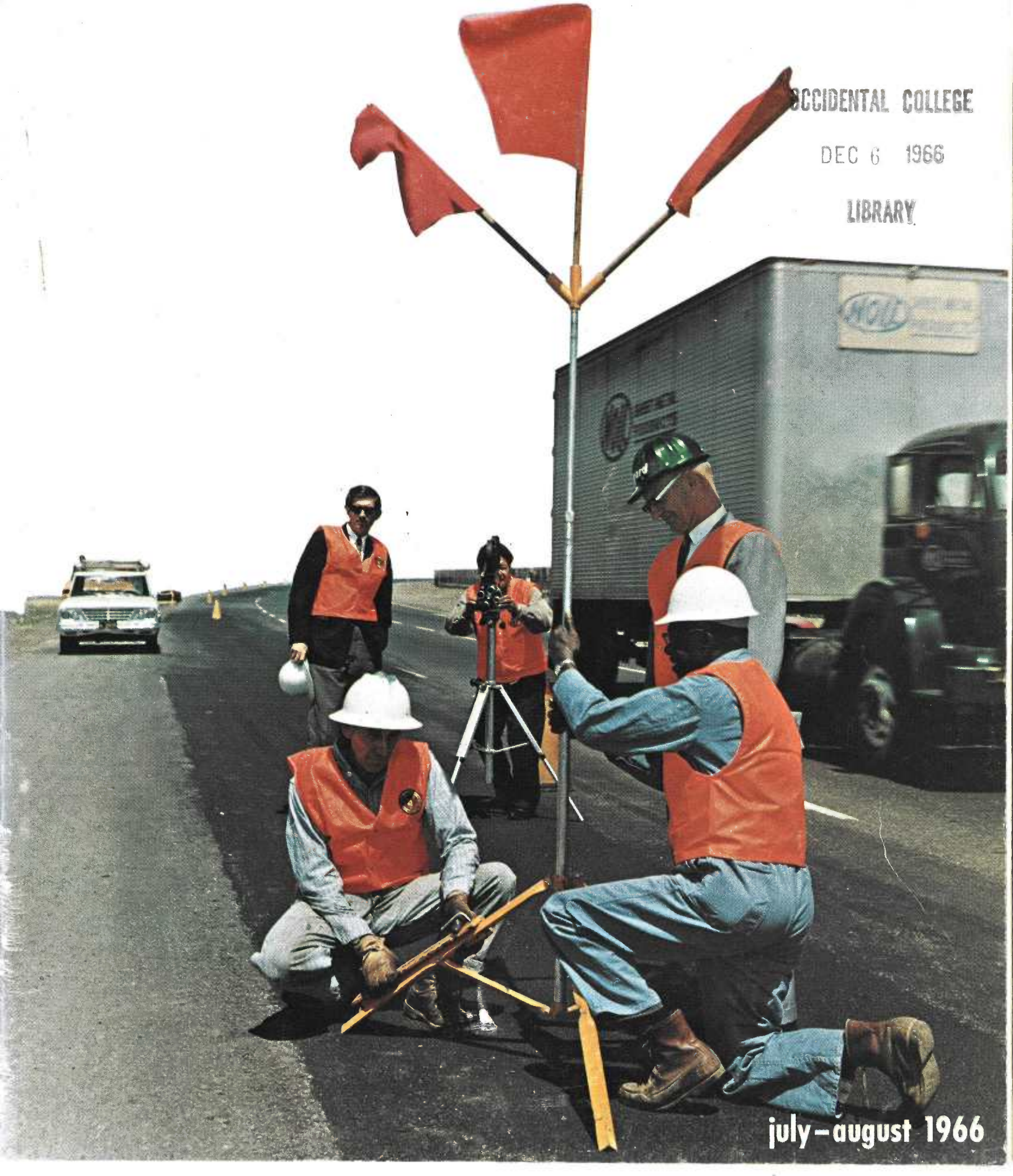
CALIFORNIA highways and public works



july–august 1966

Next Issue

One of the features of the next issue will be a study of urban transportation problems and growth in the City of Long Beach. It is hoped to make this a continuing series of articles which will appear from time to time in these pages.

Today California has 13 designated urban areas, and, although Long Beach is a part of the greater Los Angeles complex, because of its size and distinct character it is here treated separately.

CALIFORNIA highways and public works

OFFICIAL JOURNAL OF THE DIVISION OF HIGHWAYS, DEPARTMENT OF PUBLIC WORKS, STATE OF CALIFORNIA
VOLUME 45 JULY–AUGUST 1966 NOS. 7–8

"An outstanding network of state highways is essential to the future growth of California's economy"
—*Governor Edmund G. Brown*

Editors are invited to use information contained herein and to request prints of any black and white photographs.

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FRONT COVER: Scene on location of crew working on new movie for training Division of Highways maintenance men in correct safety procedure for protecting themselves from traffic. In foreground are Gerhard Busing, left, and H. C. Hall, from Burlingame Maintenance Station. Standing behind Hall is Frank Bunyard, Assistant Safety Engineer. Cameraman is Peter Asano, and rear left is Richard Jones, director. Remote control photo by Peter Asano.

BACK COVER: Photo shows a section of Route 58 looking east about 12 miles from Bakersfield, where road begins climb toward Tehachapi Pass. This is an important entry route into California from the east and, although not in the interstate system, is being progressively converted to full freeway along its entire length. Photo by Robert Mulno.

automatic lane control

PHOTO ABOVE—The freeway approach lanes and the east portal of the Caldecott Tunnel are visible in the foreground of this aerial photo. Beyond the Berkeley Hills is the City of Oakland.

PHOTO LEFT—The tunnel control room with television monitor in the background.

BY V. H. WAIGHT

Most people accept the fact that something flowing through a tunnel in one direction can be made to flow in the opposite direction, and let it go at that.

However, when the something happens to be a stream of cars, there's a trick to reversing the flow without confusion or accidents.

At Oakland's Caldecott Tunnel, where the direction of traffic through the central bore must be reversed twice daily, the problem has been solved by an automatic lane-control system of changeable message signs and markers and barriers that can pop up and down out of the pavement at the touch of a button. Further checks and aids are furnished by closed-circuit television and an antenna system that allows motorists to receive radio broadcasts inside the tunnel.

The Caldecott Tunnel on Route 24 is the main traffic artery between San Francisco and Oakland and the fast-growing cities and communities east of the Berkeley Hills in Contra Costa County. More than 54,000 vehicles use the route daily.

The original tunnel was built by Joint Highway District No. 13 in 1937. Known as the Broadway Low-

INSTANT MESSAGE CHANGES. Highways employee stands under one of the changeable message signs on approach to tunnel (photo right). At his signal a second employee at the control box activates prisms which flip (middle photo) to new message telling motorists that both tunnels are open (bottom photo).

Level Tunnel, it had two parallel two-lane bores, each 3,400 feet long, and was considered an engineering wonder of its time.

It was taken into the state highway system in 1948.

As traffic increased and the original tunnel became inadequate, construction of a new four lanes of tunnel seemed to be the answer. However, further consideration offered a less expensive solution.

The traffic was strongly directional —heavy westbound in the morning (people going from their homes east of the hills to jobs in Oakland and San Francisco), heavy eastbound in the evening (the same people returning home).

Why, the engineers reasoned, could not the problem be solved at half the cost by building another two-lane tunnel and making it reversible in favor of the heavier traffic direction?

Investigation proved that the plan was sound. Construction of the new tunnel and approaches and the automatic lane control system was completed last year.

How Lane Control Works

What is the new lane-control system and how does it work?

A motorist approaching the tunnel encounters three different kinds of things that warn or guide him: First, changeable message signs; then a series of flexible barriers or popups; finally, a rigid positive barrier to make sure that he does not cross over into opposing traffic.

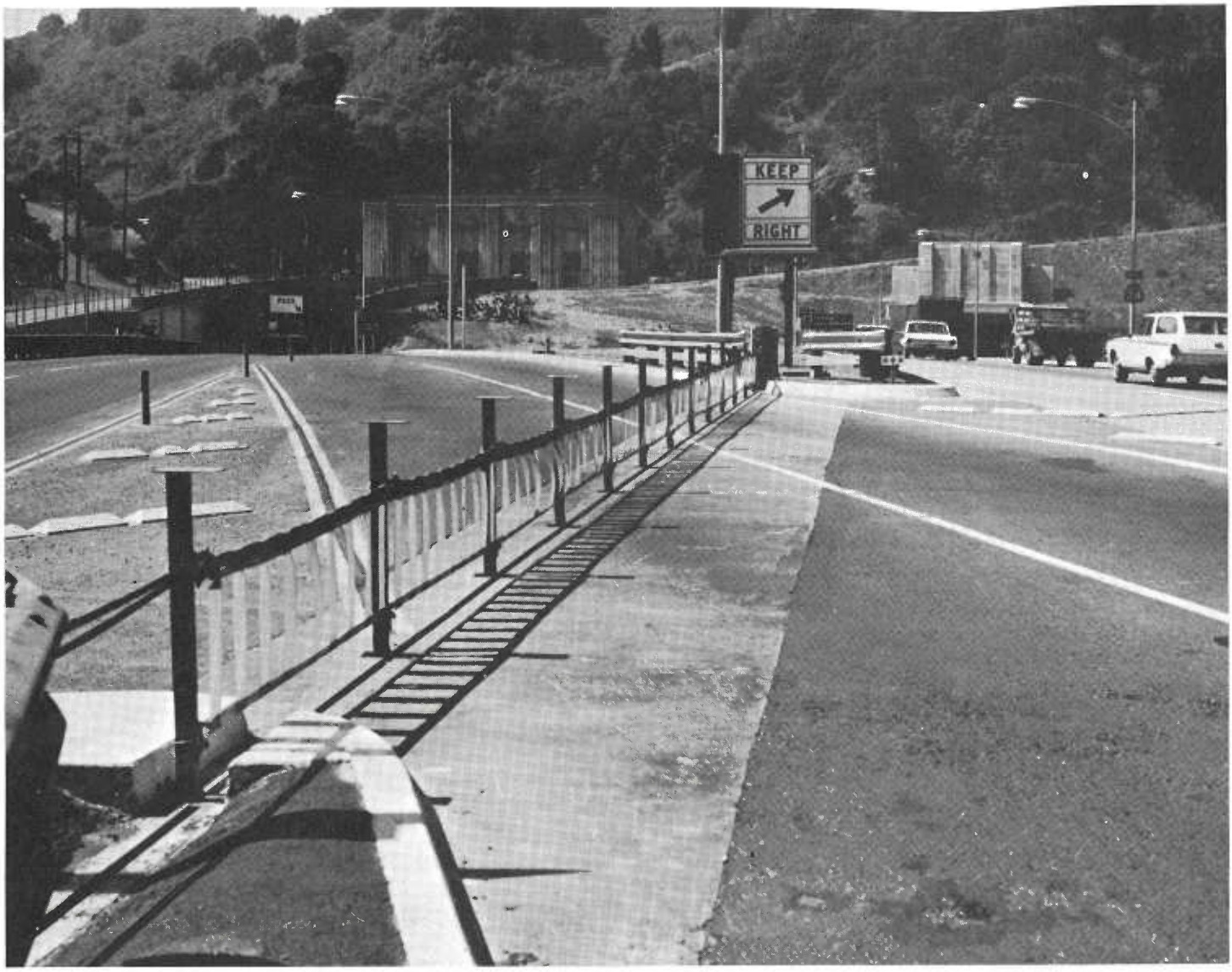
There are four changeable message signs at each end of the Caldecott Tunnel. The signs have two or three message lines. Each line is a horizontally mounted prism which can be rotated by an electric motor, using a control circuit similar to that used for a home television antenna rotor, and expose the desired message or warning.

The flexible barriers are a series of posts at each end of the tunnel in front of the positive barriers. These posts are hollow cylinders or tubes which rise out of the pavement; thus the name popups. Raised, they are about 28 inches above the pavement; lowered, the top of the tube is flush with the pavement surface.

The tube is made of flexible yellow plastic with a band of reflective material at the top so that it can be seen day or night. Its rigidity depends upon its cylindrical shape alone. Thus it can be hit by an auto with no damage to the vehicle and little or no damage to itself.

Each popup is operated by a double-acting air cylinder which raises and lowers it. Lowering by air is an added insurance because the force of gravity is sometimes not enough to lower the popup into its socket if it becomes sticky with dirt or mud. A sump under the line of popups serves to collect dirt and can be flushed out.

The positive barriers, in contrast to the flexible barriers or popups, are designed to stop and prevent vehicles from crossing over into opposing traffic. Each is a cable barrier 120 feet long that rises out of the pavement. To provide enough strength to stop heavy vehicles each barrier has two anchor posts and 14 heavy steel uprights. Strips of fluorescent red plastic cloth



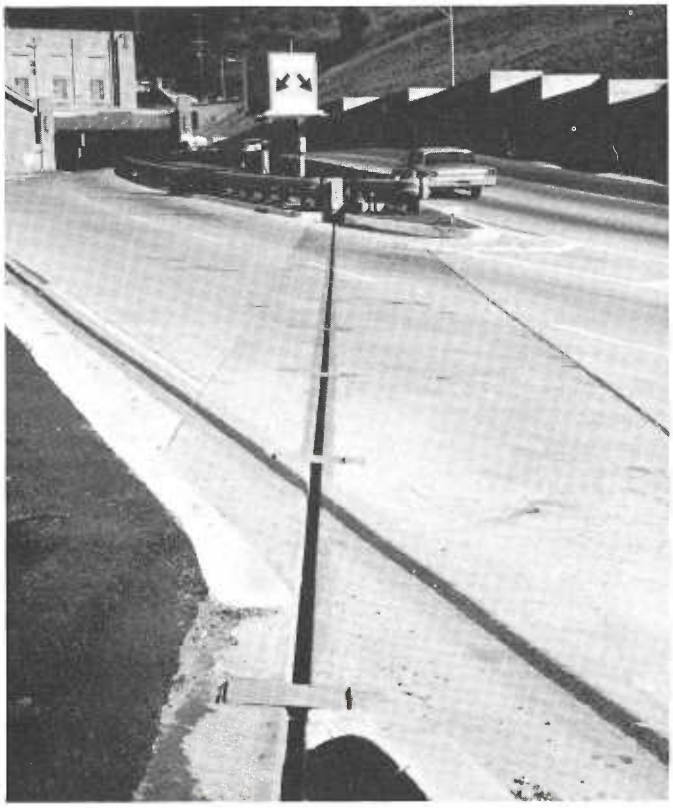


PHOTO ABOVE—A positive barrier, shown here in raised position, is designed to stop vehicles from crossing over into opposing traffic lanes. PHOTO RIGHT—Positive barrier in lowered position.

A popup in raised position. Made of flexible plastic, it can be hit by an auto with no damage to the vehicle and little or no damage to itself.

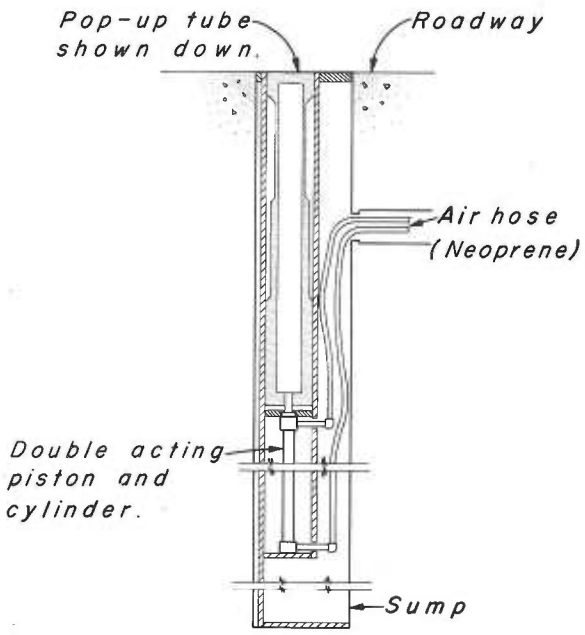


Diagram of popup in lowered position. The popup is operated by double-acting air cylinder. Lowering by air is an added insurance because gravity is sometimes not enough to lower popup if it becomes sticky with dirt or mud.

fastened on the barrier increase visibility.

At present a section-by-section changeover performed by two employees is used in making any reversal of traffic flow.

This procedure, though somewhat unsophisticated in this age of automatic switches and controls, is still considered necessary to make sure that the roadway is clear before the popups are raised (imagine a motorist's reaction if a series of posts suddenly rose out of the road ahead of him!), and that the center tunnel is clear of traffic in one direction before vehicles headed in the opposite direction are allowed in.

Step-by-Step Example

As an example, let's assume that westbound traffic is now using the tunnel and we want to change the traffic flow to eastbound.

The two-man crew moving with traffic drives down the center lane and stops beside the first control box located in the median about one-half mile east of the tunnel entrance.

Here one man observes traffic until a suitable break or interval occurs. For example, experience has taught him to be on the lookout for groups of vehicles held up by a slow truck in the lane next to the one in which the popups are to be raised. This is a time when it is unwise to raise the popups because an auto is likely to suddenly decide to pass the truck and pull out into the string of popups.

At the first man's signal that the traffic pattern is O.K. the second man pushes buttons which change messages on the first three signs to direct traffic out of the left traffic lane. When indicator lamps flash that the message changes have taken place, he pushes the button to raise the first 12 popups.

Now they proceed to the next control point and raise the next 12 popups. At the third control point they change the message on the fourth sign from two arrows pointing to both tunnels to one arrow pointing to the right. After raising the popups on the back side of the positive barrier, they push the button to raise the positive barrier itself, closing the middle tunnel to all westbound traffic.

The crew now drives west through the middle bore to make sure that it is clear of all westbound vehicles. Emerging from the tunnel, they stop at the control box nearest the tunnel and lower the positive barrier and the popups behind it. At the next control box they change the directional arrow sign to show that both tunnels are open. Continuing west, they stop at the three remaining control boxes, lower all of the popups and change the messages on the three approach signs to read BOTH TUNNELS OPEN. Eastbound traffic can then use the middle tunnel.

Fast change by remote control is essence of the new system

MESSAGE CHANGE. In the photo sequence above a press of a button flips message prisms in a sign changing double arrows to single arrow and "keep right."

Any Bugs in New System?

How is the new lane-control system working? Pretty well, so far. Some bugs did occur in the beginning, however, that had to be corrected.

For example, although the popups worked well, rising and falling quickly when they should, there were times under certain lighting conditions when their bright yellow seemed to blend with the color of the pavement and they were not easy to see. Adding fluorescent red bands on the popups solved the problem.

Also, although collision tests between vehicles and the popups were made before they were installed, in day-in and day-out operation some of them were torn off when struck by a car. This was solved by strengthening the connection between the tube and the raising piston.

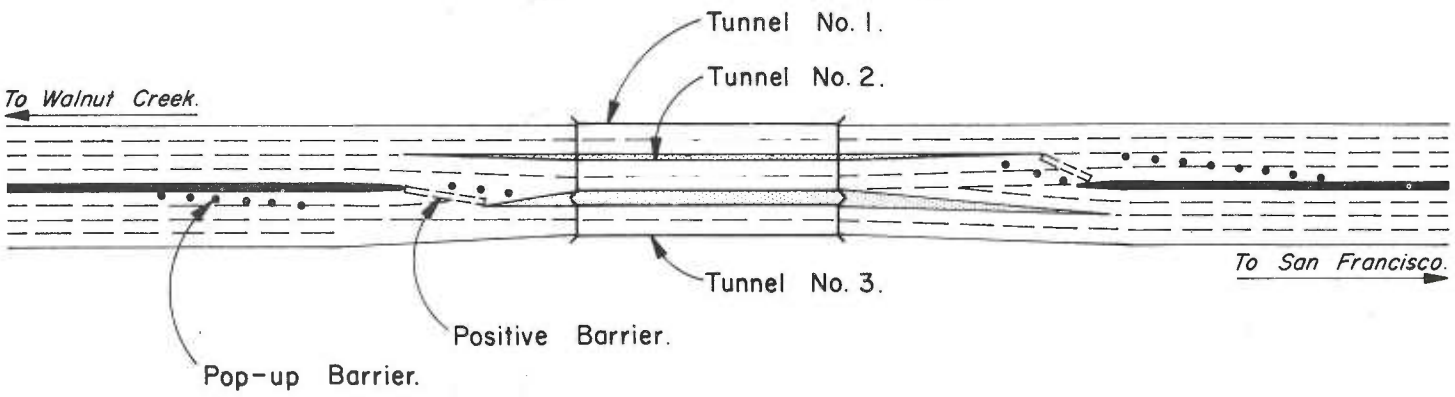
Change of the reflective material on the popups from a material that proved to be somewhat brittle to a softer material has also reduced wear and tear.

The positive barriers have also functioned well. To date collisions against them have been few and none serious. In all cases the cable has deflected the vehicles and kept them from swerving over into opposing traffic and almost certain injury or death.

Radio Programs Inform Motorists

As in many other metropolitan areas, several radio stations in the San Francisco Bay area broadcast information to automobile drivers during morning and evening commute hours.

Along with popular music, news, and chatter, announcers and disk jockeys give reports on road conditions covering accidents, flooded areas, fog, debris on pavement, and fires which they get from the State Division of Highways, California Highway Patrol, local police and sheriff's departments. Some of the most pertinent and up-to-date information comes from



A simplified diagram of the Caldecott Tunnel lane control system showing the location of the popups and positive barriers at each end.

motorists considerate enough to stop and telephone in to report on something they have just encountered on the road.

More recently, radio stations have begun using reports from airplanes and helicopters whose pilots can observe traffic conditions on a broad scope not possible on the ground.

Foreknowledge of trouble allows a motorist to choose another route and bypass the congested or blocked area, benefiting not only himself but also local law enforcement personnel who have less congestion to deal with.

Some mornings disk jockey Don Sherwood even suggests to any of his listeners whose way to work lies through some area of massive traffic tie-up that they wait at home for a while and have an extra cup of coffee rather than getting caught in the backup and spending an hour or two in their cars.

Thus far no evening disk jockey has jeopardized his popularity by suggesting that his listeners remain longer at work rather than getting involved in a traffic jam on their way home.

Closed-circuit TV Surveys Traffic

A closed-circuit television system at each entrance of the tunnel makes it possible to keep the approach roadways under surveillance from the control room at any time.

Operated by remote control, the cameras can be made to pan, tilt, or zoom in on any special portion of the traffic scene below to get a closer look.

The cameras can also be focused and the light exposure changed from the control room.

Each camera is connected with the control room by two cables, one for electronic circuitry, the other for pan and tilt control.

The scene picked up by the cameras is picked up on black-and-white screens in the control room.

The west approach camera assembly is located on top of the control building. The east approach camera was first installed on the roof of the east portal building. However, in spite of its relatively inaccessible location, someone managed to get up on top of the building and steal the entire camera assembly in December 1965. The replacement camera is located inside the portal building and looks out on to the approach roadways through an opening in the concrete face of the building.

Radio Reception Problem Solved

As early as 1947 the Department of Public Works was instructed by the State Legislature to install wires or other devices to improve reception of broadcasts by radios in cars passing through tunnels or underpasses.

Such installations, usually wires strung on insulators, proved of some use through shorter tunnels such as the Waldo Tunnel in Marin County or the Park-Presidio Tunnel in San Francisco. But in longer tunnels such as Caldecott, reception from most stations dropped off to nothing a short distance inside.

At first the problem seemed insurmountable and "beyond the state of the art." However, like many other "impossible" problems, it was solved.

A manufacturer was found whose radio experts came up with a system that involved amplifying the radio signal in the tunnel so that it could be picked up by car radios. The broadcast boosting system had three components: a receiving antenna; an amplifier; and a pair of transmission lines running the length of the tunnel.

The antenna is an upright whip of stainless steel standing nine feet high. It is placed outside the tunnel at a spot where it can pick up local AM stations and still be far enough away so that it will not pick up feedback from the transmission lines inside the tunnel.

The antenna is connected with a coaxial cable which is connected to the amplifier that boosts radio signals on the AM broadcast band. The amplifier in turn is connected to the transmission lines.

The radio-frequency energy from the amplifier creates a large enough cylindrical field to surround each transmission wire that the whip antennas of cars passing through the tunnel can pick it up, so that the motorist gets good reception on his radio along the entire length of the tunnel.

One distant radio station reports that its listeners receive it better inside the tunnel than outside.

To insure a constant field of strength along the entire length of the wire, a resistor is installed at the far end of the tunnel (from the amplifier), connecting the wire to the ground and completing the circuit system.

PHOTO TOP—Television camera set into the east portal face of the tunnel. Camera can be made to pan, tilt or zoom in on special area for closer look, all by remote control. LOWER PHOTO—A typical view of traffic as seen on one of the television monitors in the control room.

Crew working in field, left to right, includes Peter Asano, cameraman, Richard Jones, director, and Frank Bunyard, Assistant Safety Engineer. Maintenance men are from San Mateo station.

safety movie

Approximately 2,000 maintenance men assigned to the California Division of Highways are going to see a very special movie—a movie that quite possibly will save several of them from being killed.

The film is the result of the safety section's long-time study of methods for controlling traffic around maintenance work being done on highways. Produced by the audio-visual section, it illustrates the newly adopted lane closing techniques and flagging procedures employed by our maintenance forces.

Although the same basic patterns are now employed throughout the state, variations have existed, and the procedure outlined in the movie is designed to help standardize statewide practices wherever physical conditions will permit.

An extra bonus in safety for motorists may accrue. Once the procedure is in effect, drivers who come upon a lane closed by a Division of Highways maintenance crew will be confronted generally with a predetermined set of physical factors and driving conditions. After having driven by two or three of them, drivers should begin to know exactly what to expect and how to react to the situation.

It is envisioned that similar methods of controlling traffic around contract construction work can be effected when the type of work dictates such treatment.

Basically, the new procedure will depend not only on a standard format, but upon brilliantly colored warning devices to attract the attention of drivers and upon the use of trucks to protect workmen from passing traffic.

When approaching a repair area, the first thing a driver will see will be three red flags flying at least six feet above the ground. Mounted on the same flagpole will be a large, yellow diamond-shaped sign. In the case of a multilane thoroughfare the sign will read LANE CLOSED AHEAD. When a two-lane highway is involved, the sign will read FLAGMAN AHEAD.

In locations where traffic is heavy, a series of these flag-and-sign combinations will be placed along the approach to the work area. This transitional area will vary from 600 to 3,000 feet. On a job where only a few vehicles will pass, a single set of flags and its accompanying sign will be located from 600 to 1,000 feet in the foreground.

Once past the flags, drivers will be guided into the proper lane by a series of cones. The cones are painted bright orange or yellow and will form an eye-catching, symmetrical pattern designed to channel traffic through the sensitive zone in the safest manner.

In all repair work where a lane closure is involved, the maintenance men will be protected from oncoming traffic by an orange-colored truck that screens them from other vehicles. Mounted high on the traffic side of such trucks are flashing amber lights and a sign that reads (in black letters on a white background) PASS. Arrows indicating the direction in which it is safe to pass are included on these signs.

A seeming paradox exists in the use of flagmen to control traffic. Where at first glance it might appear they are needed most on busy urban freeways, such is not the case. The fact that several lanes are available to traffic is an outstanding safety factor in itself. The need is imperative, however, when work is being done on a two-lane conventional highway where opposing traffic is to be forced into a single lane. In such situations, a flagman is stationed at least 100 feet in advance of either end of the job. It is the duty of these two men to work as a team in not only slowing down traffic, but also in directing it in orderly fashion past the work area.

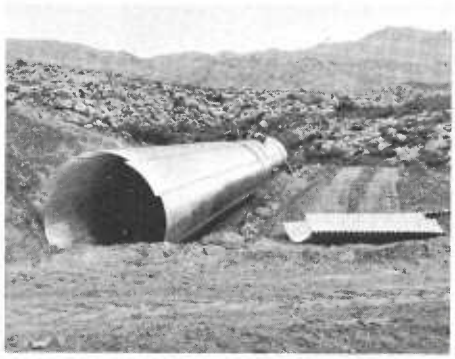
The flagmen, like all members of the work crew, will wear vivid red safety vests and white hard-hats.

Frank Bunyard, center, explains mockup used for movie sequences to Ed Tinney, right, State Maintenance Engineer, and Assistant Maintenance Engineer Harvey Towne, left.

WALKER CANYON

BY EARL ROGERS

About midway of job, wagon drills, lower center, are preparing powder holes for blasting to cut through rocks. San Diego and Arizona Eastern Railway crosses highway at top of photo.



Structural plate pipe, 144" diameter, used for culverts on job, is engineered to handle flash floods from summer thunderstorms.

Before de Anza led his soldiers across the lower Colorado; even before Coronado roamed the Southwest in his search for the Seven Cities of Cíbola, Indians lived in Walker Canyon or passed through it on their journey to the mountains and seacoast. They ate the agave cactus and piñon nuts. They drank from the seeps and springs.

Today you can pick up bits of their pottery. In secluded caverns you may discover their faded pictures painted on the rock walls.

We're building a freeway down Walker Canyon now. It's a strange, harsh, remote region where mountain and desert come together in a kind of mortal combat. A faulted, folded jumble of weathered rocks, of hardy oaks, of juniper, mesquite, and barrel cactus.

In this rocky domain, you now see rubber hose strewn about like spaghetti. Carbide bits of a dozen wagon drills clatter against the hard granite, and clouds of fine rock dust envelop the drillers. Laborers on ropes and extension ladders batter holes in the big boulders with hand-held jackhammers. Powder crews lower detonators into the holes on long thin wires. They pour in the explosive and gently tamp it with a long wooden pole. Tractors claw at the rocky ground with steel ripper teeth.

It's a world of action. It's a strident symphony of clanging metal, of diesel-driven compressors, and bellowing bulldozers.

In contrast, on nearby slopes, wildflowers bloom after spring rains, and the pale lavender manzanita blossoms are alive with wild honeybees. Boulders big as a house have been sculptured by the wind into grotesque shapes. If you're lucky you may see bighorn sheep, though they're timid creatures and don't often show themselves to humans.

The Walker Canyon project begins near Boulevard, in the southeast corner of San Diego County. It runs 10 miles to the Imperial county line, crossing the San Diego & Arizona Eastern Railroad at the upper end of Carrizo Gorge.

Low bidder on this $8 million proj-

ect was the Daly Corporation of San Diego. Their bid price for 2,780,000 cubic yards of roadway excavation was $1.40 per cubic yard. This, together with 49,500,000 station yards of overhaul, accounts for half the project cost.

Drainage

With the exception of a bridge crossing at Carrizo Creek, all drainage is handled by corrugated metal pipe culverts. There are 18 different culvert sizes ranging from 24-inch factory-riveted CMP to 144-inch structural plate pipe. The structural plate pipes alone weigh almost 400 tons and required three railroad cars for delivery from the manufacturer's plant in Ohio.

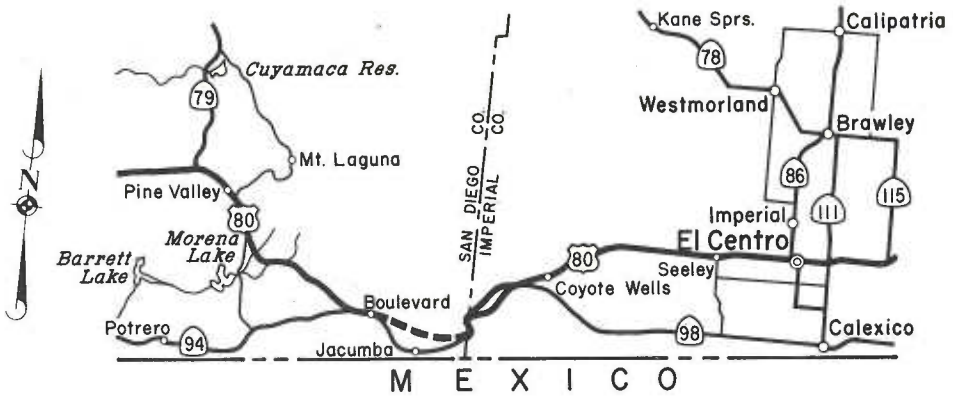
The largest culvert is 276 feet long, of 12-foot-diameter structural plate pipe. It is assembled in two days' time by bolting together about 280 corrugated metal plates weighing 350 pounds apiece. A four-man crew then clambers over the top and sides with air-driven wrenches tightening more than nine thousand ¾-inch bolts. In two more days they're all snugged up and the pipe is ready for backfilling.

This 12-foot-diameter pipe serves both as a drainage way and a vehicular access to a small portion of the Anza-Borrego Desert State Park, which is landlocked by the freeway.

Because park regulations call for preservation of all natural features, the contractor has erected signs on his haul road that read "Entering Park Area." The State Division of Beaches and Parks forbids disturbance of the natural ground outside slope lines; even tire tracks.

The largest drainage way is Carrizo Creek, which drains a 100-square-mile basin in Mexico. Since topographic maps of Mexico were not available, the runoff and peak flow estimates were based on historical records of the San Diego & Arizona Eastern Railroad. This railroad crosses Carrizo Creek on a trestle built in 1916 several hundred feet upstream from the present freeway right-of-way. It passed a record flood in December 1926 without washout.

In designing the Carrizo Creek bridge we used the criteria the waterway should pass a peak flood of 10,000 cubic feet per second, with the area of the opening not exceeding that of the railroad trestle.



Right-of-way

Walker Canyon and the region surrounding it seem isolated from the rest of the world. Families who have lived there for generations still raise cattle in spite of many years of drought.

"Some of those big oaks may be 400 years old," said Lloyd Lovell, whose father homesteaded here. "But they're dying for lack of water."

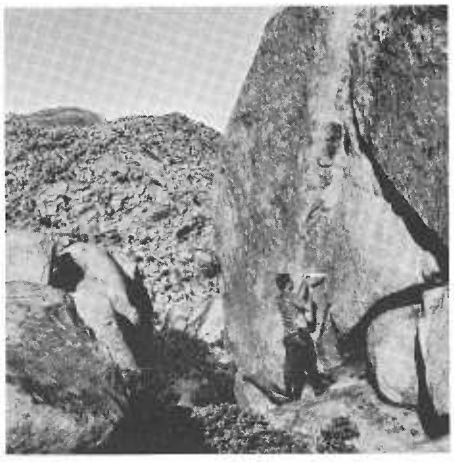
The Division of Highways has acquired land for a public stock trail so ranchers will have access to grazing lands and water in the canyon.

An undercrossing near the east end of the job will provide the Bureau of Land Management with access to its wildlife refuge area in the Jacumba Mountains.

Interchanges

A diamond interchange serves the resort town of Jacumba. In the 1920's and 30's, Jacumba was a vacation spot popular for its mineral waters and hot springs.

Truckers approaching the 10-mile, 6-percent downgrade to Imperial Valley will have an off- and on-ramp to a parking area for testing their brakes and equipment.



Survey Party Chief Walter Butcher, a District 11 employee, setting slope stakes in rock.

At the San Diego-Imperial county line, an interchange will give motorists the use of In-Ko-Pah Park. It's a quiet, peaceful little park owned by the County of San Diego. There are shade trees and benches under a grape stake pergola where you can sit and watch the mountain birds ride the wind currents. Far down in the desert the harsh glare of the sun reflects off the sand dunes in the Superstition Hills. On a clear day you may catch a gleam of blue off the southern end of the Salton Sea.

During the middle of the last century Walker Canyon, because of its remoteness, was an excellent hideout for fugitives from justice. There are people who suppose that it was named after William Walker, who organized an expedition to capture the Mexican State of Sonora. He surrendered to U.S. officials in 1853 to avoid capture by the Mexicans. Whether he ever used the canyon as a hideout is not known. He was executed by a firing squad while trying to establish a republic in Baja California.

In all likelihood Walker Canyon was named for George P. Walker, a more responsible if less colorful character who owned property there in 1869 and was trustee of Milquatay School District in 1871.

We hope that future travelers on Interstate 8 will treat Walker Canyon with the dignity it deserves. We hope that they may feel a hint of its wild, solitary beauty.

We ask you boys and girls of future generations to fight off this madness that compels you to immortalize yourselves in red paint on the side of a rock. And please don't throw papers in the park.

To the eager and inquisitive young mind, a fossilized monster from past geologic ages is a fascinating object which brings to life the sometimes dry subjects taught in school.

Last spring, the children in Mrs. Leona Wulff's fourth grade class at Gregg Rodgers School, Chula Vista, were studying rocks. Tommy Holz and Kevin Bailey brought in some strange-looking samples they had broken off a larger piece found jutting out of the side of a cut slope where grading was being completed for construction of Interstate 805. Later, classmate Loren Larson helped get some more specimens of the strange rocks, and Cindy Weichert took some pieces home to show her dad, who is an amateur geologist.

He pronounced them fossils.

A scientist or two dropped by later, and identified the outcropping as the head of an extinct whale, dead perhaps 30 million years. About this time someone apparently took the ear bones, the most interesting single pieces in the skeleton.

By the time someone called Dr. Reid MacDonald, topnotch paleontologist from the Los Angeles County Museum, quite a few people had visited the find, and most had to have a sample.

Somewhat ruefully, Dr. MacDonald definitely identified the skeleton, but said it was already so battered its value was destroyed. He pointed out to the school children who had discovered the fossils in the first place, that scientists recovering the skeleton would have left several inches of earth all around, when readying the bones for removal and later cleaning and reconstruction.

Dr. MacDonald suggested the children make a class project of recovering as much of the skeleton as they could, but unfortunately, the local newspaper did a feature story on what it called a "prehistoric Moby Dick." Souvenir hunters descended on the battered old whale, and completed the destruction.

No one was at fault, of course—it was just a case of lack of knowledge. In later correspondence, Dr. MacDonald sent the article which follows. He said that although no highway people were in any way involved in the tragic series of events, he would appreciate it if we could use any part of it.

"It would be a great help to my profession if this type article were more widely read among highway and construction people," he said.

Not because Dr. and Mrs. MacDonald have been readers of *California Highways and Public Works* magazine for many years, but because it is a good and informative article, we are reprinting it herewith in toto.

A Plea for Fossil Vertebrates*

BY DR. REID MacDONALD

A few days ago I read an article which roused me to a mood of letter-to-the-editor writing. The September issue of *Mineral Information Service* contained a well-written and documented article entitled, "A Trip to a Vertebrate Fossil Locality." To a curator of vertebrate paleontology, this was comparable to a jeweler being told that the Mafia had been given the combinations to his safes.

Before you toss aside this issue in righteous indignation and write your letter to the editor canceling your subscription, let me explain why the vertebrate paleontologist is horrified at the thought of this kind of information being made public. A few examples from my own experience will illustrate the point.

Several years ago, I visited a very famous vertebrate fossil locality in Idaho with a prospective "angel." We were thinking of reopening this quarry to collect enough material for a museum exhibit and for our reference collection. At the quarry site we found the complete skeleton of a fossil horse about the size of a modern cow pony strewn around the dump. The bones had been hacked out in hunks not more than 8 to 10 inches long. The only parts of the skeleton missing were the teeth. The otherwise perfect and complete skull had been broken up to remove the teeth.

I suppose that the average reaction is "So what?" but to me this is the worst kind of vandalism. This skeleton, if properly and painstakingly collected, would have been a perfect piece for exhibition in a public museum or a prized study specimen to be used as a standard of comparison for material brought to our museum from local sources. To those of us who devote

* Reprinted from *Mineral Information Service.*

Below: Mrs. Wulff and four children from her fourth grade class listen as reporter from Chula Vista paper interviews Dr. Reid MacDonald on children's find.

Mrs. Leona Wulff and children excavate around find. Directly behind Mrs. Wulff is Cindy Weichert, whose father's rockhunting experience helped in identifying material.

our lives to the excavation and study of fossil vertebrates, there is no excuse for such destruction.

This summer I spent three months working in and around the famous White River Badlands on a fossil collection expedition. During this time, I visited three localities which I have visited periodically for the past 15 years. Each of these had been systematically stripped within two or three days prior to my arrival, and at one of these localities the digging was done without the permission of the landowner, although the diggers had to go through his farmyard to get into the quarry area. When two stratigraphers from the South Dakota Geological Survey approached this party while they were digging, they gathered up their gear and ran, leaving a series of gates open behind them.

One day in some fairly inaccessible badlands south of the White River, we encountered a 4WD truck-camper from Oregon. This party had come in to "collect some skulls." They did not have permits from the Oglala Sioux Tribal Council, the Superintendent of the Pine Ridge Reservation, or the Bureau of Indian Affairs. Permission is required from each of these offices in order to explore or collect on tribal land in a reservation, and if the collecting is to be done on private land the written consent of the landowner must also be obtained.

From the above, one would almost get the feeling that I am against rockhounds, pebblepups, and the rest of that large group of hobbyists. This is not true; rather than fight them I'd much rather see them join us. It is from these outdoor enthusiasts that we get much of our scientifically valuable material and leads on sites which help us expand our knowledge of life in the past.

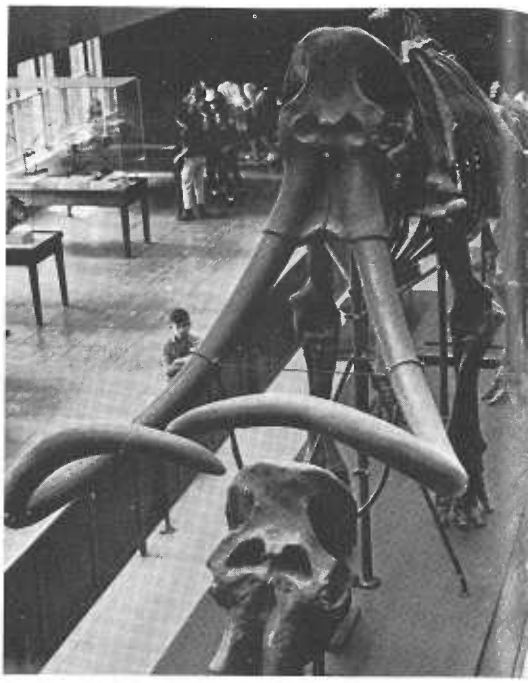
Fossil vertebrates are relatively rare. They do not ordinarily occur in large masses as do fossil plants or invertebrates. To collect most fossil vertebrates properly, a great deal of time, training and skill is required. Once collected, it is not a scientific specimen but just a curiosity unless the specimen is accompanied by complete geographical and geological data. It is because of frequent damage caused by the unthinking, the merely curious, or the avaricious that many of us do not publish locality descriptions in our scientific papers. This is a hindrance to other professional paleontologists, but it is the only way that we can protect our sources of scientific material from destruction and loss.

This introduction leads me to my plea for fossil vertebrates. Why can't the hobbyist join us in our search for knowledge and in the reconstructing of the history of the earth's buried past? Amateur collectors have been responsible for many of the important scientific finds here in California. A high school boy from Gustine led the University of California to several important finds of marine reptiles from the Cretaceous; a high school fossil club at Hayward, "The Boy Paleontologists," was responsible for the discovery of several important fossil sites in the San Francisco Bay area; a plumber from San Jacinto discovered the very important Vallecito Pleistocene fossil-bearing sequence in the Anza-Borrego Desert area and took members of this museum's staff to the site. Since he reported this discovery, a major effort has been made to collect from the area.

The results of this work will fill in a significant chapter of the history of southern California. The finder is now an honorary member of the museum staff as a research associate, he has had a fossil species named for him, and he has been invited to accompany me on two fossil-hunting expeditions which took him to the Lake Chapala area in Mexico for two months and to the famous fossil country of the Great Plains for three months. This amateur believes that specimens of scientific importance should be in museums and not in a box under the bed, in the woodshed, in the basement, or possibly cemented into the fireplace or fishpond. He feels that he has been completely compensated for his contributions by the enjoyment he has found in his close association with the museum and its staff.

Why not make sure that your finds are made useful to science? If you find a vertebrate fossil which is easily collected, bring it to a museum or university for identification. If this is impossible, send a photograph of the specimen and a description of the locality where you found it. The paleontologist you contact will be happy to identify your specimen, and, if it is of scientific value, will probably invite you to present it to the museum.

If the specimen is not collectible without special tools or knowledge, please don't try to remove it yourself. Take a picture of the specimen, cover it with paper and dirt so that it will be

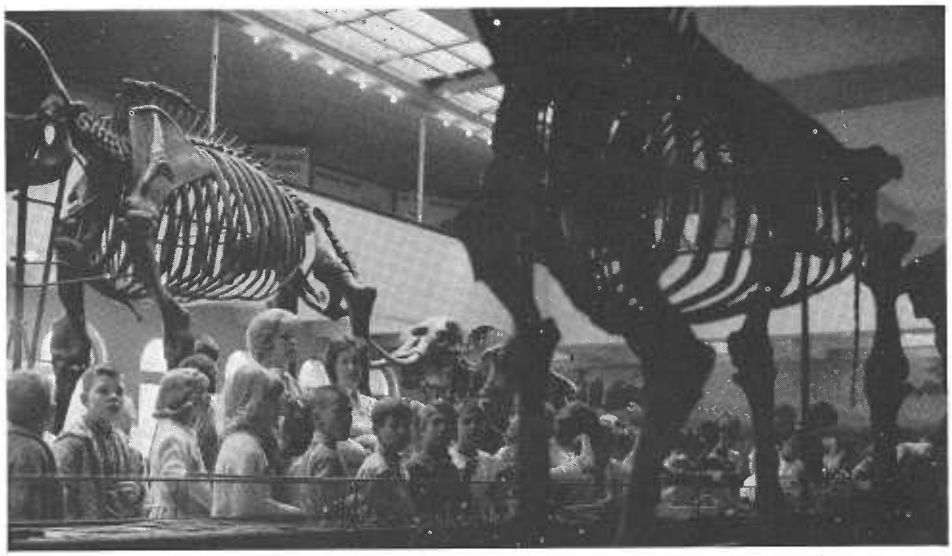


Imperial mastodon skeleton, La Brea Hall, Los Angeles County Museum of Natural History.

Dr. J. Reid MacDonald, senior curator of vertebrate paleontology, Los Angeles County Museum of Natural History.

Posing for newspaper photos are Mrs. Wulff, Kevin Bailey, Tommy Holz, Loren Larson, student teacher Lemuel Lemmons, and Cindy Weichert. Photographer-reporter is Karl Hall of the Chula Vista Star-News.

Teacher and class here inspect skeleton of Antrodemus valens *in Los Angeles County Museum of Natural History.*



Pleasure and fascination are apparent on faces of children enjoying exhibits in La Brea Hall, Los Angeles County Museum of Natural History.

Special attraction at Los Angeles County Museum is this huge piece of dinosaur bone kept available for children to feel much as they might a piece of sculpture. Contact brings them physical experience to augment evidence of their eyes.

protected from the weather and hidden from less astute collectors, and send the picture to a paleontologist or take it in person. Don't be disappointed if the museum or university doesn't send someone to you immediately. Vertebrate paleontology staffs are always small and swamped with work, but all of us will give promising amateur finds the highest possible priority.

It may be that your discovery will be the beginning of a new breakthrough in scientific knowledge. You might have a new animal named for you, have the opportunity to join a museum on its expeditions, or be allowed to work in its laboratory. Here in the Los Angeles Couty Museum we have many volunteer workers who value the privilege of being allowed behind the scenes. Most of these fine people came to us originally through their interest in having the specimens that they found made part of the museum's collection.

Often, the museum will be able to make a plaster or plastic cast of your specimen which will be virtually indistinguishable from the original. This will be your memento of your contribution to science.

If you find a specimen which you would like to have identified or which you believe is of scientific importance (and most fossil vertebrates are of scientific importance), you should contact any of the following institutions. There is at least one vertebrate paleontologist at each of these places.

Dr. J. R. MacDonald
Los Angeles County Museum
Exposition Park, Los Angeles

Mr. Phil C. Orr
Santa Barbara Natural History
Museum, Santa Barbara

Dr. D. E. Savage
Museum of Paleontology
University of California, Berkeley

Dr. Richard H. Tedford
Department of Geology
University of California
Riverside

Dr. Peter P. Vaughn
Department of Zoology
University of California
Los Angeles

Dr. John A. White
Department of Zoology
Long Beach State College
Long Beach

How about joining us? We'd be delighted to have you with us.

NATIONAL HIGHWAY WEEK

Senator James A. Cobey of Merced, and District 10 Engineer John Meyer ride Mexican carreta pulled by members of Highway 33 Association, in celebration of opening of 25 miles of Interstate 5 in Merced County. Color guard was furnished by Manuel M. Lopes American Legion Post No. 240 from Gustine.

Posed for photo at dedication of A.S.C.E. award plaque at Donner Summit, on Interstate 80, George Langsner, Deputy State Highway Engineer, Paul Larios, assistant manager, Harrah's auto collection, and Clyde Gessel, director of District 11, A.S.C.E., in front of 1927 Stutz Blackhawk from Harrah's collection. In background ex-Directors of Public Works Fred Bagshaw and Frank Durkee look on.

District 11 Engineer Jacob Dekema rides shotgun on Wells Fargo stagecoach in San Diego county celebration of opening of 25 miles of Interstate 5. Girl is Frances Rooks and man beside her is Tom Hernandez, respectively "Miss Fairest of the Fair" and "Don Diego" of county fair.

National Highway Week will be observed this year from September 18 through September 24. In California, a group of prominent citizens have formed a committee under the chairmanship of Harrison R. Baker of Pasadena to advise and direct activities throughout the state. In addition, various organizations have banded together and will serve as statewide sponsors.

Baker cited the average Californian's affinity to his automobile as a prime reason why National Highway Week should be of statewide interest.

He pointed out that at this time the number of automobiles, trucks and buses operating within the United States has reached an all-time high—slightly more than 100,000,000. Of this number more than one-tenth (10,500,000) are registered in California. The 3,500,000 located in Los Angeles County make that spot the world's vehicle population center for it is more than the number registered in any one of 45 states.

The need for additional city streets, county roads and state highways is obvious according to Baker, who told his committee that this network of California thoroughfares carried 96,000,000,000 vehicle-miles of traffic last year.

"This is a fact that should impress our astronauts," Baker declared, "for a space ship would have to make 500 round trips to the moon *each day of the year* just to equal it."

Recently completed freeway construction that enhances the state highway system was lauded by Baker. He singled four in particular: first, a 25-mile stretch of Interstate 5 in San Diego County that opened to traffic in June; another 25-mile stretch of the Westside Freeway (Interstate 5) in Merced County that was completed recently; a section of Route 88 in Amador County that this year won first place in national scenic highway competitions; and, fourth, Interstate 80 from Sacramento to the Nevada State line, which was honored by the American Society of Civil Engineers. He also commented on the favorable impact the Collier-Unruh Act had had on city streets and county roads.

A number of events already have been planned as a part of this year's National Highway Week observance. Included are ground-breaking ceremonies for highway construction just ready to begin; dedication ceremonies for newly completed projects; exhibits in schools; county fairs and other public places; and landscaping projects by youth groups and women's clubs.

Ralph Hulett's painting of a section of the Four-Level Interchange in the center of the Los Angeles freeway system picks up powerful verticals and arching curves of dramatic structure.

freeways on canvas

BY ELEANOR N. WOOD

Painting in background is of the Santa Ana Freeway and the Los Angeles Civic Center. Mr. Hulett here is working on more conventional desert and mountain landscape.

Los Angeles artist Ralph Hulett has a method for demonstrating graphically the role freeways are playing in the rejuvenation of his city: He paints them on canvas.

Hulett, who has just completed a series called "The Changing Face of Downtown," began painting the landmarks of Los Angeles in the 1930's during his days as a student at Chouinard Art Institute.

Feeling that the value of freeways as an art subject is often overlooked, Hulett has included several views of them to illustrate the dynamism of the metropolitan city.

In describing a painting called "Birth of Tomorrow," he says: "I call it that because the interchange signifies the cultural emergence of the city . . . the contemporary architectural face of it . . . the freeways converge on the cultural heart . . . the music center and all.

"The composition attracted me because of the dynamic forces . . . all these arterial thrusts working against one another . . . two being intersected by a third. It represents an interesting compositional problem."

Hulett, a color stylist with Walt Disney for many years, feels that we might pay more attention to the artistic values of freeways if we were less nostalgic about the familiar scenes progress erases.

In sympathy with those who feel sadly about change, Hulett notes: "I know how they feel because I've been sketching in the area so long. With so many of the landmarks disappearing it's like seeing old friends leaving. But freeways for the most part are beautifully wedded to their new surroundings. With the effort they put into landscaping they look right at home in a year or two.

"We're in the midst of a violent revolution—the new replacing the old. We miss our old friends but have to make new ones. And the freeways will be among them."

Honors accorded Hulett have included 23 awards in national and state art shows, including the *American Artist Magazine* citation.

He is a member of the American Watercolor Society, the California Watercolor Society, and a life member of the Laguna Art Association. He has had one-man shows in New York, Los Angeles, and San Francisco.

Because of the rugged terrain, a helicopter was used to relocate telephone poles around the Crestline Interchange. The chopper also brought in wire and other supplies. Photo by General Telephone Company.

CRESTLINE INTERCHANGE

BY TEK TANAKA

Imagine having to dig a 350- by 400-foot-wide ledge into the side of a mountain!

That was the problem facing the State Division of Highways in designing and building the Crestline Interchange in the San Bernardino Mountains. Some 330,000 cubic yards of rock and dirt had to be removed to make enough room for the two side-hill viaducts and two separation bridges needed to connect Highway 138 with the Rim of the World Highway (Highway 18) north of the City of San Bernardino.

A preliminary geologic study revealed a 25-foot-wide earthquake fault zone near the proposed location of the northeast off-ramp. As a precaution, the slope of the cut into the mountain was made shallower than normal and 20-foot-wide benches were set into it at 60- or 80-foot intervals to catch any debris that might be jarred loose by earth tremors.

The Crestline Interchange, completed in April, is the second in a series of seven contracts that will, within the next five or six years, four-lane all of Highway 18 from San Bernardino north to the interchange, a distance of 10 miles. Estimated cost of the seven jobs is $10,000,000.

Construction of the interchange presented several special problems which were solved by equally special solutions.

For example, the General Telephone Company's line which serves the Crestline-Lake Arrowhead region had to be relocated because the existing line interfered with a proposed highway embankment at Mormon Springs. The line crossed at right angles to the highway and continued up the face of the mountain. Holes were dug by hand for the new poles. A rigging and release device was attached to a heli-

Captain Seeley of Mormon Battalion Built First Road in 1850's

The City of San Bernardino was laid out by a colony of Mormons who settled in the valley in the summer of 1851. Within several years, the bench land near the base of the mountain north of the town had been brought under cultivation. Captain Seeley of the Mormon Battalion built the old mountain road leading up the canyon by Waterman's Hot Springs to the summit. The seven-mile road which made the mountains accessible to the early settlers was said to have cost $7,000.

The road was subsequently taken into the county road system. In 1917, it was acquired as a state highway by legislative action. The original alignment was used until the early 1930's, at which time portions were abandoned for more favorable routings. A portion of this Old Waterman Canyon route is being used as a detour for current construction. Two future contracts contemplate its further use.

The present highway, within the San Bernardino mountain region, is known locally as "Rim of the World Drive" and is the principal entrance to the Crestline and Lake Arrowhead recreational areas.

The original Route 138/18 separation underpass and connection was built by the county in 1931, and was taken into the state highway system in 1933.

The new interchange connects Highways 18 and 138 just south of Crestline in San Bernardino County.

copter. The poles were hung vertically under the chopper. The pilot, directed by a flagman on the ground, released the poles into the prepared holes. The cable was also flown in by the helicopter. The operation proceeded smoothly, except on one occasion when the release device let go prematurely and the pole slid and rolled to the bottom of the canyon.

In another instance, there was not enough room in the cuts for large earthmovers to maneuver. Dozers were used instead to push the material down to loaders which filled rock trucks. Most of the material was hauled one-half mile downhill to Mormon Springs, where it will be used in a future project to improve and widen the highway there.

During construction, the cut slope northwest of the separation structure was found to be unstable. A 333-foot-long retaining wall was built to hold back the loose earth and rock. However, conventional methods of forming and placing the wall appeared to be uneconomical because expensive temporary shoring would be required. In addition to expense, the hazard of slides would continually endanger the lives of the workmen involved in such an operation. There was also a definite need to speed up the wall construction in order to minimize the possibility of loss of the facility to public traffic from slides. It was decided to precast the wall and lift it into place. Fifteen precast sections 14 feet high and from 18 to 21.5 feet long were erected. An opening of one foot was left between sections and a closing pour was made at these locations. High-early-strength concrete was used in the wall sections so that they could be lifted into place two days after they had been poured.

The contractor, in sinking columns to support the interchange bridges, sometimes had to excavate to 100 feet below the surface before he reached bedrock. At most locations, suitable foundation rock was found at a depth of about 50 feet. Individual rocks encountered during the excavation operation had to be air hammered and hand removed. Larger rock masses near the column footings had to be blasted.

The workmen were lifted in and out of the holes in a cage which replaced the clamshell when handwork was to be done. Working room was reduced, and poor visibility became a problem as the crews burrowed their way deeper into the earth. In deeper holes, after blasting, the workmen sent down air compresser hoses to drive out the blast fumes but still had to contend with the compressor fumes which left a "smog alert" condition.

When it was possible, casings were driven into place by specially designed weights dropped by a crane. Recovery of the driven casings after completion of the columns and footings often was difficult. In one instance, more than two days were spent getting one casing out of the hole. The casing had to be cut from top to bottom and required the combined efforts of two cranes to dislodge it.

Traffic was allowed to travel through the project during construction except for one 10-day period when the road was closed during blasting and rock removal.

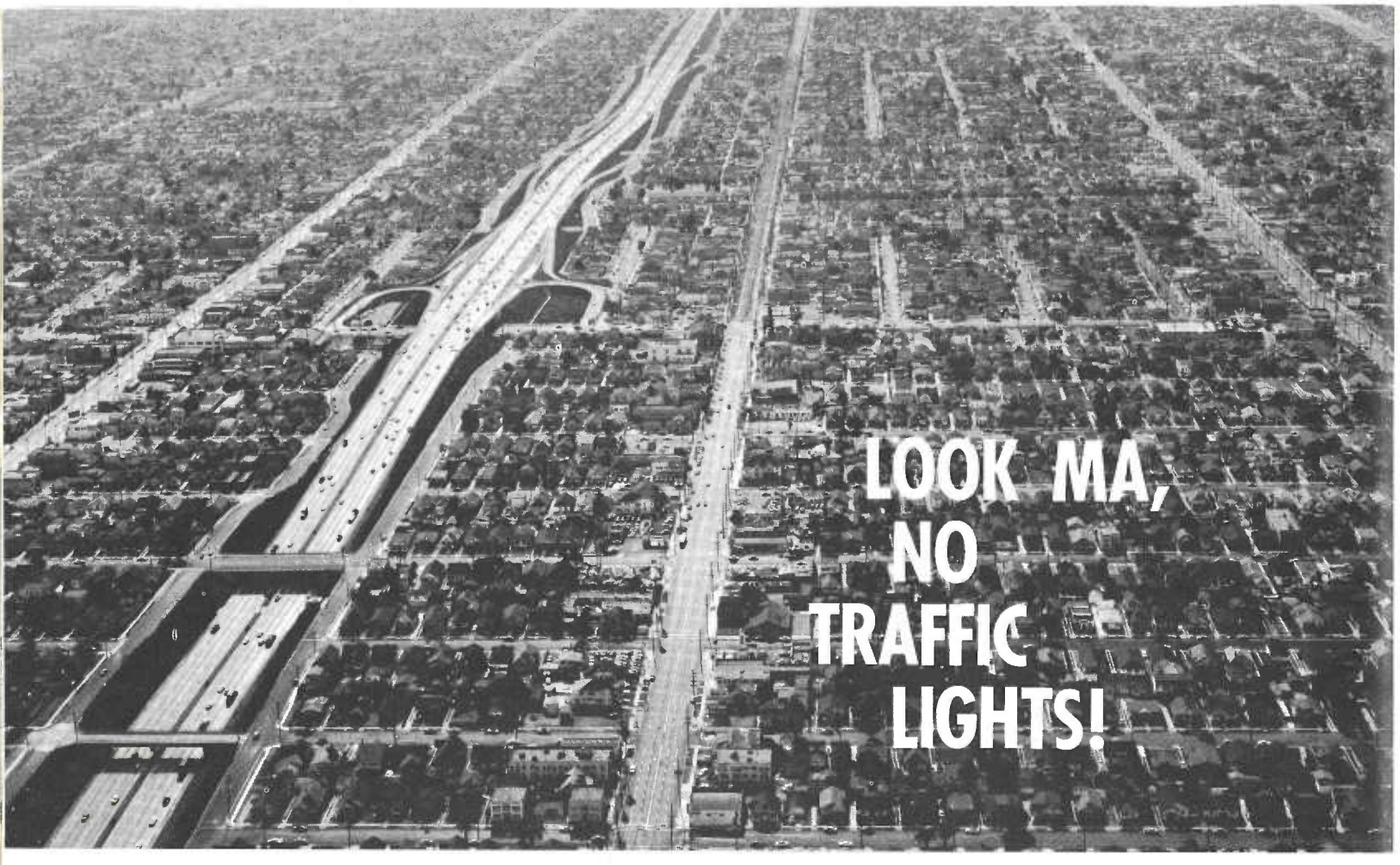
Numerous slides which occurred during the winter storms added to the problems and construction costs.

Considerable erosion control planting was done on the project. Spanish broom seed was planted on all cut slopes, and Spanish broom seedlings were transplanted at six-foot centers along all tops of cuts and fills and edges of benches. Alfalfa and brush poppy seeds were sown on bare slopes. Cedar trees were planted at various locations around the interchange to blend in with the natural terrain of the wilderness.

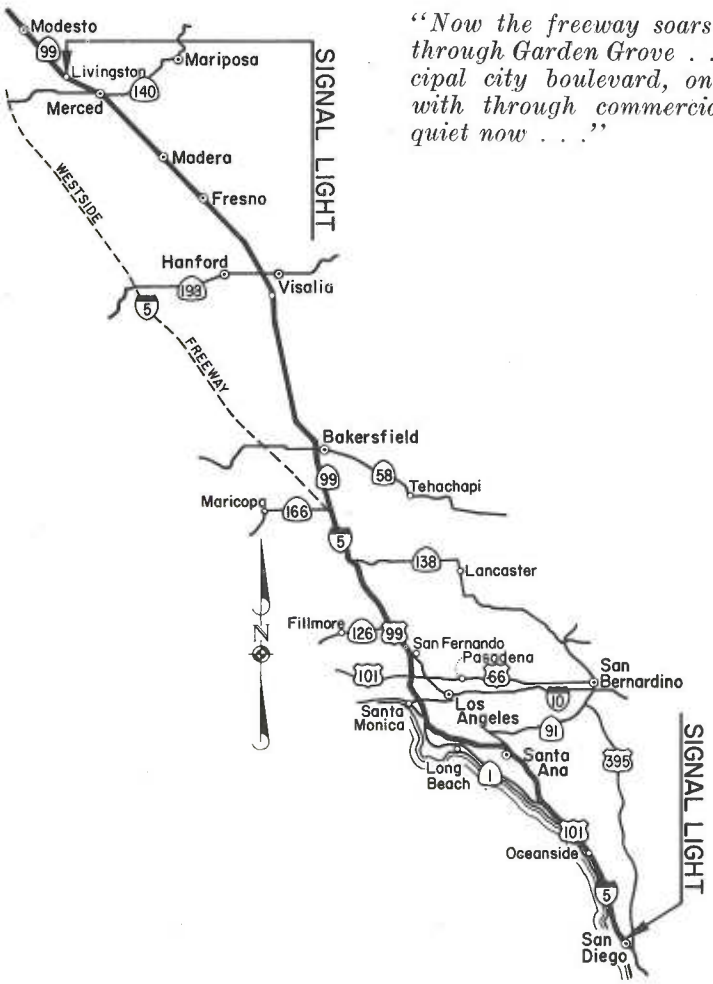
EVOLUTION OF AN INTERCHANGE.
Photo top—old interchange on the side of Mount Anderson before reconstruction.

Photo middle—a model of the proposed interchange before it was built.

Photo left—the completed interchange, a spectacuar engineering achievement in treacherously rugged country.



LOOK MA, NO TRAFFIC LIGHTS!



"Now the freeway soars unhindered through Garden Grove . . . The principal city boulevard, once thronged with through commercial traffic, is quiet now . . ."

BY CHARLES F. GUSTAFSON

At Rosecrans Street and Pacific Highway in San Diego a clutch of morning commuter traffic is backed up behind the traffic light, waiting for it to turn green. But one motorist waiting there is not a commuter. He is headed north to get onto Interstate 5, backbone route of California.

Like the morning breeze, the motorist is cool. He waits with patience. He knows that on his journey north today through one of the land's great metropolitan areas, driving what's been called the world's busiest long-distance roadway, he will see no traffic signal again for more than 400 miles.

He will make his trip at legal speeds of up to 70 miles per hour. It will take him less time, probably, than his usual working day. He will pay no toll charges, though a similar journey on the parkways, throughways, or turnpikes of other states would cost him at least a cent a mile, and frequently much more. And he will enjoy a variety of scenery—urban, rural, industrial, agricultural, mountains, sea, and forest—that many a man spends a lifetime to experience.

The signal flickers green. The mo-

torist edges forward. San Diego, California's oldest city, is soon behind, and he is heading out over the broad highway past Mission Bay and La Jolla.

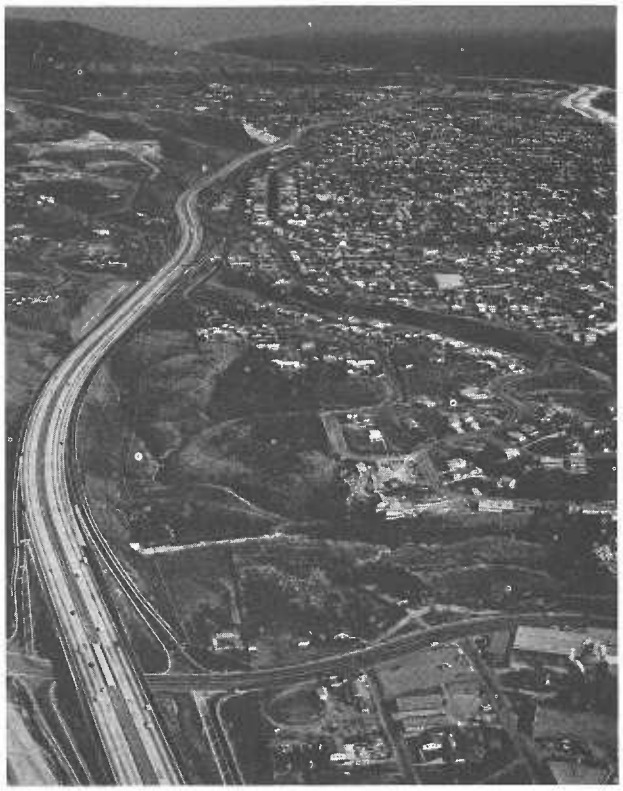
In the vicinity of Encinitas, Leucadia and Cardiff-by-the-Sea, he is a few miles inland, the old coastal route bypassed. Here near Encinitas (flower capital of the world, its citizens say), at Christmas, thousands of acres of poinsettias turn seaside and inland fields and hillsides red. Out of the corner of his other eye he sees the sparkling blue of the Pacific. Early California missions are near . . . wonderful beaches . . . a Marine Corps training camp throbbing with activity. Jet fighters scream overhead in practice sorties.

Just past San Clemente the highway swings inland to penetrate deeply into Orange County. The roadway threads miles of scented orange groves. Luxurious residential parks, golf courses, shopping centers sprout by the square mile in onetime bean fields. Yet there's room for one of the largest and most active working ranches anywhere, against the gentle rolling hills, green and dotted with grazing cattle, crowned with fleecy clouds in an unbelievable sky.

Ahead, Disneyland. The tip of its Matterhorn shows distantly over tall eucalyptus groves. Interstate 5 runs past its gates and onward . . . the vital artery to and through the industrial and commercial heartland of the City of Los Angeles.

But the driver elects to bypass this busy route. He chooses new Route 22 (Garden Grove) Freeway. Here, earlier this spring, the opening of a key section eliminated yet another traffic signal. Now the freeway soars unhindered through Garden Grove, said to be the fastest growing city in the fastest growing county in the United States. The principal city boulevard, once thronged with through commercial traffic, is quiet now, well able to serve the needs of local residents.

Route 22 merges quickly and smoothly into Interstate 405, the carefully planned metropolitan bypass called the San Diego Freeway. Los Angeles County, now. Off to the right and beyond the bustling Long Beach Municipal Airport are the blocks-long Douglas Aircraft facilities, home of the DC8s and DC9s (and the Dakotas and DC3s of fond memory). Then the slopes of Signal Hill, still black with the money trees called derricks, loom



ABOVE—". . . at Christmas, thousands of acres of poinsettias turn seaside and inland fields and hillsides red . . ." CENTER—"Just past San Clemente the highway swings inland . . ." BELOW—"But the driver . . . chooses new Route 22 (Garden Grove) freeway. Here, earlier this spring, the opening of a key section eliminated yet another traffic signal."

TOP—"Westward through miles of small cities and suburban areas . . ." NEXT LEFT— ". . . the San Gabriel Mountains rear high ahead." DIRECTLY ABOVE RIGHT— ". . . a four-lane expressway cuts through on a shorter path." LEFT—"following I-405 up through 'big cut.'"

ahead. Westward through miles of small cities and suburban areas, the local traffic is stopping and starting, inching its way on the surface streets below.

The roadway veers north again. To the right, Inglewood, where during the weeks of the Hollywood season the thoroughbreds run. The control towers of Los Angeles International Airport cut sharply into the sky. Each month more planes, more people, more cargo pass through this modern terminal, ringed by new hotels, new office buildings, new commercial facilities. The thriving southern California aerospace industry centers nearby.

Traffic constantly merges with and leaves the unhindered freeway stream at the many interchanges. A little farther north comes the separation whose sweeping curves and soaring connector roads have won national aesthetic awards. It's the Santa Monica Freeway (Interstate 10) interchange with the San Diego Freeway. Just a few miles beyond this point is road's end for I-10, of which the Santa Monica Freeway is a portion, but northbound drivers on I-405 sail swiftly through the maze of curving ramps.

A few minutes later the driver is following I-405 up through the "big cut" over the Santa Monica mountains, and then dropping down into the San Fernando Valley. Another ten miles and I-405 joins the Golden State Freeway with its familiar Interstate 5 symbol.

At once the San Gabriel Mountains rear high ahead. Ever since 1914, when a two-lane road wound a tortuous path for 48 miles up and around and over the spine of these rugged mountains, the highway through them has been called the Ridge Route. Today a four-lane expressway cuts through on a shorter path. Under construction, scheduled for 1969 completion, is the new eight-lane freeway, its curves and inclines gentled to permit a steady 70 miles per hour over the course that once took four days on horseback.

Near the Kern county line the road reaches an elevation of 4,200 feet in an area of rocky grandeur, lower slopes dotted with live oaks. Then it descends to the San Joaquin Valley floor via the spectacular Grapevine. Eight lanes and well pacified . . . but once this twisting precipitate path was the terror of the mountains. Hair-raising tales of the old road circulate whenever oldtimers gather. Now a novice can drive it safely, and if it's

spring can take time to enjoy the fields of wildflowers which spread below him at the viewpoints.

On the San Joaquin Valley plain, endless miles of cotton fields, ginning mills, and cotton warehouses slip past the straight, wide roadway. Just south of Bakersfield the even flow of the terrain and the superb highway design permit legal 70-mile-per-hour speeds for long stretches.

This wealthy agricultural domain continues into Tulare County. In the eastern haze, miles away across the level fields of crops and diagonally ordered orchard rows, the white peaks of the Sierra appear. Sequoia and Kings Canyon National Parks are up there somewhere, with all their wild beauty and many of the world's oldest and largest living trees. Looming over all, Mount Whitney, at 14,495 feet California's (and once the country's) tallest peak.

At Fresno an exit sign tempts with the road to Yosemite Valley. But the motorist presses on, with never a traffic signal to slow his steady progress. In this geographical center of California, vines and crops, pasture and rangelands sweep to the horizon in all directions. Across the San Joaquin River into Madera County, lumbering begins to come into its own. Mills and smoking beehives dot the distant landscape, for millions of board feet are cut annually on both private and government forest lands, rolling on the highway to their varied markets.

Thriving towns and cities, their local streets freed for local traffic, line the route of the freeway, which knits them all together into an unending pageant of scenes, blurring one into the next as the afternoon shadows lengthen.

Twilight comes in Merced County. In the pleasant little city of Livingston, on Route 99 at Cressey Street, the sun's last rays glint through the tree-lined street to touch the first traffic signal since morning.

The San Joaquin Valley evening air is warmer than the breeze at San Diego, 410 miles and seven and a half hours ago. And the signal glows red. The motorist, too, glows . . . with quiet satisfaction recalling the experiences of this relaxing day on the highway. For him, it has been a day free of traffic signals and traffic jams, free of stop signs and toll charges, on the backbone road of California.

TOP—". . . descends to the San Joaquin Valley via the spectacular Grapevine." NEXT LEFT—". . . the road reaches an elevation of 4,200 feet . . ." DIRECTLY ABOVE RIGHT—". . . the even flow of the terrain and the superb highway design . . ." DIRECTLY ABOVE LEFT—". . . vines and crops, pasture and rangelands sweep to the horizon . . ."

UKIAH TO BOONVILLE

BY BRIAN T. COLWELL

Pioneer fence built when redwood was easier to get than wire, still marks right-of-way.

The recent completion of the final contract to widen and improve an 18-mile section of highway between Ukiah and Boonville in Mendocino County has also marked the end of its career as a county road and its official adoption into the state highway system as Route 253.

The modern two-lane highway will serve as an important connector route between Highway 101 and Anderson Valley to the west.

Mendocino County began improvement of the route in 1952 under the federal aid secondary program.

It was added to the state highway system by the Legislature in 1963, although its final adoption as a numbered route by the California Highway Commission was made contingent upon the completion of the final improvement contract. This done, the commission officially adopted the route in March.

Special Challenges

Construction of this final unit offered special challenges to the contractor and the engineers.

The job crossed some of the most unstable terrain in the state. Consequently, as much of the road as possible was placed in a cut instead of on a fill to avoid placing additional material and weight on the extremely unstable foundations.

All embankment areas required stabilization treatment which included trench excavation, placing permeable material (gravel, etc.) and perforated metal drainpipe. In order to provide adequate stabilization during construction, excavation quantities had to be trebled over the original design estimates. Approximately two miles of underdrains were placed to handle ground water.

During the winter of 1964–65, heavy rains caused slides in all major excavation slopes in the project. Corrective measures consisted of constructing benches in the excavation slopes at the slip plane elevation, removal of the more unstable portions of the slides and additional benching to catch material from future sliding. In some cases, a work area was built so that maintenance forces could work off the traveled way when removing additional slide material.

Traffic Control

Traffic control was also a difficult problem. The contract allowed two-hour closures because of heavy grading next to and on the existing roadway. The times of the closures were well advertised in the local news media in order to keep to a minimum the inconvenience to local traffic which had been subject to delays during the construction season since the inception of the construction program on this route in 1952. Without a doubt, the local population breathed a great sigh of relief upon completion of this last unit.

Began in 1851

Route 253 began its existence as the Anderson Valley Trail in 1851.

In 1868, John Gschwind got a bill through the State Legislature authorizing the Mendocino County Supervisors to grant the right to construct a toll road over the Anderson Valley Trail Route from Boonville to a point where the Anderson Valley Trail intersected the state road in Ukiah Valley.

The total cost of this first road was $10,000. The primary use of the road, known as the Gschwind Toll Road, was to transport lumber from Gschwind's Mill to Ukiah Valley. It continued as a toll road until the late 1800's and was incorporated into the Mendocino County system about 1896. A contract was let in 1896 for a 10-foot width of roadbed and a 35-foot minimum radius curve by the Mendocino County Board of Supervisors. This road continued on essentially the original location with minor improvements until 1952.

Highway 253, newly added to state system, is important east-west connection between Highway 128 at Boonville and Highway 101 near Ukiah.

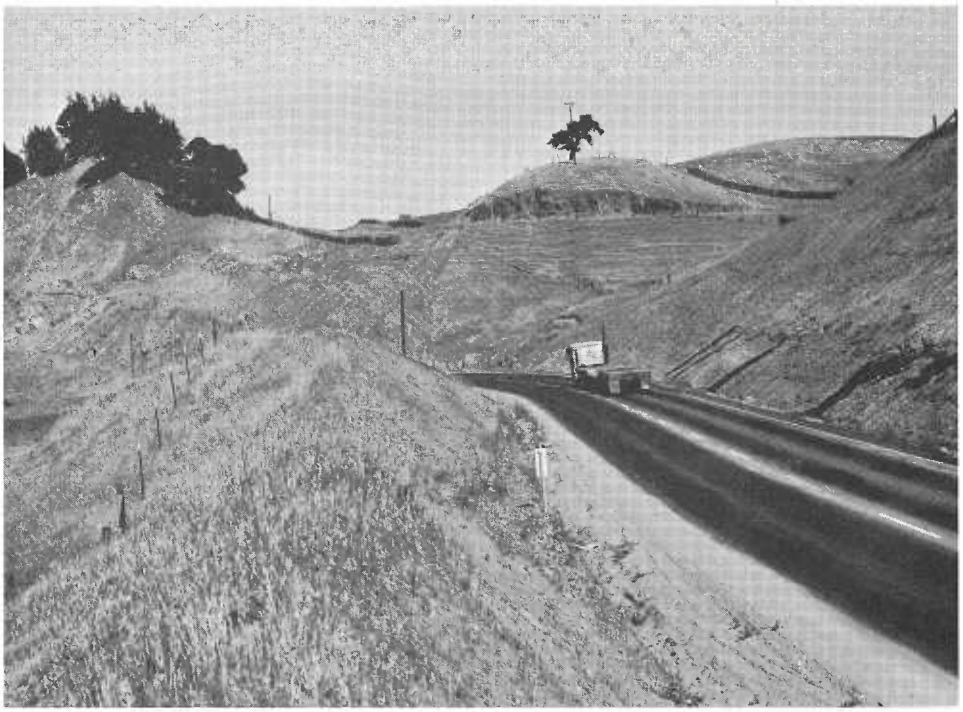
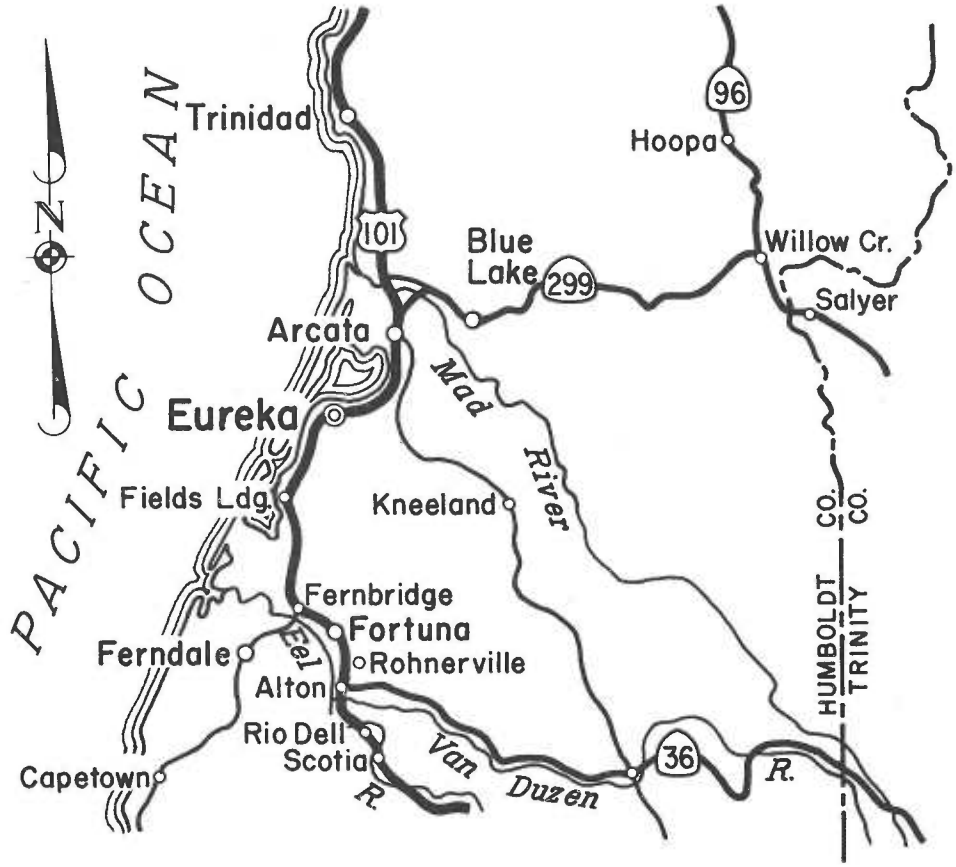


PHOTO RIGHT—Because of unstable soil conditions as much of roadway as possible was built in cut rather than on fill to minimize weight on foundations. PHOTO BELOW—Some typical alignment of the new highway with some of old pioneer toll road visible by barn in upper right.

Mad River-Blue Lake Freeway



MAP LEFT—The new section of Highway 299 freeway extends from Highway 101 just north of Arcata to Blue Lake, crossing the Mad River on twin spans. PHOTO BELOW—The freeway follows the winding Mad River northwestward toward Arcata and the coast. In left foreground is the Glendale Overhead.

LEFT—Assistant State Public Works Director T. Fred Bagshaw speaks at the freeway dedication. BELOW—Industries on Parade lumber truck breaks ribbon officially opening freeway.

BY ERNEST J. REED, JR.

The new Mad River-Blue Lake Freeway in Humboldt County follows the river for nearly five miles, blending with the new timber growth, native flora and pasture lands. Special care was taken to contour all interchange areas, cuts and other construction to fit the surrounding landscape. Seeding of all cut and embankment slopes by helicopter has materially aided in healing what construction scars there were.

Twin structures carry traffic across the Mad River. Eastbound traffic uses the old bridge; westbound uses a new parallel span. Interchanges connect the freeway and Route 200, Essex Lane and Glendale. Return of traffic to old US 299 just west of Blue Lake was handled by building a portion of a future diamond interchange presently modified with temporary connections.

The new freeway is part of an extensive program to relocate and improve Highway 299.

Built at a cost of $6,200,000, it supersedes a portion of roadway rich in the history of Humboldt County.

First a game trail, then a footpath, it was used by Lewis K. Wood and Dr. Josiah Gregg leading parties westward seeking a route from the upper Trinity River to the sea. Having descended the low coastal mountains, they picked up and followed the trail along the north bank of the river to a point just inland from its mouth. Here, after crossing to the south bank and marking the date, December 20, 1849, the two leaders became engaged in a violent quarrel. Unable to reconcile their differences, they named the stream "Mad" River. The parties split. Lewis Wood, known as the "old gentleman," moved south in search of Humboldt Bay. The Gregg party turned north to Trinidad.

By 1851 pack trains and livestock were moving along this trail to the settlement of Blue Lake, starting point for the rugged pack into the Trinity and Klamath area. Around the turn of the century the trail was widened by hand labor to buggy width and shortly afterward was improved to accommodate autos and trucks. In 1912 the Boards of Supervisors of Humboldt and Trinity Counties each appropriated $5,000 to improve it as a connecting link between the two counties.

Construction of the Blue Lake Interchange also required relocation of a half a mile of track of the Arcata & Mad River Railroad, the first and only relocation of track ever needed during the more than 100 years that the railroad has been operating. Built in 1864, the Arcata & Mad River is the oldest continuously operating railroad in California.

President Harold Hunt of Highway 299 Association receives hard hat award for his promotion of highway improvement in the north state.

Grand Oaks Study

BY

STUART L. HILL

AND

CHRISTOS BRIANAS

STUDY AREA. Interstate 80 looking northeast with Grand Oaks to the right and Antelope Road interchange in the foreground.

Typical study group homes. The truck in the background between the homes shows the proximity of the freeway.

Freeways and Private Property

Does a freeway adversely affect property values of homes right next to it?

This was the subject of a recent study by the Division of Highways Right of Way Department.

Result? The study showed that, even in a weak market, the freeway did not further weaken the potential market of properties adjacent to it.

Study Area

Two sections of a relatively new subdivision (Grand Oaks) on Interstate 80 some 16 miles northeast of Sacramento were chosen for the study.

Selection of the study area was influenced by the large number of foreclosures occurring there; one-third of the houses were foreclosed within a three-year period.

The Interstate 80 freeway through this area was completed in 1956. Houses in Grand Oaks were built by nine different contractors in late 1958 and 1959 in response to the rapid growth of the Sacramento area at that time. The subdivision was developed as a moderately priced neighborhood of smaller three-bedroom homes; 362 homes were built. Eighty-nine percent were FHA insured; the rest were veteran loans.

Initial prices of the homes ranged from $11,700 to $15,950; size from 850 to 1,200 square feet. Ninety percent of the homes had less than 1,100 square feet; 73 percent sold for less than $14,000.

The land around Grand Oaks is gently rolling so that the freeway varies from a few feet above to a few feet below the level of the adjoining lots, which are screened from the freeway by solid board fencing.

Study Procedure

The study covered all recorded transactions of the 362 homes (foreclosures, resales, original sales prices and terms, etc.) for six years, from mid-1959 to mid-1965.

The study compared foreclosure and resale figures of homes abutting the freeway and those not abutting it. In right-of-way parlance, an abutting home is one that joins the freeway right-of-way along a (in this case, the rear) property line. Of the 362 homes 44 abutted the freeway.

During the study period there were a total of 125 foreclosures including three homes which had two foreclosures each.

What were the findings of the study?

Findings

Did homes next to the freeway show a greater tendency toward foreclosure than those away from the freeway?

No. Thirty-two percent of homes next to freeway suffered foreclosure compared to 34 percent of the homes away from the freeway.

Were there any other location factors that showed a greater or lower foreclosure rate?

Yes, corner lots. They had a foreclosure rate of 38 percent and none of them were next to the freeway. On the other hand, homes adjacent to the school park (presumably enjoying a locational advantage) had a foreclosure rate of 17 percent.

Did homes next to the freeway foreclose sooner than homes away from the freeway?

No.

Did foreclosed homes next to freeway take longer to resell than homes away from the freeway?

Yes, about 10 months longer on the average.

Did the average home next to the freeway sell at a lower price than the average home away from the freeway?

Yes, but only three-quarters of 1 percent less. This is about $100 difference.

What size and price class homes showed greatest tendency to foreclose?

The smaller, less expensive homes.

Did original builders put different prices on homes next to the freeway and homes away from the freeway?

No.

Was equal financing available for houses next to and houses away from the freeway?

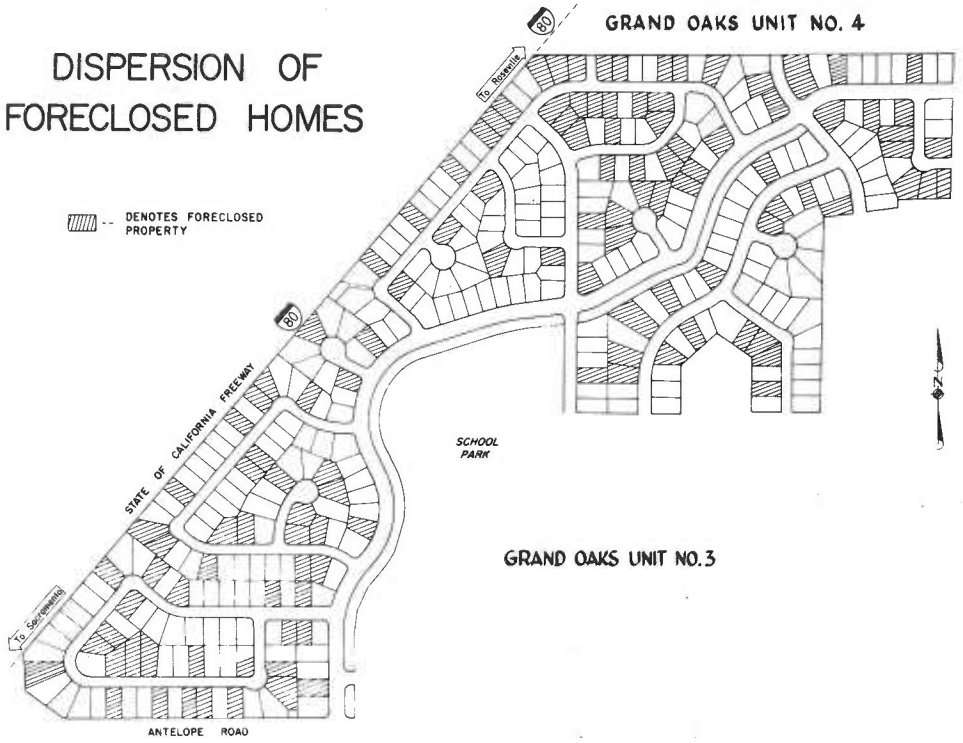
Yes.

What percentage of original owners still retain title to the properties in locations next to the freeway and away from the freeway?

A higher percentage of original buyers next to the freeway still own their homes.

(This article is based on a longer, more detailed study by the Division of Highways' Right of Way Department. Copies of this study can be obtained upon request.)

The shaded lots show that more than a third of the homes in the study area were foreclosed between 1959 and 1965.



Search for A Flagpole

As District 3 Engineer W. L. Warren looks on, Jack Snell (center) receives superior accomplishment award from Fred L. Jones, State Director of Parks and Recreation.

On May 26 Division of Highways employee John W. Snell received a superior accomplishment award for helping to find an old piece of a flagpole near Eureka for the Division of Beaches and Parks, although Snell works in District 3 in Marysville. The award, consisting of a certificate and engraved desk pen set, was given in person by Fred L. Jones, State Director of Parks and Recreation.

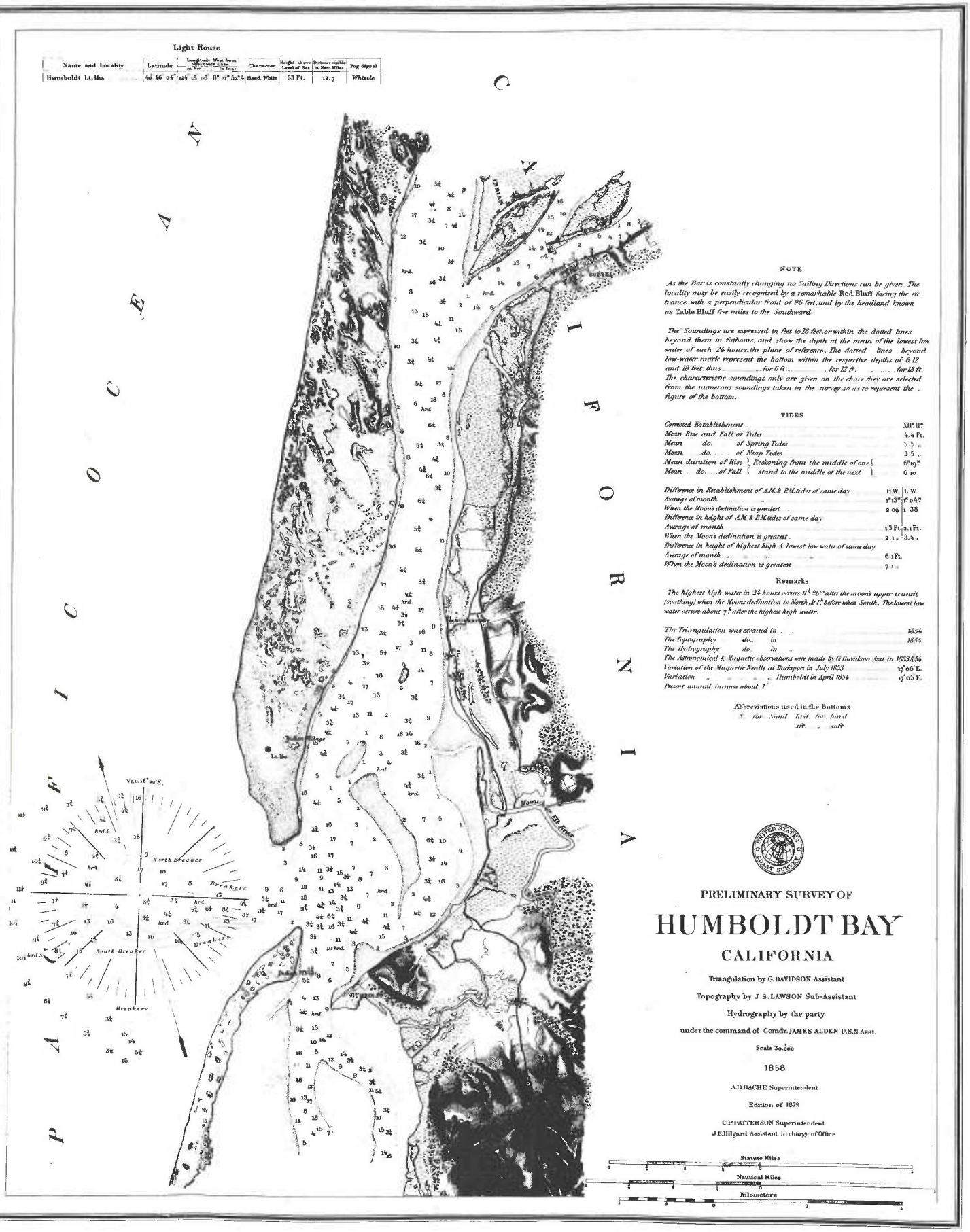
Snell, using his knowledge of survey methods gained in highway work, was told by Parks and Recreation personnel he saved the state at least $5,000 in archeological research, by finding a method for quickly and easily locating the point where the flagpole once stood at Fort Humboldt. Since the flagpole had been used in the original layout of the fort as a benchmark it was vital its location be established before any authentic restoration work could be begun.

Snell learned of the Fort Humboldt problem while working on a historical study of the old highway which once ran between Fort Sutter and the Coloma Saw Mill. During this study he became acquainted with Alan Welts, state park historian. In a friendly conversation, Welts explained the land at Fort Humboldt had been so intensively farmed in the years since the site was abandoned that it was almost impossible to find reference points, and it looked like the only way to find any was going to be by excavation.

Since Snell is a specialist in retracement research, the problem intrigued him. As soon as he had an opportunity he visited the State Library. Sharon Pfennighausen, of the Government Publications and Maps Section, became interested in the problem also.

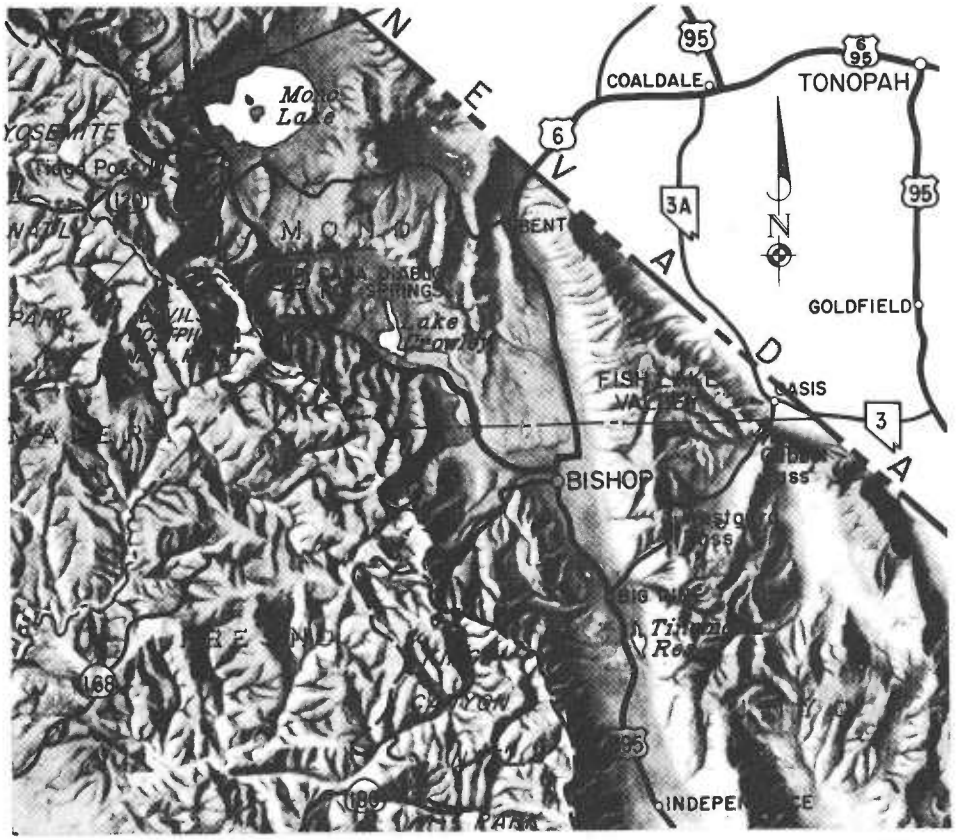
Snell, a merchant marine navigator during World War II, decided the flagpole must have been a navigational mark in early sailing directions for Humboldt Bay, and, after considerable work, Miss Pfennighausen found several early charts which were contemporary with the fort. The field notes from which the charts were made indicated the flagpole was used for sights. From this point on, location of the flagpole was merely a matter of reverse triangulation.

Of his achievement, Snell says modestly: "There is nothing unique or 'backwards' about replacing a destroyed monument from others in a control net. Surveyors all over the world have been doing it (while cursing and muttering dire threats) every day for more than 4,000 years. Even the curses have Biblical precedent, if not approval. Deuteronomy 27:17 says: 'Cursed be he that removeth his neighbour's landmark.' If you know the direction and distance from here to there, the same distance in the reverse direction ought to get you from there to here. Beaches and Parks personnel found the old flagpole base within 20 inches of the retraced position."

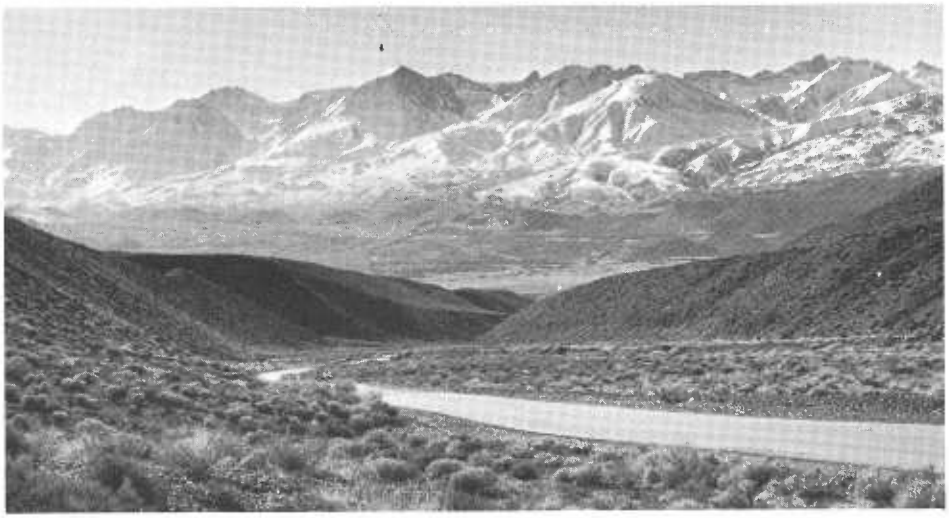


Beautifully detailed map made by U.S. Coast Survey in 1858 shows location of Fort Humboldt on east side of bay on bluff commanding bay entrance.

Oasis to State Line



ABOVE—Route leaves US 395 at Big Pine and traverses Westgard and Gilbert Passes. BELOW—Photo made as road drops down into Owens Valley. Sierra Nevada in distance is portion just east of King's Canyon National Park.



The California Highway Commission in October 1965 took into the state system a small section of county road in eastern Mono County—"Oasis to state line." Although only a little more than seven miles long, its adoption calls attention to a little-known part of the state for those who are exploration minded.

Designated State Route 266, it is one of the shorter numbered routes in California, but at its Oasis end it connects to the eastern part of Route 168, which in turn connects to US 395 at Big Pine.

Hot and dry in summer, Route 168 is best in the off season, although in winter it may, under rare circumstances, be closed by snow or flooding. The road traverses wild and barren country, almost untouched by man, crossing two summits on its way to the Nevada state line, and offers a pleasant little loop trip beyond the state line into an interesting section of Nevada.

Route 168 has a very low average daily traffic count. Nevertheless, although somewhat narrow in places, it is well maintained and perfectly safe for the careful driver.

The turnoff is plainly marked at Big Pine. Once you leave the town you start to climb almost immediately and cross the southern end of the White Mountains via Westgard Pass, elevation 7,271 feet. A feature of the trip is the very narrow canyon the road passes through near the summit, ideal as a setting for a western movie hold-up or Indian ambush.

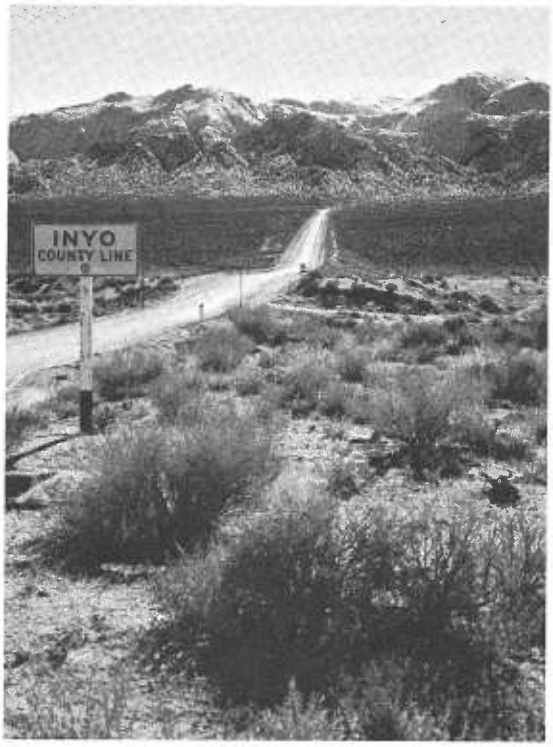
Near the summit there is a small plateau, with a road turning north into the higher ridges of the White Mountains and the now world-famous groves of bristlecone pines. We are told by scientists that some of these twisted, gnarled, and battered trees, surviving above 10,000 feet on the higher peaks of the range, are nearly 5,000 years old—the earth's oldest living things.

A mile or two farther east there is a curving, swooping descent into Deep Springs Valley, interesting as an ancient lakebed surrounded by burned and blackened mountains, across which the road travels in a straight line. Beyond this valley is another low, gentle pass, Gilbert Summit, with a

Large sign marks turnoff to Bristlecone Pine Forest.

Looking east along Route 168 into Deep Springs Valley.

At Nevada state line Route 266 becomes Nevada 3A. Vehicle is Nevada highway maintenance patrol.



View is westerly, approaching Gilbert Pass.

View looking west from Gilbert Pass is magnificent, with Sierra Nevada in far distance, and White Mountains in front of them. White line in upper left is Route 168, and Deep Springs Highway Maintenance Station is located inside angle.

series of interesting views of beautiful desert scenery, then another descent into Fish Lake Valley.

At Oasis, with its ponds of water in the middle of the desert, you can turn south and continue on 168 into Nevada, or turn north into Nevada via newly acquired 266, along the eastern base of the White Mountains, getting a different view of this range. For those interested in making a loop trip, either of these routes connects with Nevada state routes, and thirty miles or so further along, joins with US 95 in Nevada, which passes through both Tonopah and Goldfield.

Sign at Westgard Pass dates back to 1916 "good roads" movement in California. A. L. Westgard, pioneer motorist and auto association official, urged route be incorporated into transcontinental Lincoln Highway.

BART

Above: Full-scale model car with detachable forward pod.
Below in sequence downward: Laboratory car on test track. Section of BART test track near Concord. Artist's concept of aerial transit structure. Interior of model car. Attendant's seat for monitoring automatic control. (All BART photos.)

Commuters in electric trains and commuters in autos will be speeding down some of the same rights-of-way when the San Francisco Bay Area Rapid Transit system is finished in mid-1971.

Over about a quarter of the mileage of the new BART net linking San Francisco with Oakland and the East Bay, tracks for the high-speed, high-capacity trains will be in the freeway divider strip or on land alongside.

This cooperative use of land, where it is practical and where studies show that auto and train routes coincide, will mean direct savings of about 70 million dollars to BART.

And while it required the California Division of Highways to spend substantial sums much sooner than highway traffic demand alone would have dictated, it may mean long-run savings for the highway program in view of rising land and construction costs.

Coordinating the planning and financing of two limited-purpose agencies is not as simple as it may sound, because the division has no direct, legal obligation to do anything about railways, and BART is not directly charged with any responsibility for freeways.

But with close to 90 percent of California's people living in or near cities, there is arising a pretty obvious need to put all California's transportation brainpower to work on metropolitan congestion.

While highway engineers and railway engineers have worked opposite sides of the street, they are in the same business—that of providing for the movement of people and goods without which modern civilization cannot exist.

And so the Division of Highways and the Bay Area Rapid Transit District are pioneering a concept of cooperative land use that will save taxpayers millions and may contribute significantly to relieving the traffic congestion that impairs mobility in our cities.

The agreements between the two agencies for placing BART tracks in 3½ miles of the dividing strip of the Grove-Shafter Freeway in Oakland and in 6 miles of Highway 24 Freeway between Orinda and Walnut Creek have been reached long since and work on these joint ventures is well along.

In San Francisco another main travel corridor will eventually be shared, with BART lines running for about 2½ miles alongside the Southern Freeway. In southern Alameda County, the line will be laid alongside 238 freeway for about five miles.

These agreements as well as those covering joint land use by Interstate 5 and the California Aqueduct in the San Joaquin Valley will serve the Division of Highways as guideposts in metropolitan areas where rail rapid transit is under serious discussion.

In reaching these first agreements, the engineers from both agencies had to consider how the costs could be shared, how freeway and railway design could be modified to get the best use of land at the least cost in money and disruption, how design and construction schedules could be coordinated and how construction could be dovetailed for rapid completion of both systems.

The Grove-Shafter was actually underway before BART won the bond financing that made its transit net a practical reality. Here the highway people held up on their timetable and later revised their engineering to give BART time to plan its route in the divider strip.

On Highway 24, BART's decision to put tracks in the divider prompted Highways to speed up its planning and build the freeway to eight lanes immediately instead of in 1975.

Under the Grove-Shafter agreement, the division buys right-of-way, designs the freeway and the railway roadbed, and supervises construction, and BART pays as its share of engineering and inspection costs an amount equal to 10 percent of its share of construction costs.

In the same proportion as they share the right-of-way, BART and Highways share the cost of clearing and grubbing, embankments and retaining walls, streets over or under the joint facility, structure abutments and wingwalls, drainage and other utility structures, detours and traffic maintenance, and items already built by Highways before the agreement.

The two agencies share equally in the cost of frontage roads and freeway fencing and landscaping.

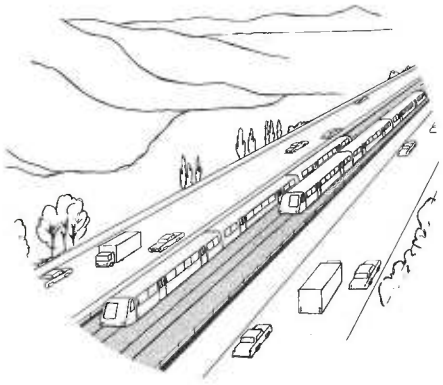
BART pays all additional costs involved in building the highway on an elevated structure where earth fill would have sufficed for freeway needs; of a median barrier where Highways would merely have installed a chain-link fence; of highway signs installed at BART's request; of entrance and exit structures where Highways contemplated only an embankment, and of other structures required solely because of the presence of transit facilities.

BART also pays the cost of pier foundations built before the agreement and not usable in the joint facility.

These are the nuts and bolts of joint action on the traffic problem by two agencies set up basically to deal each with its own phase of transportation.

Such action means reducing the amount of property needed in an area where the lay of the land leaves narrow corridors, providing convenient interconnection between two forms of transportation, and shortening the time of community disruption by building both facilities at the same time.

It may be the pattern of the future.



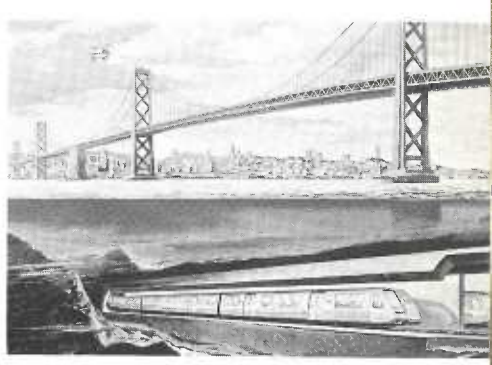
Above: Artist's concept of trains operating on freeway median. Below: Section of Highway 24 at Orinda, where trains will run in median of highway.

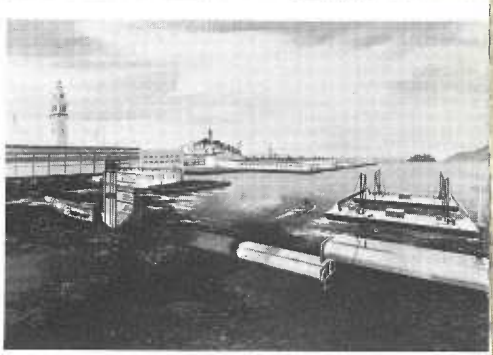
Segment of aerial transit line built near Walnut Creek as test track.

Right above: Artist's rendering showing trains operating through tube beneath San Francisco Bay.

Right center: Artist's rendering of cutaway section showing various levels to be constructed beneath Market Street in San Francisco.

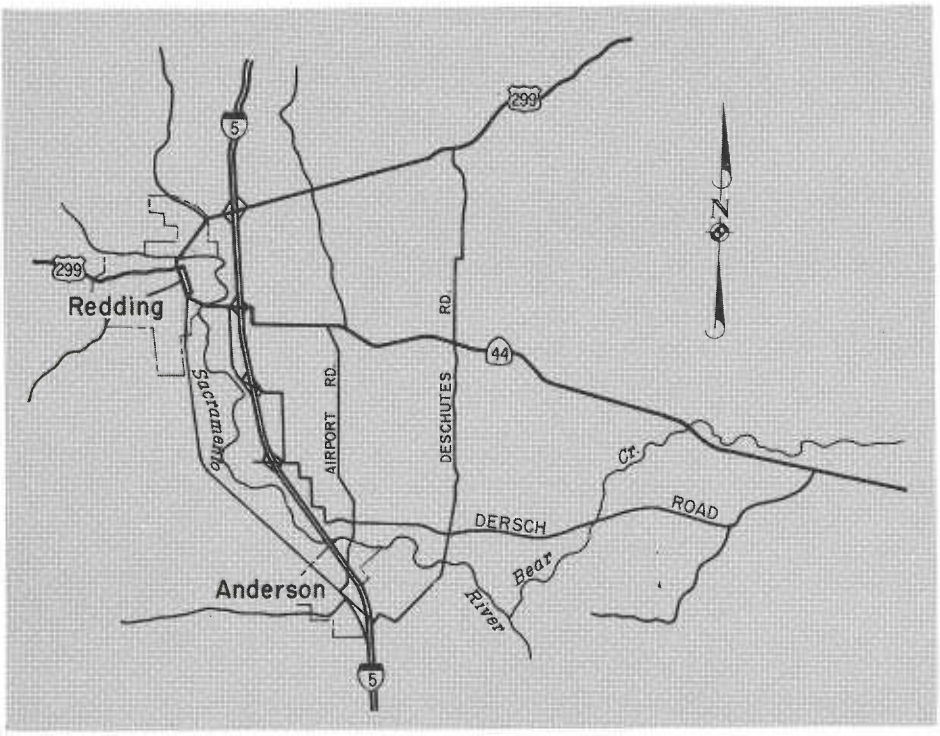
Right below: Various phases of construction include temporary tower to lay twin-bore tube, caisson, and tube sections being lowered.





Embalmer Builds Bridge

BY DONALD D. CHAMBERLAIN



In 1860, George Dersch, and his blind brother Fred, with his family, settled near the head of a beautiful small valley at the confluence of Bear Creek and Lack Creek. Six years later, at a time of great unrest between the settlers and the Indians of northern California, a hostile band of 15 Indians approached the home of the Dersches.

Unsuspecting the presence of the hostiles, Mrs. George Dersch walked outside on a routine chore and was shot down from ambush. Ten-year-old Fred, who had been working with his uncle in the orchard, ran to his mother's assistance, shouting at the Indians. Perhaps they had no more ammunition, but the aborigines saved face by throwing a few rocks, and then left. Although the location of only one of several attacks by "Digger" Indians at this time, the place of Mrs. Dersch's murder is known today as the site of the "Bear Creek Massacre."

Almost 100 years later, near this same point, community leaders celebrated the completion of 13 miles of reconstruction of "Dersch Road," FAS 1350. This road serves an important economic role in Shasta County as the primary route between vast public and private timber holdings to the east, and the lumber-processing area lying along the Sacramento River near Anderson. It also gives access to the recreational areas of Lassen Volcanic National Park, the Lassen National Forest, and the fabulous Hat Creek area, as well as Burney State Park and the general northeastern California recreational area.

Adoption of Shasta County's first five-year federal aid secondary program by the board of supervisors in 1959 authorized the project. Initial work consisted of obtaining basic topographic data, produced photogrammetrically under contract let in March 1961. Approximately 13 miles

Aerial view of country through which Dersch Road travels.

Between Deschutes Road and Highway 44, Shasta County.

was flown with maps submitted on a scale of 1″ to 50′ horizontal and 1″ to 2′ vertical, with a basic ground control set by Tellurometer and related to the California coordinate system. A complete set of individual photographs, a photo mosaic, and a pencil manuscript on chronoflex topographic map were submitted by Clair A. Hill and Associates at a cost of $1,280 per mile.

First work was completed in 1962 when the Upper Lack Creek Bridge was constructed at a cost of $28,994 entirely from county funds. At about the time this bridge was completed, the first federal aid secondary contract was let by the Division of Highways for a 5.3-mile stretch commencing at the easterly end of Dersch Road. The Division of Highways furnished the best information available at the time for the future route of Highway 44, leading from Redding to Lassen National Park. The project commenced at that point, running southwesterly. A ½-mile section between the beginning of the federal aid secondary work and Highway 44 was reconstructed on existing alignment by county forces to serve the interim period of some 5 to 10 years prior to construction of this section of Highway 44.

The initial federal aid secondary portion was constructed at a cost of $405,066 and was completed in December of 1962. The second unit commenced in early 1963 and was completed in December 1963 for a total length of 4.6 miles and at a cost of $402,119.

The following spring, 1964, a second contract for bridge construction was let by the County of Shasta, using local funds, for the construction of bridges across Lower Lack Creek, Dry Creek, and Bear Creek. These bridges were constructed of monolithic concrete T-beam after alternate bids ruled out use of precast concrete sections. The three bridges were completed at a cost of $11.12 per square foot for a total of $146,164 in September of 1963.

It is rather interesting to note that the bridge across Bear Creek, in the very near vicinity of the massacre of 100 years before, was constructed at a cost of $77,600. In the records of the county, a bridge was constructed across Bear Creek at the same point in 1903 at a cost of $975. The firm submitting the bid was the Anderson Furniture Store, who listed on their letterhead, among other things, that they were also undertakers and embalmers. This is the only time in history that we know of that a mortician has constructed a county bridge.

Following completion of the bridgework in 1964, a final FAS contract was let to Norman L. Fadel, Inc., for the remaining 2.2 miles of road. This contract also included the replacement of an old single-lane steel-truss bridge across Cow Creek. A major portion of the cost of this contract was the new bridge which is constructed of single column, Y-type bents with an open U-box girder span. The bridge substructure is footed on piles.

The roadway section has two 12-foot traffic lanes with four-foot shoulders. The basic thickness of 0.5-foot class 3 aggregate base was used throughout the project with variable thicknesses of subbase depending upon basement soil characteristics. Surfacing is of 0.2-foot asphalt concrete. Excavation was avoided wherever possible, because of the geologically recent volcanic extrusions which are overlain by very thin soils. Generally the road profile through the gently sloping lava areas was placed about 18 inches above the existing surface.

Various views of remodeled road as it is today. Note outmoded through-truss bridge common 50 years ago.

Interviewers must get information on travel patterns for all members of family. Husband is holding a card on which he listed the previous days' trips, as interviewer records the information on a detailed form.

ORIGIN AND DESTINATION STUDIES

When engineers speak of the application of Newton's law of gravity to people's travel habits, they don't mean people tend to take the downhill route as the easiest! They mean that people's travel habits follow the same pattern as Newton's law—those points close by exert much greater attraction to people free to travel than do those places farther away, just as two planets close to each other exert more attraction each on the other than do two far apart.

If you think about it, there is nothing very earthshaking about such a discovery. All it really says is that people more readily make short trips than long ones! The value of the discovery is it can now be reduced to a mathematical formula and used to predict travel needs.

This "gravity" law is just one of the things which have been learned from the ever-growing use of the "origin and destination study." The study is one of the most important tools in use today by planners who are seeking to make the best use of land and facilities in our ever-growing urban areas. Although conducted by highway engineers, the data is obviously of value to many other professions. A good study, if acted upon, enhances all community values.

The origin and destination study has come into use since World War II, and California has been a leader in its development. The San Francisco Bay area study of 1946–1947 was one of the first in the United States. The Sacramento study of 1947–1948 was another pioneer effort, and from these two were developed definite methods of approach in our state.

Since those years, the Federal Bureau of Public Roads has taken an increasing part in the studies, gradually establishing firmer guidelines. With passage of the legislation of 1962, the federal government now exercises strict control over the way the studies are conducted.

This most recent legislation encourages all cities or urban areas of 50,000 people or more to have such studies made, to insure allocation of federal funds for transportation. In California there are 13 such urban areas: Los Angeles-Long Beach; San Francisco-Oakland; San Diego; San Jose; Sacramento; San Bernardino - Riverside; Fresno; Pomona-Ontario; Bakersfield; Stockton; Santa Barbara; Oxnard; and Salinas. It is interesting to note that Texas has 22 urban areas—almost twice as many as California—but in the 22 are included many towns of less than 100,000 people, such as San Angelo, Texarkana, and Midland.

All told, the 22 Texas urban areas contain only 5 million people, whereas California's 13 areas contain 12 million. Obviously, California is now an urban state, with its people tending to concentrate in ever greater urban complexes. The extent of this urbanization is further emphasized when it is noted all the western states outside California, including Hawaii, have only 15 urban areas among them, with a total population of 5 million.

Less than 30 years ago an agricultural state, and, as we have seen, now urbanized in some areas comparable to

Interviewer has been given portion of carefully selected sample and is now checking area sample families live in to plan her route.

All interviewers carry identification cards including their photo, and must present them on arrival at home.

the crowded East, California is beset with dozens of problems. Schools, parks, hospitals, water supply, highways and streets—all must be expanded rapidly to deal with the state's population explosion.

However, since tremendous expenditures of public funds are involved, these new facilities cannot be added haphazardly as they once were, and the need for accurate data for planning is obvious. The O/D study is an important part of this planning.

Although on the face of it such a study would appear to be involved only in analyzing and predicting travel needs, road and street networks are of tremendous economic importance, and their placement will certainly be vital in developing the pattern of economic development of an urban complex. Conversely, to locate transportation routes without considering the economic forces at work in the community would be folly. This is why an origin and destination study today investigates a wide range of factors affecting the community or groups of communities.

In practice, of course, the investigating agency does not interview every person living in an area. Instead, carefully selected samples are taken, and in the personal interview stage only a limited number of dwelling units are chosen.

Personal interviews in the home are concerned only with the collection of data on travel habits of the members of the household. The information is used merely to add to a supply of statistical data, and no names are recorded, hence there is never any invasion of the individual's privacy.

The Bureau of Public Roads' "ten commandments" for the subjects which must be considered are: (1) economic factors affecting development; (2) population studies; (3) land use; (4) transportation facilities including those for mass transportation; (5) travel patterns; (6) terminal and transfer facilities; (7) traffic engineering features; (8) zoning ordinances, subdivision regulations, building codes, etc.; (9) financial resources; (10) social and community value factors.

Each of these factors is studied in considerable detail. Because of the great variety of subjects for this work, the Division of Highways employs, in addition to its engineers, experts in fields such as economics, statistics, and real estate.

In subject 1, "economic factors," for instance, there must be analysis of employment data by industrial category, per capita income, income-consumption patterns, car ownership per capita or household, plus intelligent forecasts for the future.

Population studies, as might be expected, entail forecasts of population at specified times in the future, in order to use the figures as indicators of future travel patterns. These figures are only one set of factors, however, as the travel habits of people change, and a mere interpolation of future figures from today's would be futile. Population studies then, must include all the historical data obtainable on population, patterns of growth, and an analysis of those factors which will affect population densities. The development of the motorcar itself, with its tremendous extension of the worker's mobility, has had profound effects on urban population density.

This revolution occasioned by the motorcar has likewise affected land use, the third point to be studied. The freedom and flexibility brought to transportation by the automobile broke up the old pattern of population concentration close to areas of heavy employment. Suburbs, once the zone of the well-to-do, came within reach of most workers. This not only used much more land for dwellings, but, because the new pattern had fewer homes to the acre, public transportation became more expensive to operate.

In the same vein, the automobile affected freight movement and shopping habits. Trucks became important in freight handling, particularly for short hauls, and ease of truck movement became a factor in location of industrial activities. Shopping centers with great parking spaces sprang up around the city's perimeter, eventually challenging the traditional downtown shopping districts.

In any inventory of transportation facilities, not only must the number of automobiles be taken into account, but also the freedom with which they may be used. Are existing routes congested? Do they travel in the direction of heaviest demand, or is the congestion made worse because drivers must use circuitous routes? Are more freeways and expressways needed? Are existing streets controlled to handle traffic efficiently to full capacity?

What public transportation systems are present? Are they well managed? Is use increasing or declining? If increasing, will increased income mean better service which in turn will affect private vehicle use patterns? If decreasing, can the opposite effect be expected?

Subject (5), travel patterns, requires both roadside interviews and home interviews. This means literally a study of all trips made by a selected

Prior to being allowed to go out and meet the public, interviewers get stiff training course in work they are to do.

study group, broken down into truck trips, taxi trips, auto driver trips, work trips, and any other category of value for analysis.

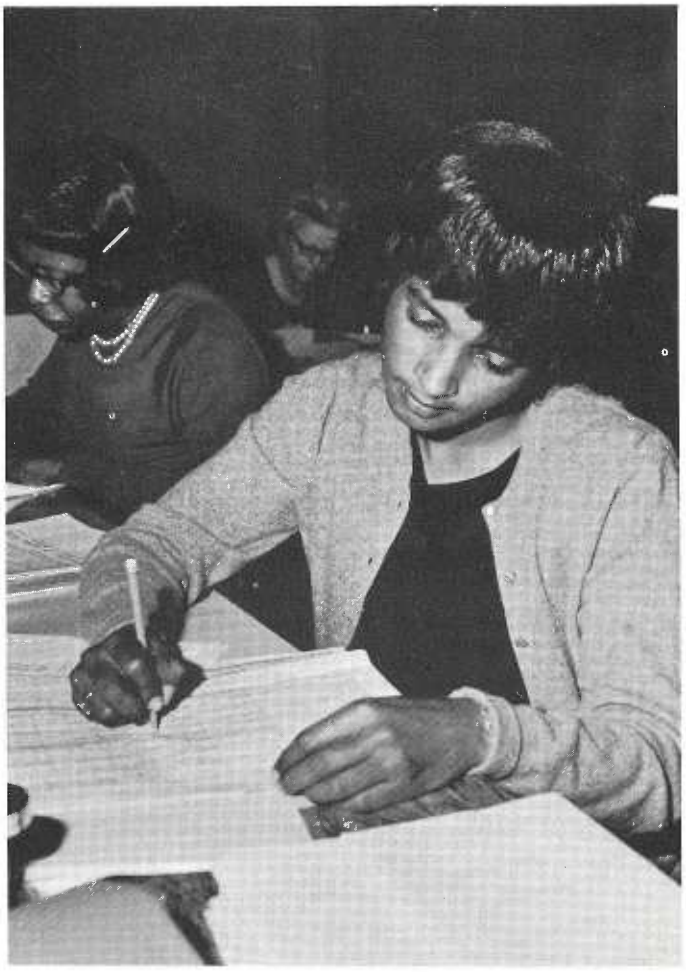
Subjects 6 through 9 are self-explanatory. They all pertain to those things in the community which might hinder or help the development of the community, or, more important, its development in one direction rather than another.

Subject (10), social and community value factors, is a difficult one in that much of it is concerned with material of a more or less intangible nature. Existing environmental factors such as parks, open space, and recreational facilities must be considered, as well as space for the provision of such additional features of this type as might be needed in future years. Preservation of historical sites and buildings also should be included in this part of the study.

Careful consideration must be given to the existence of ethnic group districts, school, fire, park, and other special districts, and all the special governmental and local divisions which might have been created. Improvements in traffic facilities must be made with as little damage as possible to such districts and facilities.

It is obvious that the job of planning improvements in our current urban patterns, be they to provide water, electricity, or transportation, is a difficult and complex problem. In planning improvements to transportation, the origin and destination study has proven the best guide yet devised to provide information on present and future needs.

TOP PHOTO—Heart of study is computer which takes information, organizes it, stores it for future availability, also makes it currently available in usable forms. BOTTOM PHOTO—Although computer does much of organization of material, considerable clerical work is necessary to code information for machines.



BY VERNE L. DAVIS
AND HOWARD CARTER

MERCED CITY-COUNTY JOB

Cooperation among several public agencies has resulted in removal of critical street deficiencies in and north of the City of Merced. Federal, state, county and city governments joined forces and funds to improve G Street and Santa Fe Drive between 27th Street in Merced and Route 59 northwest of the city. Both streets were transformed from highly congested two-lane roadways into four-lane, divided major arterials which will serve the rapidly growing Merced area for many years to come.

G Street is an important connector route for the city to many nearby recreational areas for picnicking, golfing, hunting and water sports. Merced High School and Merced Junior College both are located next to Santa Fe Drive, which also carries traffic to Castle Air Force Base, a large Strategic Air Command facility seven miles from Merced.

The project also included construction of a new bridge across Bear Creek.

Enough right-of-way was acquired so that the project can be widened to six lanes should the future traffic load require it.

The county portion of the $400,000 job was constructed and financed under the federal aid secondary highway program, the city portion under the FAS urban extension program.

NEW AND OLD. Photo above—the new, four-lane, divided section of Santa Fe Drive from above G Street and looking west. El Capitan High School is to the right. A portion of Merced is visible left background. Photo right—the old, two-lane highway looking from approximately the same spot as the photo above.

Much of the new freeway is through an area that will be developed as a green belt of parks, picnic areas and riding and hiking trails.

STEVENS CREEK FREEWAY

BY ROBERT N. KELLER

A good part of the new freeway lies along Stevens Creek. This aerial photo looking north toward Moffett Field was taken above the El Camino Real interchange. City of Mountain View is to the left.

The Stevens Creek Freeway (Route 85) is a new and interesting highway through the mushrooming Santa Clara Valley. It starts at the Bayshore Freeway near Moffett Field and ends at Route 280, bypassing the downtown sections of Mountain View, Sunnyvale and Cupertino, yet serving them by five strategically located interchanges.

It also takes traffic bound for Santa Cruz around central San Jose and on to Route 17 southwest of the city.

The new freeway, which cost $6,500,000 and took two years to build, follows Stevens Creek through a belt of woodland and parkland being preserved and developed as part of Santa Clara County's Stevens Creek park chain.

The park chain will have hiking and riding trails and picnic areas, and together with the freeway landscaping (already budgeted) will establish a green-belt oasis across the northern end of Santa Clara County.

The existing woodland along the creek is still the home of many quail, pheasants, rabbits and squirrels, and some opossums and raccoons.

Special attention was given during freeway construction and installation of drainage facilities to preserve natural trees and shrubbery.

The Noise Listeners

BY CHARLES F. GUSTAFSON

PHOTO RIGHT—Karl S. Parsons, research engineer, checks the signal which tells his audience to "listen." PHOTO BELOW—In a natural cut, the diesel's roar echoes back from every hill.

Motorists driving the Ridge Route north of Los Angeles on a recent afternoon had a captive audience. As trucks, buses and passenger cars ground and thundered up the 3-percent grade, a group of about 40 persons seated within 10 yards of and facing the roaring expressway, intently listened to the highway sounds.

A microphone just off the highway edge fed the tape recorder spinning nearby, recording for latter comparison playback, and the "audience" punched its cards, judging the sound level each vehicle achieved in a range from "very quiet" to "very noisy."

The tests continued through the afternoon on both sides of Route 99, with frequent breaks intended to keep collective judgments fresh and uniform. It is hoped analysis of the results will determine average tolerance, both psychological and physical, to a variety of typical community noises, of which traffic noise is only one.

The noise judgment tests were conducted by Bolt, Beranek & Newman, Inc., acoustical research engineers of Van Nuys, as part of a study for the Federal Aviation Agency on community noises. The total survey, which included similar "listening" sessions the same week at both the Van Nuys and International Airports in Los Angeles, is intended to evaluate the average person's sensitivity to noises from sources such as trucks, automobiles, and aircraft.

The 40 "subjects" included college students and adults from the vicinity of International Airport, preconditioned to flyover sound levels. Prior to the formal tests, the hearing of each subject had been calibrated in an echoless chamber at predetermined sound levels. Variations in individual hearing ability are compensated for in the final computer analysis of the punch cards.

The engineer in charge of the tests was K. S. Pearsons, M.I.T. electrical engineering graduate and a specialist in psycho-acoustic research. He was assisted by other engineers on the research firm's staff.

Newton H. Templin
1904–1966

Newton H. Templin, road commissioner for the County of Los Angeles, died suddenly of a heart attack on May 8 in Pasadena.

He had administered the extensive Los Angeles County highway program since 1959.

It has been said of Templin that perhaps no man in the history of the road department has contributed as much to its growth and development. He was a strong advocate of close cooperation among city, county and state governments in the planning and construction of highways. At the time of his death he was the member of several national and regional committees on highway and land utilization problems.

He was a member of three committees of the National Association of County Engineers, including chairmanship of the Committee of Finance, past president of the southern California chapter of the American Public Works Association, and vice president of the County Engineers Association of California.

He was also chairman of the Joint City-State-County Cooperative Committee of the Metropolitan Transportation Engineering Board and chairman of the Highway Advisory Committee of the County Supervisors Association of California.

His other affiliations and memberships included the Committee on Los Angeles County Beautification, California for Modern Highways, Citizens Economy and Efficiency Committee, Institute of Transportation and Traffic Engineering Advisory Committee, Los Angeles Regional Transportation Study and Los Angeles County Watershed Commission.

Mr. Templin was a native of Los Angeles and a graduate of the California Institute of Technology. He joined the Los Angeles County Road Department shortly after his graduation in 1925.

During his career with the county he served as executive head of the department's three largest activities—highway design and construction, highway maintenance, and bridges.

He was appointed successively to the positions of assistant chief deputy road commissioner and chief deputy road commissioner, culminating in his appointment as road commissioner by the board of supervisors on July 1, 1959.

Mr. Templin is survived by his wife, Laura Judith; a son, Charles, of Alhambra; a daughter, Mrs. R. O. M. Phillips, of Woodland Hills; and four grandchildren.

Bylines

STEVENS CREEK FREEWAY. Robert N. Keller, 1, is a native of Burlingame and a graduate of San Jose State College who joined the Division in 1950. Now a highway engineering associate in the San Francisco office, he recently was cited for outstanding design work in the field.

MAD RIVER-BLUE LAKE FREEWAY. Ernest J. Reed, Jr., 2, was born in Arcata and attended Humboldt State College. Now a highway engineering associate in Eureka, Reed joined the Division of Highways in 1946.

AUTOMATIC LANE CONTROL. Vernon H. Waight, 3, is a native of Sacramento and a graduate of the University of California at Berkeley. He joined the division as a part-time employee in 1936 while still a student. Now a senior electrical engineer with the San Francisco office, Waight has served on national committees of the Illuminating Engineering Society and Institute of Traffic Engineers.

GRAND OAKS STUDY. Stuart L Hill, 4, was born in Hollywood and graduated from U.C.L.A., where he also spent two years in graduate study. He is assigned to the Headquarters Right of Way Research and Development Section of the State Division of Highways in Sacramento and is responsible for statewide research on the impact of freeways upon local communities.

Christos Brianas, 9, was born in Greece and came to New England at an early age. He is a graduate of the University of Miami (Florida) and attended University of California graduate school at Berkeley for two years. Prior to joining the division as an economic analyst in 1965, he was a market analyst with a private electric company in Cleveland, Ohio.

CRESTLINE INTERCHANGE. Tek Tanaka, 5, is assistant to the senior highway engineers in the construction department of the State Division of Highways office in San Bernardino. He attended Riverside City College and California State Polytechnic College. He has been with the division for 10 years.

UKIAH TO BOONVILLE. Brian T. Colwell, 6, was born in Sandpoint, Idaho, and attended North Idaho Junior College and the University of Wyoming. He joined the California Division of Highways in 1954 and has been resident engineer in charge of major highway projects in northern California.

LOOK, MA, NO TRAFFIC LIGHTS! and THE NOISE LISTENERS. Charles F. Gustafson, 7, assistant information officer in the division's Los Angeles office, is a native Iowan and graduate of Northwestern Unversity. Before joining the state in 1965, he spent many years as a product and marketing analyst for private corporations.

FREEWAYS ON CANVAS. Eleanor Wood, 8, assistant information officer with the Division in Los Angeles, was born in Cambridge, Massachusetts, and received her B.A. from Syracuse University. She has done both newspaper and magazine writing and before joining the state in 1965 was working on assignment for 63 national business and technical publications.

WALKER CANYON. Earl Rogers, 10, was born in Los Angeles and graduated from U.C.L.A. He was recently promoted to senior highway engineer with the division's Computer Systems Unit in Sacramento. At the time he authored the Walker Pass article he was project design engineer in the San Diego district office.

Authors of MERCED CITY-COUNTY JOB and DERSCH ROAD are city and county officials of the State of California. Verne L. Davis is Road Commissioner of Merced County, Howard M. Carter is Director of Public Works for the City of Merced. Donald D. Chamberlin is Director of Public Works for Shasta County.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