Vol. 10

OPERATION AND MAINTENANCE MANUAL

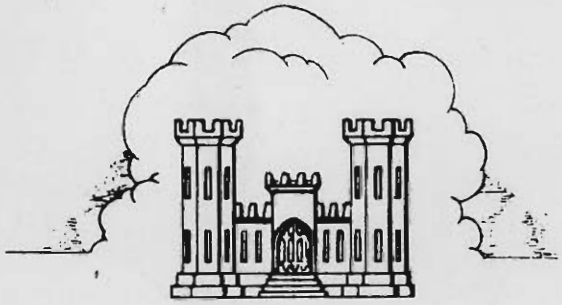
FOR

DUCK CREEK PROJECT

SAN JOAQUIN COUNTY, CALIFORNIA

FROM FRENCH CAMP ~~SLOUGH~~ ROAD TO 1/2 MILE

UPSTREAM FROM ESCALON-BELLOTA ROAD



U. S. ARMY ENGINEER DISTRICT

CORPS OF ENGINEERS

SACRAMENTO, CALIFORNIA

Incl 1

Corps of Engineers

U. S. Army

OPERATION AND MAINTENANCE MANUAL

FOR THE DUCK CREEK PROJECT,

SAN JOAQUIN COUNTY, CALIFORNIA

FROM FRENCH CAMP ROAD TO 1/2 MILE

UPSTREAM FROM ESCALON-BELLOTA ROAD

U. S. ARMY ENGINEER DISTRICT

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Sacramento, California

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FROM FRENCH CAMP SLOUGH TO 1/2 MILE UPSTREAM FROM ESCALON-BELLOTA ROAD

Section I

INTRODUCTION

1-01. Authorization. The project works covered by this manual were authorized by Act of Congress (Public Law No. 534, Seventy-eighth Congress, Second Session, H.R. 4485), approved 22 December 1944. This act authorized improvement of Littlejohn Creek and its tributaries in accordance with recommendations contained in the report of the Chief of Engineers dated 14 January 1944 (House Document No. 545, Seventy-eighth Congress, Second Session). The above authority included a diversion dike and a diversion channel from Duck Creek to Littlejohn Creek to limit Duck Creek flows below Farmington to 500 cubic feet per second. Also two small dikes on the north branch of Duck Creek near Jacktone Road. Authority to improve the Duck Creek channel from French Camp ~~Slough~~ Road to 1/2 mile upstream from the Escalon-Bellota Road was approved by the Chief of Engineers under the small flood control project program authorized by Section 205 of the 1948 Flood Control Act as amended by Public Law 685, 84th Congress, 2nd Session.

1-02. Location. The Duck Creek project, as shown on Exhibit A-1, is a small tributary of the San Joaquin River south of the City of Stockton, San Joaquin County, lying between the Calaveras River-Mormon Slough system and Littlejohn Creek. The Duck Creek channel extends from the diversion structure located about 0.5 miles northeast of Farmington, California and meanders downstream a distance of about 20 miles to French Camp Slough.

1-03. Description of Project Works. The project works covered by this manual is confined to the channel of Duck Creek that extends a distance of about 20 miles from French Camp ~~Slough~~ Road to 1/2 mile upstream from the Escalon-Bellota Road and a short reach of levee on the lower end of Duck Creek along the right and left banks. The maintenance and operation of the Duck Creek Diversion is covered under another manual entitled, "Duck Creek Diversion, a Unit of the Farmington Reservoir Project", dated December 1952.

1-04. Protection Provided. The project works are designed to protect lands adjacent to Duck Creek downstream from the diversion works against a 50-year flood. The design flows to accomplish this requires a design capacity of 700 cubic feet per second from the diversion dam to Mariposa Road and 900 cubic feet per second below Mariposa Road. Operation of the Duck Creek diversion works is outlined in paragraph 4-02(d) of another manual.

1-05. Construction Data. Channel improvement from French Camp ROAD ~~Slough~~ to 1/2 mile upstream from the Escalon-Bellota and modifications to the Duck Creek Project were accomplished as follows:

a. Channel improvement was accomplished under Contract No. DA-04-167-CIVENG-65-138 by J. P. Breen, Sr. during the period from 28 May 1965 to 29 June 1966. Specification No. 2998. Drawing No. 7-4-1679.

b. Modifications to the Duck Creek Project were accomplished under Contract No. DACW05-67-C-0029 by John M. Tyson and Anthony Cardoza, Contractors, during the period from 26 October 1966 to 19 January 1967. Specification No. 3398. Drawing No. 7-4-1705.

1-06. Flood Flows. For purposes of this manual, the term "flood" or "high water period" for Duck Creek shall refer to flows when the water surface in Duck Creek reaches or exceeds the reading of 5.5 on the gage located on Duck Creek just upstream from the diversion structure.

SECTION II

LOCAL COOPERATION REQUIREMENTS

2-01. Applicable Portions of Flood Control Act. The Duck Creek Project was approved by the Chief of Engineers under the small flood control project program authorized by Section 205 of the 1948 Flood Control Act, as amended by Public Law 685, 84th Congress, 2nd Session.

2-02. Requirements of Local Cooperation. Pursuant to the provisions of Public Law 685, as set forth in ER 1165-2-102, requires local interests to (a) provide without cost to the United States all lands, easements and rights-of-ways necessary for construction of the works; (b) make all necessary bridge and utility alterations; (c) hold and save the United States free from damages due to the construction works; and (d) maintain and operate all work after completion in accordance with regulations prescribed by the Secretary of the Army.

2-03. Assurances Provided by Local Interests. As required by and subject to Public Law 685, 84th Congress, 2nd Session, (Title 33 United States Code Annotated Section 7015), the Board of Supervisors on behalf of the San Joaquin County Flood Control and Water Conservation District gave assurances to the United States that is quoted in part as follows:

a. Provide without cost to the United States all lands, easements, and rights-of-way necessary for the construction of the project, except as otherwise provided.

b. Hold and save the United States free from damages due to the construction works.

c. Maintain and operate all works after completion in accordance with regulations prescribed by the Secretary of the Army.

By letter dated 13 November 1962, the County Counsel of San Joaquin County forwarded a certified copy of a resolution adopted by the Board of Supervisors of San Joaquin County, California, on 21 August 1962, which in effect officially adopts assurances as quoted above. See EXHIBIT G.

2-04. Acceptance by Local Interests. Responsibility for operating and maintaining the completed works herein described was officially accepted by the Board of Supervisors of the San Joaquin County Flood Control and Water Conservation District, San Joaquin County, California, by letter dated 26 January 1967. See EXHIBIT F.

SECTION III

MAINTENANCE AND OPERATION - GENERAL PROCEDURE

3-01. Reference to Approved Regulations. This manual is submitted in accordance with provisions of Title 33 - Navigation and Navigable Waters, Chapter II, Corps of Engineers, Department of the Army, Part 208 - Flood Control Regulations, Maintenance and Operation of Flood Control Works, as of 1 January 1962, a copy of which is included as EXHIBIT A, Sheets 1 and 2.

3-02. Intent of Regulations. The general intent of the regulations approved by the Secretary of the Army is stated in paragraph 208.10(a)(1) as follows: "The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits."

The principle mission of the Corps of Engineers, during flood emergencies, is to insure that flood control works are properly operated and maintained and offer technical advice to enable local interests to obtain maximum flood protection. All other matters become secondary and will yield precedence to the accomplishment of the above-stated missions. During flood periods local interests maintain close liaison with the office of the District Engineer, Corps of Engineers. However, in the event it is evident that all available county and local resources are insufficient to cope with the situation and the necessity for an emergency proclamation is anticipated, requests for State assistance in flood fighting should properly be made direct to the Department of Water Resources, which is the State agency designated by the Directors of Public Works, to receive requests from local agencies for assistance in flood fighting. This agency is authorized to request Federal assistance from the Corps of Engineers when State and local resources are insufficient to cope with the situation. Therefore, it is desired to emphasize that requests for Federal assistance in flood fighting should be made only when it is evident that County, State and/or other local equipment and manpower will be exhausted and local resources are insufficient to cope with the flood emergency situation.

3-03. Purpose of this Manual. In view of the large number of local flood protection projects authorized by Congress and the repetitious nature of regulations to govern maintenance and operation of each individual project, and in order that local interests may be fully aware of the extent of the obligations assumed by them in furnishing assurances of local cooperation for projects to be constructed in the future, the general regulations described above were established by the Secretary of the Army. The general regulations approved by the Secretary of the Army, August 1944, were intended to be sufficiently broad in scope and general in nature as to be applicable to all flood-protect-projects for which such regulations are required by law.

Section 208.10(a)(10) of the regulations read as follows: "The Department of the Army will furnish local interests with an Operation and Maintenance Manual for each completed project, or separate useful part thereof, to assist them in carrying out their obligations under this part." This manual has, therefore, been prepared to furnish local interests with information on the project works and advise as to the details of the operation and maintenance requirements applicable to this particular project, to state procedure required by the Department of the Army, and to indicate satisfactory methods of flood-fighting operations and emergency repairs. The project works are to be maintained and operated in accordance with the Flood Control Regulations referred to above and interpretations thereof contained herein.

3-04. Definitions. As used hereinafter, the term "Superintendent" shall be defined to mean the person appointed by the local agency to be directly in charge of an organization which will be fully responsible for the continuous operation and inspection of the project works; the term "District Engineer" shall be defined to mean the District Engineer of the U. S. Army Engineer District, Sacramento, or his authorized representative. The term "flood" or "high water period" shall mean any flow in Duck Creek when the water surface reaches or exceeds the reading of 5.5 on the gage located on Duck Creek just upstream from the diversion structure. The term "right bank" or "left bank" shall be defined to mean the right or left bank or side, respectively, of a stream or channel when facing downstream

3-05. General Provisions of Regulation. In addition to that quoted in paragraph 3-02 above, the general provisions of the Flood Control Regulations, contained in paragraphs 208.10(a)(2), to 208.10(a)(9), both inclusive, are quoted as follows:

(2) The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of the Army, as required by law, shall appoint a permanent committee consisting of, or headed by an official hereinafter called the "Superintendent", who shall be responsible for the development and maintenance of, and directly in charge of an organization responsible for the efficient operation and maintenance of all structures and facilities during flood periods and for continuous inspection and maintenance of the project works during periods of low water, all without cost to the United States.

(3) A reserve supply of materials needed during a flood emergency shall be kept on hand at all times.

(4) No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the rights-of-way for the protective facilities.

(5) No improvement shall be passed over, under or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any features of the works without prior determination by the District Engineer of the Department of the Army or his authorized representative that such improvements, excavation, construction or alteration will not adversely affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable shall be constructed in accordance with standard engineering practice. Advice regarding the effect of proposed improvements or alterations on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice shall be obtained from the District Engineer, or, if otherwise obtained, shall be submitted for his approval. Drawings or prints showing such improvements or alterations as finally constructed shall be furnished the District Engineer after completion of the works.

(6) It shall be the duty of the Superintendent to submit a semi-annual report to the District Engineer covering inspection, maintenance, and operation of the protective works.

(7) The District Engineer or his authorized representative shall have access at all times to all portions of the protective works.

(8) Maintenance measures or repairs which the District Engineer deems necessary, shall be promptly taken or made.

(9) Appropriate measures shall be taken by local authorities to insure that the activities of all local organizations operating public or private facilities connected with the protective works are coordinated with those of the Superintendent's organization during flood periods.

3-06. Assistance to be Furnished by the District Engineer. The District Engineer will:

a. Furnish to the local maintaining agency "As Constructed" drawings of the project works at the time they are transferred.

b. Make periodic inspections of the project works and notify the local maintaining agency of any repairs or maintenance measures which the District Engineer deems necessary in addition to measures taken by the Superintendent.

c. Submit to the Office, Chief of Engineers, all cases of non-compliance with full details thereof for determination of corrective measures to be taken.

d. Make prior determination that any proposed encroachment, improvement, excavation, or construction within the right-of-way, or alteration of the project works, will not adversely affect the functioning of the protective facilities.

e. Assist local interests as may be practicable, in their duties of ascertaining storm developments having flood-producing potentialities, assembling flood-fighting forces and materials, and initiating and carrying out flood-fighting operations.

3-07. Responsibilities of the Superintendent. In line with the provisions of the Flood Control Regulations, the general duties of the Superintendent include the following:

a. Training of Key Personnel. Key personnel shall be trained in order that regular maintenance work may be performed efficiently and to insure that unexpected problems related to flood control may be handled in an expeditious and orderly manner. The Superintendent should have available the names, addresses, and telephone numbers of all his key men and a reasonable number of substitutes. These key men should, in turn, have similar data on all of the men who will assist them in the discharge of their duties. The organization of key men should include the following:

(1) An assistant to act in the place of the Superintendent in case of his absence or indisposition.

(2) Sector foremen in sufficient number to lead maintenance patrol work of the levee, inspect the channel, and operate the gate structures properly during flood periods. High qualities of leadership and responsibility are necessary for their positions.

b. Files and Records. The Superintendent shall maintain a file of reports, records, and drawings concerning the project works, readily available at all times to the District Engineer.

c. Encroachment or trespass on Right-of-way. In accordance with the provisions of Flood Control Regulations 208.10(a)(4), no encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted on the rights-of-way for the protective facilities. The Superintendent will, therefore, cause

notices to be posted at conspicuous places along the project right-of-way directing public attention to this regulation. The Superintendent will take whatever action is necessary under local ordinances and under its own authority to remove the encroachment or to prosecute the trespassers.

d. Permits for Right-of-entry or Use of Portion of Right-of-way. Permits for temporary right-of-entry or use of portion of the right-of-way shall not be issued without prior determination by the San Joaquin County Flood Control and Water Conservation District sufficiently in advance of issuance to permit adequate study and consideration and determination of conditions to be embodied in the permit document.

e. Permits for Improvements or Construction within the Project Right-of-way. All requests for permits for construction of any improvements of any nature within the limits of the project right-of-way shall be referred to the District Engineer through the local agency for determination that such construction will not adversely affect the stability, safety, and functioning of the protective facilities, and for definition of conditions under which permit should be granted. These conditions will include, among others, the following items:

(1) That all work shall be performed:

(a) In accordance with standard engineering practice and in accordance with plans and specifications approved by the District Engineer or his authorized representative; drawings or prints of proposed improvements or alterations to the existing flood control works must be submitted for approval to the local agency sufficiently in advance of the proposed construction to permit adequate study and consideration of the work.

(b) To the satisfaction of the District Engineer.

(2) After completion of the work, "As Constructed" drawings of prints, in duplicate, showing such improvements as finally constructed shall be furnished the District Engineer.

f. Coordination of Local Activities. In accordance with the provisions of Flood Control Regulations, paragraph 208.10(a)(9), the Superintendent will, during periods of flood flow, coordinate the functions of all agencies, both public and private, that are connected with the protective works. Arrangements shall be made with the local law enforcement agencies, street departments, and railroad and utility companies for developing a coordinated flood-fighting program; and an outline of the program shall be filed with the District Engineer

g. Inspection.

(1) Flood Control Regulations, paragraph 208.10(b)(1), are quoted in part as follows:

"(b) Levees (1) Maintenance . . . Periodic inspections shall be made by the Superintendent to insure that . . . . maintenance measures are being effectively carried out . . . Such inspections shall be made immediately prior to the beginning of the flood season, immediately following each major high water period, and otherwise at intervals not exceeding 90 days and such intermediate times as may be necessary to insure the best possible care of the levee."

(2) For sake of uniformity, and to the extent practicable, the dates of inspection shall be as follows: 1 November, 1 May, and immediately following each flood flow in excess of a reading of 5.5 on the gage located on Duck Creek just upstream from the diversion structure.

(3) The suggested check lists and instructions shown in EXHIBIT E, Sheets 1 to 7, inclusive, should be followed in each inspection to insure that no features of the protective system are overlooked. Check lists locally typed or printed in conformity with sheets 2, 4 and 6 shall have printed on the reverse side of the applicable instructions shown on sheets 3, 5 and 7 EXHIBIT E. Carbon copy of the inspector's original field notes as recorded on the check list shall be transmitted to the District Engineer immediately following each inspection, and one copy included as an inclosure to the semi-annual report as provided in paragraph 3-07(i)(1) of this manual.

h. Maintenance.

(1) Flood Control Regulations, paragraph 208.10(b)(1) are quoted in part as follows:

"(b)(1) Maintenance. The Superintendent shall provide at all times such maintenance as may be required to insure serviceability of the structures in time of flood. Measures shall be taken to promote the growth of sod as required, . . . exterminate burrowing animals, and to provide for . . . removal of wild growth and drift deposits, and repair of damage caused by erosion or other forces . . . . Immediate steps will be taken to correct dangerous conditions disclosed by such inspections. Regular maintenance repair measures shall be accomplished during the appropriate season as scheduled by the Superintendent."

(2) Full responsibility for making the repairs and the methods used is placed on the Superintendent (the local agency), but the experience and facilities of the District Engineer will be available to him for advice and consultation.

(3) All repairs shall be made in accordance with standard engineering practice, to line and grade and in accordance with details shown on the construction drawings for the project works, copies of which are included in EXHIBIT B. No change or alteration shall be made in any feature of the project works without prior determination by the District Engineer that such alteration will not adversely affect the stability and functioning of the protective facilities. Plans and specifications of all changes or alterations that may be proposed by the Superintendent shall be submitted to the District Engineer for investigation and approval before prosecution of the work.

i. Reports.

(1) Semi-Annual Report. In accordance with the provisions of the Flood Control Regulations, paragraph 208.10(a)(6), the local agency shall submit within a 10-day period following 1 December and 1 June of each year, a semi-annual report to the District Engineer covering inspection, maintenance, and operation of the protective works. This report will present a statement of:

(a) The physical conditions of the protective works as summarized from the logs of inspection.

(b) Flood occurrences and behavior of the protective works, and flood-fighting activities during the period.

(c) Prosecutions for encroachment or trespass.

(d) Permits issued for right-of-way or use of right-of-way.

(e) Permits issued for improvements or construction within the project right-of-way.

(f) Maintenance measures taken; nature, date of construction, and date of removal of temporary repairs; date of permanent repairs.

(g) Fiscal statement of cost and maintenance and operation for the period.

A suggested form for submission of the semi-annual report is included as EXHIBIT D, Sheets 1 and 2.

SECTION IV

FEATURES OF THE PROJECT SUBJECT TO FLOOD CONTROL REGULATIONS

4-01. Project Works. The flood control works covered by this manual consists of the channel of Duck Creek extending from the French Camp ~~Slough~~ ROAD upstream to the diversion structure that lies about one-half mile upstream from the Escalon-Bellota Road crossing, a total distance of about 20.55 miles. The channel of Branch Creek was excavated from U. S. Highway 99 upstream to the Mariposa Road, a distance of about 4,000 feet. Spoil banks were placed intermittently along both banks of the excavated channels. On the left bank of Duck Creek from Station 61+67 to Station 96+00, as shown on the drawings of EXHIBIT B, a levee was constructed that has a crown width of 12 feet. Patrol roads were constructed along both banks of Duck Creek together with intermittent irrigation and drainage structures, low water crossings, flashboard dams and bank protection under bridge crossings.

4-02. Levees.

a. Description. The only levee on this project lies along the left bank of Duck Creek near the lower end of the project extending for a total length of 3,433 feet. Also a short reach of levee on the right bank that extends from Station 0+00 to 12+25 as indicated on the drawing of EXHIBIT B, sheet 3. The levee has a 12-foot crown width and side slopes of 1 on 3 waterside and 1 on 2 landside. The patrol road surfacing consists of 4 inches of crushed mineral aggregate, 10 feet in width. Patrol roads 12 feet wide have been constructed on each side of the Duck Creek channel, but no surfacing has been provided. For more complete details of items included in construction of the levee, the patrol roads, excavated channel and spoil banks, refer to the "As Constructed" drawings of EXHIBIT B. Regulations regarding inspection, maintenance and operation will be found in paragraphs 4-02b, 4-02c and 4-02d of this manual

b. Inspection.

(1) Pertinent Requirements of the Code of Federal Regulations. Flood Control Regulations, paragraph 208.10(b)(1), are quoted in part as follows:

> (b) Levees - (1) Maintenance . . . Periodic inspection shall be made by the Superintendent . . . to be certain that
>
> (i) No unusual settlement, sloughing, or material loss of grade of levee cross section has taken place;
>
> (ii) No caving has occurred on either the landside or the riverside of the levee which might affect the stability of the levee section;
>
> (iii) No seepage, saturated areas, or sand boils are occurring.

(iv) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged;

(v) Drains through the levees and gates on said drains are in good working condition;

(vi) No revetment work or riprap has been displaced, washed out, or removed;

(vii) No action is being taken, such as burning grass and weeds, during inappropriate seasons, which will retard or destroy the growth of sod; (see Note (a) at end of subparagraph (1).

(viii) Access roads to and on the levee are being properly maintained;

(ix) Cattle guards and gates are in good condition;

(x) Crown of levee is shaped so as to drain readily, and roadway thereon, if any, is well shaped and maintained;

(xi) There is no unauthorized grazing or vehicular traffic on the levees;

(xii) Encroachments are not being made on the levee right-of-way which might endanger the structure or hinder its proper and efficient functioning during times of emergency.

Such inspections shall be made immediately prior to beginning of the flood season; immediately following each major high water period, and otherwise at intervals not exceeding 90 days; and such intermediate times as may be necessary to insure the best possible care of the levee . . ."

Note (a)

Since the growth of sod on the slopes of the levees of this project is not practicable and as the nature of the levee growth warrants burning thereof to facilitate inspection, the provision of subparagraph b(1) of the regulations inconsistent therewith shall not apply. In place of item (vii), therefore, the following shall be observed:

> Weeds, grasses and debris on the levee shall be burned during appropriate seasons, where not dangerous or impracticable, in cracks, holes, burrows, slips, and other damage and to permit the detection and extermination of burrowing animals and that grass and weeds on levee slopes be mowed where removal by burning is dangerous or impracticable, such as on peat levees or where burning would constitute a hazard.

(2) To insure the taking of such maintenance measures as will be required for proper functioning of the levee, the following items shall be specifically covered in each inspection:

(a) Aggradation or degradation of the stream bed along the toe.

(b) Settlement of levee fill.

(c) Erosion of levee slopes; both sides of levees.

(d) Presence of seepage; saturated areas, or sand boils back of levee.

(e) Condition of access roads and roadway on levee.

c. Maintenance.

(1) Repairs to Levee Embankment. Methods used for repair or reconstruction of the levee fill will depend on the extent of the damaged section. If of small extent, the most suitable method will be to bring the levee back to line and grade by a fill made in 6-inch layers of earth free from

brush, roots, sod or other unsuitable material. If of larger extent, the fill should be made in the same manner as the original construction, of selected material from borrow pits approved for the project, placed in uniform layers of loose material and not more than 6 inches in depth and compacted in accordance with the specifications under which the work was completed or compacted according to approved construction practices, the Superintendent shall provide at all times such maintenance as may be required to insure serviceability of the levees in time of flood.

(2) Depredations of Burrowing Animals. Dens and runways formed within the levee by burrowing annimals are frequently the causes of levee failures during flood stages. Burrowing animals such as muskrats, ground hogs, ground squirrels, moles and gophers, found in the levee should be exterminated. The dens and runways should be opened up and thoroughly compacted as they are backfilled. Levees kept properly cleared are not seriously menaced by burrowing animals as they prefer areas where a protective cover, such as high grass, weeds, and brush is found. Several methods of extermination are found effective, such as trapping, baiting, and poison gases, depending on the type of animal present and the time of year the work is done. Advice concerning the best methods in each locality can be obtained from the County Agricultural Agent.

(3) Access Roads. Access roads to the levees shall be maintained in such condition that they will be accessible at all times to trucks used to transport equipment and supplies for maintenance of flood fighting.

d. Operation.

(1) Pertinent Requirements of the Code of Federal Regulations. Flood Control Regulations, Par. 208.10 (b)(2) are quoted in part as follows:

"(2) Operation. During flood periods, the levee shall be patrolled continuously to locate possible sand boils or unusual wetness of the landward slope to be certain that:

(i) There are no indications of slides or sloughs developing;

(ii) Wave wash or scouring action is not occurring;

(iii) No low reaches of levee exist which may be overtopped;

(iv) No other conditions exist which might endanger the structures.

Appropriate advance measures will be taken to insure the availability of adequate labor and materials to meet all contingencies. Immediate steps will be taken to control any condition which endangers the levee and to repair the damaged section."

(2) It shall be the duty of the local agency responsible for maintenance to keep in contact with the State Department of Water Resources' Flood Operation Center during all periods of flood danger as necessary to take advantage of its forecasts and maintain a patrol of the project works in their area during periods of flood in excess of a reading of 5.5 on the gage located on Duck Creek just upstream from the diversion structure as referred to in paragraph 1-06 of this manual.

The Flood Operations Center is responsible for data collection and issurance of a joint stream forecast with the U. S. Weather Bureau and coordinates with the Sacramento District Engineer, and other agencies to keep appraised of the current situation in accordance with terms of the Memorandum of Understanding dated 1 November 1956, between the Division Engineer, U. S. Army Engineer Division, South Pacific, and the Director, Department of Water Resources, State of California, for cooperative action during flood emergencies.

4-03. Channels and Floodways.

a. Description. The channel of the Duck Creek Project extends from French Camp ~~Slough~~ Road upstream to a point about one-half mile from the Escalon-Bellota Road, a distance of about 20.55 miles. Also, the channel of Branch Creek was excavated for a distance of about 4,000 feet from U. S. Highway 99 to the Mariposa Road. The channel was excavated with a 20-foot bottom width with side slopes of 1 on 2. Branch Creek was excavated for a 15-foot bottom width and 1 on 2 side slopes. Regulations regarding inspection, maintenance and operation of channels and floodways will be found in paragraphs 4-03b, 4-03c, and 4-03d of this manual.

b. Inspection.

(1) Pertinent Requirements of the Code of Federal Regulations. Flood Control Regulations, Paragraph 208.10(g)(1) are quoted in part as follows:

"(i) The channel or floodway is clear of debris, weeds and wild growth;

(ii) The channel or floodway is not being restricted by the depositing of waste materials, building of unauthorized structures or other encroachments;

(iii) The capacity of the channel or floodway is not being reduced by the formation of shoals;

(iv) Banks are not being damaged by rain or wave wash, and that no sloughing of banks has occurred;

(v) Riprap sections and deflection dikes and walls are in good condition;

(vi) Approach and egress channels adjacent to the improved channel or floodway are sufficiently clear of obstructions and debris to permit proper functioning of the project works.

Such inspections shall be made by the Superintendent prior to the beginning of the flood season and otherwise at intervals not to exceed 90 days. Immediate steps will be taken to remedy any adverse conditions disclosed by such inspections . . . . ."

(2) The purpose of the flood-flow channels inspection is to insure that conditions which affect the channel capacity will remain the same, as far as possible, as those considered in the design assumptions and that no new conditions develop that may effect the stability of the project structures. At each inspection required by Para. 208.10(g)(1) of the Flood Control Regulations, particular attention will, therefore, be given the following:

(a) Location, extent and size of vegetal growth.

(b) Unauthorized operations within the flood-flow channel right-of-way, such as excavations, buildings and other structures, levees, bank protection or training dikes.

(c) Rubbish and industrial waste disposal.

(d) Changes in the channel bed such as aggradation or degradation, which would interfere with free-flow from side drainage structures or induce local meanders that would scour the banks.

(e) Operationsof any nature upstream from the project that would affect flow conditions within the limits of the flood control project.

(f) Condition of project structure.

1. Channel walls;

a. Deviation from alignment and grade.

b. Development of cracks and spalls.

c. Mechanical injuries.

2. Fencing;

a. Injuries to post, fencing or barbed wire.

b. Damage to galvanizing.

3. Earth fills;

a. Settlement.

b. Erosion of both slopes.

c. Excessive seepage or saturation area back of fills.

d. Condition of bank protection - concrete or stone blanket.

4. Right-of-way;

a. Presence of dumped refuse.

b. Encroachment or trespass.

(3) No excavation within the limits of this unit of the Duck Creek Project will be permitted unless an excavation permit has been approved by the San Joaquin County Flood Control and Water Conservation District.

(4) If any work is done to improve flow conditions in Duck Creek Project, an excavation permit must be obtained from

the San Joaquin County Flood Control and Water Conservation District.

(5) The intent of these inspections is to disclose all conditions which in any way affect the stability of the structures and their functioning for the control of floods. Each inspection report should note and comment on any repair measures that have been taken since the last inspection. In making these inspections, the check sheets included as EXHIBIT E shall be explicitly followed.

c. Maintenance.

(1) Pertinent Requirements of the Code of Federal Regulations. Flood Control Regulations, Para. 208.10(g)(1) are quoted in part as follows:

". . . . Immediate steps will be taken to remedy any adverse conditions disclosed by such inspection . . . ."

(2) Shoaling or aggradation at the inlets or outlets of side drainage structures may render them inoperative. It is, therefore, imperative that all drains be kept open and unobstructed at all times.

(3) Dumped rock or other suitable types of protection should be placed at locations found by experience to be critical trouble points, with a view to stabilizing the channel alignment and preserving the general uniformity of the bank lines.

(4) Sediment and debris plugs or other obstructions should be removed from the channel to prevent any tendency for the flows to be deflected within the channel. The heavy material likely to accumulate in the new channel at the mouths of tributaries should be removed to keep the channel clear.

(5) The channel and right-of-way shall be kept reasonably clear of debris, refuse matter, or industrial wastes.

(6) Weeds and other vegetal growth in the channel shall be cut in advance of flood season and together with all debris, removed from the channel.

(7) All eroded concrete shall be repaired as soon as any reinforcing steel is exposed or erosion approaches a depth of 4 inches. For this purpose, it is recommended

that the repair be made by thoroughly clearing the surface by sandblasting and building up the section with pneumatically placed Portland cement mortar. All evidence of settlement, uplift, or failure of concrete structures shall be referred to the San Joaquin County Flood Control and Water Conservation District for analysis and remedial measures.

(8) All damage to fencing, whether resulting from accidental or willful injuries or from corrosion, shall be promptly repaired with new material in order to maintain satisfactory protection to the public.

d. Operation.

(1) Pertinent Requirements of the Code of Federal Regulations. Para. 208.10(g)(2) are quoted in part as follows:

"(g) Channels and floodways . . . (2) Operation. Both banks of the channel shall be patrolled during periods of high water . . . . Appropriate measures shall be taken to prevent the formation of jams . . . . of debris. Large objects which become lodged against the bank shall be removed. The improved channel or floodway shall be thoroughly inspected immediately following each major high water period. As soon as practicable thereafter, all snags and other debris shall be removed and all damage to . . . . walls, drainage outlets or other flood control structures repaired."

4-04. Drainage and Irrigation Structures.

a. Description. Drainage and irrigation structures through the levee are listed as follows:

Centerline Station	Structure Description
12+20 Rt.	40' x 48" CMP, Homestead Canal
18+61 Rt.	22' x 10" CMP
24+70 Rt.	30' x 30" CMP
61+50	30' x 36" CMP Flapgate W.S.
62+72 Lt.	40' x 48" CMP Riser Unit, Slide Headgate
73+40	26' x 24" CMP Flapgate W.S.
88+00	20' x 12" CMP

4-04. Drainage and Irrigation Structures - (Cont'd).

Centerline Station	Structure Description
95+30 Rt.	20' x 8" CMP
98+75 Rt.	15.5' x 3.5" Iron Pipe
107+95 Lt.	43' x 12" CMP
108+00 Rt.	30' x 30" CMP
133+40 Rt.	18' x 8" Concrete Pipe
135+00 Rt.	18' x 8" Concrete Pipe
146+40 Rt.	14' x 2" Steel Pipe
152+21 Rt.	21' x 12" CMP
179+65	12" Concrete Siphon across Channel
193+60 Lt.	20' x 12" CMP
194+00 Lt.	2" Steel Pipe, Portable Pump
196+20 Lt.	2" Steel Pipe, Portable Pump
197+70 Lt.	2" Steel Pipe, Portable Pump
203+85 Lt.	38' x 3" and 38' x 2" Steel Pipe
203+90 Rt.	30' x 6" Steel Pipe
206+00 Rt.	30' x 3" Steel Pipe
210+25 Lt.	22' x 24" and 20' x 24" CMP
204+00 Lt.	22' x 8" CMP
206+00 Lt.	22' x 8" CMP
228+35 Rt.	2" Steel Pipe, Portable Pump
230+45 Rt.	28' x 18" CMP
248+30 Lt.	28' x 12" CMP
248+55	12" Concrete Pipe Siphon
260+30	12" Concrete Pipe Siphon
262+03 Rt.	24' x 12" CMP
265+80 Rt.	28' x 10" CMP
277+80 Rt.	54' x 24" CMP, Flapgate W.S.
281+70 Lt.	24' x 24" CMP
291+20 Lt.	24' x 24" CMP
291+20 Rt.	24' x 24" CMP
314+78	18" Concrete Pipe Siphon
314+90 Rt.	18' x 18" CMP
315+00 Lt.	18' x 18" CMP
331+20	16" Concrete Pipe Siphon
331+50 Lt.	44' x 18" CMP
331+85 Rt.	32' x 12" CMP
373+40	14" Concrete Pipe Siphon
373+85 Lt.	24' x 10" CMP
391+40 Rt.	36' x 10" CMP
391+50	1-1/2" Steel Pipe across Channel
397+00	Irrigation Siphon across Channel
400+00 Rt.	10" Concrete Pipe - Flapgate W.S.
400+20 Lt.	26' x 18" CMP, Flapgate W.S.

4-04. Drainage and Irrigation Structures - (Cont'd).

Centerline Station	Structure Description
400+35 Rt.	24' x 10" Concrete Pipe
409+20	14" Concrete Pipe Siphon
417+50 Rt.	12" Concrete Pipe
422+50 Lt.	12" Concrete Pipe
435+90	14" Concrete Pipe Siphon
446+20	16" Concrete Pipe Siphon
451+25	16" Concrete Pipe Siphon
461+00 Lt.	20' x 10" CMP
462+45 Rt.	24' x 12" CMP
463+20 Rt.	24' x 10" CMP
470+50 Lt.	20' x 10" CMP
475+80 Rt.	20' x 10" CMP
485+10	16" Concrete Pipe Siphon
485+70 Lt.	10" Concrete Pipe
485+70 Lt.	20' x 10" CMP, Flapgate W.S.
498+20 Lt.	22' x 10" CMP, Flapgate W.S.
512+30	16" Steel Pipe across Channel
512+90	12" Concrete Pipe
512+90 Rt.	24' x 12" CMP
513+20 Lt.	24' x 12" CMP
520+00 Lt.	12" CMP
520+00 Lt.	20' x 12" CMP
614+55 Lt.	24' x 12" CMP
615+00 Rt.	24' x 12" CMP
616+80 Lt.	20' x 12" CMP
617+25 Rt.	20' x 12" CMP
691+20	15" Concrete Pipe Siphon
709+30 Rt.	20' x 36" CMP
728+50 Rt.	20' x 10" CMP
728+50 Lt.	20' x 10" CMP
738+00 Rt.	18' x 12" CMP
739+60 Rt.	20' x 12" CMP
739+90 Rt.	20' x 12" CMP
740+00 Lt.	24' x 12" CMP
747+00 Rt.	21' x 10" Concrete Pipe
773+20 Rt.	25' x 36" CMP
776+30 Rt.	21' x 8" Concrete Pipe
779+75	24' x 18" CMP
783+00	30' x 12" CMP
793+50 Rt.	24' x 12" CMP
797+50 Rt.	24' x 12" CMP
798+90 Lt.	24' x 12" CMP

4-04. Drainage and Irrigation Structures - (Cont'd).

Centerline Station	Structure Description
807+73 Lt.	30' x 12" CMP
807+78	18" Concrete Pipe Siphon
811+00 Lt.	22' x 8" CMP
815+50 Lt.	20' x 8" CMP
818+25 Lt.	30' x 24" CMP
819+20 Rt.	22' x 8" CMP
821+90 Rt.	22' x 8" CMP
825+25 Lt.	34' x 12" CMP
828+00 Lt.	34' x 12" CMP
831+75 Lt.	20' x 8" CMP
832+85 Rt.	22' x 8" CMP
835+60 Lt.	30' x 8" CMP
836+30	15" Concrete Pipe Siphon
836+80 Lt.	24' x 8" CMP
836+90 Rt.	20' x 12" CMP
840+00 Rt.	20' x 10" CMP
841+70 Lt.	20' x 12" CMP
843+30 Lt.	22' x 8" CMP
845+35 Lt.	20' x 8" CMP
845+50 Rt.	22' x 8" CMP
848+65 Lt.	28' x 8" CMP
850+80 Rt.	20' x 8" CMP
854+65 Rt.	20' x 8" CMP
854+65 Lt.	20' x 8" CMP
858+10 Rt.	20' x 8" CMP
858+25 Lt.	20' x 8" CMP
861+20 Lt.	20' x 8" CMP
865+80 Lt.	20' x 8" CMP
865+80 Lt.	20' x 8" CMP
871+60 Lt.	20' x 10" CMP
871+60 Lt.	20' x 12" CMP
873+00 Rt.	24' x 18" CMP
887+20	26' x 24" CMP
891+60 Rt.	18' x 8" CMP
893+90 Rt.	42' x 12" CMP, Flapgate W.S.
895+25 Rt.	18' x 8" CMP
902+00 Rt.	18' x 8" CMP
902+35 Rt.	30' x 34" CMP
937+50 Rt.	42' x 24" CMP
941+00 Lt.	24' x 12" CMP
950+00 Rt.	20' x 12" CMP
954+80 Lt.	18' x 18" CMP
968+75 Rt.	20' x 14" CMP
970+00 Lt.	20' x 12" CMP

4-04. Drainage and Irrigation Structures - (Cont'd):

Centerline Station	Structure Description
982+50 Lt.	20' x 12" CMP
983+80 Rt.	18' x 6" Concrete Pipe
984+70 Lt.	20' x 18" CMP
984+85 Rt.	28' x 24" CMP
987+80 Lt.	40' x 30" CMP
990+00 Lt.	20' x 12" CMP
991+10 Rt.	20' x 12" CMP
991+30 Lt.	20' x 8" CMP
993+30 Lt.	20' x 18" CMP
996+30 Lt.	2 - 18' x 8" CMP
998+50 Lt.	24' x 10" CMP
998+50 Lt.	20' x 10" CMP
1002+00 Rt.	20' x 10" CMP
1002+30 Rt.	20' x 10" CMP
1009+67 Rt.	20' x 8" CMP
1010+50	18' x 8" CMP
1011+20 Lt.	20' x 8" CMP
1012+60 Lt.	20' x 8" CMP
1015+20 Lt.	20' x 12" and 20' x 8" CMP
1019+15 Rt.	24' x 12" CMP
1020+55 Rt.	30' x 30" CMP
1022+00 Rt.	20' x 8" CMP
1022+65 Rt.	20' x 8" CMP
1023+10 Rt.	20' x 8" CMP
1025+90 Lt.	20' x 8" CMP
1026+75 Lt.	20' x 8" CMP
1028+95 Lt.	20' x 8" CMP
1030+65 Lt.	20' x 8" CMP
1031+50	10" Concrete Pipe Siphon
1032+30 Lt.	20' x 8" CMP
1033+16 Lt.	20' x 12" CMP
1034+00	20' x 12" CMP
1035+41 Rt.	34' x 24" CMP
1036+50	20' x 18" CMP
1037+50	20' x 12" CMP
1050+52 Lt.	20' x 18" CMP
1050+57 Rt.	20' x 12" CMP
1050+88 Lt.	12" Concrete Pipe
1051+65	24' x 12" CMP
1066+00 Rt.	22' x 8" CMP
1066+00 Lt.	22' x 8" CMP
1071+80 Rt.	4" Iron Pipe, Pump W.S.

4-04. Drainage and Irrigation Structures - (Cont'd).

Centerline Station	Structure Description
1072+00 Lt.	22' x 8" CMP
1076+20 Rt.	14' x 10" CMP
1077+20 Rt.	20' x 8" CMP
1078+00 Lt.	20' x 8" CMP
1079+00 Lt.	22' x 8" CMP
1080+00 Lt.	20' x 8" CMP
	Branch Creek
6+50 Lt.	18' x 12" CMP
19+85 Rt.	18' x 18" CMP
20+10 Lt.	18' x 18" CMP

b. Inspection.

(1) Pertinent Requirements of the Code of Federal Regulation. Flood Control Regulations, paragraph 208.10(d)(1), are quoted in part as follows:

"(d) Drainage Structures (1) Maintenance - Adequate measures shall be taken to insure that inlet and outlet channels are kept open and that trash, drift or debris is not allowed to accumulate near drainage structures. Flap gates and manually operated gates and valves on drainage structures shall be examined, oiled and trial operated at least once every 90 days . . . . Periodic inspections shall be made by the Superintendent to be certain that:

(i) Pipes, gates, operating mechanism, riprap, and headwalls are in good condition;

(ii) Inlet and outlet channels are open;

(iii) Care is being exercised to prevent the accumulation of trash and debris near the structures and that no fires are being built near bituminous coated pipes;

(iv) Erosion is not occurring adjacent to the structure which might endanger its water tightness or stability. Immediate steps will be taken to repair damage, replace missing or broken parts, or remedy adverse conditions disclosed by such inspections."

(2) At each inspection the following items, if applicable, shall be particularly noted:

(a) Debris or other obstructions to flow.

(b) Condition of pipes and gates.

(c) Damage or settlement of pipe.

(d) Condition of concrete-cracks, spalls, erosion.

c. Maintenance.

(1) All eroded concrete shall be repaired as soon as erosion reaches a depth of 4 inches or any reinforcing steel is exposed. For this purpose it is recommended that the repair be made by thoroughly cleaning the surface by sand-blasting and building up the concrete to its original section with pneumatically-placed Portland cement mortar. All evidence of settlement, uplift, or failure of concrete structures should be referred to the State Department of Water Resources for analysis and recommendation of remedial measures.

(2) If the inspection shows that the automatic drainage structures have been jammed in an open position by debris or other obstructions, they shall be thoroughly cleaned so that they swing freely to a true closure. If any parts of the gates have been damaged or broken, they shall be replaced by new parts.

(3) Compliance with the provisions prescribed above pertaining to drainage structures is essential for proper maintenance of the levee system covered by this manual. Levee failures caused by neglected drainage structures are of common occurrence; it is, therefore, of utmost importance that these structures always be kept in perfect working condition in accordance with the regulations.

(4) Care should be taken not to bury any of the side drainage inlets in the event that it becomes necessary to fill any of the low-lying pockets in back of the levee. Plans for the maintenance of drainage facilities at any such points should be submitted to the San Joaquin County Flood Control and Water Conservation District for approval before such work is started.

d. Operation.

(1) Pertinent Regulations of the Code of Federal Regulations. Flood Control Regulations, paragraph 208.10(d)(2) are quoted in part as follows:

"(2) Operation. Whenever high water conditions impend, all gates will be inspected a short time before water reached the invert of the pipe and objects which might prevent closure of the gate shall be removed. Automatic gates shall be closely observed until it has been ascertained that they are securely closed . . . . All drainage structures in the levee shall be inspected frequently during floods to ascertain whether seepage is taking place along the lines of their contract with the embankment. Immediate steps shall be taken to correct any adverse conditions."

(2) The outlets of the side drainage structures inundate at relatively low river stages. They should, therefore, be inspected at the first sign of a rise in the river to make certain that the gates are not jammed in an open position and thus allow flood waters to enter behind the levee.

4-05. Miscellaneous Facilities.

a. Description. Miscellaneous structures or facilities which were constructed as a part of, or existed in conjunction with, the protective works, and which might affect their functioning, include the following:

(1) Low water crossings, are listed as follows:

Centerline Station	Size (Width)
100+40	10'
124+00	14'
177+44	11'
192+00	10'
314+10	14'
353+50	20'
372+90	20'
379+00	30'
408+50	30'
511+14	14'
526+77	16'
601+30	14'
615+15	12'
663+80	25'
691+50	14'
709+15	14'
727+60	14'

(1) Low water crossings - (Cont'd).

Centerline Station	Size (Width)
770+00	10'
777+00	11'
808+00	34'
841+10	14'
879+30	14'
1003+00	10'
1018+10	10'
1028+41	14'
1035+55	14'
1078+90	14'
Branch Creek	
9+00	14'
21+60	14'
23+95	14'
34+90	17'

(2) Bridge Crossing are listed as follows:

Centerline Station	Description
0+00	French Camp Road
35+00	O'Dell Street
49+00	McKinley Ave & US Hyw. 50
50+00	S.P.R.R.
58+00	S.P.R.R.
107+05	Airport Way Road
152+50	B Street
182+00	Pock Lane
219+00	US Hyw. 99
1+90 (Branch Creek)	Spieckerman property
5+90	Spieckerman property
20+00 (Branch Creek)	Munford Avenue
37+80 (Branch Creek)	Foot bridge 4' wide
40+00 (Branch Creek)	Mariposa Road
230+00	Mariposa Road
260+85	Sante Fe R. R.
303+20	Wood deck bridge
392+50	Farm Road
400+00	Farmington Rd - State Hyw. 4
420+00	Farm Road
485+00	Farm Road
513+00	Jacktone Road
614+75	Hollenbeck Road
740+00	Drais Road
903+00	Hewitt Road
912+00	Farm Road

(2) Bridge crossings - (Cont'd).

Centerline Station	Description
984+50	Farm Road
1034+73	S.P.R.R.
1050+80	Escalon-Bellota Road
1072+27	Footbridge - 3' wide

(3) Utility Relocations. Because of the nature of the construction of the levee by local interests, records of utility relocations are not available.

(4) Hydrologic Facilities. An automatic stream gaging station located at about 1006+00 on Duck Creek just upstream from the diversion structure to be maintained by the U. S. Corps of Engineers.

(5) Flashboard Dams listed as follows:

Centerline Station	Description
373+55	30' wide with 2 - 24" pipes and slidegates
413+00	6' high
708+30	3' x 20'
764+60	6' high
965+38.5	4' high
1065+85	6' high

b. Inspection and Maintenance.

(1) Pertinent Requirements of the Code of Federal Regulations. Flood Control Regulations, paragraph 208.10(h)(1) are quoted in part as follows:

"(h) Miscellaneous Facilities. (1) Maintenance. Miscellaneous structures and facilities constructed as a part of the protective works and other structures and facilities which function as a part of, or affect the efficient functioning of the protective works, shall be periodically inspected by the Superintendent and appropriate maintenance measures taken. Damaged or unserviceable parts shall be replaced without delay . . . ."

(2) Inspection of the miscellaneous facilities shall be made at the same time that the inspection of the other features of the project are made, and shall be reported on check list No. 3, sheet No. 4 of EXHIBIT E.

(3) The interest of the Corps of Engineers and the responsibility of the local interests in the existing highway and railroad bridges is confined to their effect on the safety and functioning of the flood control channel, but any conditions noted in the inspections that may affect them in any way should, as a matter of courtesy, be brought to the attention of the agencies maintaining and operating them. If the inspection of any miscellaneous structure, either existent or constructed in the future under permit, discloses any condition that indicates the probability of failure during periods of high water, the Superintendent shall address a letter to the owner of the structure, quoting this manual as authority and inviting attention to the conditions observed and requesting that immediate steps be taken to correct them. A copy of such letter shall be forwarded to the District Engineer for his information. A report on the action taken by the owner shall be submitted to the District Engineer to accompany the next semi-annual report. A suggested report form is included as EXHIBIT D of this manual.

(4) The purpose of maintenance work is to insure continuous satisfactory operation of equipment. It is, therefore, important in such work that all possible causes of future trouble be found and corrected. Particular attention should be given to minor weaknesses which may be an indication of future trouble.

c. Operation.

(1) Requirements of the Code of Federal Regulations. Flood Control Regulations, paragraph 208.10(h)(2) is quoted as follows:

"(2) Operation. Miscellaneous facilities shall be operated to prevent or reduce flooding during periods of high water. Those facilities constructed as a part of the protective works shall not be used for purposes other than flood protection without approval of the District Engineer unless designed therefor."

(2) The flashboard dams listed in paragraph 4-05a(5) above shall be operated to prevent bank caving and sloughing by reason of rapid drawdown. All required flashboards may be placed in the dam during the period from 15 April to 15 October. All flashboards shall normally be out during

the 15 October to 15 April flood period. However, flashboards may be temporarily installed during this flood period upon receipt of specific written approval from the San Joaquin County Flood Control and Water Conservation District. This approval will include instructions for prompt removal of these flashboards whenever floods are imminent.

d. Special Instructions.

Low Water Crossings. Due to the fact that several low water crossings have been paved with cobbles or quarry rock, the provisions of paragraph 4-05 b. are expanded to include the following:

(1) Where scour, wash, settlement or failure of the originally provided paving has been noted, provision should be made to replace the same with stone similar to the kind and gradation as originally used and shall be placed to the thickness as shown on the drawings of EXHIBIT B. If necessary, the scour or wash shall first be filled with earth free from brush, roots, sod or other unsuitable material before stone is added. In case of emergency, when stone is not available, sandbags or bags filled with gravel may be used for temporary repair measures.

(2) In the event an inspection reveals that due to scour, settlement or other causes, stone protection on the levee or stream channel is required beyond the limits of the original construction, local interests will provide additional placement of stone protection as needed to protect the completed work. The work will be done in a manner acceptable to standard engineering practice.

SECTION V

SUGGESTED METHODS OF COMBATING FLOOD CONDITIONS

5-01. Methods Suggested. Most of the methods described herein have been developed during years of experience with the various problems that often come up during periods of high water, and they are not intended to restrict the Superintendent, or others concerned, to a rigid set of rules for every condition that may arise. The remarks are primarily concerned with the earthen portions of the levee system. If problems not covered by these suggestions arise, where the Superintendent is in doubt as to the procedure to be taken, he will be expected to consult the State Department of Water Resources, and follow standard engineering practices in meeting the situation. It should be noted that it is much better to be over-prepared for a "flood-fight" than to find at the last moment that preparations were incomplete or unsatisfactory. Confidence of the protected persons and firms is a valuable asset that should not be carelessly lost through inefficient operation of the protection system in time of emergency.

5-02. Earthen Levees. An earthen levee is in danger whenever there is water against it. This danger is directly proportional to the height of the water, the duration of the flood stage, and the intensity of either the current or wave action. The danger is inversely proportional to the cross-sectional area of the levee, the levee's height, and the degree of maintenance. A well constructed levee of proper section should, if maintained and not overtopped, hold through any major flood. However, a serious accident may result in a break. Foundation troubles result in sand boils or a sinking levee, and the local use of unsatisfactory materials causes slides and sloughs. However, such threatened failures can be met if prompt action is taken and proper methods of treatment are used. Wave wash is to be expected whenever the levee is exposed to a wide stretch of open water and is serious if permitted to continue over a considerable length of time.

5-03. Premeditated Damage. Local interests should continually guard against premeditated damage to the levee. In the event of an extraordinary flood requiring a fight over long stretches of levee on both sides of the river, there is a natural temptation to relieve the strain by premeditated breaking of the opposite levee.

5-04. Security. Personnel of the Corps of Engineers, whether military or civilian, are not vested with any civil police authority in the performance of their engineering duties, and they will not attempt to exercise any such authority. The responsibility for protecting flood control works against sabotage, acts of depredation or other unlawful acts rests with the local interests through local and State Governmental agencies.

5-05. Inspection of Flood Control Works. Immediately upon receipt of information that high water is imminent, local interests responsibile for maintenance should form a skeleton organization, capable of quick expansion, and assign individuals (Sector Foremen) to have charge of definite sections of levees. As his initial activity, each Sector Foreman should go over his entire sector and parts of adjacent sectors, making a detailed inspected, particularly with reference to the following matters:

a. Sector limits; ascertain that the dividing line between sectors is plainly determined and, if necessary, marked.

b. Condition of new levees and recent repairs.

c. Condition of culverts, flap gates, and sluice gates.

d. Transportation facilities; roads, rail and water communications.

e. Material supply; quantity, location, and condition.

f. Communications; locate and check all necessary telephones in the sector.

5-06. Preliminary Repair Work. After the initial inspection has been made, each Sector Foreman should recruit a labor crew and provide it with tools such as shovels, axes, wheelbarrows, etc. In addition, bulldozers, scrapers, trucks, etc. should be located and made ready for use in case of emergency. Then immediate action should be taken to perform the following work:

a. Fill up holes or washes in the levee crown, slopes, and landside berms. Where new construction has been completed during the year, rain washes and deep gullies may have developed. While the levee is new, preparations should be made to advance to combat wave wash along the exposed reaches.

b. Repair gaps where road crossings have been worn down and the levee is below grade. In filling the road crossings, it may be necessary to obtain material from landside borrow pits, in which case excavation for the material should be kept at least 50 feet from the toe of the levee. Any filling done in this connection should be tamped in place and, if in an exposed reach, subject to wave wash, the new section should be faced with bags of sand.

c. Repair and close all flap gates on culverts and see that they are seated properly before they are covered with flood waters.

d. Ascertain that all roads to and along the levee are in a good state of repair. The Superintendent should obtain assistance from the county road forces to have all roads put in first-class condition.

e. Locate necessary tools and materials (sacks, sandbags, brush, lumber, lights, etc.), and distribute and store the same at points where active maintenance is anticipated.

f. Check and obtain repair of all telephone lines necessary for operation, obtain lists of all team forces, motorboats, motor cars, and truck transportation that can be made available.

g. Make thorough arrangements with reliable citizens of the community for the supply transportation, subsistence, and shelter for the necessary labor.

h. Communicate directly with owners of all stock pastured on the levee and direct that all stock be removed from the levee right-of-way. Cut all fences crossing the levee that do not have gates provided.

i. Investigate all drainage ditches on the landside of the levee and open these drains when obstructions exist. Prepare to cut the necessary seep drainage ditches; however, no attempt should be made to drain the levee slope until actual seepage takes place.

j. Remove all dynamite and explosives of any kind from the vicinity of the levee.

5-07. Disaster Relief. It is the responsibility of local, state, municipal authorities, supported by and/or working connection with the American Red Cross to adopt measures for the relief of flood disaster victims. Relief measures can be undertaken by the Department of the Army through its Army Area Commander under existing Army Regulations, but such measures will be undertaken only as a last resort, in extreme cases and under compelling circumstances where local resources are clearly inadequate to cope with the situation.

5-08 Flood Fight. After the above preliminary organization and precautions have been completed, the "flood fight" itself commences. The methods of combating various defects in the earthen levee described in the following paragraphs have been proved effective during many years of use by the War Department.

a. Drainage of slopes. This work can be done economically while awaiting developments and will serve to make the levees more efficient. Crews should be organized to cut seep drains at all places on the levee

and berm when seepage appears. The drains should be V-shaped, no deeper than necessary, and never more than 6" deep. Care must be taken not to cut the sod unnecessarily. In all instances, drains should be cut straight down the levee slope or nearly so. Near the toe of the slope the small drains should by Y'd together and led into larger drains, which, in general, should lead straight across the landside berm into the landside pits or nearest natural or artificial drain.

b. Sand Boils. These danger spots are serious if discharging material. The common method of controlling sand boils consists of walling up a watertight sack ring around the boil up to a height necessary to reduce the velocity of flow to a point at which material is no longer discharged from the boil. See Exhibit "C" Plate 1. The sack ring around the boil should be large enough to protect the defective area immediately surrounding the boil. If several boils of sufficient force to displace sand are observed a sack sublevee may be build around the entire nest of boils, rising to such a height that none of the boils will discharge with enough force to displace sand.

c. Wave Wash. The Supervisor for local interests and Sector Foreman should study the levee beforehand to determine the possibility of wave wash. All such reaches will be located well in advance and for use in emergency, a reserve supply of filled sacks and rolls of cotton bagging will be kept on board flats. If the slope is well sodded, a storm of an hour's duration should cause very little damage. During periods of high wind and high water, ample labor should stand by and experienced personnel should observe where the washouts are beginning by sounding or by actually wading along the submerged slope. Sections of cotton bagging should be placed over the washed areas, as shown on Exhibit "C", Plate 3. As an alternative, filling sacks should be placed in the cut in an effective manner and as soon as possible. The filled sacks should be laid in sections of sufficient length to give protection well above the anticipated rise. Bagging so laid must be thoroughly weighted down to be effective. Plate 2, Exhibit "C" shows a movable type of wave wash protection, also used with good results. Its advantage is that it can be rapidly built at any convenient place and easily set in place on the job.

d. Scours. A careful observation should be made of the river side of the levee at all localities where a current of more than two feet per second is observed, or where profiles show a high water slope of two feet per mile or greater. Trouble may be looked for at the ends of old levee dikes, road-crossing ramps, old traverses, and places where pipes, sewers and other structures penetrate the levee. If any sign of scour is observed in the pits or at the ends of the dikes, soundings should be taken to observe the amount and progress of the scour. The approved method of construction to check scour in the pits, on the slopes, or at the ends of dikes will be to construct deflection dikes using brush, treetops, or lumber, driving stakes and wiring together, and filling in between with brush and filled sacks or stone.

e. Caving Bank Protection. As protection against active caving of riverbanks, rock-filled cribs are very effective if properly placed. Cribs are usually 14 by 14 feet in plan by 10 to 14 inches in inside depth. The cribs are constructed on a double thickness of 1" x 4" x 14' lumber, equivalent to 2" x 4" pieces, lapped rail fence fashion at all corners and intersections. They are divided into four compartments of about equal area by two perpendicular cross walls constructed in the same manner as the side walls. The floors and covers are built up of double 1" x 4" boards spaced about 9" center to center. Under the floor and perpendicular to the direction of the floor boards are five equally spaced pairs of 1" x 4" boards about 3 feet center to center. On top of the cover, perpendicular to the direction of the cover boards, are three pairs of top boards, one over each of the side walls and one over the central division wall. All intersections are nailed with one 20d nail. The compartments are filled with rock before covering. Each wall intersection of the fabricated cribs is securely fastened by a loop of No. 9 wire. See Exhibit "C", Plate 4.

5-09. Topping. Immediate consideration should be given the grade line of each levee section by comparison of existing grades with those shown on the drawings, Exhibit "B". If any reaches show a grade below the previous highest water, emergency topping should be undertaken at once to such a grade as may be established by the District Engineer of the U. S. Army Engineer District, Sacramento, as follows:

a. Sack topping. Sack topping may be used to raise the crown of the levee about three feet. The sacks should be laid stretcher-wise or along the levee for the first layer, crosswise for the second layer, and so on. Sacks should be lapped at least 1/3 either way and well mauled into place. When properly sacked and tamped, one sack will give about three to four inches of topping. If gravel is available, it should be used for the front facing so as to avoid washing out.

b. Lumber and sack topping. This is the most commonly used method of raising low reaches in emergencies. In putting on this topping, as well as other topping, a careful line of levels should be run and grade stakes set in advance. 2" x 4" x 6' stakes should then be driven on the riverside of the crown six feet apart, and 1" x 12" boards nailed to the landside of the stakes. This wall, backed with a single tier of sacks, will hold out at least one foot of water. If a second foot is necessary, the layers of sacks will have to be increased in number and reinforced. The stakes should be driven three feet in the ground, and should project out three feet, thus providing, in extreme cases, a three-foot topping if properly braced behind with sacks and earth. In some instances, it may be practicable to back up the planking with tamped earth obtained in the vicinity in lieu of the sacks as shown on the drawing, Exhibit "C", Plate 5.

5-10. Transportation. In instances where it is necessary to send equipment over roads that are impassable due to mud or sand, their passage may be provided by the use of a plant road or by means of steel or wire mats. Telephone communication should be provided along dangerous stretches of the levee when travel or other satisfactory means of communication cannot be maintained.

5-11. Use of Government Plant. The District Engineer is authorized to use or loan Government property and plant in cases of emergency where life is in danger and there is no opportunity to secure prior authority suitable private equipment is available, provided that such use is without detriment to the Government.

EXHIBIT A

FEDERAL FLOOD CONTROL REGULATIONS

TITLE 33 - NAVIGATION AND NAVIGABLE WATERS
(as of 1 January 1962)

Chapter II - Corps of Engineers
Department of the Army

PART 208 - Flood Control Regulations

MAINTENANCE AND OPERATION OF FLOOD CONTROL WORKS

Pursuant to the provisions of section 3 of the Act of Congress approved June 22, 1936, as amended and supplemented, (Sec. 3, 49 Stat. 1571 as amended; 33 U.S.C. 701c), the following regulations are hereby prescribed to govern the maintenance and operation of flood control works:

AUTHORITY: §§ 208.10 to 208.91 issued under sec. 7, 58 Stat. 890; 33 U.S.C. 709. Additional authority is cited in parentheses following the sections affected.

§ 208.10 Local flood protection works; maintenance and operation of structures and facilities.

(a) *General.* (1) The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits.

(2) The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of the Army, as required by law, shall appoint a permanent committee consisting of or headed by an official hereinafter called the "Superintendent," who shall be responsible for the development and maintenance of, and directly in charge of, an organization responsible for the efficient operation and maintenance of all of the structures and facilities during flood periods and for continuous inspection and maintenance of the project works during periods of low water, all without cost to the United States.

(3) A reserve supply of materials needed during a flood emergency shall be kept on hand at all times.

(4) No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the rights-of-way for the protective facilities.

(5) No improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the District Engineer of the Department of the Army or his authorized representative that such improvement, excavation, construction, or alteration will not adversely affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable and permissible under the above determination shall be constructed in accordance with standard engineering practice. Advice regarding the effect of proposed improvements or alterations on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice shall be obtained from the District Engineer or, if otherwise obtained, shall be submitted for his approval. Drawings or prints showing such improvements or alterations as finally constructed shall be furnished the District Engineer after completion of the work.

(6) It shall be the duty of the superintendent to submit a semiannual report to the District Engineer covering inspection, maintenance, and operation of the protective works.

(7) The District Engineer or his authorized representatives shall have access at all times to all portions of the protective works.

(8) Maintenance measures or repairs which the District Engineer deems necessary shall be promptly taken or made.

(9) Appropriate measures shall be taken by local authorities to insure that the activities of all local organizations operating public or private facilities connected with the protective works are coordinated with those of the Superintendent's organization during flood periods.

(10) The Department of the Army will furnish local interests with an Operation and Maintenance Manual for each completed project, or separate useful part thereof, to assist them in carrying out their obligations under this part.

(b) *Levees*—(1) *Maintenance.* The Superintendent shall provide at all times such maintenance as may be required to insure serviceability of the structures in time of flood. Measures shall be taken to promote the growth of sod, exterminate burrowing animals, and to provide for routine mowing of the grass and weeds, removal of wild growth and drift deposits, and repair of damage caused by erosion or other forces. Where practicable, measures shall be taken to retard bank erosion by planting of willows or other suitable growth on areas riverward of the levees. Periodic inspections shall be made by the Superintendent to insure that the above maintenance measures are being effectively carried out and, further, to be certain that:

(i) No unusual settlement, sloughing, or material loss of grade or levee cross section has taken place;

(ii) No caving has occurred on either the land side or the river side of the levee which might affect the stability of the levee section;

(iii) No seepage, saturated areas, or sand boils are occurring;

(iv) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged;

(v) Drains through the levees and gates on said drains are in good working condition;

(vi) No revetment work or riprap has been displaced, washed out, or removed;

(vii) No action is being taken, such as burning grass and weeds during inappropriate seasons, which will retard or destroy the growth of sod;

(viii) Access roads to and on the levee are being properly maintained;

(ix) Cattle guards and gates are in good condition;

(x) Crown of levee is shaped so as to drain readily, and roadway thereon, if any, is well shaped and maintained;

(xi) There is no unauthorized grazing or vehicular traffic on the levees;

(xii) Encroachments are not being made on the levee right-of-way which might endanger the structure or hinder its proper and efficient functioning during times of emergency.

Such inspections shall be made immediately prior to the beginning of the flood season; immediately following each major high water period, and otherwise at intervals not exceeding 90 days, and such intermediate times as may be necessary to insure the best possible care of the levee. Immediate steps will be taken to correct dangerous conditions disclosed by such inspections. Regular maintenance repair measures shall be accomplished during the appropriate season as scheduled by the Superintendent.

(2) *Operation.* During flood periods the levee shall be patrolled continuously to locate possible sand boils or unusual wetness of the landward slope and to be certain that:

(i) There are no indications of slides or sloughs developing;

(ii) Wave wash or scouring action is not occurring;

(iii) No low reaches of levee exist which may be overtopped;

(iv) No other conditions exist which might endanger the structure.

Appropriate advance measures will be taken to insure the availability of adequate labor and materials to meet all contingencies. Immediate steps will be taken to control any condition which endangers the levee and to repair the damaged section.

(c) *Flood walls*—(1) *Maintenance.* Periodic inspections shall be made by the Superintendent to be certain that:

(i) No seepage, saturated areas, or sand boils are occurring;

(ii) No undue settlement has occurred which affects the stability of the wall or its water tightness;

(iii) No trees exist, the roots of which might extend under the wall and offer accelerated seepage paths;

(iv) The concrete has not undergone cracking, chipping, or breaking to an extent which might affect the stability of the wall or its water tightness;

(v) There are no encroachments upon the right-of-way which might endanger the structure or hinder its functioning in time of flood;

(vi) Care is being exercised to prevent accumulation of trash and debris adjacent to walls, and to insure that no fires are being built near them;

(vii) No bank caving conditions exist riverward of the wall which might endanger its stability;

(viii) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged.

Such inspections shall be made immediately prior to the beginning of the flood season, immediately following each major high water period, and otherwise at intervals not exceeding 90 days. Measures to eliminate encroachments and effect repairs found necessary by such inspections shall be undertaken immediately. All repairs shall be accomplished by methods acceptable in standard engineering practice.

(2) *Operation.* Continuous patrol of the wall shall be maintained during flood periods to locate possible leakage at monolith joints or seepage underneath the wall. Floating plant or boats will not be allowed to lie against or tie up to the wall. Should it become necessary during a flood emergency to pass anchor cables over the wall, adequate measures shall be taken to protect the concrete and construction joints. Immediate steps shall be taken to correct any condition which endangers the stability of the wall.

(d) *Drainage structures*—(1) *Maintenance.* Adequate measures shall be taken to insure that inlet and outlet channels are kept open and that trash, drift, or debris is not allowed to accumulate near drainage structures. Flap gates and manually operated gates and valves on drainage structures shall be examined, oiled, and trial operated at least once every 90 days. Where drainage structures are provided with stop log or other emergency closures, the condition of the equipment and its housing shall be inspected regularly and a trial installation of the emergency closure shall be made at least once each year. Periodic inspections shall be made by the Superintendent to be certain that:

(i) Pipes, gates, operating mechanism, riprap, and headwalls are in good condition;

(ii) Inlet and outlet channels are open;

(iii) Care is being exercised to prevent the accumulation of trash and debris near the structures and that no fires are being built near bituminous coated pipes;

(iv) Erosion is not occurring adjacent to the structure which might endanger its water tightness or stability.

Immediate steps will be taken to repair damage, replace missing or broken parts, or remedy adverse conditions disclosed by such inspections.

(2) *Operation.* Whenever high water conditions impend, all gates will be inspected a short time before water reaches the invert of the pipe and any object which might prevent closure of the gate shall be removed. Automatic gates shall be closely observed until it has been ascertained that they are securely closed. Manually operated gates and valves shall be closed as necessary to prevent inflow of flood water. All drainage structures

in levees shall be inspected frequently during floods to ascertain whether seepage is taking place along the lines of their contact with the embankment. Immediate steps shall be taken to correct any adverse condition.

(e) *Closure structures*—(1) *Maintenance.* Closure structures for traffic openings shall be inspected by the superintendent every 90 days to be certain that:

(i) No parts are missing;

(ii) Metal parts are adequately covered with paint;

(iii) All movable parts are in satisfactory working order;

(iv) Proper closure can be made promptly when necessary;

(v) Sufficient materials are on hand for the erection of sand bag closures and that the location of such materials will be readily accessible in times of emergency.

Tools and parts shall not be removed for other use. Trial erections of one or more closure structures shall be made once each year, alternating the structures chosen so that each gate will be erected at least once in each 3-year period. Trial erection of all closure structures shall be made whenever a change is made in key operating personnel. Where railroad operation makes trial erection of a closure structure infeasible, rigorous inspection and drill of operating personnel may be substituted therefor. Trial erection of sand bag closures is not required. Closure materials will be carefully checked prior to and following flood periods, and damaged or missing parts shall be repaired or replaced immediately.

(2) *Operation.* Erection of each movable closure shall be started in sufficient time to permit completion before flood waters reach the top of the structure sill. Information regarding the proper method of erecting each individual closure structure, together with an estimate of the time required by an experienced crew to complete its erection will be given in the Operation and Maintenance Manual which will be furnished local interests upon completion of the project. Closure structures will be inspected frequently during flood periods to ascertain that no undue leakage is occurring and that drains provided to care for ordinary leakage are functioning properly. Boats or floating plant shall not be allowed to tie up to closure structures or to discharge passengers or cargo over them.

(f) *Pumping plants*—(1) *Maintenance.* Pumping plants shall be inspected by the Superintendent at intervals not to exceed 30 days during flood seasons and 90 days during off-flood seasons to insure that all equipment is in order for instant use. At regular intervals, proper measures shall be taken to provide for cleaning plant, buildings, and equipment, repainting as necessary, and lubricating all machinery Adequate supplies of lubricants for all types of machines, fuel for gasoline or diesel powered equipment, and flash lights or lanterns for emergency lighting shall be kept on hand at all times. Telephone service shall be maintained at pumping plants. All equipment, including switch gear, transformers, motors, pumps, valves, and gates shall be trial operated and checked at least once every 90 days. Megger tests of all insulation shall be made whenever wiring has been subjected to undue dampness and otherwise at intervals not to exceed one year. A record shall be kept showing the results of such tests. Wiring disclosed to be in an unsatisfactory condition by such tests shall be brought to a satisfactory condition or shall be promptly replaced Diesel and gasoline engines shall be started at such intervals and allowed to run for such length of time as may be necessary to insure their serviceability in times of emergency. Only skilled electricians and mechanics shall be employed on tests and repairs. Operating personnel for the plant shall be present during tests. Any equipment removed from the station for repair or replacement shall be returned or replaced as soon as practicable and shall be trial operated after reinstallation. Repairs requiring removal of equipment from the plant shall be made during off-flood seasons insofar as practicable.

(2) *Operation.* Competent operators shall be on duty at pumping plants whenever it appears that necessity for pump operation is imminent. The operator shall thoroughly inspect, trial operate, and place in readiness all plant equipment. The operator shall be familiar with the equipment manufacturers' instructions and drawings and with the "Operating Instructions" for each station. The equipment shall be operated in accordance with the above-mentioned "Operating Instructions" and care shall be exercised that proper lubrication is being supplied all equipment, and that no overheating, undue vibration or noise is occurring. Immediately upon final recession of flood waters, the pumping station shall be thoroughly cleaned, pump house sumps flushed, and equipment thoroughly inspected, oiled and greased. A record or log of pumping plant operation shall be kept for each station, a copy of which shall be furnished the District Engineer following each flood.

(g) *Channels and floodways* — (1) *Maintenance.* Periodic inspections of improved channels and floodways shall be made by the Superintendent to be certain that:

(i) The channel or floodway is clear of debris, weeds, and wild growth;

(ii) The channel or floodway is not being restricted by the depositing of waste materials, building of unauthorized structures or other encroachments;

(iii) The capacity of the channel or floodway is not being reduced by the formation of shoals;

(iv) Banks are not being damaged by rain or wave wash, and that no sloughing of banks has occurred;

(v) Riprap sections and deflection dikes and walls are in good condition;

(vi) Approach and egress channels adjacent to the improved channel or floodway are sufficiently clear of obstructions and debris to permit proper functioning of the project works.

Such inspections shall be made prior to the beginning of the flood season and otherwise at intervals not to exceed 90 days. Immediate steps will be taken to remedy any adverse conditions disclosed by such inspections. Measures will be taken by the Superintendent to promote the growth of grass on bank slopes and earth deflection dikes. The Superintendent shall provide for periodic repair and cleaning of debris basins, check dams, and related structures as may be necessary.

(2) *Operation.* Both banks of the channel shall be patrolled during periods of high water, and measures shall be taken to protect those reaches being attacked by the current or by wave wash. Appropriate measures shall be taken to prevent the formation of jams of ice or debris. Large objects which become lodged against the bank shall be removed. The improved channel or floodway shall be thoroughly inspected immediately following each major high water period. As soon as practicable thereafter, all snags and other debris shall be removed and all damage to banks, riprap, deflection dikes and walls, drainage outlets, or other flood control structures repaired.

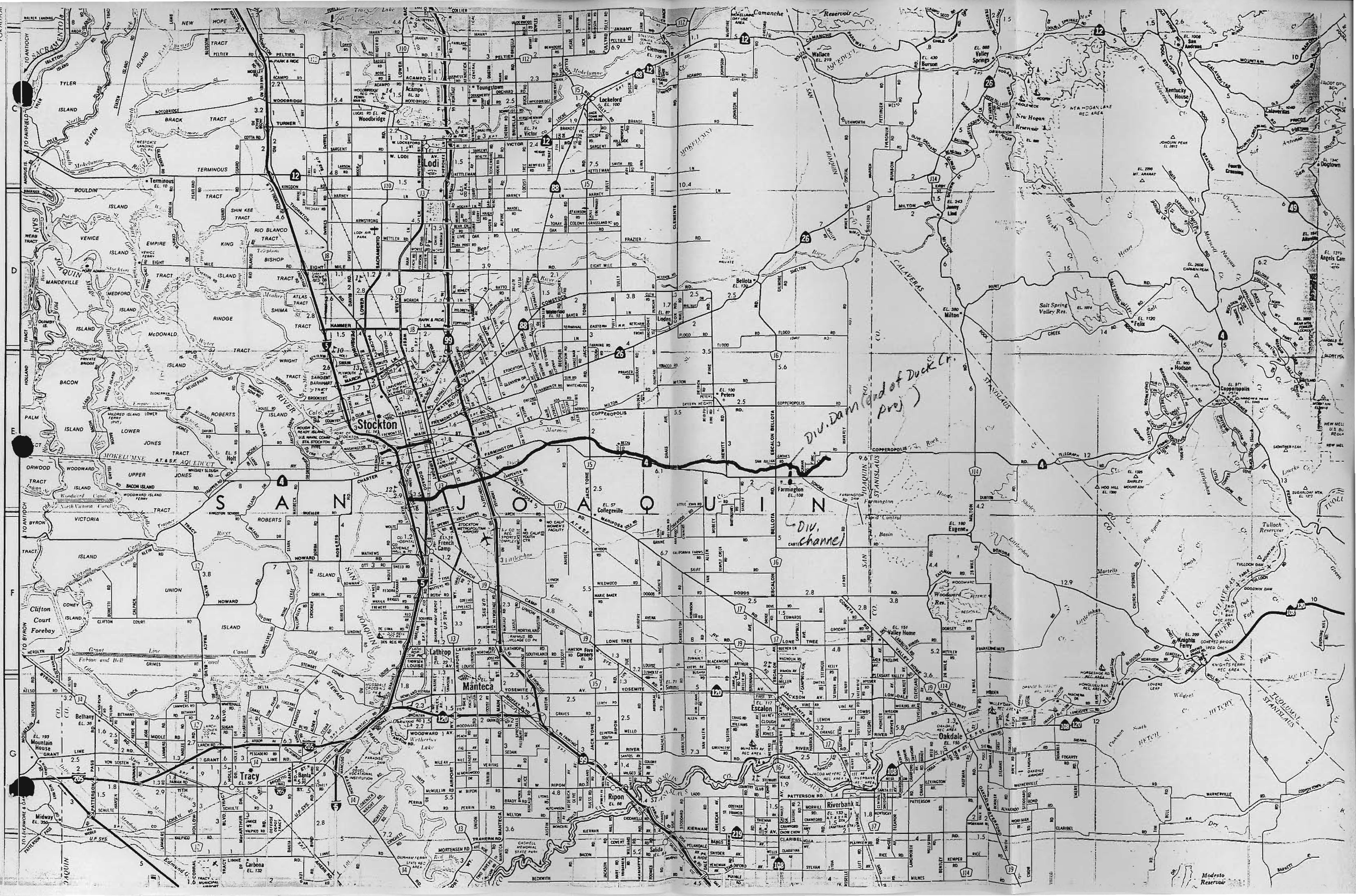
(h) *Miscellaneous facilities* — (1) *Maintenance.* Miscellaneous structures and facilities constructed as a part of the protective works and other structures and facilities which function as a part of, or affect the efficient functioning of the protective works, shall be periodically inspected by the Superintendent and appropriate maintenance measures taken. Damaged or unserviceable parts shall be repaired or replaced without delay. Areas used for ponding in connection with pumping plants or for temporary storage of interior run-off during flood periods shall not be allowed to become filled with silt, debris, or dumped material. The Superintendent shall take proper steps to prevent restriction of bridge openings and, where practicable, shall provide for temporary raising during floods of bridges which restrict channel capacities during high flows.

(2) *Operation.* Miscellaneous facilities shall be operated to prevent or reduce flooding during periods of high water. Those facilities constructed as a part of the protective works shall not be used for purposes other than flood protection without approval of the District Engineer unless designed therefor.

(Sec. 3, 49 Stat. 1571, as amended; 33 U.S.C. 701c) [9 F.R. 8999, Aug. 17, 1944; 9 F.R. [10300, Aug. 22, 1944]

1200' Proj Levee U.S. old French Camp Rd

3400' Proj levee starting about here D.S. in part way



S A N J O A Q U I N
Stockton
Lodi
Manteca
Tracy
Lathrop
Ripon
Escalon
Riverbank
Oakdale
Linden
Lockeford
Clements
Acampo
Woodbridge
Farmington
Bellota
Peters
Collegeville
Valley Home
Knights Ferry
Copperopolis
Milton
Eugene
Salida
Banta
Carbona
Vernalis
Mountain House
Bethany
Midway
Terminous
Holt
French Camp
Thornton
Wallace
Burson
Valley Springs
Jenny Lind
Hodson
Salt Spring Valley Res.
Woodward Res.
Tulloch Reservoir
Farmington Flood Control Basin
Modesto Reservoir
Clifton Court Forebay
Camanche Reservoir
Div. Dam (end of Duck Cr. Proj.)
Div. channel

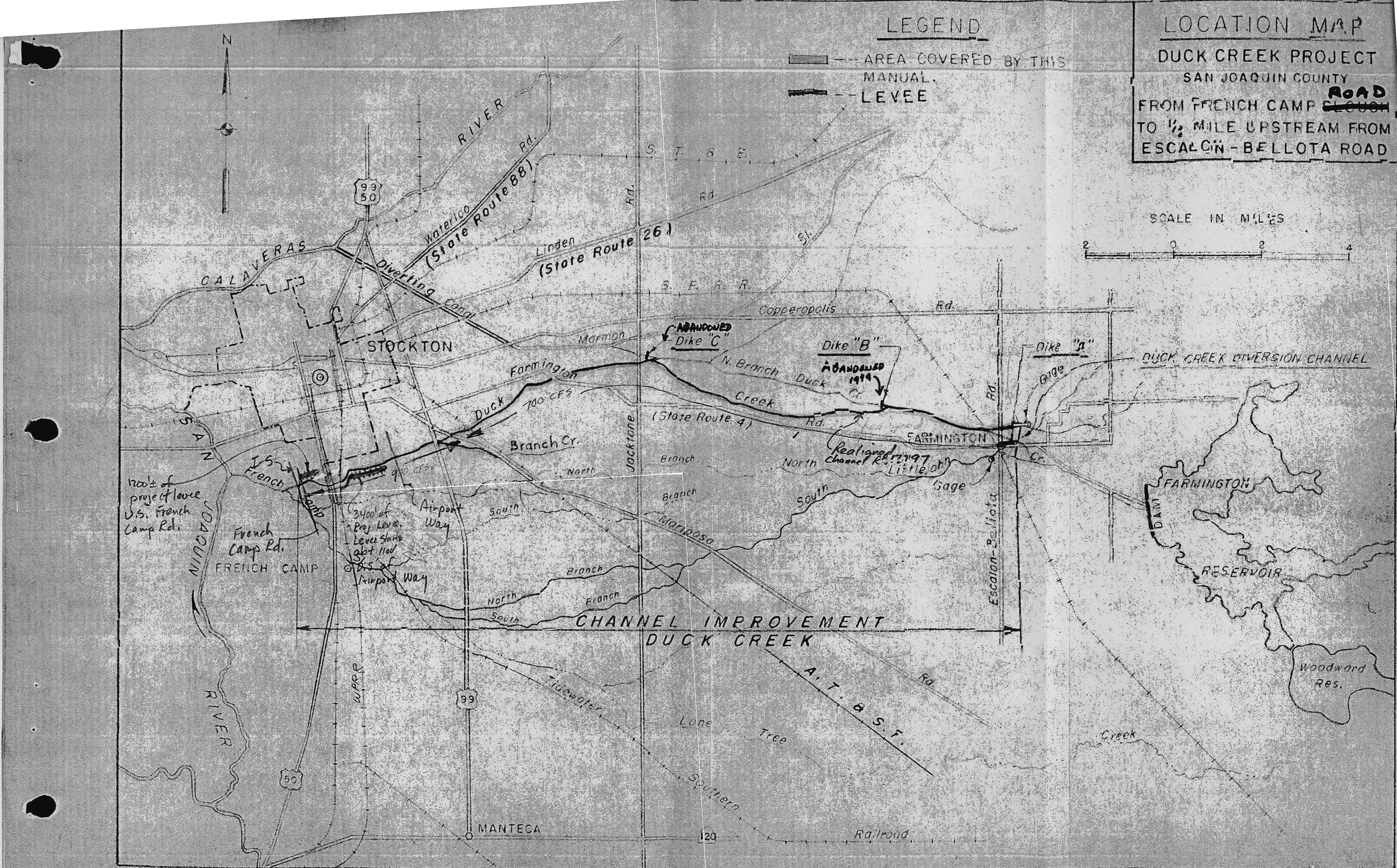

LOCATION MAP
DUCK CREEK PROJECT
SAN JOAQUIN COUNTY
FROM FRENCH CAMP ROAD
TO ½ MILE UPSTREAM FROM
ESCALON - BELLOTA ROAD
LEGEND
AREA COVERED BY THIS MANUAL.
LEVEE
SCALE IN MILES
2
0
2
4
N
STOCKTON
CALAVERAS
RIVER
Waterloo Rd.
(State Route 88)
Linden Rd.
(State Route 26)
Diverting Canal
Copperopolis Rd.
Mormon Sl.
Farmington
Duck Creek
(State Route 4)
Rd.
ABANDONED Dike "C"
Dike "B"
ABANDONED 1979
Dike "A"
N. Branch Duck Cr.
DUCK CREEK DIVERSION CHANNEL
Gage
FARMINGTON
Realigned Channel
Little Johns Cr.
Branch Cr.
700 CFS
900 CFS
North Branch
South Branch
Jacktone Rd.
Escalon-Bellota Rd.
Mariposa Rd.
SAN JOAQUIN RIVER
French Camp
FRENCH CAMP
French Camp Rd.
1200'± of project levee U.S. French Camp Rd.
3400' of Proj. Levee. Levee Starts abt 1100' D.S. of Airport Way
Airport Way
CHANNEL IMPROVEMENT
DUCK CREEK
A. T. & S. F.
Tidewater Southern Railroad
Lone Tree Creek
WPRR
99
50
120
MANTECA
FARMINGTON DAM
RESERVOIR
Woodward Res.
S. T. & E.
S. P. R. R.

EXHIBIT A

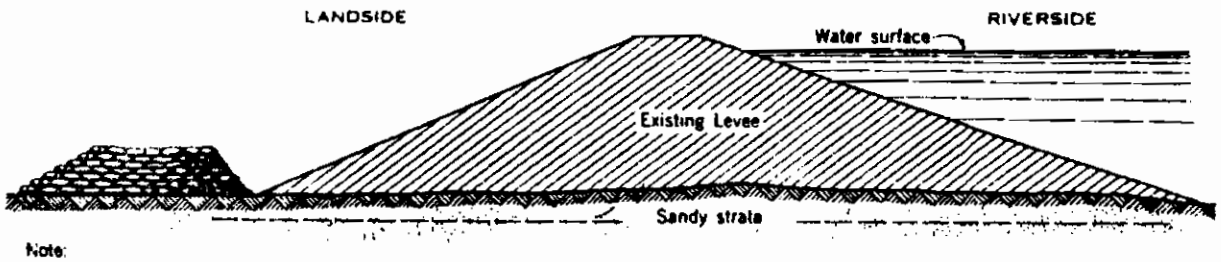
EXHIBIT B
"AS CONSTRUCTED"
DRAWINGS
(SEE SEPARATE FOLDER FOR THE FOLLOWING DRAWINGS)

FILE NO.	TITLE
7-4-1679	Duck Creek Channel Improvement from French Camp Slough to 1/2 Mile Upstream from Escalon-Bellota Road, in 38 sheets.
7-4-1705	Duck Creek Project Modification from French Camp Slough to 1/2 Mile Upstream from Escalon-Bellota Road, in 11 sheets.

EXHIBIT B
Unattached

EXHIBIT C

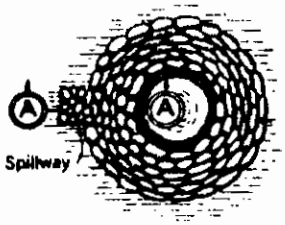
PLATES OF SUGGESTED FLOOD FIGHTING METHODS

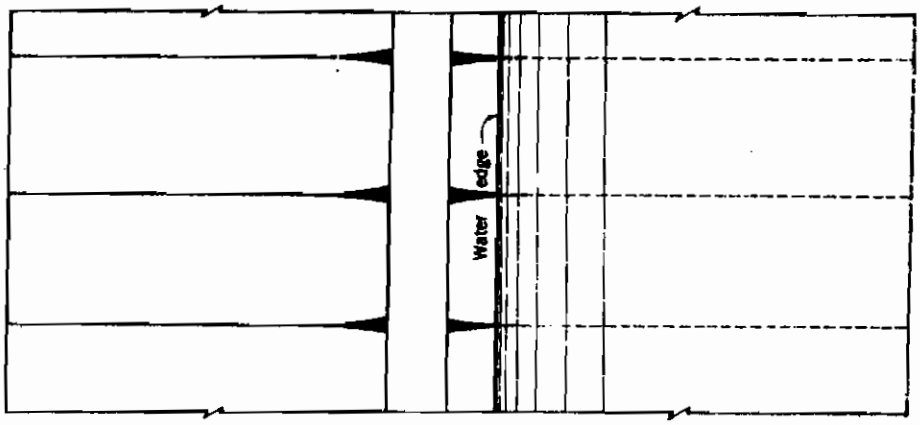


Note:
Bottom width to be no less than 1½ times height.
Be sure to clear sand discharge.
Tie into levee if boil is near toe.

ELEVATION

SECTION A-A





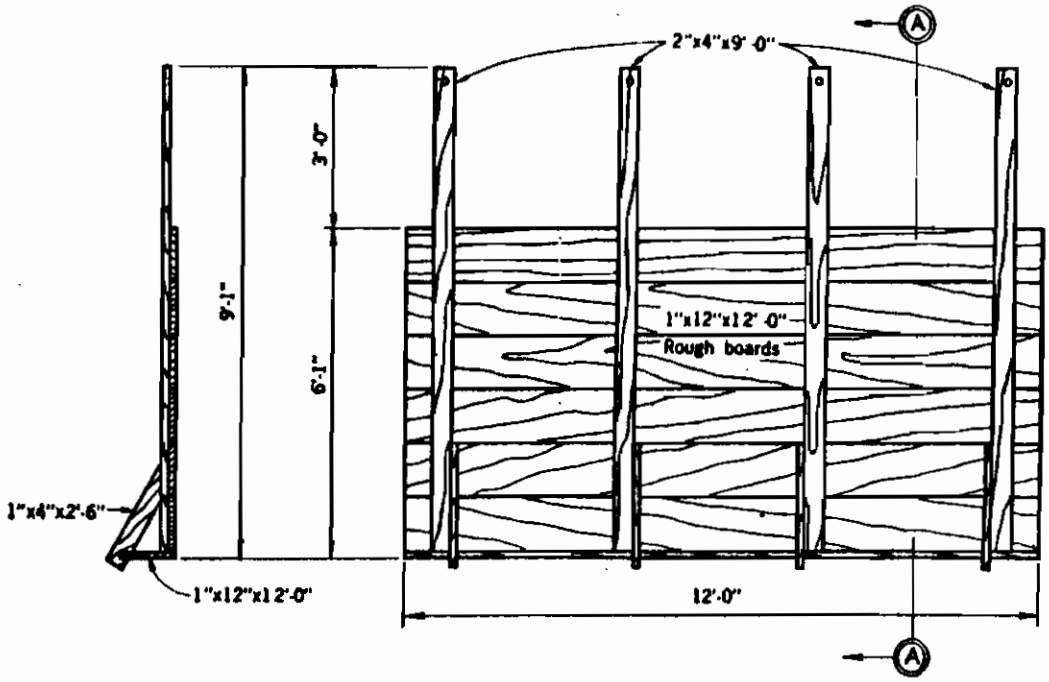
PLAN

Note:
Do not sack boil which does not put out material.
Height of sack loop or ring should be only sufficient to create enough head to slow down flow through boil so that no more material is displaced and boil runs clear.
Never attempt to completely stop flow through boil.

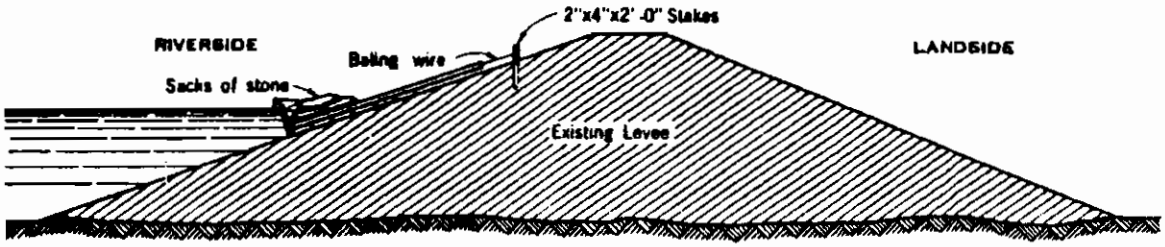
DUCK CREEK
SAN JOAQUIN COUNTY
FLOOD CONTROL PROJECT

CONTROL OF SAND BOILS

U.S. ENGINEER OFFICE, SACRAMENTO, CALIF.



SECTION A-A PLAN



SECTION

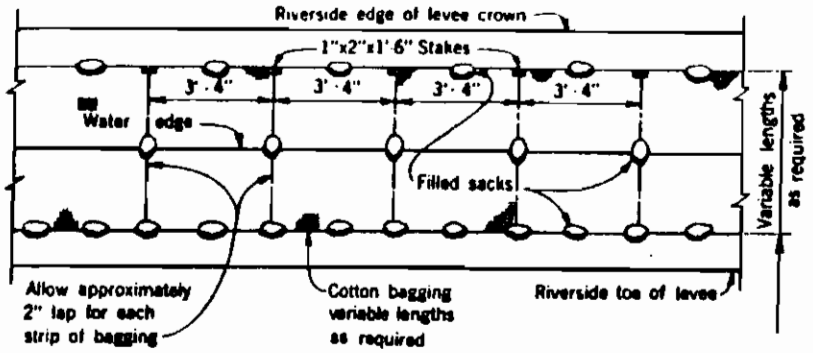
BILL OF MATERIAL FOR 100 FEET
LUMBER
56 pieces 1"x12"x12'-0" 32 pieces 1"x4"x2'-6" 32 pieces 2"x4"x9'-0" • 32 pieces 2"x4"x2'-0" • (Sharpened)
WIRE
200' baling wire
NAILS
4½ lbs.-8d nails

DUCK CREEK
SAN JOAQUIN COUNTY

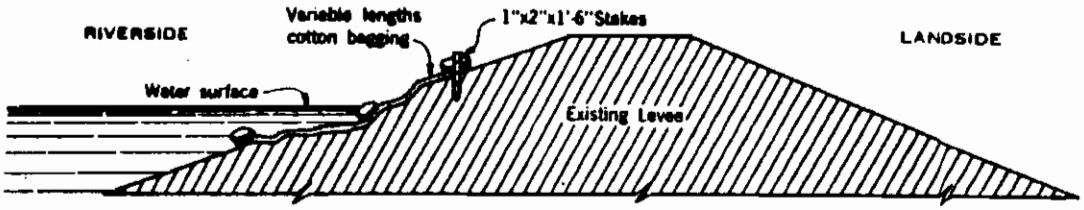
FLOOD CONTROL PROJECT

MOVABLE WAVE WASH PROTECTION

U.S. ENGINEER OFFICE, SACRAMENTO, CALIF.



PLAN



SECTION

Note:

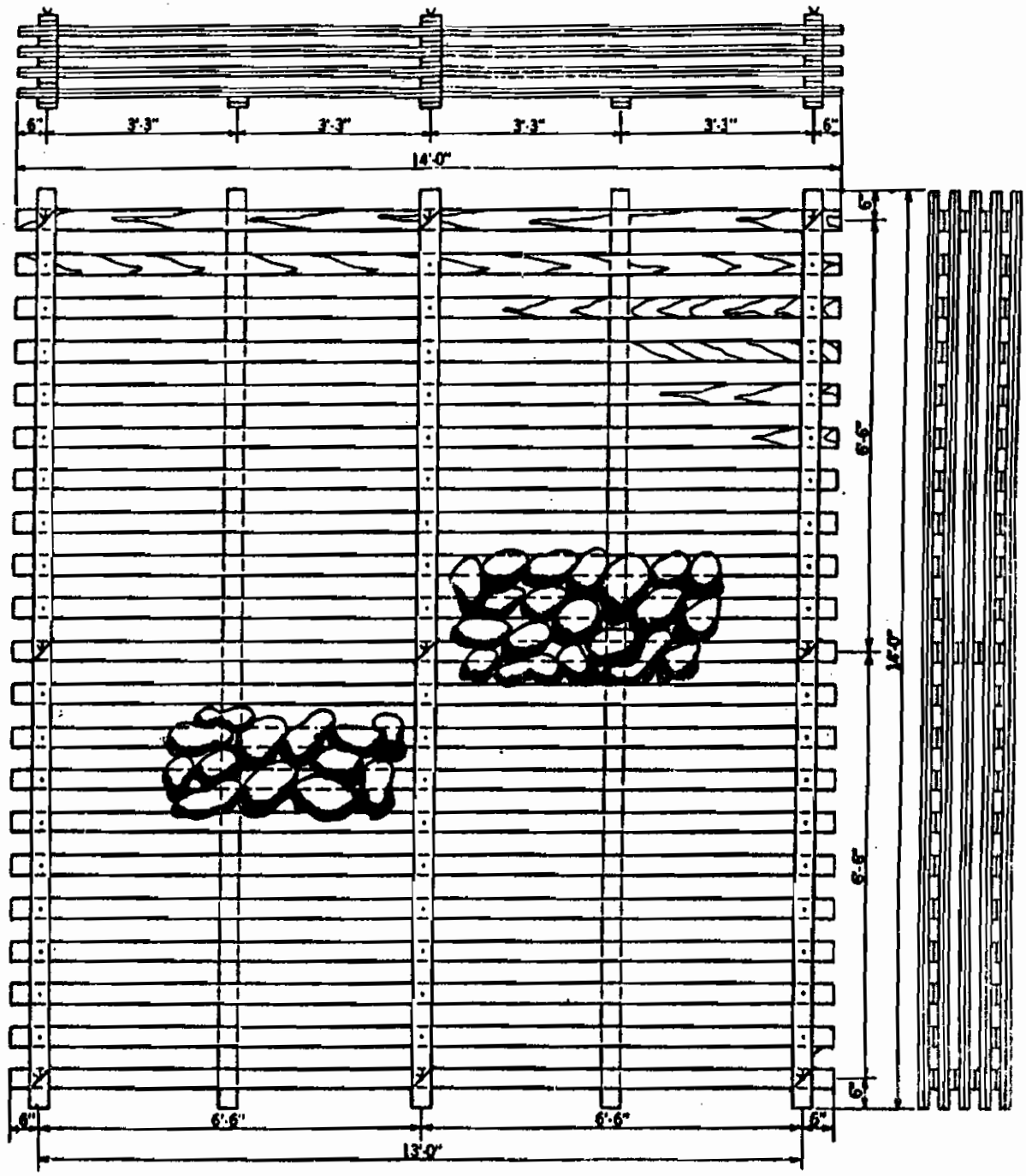
Lay lengths as required of cotton bagging approximately parallel with levee slope and across damaged section. Weight top and edges of bagging with filled sacks as shown above. The filled sacks should be wired or tied to each strip before laying in place. Stake the corners of each strip above water surface. Where cotton bagging is not available burlap sacking may be substituted.

MATERIAL REQUIRED FOR 100 LINEAR FEET OF LEVEE
LUMBER
▪ 30 Stakes 1"x2"x1'-6" ▪ (Sharpened)
SANDBAGS
120 sand bags Cotton bagging as required

DUCK CREEK
SAN JOAQUIN COUNTY
FLOOD CONTROL PROJECT

WAVE WASH PROTECTION

U.S. ENGINEER OFFICE, SACRAMENTO, CALIF.



Note:

Cribs constructed of double thickness of 1"x4"x14'-0" lumber. Nail all intersections with 1-20d nail. Each intersection of walls securely fastened by a loop of No. 9 wire, tightly twisted.

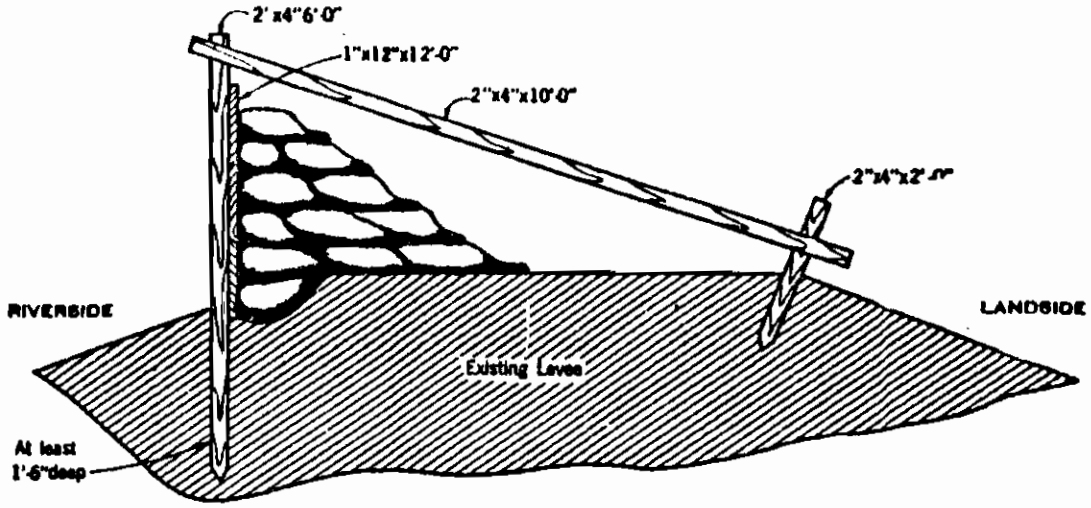
BILL OF MATERIAL FOR ONE CRIB 13'-0"
LUMBER
130 pieces 1"x4"x14'-0"
WIRE
30' No. 9 wire
NAILS
12½ lbs.-20d nails

DUCK CREEK
SAN JOAQUIN COUNTY
FLOOD CONTROL PROJECT

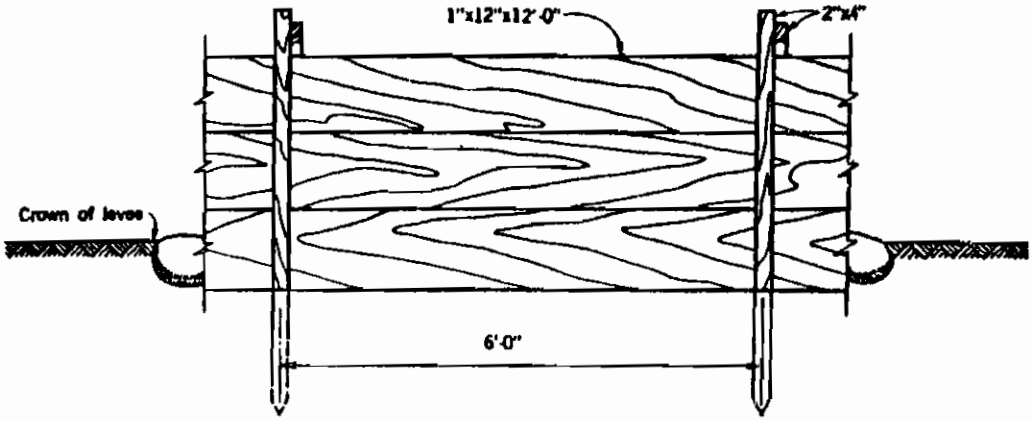
CAVING BANK PROTECTION

U.S. ENGINEER OFFICE, SACRAMENTO, CALIF.

EXHIBIT "C" PLATE 4



SECTION



FRONT ELEVATION

BILL OF MATERIAL FOR 100 LINEAR FEET OF LEVEE
LUMBER
25 pieces 1"x12"x12'-0" 17 pieces 2"x4"x10'-0" * 17 pieces 2"x4"x6'-0" * 17 pieces 2"x4"x2'-0" * (Sharpened)
NAILS
1 lb. -8d nails 2 lbs.-16d nails
SANDBAGS
1100 bags

DUCK CREEK
SAN JOAQUIN COUNTY
FLOOD CONTROL PROJECT

LUMBER AND SACK TOPPING

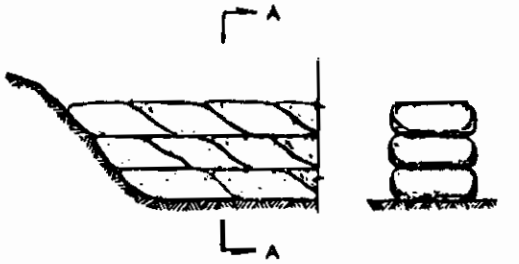
U. S. ENGINEER OFFICE, SACRAMENTO, CALIF.

LEVEE CONSTRUCTION

SANDBAGGING USED TO PREVENT OVERTOPPING OF EXISTING LEVEES AND FOR RETAINING FLOOD WATERS WHERE NO BACK-UP MATERIAL IS AVAILABLE.

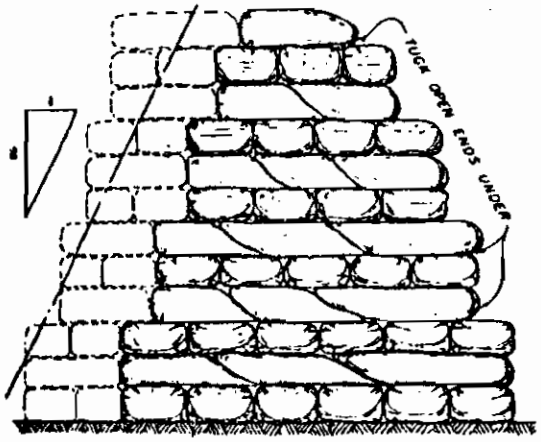
INSTRUCTIONS:

1. FILL SANDBAGS 1/2 TO 2/3 FULL BUT LEAVE ENOUGH FLAP TO TURN UNDER DO NOT TIE. LEAVE ENDS OPEN
2. FOR HEIGHTS OF 1 FOOT AND LESS, LAY 3 SINGLE COURSES WITH SACKS LENGTHWISE AS SHOWN IN SKETCH "A" BELOW.
3. FOR HEIGHTS GREATER THAN 1 FOOT, PLACE AS INDICATED IN SKETCH "B" BELOW.
4. WHEN BAGS ARE PLACED FLATTEN OUT AND FILL VOIDS BY MASHING BAGS WITH FEET AND VIGOROUSLY TRAMP EACH COURSE OF THE LEVEE SECTION. THIS IS AN EXTREMELY IMPORTANT OPERATION FOR PROVIDING A LEVEE WHICH WILL BE AS IMPERVIOUS TO WATER AS POSSIBLE AND TO INSURE STABILITY OF SECTION LOOSELY PLACED SANDBAGS IMPROPERLY KEYED TOGETHER MAY RESULT IN FAILURE AND CAUSE SERIOUS DAMAGE.



ELEVATION SECTION A-A

SKETCH A



LEVEE SECTION

FOR HEIGHTS IN EXCESS OF THE ABOVE (APPROX 3'-6") HOLD SAME BATTER AND BUILD ON THE SIDE AS INDICATED BY DASHED LINES ABOVE ALTERNATE HEADER COURSES (BAGS PLACED CROSSWISE) AND STRETCHER COURSES (BAGS PLACED LENGTHWISE).

SKETCH B

ESTIMATING DATA:

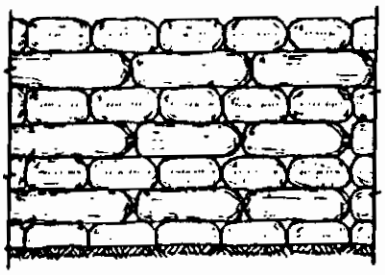
1. AVERAGE WEIGHT OF EACH FILLED SANDBAG, APPROX 50 LBS.
2. APPROXIMATELY 1000 SANDBAGS ARE REQUIRED FOR EACH 100 SQ. FT OF SURFACE (HEIGHT MULTIPLIED BY DISTANCE)

REVETMENTS

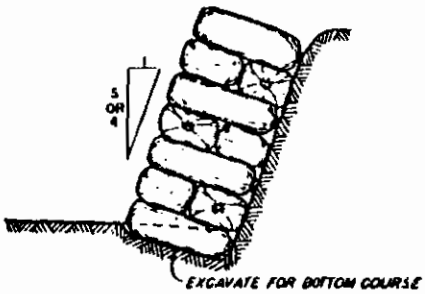
USED FOR EMERGENCY BANK PROTECTION TO PREVENT UNDER CUTTING AND CONTROL OF COURSE OF FLOOD CHANNELS

INSTRUCTIONS:

1. FILL SANDBAGS 2/3 FULL AND TIE OPEN END.
2. TUCK IN BOTTOM CORNERS OF BAG AFTER FILLING.
3. PLACE BAGS PERPENDICULAR TO SLOPE
4. LAY STRETCHER AND HEADER COURSES WITH CHOKE AND SIDE SEAMS IN: THUS:-



ELEVATION



SECTION

ESTIMATING DATA:

1. AVERAGE WEIGHT OF EACH FILLED SANDBAG APPROXIMATELY 85 LBS
2. APPROXIMATELY 320 SANDBAGS ARE REQUIRED FOR EACH 100 SQ FT OF SURFACE TO BE REVETED.

FILL MATERIAL:

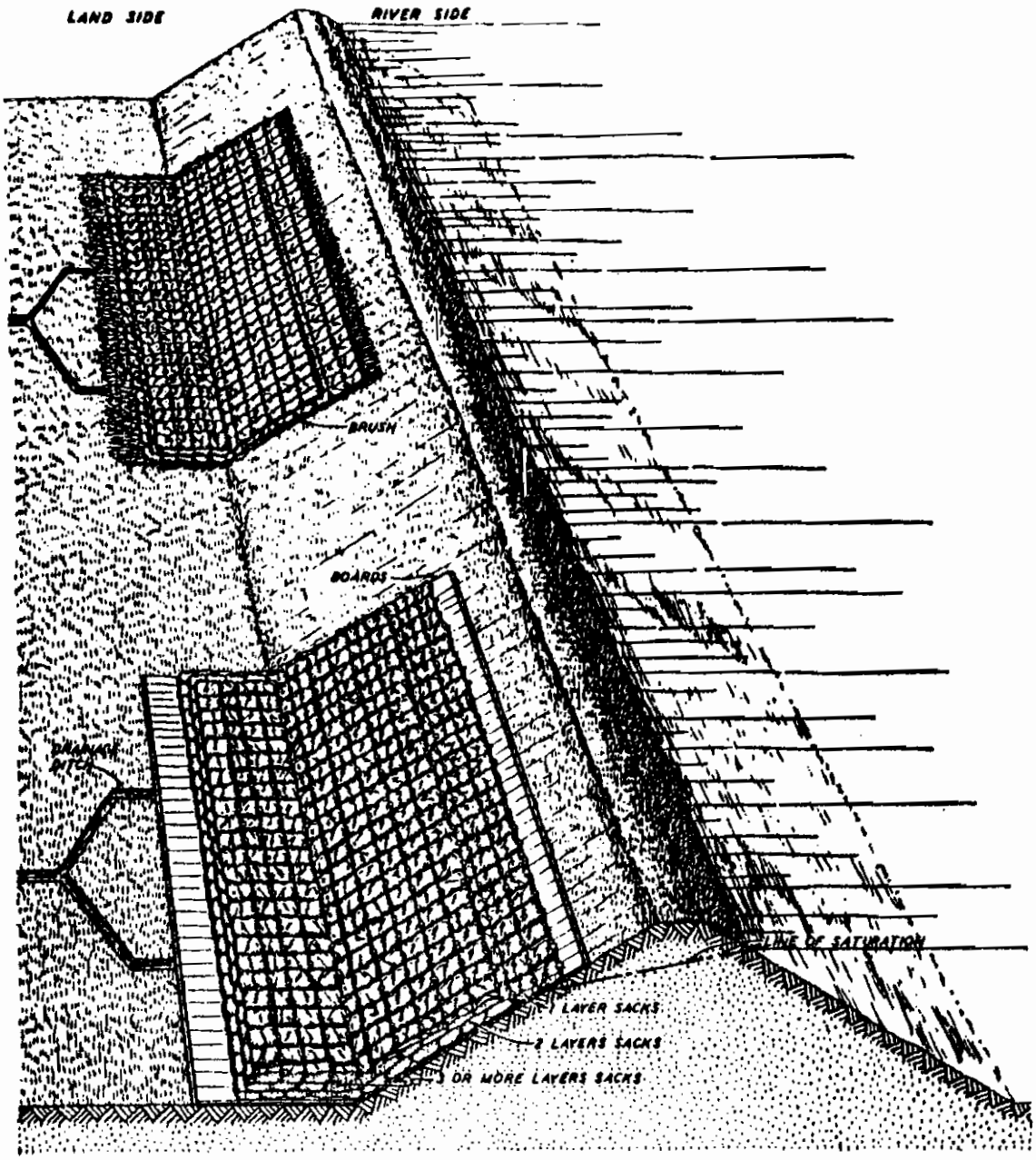
THE IDEAL MATERIAL FOR FILLING SAND BAGS IS A FINE SAND OR COARSE SILT AVOID, AS MUCH AS POSSIBLE, THE USE OF COARSE GRAVEL AND HEAVY CLAYS

DUCK CREEK
SAN JOAQUIN COUNTY
FLOOD CONTROL PROJECT

INSTRUCTIONS FOR PLACING SANDBAGS

U. S. ENGINEER OFFICE, SACRAMENTO, CALIF.

CORPS OF ENGINEERS U. S. ARMY



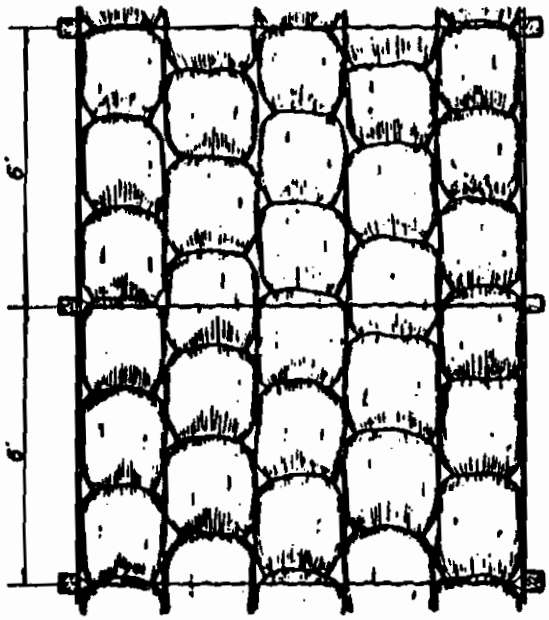
DUCK CREEK
SAN JOAQUIN COUNTY

FLOOD CONTROL PROJECT

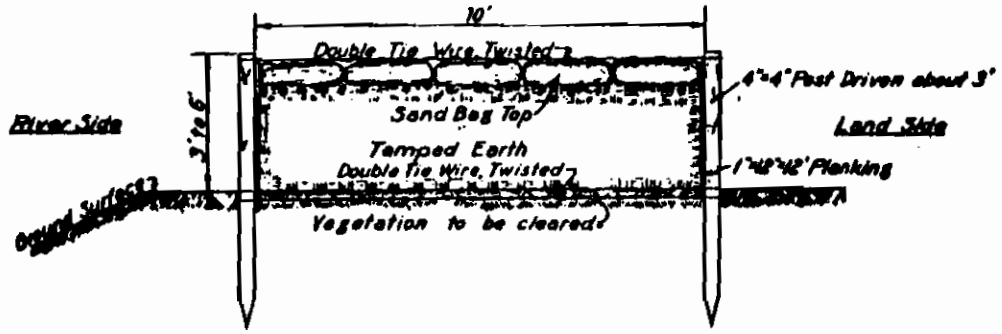
BRUSHING AND SACKING THE LANDSIDE SLOPE

U.S. CORPS OF ENGINEERS, SACRAMENTO, CALIF.

EXHIBIT C PLATE 7



PLAN



END ELEVATION

MATERIAL REQUIRED FOR 100 LINEAR FEET OF LEVEE		
4 FT. HIGH	5 FT. HIGH	6 FT. HIGH
34 pieces 4"x4"x 7' (sharpened) 1122 board feet 67 pieces 1"x12"x12' 25 lbs. wire #12 gage 13 lbs. 10d nails 600 sand bags 148 cu. yds. earth	34 pieces 4"x4"x8' (sharpened) 1371 board feet 84 pieces 1"x12"x12' 25 lbs. wire #12 gage 15 lbs. 10d nails 600 sand bags 185 cu. yds. earth	34 pieces 4"x4"x9' (sharpened) 1608 board feet 100 pieces 1"x12"x12' 25 lbs. wire #12 gage 17 lbs. 10d nails 600 sand bags 222 cu. yds. earth

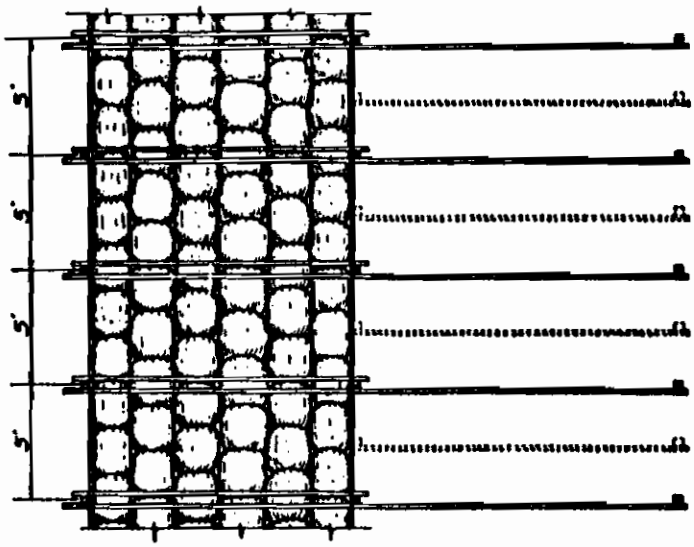
DUCK CREEK
SAN JOAQUIN COUNTY

FLOOD CONTROL PROJECT

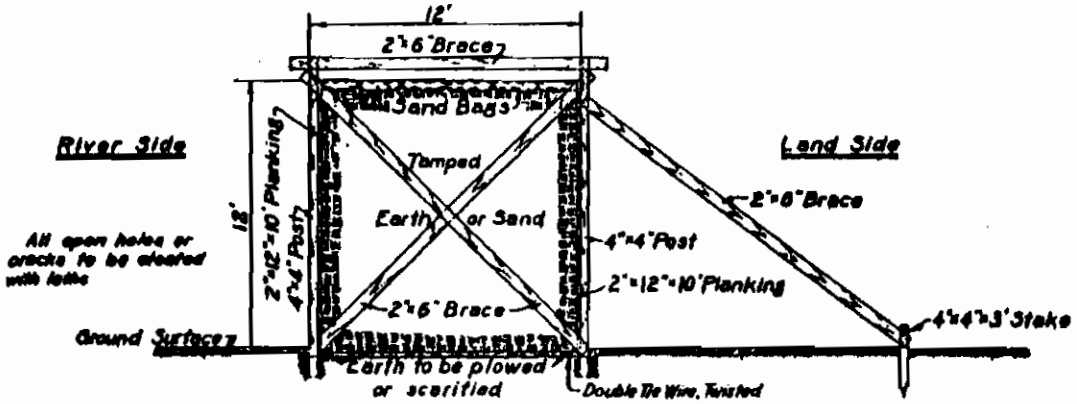
3-6FT. MUD BOX LEVEE CONSTRUCTION DETAILS

U.S. CORPS OF ENGINEERS, SACRAMENTO, CALIF.

EXHIBIT C PLATE 8



PLAN



END ELEVATION

MATERIAL REQUIRED FOR 100 LINEAR FEET OF LEVEE			
LUMBER	SAND BAGS	NAILS	EARTH or SAND
48 Posts 4"x4"x14' 248 Planks 2"x12"x10' 28 Braces 2"x6"x14' 68 Braces 2"x6"x10' #20 Stakes 4"x4"x3' 3 bundles laths Total Lumber 6987 board feet	700	120 lbs-20d 4 lbs-3d fine WIRE 20 lbs 12 gage	534 cu. yds.

ADDITIONAL MATERIAL FOR BRACING BACK SIDE IN BETWEEN BENTS			
LUMBER	SAND BAGS	NAILS	EARTH or SAND
20 Posts 4"x4"x14' 20 Braces 2"x6"x10' #20 Stakes 4"x4"x3' Total Lumber 813 board feet		6 lbs.-20d	

Sharpened

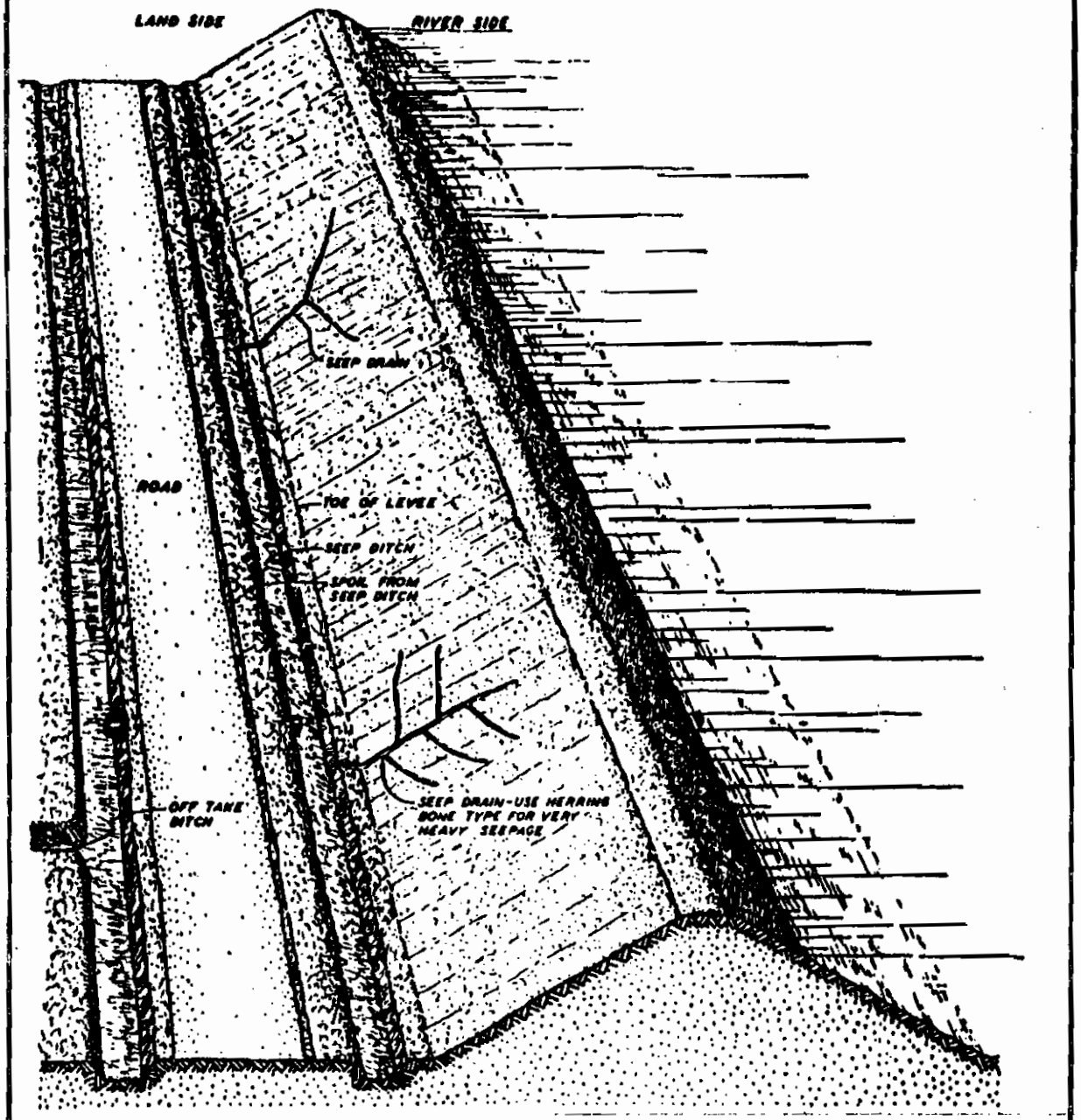
DUCK CREEK
SAN JOAQUIN COUNTY

FLOOD CONTROL PROJECT

MUD BOX BULKHEAD LEVEE CONSTRUCTION DETAILS

U.S. CORPS OF ENGINEERS, SACRAMENTO, CALIF.

EXHIBIT C PLATE 9



DUCK CREEK
SAN JOAQUIN COUNTY

FLOOD CONTROL PROJECT

METHOD OF DRAINING LEVEE SLOPE

U.S. CORPS OF ENGINEERS, SACRAMENTO, CALIF.

EXHIBIT C PLATE 10

EXHIBIT D

SUGGESTED SEMI-ANNUAL REPORT FROM

TO: The District Engineer
U.S. Army Engineer
District Sacramento
650 Capitol Avenue
Sacramento, California, 95814

(1 May 19__)
(1 Nov 19__)

Dear Sir:

The semi-annual report for the period (1 May 19__) to 31 October 19__) (1 November 19__ to 30 April 19__) Duck Creek Project levees and channels, San Joaquin County, is as follows:

a. The physical condition of the protective works is indicated by the inspector's report, copies of which are inclosed, and may be summarized as follows:

(Superintendent's summary of conditions)

It is our intention to perform the following maintenance work in order to repair or correct the conditions indicated:

(Outline the anticipated maintenance operations for the following 6 months.)

b. During this report period, major high water periods (water surface in Duck Creek reached or exceeded the reading of 5.5 on the Corps of Engineers gage located just upstream from the diversion structure) occurred on the following dates:

Dates	Maximum Elevation

EXHIBIT D
Sheet 1 of 2

Comments on the behavior of the protective works during such high water periods are as follows:

(Superintendent's log of flood observations)

During the high water stages when the water level reached a height of _____, on the gage or excess thereof (dates) _____, it was necessary to organize and carry out flood operations as follows:

(See Maintenance Manual _____.)

c. The inspections have indicated (no) or (the following) encroachments or trespasses upon the project right-of-way.

d. (No) (_____) permits have been issued for (the following improvements or construction within the project right-of-way.

Executed copies of the permit documents issued are transmitted for your files.

e. The status of maintenance measures, indicated in the previous semi-annual report as being required or as suggested by the representatives of the District Engineer, is as follows:

(Statement of maintenance operations, item by item with percent completion.)

f. The fiscal statement of the Superintendent's operations for the current report period is as follows:

	Labor	Material	Equipment	Overhead	Total
1. Inspection					
2. Maintenance					
3. Flood fighting Operations					
TOTAL					

Respectfully submitted,

_____
Superintendent of Works

EXHIBIT D
Sheet 2 of 2

EXHIBIT E

SUGGESTED CHECK LISTS OF LEVEES, CHANNELS AND STRUCTURES

For definition of "flood" or "high water period" see paragraph 1-06 of this manual.

CHECK LIST NO. 2

DUCK CREEK
LEVEES AND CHANNELS

Inspector's Report Sheet No. _____ Inspector _____

Date _____ Superintendent _____

Item	Remarks
(a) Location by Station	
(b) Settlement, sloughing, or loss of grade	
(c) Erosion of levee slopes	
(d) Condition of roadways, including ramps	
(e) Evidence of seepage	
(f) Condition of farm gates and fencing	
(g) Maintenance measures taken since last inspection	
(h) Comments	

INSTRUCTIONS FOR COMPLETING SHEET 2, EXHIBIT E
(To be printed on back of sheet 2)

Item (a) Indicate levee station of observance, obtained by pacing from nearest reference point; indicate right or left bank.

Item (b) If sufficient settlement of earthwork has taken place to be noticeable by visual observation, indicate amount of settlement in tenths of a foot. If sloughing has caused a change in slope of the embankment sections, determine the new slope, Note areas where erosion or gullying of the section has occurred.

Item (c) If sufficient erosion or gullying of back face of back toe of levee has taken place to be noticeable by visual inspection, indicate area affected and depth.

Item (d) Note any nautral change in any section of roadway or rampe. Indicate any inadequacy in surface drainage system.

Item (e) Indicate any evidence of seepage through the embankment section.

Item (f) Indicate the serviceability of all farm gates across the embankments and roadway, and indicate if repainting is required.

Item (g) Indicate maintenance measures that have been performed since last inspection and their condition at the time of this inspection.

Item (h) Record opinion, if any, of contributary causes for conditions observed and also any observations not covered under other columns.

NOTE: One copy of the Inspector's Report is to be mailed to the District Engineer immediately on completion, and one copy is to be attached to and submitted with the Superintendent's semi-annual report.

CHECK LIST NO. 3

CHANNEL AND RIGHT-OF-WAY
DUCK CREEK

Inspector's Report Sheet No. _____ Inspector _____

Date _____ Superintendent _____

Item	Remarks
(a) Name of channel and location by stations	
(b) Vegetal growth in channel	
(c) Debris and refuse in channel	
(d) New construction within right-of-way	
(e) Extent of aggradation or degradation	
(f) Condition of riprapped section	
(g) Condition of bridges	
(h) Measures taken since last inspection	
(i) Comments	

INSTRUCTIONS FOR COMPLETING SHEET 4, EXHIBIT E
(To be printed on back of Sheet 4)

Item (a) Indicate station of observation obtained by pacing from nearest reference point.

Item (b) Note nature, extent, and size of vegetal growth within the limits of flood flow channel.

Item (c) Note nature and extent of debris and refuse that might cause clogging of the conduits of the irrigation intake works, fouling of the tainter gates, or the bridtes over the channel.

Item (d) Report any construction along the diversion channel or above the diversion channel or above the diversion works that has come to the attention of the inspector and that might affect the functioning of the project.

Item (e) Indicate any change in grade or alignment of the channels, either by deposition of sediment or scour, that is noticeable by visual inspection. Estimate amount and extent.

Item (f) Indicate any change that has taken place in the riprap such as disintegration of the rock, erosion, or movement of the rock. Note the presence of vegetal growth through the riprap.

Item (g) Note any damage or settlement of the footings of the bridges. Indicate condition of wooden structures and if repainting is required. Indicate condition of bridge approaches, headwalls, and other appurtenances.

Item (h) Indicate maintenance measures that have been performed since the last inspection and their condition at time of this inspection.

Item (i) Record opinion, if any, of contributory causes for conditions observed, also any observations not covered under other columns.

NOTE: One copy of the Inspector's Report is to be mailed to the District Engineer immediately on completion, and one copy is to be attached to and submitted with the Superintendent's semi-annual report.

SUGGESTED CHECK LIST NO. 4

DRAINAGE AND IRRIGATION STRUCTURES

DUCK CREEK

Inspector's Report Sheet No. _____ Inspector _____

Date _____ Superintendent _____

(a) Location by Levee Mile	(b) Bank	(c) Debris or other obstruction to flow	(d) Damage or settlement of pipe or conduit	(e) Condition of concrete headwall or invert paving	(f) Condition of right-of-way adjacent to structure	(g) Repair Measures taken since last inspection	(h) Comments

Structures as listed under paragraph 4-04a.

INSTRUCTIONS FOR COMPLETING SHEET 6, EXHIBIT E
(To be printed on back of Sheet 6)

(1) Enter station of all structures under Column (a) for check list.

(2) Inspect inlet, barrel, and outlet for accumulation of sediment, rubbish, and vegetal matter. Note condition under Column (c).

(3) If any settlement or damage to the pipe, barrel, or invert of the drain has occurred, estimate the location and amount. Note particularly if any backfill has come into the pipe or been disturbed. Record observations under Column (d).

(4) Inspect the concrete portions of the structures for evidence of settlement, cracks, "pop-outs", spaces, abrasive wear, or other deterioration. Record conditions under Column (e).

(5) Inspect backfill area adjacent to structure for evidence of erosion caused by overflow of the drainage structure and note conditions in Column (f).

(6) Under Column (g) indicate physical measures that have been taken to correct conditions reported in last inspection, and their condition at time of this inspection.

(7) Under Column (h) record opinion, if any, of contributory causes for conditions observed, also any observations not covered under other columns.

(8) A copy of the inspector's report is to be mailed to the District Engineer immediately on completion, and a record copy shall be attached to the Superintendent's semi-annual report.

EXHIBIT F

LETTER OF ACCEPTANCE BY THE SAN JOAQUIN COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

C
O
P
Y

BOARD OF SUPERVISORS
222 East Weber Avenue, Room 701
Stockton, California 95202

C
O
P
Y

January 26, 1967

Colonel Crawford Young, C. E.
District Engineer
Sacramento District Corps of Engineers
650 Capitol Mall
Sacramento, California 95814

RE: Transfer of Modifications to Duck Creek Project,
San Joaquin County, Your Specification No. 3398
Contract No. DACW05-67-C-0029, Drawing No. 7-4-1705

Dear Colonel Young:

By letter dated January 12, 1967, you advised the Board of Supervisors of the San Joaquin County Flood Control and Water Conservation District that the Department of the Army had completed certain modifications to the Duck Creek Project in San Joaquin County, which modifications are described in the above caption.

Please be advised that on January 17, 1967, the Board of Supervisors of the San Joaquin County Flood Control and Water Conservation District accepted the transfer of these flood control modifications to the district for operation and maintenance. A certified copy of the resolution of the Board of Supervisors accepting the project for maintenance and operation is attached to this letter.

We understand that an operation and maintenance manual covering the project work is currently being prepared and that copies will be furnished to this district at a later date.

Very truly yours,

/s/Carmen Perino

CARMEN PERINO, Chairman
Board of Supervisors

EXHIBIT F
Sheet 1 of 2

COPY

COPY

BEFORE THE BOARD OF SUPERVISORS OF THE SAN JOAQUIN COUNTY
FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RESOLUTION ACCEPTING TRANSFER OF DUCK CREEK FLOOD CONTROL WORK
FOR OPERATION AND MAINTENANCE

RF-67-5

-oOo-

WHEREAS, heretofore by letter dated January 12, 1967, a copy of which is attached, marked Exhibit "A", the Department of the Army advised this Board of Supervisors of the completion of certain modification work on the Duck Creek Flood Control Project between French Camp Slough and 0.5 mile upstream from the Escalon-Bellota Road and transferred said flood control work to this District for operation and maintenance and further requested this Board of Supervisors to furnish the Department of the Army with a written acceptance of the transfer; and

WHEREAS, Mr. Charles B. Wong, District Flood Control Engineer, has recommended that this Board of Supervisors accept the transfer.

NOW, THEREFORE, BE IT RESOLVED by the Board of Supervisors of the San Joaquin County Flood Control and Water Conservation District that this District does hereby accept the transfer of the Duck Creek flood control modification work described in Exhibit "A".

BE IT FURTHER RESOLVED that the Chairman of this Board is hereby authorized to transmit a letter to the Department of the Army accepting the transfer on behalf of the District.

PASSED AND ADOPTED this 17th day of January 1967 by the following vote of the Board of Supervisors of the San Joaquin County Flood Control and Water Conservation District, to wit:

AYES: HOYT, LEHMAN, WISDOM, POWELL, PERINO
NOES: NONE
ABSENT: NONE

EXHIBIT F
Sheet 2 of 2

EXHIBIT G

LETTER OF ASSURANCES FROM SAN JOAQUIN COUNTY

C
O
P
Y

C
O
P
Y

Office of the County Counsel

COUNTY OF SAN JOAQUIN

State of California

Stockton, California

November 13, 1962

Colonel H. N. Turner, CE
District Engineer
U. S. Army Engineer District, Sacramento
Corps of Engineers
Federal & Courts Building
650 Capitol Avenue
P. O. Box 1739
Sacramento 8, California

Attention: Major C. R. Teagle, CE
Deputy District Engineer

RE: SPKGD-L, Small Project
Duck Creek, San Joaquin County,
California

Dear Sir:

Enclosed you will find a revised letter of assurances, revised extract of minutes, and a revised resolution, all relative to the above. These documents have been revised in our original records and you will note that they bear the same date as the original documents which were furnished to you. The revisions have been made pursuant to your request contained in your letter of November 8, 1962, pointing out that the assurances furnished by the San Joaquin County Flood Control and Water Conservation District were not in accordance with statutory form.

I trust and hope that all is now satisfactory.

Very truly yours,

RICHARD W. DICKENSON
County Counsel

/s/ Thomas J. Shephard
THOMAS J. SHEPHARD
Deputy County Counsel

EXHIBIT G
Sheet 1 of 5

C O P Y

C O P Y

EXTRACT FROM MINUTES OF
MEETING OF BOARD OF SUPERVISORS OF THE SAN JOAQUIN COUNTY
FLOOD CONTROL AND WATER CONSERVATION DISTRICT
STOCKTON, CALIFORNIA
Tuesday, August 21, 1962

RE: DUCK CREEK PROJECT, SAN JOAQUIN
COUNTY, CALIFORNIA

The Board of Supervisors of the San Joaquin County Flood Control and Water Conservation District met this 21st day of August, 1962, at the hour of 10 a.m. in regular session.

PRESENT: Supervisors Hawkins, McKnight, Hoyt, Lehman, Perino (Chairman)

Ralph W. Epperson, Clerk
Ida M. Golding, Deputy Clerk

A letter was received from the U. S. Army Engineer District, Sacramento, Corps of Engineers, addressed to the San Joaquin County Flood Control and Water Conservation District, dated August 9, 1962, requesting that the Board of Supervisors furnish the necessary assurances to the Federal Government for local co-operation under the plan of flood control Duck Creek, San Joaquin County, California. After a short discussion on the letter, Supervisor Lehman moved that the following resolution be passed and it was seconded by Supervisor Hoyt and carried unanimously:

BEFORE THE BOARD OF SUPERVISORS OF THE SAN JOAQUIN COUNTY
FLOOD CONTROL AND WATER CONSERVATION DISTRICT

- - - - - - -

RESOLUTION GIVING VARIOUS ASSURANCES TO THE UNITED STATES OF AMERICA RELATIVE TO THE UNITED STATES ARMY CORPS OF ENGINEERS SMALL PROJECT ON DUCK CREEK, SAN JOAQUIN COUNTY, CALIFORNIA

- - - - - - -

WHEREAS, the United States Army Corps of Engineers has completed a detailed project report on a project for Duck Creek, San Joaquin County, California, under authority of Public Law 685, 84th Congress, 2nd Session, and

WHEREAS, the District Engineer, U. S. Army Engineer District, Sacramento, by letter dated August 9, 1962, requested this Board of Supervisors to furnish the necessary assurances to the United States of America for local co-operation under the plan of flood control set forth in the aforementioned report; and

WHEREAS, the Advisory Water Commission of this District, by resolution dated February 28, 1962, has recommended to this Board that such assurances be given;

NOW, THEREFORE, BE IT RESOLVED that the Chairman of this Board is authorized and directed to give said requested assurances as an obligation of the San Joaquin County Flood Control and Water Conservation District by means of letter to the District Engineer, U.S. Army Engineer District, Sacramento, which letter shall be in the following form:

(Letterhead) BOARD OF SUPERVISORS

_____, 1962

District Engineer
U.S. Army Engineer District, Sacramento
Corps of Engineers
P. O. Box 1739
Sacramento 6, California

Re: SPKGD-L, Small Project
Duck Creek, San Joaquin County,
California

Dear Sir:

Reference is made to your letter of August 9, 1962, requesting that this Board of Supervisors give the necessary local interest assurances for the project of flood control for Duck Creek, in San Joaquin County, California.

Pursuant to the authority vested in it, the Board of Supervisors at the regular meeting of August 21, 1962, authorized its Chairman to give the assurances hereinafter set forth. A certified copy of the Motion of the Board of Supervisors is inclosed herewith for your file.

As required by and subject to Public Law 685, 84th Congress, 2nd Session, (Title 33 United States Code Annotated Section 701S) the Board of Supervisors, on behalf of the San Joaquin County Flood Control and Water Conservation District hereby assures the United States that it will:

a. Provide without cost to the United States all lands, easements, and rights of way necessary for the construction of the project, except as otherwise provided herein;

b. Hold and save the United States free from damages due to the construction works;

c. Maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of the Army.

C O P Y

C O P Y

And provided further, that whenever expenditures for lands, easements, and rights of way by States, political subdivisions thereof, or responsible local agencies for any individual project or useful part thereof shall have exceeded the present estimated construction cost therefor, the local agency concerned may be reimbursed one-half of its excess expenditures over said estimated construction cost.

Sincerely yours,

BOARD OF SUPERVISORS
San Joaquin County Flood Control
and Water Conservation District

CARMEN PERINO, Chairman

BE IT FURTHER RESOLVED that the Chairman of this Board shall sign said letter and that there shall be transmitted to the District Engineer, U.S. Army Engineer District, Sacramento, together with said letter, certified copies of this resolution and a certified extract from the minutes of this Board showing the action taken on this resolution.

PASSED AND ADOPTED this 21st day of August, 1962, by the following vote of the Board of Supervisors of the San Joaquin County Flood Control and Water Conservation District, to wit:

AYES: Supervisors, McKnight, Hoyt, Lehman, Perino

NOES: None

ABSENT: Supervisor Hawkins

CARMEN PERINO, Chairman
Board of Supervisors
San Joaquin County Flood Control
and Water Conservation District
State of California

ATTEST: RALPH W. EPPERSON
County Clerk and Ex-officio Clerk
of the Board of Supervisors of the
San Joaquin County Flood Control and
Water Conservation District, State of
California

By Marjorie C. Smith
Deputy Clerk (SEAL)

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BOARD OF SUPERVISORS
SAN JOAQUIN COUNTY FLOOD CONTROL
AND WATER CONSERVATION DISTRICT, ss.
STATE OF CALIFORNIA

I, Ralph W. Epperson, County Clerk and Ex-officio Clerk of the Board of Supervisors of the San Joaquin County Flood Control and Water Conservation District, do certify that the above and foregoing is a true and correct extract of the minutes of the meeting of the Board of Supervisors of said District held on August 21, 1962, said extract appearing at page 241 of Minute Book 1 of the San Joaquin County Flood Control and Water Conservation District.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal of the Board of Supervisors, this 21st day of August, 1962.

RALPH W. EPPERSON
County Clerk and Ex-officio Clerk
of the Board of Supervisors of the
San Joaquin County Flood Control and
Water Conservation District, State
of California

By _____ (SEAL)
Deputy Clerk

EXHIBIT G
Sheet 5 of 5

EXHIBIT H

SAMPLE PERMIT

for use of

RIGHT-OF-ENTRY

EXHIBIT H

PERMIT

_____
(Name of Levee Commission or City)

_____
(Location)

Permission is hereby granted to:

_____ _____
(Name of Firm or Individual) (Address)

TO: (Describe in thses spaces the proposal, including kind and type of construction, purpose intended, location by stationing. Indicate passage-way provided by means of gates, etc. Use separate sheets if necessary, identifying each by reference herein.)

_____

_____

_____

_____

Provided that:

Upon termination or expiration of this permit (whether by voluntary relinquishment by the grantee, by revocation by the grantor or otherwise) the grantee shall remove all structures, improvements, or appurtenances which may have been erected or constructed under this permit, and shall repair or replace any portion of the flood protection structure or right-of-way which may have been damaged by his operations (including grading and seeding, or sodding, if necessary), to the satisfaction of the grantor.

The structure or operation for which this permit is issued shall be maintained by the grantee in such manner as shall not injure or damage the flood protection structure, or interfere with its operation and maintenance in accordance with regulations of the Secretary of the Army.

The structure or operation covered by this permit may be damaged, removed or destroyed by the grantor in time of flood emergency if such action is determined by the grantor to be necessary in order to preserve life or property or prevent damage or impairment to the use of safety of the flood protection structure, and the grantor shall not be liable to the grantee for such damage or destruction.

Unless otherwise specifically provided herein, this permit may be cancelled at anytime by the grantor upon 10 days written notice mailed to the address shown above. During such 10 day period, (or such other period as may be provided herein), the grantee will be permitted to remove any property or improvements installed under this permit, and to repair or replace any damage to the flood protection right-of-way or structures resulting from his use or operations. At the end of such period, the grantor shall have the right to possess and dispose of any such property or improvements remaining upon its right-of-way, and may proceed to repair or replace any such damage, and the grantee herein shall be liable to the grantor for the full cost of such repairs or replacements.

The construction, installation and maintenance of the structure or structures covered by this permit shall be subject to inspection by representatives of the grantor and the United States at all reasonable times.

In the event the work covered by this permit consists of or includes major construction, the cost of inspection thereof by the grantor and/or the United States shall be paid by the applicant.

Grantee agrees that it will not use the area or facilities covered by this permit, or permit such area to be used, for any purpose other than is specifically covered by this permit.

(Use these spaces for special conditions applicable to this permit.)

_____

_____

THIS PERMIT SHALL NOT BE VALID UNTIL APPROVED BY THE DISTRICT ENGINEER OF THE U. S. ARMY ENGINEER DISTRICT, SACRAMENTO, OR HIS AUTHORIZED REPRESENTATIVE.

Signature (Grantor) (Title) (Date)

Terms of this permit are hereby accepted

Approved:

Signature (Grantee) (Date)

(Date)

District Engineer

EXHIBIT H
Sheet 2 of 3

REGULATIONS GOVERNING ISSUANCE OF PERMITS FOR USE OF RIGHTS-OF-WAY FOR FLOOD PROTECTION PROJECTS

As the flood protection works and rights-of-way are owned by the Local Interests and will be operated and maintained by them in accordance with the Regulations of the Secretary of the Army, and issurance of any permits to use the restriction that no such permits may be issued without the approval of the District Engineer, as stated in Paragraph No. 208.10 (a) General, (5) of the Regulations, a copy of which is attached hereto.

Applications for use of the rights-of-way should be addressed to the City or Levee Commission having jurisdiction over the local flood protection project. The City or Levee Commission will then forward the application to the District Engineer, of the U. S. Army Engineer District, Sacramento, California, with its recommendation, with reasons for such recommendation. It is suggested that the application and recommendations be forwarded with a draft copy of the permit, in order that all objectionable features may be eliminated prior to its proffer to the applicant as this may prevent misunderstandings and arguments. If for any reason it is desired to forward the permit itself without this intervening step, five copies of the proposed permit should be included on which is stated the exact use of the rights-of-way, for which permission is being requested, together with any condition or restriction of the permit. The permit should be signed by the applicant and an official of the Local Interests. A drawing, sketch or detail plans as may be required to show the exact location, nature of work and proposed method of construction should be attached to each copy of the permit. If the permit is approved by the District Engineer, three copies will be returned. This will enable each party concerned to have a copy of the approved permit.

In any case where a permit is requested for any purpose which might cause disfigurement or damage to the flood protection rights-of-way or structure in its erection, use, or removal, it is suggested that the applicant be required to post a bond of sufficient amount to protect the Local Interests from any cost of repair or removal, and to guarantee faithful performance of the permit conditions. In such cases the permit should state the amount and conditions of the bond.

In cases involving major construction or other work which may directly affect the flood protection structure, it will be necessary that the United States inspect the work and the Local Interests may also desire to inspect it. As stated in the permit form, such inspection will be at the expense of the grantee, and this should be called to his attention. Except in cases of known financial security, arrangements should be made with the grantee for an advance deposit or bond to cover such costs.

There is attached hereto a copy of a permit form which has been successfully used by a number of cities and levee committees.

SPKCO-F 15 July 1966

San Joaquin County Flood Control
& Water Conservation District
ATTN: Mr. Bruce McKnight, Board of Supervisors
County Courthouse
Stockton, California

Duck Creek

Gentlemen:

Reference is made to assurance agreement dated 21 August 1962, furnished by the Board of Supervisors of the San Joaquin County Flood Control & Water Conservation District, covering flood control work on Duck Creek and cooperative requirements of this project stated therein. Reference is also made to the joint inspection of 15 June 1966, and the meeting held in your office on 7 July 1966, made for the purpose of transferring flood control work, upon completion, to your District for operation and maintenance.

The flood control work consists of channel improvement on Duck Creek from French Camp Slough to 0.5 mile upstream from Escalon-Bellota Road, Station 0+15 to 1,084+62, a distance of 20.54 miles; and Branch Creek, Station 0+00 to 39+60, a distance of 0.75 mile. Work was completed on 29 June 1966, in accordance with Specification No. 2998, Contract No. DA-04-167-CIVENG-65-138, Drawing No. 7-4-1679.

The work was performed under the special continuing authority provided by Section 205 of the 1948 Flood Control Act as amended by Public Law 685 (Small Streams Flood Control Act), 84th Congress, 2nd Session.

The flood control work, having been completed in accordance with the requirements of the contract, is hereby transferred to San Joaquin County for operation and maintenance. A follow-on contract to clean up certain incomplete features of work is under consideration, and the scope thereof will be established in the immediate future.

Maintenance work required shall be performed in accordance with existing flood control regulations which have been prescribed by the Secretary of the Army pursuant to Section 3 of the Act of Congress approved 22 June 1936, as amended and supplemented. An operation and

Duck Creek Project
Exhibit F

CERTIFIED MAIL

RETURN RECEIPT REQUESTED

Exh. 3
C-0

SPKKO-F 15 July 1966
San Joaquin County Flood Control

maintenance manual, covering the project work, is in process of preparation and will be furnished to you upon completion.

Your written acceptance of this transfer will be appreciated.

Sincerely yours,

T. S. MEADE
Lieutenant Colonel, CE
Acting District Engineer

Copy furnished:
Dept Water Resources
O.C.E.
S.P.D.

cc: Lev & Chan
Prog Dev
Valley Res
F&A (Cordano)

COLEMAN/pnp

HENSON

for Gomez

MEADE

Duck Creek Project
Exhibit #

DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
650 CAPITOL MALL
SACRAMENTO, CALIFORNIA 95814

IN REPLY REFER TO
SPKKO-F

12 January 1967

RECEIVED
SAN JOAQUIN COUNTY
67 JAN 16 AM 10:14
BOARD OF SUPERVISORS
COUNTY ADMINISTRATOR

San Joaquin County Flood Control
& Water Conservation District
ATTN: Mr. Bruce McKnight
Board of Supervisors
County Courthouse
Stockton, California

Gentlemen:

Reference is made to our letter dated 15 July 1966, and to assurance agreement dated 21 August 1962, furnished by the Board of Supervisors of the San Joaquin County Flood Control & Water Conservation District, covering flood control work on Duck Creek and cooperative requirements of this project stated therein. Further reference is made to the joint inspection of 5 January 1967, made for the purpose of transferring flood control work to your District for operation and maintenance.

The flood control work consists of modifications to Duck Creek Project from French Camp Slough to 0.5 mile upstream from Escalon-Bellota Road. The work was completed on 9 January 1967, in accordance with Specification No. 3398, Contract No. DACW05-67-C-0029, Drawing No. 7-4-1705.

The work was performed under the general authority provided by Section 205 of the 1948 Flood Control Act, Public Law 858, 80th Congress, 2nd Session, as amended. The flood control work as referenced above now meets the requirements of the contract. Therefore, said flood control work, together with the waterway banks contiguous thereto, are transferred to San Joaquin County for operation and maintenance.

Maintenance work required shall be performed in accordance with existing flood control regulations which have been prescribed by the Secretary of the Army pursuant to Section 3 of the Act of Congress approved 22 June 1936, as amended and supplemented. An operation and maintenance manual, covering the project work, is in process. Copies will be furnished your office at a later date.

CERTIFIED MAIL

RETURN RECEIPT REQUESTED

Duck Creek, Project
Exhibit F

EXHIBIT A

SPKKO-F
San Joaquin County Flood Control

12 January 1967

Your written acceptance of this transfer will be appreciated.

Sincerely yours,

CRAWFORD YOUNG
Colonel, CE
District Engineer

1 Incl
Title 33

Duck Creek Project
Exhibit F