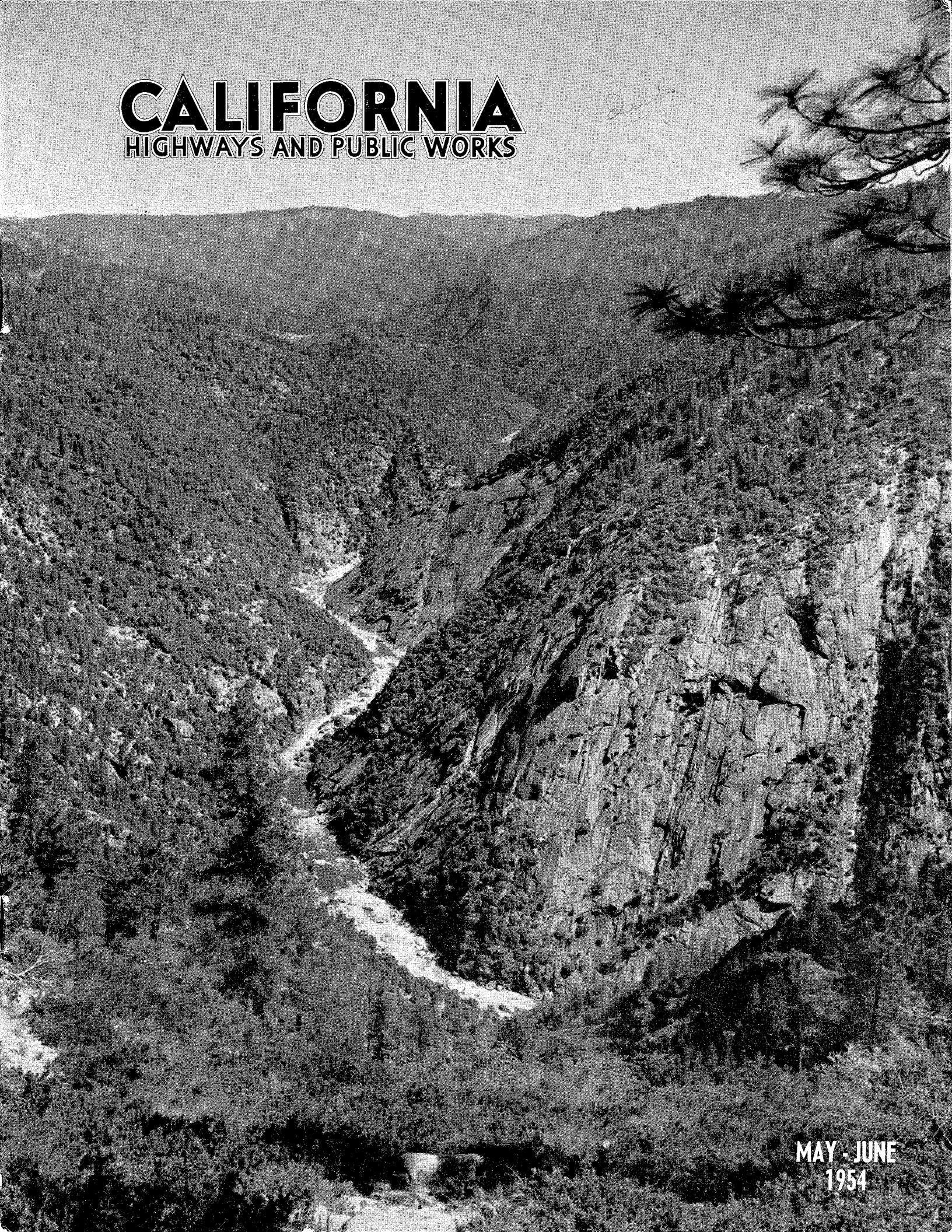
CALIFORNIA
HIGHWAYS AND PUBLIC WORKS



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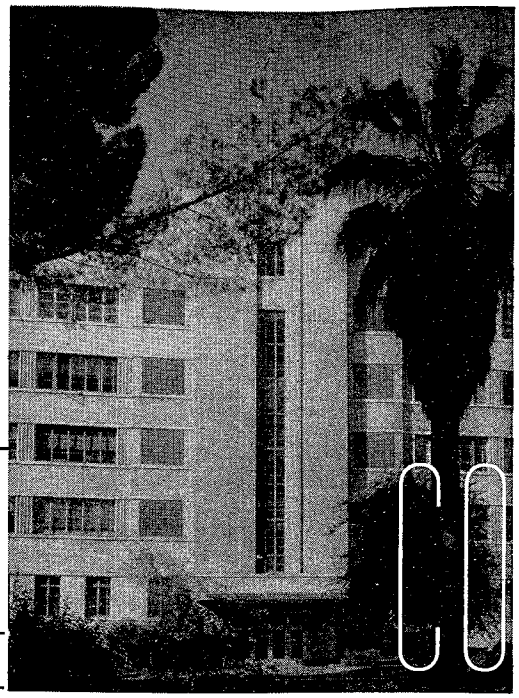

Public Works Building
Twelfth and N Streets
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CONTENTS

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Rapid Progress on Harbor Freeway

By W. L. FAHEY
District Engineer, District VII

Multimillion-dollar Project Reviewed

SINCE the last issue of *California Highways and Public Works* went to press, two construction events have occurred on the Harbor Freeway that are of considerable importance to the traveling public in the Los Angeles metropolitan area. On March 23, 1954, the J. E. Haddock, Ltd., construction contract for grading and paving the Harbor Freeway from Third Street to Olympic Boulevard was completed and opened to traffic. On May 14, 1954, the northerly half of the Oberg Bros. contract was completed and opened to public traffic from Olympic Boulevard to Washington Boulevard. Public traffic utilizing the Harbor Freeway now has the full use of the 2.2 miles of completed freeway southerly from the four-level structure.

Under the Oberg Bros. contract, construction is now in progress from Washington Boulevard southerly to Flower Street near the intersection with 23d Street. This construction is anticipated to be completed in November, 1954. Also under construction is the new J. E. Haddock, Ltd., contract between 23d Street and 42d Street, 1.4 miles, scheduled for completion in November, 1955. This contract includes not only the grading and paving for an eight-lane freeway, but also the construction of grade separation bridges at Flower Street, Adams Boulevard, 28th Street, 29th Street, 30th Street, Jefferson Boulevard, Exposition Boulevard, 37th Street, 39th Street and Santa Barbara Avenue.

One of Largest Contracts

This is one of the largest freeway contracts that has been awarded in District VII, having a total contract allotment of $3,325,584.05. On this contract bids were opened on March 25, 1954, and the contract was approved on April 20th. Notwithstanding this, the contractor, being anxious to get off to a good start, actually started his construction operations on April 12th. The first item of work which the contractor has undertaken is to construct the detour for Flower Street traffic around the site for the overcrossing bridge to carry Flower Street over the freeway. This flying start which the contractor has obtained should assure completion of this section of the Harbor Freeway on schedule, or ahead of schedule.

W. L. FAHEY

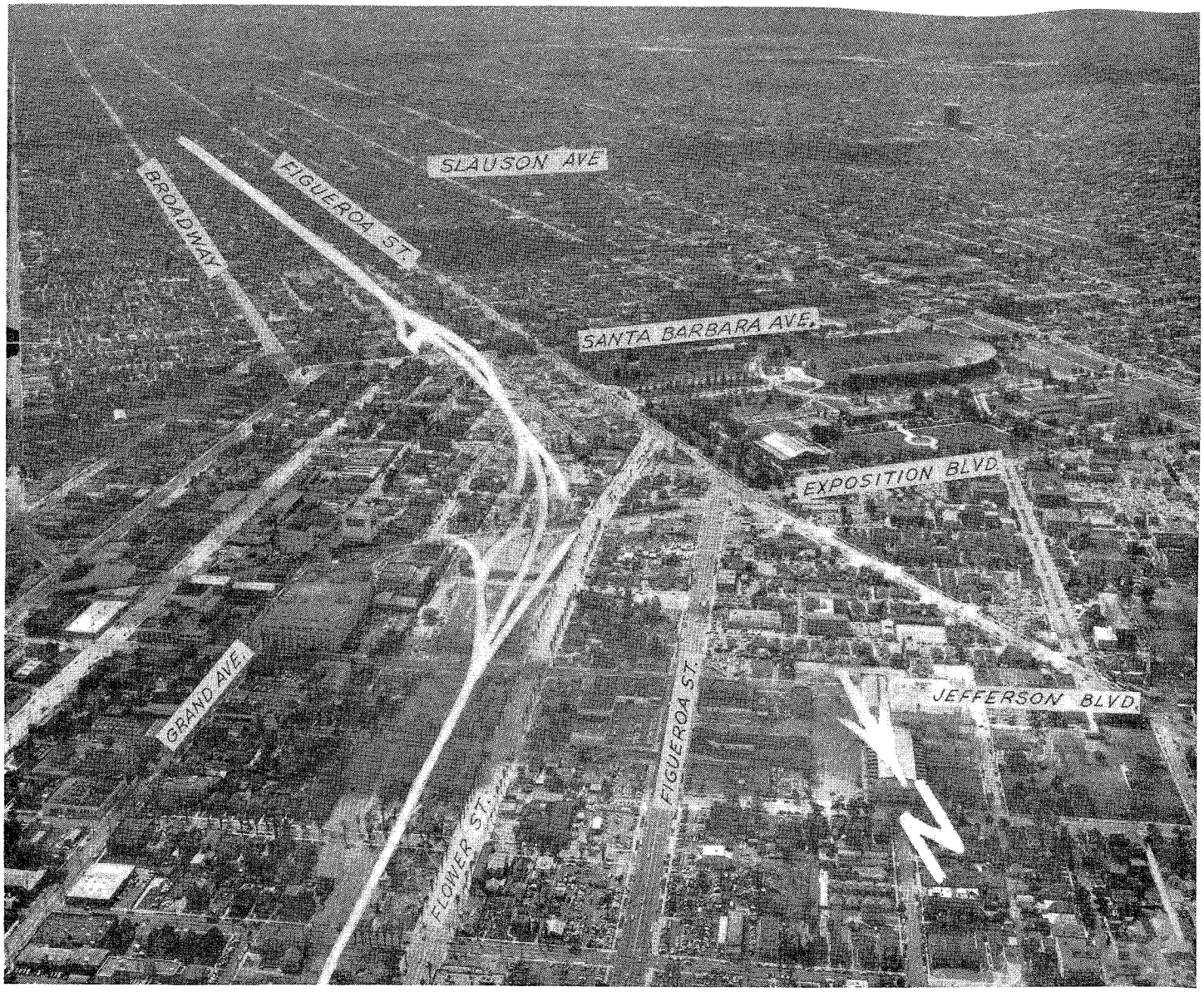
Additional construction activity can be expected within 30 days on the south end of the Harbor Freeway between Battery Street and 0.2 mile north of Pacific Coast Highway (State Highway Route 60), with the announcement that bids will be received in the District VII office of the State Division of Highways at 120 South Spring Street in Los Angeles on June 10, 1954. This section of freeway is 2.8 miles in length and is to be financed from an item of $4,650,000 in the 1954-55 Fiscal Year budget. This construction calls for a number of grade separation bridges at intersecting streets and railroads. The bridge structures and the grading are for a six-lane freeway.

Six-lane Freeway

Designs on the Harbor Freeway are on the basis of providing a six-lane freeway from the southerly terminus at Battery Street to the future Sepulveda Freeway interchange near 190th Street. From 190th Street northerly the design provides for an eight-lane freeway to the northerly terminus at the four-level traffic interchange structure.

Freeway construction through developed metropolitan areas, as is the case with the Harbor Freeway, requires a considerable amount of reconstruction on the part of existing public utility companies. The State has had excellent cooperation from the Pacific Telephone and Telegraph Company, the Los Angeles City Department of Water and Power, the various railroad lines, and other utility companies.

In the case of the Pacific Telephone and Telegraph Company, many toll cables and trunk lines have had to be moved and reconstructed to clear freeway construction. In some cases double moving is necessary; first, with installation on detours, and later on, within the permanent construction. The Los Angeles City Department of Water and Power has been required to move large water mains and underground and overhead power lines. The Pacific Electric Railway did considerable adjusting of its high power trans-



Looking southwesterly showing Harbor Freeway location close to Flower Street and Figueroa Street. Cleared right of way is in evidence foreground and center left. Los Angeles Memorial Coliseum in Exposition Park is shown center right.

mission lines at the Second Street Undercrossing with the Harbor Freeway.

Public Utilities Problem

An excellent example of the reconstruction required of public utilities located in a city street crossing the Harbor Freeway may be had by examining the situation at the Seventh Street Overcrossing Bridge. During the construction of this bridge it was necessary to carry the heavy Seventh Street traffic over a temporary detour in order that the bridge might be constructed in the old street area. It was necessary to relocate temporarily all public utilities in the detour area. This included the Los Angeles Transit Lines' trolley system and tracks, the Pacific Telephone and Telegraph Company's conduit and cables, City of Los Angeles Water Department's 30-inch water main, City of Los Angeles Power Department's distribution system, and Western Union Telegraph Company's conduit and cable. All of these moves were accomplished prior to the beginning of construction, with the exception of the Los Angeles Transit Lines, which move had to be accomplished during the construction of the detour in order to keep traffic moving at a normal rate on Seventh Street.

In order for the Pacific Telephone & Telegraph Company to plan and accomplish its temporary relocation, it was necessary to serve it with legal notification to move 18 months prior to the beginning of actual construction of the bridge. During construction of the bridge and just prior to the deck construction, all utilities, with the exception of the Los Angeles Transit Lines, installed their new facilities in the new bridge structure. The cost to the State for the relocation of various utilities at this one crossing of

the freeway was approximately $200,000.

Cost of Utility Relocation

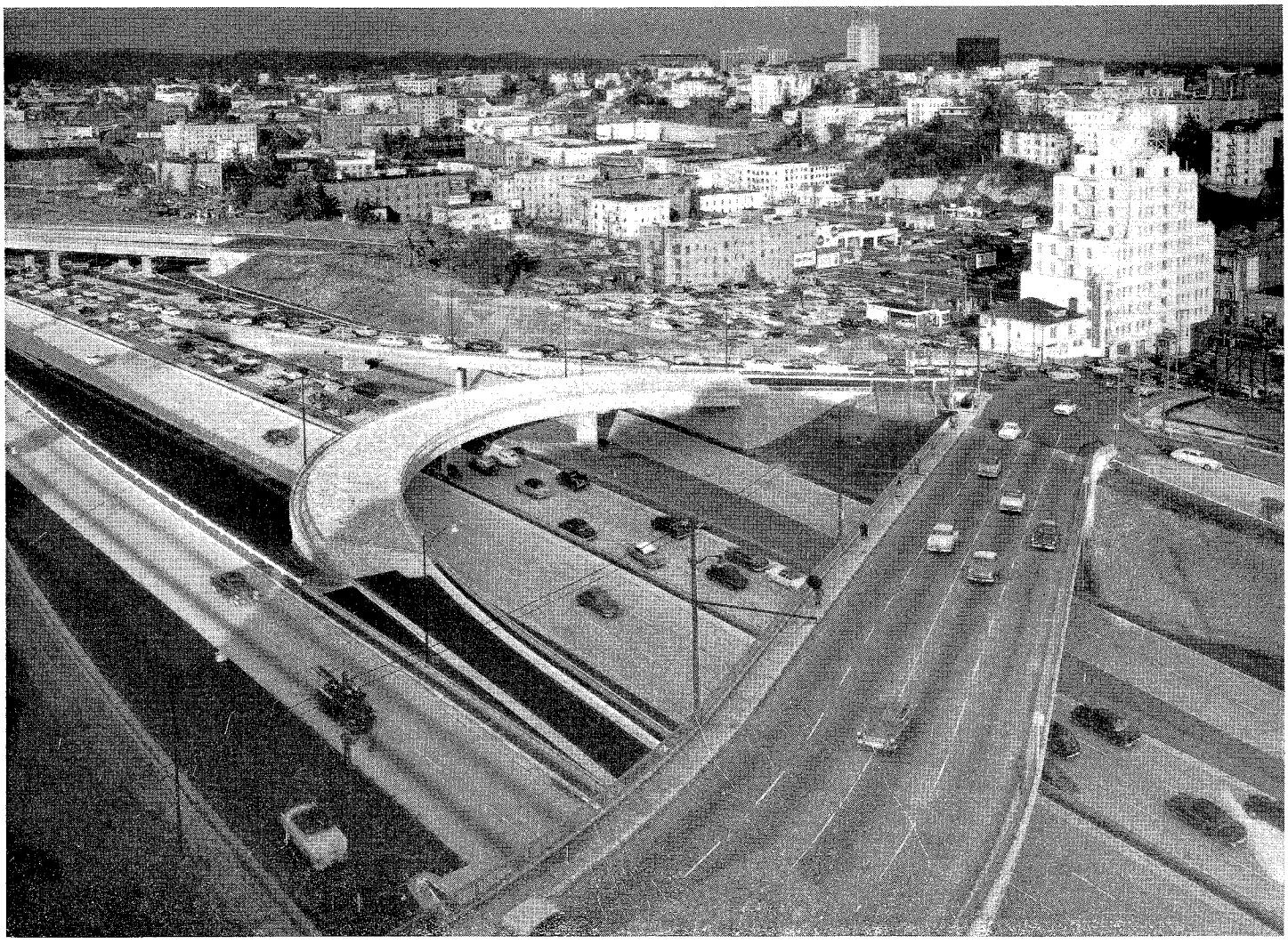
The relative cost of the relocation of public utilities made necessary by freeway construction decreases per mile as the construction moves outward from the central business area of the city. Between the four-level structure and Olympic Boulevard the cost per mile to the State for utility relocation was approximately $313,000. For the next three miles the average cost per mile is approximately $160,000. The total cost to the State of the relocation of all public utilities along the Harbor Freeway from the four-level structure south to Battery Street, a distance of 22.8 miles, is estimated to be $2,300,000.

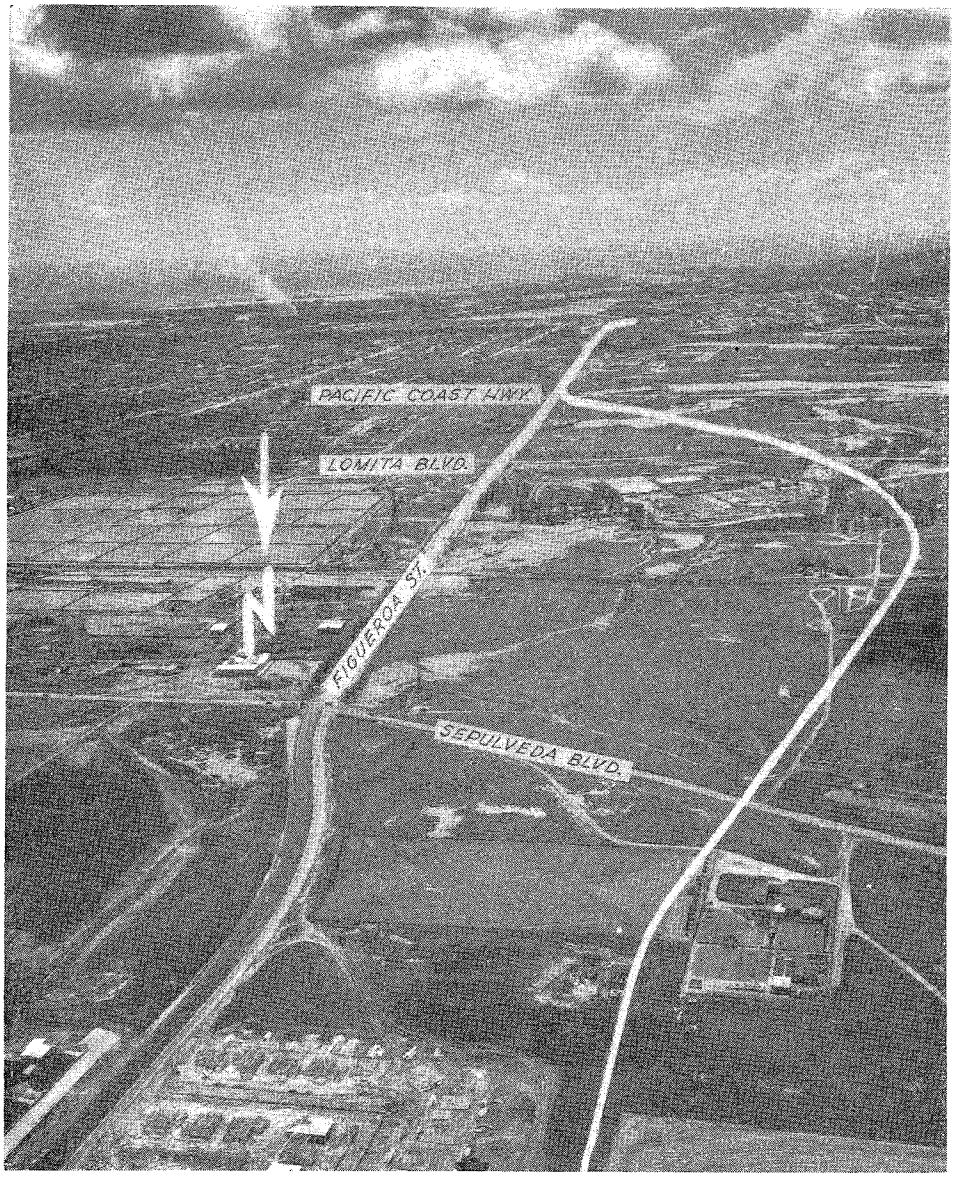
Adjustments have been necessary to existing railroad facilities in the case of the Atchison, Topeka and Santa Fe Railroad and the Pacific Electric Railway in order to work out grade separations with the freeway. Negotiations between State and utility companies have been made well in advance of construction, and, due to the wholehearted cooperation had from the utilities, no serious delays have been occasioned in freeway development.

Freeway 22 Miles Long

The Harbor Freeway, considered as a whole, is 22.8 miles in length extending from Battery Street in the San Pedro area to the four-level traffic interchange structure near the Los Angeles Civic Center. The Harbor Freeway comes in on the second level of this structure and becomes the Arroyo Seco Freeway extending northerly to Pasadena. The fourth, or top, level of this traffic interchange system carries the Hollywood Freeway, and the first and third levels carry interchange roadways. The design of the four-level traffic interchange structure that cost $1,500,000 was worked out as the most practical and least costly solution to the very complicated traffic interchange problem that was recognized to exist at this location. The State Division of Highways initiated the design and carried out the construction of this four-level grade separation structure that is the first of its kind to be built anywhere. This system provides for traffic flow in all

Evening peak hour traffic on the Harbor Freeway, with the Fifth Street Overcrossing in the foreground, the Fifth Street southbound on-ramp in the center and the northbound on-ramp carrying traffic in the direction of the four-level structure





Looking southerly along routing of Harbor Freeway with Los Angeles Harbor and Pacific Ocean in background. Los Angeles County Sanitation Plant appears center right inside loop of freeway location.

directions so that motorists can change from one freeway to another with little inconvenience and loss of time.

Freeway Location

From the four-level structure the Harbor Freeway location skirts along the westerly edge of the Los Angeles business area in rather close proximity to Figueroa Street, existing State Highway Route 165, that the Harbor Freeway will eventually replace as a state highway route. The freeway location crosses from the west side of Figueroa Street to the east side of this traffic artery at 23d Street. At this location a very complicated bridge structure passes the Harbor Freeway under Figueroa Street and 23d Street. Southerly the freeway location passes under Flower Street and West Adams Boulevard and also under 28th, 29th and 30th Streets. The freeway location passes over Jefferson Boulevard a short distance easterly of Flower Street providing ample clearance with Los Angeles Exposition Park and the Olympic Coliseum. The freeway location lies approximately halfway between Figueroa Street and Broadway from Santa Barbara Avenue southerly to 124th Street where the freeway then swings westerly of Figueroa Street and extends southerly approximately equidistant between Figueroa Street and Vermont Avenue.

Intersects Sepulveda

The Harbor Freeway location intersects the future Sepulveda Freeway location close to 190th Street where a special traffic interchange facility is now in process of design. The location from this intersection with the Sepulveda Freeway southerly has been very carefully worked out to keep interference with oil wells and oil refinery operations to a minimum. Approaching the harbor area the freeway location, still lying westerly of Figueroa Street and westerly of Wilmington-San Pedro Road, skirts to the east of the Union Oil Refinery. The southerly terminus of the freeway is at Battery Street and Gaffey Street in the San Pedro area near the west basin of Los Angeles harbor.

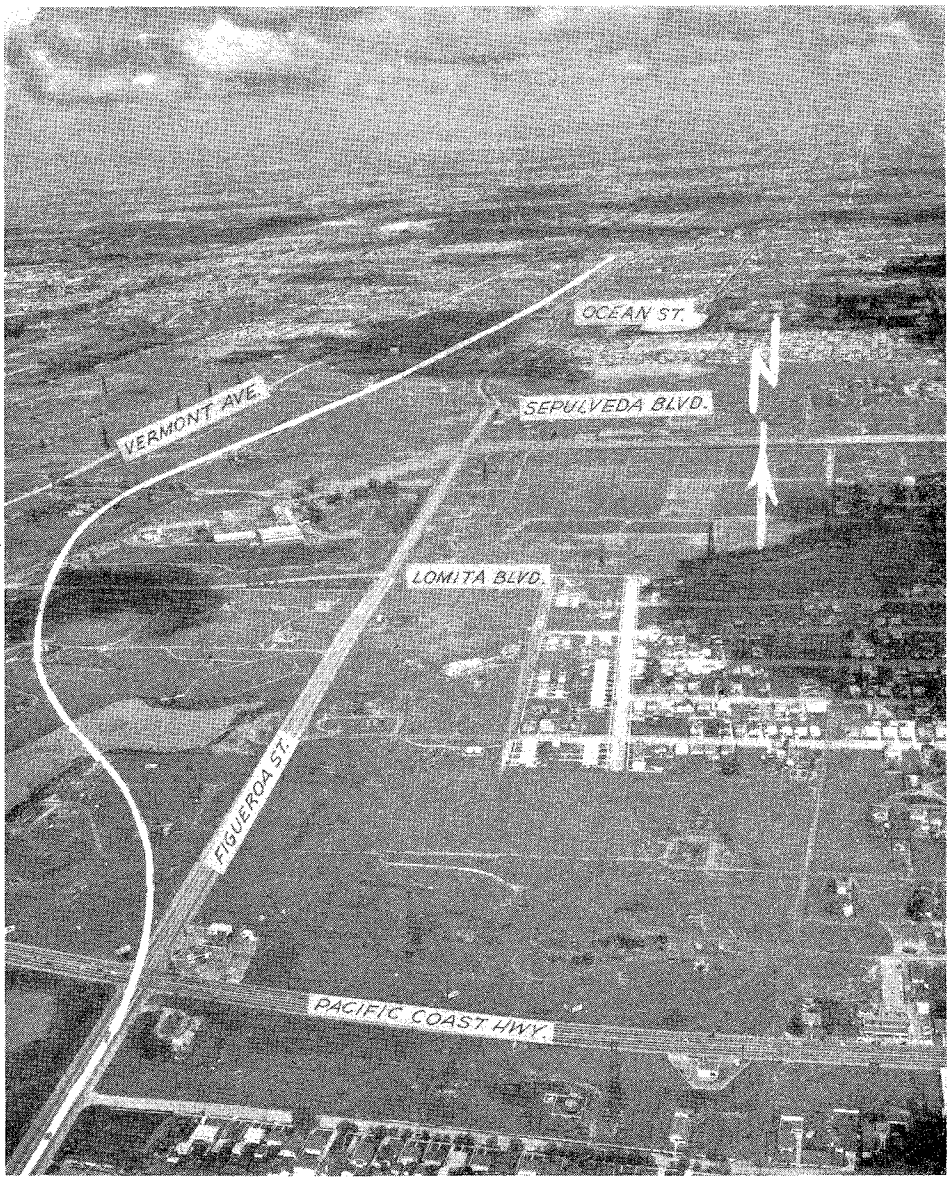
The pressing need for a new highway arterial between Los Angeles central business district and Los Angeles Harbor, to supplement the existing congested city streets and county roads, was quite generally recognized even some 15 years ago. It is indeed difficult to give credit where credit is due for the inception of the freeway idea and development of the Harbor Freeway. To list by name, all of the civic-minded individuals who have had an important part in the development of the Harbor Freeway, would be an impossible task because so many of the important contributions of some individuals would be certain to go unnoted. The same can likewise be said of any attempt to mention all of the various organizations which had an important part in developing the Harbor Freeway.

Early Reports

Turning to the early reports that were first published that served to focus public attention on the great traffic need for the Harbor Freeway was the publication by the Engineering Department of the Automobile Club of Southern California, dated April 16, 1937, entitled, "Traffic Survey Los Angeles Metropolitan Area." In this report a routing is shown for a new "motorway" between downtown Los Angeles and the harbor area that roughly approximates the routing

now adopted for the Harbor Freeway. Later under date of December 7, 1939, a more comprehensive report was made by the City of Los Angeles Transportation Engineering Board, the Citizens Transportation Survey Committee, and the U. S. Works Progress Administration, in which a proposed new highway arterial between the Los Angeles downtown area and Los Angeles Harbor was treated in three sections and called, "West Bypass," "Inglewood Parkway," and "Harbor Parkway." The combination of these three sections of proposed highway arterials in general follow quite closely to the Harbor Freeway as later adopted by the State Highway Commission and now under construction. In this report credit is given to other cooperating agencies as follows: Los Angeles Traffic Association, Central Business District Association, Los Angeles County Regional Planning Commission, and the Automobile Club of Southern California.

The Regional Planning Commission of Los Angeles County has played an important part in the development of the freeways in this area. A freeway location between the Los Angeles central business district and the harbor area is noted in the Regional Planning Commission's publication dated 1943, entitled, "Freeways for the Region." The County Planning Commission, through its control of subdivisions, has been instrumental in protecting future freeway routes from encroachment by proposed subdivisions and by housing projects that would otherwise have greatly increased the later cost of right-of-way acquisition.



Looking northerly along Harbor Freeway route, showing Los Angeles downtown area background right, Los Angeles County Sanitation Plant shown center left

Cooperating Agencies

Another important publication which gave further support to the Harbor Freeway development was the report by the Los Angeles Metropolitan Parkway Engineering Committee dated March 30, 1946, entitled, "Interregional, Regional, Metropolitan Parkways." This report gave valuable information to the *Joint Fact-Finding Committee on Highways, Streets and Bridges of the California Legislature.* This report listed as cooperating agencies the following: County of Los Angeles, Cities of Los Angeles County, Automobile Club of Southern California, Los Angeles Traffic Association, California State Chamber of Commerce, Los Angeles Chamber of Commerce, Central Business District Association, and the Downtown Business Men's Association.

The recommendations in this report and the facts and statistics printed therein were of great value to the California Legislature in its deliberations prior to the adoption of the Collier-Burns Highway Act of 1947, the passage of which greatly increased state highway funds available for freeway construction.

The bridges on the Harbor Freeway have been and are being designed by the Bridge Department of the State Division of Highways. The roadway plans for the freeway are developed in the District VII office in Los Angeles.

Locating Surveys

In making the location surveys for the Harbor Freeway, various methods were followed. Throughout the project all the available maps and existing survey information on intersecting and nearby city streets and county roads were obtained. The centerline survey was tied into the California

Aerial view of Harbor Freeway, looking northerly from Ninth Street, as it passes Statler Hotel, center right

Grid System that is in general use by Los Angeles County, Los Angeles City and other agencies. Direct location methods were followed in carrying out surveys for the major portions of the project but in the case of the eight-mile length through the Gardena area, advantage was taken of aerial survey maps in determining and computing alignment. The aerial survey mosaic maps were on a scale of 1 inch to 50 feet.

In the development of the portion of the plans for the Harbor Freeway within the City of Los Angeles areas the State has the cooperation of the Los Angeles City Bureau of Engineering. Detailed plans are developed by the Los Angeles City Bureau of Engineering for reconstruction of those existing facilities on city streets such as sanitary sewers, storm drains, lighting systems, and traffic signal installations where changes are made necessary by reason of freeway construction. In the establishment of a freeway through developed portions of a city the interference with existing facilities that is necessitated by the freeway construction is much more widespread than is generally realized. Sometimes reconstruction of sanitary sewers and storm drains has to be carried out many blocks distant from the freeway because of changes made necessary in the grade lines, particularly when the freeway is depressed below the ground surface.

For portions of the Harbor Freeway in county areas the State Division of Highways had the benefit of cooperation from the Los Angeles County Road Department and the Los Angeles County Storm Drain Department. Without the wholehearted cooperation of these other governmental agencies the progress of construction on the Harbor Freeway would not be so far along as it is today.

Design of Freeway

In the design of the Harbor Freeway, its extensive utilization by mass transportation busses is anticipated and is being provided for. The freeway will have bus turnout roadways at Seventh Street, between Pico Boulevard and Venice Boulevard, at Jefferson Boulevard and at Santa Barbara Avenue. Full provisions will be made at these locations for passenger loading and unloading facilities and stairways so that passengers can transfer between the busses operating on freeways and those operating on existing surface streets.

It has been ruled that state highway funds cannot legally be used for right-of-way acquisition and construction to provide bus transfer facilities. The City of Los Angeles has agreed to contribute sufficient city funds to reimburse the State for the construction of bus passenger loading and unloading facilities on the Harbor Freeway.

Planning and design work on the freeway started about 12 years ago when plans were being developed for the four-level traffic interchange structure at the northerly terminus of this freeway. The last freeway agreement contract with Los Angeles City and Los Angeles County was executed on August 11, 1950. Since then engineers in the drafting room crews of District VII have worked steadily on plans for the entire 22.8 miles of the freeway so that a schedule of contract advertising could be worked out that would utilize construction funds as they were budgeted by the State Highway Commission.

Economical Routing

The determination of the most economical routing for the Harbor Freeway through built-up and highly developed sections of Los Angeles City has presented many problems.

In some cases the selection of the alignment made necessary the demolition of churches and schools. In other cases, the alignment was adjusted to miss large costly installations such as the Nurses Home of the Methodist Hospital where extensive retaining wall construction was necessary. Even with all the adjustments it was possible to make in the location of the Harbor Freeway, the removal of many costly structures was necessary. Three churches in the path of the freeway have had to be demolished since they were too large to be moved economically by the usual housemoving methods. To clear the Orthopaedic Hospital on the east side of Flower Street it was necessary to shift the Flower Street-Adams Boulevard intersection to the west in order to eliminate a city street intersection occurring on the bridges for these two streets. This shift created an unusual condition in which, for economy of cost, the Adams Boulevard west abutment and Flower Street south abutment are joined together. At this location, in order to carry the heavy traffic on each street, it was necessary to work out a system of detours that would inconvenience public traffic as little as possible.

Throughout the entire length of project every effort has been made to locate the alignment and design the various sytems for traffic interchanges at important cross arteries to keep construction costs and right-of-way costs to a minimum. Wherever possible, damage to expensive installations has been avoided. The design has been carefully worked out passing through oil field areas so that construction would clear highly productive oil wells.

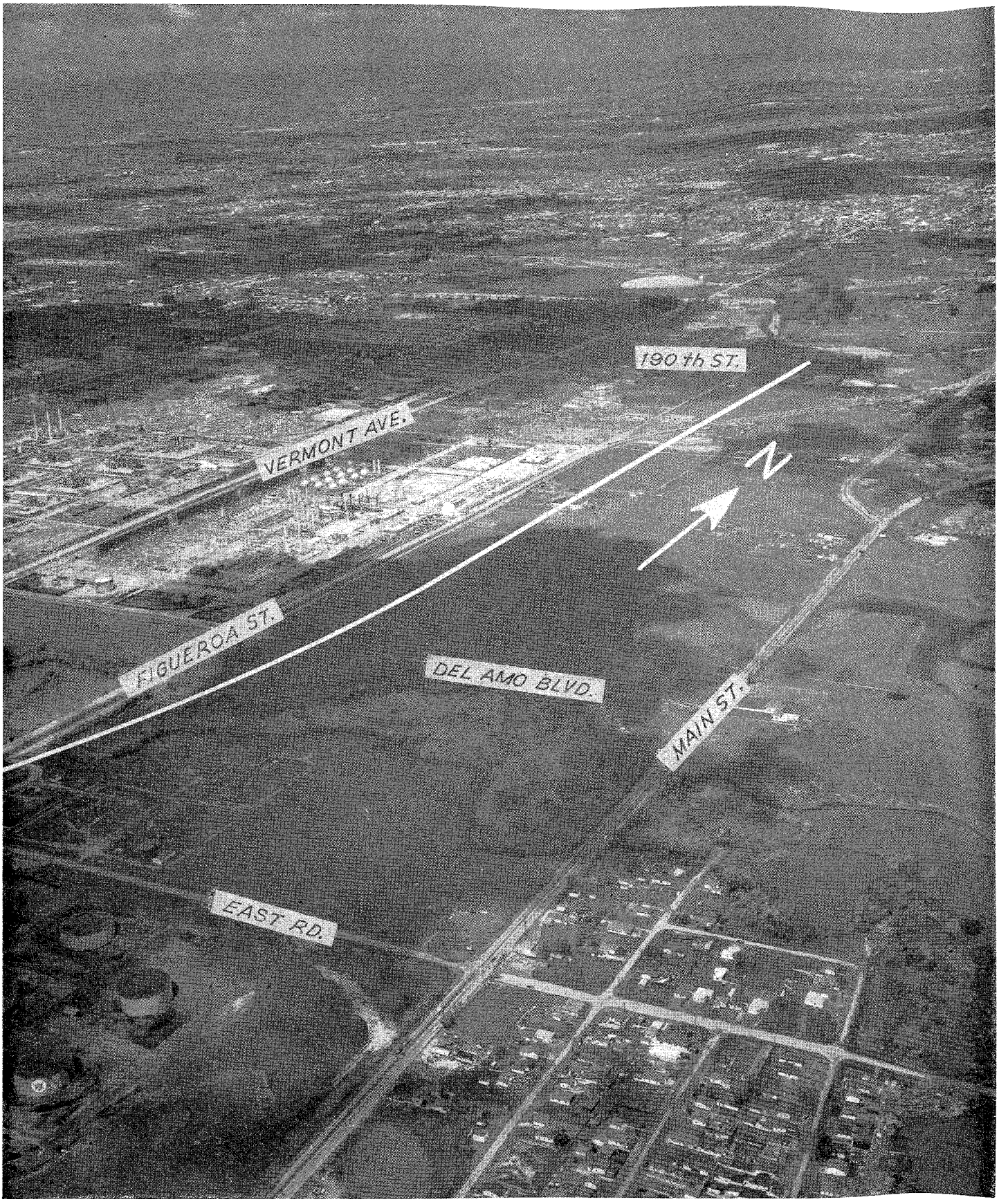
Looking southerly along route of Harbor Freeway, showing Los Angeles Harbor in background, left, and Palos Verdes Hills background, right. The curving location of the Harbor Freeway that was necessary in order to miss highly productive oil wells is shown.

Design Problems

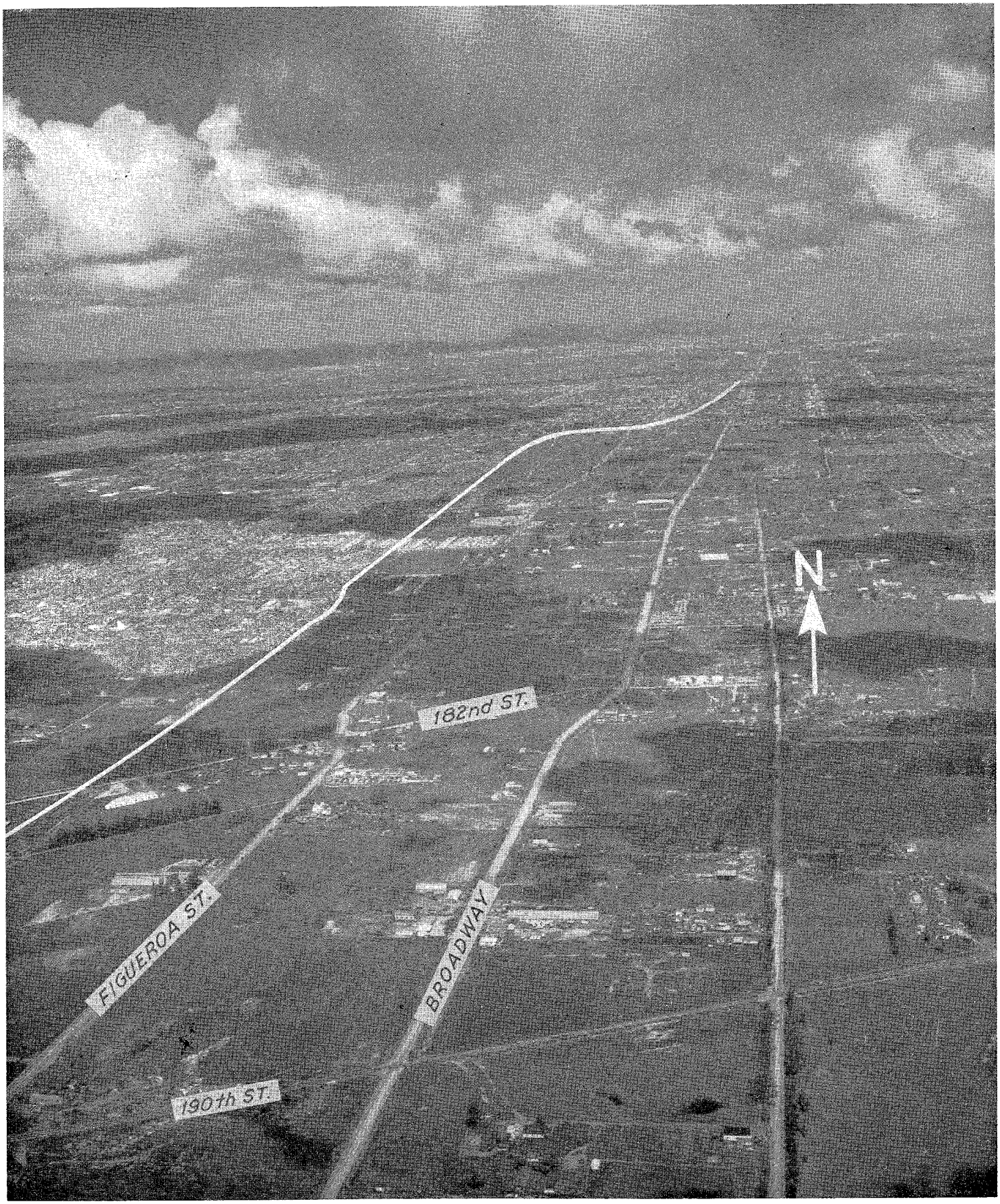
Design problems were also presented where the freeway had to be located in close proximity to very expensive oil refineries. In the case of the Shell Oil Refinery between Del Amo Boulevard and 190th Street the location chosen clears this plant in its entirety. At the southerly end of this project, between Anaheim Street and Battery Street, the location skirts around the easterly edge of the Union Oil Company Refinery and the Western Oil Terminal Company. The design of the freeway at this location has been worked out to keep interference with these oil refinery installations to a minimum. The reconstruction of these oil refinery facilities consists of relocation of pipelines leading to the loading docks in the west basin of Los Angeles Harbor and alterations to some buildings in the distribution plant.

The Harbor Freeway makes intersection with three other freeways: the Hollywood Freeway at the north end which is now completed and in operation, the Olympic Freeway for which designs are about to be started, the Sepulveda Freeway for which designs are now in process, working toward right-of-way acquisition negotiations in this area.

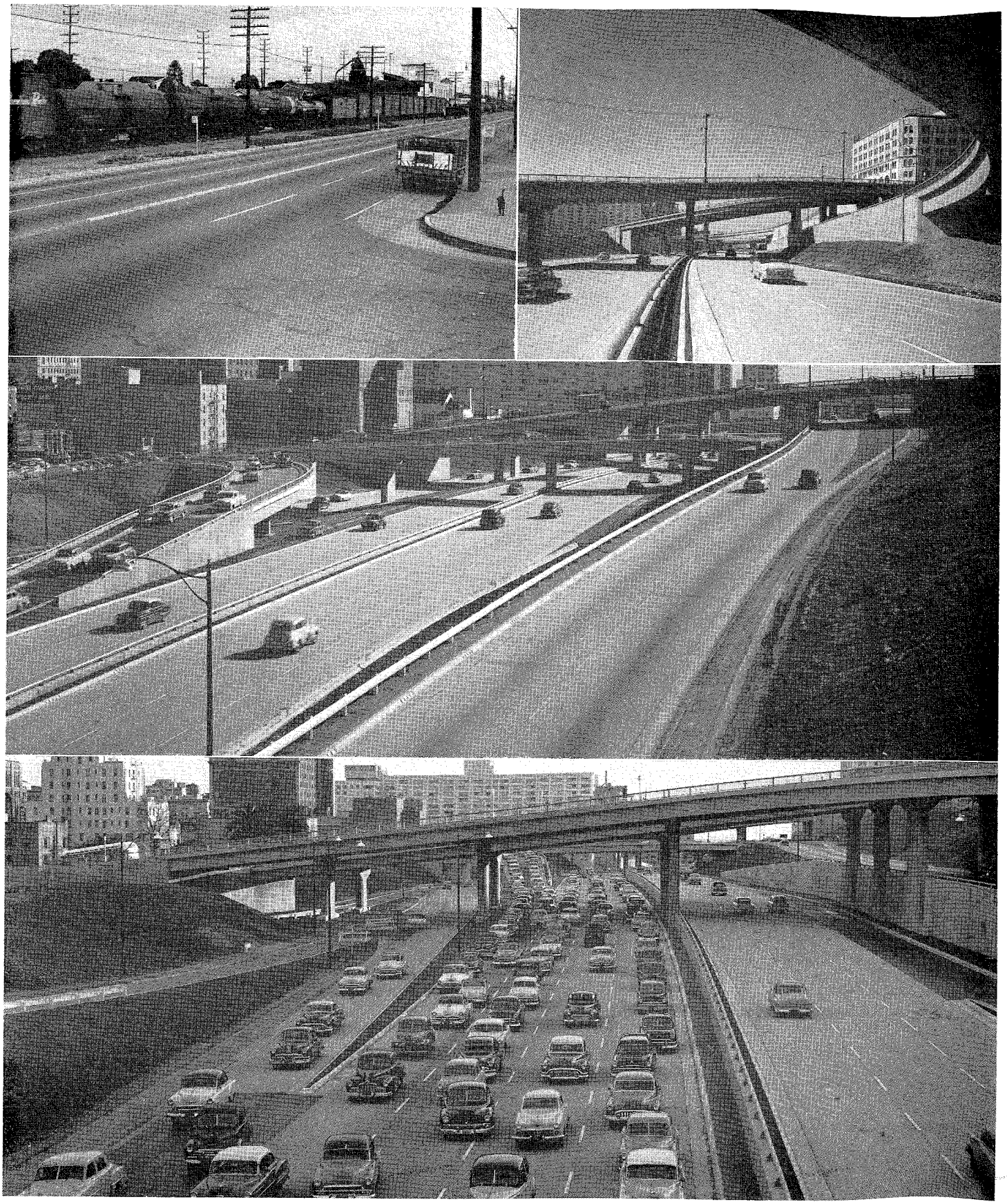
A railroad grade separation structure is now under construction for the Southern Pacific Railroad branch line on Exposition Boulevard. Designs are now in progress for the railroad grade separation structure needed for the Atchison, Topeka and Santa Fe Railway on Slauson Avenue. Preliminary studies are under way for the railroad grade separation structure required on the Pacific Electric Railway line just southerly of Imperial Highway and



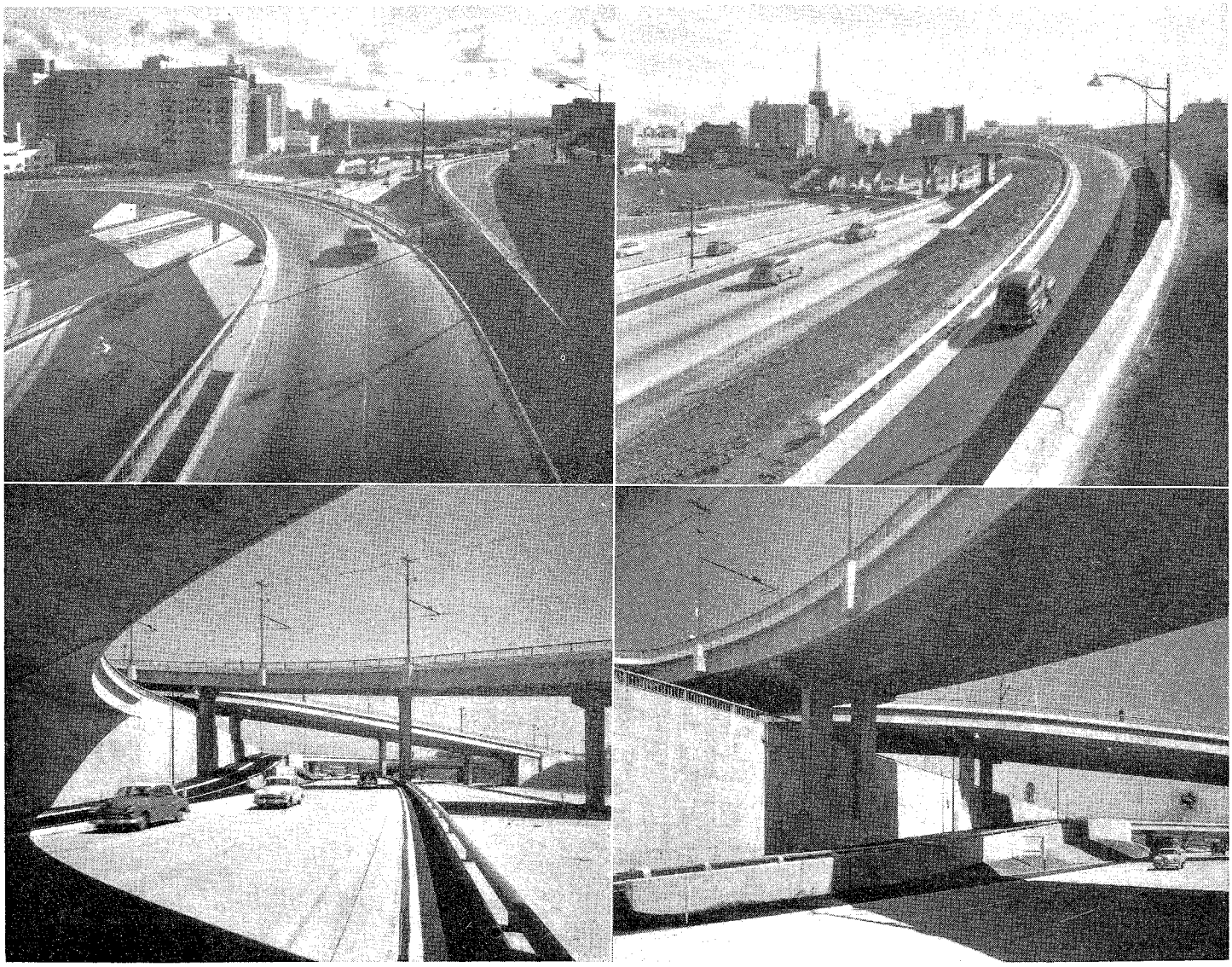
Looking northwesterly, Santa Monica mountains in background, showing Harbor Freeway in close proximity to Figueroa Street. The United States Government refinery leased to the Shell Oil Company is shown center left.



Looking northerly along route of Harbor Freeway showing Los Angeles downtown area, background, right. This portion of alignment was carefully located to clear oil production facilities.



UPPER LEFT—Looking east on Slauson Avenue in vicinity of future route of Harbor Freeway. UPPER RIGHT—Looking southerly from under on-ramp bridge for southbound traffic from Fifth Street. CENTER—Looking southerly with Statler Hotel in background. LOWER—Looking south along freeway, showing heavy northbound traffic passing under Fourth Street overcrossing.



UPPER LEFT—Looking southerly, showing off-ramp to Sixth Street. UPPER RIGHT—Looking southerly, showing Fourth Street bridges in center; Jonathan Club building, center, background. LOWER LEFT—Looking northerly from under off-ramp to Sixth Street. LOWER RIGHT—Looking northerly, showing structural details of Sixth Street Underpass.

for the Pacific Electric Railway tracks at 149th Street south of Rosecrans Avenue. Preliminary studies are also under way for the Atchison, Topeka and Santa Fe branch line southerly of the Sepulveda Freeway.

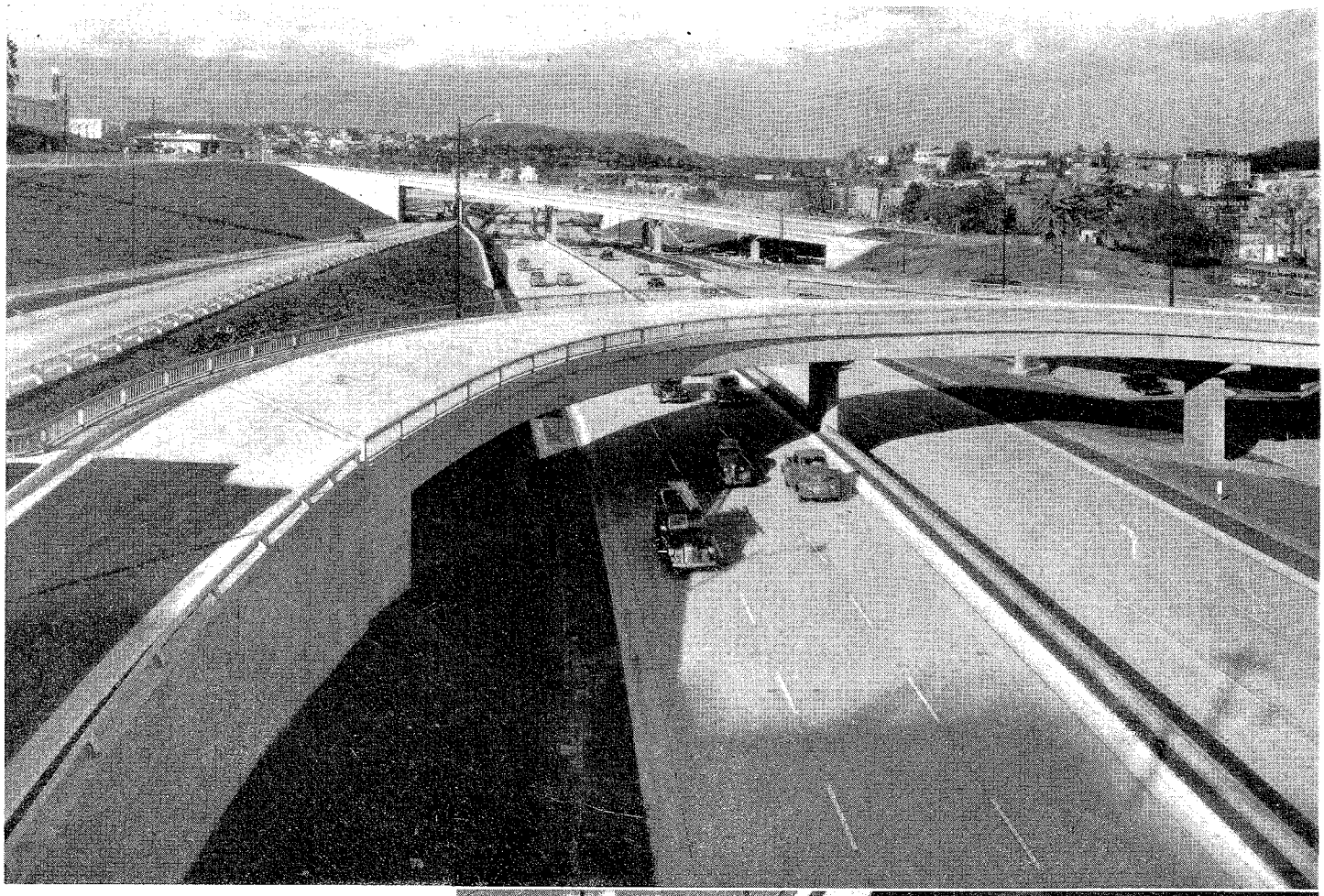
Is Full Freeway

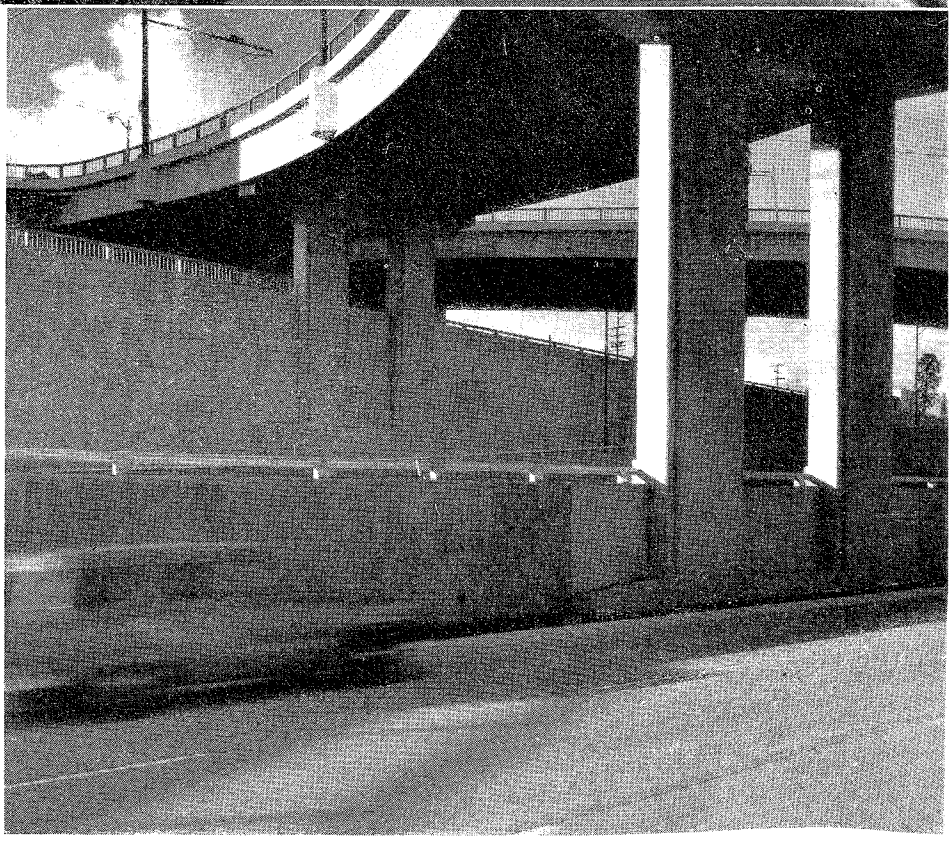
The designing of the Harbor Freeway throughout its entire length is on the basis of an eight-lane freeway from the four-level traffic interchange structure to the future location of Sepulveda Freeway near 190th Street. From the Sepulveda Freeway southerly to Battery Street in the harbor district the freeway is designed for six lanes although the initial construction on this southerly end will be for a four-lane freeway. Throughout the entire length the freeway is a full freeway in every respect with no intersections at grade and all rights of ingress and egress for abutting property taken.

Bridge structures play a very vital role in the development of the Harbor Freeway. In some locations the expenditures for bridge structures on a per mile basis equals or even exceeds the expenditures for the road facilities, sometimes costing in excess of $2,000,000 per mile. The bridges thus far designed and constructed are of the reinforced box girder type. Foundation conditions have been thoroughly investigated in advance for each structure by foundation drilling. Test holes at the bridge site are drilled as much as 80 feet to 100 feet in depth. On the basis of subsurface investigations the footing designs are worked out with bridge structures supported on steel-H piling and cast-in-place concrete piling, using both driven steel shells and drilled holes without steel shells. In many cases reinforced concrete spread footings without piles are satisfactory when foundation conditions are found to be good.

Many Bridge Structures

Many bridge structures on the Harbor Freeway have been constructed

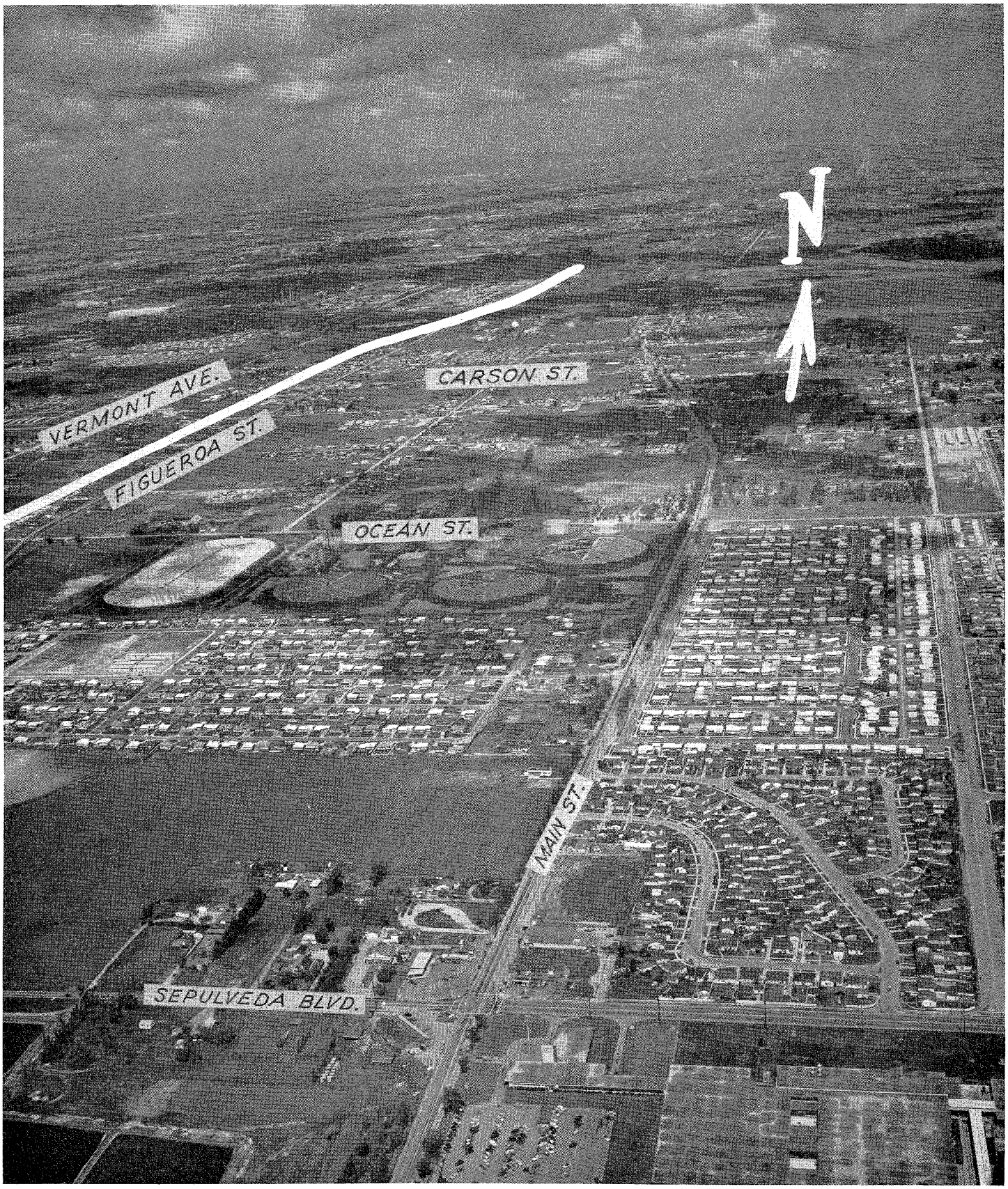




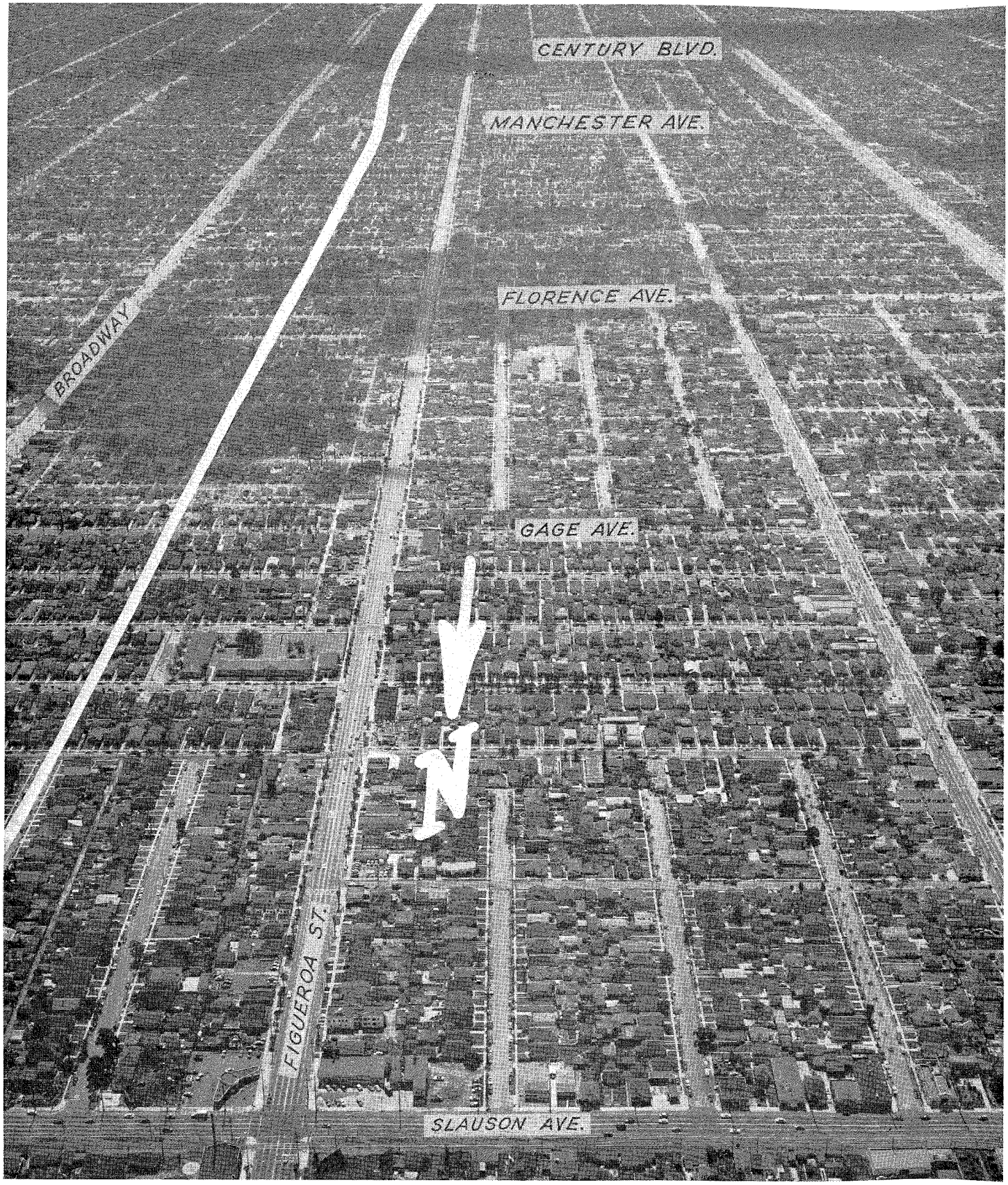
UPPER—Looking northerly, showing in foreground ramp bridge for southbound traffic from Fifth Street. LOWER—Looking westerly, showing construction details of Sixth Street Bridge.

under separate contracts well in advance of the road work. All bridge structures between the four-level traffic interchange structure to the north and Olympic Boulevard to the south were constructed under separate contracts in advance of the road construction contracts. On the other sections, road and bridge construction will be included in the same contracts. All bridge structures are designed for American Association of State Highway Officials standard loading H-20-S-16, meaning a 20-ton truck followed by a 16-ton trailer.

Satisfactory progress has been and is being made in the acquisition of rights of way for the freeway. To date over 2,000 parcels have been acquired at a total cost of about $38,000,000. It is interesting to note that of this large number of parcels sub-



Looking northerly along Main Street with Los Angeles downtown area, background, right. Location of Harbor Freeway is in close proximity to Figueroa Street in center left.



Looking southerly along freeway, showing location half way between Broadway and Figueroa Street

Looking south along Harbor Freeway. Wilshire Boulevard Overcrossing in foreground; Seventh Street Overcrossing in center.

stantially all have been acquired by negotiation. The State has gone to court in condemnation trial proceedings for the determination of the money to be paid owners for their property in only 64 instances. The fact that it has been necessary to institute right of eminent domain proceedings in the case of only 3 percent of parcels being acquired is a good indication that the prices paid by the State to property owners for land and improvements taken are fair and equitable.

Cost of Right of Way

In acquiring and clearing right of way through the downtown business area in Los Angeles between First Street and Olympic Boulevard, some very large buildings housing businesses and multiple-unit apartments have had to be demolished. The cost of right-of-way acquisition in this area totaled $11,000,000. This is the most expensive right-of-way acquisition yet encountered on any of the Los Angeles freeways. One operation of right-of-way clearing that attracted considerable

. . . Continued on page 32

CONSTRUCTION CONTRACTS—HARBOR FREEWAY

Description	Awarded	Completed	Cost	Contractors	Resident engineers
Temple St.—undercrossing	10-14-47	12-28-48	$381,000	James I. Barnes Cons. Co., Santa Monica	W. A. McIntyre
1st and 2d Sts.—undercrossing	11-10-49	1-18-51	444,600	Oberg Bros. Constr. Co., Inglewood	C. T. Woodbridge
3d St.—two R. C. overcrossings	6-10-50	8-13-51	378,900	Chas. MacClosky Co., Los Angeles	C. T. Woodbridge
4th St.—overcrossing and grading and paving	8-17-50	3-25-52	567,900	W. J. Disteli, Los Angeles	Carl Verner
5th and 6th Sts.—five overcrossings and two pedestrian undercrossings	12- 8-50	3-11-53	1,041,900	Winston Bros. Co., Los Angeles	W. Harold Johnson
Wilshire Blvd.—overcrossing	3-27-51	11- 6-52	376,400	Webb & White, Los Angeles	Wilfred E. Bastues
4th to Temple—freeway and pedestrian underpass	6-14-51	7-30-52	706,700	Webb & White, Los Angeles	H. E. Belford
3d to Temple—lighting and signs	6-14-51	7- 9-52	42,300	Ets-Hokin & Galvin, San Francisco	Ray E. DeGroff
7th, 8th and 9th Sts.—six bridges, overcrossings and undercrossings	10-19-51	8-21-53	1,241,300	Oberg Bros. Constr. Co., Inglewood	L. E. Crayne
Olympic Blvd.—R. C. bridge undercrossing	5-20-52	7-17-53	350,000	Oberg Bros. Constr. Co., Inglewood	Clinton Tompkins
11th and 12th Sts.—R. C. bridges, undercrossings	7- 2-52	6-17-53	374,000	Oberg Bros. Constr. Co., Inglewood	Wilfred E. Bastues
Pico Blvd. and Venice Blvd.—undercrossings	8-27-52	10-26-52	487,000	Oberg Bros. Constr. Co., Inglewood	F. M. Morrill
2d to Olympic—freeway retaining walls and pedestrian underpass	9-24-52	3-23-54	2,058,900	J. E. Haddock, Pasadena	H. E. Belford
2d to 11th—lighting and signs	12-15-52	3-23-54	128,200	C. D. Drauker, Inc., Los Angeles	Ray E. DeGroff
Olympic to Flower—freeway, two overcrossings and one undercrossing	6-25-53	Est. 10-30-54	1,796,400	Oberg Bros. Constr. Co., Inglewood	H. E. Belford
21st to Jefferson St.—sewers and storm drains	7- 8-53	2-25-54	330,300	Oberg Bros. Constr. Co., Inglewood	C. L. Aisthorpe
Olympic to Flower—lighting and signs	10-20-53	Est. 2-28-55	84,800	Westates Elec. Constr. Co., Los Angles	Ray E. DeGroff
23d to 42d St.—freeway and bridges	4- 1-54	Est. 11-25-55	3,325,600	J. E. Haddock, Ltd., Pasadena	H. E. Belford, Homer J. Scott
			$14,116,200		

Quake Fault

Historic Fort Ross Cut Off by Coast Highway Slide

By R. D. KINSEY, Assistant District Engineer

A SLIDE on the Coast Highway, Sign Route 1, between the communities of Jenner-by-the-Sea and Fort Ross in Sonoma County, closed the highway to travel on April 11, 1954.

The slide is located on the Mary A. C. Charles ranch approximately eight miles north of Jenner and approximately four miles south of Fort Ross and developed within the body of an old slide that originally moved, according to Mrs. Charles, at the time of the 1906 earthquake. The upper reaches of the slide are approximately 450 feet above the highway.

The closing of the highway by this slide has seriously inconvenienced highway travel in this location due to a lack of parallel roads. The California Highway Commission, recognizing the local importance of this section of state highway, has allocated $100,000 per year since 1950 to correct the many substandard sections of the highway.

It has been possible to detour light traffic and single truck traffic around the slide area over county roads, with some increase in over-all distance. Upon the closing of the highway the Pacific Greyhound canceled its bus route between San Francisco and Fort Bragg by way of the Coast Highway.

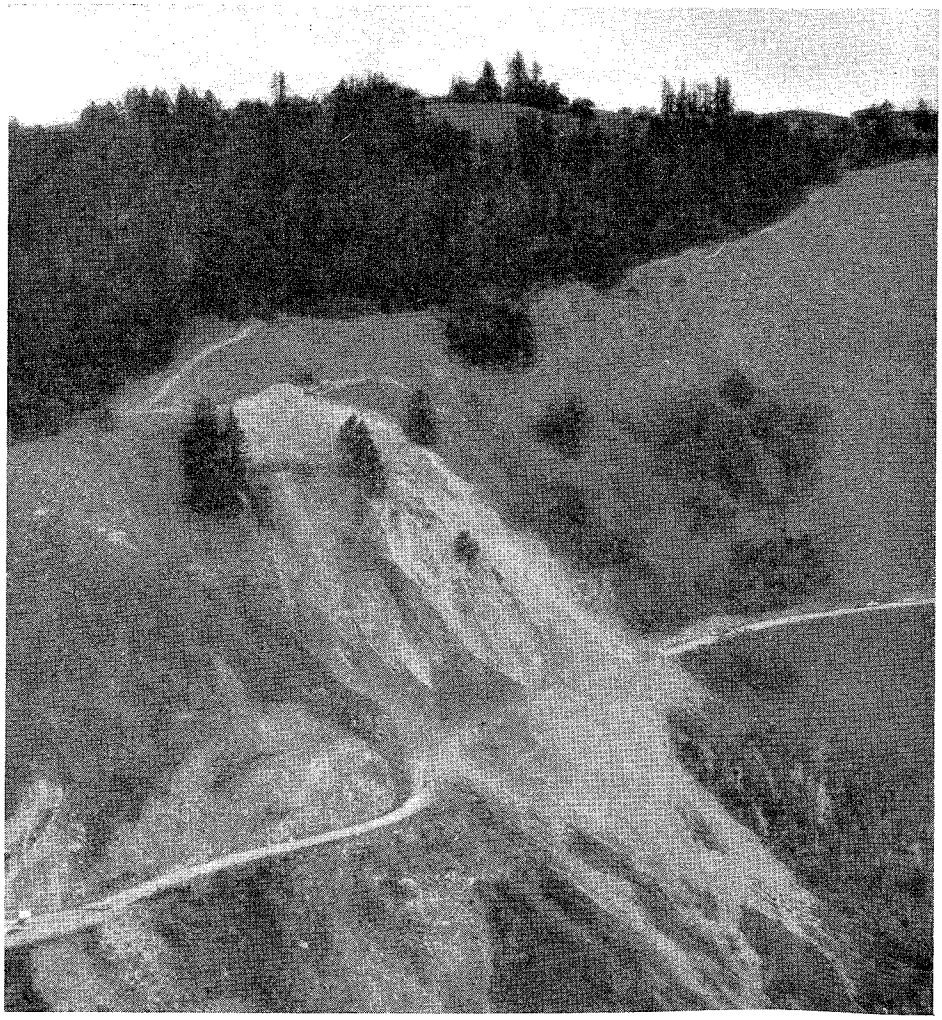
The lack of availability of detour for the heavy trucks and trailers utilized by the lumbering industries for hauling their mill products from the number of mills in the vicinity of Gualala, Plantation and Fort Ross placed an additional burden on the mills due to their inability to store their products for lack of space. For this reason it is necessary to provide a means for this traffic past the slide area and a schedule was developed with the operators by which an opening would be made during the dark period of the day.

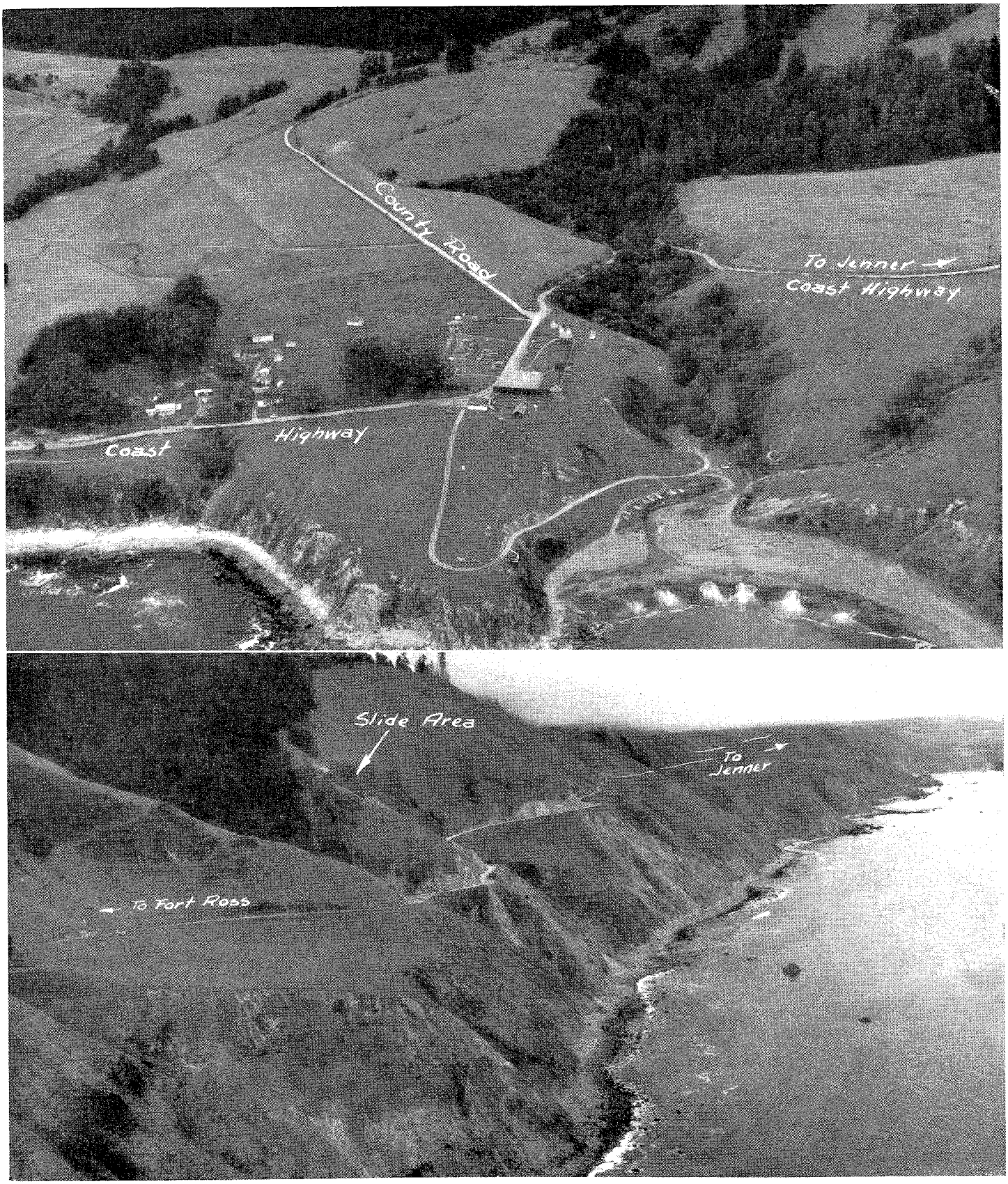
Immediately upon indication that resloping of the slide area was required tractor and bulldozer equipment started operations sloping the area and are progressing utilizing all daylight hours in order to have this highway, which is of important local use, reopened to traffic as early as possible.

After the slide operations were in progress and the area had been benched approximately 150 feet below the top, additional movement occurred southerly of the operations at the time of the recent earthquake at Watsonville. This is a natural development in view of the fact that this slide area is located on the active San Andreas earthquake fault with the result that it was necessary to remove the equipment back to the approximate starting elevation and widen the area to be sloped. This width of sloping is approximately 200 feet above the roadway where the work will be reduced in scope and continuing a width of approximately 100 feet to the roadway.

The pictures accompanying this article illustrate the broken terrain found throughout the length of the San Andreas fault where many slides have occurred in the past and can be expected to repeat in the future.

Graphic aerial photo showing extent of slide which closed Sign Route 1 between Jenner and Fort Ross





UPPER—Aerial photo showing Fort Ross on left and Coast Highway leading to Jenner on right
LOWER—This picture shows rugged terrain between Jenner and Fort Ross

HOW DO WE 'BLUEPRINT' FOR ADEQUATE ROADS?

The following address was delivered at the Fifth Highway Transportation Congress in Washington, D. C., on May 5, 1954, at the invitation of the National Highway Users Conference, by Russell S. Munro, Deputy Director of the California Department of Public Works.

IN PREPARING for our discussion this morning, I found that I was in somewhat of a quandry by our topic, "How Do We 'Blueprint' for Adequate Roads?" I felt that to an engineer it would likely mean traffic counts, origin and destination studies, grade, alignment, and all the other engineering features which go into an adequate road; an economist would probably want to talk about land-use trends, population growths and population shifts, and all the other statistical material with which he occupies his time; some users would think in terms of taxes and who was going to pay them, others would emphasize the need for greater load capacity.

None of these approaches to the subject satisfied me; so I decided to take some slight liberty with the assignment and make it read "How do we draw plans to promote a successful highway program which will result in adequate roads?"

Vast Amount of Detail

To me a blueprint is the distillation of a vast amount of detail work which has brought together in one presentation the knowledge, skill, and experience of many. Just as a discussion of the details behind a blueprint would be meaningless without the print in front of us, I think I should, at the outset of this brief discussion, lay out before you certain essential elements without which a highway program could never be gotten under way.

First is the fundamental and self-evident requirement that there be readily available from the highway engineers a thorough inventory of the highway system. This must include a determination of the structural soundness of every bridge and of every mile of road. It must also include a knowledge of the traffic capacity of the various sections of the system, with reference not only to lane capacity, but also to grade and alignment; and

RUSSELL S. MUNRO

possibly most important of all—an intelligent forecast of future traffic needs upon which to base a supportable estimate of necessary future improvement. Finally, this inventory must include an analysis of traffic accident records in order that the factor of traffic safety may receive its due share of consideration in the over-all evaluation.

Critical Deficiencies

Up to this point I am sure that I have said nothing which you have not all heard before. In application, however, we in California may be somewhat novel. We establish these three categories of deficiencies and then apply them to a determination of the "critical deficiencies" of our system. Based upon this determination, we then plan a long-range program for the correction of all of them.

The second major feature of the plan is the organization and stimulation of user groups without which it would be impossible to blueprint for adequate roads. It takes time—literally years of explanation and repetition—to focus the needs and desires of the farmers, the truckers and other organized user groups upon the objectives of a highway program. But once this is done it is like a pebble tossed into a quiet pool. Their interest stimulates the interest of chambers of commerce and service clubs, the press, public officials and various segments of business and industry—all of those various elements of our society whose thinking goes to make up what we call public opinion. Finally we have the essential ingredient of our blueprint—public awareness of the need for a highway program. Once this public awareness becomes articulate enough to be heard as a demand, politicians become statesmen, the cautious become bold and the fulfillment of the program is but a step away.

Function of Legislature

It would neither be fair nor accurate for me to leave my reference to politicians on a facetious level. The culmination—the final lines on our blueprint for adequate roads are placed there by the Legislature. They must pass revenue measures to produce the necessary money; they must pass laws to equitably allocate the money; and they must refuse to pass bills which would so dilute the program or hamstring the administration of it to such an extent that accomplishment would be impossible. This requires qualities of true statesmanship in the Members of the Legislature. I am proud to say that we in California, particularly during the past 8 to 10 years, have had the benefit of as fine a display of statesmanlike qualities in the Members of our Legislature as could be found anywhere.

Of necessity, I have stated the various fundamentals of our blueprint as separate phases of a program. In practice it doesn't work that way. Just as each line of a blueprint is inter-related to form a whole, each phase which I

have mentioned is interdependent upon the other, and they do not necessarily fall into place in the order which I have arranged them.

No Political Influences

There is one other factor which, although possibly not an essential part of our blueprint, is certainly necessary in order to transfer the program from the blueprint stage to a progressive and dynamic undertaking. That is, the highway organization must be as far removed from politics as possible. Our way in California is the merit system, where even the position of State Highway Engineer is a classification within our civil service structure. As a result, our highway organization is not subject to the many and diverse political influences which some individuals would like to bring to bear upon it. And of even more importance, I believe, is the fact that civil service tenure, particularly in the higher positions of the organization, insures continuity of program and sustains long-range planning. Only through long-range planning and the ability to follow it up with a continuing objective program can we ever have adequate roads.

Confidence of Public

Removal of the highway organization from politics has a corollary which is of invaluable importance in drawing your blueprint for adequate roads. If the Legislature and the public knows that you are not subject to political pressures, and if they know that you can plan in terms of years in the future, then it should almost naturally follow that their confidence will be expressed in a willingness to vote for and a willingness to pay the increased taxes which are necessary to meet present and future demands of traffic.

Assuming this to be a blueprint for adequate roads, has it been tested and proven? I think it has in California.

Because of limitation of time, I'm going to skip over a good deal of history. We had our Good Roads movement of the 1890's; legislative recognition of responsibility for state-wide roads came in 1895. We issued bonds for highway purposes in 1909, 1915, and 1919. I might add parenthetically that we still owe $18,575,000 principal on these old bonds, and interest this year will be $812,375. Between now and when they are all paid off, we will have paid another $4,040,500 in interest. Everything we have done in connection with highways since 1919 has been on a pay-as-you-go basis.

No Diversion of Gas Taxes

I must also skip over the evolution of our tax base from property to the highway user. It is sufficient to say that in 1923 our Legislature accepted the benefit theory of taxation for highways and applied it roughly in proportion to use. Our first gasoline tax was 2 cents per gallon. It was raised to 3 cents in 1927 where it was to remain for the next 20 years.

Of more than passing interest, however, is one of the landmarks of highway legislation in California. Almost entirely as a result of efforts by the several user groups, our Legislature in 1937 adopted a resolution proposing for vote of the people the addition of Article XXVI to our State Constitution. At the general election of November, 1938, the people adopted Article XXVI and California had an antidiversion section in our body of law. Under this provision all taxes upon motor vehicle fuel and all moneys collected from motor vehicle and other vehicle registration license fees must be used exclusively for highway purposes including costs of construction, improvement and maintenance of streets and roads, the acquisition of rights of way and the costs of collection as well as enforcement of laws governing the use and operation of vehicles.

Erroneous Impression

I would like to take this opportunity to correct a misunderstanding of our California law which has arisen as a result of an annual report by the Bureau of Public Roads, which in our opinion creates an erroneous impression. We have what is known as the motor vehicle license fee which we call the "in lieu" tax. As a result of a finding that a goodly portion of vehicles were not on the local assessment rolls for property tax purposes, it was decided in 1936 to collect the tax at the state level and return the proceeds to local jurisdictions after deducting costs of collection and administration. It is clearly a property tax and not a highway user tax. We, therefore, are a little resentful when we are periodically accused of diverting highway taxes, because we believe that we are in the forefront of those who support antidiversion of highway revenues.

How has this blueprint been put into execution? During the midst of World War II it became painfully apparent that our highway plant was rapidly becoming intolerable for our

. . . Continued on page 54

"How Do We 'Blueprint' for Adequate Roads?" was the question discussed by this distinguished panel at the opening session of the Fifth Highway Transportation Congress recently held in Washington, D. C. Shown, left to right, above, are: Sam R. Maxcy, Executive Secretary, Maricopa County Farm Bureau, Arizona; W. G. Pruett, Director, Alabama State Highway Department; William S. Canning, Engineering Director, Keystone Automobile Club, panel moderator; Russell S. Munro, Deputy Director, California Department of Public Works; and Russell H. McCain, Chairman, Maryland State Roads Commission.

Hollywood Freeway

By R. C. KENNEDY, Secretary, California Highway Commission

THURSDAY, April 15th, the last link of the Hollywood Freeway was officially opened. The last section of this world famous freeway is between Hollywood Boulevard and Mulholland Bridge in Los Angeles County.

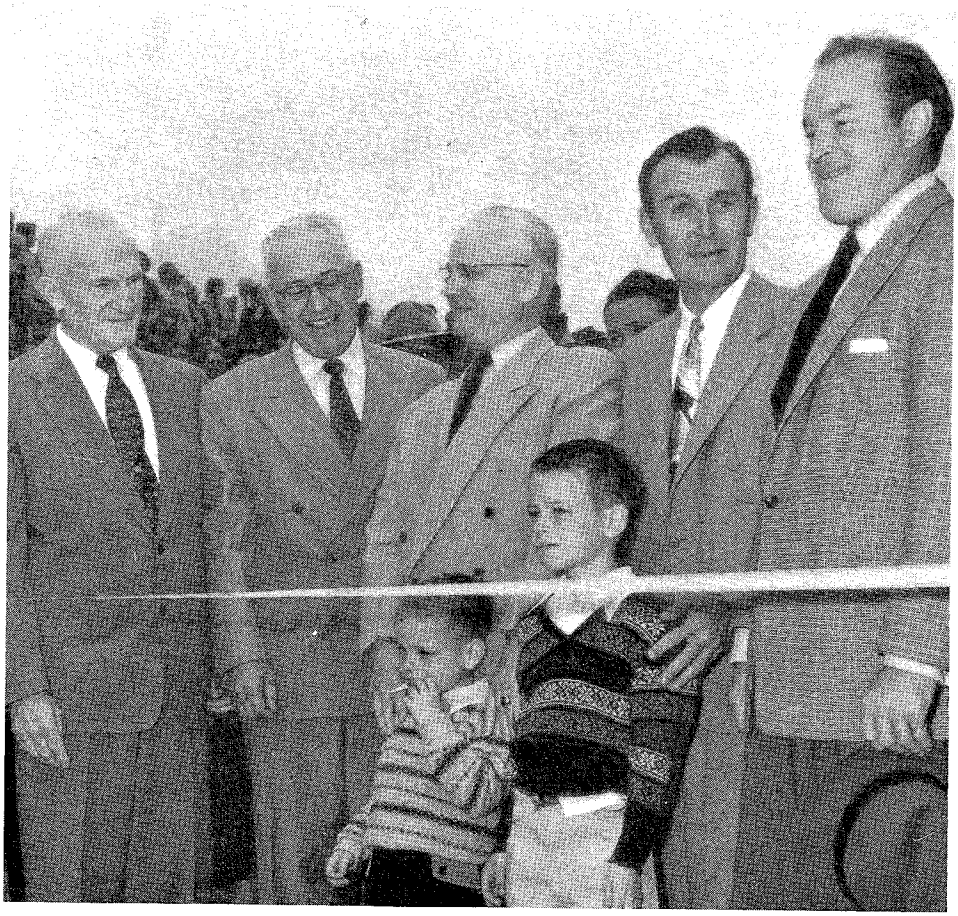
Traditional ribbon-cutting ceremonies were held on the inbound lanes half way between Mulholland Bridge and Pilgrimage Bridge at 9.30 a.m. under the sponsorship of the Hollywood Chamber of Commerce with John B. Kingsley as general chairman. Kingsley obtained the attendance of Bob Hope to act as master of ceremonies for the occasion.

After Kingsley had introduced local celebrities he called on Assistant State Highway Engineer Paul O. Harding to introduce the engineers and contractors who had worked on the job, after which Frank B. Durkee, Director of Public Works and Chairman of the Highway Commission, was called on. His remarks were short, but to the point, regarding the completion of this job and the trials and tribulations of building freeways.

And then Kingsley called on Bob Hope to act as master of ceremonies for the balance of the program. Naturally, the quips and jokes fell fast and often. One thing that Hope mentioned was that now the freeway was completed he was going to miss the detours as Seattle was so nice at that time of the year.

Then came the ribbon cutting. Helped by Durkee and Kingsley, the strip of movie film was cut by Hope and the official caravan drove over the new freeway. Thousands of motorists had lined up behind the barricades in order to be among the first over the new road. They followed the official caravan and continued downtown.

With the completion of this last link of the Hollywood Freeway there are 24 miles of continuous freeway from Pioneer Boulevard, in Norwalk, to Vineland Avenue in the San Fernando Valley that does not have a grade crossing or a traffic light to bother the motoring public.

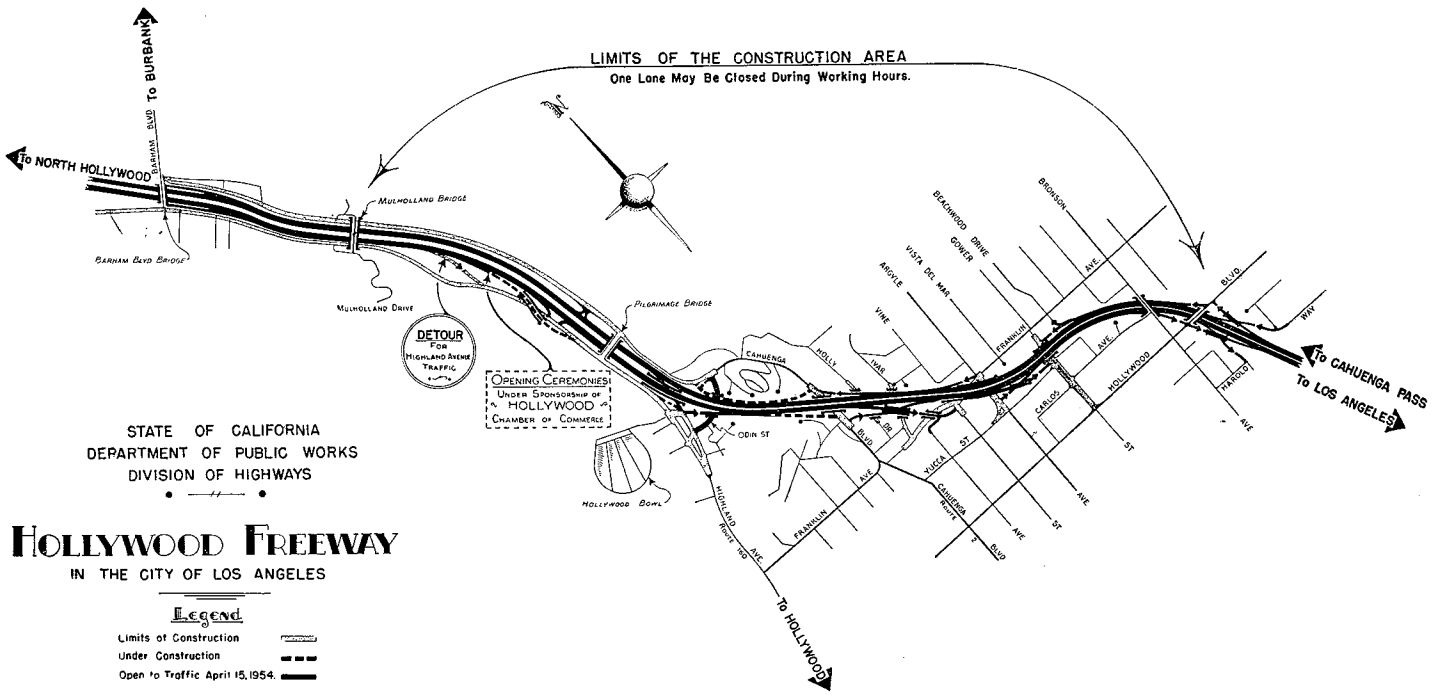


Official ribbon-cutting group for opening of last link of Hollywood Freeway. LEFT TO RIGHT—Spencer Cortelyou, retired Assistant State Highway Engineer; Paul O. Harding, Assistant State Highway Engineer; Frank B. Durkee, Director of Public Works; Wm. Marsh, Assemblyman, and Bob Hope. The two young men in the foreground are grandsons of the Director, Timothy (left) and Tobin Durkee.

The contractors have yet to do quite a bit of work on gutters, curbs, catch basins, outer highways and the connections with on- and off-ramps. Construction will still be under way on the off-ramp connection for inbound traffic to Highland Avenue between Mulholland Bridge and the Pilgrimage Bridge. Work is also continuing on the connection for northbound traffic between Highland Avenue and the west frontage road; on the off-ramp to Cahuenga Boulevard for inbound traffic; on the on-ramp and off-ramp for outbound traffic connecting with Cahuenga Boulevard in the Whitley Heights area.

The State Division of Highways has expressed its appreciation to motorists for the manner in which they have accepted the 18 stages of detours that have been necessary to complete the complicated construction of this section of freeway.

During the past eight years the Division of Highways and various civic



The last link in the Hollywood Freeway. Although not fully completed, the motoring public will now have the benefit of an uninterrupted highway through Cahuenga Pass. Dotted lines on the map show small portions yet to be constructed.

bodies have worked closely together in the development of this freeway. City and county officials and engineers, chambers of commerce and other interested groups have all done their part in promoting this gigantic job.

Many Changes in Pass

Many changes have taken place in Cahuenga Pass, and in the valleys at both ends during the 44 years since the old Ventura Boulevard was paved through the pass. The original pavement, constructed by Los Angeles County in 1910, was oil macadam. This old pavement was built to the best engineering practice of that day and followed the contour of the land in order to hold to a fair grade. But the grades were steep and the curves were short and sharp.

With the development of the San Fernando Valley and the phenomenal growth of Hollywood this original pavement, which had been the source of much pride in 1910, became inadequate to carry the rapidly increasing traffic load. The area became a part of greater Los Angeles and it was under the engineering department of the city that the pavement through Cahuenga Pass was rebuilt to improved standards about 30 years ago.

In 1940 the City of Los Angeles reconstructed the original road through the pass between Highland Avenue and Barham Boulevard. It was then known as Cahuenga Pass Freeway. Four lanes in each direction with the old Pacific Electric tracks in the center has now become part of the Hollywood Freeway. The limits of the Hollywood Freeway have been set from Vineland Avenue, in the San Fernando Valley, to Spring Street in downtown Los Angeles.

The total length of the Hollywood Freeway is 10 miles and the cost has been $55,000,000.

The first contract on this now completed freeway was awarded on May 28, 1947. This contract provided for the construction of 1.8 miles of freeway from Barham Boulevard to Vineland Avenue. This was a continuation of the work done in 1940 by the City of Los Angeles.

Following that original contract there have been 53 major construction contracts awarded by the Division of Highways of the State of California. The construction costs have been $28,000,000 and $27,000,000 have been the acquisition costs of the necessary rights of way.

ASF FELLOWSHIPS AWARDED

Automotive Safety Foundation Fellowships for graduate study with the Institute of Transportation and Traffic Engineering, University of California, during 1954-55 have been awarded to Robert W. Crommelin, of San Francisco, and Charles M. Roscoe, of Eureka. Both men are with the California Division of Highways.

This will be the third year in which these ASF Fellowships have been available. Walter R. Schroeder and Edgar F. Davis are currently completing their work under the 1953-54 grants. Schroeder was an assistant traffic engineer for the City of Dayton, Ohio. Davis was a junior engineer for the City of Berkeley.

SENSIBLE DRIVING

Use all your senses when you're driving. See what's ahead. Listen for warning signals. Feel trouble, like faulty steering or bad brakes. Smell trouble brewing, like raw gas or dangerous fumes. Then develop your sixth sense—good judgment—and give full time and attention to your driving.

Industry and Freeways

Spectacular Industrial Growth Adjacent to Eastshore Freeway

By JOHN F. KELLY, Headquarters Right of Way Agent

THE GROWTH of industry in California during postwar years has been equally as phenomenal as the population increases. The primary role being attained by industry in the economy of the State is the result of a very favorable "industrial climate." That is, the vital factors needed by industry in order to get a start and be able to grow, have been present on the California scene.

The California Division of Highways has been working to provide a network of highways which will best serve the increasing population growth concurrent with the industrial "boom." In the urban areas, the *freeway* has been found to be the answer to present and future traffic needs. Considering the fact that the greatest concentrations of California industry are found in the urban areas, it is essential to know what effect the freeway has upon such a vital part of our economy.

AREA OF STUDY

As a "testing ground" to determine the economic effect of freeways upon industry, a portion of the Eastshore Freeway in Alameda County has been used as a "guinea pig." Freeways are located in many industrial areas throughout the State and almost any one of them could have been used for making this study. However, the 7.5-mile section of the Eastshore Freeway between High Street in Oakland and Lewelling Boulevard, east of San Leandro, provided an opportunity to obtain a sufficient number of property transfers to develop a comprehensive analysis of the economic effect of the freeway upon industry. The section of the Eastshore Freeway where the study has been made shall be referred to hereafter as the "area of study." The accompanying map shows the freeway and the industrial developments in this area. The freeway zone of influence extends a distance of approximately one-half mile on either side of the Eastshore Freeway. San Leandro Boulevard and the property fronting on that street are excluded from this zone.

Freeway Planned

In 1941 the route was adopted for the Eastshore Freeway in the area of study. Although this action was of public record, and the local governing agencies projected future plans for their communities with the proposed new highway facility in mind, it did not become a reality for a number of years. Ultimate completion of the freeway in the area of study was performed by stage construction. Completion of this portion of the freeway was divided into two sections. They were both identical in type, having four lanes divided, with no conflicting traffic movements.

In the short time which intervened before World War II, only a few parcels of land were acquired for the new freeway. This land varied from unfilled marshland to rich farmland suitable for growing nursery stock. At that time there were very few improvements in this area.

Major right of way acquisition for the new freeway started in 1947 and this marked the beginning of full-scale work toward the construction of the freeway.

Other Activity

At this time other events were taking place which were to have a profound influence upon the area of study. In order to fully understand the magnitude of land improvement which was beginning to take place in this area, we must know what motivated the development.

After World War II the industrial growth in the United States progressed more rapidly than at any other time in history. The West figured prominently in this growth, largely as a result of the activity which took place in California. In growth of new industries and every type of industrial expansion, California exceeded the combined totals of all other western states and became the most active single state in the United States during postwar years.

Western Region

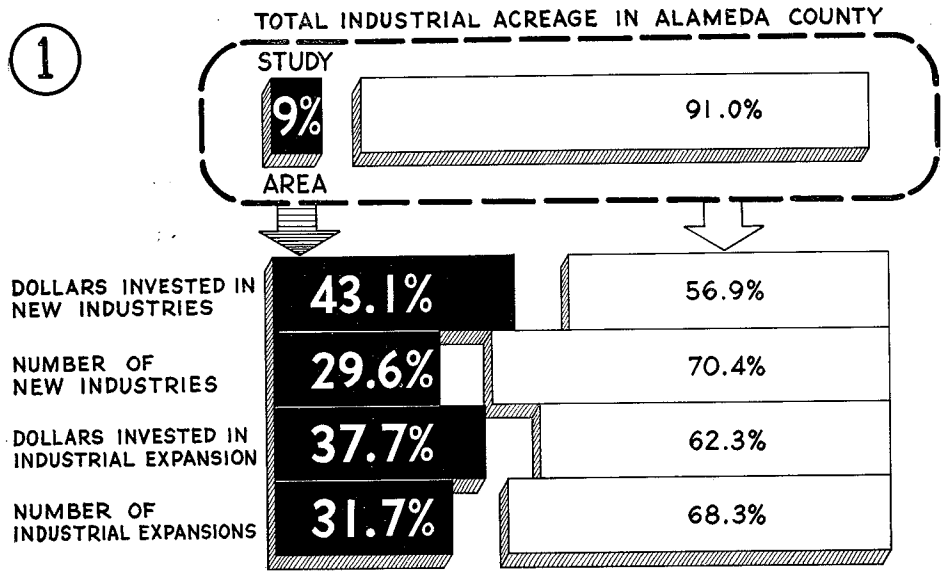
Industries located in the San Francisco Bay area have the advantage of a centralized location in the western industrial market, as well as the benefit of being in close proximity to a large, fast-growing, metropolitan market. The choice of a site among the numerous industrial areas within the Bay region is a matter of selecting the locality which offers the greatest advantages for the successful operation of an industrial plant.

From the standpoint of investments for the postwar industrial development in the nine Bay area counties, the largest expenditures were made on the east side of San Francisco Bay in Alameda and Contra Costa Counties.

Local Development

Considerable acreage suitable for industrial development was made readily accessible to the metropolitan centers of the Bay area by the construction of the Eastshore Freeway south of Oakland. There are a number of industrial areas in the Bay region which have adequate land to accommodate extensive industrial development and expansion; however, no other comparable sized industrial area has attracted so much postwar industrial development as the area of study. This area has often been referred to as a "natural" for industrial development.

A list of the nationally known industries which have located in the area of study during the postwar years looks like a page from the "Who's Who" of industry. The expenditures and number of projects for both the new development and the expansion of industry within the area of study during postwar years are shown in *Diagram I.* The percentages on the diagram are a comparison of the industrial activity in the area of study



with the remainder of the industrial acreage throughout Alameda County. These percentages represent that share of total industrial activity which has taken place in one area as compared with another, with no adjustment being made for the differences in the size of the areas.

NEW INDUSTRIAL EXPENDITURES

During the past seven years, 43.1 percent of the total expenditures for new industrial development in Alameda County has taken place within the area of study. Average annual investments during this period of time for new industry throughout the county have been in excess of $10,000,000, making it one of the leading counties in the Bay area.

The large expenditure for new industry in the county further emphasizes the important role played by the area of study as an industrial area during the post war years. The greatest significance which can be attached to this area with respect to new industrial development is the fact that it represented only 9 percent of the total industrial acreage in Alameda County. The remaining 91 percent of industrial land in the county accounted for 56.9 percent of the expenditures for new industrial development.

Within the area of study, 75 percent of the expenditures for new industry have been made in the San Leandro section and 25 percent of the new industrial growth took place in the Oakland section. The majority of land in the San Leandro section is readily adaptable for industrial development, whereas a considerable portion of the land adjoining the new freeway in the Oakland section presents greater problems with respect to fill and drainage to prepare it for industrial improvement.

In many cases poor industrial land can compete equally with good industrial land if it has the advantage of better location; however, in the area of study the freeway has made this industrial land as readily accessible despite the greater distance from the metropolitan center.

NEW INDUSTRIAL PROJECTS

The expenditures made for new industrial development within the area of study accounted for 29.6 percent of the total number of new plants started in Alameda County from 1947 through 1953. Percentagewise, the expenditures were considerably greater than the number of new plant installations. This would indicate that larger investments were made on individual plant installations within the area of study than the average investment made for new plant installations in the county.

INDUSTRIAL EXPANSION

It has been said that the strongest proof of satisfaction with an industrial area is reflected through the investment for expansions to existing facilities.

Industrial expansion consists of such changes as additional floor space for plant operation, increasing the number of production units, and providing new plant facilities.

The average annual investment for the expansion of existing plants during the past seven years in Alameda County has exceeded $20,000,000. Add to this figure the $10,000,000 which had been spent each year for new industries and it brings the total expenditure to $30,000,000 for industrial investments in the county.

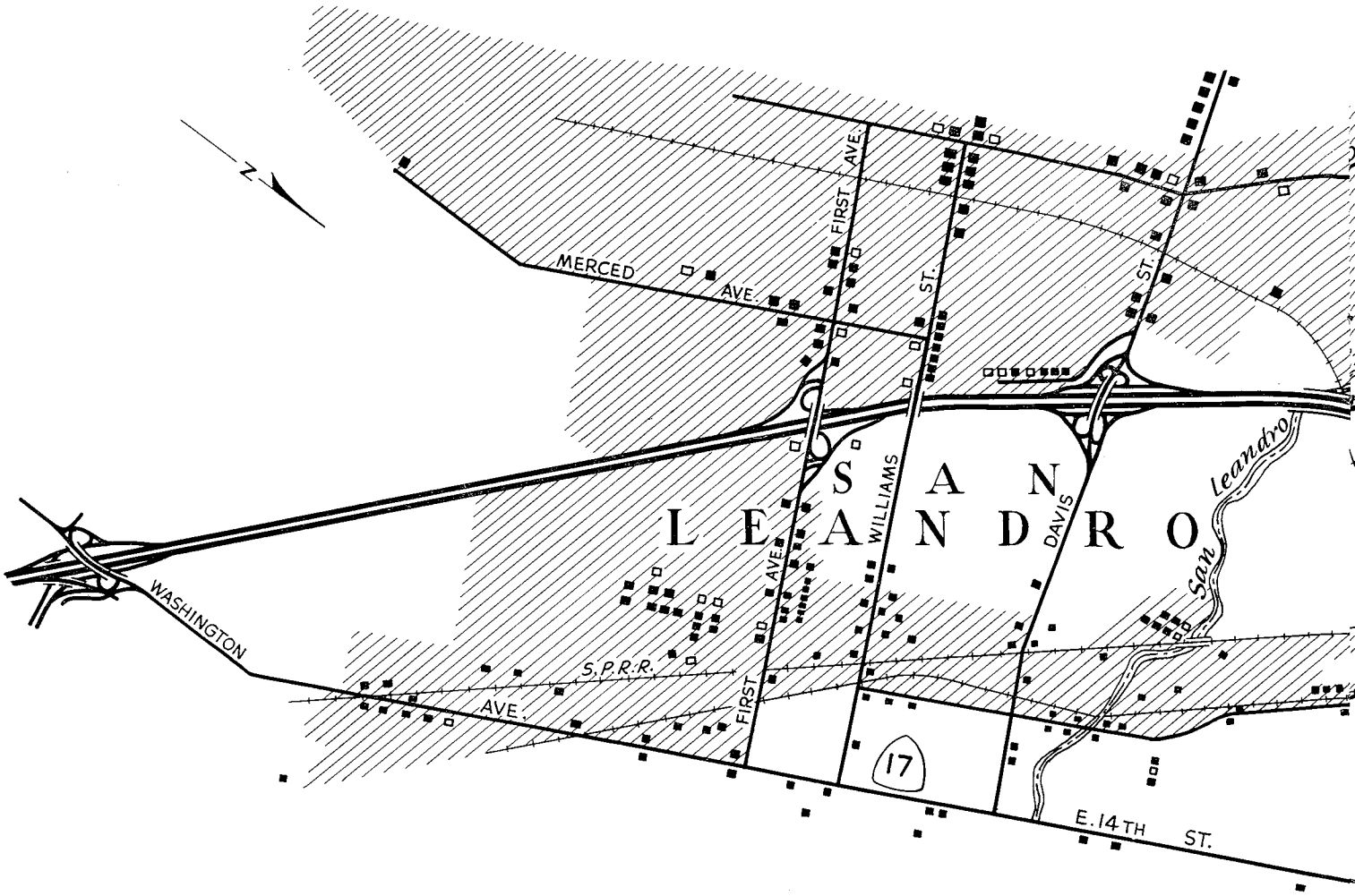
In the area of study the expenditures for plant expansions amounted to 37.7 percent of the annual county expenditures for industrial expansion. The fact that such a sizable portion of the county's record industrial expansion figure is borne by the area of study is noteworthy, not so much because of the large expenditures made in this proportionately small area, but the realization that such a relatively new industrial area would have spent so much for plant expansions. An investigation reveals that many new industries which located in the area of study had made such rapid growth within two or three years that they were already able to justify major expansions.

NUMBER OF EXPANSIONS

The number of industrial plants in the area of study accounted for 31.7 percent of the reported number of projects for the entire county during the past seven years. Like the ratio between the number of new industrial plants and expenditures for new industry, the percentage investments for industrial expansion in the area of study is considerably greater than the number of plants which were expanded. The differences between investment and number of expansions indicate that substantially greater expenditures are being made for individual plant expansions within the area of study than in other industrial areas.

INDUSTRIAL GROWTH FACTORS

This study is primarily concerned with the effect of the freeway upon the location and operation of industrial plants. In order to fully understand the relationship of a good transportation system to the plant location factors, it is essential to know what important factors constitute the basic



Freeway shown between High Street and Washington Avenue Interchange near Lewelling Boulevard. Oakland Black squares denote industrial plant locations. The white

needs for a good industrial site. Plant locations during postwar years have relied upon the same basic location factors which have influenced industrial development for many years. The importance of each factor varies according to the development of the area involved.

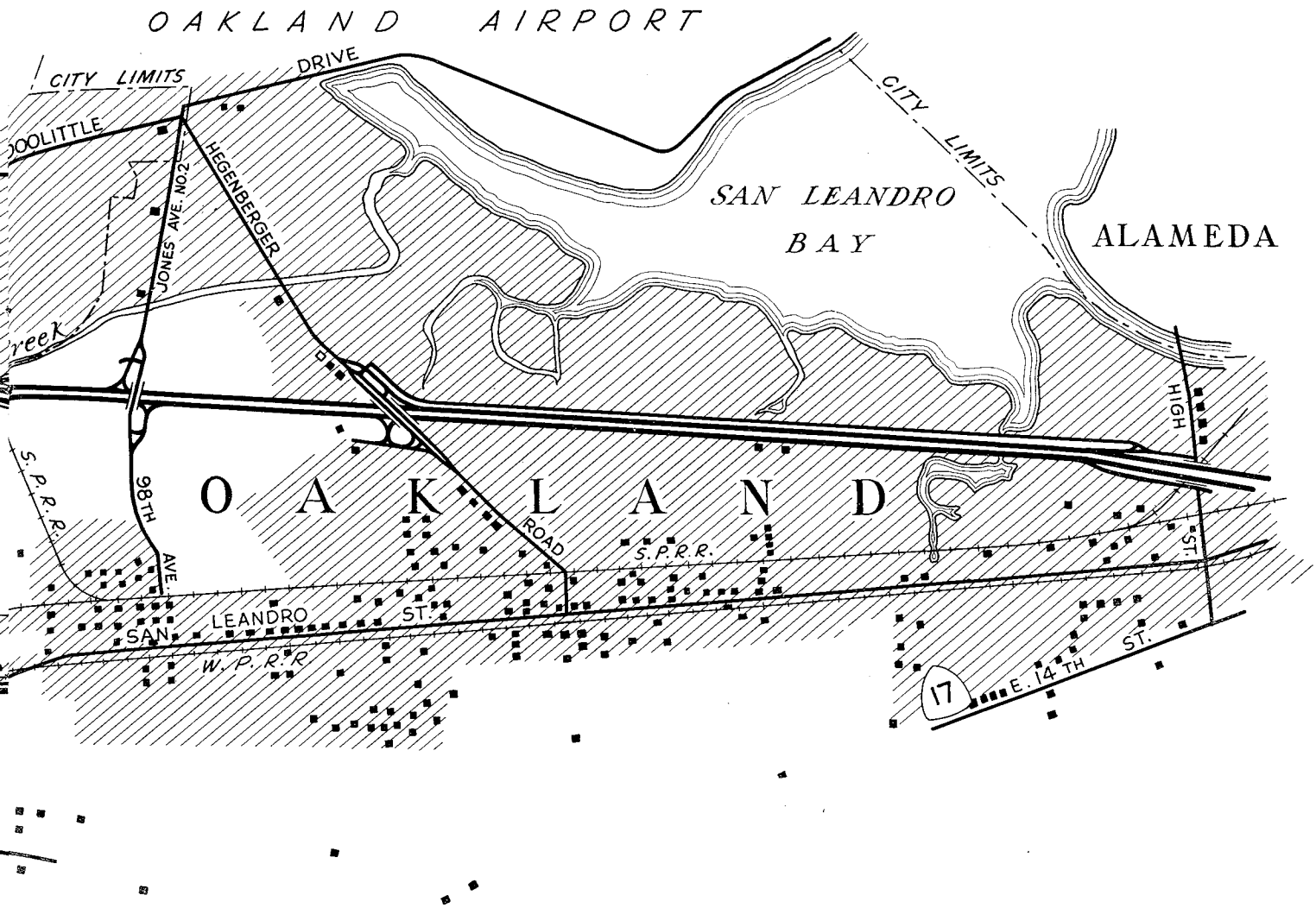
Markets

Markets are generally considered to overshadow all other factors which might be considered by industry in justifying a location in the West. The existence of a large market potential, such as exists in the Bay area, is not singularly capable of justifying the construction of new industries in that area. There must be industrial sites which provide the facilities enabling manufacturers to produce finished goods profitably. This means good transportation facilities, availability of raw materials, labor supply, necessary utilities and a fair tax base.

Transportation

Transportation costs today represent one of the largest expense items of many industries. It is understandable that transportation costs will vary among different industries, but on today's competitive market, industry is confronted with the need of avoiding excessive cost factors wherever possible. A plant location near a large market or a source of raw materials is in effect a consideration of transportation. Perhaps no other factor which must be considered in the selection of a new industrial location is more closely associated with the market.

Industries located within the market area are using truck transportation to a large extent. This type of carrier is advantageous particularly on short hauls or when speed and service are of prime consideration. In order that truck transportation can facilitate a more profitable operation of an industry, there must be a good highway system to serve the industrial area. Many comments have been made by industrialists that a poor highway system which does not facilitate good transportation requires considerably more time for the distribution of goods. The time factor, applied only to wages, becomes a sizable expense item which can be greatly reduced if a good highway facility such as the Eastshore Freeway can be used to shorten delivery time.



City limits indicated at top of map. The shaded area is land zoned or planned for industrial development. squares mark locations of proposed new industries.

The dispersion of industrial plants to reach new markets has increased their use of modern highways as a primary mode of transportation over other types of transportation facilities, such as rail and water.

Keeping in mind the profit factor enabling industry to produce locally rather than transport the finished products, it is essential that raw materials are available. An industrial plant located near the Eastshore Freeway in the area of study can be easily supplied with many of the basic materials required such as steel, cotton, lumber and food products.

Labor

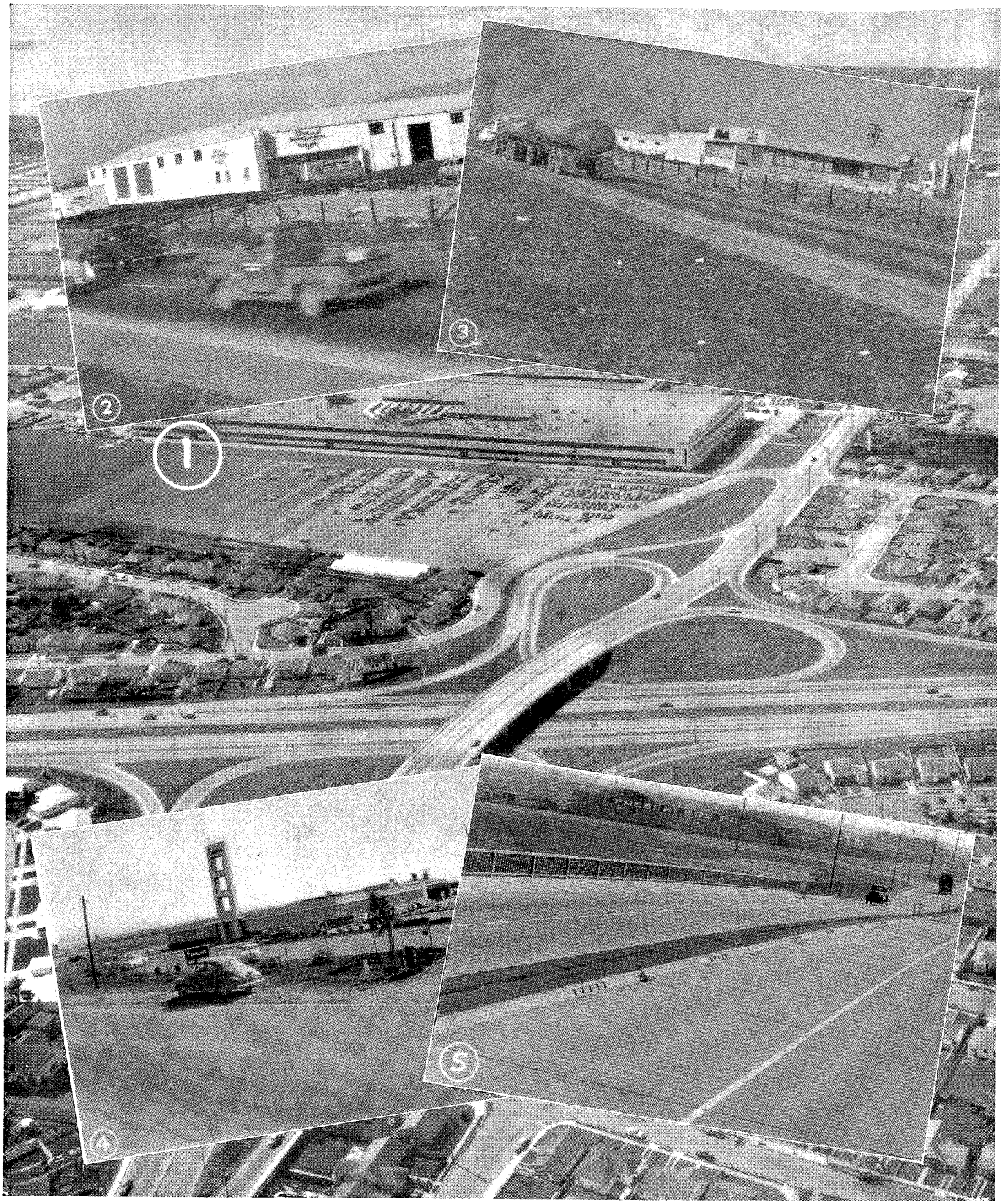
Considerations made for labor supply in locating a plant near the Eastshore Freeway have created no problem in selecting this area for a plant site. Many attractive residential tracts have been developed during recent years adjacent to the Eastshore Freeway. The availability of low cost homes has resulted in the high percentage of home ownership among workers. This opportunity for better living conditions unquestionably promotes a stable labor group for the industries. The extensive residential development adjoining the route of the Eastshore Freeway has been of such magnitude that it warrants an entirely separate study. The construction of this freeway through sparsely improved land opened an altogether new area for the development of home sites for workers in the new local area as well as commuters to other Bay area cities. The new freeway served as an inducement to attract purchasers to buy with the knowledge that they could easily reach their source of employment even though it might change to a different location within the Bay area.

In the area of study, utilities needed for industrial plant operation are available at a cost which conforms with utility rates in other industrial areas.

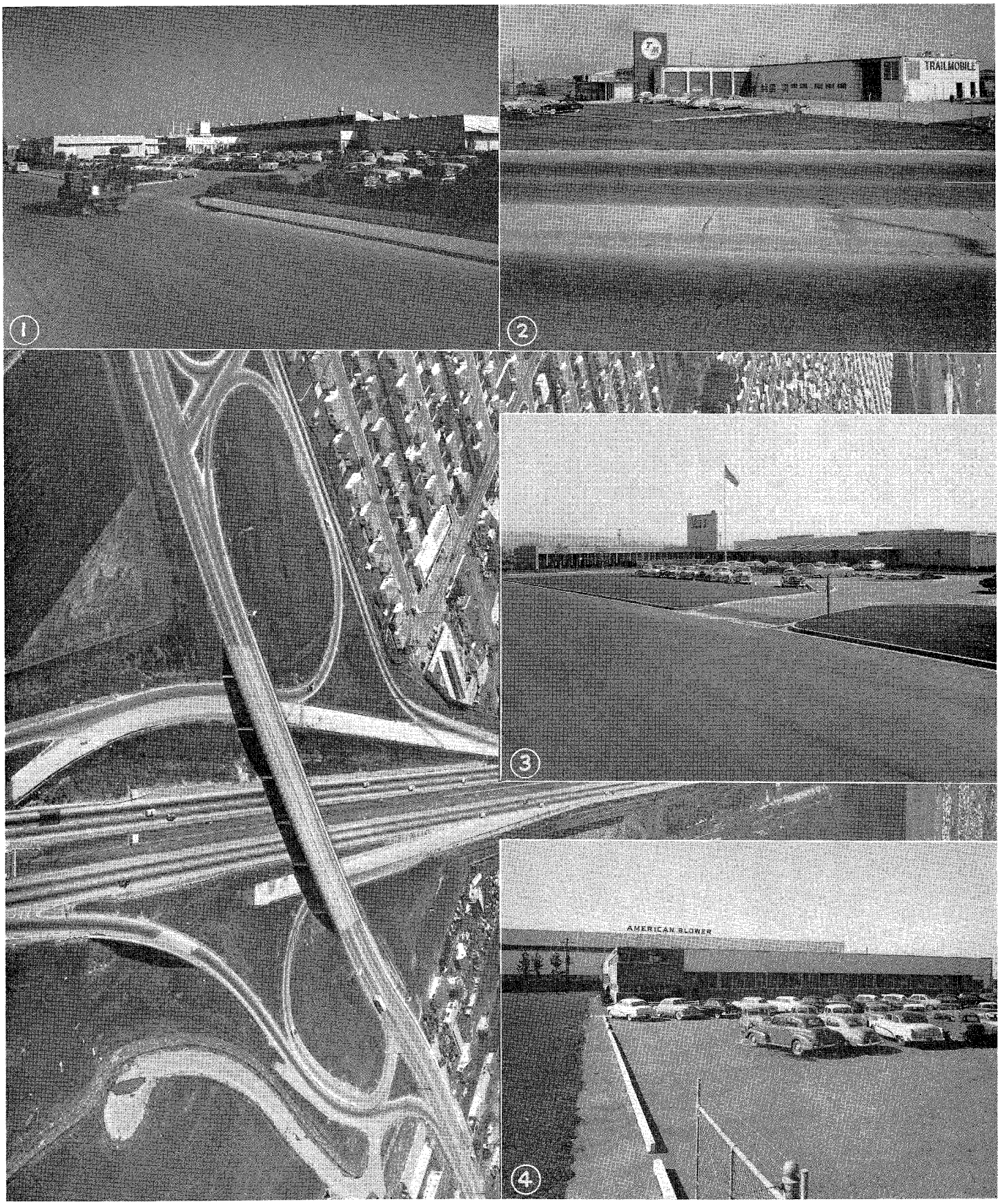
The tax base within the area of study is fair to industry although there are other industrial areas in the county which have a lower tax rate for industry.

LAND VALUES

The desirability of the area of study as an industrial location is evidenced by the tremendous expenditures which have been made for industrial development. The route of the Eastshore



Industries adjacent to Eastshore Freeway: (1) Dodge Automobile Plant, (2) Dean Van Lines, (3) A. O. Smith Company, (4) Lucky Stores Main Office, (5) Freschi Box Company



Industries near Eastshore Freeway in zone of influence: (1) Zellerbach Wax Paper Division, (2) Trailmobile, (3) Republic Supply, (4) American Blower

Freeway through this land which was devoted primarily to agricultural use, coupled with a period of economic expansion throughout the western states, has caused a complete change in the use of the land affected. The type of improvements which have been made reflect the confidence by investors that the new highway facility is providing an improved and stabilized land condition which has not only been profitable to individual land owners, but has resulted in an over-all increase in the financial stability of the community. The benefits to the community resulting from the land development in the vicinity of the freeway have been through the creation of permanent industrial plants providing steady employment and thereby promoting growth of the entire area.

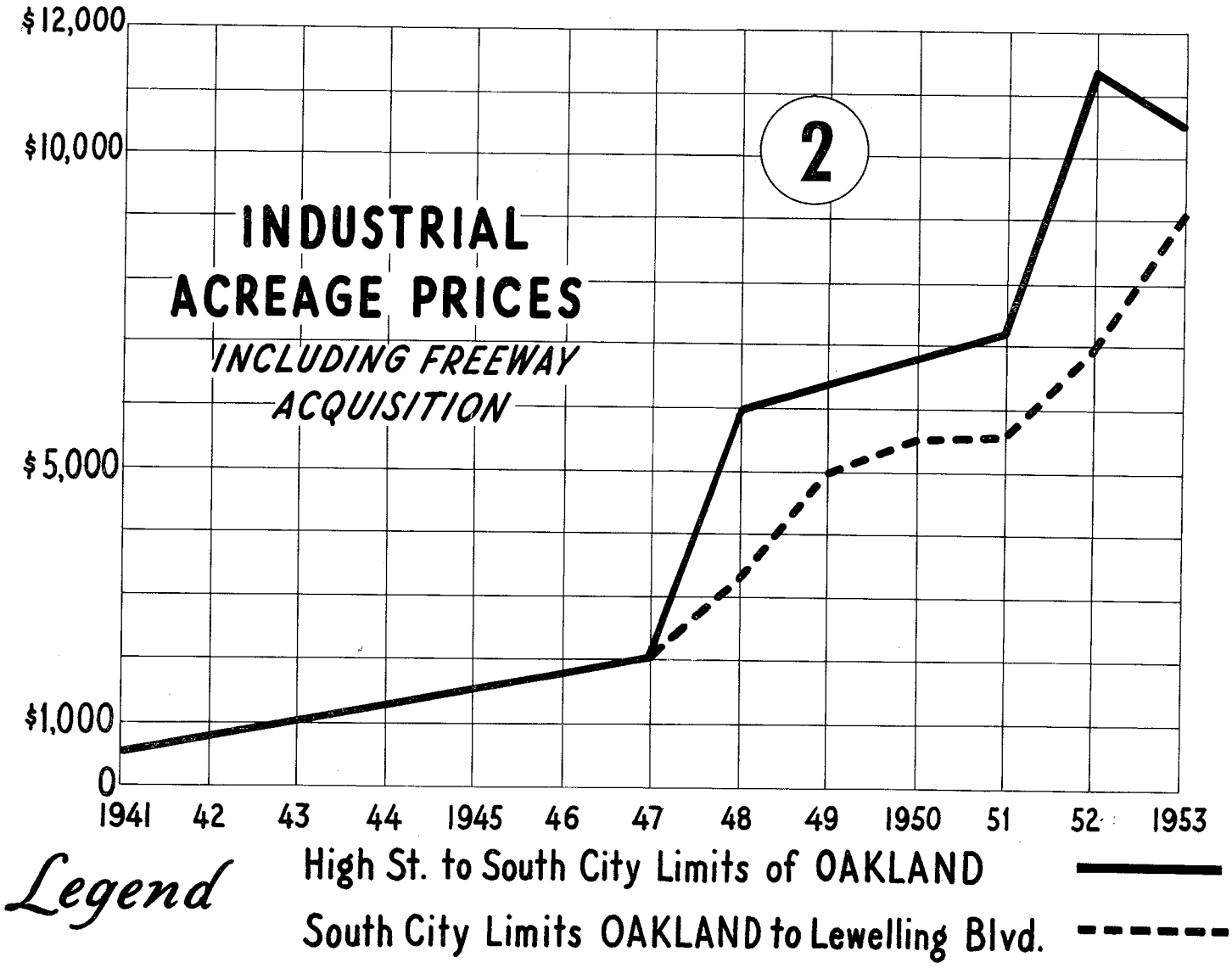
Nothing reflects confidence in an area more than the appreciating land values and substantial investments made to improve that land. The location of an industrial plant has too strong an influence upon its future growth to permit a mistake in the selection of the plant site.

It follows that one of the most positive tests for the determination of the economic effect of a freeway has been the trend in land values as established by industry's selection of sites within the freeway zone of influence. The sales of all parcels of land within this area since 1941 have been available for making this study. When right of way acquisition began on this portion of Eastshore Freeway in 1941 the property sales indicated an average of $500 per acre.

Freeway Reactivated

The war delayed construction on this freeway and it was not until 1947 that the project was again activated and put under construction. At this time, with an actual freeway in sight, acreage was selling at the rate of $2,000.

The 7.5-mile portion of the Eastshore Freeway through the area of study was scheduled for construction in two sections—first construction to begin in May, 1949, on the 3.3-mile length between High Street and the South City Limits of Oakland. The remaining 4.2-mile section, terminating at Lewelling Boulevard, was to be ready for construction in October, 1950. Dividing this portion of the freeway into two sections meant that land acquisition, construction and completion of the first section would



be 1½ to 2 years in advance of the other.

In order to more accurately compare land prices in the freeway zone of influence, the sales of industrial acreage were segregated and a separate analysis made for the two sections of the freeway.

Diagram 2 shows the price trend for land in the area of study from 1941 through 1953. The trend line on the diagram marks the average acreage price for sales within each year. The two trend lines beginning in 1947 show the average land prices in the zone of influence for the first and second sections of the freeway mentioned above.

The trend in land prices has followed a similar pattern in relationship to the progress of freeway construction in each section. The solid line indicating the average land prices in the first section increased sharply after 1947 when an all-out effort began to construct that portion of the freeway. The next sizable increase in the price of land took place after this section of the freeway was opened to traffic. A peak of $11,300 average acreage price was reached in 1952 and has leveled off at $10,500 per acre.

The land influenced by the second section of the freeway, as indicated by the dotted line on *Diagram No. 2* increased in price commensurate with the freeway progress in that area. The trend line shows that the average price for acreage has been somewhat lower than in the first section, however, the price is still increasing and there are no indications as yet of a leveling off in this section. The availability of more industrial sites readily adaptable for improvement in the second section could have been a contributing factor, along with the later development of the freeway, for the slower increase of land prices in the second section.

INDUSTRIAL SUBDIVISIONS

A recent development in the area of study has been the creation of new industrial subdivisions. They offer sites varying in size from approximately one-third acre to several acres. This arrangement is especially suited to the small industries which do not need a large building site but must have the necessary facilities for plant operation. The average current selling price for these industrial "lots" in the improved subdivisions is 50 cents per square foot without rail facilities and 60 cents per square foot with rail. Converting these prices to acreage figures they amount to $21,780 and $26,136 per acre. Although they are in a completely different price level than the acreage figures shown on *Diagram 2*, these lot prices are not unreasonable considering the fact that the purchaser does not buy more than he needs.

The highest prices asked for land in the industrial subdivisions have been for lots adjacent to the freeway. Property near the freeway commanded bonus prices because of the advertising value or advantage of being more accessible to the freeway.

CONCLUSIONS

The "test area" used in making this study to determine the economic effect of a freeway upon industry has conclusively shown that:

1. The new growth and expansion of industry within the freeway zone of influence has far exceeded the industrial activity throughout the remainder of a county whose greatest source of income is from industry.
2. The Eastshore Freeway stimulated the development of the adjacent land by attracting both industry and residents. This change in land use has been not only profitable to the property owners near the freeway but the entire community has benefited through this improvement.
3. The trend toward dispersion in plant location and greater use of truck transportation has created a demand for industrial sites outside some of the older established industrial areas. Land available for industrial development near the freeway has experienced a location preference over other unimproved areas not having a freeway nearby.

Twenty-five Years of Service Rewarded

At a District VII staff meeting on April 27th, Assistant State Highway Engineer Paul O. Harding in Los Angeles awarded 25-year service certificates and pins to five employees of the Division of Highways.

The recipients as shown in the above photograph are:

Loren F. Phillips, Senior Highway Engineer; Harold S. Throckmorton, Associate Right of Way Agent; E. F. Wagner, Deputy Chief Right of Way Agent; F. E. Sturgeon, Highway Engineering Associate, and Emil G. Hanson, Supervising Highway Engineer.

Eugene Burge, Assistant Highway Engineer, was out of the State at the time of the presentation and will receive his award later. Mr. Harding himself recently received his 25-year service award from State Highway Engineer George T. McCoy.

THIRD ANNUAL BONNEROO IS OBSERVED IN DISTRICT VII

By CHARLES L. GILDERSLEEVE, Senior Highway Engineer

THE CONSTRUCTION DEPARTMENT of District VII, Division of Highways, held its Third Annual Bonneroo (Bonne rue) Stag Party at the Rodger Young Auditorium, Los Angeles, on the evening of May 7, 1954.

Over 500 Division of Highways employees, representatives of contracting firms, construction equipment companies, materials suppliers, and engineering publications, were present.

R. M. Gillis presents trophy to Tom Polich

The purpose of these annual parties is to honor contractors and resident engineers and assistants who completed the 10 best contracts in the district during the previous calendar year; to promote a spirit of friendly rivalry and competition among both engineers and contractors to produce the best work; and to provide an opportunity for all concerned to become better acquainted.

The contracts are rated on the basis of excellence of workmanship in the various items of work, smoothness of the finished road, low engineering cost, good public relations, and other factors.

After introduction of the guest, Fahey presented Tom Tayrien a $10 cash prize for having submitted the winning name, in a contest to name the trophy awarded each year to the contractor, and to the resident engineer, on the best contract completed during the previous calendar year. The name chosen by the judges was "*Topper.*"

Cressy then announced the best contracts for 1953, numbers 10 to 2:

(10) Hollywood Freeway, Cahuenga Boulevard to Gower Avenue. Winston Bros., contractors; C. J. Woodridge, Resident Engineer.

(9) Santa Ana Freeway, Orr-and-Day Road to Pioneer Boulevard. Ukropina, Polich, & Kral, contractors; B. N. Frykland, Resident Engineer.

(8) Santa Ana Freeway, Eastman Avenue to Atlantic Avenue. Winston Bros., contractors; H. E. Belford, Resident Engineer.

(7) Ramona Freeway, Hellman Avenue to Eighth Street. Griffith Co., contractors; B. N. Frykland, Resident Engineer.

(6) Hollywood Freeway, Hollywood Boulevard to Western Avenue. Webb & White, contractors; R. A. Collins, Resident Engineer.

(5) Santa Ana Freeway, Todd Avenue to Lakewood Boulevard. Ukropina, Polich, & Kral, contractors; Haig Ayanian, Resident Engineer.

(4) Newport Avenue, Pacific Coast Highway to 20th Street. Sully-Miller Contracting Co., contractors; J. L. Needham, Resident Engineer.

(3) Santa Ana Freeway, Augusta Avenue to the Rio Hondo. Ukropina, Polich, & Kral, contractors; Haig Ayanian, Resident Engineer.

(2) Ramona Freeway, Helen Drive to Hellman Ave. J. E. Haddock, Ltd., contractors; B. N. Frykland, Resident Engineer.

D. G. Evans presented framed photographs of the trophies the 1952 winners had held for the past year to Skinner for A. Teichert & Son, and to Carr, Resident Engineer, as permanent mementos of their awards.

Climax of the ceremonies was reached when Gillis announced the number one contract for 1953, the Santa Ana Freeway from Washington Boulevard to Todd Avenue, and presented miniature golden roller trophies, appropriately called Toppers, to Tom Polich for the contractors, Ukropina, Polich, and Kral, and to Haig Ayanian, Resident Engineer.

Carl Rice, Superintendent, and Jack Yount, Project Manager for the contractor, and the following assistant resident engineers were each awarded a certificate signed by Harding, Fahey, and Cressy, in recognition of their respective contributions to the construction of the best contract: Ralph

Paul O. Harding presents trophy to Haig Ayanian

Palmer, Principal Assistant, L. J. Trombators, Joe Palmer, T. A. Roseberry, Deane Bowers, M. S. Lefton, R. P. D'Alo, Oliver Burke, A. P. Lund, A. J. A. Lynn, L. B. Munro, C. G. Bork, J. D. Stoddard, H. B. Lew, I. Varon.

The Bridge Department representative was J. M. Curran; Materials Department representative, R. J. Hagstrom; Survey Department representatives were Chiefs of Party Wayne Short and Elmer Smith. These men were also awarded certificates.

Freeway Benefits

Oceanside-Carlsbad Project Relieves Congestion and Reduces Accidents

By M. H. WEST, District Traffic Engineer

THE LAST contract for constructing the US 101 Freeway between Leucadia and Oceanside was completed in November, 1953.

Traffic counts in December, 1953, indicate that had the freeway not been in existence, the state highway which it replaced would have carried an average of 19,000 vehicles per week-day.

Data developed from the December count indicates substantial relief from congestion on the former state highway. Sixty-three percent of the average week-day traffic was removed from the former route, thus relieving acute congestion and providing freedom of movement for those vehicle drivers desiring to use the old route for business or other purposes.

Traffic Volumes Increase

Traffic volumes on the new freeway have increased nearly 20 percent since its opening to traffic.

Week-day volume counts were taken on this freeway in December, 1953, soon after its opening, and again in April, 1954. Average daily week-day traffic on the Leucadia-Carlsbad portion in April is 14,200 vehicles, an increase of 19 percent over the December volumes, and 13,700 vehicles per day on the Oceanside-Carlsbad portion. The latter counts are 17 percent higher than those made last December. These increases closely agree with those observed in traffic counts taken in December and April on US 101 in Del Mar.

In addition to the comfort and convenience offered to motorists desiring to pass through the Carlsbad-Oceanside area, this freeway also serves traffic desiring to enter or leave the principal streets in these cities by means of 10 traffic interchanges.

Major Interchanges

Four major interchanges provide for the turning of traffic from US 101 into Carlsbad. The Las Encinas interchange at the south end of Carlsbad diverts 965 northbound vehicles per day to the US 101 Business Route (former US 101 along the coast). At the Elm Avenue interchange, 220 vehicles per day turn west into Carlsbad from the south and 480 vehicles turn west into Carlsbad from the north. The Tamarack Avenue interchange presently accommodates 230 vehicles per day leaving the freeway from the south and 320 vehicles per day leaving from the north; 390 southbound vehicles leave the freeway at the Las Flores interchange and 50 per day leave from the south.

Six locations in Oceanside provide for the interchange of traffic between the freeway and principal streets in Oceanside. Interchanges at Vista Way,

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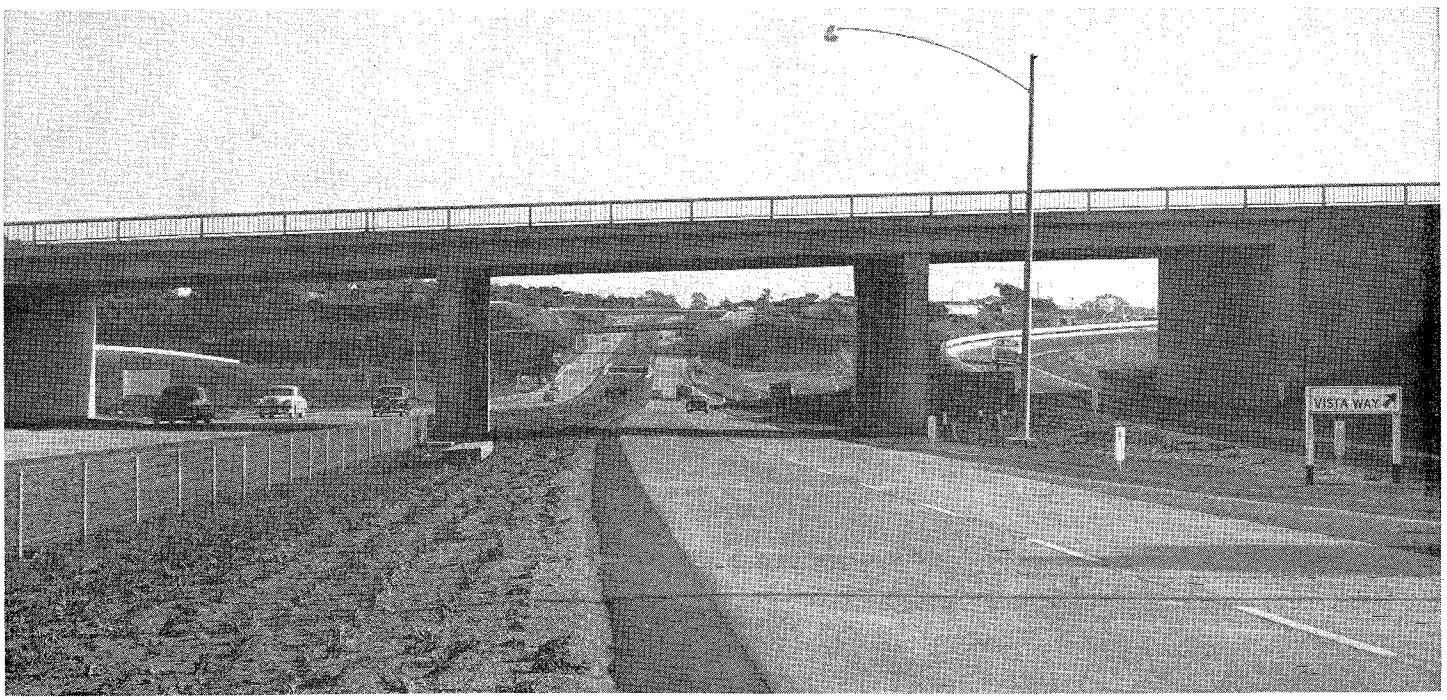
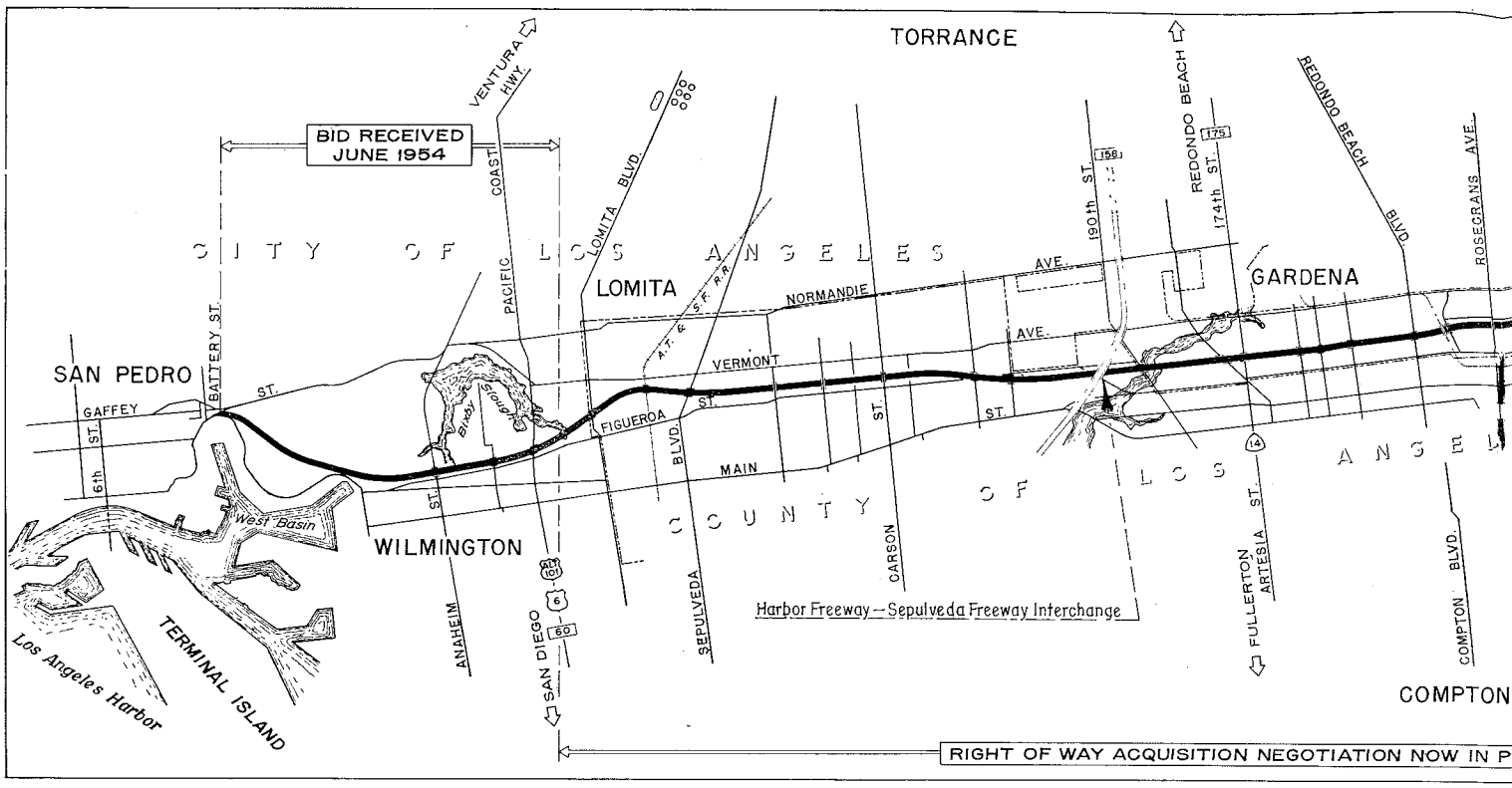
This photo gives an excellent idea of how the Oceanside-Carlsbad Freeway was constructed to provide a safe facility for heavy traffic





Harbor Freeway

Continued from page 15 . . .

attention was the wrecking of the modern reinforced concrete office building located at Sixth Street and Beaudry Avenue that housed the Ethyl Corporation. From Olympic Boulevard southerly to Santa Barbara Avenue many large business establishments, church properties and multiple unit apartments were encountered. St. Vincent's School building at the corner of Adams Boulevard and Flower Street had been demolished. Southerly of Exposition Boulevard the freeway location is through an area of older houses that some of the occupants have owned for 30 years or more. Some of the occupants are older people who expected to live in their homes the rest of their lives. It would be assumed, in approaching owners of this type, that one would meet with tears, hesitation, reluctance, and perhaps outright defiance when asked to move. This is not the case. The older folks seem to have resigned themselves to the fact that they should not stand in the way of progress and gladly cooperate. This is the rule rather than the exception. We have met with wholehearted cooperation and support many times where least expected.

Right of Way Procedure

Taking it all in all, right of way acquisition has been difficult due to

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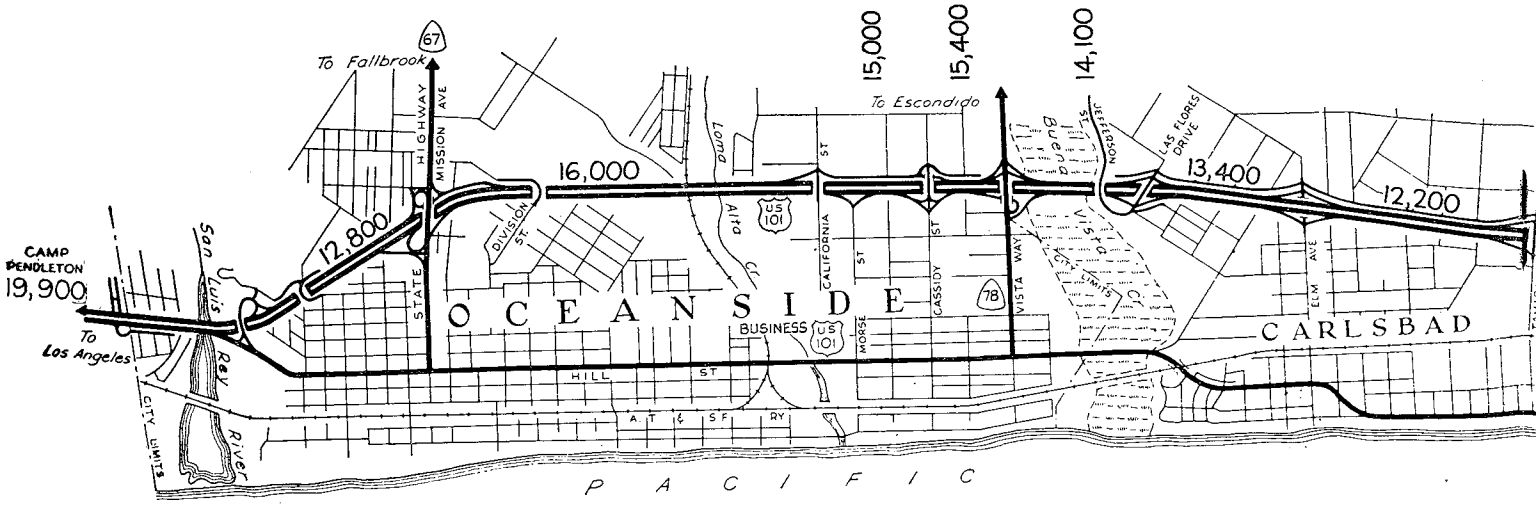

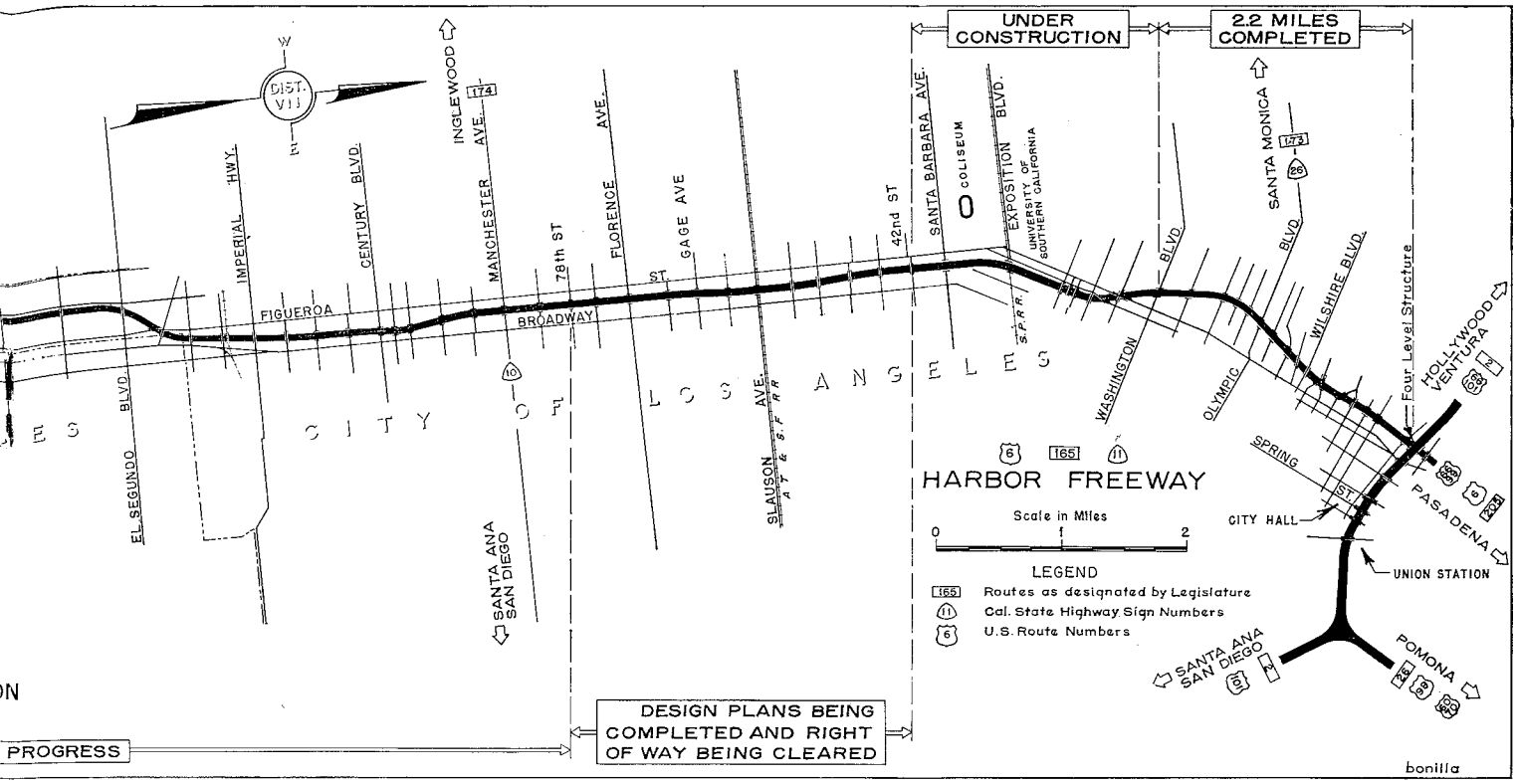

Freeway Benefits

Continued from page 31 . . .

Mission Avenue, and Hill Street are the three important traffic handlers.

Some 4,000 southbound vehicles per day were counted leaving the freeway at the Hill Street interchange bound for the Oceanside downtown area. Also, 300 additional southbound vehicles entered the downtown area via the Mission Avenue interchange. Drivers of these vehicles undoubtedly preferred traveling to the downtown area via the freeway and Mission Avenue rather than travel south on Hill Street between the San Luis Rey River Bridge and Mission Avenue.

Turning Movements

The Mission Avenue interchange also handles a substantial volume of northbound freeway traffic turning west into the Oceanside downtown area. This turning movement is 1,460 vehicles per day.

The principal turning movement at the Vista Way interchange is from the north on US 101 to the east on State Sign Route 78. This movement, formerly at the signalized intersection at Vista Way and Hill Street, is 1,030 vehicles per day. The freeway has relieved Hill Street of this traffic. Traffic movement into Vista Way west from the north is 190 vehicles per day and from the south 440 vehicles per day. These significant volumes again

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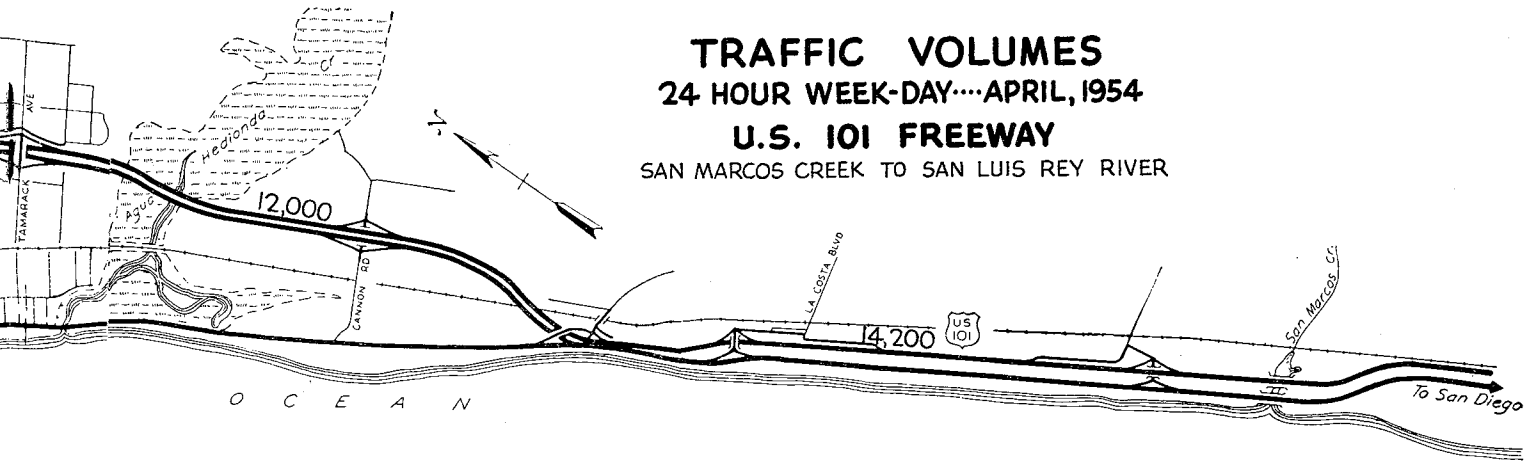


Barrier Curbs

Impact Test Program Proves Most Valuable

By J. L. BEATON, Supervising Highway Engineer, Materials and Research Department

THE DEVELOPMENT of the metropolitan freeway with its multiplicity of overcrossings and undercrossings has been one of the wonders of our age and is naturally the pride of the highway engineer. Its development has not been by chance. It has been only by the hard work of sifting known facts and applying them by engineering judgment that its development has been possible.

One of the areas in which more facts are needed is for the engineering design of barrier curbs which are used on the various bridges involved in the over- and undercrossings. With this in mind the California Highway Commission in November, 1952, voted funds to support a study involving dynamic impact testing of several different designs of roadway curbs, primarily of the barrier type.

The problem of obtaining factual information so as to compare the 11 different designs of curbing shown on the accompanying sketch was assigned to the Materials and Research Department. A program was immediately outlined and during December, 1952, a test site was selected, the curbing was constructed and a standard stock car sedan was converted into a test vehicle.

Actual Tests Started

The actual testing of the curbs was started in January of 1953 and completed in May of that year. During the balance of the year the data and moving picture film taken during the tests were analyzed and a report prepared.

Full scale impact tests are not new, having been run on various guard rail designs by the Missouri Highway Department. There also have been reports of other tests on guard rail installations and curbings. However, no record was discovered of similar systematic tests having been performed on barrier curbs.

E. W. Kessinger, Test Driver, shows safety features of car. These include safety belt, crash helmet, welded pipe bracing back seat removed and front seat fastened down by direct ties to frame.

Test Location

The Franklin Airport, situated about 25 miles south of Sacramento, was chosen as the test location. One of the airport runways supplied enough space to test 500 feet of curb with ample room to accelerate and decelerate the test car to the desired speeds. The plan of the test site is shown by an adjacent sketch. The curbs were constructed to the profile dimensions shown on the cross-section plan. Each curb type was 100 feet long. In order to provide the 11 different types a width of curbing of three feet was used with a different design on each side. One extra design was provided by placing a metal face on Curb VI. This provided data concerning the effect of changing materials. The faces of the curbs were plain, not indented.

The test car used in this series of impacts was a 1949 Ford sedan that had been surveyed by the Equipment Department for sale. The sedan was converted into a suitable test car by adding bracing very similar to that used in the hardtop racing cars. In addition a survey speedometer and a camera to record curb contact speeds were added to the vehicle.

Experienced Driver

An experienced test driver, E. W. Kessinger of Sacramento, and incidentally an employee of the Bridge Department, was hired by service agreement to drive the test car. One of the many factors which contributed to the excellent objectiveness of the data collected during this project was the uniformity of Kessinger's driving, and his strict adherence to his driving directive. The driver worked under the instructions that he was to make his approach at the speed and angle required for the particular test and that he was to control the car with a normal hand hold on the steering wheel and not force control of the vehicle until after the car had completely contacted the curb. After completion of contact with the curb he could then try to gain control of his vehicle.

The curbs were contacted at angles of approach of 5 degrees, 10 degrees, 15 degrees, 20 degrees and 30 degrees and at speeds of contact from 5 to 50 miles per hour. Not all curbs were tested at all angles and speeds since any series of tests were discontinued either when the car mounted the curb, or when it was evident that damage was so extensive that no further comparative value would result, or when it seemed probable that the car would overturn with any further increase in speed.

Speed of Approach

The driver was given his speed of approach verbally before each test and in addition it was posted on the dashboard along with other identification of the test. The speed of contact was checked by a picture taken of the speedometer and of the posted identification just before collision. The angle of approach was defined for the driver by laying a white, webbed belting 2 inches wide and 160 feet long at the appropriate angle with the curb.

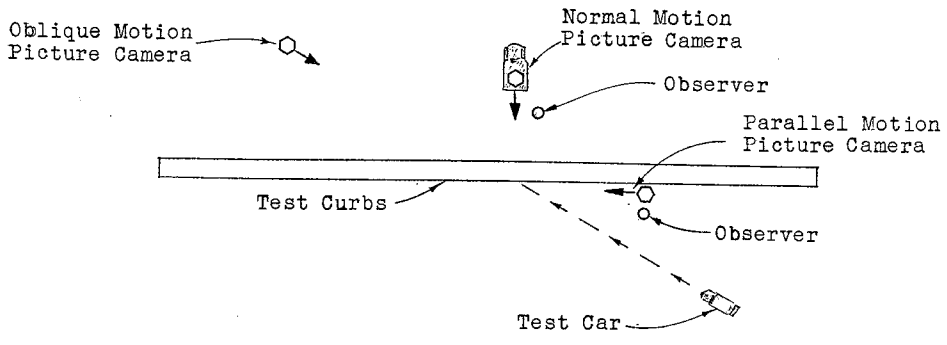
The record of each test contact was made by two technical observers and the driver. This trio listed all measurements of contact and physical damage both to the car and the curb and then recorded their observations on a voice recording machine. All physical damage to the car was appraised by the test mechanic, A. R. Hatton of the Equipment Department.

In addition each test was recorded by three motion picture cameras. The cameras were placed as shown on the site plan sketch. Two of the cameras, identified as the "parallel" and the "normal" camera, took slow motion pictures while the third camera, called the "oblique" camera, recorded at normal speed.

Typical Test Run

A typical test run went like this: The motion picture cameras were titled with the curb type, angle, speed of approach and date of the test just before the start. While this was going on, the webbed belting was set in proper position so as to guide the car into the curb, and a trigger block was set so as to trip the solenoid switch in the car which in turn tripped the speedometer camera. On completion of these preliminaries the driver made his approach, and if his speed and angle were correctly adjusted, continued until contact with the curb. If his angle was incorrect, the observer waved him off. If his speed was incorrect, the driver himself would turn off before collision.

After completion of the test the observers and mechanic inspected the curb and car and ascertained the contact made, damage to the car, type of damage caused by contact, and then immediately recorded all data, comments and information obtained by visual observation. In addition the driver recorded his exact reactions and ability to control the car both before and after contact. The mechanic immediately made a complete recheck of the car and appraised the damage caused by the particular test collision. The car was then taken to the alignment frame and an accurate check made of the wheel alignment and camber. The car was then immediately repaired either by correction, by replacement or repairing the damage. It is interesting to note that Art Hatton, automobile mechanic from Headquarters Shop, became so proficient at front end repairs that he could remove and replace an "A" frame and realign the car in less than 20 minutes. Colored slides and physical measurements were taken of the tire contact marks on the curb while the car was being repaired and readied for the next test.



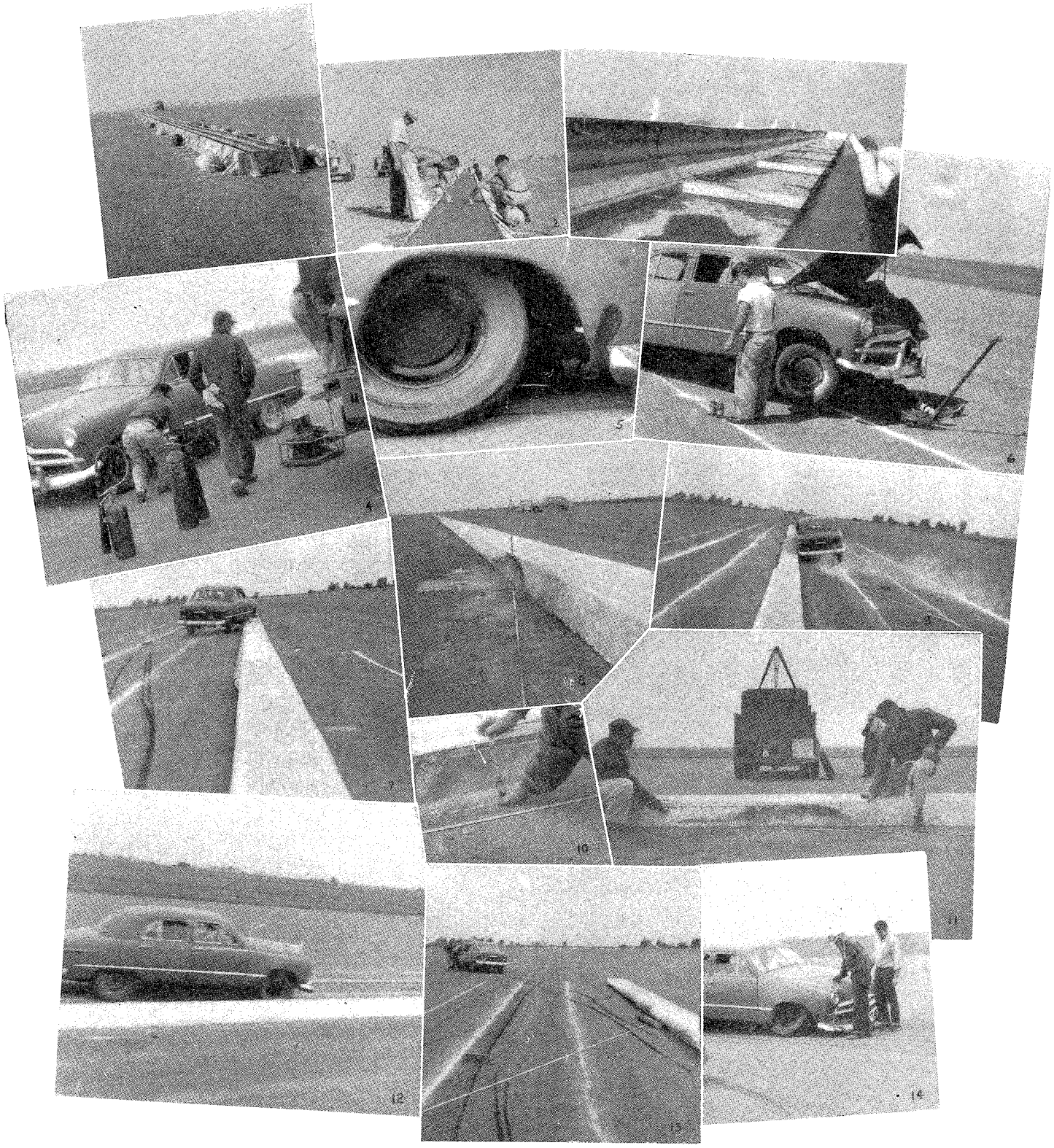
PLAN OF TEST SITE

Total of 149 Collisions

The outer sides of the front and rear contact tires were painted with cold water paint, the front tire red and the rear tire green. This paint readily rubbed off on the curb showing the tire contact and roughly the height of the climb. This is the marking that was measured. There were 149 collisions made with the curbs. This resulted in the use of 12 "A" frames, 10 wheels, 1 king pin kit, 1 set of tie rods, 1 set of coil springs, and 2 tires to replace damaged parts. There were no injuries to personnel during the entire series of tests. This was due to the fact that several safety precautions were taken before starting the test such as reinforcing the automobile and the use of a safety belt and crash helmet by the driver. In addition the danger of a fire in case of the car rolling over was considered, and men were assigned to stand by with fire extinguishers during each collision; also only sufficient gasoline to complete the run was used in the car. A man was also assigned to assist the driver in getting out of the car in case of a serious accident.

Results Interesting

The results of this test program were interesting. It should be emphasized that the purpose of this study was to cover only the investigation of the behavior of the 11 different designs of curbing shown on the accompanying plate and was not for the purpose of developing new designs. Of the 11 different designs it will be noted that all but one are generally considered to be barrier curbs. The one exception, Curb X, Division of Highways Standard Type B, sloped 4 inches in a 6-inch height, was constructed only to check the opinion that it was mountable. It was found to be easily mounted; however, it was the opinion of the observers that this slope is about as steep as will allow a vehicle to mount at average high



The above photographs show the general operations used to conduct the curb test program. Photos 1, 2 and 3—Details of concrete curb construction. Photo 4—Mechanic checking back wheel of test vehicle. Photo 5—Damaged front wheel. Photo 6—Front contact wheel being cleaned and painted. Photo 7—Collision with Curb VI-M. Photo 8—Imprint from painted tires which left data of mounting characteristics. Photo 9—Collision with Curb III. Photos 10 and 11—Measurement of tire imprints. Photos 12 and 13—Scenes of before and after test collision. Photo 14—Inspection of car damage.

speeds with no damage to the vehicle. It should be emphasized here that the data accumulated during this test primarily concerns only the effect of the curb and does not necessarily indicate what reaction a normal or average driver might have after colliding with a curb.

Of the barrier curbs the 9-inch-high test Curbs V and VI-M and the two 12-inch-high Curbs VIII and IX, proved to be the most efficient. However, each has its limitations as well as its good points. At angles of collision of 5 degrees, 10 degrees and 15 degrees Curb V proved to be over-all the most effective type. This curb not only prevented climbing at these angles of approach but also acted as an external brake on the forward motion of the car. This latter action also caused postcollision travel of the car to be close in and parallel to the curb. Mounting of this curb was relatively easy at the 20-degree and higher angles of approach.

Differences In Curbs

Curb VI-M, the metal-faced round-nosed undercut curb, was more efficient than Curb V when considered only as a barrier. It had two drawbacks. The first is that there was little or no retardation of the velocity of the colliding vehicle. The second is that there was a "tripping" action of the vehicle at the higher speed. Lack of retarding action of this curb resulted in the test car ricocheting off the curb at an angle and speed very nearly equal to the approach angle and speed of the test run.

This Curb VI-M was tested at angles up to 20 degrees and at speeds up to 45 miles per hour. The vehicle did not mount nor even partially climb the curb at any time during the test. However, any further increases in speed probably would have resulted in overturn of the car. It is interesting to note that identically shaped Curb VI with a plain concrete surfaced face served as a barrier to the vehicle only at low angles and speeds. It was mounted immediately at all angles above 5 degrees, and even at 5 degrees it was mounted at 30 miles per hour. The only difference between Curb VI and VI-M was the metal facing which was added to VI so as to create VI-M.

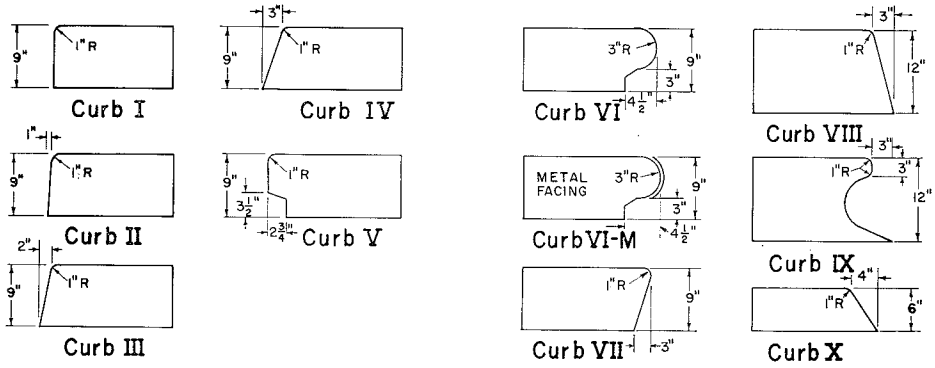
The two 12-inch-high test curbs also proved to be effective barriers. However, neither had the braking effect of Curb V nor was any more effective as a barrier than Curb VI-M, except that the "tripping" action was not so evident. There was an indication by the modified ogee shaped Curb IX that a rail located at hub center height may be very effective as a barrier. However, such a rail probably would have to be armored so as to withstand the collisions and resist the biting action of the rim.

Curb III Most Successful

The effect of changing the slope of the face of a 9-inch-high solid concrete curb was clearly indicated by Curbs I, II, III, IV and VII. The first four of these 9-inch-high sloped curbs were sloped from the base at various angles from vertical to 3 inches back from vertical. Curb VII was sloped forward 3 inches from the vertical. Of this group Curb III proved to be the most successful. This is the Division of Highways Standard Type F. Its performance very nearly matches the undercut vertical Curb V except that partial climb occurred at lower speeds and angles of approach, and there was little braking action by the curb evident during contact. Of this group the forward sloped Curb VII proved to be the least efficient as a barrier in that its leading edge served as a pivot for the rim to bite into and lift the wheel up over the curb. Also the damage to the wheel by this curb was severe.

As stated before this program was limited to the investigation of the comparative barrier efficiency of the 11 illustrated curb designs only; and while the data cannot necessarily be applied toward completely new curb designs, it can be interpreted for use in improvements of the existing designs as well as displaying their relative efficiencies. A 30-minute moving picture has been made by editing the various test pictures made during the program. This picture is available to the districts for showing on request.

The objectiveness of this test is a tribute to the excellent field supervision of the project by H. A. Peterson, Assistant Physical Testing Engineer.



ENTERING HIGHWAYS

Be especially careful when you're entering a high-speed highway from a driveway, or side road. It is better to let fast-moving vehicles pass than to insist on exercising your right of way and risk the chance of a collision. Remember it's always safe to wait—never safe to make a break!

PREVENT PARKING DELAY

When you park at the curb in a congested downtown area, always signal your intentions and back into the space in one movement. You'll save yourself the embarrassment of jamming up traffic if you learn to park properly with the minimum of time and effort.

Petaluma Bypass

Two Bridges on Project Will Be Highest of Kind in State

A MAJOR BOTTLENECK on US 101, the Redwood Highway, is now being eliminated by the construction of a five-mile bypass around Petaluma in Sonoma County.

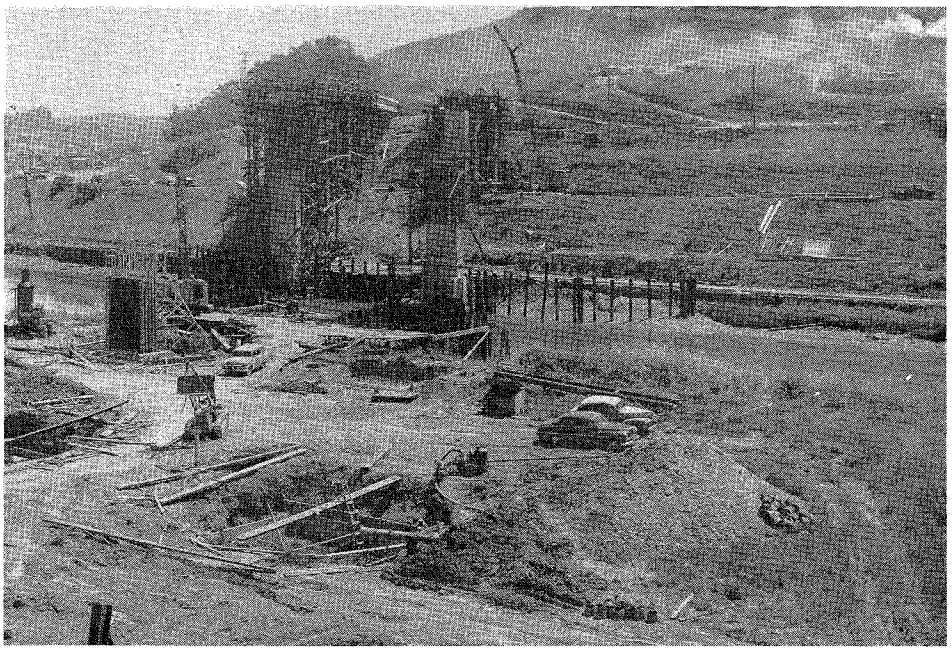
US 101 has previously been constructed as a freeway through Marin County and northerly into Sonoma County as far as Petaluma. However, the present state highway location through Petaluma follows Main Street and Third Street, both congested city thorughfares, with attendant confusion, inconvenience, delay and hazard.

The location for the freeway route is to the east of Petaluma. This necessitates a crossing of Petaluma Creek (a navigable waterway at this point), and several crossings of the Northwestern Pacific Railroad.

Project in Three Units

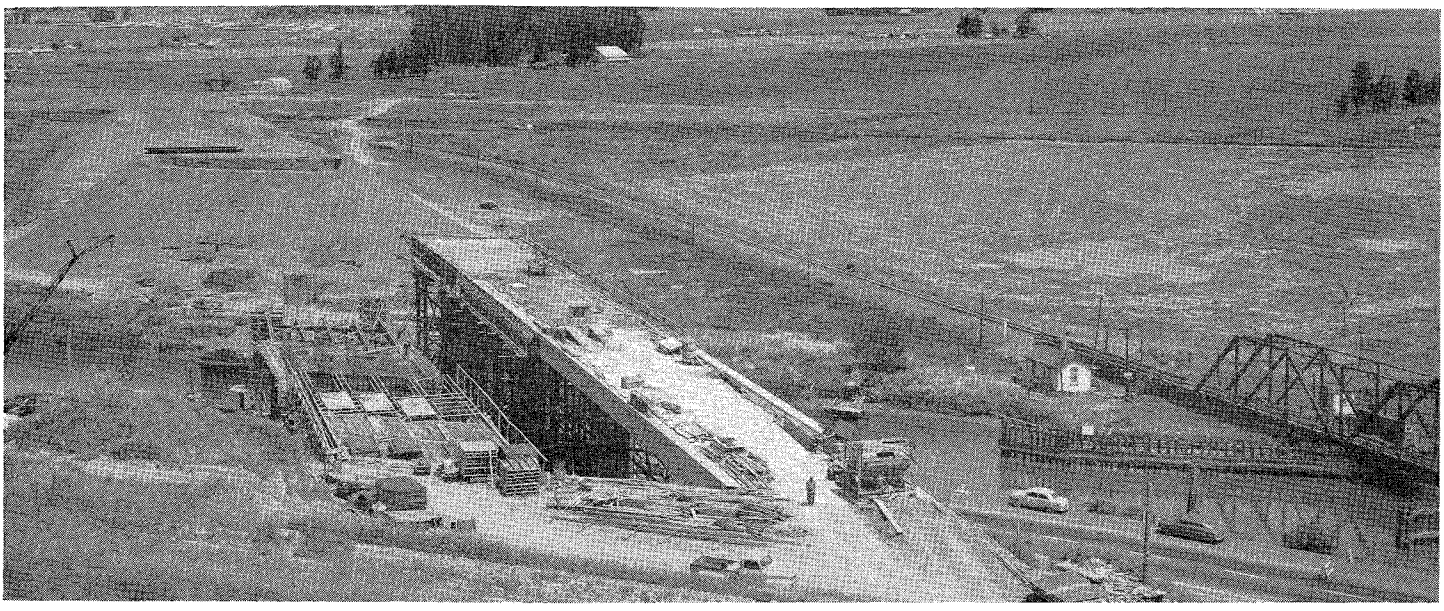
The bypass is being constructed in three units. The first unit consisted of earth fill approaches for the twin Petaluma Creek bridges at the southerly end of the project. The Petaluma Creek bridges constitute the second unit. Bids for the third unit, consisting of all remaining structures and all grading and paving, were received on May 19, 1954, with Parish Bros. and Carl N. Swenson Co., Benicia, the low bidder with a proposal of $3,425,-225.20. Total cost of the three units will be about $6,000,000, and the bypass freeway should be opened to traffic in the summer of 1956.

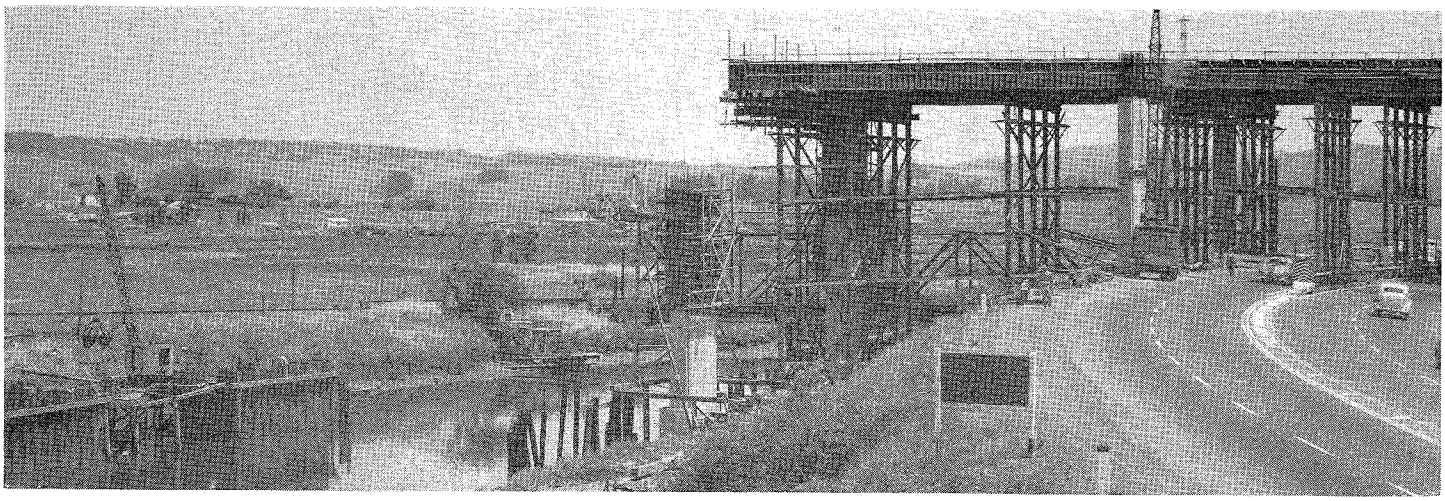
The quantities of the various grading and paving items to accomplish



ABOVE—Looking southerly at Petaluma Creek Bridge and Overhead during construction. Channel must be kept clear for navigation at all times. On far bank is Northwestern Pacific spur line into Petaluma.

BELOW—Looking northeasterly at Petaluma Creek Bridge and Overhead during construction. North approach fill and abutment excavation on far side of creek. Northwestern Pacific Railroad Bridge at lower right.





Looking easterly at Petaluma Creek Bridge and Overhead during construction. Present Redwood Highway (US 101) carried through construction with very little inconvenience to traffic.

the work included in the third unit, for which bids were received on May 19th, are of a magnitude equaled only by a few of the largest highway contracts.

Grading of this 8½ mile section involves excavation of nearly 1,500,000 cubic yards of material from within the proposed roadway section and constructing an equal volume of embankments.

Construction of base and pavement will involve the use of large quantities of materials including approximately 110,000 tons of imported base material, 32,000 cubic yards of portland cement concrete and 27,000 tons of asphalt concrete. In addition many other items will be required to provide the drainage structures, safety devices and other features to provide safe travel for the heavy use on this important artery of the State Highway System.

The freeway is being constructed initially as four lanes, but it can be widened when warranted by growing traffic demands to a six-lane divided facility.

The new bypass will be of great benefit not only to motorists traveling through the Redwood Empire, who will save several minutes of travel time, but also to residents of Petaluma as well. The Petaluma business district will at long last be relieved of the paralyzing economic effects and the congestion caused by through traffic in the downtown area. Convenient interchanges will be built at each end of the project and at two intermediate points for motorists desiring to stop in Petaluma.

Cost $7,000,000 to Santa Rosa

The construction now under way will extend from south of Petaluma to Denman Flat (near Penngrove), a distance of about six miles. Some grading will also be done for an additional 2½ miles north of Denman Flat, but completion of the project north of Denman Flat will depend upon financing in later years. Future work programmed to follow progressively will complete the freeway to Santa Rosa, a distance of 12 additional miles, at a cost of about $7,000,000. This construction will connect the freeway with the previously completed Santa Rosa Freeway, and thereby provide an uninterrupted multilane divided freeway for a distance of about 52 miles between the Golden Gate Bridge and north of Santa Rosa.

In connection with the realignment between south of Petaluma and Denman Flat, some 17 bridges are required at 11 different points. Some of these structures are parallel bridges, where others are single structures carrying local roads over the freeway. Most of the structures are concrete box girders, although some of the shorter bridges are concrete slab or concrete girder structures. The structures included in order from south to north are the following:

1. South Petaluma Undercrossing (two parallel bridges).
2. Petaluma Creek Bridge and Overhead (two parallel bridges over existing US 101, Northwestern Pacific Railroad, and Petaluma Creek).
3. Lakeville Highway Separation and Overhead (two parallel bridges crossing over state highway and Northwestern Pacific Railroad).
4. Washington Street Overcrossing.
5. Washington Street Creek (two parallel bridges).
6. Washington Street Creek Off-ramp.
7. Lynch Creek (two parallel bridges).
8. North Petaluma Overhead (parallel bridges over Northwestern Pacific Railroad).
9. Corona Road Overcrossing (county road crossing of Petaluma and Santa Rosa Railroad and the freeway).
10. Denman Overcrossing.
11. Willow Brook (two parallel bridges).

Petaluma Creek Bridges

Of particular structural interest are the two parallel and identical Petaluma Creek bridges now being built at a cost of about $850,000 at the southern end of the project. With the exception of the span over the navigation channel, these bridges are reinforced concrete box girders, that is, hollow or cellular. The bridges will be perhaps the highest structures of this type in California, the extreme height being due to the necessity of providing clearance over the Petaluma Creek navigation channel.

Petaluma Creek is classified as one of the navigable waterways of the United States and, therefore, is under the jurisdiction of the U. S. Army Corps of Engineers. At the bridge site the navigation channel is 100 feet wide, with a minimum vertical clearance of 70 feet.

Design of Span

Since falsework construction over the navigation channel was infeasible, this span will be bridged with eight 110-foot-long precast I-shaped reinforced concrete girders which will be

. . . Continued on page 58

Highway Projects in District X

Priests Grade

By C. J. TEMBY
Assistant District Engineer

In AUGUST, 1953, 3.8 miles of construction between Moccasin Creek Road and Priests in Tuolumne County was completed. This is the upper portion of Priests Grade on the Big Oak Flat Highway. Another 2.8 miles, the lower portion, is included in the 1954-55 Fiscal Year construction program and will be under construction this year.

The Big Oak Flat Highway, State Highway Route 40, State Sign Route 120, extends from a junction with Sonora Pass Highway at Yosemite Junction, about nine miles south of Sonora, to the Yosemite National Park. It traverses an area in which much of the early California history was made. Many rich gold mines were located and operated in this area.

Along the Big Oak Flat Road are located such historical places as Chinese Camp, Jacksonville, Priests, Big Oak Flat and Groveland. The First and Second Garrotte, where many of the early day hangings of horse thieves, cattle rustlers and other criminals took place, east of Groveland. Hangman's Tree still stands at the First Garrotte, just east of Groveland.

Priests Grade, showing curve correction typical of this project

Priests at top of Priests Grade. LOWER LEFT—County road Priests to Moccasin Creek powerhouse. LOWER RIGHT—County road to Coulterville. State highway, left down grade to Yosemite Junction via Jacksonville and Chinese Camp, right to Yosemite National Park via Big Oak Flat and Groveland.

Considerable logging and lumbering has been carried on in this area in recent years. There are several lumber mills presently being operated.

The O'Shaughnessy Dam and Hetch Hetchy Reservoir, City of San Francisco's water supply, is located about 12 miles north of the Big Oak Flat Road at the westerly park boundary.

Cherry Valley Dam, presently under construction, is situated northerly from the Big Oak Flat Road.

Moccasin Creek Power House, seen from Priests Grade, is located below the highway. In this same vicinity is the location of a large fish hatchery.

In addition to providing an entrance to Yosemite National Park, the Big Oak Flat Road serves the recreational areas of southeastern Tuolumne County and northern Mariposa County.

The completed construction on Priests Grade has resulted in providing a 28-foot all-paved roadbed with widening of the curves, making a safe two-lane road. Excess excavation material from grading operations was disposed of on the inside of the several short radii curves by end dump methods. These areas, beyond the traveled way, provided the visual appearance of a much wider facility, resulting in added comfort to the driver traveling this portion of the road.

The old narrow roadbed, particularly on the short radii curves, was unattractive and after one trip, tourists avoided the Big Oak Flat Road. The construction, completed under contract with Paul E. McCollum & C. L. Cypher, at a cost of approximately $350,000, involved 156,300 cubic yards of roadway excavation, 15,300 tons of untreated rock base and 8,000 tons of plant-mixed surfacing. The base and surfacing material was produced locally by the contractor from a source at Stevens Bar, the junction of Moccasin Creek and the Tuol-

Upper portion of Priests Grade. Priests at top of picture. County road, Priests to Moccasin Creek power house on right. Widened state highway up grade on left.

umne River. Mr. A. K. Nulty was the resident engineer for the State.

The lower 2.8 miles proposes a 28-foot all-paved roadbed and some realignment will be made. A new bridge over Moccasin Creek is to be constructed. The proposed construction, consisting of grading, base, surfacing and a new bridge, will be under way this summer. The major items of work will consist of 183,100 cubic yards of roadway excavation, 17,200 tons of untreated rock base and 7,500 tons of plant-mixed surfacing. Unprocessed material for concrete, base and surfacing are available locally within economical hauling distance from the proposed work.

Briceburg Grade

By R. V. POTTER
District Design Engineer

A BOON to tourists to famous Yosemite National Park is news of the widening and improvement of steep, winding Briceburg Grade. Sometimes looked-on as a deterrent to reaching the wonders of Yosemite, this grade, averaging 7 percent, extends from Briceburg, in the Merced River Canyon in Mariposa County, westerly to King Solomon Mine, a distance of 2.5 miles. The grade is on a portion of State Highway Route X-Mpa-18-E, better known to campers, vacationers and snow sports enthusiasts as the Yosemite All-year Highway.

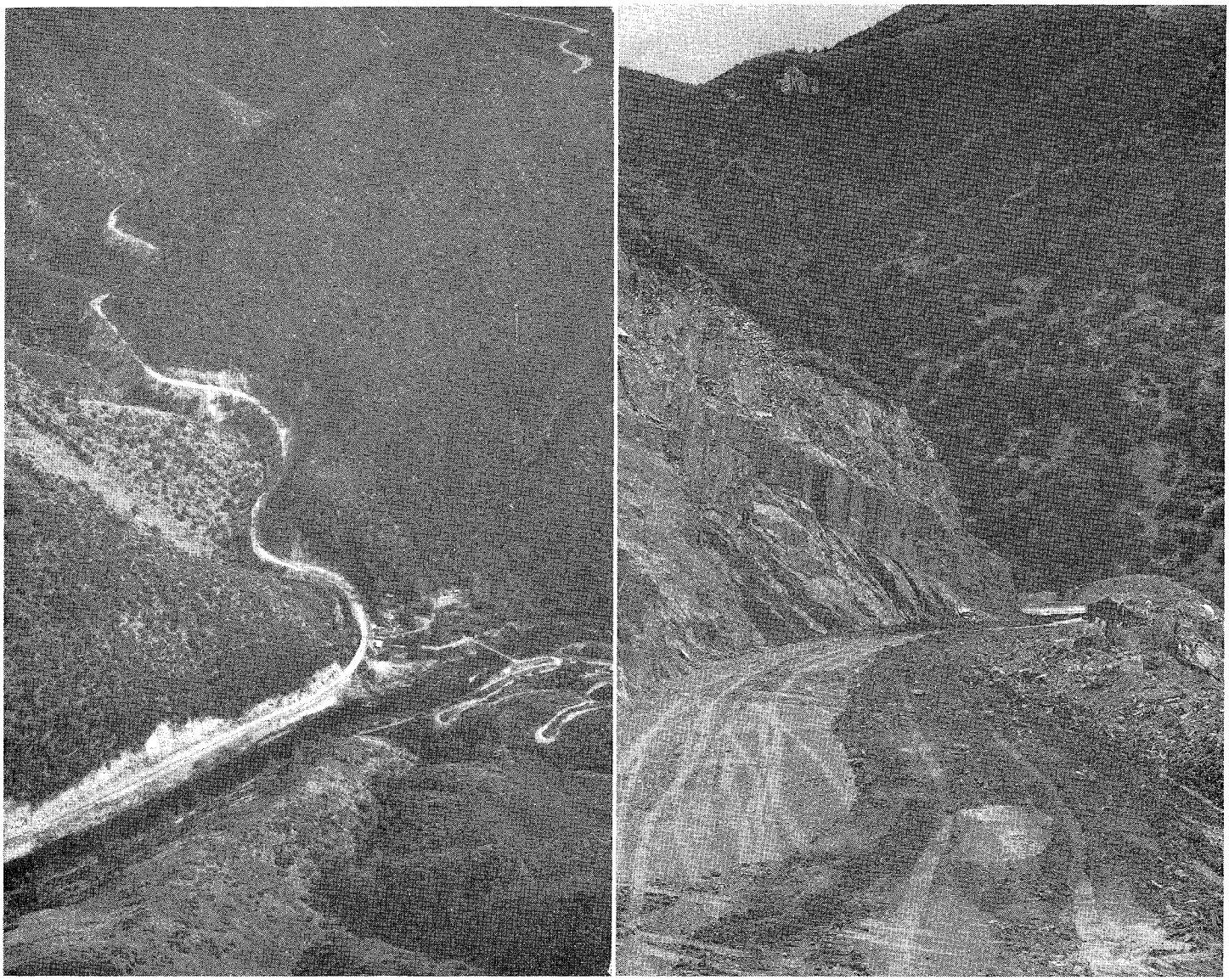
Highway locators view Briceburg Grade as a control considering that if the grade were abandoned in favor of other routing, many additional miles of heavy mountain grading work would be required to reach the Merced River Canyon. It, therefore, was decided in the interest of the most beneficial use of highway funds, to improve the investment already made in the existing route. Although the road gradient could not be appreciably relieved, widening roadbed, reducing curvature, flattening precipitous rock slopes and correcting inadequate drainage could be accomplished for the direct benefit of the tourist in safer and more comfortable driving on this recreational route.

Highway designers completed their study for improvement of this grade September of 1953. The primary benefit that could be attained for the motorist under the rigid controls of steep grade and constant curvature was pavement widening. Accordingly a 32-foot wide all-paved section was selected affording a noticable improvement as compared with the existing 20-foot wide road mix gravel pavement.

The existing alignment contained 3,080 degrees of curvature. It was found possible to reduce this curvature over 45 percent without introducing grade steeper than 7 percent.

Fearsome features of the old alignment were towering rock slopes which, to a timid driver, seemed at some locations actually to incline toward the roadway as illustrated in the accompanying photograph. Study showed that these slopes could be flattened to avoid this appearance with a consequent reduction in slides and falling rocks for which Briceburg Grade had to be daily patrolled by the department's maintenance crews.

Being on sidehill section throughout, drainage from the cut side was designed in conventional cross drains with one notable exception. At Station 215 on the grade, Rancheria Creek, a docile trickle down the cut slope during summer and winter months, attains cataract proportions in the spring, actually hurling water and debris on the roadbed shoulder and



UPPER LEFT—Aerial view, showing Briceburg on the Merced River and easterly mile of circuitous Briceburg Grade. Note portion of grade behind mountain at top of photo. UPPER RIGHT—Typical cut slope on Briceburg Grade showing up-ended rock strata inclining toward roadway. LOWER—Power shovel at work on Briceburg Grade.

pavement at times of flood crest. Means taken to correct this condition consisted in moving the roadbed out into the canyon on a local line change, installing an 84-inch diameter extra-reinforced concrete pipe cross drain and providing a grouted riprap-lined entrance channel 300 feet long and 5 feet deep with debris rack at entrance. The bid price on installing the concrete pipe cross-drain at this location was $100 per lineal foot.

This improvement project was advertised in November of 1953. The

low bid was submitted by Harms Brothers of Sacramento in the amount of $570,614, the price bid for roadway excavation being $2.50 a cubic yard which figure is indicative of the heavy rock grading work involved.

The road is presently under construction. Paving operations are now under way and the project is scheduled for completion late in the summer of 1954.

Mel Rowan is resident engineer for the State.

Yosemite Highway

By C. E. MOFFATT
Assistant District Design Engineer

CONSTRUCTION is under way for an additional three-mile improvement of a portion of Route 18 (State Sign Route 140) in Mariposa County between 9.3 miles west and 6.3 miles west of the town of Mariposa.

Route 18 runs from Merced, through Mariposa, and traverses the Merced River Canyon to Yosemite National Park and is known locally as the Yosemite All-year Highway. It is the major access route to Mariposa County and is one of the major routes into Yosemite National Park

The road serves not only tourists and vacationists, but timbermen, cattle raisers and miners. Half a million tourists visit the valley and other resorts and camping grounds yearly in all seasons.

This section was incorporated in the State Highway System under the Legislative Act of 1909 and the present route was adopted by the California Highway Commission on May 22, 1930.

Mariposa, at 6½ miles east of the project, is the County Seat of Mariposa County and has a population of around 1,000. It is an historic gold rush town with many old buildings, including the oldest active courthouse in the State.

The current project traverses a portion of the lower slopes of the Sierra Nevada Mountains, at an elevation of 1,885 feet above sea level at the westerly end rising to elevation 2,320 at 1 1/3 miles, thence descending to elevation 2,120 at the easterly end. The terrain is rather rugged and timbered with brush, conifers and live oaks.

The present alignment contains a number of sharp curves and in several locations the intervening tangent distance is substandard. Sight distance is restricted by steep cut banks on the inside of short radii horizontal curves and by numerous vertical curves.

The existing roadbed varies in width from 24 feet to 26 feet with surfacing of oiled gravel 20 feet wide by 8 inches thick. The shoulders are untreated.

The improvement consists of new alignment for one-half mile at the westerly end and widening and resurfacing along the existing aligment for the remainder of the project.

On the new alignment and at several locations on the portion to be resurfaced, the cuts will be made on 1:1 slope. The geologic formation is predominantly clays, shale and slate, with granitic intrusions at a number of locations. Existing cut slopes generally stand on 1:1.

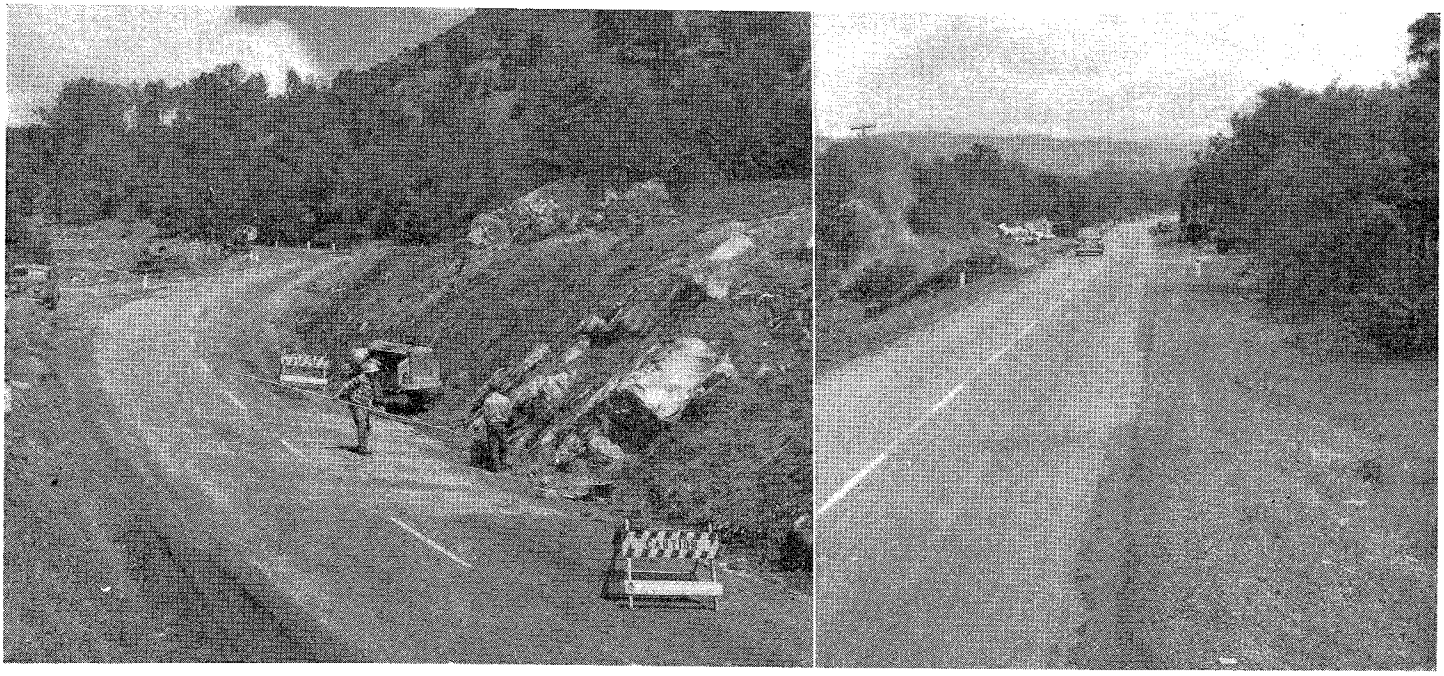
The typical section will consist of a 28-foot all-paved section with central 24 feet being 2½ inches thick and the shoulders two feet wide, the surfacing tapering to 1½ inches at the outer edges. The traffic lanes, shoulders, dikes and gutters will be paved with plant-mixed surfacing. The base will be six inches of untreated rock over five inches of imported subbase material for the new alignment and for the widening on existing alignment.

Some of the principal contract items are as follows:

29,700 cubic yards roadway excavation.

1,220 cubic yards ditch and channel excavation.

LEFT—Drilling for blasting on portions to be realigned. RIGHT—Portion of existing road to be widened and resurfaced. No change in alignment to be made.



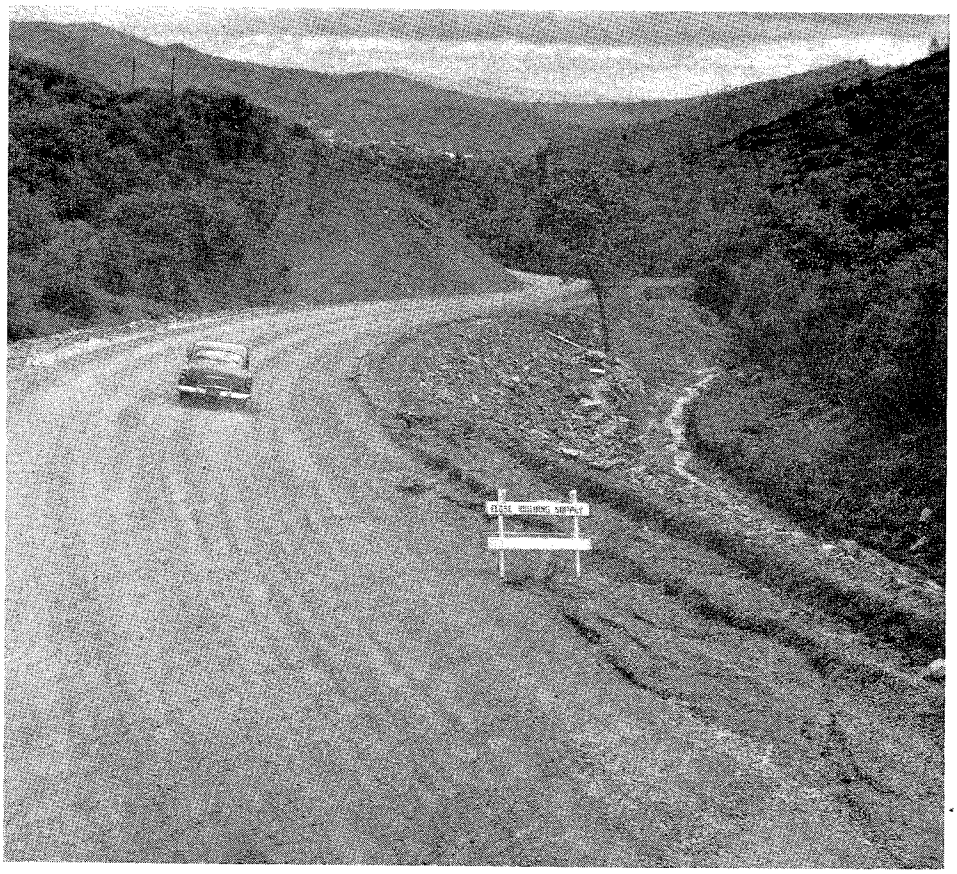
1,690 tons imported subbase material.
14,500 tons untreated rock base.
9,600 tons mineral aggregate (plant-mixed surfacing).
2,350 linear feet metal plate guard railing.
4,500 linear feet new property fence.

Construction began on April 4, 1954, and it is anticipated that the project will be completed in the fall of 1954. The contract specifies that traffic shall be taken through the construction area, no detour being available.

The current project, together with the improvement of the Briceburg Grade to be completed in late summer of 1954, and several other completed projects have improved this route greatly during the last few years.

The work, costing approximately $215,000, is being done by the Granite Construction Company of Watsonville, California. Fred L. Smith is the Resident Engineer for the Division of Highways on the project.

Bids have been received for an additional project approximately four miles long through the City of Merced and west of Planada on this same road, and other projects are planned for construction as funds become available.



Looking southeast toward town of Mariposa in distance. Photo taken before beginning of surfacing in spring of 1954.

Mother Lode

By C. E. MOFFATT
Assistant District Design Engineer

Construction will be completed soon of a two-mile improvement of a portion of Route 65 (State Sign Route 49) from the town of Mariposa northerly toward Mt. Bullion, Coulterville and Sonora.

A part of Route 49 is known as the Mother Lode Highway and extends from Auburn on the north, through the early gold mining region to Mariposa in the south. This area is rich in history of California's earlier days and attracts a considerable number of tourists each year.

The portion of Sign Route 49 from Sign Route 120 where it crosses the Tuolumne River at Moccasin Creek to Mariposa was incorporated in the State Highway System by Legislative Act of 1933 along with several miles of other county roads in District X. Most of these roads, particularly in the mountainous areas, were deficient in several respects according to recognized minimum standards. Improvements have been made as fast as funds have become available, and this program has been accelerated as a result of the increase in gas tax.

The current project traverses a region of moderate size mountains, covered with grass, brush and scattered trees, and lies at an elevation of 2,040 feet to 2,440 feet. The road prior to the present work, was on sidehill alignment generally and followed the contour of the ground with the minimum of cut and fill. It included many short radius horizontal curves and short vertical curves, with sight distance restrictions at several locations. The surface was oil treated native material from one inch to three inches thick, averaging 16 feet in width.

The improvement consists of grading and paving on improved alignment and grade along the general location of the existing road. Improved drainage facilities were included in the design. On roads in this area, available funds are limited, and the alignment was therefore very carefully designed to obtain the most economical location.

A very good alignment was obtained, however, and the first mile out of Mariposa is excellent. For the second mile it was necessary to rise 340 feet, the average grade being 6½ percent. Both horizontal and vertical alignment, however, is very good for this type of terrain and for the moderate traffic volumes to be expected.

The typical cross-section consists of plant-mixed surfacing 2 inches thick and 24 feet wide over 4 inches of untreated rock base on imported subbase material varying from 4 inches to 10

Typical alignment on new construction. Plant-mixed surfacing has not been placed.

inches thick. Shoulders are untreated rock base two feet wide with Class "C" medium seal coat.

The top soil formation is a thin layer derived from the weathering of the underlying volcanic and sedimentary rock. Cut slopes were designed on a 1:1 slope.

Contract items included the following:

- 47,000 cubic yards roadway excavation.
- 1,660 cubic yards ditch and channel excavation.
- 10,200 tons imported subbase material.
- 9,900 tons untreated rock base.
- 3,500 tons mineral aggregate (plant-mixed surfacing).
- 107 cubic yards Class "A" portland cement concrete (structures).
- 24 tons corrugated metal pipe of various sizes.

Construction began on August 10, 1953, and proceeded until December 23, 1953, when it became necessary to shut down for the winter. At that time the earthwork had been completed, the subbase and base had been placed and the drainage works completed. Paving and performing of minor items of the contract is expected to be completed July 1, 1954.

No unusual problems have been encountered during construction. Traffic has been passed through the construction are without appreciable delay.

Total cost of the project will be approximately $221,000, of which nearly one-half is F. A. S. funds, and the remainder, state highway funds.

The Board of Supervisors of Mariposa County has cooperated with the Division of Highways in selecting the portion to be improved and in allocating county F. A. S. funds to cover a portion of the cost.

The project is being constructed by the Close Building Supply Co. of Hayward, California. W. L. Creger is the resident engineer for the Division of Highways on the project.

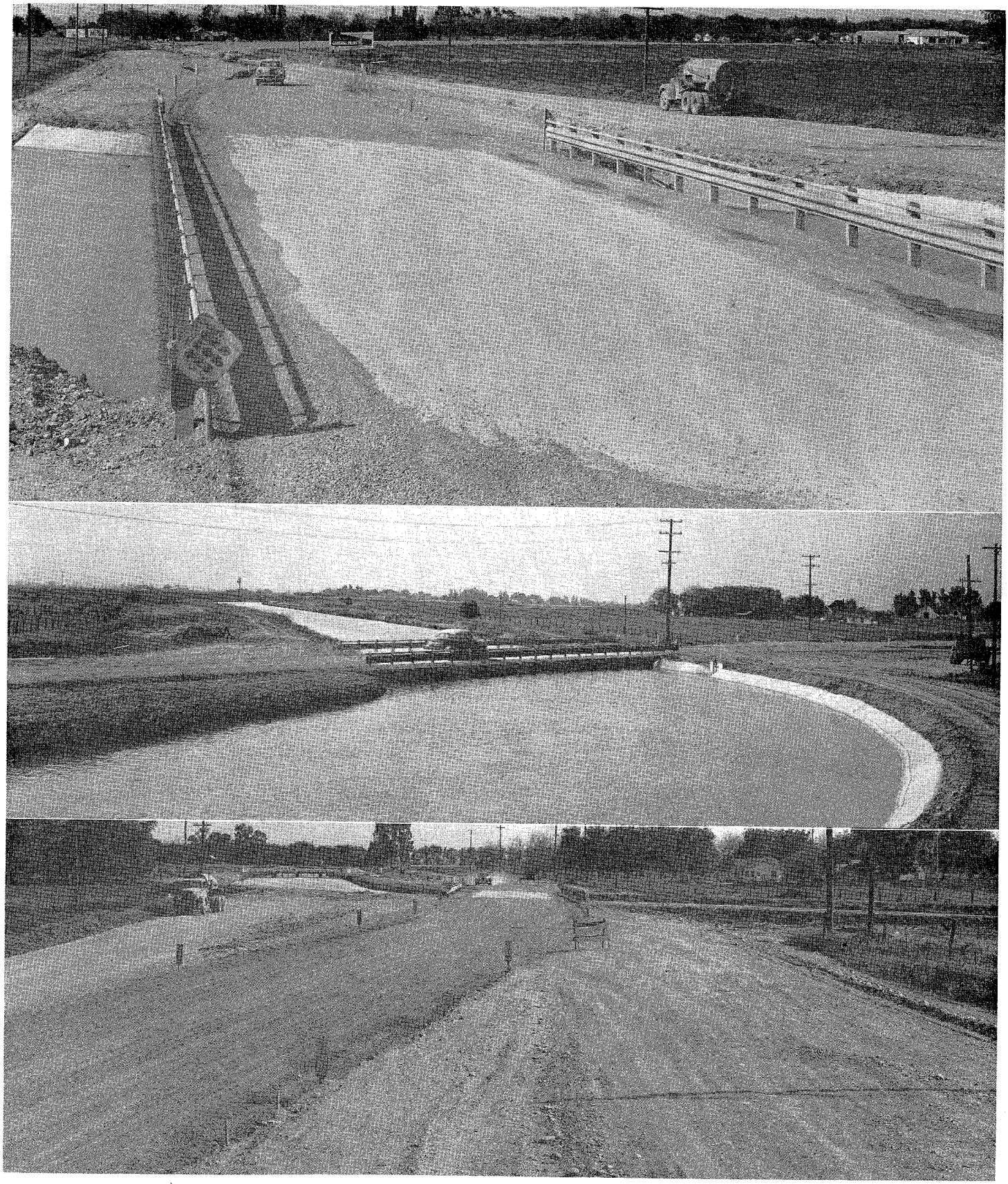
South of Gustine

By R. K. WELLS
Highway Engineering Associate

With the completion of a realignment project south of Gustine early this June one of the worst physical hazards on State Sign Route 33, the Westside Highway, will have been eliminated. The proposed work will replace an existing bridge and eliminate a "T" intersection.

The existing bridge, constructed in 1920 by Merced County, was 115 feet long and 21 feet wide. The bridge itself was on tangent with a skew of approximately 45 degrees, but the approaches were on 400-foot radius reversing curves. The combination of short approach curves, abrupt skew, and solid concrete railing created a traffic hazard of the first magnitude.

Less than one-half mile north of the bridge the highway turned east at a "T" intersection. This intersection had been widened on the inside until it



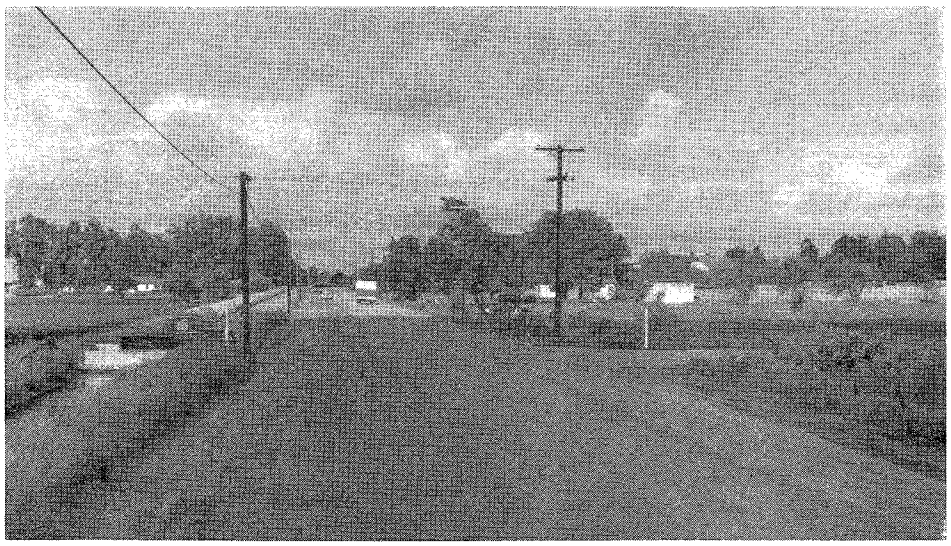
UPPER—View of project south of Gustine, looking north toward Borelli's Corner, showing new bridge with new alignment curving to right. CENTER—Bridge at Gustine Canal. View looking westerly showing bank lining. LOWER—View of project south of Gustine looking south, showing new alignment at south connection.

provided a return radius of less than 100 feet.

The present contract, awarded to M. J. Ruddy & Son on November 19, 1953, provides for a new bridge west of old structure, and elimination of the "T" intersection at "Borelli's Corner" at the approximate cost of $132,000.

The new bridge provides a clear width of 32 feet, with tangent approaches and ample sight distance, and the former "T" intersection has been replaced with a minimum 1,200-foot radius curve with the roadway built to modern standards.

Under the able supervision of Resident Engineer Herman Jantzen, this apparently simple, but actually complicated project, has been successfully integrated. In order to provide for traffic the existing road was used while the new channel, bridge and approaches were constructed. When completed, traffic was switched to new construction, the old bridge removed, the balance of the canal constructed, and the outside canal bank concrete lined. Since all work at the canal had to be completed between irrigation seasons a construction program had to be set up and strictly adhered to. The fact that no delays were occasioned, either to vehicular traffic or the flow of water, bears testimony to the excellence of the manner in which the work was handled.



View of project looking west from near Gurr Road

Gustine to Merced Highway

By R. K. WELLS
Highway Engineering Associate

On October 16, 1953, M. J. Reddy & Son was awarded a contract in the amount of $300,000 for improving portions of State Sign Route 140, between Gustine and Merced. This route is entirely rural and serves a rich dairy and truck garden area.

The original road was constructed by a number of road districts and consisted, in general, of a 16-foot oiled earth traveled way with earth shoulders.

Incorporated into the State Highway System on September 3, 1937, this route has been constantly improved by state forces and contracts; the magnitude of these improvements being reflected in an average cost of $2,000 per mile per year for maintenance.

The 3.9-mile portions that are now being improved are those that are subject to annual inundation during the

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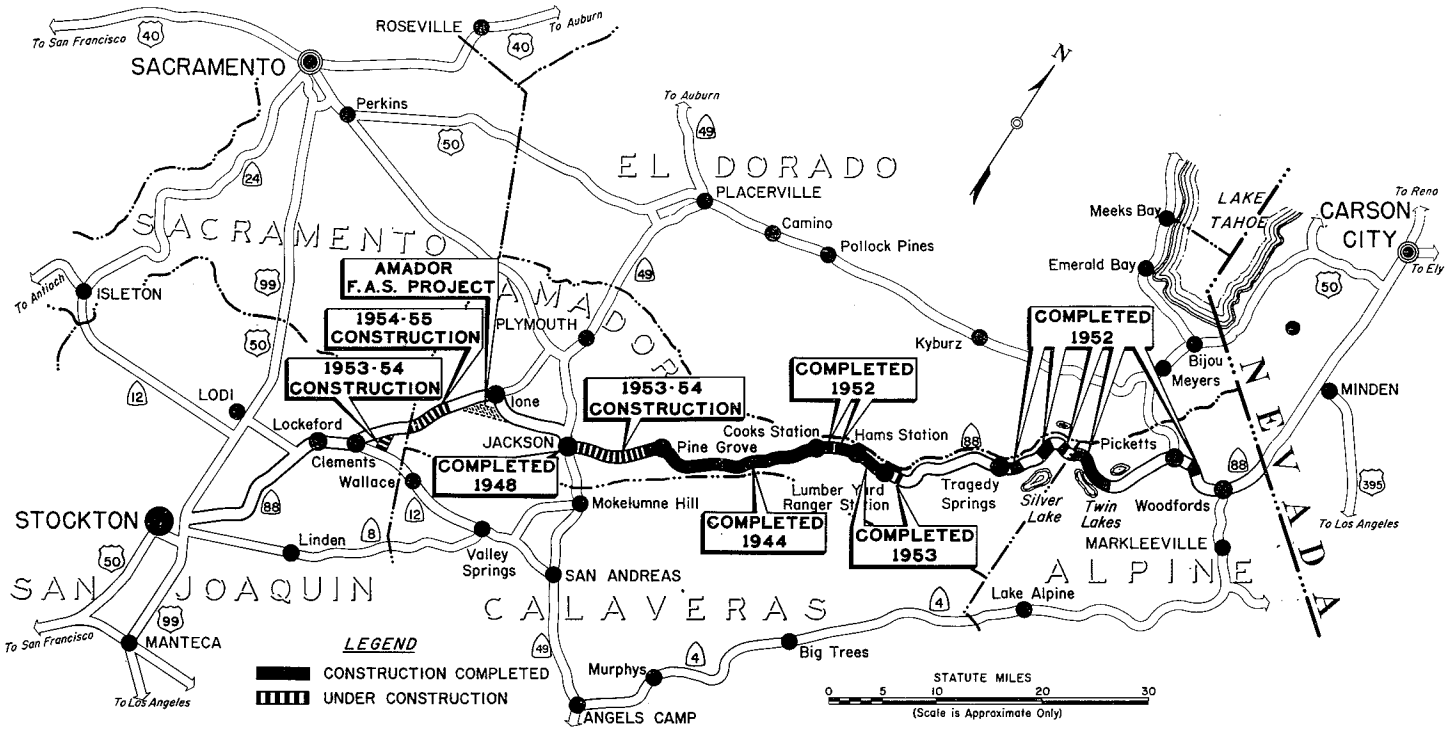
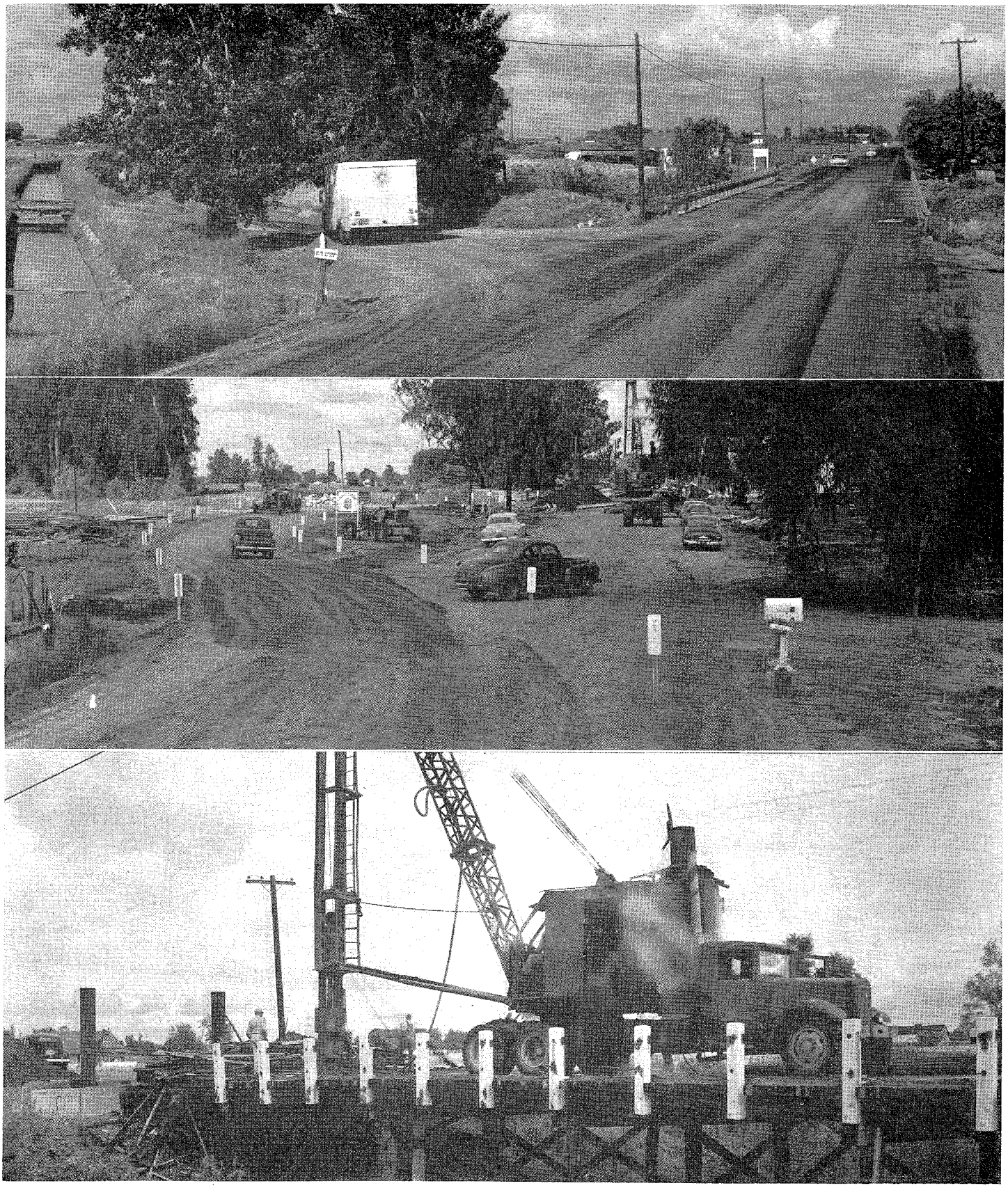




UPPER—View of project looking west from near west end of second portion. CENTER—View of old bridge and detour at Bear Creek. LOWER—View of old bridge at Bear Creek.

USE OF THREE-PHASE TRAFFIC-ACTUATED SIGNALS

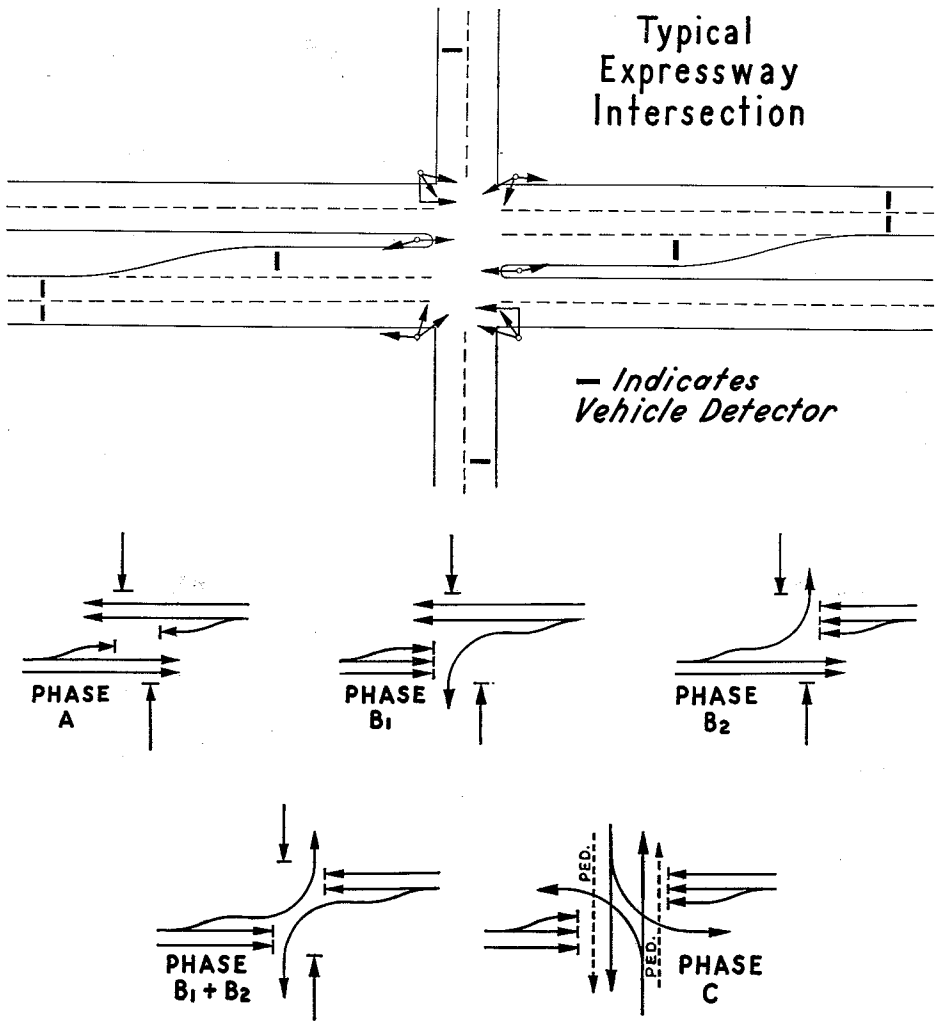
By G. M. WEBB, Traffic Engineer, Division of Highways *

THE PRIMARY reason for installing traffic signals is to facilitate the movement of traffic, and to do this in a safe manner. The installation of signals without justification, or the installation of a signal system which has not been designed for a particular location may result in an increase in accidents.

There are many locations on the State Highway System in California which have had traffic volumes to warrant a grade separation for many years, but because the demand for highway improvements far exceeded available funds, we have been unable to provide the necessary grade separation structures. At such locations, traffic signals are operating with exceedingly high volumes. Capacity and accidents are the problems at these intersections.

Left-turn Movements

One phase of the accident problem is that of accidents involving left-turn movements. With the usual two-phase signal, the motorist desiring to make a left turn from a major highway must pick a gap in the fast-moving opposing through traffic. During this time, he is in a position which may result in a fast-moving through vehicle running into the rear of his car. In addition, while he is waiting he is reducing the capacity of the intersection. Because of this, it has been found necessary to provide a left-turn median lane for this motorist. This reduces his likelihood of having a rear-end type of collision, but does not affect his problem of picking a gap in the opposing through traffic. If he takes a chance and does not make it, the result is often a serious accident. In order to reduce this potential accident hazard, we are finding that it is frequently desirable to provide three-phase signals with a separate phase for left-turn movements especially on rural, high-speed highways. We have found that the replacement of two-phase signals with three-phase signals has reduced accidents involving left-turn vehicles.



Three-phase Signals

On ordinary city street intersections, three-phase signals are not usually installed unless the left-turn movement is quite large, that is, 10 to 15 percent of the entering traffic. On rural expressways, however, because of the potential left-turn accident hazard, we now find it desirable to provide three-phase signals with a separate phase for left-turn movements of comparatively low magnitude.

The main objection to three-phase signals is the additional delay caused by the third phase. To hold this delay to the minimum, we are now using a system known as the "double split-phase." In this system, there are five different arrangements of the signal indications.

In condition No. 1 we have the usual "A" phase for both the through movements. In condition No. 2 we have a "B_1" phase in which vehicles are permitted to go in one of the two left-turn median lanes. The through movement in the same direction as the

* *This paper was presented by Traffic Engineer Webb at a session entitled "What's New in the West?" during the seventh annual combined meeting of the Western Section of the Institute of Traffic Engineers and the Northwest Traffic Engineering Conference, May 12-14, 1954, at Corvallis, Oregon.*

left-turn movement is also permitted to pass through the intersection since there are no other movements in conflict with it. Similarly, in condition No. 3 we have a "B_2" phase which provides the same operation only in the opposite direction. When vehicles appear in both left-turn lanes, we have condition No. 4 which is a straight left-turn or "B" phase. Condition No. 5 is the "C" phase for the cross-street movement. This "double split-phase" system provides the minimum delay to the through highway traffic, and is especially useful where there are heavy directional peak hours in either the through traffic or the left-turn traffic.

Another recent development in three-phase signals is the three-phase partially traffic-actuated signal system for use in coordinated systems.

Traffic-actuated Signals

We have several locations where it was necessary to install a group of three-phase signals at such spacings that required coordination to provide a progression for the through traffic. At the same time, since there was a considerable variation in traffic during the day in both direction and volume, it was desired that these devices be traffic actuated. In some cases, the spacing of the signals would not permit an ideal progression in both directions at the same time. Recreational traffic on week ends attained a high volume on Friday afternoon in the outbound direction and on Sunday night in the inbound direction. The exact time and length of these peaks cannot be predetermined.

For such requirements, the three-phase partially traffic-actuated signal system is installed. The signal controllers are coordinated by interconnection to a master controller which contains cycle selection equipment. The cycle length and appropriate offsets are selected by the master equipment so that a progressive band is provided on the highway in the direction of the major movement. Sampling detectors are provided in the through-traffic lanes in both directions to provide the necessary information to the master equipment for proper selection of cycle length and direction of the offsets.

Use of Detectors

No detectors are placed in the through-traffic lanes at the individual intersections. The detectors are placed only in the left-turn lanes and on the cross-street approaches.

Consider an example with 50 percent of the cycle length available for the through traffic and 50 percent for the left turn plus cross traffic. Thus with a 100-second cycle operating, and with saturated conditions on the left-turn lanes and cross street, there will be 50 seconds available for the through traffic, 25 seconds for the left turn, and 25 seconds for the cross-street traffic. If either the left turn or cross street does not require the entire time, the remainder of the time can be added to the other movement. If there is neither left-turn nor cross-street traffic, the green will remain on the highway. Then when vehicles do appear in the left-turn lane or the cross-street approaches, they will obtain a green indication only during a "permissive period," which will not interfere with the major highway progression.

District X Highway Projects

Continued from page 48 . . .

spring run-off period. It was the heavy losses in perishable dairy products, caused by producers being unable to deliver their products during flood stages, that dictated both the present improvements and the portions to be improved.

The new construction provides a 24-foot plant-mixed traveled way with four-foot tapered shoulders. The maximum slopes are 2: 1. In addition, two reinforced concrete bridges are being widened, and one new reinforced concrete bridge is being constructed.

Work will be done by July of this year. The major contract items are: 75,000 cubic yards imported borrow, 29,300 tons untreated rock base, and 12,400 tons plant-mixed surfacing.

Mr. Herman Jantzen is the Resident Engineer.

Freeway Benefits

Continued from page 33 . . .

indicate travel preference on the freeway over use of existing streets.

The caption "Another Freeway for Your Safety," often seen by motorists on signs at locations where freeways are under construction, is no idle claim for the Carlsbad-Oceanside Freeway. The former state highway, replaced by the freeway in these two cities, had an unfavorable accident record. In 1952, 561 accidents resulting in 13 fatalities occurred on the former route. This number of accidents averages 47 per month. During the five-month period the new freeway had been opened to traffic, an average number of 22 accidents per month, totaling 108 accidents, occurred on the former state highway and on the new freeway. During a comparable five-month period in 1952, the average number of accidents per month on the former state highway was 45. Thus, a reduction of more than 50 percent in number of accidents has been the result of the freeway construction. This reduction occurred notwithstanding an increase in traffic volumes from 1952 to 1954. The freeway itself, although carrying 63 percent of the total traffic volume on both routes, was the scene of only 40 percent of the 22 accidents, which is equivalent to only 20 percent of the 45 accidents which occurred in the comparable prefreeway period. While the five-month base period is rather short, it is indicative of the reduction in the number of accidents which may be expected by reason of the freeway construction. This good record is somewhat marred by one fatal single vehicle accident which occurred recently. A vehicle, driven by a teenage driver, went out of control, skidded and rolled, killing one of the occupants.

Traffic volumes on the new freeway compare closely with the traffic estimates made prior to its construction and all interchanges appear to handle traffic efficiently and safely. This freeway, together with others on US 101 completed in Orange and Los Angeles Counties, has considerably reduced travel time for many users between San Diego and the Los Angeles area.

Cost Index

State Highway Construction Costs Drop During First Quarter 1954

RICHARD H. WILSON, Assistant State Highway Engineer
H. C. McCARTY, Office Engineer
JOHN D. GALLAGHER, Assistant Office Engineer

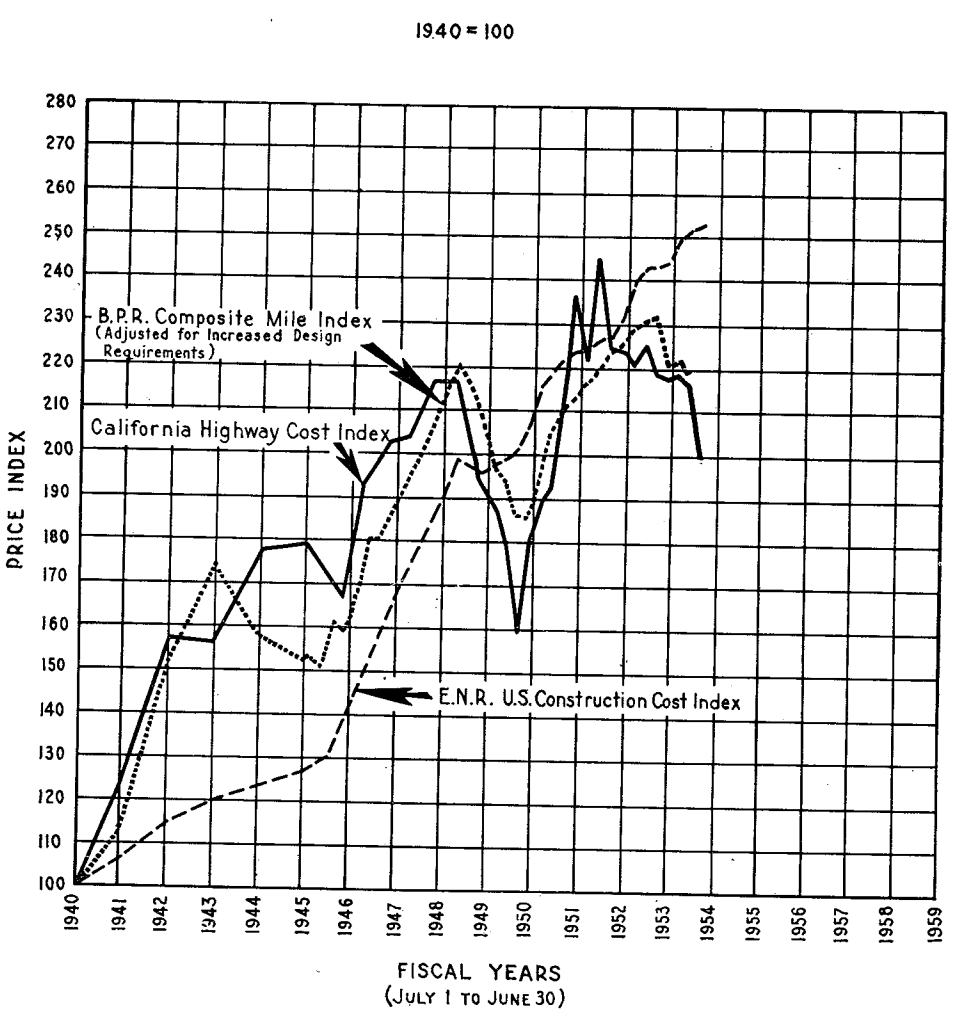
As indicated by the California Highway Construction Cost Index, contract prices on state highway construction projects were 8.0 percent lower in the first quarter of 1954 than during the fourth quarter of 1953.

The Index for this first quarter stood at 199.4 (1940 = 100) which was a drop of 17.3 points, below the last quarter of 1953. This is the first time in four years that the California Index has been below 215. In the fourth quarter of 1950 it was 194.8.

The accompanying tabulation shows the California Highway Construction Cost Index by years from 1940 to 1949 and by quarters from 1950 to the first quarter of 1954.

THE CALIFORNIA HIGHWAY CONSTRUCTION COST INDEX

Year	*Cost index*
1940	100.0
1941	125.0
1942	157.5
1943	156.4
1944	177.8
1945	179.5
1946	179.7
1947	203.3
1948	216.6
1949	190.7
1950 (1st quarter)	160.6
1950 (2d quarter)	180.0
1950 (3d quarter)	189.2
1950 (4th quarter)	194.8
1951 (1st quarter)	215.4
1951 (2d quarter)	238.3
1951 (3d quarter)	221.9
1951 (4th quarter)	245.4
1952 (1st quarter)	224.8
1952 (2d quarter)	224.4
1952 (3d quarter)	221.2
1952 (4th quarter)	226.2
1953 (1st quarter)	218.3
1953 (2d quarter)	217.5
1953 (3d quarter)	218.0
1953 (4th quarter)	216.7
1954 (1st quarter)	199.4



During 1953 the Index was practically stationary, the first quarter being 218.3, the second 217.5, the third 218.0 and the fourth quarter 216.7. Then with the first quarter of 1954 comes this 8.0 percent drop to 194.8.

The drop is not a surprise, it almost could be seen coming in the steady increase in competition among bidders. The California Division of Highways awarded 466 highway and bridge contracts with a value of $101,900,000 during the calendar year of 1953. For bids opened during the month of January, 1953, the average number of bidders was 5.5; by June, 1953, the average was up to 6.0 bidders per project; in July it was 6.2; August, 6.9; September, 6.4; October, 7.6; November, 7.4; and December, 7.6. During this steady rise in the average number of bidders highway construction costs as reflected by the Index were hovering about on a level. During the first quarter of 1954, the Division of High-

CALIFORNIA DIVISION OF HIGHWAYS AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Crusher run base, per ton	Plant-mix surfacing, per ton	Asphalt concrete pavement, per ton	PCC pavement, per cu. yd.	PCC structures, per cu. yd.	Bar-reinforcing steel, per lb.	Structural steel, per lb.
1940	$0.22	$1.54	$2.19	$2.97	$7.68	$ 18.33	$0.040	$0.083
1941	0.26	2.31	2.84	3.18	7.54	23.31	0.053	0.107
1942	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103
1943	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080
1944	0.50	2.45	4.10	4.50	10.46	31.99	0.054	0.132
1945	0.51	2.42	4.20	4.88	10.90	37.20	0.059	0.102
1946	0.41	2.45	4.00	4.68	9.48	37.38	0.060	0.099
1947	0.46	2.42	4.32	5.38	12.38	48.44	0.080	0.138
1948	0.55	2.43	4.30	5.38	13.04	49.86	0.092	0.126
1949	0.49	2.67	4.67	4.64	12.28	48.67	0.096	0.117
1st quarter 1950	0.34	2.22	3.65	3.74	----	40.15	0.077	0.081
2d quarter 1950	0.40	2.13	4.48	3.74	10.86	43.03	0.080	0.105
3d quarter 1950	0.41	2.32	4.25	5.50	10.91	44.34	0.093	0.131
4th quarter 1950	0.42	2.81	4.64	4.61	12.55	43.18	0.098	0.120
1st quarter 1951	0.45	3.07	4.06	5.22	11.71	46.38	0.103	0.206
2d quarter 1951	0.63	3.88	4.56	4.63	12.93	51.50	0.105	0.166
3d quarter 1951	0.56	2.88	4.59	3.90	12.41	46.14	0.107	0.165
4th quarter 1951	0.66	2.91	5.66	4.89	12.71	49.38	0.105	0.169
1st quarter 1952	0.56	3.25	4.88	4.77	14.25	47.46	0.094	0.152
2d quarter 1952	0.53	3.19	5.29	4.13	14.20	49.12	0.091	0.143
3d quarter 1952	0.55	2.61	5.49	4.60	12.80	48.21	0.094	0.132
4th quarter 1952	0.66	2.68	4.97	----	12.53	48.45	0.094	0.128
1st quarter 1953	0.45	2.48*	5.27	4.46	12.47	53.19	0.098	0.150
2d quarter 1953	0.50	2.07	5.38	4.59	13.06	52.68	0.091	0.132
3d quarter 1953	0.54	2.15	5.30	4.82	13.78	49.23	0.092	0.129
4th quarter 1953	0.48	2.11	4.74	4.47	14.77	53.41	0.105	0.139
1st quarter 1954	0.45	2.28	4.23	4.78	14.89	47.52	0.092	0.126

* Untreated rock base substituted for crusher run base at this point.

ways opened bids for 119 contracts, with a construction value of $27,200,000, and the average number of bidders for the quarter rose to 8.5 per project, while construction costs dropped 8.0 percent. The accompanying tabulation for the first quarter of 1954 lists the number and size of projects, with total bid values and number of bidders on state highway work.

The level of construction costs during 1953 was maintained in the face of increases in labor costs resulting from continued demands of labor for higher wages and increased fringe benefits. The drop in bid prices and the jump in the average number of bidders during the first three months of 1954 is further indication of an increasing hunger on the part of contractors for construction jobs.

One factor affecting this is the reduction in federal construction. The upsurge in the number of bidders on state highway projects also would in-

NUMBER AND SIZE OF PROJECTS, TOTAL BID VALUES AND AVERAGE NUMBER OF BIDDERS

(January 1, 1954, to March 31, 1954—First Quarter 1954)

Project volume	Up to $50,000	$50,000 to $100,000	$100,000 to $250,000	$250,000 to $500,000	$500,000 to $1,000,000	Over $1,000,000	All projects
Road projects:							
No. of projects	51	19	16	7	9	1	103
Total value (bid items)	$1,053,796	$1,350,224	$2,638,093	$2,285,183	$6,376,937	$1,544,688	$15,248,915
Avg. no. bidders	6.7	7.7	11.1	9.0	10.6	17.0	8.1
Structure projects:							
No. of projects	8	2	----	2	----	1	13
Total value (bid items)	$203,311	$116,674	----	$560,581	----	$4,194,462	$5,075,028
Avg. no. bidders	9.1	11.5	----	14.0	----	11.0	10.2
Combination projects:							
No. of projects	----	----	----	----	----	3	3
Total value (bid items)	----	----	----	----	----	$6,892,918	$6,892,918
Avg. no. bidders	----	----	----	----	----	12.7	12.7
Summary:							
No. of projects	59	21	16	9	9	5	119
Total value (bid items)	$1,257,107	$1,466,898	$2,638,093	$2,845,764	$6,376,931	$12,632,068	$27,216,861
Avg. no. bidders	7.0	8.0	11.1	10.0	10.6	13.2	8.5

Total Average Bidders by Months

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year	
1954	7.6	11.2	7.2	----	----	----	----	----	----	----	----	----	8.5	(1st quarter)
1953	5.5	6.1	7.5	6.4	5.9	6.0	6.2	6.9	6.4	7.6	7.4	7.7	6.7	

dicate a falling off of new work in other branches of construction.

Contractors with experienced and well integrated organizations wish to keep them intact; to do so requires continued income and to keep the pay estimates coming in contractors reduce their bid prices. Many have heavy equipment obligations which must be met regularly and going work is necessary to provide the funds to meet such obligations, so bid prices are cut in the effort to be low bidder.

Another item which it is thought continues to be an influence in lowering bid prices is the availability of materials and equipment. Bidders over a period of some years have included various factors in their bid prices to cover delays or premiums in securing materials and equipment. With production near an all time high, such factors become unnecessary and their discard is reflected in lower prices.

The accompanying tabulation of average contract unit prices for the eight items on which the California Highway Construction Cost Index is based shows these average unit prices by years and quarters since 1940. From this tabulation it will be noted that for the first quarter of 1954 roadway excavation dropped 6.25 percent, from $0.48 to $0.45 per cubic yard; plant mixed surfacing went down 10.8 percent, from $4.74 to $4.23 per ton; portland cement concrete, structures, was down 11.0 percent from $53.41 to $47.52 per cubic yard; the average unit price for bar reinforcing steel dropped 12.4 percent from $0.105 to $0.092 per pound and structural steel was down from $0.139 to $0.126 per pound, a drop of 9.4 percent. Three of the eight items showed an increase in average unit prices; untreated rock base was up $0.17 per ton, a rise of 8.1 percent; asphalt concrete pavement rose $0.31 or 6.9 percent per ton and portland cement concrete pavement was up from $14.77 to $14.89 per cubic yard, which is 0.8 percent.

While the average unit prices on five of the eight basic items dropped materially during the first quarter of 1954 it is interesting to note that the average unit price of portland cement concrete pavement which rose slightly reached its highest price since 1940 and structure concrete had reached its highest price during the previous quarter.

The accompanying chart compares the California Highway Construction Cost Index with the U. S. Bureau of Public Roads Composite Mile Index and the Engineering News-Record Construction Cost Index, all reduced to the base of 1940 = 100.

In view of the continuing increase in competition it is the opinion of this department that the 8.0 percent drop in California Index during the first quarter of 1954 marks a definite break in the high construction costs. As long as general production remains at high levels and materials and equipment are readily available continued lower costs may be expected, barring international developments which might result in large scale federal construction operations and a return to federal control of materials.

How Do We Blueprint?

Continued from page 19 . . .

expanding economy and increasing population. Becoming aware of this, as I have indicated they must, organized highway users, business and industrial leaders and other interested groups, acting through our State Chamber of Commerce, undertook to do something about it in 1943. This led to a state-wide conference of representatives of leading civic organizations and official bodies particularly concerned with the adequacy of highways. (The circles in our pool were widening.)

Drive for Highway Program

Out of this conference came the Major Highway Development Committee. This group spearheaded the drive for a highway program, but I do not mean to imply that other groups were idle. Although legislation was introduced in 1945, it failed of passage. We weren't quite ready. All the lines of the blueprint had not been completely developed into a workable plan. Although there was growing public awareness, it had not yet reached the Legislature with sufficient clarity. A critical step was taken by the Legislature in 1945, however. That was the formation of the Joint Fact-Finding Committee on Highways, Streets and Bridges. Here was the legislative participation so essential to the blueprint. To the lasting credit of this committee, they made the most comprehensive and painstaking study ever accomplished by a legislative interim committee in California. Some 60 meetings were held in every part of the State. Prominent engineers and tax consultants were engaged. California's highway system, the financing of highways and our present as well as future needs were subjected to the most searching studies and evaluations. Detailed reports were subsequently submitted to the entire Legislature.

Public Interest

During this interim period, the increase in public interest was best evidenced by an enlargement of the Major Highway Development Committee. Truck organizations, the oil industry, local chambers of commerce, railroads, merchant organizations as well as city and county government representatives were all brought into participation. The momentum gained during the period between sessions, 1945 to 1947, impelled Governor Earl Warren to call a special session of our Legislature to run concurrently with the regular session of 1947.

Time, of course, does not permit going into the trials and tribulations which all of us in any way connected with the matter went through. Suffice to say fuel taxes were increased from 3 cents to 4½ cents; registration fees went from $3 to $6; weight fees were increased substantially; and allocations to cities and counties for their streets and roads were materially increased. Substantive changes were also made in administrative provisions of the law.

Spiraling Costs

We thought at that time that we were making an attack upon a $1,674,000,000 problem with something just over one billion dollars over a 15-year period. However, as a result of spiraling costs the highway construction dollar fell far below the value anticipated. This, coupled with an increase in population and motor vehicle registration far beyond the wildest predictions and best estimates of 1946 and 1947, soon led to the inescapable fact that we were falling behind faster than at any period in our history. Where we had anticipated getting $5

worth of construction, we were getting only $4. Where in 1946 it was estimated, and the Legislature based its action on these figures, that the population of our State would reach 11,100,000 by 1960, we passed the 12,000,000 mark in late 1953. Where the best forecasts in 1946 told us that we could anticipate 5,250,000 vehicles by 1960, we passed 6,000,000 just at the end of last year, 1953.

As a result of all this, we found that by 1952 we had critical deficiencies amounting to $3,314,000,000 where in 1947 they had been estimated at $1,674,000,000.

Redoubled Efforts

As early as late 1949 and early 1950 the user groups were becoming aware of the inadequacy of the 1947 program. With the blueprint already prepared and proven, it was not difficult to get a new movement under way. At about this time, the California Highway Users Conference was organized and joined the ranks of those in favor of an accelerated program. The Legislature was receptive; in fact some individual Members of the Legislature were the first to sound the alert. The user groups were again ready and the public was well oriented.

The Major Highway Development Committee was reactivated. They went back to the Legislature in 1952. Upon their request a resolution was introduced and adopted setting up another joint interim committee. Also in 1952, the California Highway Users Conference formed a highway committee and, thereafter, the conference worked closely with all user groups in full support of an accelerated program. In passing, it is interesting to note that a large citizens committee was appointed to act in an advisory capacity to the legislative interim committee. Although not too successful when measured by its accomplishments, such a device to broaden participation in the formulation of a highway program should be given serious consideration by anyone who is drawing a blueprint for adequate roads.

1953 Legislation

It is enough to say that the legislative committee again hired outside talent. The Automotive Safety Foundation, as in 1946, was again retained, along with other consultants. Studies were made and reports were written. As a direct outgrowth, the Legislature in 1953 passed a bill increasing our gas tax from 4½ to 6 cents, the tax on diesel fuel from 4½ to 7 cents and increased weight fees and other fees 33 1/3 percent.

In this brief time I've been able to express this blueprint only in the broadest terms. So much has been left unsaid that I fear that I haven't told the whole story. On the other hand, it is frequently the fault of a lawyer to use too many words to say the simplest of things.

At any rate, the results in California speak for themselves. After quite a bit of petty political skirmishing during the 1953 Session, the Legislature settled down and passed a tax increase bill, which everyone conceded would be done. The climate was right. Confidence in our highway administration was evident on every hand. The best proof of the practicality of our blueprint was the general acceptance by the taxpayers of the usually unpalatable increase in taxes. We have talked to literally dozens of legislators since these increases went into effect. All have expressed amazement over the fact that there have been no protests from their constituents. Another bit of evidence is the fact that the Legislature considered and finally discarded a scheme to earmark money for expenditure on mainline roads only. We like to think of this as a compliment to our administration of the highway program.

Concrete Results

I've spent most of my time on the blueprint. It would be perfectly proper for you to say, "That's all fine, but what did you build from your blueprint?" Well, being from California, I'm naturally modest. But since you have asked the question, I feel obliged to answer it.

Between 1912, when we first went into the highway business on a statewide basis, and 1945, we spent $500,000,000 on our State Highway System. (I'm talking only of construction dollars.) In the 10 years between 1945 and the end of the fiscal year in June of 1955 we will have spent or obli-

. . . Continued on page 64

Excavation on Waldo Approach Poses Problem

(Photo following page)

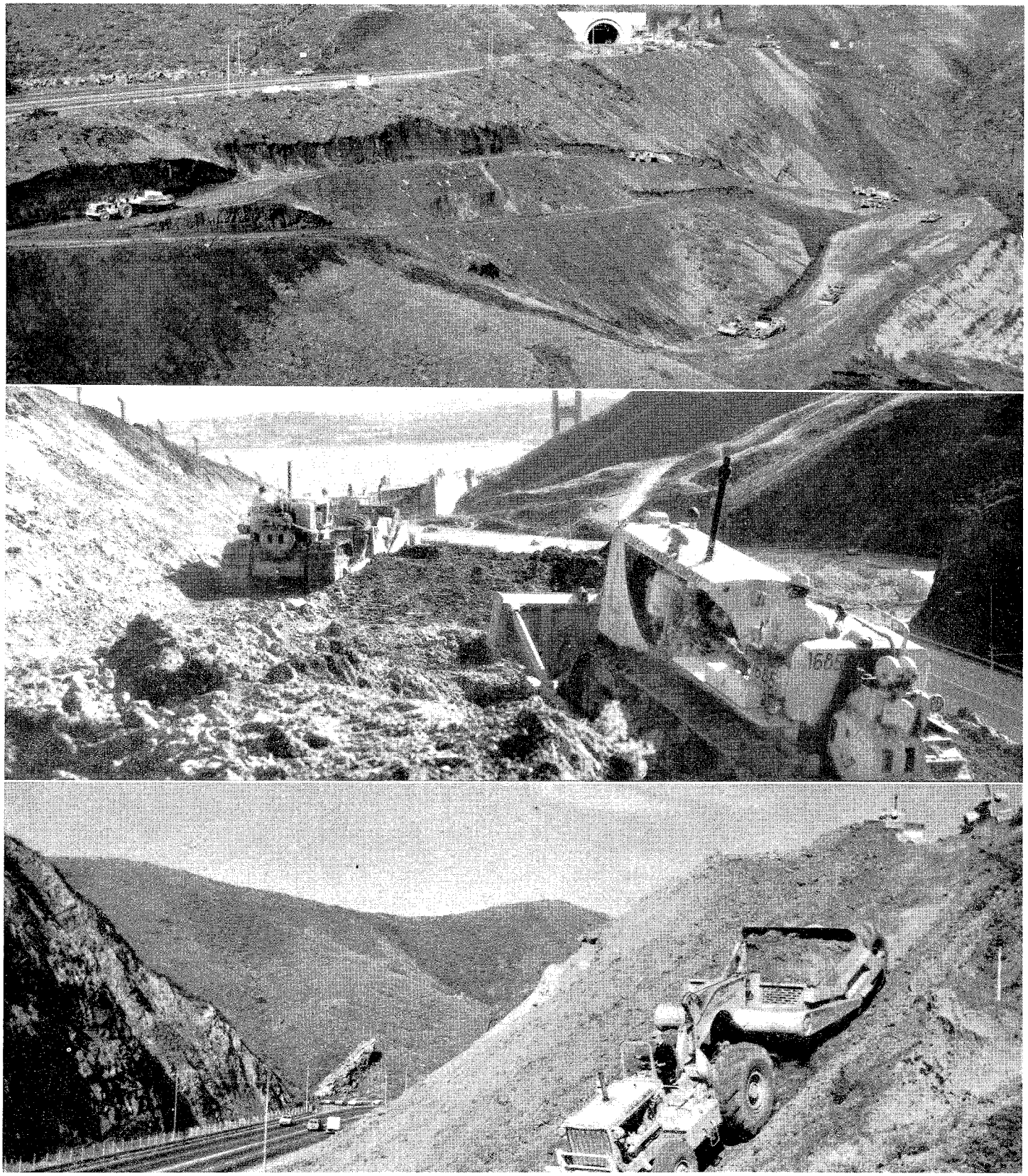
WHEN, by the end of 1954, the Guy F. Atkinson Company completes its $4,122,382 contract for grading, structures, and portions of base and surfacing on the four-mile Waldo Grade approach to the Golden Gate Bridge, a major step will have been taken in breaking the bottleneck on the Marin County approach to this world-famous bridge.

The second contract for surfacing, median curb, and final incidentals will follow immediately.

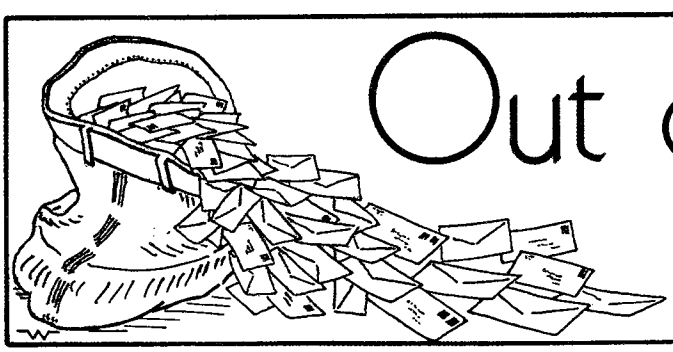
The project will convert the existing four-lane undivided highway into a modern six-lane divided freeway. This is being accomplished by construction of a new roadway approximately equal in width to the present highway. Three lanes for traffic in one direction will be constructed on the new roadway and the existing highway will then be reconstructed to provide three traffic lanes for travel in the opposite direction. The project involves construction of a second highway tunnel, two side-hill viaducts, a new undercrossing, new overcrossing, the extension of two existing undercrossings, and the extension of a military tunnel which crosses beneath the freeway.

Of primary importance during the construction period is provision for the 25,000 vehicles which must pass through the project daily.

Of particular interest will be the movement of 750,000 cubic yards of earth originating in new highway cuts which must be transported across the present roadway for construction of new embankments. Operations have been scheduled so that a new undercrossing has already been completed, which will ultimately serve to separate traffic entering or leaving the freeway from the City of Sausalito. In the meanwhile, excavated material is being transported through this undercrossing beneath the existing highway, to the end that traffic on the existing highway will not be subjected to the crossing of the contractor's equipment.



These photos courtesy of Caterpillar Tractor Company show construction on Waldo Grade approach to Golden Gate Bridge. An ingenious and carefully worked out sequence of construction operations is being followed with the result that the work is being accomplished with minimum interference to passing traffic.



Out of the Mail Bag

NEW NAME ON LIST

DEPARTMENT OF HIGHWAYS
of the
County of Cook
Chicago 6, Illinois

California Highways and Public Works

GENTLEMEN: My attention was called to your fine publication the other day. Inasmuch as I am in charge of the field-checking of all plans originating with our Cook County Highway Department many of the articles in your publication should prove of great interest and value to me and my associates, and if possible, I would appreciate having my name placed on your mailing list. You may be assured that all copies received will be read with interest.

Yours very truly,

STANLEY REZABEK
Hwy. Engr. III
Cook County Highway
Department

COURTEOUS TREATMENT

OAKLAND, CALIFORNIA

JOHN S. DANIELS
Metropolitan District
Right of Way Agent:

We would like you to know how pleased we were with our dealings with the Division of Highways in selling our home, at 1407 14th Street, Oakland. Mr. Edward W. Cutler and Mr. George N. Paul, Right of Way Agents, were most kind and understanding. We appreciate every kindness shown us. We feel they have both made friends among us.

Sincerely,

MR. and MRS. W. V. MORESI

WILL DO

CHAMPAIGN, ILLINOIS
May 5, 1954

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: I have been receiving copies of your periodical, *California Highways and Public Works* since January, 1954. Your publication is undoubtedly one of the best in its field and I read and reread every edition cover to cover. I intend to bind them yearly.

As of June 1, 1954, I shall be associated with the Bureau of Street Traffic in Chicago, and will change my address on that date. Would you be so kind as to send future editions to the new address.

ROBERT L. ZRALEK
6906 North Knox
Lincolnwood
Chicago 30, Illinois

HOW RIGHT

Alhambra, California

DEAR MR. ADAMS: For about 40 years I have been active in Chicago in politics and motor highway safety work.

As far back as I can remember when the automobile was beginning to take the place of street cars we in Chicago started to talk and hold committee meetings to improve automobile highways. In 1945 I retired from public life and moved to California. Here we have public highways of which our state officials can be proud as they did not talk about them and hold meetings, but they actually made them a reality.

I am certainly happy to be a Californian now where we believe in action. Our highway system is a good example.

Cordially yours,

FRANK J. TOMAZAK

MAGAZINE INFORMATIVE

ALFRED J. RYAN
Consulting Engineer
Denver 2, Colorado

California Highways and Public Works

GENTLEMEN: A large portion of my practice of engineering is related to the construction of modern highways. In the conduct of this practice, we have found a great deal of valuable information in your publication.

Yours truly,

ALFRED J. RYAN

COMPLIMENTS MAGAZINE

SUPERIOR MARKING EQUIPMENT COMPANY
San Francisco 5, California

KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: I wish to thank you for placing my name on the mailing list for the California state highway magazine. Already I have read the January issue from cover to cover and enjoyed it like all the other issues I have seen of this magazine. Beyond all doubt the magazine is a tribute to the periodical field.

Very truly yours,

LOUIS R. LAEREMANS

MAGAZINE IN CLASSROOM

LOS ANGELES 62, CALIFORNIA

MR. KENNETH C. ADAMS, *Editor*

If at all possible, I would like to be placed on your mailing list. I have used your magazine for teaching material and find that the students appreciate accurate, up-to-the-minute information which a textbook cannot contain. The wealth of material offered ties in with the entire school program and offers a medium for teaching safety along with mathematics.

Sincerely,

MISS THAIS E. HANCOCK

Harbor Freeway

Continued from page 32 . . .

the urgent necessity of getting the Harbor Freeway Project completed and open to traffic as rapidly as possible. However, the work has not been spectacular nor have unusual problems been encountered.

It may be of interest that after right of way negotiations have been completed with the property owner, it takes from 60 to 90 days to process the purchase, including the clearing of title and the closing of the escrow to permit payment to be made in accordance with the contractual agreement. After payment for the property has been made, the owner or occupant pays the fair market rental per month for any continued occupancy of the property. The usual elapsed time between closing of escrow and vacation of the premises is 30 days and during this interim period preliminary steps are taken for the sale of the building improvements.

Due to the difficulties with which the Division of Highways has been confronted because of vandalism to the buildings after they are vacated, the buildings are sold at public auction as soon after vacation as possible. Usually conditions of sale require the purchaser to clear the improvements from the premises within 30 days after the auction sale is held.

A limited number of buildings are not salable due to substandard original construction or such construction as reinforced concrete or brick buildings. This type of building is demolished either by state contract or by a purchaser who can secure sufficient salvaged material to make the over-all demolition project a profitable one. Approximately 50 percent of the buildings along the alignment of the Harbor Freeway between the Four-level Structure and Slawson Avenue come under this category.

To date there has been obligated and spent for right of way and construction a total of $56,000,000.

Eighteen construction contracts have been awarded by the State Division of Highways on the Harbor Freeway. These contracts, including those completed and those now under construction, have a total value of $14,116,200. Details of the construction contracts, with names of state resident engineers who were or are in charge are shown on the accompanying list.

Halfway Mark Passed

The Los Angeles City Bureau of Engineering has developed plans for improving Fourth Street as an open cut from Hill Street to Flower Street, with a viaduct connecting this open cut with the Harbor Freeway. The Los Angeles City Bureau of Right of Way and Land has acquired the necessary right of way. This project is now being advertised as a State Division of Highways construction contract, to be under the usual state supervision, with bids to be received June 17, 1954. It will be financed with Los Angeles City funds excepting for the viaduct and connection with the Harbor Freeway that will be financed from state funds available for the freeway.

In conclusion, it may be said that from the standpoint of over-all accomplishment in design, right-of-way acquisition, and construction the halfway mark has been passed in the development of the Harbor Freeway. We have completed 2.2 miles. We have under construction 2.3 miles, and we have financed and advertised 2.8 miles. This is a total of 7.3 miles out of the over-all total of 22.8 miles. With substantially all of the major design problems solved and the more complex and expensive right-of-way acquisition negotiations settled, future progress on the development of the Harbor Freeway depends upon financing. Since the State Highway Commission by law is constrained to budget funds for projects for only one fiscal year at a time and with the traffic pressure so great and the demands for construction financing so pressing, for other projects not only in this area but in other parts of the State, the funds that will be set up in subsequent budgets cannot be forecast. For these reasons it is impossible to set up a definite construction schedule. However, it is not, perhaps, too much to hope that the State Highway Commission in the budgets for the next five-year period will be able to set up sufficient funds to assure the completion of the Harbor Freeway throughout.

Petaluma

Continued from page 39 . . .

constructed on the ground and then hoisted into position. These girders will then be prestressed transversely to assure monolithic action, but there is no longitudinal prestressing, conventional steel reinforcement being used instead. After the girders have been placed and tied together, a cast-in-place concrete deck will be placed to provide a wearing surface for traffic. From a standpoint of length, these precast concrete girders are believed to be unprecedented in California bridge construction.

Each of the bridges consists of nine spans—four at 100 feet, one at 140 feet, three at 93 feet 4 inches, and one at 60 feet. Total length of each bridge is 886 feet.

The Petaluma Creek bridges are now under construction under a contract, the bids for which were received on July 1, 1953, which was awarded to Erickson, Phillips and Weisberg.

The supporting piers are rectangular single column bents on steel and concrete pile foundations. Because of the poor soil conditions, the fills on which the ends of the bridges will rest were placed early in 1953 in order that settlement and subsidence of the underlying ground might occur before the bridge construction took place. Unsuitable material—soft mud—was removed to a depth of about 12 feet before the fills were placed. As previously mentioned, these fills were the first unit of the bypass freeway to be placed under contract, and were built by Ball & Simpson at a cost of about $400,000.

Lakeville Highway Separation

Also of structural interest are the two long parallel viaduct structures which carry the new freeway over the Lakeville or Shellville Highway and also over the Northwestern Pacific Railroad. These structures will be immediately adjacent to and north of the Petaluma Creek bridges described above. The right bridge will be 641 feet long and the left bridge 534 feet long. Each will be of the concrete box girder type on single column bents supported on pile foundations. Each will have eight spans. ——→

In Memoriam

F. M. "NICK" CARTER

Fred Mortimer "Nick" Carter, Assistant Traffic Engineer of the State Division of Highways, died on May 1st in Ashland, Ore., after a period of two months of hospitalization. He had been intermittently ill for the past year.

Carter was a past president of the California State Employees Association and father of the noted concert pianist, Paulena Carter.

In the field of traffic engineering, Carter was one of the pioneers in bringing the traffic-actuated signal into use in the West, and was recognized as one of the leaders in developing mercury vapor and, more recently, fluorescent safety lighting at highway intersections. He was a former member of the board of directors of the Institute of Traffic Engineers.

Born in Massachusetts in 1886, Mr. Carter attended the Sheffield Scientific School at Yale University and then did railroad engineering work in the State of Washington.

Coming to California in 1914, he was a contractor on numerous irrigation district dam projects in the Sacramento and San Joaquin Valleys and in Oregon, including Terra Bella, Lindsay, Strathmore and Alpaugh. His work for the Madera Irrigation District included the preliminary plans for the Friant Dam.

He joined the Division of Highways in 1934. He was continuously active in the State Employees Association, attaining the presidency in 1948.

He is survived by his wife, Vetabelle, in Ashland, Ore., and by his daughter, Paulena Carter Wormser.

Dutch Engineer Retained for Barrier Study

GOVERNOR GOODWIN J. KNIGHT has been advised that Mr. C. Biemond, eminent Dutch engineer, has accepted an offer from the Water Project Authority to serve for a period of eight weeks as a consulting engineer for the San Francisco Bay Salinity Barrier Investigation.

Biemond will arrive in Sacramento on June 15th, Frank B. Durkee, State Director of Public Works, said. He will meet with members of the permanent board of consultants headed by Raymond A. Hill, Los Angeles, currently engaged in a study of the salinity control barrier problem, and with A. D. Edmondston, State Engineer, and members of his staff in charge of the study. Biemond is Director of the City Water Works of Amsterdam. His employment was approved at a meeting of the Water Project Authority on April 27th.

On a recent visit to Amsterdam, Hill interviewed several Dutch engineers and upon his return he and his associate consultants recommended that Biemond be employed. The scope of Biemond's services will cover participation in the work of the permanent board of consultants and advice to the Division of Water Resources in their investigations of the physical and economic feasibility of a barrier or barriers across San Francisco Bay, Durkee, Chairman of the Water Project Authority, said. The next meeting of the board of consultants is scheduled to commence July 21st.

In Memoriam

BRADFORD J. PERRY

Death has taken Bradford J. Perry, age 69 years, retired District X Right-of-way Agent, in Vallejo, on April 27, 1954.

Mr. Perry, known to his friends and associates as "Brad," was born in Berton, Kansas, on December 13, 1884. He came to Vallejo in 1909, where with his father, they operated the Solano Hotel, Brad also working as a traveling salesman in Solano and Napa Counties.

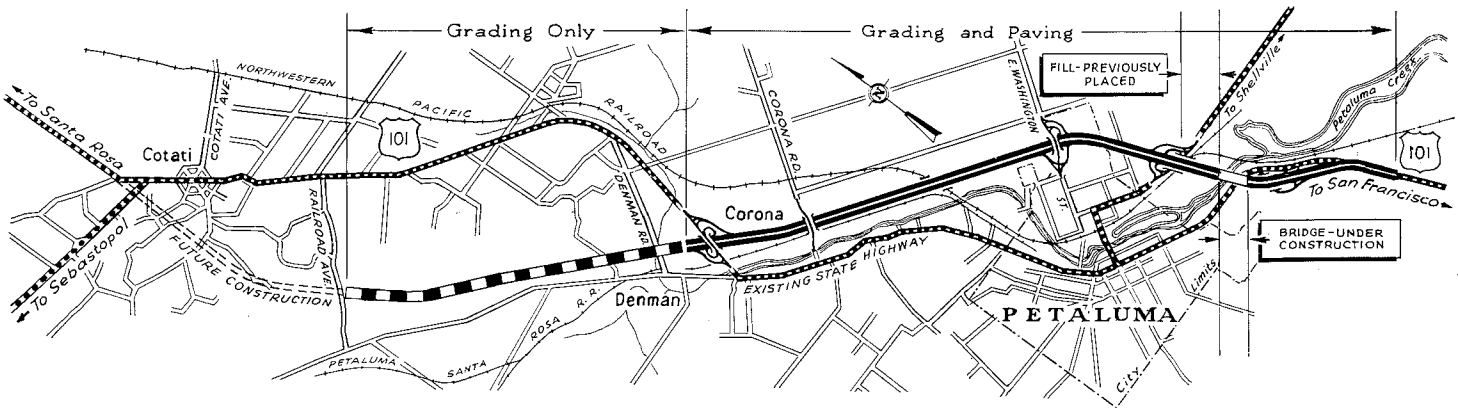
He entered the service of the State Division of Highways on January 15, 1931, in District X, as Assistant Right-of-way Agent, and was promoted to District Right-of-way Agent on October 1, 1933, the position he held until retirement from state service on June 14, 1948.

Brad maintained a keen interest in athletics and sports. During his early days, Brad gained considerable prominence in the Vallejo area as an outfielder with the old Vallejo semipro baseball nine prior to World War I. He also saw action with the old California State League in his heyday. He was a star football player for the Vallejo team in a semipro league.

He was a member of Vallejo Lodge No. 559, Benevolent and Protective Order of Elks, who officiated at the funeral services.

Brad possessed an outstanding personality and pleasant manner. He made and retained friends wherever he went and will ever be remembered for his loving kindness, assistance and cooperation.

He is survived by his sister, brother and four nieces.



Quick Thinking Saves Life of Diver Working on State Bridge

QUICK THINKING and courage on the part of Gilbert B. Wilson, diver tender, averted a tragedy on the Richmond-San Rafael Bridge. Wilson saved the life of Charles J. Wendell, Diver-Construction Inspector, and has been officially commended by Director of Public Works Frank B. Durkee and Norman C. Raab, Projects Engineer of the Division of San Francisco Bay Toll Crossing.

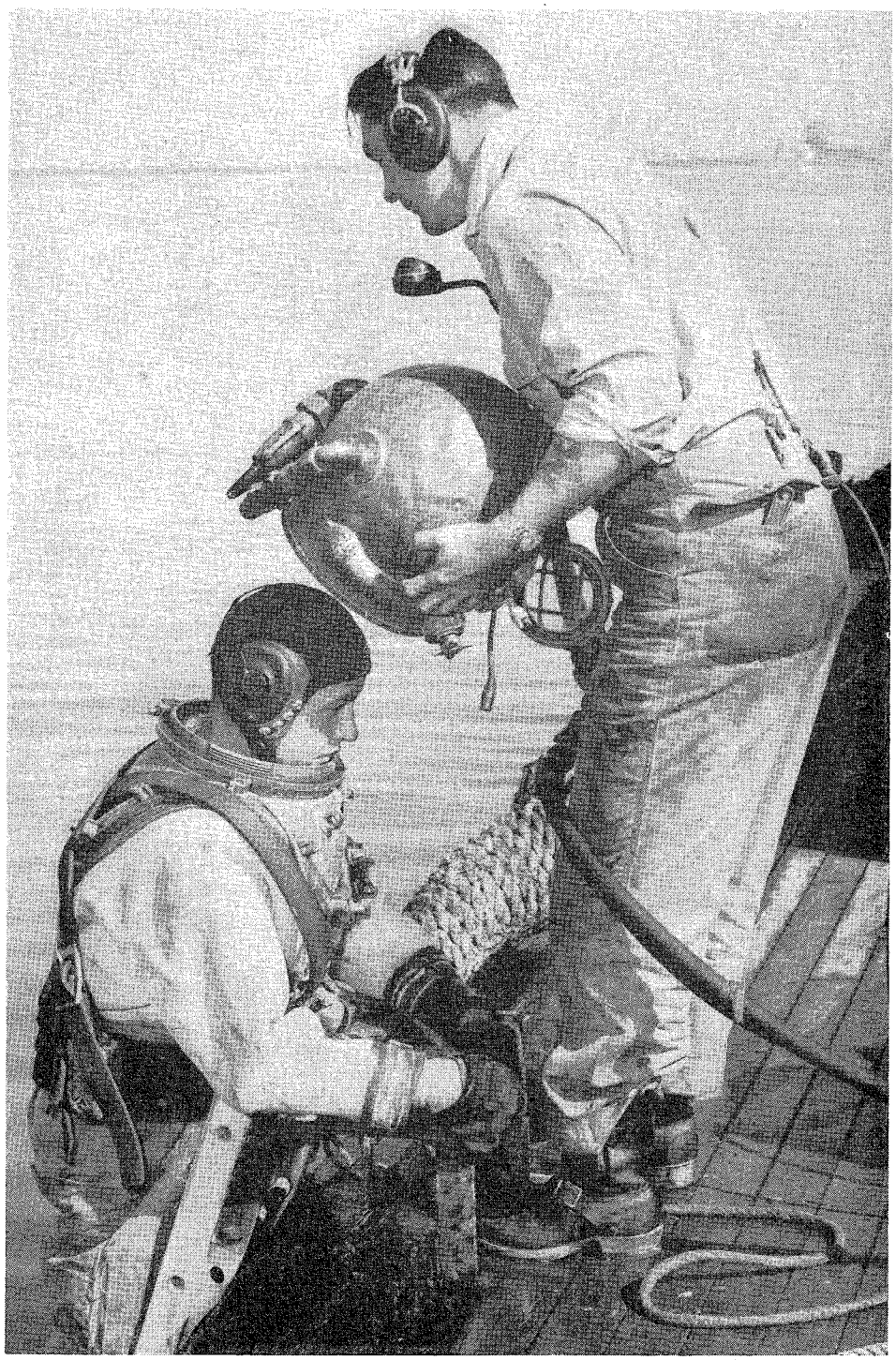
In a succinct report of the incident to his superiors, Wendell said, "On starting to enter the west diaphragm from the NW shaft, one of the No. 11 vertical bars fell, fouling the diver's air hose and telephone cable. In trying to free myself I turned upside down.

"Rather than risk rupturing the dress or inflating myself to such an extent that movement would become impossible, it was necessary to close off the supply of air, which allowed water to enter the suit and collect in the helmet. The tender, G. B. Wilson, was informed of my predicament. He handed the phones to the engineer-in-charge, and immediately jumped into the water and was able to climb down the bar steel about 10 feet below water to reach me. I had floated up to the free length of my lines from point of entanglement. In the meantime, I had lapsed into unconsciousness from lack of oxygen. The tender was able to right me and, with the assistance of the engineer-in-charge and the boat operator, pulled sufficient slack in the lines to get me to the surface. The face plate was opened and the air supply turned on. At this point I regained consciousness.

"If it had not been for the courage and cool-headedness of the tender, G. B. Wilson, I probably would not be writing this report. He should be highly commended for his prompt and courageous action."

Director Durkee wrote to Wilson:

"I wish to join with Mr. Raab in commending you for your courage and the efficient manner in which you handled this emergency. This also will express appreciation on behalf of the entire Department of Public Works."



In this photograph C. J. Wendell, diver, is being prepared for an underwater trip by G. B. Wilson, the diver's tender, right, whose courage saved the life of Wendell. Photo courtesy Richmond Independent.

Retirements *from* Service

Bert A. Reber

Bert A. Reber, a state employee since 1921, retired May 8th from his position as an associate highway engineer with the Division of Highways. He last served in the Reports and Statistical Sections of the division.

BERT A. REBER

With the exception of two short periods as Engineer and Superintendent of the Alleghany-El Dorado Gold Mining Company, Alleghany, California, Reber's service with the State has been continuous for a total of more than 31 years.

Reber was born in Lindsay, Nebraska, December 22, 1892. He received his earlier education in the Butte, Montana, grade and high schools and later was graduated in 1915 as an engineer of mines from the University of Montana, School of Mines.

Early positions were with the Anaconda Copper Mining Company, North Butte Copper Company, and as engineer and assayer for the Boston and Corbin Copper and Silver Mining Company. All were in Montana.

Reber designed and supervised the construction of the hydroelectric power plant for the Absarokee Power Company, Absarokee, Montana. He then supervised the early operation of the plant until December of 1918.

Until he became associated with the Department of Public Works in December, 1921, as a hydraulic engineer with the former Division of Engineering and Irrigation, Reber worked for several mining companies as engineer, geologist, flotation mill operator, supervisor of leases and as mine and mining examiner.

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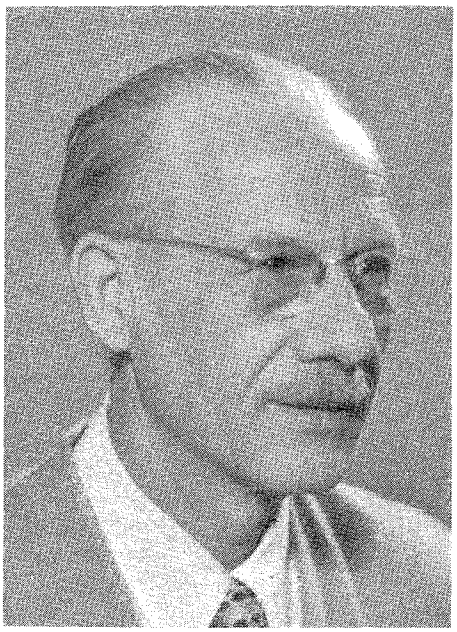
H. C. Van der Goes

HENRY C. VAN DER GOES, Associate Architectural Draftsman, retired from the Bridge Department April 30, 1954.



HENRY C. VAN DER GOES

"Van," as he prefers to be called, was born in Holland December 23, 1892. His formal education included attendance at the Netherlands branch of Beaux Arts. Following this he traveled extensively in western Europe.

His American experience in all branches of architecture and allied engineering was obtained in the Midwest and California. This work involved both design and construction of industrial and office buildings, schools, colleges, churches, apartments, hospitals and bridges.

He entered state service with the Division of Architecture January 20, 1936, transferred to Headquarters Office of the Division of Highways October 16, 1941, and to the Sacramento Office of the Bridge Department January 20, 1943.

Ruth Miles Wallauer

As a young lady, Ruth Miles on November 19, 1917, entered state service as a stenographer for the Department of Education. As Mrs. Ruth Miles Wallauer she retired on April 1, 1954, with the classification of permanent intermittent stenographer-clerk after many years of duty with the Department of Public Works, Division of Highways.

RUTH MILES WALLAUER

On July 1, 1918, she transferred to the Division of Highways; in November, 1922, went back to the Department of Education and on January 15, 1924, transferred to District X, Division of Highways.

On October 15, 1925, Ruth was granted a leave of absence to go to Europe and upon her return in 1926 was reinstated in District X. She resigned in April, 1934, to become Mrs. Carl Wallauer.

In July, 1934, she was given the title of permanent intermittent stenographer-clerk and served at intervals as her services were required in the Equipment Department, Central Office and Service and Supply Department of the Division of Highways and in the office of the Director of Public Works.

In the Department of Education in 1922 and 1923, Ruth was secretary-stenographer to Herbert R. Stoltz, Chief, Division of Physical Education, and in Highway District III and X was employed as chief stenographer.

His professional work was interrupted for a year and a half in World War I during which he was on the French battlefronts in the Field Artillery. For a considerable period his disability resulting from the war has been

. . . Continued on page 62

John D. Moore

John D. Moore was honored by associates on May 6, 1954, with a noontime testimonial ceremony on the occasion of his last day with the Division of Architecture before retirement after completing 28 years with the State. Moore, the son of Edward M. and Gertrude Emily (Faulkner) Moore, was born on April 29, 1882, at Bayshore, New York. He attended grade schools and Islip High School at Islip, New York. The Moores moved to Batty, Nevada, in 1906. Then John obtained a job as freight clerk with the Las Vegas Tonapah Railroad. In 1907 he became freight clerk for the Tonapah Railroad at Springdale, Nevada. In the latter part of that same year he moved to Los Angeles where he was employed as a bookkeeper by the German Trust and Savings Bank from 1907 to 1914, subsequent to which he was the general bookkeeper for the Merchants National Bank of Los Angeles from 1914 to 1918. In the latter year he went to Alaska where he prospected for three years, after which he hauled fuel for the Fairbanks Golddredge Company. He returned to California in December, 1922.

JOHN D. MOORE

The month of June, 1927, stands out as the most important month in Moore's life as it was in that month that he married Isabel Kimbell, originally from New Jersey. They have one daughter, Jesse Gertrude.

On June 14, 1927, Moore went to work for the Division of Highways. He was hired as a heavy truck operator, operating heavy trucks on force account road construction on the San Bernardino Big Bear Road. In 1928 when force account road construction was curtailed he was transferred to the Maintenance Department, being stationed in Westmorland from 1928 to 1930. In the latter year he was placed in charge of special handling of equipment in the Imperial Valley, and subsequently became subforeman in Indio and foreman on the San Bernardino-Running Springs Road. In 1931 he was assigned to the District VIII office in San Bernardino as assistant to the Assistant Maintenance Engineer with the title of timekeeper. A brief tour of duty in the field at Cajon Pass as maintenance leading man was followed by a 12-year assignment at Keen Camp, Riverside County, as property and equipment control man. In September, 1947, he was promoted to the rank of field office assistant in the Division of Architecture and assigned to the Division of Architecture's San Diego Office. When this became the headquarters for the Division of Architecture's District 6 in January, 1949, Moore assumed the function of chief clerk of the district. In this latter capacity he was in charge of all property, equipment, maintenance, fiscal, and clerical operations.

Mr. and Mrs. Moore intend to retire to their ranch at Stonyford, Colusa County, the northern boundary of which he points out is the deer hunting preserve boundary which gives him full season participation from his front porch. He intends to spend his time ranching and possibly traveling.

H. C. VAN DER GOES

Continued from page 61 . . .

recurring to such an uncomfortable extent as to cause his retirement. By having created new and enduring styles of bridge architecture he leaves an indelible imprint upon our bridges by economically combining functionalism and beauty. This spirit will be fostered by his assistants whom he trained. Training the men who work with him has always been one of his proudest accomplishments.

Van's art work has been reproduced in numerous publications and has been of inestimable value in developing public relations for the Division of Highways, besides assisting our designers in judging the finished appearance of their projects. He was also an expert in turning out realistic models to illustrate his ideas.

Henry with his wife Eda resides at 3114 Sixth Avenue, Sacramento. They have a week-end retreat somewhere in Pollock Pines. At both places there is ample equipment and opportunity for this artist-craftsman to enjoy his future leisure.

Francis B. Stewart

FRANCIS B. STEWART, Associate Highway Engineer in District XI at San Diego, will retire on July 1st after 23 years with the Division of Highways.

Stewart's career with the division began in 1931 when he went to work as an assistant resident engineer in District III, then located at Sacramento. In February of 1933 he was transferred to Los Angeles, and seven months later moved to San Diego where he first served as chief draftsman of the newly formed District XI and later as resident engineer on many important construction projects in the southern part of the State.

Stewart's services have proven particularly valuable in connection with special investigations, such as the scouting of material sites and the study and solution of complex hydraulic and drainage problems.

A native of Ashton in Clark County, Missouri, Stewart received his C.E. degree from the University of Missouri in 1915. From 1915 to 1922 he did surveying and general consulting work on various private drainage, sanitation, highway and mining projects. In 1923 he went to work for the Missouri Highway Department, first as chief of party, and later as resident engineer on highway and bridge construction jobs.

From 1926 to 1930 he was with the Kansas Highway Department, also as a resident engineer on bridge and highway projects.

BERT A. REBER

Continued from page 61 . . .

After service as a hydraulic engineer, Reber transferred to the Division of Highways as a civil engineering draftsman and served several years in Districts III and X. He was transferred to Headquarters in July, 1948.

HIGHWAY BIDS AND AWARDS

March, 1954

ALAMEDA COUNTY—At the San Francisco-Oakland Bay Bridge Distribution Structure in the City of Oakland, structure additions and miscellaneous road work to be constructed. District IV, Route 5, 69. Rothschild, Raffin & Weirick & Pacific Bridge Co., San Francisco, $4,314,071.50; Charles L. Harney, Inc., San Francisco, $4,441,086.25; Walsh Construction Co., San Francisco, $4,474,308; Stolte Inc., Gallagher and Burk, Inc., and Fred J. Early Jr., Co., Inc., Oakland, $4,523,481.25; M & K Corporation, Frederickson & Watson Construction Company and J. H. Pomeroy Company, Inc., San Francisco, $4,542,498.85; Williams & Burrows Inc., and Carl N. Swenson Company, Inc., South San Francisco, $4,560,536.85; Guy F. Atkinson Company, South San Francisco, $4,566,706.50; Peter Kiewit Sons' Company, San Francisco, $4,587,679; B. J. Ukropina, Polich, Kral, and John R. Ukropina, San Gabriel, $4,673,087; A. Teichert and Son, Inc., and John C. Giest, Sacramento, $4,686,772. Contract awarded to MacDonald, Young & Nelson, Inc., Morrison-Knudson Company, Inc., San Francisco, $4,194,461.50.

CONTRA COSTA COUNTY—In the City of Walnut Creek at the intersection of Mt. Diablo Boulevard and Oakland Boulevard, a left storage lane to be constructed. District IV, Route 75, Section A. Ransome Company, Emeryville, $7,452; Gallagher & Burk Inc., Oakland, $7,583.90; O. C. Jones & Sons, Berkeley, $7,882.25; McGuire & Hester, Oakland, $7,945.25; Lee J. Immel, San Pablo, $7,979.50; J. Henry Harris, Berkeley, $9,016; Orinda Excavating and Paving Company, Lafayette, $9,240.60; Independent Construction Company, Oakland, $9,500.75. Contract awarded to John A. Carstensen, Castro Valley, $6,980.35.

CONTRA COSTA AND SOLANO COUNTIES—At Martinez and Benicia, the existing ferry slips to be repaired. District X, Route 75. H. F. Lauritzen, Pittsburg, $57,883.50; The Duncanson-Harrelson Company, Richmond, $59,350; Lord and Bishop, Sacramento, $60,240; Pacific Bridge Company, San Francisco, $68,550.50; Stolte Inc., and Cantor & Coull, Alameda, $73,155. Contract awarded to Healy Tibbitts Construction Company, San Francisco, $52,230.

HUMBOLDT COUNTY—Between 11.8 miles south and 1.2 miles north of Dyerville, nine (9) redwood trees to be felled, stumps removed, and portions of roadbed to be widened by grading and placing plant-mixed surfacing. District I, Route 1, Sections C and D. John Burman & Sons, Eureka, $12,275; Guy B. Hayden, Redway, $12,947; Mercer Fraser Company and Mercer Fraser Gas Company, Inc., Eureka, $13,990; Arthur B. Siri, Inc., Santa Rosa, $19,750. Contract awarded to Paul E. Woof, Fresno, $11,455.

HUMBOLDT COUNTY—Between 13 miles and 39 miles north of Eureka, drainage facilities to be constructed. District I, Route 1, Section I, J. Humboldt Construction Inc., Eureka, $3,923. Contract awarded to Mercer Fraser Company & Mercer Fraser Gas Company, Eureka, $3,108.36.

INYO COUNTY—For constructing cottage in Inyo County at Shoshone Maintenance Station. District IX, Route 127, Section P. Indian Wells Construction Company, Ridgecrest, $16,650; Dill and Robinson, Banning, $17,396. Contract awarded to Joseph A. Schlapp, Bishop, $15,669.

KERN COUNTY—Between Rademacher and Ridgecrest Road, bituminous surface treatment to be applied to shoulders. District IX, Route 145, Section B. Oilfields Trucking Company and Phoenix Construction Company Inc., Bakersfield, $6,326.50; Robert E. L. Parker Company, Claremont, $7,365; James E. Roberts, San Bernardino, $7,717; Geiser Construction Company, Buena Park, $8,163.75; George E. France Inc., Visalia, $11,729. Contract awarded to Bishop Engineering and Construction Company, Bishop, $6,093.60.

LOS ANGELES COUNTY—City of Los Angeles, at the Ramona Freeway-Santa Ana Freeway interchange, highway lighting and illuminated sign system to be furnished and installed. District VII, Route 2, 26. Mel Dennett Electric, San Bernardino, $32,747; Fischbach and Moore Incorporated, Los Angeles, $39,240; C. D. Draucker Inc., Los Angeles, $39,755; Chagnon Electric Company Inc., Baldwin Park, $40,910; A. S. Schulman Electric Company, Los Angeles, $43,623; Westates Electrical Construction Company, Los Angeles, $47,810. Contract awarded to Electric and Machinery Service, Inc., South Gate, $32,516.

LOS ANGELES COUNTY—In the City of Santa Monica between Olympic Boulevard and the southeasterly city limits about 1.3 miles in length to be widened and surfaced with asphalt concrete on existing surfacing and on untreated rock base. District VII, Route 60, Section SMca. M. S. Mecham and Sons, South Gate, $235,108.70; Griffith Company, Los Angeles, $240,365.50; Schroeder & Company, Sun Valley, $240,677.40; Vernon Paving Company, Los Angeles, $245,116.50; Oswald Bros. Company, Los Angeles, $251,472.60; R. R. Hensler, Sun Valley, $256,914.50; Robert E. L. Parker Company, Claremont, $291,697.70. Contract awarded to George Savala Paving Company, Hawthorne, $224,383.50.

LOS ANGELES COUNTY—Near the City of Maywood, Eastern Avenue at Cheli Air Force Base, a reinforced concrete undercrossing to be constructed and about 0.4 mile of roadway to be graded and surfaced with asphalt concrete on untreated rock base. District VII, Route 167, Section B. J. A. Thompson & Son, Inglewood, $136,301; Vido Kovacevich Company, Rosemead, $137,142.50; Griffith Comany, Los Angeles, $140,163; Ukropina, Polich, Kral and John R. Ukropina, San Gabriel, $142,629; J. E. Haddock, Ltd., Pasadena, $142,654.70; Norman I. Fadel, Inc., North Hollywood, $144,436.60; C. O. Sparks Inc., and Mundo Engineering Company, Los Angeles, $146,430.60; W. F. Maxwell Company, Los Angeles, $146,815; Byerts and Sons, Los Angeles, $147,732; Webb and White, Los Angeles, $153,868.10; E. S. and N. S. Johnson, Fullerton, $153,888.50; Westway Excavating Company, Los Angeles, $158,349. Contract awarded to N. M. Saliba Company, Gardena, $124,897.

LOS ANGELES COUNTY—Firestone Boulevard between Studebaker Road and Orr & Day Road, about 0.5 mile in length to be graded and surfaced with plant-mixed surfacing on untreated rock base and construct a reinforced concrete slab bridge. District VII, Route 174, Section B. Webb and White, Los Angeles, $387,257; Griffith Company, Los Angeles, $404,307.50; Cox Brothers Construction Company, Stanton, $422,035; Norman I. Fadel, Inc., North Hollywood, $454,351; W. F. Maxwell, Los Angeles, $489,757.50. Contract awarded to B. J. Ukropina, Kral, Polich, and John R. Ukropina, San Gabriel, $368,371.

RIVERSIDE COUNTY—Between Coachella Storm Channel and Jackson Street in Indio, about 2.1 miles to be graded and surfaced with plant-mixed surfacing on cement treated base and portions to be resurfaced with plant-mixed surfacing and on existing reinforced concrete bridge to be widened. District XI, Route 26, Section E. Basich Brothers Construction Company, R. L. Basich and N. L. Basich, South San Gabriel, $292,203.20; Norman I. Fadel, Inc., North Hollywood, $294,791.50; E. L. Yeager Company, Riverside, $307,861.25; Matich Brothers and Matich Brothers Paving Company, Colton, $313,732.25; Cox Brothers Construction Company, $318,234.65. Contract awarded to Ralph B. Slaughter, Julian, $266,614.25.

SACRAMENTO AND SAN JOAQUIN COUNTY—Across North Fork Mokelumne River at Miller's Ferry, a structural steel swing span bridge to be constructed and approaches to be graded and surfaced with plant-mixed surfacing. District III, Route 900. Payne Construction Company, Oakland, $308,625.85; Rolandi, LeBoeuf and Dougherty, Erickson & Pierson, Richmond, $311,494.55; Guy F. Atkinson Company, South San Francisco, $320,160.40; Stolte Inc., and Cantor and Coull, Oakland, $320,733.29; The Duncanson-Harrelson Company, Richmond, $333,756; Granite Construction Company, Watsonville, $337,377; Dan Caputo-Edward Keeble, San Jose, $342,087; George Pollock Company, Sacramento, $343,978.10; James B. Allen, San Carlos, $357,618; Thomas Construction Company, Fresno, $377,256.90; Wixson & Crowe, Inc., Redding, $385,106. Contract awarded to Lord and Bishop, Sacramento, $292,771.40.

SAN BERNARDINO COUNTY—For modifying traffic signal system and constructing concrete curb widening in San Bernardino County, at intersection of Colton Avenue and Waterman Avenue; District VIII, Route 26, Section A. Paul R. Gardner, Ontario, $9,980. Contract awarded to Drury Electric Company, San Bernardino, $9,291.

SAN BERNARDINO COUNTY—Between 0.5 mile south of Gish Underpass and Palmdale Road, about 17.4 miles in length to be graded and surfaced with plant-mixed surfacing on cement treated base and existing surfacing and two railroad underpasses to be extended. District VIII, Route 31, Sections B,C. R. A. Westbrook and Morrison-Knudsen Company Inc., J. V., Los Angeles, $1,575,708.50; Ukropina, Polich, Kral, and John R. Ukropina and Madonna Construction Company, San Gabriel, $1,576,474.95; Peter Kiewit Sons' Company, Arcadia, $1,576,498.85; John Delphia-John M. Ferry, Gordon H. Ball and San Ramon Valley Land Company, Patterson, $1,640,355.80; Clyde W. Wood and Sons, Inc., and Matich Brothers, North Hollywood, $1,647,140.10; Vinnel Company Inc., and Subsidiaries, Vinnell Constructors, Alhambra, $1,666,158; Dimmitt and Taylor and George Herz and Company, Monrovia, $1,682,063.95; J. E. Haddock, Ltd., Pasadena, $1,683,042.80; Frederickson and Kasler, Sacramento, $1,691,547.65; A. Teichert and Son, Inc., Baldwin Park, $1,693,418.50; Basich Brothers Construction Company, R. L. Basich and N. L. Basich, South San Gabriel, $1,728,158.65; Granite Construction Company, Watsonville, $1,763,973; G. W. Ellis Construction Company and L. A. and R. S. Crow, North Hollywood, $1,797,321.65; E. L. Yeager Company, J. A. Payton and E. L. Yeager Paving Company, Inc., Riverside, $1,858,617.10; McCammon-Wunderlich Company, Palo Alto, $2,015,958.12; R. R. Hensler, Sun Valley, $2,062,506.30. Contract awarded to Griffith Company, Los Angeles, $1,544,688.35.

SAN BERNARDINO COUNTY—At the intersection of Euclid Avenue with Fourth Street in the City of Ontario, traffic signal system and highway lighting to be furnished and installed. District VIII, Route 192. Electric and Machinery Service, Inc., South Gate, $17,110; Fischbach and Moore, Incorporated, Los Angeles, $17,777; C. D. Draucker Inc., Los Angeles, $18,820; Drury Electric Company, San Bernardino, $23,823. Contract awarded to Paul R. Gardner, Ontario, $16,240.

SAN FRANCISCO COUNTY—In the City and County of San Francisco, at Harbor Piers 24 and 26 and transit shed between Harbor Piers 24 and 26, automatic sprinkler system to be repaired. District IV, Route 68; Rockwood Sprinkler Company, San Francisco, $9,852. Contract awarded to Grinnell Company of the Pacific, San Francisco, $9,406.70.

SAN JOAQUIN COUNTY—On San Joaquin River at Garwood Ferry and on Potato Slough at Terminous Timber Pile, dolphins for two existing bridges to be constructed. District X, Route 75,53, Section A,C. Elmer G. Wendt, Rio Vista, $31,786; Lord and Bishop, Sacramento, $33,080; Healy Tibbitts Construction Company, San Francisco, $34,420; LeBoeuf-Dougherty Contracting Company and Erickson and Peirson, Richmond, $37,561; H. F. Lauritzen, Pittsburg, $39,693; Pacific Bridge Company, San Francisco, $57,500. Contract awarded to Stolte Inc., Cantor & Coull, Oakland, $27,585.

SAN LUIS OBISPO COUNTY—Between 13.6 miles and 15.3 miles north of San Simeon at various locations, metal plate guard rail to be constructed. District V, Route 56, Section A. Wulfert Company, San Leandro, $2,864.80; L. J. Grey & Sons, San Luis Obispo, $2,939.30; P. J. Zuiderweg, San Luis Obispo, $3,941.20; Bickmore-Harper, Inc., Santa Maria, $4,236; D. E. Higday, Temple City, $4,828.80; Stolte, Inc., Monterey, $4,903.56; Walter Bros., San Luis

Obispo, $7,764. Contract awarded to D. D. Galbraith & Robert F. Batty, Lompoc, $2,574.97.

SAN LUIS OBISPO COUNTY—San Luis Obispo County, Paso Robles Maintenance Station, Riverside Avenue at Sixth Street in the City of Paso Robles, truck shelter to be constructed. District V. Charles G. Wiswell, Pismo Beach, $11,985; Stolte, Inc., Monterey, $12,661. Contract awarded to E. C. Livingston Company, Inc., Paso Robles, $11,914.

SAN MATEO COUNTY—Between 1.7 miles south of La Honda Road and 3.0 miles north of Alpine Road (portions) about 1.4 miles in net length to be surfaced with plant-mixed surfacing on untreated rock base. District IV, Route 55, Section D. John A. Carstensen, Castro Valley, $37,445; O. C. Jones & Sons, Berkeley, $39,218.25; Douglass and Woodhouse, Redwood City, $39,270.80; L. C. Smith Company, San Mateo, $39,899.50; Browne and Krull, Los Altos, $40,824.50; Bragato Paving Company, Belmont, $41,601; George C. Renz Construction Company, Inc., Gilroy, $45,113.50; Granite Construction Company, Watsonville, $46,430; Joseph McFadden and Sons Inc., Palo Alto, $46,526.60; J. Henry Harris, Berkeley, $47,748.25; S.A.E. Company, Redwood City, $48,913.25. Contract awarded to Leo F. Piazza Paving Company, San Jose, $37,-217.10.

SAN MATEO COUNTY—In the City of Daly City on Alemany Boulevard at the intersection with Lynnewood Drive-Lake Merced Boulevard and at the intersection with Park Plaza Drive-Cliffside Drive, traffic signal systems, highway lighting and channelization to be constructed. District IV, Route 56, Section DLC. Charles L. Harney, Inc., San Francisco, $90,495.70; George C. Renz Construction Company, Inc., Santa Clara, $91,555.25; The Lowrie Paving Company, Inc., San Francisco, $93,098; O. C. Jones & Sons, Berkeley, $95,412; Eaton & Smith, San Francisco, $100,888; J. Henry Harris, Berkeley, $101,-948.90; The Fay Improvement Company, San Francisco, $102,202.70. Contract awarded to L. C. Smith Company, San Mateo, $85,155.

SANTA CLARA COUNTY—Between 0.2 mile south and 0.2 mile north of Hamilton Avenue, about 0.4 mile in length to be widened and surfaced with plant-mixed surfacing and traffic signals and highway lighting to be installed. District IV, Route 5, Section Cmb,B. L. C. Smith Company, Inc., San Mateo, $43,965.50; Joseph McFadden and Son Inc., Palo Alto, $45,208.40; Leo F. Piazza Paving Company, San Jose, $47,478.50; George C. Renz Construction Company, Inc., Santa Clara, $47,846.80; Granite Construction Company, Watsonville, $50,407. Contract awarded to A. J. Raisch Paving Company, San Jose, $40,996.90.

SANTA CRUZ COUNTY—On Mt. Hermon Road between Camp Evers and Mt. Hermon, about 1.3 miles in length to be graded and surfaced with plant-mixed surfacing on untreated rock base. District IV, Route 1144. Leo F. Piazza Paving Company, San Jose, $87,340.58; Fredrickson Brothers, Emeryville, $99,786.90; George C. Renz Construction Company, Gilroy, $102,999.15; S. A. E. Company, Redwood City, $106,099.25; Edward Keeble, San Jose, $107,-646; Transocean Engineering Corporation, Hayward, $110,064; Guerin and Morgan, Los Gatos, $110,-207.60; Joseph McFadden and Son Inc., Palo Alto, $124,599.26; Paul E. Woof, Fresno, $131,222; McGuire and Hester, Oakland, $133,581.65. Contract awarded to Granite Construction Company, Watsonville, $86,628.

TULARE COUNTY—Prefabricated metal buildings and a loading platform to be constructed at Orosi Maintenance Station on El Monte Way, District VI, Route 130, Section A. Robert Jolly Construction Company, Fresno, $12,220; R. T. Dealy Company, Inc., Avenal, $12,719; Lewis C. Nelson & Sons, Selma, $12,734; Guy L. Munson Company, Dinuba, $12,790; Ralph Utter, Tulare, $16,599. Contract awarded to L. B. Pipes Company, Fresno, $11,699.

TULARE COUNTY—At Deer Creek, about 14 miles south of Corcoran, corrugated metal pipes to be installed and about 0.2 mile of roadway to be graded and bituminous surface treatment to be applied. District VI, Route 135, Section B. Irv. Guinn Contractor, Bakersfield, $11,667.75; Thomas Construction Company, Fresno, $12,532.10; Gene Richards Inc., Fresno, $12,710.50; Paul E. Woof, Fresno, $12,-891.20; Gill Construction Company, Bakersfield, $13,062.25; Stewart & Squire Contractors, Corcoran, $13,203.75; Baun Construction Company, Fresno, $13,294.20; Volpa Brothers, Fresno, $13,442.88; Central Valley Construction Company, Hanford, $13,715; Griffith Company, Los Angeles, $15,675.50; Dicco Inc., Bakersfield, $16,557.75; L. B. Wells Construction Company, Visalia, $17,462.50; Stewart & Nuss Inc., Fresno, $17,984.25; N. M. Saliba Company, Los Angeles, $17,986.50; Hermreck and Easter Contractors, Santa Maria, $19,436. Contract awarded to Phoenix Construction Company, Inc., Bakersfield, $10,815.10.

April, 1954

ALAMEDA COUNTY—Between Hacienda Road and Dublin, about 4.9 miles in length, to be surfaced with plant-mixed surfacing on existing pavement and untreated rock base, and drainage facilities to be constructed. District IV, Route 107, Section B. McGuire and Hester, Oakland, $97,338.50; Lee J. Immel, San Pablo, $97,398.80; Gallagher and Burk Inc., Oakland, $100,743.84; Independent Construction Company, Oakland, $101,699.60; Fredrickson Brothers, Emeryville, $101,963; O. C. Jones and Sons, Berkeley, $102,606.30; J. Henry Harris, Berkeley, $103,-922.50; Silva Brothers, Hayward, $104,228.20; Close Building Supply Inc., Hayward, $104,692.10; Browne and Krull, Los Altos, $104,711.20; Stanfield and Moody, Tracy, $108,272.10; John A. Carstensen, Castro Valley, $109,984.68; Lee Construction Company, San Leandro, $111,054.40; Charles L. Harney, Inc., San Francisco, $114,303.80; Ball and Simpson, Berkeley, $118,795.10; L. B. Wells Construction Company, Visalia, $121,131.80. Contract awarded to Clements Construction Company, Centerville, $94,482.38.

ALAMEDA COUNTY—Along and across Arroyo Seco and Arroyo Las Positas, at Livermore Bypass, about 1.4 mile east of Livermore, a reinforced concrete bridge to be modified, a reinforced concrete bridge and timber bridge to be constructed and channels to be excavated. District IV, Routes 5, 108, Sections F,A. R. G. Clifford and C. O. Bodenhamer, Berkeley, $88,786.80; Lew Jones Construction Company, San Jose, $91,036; Robert R. Murdoch, Oakland, $91,501.50; O. C. Jones and Sons, Berkeley, $96,390; Norman I. Fadel, Inc., North Hollywood, $98,516.50; James H. McFarland, San Francisco, $98,783; R. E. Maxwell Jr., and Charles S. Moore, Sonora, $99,063.50; S and Q Construction Company, South San Francisco, $100,840; Underground Construction Company, Berkeley, $102,319.80; McGuire and Hester, Oakland, $103,657; George C. Renz Construction Company, Inc., Santa Clara, $108,717; C. K. Moseman, Redwood City, $112,636.50; Fredrickson Brothers, Emeryville, $114,319.50; Oscar C. Holmes, Redwood City, $114,833; Friant Construction Company, Fresno, $115,055.50; Bos Construction Company and Ace Excavators, Berkeley, $123,-293.10; Johnson, Drake and Piper Inc., Oakland, $126,466.25; Edward Keeble, San Jose, $126,968.50. Contract awarded to Gene Richards, Inc., Fresno, $86,671.

AMADOR COUNTY — Between San Joaquin County line and 2.3 miles easterly, approximately seven miles southwesterly of Ione, about 2.3 miles in length, roadway to be graded and paved with plant-mixed surfacing on untreated rock base. District X, Route 97, Section A. John G. Mehren and Floyd O. Bailey, Sacramento, $160,725; A. Teichert and Son Inc., Sacramento, $163,851.25; Stewart and Squire Contractors, Corcoran, $166,947.40; Transocean Engineering Corp., Hayward, $167,348; McGuire and Hester, Oakland, $181,388.50; Thomas Construction Company, Fresno, $195,331; Nomellini Construction Company, Stockton, $197,944.50; Huntington Brothers, Napa, $199,871; Clyde W. Wood and Sons, Inc., North Hollywood, $207,313.50; M. J. Ruddy and Son, Modesto, $213,965.75; Harms Brothers, Sacramento, $218,075. Awarded to C. V. Kenworthy, Stockton, $154,808.10.

CONTRA COSTA COUNTY—In Mount Diablo State Park, between summit and Diablo Road, about 11.3 miles in length, to be widened and bituminous surface treatment applied. District IV. Gallagher and Burk, Inc., Oakland, $71,069; Fay Wills, Antioch, $73,711; Gordon L. Capps, Stockton, $75,522; McGuire and Hester, Oakland, $76,816; J. Henry Harris, Berkeley, $77,475.25; John A. Carstensen, Castro Valley, $87,944; L. B. Wells Construction Company, Visalia, $90,740; Gene Richards Inc., Fresno, $104,-000. Awarded to O. C. Jones and Sons, Berkeley, $68,370.

How Do We Blueprint?

Continued from page 55 . . .

gated for construction $1,122,000,000. We are presently investing in the improvement of our highway plant at the rate of about $1,000,000 every working day.

What are we accomplishing? In 1945 we had only 329 miles of multilane highway in our 14,000-mile system. Today we have 1,317 miles completed, under construction or advertised. One hundred twenty miles of this are constructed to full freeway standards and another 88 miles are under construction. Six hundred seven miles are constructed to expressway standards with limited access only; and the balance are four or more lanes of divided highway without limitation of access at the present time. We are now engaged in acquiring access along many miles of this presently unrestricted multilane highway.

Vehicle Registration Problem

Why are we doing all this? Well, I've already told you that we have 6,000,000 vehicles registered in California. That is about one-tenth of all the vehicles in the Country, and as recently as 1940 we had only 2,900,000. Our Hollywood Freeway in Los Angeles is carrying over 120,000 vehicles per day and predictions are that it will soon be carrying considerably in excess of that figure. Our San Francisco-Oakland Bay Bridge, with a designed capacity of 63,000 per day which was not expected to be reached until 1970 is now carrying an average of 87,000 vehicles per day with peaks as high as 109,000. Here's another way of more graphically stating our problem:

If all of the vehicles registered in California were traveling 40 miles per hour, at properly spaced intervals, they would fill a six-lane freeway stretching clear around the world at the equator; or they would occupy nine freeways of six lanes each stretching across the United States from the Atlantic to the Pacific.

And I might add that just to keep us in business our vehicle registration is increasing at the rate of about 7,000 every week.

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Governor of California
FRANK B. DURKEE . . Director of Public Works

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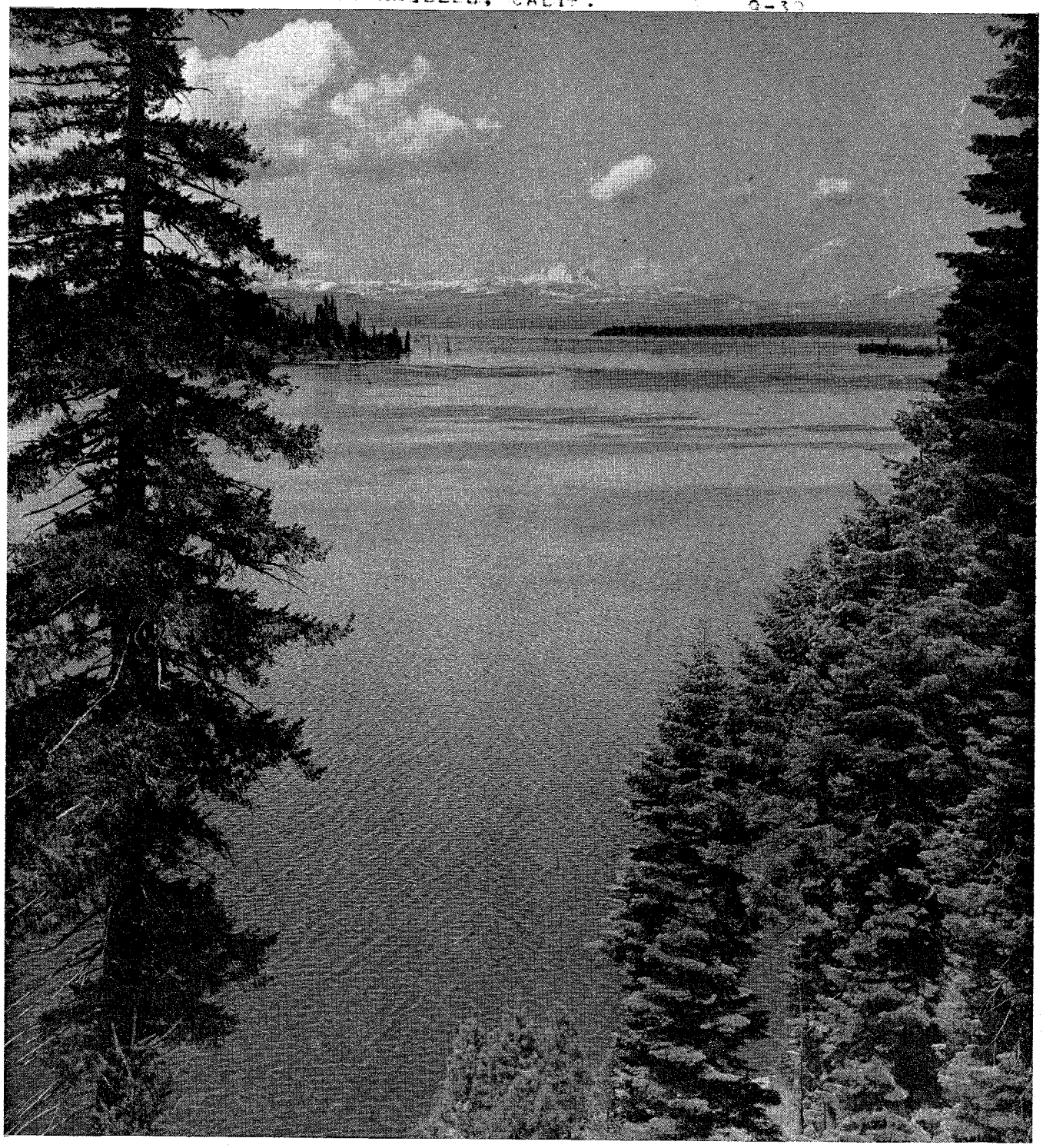

View of Lake Almanor in Plumas County taken from State Sign Route 89. Photo by Louis C. Dudley, Photographic Section, Department of Public Works.