

May 27, 1916.

Mr. ED Fletcher,
 Mgr C W Co.

Dear Sir:-

You have asked me to report the final estimates on certain elements of the Carroll in San Dieguito Ranch Development.

Carroll Reservoir

This has been previously estimated at \$267,000 and \$289,000 for various types of dam. Final design has been carried forward and contractors figures obtained sufficiently to assure that these figures will be considerably less using either the multiple arch or single arch concrete dam, say -----

Carroll Canal -----		\$ 250,000
San Dieguito Reservoir -----		113,000
Pumping plant in the water bearing gravels of San Dieguito River and pipe line to San Dieguito reservoir -----		69,700
Low service distribution pipe line covering the northwest portion of the ranch and the coast lines of Henshaw - lands below elevations 180 above sea - length 6 miles -----		25,000
High Service Distribution line for lands above 180 elevation up to 350 ft. elevation:		
Pumping plant -----	\$17,700	
Pipe Line -----	49,600	
Cement reservoir, four in number on various high elevations --	10,000	77,300
Branch of Low Service Distribution line for the Southerly slope of the Ranch below elevation 180 and down to elevation 50 covering the lands adjacent to the Ranch House and the Southerly lands of Henshaw -----		41,500
Total -----		\$ 635,300

Mr. Ed. Fletcher
 Page 2.

It will be understood that the three distribution lines listed above are so disposed as to provide very largely for the distribution of the water. The areas provided for are as follows:

Acres served distribution Lines.

	Ranch	Henshaw	Outside	Total
Low Service San Elijo	1260	300	220	1780
High service	2500	700	100	3300
Low service South Slope	1000	100	400	1500
	4760	1100	720	6580

Very Sincerely yours,

William S. Post.
 Chf. Engr.

CARROLL-SAN DIEGUITO-COAST

DEVELOPMENT

May 25, 1916.

THIS report includes the results of further surveys and sufficient land classification to determine the size of pipe lines for distribution.

LOW SERVICE DISTRIBUTION

A complete study has been made of the limits of gravity distribution, with the following essential elevations involved. It will be understood that the route of the water is as indicated in preceding report, brought from Carroll Reservoir through the Carroll Canal to the San Dieguito Reservoir. From the San Dieguito Reservoir, this study presents the cost of conveying all the water possible to the Coast by gravity, instead of making all the Coast Service from a "high service" pumping plant, as proposed in the preceding report.

Elevations - Low Service Line

Carroll Reservoir Outlet -----	255	ft.	above	sea.
San Dieguito Reservoir, high water surface -----	225	"	"	"
San Dieguito Reservoir Outlet, and limit of service on Santa Fe lands in San Elijo Valley -----	180	"	"	"
Concrete Reservoir "A" on Coast, Beginning of branch pipe lines to Del Mar and Encinitas and limit of service on lands of Henshaw -----	150	"	"	"
Del Mar - Delivery -----	125	"	"	"
Encinitas " -----	100	"	"	"

Areas - Low Service

Lands contiguous to Coast - 5 to 10 miles from San Dieguito Reservoir.

Henshaw - Coast Land -----	107	acres
" - Stevens Valley -----	193	"
Outside owners, Coast Land -----	220	"
" " Stevens Valley -----	300	"
Encinitas District below elevation 100 ft. ultimate area 800 acres, assume -----	400	"
Del Mar District - including higher area, on which Del Mar L. & W. Co. is now using auxiliary pumps - Ultimate area mostly domestic 1,000 acres - Use ---	300	" 1520 acres

<u>Santa Fe Lands</u> below elevation 180 in San Elijo Canyon - Total area, 1400 acres, deduct 10% for waste land -----	1260	"
Total - Low Service -----	2780	"

NOTE: These areas show only the Santa Fe lands available from low service in the San Elijo Valley, which can incidentally be served from the "Low Service Distribution Pipe Line" to the Coast.

Other areas of Santa Fe lands south of the San Dieguito Reservoir and along the main River may be served by gravity but are not treated here, because they would be served by another and separate pipe line.

Alignment of Low Service

Distribution Line

This line begins at the San Dieguito Reservoir and follows the left or southerly bank of the San Elijo Valley to the Coast a distance of 5 miles, and then turns southerly through the Henshaw lands one mile further.

In the first three miles it acts as trunk distribution

for about 1400 acres of Santa Fe land. At the 5 $\frac{1}{2}$ mile point it provides for some 300 acres additional (Henshaw and others) and also for branch pipe lines to Del Mar and Encinitas. At the end (6th mile) it provides for some 500 acres additional - Henshaw and other lands.

The total including Del Mar and Encinitas is about 2800 acres to be served by the "low service" line.

High Service Corresponding to Preceding Low Service

There remain on the Santa Fe Ranch in the vicinity of the San Dieguito Reservoir and extending westerly to the Ranch Line 3030 acres varying from an altitude of 180 to 350 feet above sea. These can be served by a single trunk - High Service Distribution Line - which then would be continued along the high ground into the Henshaw lands providing for 635 additional acres and 90 additional acres outside owners or a total of 3755 acres.

This involves a pumping plant at the San Dieguito Reservoir, and preferably several small reservoirs on the highest ground.

ESTIMATES

Carroll Reservoir

This has been previously estimated at \$267,000 and \$289,000 for various types. Final design has been carried forward and contractors figures obtained sufficiently to assure that these figures will be considerably less, using either the "multiple arch" or "single arch" concrete Dam.

Carroll Canal

This conduit will convey 25 second feet or 1250 Miners Inches. It is to be 36 inch cement and Riveted Steel pipe.

Excavation:

Earth & Solid Rock 19,945 Cu.yds. at \$0.46 (Average price) -----	\$ 9,131
Tunnel, 1100 lin.ft. at \$8.00 -----	8,800
36 Inch Riveted Steel Pipe, No. 10 gage, 4950 lin.ft. At \$5.00 in place -----	24,750
36 Inch Cement Pipe, 23,400 Lin. ft. at \$2.35 in place ----	54,990
15% Overhead -----	<u>15,329</u>
Total -----	\$113,000

San Dieguito Reservoir

Data

Top of Dam -----	Elevation	233
High Water Surface -----	"	225
Outlet -----	"	180
Bottom -----	"	153
Type - Earth		
Top width 10 ft.		
Slopes 2 $\frac{1}{2}$:1.		
Capacity -----		4,800 Acre Feet

Estimate

Stripping Surface, 10,000 cu. yds. at \$0.40 -----	\$ 4,000
Cut-off Trenches, 1,700 cu. yds. at \$0.60 -----	1,020
Embankment, 145,000 cu. yds. at \$0.30 -----	43,500
Concrete Outlet and Tower -----	8,000
Clearing Reservoir Brush -----	2,000
Riprap - upstream face, 740 cu. yds. concrete at \$15.00 -----	11,100
Overhead - 15% -----	<u>9,080</u>
	\$ 69,700

LOW SERVICE DISTRIBUTION LINE

San Dieguito Reservoir to Coast and Henshaw Lands

6 miles.

Estimate.

28 Inch Riveted Steel Pipe No. 12 Gage 7,500 lin. ft. at \$2.10 -----	\$ 15,750.00
28 Inch Cement Pipe, 5,500 lin. ft. at \$1.75 -----	6,125.00
26 Inch Cement Pipe, 3,300 lin. ft. at \$1.60 -----	5,280.00
26 Inch Riveted Steel Pipe No. 12 Gage, 1,500 lin. ft. at \$1.95 -----	2,925.00
24 Inch Cement Pipe, 7,000 lin. ft. at \$1.45 -----	10,150.00
18 Inch Riveted Steel Pipe, 6,000 lin. ft. at \$1.30 -----	7,800.00
12 Inch Cement Pipe, 3,800 lin. ft. at \$0.55 -----	2,090.00
12 Inch Riveted Steel Pipe 1,000 lin. ft. at \$1.00 -----	1,000.00
Overhead - 15% -----	<u>7,680.00</u>
	\$ 58,800.00

HIGH SERVICE DISTRIBUTION LINE

Lands Which Will be Served.

The lands lying above elevation 180 feet on the San Dieguito Ranch and above 160 feet on the Henshaw and outside property, along the line here estimated are as follows:

It will be understood that there are additional areas of the Ranch, which will require separate pipe lines.

Lands

San Dieguito Ranch -----	2,500 acres
Henshaw Property -----	700 "
Outside -----	<u>100 "</u>
	3,300 "

Pumping Plant

This plant will be located immediately below the San Dieguito Dam, and will lift water to elevation of 360 ft. above sea. The average lift will be 160 feet and the ultimate requirements will be 5,000 gallons per minute. The present installation should not exceed 2,500 Gallons per minute.

Estimate

Pump and Electric Motor complete for 2,500 Gallons per Minute with switches and buildings -----	\$ 5,000
Transmission Line to Source of Supply -----	6,000
Pipe Line to Local Reservoir, 18 Inch Steel Riveted No. 10, 2,000 lin. ft. at \$2.20 -----	4,400
Overhead - 15% -----	<u>2,300</u>
	\$ 17,700

Local Reservoirs

Four local reservoirs will be of advantage on various high hills, to equalize the draft on the high service and for storage during repairs. The general plan would be circular 100 to 200 feet in diameter, 5 to 8 feet deep, with sloping sides lined with concrete.

The cost of such Reservoirs would be about \$2,500 each.

4 Reservoirs at \$2,500 ----- \$ 10,000

Pipe Line

22 Inch Riveted Steel, 6,000 lin. ft. at \$1.60 -----	\$ 9,600
24 Inch Concrete Pipe, 1,000 lin. ft. at \$1.45 -----	1,450
20 Inch Riveted Steel, 6,000 lin. ft. at \$1.55 -----	9,300
18 Inch Riveted Steel, 8,000 lin. ft. at \$1.50 -----	10,800
24 Inch Cement Pipe, 2,000 lin. ft. at \$1.45 -----	2,900
12 Inch Riveted Steel, 2,000 lin. ft. at \$1.00 -----	2,000
12 Inch Concrete Pipe, 3,000 lin. ft. at \$0.55 -----	1,650
10 Inch Riveted Steel, 4,000 lin. ft. at \$0.80 -----	3,200
12 Inch Concrete Pipe, 4,000 Lin. ft. at \$0.55 -----	2,200
Overhead - 15% -----	6,500
	<u>\$ 49,600</u>

SOUTH SLOPE - LOW SERVICE

Distribution Line

Lands

San Dieguito -----	1,000
Henshaw -----	100
Outsiders -----	400

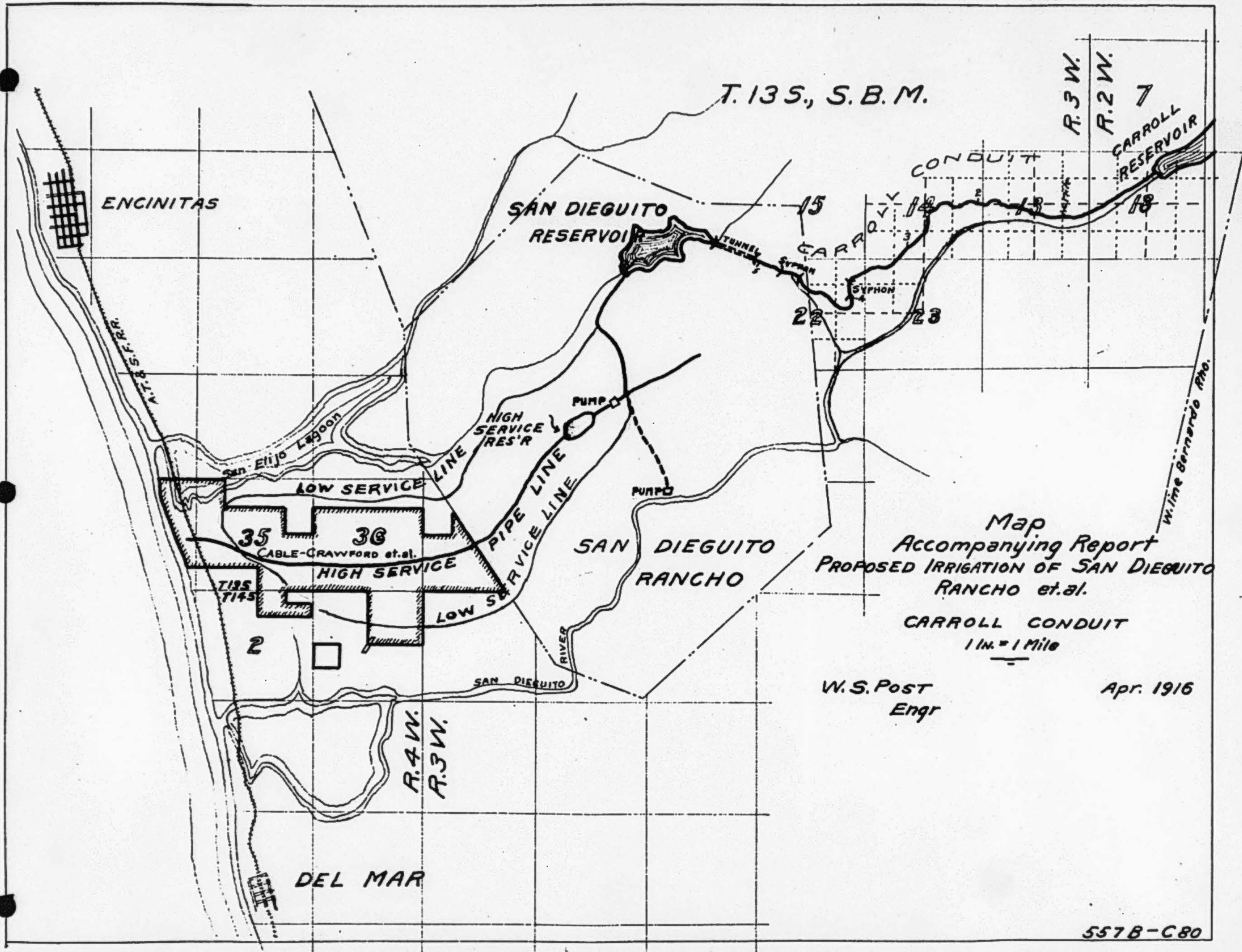
1,500 acres.

This pipe line also forms in part a link between San Dieguito Reservoir and the pumping plant in the bottoms. It will serve the south slope of the Ranch by gravity between elevations 180 and 50 feet above sea.

Estimate

18 Inch Steel Riveted, 3,000 lin. ft. at \$1.50 -----	\$ 3,900
Tunnels, 1,500 lin. ft. at \$8.00 -----	12,000
16 Inch Concrete Pipe, 7,600 lin. ft. at \$0.75 -----	5,700
16 Inch Riveted Steel, 2,700 lin. ft. at \$1.20 -----	3,240
12 Inch Concrete Pipe, 16,000 lin. ft. at \$0.55 -----	8,800
12 Inch Riveted Steel Pipe, 2,400 lin. ft. at \$1.00 -----	2,400
Overhead - 15% -----	5,460
	<u>\$ 41,500</u>

William S. Post
Chf. Supt.



T. 13 S., S. B. M.

R. 3 W.

R. 2 W.

CARROLL RESERVOIR

ENCINITAS

SAN DIEGUITO RESERVOIR

CONDUIT

15

22

14

23

18

S.F. R.R.

SAN ELIJO LAGOON

LOW SERVICE LINE

HIGH SERVICE RES'R

PUMP

PUMP

35

36

CABLE-CRAWFORD st. et al.

HIGH SERVICE

PIPE LINE

SAN DIEGUITO RANCHO

Map
Accompanying Report
PROPOSED IRRIGATION OF SAN DIEGUITO
RANCHO et al.

CARROLL CONDUIT

1 in. = 1 Mile

T. 13 S.
R. 4 W.

2

R. 4 W.

R. 3 W.

DEL MAR

SAN DIEGUITO RIVER

W. I. M. BERNARDO PHOTO.

W. S. Post
Engr

Apr. 1916

557 B-C 80

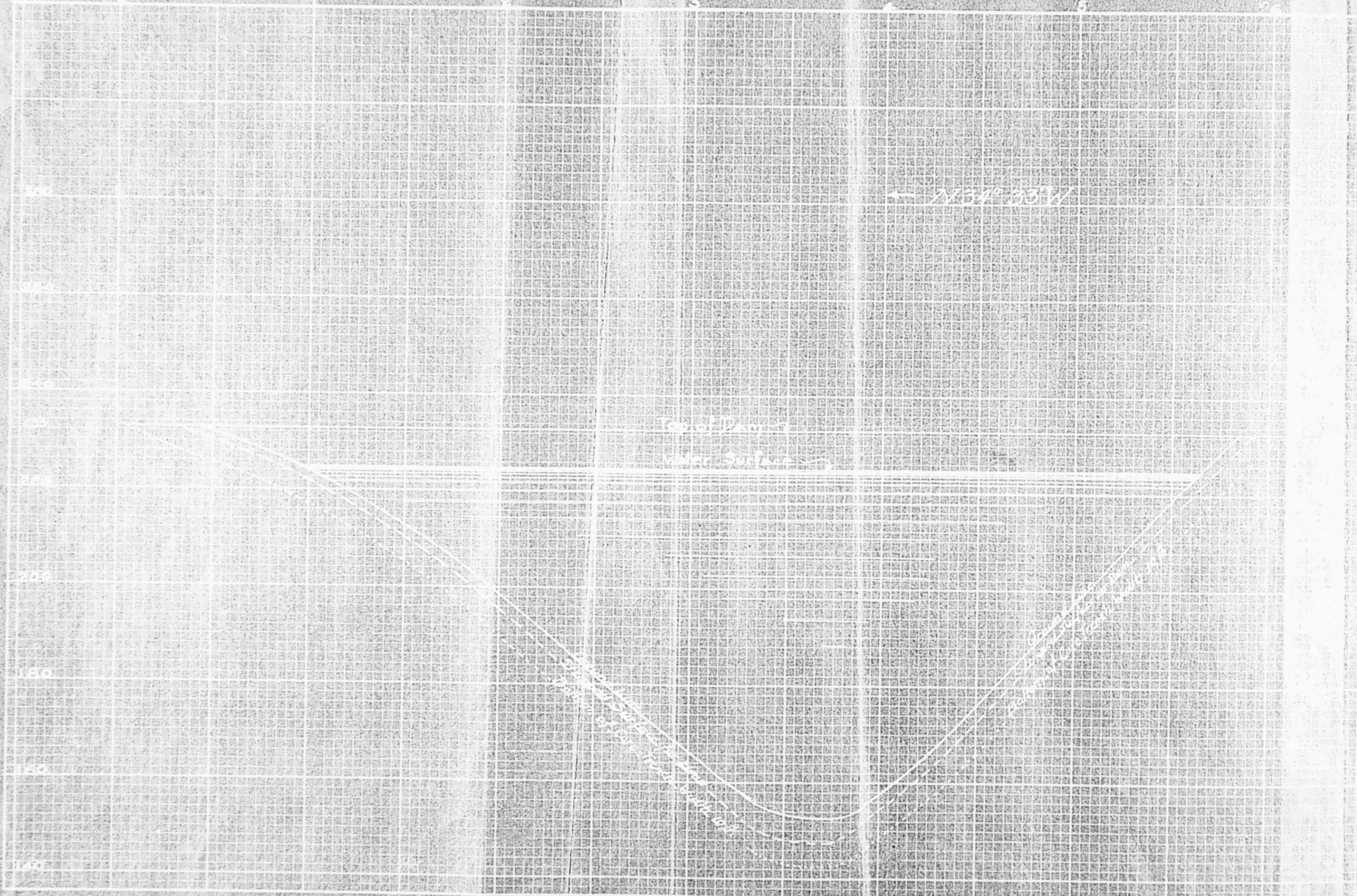
DRAWING NO. 557B

FILE NO. 080

11-11-50

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11-11-50



0-100

0-100

1

2

3

4

5

$N 34^{\circ} 33' W$

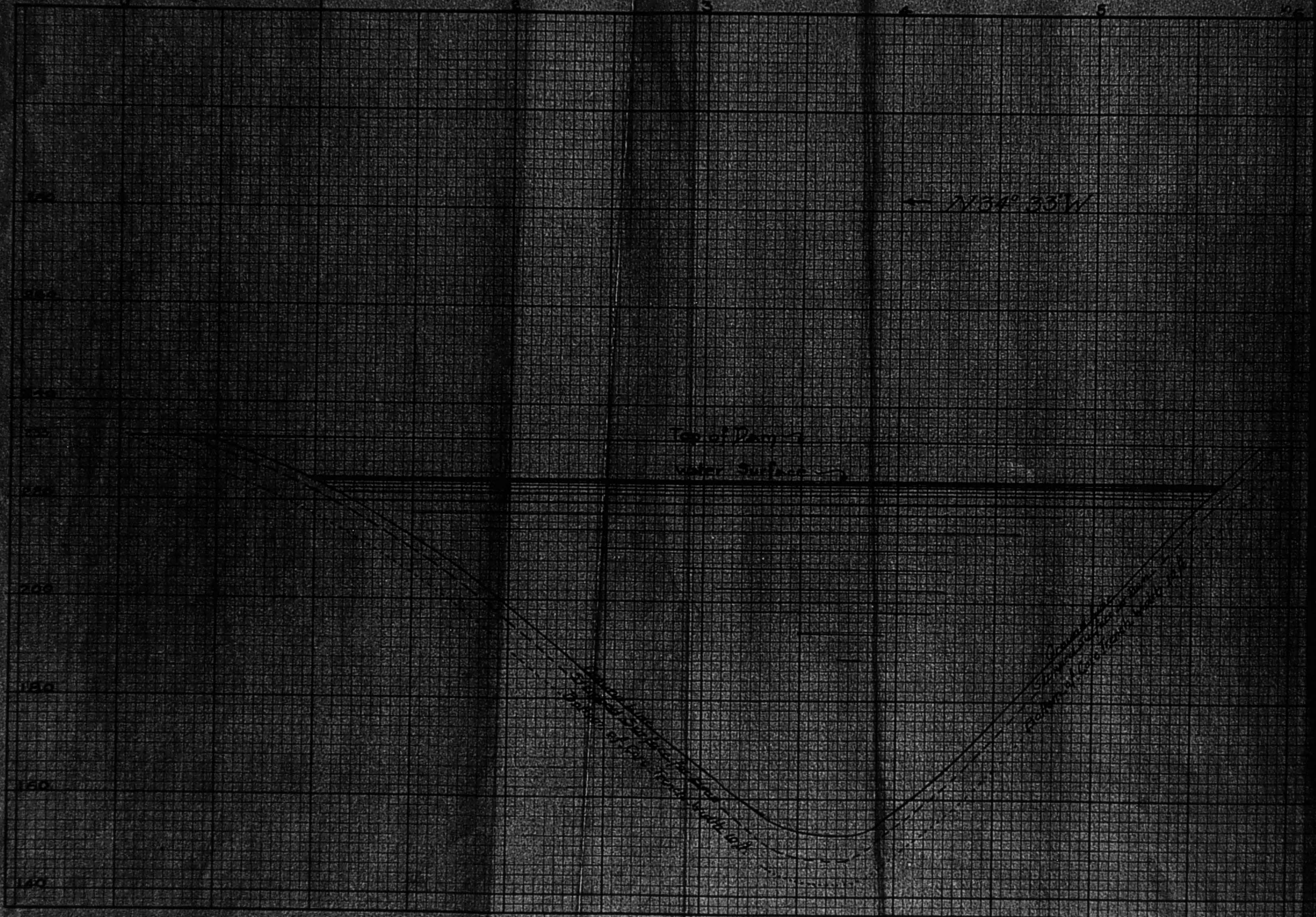
Small Dam
100 ft. across

150

150

150

150



THE UNIVERSITY OF CHICAGO
DEPARTMENT OF CHEMISTRY
DANIEL P. COOPER, DIRECTOR

JOHN H. WATSON, JR., DEAN
OF THE DIVISION OF PHYSICAL SCIENCES
AND CHEMISTRY

ROBERT H. COOPER, JR., DEAN
OF THE DIVISION OF CHEMISTRY

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VOLCAN LAND & WATER CO.
PROFILE OF DAM
SAN DIEGUITO RESERVOIR

SCALES

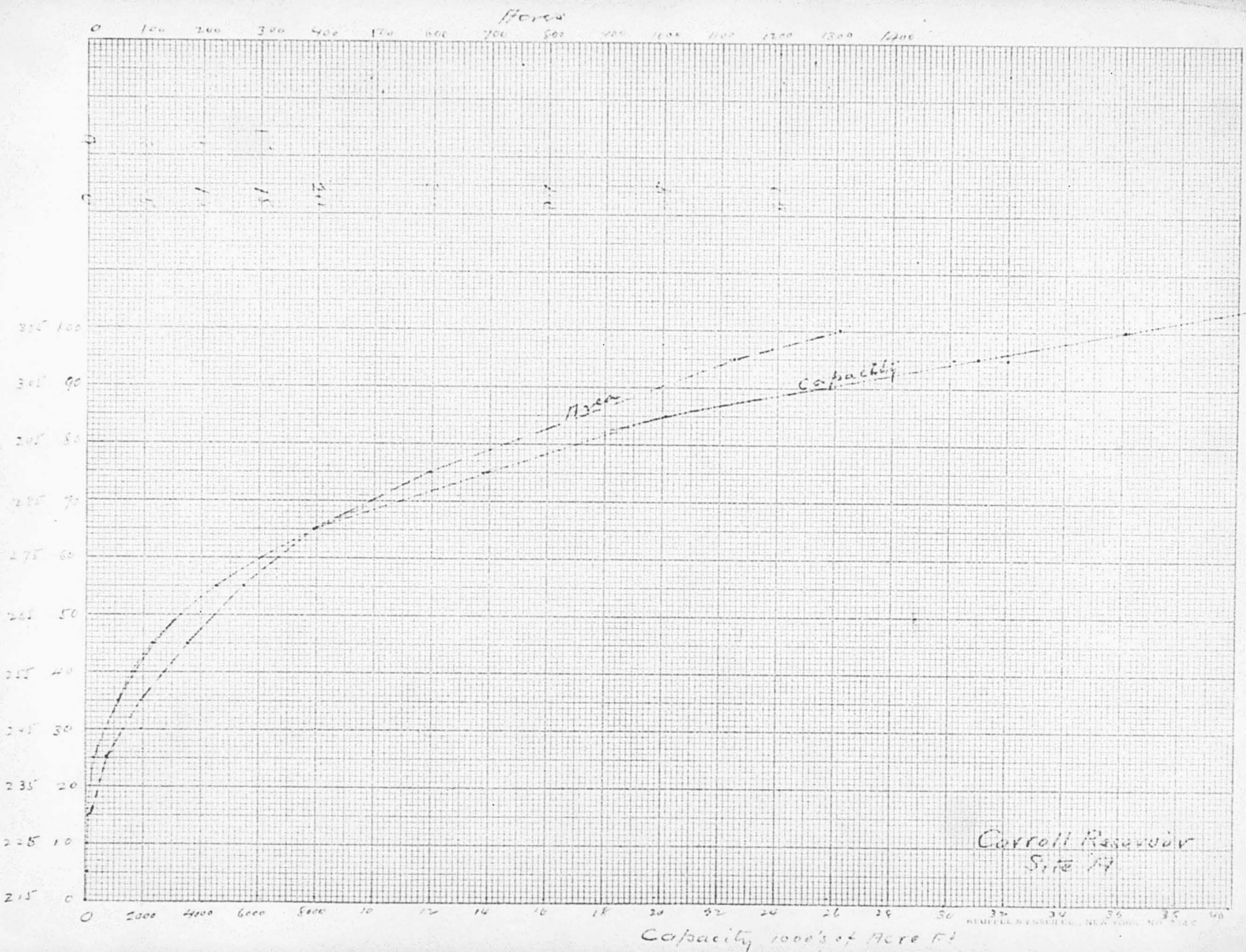
HORIZONTALS 1 INCH = 50 FEET

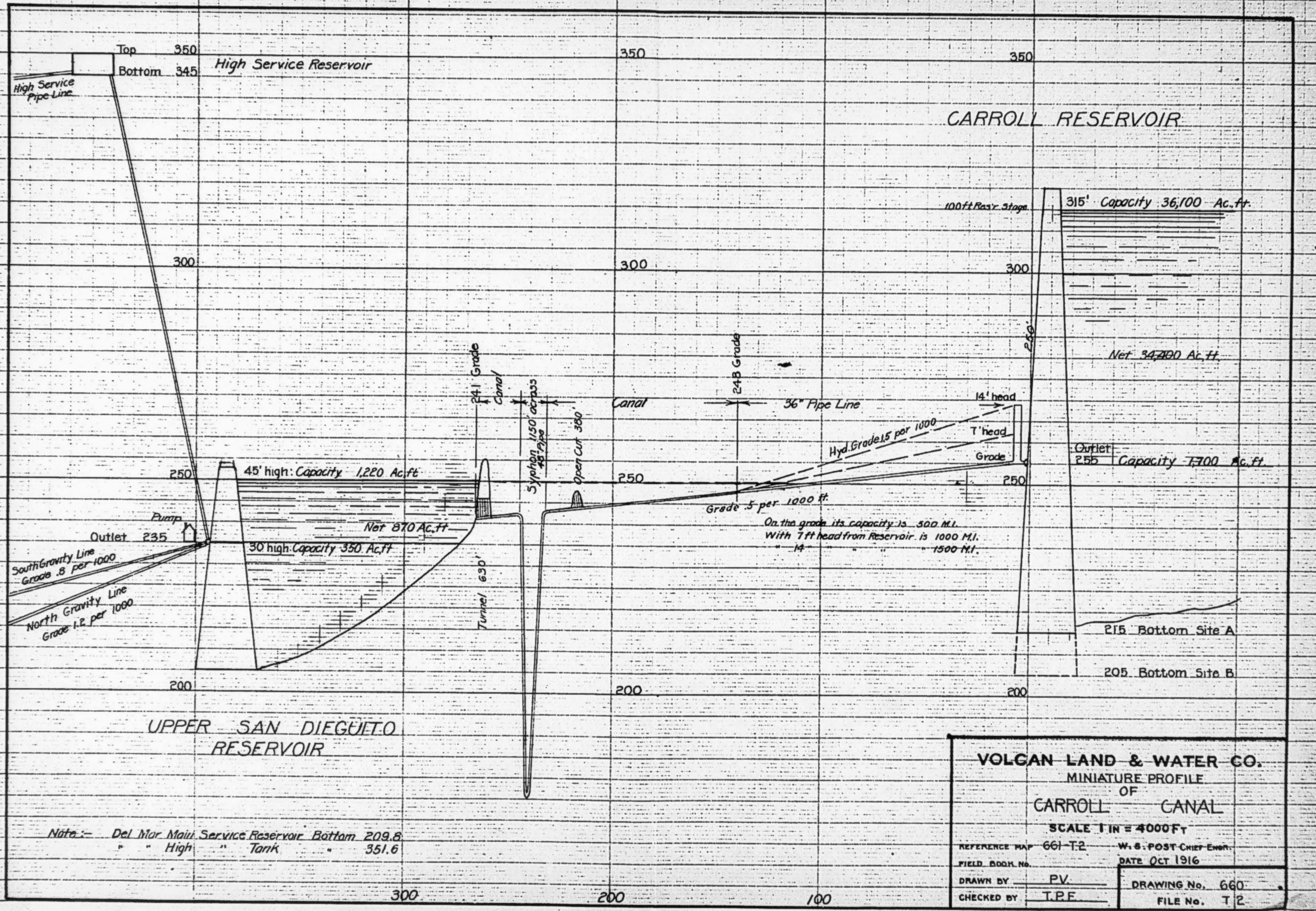
VERTICALS 1 INCH = 20 FEET

DEMPIC BOOK 15

MAY 1916

W. S. POST, ENGINEER





Note: - Del Mar Main Service Reservoir Bottom 209.8
 " " High " Tank " 351.6

CARROLL RESERVOIR

100ft Resr Stage

315' Capacity 36,100 Ac.ft.

Net 34,200 Ac.ft.

Outlet 255 Capacity 7,700 Ac.ft.

215 Bottom Site A

205 Bottom Site B

VOLCAN LAND & WATER CO.
 MINIATURE PROFILE
 OF
CARROLL CANAL

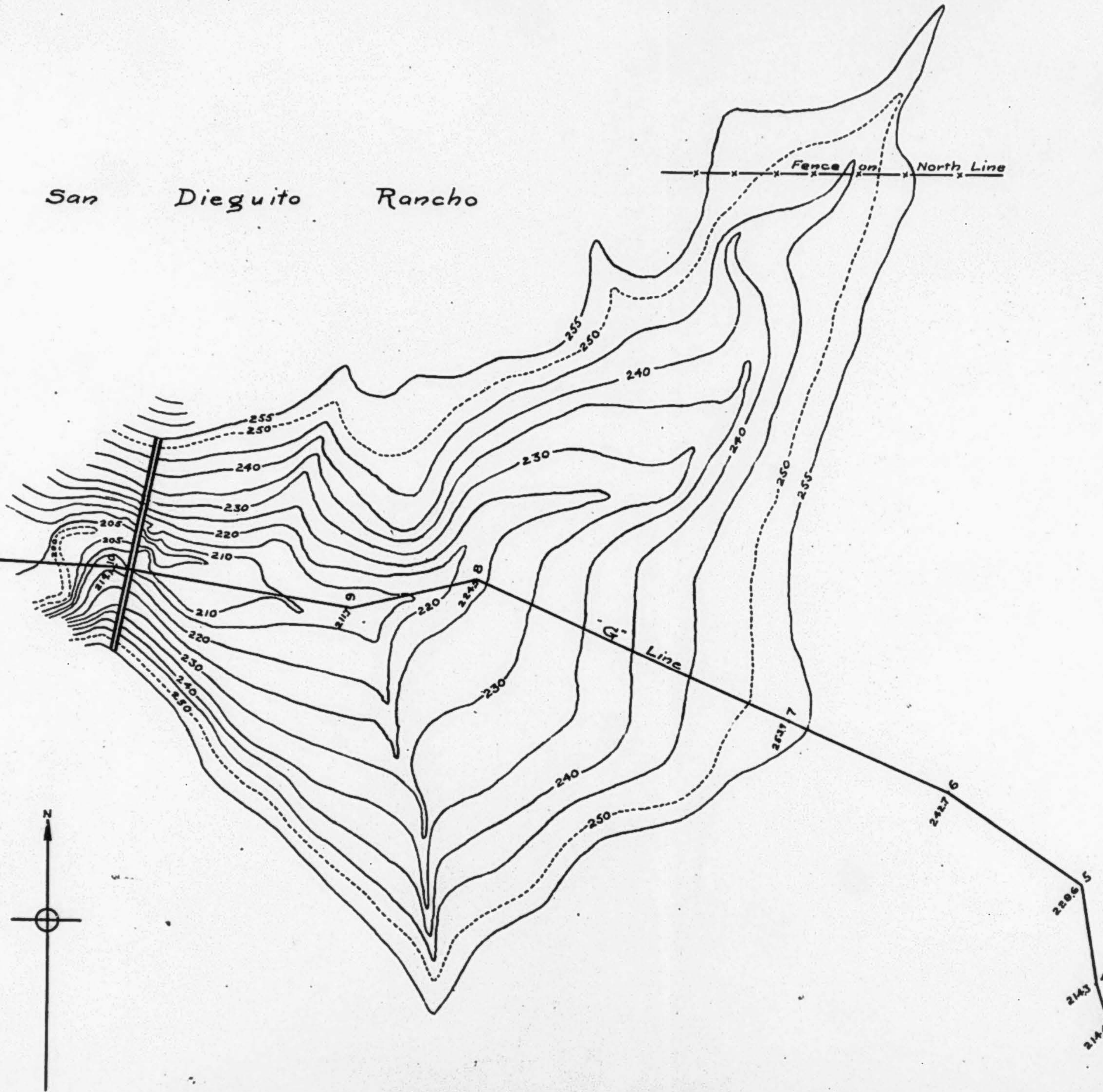
SCALE 1 IN = 400 FT

REFERENCE MAP 661-T-2 W. S. POST CHIEF ENGR.
 FIELD BOOK No. DATE OCT 1916

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 CHECKED BY T.P.F.

DRAWING No. 660
 FILE No. T-2

San Dieguito Rancho



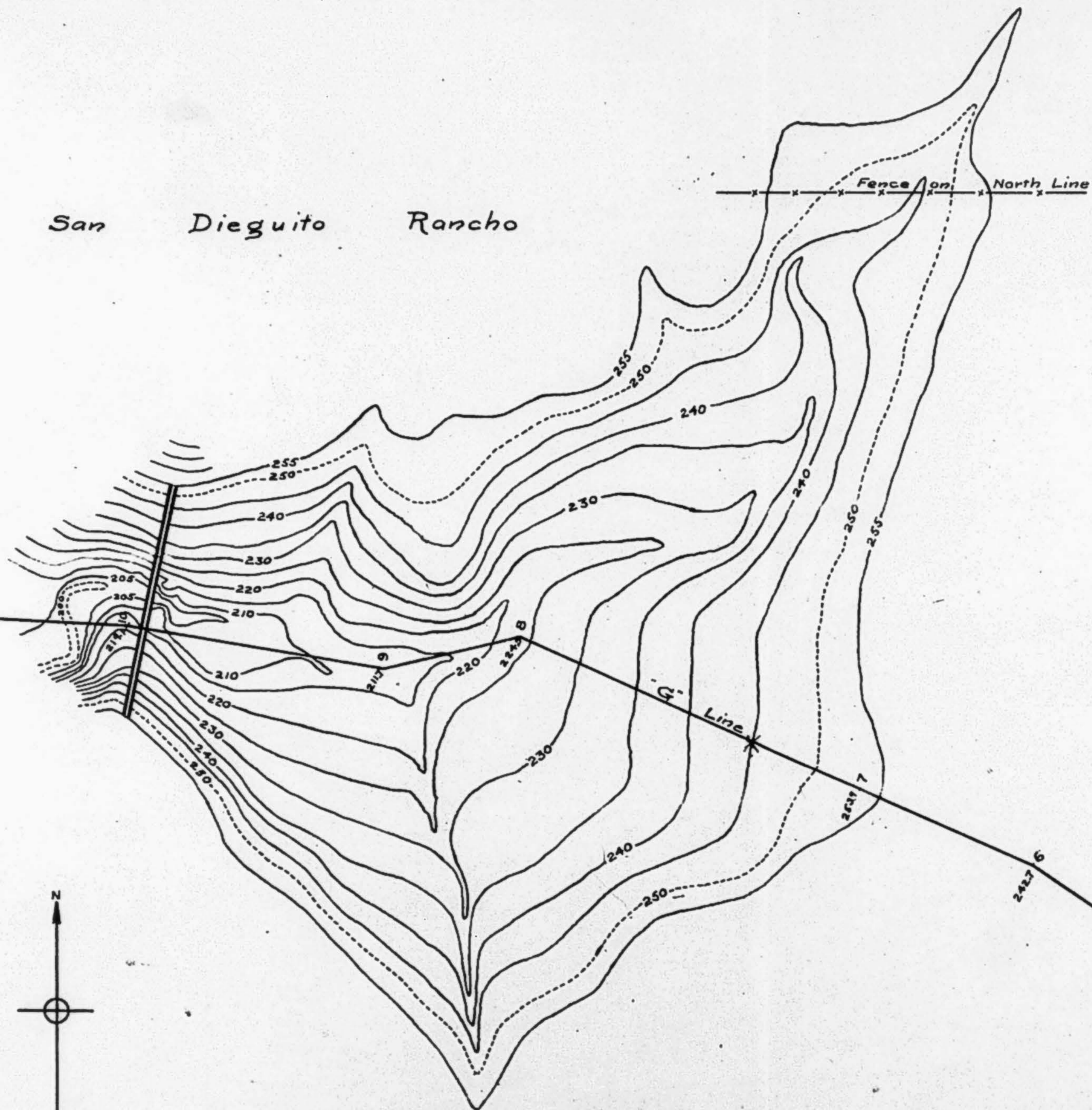
AREA & CAPACITY TABLE.				
Elev.	Depth	Acres Flooded	Capacity Ac. Ft.	Capacity Mil. Gals.
205	0	0.0	0.0	0.0
210	5	1.29	3.23	1.1
215	10	4.56	17.86	5.8
220	15	8.27	49.94	16.3
225	20	13.63	104.69	34.1
230	25	23.88	198.44	64.7
235	30	37.30	351.39	114.4
240	35	49.65	568.76	185.3
245	40	64.18	853.34	278.0
250	45	81.90	1218.54	397.2
255	50	98.80	1670.29	544.0

VOLCAN LAND & WATER CO.
CONTOUR MAP
UPPER SAN DIEGUITO RESERVOIR
 SCALE 1 IN = 400 FT.

REFERENCE MAP 583-G 3
 FIELD BOOK No. 15 p. 60 & Pl. Table
 DRAWN BY _____
 CHECKED BY _____

W. S. POST CHIEF ENGR
 DATE Sept. 25, 1916
 DRAWING NO. 652
 FILE NO. T 2

San Dieguito Rancho



AREA & CAPACITY TABLE.				
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 REFERENCE MAP 583-G 3 Detail W. S. POST CHIEF ENGR
 FIELD BOOK No. 15 p. 60 & Pl. Table DATE Sept. 25, 1916
 DRAWN BY _____ CHECKED BY _____
 DRAWING No. 652
 FILE No. T 2

REPORT OF THE U.S. GEOLOGICAL SURVEY

WATER RESOURCES DIVISION

NO. 100, 1916.

BY WILLIAM C. COST.

May 27, 1916.

Mr. Ed. Fletcher,
Mgr. V.L. & W. Co.

Dear Sir:

You have asked me to report the final estimates on certain elements of the Carroll-San Dieguito development.

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LOW SERVICE DISTRIBUTION LINE

San Dieguito Reservoir to Coast and Henshaw Lands

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20 Inch Riveted Steel, 6,000 lin. ft. at \$1.55 -----	9,300
18 Inch Riveted Steel, 8,000 lin. ft. at \$1.30 -----	10,800
24 Inch Cement Pipe, 2,000 lin. ft. at \$1.45 -----	2,900
12 Inch Riveted Steel, 2,000 lin. ft. at \$1.00 -----	2,000
12 Inch Concrete Pipe, 3,000 lin. ft. at \$0.55 -----	1,650
10 Inch Riveted Steel, 4,000 lin. ft. at \$0.80 -----	3,200
12 Inch Concrete Pipe, 4,000 Lin. ft. at \$0.55 -----	2,200
Overhead - 15% -----	6,500
	<u>\$ 49,600</u>

SOUTH SLOPE - LOW SERVICEDistribution LineLands

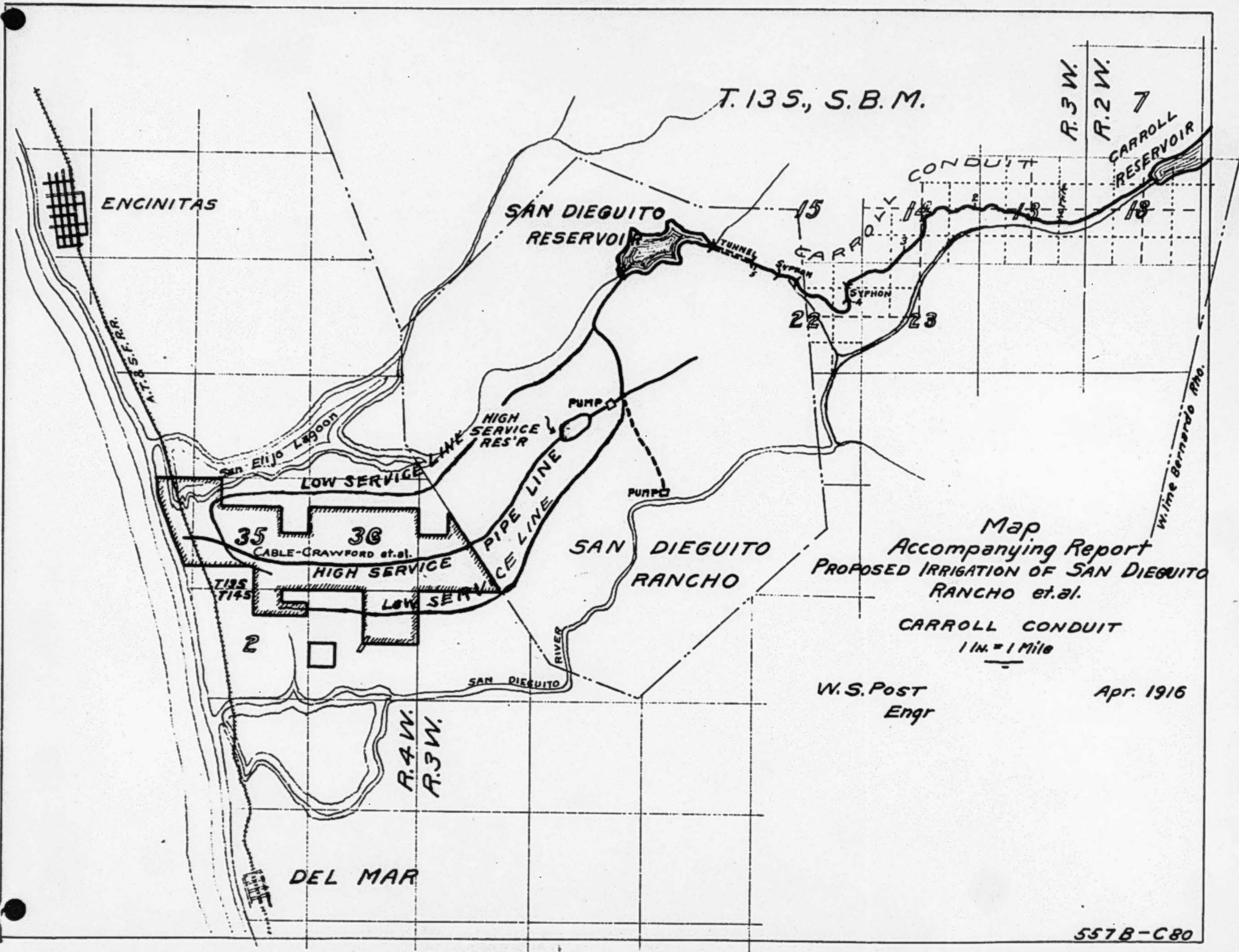
San Dieguito -----	1,000
Henshaw -----	100
Outsiders -----	400

1,500 acres.

This pipe line also forms in part a link between San Dieguito Reservoir and the pumping plant in the bottoms. It will serve the south slope of the Ranch by gravity between elevations 180 and 50 feet above sea.

Estimate

18 Inch Steel Riveted, 3,000 lin. ft. at \$1.30 -----	\$ 3,900
Tunnels, 1,500 lin. ft. at \$8.00 -----	12,000
16 Inch Concrete Pipe, 7,600 lin. ft. at \$0.75 -----	5,700
16 Inch Riveted Steel, 2,700 lin. ft. at \$1.20 -----	3,240
12 Inch Concrete Pipe, 16,000 lin. ft. at \$0.55 -----	8,800
12 Inch Riveted Steel Pipe, 2,400 lin. ft. at \$1.00 -----	2,400
Overhead - 15% -----	5,460
	<u>\$ 41,500</u>



T. 13 S., S. B. M.

R. 3 W.

R. 2 W.

CARROLL RESERVOIR

ENCINITAS

SAN DIEGUITO RESERVOIR

CONDUIT

15

22

14

23

18

A.T. & S.F. R.R.

SAN ELIJO LAGOON

HIGH SERVICE RES'R

PUMP

LOW SERVICE

PUMP

35

36

CABLE-CRAWFORD et al.

HIGH SERVICE

PIPE LINE

SAN DIEGUITO RANCHO

Map
Accompanying Report
PROPOSED IRRIGATION OF SAN DIEGUITO
RANCHO et al.

CARROLL CONDUIT

1 in. = 1 Mile

T. 13 S.
T. 14 S.

2

R. 4 W.

R. 3 W.

Wilme Bernardo Rho.

DEL MAR

W. S. Post
Engr

Apr. 1916

557 B-C80

DRAWING NO. 557 B
FILE NO. C 8

Ed Fletcher Papers

1870-1955

MSS.81

Box: 41 Folder: 15

**Business Records - Reports - Post, W.S - "Report:
Carroll-San Dieguito-Coast Development"**



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