CALIFORNIA
HIGHWAYS AND PUBLIC WORKS

MARCH-APRIL
1957

California Highways and Public Works

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

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Vol. 36 March-April Nos. 3-4

Public Works Building
Twelfth and N Streets
Sacramento

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Aerial view of University Avenue Interchange in Berkeley. Looking south is Bay Bridge distribution structure. *Photo by Merritt R. Nickerson, Chief, Photographic Section, Department of Public Works.*

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Aerial of Lafayette Bypass in Contra Costa County. *Photo by M. R. Nickerson, Chief, Photographic Section, Department of Public Works.*

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P. O. Box 1499
Sacramento, California

Freeways in District IV

Ten Years of Modern Highway Construction

By B. W. BOOKER,
Assistant State Highway Engineer

THE YEAR 1957 marks the conclusion of the first 10 years of freeway construction in the San Francisco Bay area. In singular coincidence, the closing of the decade witnesses the virtual completion of what might be considered the initial phase of freeway development in the nine counties of District IV. Approach to the metropolitan areas from the north, east and south will soon be served by four continuous freeway systems engineered to the peak of modern highway standards. Major portions of four other freeways will also be in service.

During 1956 there were 33 miles of freeway completed in District IV, making a total of 200 freeway miles now in service. Another 70 miles are presently under construction and by the end of 1957, it is expected that construction of another 25 miles will be under way. By the end of 1957 a continuous part of the Bayshore Freeway will be in service from the San Francisco-Oakland Bay Bridge to Palo Alto, a distance of 35 miles. On the other side of the bay, the last 0.9 mile of the Eastshore Freeway will be under construction in Oakland.

Continuous Freeway

When completed, a continuous freeway will be in service from San Jose through Oakland to the El Cerrito Overhead in Albany, a distance of approximately 44 miles, and another 13 miles is now under construction northerly to the new Carquinez Bridge. By the end of the year, a continuous freeway will also be in use from the Eastshore Freeway just north of San Lorenzo and Hayward to Tracy, a distance of 40 miles. Also being completed this year is the last of the major freeway projects required to provide a continuous freeway ride from the Golden Gate Bridge to Santa Rosa, a distance of 46 miles. Only the balance of the Greenbrae Interchange, a short length at the north city limits of San Rafael and a short section through Novato remain to be constructed in this entire stretch.

B. W. BOOKER

The total expenditures on freeways in District IV to date is approximately $465,000,000. Our construction and right-of-way programs totaled $19,000,000 in 1950, $65,000,000 in 1955, and will have increased to $75,000,000 in 1957-58, all of which is an indication of the accelerating tempo of freeway completions expected in the future.

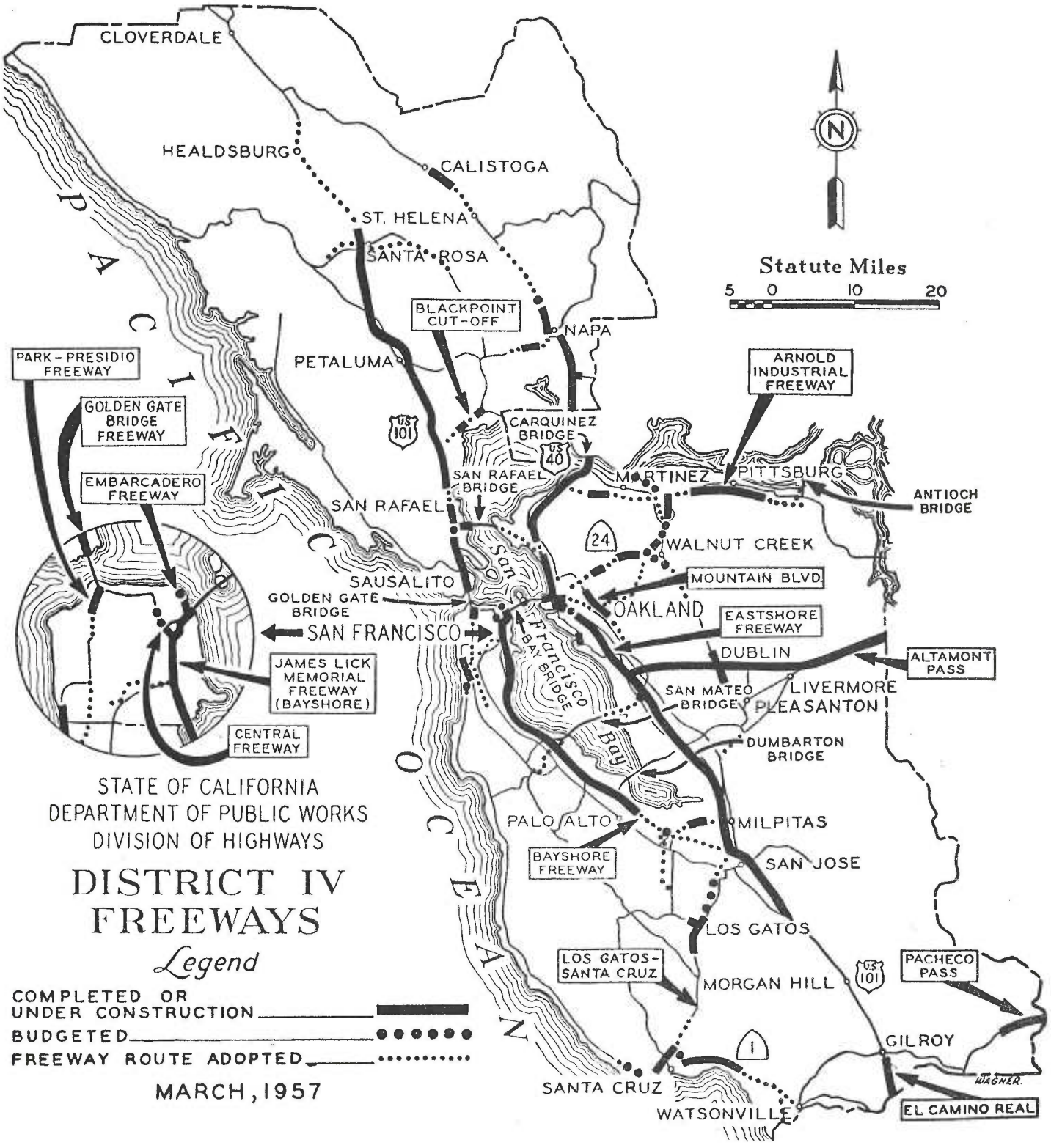
Since the opening of the first segment of the Bayshore Freeway in 1947, Burlingame Avenue to Peninsula Avenue in San Mateo County, short sections have been constructed as rapidly as funds have become available. The sequence was established by economic controls and the priority due to severity of deficiency. As the decade developed the planned pattern of continuity appeared and the completed sections now have merged into full freeway arterials.

Part of Past

This is now a part of the past. The problems of engineering and those of economic impact upon the areas affected by the physical presence of the right of way were relatively simple. With the exception of the Eastshore Freeway old alignments were largely used and the population of the involved areas had long since accepted the fact that highways are a public service and if traffic strangulation was to be avoided they had to be expanded and improved.

Most of the Eastshore Freeway, south of Oakland to San Jose, has been developed on new alignment through comparatively undeveloped lands. The many thousands of new homes lining each side of this freeway are a mute testimony of the value of high standard traffic service, not only to the alleviation of congested existing arterials, but to the development of areas farther and farther removed from metropolitan centers.

The story of the coming decade will be quite different. The planning of the system of freeways in the Metropolitan Bay area has been done in cooperation with the county and municipal authorities. From the outset the system has been based on the knowledge that but one freeway extending in each of the several direc-



tions from the central metropolitan cores would not be sufficient to handle the potentials of this great area. It has been well realized that other freeways offering similar directional movement but providing traffic service to and through many local areas of congestion somewhat removed from initial freeway developments will be required in the future. Accordingly, facilities such as the MacArthur Freeway and Junipero Serra Freeway have been foreseen in addition to the Bayshore and Eastshore Freeways.

With a present population of the Bay area exceeding 3,000,000 and an estimated increase to double that by

1975, it is not realistic to consider that freeways alone will be the answer. However, authorities in transportation all agree, that whatever form of additional transportation may be required in the future, the need for freedom of individual movement dictates that the system of freeways presently being planned and constructed must be provided and cannot be supplanted.

This is stated in several places in the Bay Area Rapid Transit Commission Report, and is included in their diagrams and bar charts illustrating the modes of travel. Quoted from page 37 of that report is the following:

First Requirement: A Regional Freeway Network.

"The existence of the very large group for whom only the private motor vehicle provides effective transportation dictates a strong highway system as the very first requirement in satisfying over-all transportation demand. Specifically, we consider that the known size of this group makes essential, as the first inter-urban transportation requirement, a regional arterial highway system of freeway-quality construction. Programming of such regional freeways in the Bay area is already well advanced, and the plans to carry these to completion must be strongly supported."

A large portion of the planned future construction will be essentially a paralleling of present freeway facilities, but farther removed from the bay. Entirely new routes through existing developed areas must be established to relieve the inevitable highway saturation which follows the growth of population and the resulting addition of vehicles. These new routes involve properties, the owners of which have heretofore had little reason to expect involvement in the highway problem. The intensity of the conflict of interests is exceeded only by the necessity of solution.

Public Opinion Important

Those responsible for highway progress are now and will continue to be faced with the necessity of extensive public explanation with respect to location of new facilities and the time table of their construction. The limitations of space make mandatory that additional property must be acquired for freeway development. The opposition of those whose personal interests are affected can be expected in regard to any proposed location. It is impossible to avoid all existing developments; however, there will be improvement in this respect in the future as advantages from extensive advance planning activities are realized.

Geography of the Bay area has established a core of industry and commerce in San Francisco and in the cities of the East Bay. The transportation pattern thus becomes one of convergence toward these areas. As the system grows it reaches farther and farther into the far corners of the area joining the similarly expanding facilities of the adjacent districts and affording the benefits derived therefrom. Other than safety and freedom of congestion on local roads and streets there are, of course, many more benefits to the motorist and general citizenry which cannot be easily evaluated though none the less real. Among these are stabilization or enhancement of property values, increasing the radius of area development from the inner core, increased access to recreational and cultural facilities, reduction in strain of driving, more expeditious movement of nonmotorists through use of freeways by express busses, lessening of costs of transportation for commodities. The monetary value of these benefits are huge as they are vital to the financial health and progress of the region. It should be borne in mind that conversely to the benefits occurring from good transportation if there were no freeways there would be the losses that the region would suffer without having them. In the words of former Commissioner of Public Roads, Thomas MacDonald, "We pay for good roads whether we have them or not; and we pay more if we don't have them than if we do."

It is with considerable satisfaction that the following more detailed review of progress and future plans for the development of the Bay area highway system is presented.

BAY BRIDGE TO SOUTH CITY LIMITS SAN FRANCISCO

Except for a short section southerly of Third Street which will be completed this summer as a part of the "open water" fill relocation south of the city limits, this six- and eight-lane freeway within San Francisco is now completed and opened to traffic. During the past year roadside development, ground cover, and erosion control projects amounting to approximately $250,000 have been completed between Third Street and 17th Street.

The 110,000 vehicle users traversing this scenic skyway daily are being afforded considerable relief from congestion and a savings in time and money. Considerably greater safety is also afforded these vast numbers of motorists all of whom were previously required to traverse congested city streets with attendant delay and high accident rates.

The construction cost of this portion of the freeway has been $20,300,000, exclusive of the open water fill project.

SOUTH CITY LIMITS SAN FRANCISCO TO PALO ALTO

At the end of 1957 or early 1958 this part of the freeway will be virtually complete. At that time there will be a continuous initial six-lane, future eight-lane facility for 35 miles southerly to Palo Alto. Completion of this entire stretch is now dependent on the finishing of four projects now under construction.

Underway at this time and nearing completion is the last contract on the open water project between Third Street in San Francisco, across an arm of the bay between Candlestick Point and Sierra Point, and tying into the completed freeway near Butler Road. This project, consisting of drainage and paving was awarded to L. C. Smith at a cost of $1,450,000. Two and two-tenths miles of this four-mile project are over open water resulting in a shortening of 0.4 mile over that traveled on the existing highway. Work is expected to be completed this summer allowing full use of this six- and eight-lane freeway resulting

LEFT—Looking northerly at Open Water Fill on Bayshore Freeway. Sierra Point in foreground and Candlestick Point ahead. Note north-bound off-ramp to existing highway in foreground. RIGHT—Bayshore Freeway construction at Sierra Point looking southerly. Note S. P. R. R. relocation. Tunnel right center eliminated.

in a time savings of as much as 20 minutes to the many vehicle users who travel this route during peak hour periods. Previous work on this project was performed under six contracts including grading along with drainage structures and construction of experimental embankments to displace the highly fluid bay mud which reaches a maximum depth of 70 feet in this area.

From the south end of the open water project at South San Francisco to Bransten Road, just north of Redwood City, the freeway has been completed and in operation for some time. This work started in 1946 and was finished with the completion of the southernmost contract in 1955.

The remaining eight miles from Bransten Road to the Santa Clara county line was broken into four projects. The first of these projects was the Willow Road interchange which was finished last year by L. C. Smith as the contractor at a cost of approximately $850,000. This project had been selected for first construction to eliminate a very congested intersection.

The second and third contracts covered the balance of the work between 0.4 mile north of Marsh Road and the Santa Clara county line. Chas. L. Harney, Inc., was low bidder on both contracts. Their combined cost is $3,770,000 and they are scheduled for completion this year.

The last of the four contracts to be finished will be the 3.8 miles relocation between Bransten Road and the junction with the above contracts at 0.4 mile north of Marsh Road. This $5,550,000 contract was advertised in October, 1956, and was awarded as a joint venture to Piombo Const. Co., M & K Corp., and Connoly and Pac. Co. The expected date of completion is in the early spring of 1958.

EMBARCADERO FREEWAY

Construction was started on the first portion of this multilane elevated freeway by MacDonald, Young and Nelson & Morrison, Knudsen Company in May of 1955. This 0.9-mile-long single and double-decked project is estimated to cost $5,700,000. The second contract providing for a two-lane single-level structure for Oakland-bound traffic and the extension of the freeway to Howard Street with a four- and six-lane two-level structure was started in March of 1956. The contractor on this 1.2-mile section is Charles L. Harney, Inc., and it is estimated that the cost will be approximately $2,000,000. When completed this spring, these two units will serve as a connection between the Skyway and Bay Bridge to Mission Street at Main and Beale Streets in San Francisco.

Also under construction at this time is the third link in this freeway system extending it 1.2 miles from Howard Street, past the Ferry Building to Broadway and Sansome Streets. Completion of this $7,800,000 contract is not expected until sometime in the spring of 1959. Charles L. Harney,

Inc., is also the contractor on this two-level freeway.

Studies for the future extension of this freeway are in the early stages.

PALO ALTO TO SAN JOSE

Included in the 1957-58 construction program is a 1.1 miles long section of freeway at Moffett Field north of Mountain View between Stevens Creek and Ellis Street. Plans call for the construction of four lanes of the ultimate eight-lane freeway and construction of a full four-quadrant cloverleaf with bus stop facilities at Moffett Boulevard. Cost of this project is estimated at $1,100,000 and work should begin early this year. Construction of this project was expedited in order to eliminate a very congested intersection at which accidents were becoming increasingly numerous and severe.

From Palo Alto to Rosa Street north of San Jose, design plans are well advanced and it is anticipated that further improvements of this important freeway will be continued as rapidly as availability of funds and priority of other worthwhile projects will permit.

SAN JOSE TO SAN BENITO COUNTY LINE

A project which eliminates the last of the three-lane portion of this route by providing an initial four-lane, future six-lane freeway from the present junction of Sign Route 17 to

Embarcadero Freeway construction in progress on single and double decked structures. West approach to the Bay Bridge at bottom. Main and Beale Street connections in center.

Santa Clara Street is nearly complete. This project is 1.6 miles long and will cost $1,800,000. It is anticipated that work will be finished in the late spring of this year. This contract is being performed by Lew Jones and Leo F. Piazza. An interchange has been completed at McKee Road eliminating another source of accidents and a new underpass beneath the Western Pacific Railroad is nearing completion.

South of Santa Clara Street to Ford Road, an expressway has been in operation since 1947. Eventually it is expected that intersections at grade will be replaced by interchanges.

From Ford Road to south of Gilroy, the last of the three-lane width through this area was eliminated by expanding to a four-lane divided section. Work on the last portion of this expansion, from Ford Road to Llagas Creek, was performed by Carl N. Swenson, at a cost of $515,700 and was completed in March of 1956.

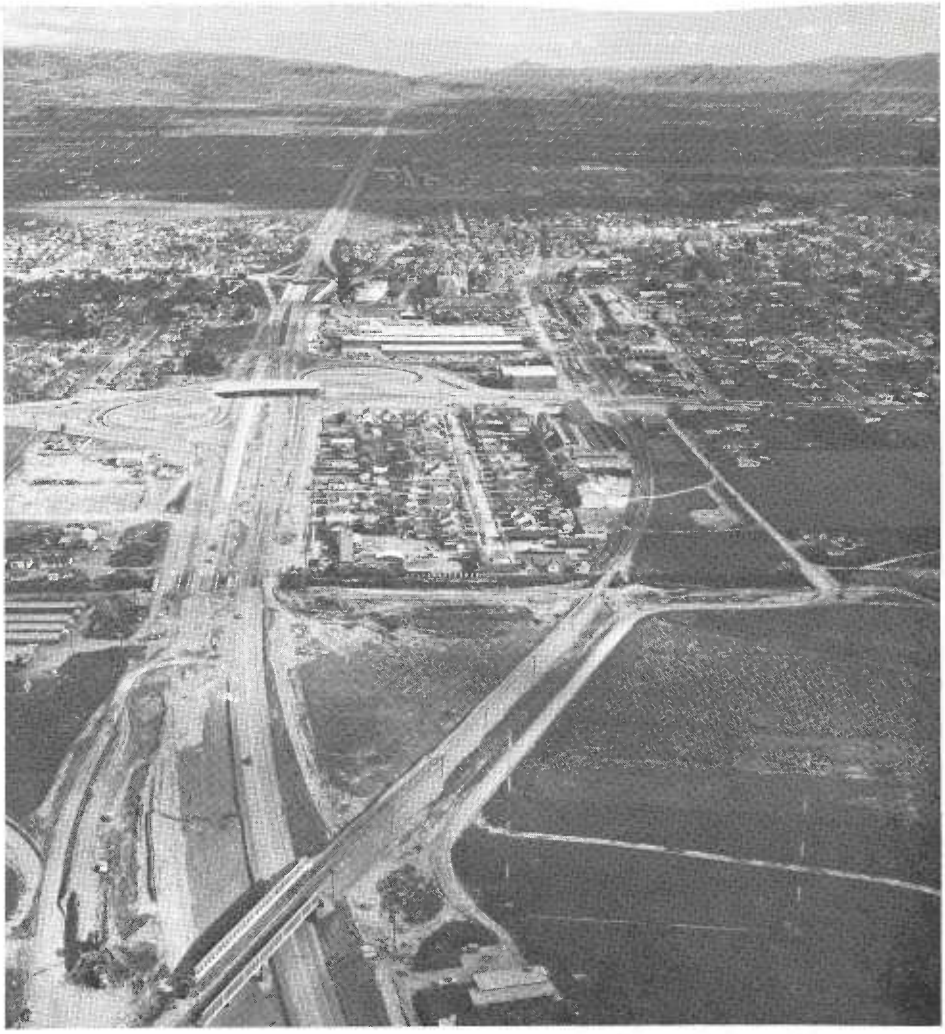
South of Gilroy to the San Benito county line, 5.8 miles of four-lane highway (future six-lane freeway), costing $935,000, have been in operation since early 1951.

SAN FRANCISCO—CENTRAL FREEWAY

The first portion of the Central Freeway, locally called Skyway, extending from the James Lick Memorial Freeway along 13th Street to South Van Ness Avenue and Mission Streets, was completed and opened to traffic in 1955.

The second section of this freeway extending from South Van Ness Avenue to Turk Street is included in the 1957-58 construction program and it is expected that this project will be under construction early this summer. This one-mile-long section of the skyway will be a two-level elevated viaduct with the three southbound lanes carried over the three northbound lanes and both directions of travel will be elevated over the city streets, leaving them clear to handle the cross traffic movements. The cost is estimated at $7,800,000.

Planning toward the eventual extension of this freeway is in the preliminary stage.



UPPER—US 101 Bypass east of San Jose looking southerly. Completed McKee Road interchange in center. End of project at Santa Clara Street diamond interchange in background. LOWER—US 101 Bypass-McKee Road interchange looking north. Western Pacific Railroad underpass at top center.

SOUTHERN FREEWAY

With virtual completion of the James Lick Memorial Freeway (Bayshore) in San Francisco, and as the most needed units of the Embarcadero and Central Freeways are now in the design and construction stages, planning has been directed to other near future segments of the much needed integrated San Francisco system.

Planning studies for an eight-lane freeway following generally along Alemany Boulevard between Junipero Serra Boulevard, near the south city limits of San Francisco, and the James Lick Memorial Freeway (Bayshore) are complete. Numerous public informational meetings as well as a public hearing before the Highway Commission were held and on June 21, 1956, this portion of the route was adopted and declared a freeway. Design studies are being expedited and an indication of near-future construction is the extensive purchasing of rights of way which to date are approximately 35 percent complete. Considerable funds have been allocated for the continued purchasing of rights of way in the 1957-58 fiscal program. The construction cost of this 4.3-mile length is estimatd at $17,000,000.

The City of San Francisco is well advanced with their plans for the extension of this freeway to a junction with the proposed Southern Crossing and Embarcadero Freeway in the vicinity of Third and Army Streets.

GOLDEN GATE FREEWAY

Plans are nearing completion on a $7,000,000 project covering 1.3 miles between Lyon Street and the Park Presidio Freeway at the southerly end of the Golden Gate Bridge. Work will consist of adding two lanes to make a total of eight lanes as well as revising the ramp connections at the interchange.

WESTERN FREEWAY

Studies for the Western Freeway are still underway and alternate locations are being investigated and compared.

SKYLINE BOULEVARD, SAN MATEO-SAN FRANCISCO COUNTIES

In December, 1954, a 2.3-mile portion of expressway on Skyline Boulevard between Edgemar Road and Alemany Boulevard was placed in service.

In July, 1955, continuation of the expressway northerly of Alemany Boulevard 1.3 miles to the south city limits of San Francisco was started under a contract awarded to Charles L. Harney, Inc. This project cost approximately $350,000. Concurrently, also under construction by Charles L. Harney for the City of San Francisco was the 1.0-mile portion north of the city limits to Lake Merced Boulevard, also as an expressway and costing $350,000. Both projects were opened to traffic on March 15, 1956.

These Skyline Boulevard projects provide another major connection to and within San Francisco from the rapidly developing residential areas in San Mateo County along the Skyline and coastal routes.

Additional all weather usage of this facility is expected after the construction of the link between Edgemar on the coast route (Sign Route 1) and Skyline Boulevard at Edgemar Road. This 2.2-mile link, to be constructed at an estimated cost of $1,500,000 includes grading, surfacing and structures to provide a four-lane expressway. This project replaces the two-lane coastal road now serving north of Edgemar but which has been subjected to numerous closures due to wet weather slides. Maintenance problems encountered have been difficult and costly. Under the present accelerated construction program this section was included in the 1957-58 Budget and advertised for bids on March 25, 1957.

JUNIPERO SERRA FREEWAY

In July, 1956, Joint Highway District 10 was dissolved and the Legislature designated the constructed portion of this route as State Highway Route 237. The Highway Commission adopted the existing facility from Route 56 in Daly City to Crystal Springs Road in San Bruno, and declared it to be a freeway. Subsequently, under a contract now underway, a portion of this four-lane divided expressway has been repaved and the major intersection at Hickey Boulevard is being signalized and channelized. Lowrie Paving Company is the contractor and completion is expected by May, 1957. It is anticipated that this route will be developed to full freeway standards in the future.

In February, 1957, the Legislature designated Route 239 as being from a point on Route 56 near Daly City to Route 2 near San Jose. Planning studies are nearly complete, meetings will be held with local authorities and it is expected that by early summer of this year, meetings informing the public of the various routes studied will be held. Later, after the public has had opportunity to consider the studies and to voice opinions, public hearings are anticipated. Until such time, the location for this additional freeway, serving San Francisco and the Peninsula to the south, will not be determined.

SAN MATEO COUNTY—19TH AVENUE FREEWAY

Planning studies have been completed for the development of an initial four-lane, future six-lane, freeway as Route 105 extending from Sign Route 5 (Skyline Boulevard), west of San Mateo, to the west end of the San Mateo Bridge across San Francisco Bay, a total distance of 7.2 miles. (For the past several months the public has been considering the proposed future development, and the State Highway Commission at its March meeting adopted a routing and declared it a freeway.

SANTA CLARA COUNTY—SIGN ROUTE 9 FREEWAY

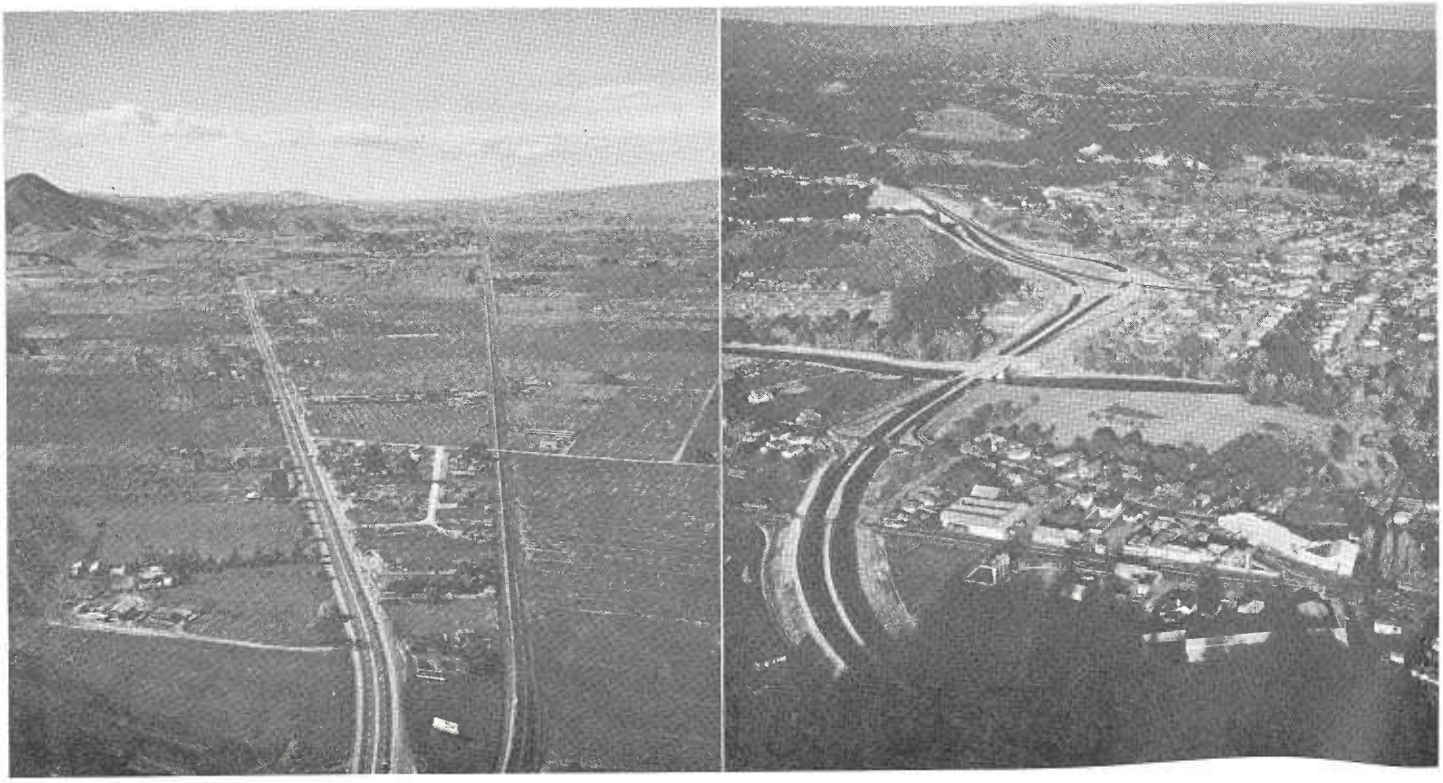
On October 18, 1956, the Highway Commission adopted the routing for a future freeway location for Sign Route 9 from Bayshore Freeway north of Moffett Field, generally following Stevens Creek to an existing Sign Route 9 location north of Azule. Design studies for this future facility are now underway.

LEFT—Sign Route 17. Completed first section of Los Gatos Bypass looking northeasterly. Routing of future extension is shown by grading at upper right. RIGHT—Sign Route 17. General view of Los Gatos Bypass showing extensive reconstruction of Los Gatos Creek. Main Street Bridge in center, Saratoga Avenue at top.

ALVISO FREEWAY

On Sign Route 9 between Lawrence Station Road east of Bayshore Freeway and 0.2 mile east of the San Jose-Alviso Road, a bypass of the town of Alviso is now under construction. This bypass will be the initial construction of two lanes of a future freeway on new alignment and above flood and tidewater level. The project is through a section of the Santa Clara Valley, subject to continuous area subsidence resulting in continuous maintenance problems during wet weather. This contract will approxi-

LEFT—US 101 completed major interim project between Llagas Creek and Morgan Hill, former three-lane facility widened to four-lane divided. RIGHT—Newly completed Sign Route 17 entrance into Santa Cruz looking north. San Lorenzo River in center and Ocean Street interchange beyond.



mate $1,000,000 and is expected to be complete in the fall of this year.

SAN JOSE-LOS GATOS FREEWAY

Further freeway development of this route is to be continued this year. Construction on the 8.8-mile relocation project extending between the junction of the Saratoga-Los Gatos Highway in Los Gatos and Bascom Avenue in San Jose will be started this spring. The relocation of this four-lane, future six-lane freeway is expectd to cost approximately $500,000. Alignment of this section lies approximately midway between the Santa Clara-Los Gatos Road and the San Jose-Los Gatos Road (existing Sign Route 17) and is located along the easterly bank of Los Gatos Creek between Los Gatos and Campbell, where the freeway crosses Los Gatos Creek and proceeds northerly to the intersection with Bascom Avenue in San Jose. A total of 20 structures will be required on this contract, including two crossings of Los Gatos Creek, six interchanges, four grade separations, and one railroad underpass. Design is well advanced for the future connection of this project with the Bayshore and Eastshore Freeways north of San Jose.

Congestion Eliminated

A source of serious congestion was eliminated with the opening to traffic last October of the 2.1-mile-long Los Gatos business district bypass. This four-lane freeway, replacing the existing three-lane city street, was constructed by L. C. Smith at a cost of approximately $1,780,000. Completion of this facility removes most of the large volume of through traffic from the city street system, providing a more orderly functioning of the local traffic pattern with attendant relief to the community.

An 0.6-mile connection between the freeway easterly to a junction with San Jose Avenue at Charles Street is expected to be completed early this spring. The contractor on this portion of the work is Lew Jones Construction Company and Leo F. Piazza Paving Company. The cost of this connection will be approximately $270,000 as a cooperative project with the City of Los Gatos participating to the extent of $80,000.

In Santa Cruz a new freeway entrance to the city has been provided from existing Sign Route 17 at the north city limits to Mission Street. The completion of this project last December provides a much needed traffic distribution facility in the Santa Cruz recreational area. This project cost approximately $1,100,000 and is 1.2 miles long. The contractor was the Granite Construction Company.

Design is now underway for the future freeway development on Sign Route 17 from Santa Cruz to Los Gatos. Also to be constructed in the City of Santa Cruz will be a new 2.1-mile-long facility connecting the Rob Roy-Santa Cruz Freeway with the recently completed freeway extending from Sign Route 17 to Mission Street. The limits of this $1,830,000 project are 0.3 mile east of Morrissey Avenue and 0.6 mile north of the junction of Sign Routes 1 and 17. This facility will be initially four lanes with provision made for the future addition of two lanes. Funds are included in the 1957-58 construction program for this project. When completed, a circumferential freeway around Santa Cruz will provide area-wide distribution and a considerable lessening of the choking congestion of city streets during the recreation months.

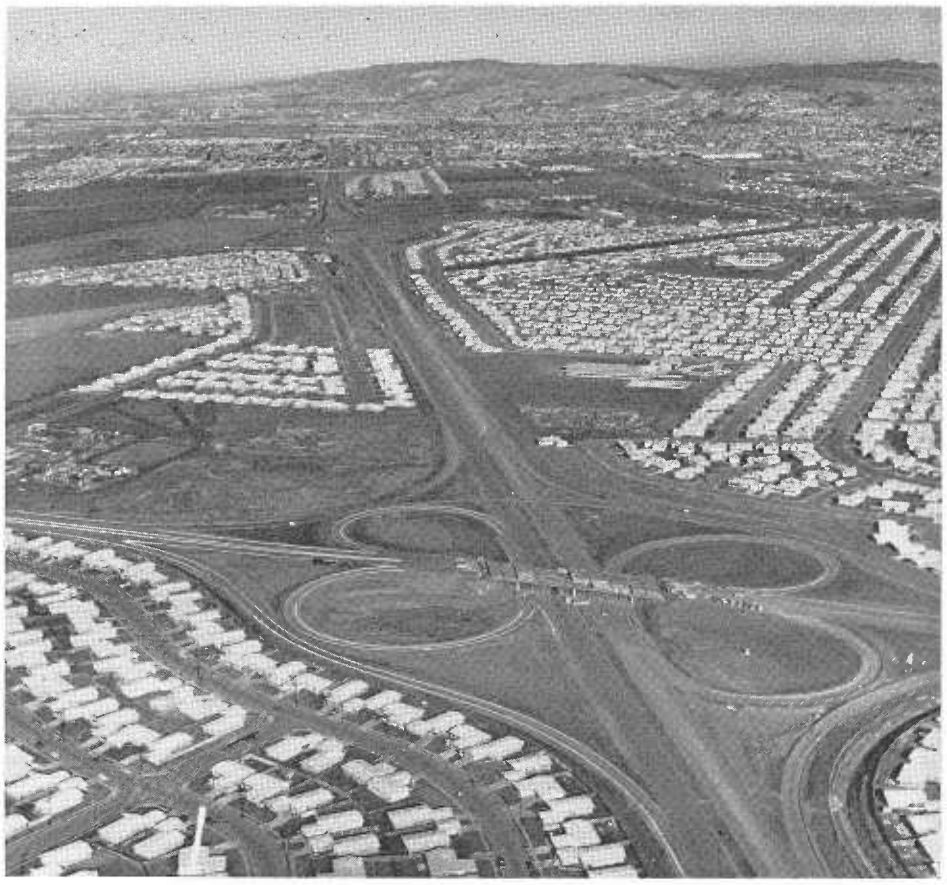
EASTSHORE FREEWAY AND US 40, SAN JOSE TO VALLEJO

San Jose to Oakland

Completion of the Eastshore Freeway between San Jose and Oakland can now be looked for in the near future. Construction is now underway on the last two contracts needed to provide 38 miles of continuous freeway for this heavily traveled route.

The first of these two projects scheduled for completion this summer is the 5.8-mile-long project extending from Beard Road northerly to Jackson Street in Hayward at a cost of

Eastshore Freeway construction between Beard Road and Jackson Street in Hayward. Note desirability of locating residential areas near ready access and also result of advance planning.



$4,800,000. The contractors on this initial four-lane, ultimate six-lane, freeway are Gordon H. Ball and Ball & Simpson. Connections for local traffic will be provided for by means of interchanges at Alvarado-Niles Road, Whipple and Alquire Roads, and Tennyson Road and at the ends of the project.

Gordon H. Ball and Ball & Simpson are also the contractors on the second project completing the gap from Warm Springs Junction to Beard Road, a distance of 9.9 miles. Work was started last winter on this $6,900,000 contract and is expected to be completed by summer of next year. Construction will be based on the need for four lanes now and provision is made for the addition of two more lanes when needed in the future.

The advantage of long-range freeway planning for the future has been demonstrated this last year with the addition of two lanes to the existing four-lane portion of the Eastshore Freeway between Route 228 and High Street in Oakland. Most effective use was made of funds available in earlier years by extending four-lane freeway construction farther south resulting in considerably earlier traffic service to this area. Provision was made for future development in the 36-foot-wide median and very little of the original construction was disrupted during the widening. Fredrickson and Watson were the contractors on this $2,000,000 job finished last fall.

The additional lanes are now required to handle the increased flow of traffic resulting from the completion in September, 1956, of the four-lane freeway connection tying US 50 and Foothill Boulevard into the Eastshore Freeway at Lewelling Boulevard. This 2.9-mile construction was performed by Ball & Simpson, Erickson, Phillips and Weisberg. The construction costs amounted to approximately $2,900,000.

Through Oakland to El Cerrito Overhead

The extension of the Eastshore Freeway through the City of Oakland is being continued with the inclusion in the 1957-58 construction program of $6,730,000 for grading, paving, and

Eastshore Freeway along Cypress Street in Oakland looking south. Distribution structure in foreground. This and the Embarcadero Freeway in San Francisco are the first double decked freeway structures in California.

structures between the present northerly end of the freeway at Fallon Street in Oakland and the existing overhead structure at Market Street in Oakland. The length of this elevated eight-lane freeway is approximately 0.9 miles and will be under construction this spring. Completion of this contract will give full freeway service through the City of Oakland from San Jose to the El Cerrito Overhead. Portions of the work were done under a separate contract that included constructing a portion of the fill and the building of the on and off-ramps. These ramps were used in the interim to pass the through highway traffic over the north approach to the Posey Tube connecting Oakland and Alameda. Construction of these ramps greatly reduced the conflict between both of these heavily traveled routes.

North of the existing overhead structure at Market Street to the distribution structure at the east approach to the Bay Bridge, there is now under contract two projects which will result in an eight-lane elevated double-decked freeway structure. Opposing traffic will travel on separate levels relieving the existing city streets of severe congestion due to the great volumes of traffic within these areas. Both of these contracts are being performed by Grove, Shepard, Wilson and Kruge of California, Inc., at an estimated cost of $9,000,000. Completion of work on both contracts is expected by early summer of 1957.

Faster service during peak hours has been obtained at the toll plaza on the east approach to the Bay Bridge as a result of the increased number of toll booths. Cost of this construction, amounting to $2,200,000, was financed by toll bridge funds and included widening and surfacing the toll plaza area and construction of new toll collection booths. Construction is expected to be completed soon and on-side toll collections for both directions

of traffic are expected to facilitate traffic flow.

North of the distribution structure to just south of the El Cerrito Overhead there is now in service a full eight-lane freeway with interchanges at Powell Street, Ashby Avenue, University Avenue, and Gilman Street. The last portion of this freeway was completed in November of 1956 and extended 1.9 miles from south of University Avenue to the El Cerrito Overhead. One interesting phase of the work on this section included raising 330 feet of an existing structure at University Avenue, east of the freeway, to meet new grade requirements and adding 417 feet of new structures to form a portion of the partial cloverleaf now open to traffic. Work was done on this $2,250,000 contract by Stolte, Inc., and Gallagher & Burk, Inc.

El Cerrito Overhead to Vallejo

Design for the extension of the Eastshore Freeway from its present terminus south of the El Cerrito Overhead to south of Jefferson Avenue in Richmond is completed. This 1.8-mile-long portion of the freeway is expected to cost $6,000,000 for grading, paving and structures. This is the only gap in the continuous freeway from south of San Jose to Vallejo. Highway Commission consideration of financing is anticipated as soon as funds are available.

The 4.8 miles of freeway on new alignment from Jefferson Avenue in Richmond to Hilltop Drive north of Rollingwood has now been completed, and opened to traffic. Fredrickson & Watson Construction Company and M & K Corporation were the contractors on this project. Present use of this completed unit permits US 40 traffic to bypass a portion of the formerly heavily congested section of San Pablo Avenue in Richmond between Jefferson Avenue and Roosevelt Avenue. US 40 traffic is directed off the freeway at San Pablo Avenue and Roosevelt while local traffic is permitted to stay on the freeway to its junction with County Road 20. Full use of this $5,400,000 project to through traffic will not be made until the next section of freeway is open to north of Hercules.

On US 40

Work is proceeding on the next 4.9-mile section of freeway extending from south of Hilltop Drive to 0.8 mile north of Hercules. Contractors for this $7,400,000 project are McCammon-Wunderlich and Wunderlich Contracting Company. Work is estimated to be about 50 percent complete with an estimated date for completion by the summer of 1958. Approximately 5,300,000 cubic yards of roadway excavation are involved in this job.

North of the Arnold Industrial Freeway, Sign Route 4, the improvement is being financed by special toll bridge bonds. These projects will result in an initial six-lane, future eight-lane, freeway. A new bridge is being constructed easterly of and parallel to the existing bridge across the Carquinez Strait. The new bridge will carry four lanes of northbound traffic. The existing bridge will carry three southbound lanes and can be widened in the future to four lanes when justified. Completion of all work and opening to traffic is expected in the fall of 1958.

LEFT—US 40 looking north from University Avenue in foreground to El Cerrito Overhead at upper right. RIGHT—US 40 looking south toward distribution structure. University Avenue interchange in foreground.

The toll financed projects in this district, including the bridge, a portion of which is in District X, are as follows:

Contracts underway Description	Estimated completion cost
(1) N of N.C.1, Hercules to Crockett Road—2.9 miles The project contains the largest highway cut in U. S.: 9,500,000 cubic yards; 3,000 feet long, 1,370 feet wide at top and 350 feet deep. Contractors—Ferry Bros., John M. Ferry, Peter L. Ferry, L. A. and R. S. Crow is moving 30,000 cubic yards per day on this job.	$7,591,453
(2) Crockett Interchange and approach ramps Contractors—Peter Kiewit Sons Co.	5,089,573
(3) Carquinez Bridge substructure Contractors—Mason & Hanger, Silas Mason Co., Inc., and F. S. Rolandi, Jr.	5,942,364
(4) Carquinez Bridge superstructure	9,972,565

In addition to the foregoing there are two contracts for mechanical, electrical and toll plaza equipment amounting to approximately $500,000. Prior to completion of the project an additional contract for the Crockett approach ramp connection and modification of the present bridge amounting to approximately $600,000 will be required.

OTHER FREEWAYS IN THE EAST BAY COUNTIES

US 50, Foothill Boulevard and MacArthur Freeway

The last link in the combined 51-mile freeway-expressway service between Tracy and Oakland via US 50 and the Eastshore Freeway is expected to be completed in the fall of this year.

This link is composed of one $4,600,000 project now under construction east of Castro Valley between 0.3 mile west of Center Street in Hayward and the existing end of the completed freeway 2.3 miles west of Dublin. This section of four lanes eliminates the last of the hazardous two- and three-lane road over Boehmer Hill and provision is made for future expansion to six lanes. Peter Kiewit Sons Company is doing the work.

Completed in 1956 was the 2.9-mile section tying US 50 and Foothill Boulevard into the Eastshore Freeway at Lewelling Boulevard as mentioned hereinbefore in conjunction with the Eastshore Freeway.

Planning for the future US 50 freeway from the distribution structure through Oakland to Castro Valley is now virtually complete. A location for 3.5 miles of the MacArthur Freeway along MacArthur Boulevard between the Distribution Structure and Park Boulevard has been previously adopted by the California Highway Commission and design is nearly completed and much of the right of way has been acquired. Recently a public hearing was held for the portion from Park Boulevard to Durant Avenue at the east city limits of Oakland. The Highway Commission is considering the routing of this facility. Between Durant Avenue and the new freeway through Castro Valley, public meetings are being held and route adoption proceedings are expected by early summer.

From Park Boulevard southerly, the proposed route lies southwesterly of MacArthur Boulevard and crosses MacArthur Boulevard just north of Mills College. From there, it runs along Mountain Boulevard and Foothill Boulevard to Castro Valley.

Mountain Boulevard

This improvement in the City of Oakland, when completed, will provide 5.6 miles of freeway from Sign Route 24 near Lake Temescal following the general route of Mountain Boulevard to a connection with the proposed MacArthur Freeway near Mills College.

Joint Highway District No. 26 originally formed to develop this route was dissolved in July of 1954 but the County of Alameda and the City of Oakland have agreed to continue to finance a total of $300,000 per year, matching a like contribution by the State, toward this continued

Looking easterly along connection from Eastshore Freeway to US 50 between San Lorenzo and Castro Valley. East 14th Street interchange in foreground. Foothill Boulevard interchange top center.

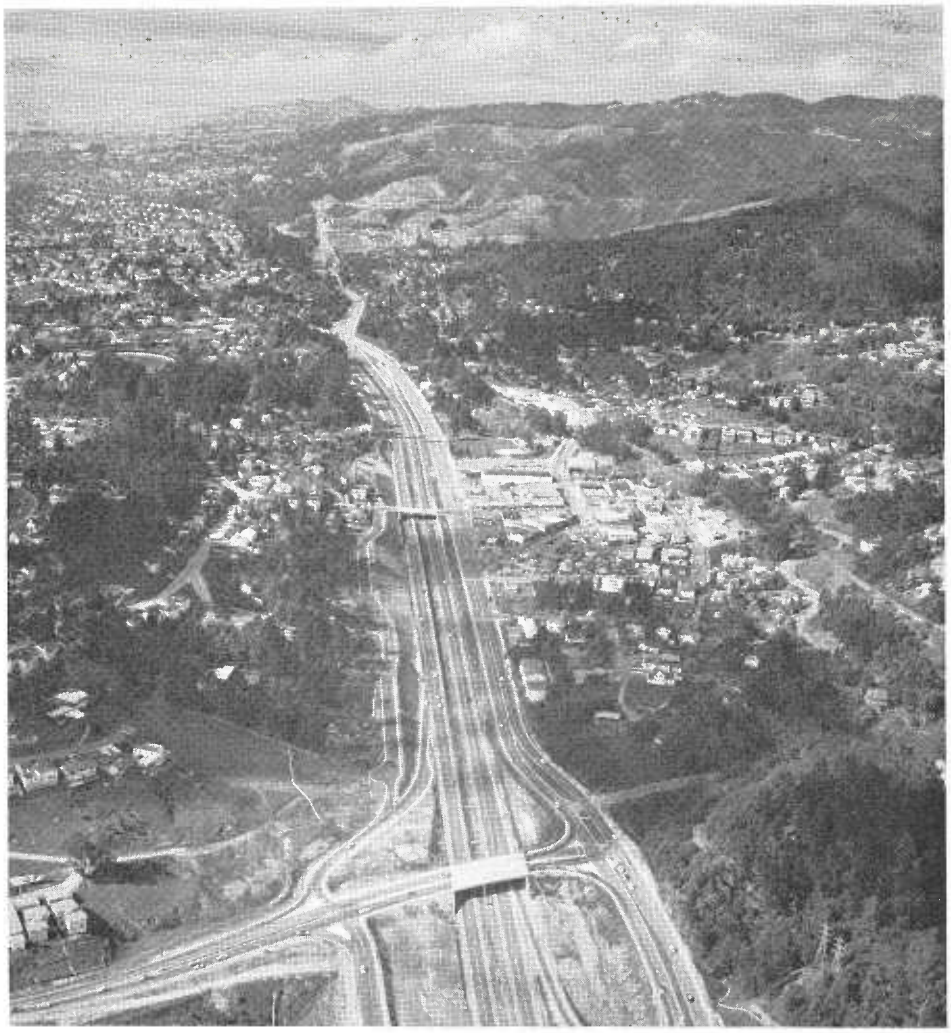
improvement of this freeway through the Oakland hills.

One project was finished this last year supplementing the previously completed 2.3-mile portion which extends from north of Broadway Terrace to south of the Moraga-Thornhill intersection. Charles L. Harney completed work on the second section (1.3 miles in length) between Thornhill Drive and Ascot Drive in October of last year (1956) at an estimated cost of $1,300,000. Construction was based on the present need for four lanes with provision made for six lanes in the future. Included in this contract is the Park Boulevard interchange which is designed as a future connection to the Shepherd Canyon Freeway through the Oakland hills into the Moraga Valley in Contra Costa County.

The 1.4-mile extension of the freeway from Park Boulevard to 0.6 mile south of Lincoln Avenue, also to be four lanes initially is now under contract at an estimated cost of $1,400,000 including grading, surfacing, one pedestrian undercrossing and seven retaining walls. The low bid on this contract was submitted by Gallagher and Burk.

The Lincoln Avenue separation was constructed under a separate contract for $130,000 by Stolte, Inc., and Gallagher and Burk, Inc., and was completed in December of 1955.

Continuation of this facility to the south is contemplated as rapidly as availability of state, county and city contributions will permit.



Looking westerly at completed portion of Mountain Boulevard Freeway. Park Boulevard interchange in foreground and La Salle Street overcrossing to Montclair in center. Broadway Terrace top center.

Sign Routes 9 and 21, Warm Springs to Benicia

Planning of this future Interstate Freeway is in various stages.

From Warm Springs to Mission San Jose, preliminary planning is being completed and public meetings are now underway to determine the location for this portion.

From Mission San Jose, for 4.9 miles, across Mission Pass to Sunol, the route was adopted and declared a freeway on January 18, 1956. Design studies are now well advanced.

From Sunol to US 50 at Dublin, planning studies are now in progress. From US 50 to the Contra Costa county line, a distance of 1.8 miles, the initial two lanes of a future freeway and an interchange at US 50 were constructed in 1955.

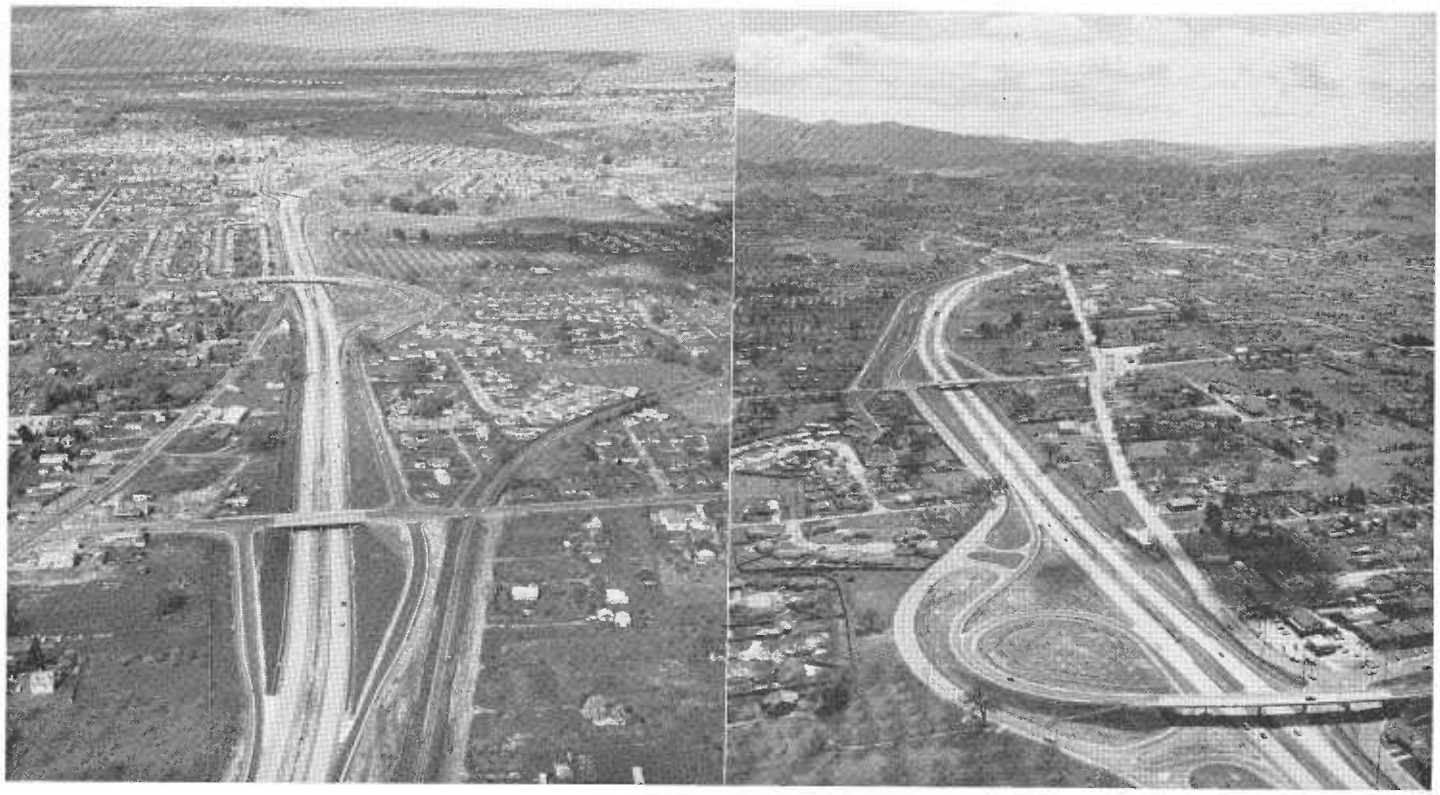
From the county line to just south of Danville, a distance of 7.4 miles, preliminary studies are completed and public meetings are anticipated within the next month or two.

Proceeding northerly from Danville to Walnut Creek, the route has been located easterly of and removed from the San Ramon Valley.

From Rudgear Road south of Walnut Creek to a junction with Sign Route 24 near Oakland Boulevard and thence to the recently completed freeway north of Walnut Creek the freeway will be under construction in 1957. This project will also provide a part of Sign Route 24 from Walnut Creek to the completed freeway east of Lafayette. Cost of the project is estimated at $8,800,000 for construction.

Northerly of Walnut Creek from Oakland Boulevard to 0.3 mile north of Monument, a $2,900,000 unit of the freeway was placed in service in January of this year. This 2.8-mile section was built by Stolte, Inc., and Gallagher & Burk, Inc. Construction was based on initial four lanes and provision made for the addition of two lanes when needed. Average daily traffic of 28,000 vehicles are now using the freeway, thus providing relief to the street intersections and properties along the old highway.

Preliminary studies have been completed and design is well advanced for



LEFT—State Sign Route 24, north of Walnut Creek, looking northerly toward monument. Geary Road in the foreground and Oak Park Boulevard interchange in center. RIGHT—Looking south on Sign Route 24 toward Walnut Creek from Oak Park Boulevard interchange. Old highway on right now serves as a local arterial.

the southern approaches to the Martinez-Benicia Bridge and the bridge itself. Construction of a portion of this freeway as a toll facility, the financing of which is in conjunction with the Carquinez Toll Bridge project, was authorized by the Legislature in 1952.

The Legislature authorized a toll facility from Arnold Industrial Freeway, south of Martinez, to a connection with State Highway Route 74 in Benicia. South of Arnold Industrial Freeway, the proposed facility will be financed from regular state highway funds. The route for this facility between the Monument north of Walnut Creek and the Solano county line was adopted by the Highway Commission in March of 1956.

This future freeway will cross Arnold Industrial Freeway a short distance easterly of the existing Pacheco Highway intersection and lies just east of the extensive Shell Oil Company development in Martinez. It will cross the strait via a new high level bridge immediately westerly of the existing Southern Pacific Railroad Bridge. This future route is a part of the recently increased Interstate Highway System.

Oakland-Walnut Creek Sign Route 24

Preliminary studies have been completed and public meetings are being held concerning the future development of a freeway from the Eastshore Freeway at Brush and Castro Streets in Oakland to the East Portal of the Broadway Tunnel.

Accelerated development through the northern half of Contra Costa County is continuing. In the past, congestion along the highway serving this area had been rapidly approaching a condition which could seriously affect the continuance of this rate of development. Material progress has been made toward alleviating this condition.

As an interim measure an additional lane between Orinda and the Broadway Tunnel was constructed in 1956. This lane enables slow moving vehicles to stay to the right over this sustained grade, thus permitting the normal two westbound lanes to serve faster traffic more safely and effectively.

In April, 1955, the Orinda Interchange was completed and this has resulted in the elimination of a serious bottleneck and accident site.

Lafayette Bypass

Design is nearly completed for the entire section from the tunnel to the project now under construction at Lafayette.

Elimination of the worst bottleneck on this stretch of highway is now underway with the construction of the 2.6-mile section of freeway, bypassing Lafayette. The project extends between west of Sunnybrook Drive and west of Pleasant Hill Road. Completion is scheduled for early summer of this year by the contractor, Gordon H. Ball, at a cost of $3,300,000. Realignment of this portion of the road will leave the present highway as a high standard, uncongested local arterial servicing the rapidly growing community of Lafayette.

Completion in December, 1956, of a two quadrant cloverleaf of the

Pleasant Hill Road interchange provided relief at another seriously congested intersection. This interchange serves as a connection between the state freeway and Pleasant Hill Road which is an important county expressway. In the future it will also be a connection to the Shepherd Canyon Freeway, Route 233 from Oakland. Work was performed by Stolte, Inc., and Gallagher & Burk, Inc., at a cost of $1,300,000.

Shepherd Canyon Freeway (Route 233)

Preliminary studies were completed in 1956 covering the location for this future freeway. On December 19, 1956, after various public meetings and a hearing before the Highway Commission, the last gap in the route was adopted and declared a freeway. This future facility will consist of initially four lanes, future six lanes, and starting at the Mountain Boulevard Freeway in Oakland, will traverse Shepherd Canyon and tunnel some 1,400 feet through the Oakland hills. It will span the Redwood Canyon in Contra Costa County and traverse the range of hills easterly thereof entering and crossing the Moraga Valley just north of the present town site. It traverses close to St. Mary's College and terminates at a junction with Sign Route 24 at Pleasant Hill Road.

Sign Routes 24 and 4—Monument to Antioch

Design is nearly completed for the future freeway now terminating at Monument to be extended through Concord to a connection with the Arnold Industrial Freeway northerly thereof. Two lanes of this future freeway were constructed in 1947 between Concord and Arnold Industrial. Further east, a four-lane expressway has been completed between Willow Pass Road and A Street in Antioch. Provisions have been made for the future development of this portion into a full freeway. Route adoption and freeway declaration has been accomplished as far east as Nerolly Road formerly referred to as Bridgehead Avenue which is directly south of the Antioch Bridge.

Recently adopted and declared to be a freeway was that portion of Sign Route 4 between the future freeway location at Nerolly Road to the Antioch Bridge.

Sign Route 4—Arnold Industrial Freeway

From Hercules to a junction with Sign Route 24 north of Concord at Willow Pass Road, planning is in various stages. A short relocation is being provided at the Hercules end in connection with the US 40 freeway relocation. Studies are now underway for the determination of future freeway development along the total route. Right of way for this freeway will be determined at an early date in the vicinity of Martinez where the city has been expanding to the south.

Sign Route 17—Toffman Boulevard, Richmond

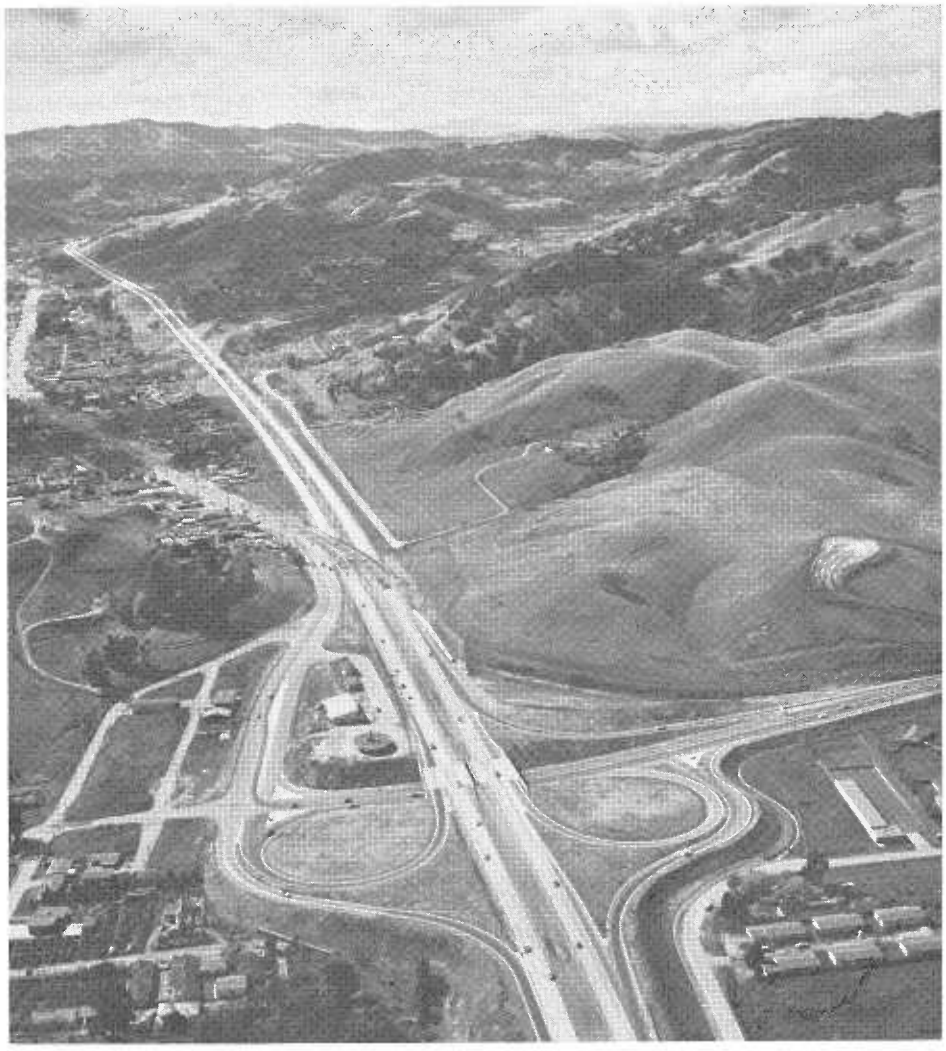
Design is progressing along this future freeway connection to the new Richmond-San Rafael Bridge. The route has been adopted and declared a freeway from the El Cerrito Overhead to the toll plaza of the Richmond-San Rafael Bridge.

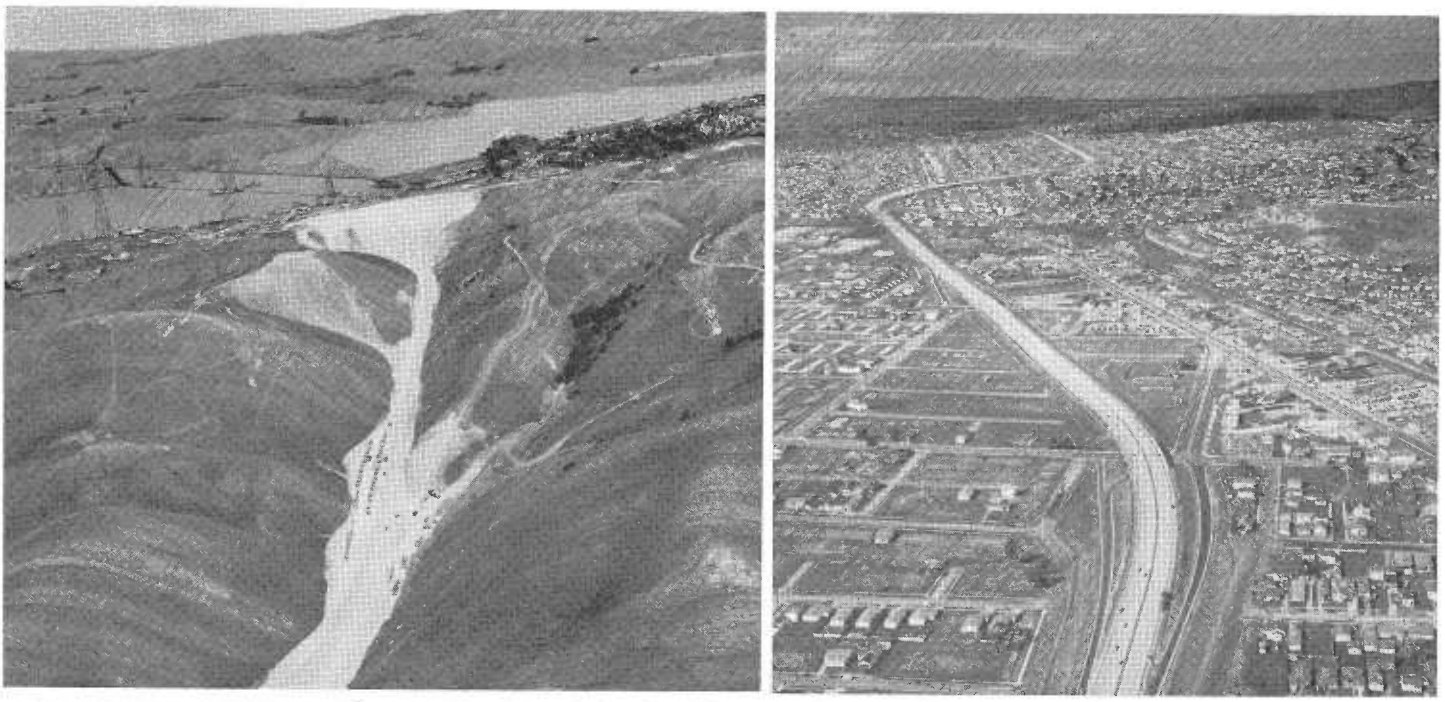
The existing State Highway route traversing generally along Hoffman Boulevard was recently selected as an extension of Sign Route 17 and directional signs will accordingly be provided in the near future.

US 101—Golden Gate Bridge to Mendocino County Line

Continued progress was made this last year toward the realization of a complete freeway between the Golden Gate Bridge and Santa Rosa.

Westerly at Lafayette Bypass on Sign Route 24 nearing completion. Pleasant Hill Road interchange in foreground.





LEFT—Aerial photo of Big Cut on realignment of US 40, showing Carquinez Bridge in background. RIGHT—US 40. Completed freeway through Richmond looking north. Potrero Avenue in foreground. San Pablo Avenue right center.

Work was completed early in 1956 over the Waldo approach from the northern end of the Golden Gate Bridge to just south of the Richardson Bay Bridge. This improvement converted the inadequate four-lane undivided facility to a full six-lane freeway. It was dedicated and opened to traffic on March 20, 1956. Construction on this four-mile facility was accomplished in two contracts.

The major portion of the work was done under a $4,500,000 contract by Guy F. Atkinson. This project, finished in April, 1955, covered grading, construction of a second tunnel and various separation structures. Completion this last year of the second contract for completing the drainage, paving and lighting permitted full use of this much needed facility. The contractor on this $1,300,000 contract was the A. G. Raisch Company. Approximately $5,000,000 of the total construction costs, covering both contracts, was financed by the Golden Gate Bridge and Highway District.

North of the above project and extending for a distance of 5.8 miles between Manzanita to the Greenbrae intersection, freeway construction is underway or has been completed.

Richardson Bay Bridge

A new six-lane bridge over Richardson Bay was opened to traffic in the fall of 1956. This new structure is a fixed type bridge providing for 40-foot clearance above the water at the navigation channel and replaces the old lift type structure which was seldom used. Incorporated in the design of this bridge were 18 prestressed-precast concrete girder spans and 26 reinforced concrete box girder and tee beam spans. The contractor on this $3,200,000 project is Duncanson-Harrelson Company and Pacific Bridge Company.

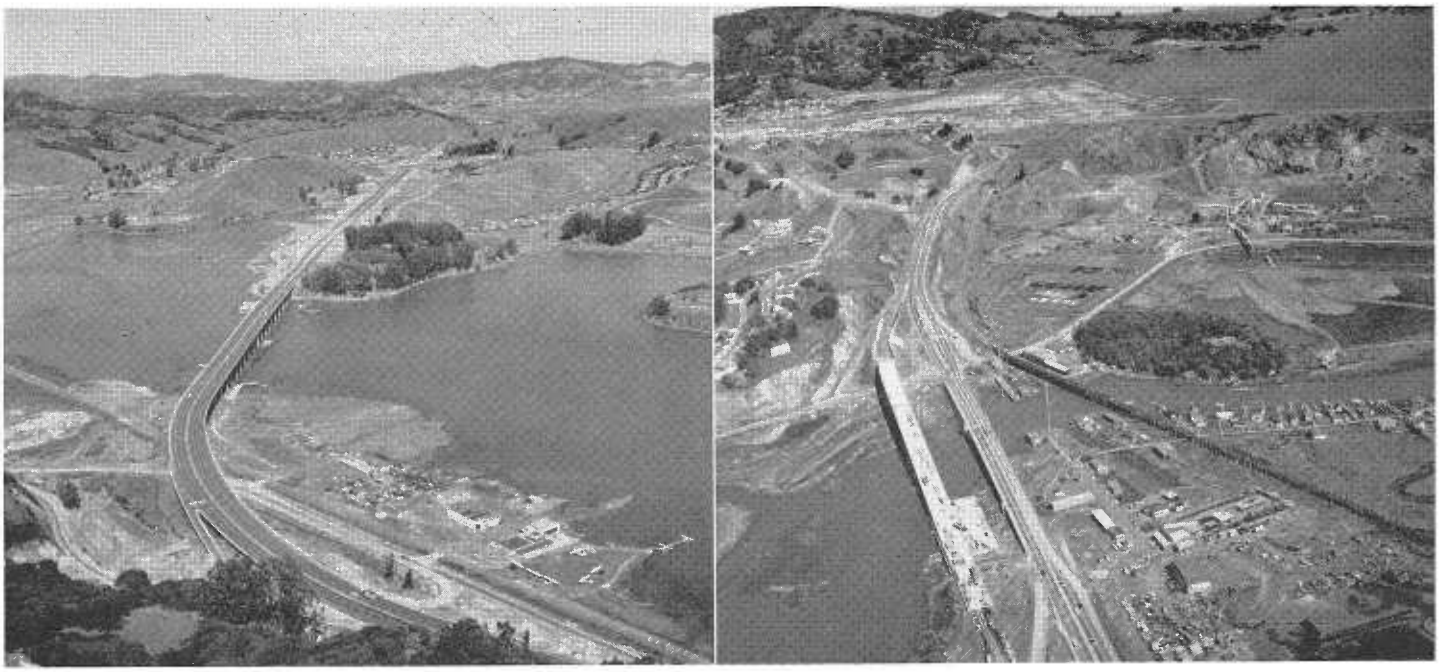
Construction is now underway on the $1,300,000 project between the Richardson Bay Bridge and 0.3 mile north of Alto and is scheduled for completion in the late spring of 1957. Dan Caputo Company and Dan Caputo and Edward Keeble are the contractors on this initial six-lane, ultimate eight-lane section of freeway. Traffic separation has already been accomplished at the Alto intersection with the opening of the interchange eliminating a source of severe accidents and congestion.

Continuing northerly to 0.6 mile north of the Greenbrae intersection is the project being constructed by Peter Kiewit and Sons Company. Work on this 3.5-mile contract started in May of 1956 and is expected to be finished in the fall of this year at a cost of $2,900,000. Included in the above contract is a four quadrant cloverleaf at Tamalpais Drive and an interchange on the south side of Corte Madera Creek. This work is the second of three stages at the Greenbrae interchange and will connect with the nearly completed southbound freeway bridge over Corte Madera at Greenbrae.

Greenbrae Project

The contractor on this latter project is Carl N. Swenson & Company. This fixed span bridge provides separation for the southbound traffic at the existing intersection and 21-foot clearance over the high water level in Corte Madera Creek eliminating the openings of the span for navigation. The estimated construction cost of this bridge is $1,020,000. The third stage or the separation of the northbound lanes across the creek and through the intersection is not financed.

Construction is expected to start on the freeway extension north of the



LEFT—Looking northerly along US 101 from the newly completed Richardson Bay Bridge toward Alto.
RIGHT—US 101 construction at Greenbrae intersection looking north to San Rafael.

Freeway construction on US 101 looking south. New southbound bridge over Corte Madera Creek at Greenbrae in foreground. ⟶

Greenbrae interchange in the early summer of this year. This contract will extend 1.4 miles from the Greenbrae interchange to 0.5 mile north of the California Park Overhead and will be the connecting link between the projects mentioned above and the existing freeway south of San Rafael. Work will consist of grading, paving and structures for a six-lane freeway at an estimated cost of $1,400,000. Twin three-lane bridges will replace the existing wooden structure over the Northwestern Pacific Railroad at California Park.

Forbes Station Overhead

From 0.5 mile north of California Park to the north city limits of San Rafael the freeway has been completed and in use for some time. Northerly of this point, as far as the entrance to Terra Linda, the highway has been declared a freeway and although left turns are physically prohibited, it has not been constructed to full freeway standards whereby access from immediate properties are controlled. Within this portion, however, there is now under construction

a new Forbes Station Overhead Bridge. This work consists of constructing new twin bridges for an initial six-lane, future eight-lane, freeway over the Northwestern Pacific Railroad. Contractor on this $500,000 project is Charles L. Harney, Inc. It is expected that this work will be finished in the fall of 1957.

From Forbes Overhead to south of Petaluma a distance of 18.9 miles, the existing facility is an expressway except within the town of Novato. Planning studies are now well advanced for the future development of this present expressway into full freeway standards with no at-grade intersections.

Work was finished in December, 1956, on the 8.6-mile Petaluma Bypass between 1.4 miles south of Petaluma Creek and Railroad Avenue north of Petaluma. The project provided a complete freeway to Denman Flat and grading to Railroad Avenue. It was performed by Parish Bros. & Carl N. Swenson Co., Inc., at a cost of $3,709,-015. Four lanes have been provided on this full freeway with provision made for an ultimate six lanes.

North of Denman Flat the freeway is being extended to three miles north of Cotati at Wilfred. This contract is being performed by Parish Bros., Inc., and Parish Bros. & Carl N. Swenson Co., Inc., and overlaps a portion of the previous contract for pavement construction. Completion of this $2,-700,000 contract will bypass Cotati and result in the elimination of another stretch of the hazardous, congested two-lane facility now existing. Work is expected to be completed in the early summer of 1957.

Construction is also underway for the freeway extension northerly and connecting with the existing expressway at Santa Rosa. This connecting link will cost approximately $2,900,-000 and is expected to be completed in the late summer of 1957. Guy F. Atkinson is the contractor on this job.

Design for the continuation of the freeway northerly of Santa Rosa to Lytton is now underway and is well advanced. Initial construction as a four-lane facility, partially expressway, and partially full freeway, is proposed.

From Lytton to the Mendocino county line, studies for this future freeway development were recently started.

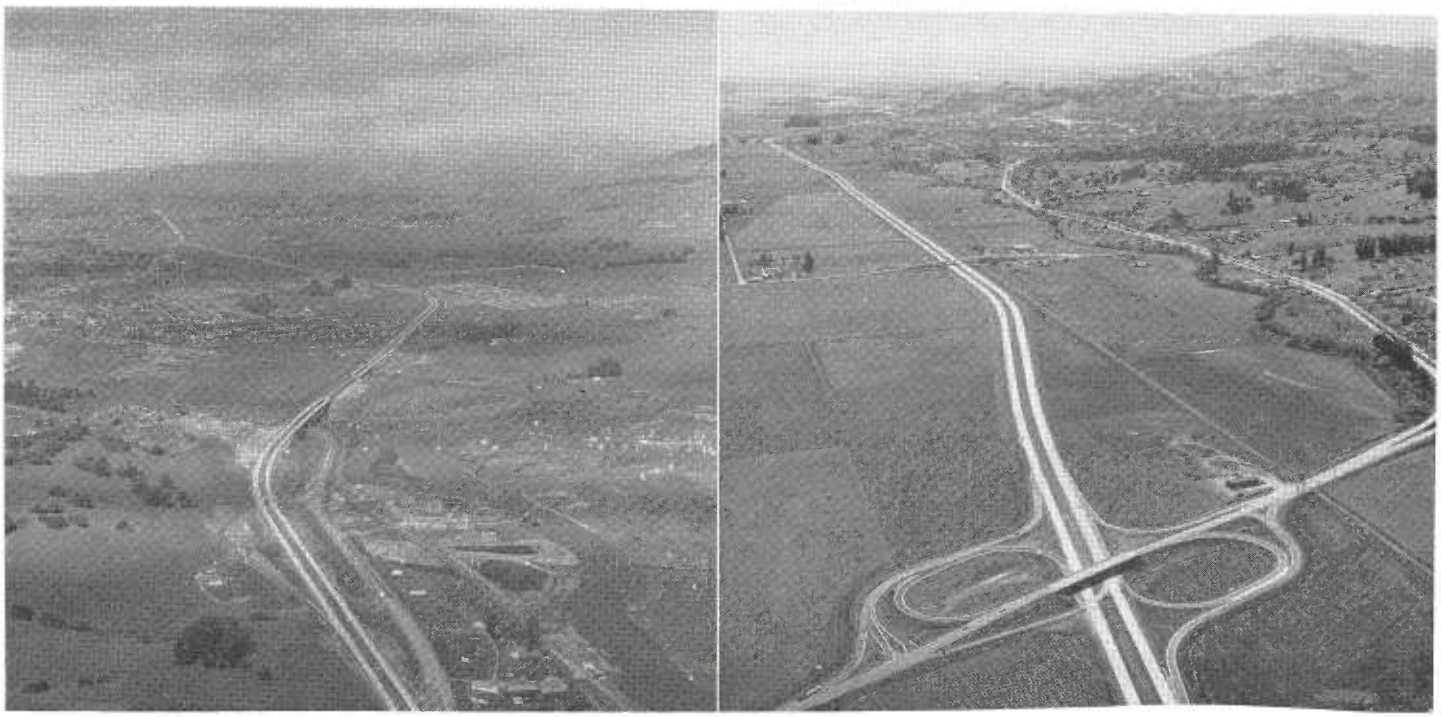
Sign Route 17—San Rafael-Richmond Bridge Approach

Underway at this time and expected to be completed early this summer is the 2.1-mile contract covering the development of a portion of the western approach to the Richmond-San Rafael Bridge. The estimated cost of this project is $955,000 and will provide a four-lane freeway westerly from the bridge to Sir Francis Drake Boulevard east. Limits of the project extend nearly to US 101, but this is primarily for the incorporation of earthwork encountered between the bridge and Sir Francis Drake to be used in the grading for the future extension of the freeway to US 101 at San Quentin Wye. Construction work is being done by Ball & Simpson and includes an interchange at the easterly approach to San Quentin as well as a major overcrossing structure at the intersection with Sir Francis Drake Boulevard.

Sign Route 37—Ignacio to Sears Point

Work is now underway on State Sign Route 37 for the replacement of the existing Petaluma Creek Bridge.

LEFT—US 101—Petaluma Bypass looking northerly. Petaluma Creek in foreground and Denman Flat in left center.
RIGHT—Looking southerly from Denman Flat along Petaluma Bypass.



STATUS OF DISTRICT IV FREEWAY PROJECTS

MARCH, 1957

Description	Total miles	Completed projects		Under contract		Budgeted		Right of way expended and budgeted
		Miles	Construction cost	Miles	Construction cost	Miles	Construction cost	
Bayshore & James Lick Freeway; Bay Bridge to Ford Rd. south of San Jose	56.6	28.3	$42,568,000	12.4	$12,342,000	1.1	$1,100,000	$34,753,000
Central Freeway; James Lick Freeway to Turk St.	1.8	1.0	4,122,000			1.0	5,200,000	8,062,000
Embarcadero Freeway; Bay Bridge to Broadway	1.5			1.5	15,012,000			10,539,000
Golden Gate Freeway; Lyon St. to Rte. 56	1.1							55,000
Park Presidio Freeway; Golden Gate Bridge to Fulton St.	2.1	1.2	1,448,000					3,000
Southern Freeway; Rte. 56 near S.C.L. San Francisco to Rte. 68 (Bayshore)	4.7							15,763,000
Coast & Skyline Blvd. Freeway; Edgemar to Lake Merced Blvd. in San Francisco	5.4	3.9	1,376,000			1.5	1,500,000	1,009,000
Redwood Freeway; Golden Gate Bridge to Lytton	66.6	37.0	*20,975,000	16.1	11,367,000	1.4	1,408,000	9,763,000
Sonoma Valley Freeway; Rte. 104 to 0.6 mile south of Kenwood	17.7							100,000
Napa-Ignacio Freeway; From Redwood Freeway at Ignacio to Napa (Ptns)	13.4	0.8	1,607,000			0.3	2,457,000	505,000
San Quentin Freeway; Rte. 1 to Richmond-San Rafael Bridge	2.4			2.0	1,143,000			845,000
Napa Valley & Napa-Vallejo Freeway; Solano County Line to Calistoga	31.8	17.0	2,790,000	2.3	540,000			1,713,000
Richmond-Carquinez Freeway; El Cerrito O.H. to Carquinez Bridge	13.6	4.7	6,012,000	7.0	†36,530,000			7,782,000
Arnold Industrial Freeway; Hercules to Bridgehead Ave.	32.0	14.7	4,728,000					1,216,000
Monument-Martinez Freeway; Monument to Solano County Line	7.4							1,255,000
Mt. Diablo Freeway; U. S. 50 in Oakland to Arnold Industrial Freeway near Concord	19.8	7.2	6,082,000	2.6	3,310,000	2.4	5,500,000	11,057,000
Shepherd Canyon Freeway; Mt. Boulevard Freeway to Mt. Diablo Freeway	10.3							50,000
Mt. Boulevard Freeway; Mt. Diablo Freeway near Lake Temescal to San Leandro	9.3	2.4	‡3,175,000	1.3	‡1,292,000			‡921,000
MacArthur Freeway; Distribution Structure to Rte. 228	15.3							22,660,000
Bay Farm Island Br. and Approaches	0.6	0.6	2,187,000					165,000
Eastshore Freeway; Richmond-San Rafael Bridge to Bayshore Freeway at San Jose	52.7	27.5	38,887,000	16.7	20,182,000	0.9	6,750,000	18,020,000
Rte. 107; U. S. 50 to Walnut Creek (Ptns)	10.1	2.1	550,000			1.4	2,000,000	2,878,000
Altamont Pass; San Lorenzo to San Joaquin County Line	33.6	28.2	9,799,000	5.4	4,595,000			6,356,000
Mission Pass; Existing Rte. 5 to Scotts Corner	4.9							50,000
Pacheco Pass; 1 mile east of Bell's Station to Merced County Line	5.3	5.3	1,286,000					12,000
El Camino Real; Ford Rd. south of San Jose to San Benito County Line (Ptns)	5.8	5.8	1,095,000					546,000
Watsonville to 4 miles south of Davenport	21.0	8.4	4,110,000			4.6	2,015,000	3,011,000
Santa Cruz to San Jose (Ptns)	19.9	4.2	3,155,000		245,000	8.8	5,770,000	8,052,000
Saratoga-Mt. View Freeway; Rte. 114 to Rte. 68	8.1							2,000
Mt. View-Alviso Freeway; Bayshore Freeway to Eastshore Freeway	8.0			2.1	981,000			295,000
Totals	482.8	200.3	$155,952,000	69.4	$107,539,000	23.4	$33,700,000	$167,438,000

* Includes total of $5,000,000 by Golden Gate Bridge and Highway District.
† $29,117,000 Toll Bridge Funds in this amount.
‡ Includes City of Oakland and Alameda County contributions.

Bids were opened in January of this year and the low bid on this 0.97-mile-long project was submitted by Ben C. Gerwick, Inc., and J. H. Pomeroy & Co., Inc. The bridge itself will be a single structure, having four lanes, comprised of 30 spans of which the center span will be steel construction and the others prestressed concrete. A total of 264 precast, prestressed concrete girders will be required for this bridge. Replacement of the existing substandard two-lane bridge is required because it is structurally and geometrically deficient. A sum of $2,457,000 is budgeted for this construction. This project will be the third stage of a four-lane freeway from Ignacio Wye to Sears Point. The last stage completed was the construction in 1951 of two lanes of this future freeway and a graded four-lane roadbed from Petaluma Creek to Tolay Creek. Plans are nearly complete for the final contract for widening to four lanes from US 101 to junction with Sign Route 48. The estimated cost of this future project is $2,500,000.

Sign Route 12—Sonoma Valley

A new freeway route was adopted on January 24, 1957, by the California Highway Commission connecting Sebastopol through Santa Rosa to Kenwood. This 17.4-mile route follows the existing highway from the east

city limits of Sebastopol to the vicinity of Wright Road, then runs just north of the present route and adjacent to the Petaluma and Santa Rosa Railroad to the vicinity of US Highway 101 in Santa Rosa. The route then continues on a generally direct northeasterly course to rejoin the present highway near Los Alamos Road east of Melita and follows the present highway routing to south of Kenwood. Surveys and design studies for details are now underway. An interim project has been included in the 1957-58 Construction Program at an estimated cost of $435,000 to widen and channelize Sign Route 12 from US 101 to 0.17 mile east of Farmer's Lane in Santa Rosa. The City of Santa Rosa is acquiring the right of way and clearing improvements and utilities. Work should be underway this spring.

Sign Routes 128, 29—St. Helena-Calistoga

A 3.8-mile section of two-lane, future four-lane, expressway was finished in December, 1956, between four miles north of St. Helena and Calistoga. The contractor on this $550,000 project was Huntington Bros.

Sign Routes 12, 29 and 37—Napa Area

A contract has been awarded to Lee J. Immel for this addition of two lanes to Sign Route 29 north of the City of Napa between Union Station and Orchard Avenue. Addition of these two lanes will convert this 2.3-mile project into a four-lane expressway and provide a faster and safer facility. Cost of construction of this project is estimated to be $525,000.

In November, 1955, the initial two lanes of a future four-lane freeway were constructed from a point two miles east of the Sonoma-Napa county line for a distance of 2.7 miles.

Southerly of Napa on Sign Routes 12 and 29 to the Sonoma county line, the present routes have been operating as expressways for many years although access rights have not been fully acquired. It is expected that at some future period, when justified, development will be to freeway standards.

Alto interchange looking south toward the new bridge at Richardson Bay on US 101

"Keep America Beautiful" Compliments California

Recently "Keep America Beautiful, Inc.," New York City, wrote to the governors of all 48 states suggesting these three specific "travel trash" control projects.

1. A litter-prevention message to be enclosed with distribution of registration applications and license plates to all motor vehicle owners in the state
2. A digest of the state's highway litter laws to be included in literature presented to new drivers with all "Learner's Permits"
3. A question on the state's highway litter laws to be included in all driver examinations.

In reply Governor Goodwin J. Knight wrote:

"* * * mail, reaching some 7,000,000 persons annually, related to our State's vehicle registrations, has for two years carried anti-litter messages. Emphasis on the State's law in this field has been included in the latest edition of the summary of vehicle laws issued to all driver license applicants. * * *

Director of Motor Vehicles Paul Mason has since received the following letter from "Keep America Beautiful, Inc."

"Several people have called our attention to your revised 'Driver's Examination on California Vehicle Code' which contains two questions on the state litter laws and in addition, the slogan at the end '*Be Courteous, Drive Safely*—and *Don't* be a litterbug'."

"As you know the inclusion of highway litter law questions on drivers' examinations is one of three 'travel trash' control projects suggested by 'Keep America Beautiful, Inc.' last year to all the state governors. A number of states are now following the example of California re the other two projects—i.e., anti-litter messages printed on vehicle registration mailings and digest of highway litter laws in state vehicle code summaries for driver's license applicants. * * *"

Freeway Spans "Hub"

Colton Freed From Traffic Congestion

By LOREN M. BARNETT, Senior Highway Engineer

NEW FREEWAY *uncorks the Colton bottleneck.**

This was the local description of relief from traffic congestion following the opening of the new freeway through Colton.

Lieutenant Governor Harold J. Powers officially cut the ribbon opening this major link of the San Bernardino Freeway on October 18, 1956, and at the same time opened the City of Colton to possibilities of unlimited progress.

Colton is one of the older cities in California, having been incorporated in 1887. It occupies a prominent spot on the "Road to Romance" and in the historic lore of California. As early as 1774, Juan Bautista de Anza and Padre Garces crossed the Santa Ana River near the site of Colton, but it was not until 1838, when Don Juan Bandini acquired the Jurupa Ranch, that the first Mexican families were brought into this section to make their homes. They settled on 2,200 acres of land at the confluence of the Santa Ana River and Lytle Creek, where they founded the first settlement in the valley at Agua Mansa.

Early Settlers

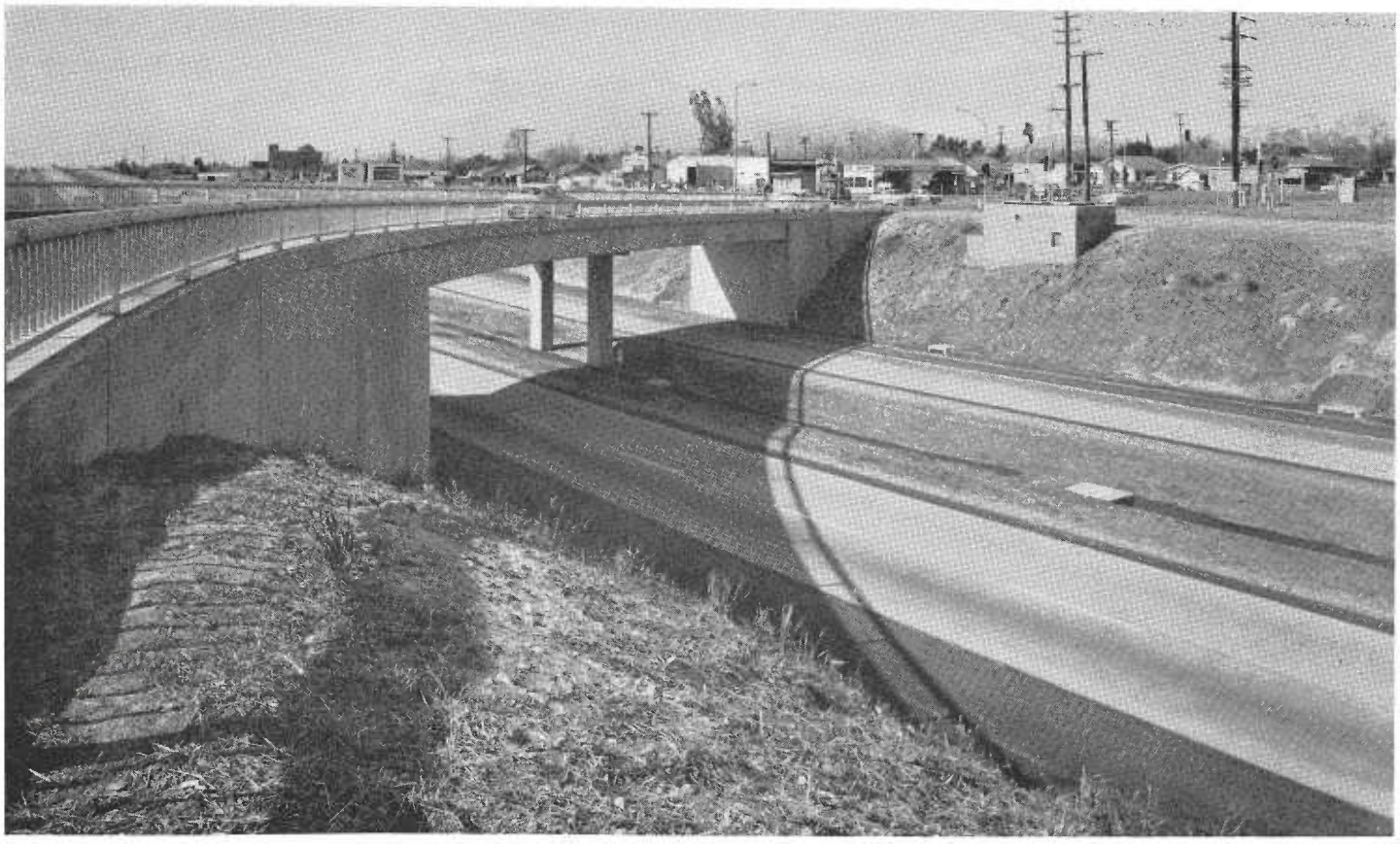
As early as 1860, first settlers established farms along the Santa Ana River and participated in the building of the Meeks and Daley Ditch, one of the pioneer irrigation projects in the valley. Meeks also built a water-powered gristmill to serve the pioneer farmers.

Wyatt Earp, of early Tombstone, Arizona fame, was one of the town's first marshals. He and his relatives were conspicuous in enforcing law in the town. Most of the family were professional gunmen and certainly lived up to their reputation and opportunities.

The first train to enter the San Bernardino Valley reached Colton in 1875. Since then, Colton has become a traffic "Hub," with both railroads and highways radiating to the other principal cities of Southern California. Subsequently the town developed a

* From editorial in *Redlands Daily Facts* and carried in the *Colton Courier*.

Grade separation carrying Mt. Vernon Avenue over San Bernardino Freeway



most severe traffic condition. If the vehicles didn't get entangled in congestion of their own making, then a train would cross the highway to contribute its part to the confusion.

Traffic Backed Up

On numerous occasions, through traffic would be backed up for over a mile, cross-town traffic could hardly get across, and those who wished to stop and shop were confronted with hazardous maneuvers in addition to annoying delays.

This congestion was created by transcontinental traffic, heavy truck traffic between Los Angeles and Imperial Valley, and an unusual amount of week-end traffic from Los Angeles to the desert and mountain resort areas—all in addition to heavy local traffic between the San Bernardino Valley cities.

With the opening of the freeway, safe, fast, and orderly movement of both through and local traffic has been provided.

One of the outstanding features of this superhighway is a pronounced increase in safety. Past experience indicates that freeways are considerably safer than city streets and that when through traffic is removed there is a marked decrease in the number of accidents along the old route.

Lt. Governor Harold J. Powers officially cuts the ribbon to open the San Bernardino Freeway through Colton as B. Wesley Vaughan, Chairman of the Highway Projects Committee, and Clinton Smith, City Councilman, assist. (Photo by Neal Adair Studio, Colton.)

A recent traffic count shows that the number of vehicles using I Street (old U. S. 70-99) has been reduced by over 50 percent.

Orderly Traffic

The fast and orderly movement of traffic through town will save the motorists and truckers thousands of dollars per year, if time lost by former delays is converted into dollars. In addition, what is it worth just not to be harassed by a concentrated mixture of cars, trucks, and trains?

With the completion of this new facility, together with the Eighth Street Underpass (completed in April, 1956 *), east-west traffic can now roll over the railroads while the north-south traffic flows under.

C. K. Dooley, Editor of the *Colton Courier*, was an ardent supporter in the development of this freeway system. His efforts were especially noted as head of the Colton Underpass Committee—an appointment made by the city council.

Colton's reaction to their improvement has been obtained by Mr. Dooley's roving reporter Melvine E. Mitchell who has asked numerous people in Colton, just five months after the opening of the freeway, how they liked their new highway system. The general consensus of the local residents is, "We are happy to have the noise of the heavy traffic reverted

. . . Continued on page 64

* See *California Highways and Public Works* of July-August, 1956.

Looking east along San Bernardino Freeway through Colton

Residences and Freeways

By JOHN F. KELLY, Headquarters Right of Way Agent

Freeway Influence on Market Value Is Nominal

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

It has been generally accepted that a freeway facility, by its reduction in travel time, brings within the scope of development areas which could otherwise not be developed. In this way the freeway adds to the wealth of the population center by surrounding it with lands of greater value and with potential earning capacity of its occupants so as to increase industrial development and the commercial business of the town or city itself.

However, within this picture of economic growth there exists one major contradiction; this is the expressed opinions of individuals as to the undesirability of residences adjoining a freeway.

Although the freeway offers an unequaled opportunity for the prospective home owner to select the particular area most suitable to his residential desires and remain within reasonable commuting distance from his place of employment, he may retain the opinion that a residence, if adjoining a freeway, is an unwise investment.

If these opinions are shared by a great number of people, they will have a tendency to accomplish a depreciation in value. After all, value, to a great extent, is a matter of opinion. The unfounded fears of well-meaning but uninformed people can create an absolutely false value premise.

Current investigation has revealed that opinions of this type have grown to the point where several lending institutions have adopted definite policies limiting individual loans on homes alongside a freeway.

This action by some lending institutions is a clear-cut example of the type of emotional thinking that can create a depreciated value if generally accepted, even though at its inception it may not be supported by factual information.

Public Agency Responsibility

It is the responsibility of a public agency such as the California Division of Highways, entrusted with the purchasing of property for highway construction, to thoroughly determine if, in fact, the value of residential property, as presently indicated by the attitude of the lending institutions, is reduced by reason of its location adjoining the freeway.

Before embarking upon this study, numerous inquiries were made to learn what facts had been developed as the basis for the policy of some lending institutions in taking the position that residential property value was depressed because of its close proximity to a freeway.

We were unable to find any evidence in California, or in any other state, of factual studies having been made to support this policy. We did find examples of polls and surveys that had been made; however, the supporting data used in these articles consisted of random sampling of property owners' comments, and from our own documented experience we know that only limited weight can be attached to this type of data.

GOAL OF STUDY

The goal of this study, then, is to make an accurate analysis of how the market value of residences have been influenced by the freeways in California. It is only reasonable that this should be considered from a very practical standpoint. The freeway's benefits in traffic-carrying capacity alone, justifies its cost, and repays many times, in the development of wealth to the community through which it passes. It is not the intention of the California Division of Highways that individual property owners should suffer monetary loss because of the public's need for freeway construction. It is understood there is not, and never has been, a guarantee of evenly distributed appreciated land value.

A residence, similar to other types of land investment, is subject to a great many economic influences which affect its rise or fall in value on the market. It is not the goal of this study to predict the anticipated future of residential property adjoining the freeway; however, it is felt that a record of past performances will furnish a reliable indicator of what is likely to occur in areas similarly treated. From past experience, we feel reasonably certain that if it is possible to chart the record of performance of a considerable volume for any specific type of property, we will have a basis for future comparison well supported by facts.

The principal benefit from this study will be to provide accurate data as an aid in appraising the market value of residential property near freeways, and in so doing, replace theories based upon opinions with factual data.

Preliminary Survey

The initial step in a study such as this requires a preliminary survey to determine: first, the best possible source of factual information; secondly, the method of obtaining this information; and thirdly, the extent

of coverage necessary to achieve the aims.

At the outset, it was decided that the "acid test" in determining freeway influence upon single-family residences was the reaction of those residents living alongside a freeway, as reflected in the actual sales taking place in the open market. If this information could be obtained in sufficient quantity, excluding those sales influenced by conditions that prevent a fair comparison, such as advantageous or restricted financing, forced sales or purchases, etc., it would be possible to make an accurate analysis of freeway impact upon residential property.

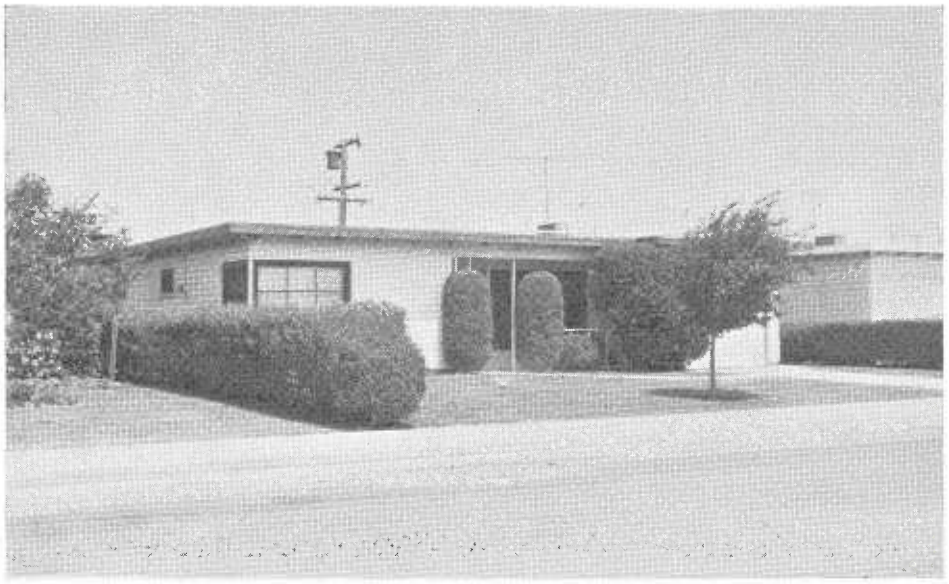
The necessity of obtaining a large number of sales, to supply the statistics required, was revealed in the preliminary survey. It was found, in order to obtain an adequate number of sales to establish a reliable indication of market price trend, that it was necessary to make this study on a state-wide basis. The need for the broadest possible coverage for this study became more apparent when an investigation of sales showed that many variations existed with respect to the physical differences of the houses and adjacent freeway, over and above the impact of different local economic conditions upon real estate values.

For these reasons it was necessary to consider many different examples before it was possible to estimate a trend on the degree of freeway impact upon marketability of residential property.

BASIS OF STUDY

Four freeways were used as the test areas to provide the data in this study. Two in Northern California, the Bayshore Freeway south of San Francisco in San Mateo County, and the Eastshore Freeway southeast of Oakland in Alameda County; and two Southern California freeways, the Santa Ana Freeway extending southeasterly from downtown Los Angeles into Orange County, and the San Bernardino Freeway east of Los Angeles.

The majority of residential development adjacent to freeway construction in California is located along these four freeways. The market trend revealed by the actual sales in these areas provides the most complete basis for determining how the greatest number of homes subject to freeway influence are affected. With a few exceptions, all of the residences along these particular freeways are in subdivisions. The majority of these tracts were developed after World War II.



This tract house with back yard adjoining Eastshore Freeway is an example of the less expensive home in this study

Custom-built and Older Homes

Throughout the State, at the present time, there are only a limited number of custom-built and older homes located adjacent to freeways. In most of the cases of this type of residence investigated, it was found that the site selection was one of owner preference. For this reason, and the fact that the custom-built home is usually built and financed in accordance with the desires and financial ability of the owner, it is not subject to the resale activity usually found in the tract-built home.

It follows, in the case of the newly constructed custom-built home, that the owner has made a special effort in selecting his site, and where that site adjoins a freeway this fact adds to its desirability.

In the older home, where an adjacent freeway has been built, after many years of occupancy by the owner the emotional reaction is sometimes out of all proportion to the economic analysis. However, in both of these cases, because of the insufficient amount of sales data, it was decided not to include custom-built and older homes in this study.

Sources of Information

One of the initial problems in conducting this study was how to obtain the factual data required. Although personal calls upon the home owners required a great deal of time, we found it to be absolutely necessary in order to obtain all information needed, particularly confirmation of sales prices and statistics relating to payments for financing. As it was necessary to contact the residents of homes * adjoining the freeways, as well as buyers and sellers of * comparable homes, we used this opportunity to obtain the property owners' comments with respect to living in these localities.

In addition to the sales statistics confirmed by the property owners, the official records in the cities and counties were also used as a source of information relating to real estate transfers in the vicinity of the freeways. The tract developers and their sales representatives, as well as realtors actively engaged in selling residential properties along freeways, were called

* In this report, residences *adjoining* freeways refers to the residences that either back up to or face the freeway fence, and *comparable* refers to similar residences within the same subdivision located one block or more away from the freeway fence.

Example of the higher priced tract home. These residences are on a frontage road alongside the Santa Ana Freeway near Paramount Boulevard interchange.

upon for additional information with respect to the problems involved in selling homes in these particular areas.

The excellent cooperation of the many people interviewed to provide confidential information, particularly in relation to financing the purchases or sales of homes, makes it possible to state that the analysis reached in this study is based upon the greatest amount of accurate data available. In appreciation of this help and as a protection to the individuals furnishing financial statistics regarding their homes, all references to selling price, down payment, monthly payments, and other figures are shown in this report by group figures or percentages.

BASIS OF COMPARISON

Previous economic studies conducted by the California Division of Highways for the purpose of ascertaining the economic effect of freeway construction upon adjacent property used a "before and after" basis of comparison which shows, by direct contrast, the degree of freeway influence. This procedure is particularly applicable for properties in the process of change or in established business continuing after freeway construction in the same manner as before such improvement.

This state-wide study consists of examples subjected to a considerable difference in economic conditions, as well as a wide variation in construction dates of the homes and adjoining freeways. The degree of freeway influence in this study cannot be measured before and after the date of freeway construction, but can only take place after the freeway is in existence. For this reason it was necessary to use a basis of comparison that would provide a uniform system of analyzing the market trend in areas having variations in the local economic condition.

A careful review of sales statistics in various locations throughout the State indicated that a comparison of resales among similar homes was the basis for making an accurate determination of freeway influence upon the market value for residential properties.

INITIAL SALES

Proceeding on this premise one of the first observations was that among the many residential tracts included in this state-wide study there was no evidence of builders putting a different "price tag" on a house because it was located alongside a freeway. Subdivision builders usually arrange for the financing of a group of homes or an entire tract as one unit. Discount rates on available money, or any penalties that may be inflicted by the lending institutions, are generally absorbed by the builder, thereby permitting equal financing for every house.

There were a few examples of price changes being made on finished houses in order to complete the sales within a tract. These price concessions were not confined to any specific area, but applied to the houses not selling as fast as the majority of homes within the subdivision.

The only variations found in the uniform financing of new houses occurred where the tract was constructed in stages, and separate financing was arranged as each unit or group of homes was built. A difference of several months could mean a substantial change in the availability of money and the type of financing obtainable for residential loans.

Rising construction costs made it necessary for many builders to increase the price of houses during the period of tract development. Numerous examples were found where the initial selling price of identical houses varied several hundred dollars between the first and last units constructed within a particular tract. These price increases caused by changing construction costs were applied to the houses without any regard to location within the subdivision.

A comparison of the initial prices in a tract with resales of the same houses on the current market has shown a continuous price increase. There has been a remarkable uniformity in the trend of price change among comparable houses within a tract; however, the degree of price change has varied between tracts adjacent to the same freeway. This is indicative that factors inherent in the entire tract, such as the livability and physical appeal of the houses in one tract as opposed to another, or the social and economic status of the residents, have a greater influence on the price trend than a freeway, school, or some other nonresidential use adjoining a small percentage of the homes in a particular subdivision.

RESALE PRICES

The sale price is indicative of market value only when the parties in the transaction act in accordance with the basic requirements that denote market value. In other words, the buyers and sellers must not be forced to make the

purchase or sale; there must be an allowance of a reasonable time, and a full knowledge of the uses and capabilities of the property.

The use of sales information as the basis for determining the freeway influence upon residential property requires an investigation similar to the collection and processing of comparable data for an appraisal. Each resale of a residence adjoining one of the four freeways included in this study, as well as the resales of comparable properties, required a personal interview with the buyers or sellers for the purpose of verifying the sale price and all circumstances involved in the transaction in order to ascertain if the sales were indicative of market value.

Selection of Comparables

Resales throughout the State included many different types of residential property. The principal variations were: (1) the size of the lot; (2) location of improvements with respect to the freeway; (3) age, quality, type of construction, size and condition of the improvements. A minimum requirement of this study was that each resale of a residence adjoining a freeway had to be compared with a similar residence located one block or more away from the freeway.

Similarity meant that physical as well as social and economic conditions must be the same. It is understandable that it is impossible to find any two residential properties nearly the same after a period of elapsed time, even though the properties were practically identical at the time of initial sale. However, in the selection of comparable properties, the number of variations were kept to a minimum. In each example used, adjustments were made for the few differences which existed that would have an influence on the marketability of the residences.

The result of a selective procedure such as this requires the investigation of a large volume of resales in order to obtain sufficient volume of true comparables to insure accuracy.

In this study all of the resales in all of the subdivisions under consideration were reviewed. This required a complete analysis of 1,092 resales. Of this amount, 520 conformed to the established requirements of the study.

Time Element

In the assembly of sales data along the freeways in Northern and Southern California, we found that by using the three calendar years, 1954, 1955 and 1956 there would be an adequate time base to provide sufficient sales information to make a well-supported analysis of freeway influence upon residential property.

A greater period of time would have made available a larger number of sales, but as it was considered essential that the freeway be in existence at the time of each resale, we were unable to use sales earlier than 1954 along all four of the freeways covered by this study.

By allowing a reasonable time to elapse after the completion of the freeway construction, the adjoining residential resales were made by residents who had an opportunity to experience and determine for themselves the advantages or disadvantages of living alongside a freeway.

Resale Price Trend

All resales occurring in each of the three years covered by this study have been tabulated to compare the annual trend in market value of residences adjoining a freeway with comparable residences. The accompanying chart shows this trend by percentage differences beginning with resales in 1954 as a base.

RESALE PRICE TREND

	1954	1955	1956
Freeway	Base	+1.69%	+4.39%
One block	Base	+3.35%	+4.71%
Two blocks or more	Base	+0.001%	+4.09%

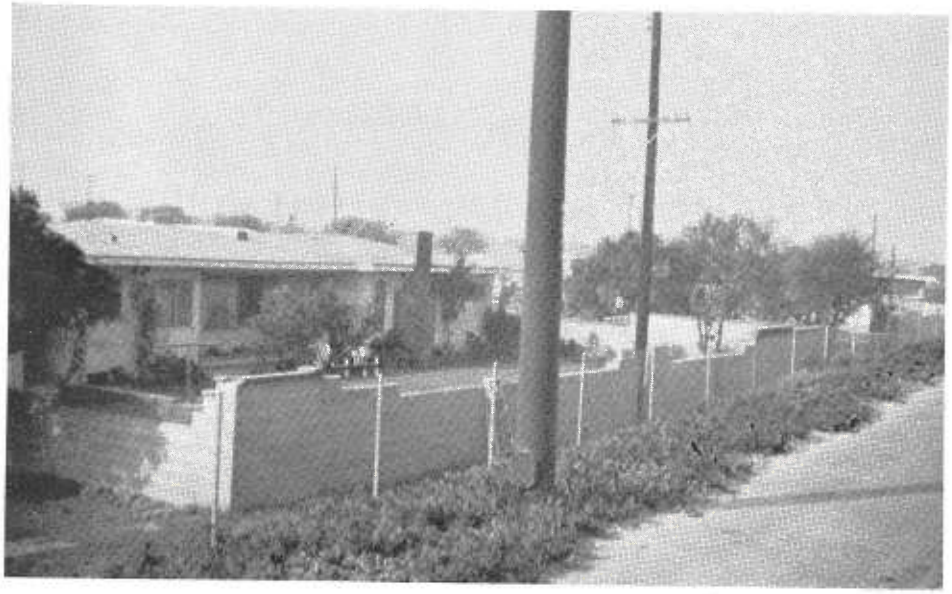
The use of all sales statistics reveals that there were similar variances in the sales prices for residences adjoining freeways as well as among comparable examples.

The average resale price was 1.69 percent higher for residences adjoining the freeway in 1955 as compared with 1954. The general upswing in the real estate market was further shown in 1956 by the 4.39 percent increase for these residences adjoining freeways as compared with the gains made in 1955.

The increase in price trend for comparable residences located one block away from the freeway was substantially greater during 1955 than the gains enjoyed by residences adjoining freeways during the same year; however, the market gains during 1956 were only slightly higher than the increase enjoyed by the homes adjoining freeways during the same year.

Those residences located two or more blocks away from the freeway experienced only a fractional increase

An example of one of the many attractive back yards alongside the freeway fence. This homesite adjoining the Santa Ana Freeway has been enclosed with a concrete block wall to provide privacy for the outdoor living area.



in the market price trend during 1955, but showed a substantial gain during 1956. Even so, they remained below the gains made during the same year by residences adjoining, or one block from, the freeway.

According to our state-wide tabulation of the resales occurring within this three-year period, those residences located one block away from the freeway experienced the greatest single increase in price trend. The fact that residences located two or more blocks away from the freeway showed gains of a much lesser degree, precludes any assumption that location outweighs all other factors influencing the general market trend. The price trend of the residences located one block from the freeway more closely resemble the gains made by residences adjoining the freeway than the rseidences located some distance away from the freeway. The variations that exist between the individual groups of homes in this tabulation limit the comparison to a general indication of the market trend.

Trend for Similar Groups

To show more specifically the price trend of residences adjoining the freeway and comparable residences, a separate study has been made of an equal number of resales which occurred within the same tracts and within the same periods of time, making possible a direct comparison in price trends among residences having the greatest similarity. The number of resales used in making this analysis was limited; however, those used in this phase of the study were nearly equal in every respect with the exception of their location.

SIMILAR GROUP TREND

	1954	1955	1956
Freeway	Base	+0.76%	+2.53%
One block or more	Base	+0.96%	+2.09%

In this limited, but directly comparable group of residences, the annual trend in resale prices from 1954 through 1956 was found to be slightly higher for the homes adjoining the freeway as compared with similar residences located one or more blocks away.

The purchasers in each of these resale transactions assumed the initial financing existing on the property. New financing was not required for any individual residence in this group.

Freeway vs. Away

This same group of sales can be analyzed in an entirely different manner; for example, the above tabulation is a progressive percentage comparison of the price increase in the resale of properties adjoining the freeway with other properties adjoining the freeway. In like manner, it also shows the price trend among comparable properties.

If, however, using this same group we compare the total sales of properties adjoining the freeway with the same number of comparable properties removed from the freeway, the following tabulation occurs:

FREEWAY vs. AWAY

1954 Comparables	1.30% higher than properties adjoining freeways
1955 Comparables	1.50% higher than properties adjoining freeways
1956 Comparables	1.88% higher than properties adjoining freeways

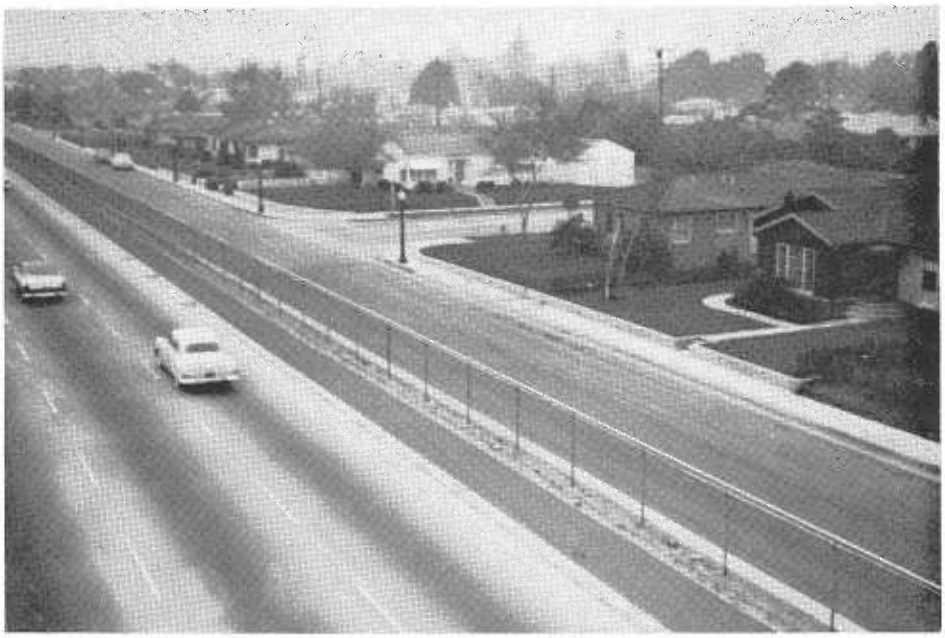
From this chart it appears that comparable residences removed from the freeways have enjoyed a slight increase in value over the adjoining residences. Although this slight increase has become progressively larger during the three years covered by this study, we cannot assume the breach will grow wider each year, any more than it can be assumed that the annual price trends for residences adjoining the freeway, or comparables, as shown on the preceding charts, will continue to increase at the same rate.

On the basis of the statistics used in this study, there is a depreciation in market value of approximately 1 to 2 percent for residences adjoining freeways. This difference in marketability may be the influence of "opinion theories" upon the bargaining practices occurring between buyers and sellers during resale transactions.

FINANCING

The importance of financing in the analysis of residential sales is made obvious by the fact that over 98 percent of all transactions investigated throughout the State required the aid of some form of real estate loan. The widespread reliance upon financing will in many cases have as great an influence upon sale of residential property as the actual sale price. In fact, investigation revealed many instances where home buyers expressed a great

Residences on frontage road alongside San Bernardino Freeway. The chain-link fence through center of photo separates freeway traffic lanes from frontage road.



deal more concern about the down payment required to cover the equity of the seller, and the amount of monthly payments, than the total purchase price for the property. For these reasons, favorable or unfavorable financing could strongly influence the marketability of a residence.

As an integral part of our investigation of sales statistics we obtained, through personal interview and a review of the official records, the exact cash down payment required for each transaction; the total monthly payment made by the purchaser on the real estate loan covering the balance of the purchase price; and the monthly payment and amount of a second deed of trust or additional loans required for the sale of each specific property.

Average Payments

In this state-wide study the cash down payment for all residences adjoining freeways averaged 12.37 percent of the sale price. The average monthly payment on real estate loans on these homes was $78.20.

Financing on comparable homes located one block from the freeway averaged 14.91 percent of the total purchase price for down payments, with average monthly payments of $77.68.

Residences located two blocks from the freeway tier of homes required an average 15.61 percent down payment during the three years covered by this study, and monthly payments averaging $77.93.

The average down payment for residences located three or more blocks away from the freeway was 14.54 percent of the total sale price, and monthly payments averaged $81.13 for the purchasers of these homes.

A review of cash down payments for each resale transaction shows those residences adjoining freeways required a smaller average down payment than all other residences having real estate loans, regardless of distance from the freeway.

The average total monthly payment on real estate loans for the residences adjoining freeways was only slightly higher than the monthly payments made for residences one and two blocks away from the freeway which required a substantially larger percentage of the purchase price in the form of a down payment. It is thereby expected that if the size of the down payment increases, there should be a commensurate decrease in the size of the monthly payments on houses having similar purchase prices.

Considering the fact that there was a variation in the range of purchase prices, we should not make the bold assumption that down payments will always be lower for houses adjoining freeways. However, from the statistics which we have, on the basis of loans which have been assumed, i.e., equal financing, there is definitely no evidence that purchasers of homes alongside freeways are required to use any more cash for the purchase of one of these homes, unless, of course, new financing may be required, which might alter the entire picture, depending upon policies of the lending institutions.

DISTANCE AND GRADE OF FREEWAY

The trend in market price of residences has been based upon all factors being relatively equal, with the exception of a location near or away from a freeway. In this analysis no distinction has been made among the residences adjoining freeways, with regard to variations in distance from the house to the fence or the traffic lanes of the freeway. The grade or elevation of the freeway near the residences is another factor to be considered in how a freeway can influence the desirability of residential property.

Having determined how a freeway location can influence the price trend among similar houses, we have further projected this study to find out what effect the distance or grade of a freeway has upon those resales.

All of the residences used in the comparison of market prices were located within tract developments. With very few exceptions the homes within each subdivision were the same distance to the fence and traffic lanes of the freeway. In those few instances where the distance was not uniform, or the grade of the freeway alongside a specific tract varied, the houses adjoining the freeway in that subdivision were segregated.

The many price variations that exist among a large number of individual sales made it necessary to adopt a system of group comparisons in order to show the influence of distance or grade of freeway upon resale prices. It was determined after considerable review that the resale price range in each tract or group of homes during the three years covered by this study provided a uniform basis of comparison that could accurately depict the relationship between sale price and the distance or grade of an adjacent freeway.

A comparison of all residential resales adjoining freeways in Northern and Southern California revealed that 26 percent of those transactions within the past three years attained a higher range of prices than was enjoyed by comparable homes during the same period of time. This group of residences adjoining freeways were in locations varying from 35 to 75 feet distant from the state highway right of way fence, and distances ranging from 74 to 200 feet to the freeway traffic lanes. These homes were at an equal grade with the adjoining freeway, or varied to differences as great as 16 feet below the level of the highway facility. Exceptions to this were 9 percent of the residences being situated 20 feet higher than the grade of the adjoining freeway.

DISTANCE AND GRADE OF FREEWAY

Resale price range	Percent of residences	Distance house to fence	Distance house to freeway traffic	Relation of residential lot to grade of freeway
Higher	26%	35 to 75 ft.	74 to 200 ft.	91% equal or below freeway grade 9% above freeway grade
Lower	36%	25 to 83 ft.	72 to 105 ft.	80% equal or below freeway grade 20% above freeway grade
Same	38%	25 to 75 ft.	72 to 160 ft.	96% below freeway grade 4% above freeway grade

The price range of 36 percent of the transactions taking place adjoining freeways was lower than the price range for comparable homes. This group of residences were 25 to 83 feet from the right-of-way fence. In comparing this group of homes selling for less money adjoining a freeway with those which attained a higher price range alongside the freeways, we found many of these residences were approximately 10 feet closer to the right-of-way fence. Conversely, there were a few of these homes having a lower price range adjoining the freeway that were eight feet further from the highway right of way than similar homes selling for a higher price.

The residences selling at the lower price range adjoining the freeway were 72 to 105 feet from the freeway traffic lanes. Eighty percent of these homes varied in grade from "level" to 16 feet below the adjoining freeway. The remaining 20 percent of these residences were situated above the grade of the freeway from 8 to 20 feet.

The price range of the remaining 38 percent of the transactions alongside the freeways showed no difference from the price range of comparable homes. This group of residences were 25 to 75 feet from the right of way fence, and 72 to 160 feet from the freeway traffic lanes. These home sites varied from 1 to 20 feet below the level of the freeway, with the exception of 4 percent of this group of homes which were located two feet above the freeway grade.

UPPER—New residences with back yards adjoining Eastshore Freeway. One property owner has enclosed back yard with solid wall fence, whereas others are using freeway chain-link right of way fence as rear property boundary enclosure. Note residence in extreme left portion of photo with solid wall-type fence only along the side property boundary. LOWER—Older residential tract along Eastshore Freeway with back yards adjoining right of way. Plantings along rear property boundary greatly improve appearance of homesites adjoining freeway.

Influence of Distance

A review of the price ranges in relation to the distances from house to fence, house to freeway, and grade of freeway, shows that homes a minimum of 35 feet from the freeway fence sold for more than similar houses located only 25 feet from the fence.

Although there were a number of houses with only 25-foot back yards selling for as much as comparable homes, we cannot overlook the fact that the majority of those houses selling for less money were also residences having 25-foot back yards.

The homes selling at a higher price range adjoining the freeway were the residences situated the greatest distance from the freeway traffic lanes.

The fact that houses showing a higher range of prices were a minimum of 10 feet further away from the freeway fence, and a slightly greater distance away from the freeway traffic lanes than all other homes, indicates that the opportunity for attaining a higher price for a residence near a freeway is definitely possible, but it is not as likely to occur if the residence has a very shallow rear yard or the traffic lanes are too close to the house.

There was no appreciable difference in the grade of the freeway alongside residences selling for a higher price range as compared with homes adjoining the freeway in the other price range groups.

The facts of the study show that a freeway grade up to 20 feet above the lot level is not singularly capable of depressing the resale price of residences. On the other hand, there were also examples of houses 20 feet above the grade of the freeway that sold for prices higher than comparable houses.

TRAFFIC

An additional factor to be considered as a freeway influence is the sound intensity levels resulting from traffic frequency.

The average daily traffic during 1956 on the four freeways in this study ranged from 50,000 to 83,000 vehicles.

The average percentage of trucks in state highway traffic is 30 percent.

As volume of traffic increases, truck percentage of the total would decrease, because the gain in traffic figures results primarily from additional passenger vehicles; for example, 23 percent of the Eastshore Freeway 50,000 average daily traffic total is truck traffic, whereas 11 percent of the Santa Ana Freeway 72,000 total is truck traffic.

The chief complaint with respect to noise from freeways is in regard to truck traffic. As the actual number of trucks on these four freeways is relatively constant, there was no likelihood that truck noises had any more of an adverse effect upon property values in one area than in another.

HOUSES ADJOINING FREEWAYS

The residential tracts included in this state-wide study comprised a total of 22,396 homes, with 1,697 or 7.58 percent of these residences built alongside a freeway. All residences adjoining the four freeways in this report have their back yards nearest the freeway fence with the exception of a relatively small number of homes along the Santa Ana Freeway in tracts designed with subdivision streets separating the residences from the freeway.

The subdivision plan whereby a row of homes were constructed to have their back yards next to the right-of-way fence provided the most efficient utilization of land from the standpoint of creating the largest number of lots per acre, and undoubtedly was the reason for that arrangement being the most prevalent.

In making a comparison of the initial and resale prices of homes with back yards adjoining the right-of-way fence, and those residences separated from the freeway by a subdivision street, there was no difference with respect to trend in the selling price or problems involved in making a sale.

In some areas the shape of the subdivision land may have made it more desirable to provide for a street along the freeway fence; however, in many cases it was the general feeling that where streets were placed alongside the right-of-way line, it was done to provide a buffer distance from the freeway traffic. The lack of difference in marketability of these homes as compared with residences having back yards adjoining the freeway property shows this type of tract design was not warranted for that specific purpose.

There were examples of a few subdivisions featuring deeper lots alongside the freeway as compared with other lots in the same tract. In some instances this was attributable to a small surplus land area remaining after the tract development. The subdivider added the small additional area to the tier of lots adjoining the freeway as an added sales incentive to home buyers. In other cases the larger lots adjoining the freeway were the result of extra area remaining in the tract caused by the freeway not being located at right angles with the subdivision streets.

In tract developments where homes were constructed, differing in price and size, it was generally the practice to equally distribute these homes throughout the tract, irrespective of location, except in those cases where an entire unit of larger or higher priced homes was constructed at a later date, featuring a variation from the original tract construction.

Fences

The State Division of Highways places a chain-link type fence along the outside limits of the freeway right of way through urban areas. This fence often serves a dual purpose in being used as the rear property fence for residences adjoining freeways. It was surprising to find many back yards adjoining freeways where the chain-link fence was being utilized as the rear property fence, and a solid wall-type fence had been used along the side property lines.

In some areas the F. H. A. or local governing authorities require a screen separating homesites from any nonresidential use, such as a freeway, schoolyard, or canal. In these cases the home builders have been required to construct a solid fence of wood or cement along the rear property boundary and parallel with the state right-of-way fence. Some home builders have voluntarily constructed a solid wall-type fence around the perimeter of a tract. These fences are usually considered a special feature by the home buyers. There was a surprisingly large number of home owners who stated that a solid wall fence along the rear property boundary was the principal reason that particular home was purchased in preference to a residence away from the freeway or tract perimeters.

Exterior Appearance

During the personal interviews and investigation of sales statistics there was an opportunity to observe the exterior appearance of the residences, and particularly the yard area nearest the freeway. There were a similar number of homesites adjoining freeways improved with outdoor living facilities, such as patios, barbecues, etc., as were found among a comparable number of homes located away from the freeway. In both locations there were also examples of lack of care or use of the yard area. The home owner's initiative or efforts in the development and use of the yard area was not influenced by location of the residence adjoining a freeway.

There was no noticeable difference in the street appearance of homes adjacent to the freeway as compared with the front appearance of similar homesites within the same residential tract.

HOUSES vs. FREEWAY CONSTRUCTION

Along the four freeways included in this study, 94.58 percent of the residences were under construction or finished before the final completion date of the adjoining freeways. This group includes a number of residences built in anticipation of a freeway far in advance of the actual construction date. For example, 10.25 percent of the homes alongside freeways were completed 12 years prior to completion of the adjoining freeway; 4.12 percent of the homes were completed nine years prior to freeway construction, and 2.95 percent of these residences were finished eight years before the adjoining freeways.

Residences built after completion of the adjoining freeways represented 5.42 percent of the total number of homes alongside freeways in this study.

Regardless of the time element, all residential tracts in the vicinity of the

freeways were built with the knowledge of a proposed new highway facility through the local area. Although the builders and realtors were aware of the future highway plans, our investigation revealed there were a number of home buyers who apparently purchased residences without giving any consideration to the vacant strip of land set aside through a newly developed area for the future construction of a new freeway. Despite the fact that some property owners may have purchased their homes without the full realization of how the adjoining area was to be developed, we did not find any marked difference in their attitude toward the freeway after it was completed as compared with the home owners who purchased during and after the construction of the freeway.

RESIDENTS' COMMENTS

The investigation made to obtain the factual data required for making this study afforded the opportunity to also get the opinion of property owners in regard to living alongside a freeway. Opinions are an indication of public reaction; however, like all polls they are an expression of the individual's attitude at the time of the interview, rather than the result of his considered thought and analysis of homesite selection as reflected through a sales transaction. The comments from residents living alongside freeways are included as a part of this report for informational purposes.

Reason for buying house alongside freeway

- 32.64% Liked house.
- 38.17% Freeway not considered; immaterial.
- 10.00% Convenience of freeway transportation.
- 19.19% Miscellaneous reasons.

Had you preferred or tried to buy in this subdivision away from the freeway?

- 56.34% No.
- 19.28% Yes.
- 24.38% Freeway of no consequence.

Type of street formerly lived

- 67.87% Residential street, quiet.
- 19.18% Residential street, heavy traffic.
- 12.95% Rural, Commercial, Freeway.

Would you buy alongside a freeway again?

- 46.11% No.
- 39.90% Yes.
- 13.99% Undecided.

Any problem in financing purchase or sale?

- 96.90% No.
- 3.10% Yes.

Any fear of theft or danger living near freeway?

- 85.52% None.
- 7.77% Fear vehicles come through fence.
- 6.71% Prowlers, fumes, vibration.

Noise.

- 41.80% No bother.
- 32.84% Slight objection.
- 15.92% Objectionable and noisy.
- 9.44% Trucks principal objection.

General Remarks

- 47.97% Freeway location no better or worse than other areas.
- 22.45% Prefer freeway location.
- 20.40% Do not like freeway location.
- 9.18% Freeway a transportation benefit.

CONCLUSION

The purpose of this state-wide factual study has been to determine how the market value of residential property is influenced by freeway construction. Through the collection and analysis of sales data, covering a three-year period of time, supported by a comprehensive study of the principal factors influencing the marketability of residential property along freeways, we have reached the following conclusions:

(1) The annual trend in resale prices among subdivision homes adjoining freeways, follows a pattern consistent with the price trend of comparable homes. This comparison was based upon residences being equal in every respect possible with the exception of location.

(2) Resales averaged from 1 to 2 percent less for residences adjoining freeways, as compared with similar homes one block or more away. This indicates there is a nominal depression in market value caused by close proximity to a freeway.

This slight difference occurring among resales can be attributed to the widespread doubt, resulting from opinions that freeways have an adverse effect upon the market value of residential property. These opinions can influence the bargaining procedure that usually takes place between buyers and sellers during resale transactions. This procedure normally does not occur during the initial sale of subdivision homes where there is uniformity of prices.

(3) "Financing" has become so important in the marketing of residential property that it is singularly capable of influencing the market value. Where equal financing is available, the freeway has no influence upon the marketability of residential property; however, where individual refinancing of a home is subjected to prejudicial influence by a lending institution, it follows that it will have a direct influence upon the marketability of that property.

(4) Resale statistics reveal that residences adjoining a freeway can attain a higher price range than comparable residences; however, this occurred only among those residences located the greatest distance from the right of way fence and freeway traffic.

The majority of homesites in this state-wide study were located below the grade of the adjoining freeways, and the trend in market value of these residences was not adversely affected by extreme differences in the height of the freeway embankment.

(5) At the present time, nearly all residences adjoining California freeways are within tract developments. There is ample evidence that pride of home ownership is as strong among residents living alongside freeways as exists among the owners of comparable homes.

The general concept that people create value has been reaffirmed in this residential study. The buyers and sellers participating freely, and with full knowledge of the current real estate market, have expressed through actual transactions, acceptance of a freeway alongside their homesites, with only a slight depreciation in marketability for the house adjoining the freeway.

CALIFORNIA LEADS NATION

California leads all other states in passenger car and motor truck registrations with 5,641,408 passenger cars and 853,910 trucks, for a total of 6,495,318 vehicles, reports the National Automobile Club.

New York, with 4,131,794 cars and a total motor vehicle tally of 4,819,000, ranks second in passenger car and total vehicle registrations. Texas, with some 834,000 trucks plying its streets and highways, has the second highest motor truck total.

Rounding out the top 10 in total registrations are: Texas, 3,959,000; Pennsylvania, 3,890,000; Ohio, 3,628,000; Illinois, 3,419,000; Michigan, 3,197,000; New Jersey, 2,131,000; Indiana, 1,828,000, and Florida, 1,756,000.

San Diego Freeway

Governor Opens New Section

On September 20, 1954, Governor Goodwin J. Knight was the guest of honor for the ground-breaking ceremony for the San Diego Freeway in the West Los Angeles area. He climbed aboard a bulldozer with State Highway Commissioner Robert E. McClure for the first breaking of ground at the site of the Sunset Boulevard Bridge over the San Diego Freeway. At the close of the program Governor Knight was heard to remark, "If you good people will be kind enough to invite me I would be most happy to be present, if I possibly can, to help you celebrate the completion of this important freeway section in the West Los Angeles area." The invitation was forthcoming and true to his promise, Governor Knight did participate on March 29, 1957, in the ceremonies at the completion and opening to public traffic of the two-mile section of the San Diego Freeway from Ohio Street to Casiano Road.

Cost $8,000,000

Including right of way costs this section of freeway represents a total investment of $8,000,000. The construction work on this section of the San Diego Freeway was carried out under three State Division of Highways contracts. The first contract, the one for which Governor Knight first broke the ground, was awarded on September 19, 1954, by Director of Public Works Frank B. Durkee to George W. Peterson and Jack W. Baker for the construction of four bridges with approaches, ramps, and frontage roads. The main structure was the bridge to carry Sunset Boulevard over existing Sepulveda Boulevard and the new San Diego Freeway. Another bridge structure included in this contract was to carry Ovada Place under San Diego Freeway. The other two bridges were to provide for ramp connections with Sunset Boulevard. This contract carried an allotment of $816,800, and it was completed February 15, 1956.

The second contract on this section of the San Diego Freeway was awarded on March 8, 1955, to the Thompson Construction Company of Inglewood for the unit between Waterford Street and Casiano Road. This contract has an allotment of $1,470,600.

The third contract, also with the Thompson Construction Company, was awarded on January 30, 1956, and it has an allotment of $2,721,900. The contractors have carried out their operations in an efficient and expeditious manner, handling the two adjoining contracts for the most part as a single project and in this way they are completing the second contract two months ahead of schedule. Howard F. Meinke and George E. Dickey have been the District VII resident engineers and C. J. Woodbridge and Fred H. Buck were resident engineers for the Bridge Department.

Cooperative Planning

The San Diego Freeway has been a truly cooperative project in every sense of the word. The first plan work on the San Diego Freeway was started by the Engineering Bureau Department of Public Works of the City of Los Angeles under City Engineer Lloyd C. Aldrich in 1939 when it was known as the "Sepulveda Parkway." It was in this year of 1939 that the State Division of Highways first entered into a contract with the City of Los Angeles whereby the State would reimburse the city for preliminary engineering work done by the city in the planning of this freeway. For several years thereafter the Los Angeles City Engineer's Office conducted surveys and plan preparation for portions of the details for this freeway from Venice Boulevard in the West Los Angeles area to San Fernando Road in the San Fernando Valley.

During recent years the State Division of Highways completed plans for the construction contracts. During this latter period, however, the Los Angeles City Engineer's Office under Lloyd Aldrich and his successor Lyall A. Pardee has continued to supply designs for reconstruction of city streets, sanitary sewers and storm drains as has been made necessary in establishment of the freeway. Closely identified with the preliminary engineering carried out by District VII were E. T. Telford, George Langsner, J. E. Eckhardt, and Ralph V. Chase.

The Veterans Administration Center, within which the southerly half of this project lies, is in Los Angeles County area, and Wilshire Boulevard and other lesser important roads through the veterans' facility are a responsibility of the Los Angeles County Road Department. County Road Commissioner Sam R. Kennedy and his staff cooperated in every way possible in connection with redesign and reconstruction of roads under their jurisdiction so that this freeway project could go forward as expeditiously as possible.

The San Diego Freeway is on the U. S. Interstate Highway System and previously was a federal aid primary route. Throughout planning and design of this project E. C. Brown, District Engineer for the U. S. Bureau of Public Roads, and his field assistant Henry A. Alderton maintained close and helpful liaison with members of the State Division of Highways staff.

Right-of-Way Negotiations

In the improvement of the San Diego Freeway through the Veterans Administration Center, it was necessary to acquire property in the name of the County of Los Angeles for the realignment of Wilshire Boulevard and for the widening of Federal Avenue, the reconstruction of which has been carried out by the State Division of Highways. The necessary grants of property from the Federal Government were secured under the provisions of Section 17 of the Federal Highway Act of November 9, 1921, as amended, 42 Statutes 216.

EXPERT WITH SAW—Governor Goodwin J. Knight wields Swedish bucksaw to cut barricade at opening of section of San Diego Freeway in Los Angeles. LEFT TO RIGHT—City Councilman Harold Harby, Governor Knight, Highway Commissioner Robert F. McClure, Mrs. Knight, and Mayor Norris Poulson of Los Angeles. Dedication ceremonies were under the auspices of the Brentwood Community Federation and Santa Monica and West Los Angeles chambers of commerce.

The Federal Government transferred a total of 54.2 acres of which 46.6 acres was to the State of California for the San Diego Freeway, and 7.6 acres was to County of Los Angeles for the improvement of Wilshire Boulevard and Federal Avenue. The State and county received from the Federal Government for this project land worth well in excess of $2,000,000. The State, in return, has carried out considerable construction and relocation work for the benefit of the veterans' facility. The grant to the County of Los Angeles provided for the vacation of San Vicente Boulevard by the County of Los Angeles through the Veterans Administration Center whereby 6.6 acres would be added to the usable area of the veterans' facility.

Negotiations for the necessary right of way through this federal property were carried on at the local level through Colonel R. A. Bringham, Manager of the Veterans Administration Center, and his engineer, E. C. McCarty. The State of California and County of Los Angeles owe a great debt of gratitude to these gentlemen for their co-operation and help in getting this state highway project under construction at the earliest possible moment.

The total cost for right-of-way acquisition and the clearing of right of way from Ohio Street to Casiano Road has been close to $3,000,000. This was the cost for acquiring privately held properties outside the West Los Angeles Veterans Administration Center.

Traffic Service

Included within this section of the San Diego Freeway in the West Los Angeles area are crossings with Wilshire Boulevard and Sunset Boulevard, two of the most important traffic arterials in the West Los Angeles area. The average daily traffic count on Sunset Boulevard is now approximately 30,000, and the average daily traffic on Wilshire Boulevard is about 40,000. At both of these highway arterial crossings, traffic interchange roadways have been designed and constructed so that all the necessary

Looking south at completed section of San Diego Freeway from Sunset Boulevard overcrossing

traffic movements will be provided for.

Between Wilshire Boulevard and Sunset Boulevard on existing Sepulveda Boulevard the average daily traffic is now approximately 25,000 vehicles. With the opening of the San Diego Freeway all except the small percentage of this traffic that is local in nature will traverse the freeway instead of utilizing existing Sepulveda Boulevard.

It is estimated that when the San Diego Freeway has been completed throughout its entire length, the average daily traffic will rise to about 100,000 vehicles per day on the two-mile unit now being opened to public traffic. It was on this basis that the former designs for making the San Diego Freeway a six-lane width were changed to provide the eight-lane width that has been constructed.

Proposed Landscaping

On February 19, 1957, the California Highway Commission passed a resolution allocating $109,000 for landscaping and erosion control on the San Diego Freeway between Waterford Street and Moraga Drive.

In general, the planting will consist of a screen of trees and shrubs on the fill slopes. A great deal of thought was given to the selection of the plant material by H. Dana Bowers of the Sacramento headquarters staff in order to create a landscaped effect that would be in keeping with the attractive residential development in the neighborhood.

The treatment of the median will consist of a solid screen of red oleanders, which have proved to be of great value to the motorists in eliminating oncoming headlight glare.

The reinforced concrete retaining wall fronting the Westwood Village Church will be planted with Boston ivy to improve appearance and to absorb reverberation of traffic noises. Shrubs will also be planted at the base of the retaining wall along this area. It is anticipated that this landscaping project will be let to contract early this summer. Plans are now in the course of preparation for continuing landscaping installations southerly from Waterford Street to Ohio Street.

Outlook for Future

Plans are progressing satisfactorily for the construction of a continuation for the San Diego Freeway from Ohio Street southerly to Venice Boulevard, a length of 3.5 miles. The California Highway Commission on October 19, 1956, in adopting the budget for the 1957-58 Fiscal Year, allocated $6,025,000 for this southerly extension of the San Diego Freeway. With right of way acquisition and clearing substantially completed, it is anticipated that this important unit of construction will be under way this summer. Subsequent units of construction on the San Diego Freeway in the Los Angeles metropolitan area will be required to await future allocations of construction funds by the California Highway Commission.

The San Diego Freeway has its northerly terminus at junction with US 99 near San Fernando, extending southerly through the West Los Angeles area, easterly through Long Beach, southeasterly into Orange County where it joins the Santa Ana Freeway near El Toro, and then continues as US 101 southeasterly to the City of San Diego, its southerly terminus.

The San Diego Freeway is on the United States network of interstate highways that is scheduled for completion within the next 13-year period. It is anticipated that this freeway will be completed throughout its entire length within this period.

Modern Toll Road Projects in Japan

There are some 1,500,000 motor vehicles today in Japan as a result of a 10-fold increase since the war. The length of paved highway, however, is only 9,000 kilometers or 5.8 percent of main highways in Japan. Because of the grade crossings and the mixed traffic on public roads, motor-vehicle traffic cannot travel constantly at high speed. To eliminate such inconvenience and to promote the development of Japanese economy, a system of express highways has been planned. As a first step the Japan Highway Public-Corporation has decided to construct a toll express-highway connecting the six major cities between Tokyo and Kobe, which is regarded to have the largest traffic volume in Japan, and actual construction work is to be started on the route between Nagoya and Kobe before long. Furthermore, the Japan Highway Public-Corporation is responsible for construction and administration of many other useful roads, tunnels, bridges, and ferry services as toll road.

GAS TAX

The average motorist pays $34 a year in state gasoline taxes, according to the California State Automobile Association.

REGIONAL CONFERENCE ON HIGHWAY ENGINEERING PRODUCTIVITY

Nearly 500 highway engineers from more than 30 states took part in an intensive three-day conference at the Biltmore Hotel in Los Angeles, March 5-7, 1957, for the purpose of exchanging ideas and exploring new developments in highway engineering to speed up the preparation of plans and highway construction and to conserve engineering manpower.

The occasion was the Western Regional Conference on Increasing Highway Engineering Productivity. It was the fourth conference of its type held in co-operation with the U. S. Bureau of Public Roads and the American Association of State Highway Officials, previous regional conferences having been held east of the Mississippi.

Also co-sponsoring the Los Angeles conference were the Institute of Transportation and Traffic Engineering and University Extension, University of California; the California Division of Highways; and the Western Association of State Highway Officials.

Message From McCoy

The keynote for the conference was expressed in the welcoming message from G. T. McCoy, State Highway Engineer of California. McCoy noted:

"The impact of the federal highway program has caused us to intensify our search for effective short cuts to reduce the time and engineering manpower needed for the development of plans and the construction of highways."

He added, "I would like to remind you that although we are discussing this subject in terms of conserving engineering manpower, our real goal is, of course, the earliest possible construction of the modern highways the Nation wants and needs."

The ultimate purpose of the conference was further emphasized by Harmer E. Davis, Director of the I. T. T. E., in his summary comments which concluded the event:

"We should not forget that our end-product is highway transportation service and that a variety of factors affect how rapidly and effectively this transportation service can be stepped up to meet the needs of our Nation and to support its economy.

"It so happens that we are here concentrating on a factor that many people thought would be a bottleneck in the production of new highway plans. I mention this to reassure those who might fear that what has developed

View of the Galeria Room in the Biltmore Hotel, Los Angeles, during the Western Regional Conference on Increasing Highway Engineering Productivity. Standing at the rostrum is H. A. Radzikowski, Chief of the Maintenance Branch of the U. S. Bureau of Public Roads. (Photo courtesy Los Angeles Examiner.)

here constitutes a preoccupation with gadgetry and a loss of perspective on final objectives. Actually, what we are witnessing is a taking advantage of modern technology to eliminate a bottleneck, and to bring our whole procedure in line with the demands that must be met."

Panel Discussions

More than 50 panelists presented technical papers and statements during the three full days of the conference. There were no section meetings; all the sessions were general, to insure the fullest possible interchange of ideas among the various specialists in different phases of highway engineering. The panel members discussed the experience of various state highway departments, other agencies and engineering organizations in developing and using different methods of conserving engineering time and manpower. The California Division of Highways was represented on more than two-thirds of the panels.

After a statement of the objectives of the conference by H. A. Radzikowski, Chief of Maintenance Branch, U. S. Bureau of Public Roads, the conference spent the entire first day on the use of electronic computers in various aspects of highway work.

Electronic Computers

Several hours of discussion were devoted to the application of electronic computers to highway location and design, right of way and earthwork computations, bridge design and geometrics, traffic studies, cost analysis and other phases of highway engineering. For the most part, these discussions consisted of a series of reports from different states and organizations and the B. P. R. on their use of electronic data processing machines for a variety of engineering purposes.

On the second day the initial emphasis was on photogrammetry and other improved methods of obtaining and using survey data. An opening session on this subject was followed by a discussion of possibilities still largely in the experimental stage, but rapidly approaching practical application—the "marriage" of electronic computation and photogrammetry. The objective in this respect is the direct production of cross section and mass diagram drawings as well as quantitative information from photogrammetric sources by means of electronic computation.

The first afternoon session which followed was concerned with the establishment of a program library among the various agencies and organizations using electronic computations for highway purposes. This topic was also the subject of a two-hour evening discussion the same day.

Sharing Organization

At this evening meeting it was decided that a sharing organization would be set up in which the manufacturers of each type of equipment would furnish on request a copy of the developed programs. These programs would be available to all agencies and concerns which are willing to contribute their own programs to the sharing organization.

Another aspect of electronics, its use in the communications field, was was the subject of another panel discussion. This session covered the use of radio in highway maintenance and other operations, the expanding use of electronic controls in integrated traffic signal systems and the possibilities of traffic signs that can be revised by remote control to alert motorists to changing highway conditions.

On the final day the conferees turned their attention away from the expanding world of new devices and machines to the continuing effort to increase engineering productivity by improving established techniques and methods. Eight panelists (two from the California Division of Highways) reported on the successful steps taken by their organizations to conserve engineering time and manpower by means of standardization of bridge design details, plan simplification, photographic reproduction of plans, etc.

Short Cuts in Construction

The two concluding panels were devoted to the construction equipment and contracting industries. Representatives of the equipment manufacturing industry and of construction firms submitted to the audience of highway engineers numerous ideas for short cuts in construction procedures aimed toward getting the roads built faster and more economically, with more efficient use of available engineering personnel.

In his concluding summary, Mr. Davis reviewed the status, as reported by the panelists, of current progress in the fields of aerial surveys and photogrammetry; traverse, earthwork and structures; computations; traffic controls; and traffic studies.

In the latter connection he predicted that the next five years would see development of a "workable traffic flow theory," made possible by the analytic study of traffic flow by high-speed computers.

Davis also pointed out that the reports at the western conference constituted a factual record of accomplishment that was "amazing."

"A year ago, at a meeting similar to this in Chicago," he said, "most people were discussing what they intended to do in utilizing these new methods and techniques. Here we have laid before us incontrovertible testimony of a fact accomplished.

Program Will Not Lag

"We can now say, with confidence, that the great highway development program, on the beginning stages of which we are now engaged, will not lag because plans, designs and estimates cannot be gotten out. These accomplishments should stand as concrete evidence to Congress that the highway engineering agencies have the necessary tools sharpened, and the highway program should go forward as planned."

With regard to the implications for the engineer in the application of high-speed computers and other new tools, Davis observed:

"You might say that we are now in a position to do for the drudgery of highway engineering what power equipment has done for the hand labor of highway construction. As one speaker remarked, these technological improvements 'can make the engineer the master of his tools rather than the slave of his calculations.' * * * Here is a renaissance in engineering."

One aspect of the "mastery of the new tools" cited by Davis was in the matter of highway location. Referring to a paper presented at the

conference by T. F. Morf of the Illinois State Highway Department, Davis said:

Important Factors

"In earlier days, a balanced gradeline was the goal. The line or location was selected by the skill of the locating engineer. Then other requirements began to take an important place, such as drainage. More recently, traffic requirements and land values and uses have become important criteria. But the overwhelming magnitude of the computations has precluded the possibility of real location comparisons, in which construction economy, operational economy and community economy could be appropriately expressed at one and the same time.

"Now the possibility of location comparisons that give a quantitative basis for defensible decisions is almost within grasp. An intriguing possibility is the development of 'programs' for location itself. We have in prospect a brand of real design that we formerly considered too idealized to do anything about, except put it into the preface of an academic textbook."

The same implication, he added, is involved in the adaptation of electronic computer methods to structural design:

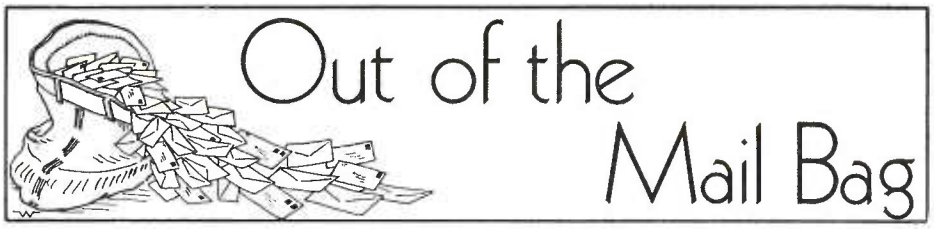
"We have long leaned toward statically determinate structures, partly because of uncertainties in the analysis of statically indeterminate behavior, and partly because of the great length of calculations for statically indeterminate structures. Now we have in prospect the possibility of design comparisons which can lead to true economies."

Deputy State Highway Engineer C. E. Waite of California served as general chairman for the conference.

Some 50 of the highway engineers from other states remained in Los Angeles an extra day to take a tour of the Los Angeles area freeways completed and under construction. The tours were arranged and guided by members of the District VII staff of the Division of Highways.

Coincident with the three-day conference, the Board of Directors of the American Road Builders Association held a business meeting at the Statler Hotel in Los Angeles. It was the first A. R. B. A. board meeting ever held on the Pacific Coast.

Throughout the conference exhibits and demonstrations of equipment were conducted by manufacturers of computing machines and other concerns.



FROM MILAN

MILANO, 15 FEBBRAIO 1957

COMUNE DI MILANO
Ufficio Tecnico
L'Ingegnere Ispettore

MR. K. C. ADAMS, *Editor*

I thank you very much for *California Highways and Public Works*. As I have written to you, I am inspector of the roads and the traffic in Milan.

I am also a designer of the new Italian turnpike between Genoa and Milan. I have therefore great interest in public works generally.

But we think that California is the country where the study and the application of these problems and of road techniques are more advanced. We look especially to your freeways, conceived not as single and separated arteries, but as a rational system, able to serve an entire region.

Your very fine magazine, which tells us so much about your solutions, is extremely useful to us.

Yours truly,

DR. ING. ALDO DI RENZO
Ispettore dell'Ufficio Tecnico
Municipale
Via Larga 12—Milano (Italia)

MOTOR VEHICLES IN U. S.

There are 54,300,000 passenger cars and 10,975,000 trucks and busses in use in the United States today. The National Automobile Club points out that that makes a grand total of 65,275,000 motor vehicles, a 90 percent increase in 10 years.

TOLL HIGHWAYS IN JAPAN

JAPAN HIGHWAY PUBLIC CORPORATION
1-1 Tamura-cho, Shiba,
Minato-ku Tokyo, Japan

MR. KENNETH C. ADAMS, *Editor*

DEAR SIR: I would like to express my cordial gratitude for the kind and efficient advices and many kinds of useful information which your Division of Highways gave me on my visit to your Los Angeles and San Francisco district offices in November, 1956.

I do hope that your division will be kind enough to give us continuing aid hereafter, which, I believe, will be of great help to our corporation and will provide us with valuable guidance to construct and administer the toll roads in this Country.

With my best regards, I remain,

Yours very truly,

KENICHI FUJIMORI
Chief of Plan and Coordination Section

WE LIKE THEM, TOO

COLUMBIA, SOUTH CAROLINA

California State Highway Commission

DEAR SIRS: My wife and I have just returned from a two months' tour of the western United States, and after spending about half of that time in your State I would like to tell you what a privilege it was to travel on such wonderful highways.

You are to be commended on having the best network of highways, boulevards, and freeways of all the 40 states in which we have traveled. It did not make any difference where we went, as long as we were in California, we knew we would have a good road or boulevard.

Yours very truly,

J. C. DREHER

California Bridges

Construction Costs Continue to Rise

By H. K. MAUZY, Senior Bridge Engineer, and
W. J. YUSAVAGE, Assistant Research Technician

This article is the fifth of an annual series dealing with California bridge construction costs. The most recent article appeared in the March-April, 1956, issue.

For total California highway construction costs the reader is referred to a series of articles entitled, "Cost Index" by R. H. Wilson, H. C. McCarthy, and L. B. Reynolds. These articles appear regularly in California Highways and Public Works.

THE MODERATE rise in bridge construction costs which began in the second quarter of 1955 continued into 1956 and, during the second quarter, broke sharply upward to an unprecedented high of 284. The levels of the third and fourth quarters with readings of 260 and 273 confirmed the fact that a major cost break-through had occurred and that, consequently, the general level of costs can be expected to run at this higher level into the calendar year 1957.

In terms of average annual index values, the cost level has been on the rise for the past three years as is indicated by the values of 219, 228, and 265 for the calendar years 1954, 1955, and 1956 respectively. The values represent a 21 percent cost increase between the two years 1954-56 and a 15 percent cost increase between the years 1955-56.

The level of costs for successive periods is presented graphically in the accompanying chart which summarizes the course of California bridge construction costs since 1933.

Value and Volume of Bridge Construction

Table I is a tabulation of statistics relating to the value and volume of the California Bridge Department construction program. The current value is shown in column VI where the

TABLE 1

INDEXES RELATING TO CALIFORNIA BRIDGE CONSTRUCTION AND PERIODIC DOLLAR VALUES OF LOW BIDS ON CALIFORNIA BRIDGE CONSTRUCTION

I Year	II Quarter	III Index of the cost of California bridge construction (1939-1940—100)	IV Index of the value of California bridge construction (1939-1940—100)	V Index of the volume of California bridge construction (1939-1940—100)	VI Dollar value of low bids on California bridge construction (in millions of dollars)
1934		94	*60	*64	3.1
1935		88	*138	*157	7.1
1936		98	*72	*73	3.7
1937		114	*60	*53	3.1
1838		99	*78	*79	4.0
1939		101	*99	*98	5.1
1940		99	*101	*102	5.2
1941		122	*78	*64	4.0
1942		158	*80	*50	4.1
1943		165	*16	*9	.8
1944		153	*29	*19	1.5
1945		167	*109	*65	5.6
1946		182	*247	*133	12.7
1947		215	*443	*202	22.8
1948		229	*307	*134	15.8
1949		201	*233	*117	12.0
1950		202	*262	*129	13.5
1951	1st	243	528	217	6.8
1951	2d	250	948	379	12.2
1951	3d	*248 256	*617 598	*247 234	31.8 7.7
1951	4th	253	396	157	5.1
1952	1st	239	396	166	5.1
1952	2d	236	1,017	431	13.1
1952	3d	*235 239	*561 652	*237 273	28.9 8.4
1952	4th	223	179	80	2.3
1953	1st	243	140	58	1.8
1953	2d	224	707	315	9.1
1953	3d	*229 231	*522 893	*227 387	26.9 11.5
1953	4th	235	350	149	4.5
1954	1st	221	691	313	8.9
1954	2d	217	1,196	551	15.4
1954	3d	*219 220	*870 1,002	*399 455	44.8 12.9
1954	4th	213	590	277	7.6
1955	1st	217	1,039	477	13.3
1955	2d	237	500	211	6.4
1955	3d	*228 228	*930 1,047	*408 461	47.9 13.4
1955	4th	237	1,148	484	14.7
1956	1st	245	833	715	25.1
1956	2d	284	1,083	232	7.8
1956	3d	*265 260	*1,117 604	*422 381	57.5 13.9
1956	4th	273	1,952	213	10.7

* Average annual information.

figures represent the current dollar value of low bids for the various periods since 1934. Columns IV and V give the value and volume of bridge construction in the form of indexes, utilizing the value of base period 1939-40 as the reference point of 100.

The index of value is computed by relating the value of any quarter to the average quarterly value ($5.1 + 5.2 million/8=$1,287,500) of the eight quarters of 1939-40. Thus the value index for the fourth quarter of 1954 is $7,600,000/$1,287,500 or 590.

The volume of bridge construction is defined as the relative physical quantity of bridge construction put in place during a given period. It is an inverse function of the cost index since a higher level of costs reduces the relative value of money and so reduces the relative volume of construction while a lower level of costs increases the relative volume of construction.

The index of volume is computed in exactly the same way as is the index of value after each of the quarterly dollar values has been modified by the cost index values of the respective quarters. Thus the adjusted value for the fourth quarter of 1954 is $7,600,000/213 (cost index) $3,568,000. This new value is then related to the average quarterly value of the eight base quarter values of 1939-40, as $3,568,000/$1,287,500 or a volume index of 277, The 277 indicates that the actual physical bridge construction activity during the fourth quarter of 1954 was 277 percent greater than that which occurred during 1940.

Bridge Building Increases

The value and volume indexes show the marked increase in bridge construction which has accompanied the augmentation of state highway budgets during recent years. As a result of legislation which substantially increased highway user tax revenues during 1953 and the consequent continued development of full freeways with their requisite separation structures, expenditures during the past year for bridge construction rose to nearly $58,000,000 or to approximately 1,117 percent of the average annual rate of expenditure during the base period 1939-40.

The data do not as yet reflect the effect of the currently operative U. S. Highway Program upon California's bridge program. This program will have its initial effect upon bridge construction during 1957 and will then continue in the subsequent years. The budget for the Fiscal Year 1957-58 proposes an increase of approximately 37 percent over that of Fiscal Year 1956-57, or an increase of about $20,000,000. This increase will, of course, have a decided impact on the demand for construction materials and also upon the number of bridges let to contract during 1957.

General Trends

Average unit prices for the various items of construction as compiled for each quarter show a general upward trend for all quarters of 1956. Average annual prices went up generally within the range of 15-18 percent. The prices for three items—structure excavation, plate girders, and driving piles—rose 30-34 percent above the average annual prices of 1955.

The increase in unit costs of concrete products is generally attributed to increased labor, equipment, and transportation costs. Steel products, on the other hand, are higher because of a combination of increased costs and of rather severely limited available supplies. This is especially true with respect to steel plates for which there has been and still is a heavy demand from the heavy construction industry and the greatly expanded programs for the construction of oil tankers and pipe lines. Current information assumes that plates will continue in short supply for an indefinite period.

Outlook

The current upward trend of construction costs reflects the prevailing trends of higher costs for all elements involved in construction, viz., labor, materials, equipment rental, and money. In addition to the generally

... Continued on page 45

Now Read This

Carquinez Bridge Project Tests Ingenuity of Engineers

By LEONARD C. HOLLISTER, Projects Engineer, Carquinez *

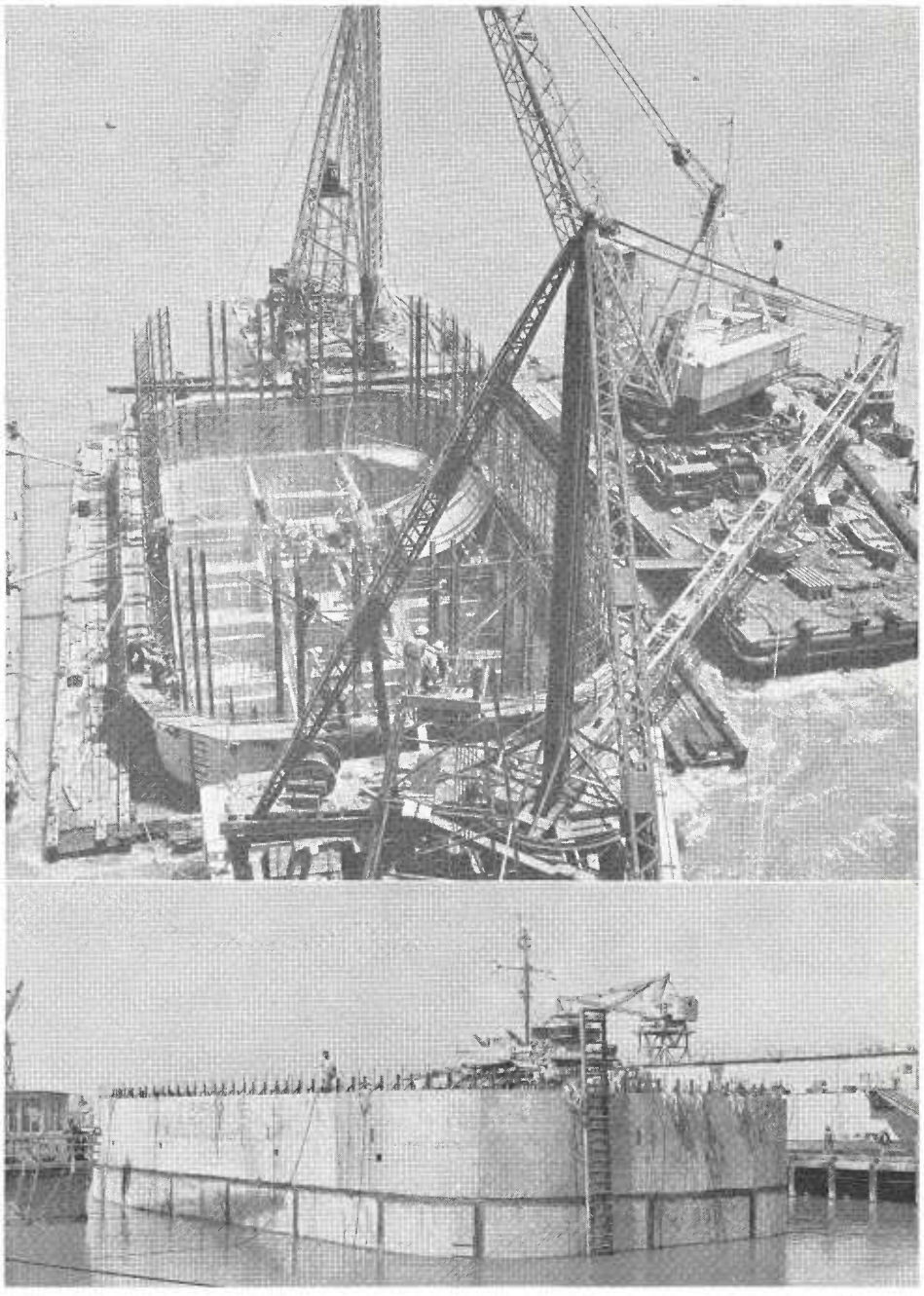
THE SUBSTRUCTURE work for the main bridge across Carquinez Strait involves the construction of an anchorage abutment set in a shale and sandstone cliff at the north end of the bridge to support the 500-foot anchor arm of the truss span, three caisson piers founded on bedrock about 132 feet below water line, one cofferdam type pier supported on 240 80-ton steel bearing piles, and an anchorage pier 125 feet high located at the south end of the bridge. This foundation work is under contract to Mason & Honger, Silas Mason Inc. & F. S. Rolandi Jr. Inc., at an approximate cost of $5,500,000.

The three deep water caissons are identical in design being 53 feet wide by 102 feet 6 inches long. They are of reinforced concrete construction with outer walls 3 feet in thickness and inner walls 2 feet 6 inches in thickness. Each caisson is divided into 18 dredging wells approximately 14 feet square. The four corners of the caisson are rounded to a 12-foot radius to reduce pressures during sinking operations from high velocity currents. The bottom 13 feet of the concrete walls are protected by structural steel cutting edges fabricated by welding from ⅜-inch, ½-inch and ¾-inch steel plates.

These steel cutting edges each weighing about 400,000 pounds per caisson were fabricated at the Bethlehem Pacific Coast Steel Shipbuilding Yards approximately 32 miles from the bridge site. Cutting edges were fabricated in sections pre-assembled in the fabricating yard for fit and then assembled on a shipbuilding dry dock and welded together.

New Precast Slabs

Following this assembly on the drydock the cutting edges were filled with concrete and the outside walls of the caisson were extended to a total height of 31 feet by placing four-inch precast slabs around the periphery of the caisson.



UPPER—Picture shows work being done on one of the caisson piers. Here heavy equipment is setting forms preparatory to placing a 10-foot lift of concrete in the side walls and partitions. LOWER—Picture shows one of the caisson piers floating at the Bethlehem Pacific Coast Steel Company's shipyard. After it has been thoroughly tested for flotation it will be towed to the bridge site.

The use of these four-inch precast slabs is a new innovation designed by the contractor for use in reinforced

* This is the second of two articles on Carquinez Bridge Project by Mr. Hollister—*Ed.*

concrete caisson construction. The slabs become an integral part of the three-foot thick outside wall when the caisson is completed. They were precast at the Basalt Rock Company plant and transported 39 miles by barge to the drydock and later about nine miles by truck to the bridge site.

The slabs were cast in sections 10 feet high by 16 feet long, and reinforced at center of slab with three-eighths-inch vertical bars 11-inch centers and three-eighths-inch horizontal bars six-inch centers. Outside surface was cast smooth and inside surface roughened and keyed for bonding to the poured-in-place section of the outside wall.

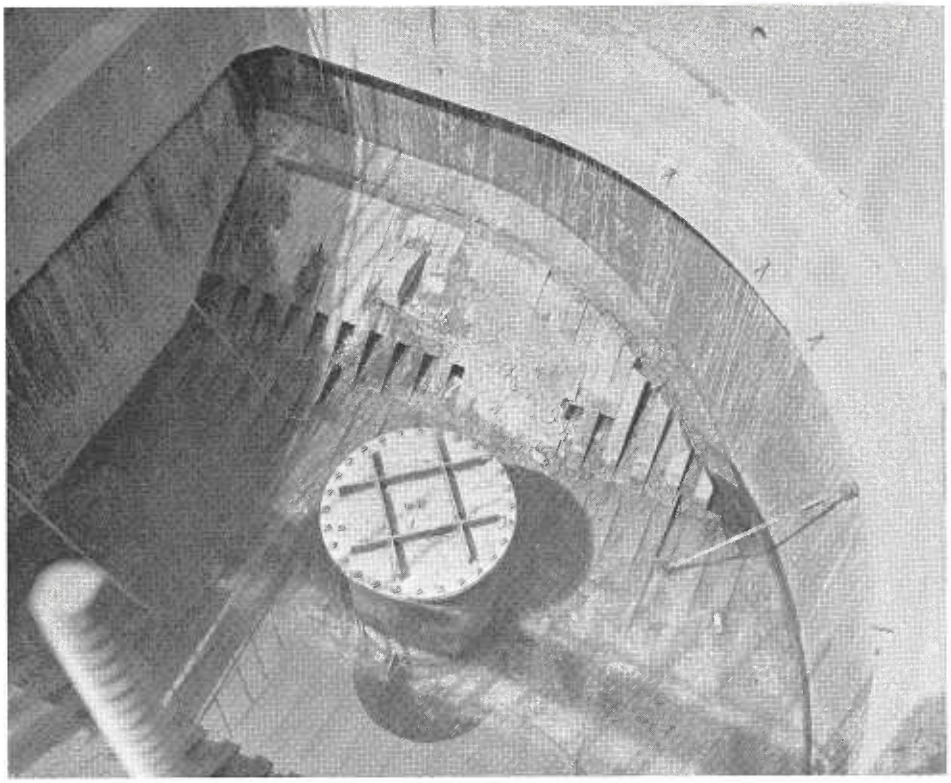
Support for Slabs

To support the slabs small vertical steel trusses 25½ inches deep were fabricated and cantilevered up from the top of the concrete and steel cutting edge below. The slabs were then secured to these trusses and the horizontal reinforcing slab bars welded at the joints between slabs. After erection there remained in the vertical joints a clear opening of one-eighth to one-fourth inch, at horizontal joints slab edges were seated on each other and there was no clear opening. To seal these joints and make them water tight the contractor used a commercial application of fiberglas fabric and fiberglas sealing compounds.

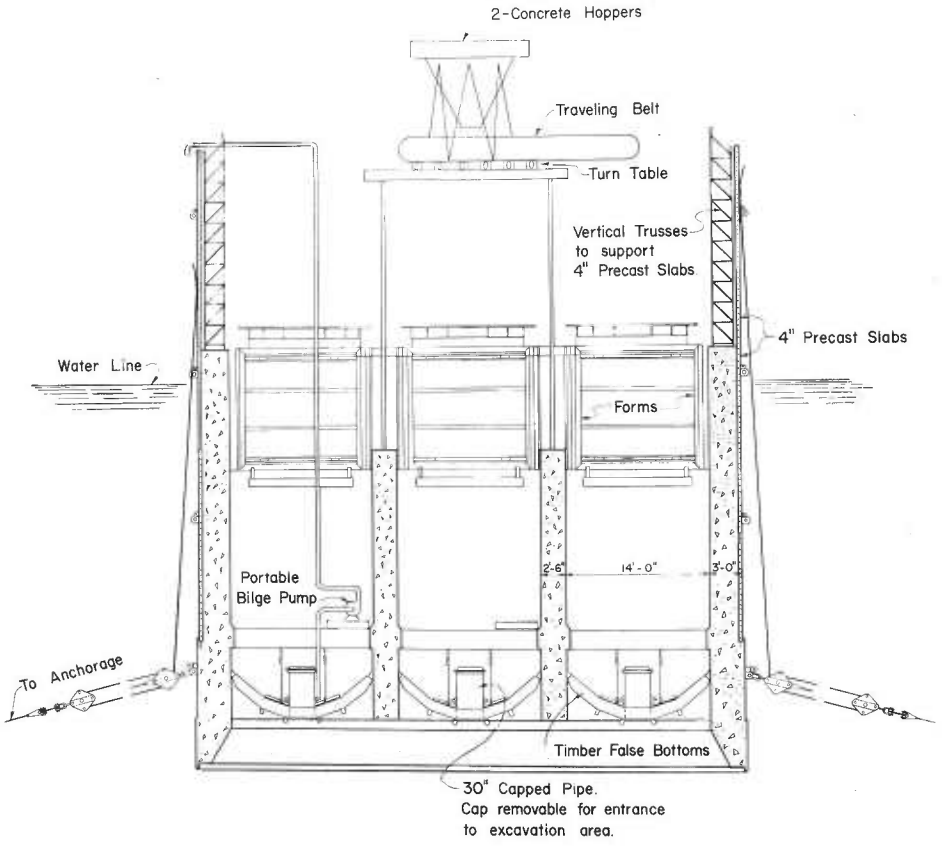
There are several advantages to this type of construction. It greatly increases the flotation qualities of the caisson by making the top 20-foot portion of the outside wall four inches thick as compared to 36 inches, thereby reducing total weight considerably. The precast slabs save the time and expense of placing and removing outside form work. This tends to speed up construction at bridge site during sinking operation. There is also provided an additional safety factor, since slabs can be placed quickly, and joints sealed to provide additional freeboard and bouyancy should the need arise.

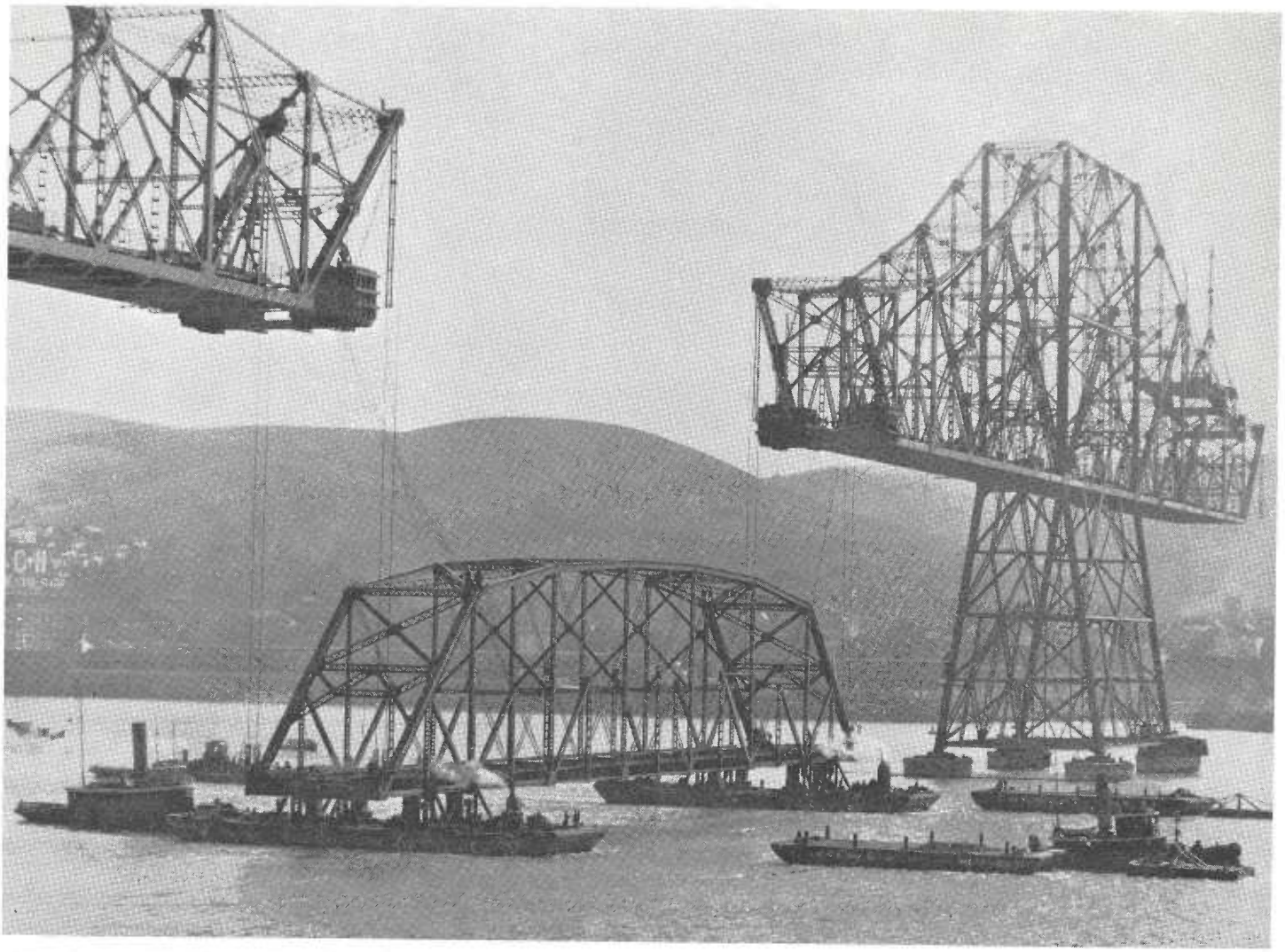
Dredging Wells Sealed

Bottoms of dredging wells were sealed with "false bottoms" fabricated from heavy timbers. Through each of the "false bottoms" there is placed a short section of 30-inch steel pipe. In-



UPPER—Picture shows the bottom of one of the corner caisson walls. Timber false bottom can be seen. The 30-inch capped pipe provides the contractor with access to underside of caisson. Jets and pumps can be lowered through 30-inch pipe and the bottom pumped out from under caisson allowing it to sink until it reaches bedrock. LOWER—Sketch showing equipment used in sinking the three caissons to bedrock. Jets and pumps can be lowered through any of the 30-inch pipes located at center of each dredging well. Contractor can also remove the whole bottom of any well and excavate by using a clamshell bucket if necessary.





Picture taken in 1927 during erection of the existing bridge. The same contractor (American Bridge Division of United States Steel Corporation) will erect the new bridge but will use a different method. This time contractor proposes to erect the center suspended span by cantilevering each half out to the center then bolting the two halves together with high-strength steel bolts. In this picture the center suspended span has been erected on barges and is being raised into position by counter weights much the same as an elevator moves up and down.

side of this there is a supplementary "false bottom" in the form of a concrete plug which can be removed and replaced whenever desired.

The purpose of these 30-inch steel pipe entrances to the bottom of the caisson is twofold. It makes access to the excavation area under the caisson possible for inspection purposes. This will be desirable in case of excavation difficulties during sinking operations and for final inspection when the caisson comes to rest on bedrock at the bottom. The other purpose is to provide access for lowering high-pressure jets and pumps into the excavation area below the caisson.

Here again the contractor has developed a new method of sinking the caissons through the mud, sand and gravel material overlaying the bedrock foundations.

Instead of the conventional method of excavating the material from beneath the caisson by clamshell buckets lowered through the dredging wells, the contractor proposes to jet and pump.

Use of Sets

This is being accomplished by extending the 30-inch steel pipes and lowering through the four center dredging wells four Chicksan Intelli-Giant Jets. These jets can be operated at pressures from 30 to 300 psi per square inch. They are so rigged that they can be lowered or raised vertically, turned in any direction horizontally, or positioned at various vertical angles. These jets are sufficiently powerful to cut loose the overburden after which it is pumped to the surface where it is discharged into barges and transported to a predetermined disposal area.

The contractor has predredged the area under each caisson to about 100 feet below water surface which leaves remaining about 32 feet of mud, sand and gravel through which each pier must be lowered. Pier No. 2 has now been sunk to bedrock at about elevation –132. The "false bottoms" were removed when north edge of caisson rested on rock at elevation –129. It was necessary to blast out along north edge for about 2 to 2½ feet in order

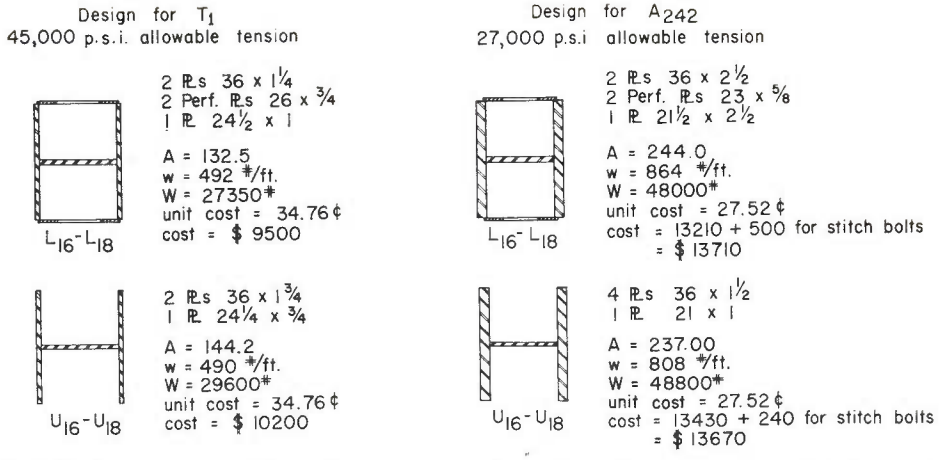
to level the bottom of caisson within specification requirements. Bottom of Pier No. 2 is now ready to be sealed with 25 feet of concrete.

Land-based Concrete Plant

For concreting the contractor has constructed a land-based concrete plant on the south shore. This plant has a capacity of about 120 cubic yards per hour. Concrete is discharged into six-cubic-yard buckets and barged to the piers in three specially constructed barges capable of carrying eight buckets each. About 20 minutes are required from the time barge leaves mixing plant until cranes pick up buckets for unloading into concrete hoppers at the pier.

For placing concrete in pier walls and partitions two concrete hoppers are set one at the center of each half pier. The hoppers discharge onto traveling belts which can be turned and extended to discharge at any point on the half pier. One 10-foot section of pier can be poured in one day. About four days are required to allow concrete to set, move forms and place reinforcing for the next 10-foot section, making sinking operations at the rate of about 10 feet per week.

The pier protection fender system is of reinforced concrete slabs and girders supported by 150-foot steel pipe piles 24 inches in diameter and filled with concrete. The steel pipe piles were fabricated from one-half inch steel plate and were put in place by jetting. When piles reach bedrock a spud was used to break up shale and sandstone which was pumped to the surface while the pile was being driven about three feet into the bedrock to form a key. Once the pile was located in the driver and jets rigged up it required only about 20 minutes to jet and drive the steel shell pile into bedrock.



Sketch showing comparison between the new type strength steel and the regular moderality high strength steel. These studies were made to determine the most satisfactory and economical type of steel to use in the makeup of the heavily stressed truss members for the 1,100-foot-long cantilever spans.

Superstructure Contract

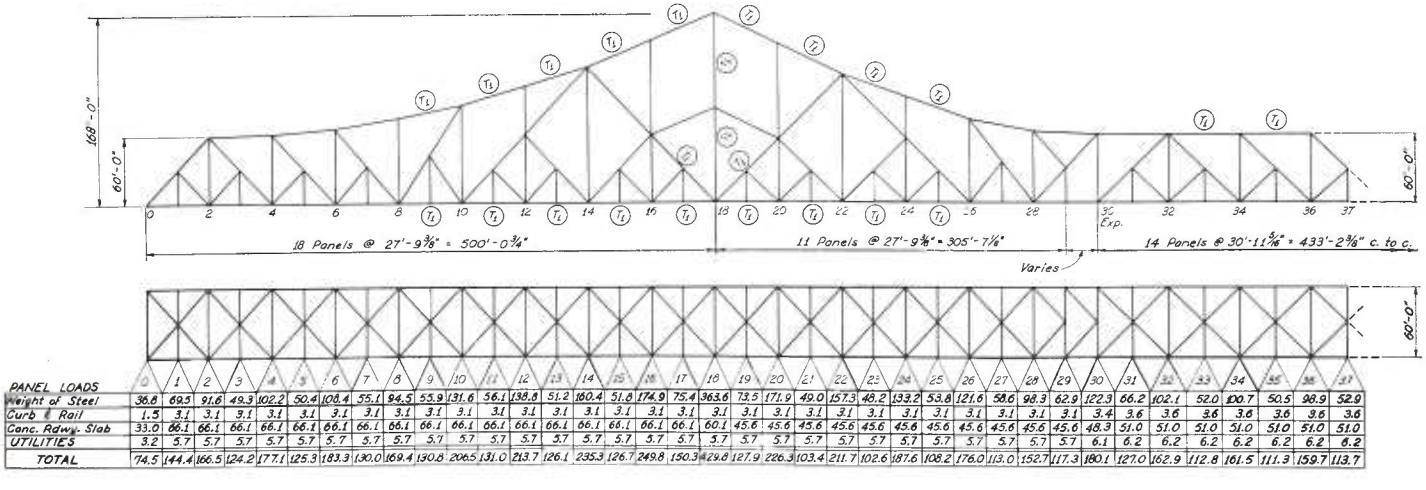
The main portion of the Carquinez Bridge superstructure consists of double cantilever truss spans with a central tower of 150 feet. The two end anchor arms are each 500 feet with two central spans each 1100 feet making the total length of main structure 3300 feet. The two suspended spans are each 433 feet 2⅜ inches long. This work is under contract to American Bridge Division of the U. S. Steel Corp. at an approximate cost of $9,500,000.

Trusses are 60 feet center to center and support a 52-foot concrete roadway with two 1-foot 10½-inch steel curbs. The roadway slab for the two anchor arms is to be of standard weight concrete while the slab for the remaining portion of the structure is to be light weight concrete at 100 pounds per cubic foot.

Three types of steel were used in the design of the superstructure. They were A7, A242 and T1 and the allowable unit tensile stresses were as follows:

A7—18,000 psi—all thicknesses
A242—27,000 psi—less than ¾ inch
A242—24,000 psi—¾ inch—1½ inches
T1—45,000 psi—all thicknesses

Sketch showing outline of truss with members fabricated from T1 steel indicated. Most other truss members are fabricated from A242 steel except for those very lightly stressed. Main dimensions of truss and dead panel loads are also indicated.

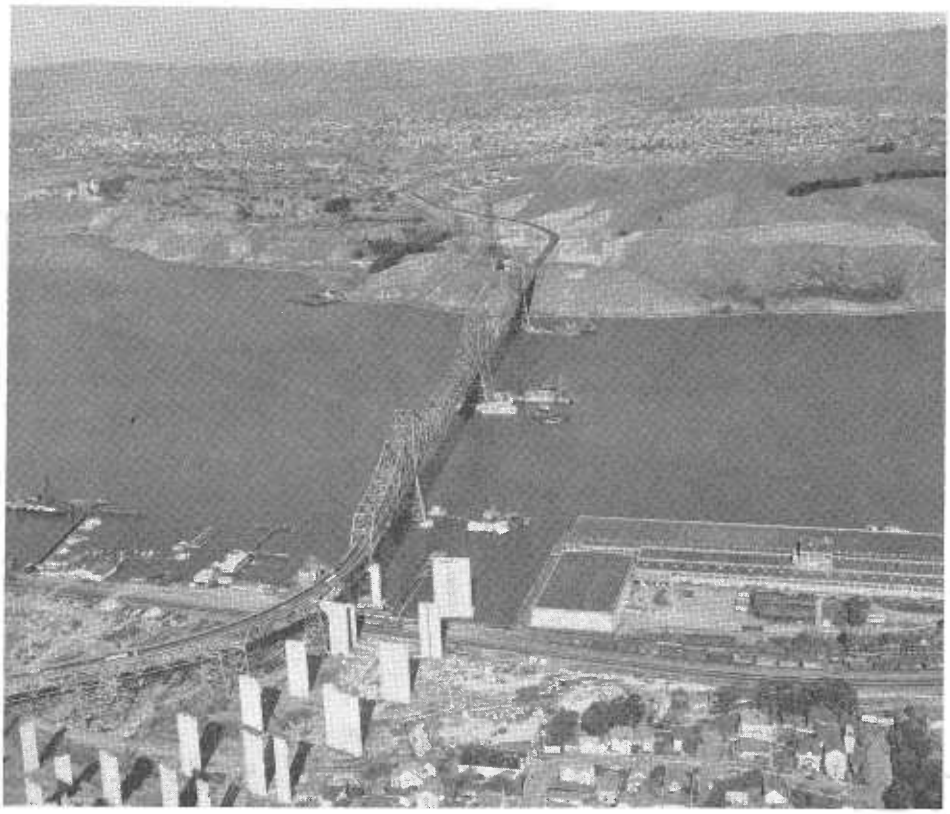


PANEL LOADS	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Weight of Steel	36.8	69.5	91.6	49.3	102.2	50.4	108.4	55.1	94.5	55.9	131.6	56.1	138.8	51.2	160.4	51.8	174.9	75.4	363.6	73.5	171.9	49.0	157.3	48.2	133.2	53.8	121.6	58.6	98.3	62.9	122.3	66.2	102.1	52.0	100.7	50.5	98.9	52.9
Curb & Rail	1.5	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.4	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Conc. Rdwy. Slab	33.0	66.1	66.1	66.1	66.1	66.1	66.1	66.1	66.1	66.1	66.1	66.1	66.1	66.1	66.1	66.1	66.1	66.1	60.1	45.6	45.6	45.6	45.6	45.6	45.6	45.6	45.6	45.6	45.6	45.6	48.3	51.0	51.0	51.0	51.0	51.0	51.0	51.0
UTILITIES	3.2	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	6.1	6.2	6.2	6.2	6.2	6.2	6.2	6.2
TOTAL	74.5	144.4	166.5	124.2	177.1	125.3	183.3	130.0	169.4	130.8	206.5	131.0	213.7	126.1	235.3	126.7	249.8	150.3	429.8	127.9	226.3	103.4	211.7	102.6	187.6	108.2	176.0	113.0	152.7	117.3	180.1	127.0	162.9	112.8	161.5	111.3	159.7	113.7

Design of Cantilever Trusses

In the design of cantilever trusses of this length, supporting four lanes of traffic with a concrete floor slab, one of the big problems has always been the makeup of the heavily stressed members in the area of supporting towers. These members frequently contain so many thick heavy plates that their resistance to bending between joints produces high secondary stresses, sometimes greater than the primary stresses. In the past some of this difficulty with high secondary stresses has been overcome by the use of pinned connected eye bars and pin connected compression members. The reliability of the pin connected compression member to relieve secondary stresses has been somewhat questionable, since the moment required to produce rotation in the pin may be as large as the moment induced by the secondary stress.

In any event the use of a high strength steel which would allow the makeup of members to retain reasonable flexibility appears to be the best answer in this case to the problem of secondary stresses.



Picture shows foundation work in progress for the main bridge. Caisson Pier No. 2 in water at far side of Carquinez Strait has now been sunk to bedrock. Caisson Pier 3A at center is now being lowered.

Comparative Designs

Comparative designs between the use of A242 and T1 for these critical members gave the following approximate figures:

	A242	T1
Maximum deadload truss deflection	100%	130%
Moment of inertia L16 L18	51,900 in-4	17,700 in-4
Bending stress L16 L18	19,200 psi	2,900 psi
Ratio secondary stress to primary stress L16 L18	110%	10%

From these comparative figures it can be seen that the high strength steel has a considerable advantage from a design standpoint and also indicates greater economy.

Using the unit bid prices for A242 and T1 received from the low bidder the total saving made by the use of T1 for the critical members was estimated to be approximately $800,000.

Before deciding on the use of this steel the California Division of Highways Testing Laboratory ran extensive tests on the parent metal and butt welded joints made from ½-inch, 1-inch and 1½-inch sample T1 steel plates. The butt weld samples were made by using a semiautomatic shielded arc, automatic submerged arc, and three types of manual low hydrogen processes.

The averaged test results for the parent T1 steel indicated a yield strength of 111,000 per square inch, ultimate strength of 120,000 per square inch, and an endurance limit of 55,000 per square inch. The steel exhibited excellent ductility.

The welded joints provided joint efficiencies from 87 percent to 100 percent of the ultimate strength of the parent metal and endurance ratios of 27 percent to 45 percent of the ultimate strengths of the corresponding welded joints. The welds exhibited moderate ductility and some porosity.

Butt Welded Joints

It was necessary to give considerable attention to butt welded joints of T1 steel because rolling limits will not permit full length plates for member makeup. Advantage was taken of this however by increasing plate thickness near joints to compensate for loss of net section due to holes for truss joint connections.

Experience gained by the California Division of Highways on the design and fabrication of thousands of tons of steel girders in the past few years prompted the consideration of steel truss members fabricated by welding in lieu of the customary stitch rivets.

This appeared to have considerable advantage such as: (1) the number of member shapes could be reduced to three for H sections, four for box sections, and five for box sections with interior webb; (2) makeup of all members can be made from plates only, eliminating the use of connecting angles; (3) shop fabrication has a good opportunity to be greatly simplified with a corresponding reduction in cost, because all stitch riveting and fitting is replaced by four continuous fillet welds; (4) maintenance, always a costly item near coastal waters, should be made easier by the smooth surfaces which are free from rivet heads, lacing bars and other small vulnerable details which are costly to clean and paint.

High Strength Bolts

Design plans call for field connections at truss joints to be made by high strength bolts with the contractor having an option between

rivets and high strength bolts for shop connections. Shop plans now being prepared by the fabricator, which is the American Bridge Division of the United States Steel Corporation, indicate that high strength bolts have been chosen for shop connections. High strength bolts for field connections were decided on for several reasons. First, it was the opinion of designers that the numerous past tests have indicated that the average high strength field bolt is superior to the average field-driven rivet in performing the fastening job that it is designed to do. The field inspection for a good high strength bolt is more positive than the inspection for a satisfactory field-driven rivet. The development and training of an efficient bolting crew is much easier than the development of an efficient riveting crew.

For these reasons designers felt that high strength bolts have an excellent opportunity to make possible more reliable field joints at reduced costs.

Field erection of the superstructure is to start in April, 1957.

Toll Plaza

The toll plaza will consist of an administration building and 16 onside modern barrier-type toll booths, with provision for four additional toll booths should future traffic demand require them.

Each toll booth will be equipped with automatic axle counters and photoelectric vehicle counters.

There is to be a nominal fee of 25 cents for passenger cars; trucks will be charged by the axle rather than by weight. Administration of the toll collection will be under the jurisdiction of the Division of Highways and will be operated by the same staff now being used to operate the San Francisco-Oakland Bay Bridge, the Richmond-San Rafael Bridge, San Mateo-Hayward, and Dumbarton Toll Bridges.

The Carquinez Bridge Project should be completed by October or November, 1958. All of the work in connection with these projects has been assigned to the Division of Highways by the California Toll Bridge Authority.

BRIDGES

Continued from page 39 . . .

higher cost is the emergence of a situation of relatively reduced competition resulting from the currently expanded programs of heavy construction.

The rise in construction costs is a part of the general price rise occurring throughout all phases of the economy. A majority of economists are of the opinion that the inflationary trends are the pattern of the current economy. In support of this thesis they cite: (1) The government's active intervention in the field of monetary controls; (2) The labor-management contracts whereby labor rates are either determined by official cost indexes or by long term contracts which call for annual wage increases; (3) The increasing trend on the part of many heretofore "backward" nations toward industrialization and the consequently increased competition for the world's rigidly limited supply of raw materials. These factors, the economists contend, inevitably lead to a creeping type of inflation on the order of 3-5 percent per year.

The situation insofar as California bridge construction costs are concerned is analagous to that of the broader economic pattern. Price advances are sometimes more dramatic but the long term trend is in the direction of an upward creep of about 5 percent, an increase which stems directly from the existing pattern of annual wage increases and the concomitant price increases of all cost elements associated with the industry.

In view of these circumstances it may be assumed that the California Bridge Department Cost Index will very likely reach a value of 285 during 1957, or a value which is about 5 percent greater than the value of 273 for the fourth quarter of 1956.

THE WORST TYPES

If you're a speeder, lane jumper, or bumper rider, you have the dishonor of being one of the three worst types of problem drivers in the United States today.

That, according to the National Automobile Club, is the opinion of 33 honored cabbies who have driven a total of 834 years and about 22,000,000 miles with nary an accident.

Common courtesy, the cabbies agree, would eliminate some 65 percent of all traffic accidents.

In Memoriam

A. D. EDMONSTON

A. D. Edmonston, 70, who retired as State Engineer in November, 1955, died on February 22d in Stanford Lane Hospital, San Francisco, where he had been under treatment three weeks.

Edmonston had 31 years of state service. Beginning as a hyldraulic engineer in 1924, he served for many years as one of the original collaborators on plans for the Central Valley Project. From 1937 through 1945 he was chief hydraulic engineer in charge of formulating the California Water Plan. In 1945 he became assistant state engineer under the late Edward Hyatt, and succeeded him as state engineer and chief of the Division of Water Resources upon Hyatt's retirement in 1950.

The position of State Engineer was the chief water planning job until the organization last year of the new State Department of Water Resources.

Edmonston directed most of the original studies on the Feather River Project and the California Water Plan, both plans now pending before the current session of the State Legislature.

Edmonston was born November 12, 1886, in Ferndale, Humboldt County, California. He was graduated from Stanford University in 1910. He served in World War I as a lieutenant with the Army Corps of Engineers.

He was a member of the American Society of Civil Engineers, the Commonwealth Club, the American Deophysical Union, and Tau Beta Pi engineering fraternity.

He is survived by his wife, Dell, of Sacramento; his sons, Donald, a graduate student at University of California, and Robert, an engineer with the Department of Water Resources, Los Angeles office; a sister, Emma Edmonston of Palo Alto, and a brother, John Edmonston.

Employees Receive Twenty-five-year Awards

Employees of the Division of Highways who become eligible for 25-year awards on January 31, and February 28, 1957, and on August 31, 1956, are:

Name	Total Service Yrs.	Mos.	Days
District II			
Barry, George R.	25	0	21
Chandler, Alvin G.	25	0	26
District III			
Barner, Martin H.	25	0	5
Chapman, Muller	25	0	18
Schance, Marvin D.	25	0	1
District IV			
Hart, Herbert A.	25	0	2
Strand berg, Egon W.	25	0	26
Pearcell, Ira C.—Eligible August 31, 1956	25	0	0
District V			
Lyons, Hugh E.	25	0	6
District VI			
Barnes, Bentley	25	0	12
Edwards, Albert B.	25	0	18
District VII			
Currey, E. Brooks	25	0	24
Farrant, Marion	25	0	23
Munro, L. B.	25	0	6
Snider, Charles B.	25	0	6
Suverkrubbe, N. H.	25	0	3
District IX			
Nilius, Martin E.	25	0	3
District XI			
Resch, Lloyd J.	25	0	23
Bay Bridge			
Cayla, Henry J.	25	0	14

Employees of the Division of Architecture receiving 25-year awards:

	25 years on	Location
Frank S. Marks, Jr.	March 1, 1957	Headquarters, Sacramento
Alice J. Moody	March 25, 1957	Area I, San Francisco

MERIT AWARD BOARD WINNERS

Employees of the Department of Public Works receiving certificates of award and commendation during February, 1957, are:

Eldon B. Roseberry, highway traffic signal technician, San Bernardino, was awarded $150 for developing an auxiliary timing device for traffic signals. This device improves the safety of vehicles approaching a traffic signal on a rural expressway by giving advance notice of approaching signal changes. Previously there was a considerable delay in obtaining the special equipment necessary to convert these signals. With the equipment Mr. Roseberry has designed, the same thing is accomplished at a saving to the State of $175 per installation. It is estimated at least 10 installations will be made each year.

Richard Alexander, assistant highway engineer, Sacramento, recommended a stamp showing the actual inches be placed on plans which are to be reduced. Showing this scale on the reproduced plans calls attention to the amount of reduction from the original drawing and could prevent misinterpretation of reduced plan scales. While the monetary award value of the savings cannot be determined, an award of $30 for an improved procedure was approved.

Ardith L. Helton, senior stenographer-clerk, Sacramento, will receive $25 for recommending the use of a Wheeldex rotary card file for filing records of powers of attorney in the disbursing office of the Department of Public Works. Under the old method a folder was maintained for each of approximately 100 bonding companies, each folder containing a list of persons who hold powers of attorney. There are approximately 4,000 names in the file, and one list may contain up to 250 names. These names are checked against about 1,500 documents received each year. The use of this Wheeldex will save considerable time.

Thomas Scrimsher, assistant highway engineer, Sacramento, will receive $25 for designing and developing a uniform light cabinet used in evaluating the results of film stripping tests. In these tests a visual inspection is made to determine the possible stripping of the asphalt film from the aggregate when subjected to water. The light cabinet makes it possible to examine all specimens through a uniform light instead of artificial or natural light formerly used. This procedure will be used in Materials and Research Department in Sacramento and throughout the various district laboratories.

Stanley R. Collis, tab operator, Sacramento, proposed a mirror be placed on the wall focused on the IBM 650 magnetic drum data processing machine. This will help the operator watch this machine from various locations in the room and will enable him to determine when the machine is not in operation and another series started. An award of $15 was given for an improved procedure.

Calvin K. Cartwright, assistant highway engineer, Fresno, was awarded a Certificate of Commendation for his recommendation that plastic railroad curves, used by the Division of Highways design units, be scribed at one-inch intervals along their length. This curve was first tried out in District VI. After it proved satisfactory, arrangements were made to obtain scribed curves from a supplier. Although the cost of placing the idea into effect offsets any direct saving, the suggestion has resulted in an improved device.

Oscar R. Olivo, senior engineering aid, Fullerton, was awarded $50 for a specially designed surveyors' vest. Samples of the vest were circulated among the districts for trial and won enthusiastic approval. As a result the vests for surveyors will be carried in division stores. The vests increase survey crew efficiency. They provide more space for carrying items, and are more comfortable and convenient.

Melvin R. Nester, assistant highway engineer, Fresno, received a $25 award for recommending the use of 4-inch x 8-inch cans in the soil laboratories in place of 5½-inch x 10-inch cans. Originally the idea had been rejected because the Division was experimenting with polyethylene plastic bags for storing soil samples. However, the plastic bags proved unsatisfactory. Mr. Nester's suggestion was reconsidered and adopted. While a new can of different dimensions than originally proposed by Mr. Nester is being used, it provides essentially the same savings in storage space.

Ann M. Dreman, accountant auditor I, Sacramento, proposed a change in the method of keeping records of annexations and incorporations. She received a $20 award for her suggestion.

Hazel F. Mitchell, accounting technician III, Sacramento, received $15 for suggesting a simpler procedure for verifying rejected checks deposited with the State Treasury for Trust Accounts.

Isadore Goldberg, highway field office assistant, received a Certificate of Commendation for suggesting a revision in Form A-579, Billing Notice.

OLDEST PARK

Sequoia National Park is the oldest in California having been established in September, 1890, reports the California State Automobile Association.

IMPROVEMENT

In 1937 there were some 15 traffic deaths per 100,000,000 miles of travel. Today there are 6.4 deaths per 100,000,000 miles.

PROMOTIONS FOLLOW WITHYCOMBE'S RETIREMENT

Earl Withycombe, Assistant State Highway—Operations, for the State Division of Highways, retired on March 1st after more than 34 years of service and State Highway Engineer G. T. McCoy announced the promotion of J. W. Trask, District Engineer in charge of District III at Marysville, to the position vacated by Withycombe.

Alan S. Hart, District Engineer at Eureka, takes Trask's place as engineer in charge of District III, while Sam Helwer, Assistant District Engineer of District X, Stockton, has been promoted to District Engineer, replacing Hart at Eureka.

The position of Assistant State Highway Engineer—Operations, held by Withycombe for the past six years, involved responsibility for the construction and maintenance work on the 14,000-mile State Highway System; the procurement and maintenance of all equipment used by the division; and materials research, a field in which the Division of Highways has pioneered.

Withycombe joined the Division of Highways in 1922 as a resident engineer on paving construction in the Fresno area. He was appointed Assistant Construction Engineer in 1924 covering highway construction projects throughout the State for the Headquarters Office in Sacramento. In 1931 he was promoted to the post of Staff Highway Engineer in the Construction Department and in 1947 was appointed Construction Engineer for the division. He was promoted to his last post in 1950.

EARL WITHYCOMBE

A specialist in paving operations, Withycombe has been instrumental in establishing uniform, modern procedures throughout the State. He has pioneered or assisted in development of new equipment and methods which have become standard practice in highway construction.

Native of Oregon

A native of Portland, Oregon, Withycombe received his degree in civil engineering from Oregon State College. He is a veteran of World War I, having served with the U. S. Corps of Engineers. He is a member of the American Society of Civil Engineers.

Trask, who came to work for the division as a junior bridge engineer in 1928, has had extensive construction and administrative experience. He was Assistant Resident Engineer on the construction of the San Francisco-Oakland Bay Bridge tunnel through

J. W. TRASK

ALAN S. HART

SAM HELWER

Yerba Buena Island. He served first as Office Engineer and later as Assistant District Engineer of District II at Redding. He became District Engineer of District II in 1950 and was transferred to Marysville as head of District III early in 1956.

Earl Withycombe addresses associates and friends who honored him with a retirement dinner in Governor's Hall, State Fair Grounds, Sacramento

Trask was born in Lincoln, Nebraska, and holds a B.S. degree in engineering from Utah State College. He is a veteran of World War I, serving the 115th Engineers. He is a member of the American Society of Civil Engineers and the American Concrete Institute.

Resignation of J. C. Young Brings About Personnel Transfers

Personnel changes in the Design, Planning and Public Relations and Personnel Sections of the Division of Highways have been announced by State Highway Engineer G. T. McCoy.

J. A. Legarra, now Planning Engineer, was transferred to the position of Design Engineer, replacing J. C. Young, who has resigned to enter private engineering practice. J. P. Murphy, head of Public Relations and Personnel, becomes Planning Engineer; and Scott H. Lathrop, in charge of personnel administration and training, replaces Murphy. The changes became effective March 15th.

Hart has been head of the Eureka district since 1953. A native Californian, Hart has had extensive experience in the District III area which he will take over. Following his graduation from the University of California in 1930 he served 15 years, first as Junior Engineer and later as Resident Engineer on construction and finally Assistant Maintenance Engineer, all in District III. He subsequently served as District Maintenance Engineer in San Luis Obispo and as Assistant District Engineer in Eureka. In 1950 he was appointed District Engineer of District IX at Bishop, where he served until his transfer to Eureka.

Sam Helwer, Hart's successor at Eureka, came to work for the division in 1936. From 1936 to 1940 he served in four districts (Eureka, Marysville, Stockton and San Diego) on various survey, construction and design assignments. In 1940 he joined the survey section of District VII in Los Angeles and in 1945 came to Sacramento to work for the division's Bridge Department. From 1947 until the time he was appointed Assistant District Engineer at Stockton in 1953 he was with Headquarters Design Section in Sacramento. Helwer is the author of several papers on interchange design.

Helwer was born in Russell, Kansas, and studied engineering at the University of California at Berkeley.

Legarra was appointed to the position of Planning Engineer in November, 1955, having served for two years prior to that time as Assistant Planning Engineer. From 1951 to 1953 he was Assistant Design Engineer. A native of Marysville, California, and a graduate of the University of California at Berkeley with a degree in civil engineering, he joined the Division of Highways in 1941.

Murphy became head of Public Relations and Personnel in 1955 after having been in charge of Public Relations since 1950. His entire professional career, since his graduation in 1930 from the University of California at Berkeley with a degree in civil engineering, has been with the Division of Highways. Before his assignment to Public Relations he was Assistant District Engineer of District III, Marysville. He is a native of Pittsburgh, Pa., and came to California with his parents in 1910.

Lathrop has been in charge of personnel administration and training for the Division of Highways since 1951. Previous to taking that assignment he had been with the District III office in Marysville since he went to work for the division in 1931. In District III he advanced through the engineering ranks in administration, planning and design work. He is a native of Spokane, Washington, and a graduate of the University of California at Berkeley with a degree in civil engineering.

Young will become associated with the engineering consulting firm of Porter, Urquhart, McCreary & O'Brien, with head offices in Newark, New Jersey.

He received his degree in civil engineering from the University of California at Berkeley in 1926 and was engaged in engineering work for private companies before joining the Division of Highways in 1928. He has held many responsible positions with the division, and was Traffic Engineer prior to becoming Design Engineer in 1952.

German Road Experts Amazed at Freeways

German construction delegation with guides who accompanied them on tour of freeway construction projects in the Los Angeles area. Photograph was taken when bus was stopped at District VII Office for tour of the building and brief words of welcome from Assistant State Highway Engineer E. T. Telford.

In attendance at the American Road Builders Association Convention in Chicago have been a large number of engineers, contractors, equipment manufacturers and materials suppliers from countries all over the world.

Upon being informed that 14 construction delegates from Germany wished to make an inspection tour of freeways in the Los Angeles Metropolitan area, State Highway Engineer G. T. McCoy instructed E. T. Telford of District VII to make the necessary arrangements.

An all-day tour was arranged on February 4, 1957, and included inspection of completed freeways and freeway projects under construction on Harbor Freeway, Santa Ana Freeway, Hollywood Freeway, and Golden State Freeway. The German construction delegation was traveling under the auspices of the International Road Federation of Washington, D. C., and the Trade and Industry Tours Association of New York City. The personnel of the group was as follows:

Ludwig Fischer, owner, L. Fischer, contractors, Bergzabern, Pfalz, Germany; Dr. Hans-Juergen Gass, Partner, Ferma-Werke, Fertigbau-und Maschinenges, mbH, Ettlingen, Baden Germany (Prestress concrete, gravel, sand, crushed stone); Carl Hermann Heise, Chief Engineer, Alfelder Eisenwerke Carl Heise KG Alfeld, Leine, Germany. Road construction machinery and equipment for iron and steel mills; Miss Ursula Lorenz, Civil Engineer, Partner and Secretary, Allgem. Baugesellschaft Lorenz & Co. mbH, Leubeck, Germany. Contractors specializing in foundations (concrete piling system "Lorenz") reinforced concrete constructions; Albert Reinsberg, Vice President in Charge of Engineering, J. Kriegeris & Co., Hamburg, Germany (overhead and underground construction); Rudolf Riedel, Vice President in Charge of Engineering, Baugesellschaft H. Kamnt G.m.b.H., Herford, Westfl., Germany, general contractors; Guenther Roemmling, Engineer, Paul Thiele, A.C., Hamburg, Germany, general contractors; Rudolf Schirmer, Partner, Bauverlag G.m.b.H., Wiesbaden, Germany, publishers of "Bauwirtschaft"; Mr. Schlephorst, Secretary, Association of German Machine Manufacturers, Building Machines Div., Frankfurt/Main, Germany; Manfred Steidle-Sailer, Owner, Bauunternehmung E. Steidle, Sigmaringen, Wttbg, Germany, general contractors; Hans Willrodt, Chief Engineer, Menck & Hambrock G.m.b.H., manufacturers of building machines, dredges, bucket scrapers, Hamburg-Altona, Germany; Otto Kurz, Owner, Otto Kurz, Ulm/Donau, Germany, general contractors; Reiner Wilkens, Owner, Reiner Wilkens, Horrem nr. Koeln, Germany, general contractors; Dr. John V. Lilienfeld, director-guide for the German construction delegation.

In making the tour a success the District VII staff of the State Division of Highways was assisted by the Los Angeles Metropolitan Traffic Association, the Downtown Business Men Association, and the Los Angeles Citizens Traffic and Transportation Committee.

It is of interest to note that Germany, the country building the first freeways, known as "Die Autobahn," starting the construction in 1933, sent to the West Coast the distinguished German construction delegation to see how we are building freeways here in California.

Reporter P. K. Padmanabhan, writing in the *Los Angeles Times* of February 5, 1957, in part said:

"After visiting completed freeways and projects under construction on the Harbor, Santa Ana, Hollywood and Golden State Freeways, the Germans expressed amazement at the methods and the magnitude of freeway construction in this country.

"Dr. John V. Lilienfeld, spokesman for the group, said that freeway building on the scale prevalent in America is almost unknown in Europe. Even in West Germany, where freeways made their debut, there are only some 2,700 miles of completed freeways.

"He said that the other features of American building techniques that impressed his group were the high quality of the work, the forward-looking planning and extent of mechanization."

SAFETY FOR THE SURVEY PARTY

Issuance of a new eight-page, pocket-size folding pamphlet entitled "Safety for the Survey Party" has been announced by the Division of Highways.

Prepared by the division's Safety Section, the pamphlet provides a guide for the use of warning devices and equipment to protect the traveling public and members of engineering parties whose duties require them to work on streets and highways under open traffic conditions. It contains drawings and diagrams in color illustrating some of the safety equipment and how it should be used for maximum effect.

The pamphlet, which establishes uniform procedures for the protection of survey parties, is published primarily for the information and guidance of employees of the division.

John H. Horn

John H. Horn, Associate Bridge Engineer with the Division of Highways Bridge Department, retired on February 15, 1957, after almost 29 years of state service. He was born and reared near Placerville in El Dorado County.

John received his engineering education at the University of Nevada where he earned a B.S. degree in civil engineering, graduating in 1924.

His early engineering experience was obtained with Stone and Webster, Inc., on the construction of the Caribou hydroelectric project on the North Fork of the Feather River. He also worked for the American Bridge Company in Gary, Indiana, and for the Nevada state highway organization.

Horn first came to the California Bridge Department for a short period in 1925 as a junior design engineer, and he returned again in September of 1928 as a junior bridge construction engineer. He has been representing the Bridge Department in the field continuously since that time, and has been resident engineer on many of the major bridge structures in both Northern and Southern California. At the time of his retirement he was resident engineer on two structure contracts on US 40 in the city of Auburn.

John's extensive knowledge of bridge construction and his frank manner have won him the respect and friendship of engineers and contractors, both present day and "old school," throughout the State. Many of the Bridge Department's resident engineers and designers received their early training under his watchful eye.

In retirement the Horns, John and Evelyn, plan to travel extensively, but their headquarters will always be their mountain home near Camino, California.

DRIVER TRAINING

Driver training courses in which students get actual on-the-road driving instruction are offered at 334 schools in California, reports the California State Automobile Association.

Study of Highway Transportation Needs Launched

The Division of Highways, in cooperation with the cities and counties, is conducting a study which will result in presentation to Congress of a complete picture of the present and future highway transportation needs on all road systems in the State of California.

The study is being carried out in compliance with requirements of the 1956 Federal Highway Act, which calls for an estimate of the cost of the improvement needs of all the mileage of highways, roads and streets in the individual states for the 15-year period from July 1, 1956, to July 1, 1971.

In submitting instructions and forms to the cities and counties for their part in the study, State Highway Engineer G. T. McCoy wrote:

"The estimates of the city and county systems' needs have never been thoroughly explored and properly presented to Congress. Such a presentation should be of vital interest to the city and county authorities who are the proper agencies to prepare such a needs study. Also, the tremendous value of this study from the standpoint of community planning will be obvious."

Complete Study Necessary

Representatives of the Division of Highways and the Bureau of Public Roads met and discussed the study with the Advisory Committee of County Road Commissioners and the Advisory Committee of City Officials. It was the consensus of these two committees, which have been working with the Legislative Joint Interim Committee on Transportation Problems, that all of the counties and cities should enter into the study and prepare the required estimate of needs.

The Division of Highways, through its county federal-aid secondary and the city and cooperative departments, and the similar staffs in the 11 districts of the Division of Highways will aid the cities and counties with technical advice.

The needs study will be made for all existing and needed roads and streets, grouped into 12 systems to include all categories. The total of these 12 systems will represent the State of California total, without duplication or overlap.

Scope of Study

The Division of Highways will be responsible for the study on all roads under state jurisdiction, including roads in the Interstate Highway System.

Counties will be concerned only with the mileage and estimates of federal-aid secondary rural, local jurisdiction, and other rural roads under county jurisdiction.

Cities will be concerned only with the mileage and estimates of city streets under their jurisdiction and those portions of federal-aid secondary roads that are located within incorporated limits.

For any given road or street system, the needs estimates will cover not only the mileage existing on each system on July 1, 1956, but also the additional mileage required by virtue of needed improvements on projected mileage and new routes, including subdivision roads and streets, regardless of the means of financing. The needs estimate will cover what should be in service in the year 1971.

Fifteen-year Program

For each road system there is to be developed a 15-year improvement program, July 1, 1956, to July 1, 1971. Costs thus developed are to be realistic engineering estimates of highway needs, unaffected by advance decisions as to ability or means of financing and executing the program.

In order to conform to the time limits in the 1956 Federal Highway Act for presentation of the required information from the states to the proper agencies in Washington, D. C., the reports from both the cities and counties must be completed and furnished to the Division of Highways in Sacramento not later than August 1, 1957.

Federal Highway Administrator Starts New Job

Federal Highway Administrator Bertram D. Tallamy has promised state highway officials "to work diligently with each of you in making good on our collective promise to the Congress that we could and would do this job right."

Secretary of Commerce Sinclair Weeks administers oath of office to Bertram D. Tallamy, Federal Highway Administrator, right

Tallamy, who was sworn into his new office on February 5th by Secretary of Commerce Sinclair Weeks, wrote a letter assuring the highway officials of all 48 States of his "firm desire and intention to continue to improve where possible our cooperative efforts."

Following is the text of Mr. Tallamy's letter:

On February 5th I was sworn in as Federal Highway Administrator and immediately assumed my new duties. The new and greatly expanded federal-aid highway program is a challenge to all of us here in the Bureau of Public Roads and in all of the state highway departments.

The streamlining of the bureau operations during the past year, with which I am familiar, has been directed toward expediting our operations and strengthening the long-established cooperative relationships between the bureau and the state highway departments. I am writing to assure you that it is my firm desire and intention to continue to improve where possible our cooperative efforts.

Let me again assure you of my resolve to work diligently with each of you in making good on our collective promise to the Congress that we could and would do this job right.

Freeway Facts Booklet

A booklet entitled "Freeway Facts" has just been published by the California Division of Highways.

Primarily designed for distribution to all interested persons attending public meetings and map displays conducted by the various district offices of the division in connection with freeway route proposals, the booklet is also being supplied to public officials and members of civic organizations interested in state highway development.

The 16-page illustrated booklet attempts to summarize in easily comprehensible form the information most generally sought by the public in connection with freeway matters.

It explains the procedural steps leading up to adoption of a freeway routing; discusses why freeways are built; and summarizes some of the principal factors weighed by engineers in considering the merits of one proposed route as against another.

The booklet also contains answers to some of the more frequently asked questions about the effects of freeways on a community, and contains a glossary (partly illustrated) of technical terms.

Copies of the booklet are available from the Public Information Section, Division of Highways, P. O. Box 1499, Sacramento 7, California.

CATCHING SPEEDERS WITH ROPES

Today they use radar to catch the speeders. Back in 1905 in Delaware, according to the National Automobile Club, they used ropes. Traffic police disguised as workmen posted themselves along the road and then swung heavy ropes across the road to stop any driver who was exceeding the speed limit of eight miles per hour.

During 1956 the figure for truck and bus registrations stood at almost 11 million.

Engineer Group Honors Fred J. Grumm

The Engineering Council of Sacramento Valley at its recent annual awards banquet named Fred J. Grumm as the outstanding engineer of the year and presented him with a framed scroll honoring him for unselfish and altruistic community service with special recognition for his work as Chairman of the Sacramento Redevelopment Agency.

James C. Coombs presents plaque to Fred J. Grumm, right, while Ridgway M. Gillis looks on

Ridgway M. Gillis, who succeeded Grumm as Deputy State Highway Engineer when Grumm retired in 1950, delivered the presentation speech.

Gillis pointed out that Grumm had served the State with distinction, contributing greatly to the advancement of highway engineering in California and in the Nation, and since retiring from state service had given freely of his time and talents toward the great redevelopment program in Sacramento. This untiring leadership, an uncompensated service to the public and community, caused the award committee to name Grumm as the outstanding engineer of the year.

The Engineering Council of Sacramento Valley consists of representatives from 12 professional engineering societies having headquarters in Sacramento Valley. The council represents the 1,600 professional engineers and architects permitted to practice in this State. James C. Coombs, chairman of the council, presented the plaque to Grumm.

Redwood Highway

Modernization at Loleta in Humboldt

By H. W. BENEDICT, Resident Engineer

PHENOMENAL growth of the north coast counties in the late war years and the ensuing postwar period has brought with it the typical "growing pains" that the entire State of California has suffered during this period. The problems of adequate housing, sufficient schoolrooms, complete utility coverage, and many others have plagued the community leaders in the various counties in the north coast group.

But the paramount problem here, as elsewhere in the State, has been the modernization of the highway system. The life line of this area is US 101 (Route 1), over which the bulk of the commerce of the area must move. The increase in population and expansion of industry and commerce have long since overtaxed the capacity of the highway.

Looking southerly from Hookton Road near north end of project with new highway under construction on left, and existing Table Bluff Grade on right

Heavy Congestion

The engineering staff of District I, recognizing the vital importance of US 101 to the growth and very life of the north coast counties, has concentrated efforts toward alleviating this serious condition. Early studies revealed that the portion of US 101 between the towns of Scotia and North Arcata qualified as one of the most congested two-lane rural highways in the State. A comprehensive over-all plan for the modernization of this section of road was formulated and, as funds became available, contract work was started. Since early in 1951, when major work was started, considerable progress has been made in the development to modern standards of the state highway.

A vital link in the reconstruction of the remaining substandard mileage is the planned project, some 13.5 miles in length, between the north city limits of Fortuna and Elk River, immediately south of Eureka. For budgetary purposes, this over-all project has been separated into four units suitable for financing. In addition to the separation of the over-all project into four units, each unit has been separated into two stages: 1—the grading and drainage facilities, and 2—the base and surfacing.

Unit No. 1

On May 15, 1956, work was started on the first stage of Unit No. 1 of this project. A contract, in the aggregate amount of $1,022,200, was awarded to Norman I. Fadel, Inc., of North Hollywood and, as indicated above, consists primarily of grading and drainage installations. Unit No. 1, approximately 4.6 miles in length, extends from Fernbridge to Beatrice, passing to the east of Loleta, and was chosen as the first construction unit since it will replace the most deficient section of the existing highway.

Paramount among these deficiencies is the Northwestern Pacific Railroad undercrossing at the south limits of Loleta, which has been the scene of several fatal accidents. The existing Table Bluff grade has also contributed heavily to traffic congestion on Highway 101, since it is not uncommon to see 30 or 40 vehicles crawling up this grade behind heavily loaded, slow traveling trucks.

Four-lane Divided Highway

In addition to providing a four-lane divided highway built to expressway standards, with a design speed of 60 miles per hour, the new facility will shorten the route between termini of the project by over 0.5 mile. It will eliminate 12 horizontal and 16 vertical curves, and will reduce by over a mile the length of grade over 3.5 percent.

To obtain the high standards of alignment and grade consistent with a development of this nature, it was necessary to locate the alignment through an area previously avoided by the builders of the roads now serving the area. While no particularly high cuts were developed in the relocation, several deep canyons were crossed and areas of swampy ground and underlying excessively wet material were

UPPER—Stabilization trench right angles to centerline. Note filter material on slope to allow for percolation of underground water. LOWER—On top of Table Bluff Hill in thorough cut. Note filter material on cut slopes on right replacing material that sloughed away by concentration of underground water.

traversed. To add to these problems of construction were a myriad of active springs and underground streams in the construction limits.

Highway construction in District I, especially to modern divided highway standards, is difficult due to the annual rainfall which is the heaviest in the State and to the generally unstable soils and foundation conditions which are characteristic of the region.

Stabilization Work

To insure a firm and well-drained foundation for the large fills on the contract and to reduce the possibility of slides in the cut slopes, extensive stabilization work was of necessity performed. All canyons on the job were stripped of wet and unsuitable material and the springs therein contained were opened and drained; a blanket of filter material three to five feet in thickness was placed in the bottom and up the sides of the stripped gulches; and a network of 8-inch and 12-inch perforated pipe was placed to adequately drain the filter material. At the site of three largest fills on the contract, additional stabilization work was performed. At regular elevations in the slopes of the gulches, notches were excavated transverse to centerline for the two-fold purpose of relieving the flow of water through the filter material by means of perforated metal drains placed in the notches; and also serving as keys to lock the new embankment to the slopes of the gulches.

Interceptor Trenches

At locations of concentrated underground flow under shallow fills and in one location where an old slide crossed centerline, typical interceptor trenches with filter material backfill and perforated pipe underdrains were constructed. At the location of the slide added assurance of a stable fill was provided by installing approximately 3,000 linear feet of horizontal drains.

In two major cuts on the job, stabilization of cut slopes presented a problem. At these locations, heavy flows of ground water were intercepted near the subgrade plane. This water flowed through a stratum of sandy gravel and clay, bedded on a distinctly different stratum of dense blue clay. The velocity of the ground water, when released by grading operations, was such that it washed out the sand and finer gravels, allowing the 1½ :1 cut slopes to slough. This condition was anticipated in the preliminary materials investigation, and longitudinal trenches were set up in the plans to correct any such occurrence.

The construction of these trenches, in brief, involved the removal of the water-bearing material to a depth of at least five feet behind the planned slope and parallel with it; placing a perforated metal pipe drain at the "heel" of the trench; and then backfilling the excavation to the original slope line with filter gravel. This treatment proved very effective in draining the underground flow and preventing additional sloughing or slides.

Fill Foundations Problem

From the above, it is apparent that the stabilization of fill foundations and of cut slopes has been the big problem on this contract. The magnitude of the work is attested by the fact that over 170,000 tons of imported filter material and over 14,000 linear feet of perforated metal pipe underdrains were used.

The excessive amount of moisture in the native soils at various locations brought attendant problems in the general grading phase of the work. As soon as any cut was opened to a depth of three or four feet, the contained moisture in excavated materials was generally above optimum, samples with 28 percent moisture being not uncommon. Therefore, in order to obtain compaction, constant shifting of grading equipment was required in order to allow the sun and wind to lower the moisture content in the cut sections. A judicious mixing of wet and dry material, and the alternate construction of several large fills allowed the work to proceed with but minor delays. By a strict adherence to these practices, the contractor was able to maintain a high daily yardage output and to keep the grading phase of the work ahead of schedule.

Included in the contract are parallel twin bridges across Salmon Creek, near the northerly limits of the work. These bridges are 156 feet long and consist of two 40- and two 38-foot spans each. These reinforced concrete bridges are of T-beam design and are founded on reinforced concrete pile bents. It is estimated that the structures will cost approximately $90,000

. . . Continued on page 72

First Unit of the Redwood Highway Is Put Under Way

Bids for construction of the first unit of the Redwood Freeway through the Humboldt Redwood State Parks were opened on March 13.

The low bid, $6,345,594.90, was submitted by Guy F. Atkinson Co., South San Francisco.

The initial project involves grading and surfacing of 4.4 miles of freeway, between one mile south of Dyerville and Englewood on US 101 in Humboldt County to provide two travelled ways each 24 feet wide with a four-foot median, and for widening the existing South Fork Eel River Bridge, and constructing undercrossings at South Fork Road, High Rock Road, and Englewood Park, and a new South Fork Eel River Bridge.

There is available for this unit a total of $5,210,000 contributed equally by the Division of Highways and the State Division of Beaches and Parks.

The proposed location of the Redwood Freeway estimated to cost $36,-400,000, including rights of way, will follow the South Fork of the Eel River from Mendocino County Line to Dyerville, the confluence of the South Fork and Eel River, a distance of 33.4 miles. From Dyerville it will follow the westerly slopes of the Eel River to Jordan Creek, a distance of 9.5 miles. It is planned as a full freeway on a standard 60-foot, four-lane divided section without access to the abutting properties except through planned frontage roads and interchanges. It will be on new alignment but close to the existing highway in most portions and generally parallel to it, with some sections of it east of and some sections west of the present highway.

UPPER—Stripping wet material and constructing stabilization trench. Highway centerline is diagonally across picture between lower left-hand corner and upper right-hand corner. This is the site of the heaviest stabilization work on the project. LOWER—General view of new construction at north end of project looking northerly. Junction with present highway in top center.

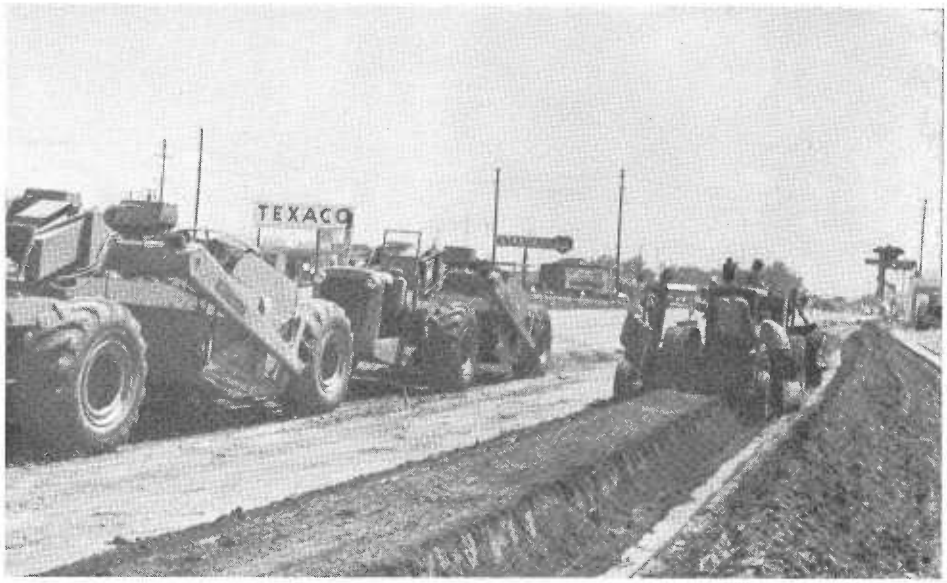
HIGHWAY PROJECTS IN DISTRICT VI

GARCES CIRCLE

By R. E. HAVERKAMP
Resident Engineer

The summer of 1957 will see the virtual elimination of one of the major traffic bottlenecks in the City of Bakersfield. No longer will the through-traveler on US 99 need to maneuver his automobile or truck through the maze of traffic at Garces Circle. Instead, he will travel up and over the traffic circle, and its local traffic, on the new four-lane separation structure which is scheduled for completion in June, 1957, Local traffic, which will still use the traffic circle, will no longer have the long wait for through-traffic to pass before entering the circle. Two-lane frontage roads on either side of the separation structure will provide access to and from the circle with its many service stations and restaurants as well as access to Oildale and the Bakersfield business district.

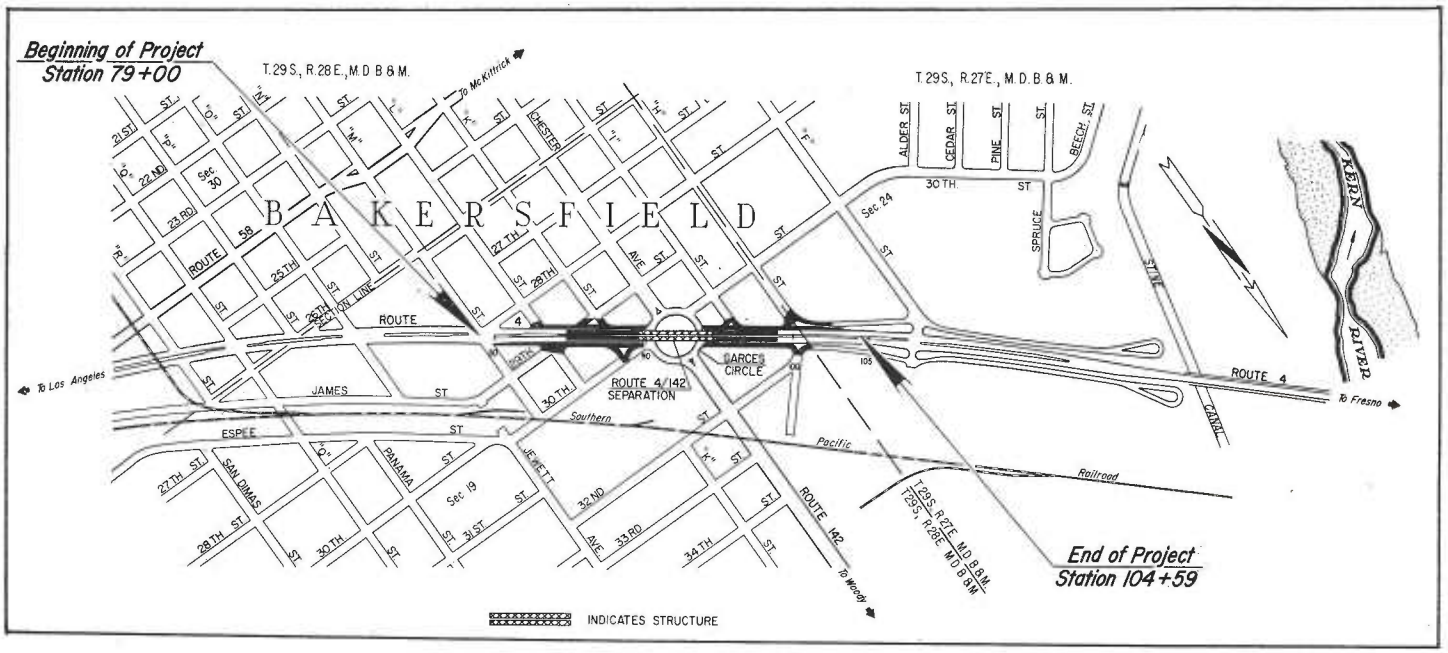
This traffic circle, as reported in the June, 1934, issue of *California Highways and Public Works*, was part of the "Bakersfield Bypass Relocation" of US 99 which was opened to traffic on June 2, 1934. The area inside the 278-foot diameter circle was later landscaped and, in 1939, the limestone statue of Padre Francisco Garces by the Sculptor John Palo-Kangas was placed in the center, hence the name "Garces Circle." As traffic volume increased through the years, the original 42-foot width of asphaltic concrete surfacing around the circle was replaced with portland cement concrete, and the 30-foot width of pavement on US 99 was increased to a six-lane divided highway surfaced with portland cement concrete pavement.



Sizer making windrows south of the Circle

Circle Now Bottleneck

Garces Circle was indeed a decided asset to the motorist of 1934, and, even in 1956 with an average daily

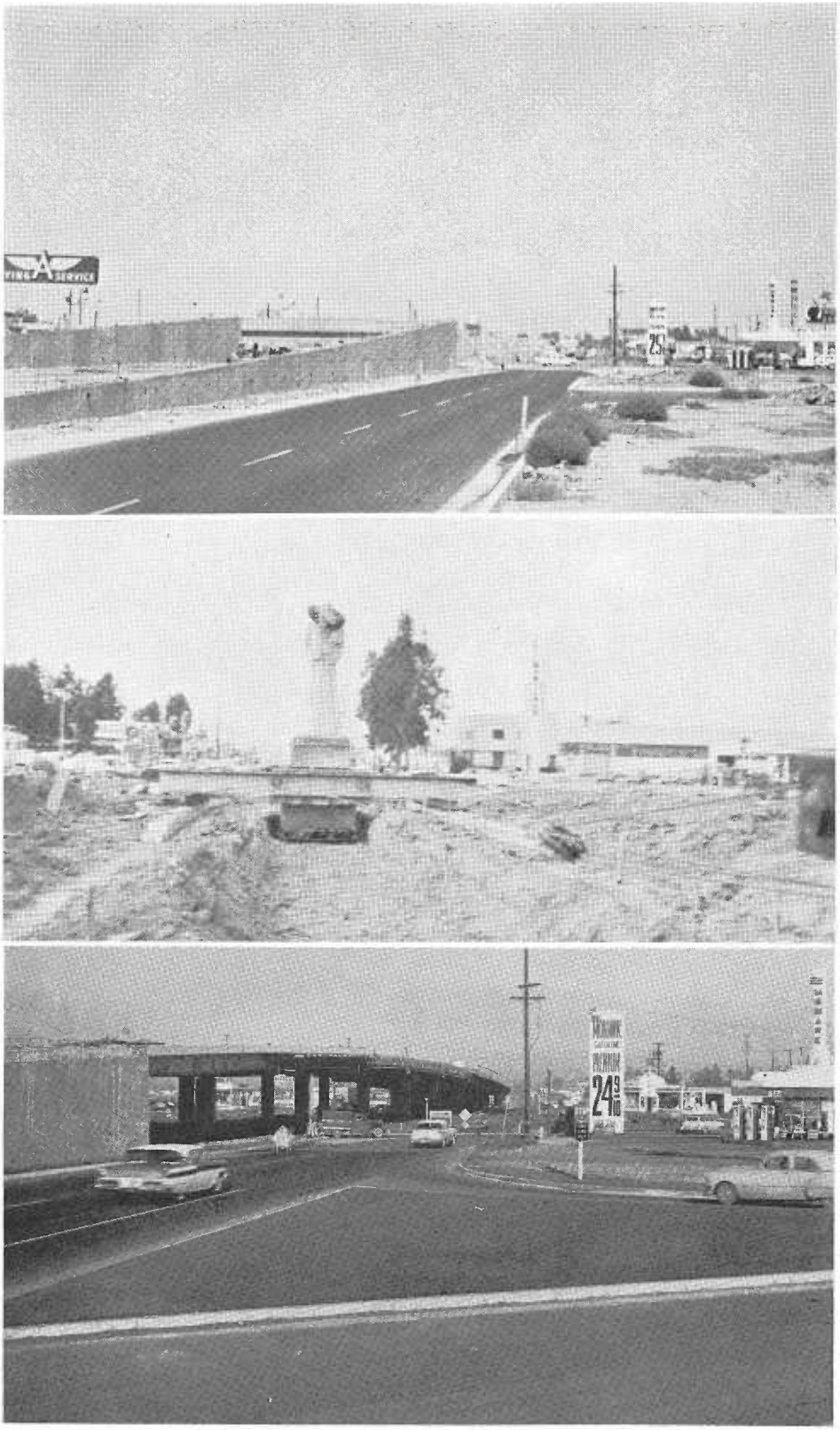


traffic of 55,000 vehicles, it handled the segregation of traffic with much less confusion than would a three-street intersection with its system of traffic signals. But, the traffic circle has become a decided bottleneck for through-traffic, particularly for those unfortunate motorists who are unfamiliar with it and frantically weave in and out of traffic, sometimes traversing the circle two or three times trying to find the proper exit.

To relieve the greater part of this traffic congestion, a separation structure was designed to carry the through-traffic on US 99 over Garces Circle. The contract for this structure, its approaches and the frontage roads was awarded to O. B. Pierson, Incorporated, of Los Alamitos, for $552,480.15 on December 16, 1955. Time allotted for this contract was 220 working days which has since been increased to 337 days because of a concrete batch plant strike and delay in the delivery of structural steel.

Overhead Structure Design

The design calls for an overhead structure about 555 feet long and 62 feet wide between curbs with a 6-foot median curb separating the two roadways. Each of the seven simply supported spans consists of nine 36-inch welded plate girders supporting a 7-inch reinforced concrete deck. Two concrete columns on pile foundations support the steel plate girder caps at each bent while the abutments are the closed type with standard retaining walls about 500 feet long containing the approach fills. Steel bridge railing will be used on each side of the wingwalls and the overhead structure. The approaches are to be paved with eight inches of Class "B" concrete over four inches of cement treated subgrade. The frontage roads on either side of the structure have an over-all width of 36 feet between curbs. The 26-foot roadway and the 8-foot parking lane are paved with three inches of dense graded plant-mixed surfacing over eight inches of Class "C" cement treated base bordered by a two-foot concrete gutter on the right. In addition, the roadway portion will receive a five-eighths inch blanket of open graded plant-mixed surfacing. Plant-mixed surfacing with cement surface treatment will be used to surface the sidewalks on each side of the frontage roads and the various traffic islands. Metal plate guard rail will delineate the frontage roads from the overhead approaches. An added



UPPER—Northbound frontage road entering Circle. CENTER—Statue of Father Garces being moved. LOWER—Looking easterly along off-ramp from US 99 to Garces Circle.

This photo looking north shows steel all in place at Garces Circle Bridge

feature will be a 67-foot sign bridge over the north bound lanes to direct the Oildale traffic to the frontage roads and the through-traffic to the structure approach.

Traffic Is Detoured

Before any work could be done on the structure, the US 99 traffic had to be moved over to the detours which were merely the outside 24 feet of the frontage roads. Consquently, in late January, 1956, the roadwork subcontractor, George E. France, started work on these frontage roads; and, on May 11th, all of the US 99 traffic was being carried on the detours. While these detours were being constructed, the general contractor moved the statue of Father Garces from his accustomed position in the center of the circle to a new point of vantage 30 feet from the south curb of the circle, still looking south on Chester Avenue. Moving this 23-foot statue weighing about 56 tons was expected to be quite a ticklish operation; but, after examining the base thoroughly, the contractor elected to move it as a unit on an improvised track of timbers. The statue moved obediently along on its rollers with a minimum of pulling necessary from the winch on the truck crane. Luminaires at the four corners of the new base slab will light the statue at night.

View looking southerly, showing long stretch of second-story concrete paving

Work on Wingwalls

With the traffic moved over to the detours, the contractor went to work on the wingwalls. Concrete for the wingwall footings was being placed at the same time Raymond Concrete Pile Company was driving the piles for the abutment and bent footings. By early July all of the substructure concrete had been placed and the long wait for structural steel began.

In the interim, curbs were placed on the wingwalls, the approach fills were brought up to grade, and the inside lanes of the frontage roads, as well as most of the traffic islands, were paved. On December 17, 1956, the long awaited steel arrived, and Independent Iron Works started their erection operations. The first span of deck concrete was placed February 12th. Before the structure can be used, however, the approaches will have to be paved and the railing put in place.

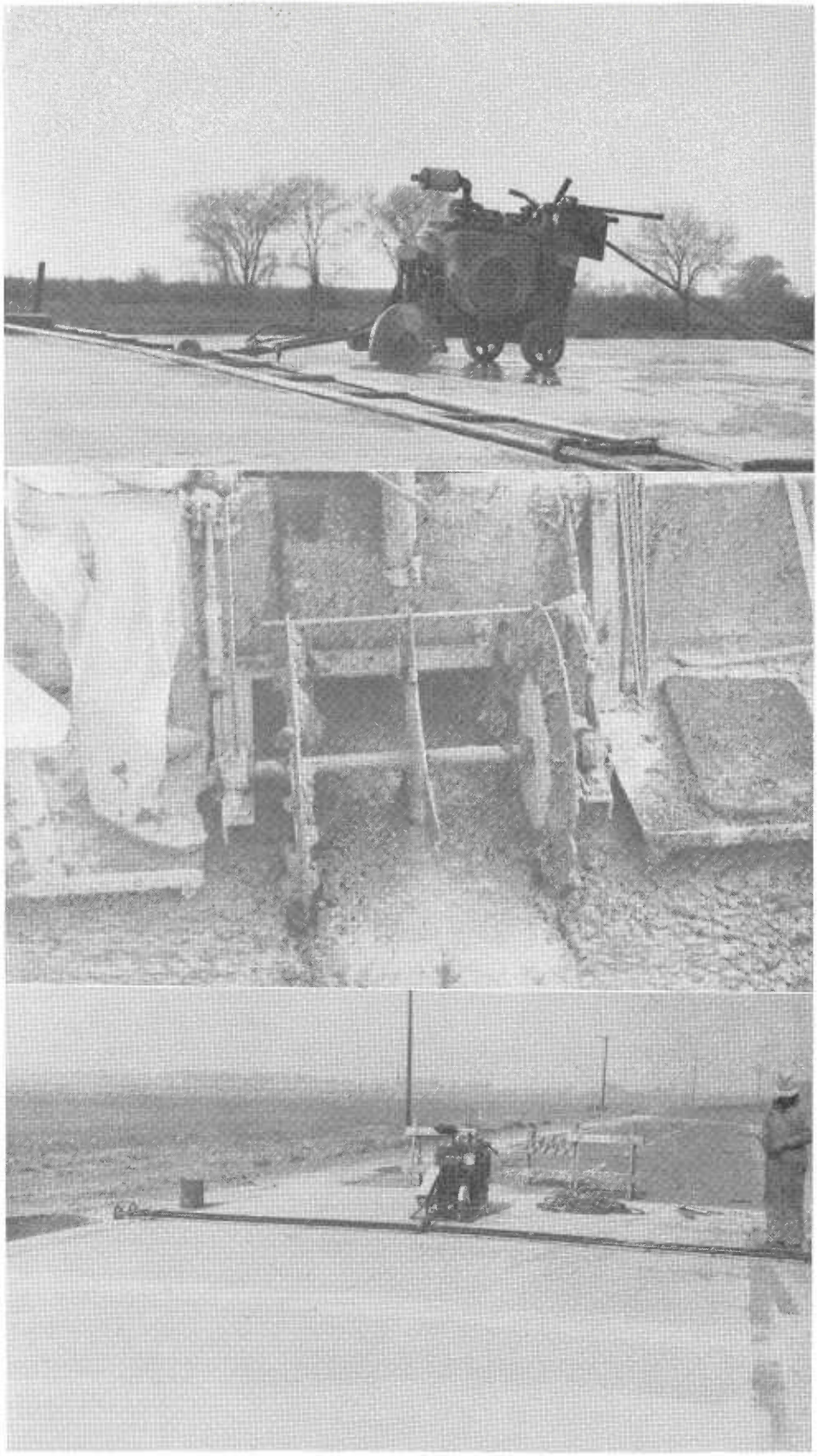
But sometime in June the entire project will be completed, and the through-traffic will be passing over the circle, leaving it to the local traffic and to those adventurous motorists who, perhaps through nostalgia, want to try their skill at maneuvering through the intricate pattern of vehicles.

This contract was administered by the Bridge Department with the author as resident engineer and George O'Dougherty as chief assistant. M. F. "Mike" Silva was District VI representative, and L. P. Cortner was the superintendent for O. B. Pierson, Incorporated.

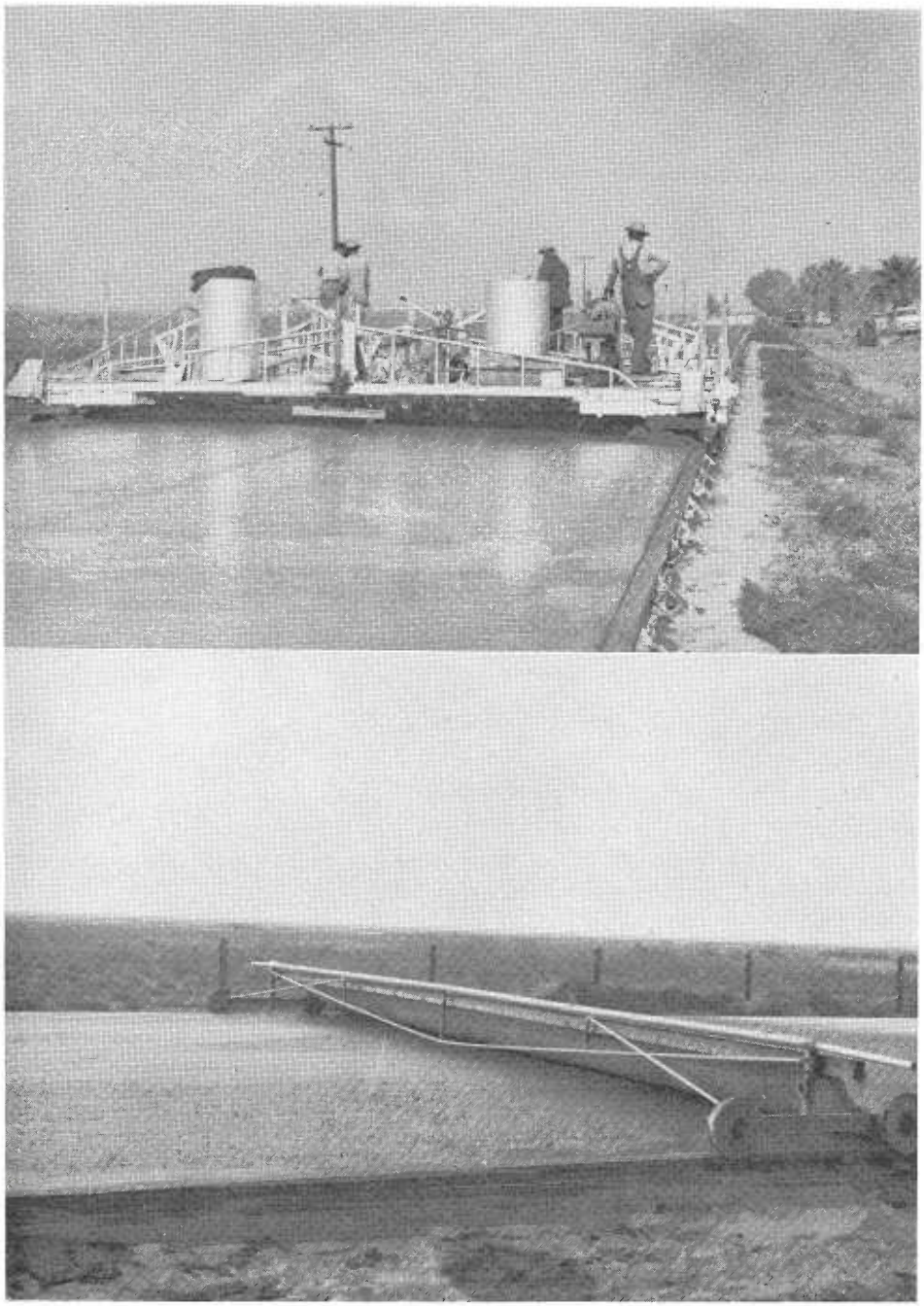
CONCRETE BLANKET

By NORMAN LAMBETH
Resident Engineer

THE MOST effective and economical salvage of old highway pavements and the most practical type of repair have always posed a problem for highway engineers. An unusual solution to this problem is presented in the design and construction of a rigid pavement overlay for a major highway in District VI. On this project a 24-foot wide rigid pavement slab was placed full width in one pour since this offered the maximum salvage of the old exist-



UPPER—Saw and equipment for long center joint. CENTER—Tiebar placed on back of spreader. LOWER—Saw and equipment for sawing longitudinal center joint.



UPPER—Johnson float in operation. LOWER—Burlap drag being used for final finish work on 24-foot pavement.

ing pavement and, at the same time, provided for economical construction methods.

Placing a 24-foot width of Class B portland concrete cement pavement directly over the old pavement made possible the omission of one line of side forms which would normally have been required with standard 12-foot width lane construction. Because of this feature and the development of special construction equipment for this project widespread interest was developed and the paving operations were observed by many engineers and contractors not directly connected with the project.

A 3.3-mile section of eight-inch-thick concrete blanket was placed on US 99 in Kern County about 15 miles south of Bakersfield on the southbound lanes of the existing highway. The existing southbound lanes were constructed in 1938 and consisted of 0.6 foot to 0.75 foot of asphalt concrete using a relatively soft asphalt. Due to difficulties with plant control of the filler dust and a relatively high asphalt content, the original pavement developed marked signs of instability several years after construction.

This section of pavement is on a long sustained upgrade which reduces the speed of the heavy trucks to a very slow rate. Slow moving heavy truck traffic has proved to be one of the most severe types of traffic encountered and produced considerable rutting of the original pavement. The tendency to rut was not entirely corrected by the subsequent plant-mix blankets. Based on this experience, reconstruction with a concrete blanket was recommended.

Question of Width

The special provisions made it optional whether the concrete would be placed in 12-foot or 24-foot widths. The contractor elected to place the pavement in the 24-foot width. The project was set up to use the existing pavement as the grade line. Since the existing pavement was 23 feet wide and concrete was being placed 24 feet wide the inside form was 1 foot out on the shoulder and had to be raised 0.03 of a foot in order to maintain the desired 8-inch thickness at edge of pavement. The contractor used rock crusher dust to raise the inside forms and to provide a level surface on which to set the other forms. The crusher dust had enough interlocking qualities so it did not drift out from under the forms as sand would have done and was also less expensive to use than shimming up the forms by the use of shingles. A shoulder machine was used to lay the crusher dust in a small windrow and a labor crew made the fine grade.

Special Equipment

As the process of placing 24-foot width concrete pavement monolithically is relatively new in California State highway work, equipment to construct this width was not readily available, so existing spreader, finisher and float equipment were rebuilt to accommodate the 24-foot width. The

spreader and finisher had recently been rebuilt for use on airport work, but the float finisher had to be built specifically for this project.

This float was built up around a 12-foot Johnson float frame. The front portion was made up of the 12-foot float turned crosswise with two driver wheels placed on each end. Framework was added to the rear of this float to accommodate the new boards which are arranged similarly to the original Johnson float. There are two longitudinal sections each 12 feet wide and so arranged that they can be adjusted to make a plane section or a crown section. Also on each longitudinal section there is one additional board independently suspended which is the strike-off board used in making the final pass. These boards are long enough so that they overlap at the front of the float. After a few trials it was found necessary to mount a short board on the front of the float near the center so it could be turned either way to throw the windrow of accumulated mortar to either side as needed. Since the original pavement was crowned this section was also crowned and it was found that the finished pavement retained the planned crown.

Spacing of Tie Bars

The plans required that tie bars be placed along the center of the pavement, and the contractor planned to place these tie bars by means of a hydraulic ram mounted on the back of the spreader. This system did not work as the ram was too slow and it was difficult to measure the interval between bars. The contractor then built another piece of apparatus which consisted of two discs having a circumference of 90 inches. Three notches were cut in the discs which gave the 30-inch spacing for the tie bars. These discs were placed on a horizontal shaft mounted paralled to the back of the spreader and adjusted so the discs rolled into the concrete four inches. The tie bars were placed manually in the notches.

Transverse joints were sawed every 15 feet and longitudinal joint was sawed down the center of the pavement. The special provisions allowed sawing the joints at any time, so the usual control joint sawing was not done. As this was a winter job the concrete set up very slowly and it was usually about 30 hours before sawing was done. There was no random cracking and because of the time interval the joints did not ravel in sawing. The center joint was sawed, using a light frame attached to the cutting machine which had flanged wheels on each end to fit over the edge of the slab to act as a guide for the saw. This proved to be a very efficient operation, and, since the saw required no manual guidance, one operator could handle the water truck and the servicing of the saw.

The pavement has been checked with a profileograph and also a roughometer and both show that the smoothness obtained is comparable to that obtained on a normal 12-foot width construction. Griffith Company of Los Angeles was the contractor and the author was the resident engineer representing the State.

CHOWCHILLA FREEWAY

By F. B. ENGLAND
Resident Engineer

Another seven miles of freeway will soon be added to US 99 in District VI with the completion of the Califa to Merced county line project in Madera County.

The major portion of the construction is on new alignment east of the existing two-lane highway and provides separation structures at three county roads and bridges at Ash Slough and Berenda Slough. In terms of increased safety for the motorist, however, the work being done at the Southern Pacific Railroad crossing of US 99 and at the intersection of US 99 and State Sign Route 152 is of primary importance.

At the Southern Pacific crossing, the existing underpass now serves both north and southbound US 99 traffic. This situation is further aggravated by the fact that the approach from either direction is on a curve with limited sight distance. Upon completion of construction this subway will accommodate only northbound traffic with the sight distance greatly increased by realignment of the approaches. Southbound traffic will utilize the precast girder overhead now under construction immediately adjacent to the existing subway to cross over the Southern Pacific tracks.

Elimination of Hazard

The intersection of US 99 and Sign Route 152 now requires northbound US 99 traffic turning west onto Sign Route 152 to cross the southbound lanes of US 99 at grade. This hazard is to be eliminated by depressing the southbound lanes and carrying the west turning movement over them on the recently completed reinforced concrete separation structure. The intersection has been further improved by realignment of the ramp serving the right turning movement from eastbound Sign Route 152 to southbound US 99, allowing traffic to merge more smoothly than was possible before on the old alignment.

The structural section of the new four-lane divided highway consists of 0.67 feet of Class "B" portland cement concrete over 0.33 feet cement treated subgrade; Type "B" plant-mixed surface shoulders, tapering in thickness from 0.25 feet at the edge of pavement to 0.13 feet at the outer edges, were placed over a Class "C" cement treated base of variable thickness. County road connections and ramps were paved with Type "B" plant-mixed surface over untreated base, both materials varying in thickness according to the design loads at the individual locations. Included as a part of the project is the resurfacing of the southbound lanes of the existing four-lane divided portion of US 99 for a distance of 3,700 feet to the north and 2,700 feet to the south of the northerly connection to the new facility. The thickness of the plant-mixed surface blanket will be one inch south of the connection and two inches to the north.

Roadway Excavation

Approximately 325,000 cubic yards of roadway excavation was removed from the depressed sections and used for embankment throughout the project. An additional combined total of approximately 420,000 cubic yards of

UPPER—Looking southerly at north end connection. LOWER—Looking northerly showing road 26E overcrossing and ramps, which will connect US 99 to the City of Chowchilla.

imported borrow and imported subbase material was obtained by the contractor from local sites with no difficulties being encountered in meeting the respective "R" value requirements of 30 and 56. The material was compacted by tractor-pulled sheepsfoot and 50-ton rubber tired rollers while being wet down at frequent intervals by water trucks to maintain optimum moisture content.

Aggregates for concrete and plant-mixed surfacing were produced at Mariposa Creek, about 15 miles northeast of the project. A hot-plant was set up at the crusher to manufacture the Type "B" plant-mixed surface, and the concrete aggregate was hauled to a batch plant which the contractor erected immediately adjacent to the job site. To date nearly 27,500 cubic yards of the estimated 36,000 cubic yards of concrete pavement have been placed, and approximately 8,000 cubic yards of Class "A" concrete have been used in the construction of the seven bridges built under this contract.

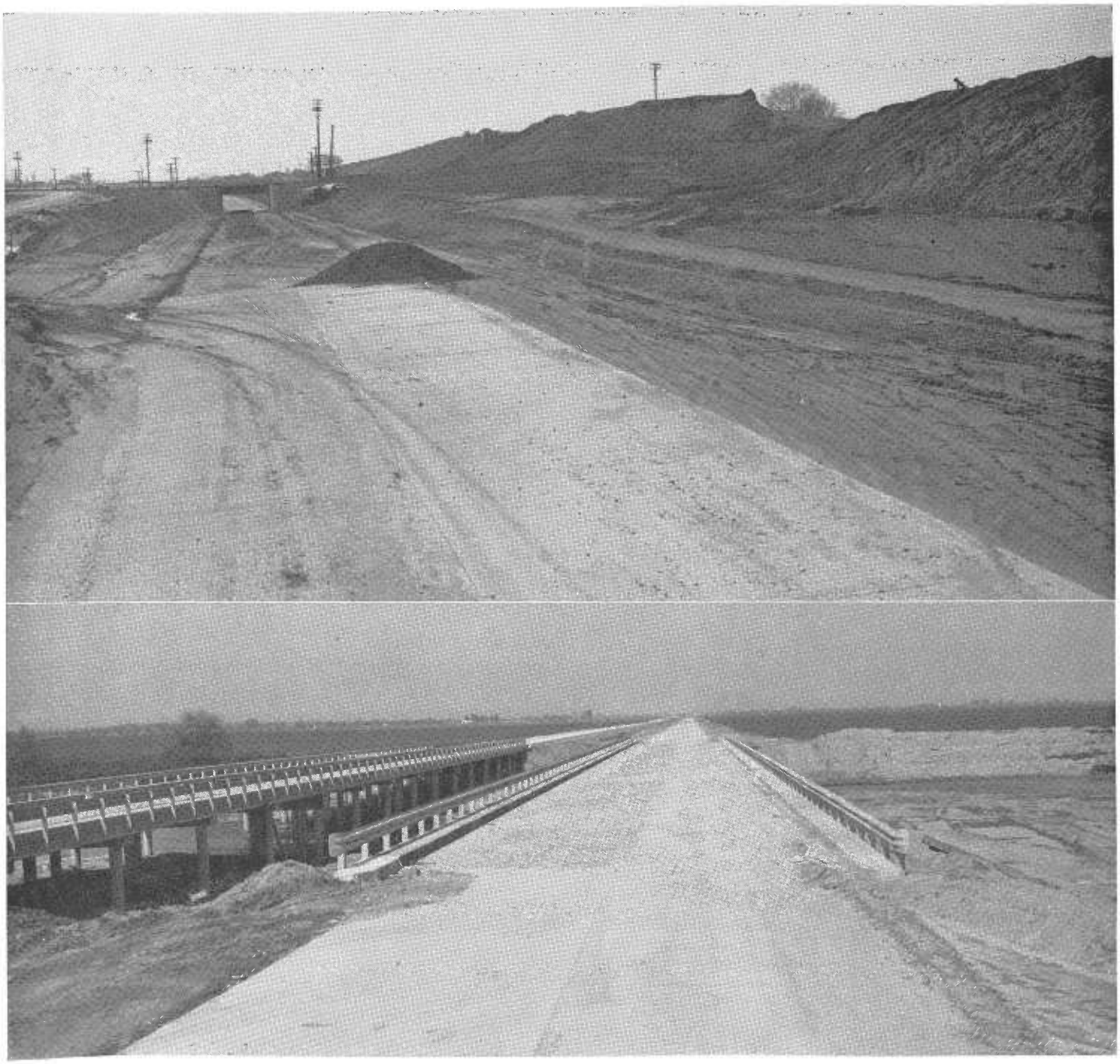
Drainage Important

Drainage was of considerable importance on this job because the new alignment crossed a natural overflow channel of Berenda Slough and adjacent lowlands for a distance of about two miles. During the Christmas flood of 1955 the water which flowed through this area was eventually backed up by the Southern Pacific

Railroad embankment until it covered the old highway in some places to a depth of three to four feet. To prevent the blocking of this natural drainage, and its possible overflow across the new facility, a battery of three 50-inch x 31-inch corrugated metal pipe arches were installed at the overflow channel, supplemented by eight 24-inch culverts through the fill at other low spots throughout the area.

The contracting firm of Fredericksen and Kasler was awarded the contract for a bid of $2,285,809.35. Project manager for the contractor is Frank O. Muren. The work is being performed under the direction of W. L. Welch, District Engineer; H. R. Bruch, Bridge Department Representative; and the author. Work was begun on March 23, 1956, and the contract, which allows 290 working days, was approved by the Attorney General on April 15, 1956. It is estimated at this time that all work on the project will be completed by July, 1957.

UPPER—Looking southerly along future northbound lane. Existing Califa underpass at left center. Embankment in center background is future southbound highway over Southern Pacific Railroad. LOWER—Looking northerly at Berenda Slough.



FREEWAY SPANS HUB

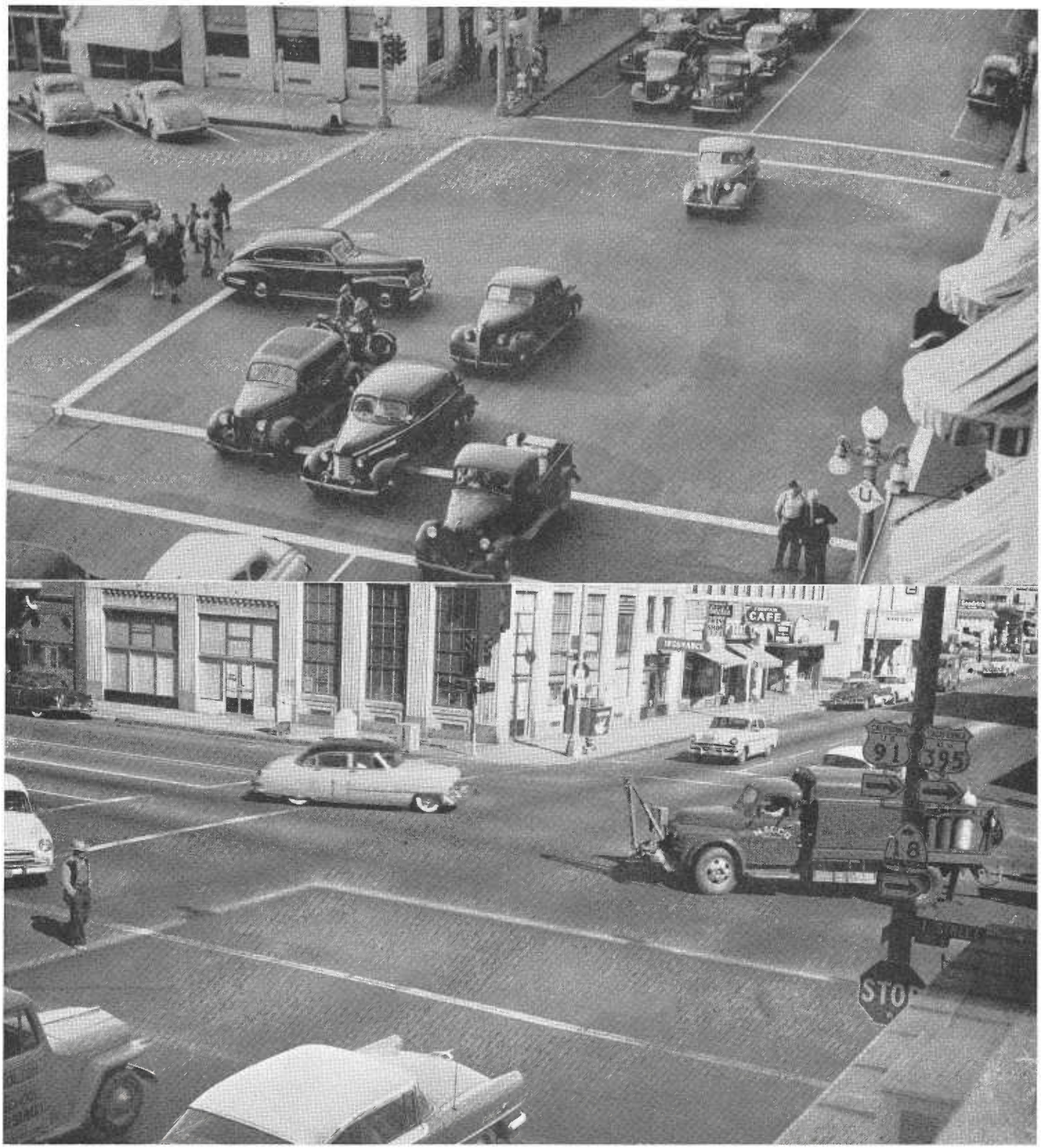
Continued from page 22 . . .

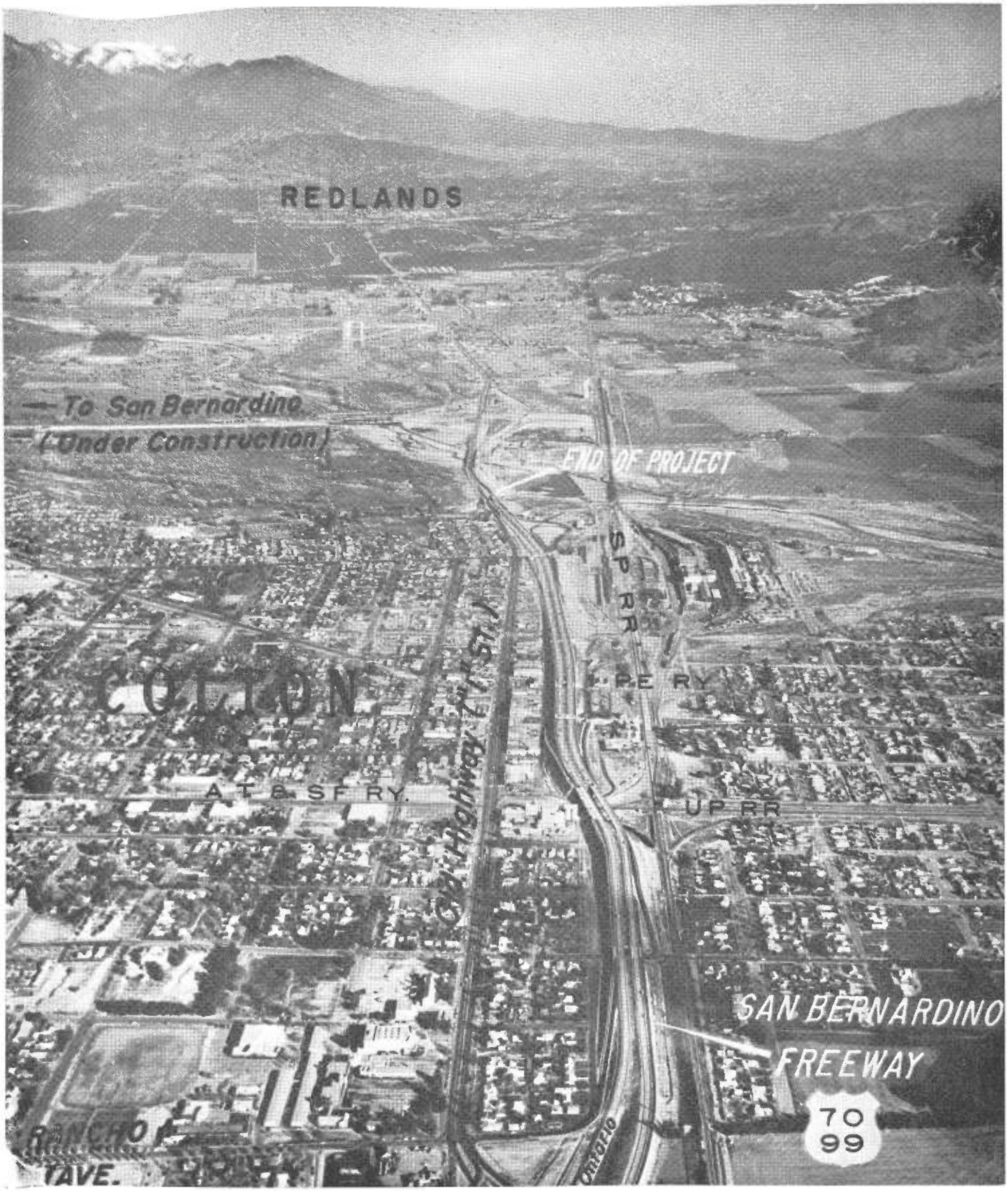
to the freeway above the city on the hill."

Business Improving

The business people, in general, feel that business is already improving. They feel that less noise and more and easier parking stimulates local trade. Typical comments from the commercial establishments are: "Now there is more parking and trade is beginning

UPPER—Traffic before freeway construction at intersection of Eighth and I Streets in Colton. LOWER—Traffic after freeway construction at same intersection.





Looking east above San Bernardino Freeway through Colton

to pick up." "People were afraid to stop and park on the street before, because the traffic was so bad." "Before, older people were scared to cross the highway."

Some of the service station and restaurant owners have noticed a decline in business. This drop-off apparently occurred in cases where there had been considerable dependence on the transient trade. However, one service station operator expressed himself by saying: "More local trade is taking the place of transient traffic. If we keep trade at home, we won't need the transient business. Those businesses that were dependent on through traffic should now gear their sales more to the local people."

Route Adopted in 1944

The freeway route was adopted in 1944. A freeway agreement for the project was worked out with the city council in 1953. Paul Young, now San Bernardino county supervisor, was then the mayor. It was done in a friendly atmosphere, with complete understanding of each other's problems.

Due in a large part to the suggestions and cooperation of City Engineer Norman Neste, the serviceability of the freeway was greatly increased. Outstanding benefits promoted by the city subsequent to execution of the freeway agreement are illustrated by two important improvements: (1) A shifting of a block-long retaining wall 10 feet to obtain 38 additional parking places for city vehicles; and (2) the addition of two ramps which greatly increased local access to the freeway.

The contractors on this $1,900,000 project were W. F. Maxwell, and Hermreck and Easter—a joint venture. The principal subcontractors were Matich Brothers, Colton—portland cement concrete pavement, and R. A. Erwin, Colton—asphalt pavement.

The State Division of Highways was represented on the project by Wayne Crawford as Senior Resident Engineer of that area, and Resident Engineers R. E. Small, B. D. Gilbert, and T. Smith. The representative of the State Bridge Department was L. E. Dunn.

Safety Awards

Three State Division of Highways employees were presented with special safety awards at the twenty-second annual banquet meeting of the San Joaquin County Safety Council held in Stockton on February 26th.

Those receiving the awards were District Materials and Research Engineer Eric Nordlin and Highway Maintenance Superintendents John Quinn and John Langenbach, all of District X, Stockton.

All three men head sections composed of several field crews which did not have a single lost time injury for more than one year.

As head of the District X Materials and Research Section, Nordline has supervision of all crews engaged in laboratory and field research in the district. Quinn is in charge of all maintenance crews operating in the Stockton area. Langenbach has charge of all special services maintenance crews in the district.

The awards were presented by John C. Ball, District Representative of the National Safety Council, before more than 300 people attending the banquet at the Stockton Hotel.

The spanning of the "Hub" with a super highway has "uncorked" the traffic bottleneck and has opened the town to possibilities of extraordinary future development. Now, through traffic is unhindered, out-of-town traffic is provided easy access to Colton from either end of town, and the existing street pattern remains undisturbed and much more usable.

In addition, this major link of the San Bernardino Freeway will enable one, within less than two years, to drive all the way from San Bernardino to Los Angeles without encountering a street grade crossing or a stop sign. This will have a tremendous impact on the whole San Bernardino-Colton-Riverside metropolitan area.

As expressed in the neighboring City of Redlands' newspaper, "Colton will be the most thoroughly revolutionized city, highway-wise, in this vicinity." *

* *Redlands Daily Facts*, October 17, 1956.

IT WAS THEIR PLEASURE

Mr. S. Evans, Landscape
Superintendent
Division of Highways
San Francisco, California

Dear Sir: I would like to express my appreciation of the very efficient and kindly assistance given to me by two of your workers on the freeway between Alameda and Oakland. I was going to Oakland when, without warning, the wheel came off my auto. When I could bring it to a stop I still had the rear left part of the car a little way on the pavement, and couldn't move the car any further.

A work truck was parked a little ahead of me and in a matter of seconds your men, Arthur Mason and Cleveland Washington ran to my car, put out flares and flagged oncoming traffic, which was heavy. They recovered the wheel which had bounced across the freeway, and replaced it on the car. Throughout all this they were very courteous and kind, and also very efficient. When I offered to reimburse them they refused to accept anything.

As an older woman, traveling alone, it was a great service rendered to me in my necessity, and I want to take this opportunity to thank the department for employing such fine workmen.

Very truly yours,

(Mrs.) Inez B. Canfield
1326 Versailles Avenue
Alameda, California

NAC CREDITS DIVISION

Two of the major highway construction projects now being solved in the San Francisco Bay area are covered by a display in the window of the Headquarters Office of the National Automobile Club. Aerial photographs of the Bayshore Freeway from Third Street to Sierra Point and of US 40, running from Richmond to north of Vallejo are supplemented by a model of the "Big Cut" at Pinole.

In keeping with its declared interest in better highways and traffic safety, NAC has chosen window-display as one of its methods for expressing a continuous support of the activity of the Division of Highways.

New Span Open

Del Norte's First Four-lane Expressway

By E. J. REED, Resident Engineer

THE DATE February 10, 1957, marked the opening to public traffic of Del Norte County's first section of four-lane expressway. The yet incomplete project on US 101 extends from 0.1 mile south to one mile north of Wilson Creek, which is approximately 12 miles north of the Town of Klamath.

Although inclement weather precluded completion of the surfacing phase of this project, it was decided to open the new bridge across Wilson Creek to traffic, thereby eliminating the necessity for a winter detour over a section of superseded highway. Inasmuch as a major portion of the new alignment is superimposed on the existing alignment, it became necessary to place a leveling course of plant-mixed surfacing on the new base, over which traffic could be carried for the remainder of the winter months.

Shortens Distance

The new facility, a 60-foot, all-paved section providing for four lanes, is 1.13 miles in length, including a 282-foot reinforced concrete box girder bridge over Wilson Creek, represents an investment of $600,000. This facility shortens the distance between project termini approximately 0.5 mile and replaces a portion of US 101 constructed in 1924, which combined the very undesirable elements of narrow roadway, heavy grade, short radius curves, and restricted sight distance. These factors accounted for a relatively high accident rate with 68 accidents recorded within the limits of the project for the period 1940 through January of 1957.

The superseded low level bridge across Wilson Creek, a 102-foot reinforced concrete girder structure, constructed in 1924, although subject to short periods of closure from flood and drift conditions, will remain in place to provide access to private properties.

Long Range Planning

As an indication of long range planning, a portion of the approach fill to this new Wilson Creek structure was constructed in the year 1938. Excess material developed on the project known as Wilson Creek to Last Chance Slide Project, then under contract to the Hemstreet and Bell Company, was disposed of as an approach embankment to the then future new bridge across Wilson Creek. J. W. Vickrey, now Deputy State Highway Engineer and then district engineer of District I, anticipated fulfillment of this project at an earlier date. The original project report for this 1956-57 project was submitted in 1948 and approved for a 34-foot roadbed. Subsequent changes in traffic volumes provided the warrant for the 60-foot, all-paved section on virtually the same alignment.

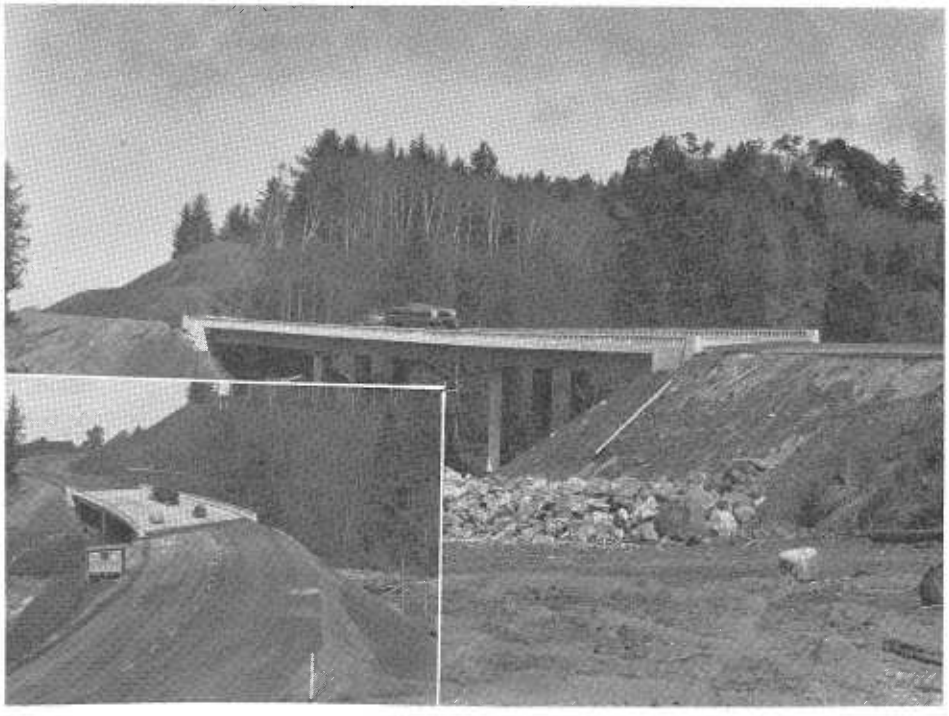
The contract for the new facility was awarded to the Natt McDougal Company of Portland, Oregon, in April of 1956. Work was started immediately, with Chet Briggs filling the position of superintendent for the contractor. Burton C. Walker, now materials engineer for the District I, was assigned as resident engineer, with Lowell Allen assigned as Bridge Department representative on the structure. Early in August, Jack Gutherie took over as superintendent for the contractor, followed two months later by assignment of the writer as resident engineer.

New Alignment Parallels Coast

The alignment of the new facility roughly parallels the coast line, crossing Wilson Creek near its juncture with the sea and ascending on a 6.3 percent grade. Minimum radius of curvature was held to 900 feet.

An unstable area was encountered at this location consisting of a surface mantle, lubricated by extensive sur-

Two views of newly completed Wilson Creek Bridge

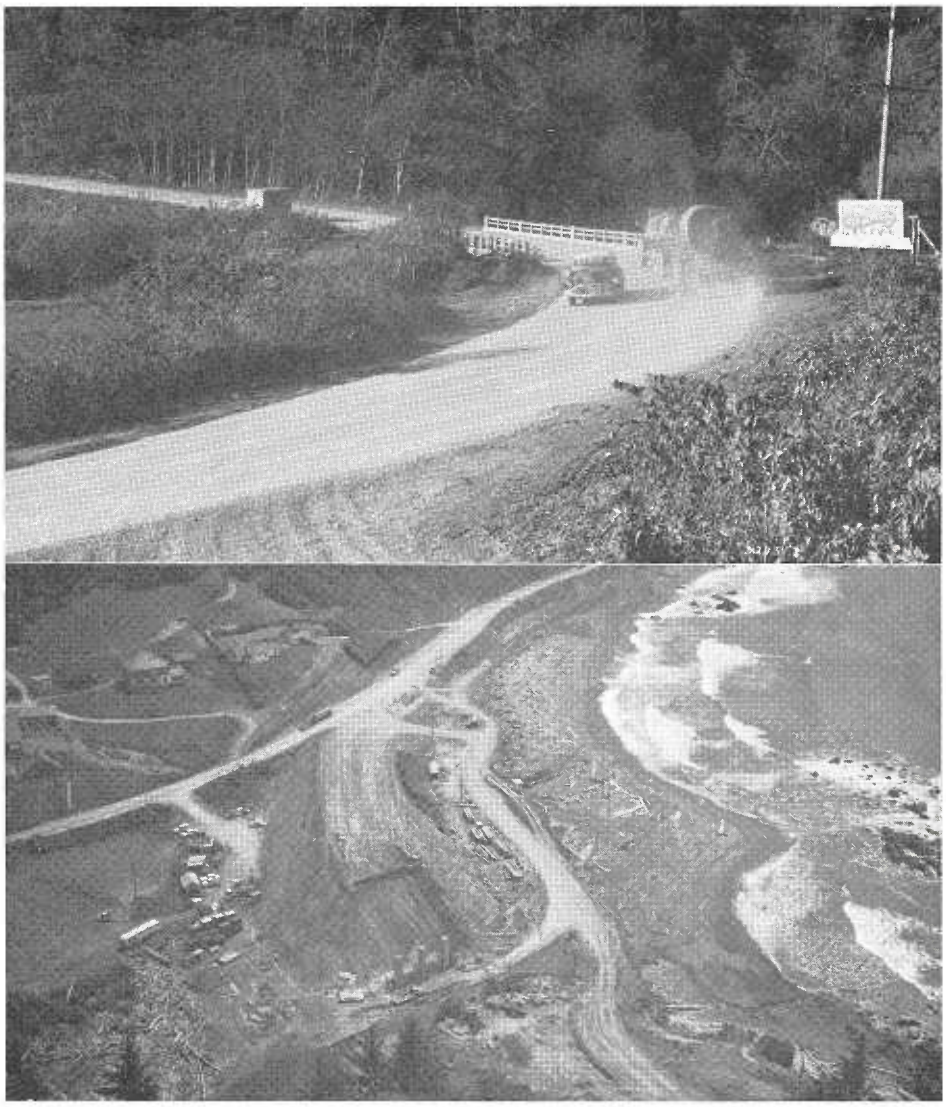


face and subsurface springs. Bedding is a shale and sandstone formation. Although quiescent for a period of years, the removal of supporting materials has resulted in renewed movement within the area with minor encroachments into the traveled way. The 80-inch annual rainfall recorded for this area creates a major problem in surface and subsurface drainage.

An extensive system of eight-inch perforated metal pipe subdrains and two-inch horizontal drains was installed to relieve subsurface drainage and assist in stabilizing the area. A large stabilization trench was constructed for the northerly approach fill section. Approximately 6,500 feet of subdrains and 3,500 feet of horizontal drains were installed, exclusive of the collector system. Horizontal drains discharge into eight-inch corrugated metal pipe laterals from which water is removed at frequent intervals by cross culvert installations. The construction of cement treated base and surfacing was made difficult, due to the ever present bleeding of cut slopes and a large flow of surface water at the gutter line.

Wilson Creek Bridge

The major structure, Wilson Creek Bridge, consists of a 282 x 58-foot reinforced concrete box girder bridge. Constructed on curved alignment and superelevated section, approximately 70 feet above the existing streambed, this structure with its supporting three-column bents presents an exceptionally clean appearance. The structural design blends well with the land and seascapes that provide one of the major tourist attractions along this section of rugged coast. Construction of the substructure presented no major problems. Abutments and one bent were founded on steel bearing piles, the remaining bent was constructed on spread footings founded on a rock outcropping. Because of the curved alignment, superelevated section, box girder construction and height of structure, a major expenditure in falsework framing and piling was required. In order to protect the falsework from damage by wave action and battering from heavy drift, a rock jetty, or barrier, was constructed at the mouth of Wilson Creek to dissipate the wave action and prevent drift from entering the creek channel during heavy seas, particularly from southwesterly storms.



UPPER—Old low-level bridge across Wilson Creek. LOWER—Showing "Deadman's Curve" in background and change in alignment, with partially completed new Wilson Creek Bridge.

Riprap Problem Solved

One of the construction problems in District I, where a major portion of the projects require some form of embankment protection, is the production of suitable material for heavy stone riprap within economical haul distances. Contrary to this general condition, the district, through agreement with the Division of Beaches and Parks, was able to furnish the contractor with a quarry site adjacent to the project. Heavy stone for riprap was produced from a sandstone stack located on the beach approximately one-fourth mile from the point of use.

With the opening of this section of expressway, the elimination of "Dead Man's Curve," a 125-foot radius curve at the bottom of a sustained 6 percent grade, came as a welcome relief to the drivers of the many heavy commercial vehicles traversing this route. Failure to maintain air in brake lines, fading brakes, and the ever-present menace of heavy fog have each taken its toll of vehicles and drivers.

Although small in comparison to the multimillion-dollar freeways of the urban areas, Del Norte County's first section of four-lane expressway keynotes the trend in future planning for this northern county.

Angeles Crest

55 Miles Now Under General Maintenance

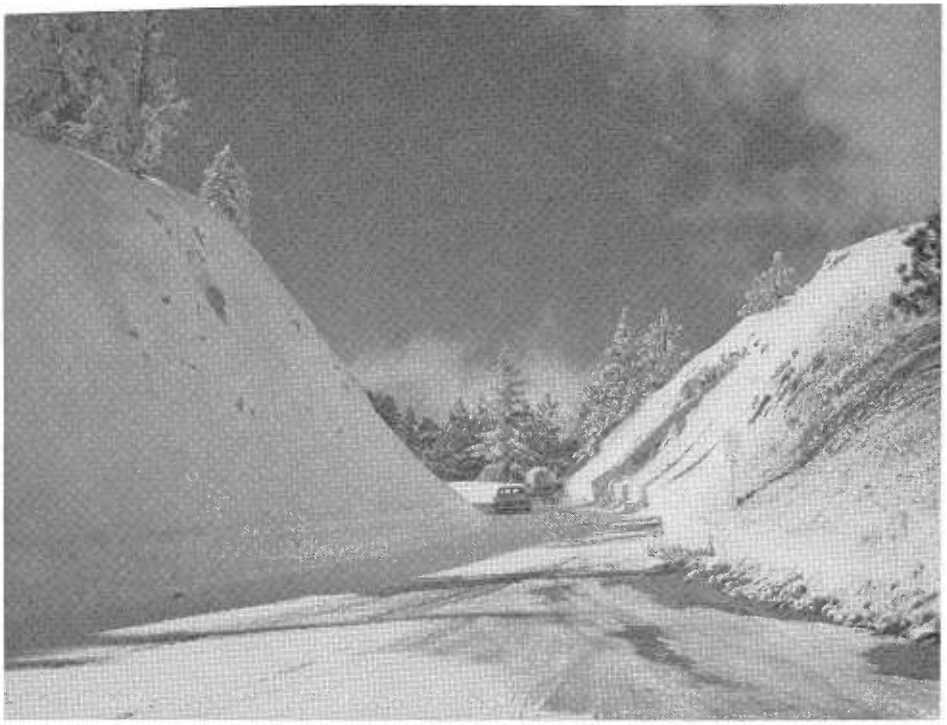
By JOHN O'MALLEY, Highway Superintendent

MAINTENANCE of the Angeles Crest Highways follows a pattern controlled by the yearly weather cycle typical of this section of California. From hot, dry summers with high fire hazard in the surrounding brush and tree covered slopes, to wet, cold winters with many feet of snow piling up in the higher elevations, through which this road runs.

The maintenance crews, which presently maintain this highway, from the junction of Foothill Boulevard to Big Pines, work out of the La Crescenta and Chilao Maintenance Stations. The latter station is located 25 miles northeast of Foothill Boulevard on a two-acre plot of ground in the Angeles National Forest. This station is maintained by the State under terms and conditions of a special use permit issued by the United States Forest Service.

During the summer months of May to September, the maintenance of the roadway is of a general nature typical of many mountain roads. The traveled way surfacing is patched where necessary to maintain a smooth, hazard free surface. The shoulders and ditches are graded and kept clean of slough and other debris. Guard rails, sight posts and culvert markers are painted, restenciled and replaced as necessary.

Signs are checked, repainted or replaced by the District VII sign crew, a part of the maintenance function that operates on a district-wide basis.



Merritt Ridge near Newcombs ski lift on Angeles Crest Highway

Surfacing in Summer

Major work on the traveled way surfacing, having been planned months previously, is carried on during these summer months. In the past years this work has consisted of reworking some sections of the existing bituminous surfacing, including the addition of liquid asphalt and aggregate from local sources as needed. On some sections blanketing has been done, using local disintegrated sand stone in a road-mix with liquid asphalt.

In recent years a Class "C" medium seal with three-eighths inch rock chips has been placed over this surface. This seal coat work was planned by the Maintenance Department and carried out by maintenance forces at the rate of approximately six miles each year. To date, this seal has been placed to Cedar Springs, until recently the end of the road opened to public traffic.

Pavement and shoulder edges along this route need periodical attention to protect them from breakage or excessive wear of both vehicle pounding and rain and snowfall runoff in the narrow gutters. This is done by motor patrol grading or by strip patching with stockpiled bituminous material previously made with local aggregate. In cooperation with the United States Forest Service, a certain amount of weed and brush removal is performed along the lower edge of cut slopes, on the berms and in the gullies at drainage structure inlets. The work generally consists of spraying for strip sterilization, with some hand cutting of heavier types of brush.

Fires Are Threats

The consequences of fires in this area are serious due to the heavily built-up areas along the foothills below and their vulnerability to flood damage caused by heavy runoff. The immediate effect on the highway itself is to cause what could be serious erosion of cut and fill slope that otherwise would not happen.

During October and November of each year all drainage facilities are checked and necessary steps taken to prepare them for the winter season. Side ditches are cleaned by means of motor graders, where possible to op-

erate them, otherwise at some locations it becomes a hand shovel job or a skip loader operation. Catch basins and culverts are inspected frequently and cleaned out before sedimentation has proceeded too far.

Along this route there are a number of metal debris risers placed vertically over culvert entrances in debris basins. Periodically, it is necessary to excavate and haul material away from these risers to make room for additional debris to accumulate. This work is performed with a truck mounted clamshell and dump trucks.

Heavy Rainfall

It is interesting to note that the average precipitation in the surrounding mountains is 35 inches per year, of which 60 percent is snow. A rain gauge maintained at Camp 37 measured a total rainfall of 62.6 inches during the period October, 1946, to April, 1947.

In the fall of the year snowstakes are placed along the edges of the roadway in the higher elevations as a guide for the snowplows. Snowplows and other winter equipment are checked over and prepared for immediate use when it starts to storm. Rock salt is stored to be added to sand, which in turn is used to sand icy pavement. Sand at present is stored in three 50-ton gravity discharge bunkers, placed between Red Box and Kratka Ridge—these being the limits of area most susceptible to icy pavement on the east slope of the mountains. Some spot sanding is also necessary at times to a point just above Foothill Boulevard.

In the past five years three factors have occurred which have influenced the stepping up of winter maintenance on this road. These are the development of extensive aircraft facilities and factories in the vicinity of Palmdale, the installation and operation of the major radio and television broadcasting stations at Mt. Wilson and the increasing numbers of snow sport enthusiasts attracted by ski-tow facilities at Mt. Waterman and at Kratka Ridge, both in the 7,000-foot elevatoin area of the highway.

Traffic Attracted

The first two developments have attracted working commuters over portions of the road and the last one recreation commuters, all of which create a demand for round-the-clock winter maintenance. Where a few years ago it was considered sufficient to plow snow during daytime hours and open the road early each morning, it is now necessary to keep the road open 24 hours a day, when at all possible to do so.

As an illustration of traffic use, the United States Forest Service made a car and person count in the Chilao-Charlton Flat areas and at ski resorts during the winter of 1955, with the following results: Vehicle and person count taken at Red Box for east or up-bound traffic only, January 9, 1955 —5,866 vehicles, 17,598 persons.

This was a maximum day for the particular season. A total of 22 Saturday and Sunday counts was 66,403 cars carrying 199,099 persons between January 8 and March 27, 1955, all out to ski or play in the snow.

Snow Removal

At the present time reversible type push plows and two rotary plows, mounted on trucks, are used to keep the road open to traffic. Plows are started out from the Chilao Station and from Camp 37 as soon as snowfall starts and are kept running until the storm is over and the road and parking areas are cleaned of snow. Sanding icy pavement is accomplished with maintenance trucks equipped with traction operated mechanical sanders.

In one of the accompanying photographs is a reversible plow mounted on a new Austin-Western four-wheel drive, four-wheel steering motor grader. It can travel at a speed of 18 m.p.h. and goes as fast up grade as it does down. With the four-wheel steering it can turn in much less space than the conventional front wheel steering grader. This is an excellent combination and a far cry from the tractor and tow grader many old-timers will remember.

The "Snogo" is the work horse of plows in any snow removal operation. They are generally mounted on a four-wheel drive truck chassis. The large motor on the rear drives the augers and blower fan. The blower fan is capable of throwing snow in a steady stream a distance of 150 feet to other side of the highway. Since in wet heavy snow these plows only travel three to five m.p.h., it is necessary to keep them running as constantly as possible in order to keep up with the snow left by the push plows.

Unpredictable Winters

Since the climate in Southern California is classed as "unusual," it is sometimes difficult to know what to expect, particularly during winter.

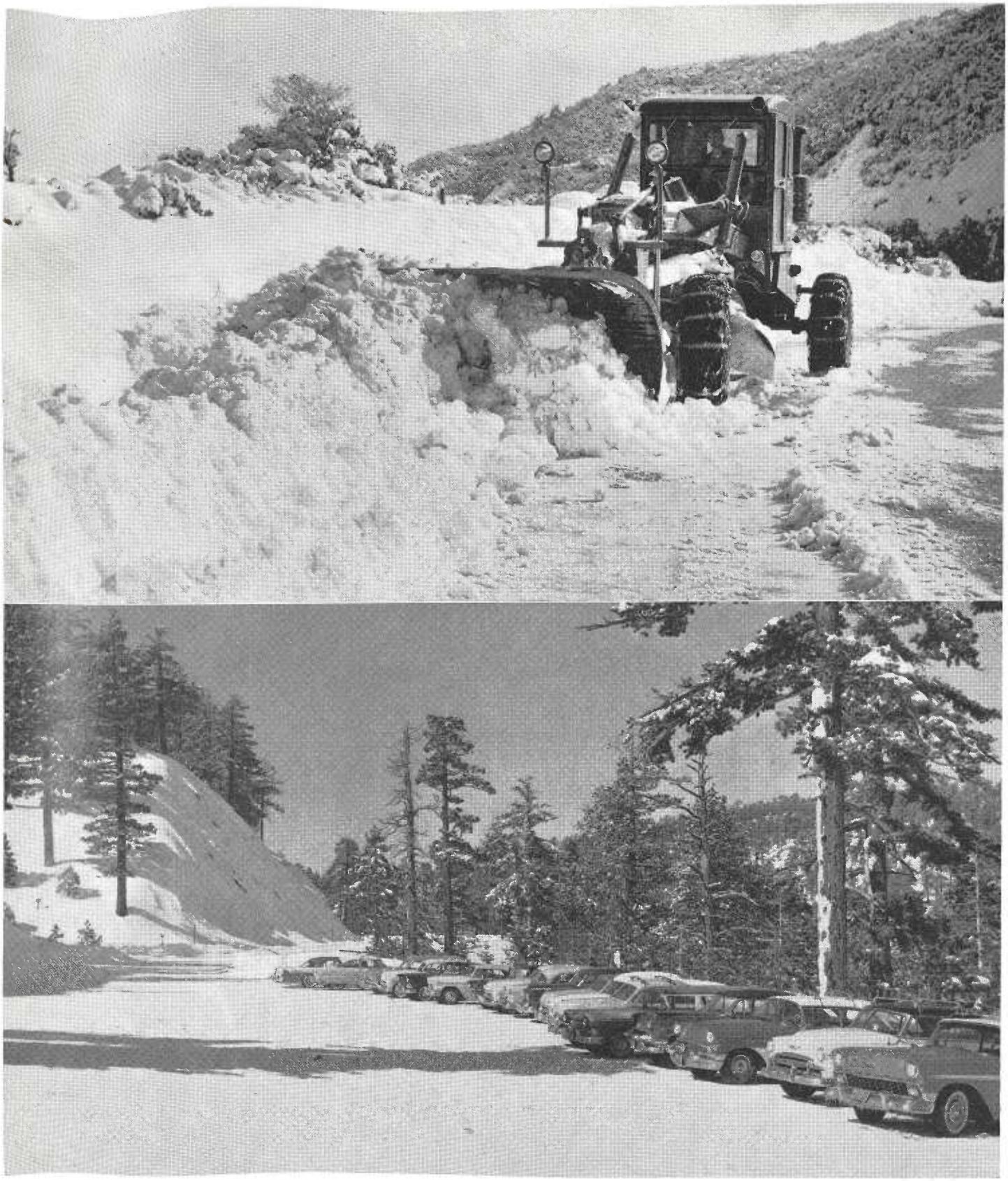
For example, during the winter of 1944-45, the snowfall at Cloudburst Summit (elevation 7,018 feet) was measured at 30 feet. In the winter of 1952, a heavy snow winter throughout the State, snow slides and drifts occurred at two or three locations near Buckhorn and Kratka Ridge that closed the road and isolated Camp 37 for a number of days. As it sometimes happens, the rotary plows were above the snow slides, the radio and telephone communications normally available at Camp 37 were put out of commission, and it was impossible, for a couple of days, to determine whether or not the plows had been caught under slides.

It was necessary to hire outside tractors and dozers to break through the slides, where to the relief of all concerned, it was found that the highway from above the slides to Camp 37 was plowed wide and clean with everyone at camp safe, warm and busy with snow removal work. On the other hand, the winter season of 1955-56 saw comparably little snowfall, most of it melting or turning to rain as it fell.

Traffic Control Problem

One of the big problems, without ready solution, is traffic control during snow removal operations. In this respect the California Highway Patrol renders splendid cooperation, assigning extra men and patrol cars to the area on week ends when snow sport travel is heaviest.

Several different times the number of vehicles attempting to reach the ski resorts were in such great quantity, plows could not operate, those at resorts could not leave and it became necessary to close the road temporarily to upbound traffic.



UPPER—Austin-Western four-wheel drive, four-wheel steer, plowing snow from parking area near 5,000-foot elevation on Angeles Crest Highway. LOWER—Parking area at Newcombs ski tow near 7,000-foot elevation on Angeles Crest Highway.

The one item of maintenance that calls for the greatest attention is falling slough and rocks. This road is largely constructed alongside hill or in through cut sections, many of them steep and rocky. Wind, rain and snow cause extensive slope erosion. For this reason one or two rock plows, mounted on maintenance trucks, make a patrol once or twice a day to clean back hazardous material. During heavy rains, this patrol works constantly.

Frequently between storms, the crews gather up the slide material with skip loaders and trucks and haul it to disposal areas. In this connection it is interesting to note that, unlike many locations elsewhere in the State, slide and slough cannot be bladed or dumped in just any convenient gully or canyon. There are designated and specifically listed locations which such material must be hauled to.

These locations are chosen in cooperation with the United States Forest Service. The reason for this is to prohibit debris from clogging the many small flood control dams constructed by the U. S. F. S. and County Flood Control Department down canyon from the highway. These dams have been built to protect the foothill communities from floods.

With the opening November 8, 1956, of the last section of the Angeles Crest Highway, from Cedar Springs to Wrightwood, 21 additional miles became the responsibility of District VII Maintenance Department. All of this mileage is subject to cloudbursts during the rainy season and to heavy snowfall in midwinter. On this new section are "Cloudburst Summit," elevation 7,018 feet, and "Dawson Saddle," elevation 7,900 feet, where severe maintenance problems can be expected to develop.

In the spring, as snow disappears from higher elevations, drainage facilities are again checked frequently, rock and slough brought down by the weight of snow from banks above are picked up and disposed of. At this time summer maintenance work is started and the yearly cycle begins over again.

Gasoline sales account for about 70 percent of the dollar volume done by the average service station.

Elbert C. Brown Ends Long Career As an Engineer

Elbert C. Brown, District Engineer for the U. S. Bureau of Public Roads for California, retired on March 31, 1957, after completing 48 years with the Federal Government, 38 of which were with the B. P. R.

ELBERT C. BROWN

Brown was born on a farm near Clifton Hill, Missouri. He received his education in Missouri, graduating from the state university as a civil engineer in 1909. He embarked on a career as a federal employee the same year, accepting a position with the Bureau of Reclamation's Shoshone Project in Wyoming. Two years later he went to the Philippines, where he spent seven years in highway work for the War Department.

His work as a highway engineer was interrupted while he served as a captain in the Engineers during World War I. Following his military service, in 1919, "E. C." reported to the Bureau of Public Roads in Mississippi.

At that time there were only three people in the State Highway Department and E. C. was one of the pioneers who helped to organize the department and begin the work of developing a system of roads. He spent only three years in Mississippi, but they were very important years, for it was there that he met and married a southern belle, Miss Lucille Summers.

In 1922, E. C. was transferred to San Francisco (Division 7) and, for the next 20 years, he was assigned to federal-aid work in Nevada. He was instrumental in establishing the federal-aid system in Nevada and in developing adequate plans and specifications for construction of the system.

In 1942 he was assigned to work in California, and in 1945 he became the district engineer, with headquarters in Sacramento. In California he participated in the establishment of the federal-aid secondary and interstate systems and the further development of freeways.

"In his many years of close association with the California highway program," commented State Highway Engineer G. T. McCoy, "E. C. Brown has consistently extended to this State the highest type of cooperation. California has also benefited from his broad knowledge of western highway problems. It is men like him who have developed the fine teamwork which exists between the B. P. R. and the states in the interest of providing safe modern highways for the motoring public."

Brown says he has no definite plans for the immediate future, but he will be happy to have more time to spend with his four children and seven grandchildren.

REDWOOD HIGHWAY

Continued from page 54 . . .

when completed. Alton F. Kay is the Bridge Department representative on this work.

At the time of suspension of all operations on the contract late in December, 1956, the contract was approximately 85 percent complete. With a favorable spring, all work should be completed sometime in June of this year. A surfacing contract will be let this spring and, with its expected completion early in November, one of the most serious bottlenecks on US 101 in Humboldt County will be eliminated.

THANK YOU COMMISSIONER

CALIFORNIA HIGHWAY PATROL
P. O. Box 898 Sacramento 4

February 21, 1957

Mr. Kenneth C. Adams, *Editor*

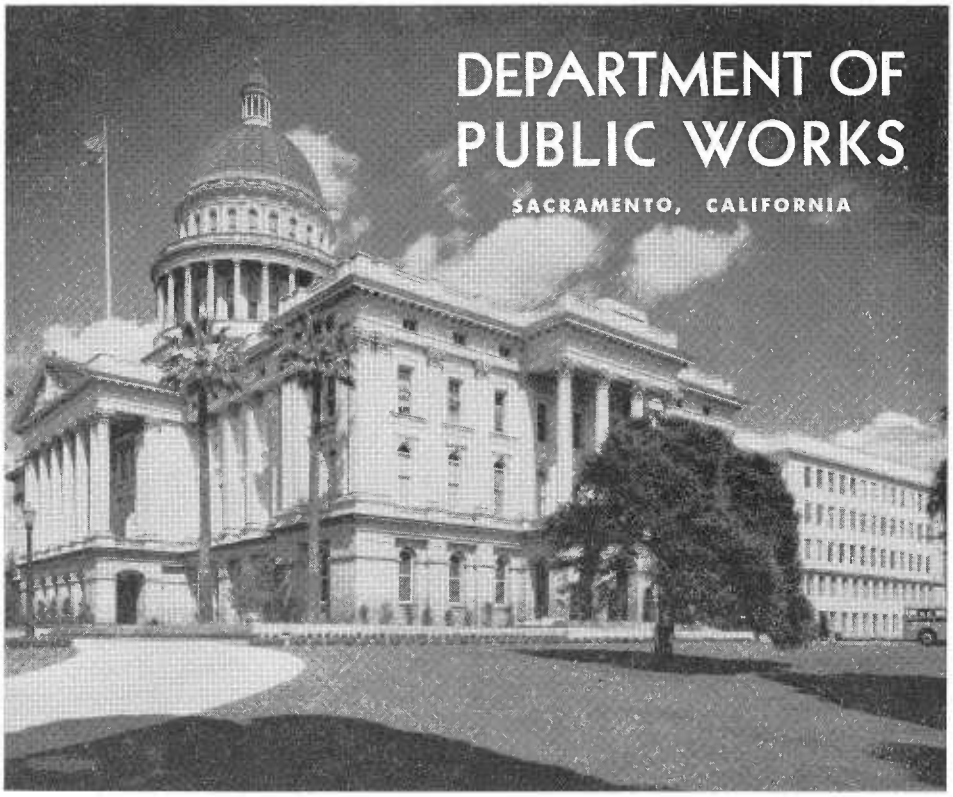
Dear Mr. Adams: Your magazine is one of the most informative and accurate means available to this department for refinement of its field deployment activities. Furthermore, it is well illustrated, interesting and easy to read.

I extend to you congratulations for a fine publication.

Sincerely yours,

Bernard R. Caldwell
Commissioner

GOODWIN J. KNIGHT
Governor of California



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