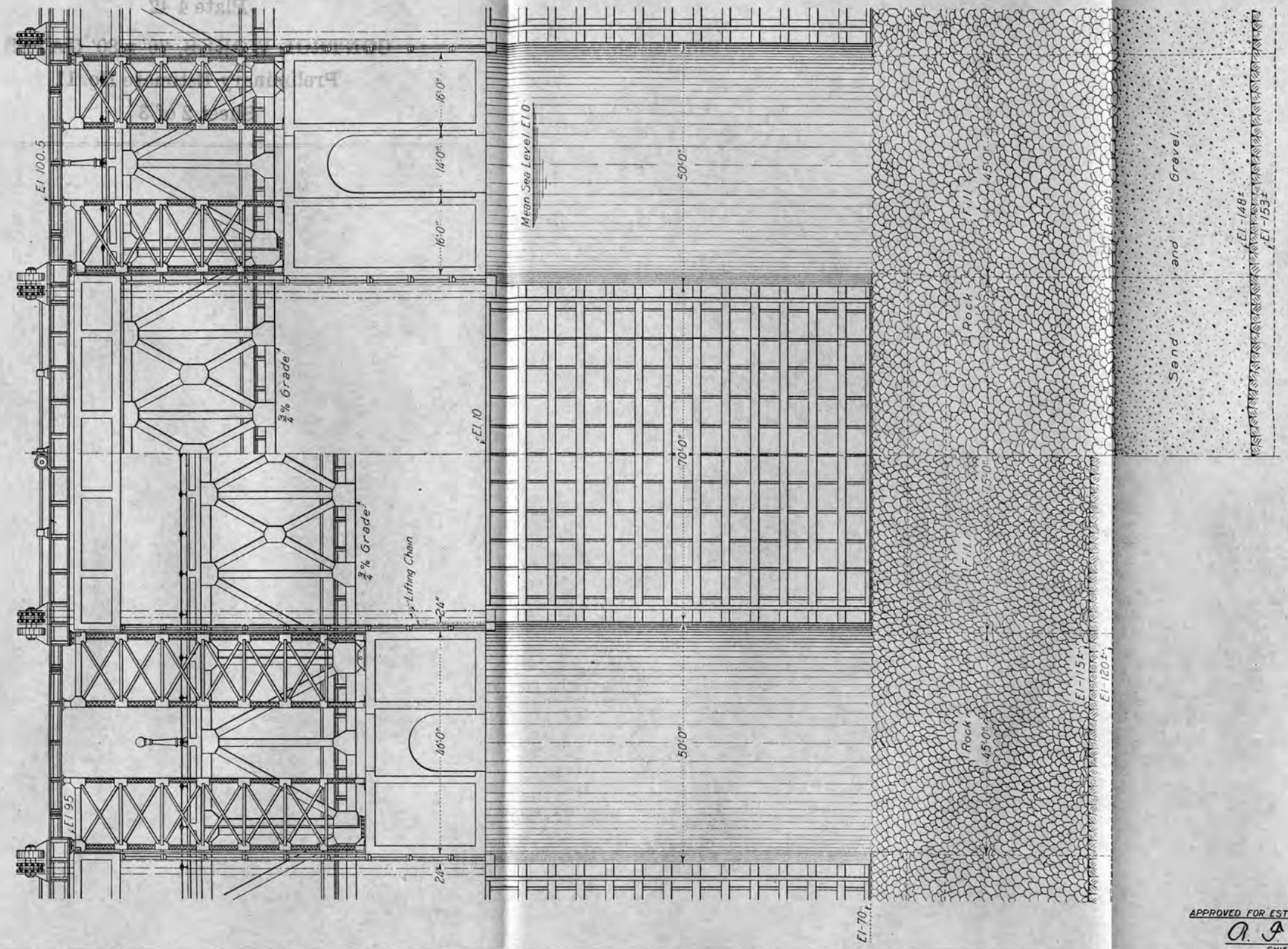


HALF UPSTREAM ELEVATIONS

Notes:-
Sides of Piers to be gunited above low Water after removal of Caisson Skin Plates.
Caisson Steel which is left in place in Substructure not shown.

Scale.

PRELIMINARY DESIGN

APPROVED FOR ESTIMATING PURPOSES-
A. P. Walter.
CHIEF ENGINEER.

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
CONTROL WORKS- 70'x 80' GATE
PRELIMINARY ESTIMATE NO. 11

DRAWN: C.M.J. C.A.M. SUBMITTED: W. R. Young
CHECKED: N.B.H. RECOMMENDED: J. L. Savage

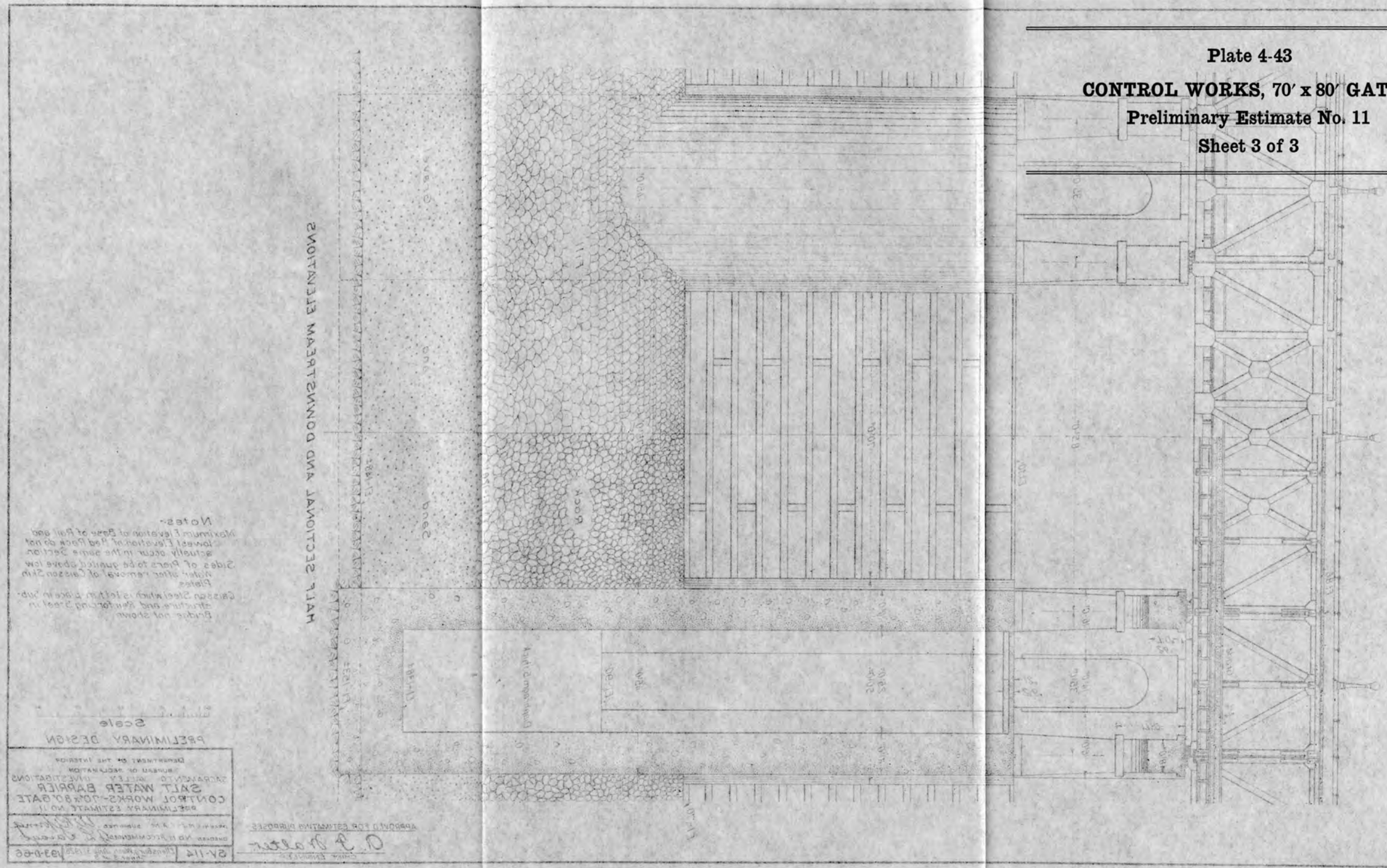
SV-113	Ellensburg, Wash. July 31, 1926 Sheet 2 of 3	193-D-65

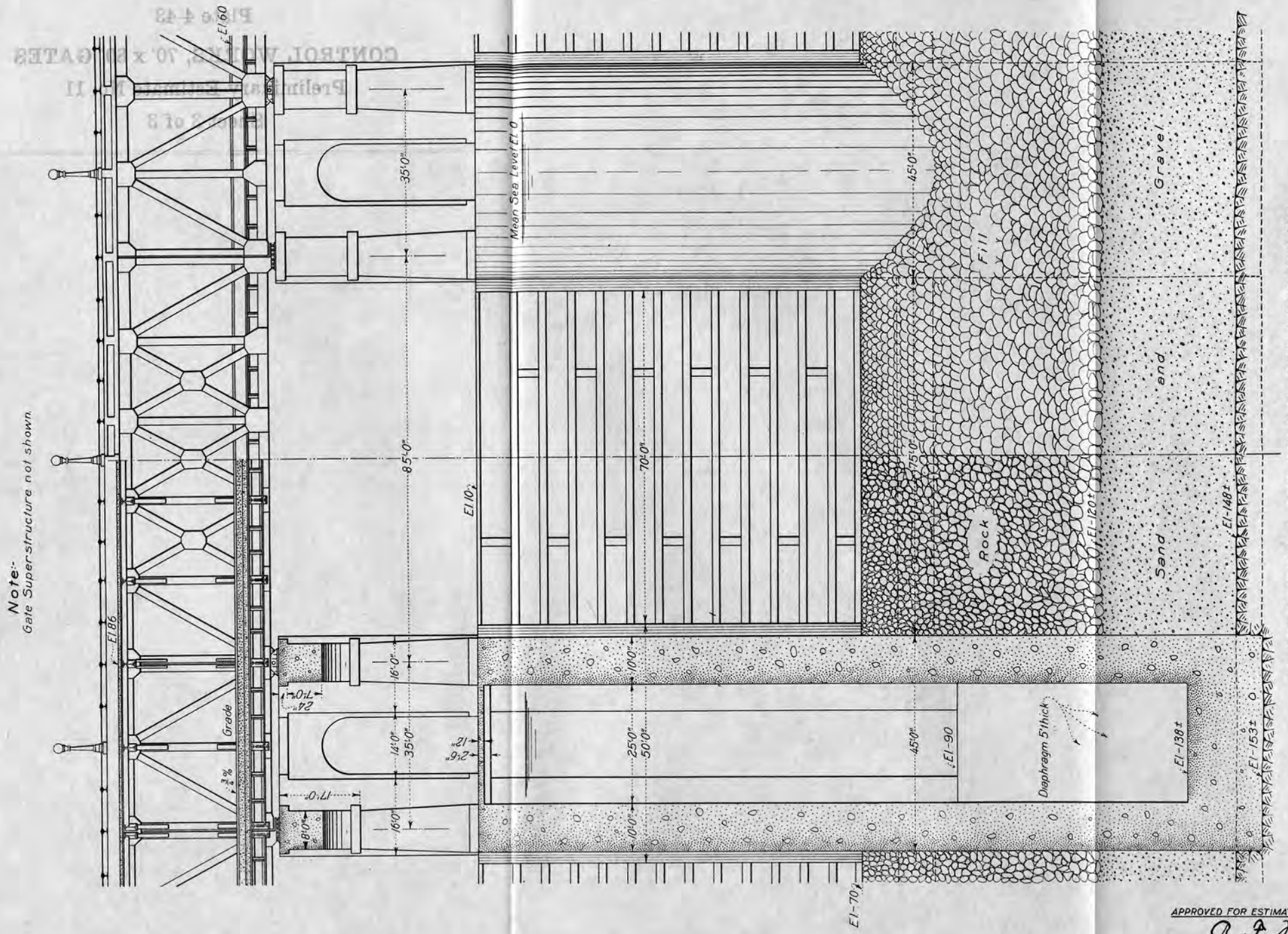
Plate 4-43

CONTROL WORKS, 70′ x 80′ GATES

Preliminary Estimate No. 11

Sheet 3 of 3





HALF SECTIONAL AND DOWNSTREAM ELEVATIONS

Notes:-
Maximum Elevation of Base of Rail and lowest Elevation of Bed Rock do not actually occur in the same Section.
Sides of Piers to be gunited above low Water after removal of Caisson Skin Plates.
Caisson Steel which is left in place in Substructure and Reinforcing Steel in Bridge not shown.

Scale

PRELIMINARY DESIGN

APPROVED FOR ESTIMATING PURPOSES:-
A. F. Walter
CHIEF ENGINEER

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
CONTROL WORKS- 70'x80' GATE
PRELIMINARY ESTIMATE NO. 11

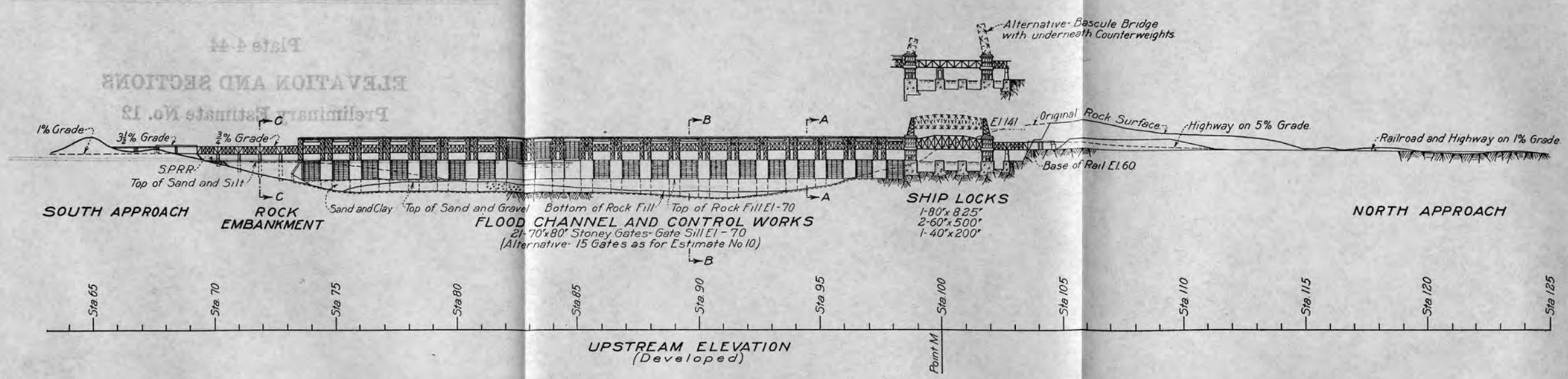
DRAWN: C.M.J.- C.A.M. SUBMITTED: W. R. Young
CHECKED: N.B.H. RECOMMENDED: J. L. Savage

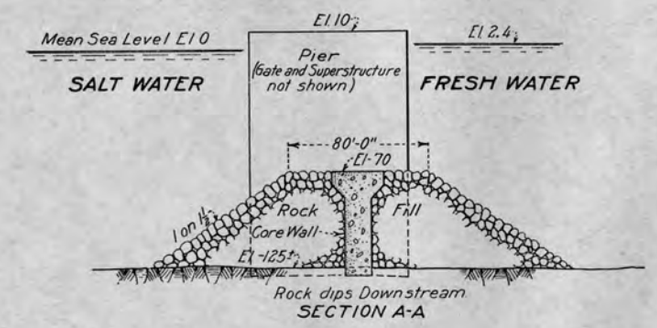
SV-114 | Ellensburg, Wash. July 31, 1926. Sheet 3 of 3 | 193-D-66

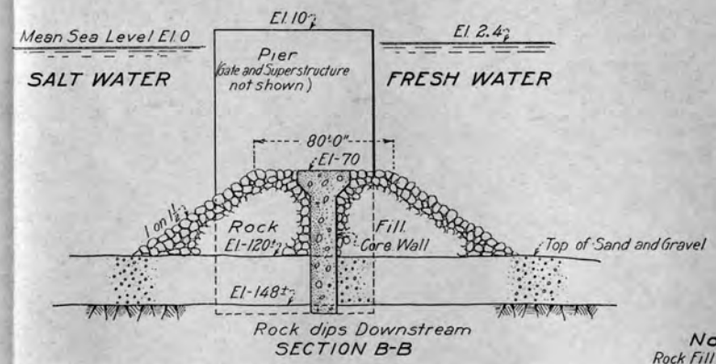
Plate 4-44

ELEVATION AND SECTIONS

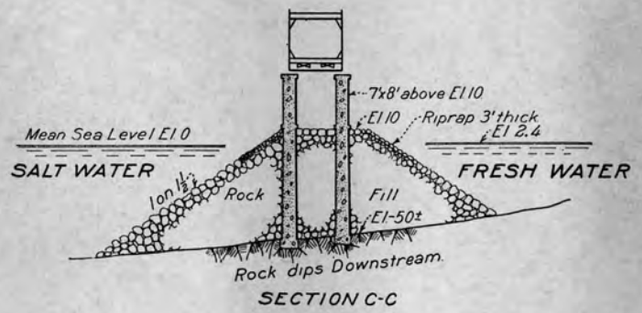
Preliminary Estimate No. 12







EMBANKMENT SECTIONS



Notes:-

Rock Fill to be placed by Bottom Dump Barges up to Maximum Elevation permitted by draft. Remainder to be placed by Derrick Barges and Skips

Sections A-A and B-B show Rock Fill deposited around Core Wall under Stoney Gates where action of Current is negligable below El-70

Section C-C shows Embankment placed inside South Cofferdam. Alternative Estimate No 12, gives cost with only 15 Flood Gates, located as for Estimate No 10

0 10' 50' 100' 150'
Scale

PRELIMINARY DESIGN

APPROVED FOR ESTIMATING PURPOSES:-
A. F. Walter
CHIEF ENGINEER

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
ELEVATION AND SECTIONS
PRELIMINARY ESTIMATE NO. 12

DRAWN: C.M.J-L.T.F-C.A.M SUBMITTED: W. R. Young
CHECKED: N.B.H RECOMMENDED: J. L. Savage

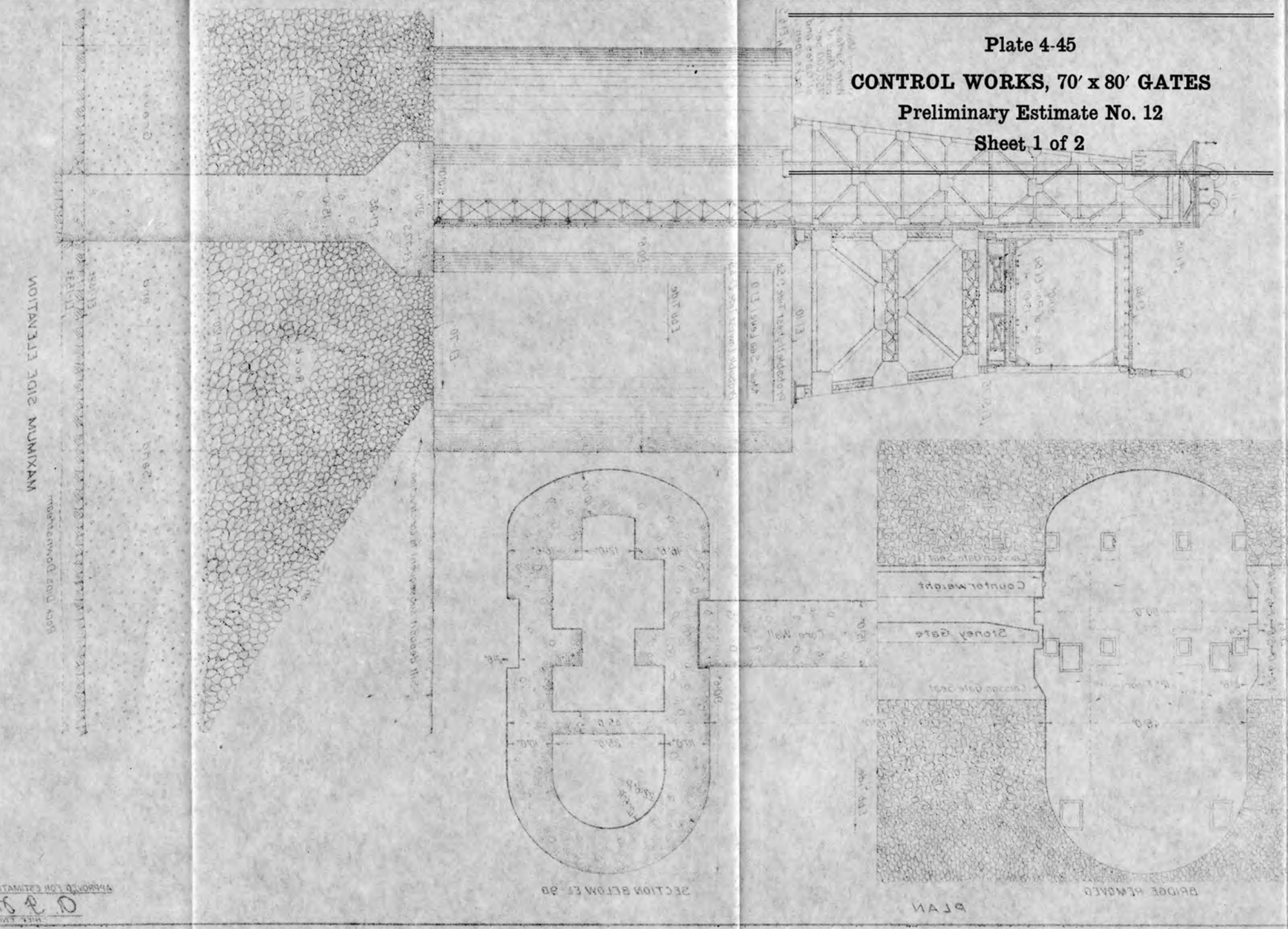
SV-115 | Ellensburg, Wash July 19, 1926. | 193-D-67

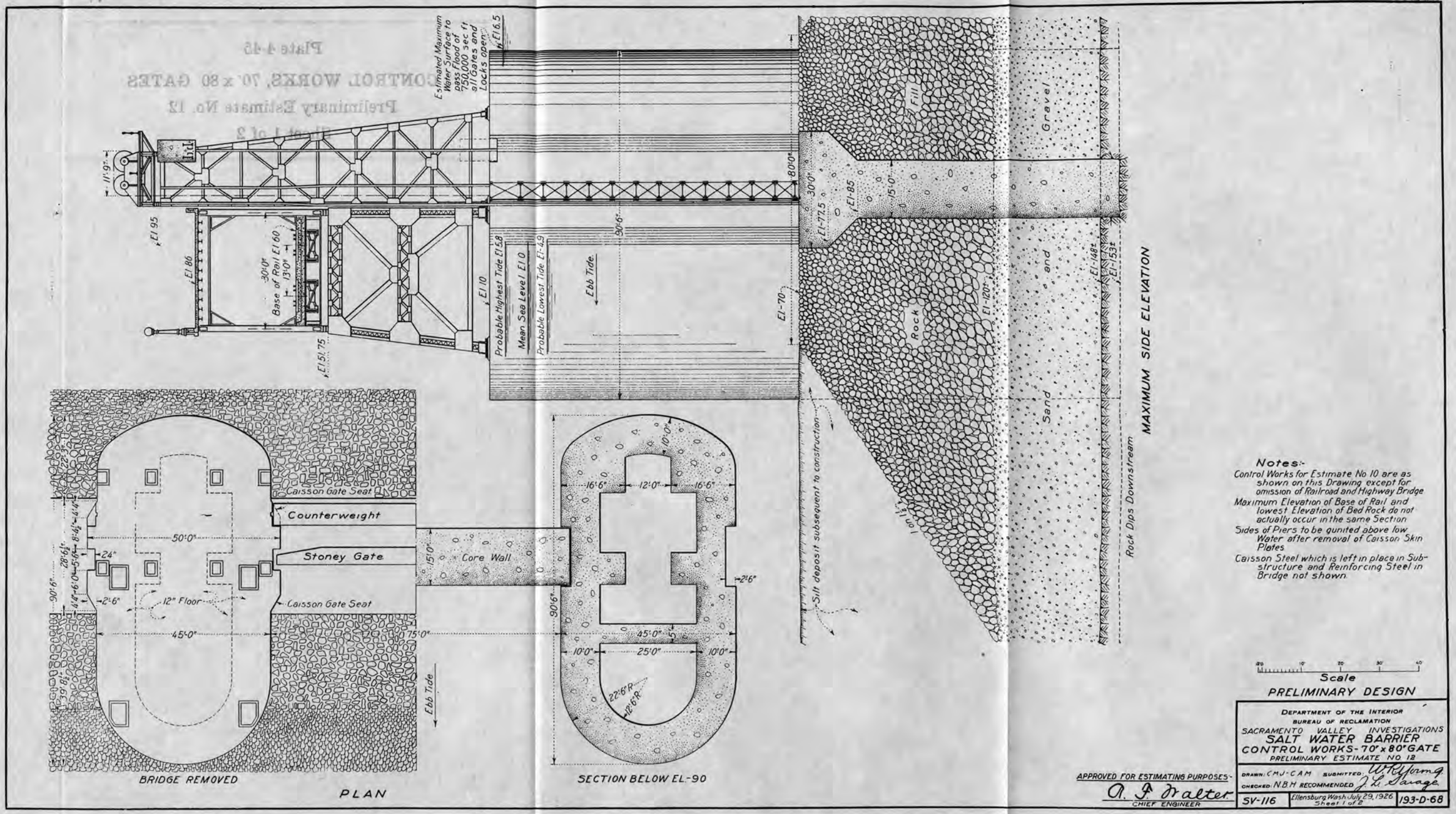
Plate 4-45

CONTROL WORKS, 70′ x 80′ GATES

Preliminary Estimate No. 12

Sheet 1 of 2





Notes:-

Control Works for Estimate No 10 are as shown on this Drawing except for omission of Railroad and Highway Bridge

Maximum Elevation of Base of Rail and lowest Elevation of Bed Rock do not actually occur in the same Section

Sides of Piers to be gunited above low Water after removal of Caisson Skin Plates

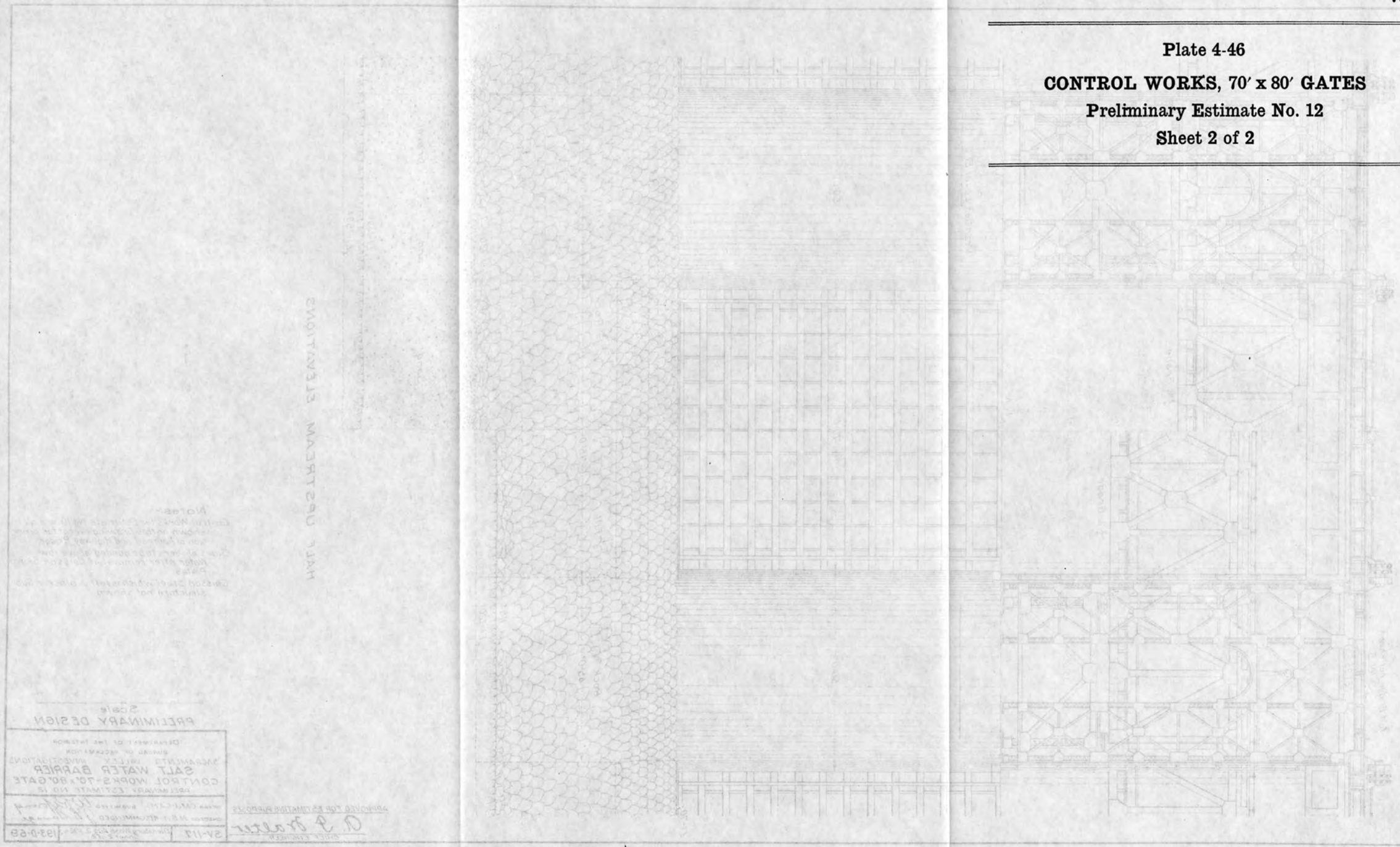
Caisson Steel which is left in place in Substructure and Reinforcing Steel in Bridge not shown.

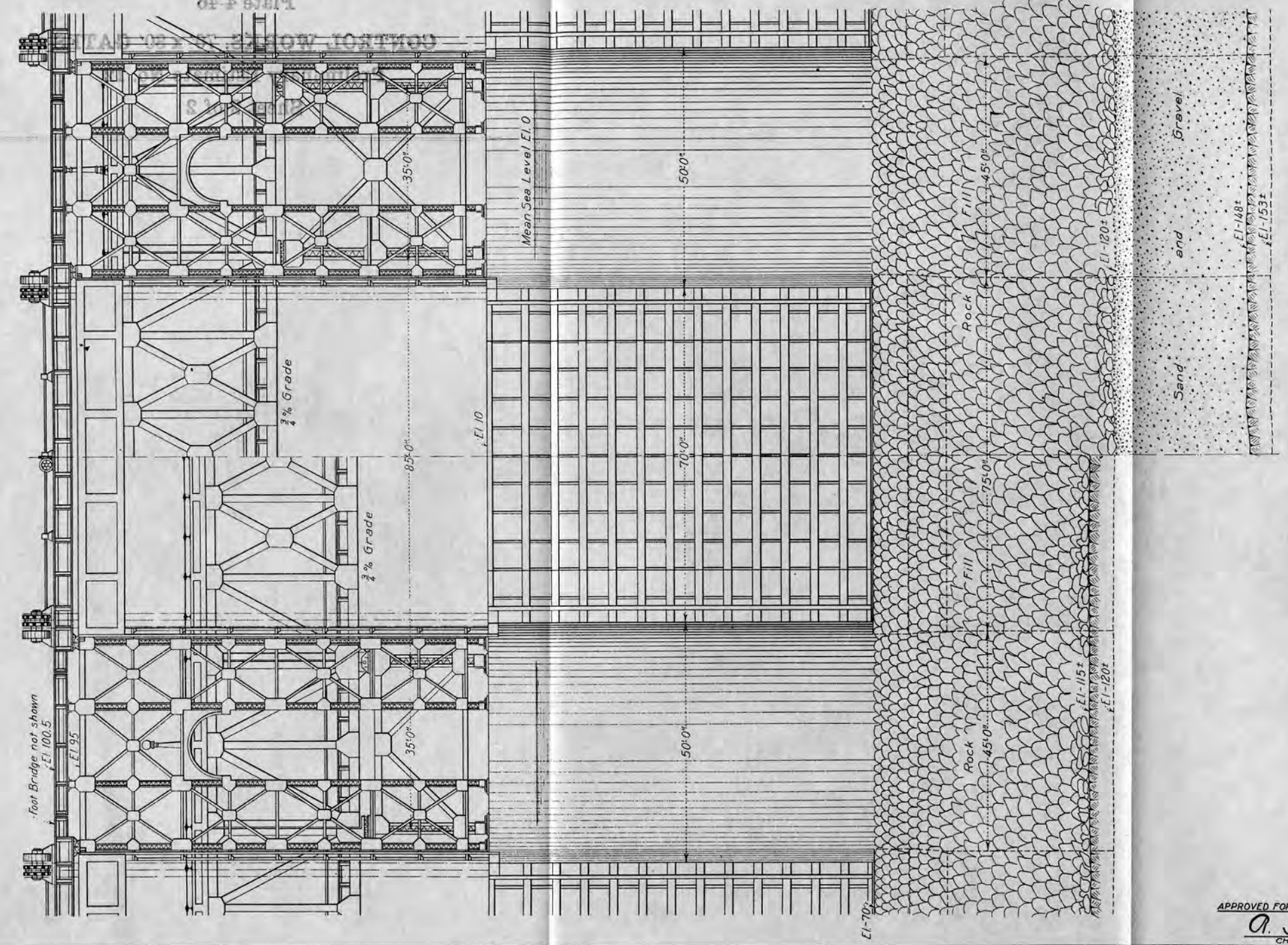
Plate 4-46

CONTROL WORKS, 70′ x 80′ GATES

Preliminary Estimate No. 12

Sheet 2 of 2





HALF UPSTREAM ELEVATIONS

Notes:-

Control Works for Estimate No. 10 are as shown on this Drawing except for omission of Railroad and Highway Bridge.

Sides of Piers to be gunited above low Water after removal of Caisson Skin Plates

Caisson Steel which is left in place in Substructure not shown

Scale

PRELIMINARY DESIGN

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
CONTROL WORKS-70'x80' GATE
PRELIMINARY ESTIMATE NO. 12

DRAWN: C.M.J.-C.A.M. SUBMITTED W. H. Young
CHECKED: N.B.H. RECOMMENDED J. L. Savage

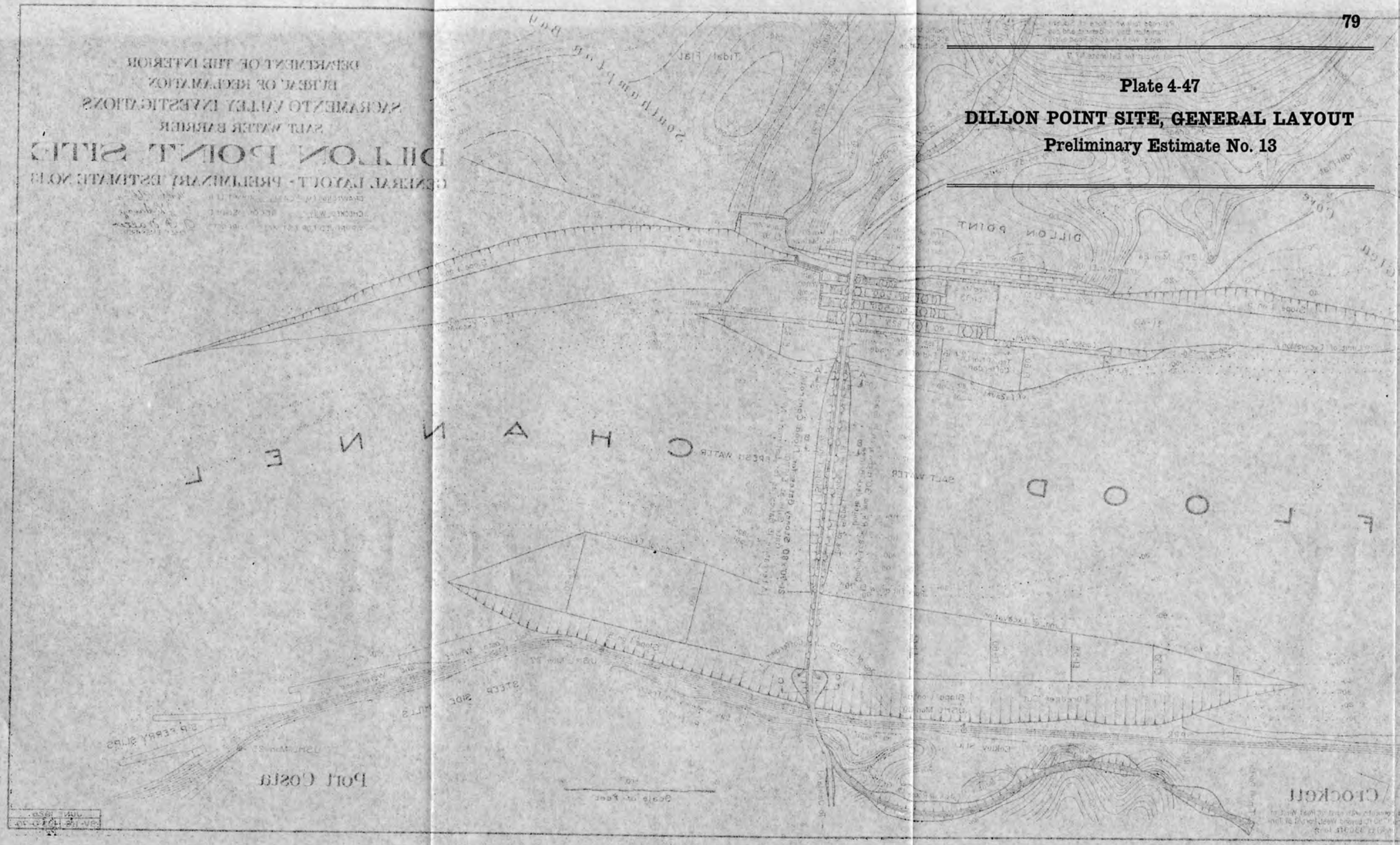
APPROVED FOR ESTIMATING PURPOSES:
A. F. Walter
CHIEF ENGINEER

SV-117 | Ellensburg Wash. Aug. 2, 1926 Sheet 2 of 2 | 193-D-69

Plate 4-47

DILLON POINT SITE, GENERAL LAYOUT

Preliminary Estimate No. 13



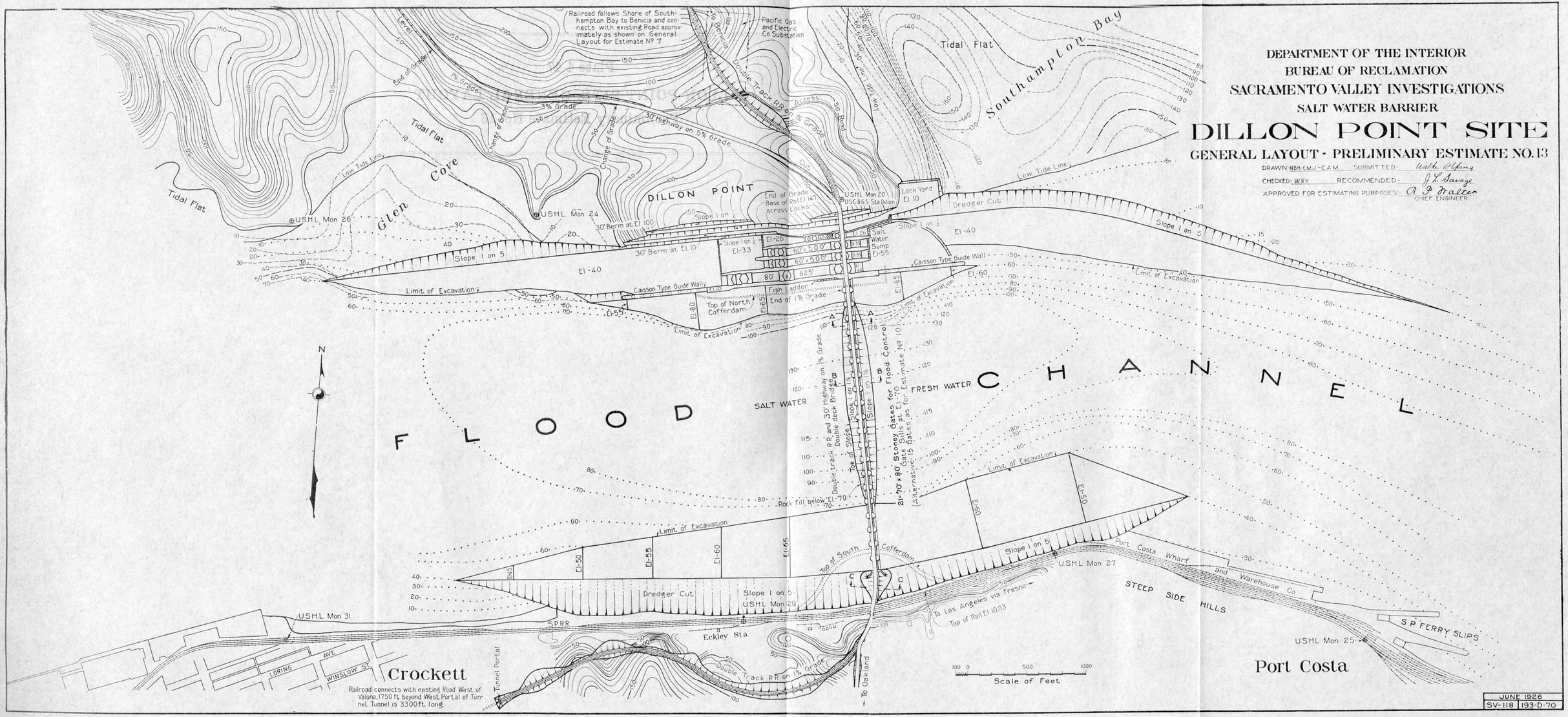
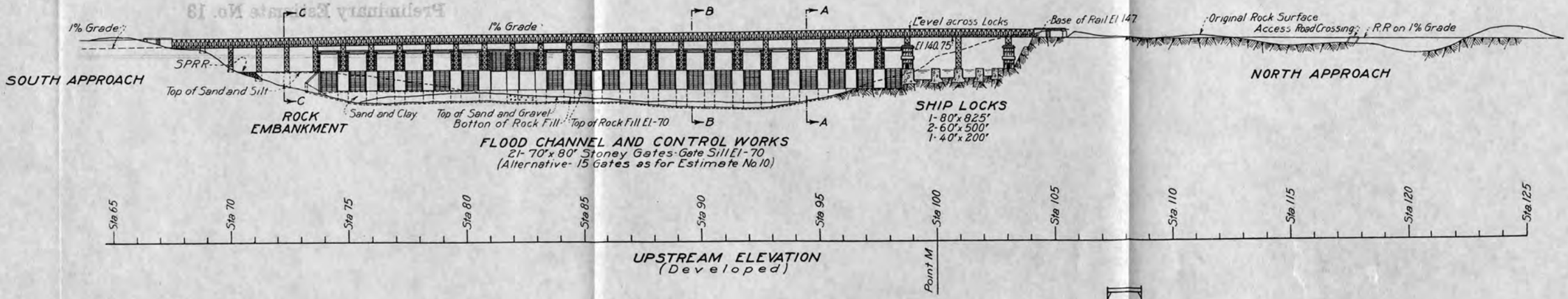
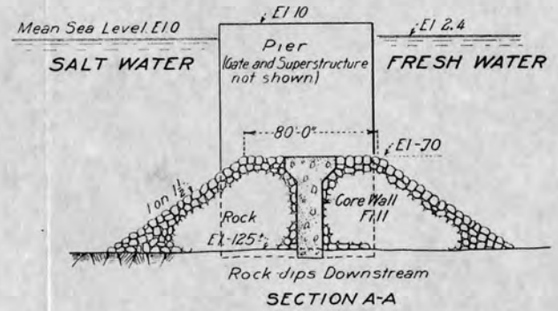

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
DILLON POINT SITE
GENERAL LAYOUT - PRELIMINARY ESTIMATE NO. 13
DRAWN-NBH-CMJ-CAM SUBMITTED-
CHECKED-WRY RECOMMENDED-
APPROVED FOR ESTIMATING PURPOSES-
CHIEF ENGINEER
Railroad follows Shore of Southampton Bay to Benicia and connects with existing Road approximately as shown on General Layout for Estimate No 7
Pacific Gas and Electric Co Substation
Southampton Bay
Tidal Flat
Glen Cove
DILLON POINT
30' Highway on 5% Grade
Double Track RR on 1% Grade
Lock Yard El 10
Dredger Cut
Slope 1 on 5
Limit of Excavation
Caisson Type Guide Wall
Salt Water Sump
Fish Ladder
Top of North Cofferdam
End of Grade
Base of Rail El 14.7 across Locks
USHL Mon 20
USC&GS Sta Dillon
USHL Mon 26
USHL Mon 24
30' Berm at El 10
El-40
El-26
El-33
El-55
El-60
El-65
60' x 5.0'
80'
825'
FLOOD CHANNEL
SALT WATER
FRESH WATER
21-70' x 8.0' Stoney Gates for Flood Control
Gate Sills at El 7.0
(Alternative: 15 Gates, as for Estimate No 10)
Rock Fill below El -7.0
Top of Slope
Double-track RR and 30' Highway on 1% Grade
Double deck Bridge
Top of South Cofferdam
USHL Mon 27
Port Costa Wharf and Warehouse Co
STEEP SIDE HILLS
S P FERRY SLIPS
USHL Mon 25
Port Costa
USHL Mon 29
Eckley Sta
Double Track RR on 1% Grade
To Los Angeles via Fresno
Top of Rail El 10.03
To Oakland
Tunnel Portal
USHL Mon 31
SPRR
LORING AVE
WINSLOW ST
Crockett
Railroad connects with existing Road West of Valona, 1750 ft. beyond West Portal of Tunnel. Tunnel is 3300 ft. long.
Scale of Feet
JUNE 1926
SV-118 193-D-70

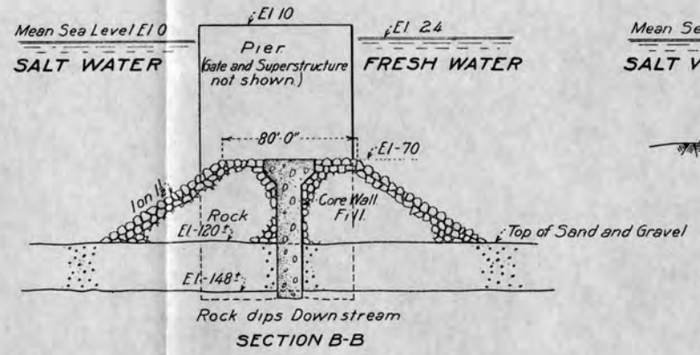
Plate 4-48

ELEVATION AND SECTIONS

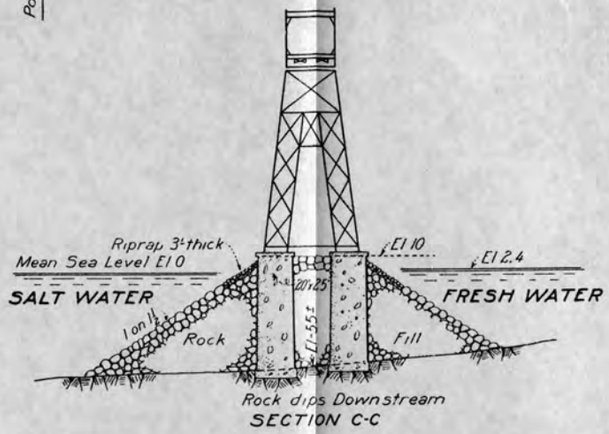
Preliminary Estimate No. 13







EMBANKMENT SECTIONS



Notes.-

Rock Fill to be placed by Bottom Dump Barges up to Maximum Elevation permitted by draft Remainder to be placed by Derrick Barges and Skips

Section A-A and B-B show Rock Fill to be deposited around Core Wall under Stoney Gates where action of Current is negligable below El-70

Section C-C shows Embankment placed inside of South Cofferdam.

Alternative Estimate No 13 gives Cost with only 15 Flood Gates, located as for Estimate No 10.

0 10 50 100 150
Scale
PRELIMINARY DESIGN

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
ELEVATION AND SECTIONS
PRELIMINARY ESTIMATE NO 13

DRAWN: C.M.J. L.T. C.A.M. SUBMITTED: W. H. Lyons
CHECKED: N.B.H. RECOMMENDED: J. L. Savage

APPROVED FOR ESTIMATING PURPOSES:
A. P. Walter
CHIEF ENGINEER

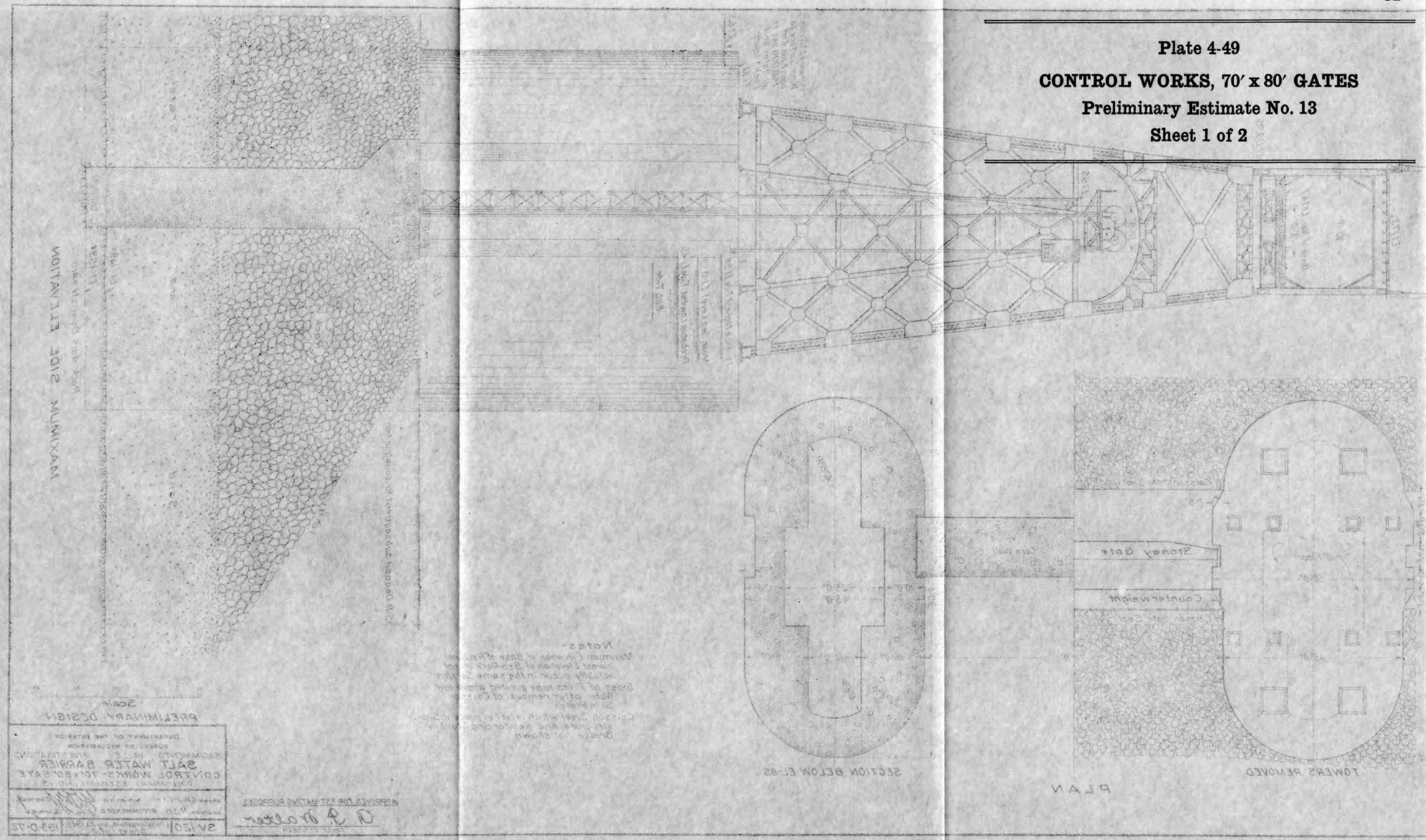
SV-119 | Ellensburg, Wash. July 23, 1926 | 193-D-71

Plate 4-49

CONTROL WORKS, 70′ x 80′ GATES

Preliminary Estimate No. 13

Sheet 1 of 2



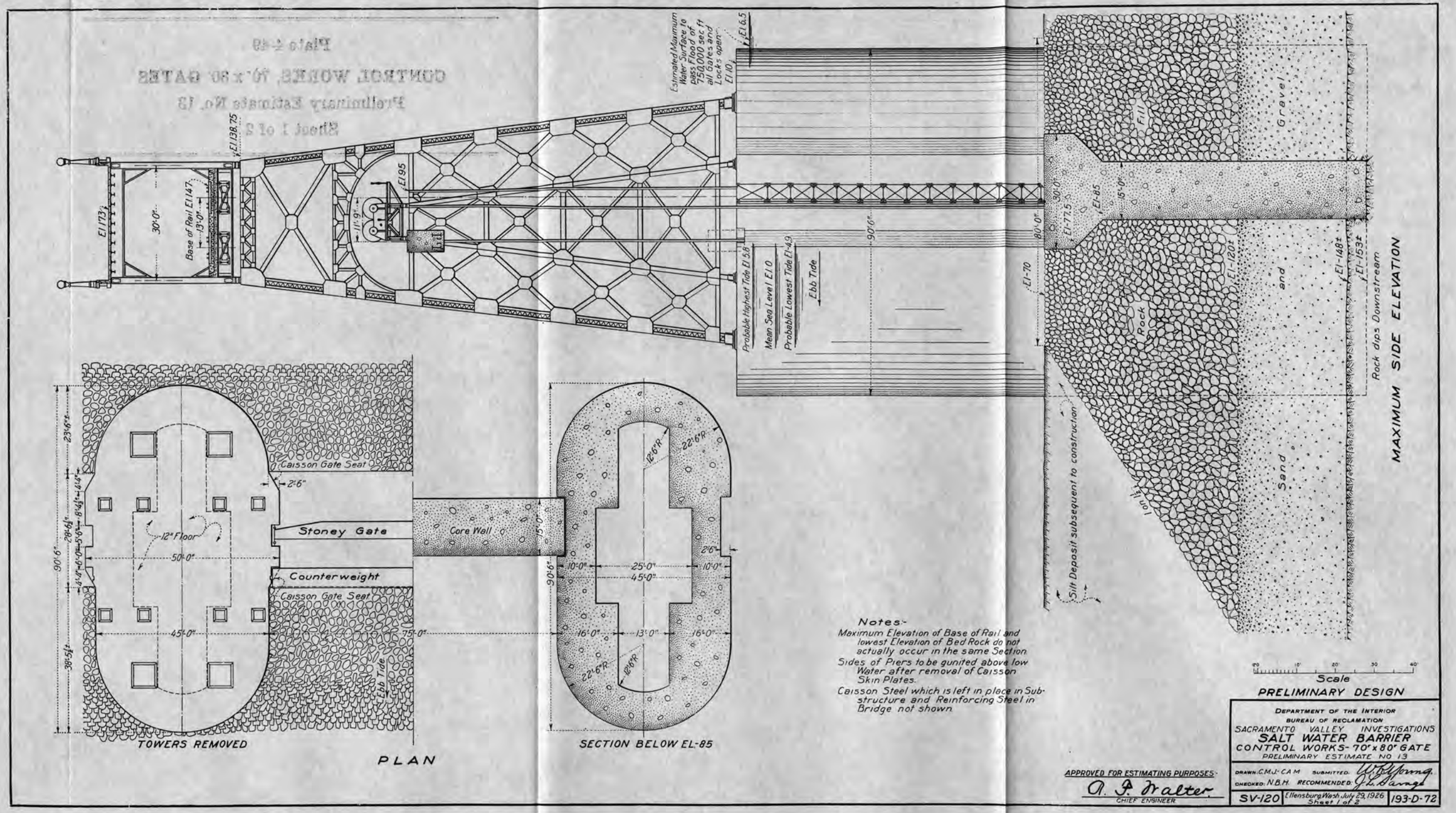
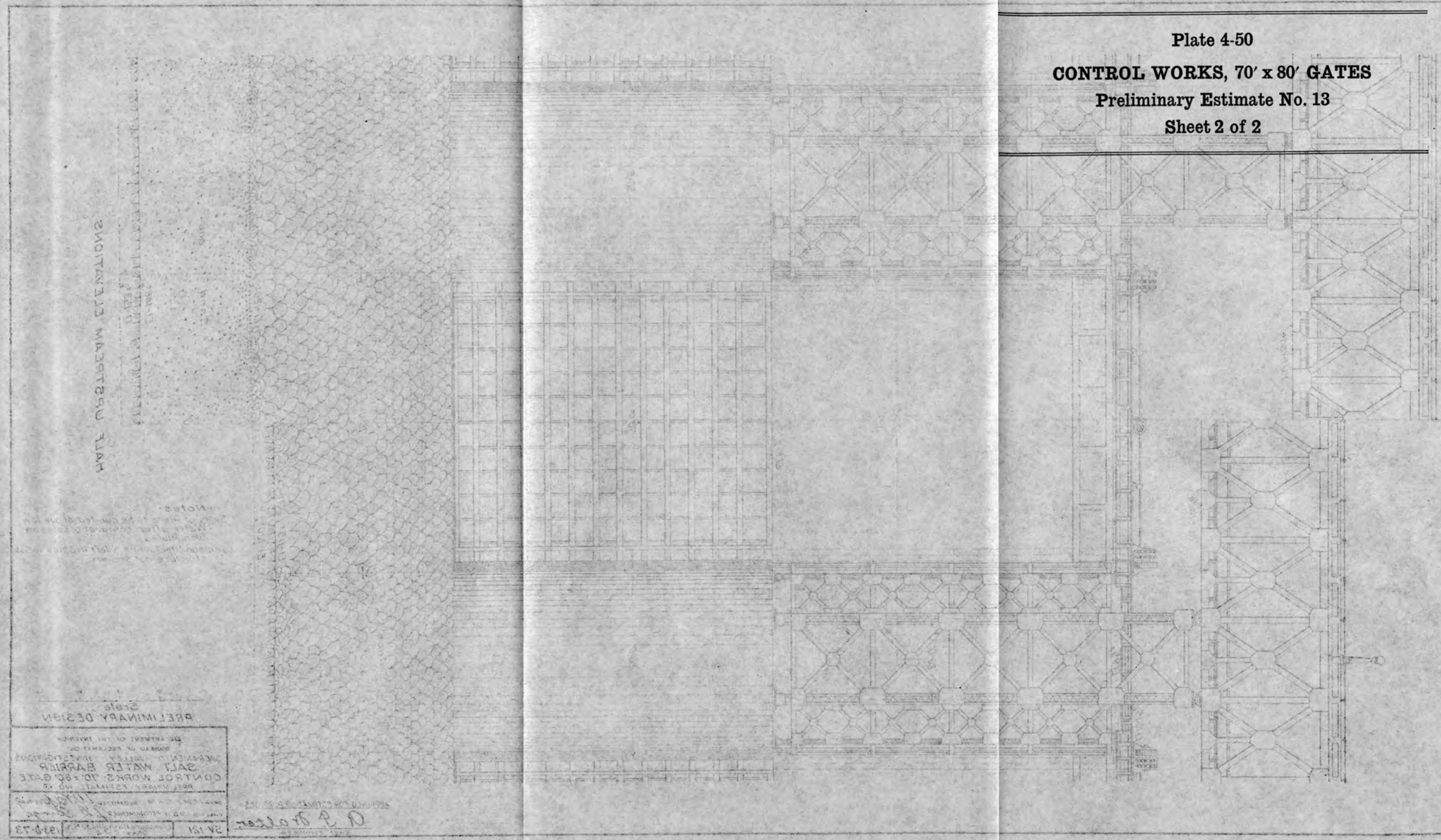

Estimated Maximum Water Surface to pass Flood of 750,000 sec ft all Gates and Locks open
El 16.5
El 10
El 138.75
El 173
30'-0"
Base of Rail El 147
13'-0"
El 95
11'-9"
90'-6"
Probable Highest Tide El 5.8
Mean Sea Level El 0
Probable Lowest Tide El -4.9
Ebb Tide
80'-0"
30'-0"
15'-0"
El -85
El -77.5
El -70
El -120±
El -148±
El -153±
Fill
Gravel
Rock
and
Sand
Rock dips Downstream
Silt Deposit subsequent to construction
1 on 1
MAXIMUM SIDE ELEVATION
Caisson Gate Seat
2'-6"
Stoney Gate
Core Wall
12" Floor
50'-0"
Counterweight
Caisson Gate Seat
45'-0"
75'-0"
Ebb Tide
90'-6"
23'-6"±
28'-6½"
38'-5¼"
TOWERS REMOVED
PLAN
12'-6"R
22'-6"R
15'-0"
10'-0"
25'-0"
45'-0"
16'-0"
13'-0"
SECTION BELOW EL-85
Notes:-
Maximum Elevation of Base of Rail and lowest Elevation of Bed Rock do not actually occur in the same Section
Sides of Piers to be gunited above low Water after removal of Caisson Skin Plates.
Caisson Steel which is left in place in Substructure and Reinforcing Steel in Bridge not shown
Scale
PRELIMINARY DESIGN
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
CONTROL WORKS-70'x80' GATE
PRELIMINARY ESTIMATE NO 13
DRAWN: C.M.J.-C.A.M. SUBMITTED:
CHECKED: N.B.H. RECOMMENDED:
APPROVED FOR ESTIMATING PURPOSES:
A. P. Walter
CHIEF ENGINEER
SV-120
Ellensburg Wash. July 29, 1926
Sheet 1 of 2
193-D-72

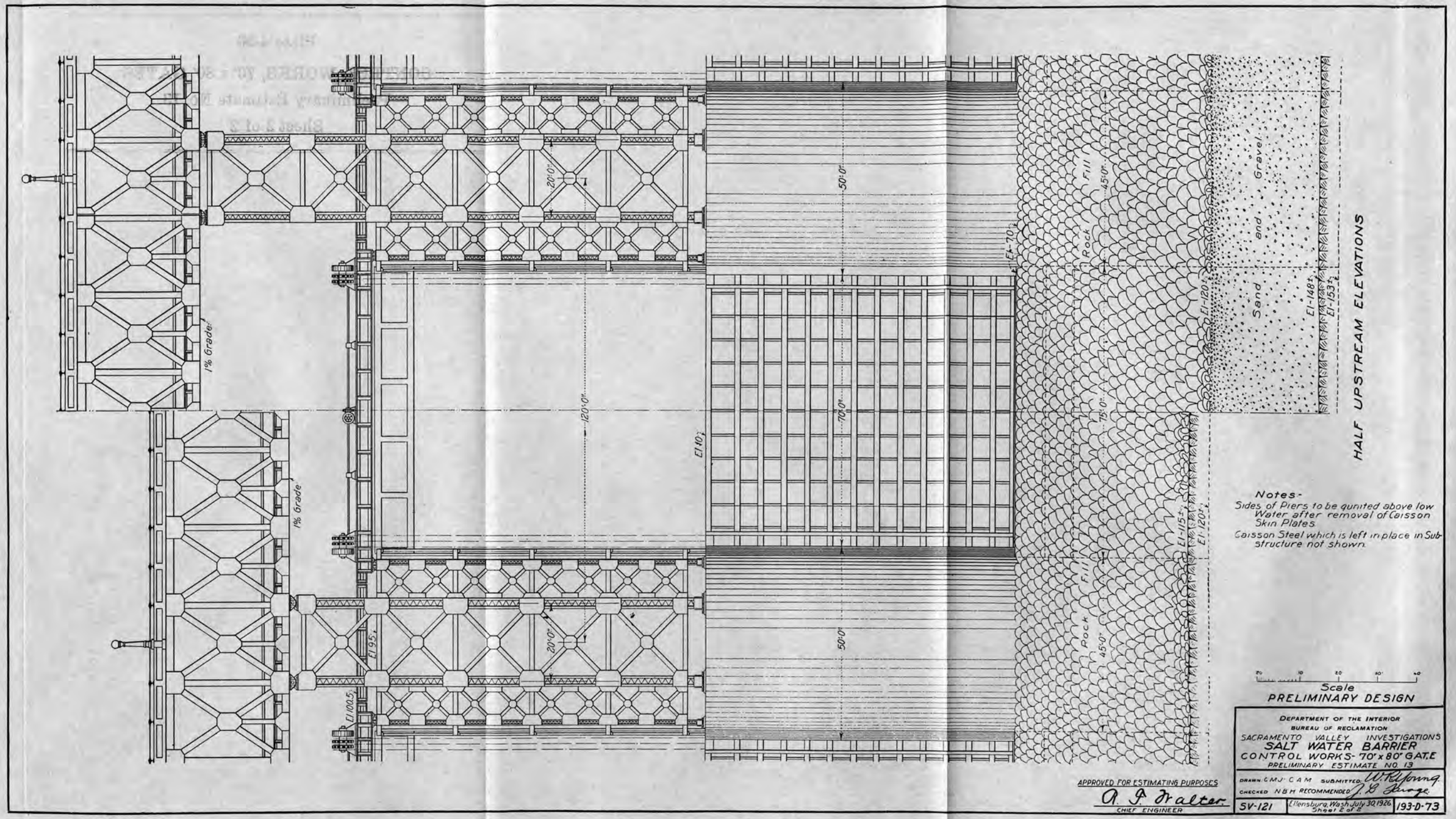
Plate 4-50

CONTROL WORKS, 70′ x 80′ GATES

Preliminary Estimate No. 13

Sheet 2 of 2




HALF UPSTREAM ELEVATIONS
1% Grade
1% Grade
20'-0"
20'-0"
120'-0"
50'-0"
70'-0"
50'-0"
El 10
El 195
El 100.5
El-70
Rock Fill
45'-0"
75'-0"
45'-0"
Sand and Gravel
El-120
El-148
El-153
El-115
El-120
Notes-
Sides of Piers to be gunited above low Water after removal of Caisson Skin Plates.
Caisson Steel which is left in place in Substructure not shown.
Scale
PRELIMINARY DESIGN
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
CONTROL WORKS-70'x80' GATE
PRELIMINARY ESTIMATE NO 13
DRAWN C.M.J. C.A.M. SUBMITTED
CHECKED N.B.H. RECOMMENDED
APPROVED FOR ESTIMATING PURPOSES
A. P. Walter
CHIEF ENGINEER
SV-121
Ellensburg, Wash. July 30 1926
Sheet 2 of 2
193-D-73

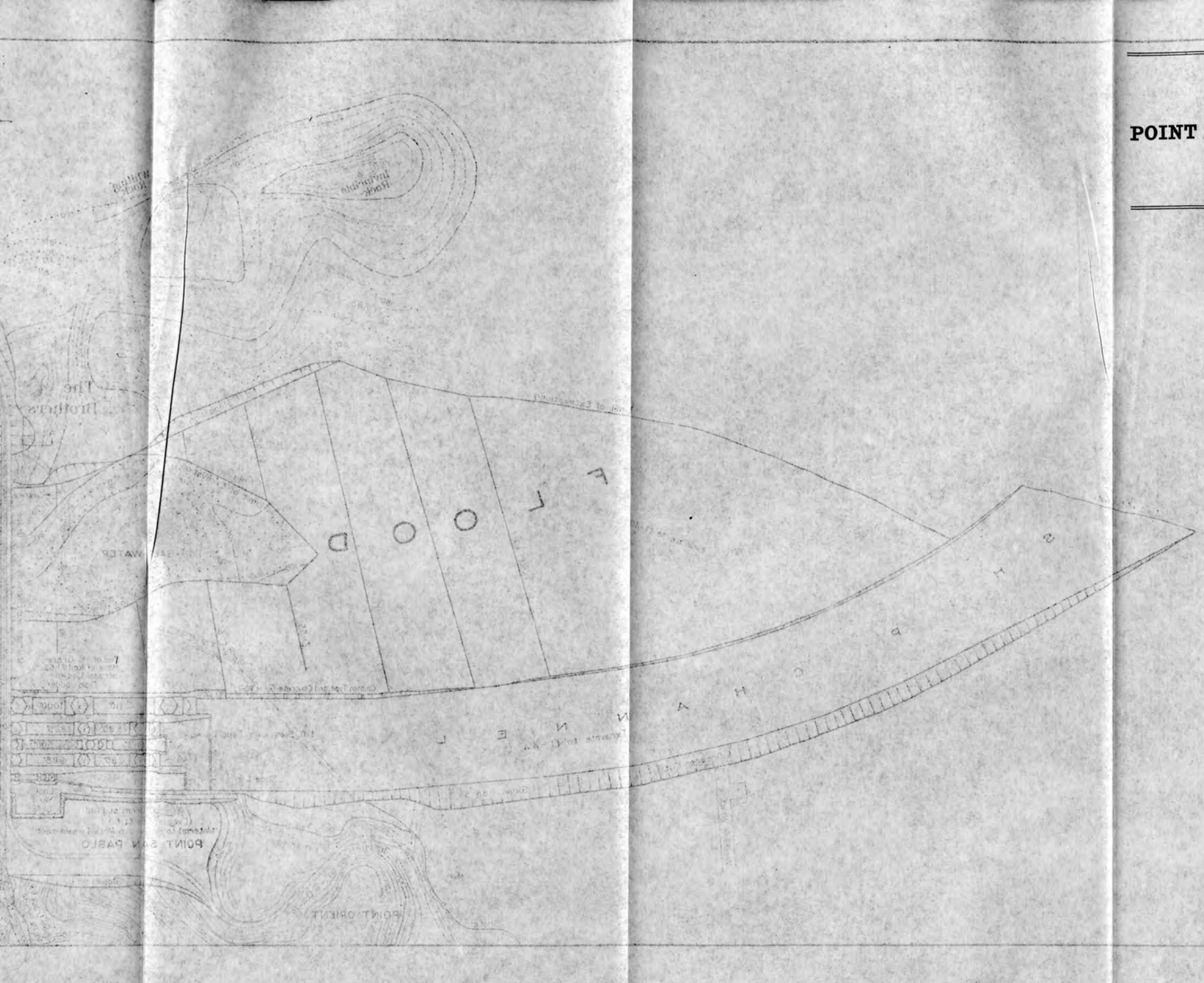
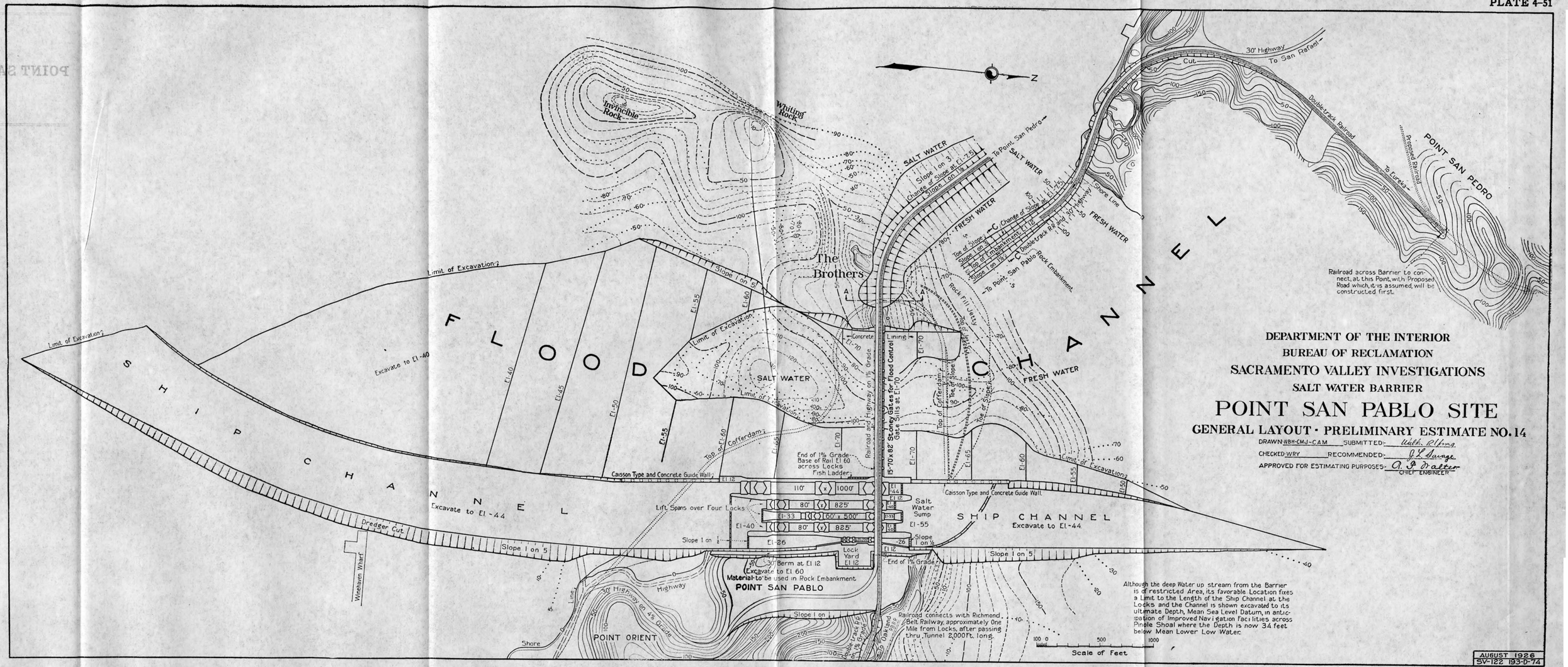


Plate 4-51

POINT SAN PABLO SITE, GENERAL LAYOUT

Preliminary Estimate No. 14


DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
POINT SAN PABLO SITE
GENERAL LAYOUT · PRELIMINARY ESTIMATE NO. 14
DRAWN NBH-CMJ-CAM SUBMITTED: Walh. Rlong
CHECKED WRY RECOMMENDED: J. L. Savage
APPROVED FOR ESTIMATING PURPOSES: A. P. Walter
CHIEF ENGINEER
AUGUST 1926
SV-122 193-D-74
POINT SAN PEDRO
POINT SAN PABLO
POINT ORIENT
SHIP CHANNEL
FLOOD CHANNEL
SALT WATER
FRESH WATER
The Brothers
Invincible Rock
Whiting Rock
Winetavern Wharf
Dredger Cut
Limit of Excavation
Excavate to El -40
Excavate to El -44
Caisson Type and Concrete Guide Wall
Lift Spans over Four Locks
Salt Water Sump
Lock Yard El 12
Cofferdam
Railroad and Highway on 1% Grade
15-70x 82' Stoney Gates for Overflows at El 70 Flood Control
Rock Fill Jetty
Railroad across Barrier to connect, at this Point, with Proposed Road which, it is assumed, will be constructed first.
Although the deep Water up stream from the Barrier is of restricted Area, its favorable Location fixes a Limit to the Length of the Ship Channel at the Locks and the Channel is shown excavated to its ultimate Depth, Mean Sea Level Datum, in anticipation of Improved Navigation Facilities across Pinole Shoal where the Depth is now 34 feet below Mean Lower Low Water.
Railroad connects with Richmond Belt Railway, approximately One Mile from Locks, after passing thru Tunnel 2,000 Ft. long.
Scale of Feet

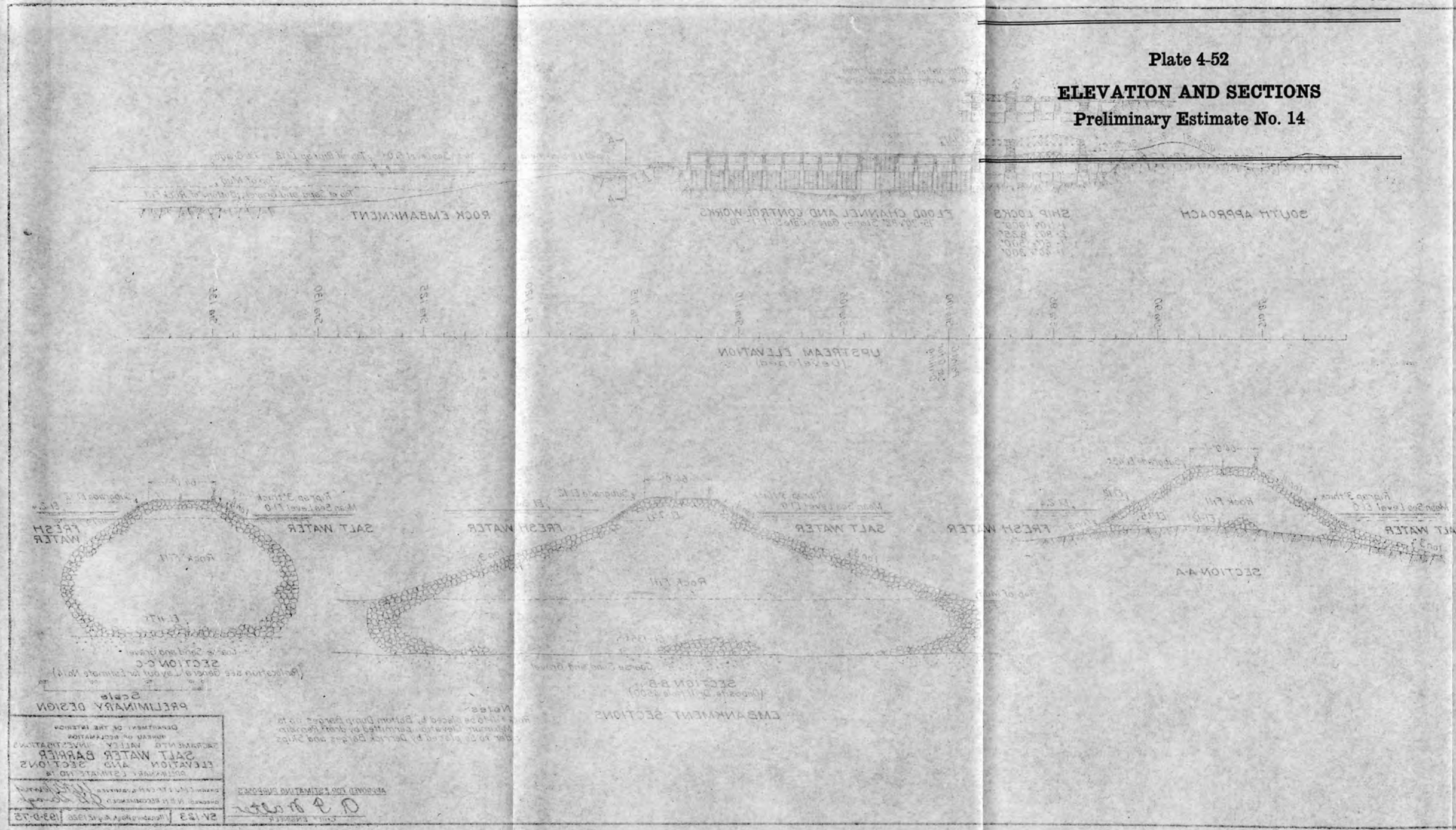
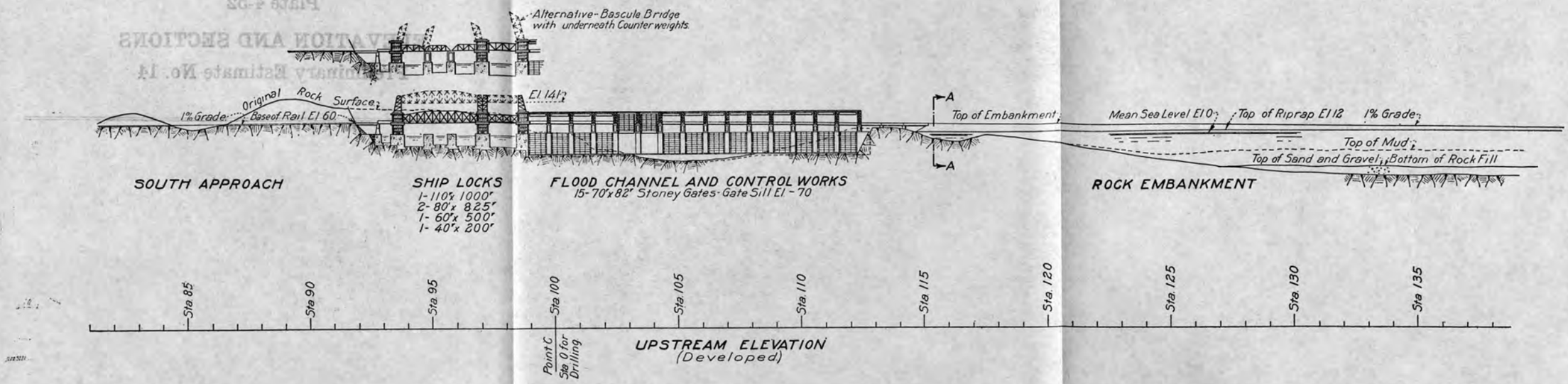
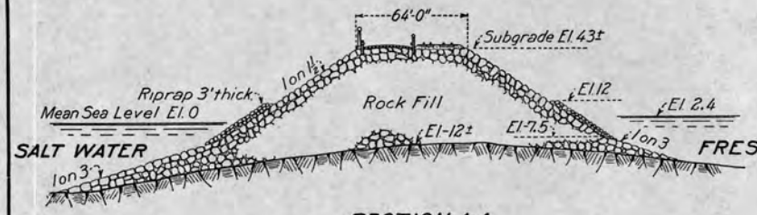


Plate 4-52

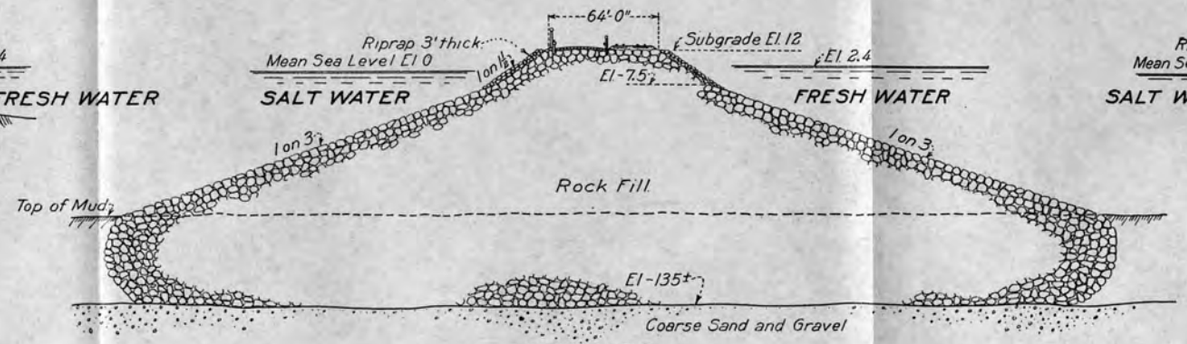
ELEVATION AND SECTIONS

Preliminary Estimate No. 14



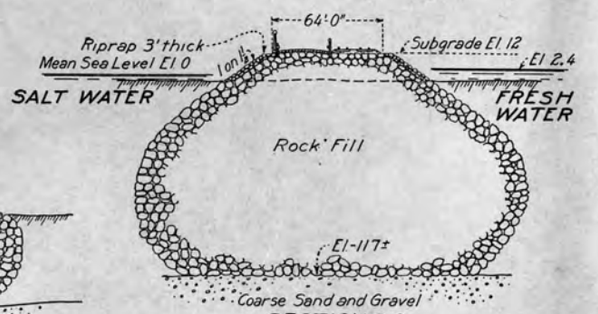


SECTION A-A



SECTION B-B
(Opposite Drill Hole 4500)

EMBANKMENT SECTIONS



SECTION C-C
(For location see General Layout for Estimate No. 14)

0 10' 50' 100' 150'
Scale

PRELIMINARY DESIGN

Notes:-
Rock Fill to be placed by Bottom Dump Barges up to Maximum Elevation permitted by draft. Remainder to be placed by Derrick Barges and Skips.

APPROVED FOR ESTIMATING PURPOSES:-
A. F. Walter
CHIEF ENGINEER

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
ELEVATION AND SECTIONS
PRELIMINARY ESTIMATE NO 14

DRAWN: C.M.J. L.T.F. C.A.N. SUBMITTED: W. H. Young
CHECKED: N.B.H. RECOMMENDED: J. R. Savage

SV-123 | Ellensburg, Wash. Aug. 12, 1926 | 193-D-75

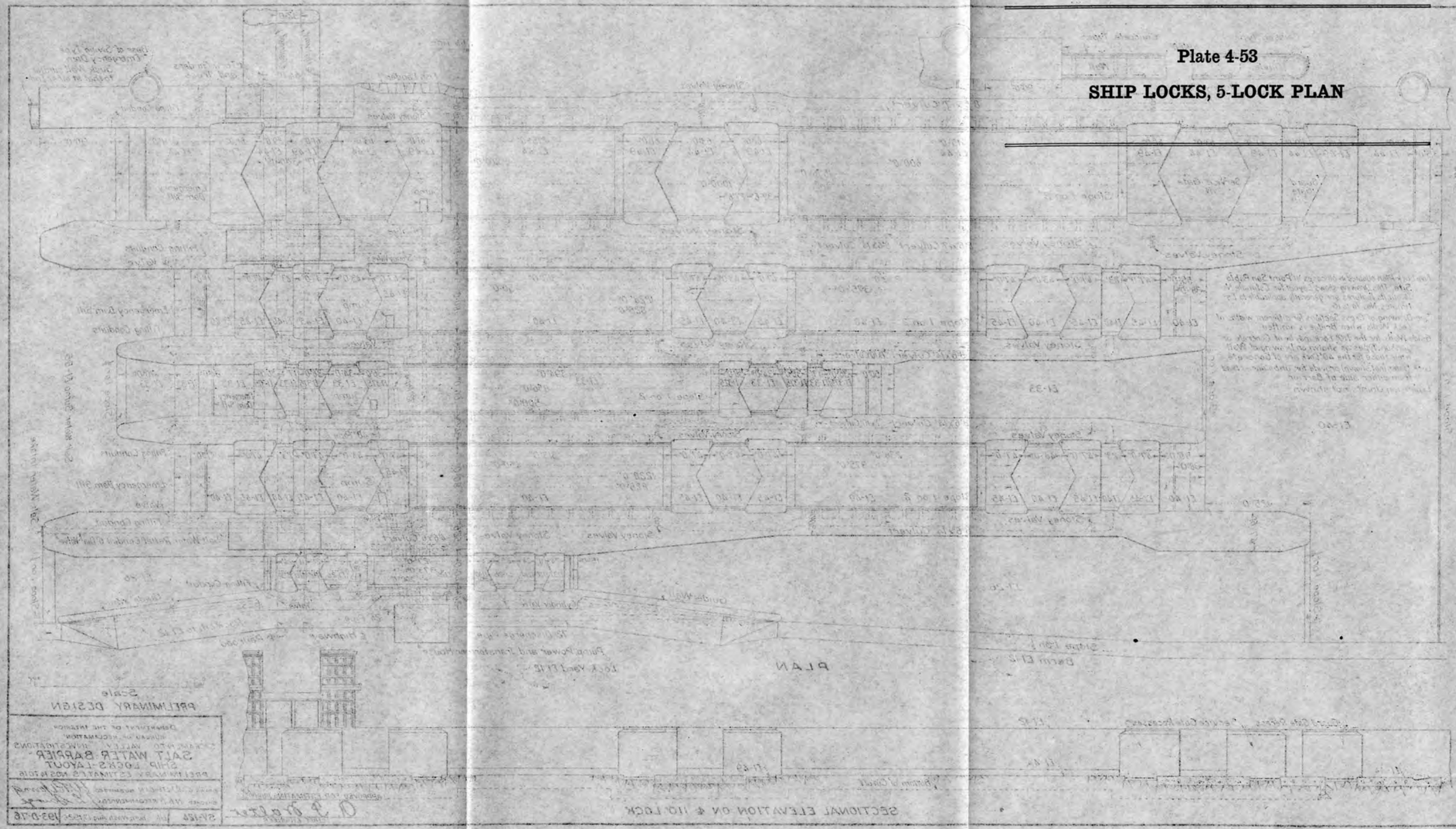


Plate 4-53

SHIP LOCKS, 5-LOCK PLAN

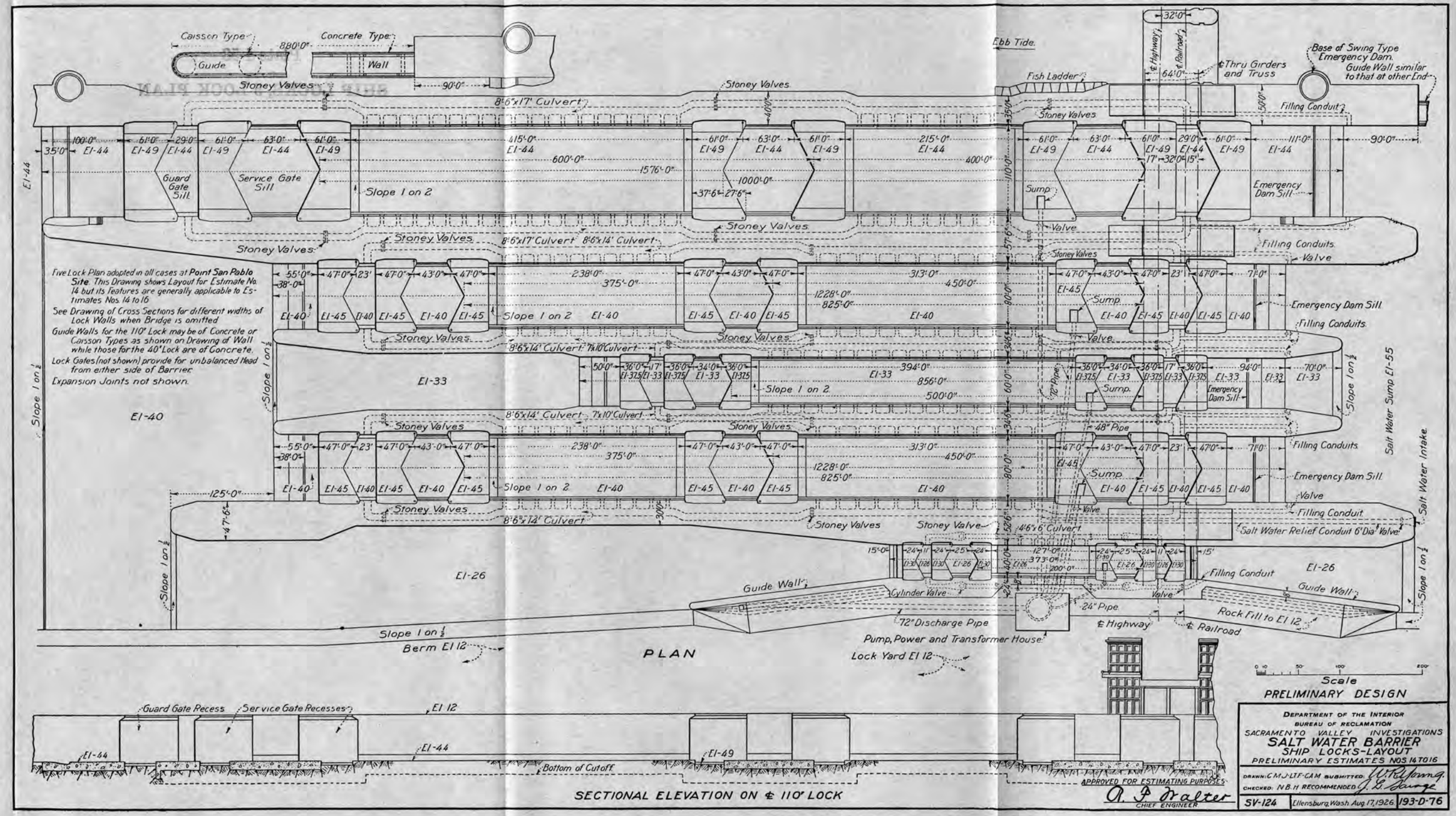
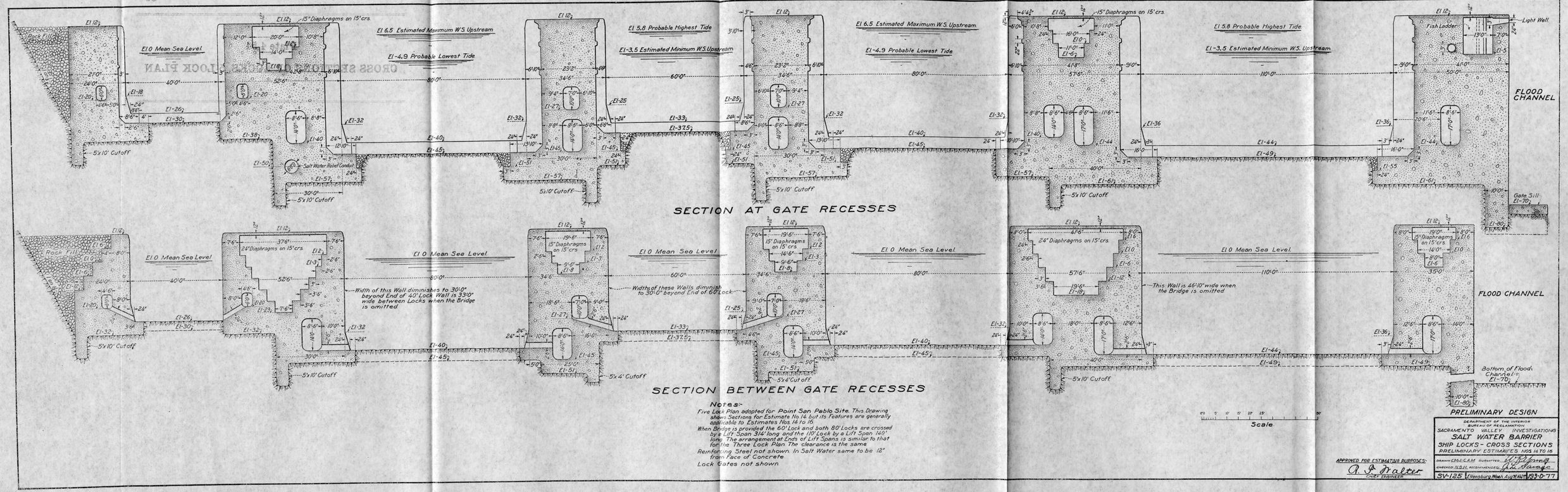

Caisson Type
Concrete Type
Guide
Wall
Stoney Valves
8'6"x17' Culvert
8'6"x14' Culvert
7'x10' Culvert
4'6"x6' Culvert
Ebb Tide.
Fish Ladder
℄ Highway
℄ Railroad
℄ Thru Girders and Truss
Base of Swing Type Emergency Dam. Guide Wall similar to that at other End
Filling Conduit
Filling Conduits
Emergency Dam Sill
Guard Gate Sill
Service Gate Sill
Slope 1 on 2
Sump
Valve
48" Pipe
Salt Water Sump El-55
Salt Water Intake
Salt Water Relief Conduit 6' Dia. Valve
Guide Wall
Cylinder Valve
24" Pipe
72" Discharge Pipe
Rock Fill to El 12
Pump, Power and Transformer House
Lock Yard El 12
Berm El 12
Five Lock Plan adopted in all cases at Point San Pablo Site. This Drawing shows Layout for Estimate No. 14 but its features are generally applicable to Estimates Nos. 14 to 16
See Drawing of Cross Sections for different widths of Lock Walls when Bridge is omitted
Guide Walls for the 110' Lock may be of Concrete or Caisson Types as shown on Drawing of Wall while those for the 40' Lock are of Concrete.
Lock Gates (not shown) provide for unbalanced Head from either side of Barrier.
Expansion Joints not shown.
PLAN
Scale
PRELIMINARY DESIGN
Guard Gate Recess
Service Gate Recesses
Bottom of Cutoff
SECTIONAL ELEVATION ON ℄ 110' LOCK
APPROVED FOR ESTIMATING PURPOSES
A. P. Walter
CHIEF ENGINEER
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
SHIP LOCKS-LAYOUT
PRELIMINARY ESTIMATES NOS. 14 TO 16
DRAWN: C.M.J. LTF-CAM SUBMITTED: W. R. Young
CHECKED: N.B.H. RECOMMENDED: J. L. Savage
SV-124
Ellensburg, Wash. Aug. 17, 1926
193-D-76

Plate 4-54

CROSS SECTIONS OF LOCKS, 5-LOCK PLAN



Notes:-

Five Lock Plan adopted for Point San Pablo Site. This Drawing shows Sections for Estimate No 14 but its Features are generally applicable to Estimates Nos 14 to 16.

When Bridge is provided the 60' Lock and both 80' Locks are crossed by a Lift Span 314' long and the 110' Lock by a Lift Span 140' long. The arrangement at Ends of Lift Spans is similar to that for the Three Lock Plan. The clearance is the same.

Reinforcing Steel not shown. In Salt Water same to be 12" from Face of Concrete.

Lock Gates not shown.

PRELIMINARY DESIGN

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
SHIP LOCKS - CROSS SECTIONS
PRELIMINARY ESTIMATES NOS 14 TO 16

DRAWN CSC-CAB SUBMITTED E.F. Spring
CHECKED DBE RECOMMENDED A.P. Drake

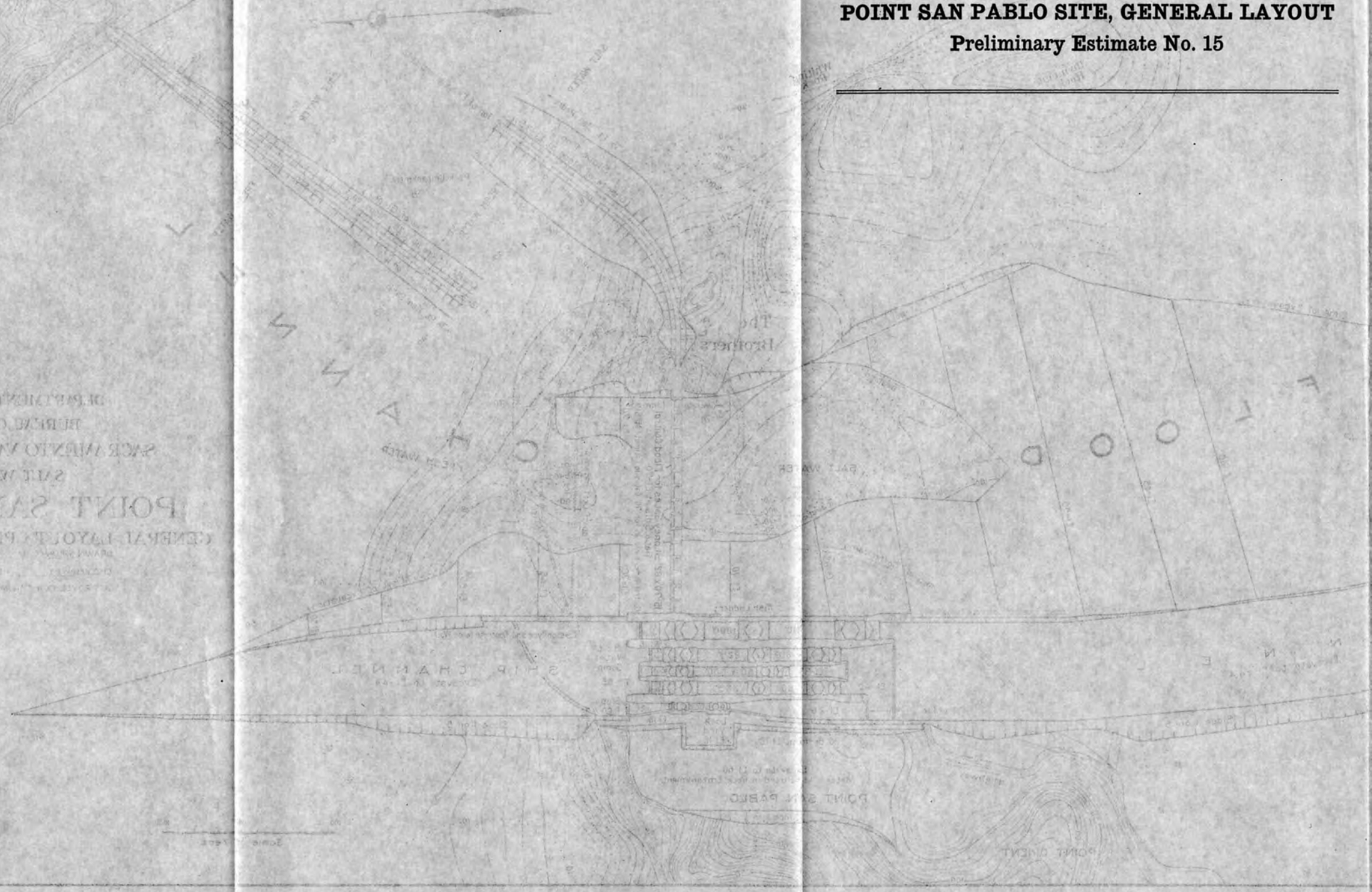
APPROVED FOR ESTIMATING PURPOSES:
A. P. Drake
CHIEF ENGINEER

SV-125 Vicksburg Mech Aug 1944 193-D-77

Plate 4-55

POINT SAN PABLO SITE, GENERAL LAYOUT

Preliminary Estimate No. 15



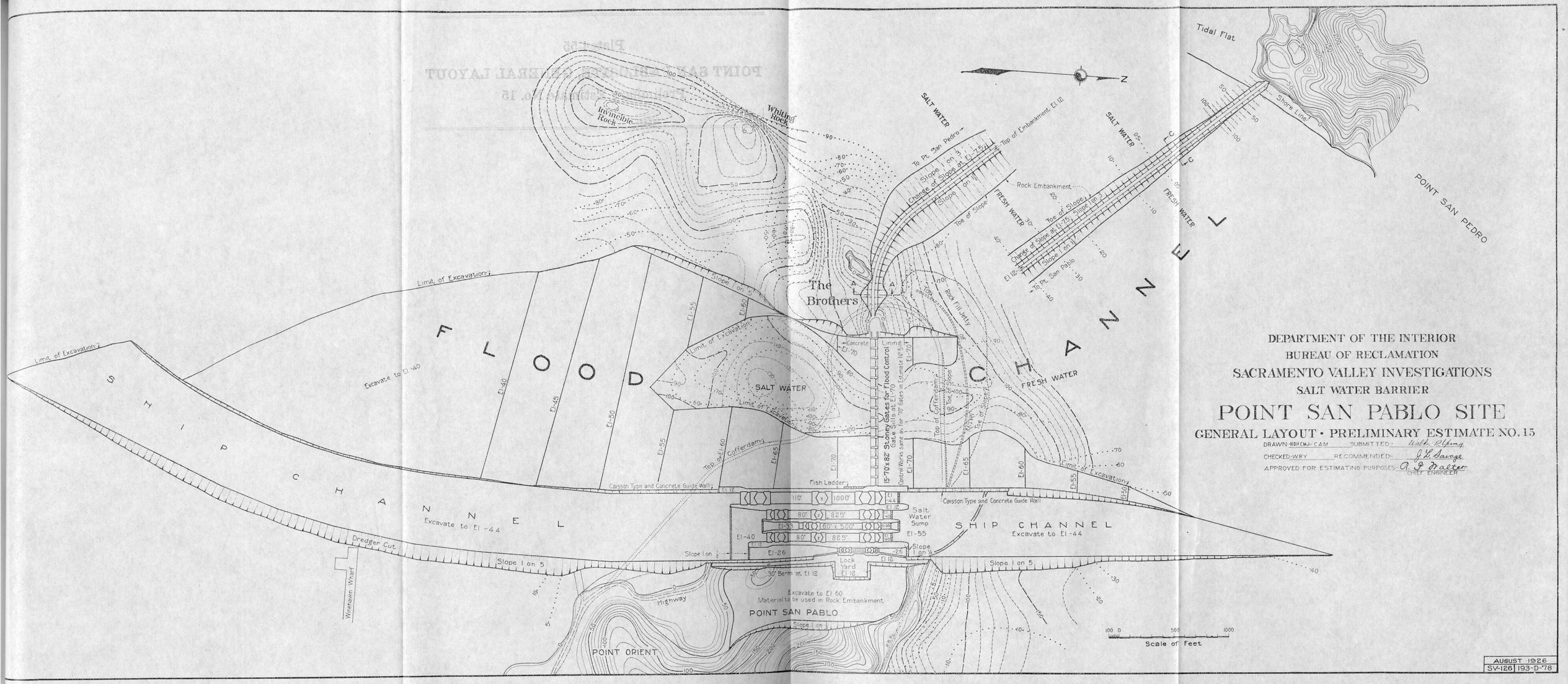
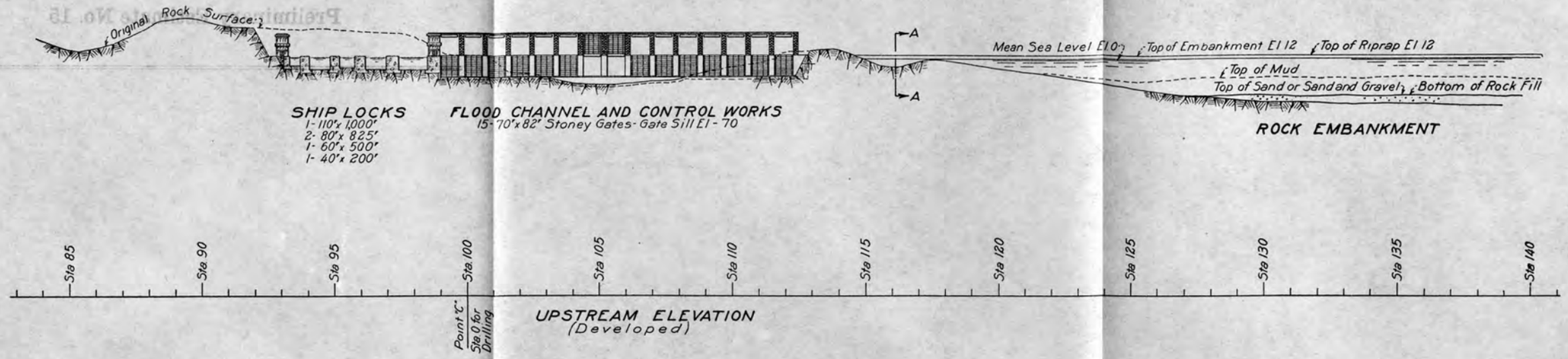
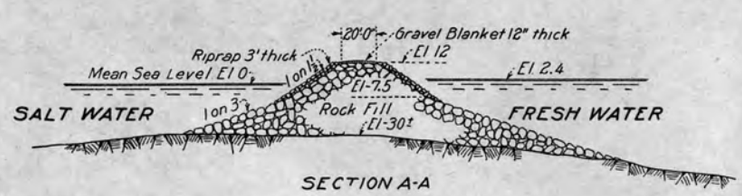

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
POINT SAN PABLO SITE
GENERAL LAYOUT · PRELIMINARY ESTIMATE NO. 15
DRAWN-NBH CMJ-CAM
SUBMITTED-
CHECKED-WRY
RECOMMENDED-
APPROVED FOR ESTIMATING PURPOSES-
CHIEF ENGINEER
AUGUST 1926
SV-126 193-D-78
Tidal Flat
Shore Line
POINT SAN PEDRO
Invincible Rock
Whiting Rock
The Brothers
SALT WATER
FRESH WATER
FLOOD CHANNEL
SHIP CHANNEL
Excavate to El -44
Excavate to El -40
Limit of Excavation
Rock Embankment
Rock Fill Jetty
Top of Embankment El 12
To Pt. San Pedro
To Pt. San Pablo
Slope 1 on 3
Slope 1 on 5
Slope 1 on 4
Toe of Slope
Change of Slope at El -7.5
Change of Slope at El -7.5
Toe of Cofferdam
Cofferdam
Concrete El -70
15-70'x 82' Stoney Gates for Flood Control
Fish Ladder
Caisson Type and Concrete Guide Wall
Salt Water Sump
Lock Yard El 12
30' Berm at El 12
Excavate to El 60
Material to be used in Rock Embankment
POINT SAN PABLO
POINT ORIENT
Highway
Dredger Cut
Winehaven Wharf
Scale of Feet

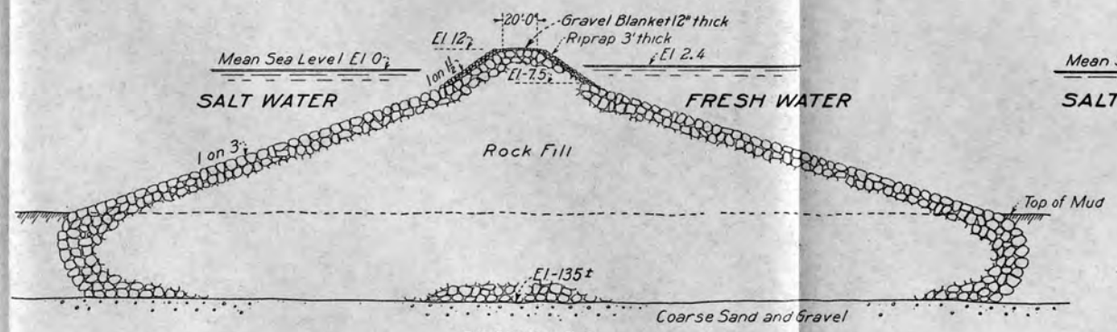
Plate 4-56

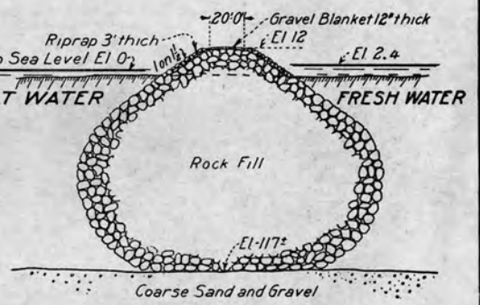
ELEVATION AND SECTIONS

Preliminary Estimate No. 15









EMBANKMENT SECTIONS

Notes:-
Rock Fill to be placed by Bottom Dump Barges up to Maximum Elevation permitted by draft Remainder to be placed by Derrick Barges and Skips

Scale
PRELIMINARY DESIGN

APPROVED FOR ESTIMATING PURPOSES:
A. F. Walter
CHIEF ENGINEER

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
ELEVATION AND SECTIONS
PRELIMINARY ESTIMATE NO. 15

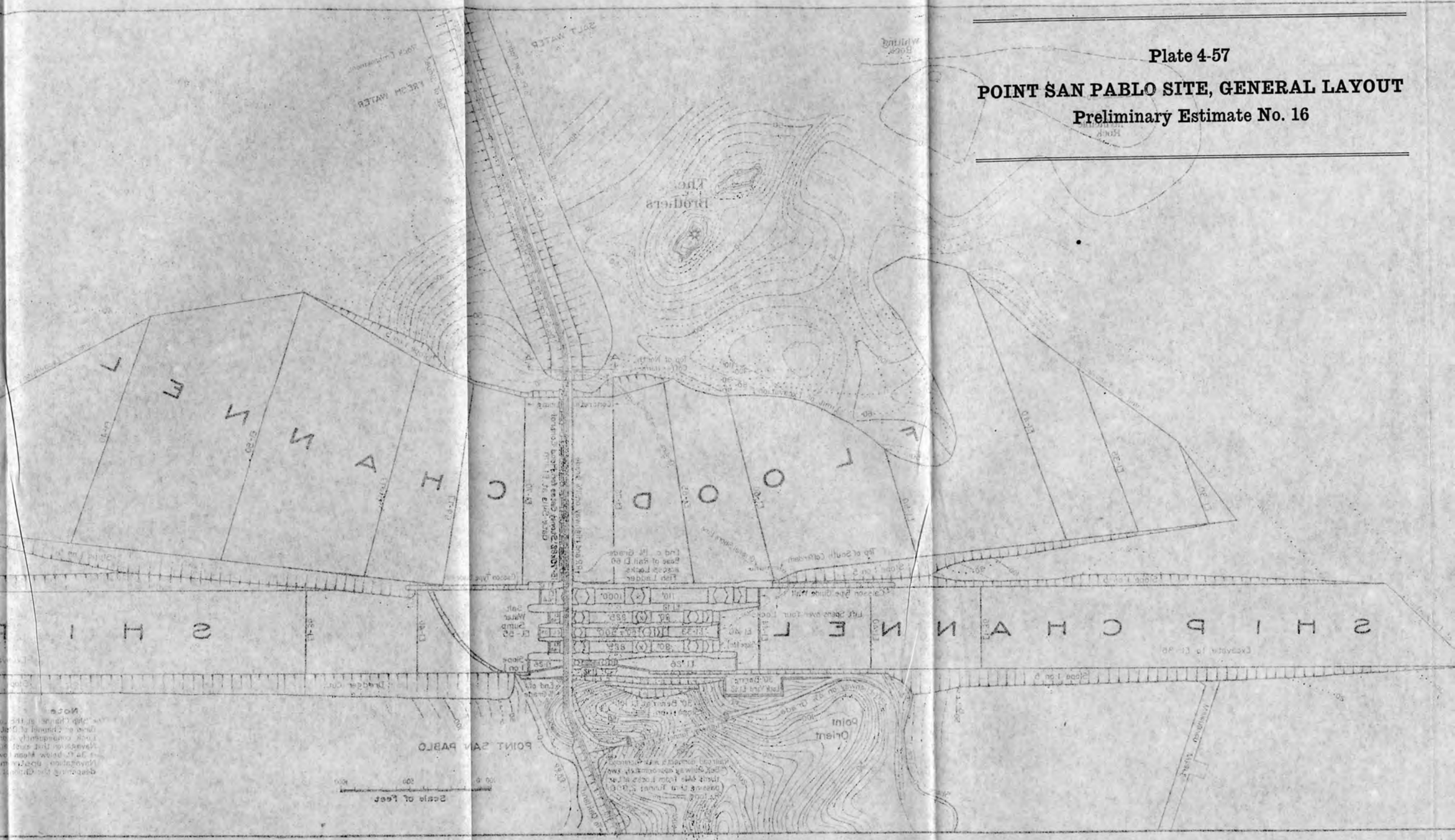
DRAWN: C.M.J.-L.T.F.-C.A.M. SUBMITTED: W. H. Lyons
CHECKED: N.B.H. RECOMMENDED: J. G. Savage

SV-127 | Ellensburg, Wash. Aug. 14, 1926. | 193-D-79

Plate 4-57

POINT SAN PABLO SITE, GENERAL LAYOUT

Preliminary Estimate No. 16



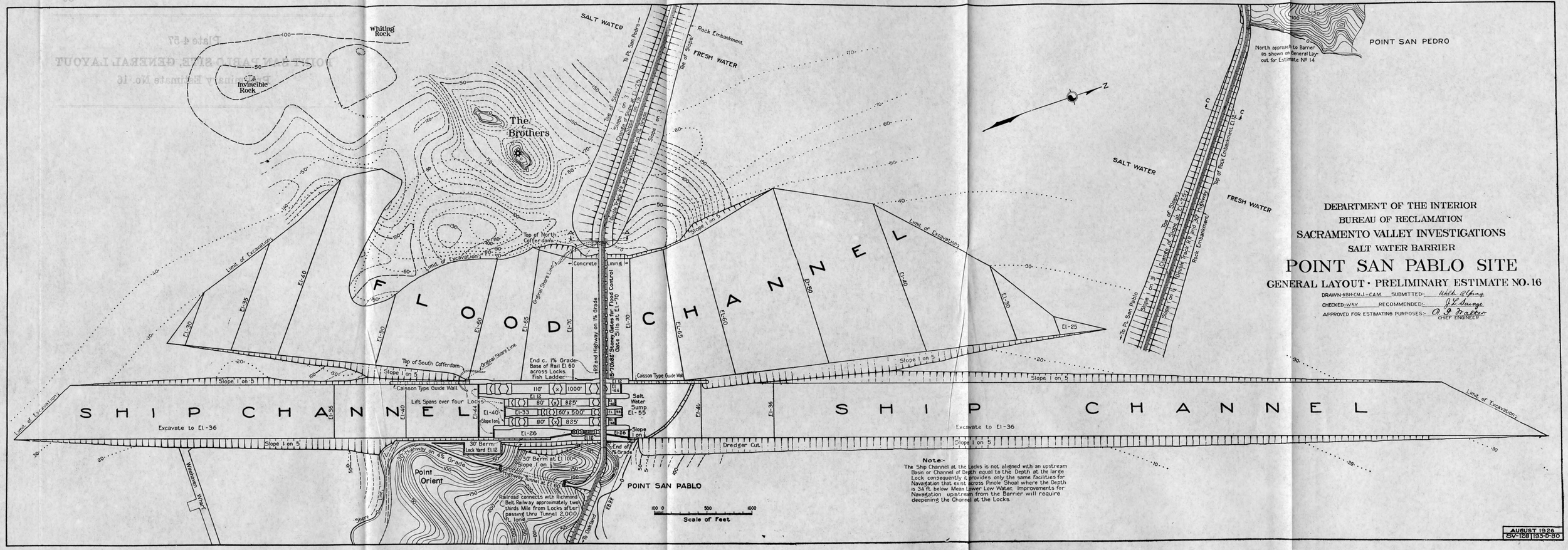
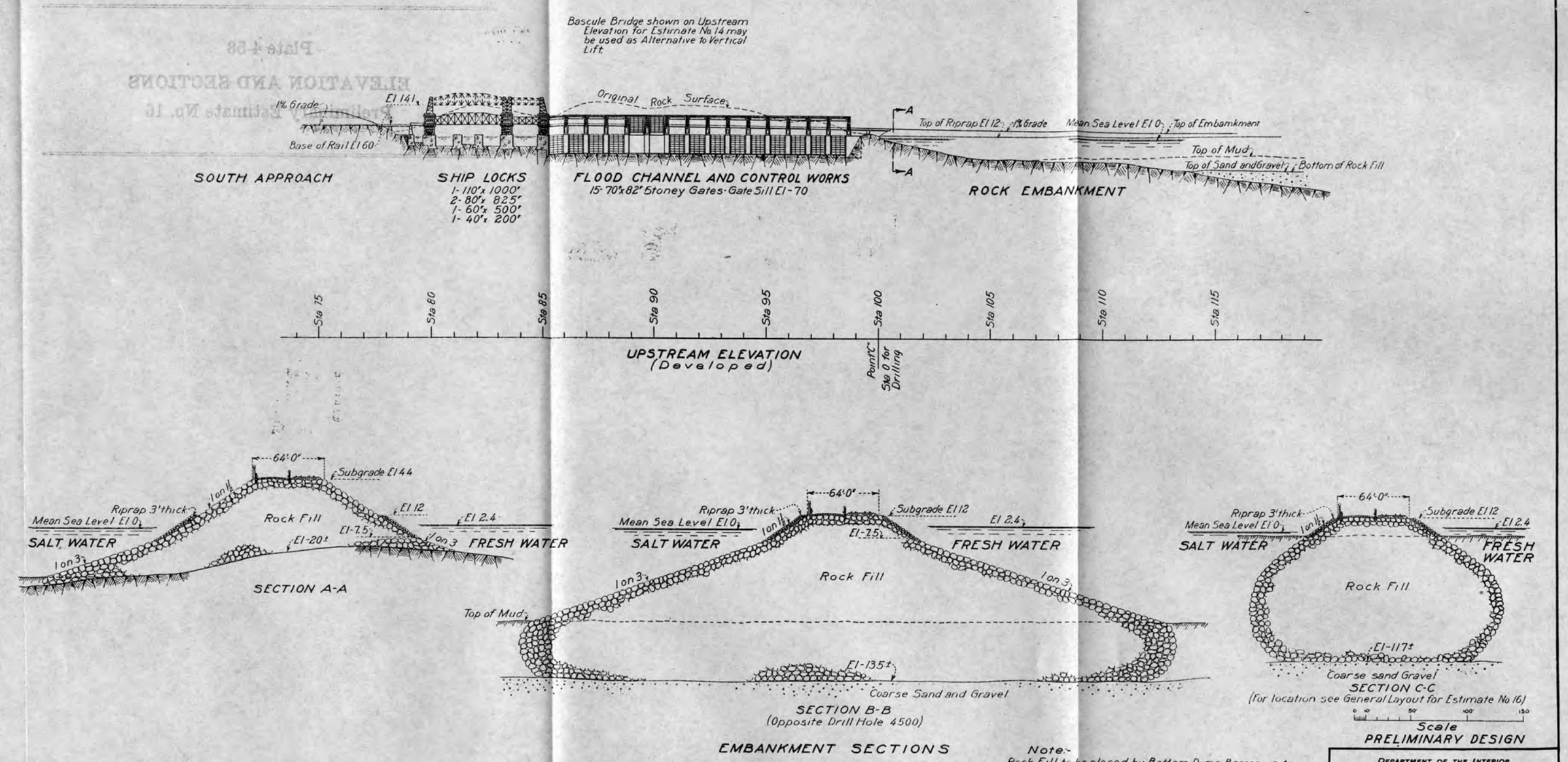

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
POINT SAN PABLO SITE
GENERAL LAYOUT · PRELIMINARY ESTIMATE NO. 16
DRAWN-NBH-CMJ-CAM SUBMITTED-
CHECKED-WRY RECOMMENDED-
APPROVED FOR ESTIMATING PURPOSES-
CHIEF ENGINEER
AUGUST 1926
SV-128 193-0-80
POINT SAN PEDRO
North approach to Barrier as shown on General Layout for Estimate No 14
SALT WATER
FRESH WATER
Whiting Rock
Invincible Rock
The Brothers
Point Orient
POINT SAN PABLO
FLOOD CHANNEL
SHIP CHANNEL
Limit of Excavation
Excavate to El-36
Slope 1 on 5
Caisson Type Guide Wall
Lift Spans over four Locks
Salt Water Sump El-55
30' Berm
30' Berm at El 100
Dredger Cut
Concrete Lining
Top of North Cofferdam
Top of South Cofferdam
Original Shore Line
End c. 1% Grade Base of Rail El 60 across Locks Fish Ladder
Highway on 4% Grade
Highway Tunnel at El 60
Railroad connects with Richmond Belt Railway approximately two thirds Mile from Locks after passing thru Tunnel 2,000 ft. long
Westpoint Wharf
To Ft. San Pedro
To Oakland
Rock Embankment
Top of Slope
Scale of Feet
Note:-
The Ship Channel at the Locks is not aligned with an upstream Basin or Channel of Depth equal to the Depth at the large Lock consequently it provides only the same facilities for Navigation that exist across Pinole Shoal where the Depth is 34 ft. below Mean Lower Low Water. Improvements for Navigation upstream from the Barrier will require deepening the Channel at the Locks.

Plate 4-58

ELEVATION AND SECTIONS

Preliminary Estimate No. 16



Note:-
Rock Fill to be placed by Bottom Dump Barges up to Maximum Elevation permitted by Draft Remainder to be placed by Derrick Barges and Skips

PRELIMINARY DESIGN

APPROVED FOR ESTIMATING PURPOSES
R. P. Walter
CHIEF ENGINEER

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
ELEVATION AND SECTIONS
PRELIMINARY ESTIMATE NO 16

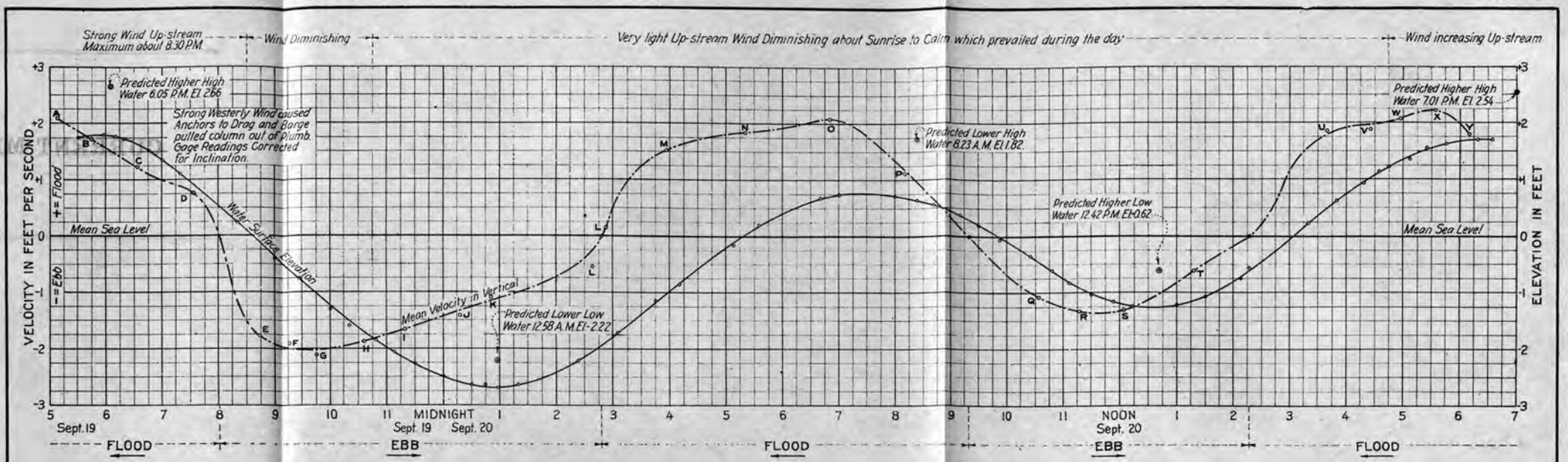
DRAWN: C.M.J. LTF-C.A.M. SUBMITTED: W. R. Young
CHECKED: N.B.H. RECOMMENDED: J. L. Savage

SV-129 | Ellensburg, Wash. Aug 20, 1926 | 193-D-81

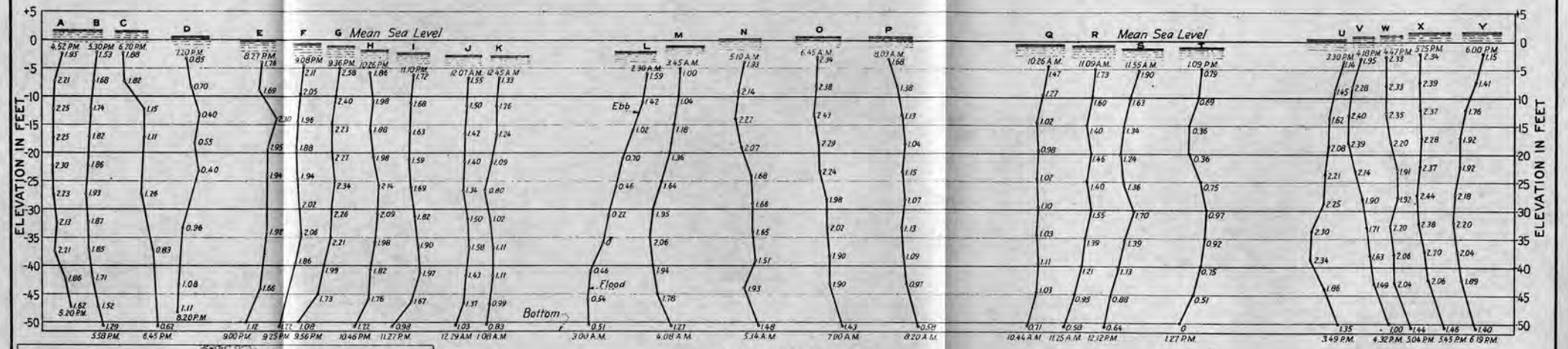
Plate 5-1

CURRENT METER MEASUREMENTS

Sheet 1 of 5



ELEVATION OF WATER SURFACE AND MEAN VELOCITY IN VERTICAL DURING TIDAL CYCLE



VELOCITY CURVES

(Numbers show velocity in ft per sec.)

Observations made from Drill Barge at Hole 2500.

Water Surface elevations determined from point of known elevation on drill column.

The time and height of predicted tides at Benicia were determined by applying corrections to figures for Fort Point as described on pages 131, 339, 340 and 372 of Tide Tables for Pacific Coast for 1924, published by the United States Coast and Geodetic Survey.

Owing to elapse of time between first and last measurements, curves do not represent simultaneous conditions throughout vertical.

The direction of flow was toward and from the Martinez ferry slip except for a few minutes during each reversal of current when the direction was perpendicular to the prevailing direction

There was no evidence to indicate variance in direction of flow at different depths except in some cases at slack tide when all velocities were low. In many cases the direction of flow was indicated by the inclination of the meter cable. When velocities were too low to carry the cable out of plumb it is believed that with gradually changing velocities at different depths and a constant direction at the surface, a change in direction below the surface cannot be inferred unless the velocities diminished to zero, or nearly zero, at some point of depth. When however the velocities diminished to zero and then increased during successive measurements and a change in direction of surface flow took place during the vertical series it was assumed that the point of zero flow marked the change in direction below the surface. See measurement L.

APPROVED FOR ESTIMATING PURPOSES:-

A. P. Walter

CHIEF ENGINEER

DEPARTMENT OF THE INTERIOR.
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
ARMY POINT SITE
GAGE HEIGHTS AND VELOCITIES
TIDAL CYCLE SEPT. 19 AND 20, 1924

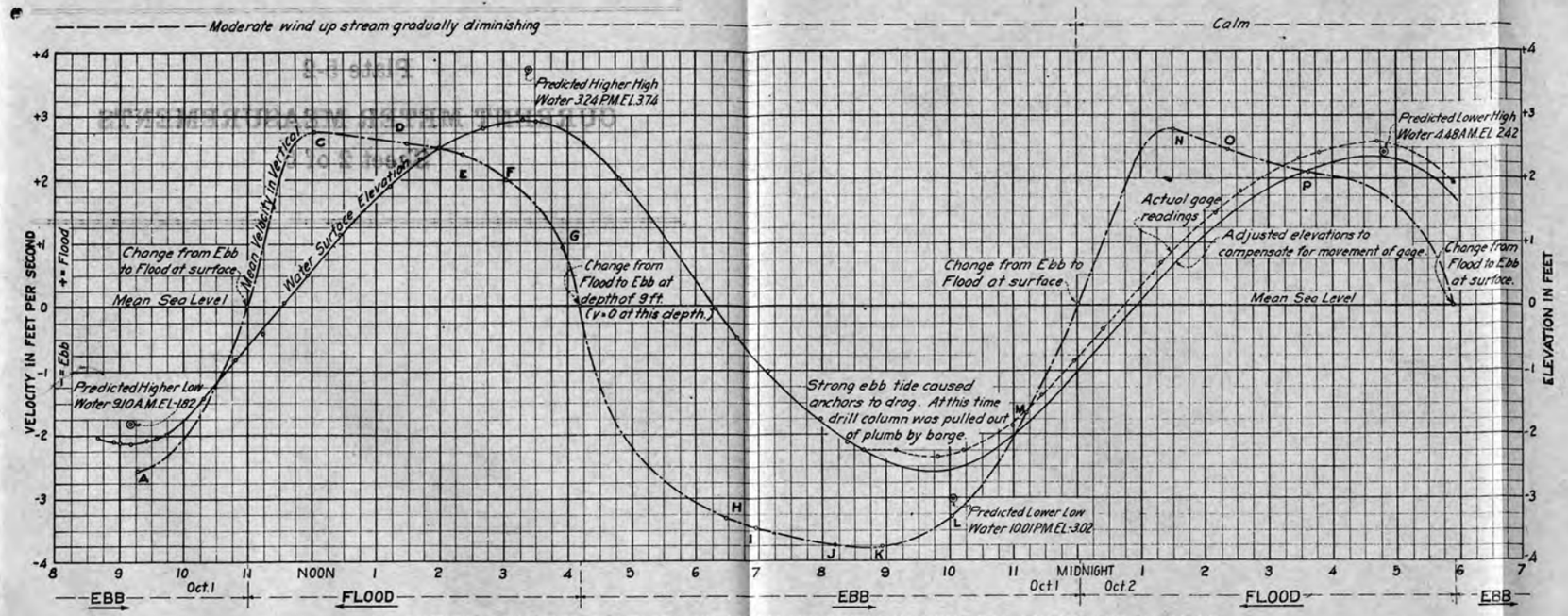
DRAWN: H.B.H.-C.B.G. SUBMITTED: W. H. Young
CHECKED: F. A. K. APPROVED: J. L. Savage

SV-4 | Berkeley, Calif. Oct. 21, 1924 | 193-D-99

Plate 5-2

CURRENT METER MEASUREMENTS

Sheet 2 of 5



ELEVATION OF WATER SURFACE AND MEAN VELOCITY IN VERTICAL DURING TIDAL CYCLE

Observations made from Drill Barge at Hole 3550.

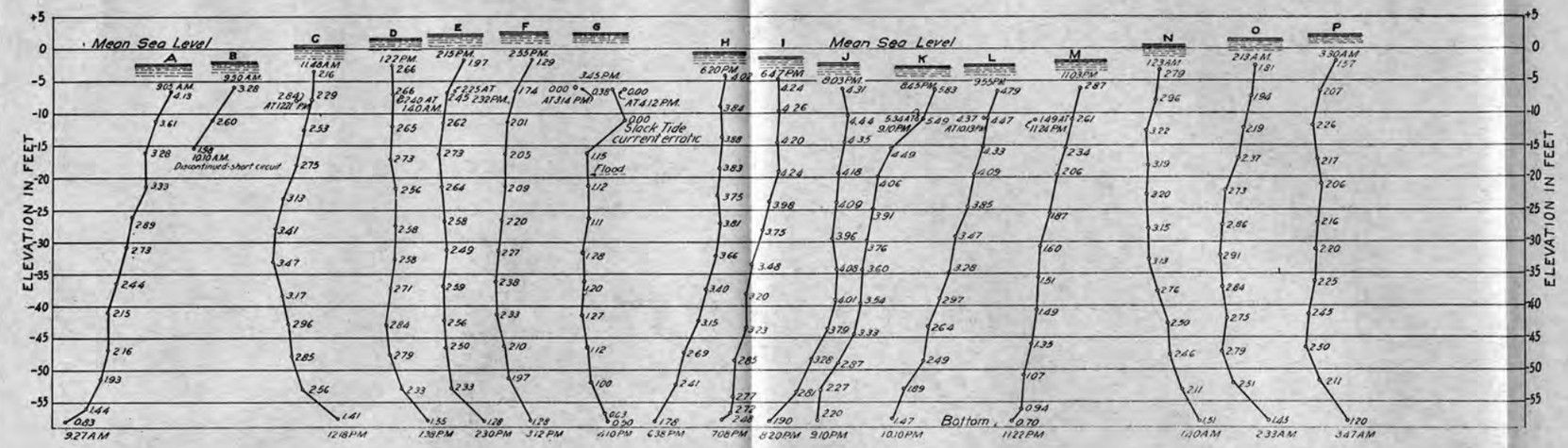
Water Surface elevations determined from point of known elevation on drill column.

The time and height of predicted tides at Benicia were determined by applying corrections to figures for Port Point as described on pages 132, 339, 340 and 372 of Tide Tables for Pacific Coast for 1924, published by the United States Coast and Geodetic Survey.

Owing to elapse of time between first and last measurements, curves do not represent simultaneous conditions throughout vertical.

The direction of flow was toward and from the Martinez ferry slip except for a few minutes during each reversal of current when the direction was perpendicular to the prevailing direction.

There was no evidence to indicate variance in direction of flow at different depths except in one case (measurement 6) at slack tide when all velocites were low. Near the end of this measurement the surface current changed from a direction across the Channel toward Suisun Point to ebb flow although the upstream inclination of cable with meter at depths greater than 35 ft showed that the flood flow had not ceased below the surface. This feature is substantiated by later measurements at other sites and these measurements also indicate that flood flow begins near the bottom before the ebb has ceased at the surface.



VELOCITY CURVES
(Numbers show velocity in ft per sec)

APPROVED FOR ESTIMATING PURPOSES:
A. F. Walter
CHIEF ENGINEER

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
ARMY POINT SITE

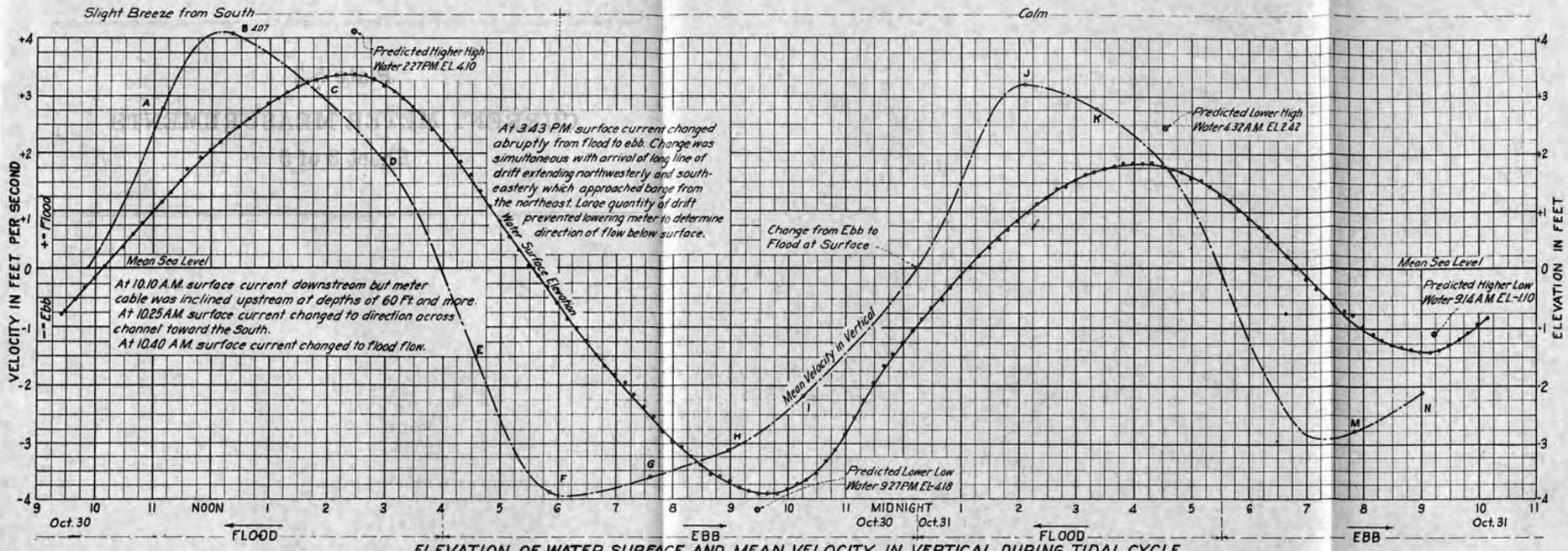
GAGE HEIGHTS AND VELOCITIES
TIDAL CYCLE OCT. 1 AND 2, 1924

DRAWN N.B.M.-H.W.		SUBMITTED W.H. Young	
CHECKED H.H.K.		APPROVED G.H. Savage	
SV-5	Berkeley, Calif. Dec. 11, 1924		193-D-100

Plate 5-3

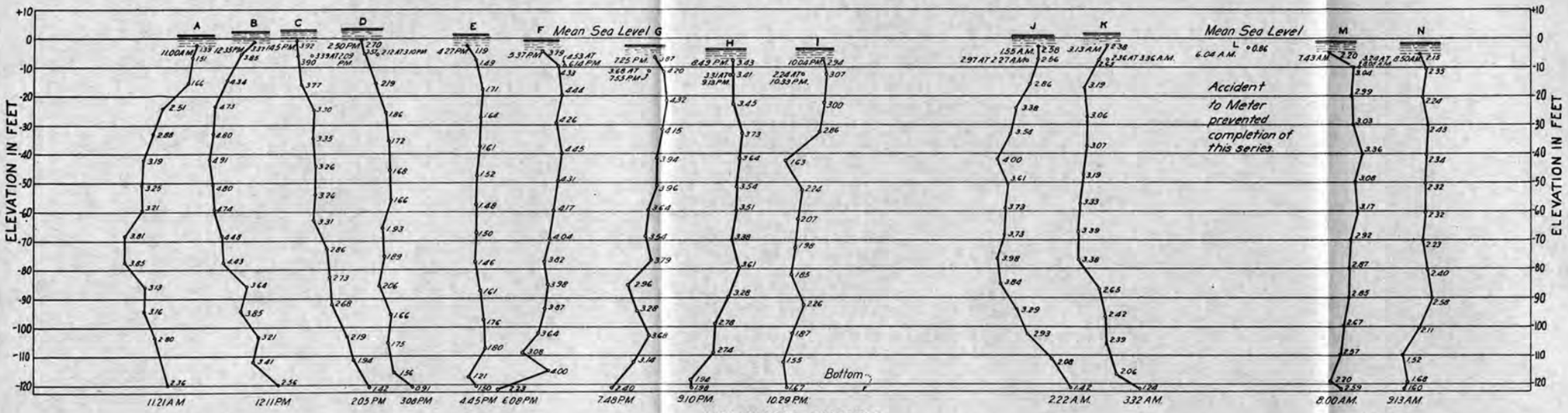
CURRENT METER MEASUREMENTS

Sheet 3 of 5

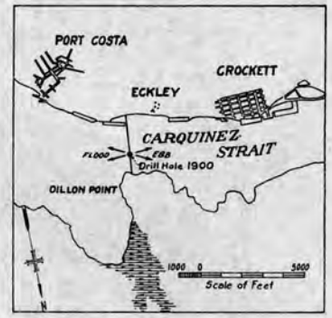


ELEVATION OF WATER SURFACE AND MEAN VELOCITY IN VERTICAL DURING TIDAL CYCLE

Observations made from Drill Barge at Hole 1900
Water surface elevations determined from gage on pier east of Eckley.
The time and height of predicted tides at Dillon Point were determined by applying corrections to figures for Fort Point as described on pages 132, 339, 340 and 372 of Tide Tables for Pacific Coast for 1924, published by the United States Coast and Geodetic Survey.
Owing to elapse of time between first and last measurements, curves do not represent simultaneous conditions throughout vertical.
The direction of flow fluctuated through an angle of 30 deg. during each ebb and flood tide and was never constant for periods of any length.
The indications that flood flow begins near the bottom before the ebb has ceased at the surface are substantiated by later measurements at another site. Measurements at other sites prior and subsequent to those at Dillon Point indicate that flood flow is sustained near the bottom after ebb has begun at the surface.



VELOCITY CURVES
(Numbers show velocity in ft. per sec.)



APPROVED FOR ESTIMATING PURPOSES:
R. P. Walter
CHIEF ENGINEER.

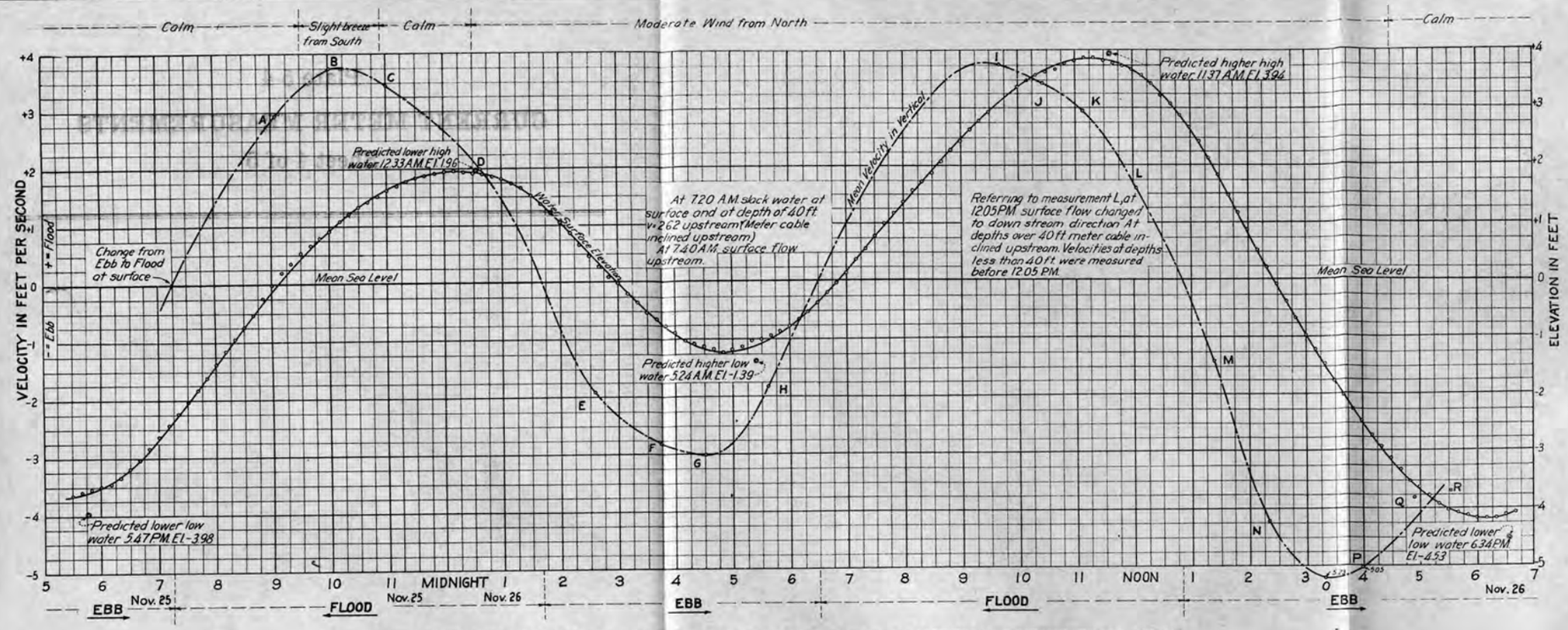
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
DILLON POINT SITE
GAGE HEIGHTS AND VELOCITIES
TIDAL CYCLE OCT. 30 AND 31, 1924

DRAWN N.B.H.-H.U.W.	SUBMITTED W.H. Young		
CHECKED A.J.S. K.S.	APPROVED J.R. Savage		
SV-6	Berkeley, Calif. Dec. 12, 1924	193-D-101	

Plate 5-4

CURRENT METER MEASUREMENTS

Sheet 4 of 5



ELEVATION OF WATER SURFACE AND MEAN VELOCITY IN VERTICAL DURING TIDAL CYCLE

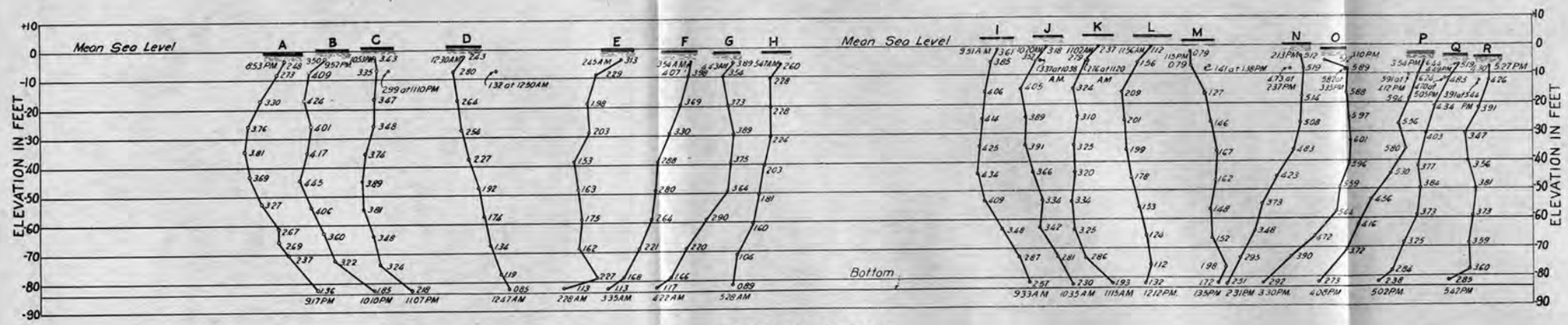
Observations made from Drill Barge at Hole 4500
Water surface elevations determined from gage on Pier at Point San Pablo.

The time and height of predicted Tides at McNear Landing were determined by applying corrections to figures for Fort Point as described on pages 132, 339, 340 and 372 of Tide Tables for Pacific Coast for 1924, published by the United States Coast and Geodetic Survey.

Owing to elapse of time between first and last measurements, curves do not represent simultaneous conditions throughout vertical.

The direction of flow was generally perpendicular to the line of drilling. During the early part of the flood flow however the surface current approached the Barge from a point between San Quentin and the Marin Islands while the direction of current below the surface was perpendicular to the line of drilling as at other times.

Observations indicate that flood flow begins near the bottom before the ebb has ceased at the surface and is sustained near the bottom after ebb has begun at the surface.



VELOCITY CURVES
(Numbers show velocity in ft per sec.)

APPROVED FOR ESTIMATING PURPOSES
A. F. Walter
CHIEF ENGINEER

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
POINT SAN PABLO SITE

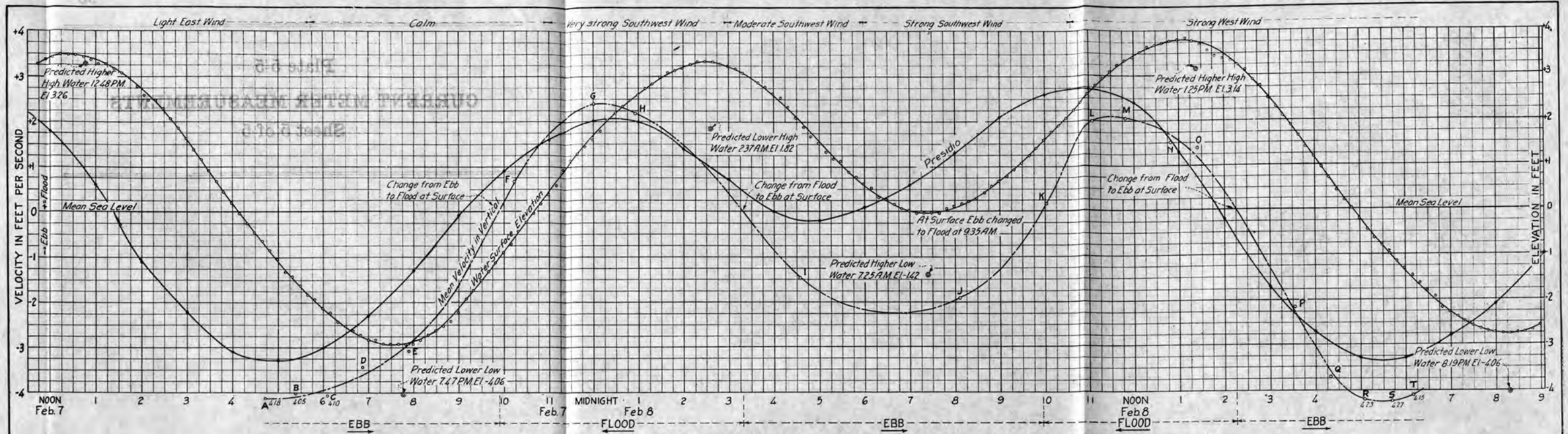
GAGE HEIGHTS AND VELOCITIES
TIDAL CYCLE NOV. 25 AND 26, 1924

DRAWN N.B.H.-H.W. SUBMITTED W.H. Young
CHECKED N.B.H. APPROVED J.L. Savage
SV-7 Berkeley, Cal. Dec. 22, 1924 193-D-102

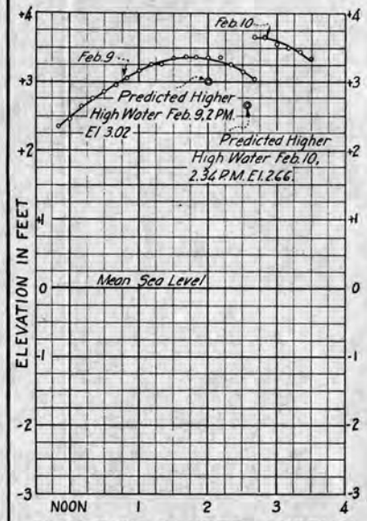
Plate 5-5

CURRENT METER MEASUREMENTS

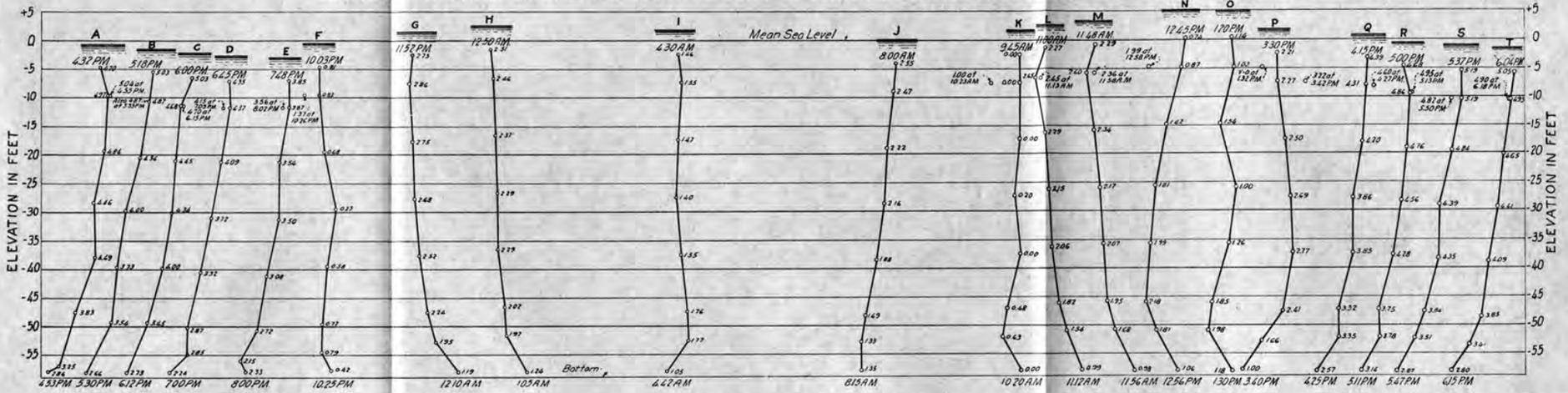
Sheet 5 of 5



ELEVATION OF WATER SURFACE AND MEAN VELOCITY IN VERTICAL DURING TIDAL CYCLE



ELEVATION OF WATER SURFACE



VELOCITY CURVES
(Numbers show velocity in ft per sec.)

Observations made from Drill Barge at Hole 3550 For locality Map see Dwg SV-5 prepared in connection with observations made Oct 1 and 2, 1924 at the same place
Water surface elevations determined from gage on Pier at Suisun Point
The time and height of predicted Tides at Benicia were determined by applying corrections to figures for Fort Point as described on pages 129, 339, 340 and 372 of Tide Tables for Pacific Coast for 1925, published by the United States Coast and Geodetic Survey

Owing to elapse of time between first and last measurements, curves do not represent simultaneous conditions throughout vertical
The direction of flow was towards and from Martinez ferry slip except for a short period during each reversal of current, when the direction was perpendicular to the prevailing direction
During reversal of surface current there was at no time any inclination of Cable to indicate direction of flow below surface

APPROVED FOR ESTIMATING PURPOSES:
R. P. Walter
CHIEF ENGINEER

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
ARMY POINT SITE
GAGE HEIGHTS AND VELOCITIES
TIDAL CYCLE FEB. 7 AND 8, 1925

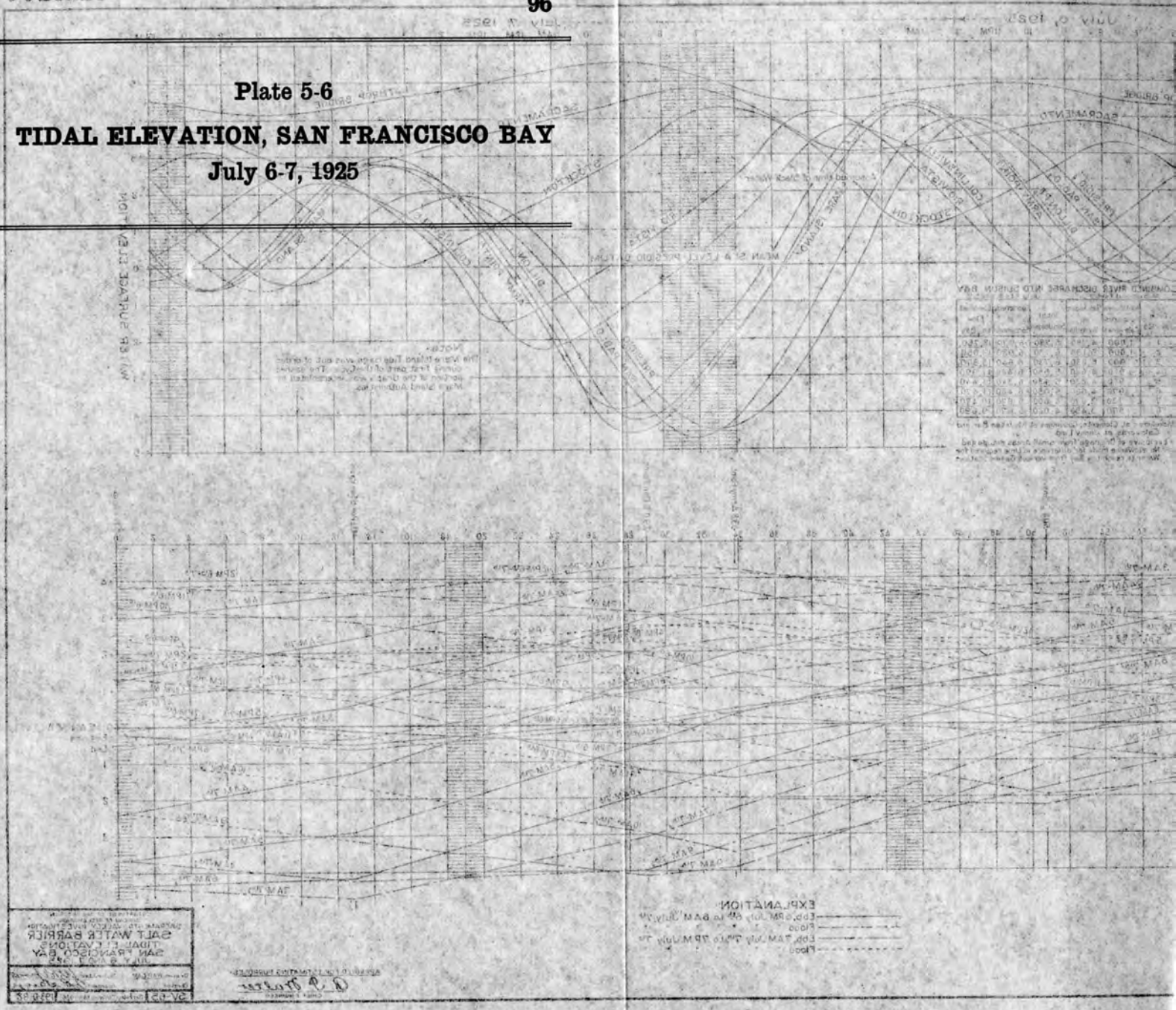
DRAWN N.B.K.-H.W.W. SUBMITTED W. R. Young
CHECKED H.A.K. APPROVED J. L. Savage

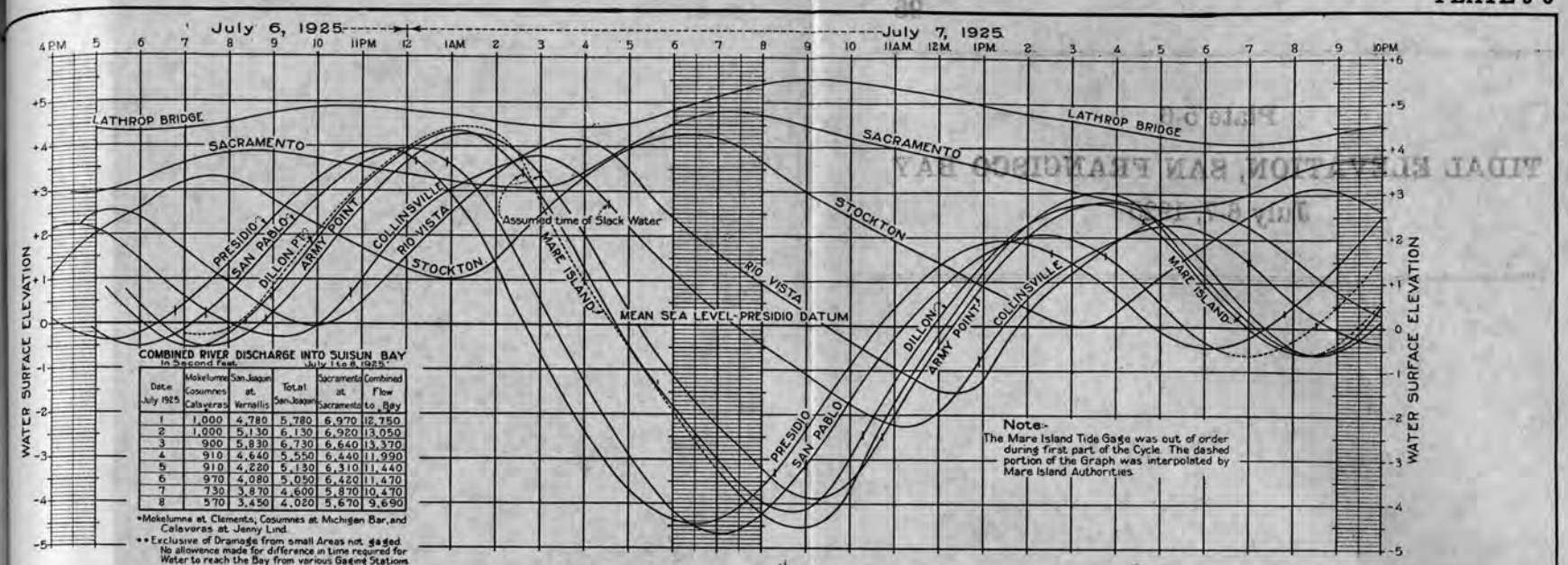
SV-27 | Berkeley, Calif. Mar. 7, 1925 | 193-D-103

Plate 5-6

TIDAL ELEVATION, SAN FRANCISCO BAY

July 6-7, 1925



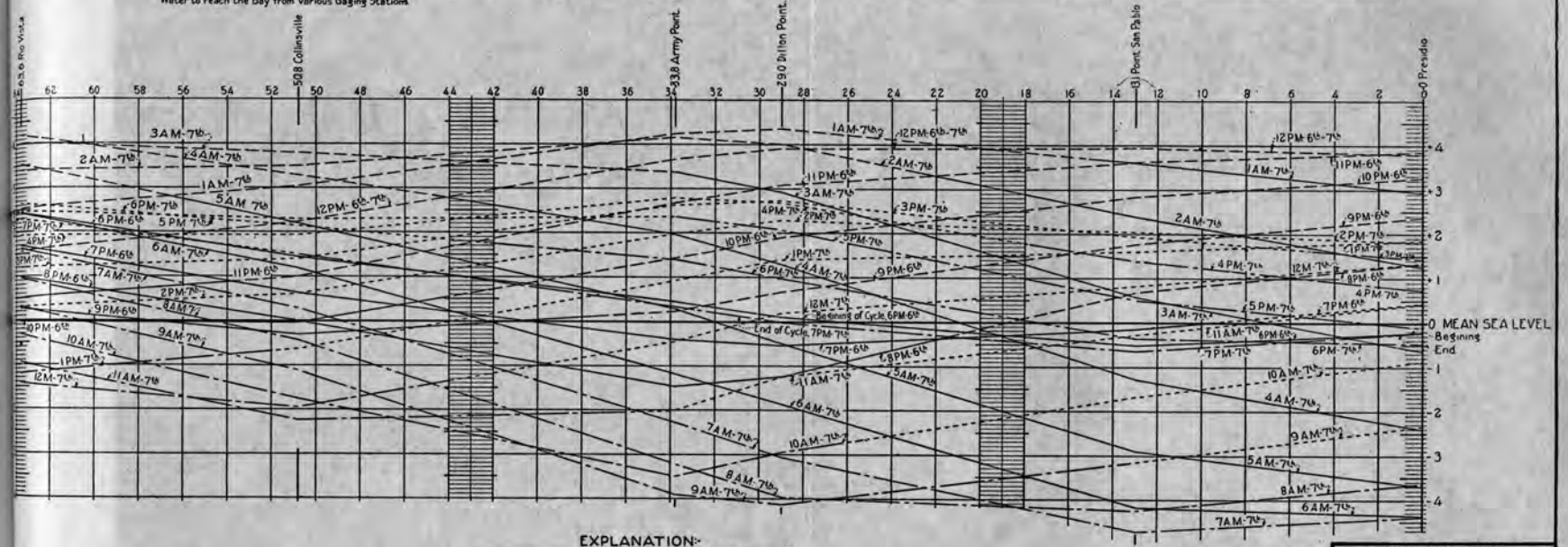


COMBINED RIVER DISCHARGE INTO SUISUN BAY
In Second feet. July 1 to 8, 1925.

Date July 1925	Mokelumne Cosumnes Calaveras	San Joaquin at Vernalis	Total San Joaquin	Sacramento at Sacramento	Combined Flow to Bay
1	1,000	4,780	5,780	6,970	12,750
2	1,000	5,130	6,130	6,920	13,050
3	900	5,830	6,730	6,640	13,370
4	910	4,640	5,550	6,440	11,990
5	910	4,220	5,130	6,310	11,440
6	970	4,080	5,050	6,420	11,470
7	730	3,870	4,600	5,870	10,470
8	570	3,450	4,020	5,670	9,690

*Mokelumne at Clements; Cosumnes at Michigan Bar, and Calaveras at Jenny Lind.

** Exclusive of Drainage from small Areas not gaged. No allowance made for difference in time required for Water to reach the Bay from various Gaging Stations.



EXPLANATION:-
- Ebb, 6 PM July 6th to 6 A.M. July 7th
- Flood
- Ebb, 7 AM July 7th to 7 P.M. July 7th
- Flood

APPROVED FOR ESTIMATING PURPOSES:-
R. P. Walter
CHIEF ENGINEER

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
TIDAL ELEVATIONS
SAN FRANCISCO BAY
JULY 6 AND 7 1925

Drawn W.A.P.-C.A.M. Submitted W. H. Lyons
Checked Approved J. D. Savage
SV-65 Berkeley, California Mch 1926 193-D-88

Plate 5-7

CURVES OF STORAGE IN DELTA

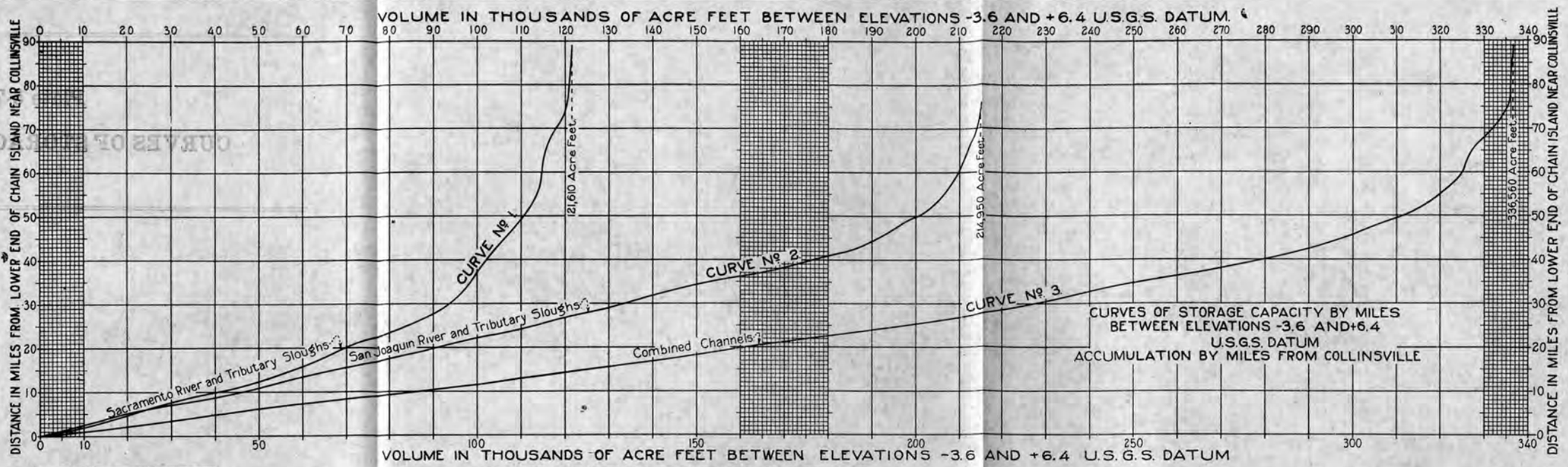
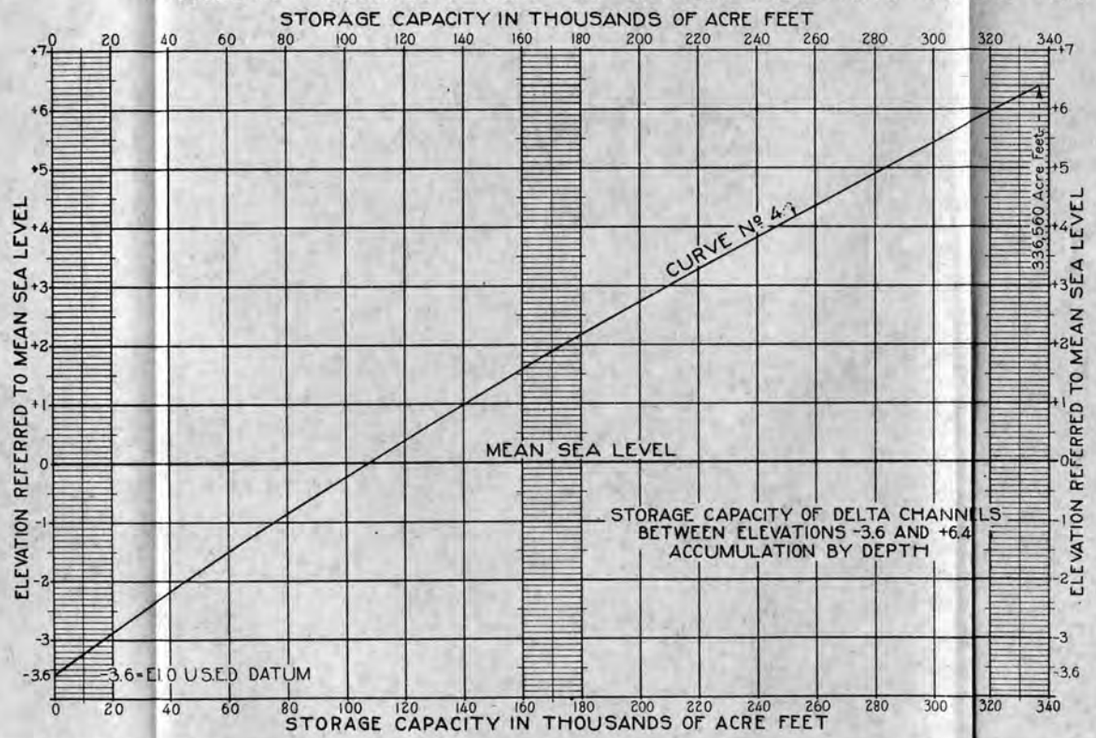
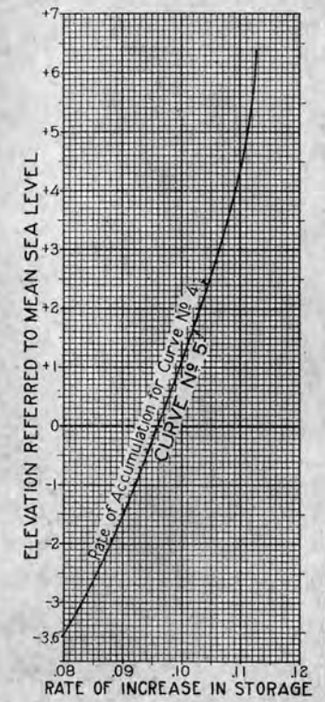


TABLE OF INCREMENTS FOR CURVES NOS 1, 2 AND 3

DISTANCE IN MILES FROM LOWER END OF CHAIN ISLAND	SACRAMENTO RIVER	SAN JOAQUIN RIVER	COMBINED CHANNELS
0			
2	10,200	8,000	18,200
4	7,500	7,800	15,300
6	6,300	8,200	14,500
8	7,000	11,500	18,500
10	9,500	10,500	20,000
2	8,600	8,100	16,700
4	5,800	8,470	14,270
6	5,300	9,770	15,070
8	5,000	10,250	15,250
20	4,630	8,260	12,890
2	5,720	8,580	14,300
4	6,060	9,690	15,750
6	5,080	7,700	12,780
8	3,780	9,180	12,960
30	3,120	7,560	10,680
2	2,340	6,940	9,280
4	1,470	8,040	9,510
6	1,510	10,010	11,520
8	1,710	10,540	12,250
40	1,670	7,530	9,200
2	1,660	7,480	9,140
4	1,570	5,230	6,800
6	1,760	4,100	5,860
8	1,760	2,890	4,650
50	1,640	4,360	6,000
2	1,200	2,500	3,700
4	1,250	2,370	3,620
6	850	1,540	2,390
8	600	1,580	2,180
60	300	1,030	1,330
2	100	830	930
4	300	790	1,090
6	550	860	1,410
8	950	950	1,900
70	1,100	860	1,960
2	1,300	470	1,770
4	800	390	1,190
6	600	100	700
8	250		250
80	100		100
2	100		100
4	150		150
6	250		250
8	150		150
90	30		30





Notes.-

The Abcissas on Curve Nº 5 represent the fractional part of the total accumulation which would be included in a Section one foot deep at the various Elevations indicated by the Ordinates.

It was assumed in the use of Curves Nºs 4 and 5 that Curve Nº 4 represents the form of the Storage Curve for each two Mile Block as well as for the total Volume of Storage.

The Curves do not include 16,810 Acre Feet of Marsh Storage lying above El. 2.9 Upstream from Cache Slough.

APPROVED FOR ESTIMATING PURPOSES:-
A. P. Walter
CHIEF ENGINEER

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
CURVES OF STORAGE IN DELTA FOR TIDAL STUDIES

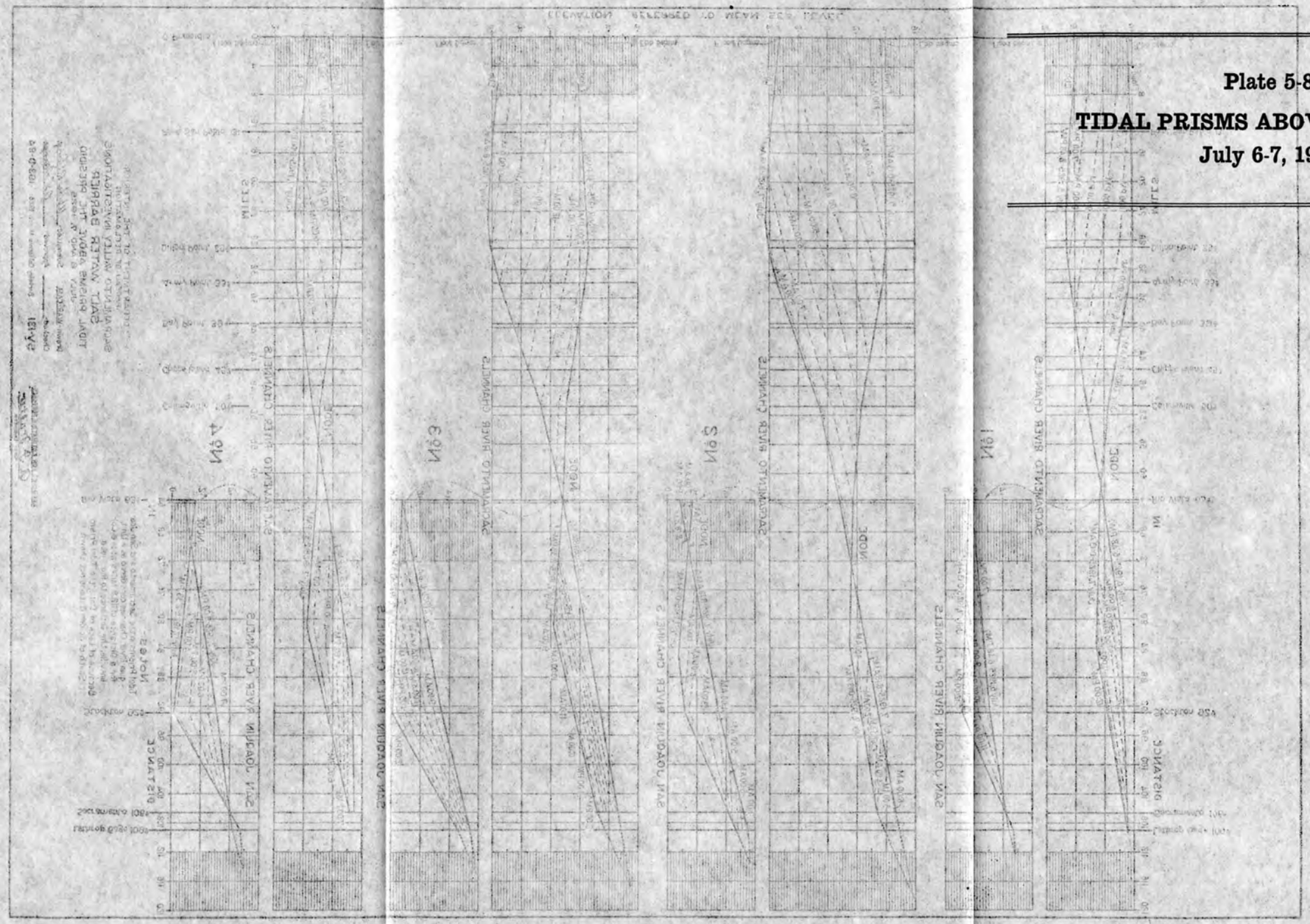
Drawn: WAP-CAM Submitted: W. H. Lyons
Checked: Approved: J. D. Savage

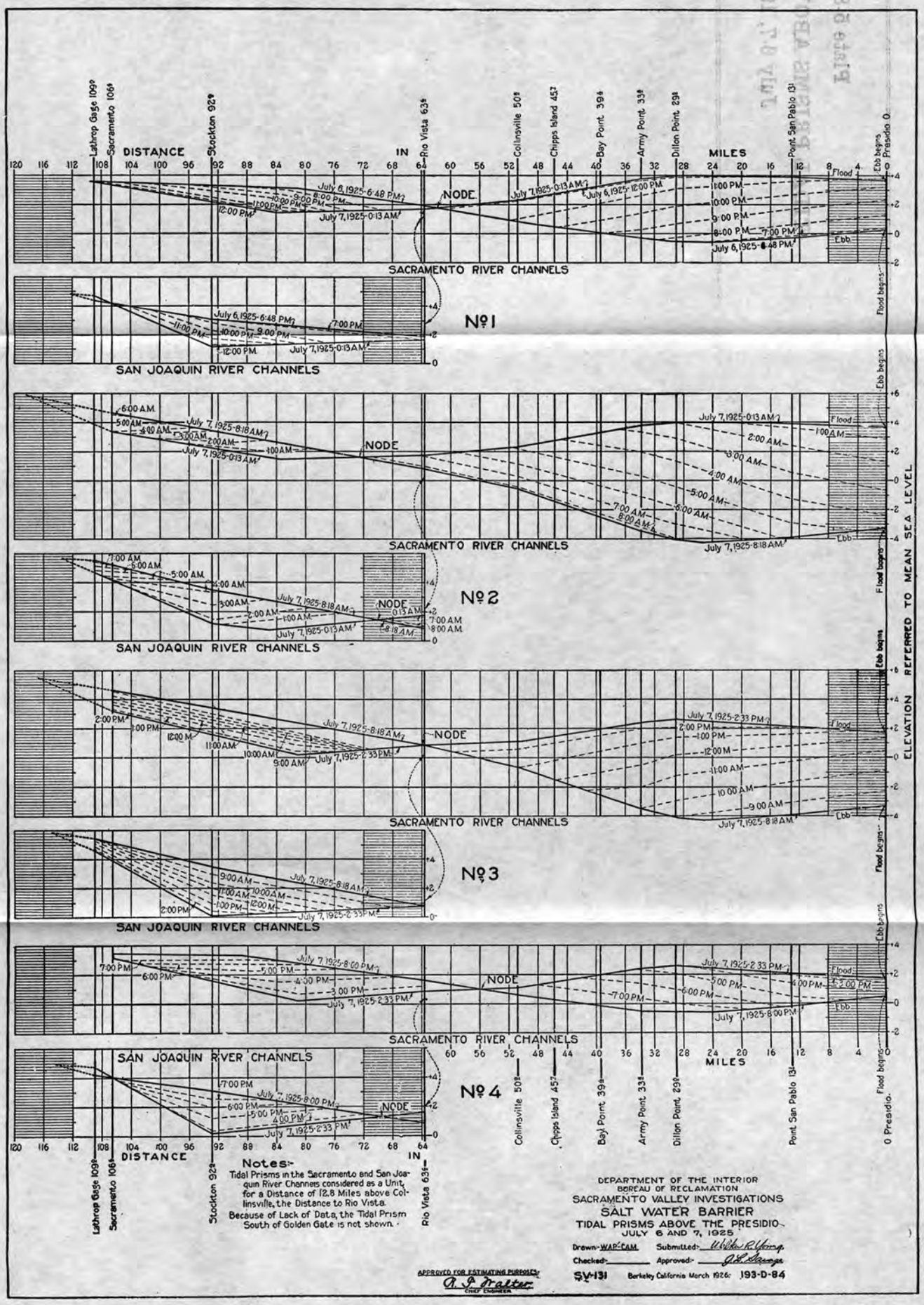
SV-130 | Berkeley California Mch 1926 | 193-D-83

Plate 5-8

TIDAL PRISMS ABOVE PRESIDIO

July 6-7, 1925





Notes:-

Tidal Prisms in the Sacramento and San Joaquin River Channels considered as a Unit, for a Distance of 12.8 Miles above Collinsville, the Distance to Rio Vista.

Because of Lack of Data, the Tidal Prism South of Golden Gate is not shown.

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
TIDAL PRISMS ABOVE THE PRESIDIO
JULY 6 AND 7, 1925

Drawn-WAP-CAM. Submitted- Wilbur R. Young
Checked- Approved- J. L. Savage

APPROVED FOR ESTIMATING PURPOSES:
A. F. Walter
CHIEF ENGINEER

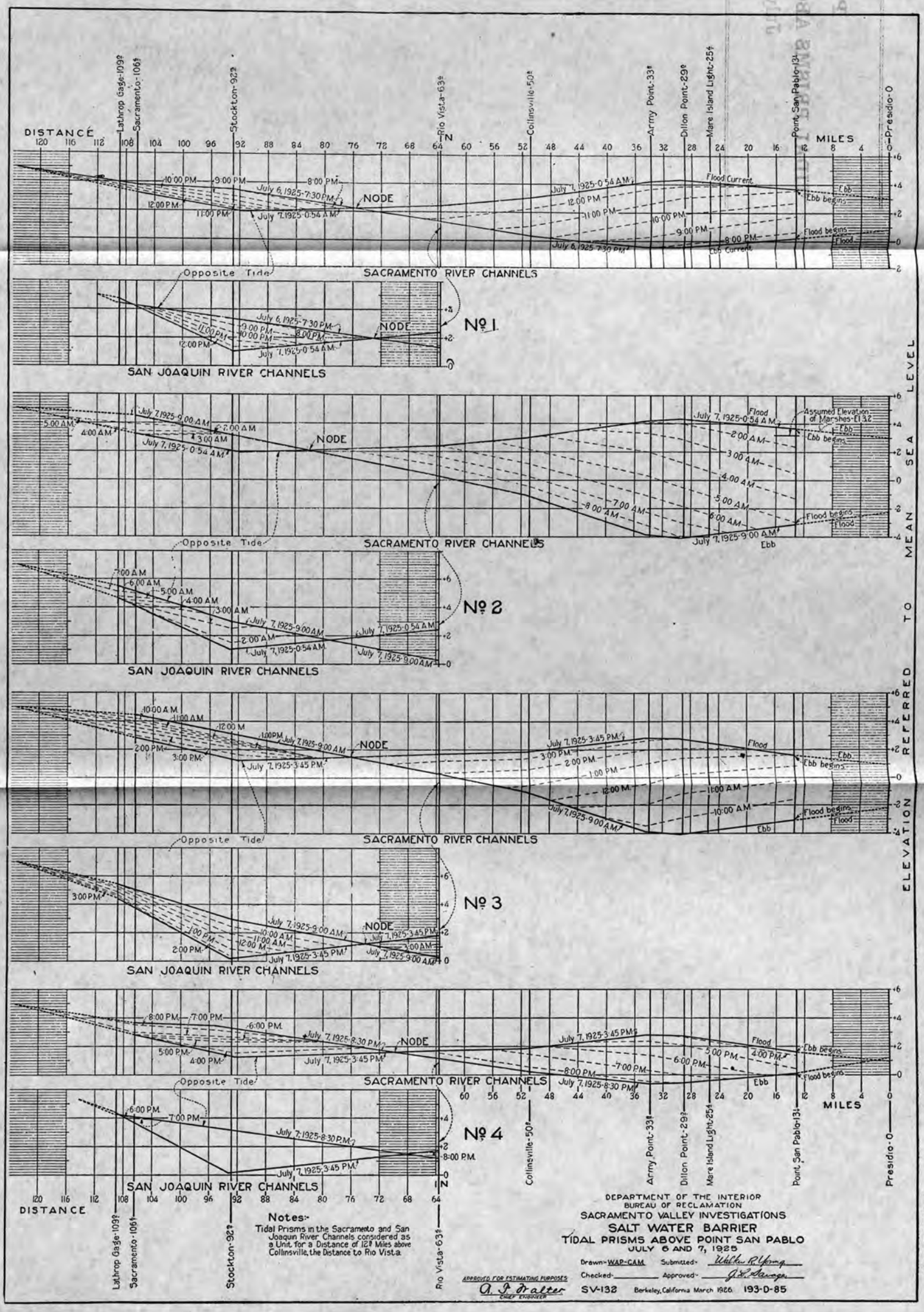
SV-131 Berkeley California March 1926 193-D-84

PLATE 5-8

Plate 5-9

TIDAL PRISMS ABOVE POINT SAN PABLO

July 6-7, 1925



Notes:-
Tidal Prisms in the Sacramento and San Joaquin River Channels considered as a Unit, for a Distance of 12.8 Miles above Collinsville, the Distance to Rio Vista.

APPROVED FOR ESTIMATING PURPOSES
A. F. Walter
CHIEF ENGINEER

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
TIDAL PRISMS ABOVE POINT SAN PABLO
JULY 6 AND 7, 1925

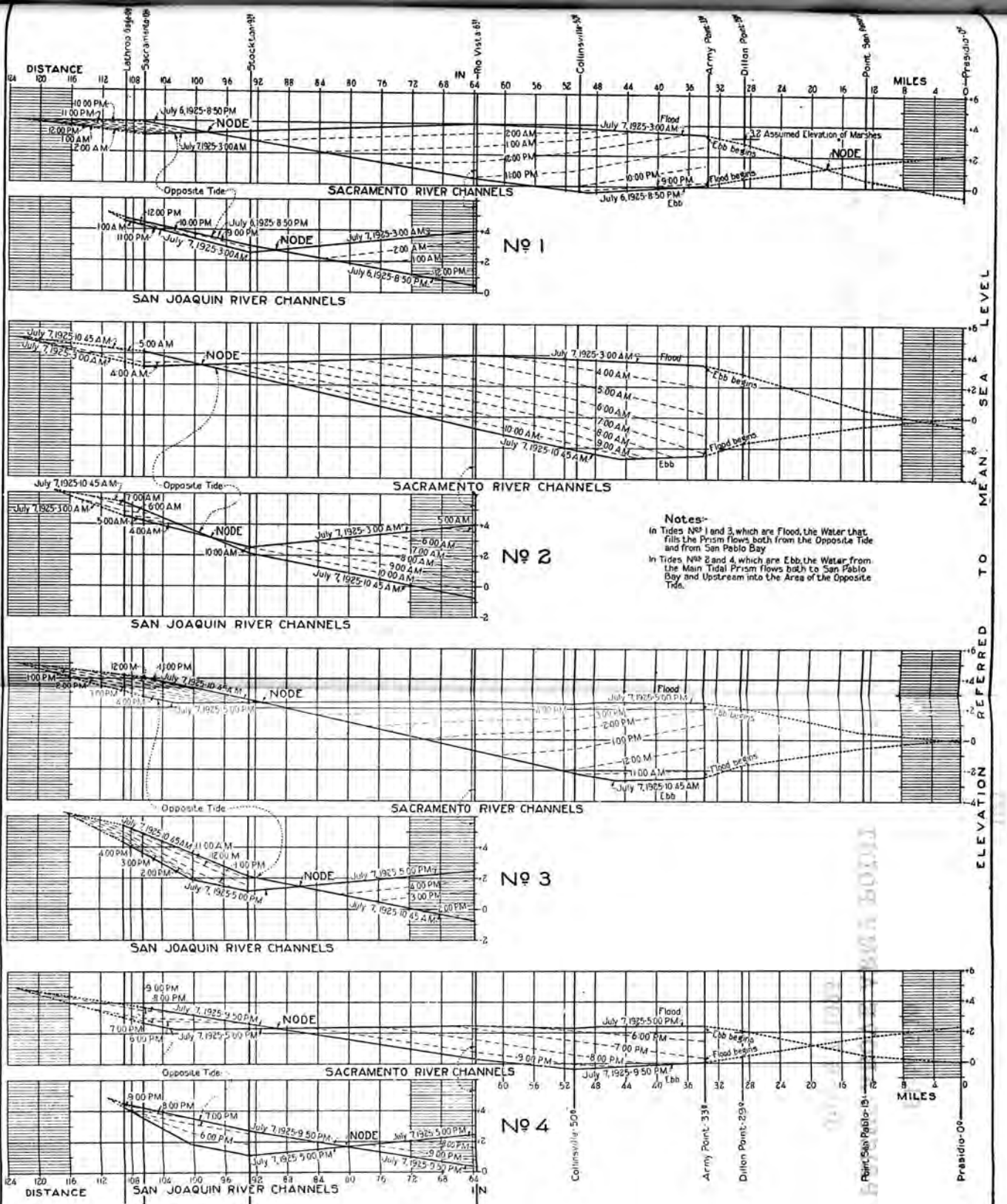
Drawn-WAP-CAM. Submitted- Walter R. Young
Checked- Approved- J. L. Savage
SV-132 Berkeley, California March 1926 193-D-85

PLATE 5-9

Plate 5-10

TIDAL PRISMS ABOVE ARMY POINT

July 6-7, 1925



Notes:-
In Tides Nos 1 and 3, which are Flood, the Water that fills the Prism flows both from the Opposite Tide and from San Pablo Bay
In Tides Nos 2 and 4, which are Ebb, the Water from the Main Tidal Prism flows both to San Pablo Bay and Upstream into the Area of the Opposite Tide.

Notes:-
Tidal Prisms in the Sacramento and San Joaquin River Channels considered as a Unit, for a Distance of 12.6 Miles above Collinsville, the Distance to Rio Vista

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
TIDAL PRISMS ABOVE ARMY POINT
JULY 6 AND 7, 1925

Drawn-WAP-CAM. Submitted- Walter P. Young
Checked- Approved- J. L. Savage

A. F. Brazer
CHIEF ENGINEER

SV-133 Berkeley, California March 1926 193-D-86

PLATE 5-10

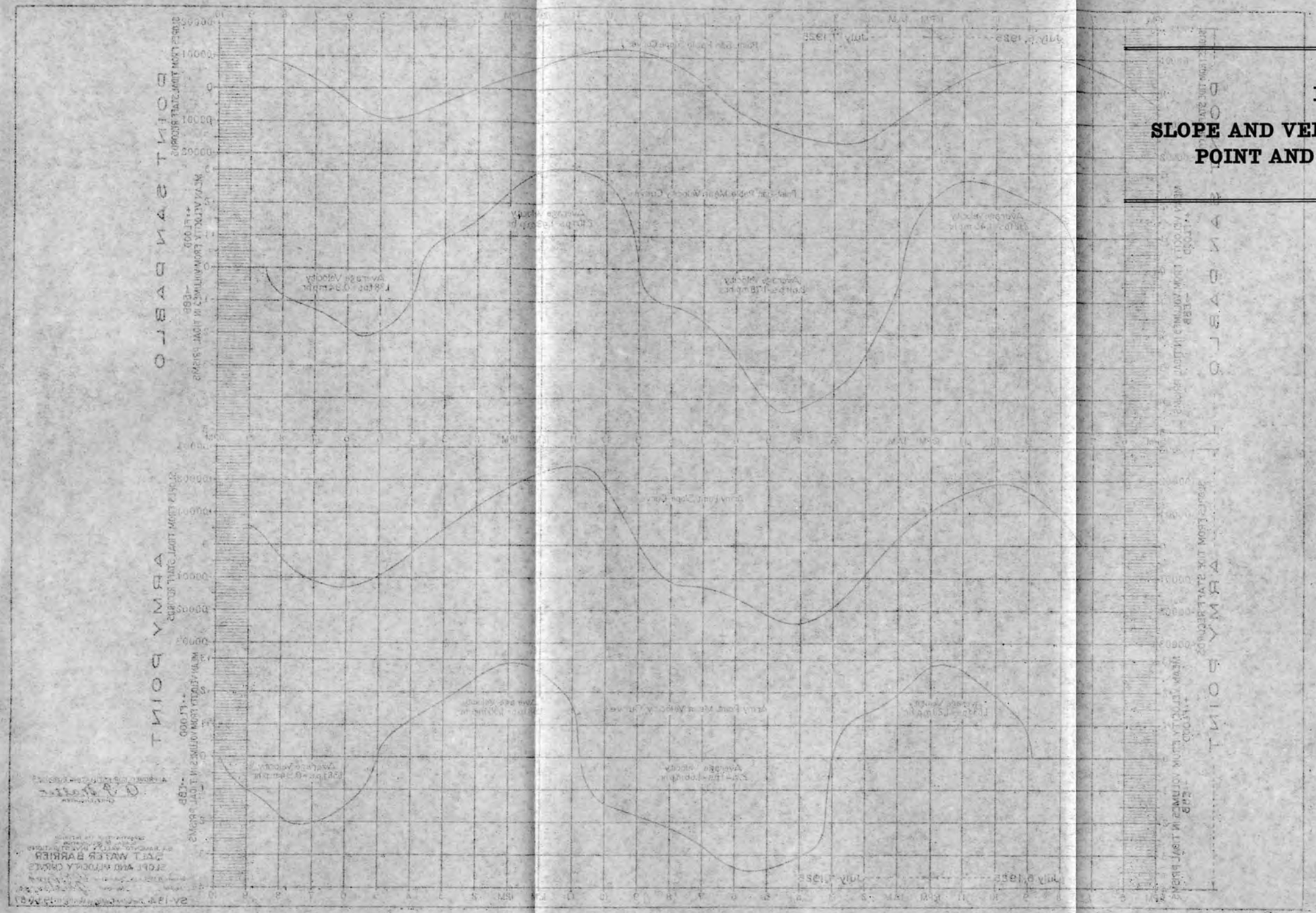


Plate 5-11

SLOPE AND VELOCITY CURVES, ARMY POINT AND POINT SAN PABLO

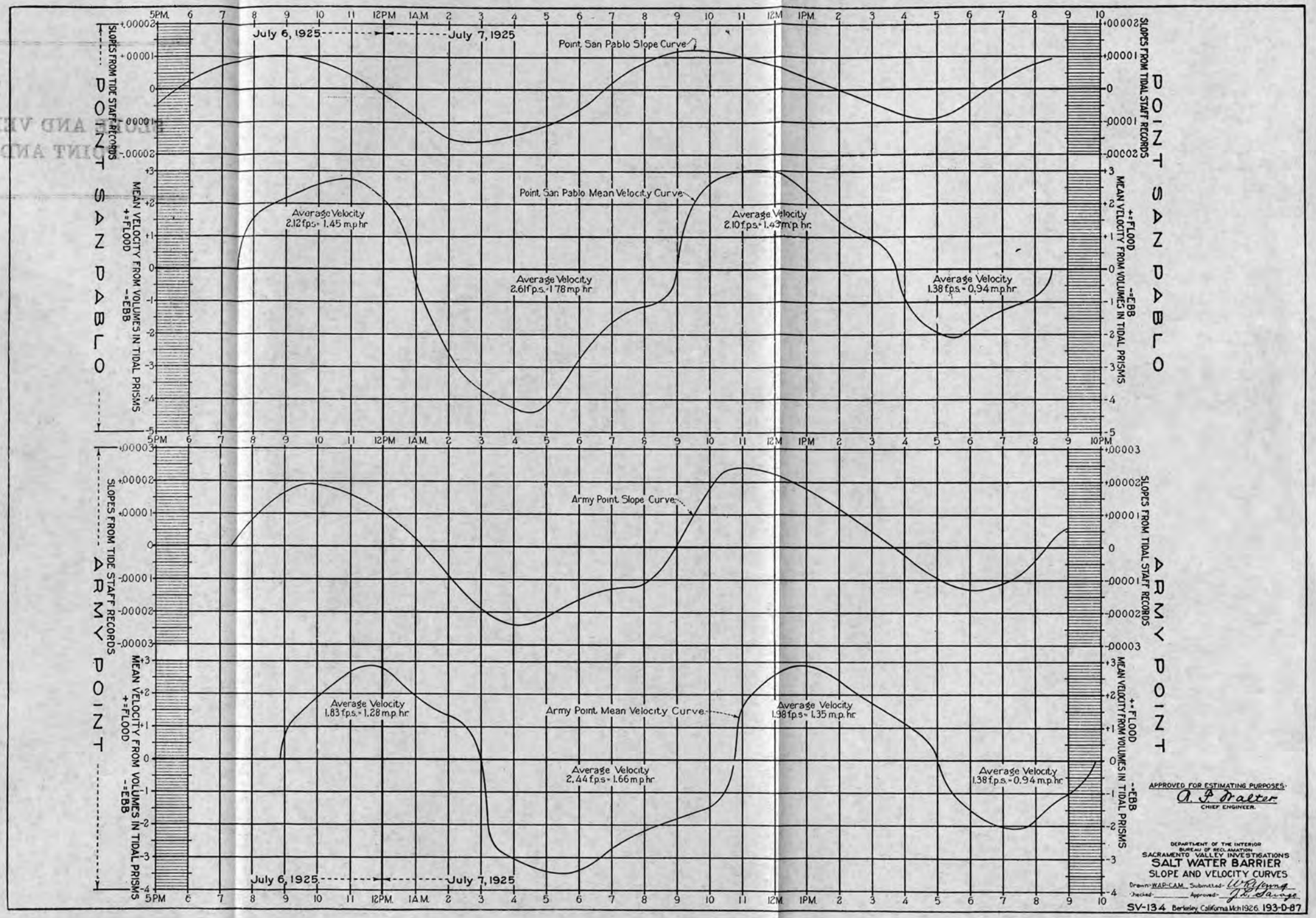
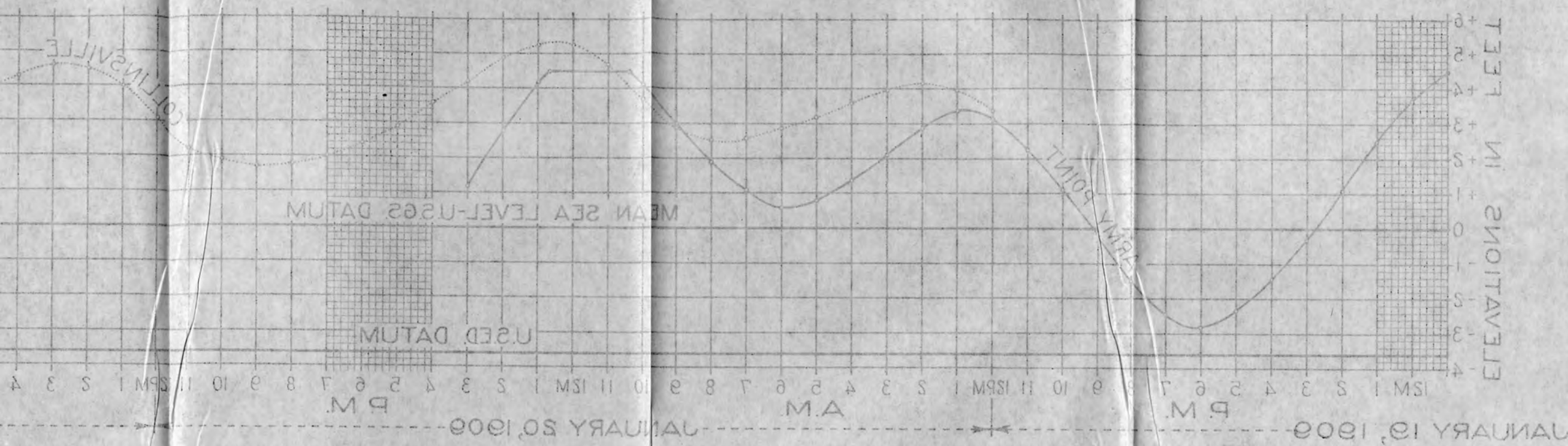

POINT SAN PABLO
SLOPES FROM TIDE STAFF RECORDS
MEAN VELOCITY FROM VOLUMES IN TIDAL PRISMS
+=FLOOD
-=EBB
July 6, 1925
July 7, 1925
Point San Pablo Slope Curve
Point San Pablo Mean Velocity Curve
Average Velocity 2.12 f.p.s.=1.45 m.p.hr.
Average Velocity 2.61 f.p.s.=1.78 m.p.hr.
Average Velocity 2.10 f.p.s.=1.43 m.p.hr.
Average Velocity 1.38 f.p.s.=0.94 m.p.hr.
ARMY POINT
Army Point Slope Curve
Army Point Mean Velocity Curve
Average Velocity 1.83 f.p.s.=1.28 m.p.hr.
Average Velocity 2.44 f.p.s.=1.66 m.p.hr.
Average Velocity 1.98 f.p.s.=1.35 m.p.hr.
Average Velocity 1.38 f.p.s.=0.94 m.p.hr.
APPROVED FOR ESTIMATING PURPOSES
A. P. Walter
CHIEF ENGINEER.
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
SLOPE AND VELOCITY CURVES
Drawn-WAP-CAM. Submitted-
Checked- Approved-
SV-13.4 Berkeley, California Mch 1926. 193-D-87

Plate 5-12

ARMY POINT AND COLLINSVILLE GAGE HEIGHTS

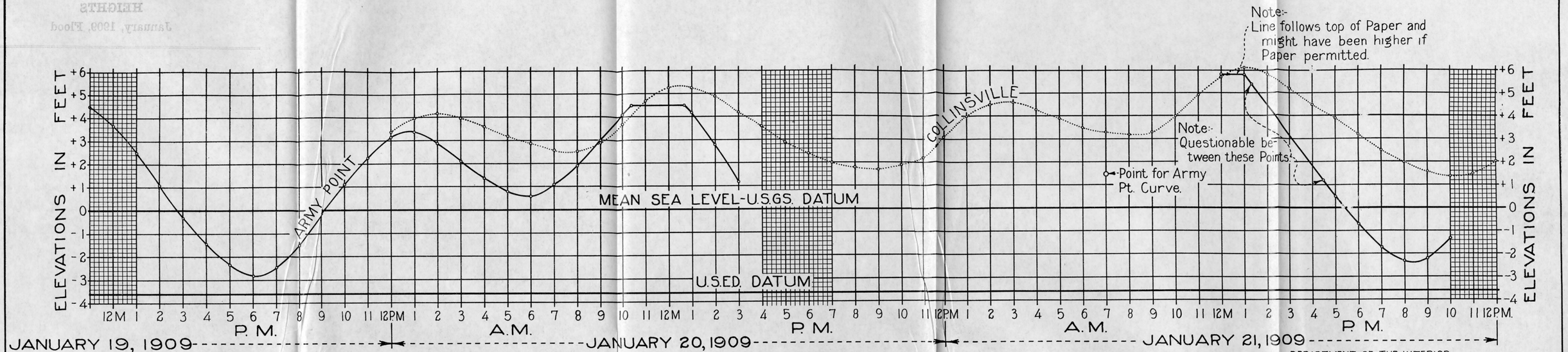
January, 1909, Flood



APPROVED FOR ESTIMATING

C. J. Mc

CHIEF ENGIN



DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS

SALT WATER BARRIER

ARMY POINT AND, COLLINSVILLE GAGE HEIGHTS DURING JAN. 1909 FLOOD-FROM U.S. ENGINEER DEPARTMENT RECORDS - AUG. 25, 1924

Drawn:- N.B.H. C.A.M. Submitted:- W. R. Young
Checked:- Approved:- J. L. Savage

APPROVED FOR ESTIMATING PURPOSES:-
R. F. Walter.
CHIEF ENGINEER.

SV-135 Berkeley, California Mch. 1926. 193-D-88

Plate 5-13

VARIATION IN SEA LEVEL IN SAN FRANCISCO BAY AND IN SACRAMENTO RIVER DISCHARGE NEAR RED BLUFF

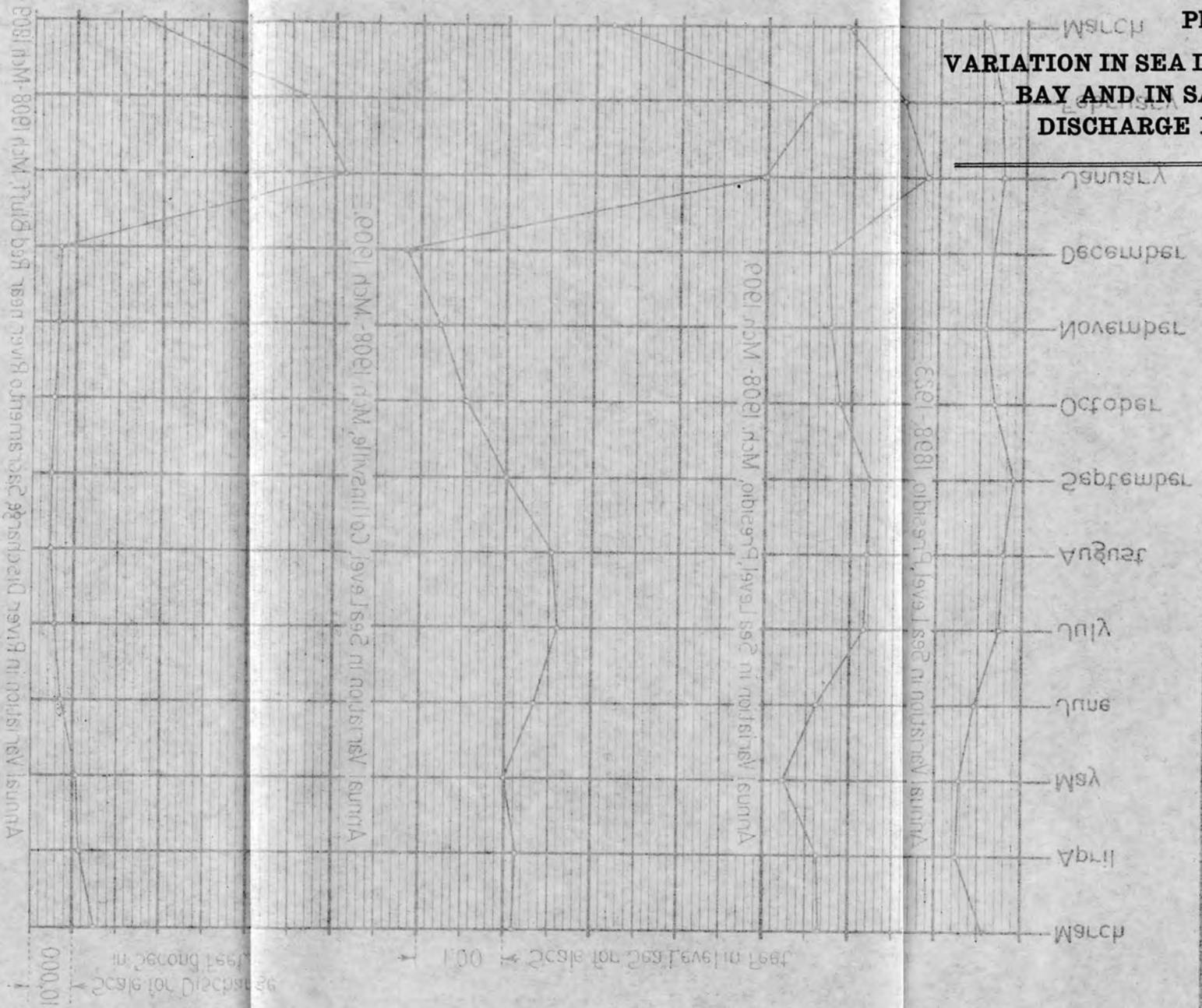


PLATE 5-13

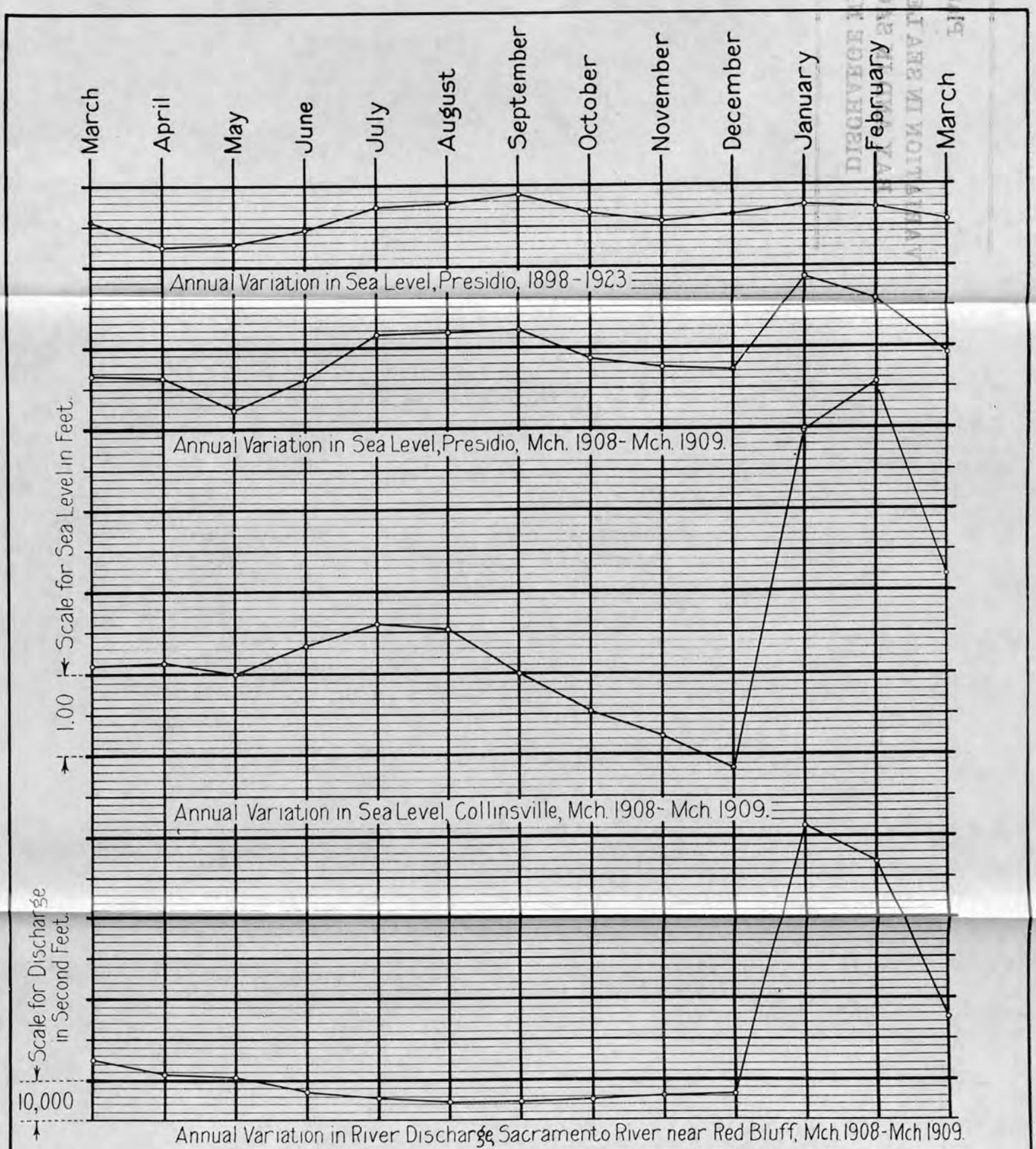
DEPARTMENT OF THE INTERIOR
SACRAMENTO VALLEY INVESTIGATIONS
BUREAU OF RECLAMATION

SALT WATER BARRIER
VARIATION IN SEA LEVEL IN SF BAY
AND IN
SACRAMENTO RIVER DISCHARGE NEAR RED BLUFF

Drawn: W.Y.Q.M. Submitted: Approved:
Checked:

Notes:-
Reproduced from Survey accompanying Letter of Dec. 18, 1925 from Mr. R. L. Faris Acting Director U.S. Coast and Geodetic Survey

APPROVED FOR ESTIMATING PURPOSES



Note:-
Reproduced from Curves accompanying Letter of Dec 18, 1925 from Mr. R.L. Faris, Acting Director, U.S. Coast and Geodetic Survey.

APPROVED FOR ESTIMATING PURPOSES:-
A. F. Walter
CHIEF ENGINEER.

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS

SALT WATER BARRIER

VARIATION IN SEA LEVEL IN S.F. BAY AND IN SACRAMENTO RIVER DISCHARGE NEAR RED BLUFF

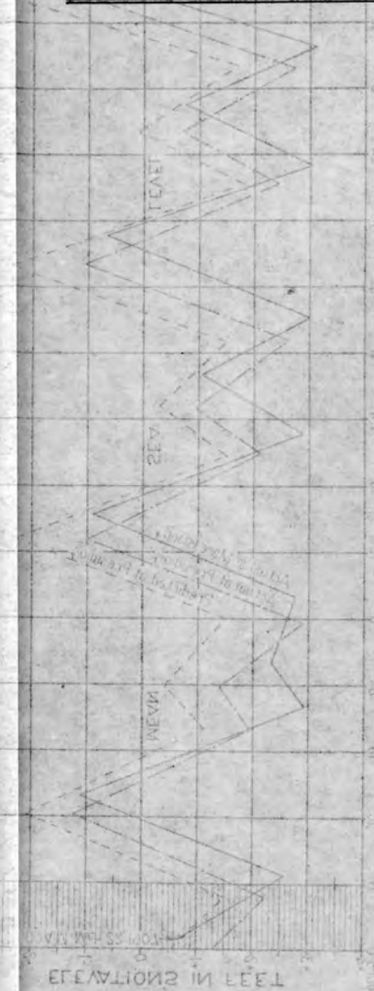
Drawn: W.R.Y.-C.A.M. Submitted:- W.R.Young
Checked:- Approved:- J.D. Savage

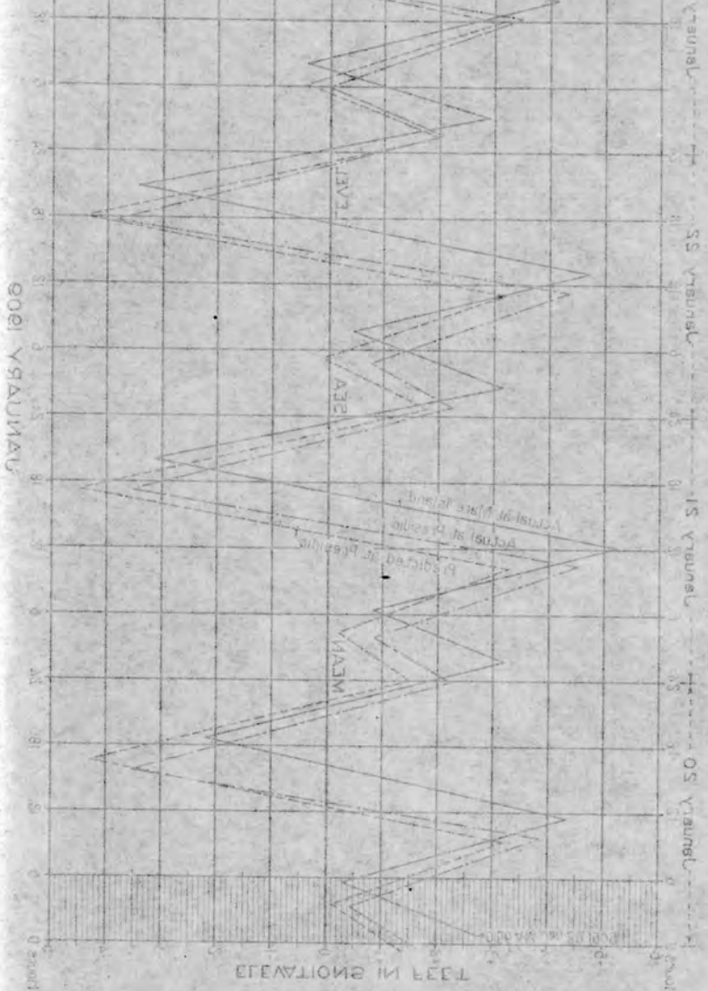
SV-136 Berkeley, California Mch. 1926. 193-D-89

PLATE 5-13

Plate 5-14

HIGH AND LOW WATER AT PRESIDIO AND MARE ISLAND DURING FLOOD PERIODS IN RIVERS





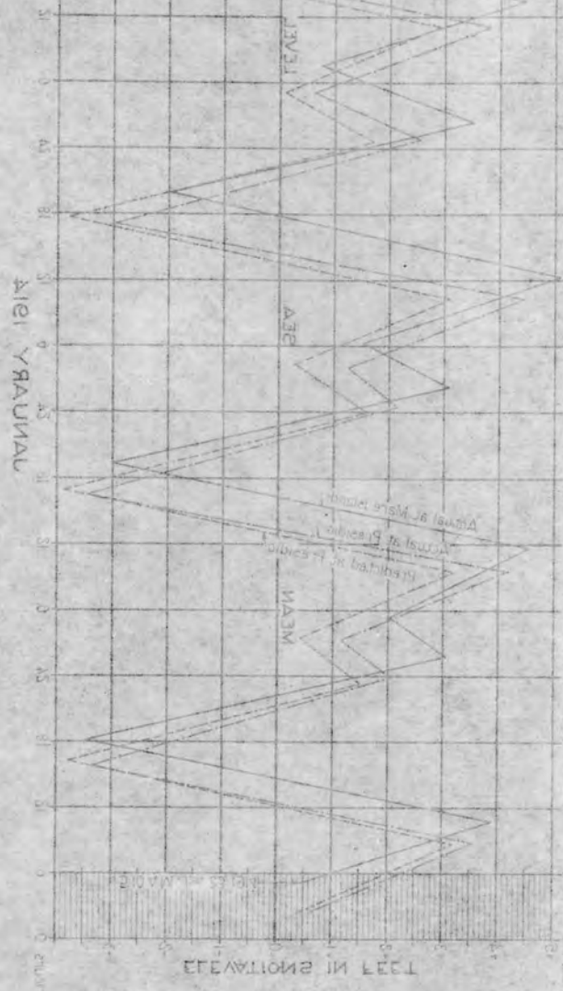
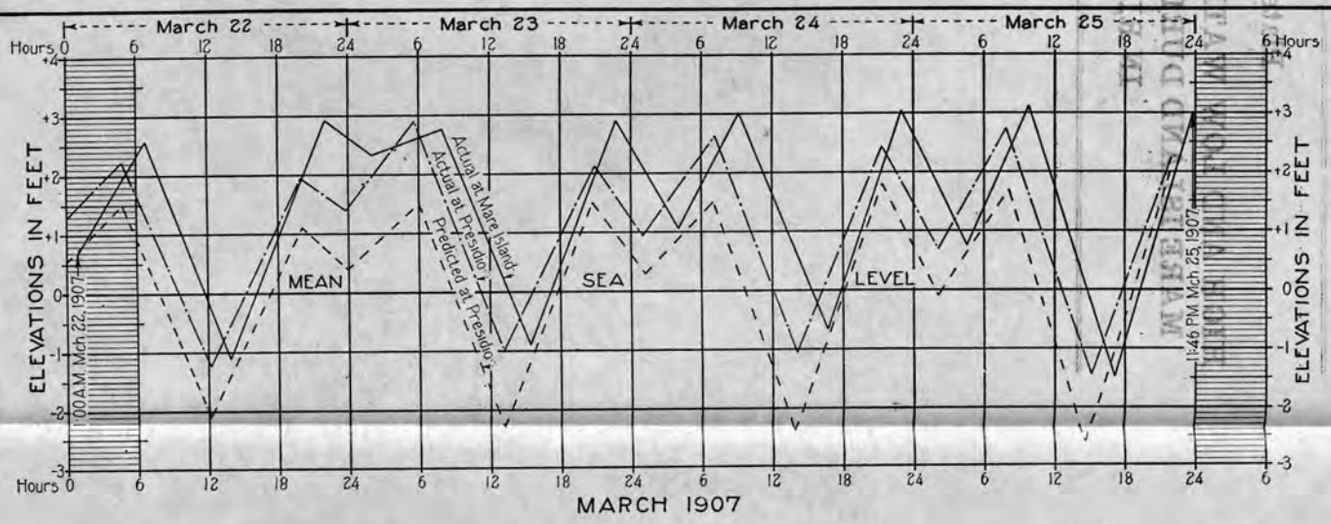
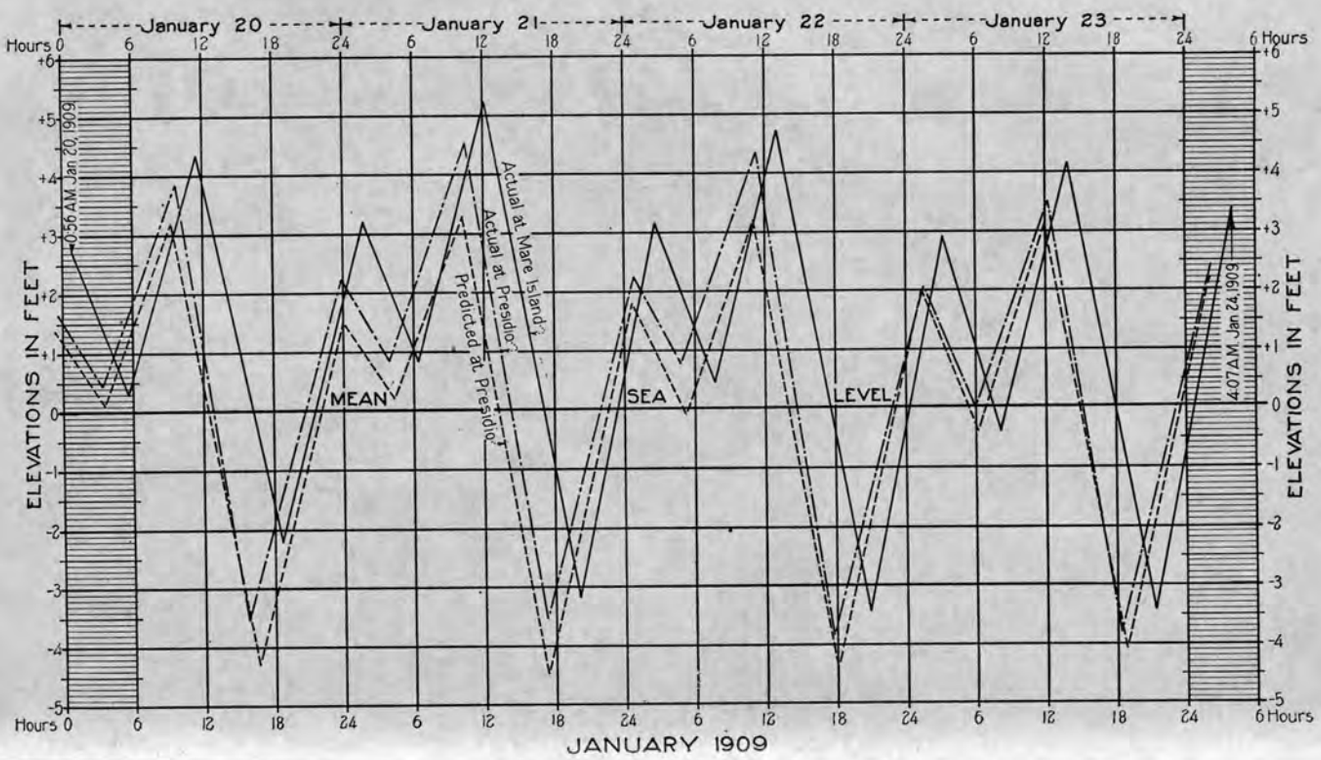


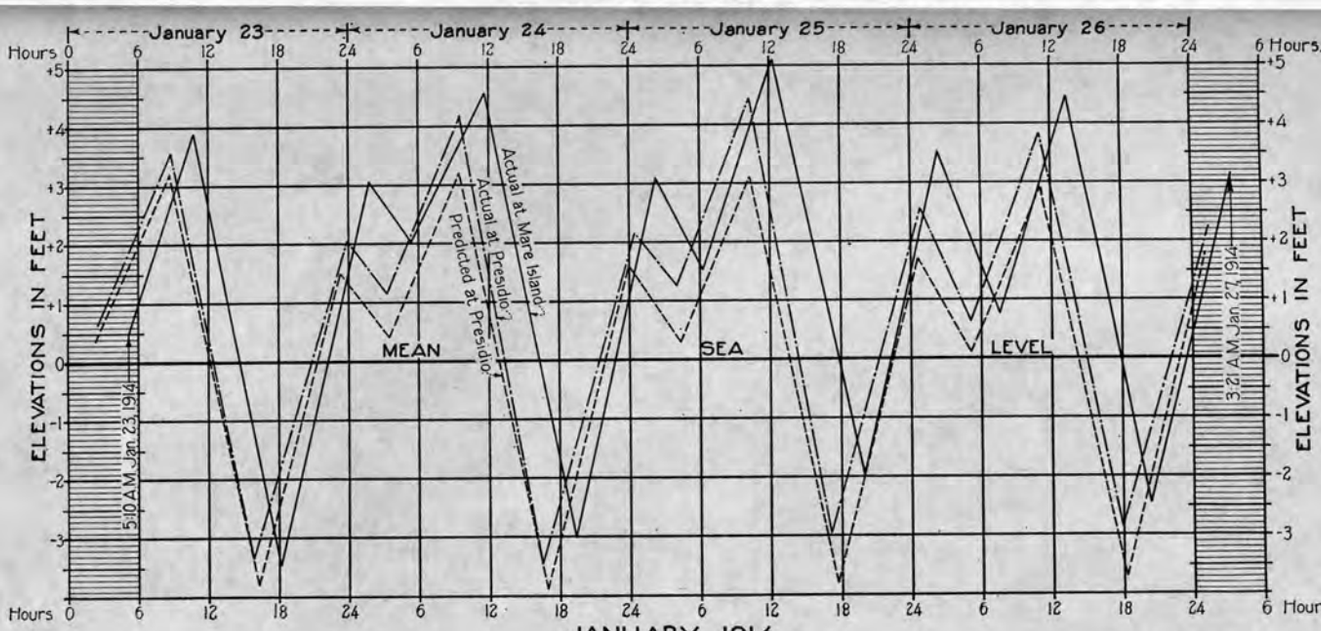
PLATE 5-14



MARCH 1907



JANUARY 1909



JANUARY 1914

Note:-
The Graphs are not true Graphs. Maximum and Minimum Elevations reached are, for convenience, joined by straight Lines.

APPROVED FOR ESTIMATING PURPOSES:-
A. P. Walter
CHIEF ENGINEER

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS
SALT WATER BARRIER
HIGH AND LOW WATER AT PRESIDIO AND MARE ISLAND
DURING FLOOD PERIODS IN RIVERS

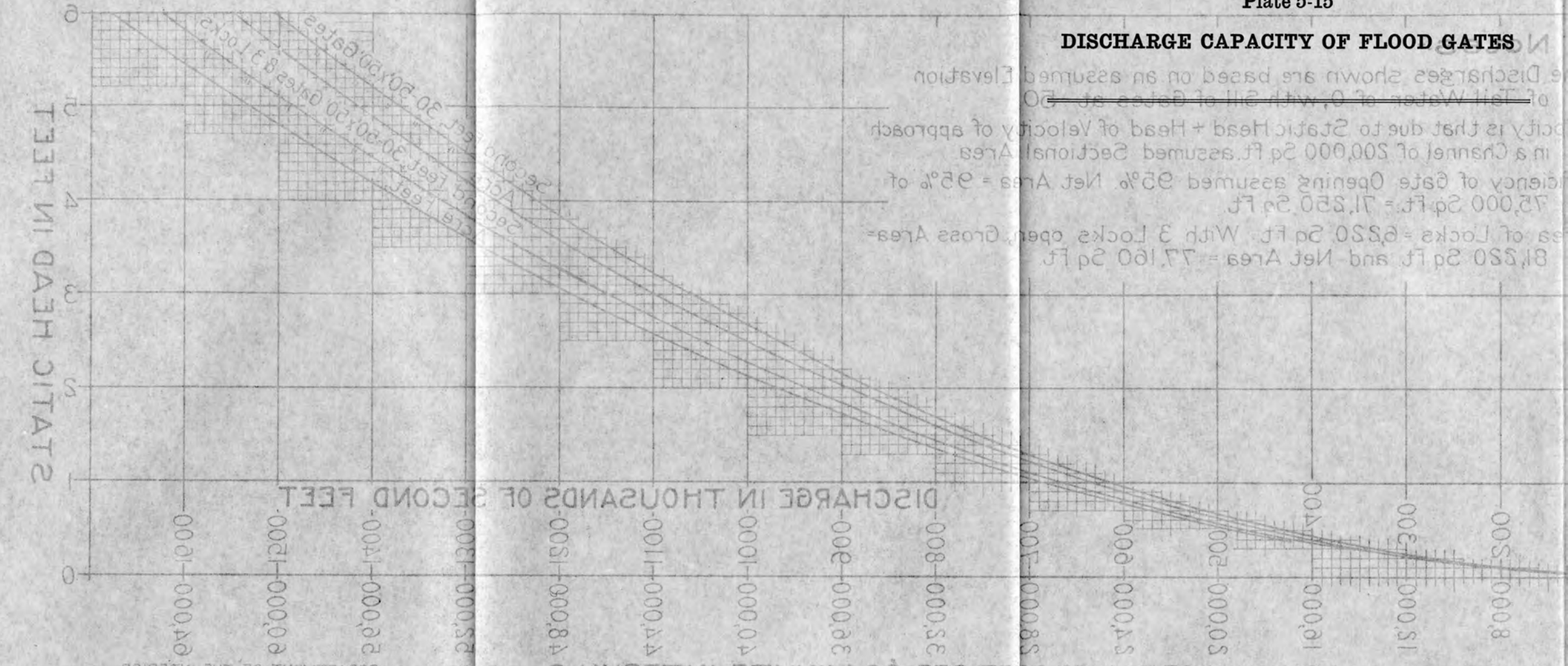
Drawn:- WAP-CAM Submitted:- W. B. Young
Checked:- _____ Approved:- J. D. Savage

SV-137 Berkeley, California Mch 1926. 193-D-90

PLATE 5-14

Plate 5-15

DISCHARGE CAPACITY OF FLOOD GATES



DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS

SALT WATER BARRIER

DISCHARGE CAPACITY OF FLOOD GATES

Drawn WAP-CAM Submitted

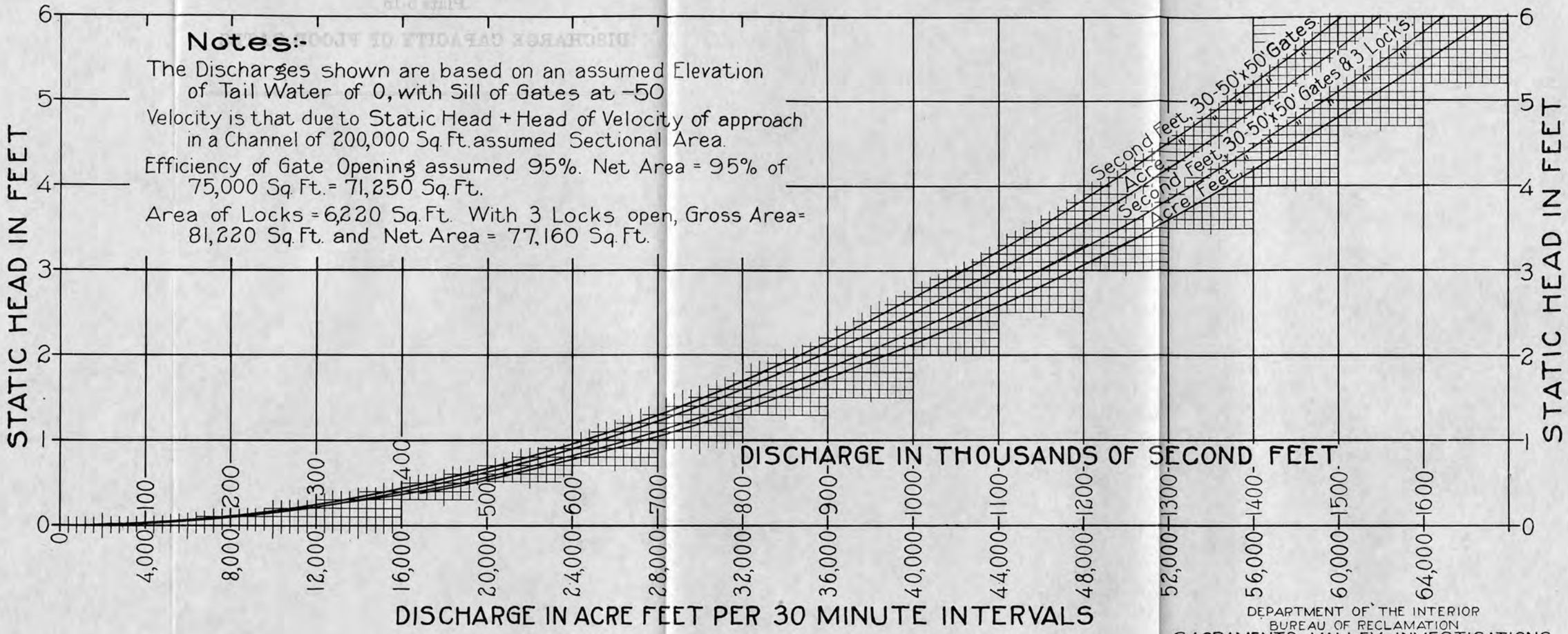
Checked Approved

SV-138 Berkeley, California Mch. 1926 193-D-91

APPROVED FOR ESTIMATING PURPOSES:

C. J. Hoover

CHIEF ENGINEER



APPROVED FOR ESTIMATING PURPOSES:-

A. F. Walter

CHIEF ENGINEER.

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SACRAMENTO VALLEY INVESTIGATIONS

SALT WATER BARRIER

DISCHARGE CAPACITY OF FLOOD GATES

Drawn:- W.A.P.-C.A.M. Submitted:- W. P. Young

Checked:- Approved:- J. L. Savage

SV-138 Berkeley, California. Mch. 1926. 193-D-91

Plate 5-16

DISCHARGE AND SLOPE CURVES