

## *Part I*

### *DRAINAGE LAW*

# **Better Drainage Facilities for Less Tax Dollars by Cooperative Agreements**

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•DRAINAGE DESIGNS for State highways can be generally divided into two groups; one group comprising designs where a satisfactory solution can be worked out within the right-of-way area, and a second group where a satisfactory solution requires something to be done beyond the normal right-of-way limits. While both require interagency cooperation, this latter group brings into sharp focus the necessity for coordinated planning and construction of drainage facilities in areas under the jurisdiction of two or more governmental agencies, plus, in some cases, private property owners. This group of highway drainage designs presents problems that warrant special consideration and includes the fields of engineering, law, economics, governmental economy, and public relations. Typically, once it is necessary for the State to go beyond the normal right-of-way, it is encroaching into areas under some other governmental jurisdiction. These areas may be urbanized, rural, or in a transitional stage. They may be city, county, or both, and further, may be a portion of a special assessment district legally organized to solve a particular localized flood control or other problem.

The State highway is usually only a long narrow strip with occasional expanded areas at interchanges. Its drainage problems are the disposal of precipitation falling within its own bounds and the passing across the right-of-way property of water coming to it; all without any unnecessary changes in the existing or natural drainage pattern and with no uncompensated damage to property.

In the early transition from rural area to urban, poor drainage and flooding may not be too serious as far as it concerns property damage and public inconvenience, and the drainage problem that is developing is not widely noticed. It is dramatically spotlighted when flooding, State highway closures or serious traffic hazards, property damage followed by claims and suits against the State, and possibly injury or death to motorists or other persons occur with the sequence of events during or following seasonal storms.

The usual natural sequence is precipitation to surface water to stream water to flood water, thence back to stream water and to final disposal usually in an ocean, bay, or inland lake. Legal concepts generally tend to follow this sequence, and legal definitions support the descriptive words used.

At some point in this sequence the works of the hydraulic engineer are needed to prevent the hazards, damage, and injury caused by uncontrolled water after it ceases to be termed precipitation. The sooner these works, generally called drainage facilities, intrude into the sequence as controlling factors, the better for all especially the taxpayer, who eventually pays all the bills, no matter what their nature or origin.

The detrimental effects of uncontrolled storm water disposal can be prevented by proper planning and construction of drainage facilities. If these effects cannot be entirely prevented due to prior inadequate construction or complete lack of facilities, they can be prevented from recurring by construction of supplemental or new works.

The adverse effects of poor drainage with or without attendant flooding on highways and adjacent properties may be listed to include:

1. Delays, interruption, and inconvenience to traffic due to floods or roadway failures. When expressed in dollars, these delays and interruptions may be quite large.
2. Injuries and hazards to vehicles and persons caused by floods or roadway failures. These also can be large if expressed in dollars, and certainly should be considered large if expressed in terms of human suffering and anguish.
3. Damage to State highway drainage facilities with resulting repair and maintenance costs.
4. Damage to private and public property. These may also be quite large, as witnessed by one claim for alleged damages in this District (California Division of Highways District IV) for \$2,100,000. This claim was not paid, although it cost the taxpayers about \$20,000 to amass the data necessary to resist the allegations. However, the probable net savings to taxpayers due to good engineering and careful attention to the drainage laws of the State of California as well as the laws of nature, in the original design, could be said to be \$2,100,000 less \$20,000, or \$2,080,000.
5. Pavement or subgrade failure with resultant costly repairs and maintenance.
6. Damage to public utilities in urban areas.
7. Contamination of public water supplies and sewerage systems with the attendant detriments to public health.
8. Public impression that the taxpayer is getting inferior engineering while paying for top grade service.
9. Lessening of the public's esteem for their governmental agencies, officials, and employees.

In California, the State is responsible for passing across the right-of-way, drainage flowing to its State highway and is also responsible for disposal of storm water falling on its property. In accordance with constitutional and statutory provisions, California Highway Users Tax funds can be expended for highway purposes only. These provisions prohibit the State from using highway funds to finance comprehensive storm drain projects or any other flood control works in excess of minimum facilities necessary for protection of the State highway system. However, there is nothing to prevent the State from contributing the estimated amount needed for its minimum drainage facilities to any agency that has developed a comprehensive drainage plan that would satisfy all the State's drainage obligations in as good or better manner than the State could provide by unilateral action. The basic requirement is that any contribution by the State must be a direct tangible benefit that can be computed by a rational method. This insures that highway funds be used for highway uses only. In some cases, it is evident that the State highway is a contributor to the drainage problem and also suffers from it along with its adjacent neighbors. Yet, it is not feasible or lawful for any one agency or owner to finance an overall system adequate to solve even its own problems, let alone those of the other agencies.

Given these circumstances, the logical solution is a scheme of cooperation among the various jurisdictions for complete solution to a specific drainage problem and to provide an equitable means for financing and following through on such a scheme.

A policy of continual contact with the nine counties of California State Highway District IV and especially with those counties having organized Countywide Flood Control Districts has been worked out. All State highway drainage facilities embodied in new construction are planned to conform to County Master Drainage and Flood Control Plans regarding capacity and location. Where master plans are not applicable, individual solutions are worked out and a separate joint agreement is obtained.

When there is a distinct line of separation between jointly planned facilities, no formal agreement is needed because the bearer of design, construction, and maintenance costs is evident. Generally speaking, the State Division of Highways accepts

these burdens within its right-of-way, and the other agency retains or accepts the burden of all facilities outside the right-of-way. In cases where the lines of demarcation are not so evident, a written cooperative agreement is required to finance, construct, maintain, and accept liability for jointly needed facilities where both agencies have tangible benefits, the duty of providing drainage facilities, or both.

This agreement might as a minimum recite the names of the agencies, the reason or need for the agreement, the benefits to be derived by each party, the amounts to be contributed by each, a statement of which agency will plan and which will construct the facility, the date construction must be completed, who is to maintain the completed system, and which party assumes liability for changes in the existing drainage pattern caused by construction of the new or improved system.

By these methods of providing proper drainage facilities during original construction, both State Highway Users Tax funds and local tax funds are conserved and the taxpayers money saved because the increased cost of installing drainage structures under completed and heavily traveled State highways is well established.

Where jointly needed facilities are required in connection with an existing State highway, a written cooperative agreement is almost always required. Many of these involve upgrading the capacity of structures due to collection of storm water by the local agency and concentrating it at a particular State highway culvert to the benefit of both parties and in accordance with their master plans. The financing, construction, liability, and maintenance must be equitably allocated and set forth to the satisfaction of both public agencies.

In rather rare instances, it is necessary for a private owner or developer to enter into an interagency cooperative project. This may be monetary in nature or the owner or developer may construct a portion of the project or cause it to be constructed. In cases like this and particularly where the local agency will take over the completed facility for maintenance, a two party agreement with the permanent local agency allowing them to make a temporary agreement with the private owner is preferred. This is also the case where there are two or more local agencies involved along with the State. Here it is also preferable to write a two party agreement between the State and the local agency that will take over the burden of future maintenance and let this agency make the necessary agreements with the other local agencies. All of these activities progress more expeditiously where directed by a special group within a public agency.

In 1948, District IV of the California Division of Highways, recognizing the growing complexity and importance of its drainage problems, set up a small crew of specialized engineers whose primary duty concerns State highway drainage as it is affected by engineering hydraulics, legal aspects of highway drainage, and disposal of storm runoff with the least detrimental effect to the State highway and to adjacent property, be it public or private. This unit has at present 31 engineers and is headed by a Senior Highway Engineer with title of District Hydraulics Engineer. District IV, served by this Hydraulics Section, comprises the nine counties immediately surrounding San Francisco Bay.

The functions of this section are to design major drainage facilities for State highway projects; advise highway designers concerning general surface drainage, and check drainage designs prepared by others; to furnish hydrology for all parts of the district; to make continuous checks of changes in land use for alterations in drainage patterns as they may affect the State highway system; to establish and maintain liaison with other agencies concerned with drainage; to make special studies for other district departments as requested; and to analyze and make recommendations for disposition of claims and complaints involving drainage damage allegedly caused by State highway drainage facilities or the lack of these facilities.

In the exercise of its functions, the Hydraulics Section frequently encounters unsatisfactory drainage conditions that cannot be properly corrected by the design of new facilities without assistance from agencies having jurisdiction over areas outside the normal limits of highway right-of-way. These problems are usually solved as previously described.

Drainage law attempts to follow the laws of nature, and drainage must in general be disposed of without damage to adjacent property. Even if the laws of some States are

not clear regarding damage due to drainage, good engineering on the part of any public agency does not dispose of storm runoff in such a manner as to unnecessarily damage private property. If there is no solution that does not cause some damage to property, then the owner should receive just compensation for the damage. Cooperatives generally result in solutions that cause no damage or at least much less than would occur if any one agency acted alone.

Since District IV of the California Division of Highways has had a fully organized and operating Hydraulics Section, it has not been required to pay a single claim for alleged damage due to recently completed State highway drainage installations where such a claim was based solely on allegedly improper engineering or violation of drainage law. In some few cases where claims have been fully or partially allowed, the awards were based on public interest and the eventual savings to the taxpaying public rather than on poor engineering or violations of drainage law.

The filing of claims or suits against the State cannot be prevented. Their cost to the taxpayers, however, can be reduced to the time and effort required to refute them if drainage facilities are so designed that there are no good engineering or drainage law violations, no uncompensated damage to properties beyond the right-of-way, and if all necessary safety devices are installed to prevent injury to persons or animals.

All of District IV's Cooperative Agreements resulted in better overall drainage facilities than any of the interested agencies could have constructed without aid from the others and resulted in taxpayers' savings either in original cost, maintenance expenditures, damage repair costs, or some combination of these.

As illustrations of drainage Cooperative Agreements in California Highway District IV, the following cooperative projects were selected as examples of good overall engineering; adherence to drainage law, and the laws of nature. They resulted in substantial direct savings to the taxpaying public and indirect savings to local citizens in the form of relief from flooding, with attendant increase in property and human values. One of these examples is in San Mateo County and the other in Sonoma County.

#### Bella Vista Avenue Drainage Outfall

At Bella Vista Avenue in the Sharp Park area of the City of Pacifica, design studies indicated a depressed section to be the best and most economical for proposed freeway (Fig. 1). However, surface drainage crosses the State highway at this point, and the depressed design had to provide for transporting this terrain drainage across the right-of-way and also to dispose of roadway drainage collecting in the depressed section. There was no adequate outfall between the right-of-way and the Pacific Ocean, about 1,200 feet westerly.

Under conditions existing at the time of design, runoff from the uplands east of the State highway was passed across the right-of-way in a 78-in. corrugated metal pipe that discharges into a completely inadequate ditch and pipe system under the jurisdiction of the city. Urbanization of the areas, above and below the highway, is in progress and the area above includes development of a community high school with large areas from which runoff will be considerably increased. Flood conditions have occurred almost every rainy season in the area below the highway and between it and the ocean.

Drainage studies by the State developed the best plan for drainage facilities, considering freeway completion and ultimate urbanization development.

This plan provides a 72-in. reinforced concrete pipe passing under the freeway depressed section, along Bella Vista Avenue, and discharging into the Pacific Ocean. This drainage system has a total length of 1,400 ft and is within two governmental jurisdictions; the State's, due to its freeway right-of-way, and the city's, due to incorporation of the area. Runoff from within the highway right-of-way, collecting in the depressed section, will discharge by gravity through the system, thereby eliminating the necessity for an expensive pumping plant with its continual operating expense. This plan was by far the superior solution to this drainage problem.

The City of Pacifica had developed a Master Drainage Plan, that proposed a major storm drain outfall along this same route. This indicated interest on the part of the city. Discussions with the city brought out that cooperation was justified and very desirable, as it would provide the best facility with minimum cost to both public agencies.

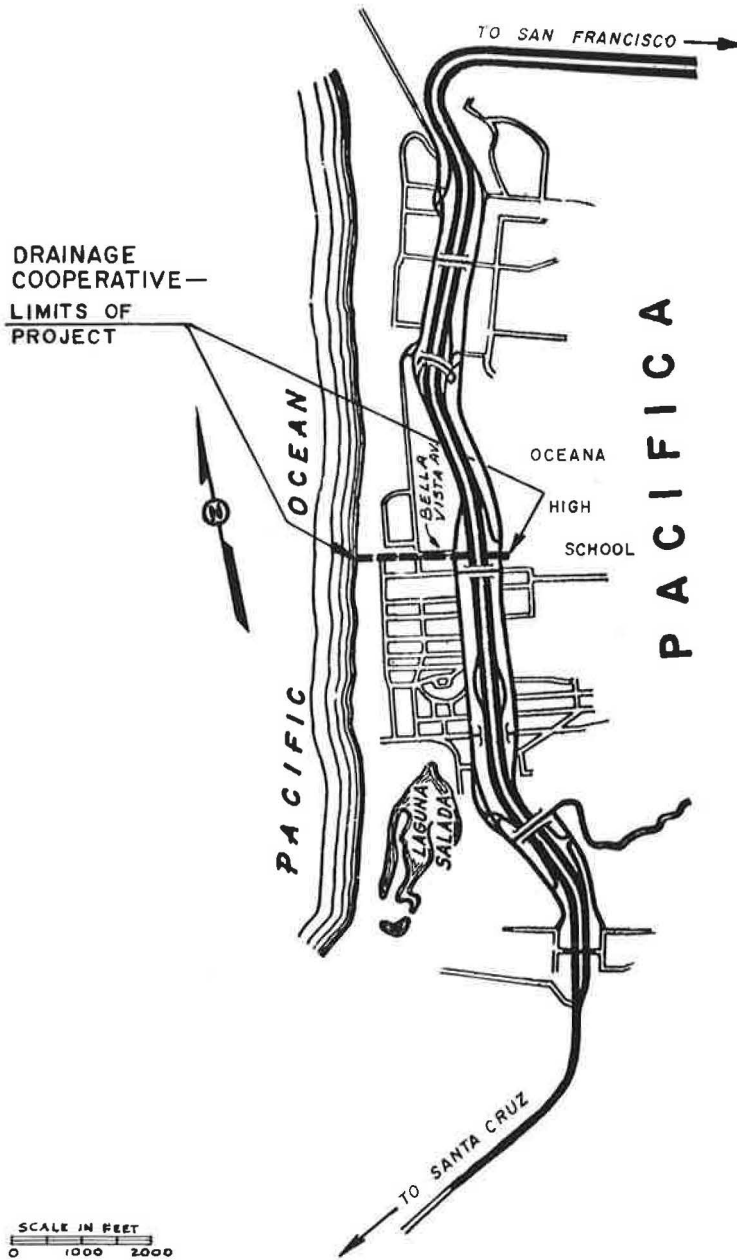


Figure 1. Bella Vista Avenue Drainage Outfall, City of Pacifica, San Mateo County, Calif.

An agreement was negotiated, and the completed cooperative agreement set forth that the city would provide the necessary right-of-way for the drainage outfall, clear and free of all obstructions, and would maintain all portions of the drainage facility lying outside the State right-of-way. The State agreed to design, construct, and finance these two items.

This project is now under construction. The State is saving right-of-way costs for the outfall, estimated at about \$22,000, and considerable maintenance costs. The city is saving about \$100,000, the cost of the outfall paid for by the State in lieu of a more costly pumping plant, less right-of-way and right-of-way clearance costs paid by the city.

### Willow Brook Channel Improvement

In December 1956, a new freeway in Sonoma County, locally called the Petaluma Bypass, was completed and opened to traffic. This freeway crosses an area north of Petaluma known as Denman Flat, which is historically a flood plain (Fig. 2). Design

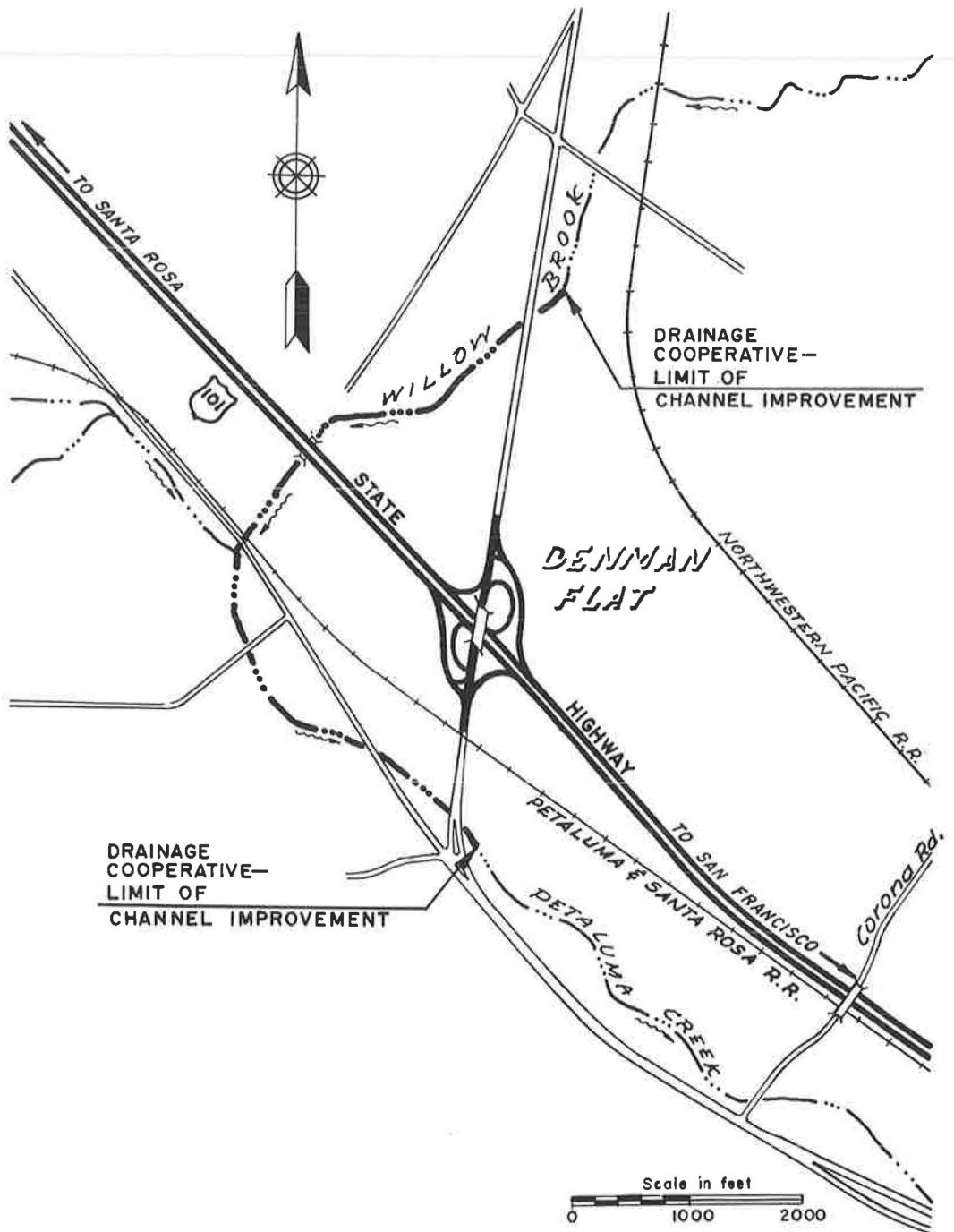


Figure 2. Willow Brook Channel Improvement, Denman Flat, Sonoma County, Calif.



and construction of freeway drainage facilities was in conformity with the historical drainage and flooding pattern; but in 1958, the seasonal rainfall was unusually heavy and portions of the freeway and some of the interchange loops were flooded eight times with considerable delay and hazard to traffic. Investigation revealed changes in the flood pattern due to changes in the channel characteristics of the upper reaches of Petaluma Creek, locally termed Willow Brook. This freeway flood caused adverse public reaction and cost \$1,800 in excess maintenance costs for this one season alone. In addition, owners of flooded private property complained bitterly and demanded action from county agencies. Investigation clearly showed that the progressively decreasing capacity of Willow Brook was the cause of the changes in drainage and flood patterns, and that improvement of about 4,000 ft of this channel was the superior engineering solution and, at the same time, the best for taxpayers and private owners.

Accordingly, a Cooperative Agreement was negotiated with the newly formed Sonoma County Flood Control District. The agreement provided for rectification of about 4,000 ft of Willow Brook Channel to improve drainage in the Denman Flat area. The project was subsequently completed and has been in operation for 4 years.

The main provisions of the agreement were that the State agreed to construct about 4,000 ft of realigned and rectified channel to replace existing Willow Brook, and the county agency agreed to acquire all necessary rights-of-way and to assume all maintenance responsibilities on satisfactory mutual inspection of the completed work. It further agreed to preserve the normal capacity of the channel as constructed.

The cost to the State was about one-half the estimated cost of an inferior alternate consisting of a series of equalizing culverts under the freeway. In addition, it was an engineering solution that permanently eliminated the flood problem instead of merely alleviating it. The cost to the county agency was only the right-of-way and maintenance costs, which it would have eventually incurred. Thus, there was a considerable saving to all taxpaying segments—the sector paying to Highway Users Tax funds via fuel use taxes and the sector paying property and other taxes for the operation of local agencies.

In conclusion, the following personal opinions are made:

1. In any highway district and especially those in some stage of transition to urbanization, the formation of a hydraulics or drainage section is well worth consideration, even if this unit is initially limited to one engineer. This unit should devote its entire time and effort to the specialized work of drainage and become thoroughly familiar with drainage structure design and have a working knowledge of the drainage laws of the State and locality. It should establish and maintain a system of communication with other governmental agencies and private interests regarding drainage matters.
2. Better overall handling of drainage will result from continued liaison with other agencies and with private interests such as land developers.
3. When drainage problems are too far reaching to be handled by an individual highway agency, negotiations with other interested agencies will nearly always result in superior facilities with less overall expenditure of tax funds. This cooperation should, however, be limited to amounts directly proportioned to tangible benefits or to legal obligations, and attempts by one agency to dip into the funds of another, under guise of a drainage cooperative, should not be permitted.
4. The methods and procedures herein described result in superior handling and solving of drainage problems and generally enhance public esteem for the governmental official and employee. The engineer in public service is thus giving his employers, the taxpayers, the highest type of professional engineering service.

#### ACKNOWLEDGMENT

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