

GUYAMACA WATER COMPANY

SUCCESSORS TO  
THE SAN DIEGO FLUME COMPANY  
OFFICE: FLETCHER BUILDING  
916 EIGHTH STREET, BETWEEN BROADWAY AND E  
P. O. BOX 1412

ED FLETCHER, MANAGER  
LOU B. MATHEWS, SECRETARY  
C. HARRITT, SUPERINTENDENT

SAN DIEGO, CALIFORNIA.

San Diego, Calif., Dec. 3, 1921.

Colonel Ed Fletcher,  
San Diego, California.

My dear Mr. Fletcher:

At your request, I have personally investigated this week the possibility of developing water from the San Luis Rey Valley gravels for the proposed Vista Irrigation District, and have furnished estimates of cost which I consider high, to Mr. King for the installation of the proposed pumping plant.

As you know, I have been for over fifteen years identified with water development of this character, and in a large way. I was amazed to see the possibilities of cheap water development in the San Luis Rey Valley, this proposed project. I believe it is the best that I have ever seen, and I am surprised to see in a progressive community a project such as this is, undeveloped and apparently overlooked. To illustrate: The cost of the development of this water, not including the acquisition of riparian rights below, is approximately \$28,000 per million gallons daily. As you know, no water in large quantities is being developed elsewhere in the county for delivery on semi-frostless lands, at any such price.

The following information may be of service:

The cost of developing every drop of the City of San Diego's water, per million gallons daily is approximately \$1,000,000, the Cuyamaca System approximately \$240,000, the Sweetwater System approximately \$240,000.

Yours truly,

C. HARRITT

Supt. Cuyamaca Water Co.

December 3, 1921.

Mr. E. J. Engel, Vice-Pres.,  
Santa Fe Railway Company,  
Railway Exchange,  
Chicago, Illinois.

My dear Mr. Engel:

As per our understanding when you were in San Diego last week, I submit the report of our Chief Engineer, Mr. King, and a letter from the superintendent of the Cuyamaca Water Company, Mr. Harritt, covering the proposed pumping possibilities for furnishing water to the proposed San Luis Rey Irrigation District, all of which are explanatory, and exceed my expectations as the cost of the water developed by pumping will be materially less than if purchased from Warner's. The first investment is less than one-half as compared to Warner's, with the advantage in favor of the San Luis Rey development, as it can be developed by units as the demand increases for water, and there is no question of a sufficient supply.

Speaking from the Santa Fe's standpoint, interested in the putting of water on the outside lands, I would recommend first - the purchase of not to exceed 3 or 4 miles of riparian lands thru which the San Luis Rey River flows at a cost of from \$75,000 to \$150,000, depending upon the property you purchase. Second - The immediate filing with the State Water Commission of an application for permission to develop sufficient water to irrigate 15,000 acres. This gives priority and I am very sure we can get 10 years' time in which to put the water to beneficial use on the plan of a progressive development.

Actual tests show that the water flows thru the San Luis Rey gravels at the rate of 1-1/2 to 2-1/2 miles a year, depending upon their fineness.

In the matter of riparian owners below, I would recommend that they all be condemned as soon as the State Water Commission approves the water filing, which, in my

Page Two

opinion, they will do at an early date, but they will insert a clause in the permit reading "subject to existing rights". I do not believe the riparian owners below can show much damage, if any, as they have a large supply of underground, water-bearing gravels to draw from, and in any event the lower gravels will be surcharged during the years of heavy rainfall when the river runs to the ocean, probably three or four years out of ten.

By making this filing and securing from the State Water Commission a permit, it immediately acts as an estoppel on any diversions of water from the watershed above, excepting on the riparian lands themselves adjacent to the stream, but there is so little tillable riparian land above, that there is no danger of any large use of water.

I am assuming that Warner's dam will be built in any event, but the watershed is so large below that by no stretch of the imagination could the diversion of all the water originating east of Warner's dam, affect the proposed supply for the San Luis Rey Irrigation District, referred to in this report.

I have every confidence in our superintendent, Mr. Harritt, and his estimates. He has made an intelligent study of this San Luis Rey proposition. As you see by his report, the cost of the plant, not including lands and riparian rights, is \$28,000 per million gallons daily. Assuming for argument sake, but which is not the case, that the lands and riparian rights cost as much more, or \$56,000 per million gallons daily, this, without doubt, would be the cheapest water developed in this county, for altho the San Dieguito Mutual Water Company's development is undoubtedly the cheapest gravity water developed in the county, yet the cost of the San Dieguito is roughly \$150,000 per million gallons daily as at present constructed.

If this proposed district development were made, I feel sure that the city of Oceanside will welcome the development and not oppose it in any manner. The city of Oceanside

Page Three/

is only using a small amount of water, 15 or 20 inches a day on an average. This would leave only the riparian owners to contend with, very few of whom are putting the water to beneficial use or realize its value, excepting the South Coast Land Company, which is pumping for their irrigating plants at Carlsbad, and I am sure a satisfactory adjustment can be made with the South Coast Land Company, of which Wm. G. Kerckhoff is President, for they could never show damage if it got into court, in my opinion, owing to the large storage of underground waters below the proposed pumping plants, mentioned in this report.

My recommendation would be that the Santa Fe Land Improvement Company quietly acquire the riparian lands necessary, get the permit from the State Water Commission, also agree to furnish water to the proposed Vista District at a certain price per thousand gallons, in consideration of which the proposed district votes bonds to build their distributing system. Later on, when values have increased to warrant the issuance of additional bonds, you could sell your water plant and take bonds in payment, or cash. It is possible that there would be sufficient bonding capacity to immediately turn over the whole project to the district, but it will make it harder to finance. With the large irrigation district behind us, and intervening in court when condemning the riparian lands below, there is not much chance for the riparian owner below to get much of a judgment.

I realize that the Santa Fe does not care to be in the water business any longer than it can help, but this section needs assistance in the development of its water, and as a business proposition I feel the Santa Fe, getting such large benefits from the additional tonnage hauled, can afford to take an interest in this development temporarily, and at all times be financially secured.

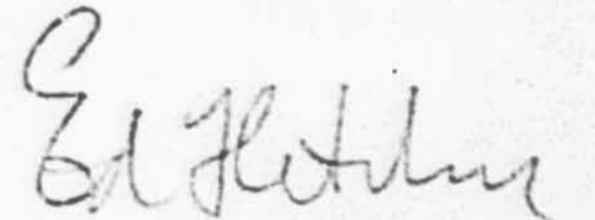
The same plan applies to Fallbrook. It is a crime - the vast amount of land there undeveloped, practically frostless, with railroad connections, etc., and so little tonnage. On a smaller scale this same plan could be worked by putting water from the Temecula River into the Fallbrook section. They are seriously considering this matter today.

Page Four/

I am sure I can handle both of these developments for you in a manner that will be satisfactory, that you will at all times be financially protected on your investment, that you will secure some profit for yourselves, and at the same time put at least 25,000 additional acres of land under water around Vista and Fallbrook. The Santa Fe has treated me handsomely. I have confidence in their intention to play fair, and I do not care for one cent for compensation for my services until I have made good, if you desire to consider either the Fallbrook or Vista projects, and I am almost ready to say that I would leave the matter entirely in your hands as to compensation.

Hoping that you will become interested in the development of our Northern San Diego County - a most fertile field, I am

Sincerely yours,



EF:KIM

San Diego, California  
November 30, 1921.

Colonel Ed Fletcher,  
Office.

Dear Sir:

You have asked for a report on the comparative cost of water delivered to the proposed San Luis Rey Irrigation District from two different sources, namely:

(a) The Warner reservoir supply.

(b) Pumping from the gravels of the San Luis Rey

River.

Together with Mr. Harritt, Superintendent of Cuyamaca Water Company, I have gone into this matter as thoroughly as possible in the very limited time at my command. The following figures will be subject to revision but the comparative result will not be materially changed.

I have not taken into consideration in either case the cost of distribution lines throughout the district but I have assumed that the water will be delivered to some convenient distribution point within the district.

I have had full charge of the formation of the present proposed San Luis Rey District and have prepared the description of the boundaries. There are included within these boundaries 14,060 acres of which 5,627 acres are below 400 foot elevation. 4,124 acres between 400 and 500 foot elevation; 2,552 acres between 500 and 600 foot elevation; 1,096 acres

between 600 and 700 foot elevation; and 651 acres from 700 to 750 foot elevation.

The outlet elevation of the Merriam reservoir is at elevation 960 feet and it will therefore supply water by gravity to all parts of the district. I have assumed duty of water as one acre foot per acre on the average for lands irrigated. This was very carefully gone into by Mr. W. L. Huber, Civil Engineer of San Francisco, in his report to the State Engineer of California on a larger district which included the lands of the present proposed district. Mr. Huber shows in this report also that not more than 60% of the gross area of an irrigation district will be irrigated in any one year and concludes as follows:

"The ratio of net area to be irrigated in any one year to the gross area (60%), compares favorably with that for other San Diego County irrigated areas and, in fact, it is not higher for even some of the Districts in the San Joaquin Valley where only level and unbroken valley lands are included."

Based on the above it is safe to say that not over 8,400 acres of this district will require water each year. If the duty of water then is one acre foot per acre annually, which is higher than the use shown by the records of the Cuyamaca Water Company, it is evident that 8,400 acre feet annually must be supplied to take care of the requirements of the district.

The records of the Cuyamaca Water Company show the following distribution of water deliveries by months for a

period of years:

January	3 %
February	2 %
March	3 %
April	5 %
May	10 %
June	13 %
July	15 %
August	14 %
September	12 %
October	10 %
November	8 %
December	5 %

It is apparent that that 15 % of the total supply must be delivered during the month of July. In figuring the capacity of a pipe line, however, 25 % must be added to provide for the probable peak load during the month of highest use.

15 % of 8,400 acre feet is 1,260 acre feet per month or 13.7 million gallons daily. Adding 25 % to this amount it is shown that the capacity of the pipe line must be 17.1 million gallons daily or 26.4 second feet.

(A) We will first consider the cost of water from the Warner reservoir supply and in so doing I have taken your cost of 6¢ per thousand gallons at the lower end of the Hellhole power drop at the Escondido Ditch. The length of line from this point to the nearest distributing point within the district

is about 107,000 feet.

In addition therefore to the cost of 6¢ per thousand gallons paid for the water at the intake of the line would have to be added the interest on the investment, depreciation annuity, and maintenance and operation. A conservative estimate of the cost of this line is \$10.00 per foot which includes cost of the benching, trestles, pipe, valves, gates, and other structures, or a total cost of \$1,070,000. The cost of the water therefore will be as follows:

Interest on investment at 6 %	\$ 64,200
Replenishment annuity	22,400
Maintenance and operation cost 6%	<u>6,400</u>
Total	\$ 93,000 annual charges.

The cost of the water, therefore, will be 3.4 cents per thousand gallons plus the 6 cents purchase price of the water, making 9.4 cents per thousand gallons as the cost of the water delivered to a distribution reservoir within the district.

(B) PUMPING FROM THE SAN LUIS REY RIVER. The area of the water bearing gravels in the upper San Luis Rey basin is 3,392 acres. Assuming an average depth of 50 feet, which I believe is a conservative estimate in view of the fact that there are records of wells ranging from 46 to 70 feet in depth within this basin, there would be a total of 7,387,776,000 cubic feet of water bearing gravels.

In 1916 there were exhaustive tests made which showed the gravels to have an average porosity of over 41%. The water available by ordinary pumping, however, will probably

be between 25 and 30% of the total volume. On the basis of 25% being recovered it will thus be seen that there is readily available 42,400 acre feet of water stored in the gravels of this basin. This constitutes a reserve supply that can be drawn upon for the use of the district. Assuming that there is no replenishment for a period of three years there would be available for use 14,133 acre feet of water annually. Since the requirements of the district are 8,400 acre feet annually it will be seen that there is sufficient storage in these gravels to furnish a 100% supply during a continuous drought of three years with an ample margin of safety.

#### Feasibility of Pumping Irrigation Water.

On this subject Mr. Etcheverry, head of the Department of Irrigation, University of California, writes as follows:

"There is a limit beyond which it is not economically feasible to pump. In California citrus districts lifts above 400 feet have been considered profitable. For favorable conditions, such as large plants and cheap fuel, this can perhaps be taken as the limit of profitable pumping when the crops grown are as highly profitable as citrus fruits, olives, apples, and other orchard products."

It is quite likely that large areas of these lands will be devoted to highly profitable winter vegetable crops which yield far larger returns than the orchard crops mentioned by Mr. Etcheverry.

#### Costs of Gravity Water.

The cost of water delivered to the consumer on the various systems in San Diego County are as follows:

Cuyamaca Water Co. per 1000 gallons	6.66 to 8 cents.
Sweetwater Water Co.	6.66 cents
City of San Diego, to irrigators	20.00 cents
Lemon Grove Mutual Co. in 1919	9.64 cents
(Since 1919 raised 2 cents)	

In the cases of Cuyamaca and Sweetwater Companys, there is an additional charge each month for the first 15,000 gallons used which somewhat increases the costs given above.

#### Cost of Pumping Water

The Cuyamaca Water Company is pumping approximately 3,000,000 gallons daily, 340 feet at an operating cost of 4.7 cents per 1000 gallons. This plant is not efficient and is extremely expensive to operate.

The proposed new plant at this point will undoubtedly show a total cost of not exceeding 4 cents per 1000 gallons or 1.18 cents per 1000 gallons per 100 feet of lift.

The City of San Diego has been pumping from 4 to 5 millions of gallons daily, 450 feet at a cost of 5 cents per 1000 gallons or 1.11 cents per 1000 gallons per 100 feet of lift.

Both the above plants are of an emergency nature where, to a certain extent, low operating costs were not taken into consideration to the same extent as was the low first cost.

Owing to the fact that in the above cited instances the gravel beds are situated within a few hundred feet of the points of delivery, as against the two miles or more in the case of the proposed district plant, the costs given will serve

only in a general way and the detailed costs given later are, while estimates only, prepared with the special conditions confronting the district in mind.

It will be seen from the table of use given under Section A that the pumping plant should have a maximum capacity of 17.1 million gallons daily when the district is fully developed.

An examination of the above table of use shows that for five months each year the consumption does not exceed 420 acre feet per month or 4.5 gallons daily while for the remaining seven months the use runs from 672 to 1260 acre feet. Owing to this wide range the plant should consist of two units, one with capacity of 525 acre feet per month to care for the period of low consumption and one approximately 1050 acre feet per month which would care for the consumption during May, June, September, October and November, both units to be operated when required, probably sixty or ninety days each year.

#### Location of Plant.

The main pumping plant to be located on the San Luis Rey River about two miles below Bonsall and one half mile below the mouth of Gopher Canyon at the junction of the Oceanside and Escondido roads at an elevation of 155 feet above sea level. Also at this plant an underground gallery, intake well, auxilliary pump, and one million gallon collecting reservoir will be located.

It is believed that a collecting gallery at this point will care for the needs of the district for at least five months each year.

The main supply wells to be located in the large basin above Bonsall, the water to be pumped directly into a gravity concrete pipe line approximately three miles long discharging into the collecting reservoir at the main pumping plant.

Main pumping plant to discharge into distributing reservoir located in Northeast corner of district at an elevation of 500 feet.

#### Description of Plant.

Collecting gallery at site of main plant, intake well and vertical centrifugal pump at same point discharging into collecting reservoir of one million gallon capacity. Pumping from this reservoir there will be one unit consisting of two, direct connected, electrically driven, multiple stage centrifugal pumps, each with a capacity of 3,000,000 gallons daily and one unit of two pumps of same type each with capacity of 5½ millions of gallons daily.

In the basin above Bonsall the main supply wells, probably 35 in number, to be installed from time to time as conditions require.

#### Cost of Plant.

The scope of this report is to make a comparison of the cost of water from two different sources delivered to a convenient point within the district for distribution. The cost of an equalizing reservoir at the end of the main supply line and the cost of the distribution system have been omitted as these items would be required by either system of supply

and the cost in each case would be approximately the same. Owing to the limited time available for investigation the following costs will be taken from data collected some time ago and are at this time somewhat high, also they will be given for the completed plant. In this connection it should be born in mind that they will be distributed over a period of probably fifteen years.

Collecting Gallery - including well	\$ 30,000
Pump and motor for same	2,500
Collecting reservoir	10,000
First unit main pump (2 pumps 3 M G D )	12,000
Second unit main pump (2 pumps 5½ M G D )	25,000
Discharge line 7000 ft. 40 in. steel pipe	105,000
Pipe from wells 15,000 ft. 30 in. at \$5.00	75,000
35 wells at \$600	21,000
Collecting pipes, wells to main line	17,500
Air supply lines	10,500
Air compressors	25,000
Buildings	15,000
Flood protection at wells	17,500
20 % of above for engineering and contingencies	73,200
Total	\$ 459,200
Cost per million gallons daily	\$ 25,825



Operating costs

Interest at 6 % \$439,000	\$26,340
Replacement annuity 5% sinking fund - average life 30 years	6,600
Power - 70% efficiency of plant - 1.5 cents per Kw. hour	73,000
Operating labor	25,500
Maintenance 5% of 439,000	21,950
Total operating charges	\$ 153,390
Cost per 1000 gallons	5.6 cents
Cost per 1000 gallons per 100 feet	1.4 cents

In addition to the above operating cost there will be required the pumping cost to supply about 4000 acres of land lying above the 500 foot contour. The average lift for this water will be 100 feet and the cost will not exceed one cent per thousand gallons for the average lift. This gives a charge, in round figures, of \$8,000 for supplying the high levels within the district. Distributing this cost over the total amount of water pumped will add approximately 0.5 cents per thousand gallons or a total cost to the district for all water pumped of 5.9 cents per thousand gallons.

It will be seen from the foregoing that water can be developed for this district by pumping at approximately 50% of the cost of the water delivered from the Warner development. The figures used in estimating the pumping plants are from quotations made some time ago and unquestionably if time were available a careful analysis of the situation would show that the plant for pumping from the gravels would be apprecia-

bly less than it is quoted in this report. On the other hand, the figures used in estimating the pipe line from the Hellhole power drop are very conservative and the cost of this line would certainly not be reduced. The conclusion, therefore, to be drawn is that much cheaper water can be developed by pumping from the gravels of the San Luis Rey River to supply the proposed San Luis Rey Irrigation District than water brought down from the Warner development.

I have not included any expenditures necessary to acquire the ownership of lands, pumping rights or riparian rights as these features are beyond the scope of this report.

The lower San Luis Rey basin has an effective area of approximately 1635 acres of water bearing gravels which have an average depth of approximately 200 feet. Mr. Charles H. Lee, hydraulic engineer of San Francisco, in a very careful study determined that 15 % of the total volume of the gravels was water which could be recovered by pumping. Assuming that the average depth of the water table could be lowered 75 feet in three years there would be an available storage in this basin of over 18,000 acre feet of water.

Assuming that there is no replenishment whatever during a period of three consecutive years of drought there would be available in these gravels an annual supply of 6131 acre feet annually.

There is tributary to the lower basin of the San Luis Rey River a drainage area of approximately 45 square

miles entirely below the area tributary to the upper basin. Runoff from this directly tributary area taken together with the flood runoff or surface flow of the river above will all contribute to keep the lower basin charged. This condition will unquestionably provide ample water by pumping for the irrigation of all riparian lands below as well as supply water for the pumping from these gravels which has taken place in the past and in all probability the lower basin will be capable of supplying a considerable additional amount of water should the emergency arise.

There is another point to which I wish to direct your attention. The bringing of the Warner water to this district would mean that the immense resources of the gravel basins of the San Luis Rey River would remain undeveloped which in itself constitutes a tremendous economic waste of the natural resources of San Diego County.

Attached to this report will be found two maps, one a general map showing the location of the water bearing gravels, pumping plant, and point of delivery within the district of both systems, and another showing the ownership of lands at the lower end of the upper San Luis Rey basin.

#### Program of Construction.

As I have previously stated the construction of the entire plant will be distributed through a considerable period of years as it is well known that it takes from ten to fifteen years for an irrigation district to reach its complete development. The collection gallery, intake well, collecting reservoir, pump discharge line and one half of the first pumping unit would be required at once. This would unquestionably meet the requirements of the district for the first year and probably the first two years. The cost of this initial installation would be as follows:

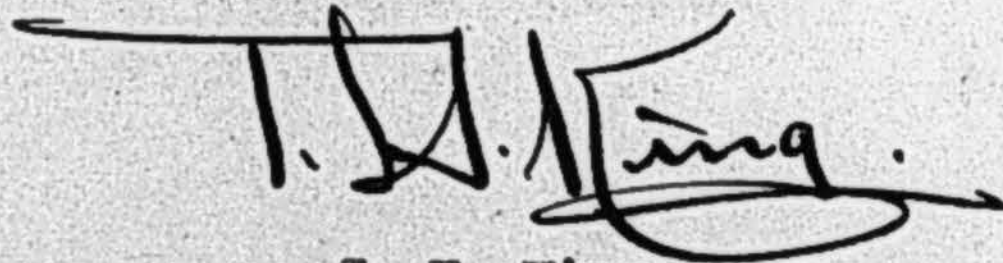
Collecting gallery - including well	\$ 50,000
Pump and motor for same	2,500
Collecting reservoir	10,000
One half of first pumping unit	6,000
Discharge line - 7000 ft. 40" steel pipe	105,000
Buildings	10,000
Engineering and overhead	<u>32,700</u>
Total	\$ 196,200

It is difficult to state at this time the development for each ensuing year in the history of the district as much depends on the rapidity of the development, but it is safe to say that the balance of the total cost of the plant of \$243,000 would be divided at a minimum over a period of ten years, or a capital expenditure of about \$24,000 a year until complete development, outlined in the total estimate on page 9, is made. Here, again, I wish to direct your attention

to the fact that the figures quoted in the estimate of the complete development are undoubtedly higher than the district would be called upon to expend. There is continual progress made in the development of pumping machinery. More efficient pumps are being invented each year and the district by putting in its plant by easy stages would be in a position to take advantage of these advances in pump and motor construction. In all probability also the cost of machinery will decline during the next ten or fifteen years rather than advance. You will note also that I have used a cost of  $1\frac{1}{2}$ ¢ per Kw. hour for the electric energy for operating the pumps. Unquestionably when the district reaches a more mature development and requires more nearly its maximum amount of power, arrangements could be made to purchase power at a more reasonable figure and if not, I believe that the district might be able to develop its own power at a lower cost.

These are matters, however, which are so far in the future that it is difficult at this time to do more than suggest the probable development.

Yours respectfully,



T. H. King.

Chief Engineer.

THK:ME

(Corona)  
11730  
3330

U.S. GEOLOGICAL SURVEY  
GEORGE OTIS SMITH, DIRECTOR

# TOPOGRAPHY

CALIFORNIA  
SAN LUIS REY QUADRANGLE



(Capistrano)

Copyright

PACIFIC OCEAN

Deep fill of Major Valleys.  
 Shallow - - -  
 Fill of Minor Valleys.

30' ENGRAVED JAN. 1901 BY U.S.G.S.  
 R.U. Goode, Geographer in charge.  
 Triangulation by U.S.C. & G. Survey and A.P. Davis.  
 Topography by L.C. Fletcher, J.B. Lippincott and T.G. Gerdine.  
 Surveyed in 1891 and 1898.



DIAGRAM OF TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

Edition of July 1901, reprinted May 1911.  
 R.1 W. 117'

SAN LUIS REY

# WARNER WATER PROJECT

## RIPARIAN MAP

### SAN LUIS REY RIVER

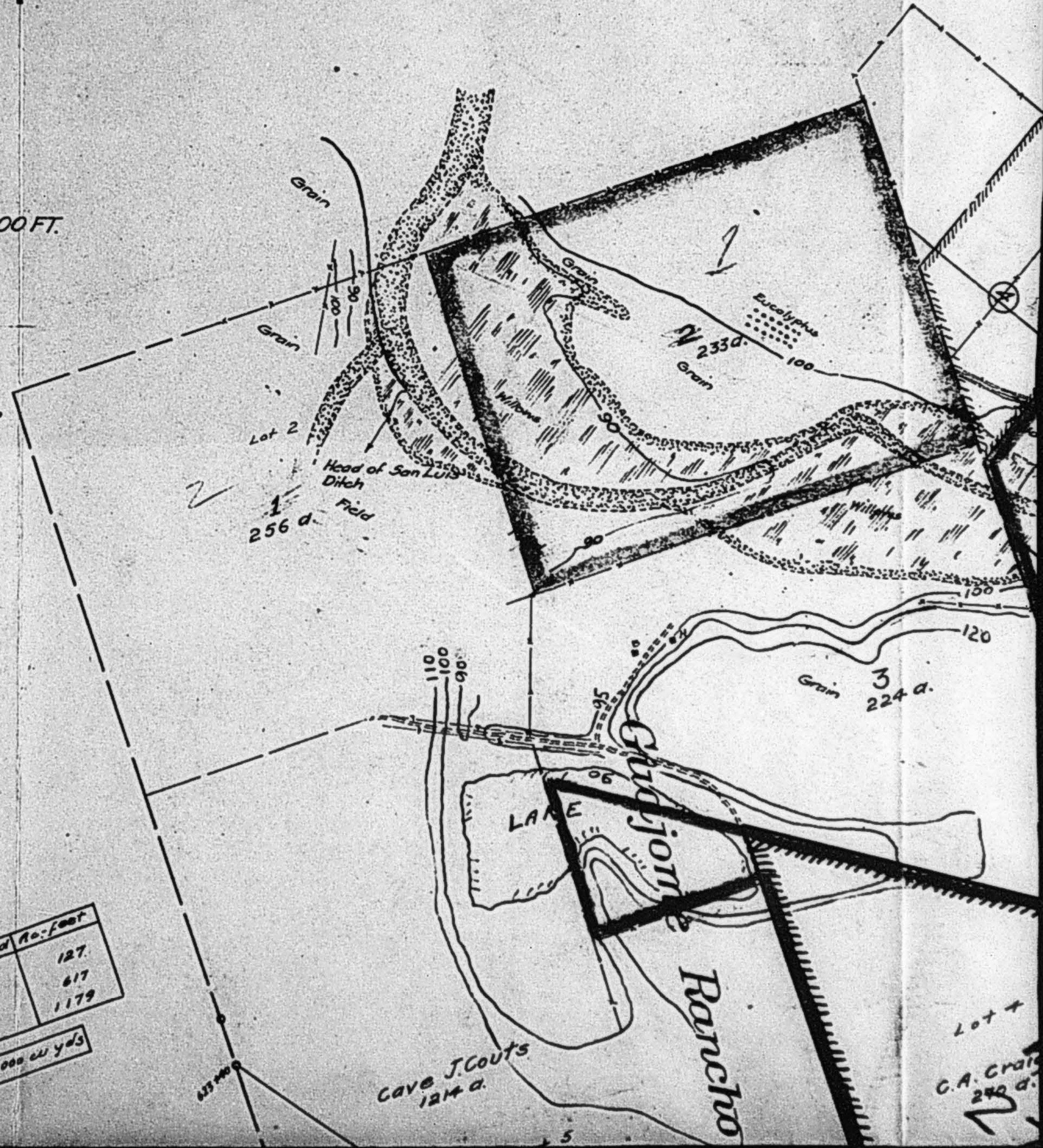
FROM  
*Guajome Rancho*  
 TO  
*Monserate Rancho.*

OCTOBER 1912

SCALE: 1 INCH = 1000 FT.

Revised Dec 1912

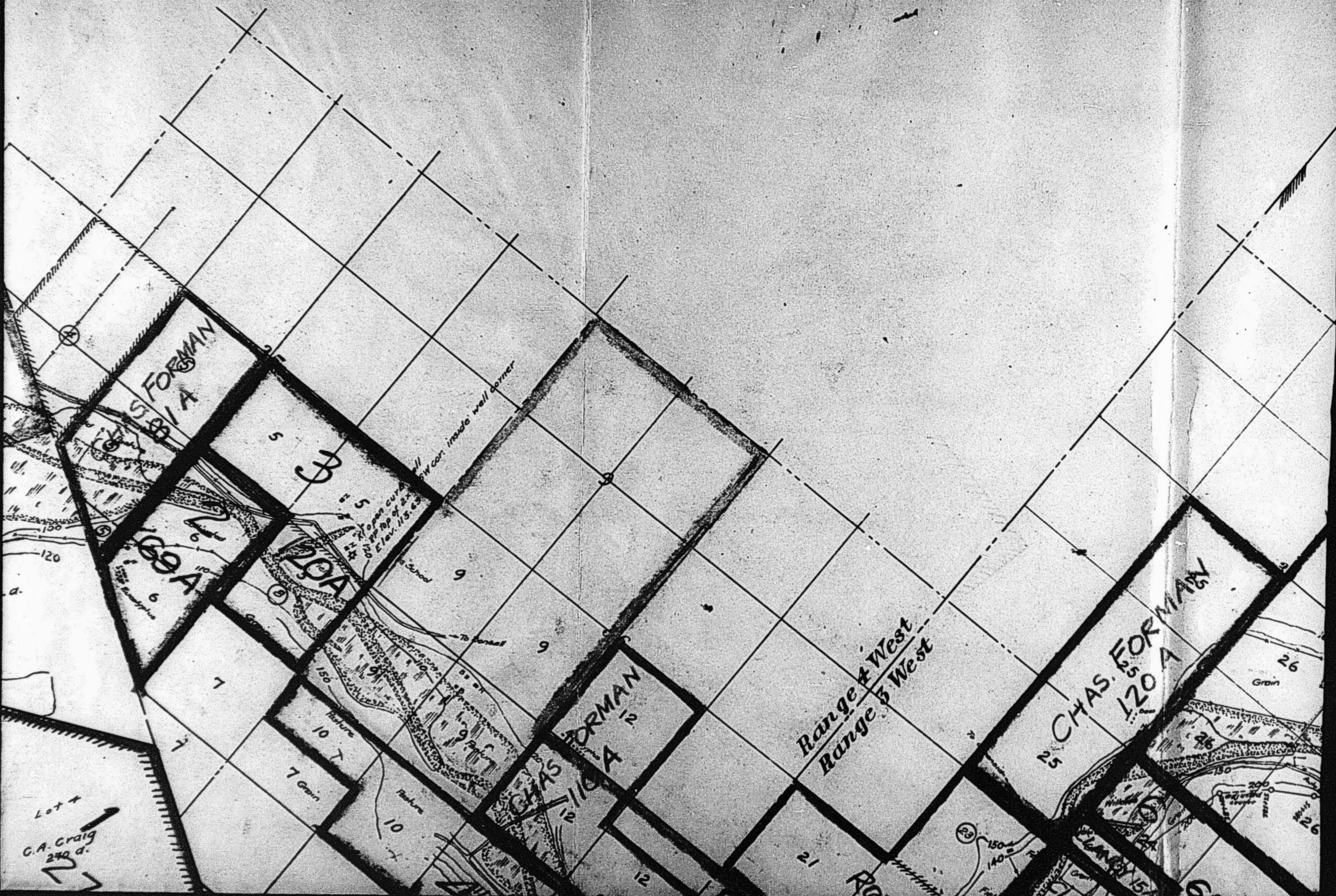
SHEET No 2.



Contour	Depth	Area Flooded	Ac. Foot
86 to 90	4	81.7	127
90 to 100	14	91.8	617
100 to 110	24	144	1179

Fill of Dam = 125,000 cu yds

WPA statement of ownership - 1911 A



S. FORMAN  
1/4

3

1/4

1/4

CHAS. FORMAN  
1/2

CHAS. FORMAN  
1/2

Range 4 West  
Range 3 West

Lot 4  
C.A. Craig  
240 d.

10  
7  
7  
10  
10

Grain

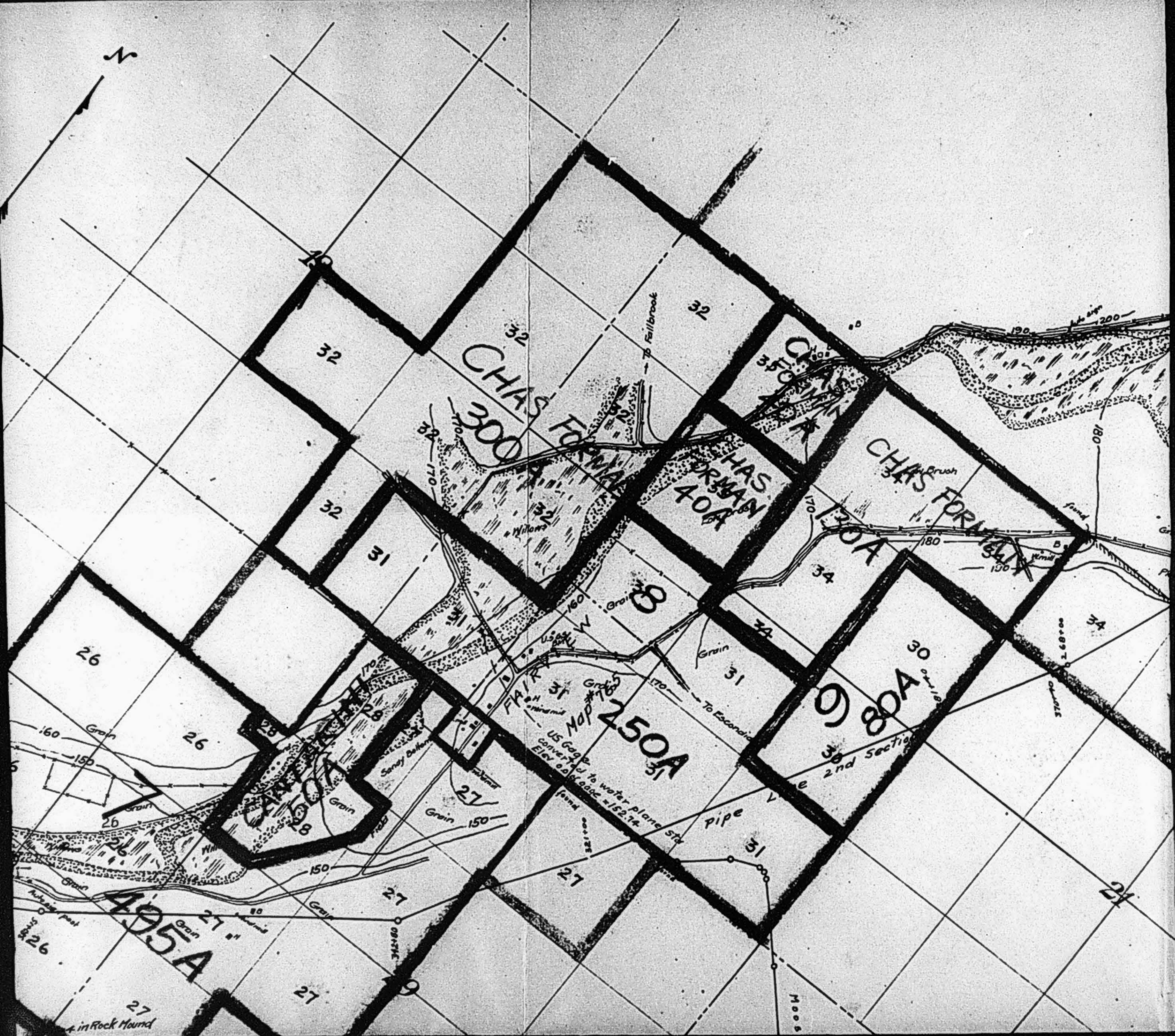
26

26

26

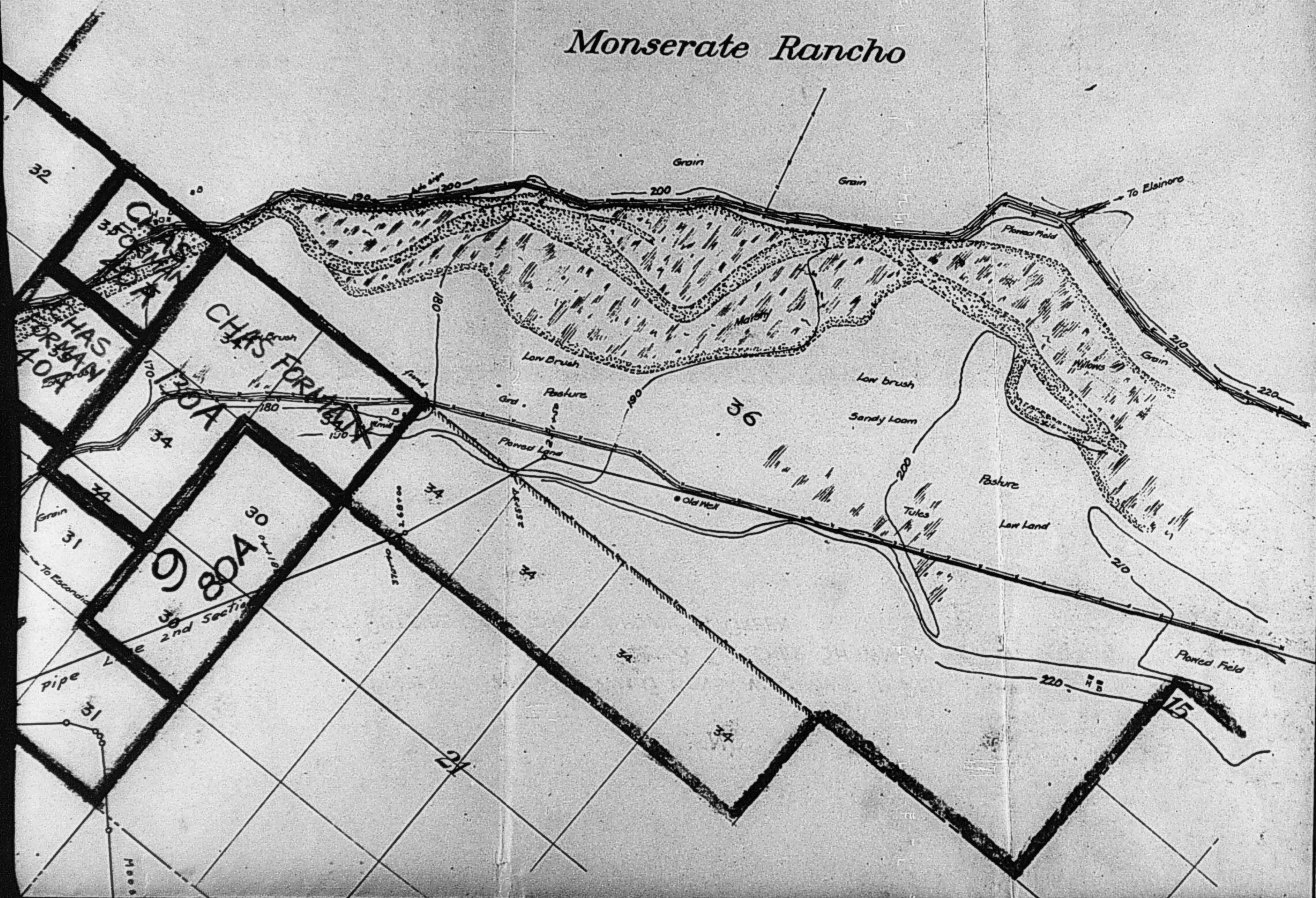
26

26





# Monserate Rancho



Head of San Luis Ditch  
Field  
256 a.

Gardjome  
Rancho  
LAKE  
Cave J. Coats  
124 a.

Grain  
3  
224 a.

Lot 4  
C.A. Craig  
290 a.

210 A

200 A

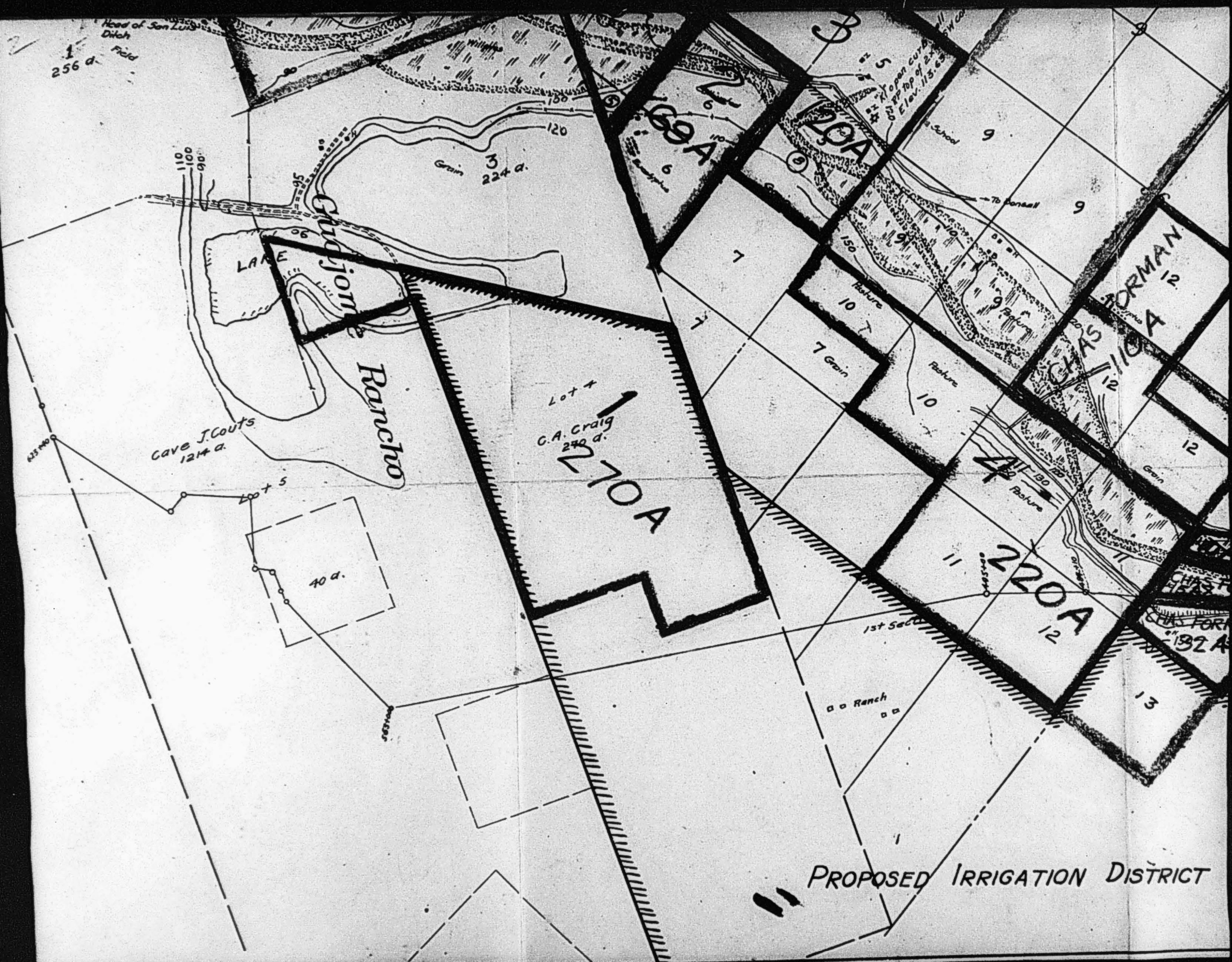
20 A

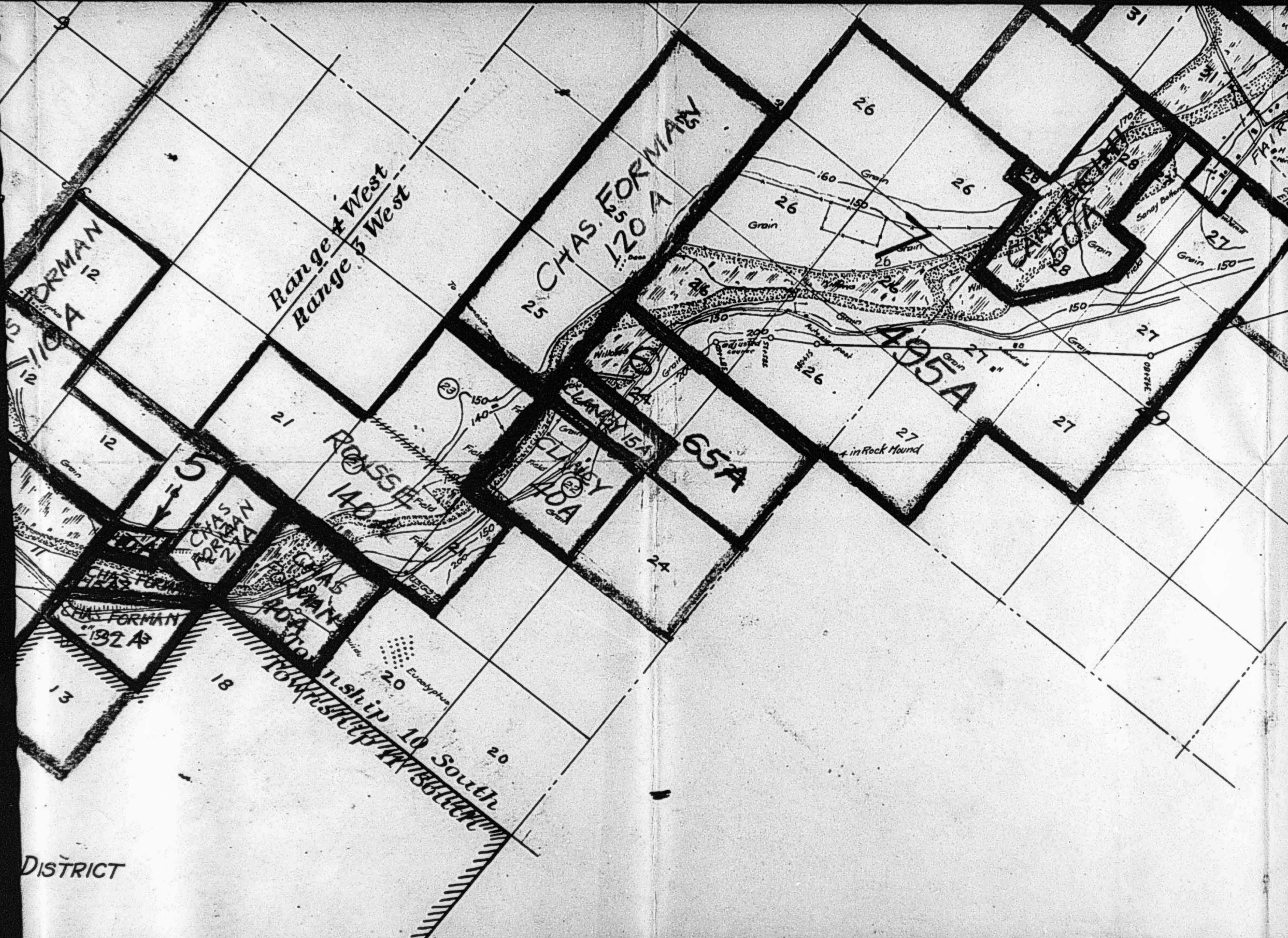
CHAS FORMAN  
110 A

220 A

192 A

PROPOSED IRRIGATION DISTRICT





Range 4 West  
Range 5 West

CHAS. FORMAN  
1204

495A

65A

ROSS  
140

CLAYTON  
15A  
40A

5

FORMAN  
12  
110A

CHAS. FORMAN  
132A

DISTRICT

Township 10 South

in Rock Mound

Grain  
160  
150  
26

23  
150  
140  
Field

20  
Eucalyptus

27  
0827E

28  
Sandy Bottom

Grain 150

FLAIR

31

27

27

26

26

26

26

24

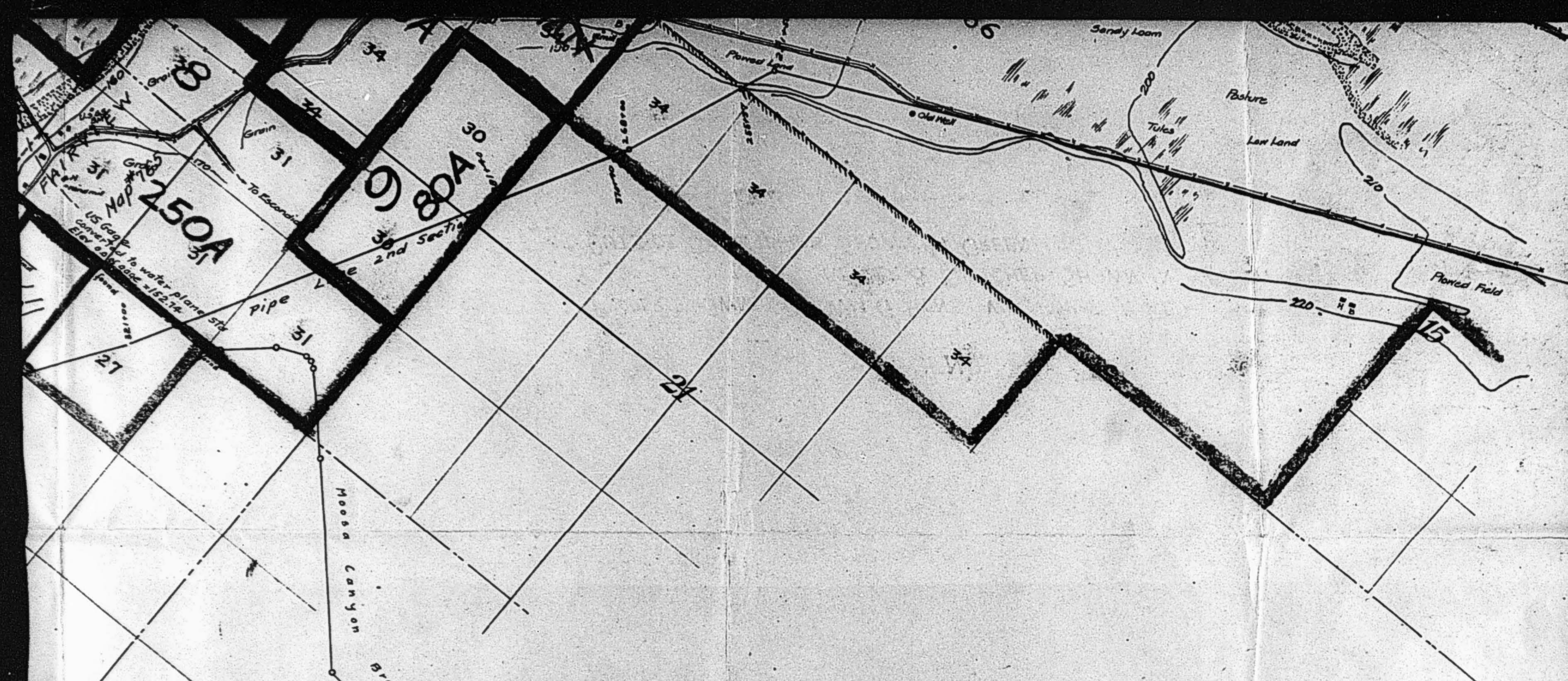
24

21

12

18

13



**LEGEND**

PROPERTY OWNED BY WM. G HENSHAW SHOWN IN RED   
 KELLER & FLETCHER SHOWN IN YELLOW   
 OUTSIDE OWNERSHIPS SHOWN IN GREEN

**Ed Fletcher Papers**

**1870-1955**

**MSS.81**

**Box: 39 Folder: 3**

**Business Records - Reports - King, T.H - "Report Showing Comparative Cost of Water Delivered to San Luis Rey"**



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