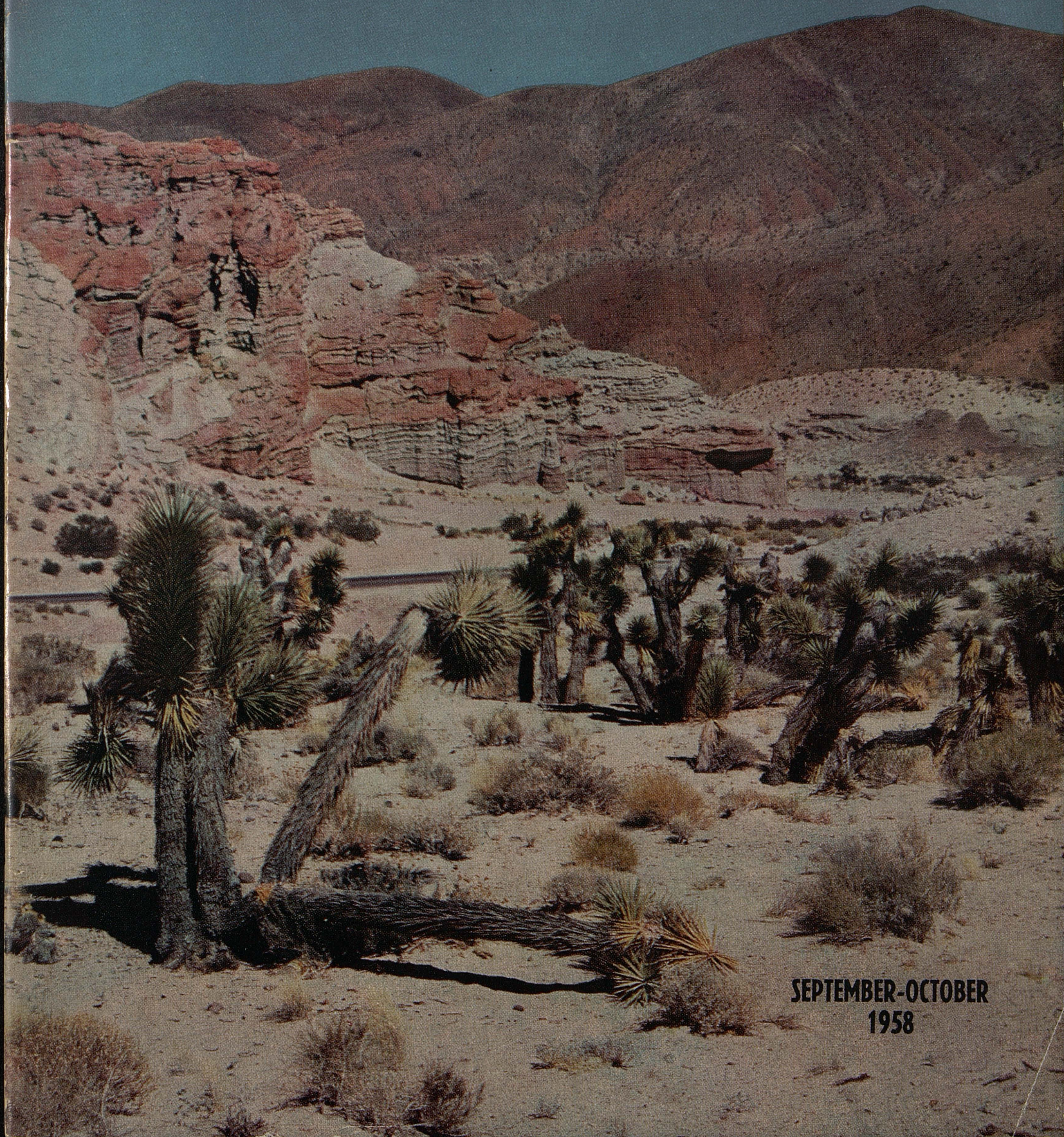


CALIFORNIA

HIGHWAYS AND PUBLIC WORKS



SEPTEMBER-OCTOBER
1958

D50 Illuminant, 2 degree observer

Inches

1	39.12	65.43	49.87	44.26	55.56	70.82	53.51	39.92	52.24	97.06	97.24	87.14	72.06	67.05
2	15.67	18.72	-22.29	22.85	-24.49	-0.35	59.80	-46.07	18.51	1.13	0.23	0.21	0.43	0.28
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														

Density

Golden Thread

1	18.10	47	18.00	19	8.26	3.44	31.41	72.46	23.97	54.91	43.96	62.74	52.79	50.87
2	0.15	0.15	0.54	0.05	-0.81	-0.23	20.98	-24.45	16.83	13.06	-39.91	52.00	3.45	50.88
3	0.01	-0.04	0.80	0.73	0.19	0.49	-19.43	55.93	68.89	-49.49	30.77	30.01	81.28	-12.72
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														

Centimeters

Don Williams

California Highways and Public Works

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

RICHARD WINN, *Editor*
HELEN HALSTED, *Assistant Editor*
STEWART MITCHELL, *Assistant Editor*
MERRITT R. NICKERSON, *Chief Photographer*

Vol. 37

September-October

Nos. 9-10



FRONT COVER

The colorful walls of Red Rock Canyon rise above a foreground of cactus and sand along a section of U. S. Highway 6 in eastern Kern County.

—Photo by William R. Chaney



BACK COVER

This bridge over the Bixby Creek gorge on Sign Route 1 in Monterey County has long been a photographers' favorite. Built in 1932, the span rises 260 feet above the creek where it enters the Pacific Ocean.

—Photo by Robert A. Munroe

Table of Contents on Page 2

Published in the interest of highway development in California. Editors are invited to use information contained herein and to request prints of any black and white photographs.

Address communications to

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

P. O. Box 1499

SACRAMENTO, CALIFORNIA

SCR 26

Report on State's Freeway Needs Submitted to Joint Interim Committee

A MASTER PLAN on the grand scale for a California freeway system to be developed over the next two decades was submitted to the Legislature by the Department of Public Works, Division of Highways, on September 2, 1958.

The plan for "the California Freeway System" was prepared in compliance with Senate Concurrent Resolution No. 26 of the 1957 Legislature.

The first proposal of its kind and scope ever developed by any state highway organization, the freeway system envisaged in the study was described by Director of Public Works C. M. Gilliss in his presentation of it to the legislative Joint Interim Committee on Highway Problems as "such a monumental proposal that it is hard to realize its full significance at first glimpse."

When the presentation before the committee had been completed, its chairman, Senator Randolph Collier, observed that "the freeway system proposed in this report seems in general to have met our requirements." As expressed in SCR 26, what the Legislature wanted was:

"* * * a study which will provide a basis for an overall statewide plan of freeways and expressways for the State of California, such study not to be limited to state highways and such study to locate the potential freeway and expressway routes of the State and the necessary connections there to as nearly as is practicable in advance of detailed engineering design of projects."

Co-operation Cited

What the Legislature received in September, after 18 months of studies, was further described by Director Gilliss as follows:

"This highway study was more comprehensive than any ever made. The State worked closely with representatives of cities and counties. The city and county advisory group made an especially valuable contribution. In

Governor Goodwin J. Knight, in commenting on the SCR 26 report on the California Freeway System, said:

"Providing adequate transportation facilities is of course one of the great needs of our State. Continuing increases in population bring a constantly growing number of vehicles both for private transportation and commerce. To meet the future needs of the State therefore it is essential that we have sound long-range planning.

"This thorough exploration of our needs is significant to all Californians as an intelligent basis for planning to meet the highway development needs that lie ahead."

connection with the study, there were 23 separate meetings involving 730 county people and representatives of

280 cities. Special thanks are due also to the Automotive Safety Foundation and to the Institute of Transportation and Traffic Engineering.

"The California Freeway System suggested as a result of the study is such a monumental proposal that it is hard to realize its full significance at first glimpse.

"It would save lives, time and money.

"It would have a favorable highway user benefit ratio of 2 to 1, that is: 20 years' use of the California Freeway System would save the motoring public \$20 billion, almost twice the cost of the system.

"It would serve every California city of 5,000 population—every city of the State which will grow to 5,000 by 1980—virtually every incorporated city and many communities not formally incorporated.



Presentation of the SCR 26 freeway report to the Joint Interim Committee on Highway Problems. Seated in the front row (backs to camera) are Assemblyman Lee Backstrand (left) and Senator Randolph Collier, cochairmen of the committee. Presenting the report is J. W. Vickrey, Deputy State Highway Engineer.



Public Works Building
Twelfth and N Streets
Sacramento

CONTENTS

	Page
SCR 26	1
I. T. T. E. Schedules Meet in January	6
Report From District IX	7
By E. R. Foley, District Engineer	
Final Link	13
By C. J. McCullough, Resident Engineer, R. F. Britton, Assistant Resident Engineer, and C. R. Holl, Jr., Bridge Department Representative	
Report From District V	17
By A. M. Nash, District Engineer	
Stanislaus County	29
By Ellis R. Delbon, County Road Commissioner	
Cost Index	31
By J. P. Murphy, Assistant State Highway Engineer, H. C. McCarty, Office Engineer, and Lloyd B. Reynolds, Assistant Office Engineer	
Citizen Commissioners	32
Visiting Japanese Officials Discuss Highways	34
A. A. S. H. O. Agenda for S. F. Meet Announced	34
Report From District VI	35
By W. L. Welch, District Engineer	
US 66-91	44
By E. J. Walker, Resident Engineer, and H. C. Prentice, District Construction Engineer	
Use of FM Radio Saves Time and Lives	44
Long Beach	49
By A. L. Himelhoch, District Engineer	
Recommendations	59
By Lorán C. Vanderlip, State Chamber of Commerce	
Twenty-five-year Awards	63
Fred Jacobson Joins Bakersfield Chamber	63
Merit Award Board Winners Announced	64
New Records Set on S. F. Bay Bridge	64
Retirements	
Gladys Boswell	63
E. J. Saldine	64

"It would serve from one-half to three-fourths of all motor vehicle travel in California, everywhere in the State.

"It would cut the death rate among motorists using its full freeways by two-thirds to three-fourths.

"It would total nearly 12,250 miles in length, almost as extensive as the present State Highway System.

"All but approximately 1,500 miles of the proposed 12,250-mile California Freeway System are now included in the State Highway System.

"It would cost approximately \$10½ billion.

"Its construction could be accomplished in 20 years.

"The final important point: Achievement of the California Freeway System outlined in the study would be possible without an increase in highway user tax rates."

Freeway Need Examined

The 36-page booklet which contains the report tells the story of the proposed California Freeway System in photographs, charts and maps, with the text relatively brief and in non-technical language. A folded-in map showing the proposed freeway system for the entire State is attached to the inside back cover. Other maps show details of the proposed system, with route locations specified only as general in nature, for the Los Angeles, San Francisco, San Diego and Sacramento metropolitan areas.

The first part of the report is devoted to examining the *need* for a California freeway system. It contains a broad picture of the State's economy as it bears on motor vehicle travel—particularly *where* people travel, where the traffic originates and to and from what regions of the State it moves. Recreational travel is analyzed, and found to be widely spread throughout the State. Commercial vehicles carrying manufactured goods were found to outnumber those carrying agricultural, timber and other natural resource products in every region of the State.

Projecting highway needs into the future, the report envisages a population of 31 million in California in 1980, with 17 million motor vehicles and a staggering 200 *billion* vehicle-miles of

total travel. This section of the report concludes:

"The development of a well-planned efficient highway transportation system for the future movement of people and exchange of goods is necessary to insure the future economy of California."

Study Methods Outlined

The second section of the report outlines the methods of study pursued by the Division of Highways and cooperating agencies in analyzing the statewide, regional and local motor vehicle transportation problem and in developing criteria for a freeway system. (See adjacent article.)

The third major section of the report contains the maps of the proposed freeway system, and an explanation of how it would serve traffic in general and the various segments of the State's economy.

Cost estimates for the proposed freeway system and a general statement on the financing picture, while not specifically called for by the Legislature in SCR 26, were prepared by the Division of Highways and were submitted

When Should a Road Be a Freeway?

The SCR 26 report established a "yardstick" made up of 10 criteria as a basis for selecting the proposed California Freeway System.

Ideally, as Deputy State Highway Engineer J. W. Vickrey pointed out in presenting the report to the Joint Interim Committee on Highway Problems, "everyone would be better off if every mile he traveled were on a freeway. His trip would be safer, cheaper, and quicker."

However, Vickrey went on, it is economically impossible to make every one of the approximately 120,000 miles of roads and streets in California a freeway, so the actual basic criterion is: What can the motorist afford?

He can afford, the report indicates, a freeway system which will meet all or most of the following criteria:

... Connect major centers of population.

- ... Connect primary centers of industrial activity and of natural resources with centers of supply of labor and material and with major shipping points.
- ... Provide access to important military installations and defense activities.
- ... Provide access to major recreational regions: national parks and monuments, and state beaches and parks; lakes; hunting and fishing areas; and to state institutions.
- ... Connect as many seats of county government as economically feasible.
- ... Provide for continuity of travel into, through, and around urban areas from rural freeway approaches.
- ... Provide for large traffic movements between population and industry within urban areas.
- ... Provide for needed capacity in the traffic corridors.
- ... Connect with major highways of adjacent states.
- ... Provide an integrated system, with a minimum of stubs or spurs, to permit general traffic circulation.

to the Joint Interim Committee along with the report.

As explained to the committee by Deputy State Highway Engineer J. W. Vickrey, the approximate \$10½ mil-

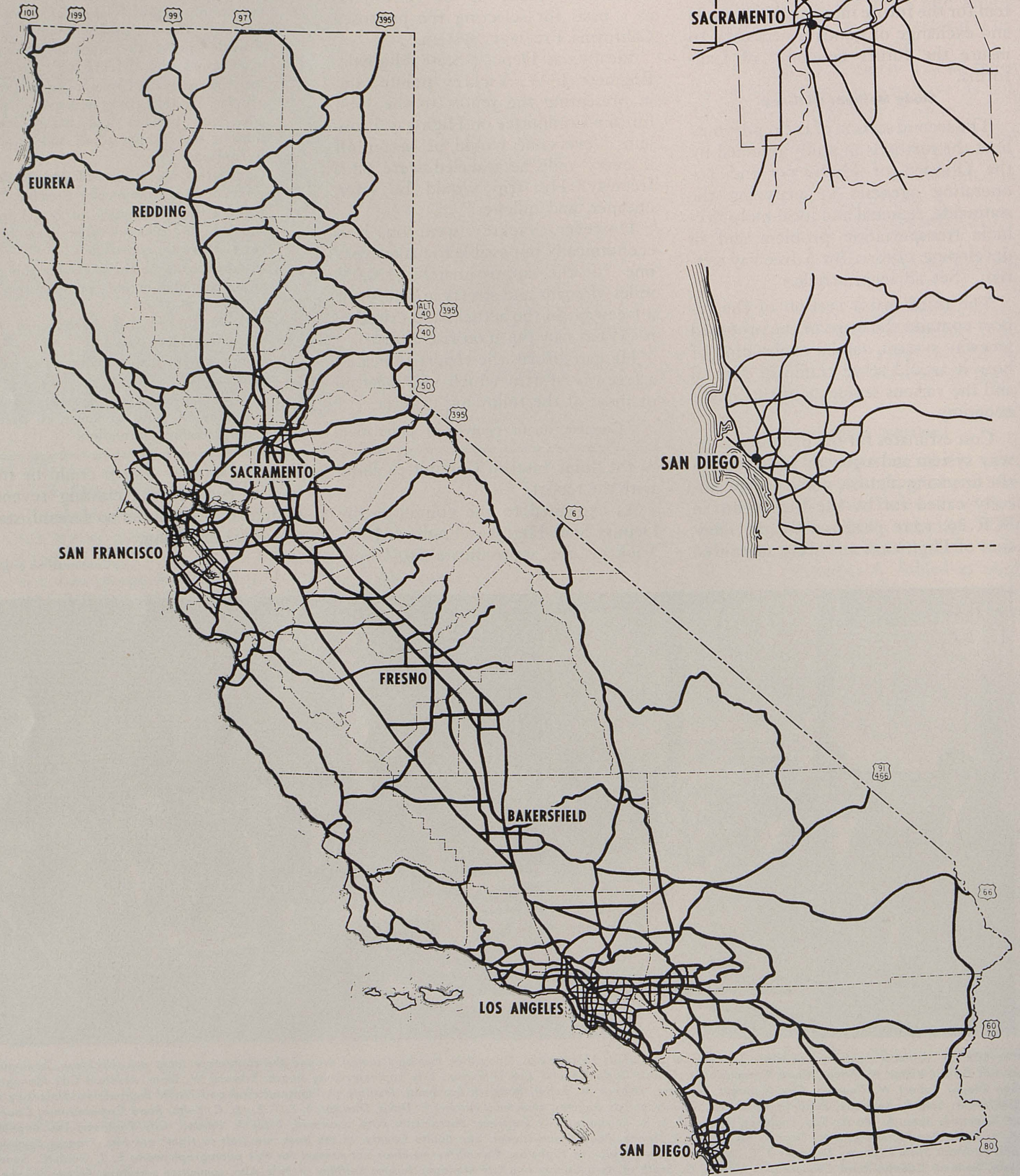
lion cost of the system could be met on the basis of the existing revenue structure as it applies to federal, state and local financing.

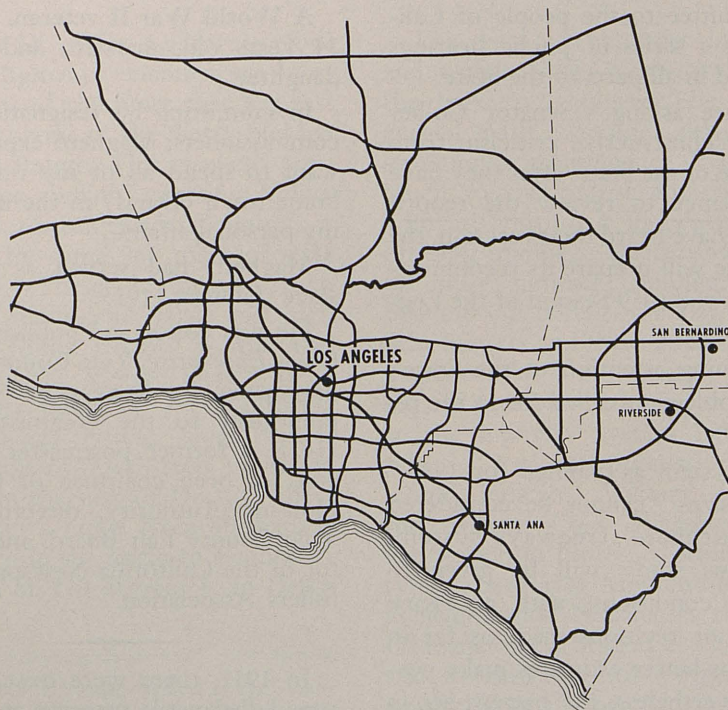
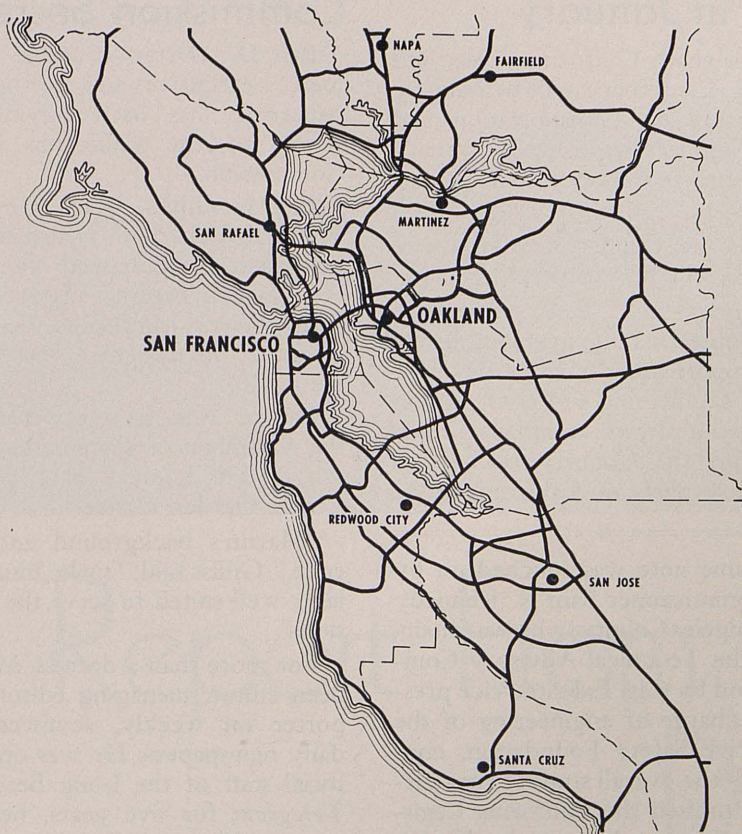
... Continued on page 5



The SCR 26 Technical Advisory Committee is shown at one of its 11 meetings. Committee members seated around the conference table are (clockwise, beginning at left front): Victor W. Sauer, Road Commissioner, Contra Costa County; Jess Gilkerson, City Engineer, Long Beach; Edward W. Blom, Assistant City Manager, San Diego; Robert W. Cowden, City Manager, Redding; Richard M. Zettel, Research Economist, Institute of Transportation and Traffic Engineering, University of California; Sam R. Kennedy, Road Commissioner, County of Los Angeles, chairman; Harmer E. Davis, Director, I. T. T. E.; A. C. Keith, Road Commissioner, County of Riverside; John A. Morin, City Engineer, Oakland; E. A. Fairbairn, City Engineer, Sacramento, vice chairman; Lyall A. Pardee, City Engineer, Los Angeles; A. S. Koch, Road Commissioner, Orange County; E. R. Hanna, Road Commissioner, San Benito County. In the back row (left to right) are Mrs. Frances Reynolds and Assistant State Highway Engineer J. C. Womack of the Division of Highways. Committee members not present for this photograph were: E. J. Guidotti, Supervisor, Sonoma County; Road Commissioner Vernon G. Smith of Kern County and City Manager Jerome Keithley of Palo Alto, committee secretary. Former members of the committee include Supervisor Heinz Kaiser of Orange County (deceased) and City Manager O. W. Campbell of San Diego and Port Commissioner Dudley Frost of Oakland (resigned).

FREEWAY SYSTEM PROPOSED TO LEGISLATURE





SCR 26

Continued from page 3 . . .

For the period 1960-1980, Vickrey said, the present revenue basis would yield an estimated \$23 billion from the following sources:

Federal aid	\$3.9 billion
Local revenues	\$4.8 billion
(City and county taxes for streets and roads, plus fines and forfeitures, etc.)	
State highway user tax revenues	\$14.3 billion
(After deducting funds for Department of Motor Vehicles, Highway Patrol, and costs of collections.)	

Of this amount, \$7 billion would be required for maintenance and administration (state, city and county), leaving \$16 billion for rights-of-way and construction.

The \$16 billion, again based on present legislation, would be distributed as follows:

County roads	\$2.4 billion
City streets	\$2.0 billion
Local grade crossing separation projects	\$0.1 billion
State highways	\$11.5 billion

The 12,241-mile freeway system proposed in the study consists of 10,722 miles which are now a part of the 14,000-mile State Highway System, plus 1,519 miles under city or county jurisdiction. Included in the 10,722 miles of present state highways proposed for the system are the 2,200 miles of national interstate routes.

Counties Consulted

Preparation of the report was assigned early in 1957 to the California Highway Planning Survey of the Division of Highways. One of its first steps was to arrange for consultation with the 58 counties and as many as possible of the 350 incorporated cities in the State. This approach was facilitated in three ways: first, SCR 26 itself called on the cities and counties to co-operate; second, it also provided for a technical advisory committee of 14 members, seven representing cities and seven representing counties; and third, the Division of Highways had already begun working with the cities and counties in compiling street, road

and highway needs estimates in connection with a provision of Section 210 of the Federal Aid Highway Act of 1956. Some of the traffic estimates and other data compiled for the "210 study" were found to be applicable to the SCR 26 study.

Dozens of meetings were held throughout 1957 and the first half of 1958 with representatives of the cities and counties by members of the Division of Highways headquarters and district staffs. The full picture of local planning and local needs and problems was brought out at these meetings, to be presented to the Technical Advisory Committee for its review.

At the same time the Division of Highways was obtaining and correlating information from numerous state and federal government agencies and from regional intergovernmental organizations.

Several of the counties retained engineering consultants to make comprehensive traffic circulation studies, in which the State assisted financially. These studies were of particular value in developing the proposed freeway system in those areas.

The long-range significance of the study, extending beyond the proposed freeway system itself, was emphasized by legislators and others when the report was formally presented to the joint interim committee in the Senate Chamber of the State Capitol.

Report Praised

Assemblyman Lee Backstrand of Riverside County, vice chairman of the committee, termed the study a "pioneering step in more effective intergovernmental relations" in California.

Harmer E. Davis, Director of the Institute of Transportation and Traffic Engineering of the University of California and an adviser in the preparation of the report, described the study as an "excellent investment" for the people of California.

"Even if the Legislature doesn't 'buy' the proposed system," Davis said, "It has set in motion the kind of planning we need. This is a system which should be considered not in terms of mileages of road but in amount of traffic service."

I. T. T. E. Schedules Meet in January

The Eleventh California Street and Highway Conference will be held by the Institute of Transportation and Traffic Engineering of the University of California at Berkeley, January 28-30, 1959.

C. E. Waite, Deputy State Highway Engineer, will be chairman.

The annual I. T. T. E. conference covers subjects ranging from broad planning problems to latest developments in engineering and construction technique. It draws attendance from throughout the Country as well as from many parts of California.

The same note was touched on by Road Commissioner Sam R. Kennedy of Los Angeles County, who was chairman of the Technical Advisory Committee, and by Carl E. Fritts, vice president in charge of engineering of the Automotive Safety Foundation, consultants in the overall study. Fritts particularly praised the California Legislature as "outstanding in the Nation for its continuing and constructive interest in highways."

The report is now being taken by the committee to the people of California, in a series of public hearings conducted in all parts of the State.

"We are asking," Senator Collier said, "for constructive criticism from the people of the State, after they have had a chance to review the report. After we have heard their reaction, the committee will prepare its recommendations to the 1959 Session of the Legislature."

Continuing attention to the State's traffic problems is called for in the report itself.

"The system as planned for 1980," it emphasizes, "cannot be considered as the 'ultimate' freeways system. Continuous study will be given to changing conditions, with necessary additions or revisions made as far in advance as better estimates make possible. Nevertheless, the pattern set in this study should remain the backbone network."

Ben D. Martin Named Commission Secretary

Ben D. Martin, chamber of commerce executive and former newspaperman, has been appointed secretary of the California Highway Commission.

C. M. Gilliss, State Director of Public Works and chairman of the commission, announced the appointment which became effective August 18th. Martin succeeded C. A. Maghetti, who resigned "for personal reasons."

Martin was secretary-manager of the Chamber of Commerce of Bellflower. His home is at 12771 Leroy Circle, Garden Grove.

"Martin's background and experience," Gilliss said, "make him particularly well suited to serve the commission."

For more than a decade, Martin has been editor, managing editor and reporter on weekly, semiweekly and daily newspapers. He was on the editorial staff of the Long Beach *Press-Telegram* for five years, he worked with radio stations in Sacramento, Santa Ana and Long Beach, and he ran the monthly newspaper of the State Junior Chamber of Commerce.

A World War II veteran, Martin is 34 years old, married, and has one daughter.

In submitting his resignation to the commissioners, Maghetti explained: "I want to spend all of my time in my home town (Davis) in the interest of my personal affairs."

Maghetti had served as secretary since January, 1955.

He was editor and publisher of the Davis *Enterprise*, Yolo County weekly newspaper, for 20 years before his appointment to the commission post. He is a former postmaster in Davis and has been chairman of the Davis Housing Authority, director of the Yolo County Fair Board, and a director of the California Newspaper Publishers Association.

In 1957, there were over 370 persons killed while crossing at an intersection with signal. Remember, cross cautiously.



Report From District IX

By E. R. FOLEY, District Engineer

DISTRICT IX of the California Division of Highways encompasses most of the area of the State that lies east of the backbone of the Sierra Nevada Mountain Range. This sparsely populated area, which contains Mono, Inyo and eastern Kern Counties, is traversed by some 965 miles of state highways. These highways reach from the timberland, lakes and high passes of Mono County to the arid expanses of the Mojave Desert; from the highest point on the California State Highway System, Tioga Pass, at an elevation of 9,947 feet, to below sea level in the sink of Death Valley. Temperatures range from 40 degrees below zero in the north to a summertime high of 140 degrees F. in Death Valley.

PHOTO AT TOP OF PAGE—Typical of the country east of the Sierra Nevada included in District IX is this view southward along US 395 near Mono Lake. This section of the highway is being relocated and improved.

This land of extremes in climate and terrain poses many problems to the highway engineer, be he concerned with planning, design, construction or maintenance. It also offers much to the tourist and vacationer who are visiting it in constantly increasing numbers. Recreational travel to enjoy summer camping, fishing, boating and hiking; the fall influx of deer hunters and the winter sports enthusiasts who flock to newly developing ski areas are bringing congestion to the highway system far beyond what a look at population figures would indicate. Military traffic to the Marine Cold Weather Training Station in Northern Mono County, to the Naval Ammunition Depot in neighboring Nevada, to the Naval Ordnance Test Station at China Lake and to Edwards Air Force Base in eastern Kern County add to the ever-increasing flow of vehicles which must be accommodated.

Important Route

The highway system which serves these many visitors in addition to the resident population has a long backbone which is Legislative Route 23. This enters District IX at the Los Angeles county line north of Lancaster as US 6 and proceeds northerly through Mojave, Red Rock Canyon and Indian Wells Valley where it is joined by US 395 near Inyokern. These two US routes then share Route 23 jointly for some 125 miles to Bishop where US 6 leaves it and US 395 continues on for another 140 miles to enter Nevada adjacent to Topaz Lake. En route it stays above 6,000-foot elevation for some 100 miles and crosses two summits above 8,000 feet, Deadman Summit, south of Mono Lake, at 8,041 feet, and Conway Summit, north of Mono Lake, at 8,138 feet, which is the highest point on US 395 from Mexico to the Canadian border.

This central backbone is crossed near its base at Mojave by US 466 which connects Bakersfield and the San Joaquin Valley with the Interstate System at Barstow. Many lateral offshoots which leave Route 23 at intervals provide access to the streams, lakes and back country of the eastern Sierra, to the mines and rangelands and to our sister state to the east. There are seven connections with the Nevada Highway System along the District IX border.

The first freeway adoption in District IX was in 1953 on a portion of State Route 212 between US 6 and the San Bernardino county line east of Ridgecrest. Additional routes which are planned for freeway development include US 466 from the District VI boundary at Bear Mountain Ranch to the District VIII boundary east of Boron, US 6 from the Los Angeles county line south of Mojave to the Nevada state line near Montgomery Pass and US 395 from Johannesburg to the Nevada line at Topaz Lake. This is a total of 460 miles to be developed initially as expressways with limited access and ultimately portions of these routes will become full freeways with no crossings at grade. To date public hearings have been held in affected communities and 156 miles have been formally adopted as freeways. Relocations of US 6 and US 466 in the Mojave area, which are now in the public meeting stage, will include an additional 26 miles and another 33 miles are in various stages of advance planning.

Initial Two-lane

Only a bare start has been made in constructing fragments of the planned freeway mileage to the initial expressway stage. In general, only two lanes of the ultimate four-lane section is planned initially. The few miles of 60-foot wide four-lane section which have been constructed are warranted because it has been more economical to construct passing lanes through rolling terrain than to make the heavier cuts and fills necessary to obtain safe passing sight distance on a two-lane section. US 6 has been likened to a long desert snake that has dined on numerous small rodents because of these

four-lane bulges along its normally two-lane length.

Since 1955 District IX has had an annual construction expenditure of approximately two million dollars. Currently some \$2,119,000 of construction work is under contract or advertised.

If you should enter via US 395 from the south the first modernized section traversed will be a five-mile length between Inyokern and a new junction with US 6 near Brady's. This was completed in February of 1958 by Schroeder and Company. It is a two-lane roadway with limited access control and has only one curve in its length. Next is a section along Haiwee Reservoir, where the Los Angeles aqueduct starts its long journey to the City of the Angels. This was surfaced to Olancho in 1955 over previous stage-construction widening to provide a 32-foot two-lane pavement, with some stretches of four-lane for passing. In 1958 this resurfacing was extended from Olancho along the west shore of Owens dry lake bed for 12 miles to join the portion reconstructed in 1955 to Diaz Lake south of Lone Pine. From here, past the World War II Japanese relocation camp at Manzanar, to the county seat at Independence, earlier construction has brought this portion up to acceptable modern standards.

Distance Shortened

North from Independence a realignment is programed for construction as soon as funds are available. This project will include the first four-lane divided section within District IX.

Proceeding northerly a six-mile section in the Fish Springs area south of Bigpine is currently under contract with I. L. Corft and Son. This construction will eliminate passing restrictions with a four-lane section and will shorten the distance by 0.3 mile by eliminating a "dogleg" in the old alignment.

North from Bishop, 11.2 miles of US 395 were widened and resurfaced in 1957 to provide a 32-foot paved width connecting with the foot of the Sherwin Grade which was constructed on new alignment in 1956. The Sherwin Grade project eliminated one of the worst bottlenecks on this

route and was the largest contract ever awarded in District IX.

Except for resurfacing at several locations, and widening from Crestview over Deadman Summit, no major construction has been done on US 395 north of the Sherwin project during recent years. However, the first of two projects which will eliminate hazards of the Conway Grade and its southerly approach is now under contract and construction operations were started this August. This job will provide a 32-foot two-lane section on new alignment from the Mono Inn for 4.2 miles to the foot of the grade. The second project, which will continue to Conway Summit, is now in the design stage and will be constructed as soon as financing can be provided. Portions south and north of Bridgeport are also in design stage and are proposed for early construction.

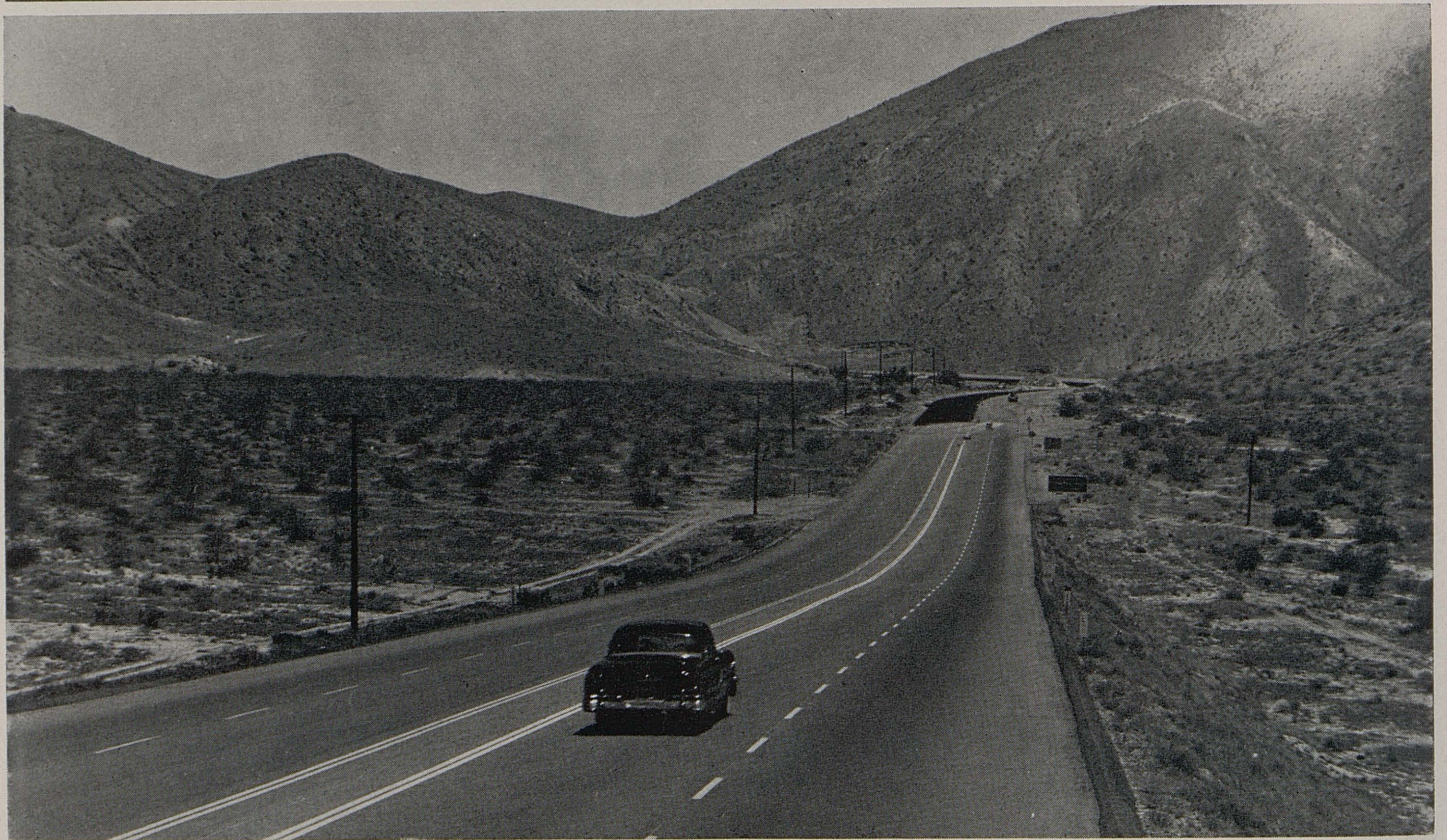
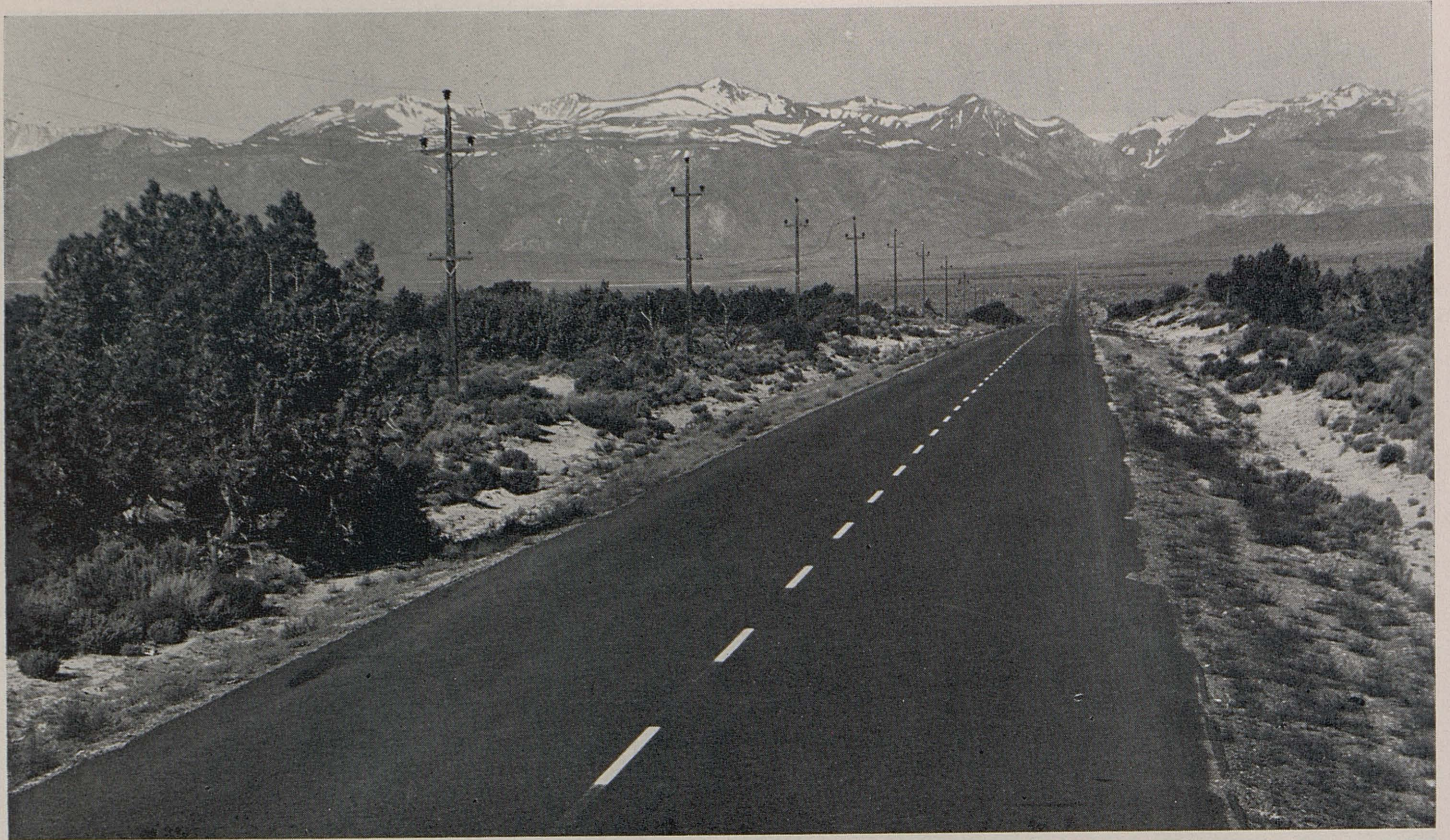
Resurfacing Completed

From the junction of the Sonora Pass Highway for a distance of 27 miles to the Nevada state line at Topaz Lake a resurfacing project is under contract which is expected to be completed this fall.

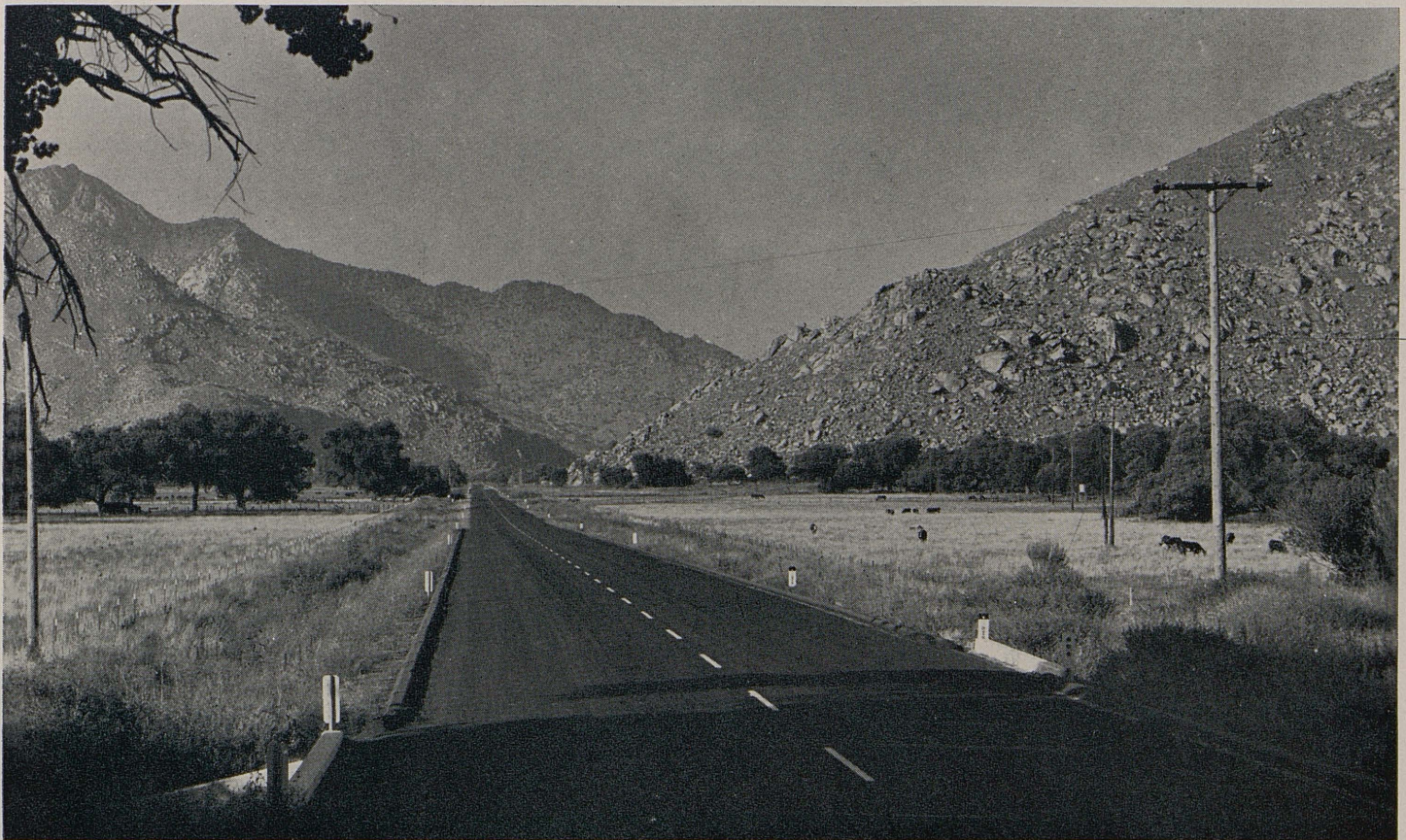
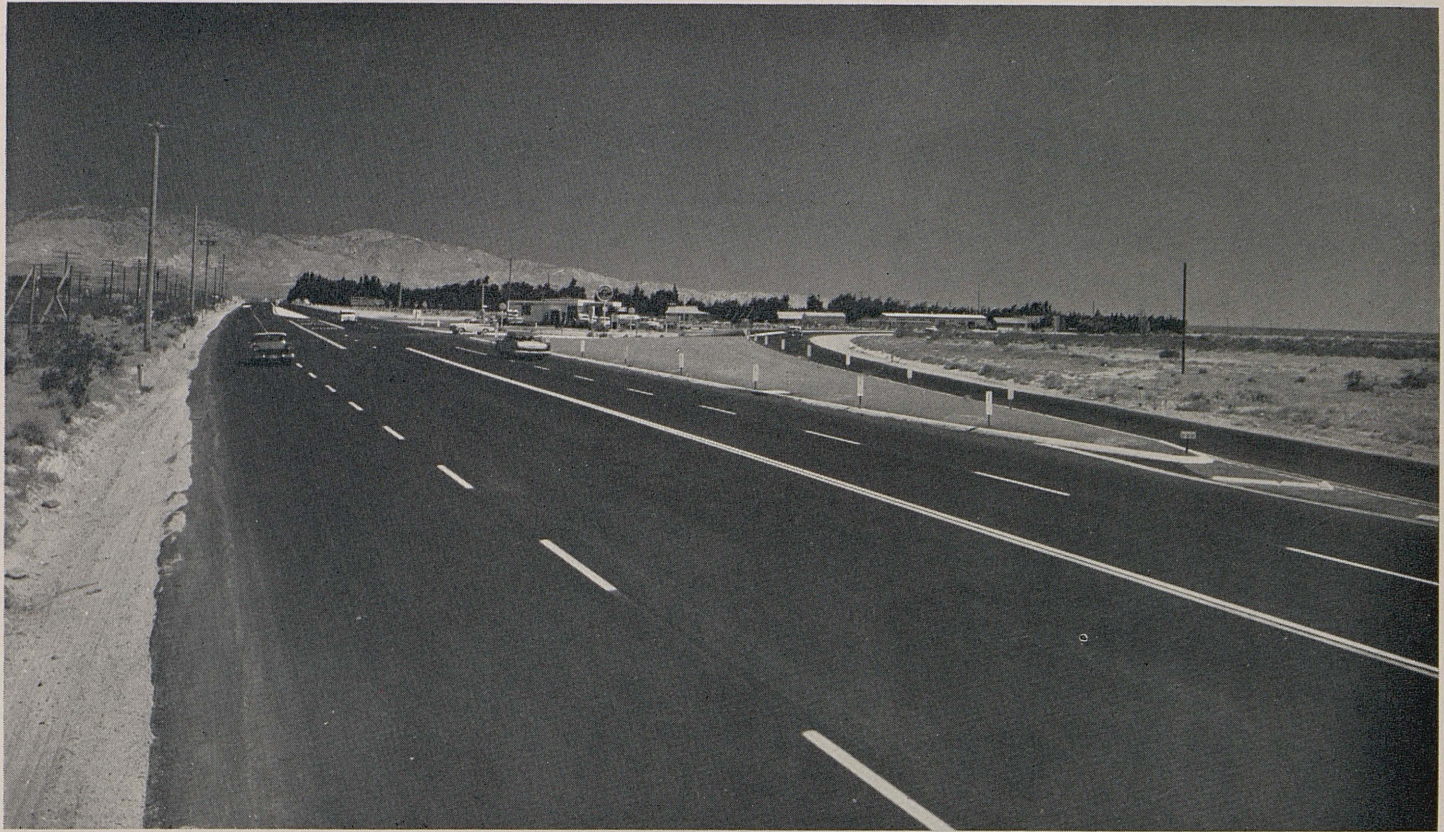
If you choose US 6 as your route into District IX from the south you will find the intersections with US 466 at each end of Mojave channelized by recent construction. Resurfacing through the Mojave business district and for a distance of six miles northerly was done this year and included these intersections. Proceeding northerly a four-mile section from Jawbone to Red Rock Canyon which was reconstructed to a four-lane width in 1954 is being extended one mile into the canyon under a current contract now nearing completion. This project involves heavy excavation in two rock points with cuts to a height of 185 feet to straighten the channel and make room for the widened roadway on improved alignment. This canyon, although normally dry, is subject to cloudburst floods and in the past has washed out this section of highway and caused serious disruption of transportation. A second project programed for early construction will bridge the main wash at the north end of the present project and climb out



US 395 follows the scenic shoreline of Mono Lake. The tortuous Conway Grade barely discernible in the left background will soon be replaced by a new highway.



UPPER—Looking west along Pole Line Road near the Nevada state line. This route connects US 395, which follows the base of the Sierra Nevada seen in the distance, with the Naval Depot at Hawthorne. LOWER—This recently completed portion of US 6 north of Mojave is typical of the divided, four-lane pavements used for new expressways in District IX. Visible ahead is a continuation of this section now under construction through Red Rock Canyon.



UPPER—The recently improved junction of US 466, on the left, and US 6 at the north edge of Mojave. LOWER—A view eastward of the Walker Pass Road (Sign Route 178) near Weldon. The old highway curved along the base of the hills to the left.



New four-lane expressway construction in Red Rock Canyon north of Mojave on US 6. The high rock cut and channel excavation on the right were necessary to make room for the highway and flood channel in the canyon.

of the canyon on new alignment to join a completed section that was constructed in 1955. This extends to Little Dixie Wash. From here to the junction with State Route 212 north of the Walker Pass connection, the pavement which had previously been widened to 32 feet was resurfaced in 1956. A few miles farther north past Homestead and you will join US 395 to Bishop.

At Bishop US 6 leaves US 395, continues north to Benton and leaves California near Montgomery Pass. The first portion of this route north of Bishop was resurfaced to the Mono county line and the remainder received a seal of rock screenings and oil last year.

Three-mile Reconstruction

If your travels should take you east from the Bakersfield area to Barstow and points east, US 466 would be your

route over the Tehachapi Pass and through the Mojave Desert. A three-mile portion of this route east of Tehachapi from Cameron Road to Cache Creek was reconstructed in 1957 to provide a 60-foot four-lane pavement. This relieved congestion that resulted from a large volume of heavy trucks where passing was restricted by lack of sight distance on a two-lane highway. This same condition has become acute on the long grade west of Tehachapi and a major project is in the design stage to reconstruct this portion as soon as financing can be obtained.

An interim project to serve traffic through Tehachapi and easterly to the Cameron section until the planned realignment in this area can be financed has been advertised for construction this fall.

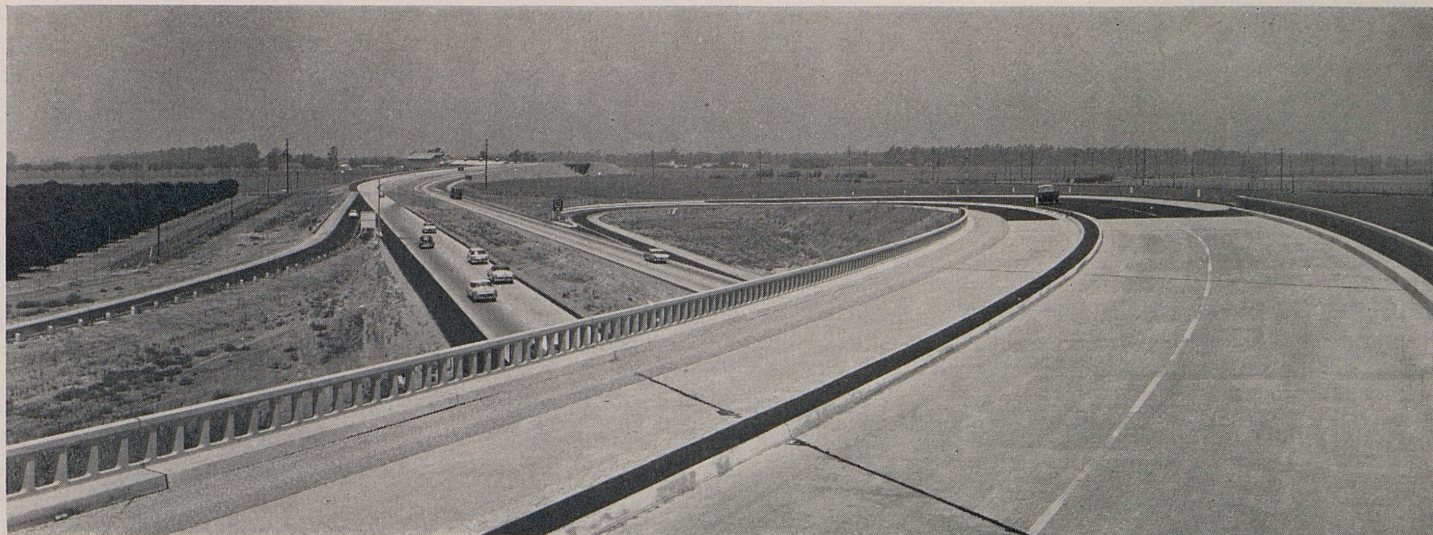
Easterly from Mojave US 466 has been widened to a 32-foot paved sec-

tion to the district boundary east of Boron. An eight-mile stretch through rolling hills easterly from the entrance to Edwards Air Force Base near Murroc was reconstructed in 1956 to eliminate sight distance restrictions and dips which were hazardous when flooded.

Steep Grades Eliminated

If you should leave US 466 at Baker for a look at Death Valley, or a destination in Nevada, you will find the steep grades and winding road at Ibez Pass superseded by three miles of newly constructed highway which has just been completed. Although approximately half of this distance is within District VIII the contract was administered by District IX and included improvement of sharp curves at four other locations north and south of Shoshone. This project is the only

... Continued on page 61



Final Link

*Last Unit on Santa Ana Provides
42 Miles Continuous Freeway*

By C. J. McCULLOUGH, Resident Engineer
R. F. BRITTON, Assistant Resident Engineer
C. R. HOLL, JR., Bridge Department Representative

ON JULY 3, 1958, there was opened to public traffic a unit of construction on U. S. Highway 101 at the Irvine Grade Separation Overcrossing which marked the completion of the Santa Ana Freeway throughout its entire length of 42.6 miles from Spring Street in Los Angeles Civic Center to junction with the future San Diego Freeway near El Toro.

For the first time on that date public traffic using the Santa Ana Freeway was able to travel throughout its entire length on multiple divided roadways with no stops for traffic signals or interference with cross traffic of any kind. This does not mean that we can close the books on the Santa Ana Freeway and consider that there is nothing more needed to be done upon it. As a matter of fact, even at the present time, there is construction work now in progress.

In Orange County, at the junction of the Santa Ana Freeway with the

Riverside Freeway, construction on traffic interchange facilities was completed in September. Also in progress in Los Angeles County is construction for a new and additional flood control channel for the north fork of Coyote Creek between Buena Park and Norwalk which requires detouring of freeway traffic around bridge construction on the freeway. This construction is scheduled for completion February 15, 1959. Also construction is under way in Los Angeles County to widen the existing four-lane Santa Ana Freeway between Buena Park and Norwalk to provide six lanes. This construction project is 3.8 miles in length, and the low bid received for this work on June 26, 1958, totaled \$956,453.70. Thus, it is evident that even though the Santa Ana Freeway is completed to full freeway standards through its entire length, additional construction thereon as well as general maintenance may well be a continuing process.

Last Contract

Of a total of 50 major units of construction on the Santa Ana Freeway

the last completed that made it possible for the first time for this important traffic facility to be operated as a full freeway throughout its entire length of 42.6 miles was Contract No. 57-7VC45-F which was awarded to Winston Brothers of Monrovia on November 29, 1956. After completion of this contract there remained but a short half-section of freeway only a few hundred feet in length at the Irvine Grade Separation structure over the Santa Fe Railroad to be opened to public traffic on July 3, 1958. This was done without ribbon-cutting ceremony or fanfare of any kind.

The Winston Brothers' contract, 5.7 miles in length, between Browning Avenue and Laguna Canyon Road, carried a contract allotment of \$3,000,614. This section of freeway is entirely within the confines of the Irvine Ranch, one of the largest and most fertile in California with an area in excess of 80,000 acres. The newly completed freeway greatly improves the ingress and egress facilities for the air base.

PHOTO AT TOP OF PAGE—The completed Santa Ana Freeway as seen from the top of the Laguna Canyon Road separation bridge with the Santa Fe Railroad overpass in the distance

The alignment, for the most part, followed along that of the old three-lane highway known as State Route 2, US Highway 101, and full advantage was taken of the capital investment in the roadbed and pavement which for long stretches was used for base by covering with plant-mixed surfacing of variable thickness. Due to the existing crown on the old two-lane pavement, it was necessary to place a variable thickness of plant-mixed surfacing ranging from a minimum of two inches to a maximum of six inches. The only portion of this project on entirely new alignment was through the Town of Irvine where the change in location created a considerable improvement in the standard of alignment approaching the Irvine Grade Separation over the Santa Fe Railroad. By adopting the new alignment, it was possible to leave undisturbed the business section of the Town of Irvine at the intersection of US Highway 101 with Central Avenue.

The present construction provided for a full freeway consisting of two roadways of two traffic lanes each with right-of-way being obtained and

provisions being made for the constructing of additional traffic lanes on the inside of both roadways at some future time so that an ultimate six-lane freeway can be obtained.

Two Railroad Crossings

The Atchison, Topeka and Santa Fe Railroad crosses this project near the southerly and northerly ends. At the northerly end the plans called for constructing a 1,400 lineal foot shoofly while the south Tustin Underpass structure was being built. The contractor had the option of digging a "glory hole" to enable the construction of the underpass or excavating the entire underpass area with the exception of the shoofly "plug." He chose the latter method, and excavated and hauled the material by the use of four scrapers and several pusher tractors.

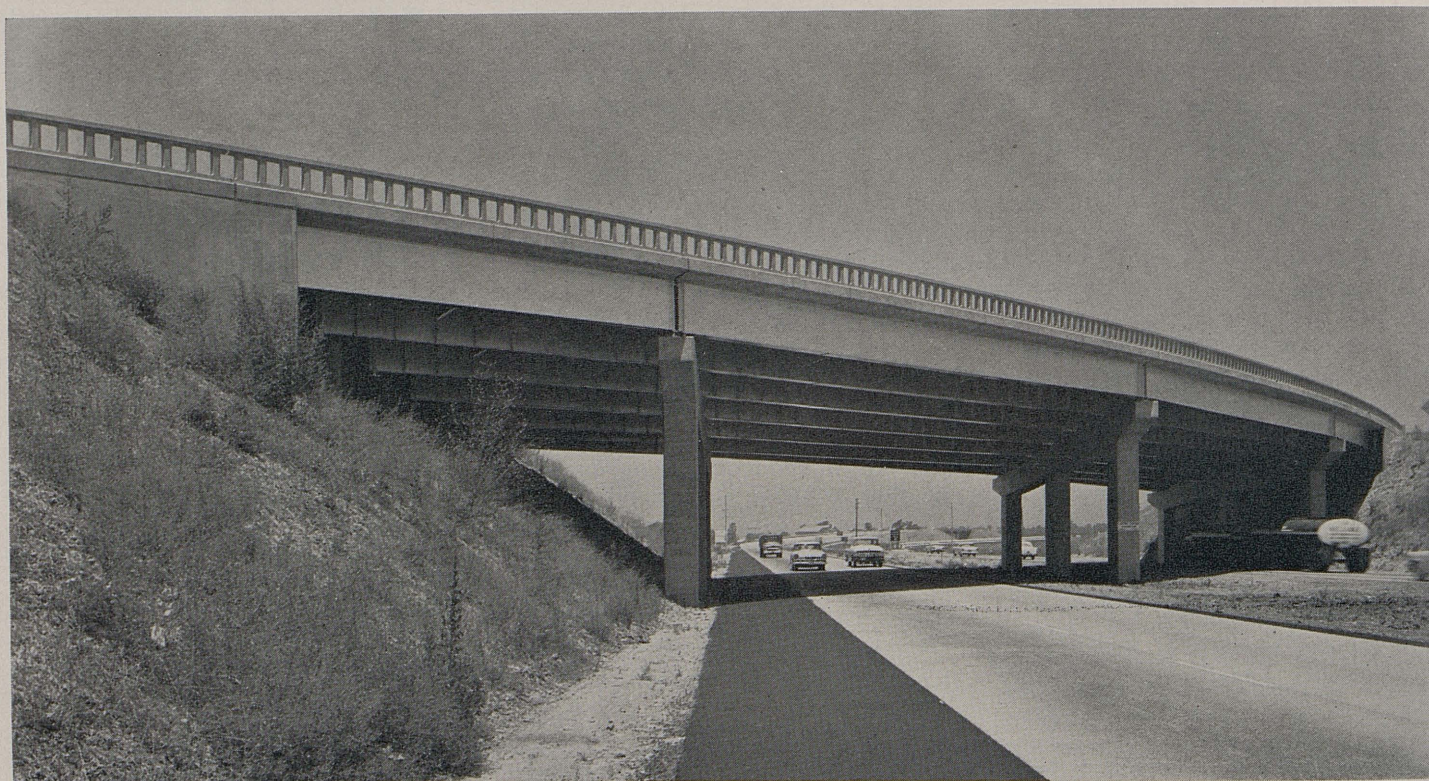
At the southerly end of the project the railroad crossed under the existing Irvine Overhead. Plans called for constructing a new northbound structure and raising the existing one to conform to the new established grades.

The contractor had agreements with the Irvine Ranch for the use of

several borrow pits. He was able to excavate, by the use of a loader, all the imported borrow necessary for this contract within a distance of 2.5 miles from the freeway site. There were 120,000 cubic yards of imported subbase material required and this was obtained by use of a two-cubic-yard power shovel from pits located four miles from the freeway. The longest haul was from San Juan Capistrano where the contractor purchased the untreated rock base and hauled it to the project in nine-cubic-yard capacity trucks.

Settlement Platforms Used

At the Irvine Overhead, Central Avenue Undercrossing, Jeffrey Road Overcrossing, and the Culver Road Undercrossing approaches, embankments plus a 10-foot surcharge and at the Myford Road Undercrossing, embankments plus a four-foot surcharge were constructed with surcharge left in place for a period of 90 calendar days. Settlement platforms were installed at these sites and daily readings made to record the settlement as it occurred. After removal of fill and surcharge at the Central Ave-



The Laguna Canyon Road separation bridge as seen from the new section of freeway. The view is northwestward.

nue Undercrossing, it was found that the existing roadway had settled approximately two feet and this had to be reconstructed.

Prior to placing the fill and surcharge for the new Irvine Overhead, it was necessary to extend an existing 8' x 8' reinforced concrete box. After backfilling this box, placing the fills and surcharge and waiting the 90-day period, profiles were run in this culvert and it was found that it had settled in a sag curve with a maximum settlement of 1.8 foot. The District Design Department had anticipated this and in co-operation with the Bridge Department had designed expansion joints to allow this settlement to take place without structurally damaging the culvert. The plans called for the construction of a new invert after settling, and \$1,000 was set up under supplemental funds to finance this work.

Another structure, which carries the flow from Hicks and Peters Canyons, had become inadequate to handle storm water during periods of heavy runoff, primarily because of land use developments in the tributary watershed. The difficulties were principally at the entrance to the culvert and at the junction of a lateral culvert carrying water from Trabuco Canyon. The work as completed on the most recent contract consisted of extending the existing 9' x 9' reinforced concrete boxes, adding two 6½' x 8' boxes and constructing a new 9' x 9' box to handle the Trabuco water. In addition to the boxes, inlet and outlet transitions and a broken concrete energy dissipator were constructed.

Other Drainage Features

Air-blown mortar paved channels intercept the runoff waters a considerable portion of the way along the northeasterly side of this project. They vary in size from two-foot round-bottom type to a 15-foot V-bottom section. Some difficulty was encountered while excavating these channels as the local ranchers and farmers do heavy irrigating every few months and if this was not anticipated correctly as the work progressed, flooding would be a certainty. Most of this work was completed with only



UPPER—A view southeast from Jeffrey Road toward the Town of Irvine along the newly completed section of the Santa Ana Freeway. LOWER—The Culver Road undercrossing on the new freeway. Culver Road connects with the county highway leading to the main entrance of the El Toro Marine Air Station.



Signing along the new freeway. Motorists are alerted to forthcoming separation structures where they may want to leave the freeway.

a small amount of damage resulting from uncontrolled irrigation waters.

The major bridge structure work on this contract consisted of one railroad underpass, one railroad overhead, one overcrossing, three undercrossings, one drainage bridge, and two pumping plants. The cost of these structures was \$834,230.

The South Tustin Underpass consists of a riveted structural steel through plate girder bridge with a reinforced concrete deck. Two simple spans carry the Santa Fe Railroad over the depressed freeway to the small section south of the City of Tustin called Venta. A pumping plant was constructed in the below-ground surface of the freeway to provide removal of the surface runoff to the drainage ditch which terminates at the Orange County Flood Control Channel at Tustin Bridge.

Tustin Bridge is a reinforced concrete slab bridge spanning the Orange County Flood Control Channel. The flood control channel is an extension of the South Tustin Storm Drain which collects the water from the newly developed housing areas south of the City of Tustin. The new structure replaced the original bridge which had been rebuilt in 1938. The new bridge is approximately 50 feet longer than the existing bridge to provide for the new channel which was

realigned and enlarged at the time of the existing bridge removal. The anticipated growth of the South Tustin area necessitated that the bridge be constructed with future channel widening provided. The existing reinforced concrete drop structure west of the bridge site was revised to accommodate the new channel section and the new bridge.

Drainage Water Removed

Myford Road Undercrossing is a reinforced concrete girder bridge spanning Myford Road, part of the Orange County Road System carrying farm-to-market traffic. A pumping plant was constructed at this site to provide removal of the drainage water in the cut section of Myford Road. The drainage water is pumped to an open ditch which terminates at the Orange County Flood Control Channel at Tustin Bridge.

Culver Road Undercrossing is a reinforced concrete girder bridge spanning Culver Road, part of the Orange County Road System and the main entrance to the El Toro Marine Base. This interchange structure permits freeway access for the heavy traffic to and from the marine base.

Jeffrey Road Overcrossing is a welded steel girder bridge with a reinforced concrete deck and provides access to the freeway for farm-to-

market traffic. Jeffrey Road is part of the Orange County Road System.

Central Avenue Undercrossing is a reinforced concrete structure spanning Central Avenue in the Town of Irvine. The traffic to and from this community may gain access to the freeway at this structure.

Irvine Overhead as regarded consists of two parallel structures, one of which is new. These structures span the Santa Fe Railroad main line between Los Angeles and San Diego. The existing overhead structure was adjusted to the new freeway grade system by jacking the existing superstructure to the new grade and tilting the deck to obtain the required slope for superelevation. C. H. Bashore & Sons, a housemoving firm from Pasadena, provided the necessary equipment and crew to carry out the jacking operation. Approximately 70,000 board feet of 6 x 8 timbers, four feet long, were required to build the crib stacks used as a jacking platform to support the entire superstructure. Some 180 screw jacks and 57 hydraulic jacks were used to raise the 1,100 tons of bridge superstructure. The actual jacking operation consumed only five days after some six weeks of preliminary preparations. After completion of the raising, new bearings were placed under the girders and the deck was surfaced with plant-mix to provide smooth riding qualities.

The completion of this 5.7 miles of four-lane freeway, replacing as it does a three-lane, 30-foot width of pavement, conventional type highway with many road intersections and one railroad grade crossing, provides the public with a much safer traffic facility. The many traffic tie-ups that used to occur on the old road on Sundays and holidays should now be a thing of the past. The 20,000 motorists per day (that figure being the present average daily traffic count) who drive this new freeway, on the basis of statewide accident statistics, will be three times safer than they were on the old superseded highway.

More than 95 percent of vehicles involved in fatal accidents on United States highways in 1957 were in apparently good condition.



Report From District V

By A. M. NASH
District Engineer

IN THE Counties of Monterey, San Benito, San Luis Obispo, and Santa Barbara that make up District V of the State Division of Highways, we have our share of the contrast and variety that is characteristic of our State. Along our wild coastline we have rocky mountains that fall abruptly into the sea. Farther inland lush green vegetable fields thrive adjacent to the arid, brown hills and the flatlands farther east. Busy modern factories spring up next to neat, peaceful-looking dairy ranches. Historic missions are spaced through the area in numbers, for here is the veritable heartland of the territory where Fra Junipero Serra and his fellow Franciscan missionaries labored so mightily.

District V has a relatively large area of 10,800 square miles, but a population of less than 400,000 with an average population density of 35 people per square mile.

ABOVE—This expressway now under construction west of Santa Barbara connects with completed expressway and freeway sections in the Gaviota Pass-Buellton area and will provide a long continuous stretch of divided, four-lane roadway for the heavy traffic using US 101

Population Growth

Yet, even in this predominantly rural area population is growing, particularly in such areas as Salinas, Monterey, San Luis Obispo, and Santa Barbara, bringing some of the same problems that concerns the large metropolitan centers.

Thus, as the population, development, and geography vary in the district so do the problems of developing suitable highways to serve these areas. We must be careful to plan for the inevitable growth of the future as well as for the immediate needs of the present, for experience has taught us that the two-lane highway of today may soon require a four- or six-lane freeway.

We must also give all possible attention to using every resource at our command to construct US 101, one of our State's main north-south arteries, to adequate freeway standards throughout our district to serve the heavy through traffic between San Francisco and Los Angeles while at the same time providing an adequate transportation system for local and agricultural

traffic on which the livelihood of so many people in our district depends.

Such important lateral connections between US 101 and US 99 in the central valley as State Sign Route 41 between Paso Robles and Fresno also require attention in developing them to modern highway standards. So does State Sign Route 1, the Cabrillo Highway, which passes through such tourist attractions as Morro Bay, San Simeon, the scenic coastline leading to Big Sur State Park, Carmel and the Monterey Peninsula vacation lands.

Federal Program

As an illustration of the continuing efforts in solving these many difficult highway development problems facing us, let us review our accomplishments of the past year as well as project our plans for the immediate future.

A federal highway bill was passed this year by the Congress which, in addition to an augmented federal-aid allocation of funds for the interstate and regular Federal Highway System roads, also contained an emergency or antirecession allocation of 400 million dollars. The terms of the law specified

that projects to be eligible for participation in these funds must be capable of being placed under construction before December 1, 1958, and must be completed by December 31, 1959.

Six projects in all were selected in this district for addition to the 1958-59 Fiscal Year Budget to be financed on the specified matching basis by these supplemental federal funds. The total estimated cost of the six projects was \$5,795,000, which will materially accelerate the construction and completion to modern standards of six sub-standard sections of state highway in this district.

The specific allocation of these funds allows construction of the following highway projects.

In San Benito County, a grade separation structure, access ramps and connections will provide an interchange at the San Juan Bautista intersection of US 101 and State Sign Route 156. The 327-foot-long bridge structure will carry traffic on State Sign Route 156 over US 101. Some existing access openings from private properties to US 101 in this area will be closed and replaced by standard freeway frontage roads. Four hundred twenty-five thousand dollars was budgeted for construction of the project with minor right-of-way acquisition adding \$66,000 to the project cost. When construction is completed on this project the present "at grade" crossing will be closed, thereby eliminating a serious traffic hazard and high accident rate location from our main coast highway.

Project Divided

Farther south in San Luis Obispo County, three construction projects were added on State Sign Route 41 and US 466, one of our main east-west laterals between Paso Robles and the San Joaquin Valley. For purpose of convenient design, budgeting, and construction, this highway development was split into three projects, the first one being an 8.7-mile section of two-lane conventional highway which begins two miles east of Estrella River near Paso Robles and extends to 0.4 mile west of Lucy Brown Road, east of the community of Shandon, bypassing this community on the north side.

The second project extends from 0.4 mile west of Lucy Brown Road to Palo Prieto Road near the area known as Cholame. This is a comparatively small section of 2½ miles requiring an estimated \$350,000 to construct.

The final project in this area involves the construction of approximately six miles of modern two-lane highway on US 466 between the junction of State Sign Route 41 and US 466 near Cholame and extends easterly to the Kern county line. Approximately \$1,100,000 will be required for completion of this important project.

When completed, all three sections will provide the initial two lanes of a future four-lane expressway. Many winding curves and grade deficiencies will be eliminated in this new alignment which will run generally slightly north of the present route.

Improved Access

Farther south in Santa Barbara County a rough and tortuous section of State Sign Route 1 between Lompoc and Las Cruces on US 101 near the Gaviota Pass will be realigned for a distance of approximately three miles, between 1.8 miles north of Ytias Creek and Jalama Road. This project will provide greatly improved access from US 101 to the City of Lompoc and the fast-growing Cooke Air Force Base. This project will require the expenditure of approximately \$1,000,000.

The remaining project resulting from these special federal aid funds is located between Santa Barbara and Carpinteria on US 101 and involves two separated sections of highway. The first or easterly section (this road runs east to west through Santa Barbara) is located at Ortega Hill replacing an existing four-lane undivided highway. Construction of an overcrossing structure at Sheffield Drive and frontage roads between Ortega Hill and Miramar Avenue in Montecito is included in the work on this section. The second or westerly section is located between Park Place and Salsipuedes railroad overhead and involves principally the construction of a complete interchange and separation structure at the existing Milpas Street-US 101 grade intersection.

Overall Picture Provided

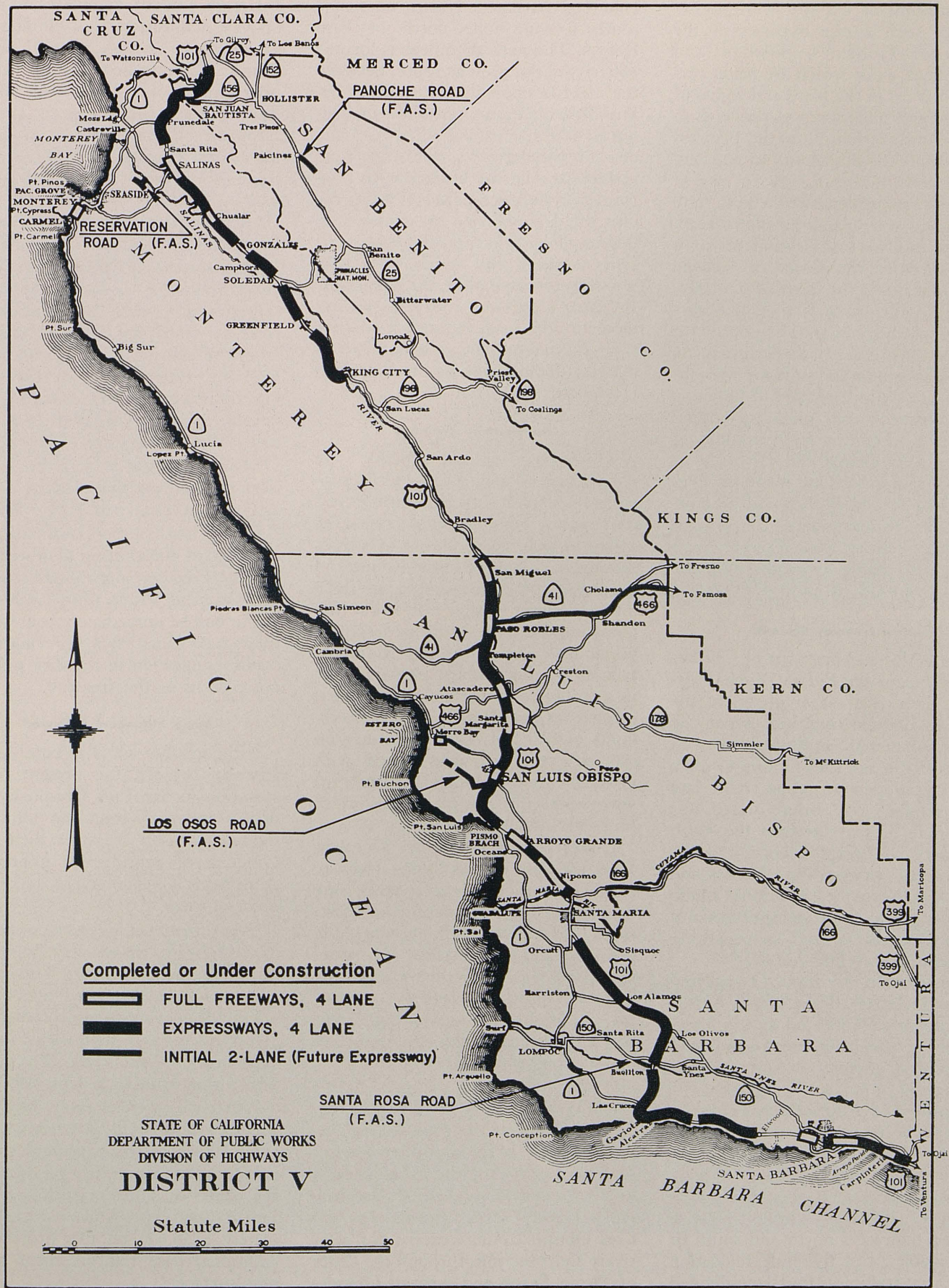
For a detailed account of our construction and planning activities for US 101 in the north section of District V, we refer to the article in the recent July-August issue of *California Highways and Public Works* magazine entitled "Monterey County." To provide an overall picture of this progress a brief summation is included here. Ten miles south of Salinas the two-lane bottleneck through the community of Chualar has now been eliminated, as a complete freeway for one mile in length was completed in May of 1958, providing continuous divided four-lane highways from the Santa Clara county line on the north to approximately 20 miles south of Salinas, just north of the City of Gonzales.

Farther south a new divided four-lane expressway project between the Salinas River south of Soledad and one mile north of Greenfield, 5.8 miles in length, was completed in March of this year at a cost of \$1,145,000. This project included the Arroyo Seco grade separation structure at the northerly end, and provision was made in our design and right of way acquisition for construction of another grade separation structure at Hudson Lane at the southerly end of the project, along with necessary frontage roads to convert this expressway to a full freeway when traffic needs and available funds permit.

Traffic Convenience

Continuing south, we have just completed a divided four-lane highway eight miles in length between the Cities of Greenfield and King City, again with provisions for development to freeway standards when circumstances permit. All three of these projects have nearly eliminated the well-remembered bottleneck produced by the heavy summer truck traffic carrying vegetable produce from the intensely cultivated Salinas area to the City of Salinas for processing and distribution. Through traffic, as well as local traffic, will no longer suffer the inconvenience of following slowly for miles behind slow-moving, produce-carrying truck traffic as has been the case for so many years.

Much planning is being carried on as a prelude to construction of other



vital sections of US 101 in Monterey County such as the bypasses of the Cities of Gonzales, Soledad and Greenfield, all of which are being carried forward in the plans and rights of way acquisition phases as fast as possible. Construction of several projects now awaits the availability of the necessary construction funds.

One such project for which fund allocation was made in the current budget is a 5.8-mile section of highway between the Cities of Soledad and Gonzales in the heart of the vegetable growing area on which construction is just beginning. The contractor has been allowed 275 working days in which to grade and surface this approximate six-mile section of highway and construct two grade separation structures to convey local traffic over the freeway. One structure will be at Camphora-Gloria Road north of Soledad. The second bridge will be constructed at the entrance of the Soledad Medium Security State Prison which will carry traffic to and from the prison from US 101.

New Freeway Opened

In the March-April issue of *California Highways and Public Works* magazine, there is a rather complete analysis of construction and use of the newly completed San Miguel Freeway on US 101 in San Luis Obispo County which was open to public traffic late in November, 1957. Briefly stated, this three-mile project between the south boundary of Camp Roberts and the expressway between Paso Robles and San Miguel provides additional traffic facilities for military transportation at Camp Roberts as well as benefiting the general traveling public.

Construction is virtually completed on the \$3,340,000 Paso Robles bypass freeway project located at the intersection of the main north-south and east-west highways in our central coast area.

Serving Los Angeles-San Francisco traffic, US 101, now passing directly through the main business district of Paso Robles, will be relocated easterly when the project is open for public travel. Connecting existing four-lane divided highways north and south of Paso Robles, this five-mile relocation will carry traffic on four-lane divided

concrete pavement from one mile south to one mile north of Paso Robles. The new alignment is located easterly of the present route, between the main business district and the Salinas River. The project will pass over the Southern Pacific Railroad at each end of the city by means of twin welded steel girder bridges with reinforced concrete decks. Within the city, at 13th Street, the freeway is depressed with local traffic being carried overhead by means of a prestressed concrete thin slab structure. Presence of ground water in this immediate area made construction of a thin slab overcrossing necessary in order to obtain the required vertical clearance.

Old Highway Replaced

This project will also improve State Sign Route 41 connecting the Fresno-Bakersfield area with Paso Robles and the central coast area by replacing approximately two miles of substandard highway between Paso Robles and recently completed projects eight miles in length further east. From that point on, the three projects described previously as part of the additional federal-aid allocation of 1958 will give us a complete modern two-lane alignment from Paso Robles to the easterly limits of San Luis Obispo County on this strategic east-west lateral with provision in the design and right of way width for future expansion to four-lane divided expressway.

Under construction since October, 1956, the Paso Robles bypass freeway has been considerably delayed by late delivery of the long sections of structural bridge steel without which the project could not progress. The structural steel was finally delivered in the middle of June, 1958, and the contractor, A. Madonna Construction Company, has been rushing the project to completion since that time.

Continuous Highway

Completion of the Paso Robles bypass freeway is an important accomplishment providing the traveling public with continuous divided four-lane highway on US 101 throughout San Luis Obispo County except for relatively short sections through the Cities of Pismo Beach and Arroyo Grande.

Design is nearly complete and right-of-way acquisition is well along on the 2.2-mile section through Pismo Beach. This planned project lies approximately one block east of the present four-lane highway through Pismo Beach and by means of on and off ramps will provide easy access to the existing highway for the benefit of local traffic. Existing divided four-lane expressways north and south of town will connect to this freeway.

Through the City of Arroyo Grande construction is presently in initial stages on a 1.3-mile four-lane divided freeway realigning US 101 westerly from the existing four-lane undivided highway extending from the south city limits of Arroyo Grande to about one-third mile south of Brisco Road just north of the city.

Main local traffic will be carried over the freeway by means of bridges at Grand Avenue and Valley Road.

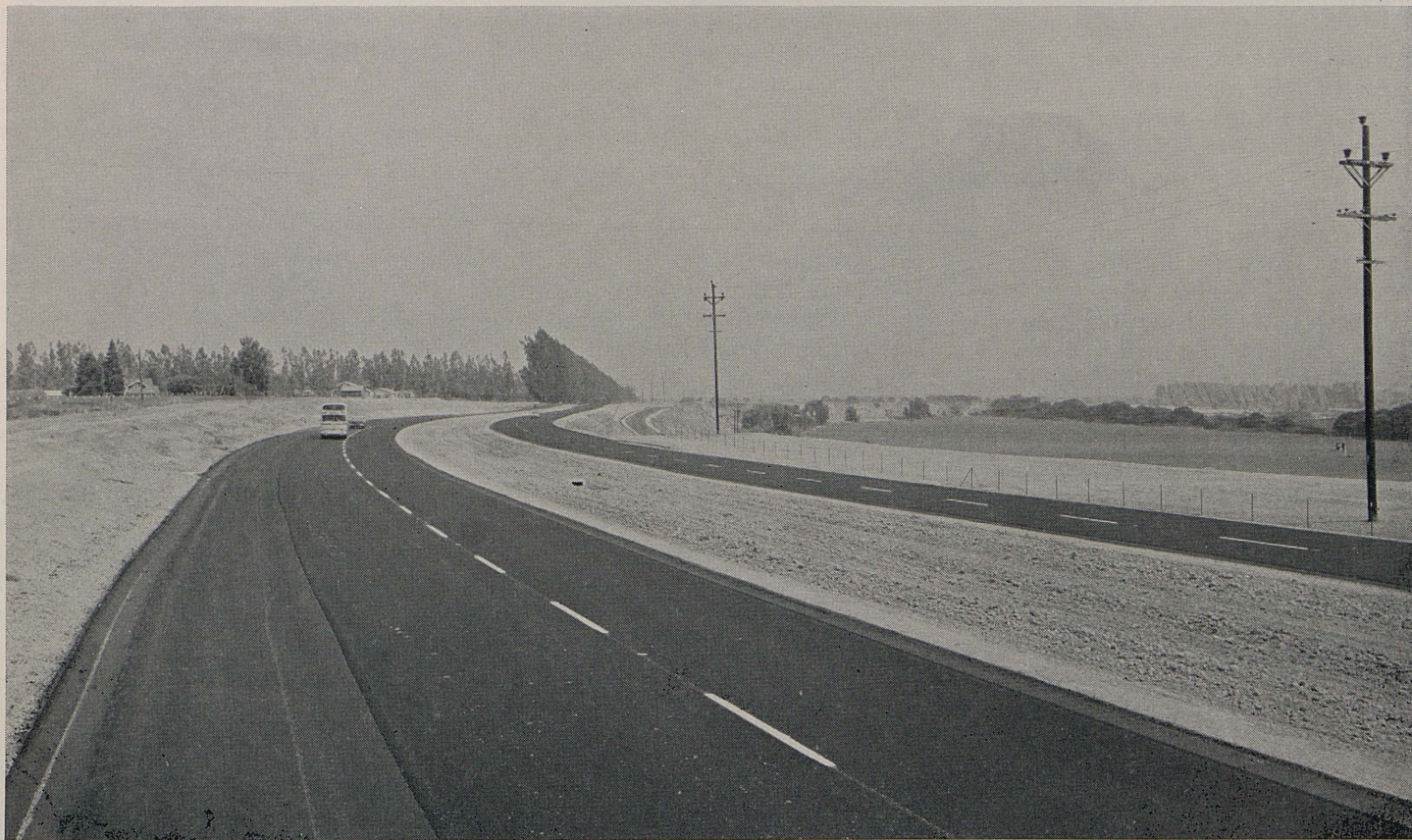
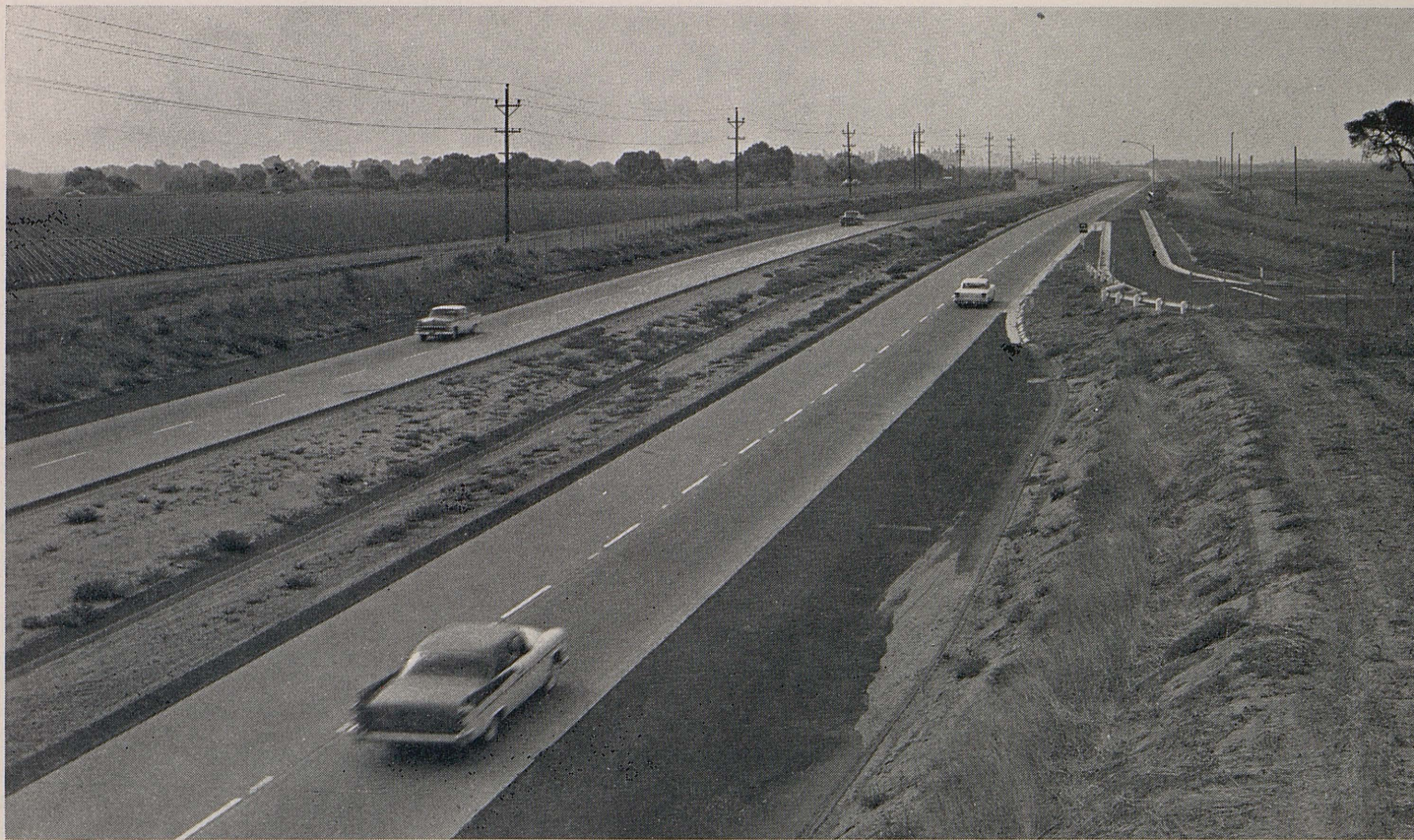
During construction, traffic will continue to use the existing highway until the new freeway southbound lanes are completed at which time southbound traffic will be immediately routed onto these new lanes thus relieving some traffic congestion in the city prior to completion of the freeway.

Same Alignment Followed

Although not actually considered a freeway project, the present reconstruction in San Luis Obispo County of 3.1 miles of four-lane undivided highway on US 101 over the Cuesta Grade is of considerable importance from both an engineering and traffic point of view.

This project begins and is contiguous to a four-lane expressway completed in 1948 at Camp Fremont. The project ends at Cuesta Overhead which joins a four-lane expressway completed in 1949, and follows essentially the same alignment as the original roadbed which was constructed in 1937-38.

Adverse superelevation on many curves, extensive fill settlements, structural failure of the pavement and resulting high maintenance costs were the principal deficiencies which warranted the expenditure of approximately \$550,000 on this project, for additional base reinforcement and a new surface.



UPPER—Completion of this new expressway between Greenfield and King City on US 101 in Monterey County has eliminated the congestion caused in the past by heavy local agricultural truck traffic. LOWER—Another scene on the new expressway between Greenfield and King City. The roadway follows the Salinas River (right).

Approximately 40 horizontal drains were placed in existing cut banks by Headquarters Materials and Research Department between 1952 and 1957. Such work was performed to relieve hydrostatic pressure which was responsible for much of the fill settlements and slide problems which had developed on this road. As the new roadbed is at an elevation greater than the outlet of these drains, it was necessary to collect the waters from these drains in a system of pipes, leading to and discharging into the natural drainage channels. In addition, approximately 6,000 feet of perforated metal pipe underdrains are being installed to prevent saturation of the roadbed in wet, unstable areas.

No Detour Available

It was necessary to carry the heavy traffic on this important road through the construction, since no detour was available. To accomplish this it was necessary to restrict the contractor's operation to half of the four-lane width, carrying traffic on the opposing two lanes and then switching traffic over to the completed two-lane portion while the other half was constructed. Minor traffic delays are inevitable on a long steep grade of the nature under these conditions due to the many slow-moving, heavy vehicles but every effort to shorten the time of inconvenience was made by pushing the construction operations in every way possible. Good progress has been made and the work has just been completed this month in accordance with the contract time allotments on the project.

Farther south in Santa Barbara County, construction of a new six-mile divided four-lane project bypassing the Town of Los Alamos south of Santa Maria has also just been completed.

This new expressway, passing through grain and flower seed farms, rolling hills and grazing lands, bypasses this community, a former stop on the old, now abandoned, narrow gauge Pacific Coast Railroad. The community presently serves the farms and cattle ranches throughout the surrounding area.

The south terminus of this project joins a five-mile length of expressway

completed in April, 1955, and the north end of the project is contiguous to a nine-mile section of divided four-lane expressway leading to the outskirts of Santa Maria which was completed in 1956.

Further evidence of the development of divided four-lane highway on US 101 in Santa Barbara County can now be seen north of Buellton where full construction operations are under way to develop the existing two-lane highway from one mile north of Buellton to the old Pacific Coast Railroad station of Zaca near the turnoff to the San Marcos Pass on State Sign Route 150. This five-mile four-lane divided highway project is being presently graded and will be paved with portland cement concrete and plant-mixed surfacing. Work on this \$940,000 project should be completed by March, 1959, providing divided four-lane highways through this central Santa Barbara County area from the southern outskirts of Santa Maria to Buellton.

Spectacular View

Passing southwest through the historic Gaviota Pass, the traveler is offered a spectacular combination of views of the Pacific Ocean, the Santa Barbara Channel Islands to the west, and the steep sandstone mountains to the east.

Construction was completed in January of this year on 2.3 miles of divided four-lane expressway along this scenic coast between Refugio Canyon and Refugio Beach Park and the railroad station point of Tajiguas some 20 miles west of Santa Barbara.

The easterly terminus of this project near Refugio Beach connects to an existing four-lane highway with a narrow median. This highway was constructed in 1942 and plans are being prepared to bring this section up to modern standards as soon as available funds permit. The westerly terminus of this newly constructed project joins a modern four-lane expressway which was completed in 1957. It leads to Gaviota Pass.

Popular With Tourists

Closer to Santa Barbara, a 9½-mile divided four-lane expressway project is now rapidly approaching comple-

tion between the station points of Elwood and Orella. This project begins about 10 miles west of Santa Barbara at what is locally referred to as the Elwood Wye and extends west between the Pacific Ocean and the foothills of the coast range. Completion of this project will provide a continuous four-lane divided highway from Elwood to the Santa Ynez River bridge at Buellton, a distance of approximately 34 miles.

This project follows the general alignment of the previous two-lane highway through this scenic coastal area. This area is also quite popular for recreation-seeking tourists as the El Capitan State Park and Refugio Beach County Park lie adjacent to the highway.

The project consists of constructing two new lanes for northbound traffic, as well as structural repairs to portions of the existing pavement, with two new lanes being constructed in the El Capitan area for southbound traffic. Three grade separations and five grade crossings have been completed, with the work being done to expressway standards. The largest separation structure is a 230-foot T-beam bridge across Dos Pueblos Creek. Local traffic moves beneath the highway at this point. There is also a 28-foot slab bridge at Las Llagas Canyon and twin T-beam bridges at El Capitan Canyon.

The terrain through which this expressway passes is quite rough, with a number of canyons or arroyos extending across the alignment. Seven arch culverts ranging in size from 9 to 17 feet in radius, as well as two large box culverts and a bridge were installed in the various canyons to handle the extensive cross drainage problems. The grading involved 1,750,000 cubic yards of roadway excavation, and 22,000,000 station yards of overhaul. Cuts ranged to 70 feet in depth and fills were up to 60 feet high.

Completion of this \$3,144,000 project is expected in mid-October of this year.

Three-lane Highway Eliminated

Another vital link was added to the ever-expanding chain of divided four-lane highways with completion in November, 1957, of the freeway at the



Traffic was routed along the completed two-lane section during reconstruction of US 101 on the Cuesta Grade in San Luis Obispo County. The winding road on the slopes to the left is the pre-1937 highway.

west city limits of Santa Barbara on US 101.

Completion of this project eliminates approximately three miles of outmoded three- and two-lane highway which could no longer meet the demands required for traffic safety of increased vehicular volume. These deficiencies became extreme, partially as a result of greatly accelerated growth of the City of Santa Barbara itself.

Favorable weather during the fall and winter of 1956 and 1957 permitted excellent progress on the required work with a minimum inconvenience to the traveling public. A total of seven major structures represented a good portion of the project.

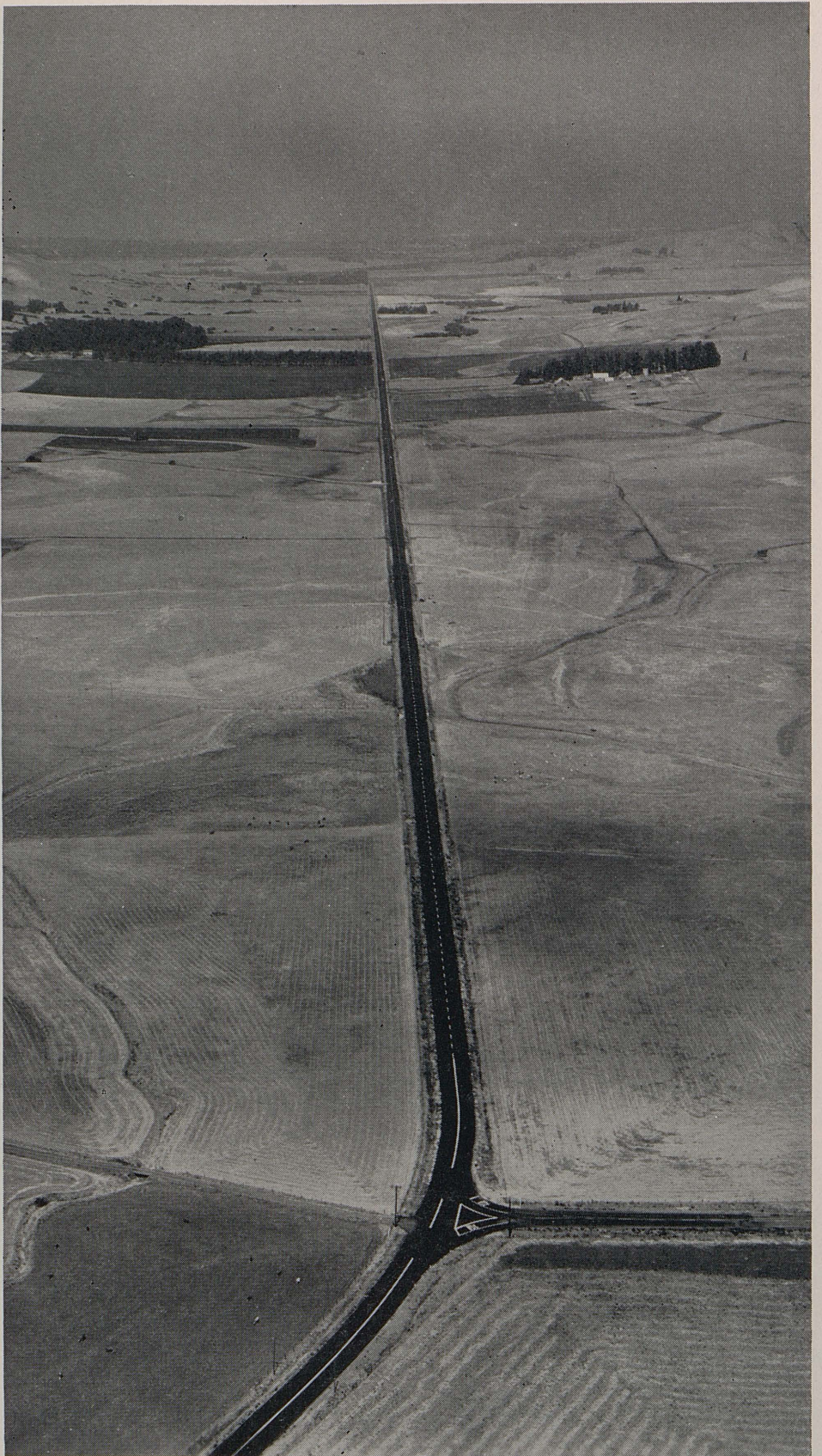
A pedestrian overpass, a precast reinforced concrete structure, was constructed at Junipero Street near the easterly end of the project primarily for the use of school children crossing the railroad and freeway at this point.

Large Interchange

The Las Positas overcrossing and the Las Positas overhead are two adjoining structures of reinforced concrete. They provide access to and from several residential sections extending over both the railroad and freeway lanes. The large State Street-Route 80 and Route 2 interchange structure was also of reinforced concrete while the structures at La Cumbre Road were reinforced decks on steel girders.

It is interesting to note that the State Street overcrossing has eliminated the first traffic-actuated signal in Santa Barbara County. This intersection, known locally as the Hollister Wye, was constructed in May, 1947. This new separation structure provides safe crossing over the freeway for Hollister Avenue-State Street traffic to and from the town of Goleta and the Santa Barbara Municipal Airport, and the newly constructed scenic campus of the University of California at Santa Barbara.

Close co-operation of the Southern Pacific Railroad was essential in the construction of all these structures and the railroad co-ordinated the movement of rail traffic through the construction area and co-operated in



This newly constructed county road between San Luis Obispo and Baywood Park on the coast serves the commuting traffic between these two communities as well as the farms and ranches along the route. Although the highway visible in the picture is absolutely straight, it curves in the distance and heads through the hills to the left.



This expressway under construction south of Santa Barbara is another link in the chain of improved sections on US 101. In this photo, the new lanes have been completed and are being used by traffic while the old roadway to the left is being reconstructed to expressway standards.

eliminating delay to railroad traffic and freeway construction progress.

Central Switchboard Used

The railroad company provided a central signal and communication control point. A central switchboard was provided at Los Positas Overhead and telephones were placed at the bridge construction sites. Warning lights were circuited into the central switchboard so that the telegraph operator could be warned of the approach of rail traffic several miles in advance. With this warning, construction crews could be properly alerted so that they could be clear of the tracks during the rail traffic movement. In an emergency, the telegraph operator could engage appropriate switches in the central switchboard which would turn outlying signal blocks "red," thus, stopping trains before they could enter the construction zone.

Total construction cost of this important freeway link amounted to \$2,567,000, exclusive of landscaping and erosion control which is being completed this winter at an estimated cost of \$116,000, thus beautifying the freeway entrance into this scenic city.

This discussion of the four-lane divided highway projects under way or completed may create the impression that the job of constructing divided four-lane highway on US 101 throughout the district is virtually completed. Actually, there is much to be done yet

in achieving this worthwhile objective. Design plans are in various stages of development projected over a period of years to achieve this goal with several projects ready for construction as soon as funds become available.

Cuyama Road Relocated

Many other large and important projects have been under construction this year off US 101 on important lateral state highways. Probably one of the most exacting of these lateral construction projects is the complete relocation of eight miles of a two-lane narrow, twisting, substandard portion of State Sign Route 166 following along the Cuyama River and referred to locally as the Cuyama Road. This facility connects US 101 north of Santa Maria with the San Joaquin Valley in the vicinity of Maricopa. The new alignment roughly parallels the Cuyama River through the Santa Lucia Mountain Range in the Los Padres National Forest.

The reason for this relocation at this time was the construction of Twitchell Dam by the Bureau of Reclamation on the Cuyama River near its confluence with the Santa Maria River. The reservoir created by this dam will subject five miles of the existing crooked highway to intermittent inundation and thus requires complete relocation. The additional three miles of the job is being constructed as a part of the

project to improve the substandard alignment of the present facility.

The new facility will have a 28-foot width roadbed in excavation and 34-foot width on embankment. The highway is designed for speeds of 50 miles per hour with maximum grades of 6 percent and minimum radius of curves of 850 feet. Anyone who has traveled on this road at any time will realize instantly what an immense improvement this will be over the existing alignment.

Welded Bridges Built

Construction involves an estimated 1,500,000 cubic yards of roadway excavation, over 34 million station yards of overhaul and 265,000 cubic yards of ditch and channel excavation in four major channel changes for the Cuyama River and Alamo Creek.

The new alignment crosses the Huasna River, Alamo Creek, and Cuyama River via composite welded bridges on reinforced concrete piers and abutments supported by steel piles and steel footings. The largest structure, the Huasna River bridge, consists of nine spans of a total length of 1,570 feet to be constructed on an 1,100-foot radius. Piers range in height from 60 to 136 feet. For this reason, the contractor has elected to use the slip-form method to construct the piers on the Huasna River and Alamo Creek bridges. Each pier will be poured continuously at a rate of one foot per

hour. The pier forms are raised by means of a hydraulic jack which are supported by rods that are embedded in the pier. Under present plans, this project will be completed in the fall of 1959.

Construction of 3.1 miles of expressway on Sign Route 1 between Pennington Creek just west of Camp San Luis Obispo and the eastern edge of Morro Bay is now in the initial stages. When completed, the project will provide the initial two lanes of a future four-lane expressway to a point 0.2 mile west of the rural Banning School and a four-lane expressway from that point to the easterly edge of

Morro Bay, where the project will be in transition to two lanes just east of Bay Street in that community. The new highway will be on improved alignment in the same general location on the existing route, but several dangerous curves will be eliminated and a wider traveled way will be provided. At several locations the existing highway will be available to motorists passing through the area until completed portions of the new project are opened.

Safe Entrance Provided

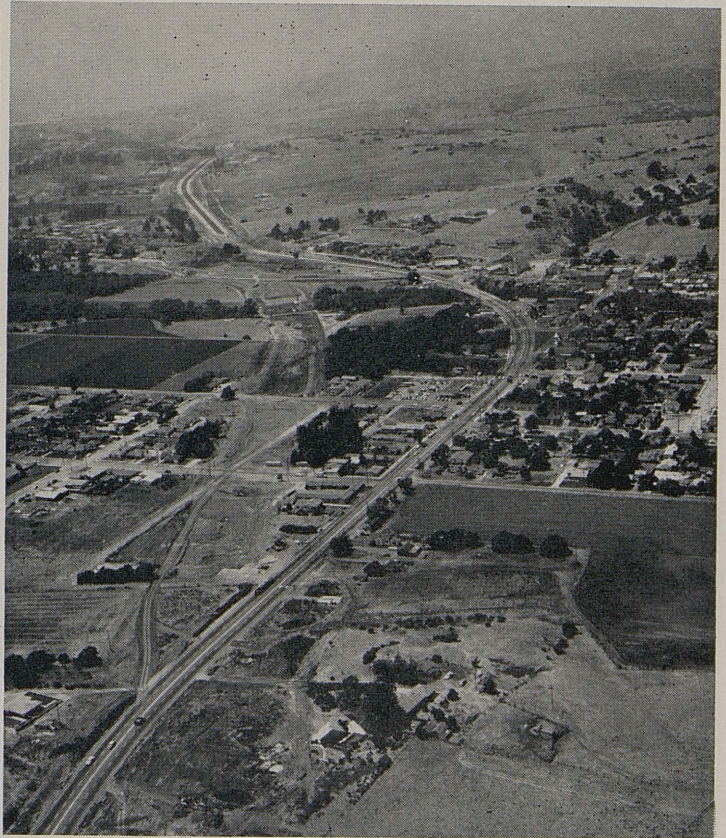
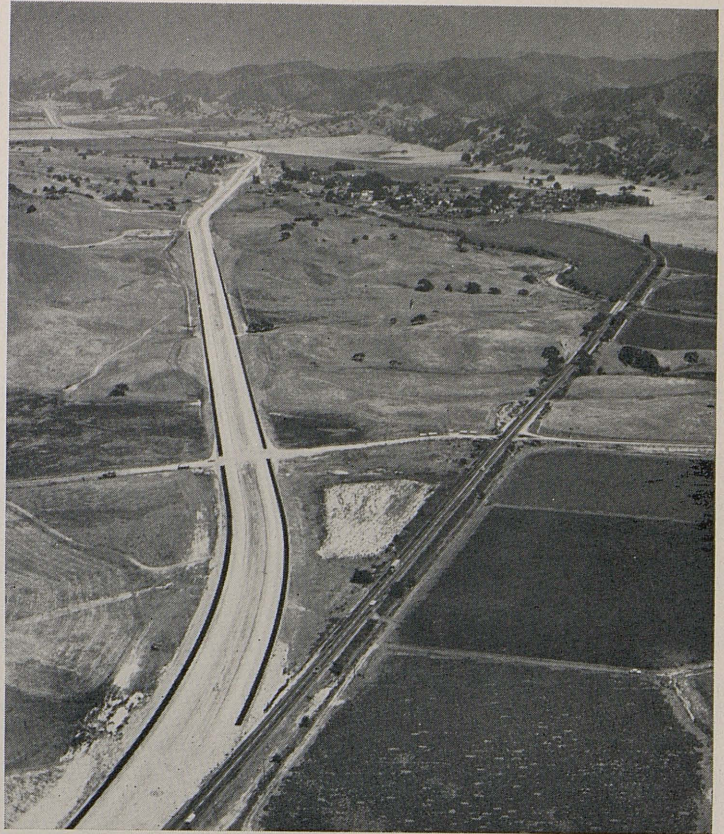
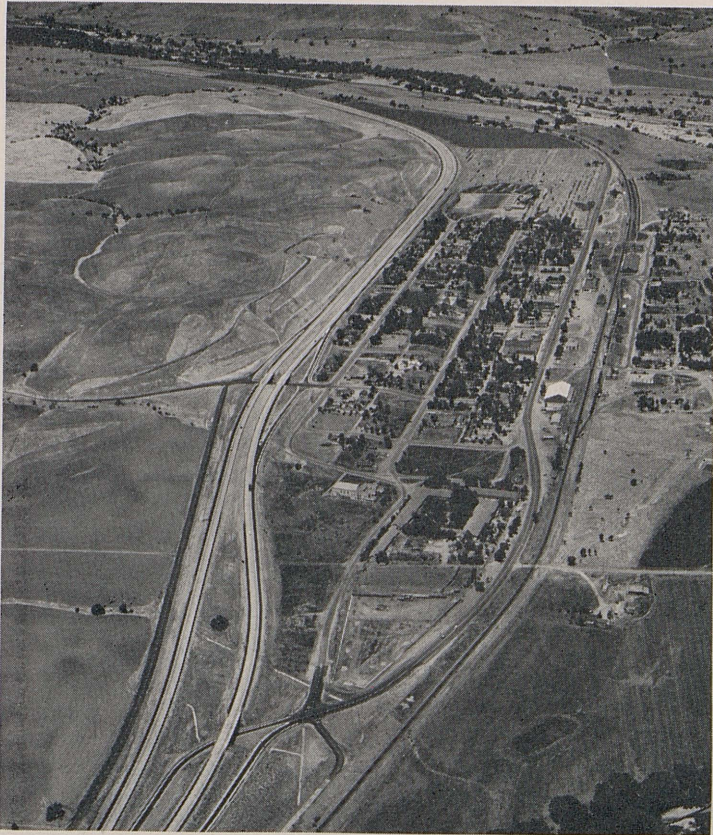
At the intersection of State Sign Route 1 and the Baywood Park Road,

a four-lane bridge will be constructed over Baywood Park Road, thus providing safe, easy entrance and exit from this road onto State Sign Route 1.

Construction of this project, which will cost approximately \$1,165,000, will be completed in early 1959. This project is the first step in developing the substandard coast highway from San Luis Obispo to Morro Bay and from Morro Bay to San Simeon where the fabulous and unique Hearst Castle, now a state historical monument, is located. This monument was opened to the public early in June of this year, and traffic to and from the castle has increased beyond expectations.



Clearing and grading for the relocation of Sign Route 166 along the Cuyama River can be seen as a lighter line following the general location of the present highway in this aerial photo



UPPER LEFT—Looking north on the freeway bypass of San Miguel. Mission San Miguel is the L-shaped group of buildings in the center foreground. UPPER RIGHT—The Los Alamos Bypass in Santa Barbara County, looking south. The project connects with previously completed expressways north and south of the town. LOWER LEFT—A view southward of the Paso Robles Bypass. The twin bridges in the foreground cross the old highway and the Southern Pacific railroad tracks. LOWER RIGHT—Clearing and grading for the freeway project through Arroyo Grande can be seen left center. Present US 101 goes through portions of the business district to the right.



Relocation of Sign Route 166 because of the construction of Twitchell Dam and eventual flooding of the present highway by the reservoir has required several large cuts and fills through rugged mountain terrain

Further development of this section of the coast highway will continue as soon as funds can be made available.

In addition to the state highway projects we have discussed, the cities and counties in District V who use a portion of our state gas taxes have been engaged in important and highly useful highway projects which should not be overlooked.

Modern Rural Highway

One good illustration is the federal-aid secondary project on the county road in San Luis Obispo known as Los Osos Road. This county road, now a modern rural highway used by local residents and out-of-town visitors taking advantage of the county's nearby recreation areas, was completed in May of this year.

The project, 8.3 miles in length and costing \$356,577, begins at US 101 and extends westerly via French Road and Los Osos Road to the easterly edge of the community of Baywood Park. Work consisted of light grading within the existing right-of-way stand-

ard surfacing work, the construction of two multiple reinforced concrete boxes and widening one existing bridge.

In Santa Barbara County work is now well under way on the Santa Rosa County road improvement project using federal, state and county matching funds. Division of Highway employees are supervising construction work. This 6.5-mile construction project, costing an estimated \$438,500, will improve the alignment, roadbed and service of this highway connection between the City of Lompoc and the community of Buellton on US 101.

Matching Funds Used

In Monterey County construction was completed in May on the important 2.8-mile Reservation County Road and Davis Road improvement project. This project, involving the expenditure of \$197,691 of federal, state and county matching funds, improved the alignment, roadbed and surfacing of an important access road to the U. S. Army permanent facility at Fort Ord

as well as providing a modern county road for use of local civilian population.

Federal, state and county matching funds were also used to good advantage to grade a new route called Panoche Road between the small community of Paicines on State Sign Route 25 and the Cottonwood County Road junction in San Benito County. This area, largely devoted to cattle ranching, is also near oil exploration sites and will be put to very good use by local people in this sparsely populated county. This \$82,000 project was begun in October of 1957 and was completed late in May this year as operations were halted for some time due to the heavy rains of last winter. However, through the excellent cooperation of county employees, the roadbed was well enough maintained to prevent damage to the roadbed by the rains and resultant runoff.

Many other projects, large and small, in the counties and cities that make up our district have been brought

... Continued on page 64

Stanislaus County

*First Major Project Completed
In \$12,000,000 Bond Program*

By ELLIS R. DELBON, County Road Commissioner

MITCHELL ROAD, River Road, Snowden Avenue, El Vista Avenue, and Old Oakdale Road, totaling 11.5 miles, are now consolidated into one modern federal-aid secondary two-lane highway serving the East Modesto area from Riverbank to Ceres with direct access to the Modesto City-County Airport and the East Modesto industrial area.

This modern highway was originally proposed by the Stanislaus County Road Department in 1953 and recommended on the basis of known

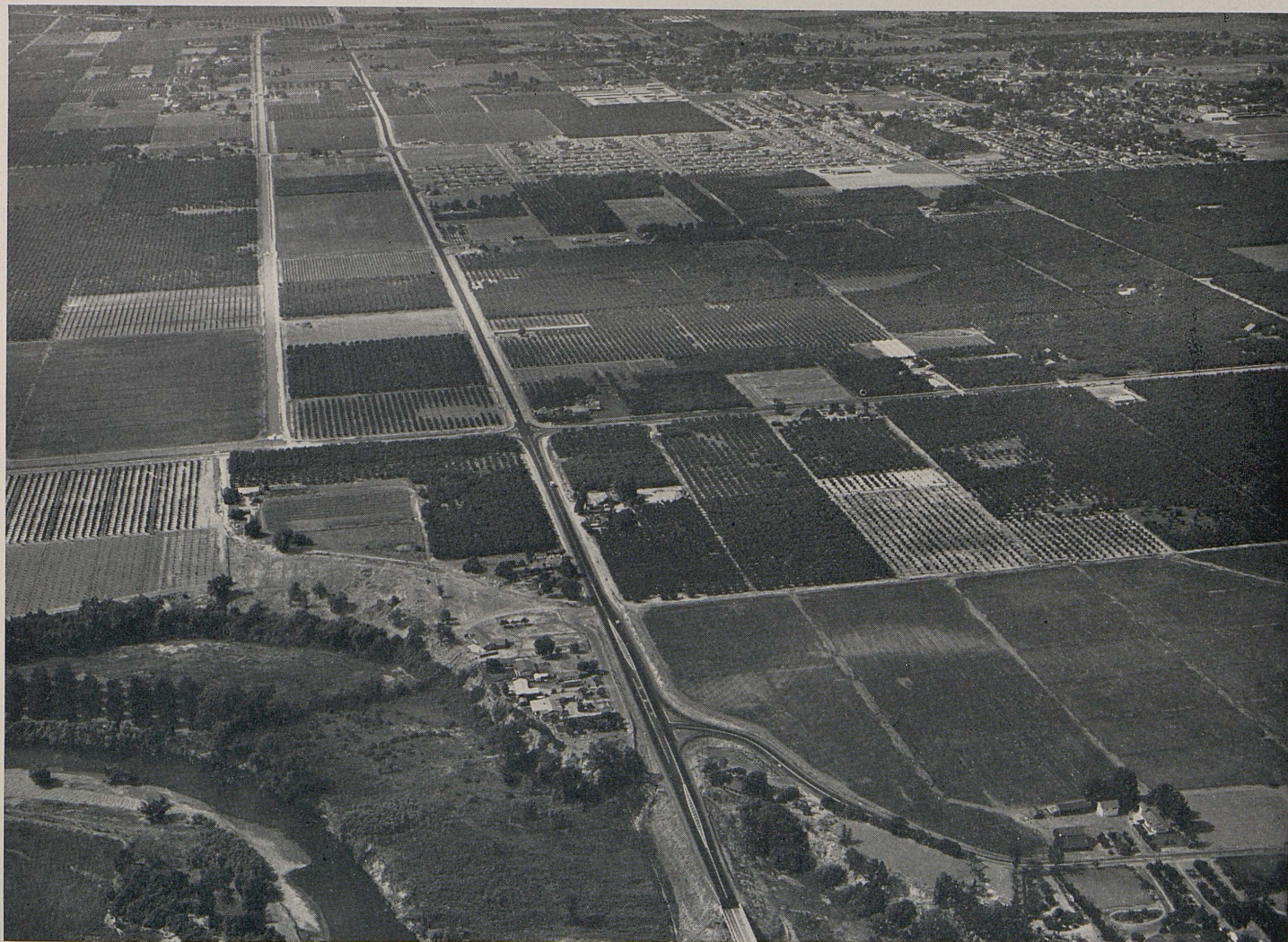
traffic desires in the East Modesto-Ceres area. Subsequent public hearings were conducted and the route established by the board of supervisors as the East Modesto Road from US 99 Highway at Mitchell Road northerly to State Route 13. In 1955, at county request, the U. S. Bureau of Public Roads approved this proposed highway as Federal-aid Secondary Route 1226.

All three contracts for construction of this route were awarded by the State Department of Public Works

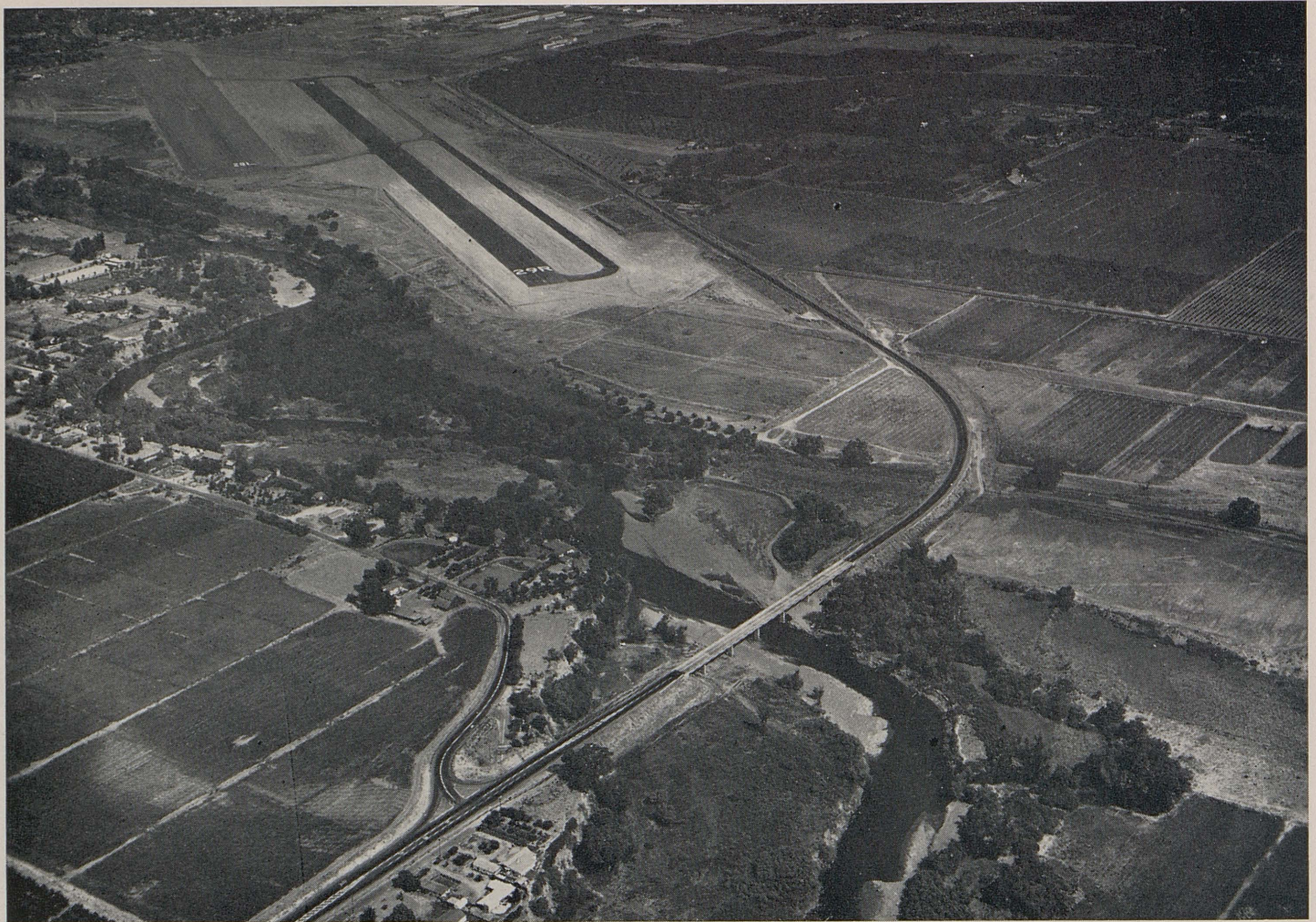
and construction was supervised by state and county personnel under county-state agreement and financed with federal, state and county funds.

To provide for ultimate four-lane improvement, 90-foot rights of ways were negotiated for by the road department at a cost of \$140,000 for property taken and severance damages.

The first and northerly section of new construction begins at the south end of Old Oakdale Road and includes a reinforced concrete girder bridge



An aerial view of East Modesto Road looking south from the Stanislaus River. The highway will eventually connect with US 99 southeast of the City of Ceres.



A view of East Modesto Road (FAS Route 1226) looking in the opposite direction of the photo on the previous page showing the bridge across the Stanislaus River and the City of Modesto in the distance

over Dry Creek 206 feet in length with two five-foot sidewalks and 28-foot roadway consisting of three spans supported on reinforced concrete piers, and abutments on concrete pile foundations. Included in the same contract was one-half mile of two-lane roadway involving construction of graded roadbed with 45,000 tons of borrow, untreated rock base and plant-mixed surfacing.

The official opening of this section on October 26, 1956, created a facility which has proven its importance by the periodic traffic studies conducted by this department. Prior to opening this section, the best available traffic information indicated a possible 2,500 vehicles per day volume by the end of the first year and 4,000 vehicles per day in five years. The actual average volume during the first eight days exceeded 2,500 vehicles per day and one

year later the average count over a period of four days was 4,900 vehicles per day.

The second section consists of two miles of two-lane highway construction from Snowden Avenue to Hatch Road and a reinforced concrete box girder bridge over Tuolumne River 656 feet long with a 28-foot roadway clearance between curbs.

This project was completed on September 13, 1957, two months ahead of schedule by Contractors M. J. Ruddy and Son, and Dan Caputo with Bob Wright of the State Bridge Department as resident engineer.

The importance of this section was predetermined by known traffic desires in the area since it would be a direct route from Ceres and the vast agricultural area east of US 99 Highway to the Modesto City-County Air-

port and the East Modesto industrial area.

The third and final section completed in July consists of constructing two miles of two-lane highway over the existing Mitchell Road, from Hatch Road south to US 99 Highway, by grading, paving and reconstructing several existing inverted siphons which serve to irrigate the adjacent agricultural lands.

This 4.7 miles of modern highway from Service Road to Scenic Drive was completed at an approximate total cost of \$860,000 and is the closing link of the first major cross-county highway improvement to be completed in a planned 10-year program of major county highway improvements which includes construction of 11 major bridges and about 65 miles of federal-aid secondary highway improvements at an estimated cost of \$12,000,000.

Cost Index

Construction Costs Continue Downward
Trend During Second Quarter of 1958

By J. P. MURPHY, Assistant State Highway Engineer
H. C. McCARTY, Office Engineer
LLOYD B. REYNOLDS, Assistant Office Engineer

THE California Highway Construction Cost Index for the second quarter of 1958 continued the downward course and at about the same rate established during the previous quarter. The index now stands at 231.0 (1940 = 100), which is 10.8 index points or 4.5 percent below the first quarter. It is the lowest point reached during the last two years and it is 35.9 points or 13.5 percent below the same quarter in 1957.

Past experience has shown that low bid prices generally result when there is a high average in the number of bids received. However, during the second quarter of 1958 bid prices were below the level of the previous period, while at the same time a sharp decrease occurred in the average number of bidders per project in comparison with the first quarter. The average number of bidders per project dropped to 5.4 in the second quarter after an average of 9.3 was established in the first quarter. It is generally considered that an average above five is in the realm of good competition.

The average was maintained above this level in the second quarter by the bidder interest shown on the many important and high value projects placed under contract during this period. Previous recent averages are: 5.5 for the second quarter of 1957; 6.6 for the first six months of 1958; and 6.9 for the 1957-58 Fiscal Year beginning July 1, 1957. Tabulations showing the average number of bidders arranged according to project value brackets for the semiannual and annual periods are included with this release.

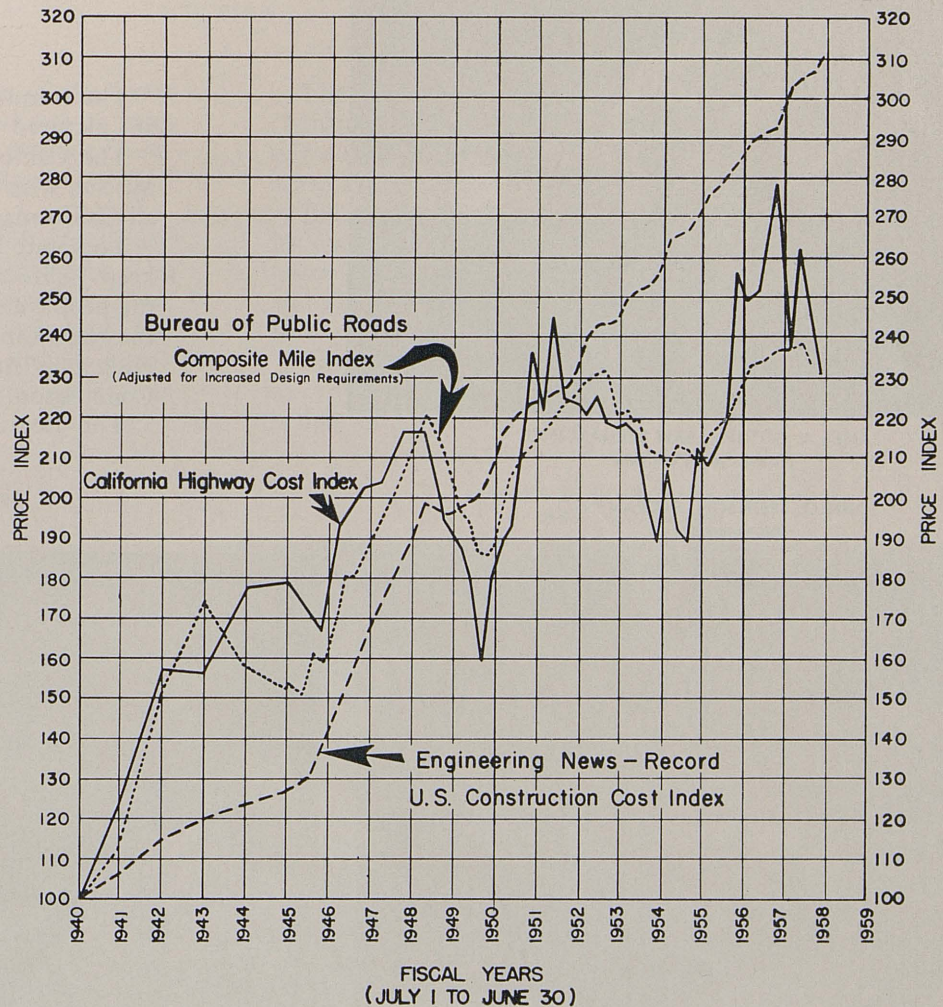
The 197 representative statewide projects for which bids were opened during this quarter and which provide the data for preparation of this quarter's index are distributed as follows:

Range	Number of projects	Value of projects
Under \$50,000	89-45.2%	\$2,150,722- 3.3%
\$50,000 to \$100,000	37-18.8%	2,766,490- 4.2%
100,000 to 250,000	38-19.3%	5,476,456- 8.4%
250,000 to 500,000	12- 6.1%	4,081,675- 6.3%
500,000 to 1,000,000	6- 3.0%	4,142,995- 6.4%
1,000,000 to 2,500,000	8- 4.1%	11,184,319-17.1%
2,500,000 to 5,000,000	4- 2.0%	12,591,589-19.3%
Over \$5,000,000	3- 1.5%	22,804,419-35.0%

... Continued on page 60

PRICE INDEX CONSTRUCTION COSTS

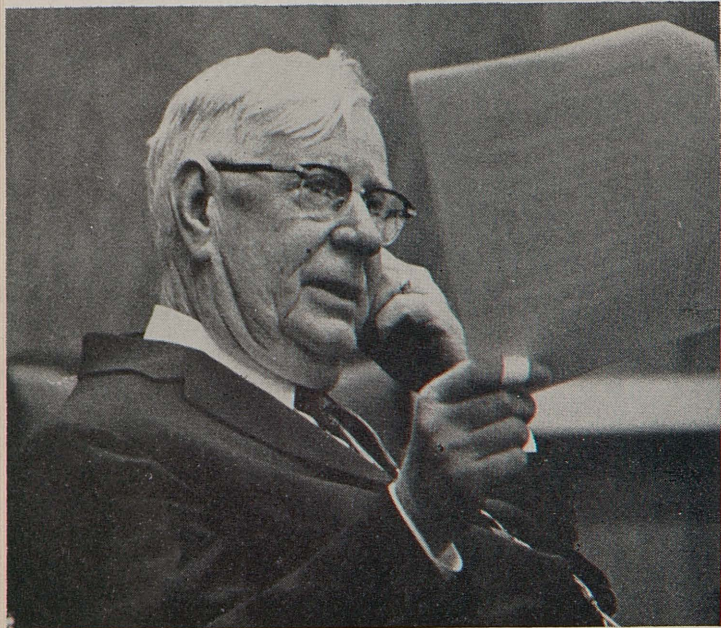
1940 = 100



Citizen Com

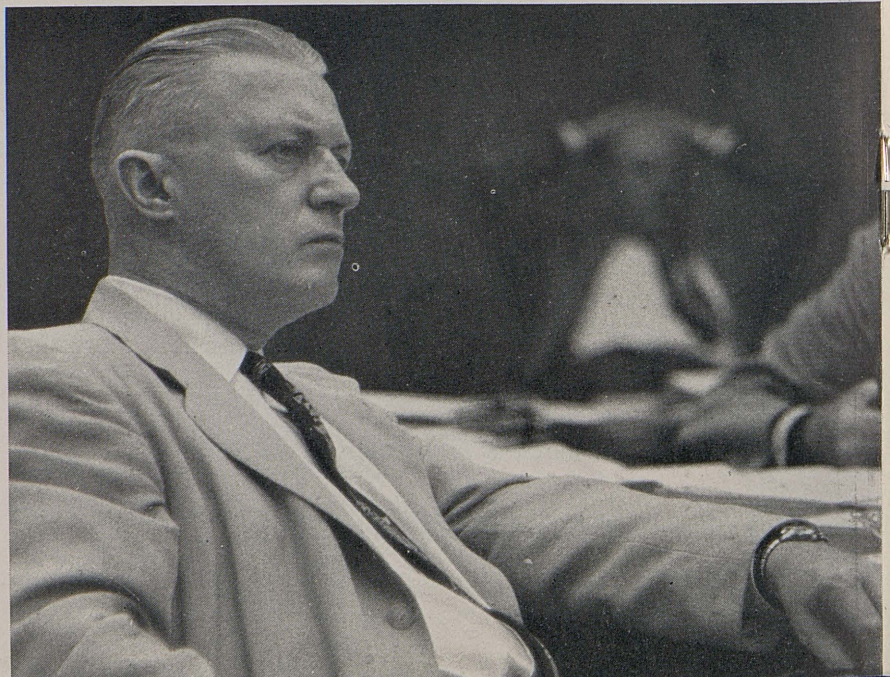


CHESTER H. WARLOW, FRESNO
Retired Banker and Attorney



JAMES A. GUTHRIE, SAN BERNARDINO
Newspaper Publisher

JOHN O. BRONSON, SACRAMENTO
Insurance Broker



FRED W. SPEERS, ESCONDIDO
Newspaper Publisher



The members of the California Highway Commission are pictured at work at one of their monthly meetings.

The California Highway Commission was established by the State Legislature as a citizen group representing all Californians in guiding the State's highway program.

The State Legislature determined that the best way to keep California's expanding highway program close to the people and responsive to their wishes was to delegate the responsibility and authority for highway routing and budgeting to a commission—the California Highway Commission.

The Legislature establishes terminal points for state

ommissioners

California Highway Commission Guides State's Highway Program



CHAIRMAN C. M. GILLISS
Director of Public Works

highways and delegates the determination of the exact routing to the commission. The Legislature sets up rules governing the general apportionment of highway user tax funds and delegates the detailed budgeting to the commission.

The Legislature created a commission of a chairman and six citizen-members, representative Californians who take time from their own businesses to contribute their conscientious counsel to the state highway program. The law arranged the commissioners' terms to provide continuity of membership and policy through changes in state administration.

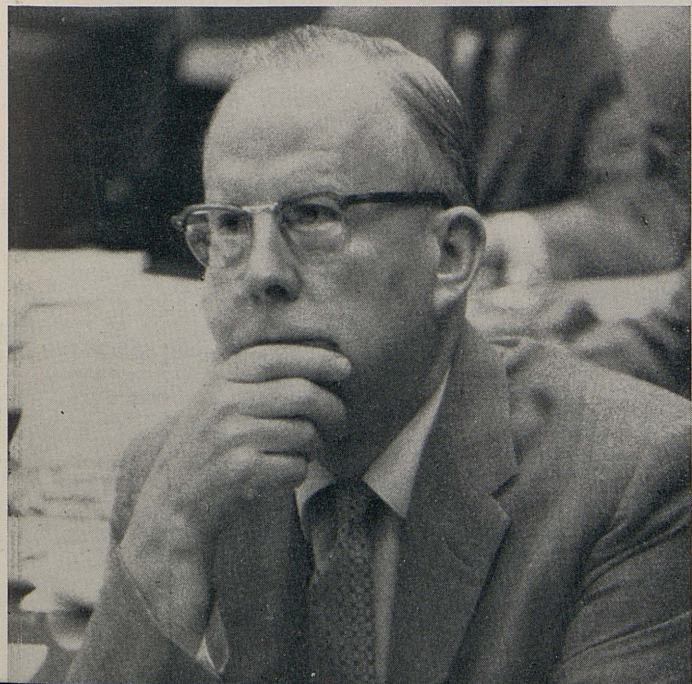
ROBERT L. BISHOP, SANTA ROSA
Automobile Dealer

The Legislature made the Director of Public Works chairman of the commission to provide working liaison between the policymaking commissioners and the operating Department of Public Works.

The commission established procedures providing for its consideration and study of the views of interested citizens, the suggestions of local governmental agencies, and the recommendations of state highway engineers before it approves route adoptions and financial allocations.

The commission reviews these procedures continually in order that it may always keep in close touch with the people of California.

ROBERT E. McCLURE, SANTA MONICA
Newspaper Publisher



Visiting Japanese Officials Discuss Highways, Right-of-way Acquisition With State Engineers



E. M. MacDonald, Assistant Chief Right-of-way Agent for the Division of Highways, explains land acquisition procedure to Japanese officials here on a tour under the auspices of the United States International Co-operation Administration

An 11-man team of Japanese Government officials was in Sacramento during the week of July 14th to 18th as part of a two-month highway study tour of the United States.

The delegation conferred with officials of the State Division of Highways on California's highway financing and right-of-way acquisition procedures.

The tour, which was under the auspices of the United States International Co-operation Administration, also included conferences with highway and transportation officials in Chicago, Detroit, Harrisburg, New York and Washington, D. C.

The group visited the Institute of Transportation and Traffic Engineering, University of California, and toured highways and bridges in the San Francisco area before arriving in Sacramento.

The visiting delegation was headed by Michizo Kishi, president of the Japan Public Highway Corporation, and Taro Ozawa, governor, Yamaguchi Prefectural Government. Others in the party were:

Tatsuo Futamura, submanager of the foreign department of the Industrial Bank of Japan; Hiroyasu Kunitomo, chief of the transportation division of the Highway Transportation Bureau, Ministry of Transportation; Moichi Miyazaki, planning officer of the Japanese Economic Planning Board; Tatsuo Nakagome, assistant controller of the Ministry of Finance; Tetsuya Nambu, chief of the accounting section of the Construction Ministry; Mitsuma Ohgushi, chief of the local road section of the Construction Ministry road bureau; Ryoichiro Tsurumi, chief of the general affairs section of the Construction Ministry road bureau; Fujio Yoshida, assistant chief of the taxation section of the Ministry of Finance taxation bureau; and Junichi Miyauchi, chief of the managing department of the Japan Public Highway Corporation.

Accompanying the visitors was Gerald J. Lally, project manager for the U. S. International Co-operation Administration.

AASHO Agenda for S. F. Meet Announced

Detailed agenda for 35 meetings of operating committees, an opening and closing general session, a field inspection trip and other events of the 44th annual meeting of the American Association of State Highway Officials, to be held in San Francisco December 1st through 5th, are nearly completed and ready for the printer at AASHO headquarters in Washington, D. C.

The complete programs, including names of speakers, specific topics for discussion and lists of technical and other papers will not be available until shortly before the opening of the meeting.

There will be a few pre-session meetings of some committees, including the executive committee, but the official opening will take place at 9 a.m. in the Sheraton-Palace Hotel, the headquarters location, under the chairmanship of President C. R. McMillan, Chief Highway Commissioner of South Carolina.

The opening general session, which will include addresses by members of Congress and other Federal Government representatives, will last throughout Monday.

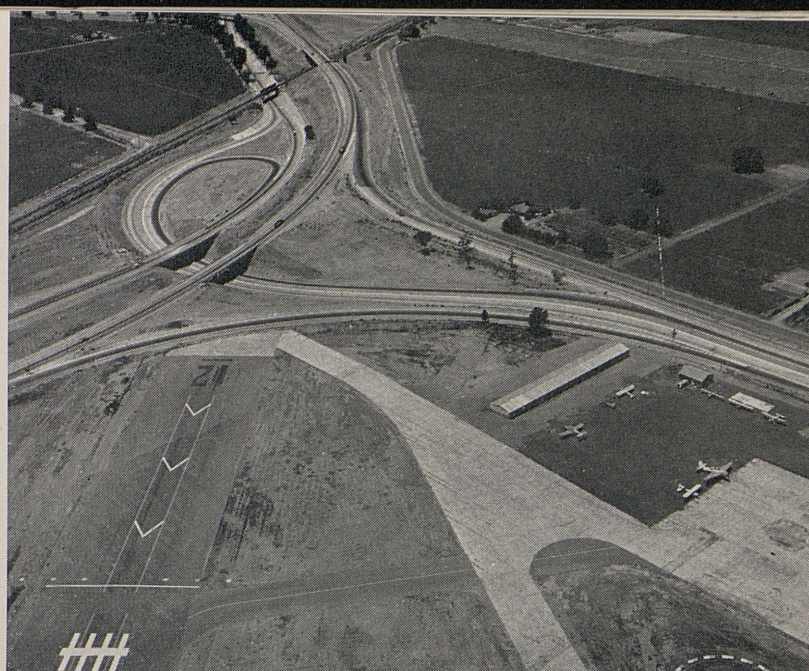
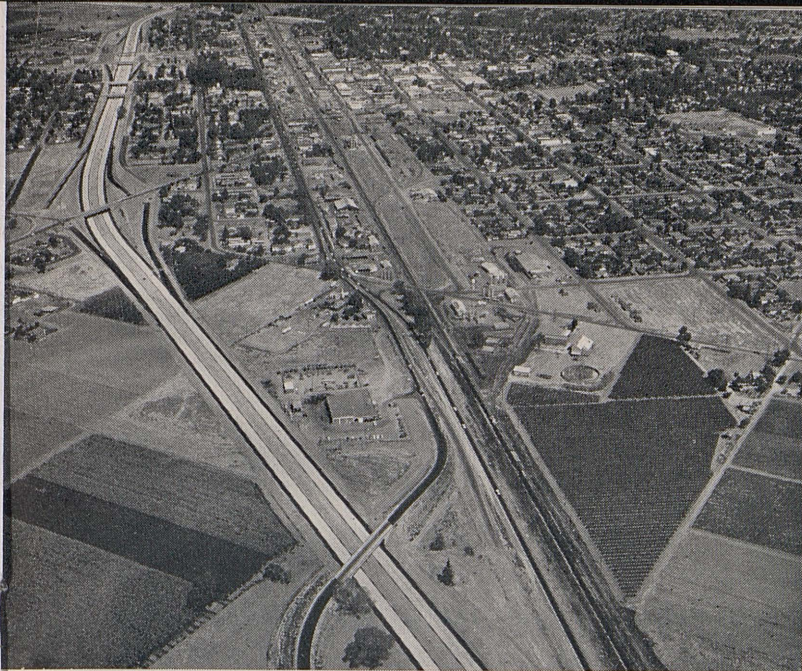
Committee sessions will begin on Tuesday, with all day devoted to them, as will also be the case on Thursday.

Wednesday, December 3d, will be given over to a guided field inspection trip of San Francisco Bay area highways and bridges, including the Carquinez Toll project. Delegates will return in time to attend the family dinner which is a traditional AASHO meeting function.

The final sessions of operating committees will be held on Friday morning, December 5th, to be followed by the concluding general session that afternoon. This session will include reports of all committees, consideration of resolutions, election and induction of new officers and other association business.

Twenty operating committees, most of which will hold two sessions during the meeting, are as follows:

... Continued on page 63



Report From District VI

By W. L. WELCH, District Engineer

DISTRICT VI, located in the southern half of the San Joaquin Valley, includes the Counties of Madera, Fresno, Kings, Tulare and most of Kern. It is bounded by the Coast Range on the west, the Sierra Nevada on the east, and extends from the Los Angeles county line to the Merced county line in a north-south direction. The population of these counties has increased from 479,000 in 1940 to 844,000 in 1957. This population growth has been accompanied by a vehicular registration increase from 179,000 in 1940 to 283,000, an increase of about 60 percent.

Included in this area are many miles of the world's richest farming areas, as well as a number of recreational areas (Bass Lake, Shaver Lake, Hun-

tington Lake, Yosemite National Park, Sequoia National Park and Kings Canyon National Park, to mention only a few), which are fed by the 1,597 miles of state highways in the district. Annual travel on this network is in excess of 2,000,000,000 vehicle-miles and covers extremes from desert areas to the mountainous regions at elevations of 7,000 to 8,000 feet. Fresno, the district headquarters, is the geographical center of the State, 180 miles from San Francisco and 220 miles from Los Angeles.

Following are some highlights of current and recent construction throughout District VI.

US 99

US 99, the most heavily traveled north-south highway in the West, extends from Mexico to Canada and splits District VI almost in the center longitudinally for a distance of 180 miles. This highway is being rapidly developed to full freeway status.

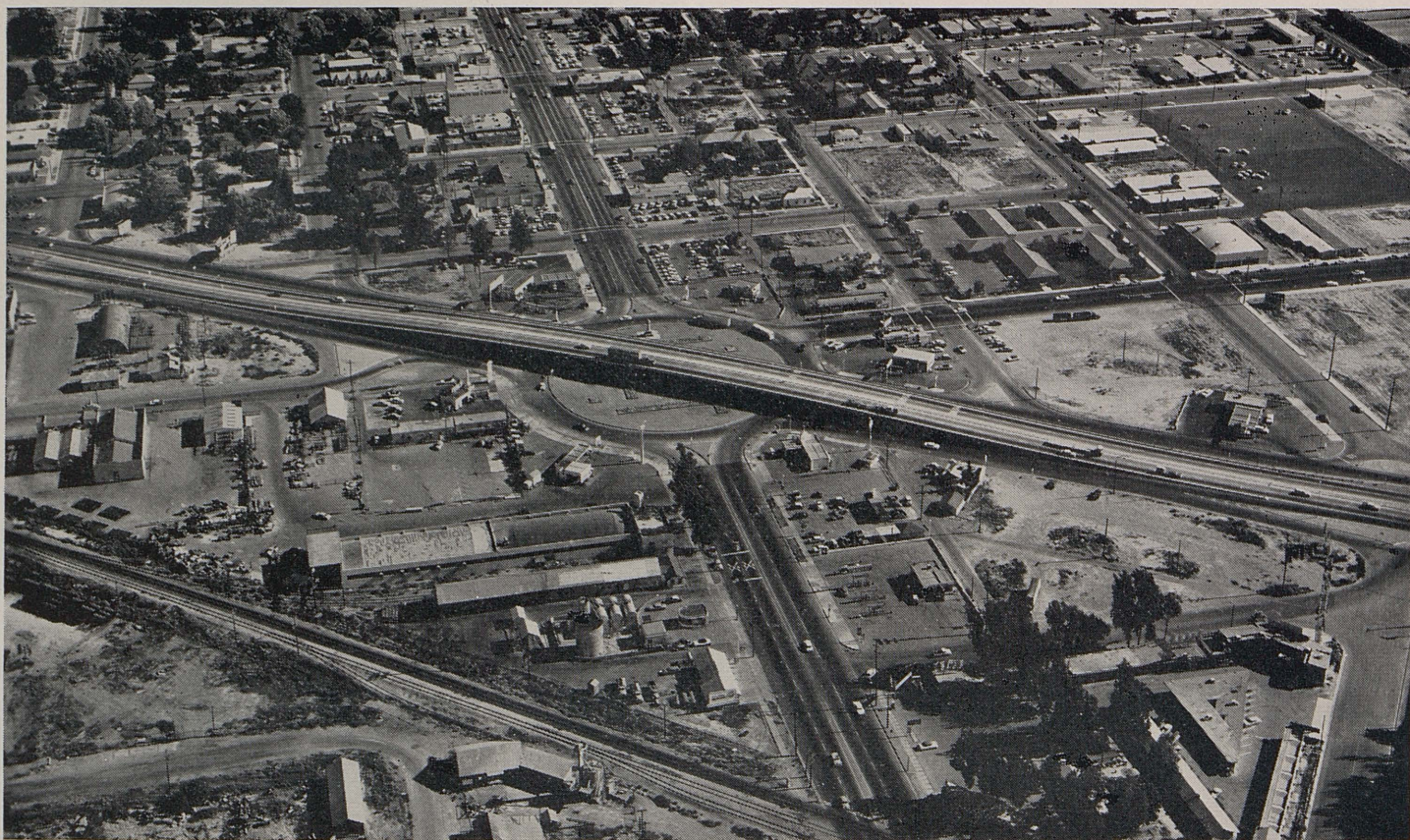
A full freeway in California is a highway having no railroad crossings or highway crossings at grade, separated lanes for each direction of travel, no access to abutting properties, and no left turns.

This is to differentiate a full freeway from an expressway which, in this State, usually means a divided highway with restricted access to abutting properties and having some street or road crossings at grade.

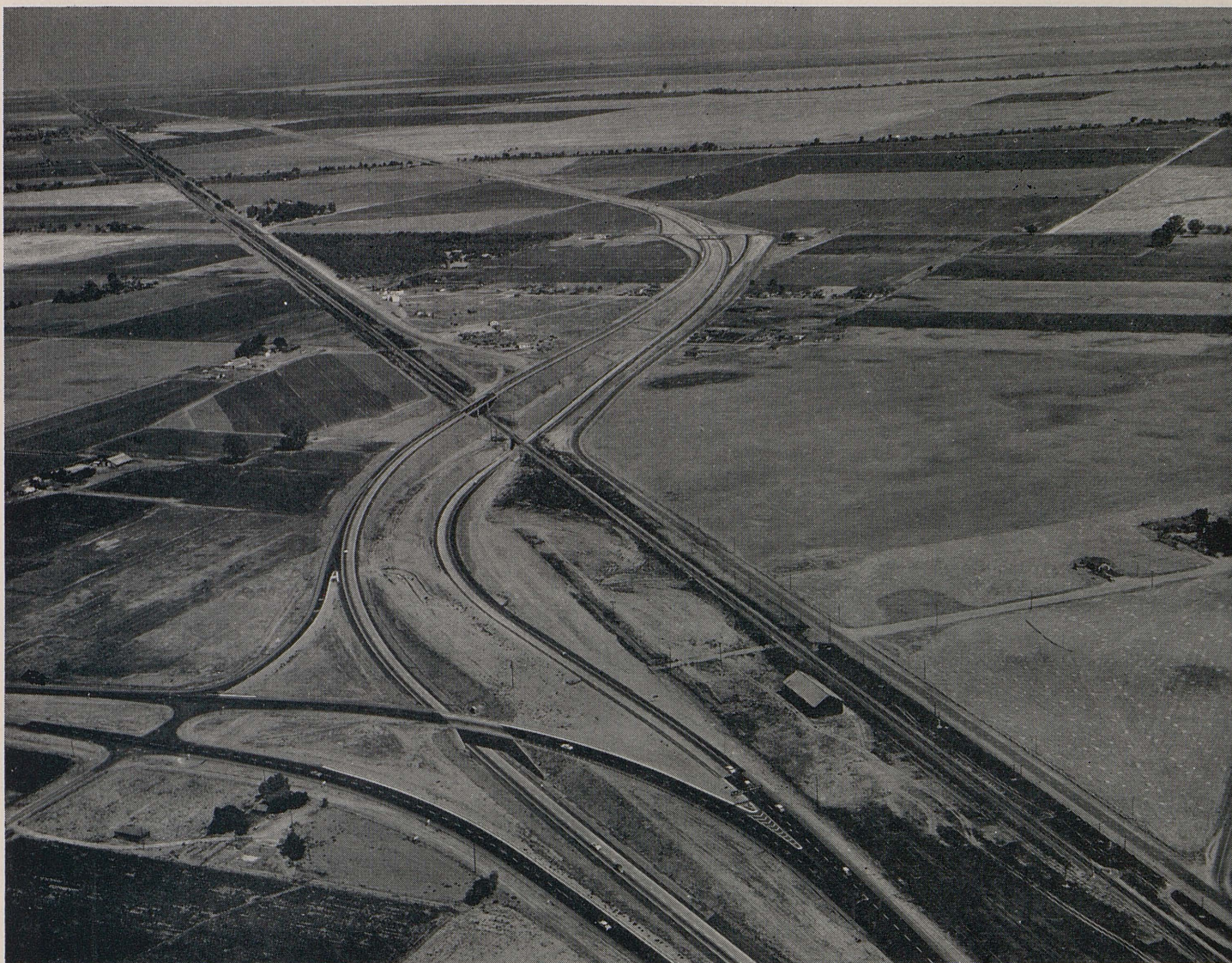
Grapevine Grade

Just north of the Los Angeles county line there is presently under construction the largest highway contract let to date in District VI. This project involves the construction of four additional traffic lanes through Grapevine Canyon and reconstruction of portions of the existing four lanes to provide an ultimate eight-lane freeway between Ft. Tejon and two miles north of

(PHOTOS AT TOP OF PAGE) LEFT—An aerial of the Madera Bypass looking northward. The old three-lane section of US 99 through the city is located to the right of the new freeway. RIGHT—The Visalia Airport Interchange on US 99 looking to the south with the Visalia Airport in the foreground.



UPPER—The new separation structure carries traffic over Garces Circle in Bakersfield. This view is to the south along Chester Avenue with US 99 crossing the photo from left to right. LOWER—A view eastward over the City of Fresno. Tuolumne and Stanislaus Streets cross the Southern Pacific Railroad in the center and the US 99 freeway in the foreground.



A view northward taken from the south end of the Chowchilla Bypass. The separation structure in the foreground connects US 99 and State Route 152. Beyond, the southbound lane crosses the railroad tracks on an overhead while the northbound lanes use an underpass.

Grapevine Station at the foot of the grade. This contract was awarded to Guy F. Atkinson Company on April 17, 1958. It is seven miles in length, is expected to cost in excess of \$7,000,000 and should be completed in the summer of 1960. A more detailed description of this project appeared in the July-August issue of this magazine.

The original separation structure under the main line of the Santa Fe Railroad in Bakersfield was built by the railway company and the City of Bakersfield in 1926. It provided a 20-foot roadway and two five-foot sidewalks. Subsequently after determination of the state highway route through the city, the structure was widened in

1935 to provide four lanes of traffic under the two main line tracks. Later reconstruction of Union Avenue to a six-lane divided thoroughfare and proportionate increase in traffic resulted in the structure once more becoming a bottleneck, and plans were made to again widen it to provide capacity equal to that of the street section on either side. The steel plate girders in the existing structure were used in the widened structure. Traffic was routed over adjacent city streets and a double track railroad shoofly constructed on earth embankment in the underpass approach. This material was removed and disposed of after completion of the railroad structure. Traffic was re-routed through the new structure in

June of 1957. Cost of the project was \$450,000.

Garces Circle

A four-lane divided overpass structure was completed in 1957 over Garces Circle in the City of Bakersfield, thus relieving the congestion at one of the most heavily traveled intersections in the district. The structure is a welded plate girder bridge with reinforced concrete deck consisting of seven spans and a total length of 555 feet. The bridge has a width of 62 feet between outer curbs with a 6-foot median strip. There were six streets entering upon this traffic circle prior to the construction of the bridge, most important of which were

the two legs of US 99, North Chester Avenue (which is State Highway 142) to Oildale, and Chester Avenue to the south, the main thoroughfare through Bakersfield. The average daily traffic through this intersection in 1957 was over 46,000 vehicles. A more detailed article on this project appeared in the March-April 1957 issue of this magazine.

Famoso and Delano

In June of this year the construction of a new overpass over the Southern Pacific Railroad at Famoso eliminated the last remaining section of undivided highway in Kern County, a short section where all traffic was carried under the railroad through a single structure. Also at Famoso a separation structure and ramps were built to provide an interchange for US 99 and US 466, thus eliminating another hazardous intersection.

From the southerly limits of Delano to the north end of Pixley, some 17

miles of full freeway have been completed in the past three years under three separate contracts with the Gordon Ball Company. The heavy US 99 traffic through Delano has been rerouted to a location three blocks westerly of its former location. Four grade separation structures carrying city streets over or under the freeway and two overhead structures over the Southern Pacific Railroad near the northerly limits of Delano were built in order to eliminate the traffic bottleneck through the city.

Earlimart and Pixley

Similarly, this section of freeway was rerouted one block easterly through the Towns of Earlimart and Pixley and the main cross streets in these towns separated from the highway traffic by depressing the freeway under the streets.

Tipton

One of the few remaining isolated traffic signals on US 99 in this dis-

trict and a location of recurring accidents was eliminated in May of this year by the opening of an overhead structure at the main cross street in the Town of Tipton. As a result there are now no signals nor stop signs on US 99 between McFarland and Kingsburg, a distance of 63 miles.

Tulare

The first full freeway of any length through the district was the Tulare Bypass, an eight-mile section of freeway which removed the highway traffic from the business district of Tulare. This bypass was completed in 1954. It included seven road separation structures and one railroad underpass.

Visalia Airport Interchange

This complicated interchange of two major highways intersecting at a main line railroad and a major airport was completed in 1954. This project involved a new three-lane structure over the railroad for northbound and westbound traffic and three highway separation structures.

Goshen

The full freeway from the Visalia Airport Interchange was extended northerly to one mile north of Goshen in 1957 and involved separation structures in Goshen and over the Coalinga branch of the Southern Pacific Railroad.

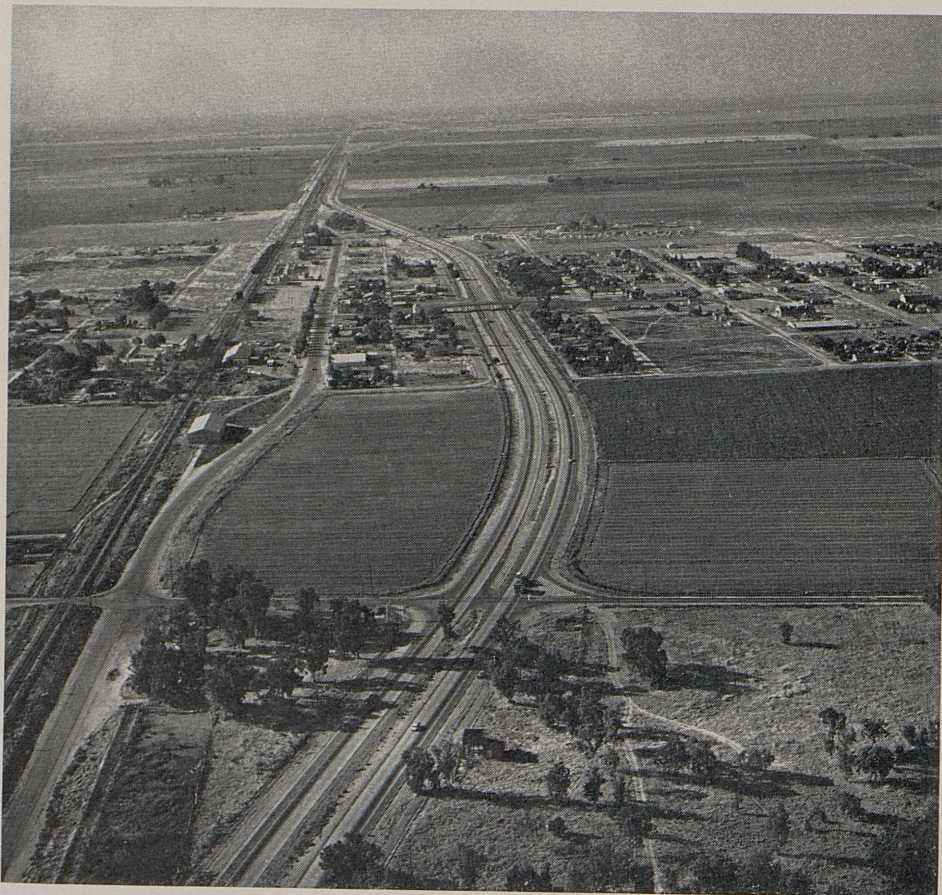
Traver to Kings River

This 5.7-mile section of US 99 was developed to freeway standards in 1957 and included separation structures for county roads at Traver and Dodge Avenue and an additional bridge over the Kings River.

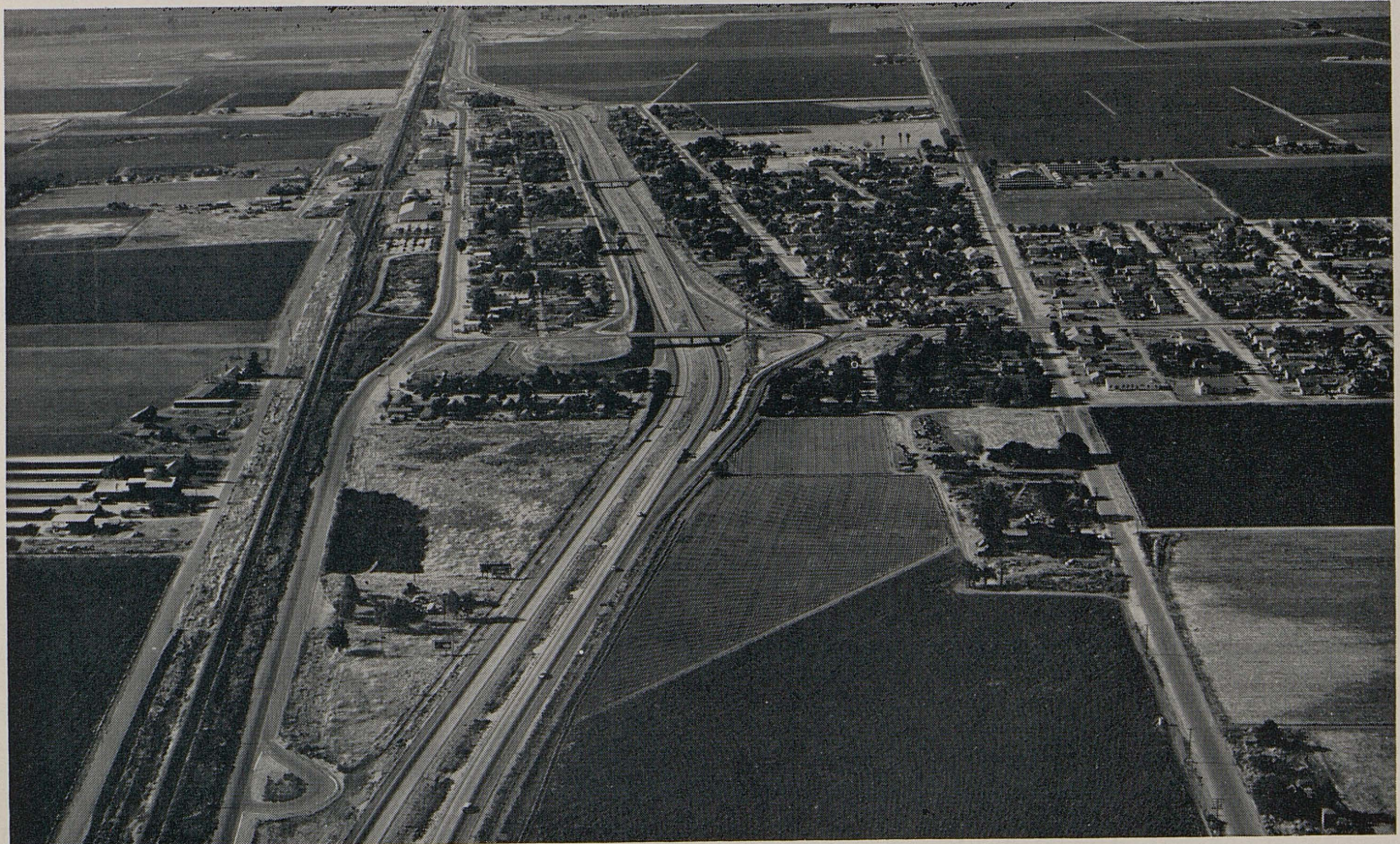
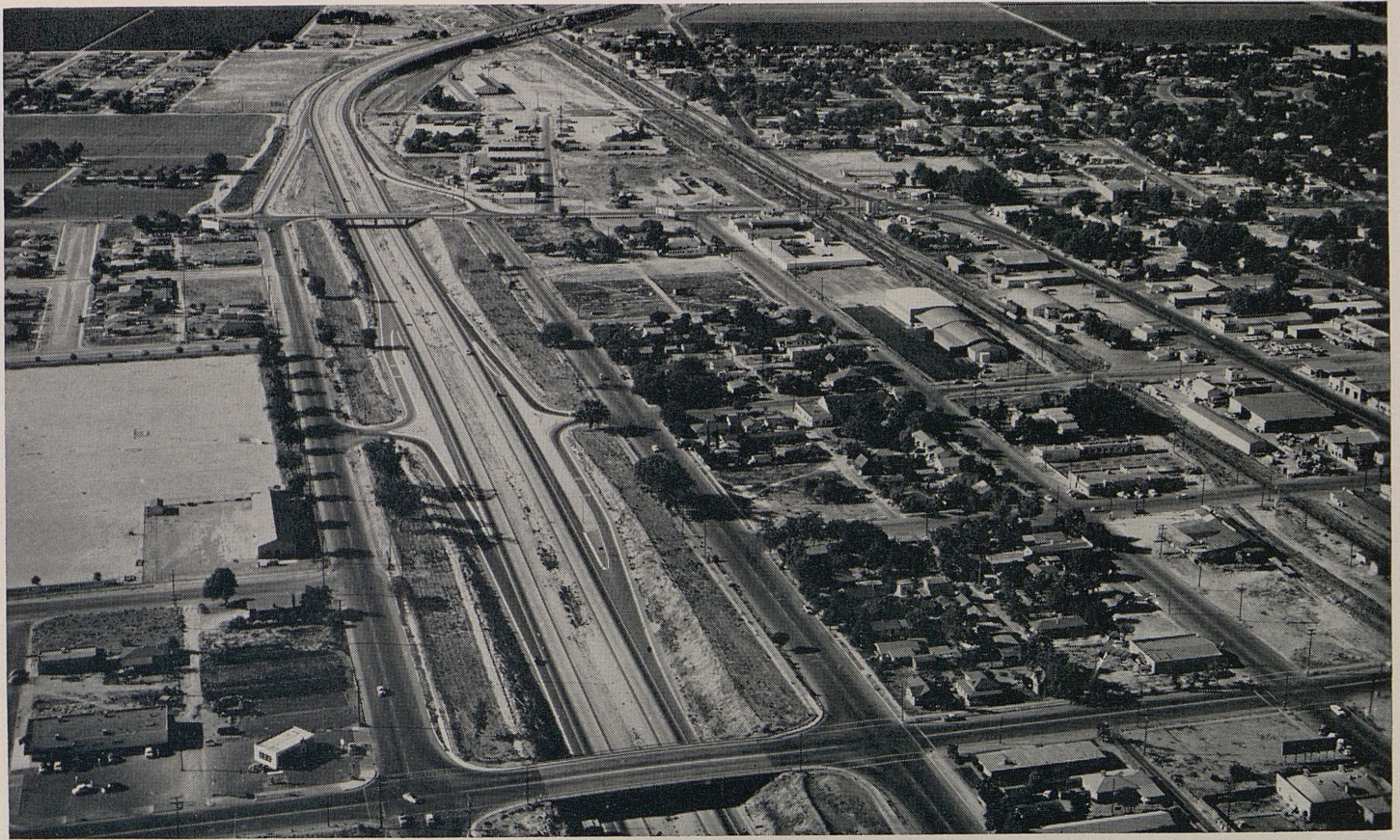
Fresno Freeway

This 5.9 miles of full freeway was opened to traffic in October of 1957 after 11 years of engineering studies and construction. The work was done under five separate contracts at a total cost of \$11,000,000, including rights-of-way. The freeway has 23 bridges, seven pumping plants, two storm water retention basins and three storm water drainage fields.

Motorists traveling Route 99 are able to travel this six-mile section of full freeway in less than half the time pre-



This expressway on US 99 bypasses the business section of Tipton. The structure over the expressway at the center of the picture is the Sixth Street Overcrossing. The view is to the north.



UPPER—Overcrossings carry local traffic over the new US 99 freeway bypass of Delano. LOWER—The business section of Earlimart is bypassed by this freeway on US 99. The old highway follows the railroad to the left. The view is northward.



Sign Route 168 crosses Rancheria Creek at Huntington Lake in Fresno County. The China Peak ski area is in the upper left corner of the photo.

viously required, avoiding 16 traffic signals. A complete resume of this project appeared in the November-December, 1957, issue of this publication.

Madera Freeway

A full freeway bypassing the business district of Madera is presently under construction and expected to be completed this fall. The contractor on this section of freeway is Fredericksen and Kasler. The project is expected to cost about \$3,000,000.

This project is four miles in length and involves the construction of eight highway separation structures, one railroad separation structure and two bridges over the Fresno River, and will eliminate the last remaining section of two-lane highway in this district. This short section of two-lane road just north of Madera has become a serious bottleneck, particularly during the peak travel periods on three-day holiday weekends.

Chowchilla Freeway

At the northerly end of US 99 in District VI, seven miles of freeway from Califa (the junction of US 99 and State Route 152—Pacheco Pass Road) to one-half mile south of the Merced county line have recently been constructed. Work on this project, which bypasses the City of Chowchilla, was completed in July, 1957, at a cost of \$2,300,000. Fredericksen and Kasler were also the contractors on this project. A detailed report on the Chowchilla Freeway appeared in the March-April, 1957, issue of this magazine.

Proposed Projects

A project to eliminate the only remaining undivided section of US 99 in the district, a three-lane section just north of Fresno, is scheduled for construction the latter part of this year. Also, plans are going forward for the ultimate conversion of the entire length of US 99 to full freeway standards.

Sufficient width of right-of-way on all projects on US 99 has been or is being obtained, to provide for additional traffic lanes when needed. The one exception is the Grapevine grade where the eight lanes being constructed will be the ultimate development.

US 399

US 399 enters the district from San Luis Obispo County through Maricopa and Taft to a junction with US 99 at Greenfield, about seven miles south of Bakersfield.

Two lanes of an ultimate four-lane expressway, between the southerly limits of the City of Taft and Weed Creek, were completed in 1956. This work, 4.7 miles in length, was done under two contracts and eliminated a hazardous section of highway through Hill 36 by relocation around the hill on improved alignment and grade, at a cost of \$440,000. A portion of this section adjacent to the City of Taft

was constructed as a divided four-lane road initially to provide for better control of traffic at some of the busier intersections.

Route 140

Between Arvin and US 466, the White Wolf Grade, a 3.3-mile section of narrow, steep and winding road was reconstructed to modern two-lane highway in 1957 at a cost of \$386,000. This road serves traffic from the southeasterly section of the valley destined for points east by way of Tehachapi, Mojave, etc.

US 466

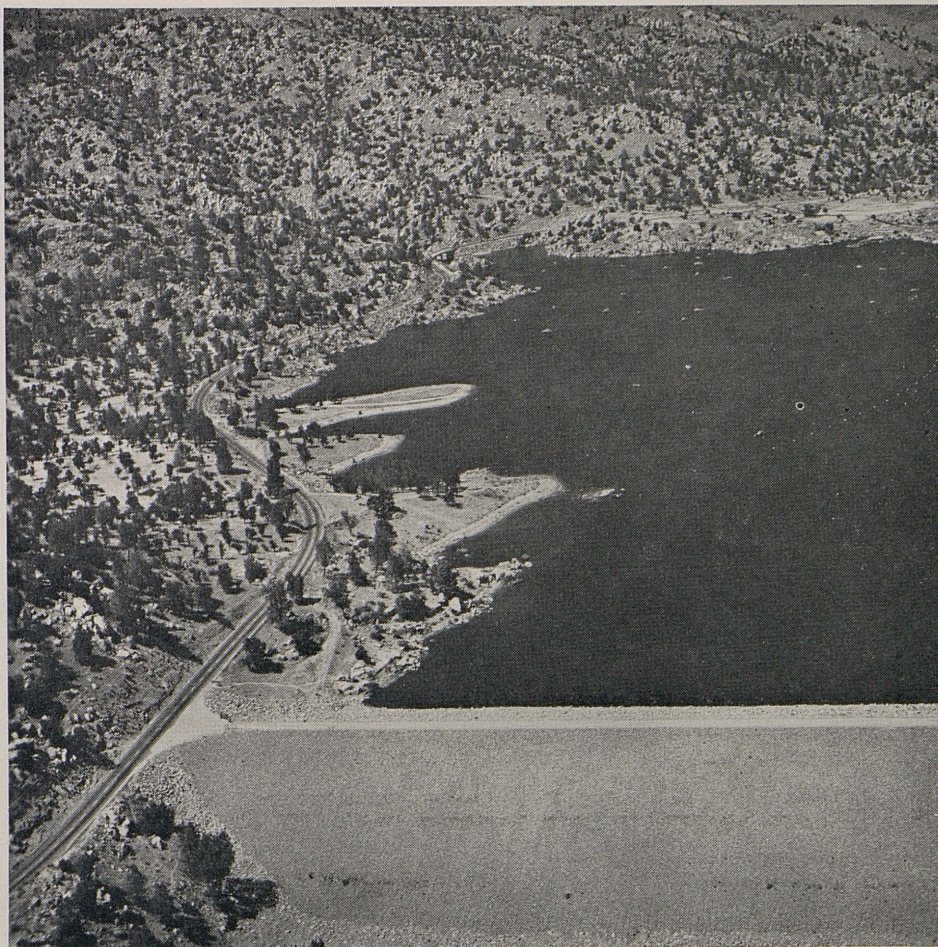
This route enters Kern County from Paso Robles on the west, through Wasco to a junction with US 99 at Famoso. It is combined with US 99 to Bakersfield and then proceeds easterly through Edison and Tehachapi in District IX. From the easterly limits of Bakersfield this road was a heavily congested two-lane street with many roadside businesses on one side and the combined Santa Fe and Southern Pacific main line on the other. Because of the probability of a future relocation of the route on a freeway basis, it was decided to develop the present road to its ultimate capacity on the existing right-of-way, most of which was 80 feet. Kern County acquired additional right-of-way needed to provide a minimum of 80 feet on a portion of the project. Reconstruction to a four-lane undivided road with left-turn storage lanes at the principal crossroads was completed to the east at Legislative Route 143, the limit of extensive roadside development, in July of this year. The length of the project was 4.2 miles. It was built at a cost of approximately \$400,000.

Route 142

North Chester Avenue in the community of Oildale, north of Bakersfield, was reconstructed to provide a six-lane divided thoroughfare between Beardsley Avenue and one-half mile north of China Grade Loop, a distance of 2.2 miles. This work was completed in 1955 at a cost of \$300,000.

Sign Route 178

Sign Route 178 extends from US 101 at Santa Margarita in San Luis



Looking north along Sign Route 178 toward Kernville from the west end of the main dam at Lake Isabella in Kern County

Obispo County to Freeman Junction on US 6 in Kern County by way of McKittrick, Bakersfield and the Kern River Canyon and is a portion of the route between Kingman, Arizona, and the Pacific Ocean known as the Cross Country Highway.

Prior to the completion of the Isabella Dam on the Kern River in 1954, approximately 15 miles of state highways had to be relocated to get above the future high waterline. These modern two-lane mountain roads were completed under several contracts in 1953 at a cost of \$1,900,000, and were financed wholly by the Federal Government.

Sign Route 190

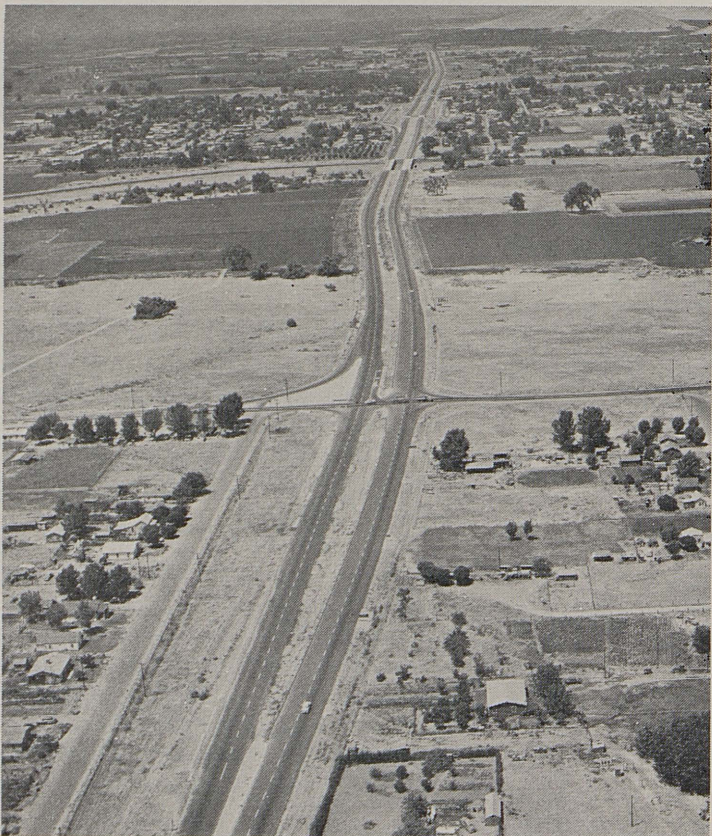
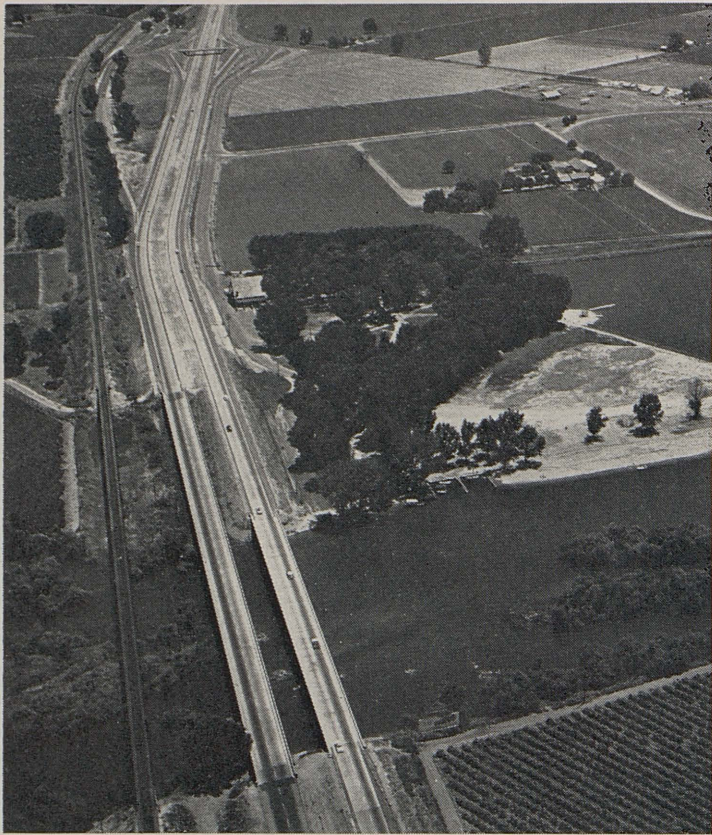
The construction of a dam to form the Success Reservoir on the Tule River east of Porterville necessitated the relocation of approximately seven miles of state highway. The proposed dam is being constructed by the U. S.

Corps of Engineers as a flood control project. It will be an earth fill dam 3,500 feet in length at the crest, 140 feet maximum height, and will form a reservoir of approximately 2,400 acres. The highway relocation is presently under construction and will be completed this fall at a cost of \$1,700,000, financed in entirety by the Federal Government.

An extension of this route to the west below the proposed dam is presently under construction to the vicinity of the Porterville State Hospital. Upon completion temporary routing will be over Grevilla Street to Porterville until such time as funds are available to continue the construction westerly to a junction with existing Route 190.

Sign Route 65

Sign Route 65 extends from US 99 north of Bakersfield to Sign Route 180 near Grant Grove in Kings Canyon



UPPER LEFT—The US 99 crossing of the Kings River south of Kingsburg in Tulare County. UPPER RIGHT—Sign Route 190 will cross the South Fork of the Tule River in Tulare County over this bridge now under construction. Relocation of the highway is necessary because of the construction of Success Dam. LOWER LEFT—A view of the Sign Route 65 bypass of Porterville taken from the south. LOWER RIGHT—A view of US 99 taken above the Grapevine Gorge looking north toward Bakersfield.



US 399 in Kern County has been relocated around Hill 36. Note the old highway leading directly across the hill (center). Ford City and Taft can be seen in the left background.

National Park. The section between Ducor and Woodlake along the east side of the San Joaquin Valley is locally known as the Orange Belt Highway because of the extensive citrus development in the area.

Some 16 miles of this route, between Deer Creek, just north of Terra Bella, and the City of Lindsay, have been designated as a freeway. Portions are being constructed to expressway standards. The section between Deer Creek and Linda Vista Avenue was completed in 1955, thus considerably relieving the congestion on Porterville's main business street. Portions of this section were constructed as a four-

lane divided expressway initially, including a separation structure over Olive Avenue, an important FAS road adjacent to Porterville. The second section, between Linda Vista Avenue and Famoso Street in Lindsay, is presently under construction and is expected to be completed in March of 1959 at a cost of \$800,000.

Route 135

Legislative Route 135 extends from Wasco on US 466 to a point just east of Hanford on Sign Route 198. It is a section of highway known as the Central Valley Highway, which is composed of sections of county highways

and state highways between Bakersfield and Selma, serving communities along a route followed by the Santa Fe Railroad.

Two lanes of an ultimate four-lane expressway on the Central Valley Highway, between Corcoran and Sign Route 198, a distance of 20 miles, have been constructed under several contracts completed in 1957 at a cost of \$838,000. This section of highway was built on new location to provide better alignment and eliminate two crossings of a main-line railroad. It was extended at the northerly end by Kings County by the construction on new alignment of four miles of FAS highway.

... Continued on page 62

US 66-91

Victorville-Barstow Freeway Replaces Miles of Winding Road

By E. J. WALKER, Resident Engineer, and
H. C. PRENTICE, District Construction Engineer

EARLY next year the traveling public will say goodbye to 34 miles of obsolete and inadequate two-lane highway and begin using instead 29.3 miles of new four-lane divided freeway between Victorville and Barstow.

Until that time, 7,500 vehicles per day, including one-fifth of all the vehicles entering California, will continue to follow the US 66 and 91 signs over the present adaptation of the old wagontrail which generally follows the Mojave River. The average motorist is prone to feel that he is, for all practical purposes, traversing the original wagontrail, for the "adaptation" includes numerous curves, 17 of 1,000-foot radius or less. Thirty percent of the 34 miles is striped for "no passing," and dips impair the riding qualities to the extent of causing occasional carsickness.

Design Features

The embankment and structures of the southerly, or Victorville, one mile of the project were constructed under separate contract with Gordon Ball Company. The going contract includes cement treating and paving this portion, as well as complete construction of the remainder of the work.

This new construction is four-lane divided, with three inches of dense-graded plant-mix surfacing on six inches of Class "C" cement-treated base. One-half inch of open-graded plant-mix surfacing will provide delineation of the traffic lanes and provide an improved wearing surface to reduce maintenance costs.

Interchanges are provided at Victorville and at each crossing of the existing county highway known as Stoddard Wells Road. Alignment features long tangents with easy curves and grades. In the 29.3 miles, eleven curves, or one per 2.7 miles, average 22.5 degree central angle, with a total of three-fourths of a circle, as com-

pared to a total of almost three complete circles for the old facility. Grades are generally not steeper than 2 percent, with 3 percent at a few locations.

A total of six bridge structures have been constructed: Stoddard Wells Road Overcrossing, 197 feet; Cement Company Undercrossing, 24 feet; Bell Mountain Wash Bridge, 224 feet; North Victorville Underpass, 208 feet; Wild Wash Bridge, 195 feet; and Lenwood Wash Bridge, 302 feet. The North Victorville Underpass, which provides a grade separation for the Mojave Northern Railroad, is an unusual structure for a separation of this nature. It is a 208-foot-long welded steel plate girder structure, consisting

of two spans supported by a reinforced concrete pier and abutments.

Unusual Aspects

For several years, rumors of the project excited the interest of highway contractors for good reason. Seldom is there presented such an opportunity for freedom of action and high production. Some of the more attractive aspects were the virtual absence of utilities and almost negligible volume of public traffic to be handled, no haul over existing highways, and rather spectacular major quantities; for example, 3,420,000 cubic yards of roadway excavation, plus 1,285,000 tons of imported borrow, equal in

Use of FM Radio Saves Time and Lives

Building 29 miles of interstate expressway through the Mojave Desert on a completely new route presents a number of problems not ordinarily found on shorter stretches along established rights-of-way. One of the most serious of these problems is that of communications.

Obviously, these same problems are common to any long highway job. Literally hours can be spent carrying messages from one end to the other; equipment breaks down far from repair facilities; a dozen culvert jobs over as many miles must be watched; inspectors must be found when the contractor is ready to move on the next phase of a job.

Faced with these problems after the letting of the contract for the Victorville-to-Barstow 29-mile stretch of new alignment of US 66-91, District VIII of the Division of Highways considered a number of ways in which communications on such a long project might be improved.

The first idea was for a continuous courier service. At first glance this

seemed a reasonable solution, but on further inspection it was realized such a method would not be much faster than special messengers, and would be very costly.

... Continued on page 57



Resident Engineer Edward Walker and Highway Field Office Assistant Doris Shealy at the FM transmitter-receiver unit in the construction field office at Victorville



A typical drainage facility along the new freeway is the Bell Mountain Wash Bridge, shown above

volume, roughly, to a square mile chunk three feet high; more than one-half million tons of imported base material, or 25,000 payloads of 20 tons or more; one-quarter of a million tons of PMS (plant-mix surfacing), or the equivalent of paving 12 feet wide, 1½ inches deep, and 400 miles long; and more than 8 miles of culvert pipe, including more than 16,600 feet of 48-inch CMP.

The submission of 13 bids reflected the unusual interest in the project by contractors. Fredericksen & Kasler of Sacramento was the low bidder, with a figure of \$5,750,655.50. This success was achieved by such prices on major items as 32 cents per cubic yard for roadway excavation, 19 cents per ton for imported borrow, 60 cents per ton for graded imported base material, and

\$2.40 per ton for plant-mixed surface aggregate.

Production Rate High

Contractors in general, as well as engineers, have since watched with interest as the contractor continues to demonstrate how work can be economically performed at these unit prices.

From the very start, it became evident that he would take full advantage of the freedom to develop high rates of production afforded by the inherent nature of the project—rates such as 20,000 cubic yards per day of roadway excavation, 2,000 tons per hour of imported base material, and 4,000 tons per day of plant-mixed surface.

The contractor has handled the work with a staff headed by General Manager R. E. "Jeff" Kasler and assisted

by Project Superintendent J. R. Beadles; Project Engineer R. Brown; earthwork, small structures, large structures, plant-mixed surface and plant superintendents; foremen as necessary; and as many as 170 operating engineers, teamsters, carpenters, and laborers. Radio has played an important part in handling the work. The contractor has a land station at his project office and has used as many as 15 mobile units.

The State is represented on the project by Resident Engineer E. J. Walker, who has used as many as three principal assistants and, at period of peak production, as many as 23 additional persons. In addition, three survey parties have been active on the project as an average, with as many as five as the maximum. The State, too, has used



UPPER—Trucks wait in line on the Victorville-Barstow job and then (LOWER) they are loaded at the Wild Wash base material plant

radio to advantage, with a land station plus four mobile units.

During peak earthwork production periods, when as much as 23,000 cubic yards of earth were being handled per day, four engineers were employed in the field laboratory alone, processing an average of 28 compaction tests per day in addition to the other work, such as shrinkage determination tests, R-value test sampling, Class "A" concrete mix checkout, sand equivalent determination for structure backfill, as well as sampling and packaging various materials for shipment to district and headquarters laboratories.

Water Major Problem

Water for the project was available only at each end of the project. The contractor elected to drill a well near the Mojave River at Victorville and pump to earth reservoirs spaced through the job. Nearly 25 miles of eight-inch pipe were laid along one edge of the right-of-way from the Victorville end of the project toward Barstow. A 300-h.p. high-pressure electric pump draws from the 160-foot-deep well and delivers 700 gallons per minute at the far end of the 24.8 miles of supply line. The pump is operated 24 hours per day in order to charge 15 200,000-gallon earth reservoirs spaced at about two-mile intervals through the job. Water was also brought in from the Barstow end of the project for about one mile with an eight-inch line supplied from the City of Barstow sys-

tem. A fleet of 12 2,500- to 3,000-gallon water trucks are supplied from the various reservoirs by six portable 3,000-gallon-per-minute pumps.

In addition, from time to time, a portable sprinkling system was used to apply water in the cuts. Here, six-inch aluminum pipe was used with sprinklers spaced at 80-foot intervals. This system was moved in and used for overnight application. In some instances, an area 500' x 250' received approximately 900,000 gallons overnight.

Anchor Chain Used

Prior to grading, 45 Joshua trees up to six feet in height were removed from the roadway prism and transplanted within the right-of-way.

The light growth of desert brush was cleared from about one-half the project by dragging an 80-foot length of battleship anchor chain with two crawler tractors. In areas where irregular terrain prevented the use of chain, bulldozers and blades were used.

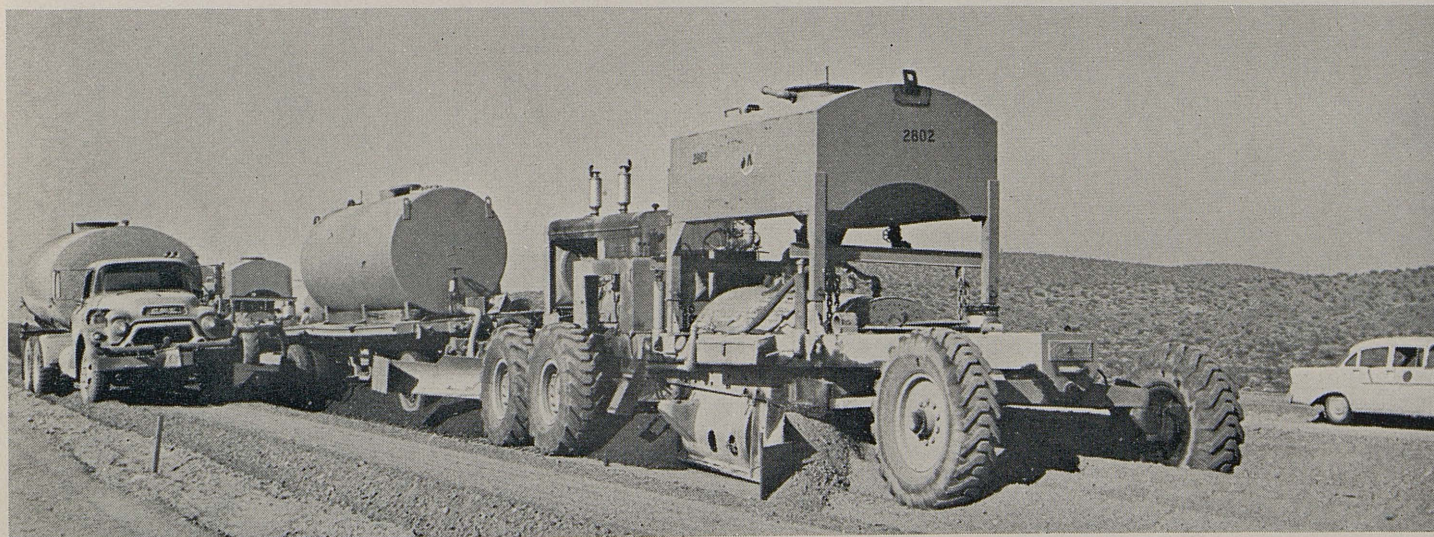
Working 10-hour days on average of 20,000 cubic yards of roadway excavation were handled per day during the heavy production period, with an average length of haul of 0.8 mile. An average of 23,000 tons of imported borrow were placed per day during that operation.

These production rates were achieved using a basic fleet of 12 large wheeled-tractor and scraper

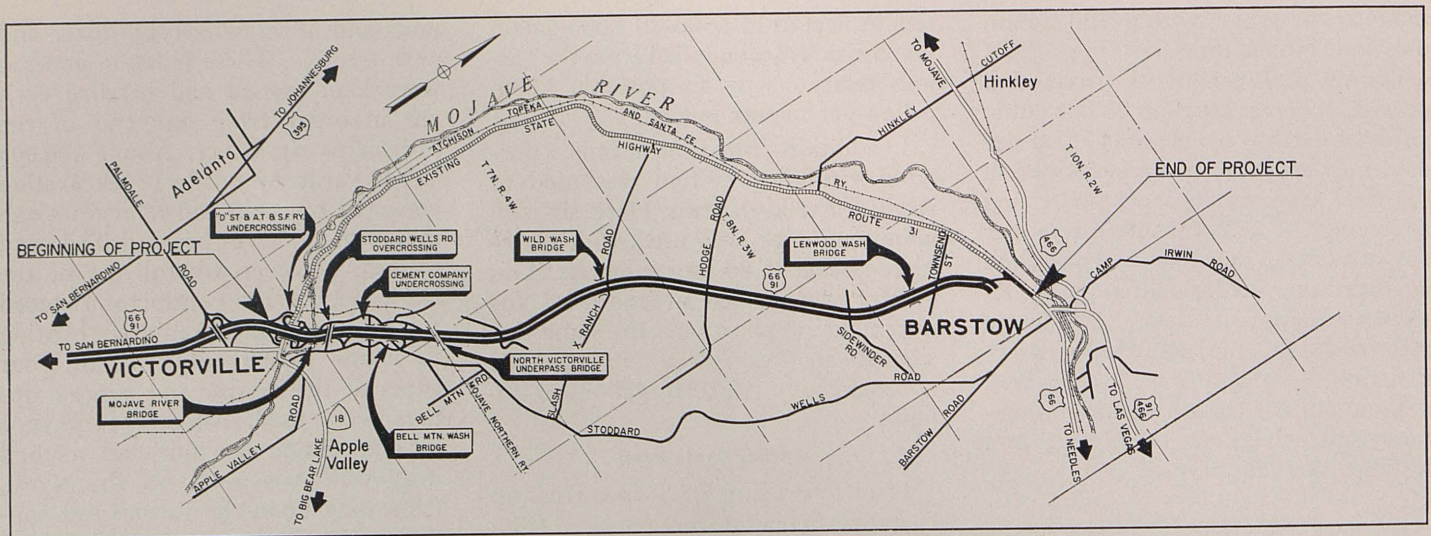
units and 20 crawler-type dozer and push tractors. These units, in general, were kept massed and handled each cut in order from one end of the project to the other. About 400,000 cubic yards of roadway excavation consisted of rock, and five years ago this would have been drilled and blasted; however, by full use of the latest rippers, the contractor reduced the amount which required blasting to about 75,000 cubic yards. Four types of the newest and biggest rippers were used. Almost every type of compacting machine and method imaginable was used on this work, depending upon the various soil conditions encountered.

Pit Site Chosen

After exhaustive exploration and tests, the contractor chose a base pit site about 12 miles from the Victorville end of the project and designed a production setup on the basis of 2,000 tons per hour. The pit is about one-half mile square and will be taken down uniformly about 12 feet. The heart of the operation consists of two side-by-side high-production hopper-type 42-inch belt-loaders, discharging into two surge bins. Oversize is screened across to a crusher and returned. One man generally controls this entire setup, including the belt speed of each loader and the surge bin discharge gates, from a centrally located control platform. Five scrapers, working with four crawler



A self-propelled mixer lays cement-treated base along the Victorville-Barstow freeway. A second unit is visible in the rear.



tractor pushers, charge the grizzly over the loading hopper. As many as sixty-five 24- to 28-ton payload trucks were used in transporting IBM (imported base material) to the grade. The average haul is around seven miles. Peak production of 2,100 tons per hour has been achieved when

trucks were available. High-speed haul was aided by construction of a median strip haul road with detours around major structures. Here the planned drop inlets were constructed and then buried in order to grade a flat cross-slope for a smooth, fast haul road.

Cement-treated Base

Class "C" cement-treated base with 2 percent cement is mixed from loose windrows by two self-propelled mixers operating in echelon. Each windrow yields a net volume of 6½ cubic feet per lineal foot of com-

... Continued on page 62



The Victorville Overhead carries the new freeway over the old highway and railroad tracks

Long Beach

16½-mile Freeway Connects Los Angeles With Area to the South

By A. L. HIMELHOCH, District Engineer—Operations, District VII

(EDITOR'S NOTE: This is a sequel to E. G. Hanson's article on the plan and design of the Long Beach Freeway which appeared in *California Highways and Public Works* in November-December, 1957.)

A \$48,000,000, 16.5-mile freeway linking the Cities of Los Angeles and Long Beach was officially opened on July 10, 1958. It is the newly constructed Long Beach Freeway which traverses Long Beach and East Los Angeles from the Pacific Coast Highway, US 101-Alternate, to a junction with the Santa Ana Freeway, US 101, at Olympic Boulevard in Los Angeles. This vital thoroughfare, a product of years of planning, design and construction on the part of the State Division of Highways in conjunction with the City of Long Beach and other agencies, provides a major alternate route between two rapidly growing industrial and business communities, Long Beach and Los Angeles. Thousands will benefit by the direct connection, and commercial and non-commercial traffic alike will gain a new means of access to and from the booming southeast section of the Los Angeles-Long Beach Harbor area.

The Long Beach Freeway now penetrates into the heart of industrial Long Beach and the harbor area, where there are 700 industries and a population of 322,500.

Dedication Ceremonies

The opening of the Long Beach Freeway was marked by appropriate ceremonies, arranged by the Long Beach Chamber of Commerce with band music and ribbon-cutting. A motorcade lined up on the new freeway just south of the Imperial Highway interchange to await the dedication and then pass in review to a luncheon at the Lafayette Hotel in the City of Long Beach. In attendance were state, county and city officials, contractors and civic leaders from neighboring communities. Among



Looking south over the Long Beach Freeway toward the Harbor area showing the Pacific Coast Highway Interchange in the foreground

those present were Robert E. McClure, State Highway Commissioner; C. M. Gilliss, Director, State Department of Public Works; Edward T. Telford, Assistant State Highway Engineer, District VII, and members of his staff; Tom Polich and Steve Kral of the contracting firm of Ukropina, Polich and Kral; Raymond C. Kealer, Mayor of the City of Long Beach; John E. Biby, Jr., President of the Long Beach Chamber of Commerce and master of ceremonies; Richard Richards, State Senator 38th District; William S. Grant, State Assemblyman, 70th District; and Herbert T. Klocksiem, State Assemblyman, 44th District.

The principal address was delivered by Gilliss who outlined the history behind the construction of the Long Beach Freeway and stressed the importance of the newly completed project. He spoke "in praise of the cat skimmers, the blade men, the ginny hoppers and all their fellows, their strawbosses and their big bosses—the contractors."

"These," Gilliss said, "are the men who really make the State of California look good by turning out top highway work. * * * It is a fine contracting industry which builds these freeways for California and Californians."

The Long Beach Freeway (formerly known as Pico Street and then as the Los Angeles River Freeway) was first conceived as a possible major traffic artery paralleling the Los Angeles River in 1913. It was just recommended as a freeway 28 years ago by the Long Beach City Engineering Department who proposed that a limited access highway be built along the westerly side of the Los Angeles flood control channel to carry through traffic between the City of Long Beach and Los Angeles and other northerly points. At that time (1930) this proposed limited access road was not on the State Highway System. It was, however, approved for inclusion in the Long Beach major city street system.

It was not until June 23, 1947, that the Long Beach Freeway was included in the State Highway System by legislative act, which described its limits as lying between Route 60 (Pacific

Coast Highway) and the Santa Ana Freeway. The State Division of Highways was thus given authority to proceed with plans for construction.

First Contract Award

State construction on the Long Beach Freeway began on June 27, 1951, when the contractor, Griffith Company, set up operations under the field supervision of H. F. Meinke,

Resident Engineer for the State. The limits of the project extended from Pacific Coast Highway north to 223d Street, a distance of 2.5 miles. Construction cost was \$1,559,300 and the contract was accepted as completed by the Director of Public Works on January 12, 1953.

One bridge, a three-span reinforced concrete box girder type, was erected on Pacific Coast Highway at the Long



Beach Freeway and a retaining wall built at the separation structure at Belhart Street. In addition to standard construction items—drainage, facilities, curbs, ditches, culverts, etc.—the potential landscape areas were cultivated and covered with topsoil.

Early Contractors

Among first contracts on the Long Beach Freeway was one awarded to the 40-year-old company of Ukropina, Polich and Kral of San Gabriel, who subsequently undertook a total of seven contracts on this freeway.

According to John Ukropina, one of the partners, their first contract, between 223d Street and Atlantic Avenue, was the most difficult. Construction began in the mud with preliminary earthmoving operations. The contractors kept 250 men in the field and over \$1,500,000 of equipment. In summing up his company's hand in the building of the Long Beach Freeway, Ukropina said: "Our contracts amounted to something like \$12,600,000. Building our part of the Long Beach Freeway was a great experience and I am happy the job is done."

The completion of the first contract of the Long Beach Freeway project was the beginning of a series of jobs culminating in the Long Beach Freeway carrying many thousands of cars and trucks to Long Beach and Los Angeles through such communities as Compton, Lynwood, South Gate, Bell, Maywood and Vernon.

In the 16.5-mile stretch of freeway, 15 interchanges and 10 separations of streets were provided.

Between Pacific Coast Highway and the future San Diego Freeway, six lanes have been provided with a curbed median 16 feet in width. Northerly of the San Diego Freeway to the Santa Ana Freeway, the section consists of six lanes, separated by an uncurbed median of 40 feet. Concrete pavement was used on main freeway lanes. At some future time it is proposed to place two additional lanes in this median area, which will provide an ultimate eight-lane freeway northerly from San Diego Freeway. The maximum grade on the freeway is 3 percent.

Traffic Separations Designated

Grade separation bridges and traffic interchange facilities were provided at Pacific Coast Highway, Willow Street, Belhart Street, Del Amo Boulevard, Long Beach Boulevard, Artesia Avenue, Atlantic Avenue, Olive Street, Rosecrans Avenue, Imperial Highway, Firestone Boulevard, Florence Avenue, Atlantic, Bandini, and Washington Boulevards and a branch connection with the Santa Ana Freeway. Also completed were the structures across the Santa Ana Freeway and over Olympic Boulevard in anticipation of the northerly extension to connect with the San Bernardino Freeway and Huntington Drive.

Design on the freeway was initiated in the early part of 1950 and the district proceeded with construction on sections of the freeway, working from both ends toward the middle. Subsequently, nine bridge contracts, 10 road contracts, two illumination contracts and two erosion control contracts, costing approximately \$28,000,000, were completed. Nine of the contracts were financed in part with federal-aid funds administered by the U. S. Bureau of Public Roads.

State contracts were awarded to the following: Ukropina, Polich and Kral, seven contracts; Webb and White, three contracts; J. E. Haddock, Ltd., two contracts; Oberg Bros., two contracts. Other single contracts went to: R. M. Price Company; J. A. Thompson & Son; Webb & White & W. J. Distelli; N. M. Saliba Company; Jannoch Nurseries; Westates Electrical Construction Company; Fishbach & Moore, and Henry C. Soto Corporation.

Savings Realized

Meanwhile the United States Corps of Engineers included in its concurrent channel contracts the construction of the substructure for a bridge across the Los Angeles River north of Imperial Highway, and the construction of a railroad bridge across the Long Beach Freeway north of Rosecrans Avenue. By reason of this co-operation, a considerable saving in state highway funds was realized. The Corps of Engineers also contributed funds to

cover a portion of the construction cost of the Domingues grade separations of the Union Pacific Railroad and Pacific Electric Railway tracks (between Carson Street and Del Amo Boulevard in Long Beach), which eliminated necessity for future construction revisions when its channel work was undertaken.

The Los Angeles County Flood Control District constructed a lined auxiliary channel between the Los Angeles River south of Southern Avenue in Compton and Jaboneria Road northerly of Firestone Boulevard. In its contract it included a covered channel under Firestone Boulevard and a covered channel under the Long Beach Freeway. Portions of the covered channel were financed by the State under the terms of a co-operative agreement.

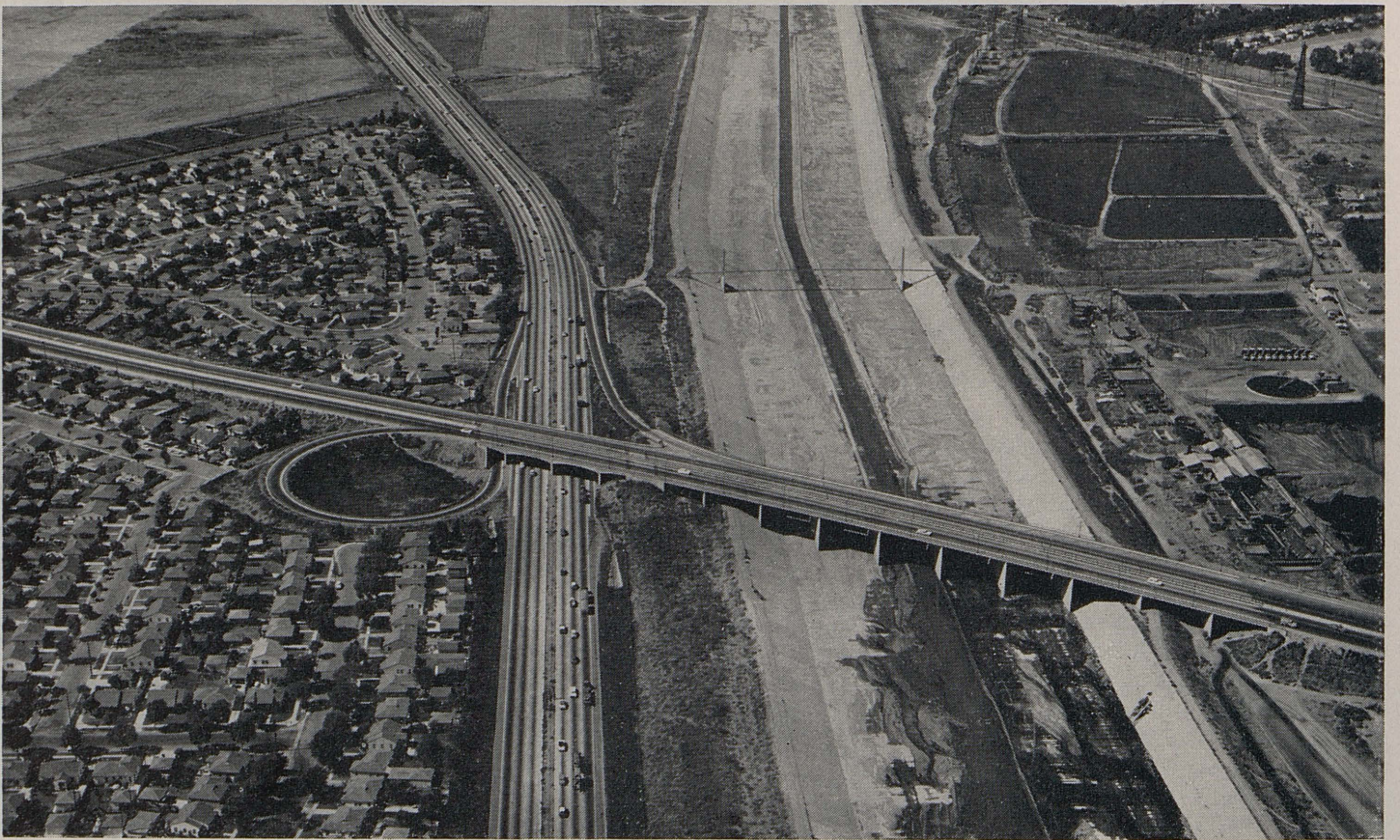
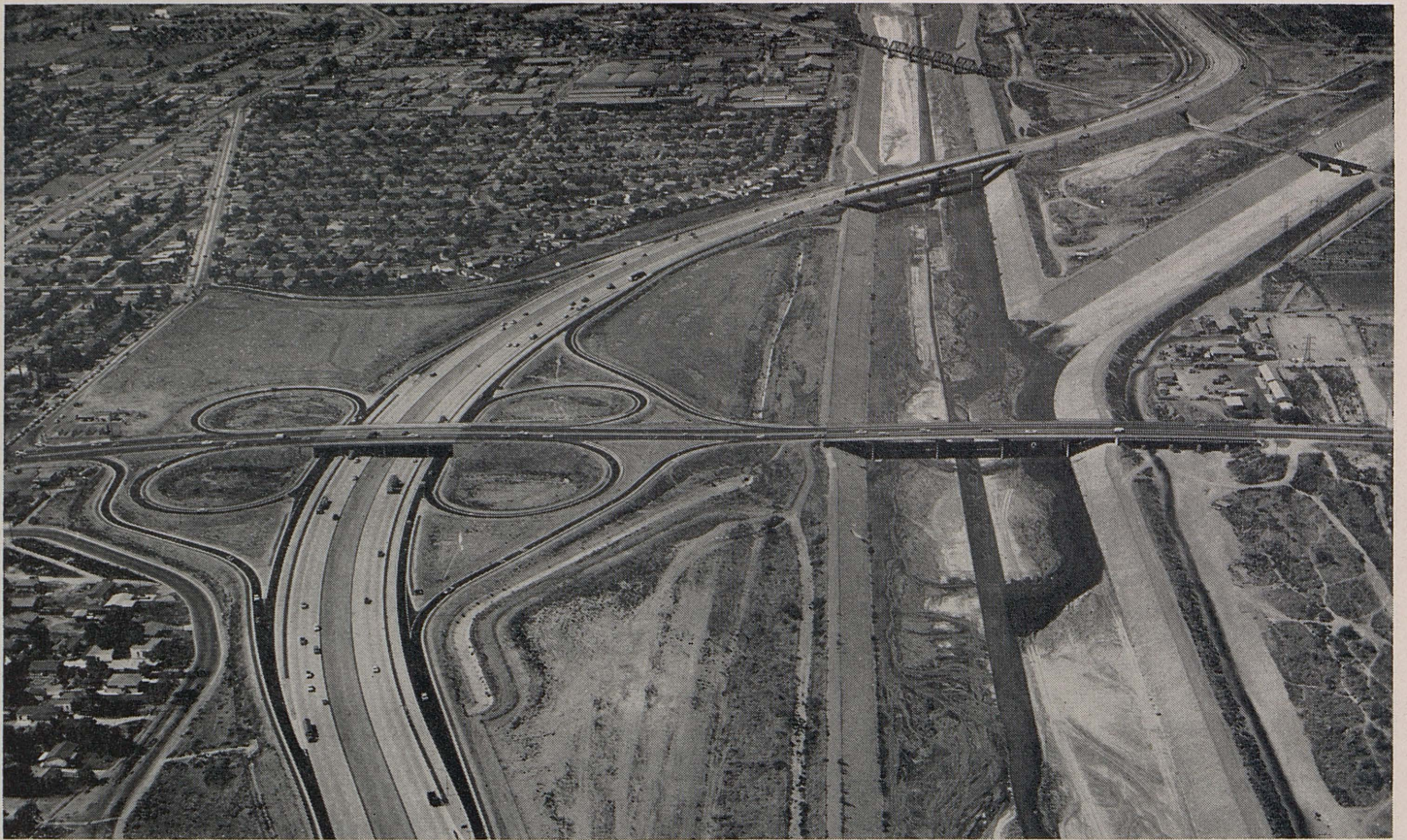
The Firestone Channel development consisted of a double 10-foot square box-type culvert, which was put into place by wedging through the embankment of Firestone Boulevard by means of heavy-duty jacks. The contractor worked from both sides of the fill until both sections of the culvert were joined.

The City of South Gate, under the terms of another co-operative agreement, constructed a frontage road on the easterly side of the freeway south-erly from Southern Avenue.

Co-operative Agreements

The Los Angeles County Road Department constructed bridges across the Los Angeles River and the Long Beach Freeway on Compton Boulevard. The Los Angeles County Road Department also constructed bridges across the Long Beach Freeway and the Los Angeles River for Olive Street. These bridges across the freeway and certain incidental approach work were financed by the State under the terms of co-operative agreements with the County of Los Angeles. The county, under terms of a co-operative agreement, financed cost of extending the Rosecrans Avenue bridges across the Los Angeles River channel.

A total of 11 co-operative agreements were entered into: three with Los Angeles County Road Department; three with the City of Long



UPPER—An aerial view of the Firestone Boulevard Cloverleaf and the Los Angeles River Channel along the Long Beach Freeway. The channel joining the river from the right is the Rio Hondo. LOWER—The Belhart Street Overcrossing built by Los Angeles County.

Beach; three with the U. S. Corps of Engineers; one with the Los Angeles County Flood Control District; and one with the City of South Gate.

The acquisition and clearing of rights-of-way on this project was a major problem. Some 1,200 parcels of right-of-way were obtained, and in carrying out clearing operations, 66 buildings were demolished and 691 were removed. The cost of right-of-way acquisition was approximately \$20,000,000. (For further details see Plan and Design story by E. G. Hanson, *California Highways and Public Works*, November-December, 1957.)

The Los Angeles River during the rainy season provides drainage for the Long Beach Freeway, which flanks it, and for the communities adjacent. This at times means vast quantities of ponding waters that must either be drained off naturally by means of pipes or channels into the river, or by means of automatically operated pumping equipment. Drainage is relatively simple when water levels lying without the river banks are higher than the water level in the river bed itself. Simple runoff results. But when the condition is reversed, that is, when the water level in the main river channel exceeds that of the outlying areas, floodwaters must be handled by pumps.

Pumping Plants Necessary

The City of Long Beach with some state co-operation constructed and put into operation four pumping plants within the Long Beach Freeway right-of-way at the following interchanges: Pacific Coast Highway, Willow Street, Long Beach Boulevard, and Artesia Street. Equipped to handle freeway and local drainage, these pumping plants are concrete structures imbedded to a depth of from 30 to 40 feet in the ground and house electrically driven vertical propeller pumps. The gallon-per-minute pumping capacities of the several pumping stations are as follows: Pacific Coast Highway, 80,000; Willow Street, 110,000; Long Beach Boulevard, 70,000; and Artesia Street, 130,000.

City engineers have completed plans for another pumping station on the east bank of the Los Angeles River

at the Ninth Street Bridge, with a pumping capacity of 40,000 gallons.

The Division of Highways constructed parallel 6,000-foot channels on either side of the freeway from Belhart Street to the Willow Street pumping plant. A pumping plant was constructed at Dominguez Street to drain the Union Pacific and Pacific Electric railroad underpasses.

Big Culvert Built

At Olive Street and the Long Beach Freeway was a large concentration of drainage originating from the communities of Lynwood and Compton. Here a large culvert was built to carry the water under the freeway and into the Los Angeles River. A pumping plant was also installed to pump drainage from the freeway into the Los Angeles River.

Other drainage structures were constructed north along the Long Beach Freeway, as follows: a large drain into the river south of Rosecrans; a concrete-lined channel approximately 3,000 feet in length on the west side of the freeway between Rayborn and San Miguel Streets, draining the Compton area; three large culverts south of the Pacific Electric Railway near Josephine Street, emptying into the river water collected from parts of South Gate and Lynwood; a 2,000-foot dike between Century Boulevard and the railroad, to prevent inundation of the freeway which is depressed at that location, and a pumping plant for freeway drainage at the railroad underpass; a large inlet to the river on the south side of Imperial Highway; a 3,000-foot concrete-lined channel and culvert crossing Imperial Highway for South Gate drainage and a 1,000-foot overflow channel draining to Louise Avenue and Wright Road, which operates at high water level; a Bandini trunk storm drain from Compton and Jaboneria Road across Firestone Boulevard and emptying into the river (a Los Angeles Flood Control District project); a pumping plant north of Firestone Boulevard near the Southern Pacific railroad underpass; a freeway drainage pumping plant on the south side of Florence Avenue, one at Gage Avenue and another at Slauson Avenue.

Subdrainage was provided between Olive Street and Rosecrans, and between the Pacific Electric Railroad at Josephine Street and Elmwood Avenue, where the freeway is below the mean ground level and is adjacent to the west levee of the Los Angeles River. Eight-inch perforated metal subdrains were constructed two feet in the ground in a continuous system of pipes at these locations in order to preserve the stability of the levee against percolation.

Concluding Contracts

One of the last remaining contracts on the Long Beach Freeway before formal completion was the 1.4-mile six-lane link between Atlantic Avenue and Rosecrans Avenue, under contract to Ukropina, Polich and Kral. This section was completed at a cost of \$1,629,400. During construction, roadway excavation amounted to 97,000 cubic yards; imported borrow, 156,000 cubic yards; and concrete for the pavement of the freeway, 10,000 cubic yards. Work began on April 1, 1957, and despite a 48-day delay because of bad weather, the contractor finished on schedule, on July 10, 1958. In the extensive paving operations the contractor devised an unusual method of laying his cement-treated base material. It consisted of a spreader mounted on the front of a tractor-scraper equipped with rubber tires for greater mobility and maneuverability. Thus mounted, the spreader dispensed the base efficiently and uniformly.

There were no major obstacles encountered in the building of this portion of the freeway, except for the removal of about two feet of unsuitable material from the roadbed, which was below the water table. Sand was substituted and underdrains were constructed throughout the length of the job. Also, a dump site in the way of the freeway was cleared of 20,000 cubic yards of unsuitable material. Borrow was loaded with belt-loaders at the borrow pit at Wilmington Avenue and Del Amo Boulevard, with 12-cubic-yard capacity bottom dump trucks doing the hauling.

Before actual construction could start on the last major contract in November, 1956, Oberg Construction Company, under separate contract,



Looking north along the Los Angeles River and Long Beach Freeway showing the Ninth Street Bridge in the foreground, the Anaheim Street Bridge next and then the Pacific Coast Highway

began preliminary clearing of the roadbed which passed through an old dump site. The dump contained 341,000 cubic yards of material, all of which was distributed outside of the limits of the roadway at various locations at a cost of \$153,450. It is interesting to note that the future roadway, rising to bridge the Los Angeles River, was to pass 60 feet above the bottom of the dump, necessitating considerable hauling and compacting. Surcharged fills were put in to hasten settlement. In all, there were 7,554,504 station-yards of overhaul involved. Haulers trucked their loads across the Los Angeles River over specially constructed steel girder bridges, but the heavy rains of December, 1955, washed out these temporary contractor's bridges, hampering operations.

Second Dump Discovered

The roadway construction contract on this last section of the Long Beach Freeway was let to Ukropina, Polich and Kral, and was completed on schedule simultaneously with the previous contract despite 56 work days lost because of bad weather. This section of the freeway, 1.9 miles in length, was built at a cost of \$2,575,000. A second dump south of Rosecrans was uncovered when grading had begun, and it was found to contain 25,000 cubic yards of material, rubber fragments, scrap metal, wood, brick and other rubbish. The contractor first tried a scraper in an attempt to clear the area, but finding it impossible to shear the tangle of junk with the blade, he resorted to clam bucket and truck, a method which proved successful. Further excavation for structures unearthed 40,000 cubic yards of abandoned riprap in the old river bed, which the contractor removed by means of a segmented dozer blade attached to a tractor. This material was used as fill for the freeway embankment. The most troublesome part of early construction was in fire control, odd as it may seem. As the debris was bucketed out of the dump, exposing the subgrade to fresh oxygen, spontaneous combustion would generate fire in the decomposed masses below. Consequently, in addition to building a freeway, workers were engaged often in

trying to put out stubborn, smouldering fires in their path.

The freeway proper required 420,000 cubic yards of borrow material, 97,000 cubic yards of other fill materials and 18,000 cubic yards of concrete pavement. 28,000 lineal feet of reinforced concrete pipe and perforated metal drains were installed. Earthen dikes were put up to stem the flow of water as this phase of construction progressed. As the freeway took shape, long lengths of metal plate guardrail, 11,000 lineal feet, were erected on the fills, together with 21,000 lineal feet of 72-inch chain link fencing. Because the freeway was located along the river and along a large transmission tower line, fenced and gated maintenance access ramps were provided for the Los Angeles County Flood Control District and the Edison Company at Rosecrans under the Pacific Electric Railroad. Another feature of the job was construction of air-blown mortar ditches, in addition to the other drainage facilities, flanking the roadway. Nine hundred cubic yards of concrete was used for the ditches.

A new borrow site at Wilmington Avenue and Del Amo Boulevard was utilized in the construction of the Long Beach Freeway between Rosecrans Avenue and Imperial Highway. Trucks hauled fill from the 9,000,000-cubic-yard capacity pit, a distance of seven and a half miles.

Whittier Narrows Lake

Other imported materials came from the Whittier Narrows Fishing Lake, about 14 miles away, and were made available to the contractor cost free, since the Los Angeles County Recreation Department had selected that location for an artificial lake. Excavation was undertaken according to a contour plan set forth by the county. As materials were excavated and trucked away, the ground water rose to fill the lake. Whittier Narrows Lake, sometimes called "Legg Lake" in honor of the late County Supervisor Legg, is located just off Rosemead Boulevard at Worsham Road in East Whittier. It is a Los Angeles County recreation area with two lakes crossed by a levee. A third lake is

nearby. Eventually, as the multimillion-dollar Los Angeles County construction program gains headway, the three lakes will become one, measuring some 100 acres in area. The more-than-300-acre park will provide many forms of recreation, including fishing, a golf course, picnic areas, etc. It will be one of the biggest recreational parks in Southern California. This entire recreational area developed by the county represents an ideal example of the dual use of land that can result from governmental co-operation and good planning. This park development is entirely within the lake area of the Whittier Narrows Dam, a flood control and regulating works constructed by the U. S. Corps of Engineers and operated by Los Angeles County Flood Control District. The park facilities utilize a portion of the area that would be flooded only on rare occasions during periods of unusually heavy rainfall. This available land lends itself admirably to development for recreation, utilizing facilities that would not be permanently damaged by infrequent inundation.

Long Beach Contributes

The City of Long Beach had been actively engaged in promoting a traffic arterial along the Los Angeles River for a number of years, and had secured much right-of-way in the city adjacent to the Los Angeles River for future highway purposes. In going forward with this development, the city in 1947 constructed a bridge across the projected highway for Willow Street and a second bridge for Long Beach Boulevard. At Willow Street provision was made for a six-lane divided highway under the bridge whereas at Long Beach Boulevard provision was made for an eight-lane facility. These bridges built by the City of Long Beach and financed with city funds became a part of the Long Beach Freeway.

Subsequently, in June, 1953, the City of Long Beach completed approximately one-half mile of six-lane divided freeway between Anaheim Street and Pacific Coast Highway. In July, 1953, the city also opened to traffic the Anaheim Street Bridge over the flood control channel. This proj-

ect also included a cloverleaf interchange with the Long Beach Freeway at Anaheim Street. In March, 1953, work was started on the piers for the Ninth to Seventh Street Bridge. This bridge and its approaches is expected to be completed by May, 1959. The old Seventh Street Bridge was demolished and the utilities it carried are presently being relocated onto a utility bridge, scheduled for completion in May, 1959. The Pacific Electric Railway has been relocated to a special railway trestle north of Third Street across the Los Angeles River. Ocean Boulevard Bridge was relocated downstream to Santa Cruz Avenue on May 29, 1953, and is now being used as a temporary detour while the new Ocean Boulevard Bridge is under construction. The estimated completion date of this bridge is June, 1959. The Long Beach Harbor Department this year expects to begin construction of a six-lane divided service road which will act as a freeway terminus from Seventh Street south. This construction, together with the freeway proper (which may go to construction in five years) and

a 10,000-foot railroad facility, is estimated to cost in excess of \$7,000,000.

City Gas Money Used

"On the east side of the river, the terminal facilities for the freeway will be handled by the construction of the DeForest Avenue project from Ocean Boulevard to Seventh Street. The Ninth Street Bridge will terminate on the east side of the channel at Seventh Street in a rather elaborate three-level interchange. It is expected that the DeForest Avenue project, which will provide for an integration of the freeway traffic into a one-way street pattern of the intervening streets between Ocean Boulevard and Eighth Street, will cost approximately \$5,000,000." (Remarks by Jess D. Gilkerson, Long Beach City Engineer, quoted in Long Beach Freeway story by E. T. Telford, District Engineer, *California Highways and Public Works*, July-August, 1954.) This construction will be financed by state gas tax moneys and a \$3,000,000 municipal bond issue voted in February, 1955.

Commenting on the Long Beach Freeway, Jess D. Gilkerson, City Engineer, said that the City of Long

Beach has to date obligated between \$9,000,000 and \$10,000,000 for past and present construction. The Long Beach Freeway in Long Beach has been financed by Long Beach Harbor and General City Funds, Los Angeles County Flood Control District Funds, bond issue and state gas tax funds. Gilkerson said that the increased traffic volume due to the extension of the Long Beach Freeway is building up and that the City of Long Beach will introduce a centralized signal control system on city streets to cope with traffic in 1959. Studies for this project are under way now, Gilkerson added.

The important construction work completed, in progress, and planned for the southerly extension of the Long Beach Freeway beyond Pacific Coast Highway by the City of Long Beach is an important achievement which should not go unnoted. The City of Long Beach can well be proud of the freeway design and construction which it has undertaken.

Northerly Extension

To the north of the Santa Ana Freeway plans for extension of the Long Beach Freeway to junction with the San Bernardino Freeway are nearing completion and right-of-way acquisition is progressing at a rapid pace. The California Highway Commission has allocated a total of \$6,150,000 for this construction in the 1958-1959 Fiscal Year, and it is expected that this work will be advertised for bids before the end of 1958. The completion of the Long Beach Freeway Extension northerly to provide a circumferential freeway connection on the east side of Los Angeles between the Santa Ana Freeway and the San Bernardino Freeway will fulfill a great traffic need.

To bring this Long Beach Freeway project to pass the State has entered into 23 major construction contracts, in order to build 16½ miles of freeway, the total construction value of which is close to \$28,000,000. In order to acquire the rights-of-way necessary for this construction, a total of \$19,000,000 has been spent. The total cost of this freeway, including cost of construction by other governmental agencies and paid for by the State, has been slightly in excess of \$48,000,000.



A view southeastward showing the Long Beach-Santa Ana Freeway Interchange



An aerial of the Olive Street Interchange on the Long Beach Freeway. The view is northward.

The construction of the Long Beach Freeway is a significant achievement that can be measured in terms of the vast sums of money saved through farsighted protective spending far in advance of construction and in terms of the hastened pace of construction occasioned by early right-of-way acquisition.

VALLEJO, CALIFORNIA

*Editor, California Highways
and Public Works*

SIR: Of all the magazines that come to our home there is none that I look forward to as yours. I started driving a car back in 1904 and I have covered practically every road in California. No one appreciates the work that has been done on the highways more than I.

The "12-mile-an-hour limit" those days might have been all right for the towns but was certainly superfluous on the roads outside the towns—a speed more than that would have shaken a car to pieces. Thirty years ago a crowd of us was going through

It was through close co-operation between various governmental agencies and other groups that the Long Beach Freeway became an actuality on July 10, 1958, and immediately undertook its assigned task of safely carrying large traffic loads. It is a welcomed addition to the Greater Los Angeles Freeway System.

the Santa Barbara Mission—we had encountered many detours on the way down from San Francisco. Many of the group were complaining about these detours when a woman spoke up and said "You folks must be from California—back east we would like to have our highways as good as these detours."

I have been driving now for almost 54 years. We have covered almost every state in the Union and, although there are some fine roads in all the states, we did notice that the directional markers along the highways cannot compare to those of California.

Yours very truly,

ALEX B. ROWLAND

USE OF FM RADIO

Continued from page 44 . . .

Field telephones were next considered, but were ruled impracticable because men would be roving, or be on rapidly restationed assignments. Walkie-talkies were also seriously considered, but discarded on the grounds of low power, short range, and ineffectiveness in broken terrain.

Finally, it was decided that good, first-quality radio installations were the only answer. As a result, with the co-operation of headquarters communications section, Resident Engineer Edward Walker last fall was furnished with two-way radio communications for the job.

Although certain contractors have been using radio for some time, and although it has been used in California highway maintenance for more than a decade, the Victorville-Barstow project is the first time two-way radio has been used by the Division of Highways as a construction tool.

The actual amount of radio equipment assigned is modest. Standard, stock model units were furnished, identical with those used by the maintenance forces throughout the State. A base station was provided for the resident's trailer office in Victorville, with a whip antenna on the roof. Since the contractor already was using radio for his operations, and his field office was close by the resident's interchange of information was possible a few steps away.

For use in the field, four mobile units were installed in sedans and pickups. These were assigned to the resident engineer, his general assistant, and two principal assistants, one of whom is in charge of structures, the other of grading.

The regular highway frequency in the 47-megacycle band was used. Although there has been some interference with maintenance communications in the area, it has not been serious because of the major mountain barriers which screen the Victorville-Barstow area from most of the other highway activities in the region.

Many Hours Saved

The job is going ahead rapidly, and the ready liaison between the con-

tractor and the State's representatives which the use of radio has provided, is in part responsible for the smoothness of the operation, Resident Engineer Walker feels. Since a round trip over the job amounting to about 60 miles along a slow-speed, contractor's service road is the only alternative, getting the information in a few minutes by radio has saved many man-hours. Furthermore, there is a considerable saving on operation of pickups and other equipment.

One of the areas in which valuable time and equipment savings have occurred is the contractor's need for a state representative on the scene quickly. Conversely, a Division of Highways representative may see something being done by contractor's men which he questions, but which he has no authority to delay. Radio quickly brings a contractor's representative or the resident engineer for a conference to iron out the problem.

Radio has saved considerable time, too, on compaction tests. On samples taken back to the field laboratory, test results have been radioed back to the job, rather than carried by car.

Facility in getting weather forecasts out to distant points on the job is an advantage, also. When the forecast is for colder weather, for instance, arrangements can be made for providing heaters for late afternoon concrete pours.

Repairs can be made in the field more rapidly, and if injuries should occur they can be better cared for when there is radio—although both of these are more likely to be contractor's problems, since most of the equipment and men on the job are his.

Driver's Life Saved

On the US 66-91 job, for example, before operations had been under way more than a few months, a scraper unit turned over and went down a railroad embankment, 11 miles out from Victorville. The driver had one of his legs cut off, and although first aid kept him from bleeding to death, he was badly in need of professional medical care. The contractor's radio had a doctor and ambulance at the scene in 20 minutes.



Inspectors using radio to check blueprints out in the wide open spaces on the Victorville-Barstow expressway are, left to right, W. T. Murray, Art Austin and R. H. T. Norton

More recently, a state inspector picked up a "dead" rattlesnake to throw it off the grade and was raked on one hand by a fang as the rattler twisted in his grasp. A radio-equipped state pickup in the vicinity flashed word ahead with the result that a doctor was waiting with antivenin serum when the man arrived at the hospital. His two weeks hospitalization might have been greatly prolonged had not radio permitted prompt attention.

Although these are dramatic examples, perhaps the greatest value of radio for the highway representatives working on long jobs such as these, is simply the ability to keep in touch. A man and even an orange-colored pickup are quickly lost to sight in the

wide expanses of desert through which this road is being built.

Meetings are arranged by radio, particularly if an unexpected representative shows up from headquarters, say, with a need to talk to the resident engineer who is "somewhere out on the job." Men go directly to their work stations and report in on the job by radio, rather than checking out through the field office. Decisions are made over the radio, without the conferees ever physically coming within miles of each other.

Although the construction situations in which the use of two-way radio is practicable are limited, the Division of Highways is considering its further use where conditions warrant.

Recommendations

Chamber of Commerce
Procedure Explained

By LORAN C. VANDERLIP, California State Chamber of Commerce

THE REGIONAL highway committees of the California State Chamber of Commerce presented recommendations concerning 680 state highway construction projects to the California Highway Commission on August 28th. The projects, covering state highway construction in all of the State's 58 counties, were for the Fiscal Year 1959-60. The recommendations were considered and decided during proceedings conducted at some 40 meetings held in all parts of the State during the months of June, July and August. The sessions were attended by about 1,500 Californians, including local and state governmental officials together with farm, business and civic leaders.

This procedure of sounding out the people's views, gathering and consolidating the ideas, then presenting them in a detailed compilation for the assistance of the California Highway Commission, has been undertaken by the California State Chamber of Commerce annually for the past 30 years or so.

Advance Notice Given

The regional meetings conducted by the chamber are open to the general public. They are real "grass roots" sessions. Advance notice of the meetings is spread widely so that all have opportunity to participate and contribute their suggestions and viewpoints.

The more important values of the state chamber's program may be summarized as follows:

1. It provides a means for highway leaders in each county to get together and agree on a highway program;
2. It brings together state highway and local governmental officials, as well as members of civic groups, in a discussion of vital state highway needs;
3. It makes it easier for the California Highway Commission to

study highway recommendations of local groups which have been tempered with an understanding of regional and statewide traffic problems and patterns;

4. It serves as an excellent medium for bringing current state highway issues to the direct attention of local governmental agencies and civic bodies; and
5. It gives added importance and recognition to projects on the State Chamber listing when local groups make formal presentations before the California Highway Commission.

Realistic Viewpoint

Until two years ago, the projects were submitted to the Highway Commission with no attempt to record them in any order of priority. In order to portray the projects more realistically in a logical listing, the establishment of three categories, for all counties, was set forth for the first time in 1956.

The projects are now listed, in each county, under one of the following A, B or C categories:

- (A) Projects recommended for construction or for the final application of funds for rights-of-way allocation (items in this category include projects which are ready for contract during the ensuing fiscal year);
- (B) Projects recommended for survey, design and commencement of rights-of-way acquisition (this category includes projects for which final plans should be undertaken); and
- (C) Projects recommended for long-term planning (this category includes projects which have not been incorporated in A or B, above, and includes items which may be considered to be eight or ten years in the future).

One area of wide interest which is purposely excluded from the recommendations to the California Highway Commission concerns additions of new mileage to the existing 14,000-mile State Highway System. Inas-

much as such projects are problems for the State Legislature and are not the responsibility of the commission, the items are not included in the compilation of recommendations for submission to the commission.

In practically every regional meeting someone asks about the matter of new mileage. The standard answer is that assistance will be given by the chamber to see that there is a presentation of the item to the proper legislative interim committee, which is charged with the responsibility for determining whether the new mileage should be added to the State Highway System.

Locally Sponsored

The 40 meetings conducted each year follow similar patterns. Local civic organizations or local governmental bodies sponsor the sessions and the meetings are built around local participation. Some of the sessions are completed within an hour and some of the meetings last for more than four hours. Every effort is exerted to obtain the full expression of participants by encouraging them to make direct statements or to ask questions of the highway engineers who are always present at the meetings.

It is of great interest to observe a highway meeting where many divergent views are expressed regarding projects. After a full discussion is completed and all questions are answered, the usual pattern is that persons in attendance will agree in a recommended program for the entire county.

In many counties, preliminary meetings are held prior to the session called by the local group in its meeting with the state chamber representatives. In those instances, all differences of opinion are usually ironed out so that the county group can come forth with a program which has the backing of all interested groups.

... Continued on page 64

COST INDEX

Continued from page 31 . . .

NUMBER AND SIZE OF PROJECTS, TOTAL BID VALUES AND AVERAGE NUMBER OF BIDDERS (January 1, 1958, to June 30, 1958)

Project Volume	Up to \$50,000	\$50,000 to \$100,000	\$100,000 to \$250,000	\$250,000 to \$500,000	\$500,000 to \$1,000,000	Over \$1,000,000	All Projects
Road Projects							
No. of projects	104	47	48	16	12	7	234
Total value*	\$2,408,217	\$3,452,566	\$7,105,381	\$5,575,795	\$8,721,594	\$11,481,818	\$38,745,371
Avg. No. bidders	5.5	5.7	6.9	9.8	9.8	9.3	6.5
Structure Projects							
No. of projects	22	6	5	1		8	42
Total value*	\$589,631	\$453,914	\$872,907	\$439,837		\$22,108,574	\$24,464,863
Avg. No. bidders	5.1	7.8	9.0	9.0		8.5	6.7
Combination Projects							
No. of projects					1	11	12
Total value*					\$941,621	\$50,928,719	\$51,870,340
Avg. No. bidders					14.0	8.9	9.3
Summary							
No. of projects	126	53	53	17	13	26	288
Total value*	\$2,997,848	\$3,906,480	\$7,978,288	\$6,015,632	\$9,663,215	\$84,519,111	\$115,080,574
Avg. No. bidders	5.5	5.9	7.1	9.8	10.1	8.9	6.6

*Bid items only.

Total Average Bidders by Months

	Jan.	Feb.	Mar.	Apr.	May	June	Avg. for six months
1958	11.4	9.2	7.6	7.1	4.5	4.8	6.6
1957	7.1	7.3	6.7	5.5	5.5	5.9	6.1

NUMBER AND SIZE OF PROJECTS, TOTAL BID VALUES AND AVERAGE NUMBER OF BIDDERS (July 1, 1957, to June 30, 1958)

Project Volume	Up to \$50,000	\$50,000 to \$100,000	\$100,000 to \$250,000	\$250,000 to \$500,000	\$500,000 to \$1,000,000	Over \$1,000,000	All Projects
Road Projects							
No. of projects	200	71	78	28	19	9	405
Total value*	\$4,038,317	\$5,283,871	\$12,026,331	\$9,647,299	\$13,324,713	\$14,213,115	\$58,533,646
Ave. No. bidders	5.5	6.2	7.6	10.1	9.5	9.4	6.6
Structure Projects							
No. of projects	44	8	16	3		12	83
Total value*	\$1,034,619	\$590,634	\$2,728,685	\$966,135		\$37,210,850	\$42,530,923
Ave. No. bidders	5.8	7.9	11.1	9.7		8.5	7.6
Combination Projects							
No. of projects					1	22	23
Total value*					\$941,621	\$92,213,959	\$93,155,580
Ave. No. bidders					14.0	9.5	9.7
Summary							
No. of projects	244	79	94	31	20	43	511
Total value*	\$5,072,936	\$5,874,505	\$14,755,016	\$10,613,434	\$14,266,334	\$143,637,924	\$194,220,149
Ave. No. bidders	5.6	6.4	8.2	10.0	9.8	9.2	6.9

*Bid items only.

Total Average Bidders by Months

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Ave. Year
1957-58	6.2	6.3	5.7	8.2	9.2	9.7	11.4	9.2	7.6	7.1	4.5	4.8	6.9
1956-57	3.8	3.7	3.7	4.2	5.3	6.1	7.1	7.3	6.7	5.5	5.5	5.9	5.1

The total value of the above projects is \$65,198,665.

Five of the seven items used in the preparation of the index show lower average bid prices during this quarter with portland cement concrete pavement showing the largest decrease. The two items with higher average prices are asphaltic and bituminous mixes and bar reinforcing steel. The following table shows average unit prices for the seven items used in preparing the index.

The average unit price for roadway excavation for this quarter is \$0.48 which is \$0.04 below the previous quarter. Projects for the second quarter were well spread over the State and since a great amount of the work is not subject to extreme traffic interference nor involves hard rock formations, a price average in the range generally considered as normal is the result.

The average unit price for untreated rock base for the quarter standing at \$1.73 is \$0.12 below the previous quarter and it is the lowest average price determined in the history of the Cost Index. However, it is in the range prevailing in the previous two quarters. The widespread distribution of projects apparently had a lowering effect on average prices in this period.

The average price for asphaltic and bituminous mixes is one of the two showing an increase during this quarter. The price of \$5.67 is \$0.22 above last period, but it is substantially below the price in the same quarter last year. The price was affected to some extent by the annual resurfacing program in which many of the projects are subject to traffic interference.

Portland cement concrete pavement was the one in this quarter which reflected the greatest reduction in average price. The average is \$13.77 or \$1.19 below the previous period. It is the lowest average price since the third quarter of 1955. This trend in a downward direction became apparent in the first quarter and continued into this period.

The average bid price for structure concrete dropped to \$54.44 from \$55.21 established in the first quarter.

The small upward change (\$0.007 per pound) in the average price for

AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Untreated rock base, per ton	Plant mixed surfacing, per ton	Asphalt concrete pavement, per ton	Asphaltic and bituminous mixes, per ton	PCC pavement, per cu. yd.	PCC structures, per cu. yd.	Bar reinforcing steel, per lb.	Structural steel, per lb.
1940	\$0.22	\$1.54	\$2.19	\$2.97	--	\$7.68	\$18.33	\$0.040	\$0.083
1941	0.26	2.31	2.84	3.18	--	7.54	23.31	0.053	0.107
1942	0.35	2.81	4.02	4.16	--	9.62	29.48	0.073	0.103
1943	0.42	2.26	3.71	4.76	--	11.48	31.76	0.059	0.080
1944	0.50	2.45	4.10	4.50	--	10.46	31.99	0.054	0.132
1945	0.51	2.42	4.20	4.88	--	10.90	37.20	0.059	0.102
1946	0.41	2.45	4.00	4.68	--	9.48	37.38	0.060	0.099
1947	0.46	2.42	4.32	5.38	--	12.38	48.44	0.080	0.138
1948	0.55	2.43	4.30	5.38	--	13.04	49.86	0.092	0.126
1949	0.49	2.67	4.67	4.64	--	12.28	48.67	0.096	0.117
1950	0.40	2.25	4.26	3.75	--	11.11	43.45	0.079	0.094
1951	0.49	2.62	4.34	5.00	--	12.21	47.22	0.102	0.159
1952	0.56	2.99	5.00	4.38	--	13.42	48.08	0.098	0.150
1953	0.51	2.14 ¹	5.31	4.58	--	12.74	50.59	0.093	0.133
1954	0.45	2.13	4.50	4.86	--	14.41	48.42	0.094	0.124
1955	0.39	2.22	4.93	--	--	13.35	45.72	0.095	0.142
1st Quarter 1956	0.40	2.08	5.40	6.50	--	14.05	52.51	0.105	0.166
2d Quarter 1956	0.51	2.06	6.27	--	--	14.64	57.13	0.113	0.219
3d Quarter 1956	0.52	2.27	6.12	--	--	15.57	56.32	0.121	0.178
4th Quarter 1956	0.52	2.21	-- ²	-- ²	\$5.93 ²	14.95	59.63	0.112	0.197
1st Quarter 1957	0.63	2.10	--	--	5.94	17.28	61.14	0.129	0.235
2d Quarter 1957	0.63	2.10	--	--	6.18	15.59	58.61	0.119	0.204
3d Quarter 1957	0.42	2.34	--	--	5.10	14.34	58.68	0.130	0.200
4th Quarter 1957	0.68	1.78	--	--	5.45	16.88	59.76	0.129	0.177
1st Quarter 1958	0.52	1.85	--	--	5.45	14.96	55.21	0.118	0.192
2d Quarter 1958	0.48	1.73	--	--	5.67	13.77	54.44	0.125	0.158

¹ The item of crusher run base was used before 1953.

² Asphalt concrete pavement combined with plant mix surfacing in fourth quarter 1956, and will be identified as asphaltic and bituminous mixes in the future.

reinforcing steel in this quarter is consistent with recent past fluctuations.

The average price for structural steel stands at \$0.158 this quarter while an average of \$0.192 was established in the first quarter. Most of this decrease can be attributed to a very low price submitted on a bridge project in the

Los Angeles area where a large volume of steel is to be used.

The most recent bids received for state highway construction and the Index graph pattern indicate that a leveling-off will occur in the third quarter.

DISTRICT IX

Continued from page 12 . . .

recent improvement of State Sign Route 127 within District IX.

For that look at Death Valley you will leave Route 127 at Death Valley Junction via State Sign Route 190 which crosses the Funeral Mountains, the Panamint and Argus ranges, skirts the dry lake bed of Owens Lake and joins US 6/395 near Lone Pine. A side trip from Lone Pine to the base of Mt. Whitney should be included in your itinerary. A four-mile portion of this Inyo County Federal Aid Secondary Road is now being reconstructed under a contract which will provide improved alignment and width from the Inyo National Forest boundary to Hunter's Flat. This project involves extremely rugged construction over an alluvial fan strewn with huge gran-

ite boulders and up the steep granite scarps of the Sierra.

On your return to the south you could cross to Bakersfield on State Sign Route 178 over the historic Walker Pass, past the new man-made Lake Isabella and through the winding Kern River Canyon. Much of this route has had scant improvement, except for paving, from the old wagon road. One two-mile portion between Weldon and Onyx that followed the base of the foothills with many sharp curves and was subject to frequent flooding was reconstructed in 1957. This is a start on planned long range improvement for this entire route within District IX.

Those who return to the desert and high Sierra country that is District IX, year after year, will continue to find new highways that provide easier, faster and safer travel.

The California Highway Construction Cost Index, the Engineering News-Record Construction Cost Index, and the United States Bureau of Public Roads Composite Mile Index, all reduced to the base 1940 = 100, are shown on the accompanying graph. The latter two Indexes are based on nationwide construction costs.

The Engineering News-Record Cost Index, which now stands at 310.4, again shows a rise over the preceding quarter. It is up 3.0 index points or 1.0 percent from the fourth quarter. This index is strongly affected by many large projects outside the highway construction field.

The Bureau of Public Roads Composite Mile Index for the first quarter of 1958 at the level of 233.4, which is the latest available, was down 4.9 index points or 2.1 percent below the fourth quarter of 1957. Its behavior in the first quarter parallels the California pattern.

THE CALIFORNIA HIGHWAY CONSTRUCTION COST INDEX

Year	Cost Index	Cost Index
1940	100.0	100.0
1941	125.0	125.0
1942	157.5	157.5
1943	156.4	156.4
1944	177.8	177.8
1945	179.5	179.5
1946	179.7	179.7
1947	203.3	203.3
1948	216.6	216.6
1949	190.7	190.7
1950	181.2	181.2
(1st quarter 1950—160.6)		
1951	225.0	225.0
(4th quarter 1951—245.4)		
1952	225.9	225.9
1953	215.2	215.2
1954	193.5	193.5
(2d quarter 1954—189.0)		
1955 (1st quarter)	189.3	189.3
1955 (2d quarter)	212.4	212.4
1955 (3d quarter)	208.6	208.6
1955 (4th quarter)	212.6	212.6
1956 (1st quarter)	219.5	219.5
1956 (2d quarter)	255.9	255.9
1956 (3d quarter)	249.1	249.1
1956 (4th quarter)	252.1	252.1
1957 (1st quarter)	277.7	277.7
1957 (2d quarter)	266.9	266.9
1957 (3d quarter)	237.5	237.5
1957 (4th quarter)	262.1	262.1
1958 (1st quarter)	241.8	241.8
1958 (2d quarter)	231.0	231.0

REPORT FROM DISTRICT VI

Continued from page 43 . . .

Sign Route 180

Sign Route 180 between Route 33 near Mendota and Kings Canyon National Park is the main east-west highway through Fresno. Presently much of this route in the city is on a one-way street system inaugurated in 1955.

Another section of this system was recently completed with the opening of the second of two one-way steel girder bridges over two city streets and the Southern Pacific yards.

Stanislaus Street, the westbound leg, extends over F and G Streets, and 21 tracks of the railroad on a structure 1,108 feet in length. The Tuolumne Street eastbound structure spans the same streets and 16 tracks and is 1,053 feet in length.

Due to the necessity of getting over one city street and down to grade at the next without excessive grades and to obtain sight distance, it was necessary to attain a maximum elevation of 34 feet above the rails on the Stanislaus structure.

The project was completed in July of this year at a cost of construction of \$1,050,000, which included approaches and street work.

Sign Route 198

This lateral is from San Lucas on US 101 to Sequoia National Park by way of Priest Valley, Coalinga, Hanford, Visalia and Lemoncove.

Construction of a 4.75-mile section between the Visalia Airport Interchange and Visalia was completed in June of this year. The construction cost was \$1,207,000. It provided a four-lane divided expressway with frontage roads on portions. The right-of-way was widened from an original 60 feet to 142 feet.

Sign Route 41

Blackstone Avenue, north of Fresno, a rapidly developing commercial street, has been widened to a six-lane divided thoroughfare between Hedges Avenue and the northerly limits of the community of Pinedale. This section was done under three contracts, covering a distance of approximately 6½ miles, the most recent section

US 66-91

Continued from page 48 . . .

packed material. Approximately 11,000 lineal feet of two-lane width (31,800 square yards) is mixed and compacted per nine-hour day. A total of 750 barrels of cement per day go into this work.

The mixed material is spread by adjustable trailing strike-off blades mounted on the mixers, augmented by motor graders. Segmented-wheel rollers key the compaction operation. The completed subgrade takes a 0.25-gallon per square yard application of SC-2 prime coat, with ⅜ inch to ½ inch penetration.

At this writing, plant-mixed surfacing production is about to begin. Two PMS batch-type plants, one 5,000-pound and one 6,000-pound, have been erected side by side at the same pit location used for IBM. Here, the contractor plans for an average production of 4,000 tons per 10-hour day. The leveling course will be spread by motor graders and the surfacing course placed by two paving machines. A shoulder machine will be utilized in placing PMS berms and lining gutters.

Innovations have also featured the State's handling of inspection work. The original earthwork quantities were calculated by the use of electronic computers. Corresponding pay quantities have been independently

between Sign Route 168 and Pinedale having been completed in April of this year. The cost of these three sections was \$1,068,000.

Sign Route 168

The construction of a modern two-lane mountain highway between Shaver Lake and Huntington Lake on new location, for a distance of 17 miles, was completed under several contracts by the U. S. Bureau of Public Roads in 1956. This section of road was turned over to the State for maintenance in 1957. The vast improvement over the original road, with its sharp curvature and steep grades, has provided much impetus for increased travel to the Huntington Lake and China Peak recreational areas.

calculated by this method, using original ground elevations taken during routine slope staking. Experience gained here has contributed to the State's knowledge of the controls necessary to permit full, free, and proper use of these methods.

At the contractor's request, finish grade stakes were offset on the slopes prior to completion of subgrade at bottom of imported base material. These stakes were driven to grades one foot above subgrade. The original intent was to permit use of motor graders with electronically controlled moldboards guided by grade wires or string lines attached to the high stakes. For various reasons, the contractor has not followed this plan through all blading operations. However, the high stakes have effected a real saving to the State in providing a guide for the operator of the motor grader.

Various Tests

The acid-base titration test was used as a measure of the transverse uniformity of cement distribution in the mixed CTB (concrete-treated base).

PMS asphalt content extraction tests will be run in the field to keep pace with the contemplated high rate of pavement production.

The extensive field laboratory work performed has been expedited by the use of radio, and by a mobile operation. One field laboratory is located at the resident engineer's office at Victorville. This is augmented by three temporary laboratories spotted through the work as necessary to minimize travel.

The production being achieved on this project apparently will result in the project being completed at least four months ahead of time, and early in 1959 the project will be presented to the traveling public at a net cost of \$200,000 per mile. A total of 29.3 miles of freeway will be added to the interstate system, 35,000 vehicle-miles per day of length of travel will be saved by the traveling public in addition to the advantage of the greatly improved safety and comfort features. In addition, countless square miles of new area will be open to development.

Gladys Boswell Retires; With State 29 Years

Gladys Boswell retired on June 30th after 29 years with the State, including positions in the Secretary of State's Office and the Board of Registration for Civil Engineers. At the time of her retirement she was secretary to the Assistant State Highway Engineer, Operations. Mrs. Boswell's father, A. A. Harrison, was a long-time employee of the Division of Highways.

Mrs. Boswell and her husband, Harry, have purchased a stock ranch in Lassen County where they will spend most of their time after her retirement.

A. A. S. H. O.

Continued from page 34 . . .

Administrative Practices, Uniform Accounting, Traffic, Roadside Development, Highway Finance, Factual Surveys, Secondary Roads, Geology and Soils, Radio, Electronics, Maintenance and Equipment, Bridges and Structures, Materials, Legal Affairs, Right of Way, Design, Public Information, Construction, Transport, and Research Activities.

An innovation in the handling of annual meeting arrangements this year is a preregistration procedure which is expected to reduce congestion at registration desks in the Sheraton-Palace lobby. Delegates have been sent registration forms which are to be completed and mailed in to the AASHO Housing Bureau in San Francisco along with their reservations at any one of 12 downtown hotels.

Visitor or guest registration and reservation forms and advance information have also been mailed to organizations requesting them who normally are represented at the AASHO meetings. Representatives of non-member organizations desiring to secure registration and reservation forms may do so by writing to the AASHO Bureau, P. O. Box 3159, Rincon Annex, San Francisco 19.

Bad driving conditions prevailed in less than 15 percent of the fatal highway accidents in the United States in 1957.

TWENTY-FIVE-YEAR AWARDS

Employees who received twenty-five-year awards since those listed in the July-August, 1958, issue of *California Highways and Public Works*.

District I

Travis, Charles W.

District II

Bidwell, James H.

District III

Culveyhouse, Elwood M.

Heflin, Robert W.

Miller, Marvin R.

Miller, Robert M.

District IV

Finley, Richard E.

Merango, Fred

District VI

Kahl, Edward James

District VII

Faulkner, Frew J.

Johnson, George A.

District VIII

Sides, Mildred K.

District X

Harrigan, Ben J.

Maciel, Manuel G.

Snooks, Jackson

Wells, R. Kenneth

Wraa, Elwood J.

Bridge Department

Barker, Robert S.

Shop 7

Davies, William H.

Warner, Charlie B.

Shop 10

Millard, William J.

THE METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA
Los Angeles, California

Editor,

California Highways and
Public Works

Sir:

On page 23 of *California Highways and Public Works* for May-June 1958 there appears an account of the plaque award to San Francisco-Oakland Bay Bridge as one of the "seven civil engineering wonders of the United States" by the American Society of Civil Engineers.

In this article in paragraph 6 there appears a list of the seven civil engineering wonders selected by the ASCE. One of the seven wonders is the Colorado River Aqueduct of the Metropolitan Water District of Southern California. However, in your article you list the Colorado River Aqueduct as "the Colorado River-Los Angeles Aqueduct." This, of course, is completely in error. The Colorado River Aqueduct is not a "Los Angeles Aqueduct" but is a water supply sys-

Fred Jacobson Joins Bakersfield Chamber

Fred Jacobson, special representative of the State Department of Public Works, submitted his resignation and left the department September 12th to become manager of the Industrial Department of the Greater Bakersfield Chamber of Commerce.

tem financed, constructed and operated by the Metropolitan Water District of Southern California, which has within its boundaries 83 incorporated cities, including Los Angeles.

Very truly yours,

ROBERT B. DIEMER
General Manager and
Chief Engineer

The name "Colorado River-Los Angeles Aqueduct" was taken from a list of prize-winners announced by the American Society of Civil Engineers. We are happy to print the above letter giving the official name of the aqueduct.

THE EDITOR

Merit Award Board Winners Announced

Employees of the Department of Public Works receiving certificates of commendation and cash awards since the last list was published in the July-August issue of this magazine are:

Thomas L. Miller, Architecture, Sacramento. Certificate for proposing that a quantity of standard working drawing tracing sheets be reprinted to include across the bottom of the sheet a printed standard scale for plan and profile.

LaMonte E. Daniel, Highways, Stockton. Certificate of award and \$10 for proposing that the daily record of platform scale weights form be prepared in triplicate with snap-out carbons included.

William R. Connelly, Jr., Highways, El Centro. Certificate of commendation for proposing that the distribution of charges between road sections on monthly progress pay estimates be discontinued.

Anthony J. Schneider, Highways, San Luis Obispo. Certificate of commendation for recommending the placing of handles on mixing bowls of mechanical mixers.

Jack Roy, Architecture, Los Angeles. Certificate of award and \$15 for recommending that blueprints and specification books mailed from the Sacramento office be shipped or mailed in one parcel.

Mrs. Lucille Davitt, Architecture, Los Angeles. Certificate of commendation for proposing the use of filing pockets instead of fasteners.

Harold E. Atherstone, Highways, Stockton. Certificate of commendation for proposing that Form WH 16 and A529 be revised.

Roy H. Dutcher, Oakland. Certificate of award and \$50 for recommending revisions of Vehicle Form 273 and S-120.

Mrs. Margaret S. Eggleston, San Bernardino. Certificate of award and \$25 for proposing that her district use a numbering machine for placing entry numbers on file books, tracings, and plans.

Samuel E. Lazarus, Modesto. Certificate of award and \$25 for recommending use of a cover demand design chart.

Franklin Lowe Young, San Francisco. Certificate of award and \$50 for devising a procedure for making up contract plan coordinate sheets.

Stephen Rusick, Crockett. Certificate of award and \$10 for proposing the use of a torque wrench device for tightening bolts on the Carquinez Bridge.

Henry S. Smith, San Bernardino. Certificate of award and \$20 for proposing a revision of Form WH 29 A.

Jesse C. Bringham and *William C. Ensley*, Sacramento. Certificate of commendation for proposing the use of sliding parallel rules for use in mechanical lettering.

RECOMMENDATIONS

Continued from page 59 . . .

For highway boosters from all parts of the State to submit their views to the commission individually would require many hours of commission meeting time and of the citizens' time. But the State Chamber of Commerce project recommendation system makes available to the commission in one brief presentation the full force and effect of hundreds of man-hours of careful, regional consideration. And the printed report the state chamber compiles and delivers remains valuable for consideration all through the commission's budget work each August, September and October.

REPORT FROM DISTRICT V

Continued from page 28 . . .

to successful completion this past year, and many more are planned for the future and will be carried forward, we feel sure, in the same atmosphere of agreement and co-operation we have experienced in the past.

New Records Set On S. F. Bay Bridge

A total of 3,255,446 motor vehicles crossed the San Francisco-Oakland Bay Bridge during the month of August, 1958, to set a new monthly traffic record for the structure.

The daily average for August, 105,014 vehicles, was also a new high record.

The previous high month was last June with a traffic total of 3,127,124 vehicles. The daily average for June was 104,237, the previous high.

Meyer K. Hyman, San Francisco. Certificate of commendation for recommending a revision of the speed zone sheet.

Paul L. Bothner, El Monte. Certificate of commendation for recommending a revision of the resident engineer's and inspector's diary form.

Richard G. Peters, San Francisco. Certificate of commendation for recommending that a space be provided on the quantity sheet for showing cross-section scale.

Mrs. Julia E. Karr, Sacramento. Certificate of commendation for recommending that every page of the *California Highways and Public Works* magazine have the date printed at the bottom for reference purposes.

E. J. Saldine Retirement Marked

E. J. Saldine, industry contact engineer, retired on September 30th after a career of more than 32 years with the Division of Highways.

Born in Great Falls, Montana, in 1897, and educated in the public schools there, Saldine graduated from Montana State College in 1921 with a bachelor of science degree in civil engineering.



E. J. SALDINE

His engineering career began in 1919 while attending college. During summer vacations

and after his graduation he worked on irrigation, highway and municipal projects in Montana until he came to California in 1923.

After joining the Division of Highways in Los Angeles in 1924, Saldine successively became assistant resident engineer, resident engineer and assistant office engineer, remaining in the Los Angeles office until 1927 when he launched his own business as a contractor.

In 1928 he returned to the Division of Highways in the Sacramento office and in the succeeding years served in key positions on the Headquarters Office staff.

His headquarters work in earlier years involved federal aid liaison, personnel and division management phases. In 1950 he became assistant operations engineer and in 1956 he was appointed industry contact engineer.

Some of his responsibilities during his years in Headquarters Office have included the handling of contractor prequalification, determination of prevailing wages in the highway industry, supervision of service agreement procedures, and administration of emergency, informal and right-of-way clearance contracts.

More than 21 percent of 1957 United States highway deaths occurred on Saturdays.

GOODWIN J. KNIGHT
Governor of California

CALIFORNIA HIGHWAY COMMISSION

- C. M. GILLISS Chairman and Director
of Public Works
CHESTER H. WARLOW, Vice Chairman . . . Fresno
JAMES A. GUTHRIE San Bernardino
ROBERT E. McCLURE Santa Monica
FRED W. SPEERS Escondido
ROBERT L. BISHOP Santa Rosa
JOHN O. BRONSON Sacramento
BEN D. MARTIN, Secretary Garden Grove

DEPARTMENT OF PUBLIC WORKS

- C. M. GILLISS Director
A. H. HENDERSON Deputy Director
T. FRED BAGSHAW Assistant Director
JOHN STANFORD Management Analyst
S. ALAN WHITE Departmental Personnel Officer
RICHARD WINN Departmental Information Officer

DIVISION OF HIGHWAYS

- GEO. T. McCOY
State Highway Engineer, Chief of Division
J. W. VICKREY Deputy State Highway Engineer
CHAS. E. WAITE Deputy State Highway Engineer
J. W. TRASK Assistant State Highway Engineer
F. W. PANHORST Assistant State Highway Engineer
J. C. WOMACK Assistant State Highway Engineer
J. P. MURPHY Assistant State Highway Engineer
F. N. HVEEM Materials and Research Engineer
FRANK E. BAXTER Maintenance Engineer
GEO. LANGSNER Engineer of Design
G. M. WEBB Traffic Engineer
MILTON HARRIS Construction Engineer
H. B. LA FORGE Engineer of Federal Secondary Roads
C. E. BOVEY Engineer of City and Co-operative Projects
EARL E. SORENSON Equipment Engineer
H. C. McCARTY Office Engineer
J. A. LEGARRA Planning Engineer
F. M. REYNOLDS Planning Survey Engineer
L. L. FUNK Photogrammetric Engineer
SCOTT H. LATHROP Personnel and Public Information
E. J. SALDINE Industry Contact Engineer
E. J. L. PETERSON Program and Budget Engineer
A. L. ELLIOTT Bridge Engineer—Planning
I. O. JAHLSTROM Bridge Engineer—Operations
R. R. ROWE Bridge Engineer—Special Studies
J. E. McMAHON Bridge Engineer—Southern Area
L. C. HOLLISTER Projects Engineer—Carquinez
E. R. HIGGINS Comptroller

Right-of-way

- FRANK C. BALFOUR Chief Right-of-way Agent
E. F. WAGNER Deputy Chief Right-of-way Agent
RUDOLPH HESS Assistant Chief
R. S. J. PIANEZZI Assistant Chief
E. M. MacDONALD Assistant Chief

District IV

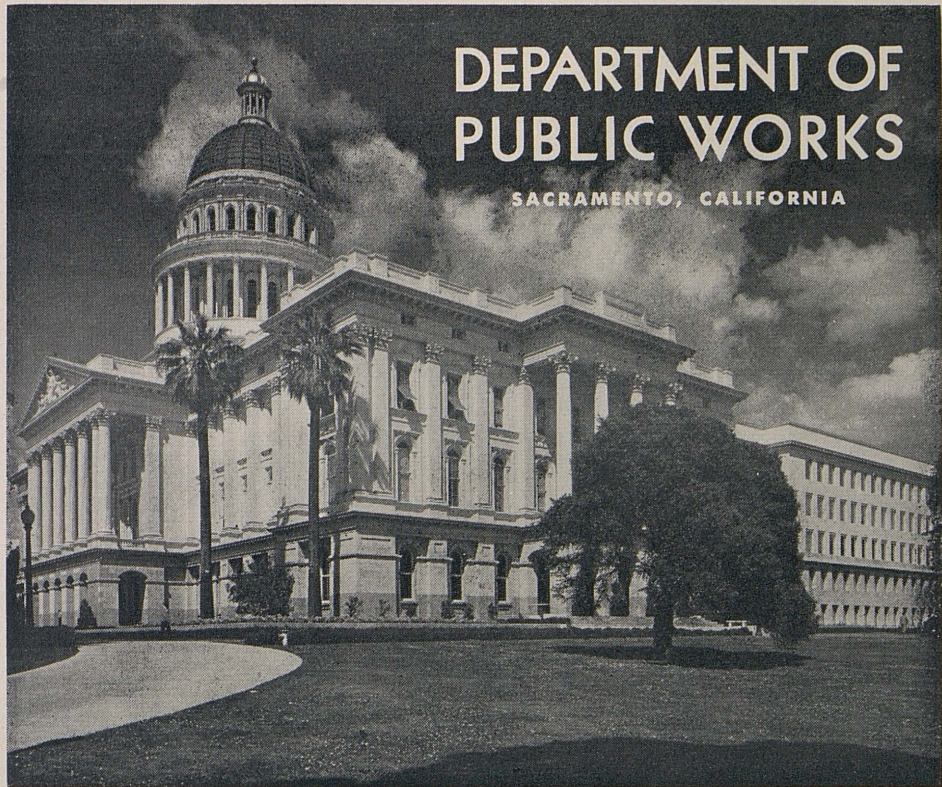
- B. W. BOOKER Assistant State Highway Engineer

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



**DEPARTMENT OF
PUBLIC WORKS**

SACRAMENTO, CALIFORNIA

- J. P. SINCLAIR District IV, San Francisco
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
LYMAN R. GILLIS 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 Bridge Engineer
State-owned Toll Bridges

**DIVISION OF CONTRACTS AND
RIGHTS-OF-WAY**

Legal

- ROBERT E. REED Chief Counsel
GEORGE C. HADLEY Assistant Chief
HOLLOWAY JONES Assistant Chief
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 of Division
ROBERT W. FORMHALS
Administrative Assistant to State Architect
FRANK B. DURKEE, JR. Information Officer

Budget and Fiscal Service

- EARL W. HAMPTON Assistant State Architect
HENRY R. CROWLE Fiscal Officer

- (VACANCY) Contract Administrator
WILLIAM R. VICK Construction Budgets Architect
WADE O. HALSTEAD Principal Estimator
STANTON WILLARD Principal Architect, Standards
WILLARD E. STRATTON
Supervisor of Professional Services
LEAVITT M. POWERS Accounting Officer
W. F. PARKS Supervisor of Office Services

Design and Planning Service

- (VACANCY) Assistant State Architect
ROBERT M. LANDRUM Chief Architectural Co-ordinator
ARTHUR F. DUDMAN Principal Architect
JAMES A. GILLEM
Principal Architect and Area Supervisor, Los Angeles
CHARLES PETERSON
Principal Structural Engineer, Los Angeles
CARL A. HENDERLONG
Principal Mechanical and Electrical Engineer
CLIFFORD L. IVERSON Chief Architectural Draftsman
GUSTAV B. VEHN Chief Specification Writer

Construction Service

- CHARLES M. HERD Chief Construction Engineer
CHARLES H. BOCKMAN
Assistant to Chief Construction Engineer

AREA CONSTRUCTION SUPERVISORS

- THOMAS M. CURRAN Area I, Oakland
J. WILLIAM COOK Area II, Sacramento
CLARENCE T. TROOP Area III, Los Angeles

**AREA STRUCTURAL ENGINEERS
SCHOOLHOUSE SECTION**

- MANLEY W. SAHLBERG Area I, San Francisco
M. A. EWING Area II, Sacramento
ERNST MAAG Area III, Los Angeles



inches

4 3 2 1 0 1 2 3 4 5 6 7 8 9 10

centimeters

10 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 10

D50 Illuminant, 2 degree observer

L*	39.12	65.43	49.87	44.26	55.56	70.82	63.51	39.92	52.24	97.06	92.02	87.34	82.14	72.06	82.15
a*	13.24	18.11	-4.34	-13.80	9.82	-33.43	34.26	11.81	48.55	-0.40	-0.60	-0.75	-1.06	-1.19	-1.07
b*	15.07	18.72	22.29	-22.89	24.49	-0.35	59.80	46.07	18.51	1.13	0.23	0.21	0.43	0.28	0.19
Density										0.04	0.09	0.15	0.22	0.36	0.51

Golden Thread

16 (M)	17	18 (B)	19	20	21	22	23	24	25	26	27	28	29	30
-49.25	-38.62	-28.86	-16.19	8.29	3.44	51.41	72.46	72.95	68.83	55.93	43.96	82.74	52.79	50.87
-0.18	-0.18	0.54	-0.05	-0.81	-0.23	20.98	-24.45	16.83	13.06	-8.80	-54.81	52.00	60.88	-27.17
0.01	-0.04	0.60	0.73	0.19	0.49	-19.43	55.93	88.80	-49.49	30.77	50.01	81.29	-12.72	-29.46
0.75	0.98	1.24	1.67	2.04	2.42									

Colors by Munsell Color Services Lab

Don Williams