

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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Governor Olson Issues Executive Order Ratifying Regulations for Pooling all State-owned Automobiles

FINAL plans for the pooling of State-owned passenger cars to conserve rubber have been completed by the special committee appointed for this purpose by Governor Olson and a letter setting up rules and regulations to govern the use of State automobiles has been sent to all departments, boards, commissions, institutions, teachers colleges, and special schools.

The committee acted under an executive order issued by Governor Olson and under powers delegated to it by the Governor on August 20th. The committee is composed of Director of Public Works Frank W. Clark, Chairman; Director of Finance George Killion, and Director of Motor Vehicles James M. Carter.

MANY CARS GROUNDED

Pending the drafting of rules and regulations, several agencies, notably the Department of Public Works, Department of Agriculture, and Department of Motor Vehicles, have grounded many of their passenger cars.

Each State agency will be required to immediately set up a department pool with such subpools as may be necessary. No State automobile shall be used for other than vital public service and shall be used only when other forms of transportation are not available.

Administration of the pool will be under direction of a coordinator of State automobile conservation with headquarters in the Public Works Building, Sacramento.

35 MILE SPEED LIMIT

Coincident with the forming of the State automobile pool, Governor Olson on September 30th, issued a proclamation in response to a request from Joseph B. Eastman, National Director of Defense Transportation, authorizing the Director of the Department of Motor Vehicles to enforce the 35 mile speed limit for passenger automobiles, trucks and buses.

"As Governor of the State of California and Chairman of the State

EXECUTIVE ORDER

IT appearing that pursuant to my executive order of July 31, 1942, relating to the conservation of State-owned passenger automobiles, the committee thereby appointed has under date of September 26, 1942, promulgated certain specific rules and regulations concerning the use of State-owned automobiles and has given notice thereof to all State departments, boards, institutions, teachers' colleges, and special schools by circular letter dated September 26, 1942, and it appearing desirable that same be properly ratified by me,

Now, therefore, it is hereby ordered that the said regulations as set forth in the said letter of September 26, 1942, signed by Frank W. Clark as Director of the Department of Public Works and Chairman of the said committee, be, and the same hereby are, ratified, confirmed and validated. In the event that the said rules and regulations hereby ratified are in any respect inconsistent with my said executive order of July 31, 1942, then to that extent the said executive order of July 31, 1942, is hereby amended.

Dated: Sacramento, California, this 26th day of September, 1942.

CULBERT L. OLSON,
Governor of California

Council of Defense," Governor Olson said in issuing the proclamation, "I urge full compliance with the Government's speed limit order by every citizen of this State, and I have given instructions for the enforcement of that order by the State Motor Vehicle

Department and by every other State enforcement agency.

"I feel sure that the citizens of California are ready and willing to comply with this regulation and that the negligible few found violating the same can and will be legally and effectively dealt with."

The Governor's proclamation is as follows:

GOVERNOR'S PROCLAMATION

"WHEREAS, By executive order the President of the United States has vested in the Director of Defense Transportation the authority to take all necessary measures to conserve the highway transportation facilities of the Nation, with particular reference to the conservation of rubber; and

"WHEREAS, Pursuant to the authority so vested in him, the Honorable Joseph B. Eastman, Director of Transportation, on September 26, 1942, issued an order designated as General Order, Office of Defense Transportation No. 23, which in part reads as follows:

"Section 501.126 Limitation on Speed. No person shall drive or operate or cause, permit, suffer or allow to be driven or operate any motor vehicle within the continental limits of the United States at a rate of speed which is (1) in excess of the applicable speed limit duly prescribed by competent public authority, or (2) in excess of thirty-five (35) miles per hour, whichever rate of speed is the lesser.

"Section 501.127 Exemption. The provisions of this subpart shall not apply to: (A) any motor vehicles driven or operated by or under the direction of the military or naval forces of the United States, or State military forces organized pursuant to Section 61 of the National Defense Act as amended.

"(B) Any motor vehicle when driven or operated in emergency for the protection or preservation of life, health, or for public safety; providing that this paragraph shall not be so construed as to authorize any such motor vehicle to be driven or operated at a rate of speed in excess of that which is reasonable under conditions prevailing at said time.

"Section 501.129 Effective Date. This subpart shall become effective October 1, 1942, and shall remain in full force

and effect until further order of the office of Defense Transportation, except that as to any person operating any motor vehicle for hire in scheduled regular route service, shall become effective on October 15, 1942."

"WHEREAS, Said order is fully justified by the present war emergency existing in the Nation, and particularly in the State of California, a state of emergency having been proclaimed to exist within the State of California by proclamation of the Governor thereof on December 14, 1941; and

"WHEREAS, It is necessary that the speed limit so ordered be observed, and that provision be made for the enforcement thereof in order to conserve public and private transportation in this State;

"Now, therefore, I, Culbert L. Olson, Governor of the State of California, under and by virtue of the authority vested in me as chief executive of the State of California, and in response to the appeal to all State and local governments to make effective the said order of the Director of Defense Transportation, do hereby declare and proclaim that it is necessary to the war effort that the said speed regulations above set forth be strictly observed in the State of California from and after October 1, 1942, except that this order shall not be deemed to increase any existing speed limit within the State of California.

"I further call upon each and every driver of a motor vehicle within the State of California, as his patriotic duty, to observe said speed limit to conserve to the fullest extent the rubber which is so vital to the war effort.

"I hereby direct the Director of Motor Vehicles, acting through the California Highway Patrol and the Division of Drivers' Licenses of the Department of Motor Vehicles, to take all lawful action necessary to enforce said speed limit and to compel observance thereof with all facilities at his command, and request that all local law enforcement agencies likewise take all lawful measures to enforce said speed limit within their respective jurisdictions."

The rules and regulations set up by the Governor's special committee are as follows:

1. Each Department, Board, Commission, Institution, Teachers College and Special School (hereinafter referred to as "State Agency") is to set up immediately a departmental pool of automobiles under its control

with such sub-pools as may be necessary.

2. The head of each State Agency shall assign to some employee thereof the responsibility for conservation of its automobiles in compliance with these rules and regulations. Such responsibility shall be in addition to the other duties of such person. The person to whom this responsibility is assigned is referred to in these regulations as "Departmental Coordinator."

There shall likewise be designated for each such agency additional employees as may be found necessary to act under the Departmental Coordinator in respect to any sub-pool of motor vehicles. Such responsibilities shall be in addition to the other duties of such persons. The employees so designated shall be referred to herein as "Sub-Coordinators."

3. No State automobile shall be used for other than essential use. Essential use is broadly defined as that necessary in furthering the war effort or for enforcement of State laws relating to the public health and safety or for the performance of a vital public service.

All State passenger automobiles not required for essential uses shall be put in pool storage by the agency responsible therefor and facts pertaining thereto reported to the Coordinator in detail.

4. The Coordinator shall have authority:

- a). To require of each State Agency such reports as he may deem necessary relating to State-owned automobiles under its control and to the uses thereof.
- b). To order any State Agency to discontinue any use which he determines is not an essential use.
- c). To order any State Agency to surrender possession, transfer possession, or do any other act in respect to possession, use, or control of any State automobile provided that no vehicle used in the performance of essential functions relating to the war effort shall be so transferred, loaned, or used as to jeopardize any State Agency's priority for tires or for recapping of tires.
- d). It shall be the duty of each State Agency and the head thereof to comply promptly with any order or direction of the Coordinator. Any State Agency aggrieved by any decision of the Coordinator may appeal the same to the Committee. Pending the determination of such appeal, the aggrieved State Agency shall comply with such decision and order.

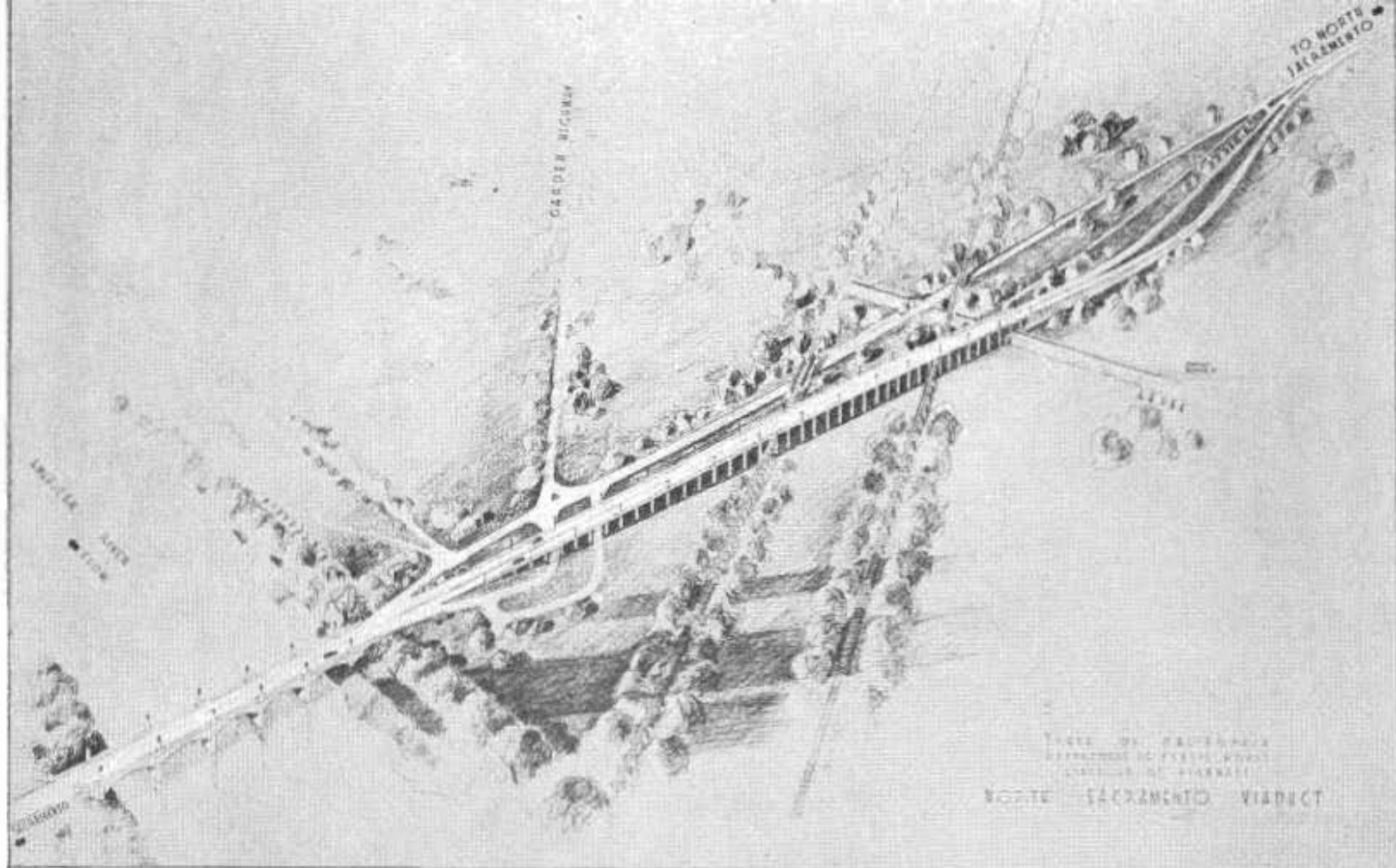
5. State-owned passenger automobiles are to be used only when other forms of transportation are not available for accomplishment of the purposes of the trip, and in no event for other than essential use. No State-owned passenger automobile shall be taken from a pool or sub-pool for use without the prior written approval of the Departmental Coordinator or Sub-Coordinator. Such approval shall be made on a written requisition of such transportation, which must in each case be signed by an authorized officer and filed with the Departmental Coordinator or Sub-Coordinator. The requisition must show the name or names of the employee or employees to use the automobile, the necessity for such use, and the period of the contemplated use.

6. Each State Agency shall maintain a list of such State-owned automobiles under its control which are assigned to individuals on a permanent basis instead of being maintained in a pool or sub-pool. Each such case shall be reported by the State Agency to the Coordinator with a statement of the necessity for such permanent assignment. An assignment of a vehicle from the pool or sub-pool to one individual for more than thirty days shall be considered a permanent assignment.

7. Wherever feasible State-owned automobiles will be garaged in State-controlled facilities. The use of State automobiles as a means of transportation between home and office is prohibited except where necessarily required by the nature of the work as in the case of a police officer subject to call. Where storage is regularly permitted at the home of an employee, that fact shall be reported in writing to the Coordinator with a statement of the necessity therefor.

8. No State car shall be operated at a speed in excess of 35 miles per hour except in actual use in police work and except in cases of extraordinary emergency involving great danger to life and property.

9. The foregoing rules and regulations are to be put into effect in each department with all possible expedition. Each State Agency will be required to furnish all information herein contemplated covering the use of any automobile under its control on and after October 1, 1942.



Artist's sketch of viaduct over American River overflow area on U. S. 99 between Sacramento and North Sacramento

North Sacramento Viaduct, Over Flood Area, Officially Opened to Traffic

OLD timers who remembered the days when a wooden trestle for horse-drawn traffic connected Sacramento and what is now the thriving city of North Sacramento got a real thrill when the \$631,000 North Sacramento viaduct was officially dedicated on September 14th.

It was back in the 90's when the supervisors of Sacramento County constructed a timber viaduct crossing the American River bottom lands between Sacramento and North Sacramento, then a part of the famous Haggin Grant. Today, traffic crosses this stretch over a modern bridge structure which passes over the tracks of both the Northern Electric and Western Pacific railroads, which in those early days had not entered the capital city.

The new all-weather, all-year highway link solves a problem with which the Division of Highways has had to contend each winter when overflow waters from the American River necessitated closing of this important route for days at a time, compelling traffic to detour over Jibboom Street.

State, county, and city officials, together with representatives of the chambers of commerce of Sacramento and North Sacramento and other civic organizations, participated in the celebration.

Representing Governor Culbert L. Olson and Director of Public Works Frank W. Clark, Deputy State Director of Public Works Morgan Keaton signalized opening of the viaduct by cutting a red ribbon stretched across the span.

"During the present emergency," Keaton said, "it has been and is essential to eliminate red tape in every conceivable way. The rapid completion of this structure is indicative of the speed and efficiency with which we are operating in war time. All unnecessary red tape has been cut. It is therefore appropriate that the final gesture in dedicating this viaduct should be the cutting, not of a silk ribbon, but of a red tape.

"For some time we realized that the three-lane highway under the two railroads was inadequate, but funds also were inadequate. However, during the last biennium, Governor Olson wrote a letter to Director of Public Works Clark at the request of the Secretary of War, urging that the

(Continued on page 16)



At top—Full width view of completed roadway of North Sacramento viaduct showing four-lane divided highway with raised curbed median strip, four feet wide. Each traffic lane is 25 feet wide. Bottom—View of east bound traffic using structure immediately after dedication. (See story on pages 3 and 16.)

Debris Control at Culvert Entrances On California State Highway System

By GEORGE A. TILTON, Jr., Assistant Construction Engineer and
CLARENCE F. WOODIN, Assistant Maintenance Engineer

As announced in the August, 1942, issue of this magazine, the following article is the second of a series of technical abstracts from a joint departmental review of culvert practice of the California Division of Highways by a Committee composed of R. Robinson Rowe, Assistant Engineer, Bridge Department; and Robert L. Thomas, Assistant Engineer, Surveys and Plans and the writers. Following the opening article on comparative hydrology in the September issue, this article defines and classifies debris and control measures, recommending that greater attention be given this problem at time of preliminary surveys of culvert locations.

CONGESTION of drift, debris, and detritus at culvert entrances with resultant impairment of culvert efficiency proved to be one of the outstanding observations of the committee's field studies.

During ordinary years, the occasional interruption of stream flow at culvert entrances by concentrated debris was not particularly alarming, but when congestion of debris caused extensive roadbed washouts in the 1938-40 series of exceptional storms in California it became evident that consideration should be given to designing culverts to pass the debris or that the debris must be controlled to avoid the congestion.

Such conditions were aggravated by changes in culture of tributary basins, as by burning, logging, clearing, cultivation, or building; also by the accumulation of debris in remote channels, ready to move with the first big flood.

FIELD OBSERVATIONS

As pointed out in the introduction to this series of articles,* it was not until 26 to 28 years after the inauguration of the State Highway System in California that widespread storms of extreme intensity occurred to focus attention on the importance of controlling debris. At the time of the 1915-16 floods, development of the State Highway System was in its infancy, and comparatively few culverts had been installed.

The first step in approaching a solution of the problem was the study of existing debris control

measures as found at scattered locations throughout the State. Significant was the fact that practically all types wherever encountered were found to be generally effective regardless of type and suitability. These observations led to the idea of classifying the various types of debris barriers and their adaptability to various conditions as found in the field.

STREAM BURDEN CLASSIFICATIONS:

1. Very light floating debris or no debris.
2. Light floating debris—
Small limbs or sticks, orchard prunings, tules, and refuse.
3. Medium floating debris—
Limbs or large sticks.
4. Heavy floating debris—
Logs and trees.
5. Flowing debris—
Heterogeneous fluid mass of clay, silt, sand, gravel, rock, refuse, or sticks.
6. Fine detritus—
Fairly uniform bed-load of silt, sand, gravel, or granitic materials more or less devoid of debris, tending to deposit upon diminution of velocity.
7. Coarse detritus—
Coarse gravel or rock fragments.
8. Boulders—
Large boulders and large rock fragments carried as a bed-load at flood stage.

DEBRIS BARRIER CLASSIFICATIONS:

- a. Debris deflector—
A "V" shaped barrier placed at the entrance of a culvert pointed up-

stream, which tends to deflect heavy floating debris or boulders away from the culvert entrance during high-velocity flow.

b. Debris rack—

A straight barrier placed across the stream channel which tends to separate light and medium floating debris from stream flow and prevent it from reaching the culvert entrance.

c. Debris crib—

Open crib type of barrier placed vertically over the culvert entrance which tends to prevent a surge of coarse detritus and floating drift from entering and blocking the culvert entrance.

d. Debris riser—

Closed type of barrier placed vertically over the culvert entrance which causes deposition of flowing debris and fine detritus before it reaches the culvert entrance.

e. Debris basin—

A natural basin formed by construction of an embankment across a steep well-defined draw which is capable of retaining and storing detritus.

f. Debris spillway—

A large opening in a roadway dyke for the purpose of spilling accumulated storm water from the roadbed.

RECOMMENDATIONS OF COMMITTEE

The following recommendations of the committee are intended as a guide for the purpose of selecting and adapting debris control measures in accordance with some pre-conceived basic principles.

The successful use of various experimental types installed within the last three years is encouraging, and it is hoped that new types and adaptations will be developed by further experience with the different various types and conditions.

* August, 1942. California Highways and Public Works.

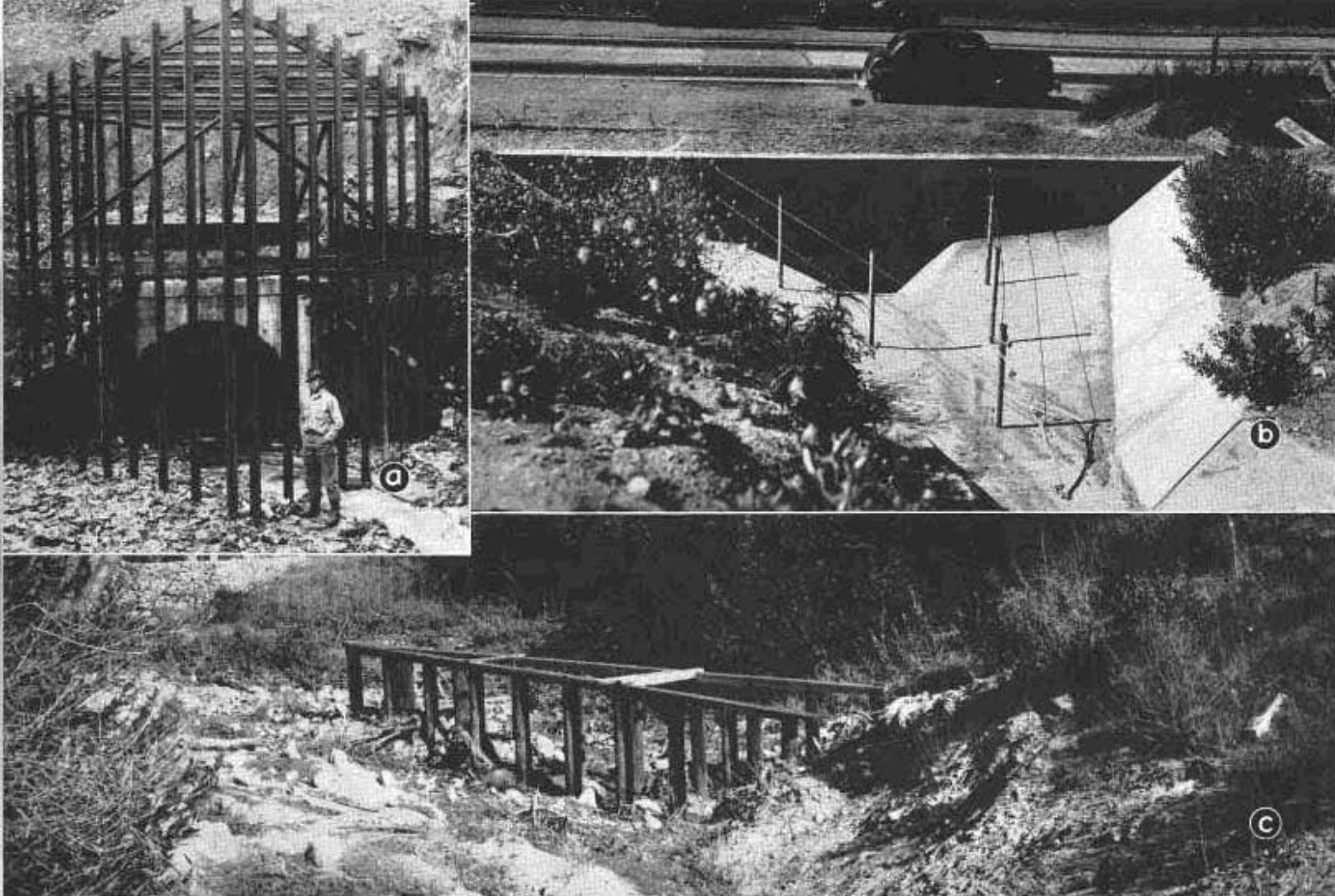


FIGURE 6. (a) Steel rail debris deflector placed at entrance to a large concrete arch culvert. (b) Wire and pipe debris deflector installed at entrance to R.C.P. culvert to deflect light floating debris. Note drop-down approach to culvert entrance. (c) Wooden pile debris deflector installed at entrance to a large culvert for the purpose of deflecting bed-load of large boulders and heavy floating debris



FIGURE 7. Metal debris riser placed over culvert entrance in debris basin. Note provision for extension when debris basin has filled to such an extent as to cause deposition of most of the detritus before it reaches the riser

FIGURE 8. Typical small culvert failure caused by deposition of detritus and light floating debris at culvert entrance due to abrupt grade break at roadway gutter

Debris Deflector

The debris deflector is adapted to diversion or deflection of heavy floating debris and large boulders or rocks carried as a bed-load in moderate to high-velocity flows often encountered in mountainous terrain. (See Figure 6-c)

This type is particularly useful at the entrance to large culverts and should be of heavy construction with the vertex of the "V" placed upstream. The vertex may be vertical or inclined. Horizontal spacing of vertical members of the deflector should not exceed the horizontal diameter of the culvert. Length of the "V" generally should be not less than three to four times the horizontal diameter of the culvert.

Like all other types of debris separating devices, the debris reflector requires periodic or seasonal removal of accumulated material.

Debris Rack

The debris rack in its various forms is essentially a straight rack placed across the path of a defined channel for the purpose of sieving floating debris from the stream flow and preventing it from reaching the culvert entrance at times of momentary flood peaks. The rack may be vertical or inclined. If inclined, it may serve some of the purposes of a deflector. (Figure 9)

Experience with the debris rack indicates that a spacing of vertical bars equal to one-half the horizontal diameter of the culvert is satisfactory. This spacing of vertical bars permits light debris to pass the rack endwise, which will also pass the culvert.

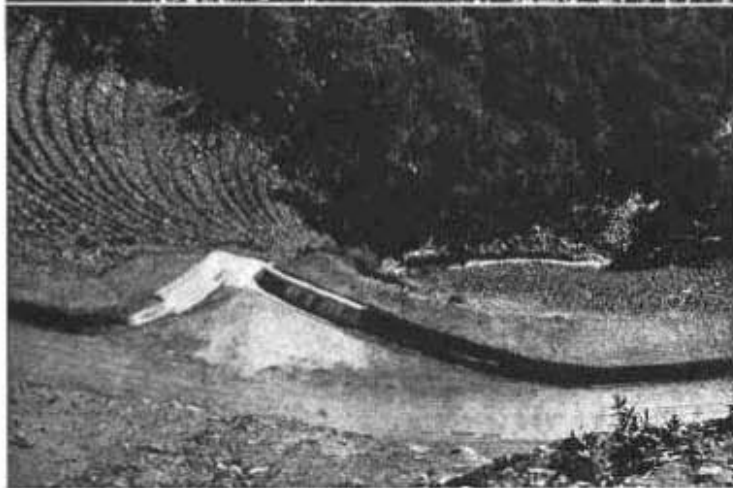
If the channel is well-defined, the debris rack should be placed well upstream from the culvert entrance. If limited by right of way or channel shape, it may be installed at the head of wings, in which case the rack should be as high as the culvert parapet.

Debris Crib

The debris crib, commonly called a "bear trap," has been successfully developed for locations where abrupt grade breaks cause deposition of detritus and clogging of the culvert



FIGURE 9. (a) Steel rail debris rack installed at end of wing walls to large reinforced concrete arch culvert. (b) Steel rail debris rack at end of wing walls to reinforced concrete arch culvert. (c) Steel rail debris rack placed in channel well above a culvert entrance. (d) Pipe debris rack at end of wing walls to reinforced concrete culvert. Note warped wing walls and curved-lip entrance



entrance. For many small culverts at or near the roadbed level, the abrupt break in grade can not be avoided. Figure No. 8 depicts a typical case so troublesome to the maintenance foreman.

The open type of debris crib is built of either timber, metal, or concrete with or without a cover and is placed directly over the culvert entrance. So placed, with a cover, detritus or debris can practically envelop the crib without completely shutting off the entry of water into the culvert. (See Figure No. 10b)

Where the open crib type is used as a riser in anticipation of a considerable depth of detritus, as in a debris basin, it should be built well above the estimated height of deposit on the culvert entrance, with provision for further increase in height as required. (See Figure No. 10a)

Debris Riser

In mountainous terrain involving high embankments, a common drainage practice requires the location of a culvert in the bottom of a waterway which places the culvert entrance in the lowest part of a debris basin susceptible to rapid filling with flowing detritus.

At such locations it is essential that the muck be kept from entering and clogging the culvert entrance. A successful solution to this problem requires a vertical riser of perforated construction either of pipe, timber, or concrete, placed directly over the culvert entrance. Perforations or openings in the riser should be large enough to permit entry of water and small enough to exclude entry of muck. The barrel or chimney should be carried well above any anticipated deposit and increased in height as necessary. (Fig. 7)

Debris Basin

In certain mountainous areas of easily eroded materials, particularly granitic materials, with steep slopes and heavy run-off, it has been found to be economically impractical to provide a culvert large enough to safely carry surges of flowing detritus.

The perforated debris riser as an expedient solution prevents clogging of the culvert entrance at a critical period when the debris basin is filling with a surging heterogeneous mass of muck, rock, and debris from surface accumulations. The basin simply acts as a reservoir to store the flowing

FIGURE 11. Top—Debris spillway entrance on rock slope in foreground. Bottom—Lined debris spillway entrance. Upper right—Typical debris basin spillway in mountainous terrain, lined spillway in background and unlined spillway in foreground

detritus until it can be dewatered by the perforated debris riser and later removed under periodic maintenance operations.

Under certain conditions, the debris riser may be progressively built up and an extensive debris table formed, which will be self-sustaining to a greater extent year by year, finally depositing its load at a safe distance above the culvert entrance.

Debris Spillway

The most serious losses of embankment were found to have occurred in mountainous areas throughout the State where debris basins proved inadequate, resulting in water overflowing the roadway embankment causing complete washouts.

The investment in heavy embankments across the ravines encountered in rough terrain definitely warrants not only ample principal drainage, but the development of auxiliary drainage facilities as a factor of safety.

The debris spillway, as an adjunct to the debris basin, is considered by the committee to be one of the foremost improvements in California drainage practice developed subsequent to the 1938-40 storms—notably on the Angeles Crest Highway east of La Canada in Los Angeles County.** (See Figure 11)

EXPENSE COMPARATIVELY SMALL

As pointed out in the previous article on comparative hydrology,* the storm of 100-year frequency occurs every year at scattered places in California; and when it does occur, the damage is usually serious. The expense of providing against heavy damage from even the 100-year frequency storm is relatively small.

The combination debris basin—spillway plan of drainage—consists of a debris basin provided with a culvert and riser for normal drainage, supplemented by auxiliary drainage facilities wherein flowage into the roadbed from an overtaxed debris basin is confined inside the shoulder dykes and flows down the channelized roadbed until a safe and natural place is found to spill the water from the roadway.

* September, 1942, California Highways and Public Works.
 ** April, 1939, California Highways and Public Works.

(Continued on page 15)



FIGURE 10. (a) Debris crib of reinforced concrete, with provision for extension placed over culvert entrance in small debris basin and commonly known as a "bear trap." (b) Timber debris crib installed over culvert entrance in roadway gutter. Note how debris has been prevented from blocking culvert entrance. (c) Debris crib of hewn timber, with a solid cover, placed over culvert entrance in roadway gutter



View of typical section of 4-lane divided highway on partially completed Davis-Dixon cut-off recently opened to traffic

Davis-Dixon Cut-off on U. S. 40 Open; Saves 150,000 Vehicle Hours

By P. O. HARDING, District Engineer

OVERSHADOWED by our present tremendous war effort, on Tuesday, September 22, 1942, without more than passing notice, public traffic was quietly permitted for the first time to travel over one side of the four lane divided highway between one mile north of Dixon and the South Fork of Putah Creek, and on both sides of the divided highway from there on to one mile east of Davis on the Davis-Dixon cut-off.

The Davis-Dixon cut-off has been the subject matter of two previous articles, by District Engineer Pierce, in the March and September, 1940, issues of "California Highways and

Public Works." This cut-off, 7.3 miles in length, starting in District III east of Davis and ending north of Dixon in District X, and crossing Putah Creek at the Solano-Yolo county line, the Southern Pacific railroad one-half mile southwest, and the South Fork of Putah Creek two and one-half miles southwest, has involved work under seven contracts.

SEVEN CONTRACTS INVOLVED

Four of these were for structures under the supervision of the Bridge Department, W. J. Deady, Resident Engineer; three were road contracts, one of which was handled by District

III, J. W. Corvin, Resident Engineer, and two by District X, George Hubbard and R. H. Lapp, Resident Engineers.

The original contract was handled by District X, awarded to Fredrickson Brothers of Emeryville, and covered the grading of the entire 7.3 miles, excepting therefrom the portions involving major structures. This grade was constructed to four-lane divided width northeast of the South Fork of Putah Creek, and two lanes, or one side of the divided highway grade, southwest of this south fork, which was originally known as the Putah Creek overflow.



One of two one-way bridges on Davis-Dixon cut-off. Each one carries two lanes of traffic across Putah Creek.

A second contract was awarded to Heafy-Moore Company and Fredrickson and Watson Construction Company for the construction of a four-lane divided underpass at the Southern Pacific railroad crossing about one-half mile southwest of the Putah Creek crossing. This was a Bridge Department contract.

A third contract under the supervision of District III was awarded to Fredrickson and Westbrook and involved the completion of grading and paving a divided highway with four lanes of concrete from one mile east of Davis to the South Fork of Putah Creek.

TWO BRIDGE CONTRACTS

The fourth and fifth contracts, under the supervision of the Bridge Department, involved the construction of the two bridges required at each stream crossing of Putah Creek and the South Fork of Putah Creek and a number of other overflow points. These contracts were awarded to A. Soda and Sons and E. T. Lesure. A sixth contract, just being completed by N. M. Ball and Sons, under the supervision of District X, involves

the completion of grading and paving on the 4.2 mile section lying southwest of the Putah Creek overflow.

Very unfortunate storm damage to two major bridge structures under construction at the South Fork of Putah Creek in the floods of last winter have delayed completion of the northwesterly bridge and the full benefit of this divided highway can not be realized until its completion, which is tentatively set for December of this year. The seventh minor bridge contract was necessary to repair damage to the southeasterly bridge at this same overflow crossing and the completion of this structure, coincident with the paving under the N. M. Ball and Sons road contract has made it possible to use this highway for two lanes of traffic southwest and the full four lane divided highway northeast of this overflow.

The present 4.2-mile paving contract consisted of the grading and placing of imported select base on one side and paving on both sides of the divided highway. The typical section as now constructed consists of an 11-foot outer and a 12-foot inner lane of portland cement concrete 8 inches to

11 inches in thickness on each side of a dividing strip of imported select material generally 32 feet in width.

An armor coat border has been placed 2 feet wide adjacent to the dividing strip and 3 feet wide next to the outer lanes. An additional 3-foot width of dividing strip and 5-foot width on outer edges has received penetration oil treatment to provide generally a 5-foot shoulder in the dividing strip next to the 12-foot concrete lane and an 8-foot shoulder outside adjacent to the 11-foot concrete lanes.

Due to the heavy underlying adobe soil of this area, specifications required a minimum of 15 per cent moisture which was maintained until the concrete pavement was placed.

Although the last of the approximate 25,000 cubic yards of concrete pavement required under this contract was poured on July 17, the contractor has since this date encountered many difficulties in obtaining the necessary materials, equipment and labor to complete the numerous details incidental to a project of this magnitude. These included a comprehensive channelization where the new highway clips a right angled corner of the old

route which will continue as an important artery of travel to and from Northern California points.

SAVES 150,000 VEHICLE HOURS

The completion of the northwesterly bridge over the South Fork of Putah Creek will culminate work started on this project some three years before, involving construction expenditures in excess of 1½ million dollars and shortening the travel distance between San Francisco metropolitan bay area points and Sacramento by 3.25 miles, aggregating some 5 million vehicle miles of travel annually.

With present 35-mile-per-hour speed restrictions, the time-saving is accentuated, resulting in an annual saving of some 150,000 vehicle hours. Under present rubber restrictions, on a highway now carrying predominantly heavy truck traffic, this represents a very substantial contribution to the war effort.

Overheard at the meeting of newly-elected officials of a city council: "Let us," said one of the aldermen, "put our heads together and make a concrete road."

Wood to Replace Steel for State Highway Signs

For the duration, there will be no more steel signs directing and warning motorists along the highways and byways of California.

Cooperating with the government's request to conserve critical materials, the markers posted by the sign-posting department of the Division of Highways, through the wartime emergency, will be composed of pressed hardwood.

Reflectorized signs will be made of the same material, beaded to reflect headlights. The first beaded placards were posted recently along the Southern California coastline designating authorized dim-out zones, replacing the emergency heavy cardboard markers.

Pre-war signs were made of porcelain enamel fused into steel for indefinite lasting qualities. The substitute

pressed wood signs, treated and painted for preservation, are expected to prove durable for a number of years.

Redwood posts will be utilized where metal posts were previously used. For the few instances where metal standards may be considered absolutely necessary, a small supply of such poles remain in stock. The only metal signs installed will be a few standard types still on hand.

A Horse On The S. I.'s

H. F. Briggs, District Office Engineer of District VI, sends us the following:

"Recently, District VI S.I.'s engaged in setting stakes preparatory to running levels in a pasture on a minor job in Kings County, were startled and then annoyed by seeing a horse following them and methodically pulling up the stakes with his teeth. Clods and other appropriate missiles were necessary to keep Dobbin far enough away to allow the work to be completed. The S.I.'s seem to feel it was a horse on them."



Four-lane divided underpass on Davis-Dixon cut-off where the Southern Pacific Railroad crosses the highway. This structure is one of the modern features which permit a saving of 150,000 vehicle hours annually

State Offers Aid to Golden Gate Bridge in Solving Fiscal Problems

FINANCIAL aid to Golden Gate Bridge and Highway District was given impetus last week by Governor Culbert L. Olson when he asked Director of Public Works Frank W. Clark to render every possible cooperation by the State of California. Likewise the Governor urged President Roosevelt and members of the California congressional delegation to seek every assistance possible from the Federal Government. The following letter was sent by the Governor to the President of the United States:

"Dear Mr. President:

"I have come to the conclusion the financial situation respecting the Golden Gate Bridge across the entrance to San Francisco Bay merits consideration by the Federal Government. This bridge constitutes one of the most vital links in the defense highway system of the Pacific Coast. It is being used, however, by Federal traffic without charge and the greatly increased amount of such traffic due to the war has placed a burden on bridge finances far beyond that which was anticipated at the time of issuance of the Federal permit.

"In an attempt to meet the situation, the directors of the Golden Gate Bridge and Highway District have imposed increased tolls which adversely affect not only regular commuters, but shipyard workers who reside in San Francisco and who cross the bridge daily to and from recently established yards in Marin County. These commuters and workers are helping to bear a burden brought about by increasing toll-free government traffic, while normal, civilian toll-paying traffic is rapidly decreasing. The result is dissatisfaction—an adverse effect upon the war effort.

"The Maritime Commission is establishing a bus service and also is proposing to institute a ferry service. Such buses pass over the bridge without charge under terms of the Federal permit. The District, however, is attempting to collect tolls from individual passengers on such buses. Further legal controversy is

expected over this attempt to secure revenue for the bridge.

"This is the immediate effect. In the long view, taxpayers in six California counties face increased taxation to make up deficits that appear certain to occur.

"I propose to recommend that the State of California do everything possible for assistance of the District, but I urge that the Federal Government also assume its share. The Bridge is on the route of a primary Federal aid highway and there is no reason in equity and justice why Federal assistance should not be given. The Secretary of War, I respectfully suggest, should be authorized, by act of Congress, if necessary, to revise conditions of the bridge permit.

"I have instructed Director of Public Works Frank W. Clark to make a comprehensive survey of the entire situation, and I shall take the liberty to write you further concerning it. I hope for your favorable consideration."

Following up the Governor's request, Director Clark went before the Finance Committee of the Board of Supervisors of the City and County of San Francisco and made the following statement:

"First I would like to compliment members of the Board of Supervisors of San Francisco for taking the steps which have resulted in the meeting of their Finance Committee under the chairmanship of Mr. MacPhee for the purpose of holding this meeting and hearing—in a matter that means as much as the Golden Gate Bridge situation does to the general public, to the users of this bridge, both passenger and commercial traffic, as well as to all property owners of the six counties, whose property is financially responsible for any deficit or liability which may accrue as a result of the bridge operations.

It is in that same spirit that the present State administration of California, under the leadership of Governor Olson, is not only interested in this general situation but is vitally concerned and is very anxious to be

of help in any way where it may serve to aid all who are affected in this important matter. I am sure all present are familiar with steps which have been recently taken by the Governor as a result of this rapidly changing situation from a financial standpoint, and as we are all well aware, these changes being seriously for the worse as far as the toll-paying users of the bridge and the property owners of the six referred to counties are concerned.

I am sure that we only echo the opinion of all public minded citizens when we say that we have full appreciation of the important and fine job that was done by those who, with courage and initiative, brought into existence this magnificent and important structure. It must be admitted that at least for the present, and in fact during this war, this all important highway defense connecting link would not be available for public use or the defense of our country if it had not been for the unusual vision and excellent work on the part of those who, as private citizens and with private capital, worked out the financial program under which this bridge was designed and constructed.

The original bond purchasers who made available the capital with which to do the job certainly played a very important part in the matter. I am sure we all agree that, without the willingness of property owners in the six counties comprising the District to guarantee the financial set up, the bridge in all likelihood would not have been built and would not now be in existence.

However, we are primarily interested in seeing to it that the toll-paying users of this bridge, who must depend upon its facilities, are not unfairly or unnecessarily penalized. Likewise, the State is not unmindful of the position and, if you please, possibly the predicament of the property owners of the six counties. We fully realize that the bond holders have their legal rights in the matter, and securely situated as they are from a financial standpoint, we cannot reasonably expect them to make concessions in a financial way as might be

construed as a subsidy for the bridge operations and carrying charges at the expense of this group.

There is still another element or group who are or who have been identified with this picture whom I must refer to, and this I certainly do without any thought of criticism or disrespect, but I make this statement in order that we may be of practicable help in this entire matter. I refer to those who, primarily for business reasons, were identified with this project from a promotional standpoint and who have in one way or another sold their services in connection with this entire matter in a way that has added materially to the cost side of the ledger as far as bridge operations are concerned. Some very substantial adjustments and improvements have already been made in this respect, specifically as illustrated by employment of James Ricketts, its present capable manager.

Appraising the entire situation, if we are to be expected to be of assistance, and in fact I feel sure before any material actual aid can be realized from any public agency, we believe the following steps must be taken: The operation of the bridge from a personnel standpoint must be carried out on the most efficient and economical basis. We believe that the heretofore broadly circulated statement, to the effect that some day this bridge can be expected to be paid off in full and will prove from that date on to be of financial assistance to the property owners of the six counties in the way of reduction of their taxes, is a fallacy and an unsound approach. We do not feel that it is consistent with good public policy for anyone connected with this bridge in any way to expect either Federal or State financial assistance at this time and still attempt to maintain a position which will make this bridge other than a free bridge for general public use, as soon as its bond obligations are liquidated in full.

The present District property owners, I am sure, will willingly forego any rights they have, or might hope for, in this respect, in the interest of protecting themselves against deficit and liability assessments with which they are practically confronted at the present time. Everybody connected with this bridge must immediately revamp their thoughts and views.

The bond holders who hold the key to this entire matter can only be expected to be of aid provided some ar-

rangement is worked out under which their interests will be fully protected and the benefits accruing to them will not be lessened. This can be accomplished, in my opinion, by a substitution of longer term bonds, provided that other important factor which enters into the value of these bonds can be met by having the new issue of bonds issued tax free—as is recognized to be the case with the bonds now outstanding. This, in my opinion, can be accomplished if quick action is taken.

As might be appreciated I have been watching the operation of this bridge since I have occupied my present position commencing in 1939. During that time there have been many discussions regarding the matter. Various suggestions and proposals have been outlined. The most concrete in this respect emanated from a man who occupied the dual position of a Director of the Bridge District and likewise a very large property owner in San Francisco, as well as at the same time being a man of well known civic interest. I refer to Mr. Arnold Haas, now deceased. Mr. Haas, possibly together with his other associate directors, had evidently given this matter a great deal of intelligent and very constructive thought. It seemed to me that he had a thorough appreciation of the seriousness of the situation which was rapidly becoming more critical at the time of his death, and therefore realized that something must be done. As is typical of most successful business men, Mr. Haas concerned himself with the workout of a program which would be fair to all concerned and therefore probably acceptable and at the same time would accomplish its purpose. In private conversation I told Mr. Haas as I have told other members of your Board of your officers, that before the State would be willing or able to enter into the picture, those certain corrective steps that I have outlined herein would have to be taken. The suggested refinancing plan as outlined by Mr. Haas would reduce the average debt service by \$400,000 a year for a thirty-year period. As you well know the present State administration has been committed to a policy of low tolls on public bridges as is well evidenced in the slashing of the San Francisco-Oakland Bay Bridge far from an average of sixty odd cents to 25 cents through successive reduc-

tions and by reason of the acquisition of the Carquinez and Antioch bridges through purchase by the State, the tolls on these bridges had even been cut to a greater extent by comparison under State operation at our insistence. Financing for the Carquinez and Antioch bridges was arranged on a basis that even with the present 25¢ toll (probably to be further reduced to 20¢) will result in these two bridges being toll free in 1948. The San Francisco-Oakland Bay Bridge can likewise be hoped to be reduced to 20¢ toll if rubber shortage and gasoline rationing does not too drastically further curtail bridge traffic as compared with the normal expectancy.

The Golden Gate Bridge, on the other hand, has a base toll of more than double that of our State-owned and operated bridges. Its bond requirements under the present arrangement mounts rapidly from \$1,711,000 to \$3,407,000 and I feel it my duty to say that with the further reduction of tolls on the Carquinez Bridge, plus the fact that it will soon become a toll free bridge, is certain to further divert a great deal of Sacramento Valley traffic of the future. In this connection I want to say that your present rate of tolls, in my opinion, will prove to have brought your financial rate picture up to a point where that if it is not already the case, any further increase will mean having passed the point of diminishing returns.

I pointed out to Mr. Haas and he seemed to fully realize that, as the war progressed, we could expect certain Federal regulation of traffic for conservation of automotive transportation which would adversely affect the normal increase in traffic. However, I was unable to foresee at that time the present acute development in the way of an abrupt cutting down of automobile traffic by reason of the rubber shortage.

All of us should consider the developments in other sections of the country, regarding toll bridges, as an indication of what to expect in the way of future projected trend affecting the Golden Gate Bridge.

New York's Triborough Bridge Authority in August, according to reports, showed a decline in revenue of over 46% from the corresponding month of 1941. The Pennsylvania Turnpike showed an overall loss of slightly more than 50% in revenue, but passenger car revenue was off 75%.

(Continued on next page, column 2)

W. H. Holmes Appointed Engineer In Charge of Design and Safety of Dams

WH. HOLMES, Senior Engineer of Hydraulic Structure Design in the State Division of Water Resources, has been appointed Supervising Engineer in Charge of Design and Safety of Dams, effective September 1st by State Engineer Edward Hyatt. He succeeds the late George W. Hawley, Deputy State Engineer.

In his new position Mr. Holmes will have charge of supervision of the 640 dams in California under State jurisdiction. These comprise 426 earthfill dams, 40 rockfill, 46 concrete gravity, 6 masonry, 56 single arch, 15 multiple arch and 51 dams of composite or miscellaneous types. Twelve are owned by the State, 186 by municipalities and districts, 128 by power companies and 314 by individual owners. They represent a construction cost of approximately \$170,000,000.

Mr. Holmes' headquarters have been in Los Angeles where he has been in charge of dams in the southern part of the State for the past 12 years. He will now be stationed in the Sacramento office of the Division of Water Resources. He joined the Division in September, 1928, and spent the following two years in Sacramento working on engineering studies which followed the disastrous failure of the St. Francis Dam.

Mr. Holmes was born near San Jose, California. During World War I he served overseas with the 23rd Engineers—a highway regiment. Returning to California at the end of the war he completed his education at Stanford University and received his engineering degree in 1921.

After graduating he went to work on design and construction of Stanford Stadium, later working on the preliminary design of the California Memorial Stadium at Berkeley. In 1922 he worked for the Turlock and Modesto Irrigation Districts as transit man. During the following six years he rose to the position of Chief Engineer in the Modesto Irrigation District.

Mr. Holmes is married and has one son who is now attending the California Institute of Technology.



W. H. HOLMES

State Offers Aid to Golden Gate Bridge in Solving Fiscal Problems

(Continued from preceding page)

Surely, no one connected with this matter can fail to recognize that a very critical situation exists. Your present State administration stands ready and is anxious to aid in every possible way. The Governor has directed me to make a financial survey of this entire matter which is already under way. A letter has been directed to the President by Governor Olson, as well as to all California Congressmen and our two Senators in Washington, asking that Federal funds be appropriated to immediately relieve this acute situation. There are three or four approaches that can be made to this matter, where State financial assistance could be brought into the picture (one being State operation), and with the full cooperation of all concerned I am confident that this matter can be worked out in a way that will make it an unfair burden to no one and a benefit to all."

Debris Control at Culvert Entrances on State Highways

(Continued from page 7)

Debris basin—spillways should be lined so as to be capable of resisting erosion. In many cases on grades, these spillways may be several hundred feet from the debris basin originating the flow.

Dykes and spillways, to be successful, must necessarily be constructed on an adequately large scale plan.

Committee Conclusions and Recommendations

1. That culvert sites be classified for debris characteristics at the time of the preliminary survey as outlined in "classification of culvert sites" to be described in a later article.

2. That debris control measures be considered as an essential part of culvert design, to be developed before or during design of conduit—not afterwards.

3. That debris barrier types be selected and adapted in accord with the general principles outlined herein.

4. That debris control devices be cleaned of debris and regularly maintained along with other drainage appurtenances.

20 Large Cities Receive All Milk By Motor Truck

Twenty large cities receive all their milk by truck, and many other cities receive a substantial part of their milk by highway transportation, according to the Automobile Manufacturers Association.

The 20 cities depending entirely on the highways for their milk supplies are: Akron, Atlanta, Cincinnati, Dayton, Detroit, Grand Rapids, Hartford, Kansas City, Louisville, Los Angeles, Minneapolis, Oakland, Omaha, St. Louis, St. Paul, Sacramento, San Diego, Spokane, Toledo, and Washington.

Baltimore, Milwaukee, Pittsburgh, and San Francisco receive more than 96 per cent of their milk by truck.

North Sacramento Viaduct Structure Officially Opened to Traffic

(Continued from page 2)

Highway Commission appropriate money for this project, and the contracting for this viaduct was the first piece of highway construction under the present biennial highway budget. The budget went into effect on July 1, 1941, and work began a few days thereafter."

TWO LANES OPENED

President L. J. Brundige, of the Sacramento Chamber of Commerce, presided over the dedicatory ceremonies. He said that the opening of the viaduct climaxed many years of effort on the part of Sacramento and North Sacramento to provide an all-year highway between the two cities. Mayor Tom B. Monk of Sacramento complimented the State Highway Commission for the part it had played in making the project possible. In the absence of Mayor Kenneth Hammaker of North Sacramento, Elwood M. Miller voiced the gratitude of his city.

At the completion of the ceremony, eastbound traffic was directed over two lanes of the structure. Temporarily until completion of the other two lanes, west bound traffic will use the existing low-level three-lane highway.

The project was financed with both State and Federal Aid funds. The cost of construction totals about \$563,000 with an additional outlay of \$68,000 for rights of way, making a total cost to the State of \$631,000.

The viaduct, built on a revised alignment planned to tie in with future development of the route, consists of a reinforced concrete structure 1,496 feet long, consisting of 36 spans of 41 feet and two 10-foot cantilever spans at each end. The roadway is of the four-lane divided type, each traffic way being 25 feet wide and the median strip four feet wide. Two four-foot sidewalks are provided on each side of the bridge. The structure is a two-post bent design supported on pile foundations.

AMPLE RAILROAD CLEARANCE

The clearance over the tracks of the railroads with sufficient allowance for future raising of the grade lines of the railroad trestles, is such that

In Memoriam Francis R. Baker

Francis R. Baker of the District IX engineering staff passed away suddenly, at his home in West Bishop, as a result of pneumonia. He was a native of Freehold, New York, where he was born November 29, 1882.

Mr. Baker was among the first engineers employed by the California Highway Commission, having been appointed in District III on February 15, 1917. He remained in that district until June 30, 1927, working as a draftsman, assistant resident engineer, and resident engineer. On July 1, 1927, he transferred to District VIII, but shortly after returned to District III.

Between March 26, 1928, and April 8, 1934, he worked as a resident engineer in Districts IV, II, V, III, VIII, and XI. On April 9, 1934, he transferred to District IX and remained there until the date of his death.

Mr. Baker was highly esteemed by his friends and fellow workers and by those of the community who knew him. He was a member of Palo Alto Lodge of Masons and of Pomona Commandery of Knights Templar. He also was a companion of Owens Valley Chapter of Royal Arch Masons where he was serving as an officer.

His wife, Mrs. Eva M. Baker, and a sister residing in the State of Washington, survive him.

the maximum height of the vertical curve of the structure is 50 feet above the ground.

Approaches to the viaduct are earth embankments and the new four-lane approaches will be surfaced with plant-mixed surface and Portland cement concrete.

In constructing the viaduct it was anticipated that work would be completed early in 1942. However, even with the A-1-e priority which was assigned to the project by the War Production Board, delays in obtaining reinforcing steel have been almost continual since early construction. The result of these delays prolonged the job by many months. Only the persistent efforts of Director Clark, C. H. Purcell, the State Highway Engineer, and Earl W. Heple, the contractor, made possible the obtain-

Highway Bids and Awards for September 1942

ALAMEDA COUNTY—Between San Francisco-Oakland Bay Bridge and Toll Plaza, about 0.8 mile to be paved with Portland cement concrete and asphalt concrete, District IV, Route 5, Oakland. Chas. L. Harney, San Francisco, \$172,949. Contract awarded to Lee J. Inmel, Berkeley, \$154,883.

KERN COUNTY—Between Snow Road and 2 1/2 miles south of Shafter Road, about 4.9 miles to be graded and paved with Portland cement concrete, District VI, Route 4, Section D, Griffith Co., Los Angeles, \$358,615. Contract awarded to Union Paving Co., San Francisco, \$326,349.

MENDOCINO COUNTY—A timber, steel and concrete bridge at Albion across Albion River, having an aggregate length of 900 feet to be constructed, District I, Route 56, Section D, Trewitt, Shields and Fisher, Fresno, \$290,805; E. E. Smith, El Cerrito, \$291,430. Contract awarded to Fred J. Maurer & Son, Eureka, \$345,528.

MERCED COUNTY—Constructing a bridge across Livingston Canal, 2.5 miles north of Atwater, District X, C. C. Gildersleeve, Colusa, \$9,628; Barney B. Goets, Stockton, \$8,365. Contract awarded to M. A. Jenkins, Sacramento, \$7,672.

NAPA COUNTY—At Rindler Creek, about 0.5 mile to be graded and surfaced with Portland cement and asphalt concrete and a timber bridge to be removed, District X, Route 7, Section A, Chas. L. Harney, San Francisco, \$184,165. Contract awarded to Louis Biasotti & Son, Stockton, \$134,742.

California highway border quarantine stations reported 146,274 tourists entered the State during February of this year. More than half of these were tourists from other states, while the remainder were Californians returning home.

"Nobody has a good word for the grasshopper," remarked a Canadian paper, "and yet he was away ahead of everybody in this idea of keeping the farmers from producing too much."

ing of the necessary steel bars for reinforcement.

The problem of flood waters and a traffic volume of 25,000 cars daily has been finally solved at this point and no longer will the detour over Jibboom Street be necessary.

Among officials participating in the celebration were:

William Rutherford, president of North Sacramento Chamber of Commerce; Arnold Vogel, Chairman of the Highway Committee of the Sacramento Chamber of Commerce; Luther Jones of the Earl W. Heple Company, contracting firm which built the structure; F. W. Panhorst, Bridge Engineer, Department of Public Works; George T. McCoy, Associate State Highway Engineer; Assemblyman John Cain, Assemblyman Earl D. Desmond and Assemblyman-elect Chester Gannon.

State of California
CULBERT L. OLSON, Governor

Department of Public Works

Headquarters: Public Works Building, Twelfth and N Streets, Sacramento

FRANK W. CLARK, Director of Public Works

ROBERT H. ROOT, Assistant Director

MORGAN KEATON, Deputy Director

CALIFORNIA HIGHWAY COMMISSION

LAWRENCE BARRETT, Chairman, San Francisco
LENER W. NIELSEN, Fresno
AMERIGO BOZZANI, Los Angeles
BERT L. VAUGHN, Jacumba
L. G. FITCHCOCK, Santa Rosa
L. L. PENFIELD, Secretary

DIVISION OF HIGHWAYS

C. H. PURCELL, State Highway Engineer
G. T. MCCOY, Assistant State Highway Engineer
J. G. STANDLEY, Principal Assistant Engineer
R. H. WILSON, Office Engineer
T. E. STANTON, Materials and Research Engineer
FRED J. GRUMM, Engineer of Surveys and Plans
R. M. GILLIS, Construction Engineer
T. H. DENNIS, Maintenance Engineer
F. W. PANHORST, Bridge Engineer
L. V. CAMPBELL, Engineer of City and Cooperative Projects
R. H. STALNAKER, Equipment Engineer
J. W. VICKREY, Traffic and Safety Engineer
E. R. HIGGINS, Comptroller

DISTRICT ENGINEERS

A. M. NASH, District I, Eureka
F. W. HASELWOOD, District II, Redding
CHARLES H. WHITMORE, District III, Marysville
JNO. H. SKEGGS, District IV, San Francisco
L. H. GIBSON, District V, San Luis Obispo
E. T. SCOTT, District VI, Fresno
S. V. CORTELYOU, District VII, Los Angeles
E. Q. SULLIVAN, District VIII, San Bernardino
S. W. LOWDEN (Acting), District IX, Bishop
PAUL O. HARDING, District X, Stockton
E. E. WALLACE, District XI, San Diego
HOWARD C. WOOD, Acting Bridge Engineer, San Francisco-Oakland Bay, Carquinez, and Antioch Bridges

DIVISION OF WATER RESOURCES

EDWARD HYATT, State Engineer, Chief of Division
A. D. EDMONSTON, Deputy in Charge Water Resources Investigation
HAROLD CONKLING, Deputy in Charge Water Rights
G. H. JONES, Flood Control and Reclamation
GORDON ZANDER, Adjudication, Water Distribution
MARK S. EDSON, Hydraulic Engineer Water Rights
SPENCER BURROUGHS, Attorney
GEORGE T. GUNSTON, Administrative Assistant

DIVISION OF ARCHITECTURE

ANSON BOYD, State Architect
W. K. DANIELS, Assistant State Architect
P. T. POAGE, Assistant State Architect

HEADQUARTERS

H. W. DeHAVEN, Supervising Architectural Draftsman
D. C. WILLETT, Supervising Structural Engineer
CARLETON PIERSON, Supervising Specification Writer
J. W. DUTTON, Principal Engineer, General Construction
W. H. ROCKINGHAM, Principal Mechanical and Electrical Engineer
C. E. BERG, Supervising Estimator of Building Construction

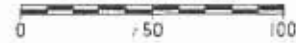
DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief
FRANK B. DURKEE, Attorney
C. R. MONTGOMERY, Attorney
ROBERT E. REED, Attorney
FRANCIS J. CARR, Attorney



CALIFORNIA STATE HIGHWAY SYSTEM

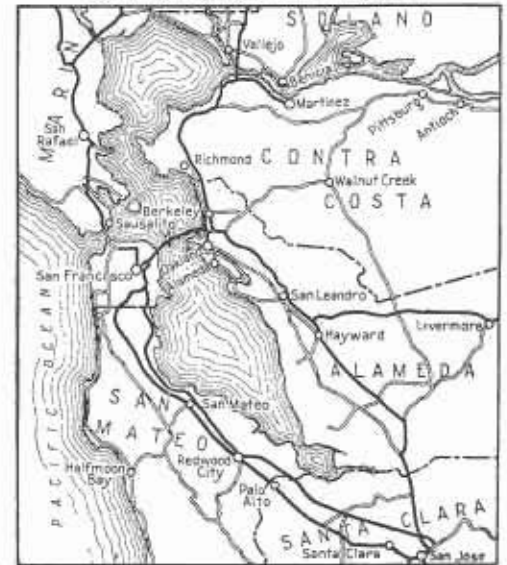
SCALE IN MILES



~ LEGEND ~
 Primary Routes ———
 Secondary Routes ———
 Proposed Routes - - - - -



SAN FRANCISCO AND VICINITY



LOS ANGELES AND VICINITY

