

**REDWOOD CREEK
LOCAL FLOOD PROTECTION PROJECT
HUMBOLDT COUNTY**

**OPERATION AND MAINTENANCE
MANUAL**

JUNE 1969



U.S. ARMY ENGINEER DISTRICT, SAN FRANCISCO

CORPS OF ENGINEERS

SAN FRANCISCO, CALIFORNIA

FOREWORD

This manual has been prepared by the District Engineer, to acquaint responsible local interests with the requirements of maintaining the earthen channel, earth levees, drainage structures, riprap protection and service roads constructed for the flood control project completed on 24 October 1968 on Redwood Creek, Humboldt County, California. Timely effective maintenance in accordance with this manual is required to assure the proper functioning of the improved channel and the continuation of beneficial results from the project.

Revisions marked with asterisk (*) were made to this manual in August 1977.

05000000 00000000

REDWOOD CREEK
HUMBOLDT COUNTY, CALIFORNIA
LOCAL FLOOD PROTECTION PROJECT
OPERATION AND MAINTENANCE MANUAL

TABLE OF CONTENTS

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
	INTRODUCTION	
1	AUTHORIZATION	1
2	LOCATION	1
3	DESCRIPTION OF PROJECT	2
4	PROTECTION PROVIDED	2
	REQUIREMENTS OF LOCAL COOPERATION	
6	ASSURANCE OF COOPERATION	3
7	SEMIANNUAL REPORT	3
	MAINTENANCE AND OPERATION	
8	PURPOSE	4
9	REGULATIONS	4
10	DUTIES OF SUPERINTENDENT	5
	a. Training of key personnel	5
	b. Streamflow stages	6
	c. Semiannual report	6
	d. Checklists	6
	3. Proposed improvements or alterations	6
11	CHANNEL	7
	a. Description	7
	b. Maintenance	7
12	LEVEES	8
	a. Description	8
	b. Maintenance	9
13	RELIEF WELLS	10
	a. Description	10
	b. Inspection	10
	c. Maintenance	11

10000 ORIGINAL 00000

TABLE OF CONTENTS (Cont'd)

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
14	DRAINAGE STRUCTURES	11
	a. Description	11
	b. Maintenance	11
15	MISCELLANEOUS FACILITIES	12
16	FLOOD PLAIN MANAGEMENT	12
	METHODS OF COMBATTING FLOOD CONDITIONS	
17	SUGGESTED METHODS	13
	a. Earthen levees	13
	b. Premeditated damage	13
	c. Security	13
	d. Human element	14
	e. Inspector of flood control works	14
	f. Preliminary repair work	14
	g. Disaster relief	15
	h. Flood fight	16
	i. Topping	17
	j. Transportation	17
	k. Checklists	18
	l. Use of Government plant	18
	m. Flood Emergency Manual	18

EXHIBITS

Exhibit A --	Code of Federal Regulations, Title 33, Section 208.10
Exhibit B --	Resolution of the Board of Supervisors of Humboldt County, California
Exhibit C --	Inspection Checklist
Exhibit D --	Suggested methods of emergency protection - 5 plates
Exhibit E --	Letter Re: zoning - Humboldt County Planning Commission

APPENDIX

*Drawings, File No.	Sheet No.
85-45-6	1-55
85-39-7	1 *

REDWOOD CREEK
HUMBOLDT COUNTY, CALIFORNIA
LOCAL FLOOD PROTECTION PROJECT
OPERATION AND MAINTENANCE MANUAL

INTRODUCTION

1. AUTHORIZATION

The Redwood Creek Flood Control Project, Humboldt County, California, was authorized by the Flood Control Act of 1962, Public Law 87-874, Eighty-seventh Congress, Second Session, under the provisions of Section 203, approved 23 October 1962, which act reads in part as follows:

"Section 203. The following works of improvement for the benefits of navigation and the control of destructive flood waters and other purposes are hereby adopted and authorized to be prosecuted under the direction of the Secretary of the Army and the supervision of the Chief of Engineers in accordance with the plans in the respective reports hereinafter designated and subject to the conditions set forth herein."

* * * * *

* * * * *

REDWOOD CREEK BASIN

"The project for flood protection on Redwood Creek, Humboldt County, California, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers and House Document No. 497, Eighty-seventh Congress, at the estimated cost of \$2,580,000."

2. LOCATION

The project is located along the lower reaches of Redwood Creek near Orick, Humboldt County, California. The creek discharges into the Pacific Ocean approximately 50 miles south of the Oregon-California border. The basin is an elongated area of approximately 280 square miles. It extends about 56 miles from the northwest to the southeast and has a maximum width of about 7 miles. The largest tributary to

Redwood Creek is Prairie Creek which drains the northern part of the watershed and joins the main stream about 3.5 miles above its mouth. Prairie Creek drains an area of about 40 square miles, extending approximately 12 miles north of the junction of the two streams. The other tributaries are short steep-gradient creeks which extend to the main stream from each side throughout its length. The area protected from floods by the completed project is the lower 3.5 miles of Redwood Creek and the town of Orick.

3. DESCRIPTION OF PROJECT

The Redwood Creek flood control project consists of an improved channel with a bottom width of 250 feet and levees along both banks. A gravity drainage system has been provided to collect and divert local drainage from behind the levees into the Pacific Ocean. Stone riprap slope protection has been provided for the slopes of the channel and the channel side slopes of the levees. The project extends from the mouth of the creek upstream approximately 3.4 miles. A derrick stone control sill was constructed at the lower end of the improved channel to stabilize the ends of the levees and to prevent degradation of the channel bottom in the lower reach. The two center piers of the U.S. 101 Highway bridge were extended upstream to provide for more efficient hydraulic conditions. A system of relief wells was installed adjacent to the landward toe of the levees, in critical areas, to discharge the anticipated seepage at high stages into the interior drainage system. Debris deflectors were installed on each side just upstream of the highway bridge to prevent log jams. County roads affected by the construction of the project were relocated as necessary. Details of these features of the project as constructed are shown on the appended plans.

4. PROTECTION PROVIDED

The project, as constructed, will provide protection to the community of Orick and the adjacent agricultural and grazing areas behind the levees against all floods up to the design flood of 77,000 cubic feet per second. This design flood is about 40 percent greater than the largest flood of record, that of December 1964. Protection from local flooding behind the levees is provided by a gravity drainage system of open ditches and storm drains with inlets as required.

5. CONSTRUCTION HISTORY

* The project constructed under Contract No. DA-04-203-CIVENG-66-190 dated 20 April 1966 by Eugene Luhr & Co., was initiated in 1966, completed in October 1968, and formally transferred to Humboldt County on 14 November 1968 for maintenance and operation. In 1976 filter drain was constructed for the right levee between stations 49+30 and 60+70 under Contract No. DAC-W07-76-C-0055 by the Venturini Corporation of San Mateo, California.*

11. CHANNEL

a. Description. The improved channel, with a 250-foot-bottom width throughout the project, extends from the mouth of Redwood Creek at station 15+50 approximately 3.4 miles upstream, to station 192+90. The natural earth channel bottom was constructed with a slope of 0.0014 throughout the project. The channel slopes were excavated to a slope of 1 vertical on 3 horizontal. Riprap was placed on the slopes the full length of both slopes. This riprap varies in thickness from 12 inches to 24 inches and the toe was carried to a vertical depth of 7 or 10 feet below the channel bottom as shown on the appended plans. Where riprap was placed under water, the thickness of the blanket was increased by 50 percent. On the right bank, the thickness of the riprap for the upstream 10 feet was increased to 60 inches; on the left bank, the upper end of the riprap was keyed in with a 24-inch-thick layer to prevent erosion. A control sill was constructed of derrick stone at the lower end of the project to protect the downstream end of the project and to prevent degradation of the channel bottom. Details of this sill are shown on Sheet 21 of the appended plans. Maintenance of the sill to the correct line and grade is essential to the proper functioning of the project.

b. Maintenance. Inspection and maintenance of channels and floodways shall be in accordance with paragraph 208.10(a) General, (see paragraph 9 of this manual) and 208.10(g) which states:

"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 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. Maintenance of the riprapped chutes at stations 59+80 and 68+34 is particularly important in order to preserve the hydraulic characteristics of the structures and to prevent an increase of velocity in this reach of the channel. The structures should be maintained to the dimensions and elevations that are shown on the appended plans.

(2) Operation. The 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 debris. Large objects which become lodged against the bank shall be removed. The improved channel 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."

12. LEVEES

* a. Description. Levees were constructed along both banks upstream from station 17+00, tying into high ground near the upper end of the project. The right bank levee extends upstream to station 171+75 that on the left bank to station 192+80. The levees, with an impervious core, were constructed with a crest width of 12 feet, the channel side slopes continue the slopes of the channel and are 1 vertical on 3 horizontal; the land side slopes are 1 vertical on 2.5 horizontal. The channel riprap was continued up the channel side slopes the entire length of both levees. The riprap was continued on around the downstream ends of the levees in order to prevent erosion at these points. Between stations 49+30 and 60+70, right levee, sand and gravel filter drain was installed in the landside berm and spalls were placed along the landside toe of the levee. Relief wells were installed at the landside toe of the levees at appropriate points along both levees. The wood stave screen type was used. The wells will discharge into the gravity interior drainage system at high flow stages. Earthen berms of pervious fill, averaging about 3 feet high were constructed along the landside toe of both levees at various points. Since the crests of the levees will be used as service roads in maintaining the project, access roads, ramps and turnarounds were provided as necessary. Wire-rope barricades were erected to prevent unauthorized entry at various points. The location and all details of the above features are shown on the appended plans.*

b. Maintenance. Inspection and maintenance of levees shall be in accordance with paragraph 208.10(a) General, (see paragraph 9 of this manual) and 208.10(b) which states:

"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 deposits, and repair of damage caused by erosion or other forces. 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) Drains through the levees and gates on said drains are in good working condition;

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

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

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

(viii) 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 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;
- (vi) 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."

Compliance with the provisions prescribed is essential for the efficient maintenance of the levee system and the successful operation of the project. Checklists suggested under Exhibit C should be used in each inspection to insure that no feature of the protective works is overlooked. Items requiring maintenance should be noted thereon; if items are found satisfactory, they should be so indicated by a check.

13. RELIEF WELLS

* a. Description. Fifth-four relief wells have been installed along the land side toe of the left and right levees, between stations 78+00 and 158+25. Locations of the relief wells are shown on Sheets 3, 4, 6 and 7. Details are shown on Sheet 22 and on Table 1, Page 19.*

* b. Inspection. The relief wells shall be sounded annually to check for sanding. The inspection should include an examination of the cover plates, locks, tee outlets and other appurtenances. Any indication of piping or slumping of the ground around or near wells shall also be included in the inspection. Relief wells shall be pump tested at 5-year intervals to obtain the specific yield of the well (gallons per minute per foot of well screen per foot of well drawdown). If this yield is less than 80 percent of the installed yield as shown on Table 1, then corrective treatment surging and flushing shall be made and the well pump tested again. The wells shall be checked for sanding before and after each pumping. Damages to relief wells and associated discharge systems shall be corrected as soon as practicable. Wells which sand badly shall be filled with concrete and replacement wells installed. During periods of high stream flow in Redwood Creek, the relief wells shall be checked for discharge to determine specific yield and possible

sanding. Results of inspections shall be reported to the District Office, Engineering Division, ATTN: Design Branch. Relief wells which do not function properly during periods of high stream flow shall be reported immediately to the above by telephone.*

c. Maintenance. Prior to 15 October of each year the relief wells shall be sounded to determine the amount of sand that has accumulated in the bottom of the pipes. If there is more than 12 inches in the wells, they are to be flushed with a mixture of air and water until all the material has been removed from inside the pipes. In addition, any trash or debris which has accumulated in the outlets of collector pipes shall be removed. Damaged relief wells and associated discharge systems shall be corrected as soon as practicable. Wells which sand badly shall be filled with concrete and replacement wells installed.

14. DRAINAGE STRUCTURES

a. Description. The area behind the levee is protected from inundation by local runoff by a gravity drainage system composed of concrete inlets, manholes where necessary and reinforced concrete pipes discharging into ditches which in turn conduct the flow into natural channels which drain into the Pacific Ocean at a point downstream of the end of the levees.

b. Maintenance. Inspection and maintenance of drainage structures shall be in accordance with paragraph 208.10(a) General, (see paragraph 7 of this manual) and 208.10(d) which states:

"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 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 of 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 closed. 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."

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.

15. MISCELLANEOUS FACILITIES

Inspection, maintenance and operation of miscellaneous facilities shall be in accordance with paragraph 208.10(a) General, (see paragraph 7 of this manual) and 208.10(h) which states:

"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. Damages or unserviceable parts shall be repaired or replaced without delay. The Superintendent shall take proper steps to prevent restriction of bridge openings.

(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."

16. FLOOD PLAIN MANAGEMENT

Flood plain zoning was not incorporated as a part of the plan as set forth in the project document. However, subsequent to the completion of project construction the subject was investigated and Humboldt County expressed an interest in flood plain zoning for these areas around the community of Orick, California and adjacent to the mouth of Redwood Creek. This interest is evidenced by Exhibit E.

SPNED-PN

Operation and Maintenance Manual, Redwood Creek,
Humboldt County, California

Chief, Design Branch

Chief, Project Planning Br

17 July 1969

Scott/6-7508/so

- 3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
- A copy of Division Engineer's comments is attached.
 - In reference to Item 2 on plastic sheeting, it is requested that desirability or need be determined for usage on this project.
 - If it is determined that this plastic sheeting should be used, please furnish this branch with the proper thickness and installation details to be included in the manual.
 - It is requested that this data be received by 23 July 1969. If any information is needed, please contact Project Coordinator Mr. Scott on 6-7508.

I. H. STEINBERG

CF:

Engr Div rdg

Proj Plng Br

SPNED-PN

-PC

-PH

Change 1
Aug 77

FOREWORD

This manual has been prepared by the District Engineer, to acquaint responsible local interests with the requirements of maintaining the earthen channel, earth levees, drainage structures, riprap protection and service roads constructed for the flood control project completed on 24 October 1968 on Redwood Creek, Humboldt County, California. Timely effective maintenance in accordance with this manual is required to assure the proper functioning of the improved channel and the continuation of beneficial results from the project.

Revisions marked with asterisk (*) were made to this manual in August 1977.

REDWOOD CREEK
HUMBOLDT COUNTY, CALIFORNIA
LOCAL FLOOD PROTECTION PROJECT
OPERATION AND MAINTENANCE MANUAL

TABLE OF CONTENTS

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
	INTRODUCTION	
1	AUTHORIZATION	1
2	LOCATION	1
3	DESCRIPTION OF PROJECT	2
4	PROTECTION PROVIDED	2
	REQUIREMENTS OF LOCAL COOPERATION	
6	ASSURANCE OF COOPERATION	3
7	SEMIANNUAL REPORT	3
	MAINTENANCE AND OPERATION	
8	PURPOSE	4
9	REGULATIONS	4
10	DUTIES OF SUPERINTENDENT	5
	a. Training of key personnel	5
	b. Streamflow stages	6
	c. Semiannual report	6
	d. Checklists	6
	3. Proposed improvements or alterations	6
11	CHANNEL	7
	a. Description	7
	b. Maintenance	7
12	LEVEES	8
	a. Description	8
	b. Maintenance	9
13	RELIEF WELLS	10
	a. Description	10
	b. Inspection	10
	c. Maintenance	11

TABLE OF CONTENTS (Cont'd)

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
14	DRAINAGE STRUCTURES	11
	a. Description	11
	b. Maintenance	11
15	MISCELLANEOUS FACILITIES	12
16	FLOOD PLAIN MANAGEMENT	12
	METHODS OF COMBATTING FLOOD CONDITIONS	
17	SUGGESTED METHODS	13
	a. Earthen levees	13
	b. Premeditated damage	13
	c. Security	13
	d. Human element	14
	e. Inspector of flood control works	14
	f. Preliminary repair work	14
	g. Disaster relief	15
	h. Flood fight	16
	i. Topping	17
	j. Transportation	17
	k. Checklists	18
	l. Use of Government plant	18
	m. Flood Emergency Manual	18

EXHIBITS

Exhibit A --	Code of Federal Regulations, Title 33, Section 208.10
Exhibit B --	Resolution of the Board of Supervisors of Humboldt County, California
Exhibit C --	Inspection Checklist
Exhibit D --	Suggested methods of emergency protection - 5 plates
Exhibit E --	Letter Re: zoning - Humboldt County Planning Commission

APPENDIX

*Drawings, File No.	Sheet No.
85-45-6	1-55
85-39-7	1 *

REDWOOD CREEK
HUMBOLDT COUNTY, CALIFORNIA
LOCAL FLOOD PROTECTION PROJECT
OPERATION AND MAINTENANCE MANUAL

INTRODUCTION

1. AUTHORIZATION

The Redwood Creek Flood Control Project, Humboldt County, California, was authorized by the Flood Control Act of 1962, Public Law 87-874, Eighty-seventh Congress, Second Session, under the provisions of Section 203, approved 23 October 1962, which act reads in part as follows:

"Section 203. The following works of improvement for the benefits of navigation and the control of destructive flood waters and other purposes are hereby adopted and authorized to be prosecuted under the direction of the Secretary of the Army and the supervision of the Chief of Engineers in accordance with the plans in the respective reports hereinafter designated and subject to the conditions set forth herein."

* * * * *

* * * * *

REDWOOD CREEK BASIN

"The project for flood protection on Redwood Creek, Humboldt County, California, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers and House Document No. 497, Eighty-seventh Congress, at the estimated cost of \$2,580,000."

2. LOCATION

The project is located along the lower reaches of Redwood Creek near Orick, Humboldt County, California. The creek discharges into the Pacific Ocean approximately 50 miles south of the Oregon-California border. The basin is an elongated area of approximately 280 square miles. It extends about 56 miles from the northwest to the southeast and has a maximum width of about 7 miles. The largest tributary to

40004 ORICK

Redwood Creek is Prairie Creek which drains the northern part of the watershed and joins the main stream about 3.5 miles above its mouth. Prairie Creek drains an area of about 40 square miles, extending approximately 12 miles north of the junction of the two streams. The other tributaries are short steep-gradient creeks which extend to the main stream from each side throughout its length. The area protected from floods by the completed project is the lower 3.5 miles of Redwood Creek and the town of Orick.

3. DESCRIPTION OF PROJECT

The Redwood Creek flood control project consists of an improved channel with a bottom width of 250 feet and levees along both banks. A gravity drainage system has been provided to collect and divert local drainage from behind the levees into the Pacific Ocean. Stone riprap slope protection has been provided for the slopes of the channel and the channel side slopes of the levees. The project extends from the mouth of the creek upstream approximately 3.4 miles. A derrick stone control sill was constructed at the lower end of the improved channel to stabilize the ends of the levees and to prevent degradation of the channel bottom in the lower reach. The two center piers of the U.S. 101 Highway bridge were extended upstream to provide for more efficient hydraulic conditions. A system of relief wells was installed adjacent to the landward toe of the levees, in critical areas, to discharge the anticipated seepage at high stages into the interior drainage system. Debris deflectors were installed on each side just upstream of the highway bridge to prevent log jams. County roads affected by the construction of the project were relocated as necessary. Details of these features of the project as constructed are shown on the appended plans.

4. PROTECTION PROVIDED

The project, as constructed, will provide protection to the community of Orick and the adjacent agricultural and grazing areas behind the levees against all floods up to the design flood of 77,000 cubic feet per second. This design flood is about 40 percent greater than the largest flood of record, that of December 1964. Protection from local flooding behind the levees is provided by a gravity drainage system of open ditches and storm drains with inlets as required.

5. CONSTRUCTION HISTORY

* The project constructed under Contract No. DA-04-203-CIVENG-66-190 dated 20 April 1966 by Eugene Luhr & Co., was initiated in 1966, completed in October 1968, and formally transferred to Humboldt County on 14 November 1968 for maintenance and operation. In 1976 filter drain was constructed for the right levee between stations 49+30 and 60+70 under Contract No. DAC-W07-76-C-0055 by the Venturini Corporation of San Mateo, California.*

11. CHANNEL

a. Description. The improved channel, with a 250-foot-bottom width throughout the project, extends from the mouth of Redwood Creek at station 15+50 approximately 3.4 miles upstream, to station 192+90. The natural earth channel bottom was constructed with a slope of 0.0014 throughout the project. The channel slopes were excavated to a slope of 1 vertical on 3 horizontal. Riprap was placed on the slopes the full length of both slopes. This riprap varies in thickness from 12 inches to 24 inches and the toe was carried to a vertical depth of 7 or 10 feet below the channel bottom as shown on the appended plans. Where riprap was placed under water, the thickness of the blanket was increased by 50 percent. On the right bank, the thickness of the riprap for the upstream 10 feet was increased to 60 inches; on the left bank, the upper end of the riprap was keyed in with a 24-inch-thick layer to prevent erosion. A control sill was constructed of derrick stone at the lower end of the project to protect the downstream end of the project and to prevent degradation of the channel bottom. Details of this sill are shown on Sheet 21 of the appended plans. Maintenance of the sill to the correct line and grade is essential to the proper functioning of the project.

b. Maintenance. Inspection and maintenance of channels and floodways shall be in accordance with paragraph 208.10(a) General, (see paragraph 9 of this manual) and 208.10(g) which states:

"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 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. Maintenance of the riprapped chutes at stations 59+80 and 68+34 is particularly important in order to preserve the hydraulic characteristics of the structures and to prevent an increase of velocity in this reach of the channel. The structures should be maintained to the dimensions and elevations that are shown on the appended plans.

(2) Operation. The 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 debris. Large objects which become lodged against the bank shall be removed. The improved channel 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."

12. LEVEES

* a. Description. Levees were constructed along both banks upstream from station 17+00, tying into high ground near the upper end of the project. The right bank levee extends upstream to station 171+75 that on the left bank to station 192+80. The levees, with an impervious core, were constructed with a crest width of 12 feet, the channel side slopes continue the slopes of the channel and are 1 vertical on 3 horizontal; the land side slopes are 1 vertical on 2.5 horizontal. The channel riprap was continued up the channel side slopes the entire length of both levees. The riprap was continued on around the downstream ends of the levees in order to prevent erosion at these points. Between stations 49+30 and 60+70, right levee, sand and gravel filter drain was installed in the landside berm and spalls were placed along the landside toe of the levee. Relief wells were installed at the landside toe of the levees at appropriate points along both levees. The wood stave screen type was used. The wells will discharge into the gravity interior drainage system at high flow stages. Earthen berms of pervious fill, averaging about 3 feet high were constructed along the landside toe of both levees at various points. Since the crests of the levees will be used as service roads in maintaining the project, access roads, ramps and turnarounds were provided as necessary. Wire-rope barricades were erected to prevent unauthorized entry at various points. The location and all details of the above features are shown on the appended plans.*

b. Maintenance. Inspection and maintenance of levees shall be in accordance with paragraph 208.10(a) General, (see paragraph 9 of this manual) and 208.10(b) which states:

"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 deposits, and repair of damage caused by erosion or other forces. 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) Drains through the levees and gates on said drains are in good working condition;

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

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

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

(viii) Encroachments are not being made on the levee rights-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 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;
- (vi) 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."

Compliance with the provisions prescribed is essential for the efficient maintenance of the levee system and the successful operation of the project. Checklists suggested under Exhibit C should be used in each inspection to insure that no feature of the protective works is overlooked. Items requiring maintenance should be noted thereon; if items are found satisfactory, they should be so indicated by a check.

13. RELIEF WELLS

* a. Description. Fifth-four relief wells have been installed along the land side toe of the left and right levees, between stations 78+00 and 158+25. Locations of the relief wells are shown on Sheets 3, 4, 6 and 7. Details are shown on Sheet 22 and on Table 1, Page 19.*

* b. Inspection. The relief wells shall be sounded annually to check for sanding. The inspection should include an examination of the cover plates, locks, tee outlets and other appurtenances. Any indication of piping or slumping of the ground around or near wells shall also be included in the inspection. Relief wells shall be pump tested at 5-year intervals to obtain the specific yield of the well (gallons per minute per foot of well screen per foot of well drawdown). If this yield is less than 80 percent of the installed yield as shown on Table 1, then corrective treatment surging and flushing shall be made and the well pump tested again. The wells shall be checked for sanding before and after each pumping. Damages to relief wells and associated discharge systems shall be corrected as soon as practicable. Wells which sand badly shall be filled with concrete and replacement wells installed. During periods of high stream flow in Redwood Creek, the relief wells shall be checked for discharge to determine specific yield and possible

sanding. Results of inspections shall be reported to the District Office, Engineering Division, ATTN: Design Branch. Relief wells which do not function properly during periods of high stream flow shall be reported immediately to the above by telephone.*

c. Maintenance. Prior to 15 October of each year the relief wells shall be sounded to determine the amount of sand that has accumulated in the bottom of the pipes. If there is more than 12 inches in the wells, they are to be flushed with a mixture of air and water until all the material has been removed from inside the pipes. In addition, any trash or debris which has accumulated in the outlets of collector pipes shall be removed. Damaged relief wells and associated discharge systems shall be corrected as soon as practicable. Wells which sand badly shall be filled with concrete and replacement wells installed.

14. DRAINAGE STRUCTURES

a. Description. The area behind the levee is protected from inundation by local runoff by a gravity drainage system composed of concrete inlets, manholes where necessary and reinforced concrete pipes discharging into ditches which in turn conduct the flow into natural channels which drain into the Pacific Ocean at a point downstream of the end of the levees.

b. Maintenance. Inspection and maintenance of drainage structures shall be in accordance with paragraph 208.10(a) General, (see paragraph 7 of this manual) and 208.10(d) which states:

"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 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 of 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 closed. 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."

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.

15. MISCELLANEOUS FACILITIES

Inspection, maintenance and operation of miscellaneous facilities shall be in accordance with paragraph 208.10(a) General, (see paragraph 7 of this manual) and 208.10(h) which states:

"Miscellaneous facilities

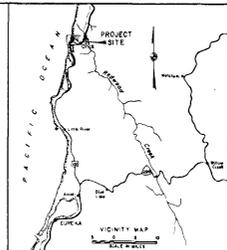
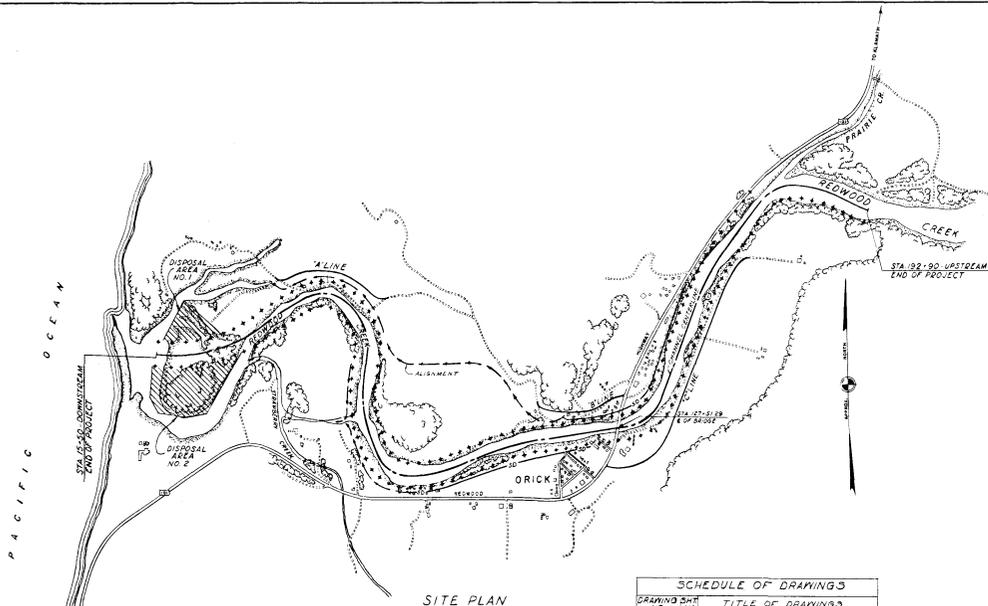
(1) Maintenance. Miscellaneous structures and facilities constructed as a part of the protective works and other structures and facilities which function as a part of, or affect the efficient functioning of the protective works, shall be periodically inspected by the Superintendent and appropriate maintenance measures taken. Damages or unserviceable parts shall be repaired or replaced without delay. The Superintendent shall take proper steps to prevent restriction of bridge openings.

(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."

16. FLOOD PLAIN MANAGEMENT

Flood plain zoning was not incorporated as a part of the plan as set forth in the project document. However, subsequent to the completion of project construction the subject was investigated and Humboldt County expressed an interest in flood plain zoning for these areas around the community of Orick, California and adjacent to the mouth of Redwood Creek. This interest is evidenced by Exhibit E.

PASCADERO 4017



LEGEND

- CONSTRUCTION RIGHT OF WAY
- ==== PAVED ROAD
- RELOCATED ROAD
- UNIMPROVED ROAD
- TELEPHONE LINE & POLES
- POWER LINE & POLES
- FENCE
- EDGE OF WATER
- BUILDING
- DEPRESSED AREA
- CULVERT - NEW
- CULVERT - EXISTING
- VEGETATION
- STORM DRAIN - NEW
- SEPTIC TANK
- RELIEF WELL - NEW
- INTERIOR ORNANCE DITCH - NEW
- LEVEE
- DISPOSAL AREA OR FILL AREA
- EXPLORATION HOLE (AUGER)
- EXPLORATION HOLE (UNDISTURBED SAWH.)
- AUGER BORING, COURTESY OF DIVISION OF HIGHWAYS, STATE OF CALIFORNIA
- REINFORCED CONCRETE P-PILE
- BUILDDINGS TO BE REMOVED BY OTHERS
- CORPS OF ENGINEERS D&K SET IN CONCRETE
- POST

SITE PLAN

PROJECT CENTERLINE			
LOCATION	BEARING	DISTANCE	COORDINATES
STA 0+00	238° 19' 32"	1.0000	705,579.30
STA 1+00	238° 19' 32"	2.0000	705,579.30
STA 2+00	238° 19' 32"	3.0000	705,579.30
STA 3+00	238° 19' 32"	4.0000	705,579.30
STA 4+00	238° 19' 32"	5.0000	705,579.30
STA 5+00	238° 19' 32"	6.0000	705,579.30
STA 6+00	238° 19' 32"	7.0000	705,579.30
STA 7+00	238° 19' 32"	8.0000	705,579.30
STA 8+00	238° 19' 32"	9.0000	705,579.30
STA 9+00	238° 19' 32"	10.0000	705,579.30
STA 10+00	238° 19' 32"	11.0000	705,579.30
STA 11+00	238° 19' 32"	12.0000	705,579.30
STA 12+00	238° 19' 32"	13.0000	705,579.30
STA 13+00	238° 19' 32"	14.0000	705,579.30
STA 14+00	238° 19' 32"	15.0000	705,579.30
STA 15+00	238° 19' 32"	16.0000	705,579.30
STA 16+00	238° 19' 32"	17.0000	705,579.30
STA 17+00	238° 19' 32"	18.0000	705,579.30
STA 18+00	238° 19' 32"	19.0000	705,579.30
STA 19+00	238° 19' 32"	20.0000	705,579.30
STA 20+00	238° 19' 32"	21.0000	705,579.30
STA 21+00	238° 19' 32"	22.0000	705,579.30
STA 22+00	238° 19' 32"	23.0000	705,579.30
STA 23+00	238° 19' 32"	24.0000	705,579.30
STA 24+00	238° 19' 32"	25.0000	705,579.30
STA 25+00	238° 19' 32"	26.0000	705,579.30
STA 26+00	238° 19' 32"	27.0000	705,579.30
STA 27+00	238° 19' 32"	28.0000	705,579.30
STA 28+00	238° 19' 32"	29.0000	705,579.30
STA 29+00	238° 19' 32"	30.0000	705,579.30
STA 30+00	238° 19' 32"	31.0000	705,579.30
STA 31+00	238° 19' 32"	32.0000	705,579.30
STA 32+00	238° 19' 32"	33.0000	705,579.30
STA 33+00	238° 19' 32"	34.0000	705,579.30
STA 34+00	238° 19' 32"	35.0000	705,579.30
STA 35+00	238° 19' 32"	36.0000	705,579.30
STA 36+00	238° 19' 32"	37.0000	705,579.30
STA 37+00	238° 19' 32"	38.0000	705,579.30
STA 38+00	238° 19' 32"	39.0000	705,579.30
STA 39+00	238° 19' 32"	40.0000	705,579.30
STA 40+00	238° 19' 32"	41.0000	705,579.30
STA 41+00	238° 19' 32"	42.0000	705,579.30
STA 42+00	238° 19' 32"	43.0000	705,579.30
STA 43+00	238° 19' 32"	44.0000	705,579.30
STA 44+00	238° 19' 32"	45.0000	705,579.30
STA 45+00	238° 19' 32"	46.0000	705,579.30
STA 46+00	238° 19' 32"	47.0000	705,579.30
STA 47+00	238° 19' 32"	48.0000	705,579.30
STA 48+00	238° 19' 32"	49.0000	705,579.30
STA 49+00	238° 19' 32"	50.0000	705,579.30
STA 50+00	238° 19' 32"	51.0000	705,579.30
STA 51+00	238° 19' 32"	52.0000	705,579.30
STA 52+00	238° 19' 32"	53.0000	705,579.30
STA 53+00	238° 19' 32"	54.0000	705,579.30
STA 54+00	238° 19' 32"	55.0000	705,579.30
STA 55+00	238° 19' 32"	56.0000	705,579.30
STA 56+00	238° 19' 32"	57.0000	705,579.30
STA 57+00	238° 19' 32"	58.0000	705,579.30
STA 58+00	238° 19' 32"	59.0000	705,579.30
STA 59+00	238° 19' 32"	60.0000	705,579.30
STA 60+00	238° 19' 32"	61.0000	705,579.30
STA 61+00	238° 19' 32"	62.0000	705,579.30
STA 62+00	238° 19' 32"	63.0000	705,579.30
STA 63+00	238° 19' 32"	64.0000	705,579.30
STA 64+00	238° 19' 32"	65.0000	705,579.30
STA 65+00	238° 19' 32"	66.0000	705,579.30
STA 66+00	238° 19' 32"	67.0000	705,579.30
STA 67+00	238° 19' 32"	68.0000	705,579.30
STA 68+00	238° 19' 32"	69.0000	705,579.30
STA 69+00	238° 19' 32"	70.0000	705,579.30
STA 70+00	238° 19' 32"	71.0000	705,579.30
STA 71+00	238° 19' 32"	72.0000	705,579.30
STA 72+00	238° 19' 32"	73.0000	705,579.30
STA 73+00	238° 19' 32"	74.0000	705,579.30
STA 74+00	238° 19' 32"	75.0000	705,579.30
STA 75+00	238° 19' 32"	76.0000	705,579.30
STA 76+00	238° 19' 32"	77.0000	705,579.30
STA 77+00	238° 19' 32"	78.0000	705,579.30
STA 78+00	238° 19' 32"	79.0000	705,579.30
STA 79+00	238° 19' 32"	80.0000	705,579.30
STA 80+00	238° 19' 32"	81.0000	705,579.30
STA 81+00	238° 19' 32"	82.0000	705,579.30
STA 82+00	238° 19' 32"	83.0000	705,579.30
STA 83+00	238° 19' 32"	84.0000	705,579.30
STA 84+00	238° 19' 32"	85.0000	705,579.30
STA 85+00	238° 19' 32"	86.0000	705,579.30
STA 86+00	238° 19' 32"	87.0000	705,579.30
STA 87+00	238° 19' 32"	88.0000	705,579.30
STA 88+00	238° 19' 32"	89.0000	705,579.30
STA 89+00	238° 19' 32"	90.0000	705,579.30
STA 90+00	238° 19' 32"	91.0000	705,579.30
STA 91+00	238° 19' 32"	92.0000	705,579.30
STA 92+00	238° 19' 32"	93.0000	705,579.30
STA 93+00	238° 19' 32"	94.0000	705,579.30
STA 94+00	238° 19' 32"	95.0000	705,579.30
STA 95+00	238° 19' 32"	96.0000	705,579.30
STA 96+00	238° 19' 32"	97.0000	705,579.30
STA 97+00	238° 19' 32"	98.0000	705,579.30
STA 98+00	238° 19' 32"	99.0000	705,579.30
STA 99+00	238° 19' 32"	100.0000	705,579.30

DRAWING NO.	DATE	TITLE OF DRAWINGS
85-45-6	1	VICINITY MAP, SITE PLAN & SCHEDULE OF DRAWINGS
85-45-6	2	PLAN AND PROFILE - STA 1+00 TO STA 46+00
85-45-6	3	PLAN AND PROFILE - STA 46+00 TO STA 46+44
85-45-6	4	PLAN AND PROFILE - STA 46+44 TO STA 11+00
85-45-6	5	PLAN AND PROFILE - STA 11+00 TO STA 10+00
85-45-6	6	PLAN AND PROFILE - STA 10+00 TO STA 46+00
85-45-6	7	PLAN AND PROFILE - STA 46+00 TO STA 10+00
85-45-6	8	PLAN AND PROFILE - STA 10+00 TO STA 17+25
85-45-6	9	PLAN AND PROFILE - STA 17+25 TO STA 32+30
85-45-6	10	TYPICAL CROSS SECTIONS AND PROFILES
85-45-6	11	CROSS SECTIONS - STA 1+00 TO STA 49+00
85-45-6	12	CROSS SECTIONS - STA 49+00 TO STA 85+00
85-45-6	13	CROSS SECTIONS - STA 85+00 TO STA 16+00
85-45-6	14	CROSS SECTIONS - STA 16+00 TO STA 50+00
85-45-6	15	CROSS SECTIONS - STA 50+00 TO STA 17+25
85-45-6	16	CROSS SECTIONS - STA 17+25 TO STA 3+00
85-45-6	17	TYPICAL CROSS SECTIONS
85-45-6	18	DISPOSAL AREAS AND TURNAROUNDS

DRAWING NO.	DATE	TITLE OF DRAWINGS
85-45-6	14	PROPOSED PROTECTIVE PROTECTION WALL
85-45-6	15	PROPOSED PROTECTIVE PROTECTION WALL
85-39-7	7	PROPOSED PROTECTIVE PROTECTION WALL

DRAWING NO.	DATE	TITLE OF DRAWINGS
85-45-6	19	CONCRETE P-PILE
85-45-6	20	TYPE OF P-PILE SYSTEM
85-45-6	21	PROPOSED PROTECTIVE PROTECTION WALL
85-45-6	22	RELIEF WELL AND C&G DATE
85-45-6	23	DISPOSAL STRUCTURES
85-45-6	24	PROPOSED PROTECTIVE PROTECTION WALL AND EROSION CONTROL
85-45-6	25	AND DRAIN
85-45-6	26	DISPOSAL AREAS
85-45-6	27	LOCATION OF EXPLORATION HOLES
85-45-6	28	LOSS OF EXPLORATION HOLES
85-45-6	29	COUNTY ROAD RELOCATION
85-45-6	30	COUNTY ROAD RELOCATION
85-45-6	31	COUNTY ROAD RELOCATION
85-45-6	32	COUNTY ROAD RELOCATION
85-45-6	33	COUNTY ROAD RELOCATION
85-45-6	34	COUNTY ROAD RELOCATION
85-45-6	35	COUNTY ROAD RELOCATION
85-45-6	36	COUNTY ROAD RELOCATION
85-45-6	37	COUNTY ROAD RELOCATION
85-45-6	38	COUNTY ROAD RELOCATION
85-45-6	39	COUNTY ROAD RELOCATION
85-45-6	40	COUNTY ROAD RELOCATION
85-45-6	41	COUNTY ROAD RELOCATION
85-45-6	42	COUNTY ROAD RELOCATION
85-45-6	43	COUNTY ROAD RELOCATION
85-45-6	44	COUNTY ROAD RELOCATION
85-45-6	45	COUNTY ROAD RELOCATION
85-45-6	46	COUNTY ROAD RELOCATION
85-45-6	47	COUNTY ROAD RELOCATION
85-45-6	48	COUNTY ROAD RELOCATION
85-45-6	49	COUNTY ROAD RELOCATION
85-45-6	50	COUNTY ROAD RELOCATION
85-45-6	51	COUNTY ROAD RELOCATION
85-45-6	52	COUNTY ROAD RELOCATION

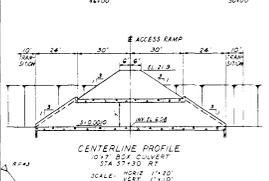
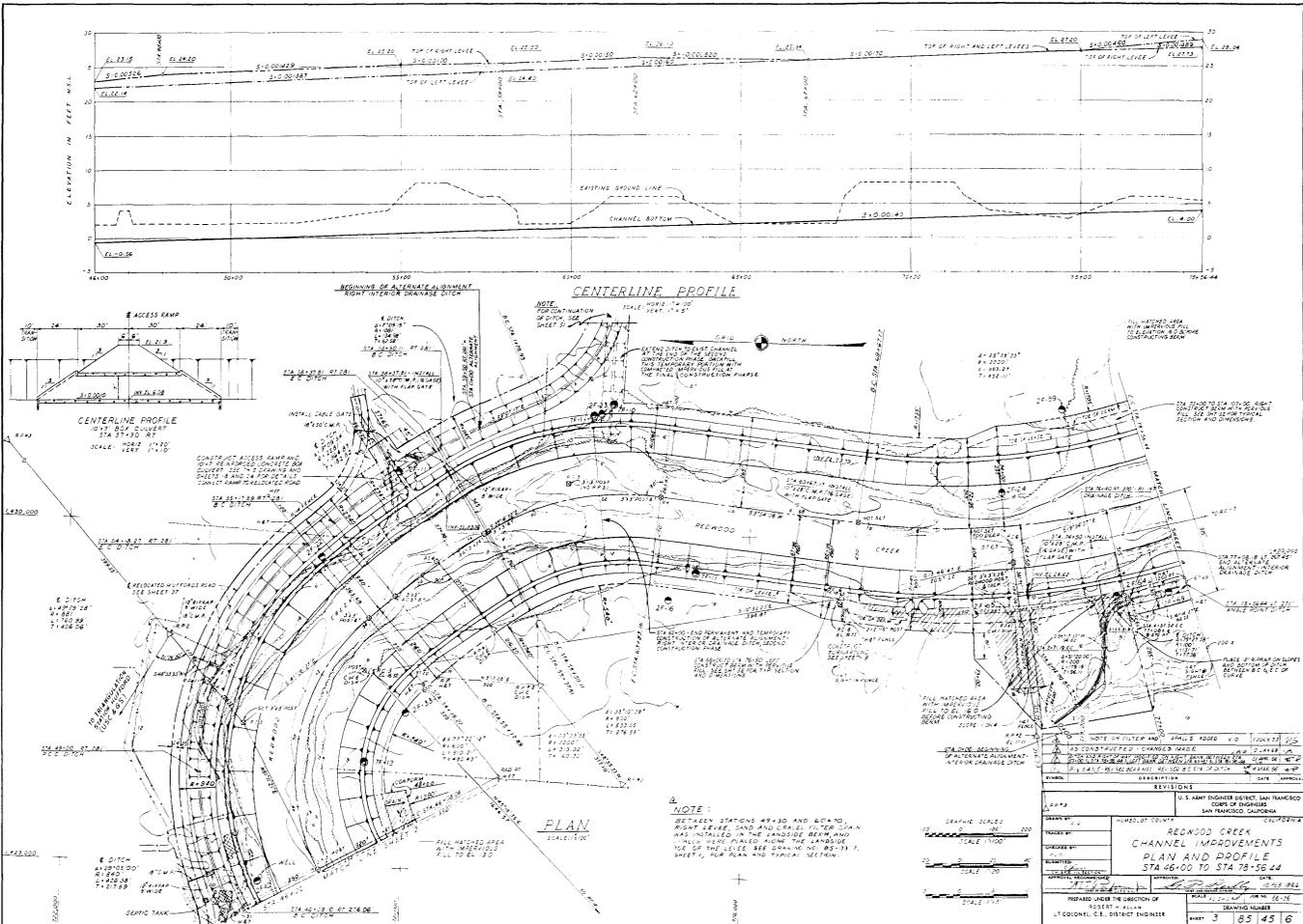
NOTES:
 1. ELEVATIONS ARE BASED ON THE DATUM OF MEAN SEA LEVEL.
 2. DISTANCES, BEARINGS AND COORDINATES ARE BASED ON THE STATE OF CALIFORNIA COORDINATE SYSTEM (NAD83) COORDINATE PROJECTION, ZONE 10, CALIFORNIA AS DESCRIBED IN LOCAL PUBLICATION NO. 128 PUBLISHED BY THE U.S. COAST AND GEODETIC SURVEY.
 3. ELEVATIONS ARE BASED ON THE L.S.M. (NAD83) DATUM FOR THE STATE OF CALIFORNIA. THE L.S.M. (NAD83) DATUM FOR THE STATE OF CALIFORNIA IS DESCRIBED IN LOCAL PUBLICATION NO. 128 PUBLISHED BY THE U.S. COAST AND GEODETIC SURVEY.
 4. ALL MEASUREMENTS AND CALCULATIONS ARE APPROXIMATE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE ACCURACY OF ALL MEASUREMENTS AND CALCULATIONS.
 5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE ACCURACY OF ALL MEASUREMENTS AND CALCULATIONS.

NO.	DATE	BY	DESCRIPTION
1	10/1/85	DKK	DESIGNED
2	10/1/85	DKK	CHECKED
3	10/1/85	DKK	APPROVED

NO.	DATE	BY	DESCRIPTION
1	10/1/85	DKK	DESIGNED
2	10/1/85	DKK	CHECKED
3	10/1/85	DKK	APPROVED

NO.	DATE	BY	DESCRIPTION
1	10/1/85	DKK	DESIGNED
2	10/1/85	DKK	CHECKED
3	10/1/85	DKK	APPROVED

PASCADERO 4019



CENTERLINE PROFILE
 STA 46+80 TO STA 79+54.44
 SCALE: 1"=20'

CENTERLINE PROFILE
 SCALE: 1"=20'

PLAN
 SCALE: 1"=100'

NOTE:
 BETWEEN STATIONS 46+80 AND 62+00, RIGHT LEVEE, SAND AND GRAVEL FILTER CANALS WERE INSTALLED IN THE HANDSOME BEYOND AND ALL WERE PLACED ALONG THE LANDSIDE OF THE LEVEE. SEE DRAWING NO. 85-29-1, SHEET 1, FOR PLAN AND TYPICAL SECTION.

U. S. ARMY DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA	
PROJECT: REEDWOOD CREEK CHANNEL IMPROVEMENTS PLAN AND PROFILE STA 46+80 TO STA 79+54.44	SHEET: 3 OF 3 DRAWING NUMBER: 85 145 6
DESIGNED BY: ROBERT A. ALLEN CHECKED BY: JAMES M. BRIDGEMAN	DATE: 1945

FOREWORD

This manual has been prepared by the District Engineer, to acquaint responsible local interests with the requirements of maintaining the earthen channel, earth levees, drainage structures, rip-rap protection and service roads constructed for the flood control project completed on 24 October 1968 on Redwood Creek, Humboldt County, California. Timely effective maintenance in accordance with this manual is required to assure the proper functioning of the improved channel and the continuation of beneficial results from the project.

Obsolete
Aug 77

REDWOOD CREEK
HUMBOLDT COUNTY, CALIFORNIA
LOCAL FLOOD PROTECTION PROJECT
OPERATION AND MAINTENANCE MANUAL

TABLE OF CONTENTS

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
	INTRODUCTION	
1	AUTHORIZATION	1
2	LOCATION	1
3	DESCRIPTION OF PROJECT	2
4	PROTECTION PROVIDED	2
5	CONSTRUCTION HISTORY	2
	REQUIREMENTS OF LOCAL COOPERATION	
6	ASSURANCE OF COOPERATION	3
7	SEMIANNUAL REPORT	3
	MAINTENANCE AND OPERATION	
8	PURPOSE	4
9	REGULATIONS	4
10	DUTIES OF SUPERINTENDENT	5
	a. Training of key personnel	5
	b. Streamflow stages	6
	c. Semiannual report	6
	d. Checklists	6
	e. Proposed improvements or alterations	6
11	CHANNEL	7
	a. Description	7
	b. Maintenance	7
12	LEVEES	8
	a. Description	8
	b. Maintenance	8
13	RELIEF WELLS	10
	a. Description	10
	b. Inspection	10
	c. Maintenance	11

TABLE OF CONTENTS (Cont'd)

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
14	DRAINAGE STRUCTURES	11
	a. Description	11
	b. Maintenance	11
15	MISCELLANEOUS FACILITIES	12
16	FLOOD PLAIN MANAGEMENT	12
	METHODS OF COMBATTING FLOOD CONDITIONS	
17	SUGGESTED METHODS	13
	a. Earthen levees	13
	b. Premeditated damage	13
	c. Security	13
	d. Human element	14
	e. Inspector of flood control works	14
	f. Preliminary repair work	14
	g. Disaster relief	15
	h. Flood fight	16
	i. Topping	17
	j. Transportation	17
	k. Checklists	18
	l. Use of Government plant	18
	m. Flood Emergency Manual	18

EXHIBITS

- Exhibit A -- Code of Federal Regulations, Title 33, Section 208.10
- Exhibit B -- Resolution of the Board of Supervisors of Humboldt County, California
- Exhibit C -- Inspection Checklist
- Exhibit D -- Suggested methods of emergency protection - 5 plates
- Exhibit E -- Letter Re: zoning - Humboldt County Planning Commission

APPENDIX

- Drawings File No. 85-45-6
- Drawings numbered 1-55

REDWOOD CREEK
HUMBOLDT COUNTY, CALIFORNIA
LOCAL FLOOD PROTECTION PROJECT

OPERATION AND MAINTENANCE MANUAL

INTRODUCTION

1. AUTHORIZATION

The Redwood Creek Flood Control Project, Humboldt County, California, was authorized by the Flood Control Act of 1962, Public Law 87-874, Eighty-seventh Congress, Second Session, under the provisions of Section 203, approved 23 October 1962, which act reads in part as follows:

"Section 203. The following works of improvement for the benefits of navigation and the control of destructive flood waters and other purposes are hereby adopted and authorized to be prosecuted under the direction of the Secretary of the Army and the supervision of the Chief of Engineers in accordance with the plans in the respective reports hereinafter designated and subject to the conditions set forth herein."

* * * * *

* * * * *

REDWOOD CREEK BASIN

"The project for flood protection on Redwood Creek, Humboldt County, California, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers and House Document No. 497, Eighty-seventh Congress, at the estimated cost of \$2,580,000."

2. LOCATION

The project is located along the lower reaches of Redwood Creek near Orick, Humboldt County, California. The creek discharges into the Pacific Ocean approximately 50 miles south of the Oregon-California border. The basin is an elongated area of approximately 280 square miles. It extends about 56 miles from the northwest to the southeast and has a maximum width of about 7 miles. The largest tributary to Redwood Creek is Prairie Creek which drains the northern

part of the watershed and joins the main stream about 3.5 miles above its mouth. Prairie Creek drains an area of about 40 square miles, extending approximately 12 miles north of the junction of the two streams. The other tributaries are short steep-gradient creeks which extend to the main stream from each side throughout its length. The area protected from floods by the completed project is the lower 3.5 miles of Redwood Creek and the town of Orick.

3. DESCRIPTION OF PROJECT

The Redwood Creek flood control project consists of an improved channel with a bottom width of 250 feet and levees along both banks. A gravity drainage system has been provided to collect and divert local drainage from behind the levees into the Pacific Ocean. Stone riprap slope protection has been provided for the slopes of the channel and the channel side slopes of the levees. The project extends from the mouth of the creek upstream approximately 3.4 miles. A derrick stone control sill was constructed at the lower end of the improved channel to stabilize the ends of the levees and to prevent degradation of the channel bottom in the lower reach. The two center piers of the U.S. 101 Highway bridge were extended upstream to provide for more efficient hydraulic conditions. A system of relief wells was installed adjacent to the landward toe of the levees, in critical areas, to discharge the anticipated seepage at high stages into the interior drainage system. Debris deflectors were installed on each side just upstream of the highway bridge to prevent log jams. County roads affected by the construction of the project were relocated as necessary. Details of these features of the project as constructed are shown on the appended plans.

4. PROTECTION PROVIDED

The project, as constructed, will provide protection to the community of Orick and the adjacent agricultural and grazing areas behind the levees against all floods up to the design flood of 77,000 cubic feet per second. This design flood is about 40 percent greater than the largest flood of record, that of December 1964. Protection from local flooding behind the levees is provided by a gravity drainage system of open ditches and storm drains with inlets as required.

5. CONSTRUCTION HISTORY

The project constructed under Contract No. DA-04-203-CIVENG-66-190 dated 20 April 1966 by Eugene Luhr & Co., was initiated in 1966, completed in October 1968, and formally transferred to Humboldt County on 14 November 1968 for maintenance and operation.

REQUIREMENTS OF LOCAL COOPERATION

6. ASSURANCE OF COOPERATION

By an unnumbered resolution, dated 16 November 1965, the Board of Supervisors of Humboldt County stated that they would:

- a. Provide, without cost to the United States, all lands, easements and rights-of-way necessary for construction of the project;
- 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;
- d. Make all relocations of buildings, utilities, roads and related facilities necessary for the construction and maintenance of the project;
- e. Prevent any encroachment on flood channels, or ponding areas, which will result in decreasing the effectiveness of the flood control improvements.

A copy of this resolution is included as Exhibit A. ^B

7. SEMIANNUAL REPORT

Attention is directed to paragraph 208.10(a)(6) of the Flood Control Regulations (inclosed with this manual as Exhibit B) which states that it shall be the duty of the responsible supervising official, hereinafter referred to as the Superintendent, to submit a semiannual report to the District Engineer covering inspection, maintenance and operation of the protective works. The report should be submitted within a 10-day period, prior to 1 June and 1 December of each year, and should include all dated copies of reports of inspections made during the period of report. The report should also include the nature, date of construction and date of removal of all temporary repairs and the dates of permanent repairs. In accordance with the regulations, inspections shall be made prior to the beginning of the flood season and otherwise at intervals not to exceed 90 days during flood seasons to forestall deterioration and insure that all equipment is in proper working order and ready for instant use. Immediate steps shall be taken to remedy any adverse conditions disclosed by such inspections. The checklists shown in Exhibit C should be used in each inspection to insure that no feature of the protective system is overlooked. Items requiring maintenance should be noted thereon; if items are satisfactory, they should be so indicated by a check.

MAINTENANCE AND OPERATION

8. PURPOSE

The purpose of this manual is to assist the responsible local authorities in carrying out their obligations through provision of information and advice as to the operation and maintenance requirements of the project. The appended construction plans are included as an aid in proper maintenance and should be adhered to.

9. REGULATIONS

Section 208.10, Title 33 of the Code of Federal Regulations contains rules for the maintenance and operation of local flood protection works approved by the Secretary of the Army in accordance with authority contained in Section 3 of the Flood Control Act of 22 June 1936, as amended and supplemented. A copy of the complete regulations will be found in Exhibit B. Compliance with these regulations is one of the requirements of local cooperation. Applicable portions of the regulations are as follows:

"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 of construction be permitted within the limits of the project rights-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 representatives 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 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 semi-annual 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."

10. DUTIES OF SUPERINTENDENT

In line with the provisions covered by the regulations, the general duties of the Superintendent should include the following:

a. Training of key personnel. Key personnel should 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 keymen and a reasonable number of substitutes. These keymen should in turn have similar data on all of the men that will be necessary for assistance in the discharge of their duties. The organization of keymen should include the following:

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

(2) Section foremen in sufficient number to lead maintenance patrol work of the entire levee during flood fights. High qualities of leadership and responsibility are necessary for these positions.

b. Streamflow stages. Permanent arrangements should be made by the Superintendent with the United States Weather Bureau at Eureka, California, to secure forecasts of weather conditions to plan adequate measures of protection.

c. Semiannual report. The semiannual reports required under the regulations should be submitted within a 10-day period prior to 1 June and 1 December of each year and should include all dated copies of reports of inspections made during the period of report. Also, the nature, date of construction, and date of removal of all temporary repairs and the dates of permanent repairs should be included in the report. Other items and suggestions relative to public cooperation are considered pertinent and desirable data for inclusion in the report, but are not required. In addition, a brief narrative statement on general functioning of the project, condition of the works and proposals for repairing damages or remedying any defects that become apparent will be helpful. A suggested form for submission of the semiannual report covering the major features of maintenance, inspection and operation is furnished as Exhibit C for the convenience of the Superintendent. The organization responsible for the maintenance and operation of the project is required to provide its own forms in accordance with the sample.

d. Checklists. The checklists shown in Exhibit C should be used in each inspection to insure that no features of the protective system are overlooked. Items requiring maintenance should be noted thereon; if items are satisfactory, they should be so indicated by a check.

e. Proposed improvements or alterations. Drawings or prints of proposed improvements or alterations to the existing Flood Control Works must be submitted for approval to the District Engineer, U.S. Army Engineer District, San Francisco, Corps of Engineers, San Francisco, California, sufficiently in advance of the proposed construction to permit adequate study and consideration of the work. The Humboldt County Public Works Department shall review all proposed plans of improvement for appropriateness and assure the improvements are located on the plans with reference to project centerline station. This review will be accomplished prior to submittal to the District Engineer. Drawings or prints, in duplicate, showing any improvements or alterations as finally constructed should be furnished to the District Engineer, U.S. Army Engineer District, San Francisco, Corps of Engineers, after completion of the work.

11. CHANNEL

a. Description. The improved channel, with a 250-foot-bottom width throughout the project, extends from the mouth of Redwood Creek at station 15+50 approximately 3.4 miles upstream, to station 192+90. The natural earth channel bottom was constructed with a slope of 0.0014 throughout the project. The channel slopes were excavated to a slope of 1 vertical on 3 horizontal. Riprap was placed on the slopes the full length of both slopes. This riprap varies in thickness from 12 inches to 24 inches and the toe was carried to a vertical depth of 7 or 10 feet below the channel bottom as shown on the appended plans. Where riprap was placed under water, the thickness of the blanket was increased by 50 percent. On the right bank, the thickness of the riprap for the upstream 10 feet was increased to 60 inches; on the left bank, the upper end of the riprap was keyed in with a 24-inch-thick layer to prevent erosion. A control sill was constructed of derrick stone at the lower end of the project to protect the downstream end of the project and to prevent degradation of the channel bottom. Details of this sill are shown on Sheet 21 of the appended plans. Maintenance of the sill to the correct line and grade is essential to the proper functioning of the project.

b. Maintenance. Inspection and maintenance of channels and floodways shall be in accordance with paragraph 208.10(a) General, (see paragraph 9 of this manual) and 208.10(g) which states:

"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 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. Maintenance of the riprapped chutes at stations 59+80 and 68+34 is particularly important in order to preserve the hydraulic characteristics of the structures and to prevent an increase of velocity in this reach of the channel. The structures should be maintained to the dimensions and elevations that are shown on the appended plans.

(2) Operation. The 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 debris. Large objects which become lodged against the bank shall be removed. The improved channel 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."

12. LEVEES

a. Description. Levees were constructed along both banks upstream from station 17+00, tying into high ground near the upper end of the project. The right bank levee extends upstream to station 171+75 that on the left bank to station 192+80. The levees, with an impervious core, were constructed with a crest width of 12 feet, the creekside slopes continue the slopes of the channel and are 1 vertical on 3 horizontal; the land side slopes are 1 vertical on 2.5 horizontal. The channel riprap was continued up the creekside slopes the entire length of both levees. The riprap was continued on around the downstream ends of the levees in order to prevent erosion at these points. Relief wells were installed at the landside toe of the levees at appropriate points along both levees. The wood stave screen type was used. The locations of relief wells are shown on Sheet 22 of the appended plans. The wells will discharge into the gravity interior drainage system at high flow stages. Earthen berms of pervious fill, averaging about 3 feet high were constructed along the landside toe of both levees at various points. Since the crests of the levees will be used as service roads in maintaining the project, access roads, ramps and turnarounds were provided as necessary. Wire-rope barricades were erected to prevent unauthorized entry at various points. The location and all details of the above features are shown on the appended plans.

b. Maintenance. Inspection and maintenance of levees shall be in accordance with paragraph 208.10(a) General, (see paragraph 9 of this manual) and 208.10(b) which states:

"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 deposits, and repair of damage caused by erosion or other forces. 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) Drains through the levees and gates on said drains are in good working condition;

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

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

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

(viii) Encroachments are not being made on the levee rights-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 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;
- (vi) 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."

Compliance with the provisions prescribed is essential for the efficient maintenance of the levee system and the successful operation of the project. Checklists suggested under Exhibit C should be used in each inspection to insure that no feature of the protective works is overlooked. Items requiring maintenance should be noted thereon; if items are found satisfactory, they should be so indicated by a check.

13. RELIEF WELLS

a. Description. Fifty-four relief wells have been installed at the left and right land side levee toes along Redwood Creek between Station 78+00 and Station 158+25. Locations and details of the relief well installations are shown on Plates 1 through 5.

b. Inspection. The relief wells shall be sounded annually to check for sanding. The inspection should include an examination of the cover plates, locks, tee outlets and other appurtenances. Any indication of piping or slumping of the ground around or near wells shall also be included in the inspection. Relief wells shall be pump tested at 5-year intervals to obtain the specific yield of the well (gallons per minute per foot of well screen per foot of well drawdown). If this yield is less than 80 percent of the installed yield as shown on Plate 5, then corrective treatment surging and flushing shall be made and the well pump tested again. The wells shall be checked for sanding before and after each pumping. Damages to relief wells and associated discharge systems shall be corrected as soon as practicable. Wells which sand badly shall be filled with concrete and replacement wells installed. During periods of high stream flow in Redwood Creek, the relief wells shall be checked

for discharge to determine specific yield and possible sanding. Results of inspections shall be reported to the District Office, Engineering Division, ATTN: Design Branch, except that relief wells which do not function properly during periods of high stream flow shall be reported immediately to the above by telephone.

c. Maintenance. Prior to 15 October of each year the relief wells shall be sounded to determine the amount of sand that has accumulated in the bottom of the pipes. If there is more than 12 inches in the wells, they are to be flushed with a mixture of air and water until all the material has been removed from inside the pipes. In addition, any trash or debris which has accumulated in the outlets of collector pipes shall be removed. Damaged relief wells and associated discharge systems shall be corrected as soon as practicable. Wells which sand badly shall be filled with concrete and replacement wells installed.

14. DRAINAGE STRUCTURES

a. Description. The area behind the levee is protected from inundation by local runoff by a gravity drainage system composed of concrete inlets, manholes where necessary and reinforced concrete pipes discharging into ditches which in turn conduct the flow into natural channels which drain into the Pacific Ocean at a point downstream of the end of the levees.

b. Maintenance. Inspection and maintenance of drainage structures shall be in accordance with paragraph 208.10(a) General, (see paragraph 7 of this manual) and 208.10(d) which states:

"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 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 of 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. 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."

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.

15. MISCELLANEOUS FACILITIES

Inspection, maintenance and operation of miscellaneous facilities shall be in accordance with paragraph 208.10(a) General, (see paragraph 7 of this manual) and 208.10(h) which states:

"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. The Superintendent shall take proper steps to prevent restriction of bridge openings.

(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."

16. FLOOD PLAIN MANAGEMENT

Flood plain zoning was not incorporated as a part of the plan as set forth in the project document. However, subsequent to the completion of project construction the subject was investigated and Humboldt County expressed an interest in flood plain zoning for these areas around the community of Orick, California and adjacent to the mouth of Redwood Creek. This interest is evidenced by Exhibit E.

METHODS OF COMBATING FLOOD CONDITIONS

17. SUGGESTED METHODS

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 District Engineer, U.S. Army Engineer District, San Francisco, Corps of Engineers, San Francisco, California, 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.

a. Earthen levees. An earthen levee is in possible danger whenever there is water against it. This danger varies with the height of the water, the duration of the flood stage, and the intensity of either the current or wave action. A well-constructed levee of proper section should, if maintained and not overtopped, hold throughout 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. Exhibit D, Plates 1 - 5 are attached to aid in flood emergency construction.

b. Premeditated damage. The Superintendent should continually guard against premeditated damage to the levee.

c. Security. Personnel of the Corps of Engineers, U.S. Army, 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 depre- dation, or other unlawful acts rests with the local interests through

local and State Governmental agencies. In the event local law enforcement agencies prove inadequate, local interests can request the aid of State forces, and if additional support becomes necessary, Federal troops can be requested as provided by law.

d. Human element. Panic does not directly endanger the levee, but psychological fear due to ignorance of actual conditions may seriously affect the high-water fight during a critical moment. This fact may be considered in organization for emergency work. Confidence, engendered by an efficient organization, free from local jealousies, is the best guard against panic.

e. Inspection of flood control works. As soon as heavy rainfall that could result in floodflows is forecast, the Superintendent 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 detailed inspection, particularly with reference to the following matters:

- (1) Sector limits; ascertain that the dividing line between sectors is plainly determined and, if necessary, marked.
- (2) Condition of new levees and recent repairs.
- (3) Condition of culverts, flap gates, and sluice gates.
- (4) Transportation facilities; roads and rail.
- (5) Material supply; quantity, location and condition.
- (6) Communications; locate and check all necessary telephones in the sector.

f. 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:

- (1) Fill up holes or washes in the levee crown and slopes. 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 in advance to combat wave wash along the exposed reaches.

PHOTOGRAPHIC
NOTES

(2) 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 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.

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

(4) 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.

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

(6) Check and obtain repair of all telephone lines necessary for operation, obtain lists of all team forces, motor-boats, motorcars, and truck transportation that can be made available.

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

(8) 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.

(9) Remove all dynamite and explosives of any kind from the vicinity of the levee.

g. Disaster relief. It is the responsibility of local, State and municipal authorities, supported by and/or working in 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.

h. 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 Department of the Army.

(1) 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 when seepage appears. The drains should be V-shaped, no deeper than necessary, and never more than 6 inches 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 be Y'd together and led into larger drains which, in general, should lead straight across the landside berm into the landside pits or nearer natural or artificial drain.

(2) 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 D, 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 built around the entire nest of boils, rising to such a height that none of the boils will discharge with enough force to displace sand.

(3) Wave wash. The Superintendent 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. Sections of cotton bagging should be placed over the washed areas, as shown in Exhibit D, Plate 3. As an alternative, filled 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 D, shows the movable type of wave wash protection, also used with good results. Its advantage is that it can rapidly be built at any convenient place and easily set in place on the job.

(4) Scours. A careful observation should be made of the riverside of the levee at all localities where high current velocities are observed. Trouble may be looked for at road-crossing ramps and places where pipes, sewers and other structures penetrate the levee. The approved method of construction to check scour on the slopes is 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.

i. Topping. Immediate consideration should be given the grade line of each levee section by comparison of existing grades with those shown on the appended drawings. 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, U.S. Army Engineer District, Corps of Engineers, San Francisco, California, as follows:

(1) Sack topping. Sack topping may be used to raise the crown of the levee about 3 feet. The sacks should generally 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 1/4 either way and well mauled into place. When properly sacked and tamped, one sack will give about three to four inches of topping. See Exhibit D, Plate 4.

(2) 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 6 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 3 feet in the ground, and should project out 3 feet, thus providing, in extreme cases, a 3-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 shown in the drawing, Exhibit D, Plate 5.

j. 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 plank road or by means of steel or wire mats.

k. Checklists. The inspection list in Exhibit C is furnished for reproduction and use by the local interests as a checklist for inspections and also for use in making the required semiannual reports. This list should be used in each inspection to insure that no feature of the protective system is overlooked. Items requiring repairs should be noted thereon; if items are satisfactory, they should be indicated as such.

l. Use of Government plant. The District Engineer, U.S. Army Engineer District, San Francisco, Corps of Engineers, 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 for such use. The authority also extends to saving of property where no suitable private equipment is available, provided that such use is without detriment to the Government.

m. Flood Emergency Manual. The most recent "Flood Emergency Manual" published by the San Francisco District Corps of Engineers should be used to supplement the information furnished in this Operation and Maintenance Manual.

Title 33—Navigation and Navigable Waters

Chapter II—Corps of Engineers

Part 208—Flood Control Regulations

Sec.

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

§ 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 right-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.

(3) *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 water.

(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. 9999, 10203]

BOARD OF SUPERVISORS, COUNTY OF HUMBOLDT, STATE OF CALIFORNIA

Certified copy of portion of proceedings, Meetings of November 16, 1965

IN THE MATTER OF GIVING ASSURANCES IN CONNECTION WITH REDWOOD CREEK FLOOD CONTROL PROJECT OF U. S. ARMY CORPS OF ENGINEERS AT ORICK.

Upon the motion of Supervisor Landis, seconded by Supervisor Mitchell, this Board of Supervisors hereby gives assurance to the U. S. Army Corps of Engineers of the willingness of the County of Humboldt to furnish the following items of local cooperation in connection with the construction of the Redwood Creek Flood Control Project at Orick:

- a. Provide, without cost to the United States, all lands, easements and rights-of-way necessary for construction of the project.
- 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.
- d. Make all relocations of buildings, utilities, roads and related facilities necessary for the construction and maintenance of the project.
- e. Prevent any encroachment on flood channels, or ponding areas, which will result in decreasing the effectiveness of the flood-control improvements.

AYES: Supervisors— Lindley, Bareilles, Robertson, Mitchell, Landis
 NOES: Supervisors— None
 ABSENT: Supervisors— None

STATE OF CALIFORNIA, }
 County of Humboldt } ss.

I, FRED J. MOORE, JR., County Clerk of the County of Humboldt, State of California, and ex-officio Clerk of the Board of Supervisors of the County of Humboldt, do hereby certify the foregoing to be full, true and correct copies of the original orders made in the above entitled matters by said Board of Supervisors, at a meeting held in Eureka, California, on November 16, 1965 and as the same now appears of record in my office.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the Seal of said Board of Supervisors this 18th day of November, 1965.

FRED J. MOORE, Jr.

County Clerk and ex-officio Clerk of the Board of Supervisors of the County of Humboldt, State of California

By Carlo Hayes Deputy Clerk.

RECORDED COPY

SEMI-ANNUAL REPORT FOR
INSPECTION, MAINTENANCE, AND OPERATION OF
FLOOD CONTROL PROJECT
REDWOOD CREEK, HUMBOLDT COUNTY

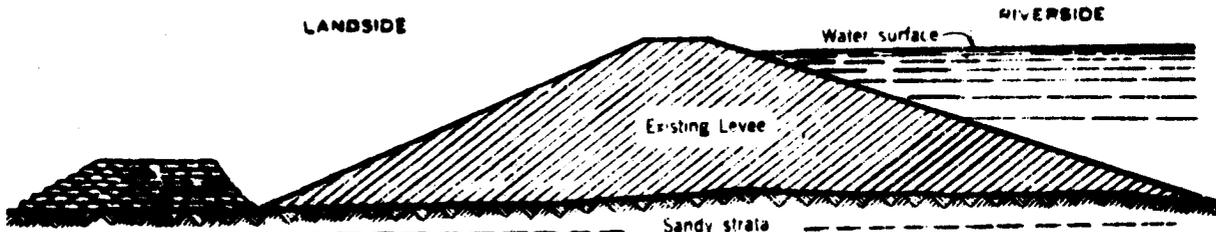
Period from _____
to _____

Submitted by _____
Date _____

INSPECTION

ITEM NO. :	FEATURE	LOCATION AND EXTENT OF MAINTENANCE REQUIRED
1	Settlement, sloughing, or loss of grade	
2	Graveled roadway on service roads	
3	Access Road ramps	
4	Fences	
5	Barricades	
6	Riprap	
7	Subdrain system	
8	Sod on levee slopes	
9	Seepage	
10	Animal burrows	
11	Flap gates	
12	Weeds or undesirable vegetation	
13	Accumulation of drift, trash, or debris	
14	Cracks, chips or broken concrete	
15	Inappropriate burning	
16	Unauthorized grazing or traffic	
17	Unauthorized encroachment of rights-of-way	
18	Unauthorized excavation and loose backfill	
19	Drainage culverts	
20	Channel	

PHOTOGRAPHIC

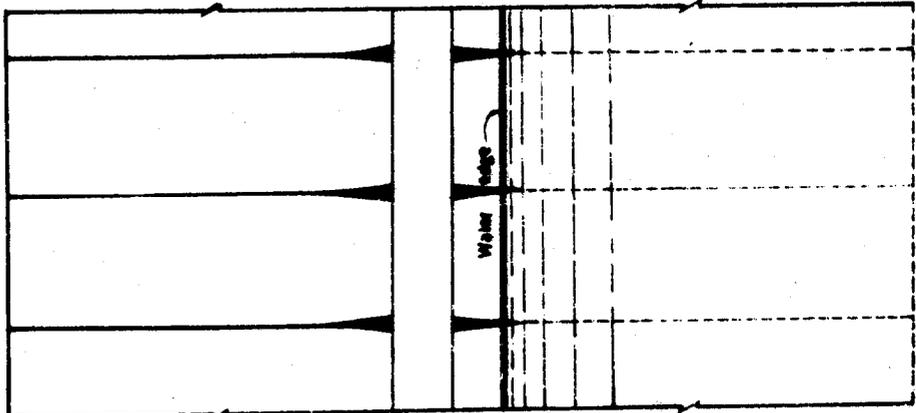
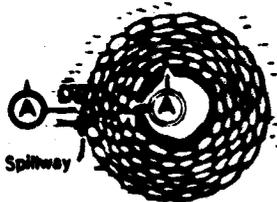


Note:
 Bottom width to be no less than 1 1/2 times height
 Be sure to clear sand discharge
 Tie into levee if boil is near toe.

ELEVATION



SECTION A-A



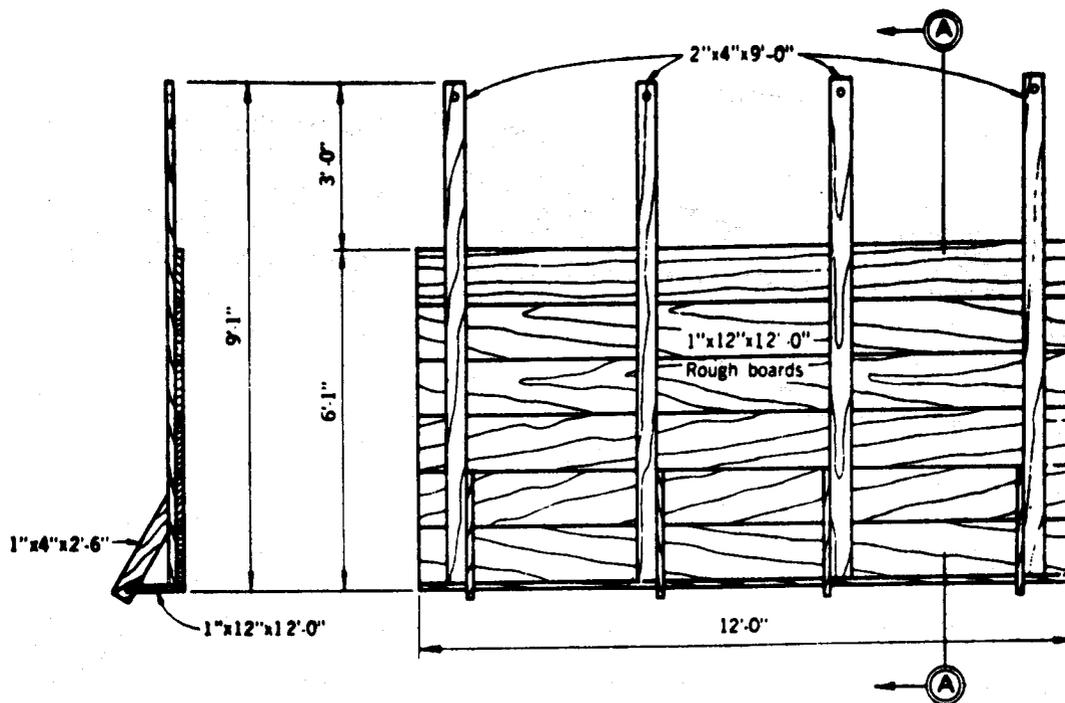
PLAN

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.

**FLOOD EMERGENCY
 CONSTRUCTION**

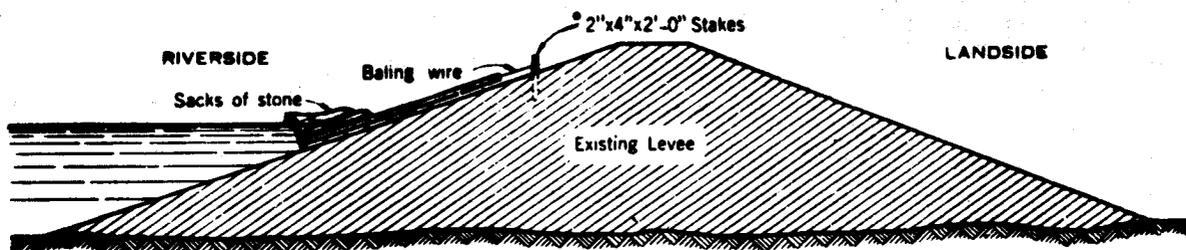
CONTROL OF SAND BOILS

U.S. ARMY ENGINEER DISTRICT SAN FRANCISCO
 CORPS OF ENGINEERS
 SAN FRANCISCO, CALIFORNIA



SECTION A-A

PLAN



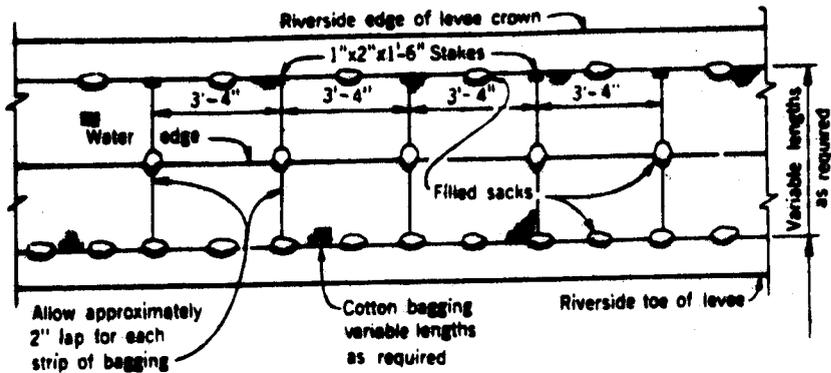
SECTION

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	
4 1/2 lbs.	8d nails

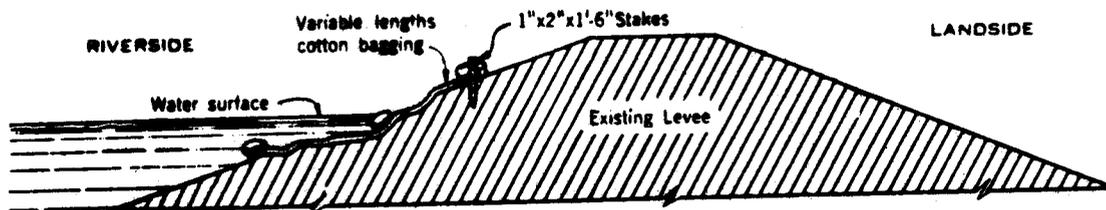
**FLOOD EMERGENCY
CONSTRUCTION**

**MOVABLE
WAVE WASH PROTECTION**

 U.S. ARMY ENGINEER DISTRICT SAN FRANCISCO
 CORPS OF ENGINEERS
 SAN FRANCISCO, CALIFORNIA



PLAN



SECTION

Note:

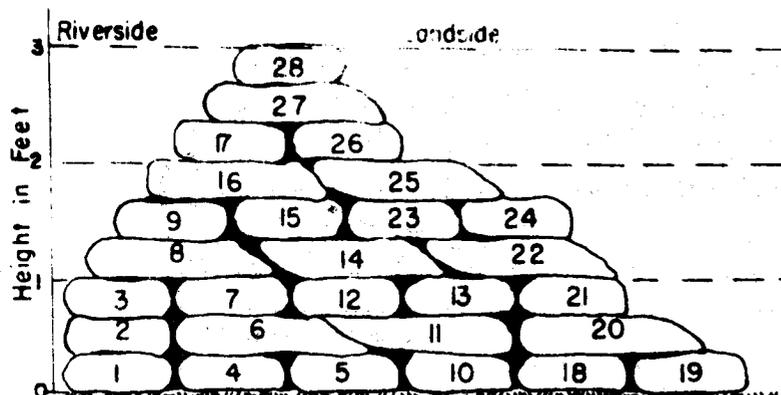
Lay lengths as required of cotton bagging approximately parallel with levee slope and across damaged section. Weight top and edges of bagging with filled sacks as shown above. The filled sacks should be wired or tied to each strip before laying in place. Stake the corners of each strip above water surface.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

MATERIAL REQUIRED FOR 100 LINEAR FEET OF LEVEE
LUMBER
<ul style="list-style-type: none"> • 30 Stakes 1"x2"x1'-6" • (Sharpened)
SANDBAGS
<ul style="list-style-type: none"> 120 sand bags Cotton bagging as required

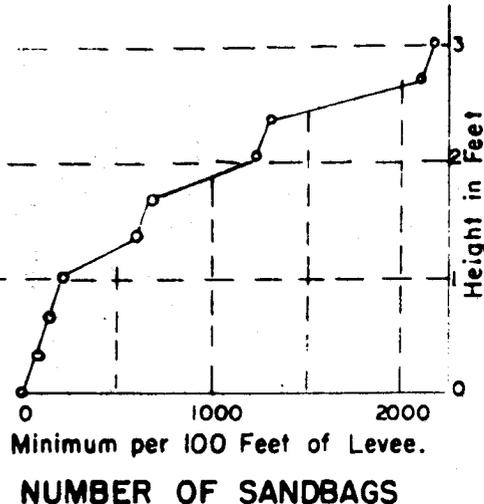
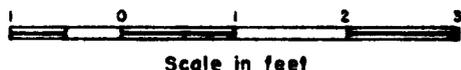
FLOOD EMERGENCY
CONSTRUCTION

WAVE WASH PROTECTION

U.S. ARMY ENGINEER DISTRICT SAN FRANCISCO
CORPS OF ENGINEERS
SAN FRANCISCO, CALIFORNIA



SANDBAG LEVEE CROSS SECTION



NUMBER OF SANDBAGS

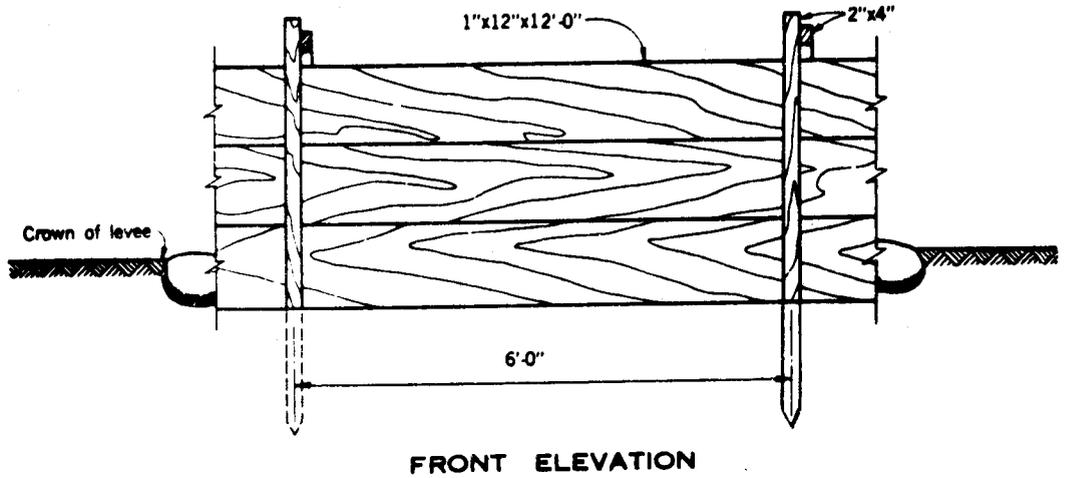
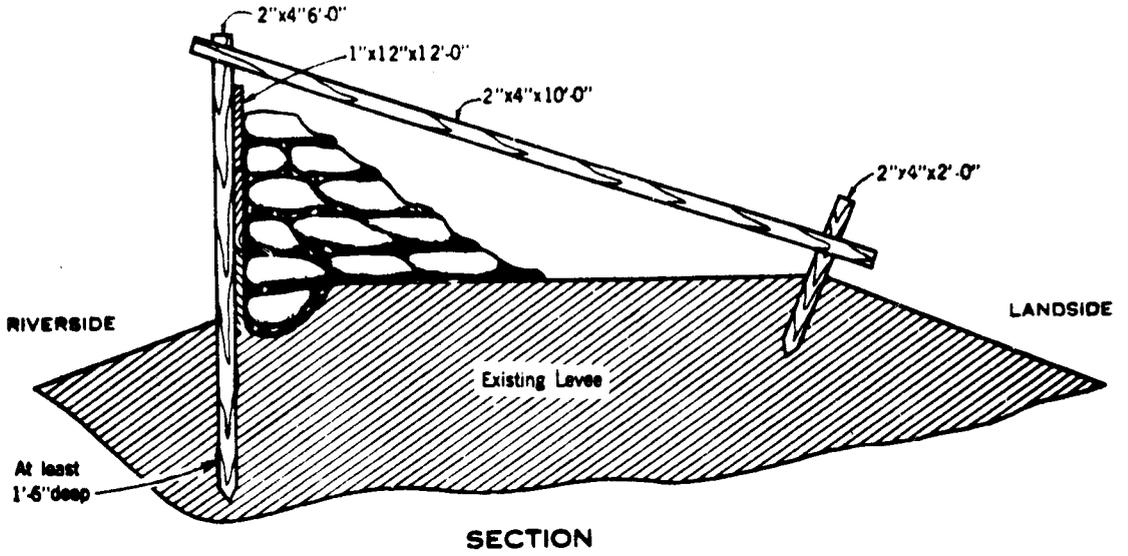
Notes:

1. Entire base to be cleared and scarified.
2. Best material for filling sandbags is a fine sand or coarse silt. Avoid, as much as possible, the use of coarse gravel and heavy clays.
3. Fill sandbags 1/2 to 2/3 full, 50 to 60 pounds, and leave enough flap to turn under. Do not tie.
4. Numbers shown on the sandbags are for the general order of placing the sandbags to give the highest protection with the minimum number of sandbags.
5. When bags are placed, flatten out and fill voids by mashing bags with feet and vigorously tramping each course of the levee section. Provide a levee section as impervious to water as possible. Alternate direction of sacks and stagger joints wherever practical.
6. The above section is based upon an average in place sandbag section of 4" x 12" x 18".

**FLOOD EMERGENCY
CONSTRUCTION**

SACK TOPPING

U.S. ARMY ENGINEER DISTRICT SAN FRANCISCO
CORPS OF ENGINEERS
SAN FRANCISCO, CALIFORNIA

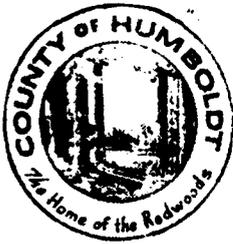


BILL OF MATERIAL FOR 100 LINEAR FEET OF LEVEE	
LUMBER	
25 pieces	1"x12"x12'-0"
17 pieces	2"x4"x10'-0"
* 17 pieces	2"x4"x6'-0"
* 17 pieces	2"x4"x2'-0"
NAILS	
1 lb.	8d nails
2 lbs.	16d nails
SANDBAGS	
1100	bags

FLOOD EMERGENCY
CONSTRUCTION

LUMBER AND SACK TOPPING

U.S. ARMY ENGINEER DISTRICT SAN FRANCISCO
CORPS OF ENGINEERS
SAN FRANCISCO, CALIFORNIA



HUMBOLDT COUNTY PLANNING COMMISSION

3130 JACOBS AVENUE - EUREKA, CALIF. 95501

TELEPHONE: 443-7555 - EXT. 385 - 386

HARVEY H. HIGGINS, DIRECTOR

COMMISSIONERS

CHAIRMAN
JAMES W. ROGERS
DISTRICT 4

VICE CHAIRMAN
JOSEPH RUSS IV
AGRICULTURE

MARVIN FORK
DISTRICT 1

JAMES N. PRIMROSE
DISTRICT 2

DR. S. A. FULLER
DISTRICT 3

WILLIAM E. (PAT) DORSEY
DISTRICT 5

EX-OFFICIO MEMBERS

NORMAN ROBERTSON
SUPERVISOR, 3RD DISTRICT

THOMAS M. MONTGOMERY
COUNTY COUNSEL

GUY C. KULSTAD
PUBLIC WORKS DIRECTOR

December 10, 1968

Mr. H. E. Pape, Jr.
Acting Chief
Engineering Division
100 McAllister Street
San Francisco, California 94102

Dear Sir:

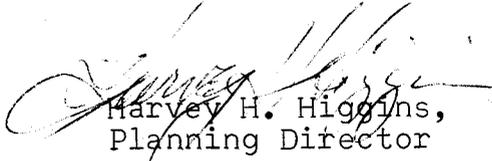
This office is in receipt of your letter dated December 9, 1968 requesting information regarding zoning around the mouth of Redwood Creek.

Humboldt County is still very interested in the zoning around Orick and the mouth of Redwood Creek, however, there have been several delays in the process of any zoning in this area. We are, at the present, holding the matter up in order to meet with Mr. Murdock who is in charge of the new Redwood National Park. Since the proposed zoning will extend to the park boundaries, we feel we should coordinate any zoning in this area with the park development plans.

We hope to be meeting with Mr. Murdock sometime within the next couple of weeks for this very purpose, after which, we will proceed with the feasibility of zoning.

Yours very truly,

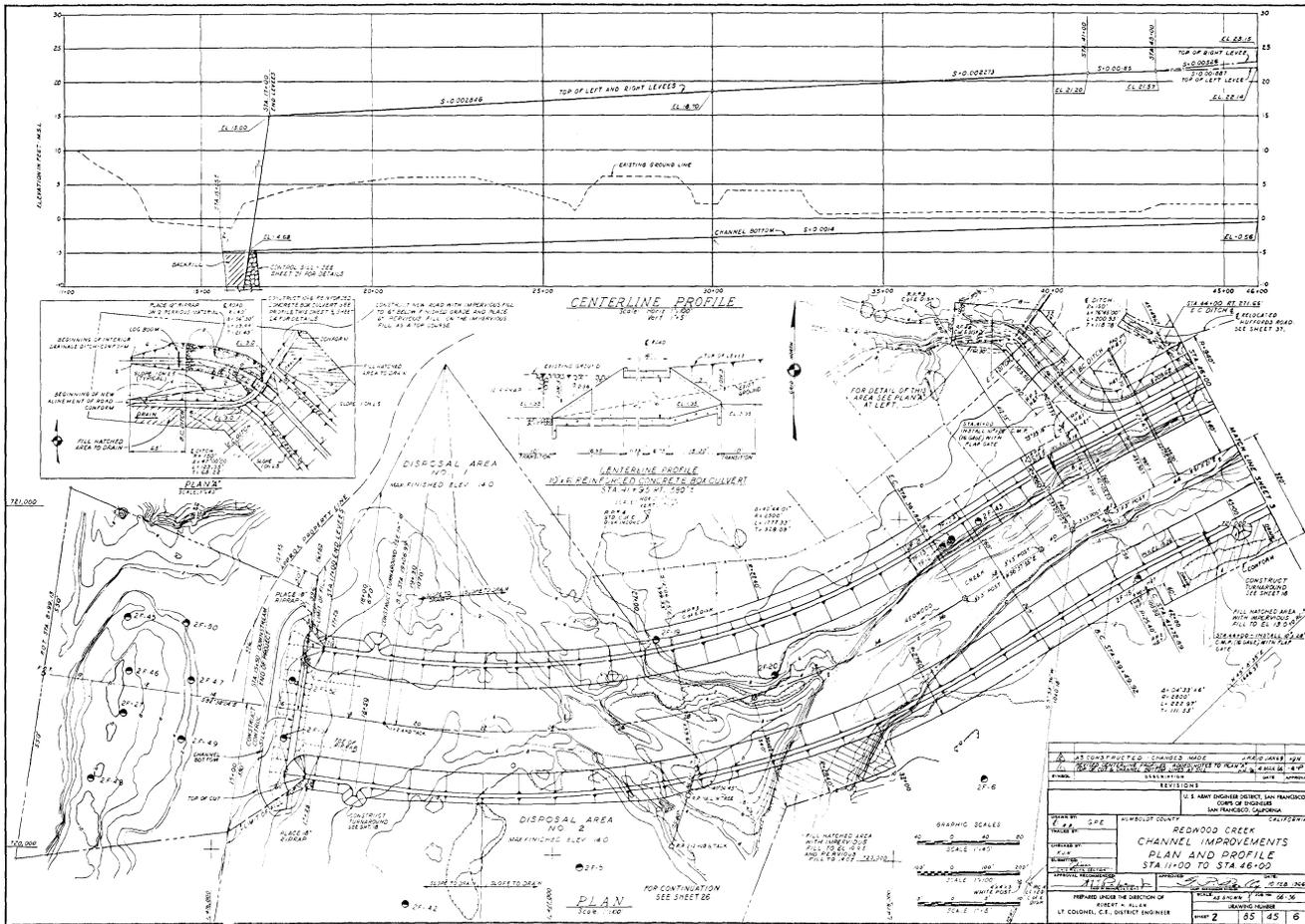
HUMBOLDT COUNTY PLANNING COMMISSION

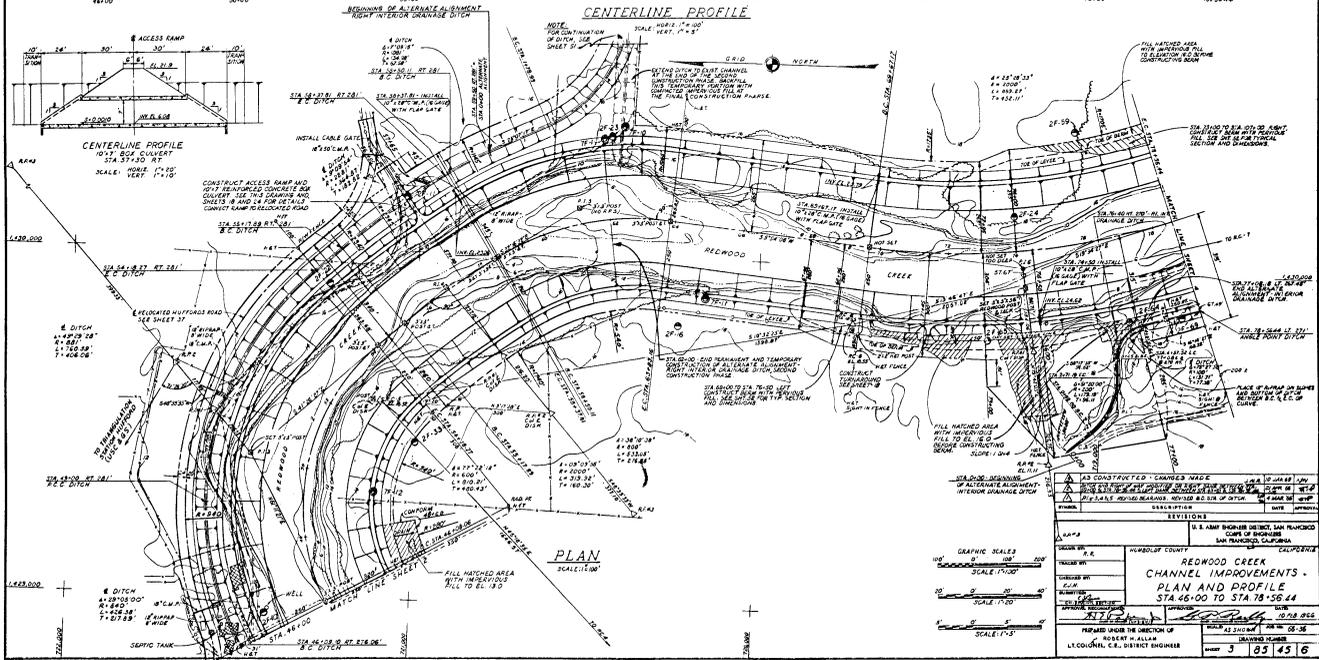
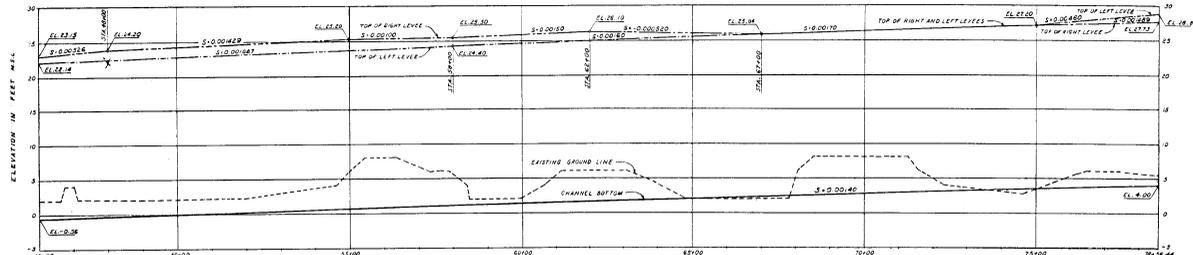

Harvey H. Higgins,
Planning Director

HHH/rcw

EXHIBIT E

PHOTOGRAPHY

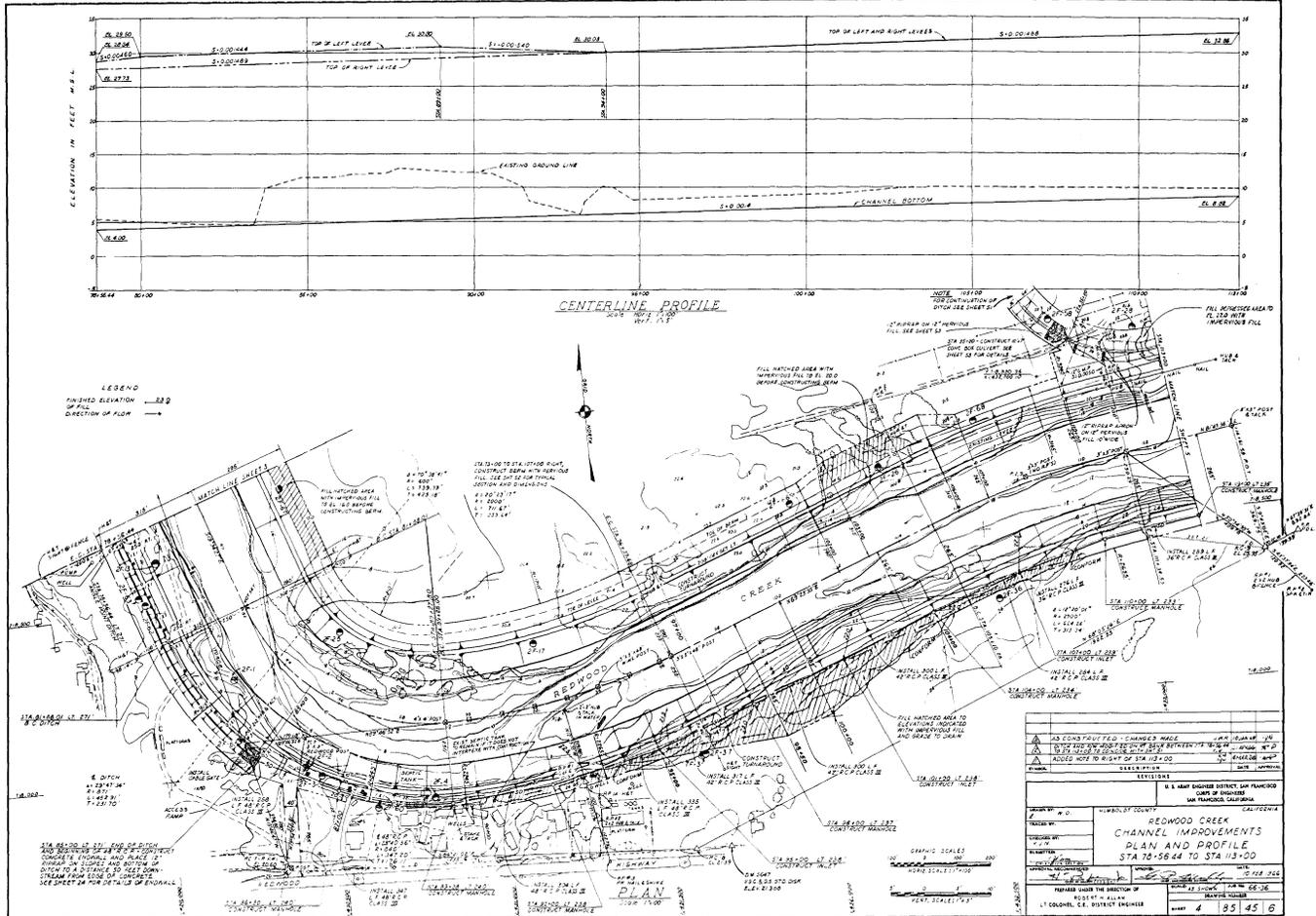


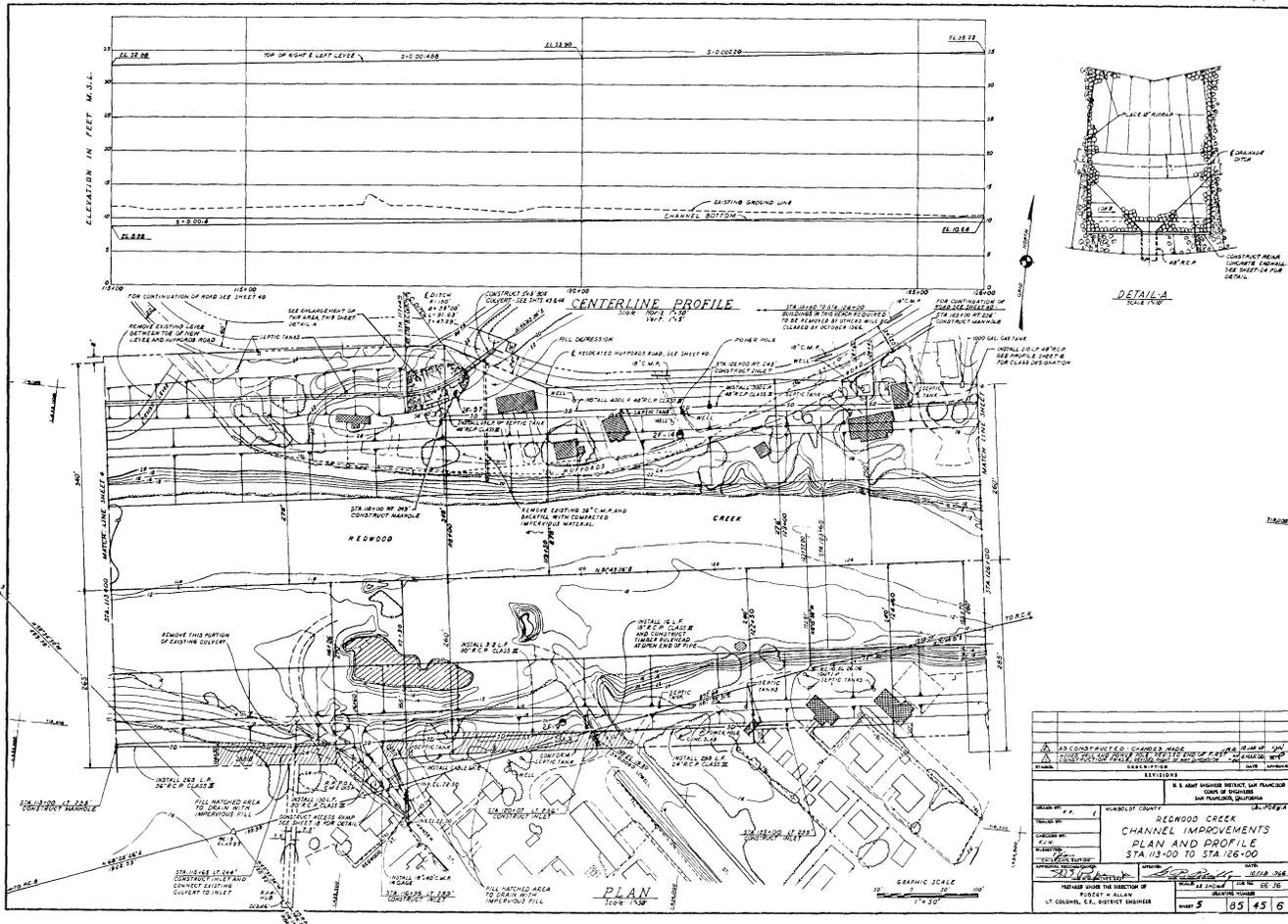


REVISIONS	
NO.	DESCRIPTION
1	AS CONTRACTED - CHANNEL WIDE
2	AS CONTRACTED - CHANNEL WIDE
3	AS CONTRACTED - CHANNEL WIDE
4	AS CONTRACTED - CHANNEL WIDE
5	AS CONTRACTED - CHANNEL WIDE
6	AS CONTRACTED - CHANNEL WIDE
7	AS CONTRACTED - CHANNEL WIDE
8	AS CONTRACTED - CHANNEL WIDE
9	AS CONTRACTED - CHANNEL WIDE
10	AS CONTRACTED - CHANNEL WIDE
11	AS CONTRACTED - CHANNEL WIDE
12	AS CONTRACTED - CHANNEL WIDE
13	AS CONTRACTED - CHANNEL WIDE
14	AS CONTRACTED - CHANNEL WIDE
15	AS CONTRACTED - CHANNEL WIDE
16	AS CONTRACTED - CHANNEL WIDE
17	AS CONTRACTED - CHANNEL WIDE
18	AS CONTRACTED - CHANNEL WIDE
19	AS CONTRACTED - CHANNEL WIDE
20	AS CONTRACTED - CHANNEL WIDE
21	AS CONTRACTED - CHANNEL WIDE
22	AS CONTRACTED - CHANNEL WIDE
23	AS CONTRACTED - CHANNEL WIDE
24	AS CONTRACTED - CHANNEL WIDE
25	AS CONTRACTED - CHANNEL WIDE
26	AS CONTRACTED - CHANNEL WIDE
27	AS CONTRACTED - CHANNEL WIDE
28	AS CONTRACTED - CHANNEL WIDE
29	AS CONTRACTED - CHANNEL WIDE
30	AS CONTRACTED - CHANNEL WIDE
31	AS CONTRACTED - CHANNEL WIDE
32	AS CONTRACTED - CHANNEL WIDE
33	AS CONTRACTED - CHANNEL WIDE
34	AS CONTRACTED - CHANNEL WIDE
35	AS CONTRACTED - CHANNEL WIDE
36	AS CONTRACTED - CHANNEL WIDE
37	AS CONTRACTED - CHANNEL WIDE
38	AS CONTRACTED - CHANNEL WIDE
39	AS CONTRACTED - CHANNEL WIDE
40	AS CONTRACTED - CHANNEL WIDE
41	AS CONTRACTED - CHANNEL WIDE
42	AS CONTRACTED - CHANNEL WIDE
43	AS CONTRACTED - CHANNEL WIDE
44	AS CONTRACTED - CHANNEL WIDE
45	AS CONTRACTED - CHANNEL WIDE
46	AS CONTRACTED - CHANNEL WIDE
47	AS CONTRACTED - CHANNEL WIDE
48	AS CONTRACTED - CHANNEL WIDE
49	AS CONTRACTED - CHANNEL WIDE
50	AS CONTRACTED - CHANNEL WIDE

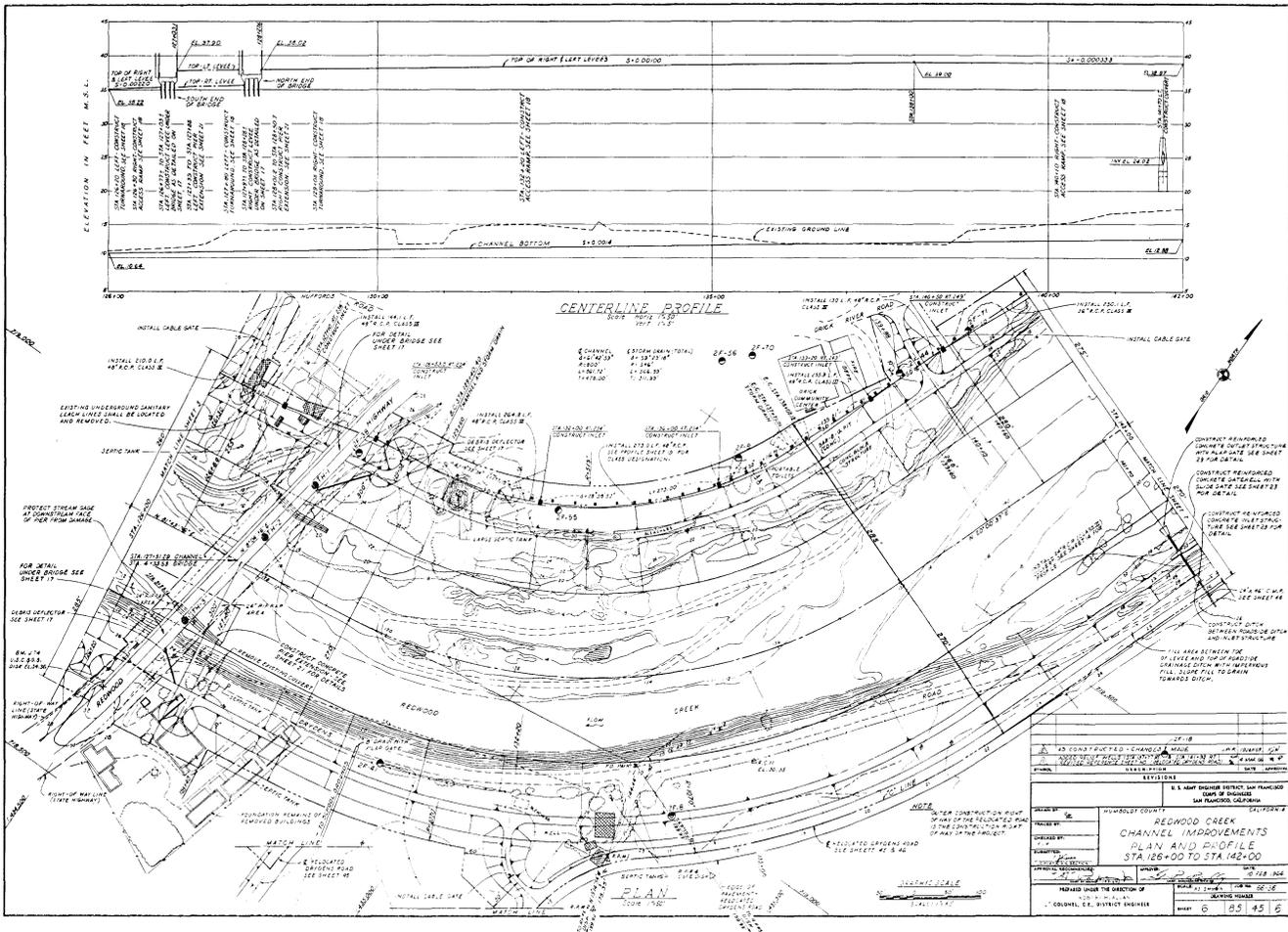
PREPARED UNDER THE DIRECTION OF
 LUDOVIC C. B. DISTRICT ENGINEER

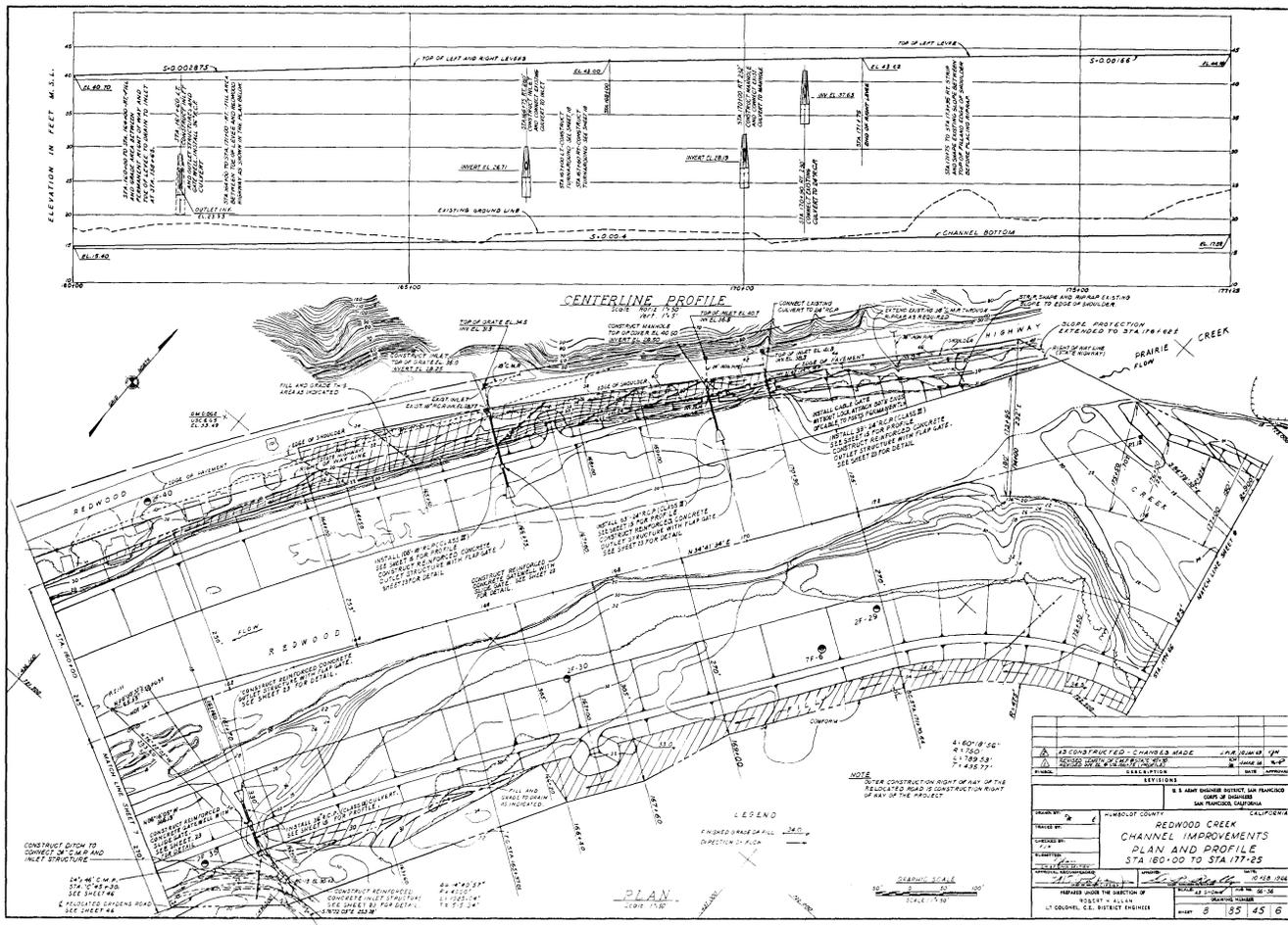
10/18/85
 3 85 45 16





AS CONSTRUCTED: CHANGES MADE (REVISIONS OF THIS PLAN SHALL BE MADE BY THE ENGINEER)	
REVISIONS:	
1. ADD BRIDGE STRUCTURE FOR THROUGH CROSS OF HIGHWAY LOS ANGELES, CALIFORNIA	
DRAWN BY: P. A.	COUNTY: HUNTERD COUNTY
CHECKED BY:	PROJECT: REDWOOD CREEK CHANNEL IMPROVEMENTS PLAN AND PROFILE STA 113+00 TO STA 126+00
DATE:	SHEET NO. 5 OF 56
PREPARED UNDER THE SUPERVISION OF PASCADERO H. HALLAN CIVIL ENGINEER	DATE:
COUNTY ENGINEER:	SHEET NO. 5 OF 56





CONSTRUCT DITCH TO
CONNECT TO C & M AND
INLET STRUCTURE

CONCRETE CHANNEL
18" x 18" x 24"
SEE SHEET 4075
E REGULATED CULVERT ROAD
SEE SHEET 4076

CONSTRUCT REINFORCED
CONCRETE INLET STRUCTURE
SEE SHEET 4075
CONSTRUCT REINFORCED
CONCRETE INLET STRUCTURE
SEE SHEET 4075

40" x 40" x 24"
CONCRETE INLET STRUCTURE
SEE SHEET 4075

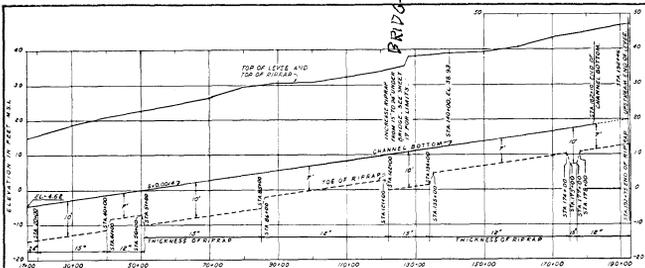
40" x 40" x 24"
CONCRETE INLET STRUCTURE
SEE SHEET 4075

LEGEND
PROPOSED GRADE OF FILL
DIRECTION OF FLOW

NOTE
OTHER CONSTRUCTION RIGHT OF WAY OF THE
PROPOSED ROAD IS CONSTRUCTION RIGHT
OF WAY OF THE PROJECT

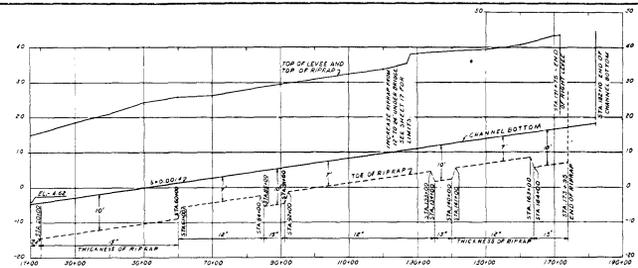
REDWOOD CREEK
SCALE 1" = 100'

4-1601-B-061 17-350 2-1789-53 7-483-37	
NOTE OTHER CONSTRUCTION RIGHT OF WAY OF THE PROPOSED ROAD IS CONSTRUCTION RIGHT OF WAY OF THE PROJECT	
LEGEND PROPOSED GRADE OF FILL DIRECTION OF FLOW	
REDWOOD CREEK CHANNEL IMPROVEMENTS PLAN AND PROFILE STA 16700 TO STA 17725	
DRAWN BY: ROBERT A. ALLAN CHECKED BY: ROBERT A. ALLAN DATE: 10/25/50	
SHEET 8 OF 15	



PROFILES — LEFT LEVEE

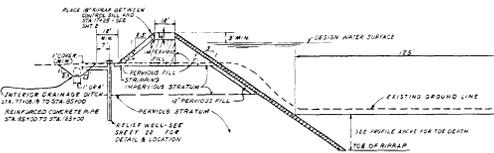
SCALE: HORIZ. 1"=100'
VERT. 1"=10'



PROFILES — RIGHT LEVEE

SCALE: HORIZ. 1"=100'
VERT. 1"=10'

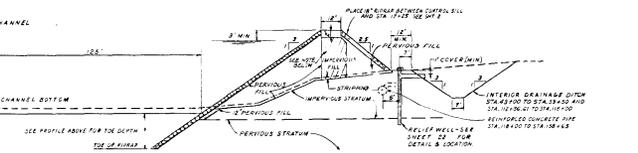
NOTE:
THICKNESS OF RIPRAP AND PERVIOUS FILL UNDER RIPRAP TO BE INCREASED BY 20% WHEN PLACED UNDER WATER.



LEFT LEVEE

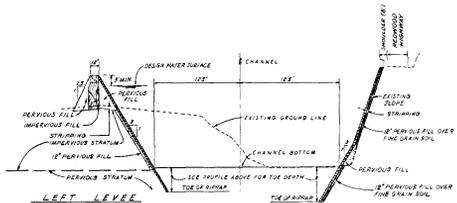
TYPICAL CROSS SECTION
STA. 171+00 TO STA. 171+75

SCALE: HORIZ. 1"=10'
VERT. 1"=10'



RIGHT LEVEE

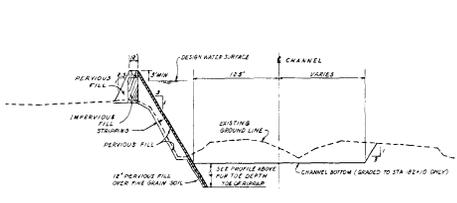
NOTE: TYPICAL - WIDTH OF CORE = 4'-6"



LEFT LEVEE

TYPICAL CROSS SECTION
STA. 171+75 TO STA. 173+35

SCALE: HORIZ. 1"=10'
VERT. 1"=10'



LEFT LEVEE

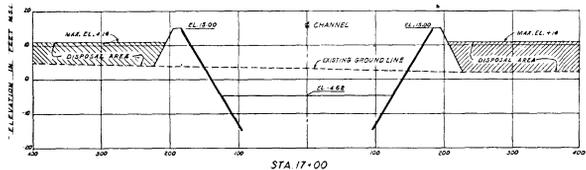
TYPICAL CROSS SECTION
STA. 173+35 TO STA. 182+00

SCALE: HORIZ. 1"=10'
VERT. 1"=10'

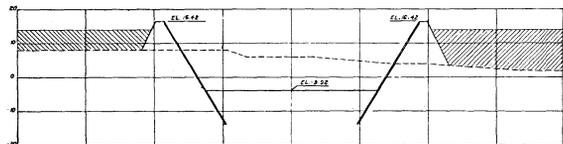
GRAPHIC SCALES



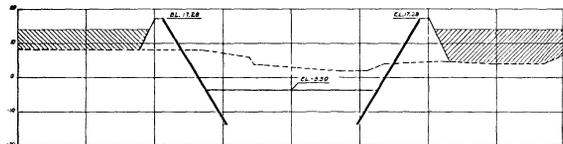
AS CONSTRUCTED CHANGES MADE	DATE: 12/18/14	BY: JLM
CHANGES DURING PRELIMINARY DESIGN AND CONSTRUCTION	DATE: 12/18/14	BY: JLM
ADDED OR DELETED FROM THIS SECTION IN PREVIOUS EDITIONS	DATE: 12/18/14	BY: JLM
REVISION	DATE	BY
U.S. ARMY CORPUS OF ENGINEERS, SAN FRANCISCO DISTRICT COUNTY OF BRIDGES, SAN FRANCISCO, CALIFORNIA		
TITLE: DISE	CONTRACT COUNTY:	CALIFORNIA
PROJECT:	REDWOOD CREEK CHANNEL IMPROVEMENTS	
SECTION:	TYPICAL CROSS SECTIONS AND PROFILES	
DESIGNED BY:	DATE:	BY:
CHECKED BY:	DATE:	BY:
REVISIONS SHOULD BE IN THE DIRECTION OF DRAWING NUMBER U.S. ARMY CORPUS OF ENGINEERS DRAWING NO. 10 83 436		



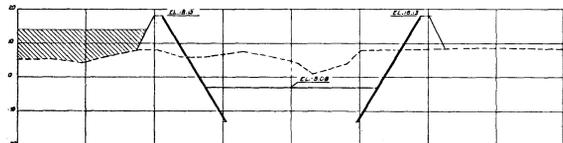
STA 17+00



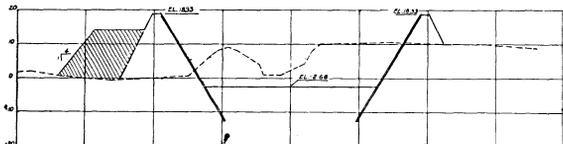
STA 22+00



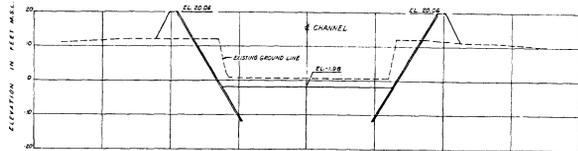
STA 25+00



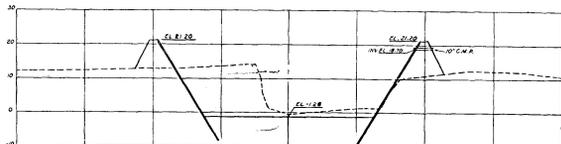
STA 28+00



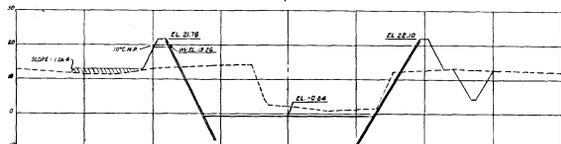
STA 31+00



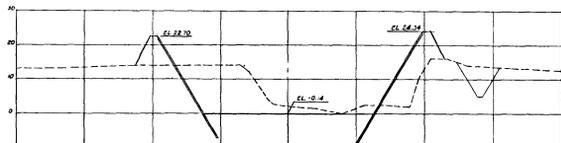
STA 36+00



STA 41+00



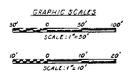
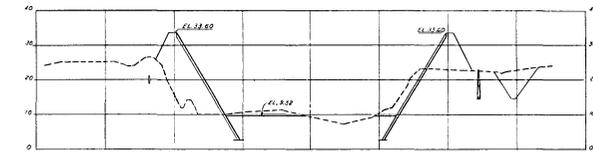
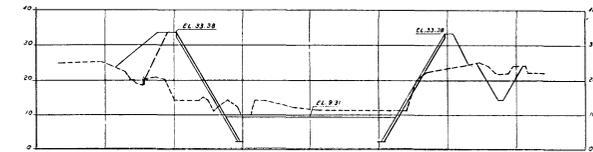
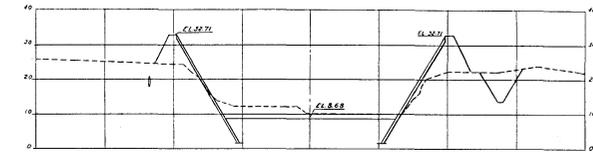
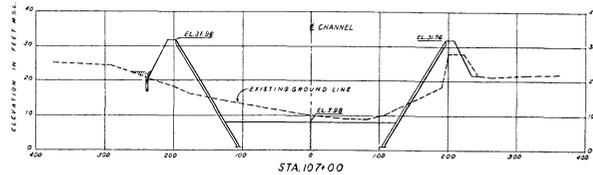
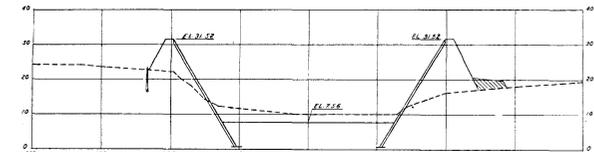
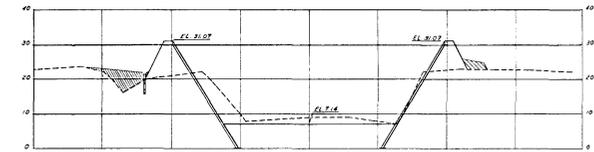
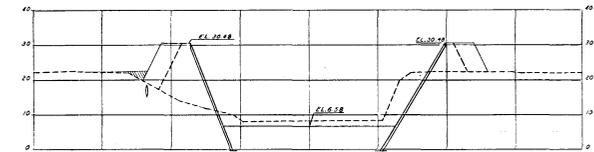
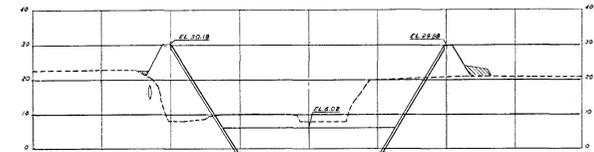
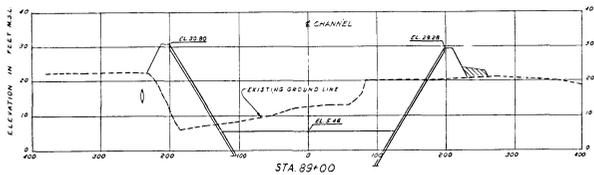
STA 44+00



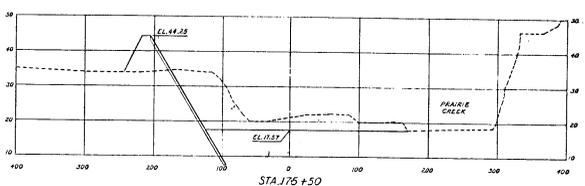
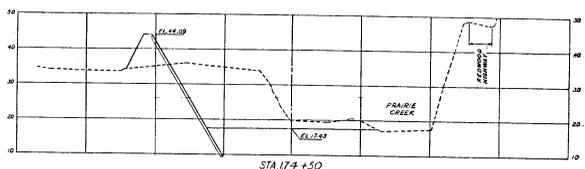
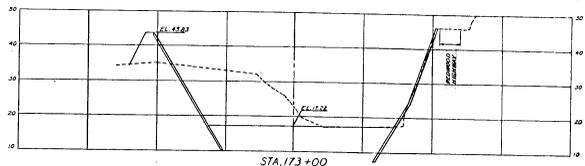
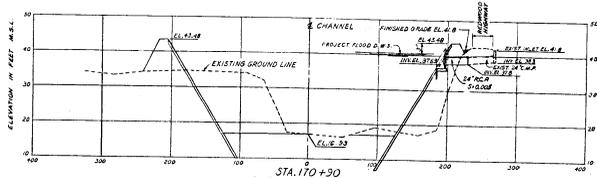
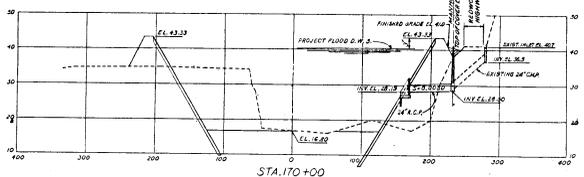
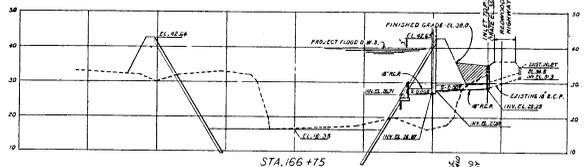
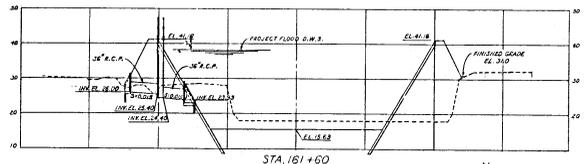
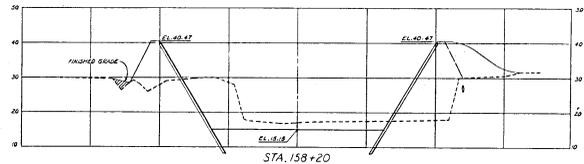
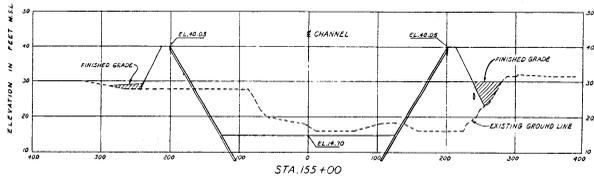
STA 49+00

GRAPHIC SCALE
 1" = 20'
 SCALE 1/2" = 10'
 1" = 10'

UNCONSTRUCTED - NO CHANNEL SIDE		DATE	JUN 28 1964
DRAWN BY		SCALE	AS SHOWN
CHECKED BY		REVISIONS	
U. S. NAVY DISTRICT OFFICE, SAN FRANCISCO OFFICE OF CHIEF OF ENGINEERS SAN FRANCISCO, CALIFORNIA			
DRAWN BY		REDWOOD CREEK	
CHECKED BY		CHANNEL IMPROVEMENTS	
SCALE		CROSS SECTIONS	
PROJECT NO.		STA 17+00 TO STA. 49+00	
DATE		JUN 28 1964	
PROJECT NO. IN SECTION OF		SHEET NO.	
L.T. COLWELL, C.E., DISTRICT ENGINEER		133 452	



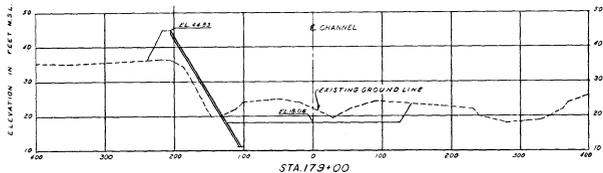
A. 25 CONSTRUCTED AND CHANGED		DATE	8.24.08	BY	W.S.
B. SELECTED INTERFERENCES FROM RECORDS		DATE	8.24.08	BY	W.S.
C. REVISIONS		DATE		BY	
DIVISION OF ENGINEERING U.S. ARMY DISTRICT SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA					
DESIGNED BY	G.F.E.	AS-BUILT CHECKED BY	REDWOOD CREEK	EXHIBIT NO.	
CHANNEL IMPROVEMENTS			CROSS SECTIONS		
STA 89+00 TO STA 118+00			SHEET NO. 13		
PREPARED UNDER THE DIRECTION OF LT COLONEL C.E. DISTRICT ENGINEER					
				DATE	8.24.08
				SCALE	AS SHOWN
				NO.	85 45 6



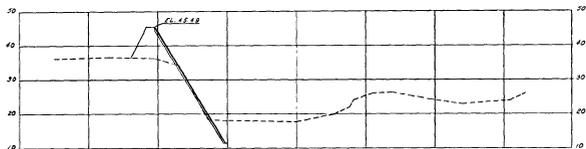
GRAPHIC SCALES
 SCALE: 1"=50'
 SCALE: 1"=100'

AS CONSTRUCTED - NO CHANNELS MADE DRAWN BY: [Signature] DATE: [Date]	
ESTIMATES BY: S. HUNT ENGINE SERVICE, SAN FRANCISCO CHECKED BY: [Signature] SAN FRANCISCO, CALIFORNIA	
SHEET NO. 13	NUMBER OF SHEETS 13
DRAWN BY: [Signature]	CHECKED BY: [Signature]
PROJECT NO. 4089	DATE: 10/28/2006
PREPARED UNDER THE DIRECTION OF DISTRICT ENGINEER LT. COLONEL, C.E. DISTRICT ENGINEER	
COUNTY: [Blank]	SHEET: 13
PROJECT: REDWOOD CREEK CHANNEL IMPROVEMENTS CROSS SECTIONS STA. 155+00 TO STA. 175+50	DATE: 10/28/2006
SCALE: 1"=50'	SCALE: 1"=100'
83	45
6	6

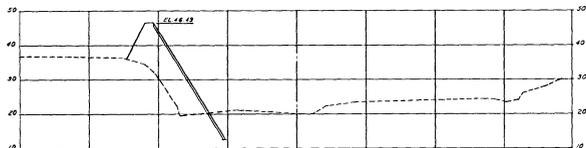
PESCADERO 4091



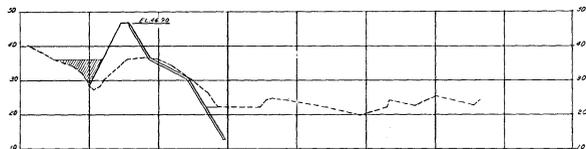
STA 173+00



STA 183+00



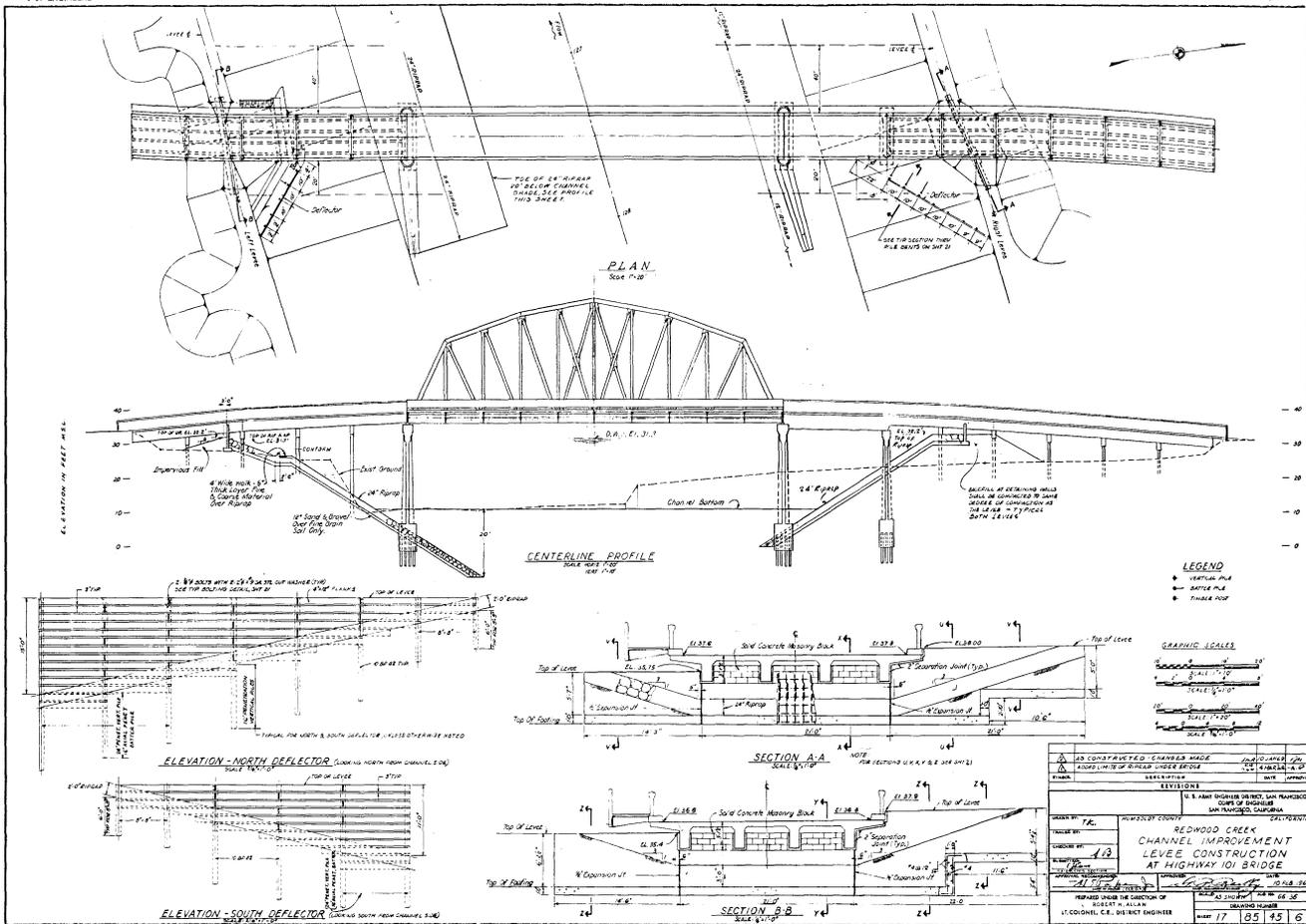
STA 189+00

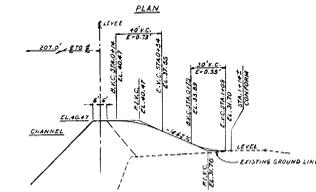
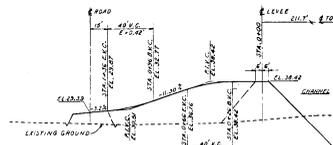
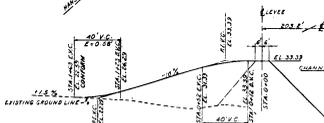
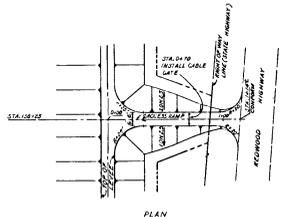
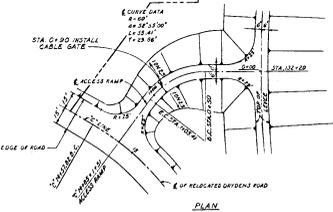
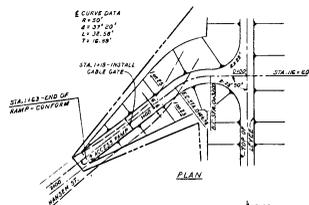
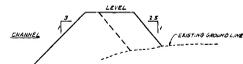
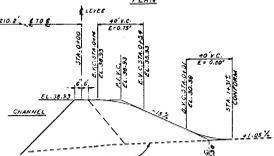
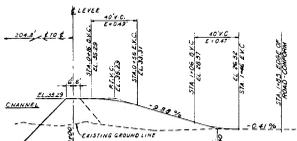
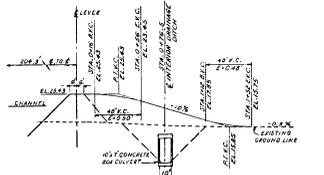
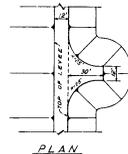
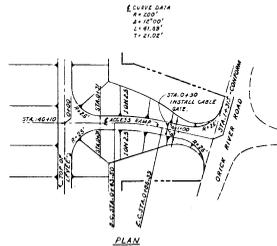
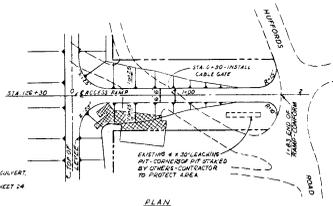
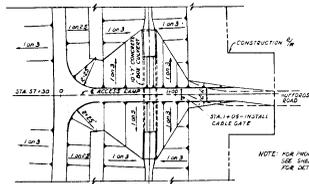


STA 191+50

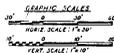


43 CONSTRUCTED - NO CHANGE MADE DRAWN: [] DATE: []	
REVISIONS	
U. S. ARMY ENGINEER DISTRICT SAN FRANCISCO OFFICE OF ENGINEERS SAN FRANCISCO, CALIFORNIA	
PROJECT NO. C-16	DIVISION COUNTY CALIFORNIA
REDWOOD CREEK CHANNEL IMPROVEMENTS CROSS SECTIONS STA 173+00 TO STA 191+50	
DESIGNED BY: []	CHECKED BY: []
DRAWN BY: []	SCALE: 1" = 10'
TITLE: []	SHEET NO. 16
PREPARED UNDER THE DIRECTION OF ROBERT H. ALLAN LT COLONEL, C.E., DISTRICT ENGINEER	DRAWING NUMBER 16 85 45 16

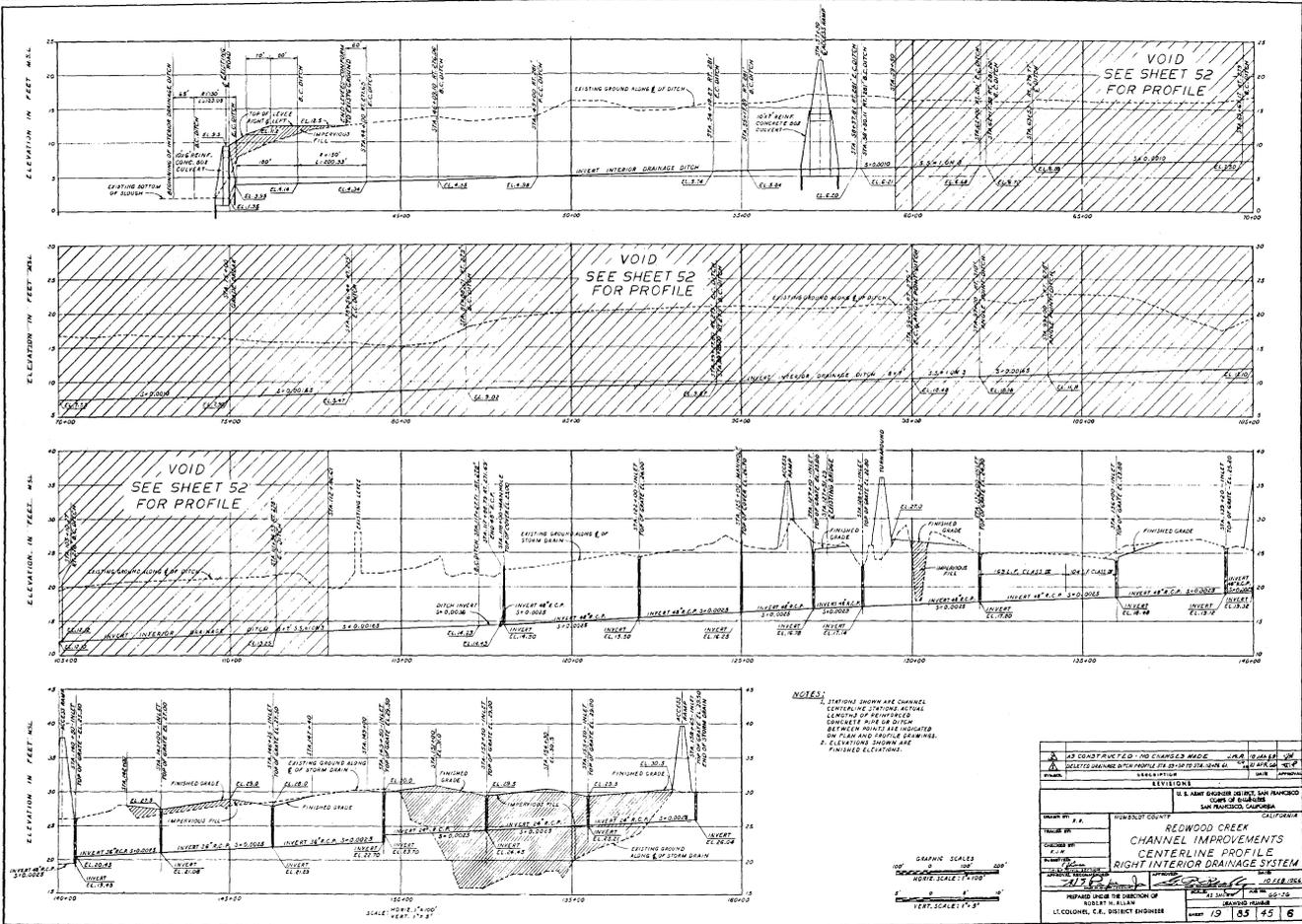




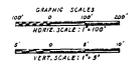
NOTE:
ACCESS RAMPS AND TURNOUTS
SHALL BE CONSTRUCTED OF REDWOOD
MATERIAL.



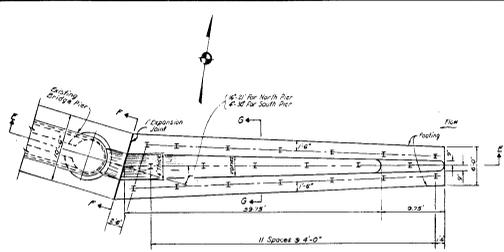
NO.	23	CONSTRUCTED	REDWOOD CREEK CHANNEL IMPROVEMENTS
DATE	NOV 20 1954	REVISED	NOV 20 1954
PROJECT	REDWOOD CREEK CHANNEL IMPROVEMENTS		
LOCATION	CALIFORNIA		
OWNER	U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO		
DESIGNED BY	SAN FRANCISCO OFFICE		
CHECKED BY	SAN FRANCISCO OFFICE		
APPROVED BY	SAN FRANCISCO OFFICE		
DATE	NOV 20 1954		
SCALE	AS SHOWN		
PROJECT	REDWOOD CREEK CHANNEL IMPROVEMENTS		
DESIGNED BY	SAN FRANCISCO OFFICE		
CHECKED BY	SAN FRANCISCO OFFICE		
APPROVED BY	SAN FRANCISCO OFFICE		
DATE	NOV 20 1954		
SCALE	AS SHOWN		
PROJECT	REDWOOD CREEK CHANNEL IMPROVEMENTS		
DESIGNED BY	SAN FRANCISCO OFFICE		
CHECKED BY	SAN FRANCISCO OFFICE		
APPROVED BY	SAN FRANCISCO OFFICE		
DATE	NOV 20 1954		
SCALE	AS SHOWN		
PROJECT	REDWOOD CREEK CHANNEL IMPROVEMENTS		
DESIGNED BY	SAN FRANCISCO OFFICE		
CHECKED BY	SAN FRANCISCO OFFICE		
APPROVED BY	SAN FRANCISCO OFFICE		
DATE	NOV 20 1954		
SCALE	AS SHOWN		



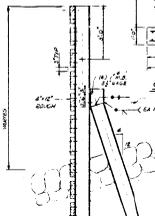
NOTES:
 1. STATIONS SHOWN ARE CHANNEL CENTERLINE STATIONS UNLESS OTHERWISE NOTED.
 2. ELEVATIONS SHOWN ARE FINISHED ELEVATIONS.



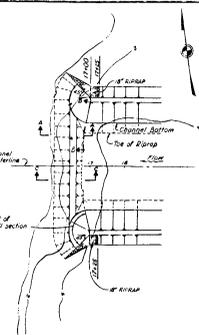
AS CONSTRUCTED - NO CHANGES MADE		DATE	BY
SELECTS CHANGE TO PROFILE 512 513-517 518 519 520		DATE	BY
REVISIONS			
NO. 1		DATE	BY
U.S. MAP SHOWING PROJECT SAN FRANCISCO COUNTY CALIFORNIA COUNTY OF SAN FRANCISCO CITY OF SAN FRANCISCO DISTRICT OF SAN FRANCISCO DISTRICT ENGINEER			
PREPARED BY	DATE	APPROVED BY	DATE
REVISIONS	DATE	BY	DATE
1	10-25	J. S. [Signature]	10-25
2	10-25	J. S. [Signature]	10-25
3	10-25	J. S. [Signature]	10-25
4	10-25	J. S. [Signature]	10-25
5	10-25	J. S. [Signature]	10-25
6	10-25	J. S. [Signature]	10-25



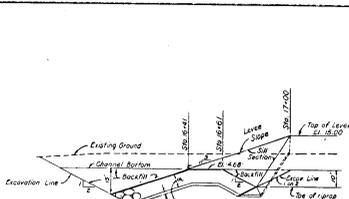
PLAN
BRIDGE PIER EXTENSION
Scale 1/4" = 1'-0"



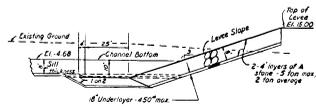
SECTION U-U
Scale 1/4" = 1'-0"



PLAN
CONTROL SILL
Scale 1/4" = 1'-0"



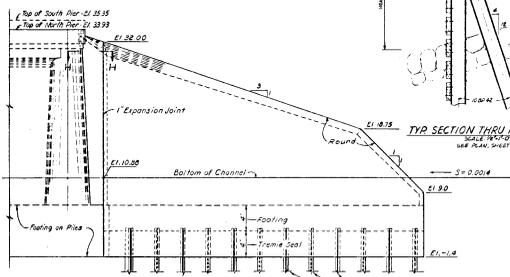
SECTION A-A
Scale 1/4" = 1'-0"



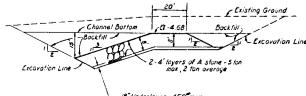
SECTION B-B
Scale 1/4" = 1'-0"

GENERAL NOTES

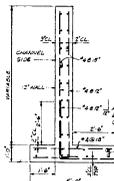
1. HOLES IN WOOD SHALL BE THE LARGEST SIZE IN WHICH A NAIL CAN BE DRIVEN THROUGH THE JOINTS.
2. CONCRETE SHALL BE PLACED IN 3' LAYERS OF 6" CONCRETE BY HOOD.
3. SPACING OF LAP SPICES IN REINFORCEMENT SHALL BE AS FOLLOWS:
1'-0" TO 2'-0" @ 12" ON C.



TYP SECTION THRU PILE BENTS
Scale 1/4" = 1'-0"

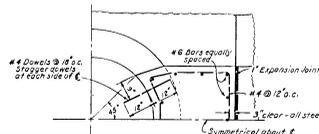


SECTION C-C
Scale 1/4" = 1'-0"

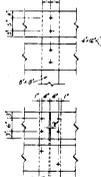


SECTION E-E
Scale 1/4" = 1'-0"

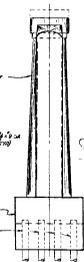
SECTION F-F
Scale 1/4" = 1'-0"



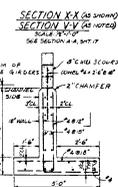
SECTION F-F
Scale 1/4" = 1'-0"



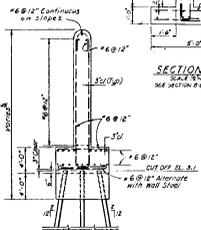
TYP BOLTING DETAIL
Scale 1/4" = 1'-0"



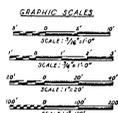
SECTION G-G
Scale 1/4" = 1'-0"



SECTION H-H
Scale 1/4" = 1'-0"



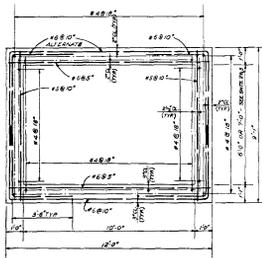
SECTION I-I
Scale 1/4" = 1'-0"



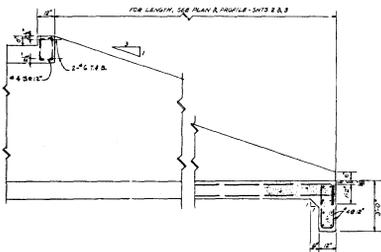
DESIGNED BY	DATE	PROJECT NO.	DATE
DRAWN BY	DATE	PROJECT NO.	DATE
CHECKED BY	DATE	PROJECT NO.	DATE
APPROVED BY	DATE	PROJECT NO.	DATE
U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO QUARTERS OF DISTRICT SAN FRANCISCO, CALIFORNIA			
SCALE	PROJECT COUNTY	SECTION	DATE
1/4" = 1'-0"	REDWOOD CREEK	CHANNEL IMPROVEMENTS	07-18-1938
BRIDGE PIER EXTENSION AND CONTROL SILL			
PREPARED AND IN CHARGE OF	DESIGNED BY	DATE	PROJECT NO.
W. B. ALLEN	W. B. ALLEN	07-18-1938	4101
1st DISTRICT ENGINEER	1st DISTRICT ENGINEER		
NO. 21	35	45	6



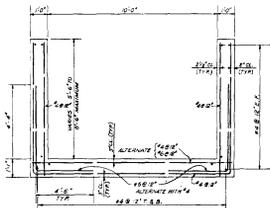
PLAN



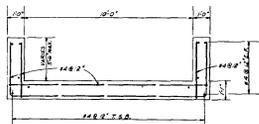
SECTION A-A



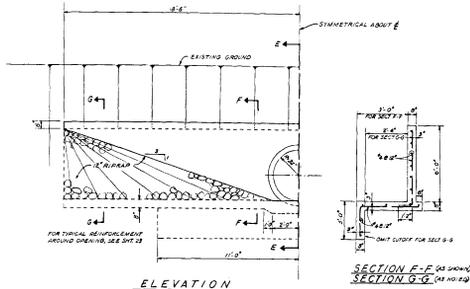
SECTION B-B



SECTION C-C



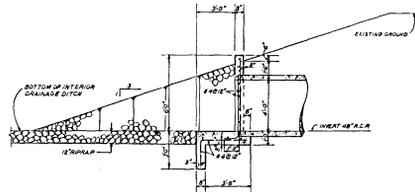
SECTION D-D



ELEVATION

FOR TYPICAL REINFORCEMENT AROUND OPENINGS, SEE DET. 22

SECTION F-F, AS SHOWN
SECTION G-G, AS SHOWN



SECTION E-E

ENDWALL DETAILS

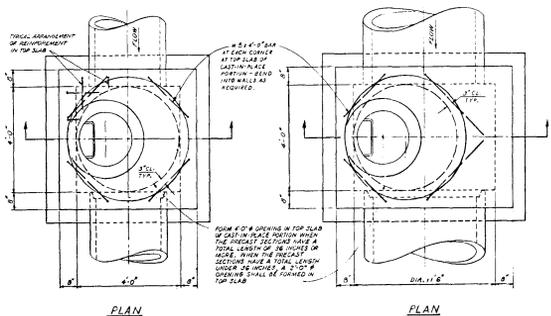
SCALE: 3/4" = 1'-0"
STA. 85+00 L
STA. 117+90 R

BOX³CULVERT DETAILS

SCALE: 3/4" = 1'-0"
STA. 41+95 R - 580'
STA. 57+30 R

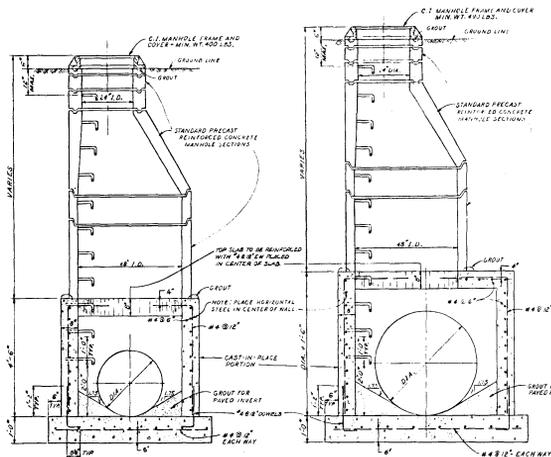


DATE	BY	CHECKED	APPROVED
28	CONDUCTED	NO CHANGES MADE	BY
28	28	28	28
28	28	28	28
28	28	28	28
U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA			
PROJECT NO. 6 DISTRICT OF CALIFORNIA REDWOOD CREEK CHANNEL IMPROVEMENTS REINFORCED CONCRETE ENDWALL AND BOX CULVERT			
DATE	BY	DATE	BY
28	28	28	28
28	28	28	28
28	28	28	28
28	28	28	28
PREPARED UNDER THE SUPERVISION OF DISTRICT ENGINEER U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO, CALIF. DISTRICT ENGINEER			
DATE	BY	DATE	BY
28	28	28	28
28	28	28	28
28	28	28	28
28	28	28	28



PLAN

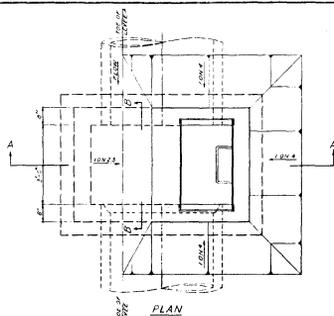
PLAN



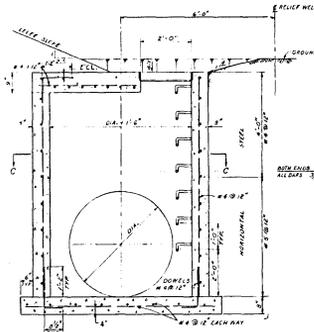
SECTION
TYPICAL MANHOLE DETAIL
FOR STORM DRAIN 30" DIA. AND SMALLER
SCALE: 3/4"=1'-0"

SECTION
TYPICAL MANHOLE DETAIL
FOR STORM DRAIN LARGER THAN 30" DIA.
SCALE: 3/4"=1'-0"

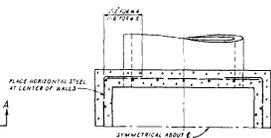
NOTE:
FOR LOCATION AND ELEVATIONS OF
MANHOLES AND INLETS, SEE SHEETS
19, 20.



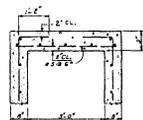
PLAN



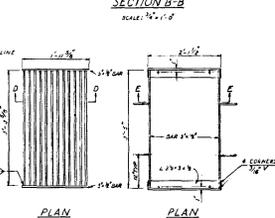
SECTION A-A
STORM DRAIN INLET
SCALE: 3/4"=1'-0"



SECTION C-C
SCALE: 3/4"=1'-0"

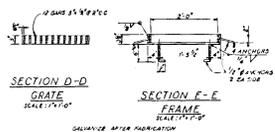


SECTION B-B
SCALE: 3/4"=1'-0"



PLAN

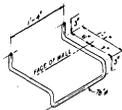
PLAN



SECTION D-D
GRATE
SCALE: 1/2"=1'-0"

SECTION E-E
FRAME
SCALE: 1/2"=1'-0"

SCALE: 3/4"=1'-0"



STEP DETAIL

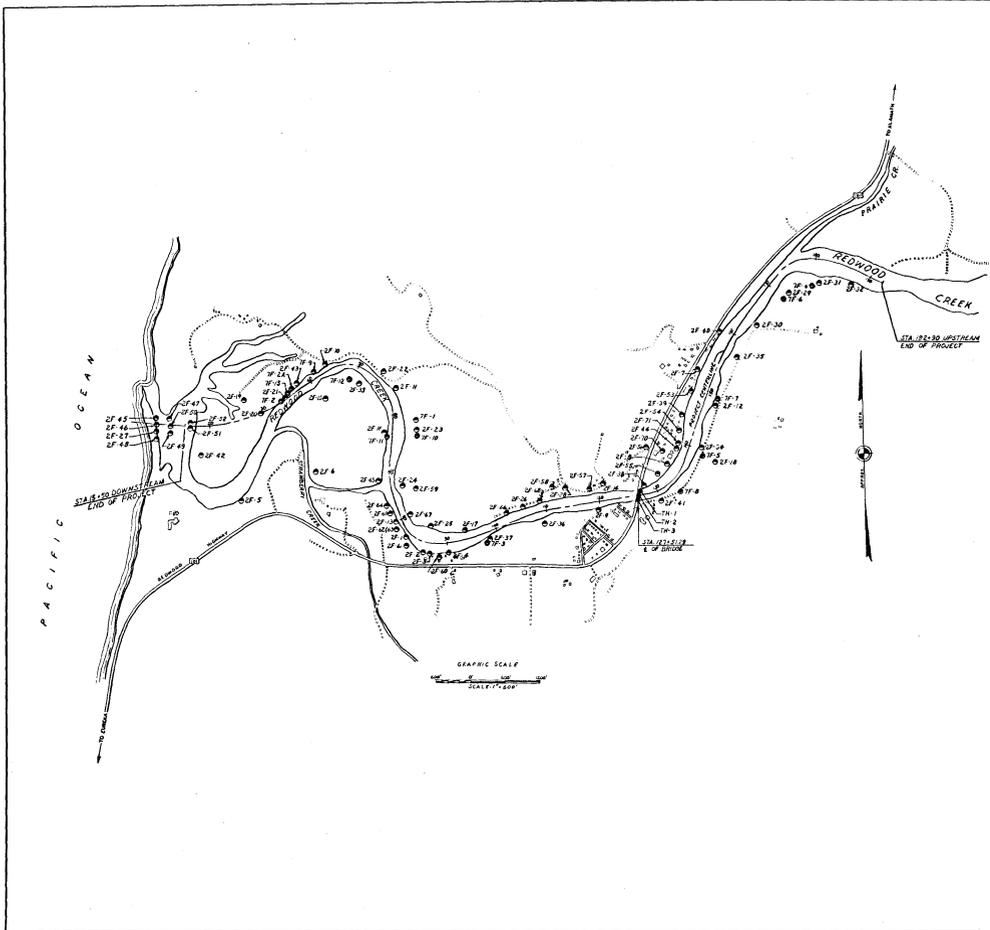
SCALE: 3/4"=1'-0"

GRAPHIC SCALES

SCALE: 1/2"=1'-0"

SCALE: 3/4"=1'-0"

DATE	BY	CHECKED	DATE
APR 1954	J. B. BROWN	J. B. BROWN	APR 1954
PREPARED UNDER THE SUPERVISION OF PROJECT IN ALLUVA L. COONER, C.E., DISTRICT ENGINEER			
DIVISION OF HIGHWAYS SAN FRANCISCO DISTRICT SAN FRANCISCO, CALIFORNIA			
COUNTY OF SAN FRANCISCO REDWOOD CREEK CHANNEL IMPROVEMENTS REINFORCED CONCRETE MANHOLE AND INLET			
SHEET NO. 25 TOTAL SHEETS 45	DRAWING NUMBER 25 45 16	DATE APR 1954	SCALE 3/4"=1'-0"



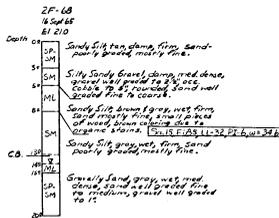
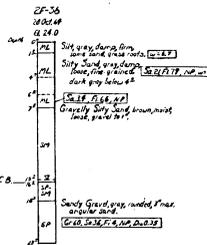
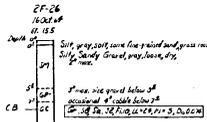
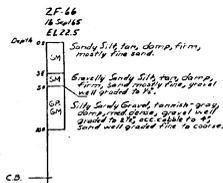
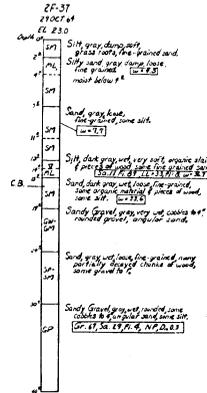
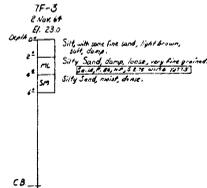
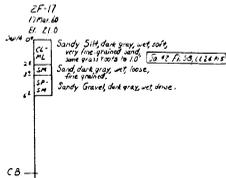
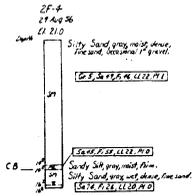
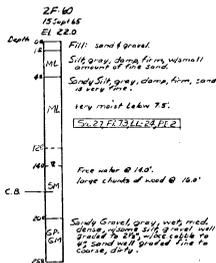
LEGEND

- 2F - AUGER BORING
- 7F - UNDISTURBED SAMPLE BORING
- TH - TEST HOLES FURNISHED BY DIVISION OF HIGHWAYS

NOTES:

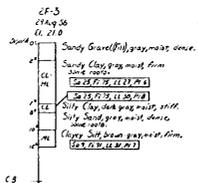
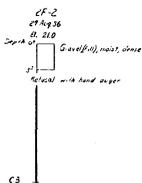
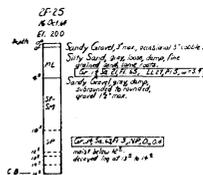
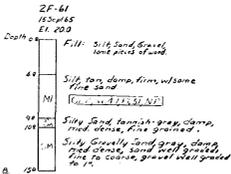
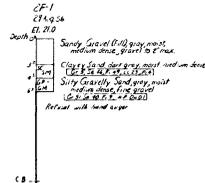
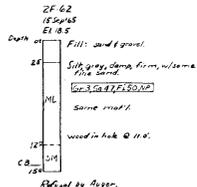
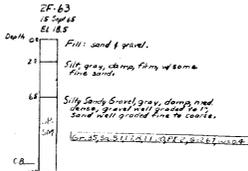
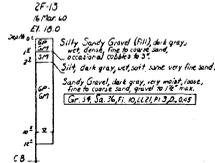
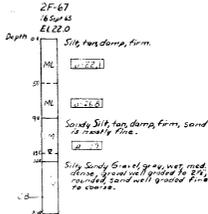
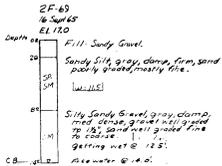
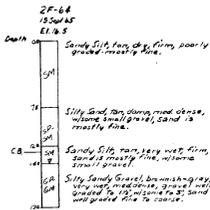
1. Logs of borings are shown on Sheets 28 through 36
2. Detailed sections of borings are shown on Sheets 2 through 9.

AS CONSTRUCTED - NO CHANGE MADE		DATE	BY
NO. OF SHEETS	DESCRIPTION	DATE	APPROVED
REVISIONS			
U.S. DISTRICT COURT, SAN FRANCISCO COUNTY OF MENDOCINO, SAN FRANCISCO, CALIFORNIA			
PROJECT NO.	CALIFORNIA		
NAME OF D.D.	REDWOOD CREEK CHANNEL IMPROVEMENTS		
CONTRACT NO.	LOCATION OF EXPLORATION HOLES		
DATE	DATE		
PREPARED UNDER THE DIRECTION OF	DRAWN BY		
FIELD ASSISTANT	CHECKED BY		
U.S. DISTRICT ENGINEER	DATE		
MAP	27	85	45 6



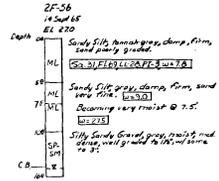
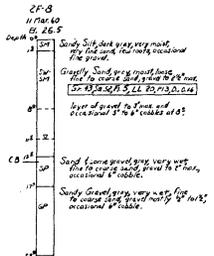
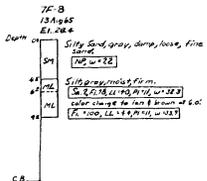
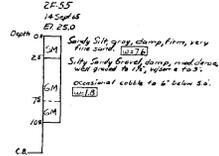
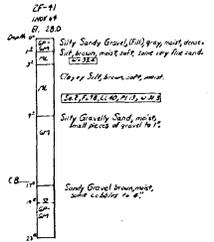
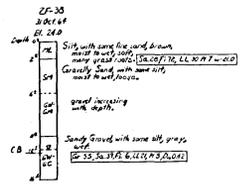
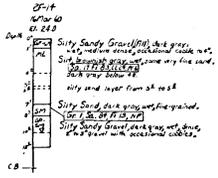
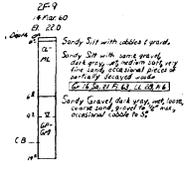
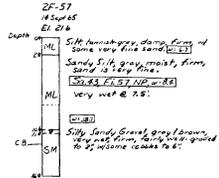
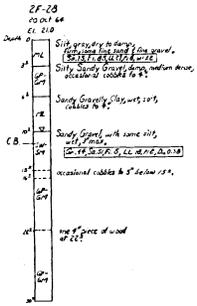
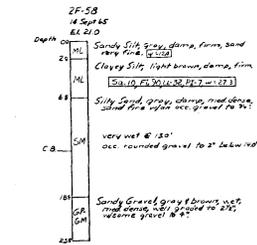
NOTES AND LEGEND ARE SHOWN ON SHEET 28

AS CONSTRUCTED - NO CHANGES MADE		DATE	BY
REVISIONS		DATE	BY
U. S. ARMY DISTRICT SAN FRANCISCO SAN FRANCISCO, CALIFORNIA			
SCALE	DEPARTMENT OF	CENTRO	
PROJECT	REWOOD CREEK		
CONTRACT	CHANNEL IMPROVEMENTS		
SECTION	LOS OF EXAGGERATION HOLES		
STATION	STATION 76+50 TO STATION 87+00		
DATE	BY	DATE	BY
PREPARED UNDER THE DIRECTION OF	DATE	DATE	DATE
ENGINEER	ENGINEER	ENGINEER	ENGINEER
L. E. COOGLER, C. E. DISTRICT ENGINEER		DATE	BY



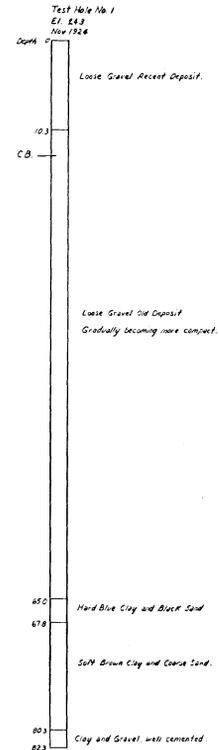
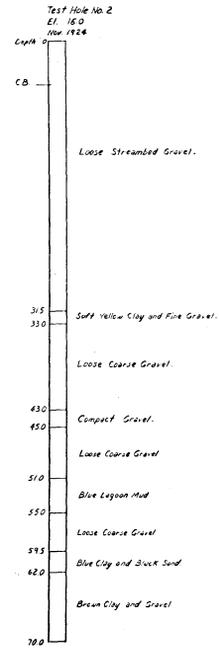
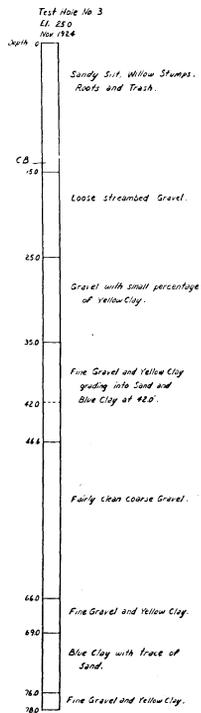
NOTES AND LEGEND ARE SHOWN ON SHEET 20

REVISIONS	
NO. 1	AS CONSTRUCTED - NO CHANGES MADE
DATE	BY
D & MARY DECKER DESIGN, SAN FRANCISCO COUNTY OF BRIDGES SAN FRANCISCO, CALIFORNIA	
DRAWN BY: SP CHECKED BY: MD DATE: 11/18/08	PREPARED FOR: REDWOOD CREEK CHANNEL IMPROVEMENTS PROJECT NO.: LOS 80 EXHIBITION HOLE 8 STATION 407+00 TO STATION 409+00
PROJECT MANAGER: ROBERT HALLAM LEAD DESIGNER: LEONARD W. DECKER	DATE: 11/18/08 SHEET NO.: 22 OF 45



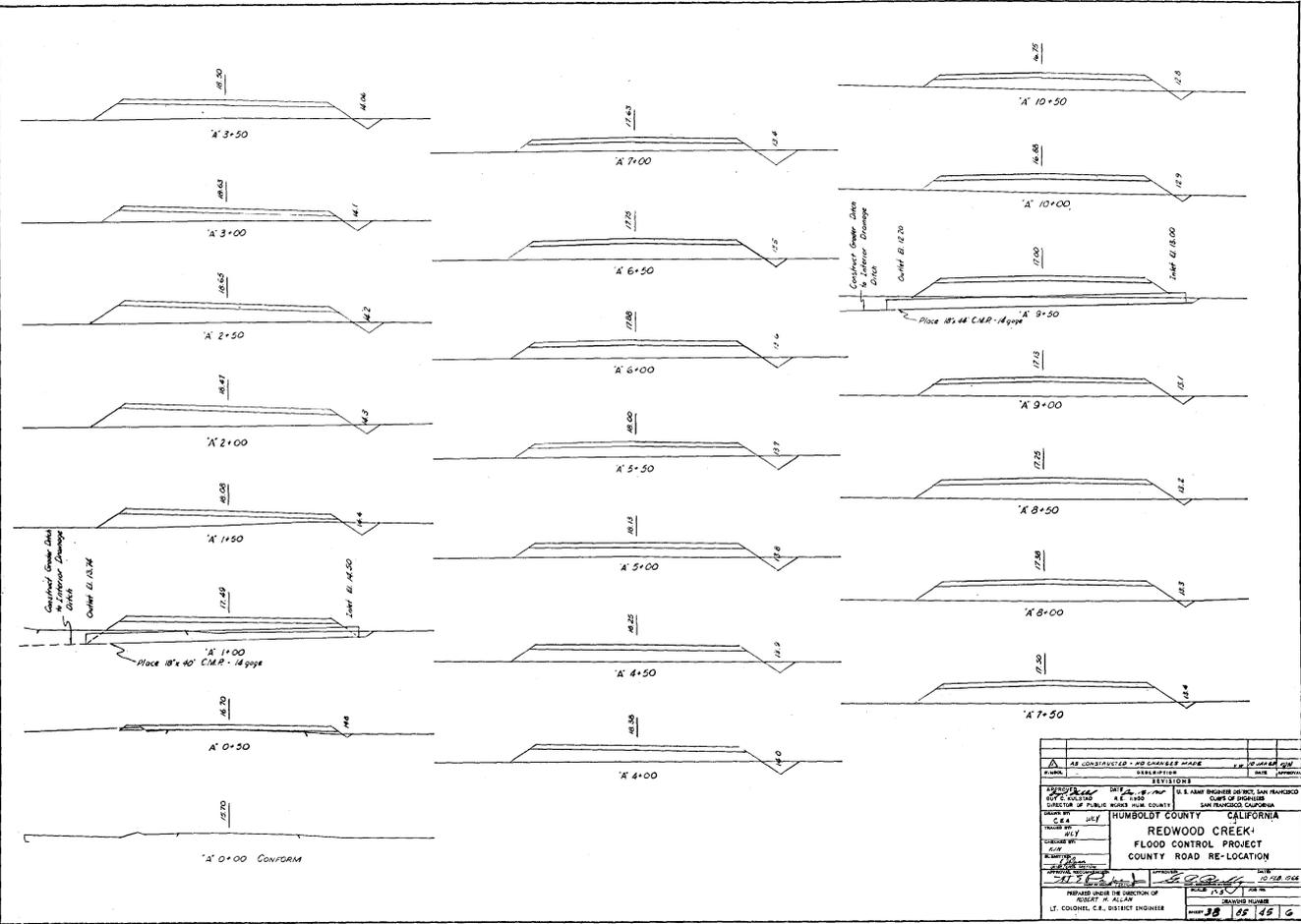
NOTES:
 1. SEE SHEET 38 FOR BORINGS TH-1, TH-2, TH-3, ALSO LOCATED IN THIS REGION.
 2. NOTES AND LEGEND ARE SHOWN ON SHEET 38.

REVISIONS		DATE	
NO.	DESCRIPTION	DATE	BY
1	AS CONSTRUCTED - NO CHANNEL MARK	11/1/65	JMR
S. I. AMY ENGINEERING, SAN FRANCISCO CORP. OF AMY & COMPANY SAN FRANCISCO, CALIFORNIA			
PROJECT NO.	MEMBER OF PROJECT	DATE	BY
REG-100	REGWOOD CREEK	11/1/65	JMR
CHANNEL NO.	CHANNEL IMPROVEMENTS		
STATIONING	LESS AN EXISTING POINT'S		
	STATION/100 TO STATION 131+50		
DESIGNED BY	ENGINEER	CHECKED BY	DATE
J. M. RYAN	J. M. RYAN	J. M. RYAN	11/1/65
PREPARED UNDER THE SUPERVISION OF	PROJECT MANAGER		
ROBERT H. ALLEY			
1100 CALIFORNIA STREET, SAN FRANCISCO, CALIF.	DATE		
	NOV 23 1965		

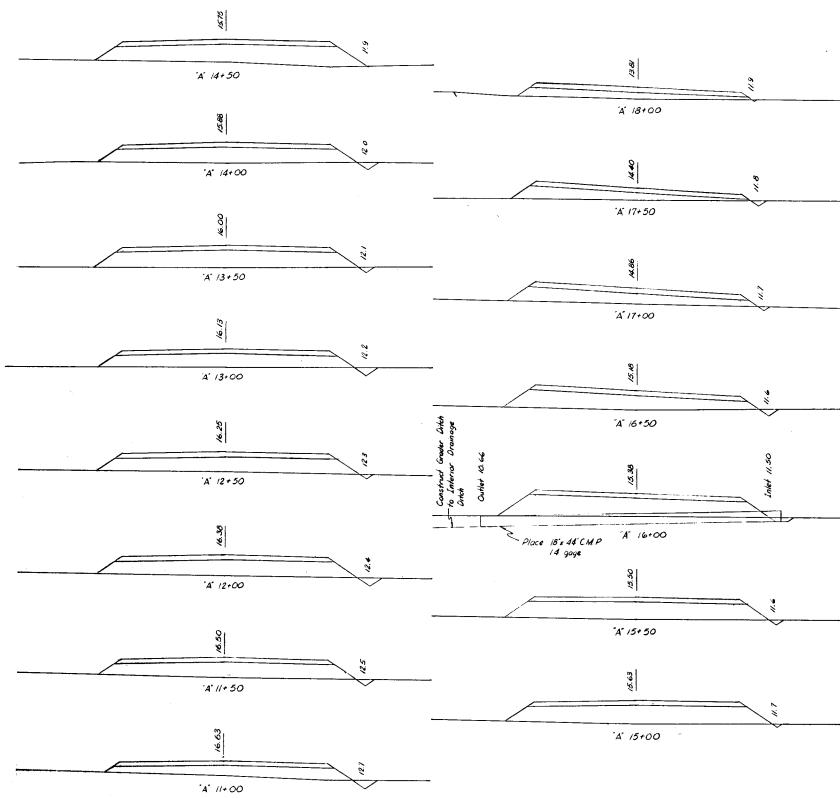


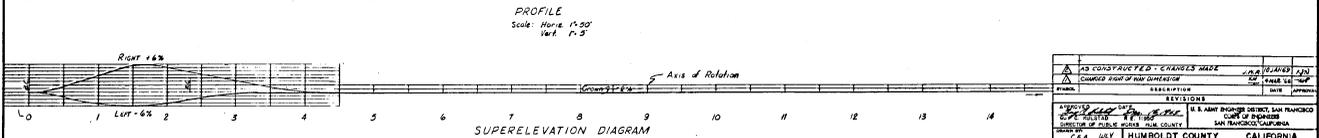
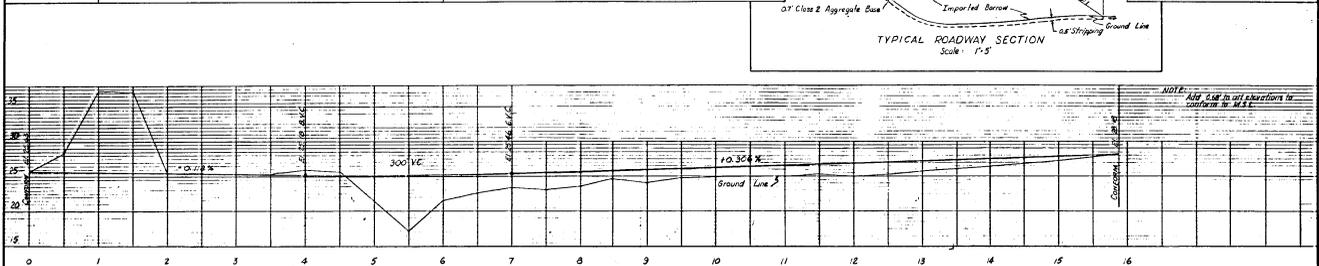
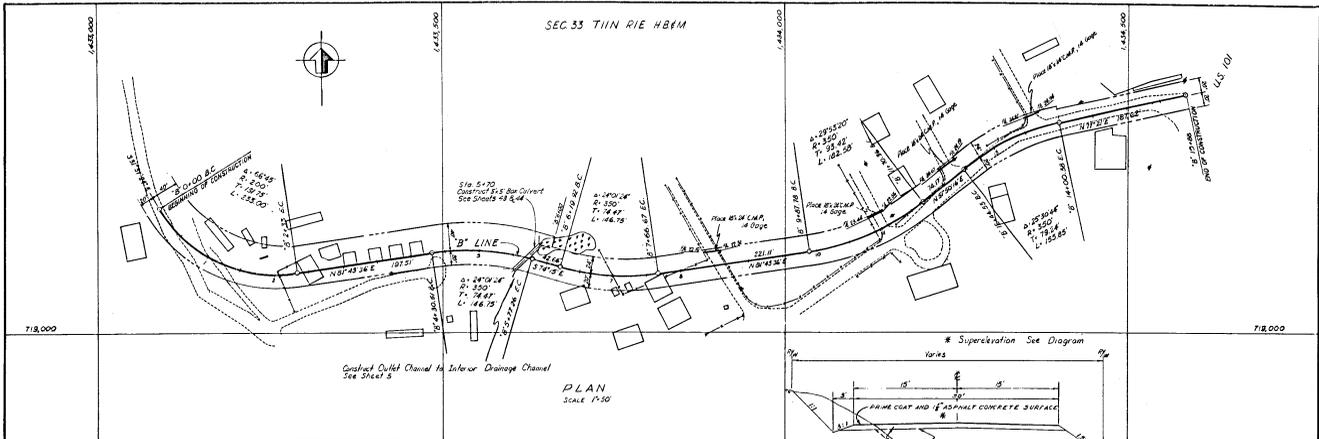
- NOTES:
 1. NOTES AND LEGEND ARE SHOWN ON SHEET 20.
 2. THESE BORINGS WERE FURNISHED BY STATE OF CALIFORNIA, DEPARTMENT OF PUBLIC WORKS, DIVISION OF HIGHWAYS, DISTRICT I

AS CONSTRUCTED - NO CHANGE MADE		DATE APPROVED
DESIGNED BY	CHECKED BY	DATE
REVISIONS		
BY S. J. HART ENGINEER DISTRICT SAN FRANCISCO		
DATE OF REVISION		
SAN FRANCISCO, CALIFORNIA		
PROJECT NO.	REDWOOD CREEK	CITY OF SAN FRANCISCO
CHANNEL IMPROVEMENTS		
LOGS OF EXPLORATION HOLES		
STATION 127+00 TO STATION 128+00		
DATE OF FIELD WORK	NOV 1924	NOV 1924
PREPARED UNDER THE SUPERVISION OF	FORNEY A. ALLAN	DISTRICT ENGINEER
DATE OF PRINTING	NOV 1924	NOV 1924
SHEET 36		OF 45



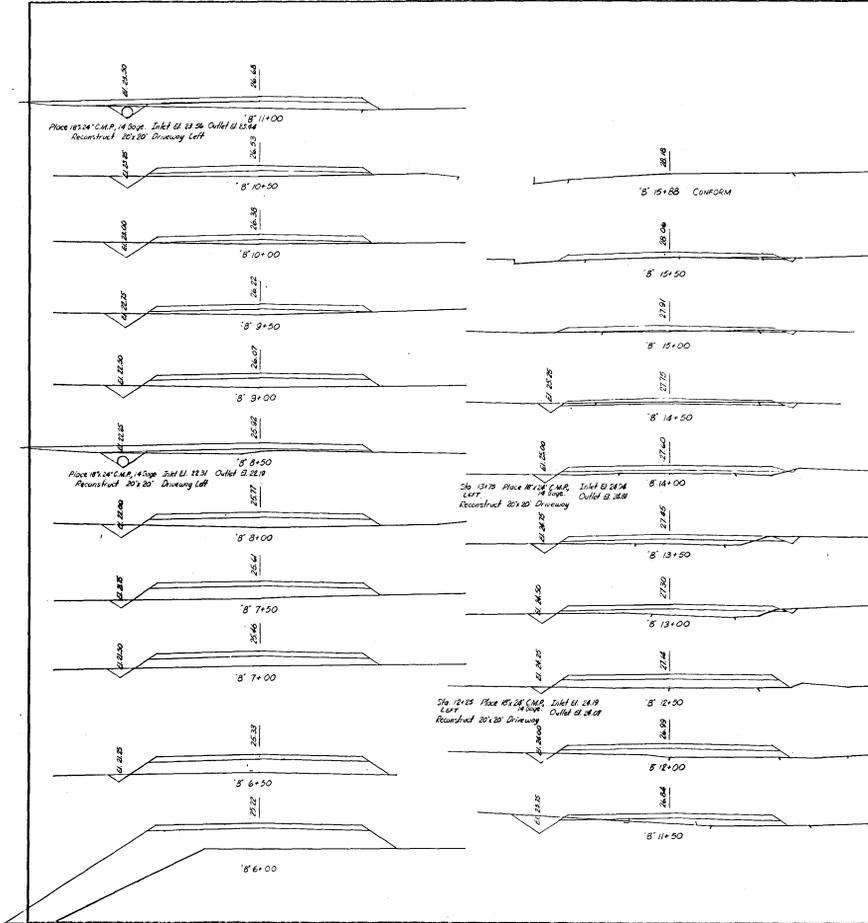
AS CONTRACTED - NO CHANGES MADE		DATE	BY
REVISION		DATE	BY
INSPECTORS			
PROJECT NO.	DATE	BY	DATE
U.S. ARMY ENGINEER DIST. SAN FRANCISCO			
HUMBOLDT COUNTY CALIFORNIA		HUMBOLDT COUNTY CALIFORNIA	
REDWOOD CREEK FLOOD CONTROL PROJECT			
COUNTY ROAD RE-LOCATION			
DESIGNED BY	CHECKED BY	DATE	DATE
SCALE	SCALE	SCALE	SCALE
PREPARED UNDER THE SANCTION OF	APPROVED	DATE	DATE
ASSISTANT TO DISTRICT ENGINEER	BY	DATE	DATE
DATE	DATE	DATE	DATE
BY	BY	BY	BY
DATE	DATE	DATE	DATE
BY	BY	BY	BY
DATE	DATE	DATE	DATE





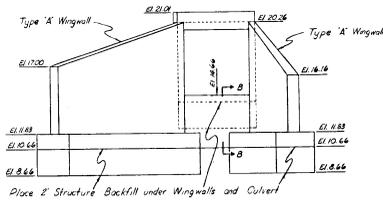
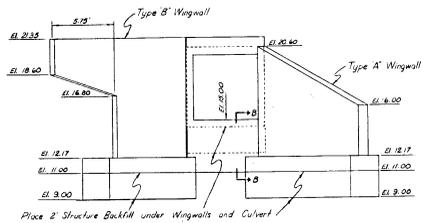
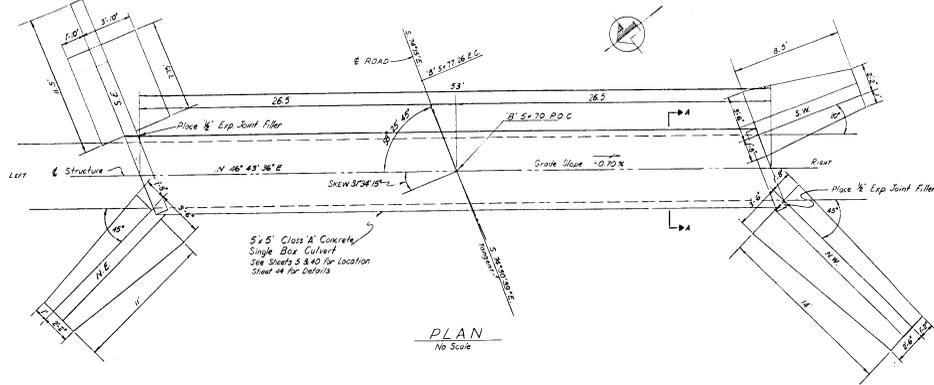
<input type="checkbox"/> AS CONSTRUCTED - CHANGES MADE <input type="checkbox"/> CORRECTED ROAD OF THIS CONTRACT <input type="checkbox"/>	<input type="checkbox"/> RELATED <input type="checkbox"/> DATE <input type="checkbox"/>
DIVISION HUMBOLDT COUNTY CALIFORNIA	
REDWOOD CREEK COUNTY ROAD RE-LOCATION	
PREPARED UNDER THE DIRECTION OF ROBERT W. JULLIAN LT. COLONEL, CAL. DISTRICT ENGINEER	DRAWING NUMBER 40 155 12 G

PESCADERO 4143



NOTE:
Add 0.16' to all elevations to conform to M.S.L.

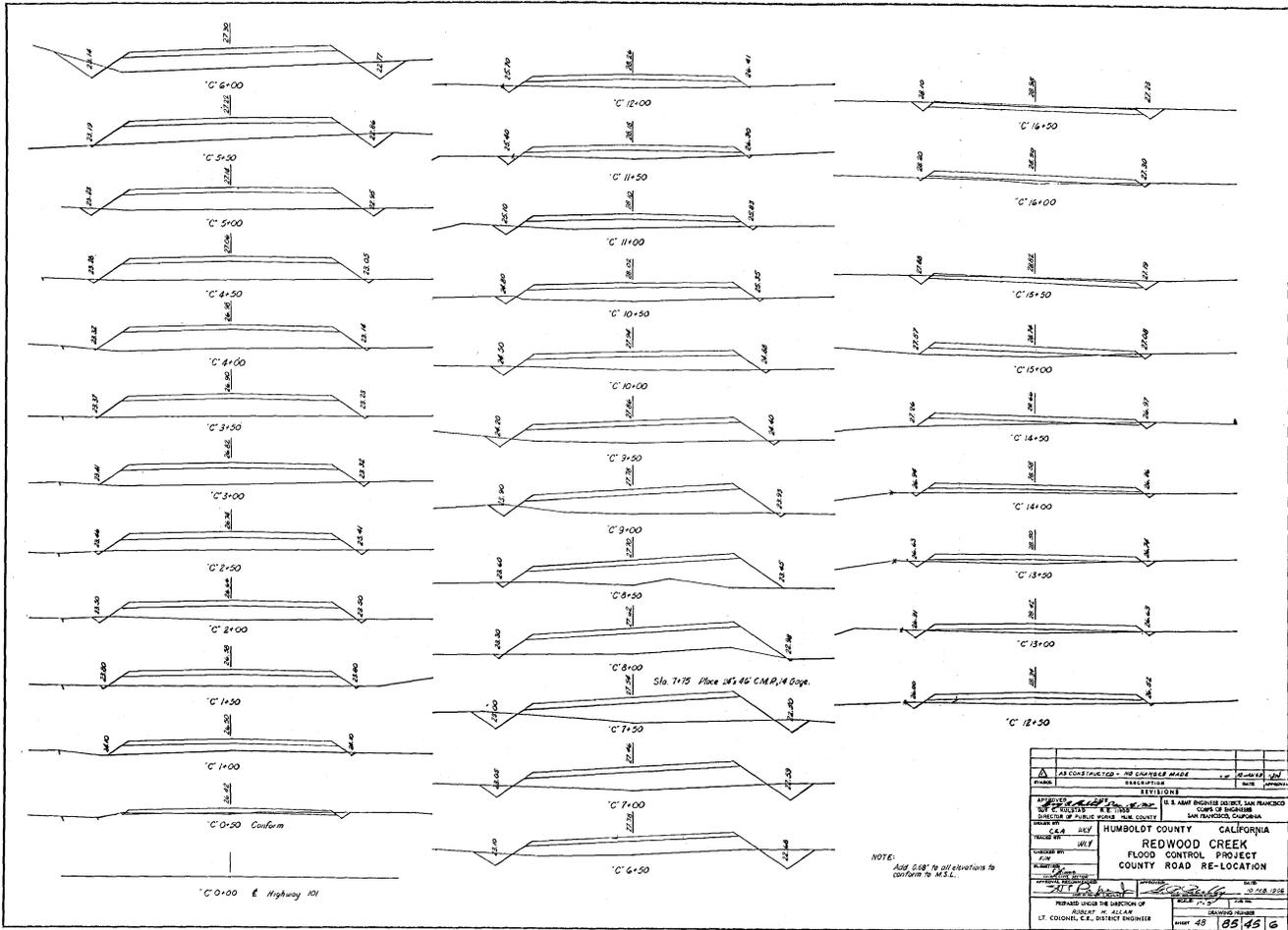
TO CONTRACTOR - NO CHANGES MADE DRAWN: _____ DATE: _____ CHECKED: _____ DATE: _____		RECEIVED DATE: _____ BY: _____
APPROVED: _____ DATE: _____ COUNTY ENGINEER HUMBOLDT COUNTY CALIFORNIA		RECEIVED DATE: _____ BY: _____
PROJECT: REDWOOD CREEK FLOOD CONTROL PROJECT COUNTY ROAD RE-LOCATION		PROJECT NO.: _____ SHEET NO.: _____ OF _____
DESIGNED BY: _____ CHECKED BY: _____ DRAWN BY: _____		SCALE: _____ DATE: _____
PREPARED UNDER THE SUPERVISION OF ROBERT M. ALLAN, CIVIL ENGINEER, HUMBOLDT COUNTY		SHEET NO. 42 85 45 6



NOTE:
Add 2.8' to all elevations
to conform to M.S.L.

AS CONSTRUCTION - NO CHANGES MADE		DATE	BY
REVISIONS		DATE	BY
PROJECT TITLE			
HUMBOLDT COUNTY		CALIFORNIA	
REDWOOD CREEK		FLOOD CONTROL PROJECT	
COUNTY ROAD RELOCATION			
APPROVED FOR THE DISTRICT BY			
DISTRICT ENGINEER		DATE	
PREPARED UNDER THE SUPERVISION OF			
ROBERT W. HELMAN		DATE	
L.T. COLWELL, C.E., DISTRICT ENGINEER		SHEET NUMBER	
		43 85 45 6	

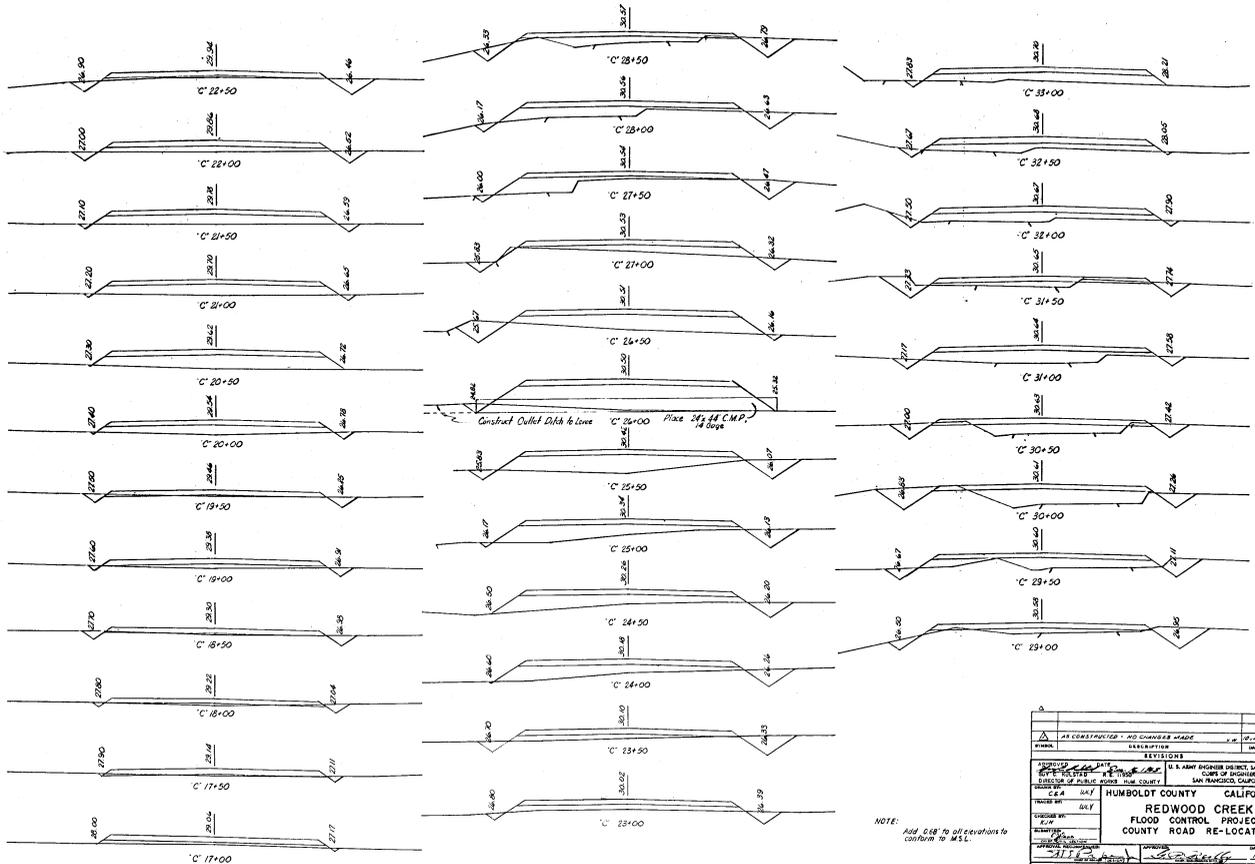
PESCADERO 4155



NOTE:
Add 0.58' to all elevations to conform to M.S.L.

AS CONSTRUCTION - NO ENGINEER NEEDED CHECKED: _____ DATE: _____		DESIGNED: _____ DATE: _____
BEST COPY AVAILABLE		
PROJECT NO. <u>4155</u>		SHEET NO. <u>48</u>
CONTRACT NO. <u>4155</u>		DATE <u>1955</u>
COUNTY OF HUMBOLDT, CALIFORNIA DIVISION OF PUBLIC WORKS, HUMBOLDT COUNTY PROJECT: HUMBOLDT COUNTY CALIFORNIA REDWOOD CREEK FLOOD CONTROL PROJECT COUNTY ROAD RE-LOCATION		
ENGINEER: <u>W. H. ALLEN</u> LICENSE NO. <u>1015</u>		CHECKED: <u>W. H. ALLEN</u> LICENSE NO. <u>1015</u>
PROJECT LOCATION: <u>REDWOOD CREEK</u> PROJECT NUMBER: <u>4155</u>		DATE: <u>1955</u>
PREPARED UNDER THE SUPERVISION OF: <u>W. H. ALLEN</u> LICENSE NO. <u>1015</u>		DRAWING NUMBER: <u>48</u>
COUNTY ENGINEER: <u>W. H. ALLEN</u> LICENSE NO. <u>1015</u>		COUNTY ENGINEER: <u>W. H. ALLEN</u> LICENSE NO. <u>1015</u>

PESCADERO 4157

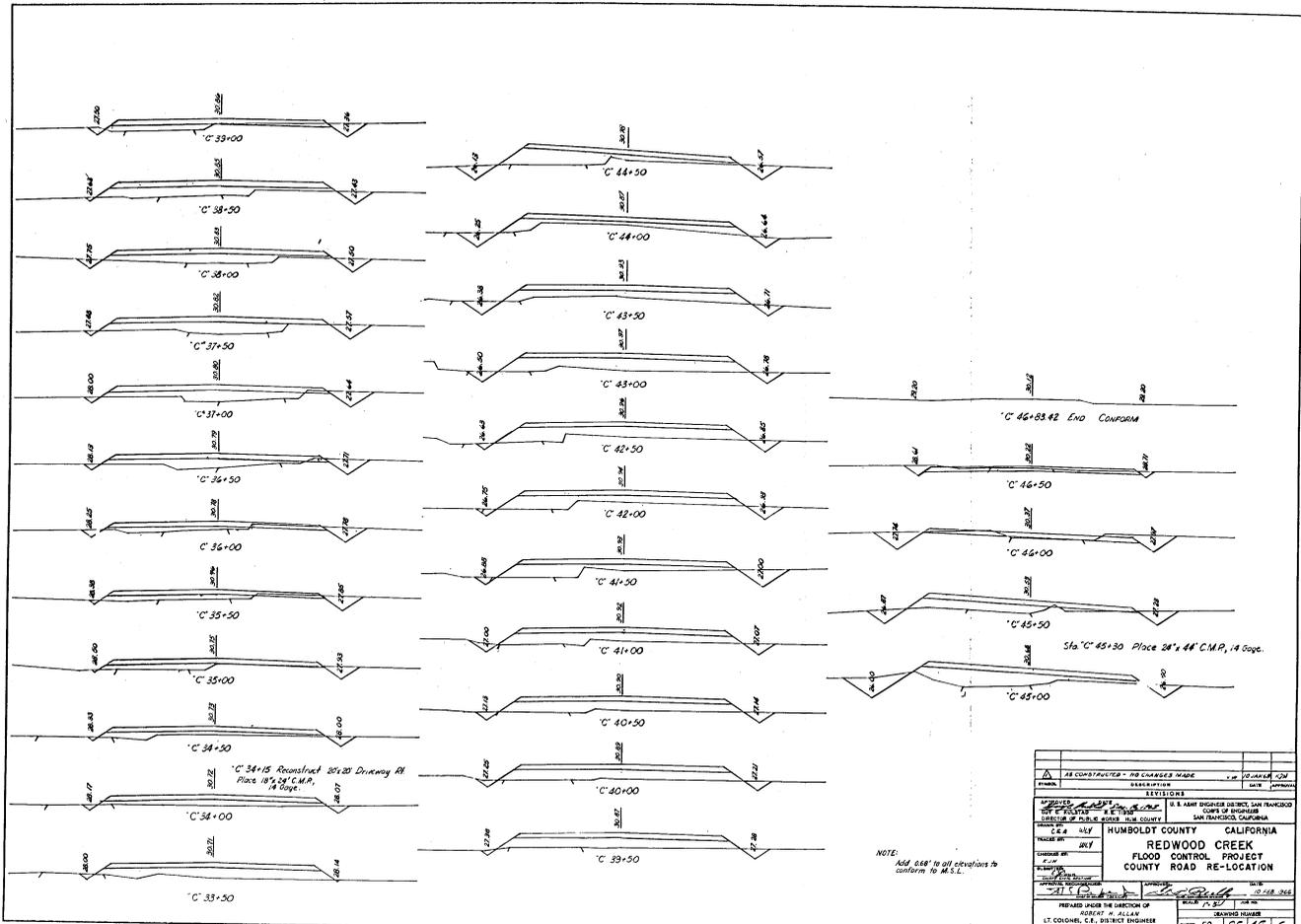


NOTE: Add 5.58' to all elevations to conform to M.S.L.

DATE	BY	REVISIONS
10/15/57	LD	AS CONSTRUCTION - NO CHANGE MADE
10/15/57	LD	REVISIONS
PREPARED BY: J. H. BRYAN, DISTRICT ENGINEER COUNTY OF HUMBOLDT SAN FRANCISCO, CALIFORNIA		
PROJECT NO.: 49 COUNTY: HUMBOLDT COUNTY, CALIFORNIA FLOOD CONTROL PROJECT COUNTY ROAD RE-LOCATION		
DATE	BY	REVISIONS
10/15/57	LD	AS CONSTRUCTION - NO CHANGE MADE
10/15/57	LD	REVISIONS
PREPARED UNDER THE DIRECTION OF HONORABLE H. A. ALLEN DISTRICT ENGINEER		
DATE	BY	REVISIONS
10/15/57	LD	AS CONSTRUCTION - NO CHANGE MADE
10/15/57	LD	REVISIONS

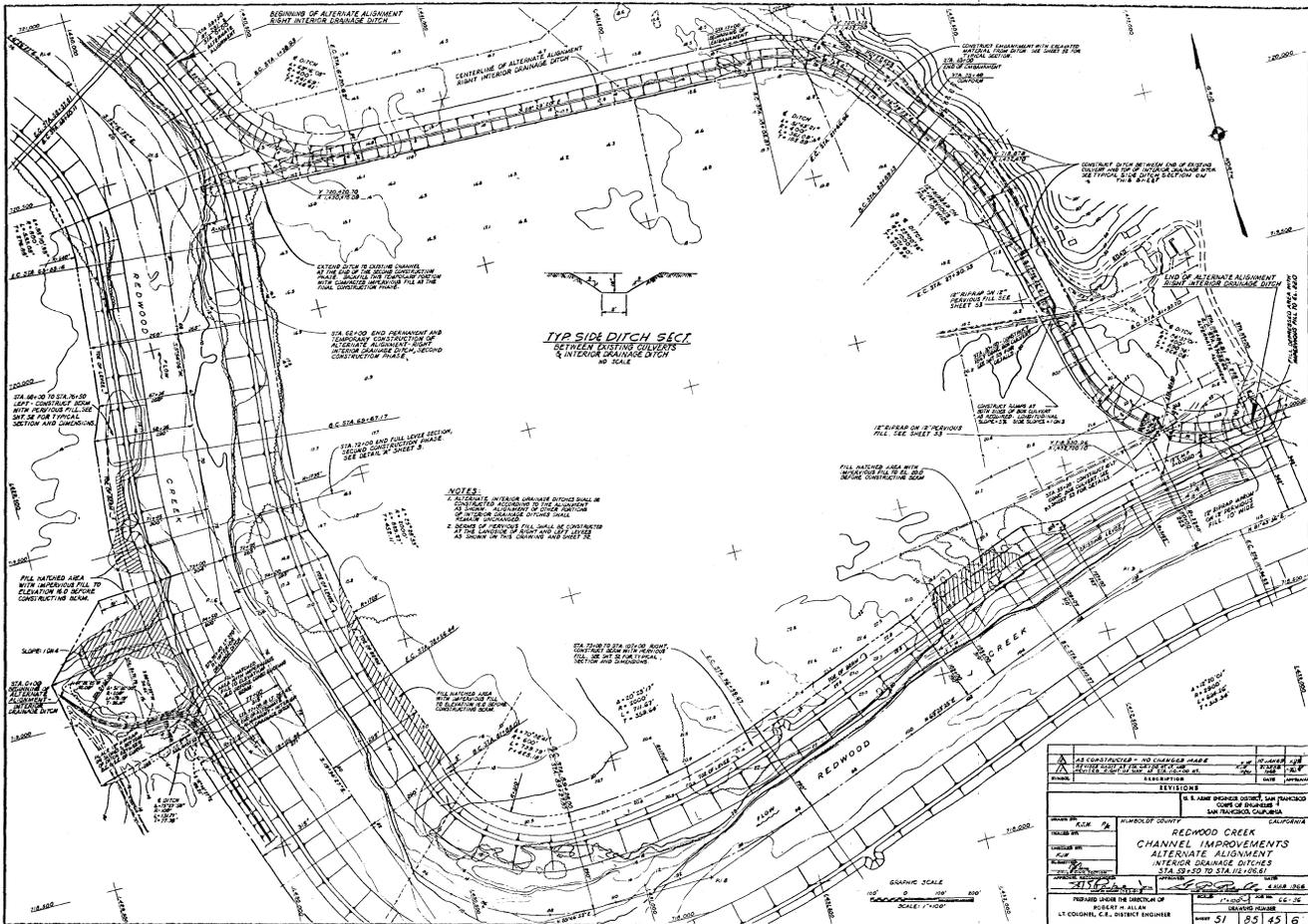
49 85 45 6

PESCADERO 4139



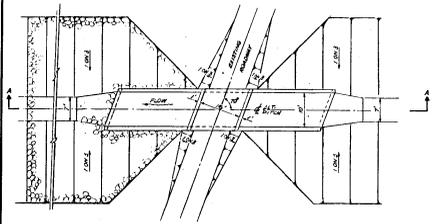
NOTE:
Add .68' to all elevations to
conform to M.S.L.

AS CONSTRUCTED - NO CHANGES MADE		DATE	BY
NO. 1	DESCRIPTION	DATE	PERSON
REVISIONS			
DESIGNED BY	DATE	CHECKED BY	DATE
HUMBOLDT COUNTY CALIFORNIA COUNTY ENGINEER COUNTY OF HUMBOLDT, HUMB. COUNTY SAN FRANCISCO, CALIFORNIA		HUMBOLDT COUNTY CALIFORNIA COUNTY ENGINEER COUNTY OF HUMBOLDT, HUMB. COUNTY SAN FRANCISCO, CALIFORNIA	
REDWOOD CREEK FLOOD CONTROL PROJECT COUNTY ROAD RE-LOCATION			
PROJECT NO.	DATE	SCALE	DATE
PREPARED UNDER THE SUPERVISION OF		DATE	
COUNTY ENGINEER COUNTY OF HUMBOLDT, HUMB. COUNTY SAN FRANCISCO, CALIFORNIA		COUNTY ENGINEER COUNTY OF HUMBOLDT, HUMB. COUNTY SAN FRANCISCO, CALIFORNIA	
NO. 50	65	45	6

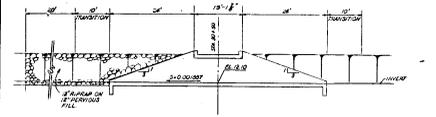


NOTES:
 1. ALTERNATE INTERIOR DRAINAGE DITCH SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE DESIGN OF THE CHANNEL AND DRAINAGE DITCHES.
 2. THE CHANNEL SHALL BE CONSTRUCTED TO THE DESIGN OF THE CHANNEL AND DRAINAGE DITCHES.
 3. THE CHANNEL SHALL BE CONSTRUCTED TO THE DESIGN OF THE CHANNEL AND DRAINAGE DITCHES.

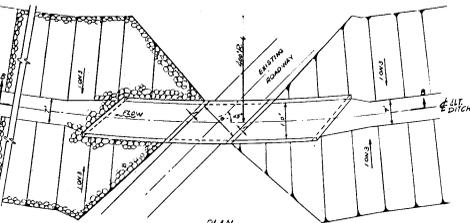
AS CONSTRUCTION - NO CHANGES MADE		DATE	BY
REVISIONS		DATE	BY
R. E. HARRIS ENGINEER, SAN FRANCISCO COUNTY OF SAN FRANCISCO CALIFORNIA			
REDWOOD CREEK CHANNEL IMPROVEMENTS ALTERNATE ALIGNMENT INTERIOR DRAINAGE DITCHES STA 11+00 TO STA 12+00			
DRAWN BY CHECKED BY DATE	PROJECT NO. SHEET NO.	SCALE DATE	ENGINEER DATE
PREPARED UNDER THE SUPERVISION OF R. E. HARRIS, E. I. T. S. E. AT COVILLO, CALIF., DISTRICT ENGINEER			SHEET NO. 51 OF 55



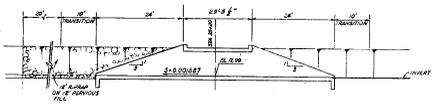
PLAN
STATION 30+50



SECTION A-A

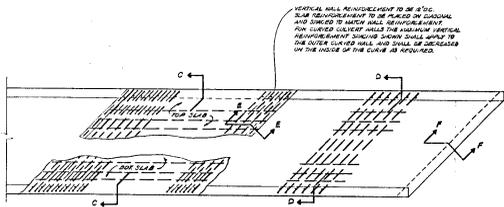


PLAN
STATION 35+20

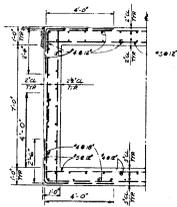


SECTION B-B

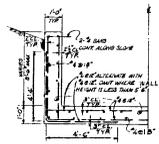
REINFORCED CONCRETE BOX CULVERTS
NOT TO SCALE



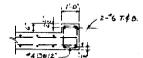
TYPICAL SLAB REINFORCEMENT
NOT TO SCALE



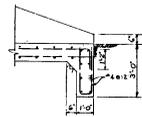
SECTION C-C
NOT TO SCALE



SECTION D-D
NOT TO SCALE



SECTION E-E
CURB BEAM DETAIL
NOT TO SCALE

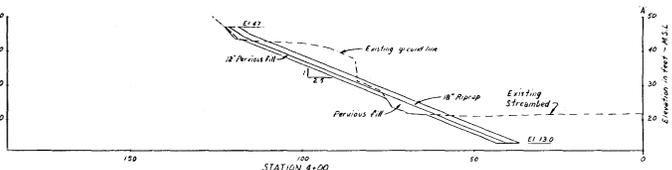
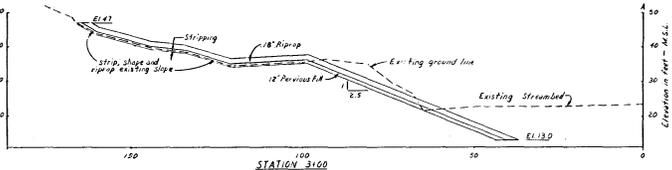
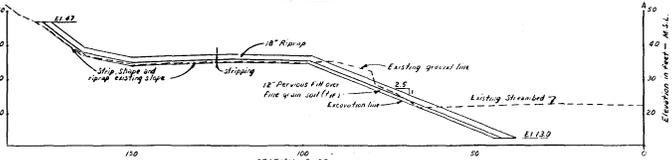
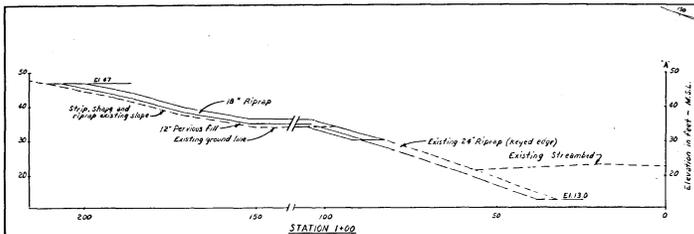


SECTION F-F
NOT TO SCALE

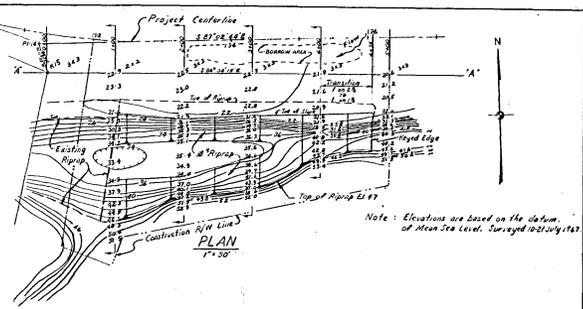
VERTICAL WALL REINFORCEMENT TO BE #5. SLAB REINFORCEMENT TO BE PLACED ON CURB AND STIFFED TO MATCH WALL REINFORCEMENT. FOR CURB COLLIER PILES THE REINFORCEMENT SHALL APPLY TO THE OUTER CURB WALL AND SHALL BE LOCATED ON THE INSIDE OF THE CURB AS SHOWN.

AS CONSTRUCTED - CHANNELS WIDE		DATE	BY
DESCRIPTION		DATE	BY
REVISIONS			
S. B. AMB ENGINEERING, SAN FRANCISCO COUNTY OF SAN FRANCISCO SAN FRANCISCO, CALIFORNIA			
DESIGNED BY	WINDOLF COUNTY	CALIFORNIA	
CHECKED BY	REDWOOD CREEK		
APPROVED BY	CHANNEL IMPROVEMENTS		
	REINFORCED CONCRETE		
	BOX CULVERTS		
PROJECT NO.	53 85 45 6	DATE	10/10/10
PREPARED UNDER THE SUPERVISION OF		BY	DATE
L.T. COOMER, C.E., SENIOR ENGINEER		ROBERT M. ALLAN	10/10/10
		SEALING NUMBER	

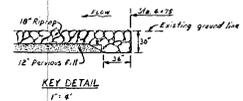
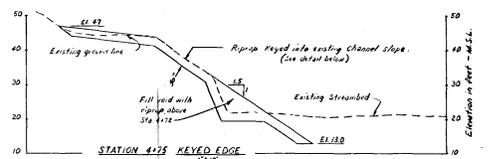
PASCADERO 4169



SECTION
1"=10'



Note: Elevations are based on the datum of Mean Sea Level. Surveyed 10-27-1970



KEY DETAIL
1"=4'

22 CONSULTING - 100 SANDHILL AVENUE SAN FRANCISCO, CALIFORNIA		114 WEST PINEBUSH AVENUE, SAN FRANCISCO CLARE OF BISHOP SAN FRANCISCO, CALIFORNIA	
DRAWN BY CHECKED BY PROJECT NO. SHEET NO.	COUNTY CITY DISTRICT	CALIFORNIA COUNTY OF SACRAMENTO DISTRICT 11	SHEET NO. TOTAL SHEETS
REDWOOD CREEK CHANNEL IMPROVEMENTS EXTENSION OF SLOPE PROTECTION UPSTREAM LIMIT OF LEFT BANK PLAN AND TYPICAL CROSS SECTIONS			
PROJECT LOCATION SHEET NO.		DATE OF SHEET SHEET NO.	
PREPARED UNDER THE SUPERVISION OF F. J. COOK, CIVIL ENGINEER		CHECKED BY DATE	
U. S. COAST AND GEOD. SURVEY DISTRICT ENGINEER		SHEET NO. 35 45 6	