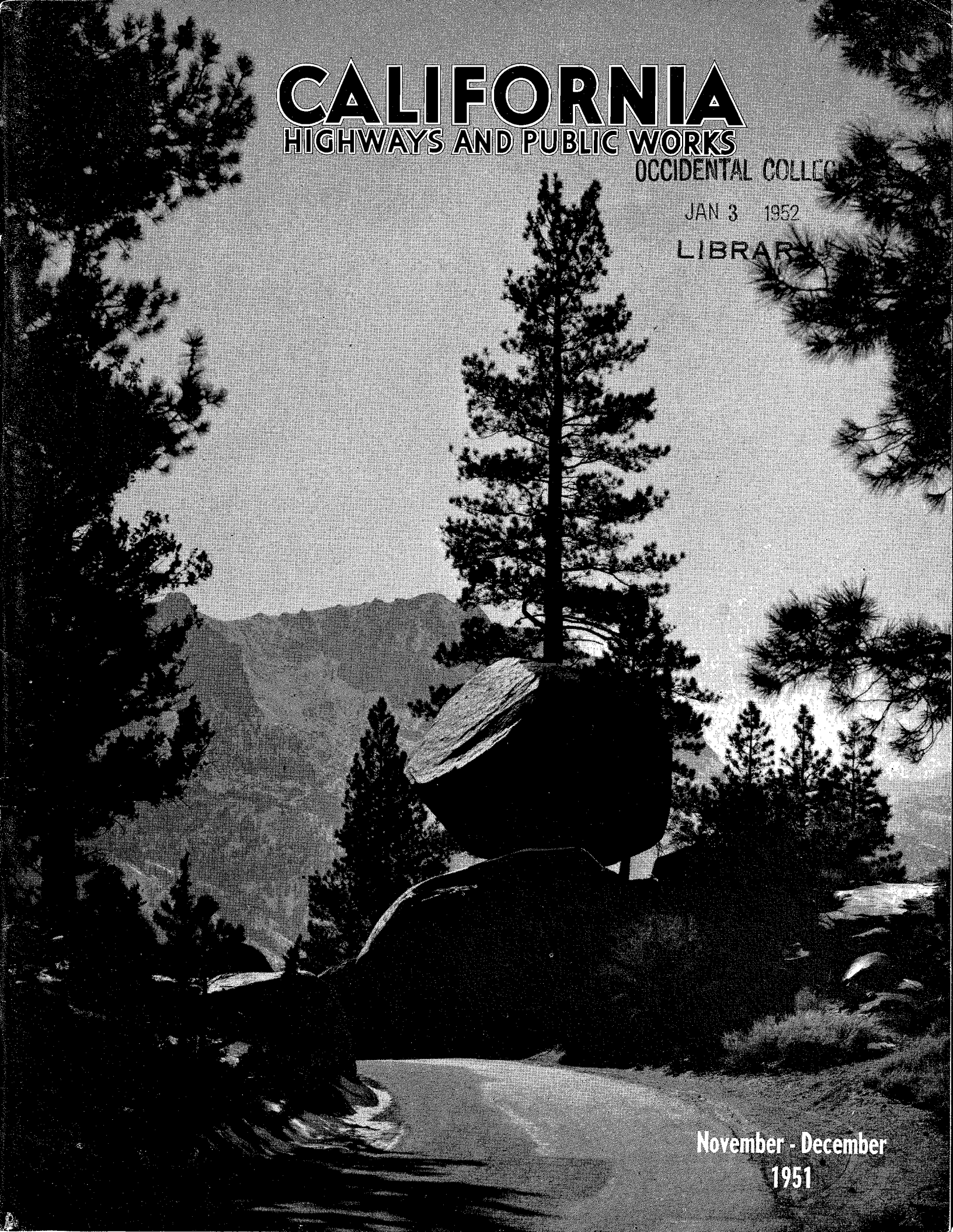

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November - December
1951

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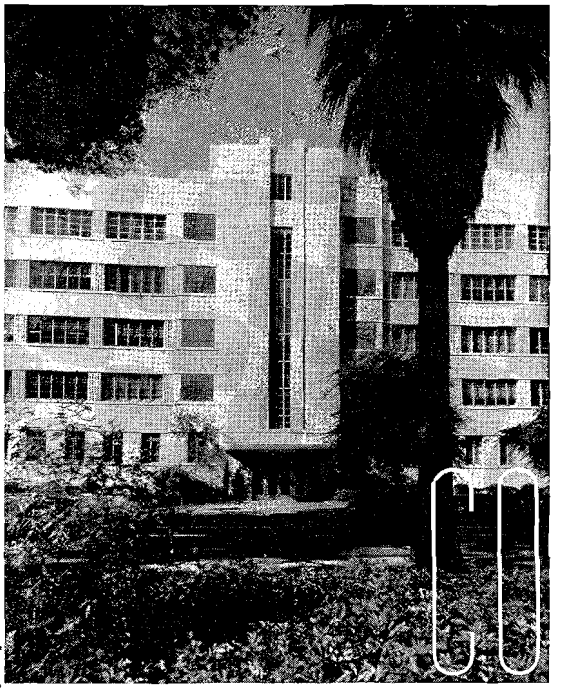


Public Works Building
Twelfth and N Streets
Sacramento

CONTENTS

Civil Defense

Part Public Works Department Will Play If Emergency Arises

By RODNEY C. RICHARDSON, Assistant to Public Works Director

EMPLOYEES of the Department of Public Works are "Shock Troops" of civil defense and disaster relief in California.

The State Civil Defense and Disaster Relief Plan, developed under the direction of W. M. Robertson, Major General, U. S. A. (Ret.), is advisory in character to political subdivisions below the state level, in recognition of their autonomy. It is realized, however, that an attack by enemy forces would undoubtedly cause a condition that would require augmentation of local relief forces, and trained engineers will be one of the most important single categories of manpower needed for effective assistance. For that reason, as well as certain other obvious conclusions, the Department of Public Works has been assigned the responsibility for providing the staff for the Engineering Service Division of the Office of Civil Defense.

The Chief of Engineering Service in the Office of Civil Defense is Dwight F. Johns, Brigadier General, U. S. A. (Ret.), formerly of the Corps of Engineers, and who is familiar with our department, through his World War II assignment at San Francisco. In case of a "state of extreme emergency" his headquarters staff will be composed of top-flight engineers from each of the three operating divisions — namely, Architecture, Highways, and Water Resources.

The Office of Civil Defense has set up 10 regions, each of which is headed by a regional coordinator, and, with the exception of the area surrounding Sacramento, these regions roughly correspond to the highway districts in the State. In the case of Sacramento, that particular civil defense region includes Highway Districts III and X.

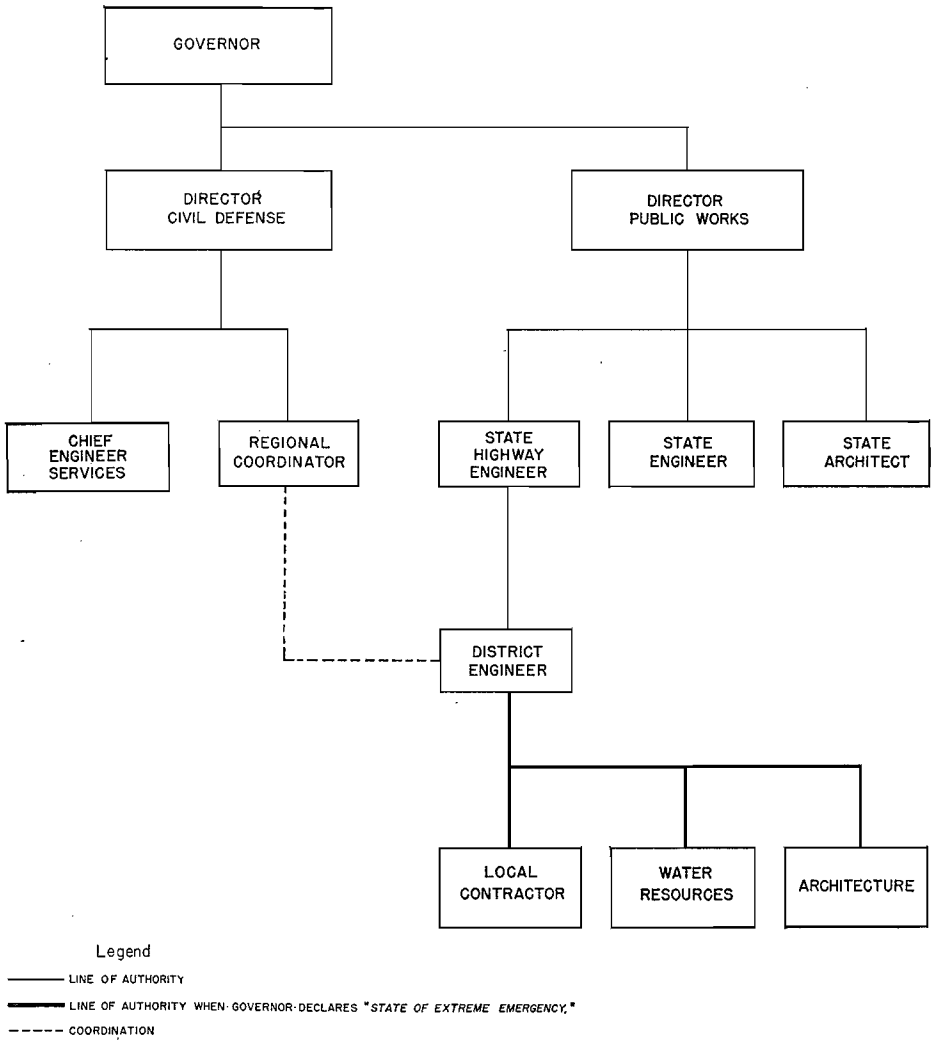
For the actual operations of Engineering Service, the District Engineer of the Division of Highways, as listed below, will be the chief for the respective civil defense region:

CALIFORNIA STATE CIVIL DEFENSE AND DISASTER RELIEF PLAN

ANNEX 4d.

ENGINEER SERVICES

INCLOSURE - 1



Region	1—District Engineer, District	I
Region	2—District Engineer, District	II
Region	3—District Engineer, District	IV
Region	4—District Engineer, District	X
Region	5—District Engineer, District	V
Region	6—District Engineer, District	VI
Region	7—District Engineer, District	V
Region	8—District Engineer, District	VIII
Region	9—District Engineer, District	VII
Region	10—District Engineer, District	XI

The State Highway Engineer will control engineering service operations within a region during a "state of extreme emergency," through direction of the appropriate district highway engineer whose forces will be reinforced by the available personnel from the Divisions of Architecture and Water Resources, in cooperation with the regional coordinator.

... Continued on page 35

Powdered Rubber

Its Experimental Field Use in Bituminous Plant-mix Surfacing

By ERNEST ZUBE, Senior Materials and Research Engineer

During the past few years the use of rubber in one form or another as an admixture to bituminous surfacing has been advocated by the rubber industries. Adding rubber either in reclaimed powdered form or crude natural rubber to asphalt pavement is not a recent development. Just prior to the second world war, experimental test sections containing rubber were placed in the East Indies and some European countries, and reportedly are still in good condition.

The advantages claimed for rubber-bituminous mixtures are:

1. Improved stability due to lower temperature susceptibility.
2. Better sealing quality, thereby preventing water from seeping through the surface mixture.
3. Reduction in maintenance expense, and
4. Better nonskid properties.

During 1949 and 1950, experimental rubber-bituminous mixtures were placed in various states, such as Virginia, Ohio, Texas, Massachusetts, Minnesota, California and others.

This article covers the installation of the California experimental section which consists of plant-mixed surfacing to which was added reclaimed powdered rubber. The section is located in Highway District III on Road III-Pla-37-A, U. S. Route 40 and is part of the new four-lane highway between Auburn and Applegate constructed during 1950 under Contract 51-3TC4.

Auburn-Applegate Project

The test section is confined to the outer eastbound lane only and extends from Station 200+50 to Station 230+11, or a distance of 2,961 feet. Approximately one-half of this distance is on a 1.8 percent grade and the other one-half on a 5.9 percent grade. The outer lane, especially on the steeper grade, will be subjected to rather heavy truck traffic and it was felt that the advantages from the addition of the rubber, if any, should be more easily discernible in the heavily traveled lane. Small identification markers are placed along the right of way to indicate the limits of the experimental section (*See Photo 10*).

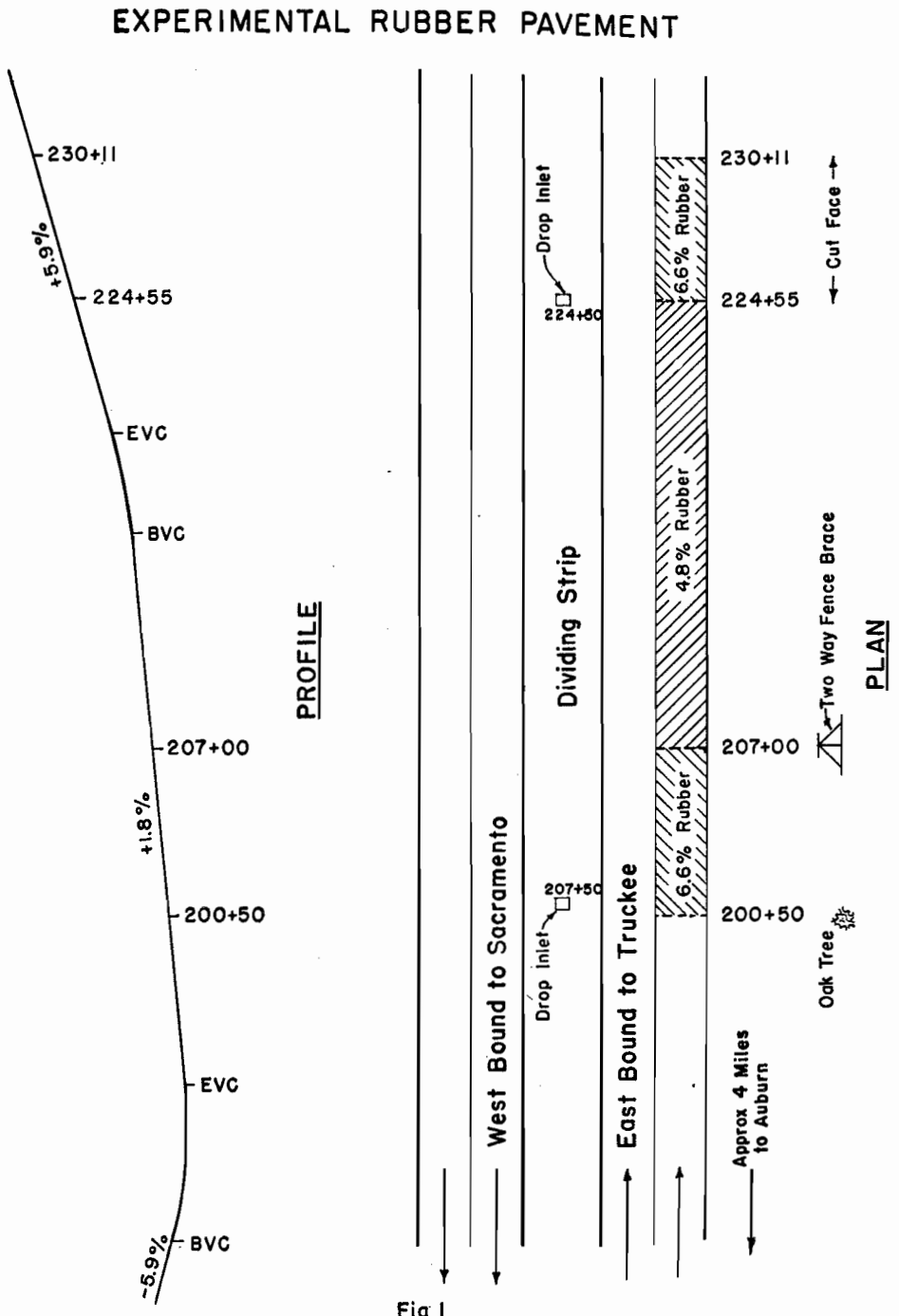


Fig 1

It was planned to add approximately 5 percent and 7 percent of rubber by weight of the asphalt to the plant-mix. Therefore, the length of the section was divided into three portions, the

two ends to contain about 7 percent of rubber and the middle portion 5 percent. This arrangement permitted the placing of both mixtures on the flat grade as well as on the steep grade. The accompanying drawing, *Fig. 1*, illustrates the layout.

Construction

The plant-mix surfacing conformed to Section 28 of the Standard Specifications, three-fourth-inch maximum size aggregate, with 150-200 penetration paving asphalt as the bituminous binder. The aggregate consisted of Bear River crushed gravel and the asphalt was obtained from the Five C Refining Company. The regular plant-mix surfacing contained an asphalt content of 4.1 percent but an additional 0.1 percent of asphalt was added for the asphalt-rubber mixture to take care of the absorptiveness of the powdered rubber. The structural section consisted of a two-inch thick surface course placed with a Barber Greene finishing machine on a two-inch blade spread leveling course. The rubber was added to the surface course only. The base was cement treated with 3 percent of Portland cement.

The powdered reclaimed rubber in the amount of one ton was furnished to the State free of charge by one of the leading rubber companies and was delivered to the job in sacks weighing about 115 pounds each.

A grading analysis of the rubber was as follows:

No. 4 sieve	100% passing
No. 8 sieve	99% passing
No. 16 sieve	99% passing
No. 30 sieve	69% passing
No. 50 sieve	17% passing
No. 100 sieve	2% passing
No. 200 sieve	1% passing
No. 270 sieve	1% passing

Mixture Used

A batch consisted of 4,000 pounds dry aggregate and 168 pounds of asphalt. As the rubber was to be only 5 percent to 7 percent by weight of the asphalt, the amount added per batch was 8.40 pounds and 11.76 pounds, respectively. Due to the vibrations of the plant, it was not practical to weigh out such small quantities. Therefore, a calibrated container was used and the proper amount of rubber was added by volume measurement.

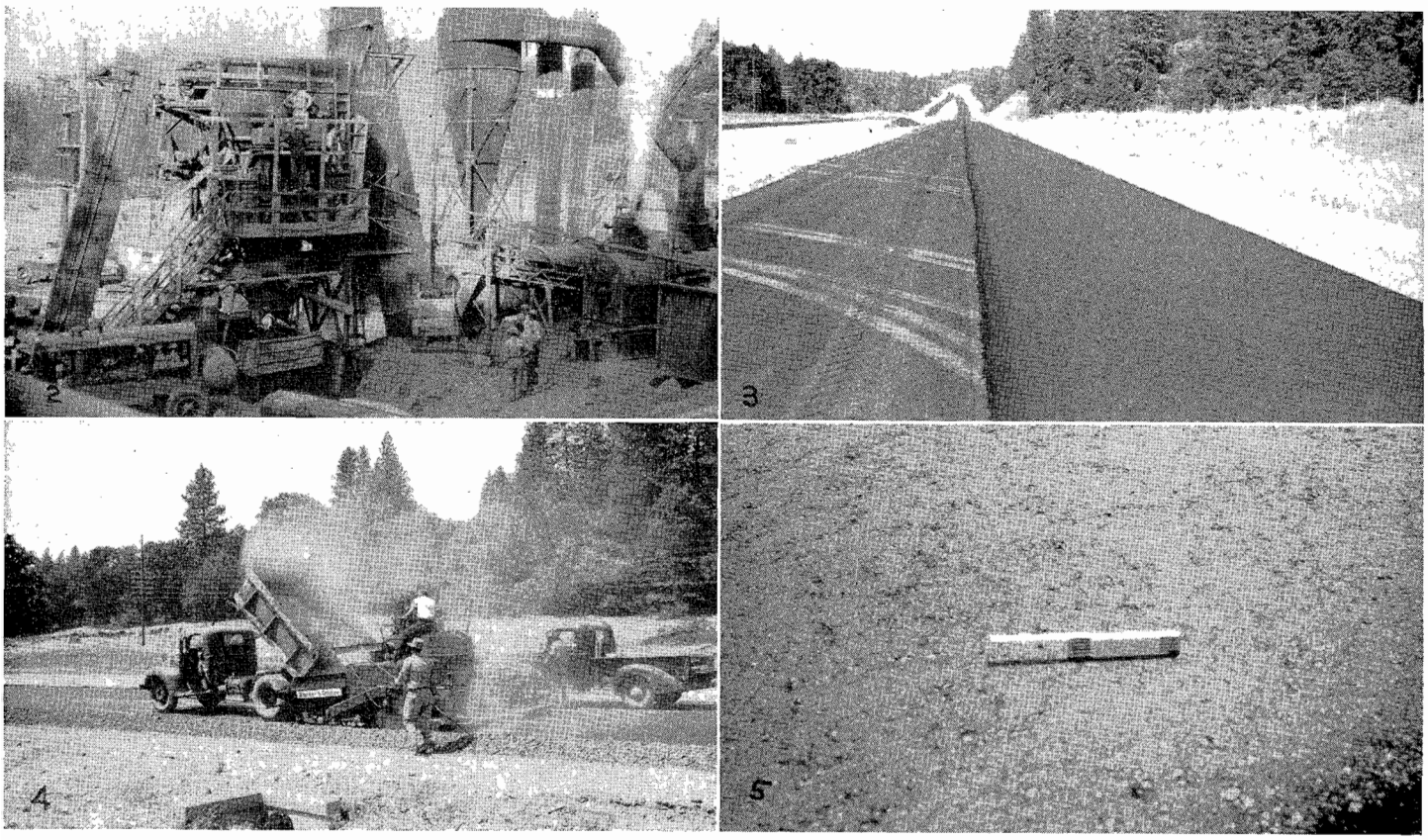
The rubber was added to the dry mix by means of an improvised chute from a platform constructed above the plant operator. The charge was then mixed dry in the pugmill for a period of approximately 20 seconds to thoroughly distribute the small amount of rubber. The asphalt was then added and mixing continued for a period of 35 seconds.

The total tonnage of asphalt-rubber mixture was 436.95 tons. Based on 2,000 pounds of powdered rubber furnished, a recalculation showed that actually only about 6.6 percent of rubber was used for the intended 7 percent portion and 4.8 percent for the intended 5 percent portion.

Conventional Spread

The mix was hauled in trucks from the plant site to the job and spread

PHOTO 2—General view of plant (rubber added at top platform). PHOTO 3—Experimental section on right after rolling (leveling course at left). PHOTO 4—Placing surface with Barber-Greene. PHOTO 5—Close-up of bituminous surface with rubber added. (Pictures taken August 21, 1950.)



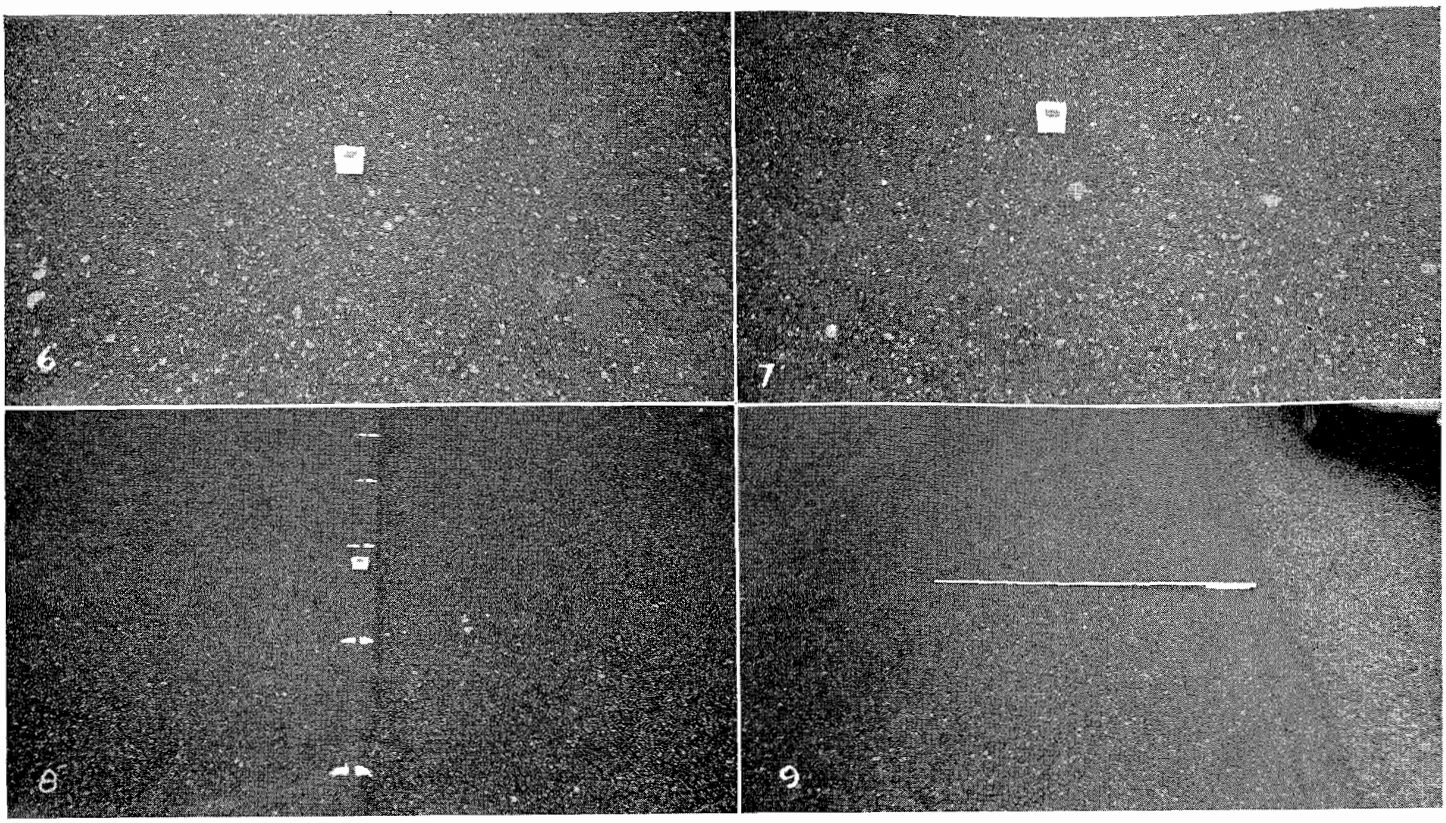


PHOTO 6—Close-up of surface, 6.6% rubber added. PHOTO 7—Close-up of surface, 4.8% rubber added. PHOTO 8—Plant-mix with rubber, right; plant-mix without rubber, left. PHOTO 9—Plant-mix with rubber, foreground; plant-mix without rubber, background. (Pictures taken February 14, 1951.)

with a Barber Greene finishing machine in the conventional manner. The materials were mixed at a plant temperature of about 300 degrees F. and spread on the road at an average temperature of 250 degrees F. No noticeable differences between the mix containing rubber and the portion containing no rubber were observed during spreading or compaction operations. Tests made in the laboratory on four samples of the rubber mixture,

TABLE 1—EXPERIMENTAL RUBBER SECTION

Test No.	SIC No.	Dist. No.	Location	Percent Rubber added	Test results							Remarks
					Percent Bit. by Extr.	Percent 200	Stab. 140°	Cohes.	Swell	MVS stab.	MVS moist	
1667	A-4160	778	Ld. #6. 229+50 Outs. E. B. Lane	6.6	4.0	4	40	175	.002			Placing Temp. 250°F.
1668	A-4162	780	Ld. #25. 221+ Outs. E. B. Lane	4.8	4.2	5	42	263	.000			Placing Temp. 240°F.
1669	A-4161	779	Ld. #46. 221+06 Outs. E. B. Lane	4.8	4.1	4	42	290	.001	27	0.4	Placing Temp. 260°F.
1670	A-4163	781	Ld. #70. 202+18 Outs. E. B. Lane	6.6	4.1	4	38	225	.000	30	0.4	Placing Temp. 260°F.
1671	A-4164	782	Ld. #98. 198+80 Outs. E. B. Lane	0.0	4.1	3	38	116	.003	27	0.3	Placing Temp. 245°F.
Above surface mixes placed on August 21, 1950.												
Average of rubber mixtures					4.1	4.25	40.5	238		28.5	0.4	
Average of regular surface mixtures entire job					3.7	3.7	39	183		27	0.3	

when compared with those of the regular routine field samples from this job, showed no noticeable differences in test results except there appears to be some tendency towards higher cohesion results with the rubber mixture.

A table showing test results of samples representing the rubber mixture is attached.

Cost Comparison

The cost of placing the experimental section, exclusive of the rubber, was $2,365 or

$$\frac{\$2,365}{437 \text{ tons}} = \$5.42 \text{ per ton of asphalt-rubber mix}$$

The cost of an equivalent section of regular plant-mix surfacing based on bid prices would have been—

Aggregate	419 tons at $2.62 =	$1,098
Asphalt	18 tons at 20.00 =	360
		$1,458

or—

$$\frac{\$1,458}{437 \text{ tons}} = \$3.34 \text{ per ton of regular mix.}$$

Net cost of experiment—

$2,365
—1,458
$907

or—

$$\frac{\$907}{437 \text{ tons}} = \$2.09 \text{ extra cost per ton of asphalt-rubber mix. (Rubber furnished free) or 62 percent increase over regular mix.}$$

Unfavorable Comparison

The above cost comparison is obviously unfavorable to the rubber mixture. In this cost is included the erection of a platform for adding the rubber, additional dry mixing time, standby time for trucks, etc. The increase in price per ton for the rubber mixture cannot be considered a criterion had the surface mixture for the entire job been set up as a rubber-asphalt mixture. If this had been the case, the powdered rubber would have been added to the asphalt at the refinery and the additional cost would have been the cost of the rubber plus the time required to mix the rubber with the asphalt.

Although the powdered rubber for this experimental section was furnished free of charge, the cost per pound in the summer of 1950 was approximately 15 cents for reclaimed rubber and 45 to 50 cents for natural rubber. Assum-

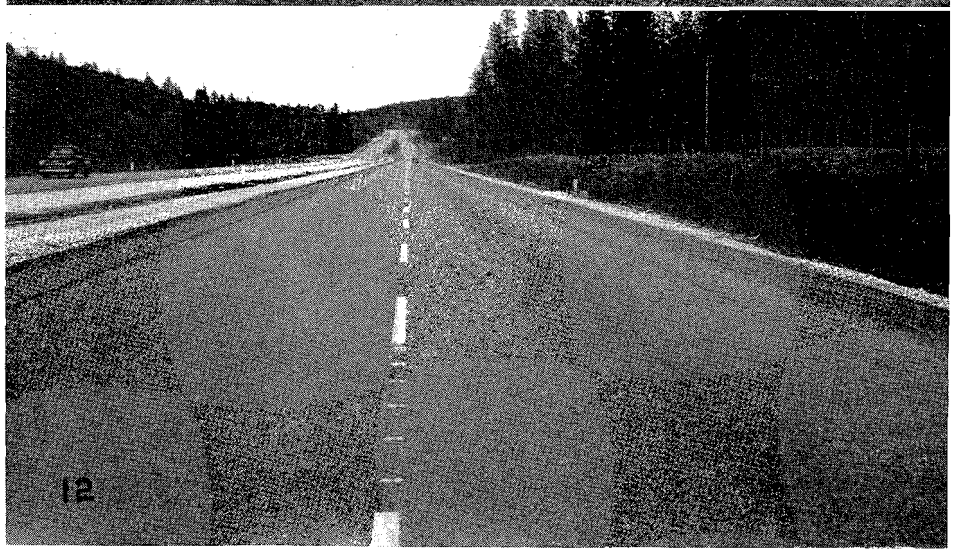


PHOTO 10—Small markers at shoulders identify experimental section. PHOTO 11—General view of experimental section looking east. PHOTO 12—Plant-mix with rubber, right; plant-mix without rubber, left. (Pictures taken February 14, 1951.)

ing an average plant-mix surfacing requiring about 4.5 percent of asphalt and adding 5 percent rubber (by weight of the asphalt), the estimated cost of the rubber per ton of plant-mix would be:

Regular plant-mix—per mile approx.	$7,370
Plant-mix—5 percent reclaimed rubber added—per mile approx.	$8,402 (estimated)
Plant-mix 5 percent natural rubber added—per mile approx.	$10,392 (estimated)

It is too early to predict whether the beneficial effects derived from this treatment will be sufficient to warrant the increased cost of the surfacing. However, based on reported experience elsewhere, it seems doubtful that the extra cost of adding rubber can be justified.

Reclaimed Rubber

As previously mentioned, the rubber used in the test section consisted of powdered reclaimed rubber such as may be obtained from ground up automobile tires or similar rubber crumbs. The type of rubber currently advocated by the Rubber Bureau is natural plantation rubber. It is therefore evident that the ultimate service record of the test section cannot be taken to indicate virtues of the natural rubber.

The experimental section was placed August 21, 1950. The pavement was subjected to some intermittent traffic during construction and was opened to traffic in October, 1950. Profilograph records of the experimental rubber-treated section and also of the adjacent pavement which had no rubber added to the mix were obtained on November 29, 1950. There was no discernible difference in roughness or riding qualities between these sections.

Skid Resistance

Skid resistance measurements of the rubber-treated section and adjacent untreated sections were made in April and August, 1951, by Professor R. A. Moyer of the Traffic Institute of the University of California. On the dry pavement there was no measurable difference in the coefficient of friction on any of the sections. On the wet pavement the rubber-treated section showed slightly higher coefficients of friction. (*See Figure 13*). This confirms results obtained on similar sections in other states.

. . . Continued on page 58

Detroit Experiments With Rubber Paving

COOPERATING with the Asphalt Division of the Detroit Public Works Department, the Firestone Tire and Rubber Company installed three test sections of Rub-R-Road on Bagley Avenue from First to Fourth Streets in the City of Detroit, Michigan.

Delegates and engineers attending the fifty-seventh annual Public Works Congress in Detroit at the time were among the most interested spectators.

Each of the three test sections consisted of 60 tons of rubberized paving mixture, with one section utilizing GR-S rubber, another section, natural rubber, and the third section, processed rubber.

In the above photograph, Detroit public works officials and Firestone representatives observe the installation of the rubber road. They are, left to right: Jan Schmedding, Superintendent, Street Construction, Detroit; H.V. Carlson, Rubber Roads Engineer, Firestone; Charles L. Shattuck, Manager, Detroit Public Works Department, and J. R. Moore, Firestone Engineering Department.

Traffic Engineering in the State of California

By J. C. YOUNG, Traffic Engineer, California Division of Highways

HISTORY

TRAFFIC ENGINEERING, as such, was first formally recognized in the California Division of Highways with the appointment of a safety engineer and organization of a Safety Department in March of 1938. Certain work now done by traffic engineers, such as traffic counting, signing, striping, and some accident analysis had previously been performed by the Maintenance Department, somewhat as a sideline to their regular maintenance work. The chief purpose of the organization of the Safety Department was study of the accident problem on the State Highway System, and coordination of all activities within the division to improve traffic conditions and promote safety.

In July of 1939, the fledgling Safety Department officially took over control of all accident and traffic data, including all traffic counts, traffic control devices—such as signs, signals and traffic stripes—employee safety work, and review of traffic and safety features in design. At that time the Headquarters Safety Department consisted of six engineers and five clerical employees, with an ultimate organization chart calling for two additional engineers and six more on the clerical staff.

Beginning of Department

The district offices, of which there are 11 throughout the State, at that time had no separate traffic sections, and the organization plans included full time personnel on traffic work in only the two metropolitan districts; namely, San Francisco and Los Angeles. Possible assignment of one man full-time on traffic work was suggested for two of the next larger districts, with traffic engineering to be handled as a part-time job for one man in each of the other seven districts. In other words, in 1939 it appeared that the state-wide traffic organization would not exceed 30 persons.

Increase in Traffic Volumes

A number of subsequent events, most important of which was of course the tremendous increase in traffic volumes, made it necessary to gradually expand the Traffic Engineering Section. The State Legislature in 1941 enacted legislation which gave the Division of Highways rather broad authority with regard to speed zoning on state highways. Again in 1947 additional legislation greatly expanded this authority with regard to speed zoning. In 1942 the title of the Safety Engineer was changed to Traffic and Safety Engineer, and in 1944 the "Safety Department" was renamed the Traffic Department. In that same year the preparation of the highway construction budget was placed under the jurisdiction of the Traffic and Safety Engineer, and the Highway Planning Survey was also made a part of the traffic department.

In 1947 legislation was passed which provided funds for a considerably augmented highway construction program, and in order to carry on this program a major reorganization of the entire Division of Highways was necessary. The organization, as developed in 1947, has remained essentially the same up to the present time, and is as described below under "Present Organization."

Present Organization

The Division of Highways, as presently organized, consists of seven major sections under the State Highway Engineer. Each major section is under the direct supervision of an Assistant State Highway Engineer, or equivalent. The major subdivisions are: Public Relations and Personnel, Operations, Administration, Planning, Bridges, Right of Way, and Accounting. Within each of these major subdivisions there are several separate departments. The Traffic Department is in the Planning Section, along with Advance Planning, Design, Budgets, and Highway Planning Survey. The various department heads within the several major subsections carry equal responsibility and authority. For instance, Traffic, Design, Maintenance, Construction and several others are separate departments at the same level of authority.

Actual functions within the Traffic Department itself are best shown on the accompanying organization chart for Headquarters Traffic Department. As previously mentioned, there are 11 districts in the State, each headed by a district engineer, and at the present time there is a traffic engineer and a traffic organization in each district. District traffic organizations vary from one or two men in the small outlying rural districts to 35 men in the metropolitan districts. Total district traffic personnel throughout the State now numbers approximately 125 with a Headquarters personnel of 30, for a total of 155 persons now engaged in traffic work.

Annual Budget

The budget for traffic engineering amounts to approximately $400,000 a year, and in addition engineering work totaling about $500,000 a year is performed by "Traffic Department" personnel for other departments and hence charged against other budget accounts. The annual construction budget for traffic improvements initiated and designed by the Traffic Department, chiefly channelization, signalization and illumination of intersections, amounts to approximately $1,800,000. The annual cost of signing, including new signs and maintenance and replacement of existing signs, is approximately $375,000.

Although the organization chart reproduced herewith is for Headquarters Traffic Department, most of the functions shown thereon are also performed at district level. The major exceptions are Traffic Research and Geometric

Standards. Most traffic research studies are supervised by Headquarters personnel, in many cases with the cooperation of district forces. Development of geometric standards for use in design on a state-wide basis is necessarily a Headquarters function, and little of this type of work is done in the districts.

Generally speaking, Headquarters acts as a review and advisory body, while actual initiation of traffic improvement projects and their design is done at the district level. For instance, placing of signs is actually performed by the District Maintenance Department, but the requisition for the sign is initiated by the District Traffic Engineer, and reviewed and approved by Headquarters Traffic Department. In the discussion of Traffic Department activities which follows, it should be borne in mind that where mention is made of review by Headquarters Office, the subject matter which is reviewed has been prepared by the District Traffic Department.

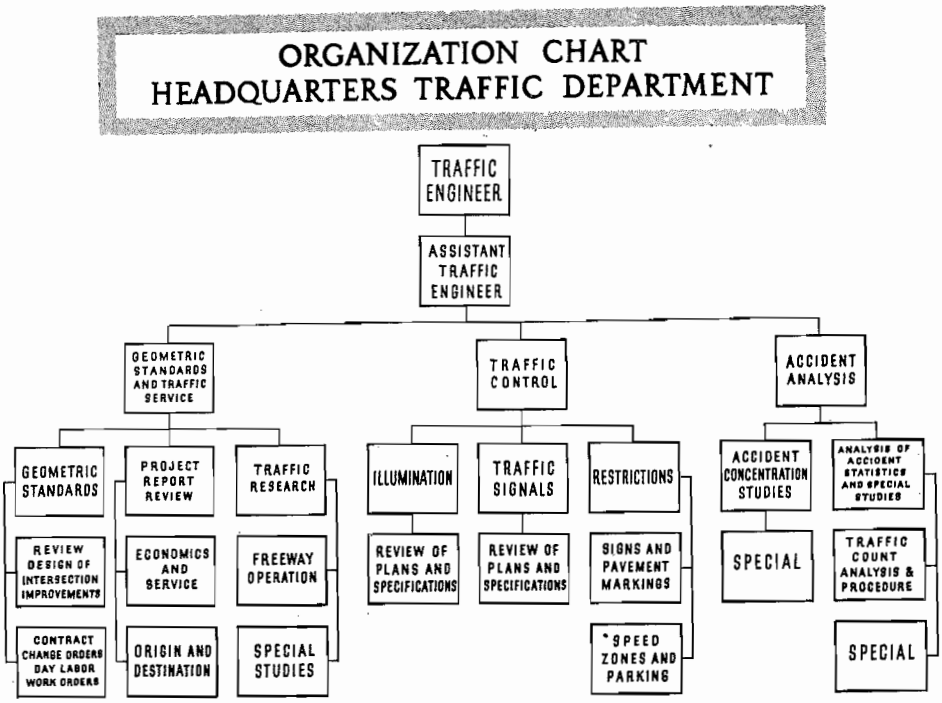
Present Activities

Many of the duties of any traffic department fall under the heading of routine chores, although special problems may be involved in many cases. Some of the items in California which might be classed as routine, in that they are continuing functions, are signing, striping, establishment of speed zones, annual and monthly traffic counts, parking restrictions, project reports, study of points of recurring accidents and intersection design, either with or without signals and illumination.

Maintenance of all highway facilities, including traffic control devices, is performed by the Maintenance Department.

Speed Zoning

Speed zoning in California requires a traffic engineering study at each proposed zone. Twenty-five mile limit business and residence zones are automatically authorized when roadside development reaches a certain density. However, the law authorizes the Division of Highways to raise these 25-mile zones to 35 or 45 miles per hour if an engineering investigation indicates such higher speeds to be suitable. The law also empowers the division to lower the prima facie 55-mile per hour



limitation to 45 or 35 miles per hour upon engineering investigation where density of roadside development does not call for a business or residence zone.

The engineering investigation as made in California consists of the following: A rough topographic survey is made and a speed zone map is prepared which shows alignment, grades and roadside development. An accident profile is also prepared, which shows the past record of the proposed zone. In addition, spot speed checks are taken at various locations in the area. On the basis of this data the appropriate speed is selected for posting. As a policy, the speed selected is not less than the lower limit of the pace and not higher than the critical or 85 percentile speed.

Project Reports

In California, a project report is prepared in the district office covering each individual project which is proposed for construction. Since these project reports are used to establish the necessity for and adequacy of the project, and also its priority, the traffic information in the report is of course of major importance. The traffic portion of each project report is prepared by the District Traffic Department and reviewed at Headquarters. Where alternate locations are available, the traffic service which will be rendered by each alternate must be analyzed, and in order to determine this traffic service it is often necessary to make an origin and destination survey.

California has made a large number of such surveys, ranging from the home interview type covering large metropolitan areas and requiring a year or more to complete to simple roadside interview surveys which may be completed in one or two days. The technique usually employed involves stopping and interviewing motorists at strategic points on the existing road system. Information so obtained is coded and tabulated on punch card equipment. Methods have been developed which reduce the manual work of analysis to a minimum and such surveys are becoming more and more popular. Frequently several will be under way at various locations in the State at the same time.

Accident Studies

A continuous before-and-after study at points of recurring accidents is being carried on in the Headquarters Traffic Department. A card index is kept of all points on the highway system where the accident rate appears to be abnormally high. The cards which are made up for these points of recurring accidents are reproduced

herewith. Card "A" represents the collision diagram "Before" and is used for study to determine suitable corrective measures. After a corrective measure has been installed, any accidents which occur are plotted on card "B." Card "C" is a chronological listing of the accidents and any improvements which are made at the specific point.

This system provides a continuous before-and-after study at several hundred points on the State Highway System, and with very little work it is possible to determine the effect of the various types of safety devices which have been installed since this card system was put into effect. Although the card index system described is being kept only in Headquarters Office, each district likewise keeps accident profiles and other traffic data on all highways within the district.

Intersection Design

Intersection redesign, and in some cases original intersection design on new projects, is a function of the Traffic Department. Such designs may include either channelization, signals or illumination, or any combination thereof. All types of signals are in use on the California State Highway System; however, many of the installations are of the fully actuated type. It is worthy of note that the three-phase signal, once considered to be a congestion producer, is now becoming very popular with the motoring public and many of the recent installations of three-phase traffic actuated signals are proving highly satisfactory.

Lighting Installations

The Traffic Department initiates and designs lighting installations on state highways. The policy of the division is to provide illumination only at points of conflict or hazard. In other words, California ordinarily does not provide continuous illumination of highways. This practically limits highway lighting to intersections and interchanges, and the lighting section of the Traffic Department has made many studies of types and location of luminaires to determine the combination which gives the best results at such points of traffic conflict.

California has actually developed a new fluorescent type luminaire specifi-

Ala-5-A, E
Curve at E. End of Altamont Pass

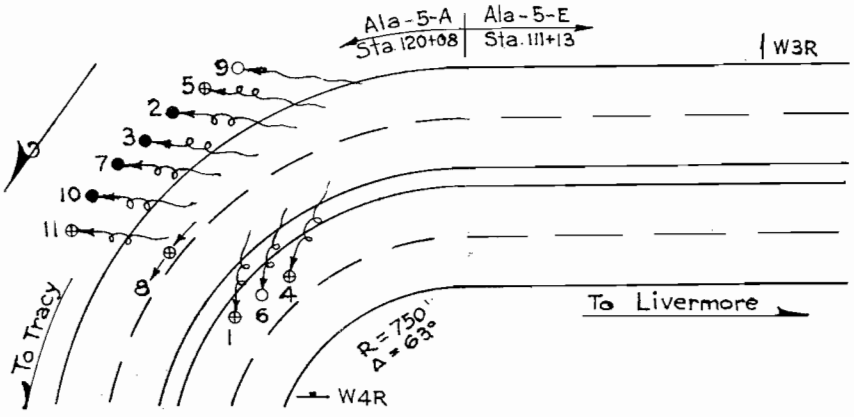
ACCIDENT CONCENTRATION

A

● FATAL ⊕ NON-FATAL ○ P.D.O. □ PARKED VEH. → VEH. PATH --→ PED. PATH ~~ VEH. OUT OF CONTROL ~~ VEH. OVERTURNED

11½, 7

Before 1/1/47 – 12/1/48 - 23 mo.



Ala-5-A, E
Curve at E. End of Altamont Pass

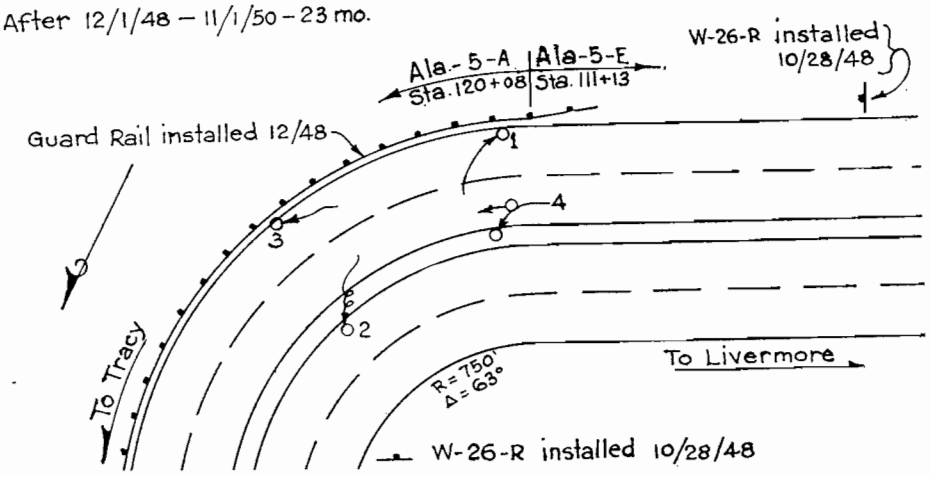
ACCIDENT CONCENTRATION

B

● FATAL ⊕ NON-FATAL ○ P.D.O. □ PARKED VEH. → VEH. PATH --→ PED. PATH ~~ VEH. OUT OF CONTROL ~~ VEH. OVERTURNED

11½, 7

After 12/1/48 – 11/1/50 – 23 mo.



IV-Ala-5-A, E
Curve at E. End of Altamount Pass

L DAYLIGHT D DARK DA DARK W/LIGHTS NS NOT STATED N NEVER
R RARELY F FREQUENTLY PED PEDESTRIAN C CAR B BUS
P PANEL OR PICKUP T TRUCK TT TRUCK & TRAILER M MOTORCYCLE

C

11½, 7

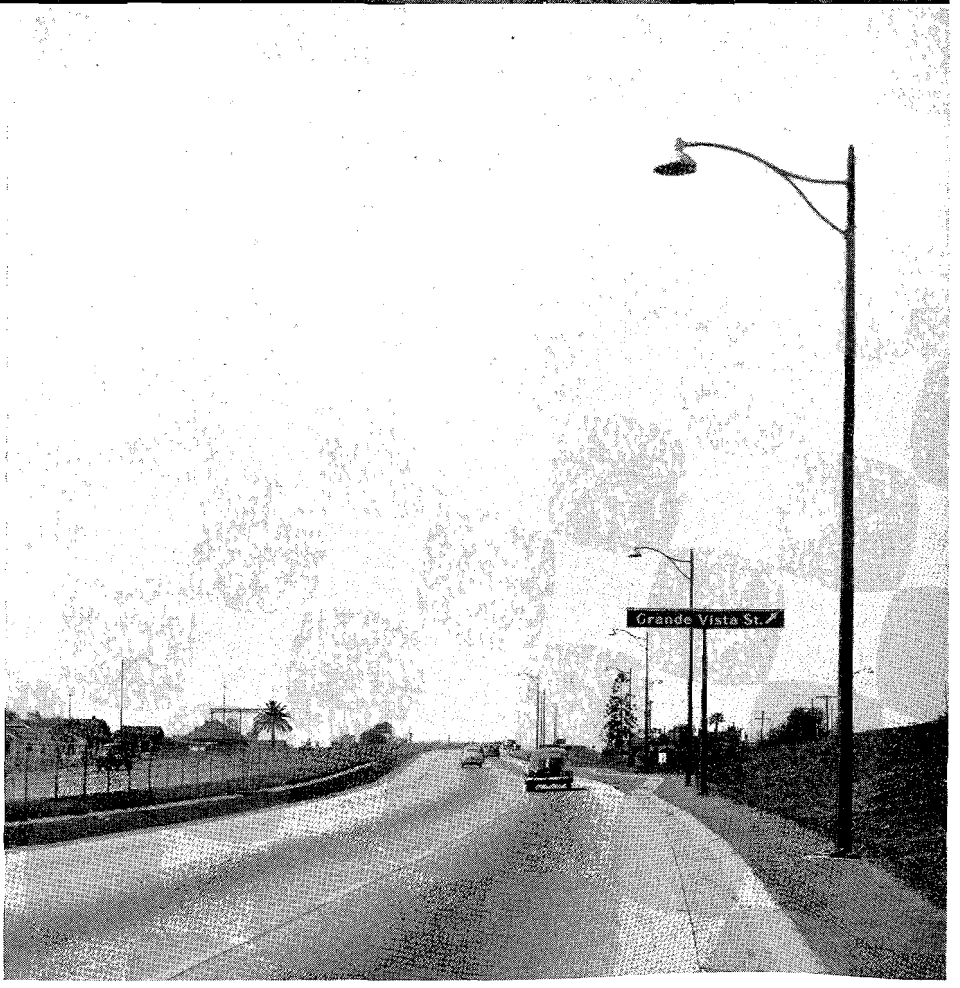
ACC NO	DATE	TIME	LITE	SEVERITY F	SEVERITY NF	SEVERITY PDO	USE 1	USE 2	DESCRIPTION
1	1 3 47	1920	D		1		R	–	C'EB pulling Trailer exceeding safe speed, went out of control on curve and overturned.
2	7 4 47	0130	D	1	1		NS	–	C'EB, HBD, high speed, evidently came upon another veh. swerved to right, over embankment.
3	10 2 47	0530	D	2			NS	–	C'EB, at high speed over drove curve, down embankment
4	1 28 48	1600	L		1		NS	–	C'EB forced into center division by another veh. over div. then over bank, excessive speed.
5	3 30 48	0005	D		1		F	–	TT'EB at high speed over drove, possible caused by blowout.
6	4 2 48	1500	L			√	R	–	C'EB, wet, out of control, over center division on to shoulder.
7	5 13 48	2000	D	2			NS	–	C'EB, high speed, over drove curve, over embankment
8	7 4 48	1830	L		1		F	R	C'EB, high speed, HBD hit C²EB in rear.
9	7 31 48	0130	D			√	F	R	C'EB, high speed, over drove curve, over embankment.
10	9 26 48	0115	D	1	1		NS	–	C'EB, Drunk, high speed, over drove curve.
11	10 2 48	2300	D		3		NS	–	C'EB, high speed, over drove curve.
									2-W26R's Installed 10/28/48, Guard Rail 12/48
1	9 19 48	N.S.	D			√	NS	–	C'WB at high speed crowded over division, hit guard rail
2	3 4 50	0035	D			√	N	–	C'EB, high speed, hit island and overturned
3	N.S.	N.S.			N.S.		N.S.	N.S.	Evidently C'EB, hit guard rail (no details)
4	9 26 50	1316	L			√	F	F	TT'EB, changing lanes, hit in rear by C²EB who then hit div.

cally designed for intersection lighting. This unit showed up very well on the first installation, and additional units are planned for further trial installations at an early date. In the electrical field, California has also pioneered in the illumination of directional signs with fluorescent tubes. Fixtures for mounting the lights at the bottom of the sign are being developed and considerable benefits are expected. Placing the lighting fixture at the bottom eliminates objectionable glare at night and also eliminates shadows on the sign during the day.

Special Studies

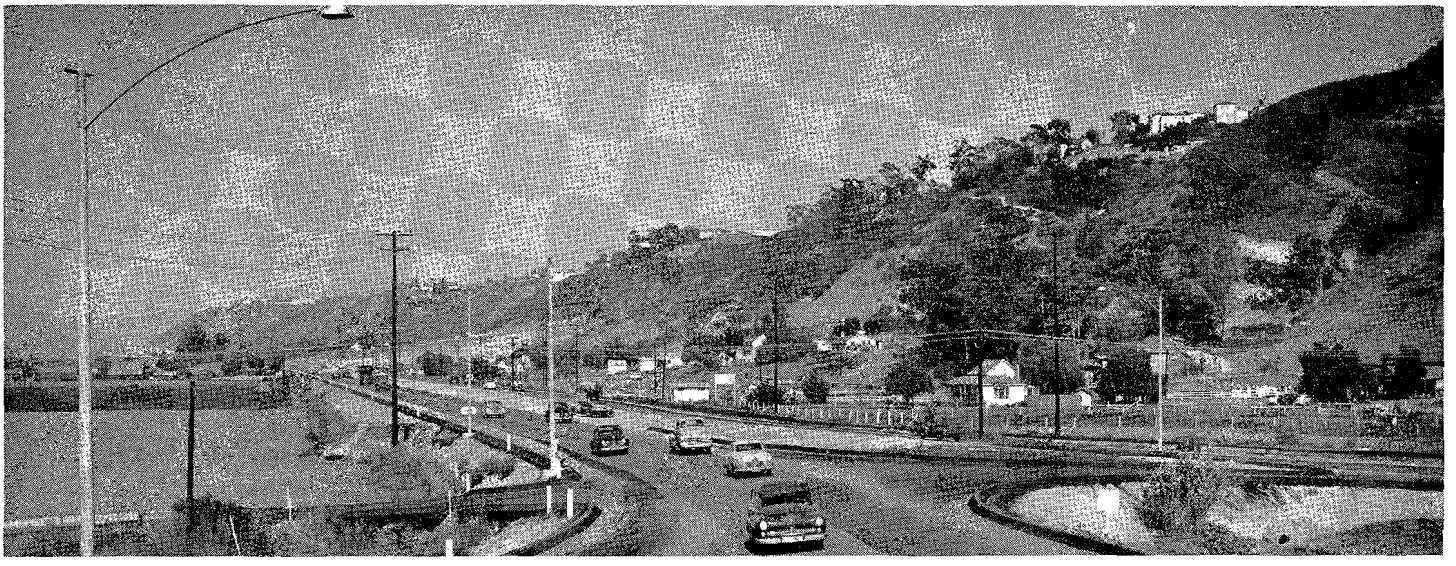
Aside from the routine functions of the Traffic Department, many special studies are made by the Traffic Research Group. The line between traffic research and establishment of geometric standards cannot be clearly drawn, since most research is aimed at ultimate improvement of design standards. At the present time the Traffic Research Group has several studies under way. One is an over-all study of intersections on four-lane divided expressways.

. . . Continued on page 58

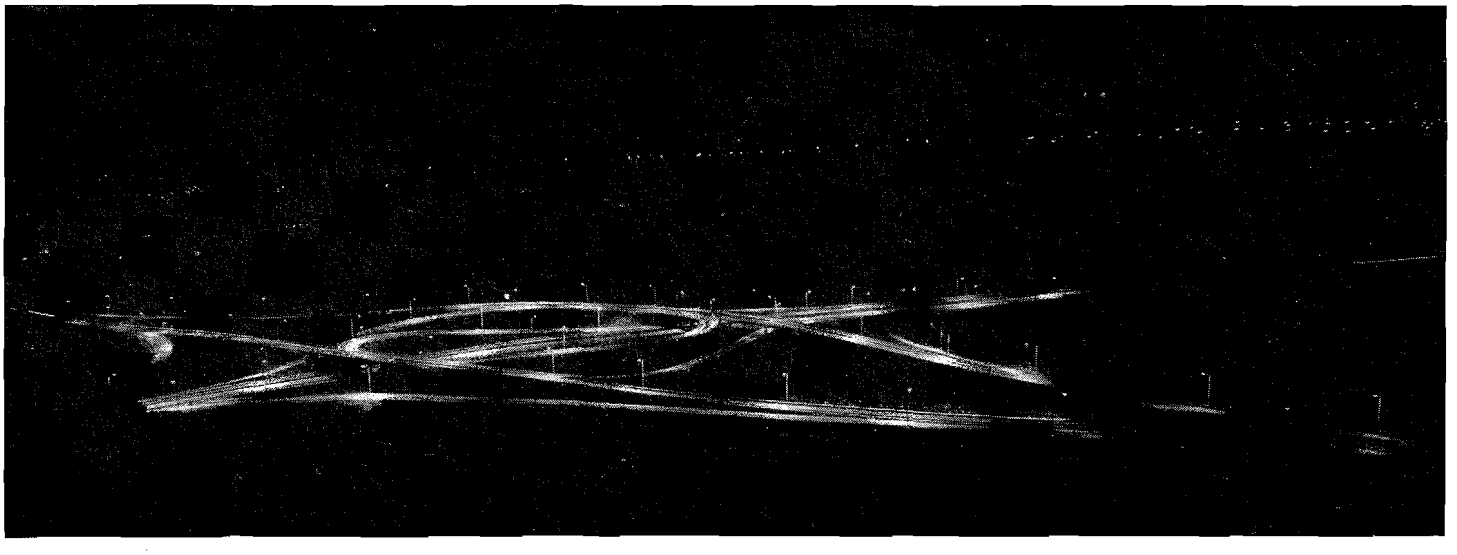


Overhead signs on Santa Ana Freeway. Night and day photos.

Overhead sign bridge on North Sacramento Freeway



UPPER—Mission Valley interchange, looking east. Photo taken just before official opening. LOWER—Mission Valley interchange photo taken at 2.30 a.m.



Budget Review

Director of Public Works Tells How Highway Funds Are Allocated

The following address on the subject "The 1952-53 State Highway Budget" was delivered by Director of Public Works Frank B. Durkee, who is also chairman of the California Highway Commission, before the Highway Section of the California State Chamber of Commerce at the Biltmore Hotel in Los Angeles on Thursday, November 29, 1951, on the occasion of the 24th annual meeting of the State Chamber.

THE STATE HIGHWAY BUDGET, like all budgets, is a reflection of the people's desires and needs, within certain economic limits. In California, the people for whom we budget daily gain in numbers. In 1940, the State Government was concerned with a population of less than 7 million; more important to the California Highway Commission was the motor vehicle registration, at that time approximately 3 million. In 1950, the population had increased to more than 10½ million, and the motor vehicle registration to more than 5 million.

The research department of your own organization has estimated that by 1960 California will have a population of more than 14 million, with 6½ million vehicles using our streets and highways.

We do not deplore this phenomenal growth. We do not say to these newcomers things would be more pleasant in California, if you had gone elsewhere. And no one has suggested relieving congestion on our streets and highways by selling fewer automobiles. Happily, we acknowledge our destiny lies in our continued growth. One need only consider the way we have met the challenge of the problem of water supply, to realize that the attitude of Californians toward the problems that come with growth is a positive attitude.

The California Highway Commission shares this positive attitude, as its policies and decisions have consistently demonstrated. But, in adopting the annual budget, the commission is necessarily governed, like other agencies of government, by the means at hand.

For the next fiscal year, July 1, 1952, to June 30, 1953, the gross State Highway Budget amounts to $186,500,000. This total includes two items not applicable to state highways, as such:

$21,803,000 is allocated to cities for city streets, representing the ⅛ of a cent per gallon of gasoline tax provided by law for this purpose; and

$5,282,000 is federal-aid secondary funds, 87½ percent of which, under legislative direction, is available for construction on county roads.

The total amount, therefore, which may be regarded as available for state highways is approximately $159,400,000.

Of this total, a sum of $23,000,000 is required for maintenance of the 14,000 miles of highway in the state system; and approximately $10,000,000 is set aside for capital outlay for buildings, plants and equipment; continuation of long-range planning studies; and general administration.

The Construction Budget

This leaves a total or gross construction budget of $126,300,000. The total cost of budgeted right of way and major construction projects, without engineering and contingencies, is $103,430,000. The amount set aside for purchase of rights of way accounts for nearly one-fourth of the $126,300,000, or $31,337,000. After deducting the cost of preliminary engineering, there remains the sum of $87,000,000 for construction purposes, including contingencies and construction engineering.

In accordance with the distribution provided for by law between the north and the south, the allocations to construction projects, including rights of way, are apportioned; to the 45 northern counties, 45 percent, or $58,845,000; to the 13 southern counties, 55 percent, or $67,491,000.

It is significant, I think, that out of this total of $126,300,000 in the construction budget (which, as indicated, includes rights of way) more than $45,000,000 is allocated for the continuation of the California major freeway program.

There is, of necessity, some element of the crystal ball in all budget-making. This is particularly true in an activity so sensitive to inflationary pressures as the construction field. The State Highway Budget, as to the number of projects included, is based largely on what our engineers anticipate construction costs will be during the coming fiscal year. We know, to some extent at least, what factors will influence the highway price structure, but it is impossible to foretell, for example, just how high these factors may send the California Highway Construction Cost Index.

Based on a 1940 level of 100, the index reached its first postwar peak of 216.8 in the first half of 1948; it then declined for a year and a half; then came Korea, and costs began to rise rapidly. For the third quarter of 1951, the California index was 221.9 or more than double 1940. Available evidence as of today points to a continued upward trend.

In addition to what may be termed the normal, or periodic, rise and fall of the cost index, the Highway Commission has had other important questions before it during the preparation of its 1952-1953 budget.

The Federal Defense Program

One of these questions is the effect of the $467,000,000 which the Federal Government has announced as available for military construction in California. To a considerable extent, this large-scale construction program will represent competition for the services of highway contractors. Contractors may be expected to adopt a "wait and

see" attitude during the next few months, for a number of reasons. For one thing, a great deal depends on the speed and manner in which the Federal Government acts to obtain bids. Furthermore, these federal projects will, in themselves, tend to affect costs in California, above and beyond the action of ordinary economic forces. Still further, it may be anticipated that the protection from material shortages which goes, presumably, with a government contract may be expected to be most inviting to contractors on federal jobs.

Material Shortages—Steel

Shortages of necessary materials, potential as to some items, but very real (although, we hope, temporary) as to steel, was another of the questions which entered into the preparation of the highway budget.

The commission was well aware that the Defense Production Administration had allocated for highway purposes (that is, for the use of all levels of government—state, county, city) approximately 1 percent of the Nation's steel production, for each quarter of the year. I am advised that this allocation will supply only about 50 percent of the immediate and critical steel needs of the Nation's highways. To those of us who live day and night with the critical highway deficiencies of California, this allocation of 1 percent, in our view, is difficult to understand.

At its recent convention in Omaha, Nebraska, the American Association of State Highway Officials took up this critical problem of steel as a principal order of business. In a resolution adopted unanimously, and directed to be forwarded to all members of the Congress and appropriate federal officials, the association declared that, "the preservation of an adequate highway system is imperative, in view of the needs of national defense and the national economy." It pointed to the deficiencies in the Nation's highway plant which serves more than 50 million vehicles in the United States, and warned that these deficiencies could become aggravated to the point of paralysis of highway transport, if the curtailment of steel for highways is continued.

Finally, it urged that the essential role of the highways in the transportation of materials for national defense be "given proper recognition by increasing the allotment of steel for highway purposes to at least 2 percent of the total national production."

During World War II, as we all know, there was a tremendous concentration of defense industry and military activity in California. That pattern appears to be repeating itself, today! In California, with the continual expansion of defense plants and armed forces installations, our State Highway System is again becoming, as it was before, to a large exent a network of military access roads.

The California Highway Commission and the Department of Public Works, wholeheartedly endorse, therefore, the stand taken by the American Association of State Highway Officials on the matter of the allocation of steel for highway purposes.

In the meantime, it is hoped that some relief can be obtained through the administrative processes of the Defense Production Administration for numerous projects requiring relatively small quantities of steel. We are doing what we can in that direction.

Possible Adjustment in the Budget

Steel, as I have indicated, loomed large in the commission's consideration of next year's highway budget. In fact, it looms large in the current fiscal year as well. We are taking all possible steps to be prepared to adjust the current, as well as the future, construction program in the light of the existing situation as respects steel. If events should so require, the Division of Highways expects to be in a position to concentrate its efforts on projects requiring relatively small quantities of steel as against others which, normally, would receive prior attention when considered on the basis of need.

While such an adjustment cannot be spelled out at this time in terms of individual projects, it is obvious that grade separations, bridges, and other structures may have to be delayed unless additional steel for highways is made available. The Collier-Burns Act, which sets up our budgeting procedure will permit, we believe, for just such adjustments should such action become necessary.

I have referred to the steel shortage as "temporary." We have the assurance of Mr. Charles E. Wilson, the Nation's mobilization director, that steel production will have caught up with the current and anticipated demand by the end of 1952, barring all-out war. On the basis of this assurance, it is evident that any adjustments which may be necessary in our current construction program should not affect our thinking with regard to long-range planning. And, specifically, as respects current planning and engineering, they mean more not less. Certainly, such adjustments would not affect, in any way, the problem of highway finances. There is every reason to believe steel will be available for critical highway deficiencies before any of the current proposals would start additional funds flowing into the State Treasury.

The Question of Interim Improvements

It has been suggested the commission should, in view of the alarming traffic congestion and accident toll, resort to more interim construction measures in lieu of major improvements and freeway developments which require large expenditures and considerable time to complete.

I should like to point out in this regard that the commission, in preparing its annual budgets, has included such projects, where it was evident immediate relief and increased safety would result.

Recent examples of such projects are the widening (1950) of Sepulveda Boulevard to four lanes over the mountains between Ventura and Sunset Boulevards; the widening of the Bayshore Highway to six lanes between San Francisco and South San Francisco (a project just completed); and, the inclusion in the 1952-1953 budget of funds for widening to four lanes U. S. 101 in San Diego County between Del Mar and Encinitas.

Inclusion in the budget of projects affording temporary relief does, however, raise a question of how much money can, consistently, be diverted from permanent improvements to short-range benefits. All such proposals must be scrutinized to determine whether the immediate benefits in terms of increased safety and relief of congestion justify deferring of long-range solutions of particular highway problems.

It may well be, however, that if the highway program is to be slowed down by high prices or lack of materials, the commission may be forced to consider more of this type of work. If this eventuates, the people should understand that such diversions, perhaps fully justified as a means of cutting down serious traffic accidents, will come from construction and not from maintenance funds.

People Support Freeway Program

In considering the highway budget, we must not forget that the only facility which will provide adequate, safe traffic capacity, where high traffic volumes must be accommodated, is the freeway. The freeway offers maximum traffic capacity and maximum safety. The freeway insures that the funds provided by the motorist—his investment in the highway—will not be lost either by encroachment of roadside businesses or otherwise. As our economic studies have shown, freeways preserve and enhance existing developments and values and foster orderly community growth so essential to the economy of the State.

The experience of motorists on our expanding network of only partially completed freeways has led to a marked change in the attitude of the average citizen toward this type of highway improvement. The first freeways were viewed with extreme optimism by highway enthusiasts, but with extreme pessimism, and often bitter opposition, by many property owners and roadside proprietors. Today there is, in contrast, widespread evidence of the general acceptance of the freeway as the best solution yet worked out by highway engineers for providing safer traffic capacity while protecting the public's investment in the highway. Discussions now going on in a few places are limited, in the main, to details of location.

The highway budget for the 1952-1953 Fiscal Year, I assure you, was prepared with full cognizance of all these factors. We believe that the budget, as adopted, accomplishes, within the limitation of available funds, the expressed intention of the Legislature to provide for a highway system adequate for the transportation needs of the people. Attention at the same time has been given, where feasible, to worthy possibilities for interim relief.

We are now in the last year of the first five-year period under the Collier-Burns Act. During this period a total of $503,000,000 has been expended or obligated for state highway expansion and improvement. The expenditure of this half billion dollars represents 2,800 miles of new or rebuilt highway, including 530 miles of divided, multilane construction. Outstanding progress has been made on freeway projects in the Los Angeles metropolitan area; on U. S. 99 between Los Angeles and Sacramento; on U. S. 101, the Coast Highway; on projects in the San Francisco Bay Area; and on U. S. 40 between San Francisco and Sacramento, and beyond.

The development has been orderly, progressive, and, insofar as possible, in accordance with relative needs. Unfortunately, the rate of progress, due to increased costs, is falling behind the schedule anticipated at the time of passage of the act in 1947.

I cannot say to you, the outlook is encouraging; for it is now obvious that, with current revenue, it will be many years before we can hope to complete improvement of the State Highway System to a standard adequate for the expeditious and safe movement of the traffic we now have, and which we can, with reasonable accuracy, predict for the future. It would seem that the only answer to the demand for early alleviation of the present congestion and accident-inducing conditions, is additional funds. But this is the problem of the people of California and their Legislature, not the Highway Commission.

Public Interest in the Highway Problem

We are, however, gratified to observe that the public is taking an increased and realistic interest in the solution of the highway deficiency problem in this State. It is encouraging that this interest is not narrow or local; that it recognizes the problem to be state-wide.

You may have noted in the press, on October 18th last, that Governor Warren received a delegation of citizens from the San Francisco Peninsula area. They had come to call his attention (and that of the State as a whole) to the serious accident rate, with high per-

... Continued on page 20

Richard Wilson Is Praised by U. S. Road Chief

COMMENDATION of the work Richard H. Wilson, Assistant State Highway Engineer of the Division of Highways, has done and is doing to convince Washington of the urgent necessity for a lifting of restrictions on steel used in highway construction is expressed by Thomas H. MacDonald, Commissioner, U. S. Bureau of Public Roads, in a letter to State Highway Engineer George T. McCoy. MacDonald wrote:

DEAR MR. McCOY: After my return from Omaha I had the opportunity to talk with Mr. Clark about the steel situation. You had spoken to me briefly about it in Omaha, and this letter is to record my appreciation of the steps which you have taken in assigning this important matter to Mr. Wilson, and of the thorough work which has been done under his immediate direction in determining the steel requirements. I hope you will pass along my appreciation to him, particularly for his description of what the State is doing in the discussions. I think if we could obtain an acceptance of a similar plan of operation on the part of all the states it would put us in a position to be very much more helpful and more successful in securing steel.

One of the reasons I am sending you this letter is that last night I found that when the question was raised with the allocation authorities as to why the road program had not received an allocation commensurate with its importance, the reason given was that the information which we furnished did not adequately relate the use of the steel to the traffic service it would render. Actually, this is not a true statement as a whole, but it has been difficult to obtain the detailed evidence from all the states, so that it weakens our position. I feel certain that for some months—maybe during the whole of 1952—we will have to be in a position to supply highly detailed information, but I am certain this is the constructive approach.

New Budget

Highway Commission Sets Up Funds for Fiscal Year July 1, 1952, to June 30, 1953

Funds for major highway construction projects as budgeted by the California Highway Commission for the 1952-53 Fiscal Year beginning next July 1st aggregate $72,093,000.

In addition, the commission allocated $31,337,000 for acquisition of rights of way which will be required for projects contemplated in the 1953-54 Fiscal Year or succeeding programs.

For the 1951-52 or current fiscal year, the commission budgeted $78,808,500 for major construction and $22,856,000 for rights of way, making a total of $101,664,500, as compared with a total of $103,430,000 for the next fiscal year.

The 1952-53 Fiscal Year will mark the start of the second five-year period under the provisions of the Collier-Burns Highway Act and in preparing the new budget the commission carefully checked to make certain that minimum allocations for each county as required by the Mayo amendments will be fully met.

If it becomes apparent that some of the projects included in the budget cannot be constructed because of nonavailability of materials, the commission must, of necessity, substitute projects that can be built without the use of critical materials. Necessary revisions in the budget are provided for by the Collier-Burns Act.

In its 1952-53 construction budget the commission allocated upwards of $45,000,000 to continue construction of essential freeways throughout the State.

Some of the major projects financed by the new budget, including freeways, are as follows:

Alameda County, for grading and structures on 1.7 miles of U. S. 50 from the San Joaquin County line to two miles east of Redmond Overhead, $586,000. In San Joaquin County, $550,000 is allocated for grading and structures on 5.7 miles between Corral Hollow Road and the Alameda County line, providing $1,136,000 for construction on 7.4 miles of U. S. 50 east of Altamont Pass.

Alameda County, for grading and structures on the Eastshore Freeway from the Santa Clara County line to a connection with U. S. 50 near Warm Springs, $1,240,000, a length of 2.8 miles.

Alameda County, grading, paving, and structures on the Eastshore Freeway from Fallon Street to Market Street in Oakland, $1,810,00, a length of one mile.

Amador and Calaveras Counties, for grading and surfacing six miles of Sign Route 49 between Mokelumne Hill and Jackson, $450,000.

Butte County, for grading 16.5 miles of U. S. 99E from Oroville Wye to 20th Street in Chico, $835,000.

Calaveras County, for grading and surfacing portions of Sign Route 12 between the San Joaquin County line and Valley Springs, $350,000, totaling 10 miles in length.

Contra Costa County, for grading and surfacing portions of Sign Routes 21 and 24 on Main Street in Walnut Creek, from the south city limits to the north city limits of Concord, and from Danville to the Southern Pacific railroad crossing south of Walnut Creek, $200,000; length 2.5 miles.

El Dorado County, for grading and structures on portions of U. S. 50 through Placerville, a distance of 1.5 miles, $300,000. This allocation will be the start of the freeway by-passing the business district of Placerville. The structures involved are grade separations over the Southern Pacific tracks and Washington Street.

Fresno County, for grading and surfacing seven miles of Sign Route 180 from four miles east of Orange Cove Road to White Deer Road, $910,000; for a structure to carry Weber Avenue over U. S. 99 at the Belmont Subway, $110,000, a cooperative project with the City of Fresno; for replacing Whites Bridge on Sign Route 180, $100,000.

Glenn County, for widening Stony Creek Bridge on U. S. 99W, $120,000.

Humboldt County, for grading 2.9 miles of the Burns Freeway on U. S. 101 from Gannon Slough to 0.9 mile north of Arcata, $600,000.

Imperial County, for grading, surfacing, and bridge on two miles of U. S. 99 from the south city limits of Brawley to 1.1 miles west of Brawley, $440,000.

Kern County, for widening portions totaling 1.2 miles on Grocer Grade on U. S. 399, $150,000.

Lake County, for grading and surfacing 1.7 miles of Sign Route 53 from 0.4 mile south of Lower Lake to 0.3 mile north of Cache Creek, $205,000.

Lassen County, for grading, surfacing and structures on Sign Route 24 through Chilcoot Pass from Beckwourth Inn to State Route 29, $443,000; a length of 4.2 miles.

Los Angeles County, for Vignes Street Separation on Santa Ana Freeway, $400,000; for grading, paving and structures on Santa Ana Freeway from Lakewood Boulevard to Pioneer Boulevard, $3,381,000; for structures on Pomona Freeway from Covina Hills Road to San Bernardino County line, $1,625,000; for grading, paving, and structures on Colorado Freeway from Patrician Way to Kensington Place, $1,473,000; for grading, paving, and structures on Harbor and Arroyo Seco Freeways from Adobe Street to Washington Boulevard, $5,160,000; for grading, paving, and structures on Los Angeles River Freeway from 223d Street to south junction of Atlantic Avenue, $3,305,000.

Madera County, for surfacing portions of Sign Route 152 for a net length of 15.7 miles from Califa to the Merced County line, $330,000.

Mendocino County, for grading and surfacing two miles of U. S. 101 between the Northwestern Pacific Underpass and Eleven Oaks, $240,000; for construction of a culvert and fill to replace bridge at Rattlesnake Creek on U. S. 101, $400,000.

Merced County, for construction of the Merced River Bridge between Livingston and Delhi, $600,000; for construction of a new bridge and approaches across the Merced River at

Major Construction Projects in State Highway Bu

Cox Ferry on the Merced-Snelling highway, $275,000.

Monterey County, for grading and surfacing 5.3 miles of U. S. 101 from Chualar to Spence Underpass, $560,000; for grading, paving, and structures on the new Salinas Freeway from Market Street to North Main Street, $1,130,000.

Napa and Solano Counties, for surfacing portions of U. S. 40 from Tennessee Street on the outskirts of Vallejo to Cordelia Underpass, for a length of 5.5 miles, $300,000.

Orange County, for grading, paving, and structures on Sign Route 59 from Finley Avenue in Newport Beach to 20th Street in Costa Mesa, $700,000; for grading and paving 2.6 miles on Huntington Beach Boulevard, Sign Route 39, between U. S. 101 in Huntington Beach and Garfield Avenue, $350,000; for a new bridge across the Santa Ana River on Sign Route 14, $500,000.

Riverside County, for grading, paving, and structures on U. S. 395 from Route 64 to Nuevo Road, $850,000; for grading and surfacing two miles on Sign Route 111 east of Cathedral City, $100,000.

Sacramento County, for grading, paving, and structures from C Street in Sacramento to North Sacramento Freeway near Swanston Road, a length of 2.3 miles, $2,280,000. This project is for the construction of the superstructure and approaches of the Elvas bridge and connections to the North Sacramento Freeway at Swanston Road.

San Bernardino County, for structures on the Ramona Freeway from the Los Angeles County line to Archibald Avenue, $2,135,000, for a length of 7.2 miles.

San Diego County, for widening to four lanes the existing 5.3 mile section of U. S. 101 from Del Mar to Encinitas, $650,000; for completion of the Oceanside Freeway on U. S. 101, $2,725,000.

San Francisco, for grading, paving, and structures on the Bayshore Freeway from 16th Street to Seventh Street in San Francisco, $3,640,000, and in San Francisco and San Mateo Counties, for grading, paving, and structures on the Bayshore Freeway from Augusta Street in San Francisco to the San Mateo-Santa Clara County line, $5,500,000.

San Joaquin County, for grading and structures on 5.7 miles of U. S. 50 between Corral Hollow Road and the Alameda County line, $550,000. In Alameda County $586,000 is allocated for grading and structures on 1.7 miles from the San Joaquin County line to two miles east of Redmond Overhead, providing $1,136,000 for construction on 7.4 miles of U. S. 50 east of Altamont Pass.

San Luis Obispo County, for grading, surfacing, and structures on U. S. 101 from Marsh Street to San Luis Obispo Creek in the City of San Luis Obispo, $860,000; for grading and surfacing 6.5 miles of U. S. 101 from one mile south of Templeton to Fourth Street in Paso Robles, $860,000.

San Mateo and San Francisco Counties, for grading, paving, and structures on portions of the Bayshore Freeway between Augusta Street in San Francisco and the Santa Clara County line, $5,500,000. (See item under San Francisco County.)

San Mateo County, for surfacing 5.2 miles of the Bayshore Freeway from Colma Creek to Broadway, $310,000.

Santa Barbara County, grading, surfacing, and structures on U. S. 101 from Gaviota to Gaviota Gorge, $1,300,000.

Santa Clara County, for grading and structures on the Eastshore Freeway from Route 68 to the Alameda County line, a length of 6.1 miles, $1,960,000.

Siskiyou County, for grading and surfacing four miles of U. S. 99 from Dunsmuir to Big Canyon, $1,200,000.

Solano County, for surfacing 2.7 miles of U. S. 40 from north of Vacaville to Midway, $150,000.

Stanislaus County, for surfacing Sign Route 132 for a length of 6.7 miles (portions) from San Joaquin County line to Modesto, $350,000.

Sutter County, for grading and surfacing on Colusa Avenue through Yuba City from Onstott Road to U. S. 99, $300,000.

Tulare County, for grading and surfacing 4.8 miles of U. S. 99 from one mile north of Pixley to one mile north of Tipton, $700,000; and for paving eight miles of U. S. 99 between Tulare Airport and Tagus, $1,250,000.

Tuolumne County, for grading and surfacing eight miles on Sign Routes 49 and 120 between Stevens Bar and Groveland, $400,000.

Yolo County, for grading and paving portions of the West Sacramento Freeway from the Yolo Causeway to Tower Bridge, a length of 4.1 miles, $1,150,000.

The complete budget follows:

MAJOR CONSTRUCTION PROJECTS IN STATE HIGHWAY BUDGET FOR 1952-53 YEAR FROM JULY 1, 1952 TO JUNE 30, 1953

County	Route	Description	Approximate mileage	Estimated cost
Alameda	5 (US 50)	San Joaquin County Line to two miles east of Redmond Overhead grade and structures	1.7	$586,000
Alameda	5 (US 50)	Two miles east of Redmond Overhead to Greenville (portions), surface	3.5	175,000
Alameda	5 (US 40, 50)	Toll Plaza to West End of Distribution Structure in Oakland, surface	0.9	25,000
Alameda	69 (SR 17)	Eastshore Freeway, Santa Clara County Line to Junction with existing Route 5 near Warm Springs, grade and structures	2.8	1,240,000
Alameda	69 (SR 17)	Eastshore Freeway, Fallon Street to Market Street in Oakland, grade, pave and structures	1.0	1,810,000

SR = State Sign Route

dget for 1952-53 Fiscal Year Total $72,093,000

County	Route	Description	Approximate mileage	Estimated cost
Alameda	105 (SR 17)	Old Route 69 to New Route 69 and East City Limits of Oakland to San Leandro Creek, surface and drainage	1.2	$140,000
Alameda	226	Bay Farm Island Bridge in Alameda, approaches	0.6	250,000
Alameda	227	Mountain Boulevard, Route 75 near Lake Temescal to Route 5 in Oakland, grade and surface (Joint Highway District No. 26)		300,000
Alameda	Various	Rights of Way on State Highway Routes		1,926,000
Amador—Calaveras	65 (SR 49)	Mokelumne Hill to Jackson, grade and surface	6.0	450,000
Amador	Various	Rights of Way on State Highway Routes		35,000
Butte	3 (US 99E)	At Western Drainage Canal, reconstruct bridge		10,000
Butte	3 (US 99E)	Oroville Wye to 20th Street in Chico, grade	16.5±	835,000
Butte	87	At Dry Creek, reconstruct bridge		13,000
Butte	Various	Rights of Way on State Highway Routes		75,000
Calaveras	24 (SR 12)	San Joaquin County Line to Valley Springs (portions), grade and surface	10.0±	350,000
Calaveras—Amador	65 (SR 49)	Mokelumne Hill to Jackson, grade and surface	6.0	450,000
Calaveras	Various	Rights of Way on State Highway Routes		20,000
Colusa	15 (SR 20)	Williams to Colusa (portions), surface	2.4	37,000
Colusa	88 (SR 45)	At High Ditch and Wilkens Slough, widen and redeck bridges		40,000
Colusa	Various	Rights of Way on State Highway Routes		100,000
Contra Costa	14 (US 40)	Through Rodeo, surface		80,000
Contra Costa	75, 107 (SR 21, 24)	Main Street in Walnut Creek, South City Limits to North City Limits of Concord and Danville to S. P. R. R. Crossing South of Walnut Creek (portions), grade and surface	2.5	200,000
Contra Costa	106 (SR 4)	Station 243 to Station 262, at intersection with County Road to Avon, grade and surface	0.4	80,000
Contra Costa	Various	Rights of Way on State Highway Routes		1,615,000
Del Norte	1 (US 199)	Foot of Oregon Mountain to the Oregon State Line, grade and surface	1.9	120,000
Del Norte	Various	Rights of Way on State Highway Routes		115,000
El Dorado	11 (US 50)	Through Placerville (portions), grading and structures	1.5	300,000
El Dorado	Various	Rights of Way on State Highway Routes		115,000
Fresno	4 (US 99)	Kingsburg to Fresno (portions), frontage roads and connections	9.0	56,000
Fresno	4 (US 99)	Weber Avenue at Belmont Subway in Fresno, structure and approaches (cooperative project)		110,000
Fresno	41 (SR 180)	At Kings Slough (Whites Bridge), bridge and approaches		100,000
Fresno	41 (SR 180)	Four miles east of Orange Cove Road to White Deer Road, grade and surface	7.0	910,000
Fresno	76 (SR 168)	At Fresno Irrigation District Crossing and Dog Creek, bridges and approaches		55,000
Fresno	76 (SR 168)	At Sales Creek and Dry Creek, grade, surface and structures		90,000
Fresno	Various	Rights of Way on State Highway Routes		600,000
Glenn	7 (US 99W)	At Stony Creek, widen bridge		120,000
Glenn	45	At Big Butte Creek Overflow, bridge and approaches		80,000
Humboldt	1 (US 101)	Burns Freeway, Gannon Slough to 0.9 mile north of Arcata, grade	2.9	600,000
Humboldt	Various	Rights of Way on State Highway Routes		250,000
Imperial	12 (US 80)	Coyote Wells Underpass to Plaster City (portions), surface	5.0	50,000
Imperial	26 (US 99)	South City Limits of Brawley to 1.1 miles west of Brawley, grade, surface, and structure	2.0	440,000
Imperial	27 (US 80)	East Highline Canal to Junction of Route 202, surface	11.5	150,000
Imperial	27 (US 80)	At Araz Wash, bridge and approaches		65,000
Imperial	187	At Holtville Main Drain, bridge and approaches		70,000
Imperial	187, 201	Pine Road Intersection, Orita Turn and Wiest Turn, grade and pave	1.2	102,000
Imperial	Various	Rights of Way on State Highway Routes		1,000
Inyo	23 (US 6, 395)	Kern County Line to Dunmovin (portions), grade and surface	16.7	155,000
Inyo	23, 76 (US 6, 395)	South City Limits of Bishop to Texaco Corners, grade and surface	1.4	100,000
Inyo	23 (US 395)	Texaco Corners to Mono County Line, widen 4 bridges		30,000
Inyo	212	At Amargosa River, construct dip		10,000
Inyo	Various	Rights of Way on State Highway Routes		2,500
Kern	4 (US 99)	Fort Tejon to Oak Glen, surface	2.0	50,000
Kern	4 (US 99, 466)	Bakersfield to Famoso Underpass (portions), frontage roads and connections	8.8	23,000
Kern	4 (US 99, 466)	Kern River Bridge North of Bakersfield, replace portions of Trestle with embankment	0.8	200,000
Kern	4 (US 99, 466)	Snow Road to Cawelo, frontage roads and connections		150,000
Kern	57 (US 399) (SR 166)	Grocer Grade (portions), grade and surface	1.2	150,000
Kern	58 (US 466)	0.8 mile east of Mojave to 4.3 miles east of Mojave, grade and surface	3.5	150,000
Kern	58 (US 466)	Edison Highway, Bakersfield to 1.35 miles east of Route 143, surface	4.2	90,000
Kern	Various	Rights of Way on State Highway Routes		100,000
Kings	134	Corcoran to the Tulare County Line, surface	2.6	66,000
Kings	Various	Rights of Way on State Highway Routes		100,000
Lake	15 (SR 20)	At Lucerne Creek and Deer Creek, culverts and fills		15,000
Lake	49 (SR 53)	0.4 mile south of Lower Lake to 0.3 mile north of Cache Creek, grade and surface	1.7	205,000
Lake	89 (SR 29)	At Dry Creek and Dry Creek Overflow, bridges and approaches	0.1	90,000
Lake	Various	Rights of Way on State Highway Routes		47,000

SR = State Sign Route

County	Route	Description	Approximate mileage	Estimated cost
Lassen—Plumas	21 (SR 24)	Chilcoot Pass, Beckwourth Inn to Route 29, grade, surface and structure	4.2	$443,000
Los Angeles	2 (US 101)	Santa Ana Freeway, Vignes Street separation		400,000
Los Angeles	166	Santa Ana Freeway-Lakewood Boulevard to Pioneer Boulevard, grade, pave and structures	4.7	3,381,000
Los Angeles	4 (US 6, 99)	Brighton Street to north city limits of Burbank at Cohasset Street, surface	1.0	75,000
Los Angeles	26 (US 70, 99)	Holt Avenue in Pomona from west city limits to Hamilton Boulevard, surface	0.7	85,000
Los Angeles	26	Ramona Freeway-Covina Hills Road to San Bernardino County Line, structures	7.2	1,625,000
Los Angeles	59 (SR 138)	Palmdale to Little Rock (portions), grade and surface	1.4	75,000
Los Angeles	61 (SR 2)	Angeles Crest Highway (portions), Prison Labor, grade		423,000
Los Angeles	77	East City Limits to West City Limits of San Gabriel, surface	1.2	75,000
Los Angeles	161 (US 66, Alt.)	Colorado Freeway-Patrician Way to Kensington Place (portions), grade, pave and structures	0.7	1,473,000
Los Angeles	162 (US 66)	Santa Monica Boulevard-Seward Street to Gower Street, surface	0.6	20,000
Los Angeles	165	Harbor and Arroyo Seco Freeways-Adobe Street to Washington Boulevard (portions), grade, pave and structures		5,160,000
Los Angeles	167	Los Angeles River Freeway-223d Street to south junction of Atlantic Avenue, grade, pave and structures	4.6	3,305,000
Los Angeles	167 (SR 15)	Atlantic Boulevard from Anaheim-Telegraph Road to Garvey Avenue in Monterey Park, grade and surface	4.0	207,000
Los Angeles	170 (SR 35)	Norwalk Boulevard from Slauson Avenue to Whittier Boulevard in Whittier, grade, surface and drainage		150,000
Los Angeles	174 (SR 10)	Manchester Avenue from Crenshaw Drive to Van Ness Avenue in Inglewood, surface	0.8	65,000
Los Angeles	175 (SR 14)	Redondo Beach Boulevard from Pier Avenue to Inglewood Avenue, grade and surface	1.2	155,000
Los Angeles	175 (SR 14)	Artesia Avenue from Alameda Street to Downey Avenue (portions), grade and surface	3.8	880,000
Los Angeles	175 (SR 14)	Artesia Avenue from Downey Avenue to Palo Verde Avenue, grade and surface	2.7	360,000
Los Angeles	Various	Rights of Way on State Highway Routes		13,684,000
Madera	4 (US 99)	Fresno County Line to ½ mile north of Berenda (portions), frontage roads and connections		110,000
Madera	32 (SR 152)	Califa to the Merced County Line (portions), surface	15.7	330,000
Madera	Various	Rights of Way on State Highway Routes		200,000
Marin	1 (US 101)	San Pedro Road Separation (Santa Venetia), structures		200,000
Marin	56 (SR 1)	Near Dolan's Corner, grade and surface	0.3	52,000
Marin	Various	Rights of Way on State Highway Routes		173,000
Mariposa—Tuolumne	110 (SR 132)	Stanislaus County Line to Coulterville, grade and surface	7.6	25,000
Mariposa	Various	Rights of Way on State Highway Routes		11,000
Mendocino	1 (US 101)	Northwestern Pacific Underpass to Eleven Oaks, grade and surface	2.0	240,000
Mendocino	1 (US 101)	At Ten Mile Creek, culvert and fill	0.3	75,000
Mendocino	1 (US 101)	At Rattlesnake Creek, culvert and fill	0.4	400,000
Mendocino	48 (SR 28)	Boonville to Shearing Creek (portions), grade and surface	1.3	170,000
Mendocino	48 (SR 28)	At Indian Creek, bridge and approaches		150,000
Mendocino	48 (SR 28)	At Mill Creek, reconstruct bridge		40,000
Mendocino	Various	Rights of Way on State Highway Routes		60,000
Merced	4 (US 99)	5.2 miles south of Merced to Merced, surface	5.02	320,000
Merced	4 (US 99)	Gerard Avenue to Parson Street, grade and surface frontage road	0.2	50,000
Merced	4 (US 99)	Merced River bridge		600,000
Merced	123	At Merced River (Cox Ferry), bridge and approaches		275,000
Merced	Various	Rights of Way on State Highway Routes		337,000
Modoc	73 (US 395)	Junction of Route 28 to the Oregon State Line, Prison Labor, grade and surface	33.8	330,000
Modoc	Various	Rights of Way on State Highway Routes		85,000
Mono	95 (US 395)	At Koenig Ranch, grade and surface	0.6	35,000
Mono	Various	Rights of Way on State Highway Routes		2,000
Monterey	2 (US 101)	Chualar to Spence Underpass, grade and surface	5.3	560,000
Monterey	2 (US 101)	Salinas Freeway, Market Street to North Main Street, grade, pave and structures	1.6	1,130,000
Monterey	56 (SR 1)	Replace 6 Timber Cattlepasses, and redeck Dolan Creek bridge and San Jose Creek bridge		120,000
Monterey	Various	Rights of Way on State Highway Routes		735,000
Napa—Solano	7 (US 40)	Tennessee Street to Cordelia Underpass (portions), surface	5.5	300,000
Napa	49 (SR 29)	Union Station to Yountville (portions), surface	3.0	150,000
Napa	Various	Rights of Way on State Highway Routes		115,000
Nevada	Various	Rights of Way on State Highway Routes		125,000
Orange	43 (SR 55)	Finley Avenue in Newport Beach to 20th Street in Costa Mesa, grade, pave and structures	2.3	700,000
Orange	60 (US 101 Alt.)	San Juan Creek Overflow Bridge to Dana Point, surface	1.4	46,000
Orange	64 (SR 74)	Route 2 to Riverside County Line, replace 8 cattlepasses		85,000
Orange	171 (SR 39)	Huntington Beach Boulevard, Route 60 to Garfield Avenue, grade and pave	2.6	350,000
Orange	175, 176 (SR 14)	At Santa Ana River, bridge		500,000
Orange	Various	Rights of Way on State Highway Routes		2,145,000
Placer—Sacramento	3 (US 40, 99E)	Sylvan School to Roseville, surface shoulders	3±	70,000
Placer	Various	Rights of Way on State Highway Routes		270,000
Plumas—Lassen	21 (SR 24)	Chilcoot Pass, Beckwourth Inn to Route 29, grade, surface and structure	4.2	443,000
Riverside	64 (US 60, 70)	Indio to Black Butte (portions), surface	50.0	100,000
Riverside	77, 193 (SR 71)	Ontario Avenue to north city limits of Corona, surface	2.7	100,000
Riverside	78 (SR 79)	Rockhaven Cattlepass and Lemay Cattlepass, bridges and approaches		30,000

SR = State Sign Route

County	Route	Description	Approximate mileage	Estimated cost
Riverside	78 (US 395)	Route 64 to Nuevo Road, grade, pave and structures	4.3	$850,000
Riverside	146 (US 95)	Palo Verde Lagoon, West C Canal, C-03 Canal, bridges and approaches		65,000
Riverside	187 (SR 111)	Route 64 to Cathedral City (portions), grade and surface	2.0	100,000
Riverside	Various	Rights of Way on State Highway Routes		500,500
Sacramento—Placer	3 (US 40, 99E)	Sylvan School to Roseville, surface shoulders	3±	70,000
Sacramento	11 (SR 24)	Sacramento River Bridge (Isleton) and Steamboat Slough Bridge, redeck bascule spans		75,000
Sacramento	98	C Street in Sacramento to North Sacramento Freeway near Swanston Road, grade, pave and structures	2.3	2,280,000
Sacramento	Various	Rights of Way on State Highway Routes		355,000
San Benito	2 (US 101)	At San Benito River, reconstruct bridge		160,000
San Benito	Various	Rights of Way on State Highway Routes		30,000
San Bernardino	9 (US 66)	Lytle Creek to west city limits of San Bernardino, grade and surface	0.3	35,000
San Bernardino	26 (US 70, 99)	Los Angeles County Line to Ontario, surface	2.1	90,000
San Bernardino	26 (US 70, 99)	Ramona Freeway, Los Angeles County Line to Archibald Avenue, structures	7.2	2,135,000
San Bernardino	26 (US 70, 99)	In Etiwanda, San Sevaine Channel, bridges		190,000
San Bernardino	31 (US 91, 466)	Barstow to Nevada State Line (portions), surface shoulders	42.3	235,000
San Bernardino	31 (US 91, 466)	Redecking Timber Trestle Bridges		75,000
San Bernardino	43 (SR 18)	Big Bear City to Box "S" Ranch (portions), surface	19.7	10,000
San Bernardino	58 (US 466)	Kramer Railroad Crossing, grade and surface	0.7	50,000
San Bernardino	58 (US 66)	Barstow to 1 Mile East of Daggett, grade and surface	8.1	140,000
San Bernardino	58 (US 66, 466)	Redecking Timber Trestle Bridges		240,000
San Bernardino	77 (SR 71)	Route 192 to Pipe Line Avenue, grade and surface	5.1	70,000
San Bernardino	177	Carbon Canyon Road, Orange County Line to Pipe Line Avenue, surface	5.5	60,000
San Bernardino	188	Crestline Road, Camp Seeley to Cedar Springs, grade and surface	6.7	25,000
San Bernardino	190	In Upland, Euclid Avenue to East City Limits, grade and surface	1.4	40,000
San Bernardino	Various	Rights of Way on State Highway Routes		565,000
San Diego	2 (US 101)	Balboa Avenue to Las Flores (portions), surface	6.0	150,000
San Diego	2 (US 101)	Del Mar to Encinitas, widen	5.3	650,000
San Diego	2 (US 101)	Oceanside Freeway, 2.2 Miles south of Carlsbad to Camp Pendleton Main Entrance (portions), grade, surface, and structures	4.1	2,725,000
San Diego	2 (US 101)	At Palm Avenue, grade and surface	0.6	186,000
San Diego	Various	Rights of Way on State Highway Routes		670,000
San Francisco	68 (US 40, 50)	Bayshore Freeway, 16th Street to Seventh Street in San Francisco, grade, pave and structures		3,640,000
San Francisco—San Mateo	68 (US 101, By Pass)	Bayshore Freeway, Augusta Street in San Francisco to Santa Clara County Line (portions), grade, pave, and structures		5,500,000
San Francisco	Various	Rights of Way on State Highway Routes		1,650,000
San Joaquin	5 (US 50)	Corral Hollow Road to Alameda County Line, grade and structures	5.7	550,000
San Joaquin	5 (US 50)	Janney Road to Alameda County Line (Altamont Pass), surface	4.1	50,000
San Joaquin	5 (SR 8)	At Calaveras River, bridge and approaches		55,000
San Joaquin	110 (SR 132)	Junction Route 41 to Stanislaus County Line, surface	1.3	65,000
San Joaquin	Various	Rights of Way on State Highway Routes		570,000
San Luis Obispo	2 (US 101)	In San Luis Obispo, Marsh Street to San Luis Obispo Creek, grade, surface, and structures	2.3	860,000
San Luis Obispo	2 (US 101)	One Mile south of Templeton to Fourth Street in Paso Robles, grade and surface	6.5	860,000
San Luis Obispo	2 (US 101)	Through Paso Robles, surface	2.7	190,000
San Luis Obispo	Various	Rights of Way on State Highway Routes		280,000
San Mateo	2 (US 101)	El Camino Real, 24th Avenue to 41st Avenue in San Mateo, grade and surface	1.5	110,000
San Mateo—San Francisco	68 (US 101, By Pass)	Bayshore Freeway, Augusta Street in San Francisco to Santa Clara County Line (portions), grade, pave and structures		5,500,000
San Mateo	68 (US 101, By Pass)	Bayshore Freeway, Colma Creek to Broadway, surface	5.2	310,000
San Mateo	Various	Rights of Way on State Highway Routes		147,000
Santa Barbara	2 (US 101)	Gaviota to Gaviota Gorge, grade, surface, and structure	3.1	1,300,000
Santa Barbara	56 (SR 1)	Black Road to Point Sal Road, surface	5.5	115,000
Santa Barbara	57 (SR 166)	1.7 miles east of Buckhorn Creek to 0.5 mile east of Clear Creek, grade and surface	0.4	40,000
Santa Barbara	57 (SR 166)	Three miles west of San Luis Obispo County Line to the San Luis Obispo County Line, surface	3.0	45,000
Santa Barbara	Various	Rights of Way on State Highway Routes		200,000
Santa Clara	32 (SR 152)	Pacheco Pass Road, Ferguson Road to five miles east of Gilroy (portions), surface	2.1	95,000
Santa Clara	42	0.1 mile east of Three Oaks Way to El Camino Grande and on Santa Cruz Avenue in Los Gatos, surface	1.1	90,000
Santa Clara	55 (SR 5)	Route 5 to Black Road (portions), grade and surface	1.1	25,000
Santa Clara	69 (SR 17)	Eastshore Freeway, Route 68 to the Alameda County Line, grade and structures	6.1	1,960,000

SR = State Sign Route

County	Route	Description	Approximate mileage	Estimated cost
Santa Clara	Various	Rights of Way on State Highway Routes		$646,000
Santa Cruz	56 (SR 1)	Branciforte Creek Bridge in Santa Cruz, widen bridge		60,000
Santa Cruz	116 (SR 9)	At Fall Creek, reconstruct bridge		20,000
Santa Cruz	116 (SR 9)	Boulder Creek to Waterman Gap (portions), grade and surface		200,000
Santa Cruz	Various	Rights of Way on State Highway Routes		71,000
Shasta	20 (SR 44)	At Shingle Creek, bridge and approaches		20,000
Shasta	28 (US 299)	At Montgomery Creek, bridge and approaches		80,000
Shasta	28 (US 299)	Montgomery Creek to Hillcrest (portions), surfacing		40,000
Shasta	Various	Rights of Way on State Highway Routes		100,000
Siskiyou	3 (US 99)	Dunsmuir to Big Canyon (portions), grade and surface	4.0	1,200,000
Siskiyou	46 (SR 96)	At Oak Flat Creek, bridge and approaches		55,000
Solano	7 (US 40)	Carquinez Bridge to the Vallejo Wye, surface	0.6	80,000
Solano—Napa	7 (US 40)	Tennessee Street to Cordelia Underpass (portions), surface	5.5	300,000
Solano	7 (US 40)	North of Vacaville to Midway, surface	2.7	150,000
Solano	99	At Miner Slough Bridge, reconstruct bridge		100,000
Solano	Various	Rights of Way on State Highway Routes		35,000
Sonoma	56 (SR 1)	Jenner to the Mendocino County Line (portions), grade and surface		100,000
Sonoma	208 (SR 48)	At Tolay Creek, culvert and fill		30,000
Sonoma	Various	Rights of Way on State Highway Routes		164,000
Stanislaus	41 (SR 33)	At Newman, Crows Landing and South of Westly, grade and surface	1.8	175,000
Stanislaus	110 (SR 132)	San Joaquin County Line to Modesto (portions), surface	6.7	350,000
Stanislaus	Various	Rights of Way on State Highway Routes		95,000
Sutter	15 (SR 20)	From Onstott Road through Yuba City (Colusa Avenue) to intersection of US 99, grade and surface	1.0	300,000
Sutter	Various	Rights of Way on State Highway Routes		46,000
Tehama	47 (SR 32)	At Deer Creek, bridge and approaches		85,000
Tehama	Various	Rights of Way on State Highway Routes		5,000
Trinity	20 (US 299)	Humboldt County Line to Prairie Creek, Prison Labor, grade		300,000
Trinity	20 (US 299)	Humboldt County Line to Prairie Creek (portions), base and seal coat	17±	60,000
Trinity	20 (US 299)	At Big French Creek, bridge superstructure and piers		50,000
Tulare	4 (US 99)	One mile north of Pixley to one mile south of Tipton, grade and surface	4.8	700,000
Tulare	4 (US 99)	Tulare Airport to Tagus, pave	8.0	1,250,000
Tulare	4 (US 99)	Tipton to Route 10 (portions), frontage roads and connections	15.8	39,000
Tulare	127 (SR 190)	Mile 7.0 to Mile 13.5, Bartlett Park to Clavicle, drainage and borders	6.5	100,000
Tulare	Various	Rights of Way on State Highway Routes		650,000
Tuolumne	40 (SR 49, 120)	At Dan's Creek, bridge and approaches		30,000
Tuolumne	40 (SR 49, 120)	Stevens Bar to Groveland (portions), grade and surface	8.0	400,000
Tuolumne	65 (SR 49)	At Moccasin Creek, bridge and approaches		55,000
Tuolumne—Mariposa	110 (SR 132)	Stanislaus County Line to Coulterville, grade and surface	7.6	25,000
Tuolumne	Various	Rights of Way on State Highway Routes		5,000
Ventura	2 (US 101)	Calleguas Road to Central Avenue, Camarillo grade separation		600,000
Ventura	138 (US 399)	Near Oakview Avenue to junction Route 151, grade and surface	2.3	65,000
Ventura	Various	Rights of Way on State Highway Routes		1,063,000
Yolo	6 (US 40, 99W)	West Sacramento Freeway, Yolo Causeway to Tower Bridge (portions), grade and pave	4.1	1,150,000
Yolo	50 (SR 16)	Esparto to Browns Corner (portions), surfacing and widen structures	12.7	200,000
Yolo	Various	Rights of Way on State Highway Routes		206,000
Yuba	15 (SR 20)	Hallwood Bottoms Road to Brown's Valley Road (portions), surface		30,000
Yuba	Various	Rights of Way on State Highway Routes		240,000

SR = State Sign Route

Budget Review

Continued from page 14 . . .

centage of fatalities, on the Bayshore Highway through San Mateo and Santa Clara Counties. The Governor went over the situation with them in considerable detail. He pointed out the statewide aspects of the problem and left them with a challenge; he assured them that he was ready to go along with any genuine, clearly expressed desire on the part of the people of California to speed up correction of our highway deficiencies in the one way it can be done—by an increase in highway revenues. But he insisted the demand must be real and that it must be state-wide.

In the past few weeks it has become evident the Governor's challenge to the "grass roots" has struck a responsive chord. Editorials have begun to take a state-wide view, have begun to speak right out of the impossibility of solving the problem without adequate funds, and, finally, have relayed the Governor's challenge to newspaper readers, to civic groups, and to the public as a whole.

This growing viewpoint has been effectively expressed by Mr. J. R. Paulson, managing editor of the Palo Alto *Times*, and a leader in the Bayshore Highway improvement campaign. Writing in the October issue of the *California Publisher*, Mr. Paulson points out:

"The Bayshore situation is bad. But we * * * realize that there are many other 'Bayshores' in California. Many other highways need widening, improvement and repair." After continuing with a recital of the State's overall, three-billion-dollar highway deficiency, Mr. Paulson urges his fellow editors of California newspapers to start working together in support of measures which will correct that deficiency through the building of full freeways.

And the members of the Highway Commission are especially appreciative

. . . *Continued on page 61*

Stephen Chase Named to State Highway Board

EXPRESSING regret that Homer P. Brown of Placerville was compelled to resign because of ill health, Governor Earl Warren appointed H. Stephen Chase of Sacramento to succeed the El Dorado County man on the California Highway Commission. Subject to confirmation by the Senate at the next session of the Legislature, the appointment is until January 15, 1955.

Chase, who is vice president and manager of the American Trust Company and a director of the California Western States Life Insurance Company, was born in San Jose in 1903, educated in the public schools there and was graduated from Stanford University and from the Harvard University School of Business Administration.

He went to work for the American Trust Company in 1927 after his graduation from the business school. He worked in branches of the bank in San Francisco, San Jose, Redwood City and Santa Rosa, Sonoma County, before his transfer to Sacramento in 1940.

Chase also has been active in community affairs, including service as chairman of the California War Chest campaign in 21 Northern California counties during World War II. He also has aided the Community Chest, Red Cross and other civic activities.

"Stephen Chase has an extensive background of business experience and a deep interest in community affairs which I am confident will make him an excellent Highway Commissioner," Governor Warren said.

"It is a matter of great regret that Homer Brown is unable to continue his service on the Highway Commission because of the condition of his health. He has been a fine public servant and has made a great contribution to the progress we have made in recent years in the development of our highway system."

Brown was appointed to the commission in 1943.

H. STEPHEN CHASE

State Engineer Appoints Three New Assistants

TO HELP him cope with the expanding activities of the Division of Water Resources, State Engineer A. D. Edmonston has elevated three principal hydraulic engineers to the posts of assistant state engineers. Those promoted are: G. H. Jones, T. B. Waddell, and Gordon Zander.

Jones, who entered the employ of the Division of Water Resources in September, 1924, will have charge of Sacramento River Flood Control Project, flood damage repairs, hydraulic construction for state agencies, field surveys for state agencies, supervision of safety of dams, Sacramento-San Joaquin water supervision, snow surveys and water supply forecasts, cooperative stream gaging, contractural work for the U. S. Bureau of Reclamation.

Waddell, who entered state service with the division in August, 1913, will have charge of state-wide investigation for the Water Resources Board, cooperative investigations for the Water Resources Board, rainmaking investigations, Central Valley Project, review of federal reports, state maps and surveys and topographic mapping, irrigation and other districts, cooperative work with the soil conservation service on irrigation investigations, work for California Districts Securities Commission, Feather River Project.

Zander, who entered the employ of the State Division of Water Resources in July, 1916, will have charge of water rights applications, water rights adjudications, watermaster service, licensing of rainmakers, water quality investigations, Chapter 1552, water pollution investigations, Chapter 1549, sea water investigations, ground water investigations.

Course in Drainage Is Available to All State Road Engineers

A SHORT COURSE in "Drainage and Drainage Structures" is being brought during the current academic year to engineering personnel of the Division of Highways and other engineers concerned with roads and streets at 14 locations throughout the State.

Under the joint sponsorship of the Institute of Transportation and Traffic Engineering of the University of California and the University's Division of Engineering Extension, the course opened at Redding on October 12th, and will have its concluding presentation in Bishop next June.

The course is conducted by H. P. Pickering, Assistant Engineer for the I. T. T. E.

In most locations the course is made up of four three-hour meetings held on successive week ends. The subjects covered include: elements of hydrology, run-off, stream gauging; hydraulic design of culverts, inlets and outlets; hydraulics of flow in open channels; subsurface drainage; and practical design examples.

The course has already been held in Redding, Marysville, San Luis Obispo and Berkeley. Future locations and opening dates are: San Diego, January 3d; Fresno, January 18th; El Centro, February 1st; Stockton, February 15th; Los Angeles, March 7th; Eureka, March 21st; San Bernardino, April 11th; San Jose, April 25th; Bakersfield, May 9th, and Bishop, June 6th.

U.S. 50 Project

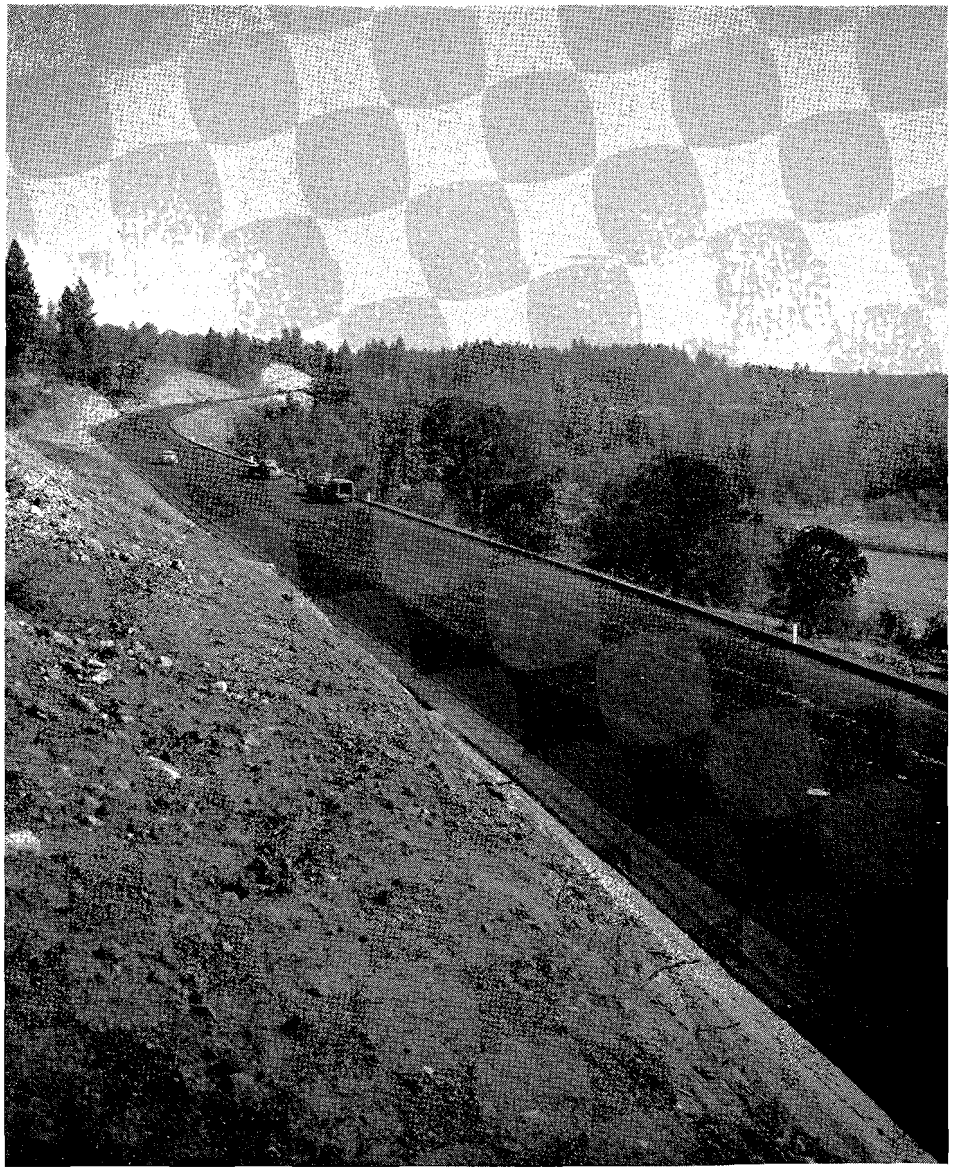
Bad Bottleneck East of Placerville Eliminated

By EDWARD F. SILVA, Jr., Resident Engineer

THE RECENTLY completed project on Highway U. S. 50 from the railroad crossing east of Placerville to Five-mile Terrace was the first major construction on this section of highway since it was taken into the State Highway System. Previous improvements to this two-mile section consisted of placing base materials and resurfacing, with minor changes in alignment.

This portion of Highway 50 was one of the worst bottlenecks on the transcontinental highway leading to the great resort areas of the El Dorado National Forest and the Eastern United States.

The work done under this contract consisted of grading and placing of plant-mixed surfacing on crusher run base. The resulting improvement of alignment and sight distances will bring this section of Highway 50 to the present standards of design.



This view of U. S. 50 project is looking west

Project Two Miles Long

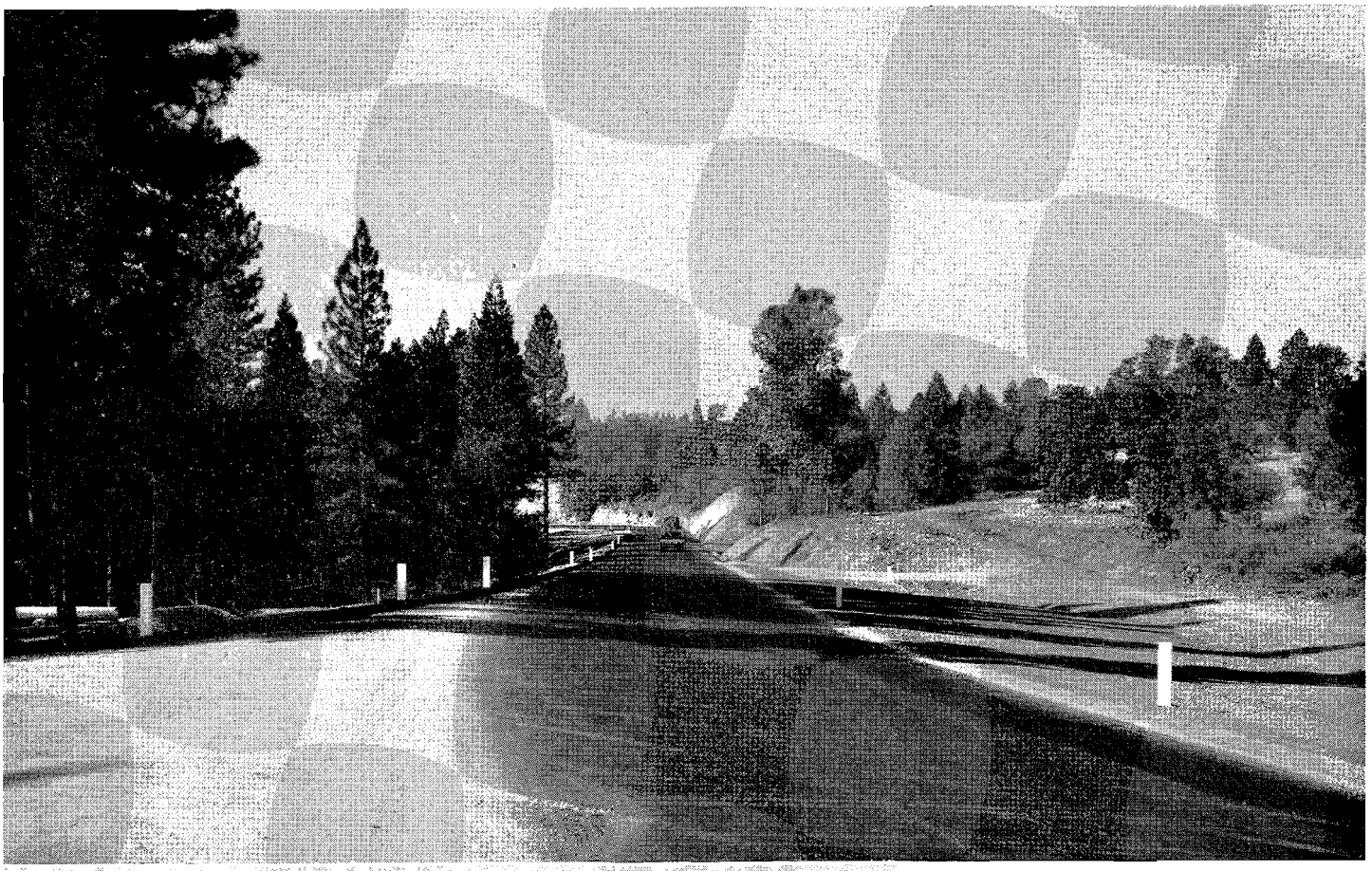
The completed roadway consists of two 12-foot lanes with surfaced shoulders on 68 percent of the total length and the remainder consists of four 12-foot lanes undivided. The total length of the project is two miles, averaging 5 percent grade.

Prior to the start of major construction activities, it was necessary to grade a roadbed on new alignment for the Camino, Placerville and Lake Tahoe Railroad. This was necessary to obtain an acceptable standard at the grade crossing on this project.

During construction numerous springs were encountered in the excavation and embankment areas. A total of 0.66 mile of perforated metal pipe underdrains was installed to intercept the subsurface water and stabilize the roadbed. In one unstable area it was necessary to excavate and waste over 4,000 cubic yards of material, taken to a depth of five feet, before a stable material was reached. This wasted material was of the consistency of mud.

It was in this area that boards were found three feet below the existing grade. These boards were the remains of an early corduroy road used in the early 1900's to carry the traffic of that time.

In the above area, state forces placed several perforated galvanized steel pipe horizontal drains to alleviate the sat-



ABOVE—East end of U. S. 50 Project, looking west. BELOW—Looking east, showing old highway location in right background. (Picture taken before striping)

urated condition of the area. The general geological formation was supersaturated clay and fissured lava rock.

During the placing of crusher run base it was decided to lime treat a portion of crusher run base already in place in order to decrease the plasticity index. By adding 3 percent lime, by dry weight, to the crusher run base, the plasticity index was reduced from eight to non-plastic. The lime-treated crusher run base stood up well under traffic, with very little raveling under the fast and heavy traffic carried throughout the entire construction period.

The contractor, H. Earl Parker, Incorporated, completed this project during the latter part of November, 1951. The author was the resident engineer on the project.

Photogrammetry

Aerial Photos Speed Up Highway Location and Design

By L. L. FUNK, Assistant District Engineer, District V

Photogrammetry is defined as "the science or art of obtaining reliable measurements by means of photography."

This article is based on a paper delivered by Mr. Funk at the semi-annual meeting of the American Society of Photogrammetry in Sacramento on October 19th, the first such meeting to be held on the West Coast. Approximately 200 engineers and technicians participated.

HIGHWAY Location Engineers of the old school have a saying that the "windshield review" and the use of an automobile by the locator are responsible for many miles of improperly located highways. In other words, they considered it necessary to walk every foot of every possible route.

Aerial photography has made a major change in this situation. It is now possible to obtain a fairly good location without leaving the office, although we do not recommend anything quite that drastic. However, there is no doubt that the proper combination of photogrammetric products and field reconnaissance will produce a better location at a lower cost than can be obtained by the exclusive use of ground methods.

For the past few years our construction budget in District V has averaged $4,000,000 annually with an additional $1,500,000 for the purchase of new rights of way. Between 80 percent and 90 percent of our construction funds go into the four-lane development of U. S. 101 to expressway or freeway standards. We maintain two location survey parties in the field and have between 50 and 60 engineers and draftsmen working on planning and design in the office.

Early Aerial Photography

We have been users of aerial photography for over 20 years, having in our files contact prints, enlargements and mosaics, made by Fairchilds in 1929, covering 80 miles of rugged coastal area in San Luis Obispo and Monterey Counties. These photographs were used in the location of the famous Carmel-San Simeon Highway.

From 1929 to 1947 our use of aerial photography was limited to small scale photographs most of which were obtained from the Production and Marketing Administration. In 1947 we were faced with a greatly accelerated highway program, together with a severe shortage of experienced personnel. Following the example of other highway organizations, we experimented with various types of large-scale aerial photography and since that time have been consistent advocates of its use.

To understand the various types of photogrammetric products which can be used to advantage by a highway department it is necessary to know the type of highway project in which that particular organization is predominately interested.

In District V a typical project would be the development of a four-lane divided highway to interstate highway standards. Access would be limited to openings at not less than quarter-mile intervals and might be restricted entirely except at the more important crossroads. Traffic interchanges might be provided at these locations. The project would generally be from 3 to 10 miles in length and would be through terrain which might vary from level to steeply rolling. Intensity of land use could range from grazing or dry farming to built-up urban areas. It could be an entirely new alignment or portions of the existing highway could be utilized for two of the four lanes.

Construction Cost

The construction cost of such a project ranges from $300,000 to $800,000 per mile. At least 80 percent of our construction and right of way budget goes into this type of project.

In the location of a highway of this type it is seldom that cut and fill quantities are the primary consideration. Excavation rarely exceeds 25 percent and may run as low as 10 percent of the total construction cost.

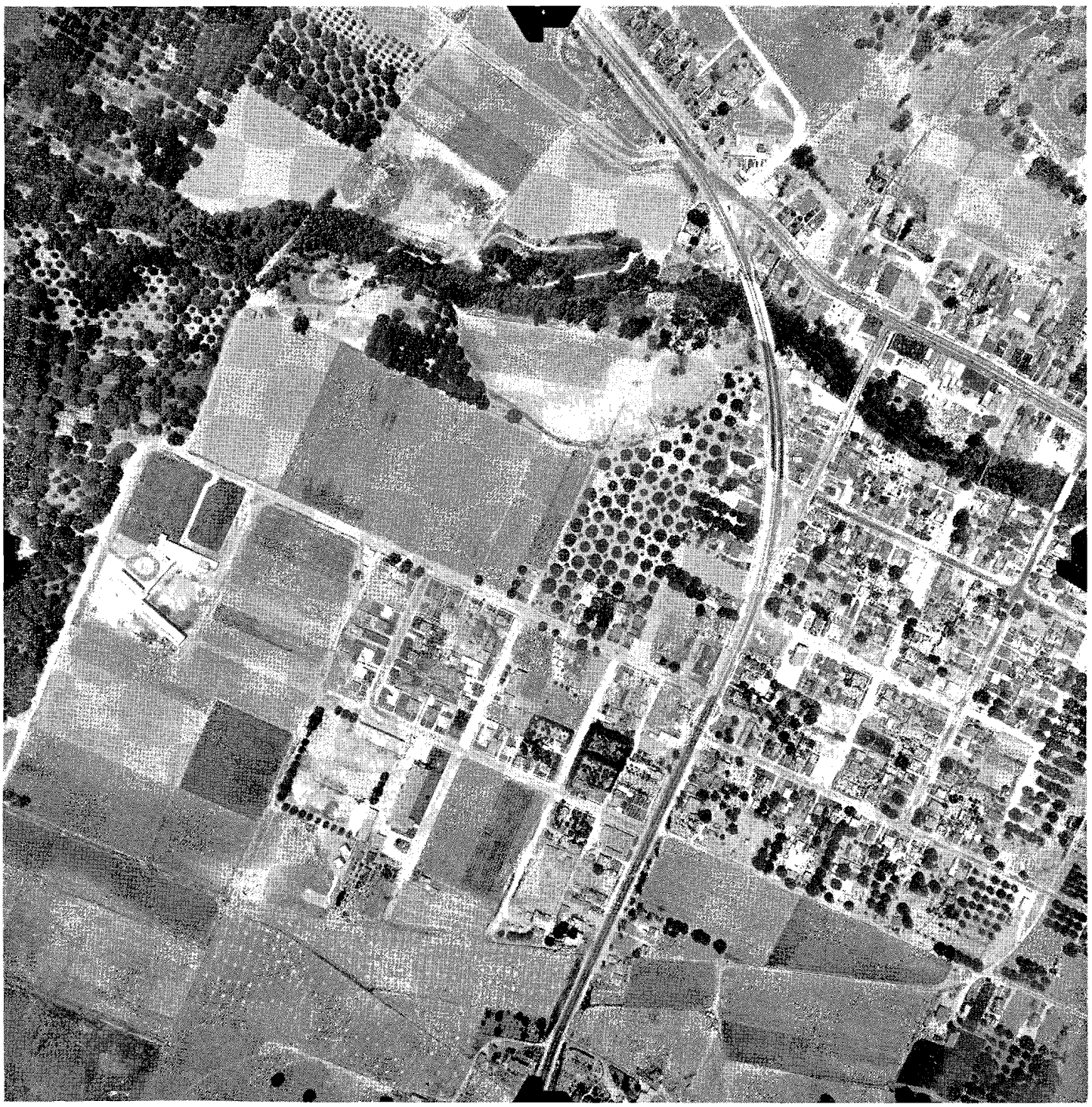
If satisfactory grades can be obtained the choice between alternate routes is more likely to be a comparison of traffic service and of fitting land use patterns rather than a close fitting of the routes to the terrain to minimize grading quantities. For the study of land use aerial photographs are superior to any planimetric map and when supplemented by a few control elevations usually provide sufficient information to determine the location of this type of highway within very narrow limits. By their use we have, in nearly all cases, either entirely eliminated the preliminary survey or greatly reduced the information required from it.

Based on our past experience we would, on this typical project, use a minimum of five different sizes or scales of individual aerial photographs. These would be: contact prints from small scale photography at 1 to 20,000 with enlargements at 1,000 feet and at 400 feet per inch, and contact prints from large scale photography at a scale of either 500 feet or 300 feet per inch with enlargements from them at 200 feet per inch.

In addition to these, if the project were through urban areas or if traffic interchanges were involved we would obtain a semi-controlled mosaic, generally at 200 feet per inch, and large scale enlargements at either 50 feet or 100 feet per inch. In some instances which will be discussed more fully, photogrammetric contour maps would be obtained.

Following is a summary of our uses for the various sizes and scales of aerial photographs during the successive steps of location and design of a typical highway project:

1. For preliminary route selection we use the 1,000 feet per inch enlargements from the small scale photography. In addition to the study of land use the photographs are examined under a stereoscope to determine major topographic controls.



Patterns of land use are often an important factor in determining highway location. Aerial photographs like this one (Arroyo Grande) tell the highway planner clearly and quickly where a proposed route may or may not be feasible. Scale 1":400' on original photograph.

2. If control elevations are required they are obtained with an altimeter or by running a stadia profile using the 400 feet per inch enlargements as a base map.

3. For the study of access and the treatment of intersecting public and private roads the 400 feet per inch enlargements on which property lines have been plotted are used. On projects through highly developed areas these are supplemented by the 200 feet or 100 feet per inch enlargements for more detailed studies.

Map Scales

4. Having determined what we consider to be the best route, a map is necessary to accompany the various reports which must be made regarding the project. The most suitable scales range from 200 feet to 1,000 feet per inch depending on the type of project. Enlargements at the most appropriate scale are used for filling in topographic details on the planimetric maps.

5. If the project is an urban freeway a mosaic is prepared showing the proposed freeway lanes, ramps, connections and separation structure in colored ink. The mosaic is used in presenting the plan to our Headquarters Office, to the California

Highway Commission and to local planning authorities as well as for display at public meetings.

6. During various stages of planning and adoption of the route the project will have received considerable publicity. Either the large scale enlargements or the mosaic are the best method of explaining the proposed plan to property owners along the route who will call at our office for information.

7. If the project is on new alignment the chief of party making the location survey is supplied with 400 feet per inch enlargements from the small scale photography on which the proposed centerline has been sketched together with notes as to the various controls.

8. During the design stage following the final location survey, the drainage engineer will study the contact prints under the stereoscope and outline the drainage areas for calculation of culvert sizes.

9. The materials engineer will study the 1,000 feet per inch enlargements for the location of sources of granular materials for base and pavement construction.

10. The designer makes extensive use of the large scale enlargements. Without them his knowledge of the project would be confined to the narrow strip of topography covered by the location survey supplemented by one or two brief trips to the field. The photographs show adjacent improvements and their relation to the proposed highway and give him a general understanding of the entire project that would be impossible to obtain without their use.

11. Right of way agents make frequent use of the large scale enlargements both to determine the fair market value of property to be acquired and in negotiation for its purchase.

Developed by Trial and Error

Many of these various uses for aerial photographs have been developed during the past four years by trial and error and without any specialized training in photogrammetry. The field is by no means exhausted and we are constantly finding new uses or variations of the old ones. On most projects of the type discussed we would consider it poor economy not to obtain all of the various sizes and scales of photographs mentioned.

We have found that our most serious mistakes in the past have been in obtaining too few photographs rather than too many. A recent check of all projects on which we are now working in the Planning, Location and Design sections showed that we are using

This vertical aerial photograph, supplemented by a relatively small amount of ground surveying, produced the contour map on the opposite page. Scale 1":400' on original photograph.

aerial photography on 20 out of a total of 22 projects.

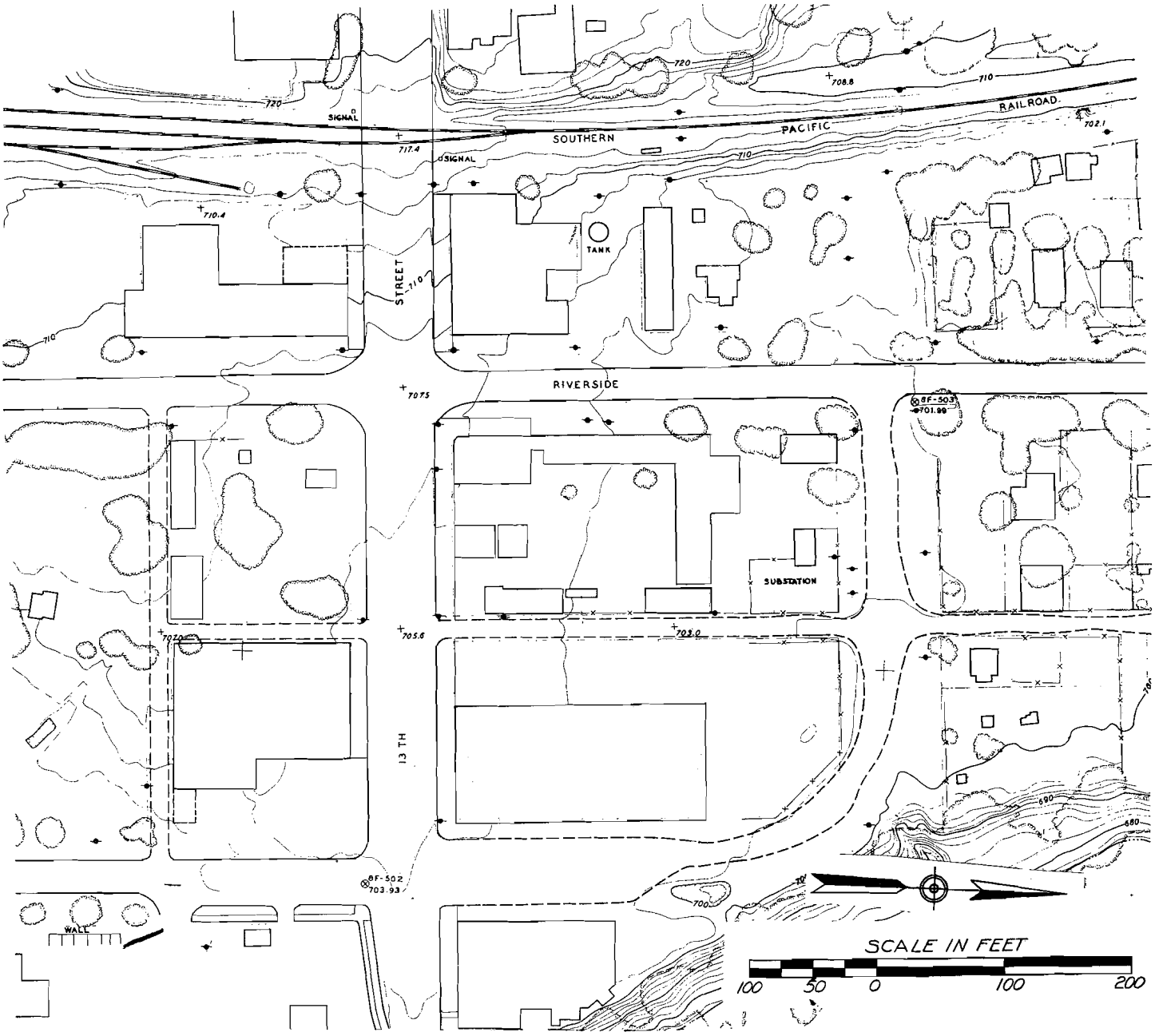
The maximum cost of aerial photography on any of our projects to date has been $175 per mile, including mosaics. The lowest cost on projects where large scale photography has been used was $60 per mile. We did not obtain mosaics on this section. It would be impossible to estimate the monetary saving that has been made. We know that the photographs have paid for themselves many times over and that we have accomplished more work and better work than would have been possible without them.

Contour Mapping

The superiority of aerial photographs over any available planimetric maps for most of the uses which have been discussed, as well as their relatively low cost, puts them in a class by themselves. In the field of photogrammetric contour mapping, however, the situation is different.

Here the photogrammetrist finds himself in direct competition with old, well established methods of making surveys for highway locations. The highway engineer will be more reluctant to experiment in this field where he must use quantitative measurements from maps whose origin is somewhat of a mystery to him. And yet there is unquestionably a large field for this type of mapping for highway location and design.

In District V we have used or have under contract photogrammetric contour maps at scales of 50 feet, 100 feet and 200 feet per inch with contour intervals of 2 feet and 5 feet. We would classify the 200-foot scale with 5-foot contour intervals as reconnaissance or preliminary survey stage maps, which would be valuable on location through steeply rolling or mountainous terrain where it was necessary to study a wide band of topography or where heavy undergrowth made it difficult to supplement the large scale photographs with ground reconnaissance. In such cases they would eliminate the need for a preliminary survey.



A portion of the area shown in the photograph on the opposite page has been reproduced in this photogrammetric contour map. Scale 1":50' on original map.

Aerial Maps Sufficient

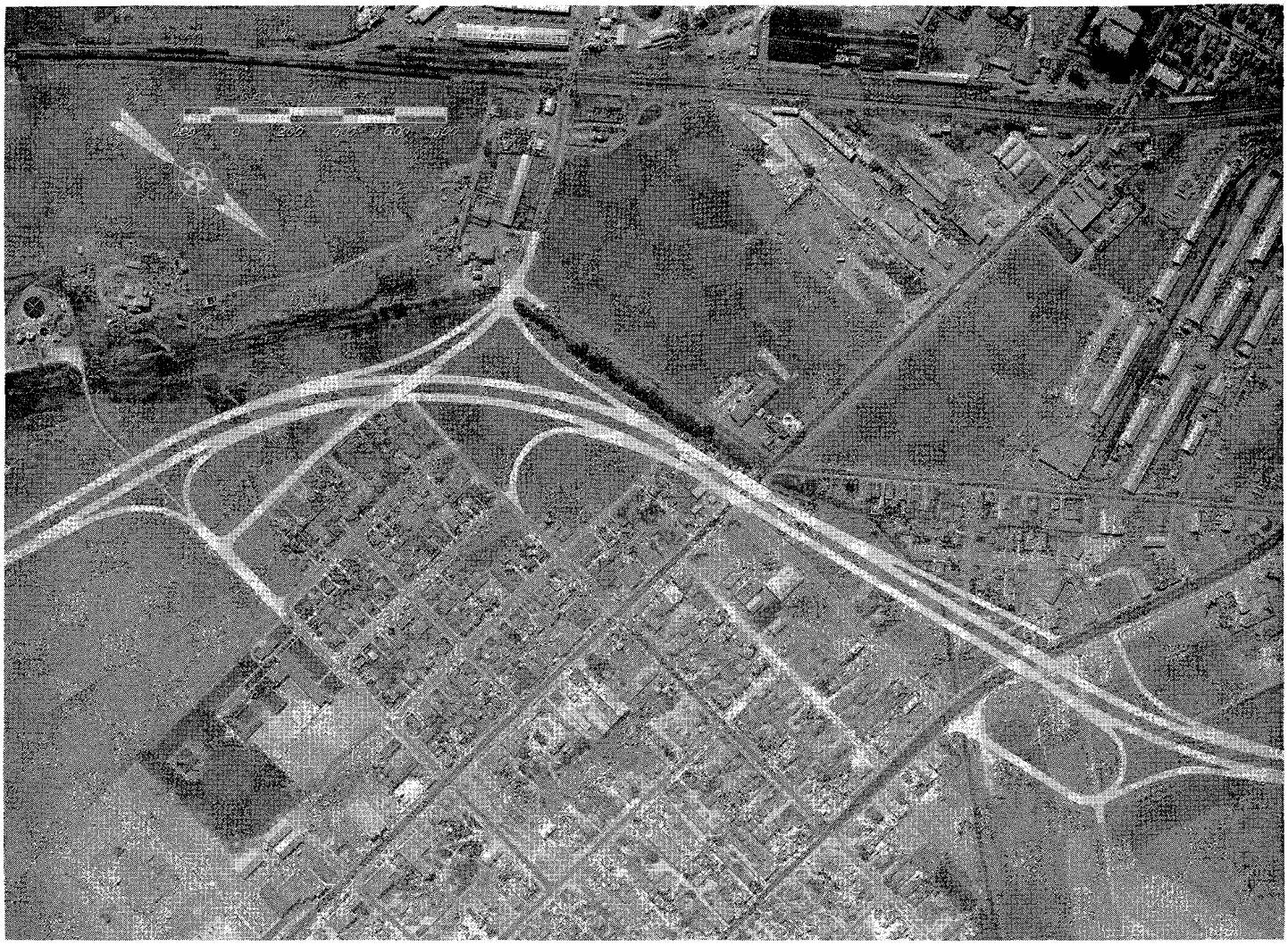
The 100 feet per inch maps with contour intervals of 5 feet or 2 feet go beyond the preliminary survey stage and greatly reduce the information required from the final location survey. Where the design is relatively simple and vegetation does not prevent accurate contouring it would be entirely feasible to develop complete construction plans and award construction contracts from the data on these maps.

Photogrammetric contour maps at 50 feet per inch with 2-foot or 1-foot contour intervals, when supplemented by a minor amount of ground surveying by our field parties, provide data for final design of the most complex highway projects. We believe that the greatest potential field for photogrammetry in highway location and design in California lies in this type of mapping. Its adaptability to one particular type of project is of special importance.

At the present time, California is embarked on a long range program of highway modernization which, on the basis of present revenue, will require many years to complete. This program will ultimately result in the development to expressway or freeway standards of practically all of our major arterial routes. It will mean relocation of many of these routes where they pass through cities, town or small suburban areas. Local communities along our principal highways are becoming increasingly aware of the probabilities of such relocations. It is only natural that they should want to know how they will be affected.

Future Planning

As an example, we were recently requested by the Board of Supervisors



A portion of the proposed Salinas Freeway is graphically shown in white ink on an aerial photographic mosaic. Scale 1":200' on original mosaic.

and local groups in Monterey County to make the necessary studies to determine the future location of U. S. 101 through all the various towns in the county. This request was made with full knowledge that construction through some of the communities was at least 5 to 10 years in the future.

There are both advantages and disadvantages to such a procedure. The obvious advantages are that it permits orderly and well integrated community planning and development and that it will result in material saving in future rights of way cost by forestalling expensive improvements which might be constructed within the next 5 to 10 years. In many cases the cost of such improvements might force us to a less desirable location in the future.

The principal disadvantage is to the individual property owner who may wish to sell or improve property which lies in the path of the future highway. By adoption of the route and the attendant publicity we have in effect put a blight on his property if he wishes to improve it or sell it. In some cases, of course, it may serve to increase its value.

Saving of Time

In all fairness to such an owner as well as to minimize future right of way costs we must be prepared to acquire such portions of the future right of way within a reasonable period of time. To do this it is necessary for us to prepare detailed plans showing all geometric features of the proposed highway including exact right of way lines. But such work requires the time of surveyors, draftsmen and designers whose services are urgently needed for projects where right of way acquisition and construction are scheduled for the next few fiscal years.

This, in our opinion, is the ideal project for the use of 50 feet per inch photogrammetric contour maps. By including key property corners in the photogrammetrist's ground control survey, we can obtain all information required for the development of plans to right of way acquisition stage with a minimum use of our own manpower. We not only save the time required for a ground survey but also most of the time required in the office to plot the survey data.

Recent Mapping Contract

This can be explained more clearly by describing our most recent photogrammetric mapping contract and the products we have obtained from it. In June of this year we contracted for maps of four highway projects totaling

16 miles in length. This included 9 miles of 100 feet per inch mapping with 5-foot contours at a cost of $940 per mile and 7 miles of 50 feet per inch mapping with 2-foot contours at an average cost of $1,670 per mile. The width of mapping ranged from 400 feet to 2,100 feet. The total contract price was $20,161.

The first maps covering 4 miles were delivered in August, an additional 8 miles in September and the last portions on October 10, four months after award of the contract. Location surveys by our usual methods for these projects would have taken one survey party over 15 months to complete and would have cost at least $45,000. Plotting the survey data would have cost another $5,000. To the $20,000 cost of the photogrammetric maps must be added approximately $3,000 for costs of checking the maps and another $2,000 for obtaining additional data not included on the maps.

Saving in Money

We have thus made a direct initial saving of approximately $25,000 and over a year in time. A portion of the initial saving will be ultimately lost as it will be necessary to run the center line prior to construction and, in order to comply with our methods of payment for excavation, it will be necessary to cross-section at least the portions of the project involving excavation quantities.

But most important is the fact that we have saved the expenditure of $45,000 worth of our own manpower at a time when the shortage of engineers is becoming increasingly critical.

The data which we will obtain from these photogrammetric contour maps is worthy of some discussion. First is the photogrammetrist's ground control survey. In conformity with recommendations of the American Congress of Surveying and Mapping, we specify modified second order accuracy for the control surveys. They are based on the State Grid Coordinate System and are adjusted to first or second order triangulation of the U. S. Coast and Geodetic Survey. These control surveys have a somewhat higher degree of accuracy than we would normally attain with our own survey parties.

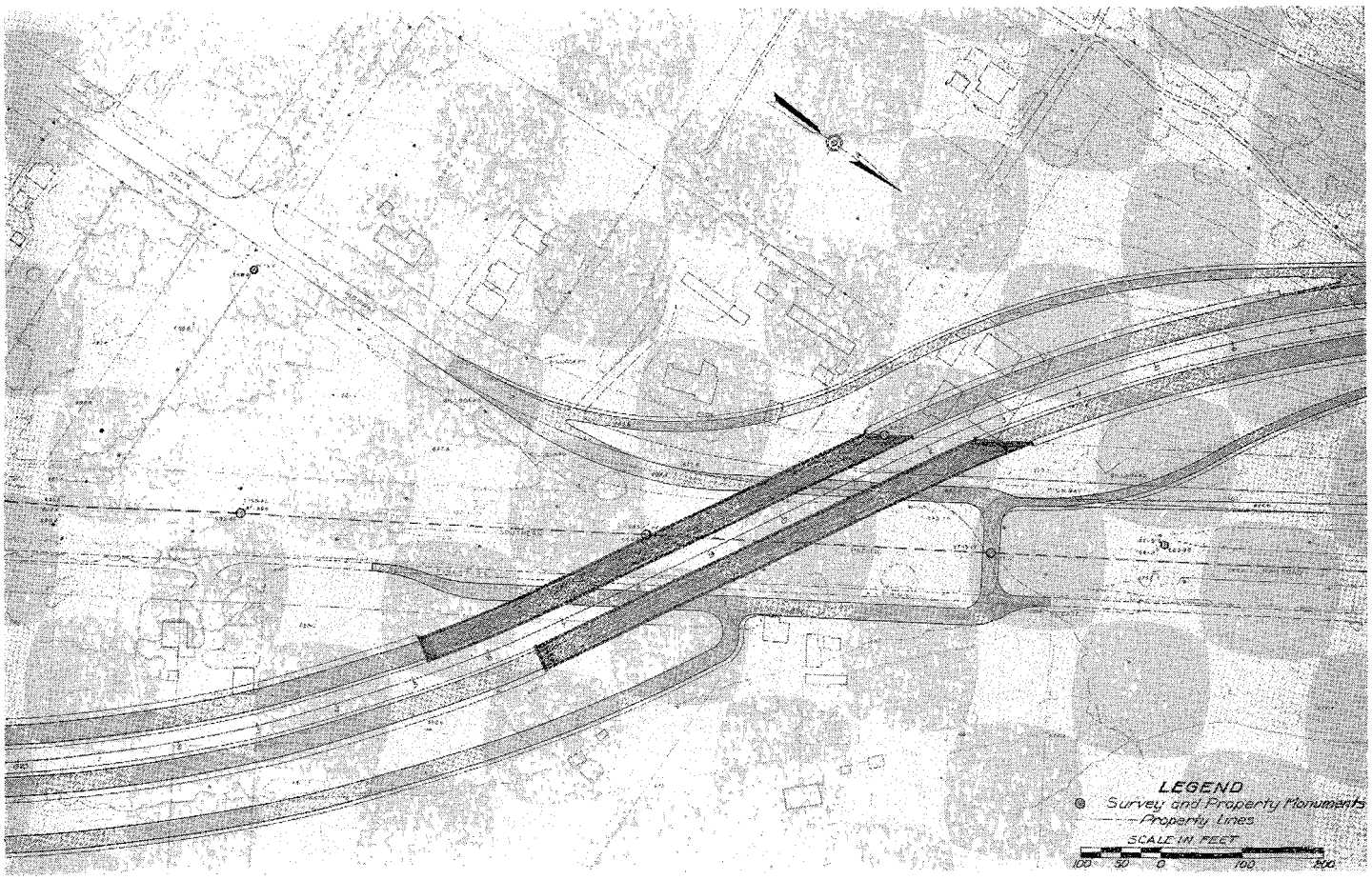
Accurate for Calculations

On the maps accompanying our specifications for the photogrammetric contract we indicate property corners, highway monuments and city street monuments which the photogrammetrist is required to locate in the course of his control surveys. As a result we are able to plot subdivisions and property lines on the maps and prepare deed descriptions with little if any additional survey work on our part.

Checks which we have made of the contouring indicate that it is suffi-

... Continued on page 35

For purposes of preliminary study, the design of a proposed traffic interchange has been developed in considerable detail on this photogrammetric contour map. Scale 1":50' on original map.



New Freeway

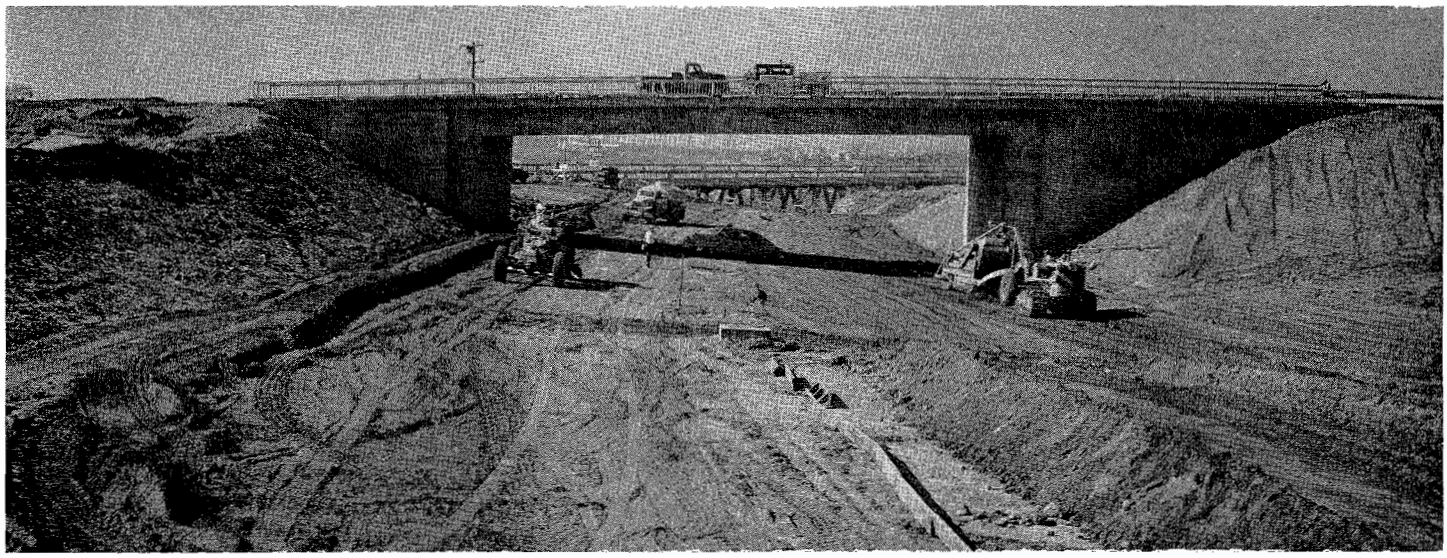
Four Units Under Way on Oceanside-Carlsbad Project

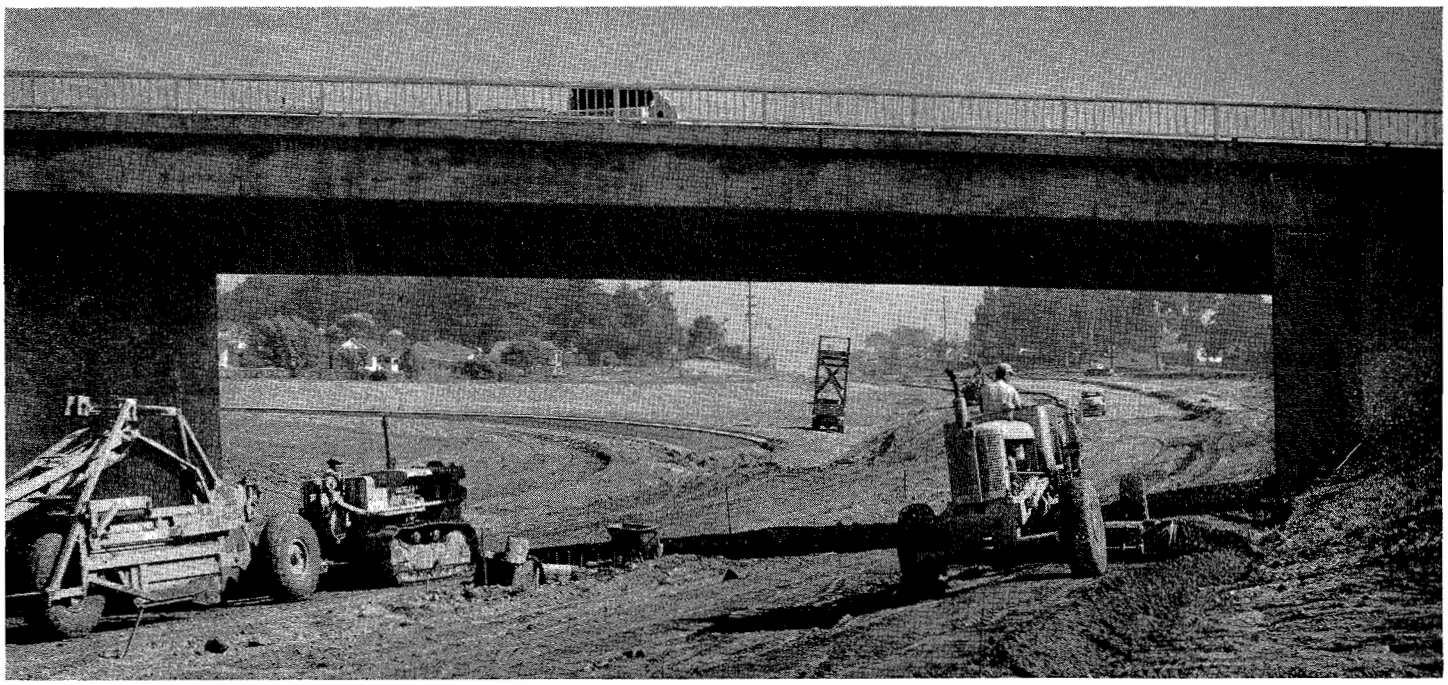
By RALPH A. LEJONHUD, Project Engineer

WORLD WAR II caused a tremendous increase in population in the San Diego area. Wartime activities of the many military centers in the county flooded the area with military personnel. In addition, there was a steady civilian influx attracted by the labor demands of rapidly expanding aircraft factories and other industries. Even with wartime restrictions, this unprecedented increase in population seriously overtaxed all highway facilities as well as other utilities in the area. Contrary to popular expectations, the cessation of hostilities did not cause an appreciable decrease in population and the relaxation of restrictions on travel placed an additional burden on the highways.

High Accident Rate

The Coast Highway, U. S. 101, is the principal connection between San Diego and Los Angeles. Between San

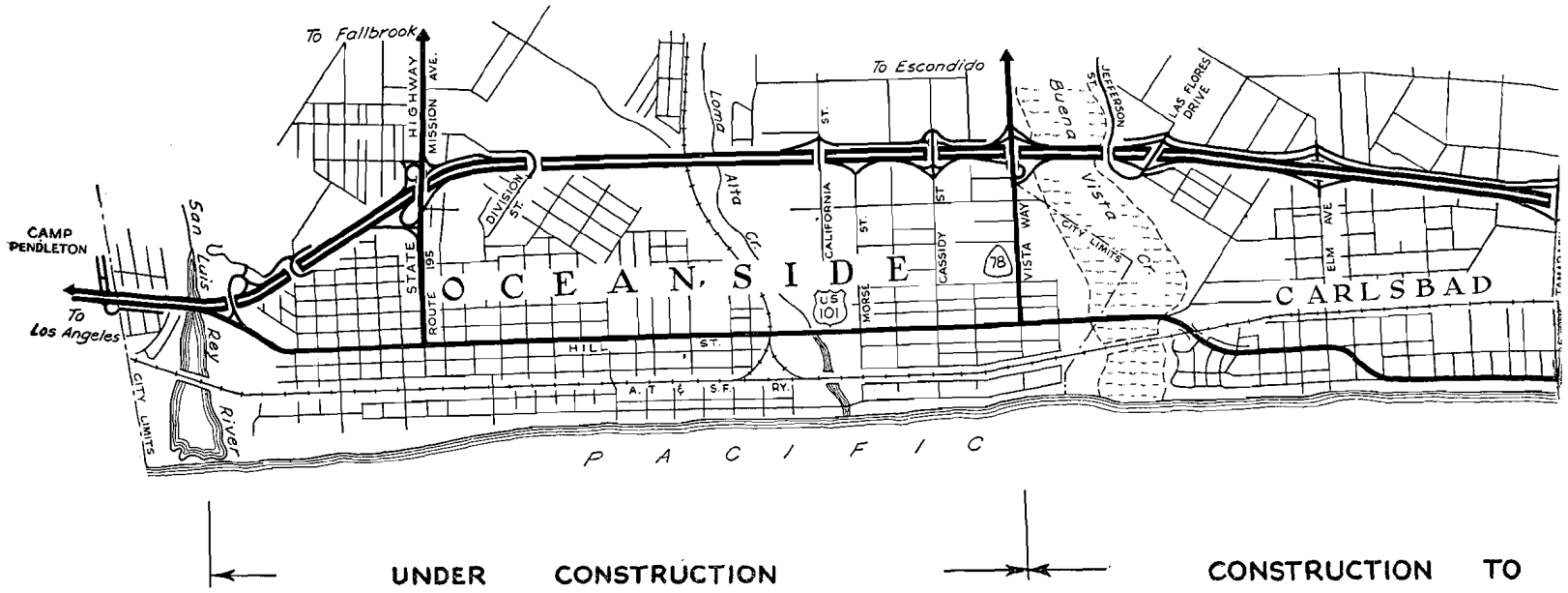




UPPER—Near the north end of the Oceanside-Carlsbad Freeway, looking under the Hill Street Overcrossing toward the southern (Oceanside) end of the existing bridge over the San Luis Rey River. LOWER—Looking south from the same bridge.

UPPER—Looking north across the San Luis Rey River toward Camp Pendleton from Oceanside, showing construction under way on widening of the existing bridge.

LOWER—Existing bridge over the San Luis Rey River will serve only southbound traffic when the structure is widened as a part of Oceanside-Carlsbad Freeway project.



Diego and Oceanside, the present road is predominantly 30-foot three-lane pavement with some four-lane and four-lane divided sections through the unincorporated areas of Del Mar, Encinitas and Leucadia. Within the City of Oceanside, highway traffic travels the principal business street of the city. Accident rates on this section are nearly three times the state average for similar sections.

It was obvious that a major improvement was essential. In February, 1947, preliminary surveys and plans were started on the three-lane portion between San Marcos Creek and Agua Hedionda Creek as the first unit in a proposed full freeway development of the entire coast highway from San Diego to north of Oceanside. In April of 1947, the work was expanded to include a proposed relocation on full freeway standards north from Agua Hedionda through Carlsbad and the City of Oceanside to the San Luis Rey River.

Proposed as Freeway

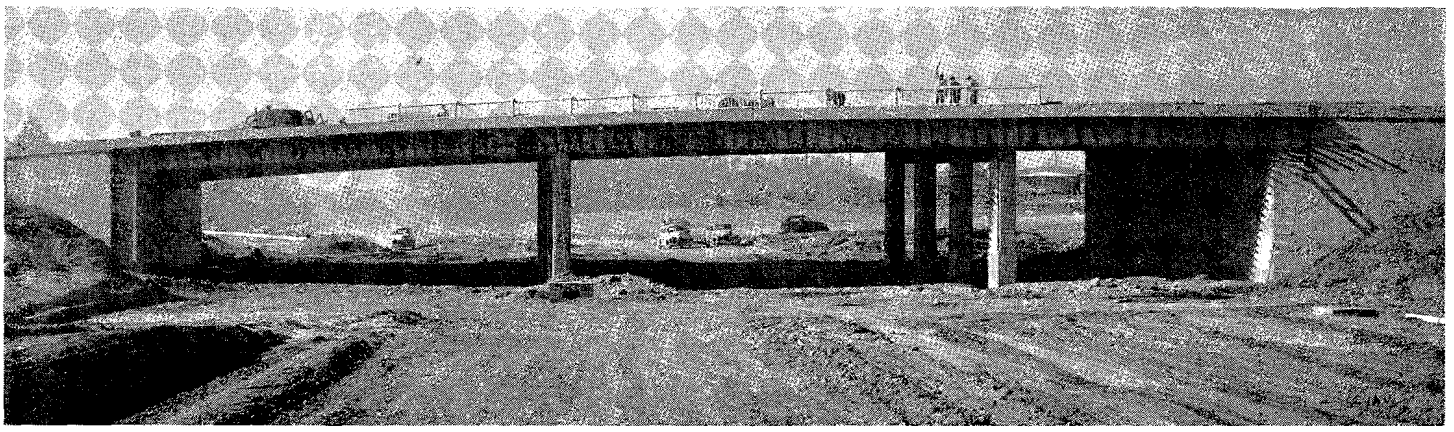
After careful consideration of all possible routes the California Highway Commission selected a route which by-passed the business districts and yet was close enough to provide adequate traffic service to the community centers.

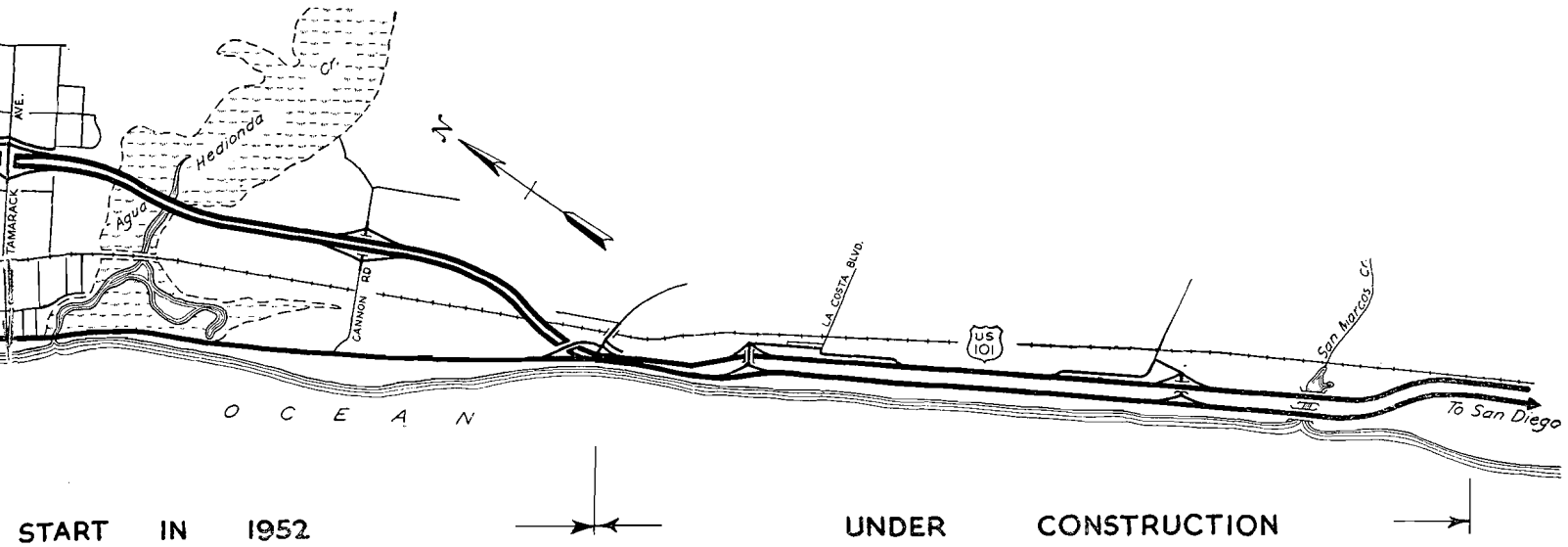
The proposed route through Oceanside and Carlsbad was adopted and a freeway resolution passed by the California Highway Commission in September, 1949. A freeway agreement was signed with San Diego County for the portion outside the Oceanside City Limits on August 1, 1950, followed by an agreement with the City of Oceanside on August 23, 1950. In March, 1951, another freeway agreement was signed with San Diego County covering that portion of the road between 0.5 mile south of San Marcos Creek and 2.2 miles south of Carlsbad. These actions set the stage for the State to proceed with the construction.

Five Construction Units

Following completion of the agreements, the California Highway Commission promptly arranged for start of construction by allocating funds as fast

BOTTOM—Looking north, with the Mission Avenue Separation in the foreground





as detail plans were completed. Due to lack of funds, it was not possible to place under contract in the current year the section from 2.2 miles south of Carlsbad to Buena Vista Lagoon. That unit has been included in the recently announced budget for the 1952-53 Fiscal Year.

The nature of this U. S. 101 relocation does not permit utilization of any major portion until the entire project is completed. A program of independent, concurrent contracts was adopted to insure completion of the whole project in the minimum possible time.

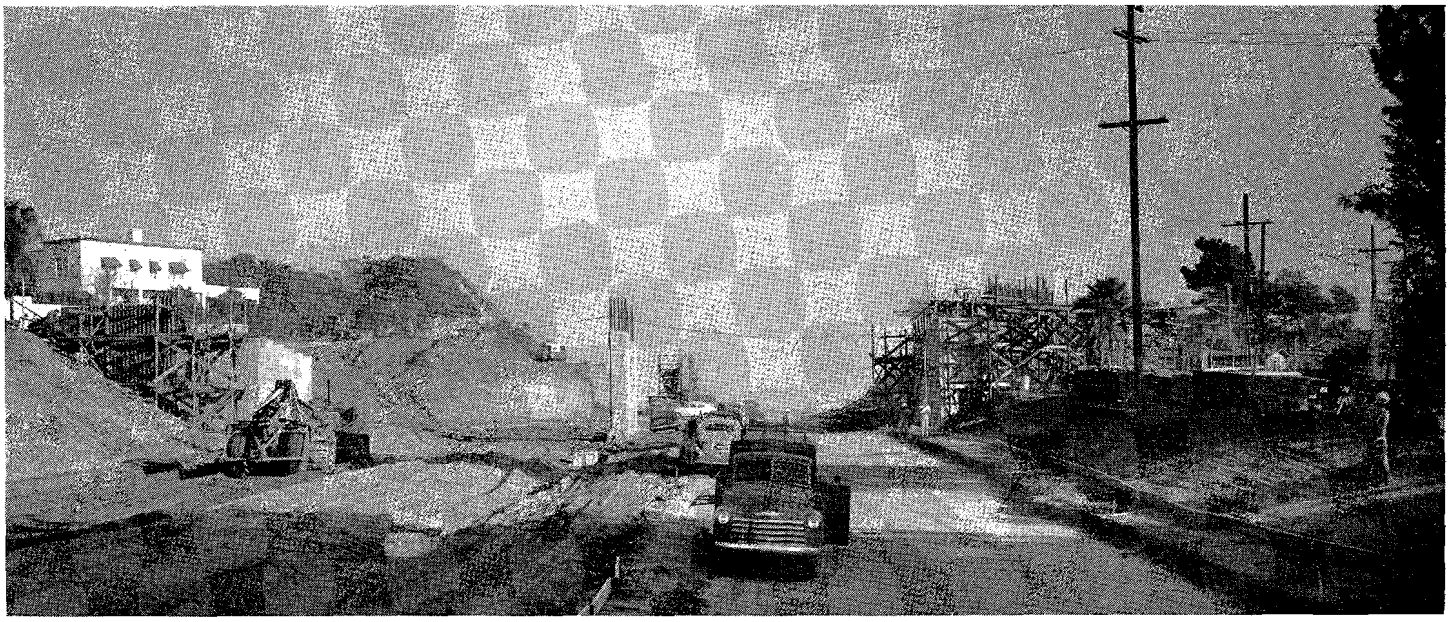
The total project between 0.7 mile south of San Marcos Creek and the main entrance to Camp Pendleton north of Oceanside has been divided into five construction units. Four of the units are now under contract:

Four Projects Under Way

On March 15, 1951, bids were opened for the first portion of the Oceanside Freeway. This 1.06 miles section between one-quarter mile south of Mission Avenue and the San Luis Rey River was awarded to Cox Brothers. The project is under the supervision of Glenwood L. Richardson as resident engineer, with a total estimated construction cost of $1,030,000. Mr. Richardson also has general supervision of the other construction units, except for the San Luis Rey River bridge and approaches contract.

From 0.7 mile south of San Marcos Creek to 2.2 miles south of Carlsbad is also under construction by Cox Brothers, with Clarence E. Walcott as resident engineer, for a total estimated construction cost of $710,000; and

Looking south on the Oceanside-Carlsbad Freeway, showing pier construction for the Eighth Street Overcrossing in Oceanside



The San Luis Rey River Bridge and approaches are being constructed by Charles McClosky, for $1,050,000, with A. K. Gilbert of the Bridge Department as resident engineer.

The most recently awarded contract on this project covers the section from Buena Vista Lagoon to one-quarter mile south of Mission Avenue in Oceanside. The contract is held by J. A. Payton and Bent Construction Company. Alvord C. Estep is the resident engineer. The estimated cost is about $1,734,000.

Plans are complete for the remaining unit between 2.2 miles south of Carlsbad and Buena Vista Lagoon. Bids for that work will be requested early in 1952.

Full Freeway Standards

The project is being developed on full freeway standards and incorporates the latest highway design features. The relocation through Carlsbad and Oceanside will provide two 12-foot lanes of portland cement concrete pavement on either side of a 40-foot median. Thus as traffic increases in the future, the four-lane section can be expanded with minimum expense to provide a six-lane facility with a 16-foot separation between northbound and southbound lanes.

The highway section has been adequately designed structurally to safely carry the maximum truck loads frequently encountered on this main artery. The eight-inch thickness of Portland cement concrete pavement is supported by four inches of cement treated subgrade which in turn is supported by a maximum of 16 inches of selected material. Thus the native material is covered by a structural roadbed section of two feet and four inches maximum thickness.

Mud Removal

In the various sloughs crossed by the route, the existing mud and muck would not adequately support the necessary highway fills. Therefore, to prevent future settlement of the fills with resultant displacement and distortion of the highway surface, a maximum of seven feet of the existing mud and muck is being removed and replaced with suitable material.

Adequate storm drain systems are being completed as a part of the freeway construction to assure the rapid removal of all storm waters for the protection of the traveling public. Nearly eight miles of various size pipes are being installed for culverts and storm drains in addition to the more than four miles of piping required for sewer and water supply relocations and sprinkler systems. Portland cement concrete gutters are being constructed adjacent to the main traffic lanes in urban areas to remove surface water. The gutter sections will also serve to confine traffic to the main lanes, thus reserving shoulder areas for emergency use.

Erosion Control

All excavation and fill areas are being covered with top soil as a part of the current work. Following the present construction operations, ornamental plantings and ground cover will be started for erosion control and landscaping.

From 0.7 mile south of San Marcos Creek to 2.2 miles south of Carlsbad, the existing road will be used to serve southbound traffic and two new lanes are being constructed to serve northbound traffic. Separation of the traffic lanes in this area will vary from a minimum of 48 feet to approximately 240 feet, due to slight differences in alignment between the existing road and the new construction.

To provide access control, all of the property west of the highway between the approximate limits of San Marcos Creek and 2.2 miles south of Carlsbad is being acquired in connection with the current project. In the disposal of any of this ocean front property found to be in excess of actual highway needs, first consideration will be given its development for recreational purposes by appropriate public agency.

The complete project represents a length of 11.3 miles with a total cost of construction plus rights of way of approximately $8,800,000.

GOOD WALKING HABITS

Don't be a jaywalker. Cross streets at the crosswalk, not in the middle of the block. And watch the traffic lights. Walking's good for you, but watch *where* you're walking.

In Memoriam

FRED W. HASELWOOD

Friends of Fred W. Haselwood were shocked and saddened to learn of his death at Redding on November 20 ,1951. It was only a year and a half ago in May that he left state service with the best wishes of his friends and coworkers, that he might have many years of enjoyable retirement.

Fred Haselwood would be ranked among the leaders of the small group of engineers who, in 1912, laid the foundation of the highway network and engineering organization of California, that has to this day been rated with the highest in the Nation. It was their unquestioned engineering ability, absolute honesty, and unrelenting resistance to any damaging influence, that carried the organization through the years with the highest respect of all, and without one single charge of corruption.

It was Fred's inherent ability to foresee the needs of the future that made his work outstanding, and he gave without personal thought of his time and effort to obtain perfection in his chosen field. Of him it can truthfully be said that "He served the people well."

Fred is survived by his devoted widow, Maude Zimmerman Haselwood, his son Robert, and three grandsons, Richard, Robert, and Douglas.

Sincerest sympathy of all is extended to the family.

NEW MEXICAN HIGHWAY TO OPEN NEXT YEAR

Mexico's new Pacific Highway, designed to link Nogales, Arizona, with Mexico City, is well under way and is expected to be completed in mid-1952, according to announcement made by the Automobile Club of Southern California.

About 1,200 miles of highway are now completed, the principal points along the way being Cuidad Obregon, Mazatlan and Culiacan. In four years of construction, 96 bridges, totaling 25 miles, have been erected. It is expected that this new highway, when completed, will take some 450,000 American visitors annually to Mexico City.

Photogrammetry

Continued from page 29 . . .

ciently accurate for calculation of excavation and embankment quantities and for establishment of slope lines and subsequent calculation of right of way lines. On the 9 miles of 100 feet per inch mapping we have run check profiles which cross 455 of the 5-foot contours. Slightly over 90 percent were in error by less than 2.5 feet and 52.5 percent were in error by less than 1.0 foot.

A tabulation of errors in half-foot groups shows close conformity to the theoretical error curve with the number of plus and minus errors being approximately the same in each group. Checks made to date on a portion of the 50 feet per inch mapping with 2-foot contour intervals indicate that over 60 percent of the contours are in error by less than 0.5 foot with plus and minus errors again being approximately equal.

Checking Worth While

This may seem to be an excessive amount of checking but we believe it to be well worth while. It has satisfied us that systematic errors have been eliminated in the various photogrammetric processes and gives us a feeling of confidence in the maps.

Cultural detail is not quite as complete on these maps as we would obtain from our own surveys, but is sufficient for right of way appraisal and acquisition. We would not plan to cut 10 feet off the front of a building or place the right of way line within a few feet of a well or other valuable improvement by scaling from the maps without a field check. However, we would, in similar cases, make an additional check of our own ground survey measurements.

Where connections are to be provided to existing streets or roads or where separation structures are provided at such locations it will be necessary for us to determine more accurate elevations in the field. We will have to locate culverts, septic tanks, and various underground utilities in the field. At locations where second story or pavement blankets over the existing highway are planned it will be necessary to take accurate cross-sections. However, few if any of these details are necessary for establishment of right of way lines and most of them can be postponed until a short time prior to construction.

To summarize, we have found in District V that we can make advantageous use of both large and small scale aerial photographs on nearly all of our projects. Photogrammetric contour mapping at scales ranging from 50 to 200 feet per inch possesses very decided advantages on certain specific types of highway projects. The greatest potential field in California is for highly accurate 50 feet per inch mapping with 2-foot contour interval.

Civil Defense

Continued from page 1 . . .

The field forces of the Department of Public Works will be further augmented by men and equipment from local contractors, working under the direction and supervision of our engineers through the execution of a service agreement. In case still more assistance is needed, the regional coordinator will request additional aid from adjacent areas not having suffered enemy attack.

Generally, the responsibilities that will be assigned to our department forces will be in conformity with our normal duties. For example, the first responsibility of Division of Highways employees will be to head up certain "debris clearance" teams to clear lines of communication (highways, roads and streets) of obstructions. The Division of Architecture will likely furnish "damage survey" teams to a stricken area, to determine those buildings and other structures that can still be used or that must be demolished because they are unsafe. The Division of Water Resources will be actively concerned with weakened dams within the area affected, and with the adequacy of the water supply. All of these duties have been set out and studied in the individual plans of the operating divisions, so that they are foreseen and expected to a degree that little or no realignment of our forces has been necessary to establish full conformity with the State Civil Defense Plan.

We are constantly experiencing situations that test the efficiency of the

. . . *Continued on page 63*

John K. Hislop Gets New Post

Appointment of John K. Hislop of Los Angeles as manager of the San Joaquin Valley Council of the California State Chamber of Commerce has been announced by James Mussatti, general manager.

Hislop, formerly assistant manager of the State Chamber's Southern California District Council, succeeds Paul Fairchild. He took over his new duties November 15. The San Joaquin Valley Council offices are located in the Fresno Hotel, Fresno.

A native of Los Angeles, Hislop attended the University of California at Los Angeles. Following service with the Navy during World War II, Hislop joined the State Chamber staff as director of public relations for the Southern California district. He later became assistant manager of the Southern California office.

Counties Share In Forest Funds

More than $2,250,000 will be distributed among counties of California containing national forest land as their share in national forest receipts for the last fiscal year which ended June 30th. These estimates of amounts to be distributed have just been released by Regional Forester Clare Hendee of the Forest Service with headquarters in San Francisco.

This amount, $2,340,742, represents an increase of about 138 percent over the last fiscal year's returns to the counties. This increase is the result of higher prices for some national forest products and the opening up of new areas for fuller utilization of previously undeveloped areas. Current receipts indicate that next year's returns will go even higher. New record highs will probably be established in most of the counties concerned.

Every year, 25 percent of each national forest's total earnings is divided among the counties in which a national forest is located. The division is made in proportion to the percentage of national forest land within each county. All moneys received by the various counties is used for roads and schools.

Gaviota Pass

Tunnel Work to Provide 4-Lane Highway Under Way

J. E. ECKHARDT, Design Engineer, District V

In Gaviota Gorge, 32 miles northerly from the City of Santa Barbara on U. S. 101, there is an historical monument to an event that didn't happen. Inscribed on this monument is the following: "*Here on Christmas Day in 1846 natives and soldiers from the Presidio of Santa Barbara lay in ambush for Lt. Col. John C. Fremont, U. S. A., and his battalion. Advised of the plot, Fremont was guided over the San Marcos Pass by Benjamin Foxen and his son, William, and captured Santa Barbara without bloodshed.*"

Gaviota Canyon traverses the Santa Ynez Range from north to south across the structural trend of the range. During the process of downcutting, Gaviota Creek and its tributaries aided by differential erosion on steep-dipping strata has dissected the canyon into a rugged terrain of V-shaped canyons trending east-west with sharp divides over 600 feet high.

Geological Formation

Rainfall averages about 20 inches and the erosional effects from runoff are very slight on the hard resistant sandstones but in the areas underlain by shale and siltstone, canyons have developed.

The Santa Ynez Mountains comprise a portion of an east-west range which in this area were formed by a raising of the earth's crust with the various layers dipping to the south.

Within the limits of the tunnel the formation is Gaviota sandstone in massive formations.

Geologically speaking, the formation of this area is very young, being formed only about 40,000,000 years ago.

Because of the historical importance and natural rugged beauty of this gorge every effort is being made in connection with the development of a four-lane expressway of U. S. 101 through this area to hold to a minimum the scar that man and his machinery will make. Further efforts in the form of landscaping will be made to obscure the workings and repair the damages of the highway contractors and the highway engineers.

As part of this plan a 420-foot tunnel is being constructed in lieu of an open cut at the narrowest point in the gorge. The tunnel will be on a 1,200-foot radius curve, on a +4.47 percent grade, and will provide for two lanes of travel for northbound traffic with the existing two-lane highway being used for southbound traffic.

Tunnel Construction

The tunnel is to be lined with 1 foot 6 inches of Portland cement concrete and will be horseshoe in shape, approximately 35 feet wide and 22 feet high. To handle possible subsurface flows, arch weepers constructed of 3-inch steel tubing are to be placed about every 30 feet along each side of the tunnel, 6-inch perforated metal pipes are to be placed near the base of the tunnel on each side at 15-foot centers, and a 6-inch pervious material blanket is to be placed under the cement concrete pavement. These will all drain into longitudinal openings to be constructed along each side of the tunnel in back of the curbs.

Provision is to be made for future lighting of the tunnel in the event it is found necessary at a later date. This will consist of the conduit, transformer boxes and other parts to be embedded in the concrete lining.

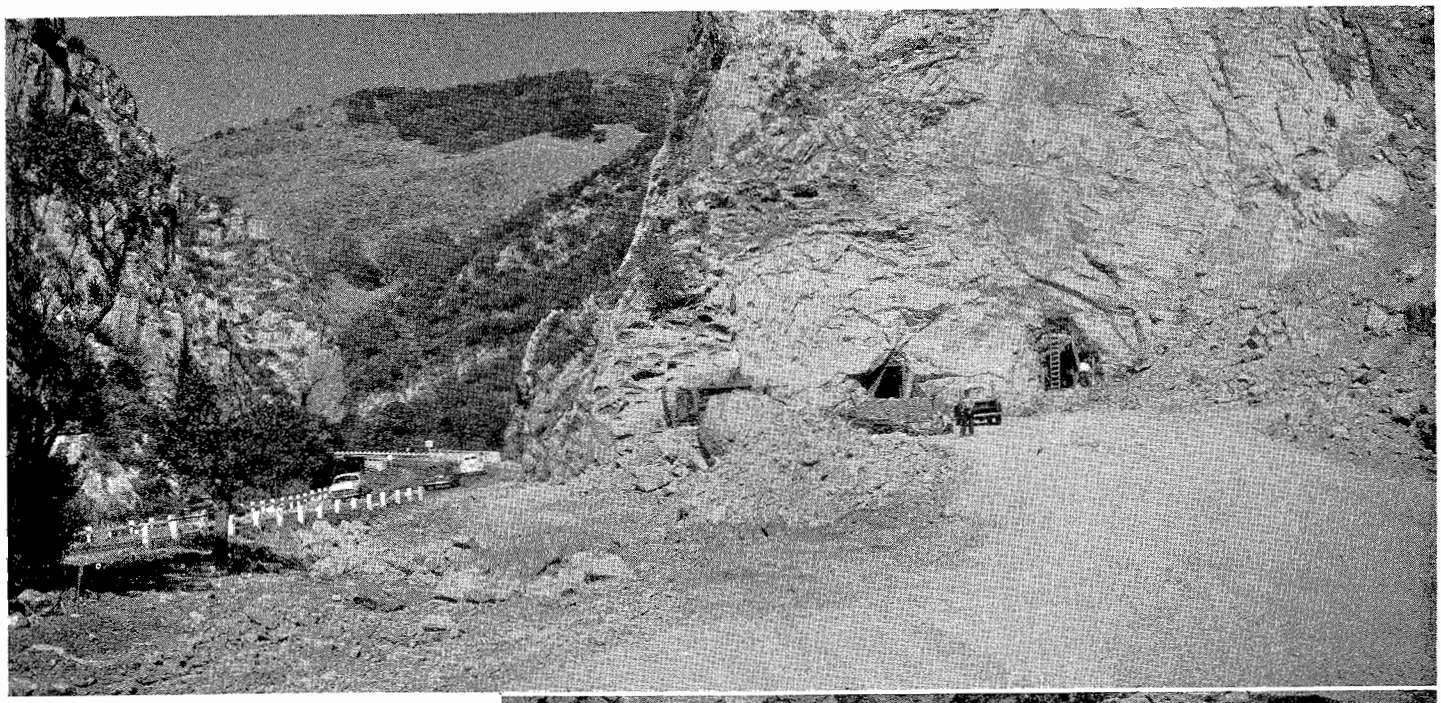
To further preserve the natural beauty of the Gorge every effort is to be made to blend the exposed portions of the tunnel with the surrounding landscape. The exposed surfaces of the tunnel portals are to be finished to simulate the native sandstone of the Gorge. Rough form lumber with the unfinished surface in contact with the concrete, with recesses formed in the concrete and an application of a sandstone colored stain will produce a concrete surface with the appearance of large blocks of sandstone. The stain will be darker in the lower portions of the portals and around the edge of the tunnel opening. A portion of the tunnel barrel near the north portal will be exposed due to the nearly vertical slope of the ridge and a 20-foot overhang. This surface will be finished in the same manner as the tunnel portals with an area on top to be backfilled with topsoil. This area and a small daylighted area just north and to the left of the north portal are to be planted with native shrubs and trees to further restore the natural appearance of the Gorge.

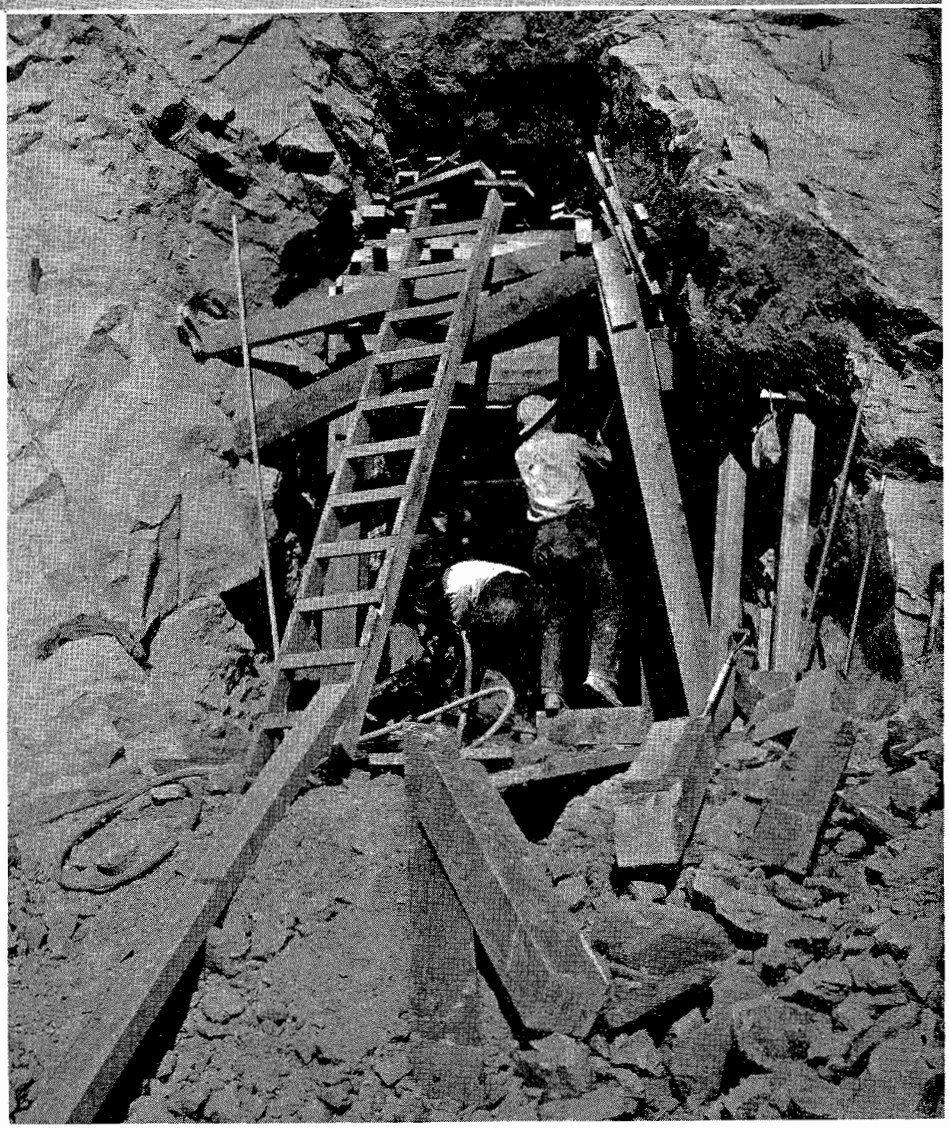
Landscaping

Several hundred feet south of the tunnel a parking area is to be provided in the median which is approximately 85 feet wide. Several existing trees, including a 48-inch bay tree, are to be saved and made a part of this parking area. Additional trees and shrubs are to be provided along with other landscaping in this area as part of a separate landscaping contract. The existing bronze plaque will be moved to a sandstone pedestal to be constructed in the parking area, along with sandstone curbs to provide protection for planting and walkway areas. To further retain the natural appearance the driveway areas will not be surfaced but will have a six-inch layer of native material as a surfacing. If a steady source of water is encountered within the tunnel it will be piped to the parking area for a drinking fountain.

Bids for the tunnel contract were opened June 6, 1951, and the contract for $460,000 awarded June 18, 1951, to Rhoades-Shofner Construction Company, Inc., of Los Angeles. The contractor's superintendent on the job is Mr. Paul Lemaster and the resident engineer for the State is Mr. John E. Witte.

A time limit of 250 working days is provided with completion scheduled for July 3, 1952.





UPPER—Gaviota Pass on left. View is looking north. Tunnel borings on left. LOWER—Construction at mouth of tunnel which will provide two lanes for northbound traffic.

Boring Under Way

The contractor is required to work from the south portal only, as any hauling of material from the north portal would be across Gaviota Creek and onto the existing hgihway at a point that would be very dangerous to traffic due to the restricted sight distance on the existing lanes. Construction operations have opened up the southerly cut to the south tunnel portal and the actual boring of the tunnel proper begun. Construction is estimated at about 10 percent complete.

There is included in the engineer's estimate 12,500 cubic yards of tunnel excavation with 20,000 cubic yards of roadway excavation provided for the cuts at the portals; 1,636 cubic yards of concrete tunnel lining and 170,000 pounds of bar reinforcing steel required.

When the tunnel contract is completed and a 3.2-mile roadway contract from near Gaviota Store to Gaviota Gorge, which is budgeted for the 1952-53 Fiscal Year, is completed, a four-lane expressway, 7.5 miles in length, will replace one of the most tortuous stretches of U. S. Highway 101 between Los Angeles and San Francisco.

Shell Beach Study

Expressway Spurs Subdivision Growth

By THEODORE A. REINHARDT, Right of Way Agent, District V

ALTHOUGH land developers have long recognized that good highway facilities are essential to successful subdivision ventures, usually this recognition has been based on observations of general trends rather than statistics. This has been because the proper evaluation of the other factors affecting subdivision marketability is generally impossible.

A singular opportunity to measure highway benefits to a residential community depending upon a larger population center for economic support stemmed from the State's conversion of 11 miles of a crooked, steep-graded section of U. S. Highway 101 south of San Luis Obispo to a modern four-lane expressway, in connection with which about 8,000 feet of the old highway was left to serve a beachside community as a frontage road.

Maximum Effects Expected

The effects this highway improvement had on businesses along the frontage road are also noteworthy because the rough terrain dictated an extremely severe construction treatment which probably resulted in the maximum effects on commercial property to be expected in an expressway-frontage road development. The new expressway was built from 10 to 20 feet above the grade of the old highway and provides only three connections to it in approximately 8,000 feet. Furthermore, the northbound lanes are separated at intervals from the southbound by intervening land which partially obscures the highway businesses from view.

Shell Beach, 10 miles south of San Luis Obispo and near the southerly end of the expressway, is a typical rural subdivision where there is a lack of adjacent industrial development providing close-by employment. Accordingly, the unprecedented residential growth and land value increases following the highway construction are probably indicative of the importance of controlled access roads to competitive suburban and rural subdivisions throughout the State where the distance from home to office is a secondary consideration to the time and degree of safety involved in making the usual one or more round trips daily.

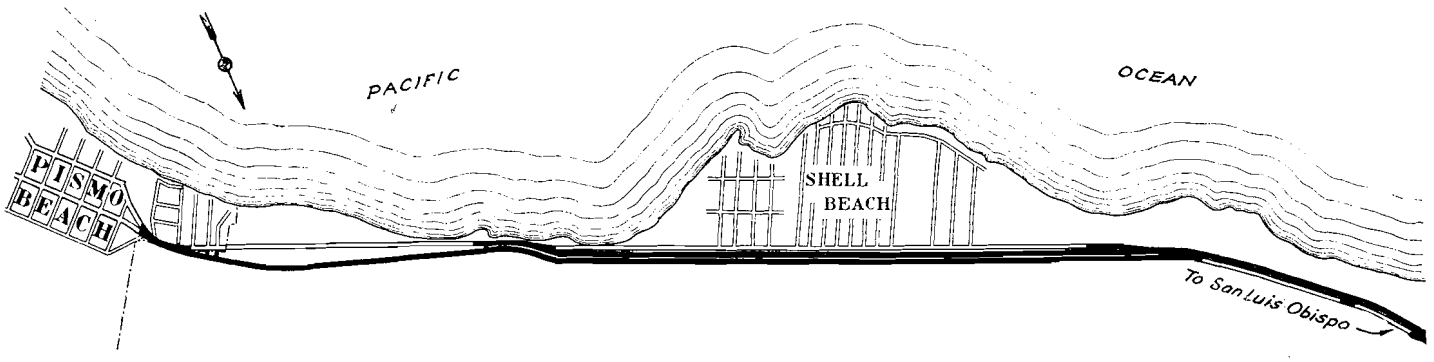
Shell Beach became a residential subdivision in 1924. Twenty-three years later, in 1947, when construction of the 11 miles of expressway south of San Luis Obispo became imminent, it was a community of less than 200 buildings and fewer than 600 people. This was despite the fact that, being located just 10 miles south of San Luis Obispo along the nearest beach to the city, the Shell Beach subdivision was ideally located for commuters who enjoy seaside living.

Growth Doubled

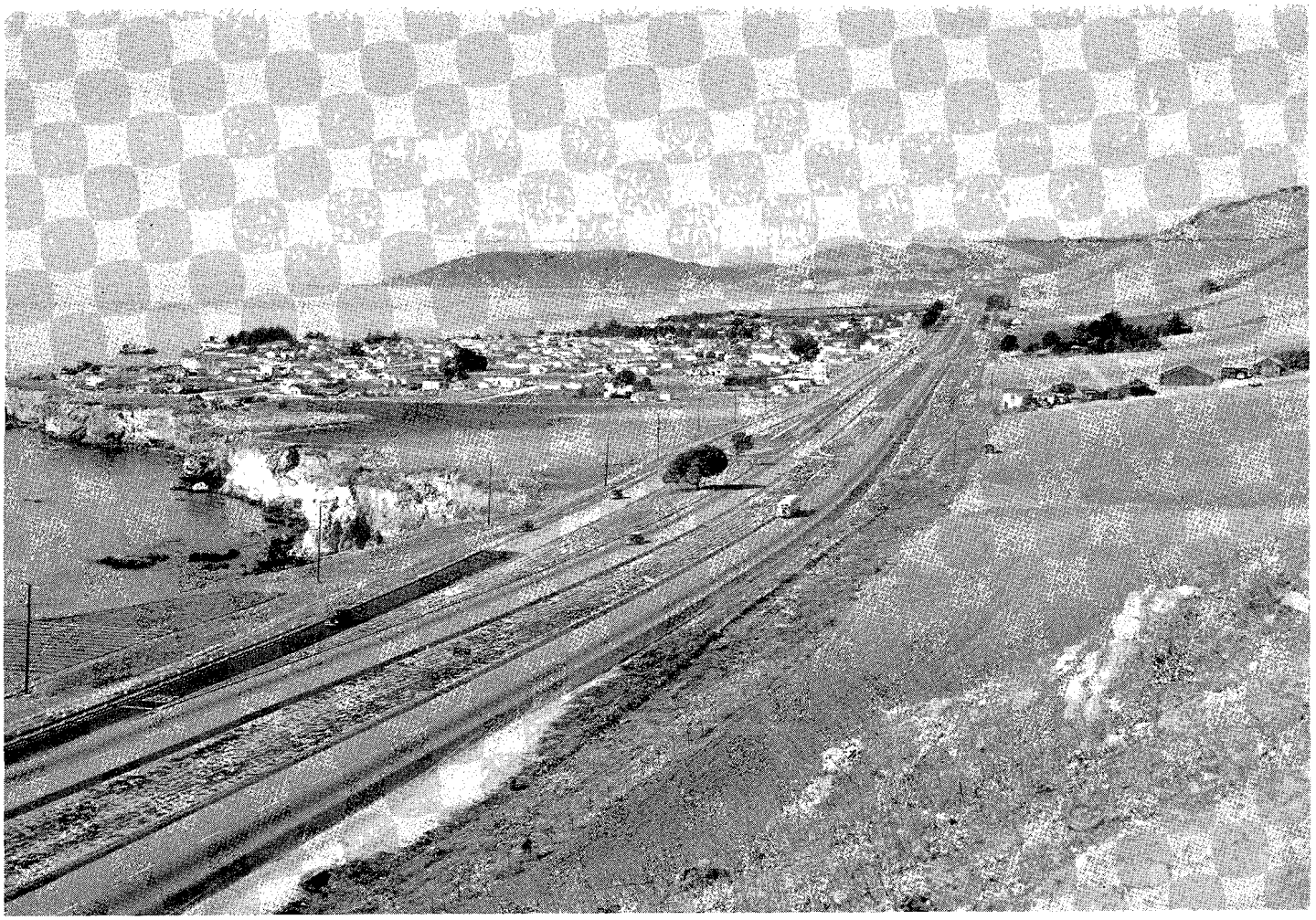
In these last five years Shell Beach has grown 125 percent—considerably more than double its 1947 size. During the full 10-year period from 1940 to 1950 no other community in San Luis Obispo County, including the county seat, expanded more than 60 percent, according to the latest census.

This comparison of Shell Beach growth figures with other communities in the county during the approximately five years since the expressway construction was begun points out that the Shell Beach development problem was just the question of getting the amenities of beachside living to market.

Residential property values in Shell Beach quickly reflected the increased



This map shows the communities of Shell Beach and Pismo Beach and the Southerly end of the 11-mile expressway between Pismo Beach and San Luis Obispo. Note the infrequent connections to the old road from the new divided highway.



Picture of the residential community of Shell Beach taken near the Pismo Beach city limits. The lack of a wide sandy beach explains why Shell Beach is primarily residential while Pismo Beach, with its nationally known miles of smooth, sandy beach, is almost completely tourist supported.

demand by San Luis Obispo employed families desiring seaside atmosphere following the highway improvement. These residential lot values rose from an average of approximately $400 in 1947 to an $800 average in 1950 and 1951. During this period no other existing subdivision in the area approaches this increase, percentage-wise.

Retail Business

The over-all effects of the highway improvement on Shell Beach commercial properties were slight. This conclusion was developed from a comparison of the nine previously existing Shell Beach retail businesses to the 22 establishments located along the portion of U. S. Highway 101 in Pismo Beach, one mile southerly. The Pismo Beach businesses were used for comparison because they provided the most accurate yardstick available, inasmuch as they are situated along an unchanged portion of the same highway within a mile of Shell Beach and consist of predominately the same business types—namely, cafes, bars and service stations.

Shell Beach businesses disclosed a gross volume drop of 1.91 percent during the first year after the expressway opened in the summer of 1949. Meanwhile Pismo Beach businesses along the same side of the highway dropped 5.28 percent in gross volume. Businesses on the opposite side of the highway in Pismo Beach gained 1.58 percent.

While these comparisons indicated there was very little change in the total business volume transacted by all the establishments studied, a study of the individual businesses in both Shell Beach and Pismo Beach indicated a normal amount of shifting of patronage from one establishment to another within the area.

This customary changing of patronage within the same vicinity probably accounts for the diverse opinions expressed by the business people concerning the effects of the highway improvement. The individual merchants varied in their offhand estimates from substantial benefits to severe losses.

Gains and Losses Shown

The number of gains and losses registered along the entire section, including Pismo Beach, actually were about evenly divided and did not indicate any special advantage of the Pismo Beach location over Shell Beach due to the highway construction. Five of the nine Shell Beach businesses in operation throughout the period of the study suffered varying amounts of

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Under a Highway

Motorists Travel Over Miles Of Pipe Lines and Conduits

By CASS M. ROSE, Senior Highway Engineer

You are driving along Lakewood Boulevard in the southeast part of Los Angeles County, and the traffic light turns red at Carson Street. As you make a 20-second pause, did you ever wonder what is under your car besides a good, dependable pavement?

Come into the District VII Substructure Section and ask the file girl that question. She will pull out a card labeled: "VII-LA-168-A" and tell you that under that particular highway intersection, crossing in several directions, and located at various depths are:

- 3 Gas lines, 8", 3", 2"
- 1 Oil line, 8"
- 1 Gasoline line, 4"
- 4 Water lines, 20", 12", 8", 6"
- 5 Telephone multiple duct lines, 2 to 6 line capacity
- 1 Power line in 2½" duct
- 1 Sanitary sewer, 8"
- 3 Traffic signal conduits
- 2 Street lighting conduits

A total of 15 pipe lines and six multiple duct lines owned by nine different companies or agencies, and this is in a rural area. Also, filed where they can be readily found, are the utility companies' maps of each of these lines.

Relocation of Utilities

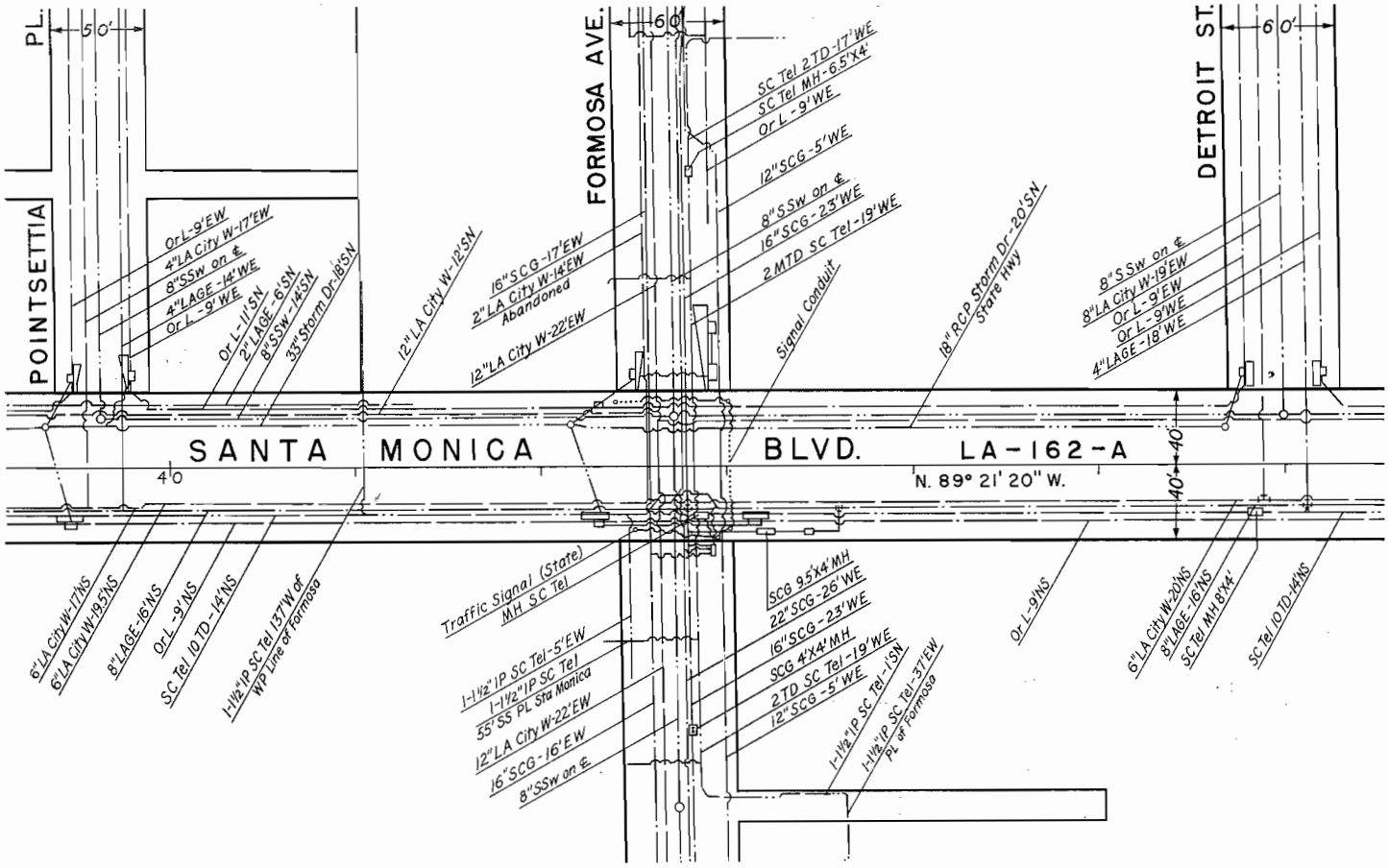
In a metropolitan area, any highway in excavation presents a major problem as to the relocation of utilities. Service cannot be interrupted; new lines must be constructed and cut in before the old lines can be abandoned.

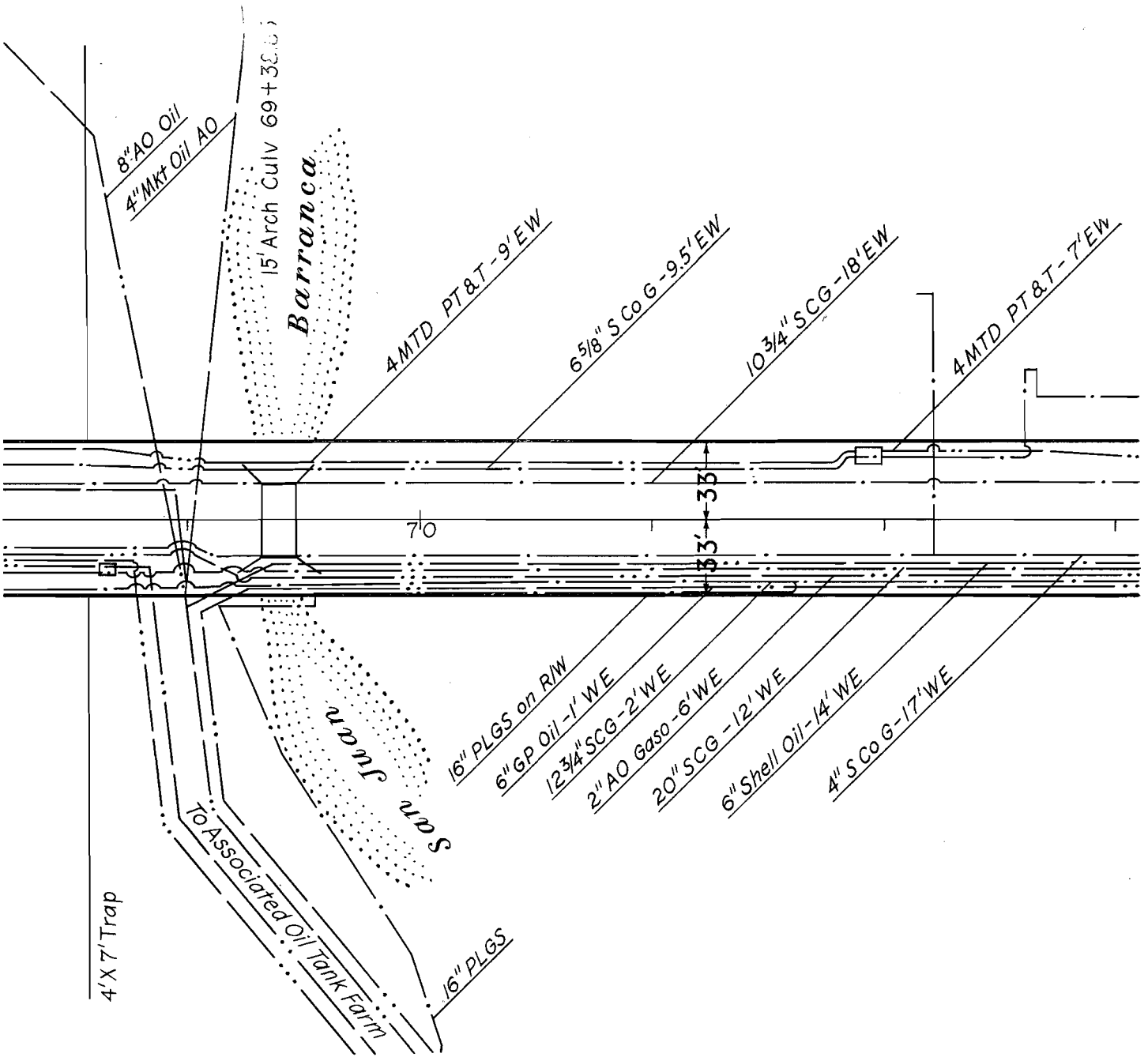
What is underground, where is it, and who does it belong to, become $64 questions, and must be answered correctly, as it is most embarrassing for all concerned when a contractor cuts a transcontinental telephone cable or a live gasoline line, which has been done in times past.

When a pipe line or lines are found during construction that are not shown on the plans, the item of removal becomes Extra Work, sometimes necessitating a change in design with considerable added cost as well as delay to the contract.

Mapping Section Set Up

District VII is endeavoring to have the answer to these questions before they are asked. A substructure mapping section was set up in January, 1951, to map all underground facilities on or adjacent to all state highways in the district, comprising Ventura, Los Angeles and Orange Counties, an area with a population of four and one-half million people. In addition to the usual utilities found in any metropolitan district, thousands of square miles of citrus groves, orchards and truck





garden farms are intensely irrigated, and some of the largest producing oil fields in the Country pipe their product to local refineries.

In the greater Los Angeles area, almost any rural highway has six or more pipe lines or ducts on or adjoining the highways, and in the vicinity of several oil fields, and at main intersections, twenty or more underground lines are not uncommon. No complete substructure map was in existence, and the only lists of underground facilities were those showing the utility companies or agencies operating under the jurisdiction of the California Public Utilities Commission.

It soon became apparent that the companies listed as "Public Utilities" were but a fraction of the total. Checking the District VII permit file for permits issued for pipe line crossings did not help clarify the picture much, since numerous lines had been laid long before many of the highways were taken into the State Highway System. Also, scattered line crossings as taken from the permits did not give the desired continuity to enable a draftsman to plot the line. "As Built" plans only showed those pipe lines that had been relaid, or those located the hard way by hitting them. That old reliable source of information, the maintenance foreman, could not be expected to know everything underground. One man proved the exception by reporting 13 pipes of various age and size encountered when excavating to install a small culvert. To date, only the owners of 11 of the pipes have been found.

Oil Companies Cooperate

Through the courtesy of the Western Oil and Gas Association, we were furnished the names and addresses of 722 oil companies in this district. All were contacted, and the response was excellent. Many were leasing, drilling or producing companies only, but some 60 companies had pipe lines, and all companies with lines on or near the state highways have now sent us maps of their pipe lines. We can now say with fair assurance that we have the location of all "live" oil and gas pipe lines in the district. Abandoned lines are a different story. Fields are pumped out, companies go out of business, or a major company revises a map and omits showing an abandoned line. When the cost of abandoned pipe line removal exceeds the salvage value, as it usually does if the pipe is on highway right of way, the pipe line is left in place and after a period of time ownership is forgotten or even denied. We have no way of mapping these abandoned lines ahead of time but this is done by a process of elimination on construction. When, during construction, live pipe lines are uncovered that have been mapped, with ownership known, any additional line or lines found are probably abandoned.

Locating Water Lines

Locating the water companies' pipe lines is even a tougher problem.

There are over 300 cities, unincorporated towns or communities in the district and 106 of them are served by 65 water companies that are listed as public utilities. The other 200 communities have a municipal, mutual or private system. From lists furnished by the State Division of Water Resources in Sacramento, by the State Bureau of Sanitary Engineering in Berkeley, and by various local water companies whose valued help is gratefully acknowledged, we believe there are over 1,500 mutual, irrigation and private water companies operating in District VII.

Each company is being contacted with a request for a map of their pipe line system if on or near a state highway, or if they have no lines affecting state highways, they are requested to inform us, so that we eventually will have a complete record showing the location and size of all water pipe lines as has been obtained in the case of the oil lines.

There are two major gas companies in the district with thousands of miles of pipe line, with service connections to practically every residential or commercial establishment. This generally means a high pressure gas line of 4 to 20 inches or larger in size on or parallel to the main highways, with four-inch or smaller low pressure service lines.

Gravity Flow Lines

The real headaches for the Design Department are the gravity flow lines, such as the sewers and storm drains, normally constructed on a very flat grade, and, unlike the pressure pipes, these lines cannot go over or under other pipe lines or obstructions. Occasionally syphons are used, but only as a last resort. One of the trunk sewers recently completed in the City of Los Angeles is 54 miles in length with a maximum size of 10 feet 6 inches in height and 12 feet 3 inches in width, having a gradient of four feet in ten thousand feet at the outfall end.

With the exception of a few rural communities which use septic tanks, all cities and towns have sewer systems, and most of these sewers in the metropolitan area flow into trunk sewers with outlets in the Pacific Ocean. Each of the 300 cities, towns and communities are being requested to furnish maps of their sewer systems, and the results obtained are as diversified as were those from the water companies, varying from towns where practically the only record is the memory of the water superintendent to others employing a fine engineering staff with all maps and records up to date.

Hydrologically, Los Angeles is situated in an area having a peculiarily intense rainfall concentration, over one inch per hour for a 24-hour period having been gaged.

Storm Drains

Metropolitan Los Angeles has over 1,400,000 dwelling units, and tens of thousands of commercial and industrial establishments, with thousands of miles of streets and other paved areas. This built up area has greatly reduced the normal percolation, and the fast runoff has resulted in flooding various districts in past years. To eliminate this condition, the city and county have constructed a network of storm drains, many being 12 feet or larger in size, and all adding to the underground congestion.

Los Angeles and the nearby cities and towns were laid out, generally speaking, without alleys and most electric light, power, telephone and telegraph lines in the streets went underground years ago, the wires or cables usually being laid in multiple ducts. As in the case of water and sewer, practically every building in Metropolitan Los Angeles is served with electricity and telephone.

The traffic signal system embraces installations at approximately six hundred intersections on state highways. To form a circuit at a normal right angle street crossing, conduits under three sides of the intersection are required. When traffic actuated signals are used, additional conduits are run from the detectors to the control box.

Many miles of ornamental street lights are in place, with separate conduit, also an elaborate police and fire signal system.

Many industries and manufacturing companies have their own water systems, as well as salt water, waste water and chemical pipe lines—all adding to the underground maze, and to the research necessary to make the underground utility mapping job complete.

All the major utility and oil companies contacted and the engineering departments of most cities and towns realize the value of a complete substructure map, and are cooperating in every respect by submitting maps of all underground utilities as they affect state highways.

Maps Available

The substructure file consists to date of over 9,000 maps, ranging from letter size to rolls 4 feet wide and 20 feet long, with all sizes in between. The information ranges from a crude lead pencil sketch showing a one-line mutual water company, exact pipe line lo-

cation and size indefinite, to carefully drafted plans numbering over 1,000 atlas sheets as were submitted by three of the major utility corporations. All maps are filed by county, route and section, with a three-way card system indexed by: (1), name of company, showing county routes and sections served; (2) county, route and section, showing utilities; (3), city or town, showing owners of all utilities operating in the city limits.

The maps being produced by the District VII Substructure Section are strip maps 18 inches in width, traced on cloth from an appropriate base map, drawn to a scale of 1 inch to 100 feet in rural areas and 1 inch to 50 feet in urban areas with intersections or points of concentrated line crossings or junctions "blown up" to an adequate scale to show the desired detail. Right-of-way, subdivision and land lines are shown, but surface topography is held to a minimum so as not to obscure underground detail.

A different symbol of dash and dot line is used for water, sewer, gas, electricity, telephone or telegraph, oil, gasoline, traffic signals, storm drains and steam lines. All lines are called out at frequent intervals showing ownership, size and location, as "6MTD-PT&T-19EW" or "18" HPG-PLG-12SN" would read "6 Multiple Tile Duct Line, Pacific Telephone & Telegraph Co., 19 feet East of the West Right of Way Line," and "18 inch High Pressure Gas Line, Pacific Lighting Gas Supply Co., 12 feet South of the North Right of Way Line." Minor companies are called out by full name.

Maps Highly Useful

To keep the maps up to date, all underground encroachment permits are turned over to the District VII Substructure Section when the construction called for in the permit is complete. Also, many of the major utility companies are submitting prints of any new lines installed by them even though on private easement if in the vicinity of a state highway.

These utility companies are beginning to realize the value of the work being done by the District VII Substructure Section, and before designing a crossing or pipe line paralleling a state highway, many of them are asking us "What's in the way?"

Like the "one-stop service station" they are finding it a lot easier, faster, cheaper and more accurate to get the information from one clearing house than to write to a dozen different sources and hope they have not missed one. They appreciate the advantage of having blueprints of the underground utilities of all companies on file in one office.

The District VII Substructure Section operates under the jurisdiction of the District Maintenance Engineer and is staffed by 10 delineators, an office assistant, and a secretary, with the writer in charge.

Highway Hi-Lites Seek Championship

TOP ROW (left to right): Evelyn Wilkerson, Maxine Struckmeyer, Marie Castro, Bonnie Simpson. FRONT ROW: Catherine Bazler, Velora Meredith, Manager, and Esther George, Gloria Artus and Jerry Wilkerson not in picture.

THE HIGHWAY HI-LITES, a basketball team organized this autumn by Ann Pratt, are entered in the State Division of the City Basketball League.

Up to the time of this writing, the Hi-Lites have lost only one game, and that was to Highway Patrol by a score of 15 to 19.

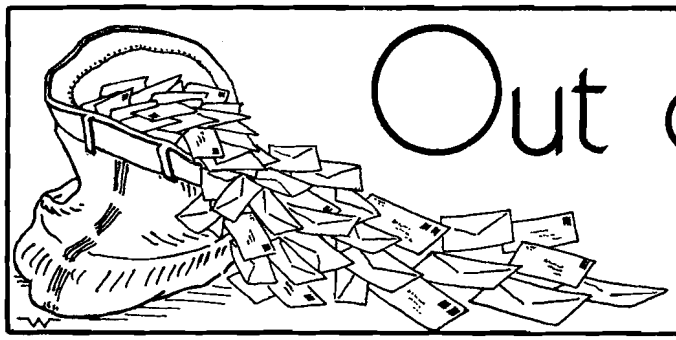
At the completion of the first half, the Hi-Lites placed second. Highway Patrol, undefeated, placed first.

The first games of the second half were played November 27, 1951.

The Hi-Lites are all out to win the league championship. Four games remain to be played.

CAN YOU STOP?

California law specifies that automobile brakes must be capable of bringing the car to a complete stop within certain distances at various speeds. A motor vehicle going 20 miles per hour should come to a complete stop within 37 feet; at 45 m.p.h., within 188 feet. This applies when driving on dry asphalt or concrete surface where the grade does not exceed 1 percent. Are your brakes good enough to make these stops?



Out of the Mail Bag

PRAISE FOR CONTRACTOR

A. TEICHERT & SON, INC.
Engineering Contractors
1846 37th Street
Sacramento 5, California

MR. KENNETH C. ADAMS, *Editor*
California Highways and Public Works
P. O. Box 1499
Sacramento, California

DEAR MR. ADAMS: Letters like the enclosed from Mrs. Ted R. Barben, 3907 East 57th Street, Maywood, California, a member of the "traveling public," commending a contractor on a highway project instead of complaining, are so rare we thought you might like to publish it in a forthcoming issue of *California Highways and Public Works.*

Sincerely yours,
A. TEICHERT & SON, INC.
By A. Teichert, Jr.
Chairman of the Board

3907 E. 57th Street
Maywood, California

A. TEICHERT & SON
Sacramento

GENTLEMEN: We recently had occasion to go over the Ridge Route to Bakersfield and knew, because of the construction work being done there, that the trip would be less than pleasant. We were delighted to find the road watered down so that aside from the surface roughness there was nothing even to complain of.

As we went for miles, I began to be so very thankful for the attention that had been paid, not only for our personal comfort but for the thoughtfulness that would reduce the severe driving hazard when clouds of dust obscure the vision. I wished I could thank someone for thinking of everything, when I saw your sign on one of the construction houses so . . . thanks very much.

Sincerely,
MRS. TED R. BARBEN

COMPLIMENT FOR C. H. HIXSON

CAMBRIA CHAMBER OF COMMERCE
Cambria, California

California Highways and Public Works
Post Office Box 1499
Sacramento, California

GENTLEMEN: The Cambria Chamber of Commerce does herein and hereby, go on record as having observed and fully appreciated the excellent job of maintaining the highways in this area, done by the former superintendent, C. H. Hixson. He has left a job well done and assume you have assigned another good man to carry on.

Both Mr. and Mrs. Hixson made a host of friends while here in Cambria, and it was with deep regret that we saw them leave. The community's loss will be Buellton's gain.

Several of the directors have reported on the results of the sincere efforts expended under the supervision of Mr. Hixson, which all adds up to making us proud of U. S. 101.

Needless to say, the community will extend a warm welcome to the new superintendent for this area.

Sincerely,
By GLADYS V. COOPER
Secretary-Treasurer

VALUABLE TO APPRAISER

HARRY J. BLEE
Consulting Appraiser
Palos Verdes Estates

California Highways and Public Works
Post Office Box 1499
Sacramento, California

GENTLEMEN: Please put me on your regular mailing list to receive *California Highways and Public Works.* Much of my appraisal work has to do with acquisition of rights of way and I feel that your magazine is most valuable in that field.

HARRY J. BLEE

YOU ARE RIGHT

EDITOR

DEAR SIR: Motorists in our Country are getting so pampered that they often blame their accidents on dangerous roads. The sooner they realize that no road is dangerous, that some roads are slow and others fast and require varying degrees of skill and caution to drive, that the only dangerous things about the road are themselves, the sooner we might cut down on our accidents.

Most motorists drive so fast in a fog that they are out of control if an obstruction looms up ahead. In clear weather they don't look far enough ahead to be ready for trouble when it comes. A large proportion of the fatalities come from passing unwisely, being in a foolish hurry.

The program today is to build roads that require no skill to drive over, because the 20 percent of our drivers that have over 80 percent of all the accidents have demonstrated that they have neither skill nor caution.

Doctors believe that too much sanitation, too little exposure to viruses in infancy, makes for dangerous susceptibility later on. Will fool-proof highways have the same result in accidents?

F. W. NORDHOFF
Buellton, California

LIKES PHOTOGRAPHS

MR. KENNETH C. ADAMS, *Editor*
Redwood City

DEAR SIR: I have just paged through your recent edition on the freeways of San Francisco and Los Angeles. This is one of the most profusely illustrated highway magazines I have ever seen, and has so many articles on advanced traffic theories that are already in actual practice.

Very truly yours,
JOHN T. AMBROSE

REALTOR LIKES MAGAZINE

VENICE REALTY BOARD
Office of: Edwin A. Johnson
12234 Venice Blvd., Mar Vista
California

KENNETH C. ADAMS, *Editor*
California Highways and Public Works
Post Office Box 1499
Sacramento, California

DEAR MR. ADAMS: I have been receiving your valued publication—*California Highways and Public Works*—for many years, and I regard it as the most important and interesting of all the magazines I receive in my office.

I have all my copies filed for future reference, and I look forward to receiving your valued publication with interest.

Yours very truly,
EDWARD A. JOHNSON, Realtor

MAGAZINE WILL BE SENT

CALIFORNIA STATE AUTOMOBILE ASSOCIATION
150 Van Ness Avenue
SAN FRANCISCO 2, CALIFORNIA

MR. KENNETH C. ADAMS, *Editor*
California Highways and Public Works
Post Office Box 1499
Sacramento, California

DEAR MR. ADAMS: I have just had the pleasure of meeting Mr. Fernd Duperly who is the vice president of the Automobile Club of Colombia in South America.

Mr. Duperly and his father have just completed a lengthy automobile tour not only of California but of all the United States, and they have been particularly impressed with the highway system in our own State of California.

The Automobile Club of Colombia, naturally, like ourselves, is tremendously interested in the building of adequate highways in their country. They have been shown a copy of your very fine and invaluable magazine and have asked us if we would have the kindness to request that you put them on the mailing list to receive regular copies of *California Highways and Public Works.*

Yours sincerely,
CALIFORNIA STATE AUTOMOBILE ASSN.
C. H. A. DUKE,
Manager, Touring Bureau

THANKS FROM TURKEY

BRIDGE DESIGN DEPARTMENT
General Directorate of Highways
Ankara, Turkey

CALIFORNIA HIGHWAYS AND PUBLIC WORKS
P. O. Box 1499
Sacramento, California

DEAR SIRS: Since I was in California for four months, during my year long visit to your Country to study highways and bridges, I have been very much interested in all California's highways.

After returning to my country two months ago, I received two copies of *California Highways and Public Works.*

I should like to say that *California Highways and Public Works* is the best magazine, having everything about highways, for a man who wishes to keep in close touch with California's highways and highway department, where he was welcomed by everybody.

I wish to express my thanks for your mailing me *California Highways and Public Works.*

Very truly yours,
HILMI GURAYMAN
Bridge Design Department
General Directorate of Highways
Ankara, Turkey

THANK YOU

MRS. C. S. MacDONALD
1138 Talbot Avenue
Albany 6, California

KENNETH C. ADAMS, *Editor*
California Highways and Public Works
Sacramento, California

DEAR SIR: I am enclosing our "Please Renew" card, but wish to also express our appreciation of the magazine you edit. It has some of the most beautiful pictures it has been our pleasure to look at, and the text has been most informative. I better understand the problems involved in creating our beautiful highways, since reading your magazine for some years.

Our deepest thanks for sending us this magazine and may it continue for many years to come.

Yours,
MR. AND MRS. C. S. MACDONALD

APPRECIATES MAGAZINE

SCOTT and SCOTT
Research Engineering

629 South Avenue 59
Highland Park
Los Angeles 42

EDITOR K. C. ADAMS
California Highways and Public Works

DEAR MR. EDITOR: Enclosed herewith the postcard we received with the July-August issue, just at hand. Yes, we surely want continuance of our name upon your mailing list for we appreciate your journal as much as any we receive (and more than some).

We have been intending writing you our special thanks for that wonderful centennial number, received in September, 1950, for almost one year, but like so many people we know we have until now neglected doing so.

We learned so much about our adopted State from that issue that we intend keeping it indefinitely.

More and greater success to you and your staff.

Most appreciatively yours,
FRANK WILBUR
Scott-Plang, England

OUTSTANDING PUBLICATION

PET MILK COMPANY
General Offices, Arcade Building
Saint Louis 1, Missouri

Greenville, Ill.

MR. KENNETH C. ADAMS, *Editor*
California Highways and Public Works

DEAR MR. ADAMS: Through the courtesy of my brother-in-law, I was able to get copies of the *California Highways and Public Works* of which you are the editor. I have certainly enjoyed this very much and consider it a really outstanding publication.

Those of us that have lived in California for some time are really greatly interested in seeing the improvements and advances that are being made there. In addition, a number of our friends in the midwest have been greatly impressed by the information carried in your journal. Usually, material dealing with highway construction is rather heavy reading, and I think that you and your editorial staff are to be congratulated for putting out such fine readable material on the highway work of your State.

F. R. SMITH, Ph.D.
Research Laboratory

Vacuum Cleaner

New Machine Gathers Trash Motorists Throw on Highways

By W. D. SEDGWICK, Assistant District Engineer

THE ROADSIDES along many miles of state highway in District VII, particularly along the beaches and in the resort areas, look like public dumps with beer cans, bottles, ice cream cups and other trash thrown out of cars or left from roadside picnics. The state highway maintenance forces are far too few, with an average of one man to each seven miles, to attempt to keep this mess cleaned up by hand even if they did nothing else.

It was therefore considered necessary to find a mechanical method of picking up this trash. No one knew of a machine now on the market adapted to the picking up of all these items. A road magnet would pick up the cans but not the bottles and paper. It was therefore decided that a suction machine was necessary and a check of the field resulted in our locating a "Leaf and Litter Collecting Unit" manufactured by the Good Roads Machinery Company of Minerva, Ohio.

Problem of Bottles

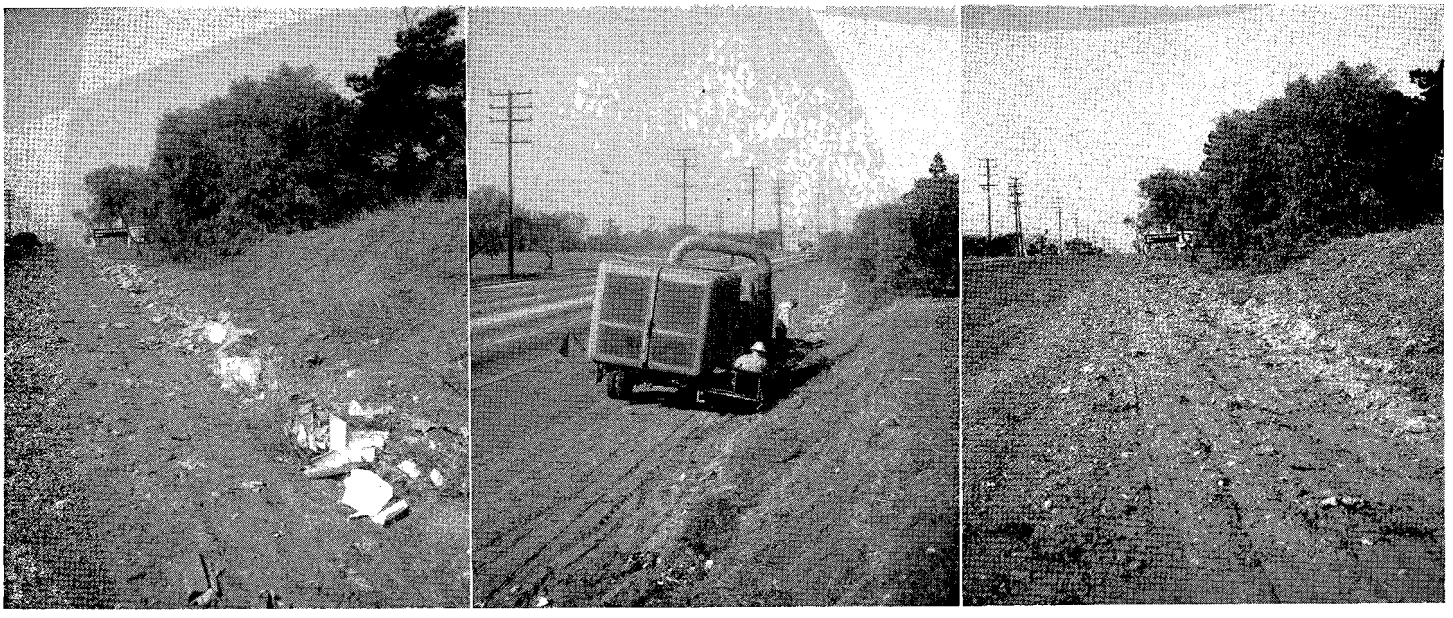
This machine had the necessary suction capacity, as it readily sucked up bottles and cans but as it was intended only to pick up leaves and paper, everything went through the vacuum-producing fan. Bottles, even half-gallon demijohns, were pulverized and cans were cut up or smashed.

It was appreciated that the fan was not designed to stand up under the battering that thousands of bottles and cans would give it. The District VII shop forces were authorized to experiment with the machine to see what could be done to pick up the bottles and cans so they would not have to go through the fan.

In the original adaptation the suction hose, which is 10 inches in diameter, was attached to the upper end of an old hot water tank fastened above the fan with a small rectangular box below. The velocity of the heavy articles through the water tank carried them past the fan into the box and the paper and light material went through the fan into the 14-cubic-yard box, which on this machine is the same as the dirt bag on a vacuum cleaner.

Economical Operation

This arrangement worked so well that it was decided it would be worthwhile to construct an air-tight compartment in the container for the heavy materials to be trapped in. The small box required too frequent emptying to make its use an economical operation; however, when used in Superintendent Davidson's territory in Orange County, his foremen were enthusiastic about it and requested permission to clean up their worst areas before it was sent to the shop for installation of the large air-tight compartment. Even with this first arrangement, which required frequent trips to the dump to empty the small-capacity tow truck, it was found that this cleanup was



Trash on roadside on Pacific Coast Highway between Seventh Street and Anaheim Street in Long Beach area. Vacuum cleaner in operation in same location. Same location after vacuum cleaning

Opened rear gates show portion of trash that has gone through fan and lower closed airtight compartment. Operators opening lower compartment prior to raising to dump load. Dumping load shows cans and heavy trash from lower compartment.

costing much less than it had cost to clean the roadside by hand.

When we first tried it out after the air-tight compartment had been installed, we found that an appreciable portion of the vacuum was lost in the hose intake so that it would not pick up the bottles, but the Equipment Department boys would not give up. They enlarged the fan and reduced friction by making all pipe connections on curves so that now the machine easily picks up anything that will go through the reinforced flexible 10-inch hose.

Improvements Made

We first tried it out with handle bars attached to the snout and the operator walked alongside the machine swinging it back and forth. This operation proved to be too hard a job and did not give positive enough control of the snout.

We next mounted a seat near the back of the box with a footrest on which is mounted a ball. A handle bar, which swivels in a socket on this ball, is attached to the intake hose near the suction end, and with it the operator can sweep a five-foot strip, also controlling the snout elevation above the ground with the same handle bar. The end of the hose is counterbalanced with springs which make it very easy for the operator to handle it.

An electric button on the side of the box near the operator is connected to a buzzer in the cab of the tow truck for the operator to signal the truck operator when something goes wrong or plugs the hose.

Method of Operation

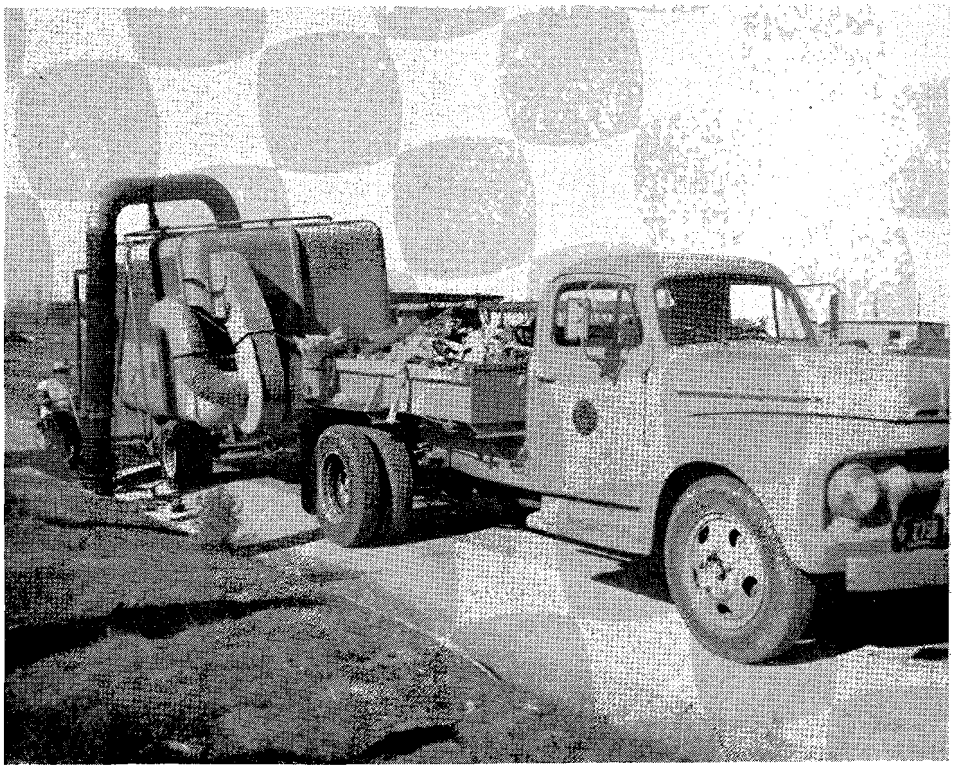
With the first time around, we have found that it pays to have men ahead of the machine rake the debris from the slopes and wider areas into a windrow in the ditch, and a man ahead of the suction hose to load into the tow truck the large boxes, sticks and other items that would plug the hose, so that the cleanup can progress smoothly down the road.

The District VII Shop, under the supervision of George Siebert, has done an excellent job of adapting and perfecting this piece of equipment. It is constructed so that the intake hose can be operated from either side of the box in order that litter can be picked up from central dividing strips without operating against traffic flow.

In cleaning up a particularly messy section through the Malibu on the Coast Highway, 12 loads or approximately 150 cubic yards of bottles, cans, and trash were picked up in three days.

The machine was used to pick up puncture vines from the roadside on

Vacuum cleaner with tow truck loaded with oversize trash, showing operator's seat, handle bar with ball-and-socket joint for controlling snout. Operator is pushing button to buzzer in tow truck cab.

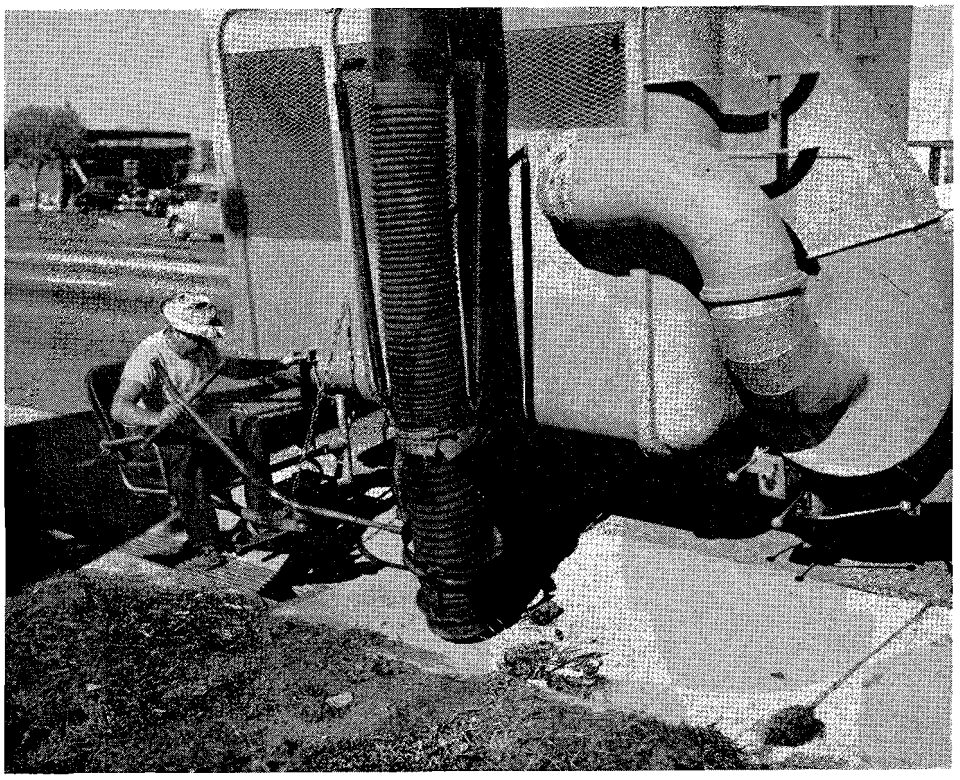


Vacuum Cleaner

Continued from page 47 . . .

the Laguna Canyon road. Most of the burrs had developed and the vines had dried before the Orange County Horticulture Department had sprayed them in this area. A large percentage of the burrs had fallen off the vines and picking them up would have been a practical impossibility without this machine. The only preparatory hand work necessary for this operation was to cut the main root of the vine with a hoe. The machine did a very clean job of picking up the vines and loose burrs quickly and efficiently.

Movies of this machine in operation are now being prepared to be available to show service clubs, parent-teacher meetings and other groups. Showing of this film should impress the people that they should not make our streets and highways a public dump with the mess that they now throw out their windows for the overloaded maintenance man to pick up.



Closeup of operator and push-button mechanism →

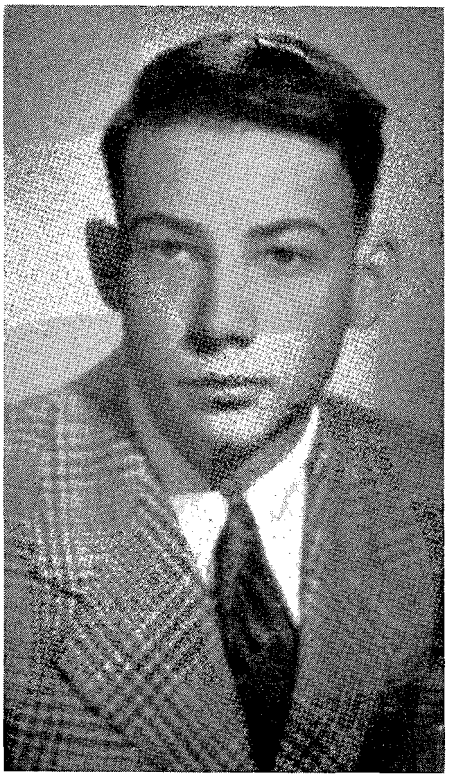
In Memoriam

HARLAN L. STEPP

Friends and co-workers were shocked to learn that Harlan L. Stepp, formerly with the Highway Planning Survey, was killed in action in Korea on October 14, 1951. He was hit by artillery shrapnel while fighting near Kumsong.

His father, Mr. Ray Stepp of Likely, Modoc County, was notified by the Adjutant General of the Army which information was later confirmed by a letter of condolence from General of the Army M. B. Ridgeway.

Harlan was born May 25, 1929 at Durham, California, and lived most of his life in Likely, Modoc County. He was graduated from the Modoc Union High School in 1947 and attended one year the California School of Mechanical Arts, in San Francisco.



On October 1, 1950, he was appointed Under Engineering Aid with the Highway Planning Survey with which department he worked until he was inducted into the Armed Forces on February 28, 1951. He took his basic training at Camp Roberts and shipped to Far Eastern Command on July 25, 1951.

At the time of his death he was a p.f.c. with Co. C, 1st Bn., 19th Inf. Regt. 24th Inf. Div. His parents, Mr. and Mrs. Ray Stepp of Likely, Modoc County, survive him.

Harlan was well liked by his fellow workers and made many friends in the short period of his employment with the Highway Planning Survey. They join the department in extending their profound sympathy to the family.

Hatchet Mountain

First Unit of Line Change on Shasta Road Completed

By W. H. BARTLETT, Resident Engineer

HATCHET MOUNTAIN remains the last major obstacle in the improvement of U. S. Highway 299 through the Pit River watershed in eastern Shasta County, a distance of 16 miles.

Work on the first section was started in October, 1950, and is now complete. The project was 1.6 miles long and encompassed the crossing of Hatchet Creek with improved alignment and grade. The old highway was narrow and crooked and in some places hard for big trucks to travel over with any speed without accident. Hatchet Creek Bridge was located at nearly right angles to the stream and the approaches were built to fit the bridge and the contour of the ground. With the improvement of this section, work can now be started on another part of the programmed projects over the mountain.

Early Day Travel

The history of travel over Hatchet Mountain is one of courage and pioneer spirit in the building of eastern Shasta, Lassen and Modoc Counties from the early days of the wagon to our present-day high speed automobiles and trucks. The trip from Redding to Burney by wagon was a major undertaking requiring from four to six days. Along the way were stopovers where horses were changed and meals could be obtained. Freight wagons hauling over the hill from Montgomery Creek to Burney usually made the trip in two days, stopping over night at Fuller's on Little Hatchet Creek. Now the trip from Redding to Burney takes about two hours and as one passes through the hills the thought comes to mind, "how did the old-timers do it?"

Old-timers on Job

Construction on this section of U. S. 299 was started in 1918 and the Hatchet Creek work was completed in 1923 and 1924. Two of the original workers for the day labor construction, as done by the State in those days, are still working for the State. Ralph Hill is maintenance foreman on this section of road which he helped to construct, and another old-timer, L. E. Robinson of Millville, is maintenance foreman on the route to Lassen Park. There may be others still working for the State who had some part in the first building of a highway across Hatchet Mountain.

The writer first went over Hatchet in 1919 to work on a staking-out party for the day labor camp at Adin Summit where construction was going on under the guidance of Spencer Lowden, now district engineer of District VIII. In 1921 another trip on foot was made from Montgomery Creek to Burney when a party of 15 men started the survey from Burney to Fall River Mills.

Freeway Bids

Public Works Director Frank B. Durkee has authorized advertising for bids for construction of an experimental section of the Bayshore Freeway across the San Francisco Bay mud flats.

The project will consist of a dirt fill causeway to carry a 132-foot roadbed from the south city limits of San Francisco at Candlestick Point for a distance of six-tenths of a mile toward South San Francisco. It will end in the water, and will not be extended until results of the experiment have been analyzed.

Highway Engineer George McCoy said it will follow the planned line and design of that portion of the Bayshore Freeway, and will not be lost.

The purpose, he explained, is to determine whether underlying water and mud can be forced out by sheer weight, eliminating the necessity of employing a highly expensive system of pumping out mud and backfilling with a sand blanket. The 1951-52 highway budget provided $402,800 for the project.

Hand Labor Used

The original highway was constructed with the use of horse and mule-drawn equipment to move excavated material. All finishing and subgrading was done by hand. Drilling was done by single jack hand labor. To eliminate haul of any consequence, the road followed the contour of the hills. As the years progressed, maintenance forces widened the road from the original 16-foot section to a wider passable width of 20 feet of oil surface plus shoulders.

Today's construction was done by diesel tractors and 15- to 18-yard carryalls. Drilling was done by pneumatic jackhammers. Subgrading and finishing was accomplished with the use of No. 12 motor graders. Hand labor was used only for clearing and some final finishing. Culvert pipe was placed by hand.

The construction of this section of highway eliminates eight curves with 534 degrees of curvature and saves 82 feet of rise in grade. The small, narrow bridge designed and built by the county in 1923 was replaced by a standard arch culvert 16 feet wide with a 17-foot rise having a carrying capacity of 3,600 second-feet at flood. The culvert is 241 feet long and has a dissipating basin at the outlet to stem the flow.

Volcanic Ash Held Water

Some difficulty was encountered in the roadway excavation, as free water was found in the cuts which were made up of lava in decomposed form lying over a formation of mud around a layer of large boulders. The mud was a fine volcanic ash and held water to the extent of from 30 to 40 percent by weight. Therefor, no water was needed in the construction of the fills except for the top portion. At times construction equipment had difficulty in moving and had to be pushed and pulled by three extra tractors. Loaded

... Continued on page 55

Encouraging

California Highway Construction Cost Index Drops 6.9 Percent

By RICHARD H. WILSON, Assistant State Highway Engineer
H. C. McCARTY, Office Engineer
R. R. NORTON, Assistant Office Engineer

DURING the third quarter of this year a slight drop occurred in the California Construction Cost Index. The index for this third quarter decreased from 238.3 in the second quarter (1940 = 100) to 221.9, a drop of 6.9 percent.

The 15-month period from the first quarter of 1950 to the second quarter of 1951 ending on June 30, 1951, showed the most rapid increase in highway construction costs in California that has occurred since 1940, when the California Highway Construction Cost Index (1940 = 100) rose from 160.0 in the first quarter of 1950 to 238.3 in the second quarter of 1951, a rise of 48.9 percent.

The cost of state highway construction in California increased 22.3 percent in the first half of this year to reach the highest peak in highway construction costs in California.

Comparative Figures

The Engineering News Record Construction Cost Index showed a 1 percent increase from March to September, 1951, after a 10.2 percent rise in the preceding year. Cost figures in the Bureau of Public Roads Composite Mile Index for the third quarter of 1951 rose to 230.2, an increase of 5.8 percent during the first three quarters of the year, which compares to a rise of 13.9 percent in the California index for the same period.

With the continued increase in living costs, higher income and other taxes, and with the increasingly short supply of steel and other essential materials and the attendant uncertainties, delays, and higher costs, we cannot feel

CALIFORNIA DIVISION OF HIGHWAYS
AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Crusher run base, per ton	Plant mix surfacing, per ton	Asphalt concrete pavement, per ton	PCC pavement, per cu. yd.	PCC structures, per cu. yd.	Bar reinforcing steel, per lb.	Structural steel, per lb.	
1940	$0.22	$1.54	$2.19	$2.97	$7.68	$18.33	$0.040	$0.083	All projects
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	
1st Half, 1946	0.41	2.31	4.00	4.54	9.85	37.38	0.060	0.099	Federal aid projects only
2d Half, 1946	0.39	2.27	4.12	5.04	12.39	49.84	0.079	0.142	
1st Half, 1947	0.48	2.62	4.52	6.46	12.41	47.03	0.080	0.133	
2d Half, 1947	0.54	2.39	4.02	6.48	11.58	50.15	0.089	0.123	All projects
1st Half, 1948	0.56	2.45	4.42	4.91	13.37	49.51	0.094	0.145	
2d Half, 1948	0.52	2.64	4.80	7.00	14.01	49.08	0.103	0.131	
1st Quarter, 1949	0.49	2.48	4.54	5.70	11.84	48.11	0.089	0.113	
2d Quarter, 1949	0.43	2.91	4.63	4.06	11.74	48.63	0.083	0.110	
3d Quarter, 1949	0.41	2.40	5.05	4.60	11.53	45.35	0.080	0.093	
4th Quarter, 1949	0.43	2.55	3.78	3.50	12.66	44.54	0.078	0.092	
1st Quarter, 1950	0.34	2.22	3.65	3.74	----	40.15	0.077	0.081	
2d Quarter, 1950	0.40	2.13	4.48	3.74	10.86	43.03	0.080	0.105	
3d Quarter, 1950	0.41	2.32	4.25	5.50	10.91	44.34	0.093	0.131	
4th Quarter, 1950	0.42	2.81	4.64	4.61	12.55	43.18	0.098	0.120	
1st Quarter, 1951	0.45	3.07	4.06	5.22	11.71	46.38	0.103	0.206	
2d Quarter, 1951	0.63	3.88	4.56	4.63	12.93	51.50	0.105	0.166	
3d Quarter 1951	0.56	2.88	4.59	3.90	12.41	46.14	0.107	0.165	

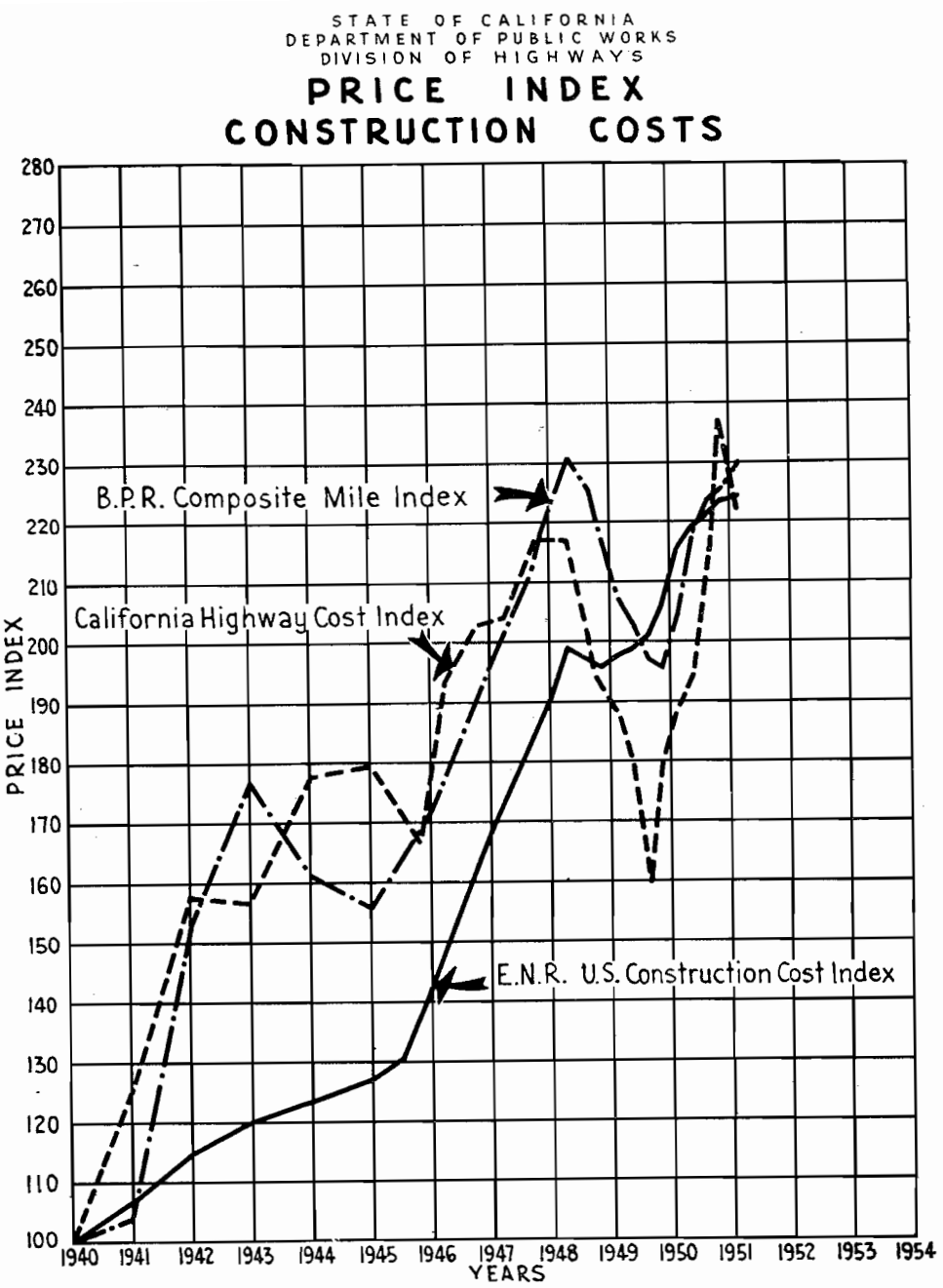
there is much possibility of any continued drop in the cost of highway construction. The sharp rise of the California index over that of the Engineering News Record Construction Cost Index and the Bureau of Public Roads Composite Mile Index in the second quarter of 1951 was undoubtedly a local condition in California occasioned by an upsurge of federal construction projects released in May and June in order to take up available funds before the end of the fiscal year. If such was the case, the 6.9 percent drop in the California index for the third quarter is merely a temporary drop from a false peak in the general upward trend of prices.

Outside Factors

From the highway viewpoint, consideration must be given to outside factors, such as more stringent control of materials, increased tax levels, and the anticipated competition from the recently voted $5,864,000,000 in expenditures ($467,000,000 in California alone) for construction projects for the Air Force, the Army, and the Navy, which may adversely affect bids for highway construction costs and raise them to higher levels. From consideration of the current trend and these outside factors it is our opinion that a continued rise in the California Construction Cost Index may be expected during the fourth quarter of 1951.

Following is a tabulation of the California Highway Construction Cost Index since the first postwar peak was reached in the first half of 1948:

Period	Index 1940 = 100	Change from previous period	Change from 1st half 1948	Change from 1st qtr. 1950
1948 (1st half)	216.8			
1948 (2d half)	216.4	—0.2%	—0.2%	
1949 (1st qtr.)	200.4	—7.3%	—7.6%	
1949 (2d qtr.)	195.7	—2.3%	—9.7%	
1949 (3d qtr.)	187.9	—4.0%	—13.3%	
1949 (4th qtr.)	178.8	—4.8%	—17.5%	
1950 (1st qtr.)	160.0	—10.5%	—26.2%	
1950 (2d qtr.)	180.0	+12.5%	—17.0%	+12.5%
1950 (3d qtr.)	189.2	+5.1%	—12.7%	+18.3%
1950 (4th qtr.)	194.8	+3.0%	—10.1%	+21.8%
1951 (1st qtr.)	215.4	+10.6%	—0.6%	+34.6%
1951 (2d qtr.)	238.3	+10.6%	+9.9%	+48.9%
1951 (3d qtr.)	221.9	—6.9%	+2.4%	+38.7%



Highway Costs

Highway costs as measured by the California Highway Construction Cost Index with the year 1940 taken as a base of 100, climbed during World War II and the postwar period to a peak of 216.8 in the first half of 1948. After 1948 there was a decline to 160.0 in the first quarter of 1950. From this point on, there was a very rapid rise through the second quarter of 1951. The second quarter of 1950 was 12.5 percent above the first quarter of 1950; the third quarter was 5.1 percent above the second quarter; the fourth quarter was 3.0 percent above the third quarter; the first quarter of 1951 was 10.6 percent above the fourth quarter of 1950, and the index reached 238.3 in the second quarter of 1951 which was 10.6 percent above the first quarter. The index for the third quarter of 1951 decreased 6.9 percent from the second quarter of 1951 to 221.9, the first drop since the first quarter of 1950, which is considered merely the leveling-off of a false peak to the general line of the continued rise.

Plumb Bob Points

Their Standardization Is Important to All Engineers

By G. G. McGINNESS, Assistant Engineer, Service and Supply

IF EACH manufacturer of household light globes designed the screw base according to their own individual fancy, you couldn't go to the corner grocery and ask for just a "light globe" and have it fit the socket in your lighting fixture. You would have to remember that your fixtures take General Electric globes, Westinghouse globes or one of a dozen others. If you had forgotten, you would have to climb on a chair or stepladder and attempt to find some identification so you would know what lamp to ask for and be sure that it would fit properly in the socket. We can be thankful that lamp manufacturers standardized when they began making electric light globes. We can buy light globes without any concern about the base fitting the fixture. Surveyors, construction men and mechanics who use precision plumb bobs haven't been so fortunate when they have needed to replace a plumb bob point.

Precision plumb bobs are made in sizes ranging from 4 to 96 ounces with those from 10 to 16 ounces being most common while those larger than 24 ounces are quite rare. It is estimated that American manufacturers produce several hundred thousand precision bobs each year. The California Division of Highways uses about 400 16-ounce precision plumb bobs each year and requires over 500 replacement points annually.

Every survey crew in America is equipped with one or more bobs which are used to transfer a point on the ground to a point some distance above the ground or vice versa. A plumb bob is hung from a transit so that it may be centered over an exact point on the ground. Chainmen use them so points on the ground may be measured with a tape supported only at the ends.

Chainman using plumb bob to transfer measurement from tape to point on ground

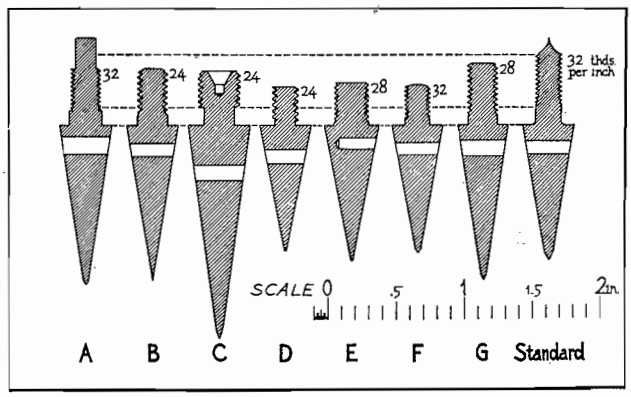
In normal use, plumb bob points are worn out, damaged, broken, and occasionally lost, and for these reasons require replacement. The point of a bob is commonly used as a scribe to mark a point on rock or concrete and this causes rapid wear in addition to the wear in normal use.

Headache for Engineers

Most bobs are marked with the name of the manufacturer or distributor but, as the bobs are made of brass, these names are often obliterated. When a surveyor wants a replacement point and can't identify the make of bob, which is usually the case, he must send a sample or trust to luck. As he wants to continue using the bob and can't spare the point for a sample, he likely will trust to luck. Probably the supplier will have to write a letter requesting identification by catalog number. The surveyor is unable to supply this information so the supplier must send samples from which the surveyor can choose a point to fit his bob. Even when the name of the distributor of the bob is known, there is no assurance that the points ordered will fit the bob, as one distributor has been known to supply bobs with three different points within a period of 10 years. All this trouble and delay increases the supplier's overhead and wastes the time of the surveyor.

Tentative Standard Proposed

A bob point must be accurate with all elements concentric with a straight axis and the threaded connection must hold the point concentric with the body of the bob. The point should also be readily replaceable without the use of any special tool and the threaded connection should be so machined that when normally installed,



Various replacement points of common American precision plumb bobs. The cross sections, accurately scaled from points purchased in the market, give graphic comparison of details such as sharp corners, size and number of threads, abrupt thread terminations, etc.

it will be secure against loss. The material from which the point is made should be hard enough to resist wear and deformation and at the same time tough enough to resist breaking.

To overcome the difficulty in obtaining replacement points for bobs and to develop a point satisfactory to all concerned, a committee of civil and mechanical engineers, manufacturers and distributors was formed. This committee has submitted a tentative standard to the National Bureau of Standards. Many American manufacturers are already producing replacement points conforming to their specifications. The tentative standard form, which the committee believes will meet all of the requirements, is shown in the accompanying drawing.

Major Nominal Diameter

The major nominal diameter of three-eighths inch was adopted because at least 90 percent of all plumb bob points manufactured at present are of this size. This size offers adequate protection to the bob and may be turned from ordinary commercial three-eighth-inch bar stock within the tolerances allowed.

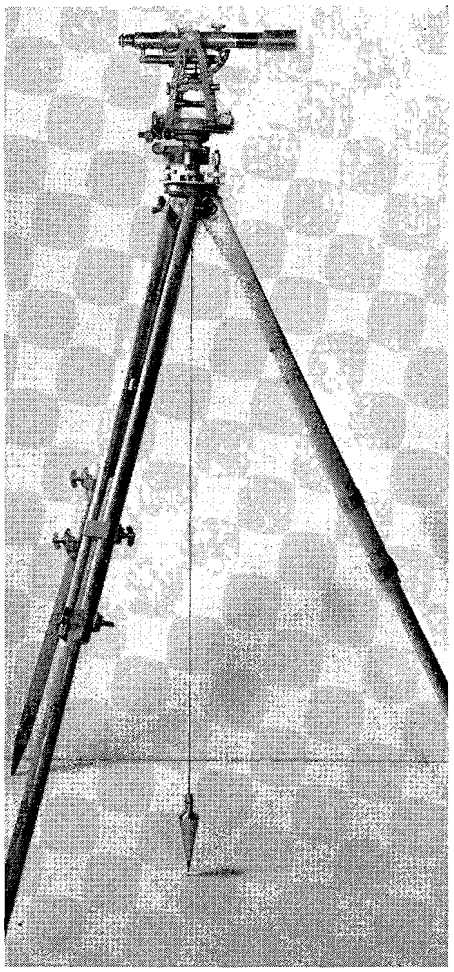
Nearly all high quality precision bobs follow a design which calls for a nominal 20 degrees included angle of cone. As the point taper should conform with the taper of the bob, this angle was chosen. The tolerance of one-half degree plus or minus allows a deviation of one degree and this accuracy can easily be maintained in manufacture.

The No. 40 drill hole is larger than generally used and will allow the use of more readily available pins or nails for removal or installation. The hole is drilled clear through as it is much easier to dig hardened mud from a clear hole than a blind hole.

Tips of Points Vary

The tips of bob points have varied a great deal according to the manufacturer. Some were needle points which easily became broken while others were very blunt and therefore lacked accuracy. The tip shown in the drawing was adopted after careful consideration of all factors.

The threaded connection is probably the most important part of the bob point and it is also the part which has varied the greatest in manufacture. It is this feature that has caused so much confusion and delay to surveyors and suppliers in obtaining replacements. The accompanying illustration shows seven common points and gives a good comparison with the tentative standard.



Plumb bob being used to center transit over survey point on ground

The 10-32 thread was chosen because it would impose the least hardship on both users and manufacturers. Many bobs have been made with this thread and have given satisfactory service for years. The several features were carefully considered to avoid concentration of stresses and facilitate manufacture. The preferred sharp cone-like termination is not required but will make it possible to test the point quickly by holding it lightly between the thumb and forefinger and spinning. If straight and concentric, it will rotate without vibration. The threaded hole in the bob will, of course, have to conform with the threaded connection on the point.

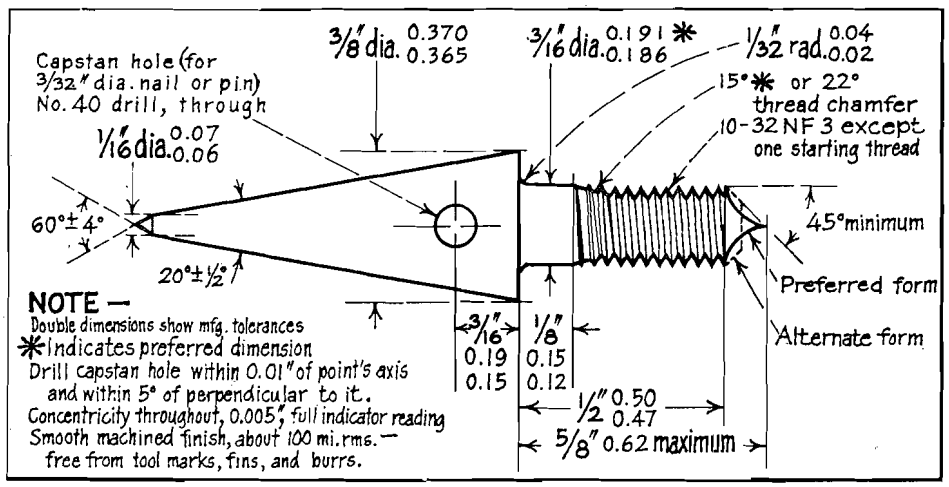
State Cooperates

As shown on the accompanying drawing, the point is to be finished smooth and free from tool marks. They may be plated with a suitable metal to make them rust-proof and when not so plated they should be coated with a wax-type rust inhibitor.

This tentative standard concerns itself with only the form of the bob point and does not presume to specify the type of material to be used. The Service and Supply Department of the California Division of Highways has cooperated with the Standardization Committee and has for some time specified that bobs furnished to the Divi-

. . . Continued on page 57

American Standard Point for precision plumb bobs.



Another Unit of Coast Highway Freeway Is Under Way

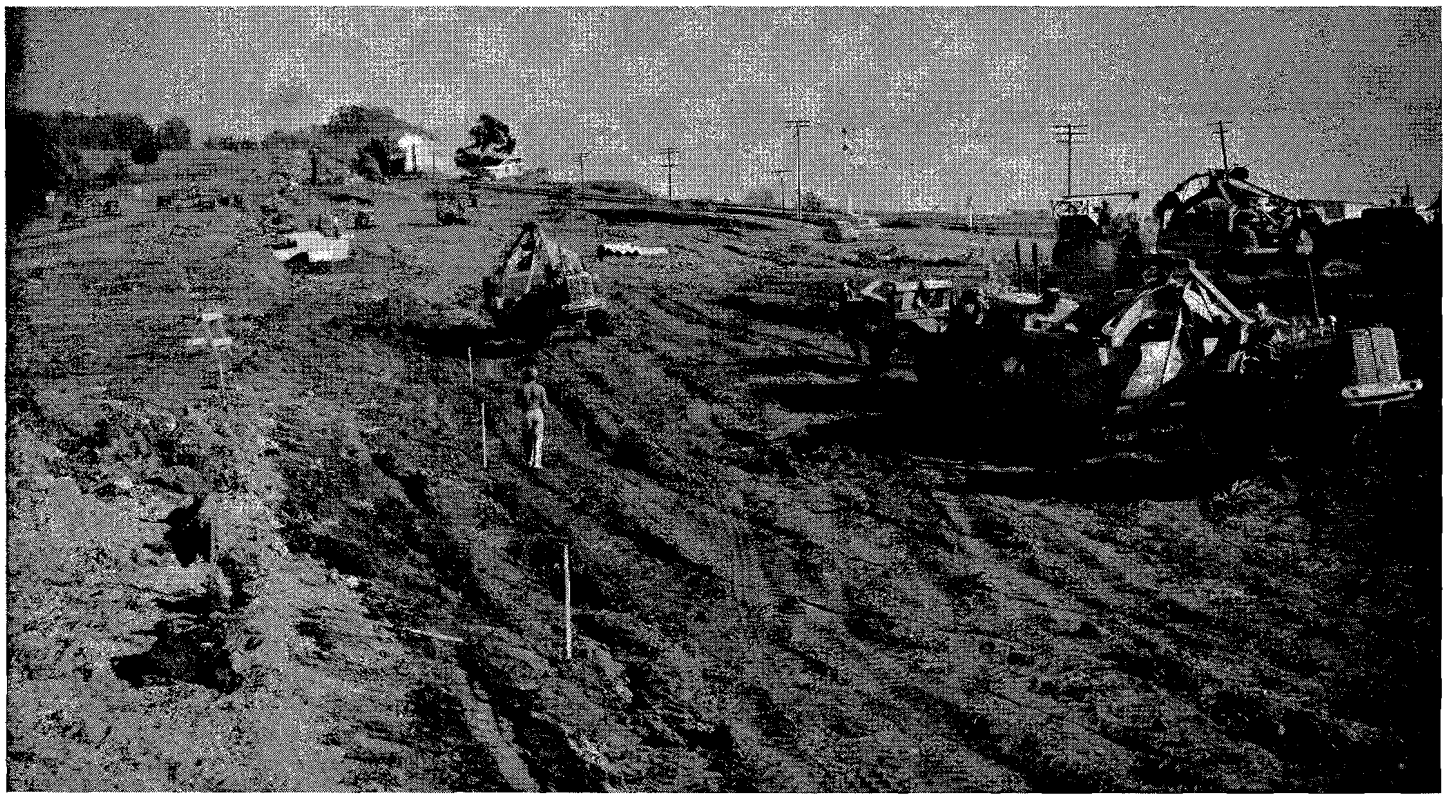
Contemplated four-lane divided expressway is being made apparent by construction now in progress on the Coast Highway, U. S. 101, in Santa Barbara County between one-half mile east of Arroyo Parida and Ortega Hill at Summerland.

This is the second of three units which will extend the initial expressway on the Coast Highway known as the Montecito Parkway, 9.7 miles to the Santa Barbara-Ventura County line.

concrete pedestrian undercrossing, grading roadbeds for a four-lane divided highway together with frontage roads, and paving with Portland cement concrete on cement treated subgrade and with plant-mixed surfacing on cement treated base. The amount of the contract for constructing this 3.7 miles of freeway is $1,135,000. Its completion is scheduled for the fall of 1952.

Preparation of plans is now in progress for the third unit from Carpinteria to one-half mile east of Arroyo

way with new lanes being constructed for northbound traffic, except through the towns of Carpinteria and Summerland. The expressway will be along new alignment to the north of the existing highway. Construction now in progress through Summerland is along the location between the present highway and the main coast line of the Southern Pacific Railroad Company, which borders on the Pacific Ocean. The present highway will become the outer highway serving the business



Heavy equipment engaged in construction at Summerland

Construction of the first unit of this project from the Ventura County line to Carpinteria, a length of 2.5 miles, was completed in October, 1950, at a cost of $690,000.

The current contract was awarded to the Griffith Construction Company of Los Angeles on August 10, 1951. This contract includes the construction of three reinforced concrete flat-slab type bridges and a reinforced

Parida and from Ortega Hill to Sheffield Drive, a net length of 3.5 miles. Funds for acquisition of the rights of way on this unit have been programed for the 1952-53 Fiscal Year. Subsequent construction will have to wait until additional funds can be budgeted.

The existing roadway will serve as the southbound lanes of the expressway

section fronting on it and the adjacent residential area.

A pedestrian undercrossing is being constructed at Hollister Street to provide a crossing of the expressway for the pedestrian traffic between the town and the adjacent beach. This beach area, which was the site of one of California's early oil fields, is being rehabilitated and developed as a recreational area by the County of Santa Barbara.

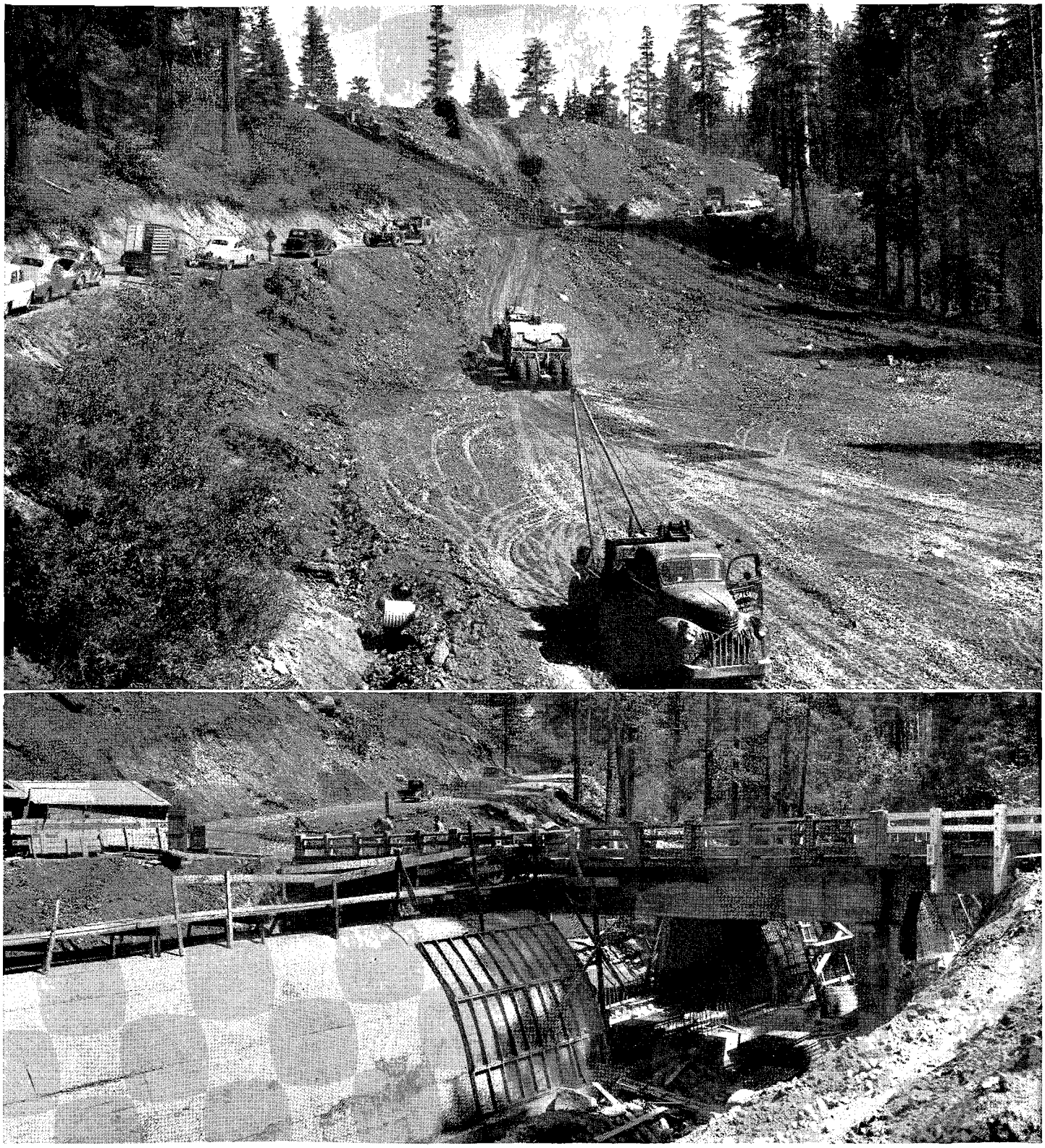
Hatchet Mountain

Continued from page 49 . . .

carryalls in one of the cuts had to be pushed downhill for the greater portion of the excavation of that cut.

The pictures show the improvement over the years in highways over Hatchet Mountain and the bridge that was eliminated by the present project.

The work was done under contract by Eaton & Smith of San Francisco for the Division of Highways, District II, J. W. Trask, District Engineer. The author was resident engineer under the supervision of H. Clyde Amesbury, District Construction Engineer.



Construction on Hatchet Mountain section of U. S. 299

AASHO Defines Aims In Resolutions

In accordance with past practice, *California Highways and Public Works* publishes the resolutions adopted at the annual meeting of the American Association of State Highway Officials which was held this year in Omaha, Nebraska, October 23-26.

The resolutions:

RESOLUTION NO. 1

Allocation of Critical Materials for Highways

WHEREAS, The members of the American Association of State Highway Officials realize their responsibility to national defense, civil defense, and the over-all welfare and national economy, and therefore feel that preservation of an adequate highway system is imperative; and

WHEREAS, Due to the prewar depression and the World War II restrictions on highway construction, the highway facilities have been found to be seriously depleted and continuous rehabilitation and reconstruction is essential if the Nation is to maintain an economy to support the national defense effort; and

WHEREAS, The states in cooperation with the Bureau of Public Roads have determined their needs and are the recognized authority on such needs; and

WHEREAS, The deficiency of the highway plant which provides service for over 50,000,000 motor vehicles has been materially aggravated by unusually severe curtailment of critical materials, principally steel products, almost to the point of paralyzing this essential system; therefore, be it

Resolved, by the American Association of State Highway Officials, in annual meeting assembled in Omaha, Nebraska, October 23-26, 1951, that: (1) the essentiality of highways be given proper recognition by increasing the allotment of steel for highway purposes to at least 2 percent of the total national production to meet the demands of vital traffic upon the highways of the Nation; (2) that this association voices complete confidence and satisfaction in the work of the Bureau of Public Roads as claimant agency, and requests that this bureau continue to function in that capacity notwithstanding the untenable conditions which have resulted from the curtailment of allotment of critical materials; and (3) since highway equipment is now being classified in a low position of priority in relation to other equipment, it is urged that the classification of such equipment be raised to its proper relationship of importance for maintaining the national defense and national economy; and be it further

Resolved, That the recommendation of Thomas H. MacDonald, Commissioner of the Bureau of Public Roads of the United States, that highways be reclassified as an industrial facility which is recorded on page 113 in the Report of Hearings, September 6 and 7, 1951, before a subcommittee of the Committee on Public Works of the United States Senate, entitled "Steel Allocation for Highways" is hereby endorsed and supported; and be it further

Resolved, That the public be advised why necessary critical materials are not forthcoming for carrying on this essential rehabilitation of our highway systems in the interest of national defense, and in view of the fact that an appropriate resolution has already been introduced into the Congress on the subject of adequate critical materials for highways, it is suggested that the Congress of the United States, through whatever channels it may deem appropriate, explore the situation to the end that a satisfactory result may be forthcoming.

RESOLUTION NO. 2

Resolution opposing the granting of authority to common carriers for the hauling of explosives over the public highways.

WHEREAS, There is pending before the Interstate Commerce Commission of the United States applications of more than 50 trucking companies which now engage in transporting various commodities and which now seek authority to engage in the business of transporting dangerous explosives, ammunition, and component parts thereof over the highways of the several states; and

WHEREAS, Before authority may be granted the Interstate Commerce Commission must decide from the evidence that the public convenience and necessity requires the proposed operation and that the transportation of explosives is in the public interest and would not endanger the public safety; and

WHEREAS, Extreme hazard is inherent in the handling and transporting of dangerous explosives under any circumstances and could endanger irreplaceable highway facilities such as major bridges and vehicle tunnels; and

WHEREAS, The states and their political subdivisions are responsible for the safety of the public in the use of highway facilities; and

WHEREAS, The injection of increased quantities of dangerous explosives into the stream of traffic on our already congested streets and highways, far too many of which are

STATE HIGHWAY ENGINEER McCOY HONORED BY AASHO

State Highway Engineer George T. McCoy returned from the annual convention of the American Association of State Highway Officials held this year in Omaha with a new engineering honor.

McCoy was elected a member of the executive committee of the AASHO to succeed the late Charles H. Purcell, who died suddenly last September 7th. Mr. Purcell had been a member of the executive committee for 21 years. He retired as California Director of Public Works on July 31, 1951.

When Purcell was appointed by Governor Warren to be Director of Public Works in January, 1943, McCoy succeeded him as State Highway Engineer.

deteriorated and obsolete, could conceivably accelerate the mounting total of traffic accidents; and

WHEREAS, The national welfare may require under some circumstances the movement of dangerous explosives over the public highways, all available facts should be carefully weighed to assure that the need to be met is commensurate with the risk involved; therefore, be it

Resolved, that the American Association of State Highway Officials, assembled in annual meeting at Omaha, Nebraska, October 23-26, 1951, Recognizing the highway departments' responsibilities for furnishing efficient highway facilities for the Nation's civilian and defense needs, and the further responsibility of safeguarding these vital facilities from accidental damage or destruction, does vigorously oppose the granting of continuing authority requested in the pending applications of the trucking companies to transport dangerous explosives, ammunition, and component parts thereof promiscuously over the streets and highways of the several states.

RESOLUTION NO. 3
Impact of Water Resources

WHEREAS, The President's Water Resources Policy Commission has recommended that federal and state water resources and highway development agencies should coordinate their efforts from the earliest stages of water project planning; and

WHEREAS, It appears that such coordination of effort is in the public interest and already has been started; and

WHEREAS, It appears that such coordination cannot be continued effectively unless information is prepared to show the impact of such projects upon highway development; therefore, be it

Resolved, that the American Association of State Highway Officials, in annual meeting assembled in Omaha, Nebraska, October 23-26, 1951, acting through its committees and through the administrative actions of the respective highway authorities, Take the appropriate steps to further the coordination of water resources projects and highway development as the public interest requires; and be it further

Resolved, That the association take such action as may be necessary in securing the enactment of legislation authorizing and directing the preparation and evaluation, on a nation-wide basis, of information showing the impact of water resources projects upon highway transportation and development, including data relating to the over-all effect of (1) horizontal and vertical navigation clearance requirements for highway bridges, (2) dam and reservoir construction, and (3) withdrawal of public lands for future power development.

RESOLUTION NO. 4
Scrap Drive

WHEREAS, The Undersecretary of Commerce for Transportation and the Commissioner of the Bureau of Public Roads, in addressing the annual meeting of the American Association of State Highway Officials, stated that the need for ferrous and nonferrous scrap materials may affect defense production; therefore, be it

Resolved, that the American Association of State Highway Officials, in annual meeting assembled in Omaha, Nebraska, October 23-26, Take the following action through the several member departments: that an immediate survey be undertaken by all state, county, and city highway departments to estimate the approximate tonnage of ferrous and nonferrous scrap available within the departmental operations and to encourage the flow of dormant scrap into processing channels and report this activity to the Bureau of Public Roads.

RESOLUTION NO. 5
In Appreciation of the Services of President J. A. Anderson

In appreciation of the many years of outstanding service rendered to this association in serving on various committees of the association, and as a member of the executive committee, as vice president, and as president for the past year, during which time he has guided the association by his sound judgment, ability and dynamic energy; therefore, be it

Resolved, by the American Association of State Highway Officials in meeting assembled in Omaha, Nebraska, October 23-26, 1951, That this association hereby expresses its appreciation for a job magnificently done and extends its sincere thanks to him on the occasion of his retirement from the high office of president of the association.

RESOLUTION NO. 6
Appreciation and Thanks

WHEREAS, the thirty-seventh annual meeting of the American Association of State Highway Officials, held in Omaha, Nebraska, October 23-26, 1951, has been in all respects an outstanding success; and

WHEREAS, This success has sprung from the splendid hospitality and cooperation of the people of Nebraska who have spared no effort or service to make this a happy and profitable visit and meeting; therefore, be it

Resolved, that the American Association of State Highway Officials in meeting assembled in Omaha, Nebraska, October 23-26, 1951, Does hereby express its sincere thanks and appreciation for the warm welcome and the courtesies extended by His Excellency, Val Peterson, Governor of the great State of Nebraska, the Nebraska State Highway Department, the City of Omaha, the Omaha Chamber of Commerce, Boys Town, and all others who have contributed so unsparingly of their time and effort to make this meeting an outstanding success.

Plumb Bob Points

Continued from page 53 . . .

sion of Highways shall have points conforming to the tentative standards.

The Service and Supply Department intends to go further by preparing specifications for the whole plumb bob so that not only the form of the point is standardized but also the bob itself and the cap and all materials used in the manufacture. The specifications for the bob will probably be broad enough to include the form of practically all precision bobs now manufactured but the form of the cap and threaded end will be specified to close tolerances.

(The author is grateful to the American Congress of Surveying and Mapping for their permission to use portions of the article "A Standardized Point for Precision Plumb Bobs" which appeared in the January-March, 1950, issue of Surveying and Mapping.*)*

Traffic Engineering

Continued from page 10 . . .

An attempt is being made to find some method of correlating traffic volumes or turning movements with accident rates, and also to establish a sound warrant for separation of grades. Approximately 180 intersections are included in this study.

Another research project which is closely related to the first is a study of accidents and volumes at signalized intersections on all types of roads and streets. This involves the detailed study of operation of approximately 280 intersections.

Still another study under way covers the proper detector spacing for traffic-actuated signals on high speed expressways. This involves detailed observation and analysis of traffic behavior and delay at one intersection with detectors at several locations in advance of the actual intersection.

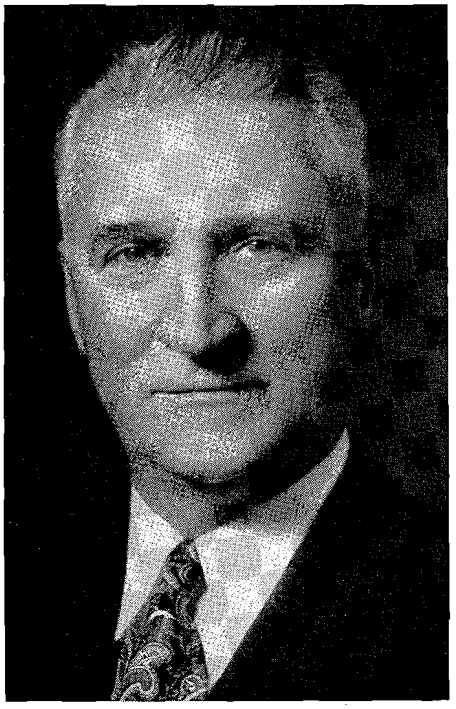
Past Achievements

During the past several years a number of traffic research projects have been undertaken and completed. Some of these were made for departmental use only, while others have been published and given wide circulation. An example of the latter type was a study of truck turns. In this study, made on an abandoned airport, maximum legal commercial vehicles were put through various maneuvers in order to measure the shape and width of the wheel paths, particularly on sharp turns. This truck path study apparently filled a long felt need, since requests have been received for it from all parts of the world. The information developed therein has been adopted by the division, and all new designs are now based thereon.

A study was made of all accidents on all divided highways in the State in order to determine the relation of type and width of median strips to accident rates.

. . . *Continued on page 64*

J. E. O'Neill Is Elected Head of AAA



J. E. O'NEILL

J. E. O'NEILL of Fresno was elected president of the nation-wide American Automobile Association at the AAA annual meeting in Kansas City, Missouri, of which he is a director and past president.

O'Neill takes over the leadership of the AAA's 3,500,000 members in the United States and Canada, following years of civic service to the cause of motoring, traffic safety and highway development. He is active in civic affairs in the San Joaquin Valley where he has extensive cotton, cattle and agricultural interests. He is Vice President of the Producers Cotton Oil Company, one of the largest firms in the cotton business in California. He is also President of the Twenty-first Agricultural District which stages the Fresno District Fair and a director and past president of the California State Automobile Association.

Powdered Rubber

Continued from page 6 . . .

An inspection of the pavement made in February, 1951, and again in August, 1951, showed no apparent difference between the experimental section containing rubber and the rest of the job without the addition of rubber. (*See Figures 6, 7, 8, 9*). Undoubtedly, it will be some time before final conclusions can be drawn concerning the relative merits of the rubber-treated sections.

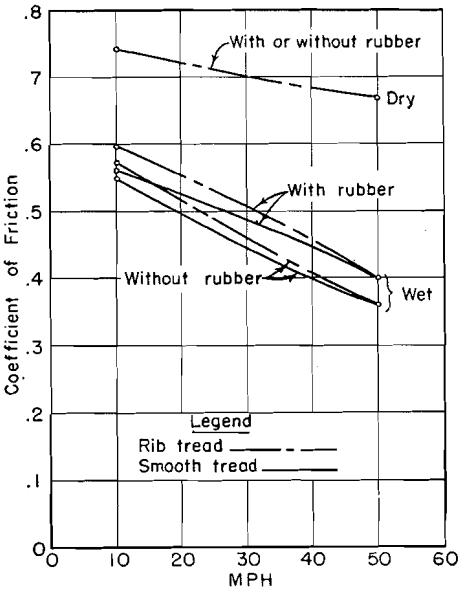


FIG. 13—Effect of rubber admixture on friction values of surfaces. April, 1951.

The construction of the experimental section was initiated by R. M. Gillis, Deputy State Highway Engineer, with the installation to be under the general direction of F. N. Hveem and T. E. Stanton of the Materials and Research Department. The project is located in Highway District III of which C. H. Whitmore is District Engineer. F. D. Hillebrand was Resident Engineer on the project and he and his assistants cooperated to the fullest extent. Fredrickson Bros. was the contractor. The writer was present as a laboratory representative during the placing of the experimental mixture.

MANNERLY DRIVING

Whenever there's a question of who has the right of way, let courtesy be your guide.

HIGHWAY BIDS AND AWARDS

October, 1951

ALAMEDA COUNTY—On Eastshore Freeway between Route 105 (Jackson Street) and Lewelling Boulevard, about 3.9 miles to be graded and paved with Portland cement concrete and plant-mixed surfacing and highway separation structures to be constructed. District IV, Route 69, Section D, Hay., C. Erickson, Phillips & Weisberg, Gordon Ball and San Ramon Valley Land Co., Ball & Simpson, Berkeley, $2,760,098; United Concrete Pipe Corp., Baldwin Park, $2,957,531; Parish Bros., Benicia, $3,116,517; Guy F. Atkinson Co., South San Francisco, $3,152,593. Contract awarded to Fredrickson & Watson Construction Co. and M & K Corp., Oakland, $2,551,228.

ALAMEDA COUNTY—Pumping system at Folger Avenue underpass in Berkeley to be revised. District IV, Route 206. Martin Murphy, Walnut Creek, $9,849; McGuire & Hester, Oakland, $9,870; S & Q Construction Co., San Francisco, $10,858; J. Henry Harris, Berkeley, $12,594. Contract awarded to C. Norman Peterson, Berkeley, $8,264.

AMADOR AND CALAVERAS COUNTIES—Across Mokelumne River about four miles south of Jackson, a reinforced concrete box girder bridge to be constructed. District X, Route 65, Sections C, A. Erickson, Phillips & Weisberg, Oakland, $137,655; Charles MacClosky Co., San Francisco, $166,645; Lefever & Bing, West Sacramento, $174,015; Nomellini Construction Co., Stockton, $177,272; Thomas Construction Co., Fresno, $179,252. Contract awarded to Tumblin Company, Bakersfield, $132,905.

ALAMEDA COUNTY—Between the south city limits of Oakland and Alvarado Street, about 1.9 miles net length, a portion to be graded and surfaced with plant-mixed surfacing on crusher run base and a portion to be widened with plantmixed surfacing on crushed rock base and resurfaced with plant-mixed surfacing. District IV, Route 226. Independent Construction Co., Oakland, $204,874; Fredrickson & Watson Construction Co. and M & K Corp., Oakland, $211,477. Contract awarded to Lee J. Immel, San Pablo, $187,351.

CONTRA COSTA COUNTY — Between 3.5 miles south of Danville and Concord, portions about 3.6 miles in length, of roadway to be graded, subbase and base to be constructed and surfaced with plant-mixed surfacing. District IV, Routes 107, 75, Sections A, WLC, B. Lee J. Immel, San Pablo, $352,570; Harms Bros., Sacramento, $379,584; J. Henry Harris, Berkeley, $385,851. Contract awarded to J. R. Armstrong, El Cerrito, $321,818.

FRESNO COUNTY—Between 5.8 miles south of Merced County line and 0.8 mile north of Mendota, portions extending over about 14.7 miles in gross length to be graded, surfaced with plant-mixed surfacing on cement treated base, drainage structures to be extended or replaced, and existing bridge to be widened. District VI, Route 41, Sections M, N. Baun Construction Co., Fresno, $105,512. Volpa Brothers, Fresno, $109,409. Louis Biasotti & Son, Stockton; $110,924; M. J. Ruddy & Son, Modesto, $114,442. Contract awarded to Thomas Construction Co., Fresno, $103,662.

IMPERIAL COUNTY—Across New River at Seeley a steel stringer bridge to be constructed and approaches to be graded and surfaced. District XI, Route 12, Section C. R. M. Price Co., Altadena, $345,855; Norman I. Fadel, North Hollywood, $379,295; K. B. Nicholas, Ontario, $384,312. Contract awarded to R. P. Shea, Indio, $343,507.

LOS ANGELES COUNTY—On Harbor Freeway at 7th, 8th, and 9th Streets in the City of Los Angeles, six reinforced concrete box girder and slab bridges to be constructed and city streets to be graded and paved. District VII, Route 165. Charles MacClosky Co., San Francisco, $1,218,947; J. E. Haddock, Ltd., Pasadena, $1,227,409; Granite Construction Co., Watsonville, $1,231,091; Webb & White, Los Angeles, $1,236,402; MacDonald & Kruse and K. B. Nicholas, Sun Valley, $1,237.222; Bongiovanni Construction Co., Los Angeles $1,238,600; United Concrete Pipe Corp., Baldwin Park, $1,248,710; W. J. Disteli and R. J. Daum Construction Co., Los Angeles, $1,333,069; Winston Bros. Co., Monrovia, $1,396,741. Contract awarded to Oberg Bros. Construction Co., Inglewood, $1,160,099.

LOS ANGELES COUNTY—On Hawthorne Avenue between 174th Street and 137th Street, about 2.5 miles, to be graded and surfaced with plant-mixed surfacing. District VII, Route 164. Vido Kovacevich Co., South Gate, $533,281; M. S. Mecham & Sons, South Gate, $535,968; Arthur A. Johnson, Laguna Beach, $553,045; Griffith Co., Los Angeles, $597,637; J. A. Thompson & Son, Inglewood, $598,253; J. L. Haddock, Ltd., Pasadena, $604,825; Tomei Construction Co., Van Nuys, $609,302; Boddum & Peterson, Long Beach, $609,940; Warren Southwest Inc., Torrance, $626,642; Dimmitt & Taylor, Monrovia, $653,915. Contract awarded to Oswald Bros. Co., Los Angeles, $526,731.

LOS ANGELES COUNTY—On Santa Ana Freeway, between Todd Avenue and Lakewood Boulevard, highway lighting, illuminated sign and traffic signal systems to be furnished and installed. District VII, Route 166, Section A. Westates Electrical Construction Co., Los Angeles, $118,986; Electric & Machinery Service Inc., South Gate, $119,720; C. D. Draucker Inc., Los Angeles, $121,654. Contract awarded to Fischbach & Moore Inc., Los Angeles, $114,464.

MARIPOSA COUNTY—Between 1.9 miles north of Mariposa and Acorn Inn, about 3.3 miles to be surfaced with plant-mixed surfacing on untreated rock base and seal coats applied. District X, Route 18, Section D. Piombo Construction Co., San Francisco, $489,521. Contract awarded to Eaton & Smith, San Francisco, $454,886.

RIVERSIDE COUNTY—Between 10 and 36 miles west of Blythe, 19 timber bridges to be redecked with reinforced concrete slabs. District XI, Route 64, Sections C, D. Laredon Construction Co., Los Angeles, $68,100; E & J Corporation, Beverly Hills, $79,625; E. S. & N. S. Johnson, Fullerton, $79,731. Contract awarded to Norman I. Fadel, North Hollywood, $66,057.

RIVERSIDE COUNTY—At Cienega Rincon Creek, about 0.6 mile east of Aguanga, a reinforced concrete culvert to be constructed. District VIII, Route 78, Section A. E. L. Yeager Co., Riverside, $24,797; Laredon Construction Co., Los Angeles, $26,008; C. B. Tuttle Co., Long Beach, $26,024. Contract awarded to H. R. Breeden, Compton, $19,221.

RIVERSIDE COUNTY—Between Antelope Road and Route 64, about 10.5 miles to be graded, imported base material to be placed and a portion to be cement treated and surfaced with plant-mixed surfacing. District VIII, Route 78, Section C. George Herz & Co. and C. G. Willis & Sons, Inc., Los Angeles, $839,925; A. Teichert & Son, Inc., Sacramento, $1,097,393. Contract awarded to E. L. Yeager Co., Riverside, $729,505.

SAN BERNARDINO COUNTY—Between Barstow and Amboy, 48 timber trestle bridges to be redecked with reinforced concrete slabs, plank floors and plant mixed surfacing. District VIII, Route 58, Sections F, G, H, J. Norman I. Fadel, North Hollywood, $211,994; E. S. & N. S. Johnson, Fullerton, $215,022; K. B. Nicholas, Ontario, $216,194; Geo. Herz & Co., San Bernardino, $232,995; R. M. Price Co., Altadena, $277,989. Contract awarded to C. B. Tuttle Co., Long Beach, $192,881.

SAN BERNARDINO COUNTY—Between Barstow and Baker, 30 timber trestle bridges to be redecked with reinforced concrete slabs, plank floors and plant-mixed surfacing. District VIII, Route 31, Sections G, H, J. K. Thomas Construction Co., Fresno, $127,053; E. S. & N. S. Johnson, Fullerton, $131,130; George Herz & Co., San Bernardino, $135,099; E. G. Perham, Los Angeles, $151,576. Contract awarded to Norman I. Fadel, North Hollywood, $125,311.

SAN JOAQUIN COUNTY—Across Paradise Cut Overflow, about 6.7 miles east of Tracy, a reinforced concrete slab bridge to be constructed and approaches to be graded and paved with Portland cement concrete on untreated rock base. District X, Route 5, Section B. Erickson, Phillips & Weisberg, Oakland, $181,644; John Delphia, Patterson, $187,269; H. W. Ruby, Sacramento, $191,259; Dan Caputo, San Jose, $196,547; Charles MacClosky Co., San Francisco, $198,744. Contract awarded to Nomellini Construction Co., Stockton, $178,089.

SAN JOAQUIN COUNTY—At three locations between 1.3 miles east of Manteca and 4.5 miles east of Manteca, an existing reinforced concrete bridge to be widened, two reinforced concrete pipe siphons to be installed, and about 0.2 mile of roadway to be graded and surfaced with plant-mixed surfacing on untreated rock base. District X, Route 66, Section B. Thomas Construction Co., Fresno, $31,866; M. J. B. Construction Co., Stockton, $38,303; Lefever & Bing, West Sacramento, $44,852. Contract awarded to M. J. Ruddy & Son, Modesto, $28,481.

SAN JOAQUIN COUNTY—Installing illumination fixtures at District X Office annexes. R. Goold & Son, Stockton, $3,075; Ets-Hokin & Galvan, Stockton, $3,493; Curtis Electric Co., Stockton, $3,733. Contract awarded to Grider Electric Co., Stockton, $2,750.

SAN LUIS OBISPO COUNTY—Across Los Berros Creek, about 2 miles southwest of Arroyo Grande, a reinforced concrete slab bridge to be constructed and about 0.1 mile of approaches to be graded, surfaced with plant-mixed surfacing on imported base material and seal coats applied. District V, Route 56, Section E. Thomas Construction Co., Fresno, $50,418; Madonna Construction Co., San Luis Obispo, $52,400; Laredon Construction Co., Los Angeles, $53,216; Ted Schwartz, Grass Valley, $53,985; Valley Paving & Construction Co., Inc., Pismo Beach, $55,686; Granite Construction Co., Watsonville, $59,397. Contract awarded to B. S. McElderry, Berkeley, $48,805.

SOLANO COUNTY—At the west and east entrances to Vacaville, at Davis Street, and at the Mason Street overhead, highway lighting systems to be furnished and installed. District X, Route 7, Sections C, Vac, D. Hall Sloat Electric Co., Inc., Oakland, $14,776; R. Goold & Son, Stockton, $15,880; Howard Electric Co., Gilroy, $19,865. Contract awarded to L. H. Leonardi Electric Construction Co., San Rafael, $13,990.

STANISLAUS COUNTY—Between the north city limits of Turlock and 0.6 mile northwesterly, about 0.6 mile, widening existing roadbed, constructing untreated rock base, placing plant-mixed surfacing, and constructing pumping plant. District X, Route 4, Section A. Baun Construction Co., Fresno, $152,747; M. J. Ruddy & Son, Modesto, $167,374. Contract awarded to United Concrete Pipe Corp., Baldwin Park, $145,913.

STANISLAUS COUNTY—In Turlock State Park, about 8 miles west of La Grange, about 1.7 miles in net length, roads to be graded and penetration treatment applied. District X. Oilfields Trucking Co. and Phoenix Construction Co. Inc., Bakersfield, $19,319; Louis Biasotti & Son, Stockton, $29,805; R. C. Downer, Reno, $30,082; Lefever & Bing, West Sacramento, $31,475; M. Ritchie, Fresno, $39,064; J. Henry Harris, Berkeley, $53,816. Contract awarded to M. J. Ruddy & Son, Modesto, $15,659.

TUOLUMNE COUNTY—In Columbia State Park, parking area and service road to be graded, surfaced with imported base material and bituminous surface treatment and seal coat applied. District X. R. E. Maxwell, Jr., Sonora, $19,697; Beerman & Jones, Sonora, $21,744; Lefever & Bing, West Sacramento, $22.090. Contract awarded to Geo. E. France, Inc., Visalia, $15,385.

YOLO COUNTY—On West Sacramento Freeway, between Yolo Causeway and 0.8 mile west of Tower Bridge, about 3.3 miles of roadbed for a four-lane divided highway to be graded. District III, Route 6, Section C. A. Teichert & Son, Inc., Sacramento, $647,096; M. J. B. Construction Co., Stockton, $673,885; Brighton Sand & Gravel Co. and Parish Bros., Sacramento, $690,972; Gordon Ball, San Ramon Valley Land Co. and Harms Bros., Berkeley, $706,876; H. Earl Parker, Inc., Marysville, $793,444; Fredrickson & Watson Construction Co., Oakland, $812,262. Contract awarded to United Concrete Pipe Corporation, Baldwin Park, $646,206.

F. A. S. County Routes

SOLANO COUNTY—On Broadway, between Nebraska Street and 1.2 miles north, to be graded and surfaced with plant-mixed surfacing on untreated rock base. District X, Route 1101. J. Henry Harris, Berkeley, $235,366; Parish Bros., Benicia, $235,330. Contract awarded to A. G. Raisch Co., San Rafael, $212,591.

November, 1951

FRESNO COUNTY—Between Selma and Fowler, about 3.6 miles of frontage roads with cross-overs and road connections to be graded and untreated rock base to be placed and surfaced with plant-mixed surfacing. District VI, Route 4, Section A. Paul E. Woof, Fresno, $111,513; Volpa Brothers, Fresno, $113,487; Griffith Company, Los Angeles, $123,861. Contract awarded to Baun Construction Company, Fresno, $101,048.

IMPERIAL COUNTY—Across Tesla Ditch, about 7.3 miles south of Riverside County line, a reinforced concrete slab bridge to be constructed. District XI, Route 26, Section E. Norman I. Fadel, North Hollywood, $24,046; Thomas Construction Co., Fresno, $24,234; J. E. Haddock, Ltd., Pasadena, $24,423; E. S. & N. S. Johnson, Fullerton, $25,933; C. B. Tuttle Co., Long Beach, $26,034; Walter H. Barber, La Mesa, $26,514; Byerts & Sons, Los Angeles, $28,610; E. L. Yeager Co., Riverside, $29,183; Webb & White, Los Angeles, $29,946; R. P. Shea Co., Indio, $33,801. Contract awarded to E. G. Perham, Los Angeles, $20,787.

KERN COUNTY—Between 0.5 mile south of Isabella and three miles west of Weldon, about eight miles to be graded and surfaced with imported base material with the upper portion bituminous surface treated. District VI, Route 57 Section I. Dimmitt and Taylor, Monrovia, $796,214; Richter Bros., Oroville, $808,826; A. Teichert & Son, Inc., Sacramento, $837,749; Eaton & Smith, San Francisco, $843,003; United Concrete Pipe Corp., Baldwin Park, $844,419; Fredrickson & Watson Construction Co., Oakland, $868,868; Ralph A. Bell Monrovia, $886,482. Contract awarded to Ball & Simpson, Berkeley, $762,411.45.

LOS ANGELES COUNTY—Over Ramona Freeway and Pacific Electric Railway tracks, at Campbell Avenue in the City of Alhambra, a structural steel and reinforced concrete bridge for pedestrian overcrossing to be constructed. District VII, Route 26. E & J Corp., Beverly Hills, $79,670; W. J. Disteli, Los Angeles, $81,121; J. E. Haddock, Ltd., Pasadena, $86,145; K. B. Nicholas, Ontario, $88,600; Gardner & McCall, Long Beach, $89,169; N. M. Saliba Co., Los Angeles, $94,476; O. B. Pierson, Bellflower, $95,023; Byerts & Sons & Geo. K. Thatcher, Los Angeles, $98,772; E. S. & N. S. Johnson, Fullerton, $99,691. Contract awarded to Griffith Co., Los Angeles, $74,923.

RIVERSIDE COUNTY — City of Corona, on Sixth Street at West Grand Boulevard and at East Grand Boulevard, traffic signal systems and highway lighting to be furnished and installed. District VIII, Route 43. Paul R. Gardner, Ontario, $9,810; Fischbach & Moore, Inc., Los Angeles, $11,787; Electric & Machinery Service, Inc., South Gate, $12,957; Westates Electrical Construction Co., Los Angeles, $13,248; C. D. Draucker, Inc., Los Angeles, $13,492. Contract awarded to Ed Seymour, Long Beach, $9,797.

RIVERSIDE COUNTY — At Alessandro Boulevard, traffic signal system and highway lighting to be furnished and installed. District VIII, Route 78, Section D. Paul R. Gardner, Ontario, $12,920; Electric & Machinery Service, Inc., South Gate, $13,504; Westates Electrical Construction Co., Los Angeles, $14,671. Contract awarded to Fischbach & Moore, Inc., Los Angeles, $12,872.

SACRAMENTO COUNTY—Under the tracks of the Southern Pacific Company on J Street and over J Street, in the City of Sacramento, an underpass and a bridge to be constructed and about one-fourth mile of city streets to be rough graded. District III. A. Teichert & Son, Inc., Sacramento, $354,169; United Concrete Pipe Corp., Baldwin Park, $366,709; John C. Gist, Sacramento, $394,729; George Pollock Co., Sacramento, $429,480. Contract awarded to Lord & Bishop, Sacramento, $349,825.50.

SACRAMENTO COUNTY—At Twin Oaks Avenue about 0.2 mile south of the Placer County line, for widening with plant-mixed surfacing on plant-mixed cement treated base. District III, Route 3, Section A. Contract awarded to McGillivray Construction Co., Sacramento, $16,653.90.

SANTA BARBARA COUNTY—At the west city limits of Lompoc, at Miguelito Channel, a reinforced concrete box culvert to be constructed, and a graded roadbed to be constructed and surfaced with plant-mixed surfacing. District V, Route 149, Seciton A. Owl Truck & Construction Co., Compton, $12,748; Valley Paving & Construction Co., Inc., Pismo Beach, $14,333; Madonna Construction Co., San Luis Obispo, $14,960; O. B. Pierson, Bellflower, $15,177; E. S. & N. S. Johnson, Fullerton, $16,700; Thomas Construction Co., Fresno, $16,840; B. S. McElderry, Berkeley, $21,325. Contract awarded to Laredon Construction Co., Los Angeles, $10,198.

SANTA BARBARA COUNTY—In Montecito, at the intersections of Coast Highway with San Ysidro Road (Eucalyptus Lane) and with Olive Mill Road, full traffic-actuated signal systems and highway lighting to be furnished and installed and channelization to be constructed. District V, Route 2, Section J. Electric and Machinery Service, Inc., South Gate, $35,174; Fischbach & Moore, Inc., Los Angeles, $35,686; Howard Electric Co., Gilroy, $36,373. Contract awarded to Westates Electrical Construction Co., Los Angeles, $34,174.25.

SOLANO COUNTY—One mile north of Cordelia Underpass, state-furnished truck-weighing scales to be installed, scale houses and truck height indicators to be constructed, electrical lighting and signal systems to be furnished and installed at two locations. District X, Route 7, Section B. Pike & Hill, Carey Bros. & Bailey, San Rafael, $22,656; Morrison Construction Co., Oakland, $26,397; Chittenden & Chittenden & Clemons, Auburn, $28,580. Contract awarded to Baldwin, Straub Corp., San Rafael, $21,902.50.

TEHAMA COUNTY—At various locations between Deer Creek Overflow and Mill Race Creek, 14 reinforced concrete bridges to be widened and about 0.3 mile of roadway to be widened and existing pavement to be resurfaced with plant-mixed surfacing. District II, Route 3, Sections A,D. O'Connor Bros., Red Bluff, $718,907; Fredrickson & Watson Construction Co., Oakland, $995,814. Contract awarded to Erickson, Phillips & Weisberg, Oakland, $548,512.

YOLO COUNTY—Between Washington Underpass and Tower Bridge about 0.6 mile of roadbed to be graded and drainage structures to be constructed. District III, Route 6, Section C. United Concrete Pipe Corp., Baldwin Park, $27,796; A. Teichert & Son, Inc., Sacramento, $38,960. Contract awarded to Brighton Sand & Gravel Co., Sacramento, $26,887.80.

F. A. S. County Routes

FRESNO AND MADERA COUNTIES—Across San Joaquin River at Friant, a reinforced concrete girder bridge supported on concrete framed bents to be constructed. District VI, Route 560. E. S. & N. S. Johnson, Fullerton, $85,842; Ted Schwartz, Grass Valley, $86,985; Lefever & Bing, West Sacramento, $92,429; Bos Construction Co., Oakland, $92,474; Trewhitt-Shields & Fisher, Fresno, $94,620; James H. McFarland, San Francisco, $107,556. Contract awarded to Thomas Construction Co., Fresno, $75,066.

SAN LUIS OBISPO COUNTY—On Calf Cayon-Huer Huero Road between 3.2 miles west of Huero Huero-La Panza Road and Creston-Highland Road, about three miles to be graded. District V, Route 676. Valley Paving & Construction Co., Inc., Pismo Beach, $87,863; M. J. B. Construction Co., Stockton, $91,133; Henry C. Dalessi, San Luis Obispo, $91,816; John Delphia, Patterson, $92,233; Gerald E. Brewster, Avenal, $92,954; Madonna Construction Co., San Luis Obispo, $98,390; Claude Fisher Co., Ltd., Los Angeles, $102,619; Esby C. Young, San Fernando, $106,085; Walter Bros. Construction Co., San Luis Obispo, $108,336; Oilfields Trucking Co. & Phoenix Construction Co., Inc., Bakerfield, $119,796; L. A. & R. S. Crow, El Monte, $141,305. Contract awarded to Louis Biasotti & Son, Stockton, $87,230.

YOLO COUNTY—Between County Road 27 and one mile north, four miles south of Woodland, about one mile of existing roadbed to be surfaced with plant-mixed surfacing on untreated rock base and penetration treatment applied to shoulders. District III, Route 1167. A. Teichert & Son, Inc., Sacramento, $36,405. Contract awarded to W. C. Railing, Woodland, $32,690.

Truck Noise

SHORT-SIGHTEDNESS on the part of business men a few years back, when highways were being routed, is largely to blame for today's clamor over truck noise in western cities.

Highway engineers, with better foresight than the merchants, wanted to by-pass small towns, route the arterial along back ways in the cities, but they were overwhelmed by political pressure applied by the business interests. Now these same business interests would seek to drive off part of the traffic that the engineers knew would be flowing over the route.

A state highway is an artery of commerce. If communities along the way, which had insisted that it be routed right down the main street, past the leading stores—because merchants foolishly thought the highway was going to bring a great flow of business—are permitted to impose restrictions on the use of the highways, then the state (and the merchants) will have lost a very valuable economic asset.—*Motor Transportation.*

NOW ON MAILING LIST

CITY OF LOS ANGELES
California

Department of Public Works
State of California
Sacramento, California

Sherman Oaks, Calif.

GENTLEMEN: I have seen copies of your publication *California Highways and Public Works* and have been so impressed with it I am writing to ask if I might be placed on your mailing list to receive copies in the future. I am certain the material contained in these publications will be of considerable value to me as a member of the Los Angeles City Planning Commission.

Sincerely yours,

EDMUND P. MCKANNA

SENSIBLE FOLLOWING

The distance you follow behind another vehicle is one indication of your competence in driving, says the California State Automobile Association. Never follow closer than a full car-length at very slow speeds. And when you're moving faster, always leave plenty of room between your car and the one in front of you, which may stop suddenly.

Well-placed Fencing

THE DIVISION OF HIGHWAYS of California is to be congratulated on what may be considered a minor matter in connection with construction of its vast network of freeways in Southern California.

In order to expedite the whole program with as little interference as possible with traffic flow, it has been found desirable in many cases to build isolated bridges first, and connect up the roadways later. In many cases, a hole is excavated just large enough for footings and abutments of the bridge, and when it is completed and traffic passes over the structure, only the rough edges of the excavation are visible.

But those edges and the dark recesses beneath the new bridge would be mighty attractive to exploring youngsters and prowling vandals. The State puts high wire mesh fences around each of these pits before they leave the site, in exactly the manner *Southwest Builder and Contractor* has long been urging for irrigation ditches, flood pools, and other man-made "attractive nuisances."

Thus the State protects its property from vandalism, denies the dark places to evil-doers, and protects children from dangerous falls and other accidents. The Division of Highways deserves a hand.—*Southwest Builder and Contractor.*

Budget Review

Continued from page 20 . . .

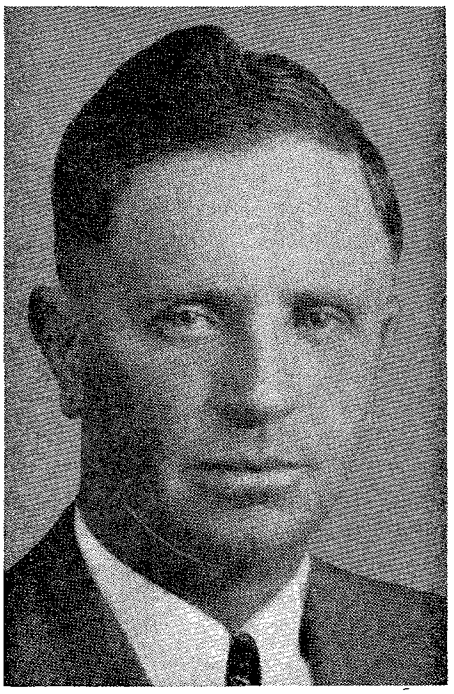
tive of one other point in his appeal, where he asserts:

> "It is fatuous to presume that we can do anything worth while by sporadic appearances before the State Highway Commission, demanding funds for 'our' special strip of highway."

What augurs well for the future of the California highway program is not so much this increasing public awareness of the relationship between highway safety and highway funds, but the state-wide point of view which it represents. The essential problem in a democracy is, as it always has been, to awaken and maintain intelligent public interest in governmental affairs.

Harvey D. Stover Retires After 34 Years

HARVEY D. STOVER—1951



HARVEY D. STOVER—1918

HARVEY D. STOVER, Senior Bridge Engineer with the Division of Highways, has retired after 34 years of state service.

Mr. Stover, who is widely known throughout the Division of Highways, was one of the early employees of the Bridge Department, having worked under Bridge Engineers H. E. Warrington, Harlan D. Miller, C. E. Andrews, F. W. Panhorst, and I. O. Jahlstrom.

The annual buck stew dinner which has by now become a tradition is due in great measure to the unfailing marksmanship of Harvey Stover, who year after year, has supplied the buck.

Harvey, who was born in a log cabin in Grant County, Indiana, December 12, 1886, started his bridge career at an early age. Shortly after graduation from high school, he went to work for D. L. Horner, an early day builder of concrete bridges in Indiana. In 1909, young Harvey came west to Berkeley, California, where he worked for several years on subdivisions in the Mt. Diablo regions of Contra Costa County, before entering the University of California. Graduating in 1915 with a B.S. degree in civil engineering, he spent one year with the City of Los Angeles Water Department and two years with the California Insurance Inspection Rating Bureau in charge of the Sacramento area.

In January, 1918, Harvey entered state service as a draftsman in the Division of Highways in District III. After taking time out for military service during World War I, Harvey returned to District III and two years later was transferred to the Bridge Department. In 1926, he became Bridge Design Engineer, a post he continued to hold for a period of 12 years. During this time, he was responsible for the design of some 1,200 bridges. These include all bridges on the Feather River Highway, Sacramento River Canyon route from Redding to the Oregon line, the Tower Bridge at the west approach to Sacramento, the coast highway from San Luis Obispo to Carmel, and numerous grade separation structures.

In 1938, Mr. Stover took over the duties of Bridge Maintenance and Research Engineer. This afforded him the

. . . *Continued on page 63*

Traffic Count

Figures for 1951 Show an Increase of 6.3 Percent Over 1950

By G. T. McCOY, State Highway Engineer

THE ANNUAL state-wide traffic count taken on Sunday and Monday, July 15th and 16th, 1951, shows an increase of 6.3 percent over the immediately preceding annual count of 1950. Continuing the trend shown by the 1950 count, freight vehicles are again increasing at a slightly faster rate than passenger vehicles. Although all route groups show gains in traffic for both Sunday and Monday counts, the interstate connections show far greater increases than do any other route group. Sunday traffic shows greater gains than Monday traffic for all route groups, but the added week-end travel appears largely confined to the major routes since the recreational routes show the smallest gains.

No change was made from the regular procedure of previous years in the manner of taking the count. Actual recording covers the 16-hour period from 6 a.m. to 10 p.m. for both Sunday and Monday, totals being shown for each hour. At selected representative stations, counts are also continued for the entire 24-hour period and are extended to record each of the seven days of the week. Traffic is segregated into the following vehicle classifications: California passenger cars, out-of-state passenger cars, busses, pickups, two-axle commercial units, three-axle units, four-axle units, five-axle units, and six-or-more-axle units.

Each year some minor changes in the census become necessary, such as the relocation, addition, or discontinuance of individual stations; but in every instance these are excluded in determining comparison with the previous year, only those stations that were identical during both years being taken into consideration.

These comparisons for the various route groups are as follows:

PERCENT GAIN OR LOSS FOR 1951 COUNT AS COMPARED WITH 1950

	Sunday	Monday
All routes	+ 7.01	+ 6.21
Main north and south routes	+ 6.96	+ 6.25
Interstate connections	+13.39	+13.10
Laterals between inland and coast	+ 6.40	+ 5.53
Recreational routes	+ 5.30	+ 4.43

BASIS FOR SUMMARY

The gain or loss of traffic volume for State Highway Routes 1 to 80, inclusive, which constitute the basis for the foregoing summary, is shown in the following tabulation:

Route	Termini	1951 Percent gain or loss Sunday Gain	Sunday Loss	Monday Gain	Monday Loss
1.	Sausalito-Oregon Line	3.46		5.53	
2.	Mexico Line-San Francisco	3.37		5.33	
3.	Sacramento-Oregon Line	11.70		5.83	
4.	Los Angeles-Sacramento	12.79		5.64	
5.	Santa Cruz-Junction Route 65 near Mokelumne Hill	5.80		6.42	
6.	Napa-Sacramento via Winters	7.34		3.57	
7.	Crockett-Red Bluff	10.66		12.10	
8.	Ignacio-Cordelia via Napa	10.27		9.20	
9.	Route 2 near Montalvo-San Bernardino	2.71		1.17	
10.	Route 2 at San Lucas-Sequoia National Park	2.57			2.87
11.	Route 75 near Antioch-Nevada Line via Placerville	12.22		14.80	
12.	San Diego-El Centro	11.74		15.16	
13.	Route 4 at Salida-Route 23 at Sonora Junction	9.93		8.24	
14.	Albany-Martinez	3.54		7.31	
15.	Route 1 near Calpella-Route 37 near Cisco	14.29		1.29	
16.	Hopland-Lakeport		0.97		7.49
17.	Route 3 at Roseville-Route 15, Nevada City	0.24		0.63	
18.	Route 4 at Merced-Yosemite National Park	9.83		5.45	
19.	Route 2 at Fullerton-Route 26 at Beaumont	6.25		7.28	
20.	Route 1 near Arcata-Route 83 at Park Boundary	6.52		9.20	
21.	Route 3 near Richvale-Route 29 near Chilcoot via Quincy	2.48		0.75	
22.	Route 56, Castroville-Route 32 via Hollister	2.04			2.25
23.	Route 4 at Tunnel Station-Route 11, Alpine Junction	18.27		13.33	
24.	Route 4 near Lodi-Nevada State Line	18.96			4.28
25.	Route 37 at Colfax-Route 83 near Sattley		6.25	5.22	
26.	Los Angeles-Mexico via San Bernardino	11.22		6.56	
27.	El Centro-Yuma	19.95		20.44	
28.	Redding-Nevada Line via Alturas	0.06		4.11	
29.	Peanut-Nevada Line near Purdy's	11.45		12.66	
31.	Colton-Nevada State Line	10.00		3.55	
32.	Route 56, Watsonville-Route 4 near Califa	6.98		0.22	
33.	Route 56 near Cambria-Route 4 near Famoso	10.52		8.12	
34.	Route 4 at Galt-Route 23 at Pickett's Junction	16.02		7.15	
35.	Route 1 at Alton-Route 20 at Douglas City	2.54		2.38	
37.	Auburn-Truckee	23.61		17.15	
38.	Route 11 at Mays-Nevada Line via Truckee River	11.67		21.91	
39.	Route 38 at Tahoe City-Nevada State Line	4.55		0.47	
40.	Route 13 near Montezuma-Route 76 at Benton	8.68			3.95
41.	Route 5 near Tracy-Kings River Canyon via Fresno	7.81			0.45
42.	Redwood Park-Los Gatos	4.05		12.08	
43.	Route 60 at Newport Beach-Route 31 near Victorville	2.86		1.94	
44.	Boulder Creek-Redwood Park	0.00			6.66
45.	Route 7, Willows-Route 3 near Biggs	25.55		13.59	
46.	Route 1 near Klamath-Route 3 near Cray	121.17		49.06	
47.	Route 7, Orland-Route 29 near Morgan		6.45	0.90	
48.	Route 1 north of Cloverdale-Route 56 near Albion		4.08	7.38	
49.	Napa-Route 15 near Sweet Hollow Summit	16.61		5.66	
50.	Sacramento-Route 15 near Wilbur Springs	3.17			10.96
51.	Route 8 at Shellville-Sebastopol	12.76		4.53	
52.	Alto-Tiburon	53.25		27.03	
53.	Route 7 at Fairfield-Route 4 near Lodi via Rio Vista	21.82		25.90	
54.	Route 11 at Perkins-Route 65 at Central House	21.85		23.92	
55.	Route 5 near Glenwood-San Francisco		3.03	14.88	
56.	Route 2 at Las Cruces-Route 1 near Fernbridge	4.24		5.01	
57.	Route 2 near Santa Maria-Route 23 near Freeman via Bakersfield	12.90		1.74	
58.	Route 2 near Santa Margarita-Arizona Line near Topock via Mojave and Barstow	21.44		20.25	

Route	Termini	1951 Percent gain or loss Sunday Gain	Sunday Loss	Monday Gain	Monday Loss
59.	Route 4 at Gorman-Route 43 at Lake Arrowhead	8.84		8.00	
60.	Route 2 at Serra-Route 2 at El Rio	7.24		7.73	
61.	Route 4 south of Glendale-Route 59 near Phelan	0.8			0.28
62.	Route 171 at Northam-Route 61 near Crystal Lake	23.29		24.10	
63.	Big Pine-Nevada State Line		21.72		33.82
64.	Route 2 at San Juan Capistrano-Blythe	15.33		11.34	
65.	Route 18 near Mariposa-Auburn	12.17			0.33
66.	Route 5 near Mossdale-Route 13 near Oakdale	10.17		0.45	
67.	Pajaro River-Route 2 near San Benito River Bridge		0.76		3.26
68.	San Jose-San Francisco	2.20		3.82	
69.	Route 5 at Warm Springs-Route 1, San Rafael		0.01	3.18	
70.	Ukiah-Talmage	5.16		18.50	
71.	Crescent City-Oregon Line	7.02		6.49	
72.	Weed-Oregon Line	5.24		9.32	
73.	Route 29 near Johnstonville-Oregon Line	6.83		6.86	
74.	Napa Wye-Cordelia via Vallejo and Benicia	14.56		18.48	
75.	Oakland-Junction Route 65 at Altaville		0.22	7.91	
76.	Route 125 at Shaw Avenue-Nevada State Line near Benton	3.87		6.32	
77.	San Diego-Los Angeles via Pomona	13.45		10.06	
78.	Route 12 near Descanso-Route 19 near March Field	9.17		10.41	
79.	Route 2, Ventura-Route 4 at Castaic	9.19		10.33	
80.	Route 51, Rincon Creek-Route 2 near Zaca		0.02	6.16	

Stover Retires

Continued from page 61 . . .

opportunity to observe under actual conditions of use, the various structures built by both the State and the counties. Many of these structures, built during the early horse and buggy days, were inadequate to carry the ever increasing loads and volume of traffic that developed through the years. The problems of strengthening and widening the more hazardous of these structures with the available funds required considerable ingenuity and became more and more of a problem as the wartime shortage of needed materials became more acute, while at the same time, the size and number of overloaded trucks greatly increased.

It is a credit to Mr. Stover's engineering ability that during these critical years, not a single bridge failure occurred on the State Highway System.

During the past three years, Mr. Stover has been engaged on special studies and investigation of various bridge problems. Among these are studies of the effect of present day traffic on thin slab bridge decks.

Upon retirement, Harvey plans to spend a good part of the time during the summer months at his cabin on Lake Tahoe, and hunting and fishing in the high Sierra country. During the rest of the year, he will reside in Sacramento where he will be available for consultation on special engineering and bridge problems.

California Autos Exceed 5,000,000

AUTOMOBILE REGISTRATION in California already exceeds the 5,000,000 mark; there is one car for every two persons in the State; the national ratio is one car for every four persons.

Yet despite heavy user traffic, California's highway development program is not keeping pace with the population growth and the competition for public money for a multitude of other governmental services. Out of 14,000 miles of state highways in California, 11,300 miles or 81 percent show deficiencies of one kind or another.

The need for accelerated highway modernization, the problems confronting adequate highway finance, increasing demands for freeways and limited access roads, the limitations imposed by material shortages—are all factors commensurate with today's motor vehicle requirements.

SQUEALING TIRES

When automobile tires squeal on curves, excessive speed may be the cause rather than under-inflation. Good drivers reduce their speed before reaching a curve, then accelerate the car gradually through the curve. This procedure prevents tire squeal and provides better control over the car.

Civil Defense

Continued from page 35 . . .

emergency organization in each division, and in each instance the results have been eminently satisfactory. Several months ago there was a fire at San Quentin Prison, and literally before the smoke had disappeared, there was a damage survey team from the Division of Architecture on the scene. The work they performed was done in such a manner that the Director of Corrections commended their efforts to the Director of Public Works.

During the floods of a year ago—higher stages of water than for many years previous—the Division of Water Resources predicted the crests and when they would occur to such exactness, that damage was greatly lessened and the human injury factor greatly reduced. The Division of Highways maintenance crews also proved their mettle during these floods, by the manner in which they restored blocked highways to use, and re-routed traffic during the emergency periods.

At the present time the development of detailed plans for certain expected conditions is of tremendous importance. Through this medium, we can evaluate the needs of each region as related to the local relief and emergency forces, thereby determining our immediate course of action when "disaster strikes."

In case we do have a state of extreme emergency, the Department of Public Works will show a hard core of coordinated effort, with a tested force of experts to lend aid to any stricken area. Representative engineers from the operating divisions on the staff of the Chief of Engineering Service will help evaluate problems at the state level, and offer their knowledge of the ability of our forces to meet any given need. In the field our engineers and other personnel will promptly translate plans into positive action to save lives and property. The Department of Public Works will meet the challenge because the flexibility and adaptability of our operation is a proven historic attribute of our entire organization.

Shell Beach Study

Continued from page 39 . . .

volume drops, while the other four registered gains. Nine of the 13 businesses on the same side of the highway in Pismo Beach disclosed business declines and establishments on the easterly side of the highway had five out of nine showing declines.

Since we do not have available business volume figures on the one other type of popular roadside business—motels—of which there are three in Shell Beach, and interview reports were quite varied, a volume comparison was not made. However, the fact that the majority of motels in the vicinity are located near the beach rather than directly abutting the highway indicates that highway frontage is secondary to the proximity of the beach. In the town of Pismo Beach almost all motels are located near the ocean and are considerably removed from the highway.

Since direct entry from the highway in this area does not appear to be of prime importance and since all the motels cater to the tourist and vacationist classes of clientele, it appears likely that the effects of the expressway construction, which enforced some circuity of travel upon prospective motel customers, were slight.

Commercial Land Values

Commercial lot values in Shell Beach have changed very little since 1947. However, the fact that these properties no longer have direct access to the through traffic lanes does not appear to be the dominant reason for the failure of commercial values to keep pace with residential values. Probably one of the two most important factors was the fact that Pismo Beach, located just one mile southerly, already had complete shopping facilities available to serve Shell Beach residents as well as tourists. The other factor is the unfavorable ratio of the number of commercial lots to the number of residential lots in the community. There are 126 lots available for commercial uses, while the maximum number of residential lots is 922. These factors resulted in a supply considerably above the reasonable need.

While Shell Beach commercial lots have remained relatively low valued due to the over-supply, several new businesses have been built since the expressway construction began. These new businesses of types catering almost entirely to local residents, include a building supply, a gift shop, a dry cleaning business, a barber shop, a plumbing shop, and a malt shop. These represent a 30 percent increase in Shell Beach commercial enterprises since the highway construction.

Conclusions

The study of the effects of the expressway benefits to Shell Beach is exceptionally valuable because the absence of other factors attributes the town's suddenly accelerated growth rate almost entirely to the improved safety and comfort and time-saving, which encouraged many of the commuters desiring seaside living to move there.

In California, where more and more city workers are choosing to reside in suburban and rural communities, the adequacy of highway facilities is a prime consideration in determining whether or not a subdivision will be publicly accepted. The Shell Beach study has shown precisely the importance of controlled access, multilane highways to the development of small communities—an importance undoubtedly applicable to any subdivision in competition with other areas. As in the case of Shell Beach, the highway improvement actually may mean the difference between success and failure.

Traffic Engineering

Continued from page 58 . . .

Design Department Problem

A problem which was troubling our Design Department concerned transitions from two-lane to four-lane divided highways. This was made the subject of a special study, and a satisfactory standard design for such transitions was developed and is now in use.

A study of accident rates as related to shoulder widths was completed by the Traffic Department and has resulted in a crystallization of standards for over-all roadbed width on two-lane roads under varying volume conditions.

Another research project which stimulated considerable interest throughout the Nation was a study of lower case letters as compared to capital letters for highway signs. For some time, California had been making some use of lower case letters on large overhead illuminated directional signs on freeways. These signs were apparently readily accepted by the general public; at least there was no visible reaction by the layman. Traffic engineers, however, were not so ready with their acceptance, so a research project was set up to compare legibility and word recognition qualities of lower case and capital letters for this type of highway sign. This study was made in cooperation with the Institute of Transportation and Traffic Engineering of the University of California, and the results of the study were reported at the annual meeting of the Highway Research Board in December of 1950. Lower case letters are now standard in California for all overhead directional signs on freeways and expressways.

Recognition

Three times in the past four years California has been awarded first place for traffic engineering achievement in the Annual National Safety Contest sponsored by the National Safety Council. In 1947 and 1948 California was grouped with the Eleven Western States and took first place both years. In 1949 and 1950 California was placed in competition in the National Safety Council's Group 5, which consists of the eight states whose population and motor vehicle registration are comparable to each other, and in this competition California took second place in 1949 and captured the first place award in 1950.

In the 13 years since its birth in California, traffic engineering has made great strides. It has now gained recognition, not as a necessary evil, but as a useful and essential branch in the over-all field of highway engineering.

PEDESTRIAN COURTESY

Let pedestrians have the right of way always. This is courteous driving and good manners make good drivers.

EARL WARREN
Governor of California

•

FRANK B. DURKEE
Director of Public Works

•

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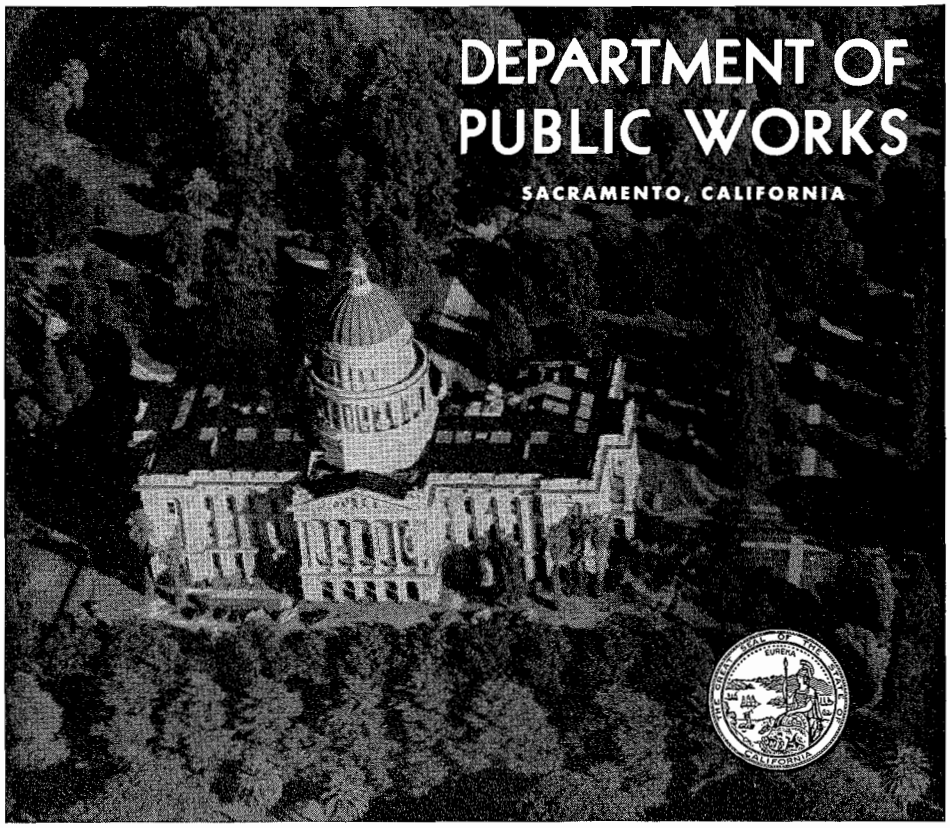

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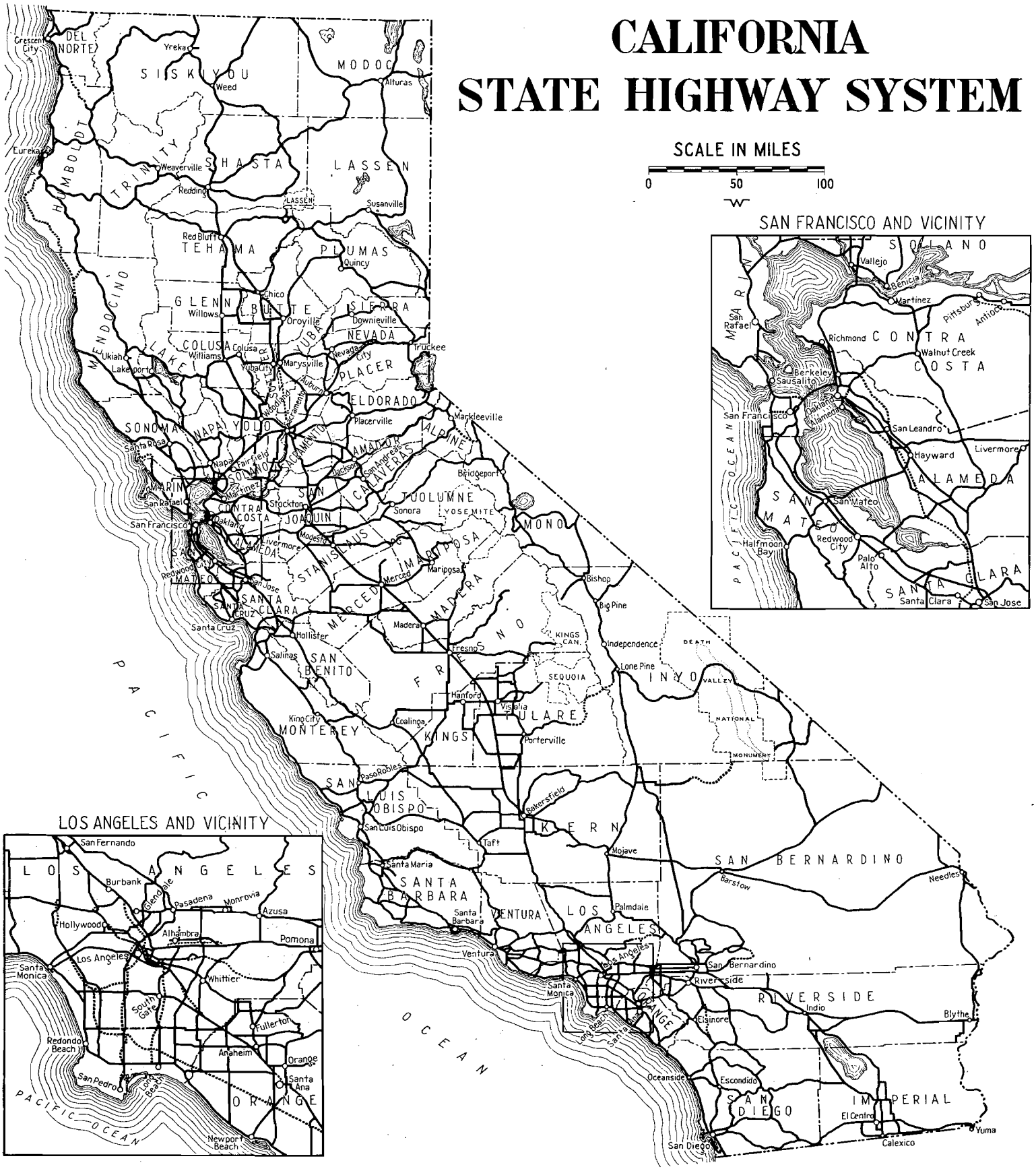

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