

# **SAN LEANDRO CREEK FLOOD PROTECTION CHANNEL**

**OPERATION  
AND  
MAINTENANCE  
MANUAL**

**JULY 1977**



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

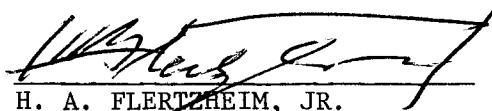
FOREWORD

This manual has been prepared by the District Engineer, U.S. Army Engineer District Corps of Engineers, San Francisco, California.

It is to be used as a guide by the Alameda County Personnel responsible for maintenance and operation of the San Leandro Creek Flood Control Project.

In content it agrees with SPN OM 500-1-1 "Natural Disaster Activities" published by the San Francisco District. The latest edition of that publication is to be used to supplement the information in this manual.

Maintenance in accordance with this manual is necessary to assure the proper functioning of the improved channel and the continuation of its benefits.



H. A. FLERTHEIM, JR.  
Colonel, CE  
District Engineer

Date: 11 July 1977

OPERATION AND MAINTENANCE MANUAL  
SAN LEANDRO CREEK FLOOD CONTROL PROJECT  
ALAMEDA COUNTY, CALIFORNIA

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<u>Exhibit</u>	<u>Title</u>
A	Code of Federal Regulations, Title 33, Part 208 (2 sheets)
B	Dept. of the Army Engineering Regulation "ER 1130-2-339, Inspection of Local Flood Projects" (9 sheets)
C	Maintenance Inspection and Report Checklist
D	Maintenance Report

OPERATION AND MAINTENANCE MANUAL  
SAN LEANDRO CREEK FLOOD CONTROL PROJECT  
ALAMEDA COUNTY, CALIFORNIA

INTRODUCTION

1. Assurances of Local Cooperation

Operation and maintenance of the San Leandro Flood Control Project is authorized by a resolution of the Board of Supervisors of the Alameda County Flood Control and Water Conservation District, dated Dec 19, 1967, which reads in part, "Now, therefore, be it resolved that it is the policy and intent of the Board of Supervisors of the Alameda County Flood Control and Water Conservation District to take any and all actions within the Board's power to meet said conditions of local cooperation on the said project on San Leandro Creek for flood control and allied purposes, as follows:...d. Maintain and operate the completed works for flood control in accordance with regulations prescribed by the Secretary of the Army;"

2. Regulations

Federal regulations controlling the operation and maintenance of this project are: (1) Title 33, Part 208, Section 10 of the "Code of Federal Regulations" as approved by the Secretary of the Army in accordance with authority contained in Section 3 of the Flood Control Act of 22 June 1936 (Public Law No. 738, H.R. 8455) as amended and supplemented (See Exhibit A) and (2) Dept. of the Army Engineering Regulation "ER 11-30-2-339 Inspection of Local Flood Control Projects (See Exhibit B).

County compliance with Title 33 Regulations (Hereinafter referred to as "Regulations") as applicable, is required.

3. Project Authorization

The basis for authorization is contained in Section 205 of the Flood Control Act of 1948 as amended by the Flood Control Act of 1962, referred to as the Small Flood Control Projects Act.

4. Project Description<sup>1/</sup>

The project on San Leandro Creek extends from San Leandro Bay upstream to 160 feet above the Southern Pacific Company trestle, a distance of approximately 9,940 feet in length consisting principally of 7,100 feet of unlined trapezoidal section and approximately 2,500 feet of rectangular concrete section. The remaining length is composed of riprapped transitions between the trapezoidal sections and the rectangular section. The improved channel forms part of the boundary between the cities of Oakland and San Leandro, California.

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<sup>1/</sup> Further channel details of the Federal channel are shown on the inclosed set of drawings.

The trapezoidal channel has a bottom width of fifty feet and an approximate average depth of ten feet. Its side slopes are 4H on 1V downstream and 3H on 1V upstream of Station 44+10 and it ends in a hundred-foot riprap-lined transition to the concrete-lined rectangular channel.

The inside width of the concrete-lined channel section varies from 25 ft. at Station 68+90 to 15 ft. at Station 93+95.28.

The inside height of the concrete reach varies from 5'-1-5/8" at Station 68+90 to 9'-0" at Station 93+95.28.

At the upstream end of the concrete channel is a riprap-lined trapezoidal transition to the natural streambed. This transition extends upstream to the end of the project at Station 97+00.

Included with these elements of construction are supplementary required work including access and service roads and sub-drains behind concrete walls and modifying existing storm drains, an irrigation system and bracing of the bents of the Southern Pacific trestle.

#### 5. Protection Provided

The San Leandro Creek Flood Control Project is designed to provide "100-year-flood"<sup>2/</sup> protection for metropolitan areas of Oakland and San Leandro and to prevent inundation of railroad property, highways and agricultural areas. The design peak discharge is 2,800 cfs.

The Southern Pacific Company railroad bridge approaches are about 3 feet higher than the surrounding ground; consequently the approaches serve as retaining dikes to direct overland flow into the creek. Connections were made to existing drainage lines leading to the creek and low-lying bench lands adjacent to the channel were filled to eliminate ponding areas.

### CHANNEL MAINTENANCE

#### 6. Preface

A well-organized inspection schedule is an indispensable part of the channel maintenance program. A comprehensive checklist such as Exhibit C is to be used during the inspection to ascertain that no feature is overlooked. Post-flood season inspections of channel bottom and slopes are to be made directly following each flood season to allow time for completion of maintenance work before start of the next flood

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<sup>2/</sup> "100-Year-Flood Control" protection design is based on a flood of a magnitude with not more than one percent chance of being exceeded.

season. Pre-flood season inspections are to be made preceding each flood season to insure operability of the channel and to insure that deficiencies noted during the post-flood season inspections have been corrected.

Action for correction of deficiencies is to be taken immediately upon discovery.

#### 7. Maintenance Measures

Maintenance is to be carried out in accordance with the regulations (Title 33).

In addition to maintenance procedures described in the regulations the following maintenance measures are to be taken:

-The channel is to be excavated as frequently as necessary to insure that the channel will contain the design flow. Therefore, as a minimum, sediment is to be removed down to original channel design grade and cross section everywhere along the channel where it threatens to reach a maximum allowable cross sectional average deposition depth of 1.5 feet over the bottom width of the channel. Permanent ranges for channel cross sections are to be established and surveyed at least once each three years to provide an estimate of channel aggradation. If it is visually apparent that significant aggradation is occurring, the channel is to be surveyed more frequently.

-Eroded areas beneath structures are to be cleared of debris and loose material down to firm undisturbed earth. The eroded areas are then to be filled with concrete or riprap properly designed to prevent future erosion.

-Displaced riprap is to be replaced so that the channel is brought to original design geometry. It is to be replaced as soon as practicable after the recession of floodwaters.

-Any scour beneath the concrete channel or damage to the concrete channel shall be cleared of all floatage and loose material to firm undisturbed material and filled with concrete.

-Channel walls and all concrete structures shall be inspected for random cracking, and large cracks filled to prevent lodging of foreign material that would support plant growth. All eroded concrete shall be repaired as soon as any reinforcing steel is exposed or erosion reaches a depth of 4 inches.

-Necessary steps shall be taken to prevent damage to, or loss of, back-fill behind walls through undue settlement, unauthorized removal of soil, sloughing of soil from adjacent property and disposition of refuse.

-All repairs are to be made in accordance with approved engineering standards and by qualified personnel.

-The grade of the banks should be checked to be sure that settlement or sloughing has not materially decreased their protective potential. In all cases where the embankment grades settle below the design elevations by more than one foot, fill material similar to that used in the original construction is to be placed and compacted to obtain design grade. All objectionable material is to be removed, the surface scarified to a depth of approximately six inches, and the new fill placed and compacted in layers. Where service roads have settled and are to be repaired, gravel that is salvagable may be removed, stockpiled and reused.

-Debris is to be removed when it collects in an amount sufficient to cause damage to riprap or to any structure, to cause erosion, or to restrict the channel.

-Surfaces of the service roads and access roads are to be maintained in original condition. All holes, soft areas and damaged road surfaces are to be repaired annually.

#### Vegetation

Area surrounding ornamental trees and shrubs (a zone 15 feet wide): All growth except grasses is to be removed from these zones and regrowth prevented. Grasses are to be cut or mowed to prevent interference with ornamental planting and to reduce fire hazard. Cuttings are to be removed from the project area.

Channel bottom in the downstream end of the channel subject to tidal action: All wild growth except flexible grasses and pickleweed is to be cut as close to the ground as possible and cuttings are to be removed. Stumps and stubble are to be sprayed or painted with a herbicide.

-Channel Side-slopes: Except for landscape plantings and for wild growth which is allowed as described below, the channel side-slopes are to be kept clear. Grasses are to be mowed as close to the ground as possible. Volunteer plants other than grasses and pickleweed are to be removed before they are four feet high except as follows: clusters not



more than ten feet average diameter and spaced no closer together than fifty feet edge to edge and single plants no closer than thirty feet to any other plant may be allowed to remain uncut. Cuttings are to be removed from the project area.

Selection and use of herbicides and pesticides is to be made in compliance with applicable Federal, State and local regulations. Special notice should be taken of EPA's guidelines on the handling, use and disposal of pesticides.

#### OPERATION AND MAINTENANCE OF INTERIOR DRAINAGE

#### 8. Preface

Fifteen drainage structures without flapgates have been modified as required to open into the designed channel. There is one 4-inch drain with a flapgate at Sta. 82+50.

There are a total of 34 drainage wells with flapgates recessed into the concrete walls. Their locations are as follows:

- a. STA. 72+15 (LT & RT) DOUBLE (4)
- b. STA. 74+90 (LT & RT) DOUBLE (4)
- c. STA. 77+64 (LT & RT) DOUBLE (4)
- d. STA. 80+38 (LT & RT) DOUBLE (4)
- e. STA. 83+12 (LT & RT) DOUBLE (4)
- f. STA. 85+86 (LT & RT) SINGLE (2)
- g. STA. 88+60 (LT & RT) DOUBLE (4)
- h. STA. 91+34 (LT & RT) DOUBLE (4)
- i. STA. 94+05 (LT & RT) SINGLE (2)
- j. STA. 69+40 (LT & RT) SINGLE (2)

All flapgates function automatically and require no manual operation except during maintenance.

#### 9. Maintenance

The flapgates are to be maintained so that they do not leak, or show erosion damage or corrosion and so that they function properly.

##### a. Inspection

Each drainpipe and flapgate is to be inspected early enough in the season to allow time for repair or maintenance before the onset of the rainy season.

##### b. Flapgate Inspection

-Inspect entire gate for corrosion - especially the machined faces.

-Close the gate and check the alignment and seating.

-Inspect the adjustable pivot points for damaged studs and for any stiff, binding action.

-Inspect the assembly bolts and pivot lugs for corrosion and shearing.

-Inspect for trash and sediment deposit that interferes or might interfere with the movement of the gate and flow of water.

c. Preliminary Preparation

Before repair of corroded surfaces the surface grease and oil is to be removed with solvent. Corrosion is to be repaired with gates in place.

Before cleaning and painting operations, all machined surfaces are to be protected with masking tape and the tape removed when the work is completed.

d. Cleaning and Painting

Clean the corroded areas by scraping, scaling and chipping to remove the bulk of the coating. Follow this with wire brushing to remove residues. Apply three coats of tar-base paint conforming to MIL-C-18480A. A special primer is to be used under the tar-base paint only if and as recommended by the manufacturer. The material is to be heavily applied by brush at a coverage rate of approximately 80 square feet per gallon to give a total dry film thickness of at least 40 mils for the completed coating. The paint shall not be thinned unless recommended by the manufacturer. Brushed strokes shall be at right angles to those of the preceding coat. Application and drying time between coats shall be performed under dry conditions and within the atmospheric temperature ranges recommended by the paint manufacturer.

e. Lubrication

e. Lubrication is to be performed at least once every 90 days as follows: The machined faces of the flapgates shall be cleaned and greased with a water resistant grease such as Conoco's "All-Purpose Superlube" or Texaco's "Multi-Fax Heavy Duty No. 2," or Shell Oil Company's "Alvania No. 1," "Lubriplate No. AAA," or equal.

The pivot points are to be lubricated with a penetrating oil while moving the gate back and forth. Should the gates bind or be frozen they are to be disassembled and the bolts, studs and bronze bushings cleaned and lubricated with the same grease as used for the machined faces. Any broken or worn-out bolts, studs and bushings are to be replaced. Where steel bolts and studs are to be replaced, the replacement fittings material shall be stainless steel within the AISI 300 Series.

f. Miscellaneous Repairs

Clean out debris and sediment which may obstruct operation of gates or flow of water. Repair any scoured earth embankment or riprap areas with the same material as original. Damaged surfaces in corrugated pipes are to be cleaned and coated with suitable bituminous paint.

10. Post-Flood Inspection and Restoration

After each storm which inundates the drainage structures an inspection is to be made and maintenance is to be performed to insure that:

-All inlet and outlet structures are free of any debris or deposition that might interfere with the free flow of water;

-All flapgates are free of debris and deposition that would inhibit their functioning;

-All flapgates are in good mechanical condition and function properly;

-All pipes (including those without gates or controls) are free of debris that could inhibit or prevent efficient operation.

THE OPERATION AND MAINTENANCE SUPERINTENDENT

11. Authority

The office of Superintendent and its function is a mandatory requirement as stated in the regulations (Title 33).

12. Duties

The duties of the Superintendent are as provided in the regulations (Title 33) and as follows:

Weather Forecasts: The Superintendent is to keep posted on weather forecasts so that flood fight forces can be mobilized in time. Also, the Superintendent is to utilize rain-gage observers in the headwaters of the basin to keep him informed on precipitation and the possibility of flooding.

Training of Key Personnel: Key personnel should be trained to sufficiently carry out field inspections (see para. 9 and 15) perform regular maintenance work and handle the problems of flood control in a quick and orderly manner. The Superintendent should have the name, address, and telephone number of each key man and of each of a reasonable number of substitutes. Also the key-man should have this information on their subordinates. The organization of key-men should include a substitute who can act in the absence of the Superintendent and enough section foremen with leadership qualities to lead maintenance patrol work of the entire levee.

The Semi-Annual Report: Paragraph (a), (6) of the regulations (Title 33) cites the mandatory requirement for submittal of a semi-annual report by the Superintendent to the District Engineer, covering inspection, maintenance and operation of the project. The reports are to be sent to the attention of the Emergency Operation Planner.

The report is to be submitted within the ten-day periods prior to the first day of May and the first day of November of each year. It is to include dated and signed copies of all field inspection reports (see Exhibits C and D) made over the period being reported on.

In addition to the completed field inspection report forms, the report is to contain all additional pertinent information including dates and descriptions of proposed and completed temporary and permanent repairs.

## COMBATING FLOOD AND OTHER DAMAGE

### 13. General Statement

Most of the methods described here are based on years of experience with the problems that arise during floods. However, they are not intended to restrict the Superintendent or others concerned to a rigid set of rules for every condition that may arise. If problems arise that are not covered by these suggestions and the Superintendent is in doubt about procedure he is to consult the District Engineer, U.S. Army Engineer District, San Francisco, California. Meanwhile he is to follow standard flood control procedure as closely as possible. It is better to be over-prepared for a flood fight than to find at the last moment that preparations were inadequate. Also, confidence of the protected parties is a valuable asset that should not be lost through inefficient operation of the protection system in time of emergency.

### 14. Premeditated damage

The Superintendent is to guard continually against premeditated damage (vandalism). Personnel of the Corps of Engineers, U.S. Army, whether military or civilian, are not vested with any civil police authority in performance of their engineering duties and they are not to assume such authority. The responsibility for protecting flood-control works against sabotage, acts of depredation, or other unlawful acts rests with the local interests through local and State governmental agencies. In the event that local law enforcement agencies prove inadequate, local interests, as provided by law, can request the aid of State forces and the aid of Federal troops if additional support becomes necessary.

### 15. Field Inspection

Personnel under the supervision of the Superintendent are to perform 90 calendar-day periodic inspections of the project to determine the condition of all of the various components of the project and any repair or replacement required.

The first inspection of each year is to be made well in advance of the flood season so that required repairs may be completed before the floods. Thereafter periodic inspections are to be made before and after every high water period during the flood season and, otherwise, throughout the year at intervals not to exceed ninety days.

Copies of forms such as Exhibits C and D are to be filled out during each inspection. They are to be used in implementing required repairs and to prepare the semi-annual report to the District Engineer, San Francisco District Corps of Engineers. Particular attention is to be paid to the following:

- Condition of the main channel, noting obstacles, dikes, debris, etc., that will substantially reduce capacity or create sufficient turbulence to scour channel bottom or banks.
- Condition of embankment and any recent repairs.
- Condition of structures, culverts and flapgates.
- Condition of access and service roads, especially to areas where problems are likely to develop.
- Availability of emergency supplies (quantity, location, condition).
- Communications with operating personnel (telephone, radio).
- Availability of personnel on short notice (operators, labor, etc.).

#### 16. Preliminary Repair Work

Because the water level rises and falls very rapidly on this project, the amount of work that can be accomplished after the water level starts to rise and before it reaches the maximum for that flood is minimal. Therefore, it is imperative that the project be kept in condition to accept design floods during the flood season. Work that requires a temporary weakening of any bank or structure should not be undertaken during the period from November through March. Repair work during this period should be confined to emergency repair of damaged areas.

#### 17. Disaster Relief

It is the responsibility of local, state and municipal authorities, supported by and/or working 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 in extreme cases where local resources are clearly inadequate to cope with the situation.

#### 18. Flood Fight

If, after preliminary organization and precautions, a flood fight is necessary, the following procedures may be adopted.

Wave Wash: The Superintendent and Sector Foreman should examine the channel slopes well before and during floodflows to find sites of probable wave washing. Supplies of rolled bagging material and filled sacks are to be held in readiness on wooden pallets. A well sodded slope should withstand floodflows of an hour duration. During periods of high wind and high water an ample labor force should be on standby. Experienced men should be assigned to watch for signs of erosion. When it is necessary to protect the slope it may be done in accord with Exhibit E or F, whichever is appropriate.

Scours: Areas of high current velocities should be watched for slope-scours, especially pipe and structure penetrations.

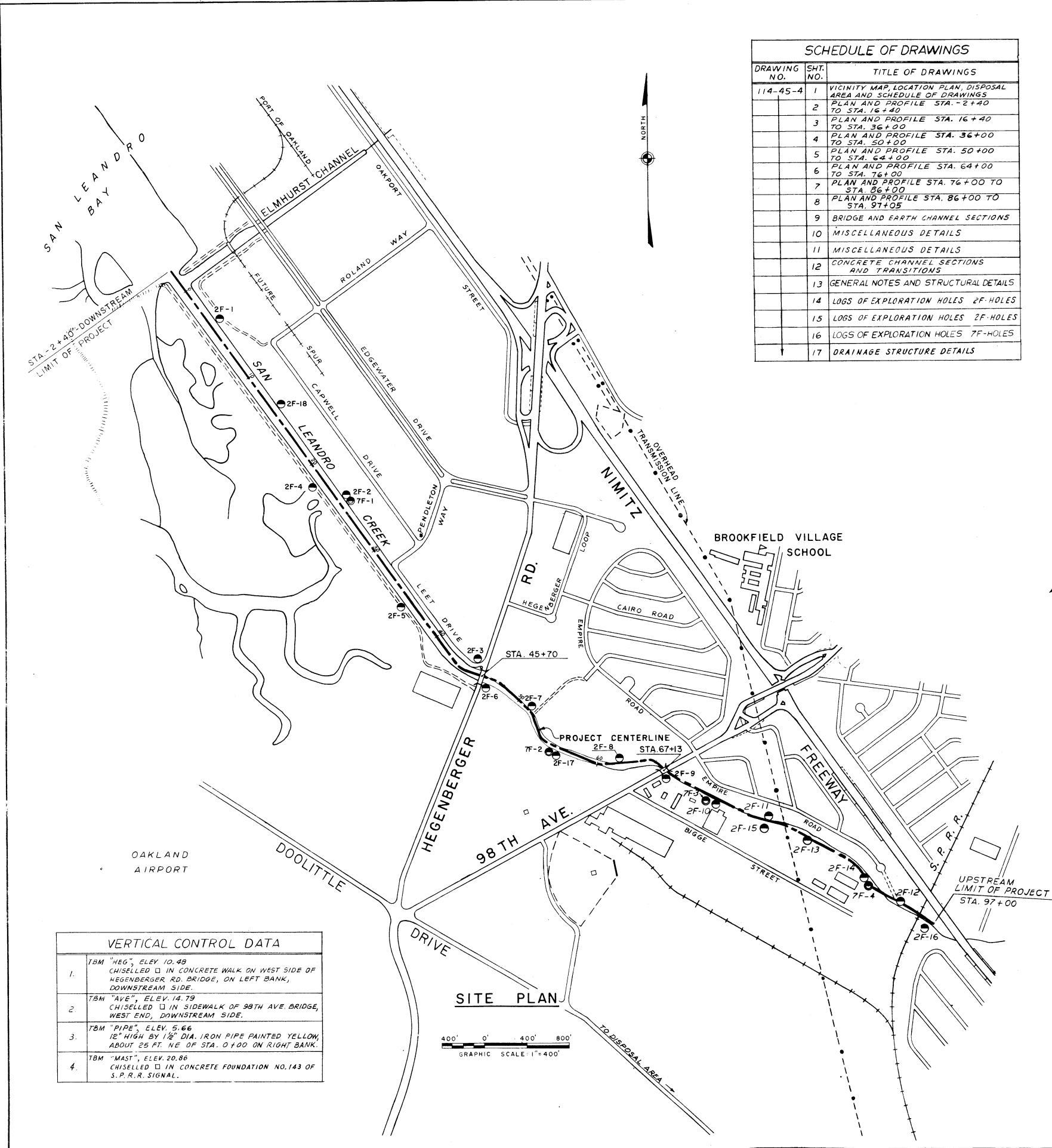
The standard method of retarding scour-erosion is to construct a mat of stakes and brush over the eroding area. An approved method is to drive stakes of appropriate size and wire the brush (or lumber if brush is not at hand) in place and weighting it all down with sacks of gravel or stone.

#### 19. Transportation

When equipment must be moved over road that have become impassable due to mud or sand, passage may be provided by laying a plank road or by laying sheet steel or wire mats.

#### 20. Liaison with District Engineer, Corps of Engineers, and Use of Government Plant

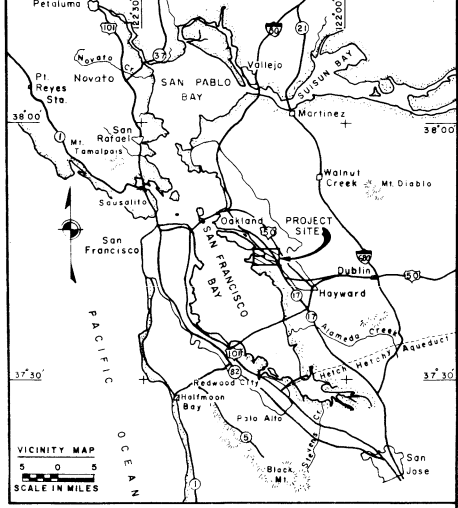
It is the overall objective of the Corps of Engineers to insure the integrity of its flood control works. Therefore it is necessary, especially during emergencies, that liaison be maintained between locally responsible parties and the Corps of Engineers so that if an emergency arises that is clearly beyond the capabilities of local interests, the Corps of Engineers may assist. The District Engineer, U.S. Army Engineer District, San Francisco, California, is authorized to use or loan Government property and plant in cases of emergency where life or property is in danger where no suitable other equipment is available provided that such action is without detriment to the Government. However, no assistance by the Government will be given unless it is requested by the locally responsible party and local capabilities have been exhausted.



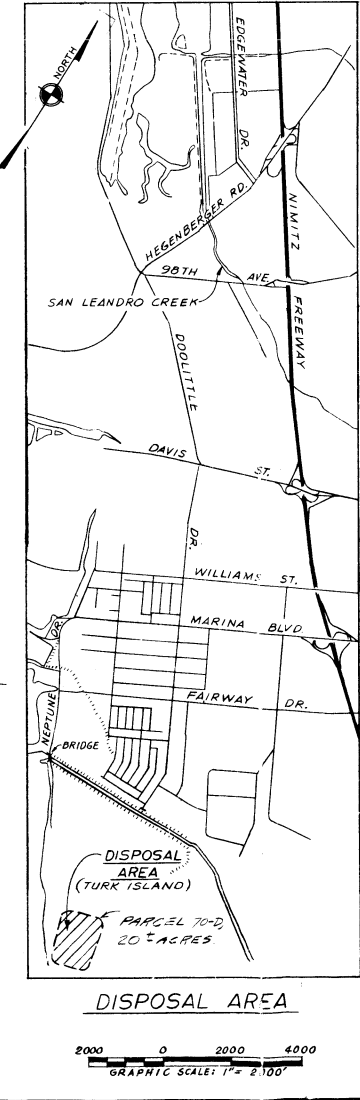
SCHEDULE OF DRAWINGS		
DRAWING NO.	SHT. NO.	TITLE OF DRAWINGS
114-45-4	1	VICINITY MAP, LOCATION PLAN, DISPOSAL AREA AND SCHEDULE OF DRAWINGS
	2	PLAN AND PROFILE STA. 2+40 TO STA. 16+40
	3	PLAN AND PROFILE STA. 16+40 TO STA. 36+00
	4	PLAN AND PROFILE STA. 36+00 TO STA. 50+00
	5	PLAN AND PROFILE STA. 50+00 TO STA. 64+00
	6	PLAN AND PROFILE STA. 64+00 TO STA. 76+00
	7	PLAN AND PROFILE STA. 76+00 TO STA. 86+00
	8	PLAN AND PROFILE STA. 86+00 TO STA. 97+05
	9	BRIDGE AND EARTH CHANNEL SECTIONS
	10	MISCELLANEOUS DETAILS
	11	MISCELLANEOUS DETAILS
	12	CONCRETE CHANNEL SECTIONS AND TRANSITIONS
	13	GENERAL NOTES AND STRUCTURAL DETAILS
	14	LOGS OF EXPLORATION HOLES 2F-HOLES
	15	LOGS OF EXPLORATION HOLES 7F-HOLES
	16	LOGS OF EXPLORATION HOLES 7F-HOLES
	17	DRAINAGE STRUCTURE DETAILS

PROJECT CENTERLINE				
LOCATION	BEARING	DISTANCE	COORDINATES	
			NORTH	EAST
P.O.T. - 2+40			457,133.27	1,506,335.01
	S 33° 50' 34" E	240.00'		
P.O.T. 0+00			456,933.93	1,506,468.67
	S 33° 50' 34" E	4,383.66'		
P.I. 1			453,293.00	1,508,910.00
	S 69° 26' 38" E	393.02'		
P.I. 2			453,155.00	1,509,278.00
	S 46° 18' 07" E	43.569'		
P.I. 3			452,854.00	1,509,593.00
	S 29° 24' 37" E	297.32'		
P.I. 4			452,595.00	1,509,739.00
	S 69° 58' 23" E	557.72'		
P.I. 5			452,404.00	1,510,263.00
	N 86° 58' 52" E	493.69'		
P.I. 6			452,430.00	1,510,756.00
	S 25° 49' 45" E	192.87'		
P.I. 7			452,256.40	1,510,840.03
	S 59° 51' 30" E	469.55'		
P.I. 8			452,020.62	1,511,246.09
	S 64° 34' 11" E	381.68'		
P.I. 9			451,856.72	1,511,590.79
	S 69° 42' 25" E	500.57'		
P.I. 10			451,683.11	1,512,060.89
	S 59° 59' 10" E	617.18'		
P.I. 11			451,374.39	1,512,594.71
	S 33° 55' 18" E	309.20'		

(CONTINUED BELOW)



LEGEND	
	CABLE BARRICADE
	CONSTRUCTION RIGHT-OF-WAY
	PERMANENT RIGHT-OF-WAY
	EXISTING BUILDING
	EXISTING BUILDING (TO BE REMOVED BY OTHERS)
	SIDE SLOPE OF NEW CHANNEL
	R.C.P.
	C.M.P.
	POWER POLE AND ANCHOR
	ELECTROLIER
	FENCE
	R/W
	2F
	7F
	EXISTING LEVEE
	N. I. C.
	HORIZONTAL CONTROL STATION
	UTILITY POLE

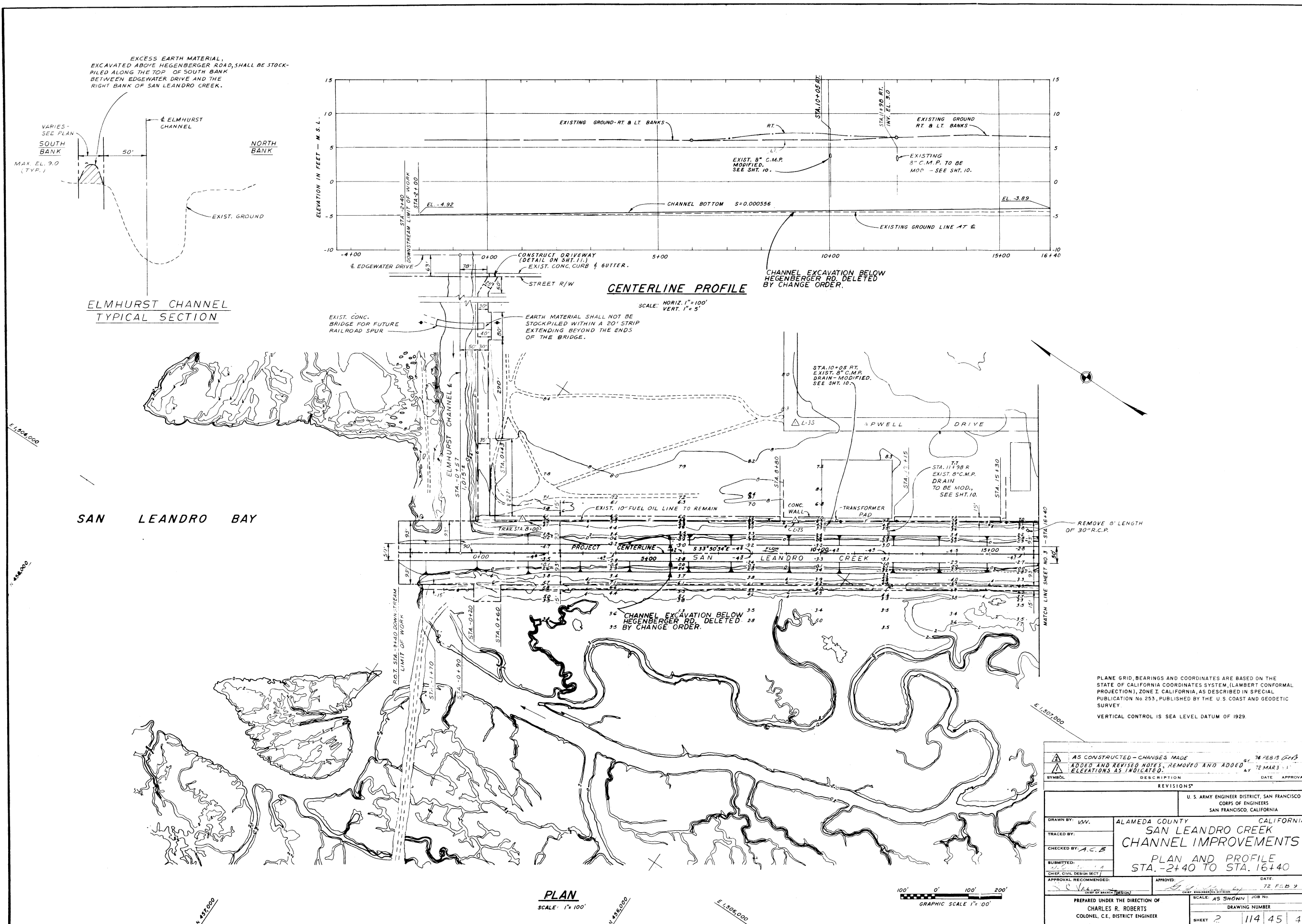


P.I. 12			451,117.81	1,512,767.26
	S 55° 01' 12" E	418.31'		
P.I. 13			450,878.00	1,513,110.00
	S 62° 30' 39" E	138.65'		
P.I. 14			450,814.00	1,513,233.00
	S 36° 24' 32" E	97.47'		
P.O.T. 96+99.89			450,735.56	1,513,290.85

NOTE: SEE SHEET 3 FOR HORIZONTAL CONTROL DATA

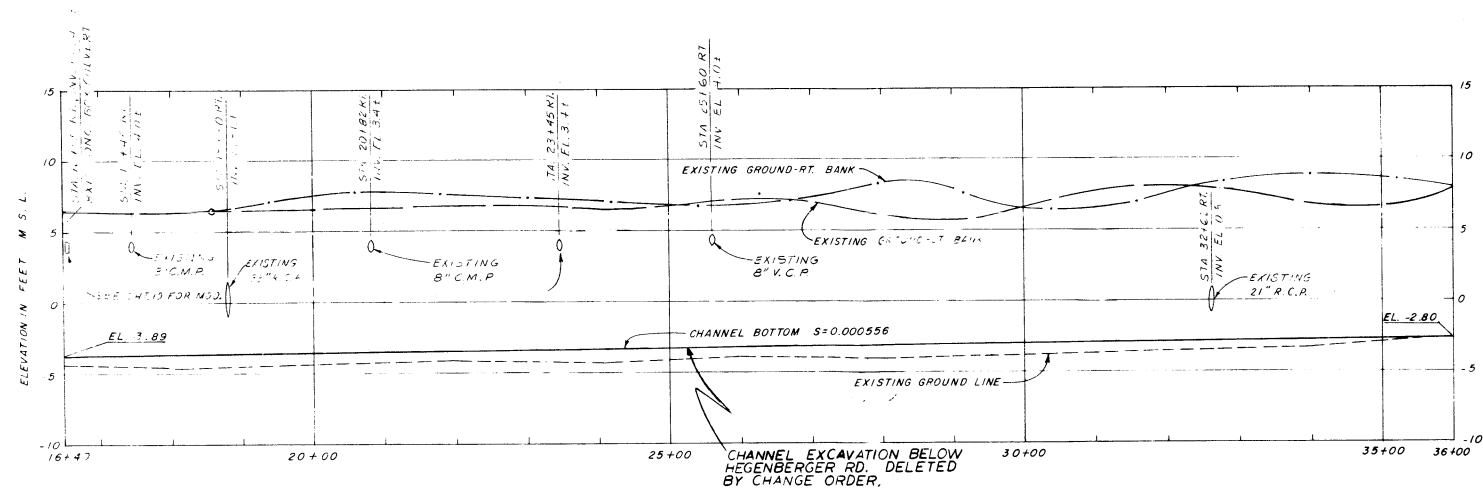
VERTICAL CONTROL DATA	
1.	TBM "HEG", ELEV. 10.48 CHISELLED □ IN CONCRETE WALK ON WEST SIDE OF HEGENBERGER RD. BRIDGE, ON LEFT BANK, DOWNSTREAM SIDE.
2.	TBM "AVE", ELEV. 14.79 CHISELLED □ IN SIDEWALK OF 98TH AVE. BRIDGE, WEST END, DOWNSTREAM SIDE.
3.	TBM "PIPE", ELEV. 5.66 12" HIGH BY 1 1/2" DIA. IRON PIPE PAINTED YELLOW, ABOUT 25 FF. NE OF STA. 0+00 ON RIGHT BANK.
4.	TBM "MAST", ELEV. 20.86 CHISELLED □ IN CONCRETE FOUNDATION NO. 143 OF S.P.R.R. SIGNAL.

AS CONSTRUCTED - NO CHANGES MADE		DATE: 7 FEB 15 02:13
REMOVED ARROWS IN "DISPOSAL AREA" AND ADDED "UTILITY POLE TO LEGEND" ADDED SHT. 17 TO SCHEDULE OF DRAWINGS		DATE: 7 FEB 15 02:13
REVISIONS		
U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA		
DRAWN BY: W.W.	ALAMEDA COUNTY SAN LEANDRO CREEK CHANNEL IMPROVEMENTS	
CHECKED BY: A.C.B.	VICINITY MAP, LOCATION PLAN, DISPOSAL AREA AND SCHEDULE OF DRAWINGS	
DESIGNED BY: C.A. Cantley	APPROVAL RECOMMENDED: DATE: 72 FEB 9	
SUBMITTED BY: R.C. Vason	SCALE: AS SHOWN JOB NO. DRAWING NUMBER	
COLONEL, C.E. DISTRICT ENGINEER		SHEET 1 114 45 4



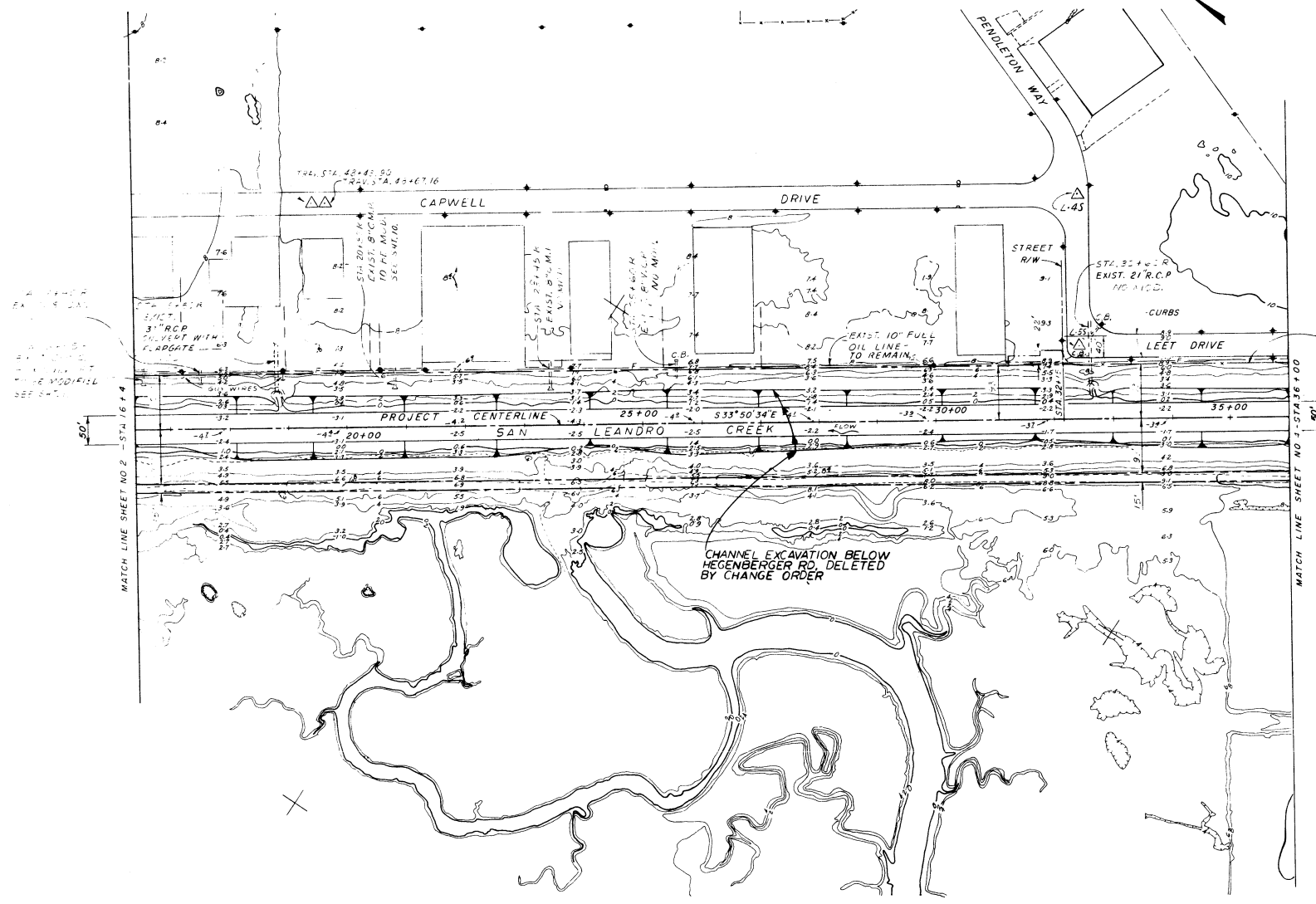
AS CONSTRUCTED - CHANGES MADE		74 FEB 13 1975
ADDED AND REVISED NOTES, REMOVED AND ADDED		72 MAR 3 1975
ELEVATIONS AS INDICATED		
SYMBOL	DESCRIPTION	DATE
REVISIONS		
U. S. ARMY ENGINEER DISTRICT SAN FRANCISCO		
CORPS OF ENGINEERS		
SAN FRANCISCO, CALIFORNIA		
DRAWN BY: W.V.	ALAMEDA COUNTY CALIFORNIA	
TRACED BY:	SAN LEANDRO CREEK	
CHECKED BY: A.C.B.	CHANNEL IMPROVEMENTS	
SUBMITTED:	PLAN AND PROFILE	
CHIEF, CIVIL DESIGN SECTION	STA. -2+40 TO STA. 16+40	
APPROVAL RECOMMENDED:	APPROVED:	DATE:
		72 FEB 13 1975
PREPARED UNDER THE DIRECTION OF		
CHARLES R. ROBERTS		
COLONEL, CE, DISTRICT ENGINEER		
SCALE: AS SHOWN	JOB NO.	
	DRAWING NUMBER	
SHEET 2	114 45	4





**CENTERLINE PROFILE**

SCALE: HORIZ. 1"=100'  
VERT. 1"=5'



**PLAN**

SCALE: 1"=100'

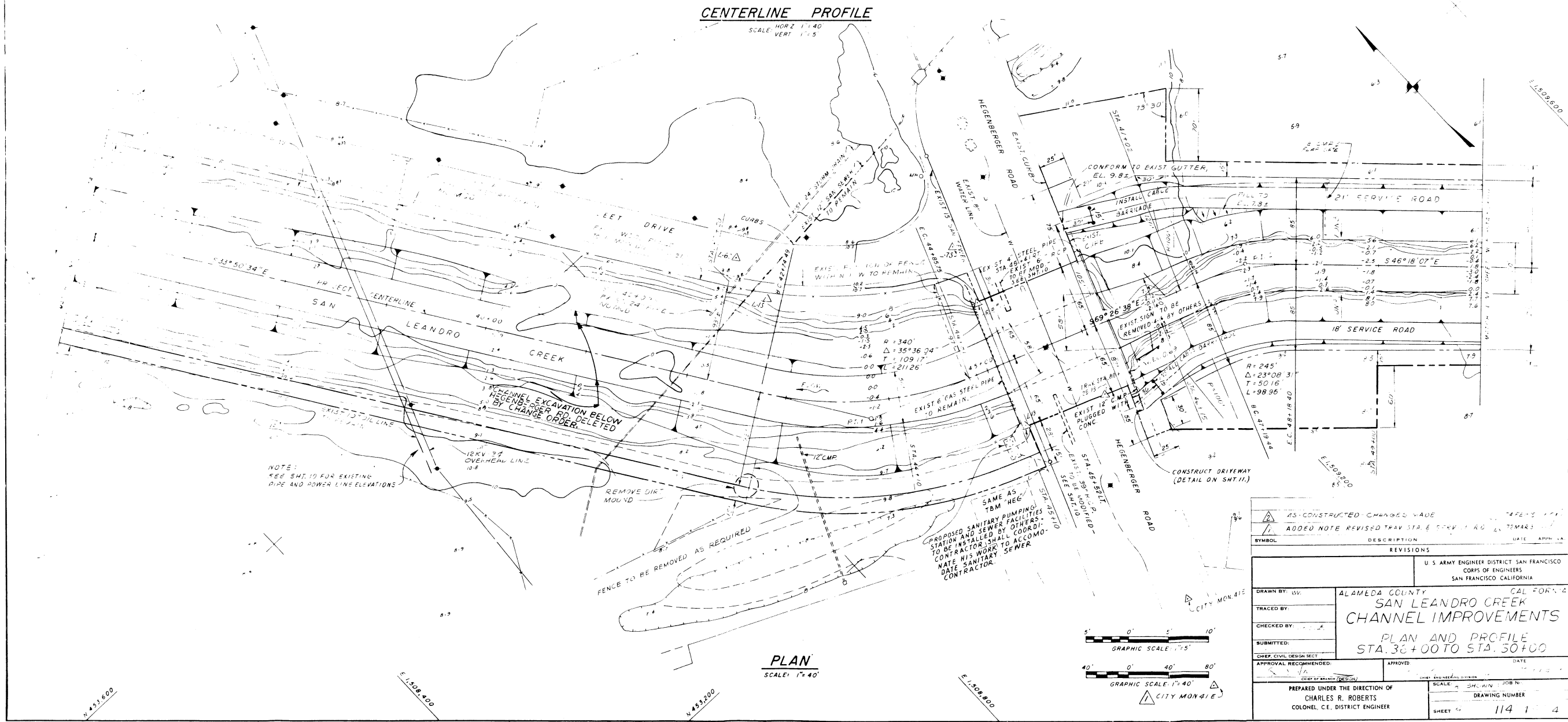
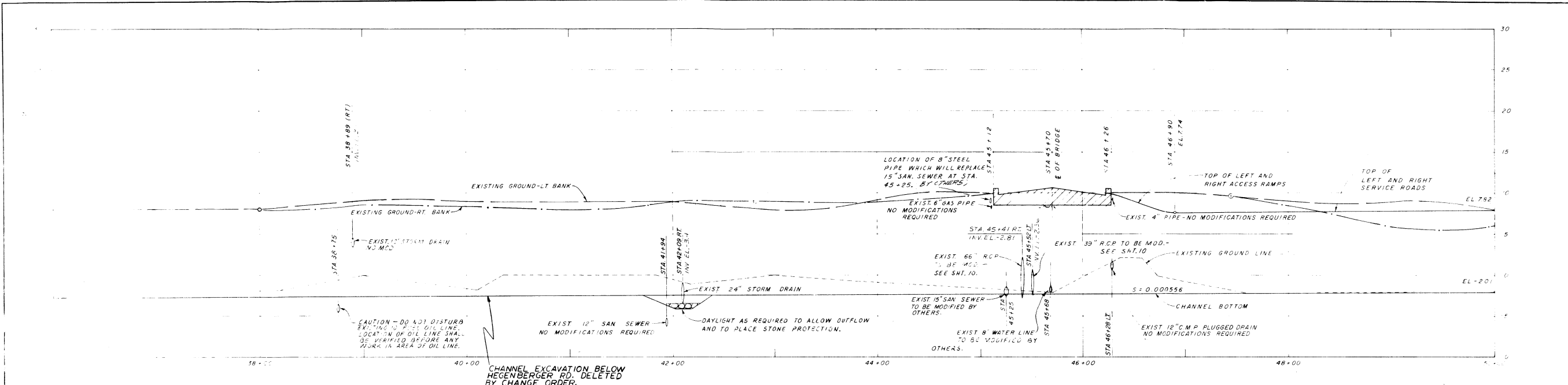


**HORIZONTAL CONTROL DATA**

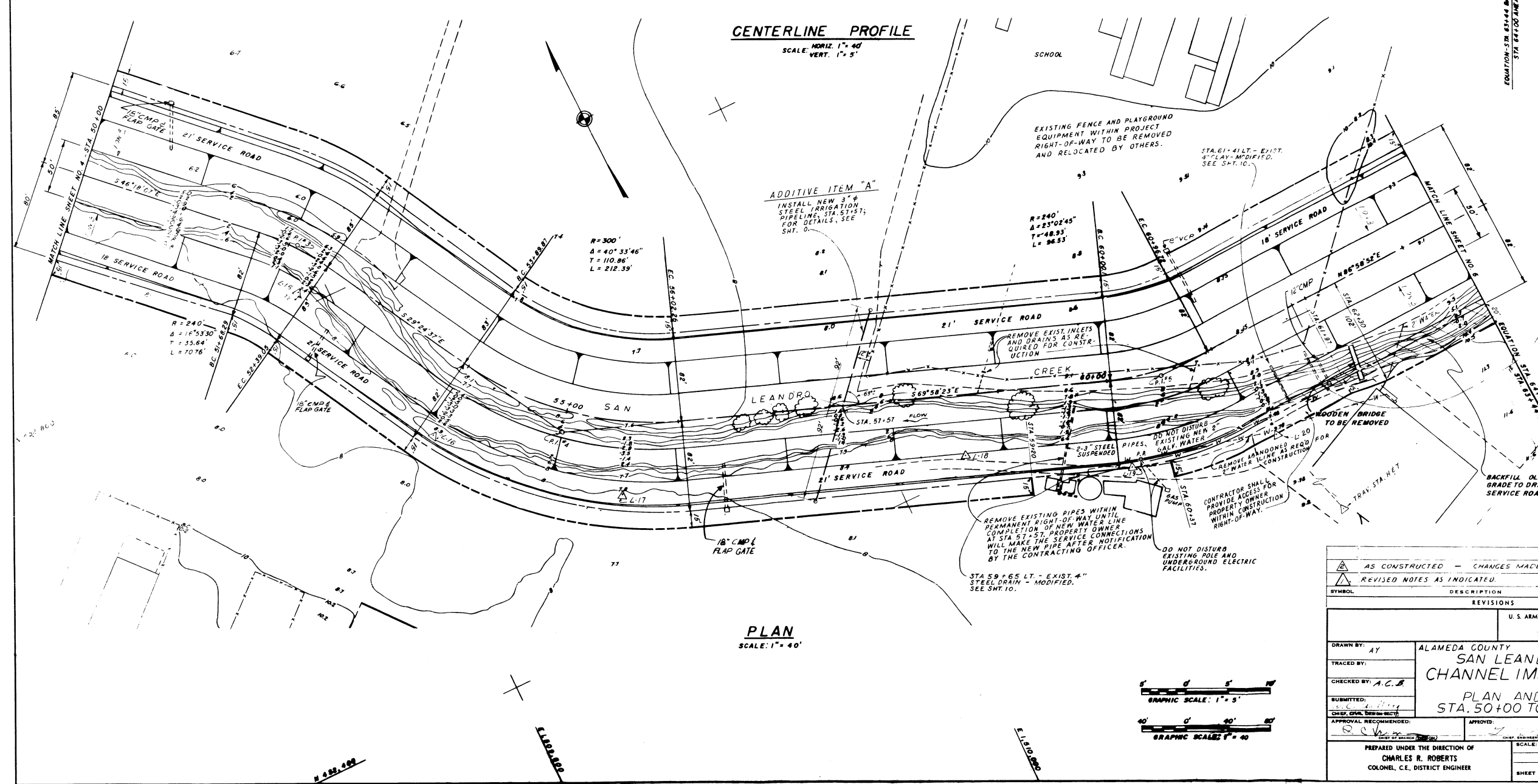
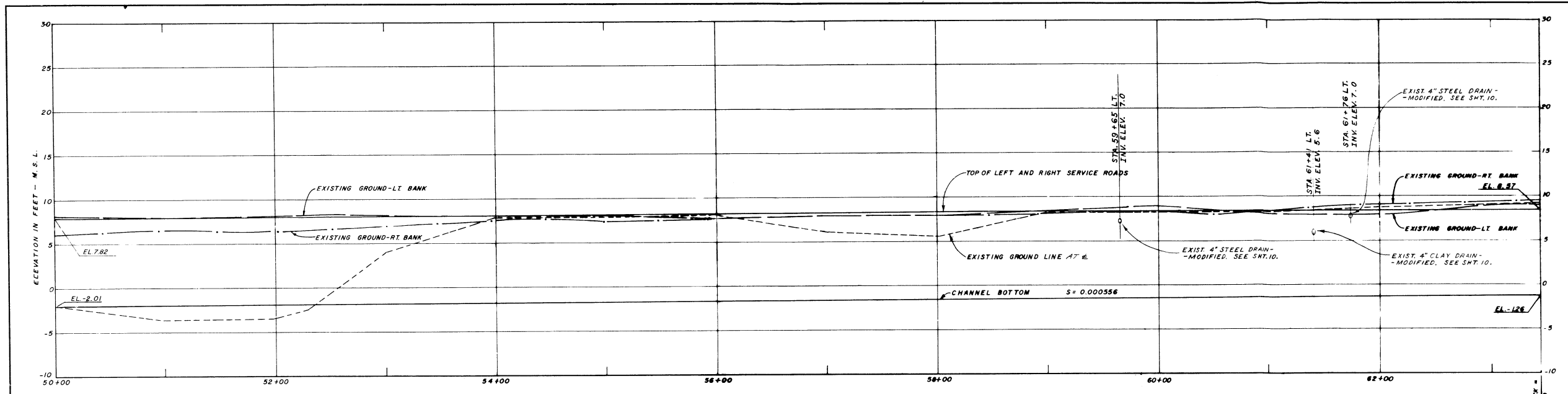
STATION	DESCRIPTION	BEARING	DISTANCE	ELEVATION
8+00	HUB & TACK	S33°45'00"E	807.74	451.89
L 25	"	N36°42'17"E	243.10	450.22
L 25	CITY MON.	S11°51'11"E	271.5	450.37
48+43.3'	DISK	S11°51'11"E	271.5	450.37
49+67.16	CITY MON.	S33°51'10"E	271.5	451.45
L 25	"	S56°04'25"W	257.2	451.21
L 60	PK NAIL STIN	S33°51'30"E	271.5	451.45
L 75	CITY MON.	S11°51'11"E	271.5	451.45
R.P.M.	CHISELED 'X'	S11°51'11"E	271.5	451.45
L 15	HUB & TACK	S11°51'11"E	271.5	451.45
R.P.M.	CHISELED 'X'	S11°51'11"E	271.5	451.45
L 15	"	S11°51'11"E	271.5	451.45
L 15	HUB & TACK	S11°51'11"E	271.5	451.45
L 16	"	S47°05'03"E	19.42	451.64
L 17	"	S70°57'07"E	320.52	451.50
L 18	"	S11°51'11"E	271.5	451.45
L 19	"	S11°51'11"E	271.5	451.45
L 20	"	S11°51'11"E	271.5	451.45
L 21	"	S11°51'11"E	271.5	451.45
L 22	"	S11°51'11"E	271.5	451.45
L 23	"	S11°51'11"E	271.5	451.45
L 24	"	S11°51'11"E	271.5	451.45
L 25	"	S11°51'11"E	271.5	451.45
L 26	"	S11°51'11"E	271.5	451.45
L 27	"	S11°51'11"E	271.5	451.45
L 28	"	S11°51'11"E	271.5	451.45
L 29	"	S11°51'11"E	271.5	451.45
L 30	"	S11°51'11"E	271.5	451.45
L 31	"	S11°51'11"E	271.5	451.45
L 32	"	S11°51'11"E	271.5	451.45
L 33	"	S11°51'11"E	271.5	451.45
L 34	"	S11°51'11"E	271.5	451.45
L 35	"	S11°51'11"E	271.5	451.45

NOTE: SEE SHEET 10 FOR STREAM DRAIN MODIFICATIONS

U.S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA	
DRAWN BY: ALAMEDA COUNTY TRACED BY: CHECKED BY: SUBMITTED:	CALIFORNIA <b>SAN LEANDRO CREEK</b> <b>CHANNEL IMPROVEMENTS</b> PLAN AND PROFILE STA 16+40 TO STA 36+00
APPROVAL RECOMMENDED: PREPARED UNDER THE DIRECTION OF CHARLES R. ROBERTS COLONEL, C.E. DISTRICT ENGINEER	DATE: DRAWING NUMBER SHEET 3 OF 114



AS CONSTRUCTED - CHANGED MADE		DATE: 7-19-11
ADDED NOTE REVISED TRAVEL SPEED TO 45 MPH		DATE: 7-19-11
REVISIONS		
SYMBOL	DESCRIPTION	DATE
U. S. ARMY ENGINEER DISTRICT SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA		
DRAWN BY: [ ]	ALAMEDA COUNTY	CAL FORNIA
TRACED BY: [ ]	SAN LEANDRO CREEK	
CHECKED BY: [ ]	CHANNEL IMPROVEMENTS	
SUBMITTED: [ ]	PLAN AND PROFILE	
APPROVAL RECOMMENDED: [ ]		DATE: [ ]
APPROVED: [ ]		DATE: [ ]
PREPARED UNDER THE DIRECTION OF CHARLES R. ROBERTS COLONEL, C.E. DISTRICT ENGINEER		
SCALE: 1"=40'		JOB NO. [ ]
DRAWING NUMBER		SHEET 114 1 4



**CENTERLINE PROFILE**

SCALE: HORIZ. 1" = 40'  
VERT. 1" = 5'

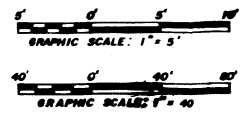
**PLAN**

SCALE: 1" = 40'

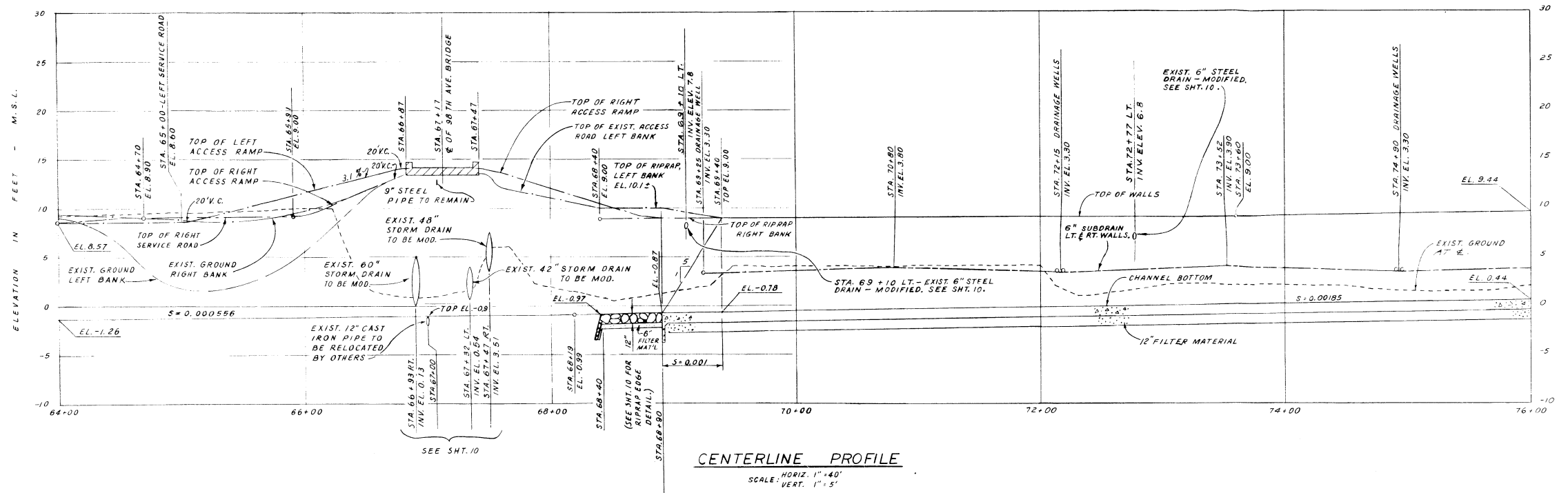
**ADDITIVE ITEM "A"**  
INSTALL NEW 3" Ø STEEL IRRIGATION PIPELINE STA 57+57; FOR DETAILS, SEE SHT. 0.

REMOVE EXISTING PIPES WITHIN PERMANENT RIGHT-OF-WAY UNTIL COMPLETION OF NEW WATER LINE AT STA 57+57. PROPERTY OWNER WILL MAKE THE SERVICE CONNECTIONS TO THE NEW PIPE AFTER NOTIFICATION BY THE CONTRACTING OFFICER.

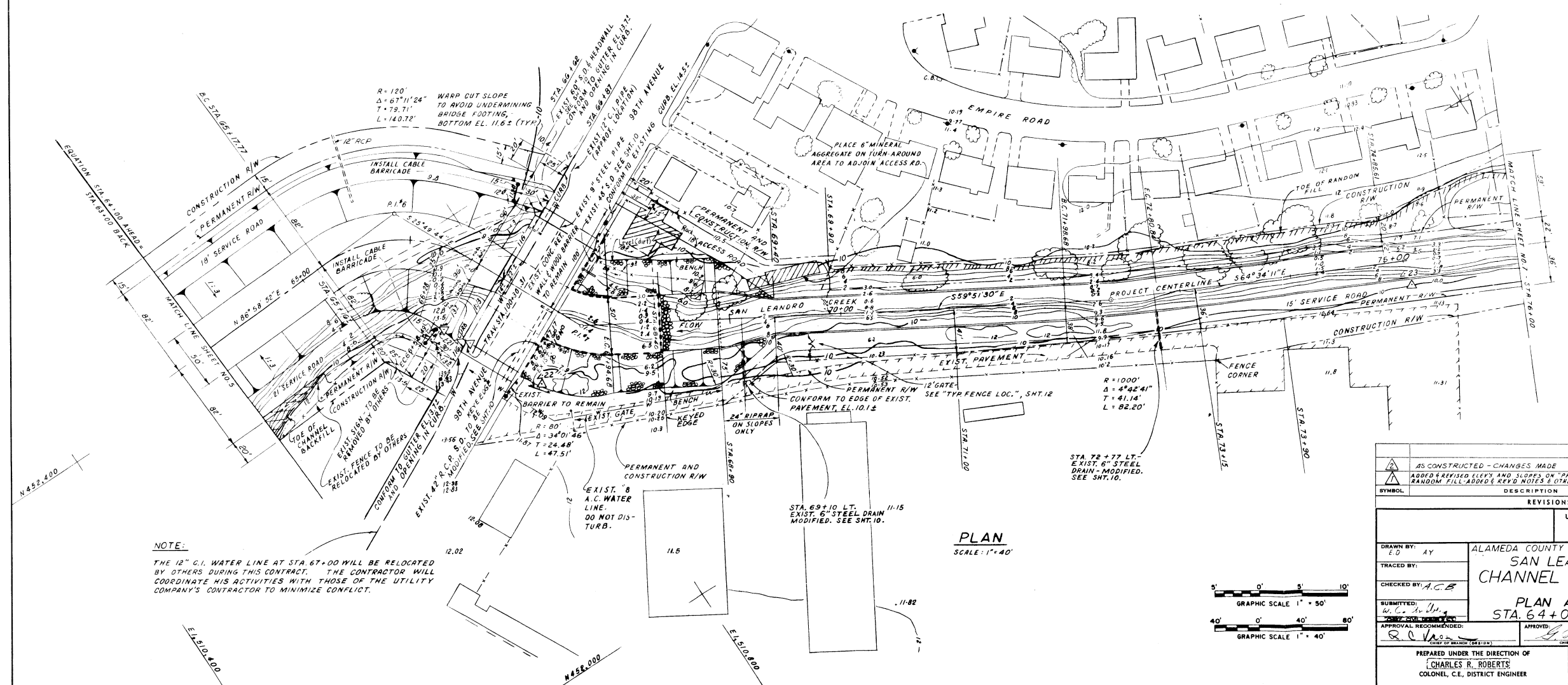
DO NOT DISTURB EXISTING POLE AND UNDERGROUND ELECTRIC FACILITIES.



AS CONSTRUCTED - CHANGES MADE		DATE	APPROVAL
REVISED NOTES AS INDICATED		AT	DATE
REVISIONS			
U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA			
DRAWN BY: AY	ALAMEDA COUNTY CALIFORNIA		
TRACED BY:	SAN LEANDRO CREEK CHANNEL IMPROVEMENTS		
CHECKED BY: A.C.B.	PLAN AND PROFILE STA. 50+00 TO STA. 64+00		
SUBMITTED:	DATE: 72 FEB 15		
APPROVAL RECOMMENDED:	APPROVED:	DATE:	72 FEB 15
PREPARED UNDER THE DIRECTION OF CHARLES R. ROBERTS COLONEL, C.E. DISTRICT ENGINEER		SCALE: AS SHOWN	JOB NO. DRAWING NUMBER
		SHEET	5 114 45 4

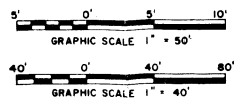


**CENTERLINE PROFILE**  
 SCALE: HORIZ. 1" = 40'  
 VERT. 1" = 5'

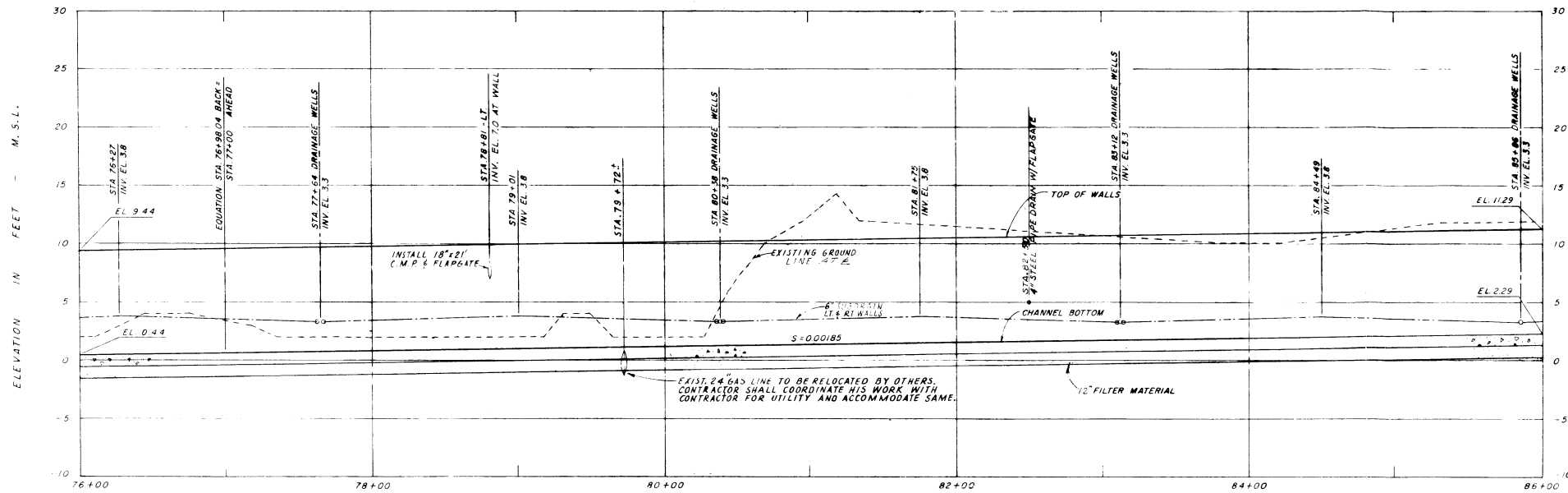


**NOTE:**  
 THE 12" C.I. WATER LINE AT STA 67+00 WILL BE RELOCATED BY OTHERS DURING THIS CONTRACT. THE CONTRACTOR WILL COORDINATE HIS ACTIVITIES WITH THOSE OF THE UTILITY COMPANY'S CONTRACTOR TO MINIMIZE CONFLICT.

**PLAN**  
 SCALE: 1" = 40'

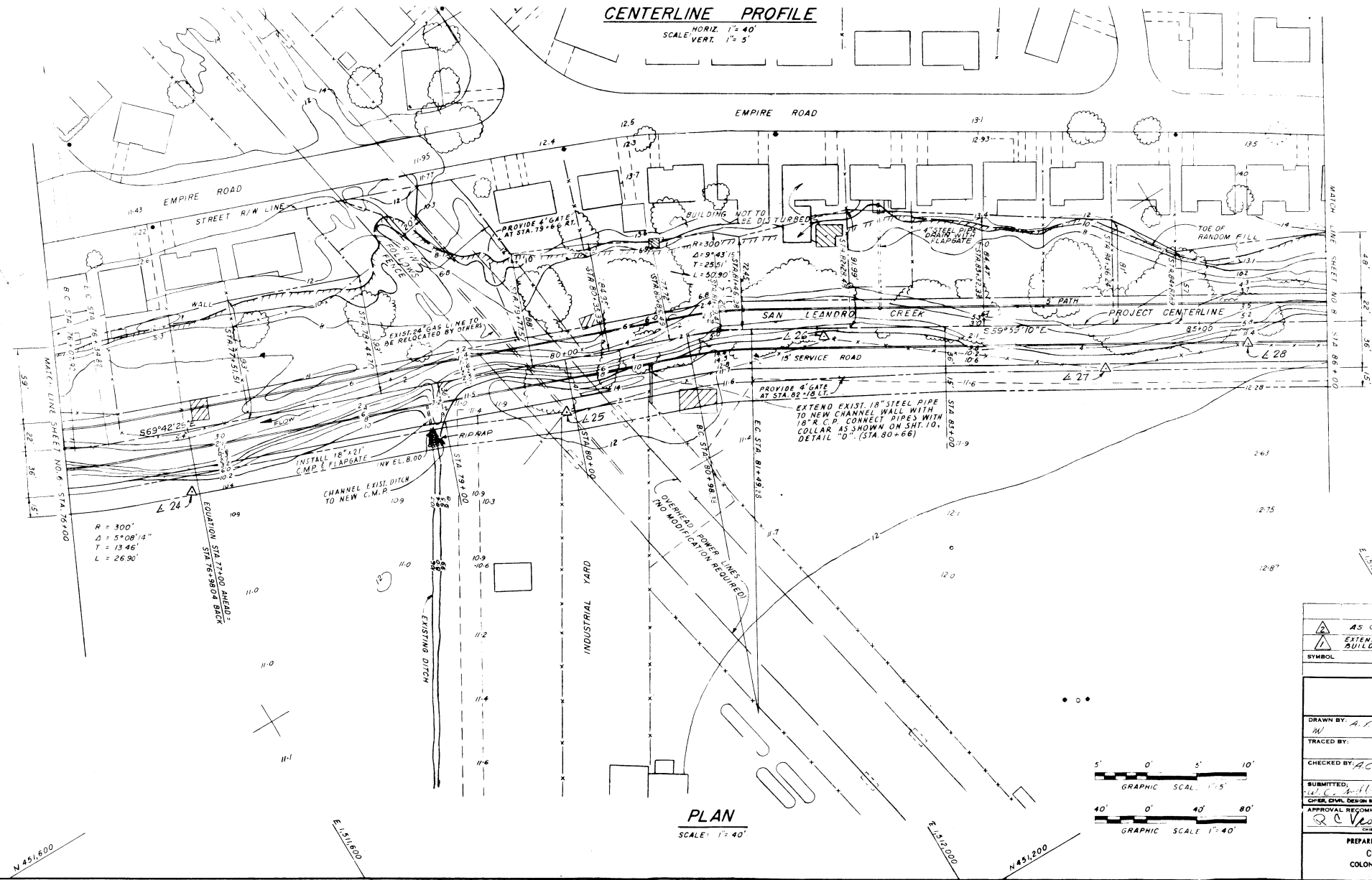


AS CONSTRUCTED - CHANGES MADE		DATE	APPROVAL
ADDED & REVISED ELEVATIONS AND SLOPES ON "PROFILE". ADDED TOE OF RANDOM FILL. ADDED & REVISED NOTES & OTHER DESIGNATED CHANGES.		24 FEB 15 2013	REMARKS 301
REVISIONS			
U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA			
DRAWN BY: E.D.	ALAMEDA COUNTY	CALIFORNIA	
TRACED BY:	SAN LEANDRO CREEK CHANNEL IMPROVEMENTS		
CHECKED BY: A.C.B.	PLAN AND PROFILE		
SUBMITTED:	STA. 64+00 TO STA. 76+00		
APPROVED:	DATE:	72 FEB 9	
PREPARED UNDER THE DIRECTION OF CHARLES R. ROBERTS COLONEL, C.E., DISTRICT ENGINEER		SCALE: AS SHOWN	JOB NO.
		DRAWING NUMBER	
		SHEET	6 114 45 4



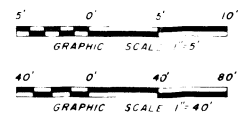
**CENTERLINE PROFILE**

SCALE HORIZ. 1" = 40'  
SCALE VERT. 1" = 5'

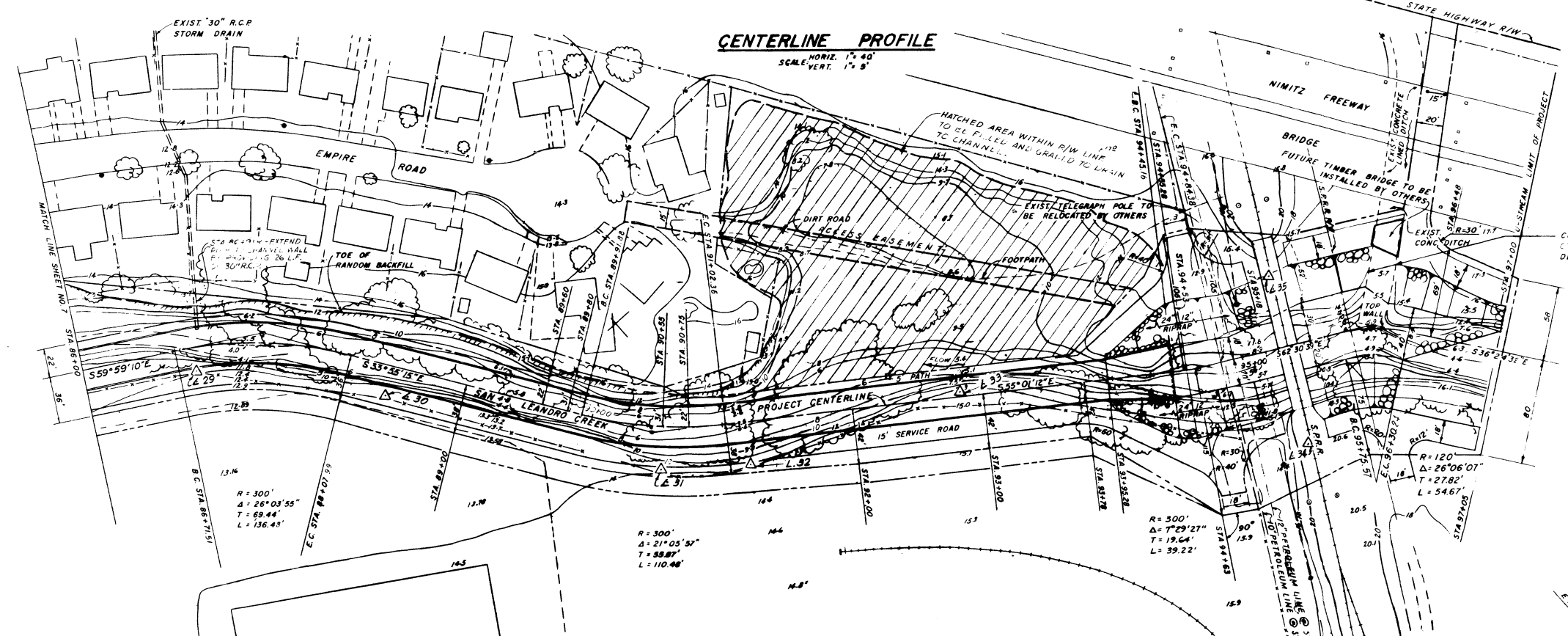
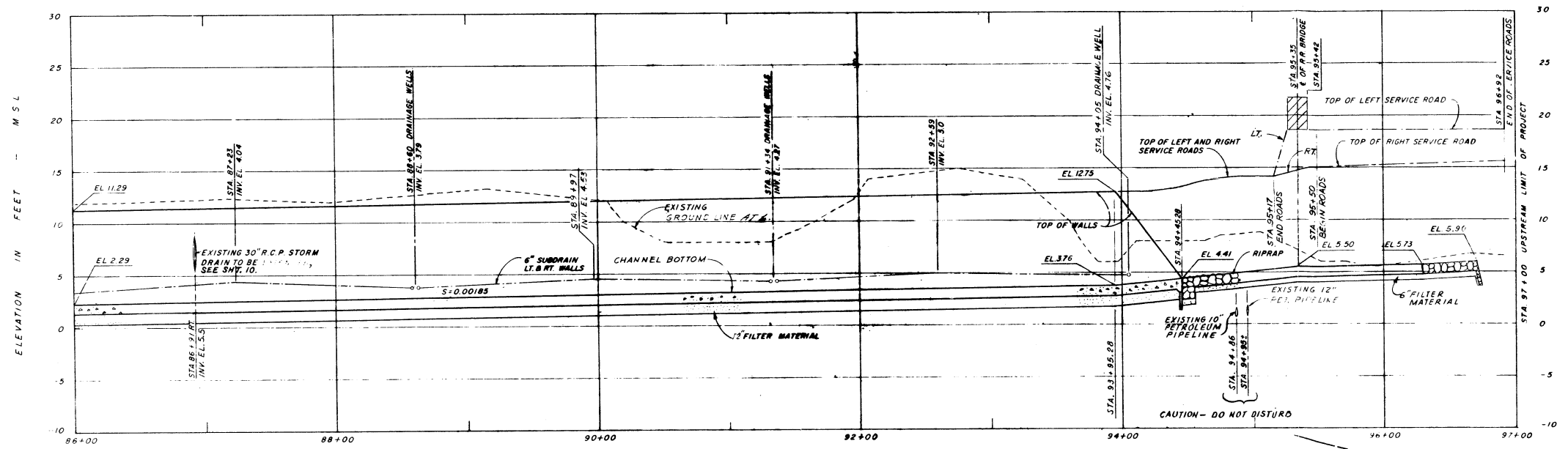


**PLAN**

SCALE: 1" = 40'

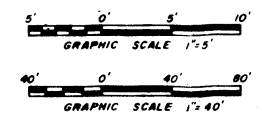


AS CONSTRUCTED - CHANGES MADE EXTENDED PIPES AS INDICATED. DESIGNATED PART OF BUILDING OUTSIDE OF CONSTRUCTION R/W, ADDED 4' GATES 72 MAR 3	
SYMBOL	DESCRIPTION DATE APPROVAL
REVISIONS	
U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA	
DRAWN BY: <i>W.A.C.</i>	ALAMEDA COUNTY CALIFORNIA
TRACED BY:	<b>SAN LEANDRO CREEK</b>
CHECKED BY: <i>A.C.B.</i>	<b>CHANNEL IMPROVEMENTS</b>
SUBMITTED:	<b>PLAN AND PROFILE</b>
CHEF, CIVIL DESIGN SECT.	<b>STA. 76+00 TO STA. 86+00</b>
APPROVAL RECOMMENDED: <i>Q.C.V.</i>	APPROVED: <i>[Signature]</i> DATE: 72 FEB 9
PREPARED UNDER THE DIRECTION OF <b>CHARLES R. ROBERTS</b> COLONEL, C.E. DISTRICT ENGINEER	
SCALE AS SHOWN	JOB NO. DRAWING NUMBER
SHEET 7	114 45 4



**CENTERLINE PROFILE**  
 SCALE: HORIZ. 1" = 40'  
 SCALE: VERT. 1" = 8'

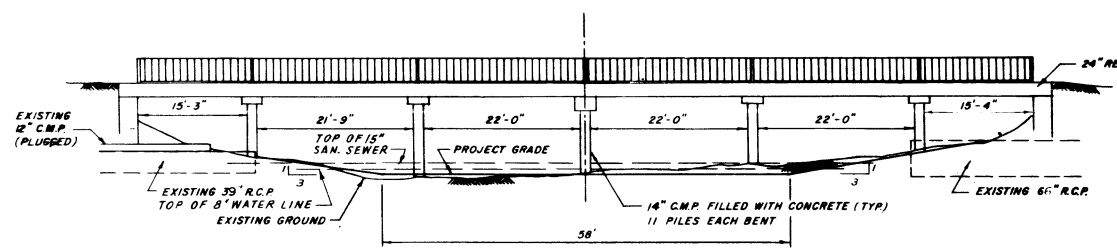
**PLAN**  
 SCALE: 1" = 40'



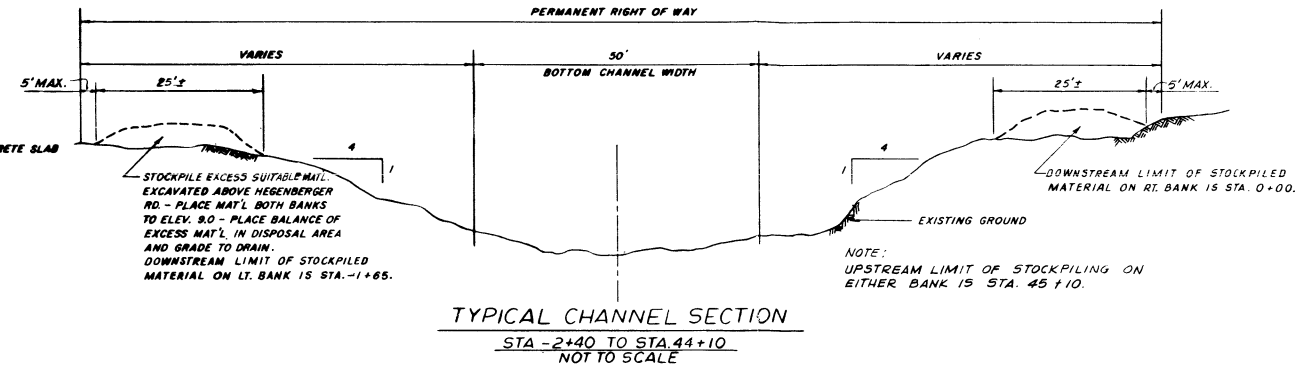
REVISIONS	
SYMBOL	DESCRIPTION
AS CONSTRUCTED	CHANGES MADE FROM 74 FEB 15 A.C.B.
DELETED	CABLE BARRICADES & CORRECTED RIPRAP @ 96+70 TO 97+10

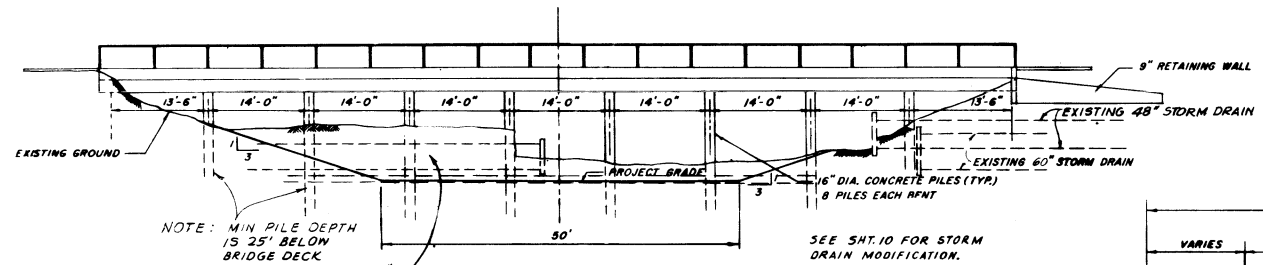
U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA	
DRAWN BY: A.C.B.	CALIFORNIA
TRACED BY:	ALAMEDA COUNTY
CHECKED BY: A.C.B.	SAN LEANDRO CREEK
SUBMITTED:	CHANNEL IMPROVEMENTS
APPROVAL RECOMMENDED:	PLAN AND PROFILE
APPROVED: R. C. Veerman	STA. 86+00 TO STA. 97+05
DATE: 72 FEB 9	
PREPARED UNDER THE DIRECTION OF CHARLES R. ROBERTS COLONEL, C.E. DISTRICT ENGINEER	SCALE: AS SHOWN JOB NO. DRAWING NUMBER SHEET 8 114 45 4



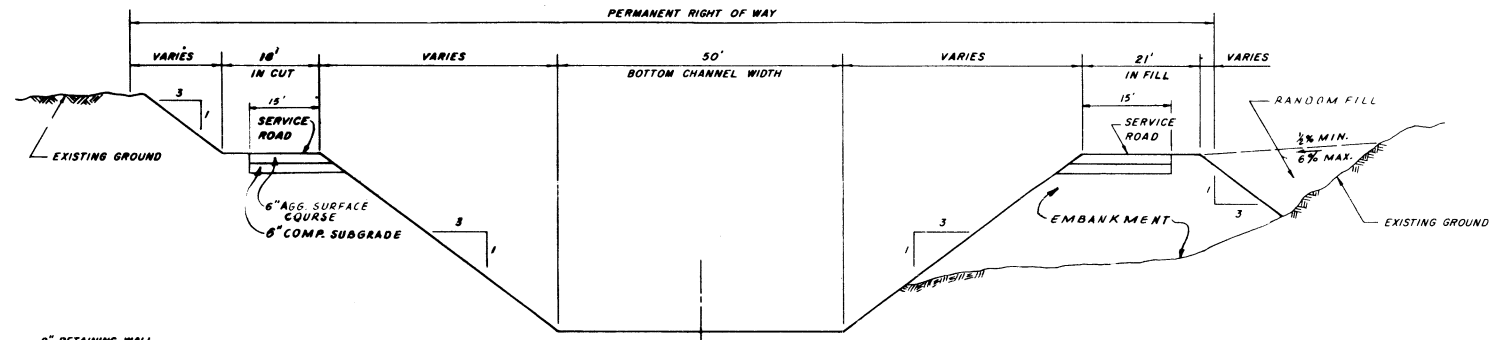
**HEGENBERGER ROAD BRIDGE**  
 STA. 45+70  
 SCALE: 1" = 10'



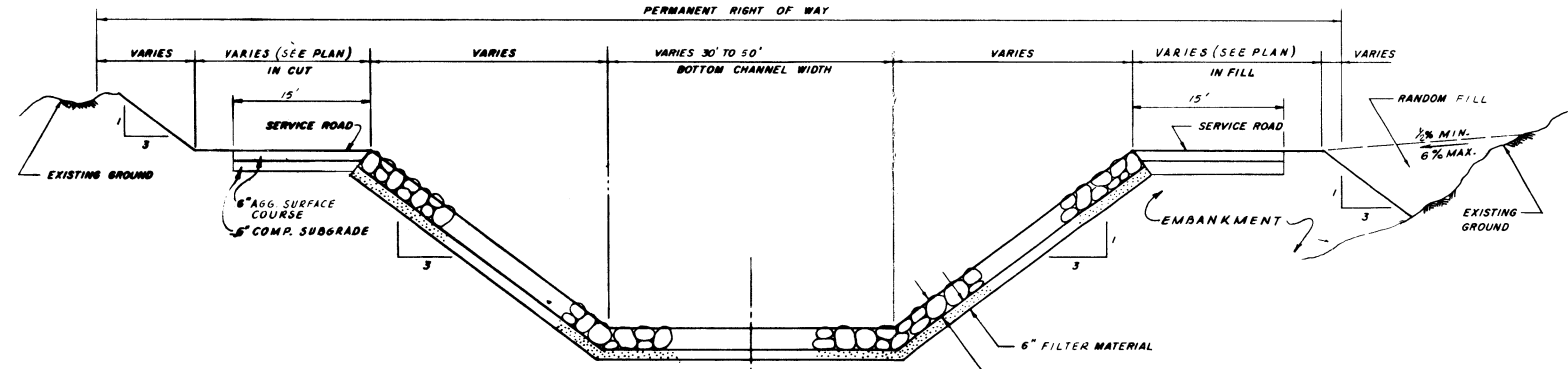
**TYPICAL CHANNEL SECTION**  
 STA. -2+40 TO STA. 44+10  
 NOT TO SCALE



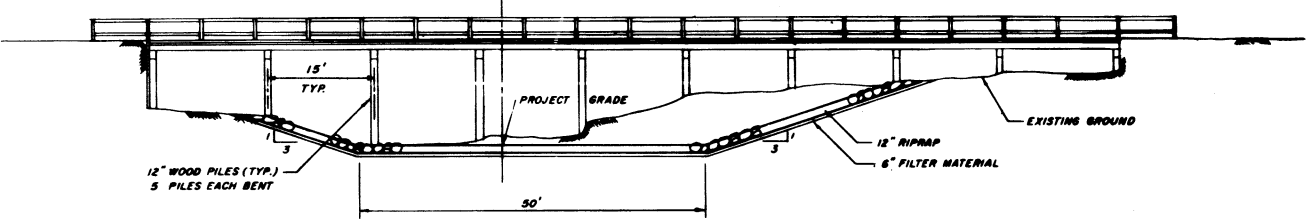
**98TH AVENUE BRIDGE**  
 STA. 67+13  
 SCALE: 1" = 10'



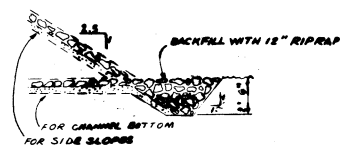
**TYPICAL EARTH CHANNEL SECTION**  
 STA. 45+10 TO STA. 66+91  
 NOT TO SCALE



**TYPICAL RIPRAP SECTION**  
 AT CHANNEL TRANSITIONS  
 NOT TO SCALE



**S.P.R.R. BRIDGE**  
 STA. 95+35  
 SCALE: 1" = 10'



**KEYED EDGE DETAIL**  
 NOT TO SCALE  
 (STA. 67+072 TO 68+402)



REVISIONS		DATE	APPROVAL
AS CONSTRUCTED - CHANGES MADE		74 FEB 15	A.C.B.
REVISED NOTES & SLOPES AS INDICATED.		72 MAR 9	

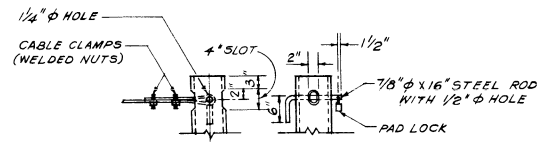
DRAWN BY: <i>V.H.W.</i> TRACED BY: CHECKED BY: <i>A.C.B.</i> DESIGNED BY: <i>W.C. Gillingham</i> APPROVAL: <i>R.C. Va...</i>	U.S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA <b>ALAMEDA COUNTY CALIFORNIA</b> <b>SAN LEANDRO CREEK</b> <b>CHANNEL IMPROVEMENTS</b> <b>BRIDGE AND EARTH</b> <b>CHANNEL SECTIONS</b>	DATE: 72 FEB 9 SCALE: AS SHOWN JOB NO.: DRAWING NUMBER: SHEET 9 OF 114 45 4
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**STORM DRAIN MODIFICATION**

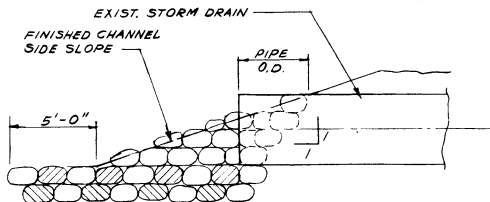
NOTE: ALL C.M.P. TO BE 16 GA. # ASBESTOS BOND BITUMINOUS COATED.

STA.	EXIST. SIZE & TYPE	EXIST. INV. ELEV.	NEW INV. ELEV.	LENGTH OF EXTENSION	LENGTH TO BE CUT OFF	REMARKS
10+05 RT	8" C.M.P.	—	—	18'	—	—
11+58 RT	8" C.M.P.	3.0	2.5	6'	—	—
16+55 RT	8"x12" R.C.B.	4.0	3.6	18'	—	SEE "D," EXTEND WITH 12" C.M.P.
45+41 RT	48" R.C.P.	-1.8	—	—	—	SEE DETAIL "C"
45+52 LT	24" R.C.P.	-2.36	—	—	—	—
59+65 LT	4" STEEL	7.0	4.0	42'	—	DETAIL "B"
61+41 LT	4" CLAY	5.6	4.5	2.0	14'	DETAIL "B" USE 6" CONCRETE
61+76 LT	4" STEEL	7.0	6.0	37'	—	DETAIL "B"
62+93 RT	10" R.C.P.	0.13	0.0	—	—	SEE DETAIL "C"
67+32 LT	48" R.C.P.	0.54	1.7	—	37'	—
67+47 RT	48" R.C.P.	3.51	—	—	—	—
68+10 LT	4" STEEL	7.8	6.5	15'	13'	—
72+77 LT	4" STEEL	6.8	4.5	20'	24'	—
80+66 LT	16" STEEL	—	—	8'	—	SEE DETAIL "D," DET. GRADES IN FIELD
86+91 RT	30" R.C.P.	—	5.5	26'	—	—

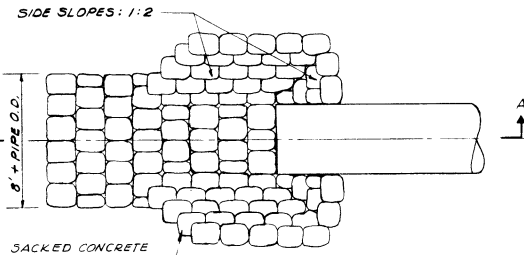
\* EXTENSION STARTS AT PERMANENT RIGHT-OF-WAY LINE.  
 NOTE "A": EXTEND WITH NON-REINFORCED CONCRETE PIPE.  
 NOTE "B": REPLACE EXISTING FLAPGATE AT END OF NEW PIPE.



**DETAIL "A"**

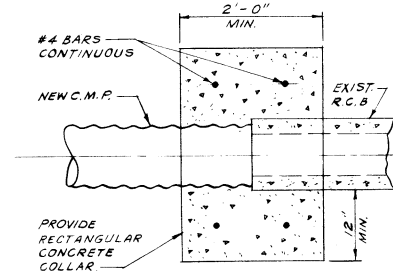


**SECTION A-A**

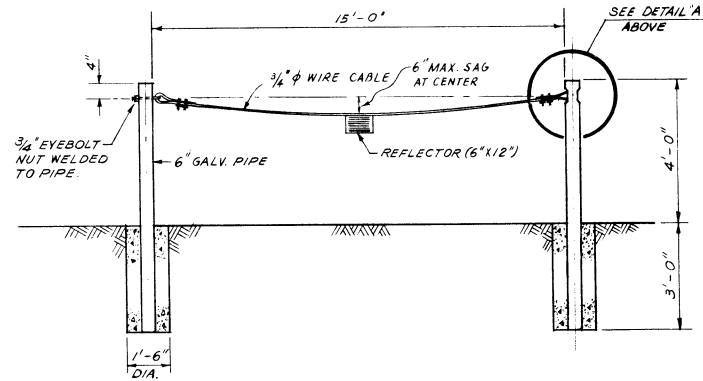


**PLAN**

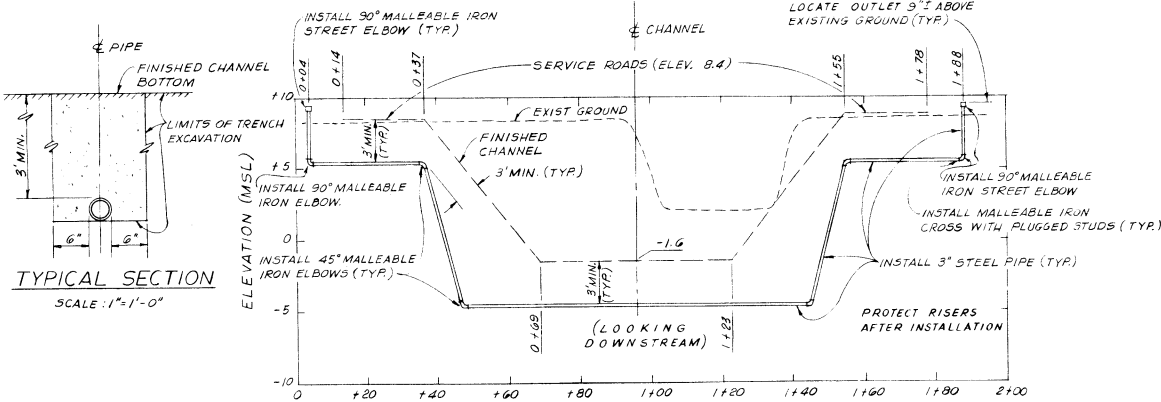
**DETAIL "C"**  
NOT TO SCALE



**DETAIL "D"**  
NOT TO SCALE

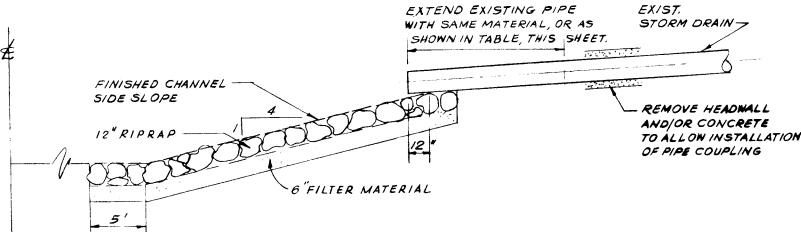


**ELEVATION CABLE BARRICADE**  
NOT TO SCALE

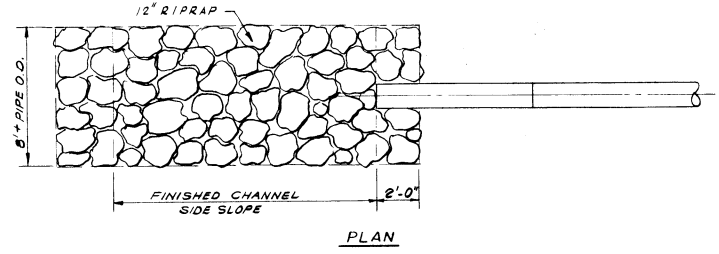


**TYPICAL SECTION**  
SCALE: 1" = 1'-0"

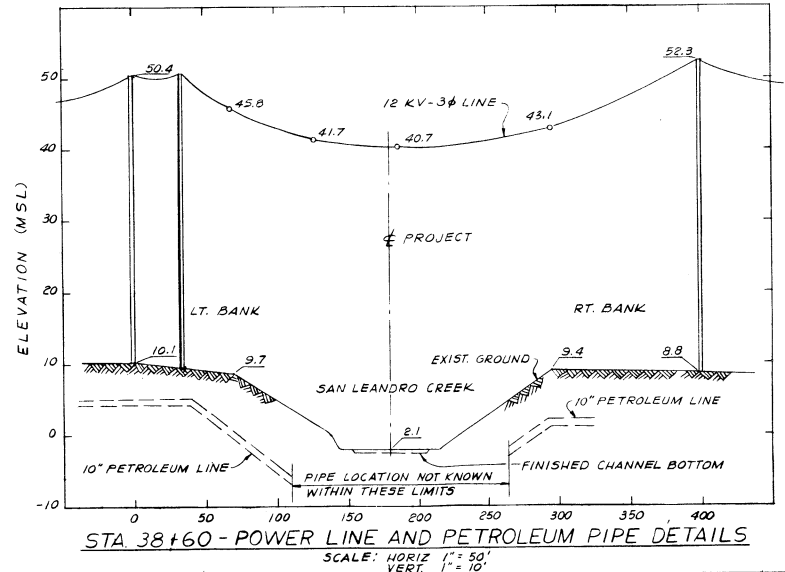
**ADDITIVE ITEM "A"-PROFILE**  
SCALE: HORIZ. 1" = 20', VERT. 1" = 5'



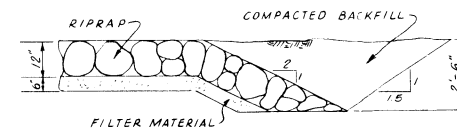
**ELEVATION**



**DETAIL "B"**  
NOT TO SCALE



**STA 38+60 - POWER LINE AND PETROLEUM PIPE DETAILS**  
SCALE: HORIZ. 1" = 50', VERT. 1" = 10'



**EDGE DETAIL**  
DOWNSTREAM & UPSTREAM ENDS OF RIPRAP  
NOT TO SCALE

**TREES TO BE SAVED**

TYPE OF TREE	NO.	STATION	NO.	SIZE (IN.)	LENGTH FROM E	REMARKS
WILLOW	2	71+95	1	10	42' RT	
CYPRESS	3	71+97	1	13	30' RT	
CYPRESS	4	72+38	1	—	23' RT	
WILLOW	5	74+06	1	30	34' RT	NO WELL
FRUIT	6	74+75	1	10	37' RT	NO WELL
WALNUT	7	74+98	1	8	57' RT	NO WELL
WALNUT	8	75+22	1	8	62' RT	NO WELL
COTTONWOOD	10	79+85	1	15	77' RT	
COTTONWOOD	11	80+03	1	12	80' RT	
COTTONWOOD	12	80+36	1	15	83' RT	
COTTONWOOD	13	81+03	1	18	78' RT	
WILLOW	14	81+32	1	18	41' RT	REMOVE LARGE BRANCHES
WILLOW	15	84+07	2	18	31' RT	
	16	85+51	1	36	45' RT	NO WELL
POPLAR	17	87+16	1	30	43' RT	NO WELL
POPLAR	18	87+26	1	24	45' RT	NO WELL
POPLAR	19	87+34	1	24	42' RT	NO WELL
LOQUAT	20	87+78	1	10	32' RT	NO WELL
	24	91+78	1	24	164' RT	45' TALL
3 TRUNKS	25	91+91	2	18	191' RT	45' TALL

AS CONSTRUCTED - CHANGES MADE BY 14 FEB 53  
 REVISED "STORM DRAIN" & "TREES" TABLES. ADDED "EDGE DETAIL" & REVISED NOTES AS INDICATED. BY 12 MAR 53

REVISIONS

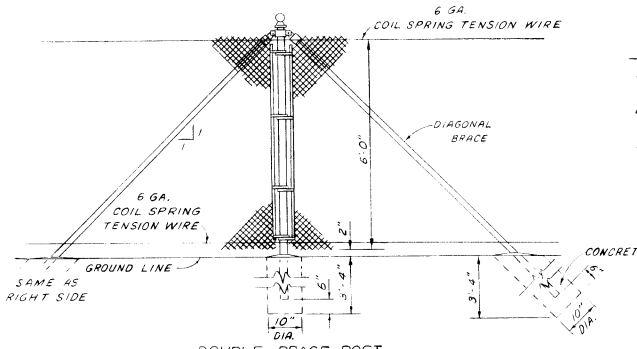
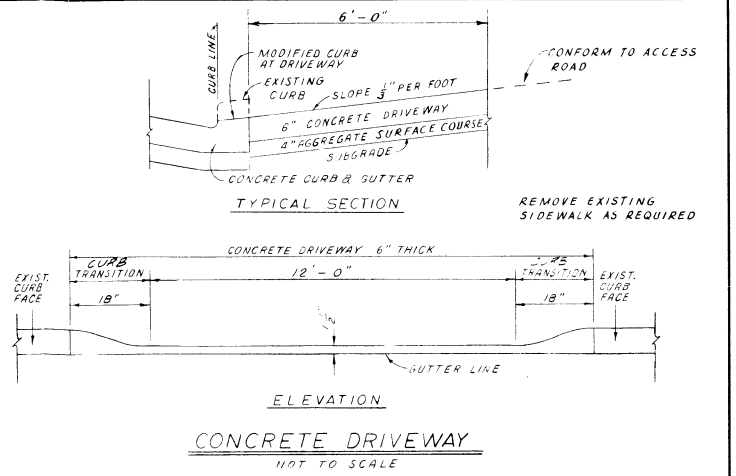
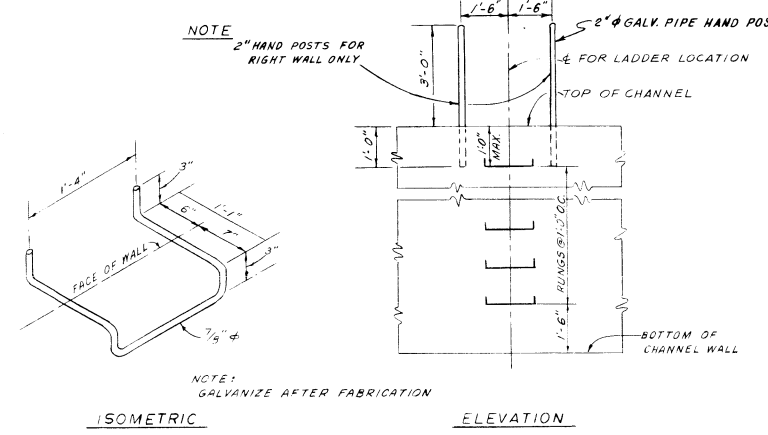
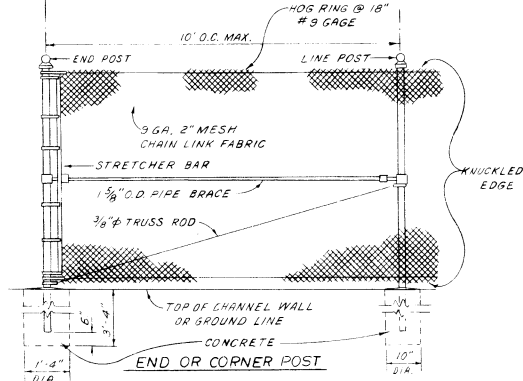
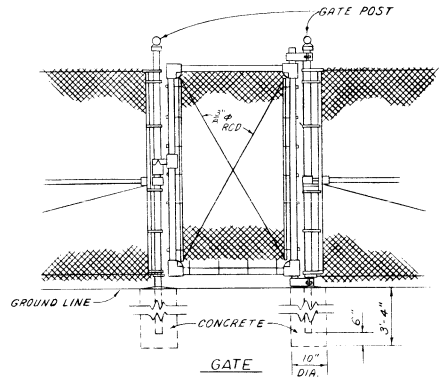
U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO  
 CORPS OF ENGINEERS  
 SAN FRANCISCO, CALIFORNIA

DRAWN BY: I.N.  
 TRACED BY:  
 CHECKED BY: A.C.B.  
 SUBMITTED: W.C. Anderson  
 APPROVAL RECOMMENDED: R.C. Anderson  
 APPROVED: [Signature] DATE: 72 FEB 9

PREPARED UNDER THE DIRECTION OF  
 CHARLES R. ROBERTS  
 COLONEL, C.E., DISTRICT ENGINEER

SCALE: NONE  
 DRAWING NUMBER: 10 114 45 4  
 SHEET: 10 114 45 4

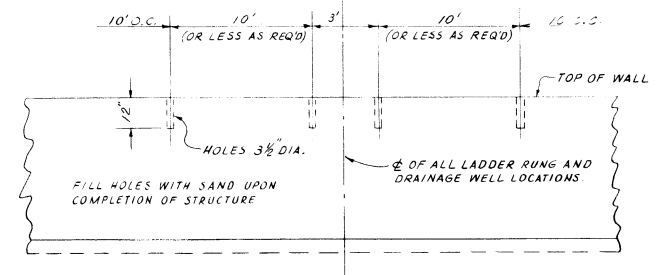




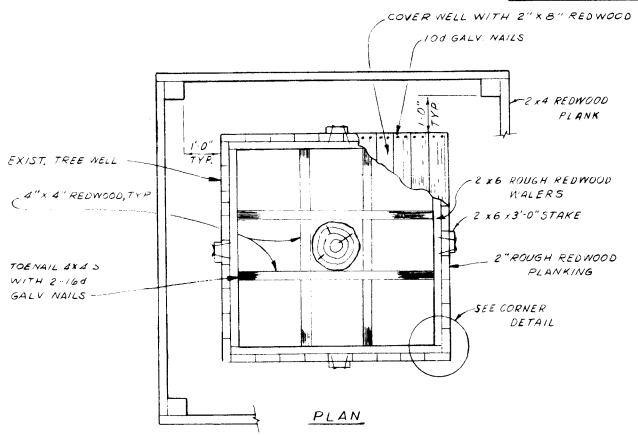
- NOTES:**
1. DETAILS SHOWN ARE FOR ROUND POSTS. POSTS MAY BE ROUND OR H-SECTION.
  2. FOR SIZES, DIMENSIONS & DETAILS NOT SHOWN, SEE SPECIFICATIONS AND APPLICABLE FEDERAL SPECIFICATIONS.
  3. ALL FOOTINGS FOR FENCE POSTS ARE FOR PLACEMENT IN GROUND. FOR CHANNEL WALLS, FORM HOLE 2" LARGER THAN POST DIAMETER AND 14" DEEP. PIPE TO BE IMBEDDED 12".

**LADDER RUNG DETAIL**  
NOT TO SCALE

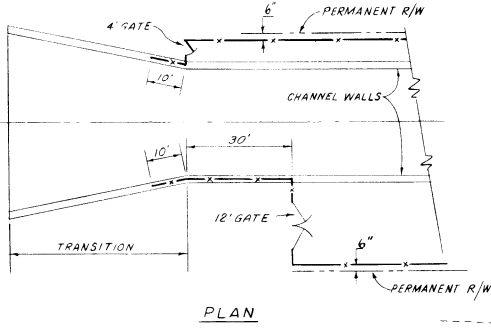
E LADDER LOCATIONS	
LEFT	RIGHT
69 + 75	69 + 45
81 + 68	81 + 68
93 + 60	93 + 90



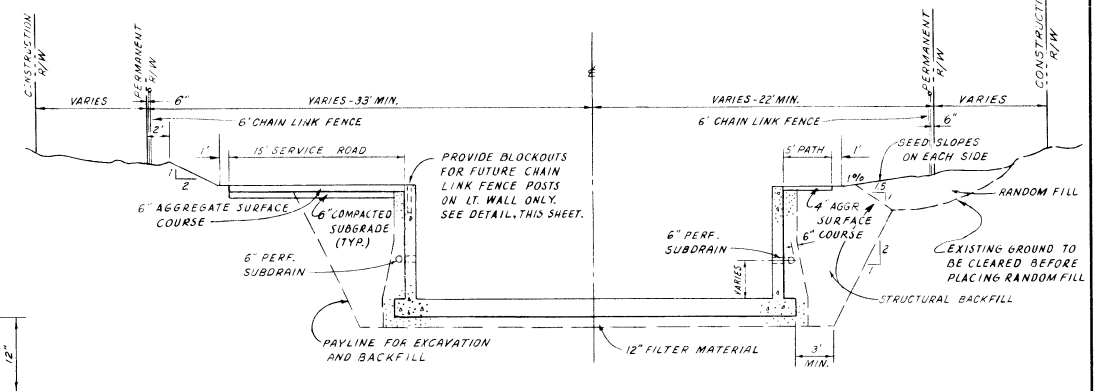
**CHAIN LINK FENCE DETAILS**  
NOT TO SCALE



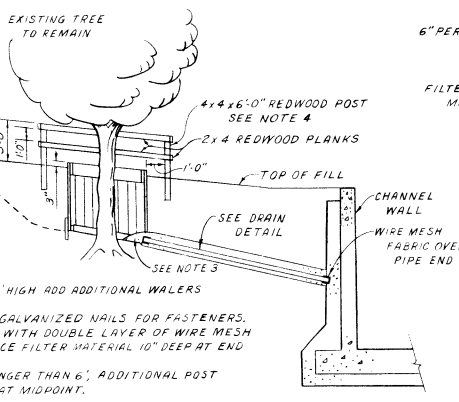
**FUTURE FENCE BLOCKOUT DETAIL**  
(LT. WALL ONLY)  
NOT TO SCALE



**TYPICAL FENCE LOCATION**  
NOT TO SCALE

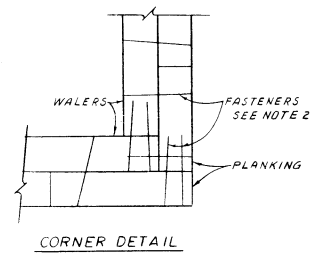


**TYPICAL RECTANGULAR CHANNEL SECTION**  
NOT TO SCALE



**TREE WELL DETAIL**  
NOT TO SCALE

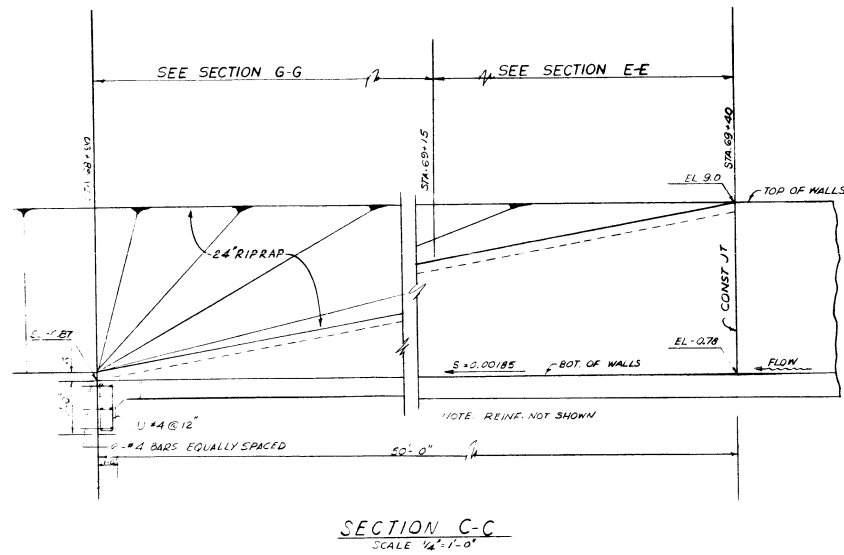
- NOTES:**
1. FOR WELLS OVER 4' HIGH ADD ADDITIONAL WALERS AT MIDDPOINT.
  2. USE 16d COMMON GALVANIZED NAILS FOR FASTENERS.
  3. CAP ENDS OF PIPE WITH DOUBLE LAYER OF WIRE MESH FABRIC, THEN PLACE FILTER MATERIAL 10" DEEP AT END OF PIPE IN WELL.
  4. WHERE PANEL IS LONGER THAN 6', ADDITIONAL POST SHALL BE PLACED AT MIDDPOINT.



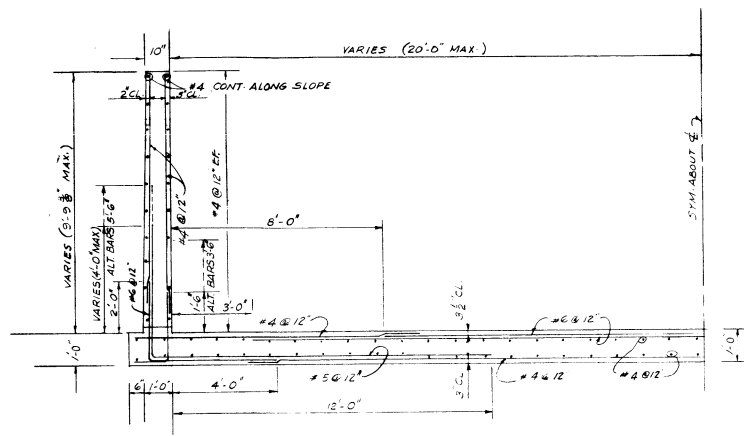
**CORNER DETAIL**

- NOTES:**
- FENCE AND GATES SHOWN ABOVE ARE FOR TRANSITION AT DOWNSTREAM END.
- FENCE AND GATES AT UPSTREAM END ARE IDENTICAL EXCEPT OPPOSITE HAND.
- NO FENCE OR GATES ARE SHOWN ON PLAN, SHEETS 7 AND 8.

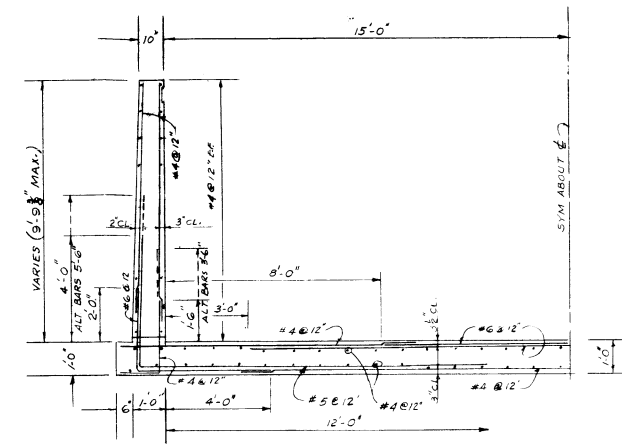
AS CONSTRUCTED - CHANGES MADE	78 FEB 15	FCB
ADDED & REVISED NOTES AS INDICATED.	72 MAR 3	AY
REVISIONS		
DRAWN BY: E.H.D.		U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA
TRACED BY:		ALAMEDA COUNTY CALIFORNIA SAN LEANDRO CREEK
CHECKED BY: A.C.E.		CHANNEL IMPROVEMENTS
SUBMITTED:		MISCELLANEOUS DETAILS
APPROVAL RECOMMENDED:	APPROVED:	DATE: 72 FEB 9
PREPARED UNDER THE DIRECTION OF CHARLES R. ROBERTS COLONEL, C.E., DISTRICT ENGINEER	SCALE: NOT TO SCALE	JOB NO. DRAWING NUMBER
SHEET 11	114	45 4



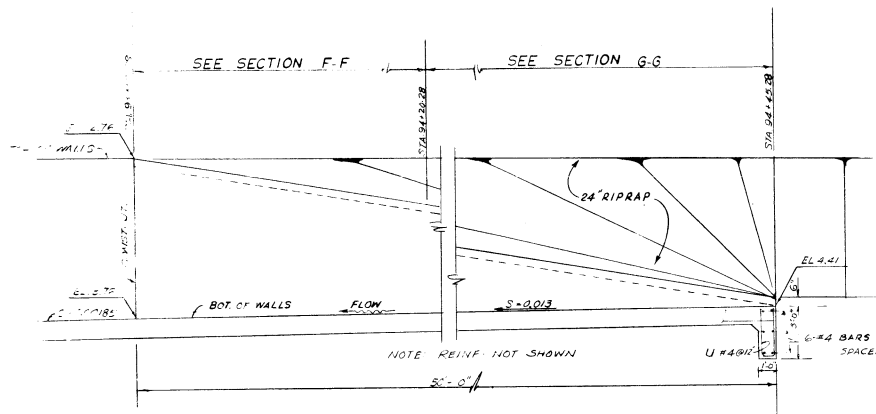
SECTION C-C  
SCALE 1/2" = 1'-0"



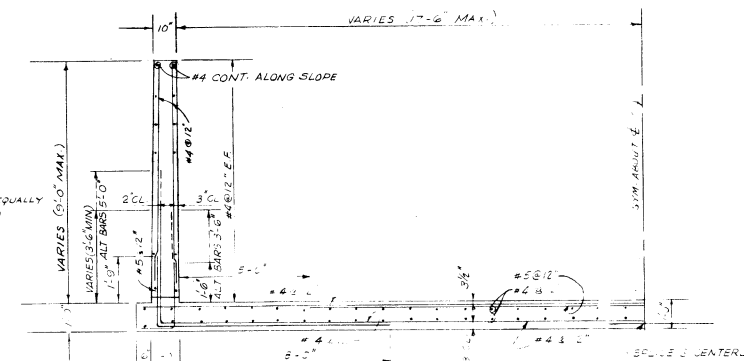
SECTION E-E  
STA. 69+15 TO STA. 69+40  
SCALE 3/8" = 1'-0"



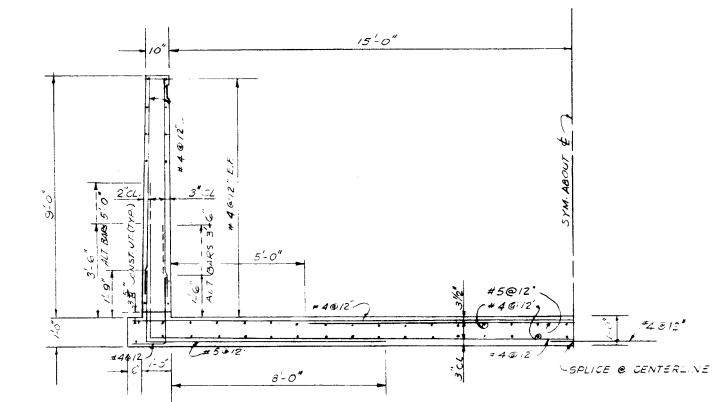
TYPICAL CHANNEL SECTION  
STA. 69+40 TO STA. 73+60  
SCALE 3/8" = 1'-0"



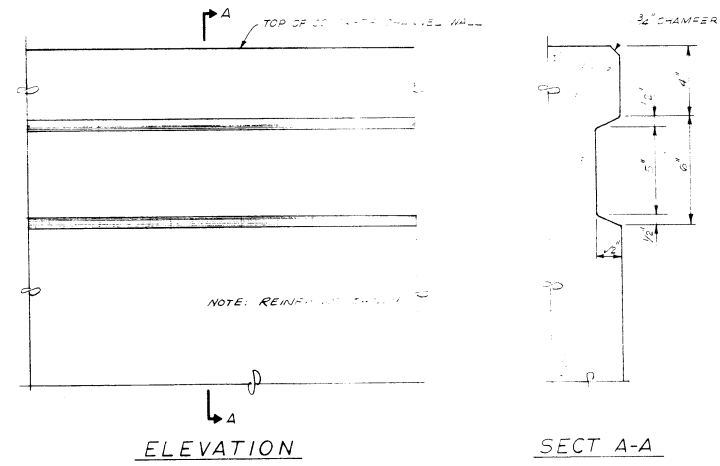
SECTION D-D  
SCALE 1/4" = 1'-0"



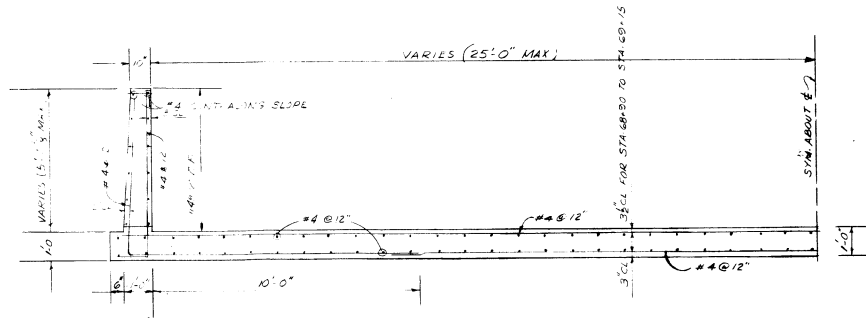
SECTION F-F  
STA. 93+95.28 TO STA. 94+20.28  
SCALE 3/8" = 1'-0"



TYPICAL CHANNEL SECTION  
STA. 73+60 TO STA. 93+95.28  
SCALE 3/8" = 1'-0"

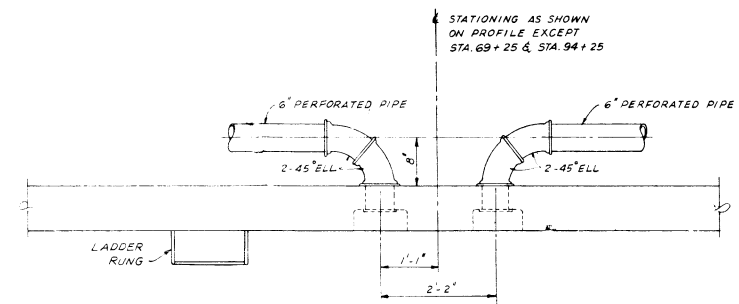


BORDER MOTIF  
STA. 69+40 TO STA. 93+95.28  
SCALE 3" = 1'-0"



SECTION G-G  
STA. 68+90 TO STA. 69+15 AND  
STA. 94+20.28 TO STA. 94+45.28  
SCALE 3/8" = 1'-0"

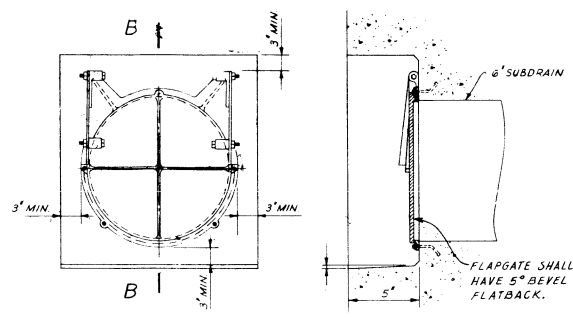
AS CONSTRUCTED - NO CHANGES MADE	74 FEB 15	RCB
REVISED TITLE BLOCK, ADDED RIPRAP DESIGNATIONS	73 MAR 3	RCB
REVISIONS		
U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA		
ALAMEDA COUNTY CALIFORNIA		
SAN LEANDRO CREEK CHANNEL IMPROVEMENTS		
CONCRETE CHANNEL SECTIONS AND TRANSITIONS		
DRAWN BY: FRP	APPROVED: S. P. Reilly 72 FEB 9	
CHECKED BY: FRP, DH	DATE: 72 FEB 9	
PREPARED UNDER THE DIRECTION OF CHARLES R. ROBERTS COLONEL, G.E. DISTRICT ENGINEER		
SCALE: AS SHOWN		DRAWING NUMBER
SHEET 12		114 45 4



NOTE:  
FOR DETAILS OF LADDER RUNGS & CHANNEL GATE, SEE SHT. 11 & 12  
SEE DETAIL "LOCATION OF FENCE", SHT. 11

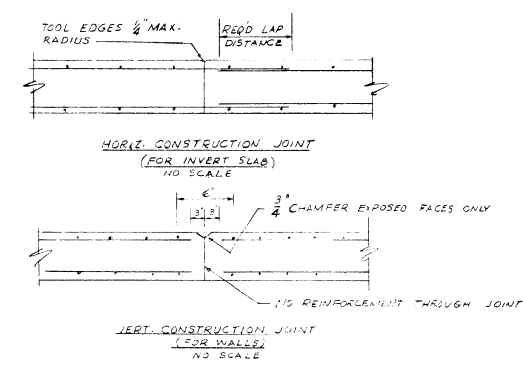
NOTE:  
DETAIL SHOWN IS TYPICAL FOR DOUBLE WELL  
FOR SINGLE WELL, 6" STA IS AT 1/2 OF FLAPGATE

PLAN

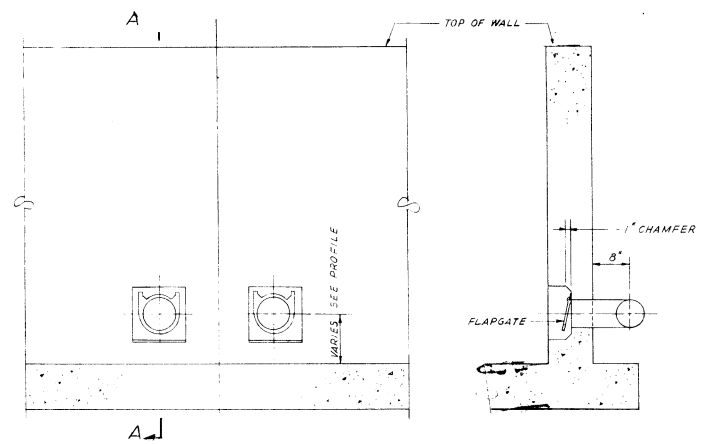


ELEV. SECTION B-B

6' FLAPGATE DETAILS  
NOT TO SCALE



NOTES:  
1. HORIZONTAL CONSTRUCTION JOINTS SHALL BE PROVIDED IN THE INVERT SLAB WHENEVER CONCRETE PLACEMENT IS STOPPED FOR PERIODS EXCEEDING 45 MINUTES.  
2. VERTICAL CONSTRUCTION JOINTS IN GENERAL SHALL BE SPACED AT INTERVALS OF 30 FEET.  
3. JOINT SPACING SHALL NOT BE LESS THAN 20 FEET FROM OTHER JOINTS AND THE MAX SPACING SHALL NOT EXCEED 45 FEET. JOINTS SHALL BE REINFORCED WITH 2 #4 BARS PER FOOT OF JOINT LENGTH.

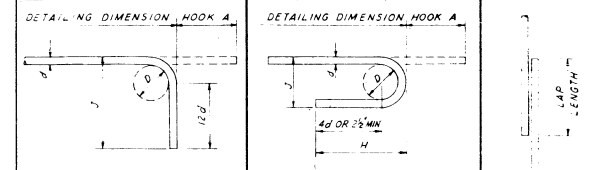


ELEVATION

SECTION A-A

DRAINAGE WELL DETAILS  
NOT TO SCALE

BAR NO.	RECOMMENDED HOOKS					MINIMUM LAP LENGTH
	90° HOOKS		180° HOOKS			
	HOOK A	HOOK J	HOOK A	HOOK J	APPROX H	
#4	7 1/2"	8 1/2"	6"	4"	4 1/2"	1'-2"
#5	9"	10 1/2"	7"	5"	5"	1'-6"
#6	10 1/2"	1'-0 1/2"	8"	6"	6"	1'-10"
#7	1'-0 1/2"	1'-2 1/2"	10"	7"	7"	2'-1"
#8	1'-2 1/2"	1'-5"	1'-1"	10"	9"	2'-6"
#9	1'-4 1/2"	1'-7"	1'-3"	11 1/2"	10 1/2"	3'-3"
#10	1'-6 1/2"	1'-11"	1'-7 1/2"	1'-3 1/4"	1'-0 3/4"	4'-1"
#11	1'-8 1/2"	2'-1 1/2"	1'-9 1/2"	1'-5"	1'-2"	5'-0"

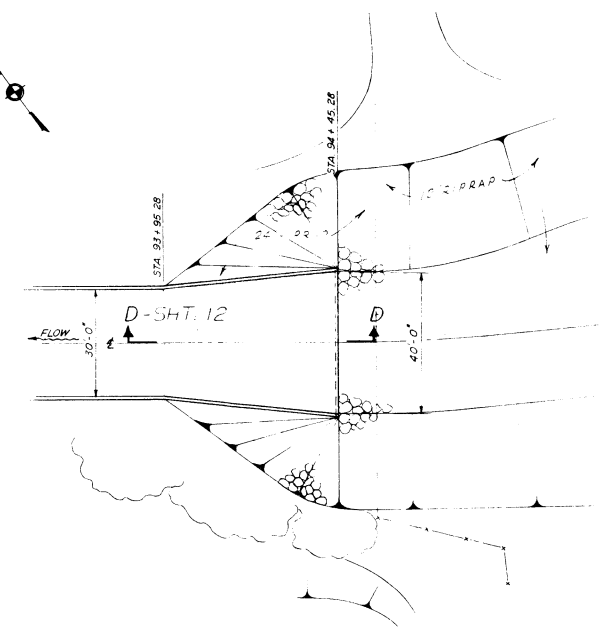
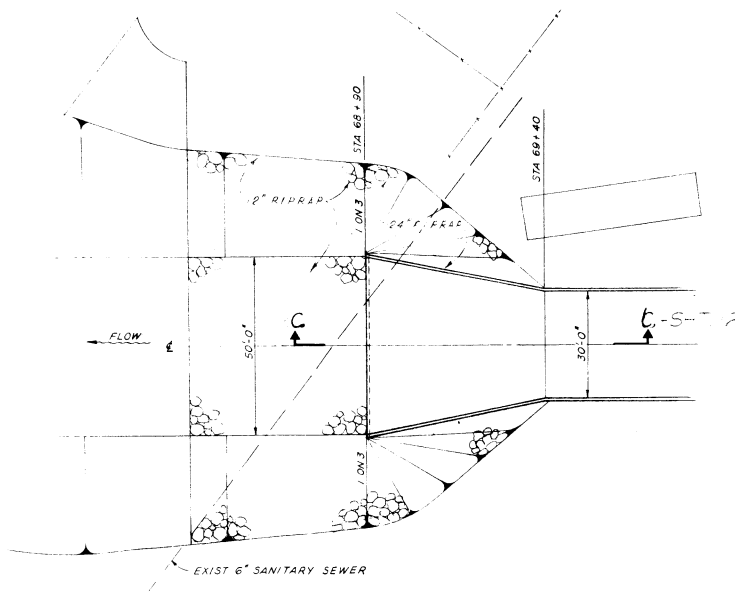


RECOMMENDED BENDING  
D = 6d FOR #4 THROUGH #7  
D = 8d FOR #8 AND #9  
D = 10d FOR #10 AND #11

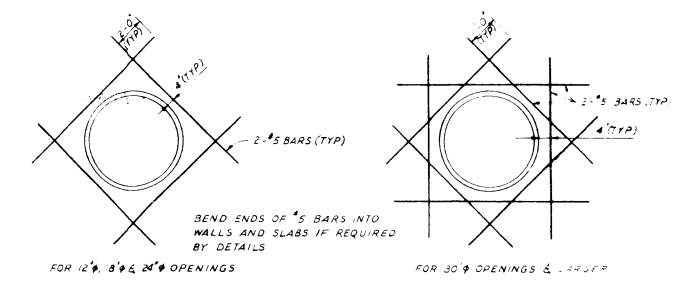
BENDS, HOOKS & SPLICE DETAIL

GENERAL NOTES

- EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4" UNLESS OTHERWISE NOTED
- SPLICES IN LONGITUDINAL REINFORCEMENT SHALL BE STAGGERED AT LEAST 4 FEET
- SPLICES IN TRANSVERSE REINFORCEMENT OTHER THAN THOSE SHOWN ON DRAWINGS WILL NOT BE PERMITTED WITHOUT THE APPROVAL OF THE CONTRACTING OFFICER
- PLACING OF REINFORCEMENT SHALL CONFORM TO THE AMERICAN CONCRETE INSTITUTE BUILDING CODE REQUIREMENT FOR REINFORCED CONCRETE (ACI 318-63) SECTION 803
- WHERE ABRUPT CHANGES IN CROSS SECTION OF THE BASE SLAB ARE INDICATED ON THE DWGS, PROVIDE FILLETS AT SIDES & BOTTOM WITH A MAX SLOPE OF 1 ON 1
- SPACING OF REINFORCEMENT SHALL BE CENTER TO CENTER UNLESS OTHERWISE NOTED
- WHERE MAIN REINFORCEMENT STEEL IS INTERRUPTED BY OPENINGS IN WALLS AND SLABS, AN EQUIVALENT AMOUNT OF REINFORCEMENT STEEL SHALL BE PROVIDED IN THE CONCRETE IMMEDIATELY ADJACENT TO THE OPENINGS.

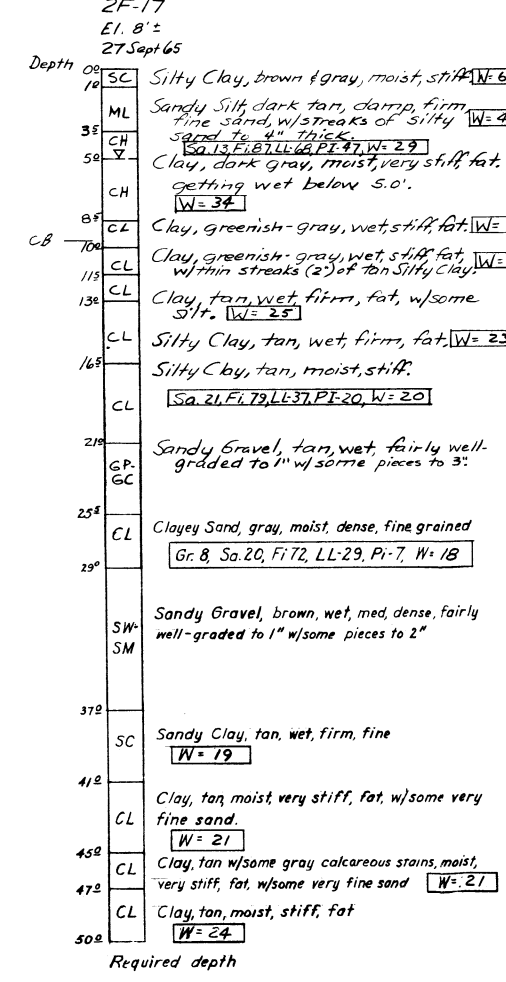
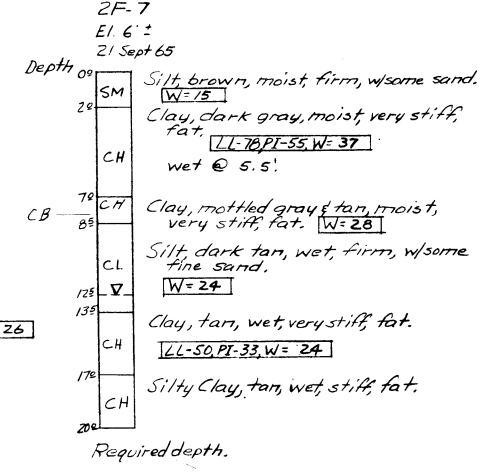
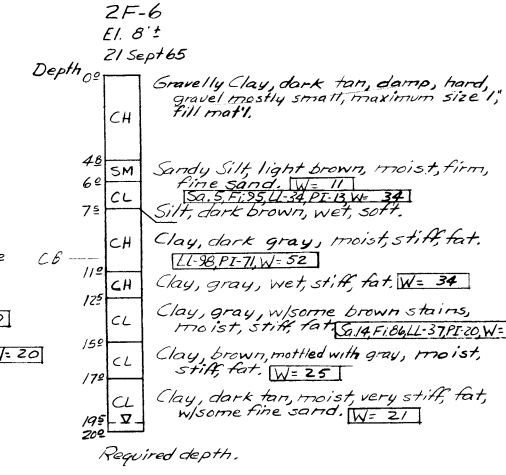
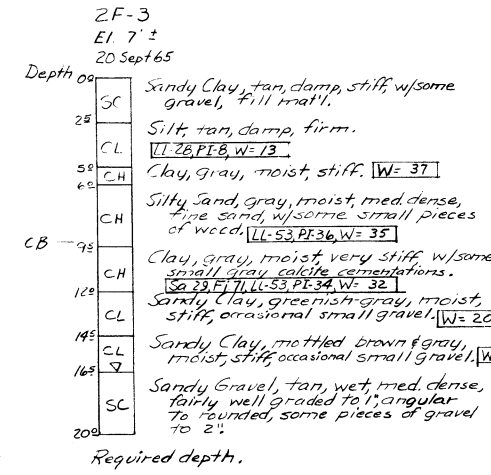
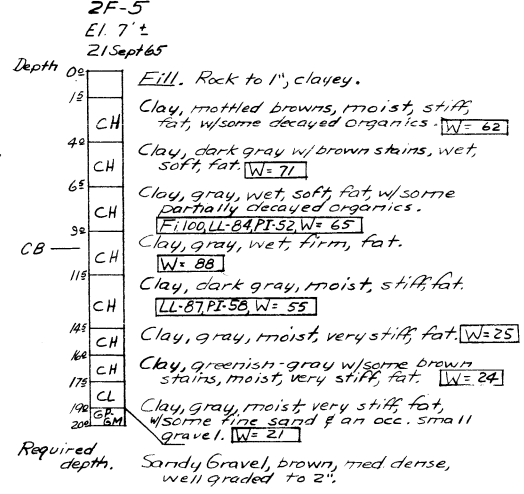
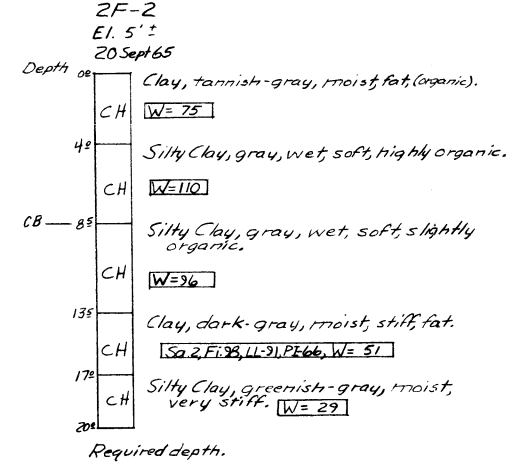
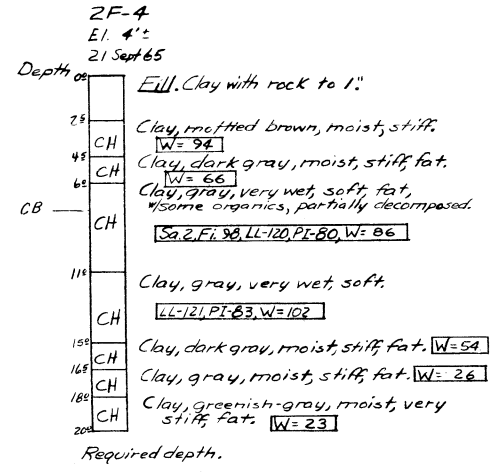
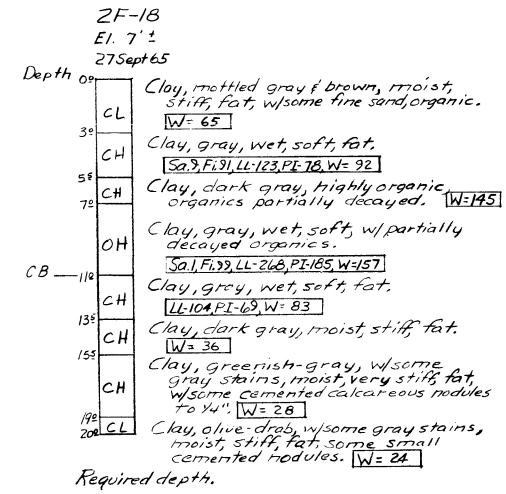
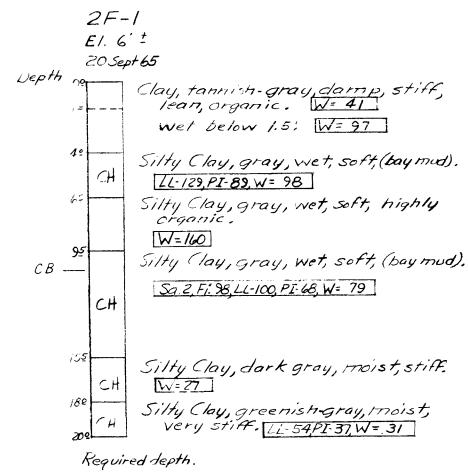


TRANSITION PLANS  
SCALE: 1" = 20'



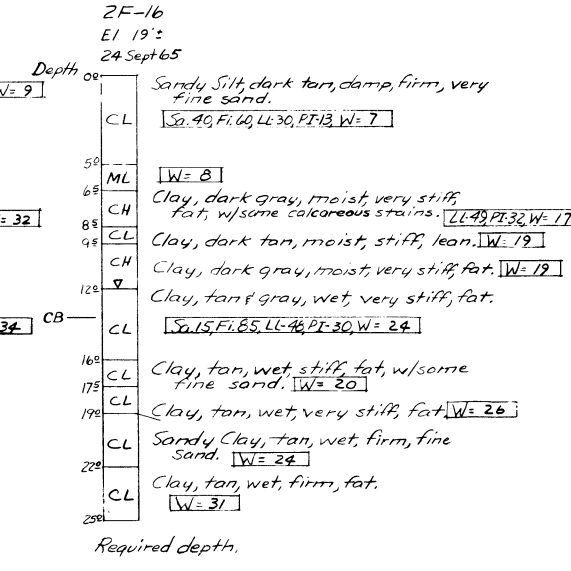
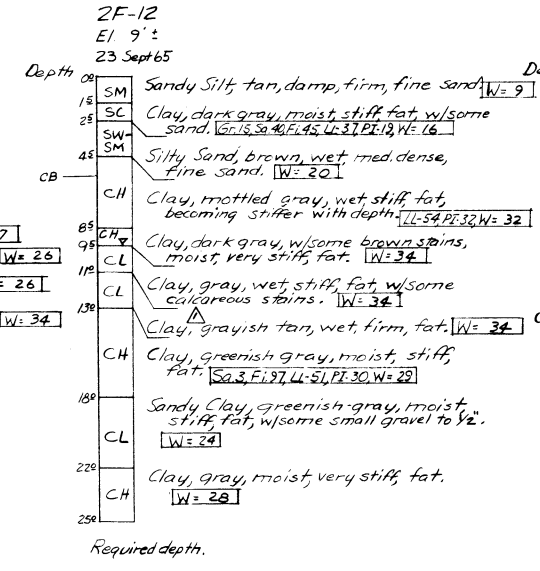
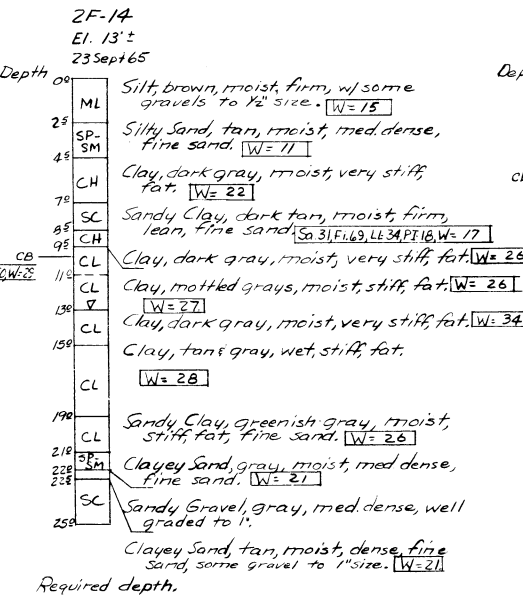
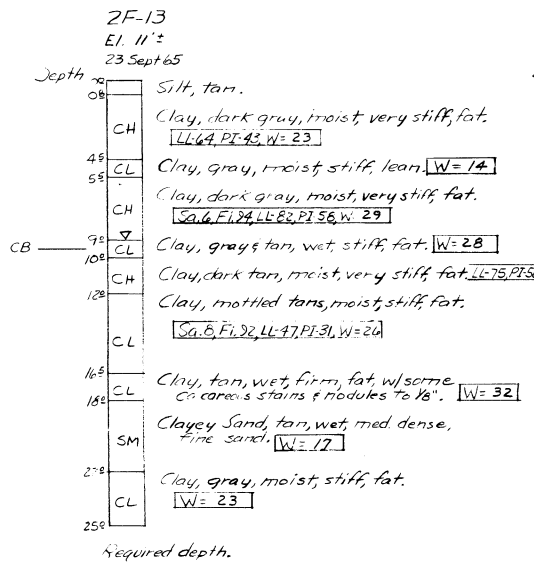
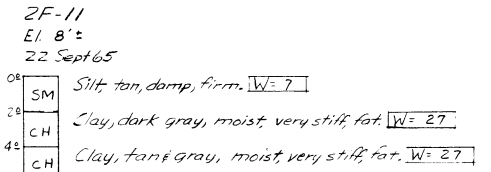
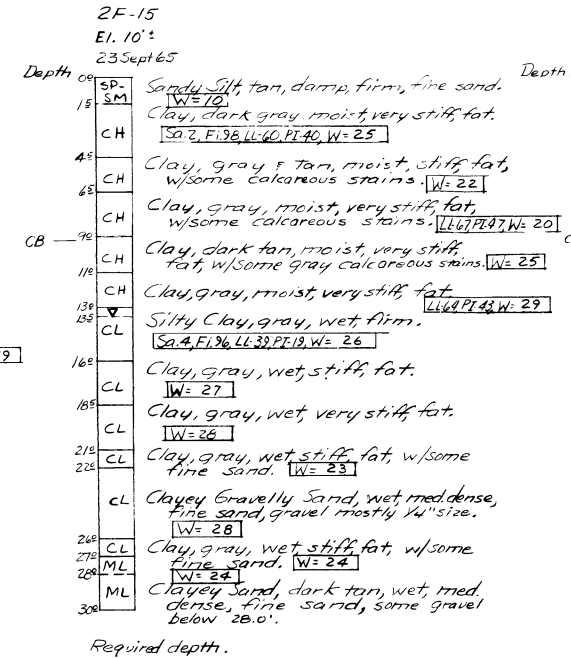
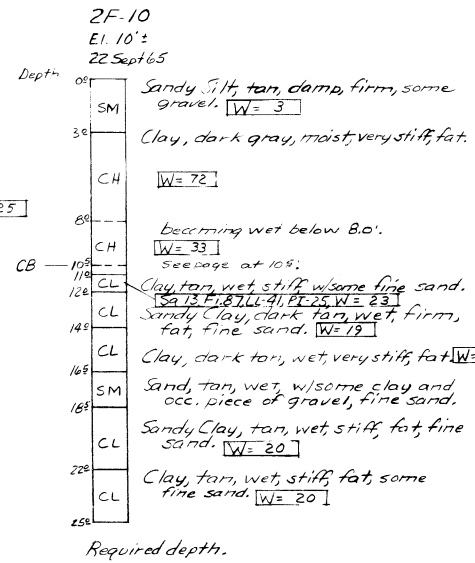
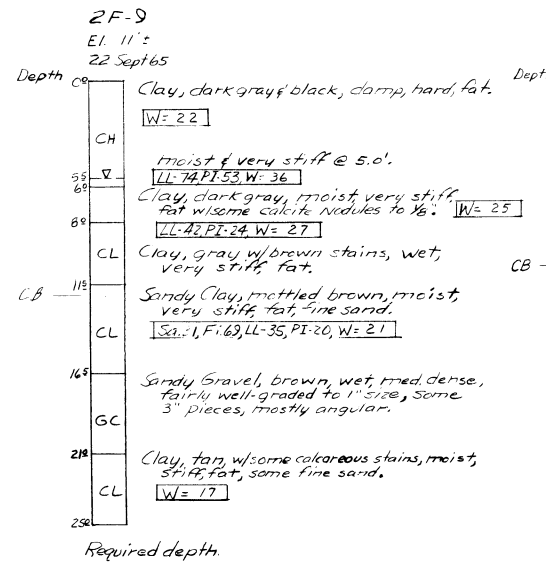
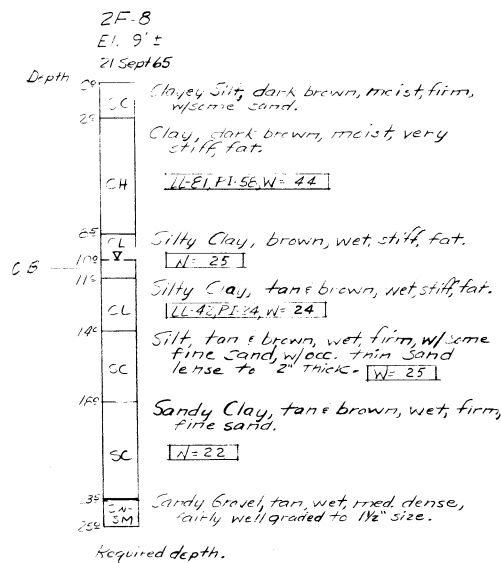
TYPICAL REINFORCEMENT AT PIPE OPENINGS  
NO SCALE

AS CONSTRUCTED - NO CHANGES MADE	14 FEB 15 1965
REVISED TITLE BLOCK & FLAPGATE DETAILS ADDED	17 MAR 65
RIPPRAP DESIGNATIONS	
REVISIONS	
U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA	
DRAWN BY FPP	ALAMEDA COUNTY CALIFORNIA
TRACED BY	SAN LEANDRO CREEK
CHECKED BY FPP	CHANNEL IMPROVEMENTS
SUBMITTED	GENERAL NOTES AND STRUCTURAL DETAILS
APPROVAL RECOMMENDED R. C. VAUGHAN CHIEF DESIGN BRANCH	APPROVED [Signature] CHIEF ENGINEER'S DIVISION
PREPARED UNDER THE DIRECTION OF CHARLES R. ROBERTS COLONEL, CE, DISTRICT ENGINEER	
SCALE: 1" = 20'	DRAWING NUMBER 13 114 45 4
SHEET	



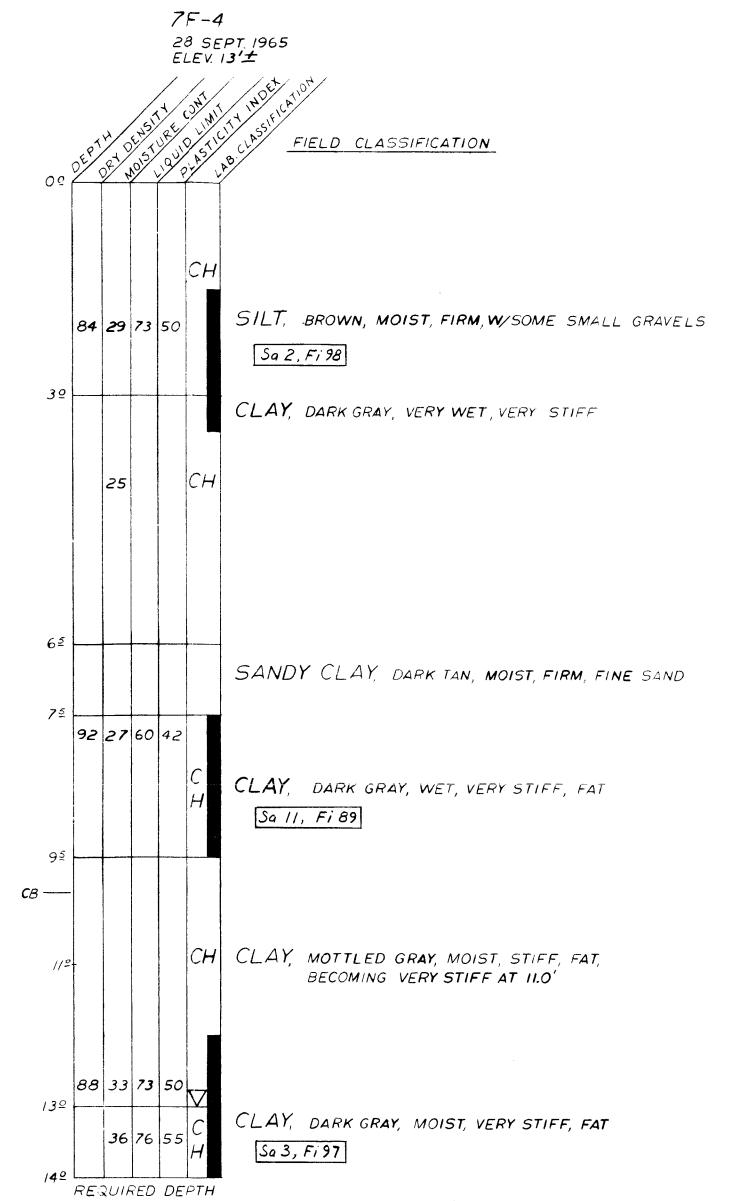
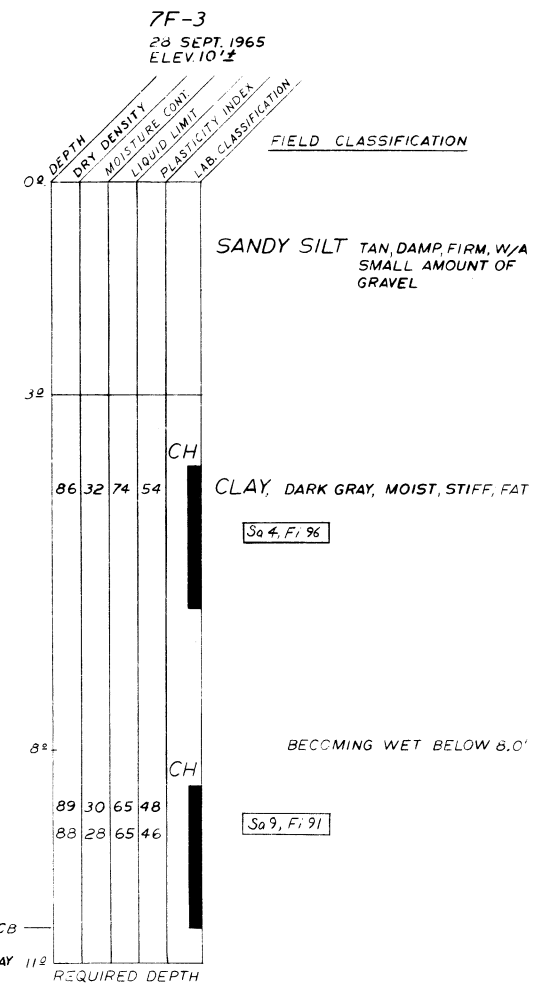
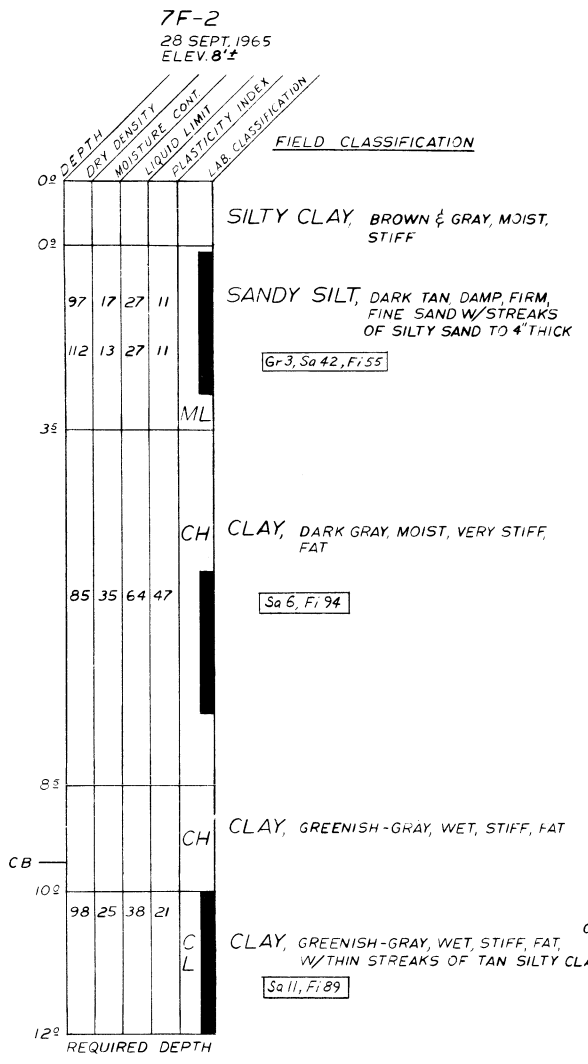
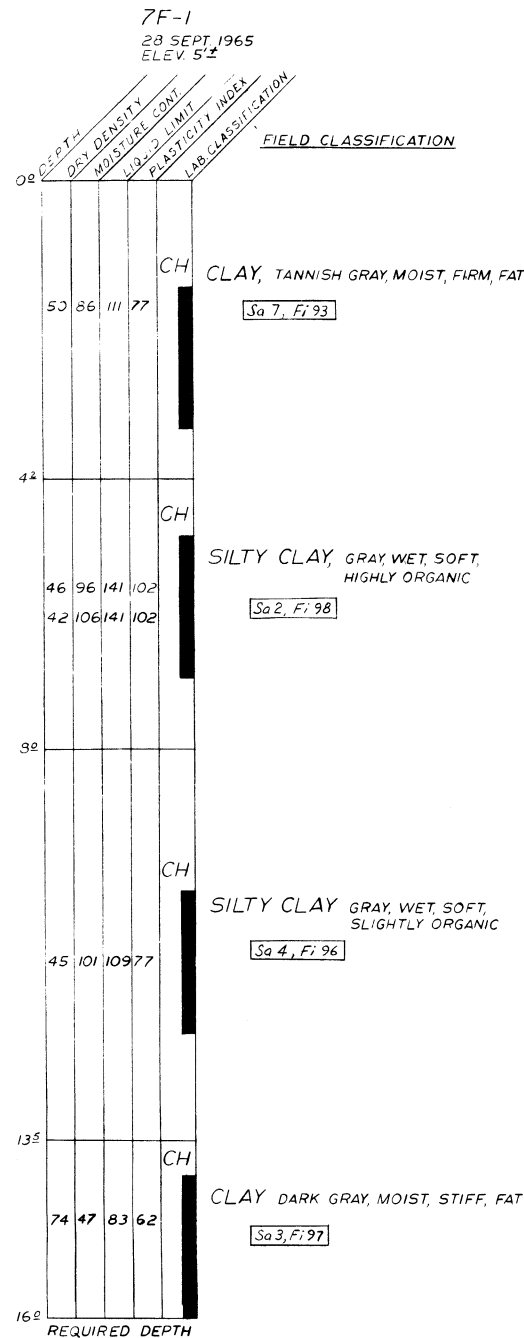
**NOTES:**  
1. Locations of exploration holes are shown on Sheet 1  
2. Legend and notes are shown on Sheet 16.

AS CONSTRUCTED - NO CHANGES MADE	DATE	74 FEB 18	
REVISED NOTES AS INDICATED	DATE	72 MAR 3	
SYMBOL	DESCRIPTION	DATE	APPROVAL
REVISIONS			
U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA			
DRAWN BY: G.H.	ALAMEDA COUNTY CALIFORNIA		
TRACED BY:	SAN LEANDRO CREEK		
CHECKED BY: R.E.T.	CHANNEL IMPROVEMENTS		
SUBMITTED:	LOGS OF EXPLORATION HOLES		
APPROVAL RECOMMENDED:	APPROVED:	DATE:	
CHIEF, FOUNDATIONS & WATERWAYS BRANCH	C. P. Pelly	72 FEB 9	
PREPARED UNDER THE DIRECTION OF CHARLES R. ROBERTS COLONEL, CE, DISTRICT ENGINEER		SCALE NO SCALE	DRAWING NUMBER
		14	114 45 4



NOTES:  
1. Locations of exploration holes are shown on Sheet 1.  
2. Legend and notes are shown on Sheet 16.

AS CONSTRUCTED	NO CHANGES MADE	DATE	74 FEB 15
REVISOR	REVISIONS	DATE	APPROVAL
U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA			
DRAWN BY: G.H.	ALAMEDA COUNTY CALIFORNIA		
TRACED BY:	SAN LEANDRO CREEK CHANNEL IMPROVEMENTS		
CHECKED BY: RET	LOGS OF EXPLORATION HOLES		
SUBMITTED:	2F - HOLES		
APPROVAL RECOMMENDED:	APPROVED:	DATE:	72 FEB 9
PREPARED UNDER THE DIRECTION OF		SCALE:	NO SCALE
CHARLES E. ROBERTS		DRAWING NUMBER	
COLONEL, C.E. DISTRICT ENGINEER		SHEET	15 114 45 4



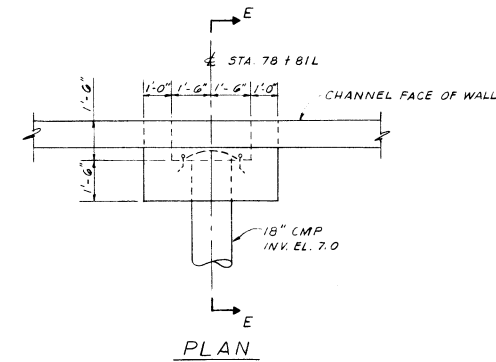
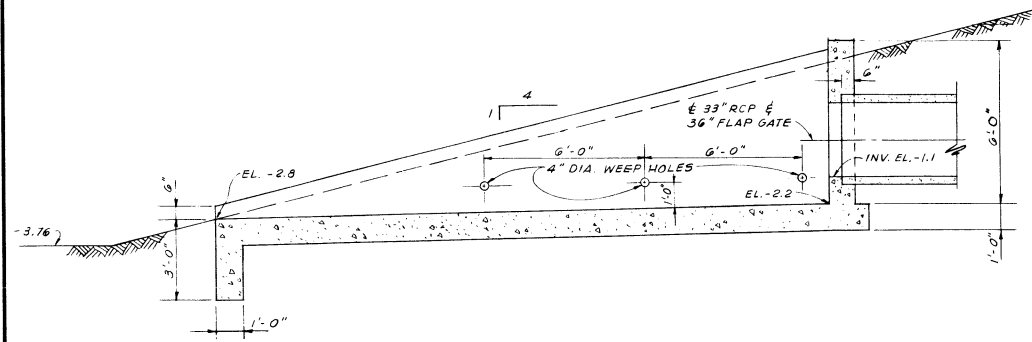
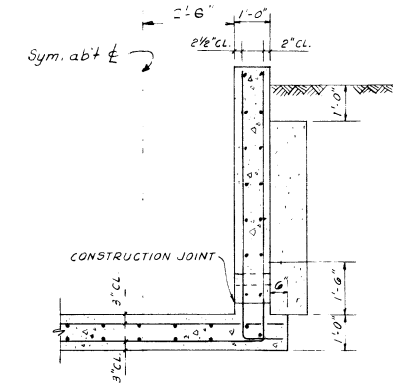
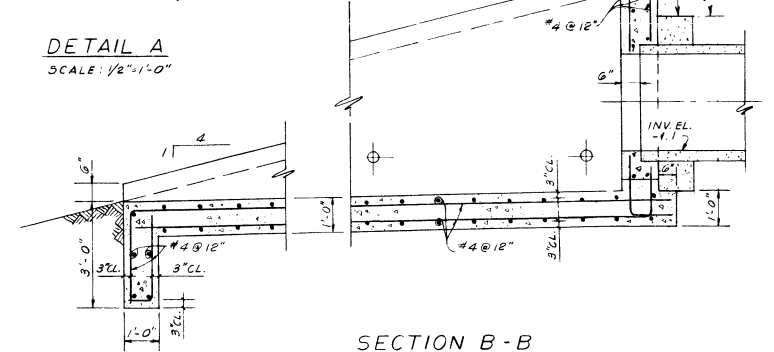
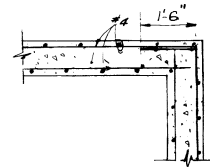
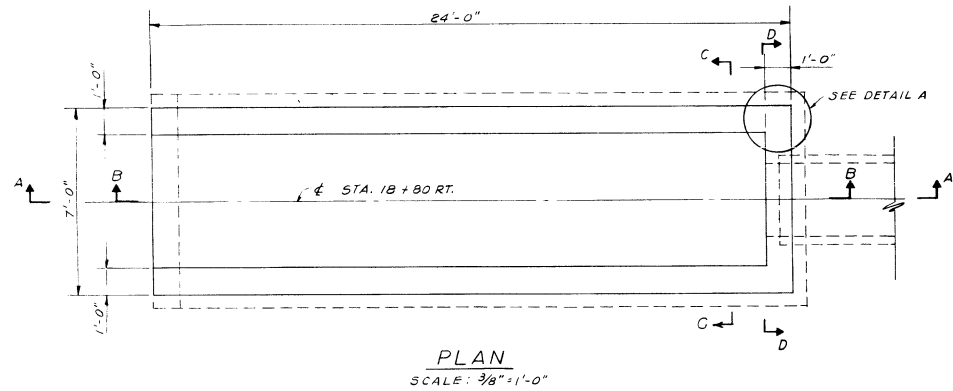
**LEGEND**

Gr. 10 = 10% Gravel  
 Sa. 20 = 20% Sand  
 Fi. 10 = 10% Fines  
 LL = 25 = Liquid Limit 25%  
 PI = 5 = Plasticity Index = 5  
 W = Moisture Content  
 ∇ = Free Water Level at Completion of Hole  
 [ ] = Laboratory Test Results  
 ZF = Auger Boring  
 7F = Undisturbed Sample Boring  
 | | 6" ∅ Undisturbed Tube Sample

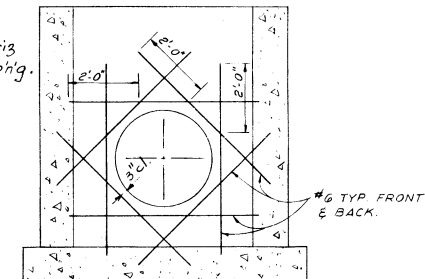
**NOTES**

- Elevation indicates approximate ground surface and top of boring. Elevations are based on the datum of Mean Sea Level.
- Soil classifications are in accordance with Military Standard 619B "Unified Soil Classification System," 12 June 1968.
- Field visual classifications and descriptions of the various soils encountered in the boring are shown to the right of the log.
- Soil symbols shown on the boring logs are based on laboratory classification tests.
- The results of lab. tests are shown to the left of the log, and in boxes to the right of the log.
- Locations of exploration holes are shown on Sheet 1.

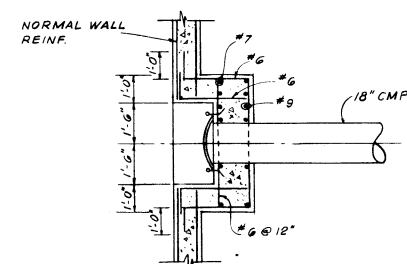
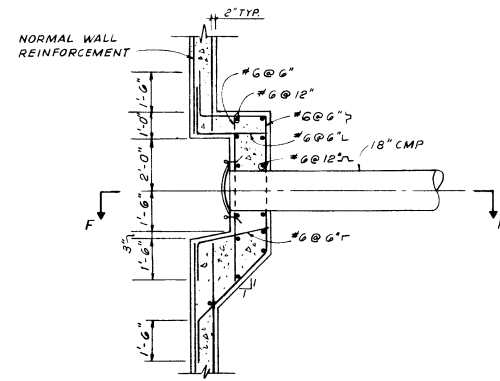
AS CONSTRUCTED - NO CHANGES MADE		DATE	74 FEB 15 1965
SYMBOL	DESCRIPTION	DATE	APPROVAL
REVISIONS			
U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA			
DRAWN BY:	TGT	ALAMEDA COUNTY CALIFORNIA	
TRACED BY:		SAN LEANDRO CREEK CHANNEL IMPROVEMENTS	
CHECKED BY:	H.D.	LOGS OF EXPLORATION HOLES 7F - HOLES	
SUBMITTED BY:		APPROVED:	DATE: 72 FEB 9
PREPARED UNDER THE DIRECTION OF CHARLES R. ROBERTS COLONEL, C.E., DISTRICT ENGINEER		SCALE	DRAWING NUMBER
		NO SCALE	114 45 4
SHEET 16			



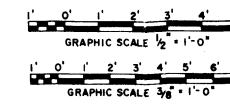
Note: Cut Vert. & Horiz.  
Wall Bars 3" From Op'g.



TYPICAL HEADWALL STRUCTURE



FLAPGATE RECESS DETAILS



AS CONSTRUCTED - NO CHANGES MADE	DATE	74 FEB 15	APPROVAL	RF
REVISIONS				
U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA				
DRAWN BY: CS	ALAMEDA COUNTY CALIFORNIA SAN LEANDRO CREEK CHANNEL IMPROVEMENTS DRAINAGE STRUCTURE DETAILS			
TRACED BY:				
CHECKED BY: TF				
SUBMITTED: Ted Flecker for				
APPROVED: [Signature]	DATE: 75 MAR 5			
PREPARED UNDER THE DIRECTION OF CHARLES R. ROBERTS COLONEL, CE, DISTRICT ENGINEER			SCALE: AS SHOWN	JOB NO.
			DRAWING NUMBER	
SHEET 17			114	454

CODE OF FEDERAL REGULATIONS

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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(d) *Drainage structures*—(1) *Maintenance*. Adequate measures shall be taken to insure that inlet and outlet channels



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

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

(ii) Inlet and outlet channels are open;

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

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

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

(2) *Operation.* Whenever high water conditions impend, all gates will be inspected a short time before water reaches the invert of the pipe and any object which might prevent closure of the gate shall be removed. Automatic gates shall be closely observed until it has been ascertained that they are securely closed. Manually operated gates and valves shall be closed as necessary to prevent inflow of flood water. All drainage structures in levees shall be inspected frequently during floods to ascertain whether seepage is taking place along the lines of their contact with the embankment. Immediate steps shall be taken to correct any adverse condition.

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

(i) No parts are missing;

(ii) Metal parts are adequately covered with paint;

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

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

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

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

(2) *Operation.* Erection of each movable closure shall be started in sufficient

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(Sec. 3, 49 Stat. 1571, as amended; 33 U. S. C. 701c) [9 F. R. 9999, 10203]

DEPARTMENT OF THE ARMY  
Office of the Chief of Engineers  
Washington, D. C. 20314

ER 1130-2-339

DAEN-CWO-M

Regulation  
No. 1130-2-339

29 October 1973

Project Operations  
INSPECTION OF LOCAL FLOOD PROTECTION PROJECTS  
(Reports Control Symbol DAEN-CWO-40)

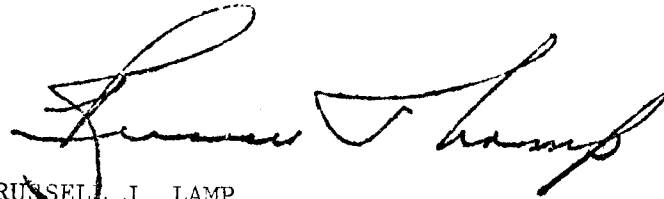
1. Purpose. The purposes of this regulation are to provide guidance for the inspection of local protection projects and to standardize reporting procedures for those projects on which maintenance by local interests is considered to be deficient. This regulation will help to insure effective operation of local flood protection projects by providing for the inspection of such projects to see that they are being maintained by local interests as required and are in good working order.
2. Applicability. This regulation is applicable to all Divisions and Districts having civil works responsibilities.
3. References.
  - a. Title 33, Code of Federal Regulations, Chapter 2, Part 208, Flood Control Regulations.
  - b. ER 1150-2-301, Policies and Procedures.
  - c. ER 1130-2-335, Levee Maintenance Standards and Procedures.
4. Basic Policy. Division and District Engineers will keep informed as to the operation and maintenance of local flood protection projects to insure that essential maintenance work is performed and that the project structures and facilities will operate as intended. To this end, a schedule of timely inspections will be initiated that will permit local interests to be advised of existing maintenance deficiencies and allow for required corrective work to be accomplished prior to anticipated flood seasons.
5. Inspection Criteria.
  - a. To provide a uniform inspection criteria, the questions in Appendix B pinpointing common deficiencies are to be applied to each project or project feature as appropriate. This list of questions is not all inclusive, but will serve as a general inspection guide.

29 Oct 73

1. The maintenance of local flood protection projects shall be considered deficient when the local responsible agency has not fulfilled its maintenance obligation in accordance with the requirements of Part 208.10, Title 33, CFR. Minor deficiencies that will not significantly affect the attainment of project benefits need not be reported unless the local responsible agency indicates that it does not intend to fulfill its obligation to correct the deficiencies or is unable to fulfill its responsibility for maintenance.

6. Reports. Reports on local flood protection projects where maintenance is considered to be deficient will be submitted annually on ENG Form 4390. The areas of deficiencies are to be indicated by a checkmark in the appropriate column. (The appropriate questions in Appendix B will be used as a guide in determining adequate maintenance.) Details of the deficiencies will be contained in the inspector's report and the correspondence with local interests, copies of which are to be submitted with the report form. Special problems or conditions will be noted under remarks column or footnoted. Negative reports will be submitted. This report has been assigned Reports Control Symbol DAEN-CWO-40 and will be submitted to HQDA (DAEN-CWO-M) WASH DC 20314 prior to 31 December.

FOR THE CHIEF OF ENGINEERS:



RUSSELL J. LAMP  
Colonel, Corps of Engineers  
Executive

2 Appendixes  
APP A - ENG Form 4390-R  
APP B - Inspection Guide



APPENDIX B

Inspection Guide

1. Readiness for Flood Emergency:

- a. Has an organization with legal responsibility been established and a superintendent appointed who is responsible for flood fighting operations?
- b. Is there a published flood fighting plan and is an appropriate supply of sandbags, tools and other flood fighting equipment readily available for an emergency?
- c. Are key personnel trained in flood fighting techniques and use of equipment?

2. Maintenance Program:

- a. Has a superintendent been designated who is responsible for operation and maintenance of the project?
- b. Is there a published program for inspection and maintenance of the project and project features?
- c. Are inspections being made in accordance with the requirements of Title 33, Code of Federal Regulations, Part 208, "Flood Control Regulations"?
- d. Are inspection reports submitted by local interests as required by existing regulations?
- e. Is the Operation and Maintenance manual furnished by the Corps readily available to the superintendent, and do his current instructions to maintenance personnel reflect the guidance furnished in the manual?

3. Maintenance of Floodwalls:

- a. Is there any evidence of seepage, saturated areas or boils that might affect the stability of the structure?
- b. Are there any signs of undue settlement that may affect the stability or watertightness of the structure?
- c. Are there any bank caving conditions riverward of the floodwall which might endanger the stability of the structure?

d. Has the concrete suffered cracking, spalling or deterioration to an extent that may affect the stability or watertightness of the structure?

e. If applicable, have the local responsible interests taken any measures to correct the above conditions?

f. Are trees or other growths which might jeopardize the stability or watertightness of the structure removed at regular intervals?

g. Is debris or trash allowed to accumulate adjacent to the floodwall? Is care being exercised to insure that fires are not built adjacent to the floodwalls?

4. Maintenance of Levees:

a. Is the levee being maintained to the design section?

b. Is there any evidence of seepage, saturated areas or boils that might affect the stability of the levee?

c. Have necessary repairs been made to cracks, erosion, or other damages to levee slopes?

d. Are there any indications of wave-wash damage or scouring?

e. Are there any indications of slides or sloughs developing?

f. Is sod cover on levees being encouraged?

g. Is sod cover mowed regularly?

h. Is sod or other desirable cover fertilized and reseeded as necessary?

5. Maintenance of Levee Crowns, Roadways and Gates:

a. Is the levee crown at design grade and is it shaped for proper drainage?

b. Is undesirable growth permitted on levee crown?

c. Are there any obstructions to vehicular passage along the crown of the levee?

- d. Are access roads to and on the levee properly maintained?
- e. Are access ramps properly maintained?
- f. Is unauthorized vehicular traffic permitted on the levee?
- g. Are cattle guards and gates in good condition?
- h. Are keys to locked gates readily available to authorized personnel?

6. Maintenance of Revetted Areas:

- a. Have damaged or subsided areas been repaired?
- b. Is riprap material sound, e.g., not cracked or weathered?
- c. Is bedding and/or bank material beneath riprap exposed or disturbed?
- d. Are there any areas where riprap or revetment work have been displaced, washed out or removed?
- e. Are the revetted areas being kept clear of undesirable growth.

7. Maintenance of Drainage Structures:

- a. Are headwalls being kept in a reasonable state of repair, e.g., no cracks, spalling or deterioration that will affect to stability of the structure?
- b. Are flap gates, manually operated gates and valves in good repair and operating condition?
- c. Are pipes through levee in serviceable condition, e.g., metal sound, no rust holes, no settled sections, no evidence of piping or subsidence?
- d. Are toe drain systems and pressure relief wells in good working order?
- e. Are inlet and outlet channels clear of growth and debris?

f. Has riprap around drainage structures been displaced?

g. Is there any erosion that might endanger the stability or watertightness of the structure?

8. Maintenance of Pumping Plants:

a. Is all pumping equipment operable?

b. Is pumping equipment being properly maintained?

c. Is the regular inspection, testing and lubrication program being followed?

d. Are adequate supplies of lubricants and fuel available for gasoline and diesel powered equipment?

e. Is emergency lighting and communication equipment operable and being properly maintained?

f. Are all switch gear, transformers, motor, valves, gates, etc. operable and being properly maintained?

g. Is electrical wiring in a satisfactory condition?

h. Are buildings being adequately maintained?

i. Is the operating room and sump clean?

j. Is corrosion mitigation equipment operable and being used?

k. Are operating manuals readily available?

l. Are operating personnel properly trained to operate and maintain the equipment?

m. Are operating logs being maintained and furnished the District Engineer?

9. Maintenance of Ponding Areas:

a. Is the capacity of ponding areas being reduced by the accumulation of silt and other deposits?

b. Are ponding areas being kept clear of undesirable growth?



c. Are fills and/or structures that reduce the capacity of ponding areas permitted?

d. Are inlet and outlet channels kept clear of debris and undesirable growth?

10. Maintenance of Channels and Floodways:

a. Is the carrying capacity of the channel or floodway reduced by sand and silt deposits, or by undesirable growth or debris?

b. Are tributary channels clear of debris and other materials that might jeopardize proper operation of the project under flood conditions?

c. Are debris basins, check dams, and related structures properly maintained?

d. Is the dumping of trash and debris allowed?

e. Are there any unauthorized structures or encroachments obstructing the channel or floodway?

f. Are banks being damaged by wave wash, sloughing, etc?

g. Have necessary repairs been made to eroded areas?

11. Maintenance of Closure Structures:

a. Are all moving parts of gated closure structures in good working order?

b. Are stop-log units readily accessible when required for closure?

c. Do stop-log units fit and are brackets in good condition?

d. Are stop-log units properly stored and maintained?

e. Is sufficient material on hand for erection of sandbag closures? Is material readily accessible?

f. Can closure be made promptly when necessary?

g. Is there a program for trial erection of closure structures? Is this program being carried out?

12. Control of Encroachment and Trespass:

- a. Have unauthorized structures through, over or adjacent to the project been permitted?
- b. Is there any unauthorized excavation within the project rights-of-way?
- c. Have agricultural activities been permitted to encroach on the project rights-of-way?
- d. Is unauthorized vehicular traffic permitted on the levees?
- e. Are boundaries properly identified?

13. Control of Wild Growth:

- a. Have trees and undesirable growth been cleared from the levees and along side floodwalls?
- b. Has undesirable wild growth been cleared from the channels or floodways?
- c. Does brush cover or other growth interfere with inspection?
- d. Is sod cover on levees being encouraged?
- e. Is there any unauthorized burning of grass and weed?
- f. Is sod cover mowed regularly?
- g. Is sod or other desirable cover fertilized and reseeded as necessary?

14. Control of Burrowing Animals:

- a. Is there an effective program for control of burrowing animals?
- b. Are animal burrows properly filled and compacted?

15. Control of Grazing:

- a. Are fences and cattle guards kept in repair?
- b. Are measures being taken to prevent overgrazing?
- c. Is there any unauthorized grazing?
- d. Have cattle trails, etc. been resodded?

ALAMEDA CREEK  
 MAINTENANCE  
 INSPECTION AND REPORT CHECKLIST

Period: \_\_\_\_\_ By: \_\_\_\_\_  
 From: \_\_\_\_\_ To: \_\_\_\_\_ Date: \_\_\_\_\_

Item	Check*	Item	Check*
------	--------	------	--------

- | <u>Levees</u>                     | <u>Mechanical</u>                |
|-----------------------------------|----------------------------------|
| 1. Service Roads - - - - - _____  | 16. Drainpipes - - - - - _____   |
| 2. Access Roads - - - - - _____   | 17. Flapgates - - - - - _____    |
| 3. Riprap - - - - - _____         | 18. Vertical Ladders - - - _____ |
| 4. Slope Erosion - - - - - _____  | 19. Other - - - - - _____        |
| 5. Animal Burrows - - - - - _____ |                                  |
| 6. Right-of-Way - - - - - _____   |                                  |
| 7. Detrimental Growth - - _____   |                                  |
| 8. Barricade - - - - - _____      |                                  |
| 9. Fencing - - - - - _____        |                                  |
| 10. Signs - - - - - _____         |                                  |

- Channel Bottom
- 11. Siltation - - - - - \_\_\_\_\_
  - 12. Erosion - - - - - \_\_\_\_\_
  - 13. Trash - - - - - \_\_\_\_\_
  - 14. Riprap - - - - - \_\_\_\_\_
  - 15. Other - - - - - \_\_\_\_\_

Comments:

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\* ✓ = No maintenance work required.  
 x = Maintenance required (see appended sheet for explanation).

NOTE: THIS SHEET IS AN EXAMPLE AND IS NOT TO BE FILLED OUT OR REMOVED FROM THE MANUAL.

EXHIBIT C

SAN LEANDRO CREEK  
OPERATION AND MAINTENANCE  
MAINTENANCE DESCRIPTION

Item: \_\_\_\_\_ (from Exhibit C)  
Signature:  
Date:

Description of Damage

Maintenance Performed

Precautions Taken Against Further Like Damage

Discussion

NOTE: THIS SHEET IS AN EXAMPLE AND IS NOT TO  
BE FILLED OUT OR REMOVED FROM MANUAL.

EXHIBIT D