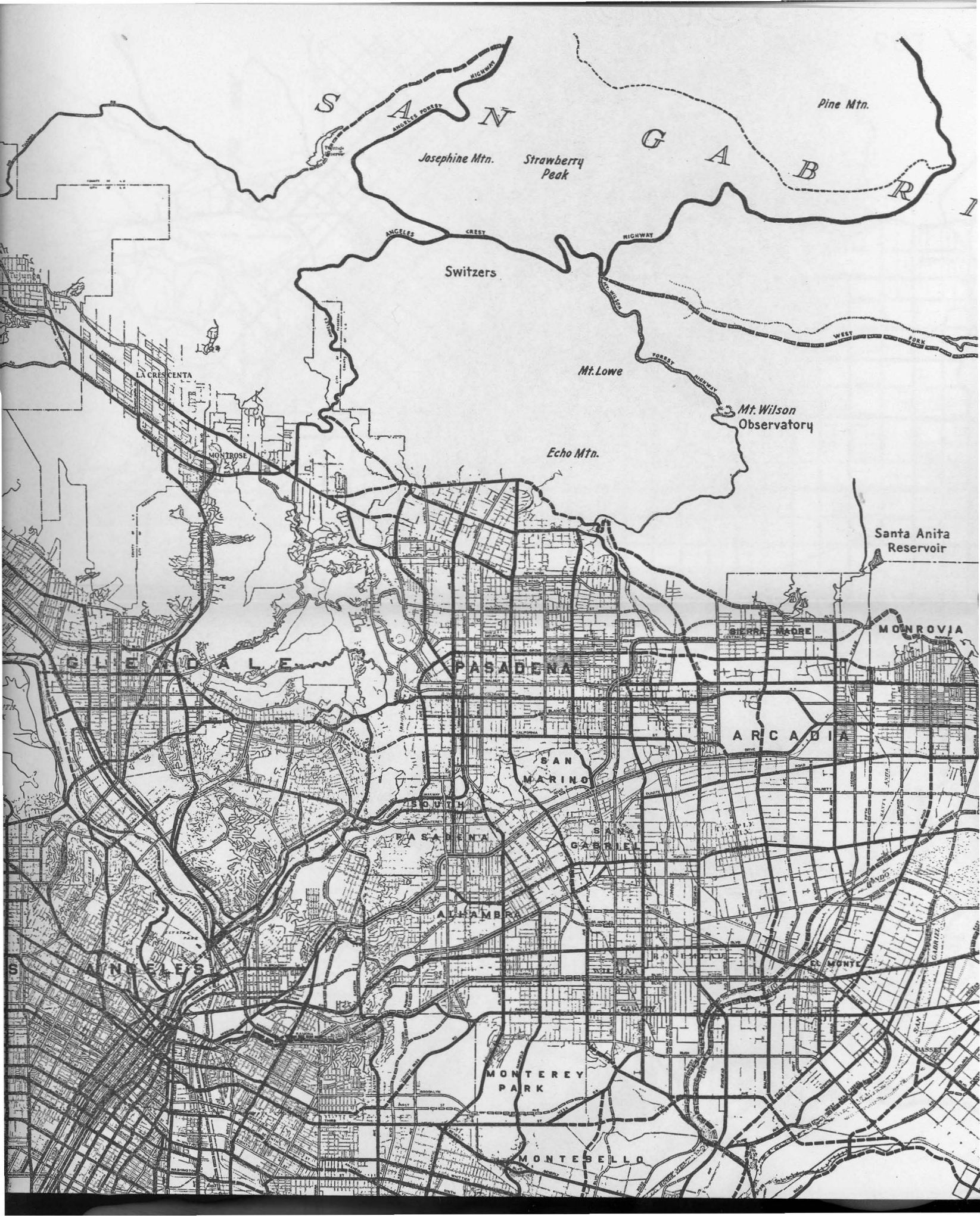
Ray Peeters
CHAIRMAN

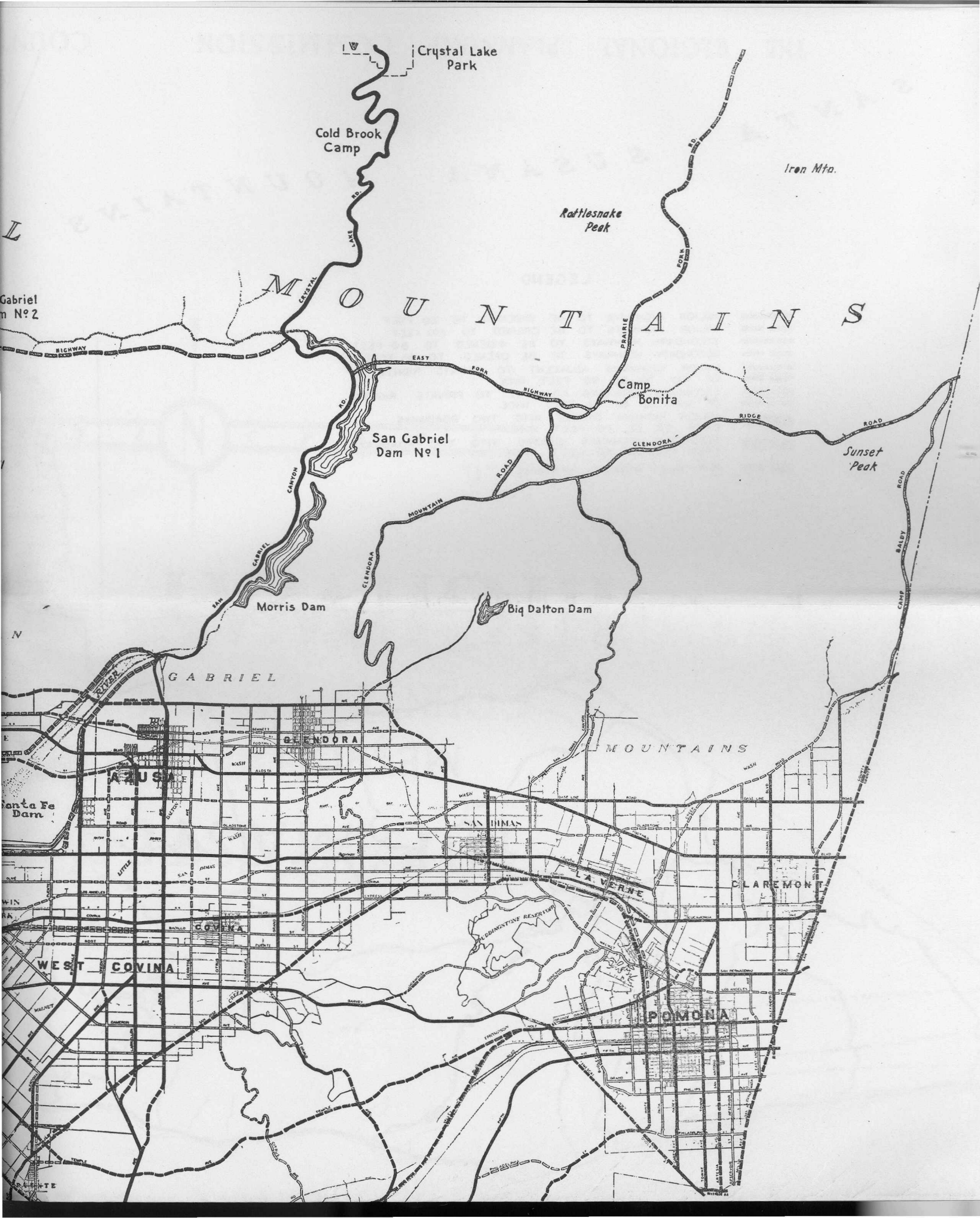
I HEREBY CERTIFY THAT THIS MASTER PLAN WAS APPROVED AND ADOPTED BY THE BOARD OF SUPERVISORS OF THE COUNTY OF LOS ANGELES THIS 27th DAY OF Feb. 1940 1939 AS A PORTION OF THE HIGHWAY PLAN OF THE COUNTY OF LOS ANGELES, AND OF THE LOS ANGELES COUNTY REGIONAL PLANNING DISTRICT, AND IT IS HEREBY DECLARED TO BE ESTABLISHED TO CONSERVE AND PROMOTE THE PUBLIC HEALTH, SAFETY, AND GENERAL WELFARE.

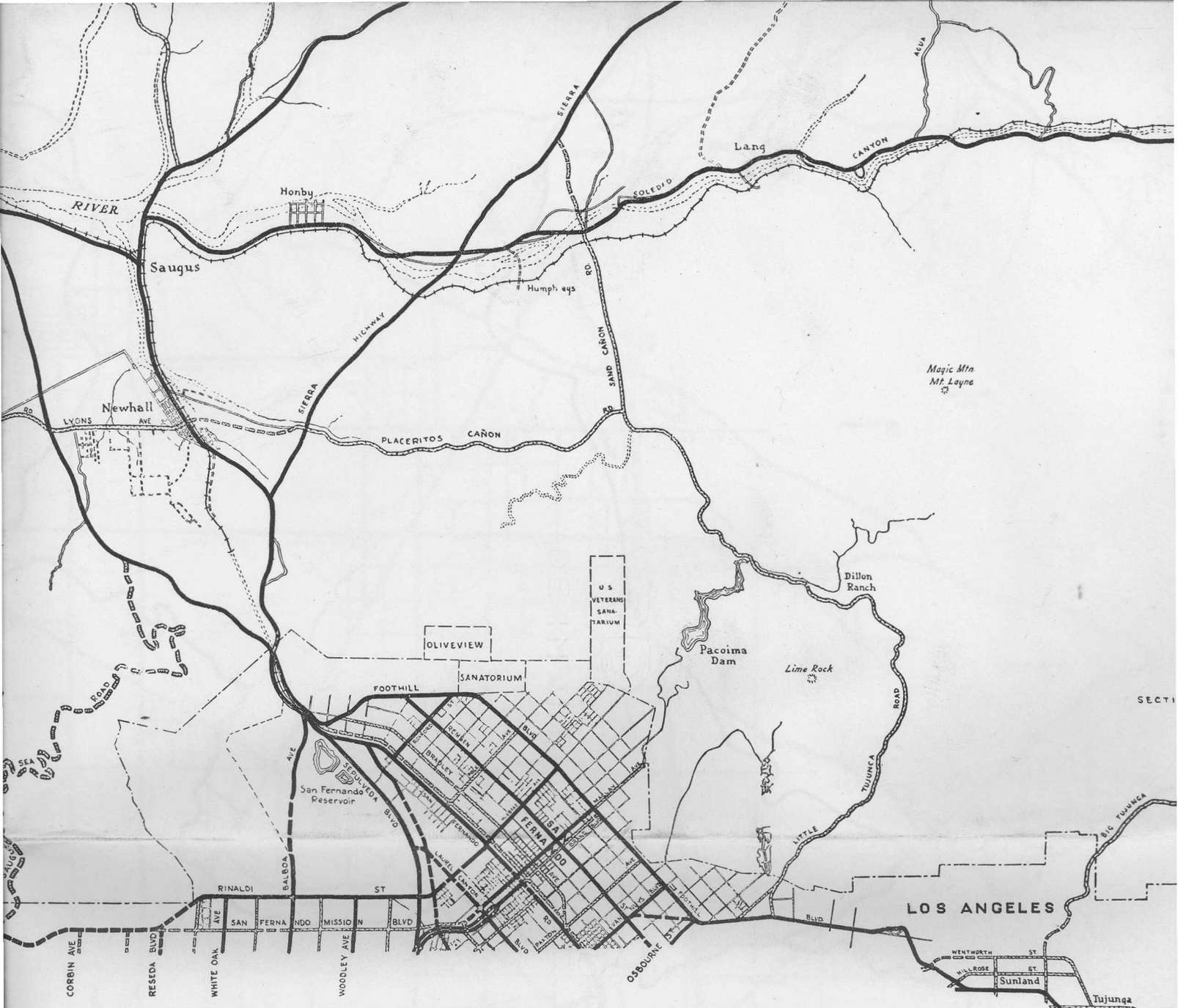
BOARD OF SUPERVISORS • LOS ANGELES CO. CAL. •

L.E. LAMPTON, COUNTY CLERK, AND
EX OFFICIO CLERK OF THE BOARD
OF SUPERVISORS OF THE COUNTY
OF LOS ANGELES

BY G. O'Bonnon
DEPUTY


SAN GABRIEL
Pine Mtn.
Josephine Mtn.
Strawberry Peak
ANGELES CREST HIGHWAY
Switzers
Mt. Lowe
MT. WILSON FOREST HIGHWAY
WEST FORK
Mt. Wilson Observatory
Echo Mtn.
LA CRESCENTA
MONTROSE
Santa Anita Reservoir
GLENDALE
PASADENA
SIERRA MADRE
MONROVIA
ARCADIA
SAN MARINO
SOUTH PASADENA
SAN GABRIEL
ALHAMBRA
LOS ANGELES
EL MONTE
MONTEREY PARK
MONTEBELLO


Crystal Lake Park
Cold Brook Camp
Iron Mtn.
Rattlesnake Peak
MOUNTAINS
Camp Bonita
San Gabriel Dam No 1
Sunset Peak
Morris Dam
Big Dalton Dam
GABRIEL
MOUNTAINS
GLENDORA
AZUSA
SAN DIMAS
LA VERNE
CLAREMONT
COVINA
WEST COVINA
POMONA
HIGHWAY
EAST FORK HIGHWAY
RIDGE ROAD
GLENDORA MOUNTAIN ROAD
CANYON ROAD
CRYSTAL LAKE ROAD
PRAIRIE FORK ROAD
BALDY ROAD
CAMP ROAD
SAN GABRIEL RIVER



THE MASTER PLAN

NORTH PORTION
COUNTY OF LOS ANGELES

HIGHWAY PLAN

AL PLANNING COMMISSION COUNTY OF LOS ANGELES

ATTEST: Irma Ruther
SECRETARY,
THE REGIONAL PLANNING COMMISSION
OF THE LOS ANGELES COUNTY
REGIONAL PLANNING DISTRICT

I HEREBY CERTIFY THAT THIS MASTER PLAN WAS APPROVED AND ADOPTED BY RESOLUTION OF THE REGIONAL PLANNING COMMISSION OF THE COUNTY OF LOS ANGELES THIS 7TH DAY OF FEBRUARY 1940, AND IS A PORTION OF THE HIGHWAY PLAN OF THE COUNTY OF LOS ANGELES

CHIEF ENGINEER
THE REGIONAL PLANNING COMMISSION
COUNTY OF LOS ANGELES.

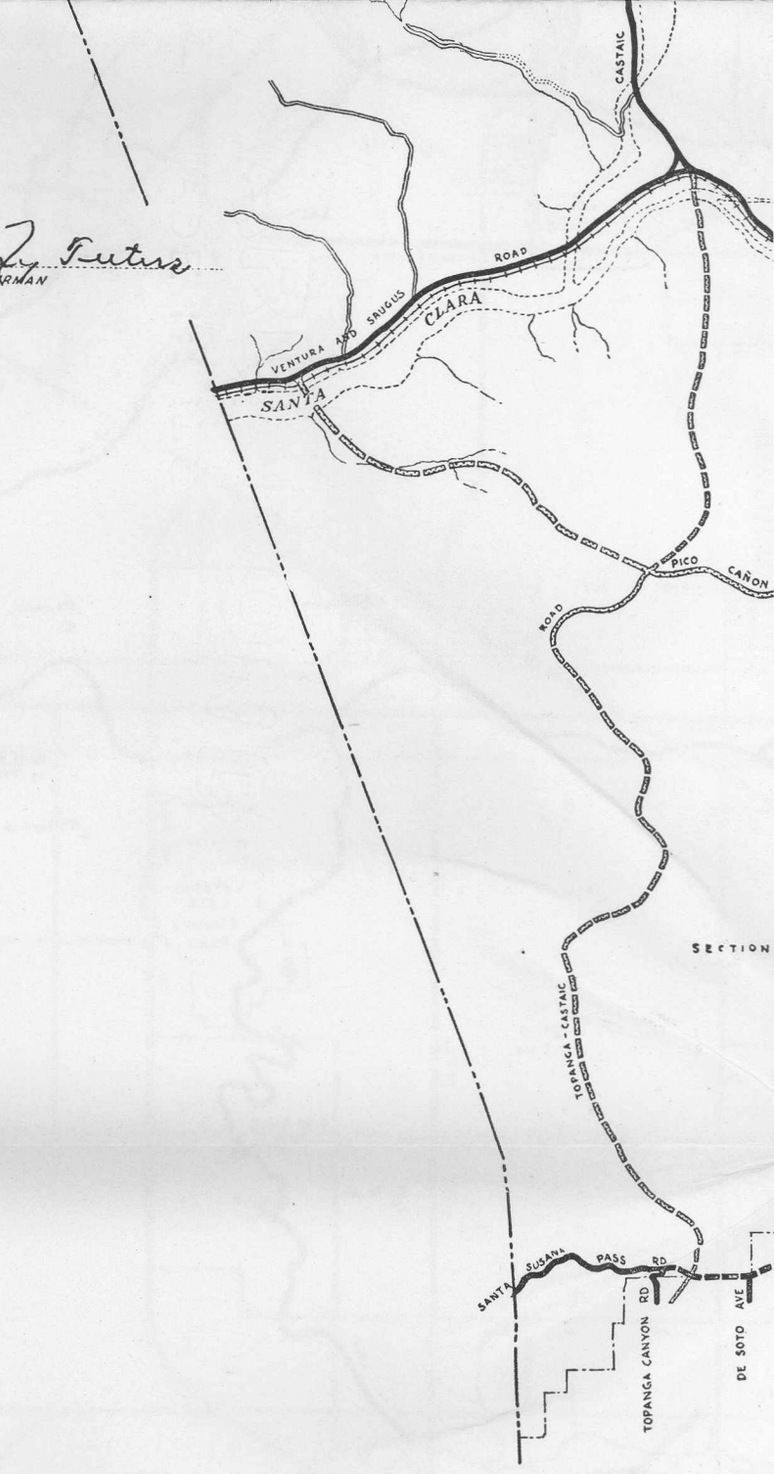
R. Ray Futurs
CHAIRMAN

ATTEST: Irma Ruther
SECRETARY,
THE REGIONAL PLANNING COMMISSION
COUNTY OF LOS ANGELES.

Scale of Miles
0 1 2 3 4 5
May ~ 1939

LEGEND

- MAJOR HIGHWAYS TO BE WIDENED TO 100 FEET
- MAJOR HIGHWAYS TO BE OPENED TO 100 FEET
- SECONDARY HIGHWAYS TO BE WIDENED TO 80 FEET
- SECONDARY HIGHWAYS TO BE OPENED TO 80 FEET
- MAJOR HIGHWAYS ADJACENT TO PRIVATE RIGHTS OF WAY TO BE 90 FEET WIDE



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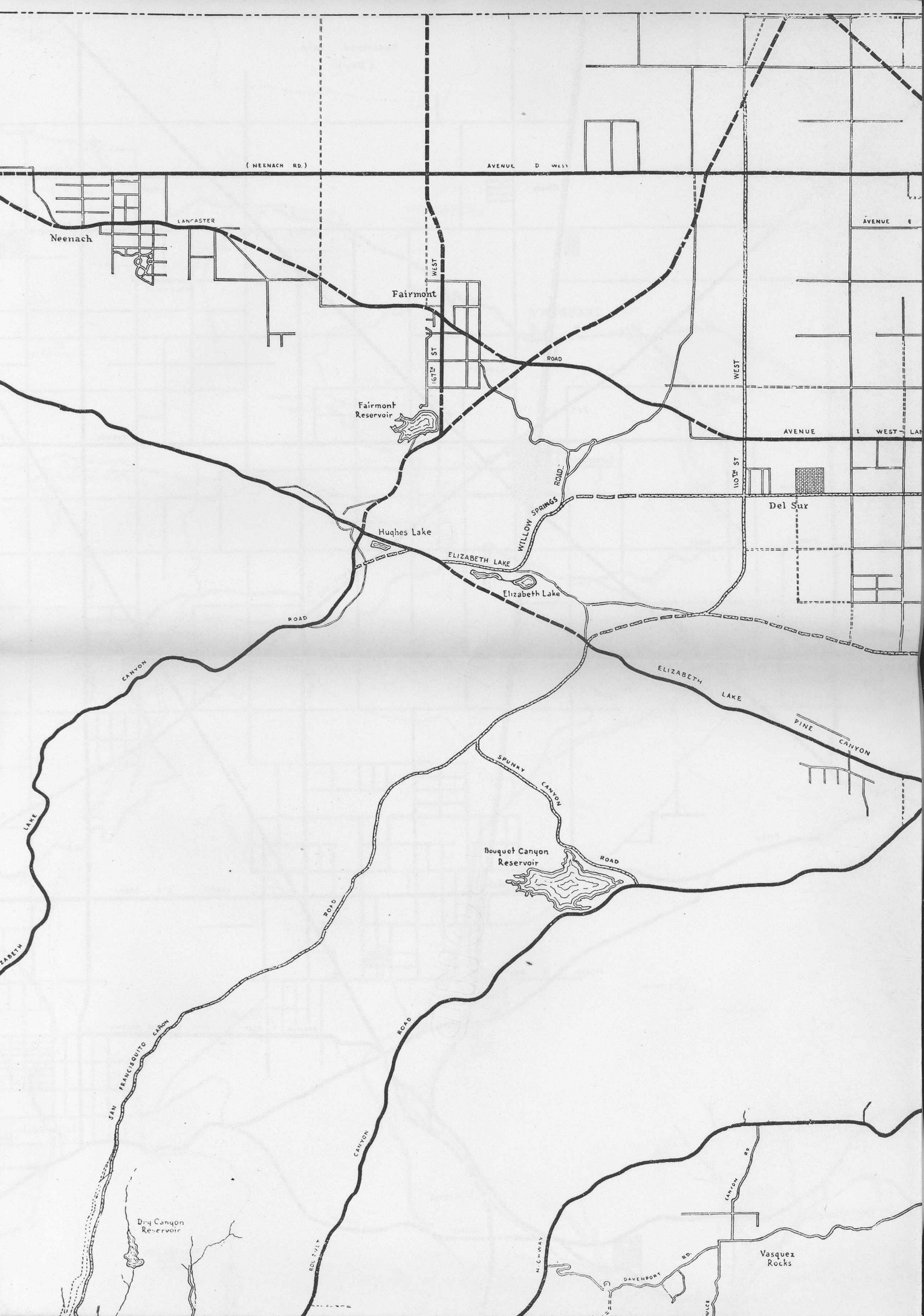
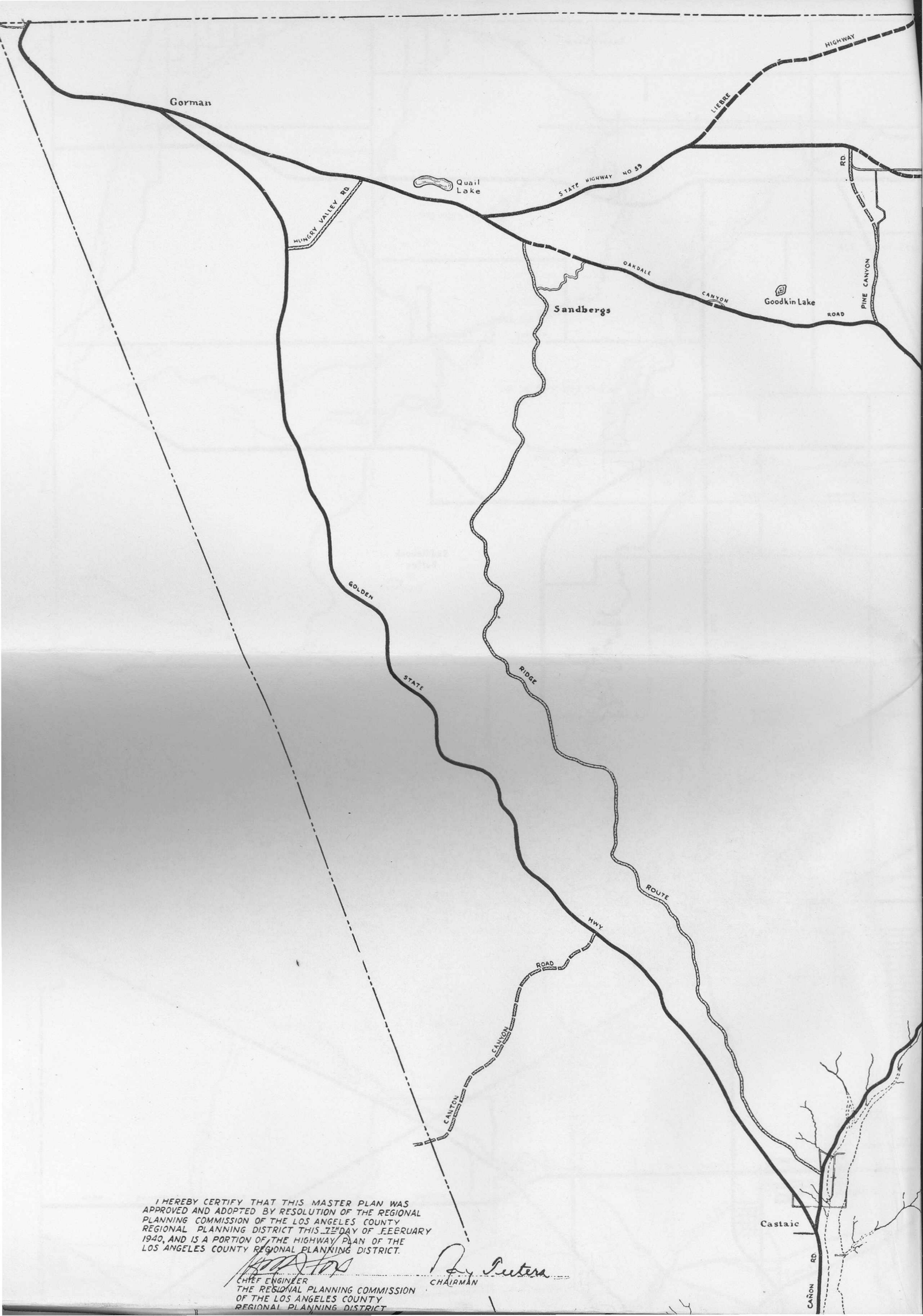
BOARD OF SUPERVISORS * LOS ANGELES CO. CAL. *

L E LAMPTON, COUNTY CLERK, AND
EX OFFICIO CLERK OF THE BOARD
OF SUPERVISORS OF THE COUNTY
OF LOS ANGELES

BY H. O'Bannon
DEPUTY

THE REGI


(NEENACH RD.)
AVENUE D WEST
Neenach
LANCASTER
Fairmont
167TH ST WEST
ROAD
AVENUE E
AVENUE I WEST
Fairmont Reservoir
110TH ST WEST
WILLOW SPRINGS ROAD
Del Sur
Hughes Lake
ELIZABETH LAKE
Elizabeth Lake
ROAD
CANYON
ELIZABETH LAKE
PINE CANYON
SPUNKY CANYON
LAKE
Bouquet Canyon Reservoir
ROAD
ROAD
SAN FRANCISQUITO CANYON
ROAD
CANYON
Dry Canyon Reservoir
SOLEDAD
N. CANYON
CANYON RD.
DAVENPORT RD.
Vasquez Rocks



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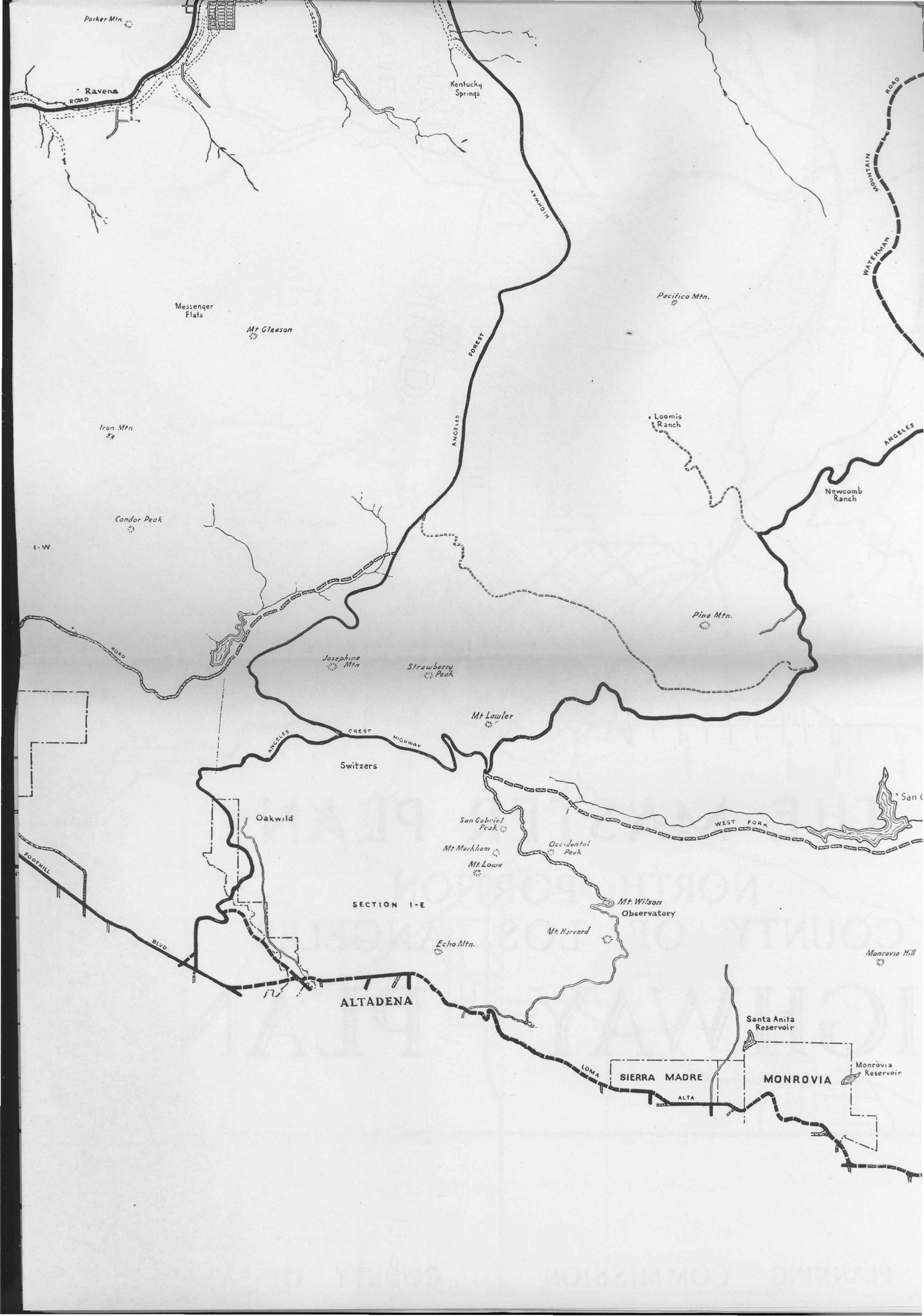
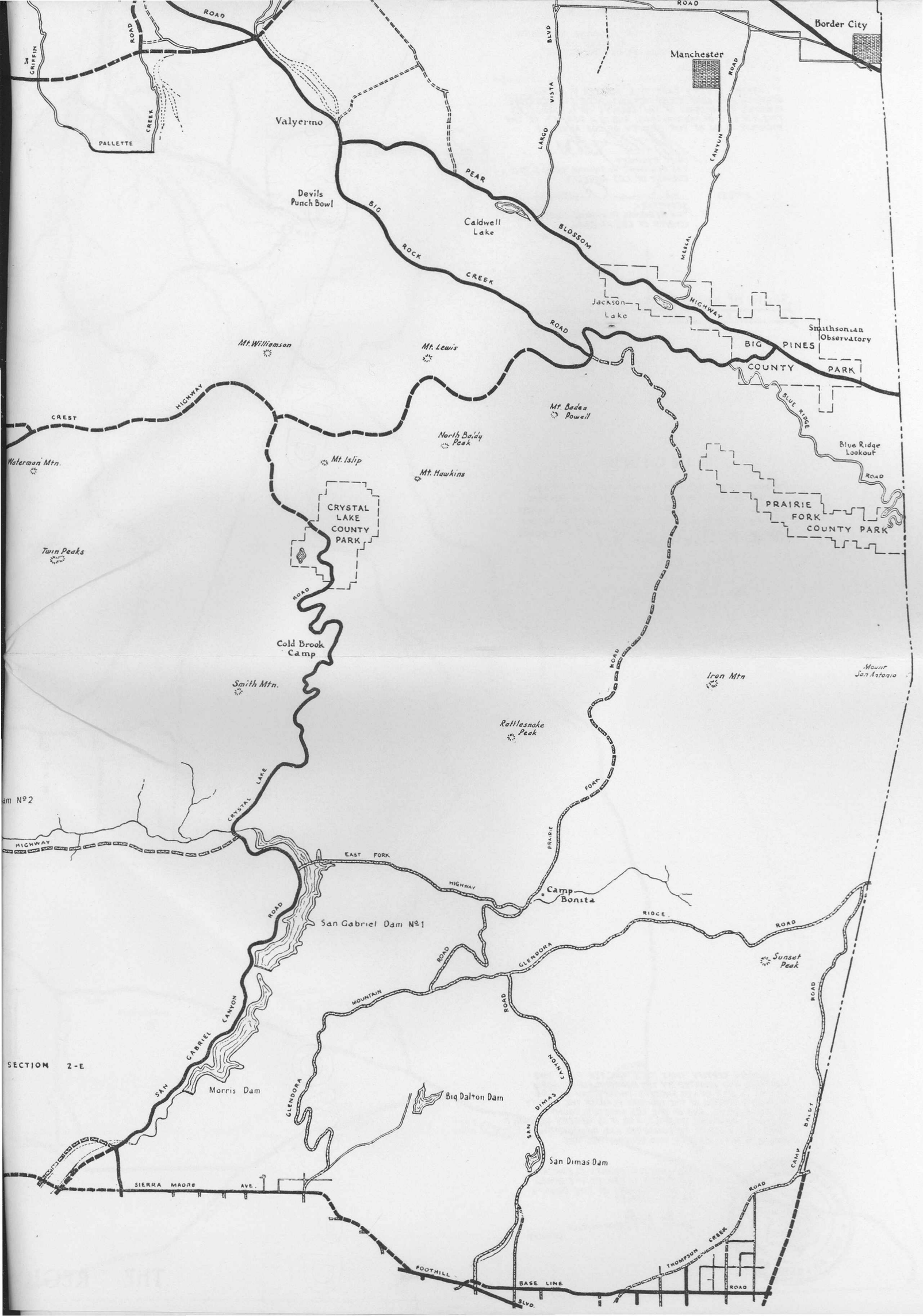
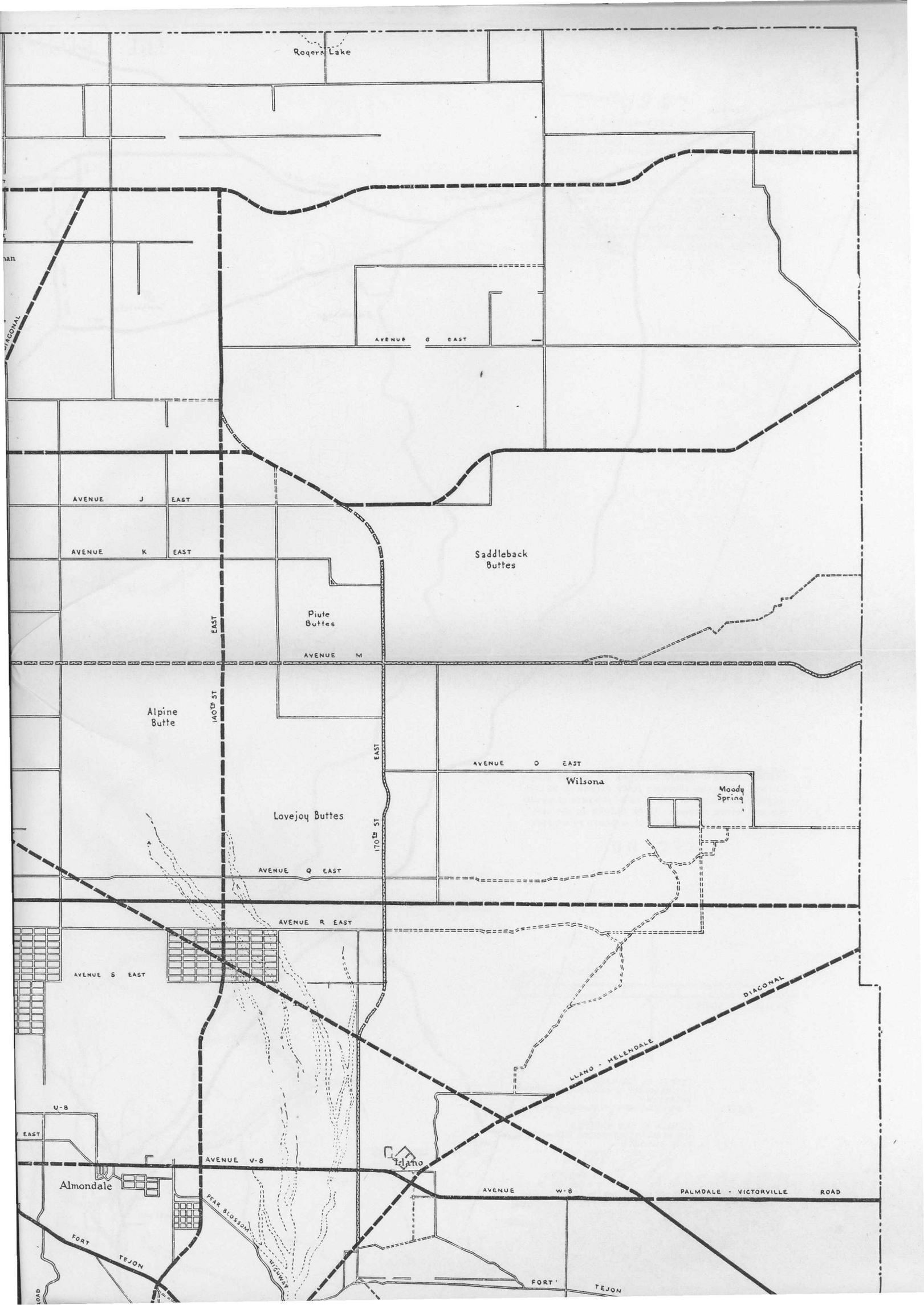
CHIEF ENGINEER
THE REGIONAL PLANNING COMMISSION
OF THE LOS ANGELES COUNTY
REGIONAL PLANNING DISTRICT

CHAIRMAN


Parker Mtn.
Ravena
ROAD
Kentucky Springs
HIGHWAY
MOUNTAIN ROAD
WATERMAN
Messenger Flats
Mt. Gleason
FOREST
ANGELES
Pacifico Mtn.
Iron Mtn
Loomis Ranch
Newcomb Ranch
Condor Peak
I-W
Pine Mtn.
Josephine Mtn
Strawberry Peak
Mt Lawler
CREST HIGHWAY
Switzers
Oakwild
San Gabriel Peak
Mt Markham
Mt Lowe
Occidental Peak
WEST FORK
FOOTHILL
BLVD
SECTION I-E
Mt. Wilson Observatory
Mt. Harvard
Echo Mtn.
Monrovia Hill
ALTADENA
Santa Anita Reservoir
LOMA
SIERRA MADRE
MONROVIA
Monrovia Reservoir
ALTA


Border City
Manchester
Valyermo
Devils Punch Bowl
Caldwell Lake
Jackson Lake
Smithsonian Observatory
BIG PINES COUNTY PARK
Mt. Williamson
Mt. Lewis
Mt. Baden Powell
North Baldy Peak
Mt. Islip
Mt. Hawkins
Waterman Mtn.
Twin Peaks
CRYSTAL LAKE COUNTY PARK
PRAIRIE FORK COUNTY PARK
Blue Ridge Lookout
Cold Brook Camp
Smith Mtn.
Iron Mtn
Mount San Antonio
Rattlesnake Peak
Camp Bonita
San Gabriel Dam No 1
Sunset Peak
Morris Dam
Big Dalton Dam
San Dimas Dam
SECTION 2-E
PALLETTE CREEK ROAD
GRIFFIN ROAD
PEAR BLOSSOM HIGHWAY
BIG ROCK CREEK ROAD
CREST HIGHWAY
CRYSTAL LAKE ROAD
EAST FORK HIGHWAY
PRAIRIE FORK ROAD
GLENDORA MOUNTAIN ROAD
SAN GABRIEL CANYON ROAD
GLENDORA CANYON ROAD
SAN DIMAS CANYON ROAD
RIDGE ROAD
CAMP BALDY ROAD
THOMPSON CREEK ROAD
SIERRA MADRE AVE.
FOOTHILL BLVD.
BASE LINE


Rosamond Lake
(Dry)
Buckhorn Lake
Oban
AVENUE D
AVENUE E
WEST
WEST
60TH ST.
HIGHWAY
DIAGONAL
ROAD
AVENUE
Lancaster
AVENUE J WEST
AVENUE K WEST
SIERRA
ANTELOPE
EAST
EAST
AVENUE
BUCKHORN
M WEST
40TH ST.
80TH ST.
MUROC
ROAD
Palmdale
AVENUE Q-8 EAST
AVENUE S WEST
Alpine Springs
AVENUE T EAST
PEAR BLOSSOM HIGHWAY
Little Rock
Vincent
LITTLE ROCK CUT-OFF
Palmdale Dam
Little Rock
Reservoir
Acton


Rogers Lake
AVENUE G EAST
AVENUE J EAST
AVENUE K EAST
Saddleback Buttes
Piute Buttes
EAST
AVENUE M
140TH ST
Alpine Butte
EAST
AVENUE O EAST
Wilsona
Moody Spring
Lovejoy Buttes
170TH ST
AVENUE Q EAST
AVENUE R EAST
AVENUE S EAST
DIAGONAL
LLANO - HELENDALE
U-8
EAST
AVENUE V-8
Llano
Almondale
AVENUE W-8
PALMDALE - VICTORVILLE ROAD
PEAR BLOSSOM HIGHWAY
FORT TEJON
FORT TEJON