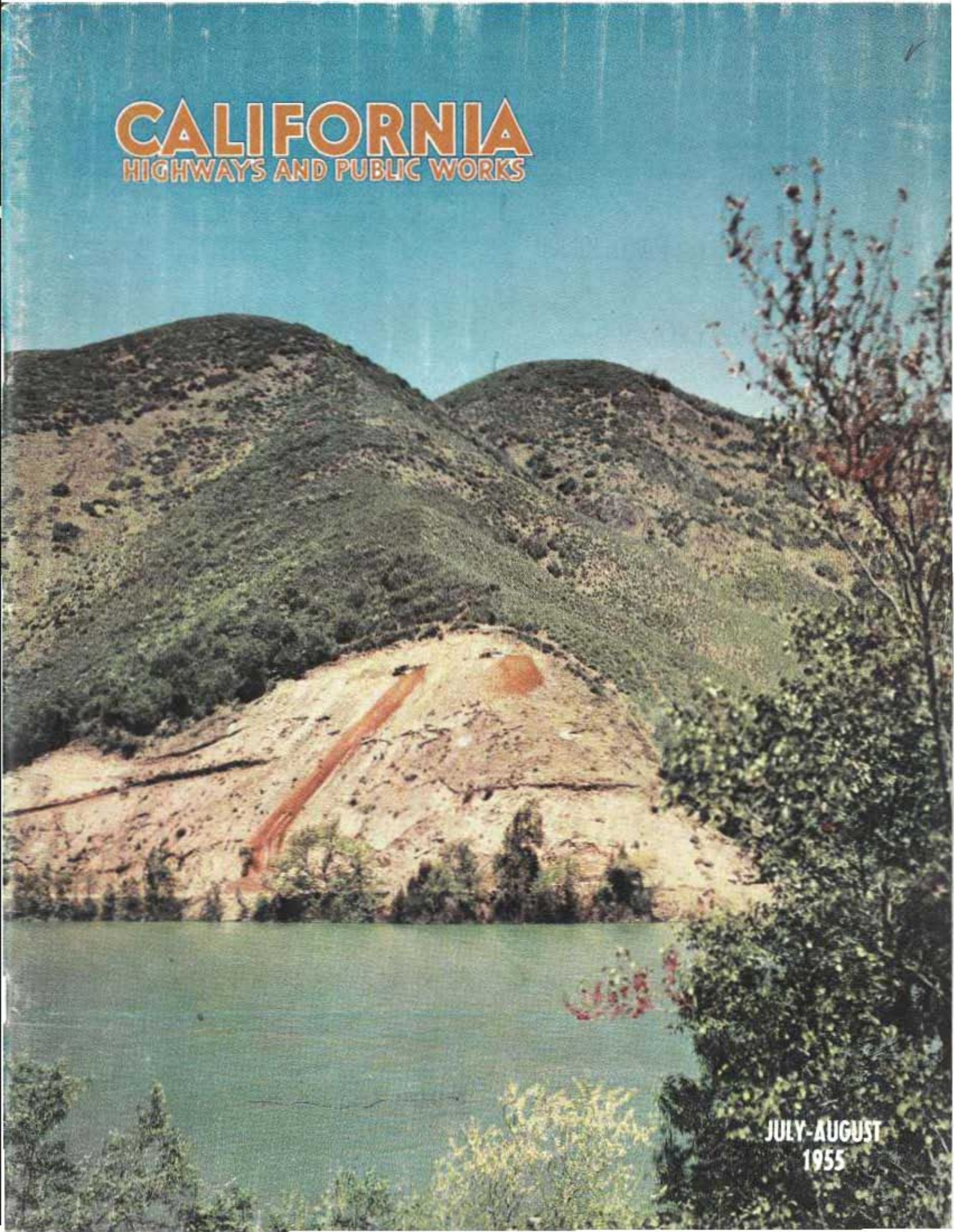
CALIFORNIA
HIGHWAYS AND PUBLIC WORKS



JULY-AUGUST
1955

California Highways and Public Works

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

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Vol. 34 July-August Nos. 7-8

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Twelfth and N Streets
Sacramento

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Parallel Bridge Across Carquinez

By C. H. DARBY,
Senior Bridge Engineer

Legislature and Governor Provide for New Strait Span

GOVERNOR GOODWIN J. KNIGHT on June 16th signed Senate Bill No. 1450 providing for construction of an additional Carquinez Strait Bridge and a bridge between Benicia and Martinez as toll facilities and promptly called a meeting of the California Toll Bridge Authority, of which he is chairman, to set in motion legalities for the issuance of revenue bonds, to finance the projects.

The estimated cost of the bridges is $73,000,000 including the cost of bond financing. The Senate bill, introduced by Senator Luther E. Gibson of Vallejo, includes more than eight miles of Carquinez Bridge approaches on US 40. Construction of the parallel Carquinez Bridge will start as soon as bond financing by the California Toll Bridge Authority can be arranged under the terms of the legislation.

Depending on the speed with which these financing arrangements can be completed, actual construction on the Carquinez project can begin this fall. Completion of the new bridge and sufficient approaches for the start of toll collections would be scheduled for some time in 1958.

Plans Advance Rapidly

Plans for the Benicia-Martinez structure are being advanced rapidly with the aim of opening that bridge to the public in 1959.

Construction plans are already well advanced on the new Carquinez Bridge and the south approach. The object is to open that portion of the facility to traffic as early as possible for two important reasons: relief from the congestion which is particularly serious on the present south approach as well as on the existing bridge itself; and assurance of an early start on repayment of the bonds from toll collections, which is expected to encourage more favorable interest rates on the bonds.

The expected order of work on the Carquinez project is as follows:

Award contract and begin construction of the bridge substructure.

Award contract for the superstructure, so that fabrication of steel can get under way in the mills while the substructure is being placed.

Start the grading for the south approach so that the very deep and wide cuts through the Valona Hills will have time to stabilize before paving is undertaken.

In the meantime, approach construction through Vallejo will be expedited, although operation of the new bridge is not dependent on that portion of the work in view of the existing multilane divided highway.

Existing Structure Inadequate

A look at the map reveals how the waterway formed by San Francisco Bay, Carquinez Strait, and the San Joaquin River effectively cuts California in two and blocks north-south motor vehicle travel for nearly half the width of the State. For 90 miles from Stockton to the Golden Gate, the waterway is bridged at only two places by highway spans. In 1927 the present bridge across Carquinez Strait provided a long-needed access across this barrier at one of these locations. The Carquinez Bridge was one of the engineering marvels of its day and its double spans still merit recognition as the fifth longest cantilever spans in the world.

Modern traffic and California's phenomenal growth have taken their toll of the old structure, however, and now its three-lane roadway is inadequate for the thousands of vehicles which daily crowd across it. Once

BRIDGE RESOLUTION

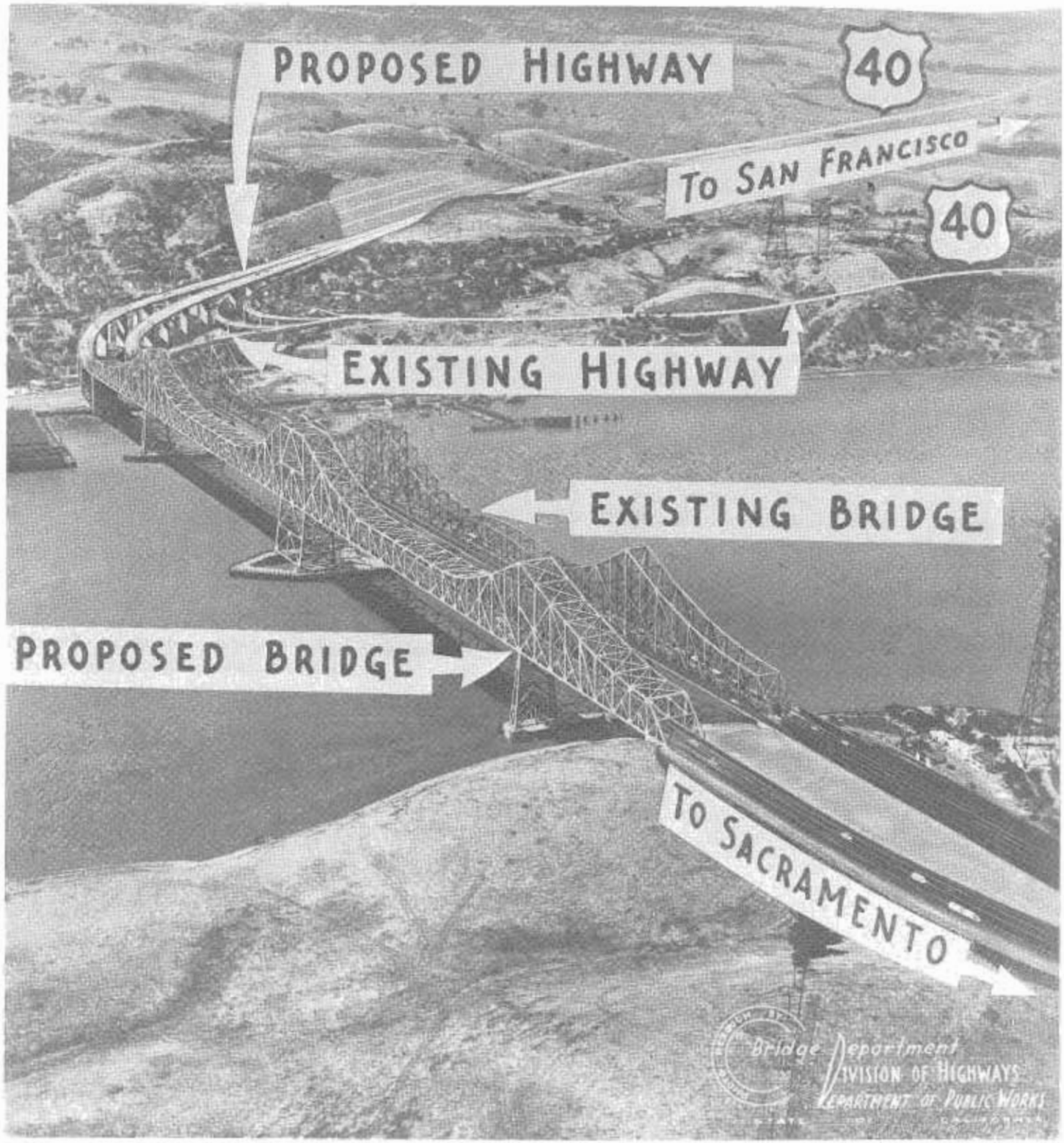
Now, therefore, be it resolved by the California Toll Bridge Authority, as follows:

1. The California Toll Bridge Authority hereby determines that, if financially feasible, it is for the best interests of the public highways of the State of California that the above-mentioned facilities be constructed, and the existing Carquinez Bridge be modified and improved, all under the provisions of the California Toll Bridge Authority Act.

2. The Director of Public Works is hereby authorized and directed to cause the Department of Public Works to complete all necessary engineering, traffic, revenue, financing, and legal studies, and to prepare and submit to the California Toll Bridge Authority the recommendations of the Director of Public Works, together with the preliminary estimates of the cost of construction of all of said facilities, and estimates of the amount required to be raised for that purpose by the issuance of revenue bonds. * * *

3. The Director of Public Works, in preparing his recommendations and in considering the form of any bond resolution, is requested, if found legally and practically feasible, to provide for the reimbursement of the State Highway Fund of any advancements made therefrom from and after the effective date of Chapter 960, Statutes of 1955, for the purchase of rights of way required for the ultimate completion of the facilities mentioned in said Chapter 960.

4. In the event the Director of Public Works determines that he will recommend to this authority that revenue bonds be issued for the construction of the facilities mentioned in Chapter 960, Statutes of 1955, the department is authorized to advertise for construction bids at such time and in such manner as to permit the execution of construction contracts simultaneously with the delivery of, and receipt of proceeds from, revenue bonds to be issued by this authority.



again Carquinez Strait has become a bottleneck to north-south travel.

This problem did not come suddenly.

Long ago it became obvious that something was going to have to be done to increase the capacity at Carquinez. The old bridge has only a 30-foot roadway—really too narrow for the three lanes which now use it. This inadequacy is not the fault of the structure itself. The traffic has jumped from less than 1,000,000 vehicles per year, when the bridge was first opened, to over 10,000,000 at the present time.

As a logical first step, the old bridge was examined to see if revisions could

be made to increase its capacity. One of the first ideas was to double-deck the old structure to provide three lanes in each direction. However, even as these studies were being made, the traffic reached a figure of 18,000 vehicles per day crossing the structure. It was obvious that three lanes in each direction would not be adequate as an ultimate solution.

Only Logical Solution

Next a temporary solution was sought by hanging additional lanes on brackets on the outside of the trusses. This would have provided a solution only for a short time and the bridge would have been overcrowded almost before the repairs could be completed. From all of these studies the present plan emerged as the only logical solution.

The new design for which plans have been prepared will provide for a new four-lane parallel bridge about 200 feet upstream from the present one. Traffic will travel north on the new bridge and south on the old. Remodeling of the present bridge, utilizing an outrigger lane on each side, would provide an ultimate four lanes on that structure.

There will be very little interference with traffic during construction. While the new bridge is being built, traffic will be maintained as usual on the old structure.

All Possible Crossings Studied

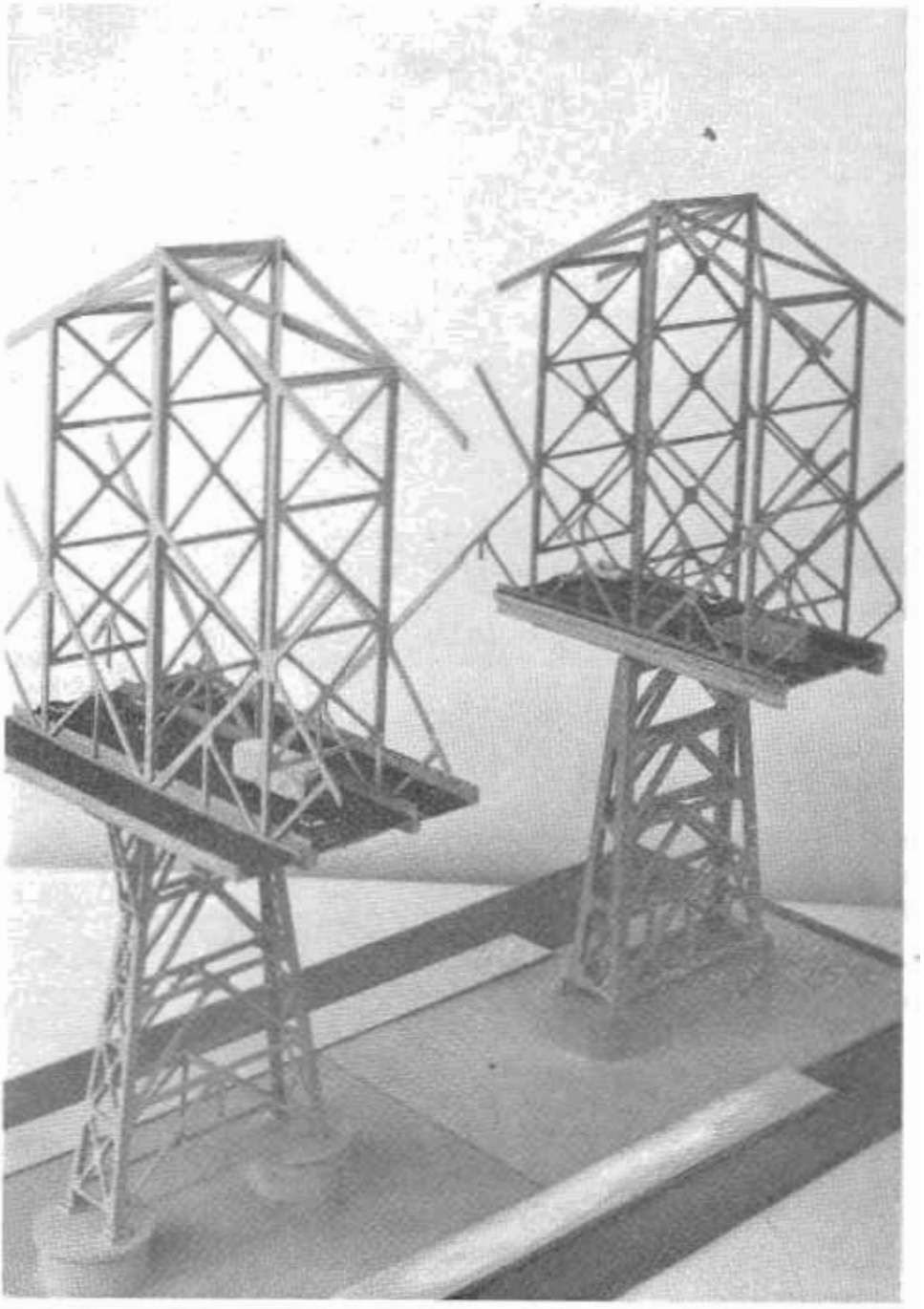
Before settling on a final design which provided for the construction of a parallel bridge, all of the possible crossings of Carquinez Strait from Selby Point to Dillon Point were considered. Along this three-mile stretch of the strait, the Carquinez Bridge location is the best for a number of different reasons. The cost of the approach highway construction through the rough country on each side of the strait east of Crockett ruled out a bridge in that location. Sites to the west also were studied but they likewise proved to be more expensive.

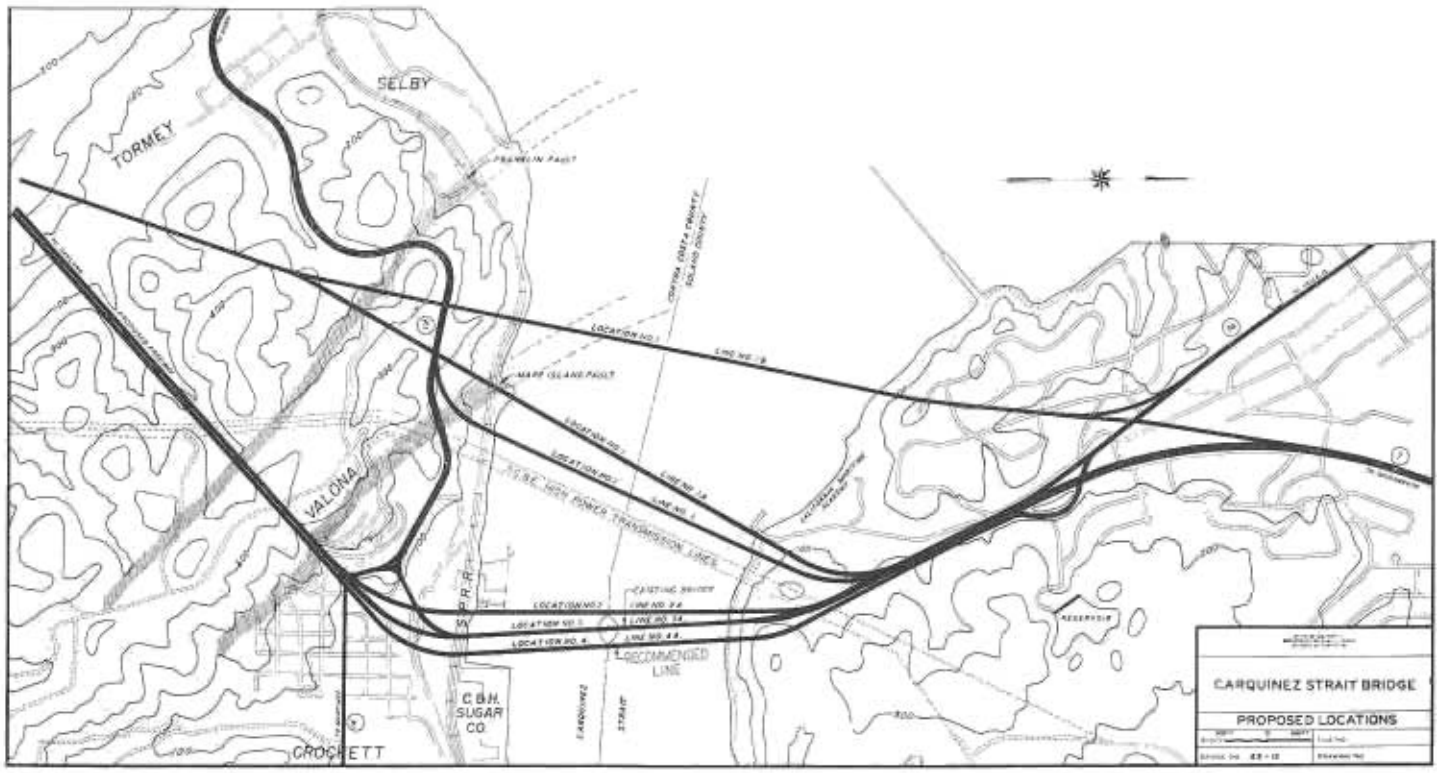
Two earthquake faults run through this area and the only other location seriously considered would have been jeopardized by the fact that the piers would have fallen on earthquake faults. The economy as well as the feasibility of getting approaches to the existing structure finally made it evident that a parallel bridge was the best solution. The possibility of using the existing bridge to carry the traffic in one direction also gave quite an economic benefit to this location.

Technical Advances

At first glance the new bridge will seem to be a twin of the old. The spans will be the same, the piers will adjoin each other. The height of the trusses and the panel length will be the same. Closer examination, however, will reveal many technical advances

Model of trusses and towers for ultimate development of the two parallel bridges at Carquinez Strait. At left, ultimate roadway of existing bridge; at right, new four-lane structure.



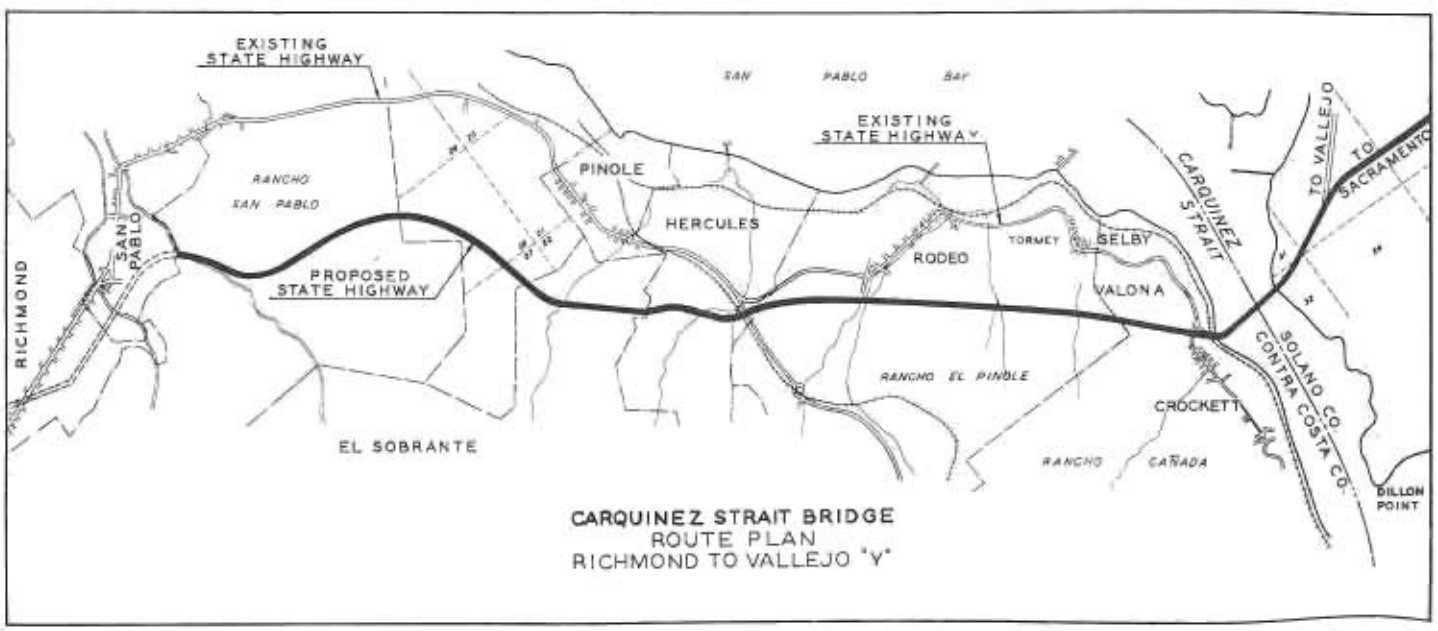


which have taken place over the past 30 years.

Welding will be extensively used and as a result the members will be cleaner and simpler than those in the old truss. This will make for easier fabrication and erection and will greatly ease the problems of painting and maintenance.

Some of the new alloy steels which have been developed in recent years will be used in the more highly stressed members. Some of these new steels have almost twice the strength of the steel used in the old structure. Easily welded and easily fabricated, the use of these new alloy steels will do much to make possible the streamlined appearance of the members in the new structure.

Another innovation will be the use of high strength bolts instead of field rivets. High strength bolts have proved their economy and usefulness and are being used more and more, especially for field connections of steel structures. The high strength bolts require less labor to place than rivets and the resulting connection is more rigid. After installation the bolts can be checked for the load they are carrying and a group can be evenly adjusted to spread the stress over the



CARQUINEZ STRAIT BRIDGE
ROUTE PLAN
RICHMOND TO VALLEJO "Y"

Legislators who sponsored Carquinez Bridge bill view sketch of parallel Carquinez Bridge in Governor Knight's office just prior to signing by the Governor of the act. LEFT TO RIGHT—Director of Public Works Frank B. Durkee, Senator Luther E. Gibson, Vallejo; Senator George Miller, Jr., Richmond; Governor Knight, Assemblyman S. C. Masterson, El Cerrito; Assemblyman Donald D. Doyle, Lafayette, and Assemblyman Samuel R. Geddes, Napa.

entire connection. This completely eliminates the necessity of cutting out and redriving rivets which have been poorly driven or which have loosened after driving.

The increased strength of the new steel alloy makes it possible to reduce the number of pieces required to make up truss members. Whereas the existing truss members were made up of many plates and angles, requiring as many as 5 to 14 separate pieces, the members in the new design will be made up of three to five heavy plates in an H or a welded box section. The use of smaller members, because of the high strength steel, also is effective in reducing the secondary stresses in some of the larger cantilever members. The use of this alloy steel avoids a sort of vicious circle whereby heavier members cause greater secondary stresses which in turn require still heavier members.

Large Concrete Caissons

Three large concrete caissons, 53 feet by 102 feet in plan, similar to the type used on the San Francisco-Oakland Bay Bridge will be used at the three piers in the water. A new and heavy fender system has been designed to protect the piers in the channel. This fender is designed so that it can be put in place before the new piers are constructed, and used as a working platform during the locating and the sinking of the caissons.

One of the more difficult problems has been the location of the highway through the Valona Hills at the south end of the bridge. The hills are rugged, cut by many ravines, and the country is unstable so that a large number of slides and slipouts occur. These hills form a rather high barrier south of the bridge and are the cause of the present poor alignment. In order to achieve a satisfactory approach to the bridge from the south, it would be necessary to either tunnel through these hills or make some massive open cuts. Present plans call for an open cut up to 300 feet deep where the freeway passes through the highest part of the hills.

Because the approach to the south of the bridge takes off across new country, nearly four miles of new highway must be included as part of the over-all project. This will carry

... Continued on page 22

Revealing

Direct Benefits From Freeway Development

By PAUL O. HARDING, Assistant State Highway Engineer

A SUFFICIENT mileage of freeways for the Los Angeles metropolitan area now has been constructed and put into operation by the State Division of Highways so that direct benefits are quite universally recognized. These consist in the safe and expeditious movement of large volumes of public traffic. Accident records show that the life of a motorist on a full freeway is four to five times safer per mile of travel than on a conventional highway. Motorists using the freeways are also very much aware of the fact that driving the freeways is much less fatiguing than driving an equal mileage on congested city streets with frequent starts and stops at traffic signals and with the hazards of turning and cross traffic.

Freeways Attract Traffic

Because the freeways so greatly facilitate driving, an amazing thing has happened. Freeways are designed to serve through traffic and those motorists living in certain areas, and if only those motorists used the particular freeway who were theoretically expected to do so, we would have no freeway congestion. But, and this is important, we do not have at this time all the freeways that the Los Angeles metropolitan area needs, and many people living outside the theoretical service area of a freeway are attracted to it. Many times motorists drive miles out of their way to be able to utilize some of the completed freeways. This is the explanation for the utilization of the Hollywood Freeway by 168,000 vehicles daily. Who would have thought that when the Hollywood Freeway was opened that traffic on Riverside Drive—some two miles to the north—would be reduced by 34 percent and that traffic on Olympic Boulevard—some two miles to the south—would be reduced by 22 percent. It is this unexpected utilization of the Hollywood Freeway that has resulted in the present overcrowding. The Hollywood Freeway is not by any means "obsolete" as has been thoughtlessly charged; it is a modern up-to-date freeway in every sense of the word. It is, however, operating under an overload of approximately 50 percent in peak hours, and this creates difficulties.

The tremendous use being made of the completed freeways in the Los Angeles metropolitan area is a proof that the direct benefits therefrom are fully recognized by the traveling public. The direct benefits can be measured in dollars and cents. Figures have been developed by the Automobile Club of Southern California which prove that Los Angeles freeways are actually saving motorists some $50,000,000 per year already. This certainly is a substantial return on a total investment of some $15,0000,000 expended on the portions of the freeway system now in use.

City Streets Benefit

So much for the direct benefits. Now what are some of the indirect or by-product benefits? One of the first of these by-product benefits that comes to mind, resulting from freeway development in this Los Angeles area, is the relief that is provided in traffic congestion of city streets. It is obvious that as various units of freeway construction are completed and opened to traffic a very considerable number of motorists formerly using nearby city streets change their routes of travel so that they can use the freeways. A special study was made of the traffic situation along the Hollywood Freeway as various sections were completed and opened to traffic. It was found that the traffic load on all of the nearby east-west city streets were materially reduced. On Sunset Boulevard west of Figueroa Street 40 percent of the traffic was diverted. On Temple Street west of Boylston Street 48 percent of the traffic moved over to use the new freeway, and on First Street west of Figueroa Street the traffic was reduced 41 percent.

Certainly if we did not have at this time the network of completed freeways extending outward from the Los Angeles Civic Center the traffic congestion on the streets of downtown Los Angeles would be absolutely intolerable. And, in addition, there are further by-product benefits resulting from relief of congestion on city streets. Chief of these is the marked reduction in driving strain, which is certain to reduce traffic accidents.

Outlying Areas Develop

Another indirect benefit to city streets by reason of freeway construction is the development of outlying areas by subdivisions that provide additional residential housing, stores, schools and industries. One might say that such close-in areas as the San Fernando Valley would show the intensive development regardless of freeway construction, and this is more or less true because of the strategic location of this area. However, it can hardly be disputed that the development and completion of the Hollywood Freeway has, to a marked degree, stimulated the intensive development of the San Fernando Valley.

In the case of the phenomenal subdivision development to the east along the San Bernardino Freeway and to the southeast along the Santa Ana Freeway one cannot escape the conclusion that the present development of this land would not have been possible without the improved traffic service which these two freeways have provided. The thousands of new homes, stores, and schools that have been constructed in easterly and southeasterly portions of Los Angeles County and nearby sections of Orange County give evidence supporting this conclusion.

Economic Studies

In deciding upon a location for freeways and working out the design, economic studies are carried out in great detail. The cost of rights of way is balanced against the cost of construction so that the over-all cost will be the lowest possible to provide the traffic service necessary to meet the situation. This means that oftentimes a freeway will be located through the older sections of the city. Close-in sections of the Hollywood Freeway and the Santa Ana Freeway were through areas of the city of this character where many old buildings were removed in clearing the right of way. This has proved a great benefit because after the freeways have been built and put into operation and freeway planting carried out, the general tone of many neighborhoods has been so greatly improved that owners have been stimulated to renovate, reconstruct, and develop their properties which became enhanced in value because of proximity to the freeway.

Aesthetic Values Improve

Another important benefit resulting from construction of freeways is the pleasure that is incidental to the protective planting program carried out by the State Division of Highways in providing erosion control. The planting of shrubs, trees and ground cover along California freeways is primarily a matter of safety and economy through the control against devastating erosion.

The Pasadena Freeway in the Arroyo Seco is one of the best examples of multiple-purpose planting. The thick green ground cover which hugs the cut slopes along this famous freeway, while appreciated for its ornamental value, was actually planted for erosion, weed and fire control.

Similarly, the ice plant on the slopes of the Atlantic Boulevard interchange on the Santa Ana Freeway is there because it will save thousands of dollars in maintenance costs. The "landscaping" effect is actually a by-product.

Beautification Contests

Los Angeles Beautiful, an affiliate of the Los Angeles Chamber of Commerce, last year conducted a city-wide contest for outstanding planting projects. There were 12 classifications set up in the completion, including one for freeways and highways, with four prizes in each classification. The first three prizes in the freeways and highways classification were awarded to State Highway projects.

The section of the Hollywood Freeway between Grand Avenue and Glendale Boulevard, which includes the four-level traffic interchange structure, won first place. Planting on this section is probably closer to landscaping of the beautification type than anywhere else on the State Highway System, and was designed in accordance with the desires of Los Angeles city authorities as well as in keeping with the importance of the four-level structure as the hub of a metropolitan freeway system. It was planted in 1950 and 1951, and includes grass, ground cover, shrubs and trees.

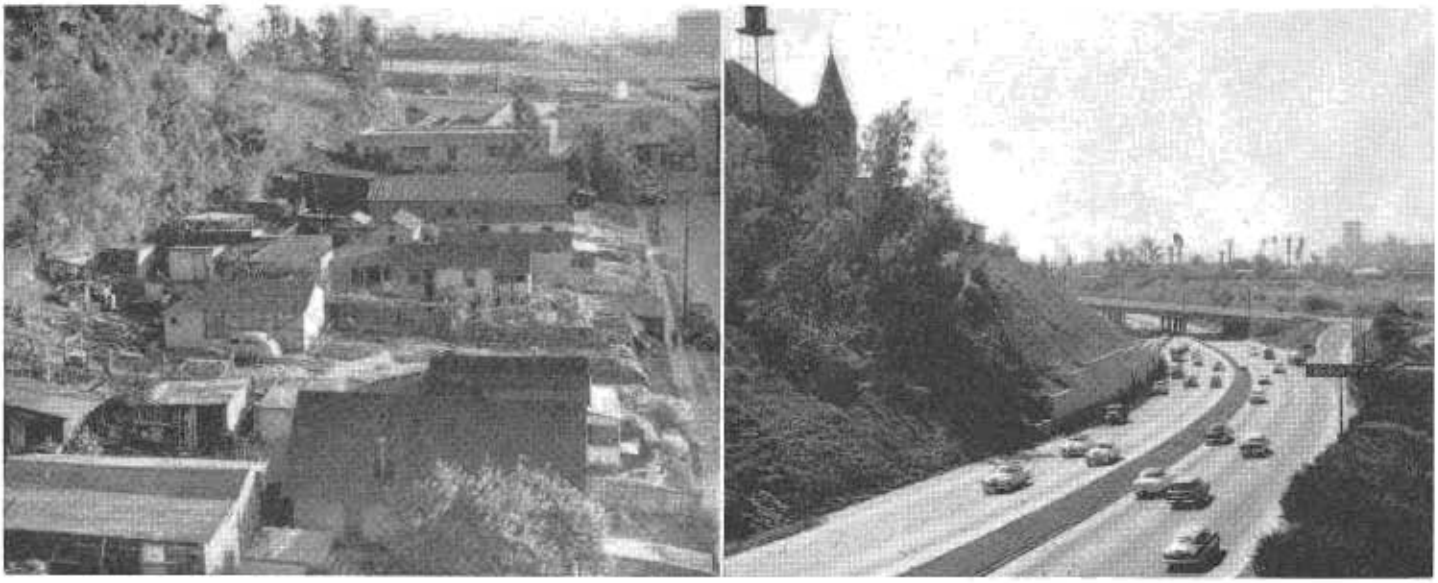
Second prize went to the Pasadena Freeway, planted between 1940 and 1948, and third to the section of the Hollywood Freeway between Glendale Boulevard and Western Avenue, planted in 1952 and 1953, both featuring the ivy and iceplant ground cover.

The freeway planting was designed by H. Dana Bowers, Supervising Landscape Architect of the Sacramento staff of the Division of Highways, and is maintained by District VII maintenance crews under the supervision of A. L. Olmsted, District Highway Landscaping Supervisor.

Further Freeway Benefits

Perhaps the greatest by-product benefit resulting in the Los Angeles area from the construction of freeways is the improvement of park areas made at the time the freeways are being built. It has been claimed by some that the State Division of Highways seeks out the flat, level areas in city park lands and builds freeways thereon because it is cheaper and easier than locating the freeways elsewhere. Flat, level areas are not necessarily always the cheapest to build on. Actually the ideal location for a free-

LEFT—Looking northeasterly along Arroyo Seco Freeway location toward City of South Pasadena in background. Photo taken in 1940. RIGHT—Photo taken at same location in May, 1955.



LEFT—Looking southerly along Santa Ana Freeway location from Sixth Street Bridge. Note Sears Roebuck Building on East Olympic Boulevard shown in background. Photo taken 1941. RIGHT—Photo taken at same location in 1955.

way would be where topography is slightly rolling so that cross streets could be constructed under the freeway in valleys and over the freeway on ridges. If the valleys and ridges were of proper size and ideally located, the freeway excavation would then just equal the amount needed for freeway embankment and the hauling costs would thus be reduced to a minimum. Of course, these ideal conditions cannot be met although the topography of the country passed through does exert a great influence on the design. It is very doubtful if the four-level traffic interchange structure at the crossing point of freeways west of the Los Angeles Civic Center would ever have been built were it not that favorable topographic features made it a natural development in keeping with the local conditions.

It should also be called to mind when there is criticism of freeways being located through city parks that the original concept was that freeways were roads through parks and they were and still are called "parkways." The Master Plan of Freeways of the County of Los Angeles, with only two or three exceptions, designates all of the freeways as "parkways."

Access Rights Essential

Probably the original conception of freeways being parkways originated from the fact that a freeway requires the taking of all rights of ingress and egress from abutting property and it was first thought that such highways should be located through park lands where these access rights of abutting property were not needed. Then the idea developed that when no park lands existed wide areas of land should

LEFT—Looking westerly from near Rosemont Avenue along Hollywood Freeway location before construction and while buildings were being moved to clear right of way. Temple Hospital in left background. RIGHT—Photo taken at same location in May, 1955.

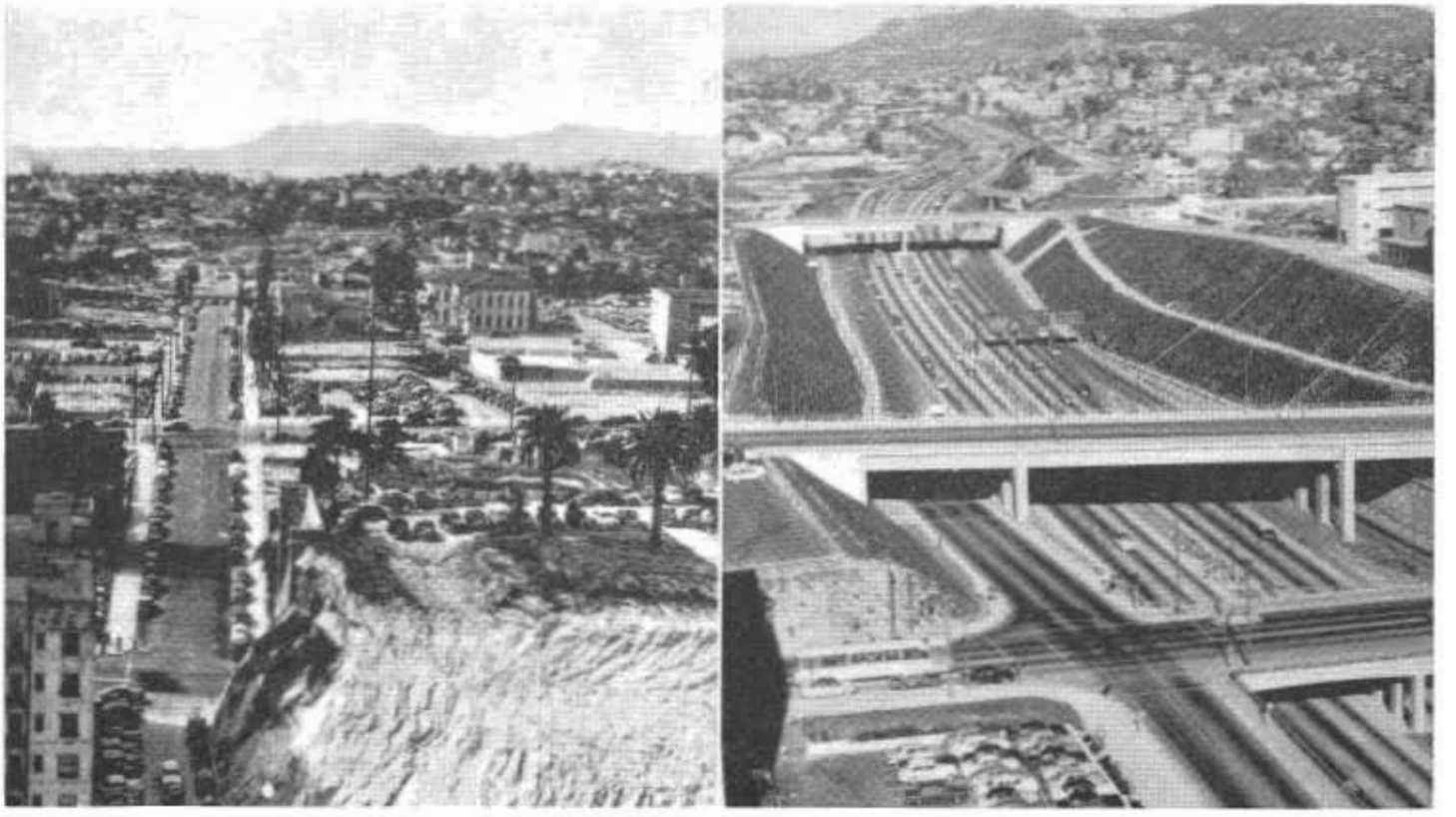
be purchased so that park areas could be created on both sides of the highway. The principle of buying out ingress and egress rights from private property owners was a later legal development without which the building of freeways as we now know them would have been impossible.

If we are to have the freeways needed for this area, construction must sometimes be carried out through public parks lands when the proper solution to the freeway problem so dictates, with very careful consideration naturally given to preserving or rehabilitating existing recreational facilities. The Pasadena Freeway passed through park lands in the Arroyo Seco of the City of Los Angeles and the City of South Pasadena. Much of the park land area taken by the Pasadena Freeway was boulder-strewn river bottom land that was periodically subject to overflow. The building of the Pasadena Freeway, along with the WPA construction of a lined channel for the Arroyo Seco stream, gave these public park lands definition and facilitated future development of adequate recreational facilities for the area.

In connection with the original agreement entered into between the State and the City of Los Angeles regarding city park lands in the Arroyo Seco it was specified that a certain park bridge for pedestrians should be built over the stream channel whenever the later need for it developed. In accordance with this agreement this bridge, in the vicinity of Avenue 58, was completed in June, 1951, at a cost of $30,000. It is interesting to note that this bridge has attracted nation-wide attention because it is the first prestressed reinforced concrete bridge to be built by the State Division of Highways in Southern California.

Elysian Park Benefits

The section of the Pasadena Freeway between the Los Angeles River and Castellar Street passed through Elysian Park. Many construction features were incorporated in the freeway construction that were of great benefit to this city park. Along the freeway itself ornamental stone walls were constructed with pedestrian walkways which for safety were fenced off from the main freeway. A beautifully designed arch bridge was constructed over the freeway at Park Road in order to provide vehicular connection between portions of the city park lands east and west of the freeway. Some 2½ miles of park roads were graded and surfaced as part of the freeway construction contract in order to provide adequate communication between other park areas. Excess excavation from the freeway was also hauled considerable distances into Elysian Park in order to fill up deep unusable canyon bottoms and washes to provide flat areas for planting of trees and installation of recreational facilities. The excavation and embankment slopes along the freeway through the park were planted with trees and shrubbery by the State Division of Highways. All things considered, the area in Elysian Park which was affected by the Pasadena Freeway con-



LEFT—Looking westerly from Federal Building in Los Angeles Civic Center before construction of Hollywood Freeway. Taken in 1948. Los Angeles City Board of Education Administrative Office Buildings shown at right. RIGHT—Showing completed Hollywood Freeway. Photo taken in May, 1955.

struction was improved rather than damaged by the freeway construction.

Echo Park Improvements

The Hollywood Freeway location westerly of the Los Angeles Civic Center between Bellevue Avenue and Temple Street, of necessity, had to pass through a portion of Echo Park. This could ony have been avoided by putting additional curvature into the freeway location and by involving the expenditure of large additional sums for right of way acquisition in the taking of homes, apartment houses, and store buildings. Under agreement with the City of Los Angeles the State provided as a part of its right of way acquisition program in connection with the freeway enough additional land for the park department to offset the area which was needed for the freeway. The State then went ahead and reconstructed the playground facilities in the path of the freeway. Among these was a baseball diamond complete with bleachers and lighting facilities for nighttime baseball games. The new playground facilities as finally reconstructed were considerably superior to the old ones that were replaced.

About three years ago when plans were being completed for the Colorado Freeway construction in the Eagle Rock area, negotiations were entered into with the Department of Recreation and Parks of the City of Los Angeles relative to freeway construction through the Eagle Rock playground area. Amicable agreement was reached between the city and the State that has resulted in mutual advantage to both parties. Among other matters the State agreed, as directed by the city, to build up low areas of park land by dumping thereon excess excavation from the freeway. To date, with more to come, some 65,000 cubic yards of material have been hauled from the freeway excavation and utilized to fill in low areas on the park land which will later on be developed by the City Department of Recreation and Parks into tennis courts, baseball diamonds and other recreational facilities. This is another instance where city park lands have been actually improved by freeway construction.

This photo shows section of completed Balboa Freeway in San Diego

Parks Are Compensated

These details are mentioned in order to acquaint the public with the fact that when a state freeway goes through public park land the people are not permanently deprived of their recreational facilities. They can rest assured that at any future time when the State finds it necessary to construct a freeway through other public park land that equal consideration will be shown, and in the final analysis the parks will be benefited rather than damaged by freeway development.

In this connection there is still another beneficial by-product of freeways through park areas which should not be overlooked. It has been found that freeways tend to open up brand new vistas of hitherto unsuspected beauty in the local landscape. The pleasurable ride through Balboa Park on the Cabrillo Freeway in San Diego is a case in point. Far from damaging the scenic and recreational values of a park, a freeway is more likely to enhance its attractiveness to the public as a whole.

There is no disputing the fact that freeway development through a metropolitan area has a terrific impact on the communities passed through. Literally thousands of people have their homes, their businesses and their institutions torn up by the roots. Money payments to owners based on fair market value for property taken cannot always compensate some individuals for sentimental attachments. The freeway construction program goes forward on the premise that there is accomplished "a greater good for a greater number." Direct benefits are widely recognized but there are many by-product benefits from freeways that are sometimes overlooked and need to be specifically pointed out. The public generally speaking appears to be sold on the freeways. This is proven by the tremendous use of those freeways that have been completed.

The State has a mandate from the people to construct more freeways, and the main duty of its engineers charged with responsibility for the freeway program is to see that every dollar of the people's money for freeways is spent judiciously to give the highest possible return on the investment to the public which it serves.

Skyways

Multimillion-dollar Section Of Bayshore Freeway Opened

SAN FRANCISCO on June 14th officially celebrated the completion of the final link in $23,000,000 worth of skyway approaches to the San Francisco-Oakland Bay Bridge.

Ribbon cutting ceremonies were presided over by Thomas J. Mellon, President of the San Francisco Chamber of Commerce, which sponsored the opening of the new freeway. Mellon, after reading a message from Governor Goodwin J. Knight, introduced the following speakers: Thomas A. Maloney, Speaker pro Tempore of the State Assembly; George J. Christopher, President of the San Francisco Board of Supervisors; Frank B. Durkee, Director of Public Works; Thomas A. Brooks, Chief Administrative Officer of San Francisco; R. M. Gillis, Deputy State Highway Engineer; B. W. Booker, Assistant State Highway Engineer, under whose direction the new freeway approaches were constructed; C. M. Corbit, Regional Engineer of American Institute of Steel Construction and F. W. Panhorst, Assistant State Highway Engineer, who is chief of the Bridge Department of the Division of Highways.

B. W. BOOKER
Builder of Skyways

On behalf of the American Institute of Steel Construction, Corbit presented to Panhorst a plaque awarded for beauty of design of the overhead freeway. Wendell Pond, Senior Bridge Engineer of the Division of Highways, designed the structure.

Following the speech making, Public Works Director Durkee took care of the ribbon cutting which signalized the opening of the new freeway to traffic.

Coincident with this ceremony, final stages of work on a five-mile section of Bayshore Freeway from Sixteenth Avenue in San Mateo to San Carlos were completed.

This six-lane freeway project was constructed at a cost of $5,859,778, including right of way acquisition, provides interchanges at Nineteenth Avenue and Hillsdale Boulevard in San Mateo, Ralston Avenue in Belmont and Holly Street in San Carlos.

While the completed project provides six freeway lanes initially, the facility has been constructed with a wide median which will accommodate an additional lane in each direction when conditions warrant the expansion.

The opening of this five-mile stretch results in a total length of 16.4 miles of continuous freeway now in operation along the Bayshore route in San Mateo County.

Completion of Downtown Section

The opening of the connection for eastbound traffic from the San Fran-

THOMAS A. BROOKS

ASSEMBLYMAN THOMAS A. MALONEY

SUPERVISOR GEORGE J. CHRISTOPHER

Surrounded by four contestants for the title of Miss San Francisco, Director of Public Works Frank B. Durkee snips ribbon. Officials, left to right, are: C. A. Maghetti, Secretary, California Highway Commission; George J. Christopher, President, San Francisco Board of Supervisors; Highway Commissioner F. Walter Sandelin; Durkee; Thomas J. Mellon, President, San Francisco Chamber of Commerce; Assemblyman Thomas A. Maloney.

DEPUTY STATE HIGHWAY ENGINEER
R. M. GILLIS

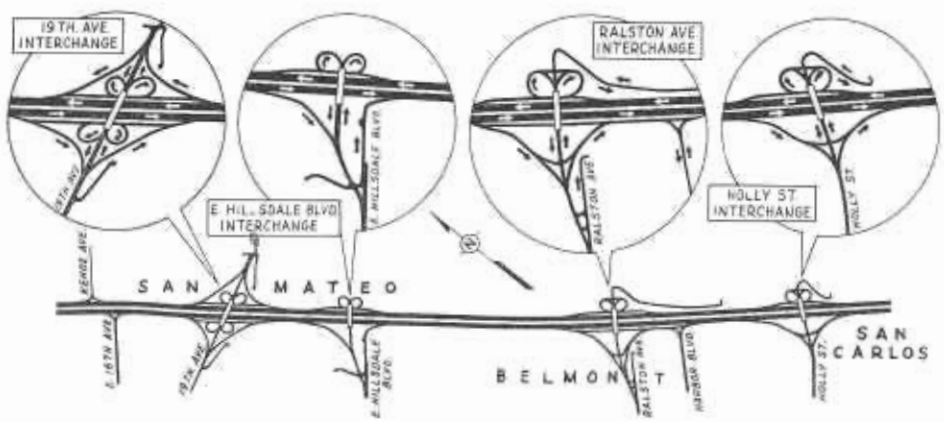
LEFT—View of recently completed five-mile section of Bayshore Freeway between San Mateo and San Carlos. Holly Street Interchange at San Carlos in foreground. RIGHT—View of recently completed section of Bayshore Freeway in San Mateo. Tenth Avenue Interchange in foreground.

cisco Skyway to the Bay Bridge on June 14th marked the completion of the downtown end of the Bayshore Freeway. The eastbound connection from the Central Freeway and the on-ramp at Eighth Street and Bryant Street were opened at the same time.

Work on the Bayshore Freeway from Alemany Boulevard to Army Street was started in June, 1949. This one-mile section was completed in June, 1951. The northerly continuation of the original section which extended the facility to ramps connecting with Bryant Street at Ninth and Tenth Streets was opened to traffic in October, 1953. In July, 1954, the next unit which extended the freeway to Seventh Street was placed into service.

On March 1st of this year the first unit of the Central Freeway which branches from the Bayshore at Division Street extended to skyway in a westerly direction to Mission Street. This was followed by the opening of the southward extension of the Bayshore Freeway from Alemany Boulevard to Third Street on March 30th.

Then on May 26th a downtown extension of the freeway from Eighth Street to Fourth Street was opened. Thus, after a six-year period of concerted effort representing a construction expenditure of $23,000,000, a total length of six miles of modern highway facility is now serving motorists in San Francisco.



Opening Significant

While the connecting link with the Bay Bridge is sandwiched in along the previously completed unit and as such does not add to the length of the completed freeway network, the opening of this final unit of the Bayshore is significant. For the first time, a substantial number of vehicles approaching or leaving the Bay Bridge were able to make full use of the freeway, thus affording a substantial measure of relief from traffic congestion for streets in the downtown, south of Market, area.

Aerial photo of Bayshore Freeway approach to San Francisco-Oakland Bay Bridge. Left foreground is 13th Street connection to Mission Street. In right foreground is Bayshore Freeway leading south. In the center is the new connection to the Bay Bridge.

The engineering achievement in providing an artery of high utility from a traffic standpoint also added to the aesthetic qualities of the metropolis. The elevated roadways of the freeway in San Francisco afford motorists an excellent opportunity to view the splendor of her world-famous skyline as they approach the central district of the city. The magnificence of the view has appropriately led to the local designation of the elevated freeway system as skyways.

Project Wins Award

To complement the beauty of the vista from the roadway of the skyway structures the construction has attained distinction in yet another manner. The unit of the viaduct first to be finished which terminated with ramps connecting to Ninth and Tenth Streets at Bryant Street was judged by the American Institute of Steel Construction to be the most beautiful Class II steel bridge opened in 1954. This award was on the occasion of an annual nation-wide competition which includes bridges costing over $500,000 and having no span over 400 feet.

UPPER—Wendell F. Pond, who designed the Bayshore Freeway Bridge, shows President Mellon of San Francisco Chamber of Commerce the plaque presented to F. W. Panhorst, Bridge Engineer, by the American Institute of Steel Construction. LOWER —Official caravan stops on new Bay Bridge approach for ribbon-cutting ceremony.

Presentation of a stainless steel plaque to the Division of Highways by the American Institute of Steel Construction was made during the opening ceremonies.

With the completion of the San Francisco terminus of the Bayshore Freeway accomplished, work is already under way on the eastward extension of the skyway which will be known as the Embarcadero Freeway. On the westerly fringe of the central district, preparation of plans and acquisition of rights of way are being pressed for the continuation of the Central Freeway. Meanwhile, studies are under way by the engineering staffs of the Division of Highways and the City of San Francisco for additional freeway facilities which, when completed, will result in an integrated modern transportation network in San Francisco.

In Lake County

Two Major Improvement Projects Are Under Way

By W. R. LOVERING, District Materials Engineer

IMPORTANT improvement of Sign Route 20 in Lake County is progressing rapidly.

The present construction actually involves two projects: (1) relocation of State Sign Route 20 between Laurel Dell Lake and 0.4 mile west of Tule Lake, and (2) the raising of the Tule Lake fill necessitated by subsidence of the foundation.

The relocation will improve 2.3 miles of state highway that contained 14 curves unsafe for speeds of 40 miles per hour, and 3 curves unsafe for speeds of 30 miles per hour. The present road, built in 1922-23, follows the edge of Laurel Dell Lake and then skirts the narrow valley of Scotts Creek. The improved alignment follows essentially the same location but maintains a modern standard by shifting Scotts Creek and crossing the valley floor where necessary. The new alignment will permit speeds up to 60 miles per hour.

Huge Fill Required

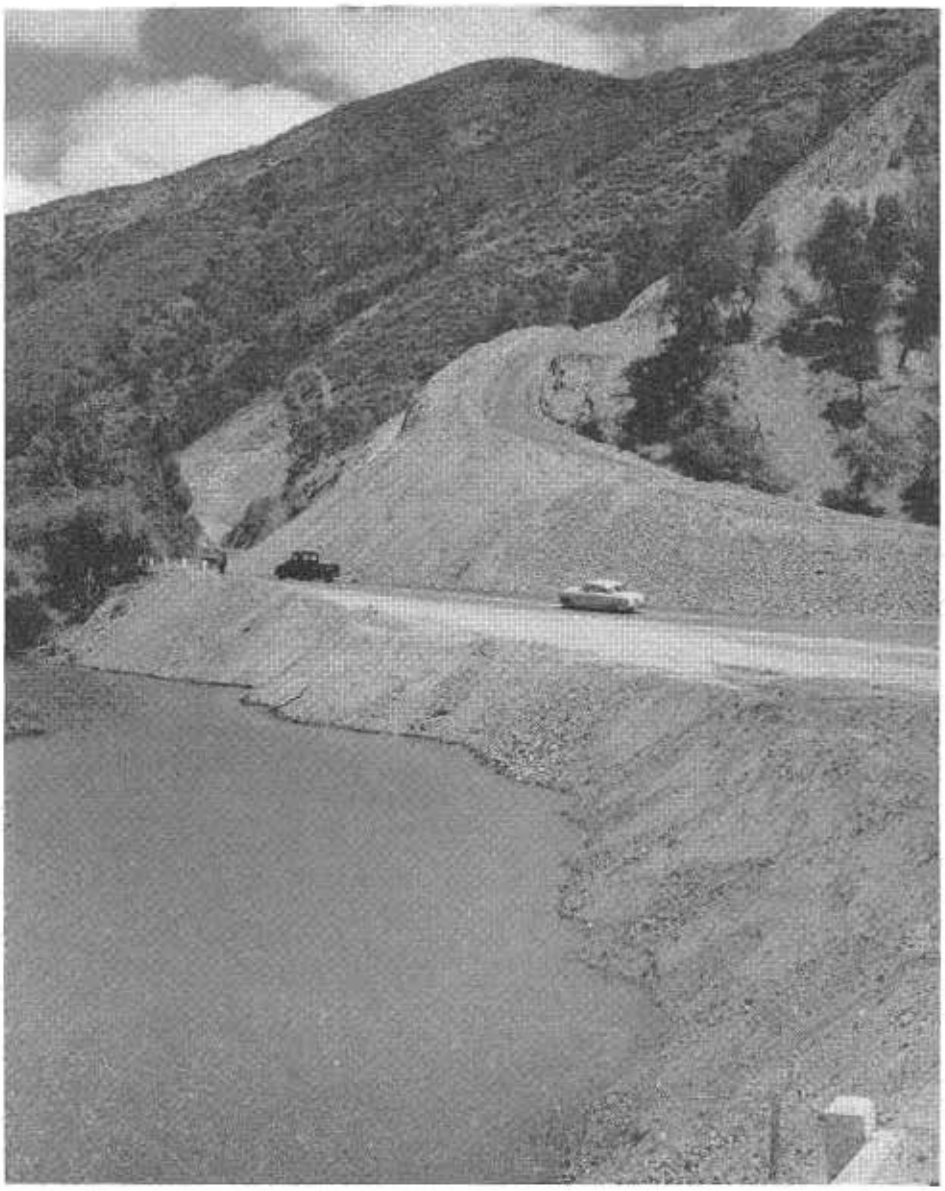
Relocation along Laurel Dell Lake will require a fill about 30 feet high, above the present level of the lake bottom, across a small bay. Borings at this location indicated a very soft peat and lay formation to a depth of 15 to 30 feet. The test data indicated that this material would not support the fill. Because of the difficulty of stripping the mud, which is below the water level of the lake, it was decided to build the fill outward from the bank so that the mud would be displaced as the fill was constructed.

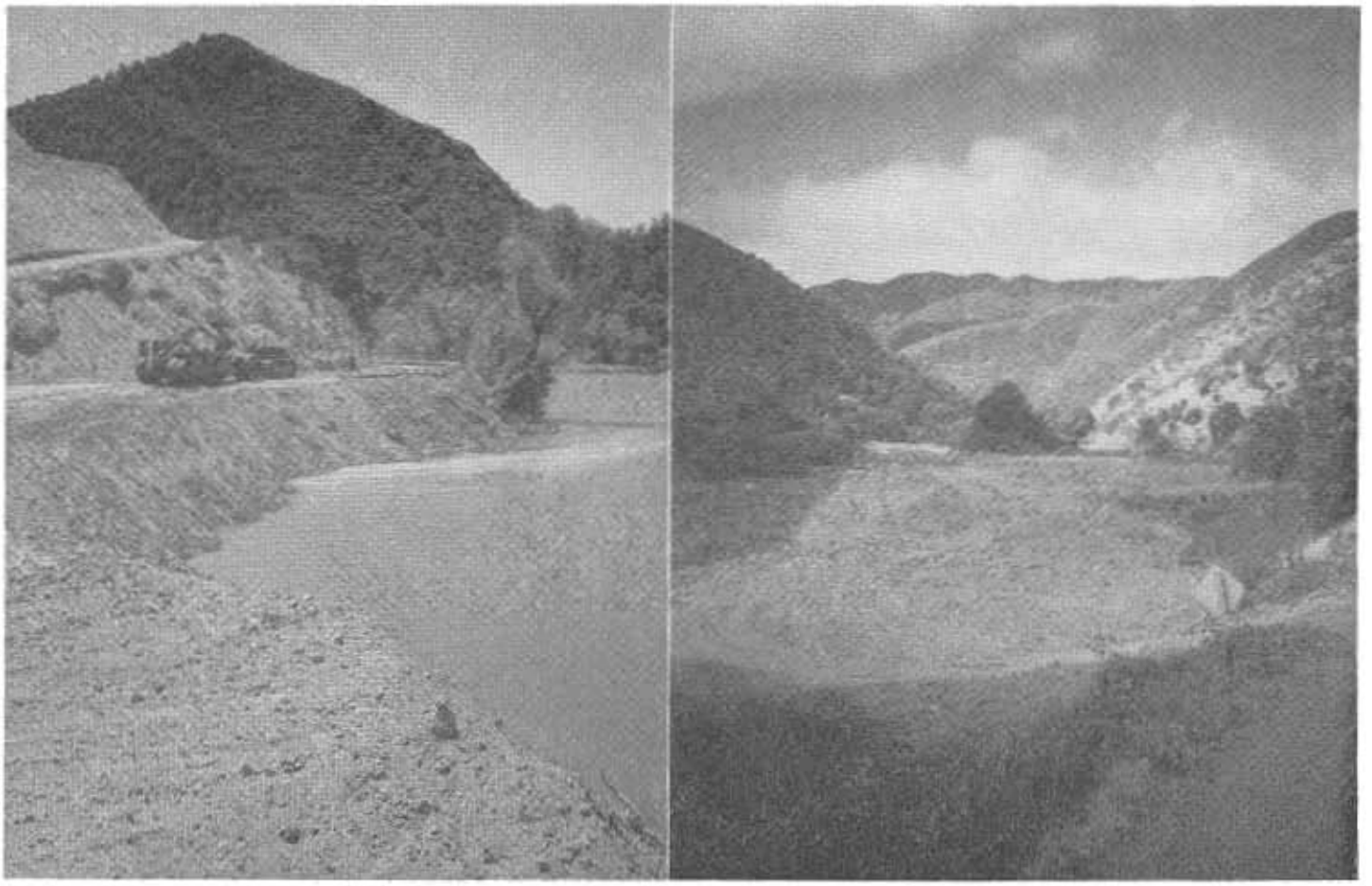
Near the Scott Valley road connection a fill of 20 feet to 25 feet is required over soft lake bed deposits. At this location a blanket of pervious gravel was placed over the foundation soils before constructing the fill. This will permit the escape of water forced from the soils by consolidation under the weight of the fill. Settlement platforms have also been installed to permit a continuous check on the rate of settlement to serve as a guide in controlling the rate of fill placement.

Tule Lake Fill

When the Tule Lake fill project was being designed, an investigation by Headquarters Laboratory of the Division of Highways indicated a depth of about 80 feet of unconsolidated lake bed soils, with high moisture content, through the Tule Lake area. The estimated cost of treatment of these materials to obtain rapid consolidation, and thus prevent later settlement of the completed fill, proved

Looking westerly along shores of Laurel Dell Lake in Lake County at the big cuts near westerly end of the Laurel Dell-Tule Lake project. New embankment extends in foreground across small bay of lake.





LEFT—Looking easterly along shores of Laurel Dell-Tule Lake project. Note sharp, narrow turn on old highway that will be superseded by new, modern alignment. RIGHT—Looking westerly along new grade on the Laurel Dell-Tule Lake project. New alignment replaces narrow, winding old highway which turns off to right and follows along base of hills forming the Scotts Creek Canyon.

to be higher than periodic rebuilding of the fill to correct for settlement.

Based on these data, it was decided to build the fill without special foundation treatment, except counterweights of strut fills to prevent complete failure, and plan on additional increments of fill at periods of 5 to 10 years as settlement occurred.

The present additions to the fill are the first in the planned stage construction. It is expected that others will be required.

J. E. Stinson is the construction superintendent for the Granite Construction Company. The resident engineer for the State is P. A. Main.

Early History

From its first occupation in 1840, when Salvador Vallejo brought cattle into the Lake County area and built a log house and corral near the present location of Kelseyville, Lake County has been handicapped by lack of adequate facilities for transportation. Although construction was started on several railroad lines into the area, none were completed and to this day there are no railroads in the county.

The first roads were constructed from the south via Napa County, followed by two roads from Cloverdale —the Dodson Road, built in 1865, and the Matt Lea Toll Road, built in 1877. In 1890 all roads into the county were privately owned. The Blue Lakes Toll Road, which connected Upper Lake and Ukiah, was purchased and made a free road in 1896, and became the first publicly owned road into Lake County.

Early travel consisted principally of vacationists from the more densely settled regions visiting these mineral springs and resort areas. These many natural mineral springs were first used by the Indians before the arrival of white men and were later developed into resort areas which still attract a large number of vacationists.

Blue Lakes was a well-known resort area as early as 1880 and, in 1900, the hotel at Laurel Dell was built by Henry Wambold. Henry Wambold has also been credited with introducing bean canning into the area and with starting the reclamation of Tule Lake, which has since proved to be ideally suited to the culture of beans as a commercial crop.[1]

Importance of State Highway

Vacationist travel is still an important part of the total highway travel, but an adequate highway system is a necessity also for marketing the pear and walnut crops and for importing the commodities necessary for the production of these crops, and for the needs of the county's residents.

[1] "History of Mendocino and Lake Counties" by Aurelius O. Carpenter and Percy H. Millberry (1914).

Looking westerly at construction activities on Laurel Dell-Tule Lake project in Lake County at intersection with Scotts Valley Road and at easterly end of Laurel Dell Lake.

State Sign Route 20 is the only reasonably adequate route available for through east-west traffic in the 200 miles between the San Francisco Bay area to the south and the Eureka-Redding road to the north. In addition to the service to through traffic between the lower Sacramento Valley and the north California coastal area, the route furnishes practically the only northerly access to the county.

From a casual inspection it would appear that the construction of a modern highway through the Blue Lakes region would involve no serious problems. A more comprehensive study, however, shows that the foundation furnished by the relatively flat valleys is far from stable and even the lowest of fills cause consolidation or settlement of the foundation. This condition has been brought about by the geologic changes that have resulted in the formation of the Blue Lakes.

Geology of the Blue Lakes

One of the earliest attempts to explain the geology of Lake County is contained in a Pomos Indian legend recounted by Carpenter and Millberry in their book "History of Mendocino and Lake Counties."

"Konocti was a proud and powerful chief, with a beautiful daughter, Lupiyomi. His rival was a young chief named Kah-bel, who loved Lupiyomi, and his passion was reciprocated. Konocti refused his consent to their marriage and was challenged to battle by Kah-bel. On either side of the Narrows of Clear Lake the mighty chiefs took their stand and hurled rocks at each other across the water. The Indian narrator, in support of this legend, points to the immense boulders strewn to this day over these mountain sides. The Indian girl grieved over the deadly contest; and Little Borax Lake, intensely impregnated with mineral, attests to her bitter tears. Kah-bel was killed and his blood is now seen in the red splashes on the gashed side of Red Hill, on the north shore of the Narrows. But old Chief Konocti also succumbed to his wounds and sank back to form the rugged volcanic rock pile which bears his name. The maiden Lupiyomi was so distraught over the death of both her lover and her father she threw herself into the lake and her unfailing tears now bubble up in the big soda spring, Omarocharbe, which gushes out of the waters of Clear Lake at Soda Bay."

Perhaps an Inland Sea

This legend explains many of the features of the county but leaves much to be desired in the way of substantiating data. The first clue to the formation of the Blue Lakes is contained in a report published in 1908 by J. O. Snyder, in which he noted the similarity of the fish fauna of the Russian River with that of the tributaries of the Sacramento River and concluded that they were derived from the Sacramento.

The past 100,000,000 years in the geologic history of the Lake County region has been essentially a period of subsidence. As the region sank, erosion from adjacent higher land filled the depressed area with sediments which accumulated to fantastic depths. From these sediments came the shale and sandstone rocks which form the majority of the hills and ridges in the county. During this early period the Clear Lake region was either an inland sea or a depressed area with drainage possibly both to the east and west.

In more recent geologic time, volcanic activity has disturbed the older sedimentary rocks and has resulted in lava flows and the formation of such mountains as Konocti.

Lava Flows and Erosion

One of the small lava flows apparently crossed the southern outlet of Cold Creek.
Clear Lake and effectively dammed this outlet. This resulted in a rise in

... Continued on page 21

Major Arterial

State, County and City Funds Combined To Construct Park Boulevard

By JOHN A. MORIN, City Engineer, City of Oakland

MANY years ago it became evident that old county road No. 625, known as Park Boulevard, running between MacArthur Boulevard (State Highway Route 5) and Mountain Boulevard (State Highway Route 227) would be inadequate. Originally improved between 1907 and 1912, the area had been built up along the the original alignment and Oakland was faced with the problem of accumulating over a million and a quarter dollars in order to acquire additional rights of way and improve this facility between MacArthur Boulevard and Estates Drive (1.40 miles) to modern standards. Beginning in 1939, the City of Oakland started setting aside a $50,000 yearly allotment of its gas tax funds for this project and, also, included a portion of the project in the 1945 bond issue.

When it became evident that actual construction could be started, the Alameda County Board of Supervisors was approached and, as this major street is of county-wide importance, that board contributed a total of $110,000 toward construction. The City of Oakland contributed $365,909.78 bond issue money, $339,329.64 of which was for right of way and the balance was used for the construction of sidewalks, lighting, drainage, and other features which are not eligible for gas tax funds, but which are necessary to complete a project in an urban area. The remainder of the cost, $855,038.53, was derived from gas tax funds.

Breakdown of Cost

The following breakdown of the total cost indicates the high cost of rights of way on this type of project and the reason why such projects are difficult in the urban areas:

Construction	$747,132.51
Rights of way	583,815.80
Total	$1,330,948.31

Photograph of the completed improvement at the intersection of Park Boulevard and Leimert Avenue looking northeasterly

Considerable savings in right of way costs were made possible by the early beginning of right of way acquisition and through the policy of purchasing entire lots and selling the remaining parcels after construction rather than purchasing portions of lots and paying high severance costs and damages.

It was necessary to design this major arterial with a median strip and four traffic lanes as it is a direct connection between the proposed Shepherd Canyon Tunnel to Contra Costa County and Oakland's central business district, as well as a connecting link between the interchange structure on the Mountain Boulevard Freeway and the interchange structure on the MacArthur Boulevard Freeway. Parking lanes, sidewalks and improved lighting were necessary as the route traverses a highly developed business and multiple home area. Major changes in alignment made it necessary to move three multiple-story apartment buildings, 35 homes and one store.

In order to eliminate an undesirable bend in the old alignment it was necessary to close two streets and change the traffic pattern immediately north of MacArthur Boulevard. A second undesirable bend was eliminated between El Centro Avenue and Hollywood Avenue and the extra street area utilized for planting. Changing the alignment and grade at this point made through access from San Luis Avenue impossible and, as this was a dead-end street, it was necessary to construct a parallel access street between San Luis Avenue and Dolores Avenue.

The widened section at the intersection of Leimert Boulevard, where left-hand turn slots and traffic signals are provided, has removed a bottleneck that had long plagued commuters. It is planned to construct six lanes to complete the remaining link between Mountain Boulevard interchange and Leimert Boulevard when traffic warrants, but the four lanes now provided are sufficient for present-day traffic.

The accompanying cross section shows the pavement design. The underlying basement soil proved to have a large percentage of clay con-

Aerial view of Park Boulevard from Excelsior Avenue to Estates Drive. Foreground shows beginning of one mile of concrete pavement; upper 0.4 mile of pavement is asphaltic concrete.

SUMMARY OF COSTS—IMPROVEMENT OF PARK BOULEVARD

		Costs			Financing		
	Miles	Right of way	Construction	Total	City funds	Alameda County funds	Gas tax funds
1st Unit—Greenwood Avenue to El Centro Avenue	0.70		$234,269.91	$234,269.91	$26,580.14		$207,689.77
2d Unit—Excelsior Boulevard to Greenwood Avenue	.28	$263,168.97	290,463.07	553,632.04	48,866.57 290,463.07		214,302.40
3d Unit—El Centro Avenue to Estates Drive	.42	320,646.83	222,399.53	543,046.36		$110,000	320,646.83 112,399.53
Totals	1.40	$583,815.80	$747,132.51	$1,330,948.31	$365,909.78	$110,000	$855,038.53

Construction of first unit started August 22, 1949.
Completion of third unit was April 6, 1955.

taining considerable ground water and accounts for the heavy sections used.

This project was a costly undertaking but has since proved its worth for traffic as well as generally enhancing the neighborhood. All of the old structures were remodeled and improved and new buildings are being constructed along the new alignment. The appearance of the neighborhood has materially improved and new buildings are being added to the tax rolls. Such projects fit in well with the efforts being made by the cities toward urban renewal.

Fine Cooperation

Much credit for the success of this project goes to the fine cooperation received from the various state and county officials and from the utility companies involved. New gas, water, electric and telephone lines were installed with a minimum delay and inconvenience. B. W. Booker, Assistant State Highway Engineer for District IV, and his staff provided excellent technical advice, and Fred Montell, a member of his staff in charge of city cooperative projects, cooperated in planning and financing to the extent that all plans were approved without delay or changes.

The Alameda County Board of Supervisors' assistance in the financing made it possible to construct this project on schedule. All plans were prepared in the office of the city engineer under the immediate supervision of E. W. Zeigler, Assistant City Engineer, and James C. Barrett, Supervising Civil Engineer. Financing details were made by Emil Kaleschke, Supervising Civil Engineer.

DON'T FOLLOW TOO CLOSELY

By far the main cause of rear-end collisions is following the vehicle ahead too closely. This fault is one of which many otherwise careful drivers are guilty. The heavy traffic on freeways and congested city streets leads many motorists to hug the bumper of the car ahead. Don't do it! Allow plenty of room for quick stops and it will save you the cost and confusion of this common highway mishap.

LAKE COUNTY

Continued from page 18 . . .

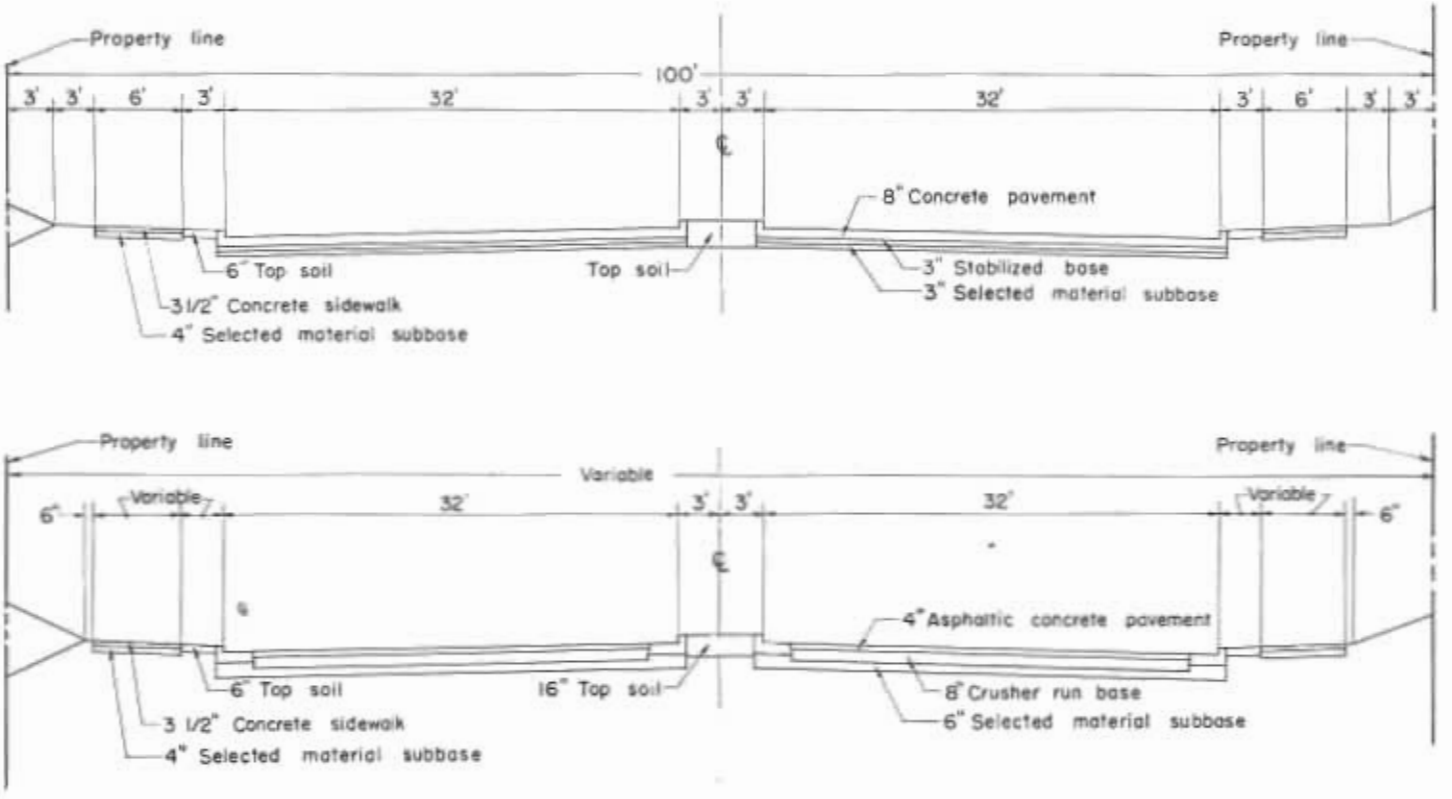
the level of the lake which eventually became high enough for the entire lake to drain to the north through Cold Creek.

The resulting erosion of the Cold Creek gorge caused landslides which either dammed or partially dammed the outlet, causing further fluctuations in the lake level. The most recent of the landslides completely dammed the Cold Creek outlet and caused the lake to rise until it topped the lava flow across the southern outlet. Eventually the lava flow was eroded through and, with the southern drainage re-established, Clear Lake receded to approximately its present level.

During this period, however, the delta from Scotts Creek separated the Blue Lakes from Clear Lake and, together with wet weather, streams in the area formed lake bed deposits of fine, poorly consolidated material varying in depth to 100 feet or more.[2]

[2] "The Lakes of California" by William Morris Davis, California Journal of Mines and Geology, January-April, 1953, Vol. 29, Nos. 1 and 2.

UPPER—Typical cross section of concrete pavement. LOWER—Typical cross section of asphaltic concrete pavement.



Pedestrian Crosswalks Near Schools Will Be Repainted Yellow

All pedestrian crosswalks on state highways in the vicinity of schools will be repainted yellow as a result of a bill passed by the 1955 Legislature and signed into law by Governor Goodwin J. Knight, the Division of Highways has announced.

At present school crosswalks are painted white like other traffic markings.

The new law further specifies that the words "SLOW—SCHOOL—XING" must be painted, also in yellow, in traffic lanes leading to school crosswalks.

Most of the repainting of the crosswalks will be done by the Division of Highways, except that on state highways through cities, where maintenance is by agreement performed by the cities, local authorities are being requested to apply the yellow color. The repainting is scheduled for completion this fall.

The division plans to obliterate the existing white markings by sandblasting to prevent a confusing mottled yellow and white effect which would otherwise arise after the new paint has worn a little.

PARALLEL CARQUINEZ BRIDGE

Continued from page 5 . . .

the freeway south of the Hercules junction, just north of Pinole.

In the four miles south of Carquinez Bridge there will be interchanges, with connections to the local crossroads, and nearby towns. Design is now under way on all of these structures.

North of the bridge, the present route through Vallejo will be converted to a full freeway with no intersections at grade. Separation structures are planned for all of the important cross streets and highway intersections.

MEXICO AND MOTOR VEHICLES

Mexico had 438,250 motor vehicles in 1953, reports the National Automobile Club.

California Wins Fifth Consecutive Traffic Award

For the fifth consecutive year, California has been awarded a first prize for outstanding performance in the field of traffic engineering by the Institute of Traffic Engineers. The award was announced by the board of directors of the institute at its meeting in Atlanta on June 10th.

This year, as last, California shares first place honors with the State of Michigan in the group of states with the most traffic and population.

Two California cities also received awards. Pasadena won first place in the 100,000 to 200,000 population class among cities throughout the Nation; Los Angeles shared a second place award with Detroit in the 1,000,000 and over group, in which first place went to Chicago.

The committee of judges, all members of the Institute of Traffic Engineers, was made up of six nationally known experts in the traffic and transportation fields.

Awards were based on the annual inventory of traffic safety activities conducted by the National Safety Council and other technical and educational organizations.

Harry Porter, Jr., Institute President and Senior Traffic Engineer for the National Safety Council, announced the awards and complimented the states and cities selected for their accomplishments.

Subsequently, on July 28th, Joe E. Havenner of the Auto Club of Southern California and a director of ITE presented a plaque in recognition of California's first place award at a ceremony in the Governor's Office in the State Building, Los Angeles.

Governor Goodwin J. Knight accepted the plaque and in turn presented it to George M. Webb, Traffic Engineer for the California Division of Highways, who represented Director of Public Works Frank B. Durkee and State Highway Engineer G. T. McCoy.

For the past five years, California has competed in a special group of the Nation's most thickly populated, heavily trafficked states which also includes New York, Pennsylvania, Ohio, Indiana, Illinois, Michigan and Texas.

New Assistant State Architect Is Appointed

Earl W. Hampton of the State Division of Architecture has been appointed Assistant State Architect, Administrative, by Anson Boyd, State Architect. Hampton has been acting in this capacity since the retirement of his predecessor, W. K. Daniels, Sr., last January.

Boyd said Hampton will have administrative responsibility for fiscal and budgetary matters pertaining to the Division of Architecture. Broadly, Boyd added, his job will be to administer and manage all construction contracts, supervise divisional cost controls and operating budgets, and administer and maintain cost controls of construction budgets. Most housekeeping activities of the division will come under the control of Hampton's office. Hampton is a native son of Sacramento County.

Civil Engineer's Society Honors Californians

Raymond J. Ivy, a supervising bridge engineer for the State Division of Highways, and Stewart Mitchell, who retired recently as a principal bridge engineer for the division, have been honored by the American Society of Civil Engineers.

They and four other Californians received the society's Arthur M. Wellington prize for 1955 for a technical paper entitled "Live Loading for Long Span Highway Bridges."

The other recipients are C. F. Scheffey and T. Y. Lin of the University of California faculty and N. C. Raab and V. J. Richey of the State Division of San Francisco Bay Toll Crossings.

Templeton Bypass

Removal of Through Traffic Helps Farm Community

By JOHN F. KELLY, Headquarters Right of Way Agent

COMPLETION of a six-mile expressway south of Paso Robles in the summer of 1953 meant another step forward in achieving the goal to multi-lane U. S. Highway 101 from Los Angeles to San Francisco. To the highway motorist, this new expressway meant an additional reduction in travel time and another step in building safe driving into the coast route. As a result of this construction it would no longer be necessary to travel at a reduced speed for a distance of approximately one-half mile to get through the community of Templeton. To the people of Templeton, the new expressway meant the removal of through highway traffic from their town. It also raised the important question which confronts every town when bypassed: How will this change affect the economy of the community?

The Land Economics Section of the California Division of Highways has prepared a number of comprehensive economic studies as a public service to provide communities affected by major highway changes with a factual report on how the economy of the community has been influenced. In keeping with this policy, a factual study has been conducted in an effort to provide an answer to the question of how the economy of Templeton has been affected by the rerouting of highway traffic away from the center of town. This economic study differs from previous studies of communities bypassed in that no evidence could be found to indicate that any portion of Templeton's economy was primarily dependent upon highway traffic.

Type of Community

Templeton is a farm center located halfway between Paso Robles and Atascadero in San Luis Obispo County. The town was created for the purpose of providing a market for the farmers in the surrounding area. The economy of this unincorporated community of 600 people is still based upon the original purpose for which it was founded: to serve the local area.

The location of the town along U. S. Highway 101 near the Southern Pacific railroad was a logical choice for a townsite because it provided good access from farm to market as well as the opportunity to utilize the railroad for shipping farm products. As the economy revolves around serving the local farm area, the role played by the highway should be the assistance that it can give to encourage and sustain farm activities. As through traffic increased, the highway ceased to effectively serve this farm community.

Traffic and Accidents

As the character of highways change from land service roads to arteries carrying large volumes of fast-moving traffic, the policy of the California Division of Highways has been to reroute traffic around many towns by means of an access controlled bypass. Development of this type of highway has improved safety conditions for highway motorists as well as providing a facility capable of serving an anticipated increase in highway travel.

The average daily traffic on U. S. Highway 101 through Templeton prior to construction of the bypass varied from 7,500 to 8,000 vehicles. Traffic studies revealed that a very small percentage of this traffic volume originated or had its destination in Templeton.

A tabulation of the number of accidents occurring on the six-mile section of U. S. Highway 101 extending south from Paso Robles through Templeton shows that there were four times as many accidents during the year before the expressway was opened as compared with the year following its completion. The accident reports also show that during the year before opening the bypass, 25 percent of the total accidents on the old highway

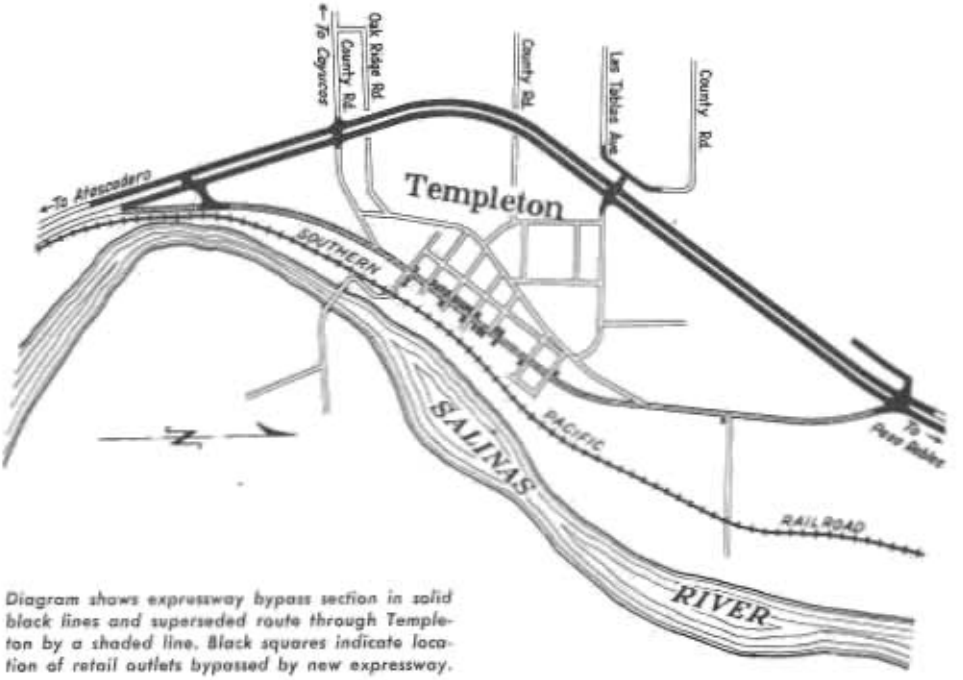


Diagram shows expressway bypass section in solid black lines and superseded route through Templeton by a shaded line. Black squares indicate location of retail outlets bypassed by new expressway.

occurred within the one-half mile portion of the highway routed through Templeton.

During the first full year the new expressway was in use, there were fewer accidents over the entire six-mile length than occurred just in Templeton during the last year that highway traffic was routed throughout the town.

A comparison of the accident rate conclusively shows that safety conditions were greatly improved for the highway motorist as well as the citizens in Templeton by rerouting the highway away from the center of the community.

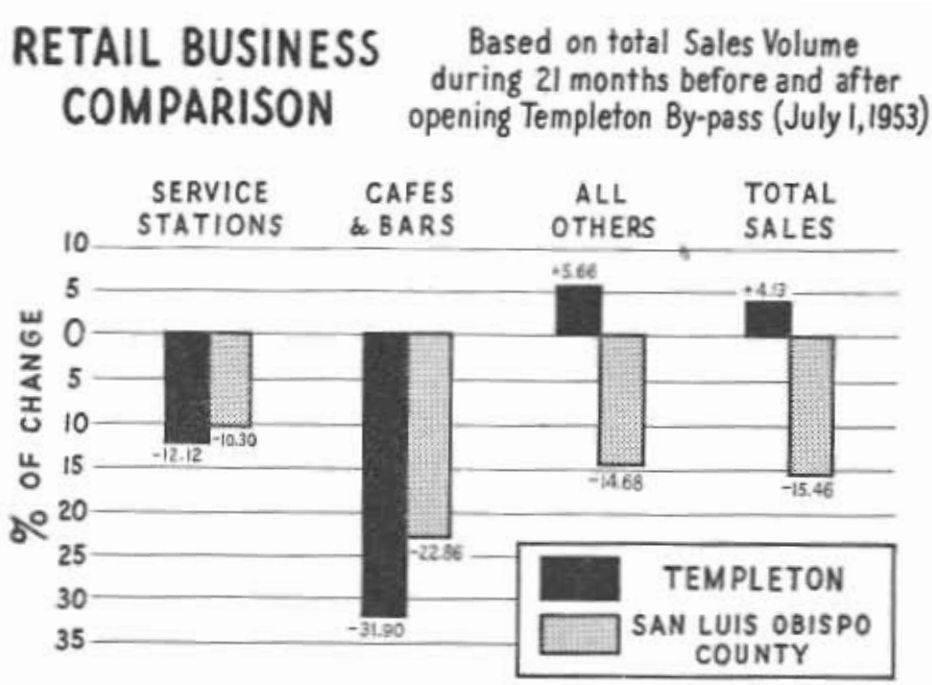
Retail Business

The residents of Templeton and the farmers doing business in town have been using the old highway for nearly two years since the construction of the bypass and have had an opportunity to observe traffic conditions in their community after the removal of the heavy volume of through traffic. It is apparent that the number of accidents have been reduced and congestion no longer exists.

However, the economic effect of the highway bypass on the community is not something that you can see and identify. Perhaps for this reason, it is not unusual to find a wide divergence of opinions on how the economy of the community has been affected. The only means of providing a reasonable conclusion of this effect is to utilize all of the factual data available as the tools for making a sound analysis.

Reliable Indicator

The data relating to retail business was found to be the largest available source of factual information on which to base this study. This source offers a reliable indicator in that the success or failure of retail business in a town such as Templeton generally reflects the economic stability of the entire community. In order to accurately measure the gains or losses made in retail business, we have tabulated the gross sales reported by the retail outlets in Templeton to the State Board of Equalization for the purpose



This graph illustrates the percentage increase or decrease in volume of retail sales in Templeton as compared with San Luis Obispo County during a similar period of time

of paying sales tax. These figures provide an accurate basis for making a comparison of the business gains or losses before and after a specific date. In this case, the date used in the time when through highway traffic was removed from the business district in Templeton.

From a mathematical standpoint, the gains or losses in the volume of gross business before and after this date might represent the degree of influence the highway change has had upon retail business. However, there are economic factors which can influence the mathematical answer and they must be interpreted in order to determine their relative weight in providing a more realistic analysis on the success or failure of retail business. This study, an economic analysis, is not based entirely upon the mathematical answer. It is our aim to consider all factors having an influence upon the general economy of the community.

The first step in analyzing the "before" and "after" gross sales volume is to determine whether the gains or losses of retail business in Templeton follow the trend normally expected during a given period of time. In order to make this analysis we have made a comparison with the gross volume of retail business in San Luis Obispo County.

Scope of Study

The time period covered by this economic study covers a total of 3½ years, which permits a comparison of 21 months before and after the removal of through traffic from Templeton. July 1, 1953, has been used as the date separating the before and after time period because it coincides closely with the date when the bypass went into effect. The gross sales reported by each retail outlet have been tabulated for the study period. As a protection to the individual businesses, this report shows business gains and losses through percentages.

Types of Business

Retail outlets such as service stations, cafes and bars are the type of businesses most frequently patronized by the highway motorist. In order to determine if the removal of through traffic from Templeton has had a direct effect upon those businesses which might derive part of their income from that clientele, the gross sales of service stations, cafes and bars are shown separately from all other retail business. The remainder of retail outlets in the community are

grouped together under an "all other" classification. These retail outlets constitute the majority of the business in the community and are dependent upon local patronage for their success.

Business Comparison

A comparison of gross retail sales in Templeton, before and after the bypass, with similar sales throughout San Luis Obispo County are listed in the table below. The percentages in this table are also shown in the accompanying chart to portray the differences in business volume for the various types of business.

	Templeton	*San Luis Obispo County*
Total sales	4.13% gain	15.46% loss
Service stations	12.12% loss	10.30% loss
Cafes and bars	31.90% loss	22.86% loss
All others	5.66% gain	14.68% loss

During the 21-month "before and after" comparison, San Luis Obispo County suffered a retail business decline of 15.46 per cent, whereas Templeton enjoyed an over-all business gain of 4.13 percent after the removal of through traffic from the community. Although state-wide gross retail sales have not been included in the accompanying table and chart, it is interesting to note that during this same comparative period, total retail business in the State increased 6.16 percent. This comparison indicates that San Luis Obispo County was influenced by economic factors not occurring on a state-wide basis. Likewise, the similarity in business activity in Templeton as compared with the State during this particular period of time indicates that Templeton apparently was not subjected to the same economic influence which seemingly affected the remainder of the county, or at least a major portion of it.

Military Influence

Sound judgment and conclusions resulting from an economic study are dependent upon a thorough investigation and an analysis of any factor which is capable of influencing the economic status of the local area. Such a factor was the military influence as a consequence of the three Army camps located in this area; namely, Camp Roberts, at the northerly boundary of the county near Paso Robles; Camp San Luis Obispo, in the central portion of the county near the City of San Luis Obispo; and Camp Cooke, in Santa Barbara County, located a relatively short distance from the beach communities in the southerly portion of San Luis Obispo County.

A special report was requested and prepared by the Sixth Army Headquarters listing the total military and civilian personnel stationed or employed at each of the three Army camps during the time covered by this study. Their report shows a remarkably close relationship between gross business in San Luis Obispo County and fluctuations in personnel strength at the Army installations.

During the 21 months "before" July 1, 1953, the total personnel in these Army camps varied from 28,874 to 53,319. The addition of this buying power to the San Luis Obispo County population of 52,000, indicates almost a 100 percent increase in potential sales.

Army Personnel

The military bases provided a limited number of living quarters. The personnel residing on the base generally do not patronize retail outlets in the "all other" classification. However, this group does patronize the service stations, cafes, and bars. Actually, their purchases follow a pattern similar to the type of merchandise sold to highway motorists. Perhaps the one notable exception to this comparison is the volume of business the local automobile dealers derive from all personnel at the nearby Army camps.

The large number of residential units in San Luis Obispo County occupied by the families of personnel at military installations indicate that the retail outlets dependent upon local business such as clothing, furniture, appliances, etc., also benefited from this "extra" buying power in the county.

On July 1, 1953, the personnel strength at the three Army camps was 32,727. Within the following six months, the total personnel at the three camps was reduced to approximately 1,000 and has remained around that figure for the entire "after" period of this study. It is an unusual coincidence that the drastic change in the military situation took place at the same time the bypass of Templeton was opened. The removal of the military buying power unquestionably was the principal cause for total busi-

View of Templeton business district along old highway route. Note large feed and grain building in left portion of photo.

ness receipts in San Luis Obispo County to decrease by 15.46 percent during the 21 months after July 1, 1953. Although the service stations, cafes and bars throughout the county suffered quite heavy business losses, the greatest loss to the county resulted from the decrease in business receipts of those retail outlets representing the majority of business and having the greatest impact upon the economy.

Considering the influence which the military installations have had upon the economy in San Luis Obispo County, the problem of this economic study is to distinguish between the influence of the military installations and the effect of rerouting through traffic in Templeton. This community did not have the facilities to provide housing for families of the military personnel. As a consequence, the majority of retail outlets in Templeton, which derive their income entirely from local trade, did not enjoy the benefits of the military purchasing power, while it existed in the county. A limited number of retail outlets such as service stations, cafes, and bars were in a positon to increase their income by the influx of military personnel in the area; however, their gains did not have any appreciable effect on the general economy of Templeton. Therefore, the military installations did not become a factor influencing the economy of Templeton, aside from the business gains enjoyed by a small number of retail outlets. Any major change can therefore be considered as a result of the highway bypass.

Service Stations

A comparison of the gains and losses by the different types of businesses as shown on the accompanying chart reveal that service stations were the only type of business where a similárity was shown between Templeton and the county.

Two major factors capable of influencing service station business in Templeton occurred almost simultaneously; the removal of highway traffic and a large number of military personnel from the general vicinity. If the military change was responsible for the 10.30 percent loss to service stations throughout the county, then that portion of the 12.12 percent loss in Templeton in excess of the county, amounting to 1.82 percent, might well be attributed to the removal of highway traffic.

In consideration of those factors which have a bearing on business activity, we cannot overlook merchandizing methods. In the case of service stations, the new modern super station is the type which attracts the highway motorist. Obsolete improvements are a definite liability in obtaining business from the through traveler. There are a number of the new super stations in San Luis Obispo County, but none of this type in Templeton.

Stations which provide good service are going to retain their customers regardless of the age or attractiveness of improvements. This type of clientele consists primarily of local citizens, and the rerouting of highway traffic would have no effect on that type of business.

It is quite possible that the absence of new super service stations in Templeton could have caused the 1.82 percent loss, even if the town had remained on the highway route.

Cafes and Bars

The greatest loss suffered by any one group of businesses in Templeton and San Luis Obispo County were the cafes and bars. The comparison of gross business reveals they suffered a 9.04 percent greater loss in Templeton than in the county. On a statewide basis, there has been a general downward trend in liquor and bar business during the past two years. Considering this fact, local economic factors play only a secondary role as an influence on this type of business because of the change taking place in the general buying habits of the public.

Like service stations, the cafes and bars in Templeton undoubtedly benefited from the personnel at the military installations during the "before" period. Therefore, it is reasonable to assume they participated equally with the county in the general decline of cafe and bar business. However, it follows that the 9.04 percent greater loss suffered by cafes and bars in Templeton was likely the result of other influences.

Management, age and attractiveness of improvements, and rerouting of highway traffic are among the principal factors which may have played a dominant role in contributing to the additional 9.04 percent decline. Exactly how much influence any one factor may have had upon the success of this type of business is difficult to ascertain.

Majority of Business

The "all other" type of business represents the largest number of retail outlets in Templeton. This group consists of such businesses as clothing, hardware, furniture, feed and grain, farm machinery, etc. Their success or failure depends upon the patronage of local customers. The tabulation of business receipts as shown on the accompanying table and chart reveals that after the removal of through traffic this "all other" group of retail business enjoyed a 5.66 percent gain. During the same comparative period of time, the county suffered a 14.68 percent loss among the majority of retail outlets. The difference of 20.34 percent indicates the stability of Templeton and the maintenance of a business growth comparable to the State as a whole. It also indicates a self-sufficiency not too greatly affected by the fluctuation of military personnel in the county.

An unusually large percentage of the total retail outlets in Templeton cater exclusively to the needs of farmers in the area. This type of business does not depend upon the highway motorist or any other outside source of income for its success. On the contrary, the removal of highway congestion makes it easier for these businesses to serve their customers. The highway again regains its position as a land service road and offers to the people a traffic facility that had been destroyed by the introduction of excess traffic.

CONCLUSIONS

In summarizing this economic study, the following conclusions can be made:

1. Templeton, regardless of highway realignment, has kept pace eco-

Employees Receive Twenty-five-year Awards

Employees of the Division of Highways who became eligible for 25-year awards during June and July, 1955, are:

Name	Total service Yrs.	Mos.	Days
ELIGIBLE ON JUNE 30, 1955			
District I			
Gutsch, Vivien A.	25	0	23
District II			
Brunelli, Louis P.	25	0	17
District III			
Ellis, Merle W.	25	0	18
Kaster, Henry H.	25	0	29
Swartz, Joseph M.	25	0	8
District IV			
Hendrickson, Carl	25	0	8
Marks, Leland A.	25	0	8
District V			
Kalar, Carl A.	25	0	1
District VII			
Driscoll, Albert E.	25	0	23
District VIII			
Dorsey, Myron W.	25	0	6
District X			
Zimbelman, Albert	25	0	29
Central Office			
Cunniff, Andrew J.	25	0	11
Nelson, Berndt	25	0	25
Bridge Dept.			
Stearns, Raymond E., Jr.	25	0	1
ELIGIBLE ON JUNE 30, 1955			
Materials and Research			
Kuhlman, Harry F.	25	0	22
Department of Public Works, Division of Contracts and Rights of Way			
Reed, Robert E.	25	0	6
ELIGIBLE ON JULY 31, 1955			
District II			
Harry, Earl W.	25	0	13
Hislop, A. W. "Joe"	25	0	9
Izzard, Loyal J.	25	0	13
District IV			
Kergal, John L.	25	0	2
Weymouth, L. A.	25	0	0
Wright, Willard W.	25	0	7
District VI			
Locamini, Inez	25	0	22
Reynolds, Albert M.	25	0	11
District VII			
Axtman, William F.	25	0	1
Shira, Alan R.	25	0	6
District X			
Dillon, Edward J.	25	0	25
Central Office			
Glass, Maynard	25	0	1
Whaley, Thomas E.	25	0	25

nomically with the State in showing a 4.13 percent gain for total retail business.

2. That Templeton's 4.13 percent business gain has been achieved in spite of a county business drop of 15.46 percent.
3. Although the service stations, cafes and bars followed the general trend of the county, their losses did not seriously affect the gains made by all other business. The 4.13 percent gain in total business confirms this fact.
4. In addition to improving local traffic conditions, Templeton should benefit in the future by its proximity to the new expressway.

OREGON'S HIGHWAY SYSTEM

Oregon's highway system, according to the National Automobile Club, currently contains over 55,000 miles of roads, including forest, state, and county roads.

DON'T LOSE YOUR TEMPER

If you lose your temper while driving you may very well lose your life.

In Memoriam

ROBERT C. McFARLAND

Robert C. McFarland, construction superintendent with the Division of Highways for 25 years, succumbed in San Jose on June 15th. Mr. McFarland retired 2½ years ago.

Mr. McFarland first came to work for the State in 1928 as resident engineer at Ingot, District II, Redding. Subsequently he served as superintendent of an honor camp in Kings Canyon-Fresno, District VI, completing a highway into Cedar Flat. In 1943 he became superintendent of Honor Camp 36 at Burnt Ranch, Eureka District I.

Mr. McFarland was born in Grafton, Massachusetts, and came to California early in the century. He was educated in the Bay area and studied at Van der Naillen College of Engineering, San Francisco.

He is survived by his widow, Gretchen Powell-McFarland, and two daughters, Gladys Rathie of Oakland and Florence Bunker of Coalinga.

Helen P. Klauser Completes Quarter Century Service

Twenty-five years, all but a year and a half with the Department of Public Works, make up the service record of Mrs. Helen P. Klauser, Secretary and Administrative Assistant to Frank B. Durkee, Director of Public Works. She recently was awarded her 25 years' service pin.

HELEN P. KLAUSER

Mrs. Klauser started her career as a junior stenographer in the District II office of the Division of Highways in Redding. She has worked in the Highway Personnel Office, San Francisco-Oakland Bay Bridge Office, California Commission for the Golden Gate International Exposition, and in the office of the State Highway Engineer.

The late Charles H. Purcell, Chief Engineer of the San Francisco-Oakland Bay Bridge, asked her to serve as his secretary in March of 1936. She was Mr. Purcell's secretary for 12 years, eight of which were while he was Director of Public Works.

She has seen the director's office grow from a staff of six to its present force of 20 employees. The duties and responsibilities of Mrs. Klauser's job are varied and numerous. Her knowledge of the functions of each of the divisions of the department, her loyalty, and her keen interest in her job have made her a credit to the Department of Public Works.

DON'T DRIVE WHILE DROWSY

Drowsing in a chair by an open fire can be pleasant pastime. Drowsing at the wheel of a moving car can be a fatal mistake. Don't drive while drowsy.

GRADE CROSSINGS

As of June 30, 1954, there were 849 railroad grade crossings on California state highways. During the preceding year 25 grade crossings were eliminated by construction of underpasses and overheads.

ADDITIONAL FOUR LANES ON U.S. 40 IN SIGHT

At its August meeting the California Highway Commission will consider the adoption of a freeway routing for an 11-mile section of U. S. Highway 40 from one mile northeast of Roseville to one mile east of Newcastle, Placer County.

Adoption of such a routing would be a step toward the further four-laning of US 40 east of Sacramento.

State Highway Engineer G. T. McCoy has recommended a route which would run from a half to three-quarters of a mile south of the present highway.

A public meeting was held in Auburn on July 13th at which information was presented on various possible routes. Subsequently the board of supervisors of Placer County adopted a resolution stating that further hearings on the proposed route were not necessary.

The recommended route would leave the present highway just east of the end of the Roseville Freeway now under construction between Ben Ali and one-half mile east of Roseville. It would follow along Secret Ravine, skirting Rocklin and Loomis to the south. Near the end of Secret Ravine it would turn northerly to bypass Newcastle on the east and connect with the existing highway approximately one mile east of Newcastle.

Plans of the Division of Highways call for construction of a four-lane full freeway on this section of US 40, with provision for ultimate development to six lanes. At each important public road a grade separation would be provided so that the present county road system would not be disrupted.

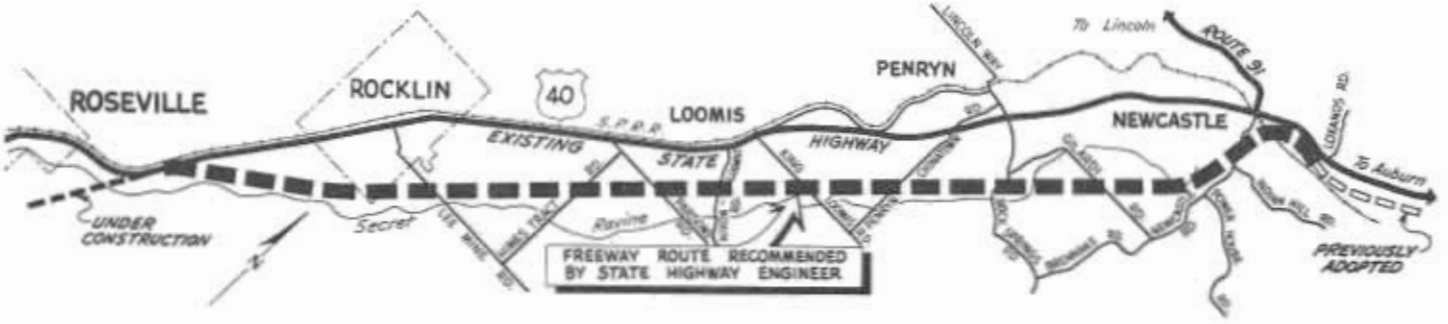
The present highway would continue to serve local traffic and would be connected with the freeway by appropriate interchanges.

State highway engineers estimate that to construct a freeway on the recommended route would cost approximately $5,500,000, including rights of way. Start of construction would depend on the availability of future state highway funds.

The 1955-56 state highway budget contains an allocation of $900,000 to build structures for 2.7 miles of freeway between one mile east of Newcastle and Elm Street in Auburn.

US 40 has been constructed as a multilane expressway for 8.1 miles between Auburn and Applegate, and construction is under way on 2.7 miles from Applegate to Heather Glen under a $671,410 contract.

Adoption of a routing between east of Roseville and east of Newcastle would close the one remaining gap in the freeway routing of US 40 between Sacramento and one mile east of Magra, near Gold Run. This is a total length of approximately 54 miles.



New Directory of ARBA Is Off Press

The 1955 edition of American Road Builders' Association's convenient pocket-sized directory of "Highway Officials and Engineers" is available for distribution.

This edition contains:

1. More than 1,500 names, titles and addresses of administrative engineers and officials in the 48 state highway departments and the District of Columbia.

2. Administrative personnel of the Bureau of Public Roads, including the heads of its division offices.

3. Engineers and administrative personnel of toll road authorities.

4. Officers and directors of ARBA, its seven organized divisions, and its Washington headquarters staff.

5. A tabulation by states showing highway funds expended during 1954, as well as an estimate of expenditures for highway construction and maintenance during 1955.

6. A tabulation of states having legislative authority to construct toll roads.

VEHICLES ENTERING CALIFORNIA

A total of 405,720 motor vehicles entered California during June of this year as compared with the 378,607 that entered during June, 1954, reports the National Automobile Club. Of the June, 1955, total, 376,689 were passenger cars, 24,803 were commercial trucks, and 4,228 were stages.

INJURED IN TRAFFIC ACCIDENTS

More than 678,000 persons were injured in week-end traffic accidents in the United States during 1954, reports the National Automobile Club.

FREEWAY ROUTING THROUGH MORAGA VALLEY IS PROPOSED

The California Highway Commission will consider at its August meeting the adoption of a freeway routing for a section of State Highway Route 233 through the Moraga Valley in Contra Costa County from Bollinger Canyon Road just north of St. Mary's College to State Sign Route 24 near Lafayette.

State Highway Route 233 was added to the State Highway System by the Legislature in 1953 and is described partly as being from Mountain Boulevard near the intersection of Park Boulevard in Oakland to State Sign Route 24 near Lafayette. No traversable route is maintained by the State at present, and future development will be entirely on new location, including the section now under consideration.

For the portion between Bollinger Canyon Road and Sign Route 24, State Highway Engineer G. T. McCoy has recommended what is known as the Reliez Road location. It runs just northerly of St. Mary's College through the Burton area and along Reliez Road to a connection with Sign Route 24 at the Pleasant Hill Road intersection. It would be a little less than four miles in length.

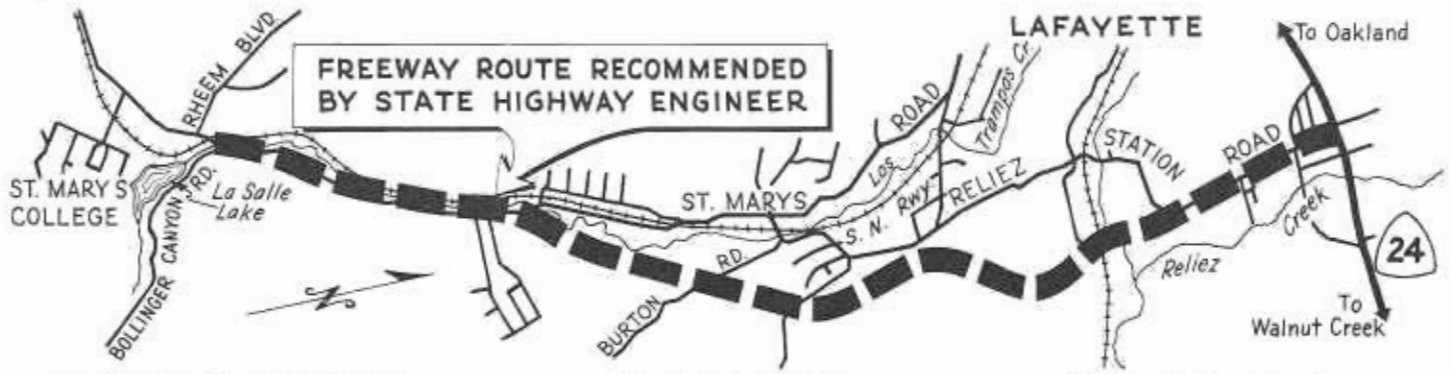
A public meeting was held in Lafayette June 15th to acquaint interested individuals with proposed location studies. On July 8th the Board of Supervisors of Contra Costa County adopted a resolution approving the recommended location and stating that a public hearing by the California Highway Commission would not be necessary.

Plans of the Division of Highways call for construction of a four-lane freeway over this section with provision for an ultimate six lanes. Start of construction would depend on the availability of future state highway funds.

McCoy told the commission that although construction might be some time in the future, adoption of a route at this time would enable the State to determine its needs for right of way before further development takes place, particularly in the Burton area and would also assist in community planning.

A freeway routing for one other section of State Highway Route 233 was adopted by the commission in September, 1954. It extends from Mountain Boulevard in Alameda County to Eastwood Court near the Contra Costa county line. In general, it follows along Park Boulevard in Shepherd Canyon.

When constructed, the proposed highway will serve as an additional connection between Oakland and the rapidly growing central Contra Costa County area as well as an important connection to the north, south, and east.



LIKES ROADSIDE PLANTING

SAN FRANCISCO 11, CALIFORNIA

California Highway Commission,
Sacramento, California

GENTLEMEN: On my vacation this summer, I drove down Highway 99, and the oleanders planted in the center of that highway, blooming and waving in the breeze were a joy.

I am sure they must give similar pleasure to other California residents as well as to our visitors, and I am writing this note so you will know that many of us appreciate the beautification of our highways.

Sincerely,

LORRAINE BOYD

LIKES MAGAZINE

CITY OF FRESNO
PLANNING COMMISSION

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: *California Highways and Public Works* is an excellent publication on highway planning and construction in our State. As a planner, I am keenly interested in highway development. The technical matters and data presented in your publication are of extreme importance to me.

Very truly yours,

E. BORIS STAHM
Director of Planning
City of Fresno

LETTER FROM TORONTO

ONTARIO
DEPARTMENT OF HIGHWAYS

KENNETH C. ADAMS, *Editor*

DEAR SIR: I have been on your mailing list for many years. I feel that I have been remiss in not writing to you before, expressing my thanks.

Your articles are well prepared and the publication is issued in excellent form. The technical information made available is most valuable and interesting.

Yours very truly,

C. A. ROBBINS
Services Manager

"Automation"

Machine Computations Save Engineering Time

By SAM OSOFSKY, Supervising Highway Statistician, and
R. K. BREECE, Assistant Engineer of Design

One of the most persistent bottlenecks which has challenged the California Division of Highways in its effort to produce the engineering plans for an expanded highway construction program is the routine, time-consuming chore of computing traverses and making other engineering calculations. The time required to make and check these calculations manually is not only costly in dollars and cents, it also represents a considerable drain on skilled engineering manpower which ideally might be devoted to more productive tasks.

For the past 19 years the Division of Highways has utilized electronic computing machines for tabulation and solution of many problems. The machines have been employed in the analysis of origin and destination surveys, of construction and maintenance costs, traffic accident reports, personnel statistics, road life studies, road inventories, status of highways and for many other tasks.

Aware of the rapid development and extended use of electronic computers and automatic calculating processes in scientific, industrial and business fields, the division has been seeking methods to short-cut the expensive drudgery of manual calculations.

In January, 1955, the writers were assigned the task of finding which, if any, calculations made by engineers in the 11 district offices of the Division of Highways could be adapted to machine computation. There is little doubt that complete automation would be possible for many problems on the complex and expensive electronic computing machines now available. The immediate target, however, was an approach to automation through the use of equipment already available in the tabulating section of the California Highway Planning Survey.

The key to the problem was found in a procedure developed by the International Business Machines Corporation for obtaining the sine and cosine of a bearing accurate to seven decimal places, making traverse computations possible.

As a result, the Division of Highways is now solving by machine calculation eight types of traverses, covering the great majority of traverse work encountered in division operations. These eight problem types now being processed are as follows:

1. Traverse computation where all sides and bearings are known. This may be used for original computations in coordinating a traverse or as a check of original computations.
2. Traverse computation where the lengths of two sides are unknown.
3. Traverse computation where the length of one side and the bearing of another side are unknown.
4. The problem described as Type 1 where, in addition, the area within the closed traverse is desired.
5. The problem described as Type 2 where, in addition, the area within the closed traverse is desired.
6. Traverse computation where the length of one side and the bearing of that same side are unknown.
7. The problem described as Type 3 where, in addition, the area within the closed traverse is desired.
8. The problem described as Type 6 where, in addition, the area within the closed traverse is desired.

The process developed depends on a modified IBM Electronic Calculator, Type 604. However, the following six other types of conventional equipment are also required in the process:

Type 024—Key Punches
Type 056—Verifiers
Type 077—Collators
Type 082—Sorters
Type 402—Tabulators
Type 513—Reproducing Punches

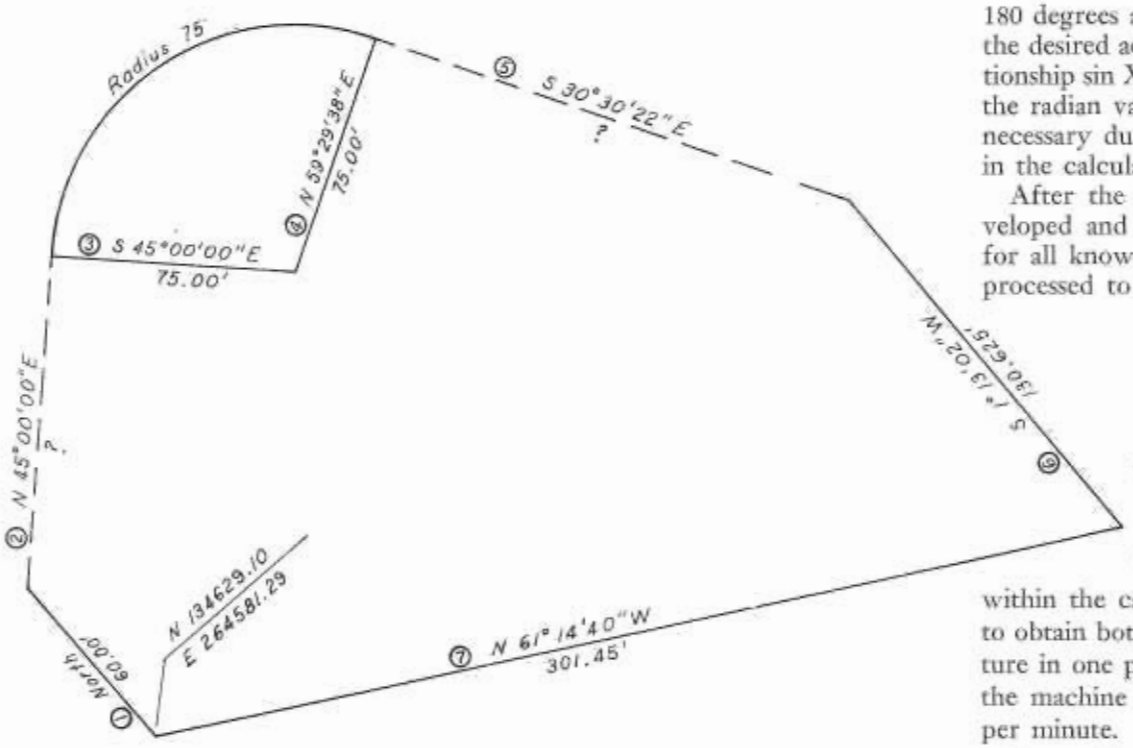
To process all eight problem types, 61 separate steps are taken using the above equipment, and 13 different wiring panels are utilized in the Type 604 Calculator. Some of these panels accomplish more than one function, requiring an additional pass of the cards through the machines, due to the limitation of the machine in some cases or the limitation of the capacity of the IBM card in others.

Since almost all traverse calculations are done in the various district offices, this procedure was made available to certain districts on a trial basis and has now been extended to all districts.

To make use of this service, the engineer in the district office, when confronted with a traverse such as the typical example shown in *Figure I*, fills out a portion of a traverse sheet with the necessary data, as shown in *Figure II*. However, instead of making the usual routine computations, he goes on to more productive work. These traverse sheets are gathered up and mailed to headquarters daily, making use of air mail where this will materially shorten the time in transit.

When the traverse sheets reach the tabulating section, the data are first punched on cards, one course to a card. The cards are verified by a second punching operation and are then ready for the calculator.

The bearings are reduced to radians, the sine and cosine computed by the formulas:



←*Figure I—A typical traverse with the length of two sides unknown. The tabulated solution is shown in Fig. III.*

$$\text{Sine } X = X - \frac{X^3}{3!} + \frac{X^5}{5!} - \frac{X^7}{7!} + \cdots$$

$$\text{Cosine } X = 1 - \frac{X^2}{2!} + \frac{X^4}{4!} - \frac{X^6}{6!} + \cdots$$

and the results punched on the cards in one pass of the cards through the calculator.

Mechanically this was facilitated by a factoring process and the application of the formula in the reverse direction. The following is a portion of the factored formula used for the sine:

$$\text{Sine } X = X \left[C_1 + X^2 \Big(C_3 + X^2 \left(C_5 + X^2 \left[C_7 + C_9 X^2 \right] \right) \Big) + \cdots \right]$$

This type of factoring lends itself to repetitive instructions to the Type 604 Calculator and makes it possible for both the sine and cosine to be produced in one pass of the cards. The repetitive instructions slow the normal speed of the calculator from 100 cards a minute to approximately 25 cards a minute. The calculator being used has available 60 programs or instruction steps, approximately 30 of which are repeated 15 times to get the sine and again to get the cosine. John A. Haller, of the research section of the California Highway Planning Survey, who did most of the program planning for the traverse computations, developed a procedure which combined the boards producing the sine and cosine with the boards to convert degrees, minutes, and seconds to radians. In this revision of the original IBM procedure, he also provided for the functions of angles up to 180 degrees and, in order to maintain the desired accuracy, utilized the relationship $\sin X = \cos (90 - X)$ to keep the radian value under one. This was necessary due to the limited capacity in the calculator.

After the sine and cosine are developed and punched onto the cards for all known bearings, the cards are processed to obtain latitudes and departures for all courses where both the distance and bearing are known. It was found that it was within the capacity of the calculator to obtain both the latitude and departure in one pass of the cards through the machine at a speed of 100 cards per minute.

For problem Type 1 (traverse computation where all sides and bearings are known), no further processing is required except that the cards be placed in proper sequence by use of the sorter and then printed at the rate of about 40 lines per minute in the tabulating machine.

Figure II—Sample traverse sheet for the traverse shown in Fig. I as submitted by the engineer in the district office

CHPS TRAVERSE SHEET

STATION	COD NO.	DISTANCE	BEARING	FUNCTIONS COS	FUNCTIONS SIN	COORDINATES N	COORDINATES E
	00					134629.10	264581.29
	1	60.00	N 00 00 00 E				
	2	?	N 45 00 00 E				
	3	75.00	S 45 00 00 E				
	4	75.00	N 59 29 38 E				
	5	?	S 30 30 22 E				
	6	130.625	S 1 13 02 W				
	7	301.450	N 61 14 40 W				
	99					134629.10	264581.29
Add	3	75.00	10 29 38				

A sample of the tabulation which is returned to the originator of the traverse is shown in *Figure III*.

Where the lengths of two unknown sides are involved (Problem Type 2), the following formula is solved by additional processing in the various machines:

$$X = \frac{\Sigma D \cos Y - \Sigma L \sin Y}{\sin X \cos Y - \cos X \sin Y}$$

In the Type 3 problem where the length of one side and the bearing of another side are unknown, the following formula is solved:

$$Y = \Sigma D \sin Y + \Sigma L \cos Y \pm \sqrt{(\Sigma D \sin Y + \Sigma L \cos Y)^2 - (\Sigma L)^2 - (\Sigma D)^2 + X^2}$$

This results in two solutions, both of which may close the traverse. The two solutions are listed as two consecutive traverses and returned to the engineer, who, by inspection, can easily select the rational solution.

The unknown bearings in problem Types 3 and 6 are solved by the use of the arc sine series:

$$\sin^{-1} X = X + \frac{1}{2}\cdot\frac{X^3}{3} + \frac{1}{2}\cdot\frac{3}{4}\cdot\frac{X^5}{5} + \frac{1}{2}\cdot\frac{3}{4}\cdot\frac{5}{6}\cdot\frac{X^7}{7} + \cdots$$

It is interesting to note that wherever possible each unknown is calculated separately instead of using a forced closure procedure. This provides an additional check of the work.

To illustrate the use of some of the auxiliary equipment a general procedure used for problem Type 4 (all sides and bearings known, but area desired) is indicated as follows:

At the completion of the second pass of the cards through the calculator which developed latitudes and departures, the cards are brought to the sorter to extract cards for circular segments. The remaining cards are sorted additionally on columns identifying the problem types, district, group, batch, traverse number, and course number.

Problem Type 4 is then extracted and processed through the collator, at which point a blank card is inserted behind each traverse. The area of the traverse is later summarized on this card. All pairs of radii are extracted

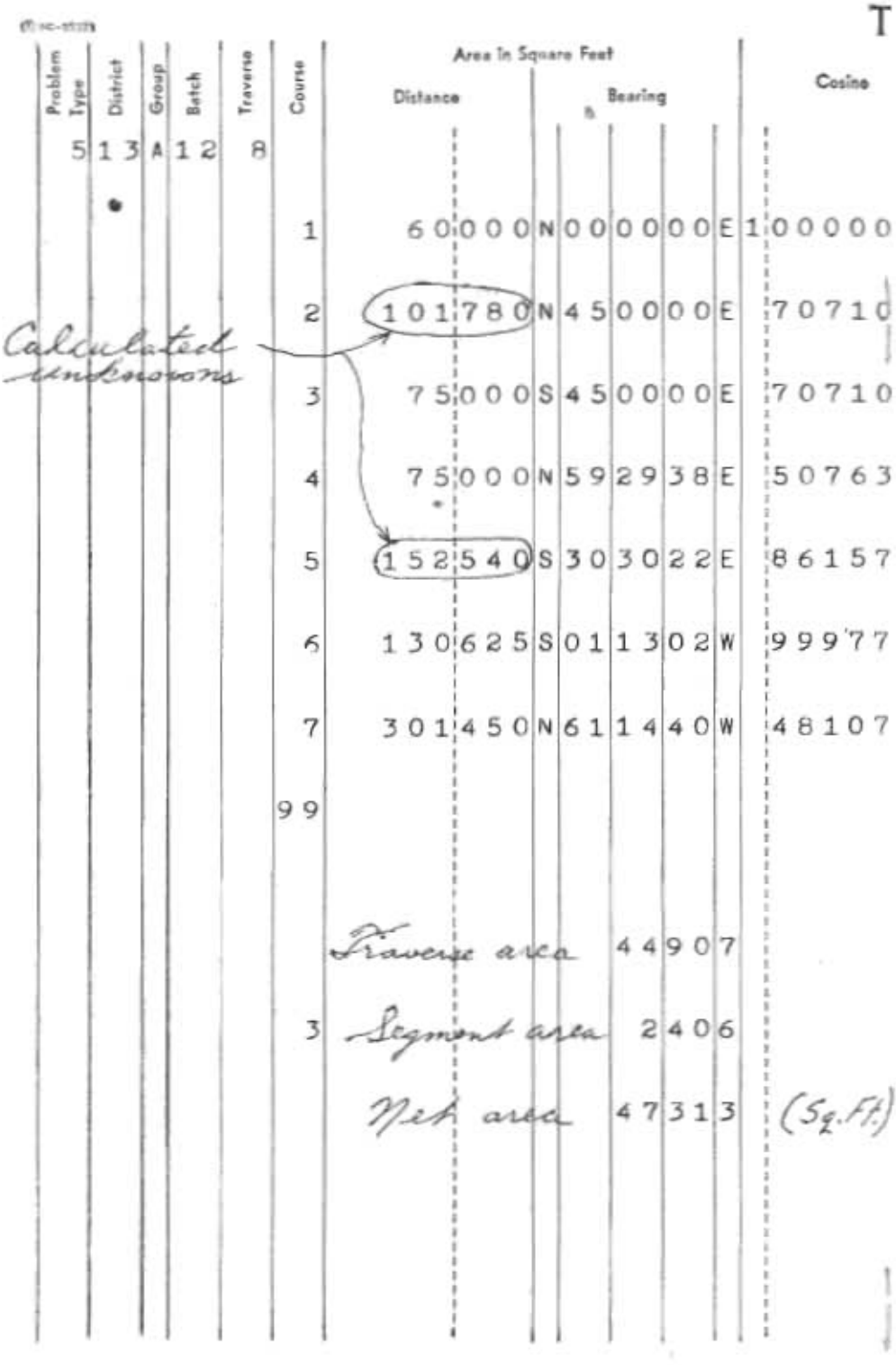
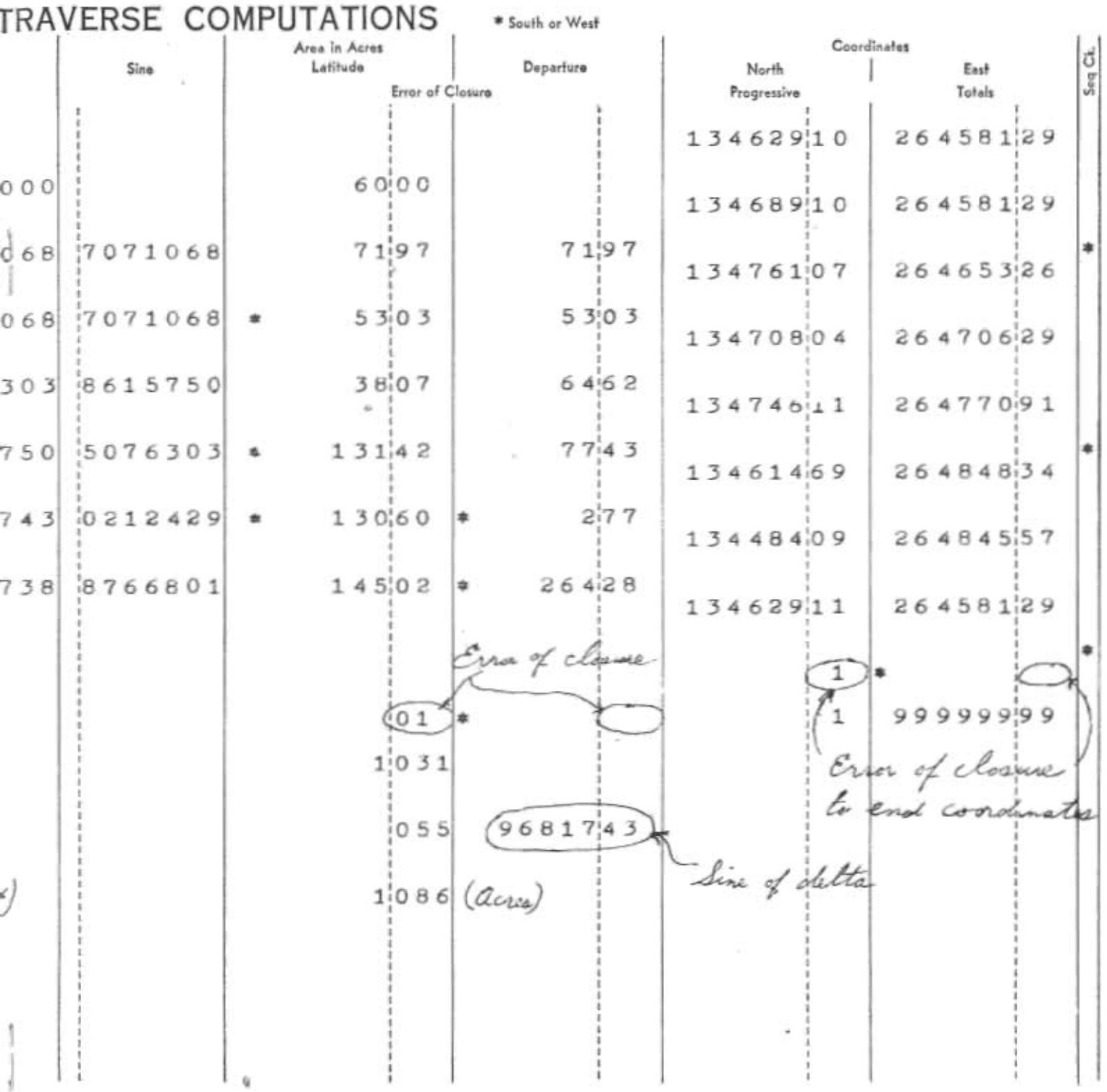


Figure III—Traverse comp



mputations. Tabulation resulting from processing the traverse sheet shown in Fig. 11.

and each pair replaced by a card containing the sums of the latitudes and departures of the pair. The area within the traverse is then computed by use of double meridian distance and recorded on the blank card. Cards for circular segments are processed separately through the calculator to obtain the area of the circular segments utilizing the following formula:

$$\text{Area} = \frac{R^2}{2}(\text{Delta in radians} - \text{sine delta})$$

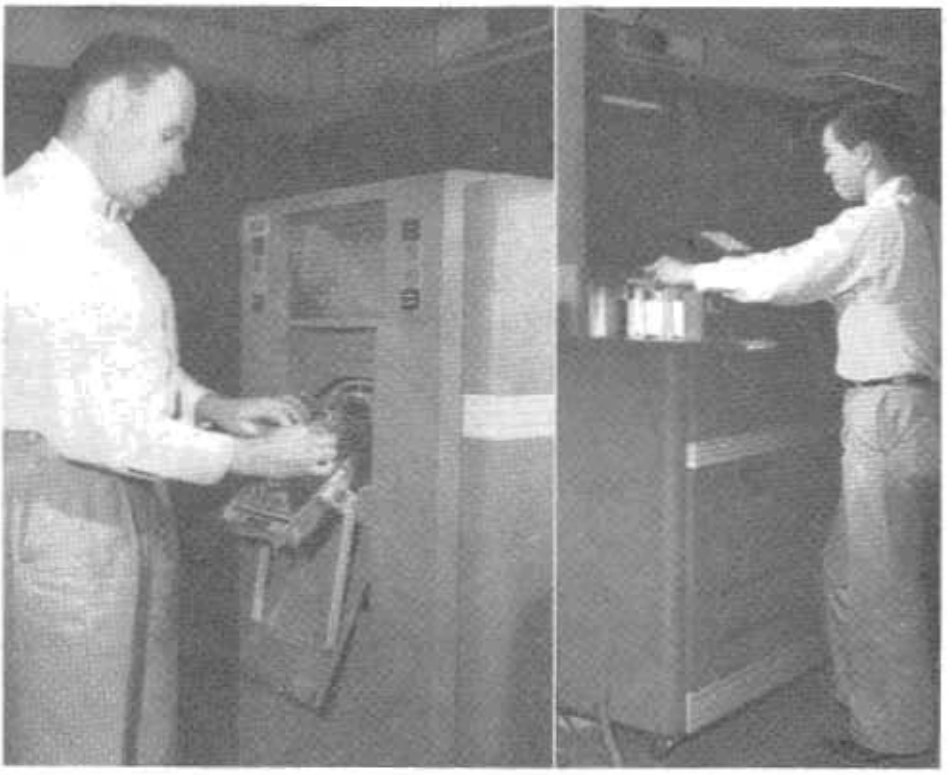
At the completion of the two phases the cards are again processed through the collator to replace the radius pairs and insert the area segment cards in their proper places. Cards are now ready to be processed through the Type 402 Tabulator which provides the listing shown in *Figure III.*

Solving for unknowns in a traverse requires the use of the tabulator and Type 513 Reproducing Punch which summarize the data to be used in the above indicated formulas. Calculation of these formulas requires several passes, due to the limited capacity of the calculator.

In order to hold some of the results of the calculation, the Type 077 Collator is used to insert blank cards behind the summary cards which are obtained in the reproducing punch in conjunction with the tabulator. Subsequently both the collator and the reproducing punch are again used to first match and then reproduce the calculated data onto the original card forms.

After all the calculations have been completed and the traverses have been listed they are separated by district and mailed. As a general rule, the traverses are processed and mailed out the same day they are received.

In general, no inspection or check of the finished tabulation is made before mailing. The users of this service have found that a detailed check of the computations is not necessary. A check of the traverse sheet before submitting it for computation, together with an inspection of the error of closure, end coordinates, and closure to end coordinates on the completed tabulation will in general show up any significant error.



Operators at work at the Type 604 Calculator

The whole procedure calls for a somewhat different approach to the problem of traverse calculations on the part of the engineer who is used to solving one traverse before going on to the next. To obtain maximum benefits from the new service, he must plan his work so that he writes as many independent traverses as possible for one portion of the work and then goes on to other sections of the job while the computations are being done for him. The change from the usual procedure may be difficult for the engineer to get used to at first, but the saving in time and money makes it well worth while.

From a tabulating standpoint the volume of cards handled in these problems is small. However, since calculations are repetitive in nature it is possible to prepare boards which are kept wired permanently for the various steps of each problem type.

Estimates of cost have been made, based on the small volumes handled to date. It has been determined that in addition to relieving engineering personnel for more productive types of work an actual saving in dollars and cents is achieved. The cost of traverse calculations as performed manually has been estimated at 13 cents a course, exclusive of checking; when processed through the presently available IBM equipment the cost is approximately 5 cents a course.

The machine calculation cost includes a pro rata charge for machine time on presently installed equipment in headquarters. As the rental cost for only one of each of the different types of machines necessary for punching and processing the traverse data would be $1,500 per month, it is planned to perform the work in Sacramento. As long as rapid service is provided to the various districts, the existing arrangement is considered the most practical under the present work load and even under a considerably increased work load.

With the development of these traverse calculations completed, the authors are turning their attention to the problem of earthwork calculations, traverse adjustments, and other types of routine engineering calculations, which we hope will bear equally fruitful results.

Precast Curbs

An Experimental Project On US 40 in Placer County

By BLAIR GEDDES, District Traffic Engineer

PRECAST white reflective curbing was installed recently at several locations on US 40, in Placer County, between Auburn and Applegate.

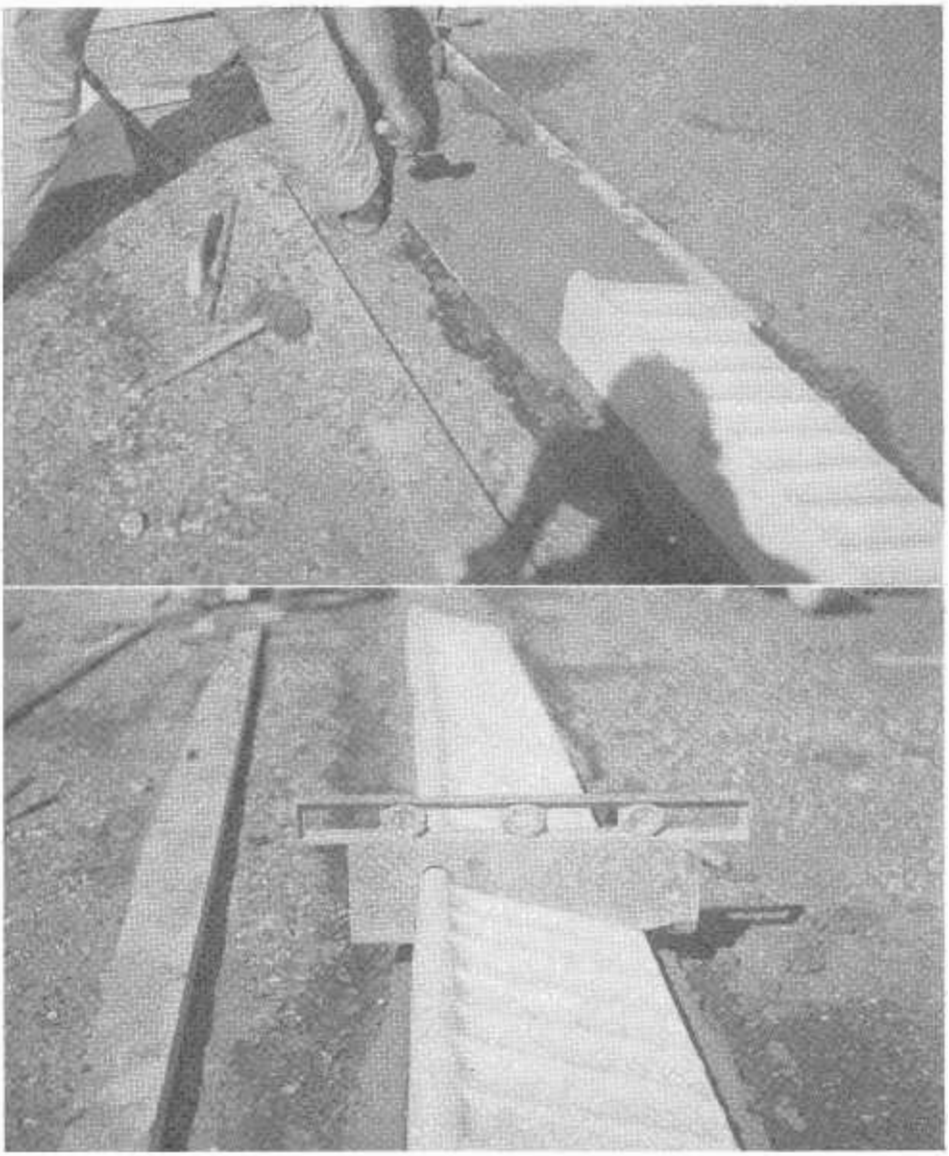
This latest endeavor of the California Division of Highways to improve the visibility of roadway delineation is one of a series of such continuing efforts throughout the State.

The usual curb delineation on California state highways has consisted of a rolled asphalt plant mix curb painted white or recessed concrete curbs with the recesses painted white. Research in this field to improve visibility and reduce curb construction and maintenance costs has included experimental installation of nonbarrier curbs with transverse striations secured through special finishing procedure.

The work reported in this paper is a California test of a curb-type which has been used by the State of New Jersey for several years.

The installation was divided into two distinct parts. The first part involved 1,422 lineal feet of double-faced divider curb placed on top of existing surfacing along the center line of a narrow paved median area. The second part consisted of 1,407 lineal feet of a single-faced curb, similar in cross-section to the California Standard D3 curb which was placed partly on existing surfacing and partly on prepared concrete base in nine separate curb noses at crossovers in the median area of the divided expressway.

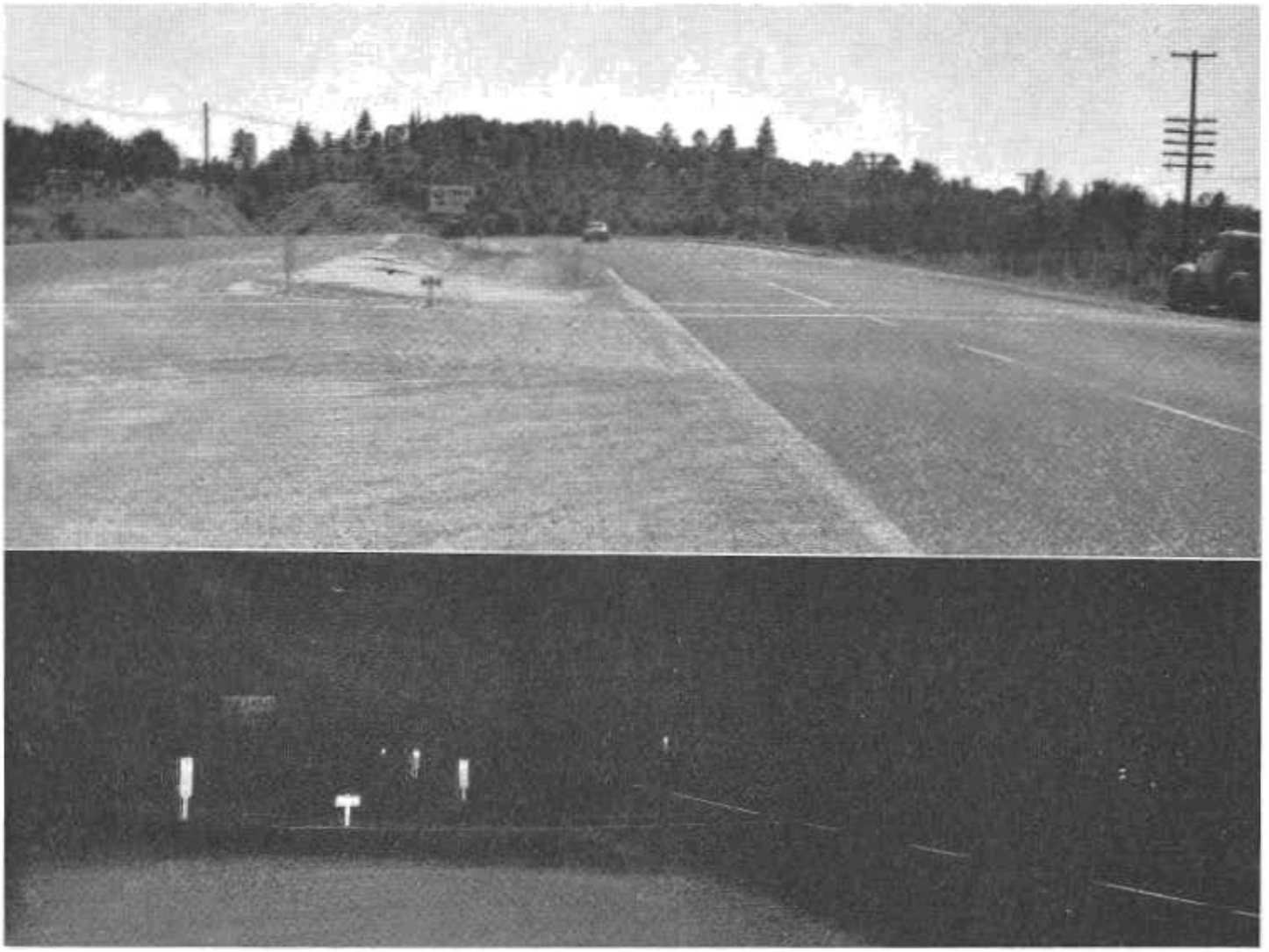
US 40 in this particular area is a 4-lane, divided highway with a median varying from an 8-foot paved area to an unpaved width of 36 feet between inner edges of pavement. Although it traverses fairly rough terrain between the 1,500 and 2,000-foot elevations, the grades of the two roadways are practically the same and the median area is depressed, in the unpaved portions, only sufficient for drainage purposes.



UPPER Spreading mortar for curb section. LOWER Leveling device for truing up curb.

The majority of the intersecting roads are at acute angles to follow contour lines of the various slopes, with resulting large intersection areas. Local practice developed into cutting across the median area rather than to proceed into the crossover proper. Where such movements appeared numerous, curb noses were planned to delineate the crossover area and discourage the improper movements.

The precast sections were manufactured at the South San Francisco plant of the vendor, the P. Grassi-American Terrazo Company, and were cast in concrete moulds on high frequency vibrating tables. A mix of white Calaveras cement and aggregate consisting of crushed Sonora white marble from



UPPER—Typical curb nose (day) before improvement. LOWER—Same location before improvement (night).

the vendor's quarry at Sonora, California, with a slump of less than 1 inch was vibrated into the forms. Preliminary curing was accomplished in a steam room and final curing in a storage yard under water spray. The extreme care in making the forms was reflected in the smooth surface of the finished product. After final curing, the curb faces were given an application of silicone sealer to completely seal against penetration of dirt and stain. The contract work of installation was also performed by the vendor.

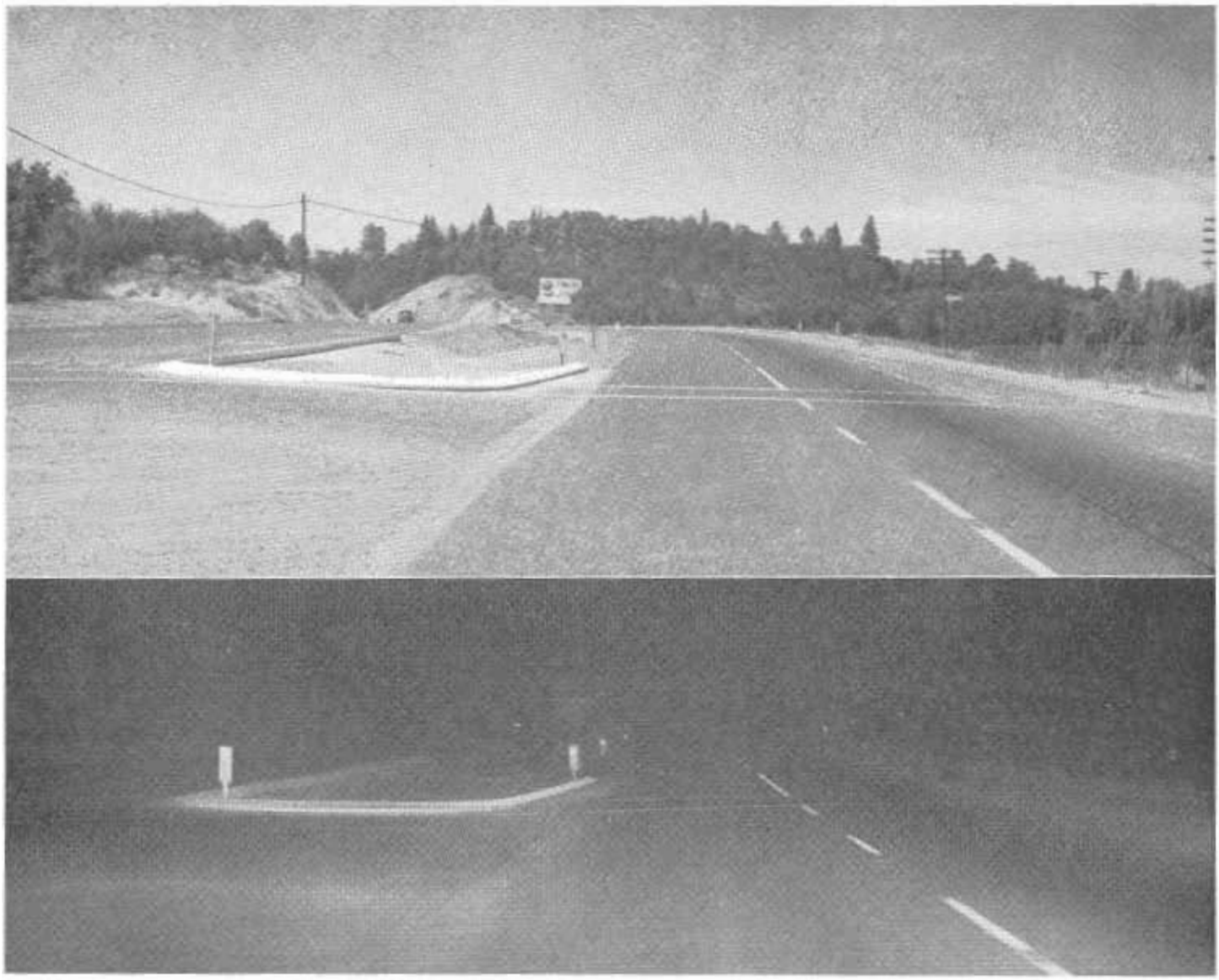
Areas Prepared

The first order of work was to prepare the areas where the curb noses were to be placed. As parts of the areas had some surfacing in place, a careful inspection was made of each location. Where existing surfacing was not completely interlocked and where the curb was to be partly or wholly over unsurfaced areas, a concrete foundation 3 inches x 11 inches was poured to line and grade staked to provide a smooth mortar bed and as near to the elevation of the adjacent pavement as possible consistent with the irregularities of the pavement edge. After these bases were poured, the delivery of the precast sections was commenced.

The installing was commenced with the double-faced divider sections over existing pavement. The precast sections, each 5 feet 4⅛ inches in length, were unloaded from the transport truck with a fork lift and placed adjacent to their final position. Concrete nails or short pieces of reinforcing steel, dependent upon the firmness of the underlying surfacing, were driven along the area over which the keyway in the bottom of the section would fit. Mortar, consisting one part Portland cement, three parts sand and 8 percent mortar cream, was spread between two 1 inch x 3 inches boards used as temporary side forms, and within the keyway of the casting. The casting was then lifted by two men using a special tong set and placed in position. A rubber mallet was used to promote subsidence and minor displacement of the mortar to bring the section to the proper grade.

Transverse Slope

Throughout the major portion of the section of paved median where the divider was placed, there was a difference in elevation between the



UPPER—Day view of curb nose after installation. LOWER—Night photograph of same project.

adjacent roadways of from 0.2 foot to 0.4 foot which created a transverse slope across the median. To eliminate ponding of water on the high side during storms, a 4-inch opening was left every 50 feet to provide cross drainage. The resulting gaps are hardly noticeable at normal driving speeds on the adjacent roadway.

By the time that the divider section was completed, the curb bases at the various nose locations were cured sufficiently to begin installation of the curb sections. Seven of the noses were of an 8.5-foot inside radius, six subtending a central angle of 170 degrees 28 feet and the seventh 176 degrees 11. The two remaining noses were 1 foot inside radius for an arc of 165 degrees. The 8.5 radius sections were cast in arcs of 45 degrees each with the fourth section of each nose subtending the required remaining arc. The 1-foot radius sections were cast to the full required 165 degrees. The balance of each installation was completed with the standard 5-foot 4⅜-inch straight sections. The length of these sections was controlled by over-all span of 10⅝ inches for each set of reflecting vanes and the lengths of sections were set up in multiples of the vane sets to attain continuity of design. In installing, the curved portion was first placed and then the balance of each side of the nose was completed.

The curb section weighs approximately 53 pounds per foot or about 282 pounds per 5-foot 4⅜-inch section. This, with the weight of the lifting tongs, amounted to about 160-pound lift per man in setting the sections into place.

Production Decelerated

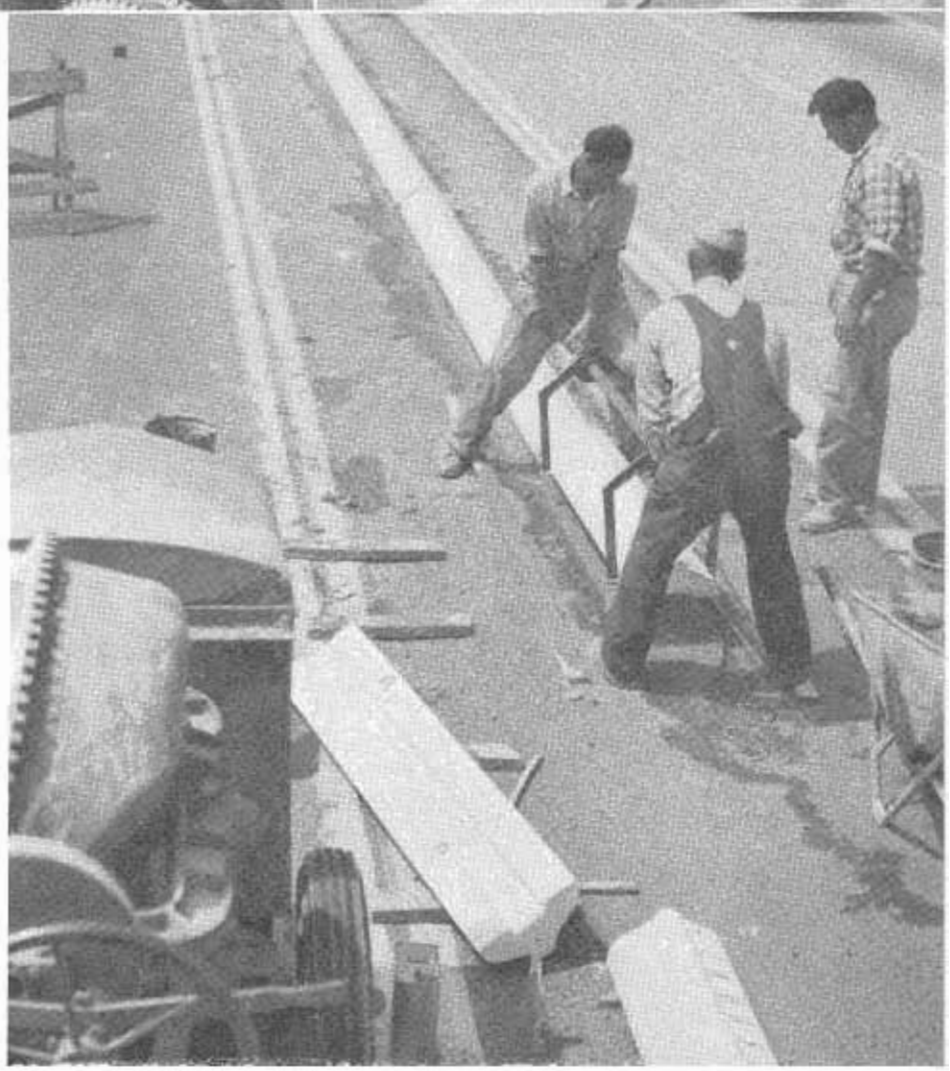
While the handles were at a height to utilize the best lifting positions, it was noticeable that production decelerated during the latter half of each shift. It appears that a reduction in length would accomplish two objectives; first, a lighter lift per section would probably allow a more uniform rate throughout the day and result in increased footage per shift, and sec-

ond, where grades must be varied to match existing surfacing a better match could be made. Where provisions are included in original planning, much effort to achieve a smooth grade line to match the pavement grade will be eliminated.

The finished job is pleasing in appearance and presents a startling contrast with the existing pavement. The contrast is more noticeable at night than in the day time, and while observations under rain have not yet been made, the visibility factor during final cleanup when the curb was wet from washing indicates that the most pronounced effect will be in stormy weather when headlights under ordinary circumstances are the most ineffective.

Rapid Installation

While the increased visibility factor is one which should improve safety, the cost of installation must be weighed against the benefits derived. On wholly new construction where form protection is minor, the competition with other types and methods will require careful consideration. There is a field, however, where the present method is without comparison and that is in areas where curbs must be superimposed on existing surfacing under traffic conditions. The rapidity with which an installation can be made will subject the traffic on the road to a minimum of inconvenience during the construction period and will have the completed installation in service almost before forms could be set for cast-in-place curbs.



UPPER LEFT—Unloading curb sections. UPPER RIGHT—Driving anchor steel for center divider. LOWER—Setting section of center divider.

Due to the limited footage involved, the actual costs of the work performed do not provide a sufficient basis for estimating costs of future work. Valuable experience was gained on this project. Decision as to further installations of this type will be deferred pending an observation period to ascertain the degree of traffic safety benefit.

Cost Index

Expected Rise in Construction Costs Begins During Second Quarter 1955

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

STATE HIGHWAY construction costs which have been relatively stationary since the fourth quarter of 1951 broke during the second quarter of 1955 when such costs, as reflected by the California Highway Construction Cost Index, jumped 12.2 percent above the Index for the first quarter of 1955. The Index for the first quarter of the year stood at 189.3 (1940 = 100); during the second quarter it rose 23.1 index points to 212.4.

During the past three years highway construction costs have undergone only minor ups and down, even in the face of rises in material costs and continued increases in wage rates and fringe benefits to labor. Competition among contractors has been keen during the last few years and it has been felt that this has been the chief cause in keeping construction costs from rising. However, bidders have evidently reached the limits in devices for cutting prices and trimming profits and the effects of rising labor and materials costs will now become apparent in bid prices.

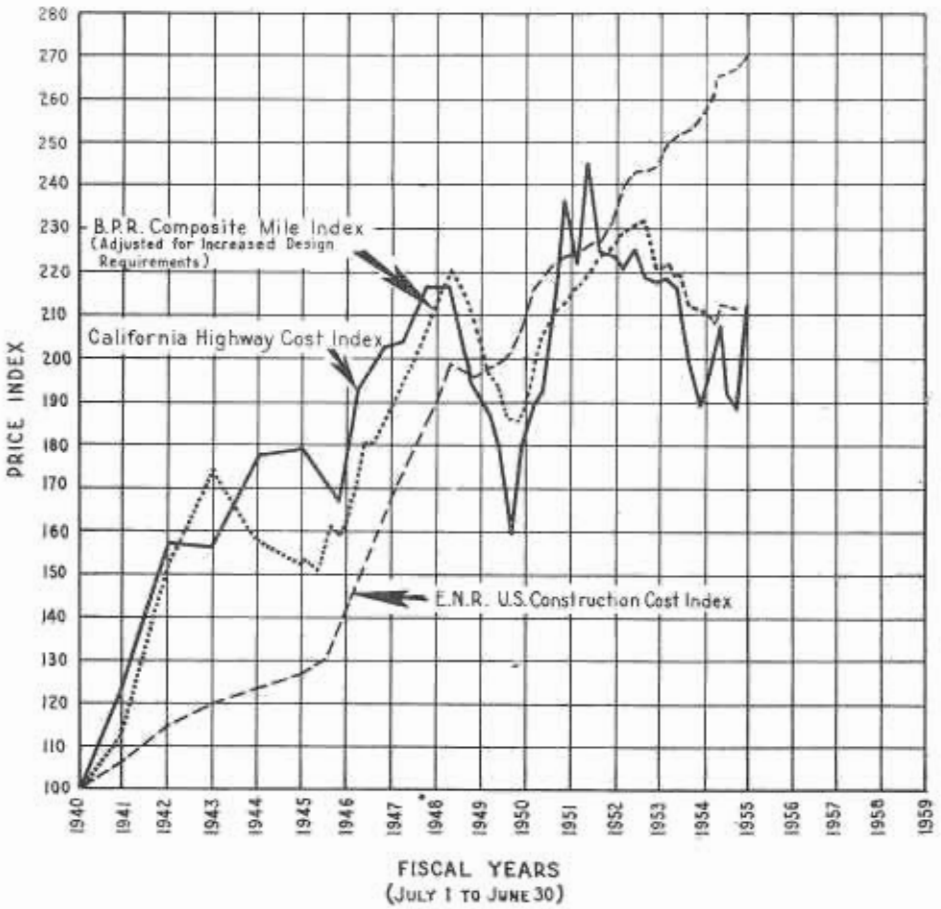
THE CALIFORNIA HIGHWAY CONSTRUCTION COST INDEX

Year	Cost Index
1940	100.0
1941	125.0
1942	157.5
1943	156.4
1944	177.8
1945	179.5
1946	179.7
1947	203.3
1948	216.6
1949	190.7
1950	176.7
(1st Quarter 1950—160.6)	
1951	210.8
(4th Quarter 1951—245.4)	
1952	224.5
1953	216.2
1954 (1st Quarter)	199.4
1954 (2d Quarter)	189.0
1954 (3d Quarter)	207.8
1954 (4th Quarter)	192.2
1955 (1st Quarter)	189.3
1955 (2d Quarter)	212.4

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PRICE INDEX CONSTRUCTION COSTS

1940 = 100



The accompanying tabulation shows the California Highway Construction Cost Index by years from 1940 through 1953 and by quarters for 1954 and 1955.

CALIFORNIA DIVISION OF HIGHWAYS AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Crusher run base, per ton	Plant mix surfacing, per ton	Asphalt concrete pavement, per ton	PCC pavement per cu. yd.	PCC structures per cu. yd.	Bar reinforcing steel, per lb.	Structural steel, per lb.
1940	$0.22	$1.54	$2.19	$2.97	$7.68	$18.33	$0.040	$0.083
1941	0.26	2.31	2.84	3.18	7.54	23.31	0.053	0.107
1942	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103
1943	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080
1944	0.50	2.45	4.10	4.50	10.46	31.99	0.054	0.132
1945	0.51	2.42	4.20	4.88	10.90	37.20	0.059	0.102
1946	0.41	2.45	4.00	4.68	9.48	37.38	0.060	0.099
1947	0.46	2.42	4.32	5.38	12.38	48.44	0.080	0.138
1948	0.55	2.43	4.30	5.38	13.04	49.86	0.092	0.126
1949	0.49	2.67	4.67	4.64	12.28	48.67	0.096	0.117
1950	0.40	2.25	4.26	3.75	11.11	43.45	0.079	0.094
1951	0.49	2.62	4.34	5.00	12.21	47.22	0.102	0.159
1952	0.56	2.99	5.00	4.38	13.42	48.08	0.098	0.150
1953	0.51	*2.14	5.31	4.58	12.74	50.59	0.093	0.133
1st Quarter 1954	0.45	2.28	4.23	4.78	14.89	47.52	0.092	0.126
2d Quarter 1954	0.38	2.09	4.29	5.18	14.28	47.12	0.093	0.114
3d Quarter 1954	0.43	1.85	4.68	7.00	12.63	49.59	0.095	0.162
4th Quarter 1954	0.35	1.78	4.83	.....	13.13	46.08	0.094	0.135
1st Quarter 1955	0.39	1.69	4.55	.....	13.44	40.66	0.095	0.140
2d Quarter 1955	0.42	1.99	5.39	.....	14.46	51.36	0.098	0.136

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

Inspection of the average unit prices bid during the second quarter of 1955 for the eight items upon which the California Highway Construction Cost Index is based (see accompanying tabulation) show marked increases for every item except structural steel. No bids were received for asphalt concrete so it does not enter the picture. Roadway excavation rose from $0.39 to $0.42 per cubic yard, a rise of 8 percent; untreated rock base was up 18 percent, from $1.69 to $1.99 per ton; plant-mixed surfacing rose a similar amount: 18 percent, from $4.55 to $5.39 per ton; Portland cement concrete pavement was up only 7 percent, $13.44 to $14.46 per cubic yard; structure concrete made the greatest jump, 26 percent, from $40.66 to $51.36 per cubic yard; bar reinforcing steel rose only 3 percent, from $0.095 to $0.098 per pound; and structural steel dropped 3 percent, $0.140 to $0.136 per pound.

It is a foregone conclusion that under the recent wage increases given to labor in the steel industry steel prices will rise appreciably in the immediate future. During the month of July a raise of $7.50 per ton ($0.004 per pound) was placed in effect.

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

The Engineering News-Record Index which comprises all types of construction is nation-wide in scope. For the second quarter of 1955 this Index was up 1.2 percent over the first quarter of 1955.

The U. S. Bureau of Public Roads Composite Mile Index was down 0.4 percent in the first quarter of 1955 from the fourth quarter of 1954. Figures on this Index for the second quarter of 1955 are not available at this writing.

To present a gauge on competition among bidders there are attached tabulations of the average number of bidders for various sizes of road and bridge contracts for the first six months of 1955 and for the fiscal year from July 1, 1954, to June 30, 1955. It will be noted that the average number of bidders is down slightly from the preceding fiscal year and for the first six months of 1955 it is considerably below the first six months of 1954.

On June 30, 1955, there were 800 contractors prequalified to bid on state highway projects with an estimated combined bidding capacity of $1,595,850,000.

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

(July 1, 1954, to June 30, 1955)

Project volume	Up to $50,000	$50,000 to $100,000	$100,000 to $250,000	$250,000 to $500,000	$500,000 to $1,000,000	Over $1,000,000	All projects
Road projects							
No. of projects	144	37	54	20	16	6	277
Total value*	$2,555,938	$2,733,005	$8,744,639	$7,025,543	$10,308,521	$7,888,196	$39,255,842
Avg. No. bidders	4.6	5.4	5.3	6.3	8.4	10.2	5.3
Structure projects							
No. of projects	32	12	8	2	2	3	59
Total value*	$614,635	$769,131	$1,227,519	$738,252	$1,660,034	$8,194,609	$13,204,180
Avg. No. bidders	5.1	8.5	8.6	5.5	6.5	7.3	6.4
Combination projects							
No. of projects	.....	.....	.....	.....	1	14	15
Total value*	.....	.....	.....	.....	$729,549	$30,030,168	$30,759,617
Avg. No. bidders	.....	.....	.....	.....	2.0	7.9	7.5
Summary							
No. of projects	176	49	62	22	19	23	351
Total value*	$3,170,573	$3,502,136	$9,972,158	$7,763,795	$12,698,104	$46,112,973	$83,219,639
Avg. No. bidders	4.7	6.2	5.7	6.2	7.9	8.4	5.6

* Bid items only.

Total Average Bidders by Months

	Jan.	Feb.	Mar.	Apr.	May	June	Avg. for six months
1955	8.5	5.8	6.7	5.5	5.0	4.4	5.3
1954	7.6	8.4	8.8	6.9	5.7	6.3	7.0

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

(January 1, 1955, to June 30, 1955)

Project volume	Up to $50,000	$50,000 to $100,000	$100,000 to $250,000	$250,000 to $500,000	$500,000 to $1,000,000	Over $1,000,000	All projects
Road projects							
No. of projects	276	77	89	33	25	9	509
Total value*	$4,672,324	$5,472,569	$14,340,010	$11,522,512	$16,040,776	$11,946,878	$63,995,069
Avg. No. bidders	4.7	5.8	6.2	7.3	8.4	9.7	5.6
Structure projects							
No. of projects	49	16	15	6	8	5	99
Total value*	$977,689	$1,081,319	$2,327,655	$2,215,127	$5,452,256	$11,091,149	$23,145,195
Avg. No. bidders	6.1	8.9	10.3	10.5	8.1	9.0	7.7
Combination projects							
No. of projects					2	28	30
Total value*					$1,547,176	$63,662,725	$65,209,901
Avg. No. bidders					6.0	9.1	8.9
Summary							
No. of projects	325	93	104	39	35	42	638
Total value*	$5,650,013	$6,553,888	$16,667,665	$13,737,639	$23,040,208	$86,700,752	$152,350,165
Avg. No. bidders	4.9	6.3	6.8	7.8	8.2	9.2	6.1

* Bid items only.

Total Average Bidders by Month

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Avg. for year
1954-55	6.7	6.0	6.5	7.9	7.0	6.4	8.5	5.8	6.7	5.5	5.0	4.4	6.1
1953-54	6.2	6.9	6.4	7.6	7.4	7.7	7.6	8.4	8.8	6.9	5.7	6.3	6.9

In arriving at a practical figure for combined bidding capacity, ratings in excess of $20,000,000 have been entered at the $20,000,000 figure.

Last year at this time there were 780 prequalified contractors with a combined bidding capacity of $1,472,445,300, using the $20,000,000 cut-off figure.

Based on their maximum rating the 800 prequalified contractors with a bidding capacity of $1,600,000,000 are grouped as follows:

10,000,000 and over	45
5,000,000 to 10,000,000	81
2,500,000 to 5,000,000	142
1,500,000 to 2,500,000	202
1,000,000 to 1,500,000	247
500,000 to 1,000,000	273
250,000 to 500,000	517
100,000 to 250,000	667
50,000 to 100,000	766
up to 50,000	800

As a comparison of the work of the Division of Highways to this bidding capacity it should be noted that on June 30, 1955, the division had under way 381 contracts with a total value of $238,031,500. This is an all time high and compares with the previous high of $226,988,600 on May 31, 1955, when 321 contracts were under way.

PATIENCE PAYS

Patience is one of the most valuable assets a driver can have. There are many situations on the streets and highways which you cannot help but they all clear up eventually and fretting will not get you to your destination any sooner.

CALIFORNIA

California ranges in width from 150 to 375 miles.

TRIBUTE TO MAGAZINE

PACIFIC GAS & ELECTRIC CO.
San Francisco, California

MR. KENNETH C. ADAMS, *Editor*

This is a tribute to your magazine which is circulated through the entire department when I have finished with it. Everyone enjoys it and it brings a clearer understanding of the problems of highway construction and maintenance. This alone makes publication worthwhile.

L. A. KRIEG

MAGAZINE IN SCHOOLS

MODESTO CITY SCHOOLS

K. C. ADAMS, *Editor*

I wish to express to you my appreciation for the very fine magazine which you edit and cause to be published for the citizens of our great State.

I read the magazine regularly and faithfully, not only for its news and report of highway development throughout the State, but it is a fine example of good reporting and wonderful photography.

I always take the magazine home where our three children read through it also. It serves as a good geography book for them as they associate what they have read in your magazine with scenes and developments experienced in our travels throughout the State. Then I forward the magazine to one of our school libraries where I observe it is read and used also.

Sincerely,

ROBERT T. ELLIOTT

SUPERVISORS VOICE THANKS

THE BOARD OF SUPERVISORS
CONTRA COSTA COUNTY

MR. FRANK B. DURKEE

DEAR MR. DURKEE: Mr. E. R. Foley, accompanied by Mr. P. A. Carmichael, made an excellent presentation to the board of supervisors of the inventory of the rural roads in Contra Costa County.

We are especially pleased with the contents of the report, and realize that the data will be of great value to not only our Public Works Department and the Planning Commission, but to every department in our county.

A resolution commending the State Department of Public Works and the United States Bureau of Public Roads for this outstanding contribution to the people of Contra Costa County, was unanimously adopted by the board of supervisors. We were all greatly impressed with the vision, interest, and the months of labor that had gone into the preparation of such a complete study.

We wish to thank you for the inventory, which is evidence again of the value of cooperation between governmental agencies.

H. L. CUMMINGS, Chairman

State Fair

Many New Highways Will Expedite Travel to Event

Two of California's most valuable resources, "Sunshine and Water," have been chosen for the theme of the California State Fair and Exposition when it opens its gates this year on September 1st. To emphasize the theme and the importance of these two resources in the economy of the State, containers of water from each of the 58 counties will be transported by highway, rail, pack animal, and air to the fairgrounds and mixed to signify the unity that exists in the State. Governor Goodwin J. Knight will officiate at the ceremonies.

Eleven beautiful maidens will pour the waters from all over the State into a pool to form a crystal-clear solution during opening day ceremonies. These maidens will be selected from beauties from nearly every county and will be finalists in the "Maid of California" contest. The winner will be crowned by the State's first lady, Mrs. Virginia Knight, wife of the Governor.

Spectacular Growth

The State Fair will again dramatize the spectacular growth and development of the State. Forty-four counties and eight foreign countries have indicated that they will display the wealth of their lands in the huge counties building in the center of the fairgrounds. The youngsters of the State will compete in many divisions, including livestock, 4-H Club, Future Farmers of America, Junior Grange Activities, and a "Sew It Yourself" fashion sewing contest. The State Fair Horseshow, oldest continuous horseshow in the West, will exhibit fine animals and experienced riding traditional to this event. The Hall of Flowers will show the blooms and greenery of California in its new building. Wines, poultry, rabbits, art, grain, cooking, and a thousand other items and commodities produced by the State will be judged and displayed in this theme of "Sunshine and Water" to dramatize the role of California in this expanding country of ours.

Record Attendance Expected

Records in attendance are expected to topple this year at this granddaddy of western expositions, as they did last year when 812,204 people came through the gates.

Thousands of Californians and out-of-state visitors will travel to the Fair over new state highways, expressways and freeways.

Last year the pari-mutuel play also set a new high of $4,144,522 for the nine-day season, and it is anticipated that this record may also fall this September, with a meet that will feature, for the first time, a $20,000 Governor's Handicap on September 8th. In addition, there will be the Inaugural and Director's Handicaps, at $5,000 added, and the Sacramento and President's Stakes, also at $5,000 added. All in all, there will be a total of 28 purses at $2,000 or more during the State Fair meeting.

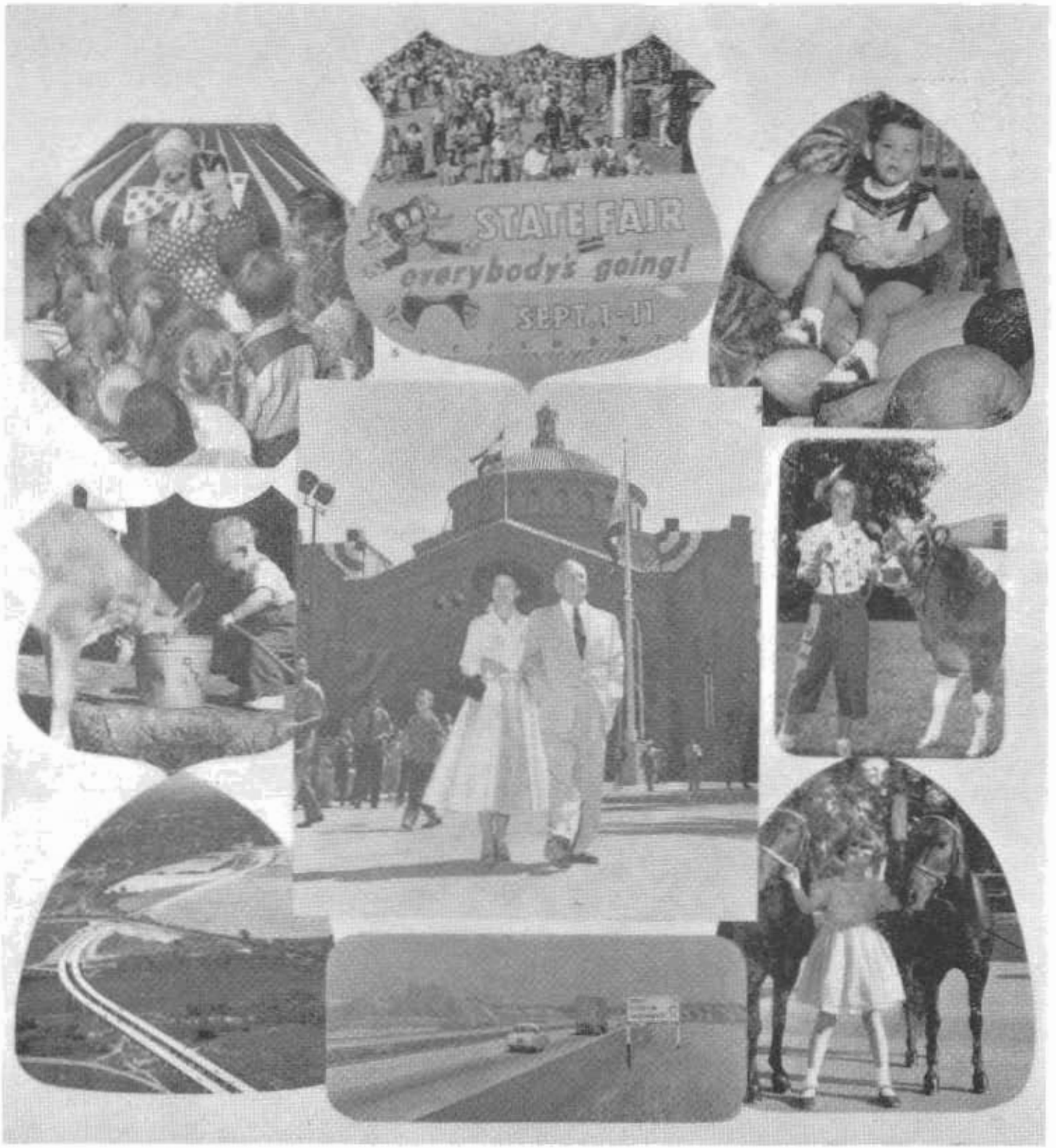
The 16 directors of the Fair are very enthusiastic about this year's events, and they openly admit that they are excited about the new entertainment feature which will be entirely different from previous evening shows. In years past, the night shows have presented top stars of stage and screen in elaborate vaudeville-type performances. This year, however, each individual show will be devoted entirely to the music of a famous American composer with music by the Hollywood Bowl Pops Orchestra, special lighting and set decorations, and an array of top Hollywood performers to interpret the music. From September 1st through 3d, for example, Gordon MacRae will interpret the music of Rogers and Hammerstein, Jeanette MacDonald follows on September 4th through 6th with the compositions of Jerome Kern. George Gershwin's music will be performed on two special nights, September 7th and 8th, with Paul Whiteman conducting the 50-piece orchestra. The final three nights of the Fair, Margaret Whiting will present the songs of Cole Porter.

For those who have interests in other things, there are items of general and specific interest throughout the 207-acre fairgrounds. Sale of exhibit and show space has already outstripped last year's total. Indications are that the 5,000 head of livestock entered in competition in 1954 will be matched, if not surpassed, this year. Two new foreign country exhibits, Japan and Belgium, have been added to the list of the Netherlands, Denmark, Pakistan, the United Kingdom, Finland, and Sweden. These and many more make the Fair this year a bigger and a better exposition of our State's growth and development.

Considered to be one of the five great state fairs in the Nation, the California State Fair thrives on curiosity of the fairgoer to look, to listen, and to compare breeds, quality, production, and popularity of various livestock, goods, and products. It is a "school" for education through comparison and demonstration. It is an institution that requires, for example, 3,000 bales of hay, 150 blocks of salt lick, 300 heads of lettuce, 10,000 electric light bulbs, 1,000,000 plants, shrubs, trees, and flowers, 13,500 premium ribbons, and a list of materials and equipment at least a mile long to display products from our State.

The Fair has been called "a tour of California on 207 acres," and the grounds literally bulge with items, activity, and pride. In addition to the entertainment at night, the horseshow, the horse racing, the county and foreign country exhibits, livestock displays, and the contests, there will be fireworks, refreshments, clowns, bands, majorettes, souvenirs, gadgets, recreation, vaudeville, homemaking, foods, and carnival fun to delight the thousands of fairgoers who travel over modern state highways to celebrate another year of progress, a year of tremendous growth, by their State of California.

All Highways Lead to Sacramento Exposition



San Marcos Pass

Historic Highway Used by Fremont Is Being Improved

By E. J. L. PETERSON, District Engineer

IMPROVEMENT of a portion of the historic route taken by Lieutenant Fremont over the San Marcos Pass in his conquest of Santa Barbara is provided for in the contract awarded to John F. Blakemore of El Monte on March 17, 1955. This contract, amounting to $830,000, includes the grading and surfacing with plant-mixed surfacing on cement treated base of about two miles of State Sign Route 150 between Painted Cave Road, approximately six miles north of Santa Barbara, and San Marcos Pass.

On Christmas Day, 1846, during the war with Mexico, Lieutenant John Charles Fremont executed a military maneuver that secured the Town of Santa Barbara for American forces, ensured a place for himself in California history and demonstrated the feasibility of passage over the now historic San Marcos Pass.

During the war with Mexico, Lieutenant Fremont was in command of the California battalion consisting of 500 men, several pieces of artillery and the usual wagon train. In November of 1846 he left his camping place in the San Juan Valley (in what is now Monterey County) and marched south to take possession of Santa Barbara preparatory to engaging the Mexican forces at Los Angeles. His intended route of travel included passage over the Santa Ynez Mountains by way of the narrow and precipitous Gaviota Pass.

Warned of Ambush

While encamped north of the pass at Rancho Tinquaic, Lieutenant Fremont received warning from the owner of the Rancho, Benjamin Foxen, that Mexican forces had prepared an ambush for him in the narrow gorge. Fremont's only alternate route lay over the San Marcos Pass which at that time was a wild and narrow horse trail.

Despite warnings that a march over San Marcos Pass was impossible, Fremont attempted the crossing and after days of heart-breaking labor and suffering the loss of several men and 300 horses, he stood on the summit.

By successfully crossing the San Marcos Pass and by-passing the Gaviota Gorge where the Mexican forces lay in wait, Fremont was able to secure Santa Barbara without a shot being fired. Three weeks after his historic march, California was ceded to the United States.

Old Toll Wagon Road

Fremont's route over San Marcos was eventually developed and operated as a toll wagon road by the Santa Barbara and Santa Ynez Turnpike Company until 1898 when the road was purchased by Santa Barbara County. The first modern improvement of this highway was undertaken about 1925 to provide easier access to the virgin area of the Santa Ynez Mountains. The portion northerly from San Marcos Pass was constructed by the U. S. Bureau of Public Roads as a forest access road. The County of Santa Barbara constructed the southerly portion to provide recreational access for the residents in and around the City of Santa Barbara.

In 1929 this road was taken into the State Highway System. Improvement has long been desired, but until recently, with the exception of one major relocation contract in 1926, only minor improvements and maintenance were accomplished.

The first major improvement of this road provided for a complete relocation which eliminated the steep grades and sharp curves between Route 2 (US 101) and Painted Cave Road, a length of six miles.

Cachuma Dam Relocation

In 1950 an important event occurred which has stimulated improvement of this road. In order to increase the supply of water for the rapidly growing south coastal section of Santa Barbara County and as a flood control measure, the U. S. Bureau of Reclamation undertook construction of Cachuma Dam on the Santa Ynez River. The impetus of this dam upon the highway has been two-fold. First, the waters impounded behind the dam inundated portions of the existing highway and thereby required immediate relocation. Secondly, the lake created behind the dam provided recreational potentialities.

Approximately seven miles of this route between Hilton Canyon and Hot Springs Canyon had to be relocated above the high-water level of the reservoir lake. This relocation provided an opportunity for substantial improvement of the affected section of this highway. Two contracts were immediately undertaken and by the latter part of 1951 were completed.

The Santa Ynez Mountain area has always provided a recreational outlet for the people living along the adjacent coastal areas. The general area has been under development for years, but the new reservoir lake opened additional areas for fishing, camping, boating, hiking, riding and other outdoor sports. The public was quick to realize these possibilities and there has been a marked increase in the use of the area. All facilities are being expanded to accommodate this demand and consequently, traffic requirements are reaching proportions which the present highway cannot properly handle.

New Contract Underway

The contract recently awarded to John F. Blakemore is for the improvement of another section of poor alignment on this mountainous highway. The original road consisted of a 16-foot to 18-foot bituminous macadam pavement. It had numerous very sharp

Type of curve which will be eliminated on San Marcos Pass Highway. This view is looking north.

curves with a radii of less than 100 feet with some being only 50 feet, and short sections of very steep grade. Many of the original fills on which the road had been built have settled, or have experienced slipouts, making further variations in grade and alignment. Inadequate sight distance and lane width add to the hazards and tensions of driving. As a result the accident rate on this road is high.

Owing to these deficiencies most of the existing highway is being abandoned in order to achieve adequate standard. The new roadway will consist of a 32-foot all-paved section.

This road, when completed, will permit public traffic to maintain a maximum safe speed of 40 miles per hour. The maximum grade encountered will be only slightly in excess of 7 percent, which is a considerable improvement when compared with the grades on the existing road.

Geological and Construction Difficulties

An appreciation of the magnitude of this improvement may be gained only if viewed against the backdrop of the terrain. Beginning on the coastal plane at an elevation of 170 feet, this highway rises to an elevation of 2,225 feet at San Marcos Pass in a distance of less than seven miles. The region is mountainous with steep sloping canyons covered with dense brush and stunted tree growths. Massive sandstone cliffs control the topographic features and the sandstones form prominent knobby outcroppings on the ridges.

The route traverses an area of unstable geological formations. This instability is the result of the sedimentary rock formations having been subjected to folding and faulting. The new alignment will involve the excavation of approximately 700,000 cubic yards of earth and will require cuts ranging up to 110 feet at center line and 340 feet along the slope. Embankments will be as high as 135 feet at center line and 360 feet along the slope. The new alignment and grades were therefore critical as minor changes affected the resulting stability of cut slopes and embankment foundations. This problem was further complicated by porous sandstone beds which contained excessive ground water. This situation has caused slipouts on the existing highway requiring several changes in its original alignment and grade. To prevent this from occurring on the new road, extensive horizontal and vertical drains will be installed where such water is encountered.

The carrying of traffic through construction in this precipitous mountain terrain would have been difficult and expensive. Fortunately, it was possible to offset the new alignment sufficiently to permit most of the existing road to remain in service until the new roadway is completed. Minor

CALIFORNIA HIGHWAY COMMISSION WORKS ON NEXT BUDGET

At its June meeting in Sacramento, the California Highway Commission began preparation of its 1956-57 budget. Shown in the midst of their work, left to right, are: Commissioners Fred W. Speers, Escondido; James A. Guthrie, Vice Chairman, San Bernardino; H. Stephen Chase, Sacramento; Director of Public Works Frank B. Durkee, Chairman; C. A. Maghetti, Secretary, Davis; Chester H. Warlow, Fresno; F. Walter Sandelin, Ukiah, and Robert E. McClure, Santa Monica.

temporary detours were planned to avoid the necessity of public traffic having to traverse through the construction zone where the new and old alignments conflict except at the beginning and end of the project.

Robert C. Kidd is project manager for John F. Blakemore and M. A. Dawson is resident engineer on the project for the Division of Highways.

LIKES COST INDEX ARTICLES

La Canada, California

Mr. Kenneth C. Adams, *Editor*

Thank you for sending me *California Highways and Public Works.* It is an excellent source of information regarding some of this State's greatest growing assets—its highways and public works. No one who has ever read your fine magazine can dispute that fact.

At this time I must also add that the articles by Mr. Wilson and his associates on construction costs are invaluable to those who like myself are concerned with the business end of construction. Any one familiar with statistical techniques and the effort needed to obtain the data that is so ably presented in those succinct articles must admire their workmanship.

James P. ApRoberts
Construction Cost Specialist

Retirements *from* Service

Carleton Pierson

Carleton Pierson, Supervising Contract and Building Specifications Writer, has retired after more than 43 years continuous service with the

Division of Architecture. He formally quit his post on September 30th, but will spend two months on terminal leave beginning July 29, 1955.

A farewell dinner was held for Pierson at the Capitol Inn in West Sacramento on Friday evening, July 22d, by his many friends and fellow employees. The group presented Pierson with a gift to commemorate his retirement. In point of service, Pierson is the division's oldest employee.

Pierson is well known throughout the State of California, particularly by contractors and other allied industries with whom his position has brought him in contact for many years. He was born and raised in Sacramento where he attended public schools and later the University Farm School at

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Raymond L. Beuthel

Raymond L. Beuthel, Office Engineer of District XI, retired on July 1st to conclude a career with the Division of Highways which began in July, 1914, and was continuous until his retirement except for two short interruptions.

RAYMOND L. BEUTHEL

Born in Burlington, Iowa, and educated there and in Bellingham, Washington, Beuthel came to California in 1907, and attended high school in Los Angeles and Fresno, and later studied at the University of California. He joined the California Highway Commission staff as an engineering assistant in 1914.

In 1923 he was appointed office engineer in District VI, Fresno, serving first under J. B. Woodson and then under E. E. Wallace. When District XI was formed in 1933 to administer state highways in San Diego and Imperial Counties and the eastern half of Riverside County, Wallace was appointed as its district engineer and Beuthel accompanied him to San Diego. After serving as district construction engineer for two years, Beuthel was assigned as office engineer and concurrently fulfilled the duties of city and county cooperative projects engineer for the district.

Beuthel served in the Army in World War I. He is a member of the San Diego Engineers Club. He and Mrs. Beuthel plan to do some traveling and to devote considerable time to their home workshop and high-fidelity and radio hobbies.

GASOLINE CONSUMPTION IN U. S.

Gasoline consumption in the United States hit the 51,100,293,000 gallon mark in 1954.

Harry L. Kile

Harry L. Kile, budget engineer for the Division of Highways and administrative engineer for the division's Planning Department, retired on July

1, 1955, after more than 22 years of state service. He was honored by his co-workers at a luncheon in Sacramento on June 30th.

Kile has been recognized nationally, as well as in California, for his pioneer work in forecasting the available amounts of revenue for highway improvements which would be derived from highway user taxes. His advance estimates, based on a portion of the traffic data obtained for design purposes, have for a number of years proved invaluable in state highway planning and budgeting. These estimates for future revenues have made possible the integration of planning to conform to the controls established by law for expenditure of highway construction funds.

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F. N. Roberts

F. N. "Bob" Roberts, Administrative and Planning Engineer for the Division of Highways District IX Office in Bishop retired July 1st, ending a 24-year career with the State. All of Roberts' state service was with District IX, where he started work as a senior engineering aid in 1931.


F. N. ROBERTS

Some of his early assignments included: assistant resident engineer on the construction of the section of US 395 between Conway Summit and Bodie Road in 1937, and between Diaz Lake and Alabama Gates the following year. He was resident engineer on the Jayhawker Trail project across the Slate Range and Panamint Valley in 1948-49.

He was promoted to construction engineer for District IX in 1951 and was made administrative and planning engineer one year later. As administrative engineer he also had charge of all city and county cooperative projects within the district.

Roberts' military service includes both World Wars I and II. During 1918 and 1919 he was a private with the 31st Aero Squadron in France. Between wars he became an officer in the Reserve Corps and in August, 1941, was reassigned as commanding officer of his old War I unit, redesignated as the 31st Material Squadron. He was stationed first in Alaska and later in Europe. At present he holds the rank of lieutenant colonel in the Air Force Reserve.

Roberts was born in Grant City, Missouri, and came to California in 1925.

He and his wife live at 387 North Fowler Street in Bishop. They have a son and a daughter and five grandchildren.

William F. Axtman

After 24 years of service, W. F. "Bill" Axtman, District Maintenance Engineer, Administration, of District VII, retired on August 1, 1955.

Bill gained his early engineering experience with the Los Angeles County Road Department. After four years of service with the county, he started work for the State Division of Highways on August 1, 1930, as an assistant resident engineer in District VII.

In December, 1931, he transferred to District VIII as assistant resident engineer on a day labor camp project. He returned to District VII in February, 1932. In June, 1937, he transferred from construction to maintenance where he continued working until his retirement.

Devotion to duty and sincerity of purpose have earned for Bill the respect and admiration of all who came in contact with him.

All Bill's friends wish him many happy years of retirement. Much of his time will be devoted to his hobbies that include photography and furniture refinishing, in both of which fields he is unusually talented.

Bill will continue to reside at 1305 Monterey Road in South Pasadena and extends a cordial invitation to his many friends to visit him at his home whenever they can.

Frank R. Austgen

On July 1, 1955, Frank R. Austgen, Area Construction Supervisor for the State Division of Architecture, retired after having served 33½ years with the division.

Austgen was succeeded by C. T. Troop, who has been district construction supervisor in charge of the San Francisco district for the last three years.


FRANK R. AUSTGEN

Austgen, with headquarters at Los Angeles, was in charge of all state building construction in the 12 southern counties of California during the last five years, during which time he was responsible for construction supervision running as high as $30,000,000 annually. He was senior member of the Division of Architecture field forces, both in rank and in point of service, having been originally employed by the State in December, 1921.

Educated in Chicago

Austgen is married to the former Agnes C. Wilson, and they have one daughter, Mrs. Joyce Batson. Austgen was born February 8, 1893, at Chicago, Illinois. He was educated in the public schools of Chicago, and he learned the construction business by serving an apprenticeship in Chicago.

From 1915 to 1917 he held a civil service position for the City of Detroit, being in charge of maintenance of all fire department buildings in that city. From July, 1917, to January, 1919, he was a civilian employee of the Federal Government, on the repair and reconditioning of interned German ships at Charleston, South Carolina. During the years 1919 and 1920 he was employed in various capacities in the construction industry in Florida and Texas, arriving at Southern California in the latter year.

Takes State Position

In December, 1921, he took a temporary position with the State Division of Architecture, guaranteeing to

. . . Continued on page 50

HARRY L. KILE

Continued from page 47 . . .

Before entering state service, Kile had spent more than 25 years in engineering work, a major part of it with the Western Pacific Railroad.

Born in Canton, Kansas, Kile attended the College of Emporia and University of Kansas. His first engineering job was in Utah and Nevada in 1905-06 on the location of the Oregon Short Line Railroad. Later he was employed on the Umatilla Irrigation Project in eastern Oregon and on the construction of the Chicago, Milwaukee and Puget Sound Railroad through Montana and Idaho.

In 1910 Kile joined the Western Pacific and remained with that railroad until 1926, except for 2½ years of military service in World War I. He rose to the position of division engineer.

During his World War I service, Kile spent more than two years as an officer on railroad construction and restoration in Europe.

From 1926 to 1931 he was engaged in private construction and manufacturing in California. In 1931 he took a temporary position as a location and construction engineer with the Division of Highways, but returned to private engineering work in the following year. He joined the division as a permanent employee in November, 1933.

One of his first assignments was the planning, organization and direction of the California Highway Transportation Survey of 1934, in cooperation with the U. S. Bureau of Public Roads. This was the first survey of its kind in the Nation but was subsequently the model for many state-wide highway planning surveys.

The value of this vast fund of information to the highway planner and designer depended on its being kept up to date, supplemented by further study of the type, volume, characteristics and behavior of traffic including an analysis of accidents. This concept is taken for granted now, but two decades ago it represented a tremendous advance in highway engineering practice. In these early years, the emphasis was on the physical stability of the highway—partly because of the

. . . Continued on page 64

Earl A. Parker

E. A. "Ace" Parker, senior highway engineer in District VII, retired from state service on August 1, 1955, after a long and varied career in the construction field. He was honored by a retirement dinner Friday night, August 5th, by his many friends in the State Division of Highways and among local contractors.

EARL A. PARKER

"Ace" was born in Waitsfield, Vermont, and received his formal education at Norwich University. After leaving school his first engineering assignment was with a survey party on railroad, irrigation and drainage projects. During World War I "Ace" was a first lieutenant and served as Commanding Officer of Company "E," 305th Infantry, through the second phase of Meuse-Argonne.

From 1919 to 1925 he was resident engineer with the State Highway Departments of New Hampshire, Illinois, and Missouri. In between service with these highway departments, he was superintendent for contractors on three occasions. In 1925 "Ace" went to work for the City of Los Angeles, becoming supervisor of construction on contract work for the city. He was responsible for all types of street, storm drain, sewer, and bridge construction until 1933.

He first started to work for the State Division of Highways in December, 1933, as resident engineer on Route 26 near West Covina. He served as resident engineer on various jobs in District VII until 1942.

During World War II, "Ace" left the State to serve as resident engineer with the U. S. E. D. on the Pan-American Highway in Costa Rica and Panama. Later he became contractor's representative on bridge construction on the Alcan Highway in Canada.

He returned to the Division of Highways in December, 1943. With construction at a standstill during the

. . . Continued on page 64

CARLETON PIERSON

Continued from page 47 . . .

Davis. Having been born within sight of the Capitol dome may have had some effect on his later life, for oddly enough, his first earned dollar came from the State when he served as a page in the State Senate in 1907. School vacations found Pierson in survey parties, the last one being with the Western Pacific when they built the railroad through Sacramento in 1907.

Chance changed the course of his young life and caused him to forsake the schooling that was leading to a farmer's life. He was enrolled in the University Farm School at Davis when he chanced to overhear the then acting State Architect, the late Maury I. Diggs, make a remark to a State Senator that his office needed young men—that there was a wonderful opportunity for learning. It was at that moment that any interest he may have had in becoming a dirt farmer began to wane, and it was only a few months later that he lost all interest in continuing his farm schooling.

With great courage, and with little to offer, he approached Nathaniel Ellery, who was State Engineer at the time, and applied for a job. Since there were no civil service formalities at that time, he was hired immediately and reported the following Monday morning to Mr. Diggs for assignment. This was November 27, 1911. Hiram Johnson was Governor at the time. Pierson states he did not inquire and did not know what his stipend was to be until two weeks had passed when he received from the State Treasurer one shiny $20 gold piece.

Pierson's first assignment was as an assistant to the office boy and consisted of making blueprints, running the mimeograph machine, proofreading specifications, mailing out plans and specifications, etc.

The office comprised five committee rooms on the fourth floor of the old Capitol Building where light and ventilation was derived from skylights. Temperatures were often over 105 degrees in the summer months, and air conditioning was as yet undreamed of.

. . . Continued on page 50

B. W. Latour

B. W. "Boots" Latour, veteran Division of Highways superintendent of the Madera maintenance territory, retired on July 1st after 37 years with the State.

Latour started to work for the division as a tractor operator on January 1, 1918.

All of Latour's state service has been with District VI. He supervised the first experimental mixing of oil with earth for road surfacing in the district in the mid 1920's and has a wide knowledge of the roads and maintenance operations in the southern San Joaquin Valley region.

During his early years Latour served as tractor operator, truck driver and blacksmith with the maintenance forces. He was appointed highway foreman in 1921 and became general maintenance foreman in 1924, one of the first appointees to this classification.

He was promoted to maintenance superintendent in 1929.

An ardent sports fan, Latour will spend a lot of his time after retirement attending local sports events. He intends to take in the World Series back east this fall. He will also devote time to hunting and fishing and pursuing his hobby of breeding racing pigeons. He has been awarded many medals and prizes for the performance of his birds.

Latour and his wife live at 400 Raton Avenue in Madera. They have a son and a daughter and seven grandchildren.

FRANK R. AUSTGEN

Continued from page 48 . . .

stay for two weeks only. This two-week period, however, lasted for an unbroken third of a century.

In 1927 he became general foreman and inspector over all construction work in what is now District 5B, which includes all of the territory east of Los Angeles, south of the desert, and north of San Diego. In August, 1932, he was promoted to the class of senior engineer of general construction, and placed in charge of our present District 10, which includes Santa Barbara and Ventura Counties.

On Big Projects

In May of 1939, he was transferred back to present District 5A, then known as the East of Los Angeles District. He remained in this position for nine years, until the year 1948, when he was placed in charge of all direct construction activities in the Los Angeles area.

In April, 1950, he succeeded C. L. Weber, on the latter's retirement, and since that date has been Area III construction supervisor, being in charge of all of the construction activities of the Division of Architecture south of Paso Robles and Delano, and east of the Sierra Nevadas. During his incumbency in this post he supervised the construction work at more than 150 sites, the total amount of construction at which was in excess of $116,000,000. During this period he was responsible for direction and supervision of over 2,500 individuals of state forces.

CARLETON PIERSON

Continued from page 49 . . .

The work proved interesting to Pierson, and in not too quick succession he was assigned duties as timekeeper on a construction project, junior draftsman, senior draftsman, electrical draftsman, structural draftsman, estimator, inspector, specification writer, and supervising contract and building specification writer. Pierson has held the latter positon for the past 26 years.

Pierson moved to Woodland in 1917 where he married Dorothy Ross. They had no children and his wife passed away in 1941. He continues to make his residence in Woodland and bears somewhere near a record for commuting, having traveled over 415,000 miles back and forth to Sacramento. He plans to spend his retirement in traveling, hunting, fishing, and may take up his golf where he left off 20 years ago.

Ted Jain

Ted Jain, City and County Projects Engineer for the Division of Highways Office in Marysville, retired on June 15th, after serving with the State for 25 years.

At the time of his retirement, Jain had charge of administering the Federal Aid Secondary road program for the 11 counties in District III, which includes Glenn, Colusa, Butte, Sutter, Yuba, Yolo, Sacramento, Sierra, Nevada, Placer and El Dorado. He also had responsibility for the expenditure of state gasoline tax funds on city streets within the district.

Earlier, as a design engineer, Jain was in charge of the squad which prepared the plans for the North Sacramento Freeway. He was promoted to city projects engineer for District III in 1949, and one year later also assumed the duties of administering the F. A. S. program.

Jain, who was born in Boulder, Colorado, attended grade school in Boulder and high school in Greybull, Wyoming. After coming to California in 1924 he studied at the San Diego State College.

From 1927 to 1930 he was an engineering draftsman with the city engineer's office in San Diego.

Jain came to work for the State Division of Highways in 1930 and for the first three years worked as a draftsman and later as a junior highway engineer with District VIII at San Bernardino. After a short assignment in District V (San Luis Obispo) he transferred, in 1934, to District III, and remained in that district until his retirement.

During World War II he was a Navy officer, serving in the Pacific area with the Seabees.

Jain and his wife live at 1059 Marilyn Avenue in Yuba City.

Southern Freeways

Rapid Progress on Southland Projects

By JAMES L. NEEDHAM, Resident Engineer

Santa Ana Freeway

THE SANTA ANA Freeway, between Browning Avenue and First Street, in and near the Cities of Santa Ana and Tustin in Orange County, consists of a four-lane divided highway about 2.5 miles in length, with frontage roads and interchange connections, surfaced with portland cement concrete pavement on cement-treated subgrade and plant-mixed surfacing on untreated rock base, and five reinforced concrete box girder bridges.

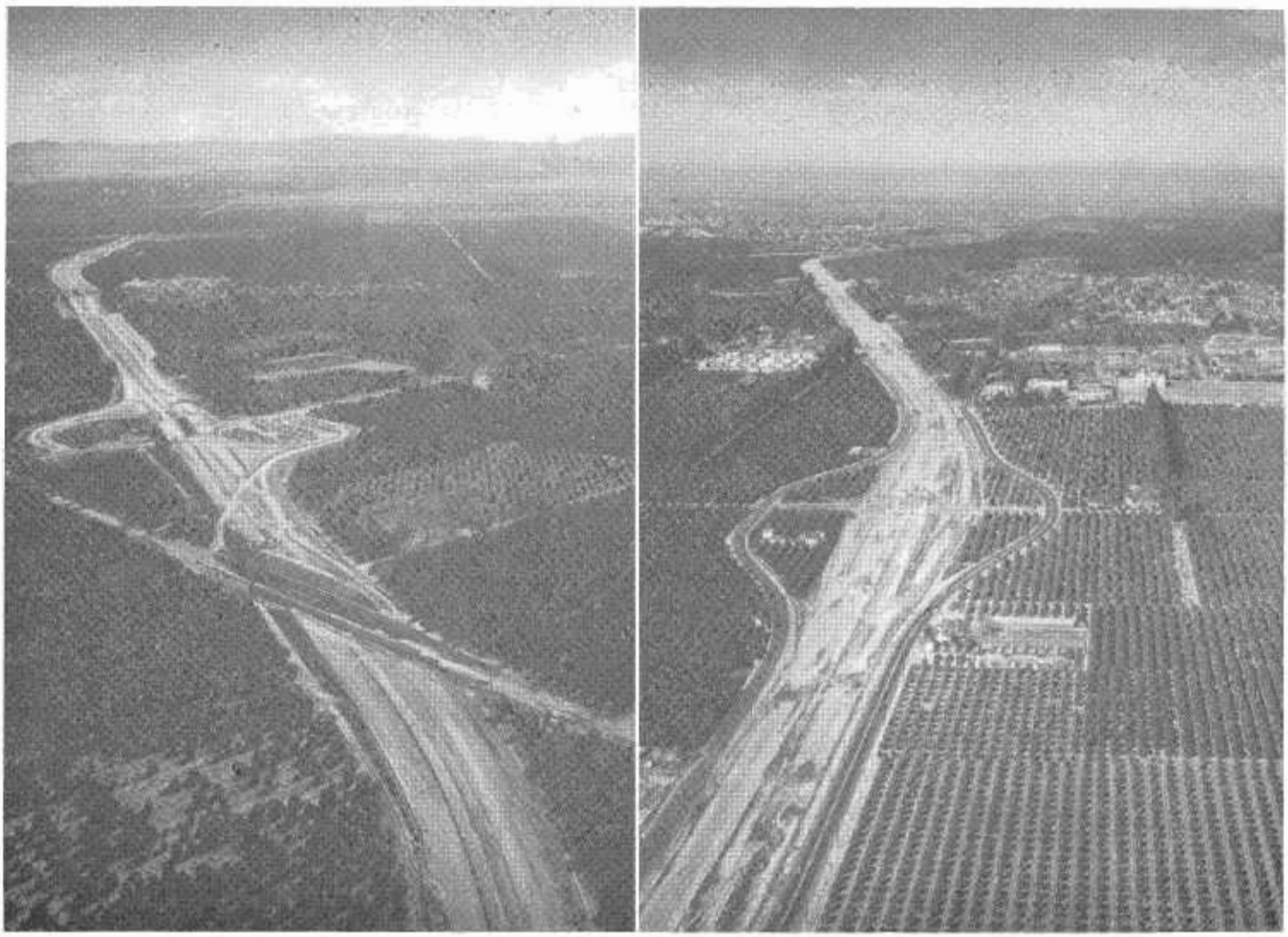
This section of the Santa Ana Freeway is the most southerly link presently under construction and is about 70 percent complete at this time. Construction of the five

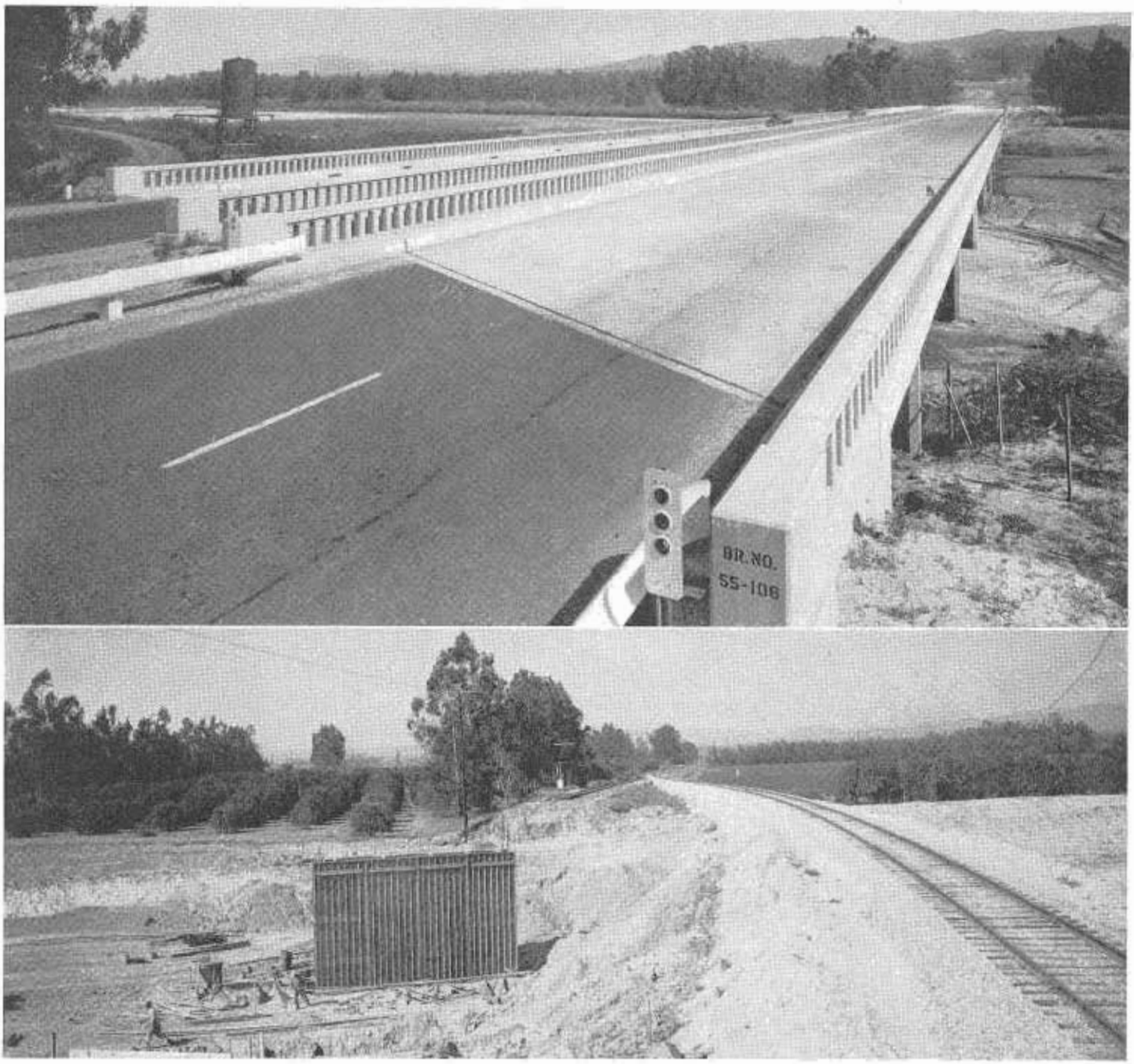
Route 175 Freeway

STATE SIGN ROUTE 14 provides direct communication between the Cities of the Santa Monica Bay area, Los Angeles County, with Eastern Orange County, Riverside County and other eastern points. Portions of this route have been adopted as a freeway by the California Highway Commission.

There seems to be a variety of names being used to designate this highway. Near the eastern terminus at the Santa Ana Canyon Freeway near Olive, it is known locally as the "Orangethorpe Freeway" and the "Houston Street Freeway." Farther west in the Buena Vista Park

LEFT—View of Santa Ana Freeway southerly from First Street showing partially completed Main Street Undercrossing and the completed Route 2/43 separation structure at Tustin Avenue. RIGHT—Looking northerly on Santa Ana Freeway from Browning Avenue to First Street site of Red Hill Avenue Undercrossing in foreground.





UPPER—View of Santa Ana River Bridge on Route 175 looking southerly from north end of bridge.
LOWER—Shoofly for Santa Fe Railroad and start of bridge work at the Olive Undercrossing.

Santa Ana Freeway . . .

bridges is complete except for the finishing operations. The bridge work is briefly described as follows:

First Street Overcrossing

A reinforced concrete box girder bridge consisting of two spans about 116 feet in total length supported on a reinforced concrete bent and abutments and providing a clear roadway width of 56 feet and two 5-foot sidewalks.

Main Street Undercrossing

A reinforced concrete box girder bridge consisting of one span about 55 feet in total length supported on rein-

Route 175 Freeway . . .

area it is called the "Artesia Freeway" and at the western terminus it is referred to as the "Hermosa Beach Freeway." I will simply refer to it as the Route 175 Freeway until such time as a definite name is evolved.

Two Bridges

This section of the freeway presently under construction, is in Orange County and extends from Cypress Avenue (Route 180), on new alignment, to Santa Ana Canyon Freeway (Route 43). It consists of a four-lane divided highway about four miles in length with ramps, inter-

Looking northerly on Santa Ana Freeway from Tustin Avenue to First Street. The completed Route 2/43 separation structure is shown in foreground.

forced concrete abutments and providing for the freeway two clear roadway widths of 28 feet with a 36-foot dividing strip.

Route 2-43 Separation at Tustin Avenue

A reinforced concrete box girder bridge consisting of two adjacent structures each having four spans about 206 feet in total length supported on reinforced concrete abutments and piers and providing for the freeway two clear roadway widths of 28 feet, 36 feet apart.

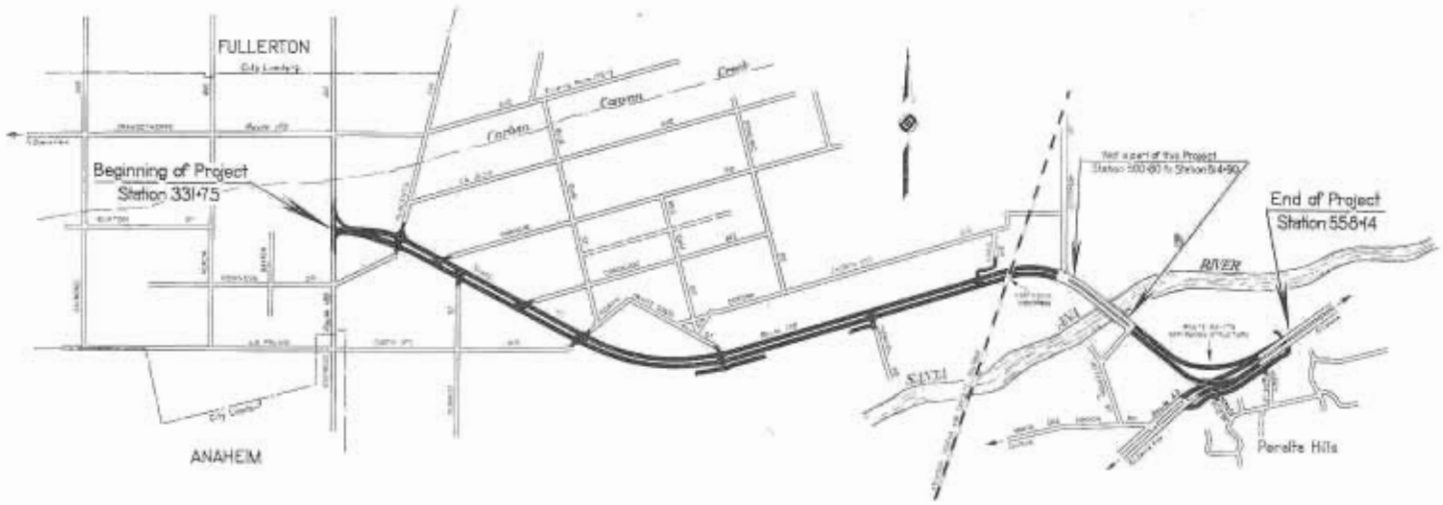
Newport Avenue Undercrossing

A reinforced concrete box girder bridge composed of two adjacent structures, one structure consisting of two spans and the other structure consisting of three spans about 180 feet and 227 feet in total length, respectively, supported on separate reinforced concrete piers and common reinforced abutments and providing for the freeway two 28-foot width clear roadways 36 feet apart.

change roadways and frontage roads surfaced with plant-mixed surfacing on untreated rock base over imported subbase material, and with two bridges. The existing double, reinforced concrete bridge across the Santa Ana River with approaches was constructed under a prior contract. The two bridges to be constructed are briefly described as follows:

A reinforced concrete box girder bridge about 102 feet long consisting of one span supported on reinforced concrete abutments on concrete pile foundations. The bridge will provide a clear roadway width of 28 feet for eastbound traffic on Route 175, going over westbound traffic on Route 43. The cast in place piling and structure excavation has been completed.

A steel plate girder bridge about 102 feet long consisting of two spans supported on reinforced concrete piers and abutments on concrete pile foundations. The contractor elected to use the cast-in-place concrete piles cast in drilled holes for this structure. The native soil consists of material varying from a fine river sand to a coarse



Santa Ana Freeway . . .

Red Hill Avenue Undercrossing

A reinforced concrete box girder bridge composed of two adjacent structures, each structure consisting of three spans about 142 feet in total length, supported on separate reinforced concrete piers and on common reinforced concrete abutments and providing 28-foot width clear roadways, 36 feet apart.

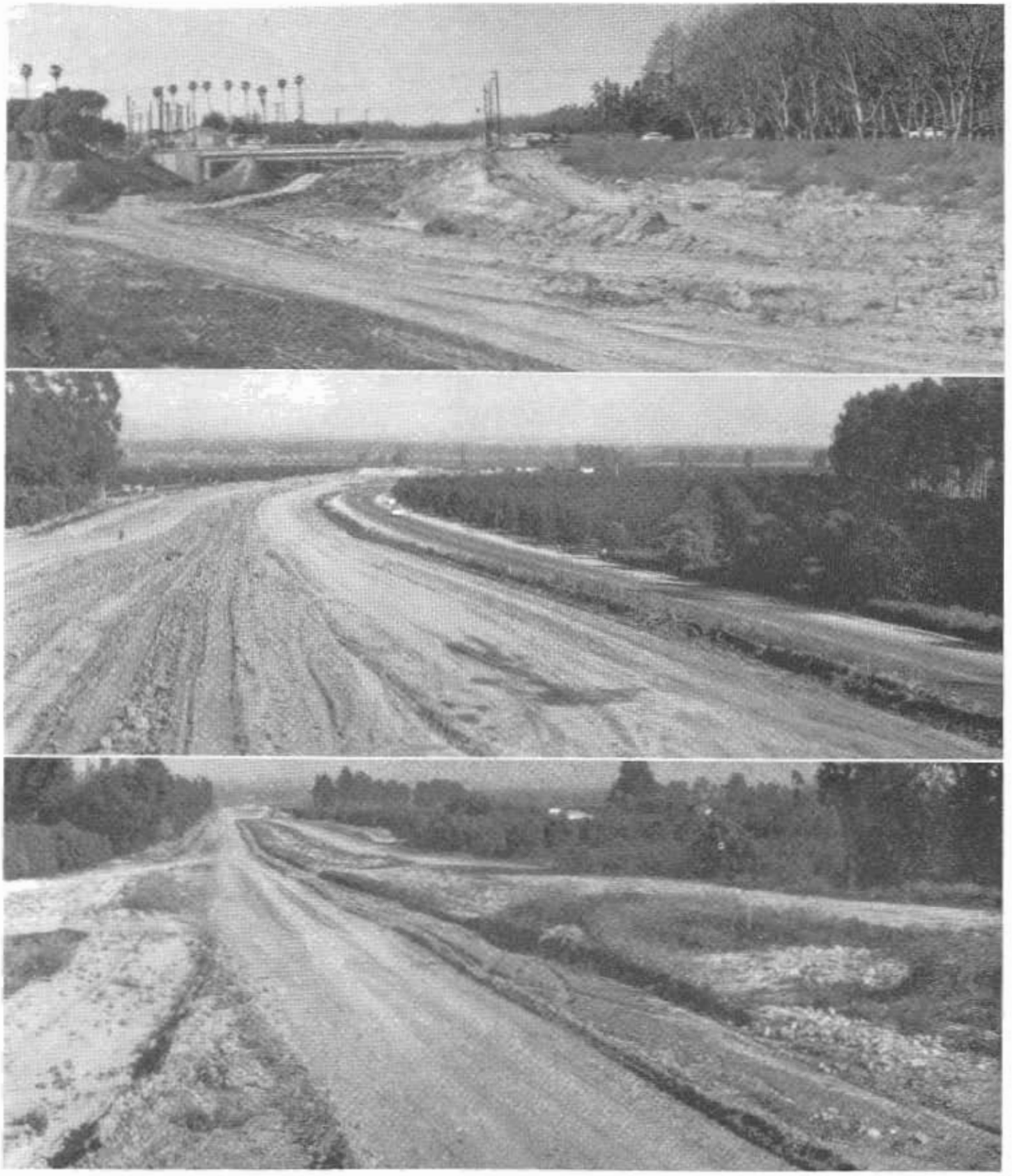
The ground areas adjacent to the separation structures at Newport Avenue, Red Hill Avenue, Main Street and Tustin Avenue (Route 2-43 Separation) were surcharged with additional height of fill for a period of 60 calendar days to an elevation 10 feet above the planned subgrade in order to consolidate the deeper soil strata. It was believed advisable to use this type of construction as a precaution in order to avoid later adverse settlement after the fills were completed. The wisdom of using the surcharges

Route 175 Freeway . . .

gravelly sand at the pile tip elevations. In order to eliminate excessive caving in the drilling operations the entire foundation area was first stabilized with sodium silicate solution placed by jetting to desired depth. This is the same solution called "water glass" that is used for preserving eggs. After treating, stabilization occurred in a few hours. Pile drilling operations then progressed very smoothly and no holes were lost due to caving. Concrete piers and abutments have been completed and structural steel placed. When completed the structure will carry the Santa Fe Railroad over the freeway.

The roadway excavation material encountered varied widely from a uniform river sand to a heavy wet clay. Approximately 30,000 cubic yards of the clayey excavation material from the Route 175-43 Separation area will have to be loaded and hauled by trucks to make the embankments from Placentia Avenue to North Street. The scrapers are also being used to haul and place the major

At easterly terminus of contract looking southerly on Route 43 at temporary connection for detour to new frontage road



UPPER—Looking northerly along construction toward end of job at First Street Overcrossing. CENTER—Looking southerly along construction from top of fill for Newport Avenue Undercrossing. LOWER—Looking southerly on construction from fill for Route 2/43 separation at Tustin Avenue.

is demonstrated by the following record of settlements obtained during the surcharge period as follows:

Main Street Undercrossing	1.10 feet
Route 2-43 Separation (Tustin Ave.)	2.36 feet
Newport Avenue Undercrossing	1.27 feet
Red Hill Avenue Undercrossing	0.57 feet

Major Construction Items

Since the removal of the surcharge no further settlements have been noted.

In addition to the bridges other major construction consists of the following items:

290,000	cubic yards roadway excavation
3,000,000	station yards overhaul
670,000	tons imported borrow
170,000	tons imported base and subbase materials
23,500	tons plant-mixed surfacing
14,650	cubic yards portland cement concrete pavement
64,000	square yards cement treated subgrade
1,600	cubic yards class "B" P.C.C. (curbs and gutters)
26,500	linear feet 72-inch chain link fence
7,000	linear feet 18-inch to 24-inch reinforced concrete pipe with miscellaneous collection structures and with drainage pumping stations at First Street and at Main Street

The roadway excavation came from the area between Main Street and First Street and was used to make the required embankments from Tustin Avenue to First Street. The balance of the roadway embankments were made from imported borrow material. The imported borrow was obtained from a site on the Irvine Ranch approximately five miles southeasterly from Browning Avenue. The borrow material consisted of a silty sand. It was loaded, by means of a loader, into trucks and trailer combinations, hauled to the job and compacted in place by a pneumatic-tired airport roller towed by a pneumatic-tired tractor. This compaction unit was able to operate at speeds of 10 to 20 miles per hour and satisfactory compaction results were consistently obtained. Major roadway excavation and embankment construction are now completed, frontage roads have been constructed, major structures are nearing completion and imported base and subbase materials have been placed on the main roadways. It is anticipated that cement-treated base and portland cement concrete paving operations will be completed by July 15th. It is estimated that all construction work will be completed and that this section of the Santa Ana Freeway will be in use before the end of this year.

The approximate construction cost for this contract is $2,000,000. Winston Brothers Company of Monrovia is the contractor, with Hugh S. Thompson as project manager, and Charles W. Goss as the job superintendent. G. C. Smith is the Bridge Department representative, with the writer as resident engineer for the State Division of Highways.

portion of the imported subbase material which is being obtained from a borrow pit on Orange County property adjacent to the highway. The imported subbase material is a uniform river sand and is being compacted by means of pneumatic-tired airport rollers towed by caterpillar tractors. By constant watering and rolling the sandy material is maintained in a firm and stable condition so that the DW-20s with carryalls are able to operate at high speeds over the roadway while hauling material.

Drainage Control

The alignment crossed a portion of an old Orange County cut and cover dump site just westerly of the Olive Undercrossing. Approximately 13,000 cubic yards of rubbish was removed from the roadway area and replaced with good material.

The drainage from the Route 175-43 (Santa Ana Canyon Freeway) intersection is concentrated by means of a system of pneumatic mortar lined ditches, corrugated metal pipes and reinforced concrete pipes into a centrally located 54-inch reinforced concrete pipe and thence into the Santa Ana River channel. Drainage across the freeway on the northerly side of the Santa Ana River is provided by means of a series of reinforced concrete box culverts at various locations. The freeway traverses an old flood plain of the Santa Ana River and "old timers" in the area tell of seeing several feet of water over the fields adjacent to the highway. It is believed that recent flood control work upstream on the river has minimized the possibility of this being repeated. Approximately 8,000 linear feet of reinforced concrete and corrugated metal pipes of various sizes in addition to 1,740 linear feet of reinforced concrete box were required to provide for drainage needs.

Drainage pumping facilities are being constructed for the depressed section of the North Olive Underpass, which is about 12 feet below the bed of the Santa Ana River.

The depressed section of the westbound lane of Route 43 is drained through the 54-inch gravity pipe line northerly to the river.

Project 50 Percent Complete

The Santa Ana Valley Irrigation Company's canal paralleled the westbound roadway of Route 43 on the north. Approximately 1,600 feet of this open channel was replaced with a 78-inch reinforced concrete pipe. Double rubber gasket joints were used in order to prevent any leakage into the depressed section of the westbound roadway on Route 43.

Construction operations are approximately 50 percent complete at this time. It is estimated that all work will be completed and the freeway will be opened for public use before the end of the year.

The estimated cost of this section of the freeway is approximately $1,100,000. B. J. Ukropina, Tom Polich, Steve Kral and John R. Ukropina are the contractors with George Ban as job superintendent. Don Keller is the Bridge Department representative, and the writer is the resident engineer for the State Division of Highways.

Harbor Freeway

Construction in the Wilmington-San Pedro Area

By F. E. STURGEON, Resident Engineer

One of the most important freeways being developed by the State Division of Highways in the Los Angeles area is the Harbor Freeway. This freeway extends for 22.8 miles from the four-level traffic interchange structure near the Los Angeles Civic Center to Battery Street in the harbor area of Wilmington and San Pedro. A total of 18 major construction projects have been awarded on this freeway by the State, 17 of which are for construction at the northerly end of this freeway project.

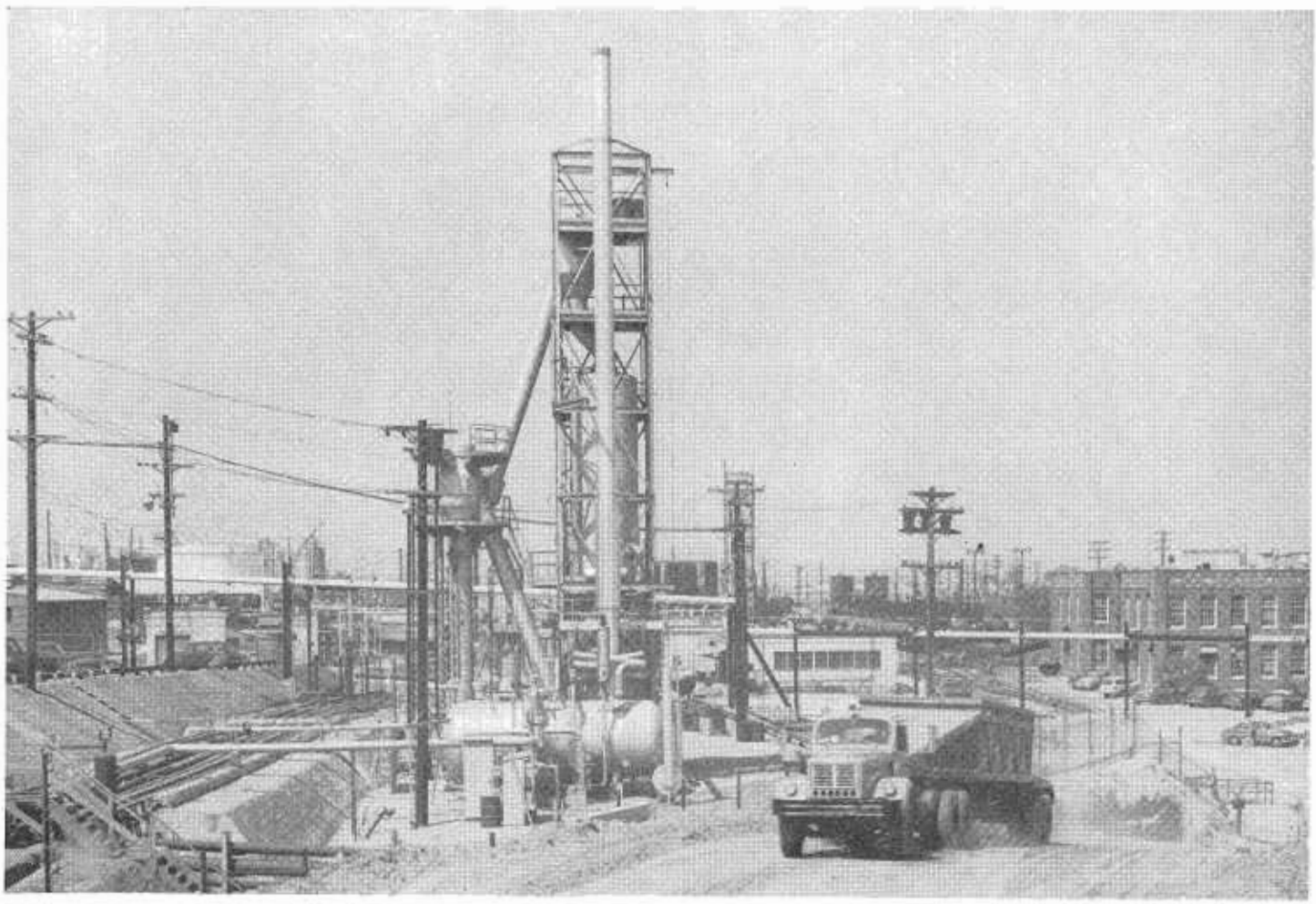
On July 22, 1954, work was started at the southerly end on a 2.8-mile section of the Harbor Freeway in the City of Los Angeles between Battery Street, San Pedro, and 0.2 mile north of Pacific Coast Highway in Wilmington. This contract was awarded to Vinnell Company, Inc. and Vinnell Constructors of Alhambra under a joint venture. Bid price was $3,077,-969.90 and provided for full freeway construction complete with on- and off-ramps and frontage roads.

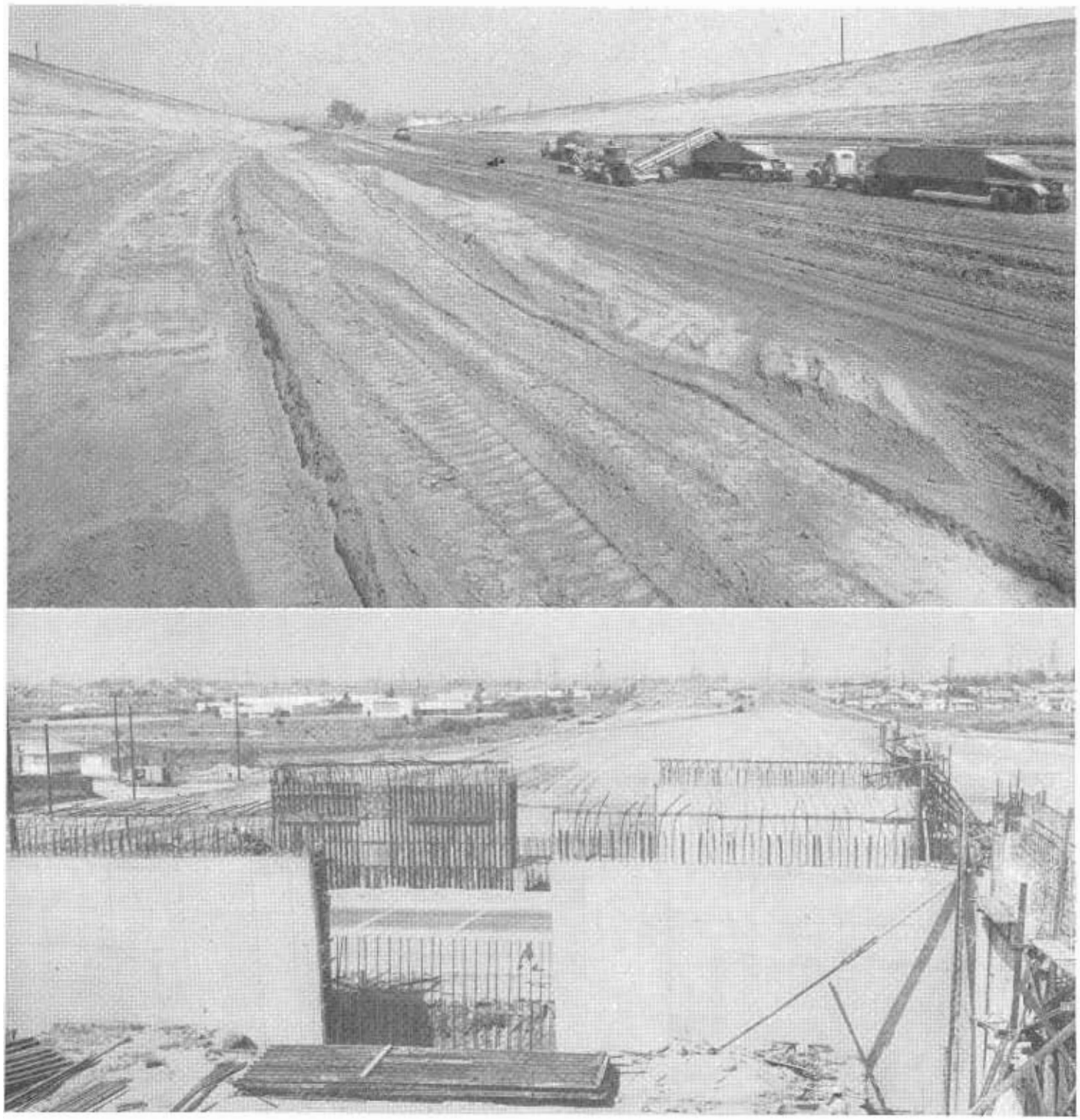
Eight Bridges

Included in the contract were eight reinforced concrete bridges, three pedestrian undercrossings, and three retaining walls. Also included was a storm drain system ranging in size from double 7-feet x 7-feet reinforced concrete boxes to 24-inch reinforced concrete pipes. Other items of work consisted of a myriad of minor contract items such as fencing, guard railing, curbs, highway lighting systems, illuminated sign systems, communication and signal systems, and traffic signal systems.

At this writing the work is 60 percent complete. All public utilities have been relocated, and private facilities of oil companies are 90 percent relocated. Frontage roads have been

Close up view of contractor's haul road through Union Oil refineries area, showing bottom-dump semitrailer that attains maximum speed of 50 miles per hour





UPPER—General view of excavation area showing loader dumping into 22.7 cubicyards-capacity bottom-dump semitrailer. Excavation from this cut totals 1,200,000 cubic yards. LOWER—Looking north at Anaheim Street Undercrossing under construction. Residential portion of Wilmington shown in right background. Harbor Junior College in left background.

Aerial view looking southerly at excavation area and haul road through oil refinery. At left is Wilmington-San Pedro Road. Traffic artery shown in background is Gaffey Street extending into San Pedro.

constructed and traffic detoured thereon. Grading and bridge construction on the freeway section is progressing at a rapid rate.

Grading operations are worthy of special note. A profile of the project shows a maximum 85-foot cut at the southerly end of the job approximately 3,000 feet in length, having a total of 1,200,000 cubic yards. The freeway is carried the remaining distance on embankment, bridging C Street, E Street, Anaheim Street and Pacific Coast Highway.

The bid price for excavation is $0.29 per cubic yard. Overhaul is $0.10 per mile yard with a 1,000-foot free haul. For this earth-moving job, the contractor moved in a fleet of 13 special built 22.7-cubic-yard water level capacity bottom dump semi-trailers. These "wagons," as they are commonly called, and varying in number from 7 to 13 depending on length of haul, are moving an average 7,500 cubic yards per eight-hour day. Other equipment working in conjunction includes six D-8's, a heavy ripper, two sheepsfoot roller units, three 3,000-gallon sprinkler trucks, one 75-ton rubber-tired compactor, and two blades. Relative compaction tests average 94 percent.

Additional information on the wagons as supplied by H. J. Yount, Vice President of Vinnell Company and project manager, is as follows: The trailer is 35 feet long and trailer plus tractor is 48 feet long. Maximum width is eight feet. The trailer's load is carried on eight pairs of truck tires. The trailer axles have full air brakes with foot and hand controls in the cab. Weight of tractor and trailer empty is 28,800 lbs. Maximum road speed is 50 miles per hour. The opening and the closing by compressed air of the bottom dump gates is controlled by the driver in the cab. Then the entire load of 25 cubic yards can

. . . Continued on page 63

State Highway Contracts Awarded

MAY, 1955

Del Norte County—US 101—Between one mile north of Wilson Creek and 2.4 miles north of Gasquet (portions) surface with plant-mixed surfacing. 15.2 miles. Contract awarded to Peter Kiewit Sons' Co., Medford, Oregon, $99,613.70.

Humboldt County—US 101—Between one mile south of Phillipsville and two miles south of Pepperwood, at various locations. Install new drainage facilities and pave existing culvert inverts. Contract awarded to Melvin W. Oldham & Harold P. Hastings, Lakeport, $13,447.

Humboldt County—FAS 1204—About 11.5 miles southeast of Bridgeville at Martin Creek. Construct a steel beam span bridge with reinforced concrete deck and construct a graded roadbed and surface with selected material. Contract awarded to R. H. Douglas, Fortuna, $44,736.

Mendocino County—SR 128—Between 8.7 miles and 15 miles east of Boonville. Scarify and reshape the existing roadbed, construct cement treated base, place plant-mixed surfacing, install guide posts and culverts. 6.3 miles. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $174,113.

Mendocino County—SR 1—Between 0.6 mile south and 0.2 mile north of Greenwood Creek, at Elk. Construct a graded roadbed and place surfacing, construct a reinforced concrete bridge, completion of which provides a bridge across Greenwood Creek and approaches, all on new alignment. 0.9 mile. Contract awarded to Granite Construction Co., Watsonville, $367,269.

Mendocino County—SR 1—Across Salmon Creek, about 0.6 mile south of Albion. Clean and paint the existing bridge. Contract awarded to Robert A. Thompson & Chas. B. Murphy, San Francisco, $36,402.

Mendocino County—SR 1—Across Albion River and Navarro River, between 18 and 22 miles south of Fort Bragg. Clean and paint two steel bridges. Contract awarded to George C. Punton, San Diego, $14,943.

Shasta County—US 299—Between Montgomery Creek and 0.2 mile east of Hillcrest, approximately 35 miles northeasterly of Redding. 3.6 miles. Grade and surface with plant-mixed surfacing on cement treated base and untreated base, completion of which provides a two-lane highway and frontage roadway on new alignment, eliminating many sharp curves. Contract awarded to Eaton and Smith, San Francisco, $601,031.80.

Trinity County—FAS 1089—Between 1.9 miles east of Costa Ranch and Buckeye Creek Road. Construct a graded roadbed and install drainage facilities. 3.3 miles. Contract awarded to Souza & McCue Construction Co., Inc., Yuba City, $94,674.

Butte County—SR 87—Across Dudley Creek, Gold Run Creek and Dry Creek Overflow, about four to ten miles northerly of the City of Oroville. Construct three reinforced concrete bridges and grade and surface approaches. Contract awarded to Thomas Construction Co., Fresno, $42,727.

Butte County—FAS 757—Between Neal Road and Wagstaff Road, on Skyway in and near Paradise. Construct a graded roadbed, place cement treated base and plant-mixed surfacing. 2.8 miles. Contract awarded to W. H. Darrough & Sons, Yuba City, $205,668.

El Dorado County—US 50—Between near west city limits of Placerville and 0.2 mile east of Washington Street Overhead. Grade roadbed and place surfacing and bases and construct channelization, connections and approaches. 1.5 miles. Contract awarded to Harms Bros., Sacramento, $368,157.25.

El Dorado County—US 50—SR 93—Adjacent to Placerville, and between 1.2 miles east of Camino and two miles east of Sportsman's Hall, at three locations. Place plant-mixed surfacing over the existing surfacing. 10.2 miles. Contract awarded to Harms Brothers, Sacramento, $72,935.

Glenn County—US 99—Between 0.3 mile south of Willows and Tehama County Line. Widen the existing roadbed, place imported burrow, surface with plant-mixed surfacing on cement treated base and untreated base. 7.8 miles. Contract awarded to Baun Construction Co., Inc., Fresno, $152,381.25.

Nevada and Placer Counties—US 40 and SR 28—At six locations, near Truckee and Tahoe City. Place plant-mixed surfacing over the existing surfacing and on cement treated base and apply seal coats, 13.9 miles. Contract awarded to Gill Construction Co., Bakersfield, $215,110.

In Sierra, Nevada, Placer, Colusa and Yolo Counties—at various locations—Paint or surface treat the exteriors of buildings. Contract awarded to Fay L. Roberts, Susanville, $3,795.

Sutter and Butte Counties—Near Yuba City and Oroville, at three locations. Place plant-mixed surfacing on existing surfacing and apply seal coat at one location, widen the existing road and place plant-mixed surfacing on cement treated base and untreated base at another location, and place plant-mixed surfacing on existing surfacing and apply seal coat at the third location. 9.6 miles. Contract awarded to Baldwin Contracting Company, Inc., Marysville, $154,909.41

Sutter County—SR 20—Between Meridian and Sutter Causeway. Place plant-mixed surfacing over existing pavement, construct untreated base shoulders and apply seal coats. 3.2 miles. Contract awarded to Baldwin Contracting Company, Inc., Marysville $48,057.23.

Sutter County—Alt. US 40—Across Sutter By-Pass, about five miles southwest of Tudor. Repair the existing bridge. Contract awarded to Pacific Bridge Company, San Francisco, $54,896.

Sutter County—FAS 926 and 1168—Between one mile south of Striplin Road and Nicolaus Avenue, on El Centro Boulevard. Widen the existing shoulders and place plant-mixed surfacing. 4.0 miles. Contract awarded to Granite Construction Co., Watsonville, $72,301.

Yolo County—SR 99—Between Solano County Line and 5.5 miles south of West Sacramento. Place imported subbase material and untreated base and apply a prime coat and double seal coat. 10.4 miles. Contract awarded to Asta Construction Co., Rio Vista, $234,401.

Alameda County—At the Hayward Maintenance Station. Construct a metal building and reroof an existing building. Contract awarded to Walter H. Gunn, Castro Valley, $7,993.

Alameda County—US 50—About one mile northwest of Livermore, at Arroyo Las Positas. Construct concrete aprons and wingwalls, construct fences at and near the concrete box culverts. Contract awarded to O. C. Jones & Son, Berkeley, $2,601.25.

Contra Costa County—Between Summit and Diablo State Park Highway. Apply a medium seal coat to the existing bituminous surfacing, place plant-mixed surfacing on portions of the roadbed and reshape roadside gutters. 11.5 miles. Contract awarded to O. C. Jones & Sons, Berkeley, $23,001.50.

Santa Clara County—SR 42—Across Saratoga Creek, about 1.2 miles and 1.1 miles west of Saratoga. Repair two bridges. Contract awarded to Bridges Construction Co., San Jose, $7,343.94.

Santa Clara County—SR 9—Between Route 2 and Beemer Avenue, on Mathilda Avenue, 0.9 mile. Construct a graded roadbed and surface with plant-mixed surfacing on cement treated base. Contract awarded to Granite Construction Company, Watsonville, $112,559.85.

Santa Clara County—FAS 1015—Between Highwood Drive and Story Road, on Capitol Avenue. Widen the existing bridge and grade approaches, place plant-mixed surfacing on untreated base, and apply seal coats. Contract awarded to Lew Jones Const. Co., San Jose, $31,781.35.

San Francisco—US 101—Over the Presidio of San Francisco and on the Marina Viaduct. Clean and paint an existing bridge and an existing steel stairway. Contract awarded to D. Zelinsky & Sons, San Francisco, $53,294.

San Mateo and Santa Clara Counties—US 101—Between 0.1 mile north of San Mateo-Santa Clara County Line and 0.1 mile north of University Avenue. 0.5 mile. Construct a graded roadbed, widen the existing traveled way, place plant-mixed surfacing over the existing pavement and on cement treated base, widen the existing bridge and construct channelization, connections and approaches. Contract awarded to L. C. Smith Co., San Mateo, $172,137.10.

Sonoma County—US 101—At the intersection of Redwood Highway with East Fulton Road and with Fulton Road near Windsor. Install complete in place, a flashing beacon and highway lighting system. Contract awarded to Fred Esselink Electric Co., Sebastopol, $3,660.

San Luis Obispo County—SR 137 and 125—Across Salinas River, 15 and 20 miles, respectively, north of San Luis Obispo. Clean and paint two bridges. Contract awarded to Howard E. Clark, San Luis Obispo, $9,393.

San Luis Obispo County—FAS 1207—Between 1.7 and 2.1 miles northeast of Cayucos, on Old Creek Road. Construct a graded roadbed and a steel bridge. Contract awarded to P. J. Zuiderweg, San Luis Obispo, $37,417.50.

Fresno County—SR 180—Between Derrick Avenue and Belmont Avenue. Construct a graded roadway and surface with road-mixed surfacing. 1.1 miles. Contract awarded to L. B. Wells Construction Co., Visalia, $24,480.

Kern County—SR 178—At Bowerbank Siding about 22 miles west of Bakersfield. 0.9 mile. Construct a graded roadbed and surface with plant-mixed surfacing on cement treated base. Contract awarded to Dicco Inc., Bakersfield, $45,939.

Kern County—FAS 884—Between Di Giorgio Road and White Wolf Road, on Comanche Drive. 2.8 miles. Construct a graded roadbed, surface with plant-mixed surfacing on cement treated base, construct road-mixed surfacing on shoulders and remove and salvage a timber bridge. Contract awarded to Griffith Company, Los Angeles, $91,804.

Los Angeles County—US 101—Between Grand Avenue and Spring Street. Construct channelization and install and modify highway lighting and illuminated sign systems. Contract awarded to C. O. Sparks, Inc. and Mundo Engineering Co., Los Angeles, $27,671.

Los Angeles County—US Alt. 101—Across Dominguez Channel, about nine miles north of Orange County Line. Clean and paint an existing bridge. Contract awarded to Acme Maint. Engr. Co., Montebello, $13,130.

Los Angeles County—Between Rosecrans Avenue and Orange County Line, on Santa Ana Freeway. Install complete in place, highway lighting and illuminated sign systems. Contract awarded to Ed Seymour, Long Beach, $27,725.

Los Angeles County—SR 175—At the intersections of Artesia Avenue with Downey Avenue, Clark Avenue, Bellflower Boulevard and Woodruff Avenue. Install and modify the traffic signal systems and highway lighting. Contract awarded to Electric & Machinery Service, Inc., South Gate, $12,872.

Los Angeles County—SR 178—Between San Gabriel River and the Orange County Line, on Carson Street. Construct a graded roadbed and place plant-mixed surfacing on untreated base and modify the existing traffic signal systems and highway lighting systems. 1.7 miles. Contract awarded to N. L. Basich, Garvey, $368,828.25.

Santa Barbara and Ventura Counties—SR 150 and US 399—Clean and paint three steel bridges and three tunnels. Contract awarded to J. P. Carroll Company, Los Angeles, $6,972.

Merced County—US 99—Between 0.5 mile and 2.7 miles north of Livingston Underpass. Install, complete in place, two scale houses, with truck scales and weighbiographs. Contract awarded to J. L. Webster, Galt, $34,863.

Tuolumne County—SR 120—Between 0.5 mile east of Chinese Camp and Woods Creek. Construct a graded roadbed and surface with plant-mixed surfacing on untreated base on new alignment, eliminating many curves. 1.9 miles. Contract awarded to O. K. Mittry and Sons, Gardena, $287,912.60.

San Diego County—US 80—At Del Cerro Avenue Connection, on Alvarado Canyon Road. Grade and widen the existing roadbed, and grade and surface the connecting road with plant-mixed surfacing and untreated base. 0.9 mile. Contract awarded to Einer Brothers Inc., Escondido, $16,206.80.

San Diego County—US 80—Between Lytton Street and Pacific Highway, in the City of San Diego (portions). Place plant-mixed surfacing, on existing roadway shoulders. 1.4 mile. Contract awarded to V. R. Dennis Construction Co., San Diego, $1,890.60.

San Diego County—US 395—At Cambridge Street. Construct a pedestrian undercrossing. Contract awarded to N. M. Saliba Co., Gardena, $19,567.

JUNE, 1954, AWARDS

Del Norte County—US 101—Two miles east of Myrtle Creek, remove an existing embankment, construct two log cribs and restore the embankment to its original grade. Contract awarded to Paul E. Woof, Fresno, $26,790.

Del Norte County—FAS 985—Across Middle Fork of Smith River, about 11 miles northeast of Crescent City, construct a bridge. Contract awarded to G. M. Carr Co. and Bati Rocca, Santa Rosa, $88,791.

Humboldt County—US 101—Between Seventh Street and 0.2 mile north of Arlington Way. Pave island and median areas with Portland cement concrete, prepare and plant roadside areas, and install a chain link fence. 1.4 miles. Contract awarded to Watkin & Sibbald, San Anselmo, $34,837.10.

Humboldt County—US 101—Between the south city limits of Eureka and 0.5 mile north of the north city limits of Eureka. Construct a reinforced concrete bridge, widen portions of the existing roadbed, construct sections of a graded roadbed and intersection channelization and surface with plant-mixed surfacing on cement treated base and untreated base. 2.5 miles. Contract awarded to Ben C. Gerwick Inc., San Francisco, $842,406.

Humboldt County—US 101 and US 299—Between Weott and 0.5 mile south of Freshwater Summit, and between three miles west and 13 miles east of Blue Lake (portions). Place plant-mixed surfacing and construct a passing lane. 21.4 miles. Contract awarded to Mercer, Fraser Company, Inc. and Mercer, Fraser Gas Co., Inc., Eureka, $156,447.50.

Lake County—SR 29—Across Long Valley Creek and at Guenoc cattlepass, about one and two miles respectively, north of Middletown. Replace an existing timber cattlepass with a reinforced concrete cattlepass, and construct a reinforced concrete slab bridge. Contract awarded to E. H. Thomas Co., Las Vegas, Nevada, $18,713.

Mendocino County—US 101—Between 0.2 mile north of Sonoma County line and 0.5 mile south of Lanes Flat (portions). Place plant-mixed surfacing, repair a slipout and construct passing lanes. 21.4 miles. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $227,000.

Trinity County—US 299—Between one mile east of Trinity River Bridge and Prairie Creek. Place road-mixed surfacing over the existing base and apply seal coat. 7.4 miles. Contract awarded to Mercer, Fraser Co., Inc. and Mercer, Fraser Gas Co., Inc., Eureka, $59,490.

Lassen and Plumas Counties—US 395 and US Alt. 40—Between Doyle and 15.4 miles south and between 1.2 miles west of Portola and 0.4 mile west of Lassen County line. Surface with plant-mixed surfacing. 33.2 miles. Contract awarded to Isbell Construction Co., Reno, Nevada, $185,708.50.

Modoc County—FAS 1215—Between Lookout and two miles east. Construct six reinforced concrete bridges, three across Pit River Slough, one across Mamoth Slough and two across Roberts Slough. Contract awarded to E. H. Thomas Co., Sacramento, $63,820.

Shasta County—US 299—Between Burney and Fall River Mills. Apply asphaltic emulsion paint binder and surface with plant-mixed surfacing on existing surfacing. 17.2 miles. Contract awarded to Clements Construction Co., Centerville, $118,390.

Siskiyou County—US 99 and US 97—Between 0.8 mile north of Shasta County line and Camp Lowe; and between Weed and 8.3 miles north. Surface with plant-mixed surfacing on untreated base and existing pavement; and construct a graded roadbed and surface with plant-mixed surfacing on cement treated base and existing pavement. 25.2 miles. Contract awarded to Peter Kiewit Sons Co., Medford, Oregon, $272,979.

Siskiyou County—FAS 1089—Between Fort Jones and Quartz Valley Road. Scarify and reshape existing roadbed, apply a prime coat and surface with plant-mixed surfacing. 6.8 miles. Contract awarded to Wm. S. & Bruce F. Rogers Co., Madera, $85,285.

Tehama County—FAS 1081—Between Lanes Valley Road and Manton. Place plant-mixed surfacing on cement treated base and on existing base materials, construct shoulders of untreated base, place plant-mixed surfacing dikes and apply seal coat. 7.2 miles. Contract awarded to Fredrickson & Watson Construction Co., Oakland, $105,305.55.

Trinity County—US 299—Between Vitzthum's and one mile east of Tom Lang Gulch. Construct a graded roadbead, place imported subbase material and place plant-mixed surfacing on cement treated base, completion of which provides a roadway on new alignment eliminating many curves. 3.0 miles. Contract awarded to Earl L. McNutt Co., Eugene, Oregon, $586,134.20.

Colusa County—SR 45—Between 4.4 miles north of Yolo County line and 1.7 miles north of Wilkins Slough (portions). Place untreated base on imported subbase material and road-mix the upper portion. 3.8 miles. Contract awarded to W. H. O'Hair Company, Colusa, $112,830.

El Dorado County—US 50—At Echo Summit Maintenance Station. Construct an extension to the existing building and partitions in portions. Contract awarded to Richard W. Porter, Yuba City, $15,605.

Glenn County—SR 45—Between 4.7 miles north of Glenn and Hamilton City (portions). Construct a graded roadbed, approaches and connections and place surfacing and base. 9.5 miles. Contract awarded to Ace Excavators, San Leandro, $237,295.25.

Placer County—SR 89—At the Tahoe City Maintenance Station. Import fill material, grade, install a culvert pipe, place road-mixed surfacing, construct concrete sidewalks, install chain link fence and furnish and install two gates. Contract awarded to Floyd O. Bailey, Auburn, $11,154.

Placer, Yuba, and Nevada Counties—At four locations. Place plant-mixed surfacing over the existing surfacing. 11.3 miles. Contract awarded to Brown-Ely Co., Contractors, Yuba City, $79,968.53.

Sacramento County—At the Headquarters Laboratory Site, at 59th Street and Folsom Boulevard, in the City of Sacramento. Relocate existing utility lines, grade an unsurfaced area, grade and surface a handstand area, install a storm and sanitary sewer system, stockpile and replace some existing base and bituminous surfacing, and place untreated base, plant-mixed surfacing and fog seal. Contract awarded to Brighton Sand & Gravel Co., Perkins, $22,627.25.

Sierra County—SR 49 and 89—Between Bassetts and 2.1 miles easterly and between Sattley and Calpine. Place plant-mixed surfacing over untreated base. 4.2 miles. Contract awarded to Brown-Ely Co., Contractors, Yuba City, $144,181.65.

Yolo and Colusa Counties—At three locations. Place plant-mixed surfacing over the existing surfacing. 16.7 miles. Contract awarded to Granite Construction Co., Watsonville, $98,873.20.

Yuba County—At the Marysville Maintenance Station. Construct a sign storage building and a sign storage shelter. Contract awarded to Coursey Construction Co., Yuba City, $19,090.

Alameda County—At the Administration Building, Toll Plaza, San Francisco-Oakland Bay Bridge. Rebuild the fireboxes of two boilers and replace burners and boiler controls. Contract awarded to Service Heat and Power Co., Oakland, $4,468.30.

Alameda County—At the intersections of Foothill Boulevard with Bridge Street and East 14th Street with Bridge Street and Grove Way. Install traffic signal systems and highway lighting and construct channelization. Contract awarded to Abbett Electric Corp., San Francisco, $30,863.

Alameda County—At the Fruitvale Avenue Maintenance Station. Construct a prefabricated metal building. Contract awarded to Walter H. Gunn, Castro Valley, $6,294.

Alameda County—At the intersections of East 14th Street with 150th Avenue and with 148th Avenue; of Jackson Street with Hesperian Boulevard; and Foothill Boulevard with Miramar Avenue. Construct channelization, install and modify traffic signal systems and highway lighting. Contract awarded to Engineering Design Corp., Berkeley, $27,022.75.

Alameda County—At Lincoln Avenue Extension. Construct a graded roadbed and place plant-mixed surfacing on untreated base and construct a reinforced concrete bridge. 0.1 mile. Contract awarded to Stolze Inc., Gallagher & Burk, Inc., Oakland, $121,406.60.

Alameda and Contra Costa Counties—At various locations. Place plant-mixed surfacing over the existing pavement and cement treated base. 8.2 miles. Contract awarded to Lee J. Immel, San Pablo, $58,188.25.

Contra Costa County—SR 21—Between Danville and 0.1 mile north of Newell Avenue. Grade and widen the existing roadbed with plant-mixed surfacing on untreated base and cement treated base, and place plant-mixed surfacing on the existing pavement. 4.0 miles. Contract awarded to Gallagher & Burk, Inc., Oakland, $244,071.94.

Marin County—US 101—Between Waldo and 0.3 mile north of Alto. Grade and surface with plant-mixed surfacing on cement treated base, construct a welded plate girder bridge, and install highway lighting and illuminated sign system, completion of which provides a six-lane divided highway, together with road connection ramps and frontage roads. 1.9 miles. Contract awarded to Dan Caputo Co., Dan Caputo & Edw. Keeble, San Jose, $1,156,675.50.

Marin, Sonoma, and Napa Counties—At various locations. Place plant-mixed surfacing over the existing pavement. 21.8 miles. Contract awarded to Reichhold & Jurkovish and Lee J. Immel, San Pablo, $146,275.95.

Napa County—FAS 824—Across Napa River near northerly city limits of Napa. Construct a reinforced concrete bridge. Contract awarded to Lord & Bishop Inc. & Alvin O. Erickson Co., Napa, $183,314.

Santa Cruz County—FAS 1146—On Freedom Boulevard, between the Monument and the Town of Freedom. Construct a graded roadbed, place imported subbase material and untreated base, surface with plant-mixed surfacing and apply seal coats. 0.6 mile. Contract awarded to Edward Keeble, San Jose, $49,921.

San Francisco County—Between Fulton Street and Lake Street, on Park Presidio Boulevard. Widen the existing roadbed and place plant-mixed surfacing on concrete base and relocate and modify the existing traffic signal systems, completion of which will provide a six-lane divided highway. 1.0 mile. Contract awarded to The Fay Improvement Co., San Francisco, $153,902.40.

San Francisco City and County—Between 18th Street and Bryant Street at 9th and 10th Street connections. Revise the existing deck drains and construct two new deck drains. Contract awarded to Adam Arras and Son, San Francisco, $1,129.40.

San Francisco—At the District IV Office. Clean and paint the district office and garage. Contract awarded to Dave Russ, San Francisco, $2,434.

San Mateo County—SR 5—Between 0.2 mile south Junction Route 56 at Thornton and south city limits of San Francisco Sign Route 1. Construct a graded roadbed and surface with plant-mixed surfacing on untreated base, construct reinforced concrete extensions to an existing pedestrian undercrossing, construct a new reinforced concrete pedestrian undercrossing, install traffic signal and highway lighting systems, construct channelization, connections and approaches. 0.9 mile. Contract awarded to Chas. L. Harney, Inc., San Francisco, $322,850.55.

San Mateo County—At the Burlingame Maintenance Station. Join two existing metal buildings by erecting foundation, front and rear metal walls and roof over an existing 10-foot by 14-foot space including the placement of Portland cement concrete floor, heating, electrical and sanitary facilities. Contract awarded to Stevenson Pacific, Redwood City, $3,889.

San Mateo, Santa Clara, and Santa Cruz Counties—At various locations. Place plant-mixed surfacing over the existing pavement. 21.3 miles. Contract awarded to L. C. Smith Co., San Mateo, $129,315.50.

Sonoma County—SR 104—Between south city limits of Sebastopol and 0.1 mile west of Route 1. Widen the existing roadbed on portions of the project, construct a graded roadbed on a portion and place plant-mixed surfacing on the existing pavement and on cement treated base. 3.7 miles. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $226,798.

Sonoma County—At the Petaluma Maintenance Station, about ½ mile south of the City of Petaluma. Construct a prefabricated metal building. Contract awarded to Walter H. Gunn, Castro Valley, $6,983.

Santa Barbara County—US 101—Between 0.5 miles west of Arroyo Hondo and Gaviota. Construct graded roadbeds with approach roads, ramps and highway connections, and place Portland cement concrete pavement on bituminous treated subgrade and plant-mixed surfacing on cement treated base, completion of which provides a four-lane divided highway. 3.7 miles. Contract awarded to Fredericksen & Watson Construction Co., Oakland, $736,666.66.

San Benito and Monterey Counties—US 101—At various locations. Place plant-mixed surfacing over existing pavements. 10.5 miles. Contract awarded to Granite Construction Co., Watsonville, $64,525.

San Luis Obispo County—US 101—Between Russell Turn and Arroyo Grande. Construct a graded roadbed and pave with Portland cement concrete on cement treated subgrade and plant-mixed surfacing on cement treated base, construct a reinforced concrete bridge and widen an existing bridge, completion of which provides a four-lane divided highway with approach roads, ramps and connections. 4.6 miles. Contract awarded to Madonna Construction Co., San Luis Obispo, $919,930.

San Luis Obispo County—SR 125—Between five miles east of Route 56 and San Gabriel Avenue. Place plant-mixed surfacing on cement treated base and existing surfacing. 7.9 miles. Contract awarded to Valley Paving and Construction Co., Inc., Pismo Beach, $52,786.50.

San Luis Obispo County—At California State Polytechnic College. Place road-mixed surfacing on the existing roads and parking areas, construct a graded roadbed and surface with plant-mixed surfacing and Portland cement concrete pavement on untreated base, and construct reinforced concrete structures. Contract awarded to C. E. Roberts & Son, Coalinga, $34,835.

San Luis Obispo County—At various locations. Place plant-mixed surfacing over the existing pavements. 18.4 miles. Contract awarded to Valley Paving & Const. Co., Inc., Pismo Beach, $72,386.50.

Fresno County—US 99—Between San Joaquin Street in the City of Fresno and West Street. Grade and pave with concrete pavement on cement treated subgrade and construct six bridges, four of reinforced concrete, and two of steel, and construct two pumping plants, completion of which provides a four-lane divided highway with bridges at El Dorado Street Overcrossing, Tehama Street Overcrossing, Newlsen Avenue Undercrossing, Pacific Avenue Overcrossing, Kerman Branch Underpass, Belmont Avenue Overcrossing and pumping plants at Tehama Street Overcrossing and at Kerman Branch Underpass. 1.8 miles. Contract awarded to Gene Richards, Inc., D. M. Underdown, Gene Richards, Fresno, $1,253,555.86.

Fresno County—SR 180—On B Street between White's Bridge Avenue and Fresno Street. Surface with plant-mixed surfacing on the existing pavement and on cement treated base on the existing shoulders. 0.6 mile. Contract awarded to Gene Richards, Inc., Fresno, $16,315.50.

Fresno and Madera Counties—SR 180 and 41, and US 99—At various locations. Place plant-mixed surfacing on existing surfacing. 23.2 miles. Contract awarded to Stewart and Nuss, Inc., Fresno, $116,067.50.

Kern County—At various locations. Place plant-mixed surfacing over the existing surfacing. 30.9 miles. Contract awarded to Dicco, Inc., Bakersfield, $155,876.

Kern County—SR 178—Between three miles west and one mile west of Democrat Springs. Widen portions of existing roadbed and place road-mixed surfacing. 2.3 miles. Contract awarded to Dicco, Inc., Bakersfield, $119,681.50.

Kern County—SR 178—At Bodfish Maintenance Station. Erect a prefabricated metal truck shelter, metal gas and oil house, concrete fuel pump island, prefabricated pump house, and surface a portion of the yard. Contract awarded to Rand Construction Co., Bakersfield, $21,976.50.

Kern County—SR 141—In and adjacent to the City of Bakersfield, at the intersection of Route 141 with H Street. Install traffic signal system and highway lighting. Contract awarded to McCrory Electric Co., Fresno, $8,570.

Kern County—SR 143—Between Di Giorgio Road and Panama Road. Construct a graded roadbed and place plant-mixed surfacing on cement treated base. 1.1 miles. Contract awarded to Griffith Company, Los Angeles, $147,759.40.

Tulare County—US 99—Between 0.5 mile north of Earlimart and 0.5 mile north of Pixley. Completion of this contract will provide a four-lane divided highway, constructed of graded roadbeds, paved with Portland cement concrete on cement treated subgrade, graded frontage roads, ramps and connecting roads and surfaced with plant-mixed surfacing on cement treated base, together with five reinforced concrete bridges at Deer Creek, at Avenue 76 Undercrossing, at Avenue 96 Overcrossing, at D Street Overcrossing and at Avenue 100 Overcrossing. 5.8 miles. Contract awarded to Gordon H. Ball, Danville, $1,521,676.20.

Tulare County—US 99—Between Tulare Airport and Tagus. Plant shrubs and trees. 8.0 miles. Contract awarded to Olivers Flowers Shop and Nursery, Fresno, $17,031.75.

Tulare County—At various locations. Place plant-mixed surfacing on existing surfacing. 47.0 miles. Contract awarded to Griffith Company, Los Angeles, $209,683.50.

Los Angeles County—On US 101, in the City of Los Angeles—Between Barham Boulevard and Mulholland Drive. Place plant-mixed surfacing over shoulder areas and construct drainage facilities. 0.5 mile. Contract awarded to Schroeder & Co., Sun Valley, $26,861.50.

Los Angeles County—At various locations, in the Cities of Los Angeles and Glendale. Place plant-mixed surfacing on the existing pavement and surfacing. 8.5 miles. Contract awarded to Schroeder & Co., Sun Valley, $74,228.

Los Angeles County—At various locations, in and near the City of Los Angeles. Construct alterations at six pumping plants. Contract awarded to Walker and Murphy, North Hollywood, $5,182.50.

Los Angeles County—SR 19—Between Pearl Street in Pomona and Foothill Boulevard. Widen the existing street roadway and place plant-mixed surfacing on untreated base and over portions of existing plant-mixed surfacing and modify traffic signals and roadway lighting systems, completion of which provides four lanes for through traffic and two lanes for parking. 2.8 miles. Contract awarded to M. S. Mecham & Sons, South Gate, $473,234.50.

Los Angeles County—US Alt. 101—Across Alamitos Bay. Repair the existing bridge. Contract awarded to Johnson Western Constructors, San Pedro, $11,880.

Los Angeles County—US Alt. 101 and SR 107—Between California Street in Santa Monica and West Channel Road in Los Angeles, and between 137th Street and Broadway in Hawthorne. Surface with plant-mixed surfacing. 1.8 miles. Contract awarded to Schroeder & Co., Sun Valley, $20,496.24.

Los Angeles County—SR 19 and 35—At various locations. Place plant-mixed surfacing on the existing pavement. 4.8 miles. Contract awarded to Warren Southwest Inc., Torrance, $27,604.

Los Angeles County—SR 35—Between Pioneer Boulevard and San Jose Creek, about 0.8 mile north of the north city limits of Whittier. Construct shoulder areas and realign portions of an existing highway by grading, placing imported subbase material, placing plant-mixed surfacing on untreated base and on existing pavement, and applying seal coats. 1.4 miles. Contract awarded to Vido Kovacevich Company, Rosemead, $107,097.45.

Los Angeles and Ventura Counties—US 99 and US 101—At truck weighing stations near Castaic and near Montalvo. Install signal systems, lighting and portions of water system. Contract awarded to Oilfield Electric Co., Ventura, $7,876.50.

Orange County—US 101 and SR 19—At various locations, on Route 2 between La Entrada Place and Central Avenue, and on Route 19, between Route 2 and Los Angeles County line. Place plant-mixed surfacing on the existing pavement. 6.4 miles. Contract awarded to Sully-Miller Contracting Co., Orange, $35,528.50.

Orange County—SR 62—Between 0.2 mile south of Imperial Highway and Whittier Boulevard. Construct a graded roadbed and surface with plant-mixed surfacing on untreated base, and remove an existing bridge, concrete curbs and structures. 1.8 miles. Contract awarded to Sully-Miller Contracting Co., Orange, $138,200.01.

Orange County—SR 171—At Stanton Maintenance Station, on Katella Avenue east of Huntington Beach Boulevard. Construct a truck shelter, including utilities. Contract awarded to Precision Fabricators Inc., Paramount, $10,848.

Orange County—At various locations. Place plant-mixed surfacing on the existing pavement. 14.2 miles. Contract awarded to Sully-Miller Contracting Co., Orange, $54,582.80.

Ventura County—At various locations. Place plant-mixed surfacing on the existing pavement and surfacing. 10.6 miles. Contract awarded to Western Motor Transfer Inc., Santa Barbara, $47,696.70.

Ventura County—At various locations. Surface with plant-mixed surfacing. 8.5 miles. Contract awarded to Baker & Pollock, Ventura, $33,250.

Ventura County—US 399—Between Route 2 and 0.3 mile south of Mills School. Grade and surface with plant-mixed surfacing on untreated base, construct four reinforced concrete bridges at Stanley Avenue Undercrossing, Shell Road Undercrossing, Pipe Line No. 3 Undercrossing, Pipe Line No. 1 Undercrossing, and install highway lighting and traffic signal systems, completion of which provides a four-lane divided highway together with a frontage road and on and off-ramps, on new alignment. 4.1 miles. Contract awarded to Guy F. Atkinson Company, Long Beach, $1,736,022.50.

Riverside County—FAS 700—Between Tyler Avenue and Van Buren Street, on Arlington Avenue. Construct a graded roadbed, place plant-mixed surfacing on cement treated base and apply seal coats. 1.4 miles. Contract awarded to Robert E. L. Parker Co. and Lowe & Watson, Claremont, $112,039.70.

Riverside and San Bernardino Counties—At various locations. Place plant-mixed surfacing over the existing surfacing. 33.3 miles. Contract awarded to Matich Brothers, Colton, $252,183.70.

San Bernardino County—US 99—Between one mile west of Colton and the Santa Ana River. Grade, place imported base material, construct cement treated subgrade and Portland cement concrete pavement, place plant-mixed surfacing over imported base material, cement treated base and existing pavements, construct eight bridges at Rancho Avenue Off-ramp Overcrossings, Third Street Undercrossing, Colton Overhead, Ninth

Street Overhead, Pavillion Spur Overhead, Route 31/26 Separation, Warm Creek Bridge, Warm Creek Overflow Bridge and a pumping plant, all of reinforced concrete construction, completion of which will provide a two graded four-lane divided highway, together with on-ramps, off-ramps, and road connections, on new alignment. 2.4 miles. Contract awarded to W. F. Maxwell & Hermreck and Easter, Los Angeles, $1,736,751.65.

San Bernardino County—US 66-395—Construct buildings and other improvements at Maintenance Station. 1.4 miles easterly from Baker. Contract awarded to Dill & Robinson, Banning, $59,937.10.

San Bernardino County—SR 18—Between Ralston Avenue and 40th Street, on Sierra Way. Surface the widened area with plant-mixed surfacing over the existing material and construct curbs, sidewalks and driveways. Contract awarded to R. A. Erwin, Colton, $5,043.75.

San Bernardino County—US 95—Between Aqueduct Road and 7.7 miles north of Pyramid Peak. Place road-mixed surfacing over the existing surfacing. 10.0 miles. Contract awarded to F. H. Harris, San Bernardino, $31,945.

San Bernardino County—SR 177—Between Orange County line and Pipe Line Avenue. Widen the existing traveled way and place plant-mixed surfacing on existing surfacing. 4.8 miles. Contract awarded to E. L. Yeager Co., Riverside, $57,457.50.

San Bernardino County—FAS 1199—On San Bernardino Avenue between Mulberry and Fontana Avenues. Construct graded roadbeds and place plant-mixed surfacing thereon and over existing pavement, apply seal coats. 2.3 miles. Contract awarded to George Herz & Company, San Bernardino, $123,807.90.

San Bernardino County—At the State Highway District Shop. Develop and plant grounds. Contract awarded to Charlton Nurseries, San Bernardino, $2,116.03.

Inyo County—SR 76—Between Otey's and Bishop. Construct a graded roadbed and surface with road-mixed surfacing on cement treated base and imported base material and widen three existing timber tresle bridges. 3.6 miles. Contract awarded to Thomas Construction Co., Fresno, $123,118.40.

Inyo and Kern Counties—At various locations. Place plant-mixed surfacing and road mixed surfacing over the existing surfacing. 17.5 miles. Contract awarded to N. L. Basich, Garvey, $145,870.

Kern County—US 6 and US 466—Between 0.8 mile north of Mojave and Boron. Construct a two-lane highway by grading, placing imported borrow, plant-mixed surfacing, on untreated base and applying a seal coat. 21.7 miles. Contract awarded to Harms Bros., Sacramento, $532,712.50.

Mono County—US 395—At the Crestview Maintenance Station about 48 miles north of Bishop. Construct an extension to an existing building. Contract awarded to D. L. Nicoll, Mammoth Lakes, $2,182.53.

Mono County—US 395—Between Route 95 and Alpine County line. Revise drainage facilities and apply fog seal coat. 7.6 miles. Contract awarded to J. Henry Harris, Berkeley, $31,553.10.

Mono County—At various locations. Place road-mixed surfacing over the existing surfacing. 13.8 miles. Contract awarded to J. Henry Harris, Berkeley, $69,465.

Mono County—SR 40—Between 10.3 miles east of Route 23 and Nevada State Line; about 17 miles southwesterly of the town of Lee Vining. 11.0 miles. Grade and apply penetration treatment to untreated base. Contract awarded to Payne Construction Co. and Matchio, Baker, Trewhitt Co., Inc., Oakland, $176,938.

Mono County—FAS 1093—From 5.5 miles to 13.6 miles southwest of Bridgeport. Construct a graded roadbed and surface with road-mixed surfacing on imported base material. 8.1 miles. Contract awarded to Payne Construction Co. and Matchio, Baker, Trewhitt Co., Inc., Oakland, $172,516.30.

Alpine County—SR 89—Between Markleeville and 0.6 mile northerly. Construct a graded roadbed, place imported base material and road-mix the upper inches. 0.6 mile. Contract awarded to Lee Const. Co., San Leandro, $49,999.70.

Amador County—SR 88—Between 2.0 miles south of Ione and the junction with Route 34. Construct a graded roadbed and surface with plant-mixed surfacing, completion of which will provide a highway on new alignment eliminating curves. 2.0 miles. Contract awarded to W. H. Darrough & Sons, Yuba City, $127,522.55.

Amador County—FAS 950—Between State Route 97, about 2.5 miles south of Ione and State Route 34. Construct plant-mixed surfacing on untreated base. 2.1 miles. Contract awarded to Claude C. Wood Co., Lodi, $66,280.

Amador, Calaveras, and San Joaquin Counties—At various locations. Surface with plant-mixed surfacing. 15.3 miles. Contract awarded to Rice Brothers, Inc., Lodi, $74,944.75.

Merced County—FAS 555—Between US 99 and Le Grande Road, on Plainsburg Road. Construct a graded roadbed and place plant-mixed surfacing on untreated base. 3.3 miles. Contract awarded to M. J. Ruddy and Son, Modesto, $135,841.60.

Merced, Stanislaus, and San Joaquin Counties—At various locations. Surface with plant-mixed surfacing and construct channelization. 21.9 miles. Contract awarded to A. Teichert & Son, Inc., Sacramento, $115,609.

San Joaquin County—US 99—Between Ripon and 0.2 mile west of Austin Road. Plant shrubs and trees. 3.6 miles. Contract awarded to Lou S. Tsunekawa, Stockton, $9,878.35.

San Joaquin County—At the State Highway District Shop and Maintenance Yard, in Stockton. Plant trees, shrubs, ground cover and lawn. Contract awarded to Stephen L. Vistica & Son, San Mateo, $8,835.80.

Solano County—US 40 and SR 12—At the intersections of Rockville Road with US 40 and Pennsylvania Avenue with Texas Street. Install traffic signal system and highway lighting and modify the existing traffic signal system. Contract awarded to R. Gould and Son, Stockton, $7,235.

Solano County—At various locations. Place plant-mixed surfacing and subseal with asphalt. 14.7 miles. Contract awarded to Frederickson Bros., Emeryville, $104,330.20.

Tuolumne County—SR 108—Between Twain Hart and McCoy Saddle. Place plant-mixed surfacing. 17.8 miles. Contract awarded to Beerman and Jones, Sonora, $104,152.

Imperial County—At various locations. Surface with road-mixed surfacing. 22.8 miles. Contract awarded to N. L. Basich, Garvey, $68,964.

Imperial County—SR 202—Between Route 12 near Coyote Wells Underpass and two miles west of Mt. Signal. Construct a graded roadbed and place road-mixed surfacing and construct two reinforced concrete bridges. 22.6 miles. Contract awarded to N. L. Basich, Garvey, $279,700.60.

Riverside County—SR 146—At various locations between Palo Verde and Wiley Hill Log Cabin. Surface with road-mixed surfacing. 6.4 miles. Contract awarded to F. H. Harris, San Bernardino, $21,685.

San Diego County—US 101—At Mission Avenue Overcrossing in Oceanside. Install metal plate guard railing. Contract awarded to Roy C. Eh, San Diego, $3,662.50.

San Diego County—US 80—Between Lake Murray Boulevard and 0.3 mile east. 0.3 mile. Grade, place imported subbase material, place plant-mixed surfacing on untreated base and apply seal coat, completion of which provides a two-lane frontage road. Contract awarded to Griffith Company, Los Angeles, $27,938.75.

San Diego County—US 395—Between Lake Hodges and Brotherton Road. Place plant-mixed surfacing on the existing pavement and shoulders and apply seal coat. 2.0 miles. Contract awarded to Ralph B. Slaughter, Julian, $23,474.

San Diego County—SR 79—Between Cuyamaca and Julian. Surface with road-mixed surfacing. 7.2 miles. Contract awarded to Ralph B. Slaughter, Julian, $21,280.

San Diego County—SR 76—Between Oceanside and Bonball (portions). Surface with plant-mixed surfacing. 3.7 miles. Contract awarded to R. E. Hazard Contracting Co., San Diego, $13,981.20.

Evans Is Appointed Asphalt Institute District Engineer

Veteran California highway engineer Don G. Evans of Los Angeles has been named district engineer for the Asphalt Institute, serving Southern California and Arizona. In announcing the new appointment, President J. E. Buchanan of the Asphalt Institute said Evans would make his headquarters at Los Angeles.

In 1927 Evans centered his area of operations in California where he served with the California Division of Highways in various capacities until his retirement.

HARBOR FREEWAY

Continued from page 59 . . .

be dumped and spread in a windrow in about 20 seconds with no stopping of the vehicle.

The writer is resident engineer working under general supervision of Assistant District Construction Engineer Haig Ayanian, Assistant District Engineer Frank B. Cressy, and District Engineer W. L. Fahey. The Bridge Department representative is Fred H. Buck.

Representing the contractor on the job is G. F. McAfee. The contractor is making exceptional progress and it is anticipated that this freeway will be completed and opened to traffic considerably in advance of the estimated date for completion, which is June 18, 1956.

San Diego County—SR 198—Between 0.2 mile south of La Mesa City limits and Lemon Avenue. 0.6 mile. Place plant-mixed surfacing, construct concrete curbs and sidewalks and apply seal coats. Contract awarded to Daley Corp., San Diego, $14,587.

San Diego County—SR 75—Between Coronado Heights and R. H. Dana Place. Construct graded roadbeds and place plant-mixed surfacing on cement treated base and existing pavement and construct four reinforced concrete bridges at Silver Strand State Park Undercrossing, and three at Silver Strand State Park Pedestrian Undercrossings, completion of which will provide a four-lane divided highway together with ramps and undercrossing. 7.8 miles. Contract awarded to Daley Corp., San Diego, $768,038.70.

San Diego and Imperial Counties—At various locations. Surface with plant-mixed surfacing. 11.7 miles. Contract awarded to R. E. Hazard Contracting Co., San Diego, $75,748.

HARRY L. KILE

Continued from page 49 . . .

continuing need to "get out of the mud" and partly because of the lack of usable data about traffic.

Among Kile's other contributions to the science of highway planning is the development of accident analysis techniques which led to the present punch-card tabulation system of accident records.

Mr. and Mrs. Kile have lived in Davis since 1928. He is a member of the Faculty Club at the University of California, Davis campus. The Kiles have a daughter living in Berkeley, and a three-year-old grandson.

EARL A. PARKER

Continued from page 49 . . .

war period, "Ace" was assigned to the District Traffic Department. Here he made some of the first traffic studies for the famous four-level traffic interchange structure at the crossing of the Harbor-Pasadena Freeways and the Hollywood Freeway. When construction began after the war, he was assigned as resident engineer on the first contract on the Santa Ana Freeway. With the expanding construction program following the war, "Ace" was appointed as field supervisor over all construction jobs in District VII. He was appointed senior highway engineer in 1950.

NOW ON LIST

HEADQUARTERS
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Ground Safety Division
APO 633, New York, N. Y.

California Highways and Public Works, Sacramento, California

GENTLEMEN: I recently reviewed a copy of your excellent publication, *California Highways and Public Works*. This publication was found at one of our air depots in France.

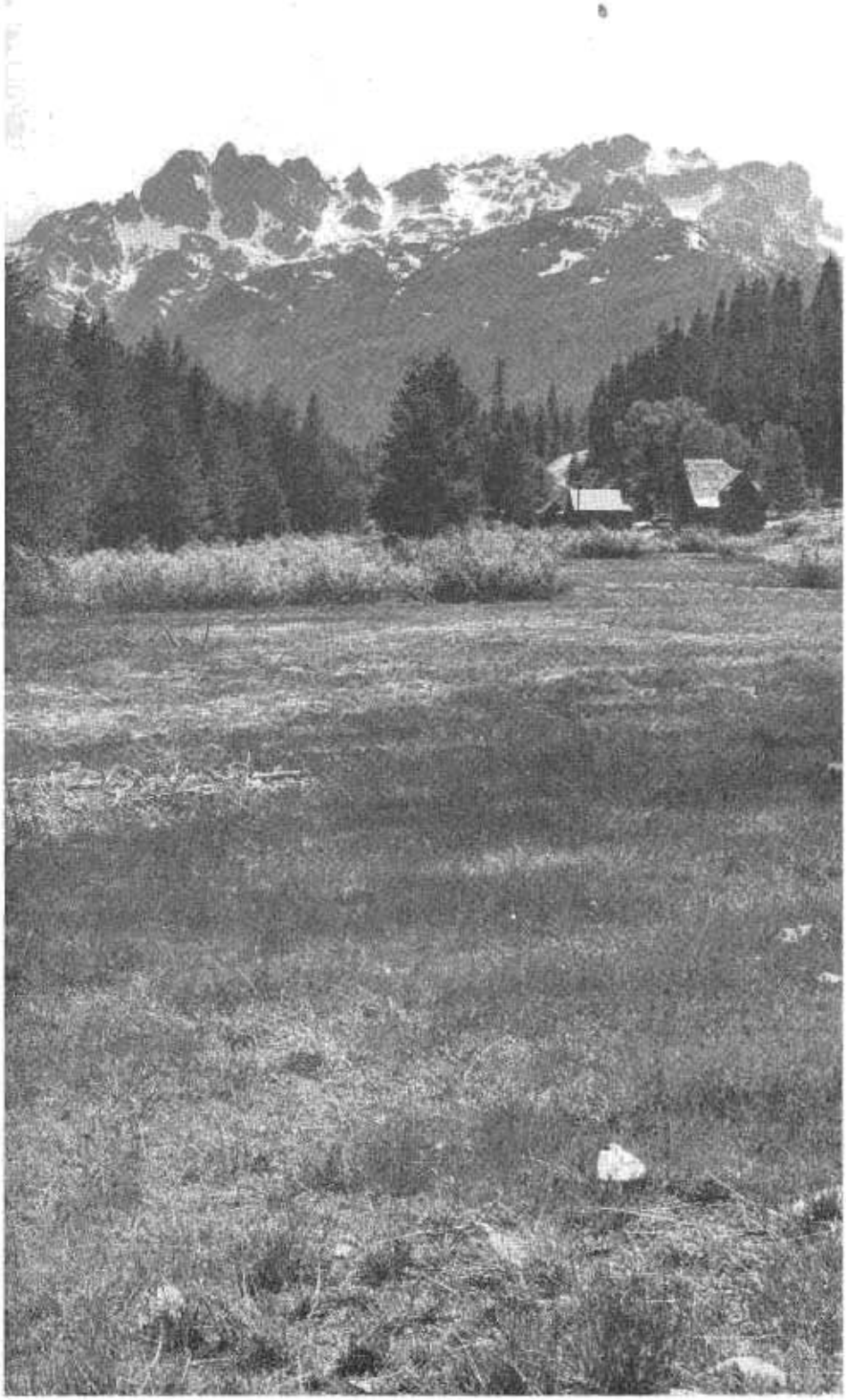
If possible, I would like to be placed on the distribution list for this publication.

Very truly yours,

E. L. NEWMAN
Chief Safety Engineer

SIERRA BUTTES

This picture was taken a few miles east of Sierra City from State Sign Route 49 in Sierra County



GOODWIN J. KNIGHT
Governor of California

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R. S. J. PIANEZZI . . . . . Assistant Chief
E. M. MacDONALD . . . . . Assistant Chief

District IV

B. W. BOOKER . . . Assistant State Highway Engineer

District VII

P. O. HARDING . . Assistant State Highway Engineer

District Engineers

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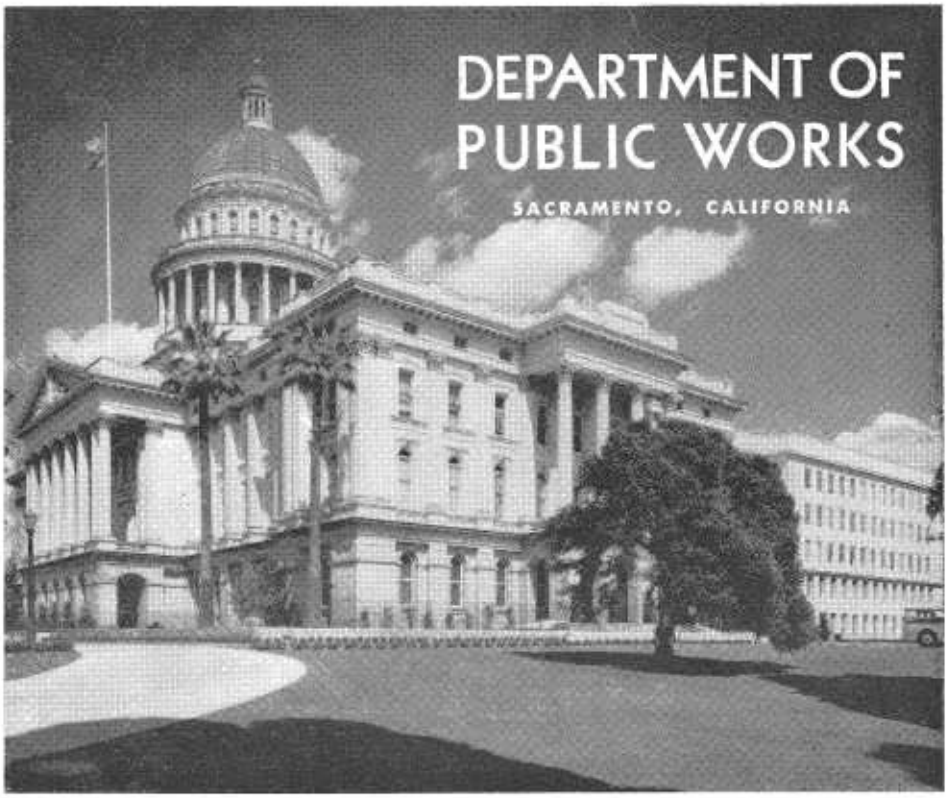

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printed in CALIFORNIA STATE PRINTING OFFICE 19714 6-55 30,400


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REPEAT AFTER ME:
I will be careful...
with matches
with smokes
with campfires
with any fire
Remember–Only You Can
PREVENT FOREST FIRES!