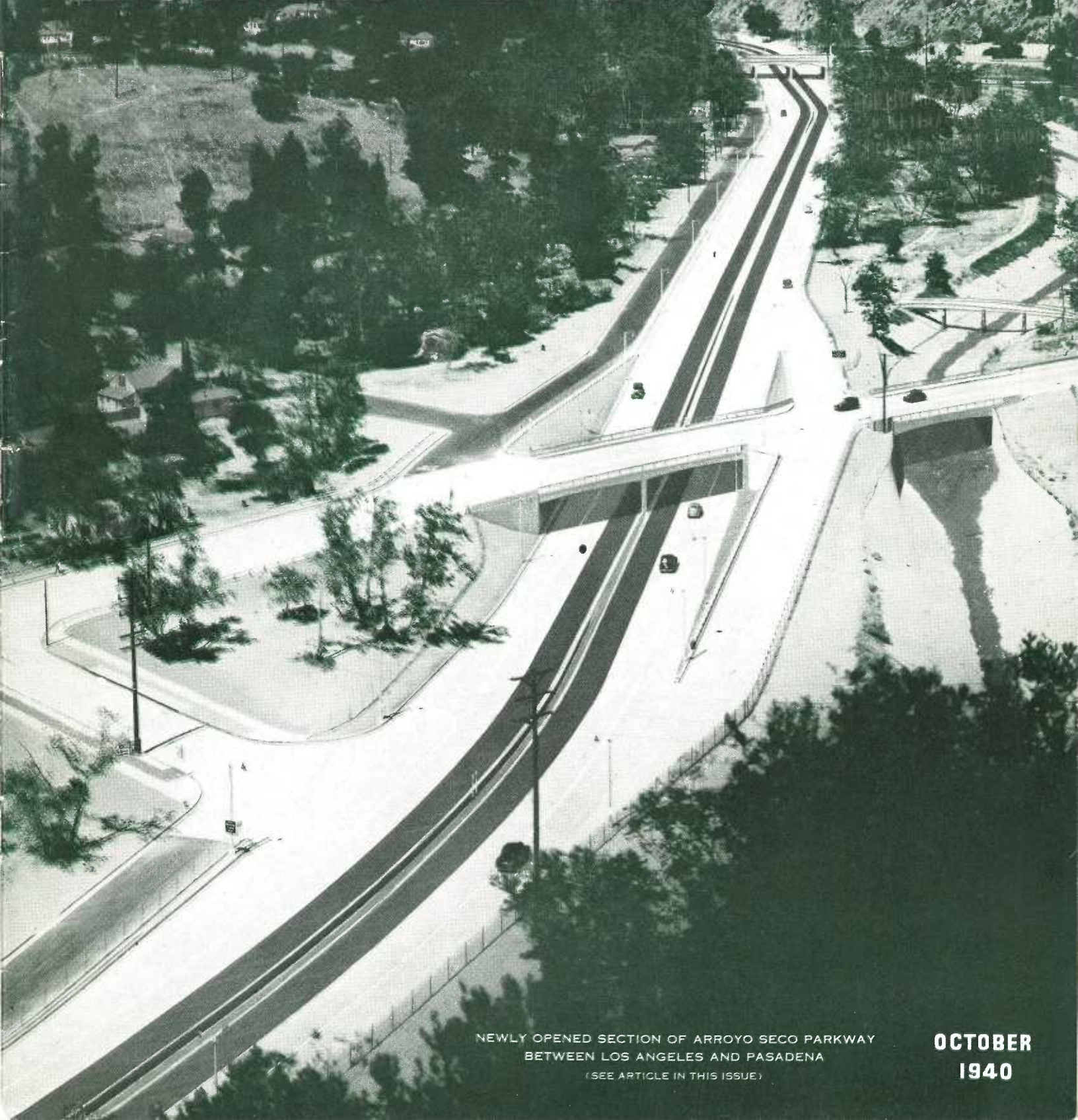


CALIFORNIA

HIGHWAYS AND PUBLIC WORKS



NEWLY OPENED SECTION OF ARROYO SECO PARKWAY
BETWEEN LOS ANGELES AND PASADENA
(SEE ARTICLE IN THIS ISSUE.)

OCTOBER
1940

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official Journal of the Division of Highways, Department of Public Works, State of California

FRANK W. CLARK, Director

C. H. PURCELL, State Highway Engineer

J. W. HOWE, Editor

K. C. ADAMS, Associate Editor

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State Adopts A Three Point Program for Marketing Power Of the Central Valley Project

A THREE-POINT program of State assistance to the Federal Government in the development of a public market for Central Valley Project electric energy was approved by the Water Project Authority of California in a meeting held in Sacramento September 8th with United States Commissioner of Reclamation John C. Page and other representatives of the Federal Government.

The program the Water Project Authority is undertaking in behalf of the Federal Government includes:

1. Preparation of a comprehensive engineering report on the means and methods of disposal of Central Valley Project power.
2. Assistance in the formation of public districts in areas desiring to purchase this power.
3. Assistance to public agencies in determining methods of financing for public distribution of power.

GOVERNMENT CONTRACT NECESSARY

Commissioner Page, who approved the program, declared that a working agreement or contract would have to be drawn up between the Authority and the Federal Government covering work to be undertaken by the State.

At the same time the Authority authorized a letter to the legislature which will convene in January asking for the appointment of a special committee of both houses to work with the Authority in framing legislation needed for the adequate financing of public agencies desiring to distribute Central Valley Project power.

The Authority, at the suggestion of Chairman Frank W. Clark, also went on record favoring a conference with Federal officials and representatives of the Pacific Gas & Electric Company concerning utilization of existing facilities for the distribution of Shasta power.

"In making any change from private distribution of power to a program of public ownership," Chairman Clark said, "our first consideration must be the public and to secure for it

Power Value Scale		
Value of Shasta Dam electric power delivered to city gates as set up by U. S. Department of Interior is shown in the following table:		
Unit Values—Mills per Kilowatt-Hour	Pumping hydro only	Service to Public customers hydro and steam
For Government delivery to load centers:		
Firm -----	3.90	5.18
Dump -----	---	1.77
Average -----	---	4.70
For Government delivery to Antioch:		
Firm -----	---	4.28
Dump -----	---	1.46
Average -----	---	3.88
For Government delivery at Shasta:		
Firm -----	---	2.98
Dump -----	---	1.02
Average -----	---	2.71

the fullest benefits and advantages of public ownership. The present administration is, and will be, unalterably for the public generation and distribution of Central Valley Project power. However, I believe we should exhaust every possibility in preparing for this change to prevent economic waste through unneeded duplication of facilities and I have therefore suggested this conference between the Water Project Authority, the Federal Government and the Pacific Gas & Electric Company.

"It is Governor Olson's belief, in which I share, that part of the necessary facilities to deliver Central Valley Project power to the people can be utilized for a proper and fair consideration, thus preventing the eco-

nomie waste of unnecessary duplication and at the same time protecting the existing utility against confiscation."

State Engineer Edward Hyatt, as executive officer of the Authority, was instructed to consult with engineers of the company concerning existing facilities of the utility.

Commenting on the proposed work program outlined by the State, Commissioner Page declared:

"I think a great amount of good will result if the Authority steps out aggressively and lets the people know that it is now in a position to give assistance to districts desiring Central Valley Project power. This move will grow like a snowball rolling down hill and then I am sure you will have no trouble in getting legislation you need for proper financing of these districts.

"I was decidedly pessimistic when I came to this conference as to the manner in which the Authority could function as a real asset to the government and the development of the Central Valley Project.

PAGE IS OPTIMISTIC

"Now I am decidedly optimistic that something can be accomplished—again stressing the fact that we are partners and a team—both of us trying to get for the State of California the maximum benefits from the tremendous undertaking on which we are now engaged."

At the September 24th meeting of the Authority the Glenn-Colusa Irrigation District, the largest irrigation district in the Sacramento Valley, submitted a request for information and assistance concerning the possibility of the district acting as a purchaser and distributor of Central Valley Project power for a large area on the west side of the Sacramento Valley.

Chairman Clark, speaking in behalf of the Authority, declared that every possible assistance would be given not only to the Glenn-Colusa Irrigation District but to all districts and areas



FRANK W. CLARK
Chairman, California Water Authority

interested in acquiring Central Valley electric energy for public distribution.

On motion by Attorney General Earl Warren, the Authority unanimously went on record instructing the executive officer to confer with and assist and encourage all areas that have indicated a desire to utilize the power from Shasta Dam. The assistance to be given will include engineering and legal aid as required.

The Glenn-Colusa Irrigation District is the largest in the Sacramento Valley, serving an area of 122,000 acres and pumping water for several other irrigation districts. In addition to its own territory the irrigation district outlined a plan to serve outlying areas extending from the Glenn-Tehama County line south to Arbuckle. Representatives of the district said the area would include half a dozen small cities and approximately 15,000 consumers of electric energy.

P. J. Minasian, attorney for the district, told the Authority his directors were particularly interested in the possibilities offered through the issuance of revenue bonds for the purpose of financing distribution lines and asked for information on marketing of such bonds.

E. Wayne Miller, attorney for the

Maxwell and Arbuckle Municipal Utility Districts, and N. C. Steele, mayor of Colusa, informed the Authority their cities would come within the scope of the Glenn-Colusa proposal and asked that they too be given assistance by the Authority in obtaining Central Valley Project power through public facilities.

Miller sharply criticized existing power rates paid by the farmers to the private utility serving the area and stressed the need for immediate action on the part of the Authority or the Federal government in setting up machinery by which areas desiring Shasta Dam power could place themselves in a position to purchase it.

"If we are going to get power and if we are going to get our power costs down," said Miller, "we feel this is our golden opportunity where we have a new source of power to be distributed. If proper machinery is provided we won't have to wait until the transmission line is completed down through our district to find the ways and means for distribution of power which in itself would probably take several years to complete."

OTHER DISTRICTS APPLY

Other districts which have requested assistance or information on acquiring Central Valley power for public distribution are the Sacramento Municipal Utility District, Banta-Carbona Irrigation District, East Contra Costa Irrigation District, Byron-Bethany Irrigation District, West Side Irrigation District, Juuquina-Packwood Canal area, Tulare Central Counties Utility District and the cities of Redding, Chico, Roseville and Lodi.

In connection with these numerous requests for information on Central Valley Project power the Water Project Authority held a preliminary meeting with representatives of the United States Bureau of Reclamation and the Department of Interior in San Francisco August 28th and 29th.

Previous to the meeting with Commissioner Page the Authority had instructed its legal staff to make a study of the adequacy of existing district acts to determine whether the various districts were properly empowered to take advantage of the water and power to be developed by the Central Valley Project.

The legal staff was also instructed



EDWARD HYATT
State Engineer

to prepare an opinion for the Authority on Section 18 of the Central Valley Project Act which has to do with the issuance of revenue bonds. The construction of the section is not clear and two attempts to have this fault in the act clarified by the Legislature have failed. Until the section is clarified either by legislation or through the courts the Authority can not issue revenue bonds which would be salable.

Another highly important development was the presentation of a paper by State Engineer Edward Hyatt, executive officer of the Authority, on the power prospects of the Central Valley Project at a meeting at Shasta Dam on October 3d of the Central Valley and Central Coastal Basin divisions of the National Resources Planning Board which acts in an advisory capacity to President Roosevelt.

MARKET FOR TOTAL POWER

The paper outlined the power production possibilities of Shasta Dam, the market and possible methods of disposal, the cities or districts which now own and operate their own sys-

Shasta Dam picture on the adjoining page shows impressive progress made in construction of huge blocks of concrete on the site of the East abutment of the dam.

U. S. Bureau Photo



tems or generate their own power and those in the process of formation. The paper concluded:

“There is no question as to the ability of the market to absorb the entire power output that can be made available and it may confidently be expected that disposal will be effected by one or the other, or a combination of the methods of disposal described.

“According to recently announced expectations of the Bureau of Reclamation, Shasta power will be available in 1945. If this power is to be utilized through the medium of publicly owned electric utility systems in conformity with the preference granted by both Federal and State law, public agencies must be organized and preparations made without delay so that the necessary electric facilities required for such wholesale disposal of power from the project can be planned and constructed and so that local distributing systems can be provided, by the time the power becomes available.”

Jean Vincenz, Director of Public Works of Fresno, discussed the paper for the group and pointed out the difficulties which are encountered by public agencies in acquiring distribution systems.

Regional Director E. W. Kramer, of the Federal Power Commission, told the board that all present estimates of power consumption in California covering the next three years would have to be revised upward because of the increases caused by the national defense program.

To be properly integrated with market demands and the program for meeting those demands, Kramer declared that Shasta Dam power should be made available in 1943 when it is estimated present and planned capacities for generation of power other than Shasta Dam will be absorbed.

Announcement of the probable value of Central Valley Project power by R. V. L. Wright, special representative of the U. S. Department of Interior, marked the high point in the conference between members of the Water Project Authority of California and representatives of the Bureau of Reclamation, which was held in San Francisco, August 28th and 29th.

The value of electric power delivered to city gates, the Federal stud-

ies showed would be 5.18 mills per kilowatt hour for firm power.

State Director of Public Works Frank W. Clark, as chairman of the Water Project Authority, declared he was gratified with the information the Federal Government had presented.

“In spite of the fact that these figures are only preliminary,” Clark said, “we are now in a position to tell the people of California the value of power available from the Central Valley Project if they take the necessary steps to buy it.

“This, however, is going to necessitate the forming of proper districts and while the Water Project Authority of California is willing and ready to cooperate with areas wishing to form these districts by furnishing assistance and engineering information, it can not go beyond that point at this time.

“Bureau representatives told the Water Project Authority quite specifically that it was the intention of the Federal Government to build and operate the project. Mr. Wright said that the government would also assist in the forming of districts for the public distribution of Central Valley Project power. To date, Mr. Wright said, nothing has been done by the Federal authorities in promoting these districts.

“The Water Project Authority through its staff is in a position to do this work. The figure of 5.18 mills for firm power will be available only to the agencies which have been properly organized and are in a position to make a bid for this power. That is where the greatest bottleneck will occur. Power will be available in the spring of 1945, which gives unorganized districts contemplating the public distribution of Shasta Dam power all too little time to organize even if they begin work at once.

“Our duty on the Water Project Authority is to inform the public of this situation and if possible arouse them to action so they will be in a position to participate in the benefits of cheaper power rates.”

Numerous other issues concerning the future of the Central Valley Project were clarified during the discussions which ranged from the history of the origination of the project by the State, through the financing and present construction period on to future policies and possibilities.

In addition to presenting a prelim-

inary estimate of the probable value of Shasta Dam power, other important discussions covered:

Clarification of the part the Federal Government expects to play in the construction and future operation of the Central Valley Project.

Delineation of the cooperative field in which the Water Project Authority of California will function.

Plans for continued conferences between the State and Federal Government on an interim contract and the exchange of engineering data on possible methods of operation of the project.

WATER AUTHORITY'S POSITION

In a formal statement at the opening of the conference, Mr. Clark, as chairman of the Water Project Authority, summed up the authority's position in regard to the Central Valley Project as follows:

“It is essential that the proper respective functions, duties and responsibilities of the authority and the United States relative to the construction, operation and management of the project should be defined.

“We want to know, first, the price, kind and quantity of the commodity we are asked to sell, and second, what authority we are to have in disposing of it. We can not provide buyers before we are put in a position to give them the answers to these questions.”

Replying, Mr. Wright quoted from a letter written to Governor Olson by Secretary of the Interior Harold L. Ickes, in which he said:

ICKES' LETTER TO GOVERNOR

“In the sale of Central Valley power, the State, or an agency of the State acting in the interests of a group of public agencies having power outlets, would, under suitable conditions, be admirably qualified to receive the preference given by the law. The State of California, I feel, has a responsibility in connection with the Central Valley Project. This responsibility, in part at least, might be discharged by the State's making itself ready to act as a power distributor or ready to act in the interests of public power distributors. The interest of the Department of Interior is to gain the widest possible public benefits from the project, and if it furthered this interest, I would be glad to make a contract with the State or a proper author-

ity of the State for disposal of Central Valley power.

"I have encouraged and will continue to encourage the State to help us in this manner."

Specifically Mr. Wright asked the Water Project Authority to outline for presentation to the Secretary of the Interior a definite plan by the State of what it can do in the way of organizing and financing public districts for the distribution of Central Valley Project power.

PLAN FOR STATE ACTION

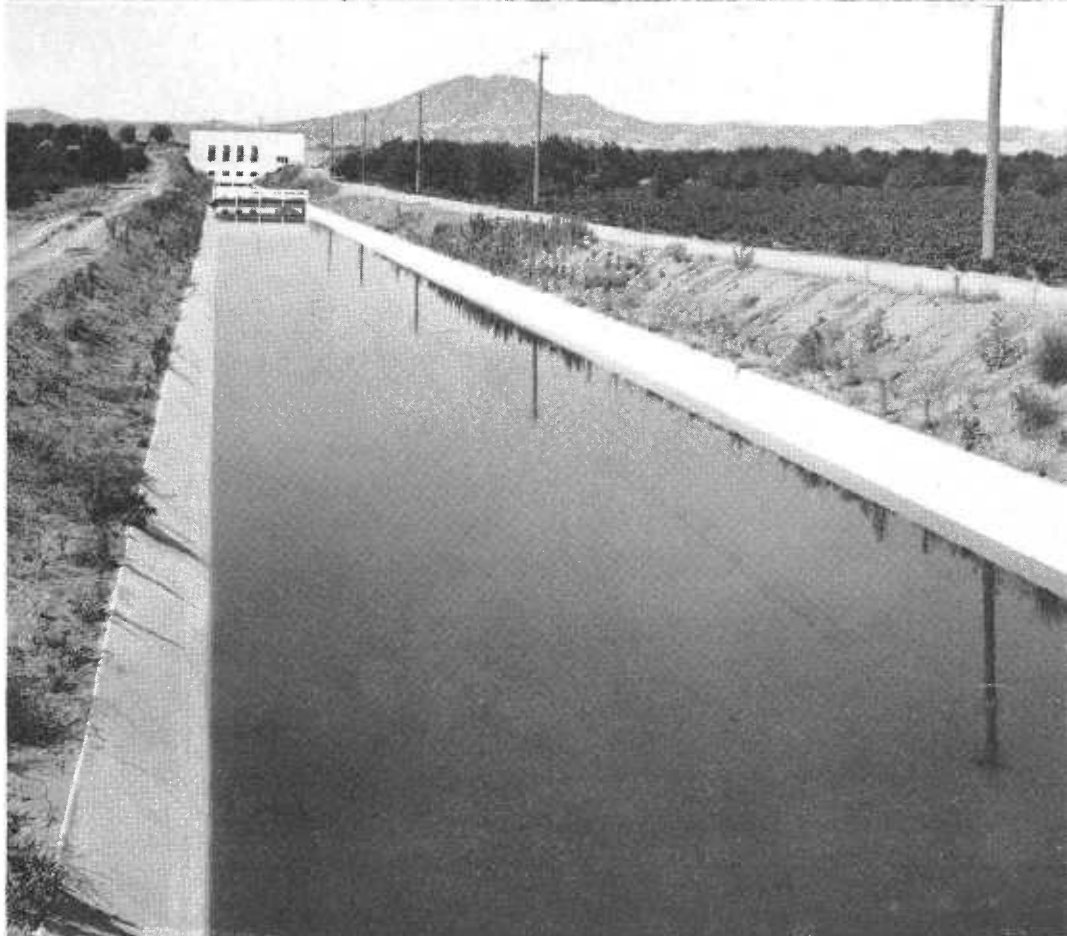
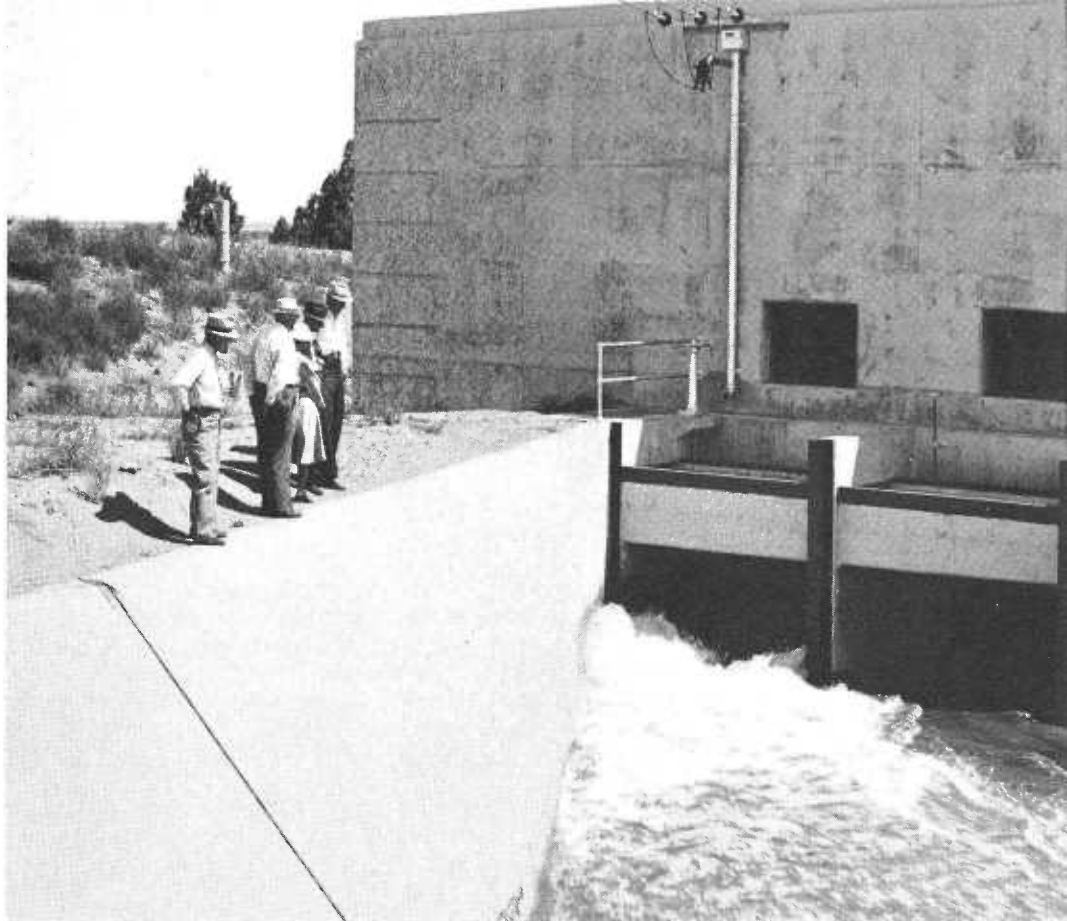
"Based on such information as the State may care to submit to us," Wright said, "we hope to be able to convey to the Secretary of the Interior our opinion as to the readiness, ability and willingness of the State to aid the development of this project in the matter of the sale and distribution of power. It would seem appropriate at this point to outline the information we would consider conclusive as to the feasibility of a plan submitted by the State.

"These showings should set forth marketing commitments from responsible purchasers of power; evidence of legal authority for and plans to finance and operate the public power system or systems proposed by the State; a statement of resale rates at which Shasta energy is to be sold to the public; a proforma statement of earnings and expense; and, finally, a request for an allotment of power which may be definitely acted upon by the Secretary and, if considered in the public interest, result in an agreement with the authority.

"I think it is up to your Authority and the Federal government," Wright said, "to pursue the exploration of what the State can and will do as rapidly as possible, so that as of March, 1945, when the power is available for distribution somebody will have done the job, whether it is you or somebody else."

In presenting the preliminary power values, Bureau of Reclamation engineers estimated there would be 834,000,000 kilowatt hours a year of firm power available for commercial sale from the Shasta Dam hydro-electric plant and that construction of a 109,000 kilowatt capacity steam plant at Antioch would be necessary. With the steam plant there would be 1,083,000,000 kilowatt hours of firm power a year available for commercial sale

(Continued on page 19)



U. S. Bureau Photos

At top—First water from Central Valley Project pumped through Contra Costa Canal for use of Pittsburg City. Bottom—Contra Costa Canal. Lift pumping plant in background

Proposed Arroyo Seco Parkway Extension to Los Angeles Business Center Through Elysian Park

By A. D. GRIFFIN, District Office Engineer, District VII

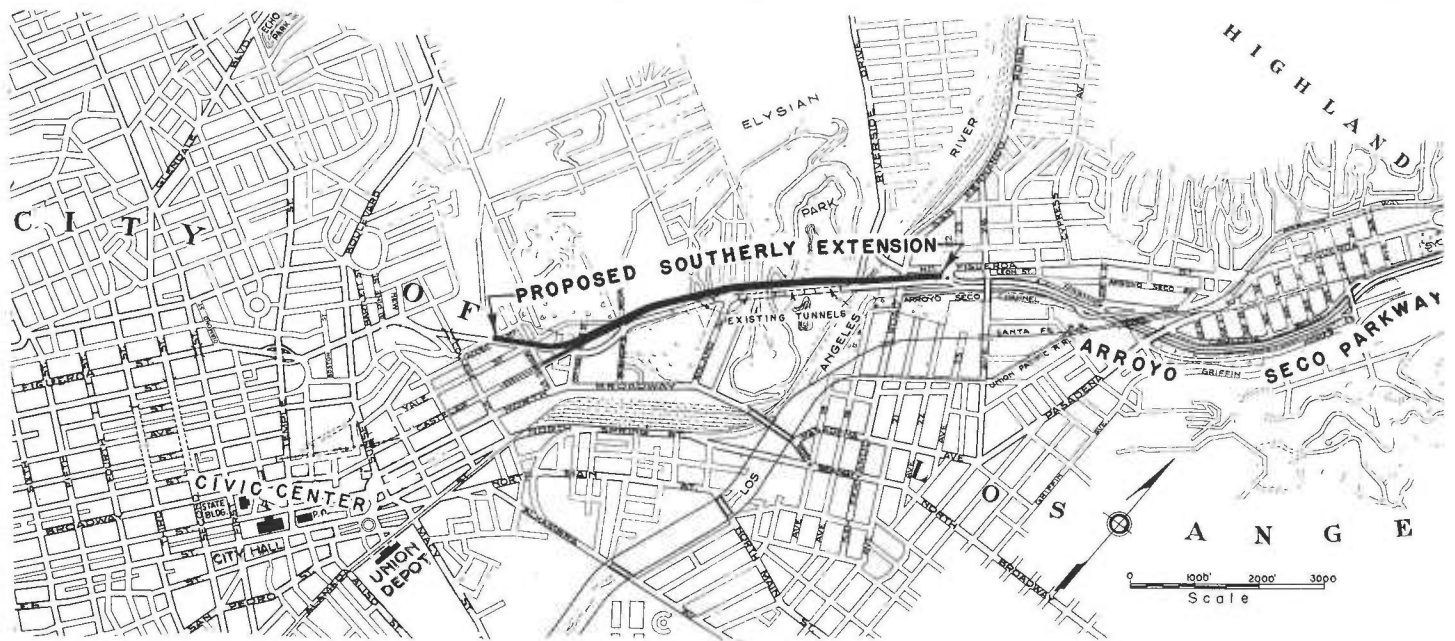
IN AND around the metropolitan Los Angeles area it is almost a foregone conclusion that when a new improved highway facility is opened to the public so large a volume of traffic is attracted to it that the adjoining sections of this highway which have not already been adequately improved become badly overtaxed. We are certain to face this situation when the Arroyo Seco Park-

22 southerly along North Figueroa Street, in order to relieve the bad traffic congestion across the Los Angeles River Bridge, through the Riverside Drive intersection, and in the four Elysian Park tunnels where even now during the morning and evening rush hours the traffic delays are intolerable?"

Existing traffic congestion on North

Street and Avenue 22 for north-bound traffic only.

2. Construct additional four-lane bridge across the Los Angeles River upstream from existing bridge, the grade of the southerly end of the bridge to be above Riverside Drive, permitting north-bound Riverside Drive traffic to turn left under the new bridge.
3. Construct a four-lane roadway, in



Map of Proposed Southerly Extension of Arroyo Seco Parkway into Los Angeles Business District

way is completed, particularly from the southerly terminus at Avenue 22 into the business district of Los Angeles city.

Los Angeles city and county traffic authorities, and the general public who will use the Arroyo Seco Parkway between Los Angeles and Pasadena after it is completed, are even now asking the question:

"What does the State propose to do in Los Angeles city from Avenue

Figueroa Street is shown by recent photographs accompanying this article. It is not difficult to imagine what will happen when the Arroyo Seco Parkway is opened to traffic before the proposed increased facilities to the south have been completed.

The general plan developed by the State for handling this situation is—

1. Use the four existing tunnels, roadway and bridge over Los Angeles River between Castelar

open cuts if possible, for south-bound traffic on the westerly side of existing tunnels and at a higher elevation to facilitate grade separations for traffic at Solano Avenue, Bishops Road and at Castelar Street.

4. The new work on Figueroa Street from Avenue 22 to Adobe Street to be on a freeway basis.

At the time the city of Los Angeles built the existing tunnels they ex-



North Figueroa Street Bridge over Los Angeles River showing effect of traffic making left turn for Riverside Drive



Traffic through North Figueroa Street tunnels meets cross traffic at Solano Street intersection



At top and bottom—Views looking southerly along Castelar Street showing interference of late afternoon traffic on North Figueroa Street by reason of southbound traffic on Figueroa Street making left turn into Castelar Street. This condition will be eliminated by a grade separation on proposed extension route

pected, when traffic developed sufficiently to require it, to construct a parallel line of tunnels. A recent estimate by the city for an additional four-lane bridge across the Los Angeles River and the additional line of tunnels and four-lane roadway from Avenue 22 to Adobe Street was given out as \$2,500,000.

By reason of the fact that considerable PWA and WPA Federal funds became available for the Arroyo Seco Parkway construction which were not anticipated when the highway budget was adopted, savings have resulted in

the State budgeted funds. The California Highway Commission made these savings available for starting work on the Arroyo Seco Parkway Southerly Extension through Elysian Park leading into downtown Los Angeles.

A study was made to determine the possibility of substituting open-cut construction for the roadway through the Elysian Park Hills instead of tunnel construction. Roadways in open-cuts are preferable to tunnels because of greater safety and efficiency in vehicular operation, and also because of

greater possibilities for beautification and landscaping. This study of "open-cut versus tunneling" immediately raised the question of stability of the cut slopes and involved us in geological considerations.

District Materials Engineer R. J. Allan, who has had considerable training and experience in geological and mining studies and investigations, made an extensive geological survey of this portion of the Elysian Park area through which the North Figueroa Street tunnels have been constructed. The studies conducted



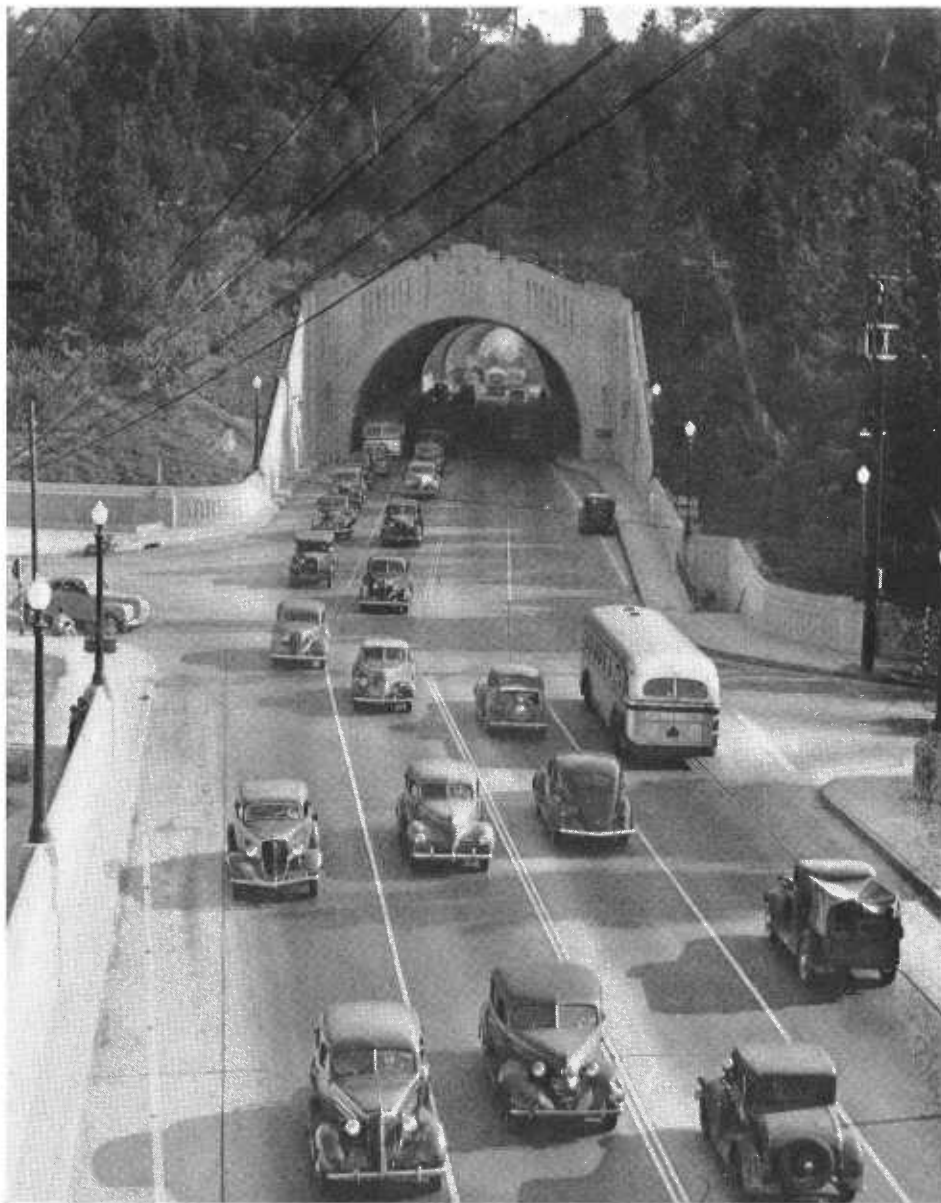
by Mr. Allan were for the purpose of answering questions as follows:

1. If open cuts are constructed instead of tunnels, what cut slopes should be used in order to be assured of safety from future landslides?
2. What would be the effect of eccentric loading on the existing tunnels due to open cut construction nearby?
3. What would be the closest distance from existing tunnels that open cuts could be constructed without danger of damage to the existing tunnels?
4. What would be the future possibility of damage due to earthquake action?

Some years ago a large landslide occurred in Elysian Park, only one-fourth mile distant from the northerly portal of the North Figueroa Street Tunnel near the Riverside Drive connection and city authorities were fearful of possible damage to the tunnels because of landslide conditions. Dr. John P. Buwalda, eminent geologist of California Institute of Technology, was engaged to make a geological study by the city to determine safety of existing tunnels.

Because of Dr. Buwalda's familiarity with this vicinity, the State engaged him as a Consulting Geologist in regard to feasibility and safety of the district's plans for open-cuts instead of tunnels for the contemplated Arroyo Seco Parkway Extension southerly through the Elysian Park Hills. It was most gratifying to find that Dr. Buwalda's investigations and report gave full approval of our plans. Geological reports are not always "dry as dust" although they largely deal with ancient happenings and certain sections of Dr. Buwalda's geological report of August 21, 1940, which will be of interest to readers of this article, are being quoted:

"GEOLOGY—The rocks of the North Figueroa Street tunnel area belong to the Puente formation, which is of Miocene age. The materials were laid down in the sea as sands and muds some 12 millions of years ago and, buried beneath thousands of feet of younger sediments, they became compacted to strata of sandstone and shale. They



View through three Figueroa Street tunnels under Elysian Park

were further solidified by the deposition of calcium carbonate in the pore spaces, cementing the constituent particles together. The sandstones are hence harder than very young sedimentary formations or soils, but softer and less strong than granite.

"In any region in which the strata have been tilted to angles of 30 or 45 degrees, minor faults develop in response to the inequality of relief afforded by the harder and softer parts of the formation. Such faults are seldom long and aside from shattering the rock somewhat locally they are not important. A number of such minor fractures are

exposed in the tunnel district but they are not seriously detrimental to engineering operations. No major faults pass through or near the Figueroa Tunnels.

"In some parts of southern California the rocks are so severely jointed as to make construction operations very difficult. The strata in the Figueroa Street tunnel district are only normally jointed and shattered rock is uncommon.

"The direction of the tunnels is such that they cross the moderately dipping strata at a large angle, which is a much more fortunate re-

(Continued on page 14)

East Shore Highway Project Wins Assurance of Highway Commission

FURTHER development in California of the freeway type of highway construction became assured when the Highway Commission at its meeting in Oakland on September 27th pledged itself to start building the proposed East Shore Highway between Oakland and San Jose next year.

The commission, through its chairman, Larry Barrett, promised to include in its next biennial budget funds to launch actual construction on the first unit of the project.

Already \$1,030,000 have been spent by the State and the city of Oakland jointly in the purchase of rights of way for the new highway from Fifth Avenue and Oak Streets in Oakland to Fiftieth Avenue, south of Fruitvale.

While the commission was unable to indicate the exact sum of money it would be able to allocate for the un-

dertaking, Mr. Barrett informed the Central California East Shore Highway Committee, the Oakland Chamber of Commerce and other civic groups that funds would be made available in the 1941-43 budget for a start on the project.

The East Shore Highway will be a six-lane divided freeway with separation structures at various important cross roads such as Fifth Avenue and Fruitvale Avenue.

A possible first unit would extend from Fifth and Oak streets to Thirty-fifth Avenue, and cost approximately \$2,000,000.

CITY AND STATE COOPERATE

From the $\frac{1}{4}$ -cent gas tax revenues for State highway construction within municipal limits the city of Oakland will have contributed about \$600,000 by the end of the present biennium for rights of way and the

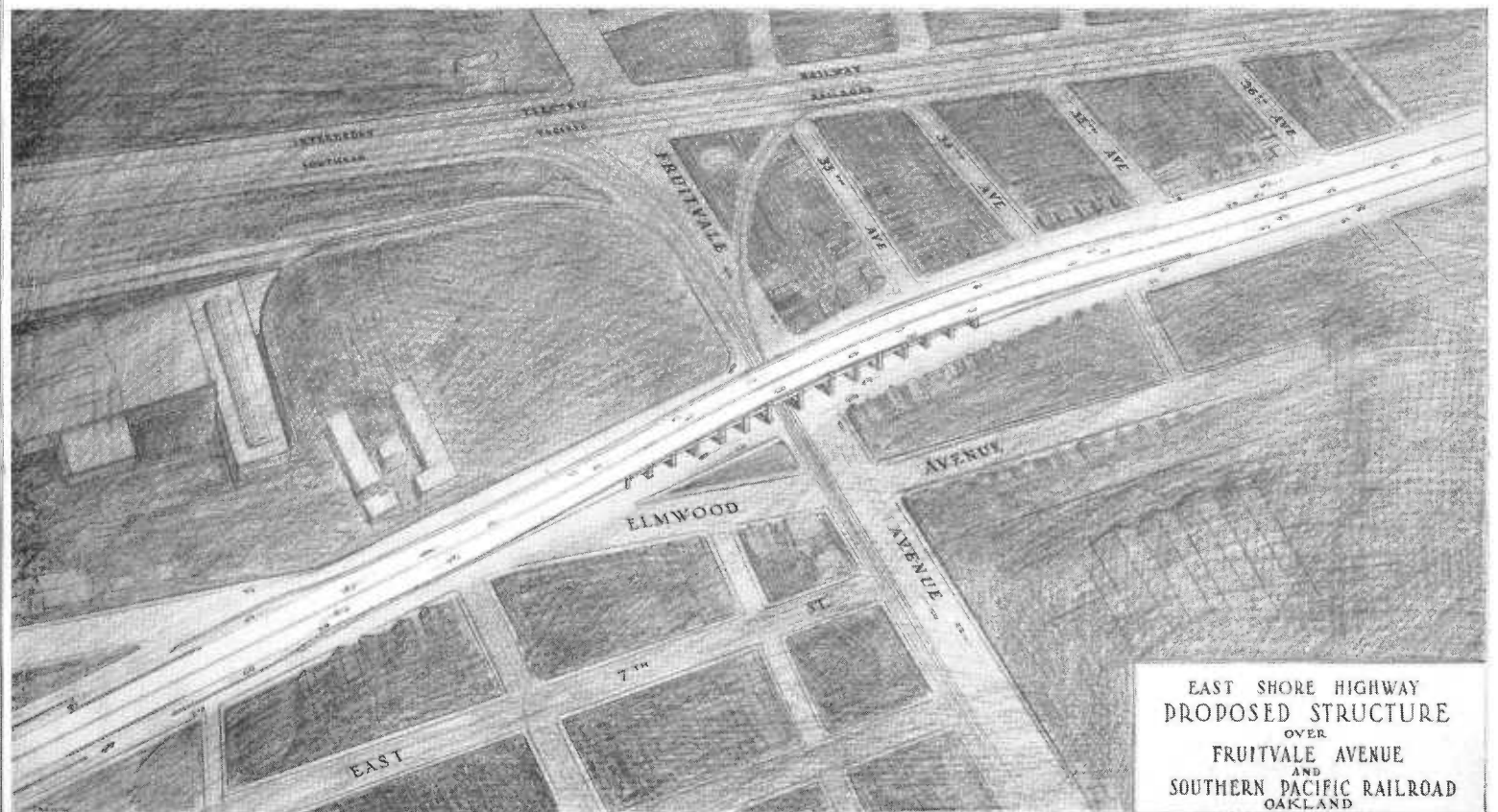
State's participation in the acquisition of rights of way will amount to \$430,000.

To a large delegation of citizens from Alameda, San Joaquin, Santa Clara and Monterey counties which was present at the Oakland meeting of the commission, Chairman Barrett said:

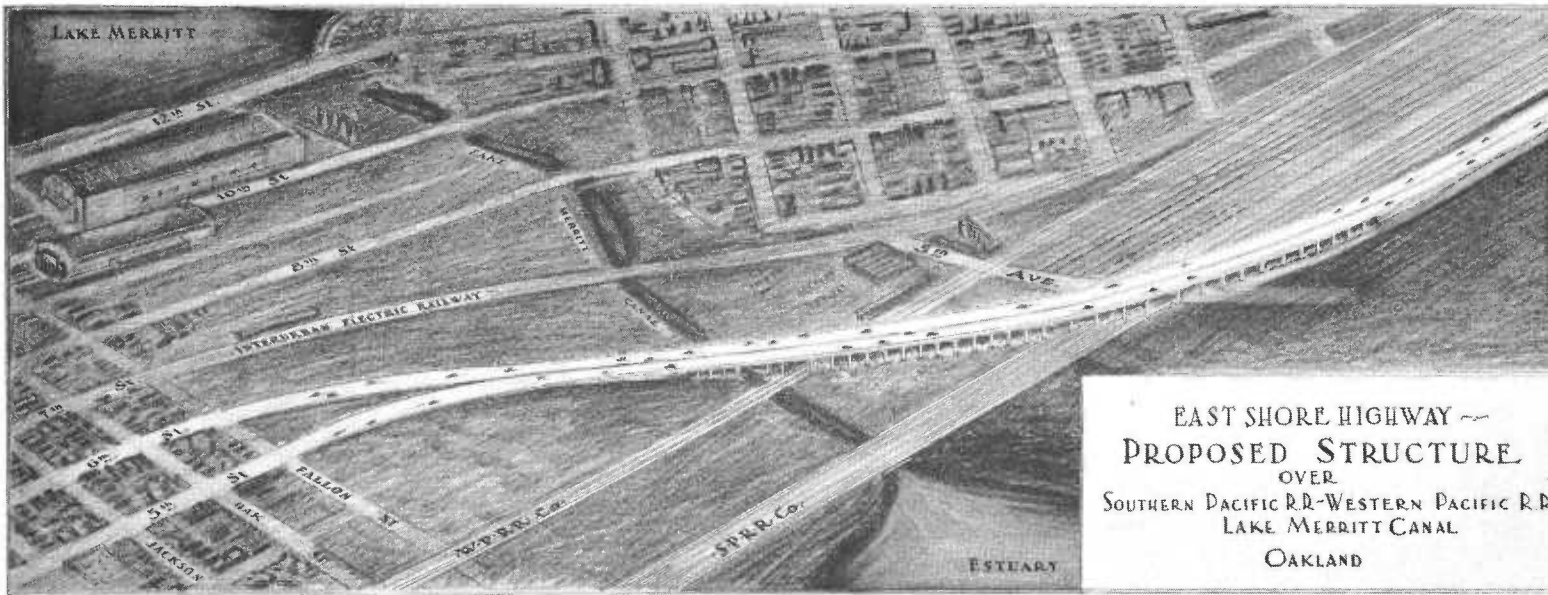
STATEMENT BY BARRETT

"The commission is in accord with your thoughts on this project and when we begin holding our budget sessions in Sacramento in October to prepare our next biennial budget, I am sure you will be pleased with the consideration we shall give to the East Shore Highway. We consider this project a very important job which should be undertaken immediately."

The design of the new freeway, as far as overhead structures and cross-



Sketch of proposed overhead structure for East Shore Highway traffic over Fruitvale Avenue and railroad tracks in Oakland



EAST SHORE HIGHWAY
 PROPOSED STRUCTURE
 OVER
 SOUTHERN PACIFIC R.R.-WESTERN PACIFIC R.R.
 LAKE MERRITT CANAL
 OAKLAND

Proposed Divided Highway Structure for East Shore traffic over Lake Merritt Canal and railroad tracks in Oakland

ing separations are concerned, will be similar to that on the Arroyo Seco Parkway between Los Angeles and Pasadena, now nearing completion, and the design for the proposed Bay Shore Freeway between San Francisco and Palo Alto.

The East Shore Highway is designed to:

1. Provide adequate transportation between Oakland and valley points for agriculture and industrial needs.
2. Open a satisfactory trade route between Oakland and San Jose.
3. Provide an easier route to reach recreation areas.
4. Eliminate a defense bottleneck, opening routes to the Oakland Naval Supply Depot, the Alameda Naval Air Base, Sunnyvale and Hamilton Fields and Camp Ord.
5. Eliminate traffic congestion during such events as football games.

A report of a traffic check made last June on East 12th Street presented to the commission showed that 40,000 automobiles traveled that day on that four-lane street, which constitutes a traffic bottleneck.

Essentials for a good date garnered from a general survey of men around the campus:

1. She doesn't eat much.
2. She's good looking.
3. She doesn't eat much.
4. She's a good dancer.
5. She doesn't eat much.

—College Humor

September Traffic on Bay Bridge Sets an All-Time High Record

TRAFFIC on the San Francisco-Oakland Bay Bridge reached an all-time high record during September, a month of 30 days. Since the end of the month saw the close of the Treasure Island Exposition, it is probable that the September traffic figures will stand for some time.

The heaviest day of the month was on Sunday, September 29, when 75,149 vehicles were accounted for. Inasmuch as the traffic from Oakland to

the exposition and return had to be handled by the collectors three times, the total number of vehicles actually handled on that day amounted to 98,273.

September traffic on the San Francisco-Oakland Bay Bridge, the Carquinez and Antioch bridges is tabulated below. The figures for the Carquinez and Antioch bridges are for the period from 11 a.m., September 16, to the end of the month only.

	San Francisco-Oakland Bay Bridge	Carquinez Bridge	Antioch Bridge
Passenger autos and auto trailers	1,552,245	127,494	7,923
Motorcycles and tricars	4,874	463	20
Buses	31,084	2,151	92
Trucks and truck trailers	67,463	11,454	2,102
Others	22,303	67	12
Total vehicles	1,677,969	141,629	10,149

“FULL OF INFORMATION”

California Highways and Public Works,
 P. O. Box 1499,
 Sacramento, California.

Dear Sirs:

I am an employee of the United States Engineer Office, and your fine magazine sent to our office falls into my hands

first, before being passed around and eventually to our files. I find it so interesting and full of information about California's highways that I would like to be placed upon your mailing list.

Kindly send the publication to my home address.

Very truly yours,

R. J. BRUN,
 1777 Vallejo Street,
 San Francisco, California.



Rugged Point Mugu on the Coast Highway in Ventura County has had its point cut off by a safe modern highway

Highway Through Point Mugu

By G. R. HALTON, Resident Engineer

TEN miles southeasterly from Oxnard in Ventura County the terrain bordering the Coast Highway, which is designated as U. S. 101 Alternate (State Route 60), changes abruptly at Point Mugu from a tidal flat to an irregular, rocky, sharply sloping coast line which continues for approximately six miles, where it changes to alluvial bench land.

At Point Mugu the physical characteristics and the resultant problems of design and construction are most difficult. Approximately nineteen years ago work was begun at this point by day labor crews, who slowly prepared a route around the rocky cliffs and coves of the point. In 1923-24 a major highway construction contract extended the rough grading from Point Mugu to Little Sycamore Creek.

Additional grading and the construction of a two-lane portland cement concrete pavement were done by contract in 1928-29, and a third lane of pavement was added in 1933.

Meanwhile day labor shore protection work has been carried on continuously to the present time, with concrete sea wall construction beginning in 1928. Because shore defense work can be done only during low tides in calm weather, other work has necessarily been provided for the day labor crew, in order to hold it in readiness for emergency repairs.

These State forces, under Construction Superintendent M. L. Sullivan, have done considerable slope excavation for minor widening or for removing precarious material and have also done much slide cleanup work.

When alignment improvement was

planned at Point Mugu it was logical, therefore, that the work be done by the day labor construction crew already established and equipped at the site of the work.

The alignment standards of this early construction were far below those demanded by modern high speed traffic. The problem of improving this alignment was particularly difficult because of the necessity for using the existing road during the construction of any improvements. Comprehensive relocations were projected, but were not adaptable to stage construction which limited budget allocations made necessary.

The demand for an improved alignment at Point Mugu was indicated by the many serious and fatal accidents which occurred there, one accident resulting in three fatalities. Early in

1937 the studies of this rugged coast line had not indicated the complete ultimate location of the road, but it was obvious that whatever the relocation, approximately the same improvement at Point Mugu itself would hold. From the standpoints of traffic safety and of alignment the most urgent need was there. Therefore, in October, 1937, the work of grading a cut 200 feet in depth through the rocky ridge of the point was begun.

The contemplated design was for $\frac{1}{2}$:1 slopes in cut with a 60-foot roadbed on a curve of 2000 feet radius, replacing the old 275-foot radius curve around the point.

Adjacent fills were to be 80 feet wide and provision was made for future widening of the Point Mugu cut to 80 feet.

A total of 320,000 cubic yards of excavation was involved at Point Mugu alone and an additional 15,000 yards for adjacent sections. Changes during construction brought the total to 400,000 cubic yards. Contrary to most jobs this material was not all utilized for embankment purposes; it was not a balanced job. Heavy riprap was used to protect the ocean side of existing fill slopes or to protect concrete sea walls from undermining. Many thousands of cubic yards which were not of riprap grade were used to backfill wave washed fill slopes and to build up the ocean floor and beach in front of the walls. Approximately 40 per cent of the excavated material was placed in new roadway embankment, most of which was across the tidal lands northwesterly from Point Mugu.

The cut was made by bulldozing the softer upper layers and by drilling and blasting the remainder from steep, full-section working faces.

Black powder in conjunction with stick dynamite was the principal explosive used but some 5 per cent granular blasting powder and a small quantity of 20 per cent bag dynamite were tried. An average of 0.537 of a pound of explosives was used for each cubic yard blasted, assuming 20 per cent of total displacement to have been mechanically made, without explosives.

Grading equipment consisted of a $1\frac{1}{2}$ -yard diesel shovel with from two to ten dump trucks, an angle dozer and RDS tractor, and two compressors and five jackhammers. Motor graders and a spreader box were used to lay the plant mix surfacing.

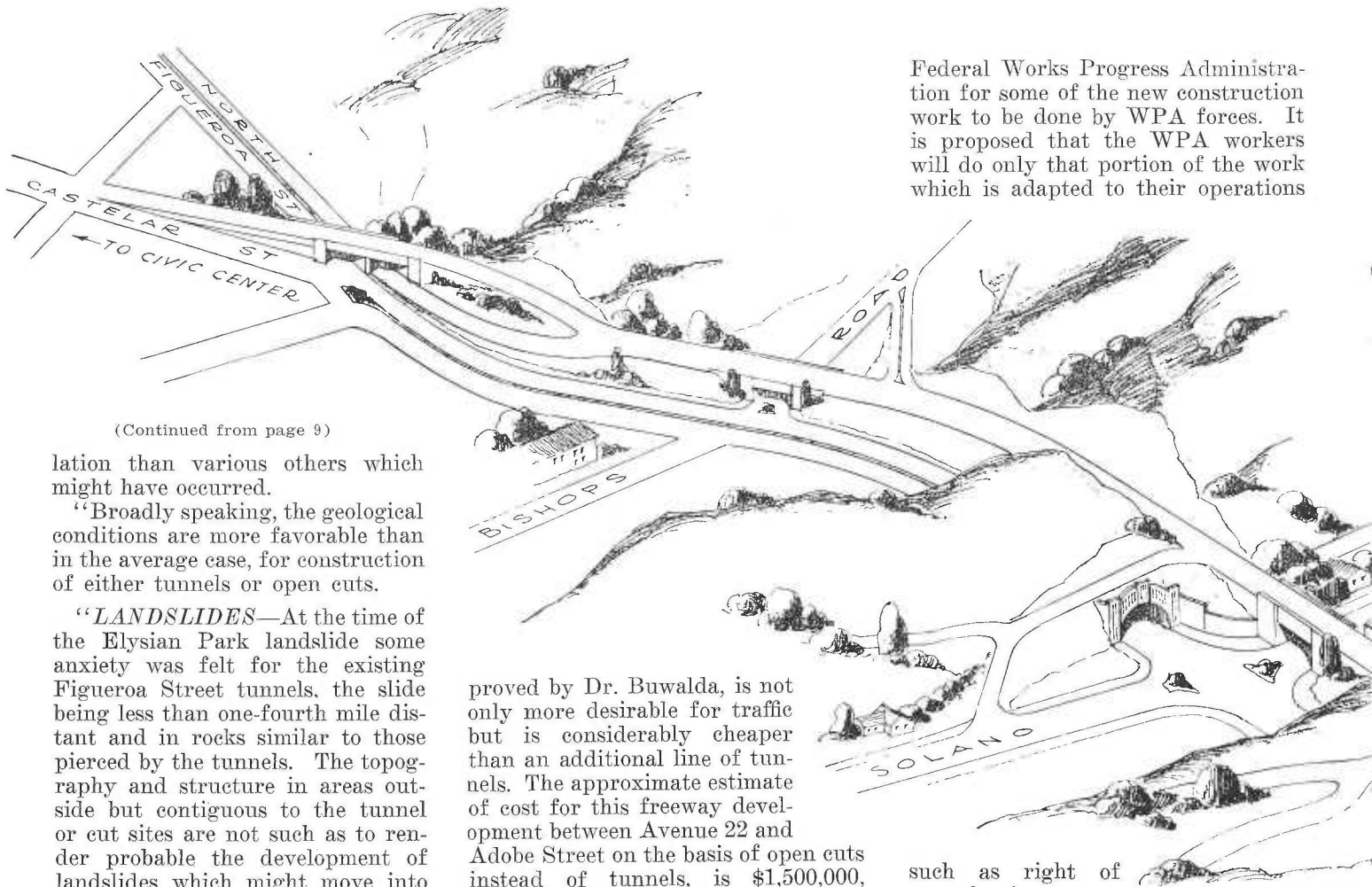
During the progress of the work it was decided to make connections with

(Continued on page 21)



Blasting and excavation scenes at cut through Point Mugu and old road around ocean end of mountain

Sketch of Proposed Arroyo Seco Parkway Extension



Federal Works Progress Administration for some of the new construction work to be done by WPA forces. It is proposed that the WPA workers will do only that portion of the work which is adapted to their operations

(Continued from page 9)

lation than various others which might have occurred.

"Broadly speaking, the geological conditions are more favorable than in the average case, for construction of either tunnels or open cuts.

"**LANDSLIDES**—At the time of the Elysian Park landslide some anxiety was felt for the existing Figueroa Street tunnels, the slide being less than one-fourth mile distant and in rocks similar to those pierced by the tunnels. The topography and structure in areas outside but contiguous to the tunnel or cut sites are not such as to render probable the development of landslides which might move into the cuts or destroy the tunnels, and it is believed that adoption of 1:1 slopes, with the exceptions noted, will prevent landsliding in the walls of the cuts.

"**EARTHQUAKES**—California is an earthquake region and it is certain, taking into account the recorded shock history of the State, that the tunnels and cuts will experience severe shaking during their lifetime. If tunnels are built earthquake accelerations should be taken into account in the design and construction. It is believed that 1:1 slopes, with exceptions mentioned, will be stable in an earthquake of the magnitude and intensity of the San Francisco earthquake of 1906, which is probably as strong a shock as it is economically practicable to guard against."

The open cut construction, the safety and stability of which was ap-

proved by Dr. Buwalda, is not only more desirable for traffic but is considerably cheaper than an additional line of tunnels. The approximate estimate of cost for this freeway development between Avenue 22 and Adobe Street on the basis of open cuts instead of tunnels, is \$1,500,000, based on some WPA assistance as hereinafter outlined. City of Los Angeles officials concur in this solution of the problem of creating a freeway extension for the Arroyo Seco Parkway. Although plan preparation is barely started and design details still have to be worked out, the general scheme for Arroyo Seco Parkway Southerly Extension through Elysian Park is shown on the perspective sketch accompanying this article.

The Federal authorities, realizing that many WPA projects in this vicinity are drawing to a close, are very anxious to have other important public work available to utilize workers from the large reservoir of unemployed in the metropolitan Los Angeles area. There are certain portions of the work on the proposed Southerly Extension of the Arroyo Seco Parkway on which these WPA workers can be used advantageously.

Mr. Frank W. Clark, Director of Public Works, has arranged with the

such as right of way clearing, reconstructing of Elysian Park facilities, carrying out roadway grading, constructing retaining walls and other related work.

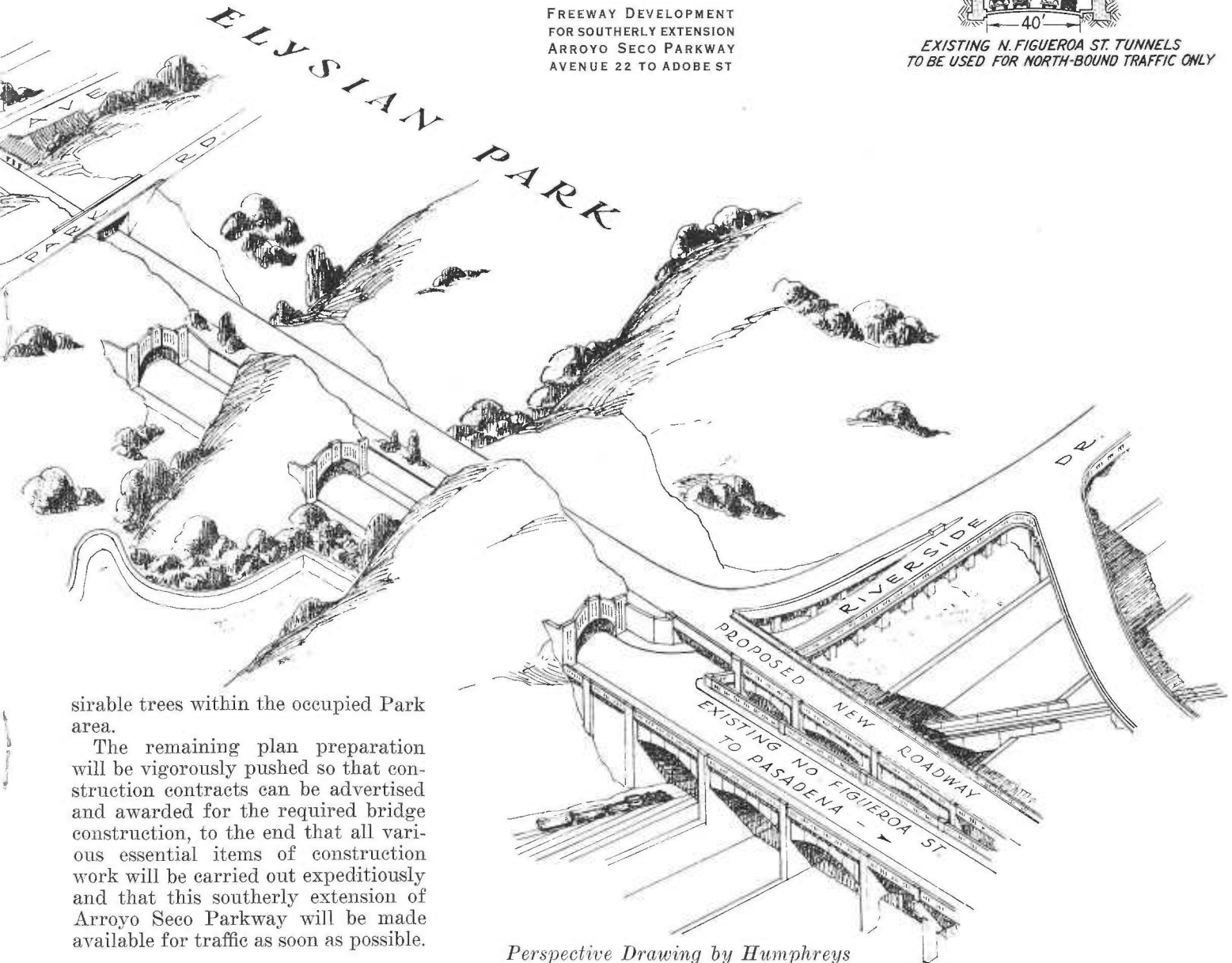
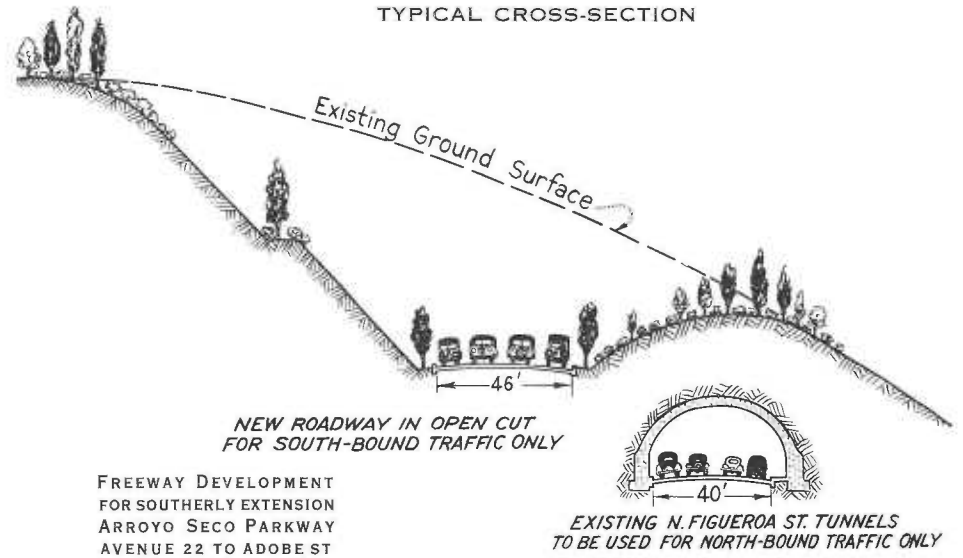
The substructure for the proposed new bridge on the Los Angeles River to carry southbound traffic is also work that will be handled by the WPA forces. It is then proposed that the new Los Angeles River bridge superstructure and also the necessary bridge structures at Castelar Street, Bishop's Road, Park Row and Solano Avenue, which require intricate specialized work not appropriate for WPA operations, be constructed by advertising and letting State contracts in the usual way.

While much preliminary work has already been done this is a project which requires many intricate designs for storm drains, sewers, retaining walls, and bridge structures, and it will be several months before all

Through Elysian Park to Los Angeles Civic Center

plans can be completed for the Arroyo Seco Parkway Southerly Extension between Avenue 22 and Adobe Street, which is 1.5 miles in length. But during the interval while detailed plans are being prepared, it is proposed that certain of the construction work be carried out immediately by WPA day-labor operations on those portions of the project for which plans can be turned out quickly.

A large force of men has already started on the WPA portion of the work, clearing for the new open cuts and carefully boxing and moving for later replanting, all valuable or de-



sirable trees within the occupied Park area.

The remaining plan preparation will be vigorously pushed so that construction contracts can be advertised and awarded for the required bridge construction, to the end that all various essential items of construction work will be carried out expeditiously and that this southerly extension of Arroyo Seco Parkway will be made available for traffic as soon as possible.

Relocation of Obsolete Section of U.S. 99 In Tehama County Underway

By F. W. HASELWOOD, District Engineer

THE improvement of six miles of the Pacific Highway in Tehama County from Red Bluff north is a continuation of the campaign to modernize this heavily traveled route. It is another attack on the few remaining stretches of 15-foot pavement on State highways. This six-mile improvement will replace a twenty-year-old highway that has seen traffic pass by in increasing volume, speed and weight until it has become obsolete to meet present requirements. The new road will embody the best that engineers now know in the matter of providing for a safe and free flow of traffic.

The road that in its day served well and faithfully its purpose now finds

itself with innumerable restrictions in sight distance, caused by sharp, horizontal or vertical curves or combinations of both, which restrict passing for long distances, impede the normal flow and cause congestion and hazards.

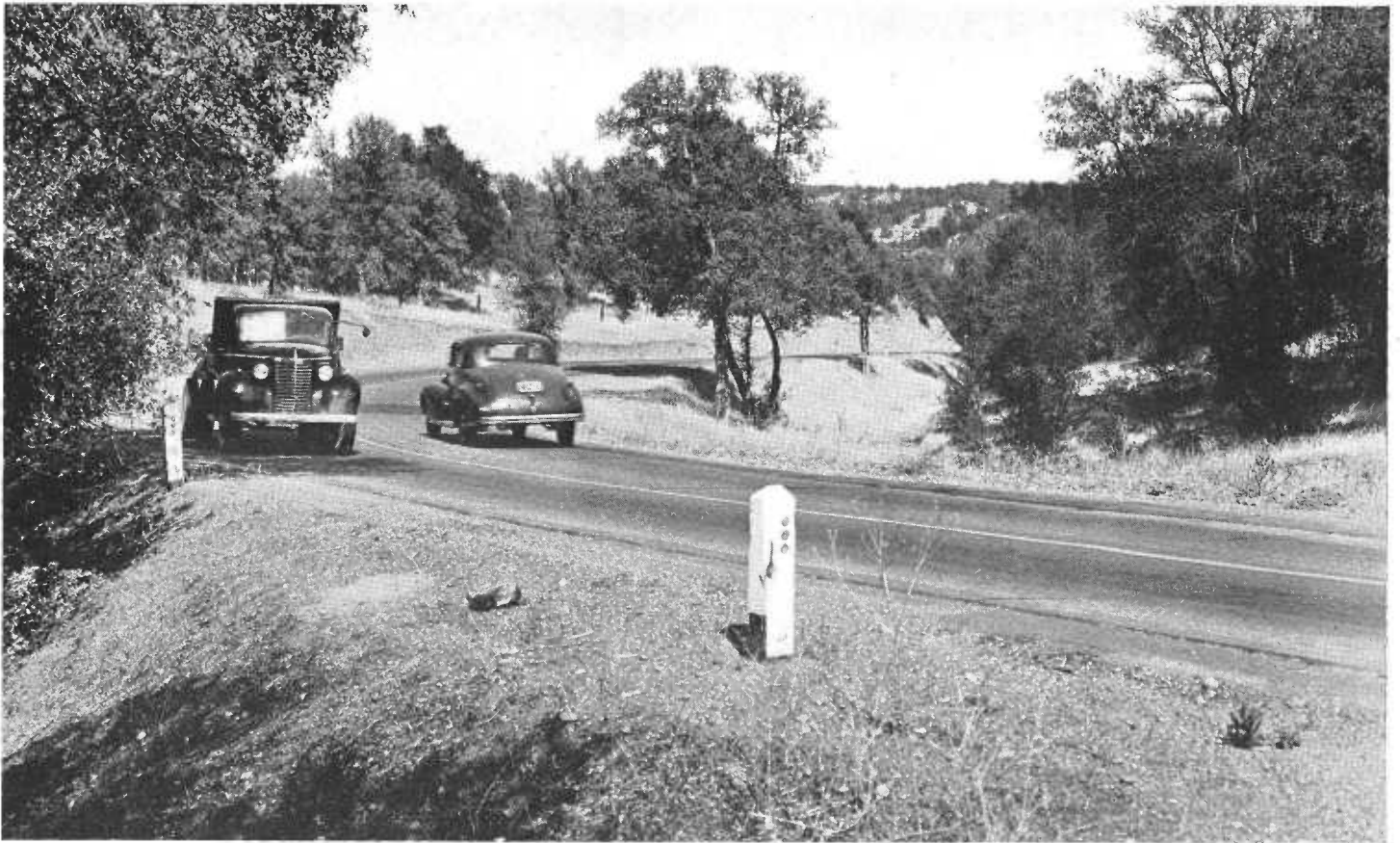
Nothing is static in highway affairs, particularly those relating to or affected by the increasing volume and changing behavior of traffic. Highway design must keep a jump ahead of these changes that affect it, even though highway finances seem never to be able even to keep up with them.

IMPROVING SIGHT DISTANCE

Therefore, new standards for safe highway alignment and grades have been set up, and we talk of highway

design in terms of sight distances, passing and non-passing, of the number of restrictions per mile and of free-flowing traffic. We talk of multi-lane and divided highways, but a first step in remedying the conditions that prevail on an obsolete highway with a pavement 15 feet wide is to provide the best two-lane highway permitted by the character of the country.

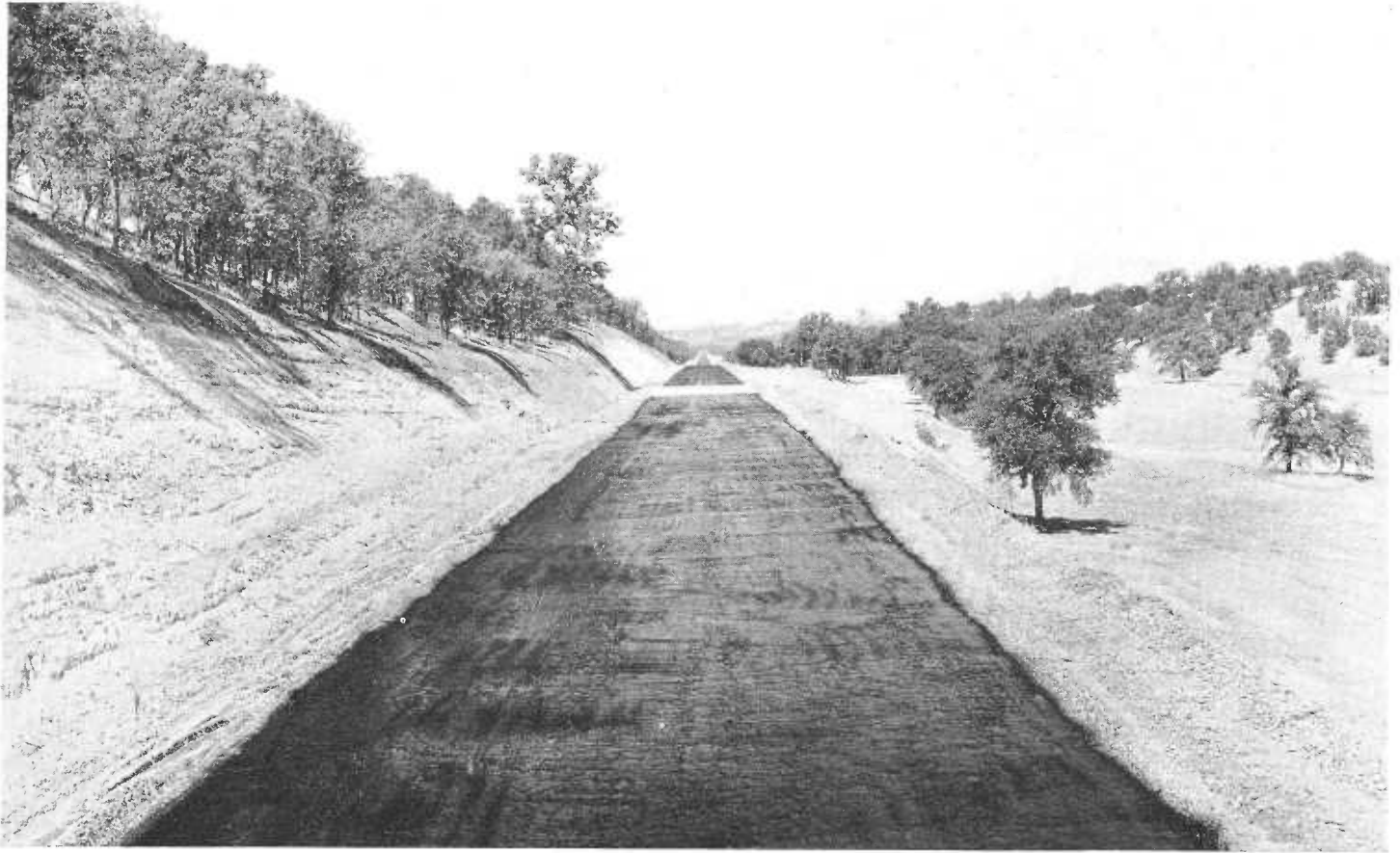
The relocation north of Red Bluff is through rolling country. The design provides for a free flow of traffic at all points at the present legal speed and with one short exception, at speeds of 60 miles per hour. To cross a low, broad ridge beginning about a mile out of Red Bluff, the problem of securing the desired minimum sight



One of sharp curves eliminated by relocation of old section of U. S. 99 north of Red Bluff in Tehama County



Top and center—Views of dumping and rolling cement stabilized base material on prepared subgrade of relocation north of Red Bluff
Bottom—Operation of applying curing seal of asphaltic emulsion on prepared subbase.



Finished base ready for second course of plant-mixed, machine-spread asphaltic concrete.

distance of 2200 feet offered a severe challenge and was finally solved by the use of a vertical curve 8000 feet long. Until challenged by a longer one, this vertical curve will claim the record for length of any such curve on any highway.

CHANNEL CHANGE INVOLVED

For nearly half its length, the highway relocation encroaches on the channel of Blue Tent Creek. This is one of those creeks that has a broad, gravelly bed, from 200 to 500 feet wide, and a small flow in normal winters that meanders back and forth in a poorly defined channel and an infrequent flow that sometimes covers almost the entire stream bed.

To provide assurance that this flow would not disturb the highway which occupied portions of the old stream bed, a channel change 2.5 miles long was made about 250 feet away from the road. Since material excavated from the cuts was of poor quality, the gravel removed from the channel change played an important part in the design of the road surface.

The absence of anything static in road design applies to surfaces as well

as other features. For several years, field experiments have been made with the use of portland cement as a stabilizer for the material composing the pavement base. On this project, another step has been taken toward the development of a lower cost but still substantial and durable surface suitable for heavy, main-line traffic.

CEMENT STABILIZED BASE

Gravel from the channel change was spread over the entire width of grade to a compacted depth of six inches. Additional gravel from the stream bed was crushed to one inch maximum size and mixed in a large concrete mixer that handles 8000 pounds at one time, with 6 per cent of cement and sufficient water to provide the optimum moisture for maximum compaction.

This mixture was spread on the road to a width of 24 feet and to a compacted depth of six inches. This layer was rolled with a 12-ton, three-wheeled roller, leveled with a blade and lightly sprinkled during rolling, finished with a rubber-tired roller and covered with a fifth of a gallon of asphaltic emulsion to a square yard to

prevent evaporation during the curing period. The result is a combination that looks and acts like concrete. The first seven-day test showed a compressive strength of 1245 pounds per square inch.

Over this stabilized gravel base will be placed a plant-mixed, machine-spread layer of bituminous mix three inches thick and 22 feet wide. Bituminous-mixed shoulders will be five feet wide on each side. The asphalt used will have a penetration of from 71 to 100. Mineral aggregate will be produced from gravel from the stream bed of Blue Tent Creek, which will be crushed and segregated into three sizes before being combined.

In some respects conditions were ideal for this type of surface. An inexhaustible supply of gravel was available at the middle of the job. It was of such size that crushing to a maximum size of 1 inch for the stabilized base and $\frac{1}{2}$ inch for the bituminous mix was not expensive. These sizes contributed much to the workability of the mixes. The 6 inch by 24 foot cement-stabilized base will cost about \$6,550 per mile, and the bituminous top will cost \$5,550 per mile.

Walter T. Ballou New Secretary Of Highway Commission

TRANSFERRED by Governor Culbert L. Olson to a larger field of public service, Walter T. Ballou, the Governor's assistant executive secretary, assumed the office of secretary to the California Highway Commission on October 1, succeeding Walter Chambers, who resigned.

Because of his familiarity with the State Highway System Mr. Ballou is considered by Governor Olson to be ideally equipped for his new position. He is well acquainted with the many problems confronting the highway Commission and has a wide knowledge of the road needs of every county in the State.

Mr. Ballou has been in State service since February, 1939, when he was appointed Deputy Director of the Department of Motor Vehicles. He was transferred from this office in April, 1939, to the State Relief Administration where he acted as Director of Personnel until August, 1939, when he was appointed assistant executive secretary for the Governor. He served in that capacity until October 1 of this year, when he assumed the duties of Highway Commission secretary.

Coming to California in 1907, Mr. Ballou established himself in Los Angeles, where he actively engaged in the automotive industry for 25 years, successfully operating and managing manufacturing companies of his own which manufactured and distributed automotive instruments of his own invention in many parts of the world. For many years Mr. Ballou took an active part in civic and business affairs in Southern California.

Mr. Ballou's appointment was announced by Chairman Larry Barrett of the Highway Commission at a meeting of the Commission in Oakland on September 27. In selecting Mr. Ballou, Governor Olson said:

"Walter Ballou is entitled to this promotion and the duties of the office are perfectly suited to his abilities. The Highway Commission could not find a more faithful, a more honest or a more capable man for the position of secretary than Mr. Ballou. He deserves the confidence placed in him by all with whom he has worked in his public activities."



WALTER T. BALLOU

Governor Olson expressed his thanks and appreciation to Mr. Chambers for his loyal services as Relief Administrator and Highway Commission secretary and voiced the hope that future developments will permit the further use of Chambers' services in State work.

WANTED IN PHILIPPINES

Collegio De San Carlos, Cebu City, P. I.

Mr. Frank W. Clark, Director,
California Highways
and Public Works
Sacramento, California.

Dear Sir:

We are fortunate this year to have a complete College of Engineering in our institution. We can boast that it is one of the best in the Islands.

We owe our success in building up this college to some contributors in States who have given their help, as in books, magazines or newspapers to our library. In like manner, we would like to beg you to include us in your free mailing list.

Thanking you in advance for the favor, I beg to remain

Very respectfully,

AMANCIO ALCORDO, Dean,
College of Engineering.

State Adopts a Program for Marketing Power

(Continued from page 5)

and 178,000,000 kilowatt hours of secondary power at Antioch.

The figures were based on the assumption that 40 per cent of the \$103,000,000 cost of Shasta Dam would be allocated to power. If the Federal government built secondary transmission lines from the substation at Antioch to city gates the value of the power would be 5.18 mills per kilowatt hour for firm energy and 1.77 mills for secondary energy or an overall average value of 4.70 mills per kilowatt hour.

TOTAL ESTIMATED REVENUE

The total required revenue for repayment, operation and maintenance of the power features of the project was estimated at \$6,652,000 a year. If the entire output were sold at the average figures quoted the income would be \$7,202,000 or 8.3 per cent over the required income.

Attending the conference as representative of the Federal government were:

- R. V. L. Wright, Special Representative of Department of Interior;
- Walker R. Young, Supervising Engineer of Central Valley Project;
- Harvey F. McPhail, Senior Electrical Engineer;
- Arthur Goldschmidt, Observer from Office of Under Secretary A. J. Wirts;
- G. A. Fleming, Electrical Engineer;
- J. R. Riter, Hydraulic Engineer;
- Phil Dickinson, Director of Information, Central Valley Project.

Representing the Water Project Authority of California were members:

- Frank W. Clark, Director of Public Works, Chairman;
- Earl Warren, Attorney General;
- Charles G. Johnson, State Treasurer;
- John R. Richards, Director of Finance.

Also:

- Edward Hyatt, Executive Officer;
- A. D. Edmonston, Acting Secretary;
- Northcutt Ely, Special Legal Representative, and others.

Haughty One: "Sure, I've three fraternity pins. I've got three boy friends."

Other Gal: "H'm. That puts you a coupla chumps ahead of me."



Section of recently improved State Highway No. 17 in Nevada County on new alignment eliminating many curves

Thirty Sharp Curves Eliminated Between Auburn and Grass Valley

By CHARLES H. WHITMORE, District Engineer

MOTORISTS using State Highway No. 17 (Sign Route 49) between Auburn and Grass Valley in Nevada County are now traveling over the recently improved section between one and one-half miles south and one and one-half miles north of Rattlesnake Creek which eliminates much of the worst alignment on this road. This route connects two of the larger towns in the Mother Lode territory and carries a traffic of between 1500 and 2000 cars per day, about 20 per cent of which are trucks.

During the past few years, as average traffic speeds have increased, the many short radius curves on the portion of this road in the vicinity of

Rattlesnake Creek have become increasingly hazardous. As a result, several serious accidents have occurred and many others have been narrowly averted. Improvement of this section has been advocated for some time and funds for reconstruction were included in the current highway budget. The project is about three miles in length and results in a saving in distance of about 0.4 of a mile owing to the fact that the major portion of the construction is on new alignment.

The new alignment includes a total of 5 curves with a minimum radius of 1500 feet, as compared to the 35 curves on the old alignment with a minimum radius of 90 feet. The

many curves on the old route combined to make up a total curvature of 1379 degrees, while the total on the new construction amounts to only 87 degrees, a decrease of 1292 degrees. The new alignment and grades were designed in accordance with standards providing for a traffic speed of 50 miles per hour.

The revision in the alignment necessitated a new crossing over Rattlesnake Creek a short distance upstream from the existing crossing. A double 8- by 7-foot reinforced concrete box culvert was constructed at the new crossing to carry the waters of the creek. A channel change was constructed adjacent to the new crossing and concrete slope paving was

placed in portions of the new channel to prevent erosion.

Roadway excavation necessitated by the new construction amounted to about 150,000 cubic yards and about 430,000 station yards of overhaul were involved. The character of material encountered made it necessary to use both shovel and scraper units in the excavation work.

The material encountered in roadway excavation was unsuitable for subgrade for the planned surfacing and a layer of imported borrow was placed throughout the length of the project over the full width of the 30-foot roadbed. This layer of imported borrow was 0.85 of a foot thick except over a one-half mile section, where the thickness was 0.60 of a foot.

The roadway on this project has a plant-mixed surfacing 22 feet wide by 0.21 of a foot thick over crusher run base 23 feet wide by 0.33 of a foot thick.

The total cost of the new construction was about \$110,000. The contractor was the firm of Hemstreet and Bell, and W. G. Remington represented the State as Resident Engineer.

Highway Through Point Mugu

(Continued from page 13)

the old existing road around the point in order to utilize it for a scenic drive or as an emergency by-pass. The connection at the southeasterly end was made in 1939, and the material for the northwesterly connection was stockpiled alongside and constructed after the new road through the cut had been graded and surfaced in February, 1940. Eighty per cent of the material rehandled was done by shovel and trucks, the remainder being bulldozed directly or cast by the shovel. A total of 30,000 cubic yards of embankment was involved in this latter connecting road.

Surfacing for the new road and for the by-pass around the point consisted of plant-mix surfacing 33 feet wide by 4 inches thick.

The total cost of making this improvement was approximately \$200,000 and took 2½ years to construct. Work proceeded continuously except when the crew was engaged in sea-wall or slide removal operations.

This work was done by State day



New alignment has 5 curves compared with 35 on old road

labor construction forces under M. L. Sullivan, Superintendent, with G. R. Halton, Resident Engineer, and A. N.

George, District Construction Engineer, all under the general supervision of District Engineer S. V. Cortelyou.

New Russian River Jetty Project Gets Under Way With Celebration

CONSTRUCTION of the new jetty project at Jenner at the mouth of the Russian River in Sonoma County got under way on September 26th and is expected to be completed by the end of November.

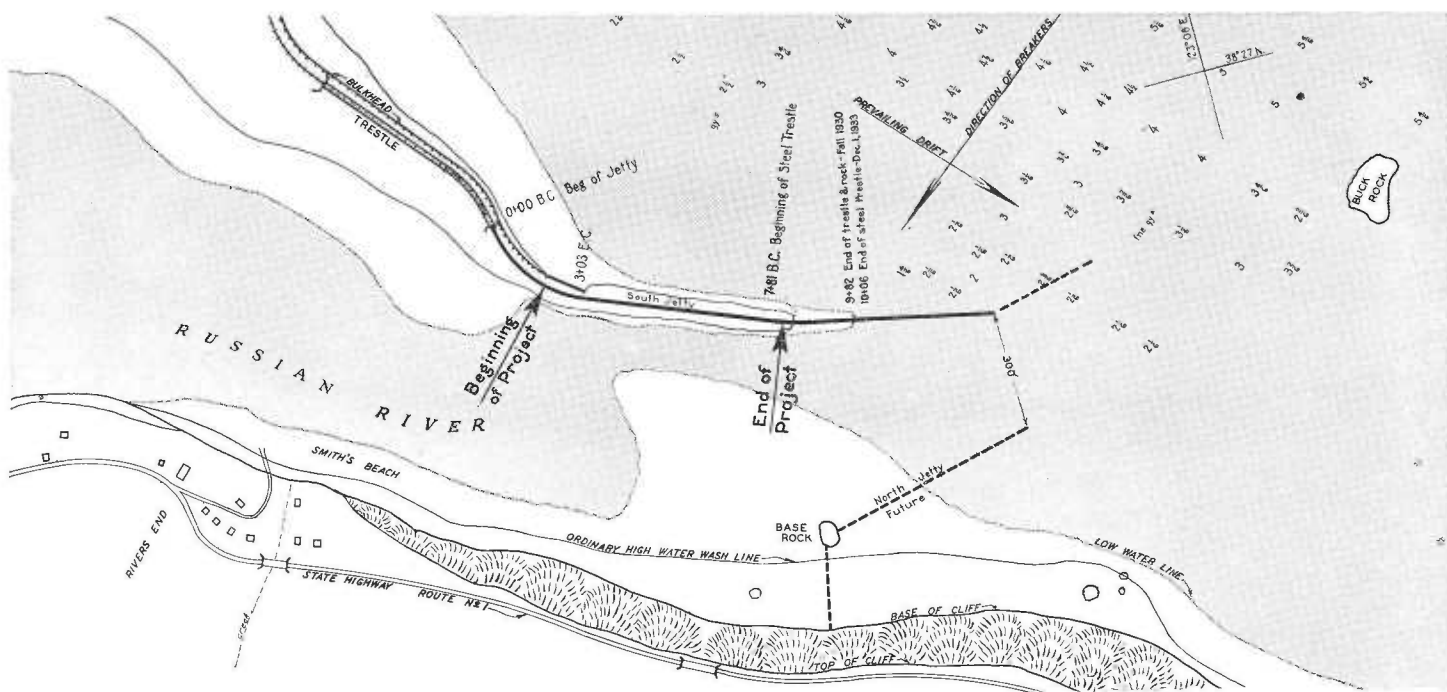
The work is being performed under an agreement between the Department of Public Works and The Basalt Rock Company of Napa. It involves the extension and improvement of the unfinished jetty at Jenner. The amount of the contract is \$48,700.

one-half to one foot slope on the ocean side and one and one-half to one foot on the channel side. The elevation of the crown of the jetty will be 17 feet above low water.

For many years, due to the scouring of the channel of the Russian River during high water periods and the high incoming tides of the Pacific Ocean, the mouth of the Russian River at Jenner has been blocked by sand bars and gravel deposits. The sportsmen of California and the Divi-

required for the jetty will be taken from Goat Rock at Jenner. Manipulating a huge steam shovel at the groundbreaking ceremonies, Doctor E. H. Crawford, who has for years been one of the leaders in the movement to obtain State aid for the project, loaded on a truck the first rock for the jetty wall.

Preceding the ceremony at the mouth of the Russian River attending officials and visitors were entertained at luncheon at Muelenbrock's Resort



Sketch showing present project for improvement of South Jetty at mouth of Russian River now almost closed by drifting sands and proposed future extensions of both the south and north jetties to keep the river open

A total of \$61,050 has been contributed for the project by State and county agencies. The Division of Fish and Game appropriated \$55,000, Sonoma County \$5,500 and Mendocino County \$550, thus providing a reserve fund over and above the amount of the construction contract.

The length of the new jetty extension will be 600 feet. Approximately 1750 cubic yards of concrete and 10,000 tons of rock will be required for the job. The jetty will have a minimum crown width of 12 feet with a

sion of Fish and Game have been particularly interested in this situation because the sand and gravel bars have prevented the seasonal runs of steelhead up the river.

Start of construction on the new jetty was made the occasion for a celebration at Jenner which was attended by State and county officials, sportsmen, and representatives of the various chambers of commerce and civic groups of Sonoma, Mendocino and neighboring counties.

The tons of material which will be

at Jenner, which was presided over by Chairman E. J. Guidotti of the Sonoma County Board of Supervisors. Speech making after luncheon was opened by V. M. Moir, Regional Manager of the North Coast Council of the State Chamber of Commerce. The principal speaker was Senator Herbert W. Slater of Santa Rosa, who led the fight in the Legislature to secure State appropriations for the work.

Guests at the luncheon paid a silent standing tribute to the memory of the late R. L. Jones, Deputy Engineer of



the Division of Water Resources, who supervised the building of the old Jenner Jetty, which is now being rebuilt and extended.

Others called upon included Assemblyman-elect Richard H. McCollister of Mill Valley; Malcolm McIntyre, general manager of the Basalt Rock and Gravel Company, who pledged that his company will complete the jetty to the best of the firm's engineering ability; Gerald H. Jones of the State Division of Water Resources, who succeeds the late R. L. Jones; Dr. William Makaroff of Guerneville, president of the Russian River Sportsmen's Club; A. M. Tomasi of Petaluma, president of the Sonoma County Sportsmen's Club; Morgan Keaton, Deputy Director of the Department of Public Works; Fred M. Huson and C. P. Shellenger of the State Engineer's office; Supervisors J. Frank Churchill and George Kennedy.

Insurance Salesman: "Now that you're married and have the responsibility of a wife, you will surely want to take out life insurance."

Bridegroom: "Insurance? Shucks, no. Why, she's not the least bit dangerous!"

Traffic Cop: "Hey, you can't make a turn to the right."

Lady Motorist: "Why not?"

T. C.: "Well, a right turn is wrong here—the left turn is right. If you want to turn right turn left and then—aw, go ahead!"



At top, part of old jetty remaining at mouth of Russian River. Center—Waves destroying construction trestle. Bottom—River mouth almost closed by sand

Sepulveda Boulevard In San Fernando Valley Rebuilt as Divided Highway

By WILLIAM H. MOHR, Assistant Engineer and A. N. GEORGE,
District Construction Engineer

IN THE spring of 1939 Los Angeles city found itself in the situation of having a large amount of Federal money in approved grants for highway construction, but having no money with which to match these grants so as to make them available. The city engineer appealed to the California Highway Commission and it was arranged to make money available to match the Federal grants on certain highways in the city of Los Angeles.

One of the projects was the reconstruction of Sepulveda Boulevard between Ventura Boulevard and Brand Boulevard, a distance of 8.05 miles.

Sepulveda Boulevard has become well known in the last few years as the most direct route from the Ridge Route near San Fernando to West Hollywood and the coastal cities in Los Angeles County. That portion of Sepulveda Boulevard in San Fernando Valley which has just been completed was formerly a narrow road with only a 20-foot pavement in the center.

STATE HANDLED CONSTRUCTION

An agreement was made between the State acting through its Division of Highways and Los Angeles city that the State would prepare the

plans, acquire the right of way and handle the construction engineering on this work, but in order to meet the requirements of the PWA it was necessary for the Los Angeles city, to whom the PWA grants had originally been made, to advertise for bids and award the contracts. Thus it was necessary during construction for the State to deal through the city in all formal matters with the contractors.

Work was immediately started on the plans and the project was divided into two parts so as to make completion possible by the deadline for PWA projects, which was June 30,



Reconstructed section of Sepulveda Boulevard showing railroad right of way used as division strip with new pavement for north bound traffic



Section of Sepulveda Boulevard reconstructed as a divided highway with 4-foot center dividing strip with 5-inch P. C. curbs

1940. The plans as developed provided for a divided highway throughout the length of the proposed improvement. The plans were prepared and right of way obtained so that the first contract, which was from Brand Boulevard to Gamut Place, a distance of 2.8 miles, was awarded to Oswald Brothers, who submitted the low bid of \$143,660. Work was started on this contract on December 11, 1939.

MADE A DIVIDED HIGHWAY

Under this contract the existing pavement on the west side of the Pacific Electric Railway right of way was designed for southbound traffic (to coastal cities) and a new pavement was constructed on the east side of the tracks for northbound traffic (to Ridge Route).

On the west side of the track the old 30-foot pavement was widened to 42 feet between curbs. This improvement consisted of the resurfacing and placing of asphalt concrete pavement 34 feet wide and the construction of 7 feet of plant mix surfacing between the pavement and the 1-foot wide portland cement concrete gutter.

The 34-foot A. C. pavement is designed to permit three traffic lanes 11, 11 and 12 feet wide, respectively.

On the east side of, and adjacent to the railway right of way, there was constructed 22 feet of asphalt concrete pavement. This pavement was placed in three layers and is 6 inches thick, with a thickened edge on the outside. The shoulders were improved for a width of 20 feet with road mix surface treatment and slope to a drainage point 12 feet from the edge of the A. C. pavement.

The Pacific Electric Railway has a right of way width of 40 feet on Sepulveda Boulevard from Brand Boulevard to Gamut Place. This 40 feet has been utilized as a center dividing strip to separate the traffic that flows in opposite directions.

The 40-foot traffic separation island is continuous except for the cross roads, which are one-half mile apart. At these intersecting roads, the railway right of way was paved, making it possible for vehicles to go to the other side of the highway where the traffic is flowing in the opposite direction.

Monolithic portland cement con-

crete curbs and gutters were constructed on each side of the 40-foot center dividing strip. The gutter is 1 foot wide and the curb is 5 inches high and slopes away from the pavement.

SECOND CONTRACT STARTED

The second contract on Sepulveda Boulevard provided for the widening between Gamut Place and Ventura Boulevard, a distance of 5.25 miles. This contract was awarded to the Griffith Company, who submitted the low bid of \$231,339.35. Work was started on this contract on January 22, 1940.

The existing pavement was widened and a 4-foot center dividing strip was constructed. The dividing strip was constructed from Gamut Place to Moorpark Street, which is one block north of Ventura Boulevard. It is continuous except for cross-over openings every 1000 feet and at all street intersections.

On each side of the center island portland cement concrete curbs were constructed 5 inches high with sloping sides. The center of the dividing strip between curbs has been filled

with earth and planted with ice plant cuttings.

The existing 20-foot P. C. C. pavement was widened 4 feet on each side. A portland cement concrete base was constructed 4 feet on each side of the existing pavement. Over the old pavement and the 4-foot widening strip, asphalt concrete resurfacing was placed on each side of the center dividing strip. The resurfacing was placed in 12-foot wide lanes with a minimum thickness of 2 inches.

On each side of center line adjacent to the resurfacing there was constructed a standard 11-foot wide portland cement concrete pavement lane. Outside of, and adjacent to the pavement lanes the shoulders on both sides were treated for a width of 20 feet with road mix surface treatment. The 20-foot shoulders slope to a drainage point 12 feet from the edge of the pavement.

RIVER BRIDGE WIDENED

The existing 100-foot reinforced concrete bridge across the Los Angeles River was widened as a part of the second contract. The two 50-foot spans were widened from 24 to 54 feet from curb to curb. The four-foot center dividing strip was carried continuously across the bridge. A four-foot sidewalk was constructed on each side of the bridge, adjacent to the pavement curb.

A 48-inch storm drain was constructed along Sepulveda Boulevard to carry water from a low point in the highway to the Los Angeles River. This storm drain was placed under the east shoulder and extends northerly to the low point. Two cross pipes have been placed under the pavement to drain the surface waters to the storm drain.

When the information was given out that it was proposed to improve Sepulveda Boulevard as a divided highway, considerable opposition developed among abutting property owners, but as the case for the divided highway was explained to them and they were referred to business property on roads which had already been improved as divided highways where the business men were quite unanimous in their belief that their business did not suffer by the dividing of the roadway, the greater portion of the opposition was removed.

It is now believed that the greater bulk of property owners recognize the advantages of the divided high-

An Appreciation

Compton Junior College

601 S. Acacia Street,
Compton, California

Mr. J. W. Howe, Editor
California Highways and
Public Works
Sacramento, California

Dear Mr. Howe:

On behalf of our institution, I am again writing you to express our appreciation of the regular receipt of your bulletin, "California Highways and Public Works."

This publication has been used regularly in connection with the work of the Department of Social Science in this institution, particularly in our classes in Economics and Government. It has been made available for study to the students in the appropriate classes, and we have also maintained a file of the bulletins for some time past.

If possible, I should appreciate your continuing to send me these bulletins regularly in the future. Any other similar materials which you feel might be of educational value to young people between the ages of 18 and 30 will always be gratefully received.

Cordially yours,

Robert C. Gillingham
Chairman Social Studies
Compton Junior College

way and do not feel that it will in any way be detrimental to their property.

The State Division of Highways supervised the construction and provided the inspectors and engineers required on these projects. E. L. Seitz was the Resident Engineer in charge of both contracts under S. V. Cortelyou, District Engineer, and A. N. George, District Engineer.

Actor: "A horse! a horse! my kingdom for a horse!"

Voice from the gallery: "Will a jackass do?"

Actor: "Sure, come right on down."

Highway Service Trend Toward Traffic Efficiency

A SATISFACTORY standard of highway service involves not only adequate physical plant, but also its proper maintenance and efficient operation. For satisfactory transportation can no longer be conceived merely as the economical movement of passengers and freight, but rather as safe movement with speed and comfort.

In the provision of highway transportation it is fairly evident that emphasis has shifted from expansion of plant to modernization, replacement and maintenance. For example, Federal-aid projects today in nearly 60 per cent of all cases are located where previous Federal work has already been done, while much of the remaining work has been reconstruction of previous undertakings by the States and counties.

The increasing importance of the maintenance bill also is evident, State highway expenditure figures since 1921 revealing that while capital outlay in 1938 was less than in 1928, maintenance expenditures had increased by close to \$100,000,000. Comparing the years 1931 and 1937, when capital outlays were identical at \$551,000,000, maintenance expenditures had increased from \$169,000,000 to \$227,000,000.

The newest development in highway expenditure programs, however, has been the growing attention to efficient movement of traffic. Experience on the State highway system of California, for example, provides specific data on expenditures for services directly related to public convenience, safety and comfort. It is revealed that these services, including pavement markings, signs, traffic control devices, roadside development, snow removal and ice control have trebled in cost since 1930. In the next two years the California Division of Highways expects to use approximately 12 per cent of all maintenance funds to comply with the growing demands for a better quality of highway service—*American Highways*.

Said the angry molecule: "Let me atom."

Model Built to Aid Study of Bridge Design

By Kenneth W. Dowie,
Assistant Bridge Engineer

TO MEET the need of the bridge designer for visualizing the deformations of a structure under loading, and in appreciation of the difficulties of picturing these deformations accurately, a small model rigid frame of spring steel was constructed by the author. The frame consists of three 19-inch spans and two short cantilever arms on four columns about 18 inches high. All members are made of 12 gauge spring steel, columns and girders connected together by soldering the wire to triangular iron plates.

As these members are made of 12 gauge spring steel, they respond very readily to light loads, and with their high elastic limit completely regain their original shape when the load is taken off. Columns are all removable, partly to make it easier to carry the frame around, but mainly to investigate the effect of loading spans of unequal length.

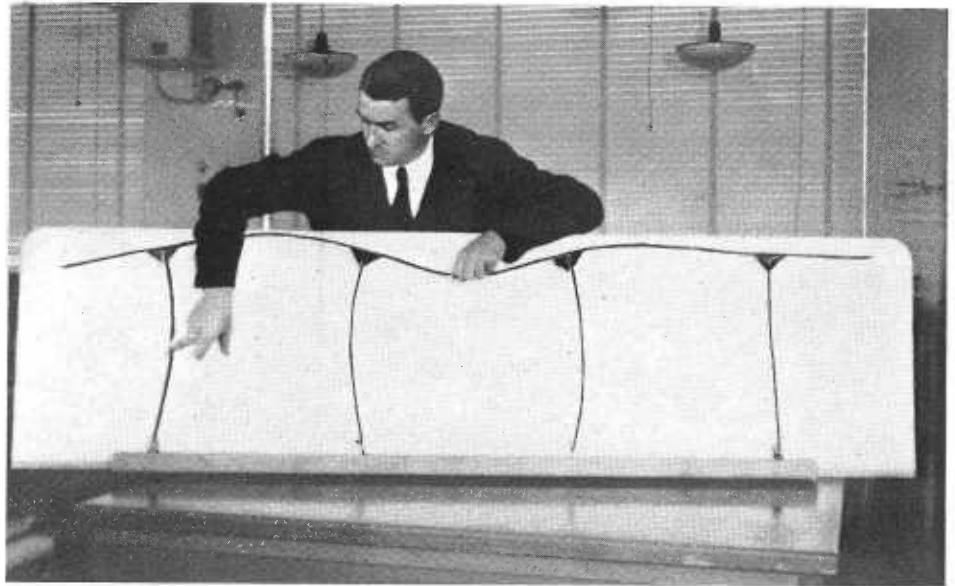
LOCKING DEVICE ARRANGED

The loads shown in the lower illustration weigh one pound each. For horizontal loads, such as would exist in a bridge with earth-filled abutments, or from temperature, seismic or tractive forces, deformations are most clearly shown by applying such loads with the hands.

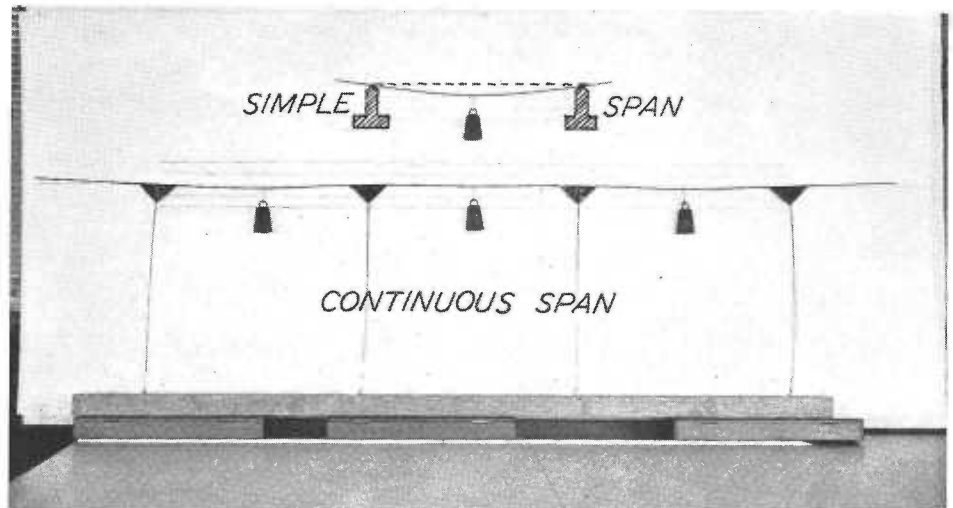
In order to show the difference in stress due to having fixed and free-end columns, a locking device has been arranged that enables the demonstrator to lock or free the base of each column at will. It was found necessary to anchor the column bases, as under unsymmetrical loading some columns developed negative reactions.

If it is desired to show the presence of these negative reactions in a somewhat dramatic fashion, it is a simple matter to loosen the thumb-screw anchors and apply a heavy live load, whereupon some of the columns pop out of the ground.

While it is in no sense a precision instrument it is thought that by means of the model an instantaneous



Method of demonstrating deformations in rigid frame structures, as used by Glenn L. Enke, Associate Bridge Engineer, in his "Bridge Design" class



Comparison with simple span showing increased stiffness of modern continuous bridge

grasp of the deformations is possible, with a clear understanding of the proper loading to secure maximum moments in the various parts of the structure. By placing the proper loads on the model frame, the problem of the correct direction of the bending moments is instantly clarified.

The model shown here has been used in a class of engineers led by Mr. Glenn L. Enke, Associate Engineer of the Bridge Department, and has proved successful in demonstrating dramatically the kind of deformations undergone by a bridge or similar rigid frame under load. In the first illustration, Mr. Enke shows the deformation of such a structure under a truck load on the second span, together with a horizontal load such as

might come from an earth-filled abutment. End columns are fixed and intermediate columns free.

The second illustration shows clearly that the deflection of a simple span is many times that from the same loading for a continuous span. The gain in stiffness from the continuity of a slender frame such as this one is remarkable.

One has only to drive over the deck of a modern continuous type bridge, and compare the riding quality with the hollows and bumps of the old simple span bridge to realize how important is this matter of reducing deflections to a minimum.

In spite of the fact that nearly all the engineers of the Department of

(Continued on page 28)

Highway Bids and Awards for the Month of September, 1940

BUTTE AND PLUMAS COUNTIES—At various locations between Hines Creek and Howell's, about 4 miles, eroded embankments to be reconstructed, rock riprap to be placed as slope protection, rubble masonry to be constructed and drainage facilities to be installed. District II, Route 21, Section C.A.B. A. S. Vinnell Co., Alhambra, \$55,540; Hemstreet & Bell, Marysville, \$57,582; Poulos & McEwen, Sacramento, \$57,828; Harms Bros., Sacramento, \$58,269. Contract awarded to Claude C. Wood, Lodi, \$52,793.

FRESNO COUNTY—Across Four Mile Slough about 27 miles west of Fresno, a reinforced concrete bridge to be constructed and about 0.2 mile of approaches to be graded and surfaced with plant-mixed surfacing. District VI, Route 41, Section P. Piazza & Huntley & Trewitt-Shields & Fisher, San Jose, \$21,335; M. J. B. Construction Co., Stockton, \$21,951; A. S. Vinnell Co., Alhambra, \$25,569. Contract awarded to F. Fredeburg, South San Francisco, \$18,372.

IMPERIAL COUNTY—Between Heber and Niland, about 15.4 miles to be surfaced with road-mix surfacing. District XI, Routes 201,187, Sections AB,E. Oswald Bros., Los Angeles, \$32,847; Daley Corp., San Diego, \$44,631; V. R. Dennis Construction Co., San Diego, \$49,321; A. S. Vinnell Co., Alhambra, \$49,654; J. E. Haddock, Ltd., Pasadena, \$56,480; Chas. H. Johnston, Los Angeles, \$58,336. Contract awarded to R. E. Hazard & Sons, San Diego, \$31,204.

KERN AND INYO COUNTIES—Between Armistead's and 5.5 miles north of Little Lake, 23.2 miles of penetration oil treatment and seal coat to be applied. District IX, Route 23, Sections DE and GH. Vido Kovacevich, South Gate, \$12,270; A. S. Vinnell Co., Alhambra, \$12,827; Basich Bros., Torrance, \$14,483. Contract awarded to Brown & Doko, Pismo Beach, \$11,987.

LAKE COUNTY—About 15 miles east of Lucerne, eroded embankments to be replaced, sacked concrete riprap slope protection to be replaced, and road-mix surfacing to be applied. District I, Route 15, Section C. Helwig Construction Co., Sebastopol, \$6,910. Contract awarded to Harold Smith, St. Helena, \$6,585.

LOS ANGELES COUNTY—On Arroyo Seco Parkway, between Grand Avenue and Fair Oaks Avenue, about 0.7 mile to be graded and paved with portland cement concrete and asphalt. District VII, Route 205, S.Pas. Oswald Bros., Los Angeles, \$81,163; Griffith Co., Los Angeles, \$87,405; Oscar Oberg, Los Angeles, \$88,437; Sander Pearson, Santa Monica, \$99,758; Radich & Brown, Burbank, \$102,353; Carlo Bongiovanni, Los Angeles, \$109,999. Contract awarded to J. E. Haddock, Ltd., Pasadena, \$79,699.

MENDOCINO COUNTY—Steel piles and steel pike splices for repairs to Noyo River Bridge. District I, Route 56, Section E. Contract awarded to R. G. Clifford, San Francisco, \$1,860.

MENDOCINO COUNTY—Across Schooner Gulch about 3½ miles south of Point Arena, a reinforced concrete bridge to be constructed and about 0.13 mile of roadway to be graded and an armor coat applied. District I, Route 56, Section A. A. T. Beckett, Oakland, \$72,473; S. J. Amoroso Construction Co., San Francisco, \$75,537; Fred J. Maurer & Son, Eureka, \$76,998; C. W. Caletti & Co., San Rafael, \$83,737; R. G. Clifford, South San Francisco, \$91,

768; The Utah Construction Co., San Francisco, \$93,440. Contract awarded to Harold Smith, St. Helena, \$71,841.

MERCED COUNTY—Between Merced and Tuttle, about 3.3 miles to be graded and surfaced with plant-mixed surfacing. District X, Route 18, Section A. S. M. McGaw, Stockton, \$51,982; Louis Biasotti & Son Valley Construction Co., Stockton, \$52,867; Piazza & Huntley, San Jose, \$55,428; M. J. B. Construction Co. & F. Kaus, Stockton, \$56,859; Claude C. Wood, Lodi, \$57,284; Marshall S. Hanrahan, Redwood City, \$67,138. Contract awarded to J. A. Casson Co., Hayward, \$48,878.

SAN DIEGO COUNTY—On Washington St., between Fifth Avenue and Ninth Avenue, about 0.3 mile to be graded and surfaced with plant-mixed surfacing on crusher run base and portland cement concrete pavement to be constructed. District XI, Washington St. B. G. Carroll & Harry L. Foster, San Diego, \$31,359; Griffith Co., Los Angeles, \$31,851; Daley Corp., San Diego, \$31,988; R. E. Hazard & Sons, San Diego, \$33,584. Contract awarded to V. R. Dennis Construction Co., San Diego, \$29,744.

SAN LUIS OBISPO COUNTY—At Miles Station about 1.4 miles to be graded and surfaced with plant-mixed surfacing. District V, Route 2, Section E. Fredericksen & Westbrook, Sacramento, \$157,055; Utah Construction Co., San Francisco, \$167,767; J. E. Haddock, Ltd., Pasadena, \$175,339; A. Teichert & Son, Inc., Sacramento, \$181,768; N. M. Ball Sons, Berkeley, \$186,775; Basich Bros., Torrance, \$195,325; Oswald Bros., Los Angeles, \$198,037; McNutt Bros., Eugene, Oregon, \$225,146. Contract awarded to Gibbons & Reed Co., Burbank, \$149,803.

SAN LUIS OBISPO COUNTY—Across San Luis Obispo Creek about six miles south of San Luis Obispo, a reinforced concrete girder bridge on concrete bents with pile foundations to be constructed. District V, Route 2, Section E. C. W. Caletti & Co., San Rafael, \$77,839; J. E. Haddock, Ltd., Pasadena, \$78,583; R. H. Travers, Los Angeles, \$79,746; Oberg Bros., Los Angeles, \$79,811; Byerts & Dunn, Los Angeles, \$82,268; Trewitt-Shields & Fisher, Fresno, \$82,692; Gibbons & Reed Co., Burbank, \$84,933; M. J. B. Construction Co. & F. Kaus, Stockton, \$88,206; The Utah Construction Co., San Francisco, \$94,554. Contract awarded to Dan Caputo, San Jose, \$68,388.

SANTA BARBARA COUNTY—Across Dos Pueblos Creek, 16 miles north of Santa Barbara, a reinforced concrete bridge to be constructed. District V, Route 2, Section G. J. E. Haddock, Ltd., Pasadena, \$23,131; J. S. Metzger & Son, Los Angeles, \$24,856; J. J. Munemann, Santa Barbara, \$26,000; Byerts & Dunn, Los Angeles, \$27,622. Contract awarded to Carl Hallin, Los Angeles, \$22,966.

SONOMA COUNTY—About 2.5 miles north of Cloverdale, about 0.4 mile to be graded and surfaced with plant-mixed surfacing. District IV, Route 1, Section D. Macco Construction Co., Clearwater, \$74,957; Claude C. Wood, Lodi, \$83,970; Fredericksen & Westbrook, Sacramento, \$88,972; Harms Bros. and N. M. Ball Sons, Berkeley, \$89,608; Louis Biasotti & Son, Stockton, \$90,052; Fredrickson Bros., Emeryville, \$90,573; McNutt Bros., Eugene, Ore., \$94,537; Hemstreet & Bell, Marysville, \$95,120; R. E. Campbell, Los Angeles, \$98,412; Piombo Bros., San Francisco,

\$104,867; A. Teichert & Son, Inc., Sacramento, \$125,677; A. S. Vinnell Co., Alhambra, \$130,354. Contract awarded to Heafey Moore Co. and Fredrickson & Watson Construction Co., Oakland, \$72,732.

SUTTER COUNTY—At Berg and Lomo, about 0.4 mile to be graded and surfaced with plant-mixed surfacing on crusher run base. District III, Route 3, Section A. Claude C. Wood, Lodi, \$13,933; C. M. Syar, Yuba City, \$13,333. Contract awarded to Hemstreet & Bell, Marysville, \$10,883.

TRINITY COUNTY—At various locations between Big Bar and Helena, about 3.4 miles to be graded, portland cement concrete cribbing, rock slope protection and drainage facilities to be constructed. District II, Route 20, Section E. Scheumann & Johnson, Eureka, \$87,054; A. S. Vinnell Co., Alhambra, \$87,694; Hemstreet & Bell, Marysville, \$86,475; Poulos & McEwen, Sacramento, \$94,997. Contract awarded to Clifford A. Dunn, Klamath Falls, Oregon, \$72,875.

Model Built to Aid Study of Bridge Design

(Continued from page 27)

Public Works are graduate engineers they have found continuous study necessary in order to keep pace with the fast development of our technical world.

Several classes of special interest to engineers have been organized through the Committee on Education of the State Employees Chapter No. 2. Nearly 140 engineers attended the class conducted by Engineer Enke, most of whom were from the Department of Public Works. Those attending the class receive valuable syllabus material covering the latest information on bridge design practice. This class is being continued again this year.

Two new classes were inaugurated this year that have proved very successful. One is a class in foundation engineering, conducted by Mr. O. J. Porter, Senior Testing Engineer for the testing laboratories of the Division of Highways. Approximately eighty engineers have enrolled in this class. The other class, conducted by R. W. Hutchinson, Associate Bridge Engineer, goes into the analysis of indeterminate structures by moment distribution. Nearly fifty engineers of the Department are enrolled.

These classes are being held at Sacramento Junior College in conjunction with adult education division.

State of California

CULBERT L. OLSON, Governor

Department of Public Works

Headquarters: Public Works Building, Twelfth and N Streets, Sacramento

FRANK W. CLARK, Director of Public Works

FRANZ R. SACHSE, Assistant Director

MORGAN KEATON, Deputy Director

CALIFORNIA HIGHWAY COMMISSION

LAWRENCE BARRETT, Chairman, San Francisco
LENER W. NIELSEN, Fresno
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G. T. McCOY, Assistant State Highway Engineer
J. G. STANDLEY, Principal Assistant Engineer
R. H. WILSON, Office Engineer
T. E. STANTON, Materials and Research Engineer
FRED J. GRUMM, Engineer of Surveys and Plans
R. M. GILLIS, Construction Engineer
T. H. DENNIS, Maintenance Engineer
F. W. PANHORST, Bridge Engineer
L. V. CAMPBELL, Engineer of City and Cooperative Projects
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J. W. VICKREY, Safety Engineer
E. R. HIGGINS, Comptroller

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F. W. HASELWOOD, District II, Redding
CHARLES H. WHITMORE, District III, Marysville
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L. H. GIBSON, District V, San Luis Obispo
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S. V. CORTELYOU, District VII, Los Angeles
E. Q. SULLIVAN, District VIII, San Bernardino
S. W. LOWDEN (Acting), District IX, Bishop
R. E. PIERCE, District X, Stockton
E. E. WALLACE, District XI, San Diego

SAN FRANCISCO-OAKLAND BAY BRIDGE

RALPH A. TUDOR, Principal Bridge Engineer, Maintenance and Operation

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GEORGE T. GUNSTON, Administrative Assistant
HAROLD CONKLING, Deputy in Charge Water Rights
A. D. EDMONSTON, Deputy in Charge Water Resources Investigation
GEORGE W. HAWLEY, Deputy in Charge Dams
SPENCER BURROUGHS, Attorney
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W. H. ROCKINGHAM, Principal Mechanical and Electrical Engineer
C. E. BERG, Supervising Estimator of Building Construction

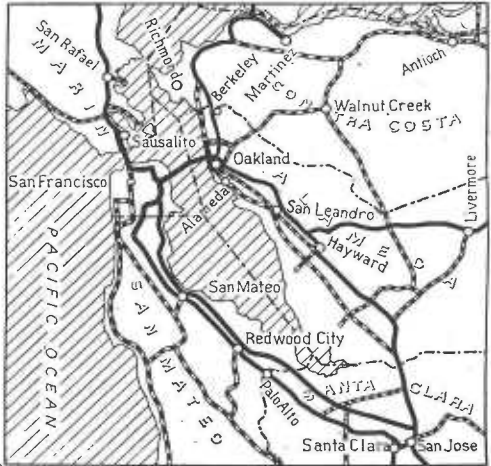
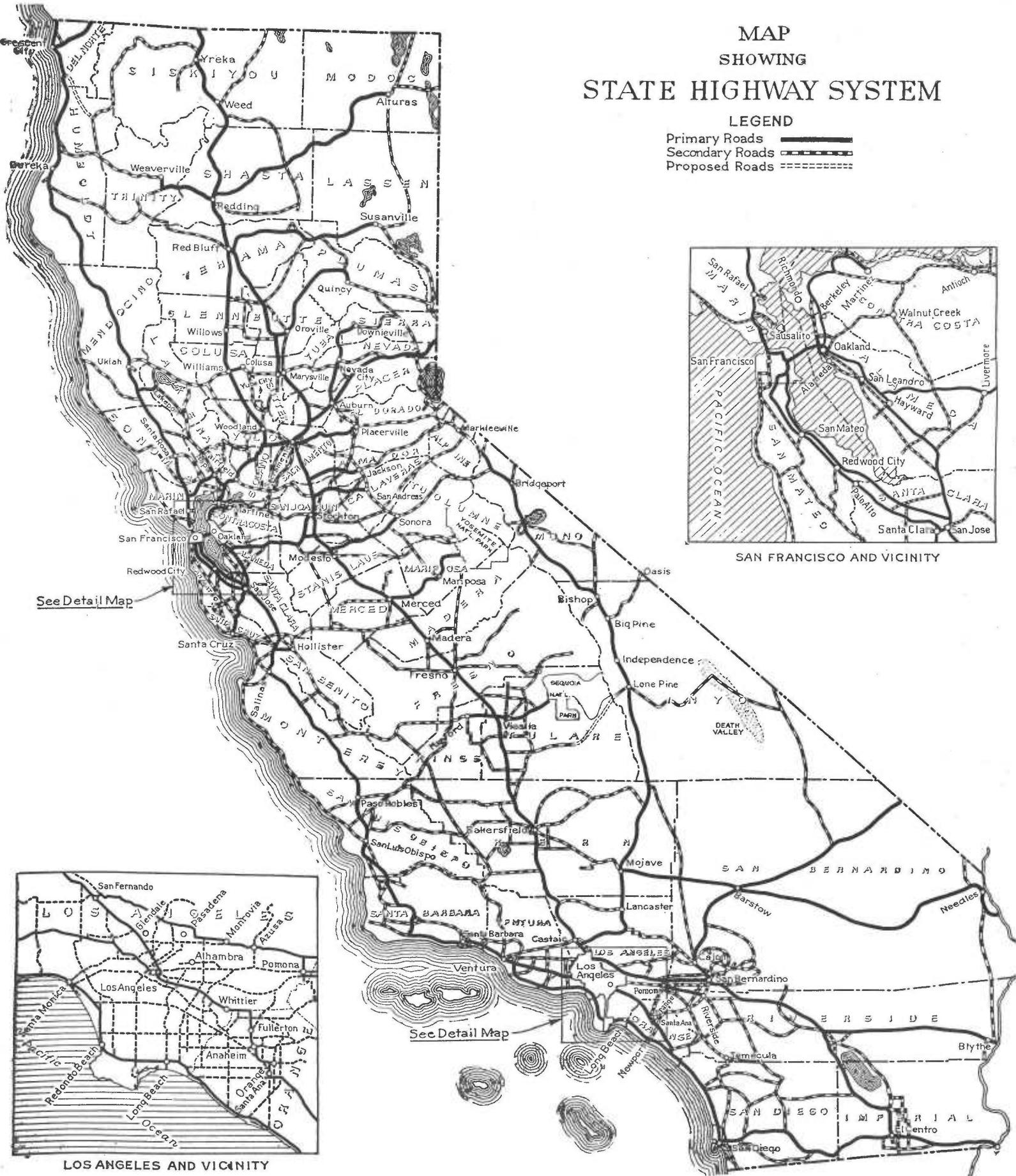
DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief
FRANK B. DURKEE, Attorney
C. R. MONTGOMERY, Attorney
ROBERT E. REED, Attorney

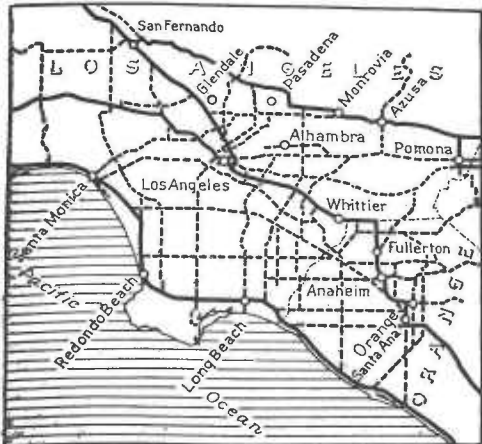


MAP SHOWING STATE HIGHWAY SYSTEM

LEGEND
 Primary Roads 
 Secondary Roads 
 Proposed Roads 



SAN FRANCISCO AND VICINITY



LOS ANGELES AND VICINITY

See Detail Map

See Detail Map