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Looking west along the completed section of the Ventura Freeway in the San Fernando Valley. The view is from Hazelline Avenue. (See article "District VII" beginning on page 3)

California Highways and Public Works

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FRONT COVER—Looking south on the San Diego Freeway through the City of San Clemente, Orange County. The photo shows the modern type of freeway signing used in California, including the Interstate Route and US Route signs. This section of the San Diego Freeway was opened to traffic last November (See "District VII" beginning on page 3).

Photo by John F. Meyerpeter



BACK COVER—An architectural study of the ventilation building portal of the Hazelview Summit Tunnel on US 199 now under construction. The view is southwest toward Gasquet, Del Norte County. The completed tunnel will be more than 1,800 feet long with a 26-foot-wide roadway.

Drawing by W. H. Ludlow, Bridge Department

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CALIFORNIA HIGHWAYS AND PUBLIC WORKS

P. O. Box 1499

SACRAMENTO, CALIFORNIA

S.F. Vista

Temporary Sightseeing Area Installed
On Section of Embarcadero Freeway



THE DOUBLE-DECK Embarcadero Freeway in San Francisco was designed and built to carry four lanes of traffic on either deck, but until connecting sections are built it is operating far below capacity.

In August, 1960, Governor Edmund G. Brown approved a plan for temporarily converting part of the upper deck into a vista area for sightseers. A contract for the installation of protective fencing and timber curbs was completed on January 26, 1961, at a construction cost of \$28,000.

There are 60 parking places provided, along with strolling areas. Motorists reach the area on the north side via the on-ramp from Broadway and Sansome Streets, and leave at the south end, using the ramps which connect to the Bay Bridge and the James Lick (Bayshore) Freeway.

Experience during the first few weeks indicated that weather and special events will be major factors in the amount of use the area receives. The arrival and departure of a new luxury liner was viewed by quite a few motorists from the upper deck vantage point.



A view of the Embarcadero Freeway from the Ferry Building, showing the fenced-off vista area on the upper deck; Telegraph Hill and Coit Tower in the background.

LOWER LEFT—Four officials inspect the vista area on its opening day: left to right, Assistant State Highway Engineer J. P. Sinclair, San Francisco Chief Administrative Officer Sherman P. Duckel, San Francisco Mayor George Christopher, and State Director of Public Works Robert B. Bradford.
LOWER RIGHT—View of the entrance to the vista area from the Broadway on-ramp, looking toward the Ferry Building and the S.F.-Oakland Bay Bridge.



District VII

Freeway Completions, Current Construction Add Up To Encouraging Progress Picture

By E. T. TELFORD, Assistant State Highway Engineer



DISTRICT VII, comprising of Los Angeles, Orange and Ventura counties, is largely a metropolitan community. Since 1940, when it had 1,314,000 motor vehicles and a population of

2,986,000, the District has grown to

a motor vehicle registration of 3,840,000 and a population of 6,942,000. By 1980 it is anticipated motor vehicles and population will again double their numbers.

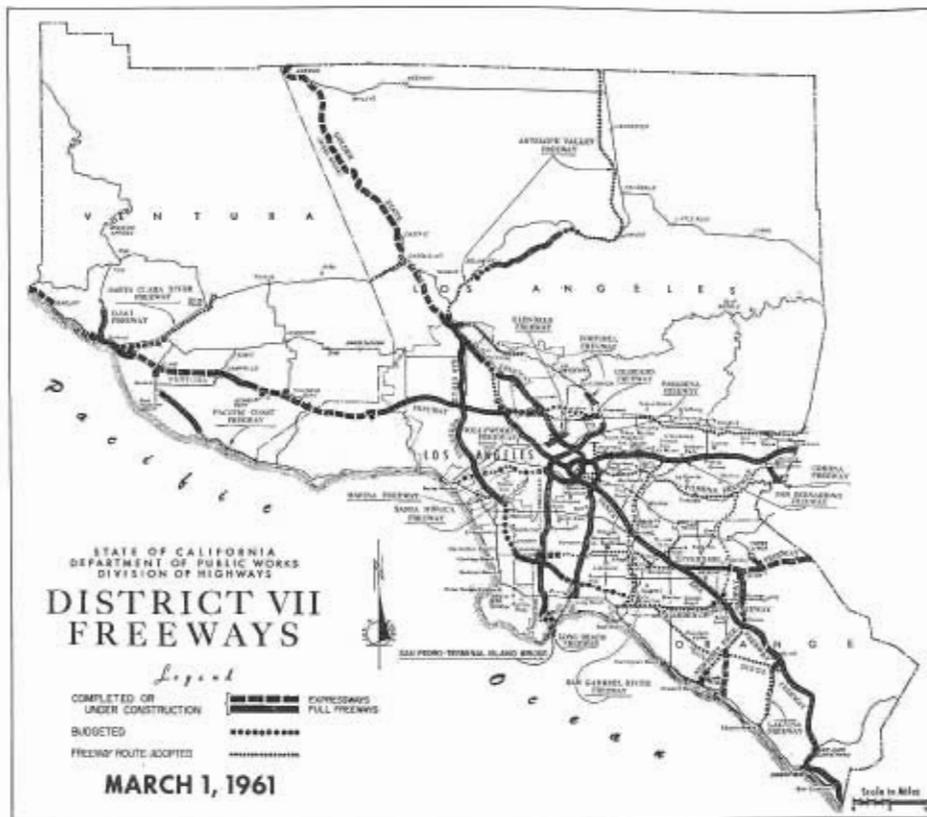
The metropolitan area can continue to grow only if it serves its proper purpose as a center of activity. To serve that purpose it must have facility of communication and transportation.

In the total plan of the metropolis, planning for transportation must consider the size and general scale of tomorrow's metropolitan area and distribution of the population needs. As a part of the transportation field, we are concerned with the metropolitan highway plan and primarily with the "freeway system."

The freeway system, a basic unit in an integrated system for motor ve-



Long Beach Freeway terminus. Connections to Long Beach City Street System south of Anaheim Street, bottom.



Freeway Progress. The above map shows the current status of freeway construction in the District VII area. Compare this with the map on the following page.

hicle transportation, offers no direct land-use service. It is through the major arterials, collectors and local land-service roads that the road network becomes a complete system. The effectiveness of the total system depends upon the proper balance between its parts.

Long-range planning is essential to the metropolitan freeway system, and it must have a sound basis in legislation. The California Legislature has maintained a long history of sound legislation, beginning around the turn of the century and most recently culminating with the enacting of Senate Bill No. 480 in 1959. This long-range framework of routes to be developed as freeways is essentially a framework of the future.

By Senate Bill No. 480, the Legislature has already provided for about 1,500 miles of the California freeway system in District VII. The California Highway Commission has adopted about 714 miles of these routes in this district.

At the close of 1960, the District had a total of \$171,608,500 under con-

tract on state highways and freeways covering a gross mileage of 163.4. During the 1960 calendar year the public received the use of another 25.5 miles of freeways representing a construction cost of \$42,950,000.

On the Golden State Freeway the sections between Sixth Street and Pasadena Avenue in Los Angeles were completed in March, 1960. The Harbor Freeway between 124th Street and 190th Street was completed in August.

The San Diego Freeway between Jefferson Boulevard and Venice Boulevard was completed in July. Two sections of the Ventura Freeway were completed in April and May for the respective portions between Laurel Canyon Boulevard and San Diego Freeway, and between Encino Avenue and Kelvin Avenue.

In Orange County, in December a section of the Pacific Coast Freeway between the San Diego Freeway and Serra Junction was completed in conjunction with the San Diego Freeway between Avenida Ramona in San Clemente and Ortega Highway in San

Juan Capistrano. In addition, the Riverside Freeway between Harbor Boulevard (formerly Spadra Road) and Placentia Avenue in Fullerton and Anaheim, was completed in January, 1960.

In addition, it is expected that 12.5 miles of freeway will be opened in 1961 and 62.9 miles in 1962.

The District now has the beginnings of a usable freeway system. The separate units of the system and the status of development on each unit or freeway follows:

Antelope Valley Freeway

The entire 54.5-mile length of the Antelope Valley Freeway (U.S. 6) was adopted by the California Highway Commission in the years 1955-56-57. Right of way expenditures at the close of 1960 amounted to \$697,000.

The Antelope Valley Freeway is an important highway in the northern part of Los Angeles County. This freeway will serve the High Sierra recreational areas as well as the governmental facilities of the U.S. Naval Ordnance Test Station at China Lake, Flight Test Center at Edwards Air Force Base and Air Force Plant 42 at Palmdale. It has also been designated as an escape route in case of atomic attack on metropolitan Los Angeles.

In March, 1956 the California Highway Commission adopted as a freeway portions from the Golden State Freeway to Solamint and from Vincent south of Palmdale to Avenue D, north of Lancaster. Because additional studies were required to establish an economical alignment through the rugged terrain from Solamint to Vincent, adoption of this segment was delayed until November, 1957. Standards for highway construction are continually being improved; therefore, studies are now under way for a more economical location of the portion from the Golden State Freeway to Solamint.

Bids for the initial construction project were opened on November 3, 1960, and the contract was awarded on December 1, 1960, for a low bid of \$7,168,660.

The project calls for grading of the roadbed, drainage structures, frontage roads, and realignment of existing county roads. The one item of road-

way excavation (7,700,000 cubic yards) accounted for nearly 56% of the total value of the bid submitted.

This project extends from Sand Canyon (approximately 9 miles north of the city limits of Los Angeles) for 10 miles to Escondido Canyon Road. The first portion of the project parallels the Santa Clara River to Lang. At this point it begins to traverse the rugged terrain across Agua Dulce Canyon Road and near Vasquez Rocks, reported in early California history as the bandit Vasquez' hiding place.

In an effort to place a usable facility in operation at the earliest possible time, the California Highway Commission has provided an additional \$8,000,000 in the 1961-62 construction budget to pave the initial grading project, construct bridge structures, and complete the freeway from Solamint to Red Rover Mine Road, a distance of 16 miles. The estimated completion date for this project is April, 1963.

As funds become available, additional segments of the Antelope Valley Freeway will be constructed. When completed from the Golden State Freeway near Los Angeles to the Kern County line, expenditures in excess of \$60,000,000 will have been made.

Artesia Freeway

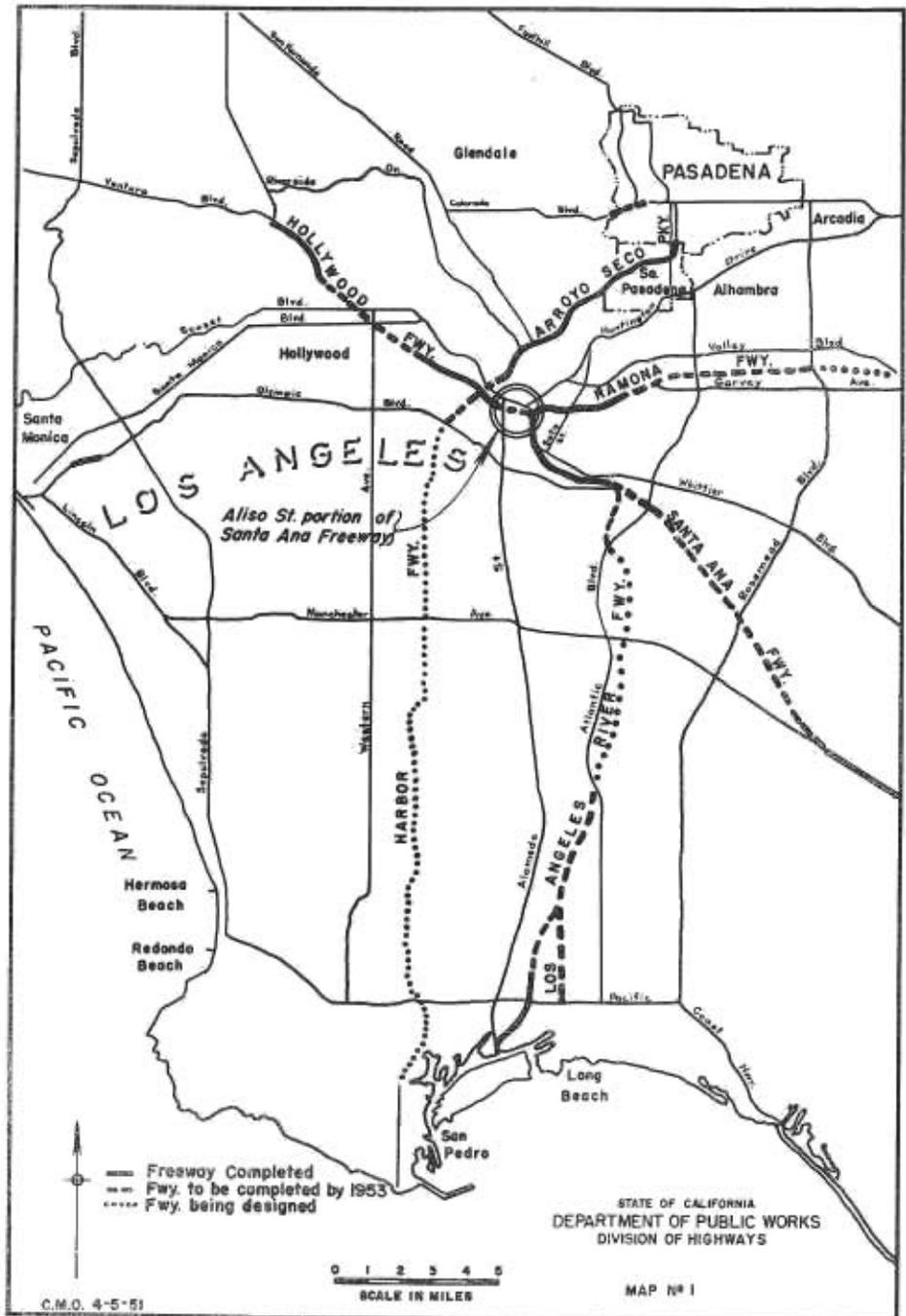
The Artesia Freeway (State Sign Route 14) takes its name locally from Artesia Street along which it follows for a considerable distance in Los Angeles County. It is a part of the route that extends from Pacific Coast Highway (U.S. 101 Alternate) in Redondo Beach easterly into Orange County.

The State Highway Commission has adopted two portions of this route as freeway. One of these extends from Normandie Avenue to Santa Fe Avenue, and the other from Palo Verde Avenue to the Santa Ana Freeway. The total distance of freeway adoption is 12.4 miles. Of this, 4.9 miles have been constructed to expressway standards at a cost of \$2,324,000. The extension of this route in Orange County easterly of the Santa Ana Freeway is known as the Riverside Freeway.

Design studies are currently in progress for the conversion of the expressway section between Normandie Avenue and Alameda Street to full freeway standards. Between Alameda Street and the Santa Ana Freeway, a distance of 14 miles, contract plans are being prepared for ultimate 8-lane freeway construction. Right of way expenditures to date, for the entire adopted route, amount to \$5,272,000.

Beverly Hills Freeway

Studies are in progress for the Beverly Hills Freeway between the San Diego Freeway near Westwood and the Hollywood Freeway. Extensive research is being conducted for this project in land-value study zones in order to provide comparable estimates of right of way needs for alternate possible alignments. It is anticipated that the studies will be completed pre-



District VII freeways in 1953. The above map shows the sections of freeway completed or under construction seven years ago. Compare this to the map on the preceding page.



Looking southwesterly from Soledad Canyon Road at construction in progress on the Antelope Valley Freeway adjacent to Santa Clara River.

paratory to a public meeting sometime in early 1962.

Century Freeway

The Advance Planning section is actively studying the Century Freeway between Lincoln Boulevard (U.S. 101 Alternate) near Inglewood and the Santa Ana Freeway near Norwalk. Meetings were held with the Century Freeway Association on April 20, 1960 and July 21, 1960, at which these studies were discussed. Also, in connection with route location research for this freeway, a post card origin and destination survey was undertaken at the Los Angeles International Airport on October 26 and 27, 1960. It is expected that a regular public meeting can be held in early 1962 for that portion of the route between the Harbor Freeway and Lincoln Boulevard.

Public meetings for the section east from the Harbor Freeway to the Santa Ana Freeway will follow at a later time.

Colorado Freeway

A part of the Colorado Freeway (State Sign Route 134) has been completed since 1955, at a total right of way and construction cost of \$8,600,000. The 2.3-mile section extends from Eagle Vista Drive in Eagle Rock to Holly Street in Pasadena. This route will eventually connect with the Golden State Freeway on the west and the Foothill Freeway on the east. Several public meetings have been held on the unadopted portions of the Colorado Freeway, with the most recent being on October 8, 1959, on the District level, followed by a California Highway Commission hearing on October 27, 1960. The results of these

meetings dealing with the location of the route west from Club Road in Eagle Rock through Glendale to the Golden State Freeway, have been under study by the California Highway Commission, who on February 23, 1961 adopted a final route. The adopted line measures approximately 6.6 miles and will cost an estimated \$29,000,000 for rights of way and construction.

Corona Freeway

The Corona Freeway (State Route 71) in District VII is completed to 4-lane expressway standards for a distance of 3.2 miles from 5th Street in Pomona to Riverside Drive at the San Bernardino County line, at a total cost of \$1,068,000. Plans have been completed to convert this route to full freeway standards northward as far as the San Bernardino Freeway, an over-all distance of 4.4 miles. Estimated cost of the conversion is \$2,500,000, which must await future financing. Grade separation bridges and interchanges will be required at Holt Avenue, Valley Boulevard and Fifth Avenue. Existing bridges over the Southern Pacific Railroad and the Union Pacific Railroad will have to be widened.

Corona Del Mar Freeway

The Corona Del Mar Freeway (Route 184) in Orange County was adopted in 1940 as a freeway between Pacific Coast Highway and the Newport Freeway, a distance of 6.3 miles. In 1942 the southerly 2.3 miles, between Pacific Coast Highway and Buffalo Ranch Road, was completed as a 4-lane divided highway and the remaining 4 miles as a 2-lane facility, at a total cost of \$283,000. Preparatory to the design of a 6-lane freeway over this route, on October 3, 1960 an aerial survey contract was awarded for contour mapping between Pacific Coast Highway and just south of Palisades Road.

The Advance Planning section, at the request of the Orange County Board of Supervisors, is resurveying this line. The Supervisors' request was made because of the conflict between a proposed extension of the existing Orange County Airport runway and the present route. It is anticipated that

a public meeting to discuss the various alternates can be held by the end of this year.

Palmdale Boulevard

Palmdale Boulevard (State Sign Route 138) is the major east-west route through the Antelope Valley.

During 1960 two separate contracts were awarded for much needed construction on this route. The first contract between 1.5 and 4.4 miles east of Palmdale was awarded on July 21, 1960. This 2.9-mile project consists of widening the existing 2-lane to a modern 4-lane divided facility with channelization for left turn movements. This project, under \$479,800 contract is scheduled for completion in the near future.

The second contract, between 6th Street East and Sierra Highway (U.S. 6) was awarded on August 12, 1960, and completed in December. This 0.1-mile project also consisted of widening to a 4-lane divided facility with left turn channelization and included widening of the existing railroad crossing and construction of ties. This project, costing approximately \$106,800, was jointly financed between the County of Los Angeles and the State.

The completion of these two projects, together with other recent contracts, will result in a continuous 5-mile section of 4-lane divided highway.

A project for improving this route from 4.4 miles east of Palmdale to the vicinity of Avenue T is presently under design, and the need for future widening and improvement to the San Bernardino County line is under study.

Foothill Freeway

The Foothill Freeway extends for 34.2 miles from junction with the Golden State Freeway to the San Bernardino County line near Claremont. In 1955 a 1.8-mile segment of this route in the Altadena-Flintridge area, was constructed to freeway standards at a cost of \$2,098,000.

Urban development along a 10.5-mile section of this Interstate route, between the Golden State Freeway and Foothill Place near Hansen Dam, is introducing an increasing number of problems, and plans are being developed in sufficient detail to protect the right of way.

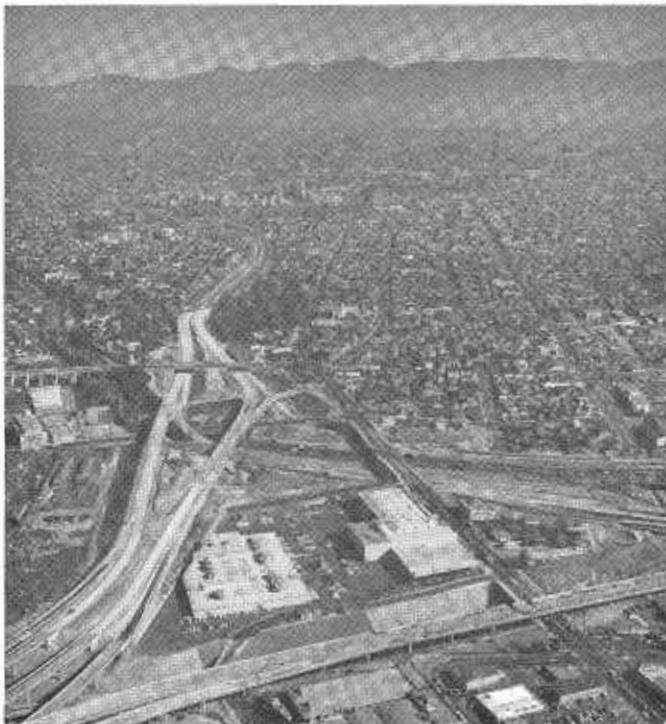
The California Highway Commission has adopted five freeway location units on the Foothill Freeway, as follows: Filbert Street to Foothill Place,

9.7 miles, March 26, 1958; Grand Avenue to San Bernardino County line, 6.8 miles, April 29, 1959; Michillinda Street to Bradbourne Avenue, 5.9 miles, May 20, 1959; Glendora Avenue to Grand Avenue, 4.7 miles, November 18, 1959; and Duarte city limits at Bradbourne Avenue to Glendora Avenue, 6 miles, February 17, 1960.

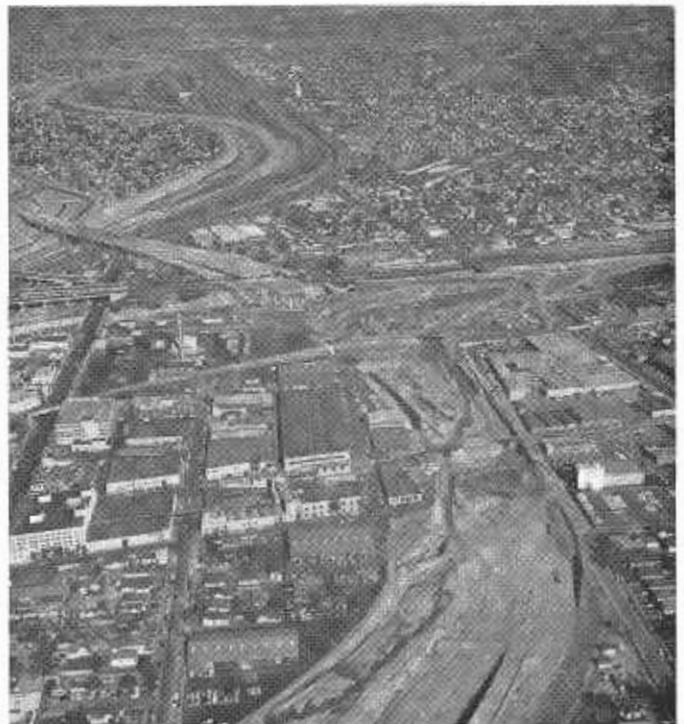
Aerial surveys covering the entire length of these five adoptions have been completed and design studies are presently under way.

On February 18, 1959, the Board of Directors of the City of Pasadena requested that the Division of Highways make a study of combining the Foothill Freeway with the Atchison, Topeka & Santa Fe Railroad between Marengo Avenue and a point east of Michillinda Avenue. This request was made upon a recommendation of the Pasadena Planning Commission after the second public meeting held by the Division of Highways on December 22, 1958 on that portion of the Foothill Freeway from Orange Grove Boulevard to Michillinda Avenue.

A report was prepared in cooperation with the staff of the City of Pasadena and presented to the Board of Directors on November 9, 1960,



Looking northerly along Golden State Freeway from East Los Angeles interchange; center, Santa Ana Freeway passing diagonally through photograph.



Looking northerly at construction in progress along Golden State Freeway; top, left, Elysian viaduct and interchange facilities with the Pasadena Freeway.

which indicated that the least expensive railway study would cost \$19,000,000 more than the \$43,000,000 as estimated for one of the most reasonable alternates outside of the influence of the Railroad. The City of Pasadena held a public meeting on January 10, 1961, and have indicated that they hope to reach a decision soon as to whether they will place a bond issue on the ballot or recommend that the State adopt one of the alternates outside of the influence of the Railroad.

The Advance Planning section also has under study a portion of the route from the Colorado Freeway to junction with Montana Street, which ties into a completed segment of the Foothill Freeway.

Garden Grove Freeway

The Garden Grove Freeway State Sign Route 22 extends from Pacific

Coast Highway to the Newport Freeway, a distance of 15.4 miles.

In 1959 an interim project was completed to provide a 4-lane divided highway between Los Cerritos Channel and Knott Avenue, a distance of 5.4 miles, at a construction cost of \$1,502,000. Most of this improvement will be utilized in the ultimate development of the freeway.

A contract for the construction of a reinforced concrete bridge and a frontage road between Studebaker Road and the proposed San Diego Freeway was awarded on September 21, 1960. This is a first-stage project in the development of the freeway. It is anticipated that this project will be completed late in 1961 at a cost of \$271,000.

Plans are being prepared for the entire freeway based on 6 lanes except

for a 2.1-mile, 10-lane section between Los Alamitos Boulevard and Bolsa Chica Road. In this vicinity the San Diego Freeway and the Garden Grove Freeway will utilize common roadways.

Contract plans are being prepared for a portion of the Garden Grove Freeway between Placentia Avenue and the Santa Ana Freeway, a distance of about 1 mile. Interchanges will be provided at Placentia Avenue and at Bristol Street. This project is Unit I of the Santa Ana, Orange, and Garden Grove Freeways interchange and will be financed from an item of \$13,700,000 in the 1961-62 budget. It is anticipated that this construction will be ready to advertise for contract in mid-1961.

A portion of the Garden Grove Freeway from the Rio Hondo Channel to Pacific Coast Highway is under restudy in conjunction with the Pacific Coast Freeway through the City of Long Beach. It is anticipated that studies for this section of the Garden Grove Freeway will be presented at a public meeting sometime this year.

Glendale Freeway

The Glendale Freeway State Sign Route 2 extends 3.2 miles from Ardmore to Vermont Avenues and from Glendale Boulevard to Avenue 36. A 1.1-mile section of this freeway, between Los Angeles River and Eagle Rock Boulevard, was completed in 1958 at a construction cost of \$2,820,000. A landscaping contract was completed on January 8, 1960, between Fletcher Drive and Verdugo Road, at a cost of \$94,000. Currently two contracts are under way on this freeway: one is between Riverside Drive and the Los Angeles River, including the interchange with the Golden State Freeway, 0.6 mile costing \$830,000, awarded on April 12, 1960, with an estimated completion date of January, 1962 (part of a 3.7-mile, \$12,404,200 contract on the Golden State Freeway between Arnold Street and Glendale Boulevard).

The outstanding feature of this project is the Glendale-Golden State Freeway Interchange, with its 12.7 miles of foundation piling, 6.5 acres of bridge deck, 3 miles of bridge railing and 94,500 tons of concrete. All of the



Looking easterly at completed portion of Glendale Freeway; foreground, bridges under construction connecting with interchange with Golden State Freeway.



Looking northerly along recently completed portion of Harbor Freeway from 146th Street pedestrian overcrossing.

substructure work has been completed and falsework towering 50 feet above adjacent Riverside Drive is a marvelous sight to the passing motorist. The falsework is unique in that the bottom 20 feet is the typical heavy timber and steel beam type topped by tubular steel scaffolding to support the 12% superelevated deck.

A second Glendale Freeway contract, work on which started on November 4, 1960, after award on October 19, 1960, is in progress between Glendale Boulevard and Riverside Drive, 0.8 mile costing \$2,325,800, tentatively scheduled for completion in January, 1962. Since the first order of work is the construction of realigned Allesandro Street and related city street work, there has been little work done on the freeway itself, except for the placing of some embankment material obtained in street excavation.

The moving of extensive utility facilities from old Allesandro Street to locations within the new roadway was begun recently. Much of this work was dependent upon the completion of rough grade by the contractor and side hill cuts and fills, which had to be made first. As the utilities are relocated, existing streets will be abandoned and work on the freeway started.

Sanitary sewer work was started within the first few weeks of construction and is nearly complete at

this time. Some delay and slow progress was occasioned by encountering hard sandstone in trench excavation areas. In some instances it was necessary to use jack hammers to remove rock through which the trenching machine could not cut.

The unconstructed portion of the Glendale Freeway between Avenue 36 and the Foothill Freeway is actively under study. It is anticipated studies can be presented at a public meeting within the next two years.

Another segment west to junction with the Hollywood Freeway has been reactivated in connection with the study of the Beverly Hills Freeway. It is believed that this part of the Glendale Freeway study will be ready for a public meeting in the latter part of 1961.

Golden State Freeway

The Golden State Freeway (Routes 4 and 161), an Interstate highway, is 73.2 miles long in District VII, extending from junction with the Santa Ana, Santa Monica, and Pomona Freeways in East Los Angeles to the Kern County line north of Gorman.

The Golden State Freeway has been completed to largely expressway standards north of the City of San Fernando in San Fernando Valley via the Ridge Route to the Kern County line and has been opened to traffic for a number of years.

In the Burbank, Glendale and Los Angeles areas the Golden State Free-

way is completed to full freeway standards and open to traffic between Burbank Boulevard and Glendale Boulevard. This 6-mile section was built previously under separate contracts: Ash Avenue to Los Angeles River, 2.2 miles, completed in September, 1957, at a construction cost of \$4,753,000; Los Angeles River to Glendale Boulevard, 2.5 miles, completed in January, 1958, at a construction cost of \$5,418,000; and Alameda Avenue to Burbank Boulevard, 1.3 miles, completed in August, 1959, at a construction cost of \$4,240,000.

In the vicinity of downtown Los Angeles two important Golden State Freeway links were opened to traffic on March 18, 1960, between Sixth Street and Mission Road and between Mission Road and Pasadena Avenue, 2.5 miles, at a combined construction cost of \$7,778,000.

At this time there are 6 projects in progress on the Golden State Freeway including the East Los Angeles Interchange, representing a mileage of 19.4 and a construction cost of \$58,315,500.

Provision has been made in the 1961-62 fiscal year budget in the amount of \$6,200,000 to complete the only remaining gap in the Golden State Freeway between Lankershim Boulevard and Osborne Street in the San Fernando Valley, a distance of 2.4 miles. Thus, taking into account completed and going projects and the

forementioned budgeted project, the entire length of the Golden State Freeway represents an estimated grand total investment of \$165,406,800 for both right of way and construction.

The active construction projects on the Golden State Freeway may be itemized as follows, in a generally south to north order: The *East Los Angeles Interchange*, bounded by 6th and 8th Streets and Boyle Avenue and Lorena Streets, 2 miles, \$10,326,600; work started on May 1, 1959 and the estimated completion date is May, 1961. *Pasadena Avenue to Arnold Street*, including the interchange with the Pasadena Freeway, 1.7 miles, \$10,410,000; work started on May 11 1960 and the estimated completion date is February, 1962. *Arnold Street to Glendale Boulevard*, including the Glendale Freeway Interchange, 3 miles, \$12,404,200; work started on April 20, 1960 and the estimated completion date is April, 1962. *Burbank Boulevard to Roscoe Boulevard*, 4 miles, \$8,830,400; work started on March 5, 1959 and the estimated completion date is June, 1961. *Roscoe Boulevard to Lankershim Boulevard*, 2 miles, \$3,718,500; work started on December 1, 1959 and the estimated completion date is June, 1961. *Osborne Street to San Fernando Road* (including grading on 4 miles the San Diego Freeway as far south as Nordhoff Street), 6 miles, \$12,625,800; work started in February, 1961 and the estimated completion date is July, 1963.

Design is under way for relocation of expressway portions of the Golden State Freeway from junction with the San Diego Freeway at the San Fernando Reservoir north to the Kern County line. It is hoped that by the spring of 1961 relocation studies will be sufficiently developed for discussion at a public meeting.

Among the minor contracts completed and in progress on the Golden State Freeway is a landscaping project between Mission Road and North Broadway, 0.9 mile covering 9 acres, under a \$52,800 contract scheduled for completion in July, 1961. Another landscaping project was completed between Linden Avenue and Cypress Avenue, 1.3 miles covering 15 acres, on October 31, 1960 at a cost of \$92,-

500. The 1961-62 budget has additional allocations amounting to \$290,000 for continued landscaping on 5.2 miles of freeway between Cypress Avenue and Roscoe Boulevard and between Roscoe and Lankershim Boulevards. A median barrier will also be installed on the Glendale Boulevard to Burbank Boulevard section, a distance of 6.1 miles, for which \$143,000 is available in the new budget.

(For a complete discussion of the Golden State Freeway and the loop portion of the Santa Monica Freeway, see story, *LOOP PROGRESS*, by A. L. Himelhoch, District Engineer, in the January-February issue of *California Highways and Public Works*.)

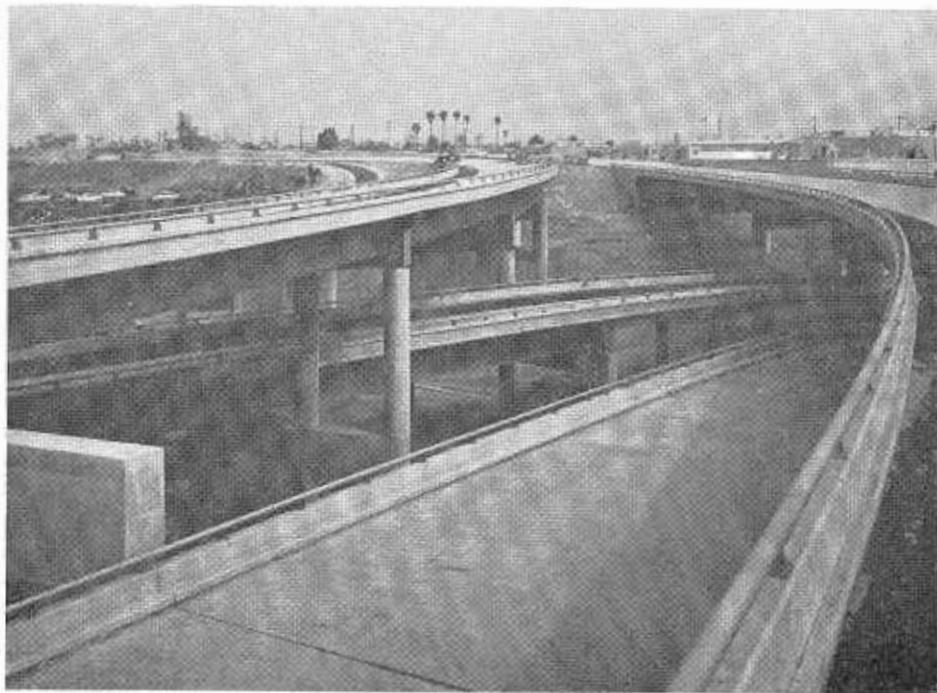
Harbor Freeway

The Harbor Freeway begins at the 4-level structure in the Los Angeles Civic Center and proceeds 22.6 miles south to Battery Street in San Pedro. The entire route is largely completed and in use, except for two contracts under construction between 190th Street and 208th Street and between 208th Street and Pacific Coast Highway, and interchange structures at the Santa Monica Freeway interchange. The total moneys expended or committed on going, completed and budgeted projects on the Harbor Freeway amount to approximately \$102,692,000.

A 4.7-mile length of the Harbor Freeway was completed in August, 1960. This \$7,755,000 contract extended the 8-lane Harbor Freeway from 124th Street to 0.5 mile south of 190th Street. It provides connection facilities with such important east-west arteries as El Segundo Boulevard, Rosecrans Boulevard, Alondra Boulevard, Artesia Boulevard, and 190th Street. Included in this length of the Harbor Freeway are 17 bridges, a pumping plant and 10 retaining walls. The contract started in October, 1958 and was accepted by the Director of Public Works on August 5, 1960, in advance of the originally scheduled completion date. In the Dominguez Channel and 190th Street area, some 143,000 cubic yards of an old trash dump had to be removed.

This contract on the Harbor Freeway also initiated slip-form paving in Southern California. Using a 24-foot wide slip-form machine the contractor placed 61,800 cubic yards of concrete pavement and was successful in meeting the smoothness requirements. (See articles on slip-form paving in the January-February and May-June, 1960 issues of *California Highways and Public Works*).

Two contracts on the Harbor Freeway are being constructed as a part of



Branch connections of East Los Angeles interchange looking northeasterly.

other projects. These are the Harbor-Santa Monica Freeway interchange, being built at a cost of \$320,000 in conjunction with a larger Santa Monica Freeway contract, and the Harbor-San Diego Freeway interchange, being built at a cost of \$780,000 in conjunction with a larger San Diego Freeway contract.

A major project under construction on the Harbor Freeway proper is in progress from 208th Street to Pacific Coast Highway, a distance of 4.7 miles. It specifies 6- and 8-lane freeway, with bridge widening at Pacific Coast Highway, 2 pedestrian overcrossings and 10 bridge structures. Work started on December 22, 1960. Under way now is the placing of reinforced concrete box structures and large drainage pipes, along with bridge, pedestrian overcrossing and retaining wall work. Target date for the completion of this section of the Harbor Freeway is May, 1962.

Certain minor projects have been completed in 1960 on the Harbor Freeway, among them a landscaping job from Athens Boulevard to 88th Place, 2.5 miles, April 4, \$178,000; September 26, \$142,000; and median barrier from 120th Street to 190th Street, 4.4 miles, November 1, \$75,000.

On March 9, 1961 bids were opened for landscaping of 4.4 miles of the Harbor Freeway between 120th and 190th Streets. This job is now in progress. A lighting and signing job from 6th Street to the 4-level structure was awarded on January 31, 1961, at a bid figure of \$68,900 from 1960-61 funds, and is tentatively scheduled for completion in May, 1961.

The 1961-62 budget allocated \$645,000 for median barrier on the Harbor Freeway from 120th Street to the 4-level structure (including a portion of the Santa Ana Freeway), a total distance of 15.7 miles. Construction should begin on this project sometime in the summer of 1961.

Hollywood Freeway

An important section of the Hollywood Freeway (Routes 2 and 159) has been completed and open to traffic for a number of years, from Spring Street in the Los Angeles Civic Center to the Ventura Freeway interchange in North Hollywood, a distance of



Long Beach-San Bernardino Freeway interchange looking westerly.

about 11 miles. Its extension north to junction with the Golden State Freeway near Wentworth Street will ultimately measure 17.3 miles in all. The first contract on the Hollywood Freeway was completed in the Cahuenga Pass area in 1940 and the last major contract, a widening project between Highland Avenue and Lankershim Boulevard, was completed in 1958.

The importance of this route as a vital connector between Los Angeles and the San Fernando Valley is evidenced by the universal acceptance it has gained from the traveling public. Westerly of the 4-level structure 200,000 motor vehicles use this freeway daily.

The total cost of the Hollywood Freeway, including projects completed and minor contracts under way, is \$68,971,000 for right of way and construction.

On March 9, 1961 bids were opened on the Hollywood Freeway Extension between Vineland Avenue and Chandler Boulevard, 1.7-miles, from \$3,000,000 available in the 1960-61 budget. This project provides for such structures as the Tujunga Avenue Undercrossing, Magnolia Boulevard Under-

crossing and pedestrian undercrossings at Morrison and Otsego Streets.

Northerly of present construction at Chandler Boulevard the Hollywood Freeway is under design to its terminus at the Golden State Freeway.

One of the first median barrier installations was on the Hollywood Freeway on portions as far west of the Civic Center as Benton Way (including some mileage on the Santa Ana Freeway), completed on May 11, 1960 at a cost of \$143,000. During the same year a \$68,000 landscaping contract was completed between Moorpark and Kling Streets. The 1961-62 budget, as supplemented in January, 1961 by the California Highway Commission, has a \$418,000 allocation for 6.3 miles of additional median barrier from Benton Way to the Ventura Freeway interchange.

Imperial-Yorba Linda Freeway

The Imperial Freeway (Route 176) is now part of the California freeway-expressway network as signed into law under Senate Bill 480, by Governor Edmund G. Brown on June 19, 1959, which added six miles to the route from La Habra Road (State

Sign Route 39) in Orange County to the Santa Ana Freeway near Norwalk in Los Angeles County. From La Habra Road southeasterly to the Riverside Freeway beyond Yorba Linda the route is known locally as the Yorba Linda Freeway. It is on the existing freeway-expressway system.

General plans for construction of two lanes of an ultimate 2.3 mile, 4-lane freeway from Yorba Linda Boulevard to the Riverside Freeway were discussed at a public meeting held by the District on February 23, 1961. Initial construction on the Yorba Linda Freeway is financed to the extent of \$1,360,000 in the 1961-62 fiscal year.

Laguna Freeway

The Laguna Freeway (Route 185) extends 8.4 miles from the City of Laguna Beach to the Santa Ana Freeway.

In 1958 the northerly two miles were improved to expressway standards in conjunction with construction on the Santa Ana Freeway. In this improvement two lanes of the proposed 4-lane freeway were constructed.

Preliminary design studies are now under way for the remainder of this freeway. At its southerly end near Canyon Acres Drive the freeway will connect to an existing expressway.

Long Beach Freeway

The Long Beach Freeway (State Sign Route 15) from Pacific Coast Highway in Long Beach to Huntington Drive in Los Angeles, is 21.5 miles long. It was officially opened between Pacific Coast Highway and the Santa Ana Freeway on July 10, 1958 and today represents an accumulated investment in going and completed projects of \$55,946,000 for both right of way and construction. The completed traversable section is 16.8 miles long and temporarily terminates at the Santa Ana Freeway, from which point it is under construction as far north as the San Bernardino Freeway.

The Long Beach Freeway extension northerly from the Santa Ana Freeway to the San Bernardino Freeway is scheduled for completion in May. Work began in February, 1959 with a contract allotment of \$6,651,500.

Construction of a reinforced concrete box storm drain and appurtenant drainage structures for the Los Angeles County Flood Control District has been completed. The storm drain extends 1.6 miles and ranges in dimensions from 9½ x 9½ feet to 13½ x 10½ feet. Also completed, is the construction of sanitary sewers, including a main for the City of Monterey Park.

Work on the east connector overcrossing at the San Bernardino Freeway Interchange is rapidly nearing completion, this being the last of 13 structures to be built on this contract.

Upon its completion in the spring of 1961, this new link of the Long Beach Freeway will serve to reduce congestion in the metropolitan Los Angeles area by providing a more direct route between the San Gabriel Valley communities and the cities located between Los Angeles and Long Beach.

A functional planting project was awarded on November 29, 1960 covering 7.2 miles and almost 86 acres of the Long Beach Freeway between Pacific Coast Highway in Long Beach and East 26th Street near Vernon. The bid figure on this job is \$74,000 and landscaping will be completed in the summer of 1961.

Senate Bill 480 established a 1.7-mile extension of the Long Beach Freeway from the City of Alhambra to near junction of the Foothill-Pasadena Freeways. In conjunction with the north-south leg of the Foothill Freeway through the City of Pasadena, the Advance Planning section has under study that portion of the Long Beach Freeway extension between Norwich Avenue and the Colorado-Foothill Freeway.

The City of Long Beach has been a unique and substantial contributor to the development of the Long Beach Freeway in the Long Beach area. Utilizing the 5/8-cent gas tax revenues, general public funds, tideland oil and harbor funds, the City of Long Beach has financed construction of several projects in connection with the Long Beach Freeway.

The continuation of the freeway south into the Long Beach Harbor area on the west side of the river is planned by the City for the near

future and \$1,226,500 has already been expended for rights of way. The Ocean Boulevard bridge provides overpass structures for the freeway, including future connections for on and off ramps. It also provides for separation of grade for terminus extension at Ocean Boulevard connections. This bridge, built at a cost of \$7,715,000, was completed and opened to traffic in August, 1959. It connects the central business district with the harbor area.

Marina Freeway

The Marina Freeway (Route 60 and 221) between Pacific Coast Highway and Sepulveda Boulevard in the Culver City-West Los Angeles area, 3.9 miles, was adopted by the California Highway Commission in December, 1959. Preliminary design has been expedited so as to cooperate with the U.S. Corps of Engineers in its program for construction of the Centinela Creek Flood Control Channel, which is scheduled to start in the spring of 1961. The Centinela Creek Channel, between Jefferson Boulevard and McConnell Street, a distance of 1.5 miles, is immediately adjacent to the Marina Freeway. Alignment of the common boundary has been agreed upon.

The Los Angeles County Flood Control District is responsible for acquisition of rights of way for U.S. Flood Control projects. The Flood Control District and the State have entered into a cooperative agreement whereby the State is acquiring those parcels, portions of which will be needed for both the Flood Control project and the freeway.

Newport Freeway

The Newport Freeway (State Sign Route 55) extends 17.7 miles from the Riverside Freeway to Pacific Coast Highway in Orange County. The route was adopted by the Highway Commission on July 20, 1944, from Pacific Coast Highway to Dyer Road, and on March 17, 1954, from Dyer Road to the Riverside Freeway.

A 1.9-mile expressway portion of the Newport Freeway was built from Pacific Coast Highway to 20th Street in Costa Mesa in 1953. Also, a 2.7-mile project was completed on May 31, 1960, which constructed a front-

age road between 19th Street and Palisades Road in and near Costa Mesa. This frontage road will eventually adjoin the proposed 6-lane freeway, but currently is used for south-bound traffic to provide a 4-lane divided highway.

A 4.2-mile project from Chapman Avenue to the Riverside Freeway has been under construction since January 10, 1961, after award of contract on December 22, 1960. The estimated completion date of this \$4,638,029 contract is February, 1962. Bids for a second project from Chapman Avenue south to connection with the Santa Ana Freeway were opened on March 16, 1961 from approximately \$4,500,000 available in the 1960-61 fiscal year. Construction on this link is now in progress.

Contract plans are currently being prepared for a 5.4-mile section of the Newport Freeway from the Santa Ana Freeway south to Palisades Road. This construction awaits future financing.

Ojai Freeway

The Ojai Freeway (U. S. 399) extends 6 miles from Pacific Coast Highway in the City of Ventura to Foster Park in Ventura County. A small segment of the Ojai Freeway from the Pacific Coast Highway to Prospect Street is under construction in conjunction with a \$6,506,432 contract on the Ventura Freeway.

The District held a public meeting on September 1, 1960 relative to route location studies for the Ojai Freeway from Foster Park north to Gorham Road east of the City of Ojai, ranged between \$10,000,000 and \$14,000,000 for construction, and between \$2,000,000 and \$7,500,000 for rights of way.

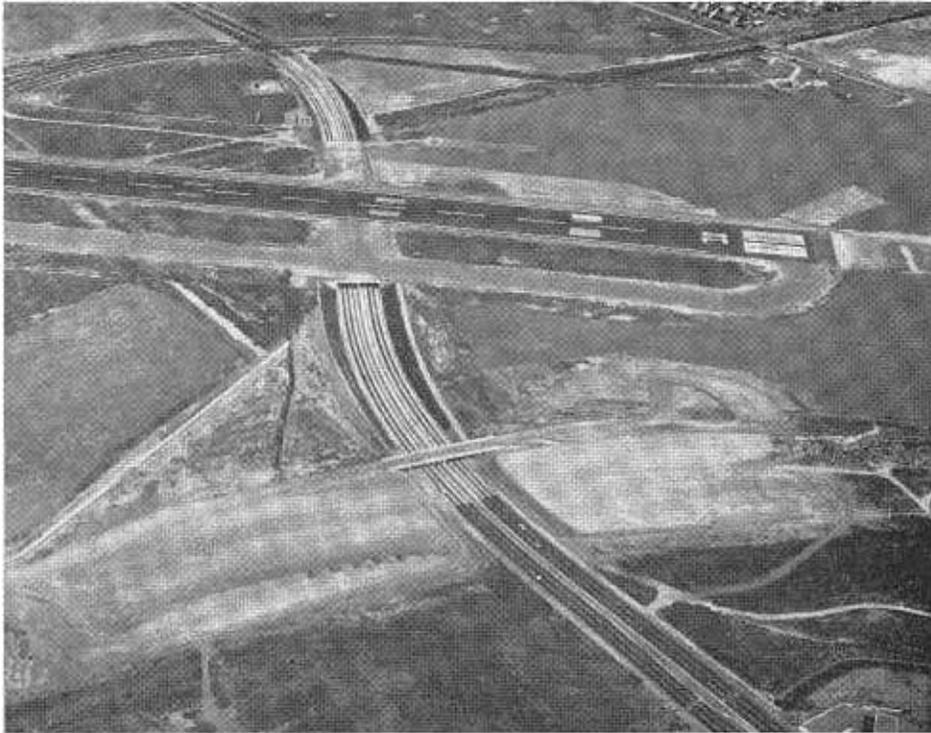
At the request of the City of Ojai and the County of Ventura, the information regarding Ojai Freeway studies was deferred for a period of six months before submission to the California Highway Commission. A report has been returned by the special committee appointed by the County and the City of Ojai Council requesting that a freeway route be adopted alongside the Ventura River to its junction with Maricopa Highway northwest of Ojai. The District has this proposal under advisement.



Looking south along Santa Ana Freeway at Long Beach Freeway interchange. White areas indicate added lanes on Santa Ana Freeway.



San Bernardino Freeway looking easterly at El Monte and the Baldwin Avenue interchange. The white areas in median are the newly constructed concrete pavement widening.



Looking north along relocated Lakewood Boulevard at Long Beach Municipal Airport. Construction in foreground is San Diego Freeway.

Orange Freeway

The Orange Freeway (Route 19) has been adopted (1956) for a distance of 16.6 miles from the Santa Ana Freeway near Orange in Orange County to the Pomona Freeway in Los Angeles County. Provision for interchange facilities for the Orange Freeway with the Garden Grove and Santa Ana Freeways is included in a \$7,000,000 construction project in the 1961-62 budget, which is scheduled for bid advertising late in 1961.

Plan preparation is under way for the remainder of this freeway and construction will be financed when funds are available. Expenditures totaling \$1,816,000 on the Orange Freeway, to date, have been exclusively for right of way.

Pacific Coast Freeway

The Pacific Coast Freeway (U.S. 101 Alternate) is an adopted route from the City of Oxnard in Ventura County to the Los Angeles County line near Mulholland Highway, a distance of 18.1 miles.

Of this mileage 7.2 miles between the City of Oxnard and Calleguas Creek was completed to full freeway standards on November 15, 1957, at a

cost of \$2,413,000. A recent addition has been in the form of a short segment, 0.7-mile, completed on December 1, 1960 between the San Diego Freeway and Serra Junction near San Juan Capistrano in Orange County. This \$117,000 connection was built together with a major San Diego Freeway contract between Capistrano Beach and San Clemente. Another 4.5-mile link in the Pacific Coast Freeway was adopted (1955) in Orange County, between Huntington Beach and Newport Beach.

The District expects to hold a public meeting on that portion of the Pacific Coast Freeway between the present junction of Pacific Coast Freeway with 5th Street (Route 153) and the Ventura Freeway in the spring. This is the so-called "Oxnard Bypass."

A little later, the District expects to proceed with a public meeting on that portion of the Pacific Coast Freeway between Calleguas Creek and Malibu Beach. Studies are also underway between Malibu Creek and the City of Santa Monica.

In cooperation with the State Department of Natural Resources, the State Division of Beaches and Parks

and the State Division of Small Craft Harbors, an attempt is being made to develop a cooperative plan for recreational and highway purposes. The Department of Water Resources has requested a study by the U. S. Corps of Engineers of the beach erosion problems in this area.

Also under study is that area between the Santa Monica Freeway and the Marina Freeway. It is anticipated that a public meeting on this route will be held shortly.

In conjunction with the studies in the Los Angeles International Airport area, that portion of the Pacific Coast Freeway between the Marina Freeway and Imperial Highway is being investigated in order to provide good vehicular circulation in connection with the expansion of the airport.

In conjunction with the studies on the Garden Grove Freeway, the Advance Planning section is actively engaged in the replacement of the existing Pacific Coast Highway as a freeway between the Garden Grove Freeway and the Harbor Freeway in the vicinity of the City of Long Beach and the communities of Wilmington and San Pedro.

Also under active planning is that portion of the Pacific Coast Freeway from its junction at the San Gabriel River Freeway Extension to the San Diego Freeway near San Clemente.

Project report studies have been completed for conversion of the existing 3-lane and 4-lane Pacific Coast Highway to an ultimate 8-lane freeway for 22.3 miles between Malibu and Point Mugu. Studies have considered improvement along the existing route, which is generally adjacent to the Pacific Ocean as well as improvement on a new location inland, wherever feasible. A public meeting will be held soon to discuss this \$35,000,000 improvement.

A 4.5-mile length of the existing Pacific Coast Highway between Beach Boulevard in Huntington Beach and Newport Avenue (Route 43) in Newport Beach was adopted by the California Highway Commission as a portion of Pacific Coast Freeway in 1955.

Preliminary design studies are now in progress and right of way negotiations are under way for the portion between Beach Boulevard and the

Santa Ana River. Plans are based on an ultimate 8-lane freeway.

Pasadena Freeway

The Pasadena Freeway is 8.2 miles long, extending from the 4-level structure in downtown Los Angeles to Glenarm Street in the City of Pasadena. The first unit, a 6-lane freeway, was completed and opened to traffic on December 30, 1940. The last unit of construction on this freeway was completed and opened to traffic on September 22, 1953. The total investment in rights of way and construction on the Pasadena Freeway to date, including going contracts, amounts to \$12,218,000.

On December 29, 1960 at 10:00 a.m., the Division of Highways joined with commemoration sponsors in 20th anniversary ceremonies marking the completion of the Arroyo Seco-Pasadena Freeway.

A project is under way on the Pasadena Freeway between Bishops Road and Avenue 40 in conjunction with the Pasadena-Golden State Freeway interchange. This \$410,000 job is scheduled for completion with the larger Golden State Freeway project between Pasadena Avenue and Arnold Street in January, 1962. Also under contract over portions of the route, is median barrier construction. Bids on this project were opened on March 16, 1961 from \$365,000 available in 1960-61 State Highway funds. The 1960-61 budget also has \$200,000 available for improved lighting of 4 existing tunnels located between Bishops Road and the Los Angeles River on the Pasadena Freeway. Bids will be opened April 13 for this work.

Design is in progress on improvement of access facilities to the Elysian Park area. The new \$16,000,000 Dodger Stadium scheduled for completion in 1962 in Chavez Ravine, the proposed World Zoo, new playground and recreational facilities, will generate traffic volumes greater than existing ramps can handle. A cooperative agreement with the City of Los Angeles is being processed to cover the cost of these improvements. (For a history of the Pasadena Freeway see A. D. Griffin's article ARROYO SECO in the January-February 1961



Looking north along completed San Diego Fwy. toward Dana Point, top, left. In foreground is connection at Serra Junction to existing Pacific Coast Highway.



Looking north along newly completed portion of San Diego Freeway in San Clemente.



Looking westerly along Santa Monica Freeway construction from Santa Fe Avenue near Los Angeles River.

issue of *California Highways and Public Works*.)

Pomona Freeway

The adopted portion of the Pomona Freeway extends easterly from the East Los Angeles Interchange, now under construction, to a junction with the Corona Freeway at the southerly limits of the City of Pomona for a total length of 30.6 miles. It will cost an estimated \$58,500,000 for construction, including rights of way.

When completed, this section of the Pomona Freeway, in conjunction with the Santa Monica Freeway, will provide a major east-west route from the Pacific Coast Highway, through the metropolitan Los Angeles area, to Pomona. It will greatly relieve high density traffic pressures on the present operating east-west routes in the District.

Adoption of the aforementioned sections of the Pomona Freeway was completed by the California Highway Commission on June 23, 1960 with the adoption of the easterly section from

the junction of the Pomona Freeway and Brea Canyon Road (Route 19) to the Corona Freeway.

This 1961-62 State Highway Budget contains \$8,800,000 for continued right of way acquisition on the Pomona Freeway.

Riverside Freeway

The District VII portion of Riverside Freeway is 19.1 miles long, extending from the Santa Ana Freeway near Buena Park to the Riverside County line in Orange County.

Completed in January, 1960 was the 2.2-mile freeway section between Spadra Road and Placentia Avenue at a cost of \$2,680,000. A landscaping project costing \$82,000 between Magnolia Avenue and Lemon Street, 3.3 miles, was completed in November, 1960.

The westerly 5.7 miles are now constructed to full freeway standards and the remainder to expressway standards. Plans are being developed for the conversion of 4.1 miles of 4-lane expressway between Cypress

Street and the Newport Freeway to a 6-lane freeway.

Plans are being completed for a landscaping project on the Riverside Freeway, 2.1 miles, between Lemon Street and Placentia Avenue. Funds in the amount of \$64,000 are provided in the 1961-62 budget.

The total construction and right of way costs on the Riverside Freeway amount to \$15,844,000 to date.

The District held a public meeting on December 1, 1960 on the routing of a portion of the Riverside Freeway from its junction at Santa Ana Canyon to the Riverside County line, and presented the facts on this meeting to the California Highway Commission in February.

San Bernardino Freeway

The District VII portion of San Bernardino Freeway extends 30.6 miles from the Santa Ana Freeway near Los Angeles River to the San Bernardino County line in Claremont and is completed throughout. Projects under contract and those previously

completed represent a total expenditure of \$60,785,000 to date. A series of widening jobs will increase the carrying capacity of this important east-west route by adding a lane inbound and outbound, giving increased traffic service on 6 and 8-lane sections.

Widening work started on the most westerly section of the San Bernardino Freeway between Eastern Avenue and Rosemead Boulevard on July 11, 1960, under \$1,920,100 contract. Work to date on the 5.4-mile job has consisted primarily of widening or altering 17 bridges on the project.

Reconstruction design and construction methods and procedures permitted the continuous use of the San Bernardino Freeway and the overcrossings with the exception of the Almansor Avenue overcrossing which was closed to vehicular traffic for a period of three weeks.

The original pedestrian overcrossings consisted of welded steel girder superstructures continuous over reinforced concrete piers with the center spans hinged. Two of the original piers at each structure were located in areas of the new freeway lanes.

Reconstruction consisted of constructing 4 reinforced concrete piers (only 3 new piers were required at the Campbell Avenue pedestrian overcrossing) adjacent to the freeway shoulders. Bearing stiffeners were installed at new pier locations and tie-downs constructed as required. The superstructure was jacked up $1\frac{1}{2}$ inches uniformly at the old piers to permit installation of the bearing assemblies at the new piers. The structure was then lowered onto the old piers. The new bearing assemblies were raised to full bearing and grout pads placed. The superstructure was again jacked up at the old piers to permit removal of the old bearing assemblies. The superstructure was then lowered onto the new piers and the old piers were removed.

The Almansor Avenue overcrossing consisted of 3 welded steel girder spans with a reinforced concrete deck slab simply supported on reinforced concrete abutments and bents. These bents were located in areas of the new freeway lanes.

Reconstruction consisted of constructing 4 steel bents on concrete

pile footings adjacent to the freeway shoulders. Hinge assemblies connecting the girders were installed over the old bents where the structure was simply supported originally. Stiffeners were installed and abutment tie-downs constructed. The superstructure was jacked up $\frac{1}{4}$ -inch uniformly at the old bents and the new bents raised to full bearing by adjusting anchor bolts at the bottom of the bents. Grout pads were placed under the bent grillage systems and the old bearing assemblies removed. The superstructure was then lowered onto the new bents and the old bents were removed.

Cost of reconstructing the three pedestrian overcrossings was approximately \$37,500, an average of \$12,500 for each structure. The Almansor Avenue overcrossing was recon-

structed at a cost of \$44,000. These costs include cleaning and painting the original structural steel.

Bids for a second widening contract between Rosemead Boulevard and Puente Avenue were opened on April 28, 1960. The low bid was \$1,148,488 covering a distance of 6.5 miles.

The work on this contract consisted of addition of two 12-foot lanes in the existing median area, with 8-foot median shoulders. For the portion between Rio Hondo Bridge and Puente Avenue, a distance of approximately 5 miles, a chain link median barrier was installed.

To provide for this additional lane, 11 bridges had to be widened, a 550-foot cantilever retaining wall had to be constructed, and revisions made to the median drainage system.



Looking westerly along Santa Monica Freeway (from Los Angeles River) at construction in progress; foreground, part of East Los Angeles interchange.

One of the major segments of work under the contract was the revision of the existing freeway signing to conform to Federal Interstate standards. Approximately 20% of the bid quantity was concerned with signing items.

While this contract could be considered a routine widening contract it was noted that the existing concrete pavement had a longitudinal keyway which locked it to the new slab. Since traffic was running on the existing pavement immediately adjacent to this new slab, it was believed that random cracking in the new lane would be a serious problem. Adding further emphasis to the possibility of random cracking was the fact that at least 90% of the existing joints were working joints. For a solution to this problem the use of a formed weakened plane joint was decided upon.

The use of masonite strips conforming to the requirements of the 1954 Standard Specifications, in lieu of sawing the transverse joints, proved very satisfactory as no random cracks have developed.

The most easterly widening job on the San Bernardino Freeway, between San Dimas Avenue and the San Bernardino County line, 5.7 miles, was completed on December 21, 1960 at a construction cost of \$970,000. Other projects completed on this freeway during 1960 include realignment between Macy and Fickett Streets (built together with the interchange with the Golden State Freeway), 1.1 miles at a cost of \$3,044,000 on March 30; the Hoyt Avenue off-ramp in El Monte at a cost of \$145,000 on April 18; landscaping between Westcott Avenue and West Covina, 2.3 miles covering 23.3 acres, on November 30.

An undercrossing on the San Bernardino Freeway in the Covina area is in progress at Grand Avenue, at a contract price of \$664,000 with an estimated completion date of February, 1962. This contract includes construction of Grand Avenue, Federal Aid Secondary Route 860, between Rowland Avenue and Toni Drive, and is being financed jointly by the State and the County of Los Angeles.

Studies covering widening of the freeway from 6 to 8 lanes between the Golden State Freeway and the

Long Beach Freeway, are nearing completion. Also, plans are presently being prepared for widening to 8 lanes between Holt Avenue and San Dimas Avenue. This is the Kellogg Hill portion of the San Bernardino Freeway.

The 1961-62 budget contains \$115,000 for median barrier construction for 2 miles of freeway between Evergreen Avenue in Los Angeles to just east of the Long Beach Freeway in Monterey Park; and \$310,000 for median barrier construction for 9.5 miles of freeway between Arroyo Avenue in West Covina to Puente Avenue in Baldwin Park (this will connect with median barrier installation under widening contract west of Puente Avenue).

Landscaping plans for 1961 call for planting at the Orange Avenue and Pacific Avenue, and Sunset Avenue and Irwindale Avenue interchanges in West Covina (\$65,000 in the 1961-62 budget) and Long Beach Freeway to Westcott Avenue in Baldwin Park (\$375,000 in the 1961-62 budget).

San Diego Freeway

In District VII the San Diego Freeway extends from the San Diego County line near San Clemente to the Golden State Freeway near the San Fernando Reservoir, a total length of 94.5 miles. Portions of this Interstate route are constructed, under construction or budgeted for construction and on other sections of the route right of way is being acquired and freeway design is in progress. As of December 31, 1960, \$173,566,000 had been committed for right of way and construction on going and completed projects on the San Diego Freeway.

This freeway was completed and opened to traffic from Burbank Boulevard to Valley Vista Street in San Fernando Valley (along with a portion of the Ventura Freeway), a distance of 1.2 miles, on July 3, 1958, at a construction cost of \$2,800,000; Mulholland Drive was relocated and a bridge built across the future San Diego Freeway in the Santa Monica Mountains on April 1, 1960 at a cost of \$1,824,000; on the West Los Angeles side of the Santa Monica Mountains, 2 miles were added between Casiano Road and Ohio Avenue in

1957 at a cost of \$4,641,000; on February 19, 1959, 3.5 miles were added between Ohio Avenue and Venice Boulevard at a cost of \$6,440,000, and on July 14, 1960 a 1.8-mile section was completed from Venice Boulevard to Jefferson Boulevard at a construction cost of \$5,371,000.

Additional mileage on the San Diego Freeway has been constructed in Orange County since early 1958, when the first unit of 1.6 miles was completed at a cost of \$665,000 from a junction with the Santa Ana Freeway near El Toro Marine Corps Air Station to Niguel Road. On September 22, 1959, a 7.5-mile section costing \$4,218,000 was completed from Niguel Road to Trabuco Creek, where it joins another 3.7-mile section through San Juan Capistrano completed on December 24, 1958, under \$4,081,000 contract. Another San Diego Freeway project through San Clemente to the San Diego County line, 1.8 miles, was completed on October 20, 1958, at a cost of \$2,413,000. On December 1, 1960 a connecting link was completed between San Juan Capistrano and San Clemente, adding 5.8 miles of freeway at a construction cost of \$6,358,000.

Some of the minor San Diego Freeway projects completed during 1960 are as follows: landscaping, Burbank Boulevard to Ventura Boulevard, April 26, \$95,000; landscaping, Wilshire Boulevard to Matteson Avenue, April 28, \$164,000; and bridge and approaches, Willow Street to Lakewood Boulevard, March 14, \$154,000.

Bids were opened on January 5, 1961 on a grading only project for the San Diego Freeway from junction with the Golden State Freeway in the north San Fernando Valley to Nordhoff Street, a distance of about 4 miles. This project is part of a \$12,625,800 contract on the Golden State Freeway scheduled for completion in March, 1963. A future contract will be let for structures and paving.

An adjoining contract in the amount of \$17,224,700 was awarded on July 25, 1960, for a distance of almost 12 miles, between Nordhoff Street and Casiano Road in West Los Angeles, with grading only for that portion of the freeway between Nordhoff Street and Burbank Boulevard (6.2 miles).

Construction to full freeway standards of the 5.6-mile link through the Santa Monica Mountains will close the gap between Casiano Road, the present terminus of the San Diego Freeway, and Valley Vista Street in the San Fernando Valley.

The portion between Casiano Road and Mulholland Drive is located in the same narrow pass containing existing Sepulveda Boulevard. In order to avoid interference with traffic using Sepulveda Boulevard, stage work was included in the contract. Construction will get into full swing this summer, after completion of stage work. The estimated completion date for the entire contract is late 1962.

Next construction on the San Diego Freeway is at Manchester Boulevard in the Inglewood area, where 3 bridge structures were completed on January 31, 1961 at a construction cost of \$421,400. On December 28, 1960 a \$1,633,000 contract was awarded for construction of roadways, bridge approaches and 5 bridges between Manchester Boulevard and Vesta Street, a distance of 0.5-mile. This project is tentatively set for completion in April, 1962. On March 9, 1961 bids were opened on a San Diego Freeway project in the Lawndale-Torrance area, between Hawthorne Boulevard (Route 164) and 174th Street, a distance of 1.2 miles, for which \$3,400,000 in 1961-62 State Highway funds was provided.

A project from the 174th Street to 190th Street was awarded on December 23, 1960 for the low bid of \$6,668,846. The estimated completion date of this 3.4-mile segment is summer of 1962.

Work started on July 17, 1960 on the San Diego Freeway (and a segment of the Harbor Freeway between 190th Street and 208th Street) between 190th Street and Carson Street, a distance of approximately 3 miles, under an \$8,120,000 contract. Plans call for 17 bridges on this job. May, 1962 is the target date for completion of this project.

A connecting job is that from Carson Street to Alameda Street, 1.9 miles, awarded in the sum of \$4,321,900 on December 13, 1960. The estimated completion date of this freeway unit, which will have 3 bridges, is



Looking north along the San Diego Freeway construction area. Existing horseshoe curve on Sepulveda Boulevard, center, and relocated Mulholland Drive and bridge, foreground.

June, 1962. Storm drain construction and imported borrow operations are now in progress.

From Alameda Street to the Long Beach Freeway another construction contract is in progress for a distance of 1.3 miles. The \$5,134,400 contract was awarded on April 20, 1960. Completion is anticipated by December, 1961. The project will have 10 major structures and provide the interchange between the San Diego Freeway and the Long Beach Freeway. Major construction items include 2,300,000 tons of imported borrow, 16,000 cubic yards of structure concrete, 74 precast, prestressed concrete girders and 101 precast, prestressed deck units.

Work started December 8, 1960 on a project between Lakewood Boulevard and Cherry Avenue in Long

Beach and Signal Hill. The \$1,350,400, 0.7-mile job is tentatively scheduled for January, 1962 completion and consists of the construction of the Spring Street overcrossing bridge and approaches, retaining wall, pumping plant, storm drains and sanitary sewer relocation work and will provide for moving roadway excavation material through the cities of Long Beach and Signal Hill at separated grade in future roadway contracts. A recent allocation by the California Highway Commission adds another \$3,700,000 to the 1961-62 budget for separation structures and approaches east to Studebaker Road.

Bids were opened on March 23, 1961 on a landscaping contract on the San Diego Freeway between Venice and Jefferson Boulevards in West

Los Angeles and Culver City. The 1.8-mile section was financed by \$150,000 from funds available in the 1960-61 State Highway budget.

The Highway Commission in October, 1960 made heavy allocations of State Highway funds on San Diego Freeway jobs in the 1961-62 fiscal year in District VII. The financed jobs are as follows: from Jefferson Boulevard to 174th Street, 10 miles, \$24,600,000 (bids were opened on March 9, 1961 on a project at the southern end); from the Long Beach Freeway near Long Beach to California Avenue in Signal Hill, 1.8 miles, \$8,000,000; median barrier, Casiano Road to Jefferson Boulevard, 7.2 miles, \$190,000; landscaping, Avenida Alessandro in San Clemente to near U. S. 101 Alternate, 7.1 miles, \$152,000; and truck scales, 4.3 miles south of Niguel Road near El Toro, \$210,000.

Plans for the section of the San Diego Freeway between 174th Street and Jefferson Boulevard have been completed. It is anticipated that it will be advertised by the spring of this year. Combined, this work and those adjacent projects already under contract will provide the longest continuous stretch of 8-lane freeway under construction at one time in the District's history.

San Gabriel River Freeway

Construction plans are now in preparation for the entire 22.6 miles of the San Gabriel River Freeway extending from the Garden Grove Freeway in Orange County to the San Bernardino Freeway in Los Angeles County. Interchange facilities will be provided between this freeway and the San Diego, Santa Ana, Garden Grove, Artesia, Pomona and San Bernardino Freeways as well as with major county roads and city streets.

This freeway passes through portions of the cities of Dairy Valley, Norwalk, Santa Fe Springs, Downey, Industry, Baldwin Park and Long Beach. Freeway agreements have been executed by all of these cities and also by Los Angeles County. Right of way acquisition is in progress throughout the entire length, with an additional \$10,000,000 allocation for fiscal

1961-62. Right of way monies already expended on the San Gabriel River Freeway (as of December 31, 1960) amount to \$16,867,000.

The 1961-62 construction budget includes an item of \$800,000 for construction of an interim project on the existing route which will include construction of the Peck Road overcrossing and the Peck Road interchange on the San Gabriel River Freeway. It is anticipated that this project will be under construction by September, 1961.

Santa Ana Freeway

The Santa Ana Freeway extends 43 miles from Spring Street in downtown Los Angeles to a junction with the San Diego Freeway near El Toro in Orange County. The first construction contract on the Santa Ana Freeway was completed in February, 1947, on a 1.5-mile section between Kearney and Soto Streets, at a cost of \$1,495,000. This freeway is open to traffic throughout and has been in service for a number of years. In right of way and construction, including going contracts, the Santa Ana Freeway has cost \$74,308,000 up to December 31, 1960.

Minor projects completed on the Santa Ana Freeway in 1960 include construction of median barrier between Benton Way (Hollywood Freeway) and Lakewood Boulevard, May 11, \$200,000; ramp revision and lighting at Telegraph Road and Slau-son Avenue, August 5, \$18,000; and a pedestrian ramp at Florence Avenue, February 1, \$15,000.

A contract for widening the Santa Ana Freeway from six lanes to eight lanes, 0.7-mile, between the Long Beach Freeway and Atlantic Boulevard was awarded on June 20, 1960, and completed on February 21, 1961 at a cost of \$485,000. The additional width will provide increased merging distance for traffic to and from the Long Beach Freeway.

Current contracts include a \$172,500 landscaping project between Orange-thorpe Avenue, 2.3 miles covering 23 Ana, 5.5 miles covering 23 acres, scheduled for completion in July, 1961; and a \$99,100 landscaping project between Coyote Creek and Orange-thorpe Avenue, 2.3 miles covering 23

acres, scheduled for completion in July, 1961.

Studies are in progress for widening this freeway to a 6-lane facility from the Laguna Freeway to Santiago Creek, a distance of some 10.2 miles. Plans are being completed for the necessary construction to convert the 4-lane freeway to 6-lane width for 3.8 miles between South Street and the Santa Ana River. This project will be advertised for bids as soon as funds are made available.

The 1961-62 budget contains \$13,700,000 for the construction of the Santa Ana, Orange and Garden Grove Freeways interchange. Unit II of this project provides for the construction of the Santa Ana Freeway between the Santa Ana River and Main Street in Santa Ana to 6 lanes and construction of the Garden Grove Freeway from the Santa Ana Freeway to just east of Main Street.

A median barrier project is financed \$535,000 in the 1961-62 fiscal year for the Santa Ana Freeway between Rose-crans and Grand Avenues, 8.7 miles.

Santa Monica Freeway

An Interstate route, the Santa Monica Freeway measures 17.6 miles from Palisades Beach Road in Santa Monica to the Santa Ana Freeway in East Los Angeles. Various parts of this route had been completed in the downtown area in the years 1957-59, including a bridge across the Los Angeles River and the Atchison-Topeka-Santa Fe and the Union Pacific Railways and bridges across the Harbor Freeway.

Going and completed projects and right of way costs on the Santa Monica Freeway amounted to \$106,035,000 as of December 31, 1960. The section from the East Los Angeles Interchange to Vermont Avenue is all under construction (mainly viaduct) covering a distance of 4.9 miles and representing a combined construction cost of \$37,166,000. The target date for completion of the Santa Monica Freeway as far west as Vermont Avenue is fall 1962. (For details on Santa Monica Freeway construction see article "Loop Progress," by A. L. Himelhoch, District Engineer—Operations, *California Highways and Public Works*, January-February, 1961.)

As a means of offering further freeway service to the westerly section of metropolitan Los Angeles, work on the Santa Monica Freeway west of the Harbor Freeway has also been expedited. Special emphasis has been placed on completion of the section between the Harbor and San Diego Freeways with the section westerly to the Pacific Coast Highway following closely thereafter. The 1961-62 budget includes \$9,860,000 for structures and related work between Hoover Avenue and the Pacific Coast Highway.

Plans for the Santa Monica Freeway as far west as the San Diego Freeway are scheduled for completion this year. Plans for the remainder west of the San Diego Freeway should be completed early in 1962. An accelerated right of way acquisition program will get under way on July 1, 1961, when \$18,700,000 in 1961-62 funds will become available for expenditure.

Santa Paula-Santa Clara River Freeway

The Santa Paula-Santa Clara River Freeway (State Sign Route 126) is adopted in two separated portions, between the Ventura Freeway and Orcutt Road in Ventura County and between the Ventura County line and the Golden State Freeway in Los Angeles County, for a distance of almost 20 miles.

Plans for the first section of the Santa Paula-Santa Clara River Freeway from the Ventura Freeway to 0.1 mile east of Wells Road, 5.5 miles, have been completed, and it is anticipated that bids will be received in the early summer of 1961. This project is budgeted for \$3,600,000 in the 1961-62 fiscal year.

Plans for the second section from 0.1 mile east of Wells Road to the east city limits of Santa Paula are nearing completion.

For the Santa Paula-Santa Clara River Freeway from the Ventura County line to the Golden State Freeway, right of way is being acquired in conjunction with a project proposed on the Golden State Freeway.

Ventura Freeway

The Ventura Freeway is 75.6 miles long in District VII, extending from the Golden State Freeway in Los Angeles County, through Ventura

County, to the Santa Barbara County line. Sections of this route are constructed, under construction or in design stages. Up to December 31, 1960 a total of \$97,447,000 had been expended on this route for right of way and construction on going and completed contracts.

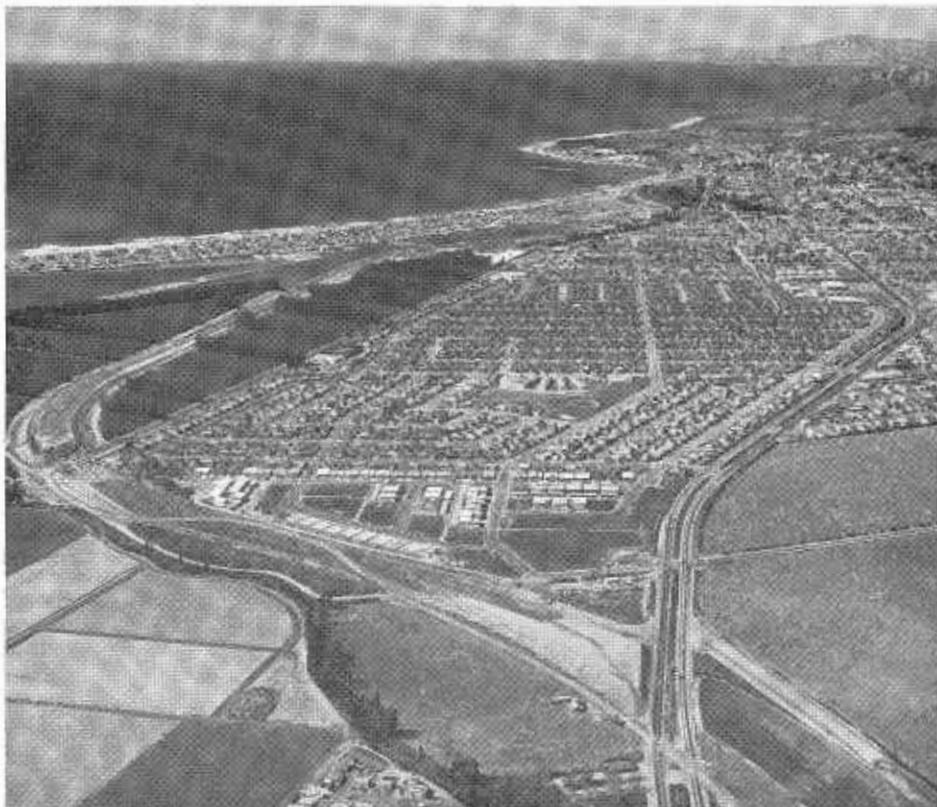
Two important Ventura Freeway links were completed in 1960, between Laurel Canyon Boulevard and the San Diego Freeway and between Encino and Kelvin Avenues in the San Fernando Valley, adding about 8 miles to this route at a construction cost of \$12,552,000. These two contracts were opened simultaneously to traffic on April 5.

Other completions on the Ventura Freeway in 1960 are as follows: landscaping, Sepulveda Boulevard (San Diego Freeway) to Encino Avenue, 2.6 miles, March 10, \$195,000; landscaping, Kelvin Avenue to the west city limits of Los Angeles, 3.5 miles, March 23, \$36,000; landscaping, Ventura Boulevard to Burbank Boulevard, 1.2 miles, April 26, \$40,000; ramps and freeway widening, Colfax Avenue to Laurel Canyon Boulevard,

June 30, \$361,000; median barrier, Laurel Canyon Boulevard to Sepulveda Boulevard, July 15, \$85,000; and landscaping, Moorpark Street to Colfax Avenue, 0.9-mile, November 22, \$23,000.

Preparation of contract plans and active construction continues on the Ventura Freeway between the Los Angeles city limits and the Santa Barbara County line. A contract through the City of Ventura, 4.6 miles, was awarded for a bid price of \$8,948,400 on February 24, 1960. This section, which calls for 10 bridges, 1 pumping plant and 13 retaining walls, will have 6 lanes (with provision for more) from Telephone Road to Palm Street. With actual work having started on March 14, 1960, the estimated completion date is March, 1962. Major quantities on the job are 2,300,000 cubic yards of imported borrow and 750,000 cubic yards of roadway excavation.

An adjoining project, totaling 4.2 miles and including interchange structures with a short length of the Ojai Freeway, was awarded on February 14, 1961, at a low bid of \$6,506,432. This connecting link of 4 and 6-lane



Looking northerly at construction in progress on the Ventura Freeway in the City of Ventura.

STATUS OF DISTRICT VII FREEWAY PROJECTS

SUMMARY AS OF MARCH 1, 1961

Name of freeway	Route No.	Total adopted miles	Completed projects				Under construction		Right of way cost	Total obligated cost to date
			Freeway		Expressway		Freeway			
			Miles	Cost	Miles	Cost	Miles	Estimated cost		
Antelope Valley*	23	54.6		60	0.3	450		7,620	697	8,827
Artesia	175	18.9		828	4.9	2,324			5,272	8,424
Colorado	161	2.3	2.3	6,325					2,275	8,600
Corona*	77	4.4			3.2	837			231	1,068
Corona Del Mar	184	6.3			2.2	215			68	283
Foothill	157,9,190	34.2	2.3	2,287					2,846	5,133
Garden Grove*	179	15.4		1,566				271	5,620	7,457
Glendale*	162	3.2	1.1	2,914			1.3	3,156	6,726	12,796
Golden State	4,161	73.2	11.3	26,241	43.6	6,901	15.9	46,004	67,435	146,581
Harbor	165	22.6	17.7	42,280			4.5	7,143	52,766	102,189
Hollywood	2,159	17.3	10.9	33,924				21	35,026	68,971
Laguna*	185	8.4				570			138	708
Long Beach*	167	21.5	16.8	27,982			2.9	4,948	23,016	55,946
Marina	60	2.6							40	40
Newport*	43	17.7			3.3	1,772	3.0	4,400	7,190	13,362
Ojai	138	6.0	2.7	1,360	0.9	376	0.2	696	1,552	3,984
Orange	19	16.6							1,816	1,816
Pacific Coast	60	24.3	7.9	2,530				10	2,809	5,349
Padadena*	165,205	8.2	8.2	10,794				410	1,014	12,218
Pomona*	172,19	28.8							4,213	4,213
Riverside*	175,43	19.1	5.7	6,248	13.4	3,920			5,676	15,844
San Bernardino*	26	30.6	30.6	39,034				4,047	17,704	60,785
San Diego*	2,158	92.5	29.1	42,212			14.7	46,919	87,785	176,916
San Gabriel River	170	22.6		190					16,867	17,057
Santa Ana	2,174,166	43.1	43.1	54,071				880	19,357	74,308
Santa Clara River	79	19.9							1,846	1,846
Santa Monica*	60,173	17.6		5,510			4.9	37,166	63,359	106,035
Seaside	167	2.2							514	514
Slauson	221	0.6								
Ventura*	161,2	75.6	24.9	33,933	29.7	7,790	9.7	18,794	43,376	103,893
Yorba Linda	176	3.1							529	529
Totals		713.4	214.6	340,289	101.5	25,155	57.1	182,485	477,763	1,025,692

*Official name.

(Cost in \$1,000)

freeway is being built west of Palm Street and it is anticipated that it will be completed by late fall of 1962.

Urban development along the present Ventura expressway has been explosive with a corresponding increase in traffic. Opening of the last two sections of the Ventura Freeway in the San Fernando Valley accelerated to a marked degree this increase in traffic. The 1960 July traffic count shows a 35% to 50% increase in traffic over the 1959 count for the entire length from Los Angeles to Ventura. This has created a conflict at the crossings at grade with resulting needs for separations of grades at the principal intersecting streets.

Right of way is being acquired and plans prepared for converting this section to full freeway with construction

of interchanges and elimination of present crossings at grade. A \$529,300 contract for the interchange at Las Posas Road in the vicinity of the Oxnard Air Base was awarded on December 22, 1960.

At Moorpark Road, construction of the interchange will be combined with reconstruction of 3.5 miles of Moorpark Road (State Sign Route 23) as far as Olsen Road. This project is financed \$1,340,000 in this fiscal year with construction to start in the summer of 1961. Similar interchanges are financed for construction along the Ventura Freeway at Borchard Road, 1.7 miles, \$599,000; and at Las Virgenes Road, 1 mile, \$380,000.

West of the Ventura River to the Santa Barbara County line details are being completed for a 4-lane freeway

on revised alignment with right of way for an ultimate 6 lanes.

Major construction projects on the Ventura Freeway are in progress in the Los Angeles area as well, with two contracts that will connect the Ventura Freeway to the Golden State Freeway at the north end of Griffith Park.

The first contract, awarded on November 7, 1960 at a bid price of \$3,915,600, extends from the Golden State Freeway to Buena Vista Street and includes construction on 1.9 miles of the Golden State Freeway to the Colorado Street extension (widening to 5 lanes of the southbound roadway) and 2.2 miles on the Ventura Freeway. This project will have 6 equestrian undercrossings and 4 bridges for vehicular traffic, one a

... Continued on next page

MacDONALD RETIRES; O'BIER, ASBILL PROMOTED

Ernest M. MacDonald, Assistant Chief Right of Way Agent in charge of appraisals for the California Division of Highways, retired on May 2 after nearly 30 years of State service.



E. M. MacDONALD
San Bernardino-Riverside County district since 1945.

O'Bier's successor as District Right of Way Agent is J. M. Asbill of San Bernardino, who has been O'Bier's assistant in charge of administration.

MacDonald, as chief of the appraisal section of the Division's Right of Way Department since 1947, has been responsible for the evaluation of hundreds of millions of dollars of property acquired by the State for freeway and other purposes.

He was born in Oakland and educated in Berkeley. He was graduated from the University of California at Berkeley in 1920 after serving overseas in World War I, and then worked as an appraiser for the Southern Pacific Railroad from 1921 to 1926. He later engaged in the real estate and insurance business in Oakland.

He entered State service in 1931 as a Senior Engineering Aid and subsequently became an Assistant Right of Way Agent for the Division of Highways in the Los Angeles area. In 1936



RAY E. O'BIER

he transferred to the State Board of Equalization, where, as senior valuation engineer, he was in charge of land appraisals for utility assessment throughout the State. He returned to the Division of Highways as its appraisal chief in 1947.

MacDonald served with the 363rd (San Francisco's own) Infantry Regi-

ment in France in World War I. He was wounded in action in the Argonne campaign and was awarded the Silver Star and Purple Heart.

He is a member of the American Society of Civil Engineers, the American Institute of Real Estate Appraisers, the American Right of Way Association, and the State Men's Club of Sacramento.

MacDonald and his wife, Dolores, live at 520 Woodland Drive, North Sacramento. They have three daughters, Mrs. David Ferguson of Colby, Kansas, Mrs. William Neuffer of North Sacramento, and Mrs. Oscar Wiger of West Covina.



J. M. ASBILL

For the past 26 years in right of way. He rose through the ranks to head the District right of way unit in 1945. For all but one year of his more than 33 with the Division he has been in the San Bernardino District.

He was born and educated in El Campo, Texas, and worked on geophysical surveys for an oil company before coming to California in 1927.

Asbill, who is being promoted to District Right of Way Agent, is also a native of Texas. He joined the California Division of Highways as a timekeeper in 1924, left State service to practice accounting in 1930, returned in 1933, and has been in right of way work in the San Bernardino District since 1943.

The State Division of Highways has opened bids on a project covering grading and surfacing on State Sign Route 89 in Plumas County and construction of 6.5 miles of two-lane access controlled highway between two miles north of Canyon Dam and 1.3 miles north of Almanor Inn. Seven bids were received. Low bidder was Baldwin Contracting Company, Inc., Marysville, \$536,701.80.

DISTRICT VII—Continued

385-foot steel girder structure over the Los Angeles River. The estimated completion date for the entire project is April, 1962.

On March 23, 1961 bids were opened for that portion of the Ventura Freeway from Buena Vista Street west to connection with existing Ventura Freeway at the Hollywood Freeway interchange in Studio City. This project is 2.9 miles long and is financed \$7,700,000 in the 1961-62 fiscal year. The project will have 14 bridges and 1 pedestrian crossing.

Minor projects in progress on the Ventura Freeway include the following: median barrier, Hollywood Freeway to Laurel Canyon Boulevard and Encino Avenue to Reseda Boulevard, 2.4 miles (bid opening held on March 30, 1961, from \$55,000 available in 1961-62 funds); landscaping, Encino Avenue to Kelvin Avenue, 4.2 miles covering 42 acres, \$135,000, scheduled for completion in September, 1961; and landscaping, at Ditch Road, Calleguas Road, Pleasant Valley Road, Dempsey Road and Wood Road, 10.2 miles covering 10.4 acres, scheduled for completion in July, 1961.

Future Outlook

Today we have in operation a portion of a true freeway system in a major metropolitan area. In 1961 we will still have only a portion, not many miles longer than in 1960. But by the latter part of 1962, with completion of a substantial mileage of major freeway projects now under construction, there will be an extended system and a choice of freeway routes available to the motorist.

In the meantime, orderly planning for additional freeways to serve all sections of the three-county area of District VII is continuing, while the Los Angeles Regional Transportation Study continues as a basis for comprehensive metropolitan planning on the part of the State, the cities and the counties in the area.

The sensible application of safe driving practices is the surest defense against motor vehicle accidents of any type.

Scotia Bridge

Parallel 2-lane Structure
Corrects Traffic Deficiency

By GEORGE W. THOMSON, Resident Engineer



WITH THE opening of the South Scotia bridge over the Eel River on December 6, 1960, one more step was realized in the ultimate development of the Redwood Highway (U. S.

101) to freeway standards.

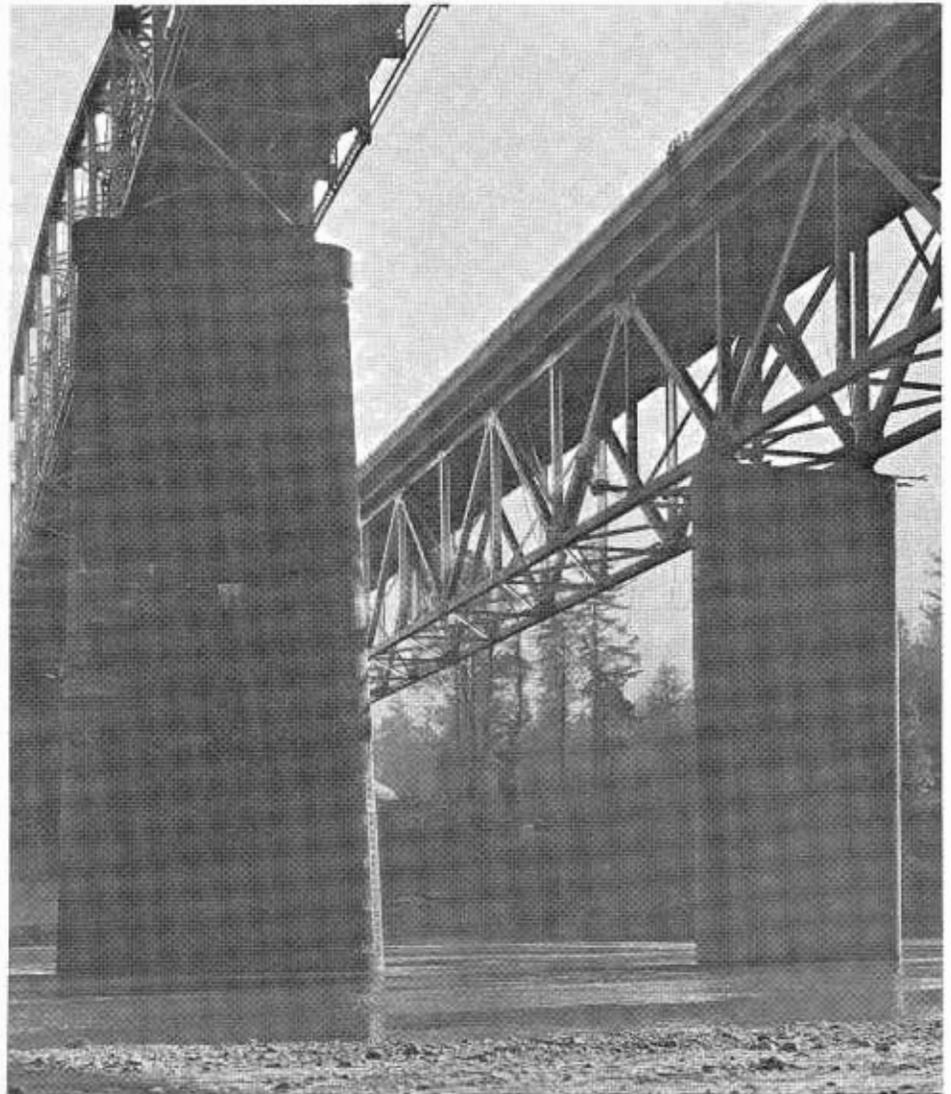
The project consists of a new parallel bridge with approach roadways 75 feet downstream from the existing Eel River bridge. The new bridge provides a 28 foot roadway for 2 lanes of southbound traffic while the existing bridge will continue in service providing one northbound lane. The project extends from 0.4 mile south to 0.2 mile north of South Scotia Bridge, approximately 3 miles south of the town of Scotia. The length of project is 0.72 miles.

The existing South Scotia Bridge was constructed in 1916 under State Contract No. 166 by Mercer and Fraser, Contractors, for the bid amount of \$120,407. It consists of two 304-foot through pin-connected steel truss spans over the river channel, and reinforced concrete slab and girder approach spans, providing a minimum roadway width of 18 feet.

With the increase in size, weight, and speed of trucks over the years, it became necessary to post the bridge; this was done in 1937, consisting of "5 MPH on Bridge for Vehicles over 5 Tons"—it was also signed "One Way for Trucks and Buses". In 1940, the original timber deck on the truss spans was replaced with a reinforced concrete deck, and the structural steel floor system strengthened.

Some Structural Damage

On several occasions the truss members suffered structural damage, as the result of "tight squeezes" between logging trucks and cars meeting on the bridge. To protect the truss a



Under view of the new parallel South Scotia Bridge (right) over the Eel River. Located some 75 feet downstream from the old bridge (left), which was built in 1916, the new bridge is 1,000 feet long and has two spans (each 304 feet long) of continuous steel deck truss construction over the river channel.

pair of skid rails (corrugated metal plate guard rail section) were placed in 1952 on each side of the roadway, attached to the truss members at truck load height. Although the old bridge is structurally adequate for legal loads, the speed restriction posting for northbound traffic over the old bridge will remain in effect. Ultimately the old bridge will be replaced by a structure similar to the new bridge.

The Eel River channel is about 600 feet wide at this location. Flow varies widely with season and run-off conditions. During the summer months the flow is only about 200 second-feet but during the winter rainy season it can be a different story. During the disastrous December 1955 flood the maximum discharge was estimated at 200,000 second-feet.

The new bridge consists of a two span continuous steel deck truss over

the river channel (2 @ 304' 4"), matching the river spans of the existing bridge with welded steel plate girder approach spans (3 at each end of truss, averaging 64 feet). The total length of the bridge is 998' 9½". The alignment is tangent and parallel to the old bridge, except for a short section of curve to left at north end of the bridge. The first approach span on the north end of the bridge is over the single track mainline of the Northwestern Pacific Railroad, hence the structure designation "Eel River Bridge and Overhead".

Welded Sections

The Warren type steel deck truss has 10 panels @ 30' 5" per span. All members are welded H sections. Chords are parallel; truss depth is 30' 0"; the 2 trusses are spaced @ 20' 0". A fixed bearing with 10" diameter pin is used at center pier; rocker assemblies are used at end piers.

Two types of structural steel were used for the truss: ASTM Specification A242 for main stress carrying members with an allowance tension stress of 27,000 to 22,000 p.s.i. dependent upon plate thickness—the lower value for plates over 1½"; ASTM Specification A373 steel was used for all other members, with an allowable tension of 18,000 p.s.i. Both steels are suitable for welding the built up members. 510,000 lbs. of A242, and 663,000 of A373 steel were required. All connections are made with ¾" high strength bolts. The reinforced concrete deck is 6¼" in thickness, and is supported by 5 stringers (27 WF @ 94) spaced @ 6' 6" per truss panel span. Floor beams and stringers are A-7 steel.

Approach spans consist of 4 welded steel girders, 39" web depth, spaced at 8'4" of A-7 steel.

The Bridge substructure consists of reinforced concrete abutments and piers on cast-in-place concrete and steel piling.

The bridge is designed for H20-S16-44 and Alternate loading, in conformance with American Association of State Highway Officials Specifications supplemented by Bridge Department specifications. It was designed by the Bridge Department of the Division of Highways at Sacramento

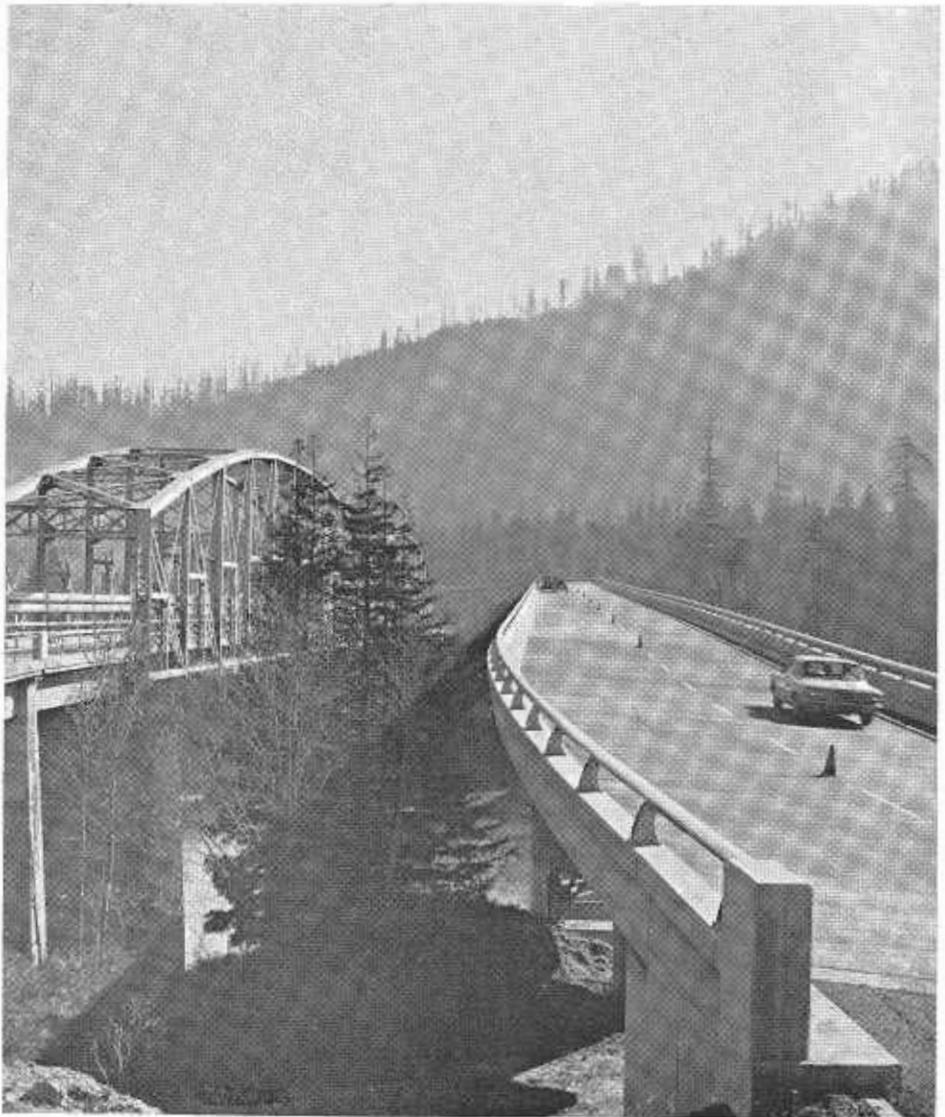
under the direction of recently retired Bridge Engineer F. W. Panhorst.

The roadwork consists of approaches to the new bridge, transitions to existing two lane facility, frontage roads, creek channel alignment, and sacked concrete riprap bank protection for north end of south approach embankment.

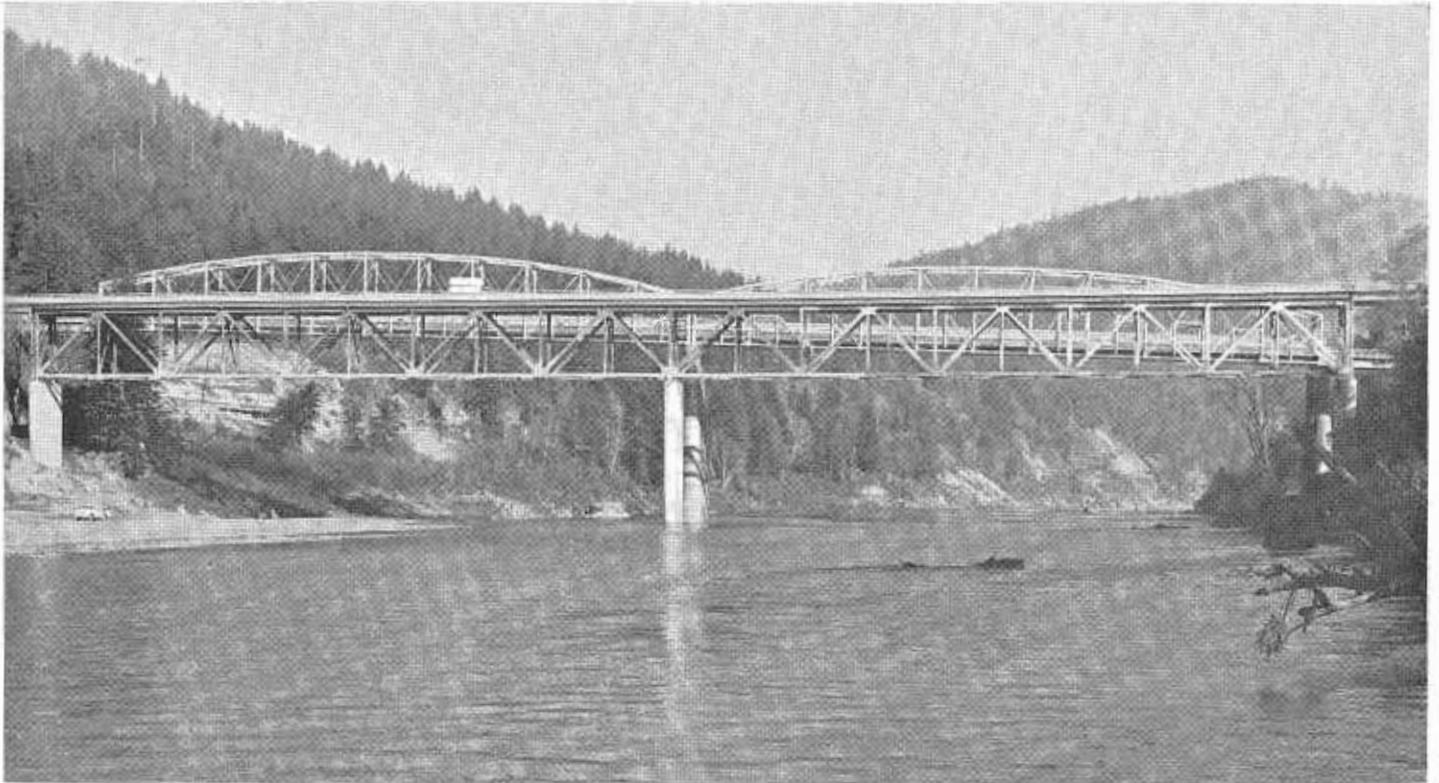
Contract Is Joint Venture

The contract was awarded to the joint venture firm of Erickson, Phillips and Weisberg of Concord; and Arthur B. Siri Inc. of Santa Rosa for the bid amount of \$984,227 on May 22, 1959. Work started on the project on May 26. Erickson, Phillips & Weisberg did the bridge work; Arthur B. Siri Inc. handled the roadwork.

The Special Provisions for the contract provided for a settlement period at the south approach fill not to exceed 30 days before the driving of piles for the south abutment of the bridge. For varying depths the surface material at this location consists of silty sand mixed with forest debris, such as old logs and decomposed vegetation; this cover is underlain by solid material consisting of sand & gravel graduating to shale. The area at one time was the ancient river channel. It was found at the end of the 30 day period, that the fill was still settling; the height of the fill at this location is about 45'. The fill finally stabilized in about 75 days, with a total movement of 3.6 feet.



The new South Scotia parallel bridge (right) over the Eel River has a 28-foot roadway which carries two lanes of southbound traffic. Northbound traffic will use the old bridge (left).



Looking upstream at the new (front) and old (rear) South Scotia parallel bridges over the Eel River. Ultimately, the old bridge will be replaced by a structure similar to the new one.

All piles were driven to a 45 ton minimum bearing capacity, excepting abutment No. 1 which was to 60 tons. Steel piles (10 BP @ 42) were used at abutment No. 1 and river pier No. 5; at all other locations cast-in-place concrete piles were used, except at pier No. 6. Pier 6 is supported by a spread footing @ 6 TSF on a dense shale outcropping. Foundation requirements on this job varied considerably; it is noted that conditions encountered agreed closely with investigation and recommendations made by the Bridge Department Geology Section. Furnishing and driving piles was subcontracted to Raymond Concrete Pile Co. of Oakland.

River piers consist of constant section reinforced concrete shafts, 29'x6', with 3' radius noses, and a single hollow cell 16'x3'6". The maximum pier height is 73', pier No. 5. Conventional forming methods were used, pouring each pier in 3 lifts.

Falsework Towers

Two leg steel falsework towers at 60' (even numbered truss panel points) were used to erect the structural steel. The average tower height was 65'; the

tower legs were supported by steel plate pads on channel bottom. The falsework bents were used initially for span 4. When erection and bolt-up of span 4 was complete, the towers were removed, excepting one @ PP6 to retain camber, and repositioned in span 5; erection and bolt-up work was then continued. A 65 Ton capacity (4 axle) truck crane was used to erect structural steel; it was equipped with a 110' boom and 25' jib. It was necessary for the Contractor to ship this large crane by rail from the Bay Area to the job site, as a highway travel permit could not be issued due to poor alignment of Highway 101 north of Ukiah, and the heavy summer tourist traffic. A center of span erection camber of 4" was provided in the 304' spans. After all falsework was removed, and the concrete deck and curbs placed, the residual camber was found to average 1 3/4".

The major roadwork items and the bridge, except for painting of structural steel, was completed in December 1960. The new bridge was opened to public traffic on December 6. The structural steel is being painted with

an aluminum finish coat, to match the adjacent old bridge. All work was completed on March 2, 1961.

The approximate cost of the bridge work is \$664,000; and the roadwork is \$353,000. This is a California Federal Aid Primary Project, No. F-0118(2). The Federal funds amount to 55.12% of the total value of the work.

Ross Phillips of Erickson, Phillips and Weisberg was the Project Superintendent for the Contractor. The project was administered by the Bridge Department, Division of Highways under J. E. McMahon, Bridge Engineer. Representing the State in the field were Resident Engineer George W. Thomson, and District I Representative John Brown, Jr. (1959), and Leland Hadley (1960-61).

The California Highway Commission has adopted a freeway routing for a beltline freeway running north of Sacramento which will form a component part of a proposed freeway network in the metropolitan area.

The adopted route is 16.5 miles in length.

Aukum Road

El Dorado County Completes
Difficult Route Relocation

By ROBERT C. DOWNER, Road Commissioner

AN EXCELLENT example of a county designed and cooperatively financed Federal-aid Secondary Highway and Bridge Project in rough mountainous country is found about eight miles southeast of Placerville where El Dorado County's Aukum Road (FAS Route 1234) crosses the north fork of the Cosumnes River.

The outstanding feature of the project is the new bridge on a graceful curve high above normal water level. Its wide concrete deck is supported by steel girders on concrete piers and abutments. Located $\frac{3}{4}$ mile downstream from the old bridge, the new structure is on a 1.5-mile realignment between Somerset and 0.7 mile north of the river in precipitous terrain which includes ledges and boulders of granite.

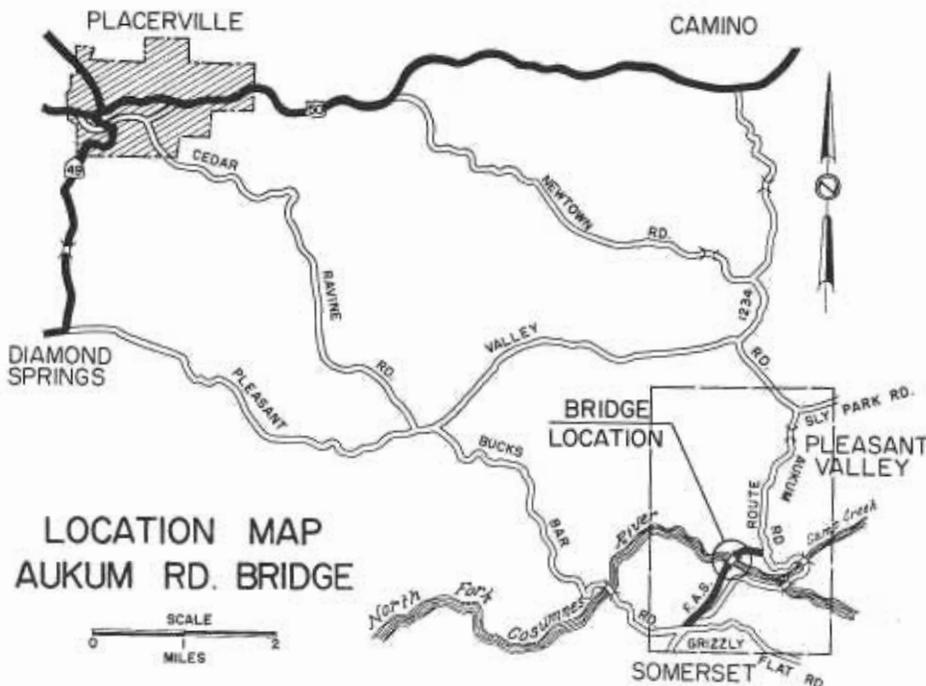
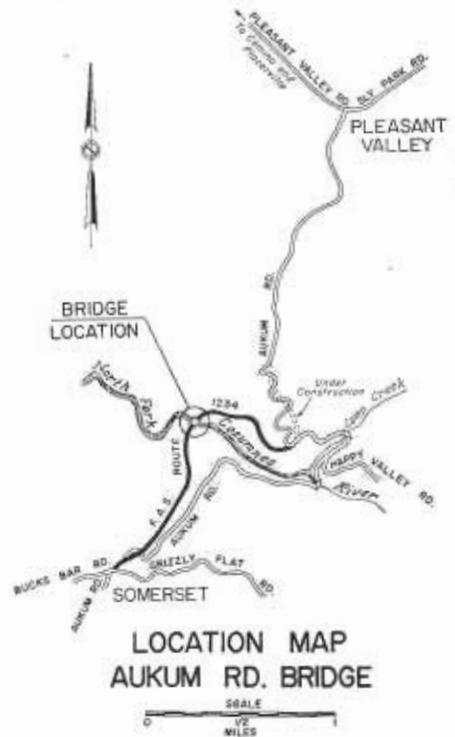
In fact, so rugged is the country that the grading contract had to be let and completed before the bridge contract could be started, since access to the bridge site was impossible for construction equipment.

Had Many Curves

Previously, the alignment was two-and-one-quarter miles of 18-foot-wide oiled earth with two-foot shoulders. Curves were as tight as 40-foot radii and grades ran up to 12 per cent. The old bridge over the Cosumnes, which remains in place for local traffic, is 38 feet long and 20 feet wide on a substandard alignment. The Camp Creek bridge consisted of one 112-foot steel truss span with timber approach spans for a total of 177 feet. It was 12 feet wide with two planks for each wheel track.

The new alignment provides a minimum curve radius of 400 feet, a nine percent maximum grade, a roadbed width of 28 feet, and saves three-quarters of a mile of travel distance. The new bridge has a reinforced concrete deck over three 85-foot welded girder spans supported on reinforced concrete abutments and single-column piers, and provides a clear roadway of 28 feet. The deck is about 75 feet above the normal water surface of the

stream. The old bridge, which it replaces, had a posted weight limit of only five tons. The new structure has no posted weight limit.



Pier footings in the essentially solid granite required drilling and blasting. The concrete was anchored to the rock with steel dowels.

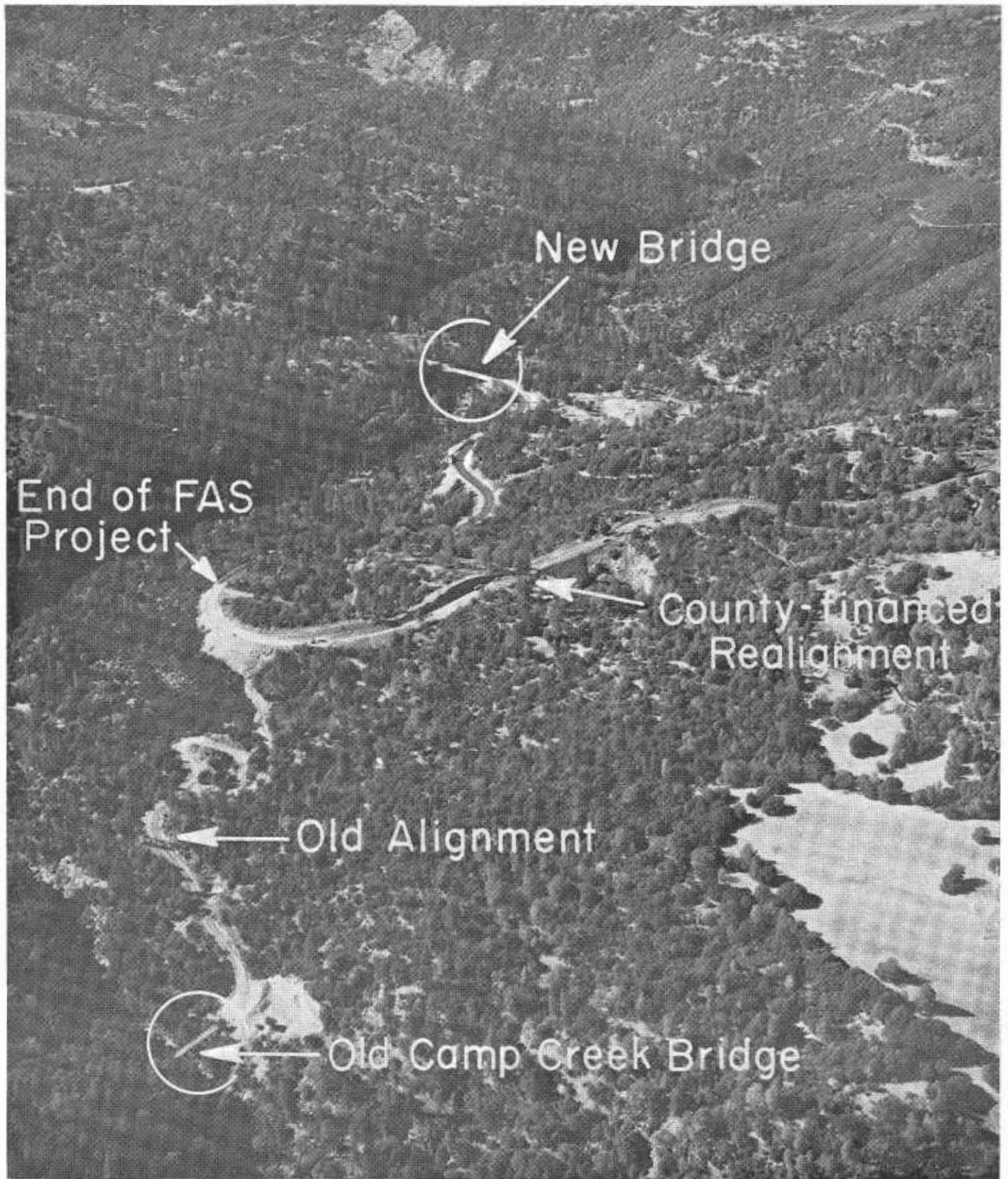
The placing of girders by truck crane went smoothly, although the steel strike from June to December of 1959 caused a backlog on orders resulting in a 77-day time extension.

Roadbed Is Surfaced

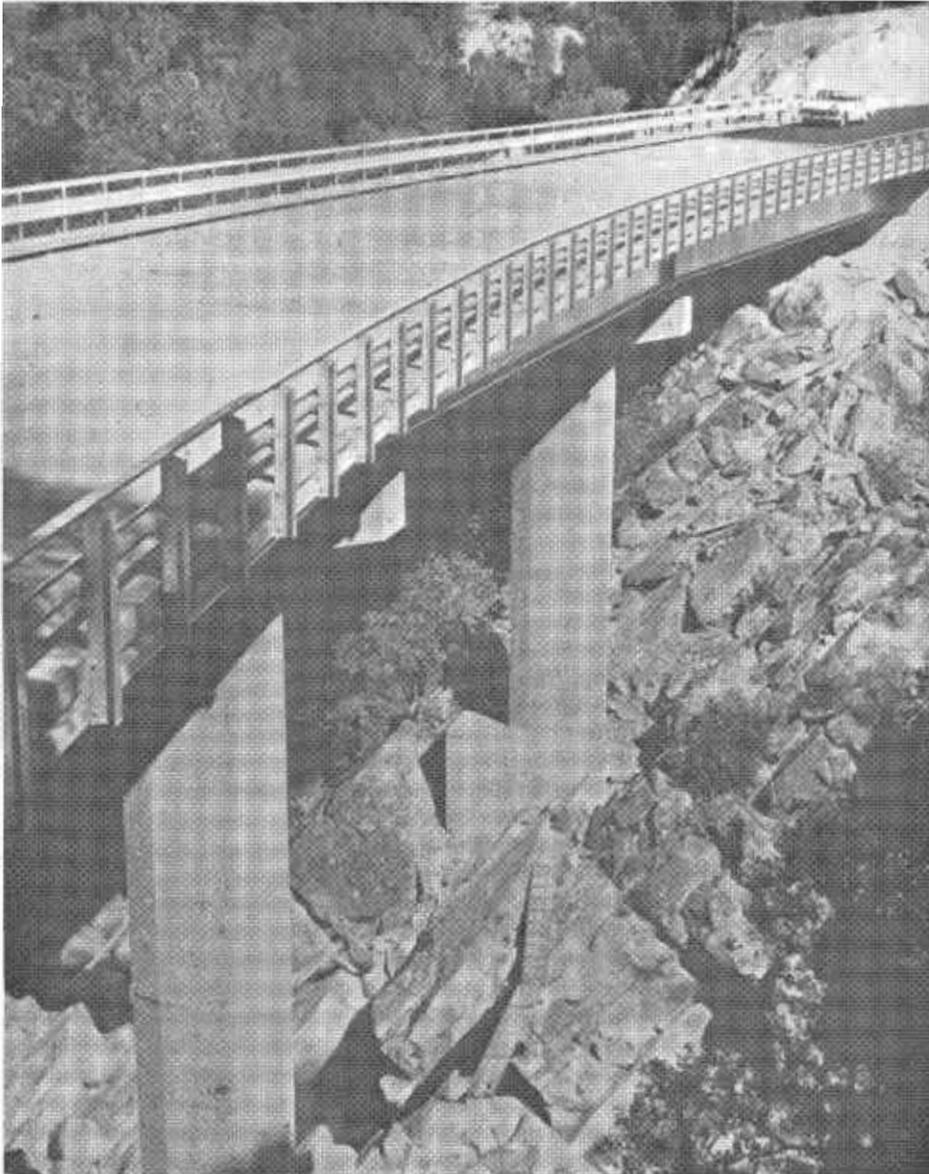
Following completion of the bridge in September 1960, the County surfaced the roadbed of the new alignment at its own expense.

Together, the three-phase project—grading, bridge, and paving—integrates nicely with the County-wide planning program for this important lumber, mining, and recreational area.

Lord & Bishop of Sacramento was the prime contractor, and Edward G.



An aerial view of the construction area looking westward. The new highway bypassed an old circuitous alignment and two substandard bridges, the Old Camp Creek Bridge (foreground) and the Old North Fork Cosumnes Bridge (located just out of the photo middle left).



A northward view of the new bridge and the granite streambed and terrain.

Naramore of the Division of Highways Bridge Department was the resident engineer.

The bridge was designed by Robert Thomas, assistant road commissioner of El Dorado County, under the direction of the writer and W. Calvin Kiedaisch of the State Division of Highways Bridge Department.

Review of plans and specifications, and coordination of the project with county, state, and federal agencies, was handled by Donald G. Foster, associate highway engineer, under the direction of Hanlon E. Rhud, District III City and County Projects engineer, with the cooperation of Boyd Syl-

vester of the U.S. Bureau of Public Roads.

At the present time, with its own initiative and funds, the County is undertaking a major realignment of the route from the north end of the FAS job to about half way to Pleasant Valley. Local logging interests are also giving their interest and support.

Construction Costs Down 0.3 Percent

The California Highway Construction Cost Index for the fourth quarter of 1960 stood at 228.5, a decrease of

Committee Proposes Scenic Highway Study

A one-year study of proposed scenic highways in California has been recommended to the Legislature after a preliminary investigation by a special Joint Agency Study Group.

The special study, authorized by Senate Resolution 26 (1960), was conducted by a committee composed of representatives of the State Departments of Public Works, Natural Resources and Water Resources, and the State Office of Planning.

In a recently published report, the group recommends that the Legislature affirm the intention of setting up a separate class of scenic highways within the state highway system.

It also recommends a one-year study similar to the study which formed the basis for the establishment of the California-Freeway-Expressway System (SCR 26 Study, 1957).

Purpose of such a study, the report states, should be to "identify, delineate and evaluate" scenic corridors and routes throughout the state. Consideration of design and planning procedures, legal questions, land acquisition, and land use and zoning is also recommended.

0.6 index point or 0.3 percent from the third quarter. According to the Division of Highways, this slight decrease, together with the small fluctuations of the previous three quarters, reflected a period of stability in prices.

A trend toward stabilization in highway costs was also indicated by the behavior of the Bureau of Public Roads Composite Mile Index, which is based on Federal-Aid highway construction contracts awarded by the state highway departments. The index for the third quarter of 1960, the latest available, increased 4.9 points or 2.2 percent. This index has shown small fluctuations during the past year.

Bidder competition in California during the fourth quarter, with an average of 6.2 bidders per project, was slightly higher than in the previous quarter (5.9).

Rural Fringe

Freeway Speeds Increase
In Land Use, Land Value

A REPORT OF THE LAND ECONOMIC STUDIES SECTION RIGHT OF WAY DEPARTMENT

Summation by BAMFORD FRANKLAND, Headquarters Right of Way Agent



DISTRICT
III

"IN THE development of California's freeways, a problem of great significance has been, and will continue to be, the economic effect this modern facility will have upon the land through which it passes and the community it serves."

This was the lead paragraph of a pioneering land economic study article by John F. Kelly, entitled "Residences and Freeways" which appeared in the March-April, 1957 issue of *California Highways and Public Works*. It requires no further elaboration, nor does the paragraph which followed it:

"It has been generally accepted that a freeway facility, by its reduction in travel time, brings within the scope of development areas which otherwise could not be developed."

Purpose of Study

"Residences and Freeways," as the title implies, explored the relationship between homes and adjacent freeways by means of a tabulation of sales prices

of individual homes. The purpose of the present study has been to explore the relationship between undeveloped land and the freeway; to trace the pattern of development leading to the ultimate construction of homes and other improvements in a rural area adjacent to a freeway which serves a growing metropolitan center; and to thus determine the results of a reduction in travel time. The study will additionally show, by comparisons with areas not influenced by a freeway, what development might have been in the study area if a freeway had not been built.

The Study Area

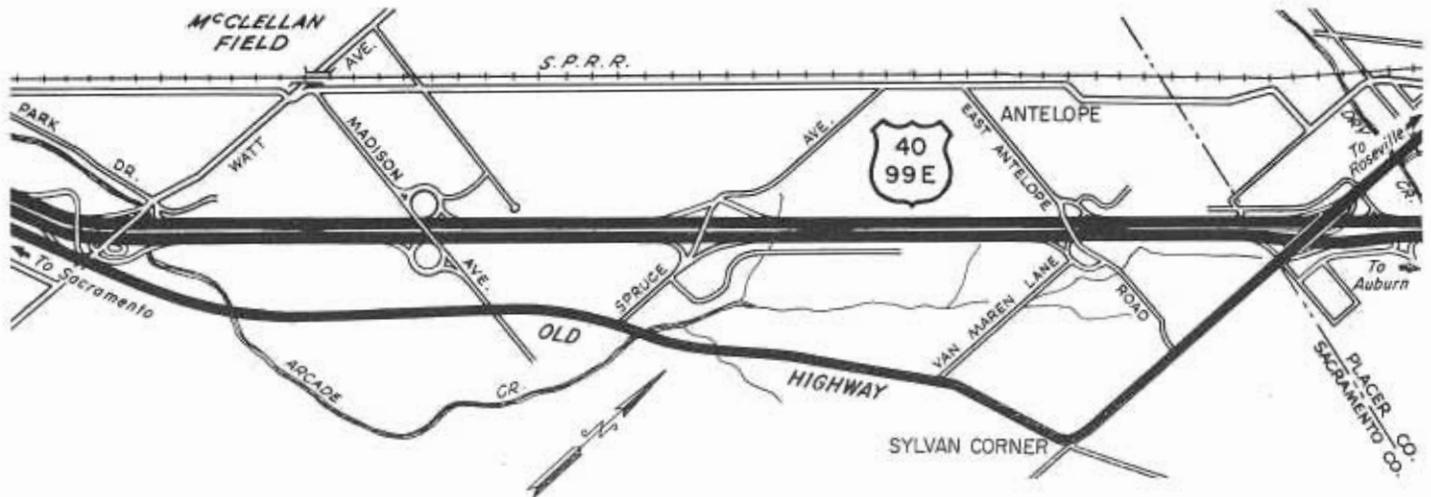
The area chosen for study was, prior to freeway construction, essentially rural in character. It lay adjacent to U.S. Highway 40, Northern California's main, east-west, transcontinental highway which passes through Sacramento, the capital of California, on its way from San Francisco to the California-Nevada border near Reno.

Prior to 1956 the study area was a part of Sacramento's rural fringe. In it were a number of two to ten acre

rural homesites and at a greater distance from the city a band of medium sized farms ranging between 80 and 320 acres. In this respect it was similar to other peripheral areas of the city. It was slightly rolling and randomly studded with mature oak trees.

Access to the area was via U.S. 40 which was typical of the old routes into many of our cities. It was a conventional two lane highway which was being forced to serve a dual function and doing both jobs poorly. Local commuter traffic in growing numbers used the highway as well as ever increasing amounts of through traffic, including large numbers of heavy trucks. Small businesses catering to both classes of highway users had sprung up along the length of the road between Sacramento and the City of Roseville, 13 miles away. This ribbon development caused many conflicting traffic movements and seriously hindered the orderly passage of traffic.

The short trip between Sacramento and Roseville came to consume as much as 45 minutes and exasperated and endangered many a motorist. There were many undeveloped agri-



The above map shows the portion of the Roseville Freeway studied in the accompanying article.

cultural areas in and around Sacramento which were much quicker and easier to reach and developers naturally tended to take the paths of least resistance. New homes, businesses and industries gravitated to other areas of better access.

The rapidly spreading metropolitan growth of Sacramento thus did not include the area adjacent to the old highway. The study area, which paralleled the old highway for 7.5 miles was, in effect, closed to development because of poor access conditions which made speculative development unattractive to potential investors.

The Freeway

The Division of Highways proposed a new full freeway to replace the obsolescent stretch of U.S. 40 between Sacramento and Roseville. It was designed, in part, to provide a congestion free facility for through traffic. Acquisition of access rights and grade separation of major road crossings would eliminate the conflicts which rise from a mingling of local shoppers, commuters and through traffic. The accompanying map shows the location of the new freeway which essentially parallels the old road but which cuts directly from Sacramento diagonally through the study area to Roseville.

Local, as well as through, traffic would be able to use the new facility and would be served by means of frequent traffic interchanges with the major county road crossings. The diversion of traffic from the old highway to the new route would, in addition, increase the capacity of the old highway to carry local traffic and would have the effect of providing two alternate and swift means of access to the study area. Construction of the new route began in 1953, and it was opened to traffic early in 1956.

Time Period of Study

Data covering the years between 1946 and 1960 was collected for use in this study. The time period begins at a time, seven years prior to completion of the freeway, when land in the area was being devoted primarily to agricultural uses. It ends seven years after completion of the freeway when the transition to more intensive land uses is virtually complete. The four-



Looking east toward Roseville along the section of freeway covered by the study. The old highway is between the lines of trees to the right.

teen year study period allowed the use of the trend method of examination of land value changes which are most indicative of the startling changes which have actually occurred in the area.

Study Procedure

There were sixty-one rural home-site or farm properties lying adjacent to the freeway which formed the reservoir from which data regarding land use and land value changes have been drawn. Of these sixty-one properties, fifty had been sold one or more times during the fourteen year study period for a total of seventy-one sales. Each sale was researched in the public records, the properties were inspected and owners and former owners were interviewed. The circumstances of each sale were carefully investigated to permit elimination from consideration of any which were not indicative of a fair and open transaction.

The inspections and interviews permitted conclusions to be drawn regarding present and future uses for the properties and the researching of public records and interviews with owners permitted the tabulation of sales price

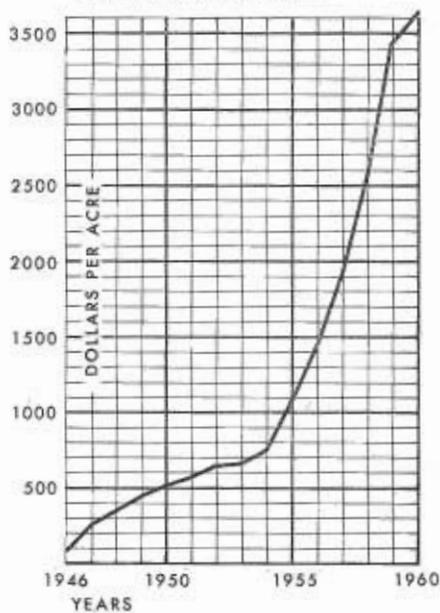
trends which are vividly indicative of the growth trend in the area.

Control Areas

The investigations and tabulations in the study area documented what actually happened to land uses and land values. The pattern of development and its pace became clear. These tabulations did not reveal, however, what would actually have occurred if the freeway had not been built when and where it was.

To determine what would have happened to the study area in the absence of the freeway it was necessary to use a comparative base or control area. Ideally, a control area is an area, away from any possibility of influence by the freeway, which is similar, including attractiveness for development and accessibility to the area with which it is being compared. Its value levels should be about the same and the future potential should appear to be for the same uses. Distances to major employment centers, shopping areas and other public facilities, such as schools should be very similar. In essence, the economic forces of change

TREND OF AVERAGE LAND VALUES OF PARCELS ADJACENT TO FREEWAY BETWEEN 1946 AND 1960



SOURCE: Actual Land Sales.

Chart 1. This shows the 14-year trend of raw land values in the area adjacent to the Roseville Freeway. The trend follows the normal pattern of value increases in a rapidly developing area.

which act upon the study and control areas should be the same with the only variable being the presence or absence of the freeway. The difference in degree of change between the study and control area should then reveal the influence exerted by the freeway.

Three separate control areas were chosen for use in this study. Each was similar, in all important respects to the study area. One hundred and fifty sales of comparable properties were investigated in the three control areas using the same methods used in the study area.

Study Area Price Trend

The sales prices of properties in the study and control areas were weighted by the amount of land in each sale to reduce the variable introduced by differences in size to a minimum. The weighted prices were then averaged for each year during the study period. The yearly weighted averages were statistically treated to achieve a smooth trend line which would be indicative of the pattern of growth in each area. Chart one depicts the trend line which was plotted for land prices in the study area adjacent to the Roseville

Freeway. Prices per acre are shown on the vertical lines of the chart while years are laid along the horizontal line.

Rapid Value Change

The trend line begins in 1946 at a time when land uses in the study area were almost purely agricultural. The average price level of seventy dollars per acre reflects this use and reveals little potential for more intensive and valuable uses. Sales activity during the years prior to 1956 was minimal but the few sales which did occur in the area were at ever increasing prices reflecting a growing amount of interest in the future possibilities for more valuable uses. By 1953, the year freeway construction began, average prices per acre were nearly seven hundred dollars. The increase of nearly one thousand percent in seven years indicates that considerably more than ordinary forces of inflation were acting upon the area. During this same period agricultural land prices for land similar to that in the study area rose only nineteen per cent.

The force causing the skyrocketing of prices in the study area was speculative activity. Investors were betting on the future potential of the area although no actual development had taken place which would appear to justify their faith. An observer would have noted no outward change in the appearance of the area. Farming activities were being carried on as usual. The number of sales definitely increased in 1954. At that time the trend line took an upward turn indicating the increased demand for properties in the study area.

Changes Become Apparent

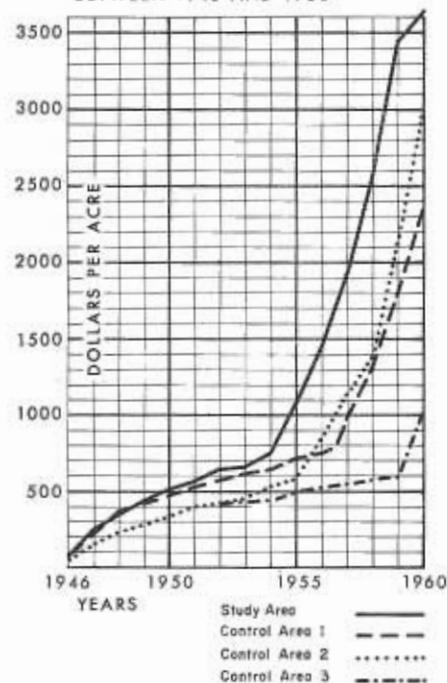
It was not, however, until 1955 that changes on the ground began to be apparent. At that time a pioneer development firm acquired a large acreage surrounding a future traffic interchange location. Construction of tract type homes was started and timed to coincide with the opening of the freeway. It is of interest to note that this first development began nearly two miles beyond the rural homesite fringe and almost four miles from the next nearest suburban residential development.

The completion of the freeway and the opening of the first tract of homes

adjacent to it combined to act as a catalyst of sales activity. By 1956 average prices had increased to over fourteen hundred dollars per acre. In 1958 they had nearly doubled again to almost twenty six hundred dollars per acre and in 1960 the average had gained another one thousand dollars to reach a level of nearly thirty six hundred dollars per acre. The average price level appears to be reaching a point of stabilization as sales activity is tapering off and development under existing ownerships intensifies.

Actual transitions from agricultural to more valuable and more intensive uses have increased rapidly since the opening of the first new home tract. In a short four years (1956-1960) the transition period is nearly complete. Some construction has started on nearly every parcel which was formerly devoted solely to farming. Of all the farms adjacent to the freeway, only one has been retained intact by the original owner and even in his case he has virtually ceased to farm

TREND OF AVERAGE LAND VALUES IN AREA ADJACENT TO FREEWAY AND COMPARATIVE AREAS BETWEEN 1946 AND 1960



SOURCE: Actual Land Sales

Chart 2. This shows the 14-year trend of raw land values in the study area and three similar control areas and illustrates the accelerating effect of the Roseville Freeway upon adjacent land development.

the property and shortly contemplates the start of a residential subdivision.

Zoning regulation has prevented changes from farm to industrial uses but some changes, other than to residential subdivisions have occurred, including transitions from farms to theater sites, golf driving ranges, cemeteries and apartment house locations.

Control Area Development

On chart two the price trend histories of the three control areas are shown in comparison with the trend already seen in the study area.

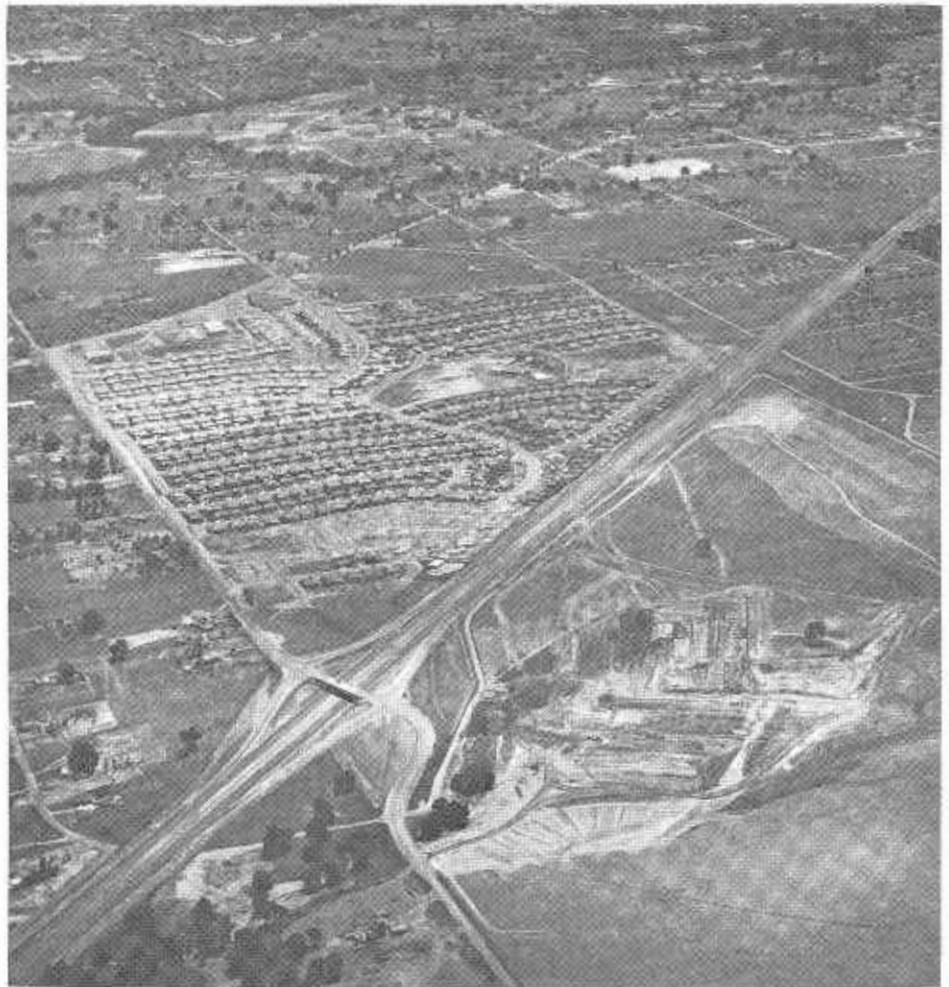
Control area one, in 1946-1953, lay just beyond the area of Sacramento's most rapid growth. It almost surely would have been the next most rapid area of development if major changes had not taken place in other areas. It was similar to the study area in all important respects except that it was closer, in time, to major employment centers.

Control area two was also similar to the study area in pre-freeway years. The pattern of growth should have been very nearly the same as in the study area. One important difference might have been expected to accelerate growth in control area two beyond that of the study area. It had two major access roads rather than one. This advantage was balanced however by the fact that the area was slightly less attractive to investors than control area one or the study area.

Control area three was most similar to the study area. They were alike in every important respect save only one. City growth was not apparently expanding as rapidly in adjacent areas as was the situation in the portion of the county near U.S. 40. The two areas were so similar, however, in every other feature that it might be said that—here is what would have happened in the study area if a freeway had not been built.

It can be seen in chart two that all lines diverge although each follows essentially the same pattern. If outside economic forces exerted equal pressures on all areas each of the trend lines should not only have followed the same pattern but they should have done so at the same time.

That the lines did not follow the same pattern at the same time is attrib-



Looking toward Sacramento from the center of the study area. The subdivision at the center of the photo was the first in the area. Control Area 1 is in the upper left corner of the photo.

utable to several important factors. Development in any community is inevitably irregular as investors balance the various factors affecting their choice of location. It will speed up in one location, then as prices begin to climb it will lag and pick up in another area. Development in one area undoubtedly retards development in another since the market for homes and businesses is not inexhaustible. The overwhelming access advantage provided by the new freeway coupled with quick acquisitions by investors in the adjacent areas slowed acquisitions in other areas.

Acquisitions Slow Down

Although control area one might have been expected to develop first, acquisitions in the study area apparently slowed it down. When investors switched their attention from the study area to control area one it rose

more rapidly in value than control area two but then an important occurrence marred the expected pattern in control area two. A new freeway was proposed in 1953 which bisected this area. Investors were quick to apply the lessons learned during their acquisition activities in the study area. Prior to the completion of the freeway every available parcel of land had been acquired for future conversion to more valuable uses. This caused the trend line for control area two to accelerate at a faster rate than that of control area one and further confirmed the conclusions drawn during the study.

The land value trend lines for the study area and each of the control areas follow a very similar pattern. A period of relatively slow rise precedes a sharp upward break and rapid climb toward maximum economic prices. This pattern is characteristic for a



Looking toward Roseville when construction on the freeway was just beginning in 1954. Compare this photo with the one on page 31.

growing community. As the city expands, speculative activity in the outskirts increases as investors attempt to acquire lands which will lie in the path of future growth. Development then begins and the pace of activity increases driving prices upward until eventually every available property is in the hands of its ultimate developer at which time sales activity of large parcels decreases, subdivision and building increases and prices begin to stabilize at their optimum level.

Summary

The area adjacent to the Roseville Freeway was apparently closed to future development by severe traffic congestion on the only route which led directly to it from major employment centers. Other areas of easier access and similar land prices, the two major controlling factors of transition and development, seemed to have greater potential for future growth.

Development in these other areas would eventually have driven their land prices to a level which would make an attempt at development of the study area very attractive even if the Roseville Freeway had not been built. Parenthetically, the economic fact of low prices which make an area attractive to investors would also encourage congestion on already crowded access roads, further compounding a serious problem, and as a consequence cause development to take place at a slow pace while local authorities and private investors undertook to improve access facilities.

The experience of the control areas indicates that the point at which investors might have turned to the study area for possible development would have been approximately the same as has happened in control area three.

What then might have happened in the study area in the absence of the freeway? Development, if it occurred

James Thacher Named to CTBA

James F. Thatcher, 36, a San Francisco attorney, was appointed to the California Toll Bridge Authority by Governor Edmund G. Brown on March 31, 1961.

He succeeds William M. Roth, San Francisco businessman, who resigned March 23 to accept an appointment by the Governor to the Board of Regents of the University of California.

Thacher is a native of San Francisco and a member of the law firm of Thacher, Jones, Casey & Ball. He also practiced law in New York City for two years, returning to San Francisco in 1953.

He received a bachelor of arts degree in history and economics at Yale University in 1948 and his law degree at the Yale Law School in 1951.

He served with the U.S. Army in the infantry in Belgium and Germany in World War II.

Thacher belongs to local, state and national bar associations and has been active in civic affairs, serving on the budget committee of the Community Chest and on the Mission Community Center Board of Directors.

He and his wife, Gladys, have three children. They reside at 3979 Washington Street, San Francisco.

at all, would have been delayed at least five full years.

What, instead, did happen in the area adjacent to the Roseville freeway? Of sixty-one rural homesite and farm properties, fifty have been sold a total of seventy-one times. Every farm property but one has been sold to a purchaser who will devote it to a more intensive and more valuable use. The one will be so used by the original owner. Land use in the area has completely changed in a short four years to a variety of suburban type uses; residential subdivisions, commercial uses, recreational uses, schools, churches and cemeteries. And, most importantly, the property owners have seen these changes accomplished a full five years sooner than have those in other similar areas which are just beginning to experience such changes.

U.S. 466

*First Freeway Section Completed
Between Bakersfield and Tehachapi*

By M. F. SILVA, Resident Engineer



CEREMONIES CONDUCTED by the Tehachapi Post No. 221 American Legion on Sunday, December 11, 1960, marked the dedication of the first section of U. S. 466 constructed to free-

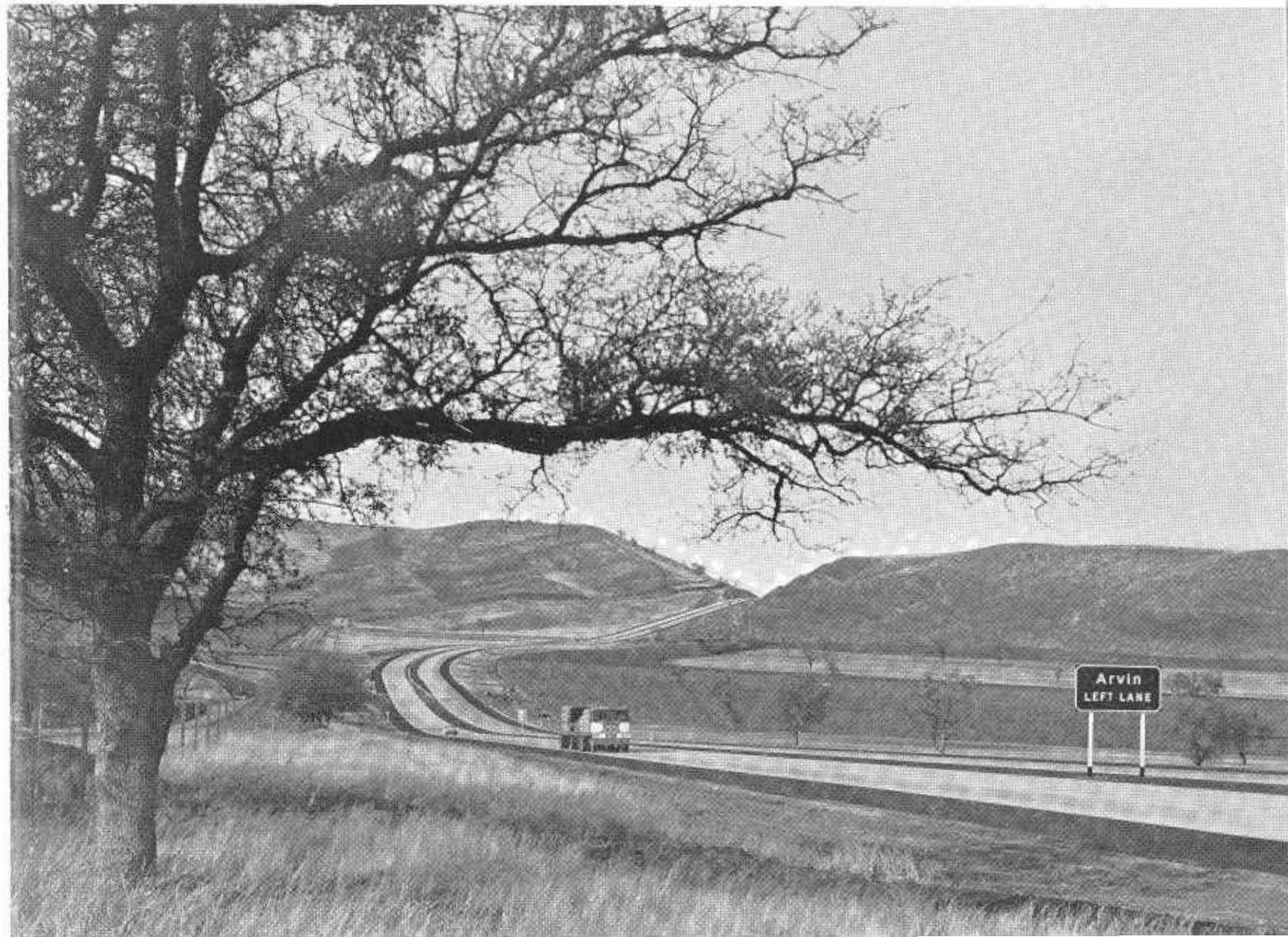
way standards between the cities of Bakersfield and Tehachapi. This route, located in Kern County and known as the Tehachapi Highway, is a major cross-continent route carrying a large volume of truck traffic and out-of-state vehicles, as well as local farm to market traffic.

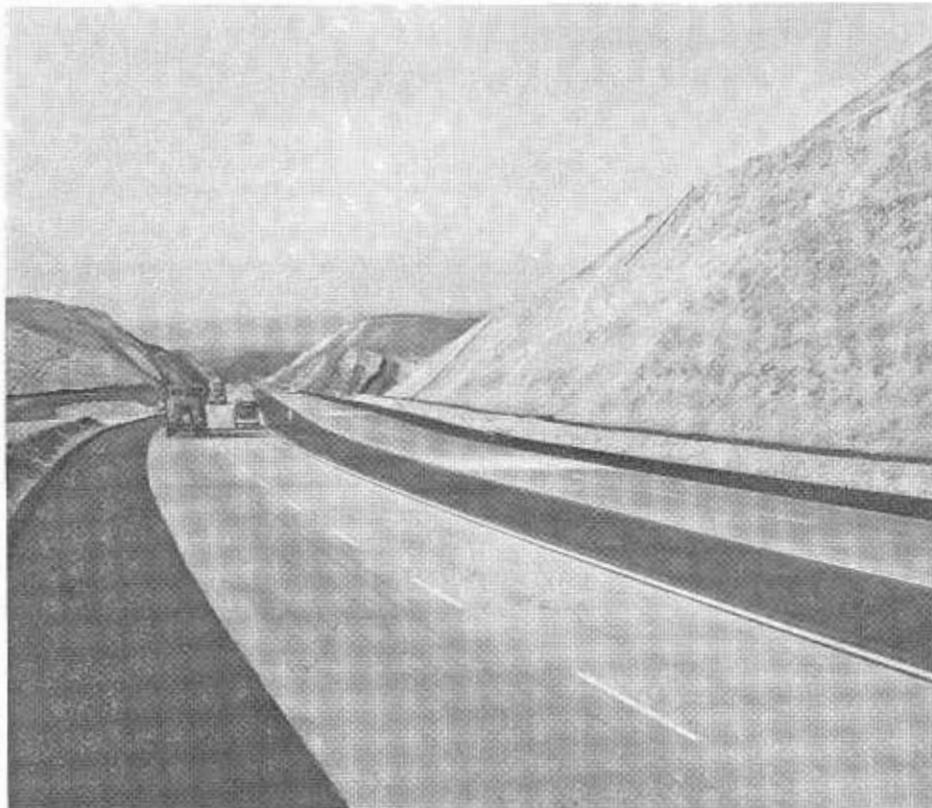
This 11.9-mile, four-lane 60-M.P.H. expressway replaces a 14.5-mile facility which is no longer adequate for present-day traffic due to deficiencies in pavement width, grade, sight distance and alignment. The old highway had a maximum grade of 7% and a minimum curve radius of 300' with a total of 38 curves and a total curvature of 1660 degrees. The new improvement begins in gentle farm lands approximately ten miles east of the City of Bakersfield in the south eastern corner of the San Joaquin valley and ends in the rugged terrain of the Tehachapi mountains some 14 miles west of the City of Tehachapi.

Few Curves

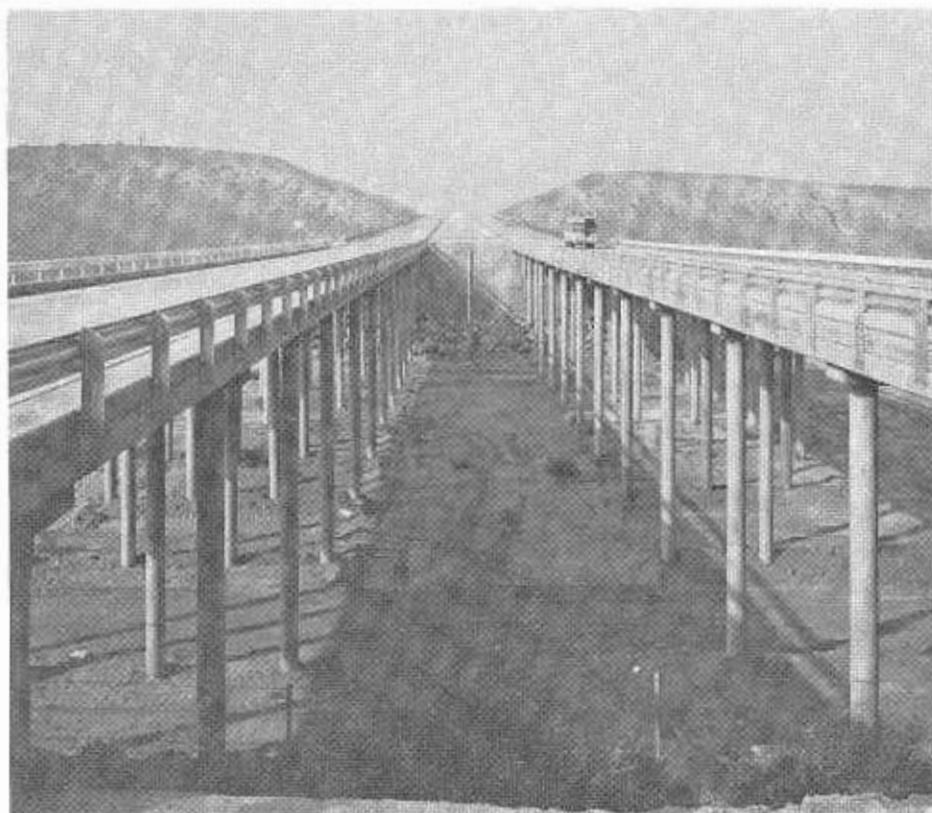
The new facility rises from the elevation 800 feet in the valley floor to 2160 feet in the Tehachapis. About 65% of the overall length is on tangent and only 12 curves, ranging in radius from 2500 feet to 5000 feet and encompassing a total curvature of 290 degrees, are used over its length to produce a design which has been aptly termed "Bold Engineering". The proposed highway grades vary from a minimum 0.12% to a maximum of 6%. A grade of 5% is used on over one-half the length of the project and the longest sustained 5% grade is three miles in length.

Looking west along US 464 toward Arvin Turnoff about 1.7 miles west of Bear Mountain Ranch.





Looking west toward Bakersfield about 2½ miles west of the Arvin Turnoff.



The Caliente Creek Bridge on US 466 about 12 miles east of Bakersfield. The view is westward.

During the early phases of the project, access to a large length of the line was not possible by truck. In the more rugged portions it required several months of roadway excavation and embankment construction before a satisfactory haul road was available for job traffic. The contractor was, therefore, faced with the problem of supplying water for the compaction of embankments in the many rugged canyons traversed by the line.

Search for Water

There was no source of water on or adjacent to the right of way. However, several deep producing wells of sufficient capacity for job requirements were situated in farmlands at the western end of the project. In order not to lose valuable time while a well could be developed, the contractor leased an existing well and was delayed only while a pump and motor could be installed and the entire installation tested for adequacy.

The next problem was that of delivering the water to its point of need both for initial embankment construction, subsequent job requirements, and to maintain storage for peak demand. This was met with the installation of 10 miles of 8" pipeline and six storage reservoirs, four of which were used as booster stations to overcome normal head losses and provide sufficient lift for a 1500 feet difference in elevation between the well head and the most remote reservoir. At each reservoir, as well as at supplemental locations where needed, loading stands were installed to load mobile equipment.

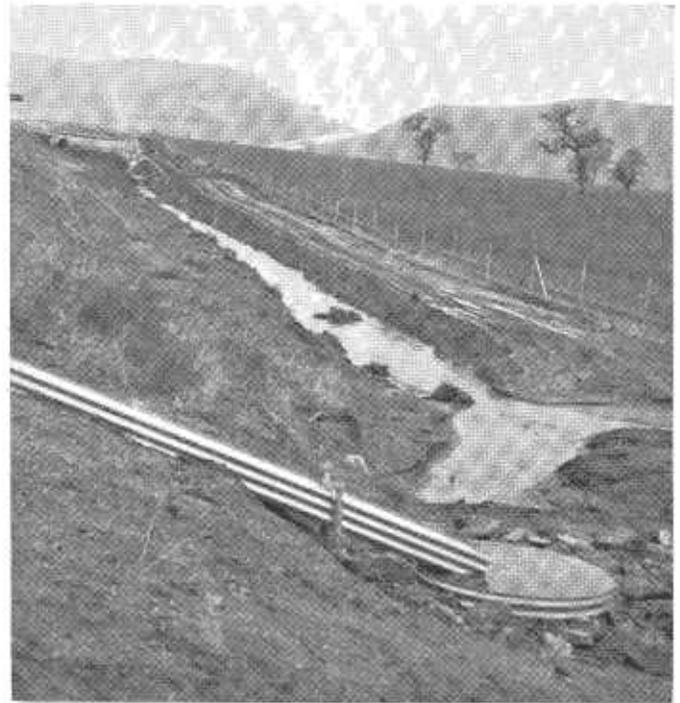
Blasting Required

Largest of the many items of work on this project was upwards of 4,500,000 cubic yards of roadway excavation of which approximately 1,500,000 cubic yards required blasting. Although conventional off-highway earthmoving equipment was used on this and related items, skillful planning was required by the contractor and his subcontractors to overcome the many obstacles presented by the rough terrain existent and to pioneer the line to allow an orderly prosecution of the work.

Of special note is that in spite of the difficulties faced on this and other



A typical reinforced concrete ditch-check series under operating conditions.



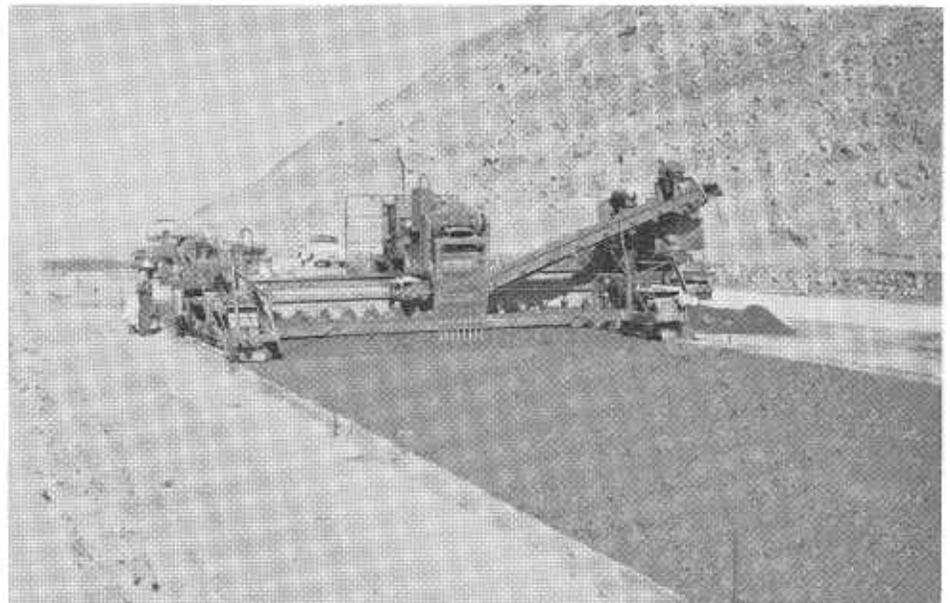
A metal pipe velocity dissipator installed for roadway surface drainage.

items of work, the job was completed without serious injury to personnel.

The project is located largely in mountainous cattle-grazing country, with the exception of the first portion, which is relatively flat cultivated farm land. In the mountainous area about 70% of all drainage areas are on steep slopes with the storm runoff crossing the line in well defined drainage channels. Native soil is highly erosive and the problems of scour and sedimentation are acute. Construction provided wherever possible, therefore, for the conveyance of cross-drainage and roadway surface drainage into existing channels that have been stabilized by natural runoff.

Pipe is Used

To implement this construction 21,321 linear feet of corrugated metal pipe ranging in sizes from 12" to 54" were used, supplemented by extensive use of velocity dissipating devices to reduce downstream velocities and to prevent further scouring action in existing channels on adjacent private property. To further augment this drainage system, extensive use was made of velocity retarding ditch checks and special pipe down drain installations. Additionally, surface ditches and roadway cut benches



A front view of a subgrade trimmer described in the article.

which will carry significant amounts of surface drainage were paved with asphalt concrete.

Over 69,000 cubic yards of portland cement concrete were required for the construction of 21½ miles of 24-foot pavement for the project. Paving was by means of a slip-form paver of the type described by Leigh Spickelmire's article in the January-February 1960 issue of this publication. With the use

of this equipment and the elimination of conventional header-boards, the contractor was faced with the problem of grade control on cement treated subgrade which was road-mixed.

Subgrade Tolerance

The contract specified that no high subgrade would be allowed and the tolerance for low subgrade was a maximum of .02 on any one theoreti-



Looking east on US 466 about 1½ miles west of the Arvin Turnoff. Caliente Road passes under the freeway in the foreground.

with the slip-form paving operation on a portion of the project. On this section a 2" wide by .004 thick polyethylene strip was fed into the center of the 24-foot wide pavement in effect forming the longitudinal joint in lieu of conventional sawing methods. The strip is fed directly from equipment mounted on the paver and requires only a minimum of attention for adequate results. The inserted strip produces a very fine crack with only moderate waving throughout the length of joint. Use of the strip substantially reduces the cost of the longitudinal joint.

The contractor on the project was Griffith Company of Los Angeles. W. B. McDonald was the project superintendent for the contractor. The work was under the supervision of W. L. Belch, District Engineer; W. E. Bertken, District Construction Engineer, and M. F. Silva, Resident Engineer. Final construction cost was \$5,700,000.

Editor's Note—With Kern County traffic now enjoying the use of the new section described in this article, work is getting started on another major improvement on U.S. 466 in the Tehachapis.

Bids were opened April 5 on a major freeway project which connects with the east end of the new expressway. This project involves construction of 5.8 miles of four-lane freeway between a tenth of a mile east of Caliente Road and a half mile east of Keene.

State Receives Bids On U.S. 466 Freeway

The State Division of Highways has opened bids on a project to grade and pave 5.8 miles of four-lane freeway on U.S. Highway 466 between one-tenth mile east of Caliente Road and one-half mile east of Keene in Kern County. Included in the project are two traffic separation structures (part of interchanges at Keene and Rowen) and a bridge over the Southern Pacific Railroad near Keene. Five bids were received. Low bidder was R. R. Hensler, of Sun Valley, \$4,839,024.50.

cal days run. Any substantial amount of low subgrade would result in excessive amounts of concrete for which no compensation would be granted. A promising step toward overcoming this obstacle was the development of an electronically controlled and guided subgrade trimmer. This machine is basically a slip-form paver in which the receiving hopper, feed hopper, vibrators and screeds are dropped in favor of a transverse cutting screw, a trimming screed, and a bucket elevator and belt conveyor for discharging the trimmed material outside the subgrade section.

The subgrade trimmer is capable of cutting, within nominal depths, a 26-foot width of subgrade to the established grade in one pass at a rate of travel equal to that of conventional

cement treating equipment. Line and grade control is by guide wires which are set in the same fashion as for the paving operation. Exceptionally good grade control was maintained with this machine in its final modified form and its performance contributed to a paving operation which developed a more favorable profile index and smoother riding surface to that constructed over conventional motor grader-trimmed subgrade. Moreover, this control reduced substantially the amount of low subgrade concrete for which the contractor received no compensation.

Experimental Joints

Mention should also be made of experimental longitudinal joint construction performed in conjunction

ITTE

Street and Highway Conference Holds 13th Annual Meet at U.C.

Nearly 600 traffic engineers, planners and government officials attended the 13th Annual Street and Highway Conference January 26-28 at the University of California, Berkeley.

The conference is sponsored each year by the University's Institute of Transportation and Traffic Engineering.

The 1961 meeting consisted of three general sessions, a closing luncheon meeting, and 14 concurrent meetings which featured group discussions covering a wide range of traffic, engineering and management problems.

General Chairman of the three-day conference was John A. Morin, Oakland city engineer. Vice chairmen were Deputy State Highway Engineer J. W. Trask and E. R. Hanna, San Benito County road commissioner. Bob Glenn of the ITTE was general secretary.

The keynote address was delivered by J. O. Mattson, president of the Automotive Safety Foundation, Washington, D. C. Mattson discussed "Communications, a Factor in Good Administration."

"In the interest of safer and more efficient highway transportation," Mattson said, "we need better two-way communication between the various professional groups concerned, as well as between the professionals and the great mass of citizens whose funds support their efforts."

Mattson said there are two necessary phases of communications in any highway agency—the internal information program designed to encourage teamwork and morale within the organization, and external communications which aim to inform and educate the public on highway matters.

Effective internal communications are necessary, he said, to help "mold the character of the organization and influence the quality of its performance." Good external communications are an "obligation," he declared.

"This includes not only the dissemination of facts about how user revenues are being spent," he explained,

"but also of essential information about plans, activities and problems. And the manner of presenting the facts is just as important as collection and analysis. They must be made crystal clear to the layman."

Another general session speaker, H. F. Kretcham, editorial writer for the *Salt Lake City Tribune*, also emphasized the importance of effective public communications.

He said an important psychological factor that seems to become involved in highway matters is "fear of change."

Kretcham cited examples of fears which often cause people to oppose badly needed highway improvements such as construction of a freeway or development of one-way streets.

"Often the fear and opposition is unwarranted," he said, "and later so proved. But in dealing with people and their emotional responses we must always remember that it isn't what is true that is important; it is what people think is true."

Kretcham explained that "you have to sell the operation to the patient," pointing out that traffic engineering "is a game where more pseudo-experts call the shots than in a championship football game."

Other speakers at general sessions were State Senator Randolph Collier; Slade Hulbert of the ITTE; Richard M. Zettel of the ITTE; E. W. Blom, assistant city manager of San Diego; Harmer Davis, ITTE director; E. T. Telford, assistant state highway engineer in Los Angeles; and A. S. Koch, Orange County road commissioner.

Collier called for a "positive approach" in the enforcement of traffic laws, with less emphasis on what motorists should not do and more on educating the public about what should be done.

Hulbert used a slide projector and a short film to introduce delegates to the driving simulator, a device now being developed for laboratory study of driver habits and reactions to roadway conditions.

Zettel and Blom talked about the recently completed study of city street deficiencies. Their subject: "SCR 62 Study: Results, Potentialities and Keeping Data Current."

Davis outlined some of the activities of the ITTE. Koch showed a film produced to explain the current Los Angeles Area Transportation Study. Telford presented a film showing traffic conditions in European countries.

One general session featured a panel discussion of "Progress in Cooperation in Freeway Planning." Panelists were Edwin S. Moore, executive vice president of the California State Automobile Association; W. H. Mosen of the Alameda County Surveyor's office; George Bohn, of the U.S. Bureau of Public Roads in Sacramento; R. A. Hayler, Division of Highways district engineer in San Francisco; and Morin.

Speaking at the final luncheon meeting was Wilfred Owen of the Brookings Institution, Washington, D.C. Owen offered a report from an imaginary technical assistance mission to the United States, an "over-developed" country, from the "under-developed" nation of Far-Offistan.

The Far-Offistan representative found many inadequacies in the transportation systems of the United States and offered "respectful" criticisms and suggestions.

Group discussions at the 14 concurrent meetings centered around papers presented by the following:

W. L. Warren, design engineer for the Division of Highways; Jerry Keithley, Palo Alto city manager; Frank Stubbs of the civil engineering department at the University of California; Martin A. Matich, president of the Matich Corporation, Colton; and Vernon Smith, Kern County road commissioner.

Harold Marks, Los Angeles County traffic planning engineer; S. S. Taylor, general manager of the Los Angeles Traffic Department; Michael Carroza, Fresno director of public

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California Roadsides - 2

A MAJOR problem in planting and maintaining planting on California Highways is the cost, which is mounting each year. In 1950-51 for instance, the Division of Highways spent \$606,-127 for planting and erosion control, while the 1960-61 budget for roadside planting and landscaping is \$4,609,000. This increase is in line with the legislative intent expressed in Assembly Concurrent Resolution No. 132, adopted in June, 1957 and printed herewith.

The much publicized California climate is another big problem, because "sunny California" also means "little rain California" for part of the year. This basic pattern of winter wet—summer dry is constant over the entire state, differing only in intensity. Even in areas of high annual precipitation there is always a long summer drought.

This long summer drought eliminates from consideration for highway landscaping in California more than 90% of the world's plants, as few can live very long without water. Some desirables might survive the drought,

but can't stand the heavy winter rains, especially in the heavy poorly drained soils which are common in California. Thus, the plants we can use are few.

Terrain a Factor

Terrain is another limiting factor, with all the micro-climates and soil variation which are found in a state with several major mountain ranges and stretching through nearly 10° of latitude. In California, state highways cross several passes over the Sierra Nevada at more than 7,000 and some nearly at 10,000 feet altitude; in Death Valley and Imperial Valley they go far below sea level. Many mountain roads are literally blasted from solid granite, other highways travel mile after mile of endless desert through sagebrush, greasewood, and cacti. Still others are almost like tunnels through dense forests.

EDITOR'S NOTE: This, the second in a series of articles on landscaping and other roadside problems on the California State Highway System, covers the implementation of today's roadside policy. Future articles will cover maintenance problems, and the division's fund of knowledge of plants and trees.

The series has been prepared by John Robinson of the Public Information Section with the assistance of various staff members concerned with planning, planting, and maintenance of roadsides.



Group of Division of Highways landscape architects discuss planting of interchange, including, left to right: Warren Chan, Dana Bowers, Mervin Blacow, Kenneth Buchanan behind James Gordon.

To cope with this tremendous variety of conditions, it has been necessary for the Division of Highways to develop its own experts. Starting with a single employee back in the 1920's, the landscaping section organized under the Design Department, consists today of 10 well trained landscape architects and draftsmen. H. Dana Bowers, who was the entire section in 1929, has continued in charge. Some of Bowers' work in slope erosion control has received international attention, and his hard-earned knowledge is being passed on to the younger men.

Two Types of Planting

During the years of the development of California's current roadside policy, two types of planting have been adopted—"functional planting" and "urban landscaping." In general, "functional planting" is basically utilitarian, as its name indicates, while "urban landscaping" goes beyond pure function and seeks aesthetic effects as well.

The modern uses of functional planting could be said to be an outgrowth of the early day roadside tree plantings for road surface protection from the sun, for these trees were actually functional. However, generally speaking, the use of plants to reduce maintenance costs dates from about 1930 when maintenance forces began planting mesembryanthemum or "ice-plant" to reduce erosion, eliminate weeds and control fire.

What Functional Planting Does

Some of the things functional planting provides today are erosion control; delineation of route, of structures, of curves; center headlight screen; roadside screens to lessen noise, dust and headlight glare; ground cover for fire control and/or weed control; and screens for the benefit of adjacent development. Plants are used in great numbers on cut and fill slopes to control wind and water erosion. In many cases these functional plantings also beautify the road and blend it into or enhance the natural landscape.

In the 1920's, with the ever increasing number of automobiles, the important thing was to get the roads built. Because California's rugged terrain made thousands of cut and fill

Assembly Concurrent Resolution No. 132—Relative to State Highways

[Filed with Secretary of State, June 13, 1957.]

WHEREAS, The Legislature of California finds:

(a) In the last 10 years more than seven million dollars (\$7,000,000) have been spent in planting on state highways, but this amounts to only six-tenths of 1 percent of total state highway construction expenditures of the same period; however, maintenance of this planting has cost more than eight million dollars (\$8,000,000) in 10 years, and the annual cost is now approaching one million five hundred thousand dollars (\$1,500,000) a year;

(b) Past policy of the Highway Commission has been directed purposely toward channeling a maximum amount of available funds into the construction of highway mileage that will provide immediate benefits to the traveling public;

(c) The Division of Highways under present policy undertakes two classes of construction work generally under the classification of planting, as follows:

i. Roadside development and control, which is constructed for the purpose of traffic control, economies of maintenance, or other engineering requirements. Within this class is included that work which may be required for erosion control, traffic safety, fire control, or traffic noise abatement;

ii. Landscaping, which is for the purpose of enhancing or preserving the aesthetic values of the highway and its immediate environs;

(d) Under present policy functional planting for roadside development and control is being done on a minimum basis consistent with actual requirements. Planting for landscaping is being done on freeways on a minimum basis, and almost exclusively in built-up or highly developed areas;

(e) Expenditures for landscaping and for design that enhances the attractiveness of highways are legitimate highway purposes for which the motor traveling public may properly be expected to pay;

(f) The appearance of freeways and other highways, and their design and landscaping in keeping with the immediate surroundings, especially in metropolitan areas, are major factors in their acceptance by the public in the affected communities;

(g) California's freeway development program can be greatly accelerated in the years ahead, largely as a result of the Federal-aid Highway Act of 1956, but such acceleration will depend in great measure on increased public acceptance which will be encouraged by attractive design and appropriate landscaping of freeways; now, therefore, be it

Resolved by the Assembly of the State of California, the Senate thereof concurring, As follows:

1. The California Highway Commission and the State Highway Engineer are commended for their past policies of economy in the matter of planting and landscaping;

2. In view of the expanded freeway development program now getting under way, the State Highway Commission is urged from this time on to give full consideration to functional planting and highway beautification in the formulation of its annual budgets for freeway construction and maintenance and local jurisdictions are encouraged to participate and cooperate in this program;

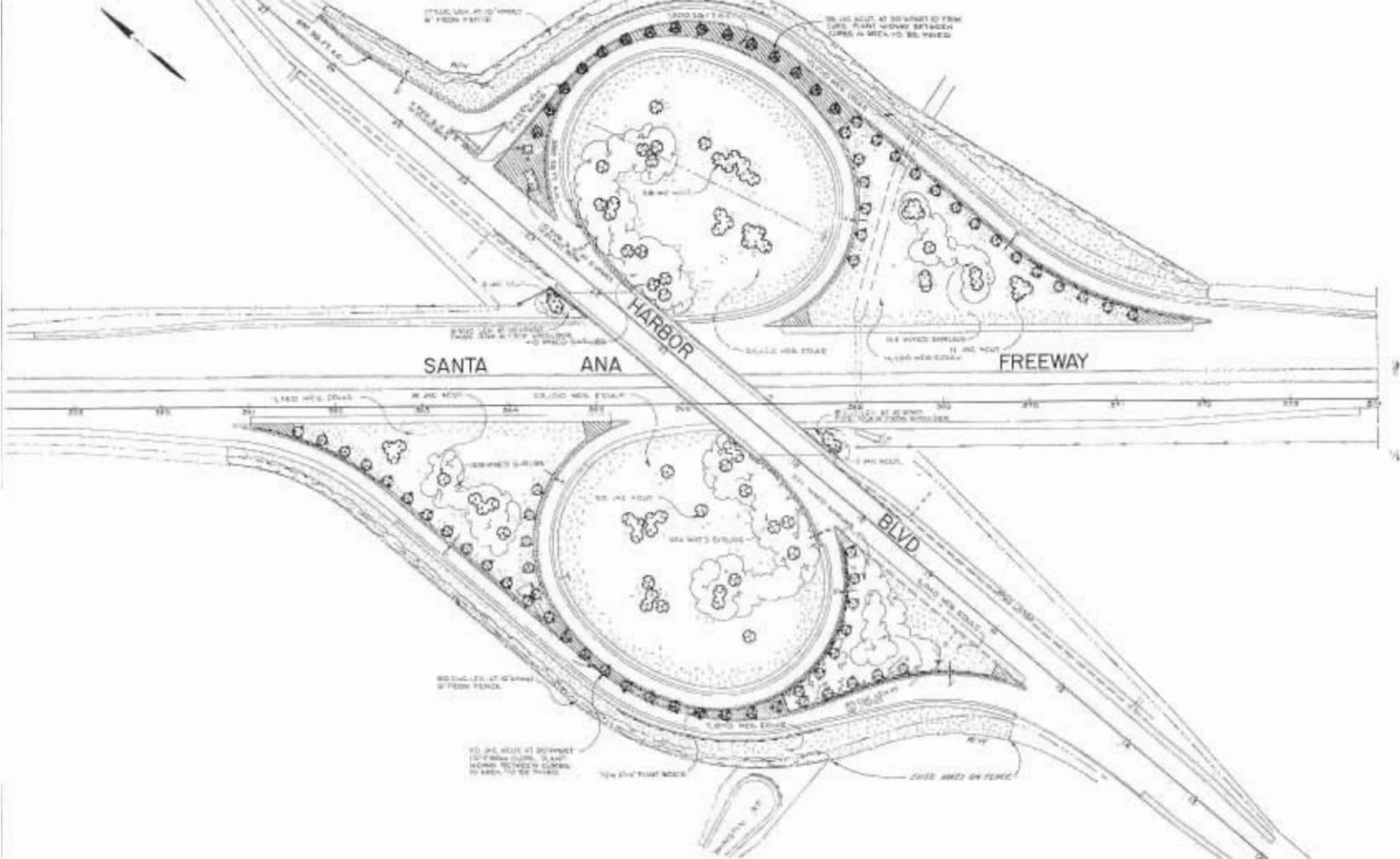
3. The State Highway Engineer is urged from this time on to give more attention to enhancement of the appearance of highways (particularly in metropolitan areas), not only by means of landscaping but also in the original design of structures and roadways. Wherever economically feasible under California's climatic conditions, consideration should be given to incorporation of parklike development in highway design;

4. The Department of Public Works is urged to portray at the earliest possible time in public hearings or on other appropriate occasions the nature of each proposed freeway design by means of artists' drawings or other visual aids in order to better inform the public as to the appearance of the freeway and its effect on the community;

5. It is the purpose of this resolution to inform the Highway Commission, the Department of Public Works, the State Highway Engineer, and the public generally, that the Legislature intends that a moderate increase in landscaping and other aspects of attractive design appropriate to conditions in this State be regarded as integral features of California's freeway program.

slopes necessary, these became a problem. Almost every Highway District had some sort of experimental pro-

gram to control erosion. Fences, wattles, board baffles, rocks and asphalt were all tried.



Typical planting plan for simple two-quadrant interchange on Santa Ana Freeway in Los Angeles. Plan calls for almost 75,000 iceplants, 250 jacaranda trees, 150 eucalyptus trees, and more than 1,500 shrubs.

One school of thought in the early days even advocated vertical cuts, claiming rain could not fall on such a cut. A few of these cuts were tried experimentally and actually were stable too, for a while, as long as the rainfall came down straight and did not continue too long. They failed quickly, however, in a driving rain or when

erosion started from runoff water at the upper edge.

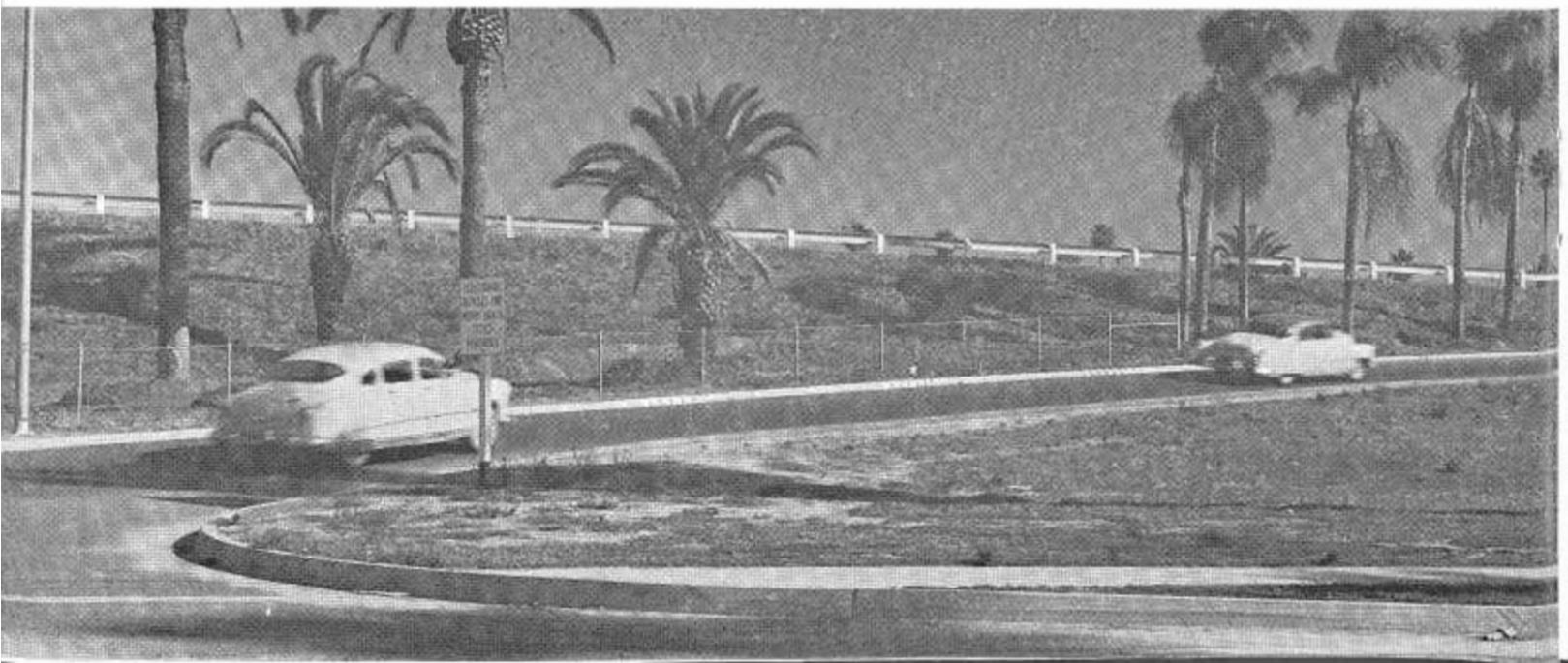
Slope Control Developed

Some of the techniques worked out by the U. S. Forest Service, the U. S. Soil Conservation Service, and the Bureau of Public Roads were incorporated into California's experiments,

with encouraging results. Eventually a great deal was learned about slope control, and techniques developed in the 1930's are still used today.

In general, these techniques include carefully calculated and flatter angles, slope "benching", rounded crowns, and good drainage. The surfaces of the slopes are then held down with

Wherever possible, existing palms are used in planting plans. These were salvaged from right-of-way and transplanted.



plantings of grasses, vines and shrubs. Sometimes binding agents such as straw or a wood grid are used to hold the slope until the plant roots grow.

These slopes, of course, may be either on cut or fill sections. They are a greater problem today because "cut and fill" construction is used more than ever to get the straighter alignment, both vertically and horizontally, which is needed to provide safety at today's higher speeds.

"Landscaping"

The other kind of planting—"landscaping"—is understood to mean something more than functional planting. It includes planting which is purely for aesthetic reasons. Landscaping is considered wherever it is necessary to blend the right of way into adjacent development.

While this type of planting goes beyond function and strives for pleasing effects, nevertheless virtually all of it is also highly functional. It is planted for aesthetic reasons, but it also provides fire and weed control, delineation, headlight, noise and dust screens.

Sprinkling systems are usually installed in landscaped areas, to give a wider choice of plant materials. With more water, the plants grow better, and the over-all effect is greener, more lush. Because of the high cost of watering and maintenance, better landscaping can be accomplished when a cooperative agreement to cover these costs is made with the community. Such agreements allow much more latitude on design and choice of plants, and have resulted in some of the finest sections of landscaped freeway.

Billboard Control

Early in the days of freeway landscaping—(landscaped freeways were then called "parkways")—the Division of Highways found it was virtually useless to landscape without adequate zoning controls against billboards. Obviously, the purpose of beautiful landscaping may be defeated by excessive advertising display.

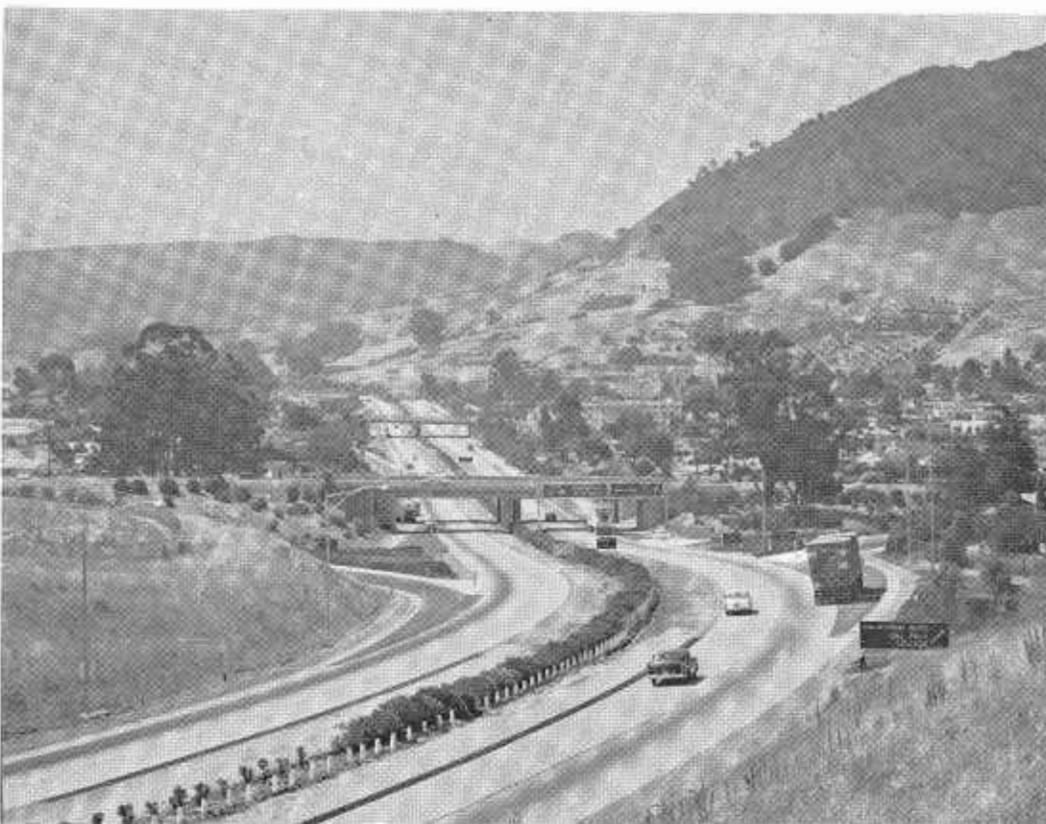
The current policy of the Division of Highways is set forth in a resolution adopted by the California Highway Commission on April 19, 1951,

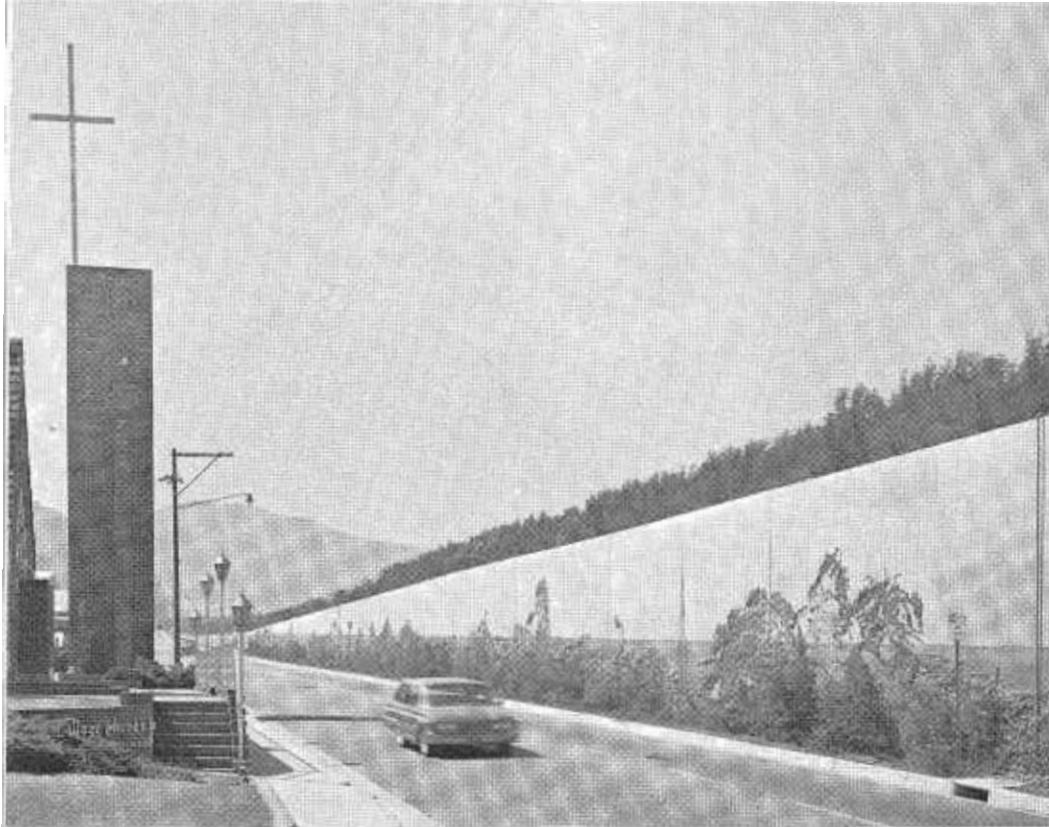
which is implemented by an order of the Director of Public Works issued June 21, 1951. Basically this order and resolution provides that no highway funds will be expended for landscaping of any section of freeway until the local governing body having ju-

risdiction has adopted proper ordinances prohibiting advertising displays "within view" of the freeway which is to be landscaped. This policy applies only to *landscaped* freeways, and certain minimum requirements as to regulatory ordinances have been



"Before and After" photos of freeway section of US 101 through San Luis Obispo to show effects of planting. Elapsed time between the two photographs was five years. Oleanders in median at lower left are later planting.





High retaining wall was necessary here on San Diego Freeway in Westwood Village, Los Angeles County, to save right-of-way costs. Planting was put in at request of Village Church. Creeping ivy eventually will cover entire wall.

worked out, which must be met before landscaping will be performed.

With the revision and adoption in 1953 of the Outdoor Advertising Act in its present form, the Director's order applies only to freeways within incorporated cities. The Outdoor Advertising Act controls the erection of advertising displays in unincorporated territory.

Advance Plan Study

All highway construction project plans are referred to the Supervising Landscape Architects office for recommendation concerning erosion control and planting before the plans are completed or the contract is advertised. This advance study often makes it possible to avoid maintenance problems which would be expensive.

For instance, these studies often recommend that construction contracts specify that the contractor must treat the slopes with straw. This is incorporated into the soil with a specially designed roller. It is essential the slopes get this straw treatment as soon as possible after completion and before rains occur, as one heavy rain can erode gulleys several feet deep in some soils.

After a highway construction job is completed, and the Highway Commission approves funds for a planting project, headquarters landscaping personnel study in minute detail the section to be planted. Several day's time is required on freeway sections, "field checking" every part of them, climbing slopes, studying local terrain, existing plant growth, exposures and soils. Planting jobs are let as separate contracts and many things must be considered before the specifications can be written.

Watering Most Important

The most important consideration is watering, as even the drought-hardy plants must be irrigated for several years before their root system is adequate to support them. Most urban landscaping jobs must be watered indefinitely. If for no other reason, the plants close to the traveled way must be washed off at least once each week to eliminate the greasy dust film generated by the fast moving traffic, which would eventually otherwise kill the plants.

Therefore the location of water outlets and permanent sprinklers is of

major concern. Not only must they be placed so they leave no planted area unwatered, but they also must not wet private grounds beyond the right-of-way. Although it might seem adjacent property owners would welcome the free water, actually it would be a great nuisance, and highway sprinklers are set so they do not encroach. Obviously, they must not wet the pavement, either.

Apparently unrelated factors, such as prevailing winds and the foibles of motorists, must be considered in planning sprinkler systems. Where possible, the service outlets themselves are best located just over the edge of the fill, off the shoulder, to prevent their being broken off by wheels of vehicles, and to make the maintenance man's job safer. In planning the sprinkler system, the arcs and throws of the sprinklers must be fitted into the odd angles and curves of the freeway right-of-way as it progresses from interchange to interchange.

Choice of Plants

Choosing the kind of plants brings up a new set of problems. Since broken or dramatic effects divert the motorist's attention, it is best to use only a few varieties and create a smooth effect. But this is only part of the job. Plans must be considered for their effect visually, for their adaptability to local growing conditions, and for their ability to thrive close to moving traffic.

Will they do well on a south slope in this latitude? What about drainage? Is the soil acid or alkaline? Are the plants deep rooted to penetrate and hold the soil, or will they slide when the earth becomes saturated? What will be the character of the plants in the local climate—compact and bushy, or straggly? Can they be obtained in quantities?

Sometimes a hundred thousand shrubs and trees, and a half million ground cover cuttings are needed all at one time if several jobs are starting—more than all the commercial nurseries can provide on short notice. Nor can these demands be staggered, for most plantings must be made in summer before the soil is too wet to work. The new plantings then have the wet

winter in which to get established. A system of advance ordering and buying has been worked out to help handle the tremendous demands.

Plants Propagated Beforehand

The Division's Service and Supply Department is notified of the plant needs through a request form. A number of bids are obtained by the State Purchasing Division, and the plants are ordered in advance of delivery. The time between the date of the order and the date of delivery may be a few months or over a year, to give the supplying nursery a chance to propagate and/or collect the plants.

Delivery in such cases is normally made to one or the other of the two storage yards the Division of Highways maintains. One of these is located adjacent to the State Nursery at Davis, the other at the Clinton Street maintenance station located between the separated roadways of the Hollywood Freeway near Vermont Avenue in Los Angeles. Plants are cared for by Division of Highways landscape maintenance personnel during the time they are in the storage yards awaiting pick up by the various landscape contractors. The contractor gets these plants "state-furnished" and allows for these free plants in his bidding on the planting job. The contractor's effective date for beginning iceplant planting contracts is controlled by the specifications which do not permit planting until there has been sufficient rainfall to moisten the earth to a depth of at least one foot.

Ground Covers

Orders for ground covers, such as the ivy which has been very success-



Prior to writing specifications on a contract preliminary to call for bids, new sections to be planted must be carefully checked against plans.



Fast growing acacias create lush effect in six years after planting on Santa Ana Freeway-Long Beach Freeway interchange, Los Angeles.

ful in the southern part of the state, are handled somewhat differently. These orders, which may run into as many as half a million plants for one job, specify holding the plants at the supplying nursery until needed, although the nursery is given a firm order well in advance. Often the contract specifies the contractor may, if he desires, take iceplant and vinca (periwinkle) plants from already well established plantings on state right of way, if he can do it without serious damage to the original planting.

The contractor is bound by a number of rigid stipulations. The plants must thrive. This requires him to water and care for them about four months after the actual planting is completed. He must clean up the area before and after planting. Specifications covering the use of commercial fertilizer, manure, and other soil conditioners must be followed. In addition he is bound by all the general provi-

sions for contractors working of Department of Public Works contracts.

These are generalizations which pertain to all planting—both landscaping and functional. A number of other considerations enter into functional planting as such, although, as heretofore stated, much of the so-called "landscape" planting is also essentially functional.

Median Screen Planting

Probably the functional planting most noted by the public is the planted median strip. The primary purpose of this center planting is to shield the driver's eyes at night from the tiring effect of the headlights of oncoming cars in the opposite lanes. Its secondary purpose is to diminish the speed of, or stop, cars crossing the median when out of control.

These cross-median accidents are relatively rare, but they may result in head-on collisions with fatalities if there is no barrier at all. A good



Eucalyptus and California Toyon used for delineation of series of short bridges on US 40 just south of Davis.



Example of Type A slope control in Cahuenga Pass section of Hollywood Freeway.

median planting absorbs the shock, slows or stops a car which is out of control, and does not throw it back into the path of others. Of course, planting for this purpose is not always practical, and the Division has spent many thousands of dollars on experiments to develop other types of median barriers.

The shrub used for these median plantings must have many properties. It must grow densely to stop headlight glare, and retain its leaves the year round. It must grow in clumps, with many stems, be strong, neither brittle nor too willowy. It must not grow too high, nor change its character as it

gets older—preferably it should grow in thick clumps between eight and ten feet high. It must be highly resistant to drought, and to the gases produced by automobiles. It must be able to survive in many kinds of soil, particularly in the heavy adobe soil found in many parts of California, through a wet, soggy winter. It should be ornamental, and it should be easily propagated so it can be obtained in great numbers cheaply.

Oleander Best for Purpose

No shrub has been found which will fit these requirements better than the oleander, (*Nerium oleander*), a

member of the dogbane family, and native to the Mediterranean region. Although the oleander is widely used in home and park planting, occasional complaints are received because the Division of Highways is planting a "poisonous shrub." A few plantings are made inside freeway fences along frontage roads, but the greatest number by far are planted in the median. In any case, if either children or stock managed to get to the vicinity of the shrubs, they would be in much greater danger from traffic than from poisoning by the shrubs, the leaves of which are bitter and unpalatable.

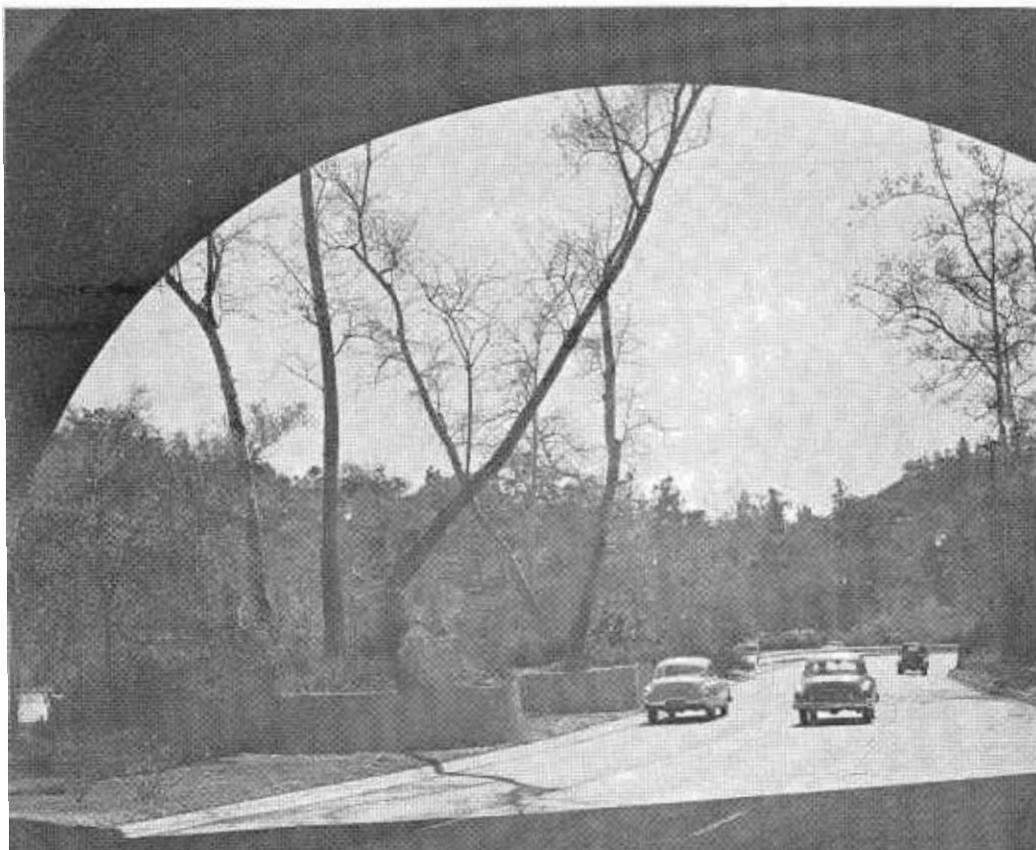
The Division of Highways has no record of either people or stock ever being poisoned by its oleanders. Balanced against a very meager possibility must be the number of lives the shrub certainly has saved from death in traffic accidents.

Slope control is another major job of functional planting. It not only can save maintenance funds, but sometimes saves millions in right-of-way cost where property values are very high. Engineers must in these cases resort to steeper slopes on cuts and fills and use functional planting to help control the slopes from slipping.

Slope Stabilization

The landscaping section has three types of slope stabilization and in cases such as this "Type A" is justified. This type is for steep slopes, and is relatively expensive—\$2 to \$3 per square yard. Its basis is a grid of wood—2 x 4's vertically, 1 x 4's horizontally, with openings approximately a yard square. The framework is held in

Existing native sycamores on Pasadena Freeway were saved by building retaining walls to preserve natural grade around them.



place with stakes. The openings are filled with compacted top soil, then covered with six inches of straw. Finally wire mesh is laid over the whole and fastened to the grid. Ground cover is then planted in the soil beneath the mesh and straw.

Type A slope stabilization was first used on the Arroyo Seco Parkway (now the Pasadena Freeway) in the Los Angeles area. Although these slopes are quite steep (one to one), there have been no serious failures in more than 20 years. Much of the wooden part of the slope control has rotted out by now, but the plant roots have spread and matted so that the structural support is no longer needed.

Type B stabilization, commonly used on $1\frac{1}{2}$ to 1 slopes, is similar to Type A, without the wooden grid. It costs about two-thirds as much as



ABOVE. Young lady making iceplant cuttings on piecework basis for contractor who is planting freeway median nearby.

Type A, and is used wherever there is danger that the toe of slopes might slump and intrude on adjacent property or communications facilities.

Type C is used on $1\frac{1}{2}$:1 or flatter slopes and consists of straw rolled into a cultivated surface and planted. If seed is used instead of plants the seeding is done before the straw is placed.

Ground Covers Useful

Ivies and iceplant are used in great quantities for these different slope and controls, and for control of weeds also. They are often used in both urban and rural areas as fire control cover, too, because they stay green and are not flammable. This is a far cry from the 1920's when maintenance crews burned the roadsides each year as the grass got dry and became a menace.

A number of hardy shrubs have been used for sound, dust, and headlight screens on the sides of urban freeways—several of the acacias, eucalypti, and California natives are used for these purposes with excellent results. The eucalypti also have proven to be one of the most useful trees for use in the arid sections, delineation of overcrossings, curves, bridges, and general screen planting.

These are all specific values obtained from planting. In addition there are the intangible values obtained, the softening and increased interest given the roadside area—both functional and beautifying. With between 25,000 and 50,000 trees planted each year, and



Photo of contractor's crew planting interchange on Hollywood Freeway Extension in North Hollywood gives good idea of scope of planting jobs. Small circles are wetted planting holes with newly planted shrubs. Dots are empty gallon cans.

between 100,000 and 200,000 shrubs, the Division of Highways more than compensates for those which must be removed for straightening or realigning the routes. This fact is often overlooked when critics complain of tree destruction. It also is important to remember there are practical financial ceilings on landscaping which can be raised only by added taxation or by reducing expenditures for highway modernization.

(The next article on California Roadsides will discuss the problems of maintenance.)

BELOW. Contractor's crew and equipment planting iceplant cuttings in median, Santa Ana Freeway, near Tustin.



Paver Control

Experimental Device Used
In Resurfacing Operations

By W. H. CRAWFORD, District Construction Engineer



ON THE District VIII "thin blanket" project to resurface existing pavement with asphalt concrete at various locations in San Bernardino and Riverside Counties, an automatic grade

control device attached to a paver was used experimentally. The device was used at three locations.

This particular project, which provides for a one-inch surface course over existing low standard pavement, was chosen for the experimental use of the electronic control to observe the operational characteristics of the device on a pavement surface of irregular grade and cross section. Although the contract plans provided surfacing material for advance leveling of major pavement failures and building up of curve superelevations, the existing pavement after such treatment could not be considered as comparable in smoothness to a regulation leveling course of asphaltic concrete over prepared subgrade. The type of surfacing operation was, therefore, considered to be ideal to test the operation of the automatic paver control on worse than average conditions, and also to determine if improved grade and cross section of surfacing could be obtained without exceeding quantity limitations.

Operation Explained

To better understand how the device functions a review of the main characteristics of the paver's floating-type screed follows:

The tractor unit tows the screed assembly by the two draft arms. The weight of the screen structure is, however, supported solely by the paved surface. In effect, the screed rides on that surface in a manner similar to a water skier.

There exists some equilibrium angle of attack at which forces on the

screed are in balance and the pavement thickness remains constant. To increase thickness, angle of attack of screen relative to draft arm is increased by means of the hand-operated screw. Then the screed rises as the machine goes forward until the equilibrium thickness is again reached. Thereafter, the thickness is constant at its increased value.

The screed structure is torsionally flexible so that the two sides act almost independently. Thus, a tapered mat can be laid by maintaining different screed-to-draft-arm angles on the two sides. Generally, one man is able to adequately control both sides, but present-day tolerances on almost all types of work sometimes necessitate having a full-time screed man on each side. This is particularly true on resurfacing work where the grade and transverse slopes of the existing pavement are almost never smooth, so that variable paving thickness is often required to remove base roughness.

Prevents Breaks

The floating screed principle assures that, under normal conditions, abrupt breaks cannot occur in the paved surface. That principle, combined with a moderately long tractor wheel base, tends to cause the paver to produce a smooth surface in the direction of travel if the base roughness is of wave length less than 20 feet or so.

Theory and practice show that roughness is reduced by approximately one-half in each succeeding layer of surfacing. For longer wave length base undulations, the mat tends to be of constant thickness and the base undulations appear in the final result. On normal roads and streets, four or more mats are required to span the width; usually the outside mats are laid first. The outside screed man will then attempt to control his end of the screed to properly match an existing concrete gutter or other structure. The inside

screed man has no guide except for periodic measurements of mat thickness.

The task of the screed man is made more difficult by another aspect of the floating screed principle; namely, that a change in the screed adjustment produces no immediate effect on the mat thickness. Thus, there is a time or distance delay of 10 to 15 feet interposed between the need for a correction and achievement of the correction. The screed man must look ahead and try to anticipate what adjustment is required. Over-controlling of the screed is a common fault, and desired accuracy is not always achieved on a manually controlled paver.

From the preceding description of the paver employing the floating screed principle, it can be readily seen that it will inherently tend to lay a smooth mat; however, the degree of smoothness obtained is to a great extent limited by the skill of the screed man.

Follows Grade

The experimental paver control employs a grade following system on one end of the screed and a transverse slope control which will cause the other end of the screed to follow the first, thereby maintaining a constant preset transverse slope on the paved surface. Photographs of the experimental control as installed are shown in Figures 1, 2, 3 and 4. Drive motors indicated as "Left Drive Motor" and "Right Drive Motor" are connected to respective screed adjusting screws to allow automatic operation. The grade follower arrangement can be transferred from one side to the other to suit job conditions. Transverse control is accomplished on the opposite side.

The follower shown in Figure 2, consisting of a steel bar $\frac{1}{2}$ " x 4" x 30'-0" with a rigid 10-foot center section, was used in the experiment to assist in establishing grade control for

the first mat placed, usually the right lane. This 30-foot semi-rigid follower, to the center of which the follower arm was attached, was passed over the existing pavement, resting on the high spots and bridging the low spots to a considerable extent. The flexible ends were designed to deflect sufficiently to conform to the radii of the many short vertical curves encountered on this project.

Figure 3 shows the follower used to pick up grade for the adjacent mat for the left lane. This follower, or ski, was a short section of $\frac{1}{2}$ " x 4" steel bar attached to the follower arm. Note that this follower rides on the top of the mat already in place and compacted.

Arm Extends Forward

Anticipatory action, which is difficult for the screed man to accomplish manually, is obtained on the grade follower side by having the follower arm extend forward toward the draft arm to union center. In effect, the control will cause the screed to automatically follow the same path it would take if the base on which the paver runs were absolutely parallel to the selected grade reference surface. That end of the screed thus becomes independent of the tractor elevation and base roughness.

Proper anticipation is needed on the other end of the screed also, because the pendulum, being mounted on the screed, will not immediately respond to the adjustments of the second screed screw. However, when the second screw is driven in response to an error signal from the transverse slope control system, a change in screed twist angle will occur. This angle is measured by a potentiometer, and the resulting electrical signal is used to oppose the pendulum signals, thus stopping the second screed motor at the proper time.

Mat is Placed First

At locations on this contract where the control device was used, the traveled way consists predominantly of two 12-foot lanes with variable width shoulders. The mat for the right-hand lane was placed first, with the paver traveling in the direction of traffic for that lane. All traffic was carried

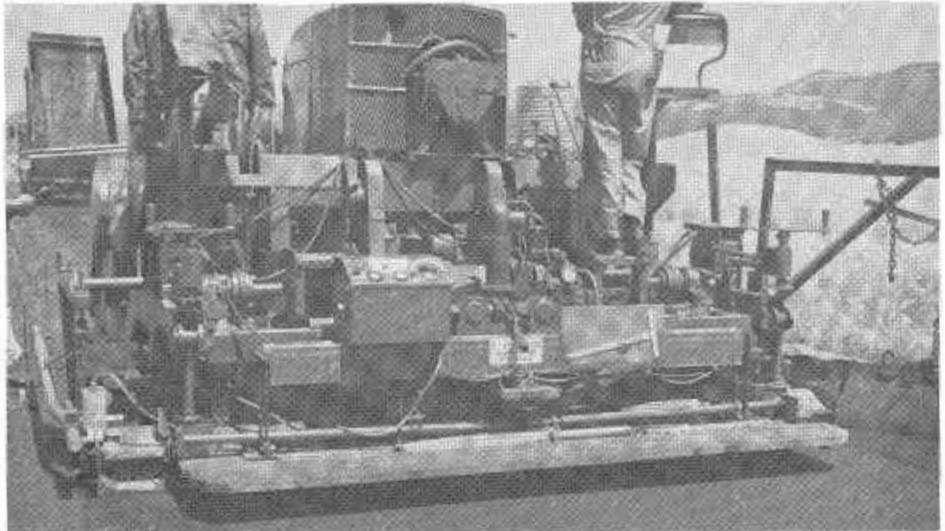


FIGURE 1. Rear view of paver showing transverse beam which supports pendulum and control equipment.

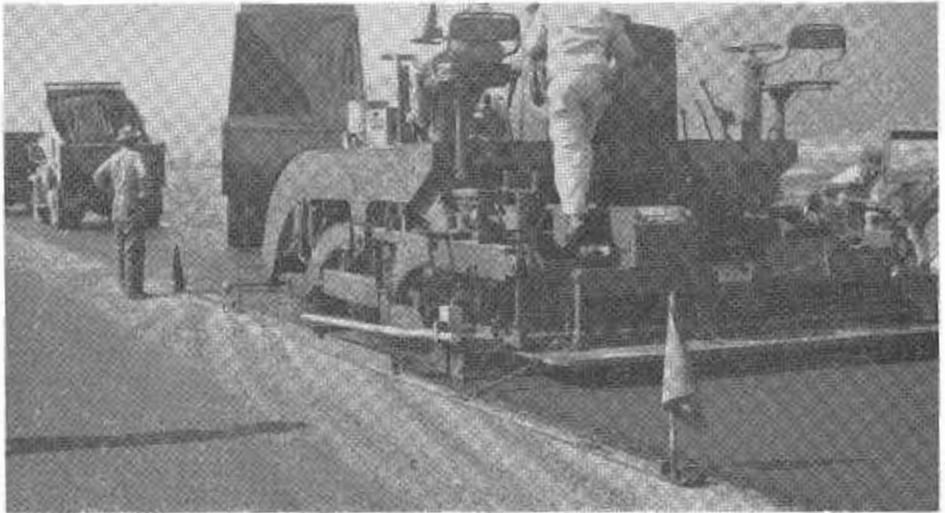


FIGURE 2. View of left side of paver showing follower arm and 30-foot skid in place. Grade control is obtained from bottom edge of skid which travels over surface of existing pavement or subgrade.

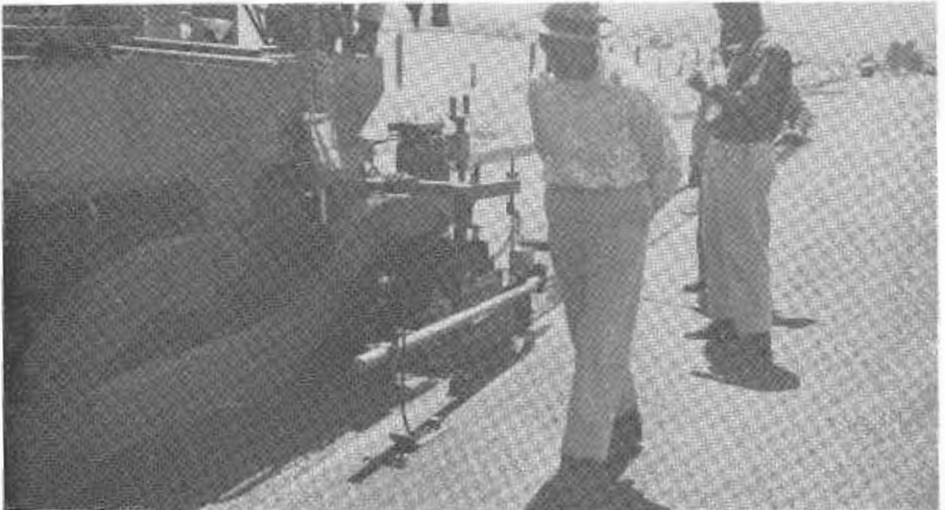


FIGURE 3. View of left side of paver showing follower arm and metal ski in operation. Note that ski travels on surface of completed adjacent mat.

through construction on the other half of the roadbed.

For the laying of this first mat, the grade follower (in this case, the 30-foot steel bar) was run directly on the existing pavement a few inches to the left of the centerline traffic stripe. The zero adjustment was set to spread material one inch compacted above the bottom edge of the grade follower. The outside end of the screed was under automatic transverse slope control with the slope dial set at the required slope. The transverse slope was determined in advance by checking the existing pavement ahead of the paver with a slope board.

Due to irregularities in the grade and cross section of the existing pavement and to the quantity limitations imposed by the job specifications, it was necessary to slightly vary the slope every few hundred feet to fit

conditions. The slope setting was changed as required while the paver was in motion. One screed man performed this operation and other duties about the screed with ease.

The mat for the opposing lane was laid in a similar manner, in that the paver operated in the direction of traffic. The grade follower for this run was a short metal skid that traveled directly along the inside edge of the compacted mat for the first lane, with the zero adjustment set to spread material slightly above the pavement edge to allow for compaction. As before, the outside end of the screed was under automatic transverse slope control.

Results Compared

At one location, a portion was resurfaced in the conventional manner with the paving machine under man-

ual control, and on another portion the grade control of the paver was handled automatically with the control device. Conditions were favorable on this stretch of highway to observe not only the operational characteristics of the automatic control but to compare results obtained by use of the automatic control with results obtained by use of conventional control.

The above two-mile stretch of highway is an old two-lane road originally constructed some thirty years ago. It is characterized by curved alignment with an undulating grade line closely following the natural terrain. There are ten horizontal curves and 37 vertical curves irregularly spaced throughout the two-mile stretch. The pavement generally was in poor condition, containing many cracks, patches, and edge failures. The transverse slope of the pavement was also very irregular with excessive crown at the quarter point and inadequate superelevation at the curves. The riding qualities were practically the same throughout the two-mile trial section.

The general appearance of the resurfacing placed by automatic control is slightly better than surfacing placed by manual grade control. There is a noticeable lack of patched areas or evidence of corrective work. The transverse slope of the pavement is also more uniform where the automatic control was used. As a uniform transverse slope tends to use more material when resurfacing old high-crowned roads, the slope was varied as necessary to remain within mat thickness limitations. Slopes for several hundred feet in advance were predetermined and the screed man made the necessary adjustments with ease as required. The use of a near uniform transverse slope added materially to the riding qualities of this test section, and also improved riding qualities at locations on other routes where the automatic control also was used.

Joints Are Matched

Another feature of resurfacing that is materially improved by use of the automatic control is the joint between adjacent or opposing mats. The automatic control, by picking up electronically the grade of the adjacent compacted mat by means of a grade

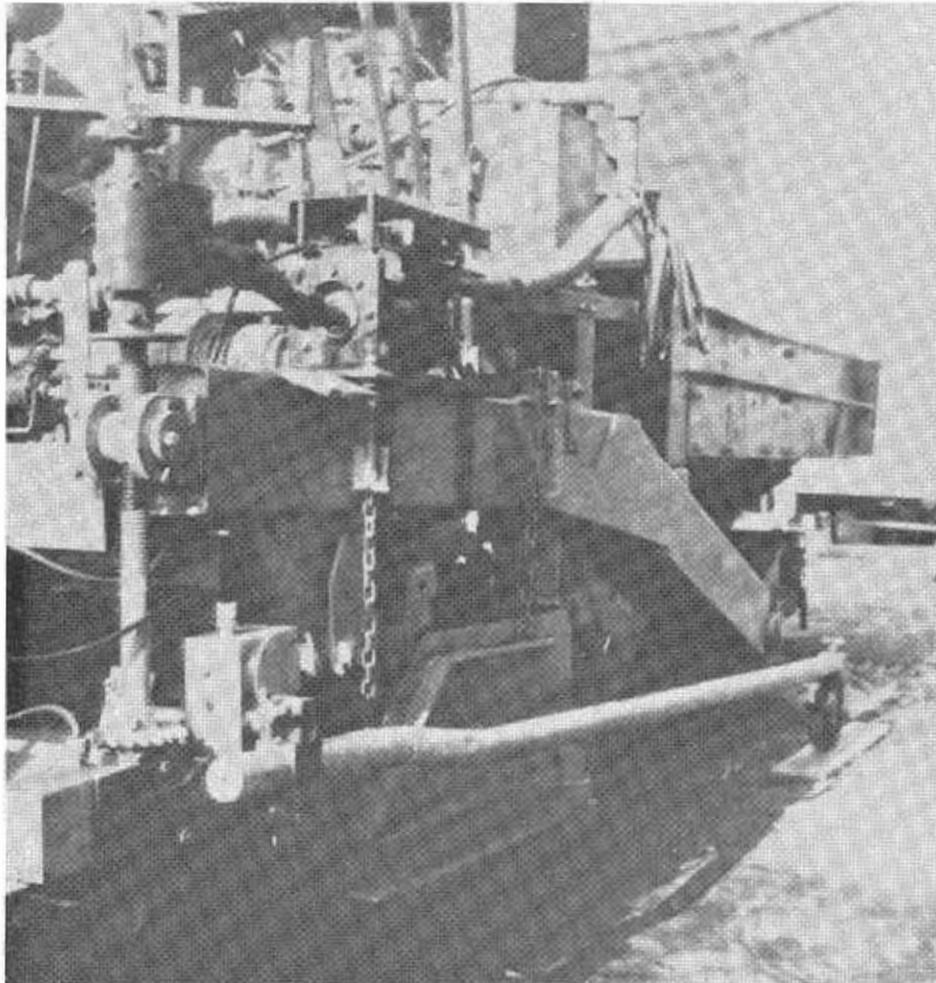


FIGURE 4. View of right side of paver with follower arm in place. Skid or spline is used instead of wheel depending on job conditions. Note electric motor on draft arm and gear box, beneath screed screw handle.

follower riding directly on the edge of the adjacent mat, assures that the correct amount of material will be placed to provide a perfectly matched and smooth-riding joint.

Based on observed results of the experimental use of the electronic control on portions of this contract, it can be said that the device, when employed, shows promise of greatly improving the operation of a floating screed paver. Its usefulness to control pavement grade over a prepared sub-grade should prove to be even more marked than was demonstrated on this resurfacing job.

The observed benefits to be derived from use of the automatic control appear to be as follows:

1. Provides positive grade and slope control, thereby removing the guess work from anticipatory screed manipulation.
2. Improves riding qualities of asphalt concrete pavement.
3. Tends to eliminate corrective work at edges and center joint.
4. Simplifies duties of screed man and eliminates need for two screed men on difficult work.

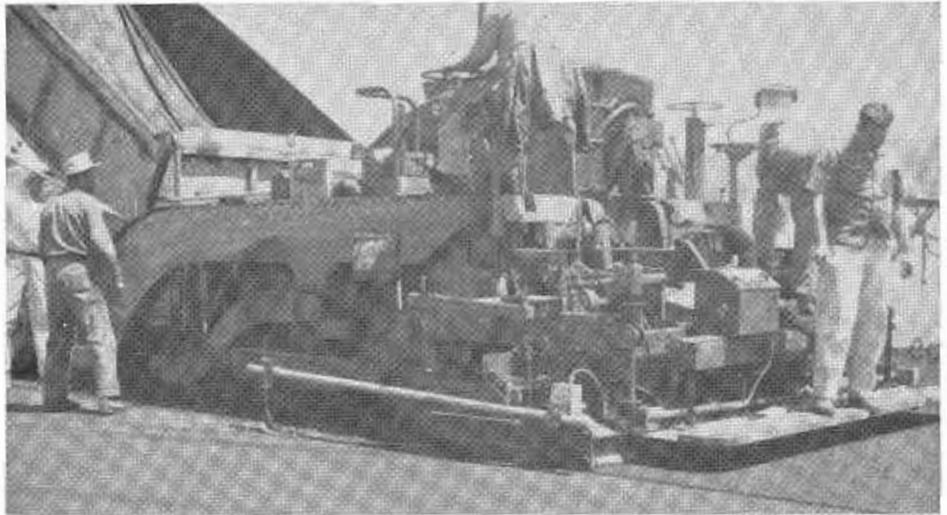
The electronic control device used on this project is an experimental model. When production models become available a full scale evaluation will be made to determine the effect on all types of asphalt concrete paving operations.

NEW U.S. 399 ROUTING

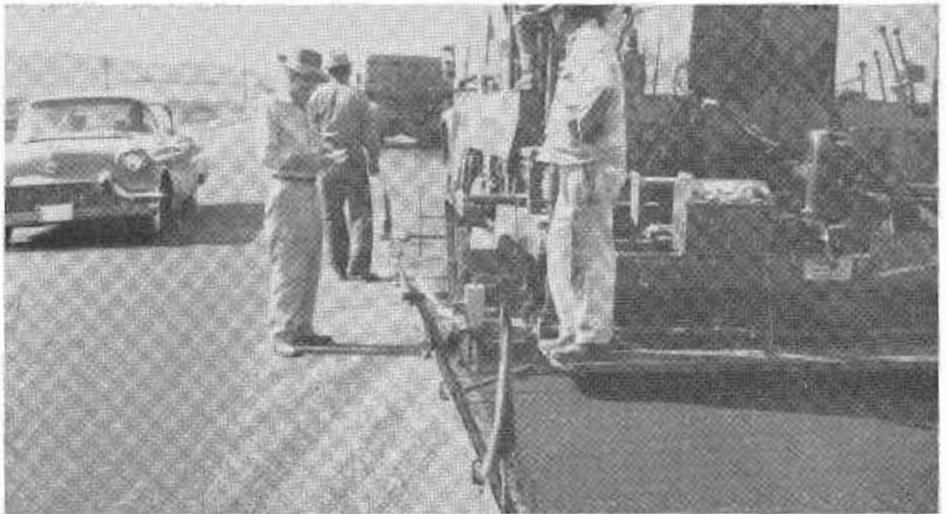
The California Highway Commission has adopted a freeway routing for the relocation of 7.6 miles of U.S. Highway 399 in Kern County between 2.25 miles northeast of Valley West Road and 0.2 mile east of State Highway Route 139 (Enos Lane).

The adopted route cuts easterly across a north-stop loop which the present highway makes west of the Kern River. East of the river the adopted route follows the existing highway.

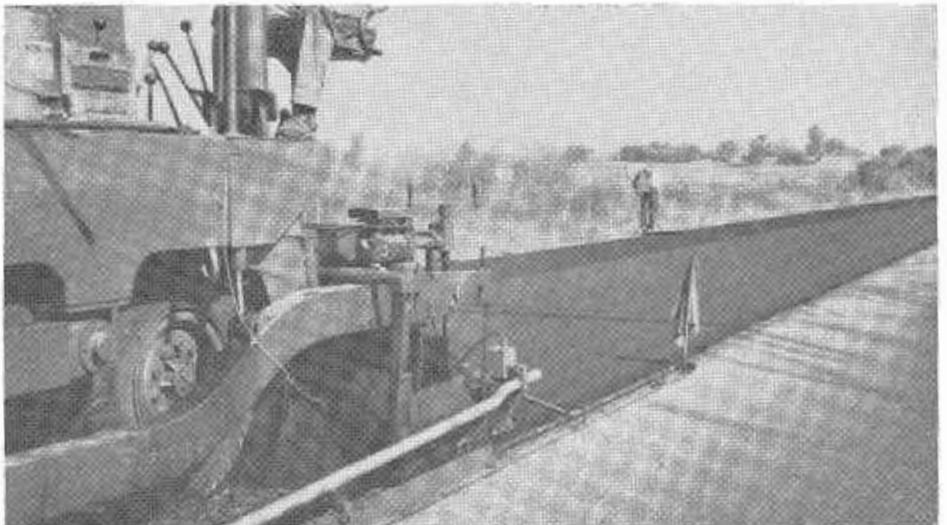
The U.S. Bureau of Public Roads has estimated total travel in the United States for 1960 to be 720 billion vehicle miles, a three percent increase over the previous year.



View of left side and back of paver with electronic grade control in operation. Follower arm with ski picking up grade from adjacent mat. Note perfect grade of uncompacted mat slightly high to allow for compaction.



View of paver and grade control attachments. Follower arm and 30-foot metal straight edge in operation. Note that straight edge does not interfere with operation of other equipment.



Close up view of follower arm and rigid center portion of 30-foot straight edge.

Salinas Valley

New U.S. 101 Freeway Sections
Bring Traffic Relief to Area

By A. M. NASH, District Engineer



WITH THE successful completion of a six-mile expressway between Soledad and Gonzales and a three-mile freeway bypassing the city of Soledad, nine miles of a modern, safe

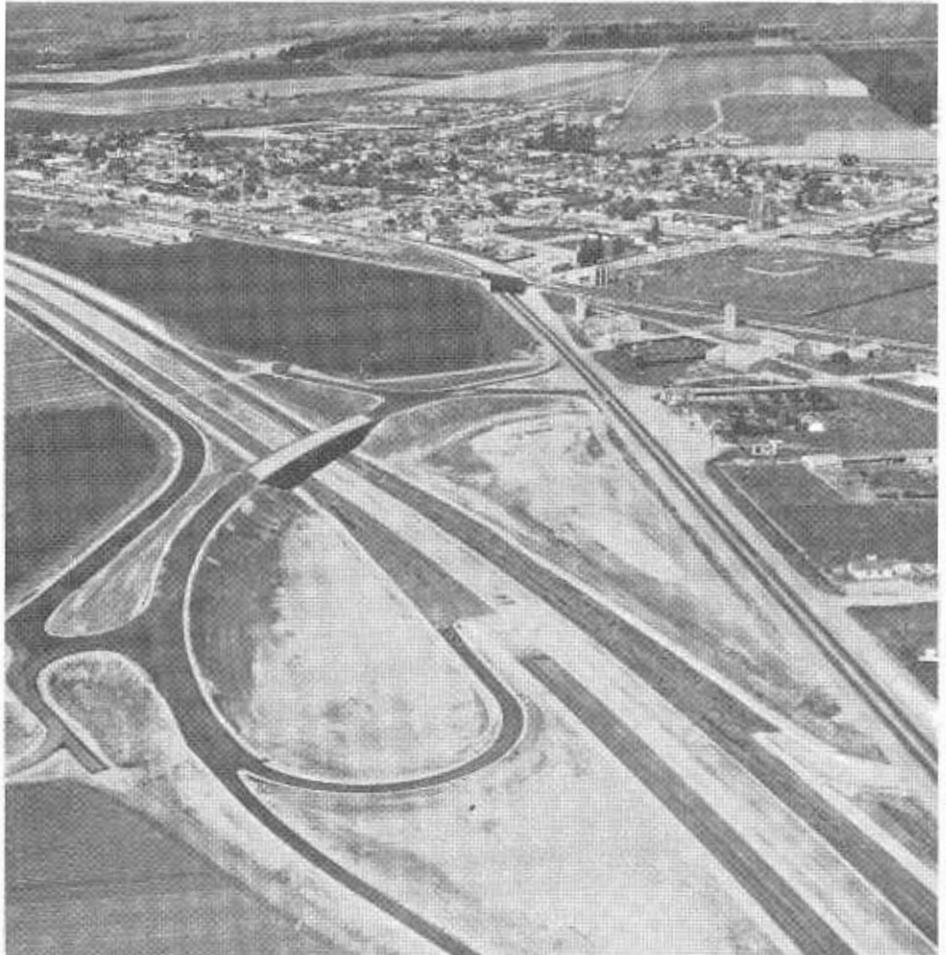
traffic artery have been added to U. S. 101 as it flows through the heart of the rich, fertile Salinas Valley, often referred to as the Salad Bowl of the United States.

Construction is now well under way on the freeway bypass of Greenfield. Construction of the Gonzales freeway bypass is imminent. With completion of these last two projects we shall be able to provide a full four-lane divided highway artery to adequately serve all traffic needs on U. S. 101 between Salinas and King City, a distance of 48 miles without a single stop sign in between.

The traveling public has already experienced the beneficial effects of the expressway between Soledad and Gonzales which was opened to the public last December eleventh.

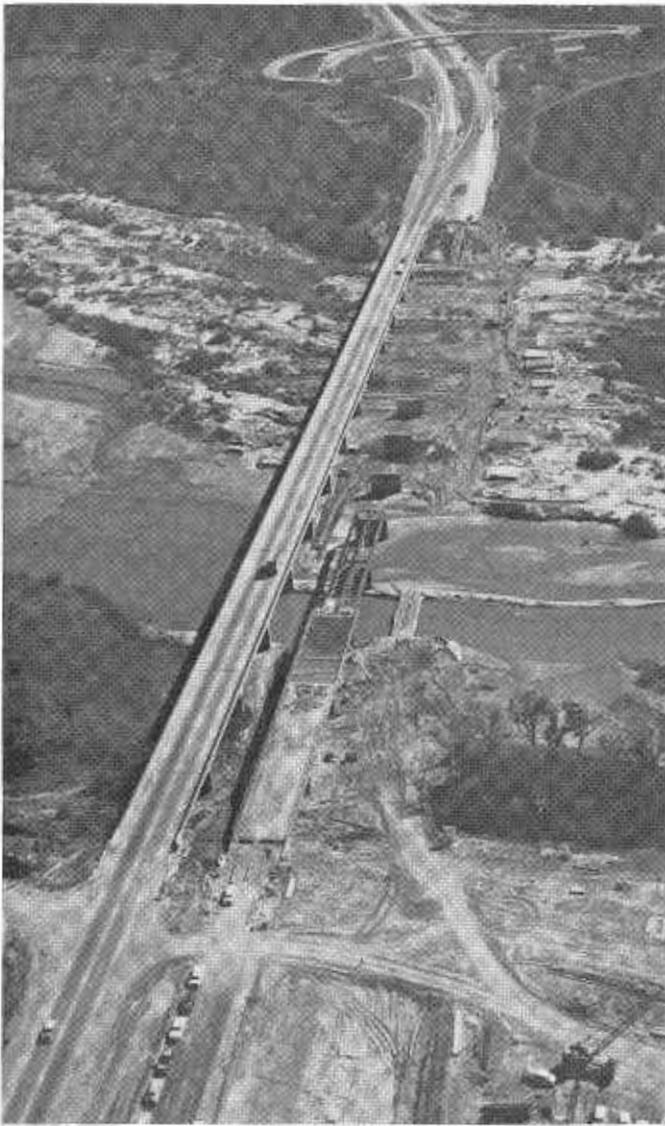
Congestion Was Problem

This project was originated to eliminate the traffic deficiencies resulting from the increasing volume of traffic using the route, coupled with congestion caused by large vegetable pro-



The interchange south of Soledad and just north of the Salinas River. The old highway (right) goes under the railroad.





Spanning the Salinas River south of Soledad with a twin to the existing bridge. The Arroyo Seco overhead between Soledad and Greenfield is visible (center background).



Piling shown in place for twin structures over the railroad and old highway (front center). The Soledad Bypass and Salinas River are in the background.

duce trucks operating during harvest season. This last factor naturally led to considerable unsafe use of shoulders for passing purposes, often at excessive speeds.

Our expressway location parallels the previously existing highway and is slightly easterly thereof, we were able to utilize approximately 60 per cent of the old highway as southbound lanes with the remainder used as frontage roads. The old highway was naturally resurfaced and brought up to the latest highway construction standards before the expressway was completely opened to public use.

With the exception of a 1.2-mile section nearest Gonzales, the project

was constructed to freeway standards with full access control and necessary grade separation structures. The remaining 1.2-mile section was constructed to expressway standards with two crossings of the expressway at grade level. This section will be converted to full freeway standards with necessary grade separation structures and frontage roads as part of the Gonzales freeway bypass project.

Two Structures Built

Two overcrossings were constructed over the divided freeway. One, a four-span concrete girder bridge, 683 feet long, provides access to the State Correctional Facility approximately half-way between Soledad and Gonzales.

A second, nearly identical structure, the Camphora Overcrossing near Soledad, provides easy access to many adjacent vegetable farms and dairy ranches.

The surrounding land within the limits of the project is relatively flat and drainage is critical. Although the average rainfall is only 10 inches, the surrounding fields are subject to heavy irrigation. The combination of rainfall and irrigation runoff over level land has flooded the old highway at several locations at varying times of the year. This condition has been corrected by placing new culverts and by locating the lanes above the runoff flood plane. Reinforced concrete



US 101 through the City of Soledad showing congestion typical of past years before construction of the freeway bypass.

pipe was used under the new lanes exclusively and was selected because of its high hydraulic efficiency on the flat grades with which we were confronted.

This \$1,610,000 project, contracted to John Delphia and Fred J. Early, Jr., is now completed. Dan Connolly was Resident Engineer, and W. H. Schooler, represented the Bridge Department.

Work on Second Project

This same team, with Dale Williams replacing Schooler as Bridge Department representative, also worked together on the Soledad freeway bypass project directly adjoining the above project at its southerly terminus. The other end of this three-mile freeway project connects to a divided four-lane expressway between Greenfield and the Salinas River south of Soledad which was completed in 1958. Completion of the Soledad bypass, therefore, immediately provides traffic with an uninterrupted divided four-lane

highway between Greenfield and Gonzales, certainly a significant achievement in itself.

The south end of the Soledad bypass freeway begins 0.3 mile south of the Salinas River. The existing highway for 3,000 feet, including the existing bridge over the Salinas River, is being utilized as northbound lanes on the new freeway. A new bridge paralleling the existing structure has 13 spans of 104 feet each and two shorter spans for a total length of over 1,500 feet, which closely approximates the length of the existing bridge. To add to the similarity, barrier type railing will be installed on both old and new structures.

Route Veers West

Continuing northerly, the new alignment veers to the west just south of the existing highway-railway underpass. A traffic interchange has been constructed at this point to provide adequate access to the city of Soledad, easy access to the freeway for

motorists traveling south from Soledad and facilitates access to a frontage road west of the freeway which serves neighboring farms and ranches.

Paralleling the railroad and the westerly Soledad city limits the freeway continues directly north, turning east to cross the railroad approximately 0.3 mile north of town. Here four-span parallel bridge structures are necessary as the new route crosses both the Southern Pacific Railroad and the existing highway which will remain in use as access to Soledad from the north. Each of the bridge structures is of composite girder type utilizing steel girders and bonded concrete decks, and are over 300 feet in length. Twenty-eight foot roadways and steel railings are provided at both of these structures and at the separation structure south of Soledad.

Interest is Created

The use of asphaltic base and asphaltic concrete has created considerable additional interest in this project

among construction and materials specialists. A cross section of the roadways shows 24 inches of new construction, including 11 inches of imported borrow, 6 inches of untreated rock base, 3 inches of asphaltic concrete base, 2 inches of asphalt concrete leveling course 1½ inches of dense graded asphaltic concrete with a cover of ½ inch of open graded asphaltic concrete. Nearly 40,000 tons of asphalt mix using nine different sizes of aggregate was used. The contractor initially had considerable trouble with this material as his hot plant and paving machine were not designed to handle large aggregate up to 2½ inch maximum size. However, experience led to relatively minor adjustments in the contractor's machinery which enabled successful efficient completion of both hot plant and paving operations.

Deflection tests were taken on various levels of construction beginning with the layer of untreated base material. Permeability tests were taken on all three layers of the asphaltic concrete pavement as construction progressed. Data from these tests will be of considerable assistance in reaching conclusions as to durability of the pavement and the entire project should serve as a fair test of these construction materials and methods.

Two-way traffic was routed onto the northbound lanes of this project last July with an immediate noticeable decrease in traffic congestion through the city of Soledad. With the opening of the entire freeway to full traffic use next October, this entire central Salinas Valley area will be free from traffic congestion for the first time in many years.

SIGN ROUTE 4

The California Highway Commission has adopted a freeway routing for 10.7 miles of State Sign Route 4 (Ebbetts Pass Highway) in Calaveras County between Camp Connell and Ganns.

The adopted route generally follows or closely parallels the existing highway, but eliminates sharp curves and excessive grades.

Stanford U. Starts Highway History Collection



We are inclined to think of test roads, such as the one recently constructed and operated by the American Association of State Highway Officials in Illinois (See page 47, January-February, 1961, issue of this magazine), as of recent vintage. However, among the material already submitted to the Western Highway Historical Collection being formed by the Stanford University libraries is this photo of an early test road near Pittsburg, California, circa 1925. (Photo by Charles W. Geiger)

The founding of an historical collection, covering the early days of highway transportation in the Western States, has been announced by the Stanford University libraries.

The project will be carried on in cooperation with motor carrier associations in 13 Western States, the provincial associations in Alberta, Saskatchewan and British Columbia, and the Western Highway Institute.

Items being sought for the collection include photographs and documents, such as tariffs, copies of operating authorities, interchange agreements, labor contracts, payrolls, house

organs and the personal recollections of pioneer carriers and suppliers.

All donations will be carefully preserved by the University for use by future scholars "wishing to recapture the events of a remarkable period in the history of transportation."

Contributions will be acknowledged and the names of donors will be suitably recorded with book plates.

Communications should be addressed to Western Highway Historical Collection, Stanford University Libraries, Stanford, California. It is requested that special care be taken by donors to identify properly names, places and events.

Interstate Estimate Nears 2½ Billion Dollars

The cost of completing California's 2,182-mile portion of the National System of Interstate and Defense Highways is estimated at \$2,458,512,000, according to a report to Congress by the Secretary of Commerce in January.

This is a considerably larger total than that of any other state, and reflects California's heavy motor vehicle registration and mounting traffic needs.

California's apportionment factor for the next four fiscal years (1963-66), based on the new Interstate needs estimate, is 9.656. In other words, California will receive 9.656 per cent of the total national Interstate apportionment for each of the four years.

In another report from the Department of Commerce, California's progress on the Interstate System was shown to be far ahead of the other states, in terms of funds expended or obligated on completed, current, or authorized projects.

The quarterly report of the Bureau of Public Roads for December 31, 1960, showed that California had expended \$556,100,000 for construction, engineering and rights of way on projects completed in the first four and a half years of the accelerated highway program. Going contracts or authorized projects accounted for an additional \$539,700,000. The figures include both State and Federal funds.

Flood Problems

State, Local Agencies Cooperate
In Improving Highway Drainage

By T. E. FERNEAU, Assistant District Engineer and
H. C. SUENDERMAN, District Hydraulics Engineer



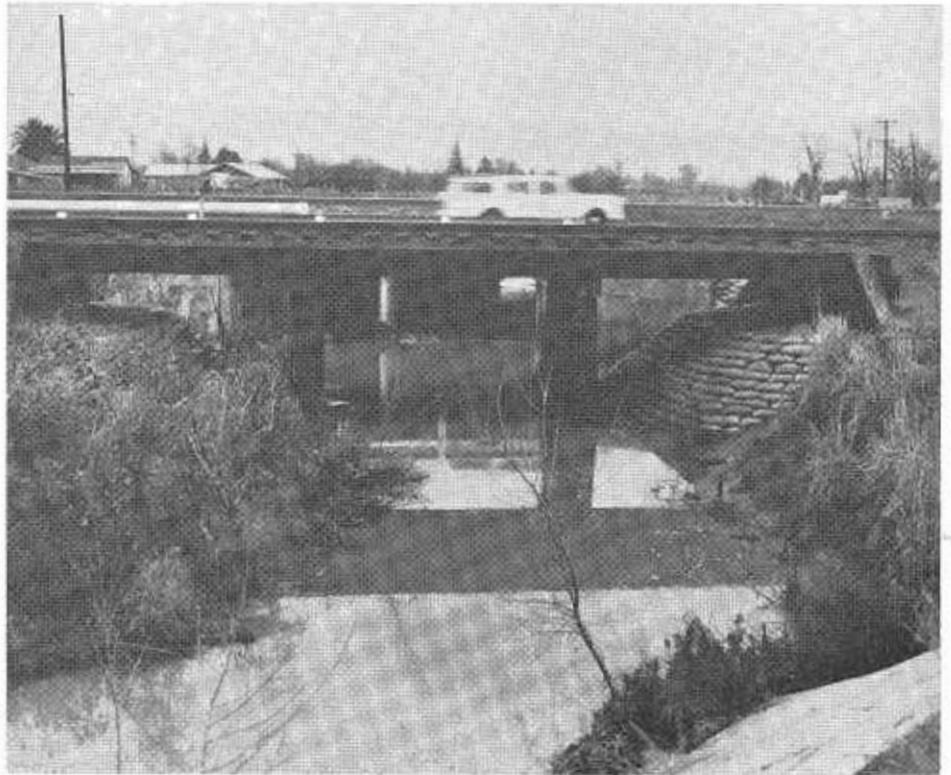
DISTRICT
IV

AFTER World War II, when State highway construction was actively resumed, California Highway Engineers found that drainage was becoming a serious and costly problem, quite different from earlier days when highway drainage consisted mainly of bridging major stream channels, placing a culvert in the gulches and small creeks, and allowing pavement runoff to flow over the side.

The population of California was increasing at an amazing rate and land values were jumping upward to unthought-of heights and then continuing their upward trend. Wastelands previously allowed to receive excess storm and flood waters were now being reclaimed, so that concentrated discharge of excess storm waters on them could no longer be tolerated. Also, vast areas of impervious surfaces were created, as farm lands became residential subdivisions. As a result, existing drainage facilities became overtaxed. The need became clearly evident for close cooperation between the Division of Highways and local agencies in the planning and construction of more adequate drainage systems, on and off the highway right of way.

Drainage Group Formed

In 1948 District IV, which includes nine counties in the San Francisco Bay area, concluded that drainage problems were of sufficient complexity and importance to warrant the development of a small group of specialized engineers whose primary duties would concern highway drainage and disposal of storm runoff with least detrimental effect to the highway and to adjacent private property. The Hy-



The Napa Cooperative Drainage Project looking downstream from the junction of the collector channels at the railroad trestle and double bridge under Sign Route 29.

draulics Section was formed and is now headed by a Senior Highway Engineer with title of District Hydraulics Engineer.

The functions of this section are to design major drainage facilities for State Highway projects; advise highway designers concerning general surface drainage and check designs prepared by others; furnish rainfall-runoff information; make continuous checks of changes in land use for drainage changes as they may affect State Highways, make special studies of drainage problems for Maintenance, Right of Way, Construction or other departments; and to analyze and make recommendation for disposition of claims and complaints involving drainage.

The primary goal of any State highway drainage facility is to prevent wa-

ter from collecting on the highway and to retain, insofar as practical, the natural drainage pattern as it exists at the time of construction. Protection of the State highway, while preserving the existing drainage pattern, is not always possible to achieve by construction of drainage facilities within the highway right of way. Under these circumstances the Hydraulics Section must take the initiative in designing a satisfactory inlet and outlet channel, and in obtaining the cooperation of the appropriate local agency in the acquisition of rights of way for, and construction of, such channel.

Subject to Regulation

The fact that expenditure of State Highway Funds is subject to certain constitutional and statutory restrictions, as well as careful budgeting, in-

roduces further complications. Particularly with respect to work outside the right of way, there must not only be a clear showing of benefit to the State highway, but also that the proposed expenditure of State funds does not exceed the amount of this benefit. This requires financial participation by the local agency, which is sometimes difficult to obtain because of its budgetary or other restrictions.

After mutual problems have been worked out a "Cooperative Agreement" is executed, whereby one of the parties does the work, subject to a financial contribution by the other or in the alternative, the State does the work within the highway rights of way and the local agency the work outside, with each agency paying its own costs.

In the design and construction of new freeway and highway projects, co-operation with city, county and flood control agencies has also made it possible to arrange highway drainage systems so that they conform to local master drainage plans. The drainage facilities thus installed for the State highway will therefore not gen-

erally require expensive modification or replacement at a later date. The overall result is a saving in public funds which would otherwise have been spent had the Division of Highways and some local agency acted unilaterally in providing their respective drainage facilities. In some cases, in which a change in drainage pattern was the best solution, the local agencies have provided the necessary right of way across private property and constructed the required channel and storm drain outfalls.

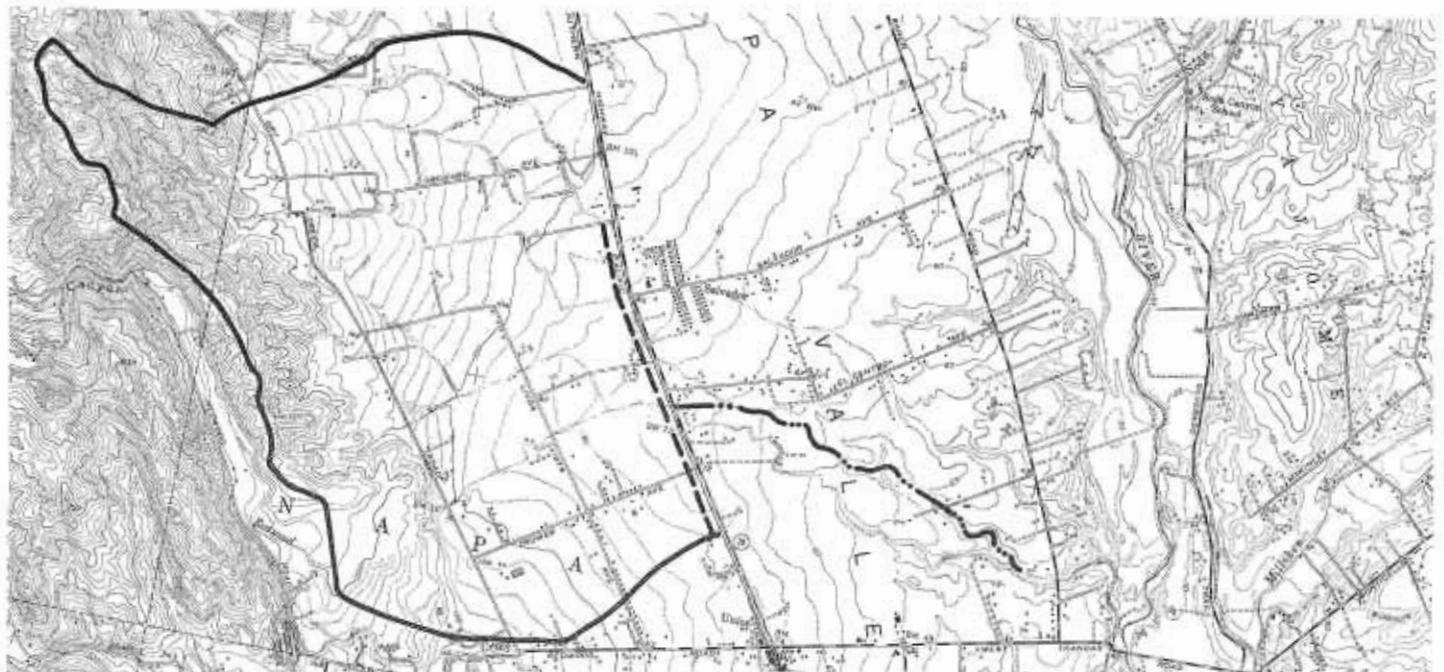
Local Interests Pay

There have also been instances where storm drain, sanitary sewer and utility crossings of local public agencies have been paid for by local interests but included in the highway construction contract, thus effecting a saving to the public by eliminating the excessive additional costs, and inconvenience to the public involved in constructing a future utility installation across a completed freeway carrying a large amount of traffic.

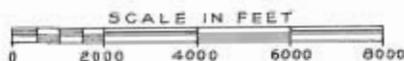
A notable case of this nature was in the design and construction of the

Nimitz (Eastshore) Freeway, between Hayward and San Jose. The close co-ordination and co-operation between the Alameda County Flood Control and Water Conservation District and the Division of Highways resulted in adjustment of location of a number of the proposed freeway drainage structures at no additional cost so as to conform with the Flood Control District's area-wide drainage plan. Inlet and outfall channels were constructed by the Flood Control District to insure proper functioning of the freeway drainage structures.

At various locations drainage improvement projects by local agencies were necessitated by urbanization of tributary watersheds. Many of these improvements involved increasing the capacities of existing natural drainageways. At some crossings of existing State highways, present drainage structures have been in existence for many years and lack the capacity to accommodate the increased drainage resulting from changes in land use. In those instances where it was concluded that provision for increased capacity at the highway was a State



- Drainage Area Boundary
- - - - - Collector Channel
- · - · - Outfall Channel



IV-NAP-49-B
SALVADOR ZONE
 OF THE
NAPA COUNTY FLOOD CONTROL AND
WATER CONSERVATION DISTRICT



A map of Healdsburg and vicinity showing the highway and drainage areas discussed in this article.

obligation, construction of an adequate size structure was financed by Highway funds. By means of co-operative agreements, the State portion of the work was co-ordinated and combined with the local agencies' project so that the project was constructed under a single contract with resultant saving in public funds.

Co-ordination Important

A typical example of this situation was that where the Alameda County Flood Control and Water Conservation District constructed a drainage improvement in the vicinity of Newark. By co-operative agreement adequate replacement of the existing old and undersized culvert across State Highway Route 107 was paid for by the State but included in the Flood Control project, thus insuring proper co-ordination of the work and eliminating the necessity of a separate contract for the portion determined to be a State obligation.

During the past four years approximately 300 improvement projects of various kinds and varying degrees of magnitude have been undertaken through the co-operative agreement procedure between the Division of Highways and local public agencies within the nine counties in District

IV. Fifty-two of these projects have resulted in solving drainage problems with direct and indirect benefits to all concerned. Evaluation of the past few years' experience in this District shows evidence that many flood and drainage deficiency problems, which have been magnified by rapid and extensive urbanization, can be solved when all agencies involved accept their responsibilities and co-ordinate their efforts. The response of local political bodies to this idea has been enthusiastic and gratifying.

The direct benefits have been savings of public funds at both the State and local levels and the accomplishment of needed drainage improvements long before these improvements could have been done by individual agency financing. Some, in fact, might never have been accomplished without co-operative action.

The indirect benefits have been increased land values and higher land use potential for lands previously subject to periodic flooding, the mental relief and thankfulness of local residents as well as State highway users no longer subject to flood hazards, and the growing idea in public agencies that more is accomplished by co-operation than by "going it alone." It may be that the indirect benefits

transcend the direct in the broad view.

NAPA CO-OPERATIVE DRAINAGE PROJECT

By W. C. McDONALD,
Associate Highway Engineer

During 1957, a 2.3-mile section of State Sign Route 29 in the County of Napa from Union Station to Orchard Avenue was expanded from a two lane highway to a four lane expressway under Contract 58-4TC3. A drainage system was constructed under this contract which included 6,500 lineal feet of longitudinal collector channel and 8,600 lineal feet of outfall channel, as a co-operative project with the County of Napa.

Topography in vicinity of the project is shown on the accompanying map. The main drainage for the area is the Napa River, located easterly from and approximately parallel to the highway, which drains southerly. Terrain adjacent to the highway generally slopes gently to the east although the highway actually traverses a broad shallow swale within the limits of the improvement as shown by contours. West of the highway there is a range of hills, and drainage from these hill watersheds crosses the highway location to outfall in the Napa River.

Prior to improvement there was a longitudinal ditch between the highway and the single track Southern Pacific Railroad which was adjacent to the highway on the west. The ditch was about 8,000 feet in length and was fed by several ditches or channels which crossed the railroad via culverts or trestles and which drained the land west of the highway. The longitudinal ditch drained north and south to the low area in the vicinity of El Centro Avenue. In the low area there were three stone arch culverts, two with spans of 8 feet and one with a span of 6 feet which passed drainage across the highway. These culverts were distributed through a length along the roadway of about 1500 feet and were drained by two outfall channels to the Napa River.

Deficient in Capacity

The longitudinal ditch and outfall channels were deficient in capacity. During heavy rains the longitudinal ditch would run bank full, with overflow water sheeting across the pavement. In the low area water would back up to submerge the pavement, and would occasionally cause the road to be closed to traffic for a period of hours.

Project report studies were made during 1953 and one phase of the study was the consideration of possible alternate methods for improving the unsatisfactory drainage condition.

These studies determined that there was insufficient space between the railroad and the existing highway for a ditch with adequate capacity. A ditch in this location would encroach on existing pavement and preclude its use for the southbound lanes of the proposed expressway. If the longitudinal ditch was to be preserved and if flooding of the pavement was to be eliminated, the ditch would have to be located either on the upstream side of the railroad or on the downstream side of the improved highway. In addition to these two alternates, an alternate was considered which would eliminate the longitudinal ditch by the construction of several outfall channels.

It appeared that only one of the three alternates considered could be done by the Division of Highways

without participation by the County of Napa, and that was the alternate which proposed a longitudinal ditch to be constructed on the downstream side of the proposed expressway. This alternate would have provided a longitudinal ditch with capacity equivalent to the then existing ditch and would have eliminated flooding of highway pavement but would not have eliminated flooding of adjoining land. The drainage condition of land adjoining the highway would not have been changed.

Alternates Require Co-operation

Both the other two alternates required extensive outfall channel improvements which were considered to be beyond the province of the Division of Highways. It appeared that these alternates would require co-operation by the County of Napa to acquire right of way, to share in the cost and to be responsible for changed drainage conditions and for continuing maintenance for portions of the system outside State's right of way.

During the Project Report studies the drainage problems were discussed with the County Engineer and Road

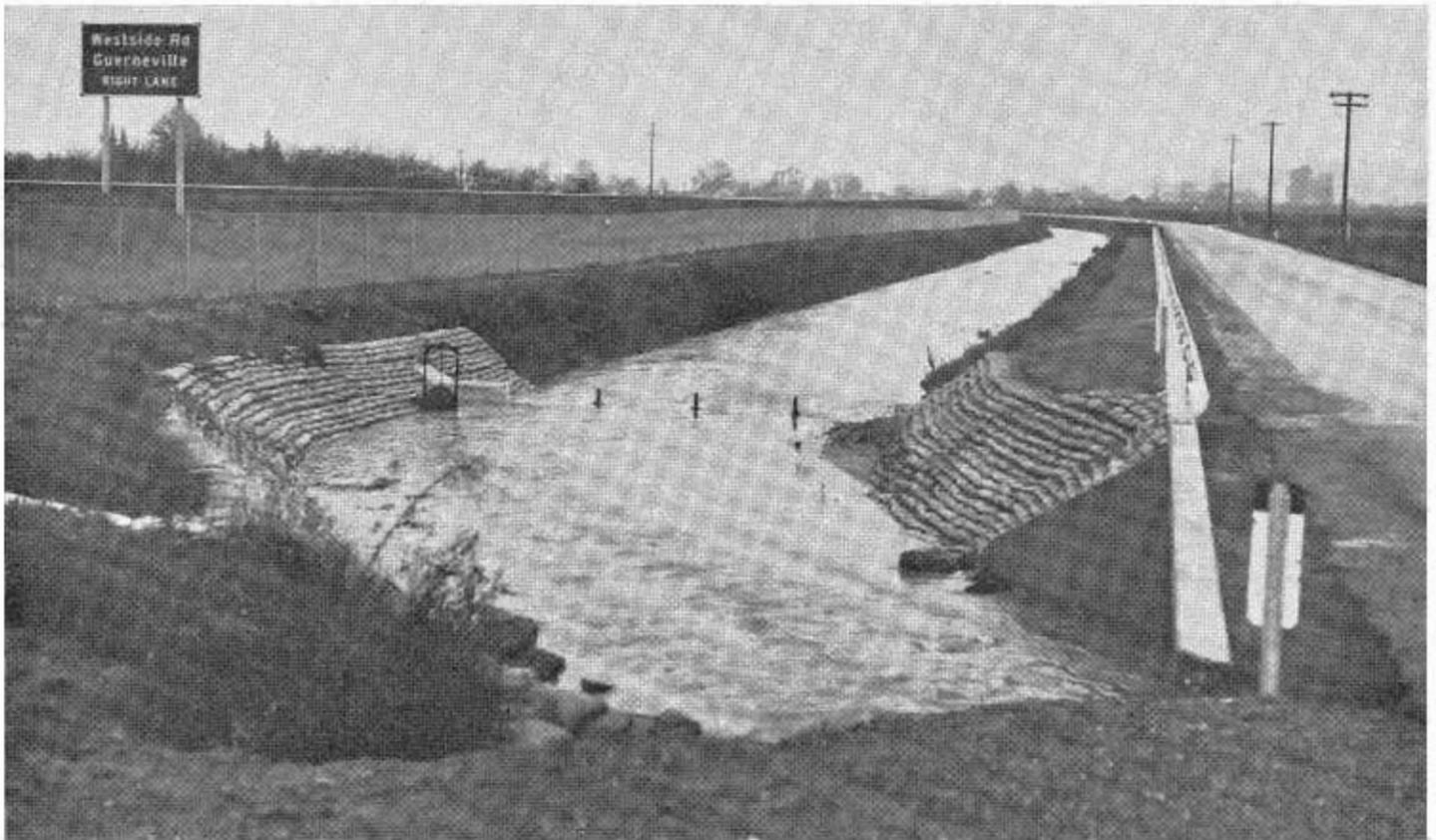
Commissioner. It developed that no improvements were then designed or contemplated for construction, but that it had been determined that the ultimate drainage system should retain the longitudinal ditch and that a single outfall channel should be developed approximately along the line of one of the two then existing outfall channels. Also, while no improvements were then contemplated, the need and justification for improvements were increasing as a result of continuing changes in land use from agricultural to residential.

The proposed expressway had a large requirement for imported borrow for fill material. Thus considerable channel excavation could be justified in conjunction with the proposed project since this would provide an economical source of fill material, provided the material produced would be usable. Accordingly, a materials survey as well as a topographic survey was then made of proposed channel sites.

In discussion with the County Engineer it was agreed that the longitudinal or collector channel and outfall channel should be designed to



Looking downstream at the outfall channel from the frontage road on the east side of Sign Route 29 in the Napa area.



Looking south at the beginning of the Norton Slough channel change. The freeway is shown (left) and the frontage road (right). The flow of water to the slough on the other side of the freeway is controlled by the 24-inch pipe partly visible above the water in the reinforced embankment to the left.

have capacity for a once in 15 year recurrence runoff with freeboard. Freeboard was provided for the 15 year runoff so that the channels would contain a once in 50 year recurrence runoff with a bank full stage. Design flows were estimated on the basis of the Rational Formula using a runoff coefficient of 45% which was considered to represent the area as it would be in its ultimate state of development. Trapezoidal sections were proposed with side slopes of $1\frac{1}{2} : 1$ and sections were proposed to be as broad as possible in order to facilitate construction.

Surveys Are Completed

During 1954, the surveys were completed and a drainage system was designed which included a longitudinal or collector channel, an outfall channel and a single culvert under the proposed highway. The culvert proposed was a double $12' \times 7' \times 140'$ R.C. Box and was designed to pass the once in 100 year runoff from the drainage area in its anticipated ultimate condition of development. The proposed

culvert was positioned directly downstream from an existing trestle under the railroad with total gross span of 45 feet. The proposed longitudinal collector channel was positioned to be adjacent to and west or upstream from the railroad. The design included a determination of channel excavation and highway fill quantities so that an economic study could be made of the proposal that channel excavation be used for proposed highway fill in lieu of pit produced material, the materials survey having demonstrated that the material produced from channel excavation would satisfy specifications for highway fill. Right of way requirements for all proposed channel work were also determined.

On December 14, 1954, at a meeting of the Board of Supervisors, the District presented the proposed design with the purpose of acquainting the county officials with the detail of the proposals. The Supervisors were informed that the Division of Highways could co-operate in the proposed project to the extent of benefits derived. The County was requested to deter-

mine whether or not the proposal was feasible from the standpoint of the County's ability to assume costs and other obligations which were in excess of those which the State could assume.

Drainage Zone Formed

The Board then instructed the County Engineer to proceed with necessary steps required to form a drainage zone for special assessment, to be known as Salvadore Zone. Costs and obligations which would accrue to the County would be borne in part by the proposed zone and in part by the Napa Flood Control and Water Conservation District as a whole. Costs of necessary hydraulic structures on County roads would be charged to a special fund which existed and was known as the Special Road Improvement Fund of the County of Napa.

Early in 1955, the proposed cooperative project was presented to Headquarters Office and in April of 1955 the District was authorized to enter an agreement with the County

... Continued on page 76

4-Level Interchange

New U.S. 101-395
Connection Is Under
Way in San Diego

By D. S. SHEPARD, Senior Highway Engineer



THERE is an age-old adage that "you can't have your cake and eat it." Also, there is the old saw that "there are exceptions to every rule." An apparent exception to this adage is the

four-level interchange construction project located in the southern section of Balboa Park in San Diego. For here is a project where various levels of government, federal, state and city, plus the private citizen, can have their cake and eat it too.

This is the result of close liaison between the State and the City, together with engineering aimed at preserving and enhancing the Park's existing beauty, whereby the public will gain a much-needed freeway and simultaneously acquire greater useful areas of park lands. By the filling and leveling of several canyons with more than a third of a million cubic yards of earth, more than 50 acres of usable land for recreation and parking areas, outside of the highway right of way, will be created.

Previous Use

Of the total park lands needed for the freeway development, 9.3 acres were previously devoted to existing roads, 14 acres were occupied for non-park uses such as the U.S. Naval Hospital and the San Diego Children's Home, and 4.4 acres were utilized for parking lots. There were 25.7 acres of steep slopes upon which landscaping will be vastly improved and 17 acres of flat- to moderately-sloped park lands.

In summary, 17 acres of usable park area will be replaced by 50 acres suitable for development to the highest and best park use.

Needless to say, the movement of substantial quantities of roadway excavation is entailed in this operation.

The moving of one million cubic yards of roadway excavation on a job not quite one-half-mile long is now nearing completion on the four-level interchange.

Of this quantity, one-half was moved across a four-lane freeway without a moment's delay to the traveling public. This was accomplished by making use of an existing overcrossing bridge. The terms of the contract permit hauling across the bridge with off-highway equipment, provided the equipment travels in a proper path with respect to the bridge girders. Under the contract, after hauling of excess dirt was completed, the bridge had to be demolished and removed.

Bridge is Used

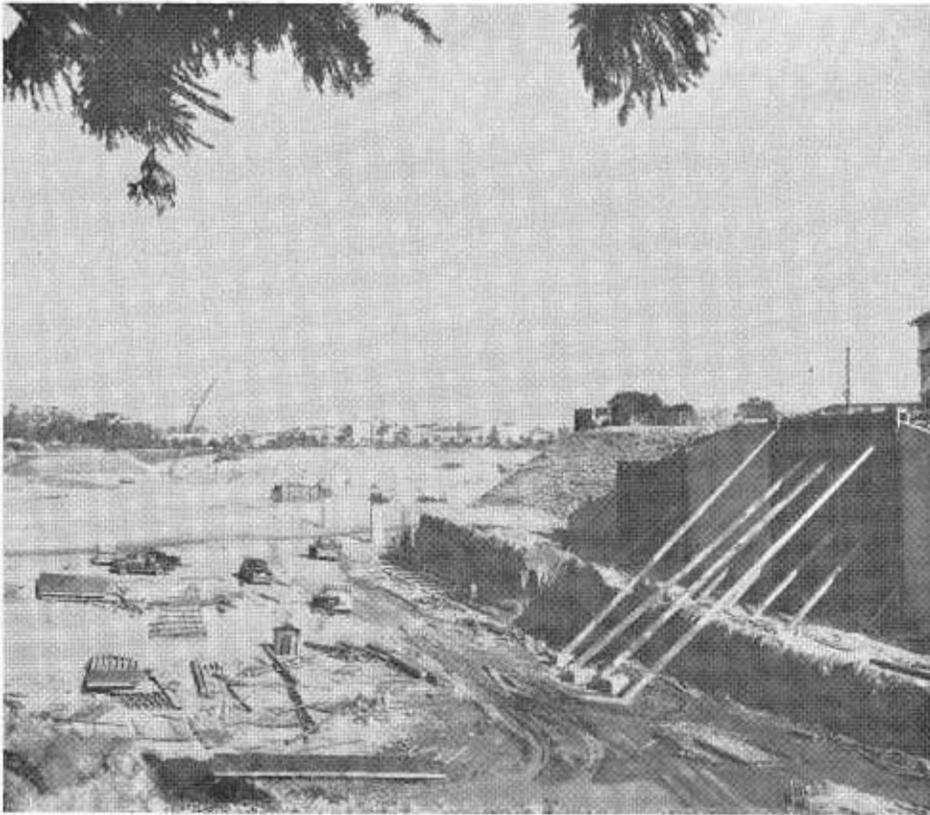
The advantage of hauling over this bridge became apparent to the con-

tractor (R. S. Hazard Contracting Co. and W. F. Maxwell) on the adjoining project, as he had to haul to a disposal site that was on the opposite side of the 4-level project from his work. Therefore an agreement was reached with the contractor on the 4-level job (Daley Corporation & R. M. Price Construction Co.) to use the same bridge. This agreement was of definite benefit to the public as it eliminated the trucking of an additional 150,000 cubic yards of material over city streets. The bridge shows no signs of distress although at times there were over 1,000 trips a day with loaded equipment (of up to 70 tons).

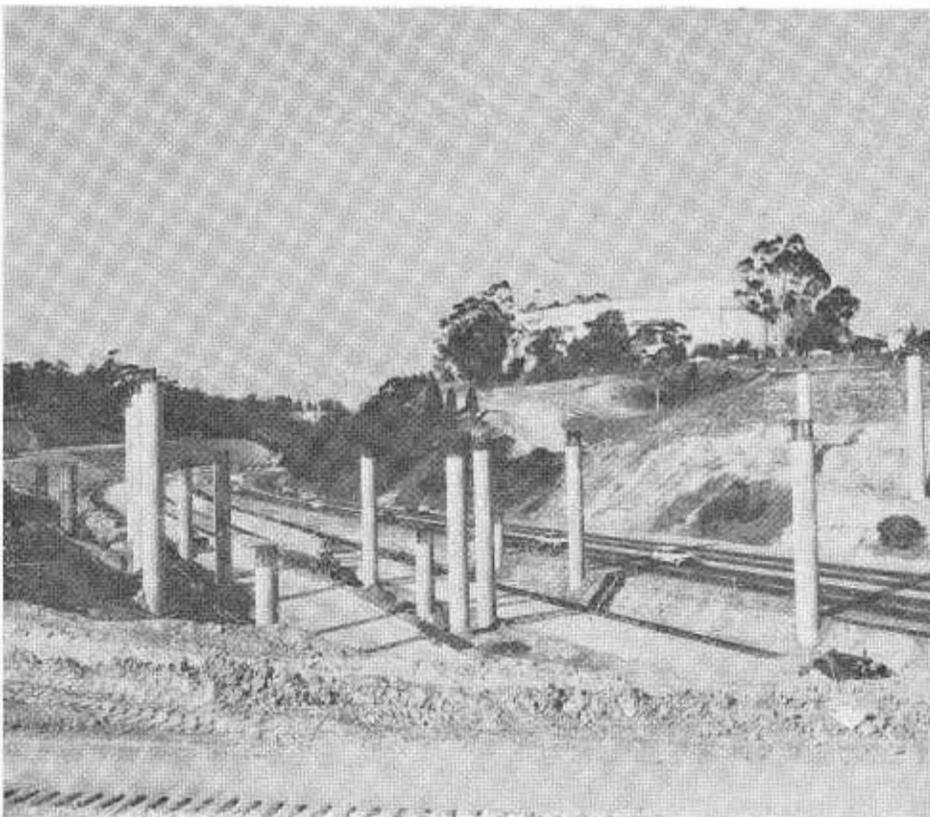
The Cabrillo Freeway traffic of 43,000 vehicles per day was handled by the construction of a detour that allowed the traffic to move without obstruction. This created a secondary



The four-level interchange under construction in San Diego showing the temporary haul bridge over the Cabrillo Freeway. The view is westward.



Looking east over the construction site of the four-level interchange in San Diego. Naval Hospital in background.



Interchange construction, looking southeast toward the Ford Building in Balboa Park.

problem when work was being done immediately adjacent to the traveled way. The regular freeway speed was too fast for safety, and normal 25 M.P.H. work zoning proved almost unenforceable. A permanent reduction was undesirable as the speed restriction was only needed during working hours. An intermittent-type control was adopted. Speed zone signs (40 MPH) were erected at each end of the project and lockable covers were provided. Thus, each work day the signs are locked open in the morning and locked closed at night. The local police department is much in favor of the system and the public seems to be accepting it.

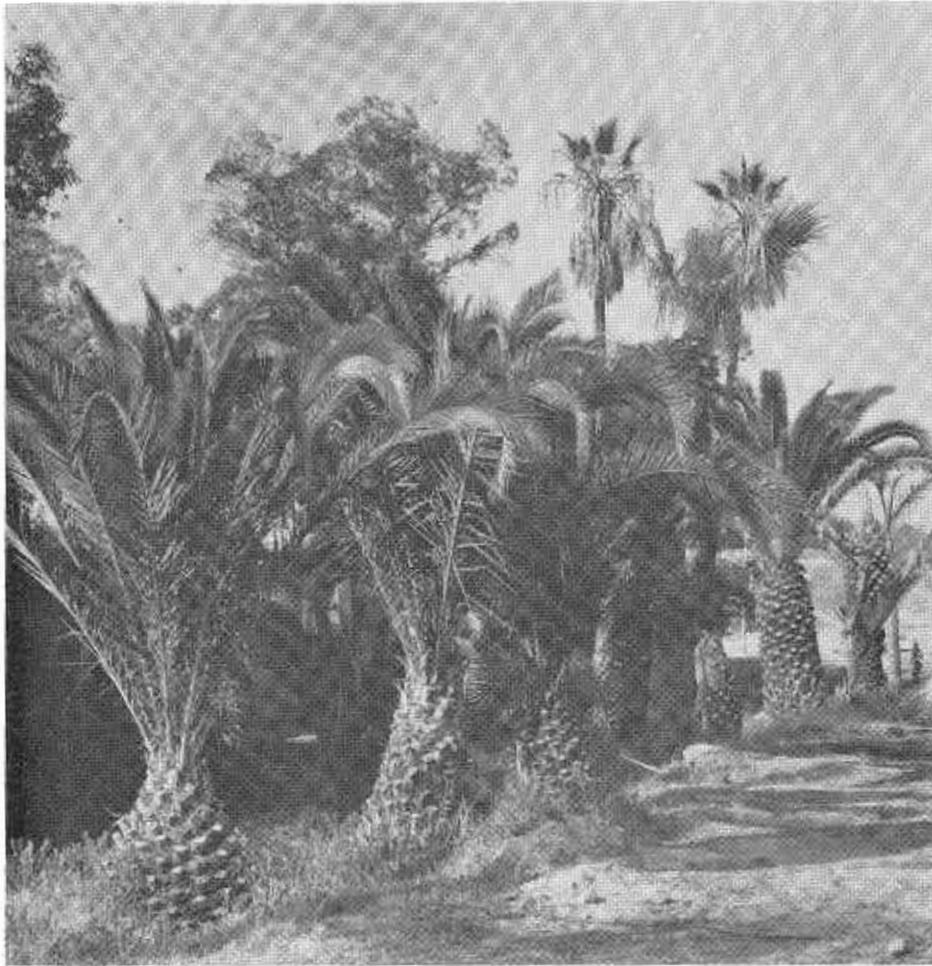
Columns Erected

At the present time the contract is over one-third completed with the earth work virtually finished. The way is now open for the bridge work; and the present sprinkling of columns is expected to change into a forest in the near future. Completion of the structures alone in the 4-level complex will require 18,000 cubic yards of concrete laced with more than 4 million pounds of reinforcing steel.

Included in this 18,000 cubic yards of concrete is 4,715 cubic yards of lightweight concrete. The use of lightweight concrete is relatively new to highway construction and is being used here to reduce the dead load on the top level of the four-level interchange. This reduction in dead load allows the use of smaller girders on this 70-foot-high bridge. It also produces a not-readily apparent savings in the construction costs.

This use of lightweight aggregates in the concrete of the upper portions of the one bridge reduced the load on its footings by more than 2,500 tons. By reducing the load on the footings, their size in turn could be reduced. This reduction of footing size obviously reduced the area of excavation needed. The fact that some of the footings were more than 20 feet below the ground surface indicates the savings of excavation involved.

Because the elevation of the top deck was controlled by the maximum permissible grades on the San Diego Freeway (U.S. 101), the real savings were in reducing the roadway excava-



Some of the palm trees salvaged during construction operations.

tion that would have been involved in lowering the level of U.S. 395 at the bottom to accommodate the necessary vertical clearances at all levels.

Storm Drains in Operation

The majority of the more than \$385,000 worth of storm drains are in and working, including one drain made up of 1852 feet of 84" reinforced concrete pipe, 1124 feet of 90" RCP, and 836 feet of 96" RCP. The base and paving portion are just beginning, with only two short sections of portland cement concrete pavement placed.

A landscaping project is scheduled to start immediately upon completion of the present highway contract, about mid-1962. This project will necessitate expenditures of more than a quarter of a million dollars and will be designed to blend with the existing Park plantings. The result will be a parkway terminated by the 4-level

structure itself as a frame for the entrance into downtown San Diego.

All of the slopes within the interchange area are being contour graded to facilitate the landscaping. Approximately 25 palm trees were salvaged during the clearing and grubbing operation for this project (see *California Highways* magazine for Sept.-Oct. 1960).

Completion of the interchange, together with its re-landscaping, will every day provide thousands of local and visiting motorists a refreshing view of nature's beauties as they travel through the area on either U.S. 101 or U.S. 395.

It may safely be prophesied that Cabrillo Freeway's claim to the "most beautiful freeway" title will be seriously threatened by the portion of the "San Diego Freeway" that borders beautiful Balboa Park along its south-erly side.

Double White Lines To Be Made Yellow

Almost all double white lines on California highways will be painted yellow within the coming year.

The change is part of a nationwide program to provide uniform highway markings conforming with the U.S. Bureau of Public Roads revised manual on traffic control devices.

The new federal manual eliminates the double white line as a permissible alternate to yellow lines for separating opposing traffic on multi-lane highways.

California has used the double white line for more than 20 years. The color will be changed on highways throughout the state as the present white lines need repainting due to weather and traffic wear.

Yellow lines will be used to designate no-passing zones where traffic is not separated by any physical barrier or else is separated only by raised traffic bars. Yellow lines will also be used to channel merging traffic and to mark railroad crossings.

School crosswalks and warning markings will continue to be marked in yellow, in accordance with State law.

Another revision of the federal manual calls for a change in California's green and white signs which are used to indicate service and rest areas and roadside businesses. In the future, such signs will be easily identified by their white reflectorized message set in a blue opaque background.

SIGN ROUTE 16

The State Division of Highways has opened bids to reconstruct 2.3 miles of State Sign Route 16 between 0.4 mile west of the junction with State Sign Route 104 and 1.4 miles southwest of Plymouth in Amador County, to provide the initial two lanes of a future four-lane expressway. Low bidder was Claude C. Wood Co., Lodi, \$328,924.

Projects on FAS County Roads are planned and in most cases constructed under the direct supervision of the county involved. They are financed out of federal allocations, state matching money and county funds when required.

Driver Training

Departmental Program Covers
Testing of 13,300 Employees

By B. A. SWITZER, Safety Engineer

ON DECEMBER 16, 1959, Governor Edmund G. Brown ordered into effect the recommendations of his Inter-Departmental Safety Advisory Committee whose report proposed an intensification of accident prevention by defensive driver training and further control methods.

The recommendations of the Governor's Accident Prevention Committee basically set up two proposals for improving the driving record of State employees: 1. Driver Training, and 2. Driver Review.

Driver Training was to be provided for all employees who even occasionally drove a State car. Training to be complete for present employees by June 30, 1961. The Driver Review was to be instigated and also operating by that time. Provision was to be made for training of new employees and retraining of old employees where review indicated such course was desirable.

Training Program

The program of Driver Training in the Department of Public Works requires that approximately 13,300 employees be provided with instruction, including lectures, testing, and road observation runs. The administration of this activity was assigned to the Safety Section in the Division of Highways.

The State Personnel Board, through the Safety Coordinator's Office, developed a manual and course for Driver Training considered adequate under the recommendations of the Advisory Committee. Selected employees were given training that was offered by the State Personnel Board under their program.

Due to the many different operations conditions under which the Department of Public Works is required to function, it was decided that a course should be developed that would be pointed toward their particular problems and responsibilities.

A Driver Training Manual was developed incorporating a part of the information developed by the Safety Coordinator's Office of the State Personnel Board and other information considered appropriate to our problems and conditions.

The lecture is designed to provide information to encourage drivers to develop in themselves an attitude of accident prevention based on defensive driving methods, rules, and regulations.

Best Safety Records

It has been found that drivers with physical limitations often have the best safety records. Investigation indicates that these people recognize and compensate for their deficiencies. In line with this broadly accepted knowledge of driver adaptability to their

limitations, psychophysical testing equipment was obtained to test and indicate to the employee if he has any physical or eye restrictions of which he should be conscious, and compensate for.

Peripheral vision is tested. (Safe driving requires a wide side vision.) Color blindness is checked. Visual acuity is determined. Also the ability of the driver to judge distances and clearances is determined by this special equipment.

An electric reaction timer is provided to determine and illustrate the time required to actually react to an outside stimulant. This is transferred into distance by appropriate tables.

Driver training in the Division also requires a road test or observation run. The employee drives over a pre-

Assistant Safety Engineer Ralph W. Zook Dies

Ralph W. Zook, Assistant Safety Engineer for the Division of Highways in Sacramento, died of a heart attack at Redding on February 15 where he had gone to conduct safe driver tests among Division employees.

Zook was in charge of the Division's driver training program for Central and Northern California. A large number of employees in the Department of Public Works had come to know him as the soft-spoken man who conducted them through their driving tests under the department-wide driver improvement program inaugurated last year.

He had been in safety work since 1954 when he moved to Sacramento from Bakersfield where he had been a Maintenance Superintendent. He joined the Division in 1941.



RALPH W. ZOOK

Zook was born in Gainsville, Arkansas where he went to grade school. He came to California in 1922 and attended high school in Glendale, later studying at Glendale College and Bakersfield Junior College.

From 1933 to 1941 he was employed on construction of the Los Angeles Aqueduct.

He was known to hundreds of boys and their parents in Sacramento where he was active in the training and managing of Little League and Babe Ruth League ball clubs. A fine chess player, he was acquainted with many leading players in the State.

He was a member of the Masons, the Scottish Rite, Elks and Sierra Club; and the American Society of Safety Engineers and the Public Relations Round Table of Sacramento.

He is survived by his wife, Anna May, a teacher; daughters, Mrs. Darrell Forney, and Cynthia; and son, Bill, all of Sacramento.

scribed course with an observer noting his driving habits and discussing with him those habits, both good and bad, that effect his driving and calling to his attention those habits which need to be changed to improve his driving.

Originally the program was developed for classes of approximately 30 employees which would be given the lecture, the psychophysical tests, and the road test. Later it was found desirable in Sacramento and District Headquarters to modify the program and give the lecture to large groups of 80 to 200 and call them back on a scheduled basis for the psychophysical testing and road observation run.

Every effort is made to obtain participation in the lecture portion by employees so as to answer questions and obtain a clear understanding on the part of all participants in the objectives of the program.

Assumes Certain Skills

The Driver Improvement Program does not attempt to teach employees to drive, it being assumed that they already are skilled in the standard driving techniques and possess a California drivers license. The purpose of the program is to develop defensive driving techniques and review and discuss the legal and moral responsibilities of an employee when driving a state-owned automobile.

A government survey of the six-year driving records of nearly 30,000 motorists indicated that 85% of the accidents are distributed among the vast majority of drivers—people like ourselves who have had occasional near-misses, or once in a lifetime, a serious accident. If all accident repeaters were removed from the highway, the study indicated, the total number of accidents would be reduced less than 4%. A study by the California Department of Motor Vehicles indicated that over one-half of the serious accidents involve drivers who haven't had an accident in the past 20 years.

Knowledge of traffic laws and regulations, manipulative skills and so-called psychophysical abilities do not indicate safe or unsafe drivers. In fact, an unsafe driver may excel in all of these functions. It becomes then a



Carroll T. Berry, Assistant Safety Engineer, talks to a group of Department of Public Works employees in Los Angeles taking the driver training course. The employees are also given driver reaction tests and taken out in a car to observe their driving habits.

matter of mental attitude and knowledge of modern defensive driver techniques as to whether a driver handles his car safely or not.

Drivers Are Surprise

Even experienced drivers are surprised when they discover how far their car travels while they are taking their foot off the accelerator and hitting the brake in an emergency stop. Accidents occasioned by following too closely are one of the serious problems in modern traffic conditions and one where the knowledge of distance travelled in the stopping time available is particularly important.

In our driver program, we use a motion picture called the "Smith Method of Defensive Driving." This picture stresses and illustrates the importance of the following five items:

1. Aim high in steering.
2. Get the big picture.
3. Keep your eyes moving.
4. Leave yourself an "out."
5. Make sure you are seen.

The objective of defensive driving is to protect your car and passengers from damage and injuries. A defen-

sive driver is defined as one who is careful to commit no driving errors himself, who makes allowances for the lack of skill or improper attitude on the part of others, and who does not allow hazards of weather and road conditions or the actions of pedestrians and other drivers to involve him in accidents.

He keeps continually on the alert, and recognizes an accident-producing situation far enough in advance to prevent a serious accident.

A defensive driver takes no unfair advantage of the mistakes of others. He is willing to take every safe driving precaution and, if necessary, help make up for the other driver's mistakes and discourtesies. He anticipates the actions of others and develops a mental attitude that every person, animal, or vehicle can be a potential hazard and might take an unexpected course of action. He endeavors at all times to maintain a cushion of protective space around his car.

Right of Way Problem

A defensive driver is conscious of the fact that the Vehicle Code does not give the right of way to anyone

at anytime, but merely provides that under certain conditions one driver must yield the right of way to another. A State driver should always relinquish the right of way rather than to continue on and try to force the other driver to yield, by the threat of collision.

The driver training program calls to the attention of each State employee that when he is driving a State car, he represents the entire State of California and anyone seeing the insignia on the side of the vehicle or the Diamond E license plates looks to such a motorist to be an exemplary driver and expects him to set an example of defensive and courteous driving.

State vehicles are not expected to be driven with obviously defective controls. If the brakes are defective, they should be corrected immediately. If there are other conditions unsatisfactory for the operation of the vehicle, it must be called to the attention of the proper person.

If Carbon Monoxide is found to be leaking into the car, the state driver is taught to take the following steps:

1. Pull vehicle over to the shoulder.
2. Stop the car.
3. Turn off the motor.
4. Set the brakes.
5. Finally open the windows.

If there is Carbon Monoxide, it is not unlikely that the driver will blackout when the fresh air hits him. That is the reason that the car should be stopped before the windows are opened.

Seat belts are provided in all State vehicles. State drivers, by executive order, are required to use them. Our files are filled with specific examples of seat belts preventing injury in case of accidents.

The Cornell studies on seat belts show that you are 60% less likely to have an injury and are 50% less likely to be killed if you are using seat belts when involved in an accident. The study also indicates that you are five times more likely to be killed if you are thrown out of your car than if you remain in the car and are held in place with a seat belt.

Driver Review

The California program of prevention of accidents to State-owned ve-

hicles involves a review of the Driver Records as well as the Driver Training Program. The Department of Motor Vehicles has found a direct correlation between the number of citations and the number of accidents in a driver's record. A number of citations can be regarded as an indication of a problem driver. Careful review of accident reports and conviction records with drivers is found to improve driving habits.

Our program now calls for all new employees to have a report from the California Department of Motor Vehicles (Form DLMU-122) covering their driving record before they are permitted to use a State car. This form is also obtained and reviewed when a driver obtains a citation from the California Highway Patrol for violations when in a State car.

The Division of Highways maintains a record of all motor vehicle accidents and the employee who is responsible. When an employee is found to have been involved in several accidents, his driving record is reviewed, and if necessary, the matter is called to the attention of his supervisor and the man is subject to counselling by a representative of the Division or even by a representative of the Department of Motor Vehicles.

Men Are Assigned

In order to obtain uniformity and continuity in the program in the Department of Public Works, three representatives, Ralph Zook, Frank Fournier, and Carroll Berry were assigned portions of the State and conferred with the Safety Supervisors and others conducting the Driver Training Program in their respective Districts.

So effective has been their handling of the situation that they and the District's representatives have frequently been called upon to speak to public gatherings and other Departments relative to the Driver Program.

As of January 1, the complete program had been given to approximately 10,000 Public Worker employees.

In the early phases of the program a questionnaire was passed out in one of the Districts where the program was underway to obtain suggestions for improvement of the presentation of the program. The principal comments

indicated desirability to use more motion pictures. We have, therefore, standardized on the film known as the "Smith System of Defensive Driving" distributed by the Ford Motor Company and a film on safety through "Seat Belts" produced by the Institute of Transportation and Traffic Engineers at the University of California at Los Angeles. Some variation in presentation of the program is permitted to the instructors to meet local conditions.

The driver training and improvement program is expected to further reduce the recordable accident record of the Division of Highways which has been lowered so far from a frequency of 1.38 per million vehicle miles in 1950 to 0.70 in 1960.

Santa Clara County Votes Road Program

On March 28, the voters of Santa Clara County approved a \$70,000,000, eight-year highway construction program, climaxing 4½ years of cooperative work and study. The program will be financed by 25-year general obligation bonds and is the first phase of an eventual \$225,000,000 long-range project to improve the County's highway system.

The completed system will consist of eight expressways—four-lane, divided high capacity highways on which access will be carefully limited and controlled. The entire network is designed to feed traffic to and from state routes as well as unite the various areas and cities of the county.

Those cities which will not have portions of the expressways within their boundaries will still receive at least 70 percent of the money raised by its citizens for other approved road construction, the allotment formula being based on assessed valuation.

Santa Clara County is the second fastest growing county in the state, being exceeded only by Orange County.

The county and city governments in 1957 joined with the state in financing a \$230,000 study of overall traffic needs.

J.H.D. No. 9

33-Year-Old Cooperative Program To Improve Sign Route 1 Concluded

On February 3, 1961, the directors of Joint Highway District No. 9, an organization which has spent almost 33 years developing the Cabrillo Highway along the coast of San Francisco, San Mateo and Santa Cruz Counties, held its final meeting in San Francisco.

At this meeting, which took place at the District Office of the Division of Highways, checks for \$244,600, the contribution from Joint Highway District No. 9 on the final project, were presented to the State. The Joint Highway District directors, representing the respective member counties, were Leo Halley, President (San Francisco); Mrs. Hulda McLean, Vice President (Santa Cruz); Alvin Hatch, Treasurer (San Mateo); and Errol V. Rosenthal, Secretary.

Receiving the check for the State was Director of Public Works Robert B. Bradford accompanied by T. F. Bagshaw, Assistant Director, and J. P. Sinclair, Assistant State Highway Engineer. Upon receiving a certificate of completion from Mr. Bradford, the directors adopted a resolution dissolving the District.

Joint Highway District No. 9 was created by the Boards of Supervisors of the three counties in 1928. The 1917 Joint Highway District Act of the California Legislature permitted organization of such districts throughout the state by two or more counties where the proposed highways were in the public interest, and set up procedures for contributing state funds to the projects. Other funds required were to be provided by the District from assessments on the member counties.

Resolution is Adopted

Proceedings for formation of the District were initiated by the Santa Cruz County Board of Supervisors by resolution adopted on May 7, 1927. The primary purpose of the District, construction of a two-lane highway connecting Santa Cruz and San Francisco along the coast, has now been accomplished.

The Ocean Shore Highway, originally decribed as "commencing within the County of San Cruz at a point of connection with a main public highway already existing and extending northerly as closely as practicable to the shoreline of the Pacific Ocean, through the County of San Mateo, and into the County of San Francisco, to a suitable point connecting with a main highway within said County," is now referred to as the Cabrillo Highway.

Subsequent to the organization of the District, the Legislature in 1933 designated the general route of the Ocean Shore Highway as State Highway Route 56. As a consequence, most of the construction was performed under State controls with the Joint Highway District contributing toward the financing.

The District Board of Directors estimated the cost of constructing the highway to be \$5,300,000 at the time the District was created, and proposed that the cost be apportioned between the three counties to derive the major benefit from the construction of the highway. The assessments ratio recently in effect provides apportionment of the cost as follows:

San Francisco County	55%
San Mateo County	31½%
Santa Cruz County	13½%

Collections of this assessment from the three member counties since the time of the district formation, to and including the final assessment for the period ending June 30, 1961, total \$3,883,000 (San Francisco \$2,135,400, San Mateo \$1,223,900 and Santa Cruz \$523,700).



A simple bookkeeping transaction marked the successful completion of a 33-year cooperative project to construct and modernize 68 miles of State Sign Route 1 between San Francisco and Santa Cruz. Supervisor James Leo Halley of San Francisco (center), president of the Board of Directors of Joint Highway District No. 9, is shown handing the district's final payment for its share of the work to State Director of Public Works Robert B. Bradford. The other two members of the board are Mrs. Hulda McLean, vice-president, Santa Cruz County supervisor; and Alvin Hatch, treasurer, San Mateo County supervisor. At right is Errol V. Rosenthal of San Francisco, secretary.

Relief Funds Used

In addition to the contributions from the three member counties, approximately \$300,000 in Federal Emergency Relief Funds and the allocation of state highway funds enabled the completion of the highway at a cost of near \$12,000,000, excluding maintenance and minor improvement expense. Expenditures for construction totaled \$9,200,000; for rights of way \$2,080,000; for preliminary engineering \$730,000.

The first project was completed in 1935—1.4 miles between Skyline Boulevard and Junipero Serra Boulevard at Daly City, and 3.6 miles southerly along the coast to Edgemar in 1935 and 1936—financed entirely from state highway funds at a cost of about \$144,000 each.

Subsequent projects were financed jointly by the District and State, with the exception of a one-mile section of highway just south of Davenport and several minor drainage and repaving projects, financed by the State.

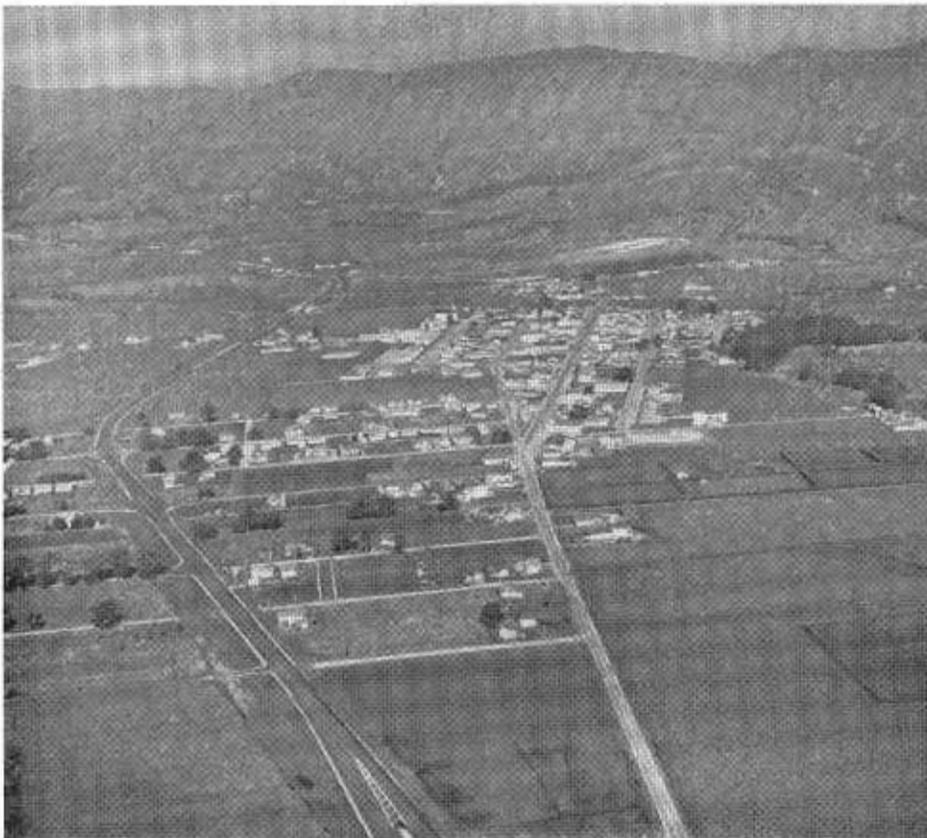
The last Joint Highway District project between New Years Creek and Whitehouse Creek in San Mateo County, was completed in December, 1960. This 2.1 mile project was financed by \$244,600 from the District and \$200,000 from state highway funds.

A total of 28 contracts have been completed in the development of the Ocean Shore Highway (now known variously as the Coast Highway, State Sign Route 1, and the Cabrillo Highway) for a distance of 68.1 miles, 50.3 miles in San Mateo County and 17.8 miles in Santa Cruz County.

U.S. 66 RELOCATION

The California Highway Commission has adopted a freeway routing for the relocation of 3.1 miles of U.S. Highway 66 in San Bernardino County east of Needles.

The adopted route begins 3.1 miles west of the Colorado River and extends to the river opposite Topock, Arizona. It is on a more direct line than the present highway, which makes a loop to the north.



The Half Moon Bay Bypass (left) looking north from the junction with the original Coast Highway south of Half Moon Bay.



Construction between Whitehouse and New Years Creek on Sign Route 1, the final project to receive a contribution from Joint Highway District No. 9.

Los Laureles Grade

New Road Saves
Time, Distance

By BRUCE W. McCLAIN, Road Commissioner, Monterey County

BEFORE reconstruction of the Los Laureles Grade Road, most commuters travelling to or from Carmel Valley shunned the slow hazardous trail encountered on the "Grade" and drove a greater distance of 17 miles by way of Monterey from "The Village" to Salinas. The new Los Laureles Grade Road (Federal Aid Secondary Route

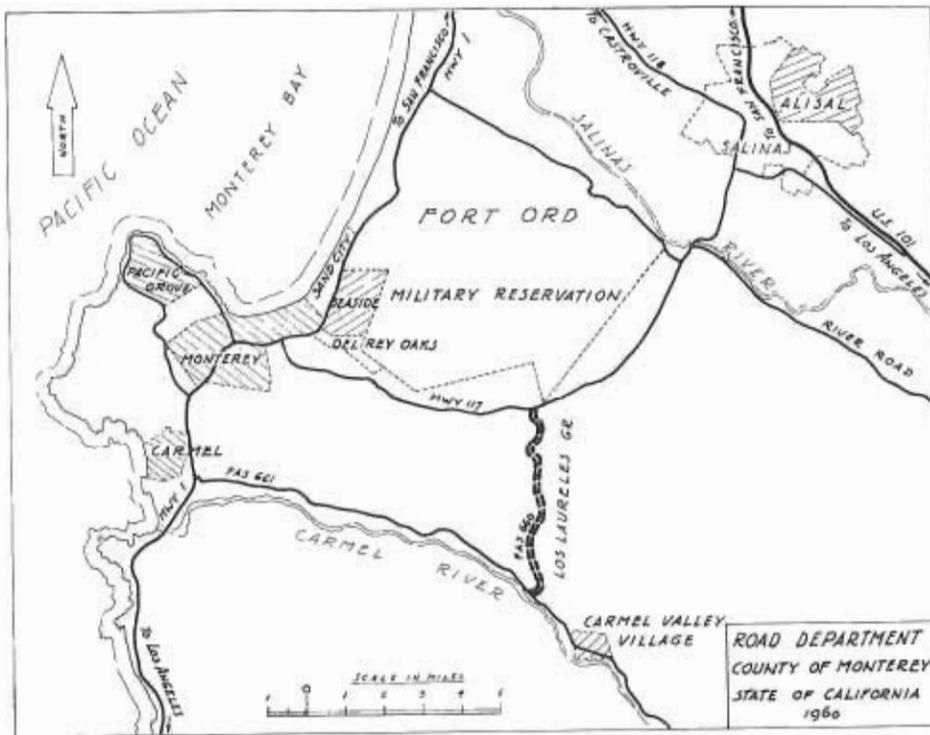
No. 660), now provides not only a savings in time and distance for the daily commuter, but also a scenic view of much of the lower Salinas Valley from the Ridge summits. It extends from the Monterey-Salinas Highway (State Route No. 117), on the north to the Carmel Valley Road (Federal Aid Secondary Route No. 661), on

the south—a distance of 6 miles; and provides a direct link over the Sierra de Salinas ridge of the Santa Lucia Range between Carmel Valley and the greater Salinas Valley.

The old Laureles Trail predated the turn of the century and the prevalence of the automobile by many years. As a horse and buggy way, it doubtless sat-



The Los Laureles Grade project, located east of Carmel and Monterey was constructed under the Federal Aid Secondary highway program and replaced a curving mountain road (sections visible in the center of the above photo) with a modern, two-lane highway. The old road has been renamed Toro Road. The view is south.



A map showing the location of the Los Laureles Grade project (double dotted lines) described in the article.

ified all criteria and standards of its day. But time and progress have a relentless way of changing things and notions. Even the superior of its day, in time, sloughs in to obsolescence, and a secure and commonplace routine then becomes, with the modes of tomorrow, a tortuous adventure. And so it was with "the old Grade"; it had many curves proven safe only at speeds of less than 10 miles per hour, and sight distances of just about total blindness. The 14 to 16 foot wide road surface consisted of oil on native soil. Maintenance costs were excessive due to the absence of imported base

material and to the lack of adequate drainage.

Conditions Corrected

In the reconstruction of the road these substandard conditions were corrected to meet minimum design standards for rural County highways as adopted by the County Engineers Association of California.

The Los Laureles Grade relocation project was laid out and designed by the Monterey County Road Department from aerial contour maps produced by stereoscopic interpretation of aerial photography using triangulated ground control points. The aerial

survey was carried out in February, 1955, and the completed maps were delivered to the County the following April. The Road Department made no preliminary ground survey for this project. It was the first Monterey County Highway project to be laid out and designed completely from aerial contour maps.

The relocated Los Laureles Grade was built in four FAS projects, since available funds were limited. Each project was laid out so that construction began and ended on the then existing old road; in this way each section became an independent construction unit, and the entire length of any of the first three segments could be utilized singly or collectively. Traffic counts were made after each section was completed as a check for the expected increase in daily traffic as reconstruction and realignment progressed. This provided the warrant for the next segment in the overall program.

Joint Supervision

Construction of the new Laureles was under the joint supervision of engineers of the State Division of Highways and the County of Monterey, and was spread over a period of 4½ years. Construction on the first project was started November 27, 1955, and the last section was completed April 14, 1960.

The first two projects of the program involved grading and temporary surfacing of 5¼ miles of the roadway. The roadbed was built to a width varying from 36 feet to 44 feet with two 12-foot traffic lanes. Minimum allowable curve radius was 250 feet



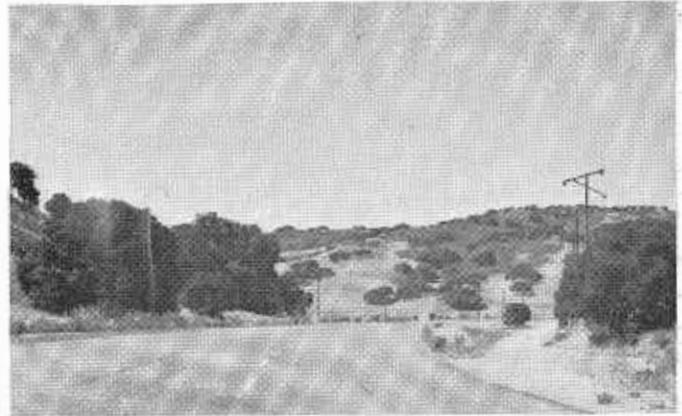
BEFORE. A section of the Los Laureles Grade road taken in 1956.



AFTER. The same section following completion of the project.



BEFORE. This photo, also taken in 1956, shows another section of the old road.



AFTER. The same section taken shortly after it was reconstructed.

and maximum grade was limited to 10 percent.

Project 1 construction involved 2¼ miles of new road extending from a point 0.7 mile north of the Carmel Valley Road to the summit of the old Los Laureles Grade. Project 2 construction extended the first from the old summit through to a new summit to State Route 117 on the Salinas Valley end. The new alignment increased the summit elevation by approximately 90 feet. To eliminate the need for excessive grading, the new road was aligned to follow the ridge top, dividing the Carmel River drainage basin from that of the Salinas River, for 0.6 mile before descending on sweeping curves to join the old Los Laureles Grade just north of its junction with Robley Road. The new alignment shortened the length of the road in the first and second sections by approximately ¾ of a mile. The increase in elevation between the old and the new summit, and the shortening of the road produced a maximum grade steeper than that of the old road. The increase in grade, however, is not critical since there are no ice conditions and heavy trucking seldom uses this route.

Sections Are Paved

Project 3 construction involved paving parts of the 1st and 2nd projects with 2 inches of plant mix surfacing after 6" of imported base material was first placed over portions of the previously sealcoated surface. The last 0.4 mile of road south of Route 117 has not been paved since the coarse seal surface of this section appears to be holding up well. The total length

of the 3rd project was approximately 4 miles.

The 4th project consisted of the following: Constructing a new road with plant mix surfacing on imported base material for the first 0.85 mile north of the Carmel Valley Road; re-aligning the first 0.15 mile of the 1st section to eliminate three short curves of sharp radii; and paving 0.65 mile of the existing roadway built under the first project construction.

The Los Laureles Grade project was made possible, in part, by anti-recession funds in the Federal-Aid Highway Act of 1958 and by normal Federal aid to Secondary Road Systems, California State Matching Funds and Monterey County Funds, as follows:

COST BREAKDOWN

	Project 1	Project 2	Project 3	Project 4	Total
FAS	\$106,500	\$139,600	\$132,713	\$77,712	\$456,525
State	48,373	96,406	12,836	55,488	213,103
County*	41,299	16,950	60,260	21,942	140,451

Totals \$196,172 \$253,016 \$205,809 \$155,142 \$810,139

* Includes preliminary and construction engineering costs.

Warrant for the Los Laureles Grade was clearly indicated from the immediate jump in daily traffic after completion of the first stage of the new road. In 1955 the average daily traffic on the Salinas side of the grade was 200 cars per day. After completion of the first project of the program, a Monterey County traffic survey made in July of 1956 indicated that traffic had increased to 580 cars per day. In May, 1960, just after completion of the last project, a traffic count of 980 cars per day was evidenced. It is expected from statistics of the past 4 years of population increases in Carmel Valley and the experienced in-

crease in traffic over Los Laureles Grade, that an anticipated population of 20,000 in the Valley by 1980 may well generate a daily traffic which will approach 5,000 cars per day.

The County of Monterey, its Board of Supervisors, the Road Commissioner and his staff commended W. S. Dolliver, former city and Cooperative Projects Engineer for the Division of Highways in San Luis Obispo, for his untiring efforts in implementing the project which led to its ultimate approval, financing and final construction. Dolliver retired last June after 33 years as an engineer with the State.

S.M.-Hayward Bridge Mole Job Is Awarded

The State Department of Public Works has awarded a contract for construction of a mole fill at the eastern approach to the San Mateo-Hayward Bridge, to Piombo Construction Company, San Carlos, \$642,820.

The fill, which will project about 0.2 mile into the waters of San Francisco Bay, will be the future location of the toll plaza for the bridge. The toll plaza is now located on the San Mateo side, but will be relocated to the Hayward side in connection with the proposed widening of the bridge from two lanes to four.

The California Highway Commission at its March meeting approved five projects on Federal Aid Secondary County Roads with a total estimated cost of \$1,055,000.

I.T.T.E.

Continued from page 39 . . .

works; Ben T. Ostergren, of the American Road Builders Association, Washington, D. C.; and Arnold H. Carver, chief communications engineer for the Division of Highways.

Richard H. Ward, Redding city engineer; George Webb, traffic engineer for the Division of Highways; Gerald Skiles, Los Angeles senior traffic engineer; Dan Finch of the ITTE; John W. McDonald and G. P. Parmelee of the Automobile Club of Southern California; Robert W. Graver, of the California State Automobile Association; Richard Bartle of Stone and Youngberg, San Francisco; and Joseph B. Hughes, Madera County road commissioner.

California Hosts Civil Defense Meet

The public works aspects of civil defense will be the subject of a five-state seminar to be held in Sacramento May 9, 10, and 11, it was announced by State Director of Public Works Robert B. Bradford.

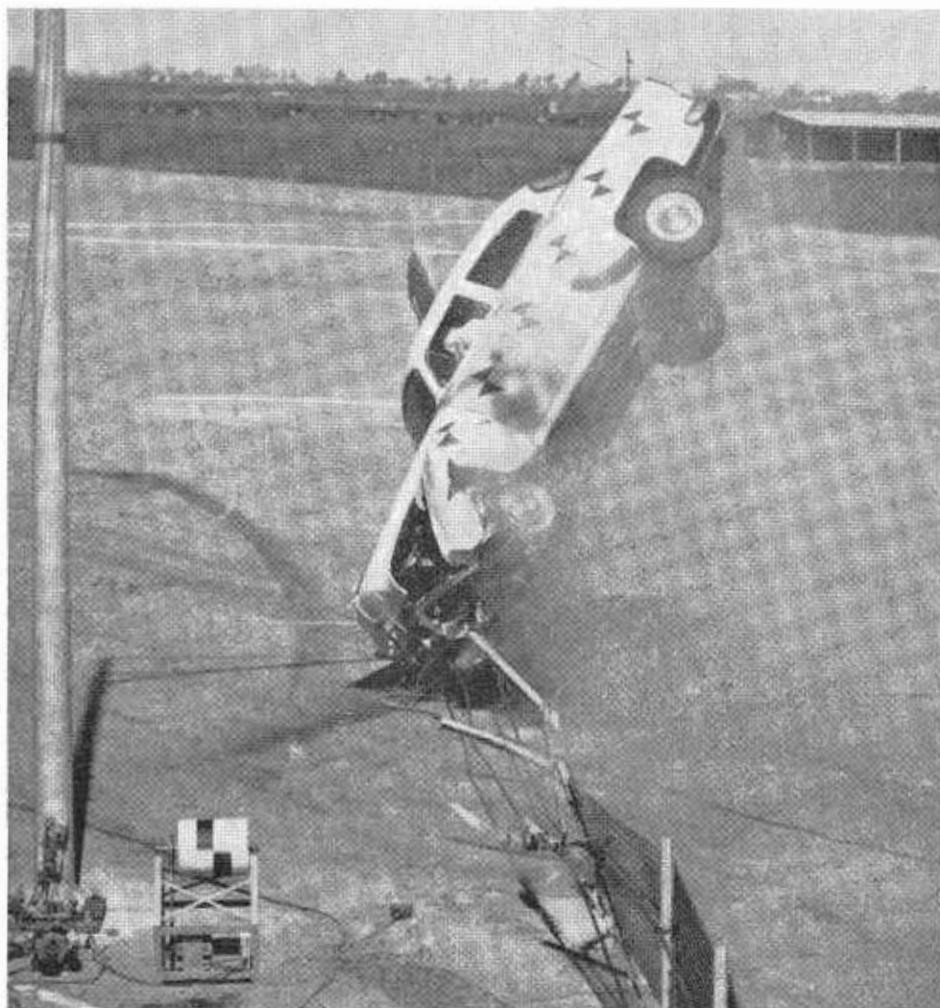
Bradford said that Governor Edmund G. Brown had agreed to have California act as host state for the seminar, in accordance with a request from the Office of Civil Defense Mobilization.

The first of four such seminars to be held this year throughout the United States, the California seminar will be attended by governmental officials and other specialists from Arizona, California, Hawaii, Nevada, and Utah.

Representatives will be present from the Office of Civil and Defense Mobilization, Bureau of Public Roads, and the Army Corps of Engineers. Business, labor, and the general contracting industry also will be represented.

Problems to be discussed are the organization and administration of federal, state and local public works services during an emergency; how to provide for demolition, shoring, and debris clearance; how to temporarily restore community facilities and services, and how to decontaminate essential resources and areas.

LAB PHOTO WINS PRIZE AT PHILADELPHIA EXHIBIT



The above crash test photo was taken by Robert M. Souza of the Materials and Research Department to illustrate why it is necessary to isolate anchorages used for chain link barrier fences. It was awarded second prize in the black and white "technique" section at the American Society for Testing Materials Biennial Photographic Exhibit held in Philadelphia. The photo was taken by Souza with a Hulcher 70 mm sequence camera from the top of a 30-foot aluminum tower. Souza suffered minor injuries during a previous test when the tower was knocked over by a runaway bus.

U.O.P. Holds 4th Annual Highway Conference

The Fourth Annual Highway Conference at the University of the Pacific was held March 7-9 in Stockton.

Speakers at the luncheon sessions on the UOP campus were Dr. Robert E. Burns, university president; Ellis Armstrong, president of the Better Highways Information Foundation; and Dexter D. MacBride, assistant chief

right of way agent for the Division of Highways.

Sixteen papers were presented, followed by group discussions, covering various technical problems and research projects. A panel discussion on city and county road financing was also featured.

A reinforced concrete bridge will be constructed over the Bear River on Federal Aid Secondary County

Road 922 (Pleasant Grove Road) about four miles northeast of Rio Oso in Sutter County.

Bridge Costs

1960 Survey Shows
Continued Decline

By H. K. MAUZY, Senior Bridge Engineer and
W. J. YUSAVAGE, Associate Research Technician

THE DOWNWARD trend of bridge construction costs which began in the summer of 1957 continued on through 1960. During this period the Bridge Department Construction Cost Index shows average annual index values of 283, 267, 260, and 248 for the years 1957 through 1960. When translated to percentage terms, the decreasing index values imply successive annual reductions in construction costs of 5.7%, 2.6% and 4.6%; an overall reduction for the three year period of 12.3%. The general pattern of bidding during the final quarter of 1960, however, suggests that bridge construction costs have completed the cycle which began with the low point in the recession year 1954 and which then moved rapidly upward with annual increments of 4.1%, 16.2%, and 6.8% for the years 1955, 1956, and 1957 respectively. In all probability costs will again move upward in 1960.

The level of cost for successive periods is presented graphically in the accompanying chart which summarizes the course of California bridge construction costs since 1934.

Construction Activity

One hundred forty-three contracts with a total value of \$127,862,803 for bridge work only were awarded during 1960. This value is about twice that of the previous record which had been established in 1958 when contracts with a total value of \$65.1 million were awarded. The large increase in the number of awards for 1960 is largely attributable to the release of Interstate Funds for a number of large projects which had been deferred in 1959 due to the curtailment of those funds. The largest group of deferred projects were those for completing the portion of the Santa Monica Freeway in Los Angeles from 8th Street to Oak Street, with a total value for bridge work of \$21.4 million.

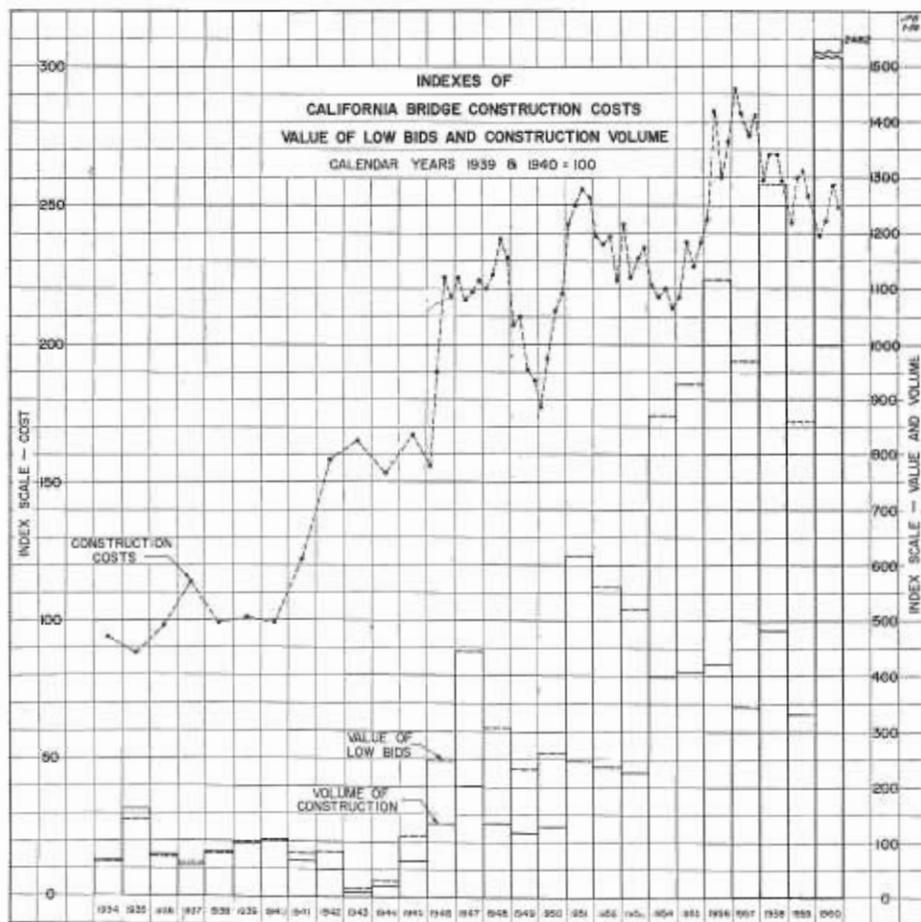
Bidder Activity

The intense bidding activity which was so prevalent during 1959 extended into the first quarter of 1960 but then began to weaken as, presumably, the work loads carried by the contracting organizations increased to a profitable level. Consequently the average number of bidders per project dropped from the average of 8.8 per project during 1959 to 7.3 during 1960. Moreover it was noted that the heavier bidding during 1960 generally favored those projects with values less than \$500,000, an indication that the smaller contractors were still looking for work. During the final quarter of 1960 the average number of bidders per

project dropped off slightly to 6.9. Bidding during the first month of 1961 is down still further, to 4 and 5 bidders per project. The trend for 1961 therefore points to a year of relaxed competition and, consequently, to the probability of increased construction costs.

Average Unit Prices

Unit prices for various bridge items were relatively unchanged from those of 1959. The unit bids received for the items included in the large and highly desirable projects, such as those for the Santa Monica Freeway and the Yolo Causeway, exerted a strong depressing effect upon the average unit



costs of the major items of construction. Unit bids for items included in the more modest contracts were generally similar to those of the preceding year.

Class A portland cement concrete (bridge) cost an average of \$50.62 during 1960, down \$1.28 from the average of \$52.00 per cubic yard during 1959. The relatively small reduction was, however, associated with a contracted quantity of 1,036,000 cubic yards of concrete so that the savings realized on this one item were in excess of \$1,000,000.

Structural steel (plate girder). There has been little change in the cost of this item since 1958. The average prices for the three years, 1958, 1959 and 1960, are \$0.164, \$0.163, and \$0.169 per pound. There seems to be a slight tendency for the price of this item to move upward.

Bar reinforcing steel. The most dramatic change over the past three years has occurred in the price of this item. The average unit costs during 1958 and 1959 were \$0.124 and \$0.113 per pound. During 1960 the price dropped to \$0.097 per pound. The reduction in the unit cost of this item was especially significant during 1960; for during this year the Bridge Department contracted for 262,536,000 pounds of reinforcing bars. At the reduced price the savings for the item are in excess of \$4,000,000.

New Technique

Prestressed concrete. This relatively new construction technique is applied in a variety of forms to bridge design. Some of the more common applications are in the form of "I" girders, "T" girders, inverted "T" girders, channels, and slabs. Rarer now but steadily increasing is the precast-prestressed box girder and the cast-in-place post-tensioned box girder. In terms of dollar value, the Bridge Department contracted for \$4,406,000 of the prestressed type of construction during 1960, a value which represents 3.45% of the total outlay.

The summary unit cost of prestressed concrete has been developed in terms of the cost of a composite

cubic yard of prestressed concrete in place. The cost therefore includes the cost of the concrete, reinforcing bars, stress steel, anchorages, prestressing operations, as well as erection costs.

The average cost per composite cubic yard of prestressed concrete for the years 1955 to 1960 inclusive has been \$135.27, \$163.03, \$164.48, \$144.74, \$134.92, and \$138.97 for the six successive years respectively. The net reduction in the cost of the item for the three year period since 1957 is 15.9%, a reduction which is 3.6% greater than the overall reduction in costs during the same period. This evidence points to the fact that the prestressing industry is continuing to increase its competitive position among the various materials used for construction.

Summary

As a result of the carry over into 1960 of the large number of projects which had been deferred during 1959, the bridge construction program attained a record valuation of \$127,862,803. Comprising this valuation were 143 contracts which call for the construction of 531 structures, including such monumental structures as the Santa Monica Viaduct, the Yolo Causeway, the Caldecott Tunnel, and the Hazelview Tunnel.

Along with the record valuation there occurred another drop in construction costs, a drop which is calculated as 4.6% below the level of 1959. On the basis of the total contract valuation of \$127.8 million, about \$5.8 million in real savings accrued to the bridge construction program during 1960.

Toward the close of the year, however, it became increasingly evident that the construction organizations began to lose a part of the enthusiasm which characterized their bidding for projects during 1959 and the early part of 1960; the average number of bidders per project began to fall off and the prices for various items of work began to increase. It is very likely now that the bottom of the cycle has been reached and that prices will increase. However, since the bridge construction program is expected to stabilize at an annual value of \$100,000,000, competition for fu-

Automatic Counters Save \$300,000 Yearly

California's vehicle traffic counts, conducted by the Division of Highways, will go "automatic" this year at an estimated savings to taxpayers of close to \$300,000 annually.

New electronic and mechanical equipment will be used to take the regular and special counts which for the past 37 years have been made almost entirely on a manual basis. The traffic count data help indicate which parts of the California State Highway System are adequate and which should be augmented or replaced.

The new machines will be paid for out of the first year's savings in wages previously expended for the two-day annual July statewide traffic counts. After the first year of mechanical traffic counting the cost of the operation will be reduced from \$650,000 to an estimated \$360,000 annually.

As many as 6,000 "once a year" employees have been hired in the past to count traffic on a Sunday and Monday in mid-July in order to help establish the average daily traffic on the state highway system.

These employees were required to count the number of vehicles and to indicate how many were automobiles, automobiles with trailers, buses, pickups, and freight vehicles by number of axles.

A close examination of these data accumulated over the past 37 years has enabled highway engineers to closely estimate the proportion of certain types of vehicles to be found in a total traffic figure for a particular area. With only a total count figure now necessary in most cases, relatively simple machines can do the counting which was formerly done by "once a year" employees.

1.5 miles of State Sign Route 1 will be converted from expressway to full freeway standards between Soquel Wharf Road and Soquel Avenue in and near Capitola, Santa Cruz County.

ture projects will probably be sufficiently aggressive to ward off the possibility of any major increases in construction costs.

HIGHWAYS EMPLOYEE WINS ENGINEERING DOCTORATE

Albert Edward Simmons, Assistant District Engineer, District IV, has been awarded the degree of Doctor of Engineering, thus becoming the first man in the Division of Highways so honored by the University of California since the inception of this doctorate.



ALBERT E. SIMMONS

The honor was conferred at the culmination of several years of graduate study and research on Simmons' part at the Institute of Transportation and Traffic Engineering. His doctoral dissertation was "Visibility Under Highway Lighting Conditions." This research resulted in a mathematical analysis of visual assessment and the objective determination of relative visibility, permitting the establishment of visibility criteria for highway lighting.

Lighting Meter Developed

From this research Simmons has designed and developed a highway lighting visibility meter that provides an objective appraisal of visibility, referenced to a standardized objective contrast.

A native of Fresno, California, Simmons attended Fresno State College for two years before enrolling at UC, where he received his B.S. degree in engineering in 1931. He received a Master of Engineering degree from the University of California in 1952.

Simmons first worked for the Division of Highways during the summer while attending Fresno State College. From June 1928 until September 1929 he worked in Districts I and VI before enrolling at UC, where he spent the summer of 1930 on a District III project.

Returns to District

Upon graduating from UC, he returned to District III, working for a time as Construction Inspector. In 1932, Simmons moved to District IX, where he became Chief Draftsman before leaving in 1937 to accept a pro-

RECENT RETIREMENTS FROM DEPARTMENT ANNOUNCED

Headquarters Office

Frank C. Balfour, Chief Right of Way Agent, 30 years; Rex H. Fulton, Senior Highway Engineer, 30 years.

District I

Ignatius F. Cramer, Highway Chief Clerk I, 39 years; John H. Kennedy, Assistant Highway Engineer, 37 years; George M. Prindle, Highway Equipment Operator-Laborer, 8 years; Clarence H. Sackett, Highway Superintendent, 34 years.

District III

John R. Benson, Highway Leadingman, 34 years; Howard O. Brushwood, Laborer, 21 years; Lewis A. Hawks, Highway Foreman, 28 years.

District IV

Sebastian A. Urzi, Highway Leadingman, 29 years.

District V

Charles L. Bunce, Assistant Highway Engineer, 29 years; Ralph J. Harrington, Highway Foreman, 34 years; Hugh Lyons, Highway Leadingman, 29 years; Melville Thomas Rhodes, Highway Engineering Technician I, 14 years.

District VI

Frank B. England, Highway Engineering Associate, 31 years; Henry H. Rickels, Highway Leadingman, 26 years.

District VII

Carrie S. Neff, Senior Stenographer Clerk, 27 years; Oscar P. Puterbaugh,

motion as Assistant Highway Engineer in District IV.

He became District Traffic Engineer in 1948 and Assistant District Engineer, Design, in 1950. Since then he has been responsible for the design of many urban and metropolitan freeways in the San Francisco Bay area.

He is a registered civil and electrical engineer and is accredited in Who's Who in Engineering.

A member of ASCE, ITE and APWA, he has also been honored by membership in Sigma XI, XI Epsilon.

Simmons lives in Berkeley, with his wife Dorothy and daughter Jane Ann.

Highway Equipment Operator-Laborer, 23 years; Robert W. Vanstan, Senior Highway Engineer, 37 years.

District VIII

Loren S. Moore, Senior Highway Engineer, 22 years.

District XI

Joseph Malter, Laborer, 16 years.

Bridge Department

Charles L. Caldwell, Assistant Bridge Engineer, 26 years; Charles W. Jones, Supervising Bridge Engineer, 41 years.

Shop 7

Albion R. Albright, Highway Equipment Mechanic, 17 years; William H. Davies, Machinist, 27 years; Gene Skipworth, Blacksmith, 38 years.

Department Awards \$6 Million Contract

The State Department of Public Works has awarded a \$6,114,848.90 contract to B. J. Ukropina, T. P. Polich, Steve Kral & John R. Ukropina, San Gabriel, for grading and paving 2.9 miles of eight-lane freeway on the Ventura Freeway between the Hollywood Freeway and Buena Vista Street at Burbank in Los Angeles County.

Fourteen traffic separation bridges and one pedestrian crossing structure are included in the project.

This project, together with a 2.2 mile freeway project to the east, will complete the extension of the Ventura Freeway from the junction with the Hollywood Freeway to the Golden State Freeway.

UNDERSECRETARY NAMED

Clarence D. Martin, Jr., of Santa Monica, is the new Undersecretary of Commerce for Transportation. He was appointed by President Kennedy in January. Martin is a Harvard graduate, and the son of former Governor Martin of Washington. He operated an automobile agency in Santa Monica and was active in civic affairs.

FLOOD PROBLEMS

Continued from page 60 . . .

of Napa. The District and the County then proceeded to study the project in complete detail and eventually in July 1956, a co-operative agreement was executed by State and County.

Since completion, this drainage system has undergone at least one severe operational test. During the heavy storms of 1958, which caused widespread flooding throughout the State, the system operated satisfactorily and all flows were contained within the banks of the collector and outfall channels. The State Highway and properties served by the new system were well protected and experienced none of the flooding evident in previous years.

HEALDSBURG CO-OPERATIVE DRAINAGE PROJECT

By H. S. NG,

Highway Engineering Associate

Under Contract 60-4TC36F the construction of the 4.4 mile section of Healdsburg Bypass on U. S. 101 began on September 1959. This new alignment of the freeway is located west of the City of Healdsburg and traverses a valley which is the flood plain of Dry Creek. This valley is covered by prune orchards and scattered residences and generally drains toward Norton Slough and West Slough, as shown on the map.

Historically this low area has been subjected to flooding from two sources: occasional overflow from Dry Creek on the west and frequent local overflow from Norton Slough and West Slough.

In the design of the drainage system for this area, it was found that with the proposed freeway embankment, while it would alleviate the flooding problem in a portion of Healdsburg, would reduce the flooding area on the west, with a resultant higher flood stage during the flooding period on that side of the freeway. Two alternate plans were studied to determine means of alleviating this condition:

Plan No. 1

To construct 1.3 miles of channel change with 30' bottom width section between the west frontage road and

the freeway as diversion of Norton Slough and to intercept overflow from Dry Creek.

Plan No. 2

To place sufficient cross-drain structures under the freeway embankment as equalizers.

Officials from Sonoma County, the City of Healdsburg and interested private property owners were invited to discuss these proposals. As the result of many discussions between the State and local agencies, Plan No. 1 was adopted.

In a co-operative agreement with the Sonoma County Flood Control and Water Conservation District, the State obtained the necessary right of way and constructed the channel change with the County being responsible for the future maintenance of the channel.

To insure efficient operation of the new channel change, improvement of 0.9 mile of the West Slough outfall channel between the freeway and Magnolia Drive was also included in the co-operative agreement. For this portion the County obtained the necessary right of way with the State doing the construction work.

Approximately 168,000 cubic yards of excavated material from both the channel change and the outfall channel improvement were used as roadway embankment and expensive cross drainage structures were eliminated. Construction cost of this drainage system was estimated to be no greater than the other alternate drainage plan under consideration and effected some savings in roadway embankment.

Shortly after the channel work was completed, Dry Creek overflowed (February 6, 1960) after a few days of heavy rainfall. As anticipated, the new channel performed satisfactorily and only minor local flooding occurred. From observation of its performance and confirmation of expected construction savings, it is evident that this channel change is well justified.

This is the first of a two-part article on drainage and flood problems in the District IV area. The second part will appear in the next issue of the magazine.

State Fatality Toll Nears All-time High

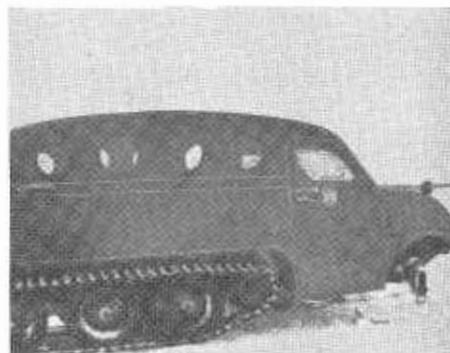
California's 1960 traffic fatality toll rose to within 81 of the all-time mark, final figures by the California Highway Patrol have revealed.

Patrol Commissioner Bradford M. Crittenden said the official tally was 3723. The highest year on record was 1956, when 3804 died in motor vehicle accidents.

"The figure is dismal even when it is known that the rate of fatalities per 100 million miles of vehicular travel held steady at 5.3, the same as 1959," the commissioner said.

"The 3723 figure means that slightly over 10 persons per day met violent death on our state's highways and streets. Many of these deaths were the result of mistakes or carelessness, momentary lapses which were the signal for tragedy to step in. Others resulted from willful violations of the traffic laws in which the guilty driver deliberately ignored the potential consequences of his action.

"No matter what your job or profession, remember that when you are behind the wheel, driving is your occupation. It requires total attention. There can be no distractions. Driving is too serious to be considered a game or avocation. It is a business. Make it a good business by applying the techniques of safe driving," he concluded.



The above photo, sent by Charles Herrick of Norway House, Manitoba, Canada, shows a type of vehicle used in his area over frozen lakes and rivers in winter. "We have no highways here," writes Herrick, "and must use boats during navigation season. Thought the photo might be of some interest to your readers." The insignia on the snowmobile door is that of the Manitoba Provincial Game Branch.

'TEMPUS FUGIT' CORNER

The following items appeared in the March-April, 1936, issue of *California Highways and Public Works*.

A SEVERE WINTER

Not since the state inaugurated snow removal operations on the Donner summit route over the Sierra Nevada (1931) has the Division of Highways been called upon to combat such storm conditions as it encountered in that area last month.

A total of 161 inches of snow fell on the Donner Summit route during 24 days in February. The highway was closed to all traffic for only 34 hours during the entire month due to poor visibility, drifting or snow slides on four separate occasions.

CHICKEN FEED

The State has only \$15,469,891 from gas tax and motor vehicle fees for major highway construction during the current biennial period.

KISMET

For several years, officials have been perplexed at the attitude of calm acceptance with which the motorists have taken accidents. * * * There is considerable volume of evidence to show that only a small percentage of accidents are due either to physical condition of the roads or to the mechanical condition of the vehicles. * * * Traffic accident study reveals major highway casualty factors are bad driving, high night speeds, and pace differential between trucks and autos.

Commission Votes L.A. Freeway Funds

The California Highway Commission has allocated \$1,250,000 for freeway structures and approaches on sections of the future San Diego Freeway route between Clark Avenue and Lakewood Boulevard in Long Beach. The project will include construction of the Willow Street Undercrossing and pumping plant, and the Clark Avenue Undercrossing, as well as the relocation and improvement of the Bouton Creek channel.

IN MEMORIAM

District II

Hugh D. Fields, Highway Equipment Operator-Laborer.

District III

Willard V. Small, Highway Leadingman.

District IV

Oliver J. Welsh, Senior Account Clerk.

District VII

Victor Nandino, Assistant Highway Foreman.

Harry R. Welch, Associate Right of Way Agent.

District IX

Charles T. Kispert, Highway Foreman.

District X

Ruben Laxson, Janitor Foreman I.

State-Owned Toll Bridges

Seldon F. Del Giorgio, Toll Captain.

Ellis L. Armstrong Becomes BHIF Chief

Ellis L. Armstrong, U.S. Commissioner of Public Roads since October, 1958, left his Federal post to become president of the Better Highways Information Foundation on January 24.

The B.H.I.F. was organized in 1960 under sponsorship of the highway construction industry. Its objective is "to develop public understanding of the need for and the benefits from long-range soundly financed programs for highway system development in the United States."

Armstrong visited California in March, including speaking engagements in Los Angeles, Stockton, Berkeley and Sacramento.

Of 1977 fatal accidents investigated by the California Highway Patrol in 1960, 1111 were in the one-car category. The implication is obvious. In the majority of last year's fatal accidents, the driver of the involved car had only himself to blame.

Federal Aid Head Rod Reynolds Leaves

Rodney F. Reynolds, assistant office engineer for the California Division of Highways, has retired after 42 years of continuous service with the state highway agency.

Since 1930, Reynolds has headed the highway division's Federal Aid Section, which is concerned with the necessary federal approval of plans, and cooperative state-federal financing for projects on California highways included in the various federal road systems.



R. F. REYNOLDS

When Reynolds was placed in charge of this section 31 years ago, the annual federal expenditure for highway work in California was approximately \$4,180,000.

This yearly total has increased steadily since then, as a result of accelerated highway programs nationally, combined with California's spectacular population and motor vehicle gains. In the current fiscal year, a total of \$218,484,000 in federal funds will be spent for highway improvements in this state.

Reynold's career with the Division of Highways began in 1919, when he was engaged in location surveys in Northern California, including work along the lower Trinity River and in the Feather River Canyon.

From 1923 to 1930 he was assigned to maintenance and construction operations on highways in the northern part of the state.

Reynolds was born in San Francisco April 19, 1899. He attended schools in Alameda. He is a member of the Knights of Columbus, U. S. Coast Guard Auxiliary, and the National Audubon Society, and a charter member of the California Employees Association.

He and his wife, Verna, live at 5311 Pleasant Drive, Sacramento. They have one daughter, Mrs. James Mercer Glynn of Chicago, and two grandchildren.

Circular Letters

New Management Section
Streamlines Procedures

By ALFRED S. ROXBURGH, Senior Administrative Analyst, and
GEORGE F. ANDERSON, Associate Administrative Analyst

PICTURE to yourself approximately 20,000 letters on your desk making a stack 10 feet high, all of which you must read.

This was the task before the staff of the Management Analysis Section in cooperation with each originating office at headquarters when the State Highway Engineer in April 1958, authorized a program for coordinating and improving the Division's circular letter system.

The circular letter system has always been a vital means of communication and management in the Division of Highways. The circulars transmit announcements, instructions, procedures, and policies from management to all district engineers and department heads.

The need for communication and management was a task which faced California's first Highway Commission and the first State Highway Engineer, A. B. Fletcher, as they began the task of developing a unified system of state highways in California in 1911.

The text of the oldest circular letter contained in the file, dated February 20, 1912, from State Highway Engineer A. B. Fletcher to "The Several Division Engineers of the California Highway Commission" is given below.

CALIFORNIA HIGHWAY COMMISSION

Gentlemen:

In several of the expense accounts the transportation charges on goods were included in the various schedules of the furniture, equipment, etc., which materials were to have been delivered at the office without further expense to the Commission. The amounts of these charges will, of course, have to be deducted from the bills of the firms supplying the materials. Please send me a statement at once of all transportation charges which you have paid on materials included in any of these schedules, or of typewriters or any other materials which were supposed to have been delivered without further cost.

As far as possible, avoid paying these charges in the future. Where the payment is necessary in order to obtain the goods,

notify this office at once lest the bill for the goods be paid before your expense account arrives.

As the years passed and the state highway organization grew to meet the needs of the state so grew the communication problem. The task assigned to the Division's Management Analysis Section was to streamline this primary system of communication in order that the Division could more effectively carry out its task of building and maintaining a road system to meet California's tremendous road problems.

The authorization for a full study of the circular letter system was a result of a preliminary study initiated in 1956, by the Advisory Committee on Management Controls. That study was to review the possibility of improving the circular letter system for the Division of Highways.

The analysis of circular letters included a detail screening early in 1957 of all circulars issued during 1954, 1955, and 1956 to identify and list about 370 active circulars out of over 900 circulars issued during these years. The cooperation of all departments, and particularly of the Office Engineer, who made available his circular letter file, made this phase of the study possible. Part of the task of analyzing the accumulation of circular letters was completed and a procedure for screening was tested.

While the cooperation of all departments was essential, Management Analysis served as the focal point for carrying out the succeeding recommendations of the report.

The staff continued the process of screening circulars, applying it to earlier periods and publishing lists until all circulars now in effect have been identified and listed. After the first screening the General Files collection of circulars was used as a basis for this screening, rather than the Office Engineer's collection, because the for-

mer was filed chronologically which proved to be more convenient for the screening.

Lists already prepared for 1954, 1955, and 1956 Division circulars which were still in effect, were updated.

Indexes of active circular letters covering the years 1953-1958 were published in January 1959 and in April 1959 an index covering all active circulars during 1947-1952 was published. These lists were distributed to all departments and districts.

Standards and controls were established to facilitate the system. These include:

Use of a distinctive heading which clearly identifies circulars. Included in the heading is an expiration date in order to permit automatic removal from active files. The specific expiration date is either a date five years from the issue date, or when appropriate, an earlier date. It is planned that if after five years, circular letter material has not been included in a manual and is still in effect, it should be reissued as a new Division circular.

Assigning of consecutive numbers for each calendar year as an over-all control and an aid in chronological filing.

General subject classifications were assigned, using the name of the originating unit in headquarters, as an aid in subject filing and reference, for example, Construction, Office Engineer, Right of Way, etc.

Separate consecutive numbers for each general subject classification are assigned as a further control and an aid in subject filing and reference.

Reference to all previous directives which are affected by a new circular are contained in the new circular.

The system also stresses avoiding "patchwork" modification of previous circulars, where successive directives change parts of earlier directives

which in turn amend still earlier directives. In general, a new circular is issued and the earlier ones replaced entirely after one or two amendments or if the amendments makes fairly extensive or complex changes.

When new or revised manuals are published, departments originating the manual are responsible for determining the effect on circular letters and specifically rescinding all Division circular letters incorporated in or replaced by the manual.

The system also distinguishes between division-wide circular letters and the directives addressed only to headquarters staff. A separate system of Headquarters Office Instructions was established.

Under the general responsibility assigned the Assistant State Highway Engineer, Administration, the Management Analysis staff has now completed the installation and launching of the circular letter system with the issuance of a master circular letter index for all active circular letters up through 1959. Each year this index will be updated and reissued.

With the assistance of those concerned the staff believes the system has improved the accessibility of the Division policy and procedure information throughout the organization, as well as to make it easier and faster to locate the standing instructions by which operations are to be guided. The future review and revision of instructions to meet changing conditions will also be facilitated.

C.H.C. Considers Westside Routing

The California Highway Commission has taken under consideration the adoption of a freeway routing for 32.2 miles of the Westside Freeway (State Highway Route 238) in San Joaquin and Sacramento Counties between Benjamin Holt Drive at the north city limit of Stockton and 0.8 mile south of Freeport.

The Westside Freeway will extend along the west side of the San Joaquin Valley northward from Wheeler Ridge in Kern County and through

DRIVER REACTION TESTED BY SIMULATOR DEVICE



This is a view of one of the driving simulators demonstrated to engineers and scientists attending the National Conference on Driving Simulation held February 27 to March 1 in Santa Monica. Driver reaction to highway features is tested by projecting a motion picture of the roadway onto a curved screen in front of the vehicle. A synchronized rear view of the road visible in a rear view mirror adds to the effect of realism. Pretesting of driver behavior by such a device could be of considerable aid to highway designers and planners in predicting reaction to various types of signs, lighting and other roadway conditions.

25-YEAR AWARDS GIVEN 18 EMPLOYEES

Headquarters Office

Veronica Mansfield

District I

Ruth H. Nielson
William V. Ferrill
Herman W. Deltorchio

District II

Russell Beckwith

District III

Gilbert Mulcahy
Leonard G. Humphreys

District V

Wendell W. Ray
S. A. Tingdahl

District VI

Lawrence T. Savaria

District VII

William M. Deamer
Clovis E. Hedrick
Lawrence W. Larson
Bosilka Russell

District VIII

Laurence A. Brown

District X

Willis E. Henderson

State-Owned Toll Bridges

Glenn F. Davis

Materials and Research

Thomas S. Cameron

Sacramento and Yolo Counties to Woodland. The route has been adopted from Wheeler Ridge through Stockton and in Yolo County from the Sacramento River to Woodland.

Plans of the Division of Highways call for the construction of a six-lane freeway at a cost of approximately \$28,700,000, including rights of way. Start of construction would depend on the availability of future highway funds. The route is on the National System of Interstate and Defense Highways.

STATE OF CALIFORNIA

EDMUND G. BROWN, Governor

DEPARTMENT OF PUBLIC WORKS

PUBLIC WORKS BUILDING — 1120 N STREET, SACRAMENTO

ROBERT B. BRADFORD, Director

FRANK A. CHAMBERS, Chief Deputy Director
 RUSSELL J. COONEY, Deputy Director (Management)
 HARRY D. FREEMAN, Deputy Director (Planning)
 I. F. BAGSHAW, Assistant Director
 JOHN H. STANFORD, Assistant Director
 S. ALAN WHITE, Departmental Personnel Officer

DIVISION OF HIGHWAYS

J. C. WOMACK, State Highway Engineer, Chief of Division

Right-of-Way

RUDOLF HESS, Chief Right-of-Way Agent

DEXTER D. MACBRIDE, Assistant Chief

E. M. MACDONALD, Assistant Chief

R. S. J. PIANEZZI, Assistant Chief

JACQUES T. ZEMMAN, Assistant Chief

District IV

J. P. SINCLAIR, Assistant State Highway Engineer

District VII

E. T. TELFORD, Assistant State Highway Engineer

District Engineers

SAM HELWER, District I, Eureka

H. S. MILES, District II, Redding

ALAN S. HART, District III, Marysville

L. A. WEYMOUTH, District IV, San Francisco

R. A. HAYLER, District IV, San Francisco

A. M. NASH, District V, San Luis Obispo

W. L. WELCH, District VI, Fresno

A. L. HIMELHOCH, District VII, Los Angeles

GEORGE A. HILL, District VII, Los Angeles

C. V. KANE, District VIII, San Bernardino

E. R. FOLEY, District IX, Bishop

JOHN G. MEYER, District X, Stockton

J. DEKEMA, District XI, San Diego

HOWARD C. WOOD, District XII, San Diego

State-owned Toll Bridges

CHAS. E. WAITE, Deputy State Highway Engineer

J. P. MURPHY, Deputy State Highway Engineer

J. W. TRASK, Deputy State Highway Engineer

J. A. LEGARRA, Assistant State Highway Engineer

LYMAN R. GILLIS, Assistant State Highway Engineer

J. E. McMAHON, Assistant State Highway Engineer

E. R. HIGGINS, Comptroller

FRANK E. BAXTER, Maintenance Engineer

L. L. FUNK, Planning Engineer

MILTON HARRIS, Construction Engineer

F. N. HVEEM, Materials and Research Engineer

H. B. LA FORGE, Engineer of Federal Secondary Roads

SCOTT H. LATHROP, Personnel and Public Information

H. C. MCCARTY, Office Engineer

E. J. L. PETERSON, Program and Budget Engineer

F. M. REYNOLDS, Planning Survey Engineer

EARL E. SORENSON, Equipment Engineer

W. L. WARREN, Engineer of Design

G. M. WEBB, Traffic Engineer

M. H. WEST, Engineer of City and Co-operative Projects

A. L. ELLIOTT, Bridge Engineer—Planning

L. C. HOLLISTER, Bridge Engineer—Special Projects

I. O. JAHSTRON, Bridge Engineer—Operations

DALE DOWNING, Bridge Engineer—Southern Area

DIVISION OF CONTRACTS AND RIGHTS-OF-WAY (LEGAL)

GEORGE C. HADLEY, Assistant Chief

ROBERT E. REED, Chief Counsel

HARRY S. FENTON, Assistant Chief

DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

NORMAN C. RAAB, Chief of Division

BEN BALALA, Principal Bridge Engineer

DIVISION OF ARCHITECTURE

ANSON BOYD, State Architect, Chief of Division

HUBERT S. HUNTER, Deputy Chief, Administrative

ADMINISTRATIVE SERVICE

W. R. VICK, Principal Architect—Project Management

IAN LEE WATSON, Supervisor of Project Coordination

THOMAS CHINN, Supervisor of Scheduling and Control

HENRY R. CROWLE, Administrative Service Officer

I. I. LEVINE, Accounting Officer

JAMES T. RANSDELL, Contract Administrator

W. F. PARKS, Supervisor of Office Services

JUSTIN DUCRAY, Division Management Analyst

FRANK B. DURKEE, JR., Information Officer

Los Angeles Office

T. LEWANDOWSKI, Supervisor of Project Management

ALAN A. HIMMAH, Administrative Service Officer

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M. A. EWING, Area II, Sacramento

ERNEST MAAG, Area III, Los Angeles

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J. WILLIAM COOK, Area II, Sacramento

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C. W. RHODES, Principal Mechanical Engineer

LEONARD CHERNOFF, Supervising Electrical Engineer

ROBERT J. PALLEN, Supervising Estimator

R. J. CHEESMAN, Chief Architectural Draftsman

H. C. JACKSON, Supervising Specification Writer

ARCHITECTURE AND ENGINEERING SERVICE



THEN

In 1930 Sepulveda Boulevard in Sawtelle was a quiet, tree-lined street. Every minute or so a car would drive by. Sometimes there was a little congestion at the intersection with Wilshire or Santa Monica Boulevard, but Sepulveda in its role as a north-south connection between the towns of the western Los Angeles area was not called upon to handle much of a traffic load.

The photo below, taken 30 years later than the one above, shows approximately the same section of street, looking south toward the Santa Monica Boulevard intersection. The pepper trees have been trimmed, curbs installed, and the street striped for four lanes. Despite these improvements, Sepulveda (then State Sign Route 7) became completely inadequate to handle the constantly increasing traffic load. State Sign Route 7 today may be seen in the right side of the photo below. It has become the eight-lane San Diego Freeway (Interstate 405), carrying 65,000 cars daily.

NOW



