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RUSSIAN RIVER CHANNEL IMPROVEMENT

MENDOCINO COUNTY

OPERATION AND MAINTENANCE MANUAL

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

RUSSIAN RIVER
CHANNEL IMPROVEMENT

MENDOCINO COUNTY

OPERATION AND MAINTENANCE
MANUAL

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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 Mendocino County, extending from river mile 83 upstream to about river mile 98, near Calpella. 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 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 intersts 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 mile 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 sprig planting were not used in subsequent work. A section of the right bank, at river mile 94.0, opposite the confluence of the East Fork of Russian River was protected by riprap. This work was completed and turned over to local interests for maintenance 4 September 1962. Channel improvement works, including stream clearing, from river mile 83.2 to 93.0 were completed and turned over for operation and maintenance in November 1962. Work performed during 1963 consisted of typical protective installations and stream clearing, extending from river mile 93.0 to 94.4 and was turned over to local interests for operation and maintenance in September 1963. Modifications of works on four sites originally constructed in 1962 were completed and turned over by letter 7 November 1963.

LOCAL COOPERATION

6. ASSURANCE OF COOPERATION

The Board of Trustees, Mendocino County-Russian River Flood Control and Water Conservation Improvement District on 12 November 1959 passed an unnumbered resolution furnishing assurances required to the Government of the United States for channel stabilization work which stated

that in consideration for channel stabilization work in that portion of Russian River lying within the County of Mendocino, it will:

(a) Furnish free of cost to the United States all lands, easements and rights-of-way necessary for the construction of channel stabilization works.

(b) Make all necessary road and bridge revisions and utility alterations and relocations required for the channel stabilization works.

(c) Hold and save the United States free from damages due to the said construction works.

(d) Maintain the channel stabilization works after completion in accordance with regulations prescribed by the Secretary of the Army.

(e) Prevent any encroachment on the stream channel which would interfere with the proper functioning of the improvements or lessen their beneficial effects.

The complete resolution is attached as Exhibit B.

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 periods as may be necessary to obtain the maximum benefits.

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

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

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

(5) No improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the District Engineer 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. 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.

11. 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."

12. MAINTENANCE OF WORKS

Location and extent of maintenance performed should be reported semi-annually in the form indicated on Sheet 3 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.

METHODS OF COMBATTING FLOOD CONDITIONS

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

c. Security. Personnel of the Corps of Engineers, U. S. Army, whether military or civilian, are not vested with any civil police authority in the performance of their engineering duties, and they will not attempt to exercise any such authority. The responsibility for protecting flood control works against sabotage, acts of 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.

d. 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.

e. 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) Transportation facilities; roads and rail.

(3) Material supply; quantity, location, and condition.

(4) Communications; locate and check all necessary telephones in the sector.

f. 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.

g. 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.

h. 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.

i. 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.

j. 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 rights-of-way for the protective facilities.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

EXHIBIT A

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

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

(ii) Inlet and outlet channels are open;

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

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

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

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

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

(i) No parts are missing;

(ii) Metal parts are adequately covered with paint;

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

COPY

RESOLUTION OF THE BOARD OF TRUSTEES OF THE MENDOCINO COUNTY-RUSSIAN RIVER FLOOD CONTROL AND WATER CONSERVATION IMPROVEMENT DISTRICT, FURNISHING ASSURANCES REQUIRED BY U. S. ARMY FOR CHANNEL STABILIZATION WORK.

WHEREAS, the Russian River flood control project was authorized by the United States Congress by the 1950 Flood Control Act, and

WHEREAS, said authorized project provides for channel stabilization works on the Russian River, including the portion thereof within the Mendocino County-Russian River Flood Control and Water Conservation Improvement District located in southern Mendocino County, California, and

WHEREAS, prior to the commencement of such channel stabilization work in Mendocino County, the said authorizing legislation provides that local interests must furnish certain assurances satisfactory to the Secretary of the Army, and

WHEREAS, Mendocino County-Russian River Flood Control and Water Conservation Improvement District is an entity qualified to give the assurances so required,

NOW, THEREFORE, BE IT RESOLVED that Mendocino County-Russian River Flood Control and Water Conservation Improvement District, acting by and through its duly constituted Board of Trustees, does hereby make the following assurances to the Government of the United States:

That in consideration for channel stabilization work in that portion of Russian River lying within the County of Mendocino, it will:

(a) Furnish free of cost to the United States all lands, easements and rights of way necessary for the construction of channel stabilization works.

(b) Make all necessary road and bridge revisions and utility alterations and relocations required for the channel stabilization works.

(c) Hold and save the United States free from damages due to the said construction works.

EXHIBIT B

(d) Maintain the channel stabilization works after completion in accordance with regulations prescribed by the Secretary of the Army.

(e) Prevent any encroachment on the stream channel which could interfere with the proper functioning of the improvements or lessen their beneficial effects.

BE IT FURTHER RESOLVED, however, that said assurances are given with the understanding that before each individual channel stabilization project is commenced on the Russian River within the Mendocino County District the United States Government will notify the Board of Trustees of the Mendocino County-Russian River Flood Control and Water Conservation Improvement District in advance in order to permit said District to protect itself by getting assurances and hold harmless agreements from the property owners immediately affected by any channel stabilization project and that such channel stabilization projects will not proceed without the approval of said Board of Trustees.

The foregoing Resolution was introduced by Trustee THOMAS, who moved for its adoption, seconded by Trustee MACMILLAN and passed and adopted this 12th day of November, 1959, by the following vote of the Board of Trustees of the Mendocino County-Russian River Flood Control and Water Conservation Improvement District:

EXHIBIT B

AYES: Trustees: COCHRANE, BITTENBENDER, MACMILLAN, THOMAS

NOES: Trustees: NONE

ABSENT: Trustees: DOMIANO

WHEREUPON, the President declared the above and foregoing Resolution adopted and SO ORDERED.

/S/ H. M. COCHRANE
President of the said Board of Trustees.

ATTEST:
Secretary

I HEREBY CERTIFY the foregoing to be a true and correct copy of the Resolution adopted on the 12th day of November, 1959.

Secretary

EXHIBIT B

SEMI-ANNUAL REPORT FOR
INSPECTION, MAINTENANCE AND OPERATION OF
FLOOD CONTROL PROJECT
CHANNEL IMPROVEMENTS - RUSSIAN RIVER
MENDOCINO 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	
	PERVIOUS EROSION CHECKS	
11	Wire mesh and fastenings	
12	Riprap	

Item No.	Feature	Location and Extent of Maintenance Required
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	

MAINTENANCE

On the chart below list the maintenance performed and submit a separate tabulation of the expenditures for equipment rental, materials, inspection, supervision, labor, etc.

Item No.	Feature	Location and Extent of Maintenance performed

OPERATIONS

On the chart below list the operations performed during the flood periods and submit a separate tabulation of the expenditures for equipment rental, material, patrolling, supervision, labor, etc.

Item: No.	Feature	Location and extent of Operation performed

CORPS OF ENGINEERS

U. S. ARMY

VINEYARD

ORCHARD

CULTIVATED

123°10'30"

RIVER ROAD

123°11'00"

State Hospital

Mildreth, L.M.

Hooper, L.

FOR DETAILS, SEE DRAWING 61-45-36, SHEET 10.

SITE 87.3 L

Ruddick, E.C.

Hooper, F.W.

Oswald, H.A.

FOR DETAILS, SEE DRAWING 61-45-36, SHEET 9; FOR MODIFICATIONS, SEE DRAWING 61-45-43, SHEET 19.

SITE 86.5L

FLOW

MATCH LINE - SHEET 12.

SP

SITE 87.6 R

FOR DETAILS, SEE DRAWING 61-45-36, SHEET 10; FOR MODIFICATIONS, SEE DRAWING 61-45-43 SHEET 19.

RUSSIAN

City of Ukiah

Schrader, O.M.

Holliday, H.C.

SITE 87.1 R

FOR DETAILS, SEE DRAWING 61-45-36, SHEET 10; FOR MODIFICATIONS, SEE DRAWING 61-45-43 SHEET 19.

Norgard, S.

Madrona Orchards (Thomas, A.R.)

MATCH LINE - SHEET 14

Cox, E.C.

Dutton, E.W.

Wilson County Water Dist.

UKIAH SEWAGE DISPOSAL

RAIL ROAD

PACIFIC

NORTHWESTERN

JEFFERSON

U.S. 101

HWY. 101

GRID NORTH

39°07'30"

39°07'00"

38°06'30"

38°06'00"

RUSSIAN RIVER PROJECT

MENDOCINO AND SONOMA COUNTIES, CALIFORNIA

OPERATION AND MAINTENANCE MANUAL

CHANNEL IMPROVEMENTS

GENERAL PLAN

RIVER MILE 56.1 TO RIVER MILE 88.7

IN 16 SHEETS | SCALE: 1" = 300' | SHEET NO. 13

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

DRAWN RKP

TRACED

CHECKED

FILE NO. 61-45-44

CORPS OF ENGINEERS

U. S. ARMY

RUSSIAN RIVER PROJECT
MENDOCINO AND SONOMA COUNTIES, CALIFORNIA

OPERATION AND MAINTENANCE MANUAL

CHANNEL IMPROVEMENTS

GENERAL PLAN

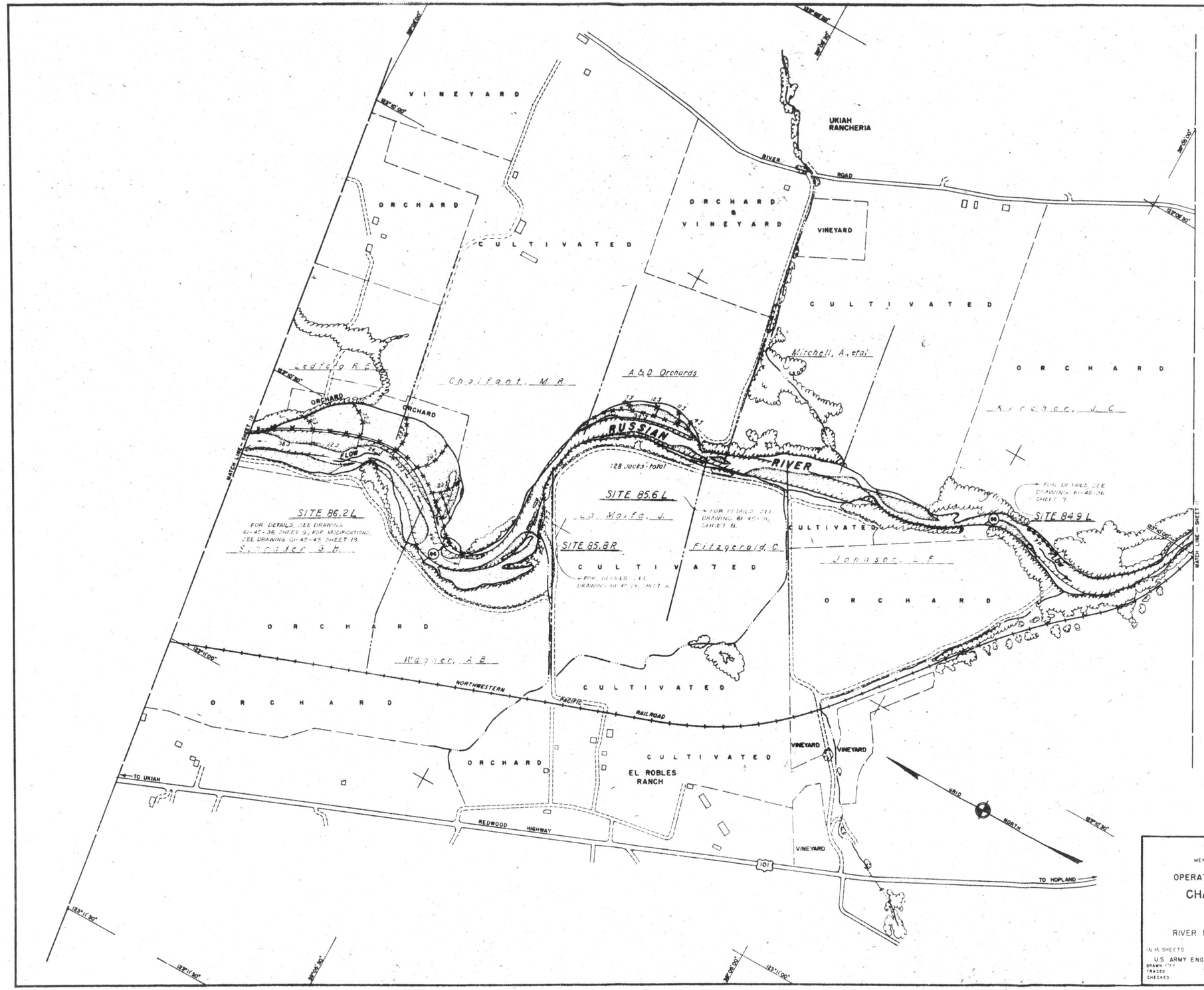
RIVER MILE 83.2 TO RIVER MILE 84.6

IN 16 SHEETS SCALE: 1" = 300' SHEET NO. 11

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

DRAWN PFF
TRACED
CHECKED

FILE NO. 61-45-44



RUSSIAN RIVER PROJECT
MENDOCINO AND SONOMA COUNTIES, CALIFORNIA

OPERATION AND MAINTENANCE MANUAL

CHANNEL IMPROVEMENTS

GENERAL PLAN

RIVER MILE 87.4 TO RIVER MILE 96.4

IN 14 SHEETS SCALE: 1" = 500' SHEET NO. 12

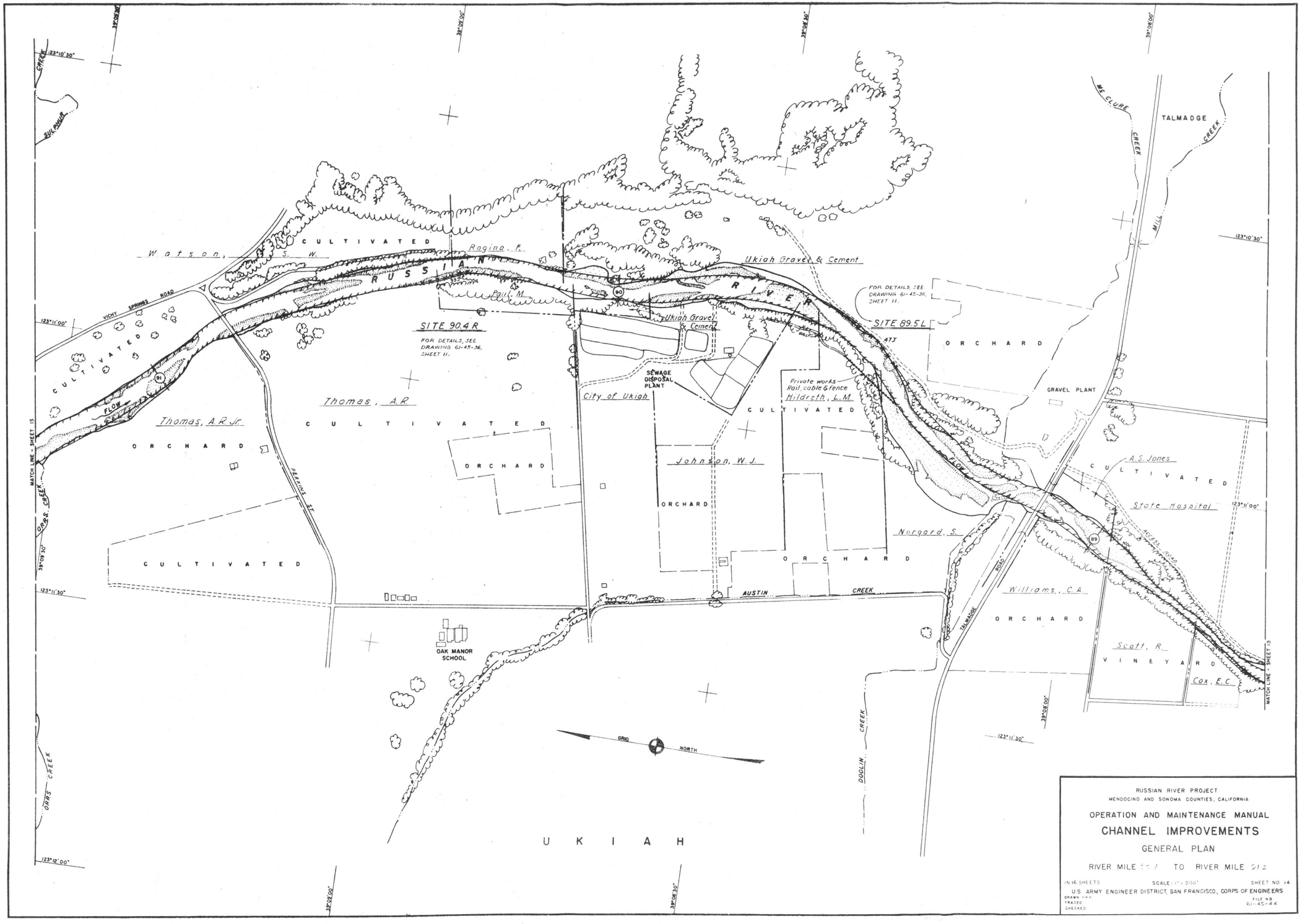
U.S. ARMY ENGINEER DISTRICT, SAN FRANCISCO, CORPS OF ENGINEERS

DRAWN
TRACED
CHECKED

FILE NO. 61-45-46

CORPS OF ENGINEERS

U. S. ARMY



RUSSIAN RIVER PROJECT
MENDOCINO AND SONOMA COUNTIES, CALIFORNIA

OPERATION AND MAINTENANCE MANUAL

CHANNEL IMPROVEMENTS

GENERAL PLAN

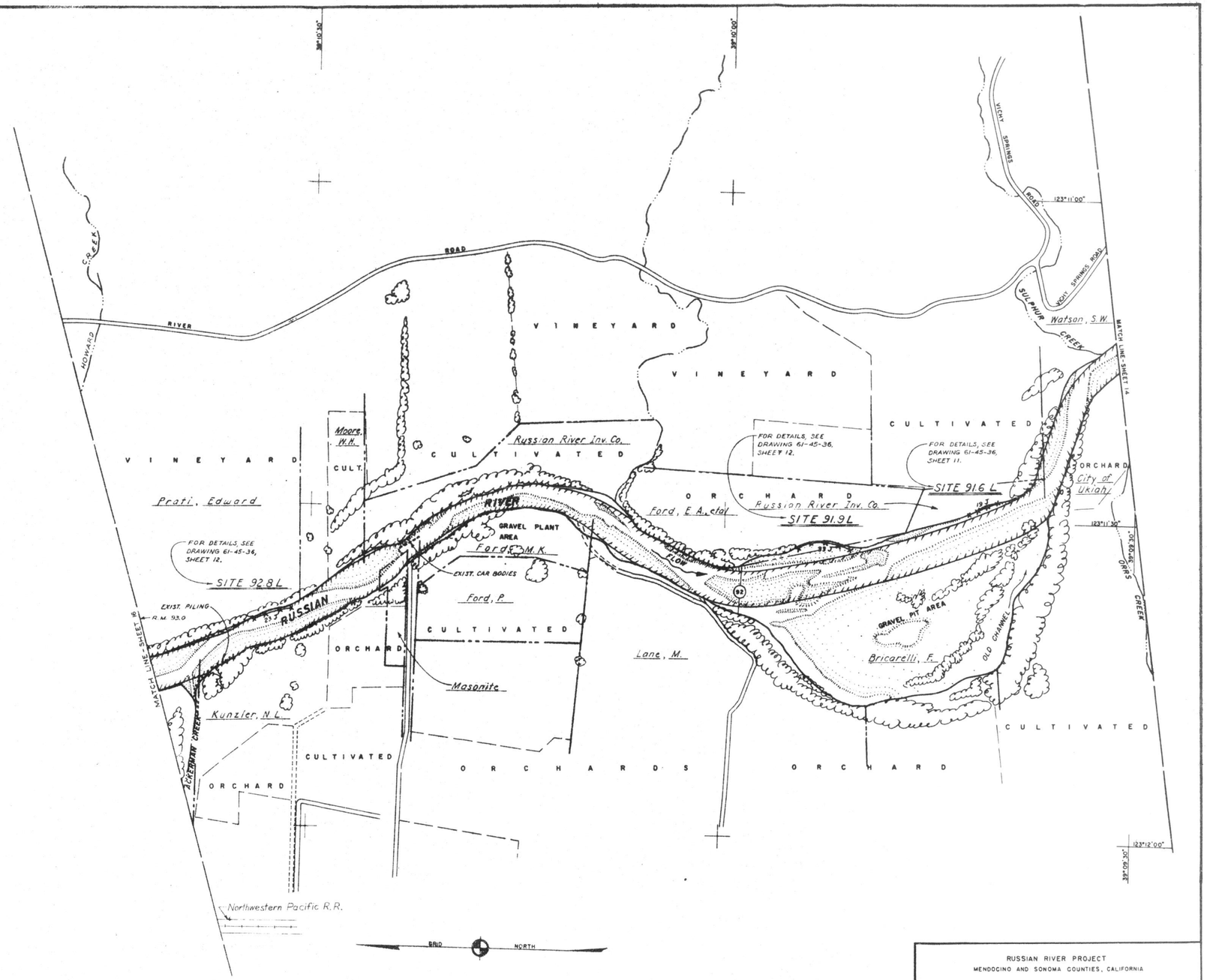
RIVER MILE [illegible] TO RIVER MILE 91.5

IN 16 SHEETS SCALE: 1" = 500' SHEET NO. 14

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

DRAWN [illegible]
TRACED
CHECKED

FILE NO. 61-45-44



RUSSIAN RIVER PROJECT
MENDOCINO AND SONOMA COUNTIES, CALIFORNIA

OPERATION AND MAINTENANCE MANUAL

CHANNEL IMPROVEMENTS

GENERAL PLAN

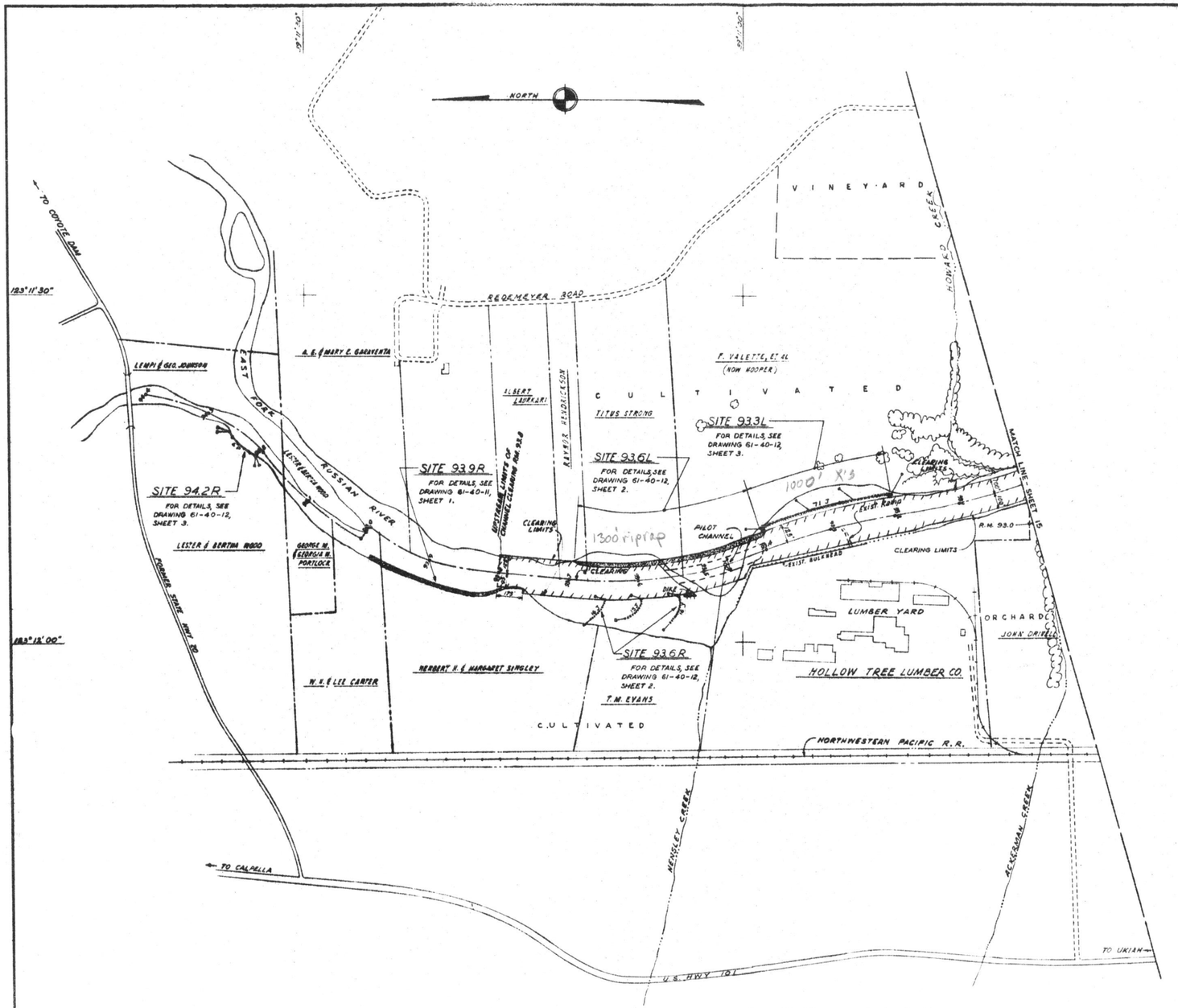
RIVER MILE 91.3 TO RIVER MILE 93.0

IN 16 SHEETS SCALE: 1" = 300' SHEET NO. 15

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

DRAWN RFF
TRACED
CHECKED

FILE NO. 61-45-44



SITE PLAN

SCALE 1" = 300'

Graphic Scale

300' 0' 300' 600'

Scale 1" = 300'

Notes:
1. Survey data is based on a survey by the Corps of Engineers January 24 and 25, February 1 and 2, 1961 as shown on drawing District File No. 61-33-31.

RUSSIAN RIVER PROJECT
MENDOCINO AND SONOMA COUNTIES, CALIFORNIA

OPERATION AND MAINTENANCE MANUAL

CHANNEL IMPROVEMENTS

GENERAL PLAN

RIVER MILE 93.0 TO RIVER MILE 94.4

IN 16 SHEETS SCALE: 1" = 300' SHEET NO. 16

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

DRAWN RKR
TRACED
CHECKED

FILE NO. 61-45-44

CORPS OF ENGINEERS

U. S. ARMY

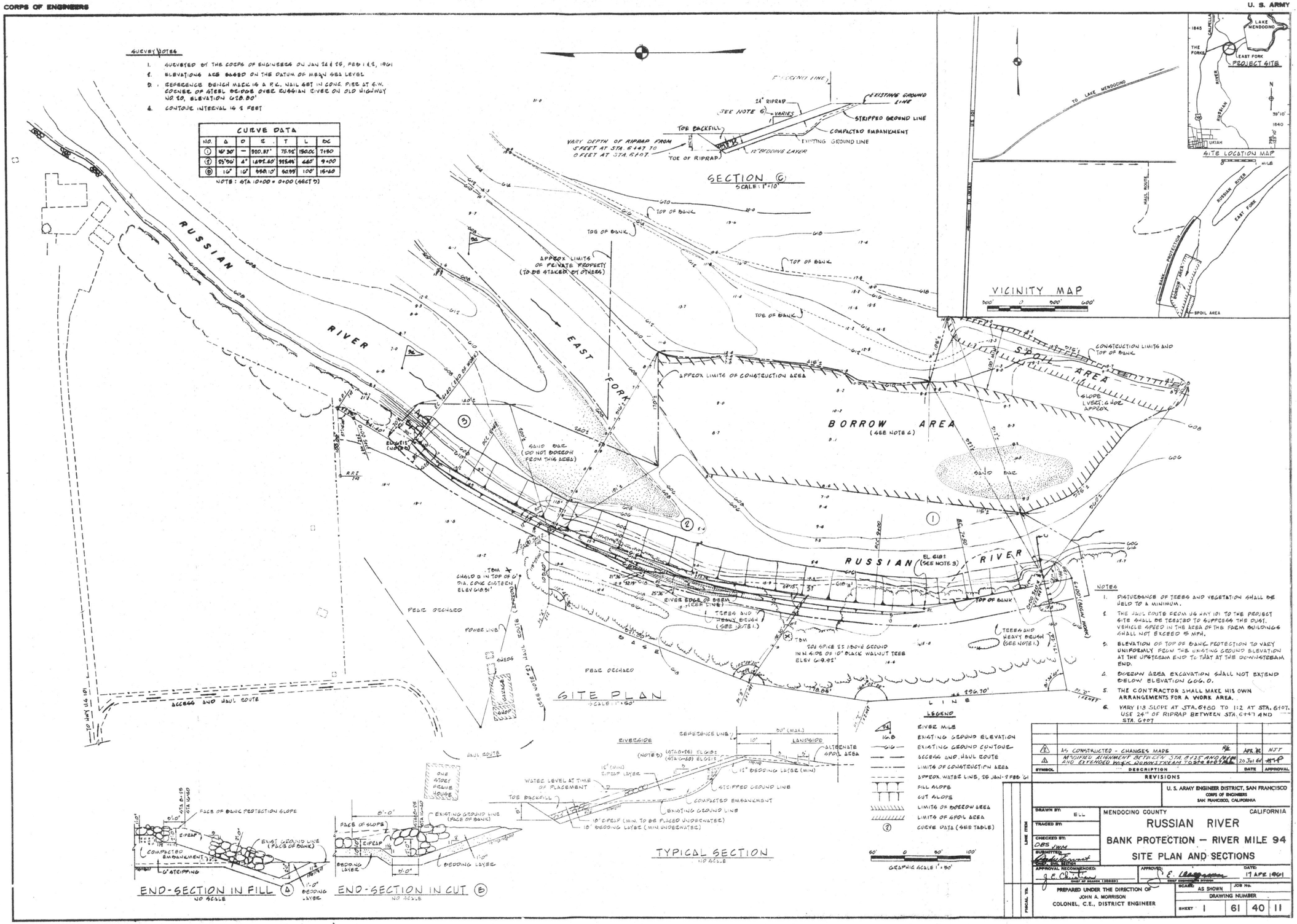
SURVEY NOTES

1. SURVEYED BY THE CORPS OF ENGINEERS ON JAN 24 & 25, FEB 1 & 2, 1961
2. ELEVATIONS ARE BASED ON THE DATUM OF MEAN SEA LEVEL
3. REFERENCE BENCH MARK IS A P.K. NAIL SET IN CONC. PIER AT S.W. CORNER OF STEEL BRIDGE OVER RUSSIAN RIVER ON OLD HIGHWAY NO 20, ELEVATION 628.80'
4. CONTOUR INTERVAL 1 & 4 FEET

CURVE DATA

NO.	Δ	D	R	T	L	EC
①	16° 30'	—	970.87'	75.96'	150.00	7+60
②	25°00'	4°	1695.80'	99.54'	660'	9+00
③	10°	10°	955.10'	92.99'	100'	15+60

NOTE: STA 10+00 = 0+00 (SHEET 2)



NOTES

1. DISTURBANCE OF TREES AND VEGETATION SHALL BE HELD TO A MINIMUM.
2. THE HAUL ROUTE FROM US HWY 101 TO THE PROJECT SITE SHALL BE TREATED TO SUPPRESS THE DUST. VEHICLE SPEED IN THE AREA OF THE FARM BUILDINGS SHALL NOT EXCEED 15 MPH.
3. ELEVATION OF TOP OF BANK PROTECTION TO VARY UNIFORMLY FROM THE EXISTING GROUND ELEVATION AT THE UPSTREAM END TO THAT AT THE DOWNSTREAM END.
4. BORROW AREA EXCAVATION SHALL NOT EXTEND BELOW ELEVATION 606.0.
5. THE CONTRACTOR SHALL MAKE HIS OWN ARRANGEMENTS FOR A WORK AREA.
6. VARY 1:3 SLOPE AT STA. 6+90 TO 1:2 AT STA. 6+07. USE 24" OF RIPRAP BETWEEN STA. 6+47 AND STA. 6+07.

SYMBOL	DESCRIPTION	DATE	APPROVAL
	REVISIONS		
2	AS CONSTRUCTED - CHANGES MADE	APR 62	NJT
1	MODIFIED ALIGNMENT BETWEEN STA. 8+25 AND 9+50 AND EXTENDED WORK DOWNSTREAM TO STA 6+07	20 JUL 61	NJT

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

DRAWN BY: ELL
TRACED BY:
CHECKED BY: OBS JWM
SUBMITTED:
APPROVAL RECOMMENDED: J. E. Christian, CHIEF, ENGR. DIV.
APPROVED: E. Langmaid, CHIEF, ENGINEERING DIVISION
DATED: 17 APR 1961

MENDOCINO COUNTY CALIFORNIA

RUSSIAN RIVER
BANK PROTECTION — RIVER MILE 94
SITE PLAN AND SECTIONS

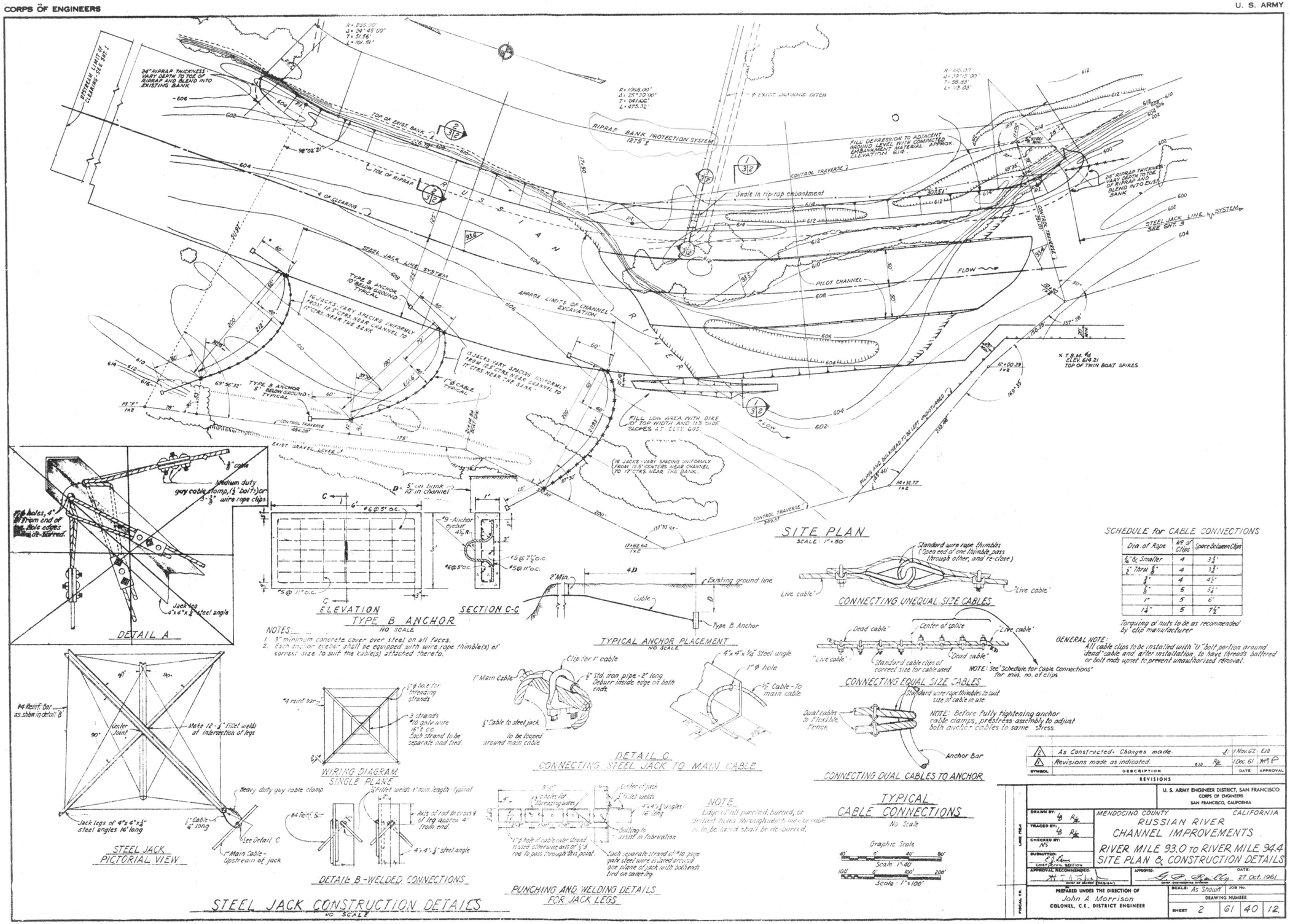
PREPARED UNDER THE DIRECTION OF
JOHN A. MORRISON
COLONEL, C.E., DISTRICT ENGINEER

SCALE: AS SHOWN
JOB No.
DRAWING NUMBER
SHEET 1 | 61 | 40 | 11

LINE ITEM
FISCAL YR.

CORPS OF ENGINEERS

U. S. ARMY



SITE PLAN

SCALE: 1" = 50'

DETAIL A

ELEVATION

TYPE B ANCHOR

NO SCALE

SECTION C-C

TYPICAL ANCHOR PLACEMENT

NO SCALE

NOTES:
1. 3" minimum concrete cover over steel on all faces.
2. Each anchor eyebar shall be equipped with wire rope thimble(s) of correct size to suit the cable(s) attached thereto.

STEEL JACK PICTORIAL VIEW

WIRING DIAGRAM

SINGLE PLANE

DETAIL C

CONNECTING STEEL JACK TO MAIN CABLE

DETAIL B - WELDED CONNECTIONS

PUNCHING AND WELDING DETAILS FOR JACK LEGS

NOTE

Edge of all punched, burned, or drifted holes through which wire or cable is to be laced shall be re-burred.

STEEL JACK CONSTRUCTION DETAILS

NO SCALE

CONNECTING UNEQUAL SIZE CABLES

NOTE: See "Schedule for Cable Connections" for min. no. of clips.

CONNECTING EQUAL SIZE CABLES

NOTE: Before fully tightening anchor cable clamps, prestress assembly to adjust both anchor cables to same stress.

CONNECTING DUAL CABLES TO ANCHOR

TYPICAL CABLE CONNECTIONS

No Scale

Graphic Scale

40' 0' 40' 80'

Scale: 1"=40'

100' 0' 100' 200'

Scale: 1"=100'

SCHEDULE for CABLE CONNECTIONS

Dia. of Rope	No. of Clips	Space Between Clips
¼" & Smaller	4	3¼"
⅜" thru ½"	4	3¾"
⅝"	4	4½"
¾"	5	5¼"
1"	5	6"
1¼"	5	7½"

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 battered or bolt ends upset to prevent unauthorized removal.

SYMBOL	DESCRIPTION	BY	DATE	APPROVAL
2	As Constructed - Changes made.	¢	1 Nov. 62	EJB
1	Revisions made as indicated.	EJB	1 Dec. 61	JAM

REVISIONS

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

DRAWN BY: EJB
TRACED BY: EJB
CHECKED BY: JVS
SUBMITTED: E. J. Bahn, CHIEF, CIVIL SECTION
APPROVAL RECOMMENDED: [signature], CHIEF, ENGINEERING DIVISION
APPROVED: [signature], 27 Oct. 1961, CHIEF, ENGINEERING DIVISION

MENDOCINO COUNTY CALIFORNIA

RUSSIAN RIVER CHANNEL IMPROVEMENTS

RIVER MILE 93.0 to RIVER MILE 94.4

SITE PLAN & CONSTRUCTION DETAILS

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

SCALE: As Shown | JOB NO.

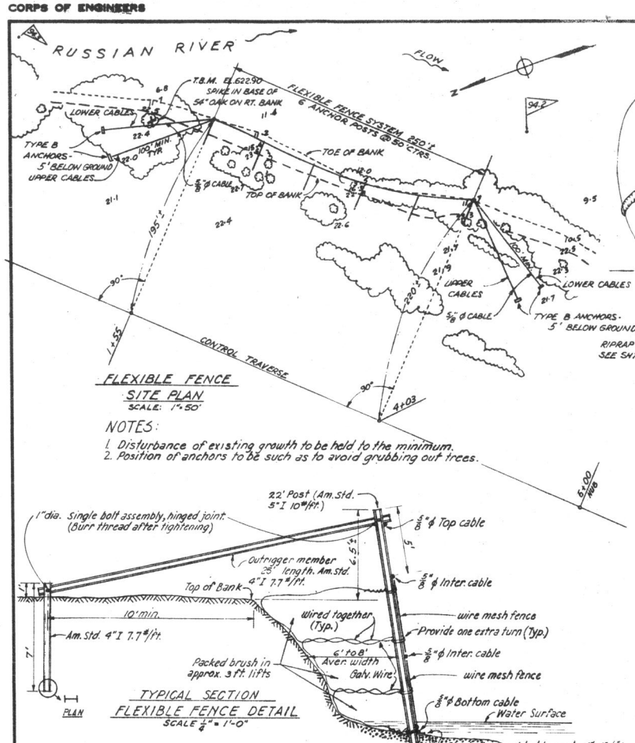
DRAWING NUMBER

SHEET 2 | 61 | 40 | 12.

LINE ITEM

FISCAL YR.

CORPS OF ENGINEERS — U. S. ARMY

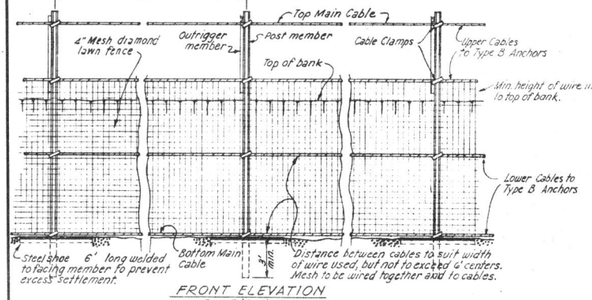


FLEXIBLE FENCE
SITE PLAN
SCALE: 1"=50'

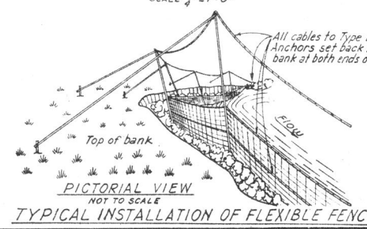
NOTES:
1. Disturbance of existing growth to be held to the minimum.
2. Position of anchors to be such as to avoid grubbing out trees.

TYPICAL SECTION
FLEXIBLE FENCE DETAIL
SCALE 1/2"=1'-0"

Notes:
1. The wire mesh fence shall terminate at the end posts and be tied to them securely.
2. Longitudinal anchor cables are to be installed so that misalignment or deformation of structural members does not occur.
3. Brush backfill is to be firmly packed, but without excessive bulging of the wire mesh in the fence. During placement of brush the mesh fence is to be maintained in the proper horizontal position between post supports.
4. Splice with upstream mesh over lapping the downstream mesh.
5. Brush is to be placed in approximately 3 foot layers and tied snugly by looping around brush layer at 4 foot centers and fastening to cables with No. 10 galvanized wire. At the ends of the work, the brush shall be tied with particular care to insure against dislogement.
6. Not less than 2 or more than 3 cables to an individual anchor.

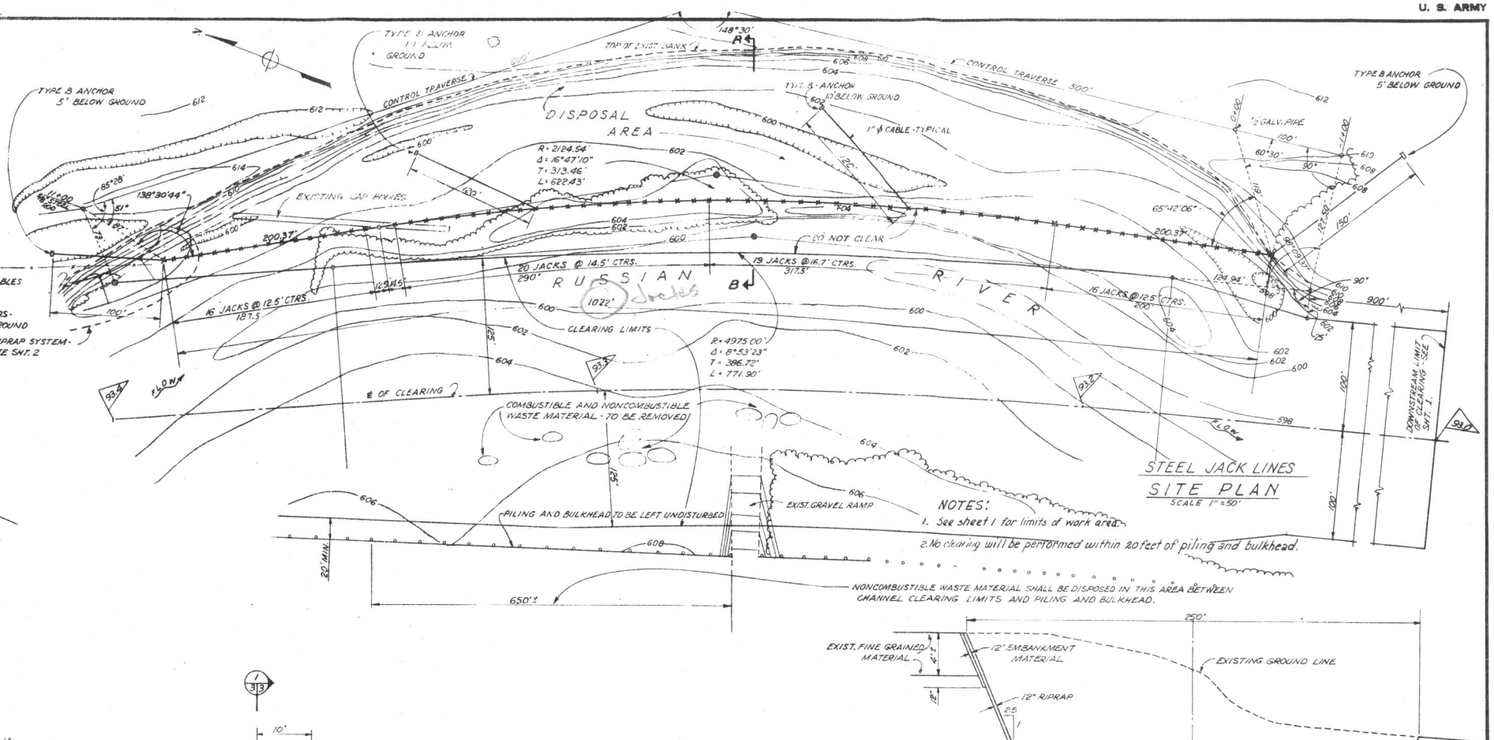


FRONT ELEVATION
SCALE 1/4"=1'-0"



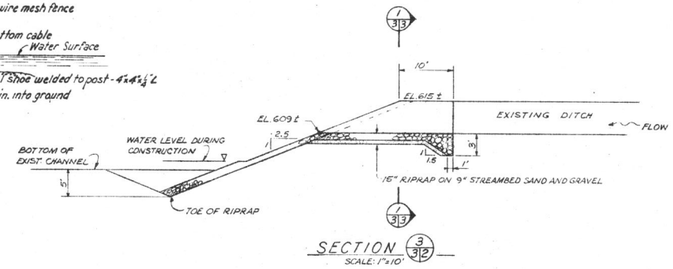
PICTORIAL VIEW
NOT TO SCALE

TYPICAL INSTALLATION OF FLEXIBLE FENCE

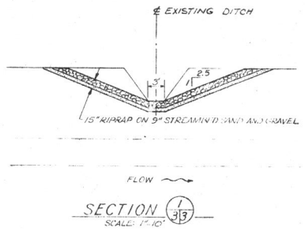


STEEL JACK LINES
SITE PLAN
SCALE 1"=50'

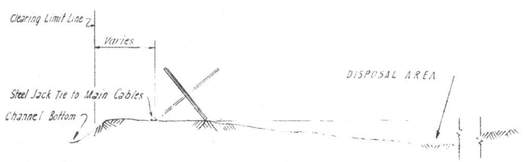
NOTES:
1. See sheet 1 for limits of work area.
2. No clearing will be performed within 20 feet of piling and bulkhead.



SECTION 3/3
SCALE: 1"=10'



SECTION 1/3
SCALE: 1"=10'



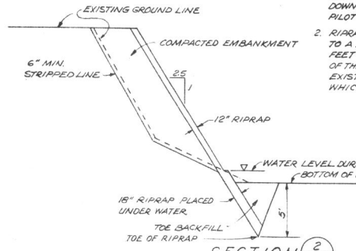
SECTION BB
SCALE: 1"=10'

Existing bank protection may be covered, but shall not be destroyed or damaged except for the necessary removal as required to place embankment and riprap bank protection system in the vicinity of river mile 94.4.

Graphic Scale
4' 0' 4' 8'
Scale: 1"=4'
100' 0' 100' 200'
Scale: 1"=100'

SECTION 1/3/2
NO SCALE

NOTES:
1. THE INVERT ELEVATION AT THE UPSTREAM END OF THE PILOT CHANNEL SHALL BE 602'. FROM THIS POINT, THE CHANNEL SHALL SLOPE GRADUALLY TO ELEVATION 601' AT THE DOWNSTREAM END OF THE PILOT CHANNEL.
2. RIPRAP IS TO BE EXTENDED TO A MINIMUM DEPTH OF 5 FEET BELOW THE BOTTOM OF THE PILOT CHANNEL OR EXISTING CHANNEL BOTTOM, WHICH EVER IS LOWER.



SECTION 2/3/2
NO SCALE

SYMBOL	DESCRIPTION	DATE	APPROVAL
	REVISIONS		
2	AS CONSTRUCTED - CHANGES MADE. K	1 NOV 62	E.I.D.
1	REVISIONS MADE AS INDICATED K.I.D.	1 DEC. 61	[illegible]

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

DRAWN BY: [illegible]
TRACED BY: [illegible]
CHECKED BY: N.S.
SUBMITTED: C. Morris, CHIEF CIVIL SECTION
APPROVAL RECOMMENDED: [illegible], CHIEF OF BRANCH / DIVISION

MENDOCINO COUNTY CALIFORNIA

RUSSIAN RIVER CHANNEL IMPROVEMENTS
RIVER MILE 93.0 TO RIVER MILE 94.4
SITE PLANS & CONSTRUCTION DETAILS

APPROVED: E. P. Rielly, CHIEF ENGINEERING DIVISION — DATE: 27 Oct. 1961

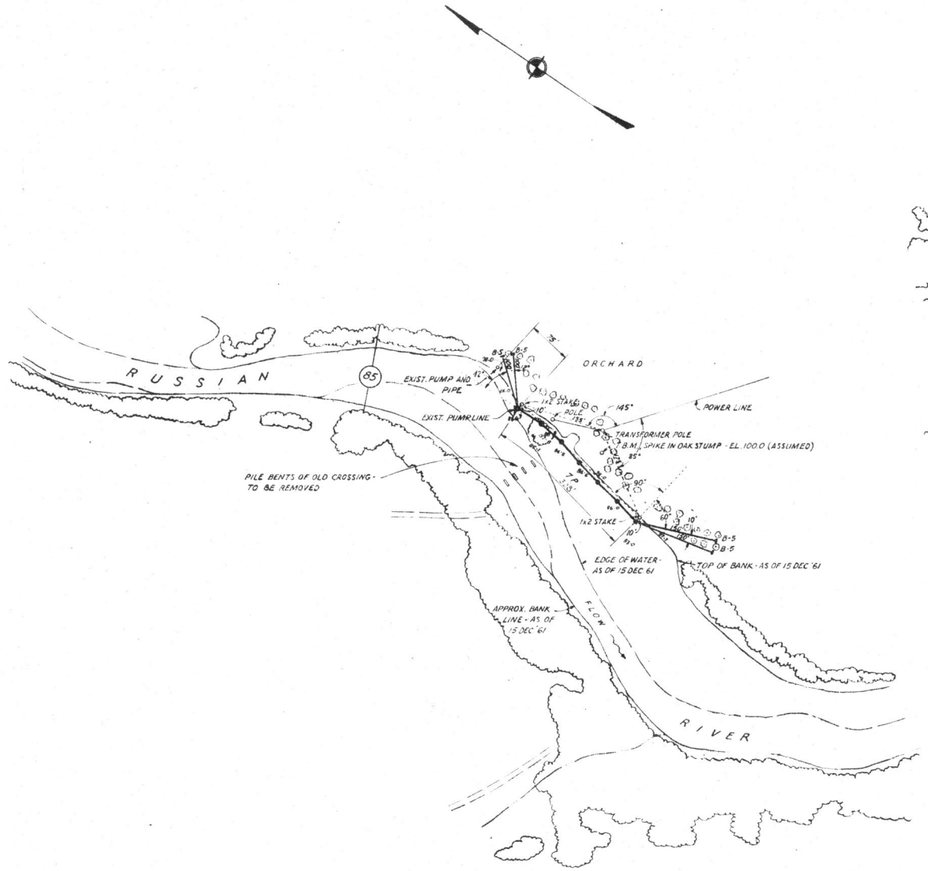
PREPARED UNDER THE DIRECTION OF
John A. Morrison
COLONEL, C.E., DISTRICT ENGINEER

SCALE: As Shown JOB No.
DRAWING NUMBER
SHEET 3 | 61 | 40 | 12

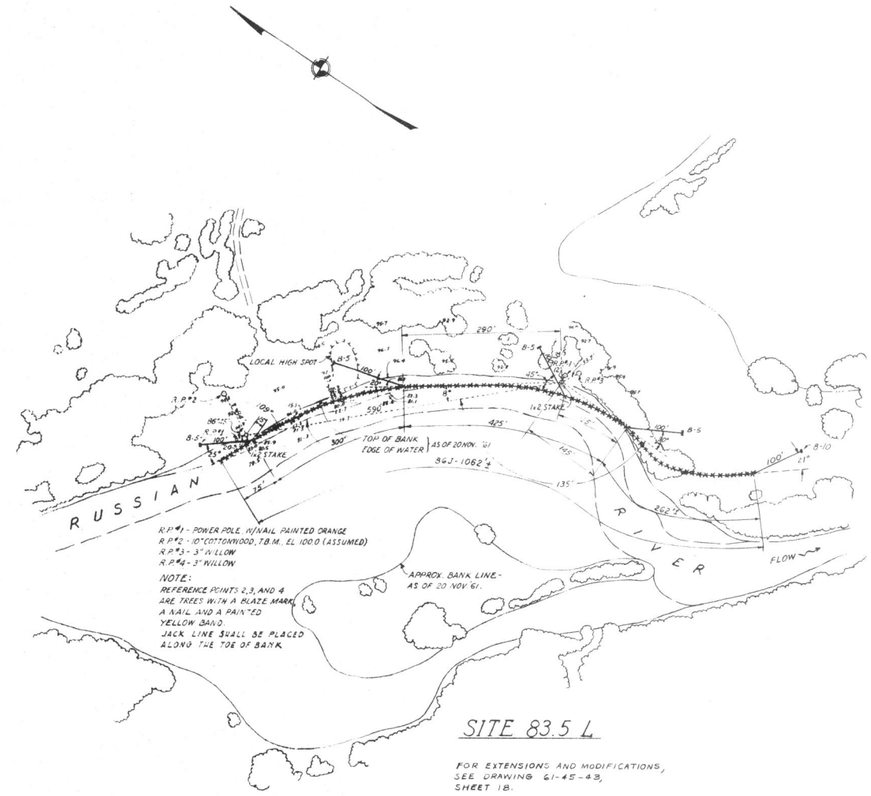
LINE ITEM
FISCAL YR.

CORPS OF ENGINEERS

U. S. ARMY



SITE 84.9 L



SITE 83.5 L

FOR EXTENSIONS AND MODIFICATIONS, SEE DRAWING 61-45-43, SHEET 18.

SYMBOL	DESCRIPTION	DATE	APPROVAL
	REVISIONS		
2	AS CONSTRUCTED - CHANGES MADE RR	11 OCT 62	J. F.
1	SITE 83.5 L LENGTHENED UPSTREAM, NOTE ADDED. LB	13 JUNE 62	ARP

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

LINE ITEM

DRAWN BY: R&
TRACED BY:
CHECKED BY: N.J.T.
SUBMITTED: E.F. Penn, CHIEF DESIGN SECTION

MENDOCINO COUNTY CALIFORNIA

RUSSIAN RIVER CHANNEL IMPROVEMENTS DETAIL PLANS SITES - 83.5L & 84.9L

APPROVAL RECOMMENDED: CHIEF OF BRANCH (DESIGN)

APPROVED: CHIEF ENGINEERING DIVISION

DATE: 25 MAY 1962

FISCAL YR.

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

SCALE: 1" = 100'

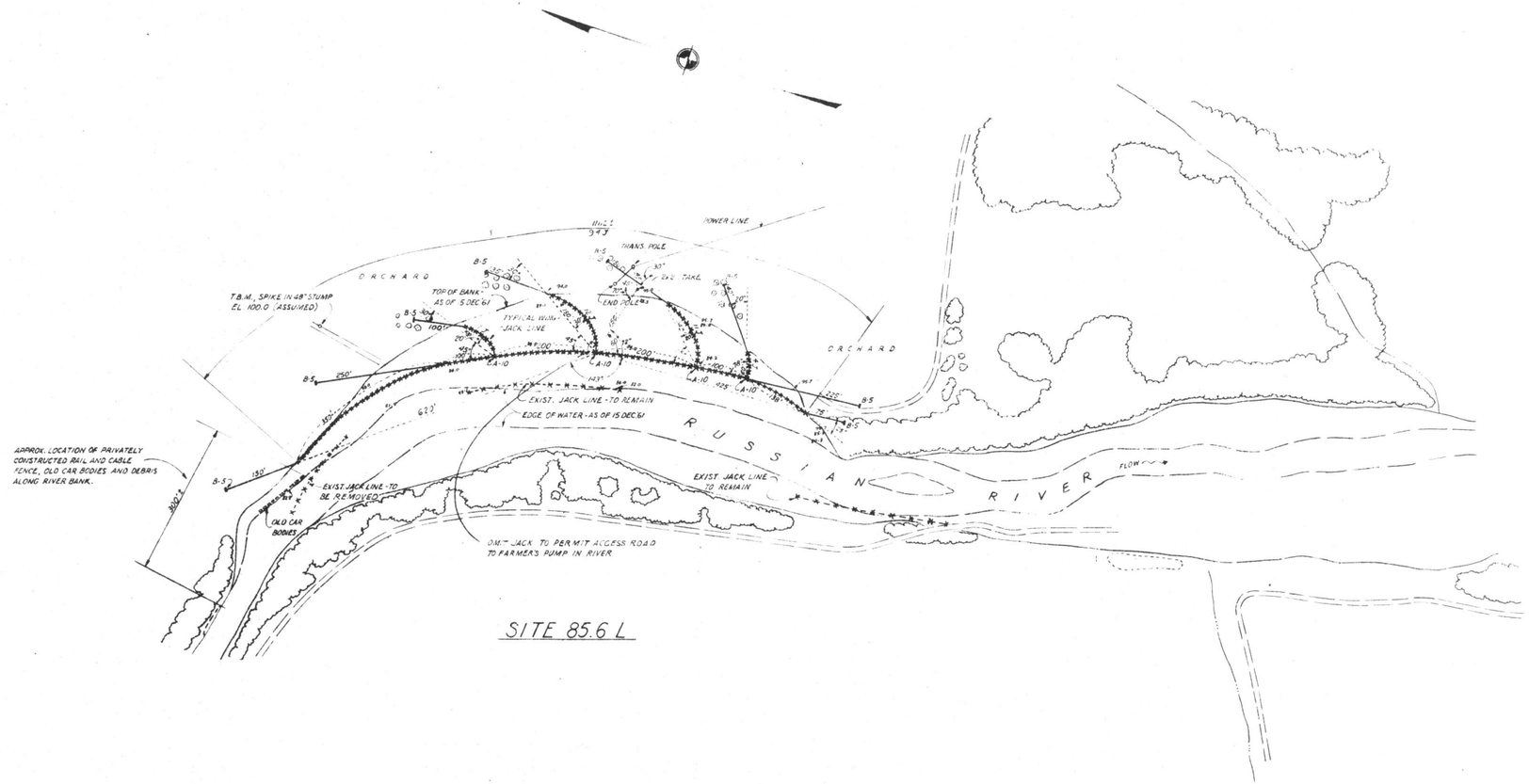
JOB No.

DRAWING NUMBER

SHEET 7 | 61 | 45 | 36

CORPS OF ENGINEERS

U. S. ARMY



SITE 85.6 L

SYMBOL	DESCRIPTION	DATE	APPROVAL
	REVISIONS		
2	AS CONSTRUCTED - CHANGES MADE	11 OCT. 63	
1	SITE 85.8L UPSTREAM END REVISED	3 JUNE '62	

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

LINE ITEM

DRAWN BY: RJL
TRACED BY:
CHECKED BY: W.J.T.
SUBMITTED: E. J. Dunn, CHIEF, CIVIL SECTION

MENDOCINO COUNTY CALIFORNIA

RUSSIAN RIVER CHANNEL IMPROVEMENTS
DETAIL PLAN
SITE 85.6L

APPROVAL RECOMMENDED: CHIEF OF BRANCH (DESIGN)

APPROVED: CHIEF ENGINEERING DIVISION — DATE: 25 MAY 1962

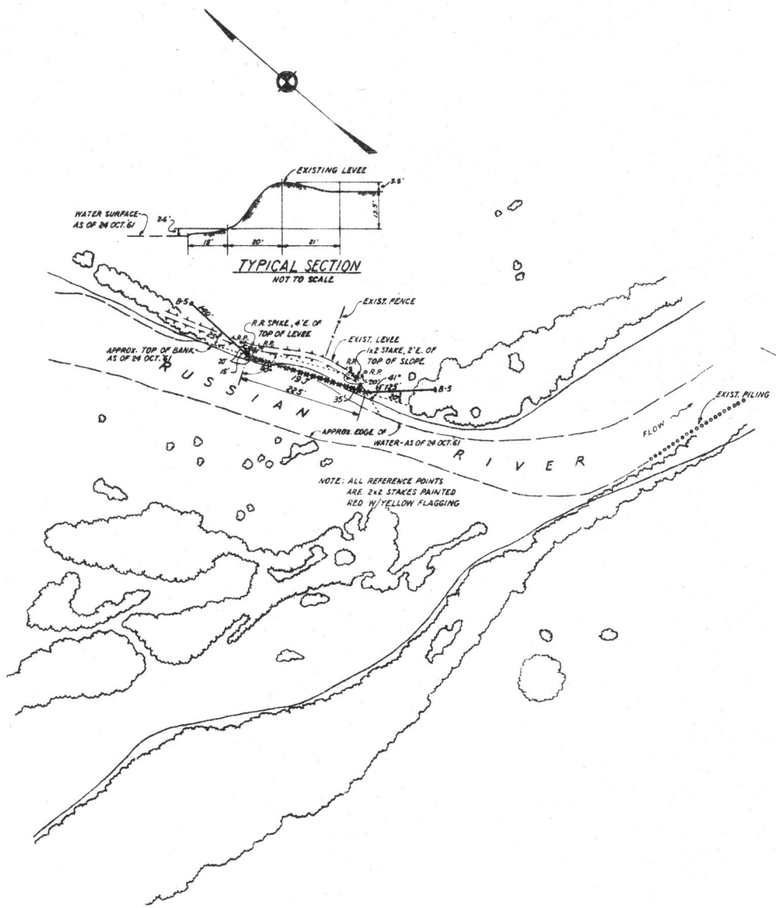
FISCAL YR.

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

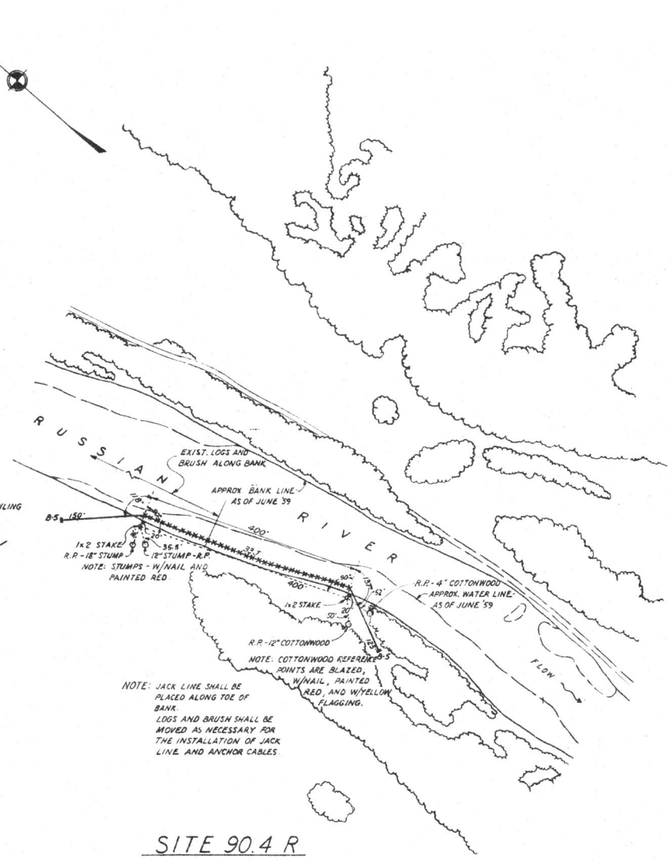
SCALE: 1" = 100' JOB No.

DRAWING NUMBER

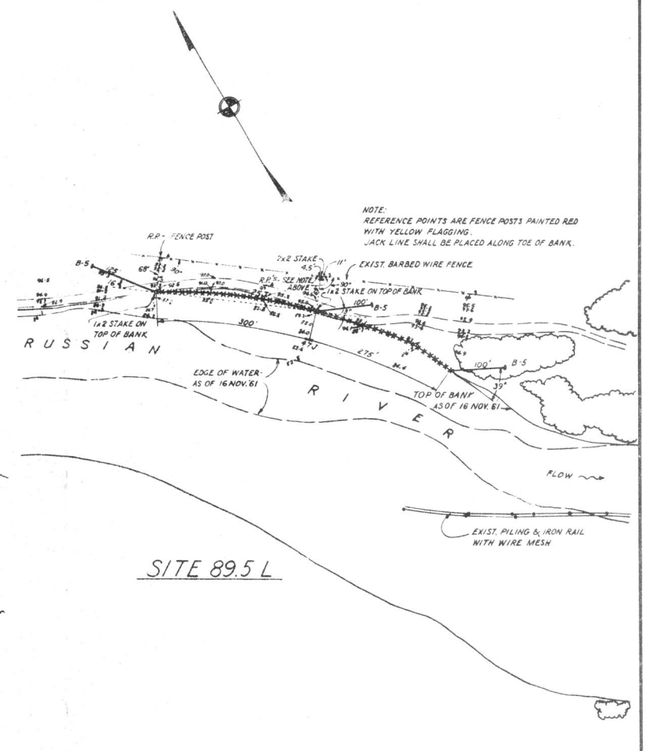
SHEET 8 | 61 | 45 | 36



SITE 91.6 L



SITE 90.4 R



SITE 89.5 L

SYMBOL	DESCRIPTION	DATE	APPROVAL
1	AS CONSTRUCTED - CHANGES MADE RR	11 OCT 63	J.R.

REVISIONS

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

LINE ITEM

DRAWN BY: RR
TRACED BY:
CHECKED BY: NJT
SUBMITTED: E. J. Dumas, Chief, Design Section
APPROVAL RECOMMENDED: N. J. Peterson, Chief of Branch (Design)

MENDOCINO COUNTY CALIFORNIA

RUSSIAN RIVER CHANNEL IMPROVEMENTS
DETAIL PLANS
SITES - 89.5L, 90.4R & 91.6L

APPROVED: E. A. Reilly, Chief Engineering Division
DATE: 25 MAY 1962

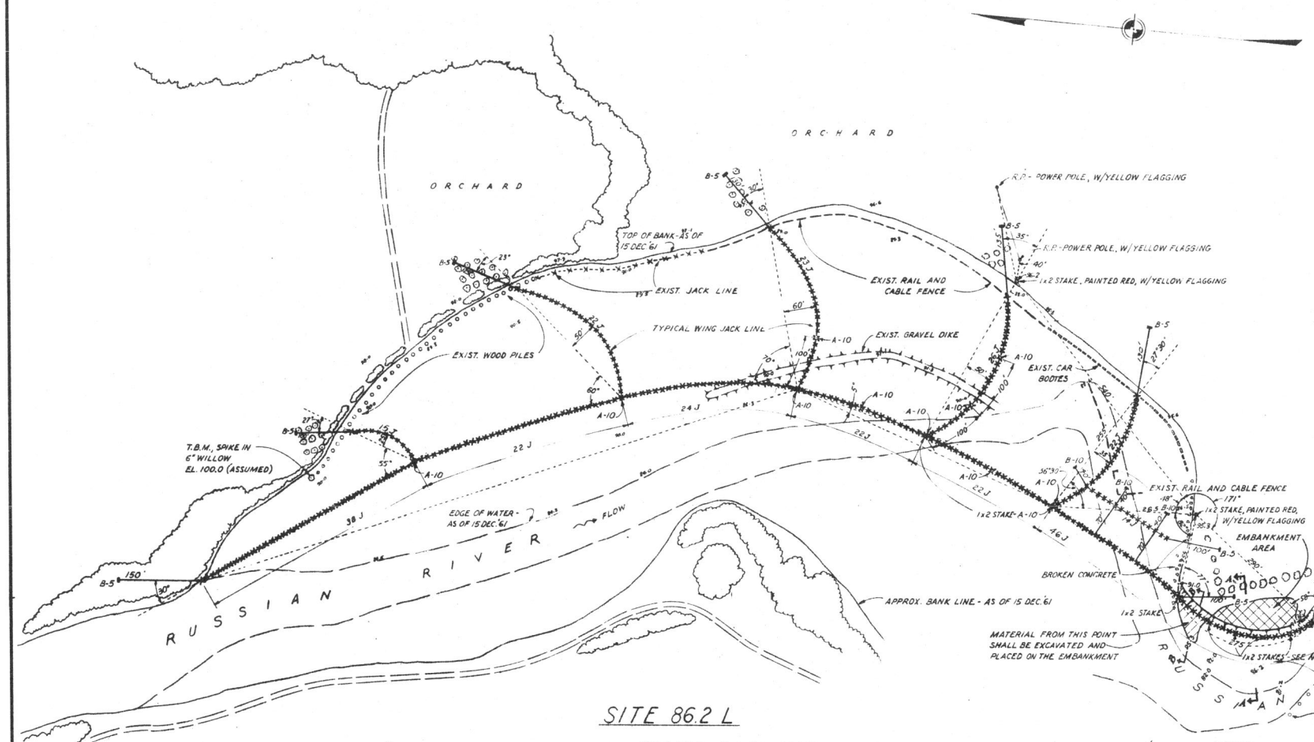
FISCAL YR.

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

SCALE: 1" = 100'
JOB No.
DRAWING NUMBER
SHEET 11 | 61 | 45 | 36

CORPS OF ENGINEERS

U. S. ARMY

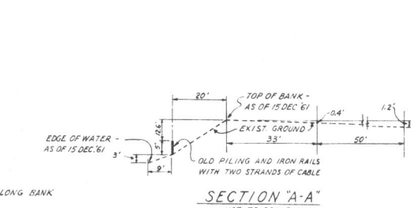


SITE 86.2 L

FOR EXTENSIONS AND MODIFICATIONS, SEE DRAWING 61-45-43, SHEET 18.

NOTES:

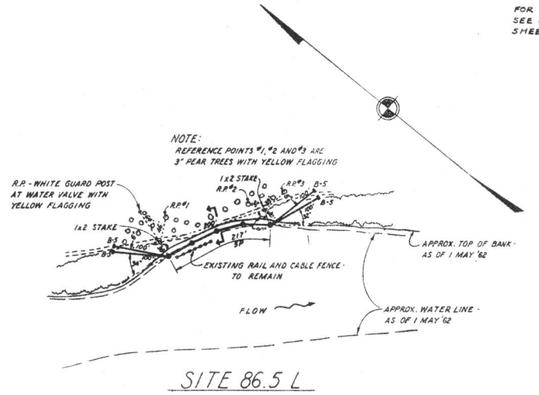
1. STAKES HAVE BEEN PLACED AT THE LOCATION FOR THE TOE OF THE EMBANKMENT
2. THE JACK LINE SHALL BE PLACED AT THE TOE OF THE EMBANKMENT.



SITE 85.8 R

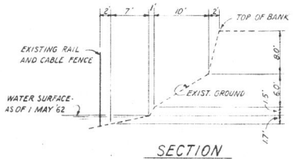
NOTE:
BROKEN CONCRETE SLABS AND SECTIONS OF REDWOOD TREES SHALL BE MOVED AS NECESSARY FOR THE INSTALLATION OF JACK LINE AND ANCHOR CABLES.

SECTION "A-A"
NOT TO SCALE
REFERS TO SITE 85.8 R

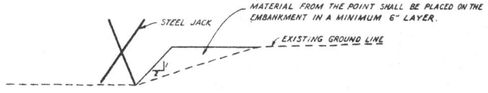


SITE 86.5 L

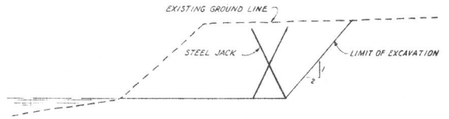
FOR EXTENSIONS AND MODIFICATIONS, SEE DRAWING 61-45-43, SHEET 19.



SECTION
SCALE: 1" = 10'
NOTE: REFERS TO SITE 86.5 L
SURVEY PERFORMED 1 MAY '62.



SECTION A-A



SECTION B-B

NOTE: THESE SECTIONS REFER TO SITE 86.2 L

SYMBOL	DESCRIPTION	DATE	APPROVAL
	REVISIONS		
3	AS CONSTRUCTED-CHANGES MADE. **	11 OCT 63	J.A.M.
2	REVISED TOPO AND SOUTHERN HALF OF JACK FIELD - SITE 86.2 ** F.B.	10 JUL 62	RER
1	SITE 85.8 R, JACK LINE RELOCATED IN FRONT OF EXIST. PILING SITE 86.5 L, STAKE ADDED F.B.	3 JUNE 62	RER

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

DRAWN BY: RER
TRACED BY:
CHECKED BY: NJT
SUBMITTED: C.J. Olsen, CHIEF CIVIL SECTION
APPROVAL RECOMMENDED: N. J. Tornberg, CHIEF BY DELEGATION (DESIGN)

MENDOCINO COUNTY — CALIFORNIA

RUSSIAN RIVER CHANNEL IMPROVEMENTS DETAIL PLANS SITES - 85.8R, 86.2L & 86.5L

APPROVED: [signature], CHIEF ENGINEERING BRANCH
DATE: 25 MAY 1962

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

SCALE: 1" = 100' JOB No.

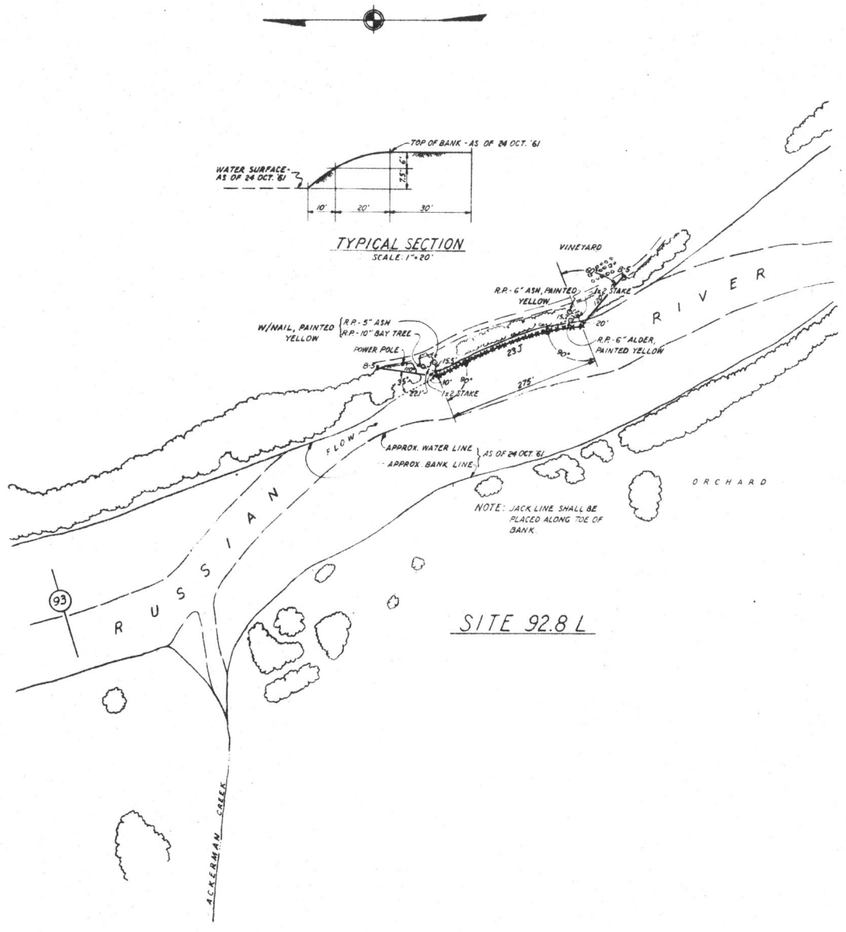
DRAWING NUMBER: SHEET 9 | 61 | 45 | 36

LINE ITEM

FISCAL YR.

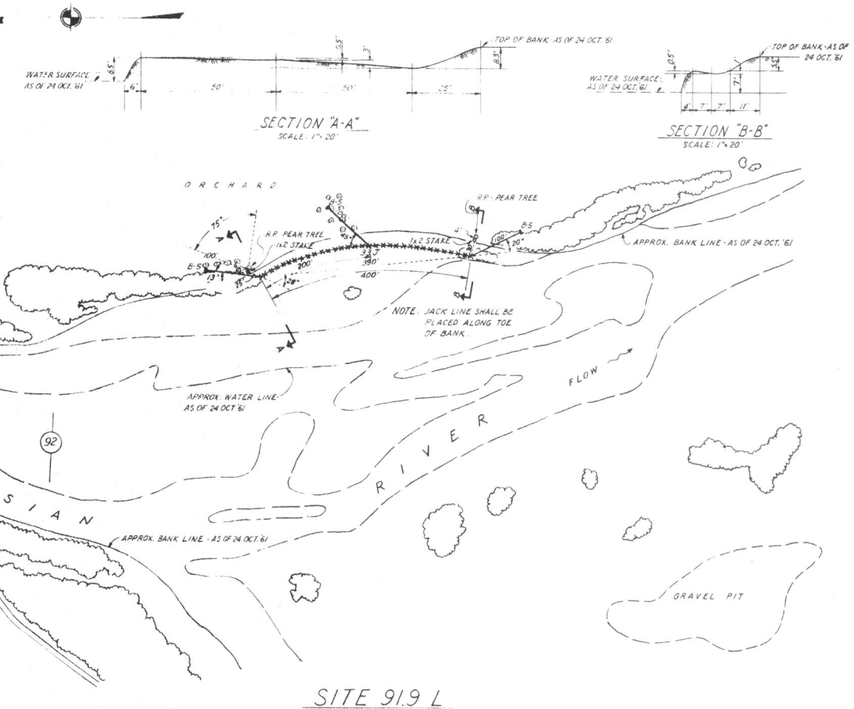
CORPS OF ENGINEERS

U. S. ARMY



TYPICAL SECTION
SCALE: 1"=20'

SITE 92.8 L



SECTION "A-A"
SCALE: 1"=20'

SECTION "B-B"
SCALE: 1"=20'

SITE 91.9 L

SYMBOL	DESCRIPTION	DATE	APPROVAL
1	AS CONSTRUCTED - NO CHANGES MADE R.R.	11 OCT. 63	J.F.

REVISIONS

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

DRAWN BY: R.R.
TRACED BY:
CHECKED BY: N.J.T.
SUBMITTED: L. J. Bauer, CHIEF, DESIGN SECTION

MENDOCINO COUNTY CALIFORNIA

RUSSIAN RIVER CHANNEL IMPROVEMENTS

DETAIL PLANS

SITES - 91.9 L & 92.8 L

APPROVAL RECOMMENDED: CHIEF OF ENGINEERING DIVISION

APPROVED: E. P. Reilly, CHIEF, ENGINEERING DIVISION

DATE: 25 MAY 1962

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

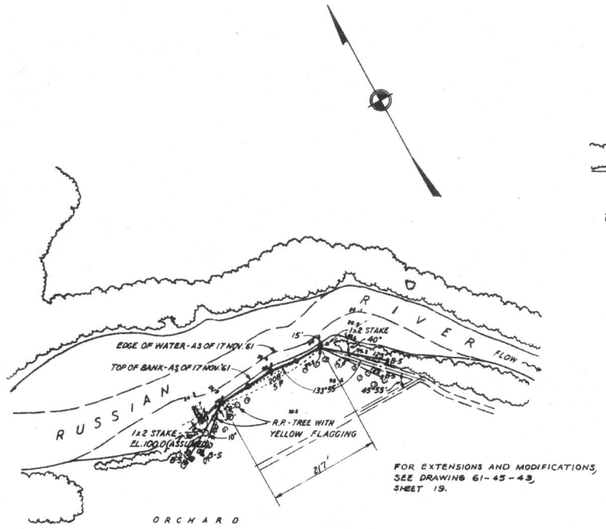
SCALE: 1" = 100' JOB No.

DRAWING NUMBER

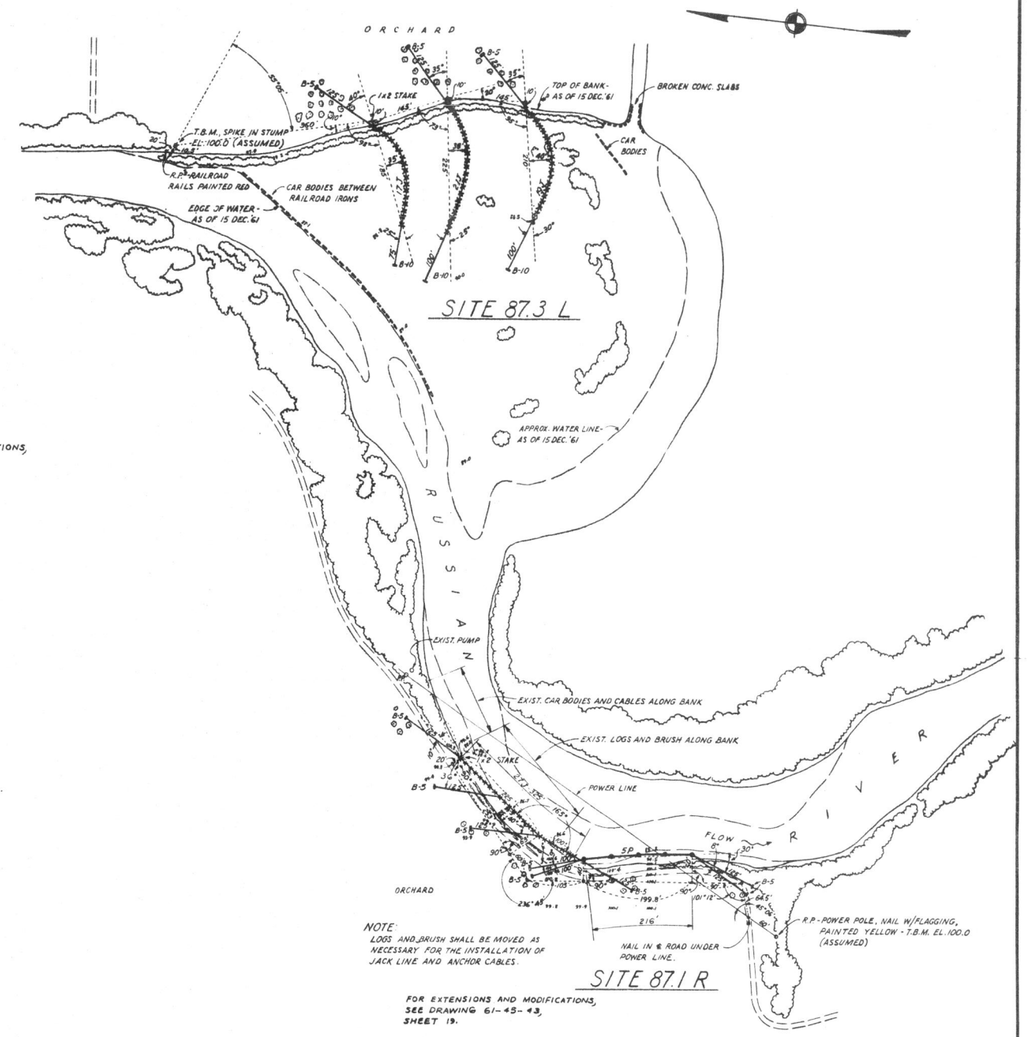
SHEET 12 | 61 | 45 | 36

LINE ITEM

FISCAL YRS.



SITE 87.6 R



SITE 87.3 L

SITE 87.1 R

NOTE:
LOGS AND BRUSH SHALL BE MOVED AS NECESSARY FOR THE INSTALLATION OF JACK LINE AND ANCHOR CABLES.

FOR EXTENSIONS AND MODIFICATIONS, SEE DRAWING 61-45-43, SHEET 19.

SYMBOL	DESCRIPTION	DATE	APPROVAL
△	AS CONSTRUCTED - CHANGES MADE RP	11 OCT. 63	J.R.

REVISIONS

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

DRAWN BY: RE
TRACED BY:
CHECKED BY: N.S.T.
SUBMITTED: C. J. Dana, CHIEF, PLANS SECTION
APPROVAL RECOMMENDED: CHIEF OF ENGINEERS DIVISION
APPROVED: CHIEF, ENGINEERING DIVISION
DATED: 25 MAY 1962

MENDOCINO COUNTY CALIFORNIA

RUSSIAN RIVER CHANNEL IMPROVEMENTS DETAIL PLANS SITES -87.1R, 87.3L & 87.6R

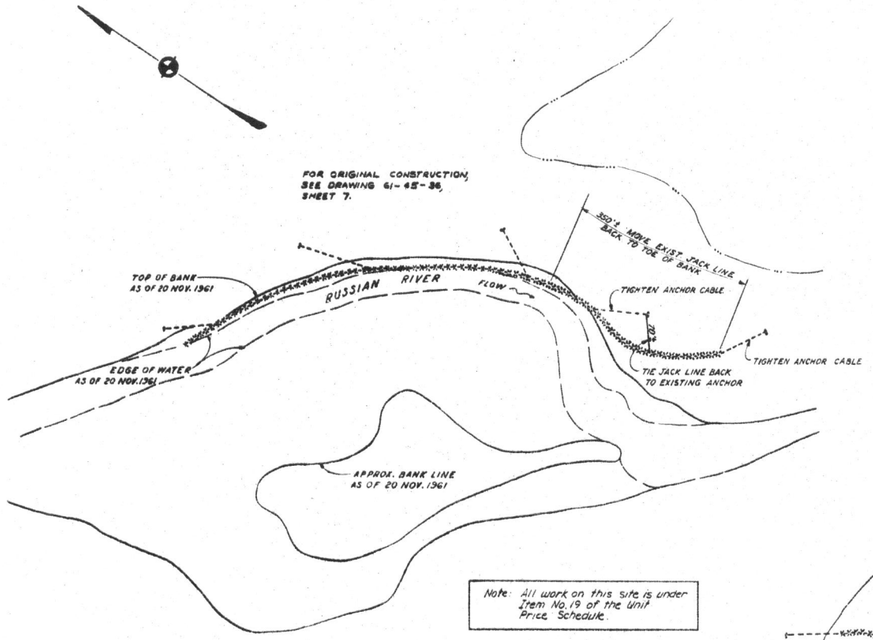
LINE ITEM
FISCAL YR.

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

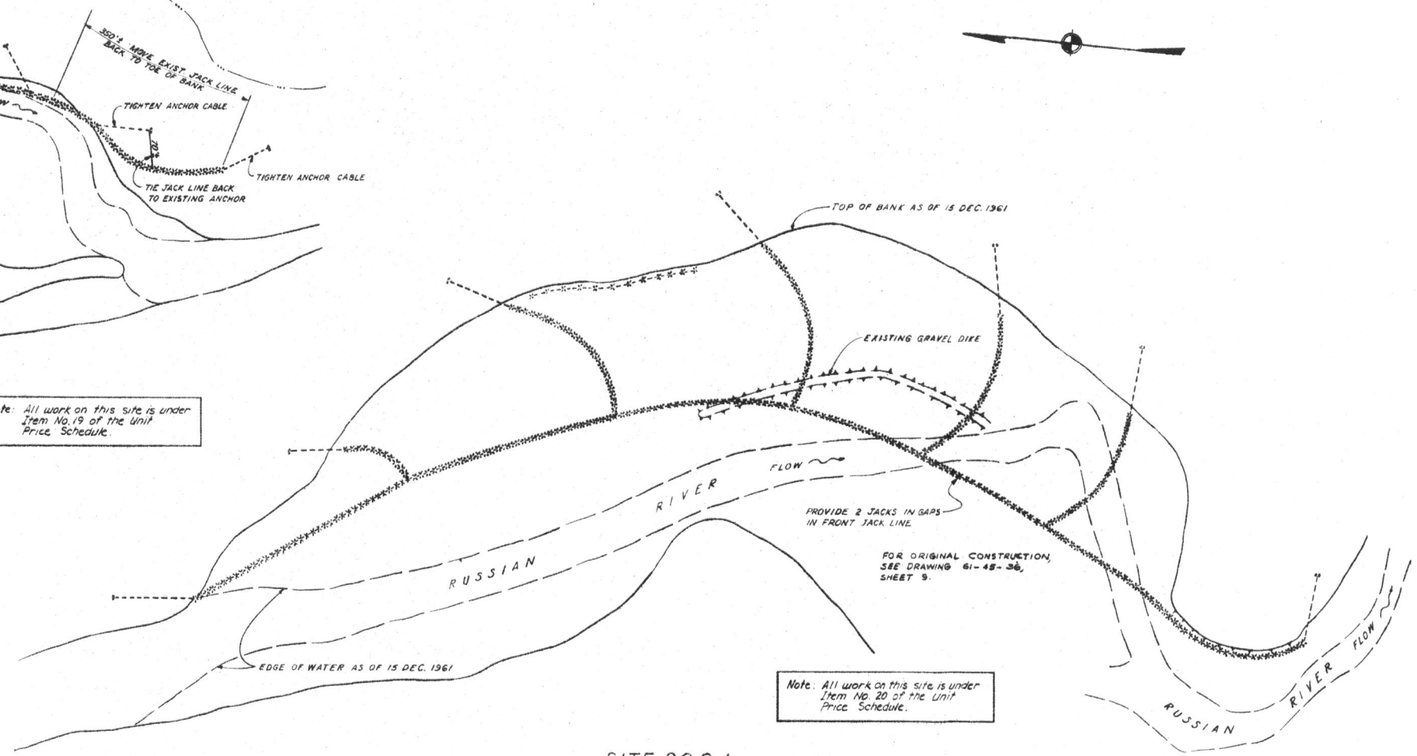
SCALE: 1"=100' JOB No.

DRAWING NUMBER

SHEET 10 | 61 | 45 | 36



SITE 83.5 L



SITE 86.2 L

NOTE
See sheet no. 1 for LEGEND and NOTES.

SYMBOL	DESCRIPTION	DATE	APPROVAL
	REVISIONS		
⚠	AS CONSTRUCTED - NO CHANGES MADE	24 June '64	R.K.R.

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

DRAWN BY: RR
TRACED BY:
CHECKED BY: A.B.
QUANTITIES:
APPROVAL RECOMMENDED: for CHIEF, CIVIL SECTION
CHIEF OF BRANCH (DESIGN)

MENDOCINO COUNTY CALIFORNIA

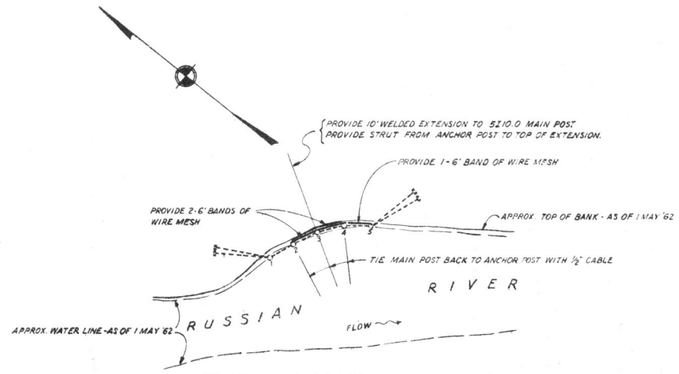
RUSSIAN RIVER
EXTENSIONS AND MODIFICATIONS OF CHANNEL IMPROVEMENTS
DETAIL PLANS
SITES - 83.5 L & 86.2 L

APPROVED: DATED: 15 MAR 1962
CHIEF ENGINEERS DIVISION

LINE ITEM
PHYSICAL NO.

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

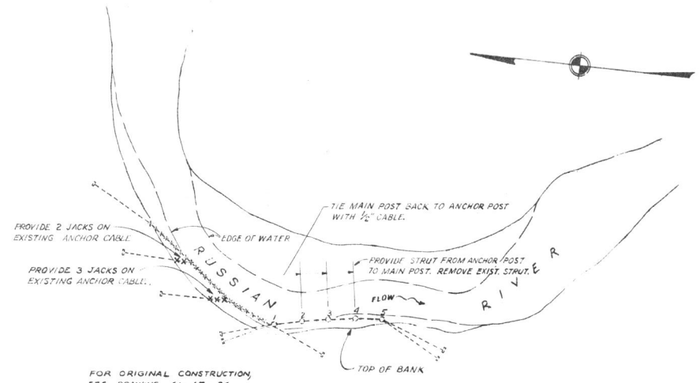
SCALE: 1" = 100' JOB No.
DRAWING NUMBER
SHEET 18 61 45 43



FOR ORIGINAL CONSTRUCTION, SEE DRAWING 61-45-36, SHEET 9.

Note: All work on this site is under Item No. 21 of the Unit Price Schedule.

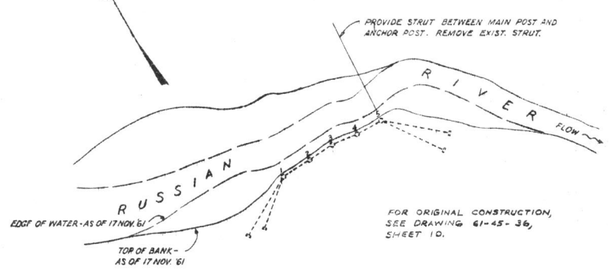
SITE 86.5 L



FOR ORIGINAL CONSTRUCTION, SEE DRAWING 61-45-36, SHEET 10.

Note: All work on this site is under Item No. 22 of the Unit Price Schedule.

SITE 87.1 R



FOR ORIGINAL CONSTRUCTION, SEE DRAWING 61-45-36, SHEET 10.

SITE 87.6 R

NOTE See sheet no. 1 for LEGEND and NOTES.

SYMBOL	DESCRIPTION	DATE	APPROVAL
△	AS CONSTRUCTED - CHANGES MADE	24 June '66	RKR

REVISIONS

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

DRAWN BY: RE
TRACED BY:
CHECKED BY: AB
SUBMITTED: for CHIEF, CIVIL BRANCH
APPROVAL RECOMMENDED: CHIEF OF ENGINEER'S REPRESENTATIVE

MENDOCINO COUNTY CALIFORNIA

RUSSIAN RIVER
EXTENSIONS AND MODIFICATIONS OF CHANNEL IMPROVEMENTS
DETAIL PLANS
SITES - 86.5L, 87.1R & 87.6R

APPROVED: DATE: 15 Dec 1962
CHIEF ENGINEERS DIVISION

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

SCALE: 1"=100' JOB No.

DRAWING NUMBER
SHEET 19 | 61 | 45 | 43

LINE ITEM
FISCAL YR.