

**RUSSIAN RIVER
CHANNEL IMPROVEMENT**

SONOMA COUNTY

**OPERATION AND MAINTENANCE
MANUAL**

JULY 1965

U.S. ARMY ENGINEER DISTRICT, SAN FRANCISCO

CORPS OF ENGINEERS

SAN FRANCISCO, CALIFORNIA

E
005.26002
REF
1965

RUSSIAN RIVER
CHANNEL IMPROVEMENT

SONOMA COUNTY

OPERATION AND MAINTENANCE
MANUAL

TABLE OF CONTENTS

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
	INTRODUCTION	1
1	AUTHORIZATION	1
2	LOCATION	1
3	PROJECT DESCRIPTION	1
4	PROTECTION PROVIDED	2
5	CONSTRUCTION HISTORY	2
	LOCAL COOPERATION	2
6	ASSURANCE OF COOPERATION	2
	MAINTENANCE AND OPERATION	3
7	PURPOSE	3
8	REGULATIONS	3
9	DUTIES OF SUPERINTENDENT	5
	a. Training of key personnel	5
	b. Streamflow stages	5
	c. Semi-annual report	6
	d. Check lists	6
	e. Proposed improvements or alterations	6
10	LEVEES	6
11	CHANNELS AND FLOODWAYS	8
12	MISCELLANEOUS FACILITIES	9

TABLE OF CONTENTS (Cont'd)

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
13	MAINTENANCE OF WORKS	10
	a. Cables and anchors	10
	b. Jacks	10
	c. Gravel blanket-wire mesh revetment	10
	d. Pervious erosion checks	10
	e. Flexible fence lines	10
	f. Channel clearing	11
	g. Levees	11
	METHODS OF COMBATTING FLOOD CONDITIONS	11
14	SUGGESTED METHODS	11
	a. Channel stabilization works	11
	b. Earthen levees	11
	c. Premeditated damage	12
	d. Security	12
	e. Human element	12
	f. Inspection of flood control works	12
	g. Preliminary repair work	13
	h. Disaster relief	14
	i. Flood fight	14
	j. Topping	15
	k. Transportation	16
	l. Check lists	16
	m. Use of Government Plant	16
	n. Flood Emergency Manual	16

EXHIBITS

<u>Exhibit</u>	<u>Description</u>
A	Code of Federal Regulations, Title 33, Part 208, Section 208.10
B	Resolution No. SA 6847 of Sonoma County Flood Control and Water Conservation District
C	Inspection Check List
D	Flood Emergency Construction Plates 1 - 5

APPENDIX

Record Drawings

OPERATION AND MAINTENANCE MANUAL

CHANNEL IMPROVEMENTS

RUSSIAN RIVER, SONOMA COUNTY, CALIFORNIA

INTRODUCTION

1. AUTHORIZATION

The channel improvement project for the Russian River was authorized by the Flood Control Act of 1950, 81st Congress, 2d Session, approved 17 May 1950. The authorized project provides for channel stabilization works on the Russian River, including pilot channels, single and multiple row jack lines, revetment, channel clearing and other appropriate installations.

2. LOCATION

The improvements are located along intermittent reaches of valley land where flood damages have been appreciable. The different installations are at scattered locations in Sonoma County, extending from river mile 41 upstream to about river mile 63, near the Mendocino County line. Specific location of each separate installation is shown on the appended plans.

3. PROJECT DESCRIPTION

Channel stabilization works include channel clearing and pilot channels to restore stream flow to the recognized channel and to develop uniform channel sections; bank protection works consisting of anchored steel jacks in single and multiple row installations; flexible fence training structures; wire mesh-gravel revetments and pervious erosion check dams. Channel clearing consists of removing serious obstructions of a permanent nature, such as trees and gravel bars located within the recognized channel. Clearing operations include the complete removal, to a point flush with the ground surface, of all trees, stumps, down timber, snags, brush, old piling, logs and other floatable debris. Pilot channels, where required, consist of a trapezoidal channel, maintaining uniform bottom width, side slopes and channel bottom slope. The type of protective works installed at a specific location was based on field conditions: anchored steel jacks and flexible fencing were used to prevent banks from undercutting. Jacks were used at those sites where the banks, though relatively well protected by vegetative growth, were subject to erosion; flexible fence was installed where banks tended to undercut easily due to the

lack of a protective growth of vegetation. A gravel blanket revetment, overlain by wire mesh, was used at locations where it was desirable to maintain the existing bank alignment with more rigid control. Pervious erosion check dams were installed at various points to control sheet erosion. All these works tend to stabilize stream flow and to reduce the tendency of the stream to meander. Typical details of different types of installations are shown on the appended plans, which should be followed in maintaining the works to assure the stream stabilization for which they were designed.

4. PROTECTION PROVIDED

The constructed channel and bank stabilization works are designed to retard the rate of bank erosion and channel meandering. With adequate and timely maintenance of the works as now established, it is anticipated that 80 percent of bank erosion damage may be prevented. This protection can continue only if all works are maintained at all times.

5. CONSTRUCTION HISTORY

The channel improvements and protective works constructed and turned over for operation and maintenance by local interests were contracted at intervals during a period of years, October 1956 through November 1963. The original works were installed in a Test Reach in Sonoma County, between river miles 52.0 and 56.2, during October 1956 to February 1957, and formed a basis for observation and determination as to the most effective types of protection for the varied conditions at different locations. This reach had been subjected to serious meandering and erosion problems through the years. Channel improvements included channel clearing; construction of pilot channels; wire mesh-gravel bank revetments; various combinations of single and multiple row jack lines; flexible fence; tree pendants; pervious erosion checks, and willow sprig plantings. Tree pendants and willow sprigs were not used in subsequent work. Channel improvement works, including channel clearing and levee reworking, river miles 56.1 to 63.0 were completed and turned over to Sonoma County local interests for operation and maintenance in November 1962. During the 1963 construction season, further channel improvement was completed between river miles 41.9 to 52.0 and turned over to Sonoma County local interests for operation and maintenance by letter 7 November 1963.

LOCAL COOPERATION

6. ASSURANCE OF COOPERATION

The Board of Directors of the Sonoma County Flood Control and Water Conservation District on 24 May 1955 passed Resolution No. .

SA 6847, pertinent parts of which are quoted below. The complete resolution is attached as Exhibit B. The resolution guarantees local cooperation as follows:

- a. Furnish free of cost to the United States all lands, easements and rights-of-way necessary for the construction of the channel-stabilization works along those portions of the Russian River located within the boundaries of said district;
- b. Make all necessary road and bridge revisions and utility alterations and relocations required for said channel-stabilization works located within the boundaries of the district;
- c. Maintain the said channel-stabilization works after completion thereof, in accordance with regulations prescribed by the Secretary of the Army;
- d. Prevent any encroachment on the stream channel within the boundaries of said district which would interfere with the proper functioning of the improvements or lessen their beneficial effects;
- e. Establish a plan as to the method of operation of the reservoir for conservation subject to flood control priority;
- f. Pertains to contribution of cash for Coyote Dam;
- g. Adjust all claims concerning water rights arising from the construction and operation of the improvements; and,
- h. Hold and save the United States free from damages due to the construction work.

MAINTENANCE AND OPERATION

7. PURPOSE

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

8. REGULATIONS

Section 208.10, Title 33 of the Code of Federal Regulations contains rules for the maintenance and operation of local flood protection works approved by the Secretary of the Army in accordance with authority

contained in Section 3 of the Flood Control Act of 22 June 1936, as amended and supplemented. A copy of the complete regulations will be found in Exhibit A. Compliance with these regulations is one of the requirements of local cooperation. Applicable portions of the regulations are as follows:

"General.

- (1) The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such period as may be necessary to obtain the maximum benefits.
- (2) The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of the Army, as required by law, shall appoint a permanent committee consisting of or headed by an official hereinafter called the "Superintendent," who shall be responsible for the development and maintenance of, and directly in charge of, an organization responsible for the efficient operation and maintenance of all of the structures and facilities during flood periods and for continuous inspection and maintenance of the project works during periods of low water, all without cost to the United States.
- (3) A reserve supply of materials needed during a flood emergency shall be kept on hand at all times.
- (4) No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the rights-of-way for the protective facilities.
- (5) No improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the District Engineer of the War Department 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 semi-annual report to the District Engineer covering inspection, maintenance, and operation of the protective works.

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

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

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

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

9. DUTIES OF SUPERINTENDENT

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

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

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

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

b. Streamflow stages. Permanent arrangements should be made by the Superintendent with the United States Weather Bureau to secure

streamflow stages and forecasts of streamflow stages and weather conditions on effective streams and drainage areas to plan adequate measures of protection.

c. Semi-annual report. The semi-annual reports required under the regulations should be submitted within a ten-day period prior to 1 June and 1 December of each year and should include all dated copies of reports of inspections made during the period of report. Also, the nature, date of construction, and date of removal of all temporary repairs and the dates of permanent repairs should be included in this report. Other items and suggestions relative to public cooperation, public sentiment on the protection obtained, and other allied subjects are considered pertinent and desirable data for inclusion in the report, but are not required. A suggested form for submission of the semi-annual report covering the major features of maintenance, inspection and operation is furnished as Exhibit C for the convenience of the Superintendent. The organization responsible for the maintenance and operation of the project is required to provide their own forms in accordance with the sample.

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

e. Proposed improvements or alterations. Drawings or prints of proposed improvements or alterations to the existing Flood Control Works must be submitted for approval to the District Engineer, U. S. Army Engineer District, San Francisco, Corps of Engineers, San Francisco, California, sufficiently in advance of the proposed construction to permit adequate study and consideration of the work. Drawings or prints, in duplicate, showing any improvements or alterations as finally constructed should be furnished to the District Engineer, U. S. Army Engineer District, San Francisco, Corps of Engineers, after completion of the work.

10. LEVEES

Inspection and maintenance of levees shall be in accordance with Section 208.10 (a) General, (see paragraph 8 of this manual) and 208.10 (b) which states:

"Levees

(1) Maintenance. The Superintendent shall provide at all times such maintenance as may be required to insure serviceability of the

structures in time of flood. Measures shall be taken to promote the growth of sod, exterminate burrowing animals, and to provide for routine mowing of the grass and weeds, removal of wild growth and drift deposits, and repair of damages caused by erosion or other forces. Periodic inspections shall be made by the Superintendent to insure that the above maintenance measures are being effectively carried out and, further, to be certain that:

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

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

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

(iv) The drainage systems and pressure relief walls 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."

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

11. CHANNELS AND FLOODWAYS

Inspection and maintenance of channels and floodways shall be in accordance with Section 208.10 (a) General (see paragraph 8 of this manual), and 208.10 (g) which states:

"Channel and floodways

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

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

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

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

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

(v) Riprap sections are in good condition;

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

Such inspections shall be made prior to the beginning of the flood season, immediately following each major high water period, and otherwise at intervals not to exceed 90 days. Immediate steps will be taken to remedy any adverse conditions disclosed by such inspections.

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

12. MISCELLANEOUS FACILITIES

Inspection, maintenance and operation of miscellaneous facilities shall be in accordance with Section 208.10 (a) General, (see paragraph 8 of this manual) and 208.10 (h) which states:

"Miscellaneous facilities

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

13. MAINTENANCE OF WORKS

Location and extent of maintenance performed should be reported semi-annually in the form indicated on Sheet 4 of Exhibit C. For the channel stabilization project to operate successfully and provide the benefits for which it was constructed, all installations must be continuously and adequately maintained at all times. Prompt correction of all deficiencies disclosed during inspections in periods of low water are much more effective and greatly lower in cost than work performed under emergency conditions. Consistent adequate advance maintenance actually is the only way in which the system can be kept in effective operation. The rapid rate of rise of the Russian River makes advance preparation and maintenance mandatory, as time for organization is usually not available after receipt of flood warnings from the Weather Bureau. The following maintenance practices and items normally most in need of corrective action should assist in the timely execution of such work:

a. Cables and anchors. Practically all the installations depend primarily on adequate anchorage to maintain their position and alignment; this alignment is an integral part of the design for channel stabilization and must be maintained. Inspection and speedy replacement of all defective main, anchor and tie cables and anchors is mandatory; if any section should become disconnected during high water, it shall be restored to original condition and position as soon as conditions permit. If conditions should develop which show the need for additional anchoring or supporting cables, the District should be informed before initiating action.

b. Jacks. The repair and replacement of jacks can be expected to be necessary; rebolting the junctions of legs, replacement of cable ties to leg ends, securing to main cables where needed.

c. Gravel blanket-wire mesh revetment. These works should not be disturbed except as needed for replacement of cables and anchors. Undermining should be repaired at low stages of the river.

d. Pervious erosion checks. These are to be kept in satisfactory condition, adequately anchored, with riprap replaced if scoured. Removal of cables and riprap by the public must be guarded against.

e. Flexible fence lines. No fires or burning shall be permitted along these lines, as effectiveness of the works would be greatly affected. Assure that all posts, outriggers, wire mesh, anchors and

cables are intact and in good condition. Rusted bolts should be replaced as needed, frames securely anchored to the bank and wire mesh securely tied to posts and cables.

f. Channel clearing. Channel clearing shall be performed as needed so that the selected centerline and the designated cleared channel width is maintained, free from all trees, stumps, debris, downed timber, snags and other floatable objects. Removal of sand and gravel bars detrimental to the operation of the project shall be accomplished after consultation with the U. S. Army Engineer District, San Francisco.

g. Levees. The extent of levee work in this project is not great but constitutes an integral part of the design for the channel stabilization works.

METHODS OF COMBATING FLOOD CONDITIONS

14. SUGGESTED METHODS

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

a. Channel stabilization works. Since anchors and cables are all important to the different types of works, they should be observed during high water at all times that flood stages permit. Replacement of anchors and cables should be expedited in the event of imminent failure, as the alignment of the individual units is most important. Jack lines and the different types of revetment are subject to attack at less than bank full stages, when corrective action may still be taken in the event of damage to the anchorage system.

b. Earthen levees. An earthen levee is in possible danger whenever there is water against it. This danger varies with the height of

the water, the duration of the flood stage, and the intensity of either the current or wave action. A well-constructed levee of proper section should, if maintained and not overtopped, hold throughout any major flood. However, a serious accident may result in a break. Foundation troubles result in sand boils or a sinking levee, and the local use of unsatisfactory materials causes slides and sloughs. However, such threatened failures can be met if prompt action is taken and proper methods of treatment are used. Wave wash is to be expected whenever the levee is exposed to a wide stretch of open water and is serious if permitted to continue over a considerable length of time. Exhibit D, Plates 1 - 5 are attached to aid in flood emergency construction.

c. Premeditated damage. The Superintendent should continually guard against premeditated damage to the flood control works.

d. Security. Personnel of the Corps of Engineers, U. S. Army, whether military or civilian, are not vested with any civil police authority in the performance of their engineering duties, and they will not attempt to exercise any such authority. The responsibility for protecting flood control works against sabotage, acts of depredation, or other unlawful acts rests with the local interests through local and State Governmental agencies. In the event local law enforcement agencies prove inadequate, local interests can request the aid of State Forces, and if additional support becomes necessary, Federal troops can be requested as provided by law.

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

f. Inspection of flood control works. Immediately upon receipt of information that a high water is imminent, the Superintendent should form a skeleton organization, capable of quick expansion, and assign individuals (Sector Foremen) to have charge of definite sections of the project. As his initial activity, each Sector Foreman should go over his entire sector and parts of adjacent sectors, making a detailed inspection, particularly with reference to the following matters:

- (1) Sector limits; ascertain that the dividing line between sectors is plainly determined and, if necessary, marked.
- (2) Condition of new levees and recent repairs
- (3) Condition of culverts, flap gates, and sluice gates

- (4) Transportation facilities; roads and rail.
- (5) Material supply; quantity, location, and condition.
- (6) Communications; locate and check all necessary telephones in the sector.

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

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

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

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

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

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

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

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

(8) Communicate directly with owners of all stock pastured on the levee and direct that all stock be removed from the levee

right-of-way. Cut all fences crossing the levee that do not have gates provided.

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

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

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

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

(1) Drainage of slopes. This work can be done economically while awaiting developments and will serve to make the levees more efficient. Crews should be organized to cut seep drains at all places on the levee when seepage appears. The drains should be V-shaped, no deeper than necessary, and never more than 6" deep. Care must be taken not to cut the sod unnecessarily. In all instances, drains should be cut straight down the levee slope or nearly so. Near the toe of the slope, the small drains should be Y'd together and led into larger drains, which, in general, should lead straight across the landside berm into the landside pits or nearer natural or artificial drains.

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

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

(4) Scours. A careful observation should be made of the riverside of the levee at all localities where high current velocities are observed. Trouble may be looked for at road-crossing ramps and places where pipes, sewers and other structures penetrate the levee. The approved method of construction to check scour on the slopes is to construct deflection dikes using brush, treetops, or lumber, driving stakes and wiring together, and filling in between with brush and filled sacks or stone.

j. Topping. Immediate consideration should be given the grade line of each levee section by comparison of existing grades with those shown on the appended drawings. If any reaches show a grade below the previous highest water, emergency topping should be undertaken at once to such a grade as may be established by the District Engineer, U. S. Army Engineer District, San Francisco, Corps of Engineers, San Francisco, California, as follows:

(1) Sack topping. Sack topping may be used to raise the crown of the levee about three feet. The sacks should generally be laid stretcherwise or along the levee for the first layer, crosswise for the second layer, and so on. Sacks should be lapped at least 1/4-inch either way and well mauled into place. When properly sacked and tamped, one sack will give about three to four inches of topping. See Exhibit D, Plate 4.

(2) Lumber and sack topping. This is the most commonly used method of raising low reaches in emergencies. In putting on this topping, as well as other topping, a careful line of levels should be run and grade stakes set in advance. 2" x 4" x 6' stakes should then be driven on the riverside of the crown six feet apart, and 1" x 12"

boards nailed to the landside of the stakes. This wall, backed with a single tier of sacks, will hold out at least one foot of water. If a second foot is necessary, the layers of sacks will have to be increased in number and reinforced. The stakes should be driven three feet in the ground, and should project out three feet, thus providing, in extreme cases, a three-foot topping if properly braced behind with sacks and earth. In some instances, it may be practicable to back up the planking with tamped earth obtained in the vicinity in lieu of the sacks shown in the drawing, Exhibit D, Plate 5.

k. Transportation. In instances where it is necessary to send equipment over roads that are impassable due to mud or sand, their passage may be provided by the use of a plank road or by means of steel or wire mats.

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

m. Use of Government Plant. The District Engineer, U. S. Army Engineer District, San Francisco, Corps of Engineers, is authorized to use or loan Government property and plant in cases of emergency where life is in danger and there is no opportunity to secure prior authority for such use. The authority also extends to saving of property where no suitable private equipment is available, provided that such use is without detriment to the Government.

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

Title 33—Navigation and Navigable Waters

Chapter II—Corps of Engineers

Part 208—Flood Control Regulations

Sec.

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

§ 208.10 Local flood protection works; maintenance and operation of structures and facilities—(a) General. (1) The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

repair measures shall be accomplished during the appropriate season as scheduled by the Superintendent.

(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

Resolution No. 8A 6847

Court House,
Santa Rosa, Calif.

May 25, 1955

RESOLUTION OF
THE BOARD OF DIRECTORS OF THE SONOMA COUNTY
FLOOD CONTROL AND WATER CONSERVATION DISTRICT
GUARANTEEING LOCAL PARTICIPATION IN FLOOD
CONTROL AND ALLIED PURPOSES WITH REFERENCE TO
THE RUSSIAN RIVER, CALIFORNIA.

* * * * *

WHEREAS, the United States Flood Control Act of 1950 (Title II Public Law 516, 81st Congress) approved the plan for flood control water conservation and related purposes in the Russian River Basin, California, substantially in accordance with the recommendations of the United States Board of Engineers for Rivers and Harbors, dated April 22, 1949, and as recommended by the Chief of Engineers in his report dated November 15, 1949; and

WHEREAS, it was therein provided that local interests shall contribute the sum of \$5,598,000 in cash in full repayment of the conservation benefits; and

WHEREAS, the report of the Chief of Engineers, U. S. Army (supra) provided that local interests furnish assurances satisfactory to the Secretary of the Army concerning easements, right-of-way and other matters related to the project; and

WHEREAS, by Resolution adopted August 23, 1948, the Board of Supervisors of Sonoma County did declare the intention to accomplish the establishment of a properly constituted public body to be responsible for fulfilling the requirements of local cooperation in connection with said project as in this resolution hereinafter set forth; and

WHEREAS, said Board of Supervisors by Resolution adopted May 2, 1949, did request the legislative representative from Sonoma and Mendocino Counties to introduce in the Legislature of the State of California, a Bill to create the Sonoma County Flood Control and Water Conservation District; and

WHEREAS, pursuant to said resolution legislation was introduced at the 1949 Session of the California Legislature resulting in

the adoption by said body of Chapter 994, Statutes of 1949, entitled "An Act Creating the "Sonoma County Flood Control and Water Conservation District" for the controlling, conservation, diversion, storage and disposition of storm, flood, and other surface waters, prescribing the boundaries, organization, operation, management, financing and powers and duties of the District. That said Act became effective October 1, 1949, and provides among other things that the boundaries of said District include all of the territory of the County of Sonoma lying within the exterior boundaries thereof, and provides further that the Board of Supervisors of the County of Sonoma shall be ex-officio the Board of Directors of said District. That said District is a duly constituted public body with lawful authority to fulfill the requirements of local cooperation in connection with said project as hereinafter enumerated.

AND, WHEREAS, at the 1951 Session of the California Legislature there were added to "The State Water Resources Law of 1943" (since recodified as Chapters 1 and 2 of Part 6, Division 6 of the California Water Code) Sections 12698, 12699, and 12700 thereof, authorizing the aforesaid project and providing specifically as follows:

"Sec. 12698. Russian River projects for Sonoma and Mendocino Counties: Adoption and authorization: Appropriation. The project on the Russian River for flood protection and water conservation in Sonoma and Mendocino Counties is adopted and authorized substantially in accordance with the recommendations of the Chief of Engineers in House Documents No. 585, Eighty-first Congress, Second Session, as authorized by act of Congress approved May 17, 1950, Public Law 516, Eighty-first Congress, Second Session, at an estimated cost to the State of such sum as may be appropriated for state cooperation by the Legislature upon the recommendation and advice of the State Water Resources Board, when funds for carrying out the project are appropriated by Congress."

"Sec. 12699. Same: Assurance of cooperation. The Sonoma County Flood Control and Water Conservation District shall give assurances satisfactory to the Secretary of the Army that the local cooperation, required by Section 201 of the act of Congress approved May 17, 1950 (Public Law 516, Eighty-first Congress, Second Session), will be furnished by the Sonoma County Flood Control and Water Conservation District in connection with the plan of flood control adopted and authorized in Section 12698."

"Sec. 12700. Same: Duty of district to execute plans and projects: Authority to modify. The Sonoma County Flood Control and Water Conservation District, in conjunction with the Department of the Army, shall execute the plans and projects referred to in Section 12698 and exercise all powers granted to it in the Sonoma County Flood Control and Water Conservation District Act, and the district may make such modifications and amendments to the plans as may be necessary to execute them for the purposes of Chapters 1 and 2 of this part."

AND, WHEREAS, pursuant to the provisions of the Sonoma County Flood Control and Water Conservation District Act the Board of Directors of said District did submit to the qualified electors of said District at a Special Bond Election held May 10, 1955, the proposition that the said District incur a bonded indebtedness in the principal amount of Five-Million Six-Hundred Fifty Thousand Dollars (\$5,650,000.) for the purpose of paying the District's share of the cost of the Coyote Valley Dam to be constructed by the Corps of Engineers, United States Army, (as more particularly described in House Document No. 585, Eighty-first Congress, Second Session) and costs and expenses incidental thereto; and

WHEREAS, more than two-thirds of all votes cast at said Special Bond Election on said Proposition were in favor thereof, and did authorize the incurring of said bonded indebtedness for the purposes stated, and said District is now in a position to issue and sell said bonds to raise money for the purpose of paying the District's share of the cost of construction of said Dam, to wit: the sum of Five-Million Five-Hundred Ninety-Eight Thousand Dollars (\$5,598,000.).

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of Sonoma County Flood Control and Water Conservation District as follows:

That the Board of Directors of the Sonoma County Flood Control and Water Conservation District, on behalf of said District, hereby agrees to provide, and guarantees the United States of America and to the Corps of Engineers, U. S. Army, local participation within the above referred project consisting of:

- (a) Furnish free of cost to the United States all lands, easements and rights of way necessary for the construction of the channel-stabilization works along those portions of the Russian River located within the boundaries of said District;

- (b) Make all necessary road and bridge revisions and utility alterations and relocations required for said channel-stabilization works located within the boundaries of the District;
- (c) Maintain the said channel-stabilization works after completion thereof, in accordance with regulations prescribed by the Secretary of the Army;
- (d) Prevent any encroachment on the stream channel within the boundaries of said District which would interfere with the proper functioning of the improvements or lessen their beneficial effects;
- (e) Establish a plan as to the method of operation of the reservoir for conservation subject to flood control priority;
- (f) Contribute Five-Million Five-Hundred Ninety-eight Thousand Dollars (\$5,598,000.) in cash, in whole or in part as required, for the reservoir construction cost prior to the initiation of said construction by the Corps of Engineers;
- (g) Adjust all claims concerning water rights arising from the construction and operation of the improvements; and
- (h) Hold and save the United States free from damages due to the construction work.

The foregoing Resolution was introduced by Supervisor Shoemaker who moved its adoption, seconded by Supervisor Guidotti, and adopted on roll call on May 24, 1955, by the following vote:

Supervisor Sampson	Aye
Supervisor Anderson	Aye
Supervisor Shoemaker	Aye
Supervisor Guidotti	Aye
Supervisor Lyttle	Aye

Ayes: 5; Noes: 0; Absent or not voting: 0.

WHEREUPON, the Chairman declared the above resolution adopted and

SO ORDERED

EXHIBIT B

SEMI-ANNUAL REPORT FOR
INSPECTION, MAINTENANCE AND OPERATION OF
FLOOD CONTROL PROJECT
CHANNEL IMPROVEMENTS - RUSSIAN RIVER

SONOMA COUNTY, CALIFORNIA

Period from _____ Submitted by _____

To _____ Date _____

INSPECTION

Item No.	Feature	Location and Extent of Maintenance Required
-------------	---------	--

JACKS, CABLES AND ANCHORS

- 1 Structural integrity
- 2 Anchors
- 3 Cables
Main
Anchor
Tie
- 4 Position and alignment
- 5 Protection of growth
- 6 Adjacent scouring

GRAVEL BLANKET AND WIRE MESH REVETMENT

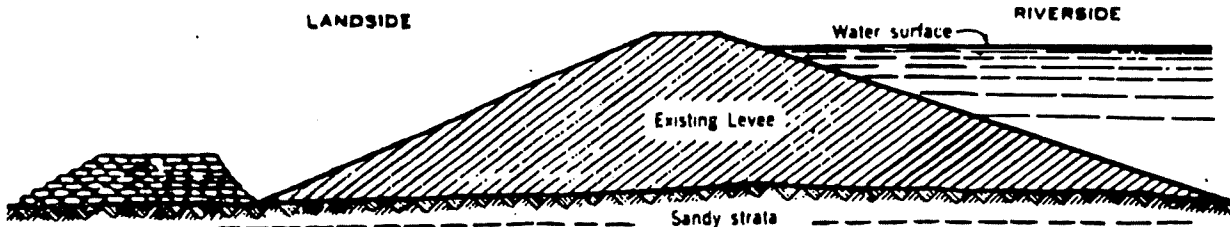
- 7 Wire mesh and fastenings
- 8 Anchors
- 9 Cables
- 10 Loss of gravel

SEMI-ANNUAL REPORT (Continued)

Item No.	Feature	Location and Extent of Maintenance Required
PERVIOUS EROSION CHECKS		
11	Wire mesh and fastenings	
12	Riprap	
13	Anchors	
14	Cables	
15	Adjacent scouring	
FLEXIBLE FENCE		
16	Posts, outriggers and bolts	
17	Anchors	
18	Cables	
19	Wire mesh	
20	Brush fill	
21	Adjacent scouring	
CHANNEL CLEARING		
22	Debris or other obstructions	
23	New growth	
24	Clear project width	
25	Pilot channels	
LEVEES		
26	Settlement, sloughing or loss of grade	
27	Access roads	

SEMI-ANNUAL REPORT (Continued)

Item No.	Feature	Location and Extent of Maintenance Required
28	Fences and gates	
29	Erosion of slopes and condition of sod	
30	Riprap	
31	Accumulation of drift trash or debris	
32	Animal burrows	
33	Inappropriate burning	
34	Unauthorized grazing or traffic	
35	Unauthorized encroachment on right-of-way	
36	Unauthorized excavation or loose backfill	
37	Drainage culverts	

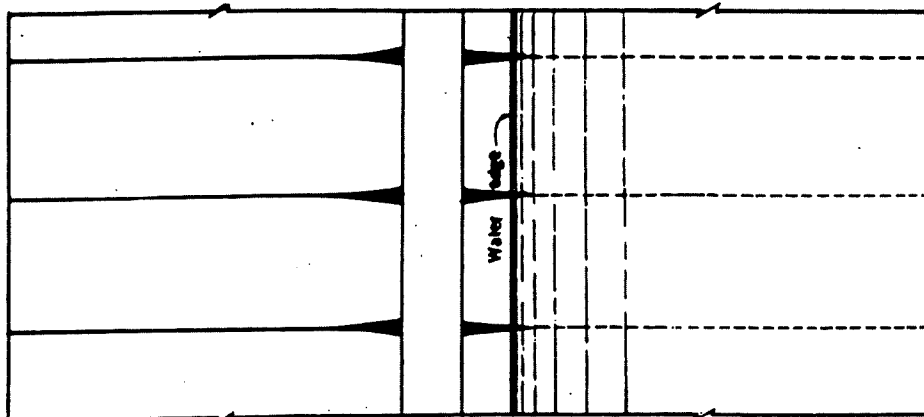
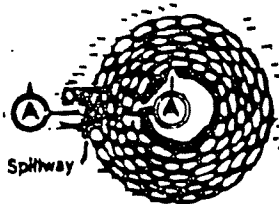


Note.
 Bottom width to be no less than 1 1/2 times height
 Be sure to clear sand discharge
 Tie into levee if boil is near toe.

ELEVATION



SECTION A-A



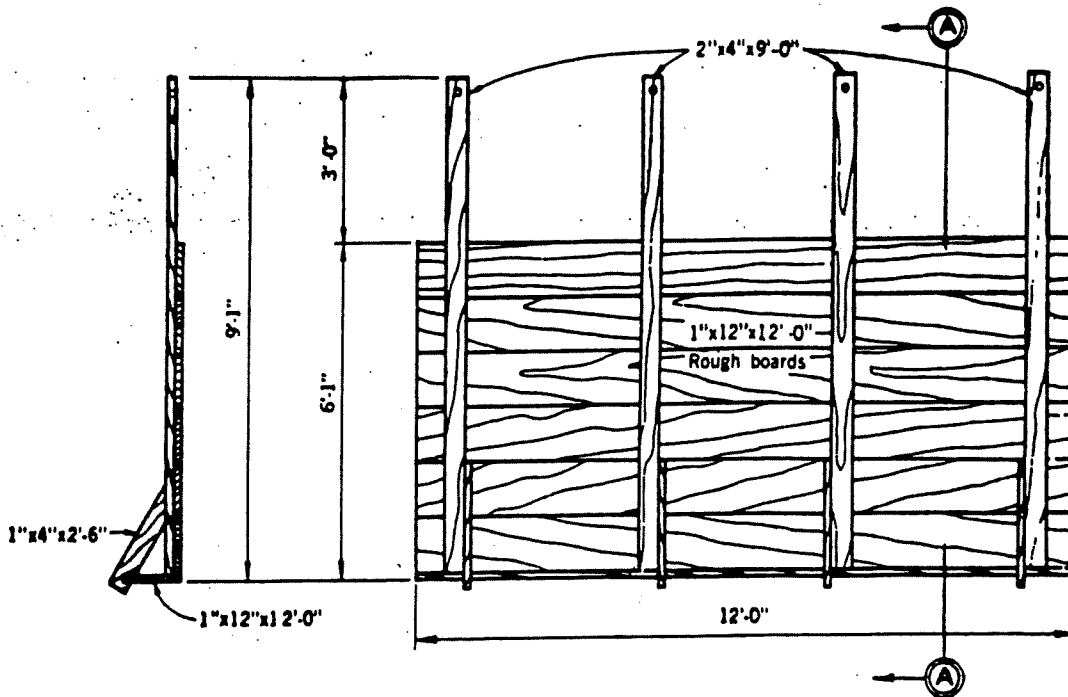
PLAN

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

**FLOOD EMERGENCY
 CONSTRUCTION**

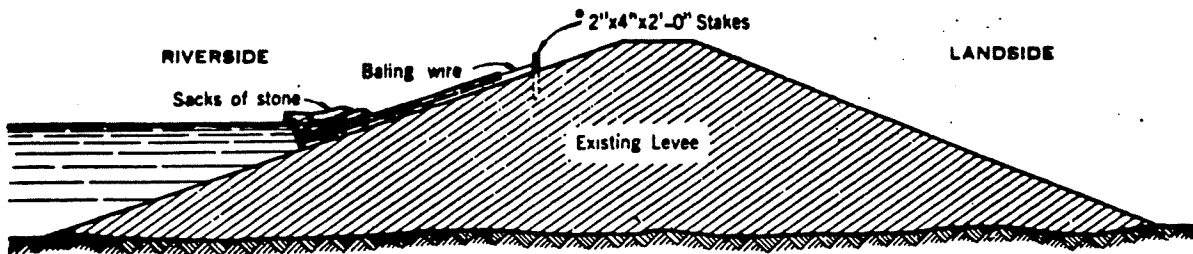
CONTROL OF SAND BOILS

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



SECTION A-A

PLAN



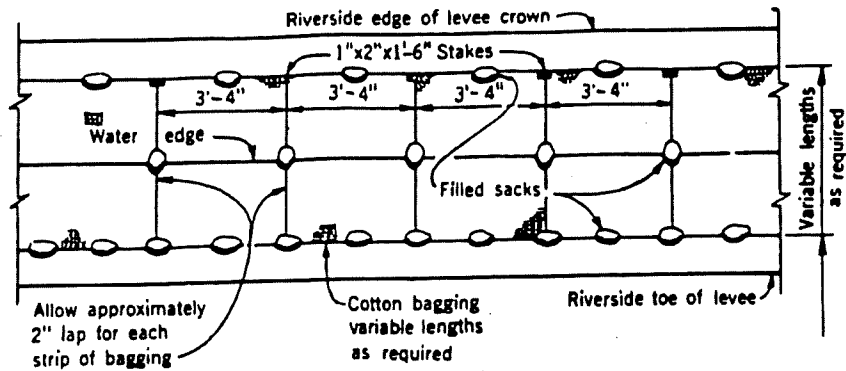
SECTION

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

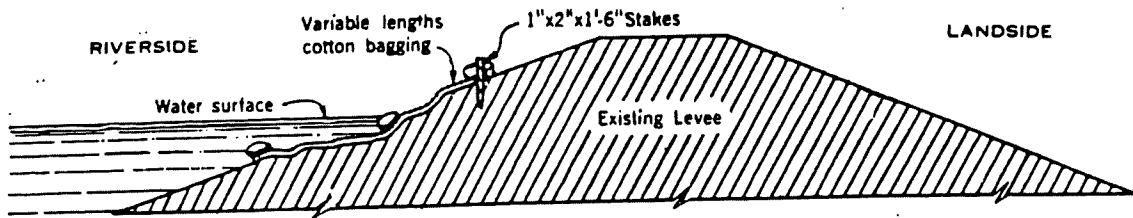
**FLOOD EMERGENCY
CONSTRUCTION**

**MOVABLE
WAVE WASH PROTECTION**

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



PLAN



SECTION

Note:

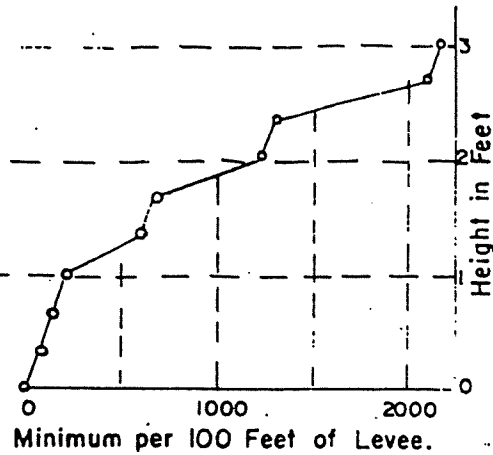
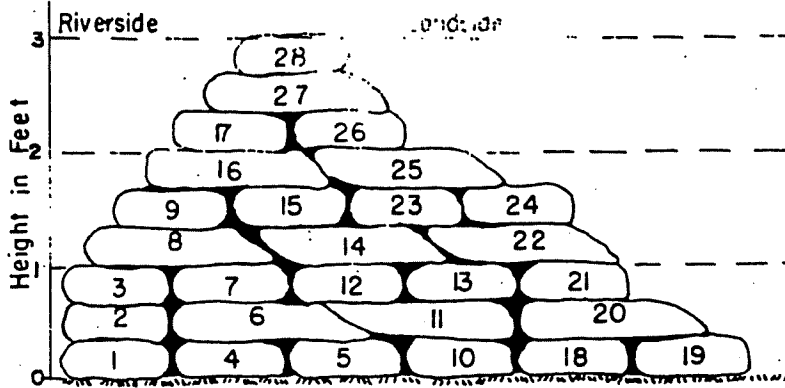
Lay lengths as required of cotton bagging approximately parallel with levee slope and across damaged section. Weight top and edges of bagging with filled sacks as shown above. The filled sacks should be wired or tied to each strip before laying in place. Stake the corners of each strip above water surface.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

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

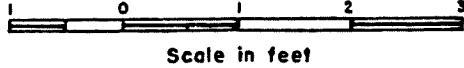
FLOOD EMERGENCY
CONSTRUCTION

WAVE WASH PROTECTION

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



SANDBAG LEVEE CROSS SECTION



NUMBER OF SANDBAGS

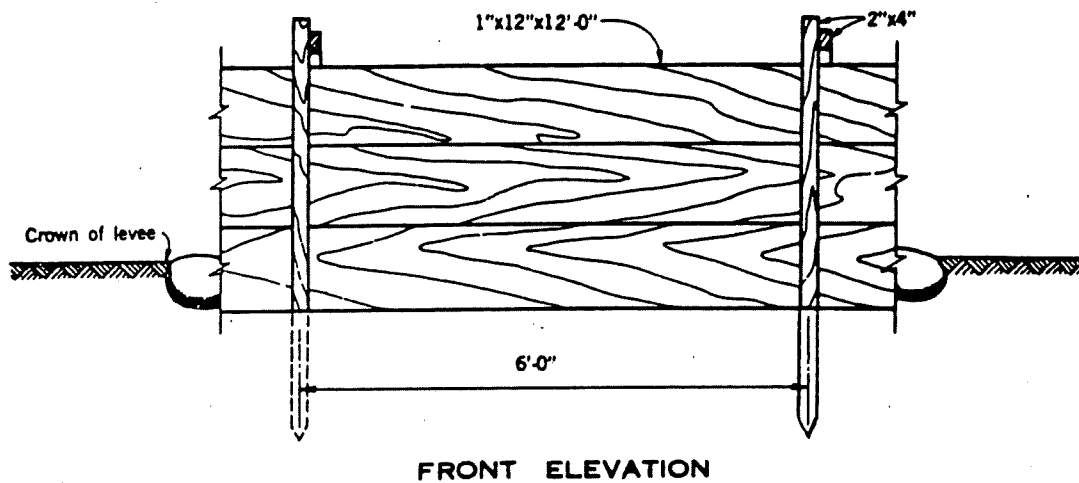
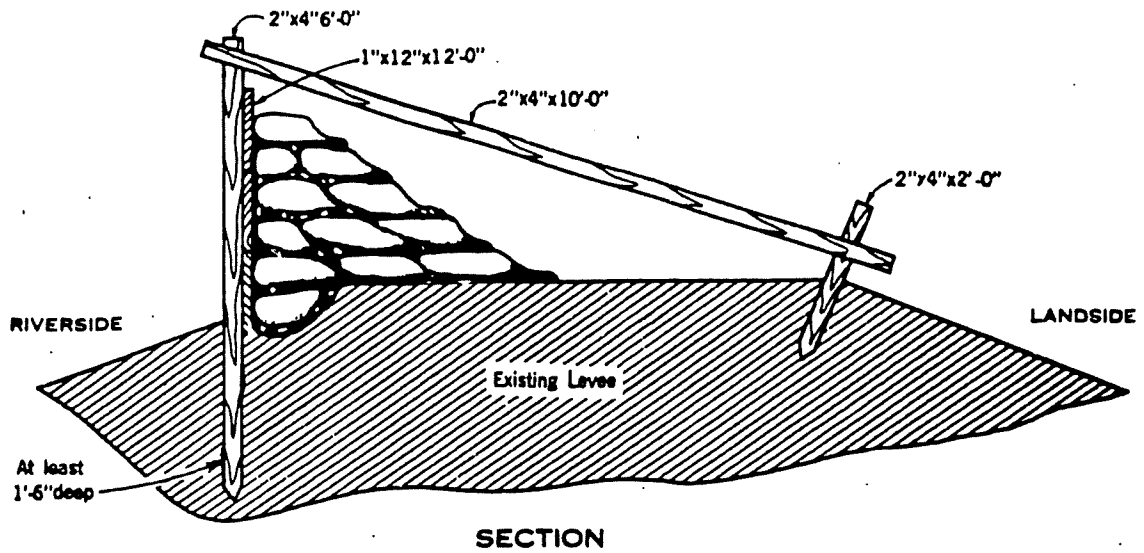
Notes:

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

**FLOOD EMERGENCY
CONSTRUCTION**

SACK TOPPING

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

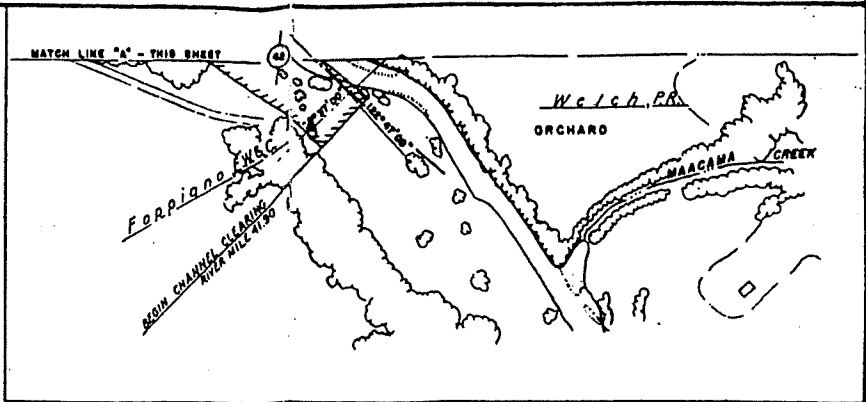
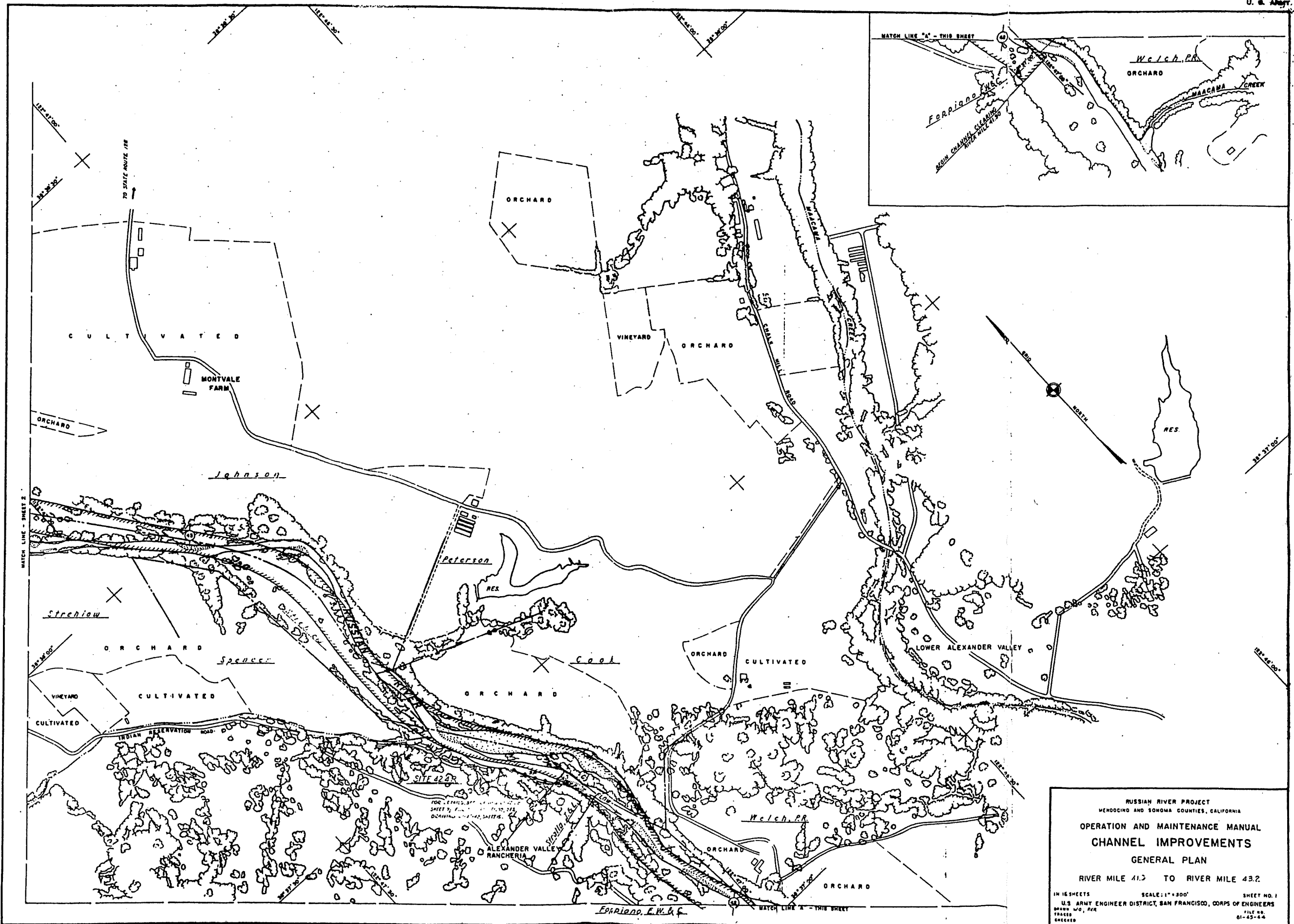


BILL OF MATERIAL FOR 100 LINEAR FEET OF LEVEE	
LUMBER	
25 pieces	1"x12"x12'-0"
17 pieces	2"x4"x10'-0"
* 17 pieces	2"x4"x6'-0"
* 17 pieces	2"x4"x2'-0"
* (Sharponod)	
NAILS	
1 lb.	8d nails
2 lbs.	16d nails
SANDBAGS	
1100	bags

FLOOD EMERGENCY
CONSTRUCTION

LUMBER AND SACK TOPPING

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

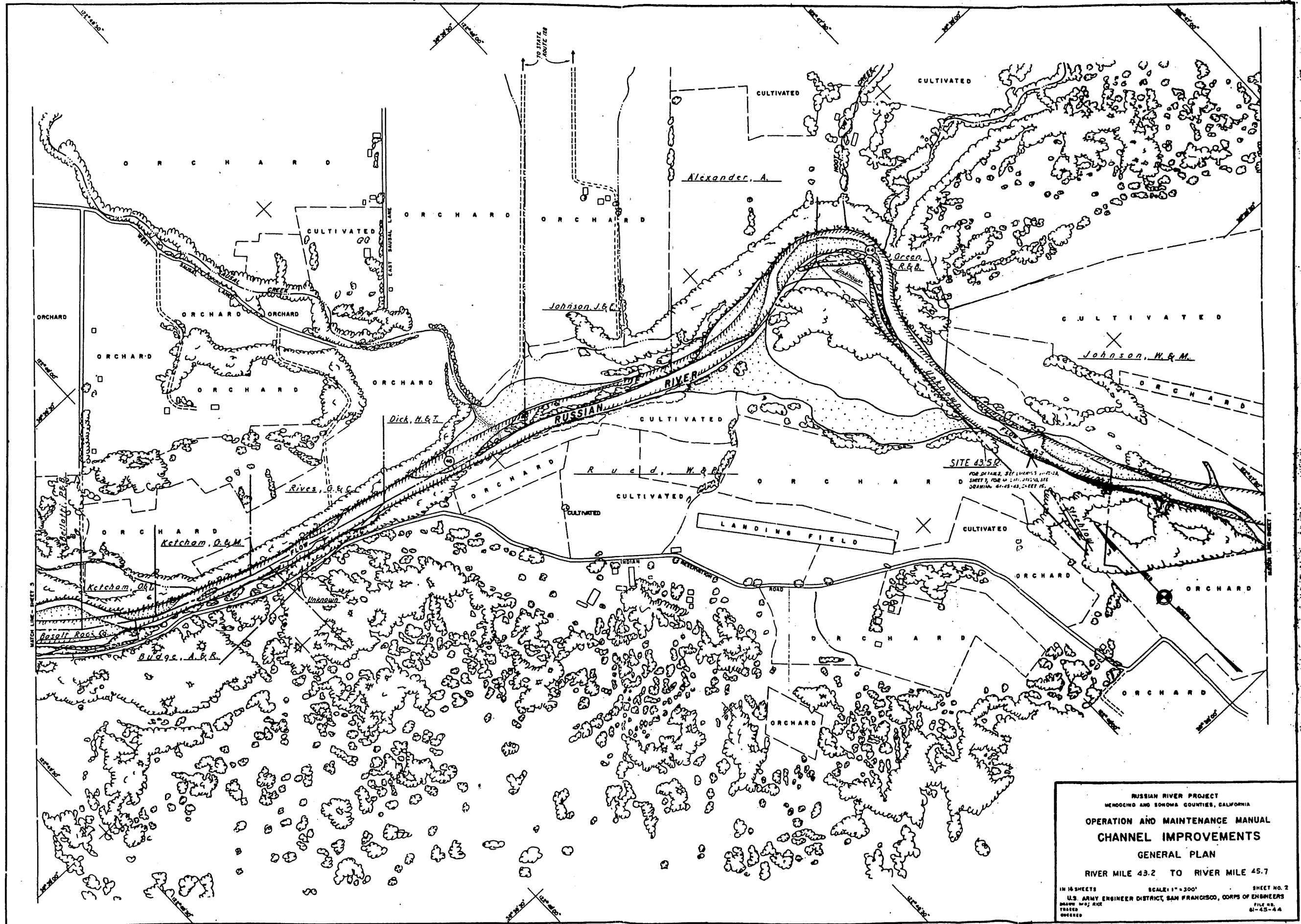


RUSSIAN RIVER PROJECT
 MENDOCINO AND SONOMA COUNTIES, CALIFORNIA
 OPERATION AND MAINTENANCE MANUAL
 CHANNEL IMPROVEMENTS
 GENERAL PLAN
 RIVER MILE 41.5 TO RIVER MILE 43.2

IN 16 SHEETS SCALE: 1" = 500' SHEET NO. 1
 U.S. ARMY ENGINEER DISTRICT, SAN FRANCISCO, CORPS OF ENGINEERS
 DRAWN: W.D., P.K. FILE NO. 61-627-A-4
 TRACED CHECKED

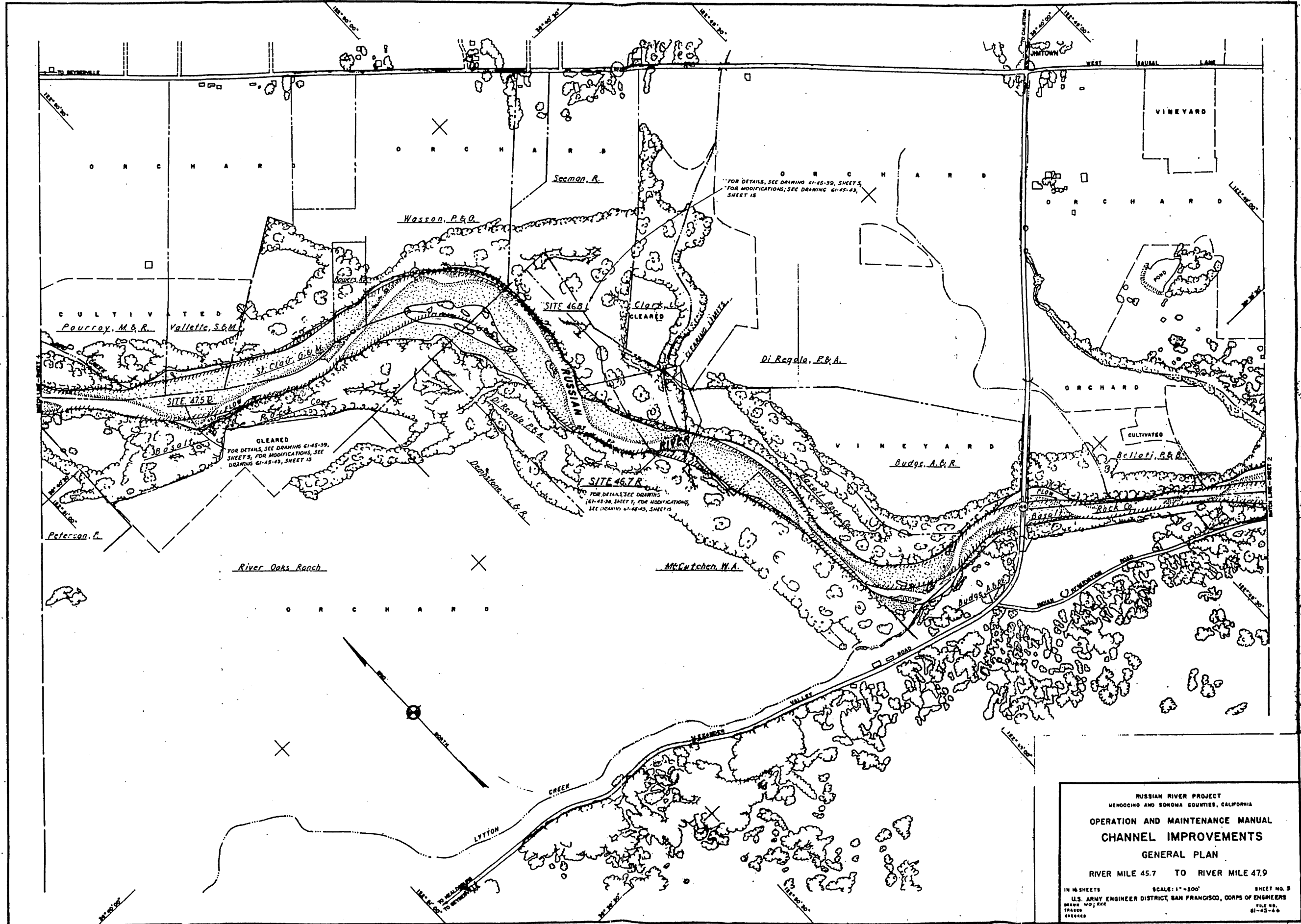
FOR DETAILS OF CHANNEL IMPROVEMENTS SEE SHEET 422 OF THIS DRAWING AND OTHER SHEETS.

Forriano, E.W. & C.

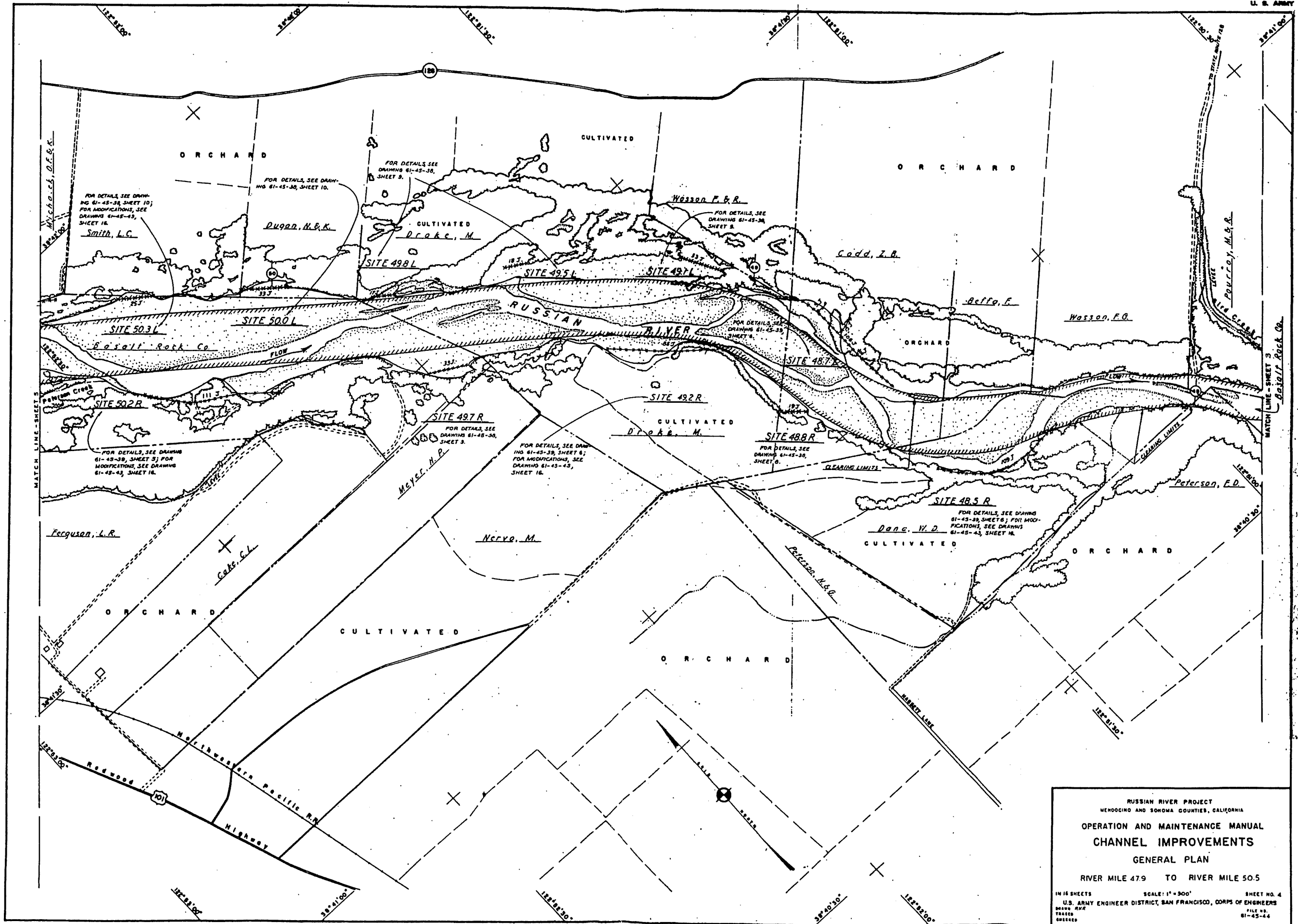


RUSSIAN RIVER PROJECT
 MENDOCINO AND SONOMA COUNTIES, CALIFORNIA
 OPERATION AND MAINTENANCE MANUAL
 CHANNEL IMPROVEMENTS
 GENERAL PLAN
 RIVER MILE 43.2 TO RIVER MILE 45.7

IN 16 SHEETS SCALE: 1" = 300' SHEET NO. 2
 U.S. ARMY ENGINEER DISTRICT, SAN FRANCISCO, CORPS OF ENGINEERS
 DRAWN BY: AUC FILE NO. 61-45-4A
 CHECKED: [Signature]

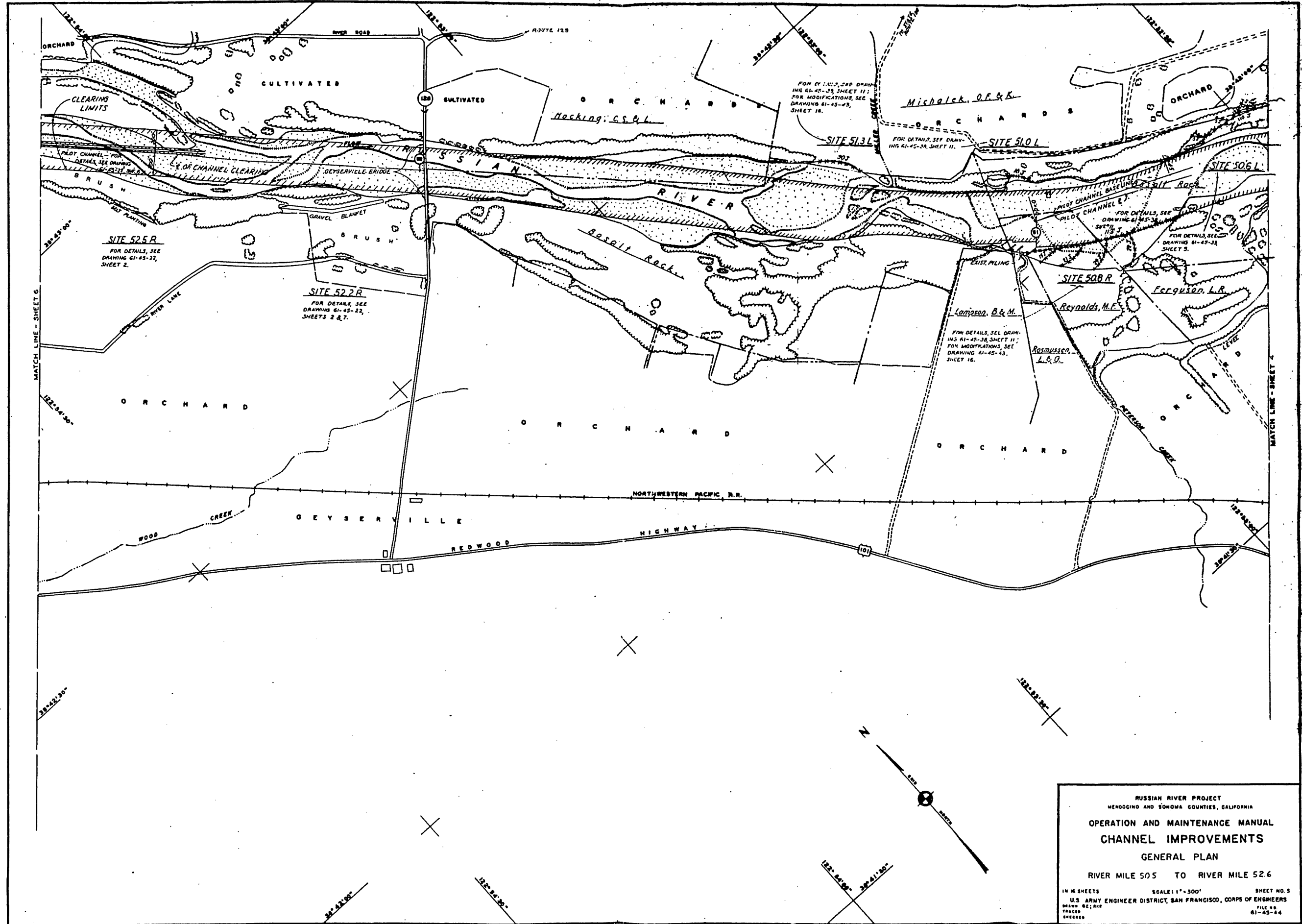


RUSSIAN RIVER PROJECT
 MENDOCINO AND SONOMA COUNTIES, CALIFORNIA
 OPERATION AND MAINTENANCE MANUAL
 CHANNEL IMPROVEMENTS
 GENERAL PLAN
 RIVER MILE 45.7 TO RIVER MILE 47.9
 IN 16 SHEETS SCALE: 1"=300' SHEET NO. 3
 U.S. ARMY ENGINEER DISTRICT, SAN FRANCISCO, CORPS OF ENGINEERS
 DRAWN: WDJ/SEE FILE NO. 61-45-26
 TRACED
 CHECKED



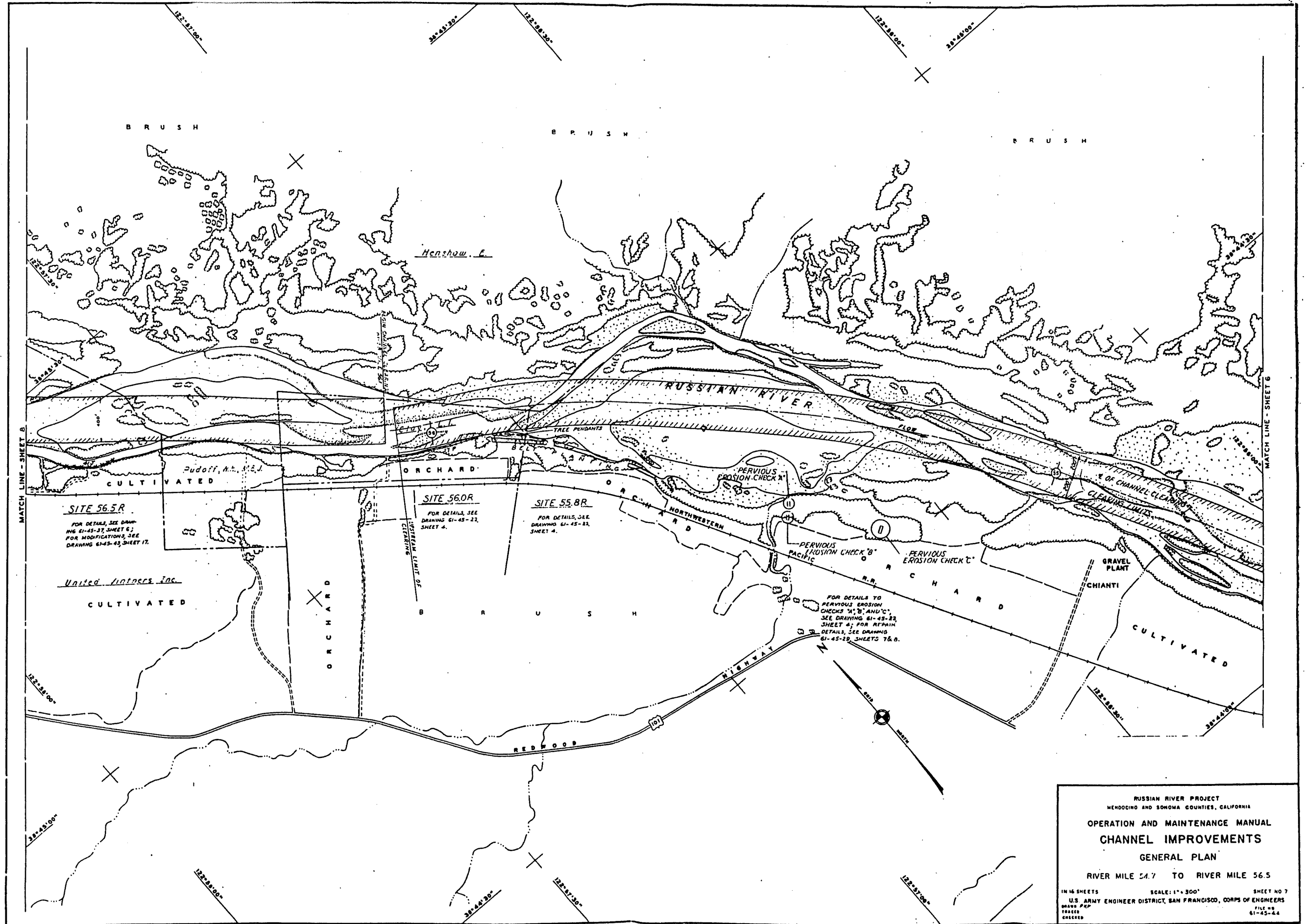
RUSSIAN RIVER PROJECT
 MENDOCINO AND SONOMA COUNTIES, CALIFORNIA
 OPERATION AND MAINTENANCE MANUAL
 CHANNEL IMPROVEMENTS
 GENERAL PLAN
 RIVER MILE 479 TO RIVER MILE 50.5

IN 18 SHEETS SCALE: 1" = 300' SHEET NO. 4
 U.S. ARMY ENGINEER DISTRICT, SAN FRANCISCO, CORPS OF ENGINEERS
 DRAWN: R.W.K. FILE NO. 61-45-44
 CHECKED: [Signature]



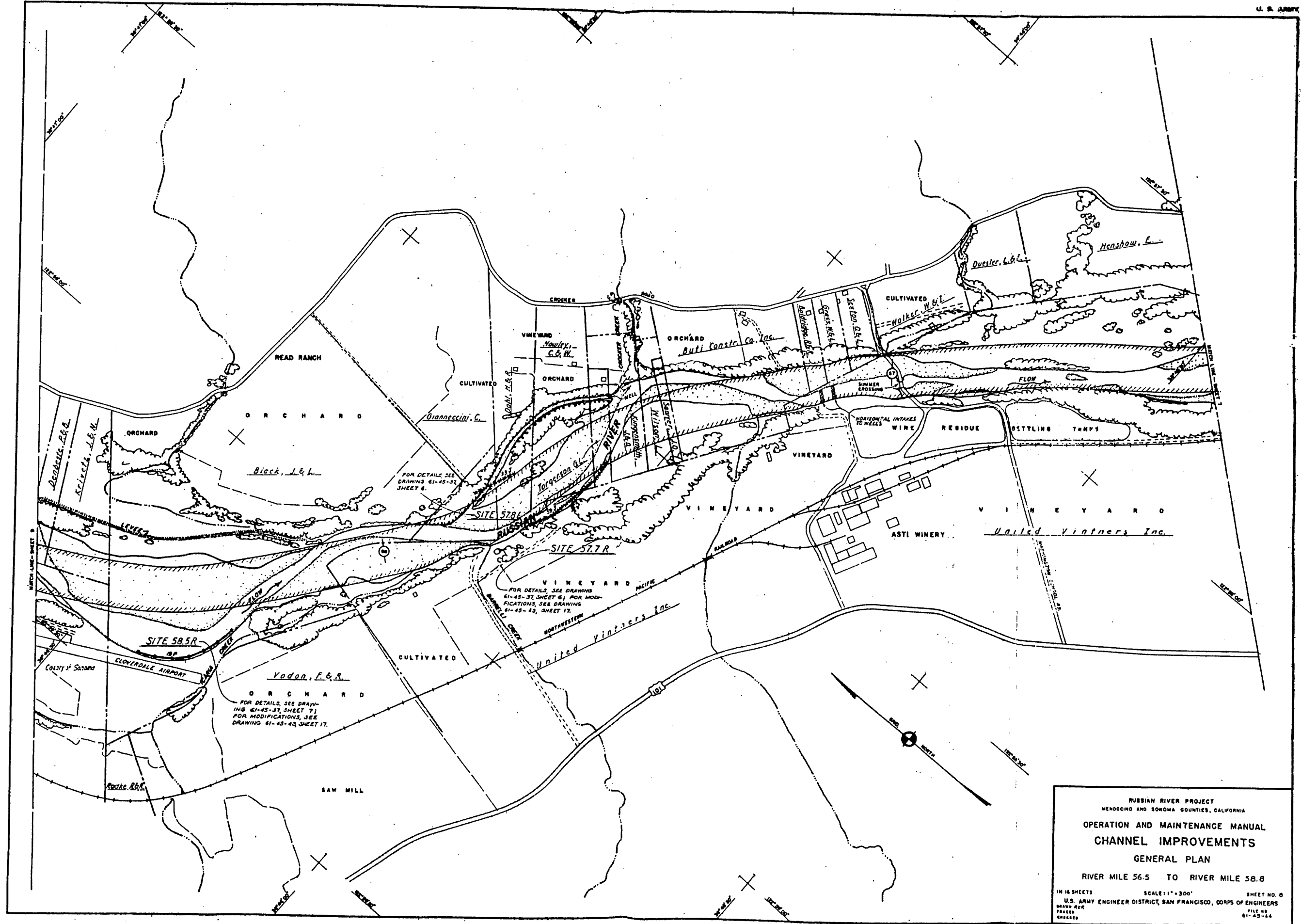
RUSSIAN RIVER PROJECT
 MENDOCINO AND SONOMA COUNTIES, CALIFORNIA
 OPERATION AND MAINTENANCE MANUAL
 CHANNEL IMPROVEMENTS
 GENERAL PLAN
 RIVER MILE 505 TO RIVER MILE 52.6

14 SHEETS
 U.S. ARMY ENGINEER DISTRICT, SAN FRANCISCO, CORPS OF ENGINEERS
 DRAWN BY: RAC
 CHECKED BY: RAC
 SCALE: 1" = 300'
 SHEET NO. 5
 FILE NO. 61-45-24



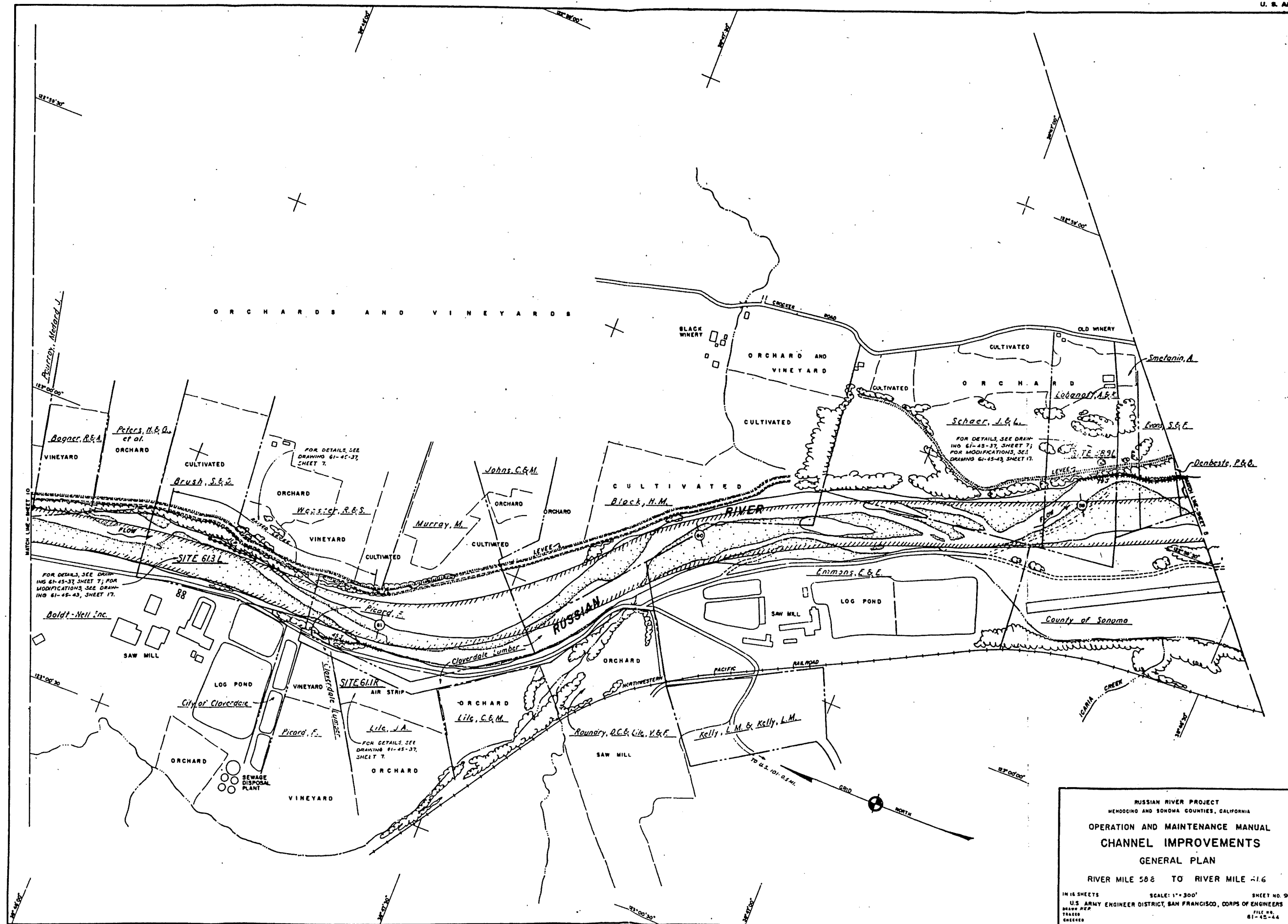
RUSSIAN RIVER PROJECT
 MENDOCINO AND SONOMA COUNTIES, CALIFORNIA
OPERATION AND MAINTENANCE MANUAL
CHANNEL IMPROVEMENTS
GENERAL PLAN
 RIVER MILE 54.7 TO RIVER MILE 56.5

IN 16 SHEETS SCALE: 1" = 300' SHEET NO. 7
 U.S. ARMY ENGINEER DISTRICT, SAN FRANCISCO, CORPS OF ENGINEERS
 DRAWN P.F.P. FILE NO.
 CHECKED 61-45-64



RUSSIAN RIVER PROJECT
 MENDOCINO AND SONOMA COUNTIES, CALIFORNIA
 OPERATION AND MAINTENANCE MANUAL
 CHANNEL IMPROVEMENTS
 GENERAL PLAN
 RIVER MILE 56.5 TO RIVER MILE 58.8

IN 16 SHEETS SCALE: 1" = 300' SHEET NO. 0
 U.S. ARMY ENGINEER DISTRICT, SAN FRANCISCO, CORPS OF ENGINEERS
 FILE NO. 61-45-44
 DRAWN RPK
 TRACED
 CHECKED



RUSSIAN RIVER PROJECT
 MENDOCINO AND SONOMA COUNTIES, CALIFORNIA
 OPERATION AND MAINTENANCE MANUAL
 CHANNEL IMPROVEMENTS
 GENERAL PLAN
 RIVER MILE 58.6 TO RIVER MILE 61.6

IN 16 SHEETS SCALE: 1" = 300' SHEET NO. 9
 U.S. ARMY ENGINEER DISTRICT, SAN FRANCISCO, CORPS OF ENGINEERS
 DRAWN BY: TALKER
 CHECKED: FILE NO. 61-45-44

LEGEND

Roads:

- Surfaced
- Dirt or Gravelled

Railroad

Intermittent Stream or Wash

Trees and Brush

Sand and Gravel Areas

Definite Bank Line:

- Open
- Overgrown

Pilot Channel

Anchor Site and Anchor

River Mile

Cable-Anchored Steel Jacks

- Type I Single Row
- Type II Double Row

Type III Previous Erosion Check

Type IV Flexible Fence

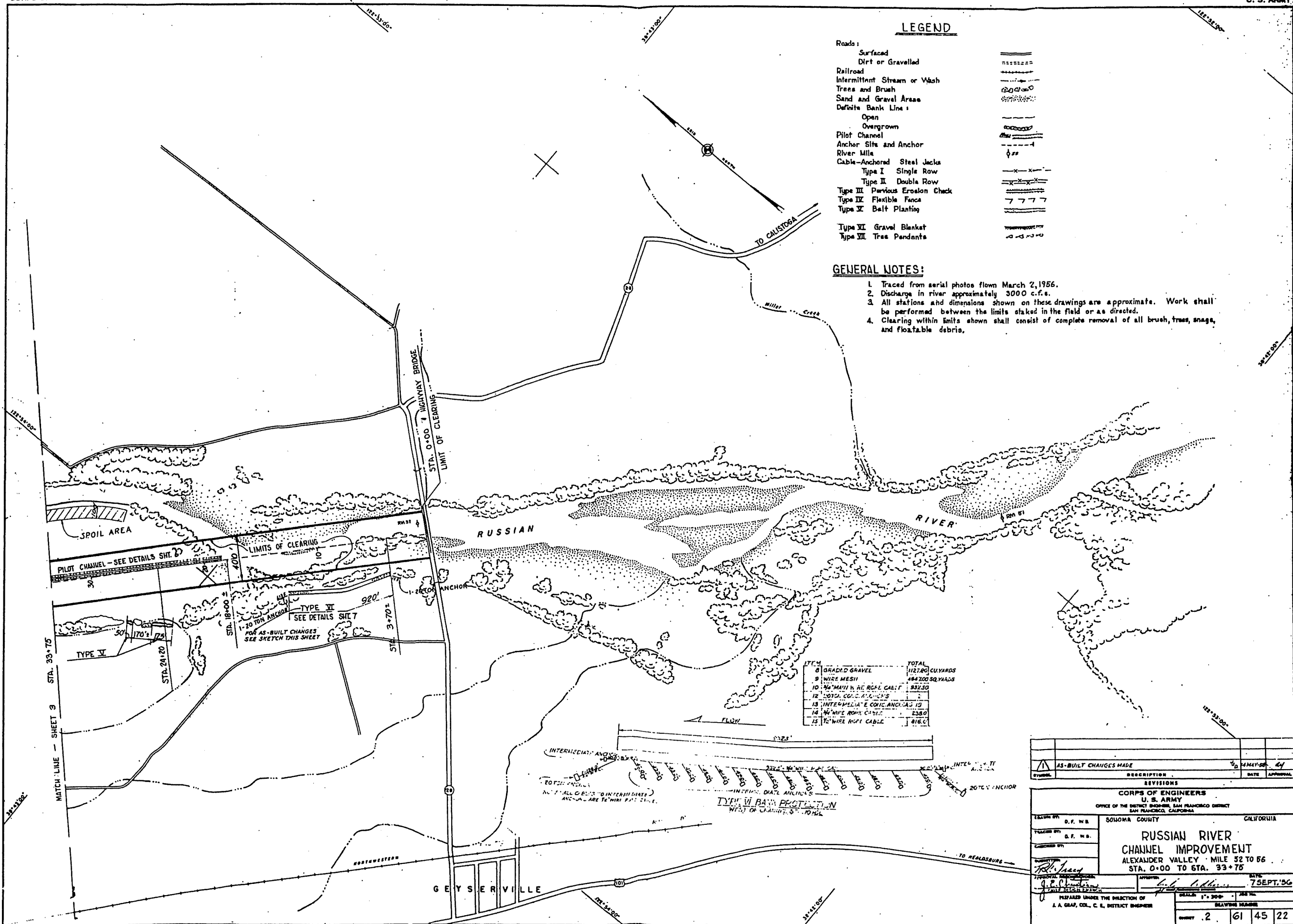
Type V Belt Planting

Type VI Gravel Blanket

Type VII Tree Pendants

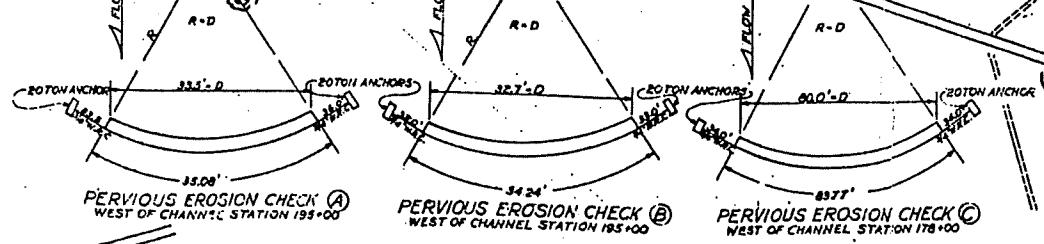
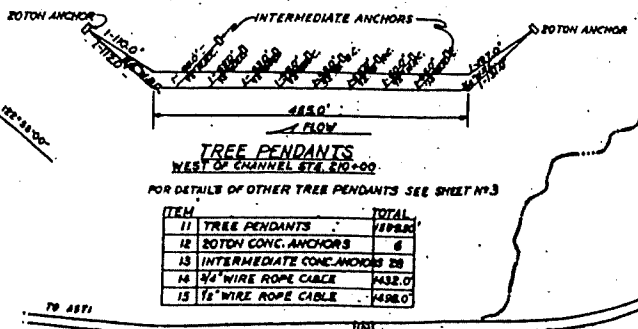
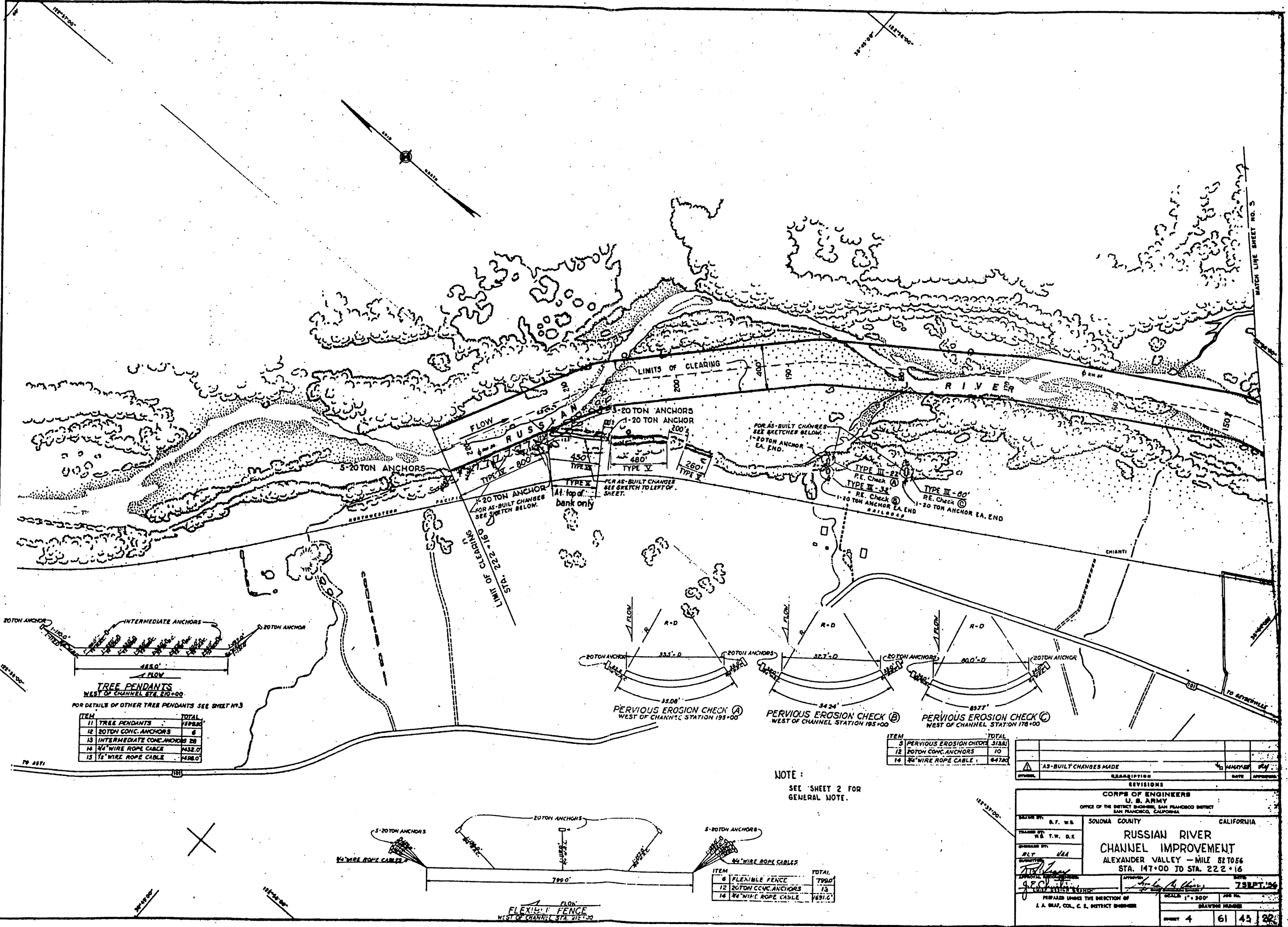
GENERAL NOTES:

1. Traced from aerial photos flown March 2, 1956.
2. Discharge in river approximately 3000 c.f.s.
3. All stations and dimensions shown on these drawings are approximate. Work shall be performed between the limits staked in the field or as directed.
4. Clearing within limits shown shall consist of complete removal of all brush, trees, snags, and floatable debris.



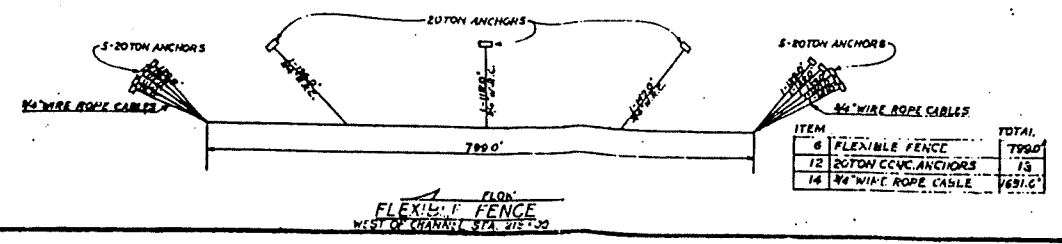
ITEM	TOTAL
6 GRADU'D GRAVEL	127.00 CUYARDS
9 WIRE MESH	484.200 SQ.YARDS
10 1/2" MESH W. RE. ROPE CABLE	832.50
12 TOTAL COILS 2" GALVANIZED	
13 INTERMEDIATE COILS GALVANIZED	
14 1/2" WIRE ROPE CABLE	238.0
15 1/2" WIRE ROPE CABLE	416.0

AS-BUILT CHANGES MADE		DATE	APPROVAL
REVISIONS			
CORPS OF ENGINEERS U. S. ARMY			
OFFICE OF THE DISTRICT ENGINEER, SAN FRANCISCO DISTRICT SAN FRANCISCO, CALIFORNIA			
ENGINEER	D. F. W.B.	SOLANO COUNTY	CALIFORNIA
TRACED BY	D. F. W.B.	RUSSIAN RIVER	
DESIGNED BY	CHANNEL IMPROVEMENT		
APPROVED	ALEXANDER VALLEY MILE 52 TO 56		
DATE	STA. 0+00 TO STA. 33+75		
PREPARED UNDER THE DIRECTION OF	SCALE	DATE	
A. A. GRAY, COL., C. E., DISTRICT ENGINEER	1" = 300'	7 SEPT. '56	
SHEET		2	61 45 22



ITEM	TOTAL
9 PERVIOUS EROSION CHECKS (318')	318'
12 20 TON CONC. ANCHORS	10
14 3/4" WIRE ROPE CABLE	647.2'

NOTE:
SEE SHEET 2 FOR
GENERAL NOTE.



REVISIONS	
NO.	DESCRIPTION

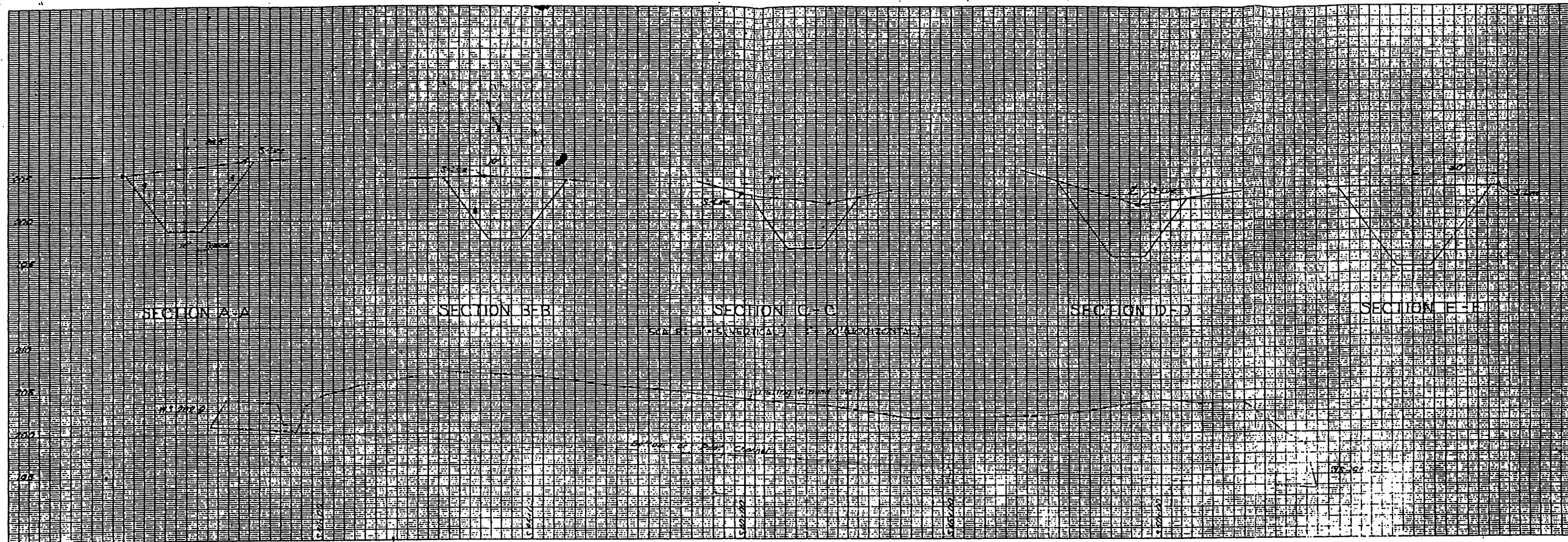
AS-BUILT CHANGES MADE

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

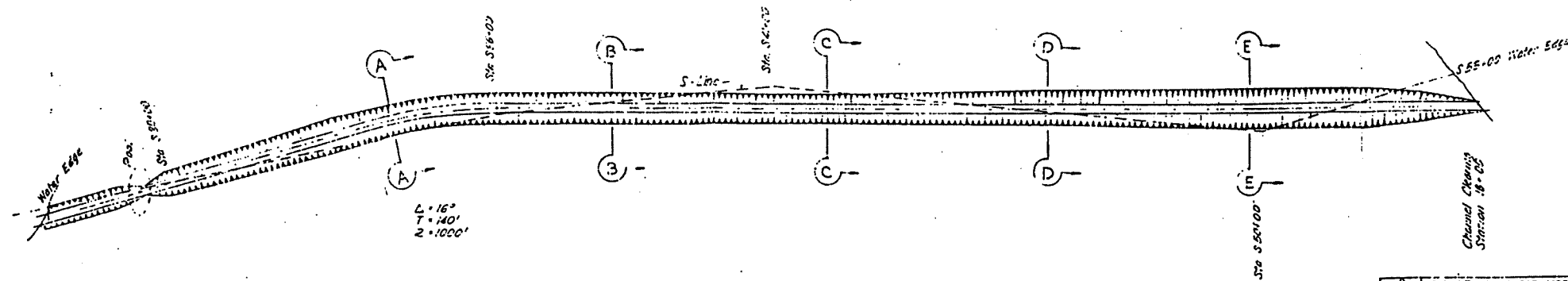
DESIGNED BY: R.F. W.B.
DRAWN BY: W.A. T.W. D.K.
CHECKED BY: R.L.T.
DATE: 7 SEP 26

RUSSIAN RIVER
CHANNEL IMPROVEMENT
ALEXANDER VALLEY - MILE 82.056
STA. 147+00 TO STA. 222+16

SCALE: 1" = 200'
SHEET 4 OF 61 45 22



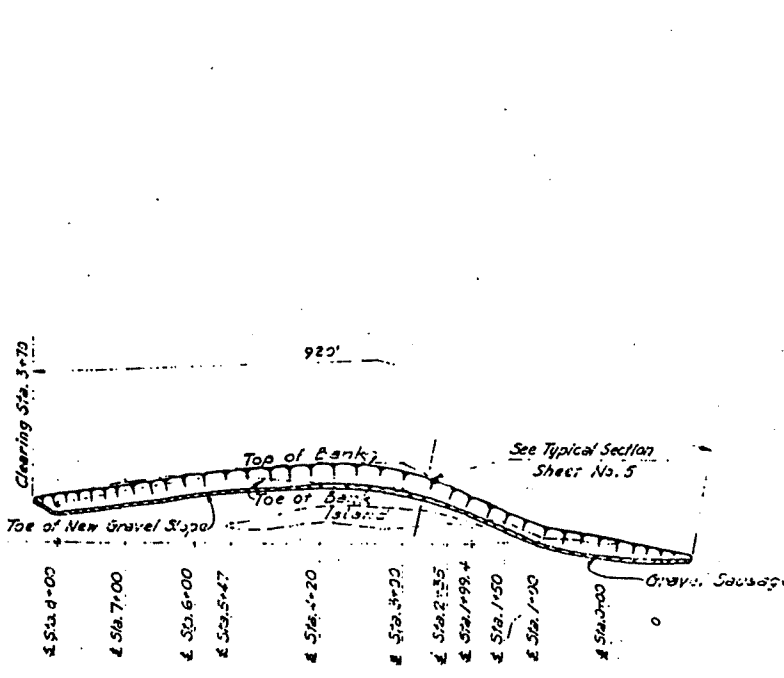
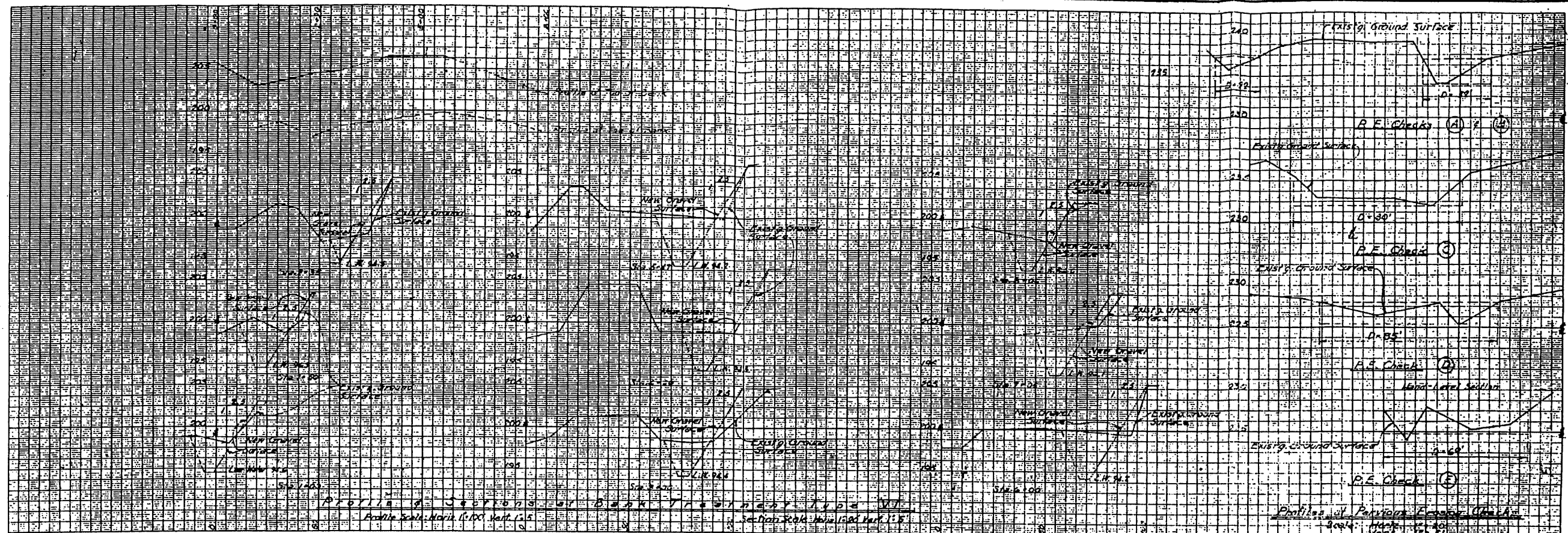
PROFILE ON S-LINE
 SCALE: 1" = 5' VERTICAL
 SCALE: 1" = 100' HORIZONTAL



PLAN
 SCALE: 1" = 100.0'

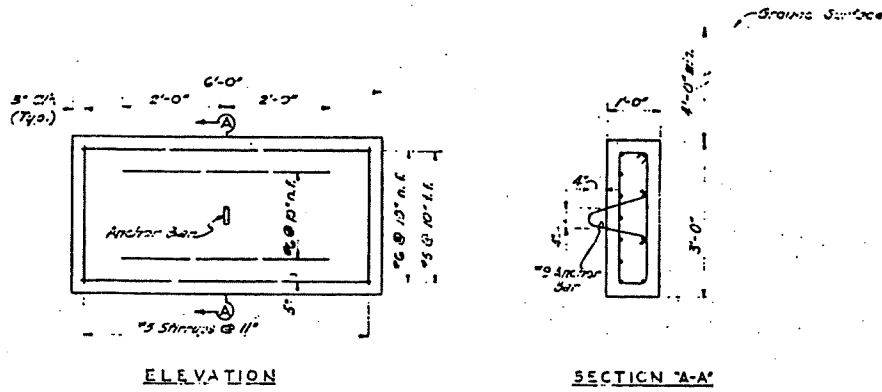
Notes:
 Surveyed by the Corps of Engineers, 13-17 Aug. & 4-11 Sept. 1956.
 Elevations based on Datum of Mean Sea Level. Referenced Bench Marks are taken from 115' of GS line at 1943 entitled 'Iris' to Collet 1226.

AS-BUILT NO CHANGES MADE		DATE	APPROVAL
SYMBOL	DESCRIPTION	DATE	APPROVAL
CORPS OF ENGINEERS U.S. ARMY OFFICE OF THE DISTRICT ENGINEER, SAN FRANCISCO DISTRICT SAN FRANCISCO, CALIFORNIA			
DRAWN BY	SONOMA COUNTY CALIFORNIA		
TRACED BY	RUSSIAN RIVER CHANNEL IMPROVEMENT ALEXANDER VALLEY - MILE 52 TO 56 PILOT CHANNEL - STA. 18+00-44+60		
CHECKED BY			
DATE			
APPROVED			
SCALE			
J. A. GRAF, CO., C.E., DISTRICT ENGINEER		61	45

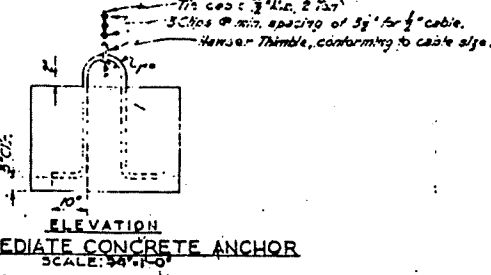
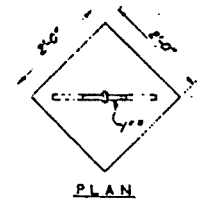


PLAN OF BANK TREATMENT TYPE VI
SCALE: 1"=100'

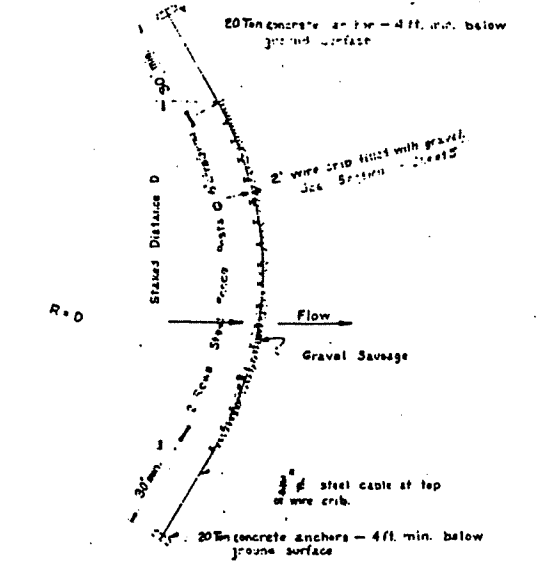
Notes:
 Surveyed by the Corps of Engineers, 13-17 Aug. & 4-11 Sept. 1956.
 Elevations based on Datum of Mean Sea Level. Reference Bench
 Marks are taken from USC of GS line of levels entitled 'Lines to
 Golden Gate.'



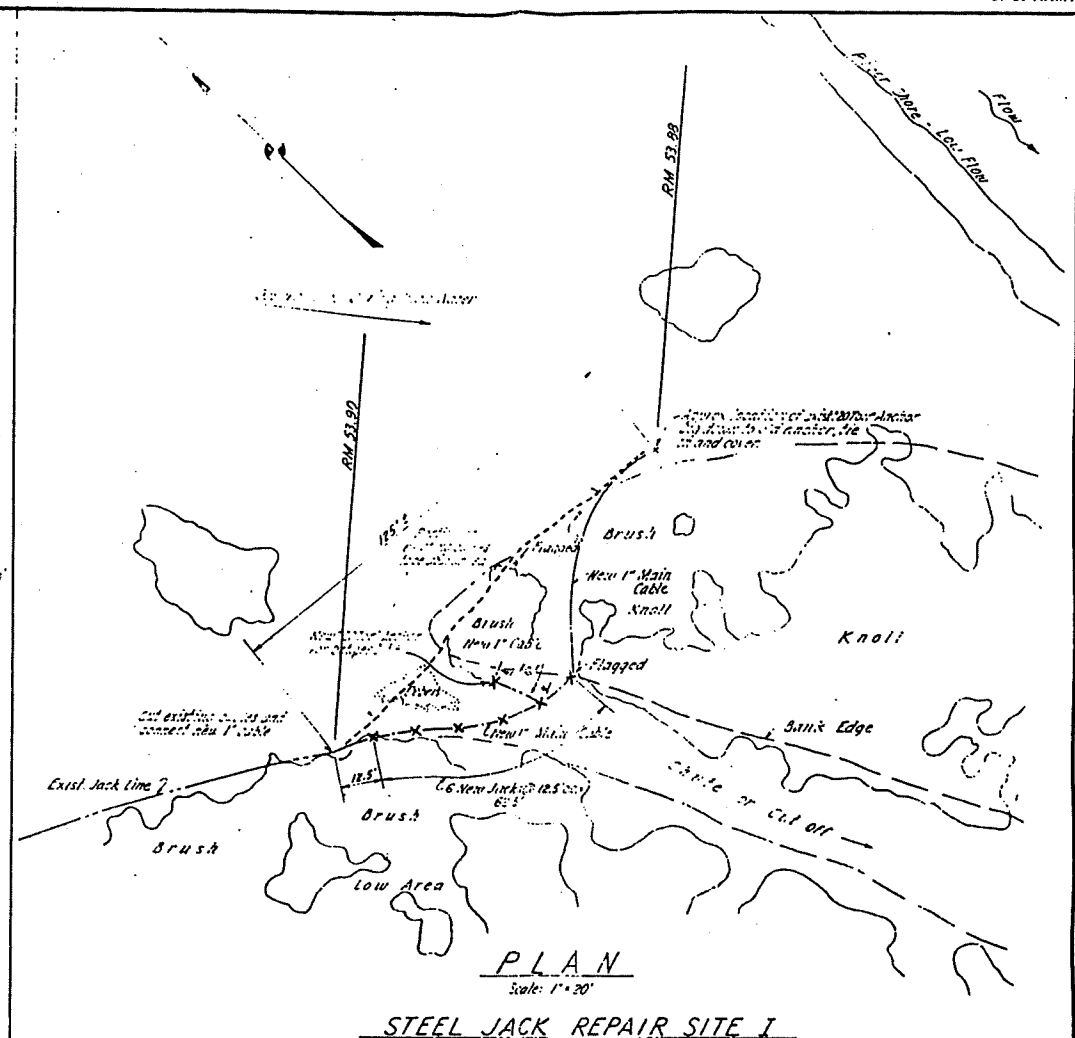
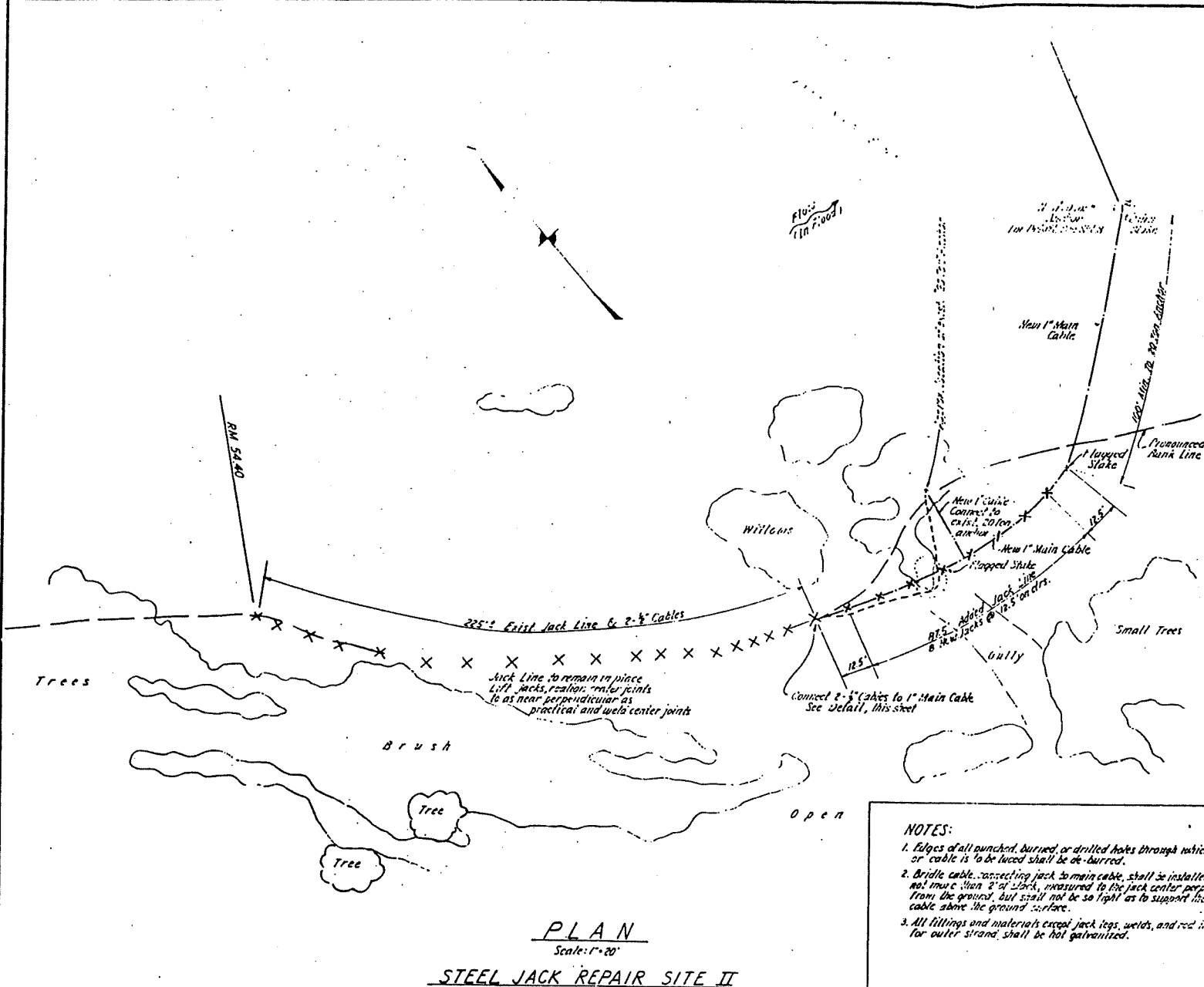
DETAIL - 20-TON ANCHOR
SCALE: 1/2"=1'-0"



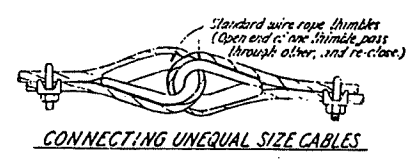
INTERMEDIATE CONCRETE ANCHOR
SCALE: 3/8"=1'-0"



TYPICAL PLAN PERIODIC EROSION CHECKS SCALE: 1"=20'			
AS-BUILT	DATE	BY	CHKD
CABLE STAYS PLACED	10/1/56	A.A.K.	A.C.C.
REVISED SURVEY LINES	10/1/56	A.A.K.	A.C.C.
SHEET	76	DATE	10/1/56
CORPS OF ENGINEERS U.S. ARMY OFFICE OF THE DISTRICT ENGINEER, SAN FRANCISCO DISTRICT SAN FRANCISCO, CALIFORNIA			
DESIGN BY	10/1/56	CALIFORNIA	A
TRACED BY	10/1/56	RUSSIAN RIVER CHANNEL IMPROVEMENT - ALEXANDER VALLEY-MILE 52 TO 56	
DESIGNED BY	10/1/56	SECTIONS FOR TYPE VII & TYPE III TREATMENTS	
APPROVED BY	10/1/56	DATE	7 SEPT. '56
PREPARED UNDER THE DIRECTION OF DISTRICT ENGINEER			
SHEET NO.		76	
DRAWING NUMBER		61-45-22	



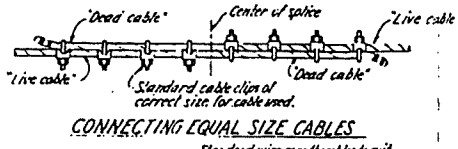
- NOTES:**
1. Edges of all punched, burned, or drilled holes through which wire or cable is to be laced shall be de-burred.
 2. Bridle cable, connecting jack to main cable, shall be installed with not more than 2" of slack, measured to the jack center perpendicular from the ground, but shall not be so tight as to support the main cable above the ground surface.
 3. All fittings and materials except jack legs, welds, and rod if used for outer strand, shall be hot galvanized.



MINIMUM NO. OF WIRE ROPE CLIPS TO DEVELOP 80% OF CABLE STRENGTH

Dim. of Rope	No. of Clips	Space between Clips
1/2" to 3/4"	2	33"
7/8" thru 1"	3	33"
1 1/8"	4	41"
1 1/2"	4	51"
1 3/4"	5	61"

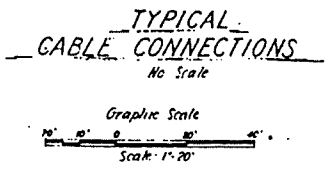
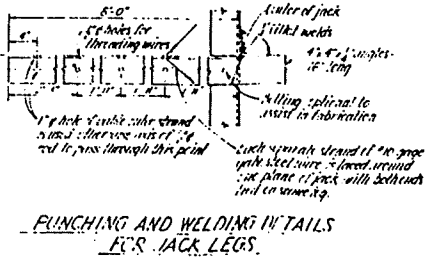
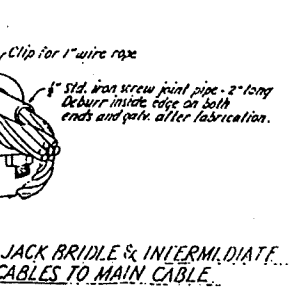
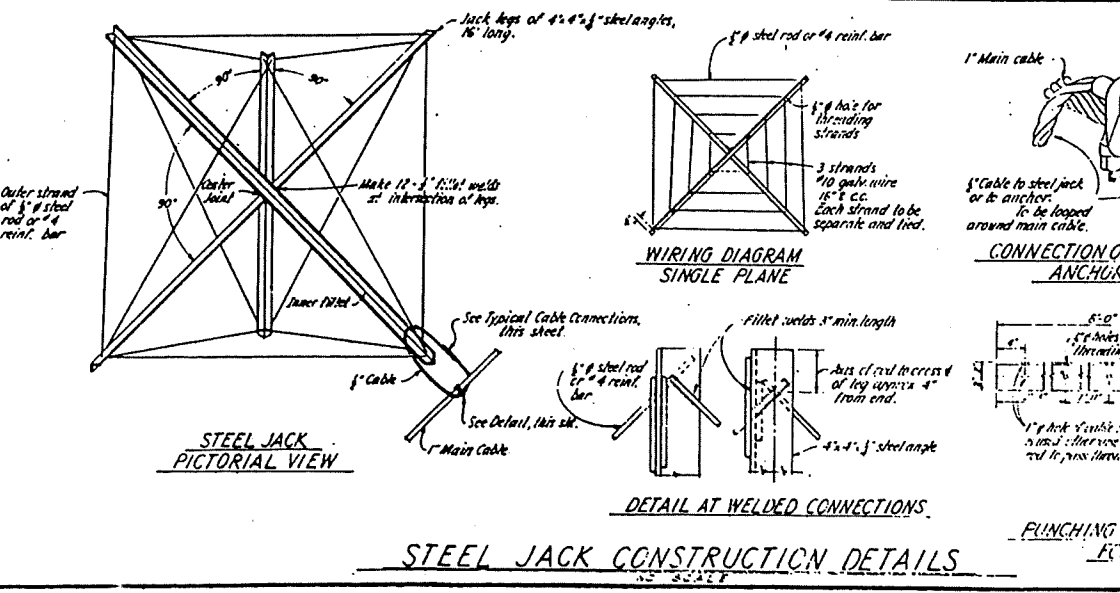
Torquing of nuts to be as recommended by clip manufacturer.



GENERAL NOTE:
All cable clips to be installed with "U" bolt portion around dead cable and, after installation, to have threads ballered or bolt ends upset to prevent unauthorized removal.



NO.	DESCRIPTION	DATE	APPROVAL



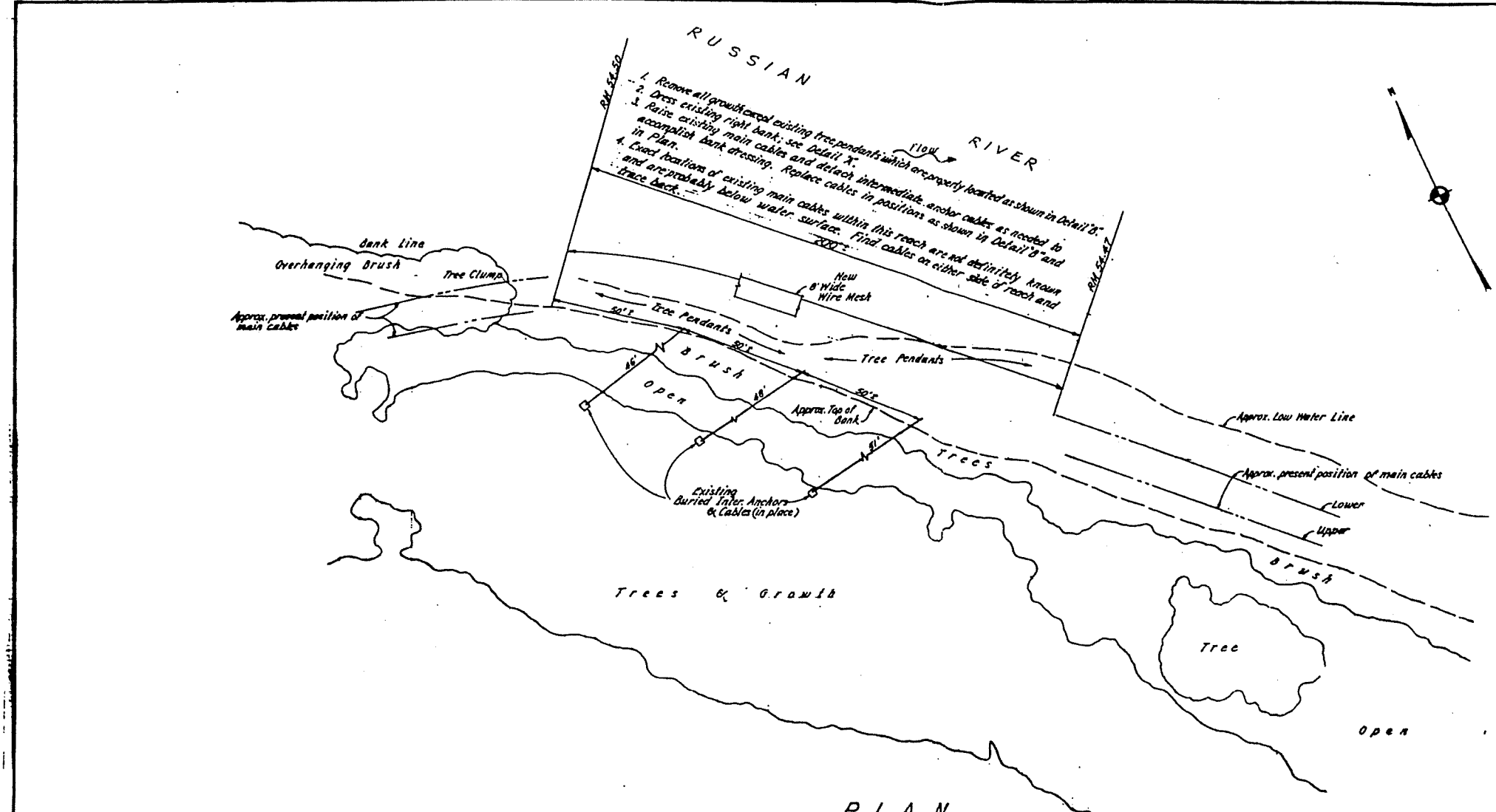
U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO
CORPS OF ENGINEERS
SAN FRANCISCO, CALIFORNIA

SONOMA COUNTY CALIFORNIA
RUSSIAN RIVER
RESTORATION OF CHANNEL IMPROVEMENTS
STEEL JACK REPAIR
SITE PLANS & CONSTRUCTION DETAILS

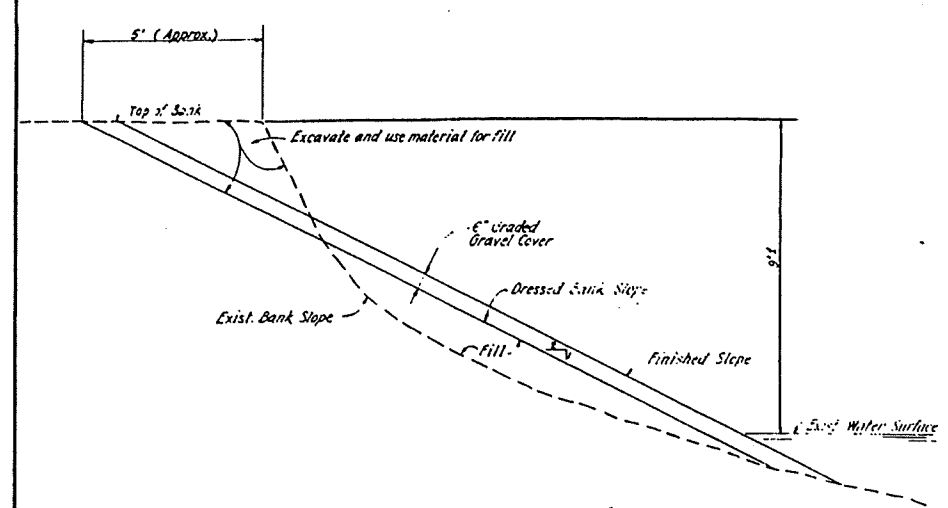
APPROVED: *[Signature]* DATE: 15 AUG '60

PREPARED UNDER THE DIRECTION OF
John A. Morrissey
COLONEL, C.E., DISTRICT ENGINEER

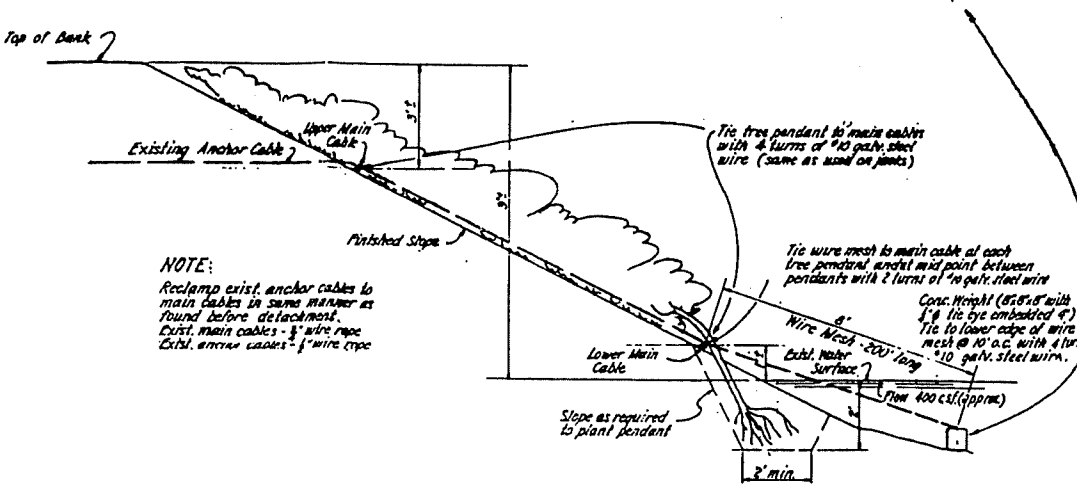
SCALE: As Shown
DRAWING NUMBER: SHEET 5 61 45 29



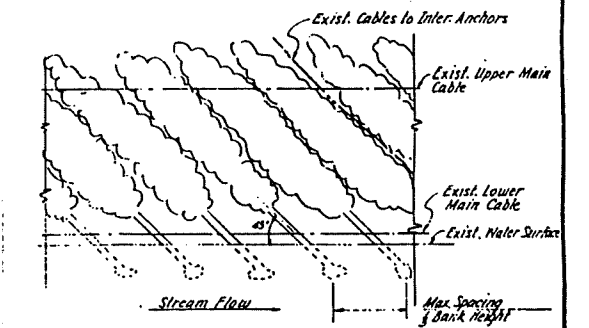
PLAN
Scale: 1" = 20'



DETAIL 'A'
Scale: 1" = 2'



DETAIL 'B'
Scale: 1" = 2'



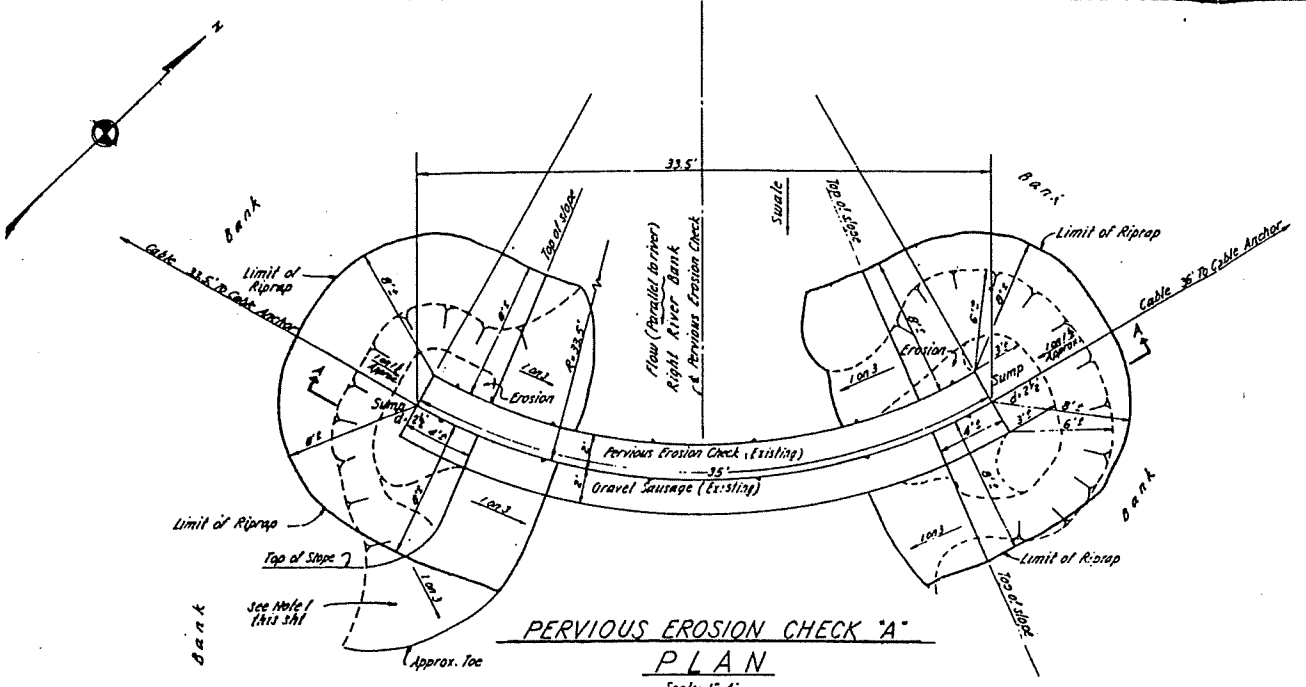
ELEVATION
No Scale
(Typical - Showing angle between stream flow and tree pendants.)

NOTE:
Reclamp exist. anchor cables to main cables in same manner as found before detachment.
Exist. main cables - 3/4" wire rope
Exist. anchor cables - 1/2" wire rope

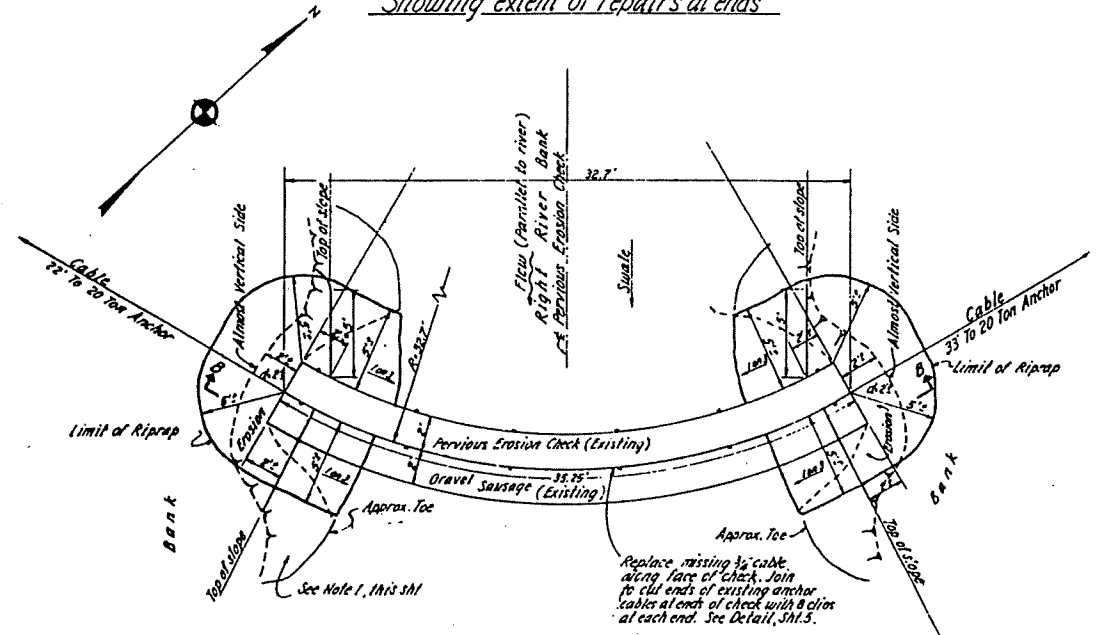
Tie tree pendant to main cables with 4 turns of 1/4" galv. steel wire (same as used on piers)
Tie wire mesh to main cable at each tree pendant about mid point between pendants with 2 turns of 1/4" galv. steel wire
Cable Weight (8" x 8" with 1/8" tie eye embedded 4")
Tie to lower edge of wire mesh @ 10' o.c. with 4 turns 10 galv. steel wire.
From 400 csl. (approx.)
2" min.

REVISIONS		DATE	APPROVAL
AS CONSTRUCTED - NO CHANGES		JR 3 Apr 61	
SLIDED NOTE AS INDICATED		01 2 Sep 60	JEC

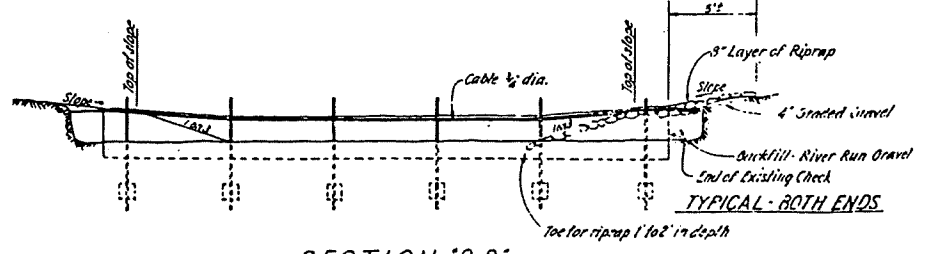
DRAWN BY: <i>[Signature]</i>		SONOMA COUNTY CALIFORNIA	
CHECKED BY: <i>[Signature]</i>		RESTORATION OF CHANNEL IMPROVEMENTS	
APPROVED: <i>[Signature]</i>		TREE PENDANT REPAIR PLAN & DETAILS	
DATE: 15 AUG '60		DRAWING NUMBER: 61 45 29	
PREPARED UNDER THE DIRECTION OF: John A. Morrison		SCALE: AS SHOWN	
COLONEL, C.E., DISTRICT ENGINEER		SHEET 6	



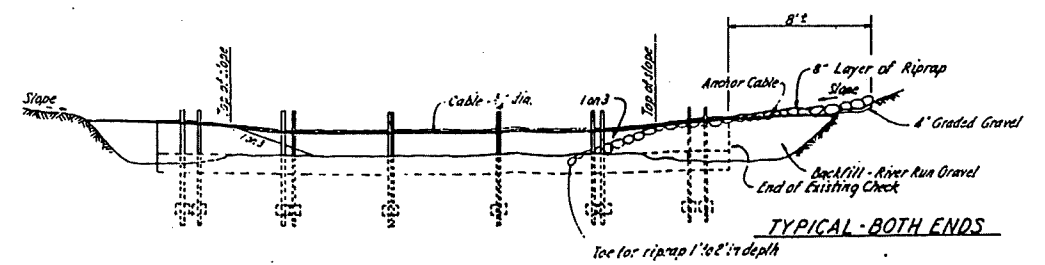
PERVIOUS EROSION CHECK "A"
PLAN
 Scale: 1" = 4'
 Showing extent of repairs at ends



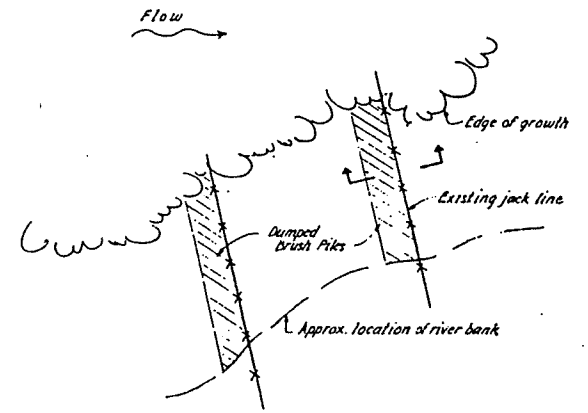
PERVIOUS EROSION CHECK "B"
PLAN
 Scale: 1" = 4'
 Showing extent of repairs at ends



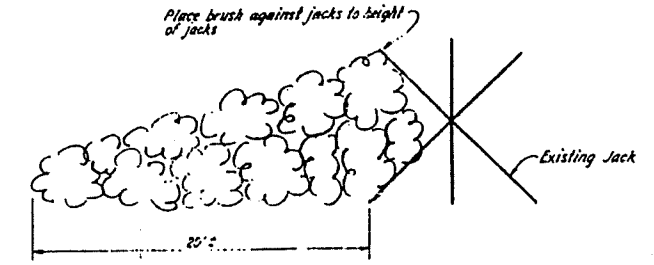
SECTION "B-B"
 Scale: 1" = 4'



SECTION "A-A"
 Scale: 1" = 4'



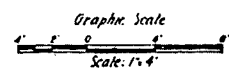
PLAN



TYPICAL SECTION

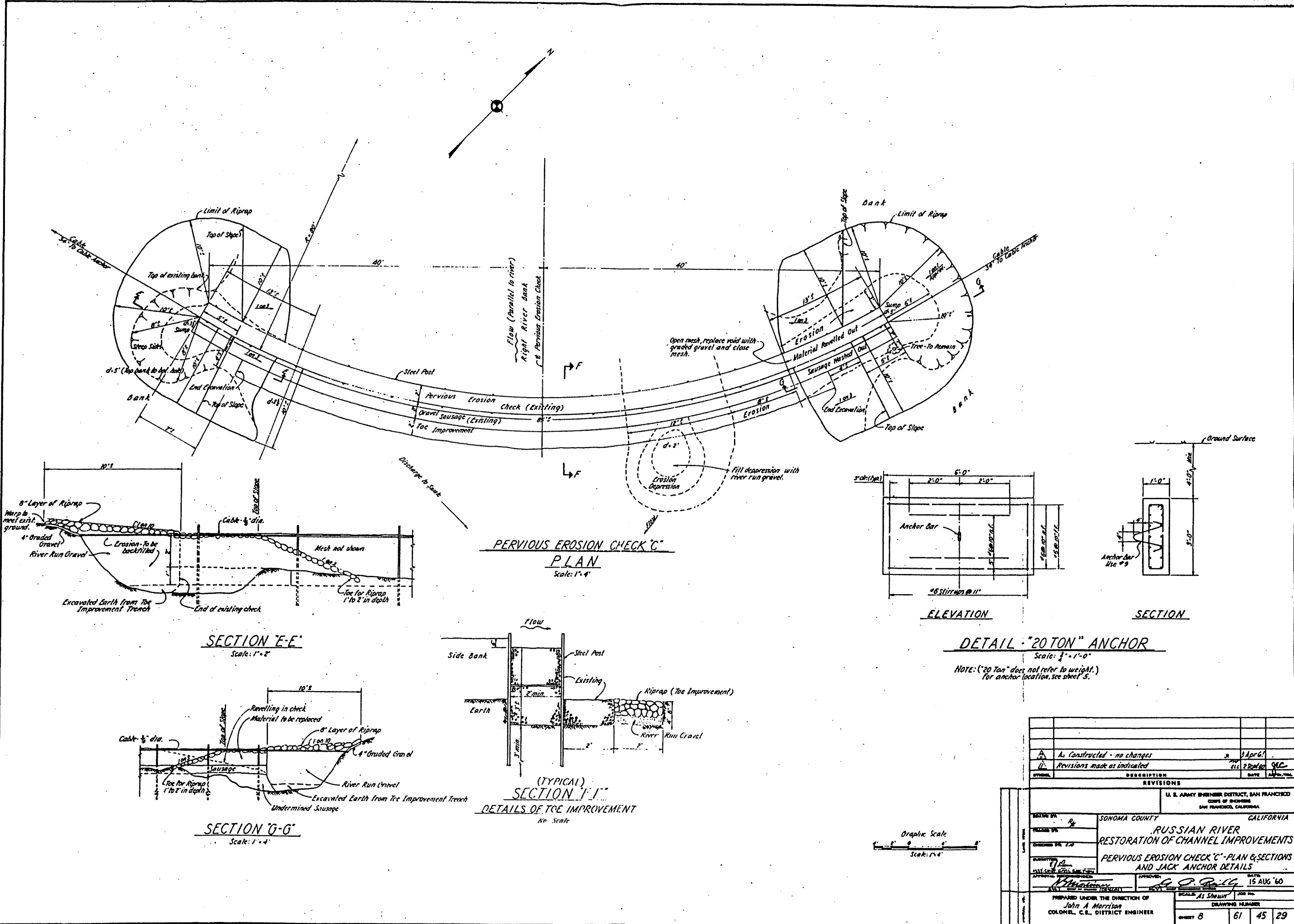
DETAIL - DUMPED BRUSH PILES
 No Scale

Notes:
 1. All grade repairs to conform to existing bank.



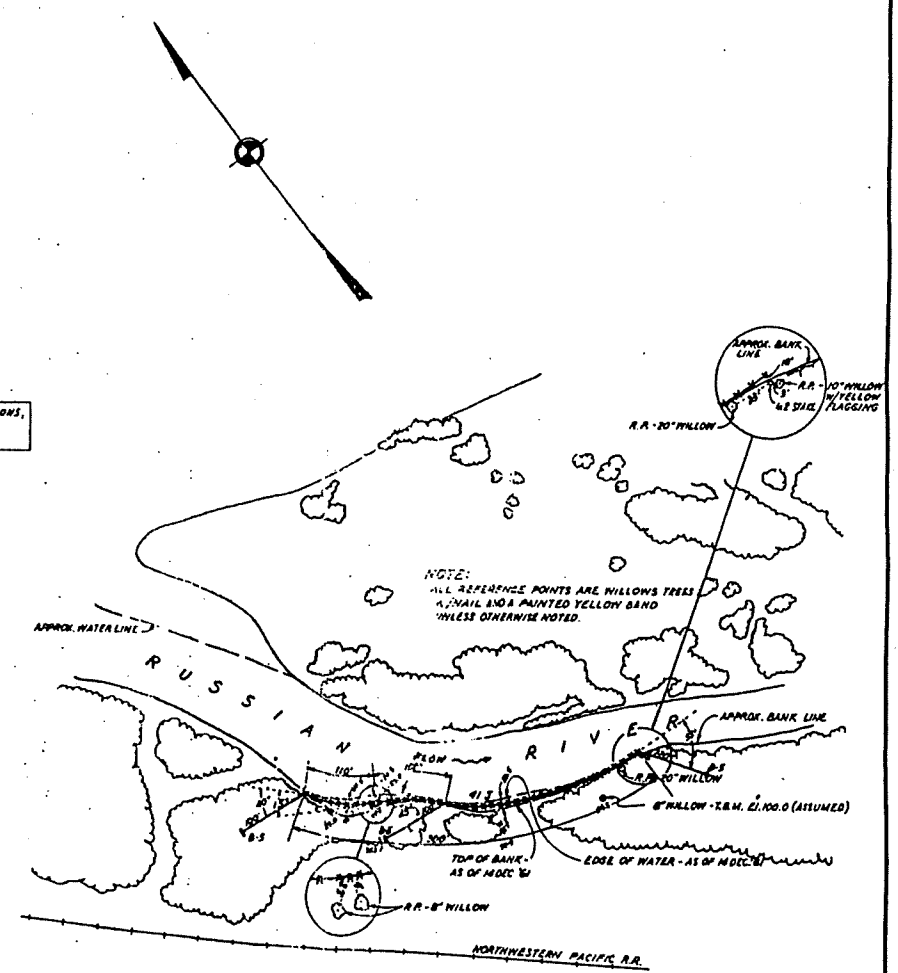
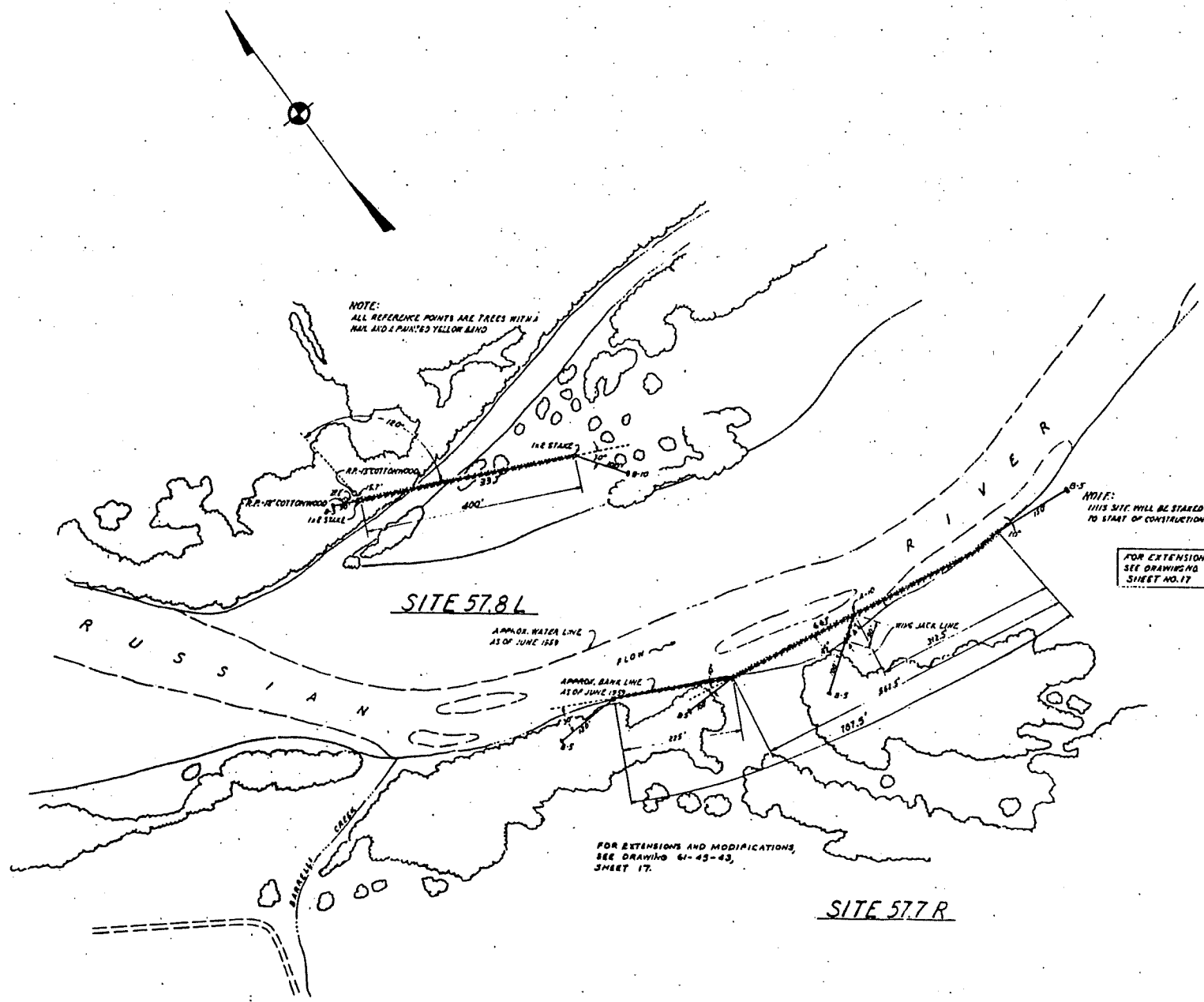
REVISIONS	
NO.	DESCRIPTION

U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO SAN FRANCISCO, CALIFORNIA	
DRAWN BY: <i> </i>	SONOMA COUNTY CALIFORNIA
CHECKED BY: <i> </i>	RUSSIAN RIVER
DESIGNED BY: <i> </i>	RESTORATION OF CHANNEL IMPROVEMENTS
APPROVED BY: <i> </i>	PERVIOUS EROSION CHECKS "A" & "B"
DATE: <i> </i>	PLANS & SECTIONS
APPROVED: <i> </i>	DATE: 15 AUG '60
PREPARED UNDER THE DIRECTION OF John A. Morrison COLONEL, C. E., DISTRICT ENGINEER	SCALE: As Shown DRAWING NUMBER: 61 45 29 SHEET 7



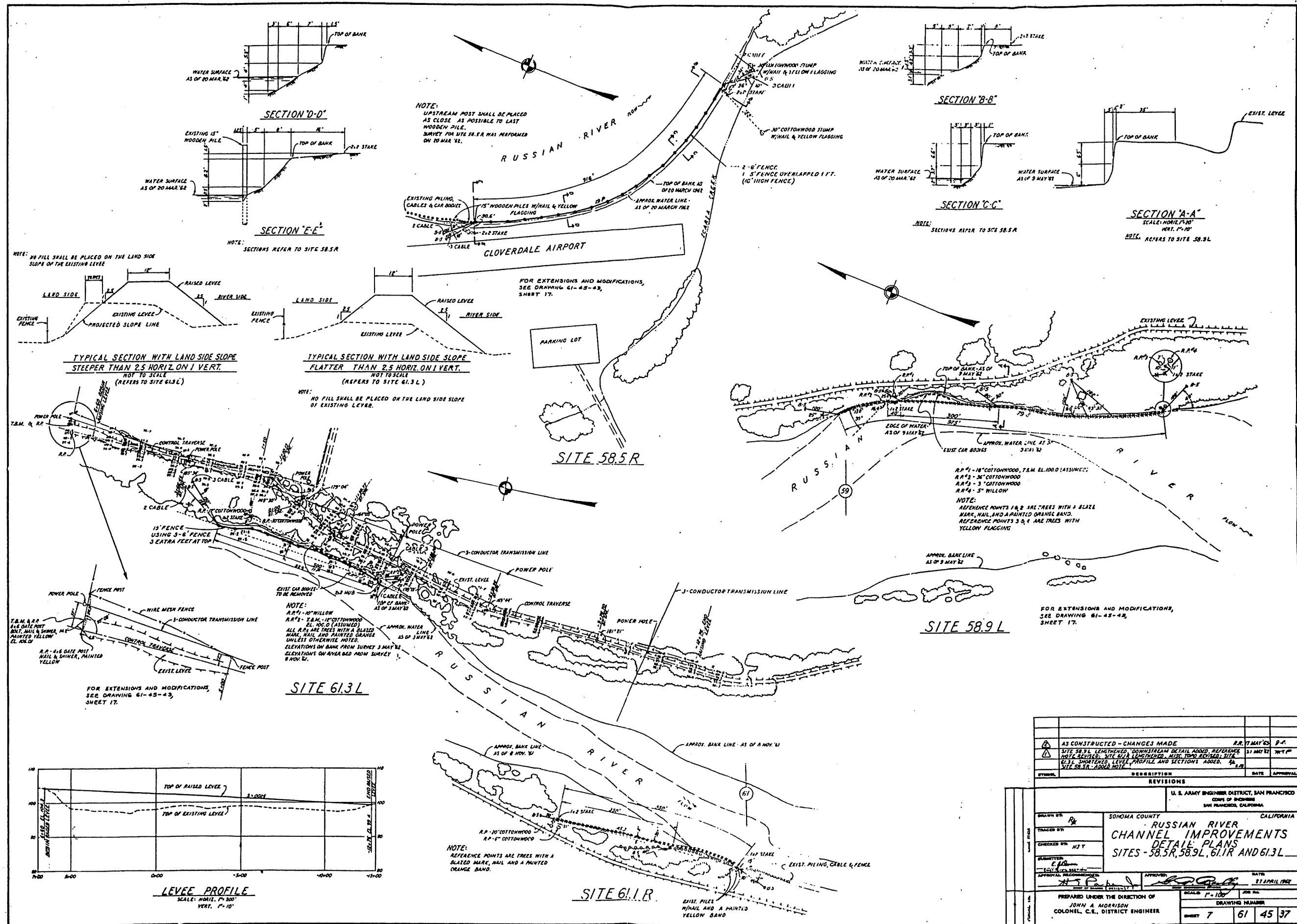
REVISIONS			
NO.	DESCRIPTION	DATE	APP. NAME
1	As Constructed - no changes	3 April 61	
2	Revisions made as indicated	15 Aug 60	

U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA	
DATE: 15 AUG 60	SCALE: AS SHOWN
PREPARED UNDER THE DIRECTION OF John A. Morrison COLONEL, C.E., DISTRICT ENGINEER	
DRAWING NUMBER SHEET 8 61 45 29	



REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
1	AS CONSTRUCTED - CHANGES MADE	17 MAY 53	[Signature]
2	SITE 56.5 R & 57.7 R CORRECTED TO REFLECT 1951 WATER LEVEL. TOPS ADJUSTED. SEE FIELD NOTES FOR DETAILS. APPROVED FOR THE DISTRICT ENGINEER.	17 MAY 53	[Signature]

U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO OFFICE OF ENGINEERS SAN FRANCISCO, CALIFORNIA	
DESIGNED BY R. C.	SONOMA COUNTY CALIFORNIA
RUSSIAN RIVER CHANNEL IMPROVEMENTS DETAIL PLANS SITES - 56.5R, 57.7R AND 57.8L	
PREPARED BY N.F.T.	DATE 27 APRIL 1953
APPROVED BY [Signature]	DATE 27 APRIL 1953
PREPARED UNDER THE DIRECTION OF JOHN A. HARRISON COLONEL, C.E., DISTRICT ENGINEER	
SCALE 1" = 100'	DRAWING NUMBER 61-45-43
SHEET 6	OF 45



NOTE: NO FILL SHALL BE PLACED ON THE LAND SIDE SLOPE OF THE EXISTING LEVEL

TYPICAL SECTION WITH LAND SIDE SLOPE STEEPER THAN 2.5 HORIZ. ON 1 VERT. NOT TO SCALE (REFERS TO SITE 61.3L)

TYPICAL SECTION WITH LAND SIDE SLOPE FLATTER THAN 2.5 HORIZ. ON 1 VERT. NOT TO SCALE (REFERS TO SITE 61.3L)

NOTE: NO FILL SHALL BE PLACED ON THE LAND SIDE SLOPE OF EXISTING LEVEL.

NOTE: R.R.#1 - 10" WILLOW R.R.#2 - 2" M. 10" COTTONWOOD R.R.#3 - 2" M. 10" COTTONWOOD R.R.#4 - 5" WILLOW ALL R.R. ARE TREES WITH A SLATED MARK, NAIL AND PAINTED ORANGE BAND UNLESS OTHERWISE NOTED. ELEVATIONS ON BANK FROM SURVEY 3 MAY 52 ELEVATIONS ON RIVER BED FROM SURVEY 8 NOV. 52.

NOTE: UPSTREAM POST SHALL BE PLACED AS CLOSE AS POSSIBLE TO LAST WOODEN PILE. SURVEY FOR SITE 58.5R WAS PERFORMED ON 20 MAR 52.

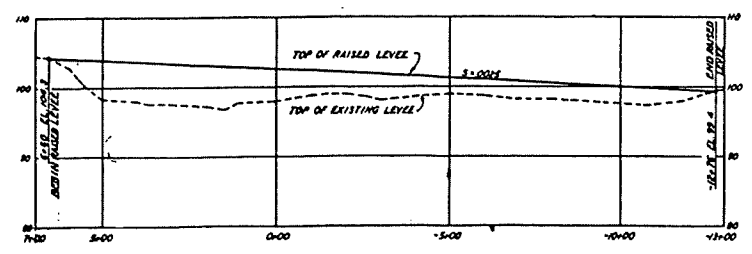
NOTE: SECTIONS REFER TO SITE 58.5R

NOTE: REFERS TO SITE 58.9L

FOR EXTENSIONS AND MODIFICATIONS, SEE DRAWING 61-45-43, SHEET 17.

FOR EXTENSIONS AND MODIFICATIONS, SEE DRAWING 61-45-43, SHEET 17.

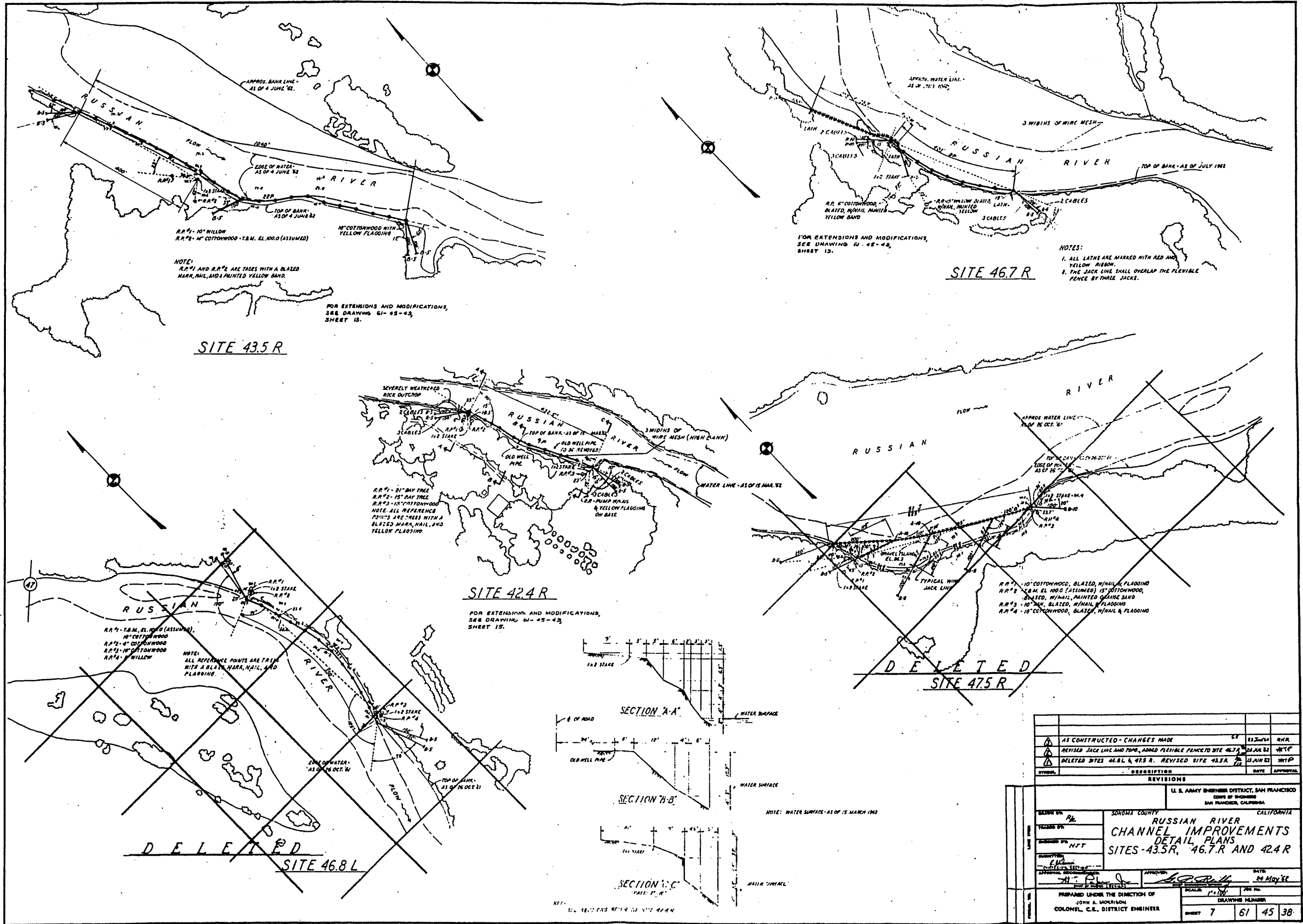
FOR EXTENSIONS AND MODIFICATIONS, SEE DRAWING 61-45-43, SHEET 17.



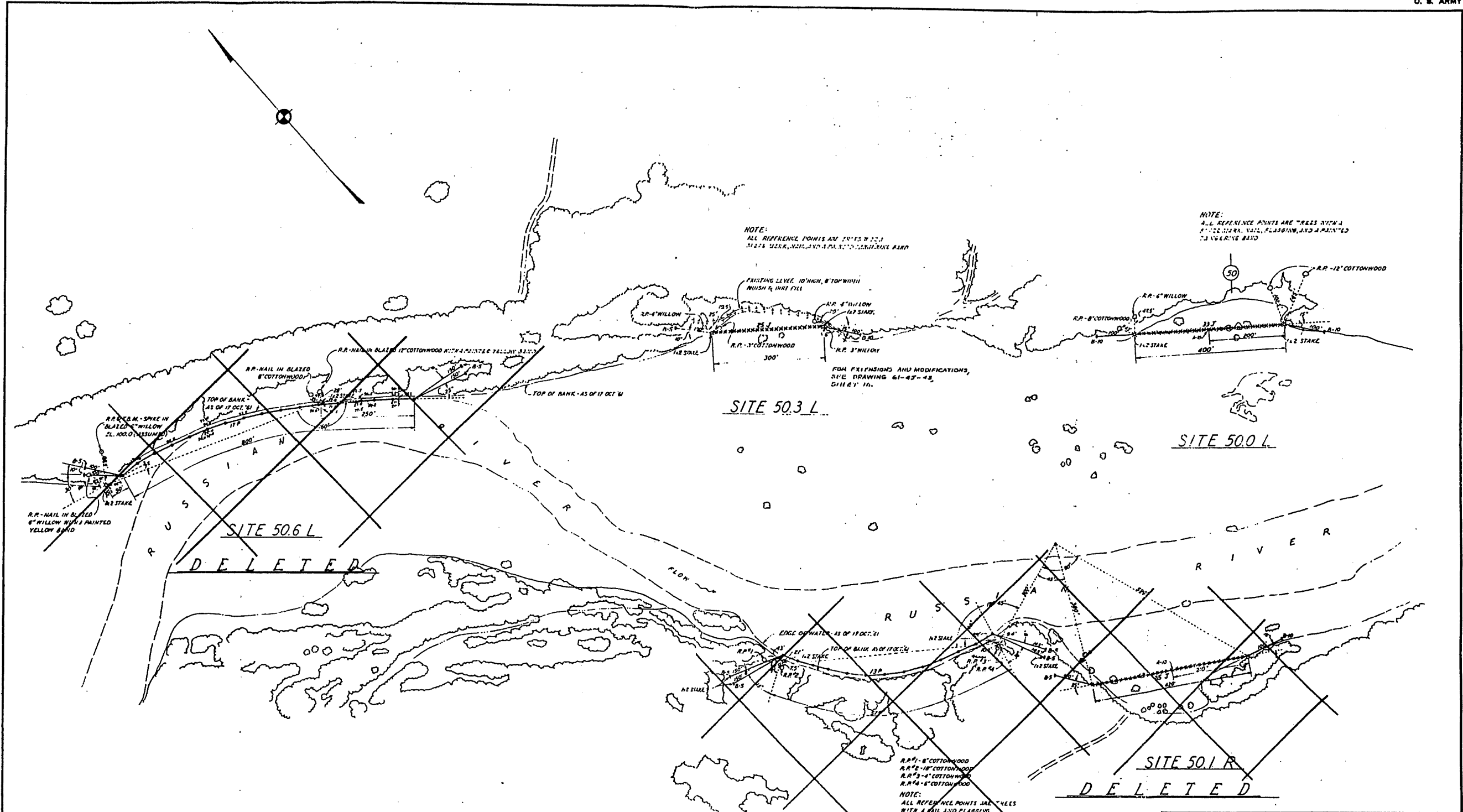
LEVEE PROFILE SCALE: HORIZ. 1" = 200' VERT. 1" = 10'

SYMBOL	DESCRIPTION	DATE	APPROVAL
AS CONSTRUCTED - CHANGES MADE		R.R. 17 MAY 52	P.C.
△	SITE 58.9L LENGTHENED DOWNSTREAM DETAIL ADDED, REFERENCE MARKS ADDED, SITE 58.9L LENGTHENED, MARK TOP OF EXISTING SITE	31 MAY 52	J.M.P.
△	61.3L SHORTENED, LEVEL PROFILE AND SECTIONS ADDED. 5L	20	
△	SITE 58.5R ADDED NOTE		

SONOMA COUNTY		CALIFORNIA	
RUSSIAN RIVER CHANNEL IMPROVEMENTS			
DETAIL PLANS			
SITES - 58.5R, 58.9L, 61.1R AND 61.3L			
DESIGNED BY	TRACED BY	CHECKED BY	APPROVED
DATE	DATE	DATE	DATE
PREPARED UNDER THE DIRECTION OF		DATE	
JOHN A. MORRISON		27 APRIL 1962	
COLONEL, C.E., DISTRICT ENGINEER		SCALE	JOB NO.
		1" = 100'	
		DRAWING NUMBER	
		SHEET 7	61 45 37



AS CONSTRUCTED - CHANGES MADE	BY	DATE	CHKD
REVISED JACK LINE AND FENCE, ADDED FLEXIBLE FENCE TO SITE 46.7R	BY	DATE	CHKD
DELETED SITES 46.8L & 47.5R. REVISED SITE 43.5R	BY	DATE	CHKD
REVISIONS			
DESCRIPTION	DATE	APPROVAL	
U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA			
SONOMA COUNTY CALIFORNIA			
RUSSIAN RIVER CHANNEL IMPROVEMENTS DETAIL PLANS SITES - 43.5R, 46.7R AND 42.4R			
DESIGNED BY	SCALE	DATE	
DRAWN BY	1" = 100'	24 May 62	
CHECKED BY			
APPROVED BY			
PREPARED UNDER THE DIRECTION OF JOHN A. MORRISON COLONEL, C.E., DISTRICT ENGINEER			
DRAWING NUMBER		SHEET 7 61 45 38	



NOTE:
ALL REFERENCE POINTS ARE TREES WITH A
1/2\"/>

NOTE:
ALL REFERENCE POINTS ARE TREES WITH A
1/2\"/>

FOR PRECISIONS AND MODIFICATIONS,
SEE DRAWING 61-45-43,
SHEET 16.

R.P. 1'-6\"/>

SYMBOL	DESCRIPTION	DATE	APPROVAL
AS CONSTRUCTED - NO CHANGES MADE		6/22/42	KEA
DELETED SITES - 50.1 R, 50.2 R AND 50.6 L		2/26/42	WTP

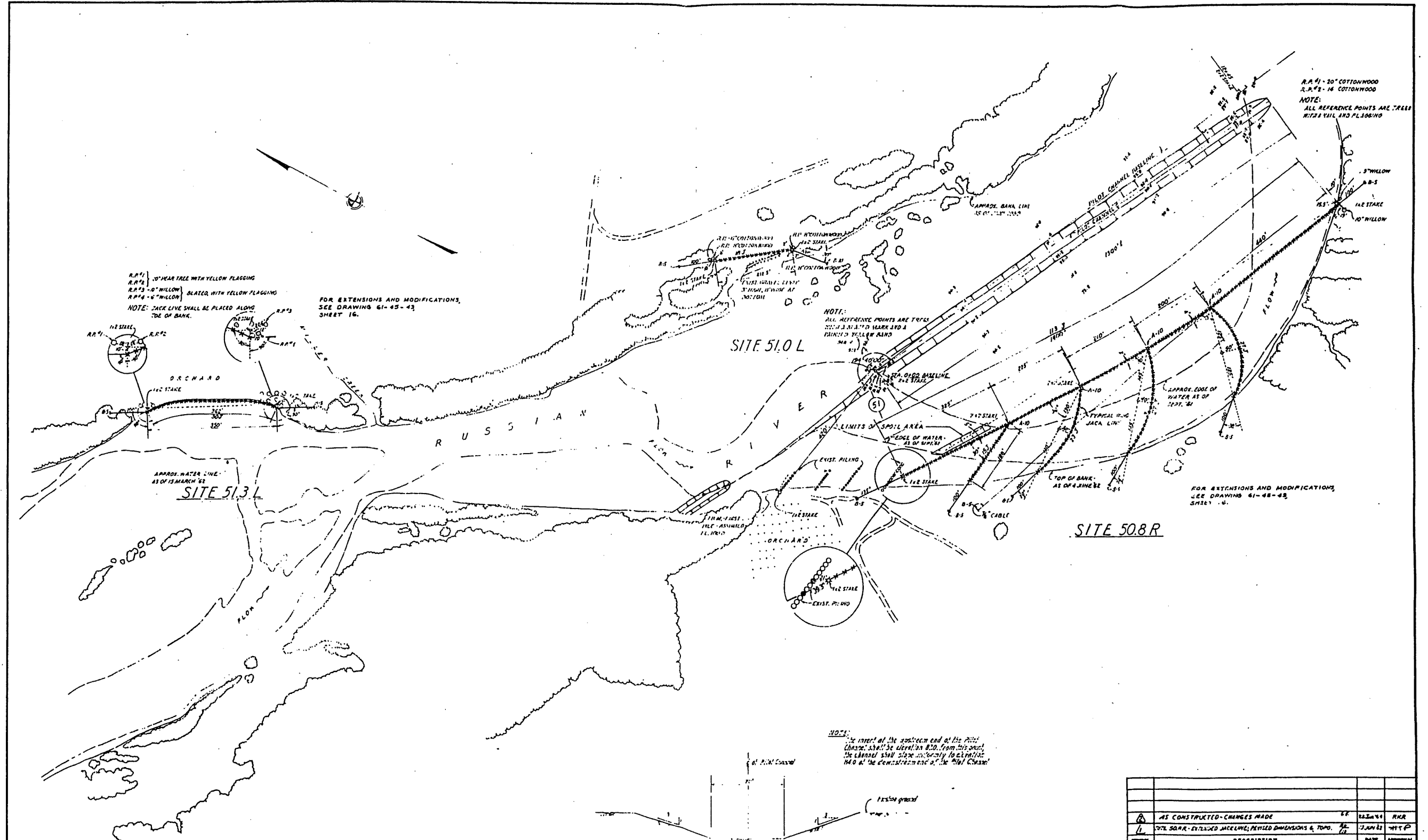
U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO
CORPS OF ENGINEERS
SAN FRANCISCO, CALIFORNIA

SONOMA COUNTY CALIFORNIA

**RUSSIAN RIVER
CHANNEL IMPROVEMENTS
DETAIL PLANS
SITES - 50.0 L, 50.3 L**

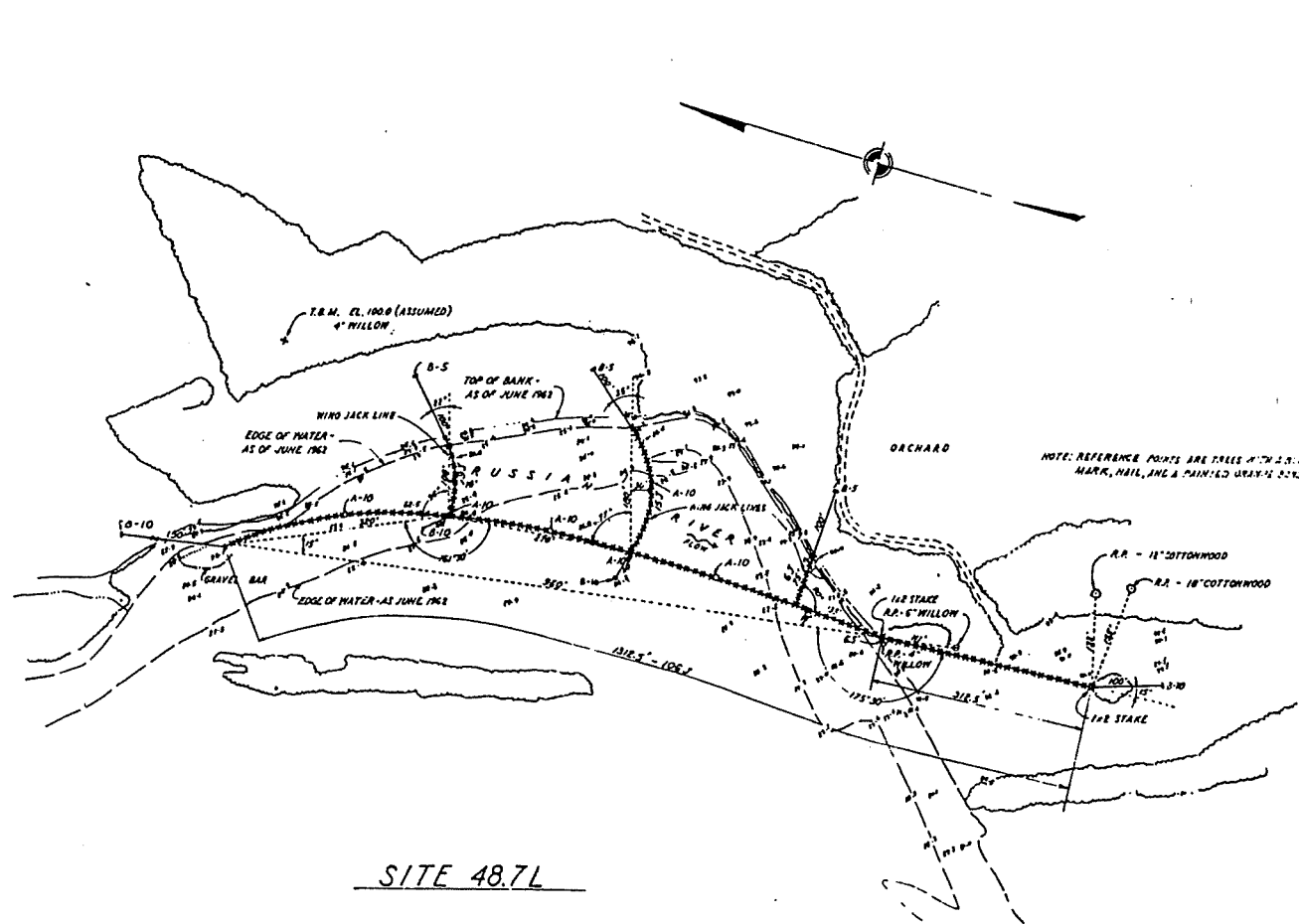
SCALE: 1\"/>

PREPARED UNDER THE DIRECTION OF JOHN A. MORRISON COLONEL, C.E., DISTRICT ENGINEER	DRAWING NUMBER SHEET 10 61 45 38
---	-------------------------------------

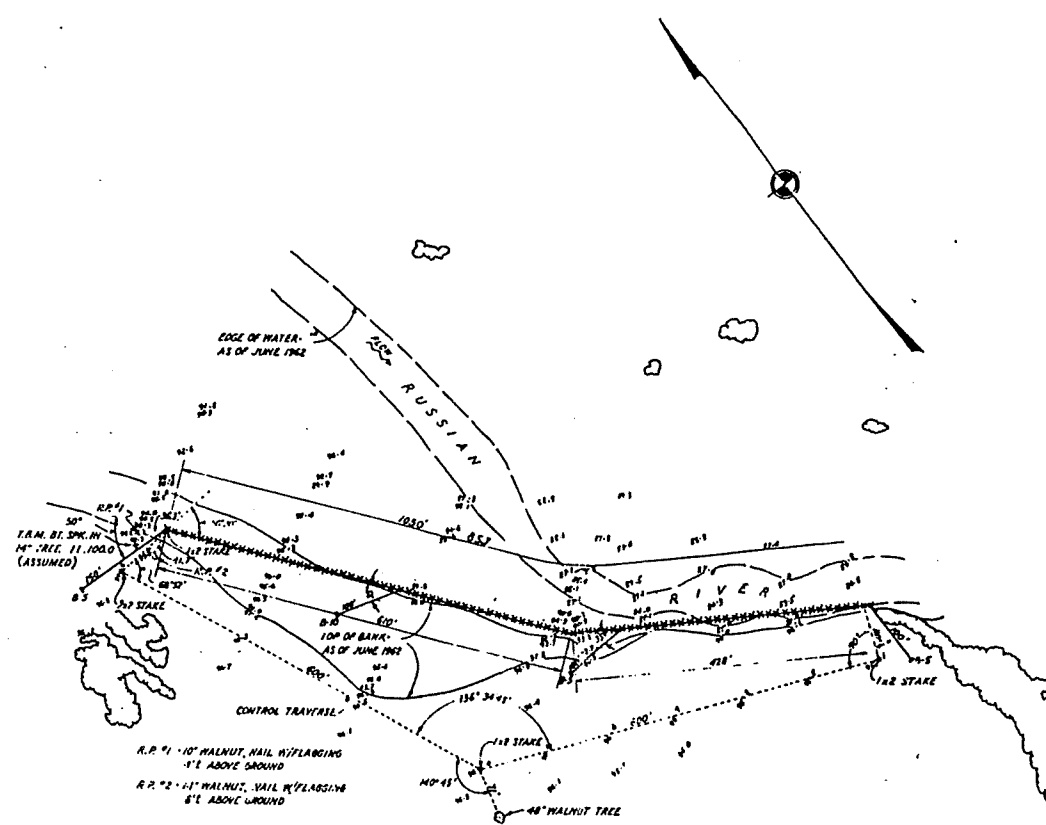


REVISIONS		DATE	APPROVAL
AS CONSTRUCTED - CHANGES MADE		22 Jan 44	RKR
57% SOAK - EXTENDED JACKLINE, REVISED DIMENSIONS & TOPO.		JAN 43	WTP

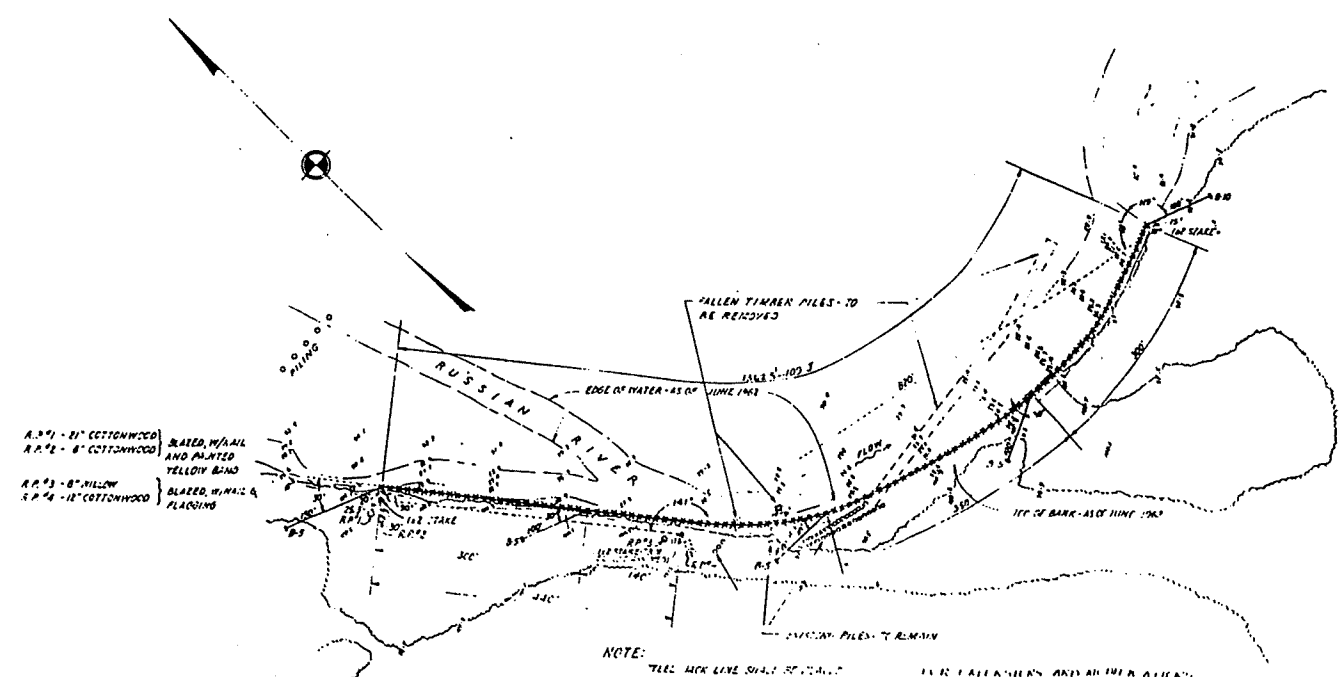
U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA	
DESIGNED BY R.E. J.	CHECKED BY N.J. J.
RUSSIAN RIVER CHANNEL IMPROVEMENTS DETAIL PLANS SITES - 50.8R, 51.0L AND 51.3L	
APPROVAL, FIELD ENGINEER [Signature]	DATE 24 May 42
PREPARED UNDER THE DIRECTION OF JOHN A. MORRISON COLONEL, C.E., DISTRICT ENGINEER	SCALE: 1"=100' DRAWING NUMBER SHEET 11 61 45 38



SITE 48.7L

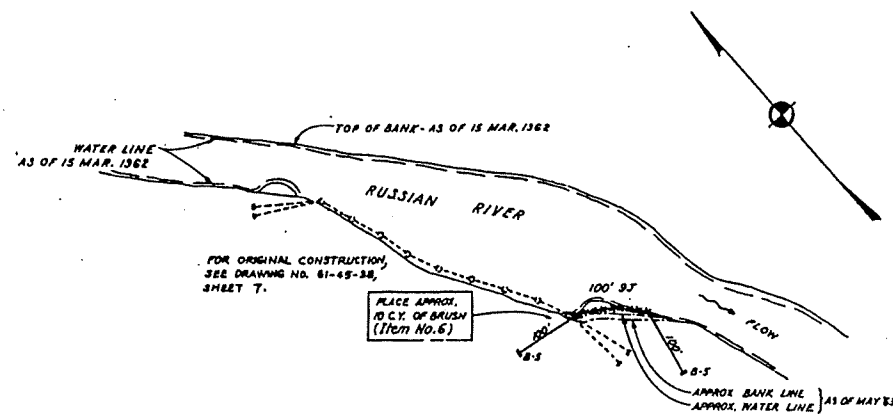


SITE 49.2R

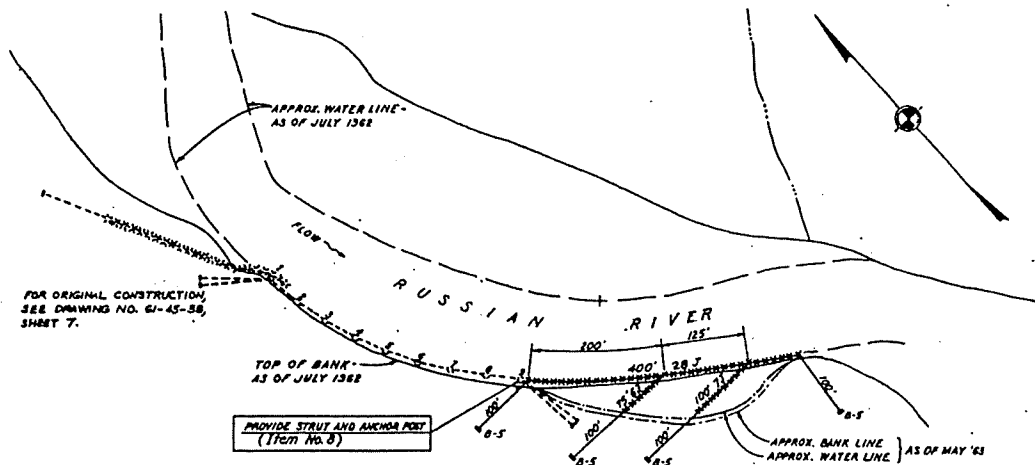


SITE 48.5R

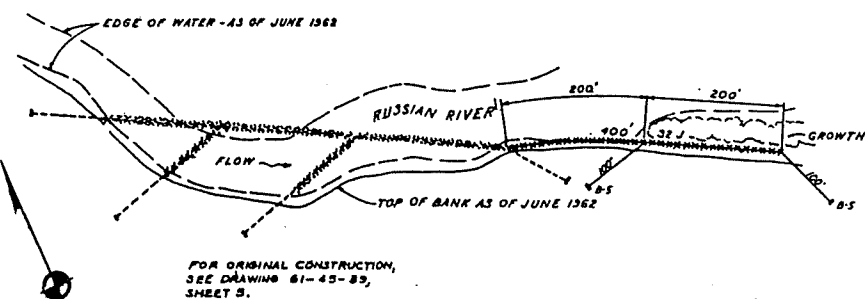
AS CONSTRUCTED-CHANGES MADE		DATE	APPROVAL
REVISIONS			
U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA			
SOLANO COUNTY CALIFORNIA			
RUSSIAN RIVER CHANNEL IMPROVEMENTS DETAIL PLANS SITES-48.5R, 48.7L AND 49.2R			
DRAWN BY	TRACED BY	CHECKED BY	SUBMITTED BY
DATE	DATE	DATE	DATE
APPROVAL		DATE	
PREPARED UNDER THE DIRECTION OF JOHN A. MORRISON COLONEL, C.E., DISTRICT ENGINEER		SCALE	JOB NO.
DRAWING NUMBER		SHEET 6 61 45 39	



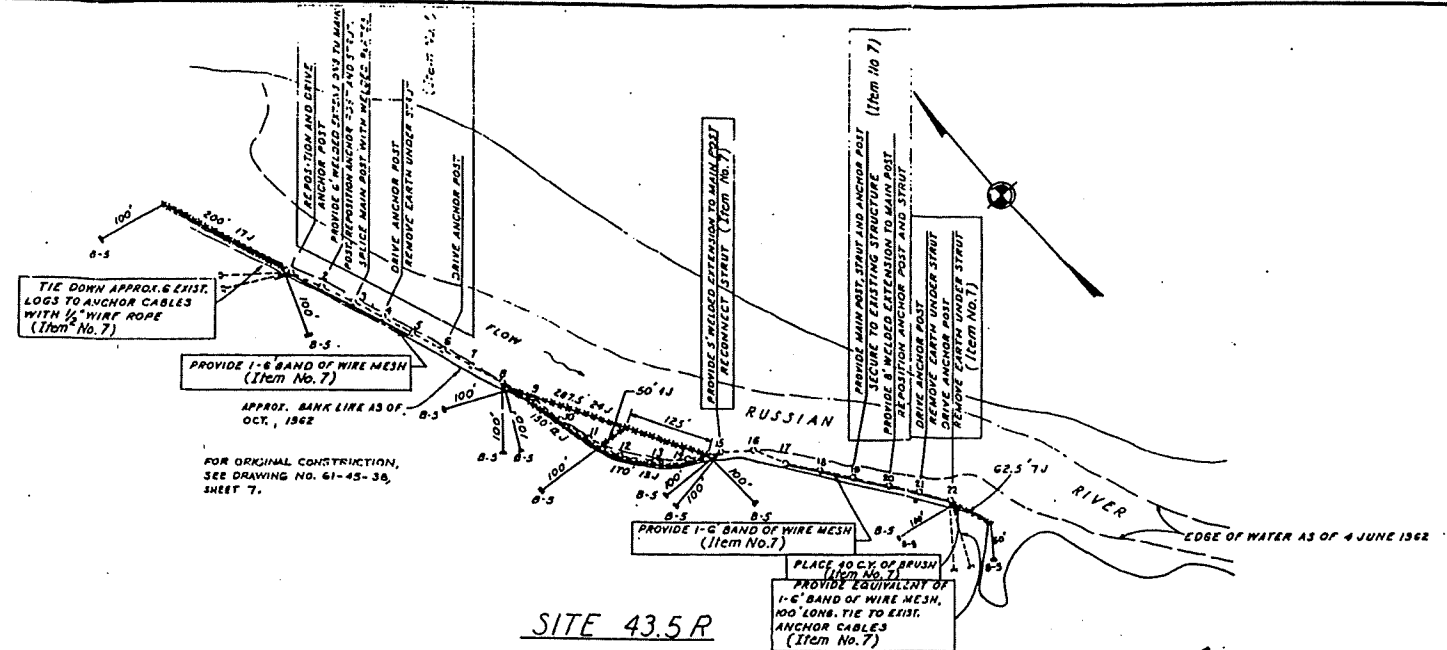
SITE 42.4 R



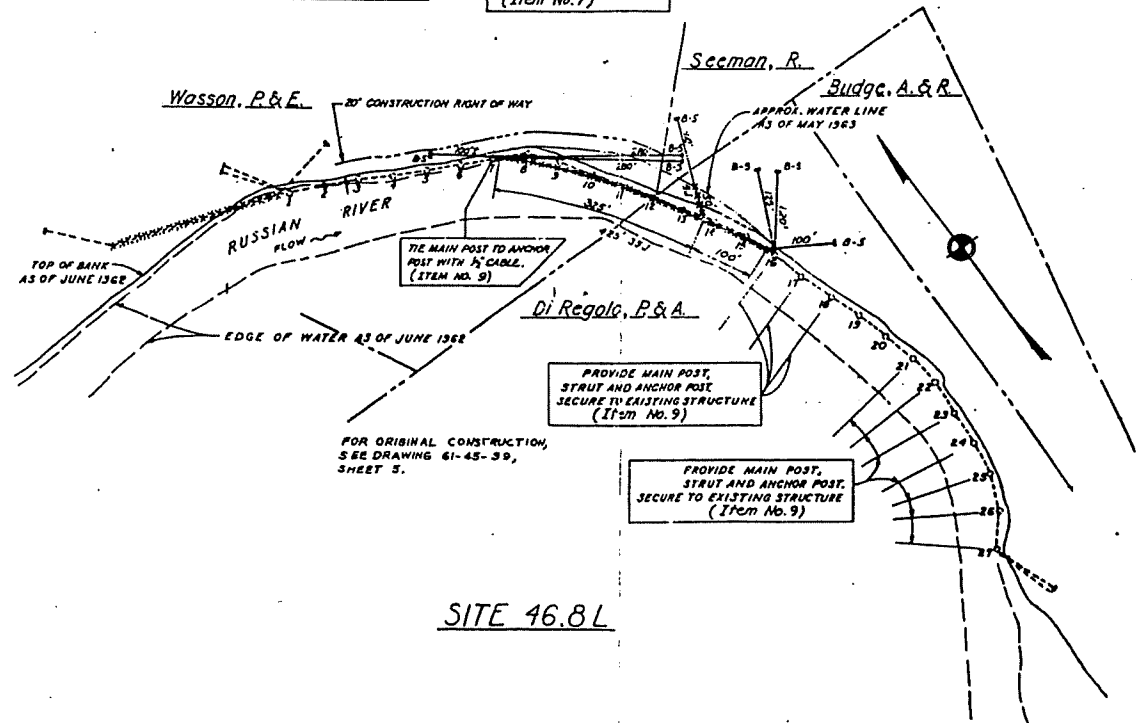
SITE 46.7 R



SITE 47.5 R



SITE 43.5 R

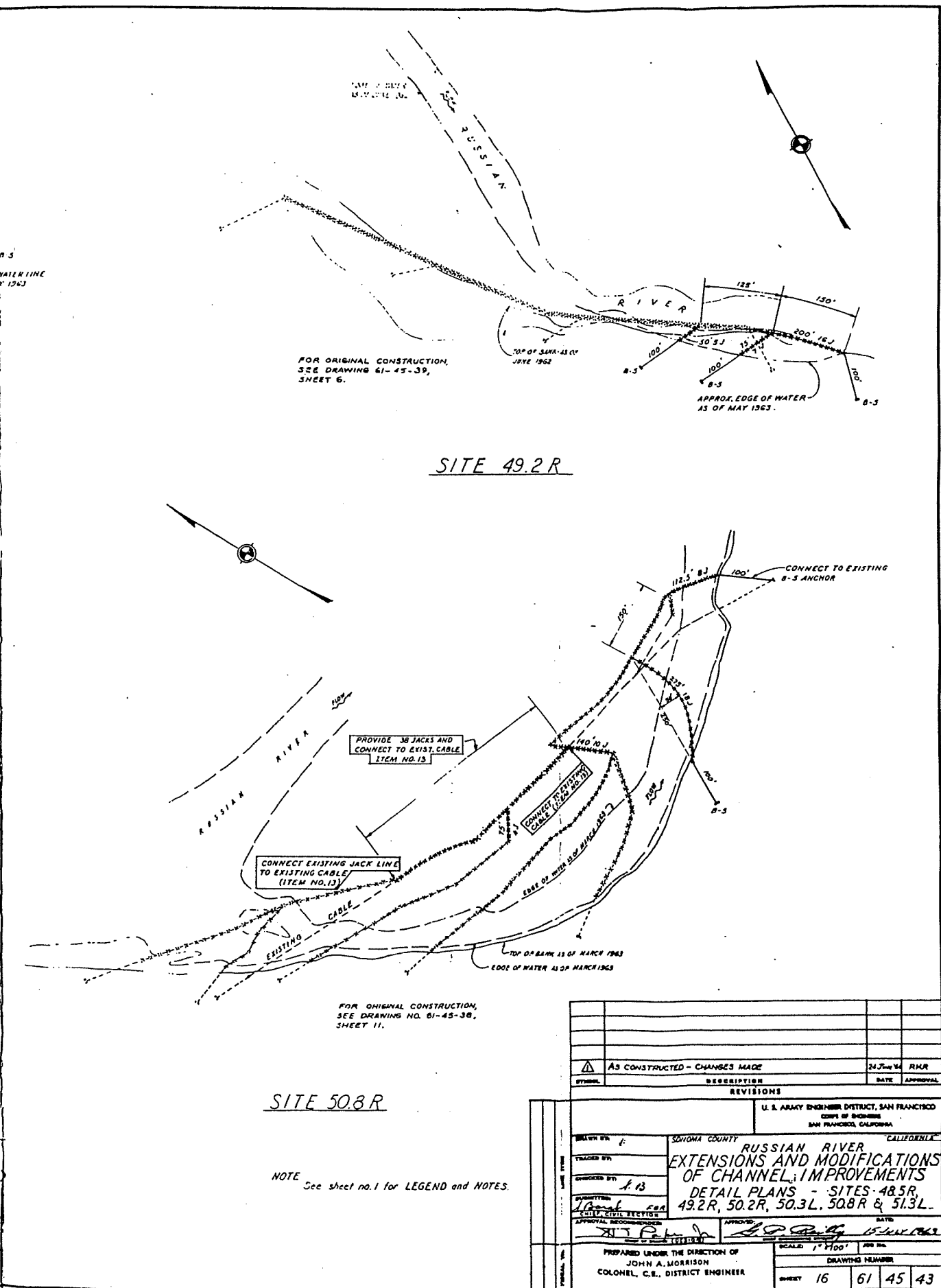
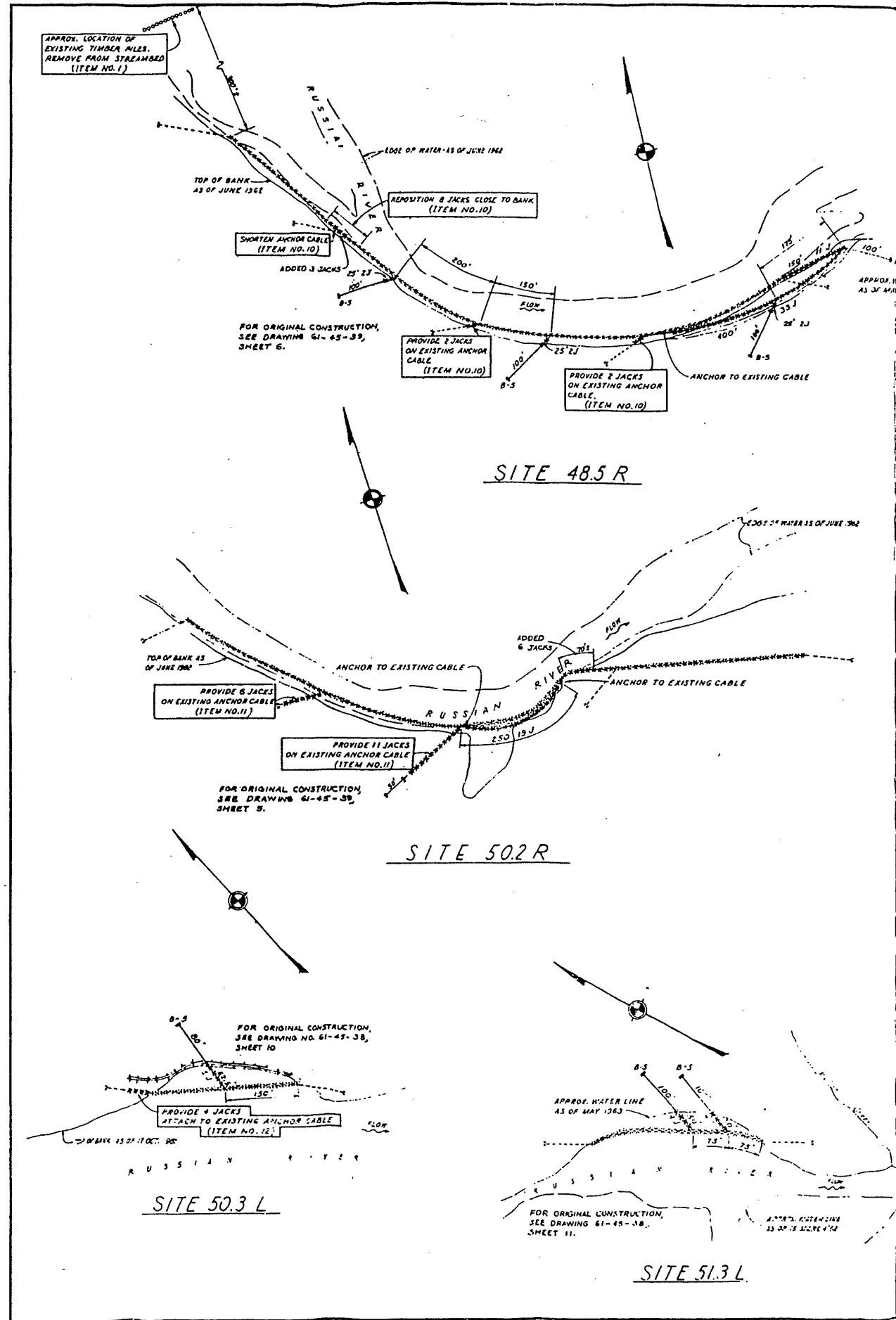


SITE 46.8 L

NOTE: See sheet no. 1 for LEGEND and NOTES.

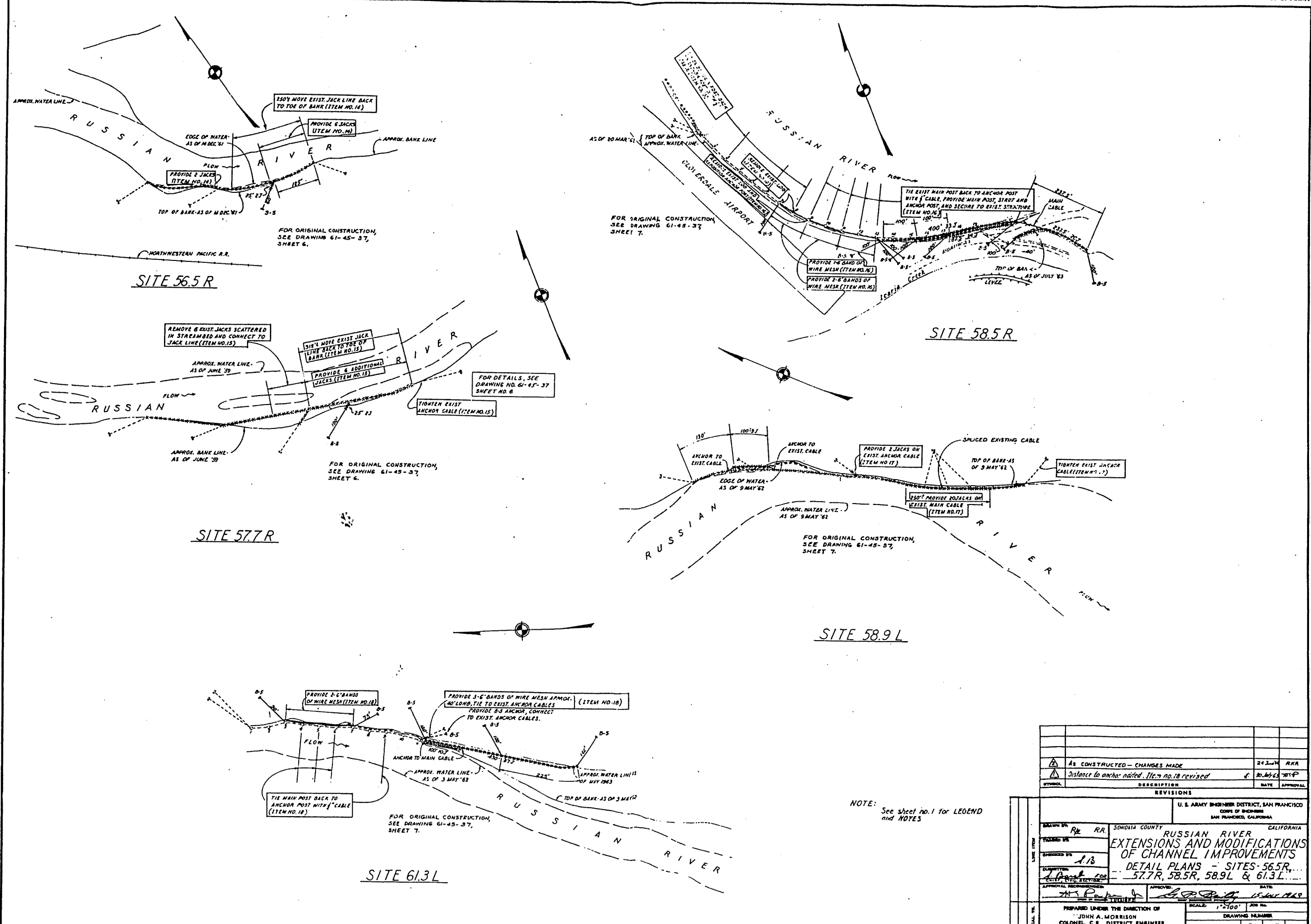
REVISIONS	DESCRIPTION	DATE	APPROVAL
Δ	AS CONSTRUCTED - CHANGES MADE	24 Jun 64	RKA
Δ	SITE 46.8 L - REVISED INCLINE & ANCHORS. ADDED PROPERTY LINE.	24 Jun 64	RKA

U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGINEERS SAN FRANCISCO, CALIFORNIA			
DESIGN BY R.A.	SOVONMA COUNTY	RUSSIAN RIVER	CALIFORNIA
TRACED BY 10	EXTENSIONS AND MODIFICATIONS OF CHANNEL IMPROVEMENTS. DETAIL PLANS - SITES 42.4 R, 43.5 R, 46.7 R, 46.8 L & 47.5 R		
APPROVED BY [Signature]	DATE 15 JUN 64		
PREPARED UNDER THE DIRECTION OF JOHN A. MORRISON COLONEL, C.E., DISTRICT ENGINEER	SCALE 1" = 100'	DRAWING NUMBER 15 61 45.43	SHEET 15 61 45.43



REVISIONS		DATE	APPROVAL
AS CONSTRUCTED - CHANGES MADE		24 July 64	RMR

SUTHER COUNTY		CALIFORNIA	
RUSSIAN RIVER			
EXTENSIONS AND MODIFICATIONS			
OF CHANNEL IMPROVEMENTS			
DETAIL PLANS - SITES 48.5R,			
49.2R, 50.2R, 50.3L, 50.8R & 51.3L			
DESIGNED BY	A. B.	DATE	
APPROVED BY		DATE	
PREPARED UNDER THE DIRECTION OF	JOHN A. MORRISON		
	COLONEL, C.E., DISTRICT ENGINEER		
DRAWING NUMBER		SHEET 16	
61 45 38		43	



SYMBOL	DESCRIPTION	DATE	APPROVAL
△	As constructed - changes made	24 Jun 62	RKA
△	Distance to anchor noted. Item no. 18 revised	30 May 62	JMP

REVISIONS

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

DRAWN BY: R.R. R.R. SONOMA COUNTY CALIFORNIA
CHECKED BY: J.B. RUSSIAN RIVER
EXTENSIONS AND MODIFICATIONS
OF CHANNEL IMPROVEMENTS
DETAIL PLANS - SITES 56.5R,
57.7R, 58.5R, 58.9L & 61.3L
APPROVED: [Signature] DATE: 15 JUN 1962

PREPARED UNDER THE DIRECTION OF
JOHN A. MORRISON
COLONEL, C.E., DISTRICT ENGINEER

SCALE: 1"=100' 200 ft

DRAWING NUMBER
SHEET 17 61 45 43

NOTE: See sheet no. 1 for LEGEND and NOTES