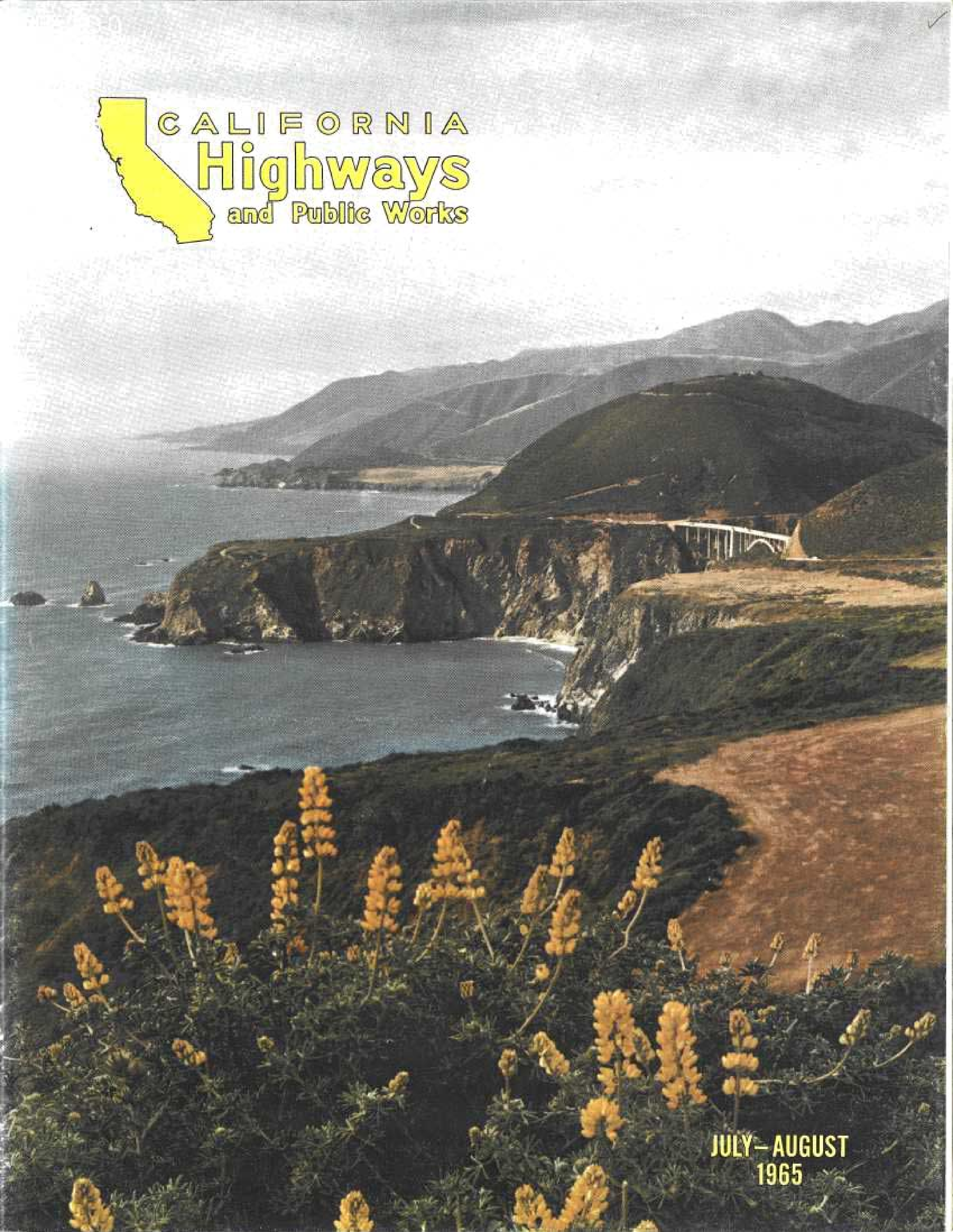
CALIFORNIA Highways and Public Works



JULY—AUGUST
1965

First 'Scenic Highway' Unit

California's first officially designated "Scenic Highway" includes this section near the Big Creek Bridge, south of Big Sur.

State Director of Public Works John Erreca has declared Route 1 in Monterey County, between the San Luis Obispo county line and Carmel River, to be the first officially designated unit of California's state scenic highway system.

His declaration followed the unanimous recommendation of the State's Advisory Committee on the Master Plan for Scenic Highways.

California's Legislature has pioneered the concept that a state be concerned with the preservation of the scenic values visible from its highways, Erreca said. Investigations into the planning, design, and conservation problems associated with the development of a statewide system of scenic highways were ordered in 1960, and a master plan for such a network was adopted in 1963.

The 1963 lawmakers decreed that "scenic highways" must fulfill the requirements of other routes in the state highway system; traverse areas of outstanding scenic beauty; and in location, design and construction receive special attention in terms of impact on the landscape and visual appearance.

Erreca added that the designation of official scenic highways depends, among other criteria, upon local governing bodies studying the scenic corridors along the motorists' line of sight, and passing appropriate zoning and other regulations to insure that the attractiveness of these corridors will be preserved.

The 72-mile stretch of Route 1 along the Pacific Coast was the subject of the pilot study authorized in 1960 by Senate Concurrent Resolution 26, sponsored by Senator. Fred S. Farr of Monterey County.

"This start in officially adopting routes in California's scenic highway system is particularly timely," Erreca said, "following as it does the White House conference of last month on natural beauty."

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FRONT COVER: California's first stretch of officially named "Scenic Highway" includes this portion of Route 1 on the Pacific Coast where this spectacular bridge crosses Bixby Creek. The segment of highway first designated goes through Big Sur country in Monterey County, from the Carmel River to the San Luis Obispo county line. See story on inside front cover. (Photo by Robert Mulno.)

BACK COVER: Caldecott Tunnels, heavily traveled by commuters from Orinda and Walnut Creek, now number three with the completion of the newest bore. The interior of the third tunnel is well illuminated and well ventilated. Operations are directed by remote control. See "The Caldecott Tunnels," page 12. (Photo by Pete Asano.)

Pacheco Pass

Route 152 Now Skirts San Luis Reservoir Site

By R. B. "BUD" WEAVER, Resident Engineer

The new 12-mile section of Pacheco Pass, Highway 152, around the north portion of the San Luis Dam and Reservior was opened following ribbon-cutting ceremonies on April 29, 1965. The contract for this project was completed with only 530 working days used of the 640 days allotted. The completion of this $12,000,000 project in record time is attributable to the mutual cooperation between the contractor, a joint venture by McNamara and Mannix, the U.S. Bureau of Reclamation, the State Department of Water Resources, and the Division of Highways.

The timing of this enormous project was critical, due primarily to the dam construction. Work started in February 1963, and shortly thereafter double shifts were employed by the contractor to provide for the completion of one lane of traffic in each direction by January 1, 1965. This was necessary in order to move the traffic from the old Pacheco Pass Highway, which will be inundated by the reservoir, onto the new road to permit the completion of the San Luis Dam. It was essential to keep this route open since it is the main connecting link between the Santa Clara and the San Joaquin Valleys.

The Challenge

The difficulties described in the March–April 1963 issue of *California Highways and Public Works* during the design stages of this project were almost eclipsed by the problems encountered during construction.

The contractor scheduled his operations to move 11,400,000 cubic yards of dirt and rock in time to complete the entire project by January 1, 1965. This required an average production of at least 27,000 cubic yards of excavation per day. Maximum production could not be obtained until access roads were constructed and drainage structures under the major fills were completed. A maximum of 100 earth-moving units were used to complete the grading on schedule, reaching a peak efficiency of over 40,000 cubic yards per day in moving the last 7,000,000 cubic yards.

This high-production operation compounded such problems as scheduling the employees of the state and contractor on double shifts, communications between the various units, field offices and laboratories; and maintenance and servicing of equipment, which was in constant use nearly 20 hours a day. The grading operations were frequently going on at the same time over the entire 12-mile length of the project and two-way radio communication was a requisite. Access to some of the job areas was by "cow trails," with high-clearance, four-wheel-drive pickups used to transport inspection and construction crews.

Water Supply

The contractor's first major problem was to find water for the project. This problem was solved by pumping water from the Delta Mendota Canal through pipelines to a reservoir near the center of the project. Feeder lines were then run from this reservoir to points along the new alignment where water was required for the easterly half of the project. Electric pumps were used to fill a pond about three

Looking west where drivers are provided an area to check their trucks at the summit of the Pacheco Pass Highway near the Santa Clara-Merced county line.

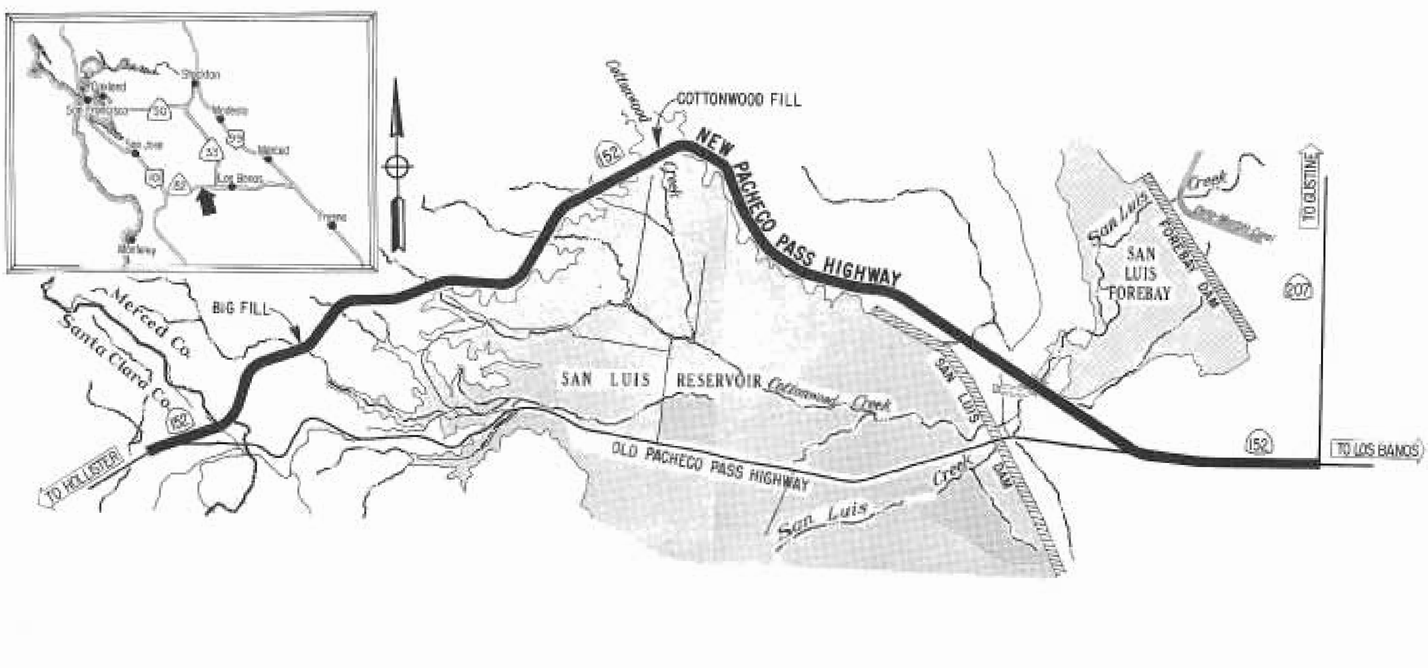
When filled, the San Luis Reservoir will have water on both sides of the "Cottonwood Fill" shown in the foreground.

miles west of the reservoir and diesel pumps boosted the water from the pond over the higher elevations to provide water for the westerly half of the project. Twenty miles of pipe were eventually installed to provide water for the entire project.

Supplying compaction water for fills in steep draws was a constant problem. This was solved by running "Rainmaker" pipe to the fills and applying the water with "monitors." The "monitors" were used until conventional water trucks could be economically used to water the fills.

Earthwork

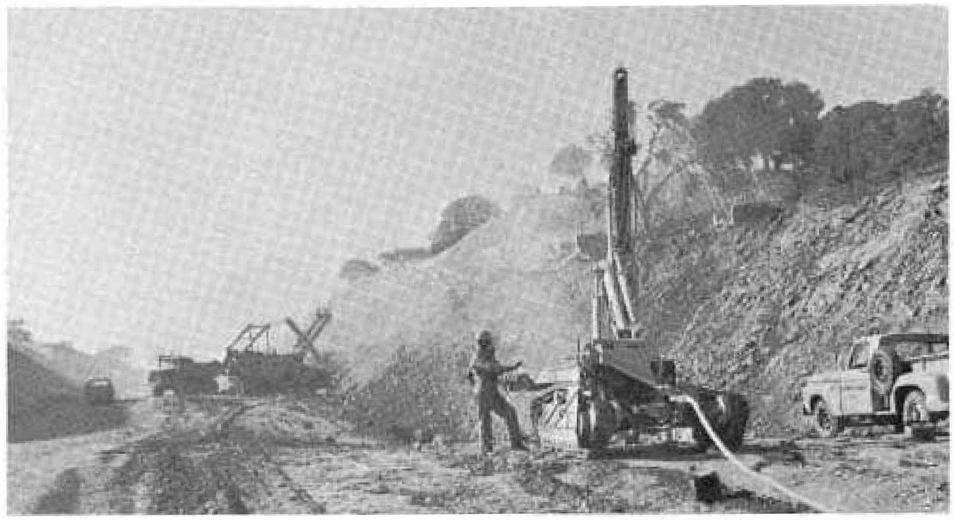
Grading operations overshadowed many of the interesting and challenging problems experienced on this project. Each cut presented a different problem. Fault planes were found to be adversely tilted, thus preventing the construction of some of the planned slopes. The type of material was constantly changing; rock cuts turned to dirt; and dirt cuts turned to rock. These conditions taxed the ingenuity of the contractor in selecting the right equipment to do the best job.



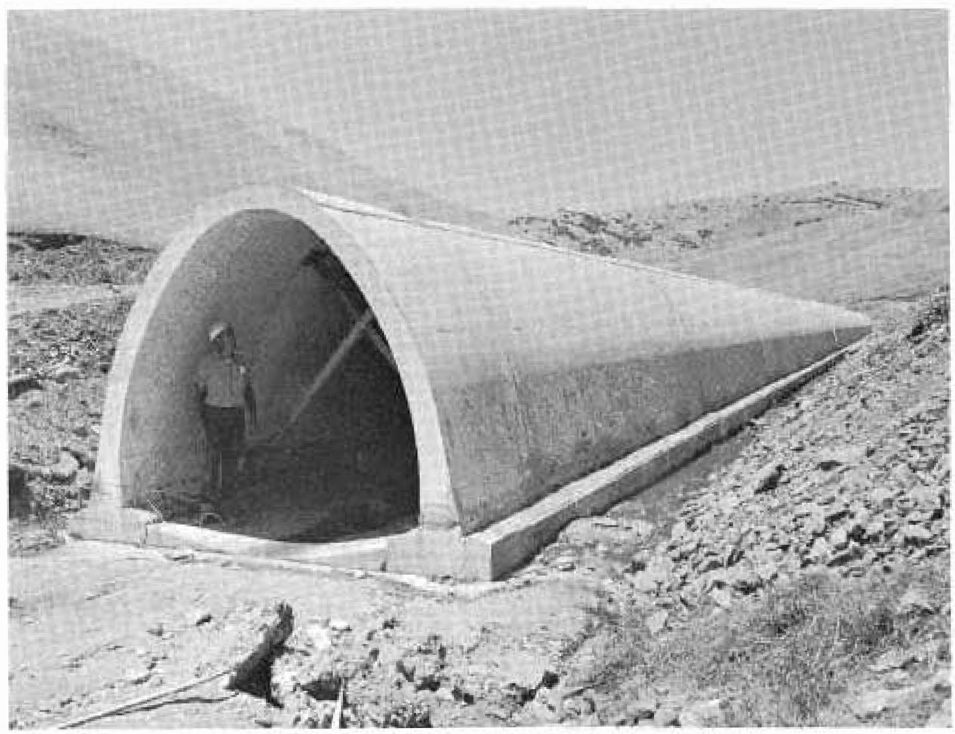
This map shows the limits of the San Luis Reservoir and the new location of Route 152.

Compaction tests were performed at night to help meet the time limitation on the project.

Above—Bin wall is constructed to contain fill slope in a steep canyon. Below—Drilling operations in the foreground coincide with rock loading by a huge power shovel onto dump trucks in background.



This arch structure now rests under 2,000,000 cubic yards of dirt required for the "Big Fill."



A 10-foot-high arch is now about 200 feet below the roadway. A fill was required to maintain the steady grade now experienced by motorists.

Grading began with a spread of scrapers; however, it was soon found that this equipment could not economically and efficiently move the various materials found in the strata encountered. Therefore, a sequence was established that was found to be successful and was continued for the remainder of the project. Cuts were started with scrapers, which were used until the fills became accessible for the movement of rock trucks. The trucks were then brought in and loaded with belt loaders which were fed by bulldozers. After about 30 feet of cut was removed, the belts would be lowered, and the operation repeated until the cut was completed. The slower shovel work was confined to the rockier cuts.

Since such large amounts of excavation required blasting, oversize 4½-inch and 6-inch drills were used for the drill holes to enable placing a greater explosive charge. Potential damage to trees and cabins was not a factor, since they were nonexistent in this area. This made it possible to use larger amounts of explosives to speed the work.

Landslides were a continuous problem throughout the entire length of this project. At the beginning, the landslides seemed of little consequence and the problem was solved by removing only that material which has been dislocated by the slide. As work progressed, however, it became necessary to institute other measures to cope with difficult areas. Where it was possible, slopes were flattened by eliminating benches and using all the available right-of-way. However, at several locations, it was not feasible to flatten the slopes due to the steep terrain. In these areas the centerline was moved downhill, thus permitting flatter slopes without substantially increasing roadway excavation quantities.

Almost a million cubic yards of dirt were moved from the slide areas where the cut slopes were flattened to provide for more stability. In many of the cuts, unusual water problems were encountered, requiring the installation of horizontal drains, deep transverse cutoff trenches, stabilization trenches, and permeable blankets.

Structures

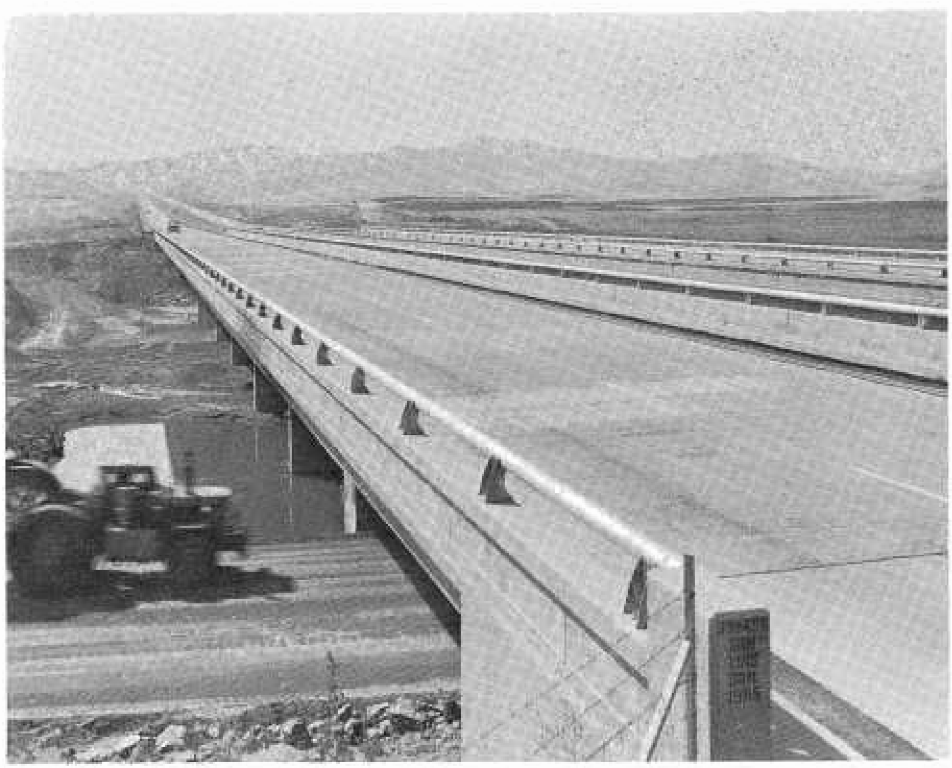
Constructing large reinforced concrete arch drains and building twin bridges in such inaccessible locations posed unusual forming and placement problems. These large drainage facilities had to be completed before the fill operations could begin at maximum production.

The larger arches (9 and 10 feet) were constructed with adjustable steel forms to accommodate both sizes, whereas the forms for the smaller arch (six feet) were built on the jobsite. A 1,042-foot-long arch (nine feet) under the 280-foot-high fill was constructed so that the center 625 feet of the arch was extra strong to withstand the tremendous earth pressure. The 560-foot-long bridges were built over the channel leading into the San Luis Forebay as separate structures.

All of the structural materials with the exception of concrete sand were obtained from or near the jobsite. Concrete aggregates were produced using materials from within the work area. The sand produced locally was not satisfactory for concrete, but it was used to blend with aggregates to make subbases, bases and cement treated base. Aggregate subbase was obtained from the conglomerate highway cuts and was processed by screening. Pervious material was also obtained by selection within the conglomerate cuts. Coarse aggregates for both base on portland cement concrete paving were produced from the same material site located in the future reservoir area near the jobsite, and methods of processing were adapted to maintain the proper respective quality controls.

Paving Operations

Almost a half a million sacks of cement were used in placing the 370,000 square yards of concrete pavement for this project. Concrete pro-



Twin bridges cross the San Luis Forebay channel. The roadway under the bridge will be inundated when heavy equipment used to construct the dam is no longer needed.

A peak is leveled and a canyon filled. Heavy equipment takes a beating in this rough terrain.

ducing operations were a modification of central mix in which the contractor split his batching and mixing operations. The batch plant was located adjacent to the aggregate production plant and batches were weighed and loaded into bottom dump trucks and trailers; one batch filled the truck and the other, the trailer. At intervals, the mixer was moved from location to location immediately adjacent to the roadway where the cement and water were added and the mixing operations performed.

This type of operation was required because of the length of the project and the hauling conditions involved. It was a very efficient way of placing the concrete pavement and meeting the specification time requirement.

Plant-mix cement-treated base was mixed in a plant fed by belt scales. This technique provided an excellent plant control of the quantities mixed, as all ingredients were proportioned by weight.

The cement-treated base was placed with a modified slipform paver which produced a well-controlled finished product. Trimming was nominal and the close tolerances secured in the placement of the cement treated base were reflected in the ease of thickness control of the portland cement concrete pavement.

The contractor was represented by C. A. Peterson, general manager; L. E. Christman and M. L. Shank, project managers; and the author was the resident engineer for the state.

Other Projects

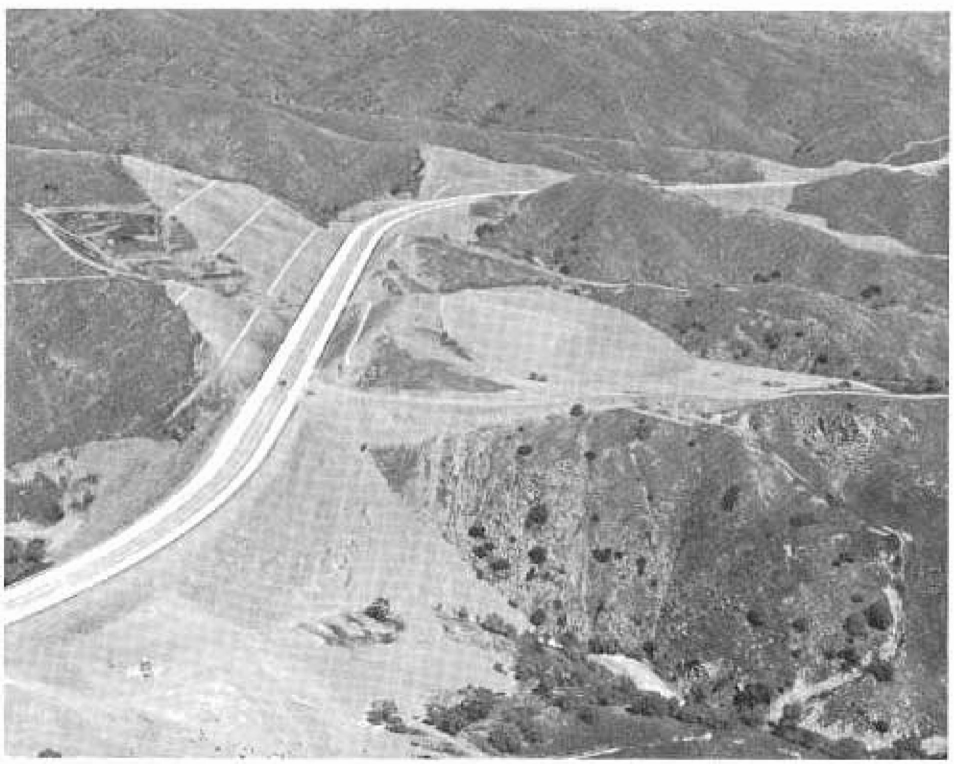
Construction was recently completed on a new four-lane stretch of Highway 152 which ties in with the east end of the Pacheco Pass Highway and extends easterly about two miles to Highway 207. The completion of this project provides a four-lane divided expressway from west of the Santa Clara county line to five miles west of Los Banos.

A portion of Highway 152 was improved in Los Banos when construction was completed this spring by widening a former two-lane section of highway to four lanes.

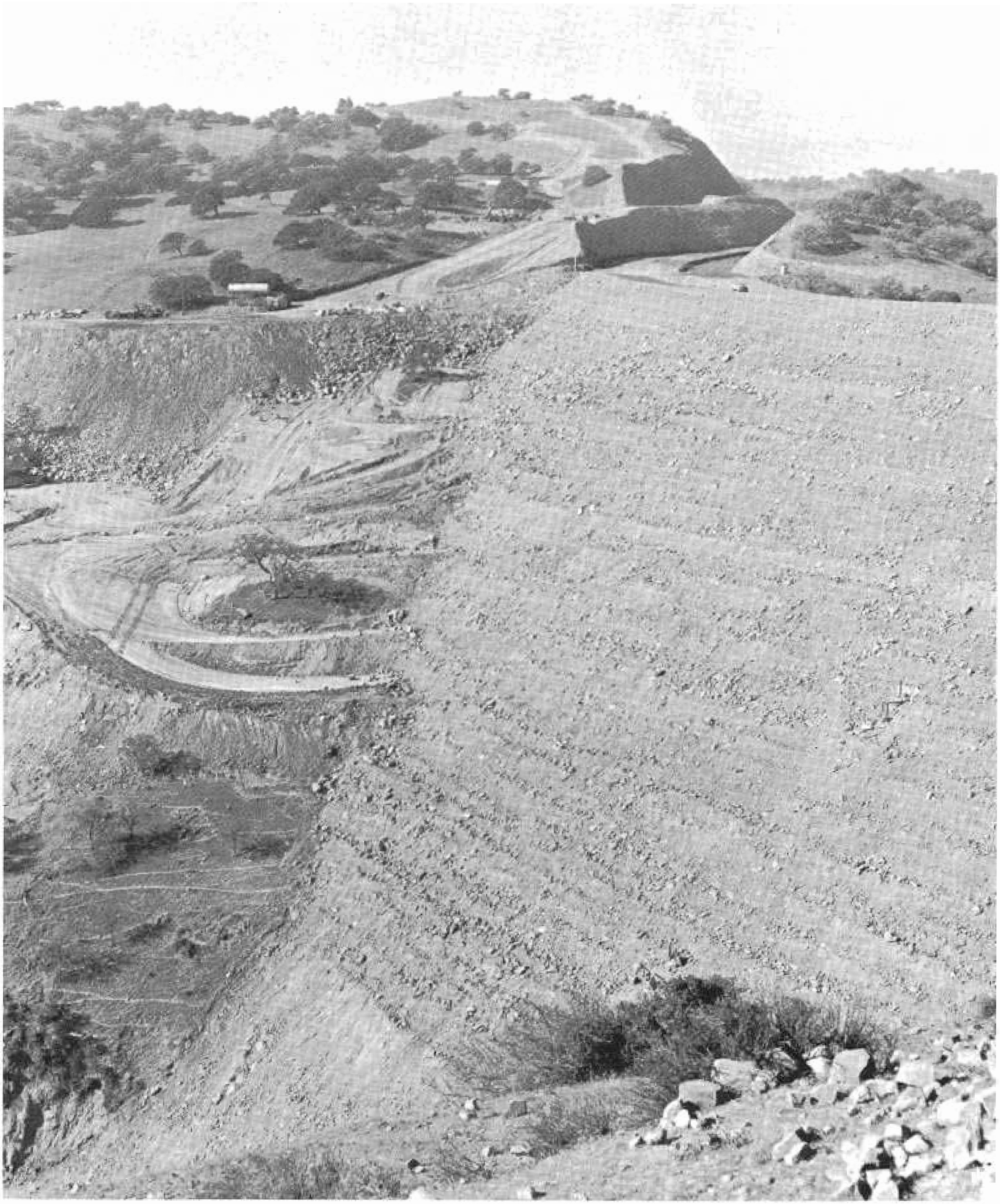
Future Planning

Highway 152 between Highway 207 and US 99 is ultimately to be improved to bring it up to four-lane freeway or expressway standards.

Although design and right-of-way acquisition work is progressing steadily and surveying and aerial mapping is being performed at various locations on Highway 152, construction of these projects will depend upon the future availability of funds.



The "Big Fill" is over 280 feet high and the "Big Cut" is over 300 feet deep.



At rough grade level, the "Big Fill" dwarfed the car at the top right.

Safety Roadside Rests

By G. A. HILL, Assistant State Highway Engineer (Planning)

Although there was no formal ceremony, the State Division of Highways has dedicated its first complete safety roadside rest to a familiar American figure—the weary motorist.

This first fully developed haven for the leg-stretcher and scenic admirer is located on Interstate 5, about five miles north of Red Bluff. Led to the site by a blue sign which hints of a peaceful place in which to shake off the strains of driving, the motorist can actually encounter two similar areas, depending on whether he is northbound, southbound, or making a round trip. This will be the general plan for all rest stops located on heavily traveled divided highways.

Although not intended for overnight stops, the roadside rest provides all the facilities of a well-developed park. There are comfort facilities, a drinking fountain, picnic tables, and stretches of black-topped sidewalk for a pleasant meander through the area to remove those driving kinks.

The buildings are designed to complement the natural setting. In the case of the Red Bluff stop, adobe-style concrete blocks and shake roofing are the materials used. Inside, ceramic tile walls and foot-operated facilities, help insure a clean and sanitary atmosphere.

Cost of this pair of roadside rests was $80,000. Others will range from as little as $5,000 to as high as $100,000, depending on their size, the facilities provided, the terrain and other factors.

For economy, most safety roadside rests, are being built in conjunction with highway construction projects. During the current fiscal year 12 roadside rests are provided for in this manner in the state highway construction budget. Most of the initial rest areas are being placed on interstate routes as an authorized part of this national interstate and defense highway system.

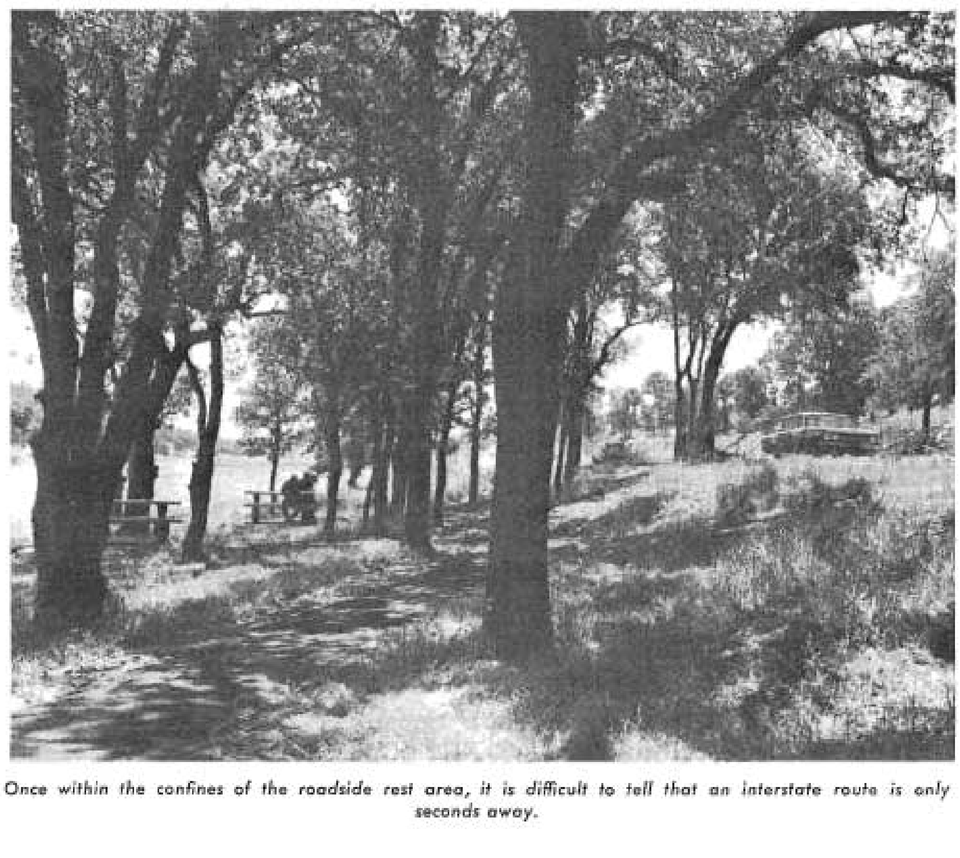
Eventually, California expects to have approximately 250 sites developed into safety roadside rests, and they will supplement other facilities to provide a stopping opportunity at about half-hour intervals of driving time.

On the outskirts of major metropolitan sections there will be stopping points with a function beyond that of the usual rest area. Designated as map inspection points, these roadside rests will provide a convenient stopping place for travelers bound for densely populated areas. It is hoped that they will stop, consult their maps, and plot their courses via freeways and city streets to their desired destinations within large cities.

The Division of Highways has been in the safety roadside rest "business" since 1963. Prior to that, a limited program had been carried out by the California Division of Beaches and Parks. The 11 roadside rests which were constructed under this earlier program have now been transferred to the Division of Highways, and those which lacked complete facilities are gradually being upgraded as programing and funds allow.

Following is a list of the current status of the 44 roadside rests and map inspection stations completed, being constructed, or budgeted under the Division of Highways program:

Del Norte County—US 199, at south portal of the Collier Tunnel, three



Once within the confines of the roadside rest area, it is difficult to tell that an interstate route is only seconds away.

miles south of the Oregon state line. Under construction.

Trinity County—Route 299, five miles south of Weaverville; originally a Beaches and Parks facility. Open.

Shasta County—Route 299, 38 miles east of Redding; originally a Beaches and Parks facility. Open; all facilities, but no water supply.

Lassen County—US 395, 12 miles south of Ravendale; originally a Beaches and Parks facility. Open.

Lassen County—Route 44, 28 miles northwest of Susanville. Budgeted.

Plumas County—Route 70, 46 miles east of Quincy; originally a Beaches and Parks facility. Open; all facilities, but no water supply.

Tehama County—Interstate 5, pair, north of Red Bluff. Open.

Glenn County—Interstate 5, pair, approximately two miles south of Artois; under construction.

Nevada County—Interstate 80, pair, near Donner Summit. Open; with comfort facilities to be added shortly. (The state opened bids on the project July 28.)

Amador County—Route 88, four miles west of Jackson, originally a Beaches and Parks facility. Open; but no water supply.

Calaveras County—Route 49, seven miles south of San Andreas; originally a Beaches and Parks facility. Open, but no water supply.

Calaveras County—Route 49, four miles south of Angels Camp; originally a Beaches and Parks facility. Open, but no water supply.

Stanislaus County—Interstate 5, pair, near Arkansas Fan south of the San Joaquin county line. Budgeted.

Merced County—Interstate 5, pair, near the San Luis Dam near Los Banos. Under construction.

Mariposa County—Route 140, eight miles east of Mariposa; originally a Beaches and Parks facility. Open, but no water supply.

This aerial view of the safety roadside rest for northbound traffic on Interstate 5 near Red Bluff shows the ease with which the motorist can leave the highway for a rest period. Blue Tent Creek is at right. A similar area for southbound traffic exists to the north of this site.

Inyo County—US 395, near Haiwee Reservoir, constructed by Inyo County and deeded to the Division of Highways. Open; all facilities.

Inyo County—US 395, near Division Creek north of Independence. Budgeted.

Tulare County—US 99, pair, five miles north of Tipton. Under construction.

Kern County—Interstate 5, near Lebec. Open, but no comfort facilities.

San Bernardino County—Interstate 15, three pair, all located east of Barstow. All open. Two pair have comfort facilities under construction; at the remaining pair these are scheduled for later construction.

San Bernardino County—Interstate 40, three, located between Needles and Barstow. Originally Beaches and Parks facilities. Open, but no water supply.

San Bernardino County—Interstate 40, pair, near Desert Oasis east of Newberry. Budgeted.

San Bernardino County—Interstate 10, near Fontana. Map inspection station. Under construction.

San Bernardino and Riverside Counties—Interstate 10, pair, between Redlands and Beaumont. Open. Comfort facilities in planning stage.

Riverside County—Interstate 10, pair, 15 miles east of Indio. Under construction, with comfort facilities to be added later.

Los Angeles County—Interstate 5, near Castaic. Map inspection station. Under construction.

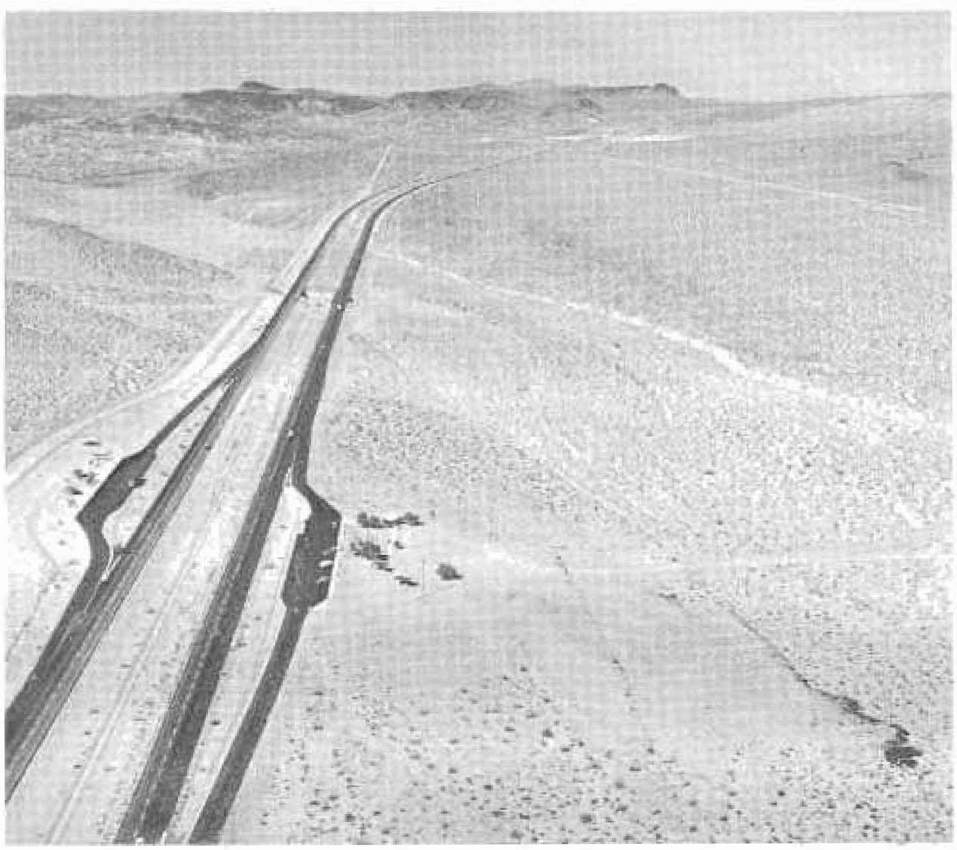
San Diego County—Interstate 5, near Leucadia. Map inspection station. Under construction, but no restrooms.

Imperial County—Interstate 8, 20 miles west of the Arizona border. Open, but with comfort facilities to be added in future when traffic circulation plan is revised.

Another law which is related to the roadside rest program is the Westside Freeway Park and Development Act of 1963 which provides complete integration of recreation features along the Westside Freeway. Skirting the western edge of the San Joaquin Valley, this completely new freeway (to be part of Interstate 5) will feature both roadside rests and roadside parks. The Legislature, in the 1963 law, stipulated that pairs of roadside rests were to be constructed at six locations between the San Joaquin River in San Joaquin County and the junction with US 99 south of Bakersfield in Kern County. Two of these roadside rests are now under construction (see listing for Merced County) and two additional rest areas will be constructed in Stanislaus County under a project to be advertised later this year (see listing for Stanislaus County).

The roadside park sites along the Westside Freeway will be located at five scenic areas—at the Kern River, south of Kettleman City, at Mercy Springs Road, at Orestimba Creek and at the San Joaquin River near Mossdale, and will be constructed under the supervision of the California Department of Parks and Recreation.

Safety roadside rest areas throughout California are really as different as the terrain in which they are built. One can see a spectacular contrast between the pair on Interstate 80 near Donner Lake (above) and the pair which flanks Interstate 15 east of Baker (below).



Last Bond Issue

On July 2, 1965, the State of California made the final payment on the last of its three highway bond issues.

The checks mailed by State Treasurer Bert A. Betts represented the last $1,000,000 in payments on the principal, plus $22,500 in interest. The total interest payments on the $40,000,000 issue have amounted to $44,950,077.

Voted by the people in 1919 and issued in 1920, this issue was the third of its kind approved by Californians to finance a highway construction program and "get California out of the mud."

In 1909 the California Legislature authorized and in 1910 the people approved the state's first highway bond issue of $18,000,000, but only by a small majority.

Even after a statewide campaign featuring photos of autos mired in deep mud on rural roads, etc., the bonds received only 93,297 yes votes against 80,509 no votes. Once passed, the issue, which bore 4-percent interest, proved hard to market. Only $4,280,000 could be sold publicly. The remainder were purchased by the counties "because," according to the Highway Commission's first biennial report (1918), "otherwise the work could not have gone on."

In spite of its unenthusiastic reception, the bond issue did make possible the real beginning of a unified system of state highways.

The act provided that a system should be acquired and constructed by the Department of Engineering and the routes selected and laid out "so as to constitute a continuous and connected state highway system running north and south, traversing the Sacramento and San Joaquin Valleys and along the coast by the most direct and practicable routes connecting the several county seats and joining centers of population, together with such lateral roads as might be necessary to connect the north and south arterials with the county seats lying east and west of such highways and also to connect the chief transcontinental routes entering California."

Governor Hiram W. Johnson summed up the problem when he told his newly appointed State Highway Commission that "you are expected to build with $18,000,000 a highway system that some of the best engineers have estimated will cost from thirty-five to fifty millions."

The state made the final payment and closed out the 1909 bond issue in July 1961 (see July–August 1961 issue of *California Highways and Public Works*, page 61). Total interest paid to the holders of these 50-year bonds was $18,061,641.

With the prospect of the 1910 funds being almost expended, the 1915 State Legislature authorized a second bond issue of $15,000,000. This was ratified by the voters in 1916 and issued in 1917. That California had become fully highway-conscious is attested by the fact that not a single county voted against the issue. The total was 542,239 in favor and 137,107 against.

Final payment on the 1915 bonds was made in July 1963, with a total of $16,172,213 being paid in interest to bond holders during the 45 years the issue was outstanding.

An indication of how the highway program was progressing is shown by the 1917–1918 biennial report, which reports that by June of 1916 a total of 1,263 miles of road had had work done on them including 323 miles graded but not yet paved.

At a special election on July 1, 1919, the people of California approved by 196,084 to 27,992 a third highway bond issue, for $40,000,000. These funds became effective immediately and provided for continued construction of the highways designated by the two previous issues. Under the third issue, additional roads were made a part of the state highway system.

This was to be the last of the highway bond issues. In its biennial report for 1919–1920, the California Highway Commission recommended creation of a gasoline tax, the proceeds of which should be "devoted solely to highway purposes."

The gas tax became a reality in 1923. That same year the Department of Public Works and the Highway Commission were reorganized, giving greater status to the latter as well as to the State Highway Engineer, who became executive officer of the commission and in direct charge of all highway construction. But in spite of California's now long-established pay-as-you-go policy which, through the gasoline tax and other highway user levies, has financed the construction of what is generally considered the most advanced system of freeways and highways in the world, the people of the state will always owe a debt of gratitude to the first three bond issues initiated by the state, meager though they seem by present standards, for they launched California on an integrated program of highway construction.

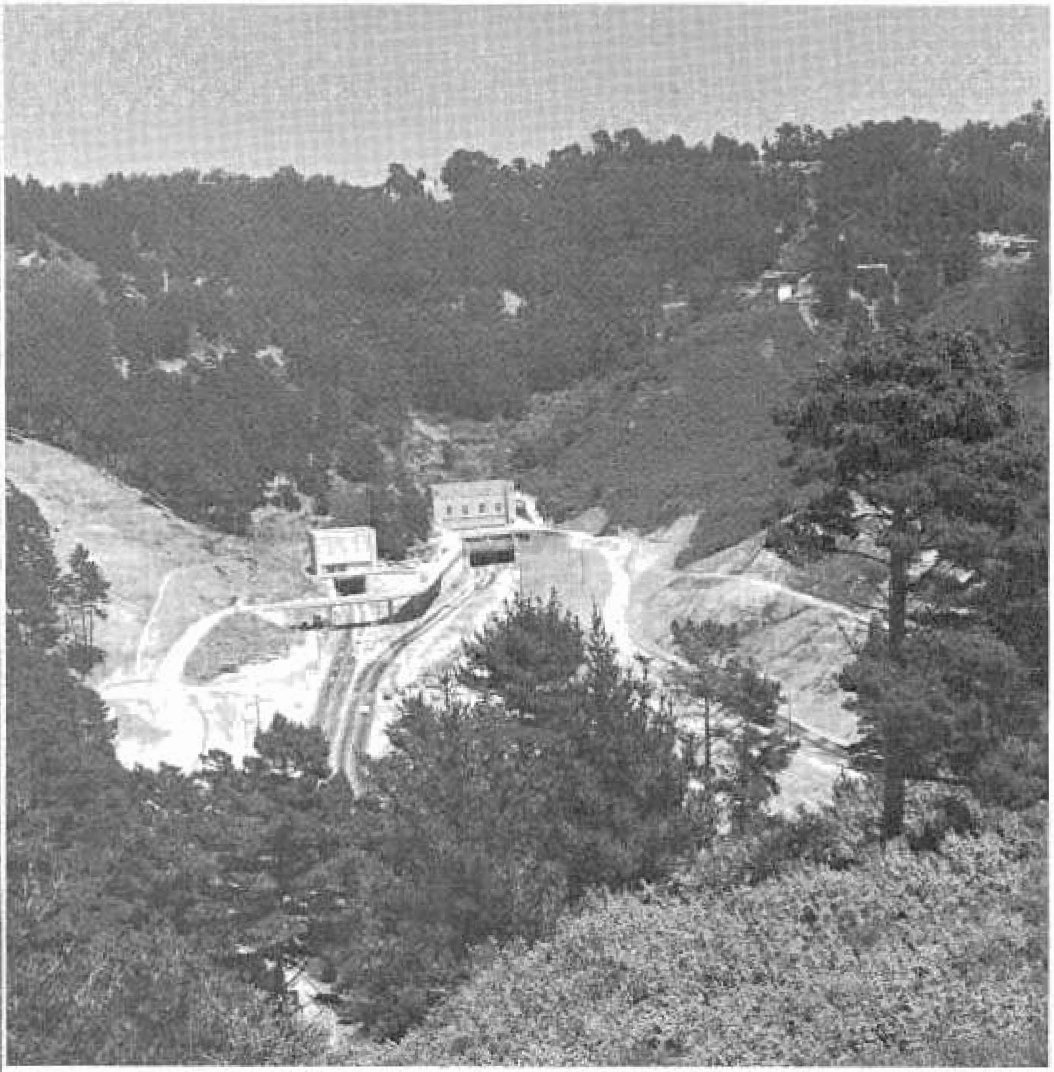
BYLINE OMITTED

Readers of the article on the Mission Gorge Road project in the May-June issue of this publication were probably baffled by the reference on page 19 to "the writer" of the article, not otherwise identified.

There should have been a byline at the head of the article reading: "Paul A. Hanssen, surveyor — road department, County of San Diego." Mr. Hanssen was one of the resident engineers on the project and prepared the article.

The Caldecott Tunnels

By IRWIN W. BLACK, Bridge Resident Engineer, and
ORIS H. DEGENKOLB, Bridge Design Engineer



Looking east at the newly completed third tunnel (at left) which facilitates progression of traffic through the Berkeley Hills on Route 24. Site of 1904 tunnel seen on facing page is now closed and completely covered over by foliage.

To the average motorist a tunnel is merely a hole through a mountain which provides a shortcut for the highway to get from one side to the other. But the amount and complexity of equipment and the numerous details which are required to design, construct and operate a modern highway tunnel quickly negate thinking of such passageways in simple terms. Highway standards are constantly upgraded, and tunnels too must be built to accommodate increased numbers of faster moving vehicles and provide the traveling public with safer, better ventilated, better lighted and more spacious appearing tunnels. Construction problems and costs rise rapidly as the size of a tunnel increases.

First Tunnel

The first highway tunnel through the Berkeley Hills between the City of Oakland and Contra Costa County was constructed in 1904. It was timber-lined, dark, narrow and only 1,000 feet long. Of course, the increase in population in this area and the increasing popularity of the automobile rendered this first crude facility inadequate in the early 1930's.

On December 5, 1937, appropriate ceremonies were held to dedicate the Broadway Low-level Tunnels and celebrate their opening, thus breaching the natural barrier to traffic. That event was the culmination of years of dreams, planning, and construction under the auspices and guidance of Joint Highway District 13, with the late Thomas E. Caldecott, president to its board of directors. Subsequent recognition has been given to Mr. Caldecott's vital role in this intercounty facility by rededicating the tunnels in his name and honor.

The twin tunnels, each 3,000 feet long, were concrete lined, lighted with incandescent electric lights and ventilated with a forced air ventilation system. Since these two tunnels were curved at the ends and joined one another at a single portal building at each end, many people have been led to believe that there is only one tunnel with a thin concrete wall separating the two roadways, but the roadways are 150 feet apart except at the curves at each end. Each of the twin tunnels has a 22-foot-wide roadway and a width of 26 feet 8 inches between the sidewalls. The original 1904 tunnel has been abandoned and the ends are closed.

Need for New Bore

Continued growth of the bay area increased traffic in the two low-level tunnels to the point where they were becoming inadequate. The need for a third tunnel to supplement the first two was the natural solution. Modern standards required that the highways at each end of the tunnels be widened and straightened and that the third bore be made wider than the first two. Since the third tunnel was to be considerably larger than the two older tunnels, it was not possible to adapt the original plans to the new location.

On October 6, 1964, dignitaries from throughout the area assembled to dedicate Tunnel III to the name and further honor of Thomas E. Caldecott. Mrs. Caldecott and her family were present on this occasion, which coincided with National Highway Week—1964.

New Features

The third tunnel has a 28 foot wide roadway and is 34 feet 6 inches wide between the sidewalls. The vertical clearance is 17 feet above the pavement, compared with the 14 feet 10 inches in the two older bores. In addition to the larger size of the tunnel itself, there are numerous other features which are new or improved. The entire length of the roadway is illuminated by a continuous line of fluorescent lights on each side of the ceiling. Extra lights are placed for a distance of 300 feet at each end so that there is a gradual transition in the daytime in order to allow drivers' eyes to adjust to the change from the bright sunlight outside and the artificial light in the center of the tunnel. Emergency power facilities have also been installed for use in the event that there is a power loss from the serving utilities.

Ventilation

A new transverse system of ventilation is being used. Fresh air is taken in at the westerly portal building and carried along a duct above the roadway. It is discharged into the roadway section through openings at one side of the ceiling. The fresh air mixes with exhaust fumes from the vehicles, and is drawn out through exhaust ports on the opposite side of the ceiling, then carried to the westerly portal building and discharged straight up into the atmosphere. The two fresh air and two exhaust blowers have a capacity of a half-million cubic feet of air per minute. The exhaust air is tested continuously (automatically) for carbon monoxide content. If the sampling indicates that there is a specified concentration of carbon monoxide accumulating, the ventilating machinery will automatically start to speed up until the concentration lowers to a desired level.

Other Equipment

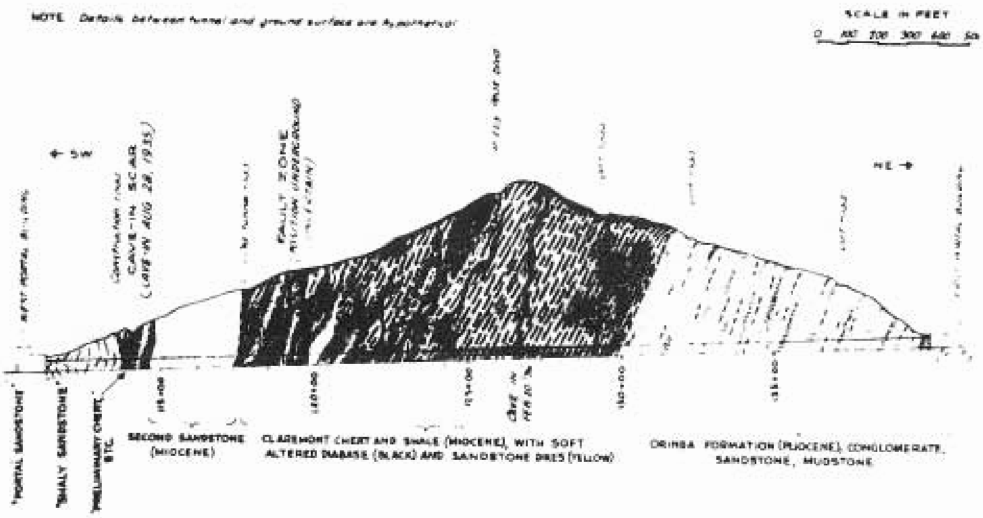
Telephones, fire hydrants, and extinguishers are located at 250-foot intervals along one side for emergency use. The fire alarm systems will notify the fire departments from Oakland and Orinda (at opposite ends of the tunnel) in case of emergency. A public address system has been installed and can be used to give instructions to motorists in case of emergencies. An intercom system connects all working locations so that workmen and tunnel operators can communicate quickly.

Television cameras are placed above each portal and are remote controlled so that the tunnel operators can detect difficulties or accidents. Provisions have been made so that TV cameras can be placed inside the tunnel at a later date for more thorough observations.

Preliminary Work

One of the most important factors in the design of a tunnel relates to geological conditions. A very comprehensive geological report had been made during the construction of the first two bores. This report was used later by the designers of the new tunnel and was also made available to the contractors who bid for its construction. Since the design of the existing tunnels had been proven to be structurally adequate by the test of time, various combinations of load-

Taken September 1, 1934, this photograph shows construction on the first low-level tunnels as well as the old tunnel (at top center) built at the turn of the century.



GEOLOGIC SECTION ALONG NORTH TUNNEL

ings considered necessary for the new tunnel were applied to the original designs.

Several Projects

The contract for construction of Tunnel III, approximating $11,000,000, was only one of several major projects completed, presently underway, or contemplated the facilitate the movement of traffic to and from central Contra Costa County through north Oakland.

Before actual tunnel work could start (November 1961), a first phase beginning December 14, 1960, included extensive drainage work and excavation for the approaches, involving about 400,000 cubic yards of material. Excavated material at the east end went into the detour which had to be constructed prior to driving the tunnel. With completion of the excavation and detour, space became available for the contractor to install necessary facilities and begin work on the West Portal service road, bridges and the tunnel proper.

Tunneling Operations

The first phase of the tunneling operation consisted of placing three small holes, called drifts, in the mountain. One of these drifts was at the crown, and the others—one at each side—were at the lower limit of the steel tunnel supports, about 14 feet above roadway grade.

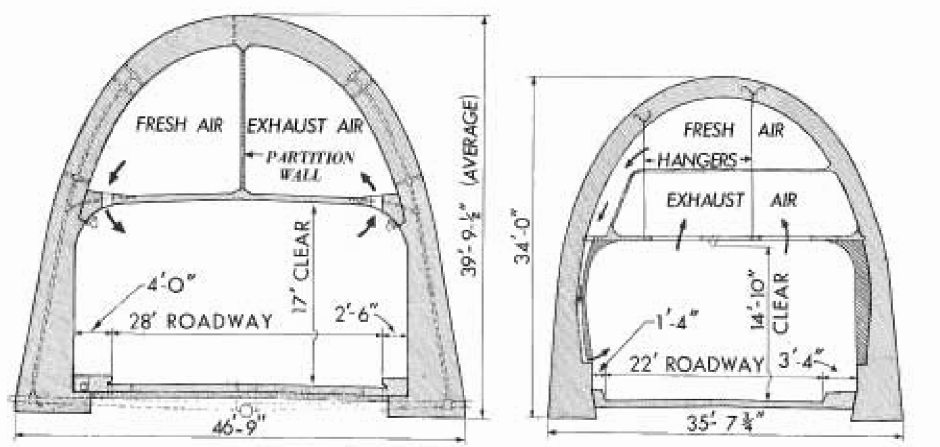
At a distance of 117 feet into the hill, a safe sandstone material was encountered. The workers then went from drift to drift, installing the steel ribs from wallplates to crown. Each rib was made up from six sections. Excavation then proceeded carefully from inside rib back out toward the portal. Only enough material was excavated to give the men sufficient working room. Excavated materials were taken out with a small air-operated loader through the side drifts. With this method, the workmen always had steel overhead to protect them. The core area was then removed from the outside with larger equipment.

Breastboard Jumbo

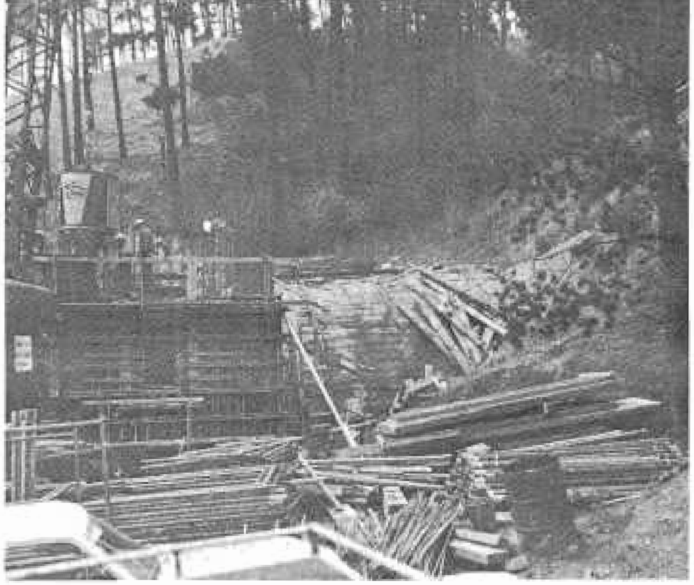
While assemblying and activating a breastboard jumbo (acquired by the contractor from the Morrison-Knudsen Co. who had used it in construction of the Broadway Tunnels in San Francisco in the early 1950's) the wallplate drifts were continued on into the hill.

This jumbo held breastboards tightly against the working face at all times, except in a small area where the excavation was being done. There were 16 forward jacks of 15-ton capacity each, placed in three rows, plus 2 jacks at the top. The jacks were hydraulically operated and they were enclosed in steel shells to prevent damage from mining or blasting. When the jumbo was forwarded, these jacks telescoped so that the breastboards never were held less than snugly against the face even with movement to the location ahead.

Four 45-ton rams held the jumbo steady and were used to move it forward. These were angled out from the sides (two to a side) and thrust against walers which were clamped to the steel ribs of the tunnel. When the jumbo was moved forward, the 45-ton pressure of these rams overcame the pressure of the breastboard jacks, forcing them to telescope without taking pressure off the face. As a



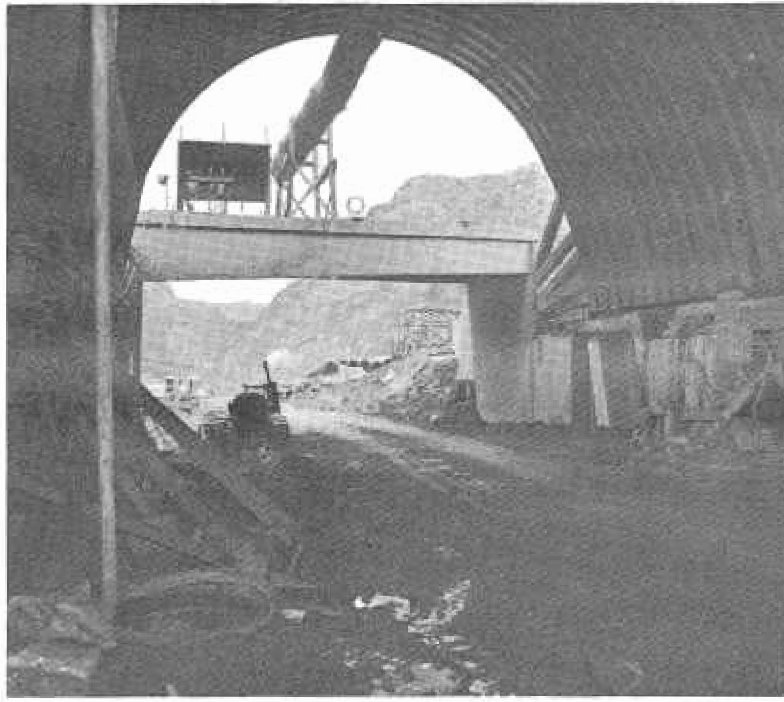
This drawing shows the contrast between the design of the first two tunnels (on right) and the newly completed tunnel. Major differences are a wider roadway, higher clearance, and a revision of the exhaust system.



Scaffolding rises for construction of the new portal building above the rounded hump of the tunnel top.

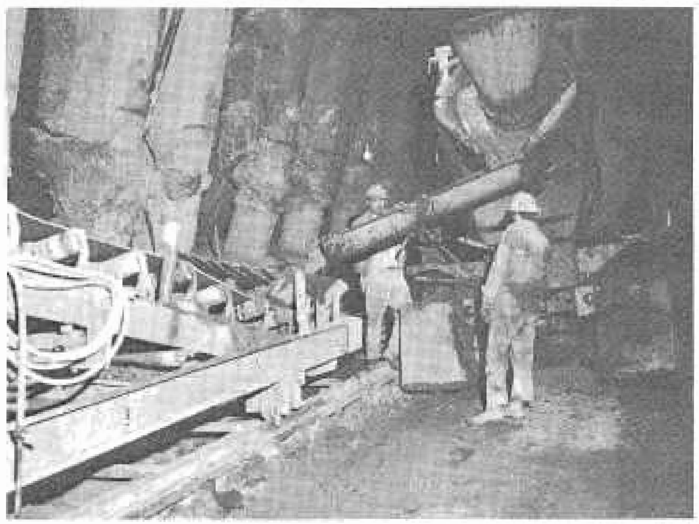
(Above) Working under the protection of the jumbo, construction personnel find that the shovel is still in style for excavation operations.

(Below) On the top level of the jumbo, miners demonstrate some of the obstacles of their work. Space is tight and some tasks are awkward to perform.



(Above) The new tunnel is finally excavated to roadway level at the east portal.

(Below) Concrete pouring by an air-propelled placement system uses compressed air to force the concrete into "slicklines" for desired delivery points.



(Below) Steel sets and timber lagging support excavation of upper portion of tunnel. Roadway level is about 14 feet lower.

A view of the completed concrete arch section, with forms in place for the ceiling above roadway.

Tiling operations mark the beginning of a more finished appearance for the tunnel.

safety measure, mechanical jacks were used in addition to the hydraulic rams.

Ribs

Miners are a tough, hardy lot and their working conditions usually leave something to be desired. The work is noisy, dirty, frequently wet and muddy, always hazardous, and is usually done in cramped quarters from precarious perches.

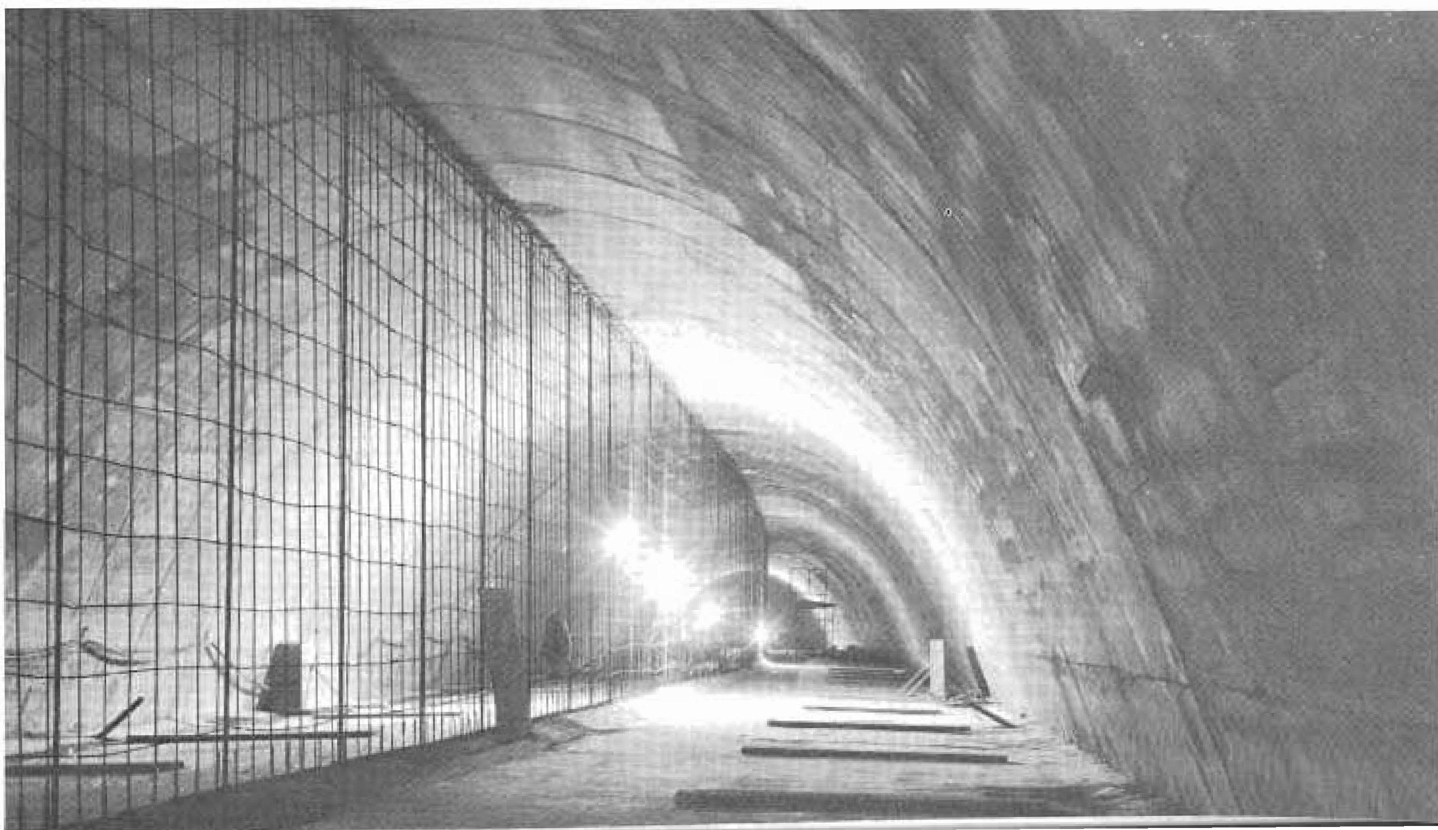
The material which was mined by spading (or blasting if required) fell to the tunnel floor under the jumbo and was picked up by a front-end overshot loader (called a mucker), dumped into a Dumpster and hauled to a canyon west of the job for fill as a part of the freeway.

The large steel ribs (tunnel supports) were erected in four sections: One lower section on each side was handled from below, and two crown sections were set up from atop the jumbo. Blocking was done and lagging was installed behind the steel supports to retain the unstable material.

Concrete Pour

While mining of the full crown heading continued well into the mountain, other operations followed from the West Portal. The first of these consisted of underpinning (or supporting) the wallplates which carried the load of the mountain transmitted through the steel ribs. Underpinning was achieved by mining or

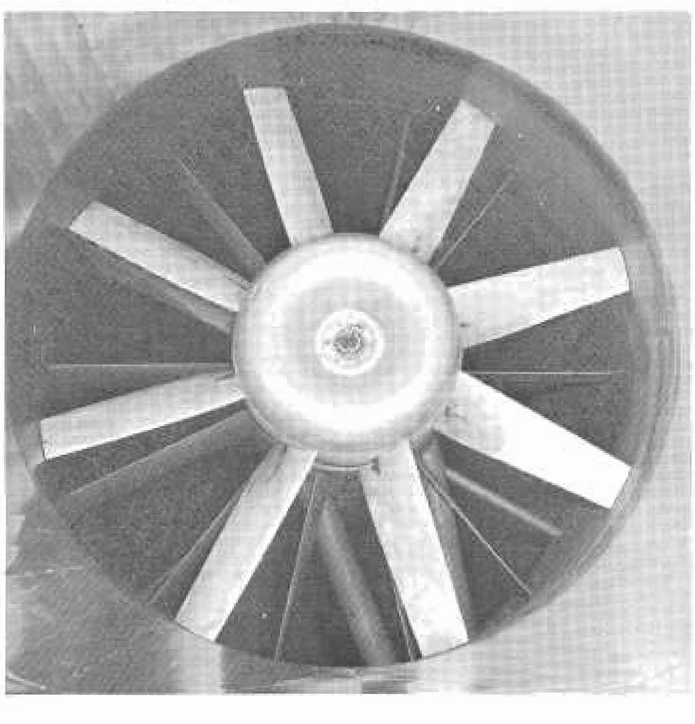
This photograph shows the partly completed partitioned ventilation channels above the roadway (see diagram at bottom of page 14).

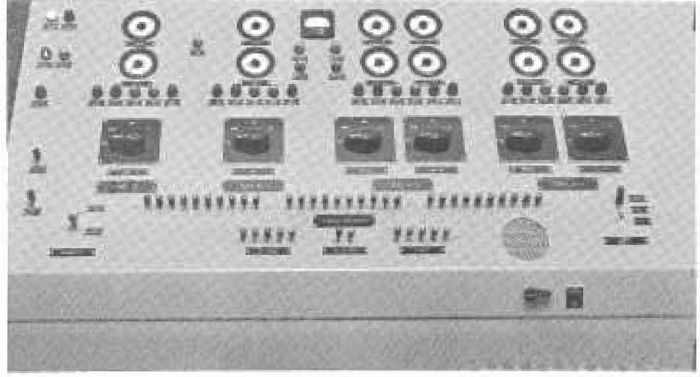


A television camera, mounted at portal top, monitors traffic heading for the tunnel. The resulting "commentary" is watched from the control room to alert the staff of emergencies and/or the need for lane control.

drilling holes at intervals to the ultimate foundation level, forming pilasters, and placing concrete up to the wallplates. After the pilasters had taken over their supporting role, the remainder of the excavation was com-

This huge ventilating fan, one of two, supplies fresh air to the new tunnel.



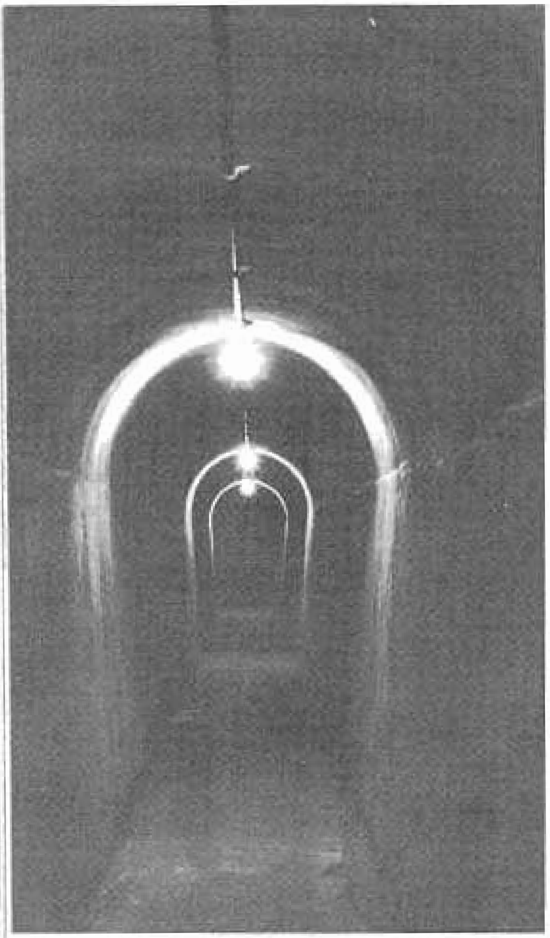


The master control panel enables personnel to handle a variety of situations in the present three tunnels, with space available to hook up to a future fourth tunnel.

pleted to roadway level, and footings were poured. Then, wall reinforcing was placed, track was laid to accommodate the wall forms with traveling jumbo, and the forms moved into place to receive the concrete pour.

Concrete pouring for the tunnel lining was done by using an air-propelled placement system. Concrete was chuted from truck mixers onto conveyor belts which transferred it to hoppers. The hoppers fed the pres-

These massive exhaust ducts take the "used" air from the tunnel and arrange for its disposition straight up into the atmosphere.



Small cross-tunnels enable personnel to get from one tunnel to another in a safe manner.

sure vessels located immediately beneath them. After the gates were closed, compressed air, introduced into the vessel, forced the concrete through pipes, called "slicklines," to the desired points of delivery.

Tiling

Completion of the basic tunnel lining was followed by tiling the ceiling, tiling the walls, constructing curbs and pavement, and installing operating and safety equipment.

The final result is a smooth-riding concrete pavement of safe, comfortably wide lanes; flanked by safety curbs and pleasing "seafoam" green tile walls and ceiling—all well lighted.

Other Details

After the third tunnel was completed and opened to traffic, the first two tunnels were closed, one at a time, and renovated. Troublesome sections of pavement were removed and replaced, the roadway area surfaces cleaned and painted, drainage facilities repaired, ventilating equipment overhauled, emergency facilities added, lighting modernized, and controls revised so that all three of the tunnels are operated from the new portal building.

The two older tunnels have fresh air and exhaust blowers in the portal buildings at each end. The third bore is ventilated from one end only. The portal buildings are equivalent to a six story building and house all of the ventilating equipment, controls, shop space and operating personnel. Provisions have also been made for the equipment of a future fourth tunnel (which will be built northerly of the present three tunnels) to be controlled from the one portal building.

Since each of the three tunnels have only two traffic lanes, it is not considered safe or desirable to have two directions of traffic in any one tunnel. Although there is always a considerable amount of traffic passing through the tunnels, it is predominantly heavy in the westerly direction in the morning and easterly in the afternoon. The first and third tunnels carry traffic in one direction only at all times. Traffic lane-changing devices are being installed so that the center tunnel can be used to carry traffic in whichever direction it will do the most good.

Adits

Small cross-tunnels, called adits, connect the main tunnels at three locations between the portals. These were intended to be used for additional safety during construction and are useful for tunnel maintenance and emergency operations.

CALDECOTT TUNNEL PROJECTS

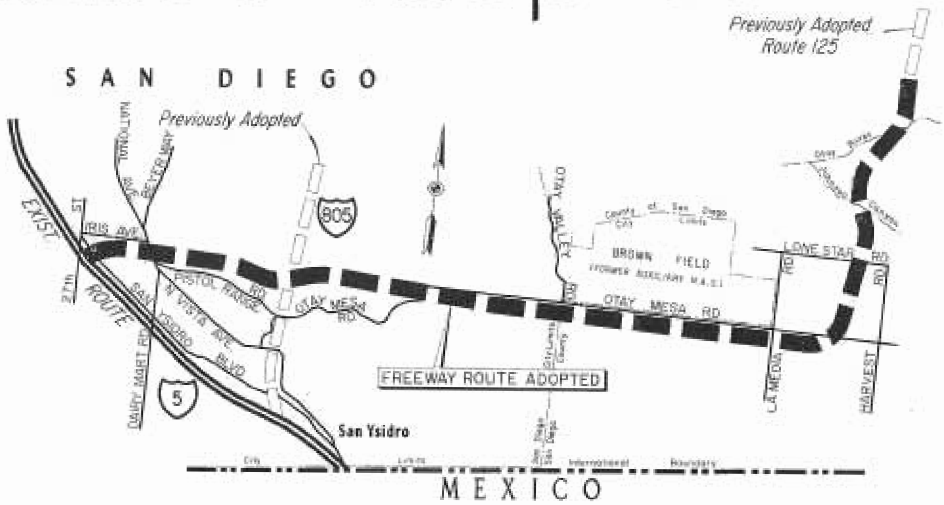
Job	Date completed	Contractor	Contract amount
Tunnel No. 3	July 9, 1964	Connolly-Grafe-Brayer-Harney	$11,030,000
Strutting and drainage No. 1 and No. 2	March 31, 1965	Dan Caputo	298,100
Renovation No. 1 and No. 2	March 28, 1965	Steiny & Mitchel	832,800
Lane control	To be completed November 1, 1965	Steiny & Mitchel	338,000

The third tunnel as it looked in the later stages of construction.

New Routes Adopted

At its May and June meetings, the California Highway Commission adopted the location for 21.8 miles of freeways on five routes.

The commission also revised the routing of 1.8 miles of Route 59, a conventional highway southwest of Snelling in Merced County, to eliminate curves, and designated short sections of N Street and Broadway in Needles as a traversable route to carry State Highway 40 traffic pending construction of the Route 40 Freeway.



In San Diego County, the commission adopted freeway routings for 9.7 miles of interconnected Route 75 and 125 near the Mexican border. The new alignment will take Route 75 easterly for 7.1 miles from Interstate 5 near 27th Street, just south of Iris Avenue in San Diego, to about a half-mile east of Brown Field.

From this point, the newly adopted alignment for Route 125 runs 2.6 miles northward, with a slight jog to the west between Johnson Canyon and the Otay River. It connects on the north with a previously adopted location for this route northward to Route 54 near Sweetwater Reservoir.

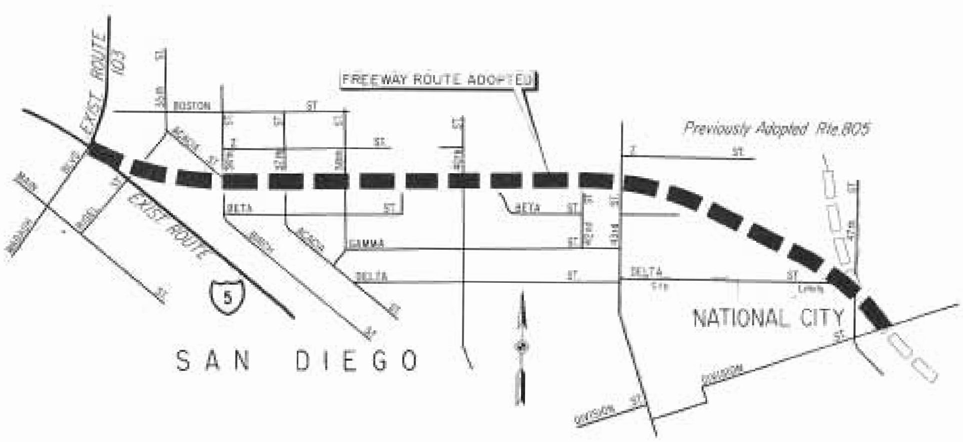
The Route 75 and 125 freeways will form the southern and eastern legs of a belt-line system of freeways around the San Diego Metropolitan area.

The commission also adopted a freeway alignment for Route 252 in its entirety in San Diego and National City.

This 1.8-mile connecting link between the Interstate 5 and Interstate 805 ,freeways proceeds easterly from the former at Wabash Boulevard (Route 103), approximately one block north of Beta Street, to 43rd Street in San Diego. It then turns southeasterly to the adopted route for the future Interstate 805 Freeway at Division Street in National City.

In Monterey County, the commission adopted a freeway location for 1.1 miles of Route 198 near San Lucas to provide a connection with the future US 101 Freeway. The new routing leaves the existing highway northeast of Cemetery Road, proceeds southwesterly to southwest of existing US 101, then turns more westerly to future US 101.

Farther north, the commission adopted a freeway routing for 9.2 miles of US 395 in Lassen County between Madeline and 0.8 mile south of the Modoc county line.

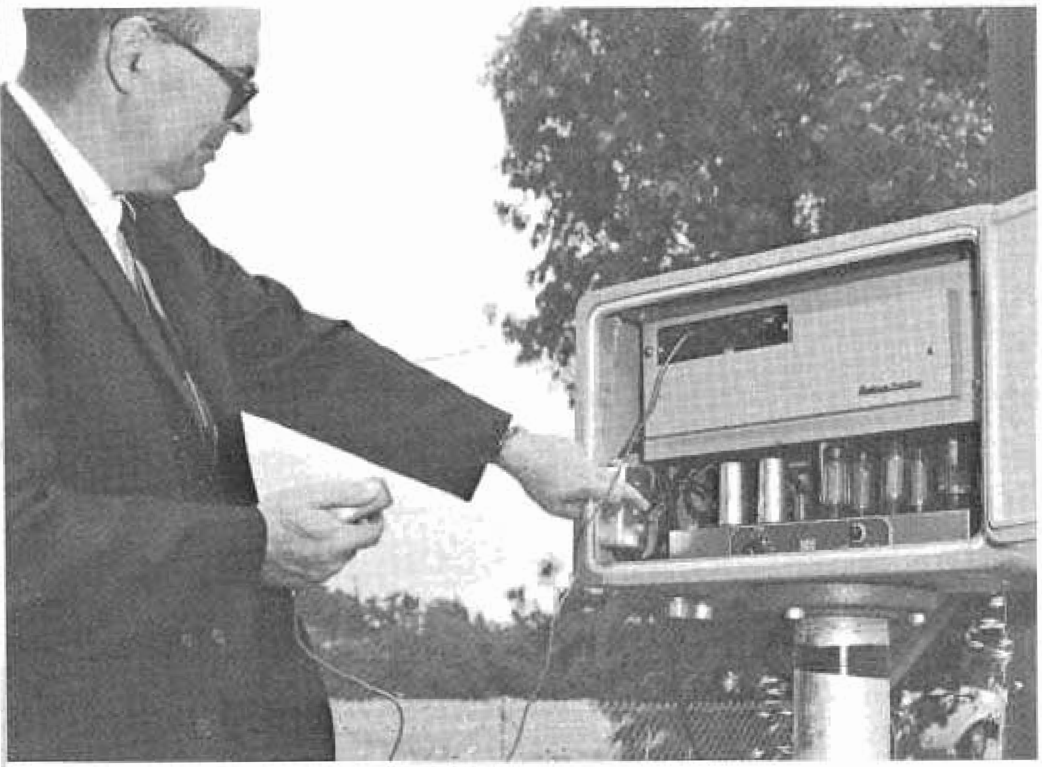


Talking Freeways

Radio Messages May Supplement Signs

The era of freeways that talk to drivers may be almost at hand if the promise indicated in recent tests of induction radio and other forms of audio highway communications systems by the California Division of Highways comes true.

Certain ethereal qualities seemed involved in the tests, for participating drivers suddenly began to hear a voice emanating from no logical source that advised them of traffic hazards they would encounter within the next few miles.



David J. Theobald, project engineer for fog studies, holds a microphone in his hand, preparatory to "planting" a message to be broadcast to motorists with vehicles equipped to receive test warnings.

But the source of the information was quite prosaic. Test automobiles were equipped with an antenna-amplifier-speaker combination, and this small electronic packet was picking up radiations from a nearby tape recorder that was feeding a message into a copper wire looped around a 700-foot section of freeway. As long as the test vehicle remained within the confines of the wire-loop the voice continued to repeat its message, and faded away only when the car had traveled the 700-foot limit of the system's sphere of influence.

The theory of augmenting with sound the visual traffic signs most drivers rely on for information is neither new nor original with the California Division of Highways. Signs have been the prime means of imparting on-the-spot information to passing travelers since at least the time of the Romans. Then as now, a person lost or confused can always stop and ask a local resident for directions. But in the last 20 years, increased speeds, restricted-access highways and massive traffic volumes have combined to alter the driver's environment drastically and to place ever-increasing demands on signs to keep travelers aware of where they are and what hazards might lie ahead.

Technology and the increased tempo in daily living have combined to make it more difficult for a sign to perform its function. The sign must compete for attention with every other item of interest to the driver, including traffic itself. And too often, when the sign is observed, its message doesn't negotiate its way to the observer's brain. The car radio is on, bases are loaded and Willie Mays is at the plate. Or the driver is deep in concentration trying to compose his next sales approach or the cutting remarks he should have made earlier in the day when his boss chided him for spending too much time at the water cooler. The distractions that compete with traffic signs are almost endless.

The tests were triggered by Senate Resolution 33, 1963 California legislative session. The intent of the resolution was that ways should be found and put into practice for warning drivers of the need to observe caution when driving during periods of reduced visibility. A second objective was to warn drivers, whose visual range is shortened because of fog or other abnormal circumstances, that an accident has occurred on the highway ahead of them and blocked their path.

Either situation is most difficult to overcome with a sign, for not only would it have to differ radically in concept from those in general use today; it would also have to be one that could be energized on short notice to meet a temporary given situation and then fade out once normality prevailed.

These were the obstacles that led to the exploitation of the long-known principles of electromagnetic induction with the ultimate aim of making highways talk to people.

The site of the tests was a stretch of Route 160 north of Sacramento. The 700-foot length of the test area was arbitrarily selected because that happened to be the distance between a culvert and an overcrossing that made ideal boundaries. A nearby utility pole made a convenient location for the ground equipment and the lines it carried were tapped to supply electric power needed to energize the system.

The roadside transmitting equipment consisted of a tape recorder feeding a prerecorded message into an audio amplifier. The amplified output was then fed into the loop of wire that had been buried along the roadway, and a magnetic field, varying in accordance with the message, was set up in the vicinity of the loop.

The companion equipment installed in test vehicles consisted of a small magnetic pickup coil in which a varying current was caused to flow by the magnetic field from the roadside loop. This signal was fed into a transistorized amplifier and then to a loudspeaker that relayed the recorded message to the driver and other occupants of the car.

During the tests the same prerecorded message was repeated continuously, but it could have been changed within seconds at the roadside by simply erasing the tape and dictating a new message into the recorder. The potential of a refined system is almost without limits.

By installing the wires when new freeways are built connecting the two sides at one-mile intervals and installing a transmitting device, a transstate freeway theoretically could be wired for sound along its entire length. If the transmitters were connected to telephone lines, messages could be changed from a message center and individual machines turned off and on at will.

Cost could be staggering, but, if the public believes the benefit worth the price, such an elaborate system could become a reality.

In an emergency situation, where such a network existed, a California highway patrolman on the scene could combine his two-way radio and the telephone connection to dictate a message into specific loops that in turn could warn drivers of impending danger.

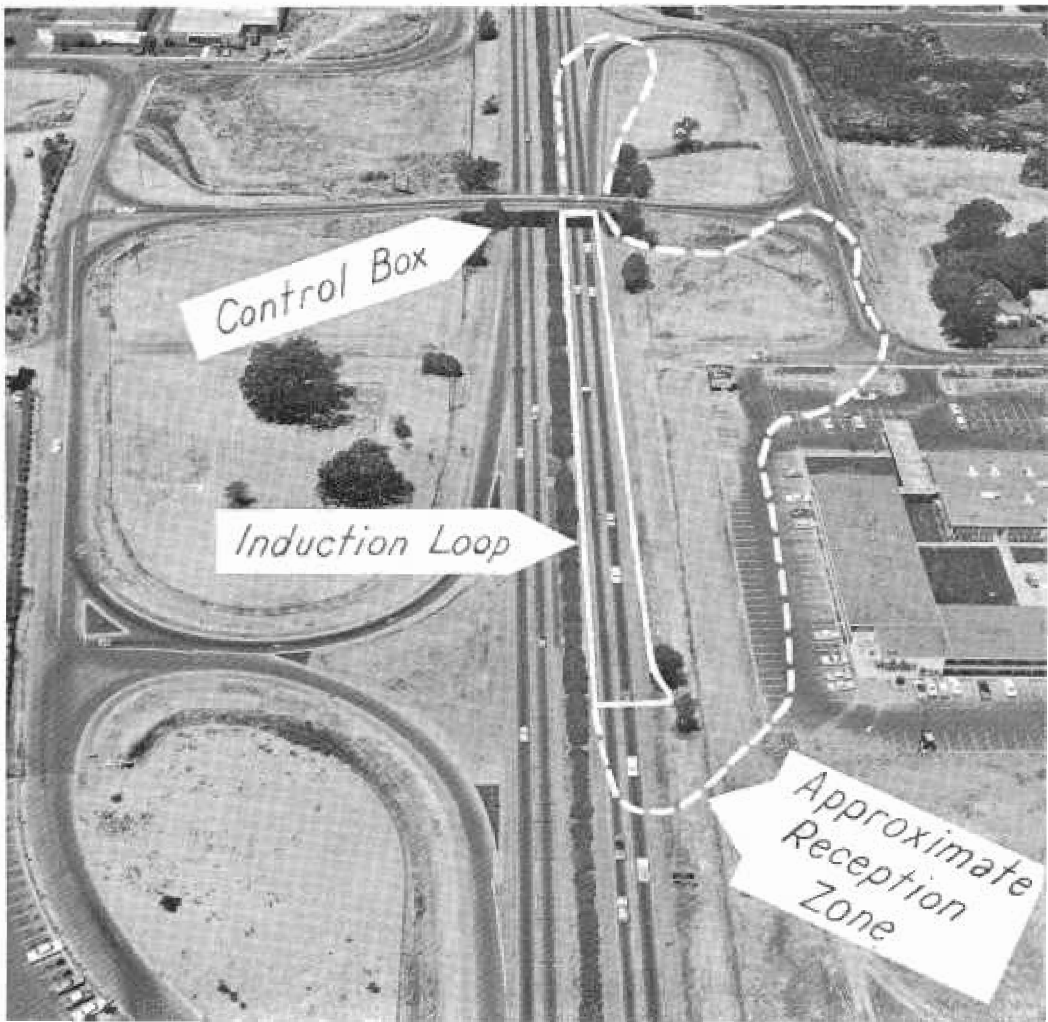
The reception of messages transmitted through the system can be controlled to very precise areas by specific placement of the wire loop. Adjustments of the loop and the amplifier output can cause the message to be heard on only one side of a divided highway or even a single off-ramp. This directional aspect is of considerable significance and enhances the value of the system in many situations. If it is imperative to advise traffic flowing in one direction, those same facts could be erroneous and misleading if imparted to vehicles traveling in the other direction.

The entire operation of an audio communications system is, of course, predicated on the assumption that all vehicles using state highways possess the receiving equipment. The time when the assumption becomes reality should not be too far off, for the automobile and electronics industries are both aware of the potential need for such devices. In mass production, the cost of the receiving set would be nominal.

And there are other details that must be tested before such a system is integrated into California highways. A minor one that could be overcome at the time of installation of equipment in autos is the fact that the system won't work if drivers shut off their receivers—so they would have to be installed to work off the ignition switch and be in the "on" position at all times when the ignition was unlocked.

A far more important detail is the human factor. Just how are people going to react when they suddenly hear an unexpected voice the first few times information is relayed to them? No one knows at this time but the answer should be forthcoming, for the University of California's Institute of Transportation and Traffic Engineering is conducting tests to uncover what a driver will do when the highway suddenly begins to speak to him in a voice both loud and clear.

This section of Route 160 north of Sacramento was the site for experimental tests on the "talking freeway." Hidden by trees, the control box activates the induction loop, providing a reception zone within the dotted lines.



Drainage Solution

Master Agreement Covers Sacramento Freeway Net

By P. D. HAUG, District Hydraulics Engineer

When design of the north-south freeway, a portion of Interstate 80 in Sacramento located between 29th and 30th Streets and extending from A Street on the north to R Street on the south, was started in early 1962, the usual problem was encountered—what to do with surface runoff.

A preliminary study was made to determine if freeway construction would add more impervious area, to the detriment of the existing city drainage system. All proposed freeways within the city were considered: from Broadway north to the American River and from the Sacramento River east to 65th Street.

The study disclosed that the *total* impervious area would not be appreciably different after freeway construction than before. In other words, the total acreage of freeway pavement, shoulders and ramps to be drained would be just about offset by the total of the roof, patio, driveway and sidewalk areas removed. The nature of the local drainage system was such, however, that the *pattern* of runoff would be affected by freeway construction.

City Accepts Runoff

To begin with, since no noticeable increase in impervious acreage would occur with freeway construction, the city was asked to accept all freeway runoff into its storm system. Close coordination was also requested of the city in activities pertaining to drainage design.

The city responded with a number of considerations. One was that amortization costs of Sacramento's combined sanitary and storm drainage trunk lines are met by direct service charges against sewer users, in addition to maintenance of the system, and that the state would not be paying these service charges.

During heavy rainfall, city sewers are full to capacity and water stands in a number of streets. The city was also concerned, therefore, with the state's pumping plants which would force water from depressed freeway sections into the system and would preempt the trunk lines which were already having difficulty handling local street drainage.

Concern was also expressed over the head which would be developed from the elevated portions of freeways by drainage appurtenances which would also take inflow precedence over local street drainage.

Knowing that the state's general policy is to participate in providing a joint project to the extent of benefits derived, the city asked for consideration of a cooperative project to provide adequate drainage where it does not now exist and where concentrated freeway drainage would tend to aggravate local street flooding.

The next step was for District 3 to embark on a thorough drainage system study to determine hydraulic requirements. It soon became apparent that in place of the ordinary procedure of drafting an individual agreement for each freeway project as it progressed through the design stage, this situation could best be met by drafting one master agreement covering all proposed projects.

Although some units, primarily on US 50 from 34th Street to 65th Street, are not scheduled for construction for several years, planning was far enough advanced to determine drainage requirements.

Following is a route-by-route description of the drainage master plan (*see map*).

U.S. 50, 34th to 65th Street

Although this section of freeway will be the last to be built, its drainage requirements had to be solved first. This was because what is done here ultimately will have an effect on the system relieving the north-south freeway (Interstate 80). A depressed portion is planned on this section between 42nd Street and 62nd Street, with provision for separation of drainage at 51st Street into two different pumping systems.

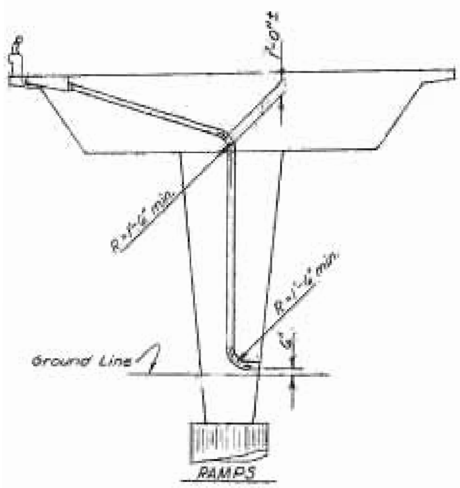
The depressed portion from 51st Street to 62nd Street will discharge east to a city trunk on 65th Street, where it is then carried north via city line to city sump No. 31. The city also agreed to accept all water from the future 65th Street Interchange into its 65th Street trunk. The state will then provide funds necessary to increase the pumping capacity of sump No. 31 to facilitate the additional concentrated inflow.

A gravity line will drain the 42nd Street to 51st Street portion from the pumping plant at 45th Street west to the city trunk on Alhambra Boulevard. This line will also drain the section from 42nd Street back to Alhambra Boulevard. The city agreed to maintain this outfall.

Interstate 80, 29th–30th Street

The only available outfalls on this north-south section adequate to carry the concentrated flows of water from this freeway unit are city lines on E, H and O Streets.

A freeway pumping plant located at C Street, draining the short depressed portion between C and A Streets, is discharged into an existing line on 30th Street.



Schematic diagram of viaduct deck drainage, showing use of curved pipe inside deck slab and column.

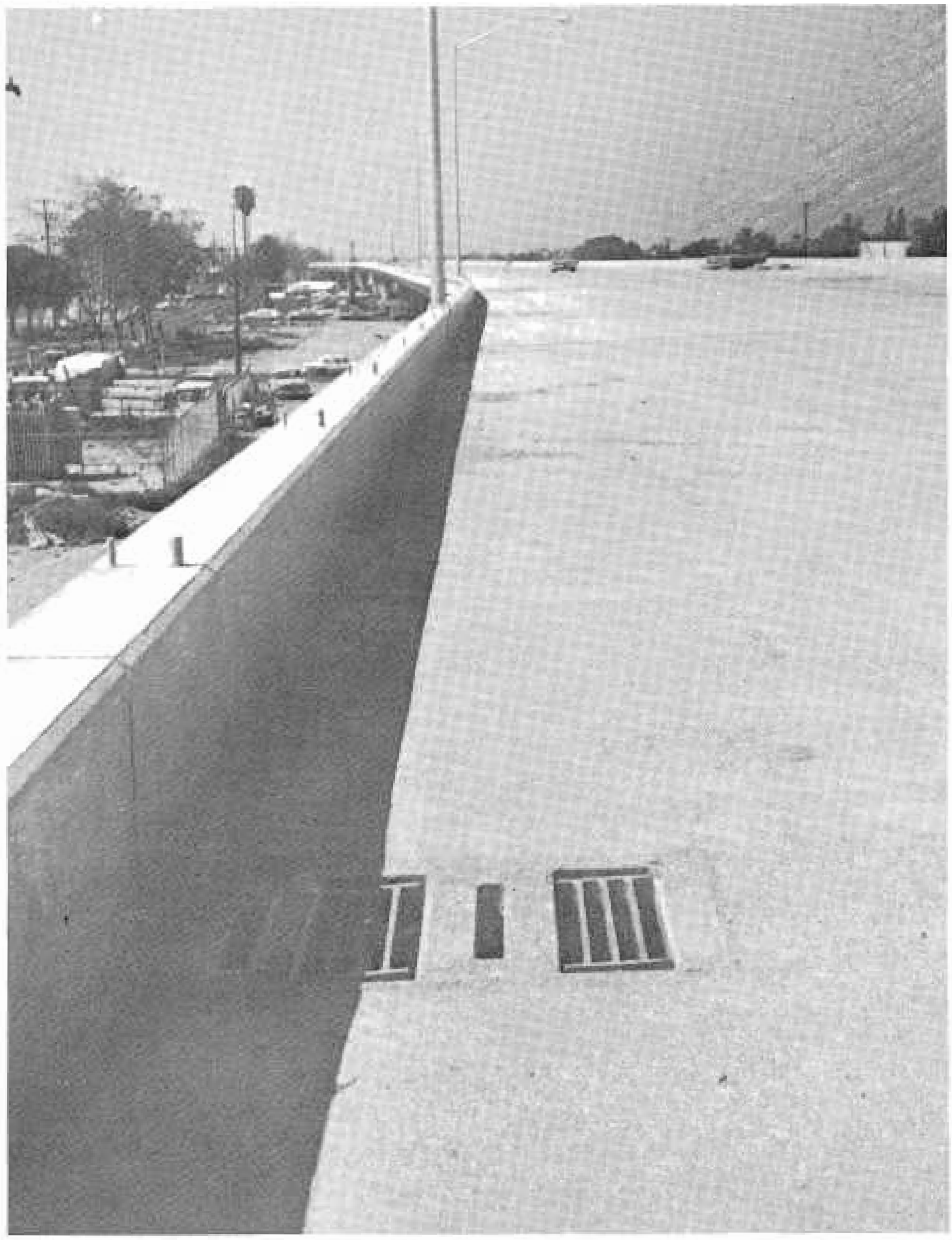


Photo shows portion of viaduct with grating in place for deck drain.

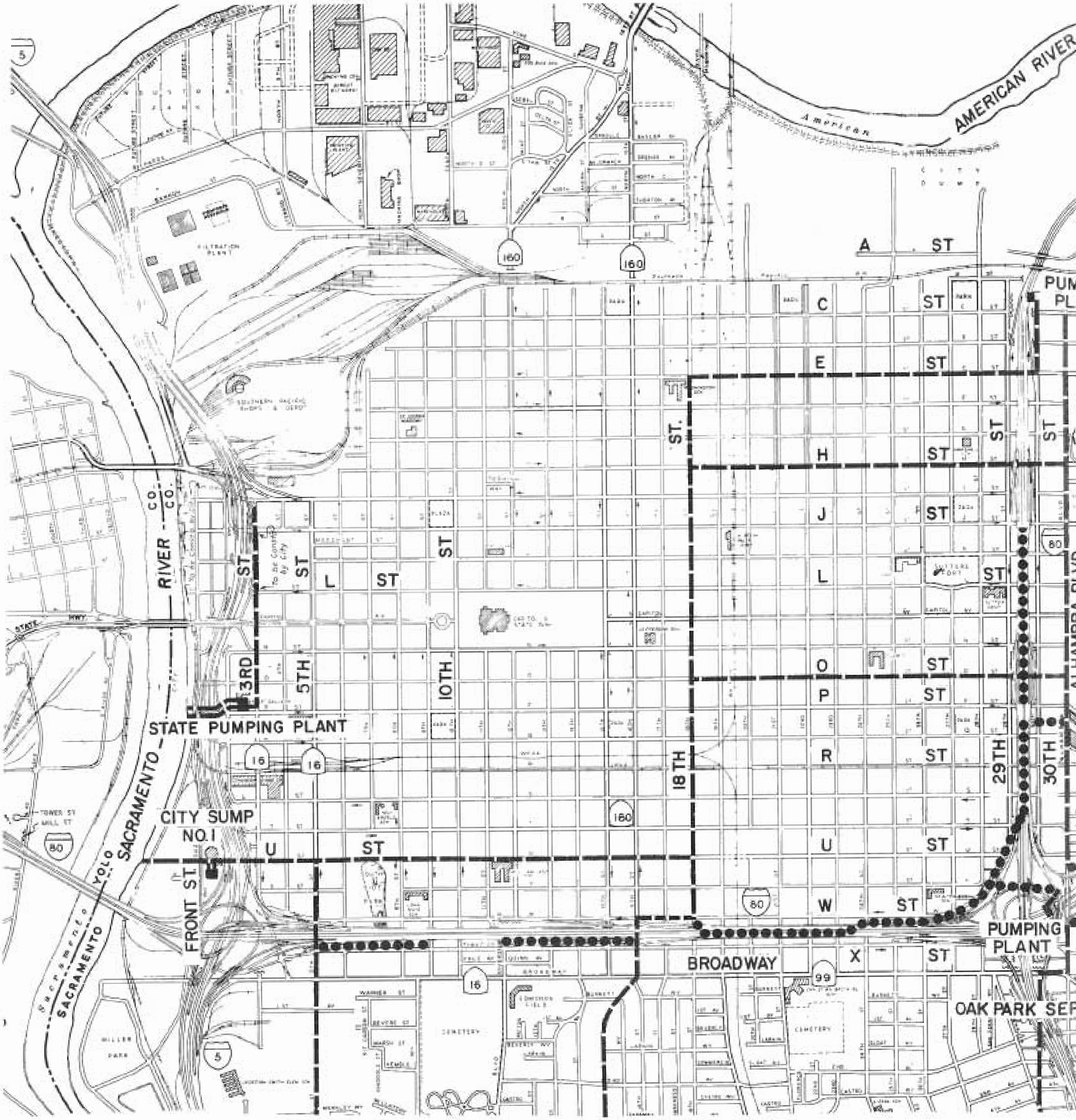
South of C Street, other freeway waters are collected at the toe of the fill slope and carried in gutters or a collector system to the other drains on H Street and O Street. Drainage from the Fort Sutter Viaduct (J Street to P Street) is collected on the structure and carried down the median columns, discharging into a ground level valley gutter. A drop inlet system intercepts this water in the median below, and conveys it by a collector which discharges into a city trunk on O Street. (This method overcomes the problem of pressure discharge from an elevated freeway directly into the trunk lines).

The previously mentioned state outfall from the 45th Street depression on US 50 drains into the city trunk on Alhambra Boulevard and would overload this system. Through negotiations with the city, this was acceptable if the state would then relieve the Alhambra trunk in the vicinity of P or Q Street with a line of equivalent capacity to the flow which would discharge into the Alhambra line from US 50.

With this in mind, the district proceeded to design an overflow from the Alhambra Boulevard trunk which would flow west between P and Q Streets, then turn down the median and proceed south toward the Oak Park Interchange (I-80/US 50) and pumping plant which serves the depression on the US 50 leg. Freeway waters would be collected en route.

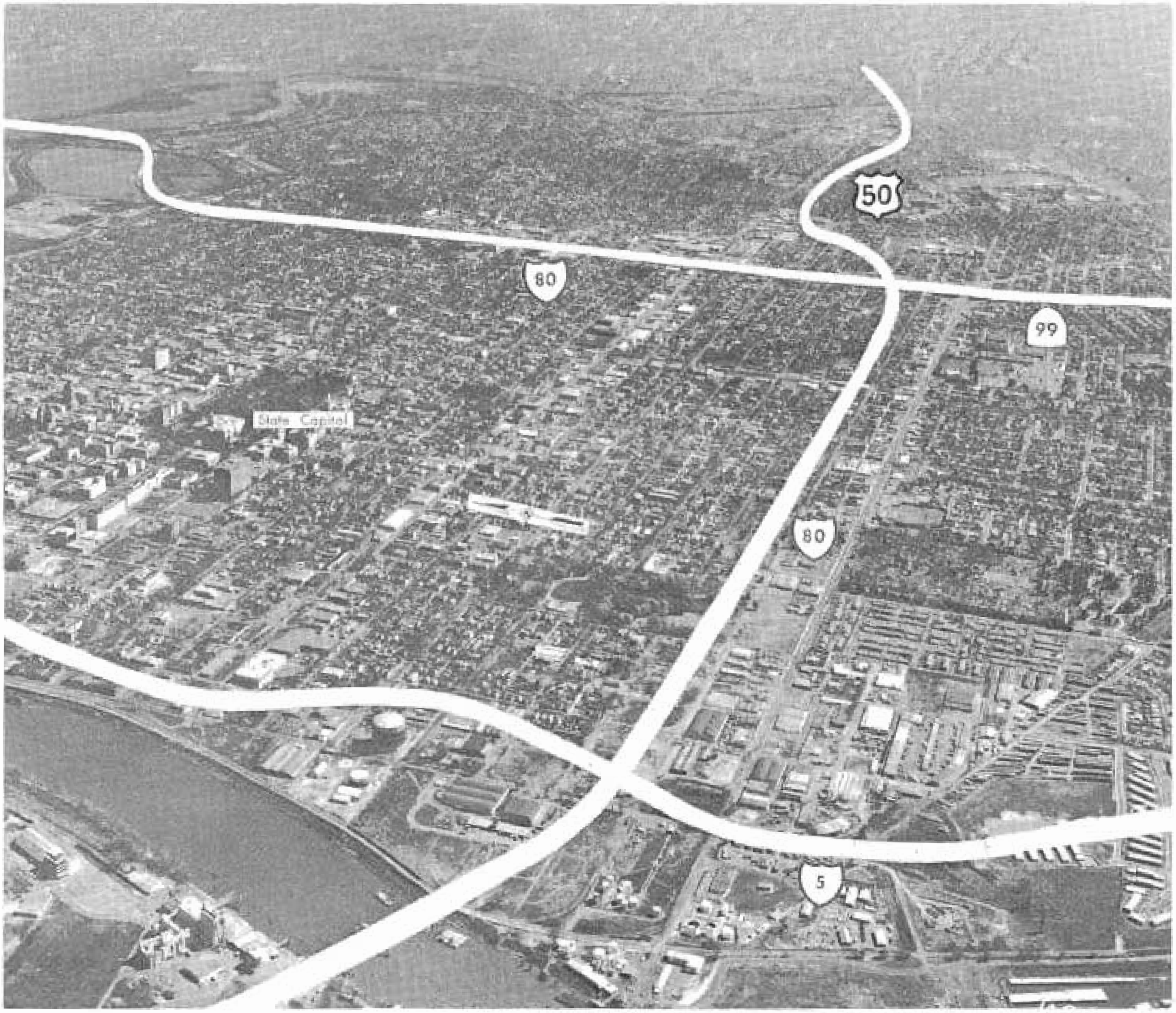
At the Oak Park Interchange, the line proceeded west along the W–X Street freeway (also Interstate 80) and discharged into the city's 108-inch trunk on 18th Street. At 18th Street the city agreed to the acceptance of the Alhambra Boulevard relief and freeway water, and also to maintain this line as a part of its system.

Manhole cleanouts on this line were placed in city streets so maintenance by the city could be performed off the State right-of-way. At several locations along the W–X Street freeway, the district permitted city street drainage to be discharged into the state outfall from lines that were to be severed or relocated by freeway construction. Cost estimates indicated it was economically feasible to enlarge the state outfall and admit city street drainage rather than provide a separate relocated line at State expense.



The layout of the master drainage plan in relation to existing and proposed freeways in the Sacramento City area is shown in the above map. The areas concerned include US 50 from 34th to 65th Streets, Interstate 80 between 29th and 30th Streets and between W and X Streets. The depressed section on Interstate 5 between U and L Streets was not included in the agreement since this north-south section will be drained independently by a state pumping

plant with discharge directly into the Sacramento River near P Street. Studies showed that such a comprehensive drainage plan was the most beneficial and economical use of both state and city funds to solve this complex problem. This master freeway drainage agreement will result in considerable savings to both city and state.



Aerial view showing key routes in Sacramento freeway network and area served by drainage system.

Interstate 80, W–X Street

Natural high ground at 10th Street on this east-west portion of I-80 provides the drainage split. Freeway water from 10th Street east will be intercepted and carried in a parallel drain within state right-of-way to the city's 108-inch trunk on 16th Street. Drainage from 10th Street west was likewise carried in a parallel drain to the 60-inch city trunk on Fifth Street. The city's sump No. 1 at U and Front Streets will handle the water from the I-80/I-5 interchange.

Interstate 5, 2nd–3rd Street

The depressed section on I-5 between U and L Streets was not included in the agreement since this north-south section will be drained independently by a state pumping plant with discharge directly into the Sacramento River near P Street. The remaining portion, from L Street to the viaduct over the Southern Pacific yard, will drain into a city trunk on Third Street.

Studies showed that this comprehensive drainage plan was the most beneficial and economical use of both state and city funds to solve this complex drainage problem.

The district's negotiations with then City Engineer E. A. Fairbairn and Assistant City Engineer Carl Jennings (now city manager and city engineer respectively), and with Ron Parker of the city engineer's staff were carried on in an atmosphere of mutual cooperation. All concerned were aware that the use of a master freeway drainage agreement in this instance meant considerable savings to both state and city.

Humboldt Bay Bridge Feasible, Report Says

A toll bridge across Humboldt Bay is feasible from an engineering standpoint but cannot be financed exclusively from toll revenues.

This is the conclusion of a feasibility report prepared by the State Division of Bay Toll Crossings for the California Highway Commission. The report was presented to residents and civic leaders of the Eureka area on June 9, 1965.

The report estimates that the proposed bridge would cost $4,011,000 to build and that toll revenues would fall $1,455,000 short of financing the construction bonds.

For the project to be undertaken, other sources of revenue would be required to make up the deficit, according to the report.

The study was financed by a $40,000 appropriation from the Highway Commission on June 24, 1964.

The study was made on the basis of the following assumptions:

—The bridge would extend from R and Fifth Streets in Eureka to a point on the New Navy Base Road north of the Georgia-Pacific Corporation Mill on the Samoa Peninsula.

—This route would bypass the main shipping channel of Humboldt Bay, eliminating the immediate need for a high-level bridge or a movable central span. An earlier study indicated that a movable span would add some $2 million to construction costs.

—The toll would be 35 cents for automobiles, graduated upward for trucks and buses.

—The two-lane facility would have 30 feet of clearance over Samoa and Eureka Channels and 15 feet over Middle Channel. The remainder of the 1.85-mile structure would be trestle or fill.

The report notes that the bridge would save up to 15 minutes and 12.2 miles of driving from motor trips around Humboldt and Arcata Bays from Eureka to the Samoa Peninsula, the site of several lumber mills.

Traffic projections and estimates show that 1,600 vehicles per day would have used the bridge if it were in operation during 1964 and that 2,300 vehicles per day could be expected to use it by 1969.

BRIDGE CONSTRUCTION HEAD LEAVES; HINEMAN NAMED

I. O. Jahlstrom, bridge engineer—Operations for the State Division of Highways, retired on July 31 after 37 years of state service.

Howard R. Hineman has been appointed to succeed Jahlstrom. Hineman was construction engineer for the Bridge Department's southern area office in Los Angeles.

I. O. JAHLSTROM

Jahlstrom came to work for the division in 1928 as assistant resident engineer on a bridge construction project on the Coast Highway near Orick, north of Eureka. For the next five years he was resident engineer on numerous steel, concrete girder and arch jobs including the much-photographed concrete arch structures at Rocky Creek and Bixby Creek on the Coast Highway south of Carmel.

HOWARD R. HINEMAN

Between 1933 and 1937 he was resident engineer on the West Bay Crossing suspension structure of the San Francisco-Oakland Bay Bridge, after which he returned to the Bridge Department in Sacramento as construction engineer.

He was appointed principal bridge engineer—Operations in 1947, a position which has not only involved overall direction of the construction of approximately a billion dollars' worth of bridges but the inspection and maintenance of all structures on the state highway system as well.

Jahlstrom was born in Astoria, Oregon, and attended grade and high school in Hockinson and Battle Ground, both in the State of Washington.

Jahlstrom served in the U.S. Navy during World War I. He graduated from Washington State College with a B.S. degree in engineering in 1923 and was awarded an M.S. degree by the University of Illinois in 1925.

He is a member of the American Society of Civil Engineers, the American Concrete Institute, the engineering honor fraternity Tau Beta Pi and the University Club of Sacramento. He is a Mason and a member of the Shrine.

Jahlstrom, whose home is at 2783 Harkness Street, Sacramento, has a daughter, Ruth Marie Wagner, and a son, Jack I. Jahlstrom, both of Sacramento.

Hineman, who was advanced to succeed Jahlstrom, joined the division as a junior engineering field aid in 1932 on construction of the Kings River Canyon Highway and transferred to the Bridge Department as a junior bridge engineer in 1935, serving on bridge construction projects in southern California for the next six years.

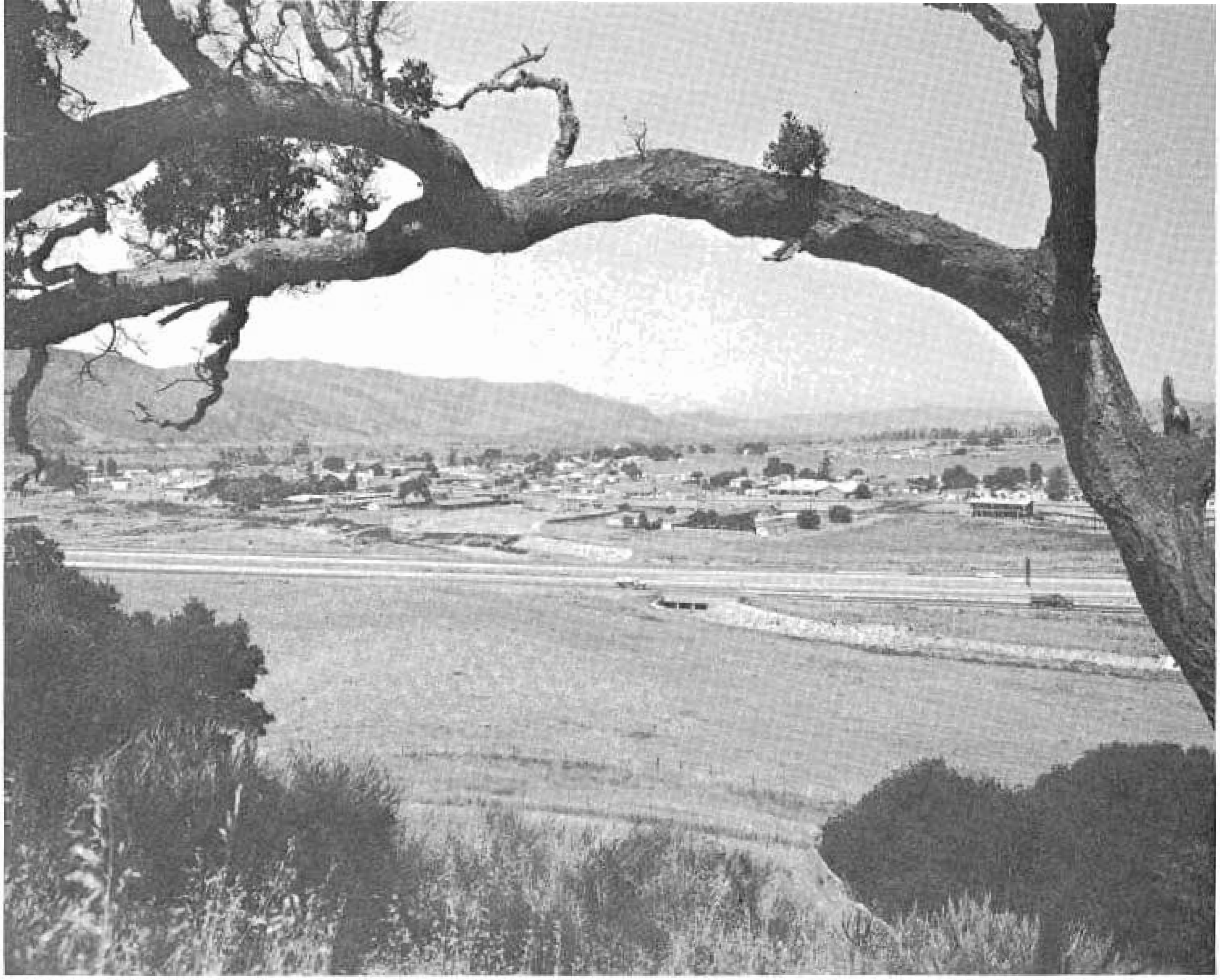
Hineman was a lieutenant commander in the Navy during World War II. His duties included command of a company in the 64th Naval Construction Battalion.

From 1949 to 1962 he was in charge of preliminary investigations and planning in the Los Angeles office of the Bridge Department. Since 1962 he has been in charge of all bridge construction on the state highway system in southern California.

Hineman was born in Salina, Kansas, and attended grade and high school in Anaheim, California. He graduated from the University of California at Berkeley with a B.S. degree in engineering in 1931. His home has been in Fullerton (830 West Valley View Drive).

He is a member of the American Society of Civil Engineers.

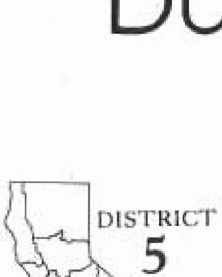
Hineman is married and has two daughters.



Looking southwesterly across the completed freeway toward the town of Buellton. The Zaca Creek Channel Change is in the middle foreground.

Buellton Bypass Project

By J. B. POPNOE, Resident Engineer



On June 10, 1965, the Buellton Bypass, extending from 0.7 mile south of Santa Ynez River to 0.7 mile north of Buellton, was opened in its entirety to traffic. The completion of this 3.6-mile project eliminated the last section of two-lane undivided highway on US 101 south of the Monterey county line in District 5.

The unincorporated community of Buellton (population 1,500) lies at the junction of US 101 and Route 246. The latter route carries traffic to the Lompoc-Vandenberg AFB area to the west and to the tourist centers of Solvang and Cachuma Lake to the east. This east-west highway thus carries a great amount of tourist traffic during the summer months. Buellton itself attracts a considerable number of touring visitors, because of a well-known restaurant located adjacent to the old highway.

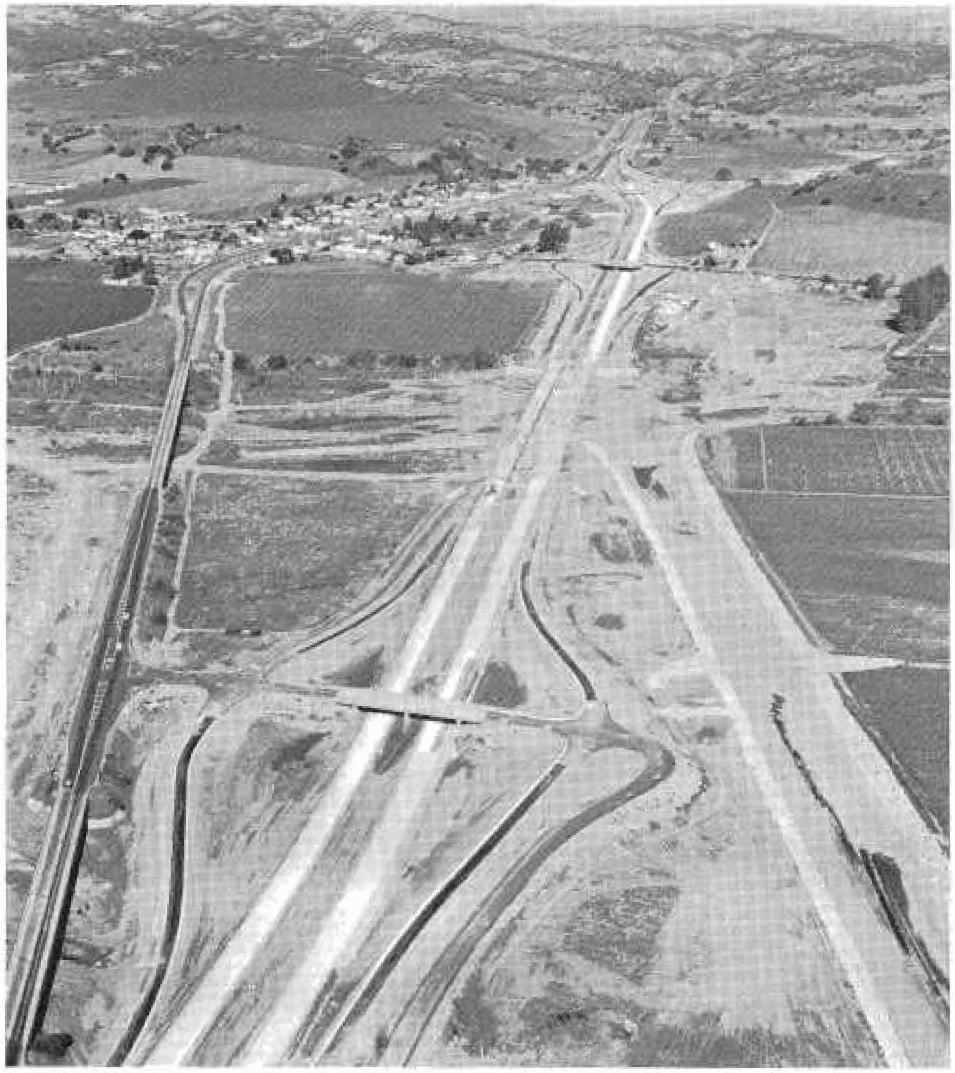
US 101 in Buellton proper was a four-lane divided roadway running through the center of town. It was flanked on both sides by frontage roads and intersected at grade by Route 246 and several other cross streets. Due to the many conflicting turns, this intersection was the scene of a large number of accidents. There were 38 accidents recorded at this intersection in the years 1962 to 1964. Of this number, 31 accidents were violation of right-of-way accidents such as left turn into approaching traffic or cross traffic being hit broadside by highway traffic. Therefore, the Route 246/US 101 Separation constructed as a part of the new freeway was one of the major benefits of an immediate nature for the motorist.

Buellton is also served by two other full interchanges. To the south is the Santa Rosa Road Overcrossing and to the north, the North Buellton Overcrossing. All three are diamond interchanges.

In addition to the structures listed above, the contract involved the construction of a four-lane divided highway with twin 1,000-foot box girder bridges spanning the Santa Ynez River. The two separate roadways sit on a common pier wall to allow for expansion at a later date to six lanes, which can be done easily by the addition of a 12-foot lane to each deck. Formerly, US 101 had been restricted to two lanes by the old Santa Ynez River Bridge. The transition from four- to two-lane traffic at the old structure had proved a dangerous bottleneck for the high-speed traffic. The completion of these two structures eliminated another hazardous condition on the old highway.

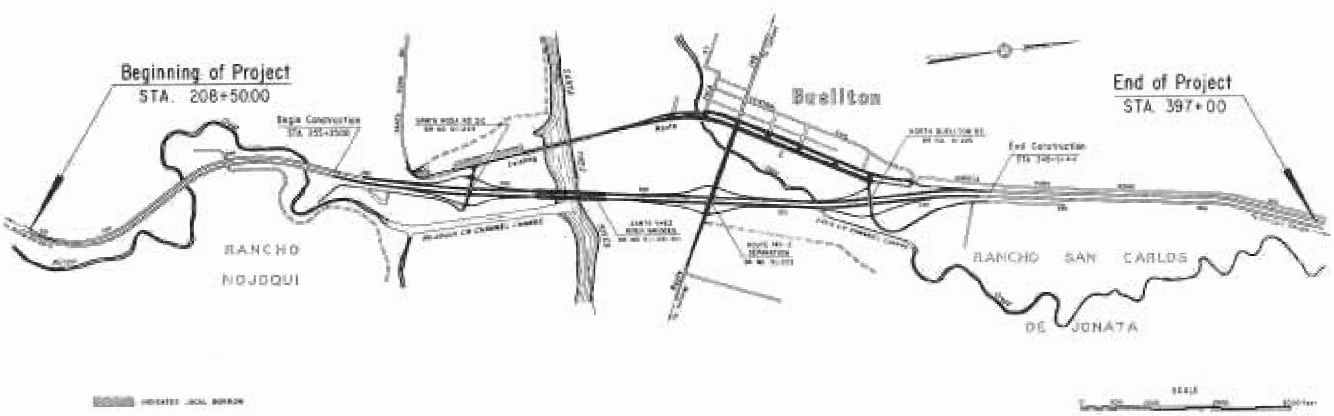
Actual construction began in January of 1964, shortly after the contract was awarded to Oberg Construction Corporation of Northridge.

The grading was essentially a borrow job requiring about 150,000 cubic yards. Of this sum, 55,000 cubic yards of local borrow were designated by the contract to be available from slope grading performed on the fill for the old Santa Ynez River Bridge. The remainder of the material was obtained by the contractor from imported borrow sites near the job. The material used was mainly a river-run gravel of good quality. The method of haul was push-loaded scrapers.



Aerial view, taken during later stages of construction, looking north, shows old and new highways in relation to Buellton. Structures, beginning in foreground, are Santa Rosa Road Overcrossing, twin bridges over Santa Ynez River, 101/246 Separation, and North Buellton Overcrossing. Nojoqui Creek channel is at right.

Aggregate bases for the project were produced by the contractor



from state-owned material. The state's Petan Pit is located one-half mile west of the project in the Santa Ynez River, and it provided a good source of material for contractor's crusher. Road-mixed cement treated base was also specified in the contract.

The contractor elected to slipform the portland cement concrete pavement on the project. This paving was done by Owl Slipform Company with a Guntert-Zimmerman paver.

One operation that was of interest was the contractor's method of constructing the large pier walls for Santa Ynez River Bridge. Using ganged forms up to 32′ x 62′, he was able to strip and reform a section in one day with only a minimum of labor. Since there were 10 pierwalls ranging in size up to 32′ x 110′, this method of construction greatly speeded the bridge operations.

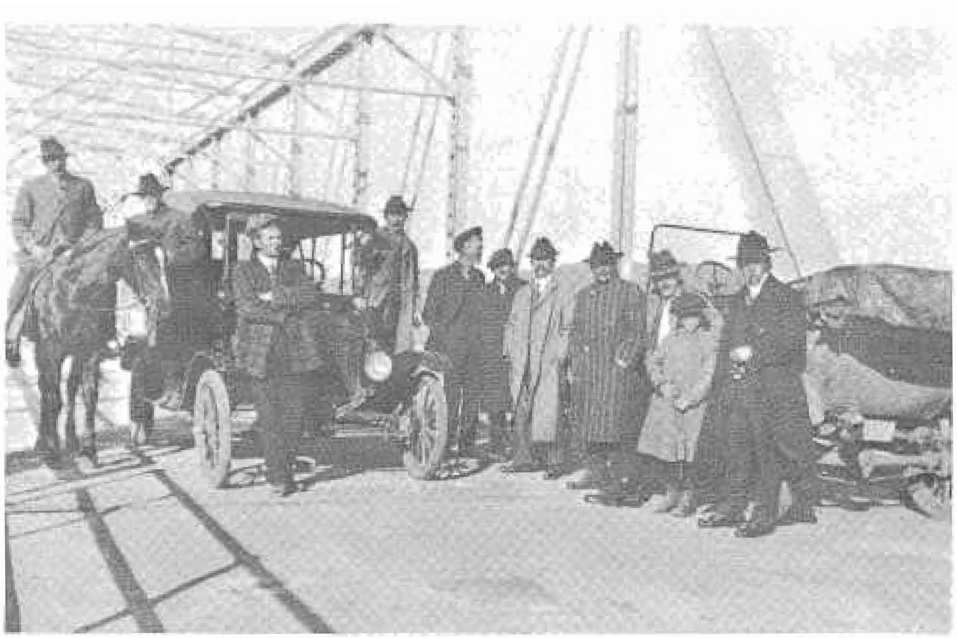
Nojoqui Creek, which had previously joined the Santa Ynez River to

ABOVE: Looking southerly from the North Buellton Overcrossing at the Route 246/101 Separation. Buelltqn is off the picture to the right.

BELOW: Looking northerly from the Santa Rosa Road Overcrossing northbound on-ramp at the Santa Ynez River Bridge and the Route 246/101 Separation. Buellton is in the left background.

the west of the project, was realigned to permit both the creek and the Santa Ynez River to flow under the new bridge. The new channel is 2,800 feet long with a minimum bottom width of 100 feet. Its side slopes are lined throughout with ½-ton rock and facing rock.

The portion of the old highway in Buellton received a complete facelifting also. The former frontage roads were widened to 42 feet, resurfaced, and restricted to one-way traffic. Between the frontage roads is a 76-foot mall. This is to be landscaped by the local businessmen's association in cooperation with the County of Santa Barbara. When completed, this should give the center of Buellton a decided parklike quality, which should be a pleasant improvement over the traffic congestion of former years.



Editor's note: Research for the Buellton Bypass article brought this dividend—a picture of the dedication of an earlier bridge over the Santa Ynez River, vintage 1917. Interestingly enough, the youngster (second from right) is Lyman Olsen, now Assistant Maintenance Engineer for the Division of Highways.

Scenic Committee Members Renamed

Governor Edmund G. Brown has reappointed Harry P. Schmidt of Gustine and Edwin S. Moore of San Francisco to new four-year terms on the state's Advisory Committee on a Master Plan for Scenic Highways.

Both were appointed to the original committee in 1963 after its creation by the 1963 Legislature.

Schmidt is a Merced County supervisor, and has served as chairman of the committee since its inception.

Moore is executive vice president of the California State Automobile Association.

Other members of the committee are: Robert Grunwald of Hanford, Richard M. Leonard of San Francisco, Dee W. McKenzie of Sacramento, Nathaniel M. Owings of Big Sur, and Charles Perry Walker of Manhattan Beach.

The State Department of Public Works has announced the award of a $5,945,745.70 contract in Stanislaus County for grading and paving 13.1 miles of four-lane Interstate Route 5 Freeway (Westside Freeway) between 0.9-mile south of Del Puerto Canyon Road and the San Joaquin County Line, approximately three miles west of Patterson.

NATIONAL HIGHWAY WEEK OPENS SEPTEMBER 19

The 1965 observance of National Highway Week has been scheduled for September 19–25.

A wide range of highway-oriented events and programs, including freeway dedications, ground-breakings, special exhibits and radio and television shows is on the agenda.

A statewide committee prompting the observance is headed by Sherman P. Duckel of San Francisco and Harrison R. Baker of Pasadena as coordinators for northern and southern California, respectively.

Governor Edmund G. Brown issued the following statement with regard to National Highway Week:

> For Californians, the annual observance of National Highway Week means an opportunity to gain fresh perspective on a major aspect of our state's forward progress. We are so accustomed to our position of national leadership in the development of safe, modern highways that we often take their benefits for granted.
>
> In the past six years we have more than doubled our mileage of full freeways, and now have more than 1,700 miles of these life-saving, time-saving facilities in operation. An additional 500 miles are under construction, and thousands more miles are on the drawing boards. We are carrying out in efficient, orderly fashion our long-range plan for freeways and expressways, including the California portion of the National Interstate System.
>
> With our motor vehicle registration approaching 11,000,000, we have a degree of personal mobility undreamed of a generation ago.
>
> Now we are broadening our outlook. We are devoting more attention to the relationship of highways to our environment, and are exploring new methods and systems of transportation. But for many years to come, the mainstay of our transportation service will be our road, street and highway network. National Highway Week is a good time to reemphasize our determination that there will be no slackening in California's effort to provide for our motorized population the safest, most efficient highway system in the world.
>
> EDMUND G. BROWN, *Governor*

Minor Improvements Program

By JAMES E. WILSON, Traffic Engineer

Mammoth highway undertakings, made necessary by America's growing automobile-oriented population, have accustomed us to think of highway improvement in terms of eight-lane freeways, complex interchanges, and projects which quite often have multimillion-dollar price tags.

In addition to equating highway improvement with large monetary expenditures, we are inclined to make a direct association between freeways and safety. (It is a fact that freeways are about twice as safe as other roads and streets.) There are other improvements to be made, however, and their price tags label them as the "bargains" of the overall highway improvement picture, especially in terms of safety.

Throughout the nation, much attention is focused upon the national system of interstate and defense highways program. With its target date for completion looming ahead only seven years from now, this emphasis is well deserved. Other projects, equally ambitious and worthwhile, are the work of the states, counties, and cities.

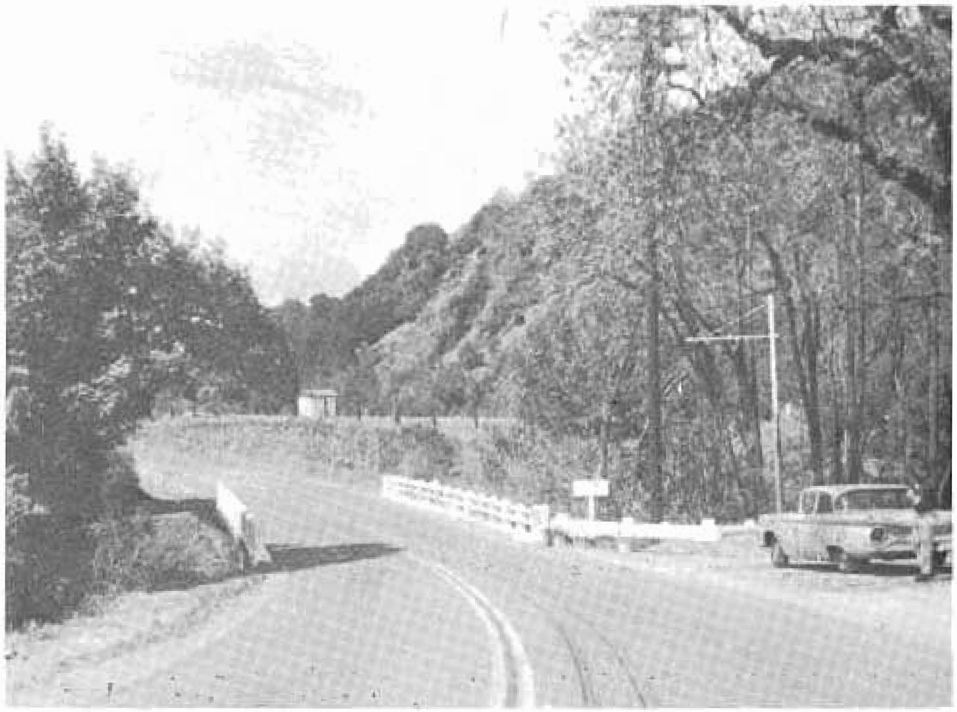
All of these superhighways will decrease the pressure on presently overworked roads and streets. The fact remains, though, that *none* of these large projects is going to do away with the conventional thoroughfare.

Term 'Minor' Is Relative

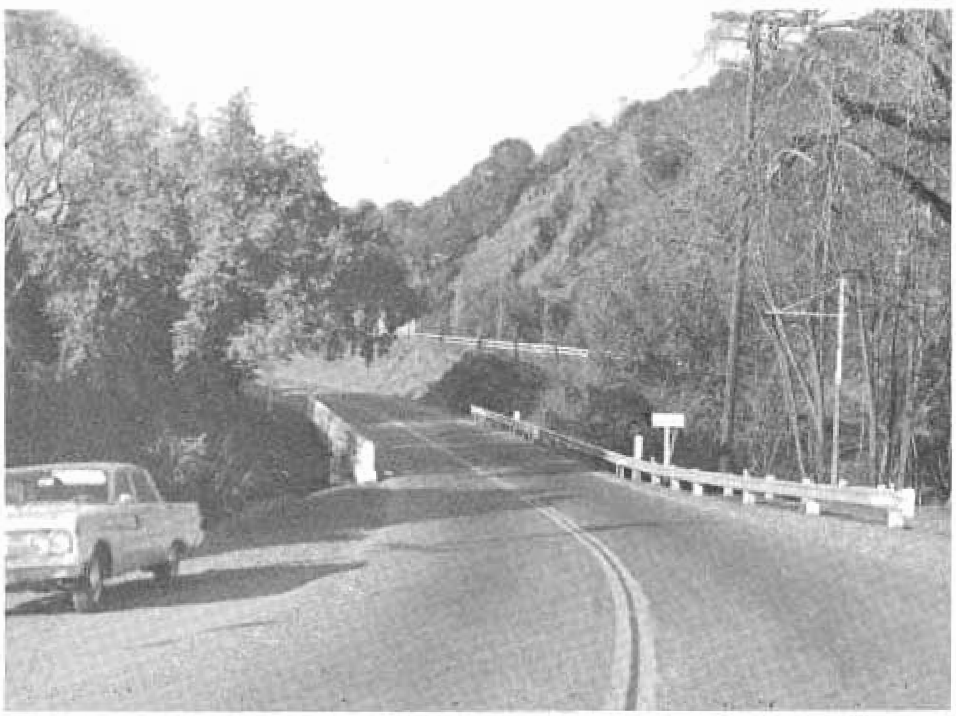
With this firmly in mind, the California Division of Highways has for many years channeled certain of its funds into a minor improvement program to increase the safety of the motorist who invariably uses conventional roads and streets for at least part of his travels by automobile.

(These projects are "minor" only in proportion to the funds expended; they are frequently "major" to the people most closely concerned.)

Many of these roads were built 50 years ago, before the advent of the



BEFORE: Cold Creek Bridge on Route 20 near Ukiah, California was the scene of 95 accidents (74 persons injured, four killed) in six years. The realignment of this section of the road is being designed, but the accident record necessitated immediate improvement.



AFTER: Accidents at this location were reduced from seven to two per year by replacing the concrete bridge railing on the offending side with a continuous metal beam strip and correcting the superelevation (project cost: $4,006).

motor vehicle, and some of their features are anything but synonymous with safety at the speeds in use today. Certain of these roads are not equipped to handle the increased volume of traffic safely. The elimination of their many inadequacies cannot be achieved overnight, of course, but if a maximum number of areas can be afforded a little improvement from time to time, the results will be fruitful from a safety standpoint.

The funds for minor projects unfortunately do have to compete with the heavy financial demands of the superhighways. The judicious distribution of these funds then becomes an important issue. The division of this small pie has been worked out as fairly as possible by assigning the appropriate priority to troublesome spots.

This process can best be shown by outlining the procedure used in one of California's 11 districts. In the 13,000-square-mile area of one district, 8,428 reports of accidents on state highways were received from 9 California Highway Patrol area units and 27 police departments in 1964.

Reports Are Reviewed

The ensuing collection of reports was reviewed, and tabulations were made with the general approach that—as a starting point—when three or more conflicts occur in a calendar year, the location is to receive consideration as a potential "problem spot." This approach considers that two conflicts at one point can be coincidental, but beyond that, there may be some other factor that should be reviewed.

Also, whenever driver statements or the "opinions and conclusions" of the investigating patrol officer indicate any cause other than driver error or mechanical failure as the primary factor in the accident, a review of the site is made promptly, regardless of the number of previous incidents or the lack of them.

All accident reports are read, coded, and posted on accident profiles as a daily procedure. These profiles provide at-a-glance information of the points of recurrence in the district, and tell whether an area has been free of conflicts in previous years or whether there have been occasional problems over a long period of time.

The traffic engineers who evaluate potential minor improvement spots rely upon information recorded on accident profiles for part of their studies. Seen here are Don Foster, Assistant District Traffic Engineer (left), and Blair Geddes, District Traffic Engineer, both of District 3.

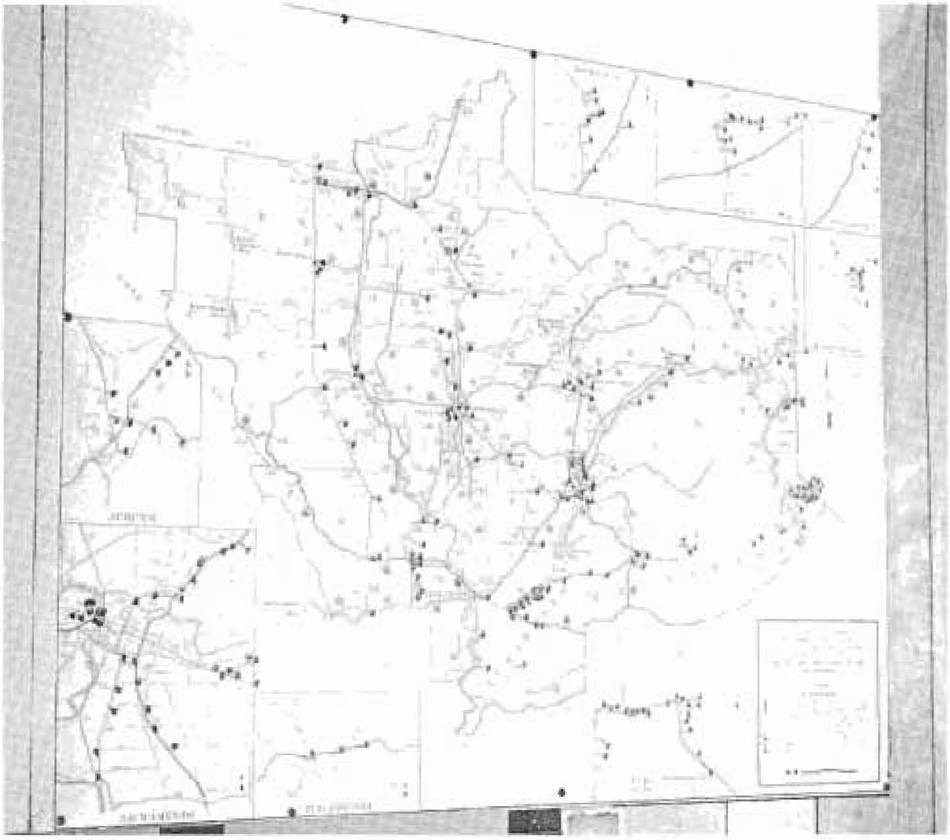
Reports are maintained (in current files with a folder for each year) for a period of five years. Each profile sheet is placed in location order for reference by the district. As a visual reminder, a map is on display and markers are used to indicate each problem point as it develops. This allows for the review of all problem spots in the district simultaneously. As spot locations are improved, the flags at those points are removed.

Once a flag goes up, a detailed study is begun. All past accidents are reviewed back to the time when any major change was made in the roadway—or if none have been made in the last few years—then back to the five year starting point of the accident files. The reports are studied, and a collision diagram and/or summary prepared as indicated. Even if a definite pattern is obvious, a field study is generally carried out.

Onsite Inspection

If no pattern emerges, onsite inspection may be especially helpful in providing insight as to a possible approach and tentative solution. In the field review, it may be useful to answer certain questoins: Has native shrubbery or tree growth created a restriction of vision? Has traffic volume increased to multiply the changes of a conflict? Has general speed increased so that approach speed is too high for conditions? Has some other factor influenced the situation or created a distraction? Is the condition obvious to the approaching traffic or is driver aid needed? Is there a daytime or nighttime aspect to the problem?

Clarification of the problem itself is a major influence in the district's recommendations for improvement. How can the spot be made safer? Should the district clear roadside growth? Add signs? Delineate? Reconstruct? Or should the improvement be a combination of several possibilities?



Accident sites are pinpointed on district maps to provide instant information concerning the troublesome spots within that area.

Although improvements are individually adapted to a particular site, they generally fall into the 10 categories which follow:

1. Delineation
2. Protective guardrail
3. Intersection channelization
4. Reconstruction
5. Safety lighting
6. Flashing signals
7. New signals
8. Modified signals
9. New signals with channelization
10. Modified signals with channelization

Some minor improvement projects, are undertaken for "operational betterment." By altering signals to coincide with the current traffic flow, and by assigning the right-of-way, the capacity of the intersection is increased and the stream of traffic is more orderly. Any resulting increase in safety is largely incidental, but important because a driver is less inclined to take chances when he knows that his turn to proceed is forthcoming. He is less inclined to become short of patience and to make a "chance" maneuver that is imprudent. If his emotions rule the situation instead of his good driving sense, that driver invariably becomes a poorer driving risk, and the site where this occurs with frequency may achieve a reputation as a problem spot.

More Than One Solution

The problem spot, once its identity is established, may actually lend itself to more than one solution. Because of the financing available for spot improvements, however, the district is likely to choose the least costly measure that can be expected to cope favorably with the problem, thereby spreading the funds to cover as many troublesome locations as possible. The saving grace of using an economical approach is that if a certain improvement falls short of the desired results, further improvements can always be made at a later date.

There are three specific sources of funds for minor improvements within the means of the California Division of Highways. Projects exceeding $50,000 in cost are placed with other major construction projects in the annual fiscal-year planning budget submitted to the California Highway Commission for approval. Naturally, funds from this category are reserved for prime locations where a simple and less costly solution would do little to eliminate accident hazards. Intermediately priced projects, costing from $5,000 to $50,000 are financed from any available contingency funds. This also requires a commission vote. Projects under $5,000 are financed through a fund set up for minor improvements, the formalities of which are simpler. Other financial aid for spot improvements may come from the city or county involved, or from the federal government.

Beginning July 1, 1965, projects costing $5,000–$50,000 will be financed from a special Traffic Safety Fund. This will provide a total of $3,000,000 per year.

Federal authorities in fact, encouraged recently by statements from President Lyndon B. Johnson, have advocated an accelerated program for accident reduction, and California's spot improvement campaign is but one program which has been accelerated to comply with these national ambitions.

92 Locations Studied

Aware of the various methods available for project financing, the district studied 92 separate locations in 1964. In most cases, both accident diagrams and accident summaries were prepared. Then, after a field review of each site was completed, 35 projects were chosen to receive immediate action. The cost of improvements at these spots ranged from $251 for purchasing and installing 50 feet of guard rail to $195,000 for modernizing and coordinating the signal system at all intersections of a state highway which passes through a town of 15,000 population.

One project, illustrative of the middle range, was completed at a cost of approximately $25,300 (of which the city involved contributed approximately $15,500 of the total). It was undertaken at an intersection where a series of accidents had occurred in the two-year period preceding the improvement. An accident review and summary substantiated the conclusion that the majority of reported accidents involved vehicles attempting to make left turns. Traffic at the intersection was controlled by a two-phase, full traffic-actuated signal with mast arms having eight-inch indications. Illumination was provided by mast arm mounted luminaires on each corner of the intersection. Stop signs were in place on each leg of the intersection.

The south leg of Peck Road and the east leg of Valley Boulevard were divided with an eight-foot concrete curbed median. Painted crosswalks were in place across both legs of Valley Boulevard. A separate right turn lane existed on the south leg of Peck Road as shown in the before photograph. Both streets were zoned for 35-mile-per-hour speed.

Left Turns Cause Congestion

The field investigation emphasized that congestion and delay resulted from left turn movements on all legs of the intersection. The lack of left turn channelization limited through traffic to the curb lane, which resulted in prolonged clearance time for through traffic and caused the left turns to be made primarily during the amber signal periods. The delay to left-turn vehicles also affected cross-street traffic, since such traffic had to wait until the intersection was clear of the left-turning vehicles from the cross street.

The advised improvement consisted of the modification of the existing controller to provide for four auxiliary movement controllers, median signals on Peck Road with 12-inch green arrow sections, walk-wait signals on each leg of the intersection, replacement of the old signal heads with 12-inch sections, and left-turn channelization on each of the four legs.

An "after" study was made to evaluate the effectiveness of the alterations. The total number of accidents declined 39 percent (from 64 to 39). Intersecting accidents were reduced 89 percent (from 9 to 1), and approaching accidents declined 94 percent (from 37 to 2). Accidents involving injury declined 35 percent, and the number of persons injured declined 44 percent. Overtaking accidents, however, increased 71 percent (from 17 to 29).

A significant reduction in the total number of traffic accidents took place in spite of the increase in accidents involving overtaking vehicles. The left-turn approaching type of collision was almost completely eliminated.

Traffic Volume Increases

Another factor to consider in contrasting the "before" period with the "after" period is that an increase of 19 percent in the total traffic volume occurred in the space of the few years under consideration. The decrease in accidents following the improvement

BEFORE: Peck Road-Valley Boulevard intersection in El Monte, California. A high incidence of accidents took place at this intersection before a minor improvement project eliminated uncontrolled left turns from four directions.

AFTER: Peck Road-Valley Boulevard intersection. With left turn channelization, improved signals, etc., the motorist's right of way is more clearly defined. Accidents have decreased 39 percent (from 64 to 39).

is, of course, even more substantial in this light.

A leg-by-leg breakdown of the traffic shows the following increase in volume for the before and after periods:

	Before	*After*
West leg of Valley Boulevard	4,249	4,595
East leg of Valley Boulevard	4,385	4,548
South leg of Peck Road	5,070	6,549
North leg of Peck Road	4,126	5,462
	17,830	21,154

Based on the significant reduction of both the intersecting and approaching type collisions, especially in view of the increased traffic volume, this improvement was considered a successful attempt to better a spot location.

Unfortunately, installing new or more sophisticated signals does not always result in fewer accidents at intersections, although it is sometimes difficult to convince the lay traffic critic of the pitfalls of this seemingly magic formula.

For instance, in a study which evaluated 140 projects in 1962, the overall accident reduction approximated 32 percent. But this total is rather misleading because safety was improved in 108 of the 140 projects. In the remaining 32 cases, the anticipated improvement did not materialize. And, in two-thirds (or 21) of the projects in which the after accident rate was higher, new or modified traffic signals without channelization were involved. In fact, 21 of the 59 new signal projects (36 percent) resulted in a worsening of the accident picture.

Master Evaluation

The outcome of spot improvement projects is forwarded to the Division of Highways Headquarters in Sacramento to become a part of a master evaluation which is carried out by the Traffic Department.

During the calendar year 1964, minor improvements reported by all 11 districts totaled 301. These projects involved a total expenditure of about $8,200,000. About 37 percent of the money was spent for reconstruction. This included easing of curves, widening of narrow roadways, widening of bridges and culverts, increasing sight distances, etc. The next largest expenditure (of the total figure) was for the installation or modernization of traffic signals. The signal projects usually included safety lighting and often the construction of intersection channelization. Substantial sums were also spent for erecting median barriers.

The majority of these safety improvement projects were initiated as a result of the continuous surveillance of the California state highway system for high accident locations, as mentioned throughout this article. The types of projects completed in 1964 are shown below:

TYPES OF PROJECTS

Projects Under Construction or With Design Complete as of December 31, 1964

Types of projects	Projects over $5,000	
	Number	Total cost*
Signals	53	$2,342,900
Flashing beacons	0	
Lighting	0	
Delineation	6	87,800
Guardrail	0	
Channelization	12	382,900
Reconstruction	22	3,410,300
Miscellaneous	10	322,400
Median barriers	2	265,300
Totals	105	$6,811,600

* Includes share of cost borne by local agencies.

It should be mentioned that many other projects were also constructed during the year to improve traffic operation, reduce delay, increase capacity, and the like, but these projects have not been included in 301 projects reported above—unless the locations had experienced adverse accident records prior to the improvement.

At the end of the year, there were another 105 projects, with an estimated cost of $6,811,600 either under construction or with the improvement design completed. Their type and cost is given below:

It should also be noted that many other improvements, which also have a safety aspect, are made on a day-to-day basis by state forces exclusive of the minor improvement program. These include the erection of curve warning signs, the improvement of striping and delineation, and the increase of sight distance by removing shrubbery and other obstructions. Although the cost of any one of these improvements is nominal, the sum total of all such improvements amounts to a substantial safety benefit.

The actual safety benefit which will result from the 301 projects completed in 1964 is only arbitrarily calculable, but projections indicate that about 800 to 1,000 fewer accidents per year should be occasioned. The total reduction during the life of each project

PROJECTS COMPLETED

January 1, 1964, to December 31, 1964

Types of projects	Projects under $5,000		Projects over $5,000		All projects	
	Number	Total cost*	Number	Total cost*	Number	Total cost*
Signals	42	$48,400	47	$2,350,400	89	$2,398,800
Flashing beacons	17	27,800	1	7,300	18	35,100
Lighting	11	22,800	3	20,800	14	43,600
Delineation	11	10,900	2	49,300	13	60,200
Guardrail	30	50,700	5	103,400	35	154,100
Channelization	23	58,900	17	759,300	40	818,200
Reconstruction	34	78,300	20	2,955,000	54	3,033,300
Miscellaneous	24	55,500	6	110,100	30	165,600
Median barriers	1	4,900	7	1,464,800	8	1,469,700
Totals	193	$358,200	108	$7,820,400	301	$8,178,600

* Includes share of cost borne by local agencies.

improved first. Further studies involving percentages are bound, by the nature of the program, to show diminishing returns.

With the knowledge on the safety program increasing every year, we do not expect to wrap up the minor improvements program in the foreseeable future. Changes and refinements will occur in the program through project evaluation and research.

Our efforts to improve the techniques of identfying high-accident locations are increasingly aided by the use of electronic data-processing equipment. Computer listings of intersection accidents and accident concentrations in 0.10-mile increments were furnished to the districts in 1964.

Identifying the high accident locations on California's 12,414-mile state highway system is increasingly facilitated through the use of electronic data-processing equipment, as shown by Richard Bjorklund of Headquarters data processing.

would exceed the yearly amount by many times. By averaging the experiences to date, we find that each project can be expected to eliminate about three accidents per year, or about 30 in 10 years.

The present accident reduction through minor improvements is about 25 percent (despite increased traffic volume in the "after" period), as shown in the tabulation below.

It is interesting to note that an earlier survey of the accident reduction attributable to minor improvements showed a 32-percent decline in accidents, but justification for lesser seeming results (25 percent) lies in the fact that the worst locations were

Type of improvement	Number of projects			Number of accidents per year		Percent reduction in accidents
	Improved	Worsened	Total	Before	After	
New signals	76	49	125	1,125	965	14
Modified signals	14	8	22	485	409	16
New signals with channelization	33	23	56	717	583	19
Modified signals with channelization	34	3	37	824	550	33
Flashing signals	35	10	45	437	338	23
Safety lighting	30	11	41	300	173	42
Delineation	13	0	13	125	69	45
Protective guardrail	9	0	9	45	15	67
Intersection channelization	29	5	34	596	464	22
Reconstruction and miscellaneous	40	10	50	395	237	40
Total of all projects	313	119	432	5,049	3,803	25

Computer Use Expanded

An evaluation is being carried out this year to test the feasibility of greatly expanding the use of computer listings in the minor improvement program. It is expected that these listings will supplement, and in some cases supplant, the present methods of hand posting and visual inspection of accident strip maps. At present, both hand posting and computer listing are carried out, with the comparison of one set of data serving as a convenient cross check for the other.

On the whole, it may be concluded that minor improvements are an effective means of reducing accidents. And, although the number of accidents—before and after—at any one location is usually too small to provide a statistically reliable base, a definite contribution to safety has been proved in all research to date.

The only word of caution to be exercised in a program such as this is that each project should be evaluated on its own unique merits. There is no predictable manner in which to judge the outcome of any particular improvement. Good results, however, can be expected with most projects by using a logical approach to the problem, the solution, and by implementing available funds to carry out the dictates of a soundly conceived working approach.

Governor Edmund G. Brown is shown signing into law Senate Bill 648, which extends the life of the Bay Area Transportation Study Commission for three years. Seated with him at the news conference in the Governor's San Francisco offices on July 12, 1965, is Senator "J" Eugene McAteer of San Francisco, author of the legislation. The interested spectator behind the Senator is Nils Eklund, chairman of BATSC. Newsmen at Governor's right are Earl C. Behrens, political editor of the San Francisco Chronicle, seated; and Vern Williams, radio correspondent, standing.

S. F. Bay Area Transportation Study

By RICHARD M. ZETTEL, Study Director

High in the Berkeley hills a combination of human brains and modern technology is underway with work that will profoundly affect the future of the San Francisco Bay area.

The place is the picturesque Claremont Hotel. The research group is the Bay Area Transportation Study Commission. The goal is the creation of a regional, balanced transportation and land use plan to guide the future of the nine counties which comprise the bay area.

Mindful that population studies indicate a "super-Metropolitan status for the bay area to rank seventh in the nation in size by the year 2000," the study's basic aim therefore is to get ahead of these developments as far as possible so that meaningful choices, based on factual data, are available to those who must help shape the future.

It was primarily to meet this challenge that the study commission was set up by the 1963 session of the California Legislature. An additional reason was a requirement of the 1962 federal-aid highway law providing that after July 1, 1965, no highway project involving federal aid, be it interstate highway or secondary road, may be approved by the Secretary of Commerce, unless it is based on a continuing comprehensive transportation planning process carried on cooperatively by states and local communities.

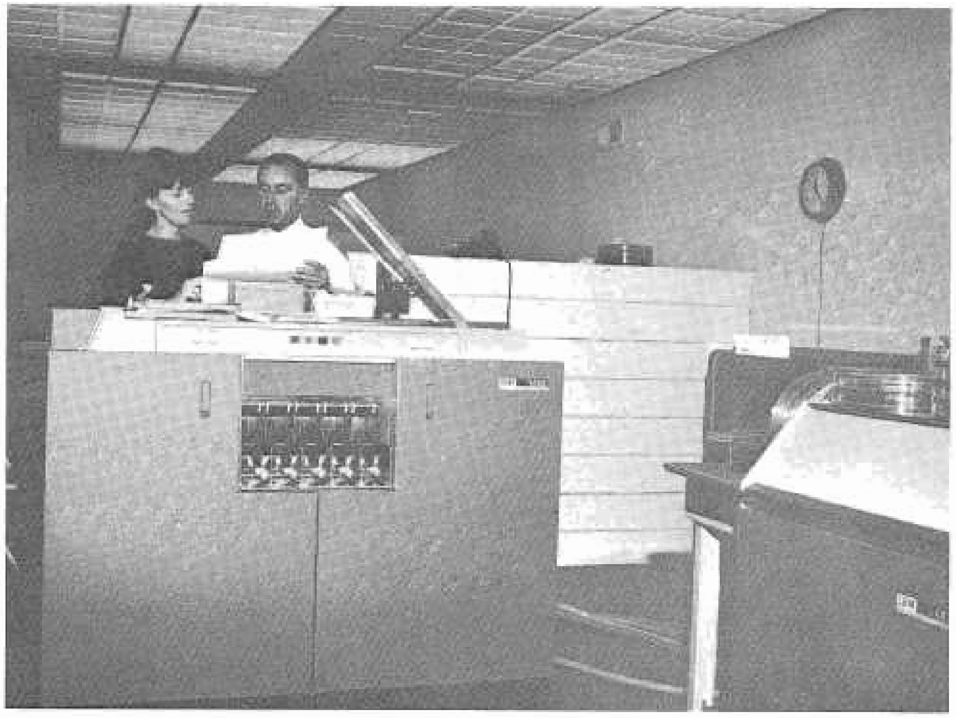
The federal law providing aid for transit also requires that "a unified or officially coordinated transportation system as a part of the comprehensively planned development of the urban area" must be developed if the area is to qualify for transit funds.

Total Transportation

Aware that every resource must be called into consideration if its responsibility is to be met, the commission will overlook no possibilities. Be it new freeways, new bridges or more underwater Bay crossings, train, bus, hovercraft, hydrofoil or helicopter, all suggestions will be carefully heard and exhaustively studied. The economy involved is an expanding one and is built upon the free movement of people and goods in and around and through the bay area. The commission's job is to point out what can be done to help future development meet the objectives of all concerned.

Organized on a "grass roots" basis, the 37-member commission has already attracted national interest. Although it may be somewhat unwieldly administratively because of its size (there is also a 50-member citizens' advisory committee) this same factor is a potential source of great good will, looking to the time when the commission must submit its recommendations to the general public and secure the widespread support necessary for implementation of its proposals.

As is well recognized, numerous transportation studies of excellent technical competence have foundered and disappeared or have been relegated to the dust of library shelves because the governmental jurisdictions were not coordinated, or because the attitudes and desires of the general



In the BATSC computer room, Programmers Adeline Bergeron and John Hertz confer on a set of data.

The children of Carolyn and David Schiller of Orinda help their parents supply information about the family's transportation pattern to BATSC Survey Interviewer Mary Johnson (right).

Staffs of Bay Area Transportation Study Commission and Association of Bay Area Governments work together closely. Left to right, ABAG Executive Director Warren Schmid, ABAG Planning Director James H. Hickey, BATSC Study Director Richard M. Zettel, and BATSC Assistant Study Directors Gibson W. Fairman and Jay W. McBridge.

public were not sufficiently taken into account.

The commission suffers from no such deficiency. It must make practical suggestions on ways of implementing its plan. Its makup is worth noting in some detail.

Commission Makeup

There are seven at-large members appointed by Governor Edmund G. Brown. Four members of the State Legislature, including State Senator J Eugene McAteer of San Francisco, sponsor of the legislature authorizing the commission, also are members. The other legislators are Senator John F. McCarthy, Marin County, and Assemblymen W. Byron Rumford and Leo J. Ryan, of Alameda and San Mateo counties, respectively.

Representatives of the boards of supervisors and spokesmen for the mayors in the nine counties involved in the study also have places on the commission.

Agencies represented include the State Highway Transportation Agency, Department of Finance, Association of Bay Area Governments, Alameda-Contra Costa Transit District, Bay Area Rapid Transit District, Golden Gate Bridge and Highway District, United States Bureau of Public Roads and the United States Housing and Home Finance Agency. The chairman of the commission is Nils Eklund, Vice President of Kaiser Industries, Oakland.

To direct the manifold operations of the study, the commission selected the writer, research economist of the Institute of Transportation and Traffic Engineering of the University of California. Serving as assistant directors are Gibson W. Fairman and Jay W. McBride, both of whom have had extensive experience in regional transportation planning.

Working in close coordination with the commission is the Association of Bay Area Governments. In addition to its direct representation on the commission, ABAG will cooperate in the land use portion of the commission's study and will in fact play a key role throughout the survey. The association has been recognized as a regional planning agency eligible for planning assistance grants by the U.S. Housing and Home Finance Agency. It thus becomes the vehicle through which such financial assistance may be made available to the commission.

In the performance of its basic responsibility to conduct a comprehensive study and to prepare a master regional transportation plan for the future, the commission is explicitly limited to this field by terms of the authorizing legislation. Moreover the commission itself has no powers of decision on contemporary transportation issues, nor does it have powers of review over decisions of other agencies, public or private.

The commission could easily lose its long-range effectiveness if it became embroiled in immediate issues of the day. Progressively as its studies proceed, however, the advisory function of the commission will become more pertinent to current decisions, because the outlines of its plan will begin to emerge.

Initial Work

Standing by itself, the commission's own specific task is a grave and difficult one in a region which is really only beginning to examine its regional problems on an overall basis and to develop articulated plans and means with which to cope with them.

The commission has reached its present status through a succession of steps which may be highlighted as follows:

Acting upon authority conferred by Senate Concurrent Resolution No. 20, approved by the 1962 session of the Legislature, the State Department of Public Works, assisted by a large bay area committee of technical and citizens' representatives, prepared a prospectus setting forth broad general lines along which such a study could proceed.

Senator McAteer then introduced legislation creating the commission. The law took effect in September 1963, but it required some months before all 37 commissioners could be appointed by the many agencies and governmental jurisdictions concerned. The full commission thereupon held its first session in Oakland on March 20, 1964.

The study director was appointed in June, and in August the commission approved a cooperative agreement with the Association of Bay Area Governments and the State Highway Transportation Agency to "provide organizational and working arrangements for a continuing, coordinated, comprehensive planning process in the San Francisco Bay area."

In October the commission approved and adopted the preliminary study design prepared by the technical staff. During December the commission moved its financing arrangements to the final stages. (The authorizing legislation did not provide for any direct operating funds for the commission and negotiations for this purpose occupied many weeks.)

Approximately $3,465,000 has been set as the amount which will be needed to complete the study, which is now scheduled for early in 1968.

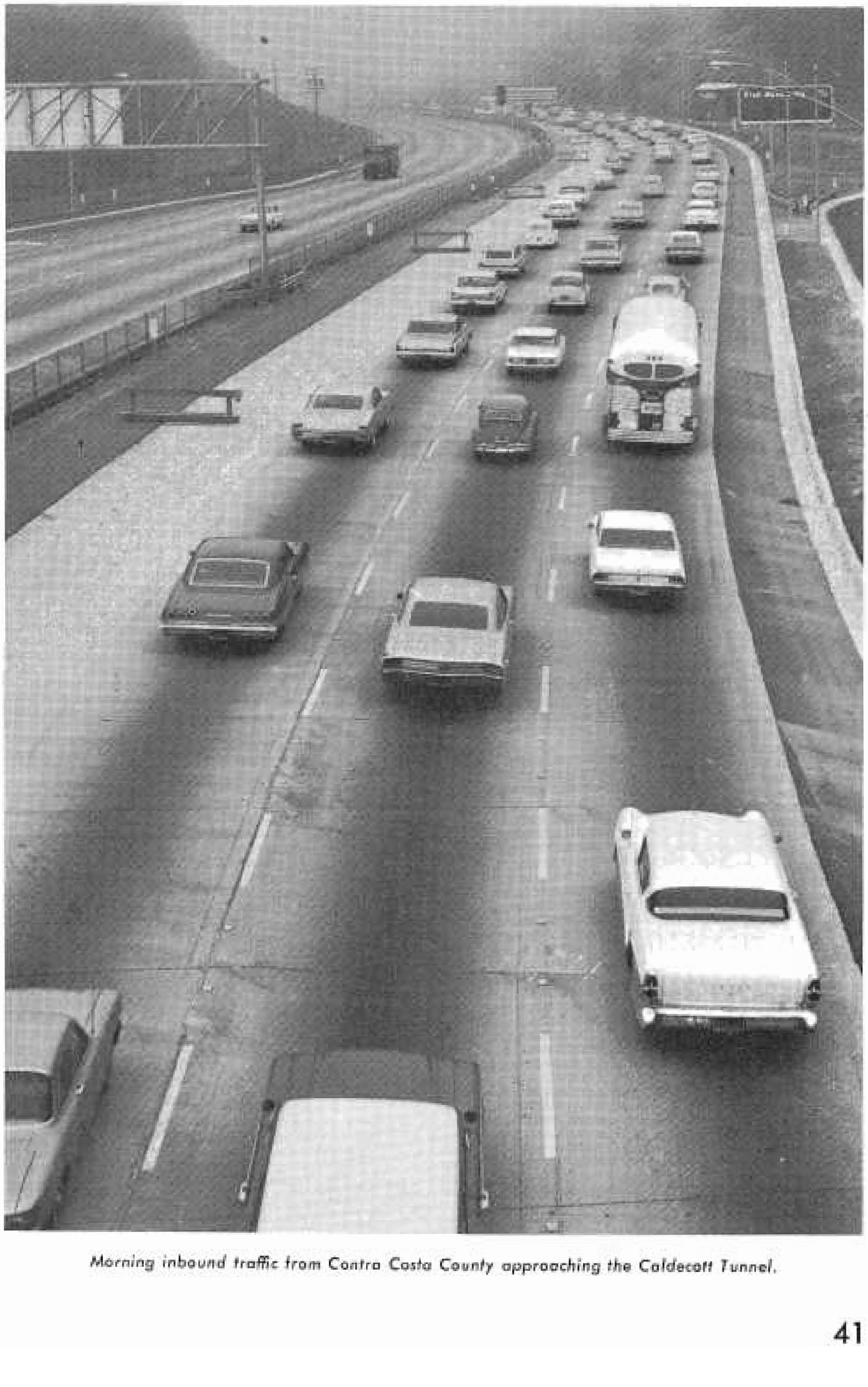
These funds will come from a combination of federal, state and local sources, with the federal government accounting for the greatest portion.

Thus, with major problems of organization, financing and staffing behind it, the commission has moved rapidly into the vital data-gathering and analysis phase of the study in this effort it is working closely with the many existing planning and transportation agencies operating in the bay area. These include both District 4 and the Urban Planning Department of the State Division of Highways, the State Division of Bay Toll Crossings, the Golden Gate Bridge and Highway District, the Bay Area Rapid Transit District, the Alameda-Contra Costa Transit District, the San Francisco Municipal Railway, the West Bay Rapid Transit Authority, and the Marin County Transit District; all in addition to planning and transportation agencies of the individual counties and cities.

Existing Studies

Actually, a considerable amount of excellent transportation planning has already been done in the bay area. But it has often been fragmented along political or geographical lines or limited to a particular mode of transportation. All usable information from past studies, as well as from present planning programs, will be incorporated in the current study. But a vast amount of new data must be collected and collated if the commission is to meet its goal.

A truly comprehensive study requires "that the economic, population,



Morning inbound traffic from Contra Costa County approaching the Caldecott Tunnel.

Peninsula commuters boarding San Francisco-bound train at Palo Alto.

and land use elements be included; that estimates be made of the future demands for all modes of transportation both public and private for both persons and goods; that terminal and transfer facilities and traffic control systems be included in the inventories and analyses . . ."

Field Surveys

Many field surveys are being undertaken concurrently. These will include traffic counts and interviews along roadsides and in buses; inventories of road, transit, and parking conditions; studies of truck, bus, and taxi operations.

One of the most important surveys is the home interview, which involves personal contact with selected families concerning trips made and characteristics of the household. In excess of 50,000 households will be interviewed, the list having been selected at random to cover all geographical areas and all kinds of families.

All information obtained is held confidential, of course, and will be used only in statistical summaries which will explain present travel patterns and help in prediction of the future.

The land use survey which will be accomplished largely through analysis of aerial photographs will be of great interest for general planning as well as transportation analysis. Complete aerial coverage of the study area is now being acquired in a form suitable for enlargement to a 1-to-200 scale. The land use survey will be supplemented by floor area surveys.

Computer Use

All of the data mentioned, along with information from still other surveys, will be fed into an IBM 1401 computer at the commission's headquarters for summarization and subsequent analysis. A study of this scope and depth would be impossible to accomplish manually. Literally tens of millions of individual items of data are involved.

One of the important byproducts of the commission's work will be the ability to furnish information to other transportation and general planning agencies quickly and in the form desired, so that they may take advantage of the commission's vast store of data in their own programs.

A second important feature is that an adequate historical base of information will be established which will allow the commission and other planning bodies to analyze the impact of decisions made in the future. For instance, with the frame of reference now being accumulated it will be possible to gauge accurately the impact of future rapid transit on bay area development.

Weighing Alternatives

However, the main objective is to develop an acceptable and practical comprehensive transportation plan. Analysis of current data will permit the development of models or mathematical expressions which reproduce current travel and land use patterns. These will then be used in prediction of the course of future development of the bay area and the resulting transportation demands.

Once the basic analyses are completed it will be possible to develop alternative plans of land use and transportation development and descriptions of the public policies needed to bring them about. The alternatives will be submitted to the commission for evaluation and public debate in light of the goals and aspirations of the region. Finally, a preferred regional transportation plan will be selected by the commission for recommendation to the Legislature.

Briefing Sessions

While the technical work proceeds, the commission is going forward with more generalized aspects of the study so that it may make a more informed choice among possible alternatives at the appropriate time.

Planned for action in the near future is a "briefing" on the so-called "novel" transportation methods, some of which were mentioned earlier. Also scheduled is a meeting to hear from representatives of business, labor and civic groups. The general public will also be invited to put their viewpoints before the commission. These meetings will continue and expand a program of meetings held by the commission at various localities during 1964, when federal, state and local officials reported on the current status of transportation facilities and planning for the bay area.

Among several important innovations in the commission's organizational setup was the provision for a 50-member citizens' advisory committee. Under the chairmanship of Stanley E. McCaffrey, president of the San Francisco Bay Area Council, this group is fully organized and has held a joint meeting with the commission. The advisory group is expected to play an active part in the entire study, both in the formulation of the commission's final recommendations and in helping to obtain public support for the proposals.

Long-range Planning

The goal set for the commission—to design a balanced transportation system that will serve the nine bay area counties efficiently in the 1980's, the 90's and beyond—may be thought to be too remote to be practical.

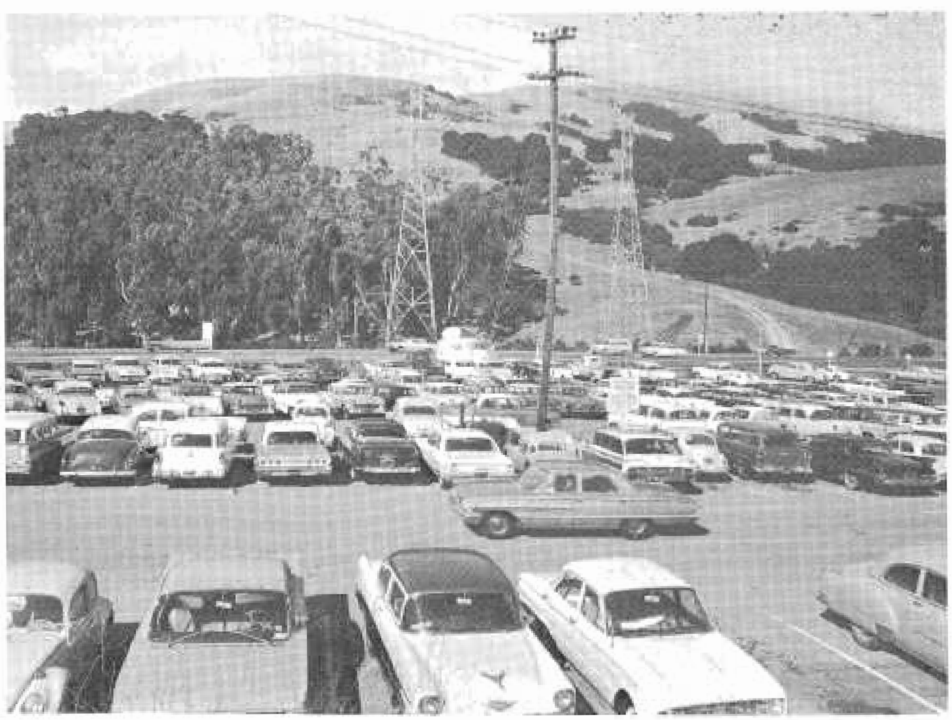
However, one or two points should be kept in mind in relating the work of this commission to the future transportation system in the bay area.

Foremost is the fact that the commission does not intend to set up any arbitrary and rigid plan, put a date of 20 to 25 years from now on it, and call it quits.

What it is aiming for is to set up some basic goals and general guidelines, to make specific recommendations within that framework, and to make provision for periodic review and updating, probably at five-year intervals.

This last is most important. The commission itself is temporary, but it must, as a part of its responsibility, make adequate plans for transfer of its planning functions to appropriate permanent agencies.

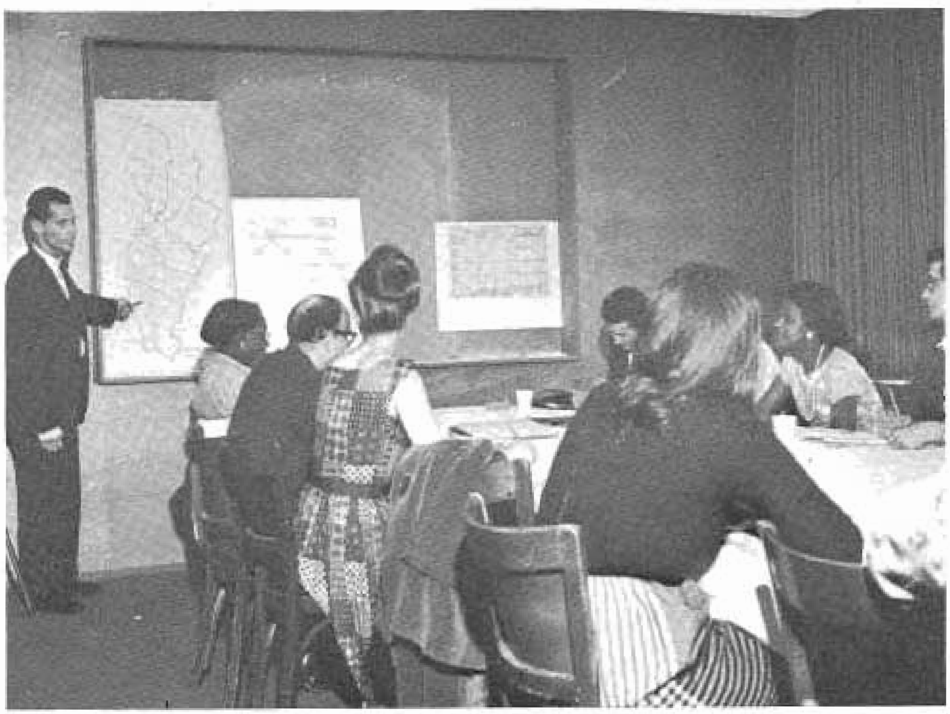
It is believed that the people of the bay area are going to be much more disposed to support the commission's long-range suggestions if they know they are flexible enough to accommodate factors that may not be seen clearly enough today.



Commuter parking lot for freeway bus connection at Orinda, Contra Costa County.

Aerial photos are a major tool in the land use survey of the bay area. Intermediate Clerk Mary Henderson is shown making measurements on a photo preparatory to calculation of enlargement factors.

The important thing is to set the stage now for a continuing process that will help to shape the bay area into an increasingly desirable place in which to live as our population grows and the economy expands. An adequate job of transportation planning, properly coordinated with other planning efforts, will do much to assure a pleasant future.



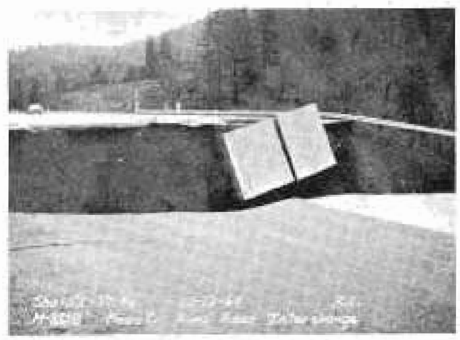
Home interviewers undergo extensive training. Instructor Louis Nackos is shown conducting one of the classes.

APOLOGIES TO MR. LITTLETON

On page 17 of the January–February 1965, issue of *California Highways and Public Works* magazine the photo of the piece of paving falling into the gap of the washout at Mears Creek on Interstate 5 was credited to the maintenance foreman of that section.

Actually the picture was taken by Ray E. Littleton, son of the maintenance foreman, who is a member of the Redding Fire Department, Fire Hall No. 2, 1900 Placer Street, Redding.

The photo was made with a Polaroid camera, in alternate rain and snow squalls. The referred to picture and two others made by Mr. Littleton at the same time appear below.



Right-of-Way Agents Hold 3rd Academy

The third two-week summer training academy for Division of Highways Right-of-Way Agents was conducted August 2–14 at the University of California's Davis campus.

Approximately 90 of the division's junior agents and some of its newer assistant agents from the state's 11 highway districts attended this concentrated 88-hour course of technical training in property acquisition and related fields.

In California's highway program, most of the land required for freeway and highway construction is purchased from private owners. Right-of-way agents are responsible for appraising these properties, negotiating their purchase, and managing them until construction begins. In the 1964–65 fiscal year, approximately 7,500 such transactions were made, representing an expenditure of nearly $180,000,000.

"As a concentrated extension of our comprehensive in-training program, the academy's value has been proven through a higher level of productivity on the part of our agents, who already represent the top 10 percent of applicants for a right-of-way career," said J. C. Womack, State Highway Engineer. "This is in turn reflected by savings in both time and money, since it speeds the translation of highway user taxes into safe, modern highways and freeways.

"Also, because right-of-way work is extremely varied, our agents must supplement technical knowledge of real estate laws and values with recognition that rights of the public and the property owner must be protected. Agents must merit the public's confidence and good will through care, courtesy, and constructive cooperation."

Classroom sessions incorporated: The Right-of-Way Function; Basic Engineering; Appraisal Theory; Acquisition Law and Techniques; Property Management; and Administration.

Senior members of the division's right-of-way staff served as instructors. Group conferences were scheduled as evening sessions. Classes were held in the Physical Sciences Building and Olson Hall on the Davis campus, and residence was in Ryerson Hall.

Rudolf Hess, Chief Right-of-Way Agent for the Division of Highways, supervised plans and curriculum for the academy, which offered opportunity for a uniform instructional pattern for agents who will apply this training in their respective districts throughout the state.

Rotation Involves Key Assignments

Job rotation within the Division of Highways is mandatory only at the junior civil engineer, or entry, level. Its advantages were described in an article in the May–June 1963 issue of *California Highways and Public Works.*

In some districts the rotation policy has been increasingly applied at higher levels of responsibility, and for the same reasons: to broaden the engineer's base of experience, and to provide better qualified highway leadership for the future.

In recent months the division's two largest districts have carried out major shifts of assignments, one involving Assistant District Engineers (supervising level) and the other involving Senior Highway Engineers.

In District 4, San Francisco, a series of such changes involved eight Assistant District Engineers. Some of the moves were from traffic to administration, from construction to design, from planning to maintenance, and from right-of-way engineering to programs and budgets. Several of the men involved had held their previous assignments for many years.

More recently, seven of the Senior Highway Engineers in District 7, Los Angeles, were reassigned to new duties in different units. For example, the new administrative head in the district maintenance office is a transfer from the programs and budgets unit. Other lateral changes involve route planning, design and materials units.

Baynard A. Switzer, Safety Head, Leaves

Baynard A. Switzer, Safety Engineer for the California Division of Highways, retired on August 31, after a 41-year career with the state.

As head of the Safety Section since 1955, Switzer has had charge of all industrial and traffic safety and fire protection for the division's now more than 17,000 employees. He has also supervised the division's Merit Award Program.


BAYNARD A. SWITZER

The 27-year-old employee safety program has brought outstanding reduction in accident rates and costs among division personnel. Under Switzer, the rate of recordable motor vehicle accidents among highway employees has been reduced by one-third, the lost time injury rate by more than one-half.

Prior to his appointment as Safety Engineer, Switzer also played an important role in the division's research program on traffic signing, pavement marking and speed zoning.

Switzer was born at Fredalba (now Smiley Park) north of San Bernardino and went to grade and high school in Highland and San Bernardino. He later studied engineering at Oregon State University.

He joined the Division of Highways in 1924 as an engineering draftsman.

He was appointed district traffic engineer at San Bernardino in 1940.

He transferred to the headquarters office in Sacramento in 1950 as an assistant traffic engineer.

Switzer is a member of the Institute of Traffic Engineers. He is a Mason, a member of the State Men's Club and is past regional director of the California State Employees' Association.

Switzer is married and has a son, Robert, and a daughter, Barbara N. Cullen, both of Victorville.

District 3 Loses Maintenance Chief

R. I. Nicholson of Yuba City has retired from the California Division of Highways August 1 terminating a 35-year state engineering career.

For the past 15 years he has been district maintenance engineer supervising a staff of 400 in the upkeep and repair of 1,400 miles of state highways and freeways in the 11 counties served by the Marysville district office.

R. I. NICHOLSON

Succeeding Nicholson will be Elmo C. Meister, a senior highway engineer who, for the past two years, has headed the locations department charged with mapping adopted routes for future freeways.

After the 1955 Marysville-Yuba City floods, crews under Nicholson's direction were cited for their excellent work in re-opening state roads and making emergency repairs.

Born in Shasta County, he attended the University of California in Berkeley majoring in civil engineering.

In 1930, he joined the Division of Highways in Marysville, and has spent his entire career in District 3 with the exception of a two-month assignment in Sacramento headquarters.

He was promoted to senior highway engineer in 1950. Before promotion to his present position, he was in charge of the district's federal aid secondary system of roads.

He is state president of the Quarter Century Club of the Division of Highways and is past president of Chapter 40 of California State Employees' Association.

He helped organize the highway district's safety committee and was its first chairman.

Nicholson served as chairman of the Sutter County rehabilitation committee, formed after the 1955 floods.

He is a member of the Elks Lodge, Marysville, and the James Marshall Chapter of E Clampus Vitus.

He and his wife, Mary Frances, have two daughters, Mrs. John Wilkins of Tahoe Valley and Mrs. Floyd Brockman of Stockton, and four grandchildren.

DEPARTMENT LOSES 29 MEMBERS TO RETIREMENT

District I

Vernon A. Martin, highway maintenance man II, 38 years.

District II

Lester F. Ball, senior highway foreman, 43 years; Frank F. Dais, highway maintenance man III, 42 years.

District III

Andrew T. Hartley, Groundsman, 10 years.

District IV

Bert P. Bongera, assistant highway engineer, 36 years; Howard C. Farris, senior highway engineer, 38 years; Helen M. Horne, intermediate clerk, 27 years; Ralph D. Kinsey, supervising highway engineer, 41 years; Carl R. Klinkenberg, assistant highway engineer, 19 years; F. W. Montell, supervising highway engineer, 41 years; Paul M. Morrill, assistant highway engineer, 34 years, George M. Pimentel, highway maintenance man II, 32 years; Charles M. Thornton, skilled laborer, 11 years.

District V

Udo M. Jante, delineator, 12 years; Owen F. Maxham, intermediate clerk, 5 years.

District VI

Ellsworth I. Van Patten, associate right of way agent, 34 years.

District VII

Charles C. French, highway engineering associate, 38 years; Abe Givens, groundsman, 9 years; Frank D. Gore, associate highway engineer, 14 years; William V. Hesp, highway engineering associate, 17 years; David A. Stewart, highway maintenance man II, 12 years.

District VIII

Donald S. Wieman, highway superintendent, 34 years.

District X

Violet L. Rosa, intermediate file clerk, 7 years; Dolph J. Vergara, automobile mechanic, 35 years.

District XI

Harold D. Martin, highway tree maintenance foreman, 28 years.

Headquarters Office

Martha E. Harris, senior clerk, 22 years.

Bridge

Elynor A. De Regne, supervising clerk I, 19 years; Edward M. Derby, associate bridge engineer, 28 years.

Shop 8

James R. Mackie, automobile mechanic, 21 years.

IN MEMORIAM

District I

Gerald L. Belak, highway maintenance man II.

District IV

Ah Y Fong, assistant highway engineer.

Edward J. Riordan, engineering student trainee—Range C.

District VII

Carl U. Bliss, assistant highway engineer.

Emory Douglas, janitor.

Clarence F. Gurss, assistant highway engineer.

District XI

Fred Young, highway mantenance man III.

Shop 7

Charlie B. Warner, machine parts storekeeper.

HIGHWAY COMMUNICATIONS MEN MEET IN CAPITAL

Representatives of 30 states with an interest in highway communications met in Sacramento on June 22–23 to discuss new developments in this field. The conference was sponsored by the Subcommittee on Communications of the Committee of Administration, American Association of State Highway Officials. Inspecting one of the exhibits are, left to right, Assistant State Highway Engineer Lyman R. Gillis of California; State Highway Engineer Virden E. Staff of Illinois, chairman of the subcommittee; Communications Engineer Arnold H. Carver of California, conference chairman; and W. D. Dillon of the Research and Development Division, U.S. Bureau of Public Roads.

Langsner Reelected To WASHO Office

Deputy State Highway Engineer George Langsner, California, was reelected secretary-treasurer of the Western Association of State Highway Officials in June at the concluding session of the association's 44th annual conference, held in Santa Fe, New Mexico.

Langsner will serve with State Highway Engineer Charles E. Shumate of Colorado, elected president for 1965–66, and Washington State Director of Highways Charles G. Prahl, vice president.

In addition to these three officers, the executive committee of WASHO includes S. N. Halvorson of the Montana State Highway Commission; Chief Highway Engineer T. B. White of New Mexico; William K. Holbrook of the Arizona Highway Commission; Superintendent and Chief Engineer R. G. Stapp of the Wyoming Highway Department; and State Highway Engineer D. C. Greer of Texas.

Idaho will be host state for the 1966 meeting.

Kozak Promoted To Deputy Chief Post

Appointment of John J. Kozak as deputy chief engineer of the Division of Bay Toll Crossings was announced recently by E. R. Foley, chief engineer.

Kozak, 44, an engineer for the State of California since 1947, came to Bay Toll Crossings last November as a principal bridge engineer.

In his new capacity, Kozak will assist Foley in administering the division, which has a statewide responsibility for operation, design and construction of toll bridges.

Frederick Montell Retires in District 4

Frederick W. Montell, assistant district engineer in District 4, retired on June 1, 1965, after more than 41 years of service with the Division of Highways—40 years of which were in District 4.

A native of San Francisco, Montell was raised and schooled in Fresno, studying civil engineering at Fresno State College.

He joined the Division of Highways in July 1923 as a chainman on a location survey party on the Yosemite All-year Highway in the Merced River Canyon and has been continuously associated with the division in a variety of engineering assignments since that time.

FREDERICK W. MONTELL

Montell was assigned to construction from 1933 to 1948, on major projects in the bay area. One of the jobs involved the East Bay approaches to the San Francisco-Oakland Bay Bridge.

From 1948 to 1960, Montell was head of cooperative projects with the ratings of senior and supervising highway engineer. On January 1, 1960, he was reassigned as head of the Survey and Materials Department, a position he held until his retirement. The department was reorganized in 1962 as the Engineering Services Department.

Montell is a member of the American Society of Civil Engineers, the American Public Works Association, and the East Bay Engineers. He is also a past master of his Masonic Lodge, past president of Chapter 5, CSEA, recipient of the Samuel A. Greeley Service Award in 1954, and a member of the Commonwealth Club.

He and his wife, Cora, have a son, Robert, of Pleasantville, New York, and a daughter, Shirley (Mrs. William Soares), of San Leandro, California.

STATE OF CALIFORNIA

EDMUND G. BROWN, *Governor*

HIGHWAY TRANSPORTATION AGENCY

ROBERT B. BRADFORD . . . Administrator

DEPARTMENT OF PUBLIC WORKS . . . JOHN ERRECA, Director

FRANK A. CHAMBERS . . . . Chief Deputy Director

RUSSELL J. COONEY . . Deputy Director (Management)
HARRY D. FREEMAN . . Deputy Director (Planning)
T. F. BAGSHAW . . . . . . Assistant Director
C. RAY VARLEY . . . . . . Assistant Director
JUSTIN DuCRAY . Departmental Management Analyst
S. ALAN WHITE . . Departmental Personnel Officer

DIVISION OF HIGHWAYS

J. C. WOMACK . . . State Highway Engineer, Chief of Division

J. P. MURPHY . . . Deputy State Highway Engineer
J. A. LEGARRA . . Deputy State Highway Engineer
GEO. LANGSNER . . Deputy State Highway Engineer
LYMAN R. GILLIS . Assistant State Highway Engineer
J. E. McMAHON . . Assistant State Highway Engineer
FRANK E. BAXTER . Assistant State Highway Engineer
GEORGE A. HILL . Assistant State Highway Engineer
J. C. BURRILL . . . . Comptroller
NEAL E. ANDERSEN . . . . . Equipment Engineer
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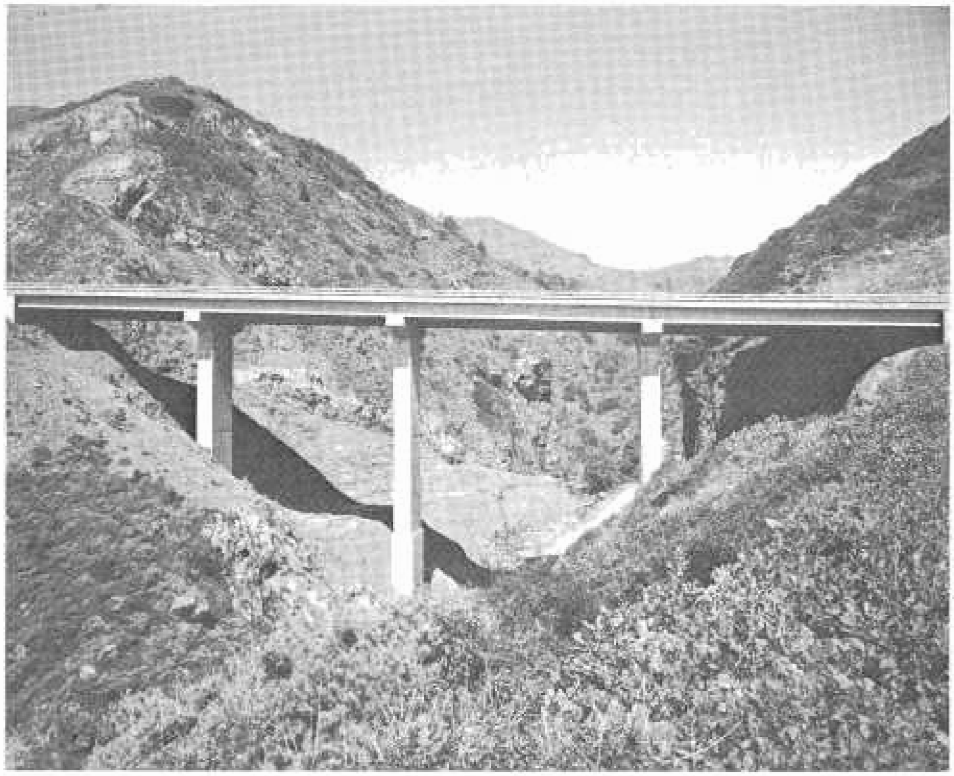
PCI AWARDS OF MERIT FOR TWO CALIFORNIA BRIDGES

The Prestressed Concrete Institute has bestowed award of merit plaques on two of California's bridges: the MacKinnon Avenue Overcrossing on Interstate 5 north of San Diego and the Vincente Creek Bridge on Highway 1 some 50 miles south of Monterey. The PCI makes its awards annually to recognize creative design using prestressed concrete.

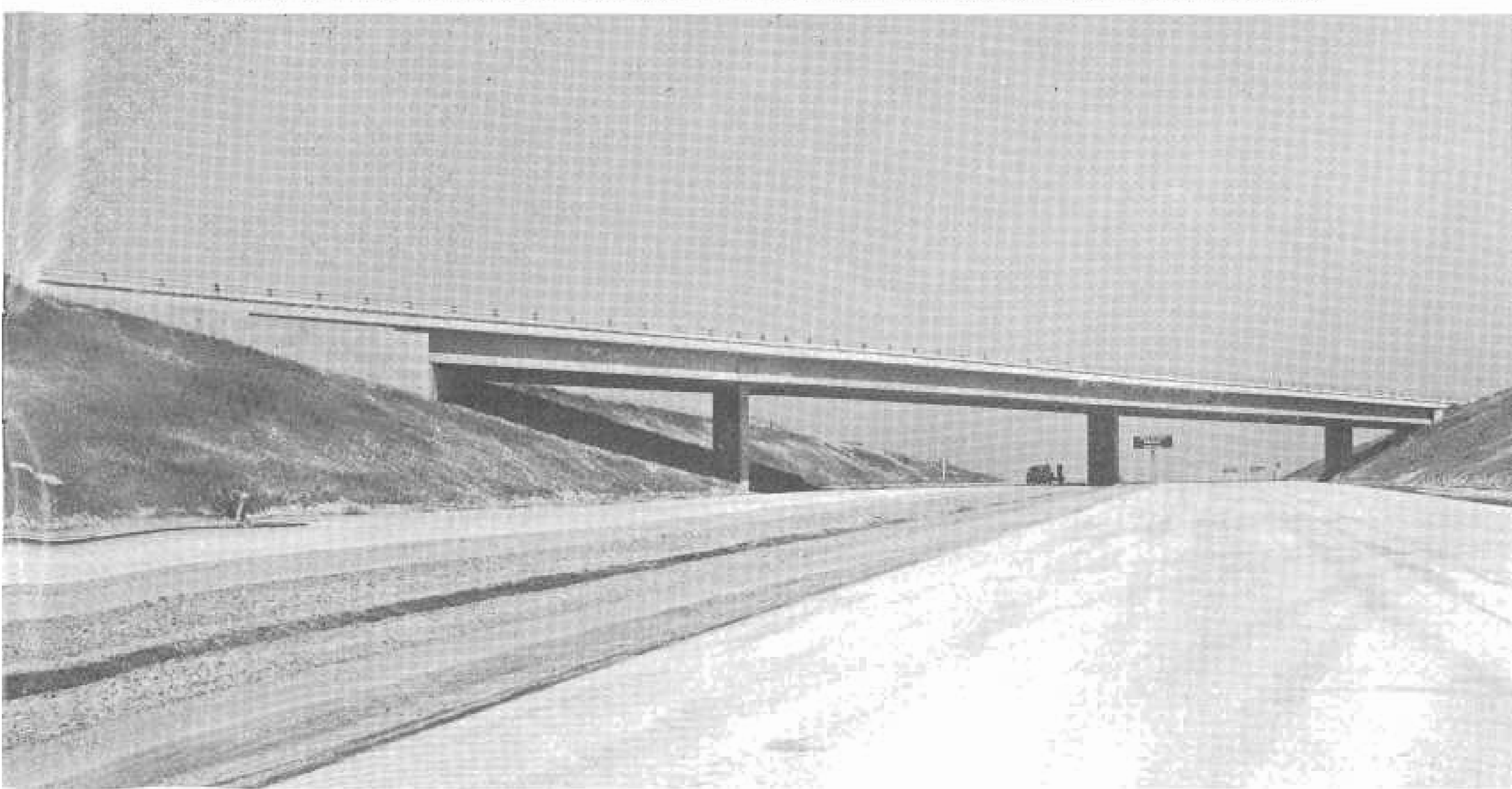
The awards take into account originality of architectural or engineering design, techniques of assembly, effective employment of the properties of prestressed concrete and aesthetic appearance.

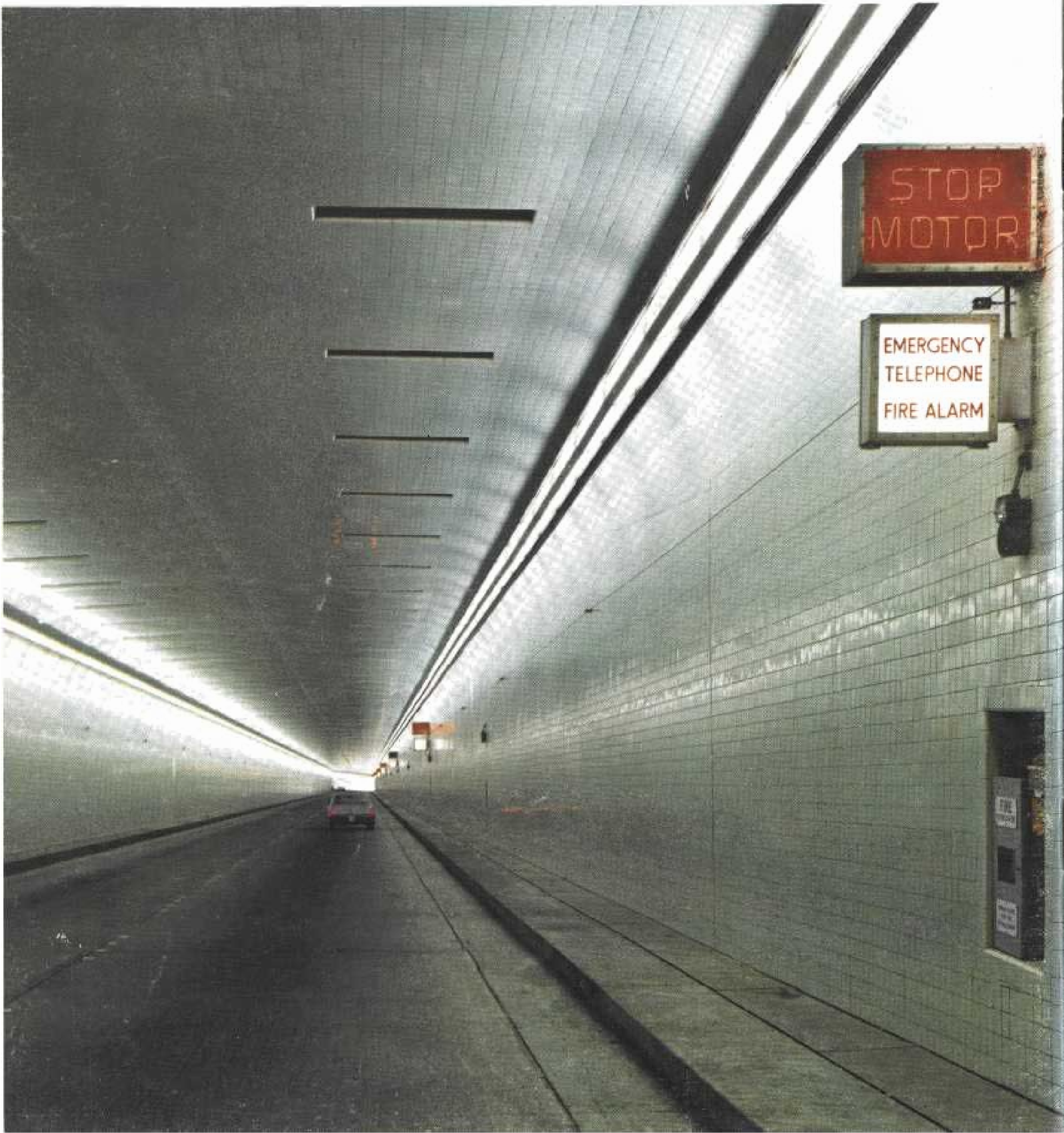
Two of the 10 nationwide awards offered by the institute in 1964 were also won by California bridges when awards of merit were presented for the Willow Creek Bridge on the Coast Highway 65 miles south of Monterey and by three prestressed carrying beams over the Arroyo Seco flood control channel in Los Angeles. (See July–August, 1964, issue of the magazine.)



Structure site of the Vincente Creek Bridge on Highway 1 south of Monterey is a steep canyon on the coast in an area noted for its rugged beauty. Designers endeavored to integrate it with the environment and offer a minimum of visual detraction from the natural surroundings.

The simple, neat lines of the MacKinnon Avenue Overcrossing on Interstate 5 north of San Diego were felt to be aesthetically appropriate in this particular area on the state's scenic highway system. The prestressed design is a two-span continuous box girder with unbonded wire tendons.




STOP
MOTOR
EMERGENCY
TELEPHONE
FIRE ALARM