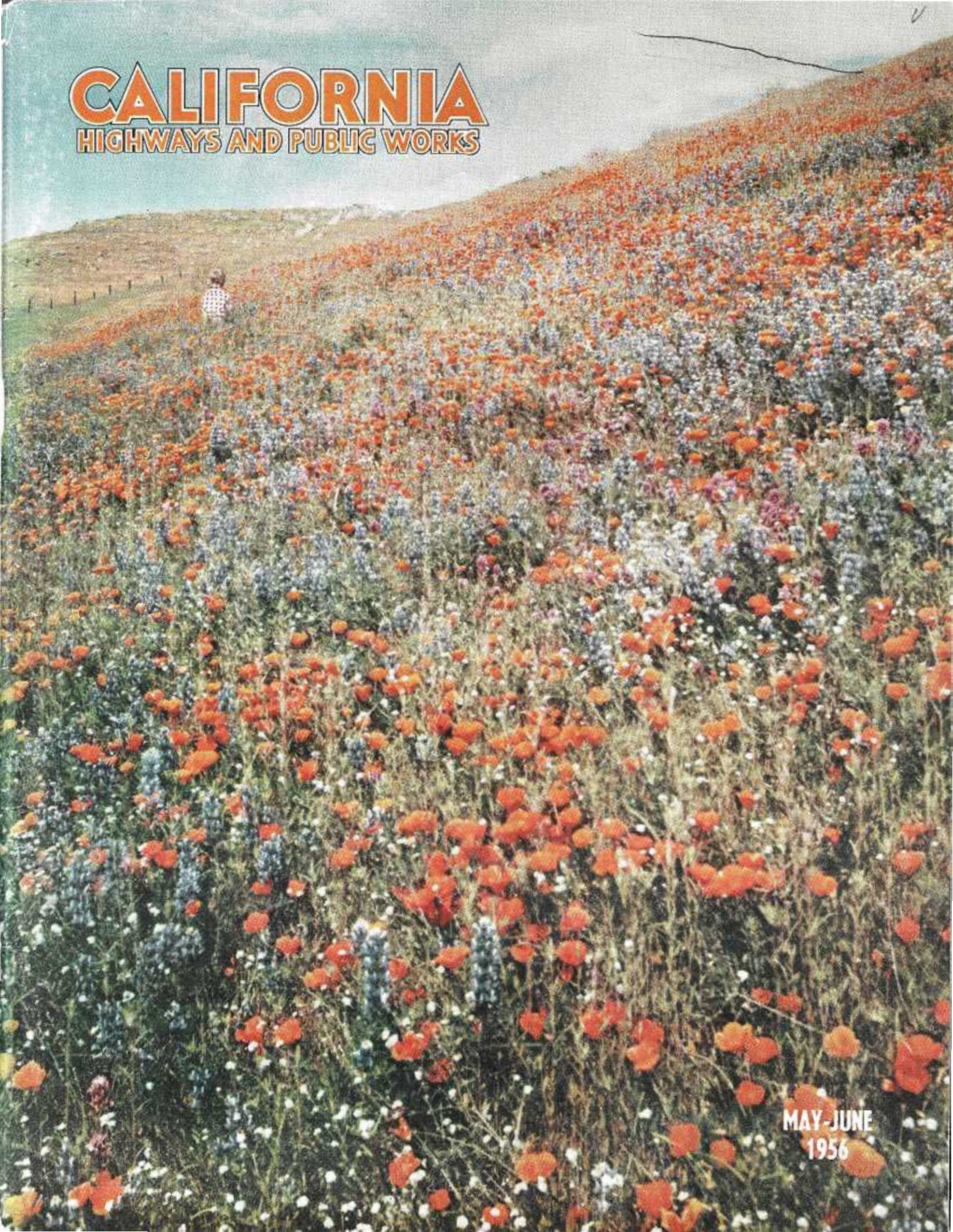
CALIFORNIA
HIGHWAYS AND PUBLIC WORKS



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California Highways and Public Works

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P. O. Box 1499
Sacramento, California

Directions for the Traveler

STATE OF CALIFORNIA · DEPARTMENT OF PUBLIC WORKS · DIVISION OF HIGHWAYS

RECTA VIA DIRECTVM SCIENTIA EST VIA FORTVNAE

Signposts

Directions for the Traveler Are Hundreds of Years Old

By GEORGE M. WEBB, Traffic Engineer

FOR HUNDREDS of years, signposts have guided the traveler on his way, whether a pilgrim traveling on foot or a motorist on an eight-lane freeway.

Ancient traffic signs are described in the 1954-55 winter issue of *Road International*. One relic of the past, nearly 300 years old, is located in England upon the Cotswolds at the intersection of the roads to Gloucester and Worcester. This is believed to be the oldest signpost in Britain. It is carefully preserved by the British highway authorities. Four iron arms point the ways to Worcester, to Oxford, to Warwick, and to Gloucester.

When a traveler wanted to know how far it was to any one of these towns, he consulted the side of the appropriate arm. It is known as the Cross-Hands.

Old milestones are also found in Britain which give distances and directional information to the traveler. The distances are given to towns with only the first letter of the place name. Some of the old milestones carried only the number. The traveler was expected to know where the roads led.

Pioneer Signs on US 50

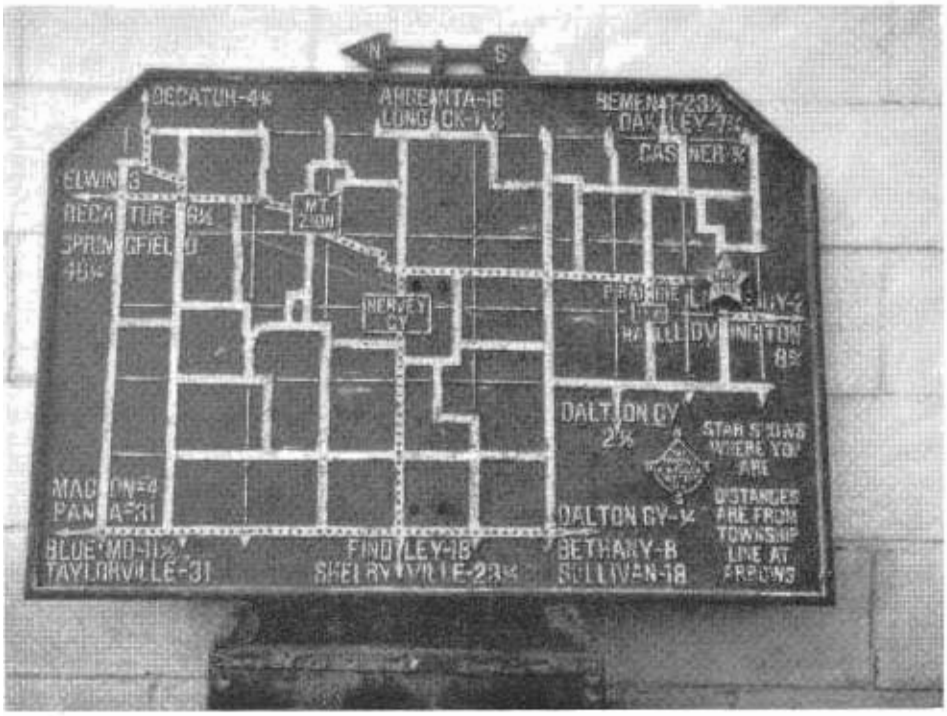
Travelers along modern US 50 between Placerville and Lake Tahoe can still glimpse some of the stone mileposts on which have been engraved the distance easterly from Placerville. In Central Illinois, rural road markers of a generation ago consist of a map cast in iron, with the location of the particular marker indicated by a star. Thus, by careful and leisurely inspection, the traveler could determine his location and his route.

These signs of bygone days would be of little value with present-day speeds and traffic volumes. Today, traffic signs are recognized as an integral part of a modern highway—essential to its operation and to the safe, orderly, and smooth flow of traffic.

This marker on US 50 in El Dorado County shows the distance to Placerville

The Division of Highways continually studies and improves signing techniques to keep pace with the ever-increasing traffic demands and to provide California motorists with superior signing service. Signposting has changed throughout the years along with other highway features, but its purpose to guide the traveler remains the same as in olden times.

Iron "map" served as guide to traveler in early days of motoring in Central Illinois (Photo courtesy of Macon County Road Department)



Auto Increased Travel

When the automobile came into popular use, people traveled farther and faster than ever before. Longer trips over new roads were commonplace, and there were more people using strange roads far from their homes. This increased travel, particularly travel for long distances, created a strong demand for legible signs. As highways and automobiles improved, speeds increased and so did the need for adequate highway signs that could be read from a moving car.

Types of Signs and Uniformity

There are three general types of traffic signs in use today:

1. *Warning* signs to caution drivers of the need for added alertness or reduction in speed;

2. *Regulatory* signs to inform motorists of regulations governing movement;

3. *Guide* signs for guidance and directional information.

Obviously, traffic signs of all types should follow uniform standards and be placed in accordance with uniform practice so they will have the same meaning and require the same action on the part of motorists wherever encountered. State-wide uniformity on county roads, city streets, and state highways minimizes drivers' confusion and contributes materially to the safe, orderly, and expeditious movement of traffic.

National uniformity is likewise important. California follows the general standards of the Manual on Uniform Traffic Control Devices for Streets and Highways approved by the American Association of State Highway Officials, Institute of Traffic Engineers, and the National Committee on Uniform Traffic Laws and Ordinances. State-wide uniformity on county roads and city streets, as well as state highways, is encouraged by membership and active participation in the deliberations of the California Sign Committee, the Engineering Division of the Governor's Traffic Safety Conference, and other professional groups.

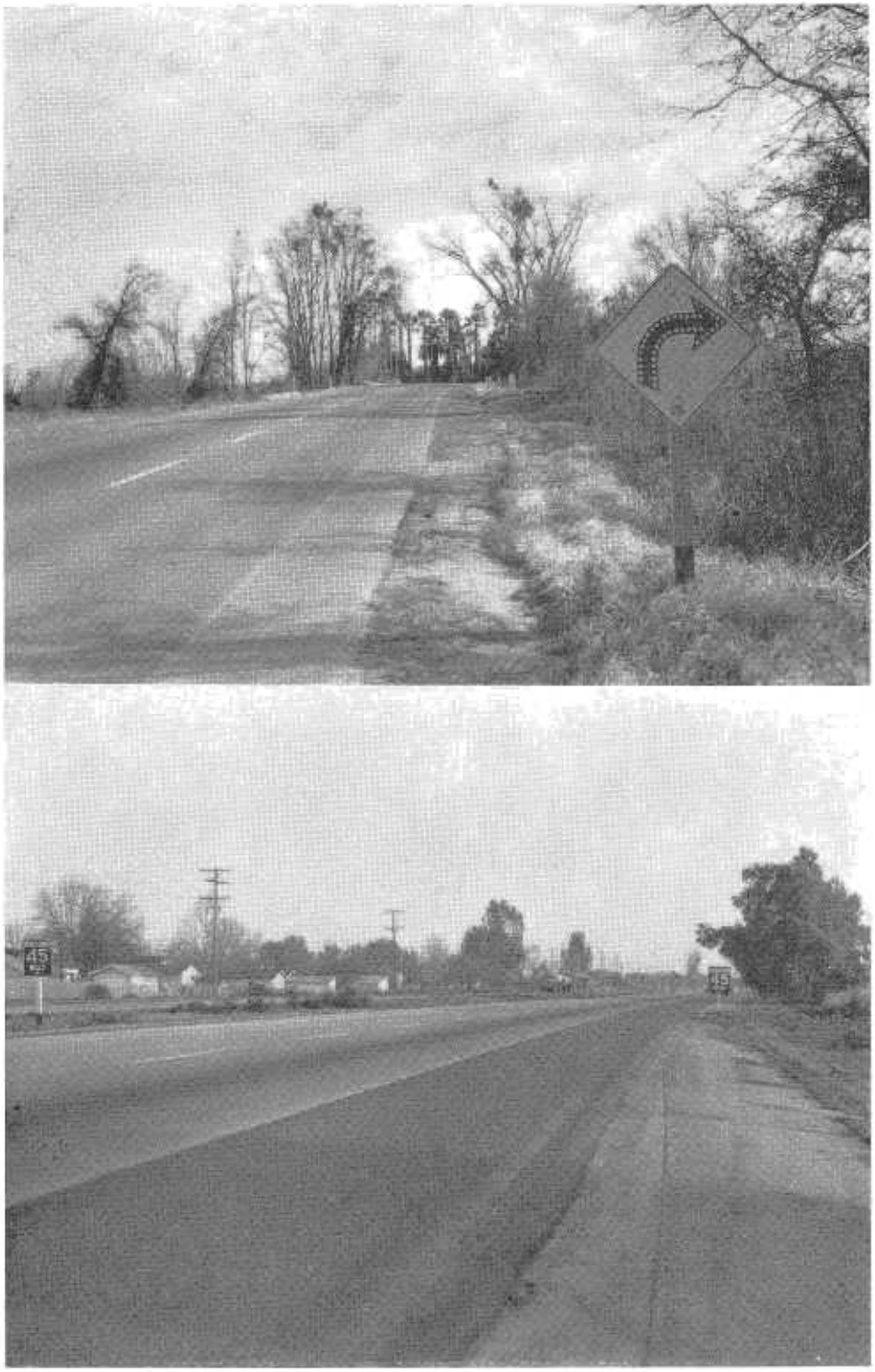
General Rules for Use of Signs

Signs are essential where special regulations apply, where unusual conditions are not self-evident, and to furnish directional information. They should be used wherever there is a real need but not profusely. Too many signs detract from the effectiveness of those necessary for safety and guidance.

Well-known rules of the road or general provisions of the Vehicle Code are not generally required on traffic signs. Drivers are expected to know the rules for safe operation of their vehicles, and a multiplicity of needless signs with long messages would be distracting and serve no useful purpose.

Guide Signs

Except for the foregoing general comments, this discussion is limited to guide signs. The function of guide signs, as the name implies, is to guide motorists along routes and to destinations of their choice, to inform motorists of intersecting routes, to direct to cities or towns, and, to a lesser extent, to furnish information and to identify locations not readily apparent.



UPPER—Diamond-shaped yellow sign indicates a warning; reflectorized arrow specifically warns of curve to right ahead. LOWER—Speed limit signs are most familiar examples of regulatory type sign.

The modern highway with adequate visibility and easy curvature to accommodate all normal driving speeds reduces the need for warning and regulatory signs. However, the increased width and higher speeds, and the necessity for making decisions far

Directional information is purpose of guide signs

in advance of turnoffs or intersections greatly increases the importance of the guide signs. This is particularly true on full freeways. Practically no warning signs are needed on freeways except on ramps and connections at interchanges.

Like the early day traveler, the motorist on present-day conventional highways takes advantage of familiar scenes, landmarks, buildings, and geographical features for information as to his whereabouts and the location of intersections and points where choice of direction is made; but the full freeways, with wider rights of way and no businesses or buildings of any kind fronting directly on the highway, present a sameness which may make identification of location difficult. This further brings out the need for guide signs of adequate legibility placed a considerable distance in advance of turnoffs.

It has been frequently said that directional signs were needed only for the infrequent user or the complete stranger on a highway. This is not true on the modern highway with access completely controlled and no intersections at grade. Even frequent users need signs to identify locations and turnoffs.

State-wide Problem

The extensive highway improvement program now under way in many cases removes traffic from congested business streets. This traffic is diverted to the newly constructed routes, generally freeways, which bypass the main business district. This makes the subject of adequate directional signing of great interest to many communities and areas throughout the State. The state-wide scope of the problem requires that it be treated on a uniform state-wide basis.

The state-wide signing practice of the Division of Highways has evolved through the years in meeting changing conditions, increased traffic, and the growth of communities along the expanding network of state highways.

California Sign Committee

Current state highway signing practice, while it is the responsibility of the Division of Highways, was not developed alone by this division. Much of it stems from the studies and consultations of the California Sign Committee which was organized to promote orderly, safe, and consistent signing throughout the State. Members of the Sign Committee are the State Division of Highways; California State Automobile Association; Automobile Club of Southern California; California Supervisors Association; League of California Cities; and Institute of Transportation and Traffic Engineering of the University of California. The individuals who represent these organizations on the committee are directly concerned with highway signing.

All matters pertaining to type, size, color, positioning, and use of signs are agreed upon after considerable study by this committee, and the several members observe these agreements very closely. Although this organization is advisory only, it has been very effective in securing uniformity on California roads, streets, and highways. Informal meetings of this committee are held as needed, generally several times a year.

Basic Principles and Standard Practice

Certain principles must be followed if signing is to achieve the best results in guidance and safety. One such principle is that the number of place names which can be used effectively on a single sign is distinctly limited. Except under very unusual conditions, the number should not exceed three. Drivers of vehicles moving at present-day speeds are unable to read a long list of place names and directional arrows. Neither can they stop or slow down without hazard to traffic.

A study by the Institute of Transportation and Traffic Engineering of the University of California indicated that the number of drivers' errors in reading signs increases sharply if the number of names on a sign exceeds three. This study also indicated that a dividing line between destinations in opposite directions is of great benefit in reducing drivers' errors in reading signs. As a result, it has now become standard practice of the Division of Highways to use the dividing line be-

This sign once guided travelers in Southern California, but would obviously be impossible to read and digest from a vehicle driving on a modern highway at normal speed

tween destinations on new standard directional signs or replacements.

Reassurance Signs

To reassure motorists that they are on the right road and to tell them how far it is to points along the route, reassurance guide signs are placed facing outbound traffic at the outskirts of cities or towns and just beyond principal highway junctions. These signs generally show (1) the next town, (2) the next county seat, road junction, or important city, and (3) the end of the route. All of the towns named are on the route being traveled. Where the road divides, locations in each direction may be shown, and cities designated as the termini may be alternated on the bottom line of successive signs. Distances are shown to the nearest mile for each destination.

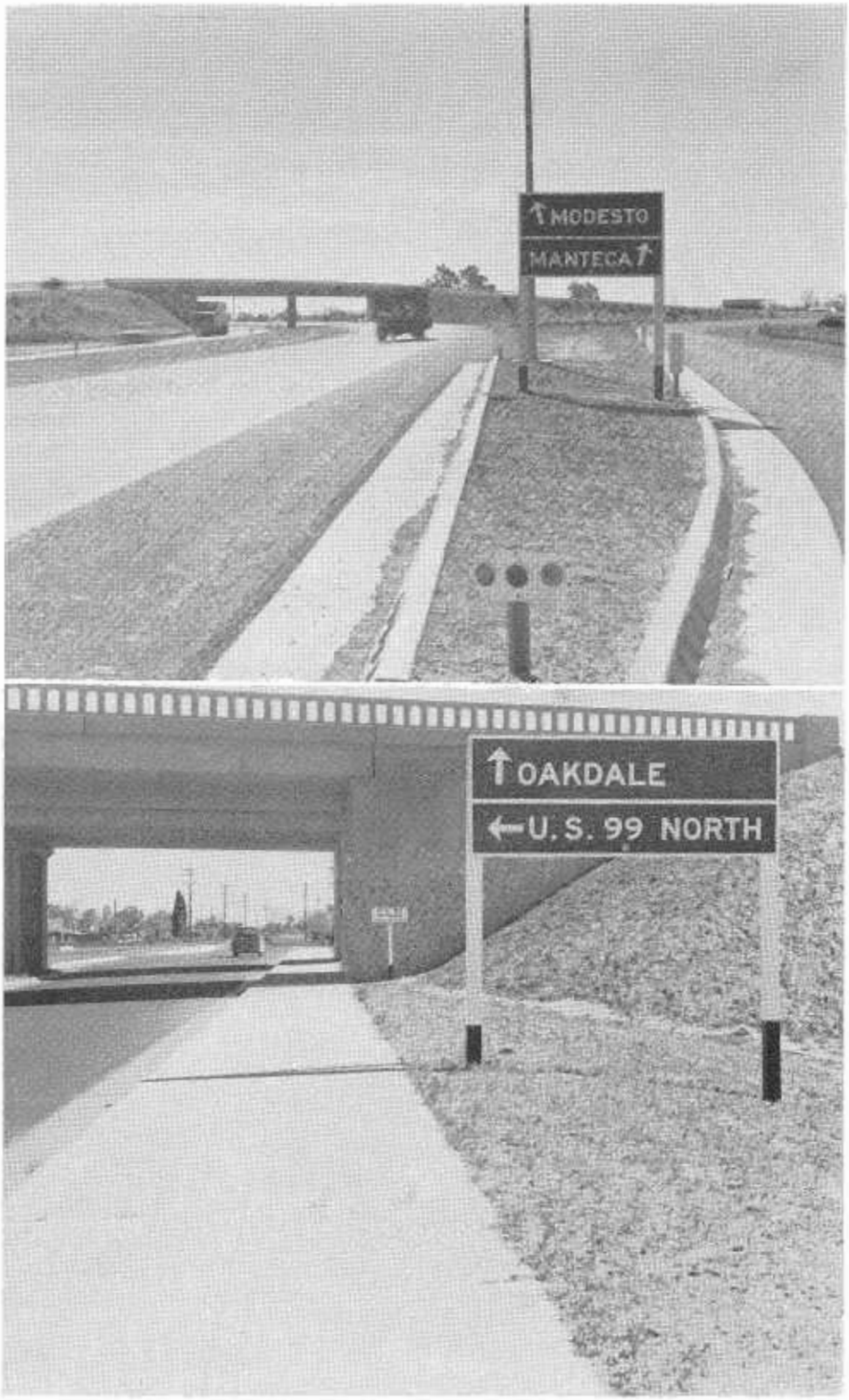
This reassurance sign does not need to be very prominent because it does not call for immediate action by the driver; but it must still be easy to read from a moving vehicle. The standards for this sign on freeways and major highways have recently been improved from plain five-inch letters to reflectorized six-inch letters. This makes for easy reading both day and night at highway speeds.

On high-standard roads, in particular, signs must be both located and proportioned so that motorists may recognize the messages, comprehend the meaning, make decisions, and direct their vehicles into the proper lane without a reduction in speed.

Tip to Freeway Motorists

When driving a freeway for the first time, a motorist should always consult a map to find out which exit will lead to his destination. A single exit in a metropolitan area generally leads to many city streets and destinations. Only the name of the street to which the ramp connects and one place name or route number can be shown on the sign; so the motorist must know the name of the exit where he wants to turn off. In other words, a driver must know in advance where he wants to go if he expects to get there without confusion or mistakes.

The main purpose of highway guide signs is to tell the motorist how to reach his destination by the shortest and most efficient route. Any message on a sign which would tend to influence the motorist's decision or to encourage him to turn off the highway at a particular road or area is not within the scope of proper highway signing.



Newer guide signs include divider between destinations in different directions

State and US Markers

On any route, there are nearly always a great number of possible desti-

nations and connecting highways, and it has been found impracticable to place signs along highways or at turnoffs naming all possibilities. As a statewide practice, it has been found necessary to restrict the naming of locations on a given route to those actually on the route, and, in conformance with findings of the Institute of Transportation and Traffic Engineering, to limit to three the number of destinations on a single sign under all but the most exceptional conditions.

Obviously, it would be impossible to place a sufficient number of signs on the highways to enable a motorist, without knowledge of the general direction or local geography, to find his way merely by looking for place names on traffic signs.

Consequently, as a matter of primary guidance, considerable use is made of state and US highway route markers. Under present-day conditions in California, a motorist unfamiliar with a geographical area needs the assistance of a road map, and road maps are readily available. We believe that most motorists rely upon such assistance and that the route markers in use provide generally adequate directional information.

US Numbered Routes

The importance of a nation-wide system of numbered highways was recognized in the early 20's, and the American Association of State Highway Officials (AASHO) requested the Secretary of Agriculture, under whose offices the Bureau of Public Roads at that time operated, to name a committee for the purpose of formulating a plan or system of numbered highways. The association was asked by the Secretary of Agriculture to develop such a system. This system was developed and officially adopted in 1926. The American Association of State Highway Officials is made up of the 48 State Highway Departments and the Highway Departments of Puerto Rico, Hawaii, and the District of Columbia, and the US Bureau of Public Roads.

The selection of US sign routes and the assignment of numbers is a function of the Executive Committee of AASHO. Over the years, this committee has developed a set of policies

New type reassurance signs are larger and reflectorized for easy nighttime as well as daytime reading

for the purpose of facilitating travel on the main interstate lines over the shortest routes and best roads.

AASHO Policies

In accordance with these policies, it has been the practice of the Division of Highways to request that the best route from a traffic service standpoint be designated as the basic US route. Therefore, when a highway is reconstructed to higher standards on new alignment, either through or around a city or community, this new routing is signed as the basic numbered route.

Included in the established policies of AASHO is the provision that "No additional road shall be added to the US numbered road system, and no existing US road shall be extended except where there is a definite showing of an adequately improved highway carrying an established and necessary line of interstate traffic not otherwise provided for by existing US routes

and for which traffic adequate service cannot be provided by state route numbers.

"Extension of present US numbered routes may be made only when the proposed extension is in the general direction of the present route.

"Proposed extensions shall not be made when, to do so, it is necessary to duplicate US routes already established, unless the duplication is for a short distance and the routes then diverge, ending in different terminal points."

There is obvious need for these well-established policies because designation of inadequate routes not providing the best traffic service would discredit the entire system of US numbered routes. Also, extensive or unwarranted use of alternate or business routes would result in confusion and lack of confidence in numbered routes on the part of motorists.

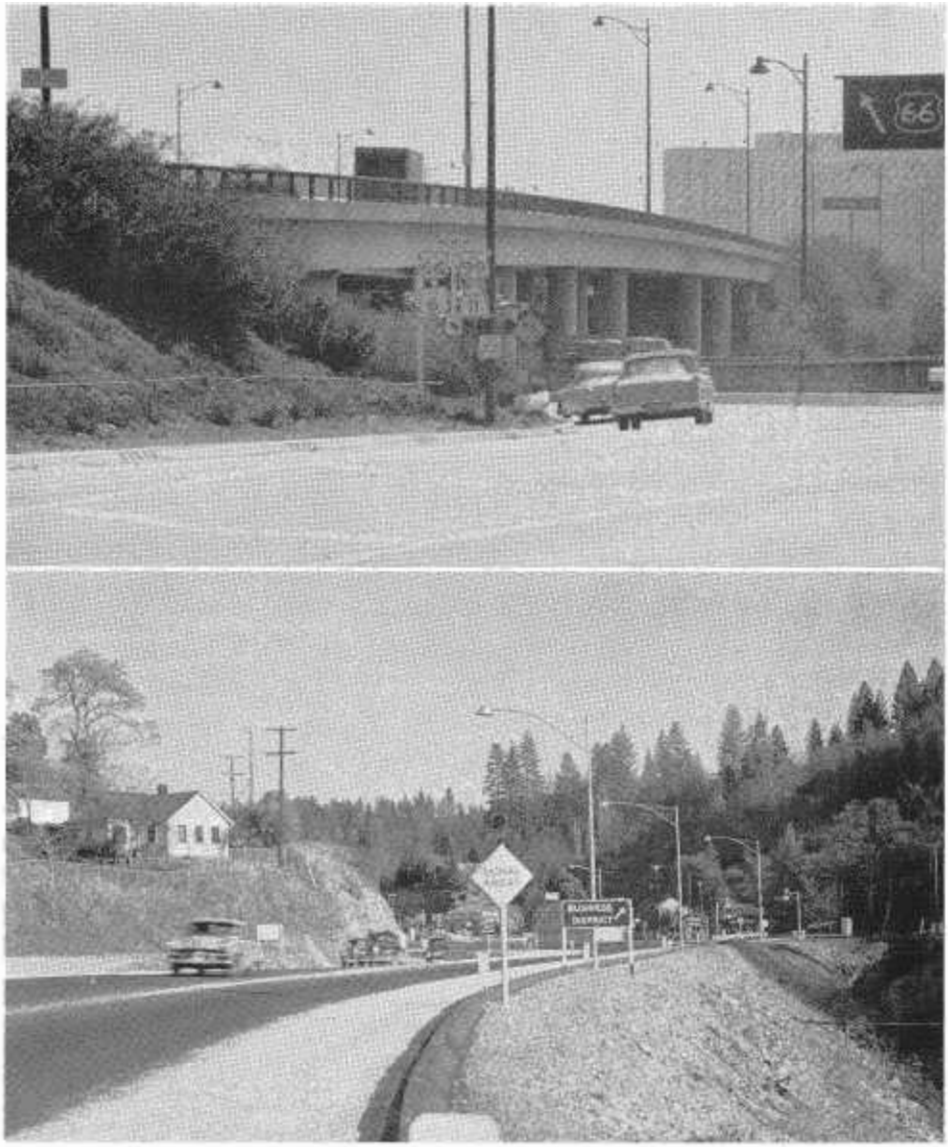
For the sake of uniformity, US sign route policies are also followed in the establishment of California state sign routes insofar as they apply.

The route numbers are used extensively by the makers of road maps. Businesses that cater to the traveler use route numbers to tie in the location of their businesses in their advertising.

Business Districts and Business Routes

With the extension of the freeway system with no businesses fronting directly on the highway, it becomes more and more important to designate to motorists where services normally required by the traveler may be found. On directional signs, this is accomplished by designations such as *central district*, *business district*, *downtown*, or *civic center*, and sometimes the name of a district or area within a city.

It is frequently found desirable to designate a "business" route on a section of former state highway which is relinquished when the community which it serves is bypassed by a new freeway. Proposed business routes must be submitted for approval to AASHO. These business routes are principally within the corporate limits of a city and provide the traveling public with the opportunity to travel through the business section.



UPPER—New type shields to indicate US and state-numbered routes are larger than before. LOWER—Motorists desiring to enter the business district are clearly notified which direction to take.

Business Route

In cases of this type where a business route would be of benefit to the motorist, and local authorities are in accord and agree to place and maintain the necessary signs, it is the division's practice to recommend approval to AASHO. When a business route is approved, all directional signs on the state highway directing to the business route are installed and maintained by the Division of Highways. The remaining signs on the business route are installed and maintained by the city or county.

The use of the business route is a convenient and logical way to direct a stranger so that he can easily find his way to the business section, transact his business, and then proceed to find his way back to the main highway by following the route shields.

The Division of Highways recognizes that the business centers of bypassed communities and along old routes provide needed services to the highway user, and every effort is made to give recognition to these business districts in a manner consistent with the principle of providing the best possible signing for all highway users.

Either overhead illuminated or reflectorized signs are installed where practicable at the connections with the road leading to the business district and the main highway. In addi-

tion, where there are other connections from the freeway to the business district, supplementary signing is also provided.

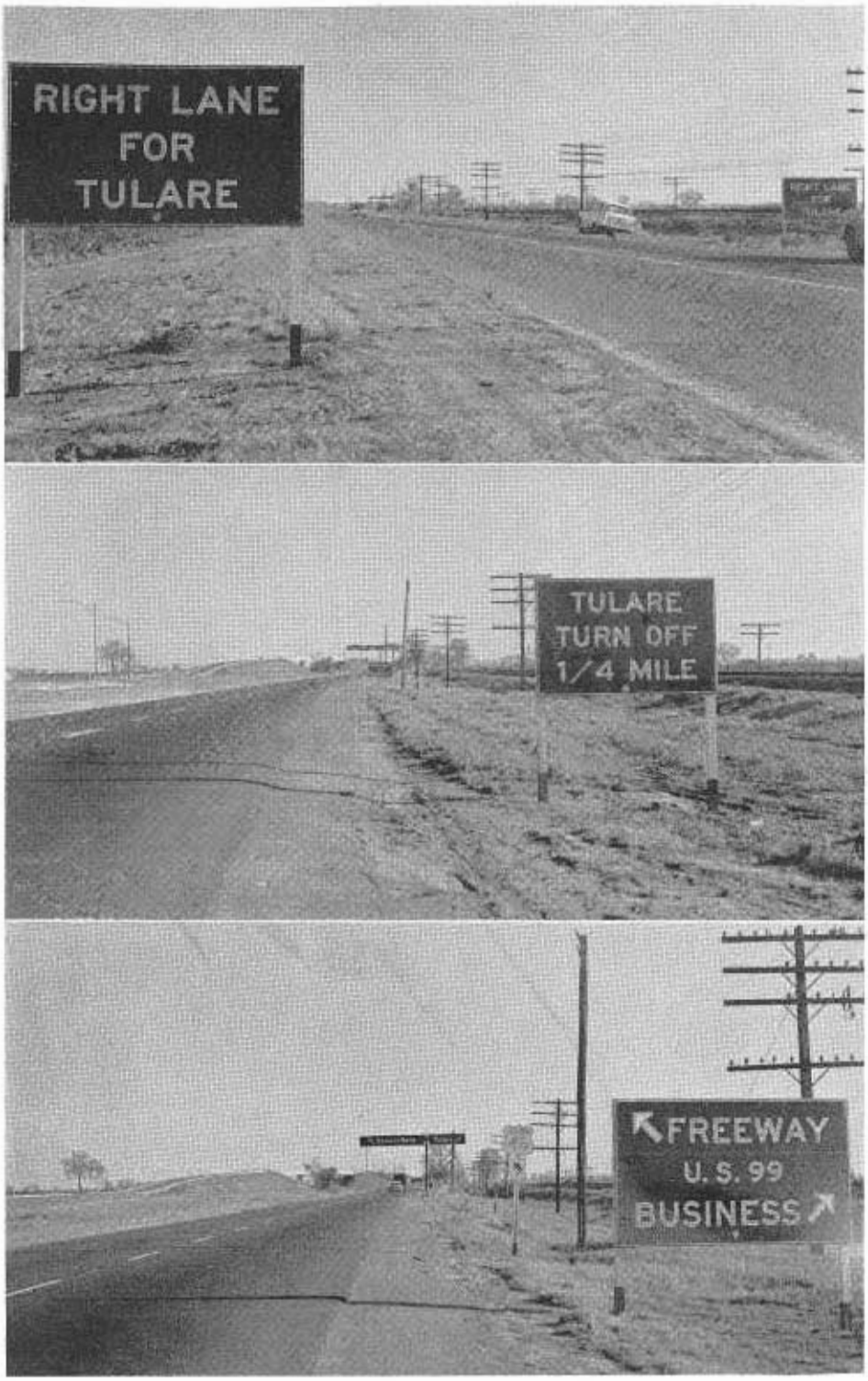
Frontage Roads and Roadside Business

When the construction of a new freeway separates developed property from the existing local road or street system and leaves no suitable connection to the freeway, it is frequently necessary to provide access to the property by construction of a local service road parallel to the freeway. This type of road is designated as a frontage road. In the case of new construction, they are parallel to the freeway. Often the old highway, or portions of the old highway, roughly parallel to the new freeway, will serve as a frontage road. Frontage roads have proven to be advantageous locations for businesses, especially those which provide necessary services for motorists.

The problem of providing adequate directional signs to roadside businesses on frontage roads or on old roads bypassed by construction of freeways developed about 1949. Signs with various wordings were considered, such as *roadside services, roadside business, roadside business area, roadside motels,* etc.

Roadside Business

A sign reading *roadside services* was considered satisfactory for locations where the business on the frontage road consisted of service stations, garages, etc., but would not convey the correct message for sleeping accommodations, restaurants, or roadside stands or other types of business. A sign reading *roadside motels* seemed to be too restricted for many locations. For example, sleeping accommodations might be had in hotels, inns, resorts, tourist cabins, or cottages. A broader term seemed necessary. The word *accommodations* was seriously considered but it was decided it was too long to place on a sign. A sign reading *roadside business* includes all types of services and accommodations and is consistent with our present signing practice of placing *business* signs with route markers to indicate business routes not on the main highway and providing direction to business districts.



Approaching a turnoff from a major rural freeway, the motorist is notified repeatedly of route to follow to by-pass or enter city

In 1951, signing to motel areas was discussed at a conference of the Motor Hotel Association of California. The practice of placing a reflectorized *frontage road* sign in advance of the intersection and a plain sign reading *roadside business* near the intersection was agreed upon.

One of the important factors in the development and use of the sign reading *roadside business* was that the use of a uniform standard sign to desig-

nate these businesses would soon cause it to become known by the public. Motorists, when they recognized such a sign, would know that roadside services were available.

A survey was made by the Division of Highways Right of Way Department on the effect of bypassing roadside business. Operators of motels, restaurants, etc., were contacted and appeared satisfied with the wording of the signs, but expressed concern regarding their placement and visibility. As a result of this survey, the signs are now being placed farther in advance of the intersection and the *roadside business* signs are reflectorized for night visibility.

As a further aid to motorists seeking roadside businesses, the *roadside business* signs are placed in the median as well as on the right shoulder on multi-lane divided highways, where the median is of sufficient width to accommodate the signs. One of the most important factors in the statewide use of uniform standard signs reading *roadside business* is that their continued and consistent use will further increase their effectiveness.

Metropolitan Freeway Signing

It is a long step from the first roads and streets used by automobiles to the present-day six- and eight-lane freeways in the large metropolitan areas. Likewise, it is a long step from the early signing to that which is now required on these freeways which carry a tremendous traffic load.

It is a fact that the signing cannot be separated from the freeway because it is an integral part of it. Adequate signing is essential to completeness and satisfactory operation of the modern freeway. The high volumes carried by this type of facility greatly increase the signing requirements.

For example, volumes which preclude changing lanes at will on the approach to an exit make it necessary to provide much greater advance notice of the turnoff. There was a time when 50 feet in advance of an intersection was adequate. Later, the distance increased progressively to several hundred feet, to one-quarter mile, to one-half mile, and now one mile is considered a desirable distance for the first indication of a turnoff from a metropolitan freeway. This desirable distance is not always obtainable, due to limitations on design and the need for frequent connections to provide proper traffic service in highly developed areas.

Positive indications of the lane to use for different exits are very neces-

These signs for the information of motorists fall into the same category as the signs on the opposite page

sary. Drivers also need to know the approximate distance to the off-ramp they expect to use.

New System of Signing

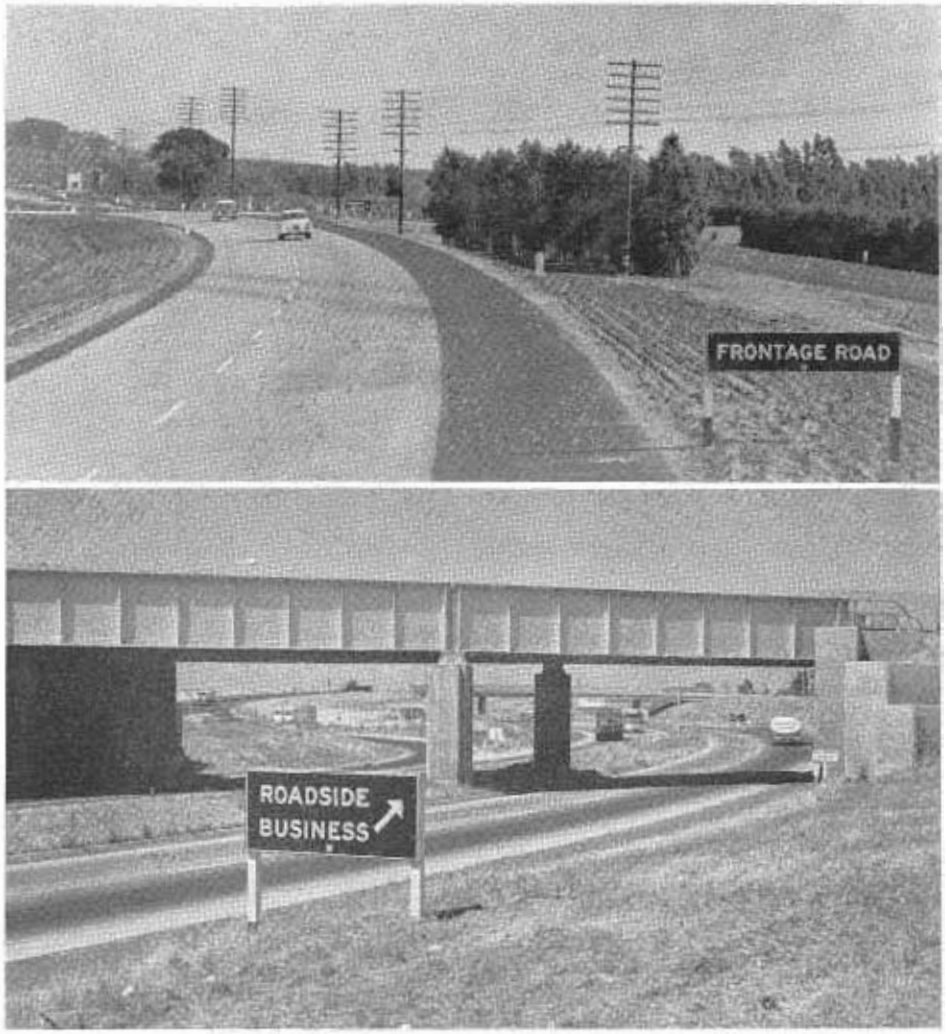
After careful study of this problem by traffic engineers of the Division of Highways, a new system of signing has been devised for metropolitan freeways. The main features of this system of signing are:

1. In order to inform drivers of their general location and the distance to the exit which they are seeking, signs will be placed indicating the next three exits and the distance thereto in miles and tenths. A typical sign of this type is shown in *Figure 1*. These signs will be located as soon as practicable after passing an exit and, of course, would list the next three exits. As soon as an exit was passed, its name would be dropped from the top line and the second line would move up to the top position. A new exit name and distance would then be added on the bottom. The names for the exits would be street names, road names, route numbers, or any other name which best fits local conditions. These signs will be frequent reminders to motorists so that they will be prepared to turn off when they reach the exit that will take them to their destination.

Overhead Illuminated Signs

2. Overhead illuminated signs will be placed at exits in the gore; that is, in the triangular area between the turnoff and the main freeway lanes. These signs will carry the name of the off-ramp, positioned directly over the off-ramp with a vertical arrow pointing downward to the approximate center of the ramp. The other side of the sign will normally be over the outside freeway lane, and will carry the name of the next exit ahead, with an arrow pointing downward to the approximate center of the outside lane. This will give motorists the greatest possible advance notice of the proper lane to use for an exit without overlapping the preceding turnoff. *Figure 2*.

3. At intermediate locations between exits, sign bridges may be erected to carry the name of the next exit and other directional information for the guidance of motorists. With this system of signing, the names of all major exits will be indicated generally three times on overhead illuminated signs. *Figure 3*. It is a well-known facts that drivers, through inattention or distraction, frequently pass even a prominently-placed sign without comprehending it. The repetition of the exit names and lane indications should reduce this problem to the minimum. *Figure 4*.



UPPER—"Frontage Road" sign is motorist's first indication of roadside business area ahead. LOWER—"Roadside Business" sign notifies traveler of where he may leave freeway to obtain desired services.

Highway designs, including signing, are continually being improved. It is not economical or practical to go back and revise all previous designs and installations whenever a new and better way of signing is developed. Consequently, the new signing described herein is, for the most part, only on the drawing boards, and will be seen only on new projects and at locations where the need is most urgent for this improved type of signing.

California has taken the lead in developing overhead illuminated freeway signs and rates high nationally in the field of traffic control. Uniformity, so vitally necessary for effective signing, is obtained by an up-to-date looseleaf manual setting forth uniform standards and policies for signs and other traffic control devices used on state highways. Uniformity and adequacy of signing on California county roads and city streets is, with a few exceptions, very good, largely through the activities of the California Sign Committee.

The driver must not be left out of the picture. The best signs in the world are no positive assurance that

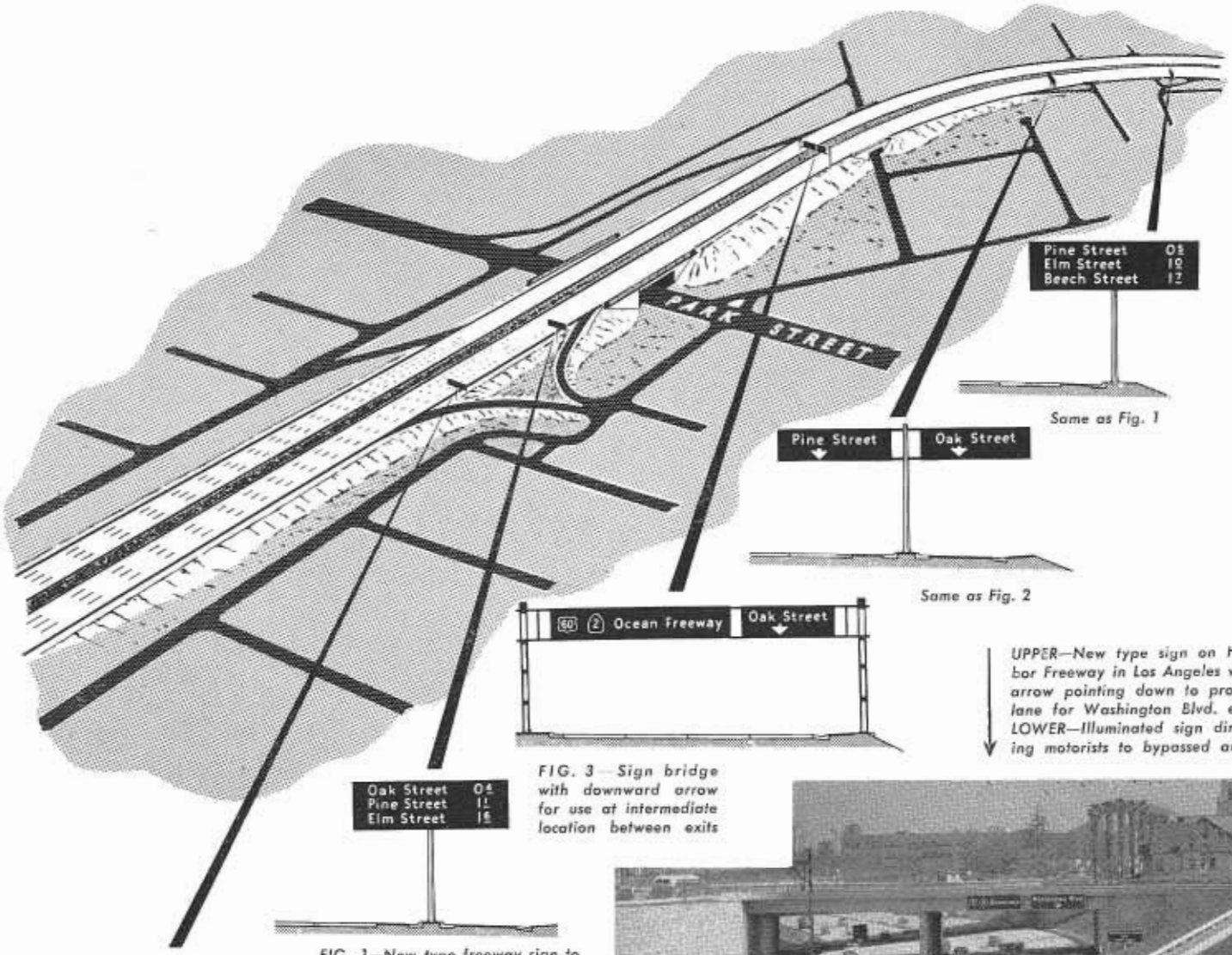


FIG. 1—New type freeway sign to inform drivers of their general location and the distance to the next three exits

FIG. 2—Overhead gore sign with downward arrows indicates proper lane to use

FIG. 3—Sign bridge with downward arrow for use at intermediate location between exits

UPPER—New type sign on Harbor Freeway in Los Angeles with arrow pointing down to proper lane for Washington Blvd. exit. LOWER—Illuminated sign directing motorists to bypassed area.

a few drivers won't make mistakes or take a wrong turn occasionally. Drivers must take their share of the responsibility. They should study a map when using a highway or a metropolitan freeway for the first time so they will know what routes to follow and where to turn off to reach their destination, and above all be alert and courteous, and follow the rules of the road at all times. Careful, competent driving, combined with safe highways and adequate traffic signs, will surely contribute substantially to smooth, orderly traffic flow.

First Highway Tunnel

Don Francisco Sánchez Bored It in 1800's

By E. D. DREW, Associate Engineer Geologist, Materials and Research Department

WHAT IS probably the oldest highway tunnel in California is located near Sign Route 1 about six miles south of San Francisco at Mussel Rock, just a few hundred feet from where the famous San Andreas Fault meets the ocean.

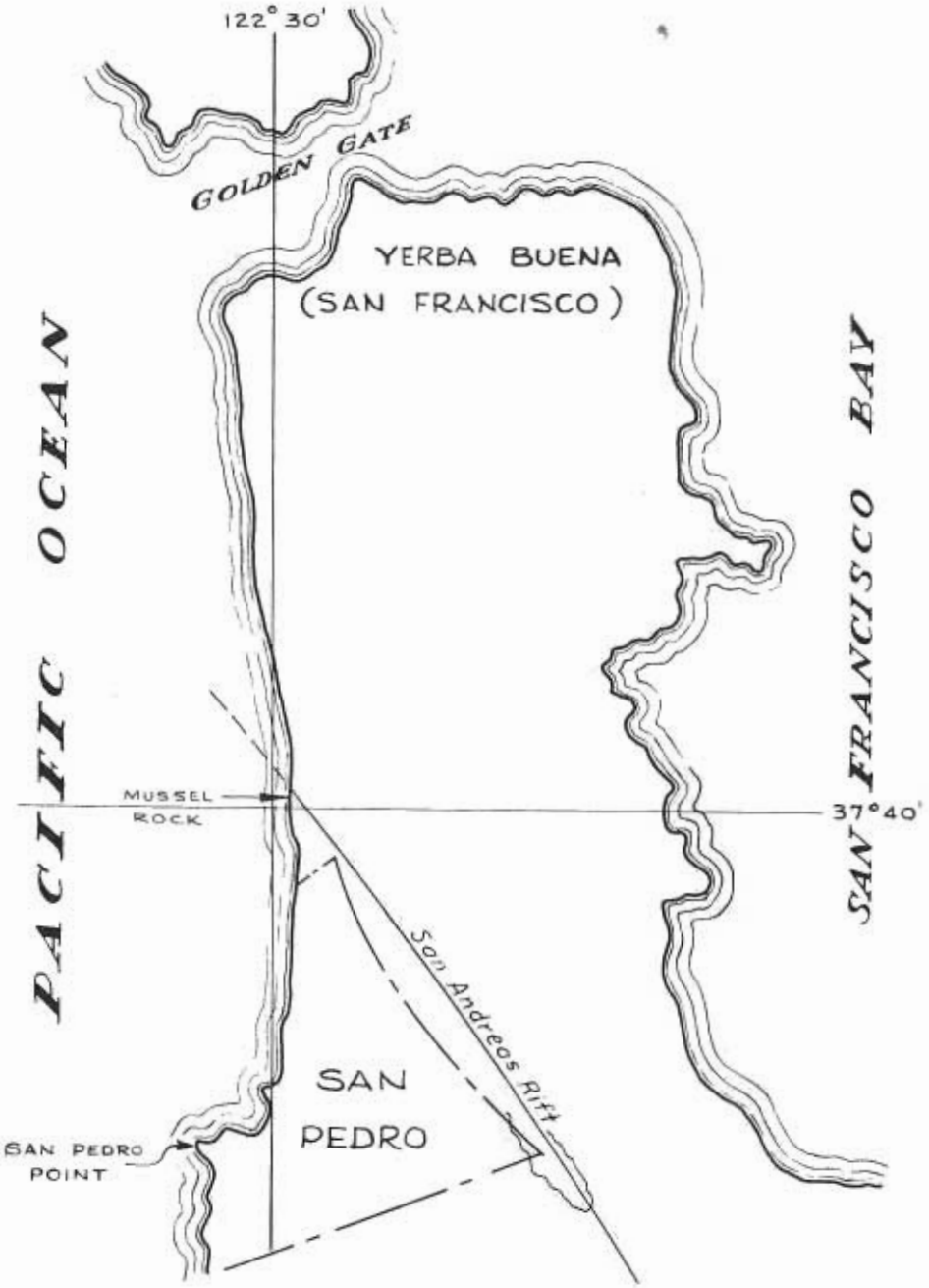
The writer first noticed the tunnel several years ago while engaged in a geological survey of the area. At first it appeared to be one of the natural arches or sea caves frequently seen along the coast. Upon closer examination at low tide, chisel and pick marks were found on the walls of the tunnel. There is also evidence of a crude cut and grade just beyond the north end of the tunnel.

By glancing at a topographic map or air photo it will be seen that an almost unbroken beach strand extends from Laguna Salada to a point near the Cliff House in San Francisco. The point of interruption is at Mussel Rock where for a short distance the beach is blocked by a high rock cliff.

History of Tunnel

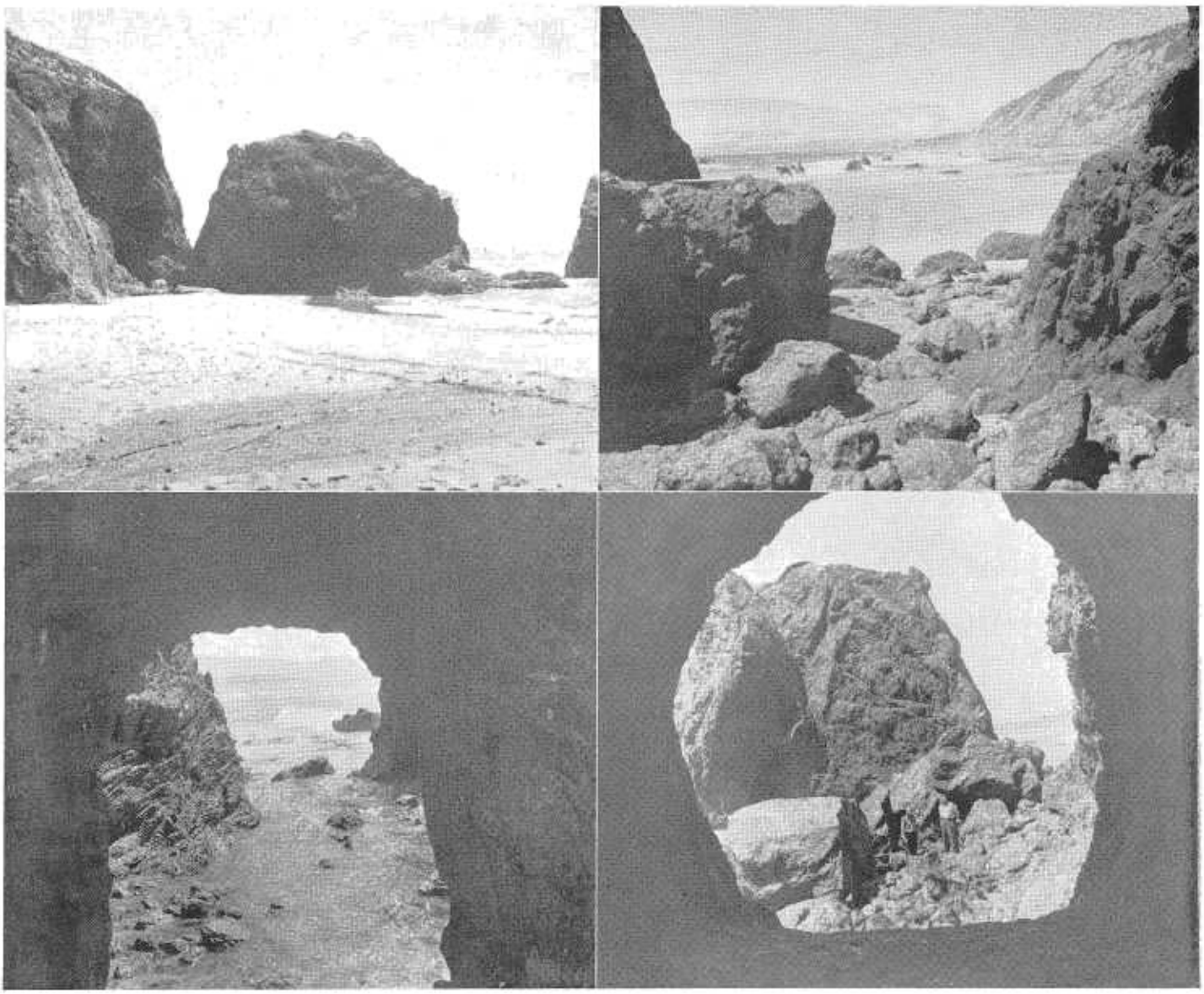
In order to obtain some history of the tunnel, inquires were made of old-timers who were all in accord that the tunnel had been built many years ago by one of the California dons, probably Don Francisco Sánchez.

Don Francisco Sánchez, one of the early Californians, was at one time the hacendado of the Rancho San Pedro, consisting of 8,926.46 acres granted to him on January 26, 1839. It was from Montara Mountain, later a part of Rancho San Pedro, on October 28, 1769, that Sergeant José Ortega, under command of Gaspar de Portolá, first caught a glimpse of the northern coast and San Francisco Bay. Portolá at this time overlooked the significance of the discovery and recorded, "I saw nothing." Fr. Crespi, the spiritual guardian of the party, reported in his diary, "It is a very large and fine harbor. All his majesty's and Europe's navies could be sheltered here."



INDEX MAP SHOWING
LOCATION OF MUSSEL ROCK,
RANCHO SAN PEDRO AND YERBA BUENA.

The rancho is mentioned as early as March, 1793, when a Captain Brown of H. M. Navy stopped for a short



Four views of ancient tunnel and cut through Mussel Rock below Sign Route 1 in San Mateo County

visit, anchoring at nearby San Pedro Point. According to legend, the original Sánchez home was constructed in 1817. The material used was obtained from a wrecked Spanish ship driven on to the beach at San Pedro Point. Several very old anchors can be seen today at the point.

In their book, "The Spanish and Mexican Adobe and Other Buildings in the Nine San Francisco Bay Counties 1776 to About 1850," G. W. Hendry and J. N. Bowman say:

"The Sánchez Adobe Dwelling stands on the north side of San Pedro Creek and on the south side of the road about one mile east from the new coast highway; it is in the lower San Pedro Valley.

"It is not marked on the diseño of 1839 but is found on several surveys of the '50's and '60's, and labeled 'Francisco Sánchez Old Adobe.' Sánchez had earlier, in 1834, applied for a grant in this area but had been denied a grant because the land was occupied by Indians; before this grant was finally made he had occupied the land. His brother José de la Cruz Sánchez testified in the land case that he had a house on the land about 1837 or 1838 and was living in it before the date of the grant; General Vallejo testified to the same facts; but no statement was made as to the building material. At this time and in this place it may be inferred that it was of adobe and nothing has been found to indicate that this early adobe was not the one that is now standing. There is a local legend that a house was built there late in the preceding century and that it had been reconstructed in 1817 and that the present dwelling was erected in 1842; but nothing of a documentary nature has been found as to these stories.

"It is possible that he built a palizada house about 1837 and an adobe soon after the grant in 1839, but no evidence has been found as to that fact.

. . . Continued on page 52

Fourth Street Project

Traffic Barrier in Los Angeles Removed

By LYALL A. PARDEE, City Engineer, City of Los Angeles

UPON THE COMPLETION of the Fourth Street open cut and elevated extensions to the Harbor Freeway project on May 1, 1956, the City of Los Angeles gained a sorely needed traffic artery through the Bunker Hill area which has been a barrier to the downtown business district of the City of Los Angeles for many years.

Celebrating the completion of this important cooperative project a ribbon-cutting ceremony was held starting at 10 a.m. on May 1 under the sponsorship of the Los Angeles City Downtown Business Men's Association. The colorful ceremony was culminated in a trial run being made over the new highway by soapbox derby contestants. The principal address of the day was made by Mayor Poulson of the City of Los Angeles who, in the course of his remarks, said, "This is an example of teamwork by many groups and individuals, including the members of the city council, the staffs of the Bureau of Engineering and the Traffic Department, and the businessmen of the downtown area."

Bunker Hill Area

Roughly, the area between Temple Street on the north, Fifth Street on the south, Hill Street on the east and Flower Street on the west constitutes what is known as the Bunker Hill area, a steep hill just west of most of the downtown Los Angeles business district and Civic Center area. The only access through the hill, traffic wise, was via the Second and Third Street Tunnels or via First Street which crossed the hill on ascending and descending grades of over 11 percent. The Third Street Tunnel, however, is only a narrow two-lane tunnel and in handling two-way traffic has been the cause of tremendous traffic congestion for all vehicles going either to or from the business district.

One-way Streets

One of the prime factors in the Fourth Street project was to alleviate this congested traffic situation in the Third Street Tunnel. With the opening of the Fourth Street project, Fourth Street has been made a one-way street eastbound from Boylston Street to the juncture with Fourth Place, about 1,000 feet east of Alameda Street. At the same time, Third Street has been designated a one-way street westbound between Alameda Street and Boylston Street, thus improving the one-way traffic flow in Third Street at least 50 percent through the narrow tunnel and adding Fourth Street as an entirely new eastbound through traffic artery.

E. T. Telford, Assistant State Highway Engineer

In order to accomplish the opening of Fourth Street as a through traffic artery it was necessary to acquire and improve a new street easterly from Third Street at Boylston Street to Beaudry Avenue at Fourth Street. Two roadways were constructed from Beaudry Avenue easterly, the southerly roadway replacing the existing Fourth Street as a local street between Beaudry Avenue and Figueroa Street. The northerly roadway was constructed to receive the off ramps from both the northbound and southbound roadways of the Harbor Freeway and to connect these ramps as well as Fourth Street with the present Fourth Street project about 425 feet west of Figueroa Street. All of this work was built with the Harbor Freeway.

Passes Through Bunker Hill

The present Fourth Street project as now completed extends easterly from the work described above. It begins with a viaduct approximately 687 feet in length spanning Figueroa Street and Flower Street on a 1 percent ascending grade. The viaduct terminates at the bluff about 100 feet east of Flower Street where the roadway then passes into an open cut passing through Bunker Hill. This cut rises easterly on a 4.5 percent grade and makes transition by means of a long vertical curve to an 8 percent descending grade which meets the existing elevation of Olive Street and Fourth Street. The through roadway just described provides a four-lane roadway 44 feet wide across the viaduct and through the cut to Grand Avenue. At this point the roadway is widened one lane on the south side to permit the efficient handling of the large number of automobiles desiring to make right turns at Olive Street.

Between Olive Street and Hill Street the existing roadway, 40 feet wide, was widened to 49 feet, which is as much as it was possible to obtain within the present street right of way. Due to large buildings adjoining Fourth Street in this block, the cost of widening would have been prohibitive. This will also make available an additional lane for right turning traffic at Hill Street which is the terminus of this project. To provide for proper access between the portions of Bunker Hill north and south of the cut, bridges were constructed at Grand Avenue and at Hope Street.

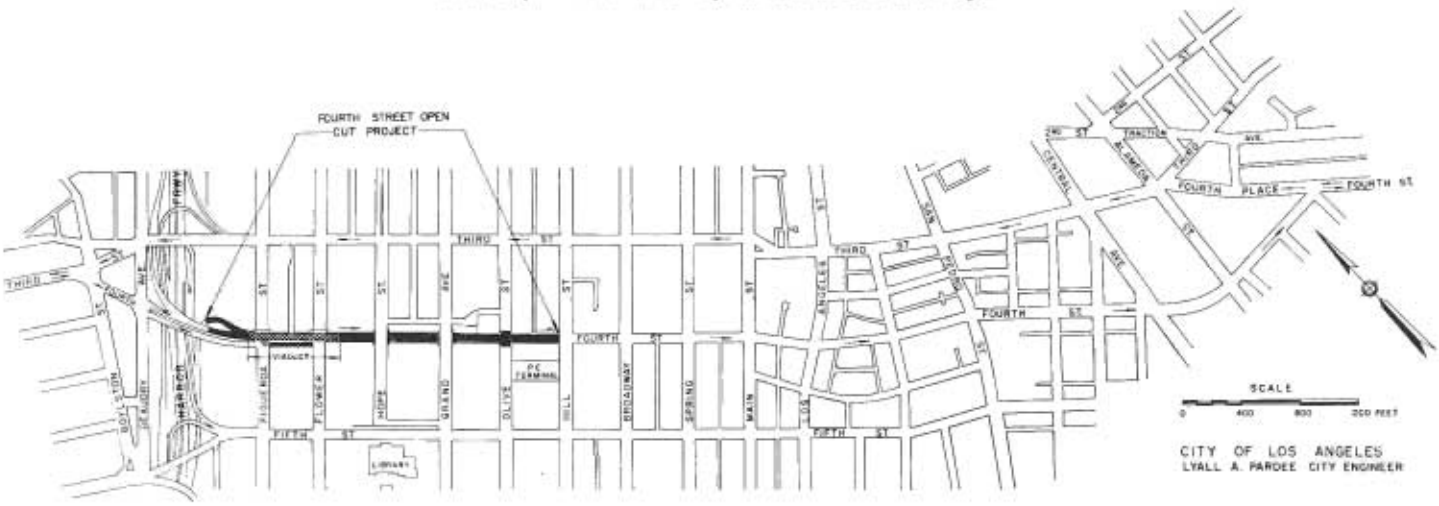
Looking easterly from intersection of Fourth Street and Beaudry Avenue, showing in background downtown Los Angeles business area and in foreground, right, one-way ramp over Harbor Freeway leading to Figueroa Street; in foreground, left, the roadway for eastbound Fourth Street traffic over Harbor Freeway, Figueroa Street, and Flower Street.

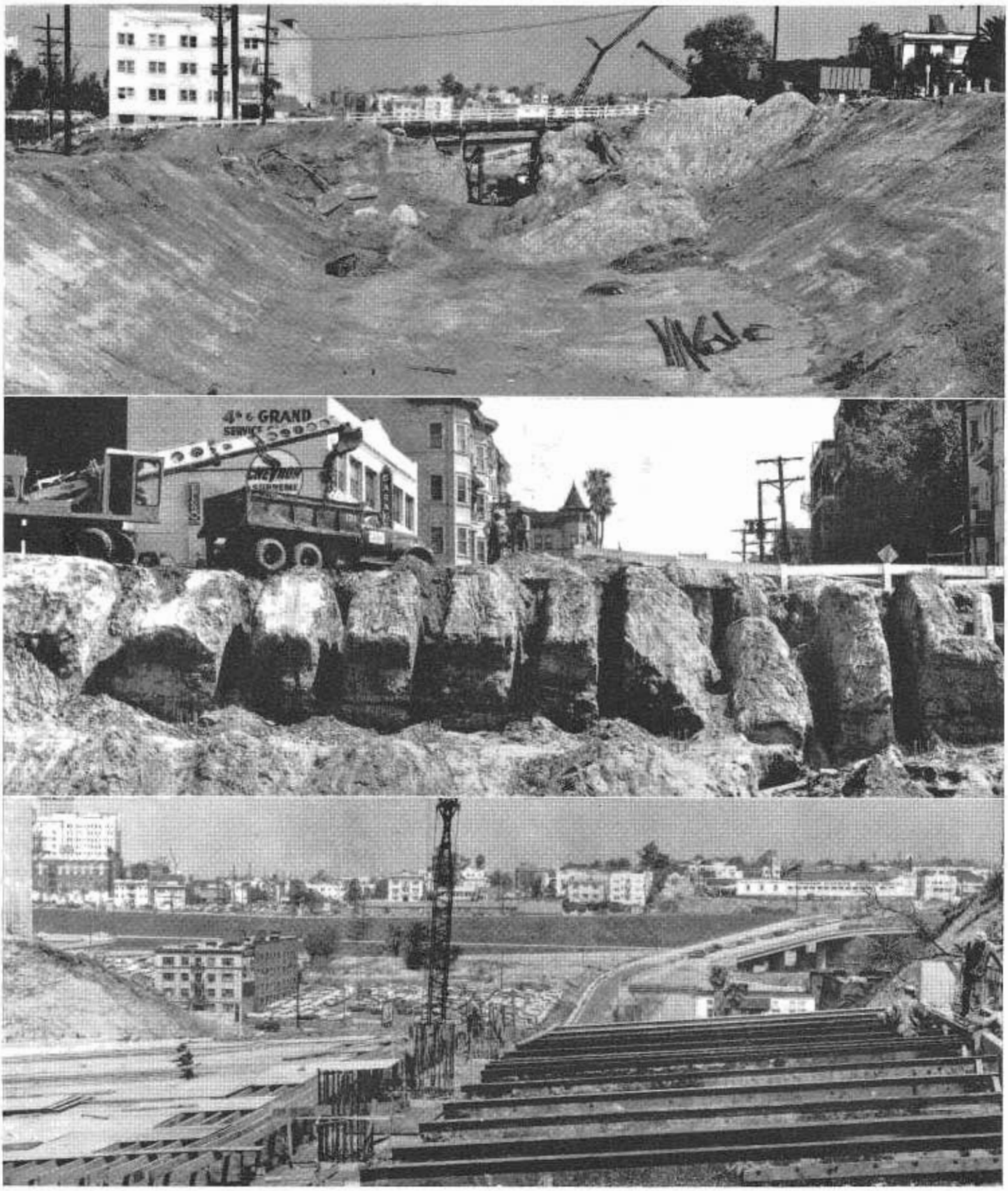
Total Cost $3,348,700

The total cost of the Fourth Street open cut project was approximately $3,377,200. Broken down, this amount included $266,000 for engineering, $126,000 for right-of-way costs in connection with acquisition and condemnation, $1,575,000 for acquisition, actual right of way and property damage and $1,410,200 for construction.

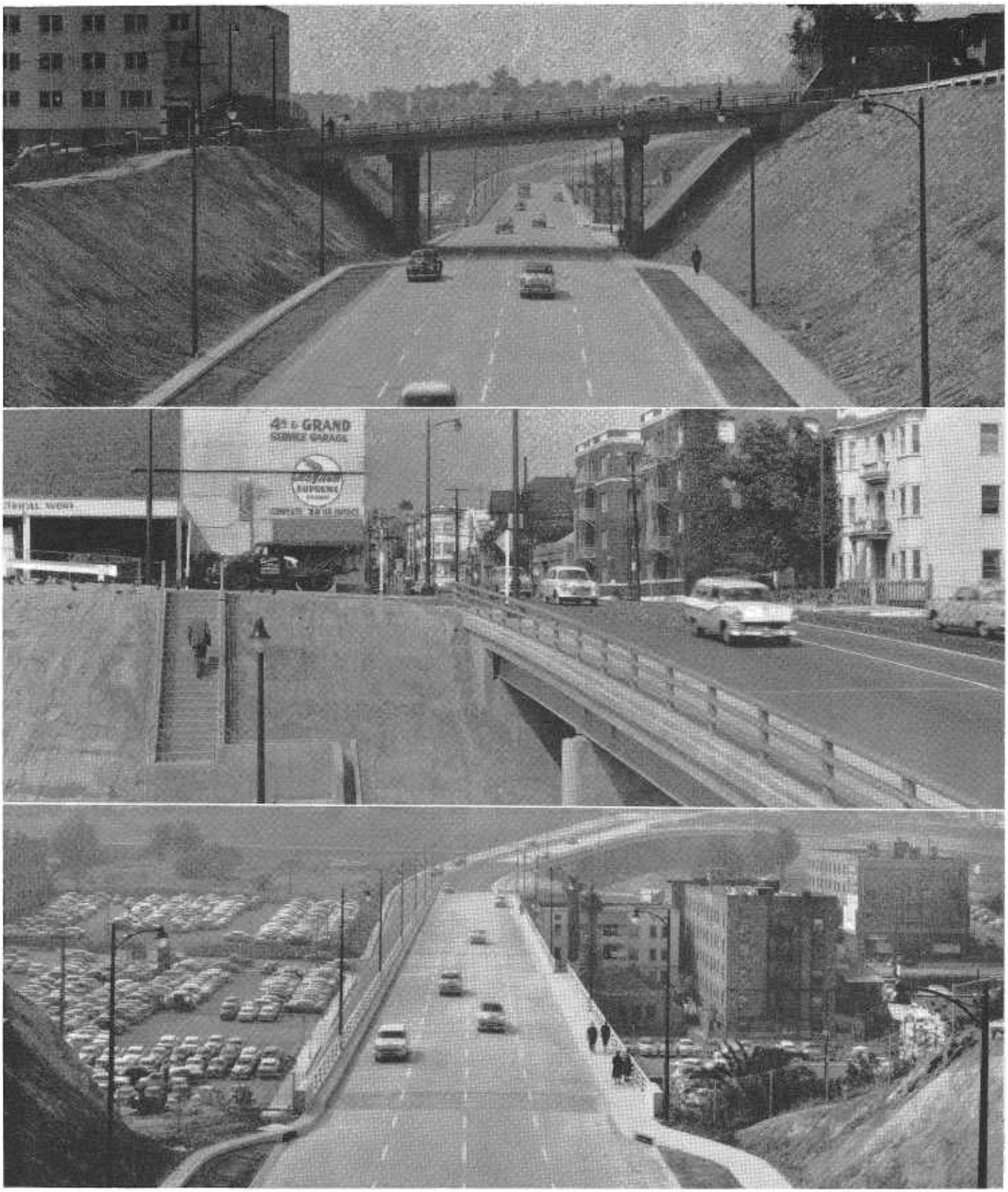
Because this open cut project divided the Bunker area into two parts and removed an existing surface street in Fourth Street between Hope and Olive Streets, one of the requirements of this improvement was to give the people living in this area a new inlet and outlet to the downtown district. This was provided by a new 30-foot street with a 24-foot roadway called Third Place which was located 110 feet north of the center line of the new Fourth Street between Hope Street and Grand Avenue. Third Place will then proceed easterly to Olive Street on a curving alignment, to avoid an existing five-floor concrete garage building located at the northwest corner of Fourth Street and Olive Street. The work easterly of

This index map indicates the manner in which Third Street and Fourth Street have been put into operation as a pair of one-way streets by the Los Angeles City Traffic Department of which Lloyd M. Braff is General Manager





UPPER—Grading operations in progress. Timber bridge shown was erected as traffic detour for Hope Street. CENTER—Grading operation under way across Grand Avenue. Traffic was detoured to east on timber bridge not shown in photograph. LOWER—Shown in foreground are details of falsework for Hope Street Bridge on Fourth Street. Harbor Freeway in background.



These three photographs were taken at same location as shown on opposite page after completion of project construction. (Note stairways for pedestrians to left of bridge carrying Grand Avenue over Fourth Street.)

Grand Avenue will be included in a separate city contract.

Unique Feature

Another unique feature of the design also had to do with this same garage building. This garage had an entrance on Fourth Street about 140 feet west of Olive Street, but the new grade of Fourth Street, due to the open cut, lowered the street level in front of this entrance about 12 to 14 feet thus making impractical the maintenance of this entrance. In order to give the garage the same facilities as it had prior to the construction of this project, a new entrance was designed to join the west side of the building at the third floor level from the new Third Place east of Grand Avenue. This work was a part of the present contract.

Another design feature was the provision of parking lanes on either side of Fourth Street between Grand Avenue and Hope Street and between Hope Street and the viaduct. By means of reverse curves in the curb alignment, the roadway was widened 10 feet on each side to allow for emergency parking. Between Olive Street and Grand Avenue, the south side of Fourth Street was widened 11 feet to allow for an extra lane with a traffic island provided west of the intersection of Olive Street to permit cars to turn into Olive Street without hindering the through traffic on Fourth Street.

Grand Avenue Bridge

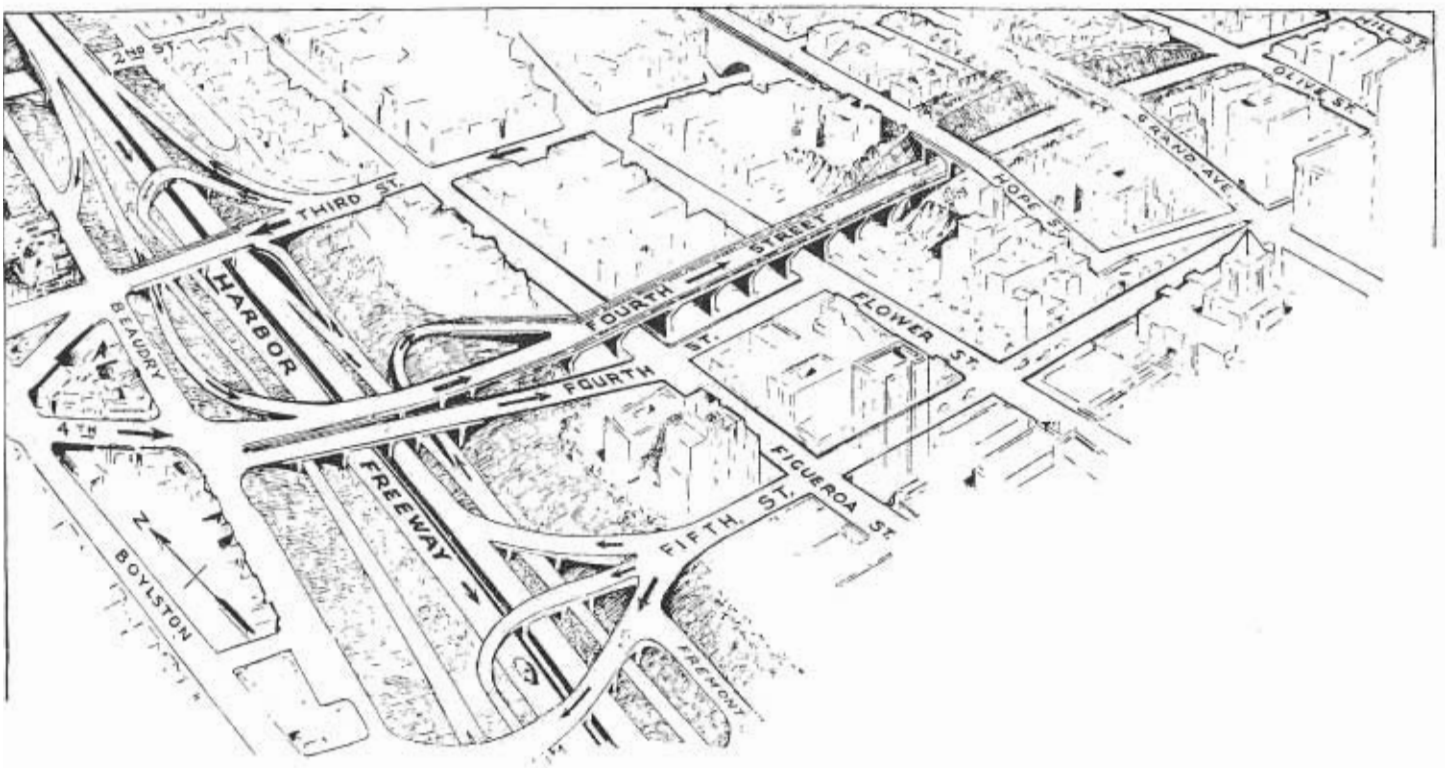
Another unusual design feature of this project, to take care of a future plan for reducing the grade on Grand Avenue was in the construction of the Grand Avenue Bridge over the Fourth Street open cut project. Grand Avenue between Fourth and Fifth Streets is now on a steep grade varying up to 19 percent. The city plans to reduce this to a short 16 percent grade at Fifth Street and then further reducing to a 9.32 percent grade for about three-fourths of the distance to Fourth Street. The bridge as designed provided hinges at both ends so that it could be lowered to meet the proposed change in grade. However, before it was constructed, funds were allocated assuring the lowering of Grand Avenue to the proposed final grade, and the bridge was therefore constructed to this grade. It was connected by means of a temporary roadway to the existing grade, necessitating a dip in the traveled surface of Grand Avenue until the new improvements are built.

Inasmuch as both Grand Avenue and Hope Street are now main arteries for traffic from the Hollywood Freeway to the downtown area and access to the hill, they could not be closed during construction of the open cut project. It was therefore necessary to build a detour on each street with temporary timber bridges to permit traffic to use them and at the same time to provide access by the contractor for excavating the open cut area in Fourth Street.

History

Although this project is now completed after nearly two years of construction, there were many problems involved in the original planning which started some 20 years ago. It had been periodically considered since then but was actively revived in 1949

Perspective sketch looking northeasterly showing how the recently completed Fourth Street open-cut construction in the City of Los Angeles and existing Third Street are tied into the Harbor Freeway by connecting ramp interchange roadways and now operate as one-way streets, Third Street for westbound traffic and Fourth Street for eastbound traffic.



with the construction of the Harbor Freeway, with the additional suggestion of constructing a viaduct approach at the westerly end to separate grades with Figueroa and Flower Streets.

The original idea was to tunnel under Bunker Hill with various schemes ranging between the location of the easterly terminus at either Hill Street or Olive Street and with various connecting grades. In fact there were in all eight different schemes, each investigated for practicability and cost.

It was first proposed to build a full tunnel, by normal tunneling methods with direct connection to Hill Street. After a public hearing, the Los Angeles City Council, on March 7, 1951, decided upon a combined tunnel with viaduct extension with an easterly terminus at Olive Street. However, preliminary estimates of cost of building tunnels or open cuts of different lengths and grades, ranged anywhere from $2,612,400 to $3,956,500 and these studies were eventually set aside in favor of an open cut through the Bunker Hill area with a maximum 8 percent grade west of Olive Street. This was known as Scheme No. 8 and was the one finally adopted.

Different Plans Studied

The city engineer was instructed on November 20, 1952, to prepare the necessary plans and specifications for the construction of the Fourth Street project on the basis of an open cut with sloped banks.

This again brought a demurrer from the property owners along Fourth Street and on Bunker Hill who hired a private engineer to represent them and who requested the city council that further consideration be given to Scheme No. 3 which was an open cut with straight alignment and retaining walls but on a grade differing from that of Scheme No. 8. This again delayed final action by the city council until a comparative study could be made of the two schemes. To adopt Scheme No. 3 as presented by the property owners would have necessitated a signed waiver of damages by all the property owners fronting on the south side of Fourth Street.

Auto caravan lines up following ceremonies dedicating the Fourth Street project

The owners were given 15 days to sign these waivers with at least 80 percent of the affected property owners waiving any damage claims in order for the council to adopt Scheme No. 3. When the necessary 80 percent were not received, the council reverted to its previous stand of adopting Scheme No. 8. Final authority to proceed with the plans was obtained on July 29, 1953.

Three Agencies Share Cost

Financing of this project was shared among three agencies; the City and County of Los Angeles and the California State Division of Highways. The State financed the construction of the viaduct located on the west end of the project at a cost of approximately $650,000. The balance of the project including the cost of the surveys and plans, right of way acquisition, and construction of the open cut section was financed jointly from the gas tax funds of the City and County of Los Angeles.

The project was designed by the Street and Freeway Design Division of the city engineer's office and was constructed under state contract by Webb and White, contractors of Los Angeles.

The writer is now city engineer, succeeding Lloyd Aldrich who was city engineer at the time the project was designed. Merrill Butler is engineer of design and Hugo H. Winter, now assistant engineer of design, was in charge of the Street and Freeway Design Division during the time preliminary studies and investigations and contract plans were prepared. Hazen A. Wright, head of the Structural Design Division, supervised the design and planning of the viaduct. Charles D. Weinstock of the Street and Freeway Design Division supervised much of the design and planning of the project from its early planning stages.

Construction

The following paragraphs record some of the major construction details.

Bids for this project were open June 24, 1954, and a contract was awarded on June 30, 1954. Actual work was started on July 19, 1954.

(A) The State awarded a contract covering the construction of Fourth Street between the Harbor Freeway and Hill Street to Webb & White, contractors, for the sum of $1,135,000. The contract time was 375 working days with a penalty of $100 per day for overrun of time. Original completion date was January 23, 1956, but because of right of way, strike delays, and weather delays, the original completion date was extended about 90 days.

(B) This contract involved building three bridges and making a heavy roadway cut through Bunker Hill. The three bridges were:

1. Reinforced concrete box girder viaduct over Flower Street and Figueroa Street and extending from the Harbor Freeway to the west side of Bunker Hill.
2. A reinforced concrete bridge over Fourth Street at Hope Street.
3. A steel girder bridge with concrete deck over Fourth Street at Grand Avenue.

A maximum 35-foot-deep roadway cut was made through Bunker Hill between Flower and Olive Streets.

Ribbon cutting ceremonies. Left to right: John Anson Ford, Supervisor, Third District, Los Angeles County; Richard P. Magpiong, Boys' Week Acting County Supervisor, County of Los Angeles; Norris Poulson, Mayor, City of Los Angeles; Bruce Gardner, Boys' Week Acting Mayor, City of Los Angeles; Edward R. Valentine, Chairman, Downtown Development Committee of Downtown Business Men's Association of Los Angeles; Robert E. McClure, State Highway Commissioner. The soap box derby drivers are Jim Burwell, Wayne Ford, and Lynn Erickson.

The work included in this contract extended from Harbor Freeway easterly by means of a viaduct and a cut through Bunker Hill to Hill Street, a distance of 2,445 feet, or 0.463 mile.

Fourth Street Viaduct

(C) The Fourth Street Viaduct over Flower Street and Figueroa Street is 687 feet long and provides for a 43-foot roadway. It also provides for considerably more than the required minimum vertical clearances above the streets crossing underneath. At Flower Street a spiral concrete stairway leads up to the roadway elevation of the viaduct. It is supported by two abutments and eight intermediate reinforced concrete rectangular piers. The piers are supported by six caissons approximately 25 feet deep with 3-foot diameter shafts and the abutments belled out 6 to 9 feet in diameter. These caissons were a special problem to the contractor due to gas seeping into shafts from the ground and endangering the workmen. The caissons carried the pier loads down onto the underlying blue shale.

Due to the extreme height of the viaduct over the city streets, very heavy falsework was required to support the deck forms during the placing of the concrete. The falsework consisted mainly of wood pile bents which supported wood and steel stringers, wood joints and plywood forms.

Heavy Roadway Cut

(D) A heavy roadway cut was required for that portion of Fourth Street through Bunker Hill. It had a 35-foot maximum depth and required 135,000 cubic yards of roadway excavation.

(E) The paving of Fourth Street consisted chiefly of four 11-foot portland cement concrete lanes on Fourth Street with asphalt concrete approaches at the Harbor Freeway. The bridges at both Hope Street and Grand Avenue were topped with asphalt pavement to match the adjacent city streets.

(F) Work between Hill Street and Olive Street involved changes to two buildings whose basements extended under the sidewalk area. Paving was made difficult in this area due to the numerous manholes and utilities in the street. Inconveniences were caused to the occupants of the buildings adjacent during wet weather because of the street being torn up and paving being delayed due to the gravel suppliers strike.

(G) Among the 87 pay items included in the contract for this project there were 8,000 cubic yards of structure concrete 135,000 cubic yards of roadway excavation, 250,000 pounds of structural steel, 1,552,000 pounds of reinforcing steel, 2,000 cubic yards of portland cement concrete pavement, and 4,300 tons of asphalt concrete paving.

(H) As previously stated, this project was designed by the City of Los Angeles. The contract supervision was assigned to the State Division of Highways and administered by the Bridge Department. District VII engineering personnel supervised all roadway items.

Representing the State were Oscar A. Johnson, resident engineer, succeeded by Warren B. James, resident engineer for the Bridge Department. H. E. Belford was senior supervising engineer for District VII, with J. Smith and W. Hashimoto as district representatives. James S. White, copartner in Webb & White, directed the work for the construction company with Ken Murray acting as superintendent.

Silver Strand

Major Project Is Nearing Completion in San Diego

By C. WIGGINTON, Assistant Highway Engineer

WHEN BIDS were opened June 23, 1955, for reconstruction of a portion of State Sign Route 75 on Coronado's Silver Strand, it marked the addition of a new chapter to the history of California's romantic past and fabulous future. The Silver Strand, a narrow stretch of sandy beach about seven miles in length, besides providing San Diego with a fine harbor by separating San Diego Bay and the Pacific Ocean, is also the means of saving Coronado and North Island from being an island.

Transportationwise, the Strand has served practically every mode of travel available to man from the pedestrian to the motor car; from the railroad to amphibious vehicles, and one may even see an occasional airplane on its way to North Island by truck. Usually, one thinks only of Coronado as a vacation pleasureland and yet ironically, this home of fun and sun is one of the Nation's greatest bastions of air and naval defense. Its beautiful palms shelter alike the stately mansions of the elderly retired, the defense workers' modest homes, and the residences of navy recruit and grizzled admiral.

Southern end of Strand on Palm Avenue prior to construction. Divided highway in background marks completed portion of first unit.

Work Started in July, 1955

On July 20, 1955, the Daley Corporation of San Diego, successful bidder for the project with its quotation of $768,038, began operations. The job extends from R. H. Dana Place in Coronado to Coronado Heights near Palm City, a total length of 7.8 miles, with J. R. Cropper assigned as Resident Engineer representing the State Division of Highways. Construction was planned so that most of the original 22 feet of concrete pavement could be used for the northbound lanes. When completed, four 12-foot lanes of divided highway will be available to serve traffic.

Inasmuch as the northern end of the Strand is the site of the U. S. Naval Amphibious Base, the contract provides for rearrangement of its buildings and utilities as necessary. The Division of Beaches and Parks of the State of California maintains extensive areas on both sides of the Strand for public use, and construction includes a bridge and three pedestrian undercrossings to serve the beach facilities. A frontage road opposite the Coronado City Hall is also included among the provisions.

Problems for Engineer

Every construction project invariably presents problems challenging engineer and contractor alike, and this job followed the usual pattern. Of great concern was the Strand's most attractive feature, an overabundance of sand, and sand does not provide the best surface for vehicle operation, especially for heavily loaded construction equipment. In the Fort Emory cut there was sufficient select material available to cover about five miles of noncohesive beach sand. The

LEFT—View northerly toward Coronado. New lanes for southbound traffic under construction on left. Existing concrete pavement on right provides two lanes of travel for northbound traffic. Note new frontage road on right serving bay development area. RIGHT—Northerly end of Strand before construction.

contractor, at his option, elected to spread this material as far as the increased cost of haul would permit. There was then left about two miles of plain beach sand with no cover over which to operate. It was decided to bring up the moisture of the beach sand to 20 percent and place cement-treated base directly upon the sand. To everyone's satisfaction, it was found that equipment could get into and out of the zone of operations without seriously rutting the grade. The small ruts which did develop were knocked down with hand labor and the area rewatered. This method proved satisfactory throughout the job. Occasional pockets of dredged sand were encountered containing sea shells which made an excellent base. Unfortunately, these materials were rather sparse in occurrence.

Old Traffic Artery

Historical research revealed that the Strand has proven a traffic artery as far back as one can trace. Prior to 1918, the pedestrian or the equestrian depended upon following a road of sorts over earth and sand which had in essence "Jes' growed"! About 1918, a concrete pavement was placed as part of the improvement from the south city limits of Chula Vista to Coronado. Material for the construction was hauled from the Otay River in wagons pulled by mules.

In the early forties, Fort Emory's growing military demands occassioned a relocation in order to serve the needs of national defense, resulting in an improvement of this route, by this time State Sign Route 75, from Ninth Street in Palm City to the north end of Fort Emory. In 1944-1945, a succeeding project extended the improvement from Fort Emory to the City of Coronado. When the Montgomery Freeway was constructed to the International Border, a three-level structure was built connecting the Montgomery Freeway (US 101) to State Sign Route 75 on Palm Avenue. Palm Avenue was very restricted and in need of improvement structurally; and as the business development was growing almost beyond expectations, considerable amounts of traffic were generated along Palm Avenue.

In 1954, a contract was let improving State Sign Route 75 from its connection to the Montgomery Freeway at the three-level structure through the developed business section along Palm Avenue and to the beginning of this present improvement. With the completion of the latest project, during July of this year, Route 75 will be a four-lane divided highway over its entire length.

History of Coronado Area

Historically, the area of Coronado and North Island abounds in fact and fiction. Originally, North Island was truly an island, in character as well as name. Reclamation of the narrow passageway between Coronado and North Island has resulted in their forming one land mass with no separation other than a military fence. San Diego's first distinguished visitor, Juan Rodriguez Cabrillo of Portugal, who arrived September 28, 1542, was either unimpressed with the possibilities Coronado presented or else he was a very unobservant type of an explorer. He had a few kind words to say about San Diego in general; but as far as the island was concerned, praise was conspicuous by its absence. July 1, 1769, Father Junipero Serra and party arrived in town after shanks-maring it from Loreto in distant Baja California from whence they had departed March 9, 1769. Here again we find no mention of Coronado, occasioned no doubt by a

lack of interest in anything resembling sand after what the party had been through during their weary footsore trek.

Once Grazing Land

The first official notice of the island was taken by Don Pedro Carrillo in 1846, who petitioned Governor Pio Pico to grant him 4,185 acres of sagebrush and sand-covered island in order to graze cattle. May 15, 1846, said petition was granted by Pio Pico, naming the island the Peninsula of San Diego and noting that these 4,185 acres would provide two grazing sites, and adding that for what it was worth, Carrillo, his children, and his children's children could have it throughout eternity.

Eternity for Carrillo lasted for one year when he sold the parcel to Bezar Simmons for $1,000 and figured he'd made a right smart financial move. Simmons in turn sold the holding to Archibald Peachey and William Aspinwall for $10,000, who held it until 1886 and disposed of it for $110,000 to the Coronado Beach Company, the original developers of modern Coronado.

E. S. Babcock, head of the firm, decided that this potential paradise only suffered one major drawback; nobody knew anything about it. He decided to publicize the place, and after a whirlwind nationwide campaign, he began a public auction of subdivided lots on November 13, 1886. More than 6,000 people came from all over the United States, including San Diego, to buy a piece of California's golden pleasure land. It may be somewhat of a surprise to learn that even then real estate was at a premium. The first lot went to Major Levy Chase for $1,600, and history notes that the good major was offered $2,000 for his lot 'ere the sun set that same evening.

Famous Hotel Built

Even though the development hit the peak of the land boom of the eighties, Babcock and his group decided that Coronado must have substance in order to assure its future. Accordingly, plans were laid to provide a hotel sufficient to attract the easterners. Upon seven and one-half acres Hotel del Coronado came to life boasting 750 rooms, 11,000 square feet of ballroom and theater, and a dining room capable of seating 1,000 people.

During the late 1880's and 1890's Coronado enjoyed great popularity as a resort area, and National City and the surrounding territory became thriving industrial and business centers.

Railroads Begin Operating

Two railroads operated out of San Diego to the south, serving both National City and Coronado. One traveled to the International Border, carrying vast numbers of people commuting to their work. National City was something of a railroad center. However, following the recession and removal of heavy railroad traffic, many of the houses, including a number owned by the railroad, were moved away. It was not unusual to see a parade of lighters crossing the bay, each with a house on board.

The second railroad traveled from San Diego, around the Silver Strand, to Coronado. Each of these railroads carried from 10 to 15 coaches on a run and operated on an hourly schedule.

Transportation was also available on a steamer from National City to San Diego and thence across the bay to Roseville. This was a popular and gala trip with music and gaiety at a high pitch.

Tent City

By the turn of the Twentieth Century, a rather curious development was under way. Clustered to the south of the hotel was an extensive collection of cottages (using the term loosely). These cottages, in the main, were sided with tent cloth and thatched with palm fronds. The settlement soon grew to a point that it was named "Tent City." This became a mecca for the vacationer. The furnishings were rather crude, boasting cast-off beds from the hotel, wavy mirrors, and running water in the town square from whence the vacationer ran to his cottage, pail in hand. But withal, possessing the appeal of a California type "Mediterranean villa." Truly, life was wonderful! With the relocation of the highway during the early forties, it was decided that Tent City must go. Amid many cries of the faithful, road construction began and many of the cottages were moved to Palm City and Coronado Heights, with a few

State Sign Route 75 joins US 101 at three-level structure in Palm City. Left center marks beginning of completed first unit of Route 75.

UPPER—Looking south on Silver Strand during construction. Temporary detours provide passage as pedestrian underpasses are built. Silver Strand State Park on right and left. LOWER—North end of Silver Strand at Coronado on Sign Route 74. New construction on ocean side will provide a four-lane divided highway.

destined as forest cabins in the back country. So ended a frivolous rollicking era dedicated to fun and sun with the war years lying ahead.

Army Moves In

As the military value of North Island became more and more apparent, the Army and the Navy began casting envious and covetous eyes upon this area. In 1893, game hunters on the island were mildly disturbed by construction activities for the Zuninga Shoal Jetty; and the opening of the Twentieth Century found 38½ acres reserved for the military. The years rolled by until in 1913, North Island became the site of the first base of the infant Army Air Corps. The First Aero Squadron, which was the beginning of the Army Air Corps, had been organized as the Aviation Section of the Signal Corps in Augusta, Georgia; moved on to Texas City, Texas, and was assigned to duty at North Island early in 1913. From this small beginning of 78 men, 16 officers and 8 aeroplanes, grew the great Army Air Corps. The men were billeted in tents on the sand until barracks, hangars, etc., could be built. The greatest amount of construction was accomplished just before and during World War I, and many of the old hangars, offices, and the old Army hospital are still in use by the Navy.

Ferry to Coronado

In those difficult early days the only access to North Island was by small ferry from a wharf located between Broadway and Market Streets in San Diego. A landing dock was constructed on the island. In later years a fill and bridge was placed across the Spanish Bight, connecting North Island to Coronado and providing access for vehicles to the island.

During the years from 1913 to 1938, the Army continued to operate an airfield and supply depot known as Rockwell Field, often called "The Cradle of Army Aviation." In the meantime, the Navy had been given

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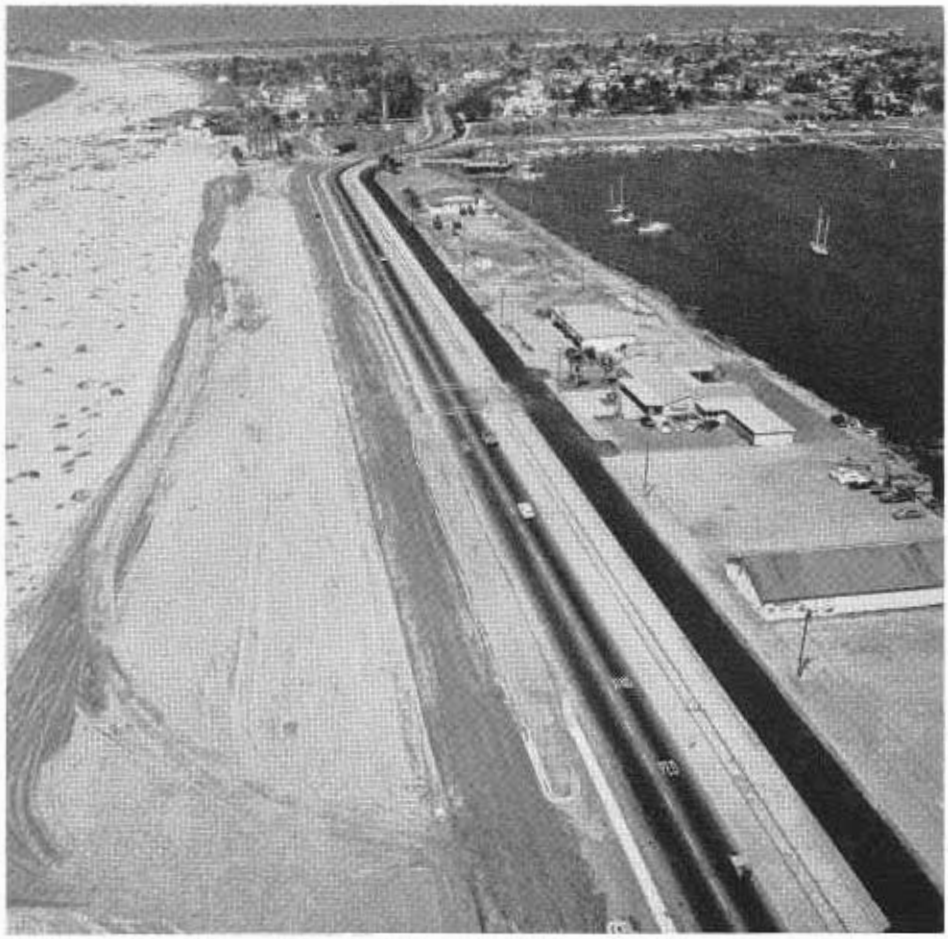


Redwood Freeway

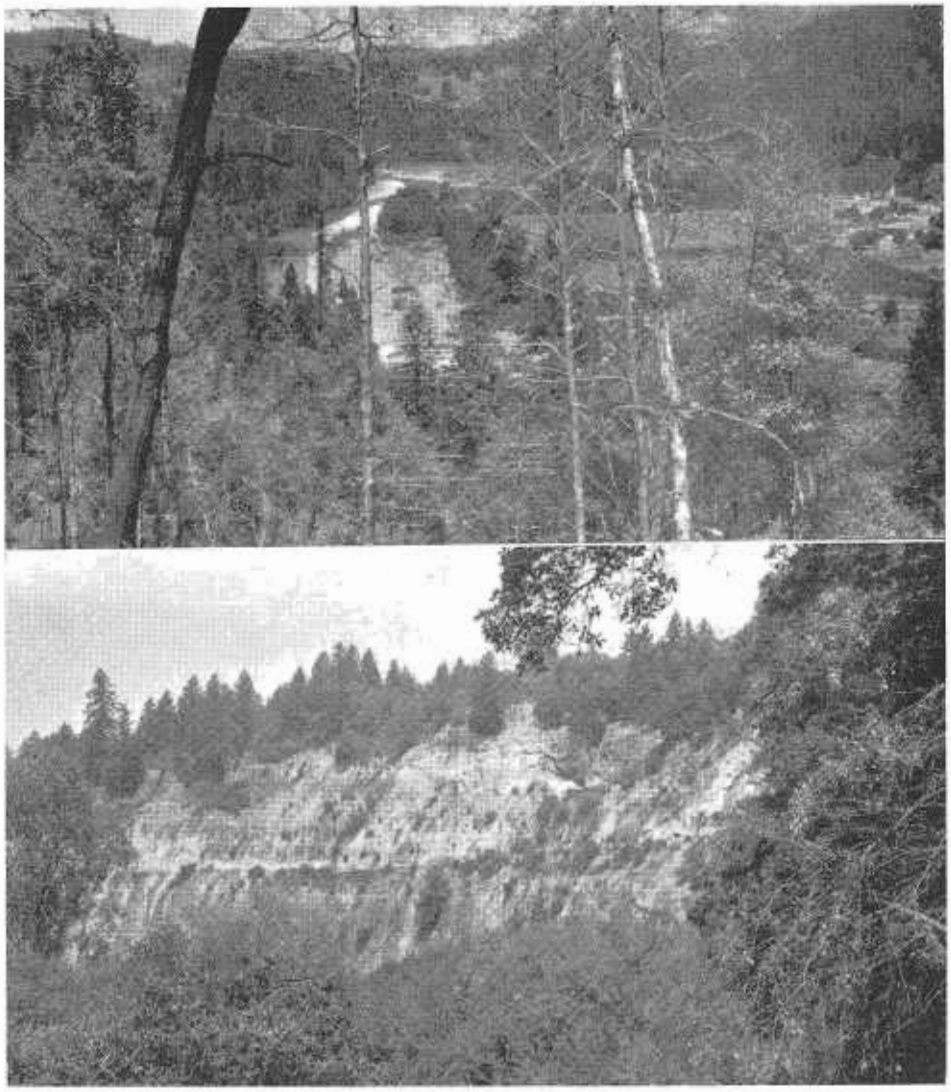
Fifty Miles of Highway Planned

By GEORGE LEATHERWOOD, District Advance Planning Engineer

THE COMPLETION of the Redwood Highway study US 101 in Southern Humboldt County for 50 miles through the heart of the Redwood Empire as a single project on a full freeway basis places this accomplishment at the top for projects of such length and magnitude undertaken by the State of California Division of Highways.

The present traveled way through the world-famous Humboldt Redwood State Parks is Northwestern California's only highway artery. All north and south motor vehicle traffic must, of necessity, pass through these groves. In the redwood flats the trees stand scarcely more than 12 feet from the centerline, and the road itself is composed of short tangents and small radius curves. It is truly a scenic highway, but as a modern transportation facility is completely obsolete.

These redwood flats were acquired by the State Division of Beaches and Parks through the joint efforts of individuals, conservation-minded groups, and the State of California at a time before any essential modernization of the original 1914 road was undertaken.



UPPER—Looking northerly down South Fork of Eel River, Phillipsville and Redwood Highway at right of picture. Typical of the terrain to be traversed by the Redwood Freeway. LOWER—Existing Redwood Highway just north of Garberville is benched into Garberville Bluffs along South Fork of Eel River. New location of proposed Redwood Freeway will supersede this portion of Redwood Highway.

Study Started in 1953

The existing state highway traversing this section has gone through the same economic evolution as other highways throughout California. First came a trail for foot and horseback travel. Then came its widening and relocation to accommodate wheeled vehicles. Then came powered transportation of faster speeds that again demanded improvement and relocation. The efficiency, speed, and volume of these latter vehicles have increased on a steadily rising curve with the result that the type and location necessary to provide a suitable facility outstripped the State's means of financing such a project.

On August 20, 1953, notwithstanding the financial problems involved for a project of this magnitude, a study was started between the Mendocino county line and Jordan Creek, a distance of approximately 50 miles via the existing highway.

In instigating this project, the district proceeded with an extensive preliminary exploration study through the media of aerial photographs and U. S. Quadrangle sheets followed by aerial reconnaissance and field investigations. Upon completion of this first phase and satisfied that the area had been thoroughly explored, it then became possible to outline the area required for reconnaissance type aerial survey at a scale of 1″-400′ and 20′ contours.

Aerial Survey Made

On October 30, 1953, the district requested an aerial survey of the area

needed which covered 30,000 acres, which survey was delivered and accepted on November 12, 1954.

With these relatively detailed maps to work with the task of developing the numerous possible locations progressed smoothly. Trial lines and profiles were developed and studied. When satisfied that the placement was firm to the extent these maps would permit, they were transferred to vellum transparencies and the cut, fills, bridges, interchange ramps and other planimetric features that would aid in visualizing the proposal were added.

Individual natural controls were not unlike similar physical features encountered elsewhere; however, their abundance, combined with high standards of design, provided a constant engineering challenge.

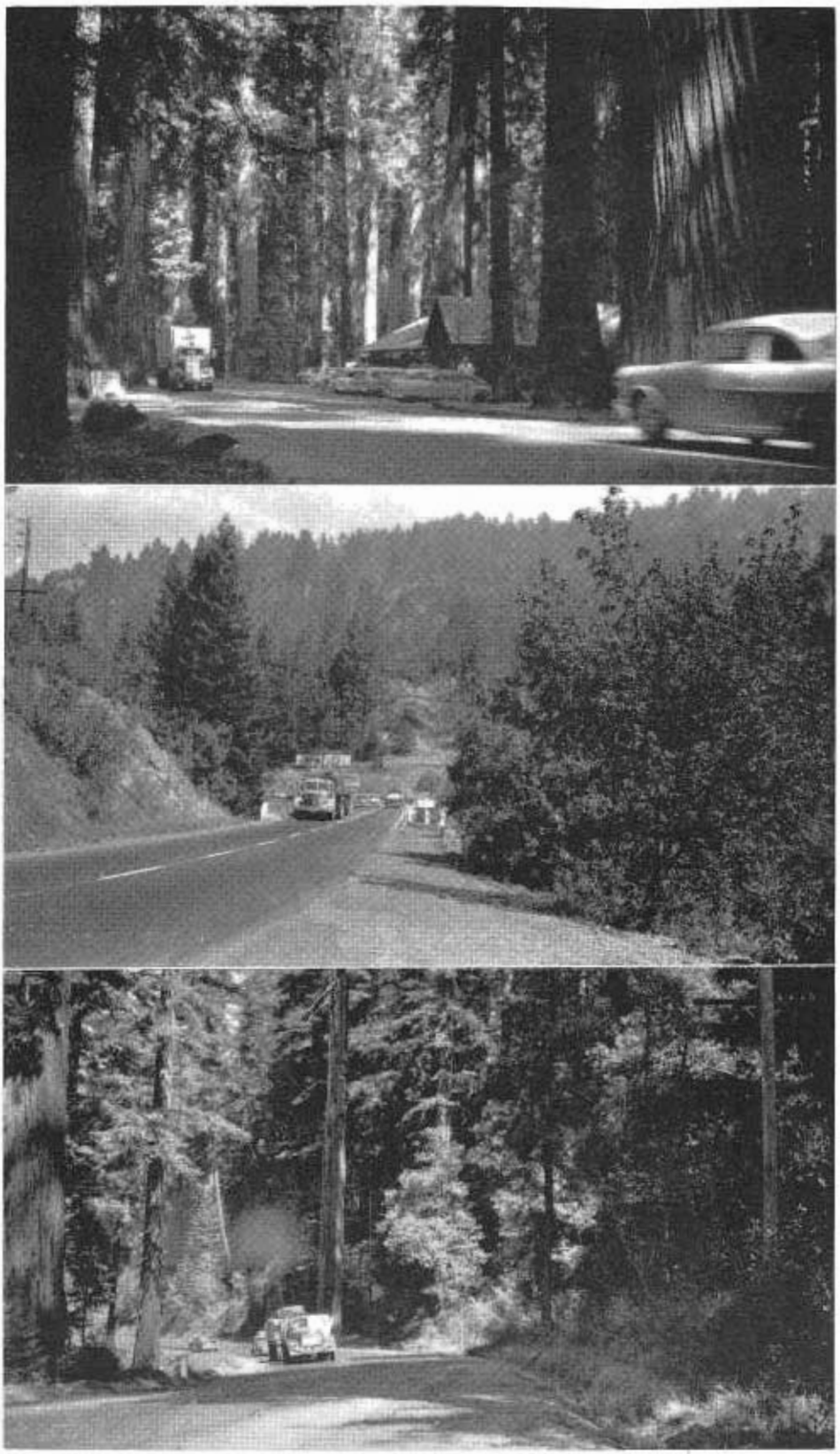
The redwood trees bordering the river and extending into the canyons and up the hillsides were given a great deal of publicity as being the prime physical control for any new location due to their majestic size and tranquil beauty that bring visitors from all parts of the North American Continent and other parts of the world. Actually, these trees were only one of numerous controls.

River Economic Barrier

In addition to the trees, there was the rugged, meandering South Fork of the Eel River Canyon with the river acting as an economic barrier. The configuration of the terrain forming the spurs, ridges, and side canyons coupled with the unstable formation common to this region were by far the more formidable controlling factors.

Last, but most important to consider, is the highway user who foots the bill for projects of this nature. Within reasonable financial limits, modern highways are located to do the most good for the greatest number on both a local and regional basis. Each vehicle, regardless of type, weight, class, where it came from, and where it is going, becomes a factor in the final determination of what can be done to provide the greatest return to the highway user in terms of comfort, safety, and money invested.

Although right of way is not a factor in the sense of physical control, it



UPPER—Redwood Highway passes through Richardson Grove State Park, a popular recreational area. Through traffic, vacation traffic, and pedestrian movements are in conflict on this now obsolete main line highway. CENTER—Redwood Highway south of Garberville. Note the heavy commercial traffic utilizing the route, resulting in long queues of traffic. BOTTOM—Redwood Highway at Holbrook Grove. This is a typical portion of the Redwood Highway to be superseded by the proposed Redwood Freeway.

does have an important bearing in the over-all picture. Property lying in the path of the various studies was carefully considered. In most instances it is a matter of pure economics; however, there are times when aesthetics enter into the problem. How can the value of say a grove of 5,000-year-old trees, 10 feet to 20 feet in diameter and 300 feet high, be evaluated; or, other natural phenomena? Surely not by board feet, cubic feet or other media of measurement.

Concurrently with the projection, estimates of cost were prepared for each line. These estimates included clearing, earthwork quantities, cost of stabilization, drainage, bridges, base material, surfacing, right of way and numerous incidental items that make up the final estimate.

Traffic Volume and Type

As the work progressed, geological studies were made in the broad sense for estimating the approximate amount to be set up for stabilization of excavation slopes and embankment foundations.

For the purpose of determining what volume and type of traffic would use the various alternate locations, a traffic origin and destination survey was made in which interview field stations were established. Vehicles of all types were stopped and their drivers questioned regarding the origin and destination of their trip and whether they preferred a highway passing through or around the redwood groves.

From this information, it then became possible to prognosticate the type and volume of traffic that would make use of each line over a 20-year period. Truck traffic was given special attention due to its importance to the economic welfare of the State as a whole and to the fact that it is the basic prime mover for outgoing forest products and incoming goods and commodities manufactured elsewhere. For these reasons, grades were carefully analyzed regarding their effect on truck operational cost and became one of the factors governing the final selection of routes.

Study Is Submitted

This information was then reduced to time and distance via each line and combination of lines that made up a routing and finally to cost of travel in dollars. Knowing the cost of travel via the present facility, it then became a simple matter to compare each alternate to this latter, relative to cost of construction to determine which line would do the most good for the highway users on a local and regional basis.

Finally, on September 27, 1955, the study closed on its second important phase with the submission of the project report for headquarters review and deliberations.

On November 30, 1956, a preliminary headquarters review was held in Sacramento with full scale projection maps, profiles, translite aerial film exhibits showing the dedicated redwood groves and traffic flow diagrams.

On Thursday, January 19, 1956, the Beaches and Parks and Highways Commissions held a joint review in Sacramento, using the same exhibits as in the preliminary review. The presentation described lengths, rise and fall, estimates of cost, unusual features, effect to state parks and the value to highway users.

Public Hearings Held

Both commissions approved the proposal in principal reserving their final action until they could review the broad aspects of the study.

On January 25, 1956, G. T. McCoy, State Highway Engineer, approved the location as recommended.

On February 8, 1956, a public hearing was held in Garberville at the Garberville Theater. Approximately 350 people attended; some from as far south as San Francisco and as far north as Crescent City. The same exhibit maps and presentation as in the Sacramento hearings were used.

Upon completion of the presentation, the audience was invited to express its views regarding this proposal. Notwithstanding the tremendous impact an improvement such as described would have at a local level, there was not a single dissenting voice. However, there were numerous representatives from civic organizations who expressed their satisfaction and concurrence in the proposed routing.

Supervisors and Highway Commission Act

On the Monday following this hearing, the Humboldt County Board of Supervisors passed a resolution favoring the recommended route and waiving a formal commission hearing.

On March 21, 1956, the California State Highway Commission at its regular meeting adopted the proposed routing thus officially clearing the way for surveys, design and construction.

So far, this article has described the highlights of important events that have transpired between the dates August 20, 1953, and March 21, 1956. Without going into a great amount of detail, the proposed location can best be described as a line generally following either on the east or west side of the South Fork of the Eel River from Mendocino County line to Dyerville, the confluence of the South Fork and Eel River a distance of 33.4 miles via the recommended line versus 40.4 miles via the existing highway. From Dyerville it follows the westerly slopes of the Eel River to Jordan Creek, a distance of 9.5 miles via the recommended line versus 9.6 miles via the existing highway for a total length of 42.9 miles and 50.0 miles, respectively, or a savings of 7.1 miles.

Design of Freeway

It is planned as a full freeway on a standard 60-foot, four-lane divided section without access to the abutting properties except through planned frontage roads and interchanges.

The existing road will be preserved for local, tourist and recreational traffic as well as serving as a frontage road for a good portion of its total length. By removing heavy hauling equipment and fast through traffic, its value to the public will be considerably enhanced and a pleasure to drive when time is no longer a factor.

The savings in length of travel more or less indicates that large reductions were made by taking advantage of the shorter distance across loops in the meandering river.

In general, the recommended line is slightly higher than the existing with a total rise and fall of close to 5,600 feet versus 4,600 feet in the existing facility over its total length. However,

the weighted grade which is the sum of the vertical ordinates divided by its length is only 3.55 percent for the first 14 miles and less than 2 percent for the next 36 miles. Perhaps the most outstanding feature of the proposed improvement to the highway user is the reduction and elimination of the number of substandard curves. The recommended line contains 143 curves of minimum 50 miles per hour and 3,800 degrees total curvature; whereas, the existing road contains an assortment of compound, broken back and reversing curves totaling 10,000 degrees of curvature, with safe speeds reduced to as low as 20 miles per hour.

River Crossings

The South Fork of the Eel River will be crossed six times with major structures. In most instances, these bridges are planned to serve a two-fold purpose of crossing the river and also act as a separation structure over the existing highway.

When this section is constructed and placed in service, highway users from wherever they originate will be able to pass through this area and enjoy maximum safety, physical comfort and convenience. Commercial traffic will have tangible proof of savings in operational cost. Through traffic will be free from dangerous cross movements and long slow-moving traffic queues. Commuting traffic will have safe ingress and egress through conveniently located interchanges. Tourists will be able to view changing scenery and close inspection of groves or places they wish to visit by making use of these interchange facilities. Communities will benefit by the removal of impatient through traffic, thus making their streets safer and more inviting to the bona fide customer.

Study Took Two and One-half Years

Of incidental interest is the amount of time and effort that went into this study. It may be noted in the text that it was a matter of 2½ years from its inception to approval by the Highway Commission. However, it was a matter of less than 11 months from delivery of the aerial survey maps to sub-

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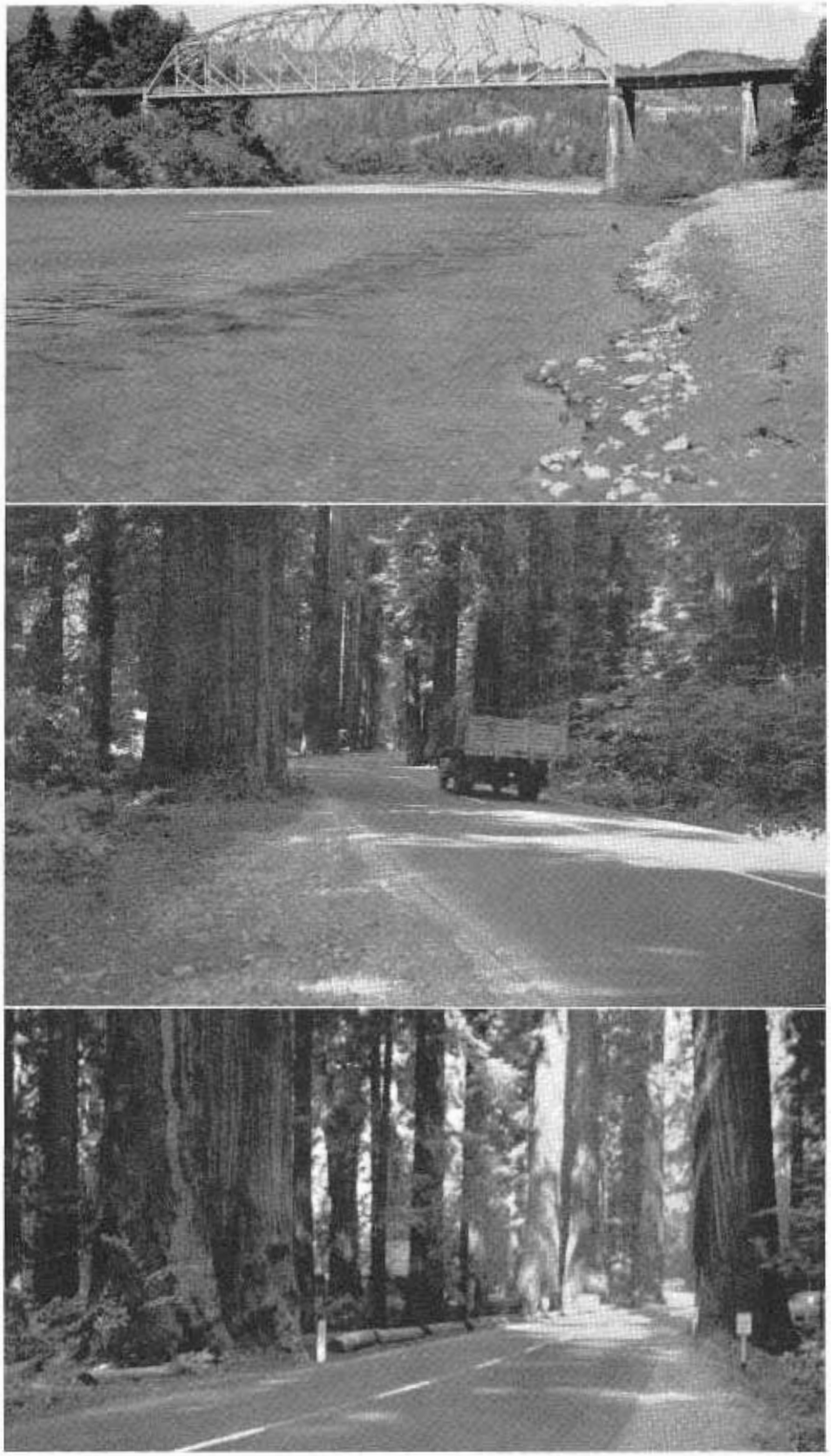


TOP—Redwood Highway crosses the South Fork of the Eel River at Dyerville. This bridge will continue to serve as part of traffic interchange system on new freeway. CENTER—The Blair-Lansdale State Park on the Redwood Highway in Humboldt County, typical of the large redwood groves which were a major factor in determining new highway location. BOTTOM—Richardson Grove State Park in southern Humboldt County, with existing Redwood Highway passing through the large, stately trees.

US 40

Four-laning Progresses—New Ben Ali-Roseville Freeway Dedicated

By HELEN HALSTED, Assistant Editor

THE 13-MILE Ben Ali-Roseville Freeway was officially opened to traffic Tuesday morning, April 24th, when Lieutenant Governor Harold J. Powers, representing Governor Goodwin J. Knight, applied a torch to the "golden" chain across the freeway, signalizing completion of the $5,500,000 project.

Governor Knight was officiating at two dedications in Santa Clara County on that day, one a ribbon cutting at the opening of the section of US 101 between Ford Road and Madrone, the other at the formal dedication of the Lexington Dam near Los Gatos.

Helicopters, band music, the presentation of colors, invocation and speeches were features of the ceremonies at the Spruce Avenue overcrossing about half way between Roseville and Ben Ali. Sponsored by the Roseville Area Chamber of Commerce, the Greater North Area Chamber of Commerce, and the Greater Sacramento Chamber of Commerce, the event was attended by 500 representatives of gratified civic organizations, officials, and citizens from surrounding communities. The armed forces were well represented at the road opening. Major General Roy L. Green, USA, Commander of the 49th Infantry Division, and Colonel Johnnie R. Dyer, Commander of McClellan AFB, dropped in for the ceremonies by helicopter.

Senator Johnson Master of Ceremonies

Music was provided by the Roseville Joint Union High School Band and a color guard of the California Cadet Corps of San Juan Union High School presented the colors. The invocation was by the Rev. Floyd Brown, pastor of the First Baptist Church of Roseville. State Senator Harold T. Johnson of Placer County was master of ceremonies and he introduced a host of state and local officials.

State Highway Engineer George T. McCoy at microphone. CENTER—Selden Menefee, President Greater North Area Chamber of Commerce. LEFT—State Senator Harold T. Johnson.

Speakers at the ceremonies included Senator Earl Desmond, State Highway Engineer George T. McCoy, Director of Public Works Frank B. Durkee, and Lieutenant Governor Powers, and others.

Freeway Law Constitutional

Durkee pointed out that litigation over the relocation of US 40 (State Route 3) between Ben Ali and Roseville established two things: one, that the freeway law is constitutional; and two, the right of the California Highway Commission to relocate any part of the State Highway System. The so-called bond act roads are in no different category with respect to their location than other highways in the system.

Governor Powers in a brief but forceful speech said that since the Legislature took cognizance in 1947 of the need for more highway financing, $1,650,000,000 had been spent for highways—more than had been spent in all the 37 years previously.

McCoy's remarks were as follows:

"Today you are celebrating, with appropriate ceremonies, the completion of an important 13-mile section of the State Highway System. It is also an important part of the National System of Interstate Highways.

Long Range Planning

"California is currently spending some $250,000,000 per year on state highway construction (including rights of way). Mile by mile, and in accordance with carefully worked out long-range planning, we are obtaining a highway system adequate to meet our needs—but it will take a long time, under the present financing program, to do the job.

"Experience has taught us that the only permanent solution to the problem of building traffic capacity and safety into highways is to make them freeways. The Federal Government has recognized this fact, also, and requires the states to plan all interstate system highways on a freeway basis. Like other truly worthwhile things, freeways tend to be expensive.

"As you have undoubtedly seen in the newspapers, the Congress is now considering legislation which, if enacted, will nearly double our highway construction program in California. The bulk of the increased federal funds would be concentrated on the interstate system. This would mean faster improvement of US 40 and other interstate routes in California, and at the same time would release more of our state funds for use on other highways.

"Freeway design improves with experience. Each new freeway that we build incorporates some improvements over those which were built earlier, and this project is no exception.

"Speaking for the engineers and the other workers of the State Division of Highways, we pledge our continued full-scale efforts toward

providing the people of California with a system of freeways and other modern highways of which they can be proud. We shall continue to build these highways as rapidly as available funds permit."

Durkee's talk included the following information regarding U. S. Highway 40:

US 40 Progress

1. The length of US 40 from San Francisco to the Nevada line is 211 miles on the traveled way.

2. Not including the Ben Ali-Roseville section, 100 miles have been completed to four-lane standards. Opening of the Ben Ali-Roseville Freeway will increase this by 13.5 miles.

3. Fourteen projects are under way (including work at Carquinez and the Ben Ali-Roseville Freeway) covering a total of 31.6 miles at an approximate total cost of $54,000,000 (see list).

4. Freeway declarations now cover 159 miles of US 40 between San Francisco and the Nevada line. (A tentative routing for 16 miles between Donner Lake and Floriston was discussed at a public meeting in Truckee April 7th.)

5. Projects budgeted but not yet advertised for bid cover 21 miles and will cost a total of approximately $11,364,000.

(a) One mile east of Newcastle to Elm Avenue in Auburn, 3.1 miles, grading and paving for freeway, total estimated cost $1,646,000.

(b) Heather Glen to Colfax, 6.1 miles, expressway, total estimated cost $3,250,000.

(c) Colfax to near Magra, 6.5 miles, expressway, total estimated cost $3,868,000.

(d) Near Floriston to Nevada line, 5.3 miles, expressway, total estimated cost $2,600,000.

Projects Under Construction on US 40

1. Toll Plaza and Port of Oakland Overcrossing revise facilities, $2,635,000 (Bay Bridge funds).

2. South of University to El Cerrito Overhead, eight-lane freeway, 1.9 miles, $2,230,000.

3. 0.2 mile south of Jefferson to south of County Road 24, freeway, 4.8 miles, $5,461,000.

UPPER—Lieutenant Governor Harold J. Powers applies torch to "golden" chain. LOWER—Auto caravans head for Sacramento and Roseville following dedication ceremony.

4. South of Hilltop Drive to north of Hercules, freeway, 4.9 miles, $7,413,000.

5. North of Hercules to Crockett Road, freeway, 2.9 miles, $7,829,000 (toll bridge funds).

6. Carquinez Bridge substructure, $5,942,000 (toll bridge funds).

7. Carquinez Bridge superstructure, $9,973,000 (toll bridge funds).

8. Crockett Interchange, freeway and bridge approaches, $5,090,000 (toll bridge funds).

9. Between Vallejo Wye and Alhambra Street, 0.9, grade surface and structures, $474,000.

10. Ben Ali to 0.5 mile east of Roseville, freeway, 13.5 miles, $5,400,000.

11. One mile east of Newcastle to Elm Street in Auburn, structures for freeway, $391,000.

12. West Auburn Underpass, $505,000.

13. One mile west of Applegate to Heather Glen, expressway, 2.7 miles, $644,000.

14. Colfax to Yuba Gap, truck turnouts, $100,000.

New Directional Signs

The Ben Ali-Roseville Freeway is not only a typical modern freeway in its design and construction, but it may also be a model for highways of

Upper and lower case letters are used in directional signs on the new Ben Ali-Roseville Freeway. The signs were installed on a test basis in an attempt to improve readability. Heretofore only overhead illuminated signs were of this type, the others all capital letters.

the future as far as directional signs are concerned.

The Division of Highways has installed certain directional signs on the Ben Ali-Roseville Freeway on a test basis in an attempt to improve readability and better serve the motoring public. If they prove successful, some of the sign types may become standard and take their places on the highways throughout the State.

The principal difference which an observing motorist will note is the use of small letters after initial capitals (upper and lower case) in the directional signs. Heretofore only overhead illuminated signs were of this type. Others were all capital letters. Most newspapers have long since adopted the upper and lower case style in their headlines for better readability.

One of the most interesting developments will be noted at night at the east-bound Fulton Avenue turnoff. There black light (ultra violet) will be used to illuminate fluorescent material on 18-inch and 12-inch letters reading "Fulton Avenue" and a directional arrow pointing to the right. The sign is 18 feet long and 40 inches wide and is placed 17 feet above the ground.

First Application

This is the first application in highway signing in California of the black light principle which makes the letters of a sign glow and stand out while the background remains invisible. Such signs have been used in commercial advertising where permanence is not the important factor that it is in highway signing.

Weathering rapidly reduced the effectiveness of the fluorescent material on such signs previously tested for highway use. Now a method of putting a porcelainized, glass-like finish over the letters has been developed which preserves the fluorescence.

On the conventional reflective signs, colored backgrounds are being tested as possible replacement for the standard black. Green reflective sheeting is used for directional signs and blue for *no turn* signs.

Against the green reflectorized background two types of lettering are being tested—metal cut-out letters fitted with reflector buttons and cut-out letters made of reflective sheeting.

BEN ALI-ROSEVILLE FREEWAY

Length—13.5 miles from Ben Ali to 0.5 mile east of Roseville

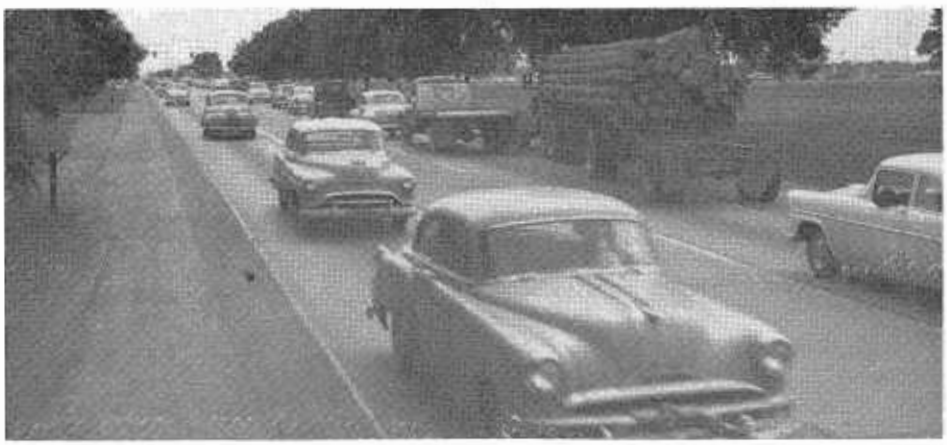
Approximate cost (including right of way)—$5,500,000

Work began July 17, 1953

Major contracts:

1. Between 1 mile south and 0.5 mile east of Roseville—grading 3.5 miles and construction of six bridges; awarded June 10, 1953—cost $1,389,237; Ukropina, Pollock, Kral and Ukropina, Contractor.
2. Between Ben Ali and Placer County line—construct seven bridges and approaches; awarded August 6, 1953—cost $659,976; Ukropina, Pollock, Kral and Ukropina, Contractor.
3. Between Ben Ali and one mile south of Roseville, grading 10.3 miles and surfacing frontage roads and overcrossing roads; awarded December 7, 1954, cost $812,000; A. Teichert & Son, Inc., Contractor.
4. Between Ben Ali and 0.5 mile east of Roseville—plant-mixed surfacing on cement treated base, 13.1 miles; awarded December 17, 1954—cost $1, 691,-807; Baldwin Contracting Co., Inc., Contractor.

Traffic on Auburn Boulevard before opening of Roseville-Ben Ali Freeway



Sacramento Canyon

Interesting Background of New State Highway

By H. CLYDE AMESBURY, District Traffic Engineer

WE WHO now live here in Shasta County accept the route through the Sacramento Canyon as being the main thoroughfare to the north, but there is every reason to believe that this is only true since the relatively short era of modern transportation.

Prior to the coming of the white men, it is probable that the canyon route was little used. It was too tough. Such north and south travel as there was detoured around it. It is significant that the first white man to reach Shasta County, which occurred in 1829, came from the north but did not come through the canyon.

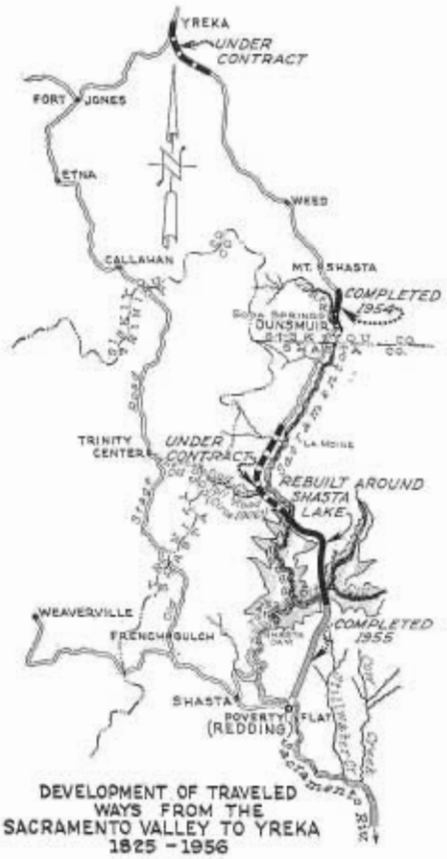
Jedediah Smith first came to the San Gabriel Mission, near what is now Los Angeles, in 1828. He had 18 men and 300 horses and mules. He was not welcomed by the Spaniards and was forced to leave. He went back to Salt Lake City, but next year he started out again. This time he came down the Columbia River, turned south at Walla Walla and arrived in the vicinity of Sacramento by following the American River. This he named the Wild River because the Indians who had never seen a white man, fled wildly at his approach.

From the Sacramento area, he turned north along the east bank of the Sacramento, crossed some place in the vicinity of Red Bluff and came into Shasta County. The expedition there turned west into Trinity County and the vicinity of Burnt Ranch.

At this time there was considerable mystery as to whence the Sacramento River came. One old map showed it as draining from the Great Salt Lake.

Coming of Trappers and Traders

Trappers and traders followed the footsteps of the Smith expedition to reach the Sacramento Valley, but they did not come through the canyon. They mostly came from Oregon down the lower Klamath Lake area,



DEVELOPMENT OF TRAVELED WAYS FROM THE SACRAMENTO VALLEY TO YREKA 1825 – 1956

thence southwest to the Pit River and Cow Creek to the valley.

Oddly enough, the first activity that might be considered as an effort to use the canyon route was the attempt to move a herd of cattle from California to Oregon. This occurred in 1837 and was an endeavor by Ewing Young.

He came to California in 1830 and soon after went to Oregon. He became acquainted with, and indignant at the Hudson Bay Company because they would not let the settlers buy any cattle. The company owned 28 head and they wouldn't sell any.

Young formed the Willamette Cattle Company with a capital of $3,000. He was president, and a Mr. Edwards was treasurer. He then came down to California to buy cattle and take them back to Oregon.

Deal in Cattle

As a first step, he went to Santa Cruz and bought 40 head of horses. Then he went to see Governor Alvarado at Monterey to arrange for buying cattle. At first he met with a blank refusal. After lengthy negotiations, he finally got an order on the San Francisco Mission to sell him 30 bulls and 170 cows. He was then to be allowed to buy enough additional to bring his herd up to 700 head. He was to pay the Spanish Governor for the 500 head even though the cattle belonged to the Mission.

When he presented his order to the Mission Padres they did not wish to dispose of any cows and deliberately misread the order to mean that they were to supply 170 bulls and 30 cows. This meant more trips to Monterey and Santa Cruz. Finally, he got this straightened out.

The Missions were required to gather the cattle, but when Young went to get them, he found some of them had been starved and beaten to bring them under submission to the extent that they could not travel. Again Young engaged in a hassle and finally got these animals replaced. Finally, he was ready. Don't forget that Young originally had only $3,000. With this, he had purchased 40 horses, 700 head of cattle, bought necessary supplies and had enough to hire men to help take the herd to Oregon. The price of beef was not as high then in California as it is now.

Fording a River

The crew and herd started out. At the first river they encountered, the San Jose, the herd absolutely refused to cross. Crossing rivers wasn't in their contract. The drivers then built a raft, lassoed a few calves and ferried them across. The theory was that the cows would follow. It didn't work. Finally they had to build a holding corral on the opposite bank, lassoed

Typical highway construction in Sacramento Canyon about 1928. Dotted line shows road before relocation.

a few head at a time, and dragged them across the river with the raft. It took 30 days to get the herd across this stream.

On August 14, 1837, they crossed the Sacramento River near Red Bluff. Shortly thereafter, he passed through Poverty Flat, now the site of Redding, and started up the canyon.

Picture, if you can, the trials facing this undertaking. In the first place, these cattle were only a shade less wild than deer. Prior to the start of the drive, they had never been handled and were continually trying to break away and escape. Some did break away in this upper valley and formed the nucleus of the wild cattle that were here when the settlers came later. Cow Creek got its name from these same wild cattle. Then in August, the Sacramento Canyon is blazing hot. The hills are baked hard and dry. We have no record that there was even a trail. Cattle feed must have been scarce.

Tough Trip

Soon after entering the canyon, Edwards recorded in his diary that, "Over the different steeps, thru compact masses of Chameese and Manzanita, in and out of the successive craggy canyons, they urged and forced the stubborn cattle."

The drivers want to quit but had no place to go if they did.

Later Edwards wrote, "Lofty mountains exchanged for deep and difficult canyons. On every hand Alps rise above Alps and mingle with the clouds. A repulsive mountain rises before us."

Finally, they reached Chasty Valley. Spelled C-H-A-S-T-Y. They lost 170 head of cattle on the way, but had traded some horses for cattle and actually came through with 724 head.

From here on the trip to Oregon was relatively easy. As to profits, one stockholder said he would trade his for a drink of water, so it couldn't have been a very successful venture.

Later several other mounted parties came down the canyon.

Gold Discoveries

Gold discoveries in 1849 greatly increased travel and while the first north and south stage travel went west from Shasta to French Gulch, thence north into Scott Valley and Yreka, settlements south of that place in the vicinity of Mount Shasta and Weed, made demands for a route through the canyon.

At this time, Shasta "The Queen City" was the metropolis of Northern California. In fact, with Sacramento and San Francisco, it shared the honor of being one of the three largest towns in the State. Los Angeles was only a Mexican pueblo.

In 1849, a combination stage and mule train schedule was put in operation by way of Buckeye, Pit River, Dog Creek and Soda Springs. Passengers traversed the first 17 miles from Shasta to Pit River by coach, then they traveled 40 miles to Soda Springs by mule back where they again took the stage for the final 49 miles to Yreka.

The mule trains generally consisted of 30 to 40 mules with packers. Each passenger was allowed 40 pounds of baggage and a canteen of water. The advertisements of the day dwelt heavily on that fact that everything was done for the passenger's comfort.

The First Road

Between 1850 and 1871, highways were in the making. They were mostly ungraded and unsurfaced. One stage going the 40 miles from Red Bluff to Shasta spent 2½ days traveling the last 11 miles. Comment on the record: "We were visited by a storm."

We do not know too much about the building of a road through the canyon. Doubtless, it was accomplished by working from both ends and consisted of first knocking off points and clearing so that wagons could get through. Doubtless bridges were built over tributary streams only to be washed out and built again. It it also highly probable that after the road was first opened, there were considerable periods when soil and flood conditions closed it to all but pack train travel.

First Highway Bond Issue

In 1902, the Legislature extended the powers of the Legislature so that a State Highway System could be designated and in 1909 a bond issue of $18,000,000 was voted to build such a system. In 1911, a highway commission was organized and seven district offices established. This commission was assigned Room 118 in the State Capitol. T. A. Bedford was the first district engineer of the Redding district.

The minutes of the meetings of this first highway commission are of interest to us now. They owned considerable stock; horses for survey wagons, saddle horses and animals for general use in hauling light passenger vehicles. Quite a lot of time was devoted to securing a suitable brand. Finally, they decided on a device which represented two letter C's

placed backwards to each other and some distance apart. A bar connected them to represent a C, an H, and a C.

In other meetings, some considerable time was devoted to securing a car for the use of the commission. The choice simmered down to either a 28-horsepower Franklin or a 32-horsepower Cadillac.

This commission made a good start; many present highway policies were conceived by this same body and are still being followed.

On February 8, 1912, the commission voted to have the highway engineer make a reconnaissance of US 99 in Division II, between Redding and Dunsmuir.

Construction Begun

Apparently, this report was prepared in piecemeal. In covering the 13-mile section from Mullin's Ranch to La Moine, Bedford reports, "Practically all the through traffic between the Sacramento Valley and Oregon passes over this section when the road is in good condition, but a large portion has been diverted over other roads of late on account of the miserable condition of the county road. The width of the traveled way will average about eight feet." A little further on he says, "The existing road has rather crooked alignment with some curves as sharp as a 20-foot radius. The grades are fairly light with the exception of the grade in and out of Dog Creek near Delta and the grade from the saddle into La Moine. These grades run as high as 15 percent in places."

On the section between Castle Crags and Dunsmuir, Bedford says, "There is considerable local travel for this part of the country, over this section. * * * The width of the traveled way is 12 to 16 feet." Later, he says, "Grades are up to 12½ percent."

Altogether, we get the picture of a narrow, crooked, unsurfaced road that was never very good at best and impassable in portions of the year.

Four-lane divided highway near south end of Sacramento Canyon, 12 miles north of Redding

The Highway Commission began construction of the road through the canyon in 1912.

Now Highway Needed

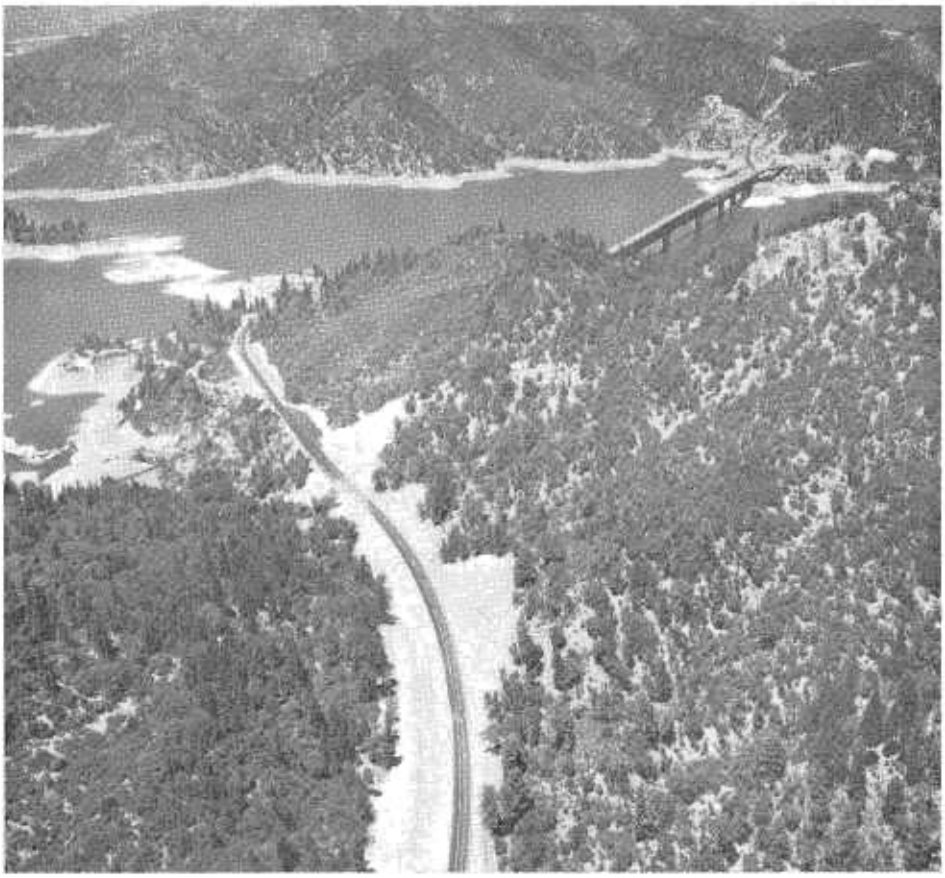
It proceeded partly by day labor, but generally by contracts. These cover the period from 1914 to about 1930. The total expenditures in this period amounted to about four and one-half million dollars. When you consider that in order to bring this figure in line with present day dollar value, it would be necessary to multiply it by about three; then compare this 13½ with today's 17 million dollar estimate for the canyon construction. It appears that the State will get a lot more for its money today than it did then. The existing road was located, in no small degree, in such a way as to get through the country the most economically. The new highway, besides being over twice as wide, will be built to a location which provides certain necessary sight distance and grades.

F. W. Haselwood came to Redding as district engineer in 1932. He replaced H. S. Comley who told him that he was free of one worry. The road up the Sacramento Canyon was built and would need no more attention. In accordance with the traffic requirements at that time, it was. The phenomenal increase in population and traffic in our State has now rendered it obsolete. It cannot take care of present day traffic and unless replaced will be a serious bottleneck within a few years.

Even the section from Bass Hill to Antler that was constructed to clear the reservoir created by Shasta Dam, is not up to present day standards. However, it is likely to serve for quite a few years because other sections of the highway are much more in need of attention.

First Contract in 1952

In 1952, the first contract looking toward the reconstruction of the Sacramento Canyon was let. This was for four miles of divided highway north of Dunsmuir. This was followed in 1953 by a contract for a new bridge over the Sacramento River in Dunsmuir. This was the only part of the canyon project that could be built without a complete study of the entire canyon relocation.



Reconstructed highway around Shasta Lake. Pit River Bridge in background. Terrain across the lake is typical of that over which Edwards drove his cattle.

Accordingly, the entire canyon from the new bridge south clear down to the north end of the relocation around Shasta Lake was photographed by aerial survey. A contour map was then prepared. From this a tentative location was made. This was then placed on the ground and checked. This probably saved two years of time. After this was accomplished, it was possible to pick out any individual section, prepare plans and let a contract for construction with the assurance that the work done would finally fit into the completed whole.

Last year, the Division of Highways completed the relocating and constructing of the 12-mile section of highway between Redding and Shasta Lake. This was accomplished by an expenditure of about $2,700,000.

Three Contracts Under Way

Beyond the portion of highway that was relocated around Shasta Lake, three contracts are under way that represent an expenditure of an additional $4,500,000. This covers the construction of a new bridge over Dog Creek and 6.5 miles of highway. All of these should be completed in 1956 or early in 1957.

The surveys are completed and plans are under way for the balance of the 19 miles that remain between the north end of the current contracts and the Sacramento River Bridge in Dunsmuir.

A real start is being made on the Sacramento Canyon reconstruction. We do not know how long it will be before the entire canyon will be completed. It depends on several factors, the most important is when the Highway Commission can make funds available.

However, when it is all completed and you can safely drive from Redding to Dunsmuir at a sustained speed of 55 miles per hour, try and remember Ewing Young. Think about him trying to herd those wild cattle over

. . . Continued on page 72

SUSANVILLE-ALTURAS ROAD IN LASSEN AND MODOC GETS IMPROVEMENT

By H. C. HOLUM, Assistant Highway Engineer

When the State took the road between Johnstonville and Alturas into the State Highway System in 1933, it got a road that had never been located as a highway; it was merely established through usage.

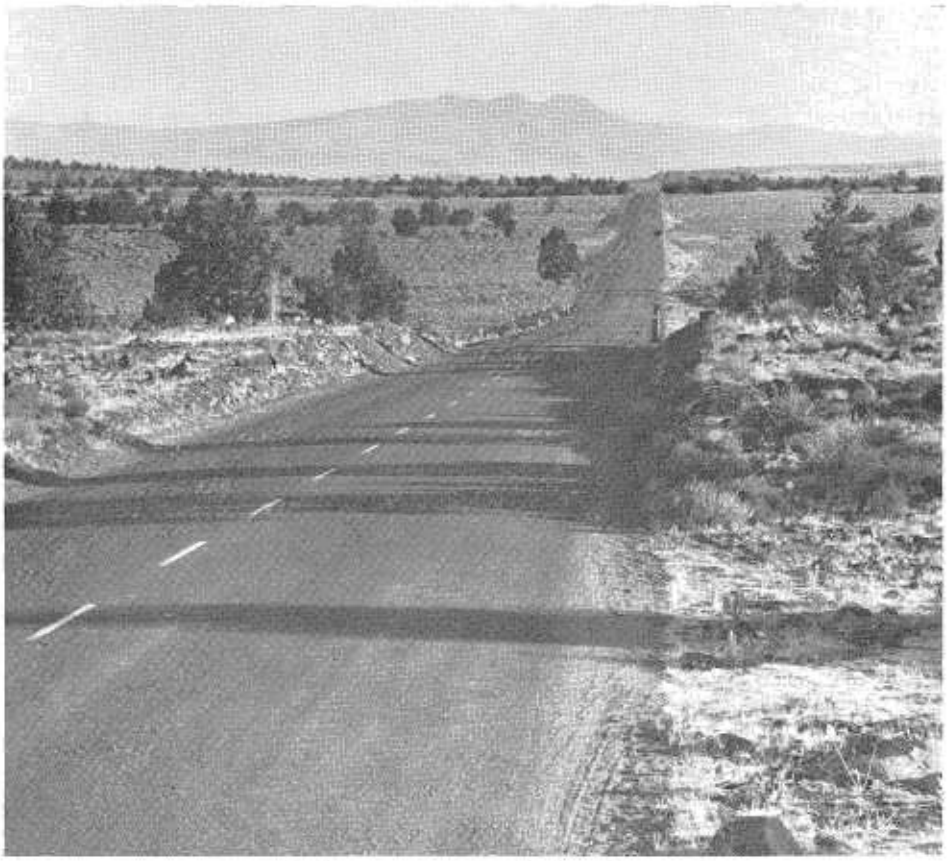
While the entire section was deficient, the worst portion was between Secret Valley and Ravendale in Lassen County. The road ran into and out of gulches, around the points of hills and dodged lava outcrops. Cuts and fills were limited to about two feet in depth. It advanced by indirection. As a route for exploring the area, it was ideal. As a route for getting through the area, it left much to be desired. Sometimes the road ascended a short steep pitch with a short radius curve on top. These added a certain sporting hazzard to night driving, because after ascending the rise and the vehicle's headlights were still pointing above the horizon, the driver had to make a rather abrupt turn without full benefit of his lights!

Outside of adding light surfacing and patching the same, very little had been done to this section in the following years. There were several reasons. First, due to the volcanic character of the country, any grading would involve drilling and shooting lava. It would be expensive. Second, anything accomplished would be for temporary relief and would not fit into the final plan and location. Third, highways in other locations carrying much heavier traffic had to have priority due to congestion and a high accident rate.

Survey Made in 1946

The district made a survey in 1946 over the entire section. After the Collier-Burns Act became a law in 1947, plans were completed for a 3-mile portion located between 6.5 and 9.5 miles north of Secret Valley, using these plans, the Bureau of

This photo is typical of the old Susanville-Alturas road



This photograph shows a typical section of the completed new highway

Public Roads awarded a contract to Harms Bros. for its construction. This was completed in 1951 at a cost of $307,000.

In 1952 a section was constructed 2.08 miles in length, extending south from the bureau project, by A. Teichert & Sons, Inc. The resident engineer was Ellis Engle. It was completed in 1953 at a cost of $333,214.

In the fall of 1953, Harms Bros. received a contract from the Division of Highways to construct the balance of the southern portion. This was 4.7 miles long and extended from Secret Valley to the completed highway at the north end. It was completed at a cost of $547,392. R. J. Felton was resident engineer.

In the fall of 1954, Harms Bros. was awarded a contract on the northerly and last section. This project covered 7.3 miles and extended from the north end of the bureau project to Ravendale. It was completed in October, 1955, at a cost of $563,780. The writer was resident engineer.

Savings in Time

All of the foregoing projects totaling 17 miles consist of an all-paved 32-foot section providing two 12-foot lanes with 4-foot shoulders.

Approximately 26 miles north of Ravendale, between the communities of Madeline and Likely, another contract was awarded to Harms Bros. in October, 1955, at a low bid of $301,898, to grade and pave a 3.5-mile section in the north end of Lassen County. The project extends between Sagehen Summit and Dry Creek. The existing road is very narrow and crooked, with short steep grades. The project is being constructed on entirely new alignment and will be completed by fall. This project will also be a 32-foot all-paved section with 4-foot shoulders.

The improvements, completed and under way, will provide a considerable savings in time and distance to the traveling public. At the same time, in comparison with traveling over the old "tortuous trail," the route can be traveled with driving comfort and a relief from accident hazards.

REDWOOD FREEWAY

Continued from page 28 . . .

mission of the completed study to headquarters.

The 43 miles submitted and adopted was the result of over 200 miles of detailed investigations at an engineering cost of close to $40,000 including the aerial survey.

The successful conclusion of a project of this magnitude that involves a great number of people, communities, towns, industries, and interorganizational divisions within State and local governments indicates the smooth-working policies that dictate and guide such projects through the intricacies of complex physical, personal, and theoretical problems involved in such an undertaking.

The endorsement of the recommended line by the Division of Beaches and Parks, which is responsible for the preservation of the dedicated groves and recreational areas, was the result of close liaison and mutual understanding of problems that demanded the utmost in cooperation by both organizations.

In conclusion, credit should be given to the generous volume of intelligent publicity accorded this study by newspapers, radio, and television. Following official news releases that the study had been completed, these organizations went all out to present the facts through their particular medium. In one instance, a team of four television specialists was dispatched to attend the Sacramento hearing which they recorded pictorially and by sound.

These recordings and pictures were later released through a series of television broadcasts in their entirety. The value of this publicity paid off by the prompt acceptance of the recommended routing by a well-informed public.

During the 1954-55 Fiscal Year the total number of contractors prequalified to bid on the various types of state highway construction increased from 691 to 780. The combined bidding capacity of these 780 prequalified contractors is estimated to be $1,472,000,000.

THE STORY OF US 40 AND US 50

California Highways and Public Works is indebted to William F. Kilcline, Manager of the News Bureau of the California State Automobile Association, for the following clarification of the histories of US 40, US 50, and Sign Route 24, popularly known as the River Road between Sacramento and Oakland:

Since the uncertainty about the routing of the Lincoln Highway also involves the routing of the Victory Highway, it will be necessary to go into some detail to clear up the matter. This is especially true when an analysis of the available information shows there are three sources for the misunderstandings on the locations of these famous highways.

The first uncertainty or misunderstanding arises from the fact that in the East and in the Midwest, the Lincoln Highway runs north of the Victory Highway and follows U. S. Highway 30 through Philadelphia, Chicago and Omaha. At Salt Lake City, the Lincoln and Victory Highways merge and continue as one route through the Great Salt Lake Desert to Wendover, Utah, where the Lincoln Highway (following U. S. Highway 50) strikes southward and becomes the southern route into northern California and the Victory Highway, following U. S. Highway 40, continues westward and becomes the northern route into California. This merging and crossover of the two cross-country highways in the Utah-Nevada area is not always clearly understood by many people. (Before the completion of the highway across the Great Salt Lake Desert, it should be remembered, too, that the Lincoln Highway turned southward to Main Forks, on the southern tip of the Great Salt Lake, then took a southwesterly course through Tooele, Granite Mountain and Ibapah, Utah, to Shellbourne, Nevada, then south to Ely, Nevada.)

The second uncertainty arises from the fact that the Lincoln Highway was the first cross-country route to be promoted and developed, but the Victory Highway, though the second cross-country route to be promoted and developed, was the first to be completed as a through route. This was a situation to keep any political pot boiling. Naturally, before the Victory Highway was promoted and its construction began in earnest, every city and town wanted to be situated on the Lincoln Highway, particularly in California. Thus in this State, the highway over Donner Summit (US 40) and the highway over Echo Summit (US 50) were originally designated alternate Lincoln Highway routes.

But with the promotion and development of the northern trans-Sierra route (U.S. 40) as the Victory Highway, it was generally agreed that the southern trans-Sierra route (U.S. 50) would thereafter enjoy the sole right to be designated the Lincoln Highway route in California.

Of course, interested parties on the northern route continued for a time to cling to the advantage of keeping a double name for their highway. In other words, they accepted the Victory Highway designation but, at the same time, clung to the Lincoln Highway designation, too. There would have been a definite clarification of this matter, no doubt, had not the federal highway numbering system come into existence at about this time.

With the advent of the federal numbering system for highways, the highway officials, and motoring public were less concerned about maintaining the correct use of names for highways than they were concerned about federal and state numeral designations. Besides, it helped them to maintain a certain air of neutrality in local fights over appropriations and the use of these names. Signboards, markers, plaques carrying highway names were neglected, or they disappeared, and the use of highway names consequently declined, especially since the "promoting organizations" began to go out of existence. A new generation of tourists arose who preferred to follow numbered routes because of their mathematic-like accuracy and, gradually, the Lincoln and Victory Highway, what with changes, realignments and other developments, suffered accordingly in the matter of the public's knowledge of their exact routing.

To increase the confusion, upon the completion of the Yolo Bypass, the present U. S. Highway 40 was designated as an alternate Lincoln Highway route.

Original Lincoln Highway

The original Lincoln Highway turned south from the State Capitol to Stockton and then east through Livermore to Oakland and San Francisco. The new routing then gave two designated Lincoln Highways from Sacramento to the Bay area, US 50 and US 40. This latter route is properly a part of the Victory Highway, since this highway follows US 40 from the Eastern Seaboard all the way cross country through Baltimore, Columbus, St. Louis, Denver, Salt Lake City, and Reno to Oakland and San Francisco. It also should be pointed out that the Lincoln and Victory Highway Associations, in their efforts to obtain funds, made several reroutings which involved the "River Road" (State Highway 24) between Sacramento and Oakland. In other words, there was a short time in which US 50, US 40 and State Highway 24 were a three-way choice for Lincoln Highway travelers and US 40 and State Highway 24 were a two-way choice for Victory Highway travelers between that State Capitol and the Bay area. Thus the Lincoln and Victory Highway, upon approaching their Pacific Coast termini overlapped again, as they did through the Great Salt Lake Desert in western Utah.

This is a general picture of the situation and perhaps the explanations of the uncertainties that have arisen do not fit every specific case regarding the Lincoln and Victory Highway routings; nevertheless, they do show the over-all pattern of the misunderstandings and their causes.

Tulare Bypass

Community Made Successful Adjustment to Highway Change

By JOHN F. KELLY, Headquarters Right of Way Agent

DECEMBER, 1953, was an important date to the citizens of Tulare, and to the thousands of motorists using U. S. Highway 99, the popular Valley Route between Los Angeles and San Francisco. This date marked the completion of a 7.9-mile freeway between Tulare Airport and Tagus in Tulare County.

To the highway motorists this new freeway meant that another vital link had been added in bringing a desired goal into reality; a continuous four-lane divided roadway connecting Southern and Northern California.

To the citizens of Tulare the new freeway meant that several thousand vehicles driving through the center of their town each day would be diverted to a new highway bypassing their community. In the opinion of many people this new highway alignment, so far away from the central section of the town, might result in economic ruin to retail business in Tulare, and therefore might seriously damage the general economy of the community.

Tulare is about an hour's drive from Bakersfield or Fresno, and approximately midway between Los Angeles and San Francisco, on U. S. Highway 99. Like all other towns along a main traffic arterial, the highway route became one of the first commercial areas in the community. As the town grew, nearly every type of business enterprise located along the highway, creating a ribbon-type business area extending for a distance of nearly five miles, with the center of this ribbon development near the junction of the highway extending east and west to Lindsay and Corcoran. As often happens during the growth of communities, the center of business areas shifts to new locations. During Tulare's growth the main business area shifted to K Street, parallel with the former highway route.

Aerial view showing freeway bypass of Tulare. Old highway can be identified by row of trees across upper right portion of photo. Interchange in center of picture shows Lindsay highway left of freeway and Tulare street on the right. This street extends west to intersection with old highway in vicinity of central business district, right of photo.

Highway Change

The present highway change also follows an almost predictable pattern in the normal development of most of California's cities. Although to Tulare's citizens this removal of through traffic presented an immediate cause of unrest because of anticipated property depreciations, experience in similar situations has indicated a more satisfying and beneficial effect than is normally expected.

Although it has always been our policy to accept willingly the responsibility for analyzing the over-all economic climate of a community that has had its traffic and travel habits changed by freeway construction, experience has not simplified the problem of evaluating the changing effect but rather has accentuated the need of being fully cognizant of, and completing a thorough analysis of the major contributing factors of the economic growth of the area.

As a general concept it can be stated that every improvement, whether it be water supply, drainage, or highways that performs a service to the public at a lower unit cost than

the facility it replaces, represents a capital gain to the community and, therefore, an economic benefit.

In the case of freeway development, every construction is thoroughly justified by reason of the transportation savings to the individual motorist. These savings represent added purchasing power in additional transportation or other fields for every resident who utilizes the facility, and, therefore, the dispersion of these savings is a measure of general economic gain. However, the problem of freeway influence, although involving these general benefits, must be demonstrated for maximum clarity not by general benefits enjoyed by the community, but rather by the special measurable benefits on individual properties either through their increase in value or the improvement or diminution of their business attraction potential.

In individual instances this matter of highway influence may have a marked effect, sometimes factually, but unfortunately many times psychologically; however, to measure this effect by factual information requires that the major contributing factors to economic growth be first analyzed and properly evaluated.

In spite of the exaggerated importance often given to the highway effect individually on these properties, it is a relatively small percentage of the influence exercised by these broader fields.

Community Income

In the case of the City of Tulare, as is true in every economic study, it was apparent that before measuring this highway influence it would be necessary to measure the fluctuation or stability in the fields representing the City of Tulare's major source of income. The trend in this basic income stream affects every businessman and every property owner in the community to an extent far in excess of the revisions of its transportation system. It is axiomatic that the fluctuation in this income stream is the factor that will determine to the greatest extent the economic status of the community.

The transportation system, and in Tulare that means the highway system, can increase or reduce the income stream in some specific location for those businesses primarily catering to the highway traffic. However, from past experience it has been proven that this effect is generally temporary in nature, and is subject to almost immediate stabilization by the readjustment of the traveling habits of the public, and the merchant's adaptability to accept and to capitalize on these traveling habits.

Again, and I think it is worthy to repeat, that such changes created by a diversion of traffic are temporary in nature, and are small percentagewise in the relationship to the entire community economy, and in the final analysis will recuperate so that in the broad concept the community will derive not only the calculated saving to the individual motorist, but the additional benefits inherent in an improved transportation facility.

In a study of the City of Tulare it was apparent that the area's basic income stream depended upon its agricultural production; therefore, in the following analysis specific consideration is given to this field.

Secondary effects which also loom large in the economic picture, such as relative population growth both in the county and in the city, and the relative employment factor, have also been given thorough analysis. The property sales and building activity are also major fields of activity that tie very closely to the rise and fall of the basic income stream.

This is particularly true in the industrial development where new industrial growth or expansions of existing plants are noticeably allied to the agricultural field.

It is not until these major fields have been studied and properly evaluated that it is possible to apply the additional effect of traffic and traveler behavior pattern to those properties and businesses catering to highway travel so that the contributions of the highway changes can be measured.

Agriculture

Our analysis of Tulare's income stream indicated that the majority of farm income around Tulare relies upon cotton and dairying, whereas agriculture in other sections of the county is more diversified.

Tulare is referred to as the center of the cotton belt in the county, and this crop has been one of the biggest sources of cash income to farmers in this area. Acreage planted to cotton is under the jurisdiction of the Federal Government, and during the past four years the acreage allotted for the production of cotton has been reduced approximately 50 percent. The acreage taken out of cotton has been planted to substitute crops; however, the income from these other crops is substantially smaller than the cash return from cotton.

This reduction of cotton acreage in the Tulare area has had a marked effect upon the purchasing power among the farmers, and in turn directly influences the economic welfare of Tulare.

Individual cotton farmers in the Visalia and Porterville areas were also hurt by the reduction in acreage allotted to cotton production; however, the diversification of agriculture around these communities has provided other revenues to help offset the reduced cotton income so that the economic status of those communities was not as seriously influenced by the decrease in revenue from one particular crop.

The dairy industry at Tulare is generally considered to be second to cotton in importance as a source of revenue from agriculture. The income from dairying has decreased in recent years because of several adverse factors, such as the growing competition from other producers selling to their chief metropolitan market, and an increasing trend in reducing dairy operations in favor of other types of agriculture utilizing irrigation water.

Gradual changes by individual farmers, from dairying into other fields of agriculture, is very likely being done because of necessity or the opportunity to achieve higher incomes. Even if individual incomes improve, and Tulare benefits financially, dairying as a key industry supporting the general economy has been diminishing, and, in so doing, the many business enterprises closely associated with this specific phase of agriculture have been affected.

Employment

There has been a marked effect upon the number of agricultural workers in the Tulare area because of the reduced cotton allotment, crop changes, and the reduction in dairying. In addition, the mechanization of the cotton industry has further reduced manpower requirements. Because of these changes, Tulare County has suffered a decrease of approximately 4,000 farm laborers.

At present there are 34 principal crops in the county, each requiring more than 500 seasonal workers, the greatest demand for workers being in the eastern portion of the county commonly referred to as the "thermo belt."

In the Tulare area, cotton is the principal field crop requiring farm laborers. The use of cotton picking machines has become so popular in this area that approximately 65 percent of the cotton grown during the past three years has been picked by machine.

This decreasing employment was so pronounced that it became necessary for the farm labor office at Tulare to close in November, 1953. The State Department of Employment now is able to serve the Tulare area adequately with mobile units.

This sharp reduction in the number of migratory workers at Tulare could not help but have an influence on business receipts, particularly noticeable among certain types of retail outlets. The loss of hundreds of customers who made purchases in the business district during five to six months of every year can, and do, seriously affect the gross receipts of many businesses.

Population

The 1955 estimated population of California areas and counties revealed the population of Tulare County was 2.9 percent lower than in 1950. During this same five years the population throughout the State increased 23.1 percent.

In May, 1955, a special census was conducted in the City of Tulare, and the report shows a 6.49 percent population increase within the city limits since 1950. A special census made in 1954 and 1955 in the larger cities of Tulare County revealed population increases since 1950 similar to the gain made in Tulare. The annexation of areas which had been outside the city limits in 1950, and the normal increases of births over deaths have accounted for a portion of the population increases in the cities. With allowance for these increases which do not comprise new migration into the communities, Tulare and other cities have not suffered the population decline that occurred in the over-all total for the county. The reduction in the employment of approximately 4,000 farm laborers during recent years is reflected in the county population figures rather than in the cities. Nearly all of the farm laborers reside in areas outside the city limit boundaries.

The population loss in the rural areas of the county will definitely influence business conditions, and indirectly affect the economic conditions of the cities who are dependent upon the purchasing power produced by agriculture in the surrounding areas.

Looking north on K Street, Tulare's "main street," parallel with old highway route

Traffic

In the selection of possible routes for any highway relocation, traffic studies are made to determine the destinations of all vehicles driving through a community. Prior to the construction of the freeway bypass of Tulare, traffic studies revealed that 60 percent of the traffic entering the city passed through without stopping. In other words, 60 percent of U. S. Highway 99 traffic indicated a preference for a bypass of the town wherever it was located.

The average daily traffic count in 1955 revealed that 78 percent of the highway traffic bypassed the south entrance into the town. A certain percentage of these vehicles entered the city at the five interchanges on the freeway between the north and south entrances. The traffic counts clearly reveal that the freeway in its present location is performing the traffic service for which it was designed by removing from Tulare's streets only the highway motorists who have no intention of stopping in the community.

Consequently, the decrease in the number of through highway travelers in front of the ribbon-type business development extending along the old highway in Tulare has improved the safety and parking conditions for the local customers patronizing these retail outlets. The improvement in this area for local shopping is fairly well proven by the fact that these retail outlets which cater to the needs of the people living in the Tulare area showed the greatest increase of any business sector in Tulare after the rerouting of through traffic to the freeway.

Retail Business

The largest available source of factual information used in this study was in relation to retail business. This data consists of sales tax reports of the busi-

nesses in the City of Tulare, as well as those businesses located outside city limit boundaries serving the city and suburban areas. This statistical information provides a thoroughly reliable indication of the economic trend in the community.

The basis of this retail business portion of the study has been a comparison of the two years *before* and *after* the completion of the Tulare freeway bypass in December, 1953. To determine whether the gains or losses of retail business in Tulare follow the trend normally expected during a given period of time, a comparison was made with all retail outlets in Tulare County.

To ascertain if the removal of through highway traffic from the center of Tulare has had a direct effect upon those businesses in the community most likely to benefit from the patronage of highway motorists, gross sales of service stations, and eating and drinking places, have been tabulated separately.

The gains and losses of the retail businesses in Tulare, as compared with Tulare County before and after the freeway opened, are illustrated in the chart on page 43. The service stations represent 13.5 percent of the total number of retail outlets in the community, and the eating and drinking places account for 18 percent of the total. Sixty-five percent of the retail businesses in the community are the "all other" group, the businesses that depend entirely upon local patronage for their livelihood.

Service Stations

A tabulation of the total sales of all service stations in Tulare revealed that gross sales during the two years after the completion of the freeway bypass decreased 9.54 percent as compared to the two years prior to that date. During the same period of time gross sales of all service stations throughout Tulare County declined 4.37 percent.

With full consideration given to all factors contributing to the sales activity of service stations, a portion, but not all, of the loss suffered by stations in the City of Tulare in excess of the losses of stations throughout the county, represents the volume of business lost from motorists using the bypass during the two years it has been open.

In considering the loss and gain of any business catering primarily to through highway traffic, it is necessary to resort to the fundamental changes that occur in any transportation revision; for example, if any revision of traffic flow was made in a conventional manner there would be a tendency first by all business catering to the traveling public, and then by any business which might have a portion of its income from the traveling public, to seek new locations adjacent to the new facility.

One of the greatest advantages of freeway construction with its control of access is that it restricts the use of the land adjacent to the new facility to such an extent that general businesses will find it more advantageous to continue operations in their existing locations than to attempt to reestablish in the vicinity of the interchange structures to the new facility. However, in the case of service stations, it is only natural that they should reappraise their merchandising policies in relationship to location, and if their policy and the bulk of their business is derived from the highway, to attempt to locate at strategic locations that would guarantee the greatest potential patronage.

If those businesses making this decision were able to ascertain the most suitable location, and to start operations at the time the freeway was open, an immediate shift of the location of gross sales would take effect, and in the over-all totals the community would retain its income stream. However, a period of readjustment is necessary. This period of readjustment all occurs during the study period after the opening of the freeway. Therefore, it follows that the total sales during the period of adjustment will be less than the expectancy for the area, and will increase as stations make the necessary adjustment.

In this study it is possible to trace this reaction to some degree. You will note separate tabulations on the service stations located along the superseded highway, and in various sectors of Tulare. It is possible, using this tabulation, to determine the effect of rerouting traffic within specified areas. The actual analysis of the entire service station picture cannot be made until the readjustment has been completed.

Eating and Drinking Places

In addition to service stations, the retail outlets in Tulare selling food with nonalcoholic drinks, beer and wine or liquor, have been segregated from the remainder of all other types of business in the community because they are most likely to benefit from the presence of highway motorists, and by the same token could be damaged to the same degree by the loss of highway traffic. A review of the gross sales of all eating and drinking places in Tulare, as compared with the same class of retail outlets throughout the county, reveals that business activity was virtually the same. During the two years following the completion of the freeway bypass, gross receipts among this class of businesses in Tulare decreased 12.01 percent. During the same period the eating and drinking places throughout the county decreased 12.07 percent in gross sales.

This comparison indicates that loss of gross sales among eating and drinking places in Tulare was not the direct result of removing through highway traffic from the central portion of the city. Tulare was the only city in the county subjected to a major highway change during the time this comparison was made; therefore, it is apparent that other factors influencing business conditions in this area were primarily responsible for the loss to eating and drinking places.

A separate tabulation has been made to determine whether business receipts of eating and drinking places within specific sectors of the city may have been influenced to a larger degree than others by the rerouting of highway traffic around the city.

All Other Business

The segregation of service stations and the eating and drinking places leaves the remainder of business enterprises in the community in a category which we are referring to as the "all other" group. These are the businesses which derive very little, if any, benefit from the highway traveler. In fact, the congestion caused by through highway traffic along business streets

has been found in previous economic studies to have been extremely detrimental to this group of retail outlets. They are the businesses which usually reflect the greatest benefits directly following the removal of highway congestion.

In Tulare the majority of retail outlets in the community are represented in the all other group. They have shown a gain of 8.0 percent in gross sales during the two years following the freeway bypass as compared with the two years prior to that date. The same class of retail outlets elsewhere in the county increased only 2.51 percent during the same period of time.

In view of other factors influencing the economic status of Tulare during the four years covered by this study, it is apparent that the removal of highway traffic was not damaging to the majority of retail business in the community. Following the pattern of analysis of the traffic-catering businesses, a separate tabulation of gross sales within specific business sectors in Tulare was developed to trace, if possible, the business shift resulting to the majority of retail outlets in Tulare following the construction of the freeway bypass.

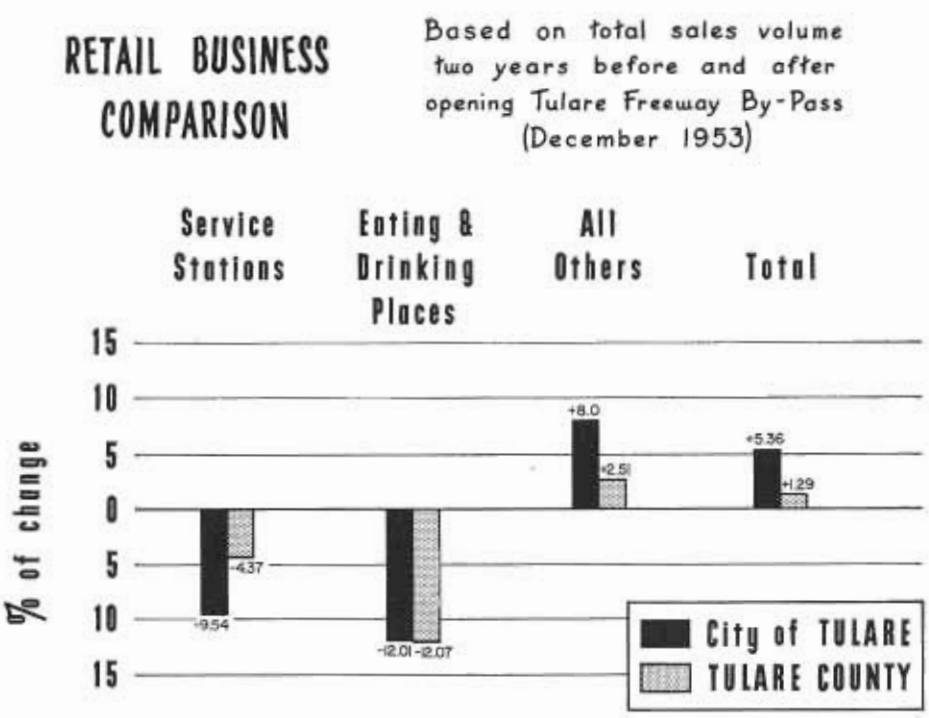


Illustration of gross sales increase or decrease in Tulare as compared with Tulare County during the same period

Total Business Gains

The total gross sales in Tulare were 5.36 percent greater during the two years after the freeway opened as compared with the two years before. A tabulation of total volume of retail sales in Tulare County for the same period shows an increase of 1.29 percent. This reveals that the City of Tulare enjoyed a 4.07 percent increase over and above that of the county, or over and above that required to attain equal status with the normal trend in business conditions in this general area.

The damage caused to the general business conditions in the community by the losses among some businesses which had previously catered to highway traffic when it was routed through the city, was more than offset by the gains made by the majority of retail outlets after the freeway opened. It is noteworthy that these gains were made during a period when the general source of community income was subjected to several adverse conditions.

Business Sectors

In addition to comparing total retail business in the community with the county, the accompanying tabulation has been made to trace the degree of influence upon retail business within specific areas attributable to the rerouting of highway traffic away from the center of the city. The basis for comparison in these sectors has been the same as throughout the community, that is, two years before and after the completion of the freeway bypass.

As a further check on business conditions within specific areas in the city, a segregation has been made between those retail outlets most likely to be directly affected by the highway, and the businesses which do not benefit from highway customers.

The map of Tulare and accompanying tabulation show the location of the business sectors, and the gains or losses of retail business in those specific areas.

Area A

The Lindsay highway extending east from the freeway is the newest and fastest-growing business area in the community. Although the retail businesses along this conventional highway are outside the city limits, they are patronized by residents in the city and in the suburban areas.

Every type of retail outlet in this sector has enjoyed substantial gains in gross sales since the freeway opened. The smallest increase in gross business receipts was made by the service stations. These stations were too far from the old highway route to have suffered any loss because of traffic rerouting in the city. Traffic on the Lindsay highway in front of the retail outlets in Area A increased 16.37 percent from 1953 to 1955. With traffic conditions favorable to service station business, the assumption would be that business gains should have been as high as the increase in gross sales by other classes of retail outlets. Apparently local influence and not through highway traffic is responsible for the difference in the volume of gross sales.

Area B

Inyo Street, extending west from the old highway route in a perpendicular direction, is also the highway between Tulare and Corcoran. Motorists using Highway 99 when it was

. . . Continued on page 65

OBSERVATIONS ON HIGHWAYS IN NEW ZEALAND

Recently returned from an extended visit in New Zealand where he studied driver licensing procedure and traffic laws, Ross Dewdney, Driver Improvement Analyst of the California Department of Motor Vehicles, has included in his report some interesting observations on highway signs and road markings used "Down Under," which may be of interest to readers of *California Highways and Public Works*. Following are excerpts from Mr. Dewdney's report.—Editor.

ROSS DEWDNEY

We found the road signs in New Zealand very adequate, much more so than we had expected. The most familiar and interesting signs to us were the following: A speed restriction sign is a circular disc with a red circle around the outside and with black figures on a central white background. Of these signs, 19 out of 20 show the figure 30. There are a few cases in which additional street restriction is imposed, such as 15 miles per hour or 10 miles per hour and a similar sign is used there. The sign doesn't have any statement as to "miles per hour" or "speed limit," just the figures. The motorist is supposed to know what it means. When you come to the end of the speed restriction zone, instead of a sign with which you are familiar which would say "End 30 Mile Zone," there is only a circular disc about the same size as the other but with a black diagonal bar on a white background. This is called the "De-restriction" sign. And wherever there is a speed restriction sign, somewhere further along you will find the "De-restriction" sign. Strange to say, we found a good many De-restriction signs which didn't seem to be in any way associated with restriction signs.

Parking Limit Signs

Parking limit signs or no parking signs have a lemon yellow background with black letters. "No parking" has the letters "N P" on this sign; parking limit signs have a large P and underneath, the number of minutes permitted.

We discovered that New Zealand does not use the curb marking signs with which we are familiar, but these no parking signs and parking restriction signs are much larger and more clearly marked than our own.

In connection with parking, we discovered that they require much greater clearance from intersection corners and from pedestrian crosswalks than they do from fire plugs.

Stop signs are much more infrequent than they are in California. A great many streets which we would mark as through highways and protect with stop signs are not so protected over there. However, they do have a good many stop signs which are similar in shape to our own, not quite so large, colored a lemon yellow instead of red, with black letters.

All the large cities have a few signal lights, with similar light patterns to ours, but we had expected a good many more than we found.

Caution Signs Frequent

Caution signs of various sorts are very frequently used and are quite adequate. Of course, to one familiar with California signs one is slightly amused at the wording used. What we call curves are always "bends," and such signs as "sharp bends" or "caution—deceptive bends," are quite frequent. We also discovered that a slippery road was apt to be called "greasy."

New Zealand is very proud of its school patrol system in which the honor of being on the school patrol is determined on a merit system. We discovered that the boys or girls, as the case may be, who are on the school patrol, regard their position very seriously. They are given a stop sign on a pole similar to the school patrols in this Country. We found, however, that the orders of the school patrol are much more vigorously enforced, and we learned that persons who violated the orders of the school patrol were really apt to get a rough going over by the magistrate.

Crosswalks Well Marked

As mentioned above, not every sidewalk extension is an authorized pedestrian crosswalk. The crosswalks, however, were well marked. The usual marking was a series of vertical bars, the bars being perhaps six feet long and approximately two feet apart going across from one curb to the other. We found these crosswalks very easy to see and found that pedestrians in these crosswalks were usually treated with utmost courtesy. Woe to the pedestrian, however, who tries to cross anywhere else. The car driver has the right of way and really knows it. With this exception, we discovered that New Zealand drivers are, as a whole, much more courteous and considerate of others than our California ones. We noticed that they were especially careful and courteous out on the open road when they would come to a band of sheep or cattle. Such occurrences are very, very many and very frequent, since New Zealand is primarily a livestock country, with emphasis on sheep and on cattle. Even on the important through highways a person would have to stop or slow down to a crawl a dozen times a day because of the bands of livestock going one way or the other.

Directional Signs

Directional and mileage signs are very frequent and well marked. As you came to a crossroad you would see anything from one to eight or nine of these signs in both directions on the crosswalk, one sign for each of the major points to which the

road would lead. The signs are painted yellow with black letters and are maintained by the Automobile Association, and they do a very good job. The signs usually contain the mileages which we found to be quite reliable. In one or two places we found that instead of a series of single signs, several places were listed on a single sign. This was especially true in Christchurch and one or two other places.

In the North Island, most of the many narrow bridges have a sign at *one end* which reads, "Narrow Bridge, please give way." At the other end of the same bridge the sign would simply read "Narrow Bridge." The idea is that a person traveling in one direction would give the right of way to the person traveling in the other. We learned that this was purely a matter of courtesy, that there was no law requiring it. The signs were so distributed that signs on half of the narrow bridges would give the right of way in one direction and the other half in the other direction. In the South Island, however, there were no such signs. Apparently in this and a good many other respects, the usual procedures and rules varied from one island to another.

Speaking of Bridges

Speaking of bridges, we found that New Zealand has a great many old one-way bridges, becoming rather decrepit and dilapidated and about ready to cave in. All of them were marked by signs limiting the size of trucks which might pass over them. We discovered, however, that the country is replacing these by modern bridges just as rapidly as they can. Being a country with much rainfall and many rivers and streams, of course, the bridges are numerous and they can't all be replaced at once. In the South Island there are many long bridges. Some of these have been replaced by good structures, a few have not. One of the most interesting of the "have nots" was a monstrosity said to be about 4/5 of a mile in length with rails fastened to the timbers of the bridge and extending the entire length thereof. A person with an Austin or certain other very small cars had sufficient room on each side of the tracks to fit between the outside track and the bridge railing. Persons with normal vehicles, however, had to drive with their right-hand wheels on the inner side of the rails. Considering the fact that all New Zealand railroads are narrower than standard gauge, this brings vehicles in reasonably close contact as they pass one another! We have been wondering ever since what happens when a train starts to cross the bridge at one end and the 3/5 of a mile at the other end is occupied by vehicles!

Road Conditions

The travel folders usually grade the New Zealand roads in three different types: (1) "sealed roads"; (2) "metal roads"; (3) just plain roads.

The better roads are called sealed roads because the customary type of pavement used is a surface in which gravel or other aggregates are tar sealed. This forms a very good surface and one of considerable endurance. There are a few miles of concrete pavement, some of bitumin, all of which are included in this general category of sealed roads. By comparison, I would say that most of these sealed roads are fully as good as our better country roads and some of our state highways. New Zealand does have a few miles of four-lane divided highways. These are called motor ways. Some 20 miles of good motor ways are found in a stretch just north of Wellington on the coast route, not quite equivalent to our freeways because of numerous intersections. Then there are two stretches of approximately seven miles each, in the Auckland area, of good freeway. This freeway is just being opened at the present time.

Metal Roads

The second classification of roads, called "metal road," is something of a puzzle. The word "metal" seems to designate either large gravel or crushed rock. The metal roads we found are apt to be very dusty, rather treacherous because of loose rock or gravel, and tend to be quite "washboardy." What puzzled us was that that road maps and even the guide published by the Automobile Association show no distinction, practically speaking, between these metal roads and good tar sealed roads. The Automobile Association puts out an instructive and interesting booklet, usually quite reliable, describing in some detail each stretch of road that you will be traveling over and lists the approximate speed which you can expect to make over that stretch of road.

For good roads, they use the figures "ATS" meaning, "average touring speed." We found that in most stretches metal roads were designated as "ATS" just the same as the good sealed roads. Perhaps this is due to the fact that the average New Zealander seems to drive just as fast on the metal roads as he does on the sealed road; perhaps he finds that the faster he drives the more he avoids the bumps! To us, however, some of these metal roads were rather disappointing. There is much work being done on these roads, many of them being gradually transformed to sealed roads. In other words, it should not be many years before New Zealand will have an extensive network of excellent roads.

Not So Good

During the construction process, however, we found some of the going rather unpleasant because it seems they expect you in most cases to drive over the road during construction time. In many cases the base of the road seems to be rocks about the size of your fist or larger. Needless to say, traveling over a two-mile stretch of such roadway was a bit painful. We also discovered that during these road construction processes there was a noticeable lack of flagmen and other guides to direct the traveling public as to which way to go and how to get there. At one stretch we came suddenly upon a tar sealing in process. We didn't want to go through the stretch of gooey tar and there were no guides to tell us what to do. We did remember, however, that a quarter of a mile down the road there had been a fellow leaning on his shovel whose duty was perhaps to guide us but who had

failed to do so. So we had to back up a quarter of a mile and then take a detour to the side. This lack of guides or flagmen was not universal and in some places we found them very courteous and very helpful.

The "just plain roads" include dirt roads and roads in which a few rocks had been placed to fill up the holes and which scrapers had gone over once in a while. Usually before you get on to these you have some sort of description as to what you may encounter and actually we didn't find many of them too bad—or at least we expected what we came to. In general we decided that it was the best policy not to get too far off the beaten tracks.

"Guinea Pig Highway"

One of the most interesting experiments being carried on at present in New Zealand is on a 100-mile stretch of highway between Wellington and a town with the unpronouncable name, "Packakariki." Driving south one comes to a most interesting sign: "You Are on the Guinea Pig Highway." Then follows in rather rapid succession numerous signs, many new and different, each aimed at securing public reaction and performance—studied to determine their effect on the driver. In addition, according to published news releases, it is intended on this road, "to righten and correlate control," and "to test new methods of catching the erring motorist."

At strategic points along this route there are located radio equipped "traffic stations" from which long stretches in each direction are visible. These stations are in constant contact with patrol cars. Microwave speed detectors and polaroid cameras are used to detect violators.

One interesting signs says "yellow bars show spacing for 40 m.p.h.," and we see a series of horizontal bars across the traffic lane to show how far apart cars should be for 40 m.p.h. We also noted use, in places, of the solid-broken line combination so familiar in California.

Out of the 5,252 bridges on the State Highway System, only 16 are posted for reduced loads and 63 for restricted speed.

PHOTOGRAMMETRY PROGRAM EXPANDED

Another step toward getting highway projects ready for contract more rapidly under California's stepped-up highway construction effort has been announced by the State Division of Highways.

L. L. FUNK

RALPH LEJONHUD

State Highway Engineer G. T. McCoy said that a new unit has been set up to expand and improve the division's state-wide photogrammetry program, which makes use of modern aerial photographic techniques to reduce the need for time-consuming ground surveys in highway location and design.

Under the general direction of Principal Highway Engineer F. M. Reynolds, the new unit will be headed by L. L. Funk, who has been Assistant District Engineer—Planning of District V in San Luis Obispo for the past six years. Funk will be assisted in his new assignment by R. H. Fulton, Senior Highway Engineer.

Both Funk and Fulton have been closely associated with the development of the division's photogrammetry program.

Nation-wide Recognition

Funk's work in using and adapting photogrammetric techniques in the production of highway plans in District V, which includes Monterey, San Benito, San Luis Obispo and Santa Barbara Counties, has won nation-wide recognition for him and the California Division of Highways.

Funk's position in the San Luis Obispo district will be filled by Ralph Lejonhud, at present Planning Engineer for District XI in San Diego. A graduate of the University of California at Berkeley, Lejonhud has been with the division since 1941.

Photogrammetry Important

The division's new photogrammetry unit, which Funk will head, will not only be responsible for developing a state-wide photogrammetric program but will also carry on research to improve the quality and usefulness of photogrammetric processes and equipment as well as disseminate to all the districts the latest information in the photogrammetric field.

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ORIGINAL HIGHWAY COMMISSION HAD PROBLEMS TOO

By A. D. GRIFFIN, Assistant District Engineer, District VII

Back in 1911 and 1912 the first California Highway Commission, appointed by Governor Hiram Johnson, was confronted with problems similar to those now faced by Governor Goodwin J. Knight's highway commissioners, but, of course, not of such magnitudinal proportions. At least at this late date it so seems to Newell D. Darlington, former member and later chairman of the original highway commission, who retired from state service on January 8, 1923.

On a recent visit to Los Angeles Director of Public Works Frank B. Durkee, chairman of the present commission, paid a visit to Mr. Darlington and the two reminisced about old times. Darlington and Charles D. Blaney of Saratoga and Burton A. Towne of Lodi, were appointed commissioners by Governor Johnson on August 8, 1911.

Darlington said that the present state highway commissioners are faced with substantially the same kind of decisions to make that the original commissioners had, and that then, as now, many times they were forced to establish locations for new state highways that made them "anything but popular with the local people." Durkee told Darlington that he considered the original state highway commissioners had done a wonderful job in laying foundations for the State Highway System, and that the achievements of today would not have been possible had it not been for their capable leadership and wisdom in getting the system off to such a good start.

Newell D. Darlington (left), member of original Highway Commission, and Director of Public Works Frank B. Durkee reminisce in Mr. Darlington's home

First Commission Meeting

The first meeting of the old Highway Commission was held in Sacramento on August 9, 1911, and Ben Blow in his book "California Highways," published in 1920, quotes Governor Johnson as addressing his new commission as follows: "Gentlemen, you face a tough job. You are expected to build for 18 million dollars a highway system that the best engineers of the Country have estimated will cost from 35 to 50 million dollars."

Quoting still further from this book, Mr. Blow said: "In justice to the gentlemen named, it may be said that the magnitude of the job did not terrify them in the least. They were all men of affairs. Each had made good in his own particular line of effort, and as a committee they took up, with Mr. Towne as chairman under the statutory compensation of $3,600 a year each, what was then probably the biggest road building job of modern times."

Darlington was born in January, 1874, reared in Pennsylvania, and graduated with degree in civil engineering from Lafayette College in the City of Easton, Pennsylvania, in 1895. He came to California shortly thereafter. He first entered public service in 1909 when he was appointed by Mayor George Alexander of the City of Los Angeles as a member of the City Public Utilities Commission. Later he was appointed by Mayor Alexander as a commissioner on the City Board of Public Works, from which position he resigned June 30, 1911, to accept appointment to state service by Governor Johnson.

Exchange of Reminiscences

It might be said in passing that Director Durkee in point of service is not to be classed as a newcomer himself. He started his state service in November, 1923, when he became editor of *California Highways and*

Public Works. After being admitted to the Bar, he joined the legal staff of the department and later was appointed Deputy Director of Public Works, and on August 3, 1951, Governor Earl Warren appointed him Director of Public Works upon the occasion of Charles H. Purcell's retirement. Durkee is also chairman of the California Highway Commission, so he now holds the same position formerly held by Darlington.

As early as 1919, Durkee had contact with the original Highway Commission as this excerpt from commission minutes on February 26, 1919, attests:

> 11 a.m. A delegation consisting of Mr. Durkee and Dr. Copeland, representing the Chico Chamber of Commerce, appeared and urged the commission to begin early construction of that section of the state highway between Nelson and Biggs.
>
> Chairman Darlington explained that the commission was not in a position to make any promise on account of the shortage of funds but stated that the commission would take the matter under advisement and improve or complete said road as soon as funds were made available.

Durkee and Darlington enjoyed very much their discussion of old times and old friends. Darlington has a well stocked library and is an avid and enthusiastic reader. He keeps abreast of the times and maintains a keen interest in current state highway affairs. On his desk, among copies of current periodicals, were recent issues of *California Highways and Public Works*.

Darlington said that he found the complexity of the modern freeways the State is now building, somewhat overwhelming when he compared them with the highways on which he had responsibility in the old days. He said that the rapid growth of the State and the tremendous increase in population and number of automobiles had far exceeded his most optimistic expectations.

Darlington's home is on the palisades along the west bank of the San Gabriel River near the Whittier Narrows Dam, and when the future Pomona Freeway (State Highway Route 172) is constructed, he will be able to carry out personal inspection of part of the construction right from his home.

Young Engineers on Job in District VII

Photographed after their promotions in Highway District VII, which includes Los Angeles, Orange, and Ventura Counties, are Lyman R. Gillis, left, Assistant District Engineer, who was transferred from District IV, San Francisco, and George Langsner, who was elevated to the position of district engineer in charge of planning, to succeed Edward T. Telford, who took the post of Paul O. Harding, Assistant State Highway Engineer, when Harding retired last January.

PHOTOGRAMMETRY

Continued from page 46 . . .

In the light of a growing nationwide shortage of trained engineers and the strong possibility of a still further accelerated California highway construction program as a result of legislation now being considered by Congress, time- and manpower-saving techniques such as photogrammetry are assuming ever greater importance.

According to McCoy, photogrammetry and the use of electronic machines to compute engineering calculations are the two most promising techniques yet developed to aid highway engineers who now find themselves faced with the biggest expansion program of highway construction in history.

The Right of Way Department of the Division of Highways concluded 9,444 transactions during 1954-55.

New Highway Teletype System Is Installed

A new state-wide private line highway teletype system for the Division of Highways is being installed to replace the present teletype system used by the division, State Highway Engineer George T. McCoy announced. Installation started on May 21. It is anticipated the new teletype system will correct present operating problems as well as greatly increase the efficiency of the system.

The new system is known as a Teletypewriter Automatic Dispatch System (TADS) and transmits automatically by tape at 60 words per minute. The teletype operator merely prepares a message in tape form, places the tape in the teletype transmitter, and the machine does the rest.

Transmitters Automatic

Transmitters are automatically started in any predetermined sequence, eliminating the need for continuous watching by the operator for an opportunity to seize the line. Several transmissions can be made from one continuous tape so that the tape may contain messages to several different points, and the equipment will automatically route them to the proper destinations. The teletypes are started and stopped and stations selected by the transmission of single letters inserted on the tape. Contention between stations is entirely eliminated, and the system operates with a maximum of speed and the minimum of attention on the part of the operator.

The system will be comprised of a north and south circuit as is presently used. Typing reperforators in Sacramento administration will automatically make tape for cross transmissions between circuits. In addition, Sacramento Communications will have automatic reperforating interceptors on each circuit. Should any tape be accidentally misdirected, the message will be automatically intercepted on a tape, thus preventing a message from becoming lost. The tape will then be directed to the proper station.

In Memoriam

ROGER T. BALLOCH

Roger Thurston Balloch, 56, an employee of District X, died April 7, 1956, in the Oakland Veterans Administration Hospital. He served as a blueprinter from March 17, 1952, until his death.

He was a veteran of World War II in which he served as a captain in Army Intelligence. An active member in the Masonic Lodge, Mr. Balloch was president of the Sojourners in Stockton. He was a member of the Maj. Gen. Henry Knox Blue Lodge of Masons in Boston, the only military Blue Lodge; a member of the Stockton Body of Scottish Rite Masons, the Ben Ali Temple of Shriners, the Sons of the American Revolution, the Military Order of the World War, past commander of the Disabled American Veterans, and the Society of the Cincinnati. Membership in the latter organization requires that an ancestor must have served either with George Washington or Lafayette.

Masonic funeral services were held in Stockton April 11, 1956. Burial was in New Bedford, Mass.

In Memoriam

WILLIAM BRUCE PIPER

William Bruce Piper, Resident Engineer with the Bridge Department of the Division of Highways, died in Santa Ana on April 11, 1956.

Bruce was born in Prescott, Arizona, on August 5, 1888. After graduating from Stanford University he obtained his early experience in highway building with the Highway Department of the State of Arizona. He joined the Division of Highways of the State of California in 1928.

His work with the Bridge Department was as resident engineer on major bridge structures throughout the State.

Bruce made friends wherever he went, and will be remembered for his kindness, his pleasant manner and his willingness to be of assistance to all with whom he associated.

GRIFFITH COMPANY WINS TOPPER FOR BEST 1955 DISTRICT VII CONTRACT

With Charles E. Waite, Deputy State Highway Engineer, making the presentation Friday evening, May 18, 1956, the contracting firm of Griffith Company, Los Angeles, was the recipient of the "Topper" trophy for having completed the No. 1 state highway contract in District VII during 1955. Joe Porcher, representing the company, accepted the award from Waite. The winning contract was a section of the Golden State Freeway between Sepulveda Boulevard and the north city limits of Los Angeles which replaces the most southerly three-mile section of the Ridge Route just north of the town of San Fernando.

E. T. Telford, Assistant State Highway Engineer, District VII, making presentation of "Topper" trophy to Robert H. Butler, State Resident Engineer

A similar trophy was presented by Edward T. Telford, Assistant State Highway Engineer, to Robert H. Butler, who was state resident engineer in charge of construction on the project. Butler recently resigned from state service to join the contracting firm of Weardco Construction Co. of Montebello. Milton Harris, State Construction Engineer, presented certificates of merit to Hal McGregor and Bill McCray, the superintendents on the job for the Griffith Company and to state engineers who participated in the construction.

Scene of the award presentation was the Fifth Annual "Bonneroo," a stag banquet sponsored by the District VII Construction Department of the California Division of Highways and staged this year at the Rodger Young Auditorium in Los Angeles. The annual affairs, this being the fifth of its kind, are primarily held for the purpose of honoring contractors and resident engineers who completed the 10 best state highway contracts in District VII, comprising Ventura, Los Angeles, and Orange Counties, during the preceding calendar year.

The winners for 1955, announced at the Bonneroo, were:

No. 1—Golden State Freeway, Los Angeles Co.—Sepulveda Blvd. to north city limits of Los Angeles—Griffith Co., Contractors; R. H. Butler, Resident Engineer.

No. 2—Highway 101, Ventura Co.—Central Avenue to Santa Clara River near El Rio — Frederickson-Watson, Contractors; B. A. Gentry, Resident Engineer.

No. 3—Santa Ana Freeway, Orange Co.—Browning Avenue to First Street near Tustin—Winston Bros., Contractors; J. L. Needham, Resident Engineer.

No. 4—Highway 101, Ventura Co.—Punta Gorda to Santa Barbara County line—McCammon-Wunderlich, Contractors; G. E. Dickey, Resident Engineer.

No. 5—Ventura Road, Ventura Co.—Lord Creek to Town of Fillmore—R. R. Hensler, Contractor—Hugh Whitnall, Resident Engineer.

No. 6—Artesia Avenue, Los Angeles Co.—Normandie Avenue to Main Street—Sheets Construction Co., Contractor; L. W. Sixt, Resident Engineer.

No. 7—Foothill Freeway, Los Angeles Co.—Hampton Road to Montana Street, connecting La Canada to Pasadena across Devil's Gate Dam—Peterson & Baker and Dragline Rentals Co., Contractors; C. J. Verner, Resident Engineer.

No. 8—Hawthorne Blvd., Los Angeles Co.—Pacific Coast Highway to 174th Street—M. S. Mecham and Sons, Contractors; L. W. Sixt, Resident Engineer.

No. 9—Hueneme Road, Ventura Co.—Wood Road to Laguna Road—Frederickson-Watson Construction Co., Contractors; W. K. Loban, Resident Engineer.

No. 10—Palos Verdes Dr., Los Angeles Co.—City limits of Palos Verdes to Narcissa Drive—Tomei Construction Co., Contractor; F. N. Owens, Resident Engineer.

The contracts are rated primarily on the basis of workmanship and ex-

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Cost Index

Highway Construction Prices Up During First Quarter of 1956

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

DURING the first quarter of 1956 state highway construction costs were up 16.0 percent over the first quarter of 1955 and were up 10.1 percent over the first quarter of 1954. The Index stands at 219.5 (1940 = 100) for the first quarter of 1956 which is 3.2 percent higher than the fourth quarter of 1955 which preceded it.

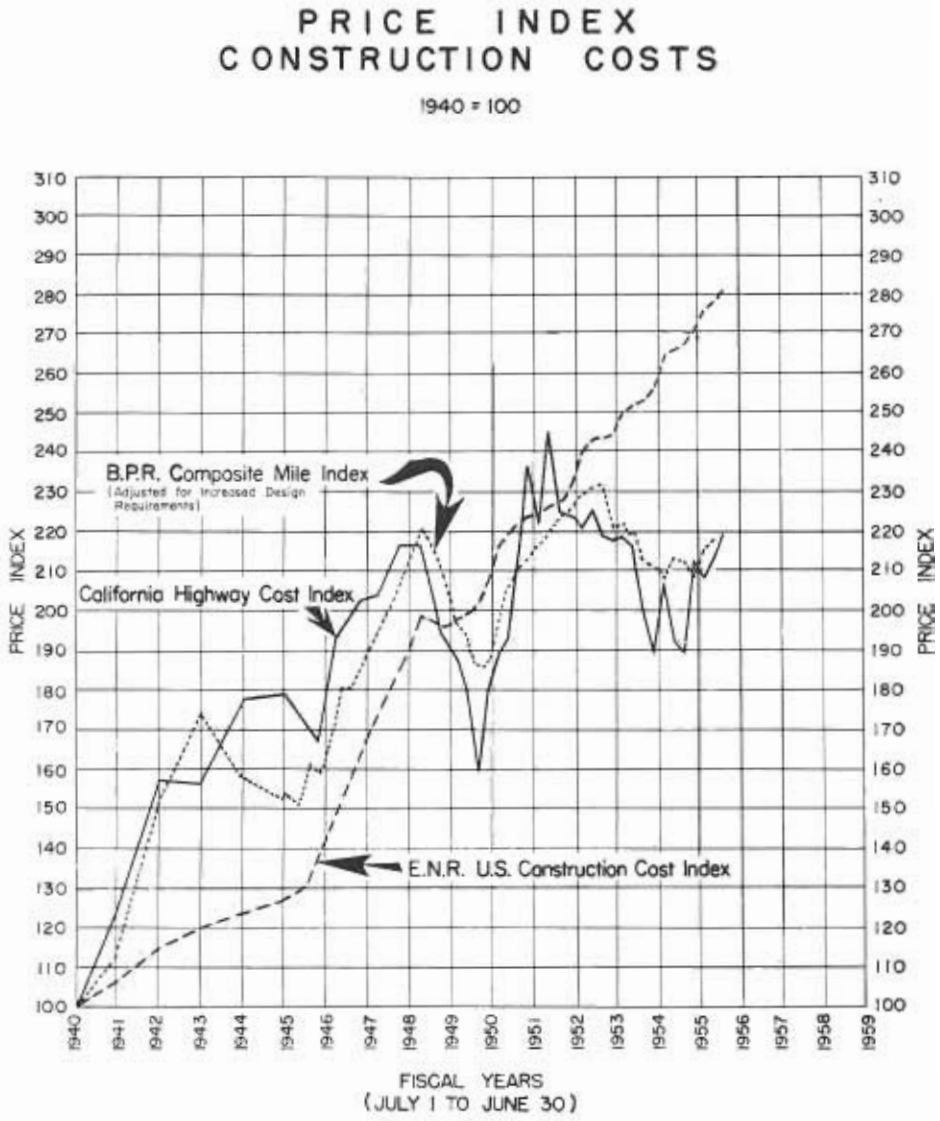
The Index for the first quarter of 1956 shows an increase of 7.7 percent over the Index for the year 1955.

At the fourth quarter of 1955, a separate Index was prepared to include bid prices and quantities for the three contracts for constructing a new parallel bridge across Carquinez Strait. The resulting Index of 228.8 was approximately 7 percent higher than the normal Index without the Carquinez Bridge contracts and it exceeds the present Index figure by 4.2 percent. Reasons for excluding Carquinez Bridge contracts from the normal Index were based on the extremely large quantities of special steels included in design of the bridge that are not comparable in price to those found in normal highway construction.

It was our opinion last year that the sag in the Index was temporary. At that time, it was believed that construction costs would reverse to an upward direction resulting from increased labor costs. This opinion is substantiated again in this quarter and it is believed that, with many labor contracts in various fields coming up for renegotiation, a further rise will be observed in the second quarter of this year.

The California Highway Construction Cost Index prepared since 1940 is shown on the accompanying tabulation.

Competition among contractors is evidenced by the average bidders per project as shown on the accompanying table of "Number and Size of Contracts." The average number of contractors per contract, while below the average for 1954, is slightly above the average for 1955.



The table showing average unit prices bid during the first quarter of 1956 for the eight items upon which the California Index is based (see accompanying tabulation) shows an increase in five items and a decrease in three. Roadway excavation rose about 8 percent from 37 cents to 40 cents. In the previous quarter the drop was attributed to extremely large quantities and low unit price for freeway construction on US 40 between Hercules and Crockett, on the south approach to the new Carquinez Bridge. The unit price for this quarter still

THE CALIFORNIA HIGHWAY CONSTRUCTION COST INDEX

Year	Cost index
1940	100.0
1941	125.0
1942	157.5
1943	156.4
1944	177.8
1945	179.5
1946	179.7
1947	203.3
1948	216.6
1949	190.7
1950 (1st Quarter 1950—160.6)	176.7
1951 (4th Quarter 1951—245.4)	210.8
1952	224.5
1953	216.2
1954 (1st Quarter)	199.4
1954 (2d Quarter)	189.0
1954 (3d Quarter)	207.8
1954 (4th Quarter)	192.2
1955 (1st Quarter)	189.3
1955 (2d Quarter)	212.4
1955 (3d Quarter)	208.6
1955 (4th Quarter)	212.6
1956 (1st Quarter)	219.5

is one cent below that for the third quarter of 1955. Untreated rock base increased from $2 to $2.08. This 4 percent increase probably reflects additional labor costs resulting from the settlement of the extended labor dispute in rock plants in the southern part of the State during the latter part of 1955. Asphalt concrete pavement made a 62 percent jump from $4 to $6.50 per ton. This advance is primarily due to the low quantity of this type pavement used during the period.

Bar reinforcing steel and structural steel rose from $0.099 to $0.105 and from $0.144 to $0.166 per pound respectively. Of the eight items used for Index purposes, structural steel prices had the greatest effect in the upward trend. This is undoubtedly due to the increasingly short supply and delayed deliveries of steel, reflecting the heavy demand for repair of flood damage in the northeastern states.

Plant mixed surfacing dropped from $5.52 to $5.40 per ton and it is now below the price for the third quarter of 1955. Portland cement concrete pavement dropped $1 to a price of $14.05 per cubic yard. Structural concrete decreased slightly from $52.72 to $52.51 per cubic yard.

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

(January 1, 1956, to March 31, 1956)

Project Volume	Up to $50,000	$50,000 to $100,000	$100,000 to $250,000	$250,000 to $500,000	$500,000 to $1,000,000	Over $1,000,000	All Projects
Road Projects							
No. of projects	40	5	12	6	6	1	70
Total value	$553,686	$333,240	$2,205,314	$2,203,171	$4,412,001	$1,477,870	$11,195,282
Ave. No. bidders	4.5	5.0	5.8	7.7	5.0	5.0	5.1
Structure Projects							
No. of Projects	9	2	2	3	1	1	18
Total value*	$195,322	$116,742	$286,279	$1,296,358	$910,694	$1,859,233	$4,664,679
Ave. No. bidders	5.3	3.5	4.5	7.7	9.0	4.0	6.1
Combination Projects							
No. of projects						7	7
Total value*						$18,173,661	$18,173,661
Ave. No. bidders						6.4	6.4
Summary							
No. of projects	49	7	14	9	7	9	95
Total value*	$754,008	$449,982	$2,491,593	$3,504,529	$5,322,695	$21,510,814	$34,033,622
Ave. No. bidders	4.6	6.0	5.6	7.7	5.6	6.0	5.4

* Bid Items only.

Total Average Bidders by Months

	January	February	March	Average for first quarter
1956	5.9	5.1	5.1	5.4
1955	8.5	5.8	6.7	6.9

AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Crusher run base, per ton	Plant mix surfacing, per ton	Asphalt concrete pavement, per ton	PCC pavement, per cu. yd.	PCC structures, per cu. yd.	Bar reinforced steel, per lb.	Structural steel, per lb.
1940	$0.22	$1.54	$2.19	$2.97	$7.66	$18.33	$0.040	$0.083
1941	0.26	2.31	2.84	3.18	7.54	23.31	0.053	0.107
1942	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103
1943	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080
1944	0.50	2.45	4.10	4.80	10.46	31.99	0.054	0.132
1945	0.51	2.42	4.20	4.88	10.90	37.20	0.059	0.102
1946	0.41	2.45	4.00	4.68	9.48	37.38	0.060	0.099
1947	0.46	2.42	4.32	5.38	12.38	48.44	0.080	0.138
1948	0.55	2.43	4.30	5.38	13.04	49.86	0.092	0.126
1949	0.49	2.67	4.67	4.64	12.28	48.67	0.096	0.117
1950	0.40	2.25	4.26	3.75	11.11	43.45	0.079	0.094
1951	0.49	2.62	4.34	5.00	12.21	47.22	0.102	0.159
1952	0.56	2.99	5.00	4.38	13.42	48.08	0.098	0.150
1953	0.51	2.14*	5.31	4.58	12.74	50.59	0.093	0.133
1st Quarter 1954	0.45	2.28	4.23	4.78	14.89	47.52	0.092	0.126
2nd Quarter 1954	0.38	2.09	4.29	5.18	14.28	47.12	0.093	0.114
3rd Quarter 1954	0.43	1.85	4.68	7.00	13.63	49.59	0.095	0.162
4th Quarter 1954	0.35	1.78	4.63	--	13.13	46.08	0.094	0.135
1st Quarter 1955	0.39	1.69	4.55	--	13.44	40.66	0.095	0.140
2nd Quarter 1955	0.42	1.99	5.39	--	14.46	51.36	0.098	0.136
3rd Quarter 1955	0.41	2.33	5.43	5.70	13.46	49.64	0.093	0.132
4th Quarter 1955	0.37	2.00	5.52	4.00	15.05	52.72	0.099	0.144
1st Quarter 1956	0.40	2.08	5.40	6.50	14.05	52.51	0.105	0.166

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

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

The *Engineering News-Record* Index shows a steady rise since 1949. Slight leveling offs have occurred since, but at no time has a downward

course been evident. During the first quarter, this Index rose 0.9 percent over the fourth quarter of 1955 to 280.8 Index points.

The Bureau of Public Roads Composite Mile Index has, in most instances, approximated the pattern of California's Index. First quarter figures for the bureau's Index are not available at this time. Should past behavior be a criterion, it is reasonable to assume that the Composite Mile Index will also continue in an upward direction. During the fourth quarter of 1955, this Index increased 1.3 percent from 215.1 to 217.9, a rise of 2.8 points. The fourth quarter rise was slightly less than California's 1.9 percent increase in the same period.

ERNIE SMITH TROPHY IS ESTABLISHED

Commemorating the first civilian flight across the Pacific, which originated in Oakland, by Major Ernie Smith and Emory Bronte, a perpetual trophy has been instituted by Trans World Airlines for award to the 80th Detachment of the Air Force ROTC at San Francisco State College.

To be known as the "Smith-Bronte Award," the trophy was presented by Major Ernie Smith, now a TWA sales account executive, to the cadet with the "greatest leadership potential in aviation," during presentation ceremonies following full-scale parade maneuvers at the school's football stadium on Tuesday, May 15th. He is Edmund X. Loughran, 21, of 3763 20th Street, San Francisco.

Smith and Emory Bronte, now a Honolulu businessman, made the historic flight on July 14, 1927, in a high-winged monoplane which crash-landed in a group of Kawae trees on the Island of Molkai when it ran out of gas.

During Fiscal Year 1954-55 the Division of Highways spent approximately $280,000 for the installation and maintenance of signs on state highways.

Maintenance work, including painting, washing and post straightening was performed on 117,000 state highway signs during the 1954-55 Fiscal Year.

FIRST HIGHWAY TUNNEL

Continued from page 13 . . .

No doubt the legend refers to the Mission Dolores house * * *. Until further evidence is forthcoming it may be assumed that the present house or the basic part of it was erected about 1837."

Don Francisco was the unwitting leader of a punitive revolt against the new American Government. The fiasco, called the "Battle of Santa Clara," resulted in the wounding of two Americans and the death of one of the Californian's horses.

Turning to other pursuits, Don Francisco probably recognized the possibility of a smooth-traveled way to the pueblo of San Francisco. With an abundance of cheap labor available, he undertook the construction of a tunnel through Mussel Rock. Whether or not this is the way it happened, the fact remains that here is a man-made tunnel, and old records show that the beaches were used as a travel route. It is easy to imagine the don and his caballeros, probably accompanied by their senoritas garbed in colorful and picturesque costumes, heading along the beach at low tide to attend a fiesta in San Francisco.

Francisco Sanchez was a son of Jose Antonio Sanchez of Buriburi. He was born at San Jose about 1807; for a short time he was a San Francisco Presidio soldier and the remainder of his days were spent in the Bay area.

GRIFFITH COMPANY

Continued from page 49 . . .

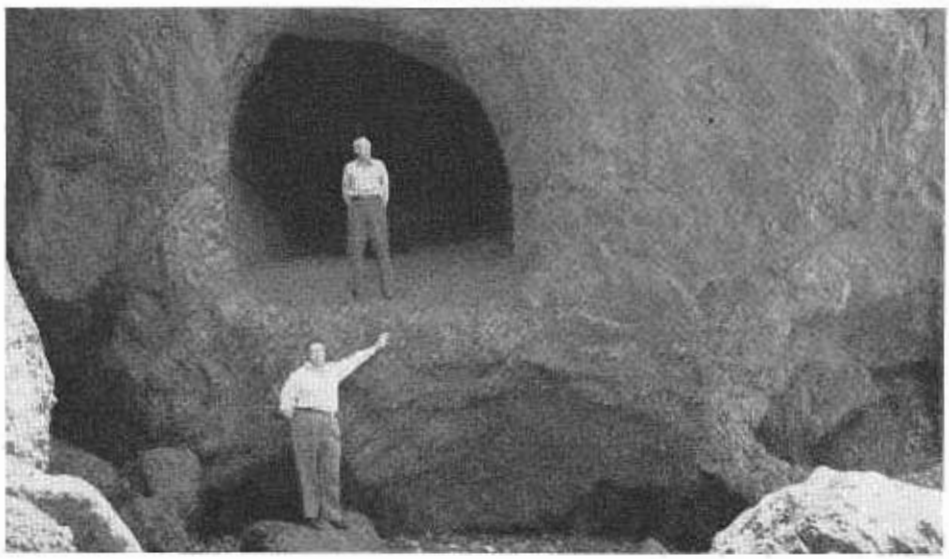
cellence on the various major items of work and smoothness of the finished pavement. Job complexity, safety, and diligence of contract prosecution are also factors which are considered in judging the 10 best projects.

Attending the affair were 700 contractors, material suppliers, and state highway personnel. Among the guests were C. M. Gilliss, Deputy Director of Public Works, California; C. E. Waite, Deputy State Highway Engineer; R. H. Wilson, Assistant State Highway Engineer, Sacramento; E. T. Telford, Assistant State Highway Engineer, District VII; Milton Harris, State Construction Engineer, Sacramento; L. R. Gillis, District Engineer, Operations; George Langsner, District Engineer, Planning; W. F. Maxwell, President, Associated General Contractors; S. R. Kennedy, Los Angeles County Road Commissioner; A. S. Koch, Orange County Road Commissioner; Dan Penkoff, Galion Iron Works.

INCREASE IN NUMBER OF VEHICLES ENTERING CALIFORNIA

A total of 36,455 motor vehicles entered California during October of this year, 12,624 more than entered during October, 1954.

Highway Superintendent A. E. Cooper and Highway Foreman H. E. Grosser (in mouth of tunnel) pose for picture in Mussel Rock



MOBILE OFFICE TRAILERS DESIGNED BY STATE

By EARL E. SORENSON, Equipment Engineer

The acute housing shortage which developed during the early and middle forties was partially solved by the Equipment Department through supply house trailers to engineering personnel on isolated jobs. These trailers were furnished for housekeeping, with heating and cooking facilities, running water, bedroom and dining furniture, closets and storage areas.

The shortage of field office space was provided for by purchasing unequipped house trailers consisting of the basic trailer unit, provided with only heating facilities. Crude office furniture was improvised in the field. Some 200 of these office and house trailers were purchased.

Concurrently with the easing, in the early fifties, of the shortage in living quarters the need for field offices increased, and was cared for by conversion of the house trailers to office use by the removal of all housekeeping facilities.

New Design Suggestions

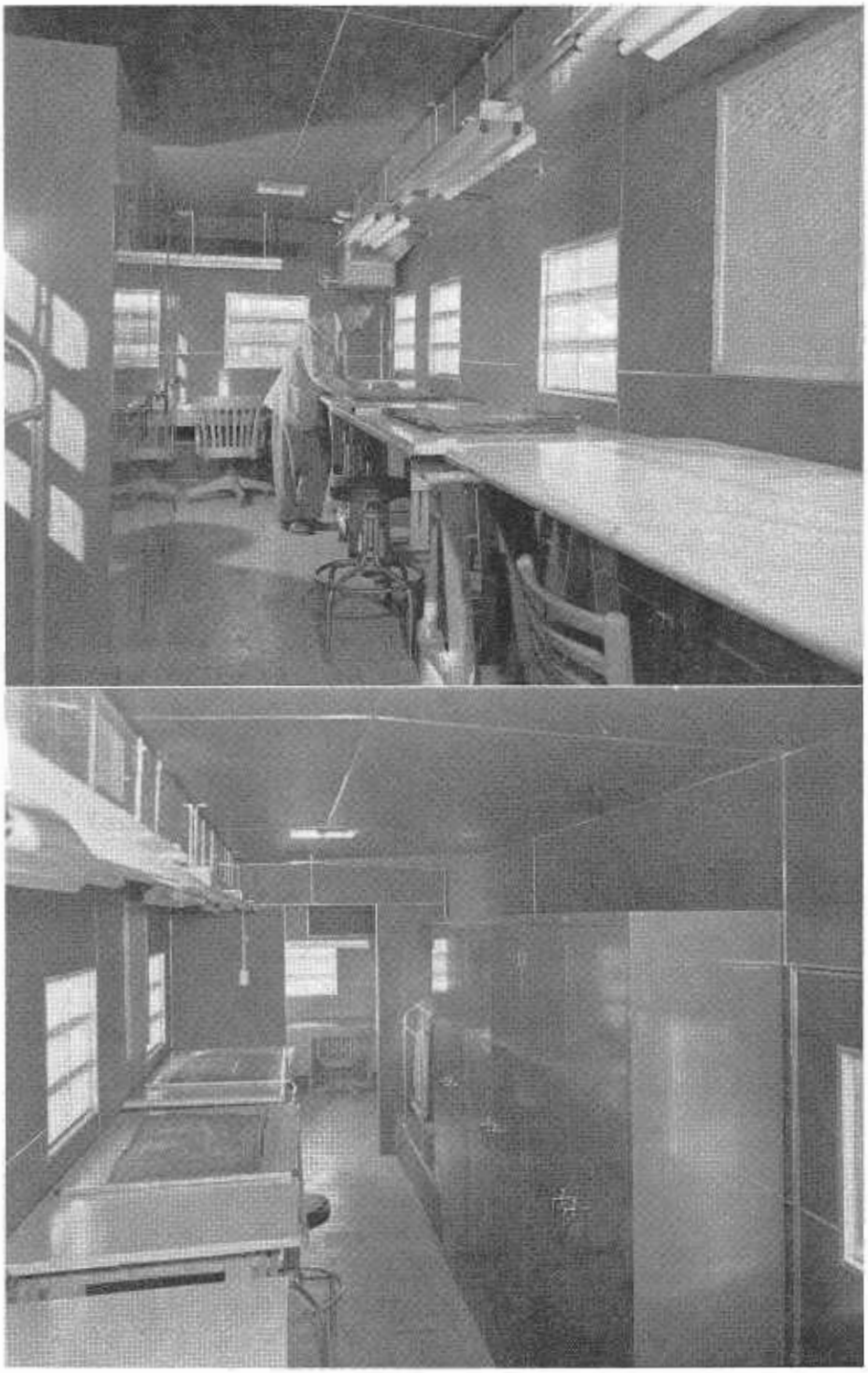
Serving the purpose, after a fashion, they were never too satisfactory. They were not sufficiently well constructed for the rough usage to which they were subjected on construction jobs, nor were they properly insulated against the wide range of climate in various parts of the State. Heating and cooling were both difficult owing to the restricted dimensions.

They have supplied, and are still filling, a very urgent need. They also demonstrated the need for units specifically designed for the purpose.

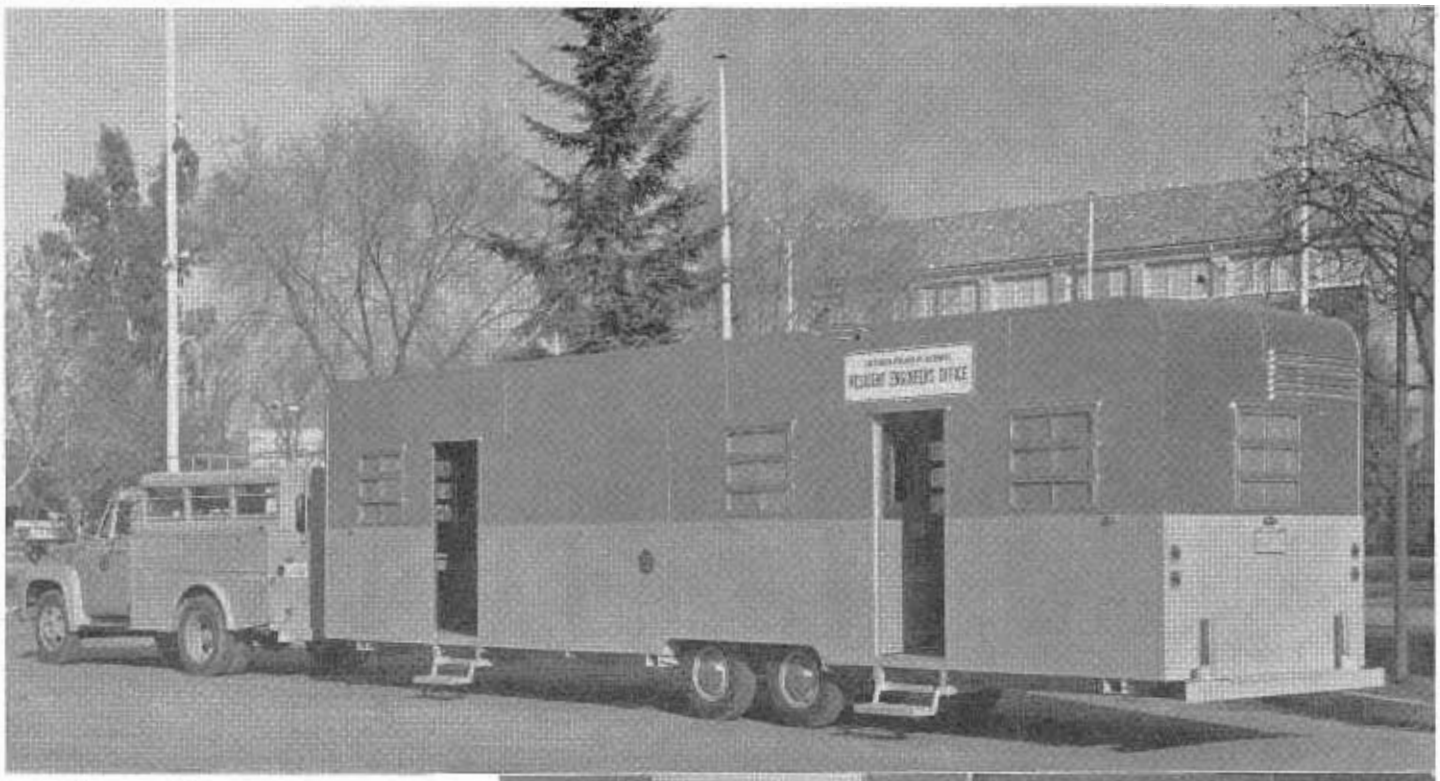
The Equipment Department therefore contacted the various using agencies to obtain data on their requirements, prior to the design and construction of a prototype.

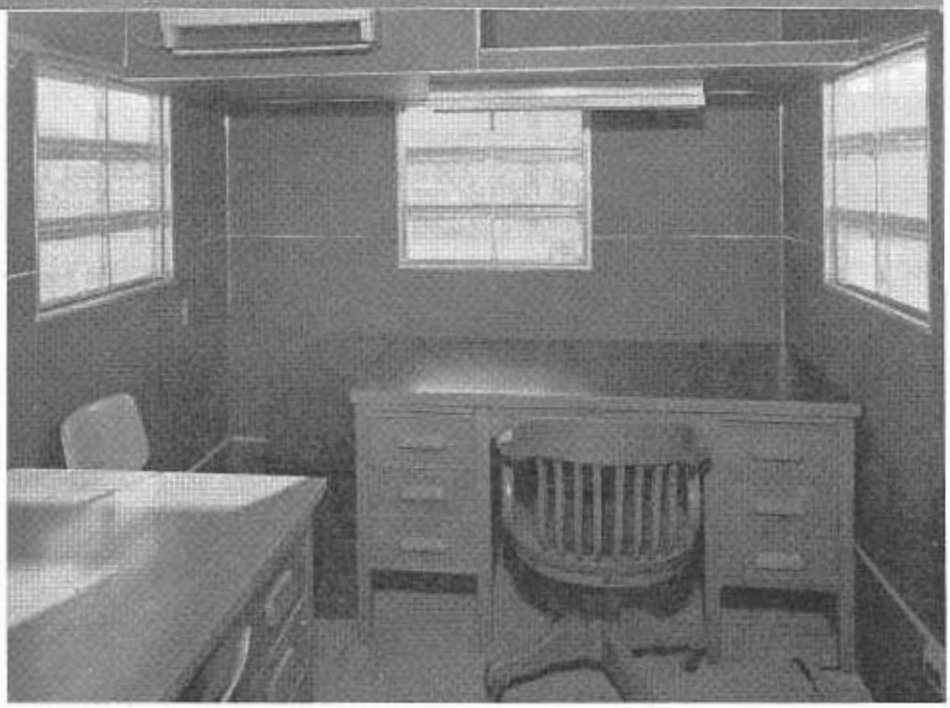
A state-wide request for design suggestions brought out the following desirable features:

A floor space of from 200 to 300 square feet, and division into two separate rooms, permitting the resident engineer a private office, the maximum



UPPER—Interior view of drafting room. LOWER—Looking through file room into resident engineer's office.





UPPER—Left-hand exterior entrance to trailer. LOWER—Resident engineer's office.

width legally allowed, a high ceiling for better air conditioning, complete insulation for heat and cold, air conditioning equipment, and office furniture to be provided by using standard desks, drafting tables, map racks, lockers and storage facilities.

In other words, they were to provide facilities as nearly like that of a standard office as possible.

Shops Build Serviceable Unit

It was not practical to incorporate sanitary facilities, this because of limited space and the difficulty of maintaining them in satisfactory operating condition. It was also found that offices were usually parked where these facilities were already available or could be installed separately by the contractor as part of the construction job.

With the above general requirements in mind, the Equipment Department designed a unit approximately 34 feet in length, with a ceiling height approaching eight feet, and of maximum allowable width.

Incidentally, the recently enacted statutes, which exclude the clearance lights, door handles, etc., from the eight-foot maximum allowable width, will permit an additional four inches of width which, although seemingly small, is very important in a unit of this kind.

The trailer is constructed almost entirely of steel, using two-inch square, high tension steel, tubular members for the floor and ceiling joists, and also for wall studding.

The outside covering is of body sheet steel, the inside finish Masonite, with trim of chrome. The floor, walls and ceiling are all insulated with a full two inches of spun glass.

Heavy duty electric wiring is incorporated which will handle a maximum load.

Interior Fixtures

Fluorescent fixtures are provided over all desks and drafting tables, with numerous electrical outlets for the various appliances used in a modern office.

A forced-draft heater is installed in one end and connected to a plenum running the entire length of the trailer, with numerous adjustable outlets for controlling the circulation.

Liquid petroleum is provided for heating fuel.

Provisions are made at the other end of the plenum for the installation of a compressor-type cooling unit. Valves or dampers are provided to regulate and control the flow of hot or cold air, whichever is desired.

Permanently installed jacks and blocking pads are provided at the corners of the trailer body to facilitate leveling and blocking when parked.

Based on past experience with mass-produced trailers, sturdy and well-designed units of this kind should have a useful life of an estimated 20 years, with only nominal costs for maintenance.

While the initial cost of the unit is high, it will be offset by the anticipated long life. Its use in lieu of temporary buildings, now quite commonly provided as a contract item, should result in a considerable saving over a long period of time.

The pilot model has been completed and is now on a state-wide tour, visiting all districts, where it will be on display for those interested. The tour is being supervised by Construction Department personnel who will, in this manner, not only acquaint the districts with the new unit but also obtain their reaction and, no doubt, valuable suggestions.

DRIVES LAST RIVET

At 2.30 p.m. on May 10, Jim Austin, steelworker for Peter Kiewit Sons' Co., and Judson Pacific-Murphy Corp., contractors for steel construction on the Richmond-San Rafael Bridge, had the honor of driving the last rivet on the huge span. Austin lost a leg during construction of the bridge. The same crew that drove the first rivet on the structure was on hand for the driving of the last one.

L. R. McNeely

On February 17, 1956, a retirement party was held for L. R. McNeely, better known as "Doc," in San Bernardino. Farewell gifts included a wrist watch and a matched set of luggage. He retired from the State Division of Highways on February 29, 1956, after completing 35 years of continuous service.

At the time of his retirement, "Doc" was Assistant District Engineer—Operations for District VIII. He had held this position since January, 1951.

McNeely commenced work in District VII in 1920, his first job being that of chainman with a survey party. During this period of time "Doc" covered the territory which now consists of Districts VII, VIII, and XI. At one time during this period, only one survey party was employed.

He was graduated from the University of Missouri in 1912 with a B.S. degree in agriculture. From February, 1913, to June, 1915, he was employed at the agricultural experiment station of the New Mexico Agricultural College, Las Cruces, New Mexico, performing irrigation tests of alfalfa crops. He subsequently worked as a rodman and chainman with the Los Angeles County Flood Control and Southern California Edison Company until 1920.

McNeely has encountered all types of highway construction, and at the time of his promotion to Senior Highway Engineer in 1945 he was made District VIII Maintenance Engineer. In 1947 he was promoted to Supervising Highway Engineer in the district and placed in charge of administration and maintenance. "Doc" has been a registered civil engineer since 1931.

McNeely saw service in the American Expeditionary Force in France from March, 1918, to May, 1919.

"Doc" plans to maintain his home in Southern California, but has not formulated any definite plans as to how he will spend his well-earned retirement time.

Director Durkee Adds Analyst To His Staff

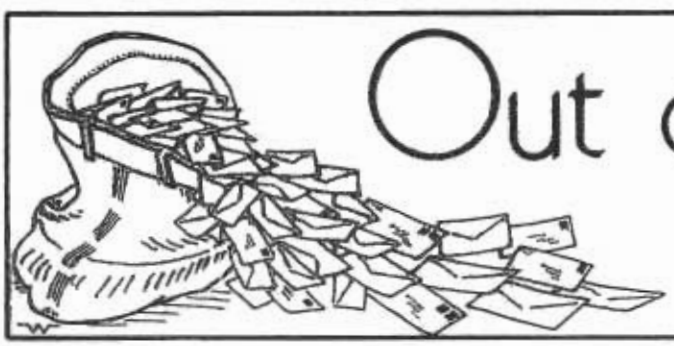
Frank B. Durkee, Director of Public Works, has announced the addition to his staff of John H. Stanford of Sacramento, Supervising Administrative Analyst. Stanford will make studies and provide consulting services for the director and the divisions of the department on organization and management problems. Recent administrative surveys of the department initiated by the Senate Committee on Public Works and the Joint Legislative Budget Committee recommended the establishment of this kind of position. The appointment became effective on May 21st, and was made from a civil service list following a nation-wide examination.

Stanford is a graduate of the University of California, receiving his master degree in public administration from Syracuse University. During the war he served in the U. S. Air Force in various grades from private to captain. For the past 10 years, Stanford has been employed by the State of California. For three years he was administrative officer of the Department of Insurance in San Francisco. For seven years he worked in positions of increasing responsibility in the management analysis section of the Department of Finance. He is the President of the Sacramento Chapter of the American Society for Public Administration.

By June 30, 1955, contracts covering a total of 6,785 center-line miles of state highway construction had been placed under way during the eight years following passage of the Collier-Burns Highway Act in 1947.

The sum of $1,675,158 was expended by the Division of Highways for snow removal and sanding icy pavement during the Fiscal Year 1954-55.

Fire hazard and noxious weed control on state highways cost $419,000, and $1,167,470 was expended for erosion control and care of trees during the Fiscal Year 1954-55.



Out of the Mail Bag

NICE LETTER

California Highways and Public Works

GENTLEMEN: The writer is an old lady who has always been very active in getting about the state, but for the past two years has been confined to a wheel chair. I wish to say I find the *California Highways* magazine just as interesting from a wheel chair as I did from the steering wheel of my car. Never a copy comes that I do not tear it apart and send pages in letters to less fortunate friends who must still live in the east and other less desireable places–some in foreign lands.

Very truly,

MRS. M. E. ROSS

THANK YOU

KEYSTONE AUTOMOBILE CLUB
Philadelphia 2, Pennsylvania

MR. K. C. ADAMS, *Editor*

I would not want to miss your magazine. It is one of the best and most informative documents I receive. Congratulations to you and your entire organization on this publication.

Cordially yours,

WM. C. CANNING
Engineering Director

HIGHWAY DIRECTORY

SAN DIEGO 17

California Highways and Public Works

I wish to take this opportunity to thank you for a very interesting and informative magazine. It has many times settled discussions as to new roadways, freeways, etc.

Thank you again.

WILLIAM K. WORKS

THAT THEY WILL DO, COLONEL

SAN DIEGO 15, CALIFORNIA

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: The reports of the district engineers and the illustrations depicting the terrible and devastating flood disasters which recently occurred throughout the State as published in the January issue of *California Highways and Public Works* are most revealing and edifying.

The illustrations give a clearer understanding of the damage that the flood waters caused than could be conveyed by any other media. There is one consolation left us in this sad affair; no matter how severe the damage, our highway engineers, bridge engineers and employees are capable of restoring the road beds and bridges to safe and standard conditions.

With best wishes,

Sincerely yours,

GEORGE RUHLEN
Colonel, U. S. Army, Retd.

INTERESTED IN HIGHWAYS

YOSHIMURA NURSERY
Gardena, California

K. C. ADAMS, *Editor*

DEAR SIR: As a former employee of the Division of Highways in Fresno, I'm still very interested in the work you are doing in improving the highways and freeways of this State. And since our trucks use them quite a bit, it's very interesting to read about the future plans of your department.

May I thank you very much for your kindness in sending the magazine to me.

Yours truly,

JOHN FUJITA

A VETERAN WRITES

Yountville, California

KENNETH C. ADAMS, *Editor*

I am so pleased to get your highway magazine. We eat it up here. I have been down five months. Just beginning to get a bit strong again. They tell me I sure was sick, but they take good care of us and are so kind to us. So, if you have a spare line in your beautiful magazine to give the doctors and nurses a boost, I ask you, from the bottom of my heart, please do so. I will be a very happy friend. I feel a bit better now.

Again thanking you for all of us shut-ins. I am as always,

Sincerely,

JOSEPH KISBER
Veterans Home

FROM OHIO

THE UNION METAL MANUFACTURING CO.
Canton 5, Ohio

MR. K. C. ADAMS, *Editor*

DEAR MR. ADAMS: For a number of years I have been enjoying reading this fine publication which is so well illustrated and has such excellent format and interesting articles. After reading the magazine I circulate it among a number of our officials and sales people here.

Fortunately, I count among my good friends many of the officials of the California Highway Department and that makes the magazine even more interesting. You and your staff are to be congratulated on producing such a fine, attractive publication.

Very truly yours,

W. A. PORTERFIELD
Vice President in
Charge of Sales Promotion

GENEROUS OFFER

SOUTHWESTERN PORTLAND CEMENT COMPANY
Los Angeles 14, California

THOMAS E. RICH, *Right-of-Way Agent*
Division of Highways, District VIII
San Bernardino, California

DEAR MR. RICH: Mr. Halstead forwarded me your right-of-way map 426584, which shows crossing of certain lands near Victorville owned by this company, together with report from you as to the area needed and offering a price for what seems to be a total of 4.85 acres.

We are glad to comply with your request for right-of-way contract and the terms of your proposal number 7242 are satisfactory, except in the following particulars:

Paragraph 2, item A, suggests the sum of $1,204 in consideration of grant deed No. 7242, and lists the stipulations and exceptions. Realizing the very great need for this improvement, the benefit which will accrue at Victorville and environs in which so many of our employees live, and through which our commerce now moves, we should like to amend the terms to provide that you pay the grantor the sum of $1 for the property instead of $1,204.

While the sum is not large, it will indicate to you the encouragement of the project and our belief that it will be of great value to our State and the local community as well.

If agreeable to you and you will redraw the papers, we will be glad to execute them and place them in your hands promptly.

Very truly yours,

G. E. WARREN
President

APPRECIATE MAGAZINE

DEAR SIRS: I can not tell you how much we appreciate the California Highways and Public Works magazine. We have lived here in Pasadena since 1923 so you can realize the changes we see in our highways, and the magazine helps us to know the work the State is doing all around us. Our freeways are wonderful down here.

Sincerely,

MR. AND MRS. CHAS. HOWARD

ENJOYABLE READING

YUBA CITY

GENTLEMEN: May we take this opportunity to thank you for your very fine publication *Highways and Public Works*. We read and enjoy thoroughly every issue.

Each issue covers so completely any changes in our highways and we are thus able to know new routes in advance, saving "wear and tear" mentally in driving. We are also made aware of the tremendous amounts of work involved to keep our highways and our public buildings in good shape in every way.

Thank you for the wonderful issues of your magazine.

Yours truly,

MRS. O. A. NICHOLS

FROM SISTER STATE

OREGON STATE HIGHWAY DEPARTMENT
Salem, Oregon

California Highways and Public Works

GENTLEMEN: I would like to express my appreciation for your publication and to assure you that I find it very valuable in my work. Since our states are so close together, our problems have much similarity, and I find your studies of maintenance problems very thorough and applicable to our problems.

Respectfully,

F. W. FARRAR
District Maintenance Supt.

WHAT'S COOKING?

LA MESA, CALIFORNIA

EDITOR ADAMS

DEAR SIR: You can be sure that *California Highways* is appreciated and thoroughly read. It is passed along to other engineers and finally finds a resting place in the library of a local junior high school. It gives the retired engineer an insight into what is going on in highway development. Its reading relieves the feeling of being the lower half of a double boiler "all steamed up but not knowing what's cooking."

Sincerely,

L. L. MILLS

FROM LOS ANGELES

COUNTY OF LOS ANGELES
DEPARTMENT OF PARKS AND RECREATION
DESCANSO GARDENS
La Canada, California

K. C. ADAMS, *Editor*

DEAR MR. ADAMS: I for years have been going to write you to express my appreciation for your wonderful magazine.

In my work in Los Angeles County I find *California Highways* one of the most valuable magazines from an educational standpoint—to say nothing of the interesting facts which you publish. I have a file of them that I am referring to constantly.

WILLIAM L. NEWMAN
Director of Public Relations

WE THANK YOU

MISSOURI STATE HIGHWAY COMMISSION
Jefferson City, Missouri

DEAR SIRS: I wish to take this opportunity to express sincere appreciation for the privilege of being included on your list to receive your splendid publication.

Those responsible for the makeup of this publication deserve commendation for the instructive and human interest items supplemented by excellent photography.

Yours very truly,

J. J. CORBETT
Engineer of Construction

WE AGREE WITH YOU

CHICAGO, ILLINOIS

GENTLEMEN:

Thank you for your past issues of your magazine which I have found very instructive and entertaining.

I have had occasion to use your "Freeways in Southern California" and I can say that they are wonderful and safe for all drivers who use them.

As a civil engineer engaged in construction work, it was a treat to see your highways, after reading about them in your magazine. Your highway organization is hard to beat, and I want to congratulate them on the wonderful work they are doing.

CAPT. E. W. FALANDERS, C. E.

Tough Job

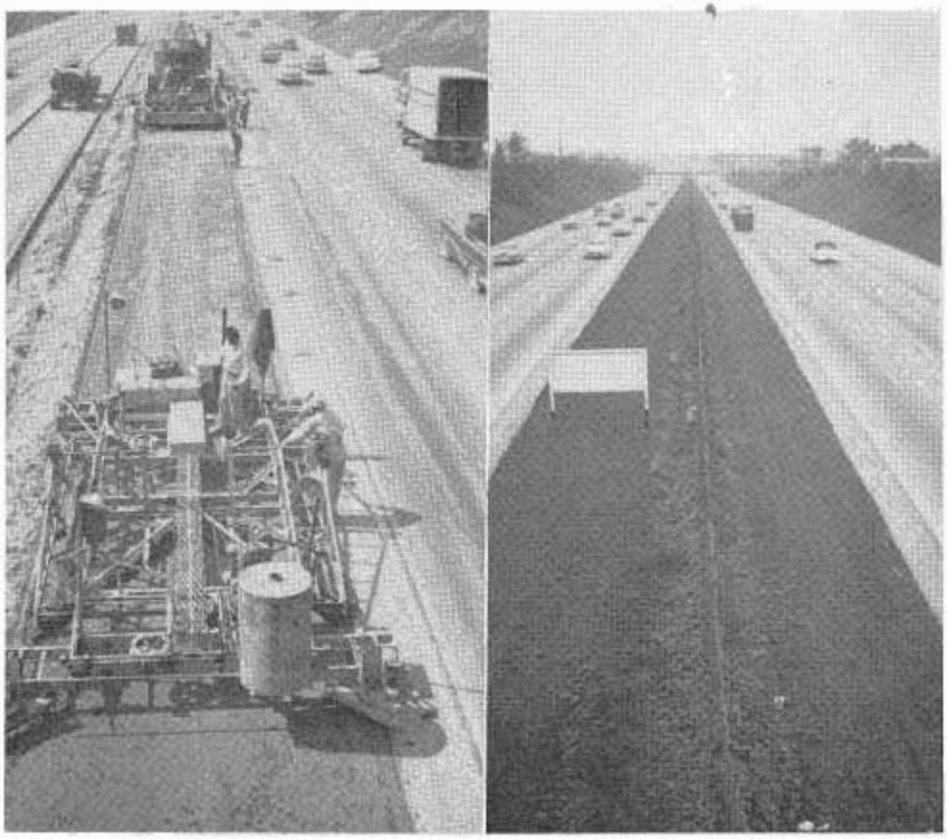
Santa Ana Freeway Widening Carried Out Under Heavy Traffic Conditions

By DON FRISCHER, Resident Engineer

UNDER THE WATCHFUL eyes of passing motorists, the ultimate construction of the Santa Ana Freeway on the 2.3-mile section between Camulos Street and Olympic Boulevard in the East Los Angeles area was completed.

The work on this contract, which started January 6th of this year, involved widening an existing six-lane freeway to eight lanes by replacing the existing 34-foot median strip with two 12-foot portland cement concrete pavement lanes, curbs and gutters, plant-mixed surfacing, and an almost continuous 6,600-foot metal plate guard rail mounted both in a median retaining wall and on the ground. In addition, 53 catch basins were constructed and existing storm drains extended.

To provide working space in this particularly cramped area, the existing pavement in both directions was restriped as three 11-foot lanes, and double stripes were placed three feet from the inside edges. Between the hours of 9 a.m. and 3 p.m. the contractor was allowed to barricade the inside lanes in each direction for his own use.



On left, paving construction operations; on right, typical of conditions before construction

Despite the heavy traffic (80,000 vehicles per day) which flowed past the construction operations within inches of the workmen and equipment, an excellent safety record was achieved by the contractor. Unfortunately there were some minor collisions, usually involving what the newspapers referred to as "mechanized sidewalk superintendents." None of these accidents resulted directly from the construction operations but occurred because drivers got to watching construction activities instead of keeping their eyes on the road.

Several deviations from the usual construction procedures were allowed by the contract special provisions, particularly in paving. The paving mixer was operated on the newly constructed cement treated subgrade. In this manner the contractor was able to work normal eight-hour shifts. To achieve early strength in the pavement, calcium chloride was added in amounts up to 1½ percent by weight of cement. Not only was the contractor allowed sooner than usual use of the newly placed traffic lanes by virtue of early strength, but the addition of the calcium chloride served to prevent the random cracks so frequently found in new pavement.

Despite cramped working area and heavy traffic the contract was completed well within the specified 90 working days. The cost of construction amounted to slightly over $500,000. Ray Mason was superintendent for the Contractor Webb and White. The contract was under the general supervision of Frank B. Cressy, district construction engineer, and Basil N. Frykland, field supervisor.

Stage Construction

Some 15 years ago when the first designs on the Santa Ana Freeway were being prepared, limited funds for construction made it necessary that plans be prepared on the basis of stage construction to take care of immediate traffic needs. Following this principle much of the first construction on the Santa Ana Freeway provided pavement lanes less in number than the contemplated ultimate future requirement. The right of way, however, was obtained sufficient in width for the ultimate construction. Then through the agricultural areas of Orange County the first designing and

original construction was carried out on the basis of providing an expressway or divided highway facility rather than building a full freeway. Thus, in Orange County we have had many signalized intersections at grade with cross traffic arterials where we did not erect the bridges that would have been necessary to provide full freeway operation. By following these methods millions of dollars were saved, for the time being, at least, so that many more miles of divided highways and stage-construction freeways were constructed and put to traffic use that would otherwise not have been built.

Population Growth

The growth of population both in Los Angeles County and in Orange County has well been described as "explosive" in nature. This has had its reflection in increased volumes of traffic using the freeway facilities. Latest traffic counts on the Santa Ana Freeway in the City of Los Angeles near Soto Street indicate that the average daily traffic is now 113,000 vehicles. The time has now come that divided-highway sections of the Santa Ana Freeway should be reconstructed to full freeway status. Two such construction contracts are now in progress in Orange County to convert sections of expressway to full freeway status from Santa Ana, through Anaheim and Buena Park to the Orange-Los Angeles County line. These contracts will be completed in 1957. In Los Angeles County between Norwalk and Buena Park four bridge structures at cross highways were completed September 27, 1955, that converted some four miles of expressway to full freeway status.

Just recently completed is this 2.3-mile section in the East Los Angeles area that provides for widening the existing six-lane freeway to eight lanes. Other contracts of this same character will have to be carried out from time to time as the pressing traffic need develops for additional traffic lanes on freeways. There are many miles of freeways in this district where right of way has been obtained of sufficient width that necessary future widening can be carried out, when the time comes, with a minimum interference to traffic and without the necessity of getting additional rights of way. This procedure is really good business because in this manner it is possible for the State initially to build longer mileage minimum-width freeways and divided highways to serve existing traffic rather than build shorter lengths of full freeways to ultimate standards.

This photo shows extent of widening operations

First Freeway Widening

The widening of the Santa Ana Freeway between Camulos Street and Olympic Boulevard to provide eight lanes is logically the first freeway lane widening to be undertaken in this district because of the current construction contracts on the Long Beach Freeway easterly of Olympic Boulevard and plans for early construction on the Olympic Freeway and the Golden State Freeway westerly of Camulos Street. This section of the Santa Ana Freeway between Camulos Street and Olympic Boulevard will be in effect a connecting traffic arterial between these three other freeways, and eight-lane width is well justified.

When the traffic needs so warrant, other reconstruction contracts of a similar nature will have to be carried out from time to time on our freeways.

SILVER STRAND

Continued from page 24 . . .

permission to occupy part of the island; and with the development of the Navy and retrenchment of the Army, it was finally decided to turn the entire island over to the Navy; and Rockwell Field closed its doors in 1938.

The Navy early established a small facility on the island and began enlarging its holdings. As the location offered such a strategic position for repair and refitting of naval vessels, its importance grew in stature until in 1935, North Island became the largest Naval Air Station in the United States. Today, North Island is one of the Navy's prime operating centers.

Strange it is that State Sign Route 75, one of the shortest, if not the shortest, route in the State Highway System should serve such a potent place in our network of fine roads. We feel certain that were the venerable Cabrillo to return to this scene of his first discovery, he would offer his abject apologies for dismissing the sand-covered islands so lightly.

State Highway Contracts Awarded

JANUARY, 1956

Alameda County—Eastshore Freeway— Between Beard Road and Jackson Street. Construct graded roadbeds, pave with portland cement concrete on cement treated sub-grade and with plant-mixed surfacing on cement treated base and construct 11 bridges and one pumping plant, completion of which will provide a new four-lane divided freeway together with frontage roads, ramps and connections at: Hesperian Boulevard Overcrossing (north); Patterson Slough; Alameda Creek (frontage road); Alameda Creek; Alvarado Overcrossing; Whipple Overflow; Whipple Road Undercrossing; Alquire Road Overhead; Ward Creek; Tennyson Road Overcrossing; Route 105/69 Separation; Route 105/69 Separation Pumping Plant, 5.8 miles. Contract awarded to Gordon H. Ball & Ball & Simpson, Berkeley, $4,326,890.70.

Alameda County—State Route 105—Across San Francisco Bay, between San Mateo and Hayward. Repair portions of reinforced concrete spans of bridge. Contract awarded to Johnson Western Constructors, San Pedro, $444,555.

Contra Costa County—Sign Route 4—On Railroad Avenue at Oak Street. Construct drainage facilities and place untreated base and plant-mixed surfacing. Contract awarded to "L" & "Y" Const. Co., Oakland, $3,225.70.

Contra Costa and Solano Counties—At Martinez-Benicia Ferry Slips and Wharves. Construct a ferry boat. Contract awarded to Pacific Coast Engineering Co., Alameda, $616,500.

El Dorado County—US 50—Placerville to 29 miles easterly (emergency contract). Remove slides and restore drainage. Contract awarded to Joe Vicini, Placerville, $30,000.

Humboldt County—US 101—At north end of North Scotia Bridge (Emergency Contract). Repair embankment and placing riprap. Contract awarded to Humboldt Constructors, Eureka, $15,000.

Humboldt County—US 101, US 299, and State Route 85—Reconstruct roadway embankments and bridge approaches (emergency contract). Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $11,000.

Humboldt County—Sign Route 36—At three locations in the vicinity of mile 3.50 (emergency contract). Reconstruct roadway. Contract awarded to Humboldt Const. Inc., Eureka, $30,000.

Humboldt County—Sign Route 96—Across Trinity River. Construct a bridge (emergency contract). Contract awarded to Ben C. Gerwick, Inc., San Francisco, $60,000.

Humboldt County—County Road—Across South Fork of Eel River at Maple Hill (emergency contract). Construct timber bridge. Contract awarded to W. S. Selvage, Eureka, $40,000.

Humboldt County—County Road—Across South Fork Eel River to Redway (emergency contract). Repairing bridge. Contract awarded to Judson Pacific-Murphy Corp., Oakland, $50,000.

Inyo County—US 395—Between Birchim Canyon and Whiskey Canyon. Construct a graded roadbed and place plant-mixed surfacing on untreated base and apply seal coats, completion of which will provide a two-lane highway on new alignment with four-lane passing locations, 11.8 miles. Contract awarded to R. A. Westbrook, Inc. and Morrison-Knudsen Co., Inc., Los Angeles, $1,318,157.75

Kern County—US 99—Between California Avenue and 17th Street, on Union Avenue. Widen the existing roadway and place plant-mixed surfacing over untreated base and existing pavement and construct a steel girder bridge, completion of which will provide a six-lane divided highway together with a Union Avenue Underpass, 0.3 mile. Contract awarded to Griffith Co., Los Angeles, $384,352.90.

Kern County—State Route 141—On Oak Street at Brundage Lane, Chester Lane, 18th Street and 19th Street. Install traffic signal systems and highway lighting and construct channelization. Contract awarded to Griffith Company, Los Angeles, $41,699.

Kern County—FAS 887—Between Columbus Street and Main Canal, on Manor Street near Bakersfield. Construct a graded roadbed and surface with plant-mixed surfacing on a cement treated base and construct a reinforced concrete bridge at Panorama Drive Overcrossing, 0.4 mile. Contract awarded to Earl Brown, Beverly Hills, $184,942.

Los Angeles County—US 101—Between Los Angeles River and 0.2 mile west of Vineland Avenue. Construct an embankment, grade and pave Vineland Avenue with asphalt concrete and grade and pave a detour, and construct two bridges, the Los Angeles River Bridge and Vineland Avenue Undercrossing, to provide for a future freeway. Contract awarded to Oberg Const. Co., Inglewood, $910,694.

Los Angeles County—At the intersections of Verdugo Road with Acacia Avenue, Maple Street, Colorado Street, Broadway, Wilson Avenue, Chevy Chase Drive, Lexington Drive, Monterey Road, and Glenoaks Boulevard and Canada Boulevard with Colina Drive. Modify traffic signal systems and highway lighting and construct channelization. Contract awarded to Fischbach and Moore, Inc., Los Angeles, $36,835.

Los Angeles County—San Diego Freeway—Between Ohio Avenue and Waterford Street. Construct roadbeds, pave with portland cement concrete pavement on cement treated subgrade, surface with plant-mixed surfacing on cement treated base, untreated base and concrete base and construct seven bridges, a pedestrian undercrossing, retaining walls and a pedestrian undercrossing to be extended, completion of which will provide a new eight-lane divided freeway together with bridges, the Bonsall Avenue Undercrossing, Bonsall Avenue Pedestrian Undercrossing, Pepper Avenue Undercrossing, Wilshire Boulevard Undercrossing, Sepulveda Boulevard Undercrossing Wilshire Off-Ramp South, Sepulveda Boulevard Undercrossing Wilshire On-Ramp South, Sepulveda Boulevard Undercrossing Wilshire Off-Ramp North, Sepulveda Boulevard Undercrossing Wilshire On-Ramp North, San Vicente Boulevard Pedestrian Undercrossing (altered) and retaining walls, 1.1 miles. Contract awarded to Thompson Const. Co., Inglewood, $2,465,402.50.

Marin County—Sign Route 1—Between 1.1 miles and 4.4 miles north of Stinson Beach. Construct a graded roadbed and surface with plant-mixed surfacing on untreated base. 0.3 mile. Contract awarded to Brown-Ely Co., Contractors, Box 474, Corte Madera, $26,793.

Mariposa County—Sign Route 140—Between 4.2 miles and 0.1 mile west of Mariposa. Construct a graded roadbed, place plant-mixed surfacing on untreated base and existing surfacing. Contract awarded to Baun Const. Co., Inc., Fresno, $234,702.30.

Mendocino and Humboldt Counties—US 101—Piercy to Ohman Creek. Reconstruct slipouts, washouts and slides (emergency contract). Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $75,000.

Mendocino and Lake Counties—Sign Route 20—Between 0.2 mile east of North Fork of Cold Creek and Laurel Dell. Construct a graded roadbed, place imported subbase material and untreated base, surface with plant-mixed surfacing on cement treated base, and resurface an existing portion with plant-mixed surfacing, completion of which will provide a two-lane roadway, part of which is on new alignment eliminating many curves, 5 miles. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $539,310.

Monterey County—US 101—Between two miles south of San Ardo and Salinas River. Grade, place imported subbase material, imported base material and cement treated base material, surface with plant-mixed surfacing and apply seal coats, 1.2 miles. Contract awarded to Stecker & Scott, Sun Valley, $228,344.50.

Monterey County—US 101 and Sign Route 156—At Prunedale Junction, about seven miles north of Salinas. Construct an acceleration lane with plant-mixed surfacing on untreated base. Contract awarded to William Radtke and Son, Gilroy, $7,495.60.

Monterey County—Sign Route 1—At Soledad Drive, at the south city limit of Monterey. Grade, place plant-mixed surfacing on untreated base and construct portland cement concrete curbs and gutters, completion of which will provide channelization. Contract awarded to Buttler and Fox Contractors, Salinas, $3,709.50.

Napa County—Sign Route 29—Between four miles north of St. Helena and Calistoga, 3.8 miles. Construct a graded roadbed, place plant-mixed surfacing on cement treated base, existing pavement and selected material and apply seal coats, part of which is on new alignment, for two lanes of ultimate four-lane divided highway. Contract awarded to Huntington Bros., Napa, $481,849.40.

Orange County—US 101 Alt.—At the entrance to El Morro Elementary School. Install flashing beacon system. Contract awarded to Ed. Seymour, Long Beach, $2,795.

Orange County—State Route 175—Between Placentia Avenue and Carbon Canyon Creek, on Orangethorpe Avenue. Surface with plant-mixed surfacing and adjust manholes to grade, 1.8 miles. Contract awarded to Sully-Miller Contracting Co., Orange, $7,313.20.

Orange County—Between Wright Street and Euclid Avenue, on Garden Grove Boulevard. Install semi-traffic actuated signal systems and highway lighting and roadway improvements. Contract awarded to Ed. Seymour, Long Beach, $37,137.50.

Placer County—US 40—Between 1.6 miles east of Newcastle and 0.1 mile east of Nevada Street. Construct graded roadbeds and ramps and two concrete slab bridges and one welded steel bridge at Hallbom Road Undercrossing, Auburn Ravine Undercrossing and Nevada Street. Overcrossing to provide for a future four-lane divided freeway. Contract awarded to Thomas Const. Co., Fresno, $369,953.70.

Placer County—US 40—At Crystal Springs Slipout, 0.3 mile west of Baxters. Construct a bridge (emergency contract). Contract awarded to Pacific Bridge Co., Contractor, San Francisco, $40,000.

Plumas County—Sign Route 89—Across Sulphur Creek. Repairing a bridge and approaches (emergency contract). Contract awarded to R. E. Hertel, Sacramento, $20,000.

Riverside County—US 70-99—About three miles north of Palm Springs, at Indian Avenue. Construct graded roadbeds and place plant-mixed surfacing on imported base material and existing pavement and construct a welded plate girder bridge, completion of which will provide a new traffic interchange, 0.5 mile. Contract awarded to O. B. Pierson, Inc., Los Alamitos, $192,603.35.

San Francisco County—Bayshore Freeway—Between Army Street and Seventeenth Street. Pave roadside areas with plant-mixed surfacing, construct a maintenance building and prepare and plant areas, 1.1 miles. Contract awarded to Stephen L. Vistica & Son, San Mateo, $82,875.70.

San Francisco County—Bayshore Freeway—Between Alemany Boulevard and Army Street. Prepare and plant roadside areas, 1.0 mile. Contract awarded to Associated Engineers, Inc., Palo Alto, $45,370.95.

San Luis Obispo County—Sign Route 1—Between Morro Bay and Cambria, at four locations. Install corrugated metal pipe culverts, place untreated base and plant-mixed surfacing and construct portland cement concrete drainage structures. Contract awarded to R. McCray, Santa Maria, $4,404.25.

San Luis Obispo County—FAS 684—Between 4.8 miles and 5.5 miles west of Paso Robles. Construct a graded roadbed and road approaches, 0.7 mile. Contract awarded to Los Gatos Construction Co., Los Gatos, $40,376.

San Mateo County—Sign Route 1—At the intersection with Manor Drive, in Edgemar. Install

a two-phase full traffic-actuated signal system with highway lighting and advance warning flashing beacons, place plant-mixed surfacing on untreated base and on existing pavement. Contract awarded to Hall Sloat Electric Co., Inc., Oakland, $19,884.

Santa Barbara County—US 101—Between 0.7 mile and 1.3 miles west of Carpinteria. Construct corrugated metal pipe culverts at five locations and extend an existing corrugated metal pipe arch culvert. Contract awarded to Hurst Concrete Products, Santa Barbara, $2,335.

Santa Clara County—Sign Route 17—0.2 mile south of Moorpark Avenue and Stevens Creek Road, near San Jose. Construct embankment of imported borrow material, 0.6 mile. Contract awarded to Los Gatos Const. Co., Los Gatos, $31,855.

Solano County—State Route 208—About 0.7 mile northwest of Vallejo at Napa River. Repair fenders of bridge. Contract awarded to Healy Tibbitts Const. Co., San Francisco, $2,230.

Sonoma County—US 101—On West Street at First Street. Install traffic signal system. Contract awarded to Karl F. Stolting, Santa Rosa, $9,446.

Trinity County—US 299—At Douglas City Bridge. Supplemental Bent (emergency contract). Contract awarded to Fredrickson & Watson Const. Co., Oakland, $8,000.

Tulare County—State Route 131—Across Kaweah River, about 18 miles east of Visalia. Bridge repair (emergency contract). Contract awarded to Intrusion-Prefakt, Inc., Cleveland, $8,000.

Tulare County—Sign Route 63—At Cottonwood Creek and at Cottonwood Creek Overflow, about 8.5 miles north of Visalia. Construct metal beam bridge railing on two bridges and metal plate guard railing on approaches. Contract awarded to Seaboard Const. & Diving, Richmond, $5,085.

Ventura County—Sign Route 23—About four miles southeast of Moorpark. Install a corrugated metal pipe culvert. Contract awarded to Taylor & Hoover, La Canada, $1,680.99.

Ventura County—FAS 1164—Across Santa Clara River, on Ventura-Hueneme Coast Line Road. Constructing a reinforced concrete bridge. Contract awarded to C. B. Tuttle, Los Alamitos, $574,714.

Yuba County—US 99E—Between 0.2 mile south of Seventh Avenue in Olivehurst and Yuba River Bridge at Marysville Grade, place plant-mixed surfacing on cement treated base and on untreated base, remodel a portion of an existing bridge and install highway lighting systems, completion of which will provide a new four-lane divided highway together with necessary ramps, speed change lanes, frontage roads and road connections, 3.7 miles. Contract awarded to Baldwin Contracting Co., Inc. and H. Earl Parker, Inc., Marysville, $930,580.39.

FEBRUARY, 1956

Butte and Plumas Counties—US 40 Alt.—Jarbo Gap to Indian Creek. Remove slides, restore drainage facilities and remove debris (emergency contract). Contract awarded to Richter Brothers, Oroville, $150,000.

Contra Costa County—US 40—About two miles north of San Pablo, at Tara Hills Drive. Install a flashing beacon system and highway lighting. Contract awarded to Manning & Whitaker. Division of Coopman Electric Co., San Francisco, $1,979.

Contra Costa and Solano Counties—Sign Route 21—At Martinez and near Benicia. Repair the existing ferry slips. Contract awarded to Healy Tibbitts Construction Co., San Francisco, $154,556.

Del Norte County—US 101—At Station 138+. Erosion protection (emergency contract). Contract awarded to Mercer Fraser Co, Inc, Eureka, $1,700.

Fresno County—US 99—Between Cherry Avenue and Princeton Avenue, portions. Construct graded roadbeds, place concrete pavement on cement-treated subgrade, place plant-mixed surfacing on untreated base, construct six reinforced concrete bridges and three pumping plants, completion of which will provide a four- and six-lane divided freeway together with overcrossings, grade separations and pumping plants at: Ventura Street Overcrossing; Ventura Street Overcrossing Pumping Plant; Kern Street Overcrossing; Tulare Street Overcrossing; Tulare Street Overcrossing Pumping Plant; Fresno Street Separation; Tuolumne Street Overcrossing; Stanislaus Street Overcrossing and at Stanislaus Street Overcrossing Pumping Plant. 1.2 miles. Contract awarded to C. K. Moseman, Redwood City, $1,568,300.50.

Fresno County—Sign Route 41—Between Shields Avenue in Fresno and 0.3 mile north of Shaw Avenue. Construct a graded roadbed and place plant-mixed surfacing on cement-treated base and existing pavement, modify traffic signal and highway lighting systems, completion of which will provide a new six-lane divided highway. 2.3 miles. Contract awarded to Richards-Underdown Company, Fresno, $318,361.

Humboldt County—US 101—Between Eel River Lodge and Greenlaw Bluff. Repair washouts, slipouts and remove slides (emergency contract). Contract awarded to Mercer Fraser Co., Inc., Eureka, $105,000.

Humboldt County—US 101—Near Pepperwood. Remove flood-deposited houses and debris from highway (emergency contract). Contract awarded to A. C. Johnson & Sons, Eureka, $10,000.

Humboldt County—US 101—About two miles north of Arcata, at Turner Draw. Construct graded roadbeds for approaches and a detour, place plant-mixed surfacing on untreated base over imported subbase material and construct a reinforced concrete bridge across Turner Draw. 0.1 mile. Contract awarded to Mercer Fraser Co. and Mercer Fraser Gas Co., Inc., Eureka, $50,448.98.

Humboldt County — US 101 — At Mad River Bridge. Construct embankment protection (emergency contract). Contract awarded to Tom Hull, Gas Co., Inc., Eureka, $50,448.98.

Humboldt County — US 101 — At Mad River Bridge, Boyd Draw and Moore Draw Bridges. Reconstruct portions of approaches and bridges (emergency contract). Contract awarded to Tom Hull, Eureka, $35,000.

Humboldt County — US 299 — At Mad River Bridge. Repair approaches (emergency contract). Contract awarded Mercer Fraser Co., Inc., Eureka, $2,500.

Humboldt County—US 299—Willow Creek to Hoopa Bridge across the Trinity River. Remove slides and reconstruct drainage facilities and roadway (emergency contract). Contract awarded to J. Ira McNutt, Springfield, Oregon, $40,000.

Humboldt County—Sign Route 36—At Yager Creek Bridge. Repair bridge (emergency contract). Contract awarded to Mercer Fraser Co., Inc., Eureka, $8,000.

Humboldt County—Sign Route 96—Across two channels of Bluff Creek. Construct two log bridges and approaches (emergency contract). Contract awarded to J. J. Tracey, Eureka, $10,000.

Humboldt County—Sign Route 1—At Arlynda Corners. Construct timber pile bridge (emergency contract). Contract awarded to Mercer Fraser Co., Inc., Eureka, $25,000.

Humboldt County — Sign Route 1 — Between Fernbridge and Ferndale. Reconstruct washouts, embankments, pavement and culverts (emergency contract). Contract awarded to Mercer Fraser Co., Inc., Eureka, $90,000.

Humboldt County — Sign Route 1 — Between Route 1 and Arlynda Corners. Place plant-mixed surfacing (emergency contract). Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $12,850.

Humboldt County—Sign Route 96—Across Trinity River at Hoopa. Construct approaches to temporary bridge (emergency contract). Contract awarded to J. Ira McNutt Construction Co., Springfield, Oregon, $10,500.

Humboldt County—On Howe Creek Road, Price Creek Road and Blue Slide Road. Remove slides, repair washouts and place rock surfacing (emergency contract). Contract awarded to J. L. Conner, Jr., Eureka, $15,000.

Humboldt County—On Weymouth Bluff Road, Howe Creek Road, Price Creek Road and Blue Slide Road. Repair and replace bridges (emergency contract). Contract awarded to J. J. Tracey, Eureka, $18,000.

Humboldt County—Across North Fork of Bear River at Ambrosines. Log bridge (emergency contract). Contract awarded to W. S. Selvage, Eureka, $10,000.

Humboldt County—On Burrell Road, Conklin Creek Road, Cooke Road and at Mill Creek. Remove slides, repair washouts, place rock surfacing and construct log bridge (emergency contract). Contract awarded to Ted May, Eureka, $12,000.

Humboldt County—State Park Boundary to Fruitland on Dyerville Loop Road. Remove slides and restore roadway (emergency contract). Contract awarded to John Burman and Sons, Eureka, $12,000.

Humboldt County—At Mad River at Giacomini Ranch. Reconstruct pile bents (emergency contract). Contract awarded to Mercer Fraser Co., Inc., Eureka, $4,000.

Humboldt County—In Eureka. Construct alterations and improvements at shop building. Contract awarded to Singleton Company, Eureka, $4,250.

Humboldt County—Across Mattole River at Gardners. Repair bridge and approaches (emergency contract). Contract awarded to E. J. Armstrong & Son, Inc.. Eureka, $16,000.

Humboldt County—Across Bear River at Lowerys and across Bonanza Creek Bridge on Upper Bear River. Repair bridges and approaches (emergency contract). Contract awarded to Tom Hull, Eureka, $3,000.

Humboldt County—The Lighthouse Bridge, across Mattole River, at Petrolia. Repair bridge and approaches (emergency contract). Contract awarded to E. J. Armstrong & Son, Eureka, $15,000.

Humboldt County—Across Larabee Creek at Larabee. Repair bridge (emergency contract). Contract award to J. J. Tracey, Eureka, $10,000.

Humboldt County—Between Bald Hills Road and the vicinity of Weitchpec. Remove slides, surface and construct a bridge (emergency contract). Contract awarded to J. L. Conner, Jr., Eureka, $10,000.

Los Angeles County—US 66—Approximately 2.5 miles east of Monrovia, on Huntington Drive at Fish Canyon Road-Crownhaven Drive. Constructing channelization and furnishing and installing a traffic-actuated signal system and highway lighting. Contract awarded to Osborn Company, Pasadena, $44,287.15.

Los Angeles County—Sign Route 71—On Bellevue-Arroyo Avenue at Holt Avenue, at Pomona city limit. Modify traffic signal system. Contract awarded to Galland Electric Co., Inc., South Gate, $4,394.

Los Angeles County—Between Montebello and Whittier, at intersection of Rosemead Boulevard with Manzanar Avenue-Havenwood Drive. Install a traffic-actuated signal system and highway lighting. Contract awarded to C. D. Draucker, Inc., Los Angeles, $13,827.

Mendocino County—US 101—Between Station 386 and Station 391. Repair washouts and place riprap (emergency contract). Contract awarded to Lange Brothers & Hastings, Lakeport, $20,000.

Mendocino County—US 101—At Station 151. Construct roadway around timber crib (emergency contract). Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $5,000.

Mendocino and Humboldt Counties—At various locations. Remove slides and debris and reconstruct roadway (emergency contract). Contract awarded to Humboldt Constructors, Inc., Eureka, $30,000.

Mendocino and Humboldt Counties — Between Rattlesnake Summit and Scotia. Repair and replace culverts (emergency contract). Contract awarded to Harold Hastings, Lakeport, $10,000.

Mendocino and Humboldt Counties—Between Jitney Gulch and one-half mile north of Myers Flat. Repair slides and washouts (emergency contract). Contract awarded to John Burman and Sons, Eureka, $20,000.

Mendocino County—Sign Routes 128 and 1—At Elk Creek and others locations and at Big River. Repair washouts (emergency contract). Contract awarded to Granite Construction Co., Watsonville, $20,000.

Mendocino County — Sign Route 1 — Across Brush Creek, near Manchester. Construct a reinforced concrete bridge and grade and surface with road-mixed surfacing the approaches. 0.3 mile. Contract awarded to Thomas Construction Co., Fresno, $131,722.65.

Modoc County—US 299—Between eight miles north of Adin and Pit River Bridge. Place plant-mixed surfacing on the existing pavement and on untreated base. 9.2 miles. Contract awarded to Baldwin Contracting Co., Inc., Marysville, $210,218.44.

Riverside County—MAFB Access Road—Between Avenue "C" and Graham Street. Construct a graded roadbed, place imported borrow, imported base material, cement-treated base and plant-mixed surfacing and construct two bridges, completion of which will provide a grade separation and overhead, at March Field Road Overcrossing and at March Field Off-ramp Overcrossing. 1.9 miles. Contract awarded to E. L. Yeager Co., Riverside, $462,940.90.

Riverside County—US 60-70-99—Between 0.8 mile north of Indio Overhead and Indio Grade. Place plant-mixed surfacing on cement-treated base and on existing pavement and construct two bridges, completion of which will provide a four-lane divided highway with bridges at Coachella Storm Drain and Indio Overhead. 2.7 miles. Contract awarded to Altfillisch Construction Co. and Love & Watson, Downey, $488,031.60.

San Bernardino County — US 70-99 — Across South Channel Warm Creek, about 0.8 mile south

of San Bernardino. Repair the existing bridge. Contract awarded to Louis J. Strona, Pomona, $6,930.75.

San Bernardino County—US 66—At the Amboy Maintenance Station. Construct a cottage and install utilities. Contract awarded to Cal. Const. Co., San Bernardino, $13,400.

San Diego County—US 395—Between Richmond Street and Fulton Street. Paint metal plate guard railing. 3.3 miles. Contract awarded to Geo. C. Punton, San Diego, $2,467.50.

San Diego County—Sign Route 94—Between Wabash Freeway in San Diego and 0.6 mile east of Euclid Avenue. 2.4 miles. Grade and pave with portland cement concrete pavement on cement-treated subgrade, place plant-mixed surfacing on cement-treated base and imported base material, construct one wended structural steel and three reinforced concrete bridges, completion of which will provide a new six-lane divided freeway together with ramps, interchange lanes and street connections at Las Chollas Creek-Home Avenue On-ramp Bridge, at Home Avenue Off-ramp Overcrossing, at 47th Street Overcrossing, and at Euclid Avenue Overcrossing, all on new alignment. 2.4 miles. Contract awarded to Guy F. Atkinson Co., South San Francisco, $2,062,928.70.

San Diego County—FAS 732—Between Brockton Street and Magnolia Avenue in El Cajon. Construct a graded roadbed, place imported subbase material and plant-mixed surfacing on imported base material and on existing surface and apply seal coats, completion of which will provide a four-lane divided highway together with road connections, approaches and crossroads. 2.0 miles. Contract awarded to Ralph B. Slaughter, Julian, $352,452.

San Francisco City and County—Between 10th Street and Fourth Street, adjacent to Bayshore Freeway. Construct chain link fence. Contract awarded to United States Steel Corp., Amer. Steel & Wire Div., Cyclone Fence Dept., Oakland, $18,711.

San Joaquin County—US 99—Between 0.3 mile north of Lathrop Road and 0.4 mile north of Turner Station. Construct graded roadbeds, pave with portland cement concrete on cement-treated base, surface with plant-mixed surfacing on untreated base and on existing pavement and construct a steel bridge, completion of which will provide a four-lane divided highway together with frontage roads and ramps, including the Turner Station Overhead. 2.5 miles. Contract awarded to A. Teichert & Son, Inc., Sacramento, $914,045.70.

San Joaquin County—US 99—Between Lodi and 0.5 mile north of Jahant Road. Construct a graded roadbed and surface with portland cement concrete on cement-treated subgrade and plant-mixed surfacing on untreated base and construct five bridges and one pumping plant, completion of which will provide a four-lane divided freeway together with bridges at: Mokelumne River; Woodbridge Road Overcrossing; Acampo Road Overcrossing; Peltier Road Overcrossing; Jahant Road Overcrossing; and a pumping plant at Acampo Road Overcrossing. 4.8 miles. Contract awarded to M. J. B. Constr. Co. and Lord & Bishop, Inc., Stockton, $1,975,959.20.

San Mateo County—US 101—At Carmelita Avenue and at Chapin Avenue, on El Camino Real. Install traffic signals. Contract awarded to R. Flatland, San Francisco, $6,000.

San Mateo County—At Burlingame Maintenance Station. Reconstruct electrical systems. Contract awarded to Coopman Electric Co., San Francisco, $1,358.

Santa Barbara County—US 101—Between El Capitan Creek and 0.6 mile west of Arroyo Hondo, about 23 miles west of Santa Barbara. Clean and paint the existing guard railing and install metal plate guard railing, guide posts, and culvert markers. 7.6 miles. Contract awarded to L. J. Grey & Sons, Balboa, $20,177.80.

Santa Clara County—US 101—On El Camino Real at El Monte Avenue. Install a traffic signal system. Contract awarded to Progress Electric, Palo Alto, $8,896.

Santa Clara County—State Route 42—At the intersection of Santa Cruz Avenue with Saratoga Avenue. Install a two-phase pre-timed traffic signal system. Contract awarded to L. H. Leonardi Electric Construction Co., San Rafael, $2,999.

Shasta County—US 299—Between 0.7 mile east of the west city limit and Southern Pacific Railroad Overhead. Construct a graded roadbed, place imported subbase material and place plant-mixed surfacing on cement-treated base and untreated base. 1.5 miles. Contract awarded to Fredrickson & Watson Const. Co., Oakland, $185,330.55.

Trinity and Humboldt Counties—Sign Route 36—Between Bridgeville and Forest Glen. Repair culverts and remove slides (emergency contract). Contract awarded to Lennon Brothers, Inc., Fortuna, $21,000.

Trinity County—US 299—Cedar Flat to District II line. Restore roadway (emergency contract). Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $40,000.

Tulare County—Sign Route 65—At Tule River Bridge at Porterville. Construct pier protection (emergency contract). Contract awarded to Thomas Construction Co., Fresno, $6,618.

Tulare County—FAS 1212—Between Grevilla Street 0.5 mile south of Porterville and Porterville State Hospital. Construct a graded roadbed and surface with plant-mixed surfacing on imported base material. 2.0 miles. Contract awarded to L. B. Wells Construction Co., Visalia, $83,867.

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Contra Costa County—Between Esmond Avenue and McBryde Avenue, on San Pablo Avenue. Grade and pave parking lanes with portland cement concrete on untreated base and construct curbs. Contract awarded to O. C. Jones & Sons, Berkeley, $11,577.50.

Humboldt County—US 101—Between 0.6 mile north of Plaza Avenue in Arcata and 1.0 mile south of Mad River, and on US 299 between US 101 and Mad River, grade and surface, to provide a 4-lane divided freeway and expressway together with frontage roads, 2.9 miles. Contract awarded to Mercer Fraser Co., Inc. & Mercer Fraser Gas Co., Inc., Eureka, $629,224.48.

Imperial County—State Route 187—Across Alamo River, about three miles east and seven miles north of Brawley redeck and widen two bridges. Contract awarded to R. E. Staite & Roy C. Ek, San Diego, $23,691.75

Kern County—US 466—At Mt. Vernon Avenue, about 0.5 mile east of Bakersfield. Install flashing beacon and highway lighting system and construct channelization. Contract awarded to Dicco, Inc., Bakersfield, $13,930.

Kern County—US 399—Between Sunset Railroad and 1.4 miles north of Taft. Grade roadbed and place plant-mixed surfacing on cement treated base, and install a highway lighting system, completion of which will provide renewed existing highway and four-lane divided highway on new alignment, 2.4 miles. Contract awarded to Phoenix Const. Co., Inc., Bakersfield, $241,327.30.

Los Angeles County—US 101—Between 0.4 mile west of Washington Boulevard and the Orange County line. Widen the existing roadbed and place plant-mixed surfacing on untreated base and existing pavement and construct an extension to the Whittier underpass, completion of which will provide a seventy-six foot street, 4.8 miles. Contract awarded to J. E. Haddock, Ltd., Pasadena, $1,477,869.90.

Los Angeles County—US 66—Between 0.1 mile west and 0.2 mile east of Fifth Street, near Azusa on Alosta Avenue. Widen the existing roadway with plant-mixed surfacing on untreated base and apply seal coats, 0.3 mile. Contract awarded to J. E. Haddock Ltd., Pasadena, $15,783.30.

Los Angeles County—US 6—Between Lancaster and Kern County line, at seven locations. Replace corrugated metal pipe culverts. Contract awarded to Ed Waters, Van Nuys, $6,693.20.

Los Angeles County—US 66—Between Princeton Road and 0.2 mile southeast of Colorado Boulevard, 0.4 mile. Grade, place imported subbase material and untreated base, surface with plant-mixed surfacing and apply seal coat, completion of which will provide a four-lane divided highway. Contract awarded to Osborn Co., Pasadena, $43,017.55.

Los Angeles County—US 66—Between Colorado Boulevard and Melrose Avenue. Pave with plant-mixed surfacing, install watering system and prepare and plant with trees and shrubs, 1.0 mile. Contract awarded to Moulder Bros., Glendale, $52,753.01.

Los Angeles and Orange Counties—Between Coyote Creek and Ball Road, on the Santa Ana Freeway, 6.5 miles. Grade, pave with portland cement concrete on cement treated subgrade, place plant-mixed surfacing on untreated base, and construct 16 bridges and two pumping plants, completion of which will provide a six-lane divided highway together with frontage roads, interchange roads, speed change lanes and connections to existing streets. Bridges at Artesia Avenue undercrossing; Western Avenue overcrossing; Route 171/174 separation; Stanton Avenue overcrossing; Stanton Avenue on-ramp overcrossing; Fullerton Creek; Brookhurst Avenue Overhead; Brookhurst Avenue overcrossing; La Palma Avenue overcrossing; Euclid Avenue overcrossing; Euclid Avenue off-ramp overhead; Lincoln Avenue overcrossing; Broadway overcrossing; Anaheim underpass; Santa Ana Street overcrossing; and Ball Road overcrossing. Pump plants at Route 171/174 separation and at Lincoln Avenue. Contract awarded to J. E. Haddock Ltd. and R. M. Price Co., Pasadena, $5,929,776.30.

Los Angeles County—Between Narcissa Drive and Crenshaw Boulevard, on Palos Verdes Drive south. Grade and surface with plant-mixed surfacing on untreated base and imported base material, completion of which will provide a four-lane divided highway, 1.1 miles. Contract awarded to Westway Excavating Co., Los Angeles, $212,582.85.

Marin County—US 101—Alto intersection. Drainage correction. Contract awarded to Ghilotti Brothers, Inc., San Rafael, $6,945.

Marin County—FAS 608—Between Lagunitas School and 3.2 miles west of Fairfax. Construct a graded roadbed and place selected material, 2.6 miles. Contract awarded to John Delphia, Patterson, $270,106.

Mendocino County—US 101—About 39 miles north of Willits, at Rattlesnake Creek. Construct an unlined tunnel for a channel change. Contract awarded to Mercer Fraser Co., Inc. & Mercer Fraser Gas Co., Inc., Eureka, $38,590.00.

Mendocino County—US 101—Between Low Gap Road—Brush Street, and 0.2 mile north of Ford road. Construct a graded roadbed and surface with plant-mixed surfacing on cement treated base, 0.7 mile. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $133,058.50.

Mendocino County—Sign Route 128—Between Coon Creek and Ornbaun Creek, about four miles southeast of Boonville. Construct a graded roadbed, place imported subbase material, place plant-mixed surfacing on cement treated base and on untreated base and apply seal coat, 0.8 mile. Contract awarded to Granite Const. Co., Watsonville, $152,103.00.

Monterey County—At the intersection of SR 1 with Ocean Avenue, Near Carmel. Install traffic signal system and highway lighting and construct channelization. Contract awarded to Granite Const. Co., Watsonville, $14,016.50.

Orange County—US Alt. 101—Across San Juan Creek overflow, about 3 miles northwest of San Clements. Repair a timber trestle bridge. Contract awarded to Macco Corporation, Paramount, $5,828.

Orange County—At intersection of Ocean Avenue with Main Street, in Huntington Beach, and at intersections of Newport Boulevard with Via Lido and of Pacific Coast Highway with Seaward Road and with Morning Canyon Road, in Newport Beach. Furnish, install and modify traffic signal systems and highway lighting systems and construct channelization. Contract awarded to Ed. Seymour, Long Beach, $54,727.

Riverside County—SR 18—Between 0.4 mile south of 14th Street and 0.3 mile north of Russell Street. Construct two graded roadbeds, place imported base material; construct cement treated subgrade and Portland cement concrete pavement; place plant-mixed surfacing over imported base material, cement treated base and existing pavement; construct six bridges and a pumping plant, completion of which will provide a new section of four-lane divided highway with bridges at: 14th Street overcrossing, Eighth Street separation, Seventh Street undercrossing, Third Street undercrossing, Riverside Junction underpass, Spruce Street overcrossing and pump plant at Riverside Junction underpass, 2.2 miles. Contract awarded to Griffith Co., Los Angeles, $1,885,484.60.

Riverside County—SR 74—Between 9.5 miles east of Hemet and 1.1 miles west of Mountain Center. Grade the existing roadbed, place plant-mixed surfacing and apply seal coats, 7.3 miles. Contract awarded to Matich Constructors, Colton, $118,476.

San Bernardino County—US 70, 99—At Milliken Avenue and at Holt Boulevard connection, near Ontario. Grade a deceleration lane and surface with plant-mixed surfacing and construct metal plate guard railing. Contract awarded to Ralph J. Laird, La Verne, $3,823.10.

San Bernardino County—At Alabama Street, on Colton Avenue, near Redlands, and at Marshall Boulevard, on E Street in San Bernardino. Install traffic signal systems and construct concrete curb median widening. Contract awarded to Paul R. Gardner, Ontario, $26,740.

San Bernardino County—US 91—Between 0.3 mile south and 0.3 mile north of Cable Creek, about 4 miles north of San Bernardino. Grade the existing shoulders, surface the existing roadway and shoulders with plant-mixed surfacing, 0.6 mile. Contract awarded to Vernon Paving Co., Fontana, $4,062.

San Bernardino County—SR 2 and State Route 188—Across west fork Mojave River about 9 miles and 11 miles north of Crestline. Construct graded roadbeds for detours, construct bridge approaches and reconstruct two steel girder bridges at west fork Mojave River at two locations. Contract awarded to Hubbs Equipment Co., Colton, $38,280.

San Diego County—On south Harbor Drive at Sampson, Beardsley and Sigsbee Streets. Grade and surface left turn lanes with plant-mixed surfacing on untreated base, 0.5 mile. Contract awarded to M. H. Golden Const. Co., San Diego, $7,515.20.

San Diego County—SR 94—Between 0.5 mile east of Euclid Avenue and 0.3 mile east of College Avenue. Install Highway lighting and illuminuted sign systems. Contract awarded to Hall Sloat Electric Co., Inc., Oakland, $36,105.

San Francisco County—State Route 224 (Embarcadero Freeway)—Between San Francisco-Oakland Bay Bridge at Fremont Street and Howard Street. Construct portions of a multilane multilevel separation of reinforced concrete box girder spans supported by reinforced concrete bents and construct contour graded areas and replace portions of city streets with plant-mixed surfacing on portland cement concrete base, 0.9 mile. Contract awarded to Chas. L. Harney, Inc., San Francisco, $1,859,283.40.

San Francisco County—Between 15th and 16th, San Bruno and Vermont Streets, at the San Francisco maintenance station. Install three metal buildings, construct concrete curbs and pave portions of the yard areas with plant-mixed surfacing on untreated base. Contract awarded to Bos Const. Co., Berkeley, $28,830.

San Luis Obispo County—FAS 1208—Between 0.5 mile and 4.1 miles west of Templeton. Grade, place imported subbase and imported base materials, place plant-mixed surfacing and apply seal coat, 3.6 miles. Contract awarded to Madonna Construction Co., San Luis Obispo, $111,625.

San Mateo County—US Bypass 101—Between Millbrae Avenue in Millbrae and 0.4 mile north of Broadway in Burlingame. Prepare and plant roadside areas, 0.4 mile. Contract awarded to Stephen L. Vistica & Son, San Mateo, $1,656.

Santa Clara County—SR 9—Between 0.4 mile south of McClellan Road and US 101. Widen and surface with plant-mixed surfacing on cement treated base and over the existing pavement, install one traffic signal system with highway lighting and modify two existing traffic signal systems with highway lighting, 4.0 miles. Contract awarded to L. C. Smith Co., San Mateo, $316,279.80.

Sonoma County—US 101—Across Mark West Creek, four miles north of Santa Rosa. Construct a reinforced concrete bridge and constrtuct graded approaches and surface with plant-mixed surfacing on untreated base. Contract awarded to Bridges Const. Co., San Jose, $66,282.90.

Sonoma County—At the Schellville maintenance station. Construct a metal building. Contract awarded to Stevenson Pacific, Redwood City, $3,343.

Yolo County—Between Johnston and Pendergast Streets on Main and East Streets, and between Johnston and East Streets on Oak Avenue. Install traffic signal system and highway lighting and construct drainage facilities. Contract awarded to A. Teichert & Son, Inc., Sacramento, $35,223.50.

Yolo County—At the Division of Highways Nursery about 10 miles west of Sacramento, near Davis, repair and improve a lath house. Contract awarded to A. Teichert & Son, Inc., Sacramento, $2,260.50.

APRIL, 1956

Del Norte County—US 101—Across Panther Creek, about two miles north of Klamath. Construct a detour of imported borrow, surface with plant-mixed surfacing; grade and surface the approaches with untreated base material and plant-mixed surfacing, and construct a reinforced concrete bridge, 0.2 mile. Contract awarded to Osborne Bowie Eng. Contrs., Crescent City, $71,907.

Del Norte County—US 101—Between 0.4 mile and 0.8 mile north of Wilson Creek, about 13 miles south of Crescent City. Grade and surface with plant-mixed surfacing on cement treated base and construct a reinforced concrete bridge, completion of which will provide a four-lane highway, part of which is on new alignment eliminating a bad curve, 1.1 miles. Awarded to Natt McDougall Co., Portland, Oregon, $552,100.21.

Humboldt County—US 101—Between 0.2 mile south of Elk River and south city limit of Eureka. Widen the existing two-lane approaches and surface with plant-mixed surfacing on cement treated base and construct a precast concrete bridge, completion of which will provide a four-lane divided facility, 1.5 miles. Awarded to Mercer, Fraser Gas Co., Inc., and Mercer, Fraser Co., Inc., Eureka, $249,141.26.

Humboldt County—Sign Route 96—Across Trinity River at Hoopa. Grade bridge approaches and surface with road-mixed surfacing on untreated base and construct a welded plate girder bridge, 0.4 mile. Awarded to Peter Kiewit Sons' Co., Medford, Oregon, $710,276.50.

Imperial County—US 80—At Pack Ditch, about 11.3 miles west of Winterhaven. Construct a triple reinforced concrete box culvert and place plant-mixed surfacing on untreated base. Awarded to R. E. Staite-Roy C. Ek, San Diego, $25,004.15.

Kern County—US 466—Between Keck's Corner and 0.3 mile easterly, about 44 miles west of Wasco. Construct a graded roadbed and place plant-mixed surfacing on cement treated base, and construct a reinforced concrete box culvert with headwalls and end walls, 0.3 mile. Awarded to Rand Const. Co., Bakersfield, $25,467.50.

Kern County—US 466—Between 2.3 and 4.6 miles east of Lost Hills. Construct bridge approaches and detours, place imported borrow and cement treated base, surface with plant-mixed surfacing and construct three bridges and a box culvert, at Goose Lake Canal Bridge, bridge across Main Drain Canal, West Side Canal Culvert and bridge across Main Flood Canal, 0.4 mile. Awarded to Thomas Const. Co., Fresno, $134,385.

Kern County—Sign Route 33—Between Eighth Street and Lincoln Avenue, on Kern Street. Grade the shoulder areas and surface with plant-mixed surfacing. Awarded to Phoenix Const. Co., Inc., Bakersfield, $2,176.50.

Lake County—Sign Route 29—Across Thompson Creek, about two miles south of Lakeport. Construct a reinforced concrete bridge and grade approaches and surface with plant-mixed surfacing on untreated base, 0.1 mile. Awarded to Robert R. Murdoch, Lafayette, $40,958.

Los Angeles County—At Hillcrest Blvd., on La Brea Ave. Install traffic signal system and highway lighting. Awarded to Westates Electrical Constr. Co., Los Angeles, $6,600.

Los Angeles County—Long Beach Freeway—Between 0.4 mile south of Imperial Highway in Lynwood and Dozier Street. Grade and pave with portland cement concrete pavement on cement treated subgrade and plant-mixed surfacing on untreated base and construct four reinforced concrete and one riveted plate girder bridges and two reinforced concrete pumping plants, completion of which will provide a new six-lane divided freeway together with interchanges and off and on ramps; bridges at Salt Lake Avenue Overhead, Garfield Avenue Undercrossing, Route 174/167 Separation, Southgate Underpass, Clara Street Overcrossing, and Pumping Plants at Southgate Underpass and at Clara Street Overcrossing, 3.8 miles. Awarded to Webb & White and W. J. Disteli, Los Angeles, $4,174,204.

Madera County—US 99 and Sign Route 152—Between Califa and Merced County Line. Construct graded roadbeds, place imported subbase material, pave with portland cement concrete on cement treated subgrade and plant-mixed surfacing on cement treated base and untreated base, and construct seven bridges, two pumping plants, and modify an existing pumping plant, completion of which will provide freeway, together with frontage roads, ramps and interchanges, bridges at: Route 32/4 separation; Califa Overhead; Road 24-E Overcrossing; Berenda Slough Bridge; Road 26-E Overcrossing; Ash Slough Bridge; and Le Grand Ave. Overcrossing, all on new alignment, and four-lane divided, 7.0 miles. Awarded to Fredericksen & Kasler, Sacramento, $2,285,809.35.

Marin County—Sign Route 37—Across Novato Creek, about 9.5 miles north of San Rafael. Repair a reinforced concrete bridge. Awarded to C. C. Gildersleeve, Grass Valley, $8,152.

Marin County—Sign Route 1—Across Arroyo San Geronimo, about 0.2 mile south of Point Reyes Station. Clean and paint bridge. Awarded to R. W. Reade and Co., Berkeley, $1,940.

Monterey County—Sign Route 1—About 55 miles south of Monterey, at Limekiln Creek. Construct a reinforced concrete bridge and construct graded approaches and pave with plant-mixed surfacing on cement treated base. Awarded to James B. Allen and Lee Arnold, Inc., San Carlos, $361,980.

Nevada County—Sign Route 20—Between 0.4 mile west of Casey's Corner and Rough and Ready, about five miles west of Grass valley. Place road-mixed surfacing on untreated base and redeck and widen a steel stringer and a timber stringer bridge, 2.1 miles. Awarded to M. J. Ruddy & Son, Modesto, $72,176.35.

Orange County—At Commonwealth Ave. and at Artesia Ave., on Grand Ave. Modify the existing and install new traffic signal systems and highway lighting. Awarded to Sherwin Electric Service, Los Angeles, $9,396.

Orange County—Across Brea Canyon Creek, on bridge. Construct a pedestrian walk. Awarded to E. S. and N. S. Johnson, Fullerton, $2,793.

Riverside County—Sign Route 111—Between Ramon Road and Indian Trail. Widen the existing roadway and bridge by grading and surfacing with plant-mixed surfacing, completion of which will provide a four-lane roadway, and widened bridge across Tahquitz Creek, 1.3 miles. Awarded to E. L. Yeager Co., Riverside, $136,476.50.

San Francisco City and County—On Bayshore Freeway—Between Third St. and Alemany Blvd. Pave areas with plant-mixed surfacing, construct a maintenance building, install a watering system, install a plant box, prepare and plant trees and shrubs, 1.2 miles. Awarded to Stephen L. Vistica & Son, San Mateo, $62,066.30.

San Francisco City and County—Golden Gate Bridge Approach—Between the Toll Plaza and Sign Route 1. Contract new concrete bases for a monument and drinking fountain, construct plant-mixed surfacing pavement widening on concrete base, and prepare and plant areas, 0.3 mile. Awarded to Watkin & Sibbald, San Anselmo, $22,794.10.

San Luis Obispo County—US 101—Between Hourihan Grade and Russell Turn, about 3.0 miles to 10.1 miles north of Santa Maria Grade. Pave with portland cement concrete on cement treated subgrade, place plant-mixed surfacing on cement treated base and concrete pavement and construct three reinforced concrete bridges, completion of which will provide a four-lane divided highway with bridges at Robbins Street Overcrossing, Nipomo Creek Frontage Road Bridge and at Nipomo Creek, all on new alignment, 7.1 miles. Awarded to Madonna Const. Co., San Luis Obispo, $1,777,164.

San Luis Obispo County—Sign Route 1—At Arroyo Grande Creek, near Oceano. Grade a two-lane roadway, place plant-mixed surfacing on untreated base and construct a reinforced concrete bridge, 0.4 mile. Awarded to Madonna Const. Co., San Luis Obispo, $79,827.

Santa Cruz County—State Route 42—About 2.6 miles northerly of Governor's Camp, in Big Basin State Park. Construct a graded roadbed and embankment and place plant-mixed surfacing on untreated base, 0.3 mile. Awarded to Granite Const. Co., Watsonville, $16,875.

Siskiyou County—Sign Route 96—Across Swillup Creek, about 20 miles south of Happy Camp. Construct a reinforced concrete bridge. Contract awarded to Rett Company, West Sacramento, $34,678.50.

Trinity County—US 299—Between Court Street in Weaverville and 1.8 miles east. Construct a graded roadbed, place imported subbase material, untreated base and cement treated base and surface with plant-mixed surfacing, 1.8 miles. Awarded to Mercher, Fraser Co., Inc., and Mercer, Fraser Gas Co., Inc., Eureka, $183,206.

Trinity County—US 299—On US 299, Trinity River at Douglas City (emergency contract). Assemble Baily Bridge and remove debris. Awarded to United States Plywood Corp., $2,150.

Tulare County—US 99—Across freeway, about 120 feet north of the intersection of County Road 128 and Avenue 80. Construct a reinforced concrete bridge, install lighting system, and place imported borrow and plant-mixed surfacing for the approaches, completion of which will provide a new pedestrian overcrossing. Awarded to Thomas Const. Co., Fresno, $58,180.

Ventura County—State Route 9—Near Saticoy on Los Angeles Ave. about 0.5 mile north of Santa Clara Ave. Grade and surface with plant-mixed surfacing on untreated base and construct reinforced concrete culverts, and apply seal coats, 0.3 mile. Awarded to Paul V. Pollock, Ventura, $23,168.40.

Ventura County—State Route 9—Across the Santa Clara River, near Saticoy. Remove and reconstruct a portion of bridge, and remove and reconstruct curbs and railings of bridge across Santa Clara River. Awarded to W. F. Maxwell Co., Los Angeles, $605,441.50.

Yuba County—At the State Highway District Office and Laboratory Building in Marysville. Prepare and plant ground areas. Awarded to R. B. Gregory, Berkeley, $1,800.31.

Employees Receive Twenty-five-year Awards

Employees of the Division of Highways who became eligible for 25-year awards on March 31, and April 30, 1956, are:

Name	Total service Yrs.	Mos.	Days
ELIGIBLE ON March 31, 1956			
District I			
Parker, Elmon L.	25	0	13
District III			
Engrahm, Alvin E.	25	0	7
District IV			
Miles, Herbert S.	25	0	23
Norris, Robert Johnston	25	0	4
DISTRICT VII			
Bray, Otis	25	0	29
Dane, Sylver P.	25	0	27
Tibbet, Edward P.	25	0	16
District VIII			
Smith, Neil L.	25	0	17
District X			
Pleau, Henry L.	25	0	16
DISTRICT XI			
Jorgensen, J. Frank	25	0	15
Bridge Dept.			
Greene, George A.	25	0	28
Verner, Carl J.	25	0	24
Headquarters Shop			
Keleher, James J.	25	0	18
ELIGIBLE ON April 30, 1956			
District I			
Burgess, Bernard J.	25	0	11
Leger, Leslie L.	25	0	3

Name	Total service Yrs.	Mos.	Days
ELIGIBLE ON April 30, 1956—Continued			
District I—Continued			
Robson, James Daniel	25	0	6
Smart, Elwin J.	25	0	6
District II			
Davis, Edward E.	25	0	12
District IV			
Loeffler, Paul A.	25	0	26
Milner, Donald C.	25	0	17
District V			
Beuttler, Louis James	25	0	2
District VI			
Stumbaugh, Wayne S.	25	0	00
District VII			
Decker, Ralph E.	25	0	21
Madden, Russell J.	25	0	18
District VIII			
Barrett, W. V. (Bill)	25	0	00
District X			
Black, Darrell J.	25	0	14
Bridge Dept.			
Ivy, Raymond J.	25	0	27
Mauzy, Harris K.	25	0	21
Turpen, Loretta	25	0	9
Headquarters Shop			
Revelino, James B.	25	0	16
Schang, Robert M.	25	0	14

THE MONARCHS

Visit Monterey, Pacific Grove, or Carpinteria and you're almost sure to hear about the butterflies. In this case, points out the National Automobile Club, the butterflies will be the giant monarchs, their reddish-brown wings veined with black. And you'll hear about them because of their most unusual semiannual migratory flight that takes them over the hundreds of miles from Alaska to California.

There are migratory flights and migratory flights but that of the monarchs is most unusual for they fly only one way and then die; their progeny fly back to the starting point in Alaska.

Cycle Occurs Each Year

Let us look at the cycle as it occurs each year. In the late summer, monarchs from the meadowlands of Alaska start to congregate in large groups and move down the coast. As they go, they are joined by other monarchs along the way and soon great masses of them are winging their way southward. Down along Washington and Oregon they go, and into California. In Central California they wing out across Monterey Bay and then begin to take to the trees at Monterey, Pacific Grove, and farther south at Carpinteria. On the same Monterey pines and live oaks on which they have been swarming for years, they settle down, each hanging to the end of a pine needle, leaves folded, dormant. For four long months they nap there, and then, with the coming of spring, they awaken.

In the early spring they breed and die. Their progeny flutter about the hills and valleys, feeding on the milkweed, gaining strength for the long journey back to the North. And then, one day, these butterflies born in Monterey begin to move out in little groups, begin to move up the coast, Northward they go, feeding lightly on plant nectar as they go, and coming at last to the meadowlands that their parents had left the late summer before. There they will breed and die and their progeny will come down to Monterey.

So strange is this flight that each year the arrival of the monarchs is celebrated by a butterfly pageant in Pacific Grove and police of the area are not slow to arrest anyone found disturbing or destroying the butterflies during their long winter sleep.

A total of 10,530,725 toll-paying interurban train and bus passengers crossed the San Francisco-Oakland Bay Bridge during the Fiscal Year 1954-55. A new high record of 31,728,722 vehicles crossed the bridge during the same period.

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routed through the city did not drive by the retail outlets on Inyo Street, and it is extremely doubtful if these businesses derived any benefit from this source.

Eating and drinking places were the only business group in this area that enjoyed an increase in gross sales during the two years after the freeway opened. As all business in this area showed a decline and the only type of business showing an increase was the type catering to highway travel, it is reasonable to assume the losses suffered by the other businesses were not caused by diverting U. S. Highway 99 traffic to the freeway bypass.

Area C

All retail outlets along the entire 7.9-mile length of the old highway route, bypassed by the freeway, were included in this business sector. These retail outlets, because of their location, would be most directly affected by the freeway bypass.

The service stations on the old highway suffered the heaviest loss of gross sales in this sector. As compared with service stations in other sectors of Tulare it is apparent that a portion of the loss is directly attributable to the rerouting of the highway traffic to the new freeway.

Eating and drinking places on the old highway route suffered a loss in gross sales amounting to 8.51 percent. This decrease was not as great as the losses suffered by the same group of businesses located in some other sectors of the city. However, there were eating and drinking places in business sectors in the community which enjoyed an increase in gross sales during the two years following completion of the freeway. We can assume that this type of business on the old highway route was affected to a certain degree by the change in highway routing; however, in view of the loss in some of the other sectors which were not affected by highway traffic, it would be wrong to attribute the entire loss to the highway change.

The highest business increase made by any group of retail outlets at any location in Tulare were the retail businesses along the old highway route catering to the needs of the local buyers.

Area D

K Street, the "main street" of Tulare, is one block east of the old highway route. Although traffic on the highway through the city was routed on a parallel street, the close proximity of the main business street undoubtedly attracted some travelers.

The sale of merchandise in a large majority of the retail outlets on this street is influenced by local purchasing power, and does not appeal to a stranger driving through the town.

The relatively high losses in gross sales among service stations and the eating and drinking places represented a relatively small volume of the business performed on K Street, as evidenced by the fact that their losses did not substantially change the loss shown by the majority of business as a part of the total business activity on the street.

In comparing the majority of businesses, identified as the all other group, on K Street with the same class of retail outlets on the two parallel streets shown on the accompanying chart as Sectors C and F, business catering to local buyers in those areas enjoyed high increases in gross sales following the rerouting of through traffic to the freeway. It is noteworthy that the highest gain was made in Sector C, the old highway route.

Area E

Tulare, Kern, King, and Inyo Streets, extending in a perpendicular direction east of the old highway route, suffered a loss in total business volume amounting to 2.72 percent during the comparative period of time in this study.

Any benefit these businesses would derive from highway motorists using the old highway would only be from those travelers who desired to stop and shop in the Tulare business district. The fact that the freeway bypass percentage of traffic shows that in general only those motorists who had no intention of stopping in Tulare are using the bypass, indicates that the rerouting of highway traffic to the freeway bypass should have little, if any, influence on gross business receipts among these retail outlets.

Area F

L Street is parallel and two blocks east of the old highway route. The service stations and the eating and drinking places on L Street decreased in gross sales during the two years after the freeway bypass opened; however, they represented such a small percentage of the total business volume on this street that their losses had very little effect on the gains made by the other business on this street.

Area G

Single retail outlets located outside the specific business sectors at various locations throughout the community have been tabulated into a miscellaneous group. None of these businesses are in locations where they were directly affected by motorists using the old highway route.

Area H

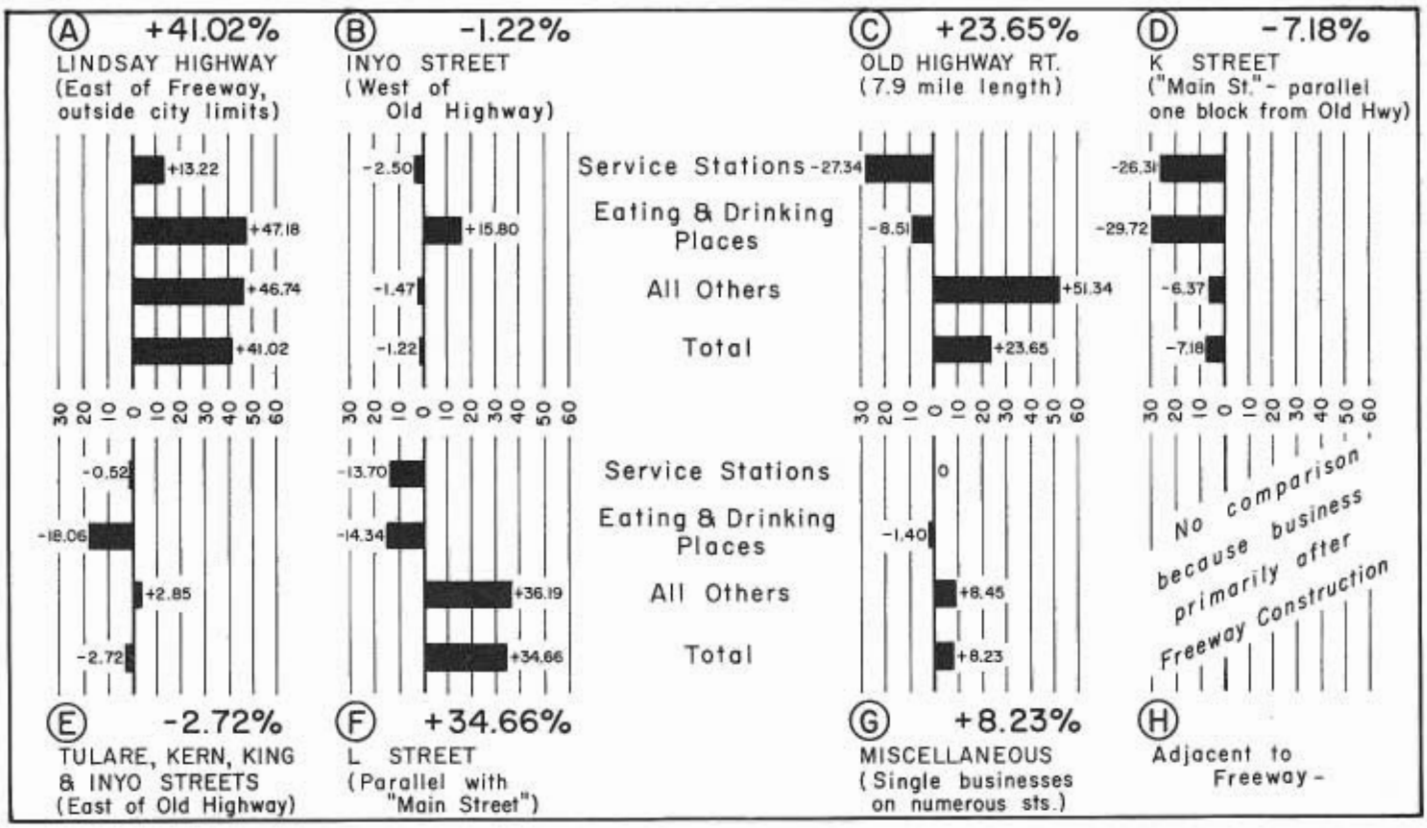
The retail outlets located on approach roads adjacent to the new freeway have opened for business subsequent to the date the freeway bypass was completed. It is not possible to show any comparison of these businesses because there were none in operation while highway traffic was routed on the old highway.

Property Sales

A review of the property sales from January, 1951, to July, 1955, along the principal streets in Tulare indicate there has been a slight increase in sale prices. The investigation of sales covered these specific areas: (1) the entire 7.9-mile length of the old highway route which had been bypassed by the freeway; (2) K Street, Tulare's "main street"; (3) Tulare Street, principal business street perpendicular to old highway and K Street; and (4) Lindsay Highway.

The greatest number of real estate transfers taking place within a specific commercial area in Tulare was along K Street, and the fewest transfers were found on the Lindsay Highway. This was at first surprising because this area is perhaps the most active section from the standpoint of new commercial building activity. How-

COMPARISON BEFORE AND AFTER FREEWAY BYPASS, IN BUSINESS SECTORS OF TULARE.



ever, an investigation revealed that the majority of construction was taking place on leased sites. This certainly is indicative of the property owners' confidence in the growth potentials of this area.

The sales of unimproved properties along the old highway route indicated a slight increase in the cases where comparisons could be made.

In general, the price trend in Tulare has been increasing; however, the real estate market has not been extremely active. The lack of a sufficient number of transfers of unimproved properties where accurate comparisons could be made precludes the opportunity to set forth a distinct pattern showing the exact degree of price change which has taken place before and after the rerouting of highway traffic around Tulare.

Building Activity

A comparison has been made of the total building activity before and after the completion of the Tulare freeway bypass in December, 1953. In order to determine whether the growth in Tulare has followed the normal expectancy for building activity in this portion of the San Joaquin Valley area, a comparison has been made with other cities of comparable size located in this vicinity.

The following percentages show the gains and losses in building activity during the two years after the completion of the freeway at Tulare as compared with the previous two years.

Tulare	+ 38.55%
Porterville	+ 24.64%
Visalia	+128.03%
Hanford	— 13.35%
Delano	+ 90.04%

A review of the cities with increased building activity during the past two years shows that Tulare has kept pace with the other cities, with the exception of Visalia. Every city enjoys the benefit of municipally or government-financed construction which adds substantially to the building activity during a particular year; however, the three million dollar county courthouse in Visalia has greatly exceeded any single expenditure in the other cities, and for this reason Visalia does not present a true comparison with the other cities having normal building growth.

Assessed Value of Real Estate

The increase in assessed valuation of real estate in the City of Tulare has been slightly slower than in some of the other cities in this general area. A comparison of the change does not indicate any appreciable difference in growth or property valuation.

The changes in assessed valuation of cities in the San Joaquin Valley area during the two years following the completion of the freeway bypass in Tulare as compared with the two years prior to that date are listed below:

Tulare	+ 8.82%
Porterville	+10.94%
Visalia	+15.95%
Hanford	+ 0.90%
Delano	+14.16%

Conclusion

In summarizing this study, the basic problem is to analyze a minor influence during a major economic change. The highway rerouting in Tulare occurred at a time when the community was subjected to changes in the principal sources of income affecting the entire economy.

In making the final analysis to differentiate between the economic reaction to the change in income stream within the local area, and the change in income stream resulting from a traffic pattern, this study has shown that:

(1) The majority of retail outlets in the community dependent upon local buying power, and particularly those on the old highway route, have enjoyed gains substantially higher than the county average during the two years after completion of the freeway bypass.

(2) The retail outlets most likely to benefit from highway traffic routed through the city have decreased in gross sales; however, only a portion of their losses are attributable to the rerouting of through traffic to the freeway. These businesses represent a relatively small share of total business activity and their losses have not seriously affected the community gain.

(3) Property sales, building activity, and other reliable indicators of growth and development in the community have shown a steady upward trend.

In view of the many adjustments the community was required to cope with, Tulare has succeeded in the face of what appeared to be overwhelming odds to surpass the normal economic trend in the general vicinity since December, 1953, the completion date of the freeway bypass.

The new freeway gives Tulare a modern highway facility to aid in developing a strong, self-reliant economy not influenced by the unpredictable buying habits of the traveling public.

Sources of Factual Data

State Board of Equalization
State Department of Finance
State Department of Employment, Tulare County Office
Security Title Insurance Co., Tulare County Branch
Tulare County Assessor, Recorder
Tulare County Farm Advisor
Tulare County Annual Agricultural Crop Reports, Agricultural Extension Service
King County Farm Advisor
City Clerk, Assessor, Tax Collector, and Building Inspector of Tulare, Visalia, Porterville, Hanford, and Delano

LIKES MAGAZINE

OXHEY, WATFORD
HERTS, ENGLAND

The Editor

DEAR SIR: You have been sending me copies of *California Highways and Public Works* since 1947 and I should like once again to thank you for this courtesy. Your magazine has been greatly appreciated, not only by me, but by all professional staff who have served under me since 1947. During this period I have been employed on engineering works in several parts of the world and *California Highways and Public Works* (which is forwarded to me from my home address) has always been eagerly awaited by senior and junior staff members alike.

I look forward to receiving it in the future and assure you that it will be given the widest circulation wherever I may be.

Yours sincerely,

W. J. COZENS

Another Freeway

Contra Costa County Bond Issue Project

By W. C. DALTON, Assistant Director of Public Works, Contra Costa County

In recent years, new highways have been completed in Contra Costa County with such frequency as to become commonplace. However, the Ygnacio Valley Road extension drew exceptional public interest, as evidenced by the number of inquiries as to when it would be opened to traffic.

This project had almost reached completion in December of last year, well ahead of schedule, when the heavy rains halted work. From the end of the heavy storm period until April 12, 1956, when traffic was routed over the new road, the intense public interest in this project was a revelation to the county board of supervisors, as well as to the engineers of the county public works department. As a result, an extra effort was made by everyone concerned with the project to open it to traffic as early as possible.

Benefit to Commuters

The interest in this new highway link stems from the improvement in service in will render to commuters between the Pittsburg-Antioch industrial area and the central county residential valleys, and to travelers between the eastern and western county areas, as well as commercial interests using and serving the project area. As a contrast to the sudden excitement in the final months of construction, this route has been under study at various times since 1928 when J. H. Obermuller (retired), Assistant Engineer Surveys and Plans, of the Division of Highways, included it as part of a "reconaissance survey between Oakland and Stockton"—a survey jointly sponsored by Alameda, Contra Costa, and San Joaquin Counties. In 1950, George Berry, Assistant Road Commissioner of Contra Costa supervised a study of the new link, and it is worth noting that very substantial agreement exists between both earlier surveys and the final construction.

The Ygnacio Valley Road extension connects the intersection of Ygnacio Valley Road and Oak Grove Road over new alignment with the intersection of Kirker Pass Road and Clayton Road, a distance of 4.1 miles. The westerly end of Ygnacio Valley Road extension is located about three miles northeast of the center of Walnut Creek and the easterly end four miles southeast of the heart of Concord. The road passes through the property of the Cowell Portland Cement Company (now inoperative). Its highest elevation is 455 feet where it traverses Lime Ridge from which there are many vantage points that present broad and expansive views of both Ygnacio and Clayton Valleys.

Special acknowledgment is due Contra Costa County for the constructive vision that has made such limited access expressways a reality.

G. T. McCOY
State Highway Engineer

Included in Bond Program

With the earlier surveys and studies of this route and the knowledge of development and traffic patterns in the area which indicated its importance, the public works department (formerly the road commissioner's office) recommended its inclusion in the bond program and the Tudor Engineering Company of San Francisco agreed with the department's findings. Accordingly, in the Tudor Report of March, 1952, to the board of supervisors, it was recommended that the extension be included in the road bond program. It was given the designation of Project H(2).

Also considered necessary for development, service, and safety reasons along this Walnut Creek-to-Pittsburg route were: Bond Project H(1) which provides for reconstruction of the existing Ygnacio Valley Road from Walnut Creek to Oak Grove Road; the addition of a slow traffic lane on the steep grades of Kirker Pass Road (Bond Project L(1)); and the reconstruction of approximately two miles of the existing Kirker Pass (Bond Project L(2)).

Bond Issue Approved

Following the approval of the $10,250,000 road bond issue by the voters at the June 3, 1952, election, aerial photographs and topographic maps were prepared of the area to be traversed, and Norman T. Riffe, Civil Engineer of Martinez, was retained to prepare construction plans. Concurrent with the design work, action was taken to have the proposed highway included in the federal-aid secondary road net in Contra Costa County.

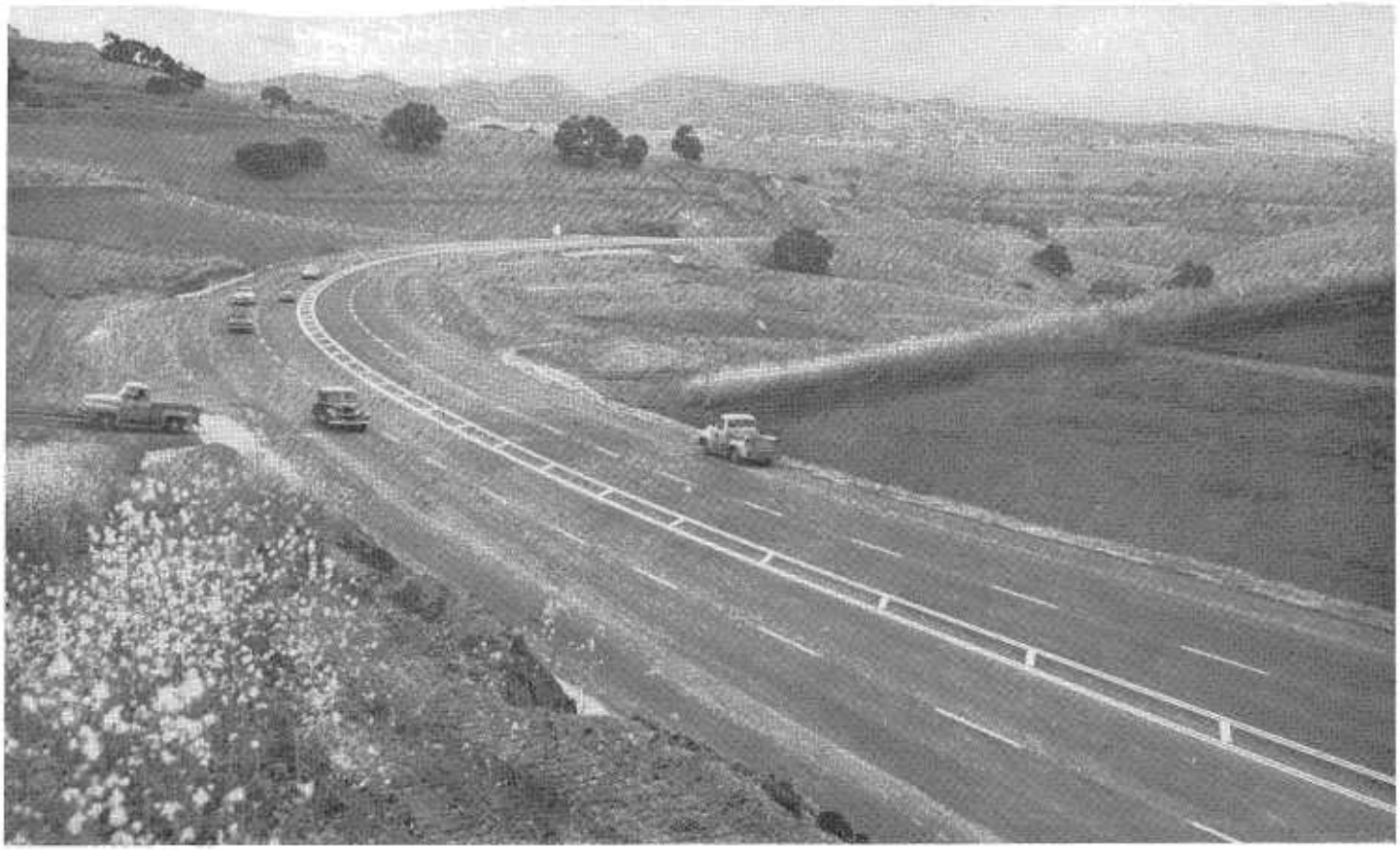
A total of 21 bids were received (by the Division of Highways on January 5, 1955), the lowest being $547,527.95 by Transocean Engineering Corporation of Hayward, which was awarded the contract.

The contractor started work on February 15, 1955, with 260 working days allowed for completion. The winter weather conditions and additional time granted because of extra work would have extended the contract completion date into July. The contract was accepted by the State Director of Public Works on April 20, 1956, well ahead of the legal deadline.

Design of Highway

The typical geometrical section provides two 12-foot-wide traffic lanes with eight-foot-wide paved shoulders on each side. On the summit grades four 12-foot lanes with shoulders are provided for passing of slow-moving vehicles. Curvature of the highway is to modern standards, and maximum grades are approximately 6 percent.

Structurally, the highway was built for an anticipated increase in car and truck traffic. Nominally up to 14½ inches thickness of subbase material,



A view of the recently completed Ygnacio Valley Road Extension constructed by Contra Costa County as a limited access expressway under the Federal Aid Secondary Highway Program and the County Road Bond Issue Program

a 6-inch thickness of untreated base material and a 2½-inch thickness of plant-mix surfacing were used.

Some of the major items of work were: 590,000 cubic yards of roadway excavation, 7.7 miles of fence, 2,800 lineal feet of culvert pipes, 50,000 tons of base rock, and 17,000 tons of plant-mix surfacing.

Sufficient right of way has been acquired to provide for future widening of the roadway to four lanes. Much of the work on this project was performed with provisions for future widening.

Control of Access

Because of the increase in highway safety and service standards and the phenomenal growth of the area, the actual construction of the road exceeds the recommendations of the Tudor report. The most significant improvements beyond the report are:

A. Acquisition of four-lane right of way instead of two-lane.
B. Provisions for future four lanes by partial construction of a four-lane section, widening of structures, and design of future roadway including a median.
C. Increased structural strength and fully improved shoulders.
D. Provision for future creek and channel developments by the flood control district.
E. Control of Access. This is one of the most important features of this project. Much of this project area is valuable subdivision and commercial property and without access limitations severe restrictions on capacity and safety could be expected within a few years. Adequate traffic service to the area by feeder and secondary roads is being incorporated in the county master plan.

Contra Costa County's federal-aid secondary highway projects have also been milestones in the progress of the $10,250,000 county road bond issue starting with the improvement of the Byron Highway as reported in the November-December, 1953, issue of this magazine. These FAS projects are constructed under a cooperative program involving the county, the State Division of Highways and the U. S. Bureau of Public Roads.

Comprehensive Program

Of the 18 major routes or projects selected for improvement under the bond issue program, work has started on 13 as of April, 1956. A total of 40 contracts are contemplated to complete all work on the road bond program and of these, 27 contracts are under way or have been completed. Before the end of the fiscal year, three additional major contracts will be awarded. Total completion of the entire road bond issue program is expected late in 1957. Contract work complete totals $5,314,000, and the total value committed to date is $7,466,000.

This county has been able to convert sections of four primary county roads to limited access freeways during the bond issue program. Portions of the San Pablo Dam Road between Orinda and the dam, all of the Cum-

. . . Continued on page 72

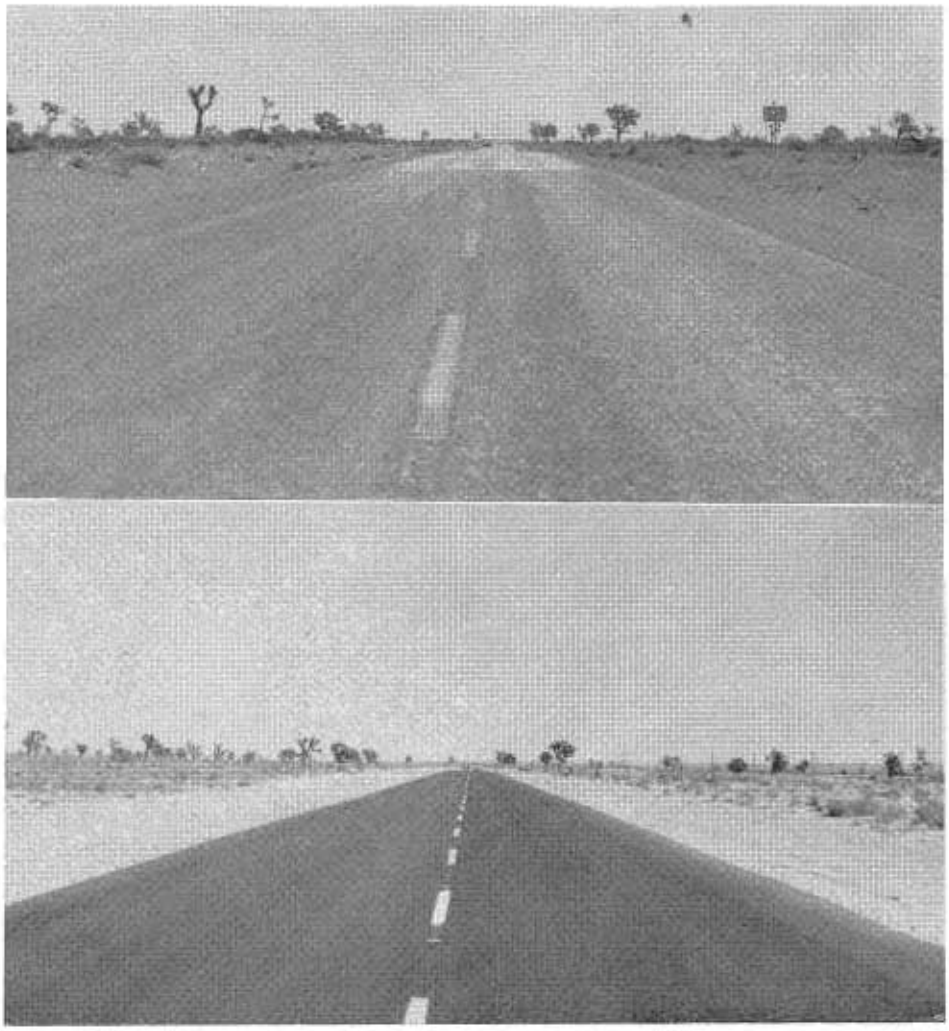
Desert Highway

Mojave-Barstow Route Improvement Completed

By ROBERT M. KELLY, Resident Engineer

ANOTHER PORTION of US 466 has recently been completed to modern two-lane standards. Situated in the Mojave Desert, between Mojave and Boron on the Mojave-Barstow road, the improvement consisted of eight miles of full grading, 12 miles of widening and the channelization of two intersections, a total distance of 21.7 miles. The total cost of the project was $571,711.48, one of the largest single contracts ever awarded in District IX, which has headquarters in Bishop, and is under the direction of District Engineer F. E. Baxter.

The history of the formation of this road is typical of all desert roads. Where one wagon passed, another followed in the same tracks until a trail was formed. The County of Kern did some maintenance work to make the road passable until the route was adopted into the State Highway System in 1919. The dirt road continued until 1930 when the state maintenance forces applied a penetration oil treatment. The first contract was let in 1938 when a portion of this road was regraded and surfaced with road-mixed surfacing. The remainder was improved by contracts in 1947.



UPPER—Section of Mojave-Barstow highway before improvement. LOWER—Newly completed section of desert highway.

Air Force Base

In recent years the development of this desert area has increased tremendously with the establishment of Edwards Air Force Base at Muroc, midway between Mojave and Boron. The climatic conditions and the wide expanse of the Mojave Desert make this area ideal for the experimental type of aircraft operating from this base. Many of the aircraft corporations are establishing major facilities in this area. World speed and altitude records have been made by aircraft operating from these bases. A very colorful sight in the crystal clear desert atmosphere are the many patterns of jet trails across the sky with the snow-capped San Bernardino and Sierra Mountains as a backdrop.

The Pacific Coast Borax Company at Boron has started an extensive remodeling program at their site just north of Boron. The old underground mining system is being replaced by an open pit which will vary in depth from 250 to 400 feet. Included in the development will be new buildings for processing the raw material. This is one of the largest deposits of borax in the Country and its uses in everyday affairs have increased to a total of more than 50 which include: water-softener, cleanser, grease-solvent, deodorant, preservative and shampoo.

Industrial Growth

Adding to the industrial growth of this area is the recently completed cement plant just west of the town of Mojave. This plant is of the latest modern design with an elaborate dust collection system designed to prevent any harmful smog condition from arising.

With all of the new activities in the vicinity the colorful town of Mojave has grown considerably from the water stop it was in the early days of the railroad. In addition to being the junction point between the Southern Pacific and Santa Fe Railroads, it is at the cross point of U. S. Highways 6 and 466. With heavy snows occurring on U. S. Routes 40 and 50, US 466 is the route used for eastbound traffic from Central and Northern California. Agriculture and other developments in western Arizona have increased the truck traffic to 15 percent.

The area traversed is typically desert mesa at the foot of a low mountain range. The sparse vegetation consists of sagebrush, greasewood, and a spotting of Joshua trees.

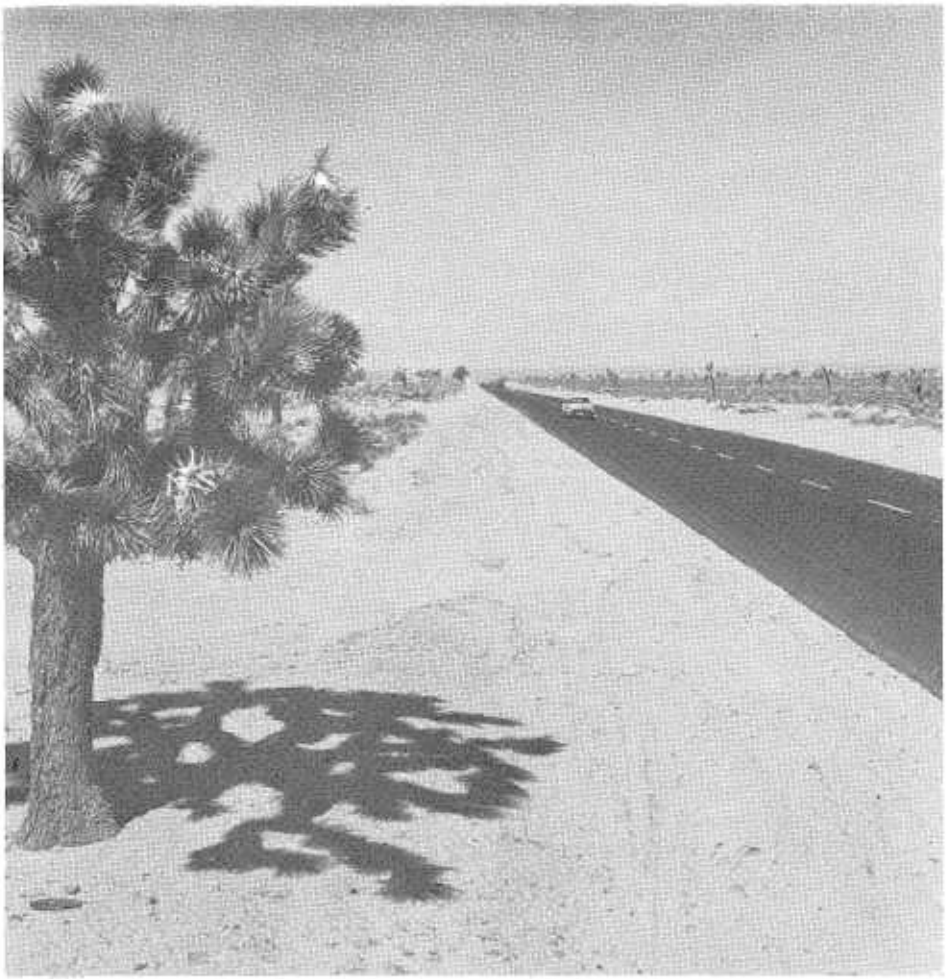
Project Completed in April

The contract for the construction was awarded to Harms Brothers, a construction firm of Sacramento. Work was started on September 14, 1955, and completed on April 18, 1956. Although the road was constructed during the winter months the weather was with the contractor and the contract was completed with no unusual delays or shutdowns. The traffic was carried through the construction with little inconvenience and delay although the contractor had several operations in progress at all times.

To further expedite the traffic through the construction, the contractor resorted to watering the imported borrow in the borrow pits. A rainmaker system with water supplied by nearby wells was used. Test holes were made to determine the time of wetting to give the proper uniform moisture content. This method speeded up the road operation, eliminated the dust nuisance and the delays to traffic were held to a minimum. Major quantities involved in the contract consisted of 255,000 tons imported borrow, 46,000 tons base material, and 46,000 tons of plant-mixed surfacing. The contractor produced the aggregate with a primary and a secondary crusher with a 5,000-pound Madsen batch plant completing the mixing operation.

Desert Washes

Several desert washes cross the highway at various locations. Normally these are dry but cloudbursts are not uncommon in this desert country resulting in capacity flows. Four dip sections were constructed at strategic locations to take care of these situations. For the normal runoff, four 24-inch reinforced concrete pipes were installed at the center of the 750-foot-long dip. As the name implies, the profile of the roadway is dipped in a depressed vertical curve with the pavement sloped to the outlet side. The slopes are paved with plant-mixed surfacing from the edge of pavement to a point eight feet below the natural surface of the ground acting as a cutoff wall to prevent undermining the roadbed. During heavy runoffs the water, by the roadway design, is diverted to these dip sections where the roadway has been constructed to withstand the onslaught. Many more smaller culverts were constructed, including a storm drain system in the Town of Mojave.



Desert scene showing section of new highway between Mojave and Boron

J. Shelden and T. Kelley acted as general superintendent and project superintendent, respectively, for the contractor. The State was represented by J. R. Jarvis, District Construction Engineer, and the author.

LIKES COVER PAGE

SANFORD C. WING, INSURANCE
Los Angeles 42

California Highways and Public Works

GENTLEMEN: I consider *California Highways* magazine one of the most interesting of several for which I subscribe. The September-October cover is especially beautiful and I believe it deserves framing for permanent preservation. Also, I find the descriptions and illustrations of new construction very interesting.

Sincerely yours,

S. C. WING

Canada Officials Study Highways In California

Four officials of the Ministry of Highways of the Province of Ontario, headed by Hon. James N. Allan, Minister of Highways, were in Sacramento in April to study California's freeway program.

The Canadian province is just launching a large-scale program of controlled access highways. Allen said many of Ontario's problems of route selection and right of way acquisition are similar to those which have been faced and solved in California.

"We have read a good deal about the progress on your highways," he added, "and we want to see just how California plans, manages and finances these freeways and expressways. In Ontario, our King's Highways, as they are called, do not go through the cities but the provincial government does participate in the financing of the connecting links through the cities."

Accompanying Allan were: M. A. Elson, Deputy Minister of Highways; W. J. Fulton, Director of Planning and Design; and C. A. Robbins, Director of Services.

The Canadian group conferred with Director of Public Works Frank B. Durkee and State Highway Engineer G. T. McCoy before entering into three days of conferences with members of the Division of Highways staff. Most of their attention was devoted to the planning and right of way phases of the California highway program.

MAGAZINE IS HELPFUL

UNITED STATES
DEPARTMENT OF THE INTERIOR
Geological Survey

San Francisco 11, California

Mr. Kenneth C. Adams, *Editor*

Dear Mr. Adams: When I received your March-April, 1956, edition I could not resist the temptation to write to you at once to compliment you on the stunning cover.

CANADA LIKES OUR FREEWAYS

ONTARIO
Department of Highways

Toronto 2, Ontario

California Highways and Public Works

Gentlemen: I have had the good fortune to receive *California Highways and Public Works* for the past few years. The articles dealing with the many phases of highway engineering have always been most informative and interesting.

The wonderful aerial views of California's freeways certainly point out the rapid modernization of your highway system with the views of the Hollywood-Santa Ana Freeway particularly fascinating.

Again, many thanks.

Sincerely,

Tom Mahony
Supervisor, Accident Records and Administration
Traffic Engineering, Province of Ontario

SACRAMENTO CANYON

Continued from page 35 . . .

the steep, blazing, trackless, sun-baked hillsides in this same canyon in August, 1837.

Try to figure what Young and his chronicler Edwards would say if they could step into a modern car and make the canyon trip in about an hour in comfort; the same one that required about a month of hardship to negotiate.

Acknowledgment made to "Shasta County" by Rosena A. Giles

Your journal has proved most helpful to us in keeping abreast of projects in the State which is one of our major duties here. It also helps us to foresee a demand for topographic quadrangles and order our sales stock of these maps to meet the expected demand. I am therefore most grateful for having a place on your mailing list.

Sincerely yours,

Jean V. Molleskog
Inquiries Specialist

GENERAL PRENTISS TAKES OVER AS EXECUTIVE VICE PRES. OF ARBA

Maj. Gen. Louis W. Prentiss (USA Ret.) has assumed his duties as Executive Vice President of the American Road Builders' Association.

General Prentiss, who succeeded General Eugene Reybolds (USA Ret.) as ARBA's executive head, has a background of over 35 years of distinguished military service. He is 56 years of age and a native of the District of Columbia. He is a graduate engineer of the Colorado School of Mines and entered the Army as a second lieutenant, field artillery, in 1921. After regular Army service he transferred to the corps of engineers in 1929 and has held increasingly important posts in the corps. The general became best known, perhaps, after his appointment by President Truman, in December, 1952, as Engineer-Commissioner of the District of Columbia. He served during 1953 and 1954 in that capacity and was a popular administrative figure in Washington, D. C. He was promoted to major general by President Eisenhower in 1954. In December of that year he took over command of the Engineer Center at Ft. Belvoir, Va., and served in that post until his Army retirement this week.

ANOTHER FREEWAY

Continued from page 69 . . .

mings Skyway between the Franklin Canyon Summit of State Highway 4 and the Crockett Highway, two sections of the Pleasant Hill Road between Martinez and Lafayette and the Ygnacio Valley Road extension are all limited access highways. One other project, the Loveridge Road interchange, is within and adjacent to the state freeway area. All of these freeway designs provide sufficient right of way for future expansion as traffic increases.

The resident engineer for the Ygnacio Valley Road extension was Robert S. Latchaw and Harold Hudson was project manager for Transocean Engineering Company. Contra Costa County Public Works Director is Victor W. Sauer.

GOODWIN J. KNIGHT
Governor of California

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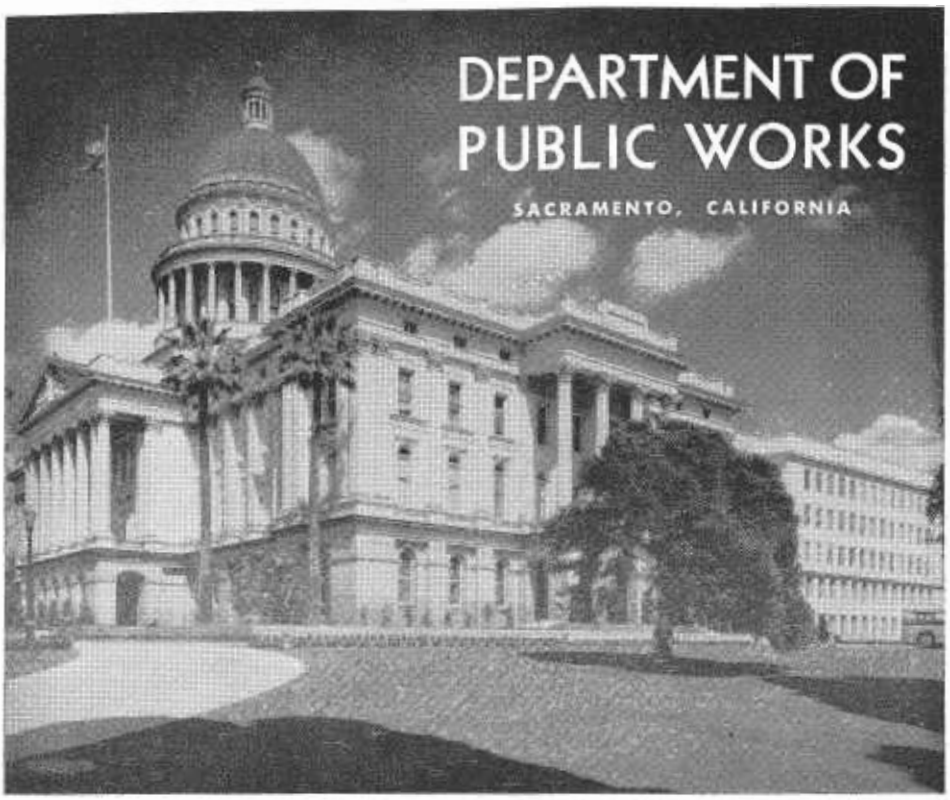

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Fields in bloom near Hollister, San Benito County, on Route 22, looking westerly toward San Juan Bautista. Photo by M. R. Nickerson, Chief, Photographic Section, Department of Public Works.