ENGINEERING REPORT

UPON

La Mesa, Lemon Grove and Spring Valley Irrigation District

W. L. HUBER, CIVIL ENGINEER

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August 12th., 1919.

La Mesa, Lemon Grove and Spring Valley,
Irrigation District,
La Mesa,

San Diego County, California.

Subject: Value - Cuyamaca Water System.

Gentlemen:-

Since furnishing you a copy of the report made for your district, compuled by Mr. W. L. Huber, and which places a value upon the Cuyamaca Water System, as of even date, at $1,440,000, we are advised by the Secretary of the Cuyamaca Water System that judgment has been rendered against them in amount $7856.61, and that in addition to this amount, said company must pay attorney fees, witness fees and court fees, which they estimate will amount to approximately $4,000.

Please note, therefore, that our valuation for the purpose of possible sale to your district is $1,451,850.

Yours very truly,

W F McClure

-State Engineer-

WFL/AB
CC-WLHuber
CC-EdFletcher

Property
Ed Fletcher
San Diego
Cal,

of Construction Murray dam,

WALTER LEROY HUBER
CIVIL ENGINEER

Mr. W. F. McClure,
State Engineer,
Sacramento, Calif.

Dear Mr. McClure:

I am submitting herewith a report of my investigation, made at your request, of the proposal of La Mesa, Lemon Grove and Spring Valley Irrigation District to acquire the system of Cuyamaca Water Company and to adapt this system to its needs.

My investigations have covered a period of several months and, in addition to extensive office studies, have included many field trips which covered all parts of the District and of the Cuyamaca system, several of these trips being made in your company. The problem presented is a very extensive one, in fact, multitudes of details unfolded as the investigation proceeded, and to have exhaustively studied each of these would have prolonged the investigation for many weeks. It is believed that the report here presented covers all features concerning which your Department desires authentic information at this time.

I particularly call your attention to the fact that, in acquiring the Cuyamaca system, the District will be required, for a time at least, to assume the obligation of some outside service, but my report does not cover the effect of the application of revenue derived from such outside service to meeting some of the operating expenses or interest obligations of the District.

Very truly,

W. L. Huber

Civil Engineer.

San Francisco, Calif.,
April 28, 1919.

WALTER LEROY HUBER
CIVIL ENGINEER

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UPON

LA MESA, LEMON GROVE AND SPRING VALLEY IRRIGATION DISTRICT.

W. L. Huber, Civil Engineer,
San Francisco, California.

April 28, 1919.

WALTER LEROY HUBER
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ENGINEERING REPORT UPON

LA MESA, LEMON GROVE AND SPRING VALLEY IRRIGATION DISTRICT

WITH SPECIAL REFERENCE TO THE PROPOSAL OF THE DISTRICT TO ACQUIRE THE SYSTEM OF CUYAMACA WATER COMPANY.

DESCRIPTION.

Organization:

La Mesa, Lemon Grove and Spring Valley Irrigation District was organized November 1, 1913. It includes a gross area of 14,794 acres held by some 3,000 separate land owners. The estimated population living within the District is 2,000. A bonded indebtedness of $66,000 has been incurred.

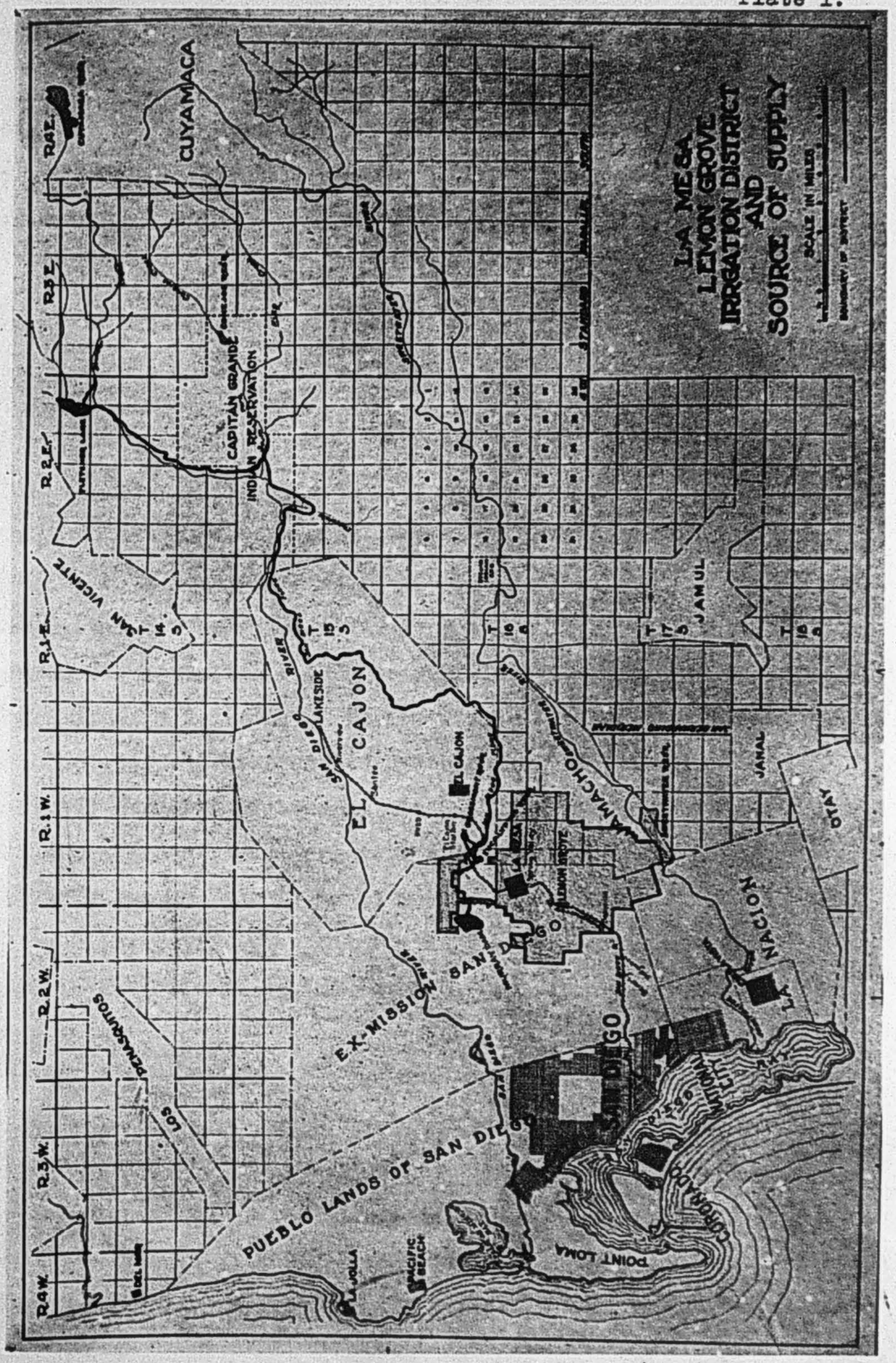
Location:

The District is located in San Diego County, California, a few miles inland and directly east of the City of San Diego. The town of Lemon Grove and the incorporated city of La Mesa are wholly or in part included within its boundaries. The Cuyamaca and Eastern Railroad which runs from San Diego to Lakeside passes directly through the District. (See Plate 1 for general map.)

Topography:

It is comprised of rolling land, most of it suited for growing orchards, particularly citrus orchards. While most of the land is hilly, it is, with the exception of a portion of the south slope of Mt. Helix, not generally of such broken character as to make its cultivation particularly

Plate 1.


LA MESA
LEMON GROVE
IRRIGATION DISTRICT
AND
SOURCE OF SUPPLY
SCALE IN MILES
BOUNDARY OF DISTRICT
CUYAMACA
CAPITAN GRANDE
INDIAN RESERVATION
EL CAJON
LAKESIDE
SAN DIEGO
LA MESA
LEMON GROVE
SPRING VALLEY
JAMUL
OTAY
NACION
PUEBLO LANDS OF SAN DIEGO
POINT LOMA
LA JOLLA
PACIFIC BEACH
R.4E.
R.3E.
R.2E.
R.1E.
R.1W.
R.2W.
R.3W.
R.4W.
T. 14 S.
T. 15 S.
T. 16 S.
T. 17 S.
T. 18 S.
T. 19 S.

difficult. The southern portion of the District is a rolling plain directly above Sweetwater Reservoir and tributary to the Sweetwater River.

CLIMATE.

Rainfall:

A record of precipitation at San Diego from 1850 shows an annual precipitation of 10.52 inches. A record which is available for a station at La Mesa (now Murray) Dam from 1913 to date shows an average of 135% of that for San Diego for the same six years, from which it appears that the annual precipitation over a long period at Murray Dam would be approximately 14 inches. Murray Dam is not included within the District but is near its north end. Precipitation is probably somewhat lighter in the southern portion of the District and the average annual precipitation throughout the District probably ranges from 10 to 14 inches. Some crops are produced without irrigation, but farming in this manner is not at all certain and offers, on the whole, a very uncertain remuneration.

Temperature:

Killing frosts have never been recorded in San Diego. A record of forty-one years gives the annual mean temperature as 60.6°. The highest temperature recorded is 101° and the lowest 32°. The District, being farther removed from the ocean, has a slightly less uniform but still a mild climate. Frosts occur very rarely and the region is well suited to citrus

Fig. 1.

Fig. 2. Views of the Albright Orchard within La Mesa, Lemon Grove and Spring Valley Irrigation District.

WALTER LEROY HUBER
CIVIL ENGINEER

difficult. The southern portion of the District is a rolling plain directly above Sweetwater Reservoir and tributary to the Sweetwater River.

CLIMATE.

Rainfall:

A record of precipitation at San Diego from 1850 shows an annual precipitation of 10.22 inches. A record which is available for a station at La Mesa (now Murray) Dam from 1913 to date shows an average of 12.8% of that for San Diego for the same six years, from which it appears that the annual precipitation over a long period at Murray Dam would be approximately 14 inches. Murray Dam is not included within the District but is near its north end. Precipitation is probably somewhat lighter in the southern portion of the District and the average annual precipitation throughout the District probably ranges from 10 to 14 inches. Some crops are produced without irrigation, but farming in this manner is not at all certain and offers, on the whole, a very uncertain remuneration.

Temperature:

Killing frosts have never been recorded in San Diego. A record of forty-one years gives the annual mean temperature as 60.6°. The highest temperature recorded is 101° and the lowest 35°. The District, being farther removed from the ocean, has a slightly less uniform but still a mild climate. Frosts occur very rarely and the region is well suited to citrus

Fig. 1. J. H. Halley's Orchard near Lemon Grove.

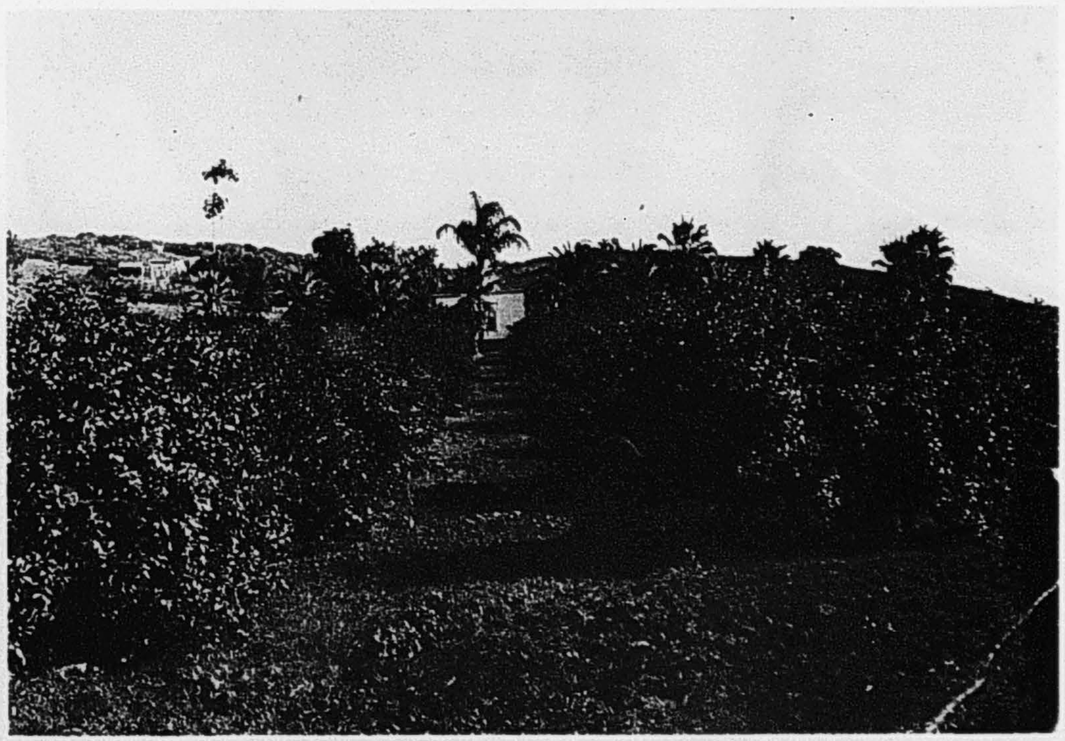


Fig. 2. A view in the Spring Valley District.

oulture as has been shown by actual trial on those areas which are irrigated. Records of temperature within the District are not available, but a record for thirteen years at El Cajon, which is farther inland and subject to greater extremes, is of interest. Here the annual mean temperature is 62.4°. The highest temperature recorded is 110° and the lowest 23°.

Seasons:

While it is true that most of the annual precipitation is recorded from November to March, distinct seasons do not prevail. A large percentage of days are sunny and well suited to growing crops. With irrigation, truck garden crops can be produced well into, if not throughout, the winter.

CROPS.

The ability of the lands within the District to successfully produce good crops has already been well demonstrated. Instances are the excellent citrus orchards about Lemon Grove and La Mesa which are already under irrigation with water supplied by the Cuyamaca Water Company's system.

All of the tillable lands are capable of intensive farming and will, when thus farmed, produce the most valuable crops. It is probable that a large percentage of the District will finally be planted to citrus orchards, although a considerable percentage will be planted in truck garden. Some of the District is also well suited to growing olives.

It is a region which with its mild and delightful

climate is very attractive to home seekers and for this reason, and because of its proximity to the City of San Diego, it is, with a more plentiful water supply, certain to contain many beautiful homes and to have an unusually large percentage of home sites.

SOILS.

Within the boundaries of the District there is a considerable variation of soils. Much of the land is rolling. The hilly lands are often gravelly and are generally well drained. With a few exceptions, these hilly lands have a soil covering of ample depth and are well suited for orchard culture. Some of the swales are partially filled with alluvial deposits. These soils are rich and in a few places sufficiently moist to grow crops with more or less success without irrigation. With general irrigation of the District, some of these lands will probably show tendencies of water-logging and will then need drainage, but the topography is such that this condition can very easily be remedied. No serious problem is thus introduced.

The Bureau of Soils of the U. S. Department of Agriculture has classified the soils within the District (Field Operations of the Bureau of Soils, 1915) as being principally of the following five classes: Montezuma adobe, Redding gravelly loams and sandy loams, Olympic loams, Aiken loams, and Sierra sandy loams.

These several classes are described as follows:

Montezuma Adobe:

"The Montezuma clay adobe consists of a dark-gray to black clay with typical adobe structure. In drying the soil checks and cracks; the larger cracks, roughly dividing the surface into blocks a foot or more across, may extend to the subsoil. Smaller cracks, both vertical and horizontal, further break up the soil mass. The soil is untillable when wet or dry, but can be pulverized fairly well if cultivated when in an intermediate stage of moisture. When cultivated the excessive cracking is prevented and both the surface soil and subsoil store and retain a large supply of moisture. In places the dark-colored soil extends to a depth of 4 or 5 feet without change, but usually a light-brown, yellowish brown, or grayish-brown subsoil, similar in texture to or lighter than the surface soil, is developed at any depth from 12 to 35 inches. The subsoil layers are subject to considerable variation in structure, but usually they are quite compact and include occasional semicemented layers. A grayish stratum often underlies the surface soil. Both surface soil and subsoil are apparently calcareous. The deeper underlying material of the type often consists of gray, clayey beds with a peculiar bleached appearance.

"The Montezuma clay loam adobe consists of a dark-gray to black clay loam which upon drying assumes a little less pronounced adobe structure than the clay adobe, but is otherwise quite similar."

Redding Gravelly Loams and Sandy Loams:

"The Redding gravelly loams and sandy loams group comprises gravelly soils of sandy loam, fine sandy loam, loam, and clay loam texture. The group is largely made up of the gravelly sandy loam and gravelly loam, the former predominating. Although the group is considered one of reddish-brown or red soils, over a large part of its extent the soils are brown. In other respects, however, the types are similar to the typical Redding soils.

"The Redding gravelly loam typically consists of a reddish-brown or light-red to red loam, usually with an appreciable content of waterworn gravel. The proportion of gravel varies considerably. In a few places the content is very small; in other places it is large, probably more than 50 per cent of the soil mass.

"The gravel particles are usually well rounded and of hard, resistant rocks, mainly quartzitic. The fragments range in size from small pebbles to cobbles

3 or 4 inches in diameter. Fragments of medium size are most numerous. The surface soil usually gives way at a depth of about 8 to 18 inches to a thin layer of exceedingly compact red clay loam or clay, which bakes hard and checks upon exposure during dry periods. This heavy subsoil layer carries less gravel than the surface soil. It gives way within a few inches to a more or less well-defined layer of reddish or brownish hardpan, also relatively free from gravel. This true hardpan may be several inches thick and is underlain in turn by beds of waterworn gravel mixed with a small proportion of fine material, the mass usually being semicemented or very compact.

"The other types of the Redding series included in the group are similar to the loam except in texture.

"Variations from the typical cross section of the soils in this group occur in many instances, but the variations are seldom sufficient to influence the agricultural value of the land. In certain places, however, the material has been reworked or eroded, and the unfavorable substrata have been loosened by water action or have been otherwise modified, as by being covered with deeper layers. Such areas of deeper soil are encountered near La Mesa and to a smaller extent elsewhere, occurring usually on slopes where the original surface material has been altered or removed by erosion. Here the distinct hardpan layers may be lacking."

Olympic Loams:

"The group mapped as the Olympic loams includes the loam and clay loam of the series, the loam predominating.

"The Olympic loam consists of a friable brown or dark-brown loam, ordinarily grading into the parent rock without distinct change in color or texture. In places, however, the soil becomes a little lighter colored near the bedrock and occasionally it grades through a reddish-brown clay loam subsoil. The depth to bedrock ranges from 12 to 48 inches or more, although it is usually encountered within the 6-foot section. The soil in many places contains angular rock fragments, and rock outcrops and rocky hills are numerous. Over a considerable proportion of some of the areas the soil is shallow and rather stony.

"The Olympic clay loam differs from the loam only in texture. In a few areas the soil possesses an adobe structure, such areas representing occurrences of the Olympic adobe soils.

# # # # # #

"The most important body, as far as agricultural development is concerned, lies just south and southeast of La Mesa.

# # # # # #

"Topography and drainage. - The topography ranges from rolling to hilly. There are many steep slopes, some of which extend well up the slopes of the mountains. Drainage is good to excessive, and in places erosion keeps pace with soil formation.

"Utilization. - Much less than 50 per cent of the land is tilled. More of the type can be brought under cultivation, but there are extensive areas in which the soil is probably too shallow for dry farming. Grain and hay are the most extensively grown crops. Citrus and other fruits with some intensive crops are grown under irrigation near La Mesa, and the results obtained indicate that many crops can be produced successfully where water for irrigation can be secured. Increase in yields and wider utilization of these soils apparently depend on better tillage methods, since extensive irrigation of the upland soils is probably not feasible."

Aiken Loams:

"The Aiken loam consists of a red to deep-red or reddish-brown friable loam, typically not micaceous. Gravel and angular stone fragments, as well as rock outcrops, are a common feature of the soil, and there is a considerable range in the soil depth. The red loam surface soil quite frequently extends to bedrock, which may be reached at any depth from 12 to 36 inches or more. In other places the surface soil is under lain by a distinct, heavier, and more compact subsoil, of redder color. The contact between the soil material and the bedrock is usually through a stratum of partially disintegrated rock, though this stratum is ordinarily not so thick as that found in the Sierra soils. On some of the steeper slopes the bedrock comes sufficiently near the surface to impair the agricultural value of the land. The total depth of the soil mantle averages a little less than in the Holland and Sierra sandy loams.

"The Aiken sandy loam is lighter red in color than the loam. In places there is little variation in the material throughout the soil column. Elsewhere there is developed a distinct, heavier textured, and more compact subsoil. The sandy loam member is of small extent. It seems to be related to certain rocks intermediate in character between the dark-colored, basic

igneous rocks typically giving rise to the Aiken soils and the granitic rocks forming the material of the Sierra soils.

"The Aiken clay loam consists of a red or deep-red, rather friable clay loam, having about the same variations in depth as the Aiken loam. It is not extensive.

# # # # # #

"An area lies southeast of La Mesa and several others of lesser importance are mapped in other parts of the survey. Small developments of the group are included with the associated residual soils.

"Topography and drainage. - The topography of the Aiken loams is rolling to mountainous. Drainage is usually very free and the run-off is rapid. Many steep slopes, ravines, and small rocky areas are included where the land is nonarable, but wherever possible such areas are mapped as Rough stony land.

"Utilization. - Probably more than 50 per cent of the Aiken loams is cultivated. Grain and grain hay are by far the most extensively grown crops. A few orchards have been established in the areas of deepest soil, but there has been no development on a large scale. The uncultivated land is covered with brush and is used for grazing. The area under cultivation is increasing slowly.

"Except in the most favorable situations, these soils require irrigation for the production of intensive crops. The apparent necessity for practicing dry farming over nearly all the group probably limits its use to hay and grain production, except in the few instances where special methods will make the growing of fruits and grapes profitable. The area near La Mesa supports a few orchards, irrigated in part, and these indicate the value of the soil where irrigation is possible."

Sierra Sandy Loams:

"The Sierra sandy loam consists of a friable, micaceous, light-red or pronounced reddish brown sandy loam, varying greatly in depth. The soil is rather free from stone fragments even in the midst of rock outcrop, owing to the rather thorough disintegration of the parent rock. Rock outcrop is in places abundant, and in few instances are there large areas without some exposures. Bowlders occur occasionally, but it is not usually necessary to remove many stones to put the land in condition for cultivation, as areas that are suitable for tillage in respect to soil depth and topography are usually also rather stone free. In

places the red sandy loam surface soil grades rather sharply at any depth from 10 to 36 inches into a redder subsoil which is typically much heavier in texture, practically a clay loam. The subsoil becomes hard and flinty when dry and cracks upon exposure. Below the subsoil the material becomes a little more friable in structure and passes through zones of disintegrating granite into the parent rock, which is usually encountered within 6 feet of the surface. A variation in the type occurs where the surface sandy loam extends to the underlying rock with little change except that the material is usually somewhat lighter colored near the bedrock, and varying thicknesses of rotten granite are encountered before the unaltered rock is reached. The parent rock here is encountered at any depth below a few inches, its average depth perhaps being about 3 or 4 feet.

# # # # # #

"Topography and drainage. - The Sierra sandy loams occupy the smoother, rather rock free, and more deeply weathered parts of the excessively rough and mountainous areas in which they occur. The surface is rolling or hilly. Nearly all the land is tilled or tillable, and the included unarable bodies are usually nonagricultural by reason of their stone content rather than on account of steep surface. Drainage over these soils is typically excellent; the runoff is not often too rapid or damaging, owing to the ease with which the rainfall is absorbed.

"Utilization. - The Sierra sandy loams are the principal agricultural soils in the central part of the San Diego area from the north-central part southeastward to the southern boundary. They are recognized as valuable soils for a wide range of fruit and other intensive crops, but they can be fully utilized along these lines only in exceptional cases, owing to a general lack of water for irrigation. As a consequence, their principal use is for growing grain and grain hay. In some places, where the soil is deep and moister than usual, the land is utilized without irrigation for producint fruits, including grapes. Very good results have been obtained, careful cultivation assisting to overcome the disadvantage due to the normally low rainfall. Irrigation has been supplied for some of the soils of this group around Escondido and elsewhere, and where the local climatic conditions are favorable some citrus orchards and many deciduous orchards are in bearing, with more extensive plantings under way. Olives are a prominent crop in some localities. There are many home orchards, vineyards, and gardens on these soils."

WATER SUPPLY.

General Conditions:

La Mesa, Lemon Grove and Spring Valley Irrigation District will, according to the proposal now made to purchase the system of the Cuyamaca Water Company, receive its water supply from the San Diego River and almost entirely from the system of the Cuyamaca Water Company, including some substantial additions to that system as now proposed.

The present system of the Cuyamaca Water Company consists of the Cuyamaca Reservoir, located in the mountains at the head of Boulder Creek, a tributary of San Diego River, at an elevation of 4,600 feet above sea level; the channel of Boulder Creek, about 12½ miles in length, into which the reservoir discharges and which carries this discharge to San Diego River proper; a diverting dam across San Diego River, located a few hundred feet below the mouth of Boulder Creek at an elevation of about 800 feet; a flume line 31.4 miles in length of which 0.8 miles is tunnel, the remainder being steel siphon or wooden flume, this line includes a feeder flume from the South Fork of San Diego River; a small regulating reservoir known as Eucalyptus Reservoir at the end of the flume; two storage reservoirs somewhat below the end of the flume, Grossmont and Murray Reservoirs, which are used for storing the flood flow of the San Diego River; and distribution pipe lines from these three reservoirs to irrigation and domestic consumers.

Fig. 1.

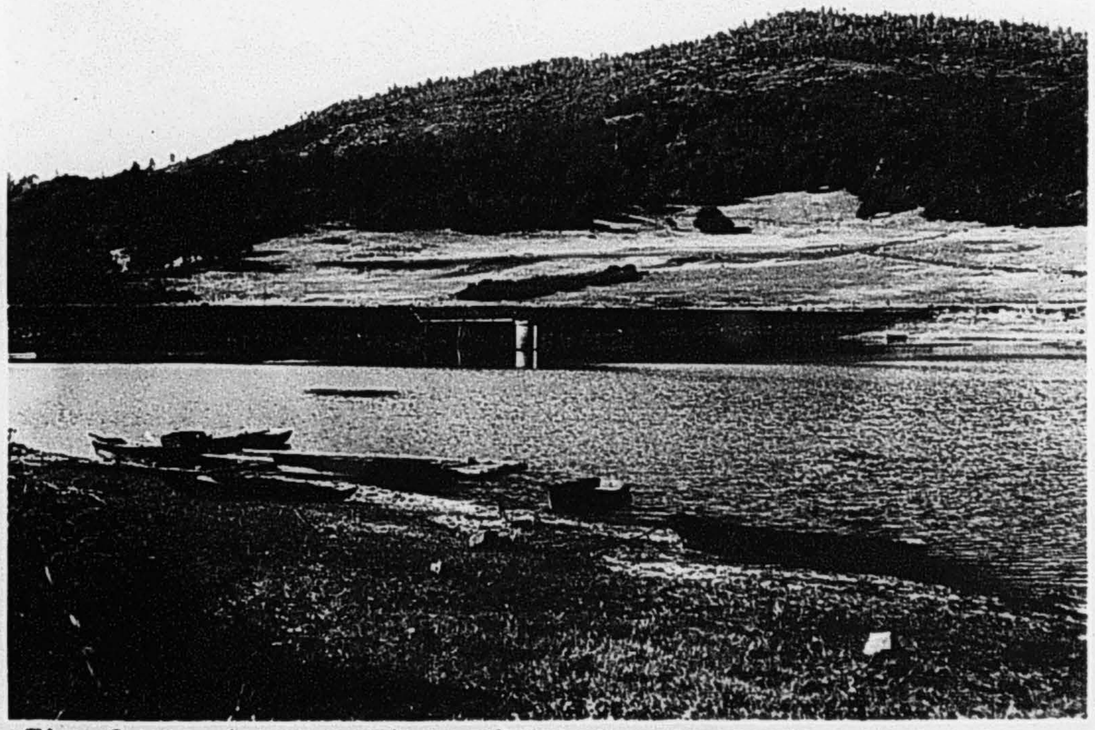


Fig. 2. Views of Cuyamaca Reservoir.

It is now proposed to add a storage reservoir (Fletcher Reservoir) with capacity of 17.106 acre feet, on San Diego River immediately above the mouth of Boulder Creek and to construct a conduit which will make the run-off of Boulder Creek tributary to this reservoir. As the demands upon the water supply increase, the existing South Fork feeder flume will be replaced with a conduit having a capacity equal to that of the main flume, making it possible to supply the main flume from South Fork, when sufficient flow is available, and to then conserve all run-off available for Fletcher Reservoir. Along with this latter improvement, Conejos Reservoir, with 1,680 acre feet capacity will be constructed on South Fork and will be available for withholding flood rushes until they can be diverted through the conduit.

Records:

The Company's original hydraulic records consist of measurements of the depth of water in Cuyamaca, Eucalyptus, Grossmont, and Murray (formerly La Mesa) reservoirs; the depth of water flowing in the flume at the Diverting Dam at Chocolate siphon (11.29 miles below), at Los Coches (21.09 miles below), and at Grossmont, near the end of the flume. Certain notes are also available from which the flow over the Diverting Dam (not diverted through the flume) may be approximated. Capacity tables, prepared from the original surveys, are available for each reservoir. Current meter ratings, prepared by the U. S. Geological Survey, are available for the stations at the Diverting Dam and Los Coches, based upon the Company's gages.

Fig. 1. The site of proposed Fletcher Reservoir on San Diego River.

Fig. 2. Upper San Diego River Gorge.

A record has also been reported of the draft, in miner's inches, from Cuyamaca Reservoir as reported by the care taker at the dam. This record was obtained by observing the depth of water flowing through an orifice 6 feet long and 10¼ inches high, with lower edge practically flush with the bottom of the stream channel. Mr. Chas. H. Lee, Hydraulic Engineer, reports:

> "The discharge was obtained by entering these depths in a standing weir table prepared from the Francis formula for weirs without end contractions. The results were obviously erroneous. In the fall of 1911 the company installed a true weir of the Cipoletti type above the old one, and in July, 1912, E. W. Case, for the company, made a current meter rating of the new weir. It was found that more water was passing over the weir than was indicated by the weir table, so that a rating table was prepared for the weir. On August 8, 1912, a rating of the old weir was obtained by C. H. Lee based upon Case's rating of the new weir by making synchronous observations of depth over the crest of each weir. From this a conversion table was prepared by which recorded drafts can be changed to true draft for the period 1888 to end of 1911. Since January 1, 1912, observations of depth have been made in the new weir to which Case's rating applies. Observations of waste at Cuyamaca consisted of noting the depth and width of the stream passing through the spillway."

Regarding the measurements of the flow over the Diverting Dam, which I have already reported as being quite unsatisfactory, Mr. Lee reports as follows:

> "Observations of flood waste at the Diverting Dam on San Diego River consists of depths of water over the crest of the dam, noted by eye without the aid of a gage rod or foot rule. The amount passing through the waste gates in the dam was also estimated by eye as so many miner's inches, on several occasions having been reported as great as 1,500 miner's inches. These observations are thus very unsatisfactory. To complicate matters further, the main crest of the dam was not level, there were several notches at higher levels and a considerable angle exists near the center of the channel. In the spring of 1912 five feet was added to the height of the dam and the original con-

ditions changed. The rating table prepared by Messrs. Bartl and Case of the company based on original conditions is presented. The Francis weir formula was used with the factor of 0.80 to correct for broad crest conditions."

Yield from Area Tributary to Cuyamaca Reservoir:

There are no measurements of the inflow for Cuyamaca Reservoir, consequently, any estimates of run-off from the tributary area must be made from the records of reservoir stages and draft combined with evaporation losses. No reliable measurements of evaporation losses from Cuyamaca Reservoir were made before June, 1913. From that date measurements have been made continuously, excepting for a single period of four months. For the period of operation prior to June, 1913, it is necessary to assume a rate of evaporation in order to estimate the run-off from the area tributary to Cuyamaca Reservoir.

Mr. Chas. H. Lee, Consulting Hydraulic Engineer, completed a very complete and careful estimate of this run-off in 1914. At that time the available records of evaporation were too meagre to be of much assistance to Mr. Lee, who, after making some use of records for Sweetwater and Independence, assumed an annual rate of evaporation of 58 inches. A record of evaporation now available for Cuyamaca Lake surface indicates that Mr. Lee's assumption is probably low. In fact, for the calendar years 1914 to 1918, inclusive, the average gross evaporation is 67.81 inches. It is not improbable that these five years show a higher average than would be found for a longer period. A comparison of Mr. Lee's assumption and the

measured record is here given:

	Lee		Average Measurements 1914-18.	
	Depth (inches)	% of Annual	Depth (inches)	% of Annual
Jan.	1.16	2.0	2.64	3.89
Feb.	1.74	3.0	3.94	5.80
Mar.	3.48	6.0	4.79	7.05
April	5.22	9.0	4.81	7.10
May	6.96	12.0	6.00	8.85
June	8.70	15.0	7.94	11.70
July	8.12	14.0	8.92	13.15
Aug.	6.96	12.0	9.08	13.40
Sept.	6.38	11.0	6.91	10.20
Oct.	4.64	8.0	5.95	8.78
Nov.	2.90	5.0	3.51	5.18
Dec.	1.74	3.0	3.32	4.90
Year	58.00	100.0	67.81	100.00

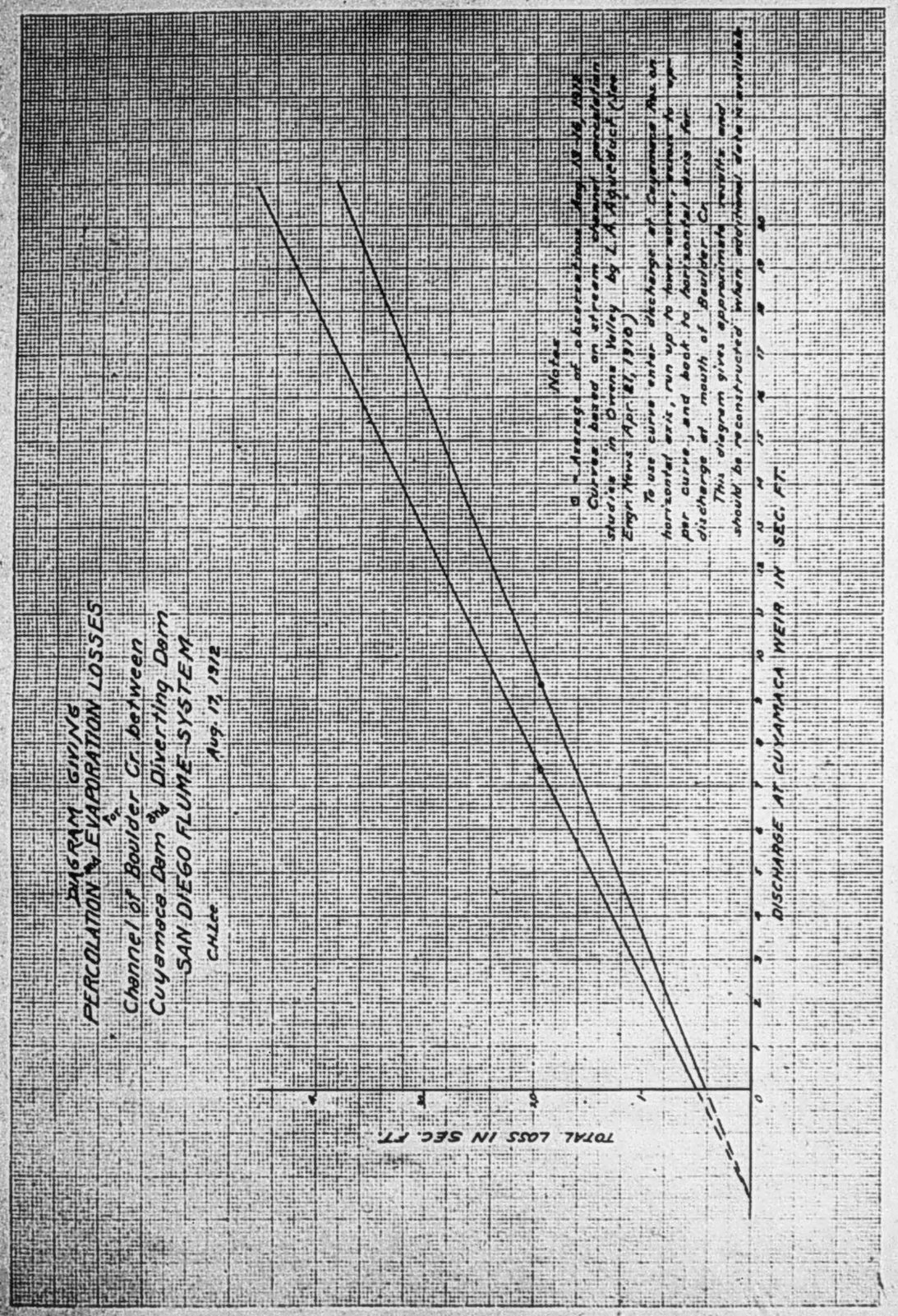
This difference is not an important one. While the assumption of a higher rate of evaporation would indicate a greater total run-off, the losses thus occasioned would also be greater. Mr. Lee's results would not be greatly changed by this difference. I have carefully reviewed his work and find that it was performed with great care and, considering the basic data, is in my opinion as accurate an estimate of the actual conditions of run-off as can be prepared. Accordingly, I have adopted Mr. Lee's estimate for the monthly run-off from July 1893 to June 1914. From July 1914 to September 1918 I have estimated the run-off, utilizing actual records of evaporation as well as those for reservoir stage and draft. The entire estimate of run-off is given in Table 1, the details of calculation being omitted from this report except for the period from July 1914 to September 1918, for which actual

records of evaporation are available, as shown in Table 2.

Yield from Area of 92 Square Miles Tributary to Diverting Dam but Not to Cuyamaca Reservoir:

As previously explained, a record of gage heights for a station on the flume just below the Diverting Dam on San Diego River is available from February 12, 1899, to date. A rating curve for this station was prepared by the U. S. Geological Survey on July 15, 1912, and this rating curve was applied to the entire record of gage heights to January 1, 1914, when the flume was lined and the rating changed. A new rating by the U. S. Geological Survey has since been applied. To the record of flow thus obtained, an estimate of the discharge over the Diverting Dam was added to give the entire run-off of San Diego River at Diverting Dam. These calculations were carefully made by Mr. Chas. H. Lee in July 1914, at which time Mr. Lee carried his work through the record for June 30, 1914.

To eliminate the flow derived from the area of 12 square miles tributary to Cuyamaca Reservoir, Mr. Lee deducted flows released from Cuyamaca Reservoir after diminishing them for percolation and evaporation in the 12.5 mile channel of Boulder Creek between Cuyamaca Reservoir and Diverting Dam. This channel is lined with trees and shrubs and, through portions of its length, choked with grass. The lower half of the canyon is also filled with more or less porous formations which readily absorb water during the dry season. The loss in this portion of the channel is considerable during the dry season although contributions from springs and seepage are acquired



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WALTER LEROY HUBER
CIVIL ENGINEER

records of evaporation are available, as shown in Table 2.

Yield from Area of 92 Square Miles Tributary to Diverting Dam but Not to Cuyamaca Reservoir:

As previously explained, a record of gage heights for a station on the flume just below the Diverting Dam on San Diego River is available from February 18, 1889, to date. A rating curve for this station was prepared by the U. S. Geological Survey on July 15, 1913, and this rating curve was applied to the entire record of gage heights to January 1, 1914, when the flume was lined and the rating changed. A new rating by the U. S. Geological Survey has since been applied. To the record of flow thus obtained, an estimate of the discharge over the Diverting Dam was added to give the entire run-off of San Diego River at Diverting Dam. These calculations were carefully made by Mr. Chas. H. Lee in July 1914, at which time Mr. Lee carried his work through the record for June 30, 1914.

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Plate 7.

CAPACITY AND AREA CURVES -
CUYAMACA RESERVOIR.
Gage Heights in Feet
Area in Acres
Capacity in Acre Feet
Spillway Level 5' 5"
Dam Full at Gage Height 30' 5"
Capacity
Area
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
100
200
300
400
500
600
700
800
900
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000

Plate 8.

AREA & CAPACITY
OVER LING DAM-MARICOPA SITE
SALT RIVER RESERVOIR
SALT RIVER VALLEY
ARIZONA
ACRES FLOODED
CAPACITY — THOUSAND ACRE FEET
MAXIMUM DEPTH OF WATER
AREA
CAPACITY
EL 440
THE A. LIETZ CO. S. F. 903

Plate 9.

AREA & CAPACITY
MURRAY RESERVOIR
DEPTH OF WATER
CAPACITY IN ACRE FEET

early in each season. Mr. Lee explains his method of estimating this loss as follows:

> "The basis for computation of this loss in past years are a series of comparative measurements made August 13th to 16th, 1912 at Cuyamaca Dam and the mouth of Boulder Creek and the maximum amount of water which, if liberated at Cuyamaca, will be completely lost before reaching Diverting Dam. The latter quantity was determined to be about 0.5 second feet by comparing the effect of increase in draft at Cuyamaca from zero to 2 or 3 second feet upon corresponding increase in the rate of diversion at Diverting Dam. The average draft for the period August 13th to 16th was 9.35 second feet and the average flow at the mouth of Boulder Creek as measured in a standard rectangular weir 7.4 sec. ft. giving loss of 1.95 sec. ft. From this data, Diagram 1.016 was constructed according to the principles developed in the Owens Valley experiments made by the Los Angeles Aqueduct. (See Engineering News, Apr. 21, 1910.) With this diagram the average monthly draft at Cuyamaca was corrected throughout the period of record to the amount which should appear at Diverting Dam. By choosing months when it is known that the only source of water for the flume at Diverting Dam is from Cuyamaca and comparing the measured draft and measured flume diversion it is found that the loss agrees closely with that indicated by the diagram. Table 19 shows that the Boulder Creek loss varies from 84 to 15% during the period of record, being largest during years when the rate of draft is small. The average loss is 30%. For normal and above normal years it is about 24% and for years below normal between 35 and 40%."

I have checked Mr. Lee's estimate using the record of actual measurements obtained for the period from August 12, 1912 to January 26, 1916 for Boulder Creek at its mouth, comparing this record with that for flows released from Cuyamaca Reservoir during the same period. His diagram of percolation and evaporation losses (Plate 6) represents the actual losses incurred as nearly as those losses can be represented by such diagram. It must be appreciated that this method is approximate, only, since these losses are in-

fluenced by many complex conditions not subject to exact analysis. I have accepted Mr. Lee's estimate of losses and with it his estimate of run-off (Table 3). Later, in making a storage study for the system, I shall not make an allowance for such large losses in the channel of Boulder Creek because, with the construction of Fletcher Reservoir at Diverting Dam, it will be possible to operate the system so as to lessen these losses. For the period subsequent to October 1, 1912, the figures for monthly run-off in Table 3 were computed from available records of measurements as shown in Table 4.

Yield from Area of 44 Square Miles Tributary to South Fork Diversion:

The records of the San Diego Flume Company, predecessor of Cuyamaca Water Company, cover the actual diversions from South Fork, but, before August, 1912, do not cover the run-off which was not diverted into the flume. These records are, therefore, of little value for determining the total run-off prior to that date. Instead, it has been estimated as shown by the figures in parenthesis in Table 5. Quantities not enclosed in parenthesis in Table 5 are the results of actual measurements.

Evaporation:

Cuyamaca Water Company has measured the evaporation from the surface of Cuyamaca Reservoir since June 1913, and from the surface of La Mesa (now Murray) Reservoir since January 1913. The Company's measurements of evaporation are

made with reasonable care by using standard pans 3 feet square and 18 inches deep with a fixed point in the center about 3 inches below the top of the pan. The measurements are made at least once a week, and in some cases oftener, by adding or removing standard dippers of water representing a definite fall or rise in inches. Pans floating in reservoirs such as the two just mentioned are protected from waves by log booms to which they are secured. The Company also makes measurements of the evaporation from a pan set in the ground at Cuyamaca Reservoir, but in my opinion the floating pans more nearly record the conditions actually existing on the reservoir surface. The relation of floating pan observations to actual evaporation from lake surfaces is a disputed point among engineers, some of whom contend that the actual evaporation from lake surfaces is somewhat less than the measurements indicated by pans floating on the lake surface. Possibly this is true for measurements from certain badly constructed or poorly arranged pans, but for equipments such as those of the Cuyamaca Water Company I agree with Mr. Chas. H. Lee that "for all practical engineering purposes, floating pan observations give the true depth of evaporation from a large body of water", (Trans. Am. Soc. of C. E., Vol. LXXX, page 1925). As previously noted, the average annual evaporation as indicated by measurements from the surface of Cuyamaca Reservoir for the five calendar years 1914 to 1918, inclusive, was 67.81 inches; 24.15 inches during the winter season, October to March, inclusive, and 43.66 during the summer season, April to September, inclu-

sive (Table 9). For the purpose of studying storage possibilities of Cuyamaca Reservoir I will use an annual gross evaporation of 68 inches, of which I will assume that 24 inches occurs during the winter months and 44 inches during the summer months.

Records of the evaporation from the surface of La Mesa (now Murray) reservoir are available for the six calendar years 1913 to 1918, inclusive, and these show an annual evaporation of 64.12 inches, of which 21.57 inches occurs during the winter months and 42.55 during the summer months (Table 9). For the purposes of this study, I shall utilize a figure of 64 inches for the total annual evaporation, 22 inches during the winter months and 42 inches during the summer months. In the absence of actual measurements of the evaporation at the site of the proposed reservoir at Diverting Dam (Fletcher Reservoir), I will assume that it is the same as Cuyamaca Lake. This assumption is probably conservative because this site is probably a little less affected by desert winds from the Imperial Valley, but any possible error because of this assumption is so small as to be of little importance. Tables 9, 10 and 11 show the calculation of net evaporation losses at Cuyamaca Lake, at Fletcher Reservoir (Diverting Dam site), and at Murray (formerly La Mesa) Reservoir. The algebraic summation of gross evaporation and direct rainfall to give the net loss, or gain, for each season from 1894-5 to 1917-18 for Cuyamaca Reservoir, Fletcher Reservoir and Murray Reservoir is given in Tables 10, 11 and 12.

Storage Study:

As will be shown later, an annual water supply of 11,000 acre feet is very desirable, since 9,000 acre feet per annum will eventually be required to meet the needs of the District and the District will, after acquiring the system of Cuyamaca Water Company, be obligated, and will probably be required, to continue service now rendered by that Company to consumers outside the District - a service which has, during the past three years, averaged 2,000 acre feet per annum.

Table 13 shows a storage study for a draft of 11,000 acre feet per annum. In making this study it has been assumed that 65% of the total annual draft will be made during the summer months, April to September, inclusive, and 35% will be made during the winter months, October to March, inclusive, which assumption agrees very closely with the present demands upon the system of Cuyamaca Water Company. An allowance is made for losses of 5% of all water released from Cuyamaca Reservoir before delivery to Fletcher Reservoir during the winter season, and 10% during the summer season. These losses are less than those which have, up to date, been sustained in the operation of the system. However, I am of the opinion that the construction of Fletcher Reservoir will permit considerable reductions, since large flows may be released for shorter periods, after it is no longer necessary to release quantities just sufficient to make up deficiencies in the supply required for the flume. As the system is now operated, comparatively small flows are necessary over long periods since no storage exists at the head of the flume. An allowance of 5% for losses

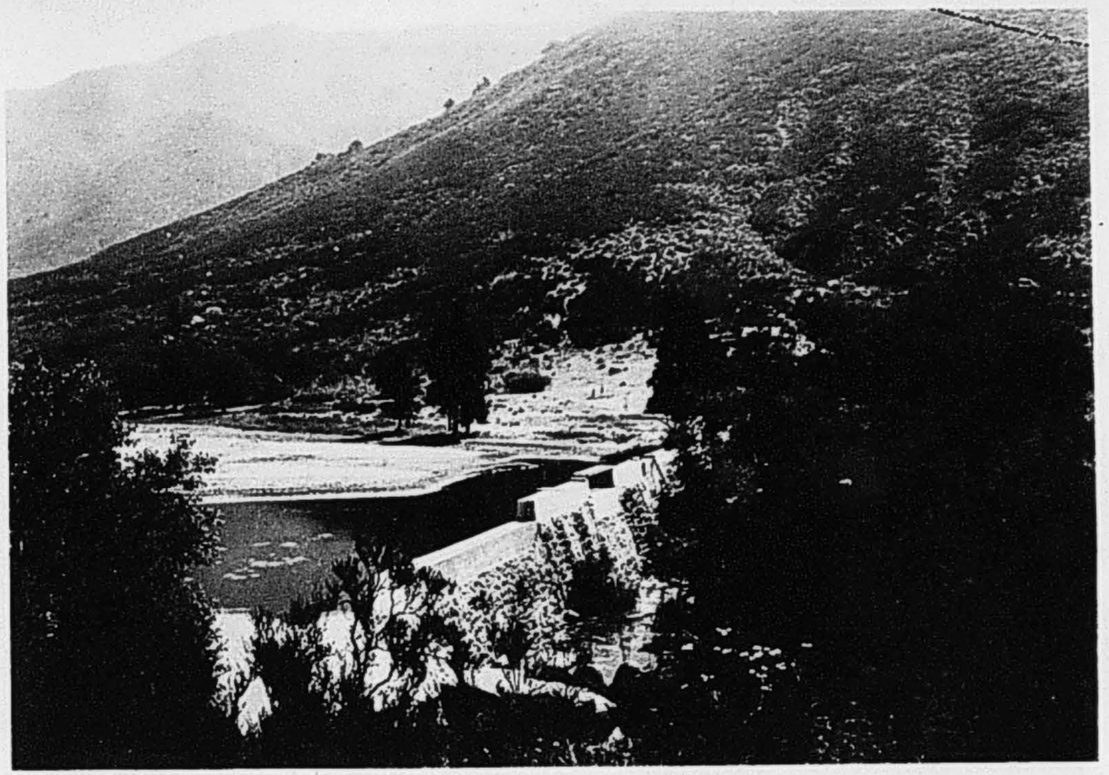


Fig. 1.

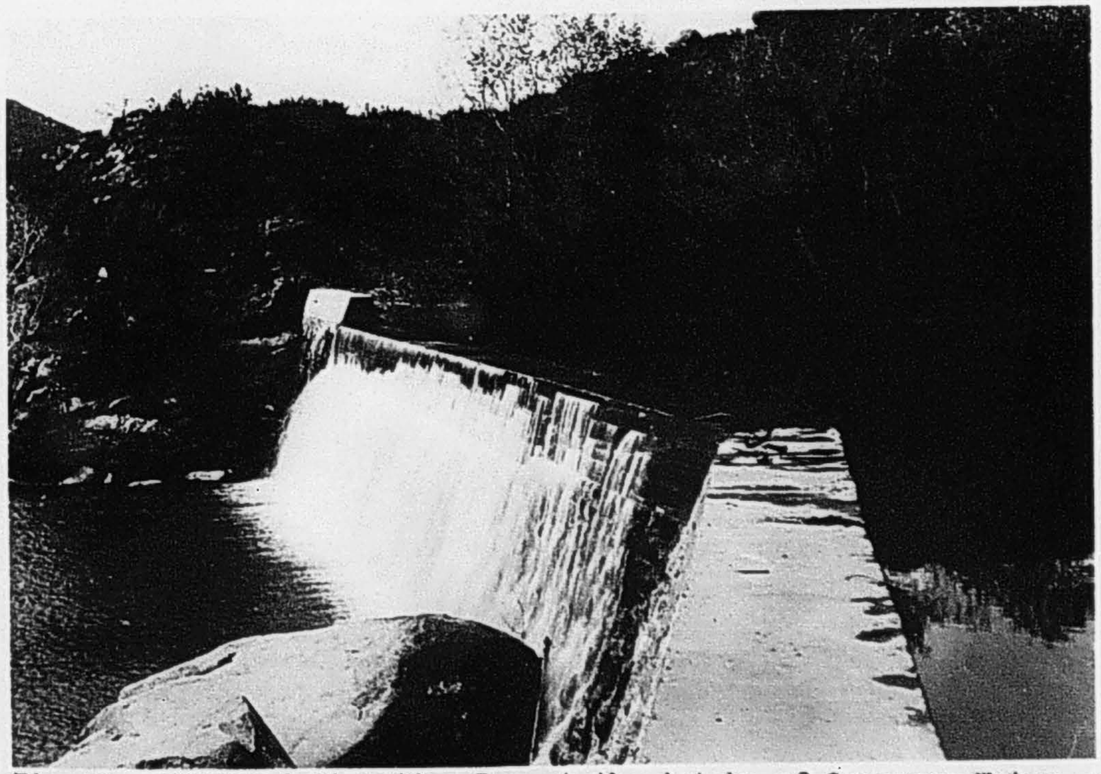


Fig. 2. Views of Diverting Dam at the intake of Cuyamaca Water Company's flume.

from the flume has also been made. These losses have in the past varied from unreasonable quantities when the flume was poorly maintained to less than 3% after it had been relined. With proper care, it should be possible to keep these losses down to 5%, and to depreciate the yield of the watershed by allowing for greater losses is, in my opinion, unwarranted. As will be noted, during the 24 year period of record the supply would have been deficient during a continuous period of six years, from 1898-99 to 1903-04, during which time supplies of 75%, 36%, 60%, 56%, 75% and 47.5%, respectively, would have been available, the supplies for 1898-99 and 1902-03 being purposely held to 75% to help equalize the available supply, as would probably be done in actual operation during any such emergency. During this period of drought, some relief could be obtained by pumping from the water bearing gravels along San Diego River, as will be shown later.

Table 14 shows a similar study for a draft of 9,000 acre feet. Again, for the 24 year period of record the supply is found to be deficient for the six years from 1898-99 to 1903-04. In making this study a 75% supply was utilized, when available, from the beginning of the period of drought. Only during the fourth and sixth years was it not available, and for those, 72% and 60% supplies were available. The conditions here shown can be relieved by pumping from the gravels of San Diego River, utilizing pumping rights already owned by Cuyamaca Water Company.

Pumping Reserve:

During the very years in question, San Diego

Flume Company, predecessor in interest of Cuyamaca Water Company, pumped from the sands of San Diego River as follows:

1899	1271	acre feet.
1900	1871	" "
1901	648	" "
1902	657	" "
1903	854	" "
1904	1278	" "
Total	6579	acre feet.
Mean	1096	acre feet.

Even this amount of pumping, although it does not measure the total available supply from the basins from which it was derived, would have insured crops during each of the years of drought. The above quantities, added to the available surface supply indicated in Table 14, would have given supplies of 89%, 96%, 82%, 84.5% and 74.2% during the years of drought. Thus the system of Cuyamaca Water Company, with proposed additions and including its pumping rights, is capable of meeting the actual demands of La Mesa, Lemon Grove and Spring Valley Irrigation District. It may be contended that the construction of additional storage works above the underground reservoirs from which the Company pumps will lessen their capacity by conserving run-off which would otherwise be available for re-charging them. However, during the drought in question it appears that there was little run-off thus available and, after investigation, I am convinced that these underground basins themselves have sufficient actual storage capacity to yield this amount.

However, as previously mentioned, this District,

in acquiring the system of Cuyamaca Water Company, must assume the obligation of the Company to serve some 2,000 acre feet per annum to consumers outside of the District's boundaries. A majority of these consumers are in El Cajon Valley, the remainder being in territory immediately adjacent to the City of San Diego in East San Diego, Normal Heights and Kensington Park.

From records of well logs of the underground basins along San Diego River, I have been able to determine approximately the extent of these underground basins. I have also found much reliable data in a report of September 16, 1912, by Chas. H. Lee, Hydraulic Engineer, to John M. Eshelman, Chairman of the California State Railroad Commission, upon the San Diego riparian problem, from which the following is quoted:

> "The San Diego River heads in a plateau lying at an elevation of about 4,000 feet between the Volcan and Cuyamaca Mts. It receives the drainage from the plateau, the Cuyamaca Mts., and a zone of mountains and hilly country about 12 miles in width extending in a southwesterly direction toward the Pacific Ocean. The upper portion of the drainage area, particularly the slopes of Cuyamaca Mt., is the most productive of run-off. The lower tributaries are less productive.
>
> "The river channel occupies the bottom of a deep canyon cut into granite from its upper reaches to Lakeside. Here the granite begins to dip beneath alluvial formations and the channel is in open valleys to Old Mission Dam. Below here the river has cut a deep gorge through an obstructing range of hills, beyond which is the Mission Valley excavated from the alluvium. The granite is of fine texture and is non-water bearing except where disintegrated or fissured. The alluvium of the mesa extending from El Cajon Valley to the coast is a cemented conglomerate with strata of marl and is non-water bearing and practically impervious to the passage of water. Hence,

generally speaking, the river channel is underlaid by impervious formations from its source to the ocean.

"In its past history, however, the river has cut into the underlying impervious formation to a greater depth than at present. This deeper channel has been filled in modern geologic times with the gravel, sand and silt carried by the stream and a new grade established to suit altered conditions. These modern deposits are porous and not only contain water but allow a slow movement downstream.

"The river in cutting the granite encountered rock of varying hardness. Where the rock was soft a wide channel was formed which, with the aid of tributaries, became a small valley. The dykes of hard rock however, resisted the side cutting and permitted only a narrow gorge. The modern alluvial filling therefore, is not continuous in cross-section, but widens out in the old valley and contracts in the narrows. The water bearing formations along the San Diego River, thus are a series of basins filled with porous material and connected by narrow necks at the bed rock contractions. They can be thought of as a series of underground reservoirs connected one with the other. Riparian bottom lands are those forming the surface of the reservoir, while the adjacent mesa and hill lands are the surface of the surrounding water tight formation.

"The source of supply of these reservoirs is percolation from direct precipitation, percolation from the San Diego River and its tributaries, seepage from surrounding porous formations such as cones of side streams and disintegrated bed rock in place, and underflow from the basin above. The movement of water is very slow through this material because of its fineness and the light grade of the ground-water surface. The most important sources of supply are therefore percolation from surface streams and precipitation. The rainy months are December to March inclusive, but stream flow in the river continues in normal years until the end of June. Hence the bulk of the supply is received from December first to June thirtieth of each year. In dry years the river dries up in May and in excessive drought there may be no stream flow beyond the upper basins. From 50 to 75% of the rainfall joins the ground-water supply. The amount absorbed from the streams depends upon the depth of the general water plane, the character of material surrounding the stream channel and the length of time during which the stream flows. The most favorable conditions for rapid absorption are coarse sands depleted of water.

"The outlet from the reservoirs is by underflow to the next lower basin, by overflow into the river channel and by evaporation. The underflow through contractions is small and need be considered only in the upper basins where the material is coarse and the grade steep. In no case along the San Diego River does it exceed 70 M.I. and in most cases it is much less than this. The overflow into the river channel can be observed in the river bed at contractions in the canyon walls. These streams flow for a short distance and disappear again into the sands of the next lower basin. They are caused by the crowding of water from a basin into the contraction at its lower end. Another outlet afforded just above the contraction is by evaporation. A characteristic feature of every reservoir is a cienega or area of moist soil supporting water grasses, rushes and water-loving trees. The evaporation from such vegetation is enormous. Experiments indicate that it exceeds that from the same area of open water surface, in some cases by 100%. Evaporation is the most important natural draft upon the ground-water reservoirs. The months of greatest evaporation are May to September inclusive, during which 50% of the annual evaporation occurs. (See table 23.) During May and June of the normal year the river is still flowing so that months of greatest natural depletion of ground water are July, August and September.

"Considered as an average, inflow and outflow must be equal if the ground-water level does not change from year to year. Therefore, if the ground-water level continues to lower from year to year the draft on the reservoir is greater than the supply. The movement of water toward the lower or outlet end of the reservoirs is so slow that they withstood the period of seven years' drought, 1897-8 without material lowering of the water levels except where artificial draft occurred."

The total storage capacity of the four underground basins along San Diego River cannot be exactly determined with data now available, but a conservative estimate is 50,000 acre feet. Utilizing the map prepared under Mr. Lee's direction in 1912 and well logs collected under my own direction in March, 1919; assuming 33-1/3% porosity and 66-2/3% availability, I make the following estimate:

Monte Basin, Cape Horn Point to Monte Pump -- 9,093 ac. ft.
Lakeside Basin, Monte Pump to Riverview ----- 14,522 " "

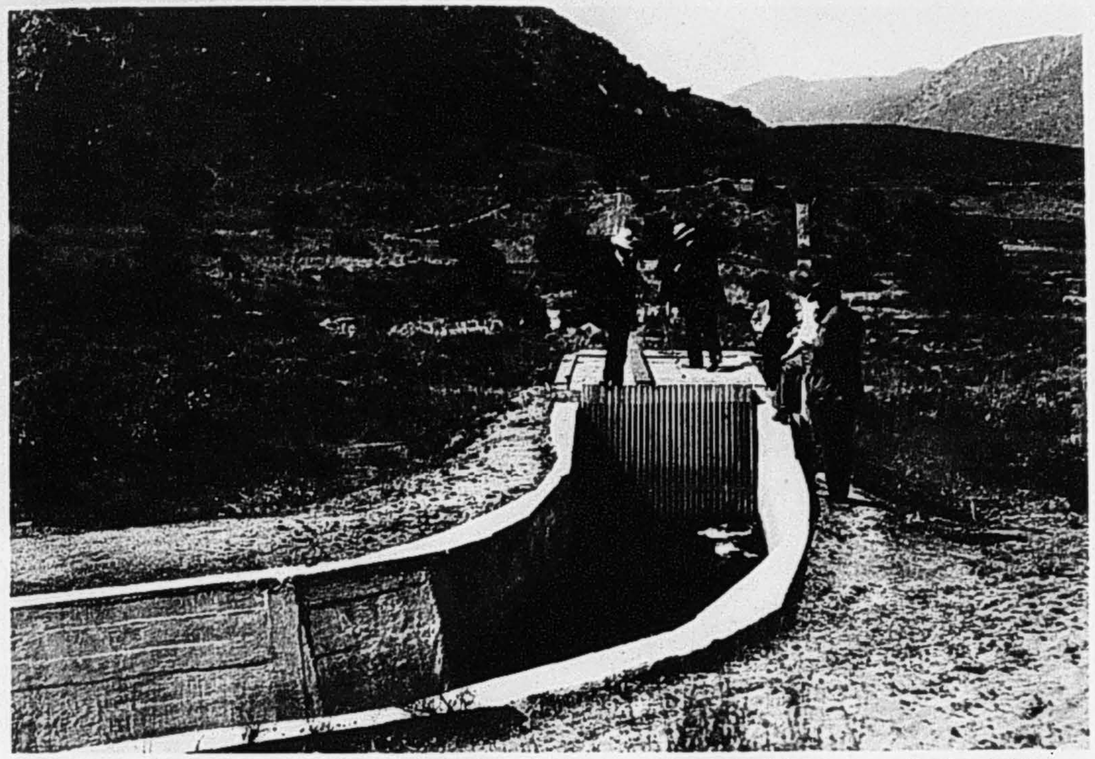


Fig. 1. Intake of Sand Creek Siphon - inspection by State Water Commission. 6/26/18.

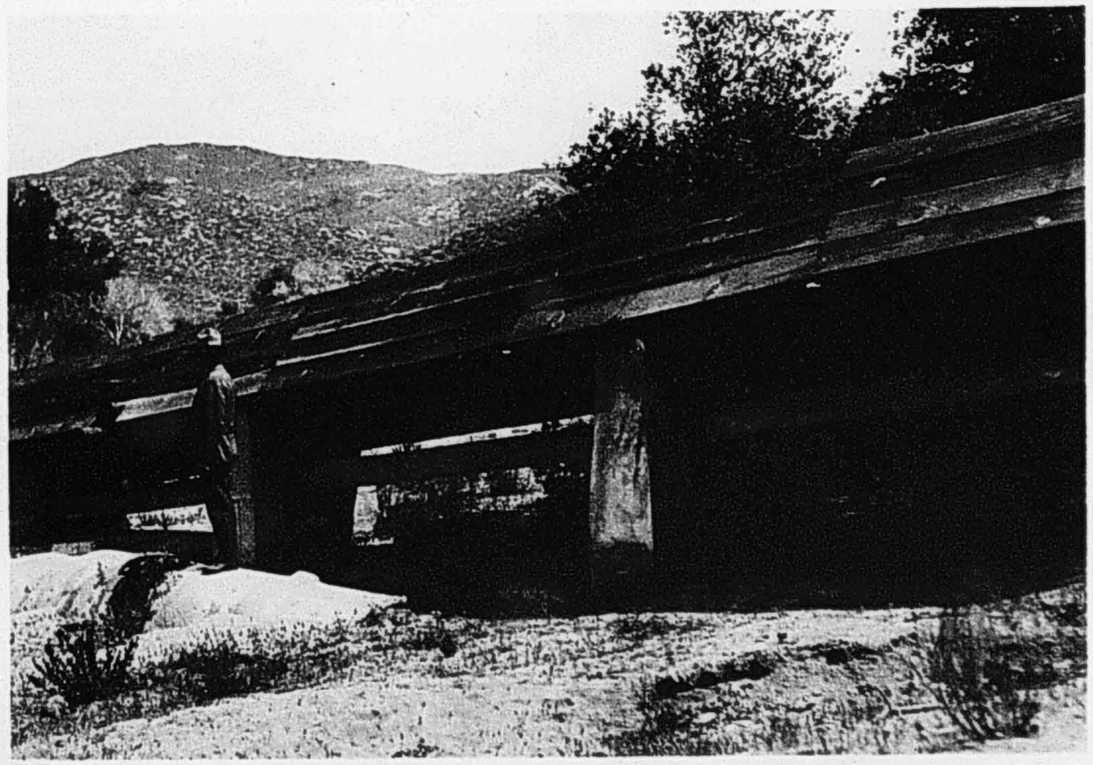


Fig. 2. Sand Creek Siphon at the crossing of Sand Creek.

Riverview Contraction to Old Mission Dam -- 7,472 ac. ft.
Ex-Mission Basin ---------- 22,627 " "

Total ---------- 53,714 ac. ft.

While the run-off from the upper portion of the basin of San Diego River will be entirely diverted during years of drought, an area of 217 square miles, exclusive of the 148 square miles above the Cuyamaca intakes, drains to these underground basins above Mission Gorge and, in addition, the basins of Murphy Canyon and Murray Canyon drain directly to Mission Valley. These basins are lower in altitude, are in an area of very much lesser rainfall and are more inclined to absorb precipitation, hence are much less productive of run-off than are the areas tributary to the Cuyamaca system. Mr. Lee estimates that, on an average, once in every thirty years a series of three consecutive years will occur when there will be no run-off from this lower area. From a study of Table 13, it appears that to insure a full supply of 11,000 acre feet as required by La Mesa District, together with the outside service which it may be required to continue, it will be necessary to pump some 12,000 acre feet from these gravels during three consecutive years when they can receive no replenishment, and this demand in addition to that imposed by pumping plants directly serving the farms along the river bottom. Not only will this condition be imposed, but, from my own studies, I find that some demand must be made upon these underground sources for a period of six consecutive years during none of which will they receive complete replenishment unless possibly the fifth year of the six year series. Although the records of available stream flow

are fragmentary, it is certain from a study of available miscellaneous measurements of San Vicente and other creeks as well as some records of river stations, that the replenishment during this fifth year of the period of drought would have been considerable, if not complete.

It is of interest to analize the service to areas outside of the District. During the year 1918 it amounted to 1,745 acre feet, of which 1,081 acre feet was served to the region in and adjacent to El Cajon Valley, and 664 acre feet was served to the communities directly east of the San Diego city limits. It is quite probable that the communities directly east of San Diego will, by the time La Mesa, Lemon Grove and Spring Valley Irrigation District is under complete development, have acquired their own distribution systems, will have been annexed to the city and will have elected to take their water supply from the city's system. Thus it is possible that the present demands from territory outside of the District will be greatly reduced before development has progressed to a point requiring the whole water supply. It is further pointed out by officials of Cuyamaca Water Company that the demand for El Cajon Valley is annually decreasing because of the increased use of water pumped from wells, and it is contended by these same officials that this increase will continue until it eventually practically eliminates this, the other outside service, approximately 97 wells having been driven in El Cajon Valley during the last three years. While I am willing to admit some decrease in service in this valley, I am not willing to make

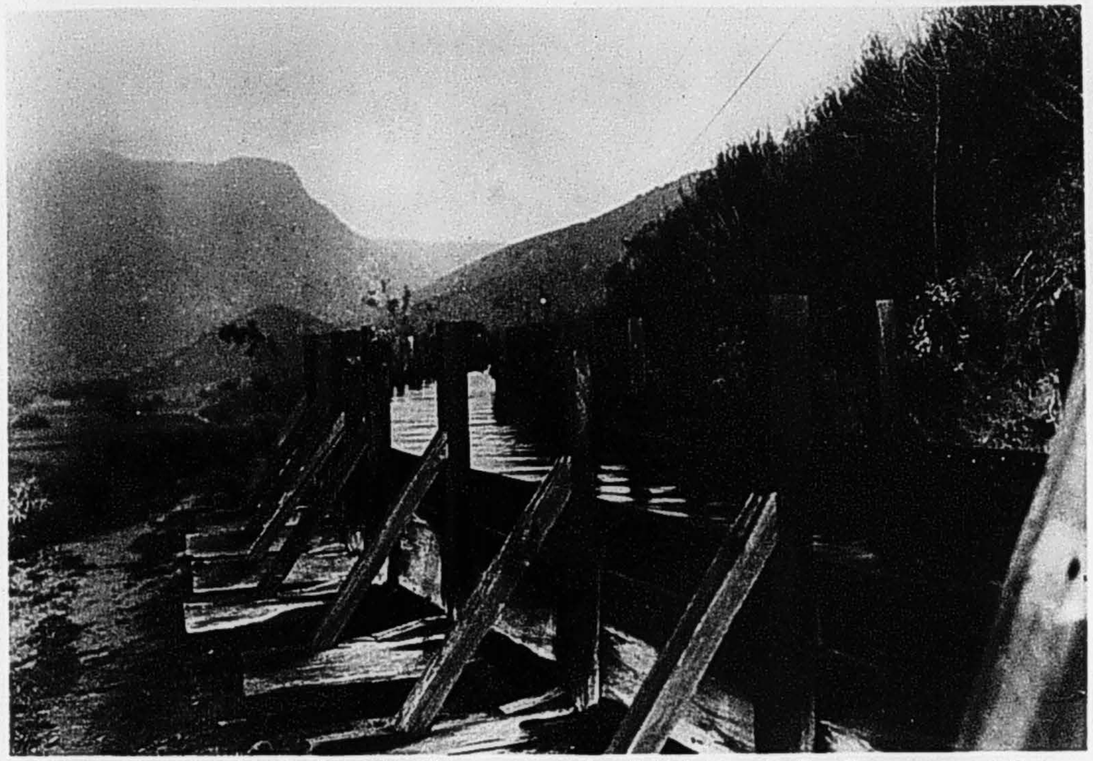
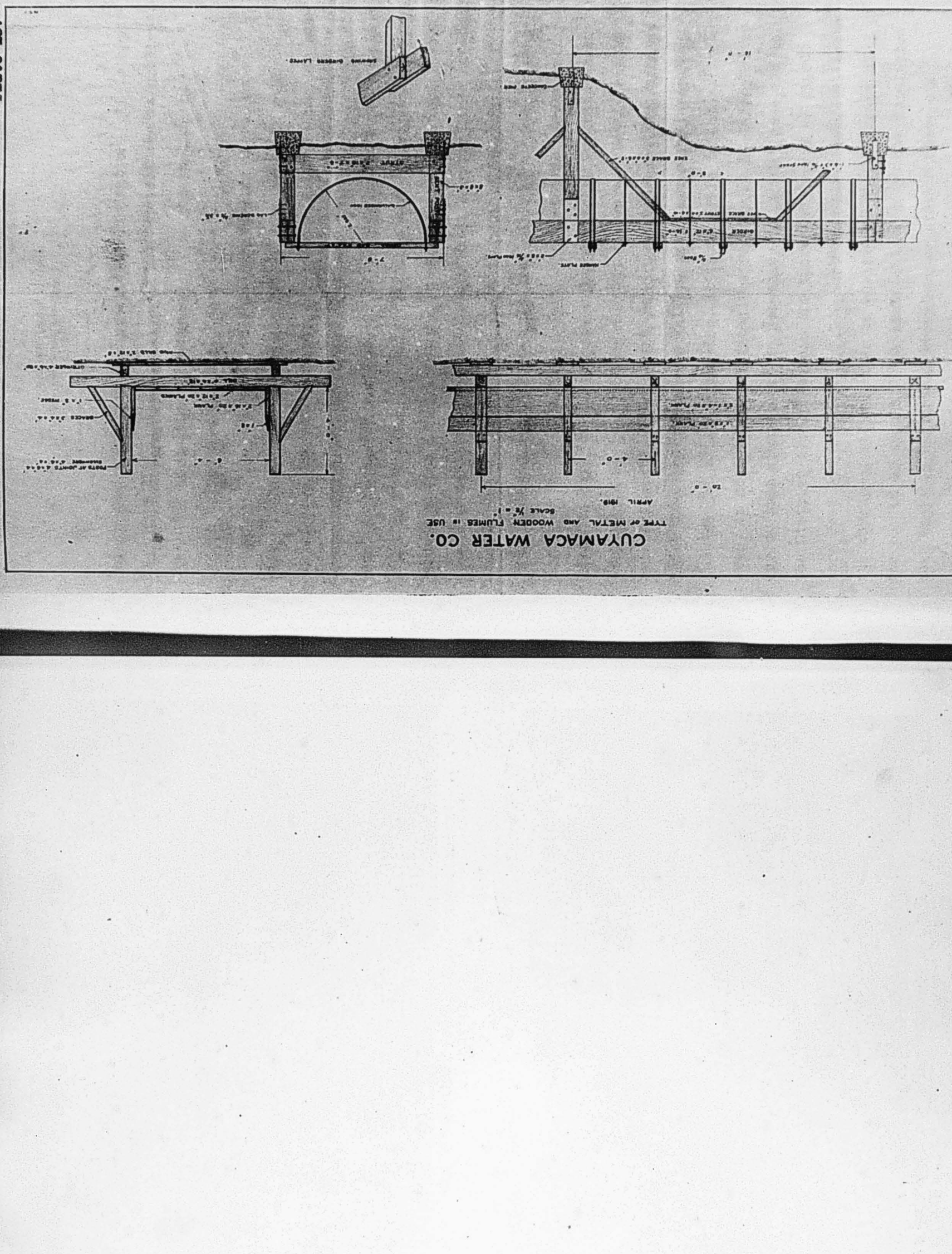


Fig. 1. Typical bench flume - note lining of 2 ply prepared roofing.

Fig. 2. Flume a short distance below the diverting dam.

Plate 13.



CUYAMACA WATER CO.

TYPE of METAL AND WOODEN FLUMES in USE

SCALE ½" = 1'

APRIL 1912.

plans dependent upon its practical elimination. It is apparent that the service outside of the District can be subdivided into two areas considerably separated geographically - El Cajon Valley and the East San Diego area.

In order to continue serving these, as well as the District after it is completely developed, it will be found that the water supply of Cuyamaca Water Company is adequate during ordinary years, but that for periods of drought such as occurred from 1898-99 to 1903-04, additional supplies must be obtained. The only available sources are the underground basins afforded by the gravels along San Diego River. The District already owns certain water bearing lands between Santee and Old Mission Dam which it secured in accordance with a previous plan for irrigating all of its area by pumping from them. The supply from these lands is hardly sufficient to carry the lands now being served by Cuyamaca Water Company in El Cajon Valley through a severe drought, but by augmenting this supply with pumping rights owned by Cuyamaca Water Company in Lakeside Valley, which are more favorably located for water production, it is possible to do so. However, in addition to carrying the service in El Cajon Valley during such drought, it is necessary to furnish some aid to the District itself because the increased demand of 11,000 acre feet per annum over 9,000 acre feet per annum will cause the supply of stored water to be less at the beginning of the period of drought. My studies lead me to the conclusion that there is sufficient ground water storage above old

Mission Dam to meet the requirements of the riparian lands which are now dependent upon it and to so augment the supply of Cuyamaca Water Company as to carry its present consumers in El Cajon Valley and La Mesa, Lemon Grove and Spring Valley Irrigation District through a period of drought as severe as any of record without serious damage to orchards or crops, but without a full water supply. This conclusion is based upon the assumption that during such drought the present service area between the City of San Diego and the District will be cared for by pumping from the underground basin in Mission Valley and that the service in this area will not be materially increased over that now existing, 664 acre feet in 1918; and upon my further conclusion that pumping from Mission Valley to lands within the District is economically, if not otherwise, impracticable. It should be noted that if ever another period of drought as severe as that recorded (1898-99 to 1903-04) occurs after the District is developed, and this excessive demand upon the ground water supplies is made, riparian owners in the basins above Mission Dam will suffer damage due to the lowering of ground water levels necessitating sinking pumping machinery, greater lift with consequent greater operating expense, etc. These owners would be fully entitled to damages from the District in this event. The District will acquire, with the system of Cuyamaca Water Company, riparian rights in Lakeside Valley which will to a considerable extent insure its right to pump as required. These rights, with those which the District al-

WALTER LEROY HUBER
CIVIL ENGINEER

ready owns between Riverview contraction and Old Mission Dam, will probably be sufficient to insure this. I am, also, of the opinion that along with the system the District will acquire riparian rights in Mission Valley which will fully guarantee its right to pump the more moderate draft required during such drought for the area immediately east of the City of San Diego.

Conclusions as to Water Supply:

Finally, my conclusions regarding available water supply may be summarized as follows: The supply of Cuyamaca Water Company, when developed, will be sufficient to meet the actual requirements of La Mesa District; the District will, in acquiring the Company's system, also acquire certain obligations to serve outside consumers and, should these outside obligations be continued until the District is under full development, it will be necessary to draw heavily during periods of drought upon ground water basins along San Diego River which have not been drawn upon by Cuyamaca Water Company or its predecessor, the San Diego Flume Company; a supplemental water supply is available in these gravels which will tide the District and its outside consumers through a drought equal to the most severe of record with a partial water supply which will prevent any irreparable damage within the District, should such an emergency arise, riparian owners along San Diego River would be entitled to some damages for increased costs of operation and modification of existing pumping plants, but a full

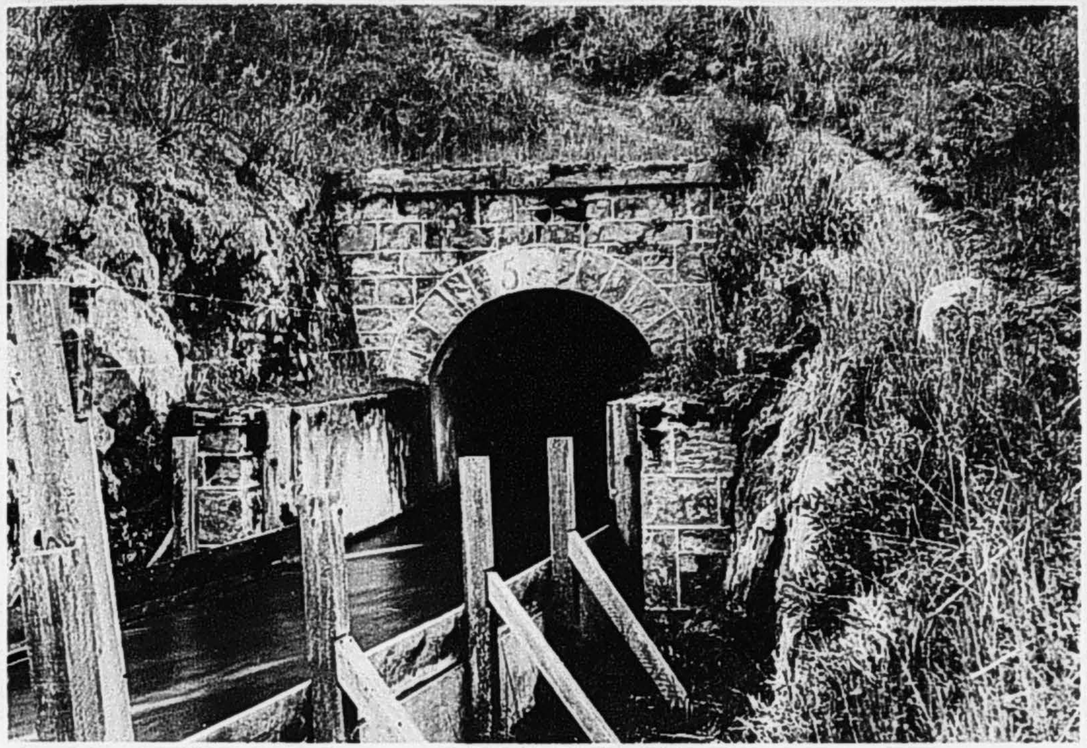


Fig. 1. Upper portal of Monte Tunnel.

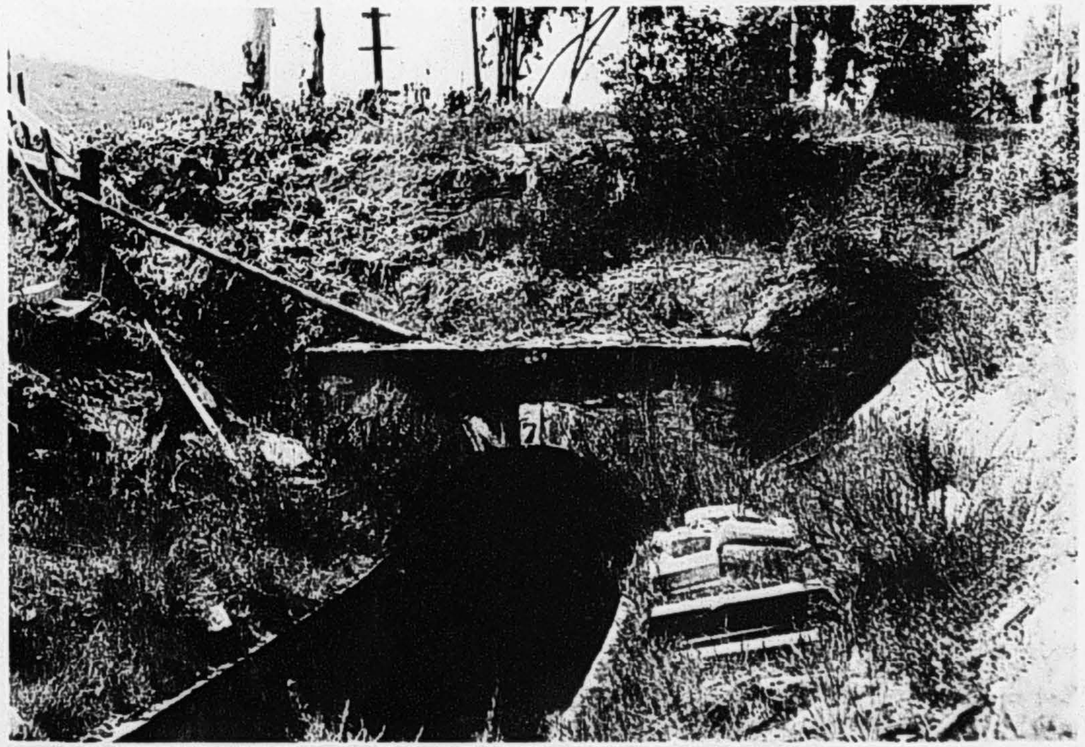


Fig. 2. Upper portal of Lankershim Tunnel.

water supply would be available for these riparian owners after modifying their present pumping equipment, it is possible that, before the District is under complete development, the outside service can, to a considerable extent, be eliminated - a condition greatly to be desired.

DUTY.

Fortunately a record of the duty of water for irrigated areas actually within the La Mesa, Lemon Grove and Spring Valley Irrigation District is available. Some months ago, in connection with an investigation of another irrigation district and at my request, Mr. Faude prepared a statement of the duty for the area irrigated by the Cuyamaca Water Company, including the irrigated area of La Mesa, Lemon Grove and Spring Valley Irrigation District. The area reported upon is one which is planted in mixed crops similar to those which will be grown in the District after it is completely developed. The following is quoted from Mr. Faude's statement:

> "On the Cuyamaca Water System the areas irrigated and various crops raised were determined by actual field surveys in 1913 and 1914. This survey covered several months and cost the Company nearly $5,000 for surveys, computations and platting. The net areas irrigated and crops raised were as follows:

	Area Irrigated in Acres			
Crop	Low Service	High Service	Flume Service	Total
Olives ----------	3	198	153	354
Deciduous Fruits ---	22	56	138	216
Grapes ----------	0	1	604	605

Citrus Fruits ------	196	926	1092	2214
Alfalfa ----------	0	12	40	52
Vegetables ---------	52	82	71	205
Ornamental, etc. ---	20	21	38	79
Total ----------	293	1296	2136	3725

The Low Service Area includes lands lying between the limits of the City of San Diego and Old La Mesa. The two Mansur 5 acre tracts are on the easterly edge of the Low Service Area.

The High Service Area includes lands lying between Old La Mesa and Eucalyptus Reservoir. The La Mesa, Lemon Grove and Spring Valley districts are included within the High Service Area.

The Flume Service Area includes all lands east of the Eucalyptus Reservoir and are all served direct from the Company's flume.

While the surveys referred to above were made in 1913-1914 conditions have changed but little since that time and the total areas irrigated will not be materially affected. The areas in citrus fruits, deciduous fruits, olives and grapes are practically the same and practically the only changes will be found in the other crops whose total areas are small.

Owing to the mixed character of crops on lands under irrigation under the system, it will be impossible to give duties of water for any particular crop, such as oranges, lemons, olives, etc., except in isolated cases. The duty of water for the system will therefore have to be worked out as an average one covering all crops.

The duty of water for 1915 was as follows:

	Low Service	High Service	Flume Service	Total
Water delivered acre feet -------	260	1235	1642	3137
Acres Irrigated ---	293	1296	2136	3725
Depth of Water applied acre feet per acre --------	0.89	0.95	0.77	0.84

A full supply of water was furnished in 1915.

The duty of water for 1916 was as follows:

	Low Service	High Service	Flume Service	Total
Water delivered acre feet -------	277	1297	1782	3356

Acres Irrigated ---	293	1296	2136	3725
Depth of Water applied acre feet per acre --------	0.95	1.0	0.83	0.90

A full supply of water was furnished in 1916 except for a short interruption after the floods of January 1916. This interruption was, however, for so short a period and came at a time when the ground was so saturated that the total supply for the year was not appreciably affected.

From an inspection of the computations for duty of water in 1915 and in 1916, it is seen that the use on the flume line is less per acre than on either the high or low service areas. This is explained by the fact that some of the flume line consumers have pumping plants which are operated occasionally. Such operation in 1916 was almost negligible. No definite figures are available to show the actual quantities pumped as the owners of the plants keep no reliable records.

The duty on the high service area in 1915 was 0.18 acre feet more than on the flume service area and in 1916 was 0.17 acre feet less.

If 0.18 acre feet is added to the flume service use to compensate for pumped water from private plants, the 1916 figures become:

Low Service Area ---------	1.00	acre	feet	per acre.
High " " ---------	0.95	"	"	" "
Flume " " ---------	1.01	"	"	" "
Average for entire system-	1.00	"	"	" "

On April 1st, 1917, a new schedule of rates went into effect. Under the old rates the irrigator paid at the rate of $65 per year per miner's inch (630,720 cubic feet) for water delivered on the flume and $70 per year per miner's inch for water delivered on the low and high service districts. Each consumer had a certain allowance each month which he could use but not exceed and for which he paid whether he used the water or not. Under the new rates the irrigator pays $4.00 for the first 2,000 cubic feet and for all additional water used, 2-1/2 cents per 100 cubic feet with no restrictions as to minimum or maximum use.

The result has been that use has decreased 27% for the first eight months of operation under the new rates as compared with the corresponding months of the previous year. The table below shows the comparative records:

Month	Use Under Old Rates Year 1916 Irrigation use in Thousand Cu. Ft.	Use Under New Rates Year 1917 Irrigation use in Thousand Cu. Ft.	Percent of Decrease
April	16,649	6,883	59
May	17,896	7,386	58
June	16,087	12,806	20
July	20,304	17,969	12
August	17,507	15,380	12
September	15,659	12,930	17
October	12,133	12,945	# 7
November	14,075	8,356	41
	130,310	94,655	27

- Increase

The decrease shown above is in spite of the fact that the year 1917 has been one of considerably less rainfall than 1916. It is expected by the Company officials that the winter use under the new rates will be considerably less than in 1916.

It is unquestionably true that the new rates will operate to decrease the use of water for irrigation and that the average compensated use for 1916 of 1 acre foot per irrigated acre over the entire system will in 1917 amount to at least 20%, giving an average annual use of water on the entire system of approximately 0.80 acre feet per irrigated acre."

Mr. Faude's statement includes the net irrigated area, but this does not, therefore, include rough, broken or waste lands or dedicated streets or roads.

In reporting upon the probable duty of water for Cardiff Irrigation District, Mr. Frank Adams, of the U. S. Department of Agriculture, recently stated:

> "The Escondido Mutual Water Company, in the irrigation census of 1909, reported a gross project duty of 0.99 acre foot per acre. Mr. J. E. Boal, manager of the Sweetwater Water Company, stated to both Mr. Tait and Mr. Veihmeyer, that his company has found 350,000 gallons per acre (1.07 acre feet) sufficient for citrus orchards, although the amount used by the different irrigators varies somewhat from the usual averages."

The data enumerated applies to areas of mixed crops located in

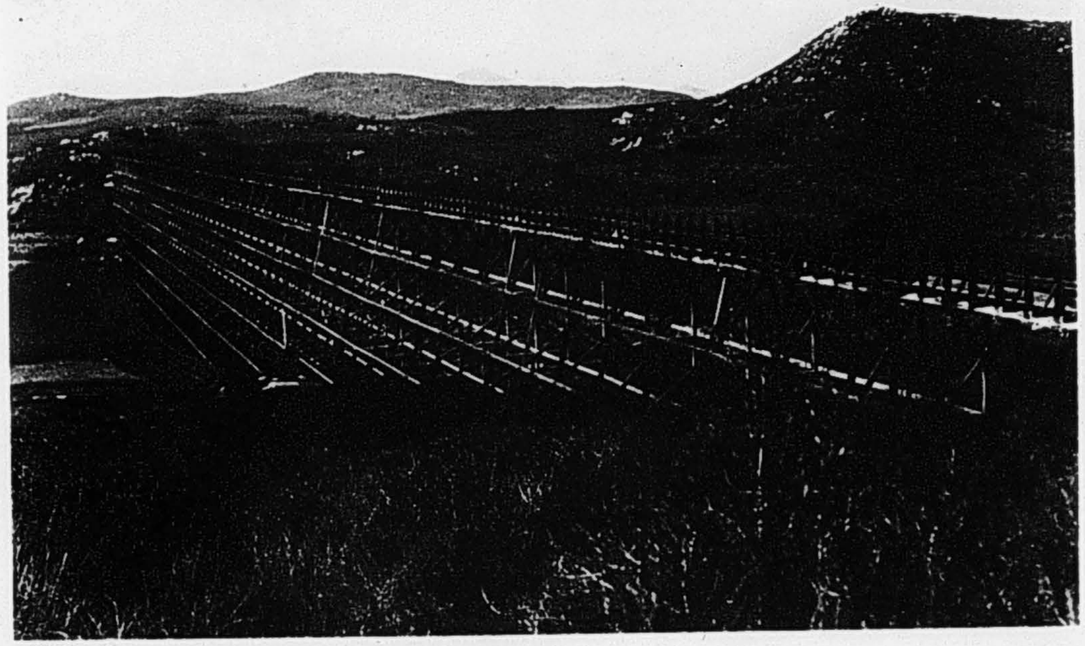


Fig. 1.

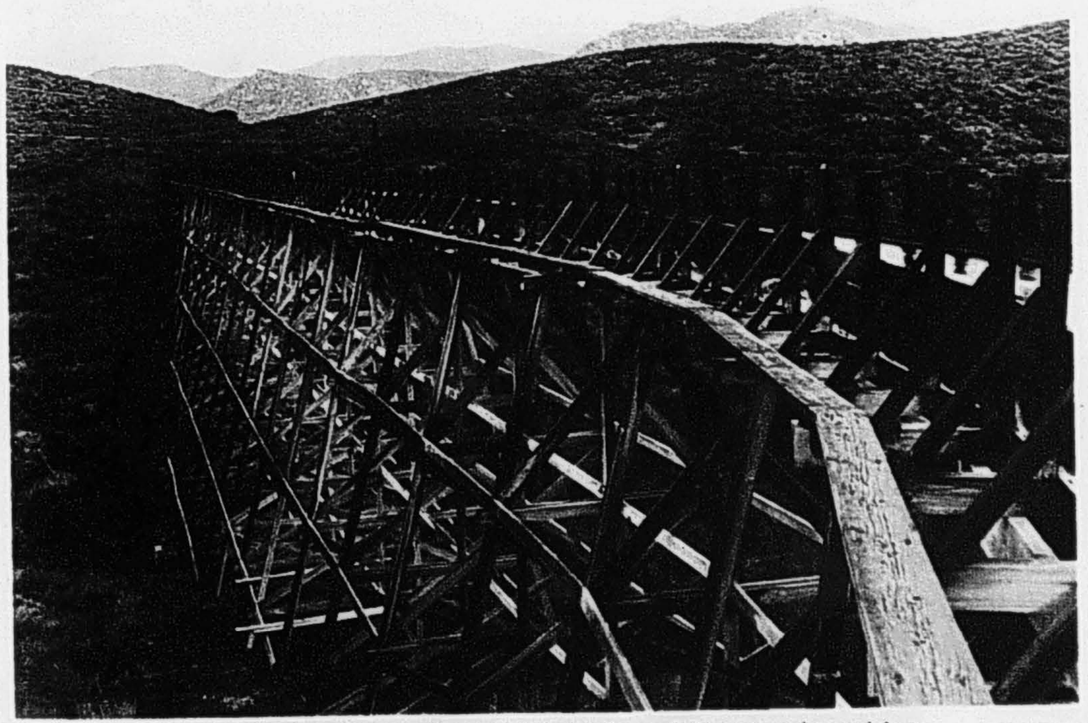


Fig. 2. Typical views of high trestle construction.

part within the District and entirely comparable to the District when completely developed. In addition to this data, I have personally examined all of the area included in the District. I consider 1.0 acre foot per acre, net area, necessary to produce the best results in this District.

AREA AND BOUNDARIES.

The gross area of the District is 14,794 acres. The boundaries are quite irregular as shown by the map of Plate 1. Some of the south slope of Mt. Helix, which is included within the District, is too rough for irrigation or successful cultivation. This is also true of certain other smaller hills which have been included. After considering these features and the fact that much of the District will be sub-divided into small home sites, with consequent large proportion of roads and streets, I find that an assumption that 60% of the gross area will be the maximum area irrigated during any one season is in accordance with the practice in other Districts where conditions have actually been investigated.

DRAINAGE.

As previously noted, small areas in swales will, when the District is completely irrigated, probably need some drainage, but this problem is so small and the

topography makes its solution so simple that it needs no particular attention.

WATER RIGHTS.

The original appropriations for those waters from the San Diego River which are utilized by Cuyamaca Water Company were made by its predecessor, the San Diego Flume Company.

On May 28, 1886, San Diego Flume Company filed a notice appropriating all the waters of the San Diego River at the head of Boulder Creek to the extent of 6,000 miner's inches measured under a four-inch pressure. The notice states that the water "is appropriated, claimed and intended for irrigation and domestic use and mechanical purposes." The notice continues as follows: "The places where it is intended to use said water are the city of San Diego, Ex-Mission Rancho, and Rancho of El Cajon."

On June 29, 1886, San Diego Flume Company posted a notice appropriating all the waters of the south fork of the San Diego River to the extent of 4,000 miner's inches measured under a four-inch pressure. The notice of appropriation states that "said water is appropriated, claimed and intended for irrigation and domestic use and mechanical purposes." The notice continues as follows: "The places where it is intended to use said water are the city of San Diego, Ex-Mission Rancho, Rancho of El Cajon and

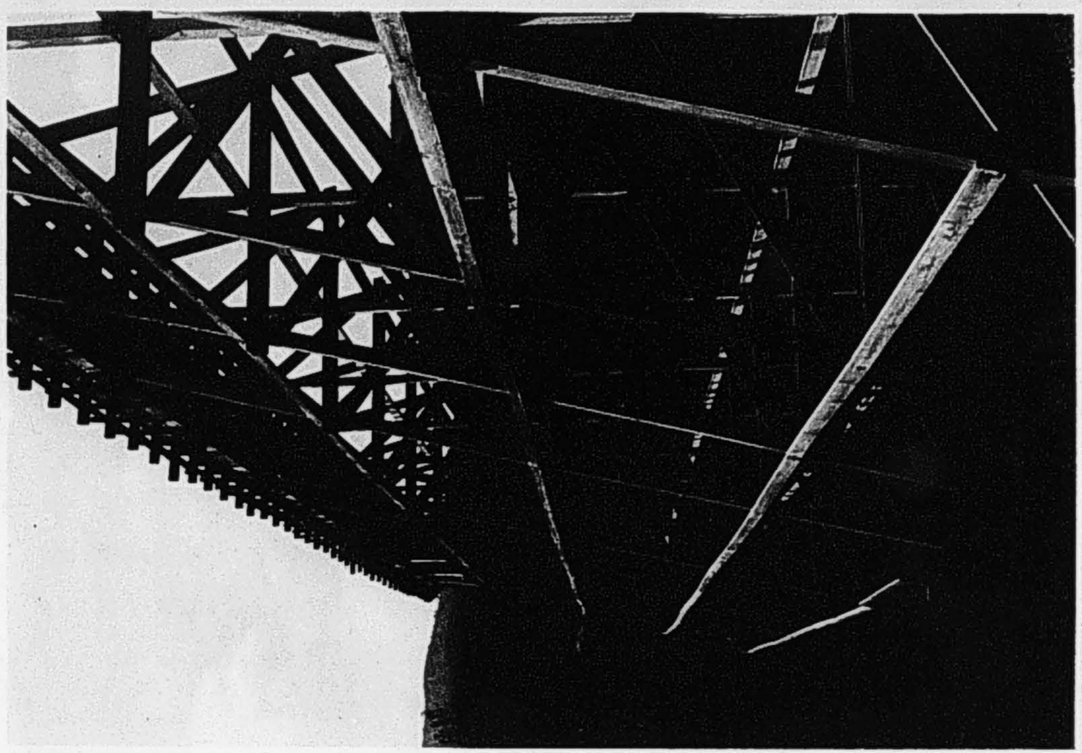


Fig. 1.

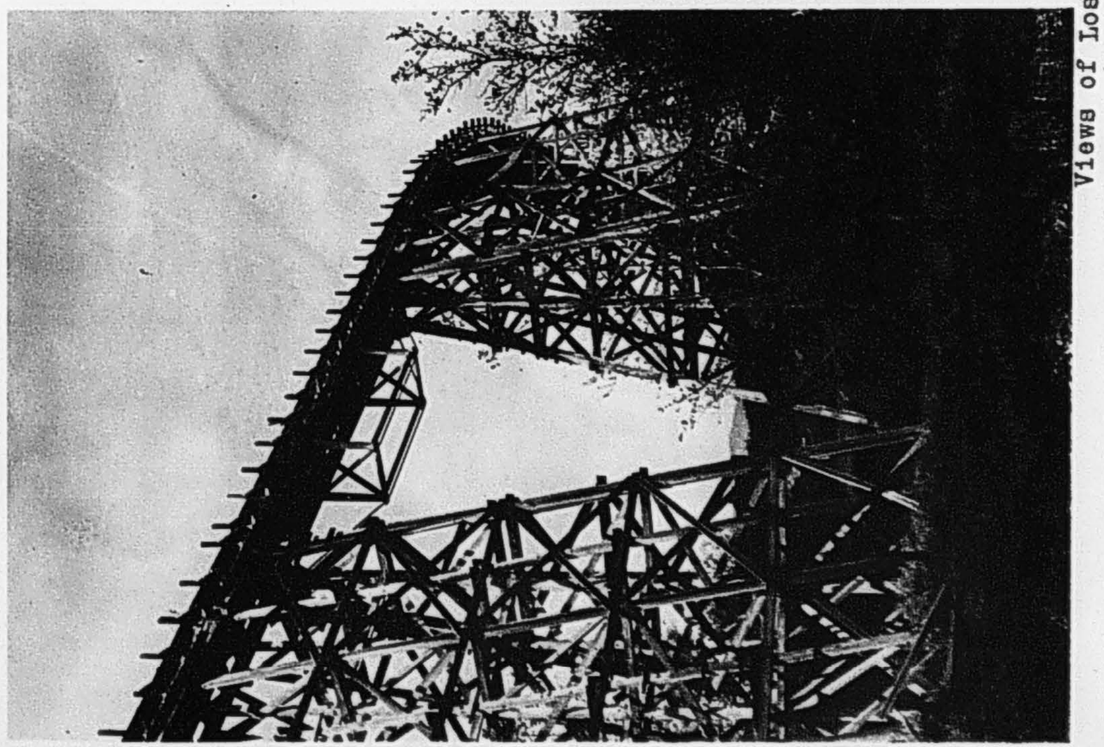


Fig. 2.

Views of Los Coches Trestle.

other places between the point of diversion and the seaboard."

On July 31, 1886, San Diego Flume Company posted a notice appropriating all the waters of Boulder Creek to the extent of 2,000 miner's inches measured under a four-inch pressure. The notice states that "said water is appropriated, claimed and intended for irrigation and domestic use and mechanical purposes." The notice continues in part as follows: "The places where it is intended to use said water are the city of San Diego, Ex-Mission Rancho and Rancho El Cajon."

Work was begun on the San Diego Flume and related works immediately upon the posting of these notices. These works were completed within the next couple of years and water was then continuously diverted and has been, except for short periods during which repairs were being made, until the present time. The amount diverted has varied. At the present time the capacity of the flume is 31 second feet.

On June 10, 1910, after the system had been acquired by Murray and Fletcher, notices were posted in their behalf and since this date it appears that continuous expenditures for development work have been in progress. The facts in this regard have not long since been informally investigated by the State Water Commission at the Company's request. The appropriation of June 10, 1910, which was made in behalf of Murray and Fletcher, was made by B. Otterstedt.

and claim was made to "all the flood water of the San Diego River, and all surface and subterranean water of said river, not otherwise appropriated, flowing at the point where this notice is posted to the extent of 100,000 miner's inches, measured under a four-inch pressure". The point of diversion was given as at or near the dam known as Diverting Dam; the purposes for which the water was claimed were "primarily for domestic and irrigation purposes"; and the place of intended use was named as "on lands lying between the point of diversion westward to the Pacific Ocean". It appears that the rights of Cuyamaca Water Company under the notices here enumerated are fully protected. However, a suit brought by lower riparian owners some years back but never prosecuted has not yet been formally dismissed. Negotiations are now pending between some of these riparian owners and the Company whereby the State Water Commission shall act as arbitrator to determine whether or not any damages are suffered by the lower riparian owners due to the Company's future developments, in which case the Commission will prescribe remedial measures.

In addition to the appropriations above mentioned, the Cuyamaca Water Company owns or controls various riparian rights along the entire length of San Diego River from immediately below the mouth of the South Fork to the city of San Diego, particularly those from Monte pumping plant to Mission Gorge. While it does not control by

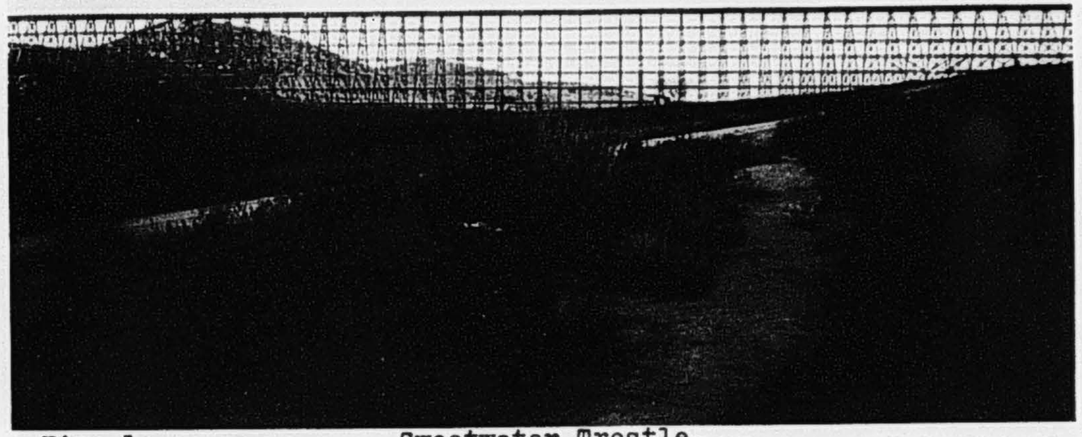


Fig. 1. Sweetwater Trestle.

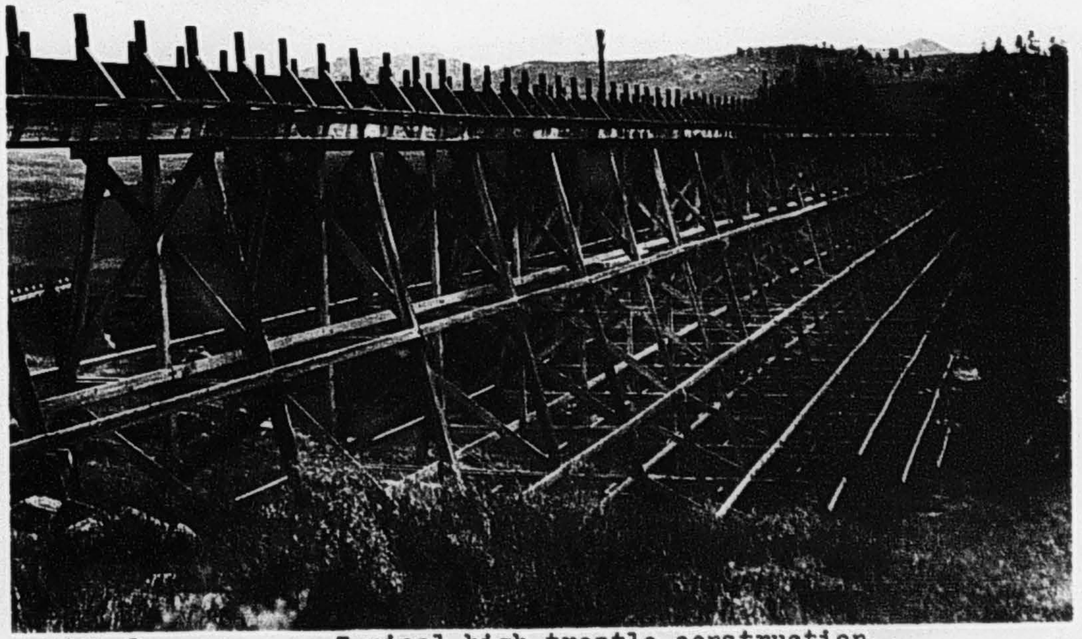


Fig. 2. Typical high trestle construction.

any means all of the riparian rights along the river, the rights which it does control are a very substantial asset in connection with the use of its auxiliary pumping plants which are used as an insurance during periods of drought. As has been shown in a previous description, the La Mesa, Lemon Grove and Spring Valley Irrigation District will find it necessary to draw upon the gravels along the San Diego River more heavily than the Company has in the past if, in addition to the complete development of the District, present outside consumers must still be served.

IRRIGATION WORKS.

Cuyamaca Water Company's System:

As has already been shown, the District will, after acquiring the works of Cuyamaca Water Company, depend entirely upon them for its water supply except for some additional pumping reserves which may be found necessary during extreme periods of drought after the District is completely developed. This system consists of Cuyamaca Reservoir, which is located in the mountains at the head of Boulder Creek, a tributary of San Diego River, at an elevation of 4,600 feet above sea level. This reservoir has a maximum capacity, including the use of flash boards in the spillways, of 14,075 acre feet, and maximum flooded area of 1,086 acres. Its capacity is sufficient to regulate, so far as economic considerations warrant, all of

the run-off from the tributary area, including an additional area of a few square miles made available by a feeder ditch known as the Kelly Ditch. It is formed by an earth dam which was first built, to somewhat less than the present height, about 1886. At practically its present height, it withstood the unprecedented flood of 1916. Two spillways, one around either end, carried this great flood without permitting the dam to be overtopped. A masonry outlet tunnel and tower of substantial construction have been provided. The dam is clearly shown in the views of Plate 4. From this reservoir, water is allowed to flow down Boulder Creek some 12½ miles to San Diego River, and immediately below the junction of Boulder Creek and the San Diego River it, with much of the flow of San Diego River, is diverted into the Company's flume.

The diverting dam (see Plate 10) at the head of the Company's flume is constructed of masonry (rubble and concrete). It is a substantial structure and serves adequately for diversion purposes. It at one time had a ponding capacity of sixty odd acre feet, but this is now practically filled with silt. The width of the gorge at this point makes this dam a long and rather costly one, considering its moderate height. It is 340 feet long. It is not now possible to observe the full section of the dam as much of it is buried, but Mr. James D. Schuyler, writing in 1900, after making exhaustive investigations for the U. S. Government, stated:

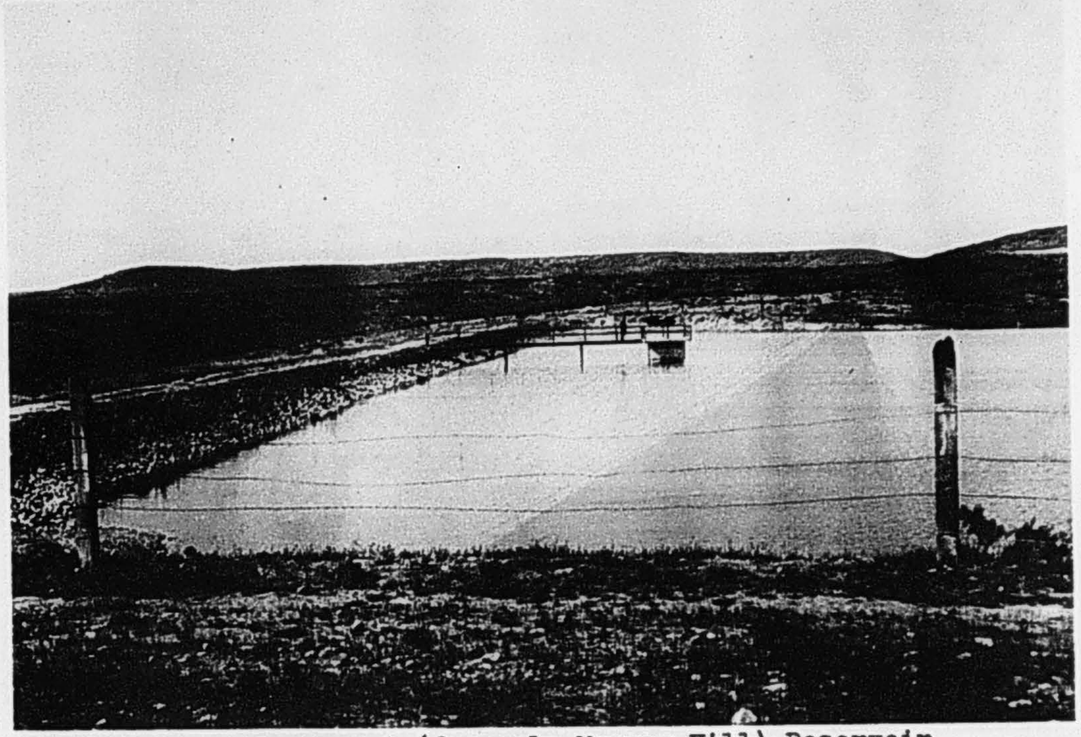


Fig. 1. Grossmont (formerly Murray Hill) Reservoir.

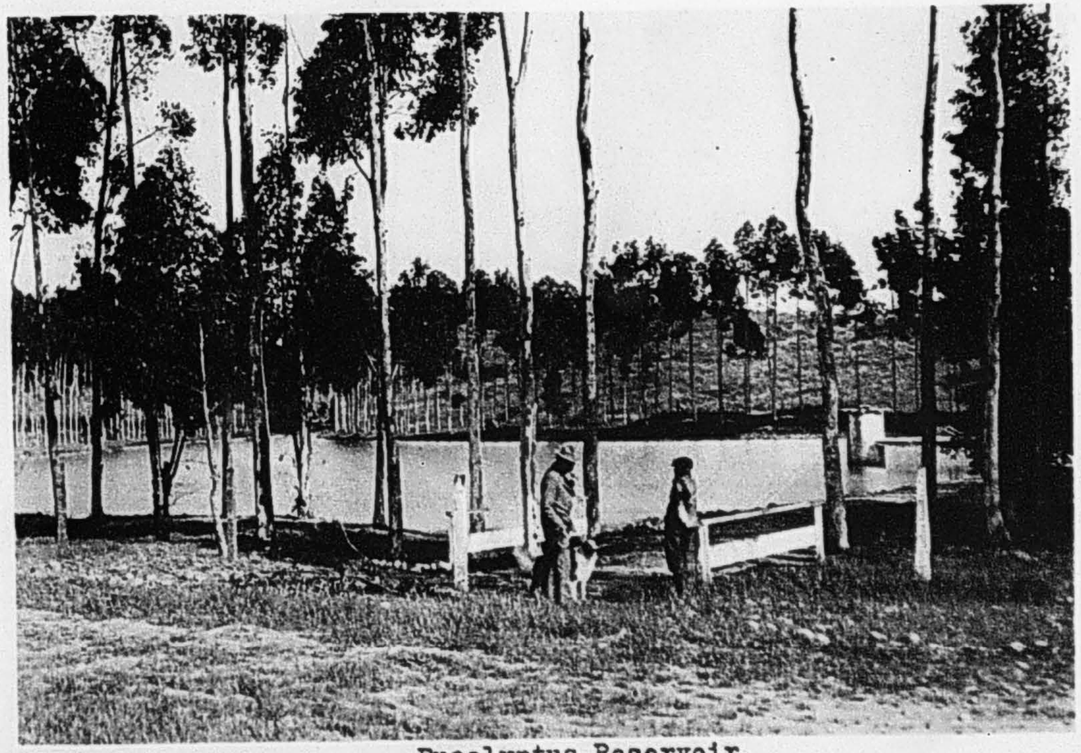


Fig. 2. Eucalyptus Reservoir.

"This diverting dam is 340 feet long on top, 35 feet high, 22 feet thick at base, 5 feet at the crest. To cut off leakage under the dam, a subwall was built on the upstream side in the main channel, lapping onto the base of the dam and extending down 15 feet deeper. This wall is 5 feet thick at bottom. The original wall had been founded on disintegrated granite. The subwall was built in a trench that cut deeper into the soft granite, but was not entirely effectual in stopping the leakage."

The Company's flume has a length of 31.4 miles from Diverting Dam to Eucalyptus Reservoir, and in this length are eight tunnels aggregating 0.8 miles in length. In general, it has an inside width of 6'-0". It formerly had an inside depth of 1'-2", although it was built to have additional side boards which might give it an inside depth of 3'-6", or thereabouts. An additional 8" side board has been added, giving a maximum inside depth of 1'-10". This depth, when the flume is brought up to a uniform slope, has given a carrying capacity of 31 second feet. From my studies of available water supply, I find that this capacity is well suited to the needs of the system as determined by the available water supply and by economic considerations. In other words, the use of additional side boards is not warranted, but the present capacity is all necessary and desirable. Throughout most of its length, the flume is constructed upon a bench graded along the mountain side (see Plate 13). Short sections of metal flume have been substituted in recent years, but their use is not general. Many high trestles are used to cross side canyons and valleys (see Plates 15, 16 and 17). This construction is not in accordance with modern practice,

which would prescribe the use of siphons instead of high trestles. The Company has, in late years, substituted siphons for those flumes which had suffered most depreciation, notably Sand Creek and Chocolate Siphons (see Plate 11). Two of the largest trestles remaining are Los Coches and Sweetwater, each of which is approximately 70 feet in maximum height. When the flume was acquired by its present owners it was leaking badly, but this condition has been overcome by the application of a lining of 2 ply prepared roofing. This lining has been very serviceable and has, in fact, exceeded all expectations. Tunnel sections have been lined with masonry to a point above the water line. The roof of the section is, in general, supported by concrete or by timbering. The portals of these tunnels are constructed of neat cut stone masonry (see Plate 14).

Near the lower end of the flume a 36" concrete pipe line branches off to Grossmont (formerly Murray Hill) Reservoir. This reservoir was formed by the construction of an earth dam in 1911. It has a capacity of only 127 acre feet. This capacity is too small to be considered in storage studies but is, nevertheless, very necessary at the end of the long flume for an insurance against short interruptions or to meet sudden demands in excess of the flow to which the flume is at any time regulated to supply. Earth suitable for the construction of this dam was not plentiful at the site, and such earth as was available was mixed with boulders, making construction costly.

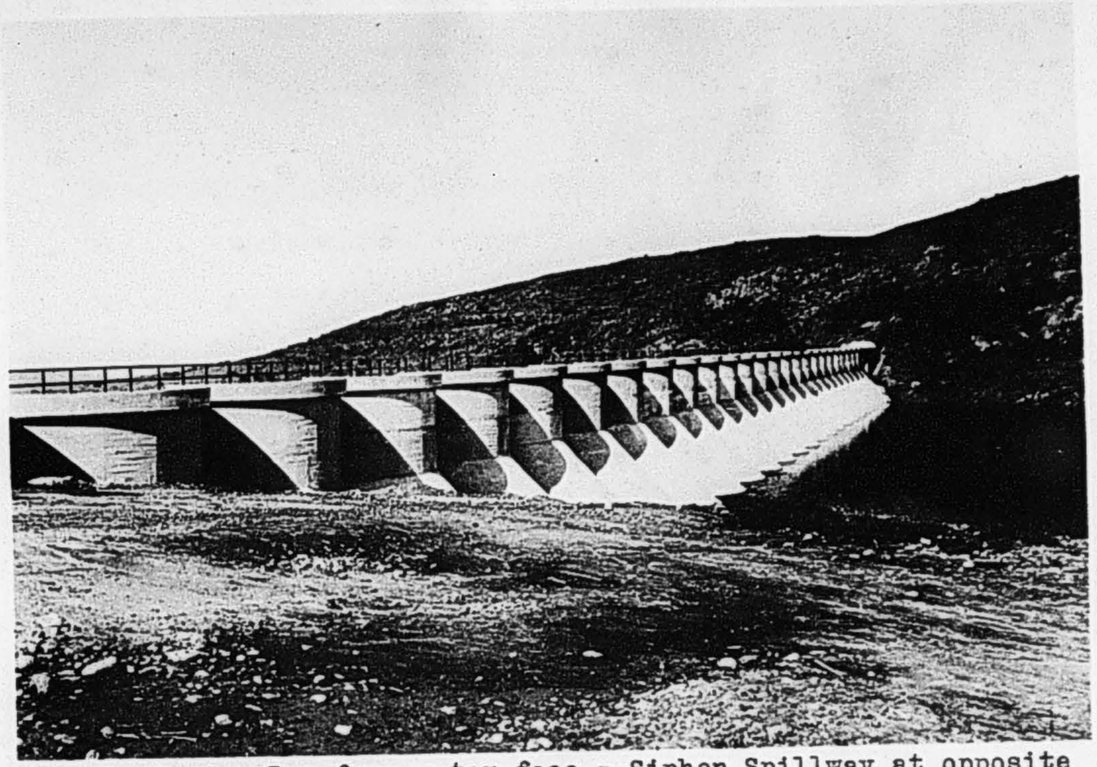


Fig. 1. Murray Dam from water face - Siphon Spillway at opposite end - former La Mesa Dam completely submerged.

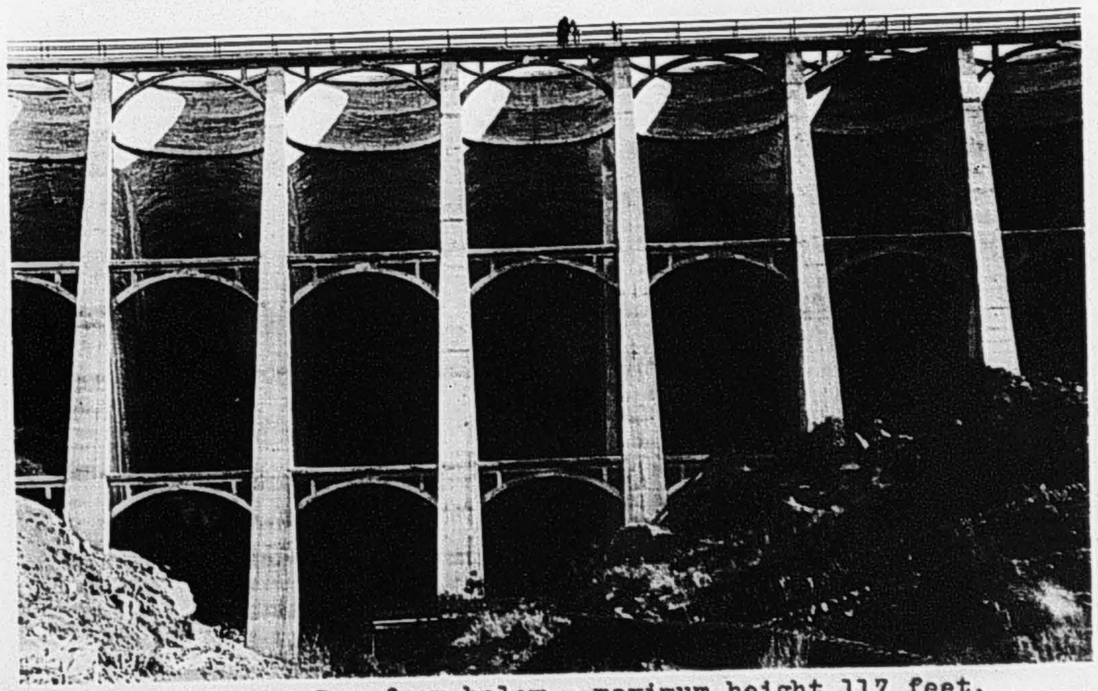


Fig. 2. Murray Dam from below - maximum height 117 feet.

Grossmont Reservoir is connected by a pipe line with Eucalyptus Reservoir which is at the end of the flume. The water levels of the two reservoirs are approximately at the same elevation and water runs from one to the other with changes of level.

Eucalyptus Reservoir at the end of the flume has a capacity of only 26 acre feet. It is also formed by the construction of an earth dam. From the flume at Eucalyptus Reservoir water is carried to Murray (formerly La Mesa) Reservoir through La Mesa Ditch, an earth ditch.

Murray Reservoir is formed by the construction of a new reinforced concrete multiple arched dam. This dam is composed of 30 arches of 30 foot span, has a total length of 900 feet and maximum height of 117 feet. It provides a storage capacity of 6,750 acre feet. Its construction was begun in April 1917 and completed in January 1918 and was performed under the general requirements of the State Railroad Commission of California. It is well shown by the photographs of Plate 19. The construction of this dam completely submerged the earth dam known as La Mesa Dam which had been in service since 1895. The storage afforded by Murray Reservoir is not well suited for supplying the area included within the boundaries of La Mesa, Lemon Grove and Spring Valley Irrigation District, but, nevertheless, the storage of this quantity of water in close proximity to the District is very desirable. A limited area of the District can be supplied by gravity,

and with a moderate pumping lift, much of it can be supplied.

The Cuyamaca Water Company's distribution system really begins at Eucalyptus Reservoir. The principal line leads through La Mesa and via El Cajon Avenue to Normal Heights, Kensington Park and East San Diego. All of these latter areas are directly east of the City of San Diego and are west of and below the Irrigation District - they comprise an important part of the outside service which the District must continue if it acquires the Company's system. A considerable area within the District is now served from the Company's mains through distribution systems owned by land owners who operate them under mutual organizations.

Necessary Future Construction:

In addition to those parts of Cuyamaca Water Company's system which are constructed and in operation, it is necessary, in order to meet the demands which will be imposed by the addition of the demand for complete irrigation of the District, to construct certain other contemplated works.

Additional storage at the head of the Company's flume is essential, and this may be had immediately above the diverting dam on San Diego River at a site where Fletcher Reservoir has been proposed. This site is on San Diego River immediately above the mouth of Boulder Creek, consequently it will be necessary to also construct a conduit of large carrying capacity to make the floods of Boulder Creek available for storage in Fletcher Reservoir. The Company has had

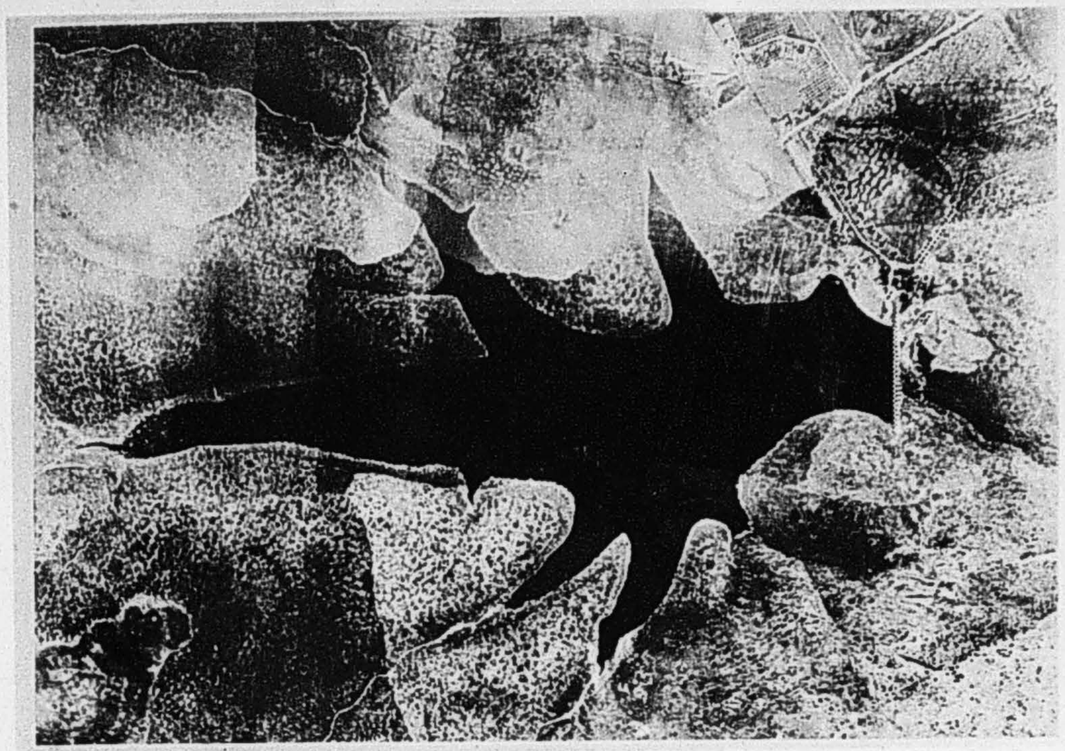


Fig. 1. Aeroplane view of Murray Reservoir from an altitude of 5200 feet.

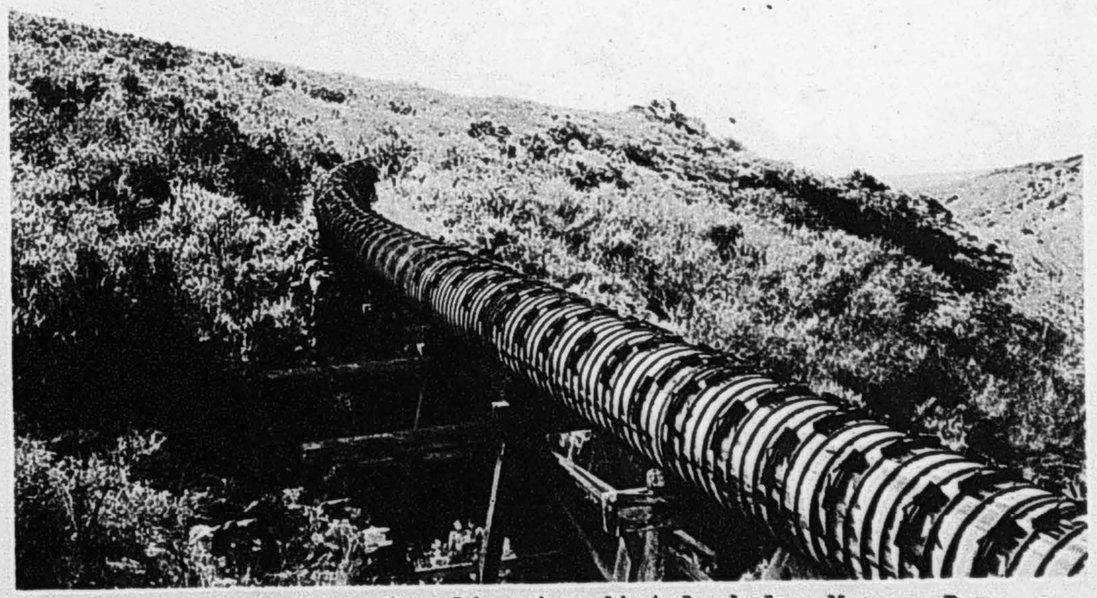


Fig. 2. Woodstave pipe line immediately below Murray Dam.

plans prepared for a reinforced concrete multiple arched dam approximately 150 feet in maximum height which will afford a storage capacity of 17,106 acre feet. These plans are based upon assumptions as to foundations since explorations of the foundation underlying the site have not been made.

After Fletcher Reservoir has been constructed, it will be desirable and necessary to rebuild the South Fork Feeder with capacity equal to that of the main flume (31 second feet) and, next, to construct Conejos Reservoir. Conejos Reservoir, which is to be located on Conejos Creek, will have a capacity of only 1,680 second feet, a capacity too small to be effective for seasonal storage but yet sufficient to withhold flood rushes until they can be diverted through the enlarged South Fork Feeder to the Main Flume. After the construction of these additional works, the system would be operated by making no draft upon Fletcher Reservoir while sufficient flow is available from South Fork to meet the demands of the system.

It will also be necessary, in order to adequately serve the District, to build a rather extensive distribution system in addition to any existing works of Cuyamaca Water Company or of any of the mutual organizations. Unfortunately, 22.6% of the entire area is too high to be served by gravity from the system of Cuyamaca Water Company and, in order to serve this high portion of the District, pumping must be resorted to.

A gross area of 1,586 acres at the north end

of the District is connected to the main body only by a narrow neck of land. In this area some of the finest lands are located, but, unfortunately, practically all of them lie at too great an elevation to be served from the Cuyamaca system, or from any other source of supply, by gravity. To supply this area most economically, a pumping plant must be installed at Grossmont (formerly La Mesa) Reservoir with pressure main extending through the area from east to west.

Other areas in the eastern portion of the District, south and southeast of Mt. Helix, are too high to be served by gravity from Cuyamaca Water Company's system, and the service of other areas through mains beginning below the end of the flume is indirect and troublesome. To solve these difficulties, a new conduit should be constructed from the Sweetwater trestle, which carries Cuyamaca Water Company's flume over a saddle in the divide between the watersheds of San Diego and Sweetwater Rivers. This conduit should lead along the southerly or Sweetwater side of the divide, entering the District across its most easterly line. It would afford a gravity supply for the lower lands of this easterly portion of the District and, continuing, would also afford a gravity supply for the southerly portion of the District, including Spring Valley. A single pump located near the point at which this conduit enters the District could be made to serve a pressure main reaching an area of high but very fertile lands southwest of Mt. Helix and another pressure main reaching most of a high area a little

farther south. The higher portions of the south slope of Mt. Helix are too rough for intensive cultivation and will be used only for residence. Their supply for domestic and gardening purposes can be obtained from an extension of the works now operated by Cuyamaca Water Company for supplying Grossmont or a separate similar but independent system.

Thus all of the District, with the exception of the top of a small hill directly west of Spring Valley, can be included in the District's service. The inclusion of this hill will require an additional pumping plant which I have not considered as part of the District's works.

VALUE OF IRRIGATION SYSTEM.

Cuyamaca System:

In valuing the system of Cuyamaca Water Company for sale to La Mesa, Lemon Grove and Spring Valley Irrigation District, I shall consider the property under three subdivisions: lands, physical structures, and water rights. After careful consideration, I have intentionally included no going concern value. It is well established that in many cases such value must be allowed, but in the case of Cuyamaca Water Company and its predecessor, the San Diego Flume Company, continued inability to earn operating expenses, to say nothing of an adequate return upon invested capital, must largely depreciate such possible value. I will consider the value of the property under separate

headings as outlined above.

Lands: The Company has submitted an appraisal of real estate to be transferred with its system totaling $333,402. With this appraisal I am not in accord either as to unit prices or as to the property which should be acquired by the District.

For instance, the so-called Kuehner Property has been included. This property includes the El Capitan dam site which must, according to an Act of Congress approved February 28, 1919, be acquired by the City of San Diego if it is to proceed with its El Capitan project on San Diego River. This act is so drawn as to protect the Cuyamaca Water Company, or its successors, in the enjoyment of their rights to the use of the waters of San Diego River, consequently it has not been considered as a menacing adverse claim in reviewing water rights. However, it does directly affect the so-called Kuehner Property, which must be acquired by the City of San Diego by condemnation, or other-wise, before it can make any use of the grant by Congress. This property was acquired by the owners of Cuyamaca Water Company, no doubt, because of its possible value as a dam site. However, the completion of the Company's development, including Fletcher Reservoir, will, in accordance with its rights which are protected by the Act of Congress, provide for such complete utilization of the flow of San Diego River as to leave no water available for storage at this site for long periods of successive years (see previous section on Water Supply and Tables 13 and 14 of Appendix

A). Indeed, the water supply which will then be available for storage at this site is so limited and uncertain that I consider the lands of no value to the District for purposes of water supply. Consequently, I have refused to include them in my appraisal. Likewise, I have refused to include the lands embracing the Poverty Gulch Reservoir site, a proposed reservoir upon a tributary of the South Fork of San Diego River.

My appraisal of lands and rights of way which should be acquired with the Cuyamaca Water Company's property is as follows:

Item	Parcel	Area (acres)	Unit Price	Value
1.	Cuyamaca Reservoir	1074.	$100	$107,400
2.	Kelly Ditch	50.	25	1,250
3.	Diverting Dam (easement)	8.	25	200
4.	El Monte Pumping Plant:			
	Valley	7.06	300	2,118
	Hillside	.79	50	40
5.	Main Flume rts. of way to Tunnel #6	136.29	25	3,407
6.	Main Flume rts. of way Tunnel #6 to Eucalyptus	91.50	100	9,150
7.	Murray 36" Supply Line	.47	100	47
8.	La Mesa Ditch Line	22.25	100	2,225
9.	Webster Reservoir	.14		50
10.	Grossmont Resvrs. 1, 2, 3 and 4	.41		200
11.	Miles Res. #1	3.42	200	684
12.	Miles Res. #2	.42	400	168
13.	Miles Pumping Plant	.25	400	100
14.	Grossmont (formerly Murray Hill)	15.7	100	1,570
15.	Murray Eucalyptus Siphon (rt. of way)	1.19	200	238
16.	Eucalyptus Reservoir	4.71	150	706
17.	Eucalyptus Lands (condemned)	2.	688	1,376
18.	Murray Reservoir:			
	Owned	119.71	200	23,942
	Floodage rt.	120.	85	10,200
19.	La Mesa Pipe Line	2.05	150	307
20.	Normal Heights shop	.273		300

21.	Rt. of way across all La Mesa Colony	$ 7,500
22.	Conejos Reservoir rights	4,000
23.	All franchises from County, Municipalities, etc.	----
Total Value of Land, Rights of Way and Franchises		$177,178

In valuing lands occupied by reservoirs or other structures I have not been unmindful of the principle that lands peculiarly valuable for reservoir purposes or some other special purpose must be valued for that particular purpose, not necessarily for some other less important use. This principle was established as early as 1879 by a decision of the U. S. Supreme Court in the case of Boom Company vs. Patterson, (98 U.S. 403). This was a case in eminent domain for the condemnation of certain small islands in the Mississippi River peculiarly adapted for the construction of a boom. The jury rendered a general verdict assessing the value of the land at $9,358.33, but accompanied it with a special verdict assessing its value aside from any consideration of its value for boom purposes at $300, and, in view of its adaptability for this purpose, a further and additional value of $9,058.33. The court reduced the verdict to $5,500. The plaintiff brought the case on writ of error to the Supreme Court of the United States where the judgment was affirmed. The following is quoted from the decision of the United States Supreme Court:

> "In determining the value of land appropriated for public purposes, the same considerations are to be regarded as in a sale of property between private parties. The inquiry in such cases must be what is the property worth in the market, viewed not merely with reference to the uses to which it is at the time

applied, but with reference to the uses to which it is plainly adapted; that is to say, what is it worth from its availability for valuable uses? Property is not to be deemed worthless because the owner allows it to go to waste, or to be regarded as valueless because he is unable to put it to any use. Others may be able to use it, and make it subserve the necessities or conveniences of life. Its capability of being made thus available gives it a market value which can be readily estimated.

"So many and varied are the circumstances to be taken into account in determining the value of property condemned for public purposes, that it is, perhaps, impossible to formulate a rule to govern its appraisement in all cases. Exceptional circumstances will modify the most carefully guarded rule; but, as a general thing, we should say that the compensation to the owner is to be estimated by reference to the uses for which the property is suitable, having regard to the existing business and wants of the community or such as may be reasonably expected in the immediate future."

There are numerous later decisions of the courts which uphold all of the principles of law stated in this leading case (Minnesota Rate Cases, 232 U.S. 352, etc.). With this principle in mind, after carefully considering the value of lands in question for other purposes, as well as those to which they have been devoted, I have derived the above values.

Certain rights of way, such as that for the upper portion of the flume, occupy both government lands over which easements were secured and lands in private ownership through which rights of way were purchased. The figure of $25 per acre is used in this case as an average of the cost of engineering and legal expense connected with the securing of easements from the government and the actual purchase of rights of way in other cases. It is in accordance with experience elsewhere. Certain franchises were obtained from

the county and from municipalities without cost, and these I have not appraised in my valuation.

Physical Structures: In arriving at a fair value of the physical structures of the Cuyamaca Water Company, I have, as one line of evidence, very carefully prepared an estimate of the reproduction cost of these structures, the accrued depreciation, and, finally, their reproduction cost less depreciation. A summary of this estimate is contained in Appendix B of this report. The estimate has, in its preparation, required both field inspection and tedious office compilations which together have consumed many weeks of time. As noted on the summary sheet, page B-1, the total reproduction cost of physical structures is $1,960,661 and the reproduction cost less depreciation of these structures is $1,136,983. As already stated, this estimate was prepared merely as one line of evidence to aid in determining the fair value of the property. In considering this evidence, certain other considerations should be borne in mind.

It has been contended that the capacity of the flume, 31 second feet, is greater than necessary and that some unnecessary investment is therefore included. I do not find that this capacity is greater than will be required by the completely developed system of Cuyamaca Water Company, but, on the other hand, this entire capacity is well suited to the requirements of the completely developed system. However, the flume was designed for the addition of more side boards and this addition is unwarranted. This provision, however, influ-

enced the design so that for its present capacity the ratio of width to depth is greater than would be dictated by economic and hydraulic considerations. Some lumber would be saved by the substitution of a design which did not provide for these additional unnecessary side boards and a still greater saving would be accomplished by the narrower bench with consequent decreased excavation. After carefully considering these conditions, I am convinced that $125,000 is a fair figure to be subtracted from the reproduction cost, and $108,000 from the reproduction cost less depreciation, in order to properly allow for their effect.

For the completed project required by La Mesa, Lemon Grove and Spring Valley Irrigation District, the South Fork Feeder with its present limited capacity will be useful only until Fletcher Reservoir is completed - for a period of two years, I will assume. It must then be completely rebuilt, only the bench on the hillside remaining useful. For this reason in valuing this feeder for purposes of sale to the District as a portion of its proposed complete system, the reproduction cost less depreciation included in Appendix B should be reduced approximately $19,000.

Many long and high trestles still remain on the main flume line, although the Company has replaced similar trestles at Sand Creek, South Fork and Chocolate Creek with modern siphons. These remaining trestles can hardly be considered modern and, consequently, some of their reproduction cost less depreciation must be written off because of

obsolescence. I am willing to admit that these structures have value so long as they perform the work required of them, but where their cost exceeds that of another type of structure more satisfactory and less difficult to maintain and operate, certainly their value should be depreciated by the difference in cost, and even more. From all available information, and after a personal inspection of these trestles, I am of the opinion that they should be the subject of a reduction of $10,000 in the reproduction cost less depreciation given in Appendix B. In considering the figure for reproduction less depreciation given in Appendix B, the following reductions should be made:

Reproduction cost less depreciation of structures, from Appendix B		$1,136,983
Reduction because of unnecessary design of flume due to provision for enlargement	$108,000	
Reduction because of short use by District of present capacity of South Fork Feeder	19,000	
Reduction because of obsolete trestle construction	10,000	
		137,000
Remaining reproduction cost less depreciation		$ 999,983

It is also of interest to consider some of the fundamental conditions which governed in the preparation of my estimate of the reproduction cost of physical structures on the system. I am not unmindful of the fact that the courts have, in condemnation proceedings, required that values be fixed as of the exact date of initiation of litigation. I

am of the opinion, however, that such procedure would not in this case lead to a fair value because prices are now abnormally high. On the other hand, I think it unfair to use pre-war prices, for instance those prevailing in 1913, because prices were lower at that time than they will probably ever be again. My desire is to arrive at values such as will apply to the system after its acquisition by the District. As near as can be determined, the general average cost of all materials purchased by Cuyamaca Water Company since 1913 has increased as follows (cost for 1913 taken as unit):

1913	1.00
1914	1.18
1915	1.32
1916	1.44
1917	1.64
1918	1.90

The price of unskilled labor has increased as follows:

1913	1.00
1914	1.125
1915	1.125
1916	1.250
1917	1.375
1918	1.500

The price of skilled labor has increased as follows:

1913	1.000
1914	1.086
1915	1.0821
1916	1.1321
1917	1.2143
1918	1.3107

Finally, an effort has been made to use unit prices which are approximately an average of those prevailing for the past five years. The quantities used and the classifications are those which were agreed upon by engineers representing La Mesa, Lemon Grove and Spring Valley Irrigation District, Cuyamaca

Water Company and the State Railroad Commission of California during a proceeding before the State Railroad Commission, with certain minor modifications made after personal examination and with certain additions to cover new construction. Interest during construction has not been included. The inclusion of a definite figure for this item would be difficult, except, possibly, for new construction such as Murray Dam, for which the period of construction is definitely known. In a later section an effort will be made to allow for this item. It will also be noted that overhead is not allowed for Murray Dam. The figure given is actual cost which includes engineering and contingencies.

I have given no consideration to the cost of La Mesa Dam, which has been submerged by the construction of Murray Dam and which, being now obsolete, adds no value to the system to be acquired by the District. This decision refers simply to the value of the Cuyamaca Water Company's system for sale purposes and should in no way prejudice rate proceedings in which the Cuyamaca Water Company may be justified in receiving some remuneration to reimburse it for obsolete structures which have been replaced by modern ones in an effort to maintain adequate service.

Water Rights: Many and conflicting theories have been advanced for determining the value of water rights. The Supreme Court of the United States has decided that a value must be allowed for such rights, but no rule has been defined for determining the value, and in practically every

case, as in this one, values have been fixed by more or less arbitrary methods as dictated by judgment after weighing available and relevant evidence.

The value as fixed by sales of water rights of like character is relevant. Unfortunately evidence of such sales is in this case meager. Mr. Chas. H. Lee, Civil and Hydraulic Engineer, of Los Angeles, has made a careful compilation of water right values as determined by sale prices of stock in mutual water companies of Southern California. As these stocks include an obligation upon the part of the company to deliver water to the owner's lands, Mr. Lee has, from the gross sale value of the stock, compiled what he terms the gross water right value. By deducting from the gross water right value the cost of works necessary to deliver water to the lands, Mr. Lee has deduced a <u>net</u> water right value. He has further divided these rights into three classes: (1) exclusively citrus; (2) citrus and diversified crops; (3) diversified crops, no citrus. In making comparisons it should be noted that the water supply for La Mesa, Lemon Grove and Spring Valley Irrigation District will eventually be largely devoted to the irrigation of citrus crops and domestic uses, although other crops will also be produced.

The following data was introduced by Mr. Lee as Appendix B in his testimony in the matter of Spring Valley Water Company vs. City and County of San Francisco, heard before the Master in Chancery, H. M. Wright, April 5, 1916.

Listing the companies of each class in order

of gross water right value, the following is obtained:

	per M.I.	per m.g.d.
1. Exclusively Citrus.		
Lugonia Water Co.	$2,100	$163,000
San Antonio Water Co.	1,950	151,000
Canyon Water Co.	1,500	116,000
Del Monte Irrigation Co.	1,360	105,000
Temescal Water Co.	1,250	96,600
Gage Canal Co.	1,250	96,600
Redlands Water Co.	1,050	81,300
San Dimas Irrigation Co.	875	67,700
Average	$1,417	$109,600
2. Citrus and Diversified Crops.		
Alta Mutual Water Co.	$1,000	$ 77,400
Thermal Belt Water Co.	1,000	77,400
Escondido Mutual Water Co.	950	73,500
Riverside Water Co.	750	58,000
Santa Ana Valley Irrigation Co.	750	58,000
California Domestic Water Co.	500	38,700
South Side Improvement Co.	210	16,200
Los Nietos Ditch Co.	209	16,200
Irrigation Co. of Pomona	208	16,100
Average	$ 620	$ 47,900
3. Diversified Crops, No Citrus.		
Banning Water Co.	$ 612	$ 47,400
Moneta Water Co.	350	27,100
Stout Ditch Co.	175	13,600
McKenzie Ditch Co.	175	13,600

	per M.I.	per m.g.d.
Arroyo Ditch Co. ----------	$ 80	$ 6,200
Imperial Water Co. No. 5 ---------	72	5,570
Puente Land & Water Co. ----------	45	3,480
Imperial Water Co. No. 1 ---------	43	3,330
Little Lake Irrigation Co. -------	25	1,930
Average ----------	$ 175	$ 13,600

Generalizing the data at hand, gross water right values in citrus culture in Southern California range from $875 to $2,100 per miner's inch, averaging $1,417.

For citrus culture combined with diversified crops, values range from $210 to $1,000, and averages $620 per miner's inch.

For diversified crops with no citrus, the values range from $25 to $610 per miner's inch, and average $175.

From the data at hand, it would appear, therefore, that gross water right values in Southern California are highest in citrus culture and lowest in diversified crop farming, including alfalfa, deciduous fruits, grain and vegetables. Values for the combination of the two lie between the extremes.

Expressed as ratios, the average for citrus culture is 2.3 times that for citrus culture combined with diversified crops, and 8 times that for diversified crops exclusive of citrus.

A similar analysis of <u>net</u> water right values results as follows:

1. Exclusively Citrus.	per M.I.	per m.g.d.
Lugonia Water Co.	$1,995	$154,000
San Antonio Water Co.	1,845	142,800
Del Monte Irrigation Co.	1,173	90,900
Temescal Water Co.	900	69,600
Gage Canal Co.	950	73,500
Redlands Water Co.	677	52,400
San Dimas Irrigation Co.	665	51,500
Average	$1,172	$ 90,700
2. Citrus and Diversified Crops.		
Santa Ana Irrigation Co.	$ 563	$ 43,500
Alta Mutual Water Co.	550	42,500
Thermal Belt Water Co.	550	42,500
Riverside Water Co.	190	14,700
Los Nietos Ditch Co.	171	13,200
South Side Improvement Co.	37	2,860
California Domestic Water Co.	Negative	Negative
Irrigation Co. of Pomona	Negative	Negative
Average (exclusive last 2)	$ 344	$ 26,500

Following are sale values, or values which have been actually awarded, in Southern California, in most instances for domestic use, however:

"$3,500 per miner's inch fixed by Judge Conroy for Sierra Madre where water was taken from the Baldwin Ranch for the use of the City.

$2,500 per miner's inch selling price at McClay Rancho in 1902.

$2,800 per miner's inch selling price from West Los Angeles Water Company.

$2,000 per miner's inch value fixed by California Railroad Commission in the matter of the petition of the City of Glendale to have valuations made of certain water systems within the city.

The City of Los Angeles has constructed its aqueduct from Owens Valley and has thus brought in a water supply at an actual cost in excess of $2,000 per miner's inch."

Most of the values here discussed are for the region of Los Angeles, Riverside and San Bernardino Counties. In San Diego County the water supply is even more limited. Here the development of agricultural land is limited by the ultimate available water supply. Many acres of otherwise valuable land must, so far as we know today, remain unirrigated and, therefore, of small value because no water supply will be available for them. Under these circumstances, consider the case of one man owning lands without water and a second owning water rights. The application of water to the lands will at once greatly enhance the value of the lands. Naturally, the owner of the water rights can to a considerable extent command this enhanced value since his rights are in demand, in fact, actual competition for them exists. It will require an expenditure for works to deliver this water to the lands, but seldom an expenditure equal to the enhanced value of the lands. For this condition the difference may be considered a measure of the value of the water rights for the sole purpose of irrigation, a value which the land owner will willingly meet, in addition to the cost of hydraulic works, in order to develop his lands. This method is particularly applicable for regions where irrigation is the sole use to which water

supplies may be devoted. However, this is not the case in the vicinity of San Diego. Here we have the city of San Diego rapidly growing and its growth jeopardized because of limited water supply. Obviously the city can, in order to insure its growth, afford to pay for a domestic water supply a greater price than can a strictly agricultural community which intends to use its water supply only for irrigation purposes. This is precisely the condition which obtains in the case of the Cuyamaca Water Company's supply. The San Diego Flume Company, predecessor to the Cuyamaca Water Company, formerly supplied water to the city of San Diego. Later the city acquired its own source of water supply from another neighboring source and discontinued using water from the San Diego River. The city is now, however, approaching the limit of supply from its own system and during several years last past has purchased considerable quantities of water from the Cuyamaca Water Company. Aside from consideration of the water supply of the city of San Diego, much of the service area of Cuyamaca Water Company is being, and will continue to be, developed for residence purposes, and with this development the water supply will be used more and more for domestic purposes. Thus it is apparent that any effort to reach a fair value of the water rights in question must include careful consideration of the possible use of the available water supply for domestic as well as for irrigation uses. With these considerations in mind, it is of interest to review some of the costs of delivery of water from neighboring sources of supply.

A statement by F. M. Lockwood, Manager of Operation for the city of San Diego, gives the cost of water delivered to University Heights Reservoir at the edge of the city of San Diego, but not including any distribution costs within the city, as $0.189 per thousand gallons for the year 1915 and $0.190 per thousand gallons for the year 1916, without any of the burden of replacing flood damage of 1916, including rebuilding of Lower Otay Dam and Bonita Pipe Line. Figures obtained from the city for the cost and quantity of water delivered, exclusive of that purchased from Cuyamaca Water Company, make the same figure $0.204 for 1917 and $0.200 for 1918. These figures include interest on bonds, cost of operation and maintenance and an allowance for depreciation.

From annual reports submitted to the State Railroad Commission, the total cost of water delivered by the system of Sweetwater Water Company has been computed for the past three years. These figures include depreciation but do not include interest charges. If a rate of 6% be allowed upon a valuation of $1,241,737, which is the value claimed by the Company for its system, exclusive of water rights, the following total costs will result:

	Cost exclusive of interest	Interest	Total cost per thous. gals.
1916	$0.0735	$0.0645	$0.138
1917	0.054	0.05	0.104
1918	0.0373	0.0435	0.081
Mean			.108

Similar figures for Cuyamaca Water Company made up from the annual reports submitted to the Railroad Commission for the past three years for costs exclusive of interest charge and with addition of interest at 6% per annum upon an assumed valuation of $1,177,161, exclusive of water rights, give the following results:

	Cost exclusive of interest	Interest	Total cost per thous. gals.
1916	$0.08	$0.04	$0.12
1917	0.0975	0.0693	0.1668
1918	0.078	0.0512	0.1292
Mean			0.1387

For the completely developed system of Cuyamaca Water Company the unit costs will probably not exceed those obtained in operating the present system, and, indeed, approximate estimates show that they will be somewhat less. It should be noted that the figures for both the Sweetwater and Cuyamaca systems include the cost of some distribution, while the figures for the system of the city of San Diego do not. This inclusion is not large enough to have any great effect. The figures for operation and maintenance costs have been accepted as they appear in the reports mentioned without analysis to determine the justice of the inclusion of all items contributing thereto, but figures thus obtained are believed to be close enough for the purposes of this discussion.

The valuation of the system of the city of San Diego is derived from bond issues for the purchase of the system and for subsequent additions. This valuation is intended to cover value, if any, of water rights, but even if no

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A statement by F. M. Lockwood, Manager of Operation for the city of San Diego, gives the cost of water delivered to University Heights Reservoir at the edge of the city of San Diego, but not including any distribution costs within the city, as $0.189 per thousand gallons for the year 1918 and $0.190 per thousand gallons for the year 1916, without any of the burden of replacing flood damage of 1916, including rebuilding of Lower Otay Dam and Bonita Pipe Line. Figures obtained from the city for the cost and quantity of water delivered, exclusive of that purchased from Cuyamaca Water Company, make the same figure $0.204 for 1917 and $0.200 for 1918. These figures include interest on bonds, cost of operation and maintenance and an allowance for depreciation.

From annual reports submitted to the State Railroad Commission, the total cost of water delivered by the system of Sweetwater Water Company has been computed for the past three years. These figures include depreciation but do not include interest charges. If a rate of 6% be allowed upon a valuation of $1,641,737, which is the value claimed by the Company for its system, exclusive of water rights, the following total costs will result:

	Cost exclusive of interest	Interest	Total cost per thous. gals.
1916	$0.0758	$0.0648	$0.138
1917	0.084	0.06	0.144
1918	0.0378	0.0438	0.081
Mean			.108

value be attached to such water rights, a supply from a neighboring source from which delivery can be made for a lower unit cost must, for that very reason, have an added value, which may be considered a water right value. In this case, a difference of $0.057 in the average cost per thousand gallons exists which, if capitalized at 6%, represents a value of $309.63 for each acre foot per annum in yield. Upon the assumption that the system now owned by the city was purchased at a reasonable rate, the city could, in providing for an additional supply, afford to include in the purchase price of a system where costs are the same as those for Cuyamaca Water Company, a water right value of this amount. However, such purchase is predicated upon a demand existing for the supply for like use - domestic consumption. The consumption of the city of San Diego has reached the safe limits of its water supply, but, whether it seeks to augment its supply from the supply of Cuyamaca Water Company or elsewhere, for some years to come a demand for all of Cuyamaca Water Company's supply, including its future development, solely for <u>domestic</u> use does not exist. While domestic uses have an important part in fixing a valuation for these water rights, this value must also be governed by considerations of irrigation uses to which much of the supply will continue to be devoted. I have already discussed methods of valuing water rights for irrigation purposes in regions such as this one, where the supply of irrigable land is more plentiful than is the available water supply.

Unfortunately, the area embraced within the boundaries of La Mesa, Lemon Grove and Spring Valley Irrigation District is not the area most easily supplied by the Cuyamaca system. Indeed, when the total cost of the complete system necessary for completely irrigating the District, of which system the Cuyamaca properties are to be only a portion, is pro-rated to the lands and subtracted from their possible enhanced value, but little, if any, remainder remains as a water right value in accordance with the theory which I have previously advanced. However, the value of these rights should not be depreciated because it is now sought to apply them to lands which can be reached only by expensive pumping lifts. If it were proposed, instead, to apply them only to lands reached directly by gravity, a substantial value would remain, and there is available an area of such lands sufficient to utilize the water supply. A value of at least $17 per acre foot yield per annum would thus be derived as a value based purely upon agricultural use, and this is a minimum figure.

The San Diego Flume Company, predecessor of Cuyamaca Water Company, entered into a number of so-called water right contracts by which it purported to obligate itself and its successors to deliver water from its system. It has been contended that many of the consumers in securing these contracts, in making payments upon them, and in putting water to beneficial use secured the actual ownership of water rights and that the Flume Company merely acted as

agent for delivering the water. On June 1, 1910, when the system was acquired by Murray and Fletcher, there were outstanding contracts of this character purporting to cover 625.08 miner's inches (7 Cal. R. R. Com. Decisions 348), these contracts being of nine different forms. The State Railroad Commission found that by March 1, 1912, Murray and Fletcher had eliminated several of these contracts and that but 428.08 miner's inches remained under contract on that date. These are understood to cover so-called "nine months miner's inches", from which it appears that 4,623 acre feet per annum were then involved. It is interesting to note that these contracts covered more than the total service of the flume at the time. In an exhaustive decision of the California Railroad Commission by Commissioner Eshelmen, rendered March 28, 1913 (Decision No. 536, 2 Cal. R. R. Com. Decisions 464), a decision fixing rates for service, these contracts were abrogated, at least in so far as they effect rates for service. This decision of the Commission is similar to other decisions which it has made (L. E. Cole, et al. vs. South Feather Land & Water Company, 6 Cal. R. R. Com. Decisions, 121). The right of the Railroad Commission to abrogate private contracts fixing rates and service is quite well established by the courts and has often been exercised, as, for instance, in a recent ruling affecting a contract between Southern California Edison Company and Riverside Portland Cement Company, as well as other cases. It is also well established by the courts that a water utility has no

right to charge a water right in addition to the established rates as a condition precedent to service (San Diego Land & Town Co. vs. National City, 72 Fed. 79, 86; Lanning vs. Osborne, 76 Fed. 319, 329, 333; San Joaquin and Kings River Canal Co. vs. Stanislaus County, 191 Fed. 875, 891). From the decision of the Railroad Commission abrogating the contracts in question, rendered March 28, 1913, no appeal has ever been taken by the consumers, from which condition it would appear that their rights, if any, have completely lapsed by reason of laches in prosecuting their appeal. While no determination has been made by the courts of rights under these contracts, it appears doubtful if any rights exist because of these contracts. As a matter of justice and equity it seems unfair that the Company, or more particularly its predecessor, should have received payments which, although illegally collected, have, nevertheless, been received for water rights, and that it should then again be paid for these same water rights in a sale of its property, a sale made to a District in which many of the land owners are parties who previously purchased, or at least made payments purporting to be for the purchase of, such water rights, and I have considered such equity in valuing those rights which were acquired by the Cuyamaca Water Company from the San Diego Flume Company when the system was purchased. None of the rights developed by Cuyamaca Water Company since it acquired the system are subject in any way to such equity. For development proposed, but not yet completed, the Company has made appropriations and

has proceeded with development necessary to protect it in the complete development of these rights, but until development is actually completed, these rights will not become absolute.

It should be noted that many of the considerations which I have given to valuation of water rights are applicable only in the case of a sale of the rights of Cuyamaca Water Company to the La Mesa, Lemon Grove and Spring Valley Irrigation District as those rights exist at this date, and that the value which I have fixed is applicable only to this particular case. I am of the opinion that $250,000 is a fair value for water rights under these particular circumstances.

Interest During Construction: It is doubtful whether the allowance for overhead included in the estimates of Appendix B is sufficient to cover necessary interest during construction of some of the more extensive structures as well as engineering expense and contingencies, and no specific item is allowed to cover such interest. It is certain that this item is not provided in the case of Murray Dam, recently constructed, where the reproduction cost given in Appendix B covers the actual cost, including engineering and contingencies, but does not include interest during construction. This item of interest during construction will be considered in fixing the total value of the system hereafter found.

Previous Sale: In valuing the properties then

owned by Cuyamaca Water Company for sale to the La Mesa, Lemon Grove and Spring Valley Irrigation District, Commissioner Thelen, in Decision No. 2531 of the State Railroad Commission of California, decided June 26, 1915, gave careful consideration to the cost of the properties to their present owners, including original purchase price, expenditures for additions which can properly be added to capital account, reasonable interest upon money actually invested, and reimbursement for unavoidable deficits. While I have also considered this line of evidence, I am not willing to accept it without some reservations. For instance, the purchase price of the property as it stood in 1910 is accepted without question as representing its fair value at that time - an admission which I am unwilling to make without careful investigation of the property acquired. Following this reasoning to an extreme case, property transferred as a gift without a consideration must thereafter be considered as valueless. On the other hand, such property might be sold for a consideration far greater than its real value. While I am willing to consider such evidence, I am unwilling to accept it without careful consideration of the probable value of the property as determined by other methods. Following the lines of Mr. Thelen's investigations, I have caused the Secretary of the Cuyamaca Water Company to prepare a sworn statement completing Tables X, XI and XII of Commissioner Thelen's decision (7 Cal. R. R. Com. Decisions 378) to December 31, 1918. This statement appears in Appendix C of this report. It will be noted that the expenditures upon

capital account (Table 15) now total $840,161.28 and that, in addition, there are open capital accounts which have not been transferred to capital expenditures (Table 18) aggregating $153,926.26. Included in the first table are items entitled Boulder Creek, Conejos, Poverty Gulch and El Capitan Reservoirs $18,931.15, but since only Conejos Reservoir can be useful to La Mesa District, it alone should be considered (I have allowed $4,000 for it alone and have assumed the expenditure made in 1915); also, in the latter table, I find the following items which cannot be included in a valuation for sale to the District: Expense, largely engineering, preliminary to construction of pipe line to Camp Kearny; Boulder Creek Reservoir; and El Capitan Reservoir. After subtracting these latter items, which total $16,792.82, there remains a total open capital account of $137,133.44, making the total investment in parts of the system necessary and useful to the District $962,363.57. Following the methods of Table XI of the Railroad Commission's Decision and using the same rate of interest as fair, Table 16 was prepared, but to this should be added sums expended for useful structures but still carried in open capital account, giving the following result (after elimination of expenditures for rights or structures not useful to La Mesa District):

	Investments	Interest 8%	Total
1910 Capital Expenditures	155,390.32		
Interest for 8 years 7 months		106,701.38	262,091.70
1911 Capital Expenditures	49,252.97#		
Interest for 7 years 6 months		29,551.78	78,804.75

	Investments	Interest 8%	Total
1912 Capital Expenditures	51,340.40#		
Interest for 6 years 6 months		26,697.00	78,037.40
1913 Capital Expenditures	87,346.10#		
Interest for 5 years 6 months		38,432.28	125,778.38
1914 Capital Expenditures	167,849.63#		
Interest for 4 years 6 months		60,425.87	228,275.50
1915 Capital Expenditures	271,454.83/		
Interest for 3 years 6 months		76,007.35	347,462.18
1916 Capital Expenditures	23,751.79		
Interest for 2 years 6 months		4,750.36	28,502.15
1917 Capital Expenditures	11,133.16		
Interest for 1 year 6 months		1,335.98	12,469.14
1918 Capital Expenditures	139,097.20		
Interest for 0 years 6 months		5,563.89	144,661.09
Total			$1,306,082.29

The net deficit incurred by Cuyamaca Water Company in operating the property since June 1, 1910, when it was acquired, is $173,929.13 (Table 17, Appendix C). In considering the same figures to April 1, 1915, Commissioner Thelen, in Decision 2531, previously referred to, commented upon the maintenance and operating expenses being unnecessarily high. This is probably true in so far as salaries of general officers is concerned, but, even

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Reduction of $2,562.25 from Company's record because of expenditures for rights or structures not useful to District.

/ Reduction of $4,682.24 from Company's record because of expenditures for rights or structures not useful to District.

with proper revision, the net deficit with interest allowance, following the lines of Decision 2531, must now be a substantial item - at least more than $130,000. The Secretary of Cuyamaca Water Company has of his own initiative prepared an exhibit (Letter of April 2, 1919, to W. L. Huber, Appendix C) showing the total actual investment to date and also the total with interest allowance at 8% compounded annually, giving a total of investment and interest amounting to $1,438,840.58. This statement contains certain minor items for Boulder Creek, Poverty Gulch and El Capitan Reservoirs, none of which would be useful to La Mesa District. In this respect it is subject to the revision made in the tables prepared at my direction and just reviewed. It is also noted that in this statement some of the expenditures previously included in the investments for 1918 are transferred to 1917. I have not revised this exhibit because, although the Company's claim for compound interest may not be without some foundation, either this, or the discussion next preceding, leads to the consideration of a figure (at least $1,421,000 if interest be not compounded) at which the present owners can afford to dispose of their property without actual loss, unless, perhaps, for any unwarranted expenditures in maintenance and operation. While this evidence is of value, it does not necessarily determine the real value of the property. In fixing such value I shall give more weight to the present depreciated value of the property, together with rights of way and certain intangibles as previously appraised.

Historical Cost: Satisfactory data is not available to show the historical cost of the system now owned by Cuyamaca Water Company. A report by C. S. Alverson dated August, 1912, gives some incomplete information as to contract prices and historical costs, but these are interspersed with estimates by Mr. Alverson. The following quotation is of interest:

"Original Construction
Schedule "F"

C o s t o f W o r k s.

The following is the cost of the works up to January, 1891, this does not include legal services, interest account, bond account, or the operating expenses.

Engineering main line and Branches	$ 59,006.03
Grading and tunnel contract	58,802.71
Tunnels and grading	75,939.30
Miscellaneous construction	41,222.45
Flume construction	490,590.57
Road account	7,228.03
Telephone construction	1,286.15
Cuyamaca Dam	50,694.74
Cuyamaca Reservoir Lands	76,908.00
Diverting Dam	51,476.59
Right of way for flume and pipes	212,093.65
Pipe Line construction	52,740.00
Reservoir Site La Mesa No. 3	13,200.00
Total	$1,191,188.22

Additional Cost of Works.

On Feb. 14th, 1891, L. F. Doolittle, Secretary of the San Diego Flume presented to the Board of Supervisors of San Diego County, the following sworn statement of additional expense other than those given in Schedule "F" as follows:

Legal services	$ 12,723.15
Expense account	27,743.42
Operating account	2,388.75
Bond expense	4,071.51
Phelan Loan expense	2,814.90
Bond interest	18,444.23

Discount on bonds	$ 29,700.00
Interest account	14,071.71
Insurance account	23.25
Added interest account	9,044.51
Added expense account	8,112.97
Added operating account	2,320.02
Added bond expense account	30.70
Added bond interest account	7,249.33
Added discount on bonds	27,600.00
Total added cost	$ 166,338.49
SUM TOTAL	$1,357,526.71

Cost of Right of Way, Flumes & Pipes.

In Schedule "F" the cost of right of ways for the flume and pipe lines is given as $212,093.65. This is from the sworn statement of L. F. Doolittle, Secretary for the Flume Company for several years.

I have no memorandum that would throw light on the matter, except the statement made by some of the officers of the Company, at the time the pipe line from end of flume to City of San Diego was constructed. That cost of right of way for the pipe line was an expense item and in the nature of a hold-up, but that it better be paid than delay the completion of the work. At that time a considerable portion of the proposed pipe line was on private ground, which has since been made a public highway."

Mr. Alverson also mentions raising Cuyamaca Dam in the winter of 1894-5 at a cost of $3,400; raising Diverting Dam 1911-12 and installing gates at a total cost of $9,970. As the record is incomplete, it is very probable that there are other items, but those listed, together with expenditures made on capital account by Cuyamaca Water Company, bring the total expenditures to more than $2,000,000. These figures are very incomplete, but, nevertheless, they show that, in view of the continued increase in cost of labor and materials during the thirty year life of the system, my estimates of the cost of reproducing the system ($1,960,661 for physical structures, plus $177,161 for

lands and rights of way, total $2,137,822) is entirely reasonable. It is also of interest to note that the figure of $212,093.65 for "Right of way for flume and pipes" in Schedule "F" is greater than my total allowance for lands and rights of way for the entire system ($177,161). Further than these rough checks, the available figures of historical cost are of little value, and again it is necessary to return to estimated reproduction cost less depreciation.

General Considerations: In arriving at a fair value of these properties for sale to La Mesa, Lemon Grove and Spring Valley Irrigation District, I wish to emphasize the fact that I am arriving at a value for sale purposes only, and for sale to this particular District. That a fair value for condemnation or purchase is not necessarily the same as fair value for rate purposes is well recognized (Willcox v. Consolidated Gas Co., 212 U.S. 19, 29 Sup. Ct. 192, 53 L. ed 382, decided Jan. 4, 1909); (Omaha v. Omaha Water Co., 218 U.S. 180, 30 Sup. Ct. 615, 54 L. ed 991, decided May 31, 1910); (Spring Valley Water Works v. San Francisco, 192 Fed. 137, decided Oct. 21, 1911). The value hereafter found is influenced by certain equities in the matter of alleged water rights claimed by consumers of the Cuyamaca Water Company who are also land owners of the District seeking to purchase the system, by the ability of the lands within the District to produce sufficient crops to carry the debt incidental to the acquisition of the system, and many other considerations. I am not unmindful

of the fact that the value hereafter found will constitute a considerable burden upon the lands of the District but, in justice to the Company, it must be considered that other lands more favorably located could more easily carry such burden and that, in the not far distant future, a demand for a large part of the available water supply for domestic consumption will be made and that for this use even higher values could very easily be sustained. I am also not unmindful of the fact that, for conditions of operation and demand upon the existing partially completed development, the system has, for several years past, been valueless as a revenue producer. While this condition depreciates its value to a considerable extent, its potential value must be considered. After carefully considering all of these conditions, together with historical cost, estimated reproduction cost, depreciation and reproduction cost less depreciation, interest during construction, water right value, and all other pertinent facts, I find that the fair value of the properties of Cuyamaca Water Company listed in Appendix B of this report, together with lands and water rights heretofore enumerated is, at this date, $1,440,000 for purposes of sale to La Mesa, Lemon Grove and Spring Valley Irrigation District.

Estimates of Future Construction:

Additions to Cuyamaca System: As previously noted, three important pieces of construction are necessary to complete the system of Cuyamaca Water Company: the con-

struction of Fletcher Reservoir with adequate feeder conduit from Boulder Creek, the construction of Conejos Reservoir, and the rebuilding of South Fork Feeder with capacity of 31 second feet.

Plans for a multiple arched reinforced concrete dam at the dam site of Fletcher Reservoir have been prepared by Mr. John S. Eastwood. These contemplate a design similar to Hodges Dam of San Dieguito Mutual Water Company on San Dieguito River, but some 30 feet higher, having a maximum height of 160 feet. Fifty arches, each spanning an opening of 24 feet between centers of buttresses, except at the extreme ends, give a total length of 1,200 feet. If this structure is built by the District, the plans must first receive the approval of the State Engineer, or, if built by the Cuyamaca Water Company, by the State Railroad Commission. Possibly some modifications will be required, but a detailed review of the particular plans which have been informally submitted is beyond the scope of this report and is, therefore, not included. The construction of the structure shown on these plans would require 35,000 cubic yards of concrete in the buttresses and 10,660 cubic yards in arches, foot bridge, struts, etc. I estimate the cost of constructing a structure of this type, satisfactory to the State Department of Engineering, to be $675,000. It should be noted that this estimate is not at all certain because no explorations to determine the depth to bed rock or actual foundation conditions have been made. Superficial

examinations indicate the site to be favorable for the construction of a dam, but, as shown by the estimate, a rather costly one. In addition to this dam it will be necessary to construct a flow line from Boulder Creek to pass water, even in flood rushes, to Fletcher Reservoir. Probably no conduit will be satisfactory for this purpose except a tunnel of large hydraulic capacity. For this tunnel, which must be approximately 2600 feet long, I estimate the cost to be $30 per lineal foot, or $78,000. In addition to the conduit, a diverting dam, which I have estimated to cost $25,000 will be required. Again, the data for estimating the cost of this structure is meagre. Thus the expenditures necessary to store 17,106 acre feet of water at Fletcher Reservoir site are:

Fletcher Reservoir	$675,000
Feeder Conduit from Boulder Creek	78,000
Diverting Dam at Head of Conduit	25,000
Total	$778,000

an expenditure of approximately $45 per acre foot.

The information concerning Conejos Dam site is also meagre. No borings or other explorations of the site have been made and the topographic map of the dam site which has been supplied is not entirely complete. Mr. Post, formerly Chief Engineer for Cuyamaca Water Company, estimated the cost of a dam at this site to store 1680 acre feet as approximately $100,000. Mr. Post's estimates were made several years ago, and in the meantime prices of labor and materials have greatly increased, but on the other hand, I believe that a multiple

arched reinforced concrete dam can be built at the present time at this site, barring unforeseen foundation difficulties, for this figure - Mr. Postb estimates were based upon another type of dam. It should be noted that even for this limited storage capacity, a dam with maximum height of 96 feet will be required.

Rebuilding South Fork Feeder to supply 31 second feet capacity, utilizing the present bench, will, according to my estimates, cost $15,000.

The total estimate of necessary future development of Cuyamaca Water Company's system is, therefore:

(1)	Fletcher Reservoir and Feeder Conduit ---	$778,000
(2)	Conejos Reservoir ----------	100,000
(3)	Rebuilding South Fork Feeder to 31 sec. ft. capacity ----------	15,000
	Total ----------	$893,000

Construction of Necessary Laterals for Supplying District:

The completeness of the system of laterals constructed by irrigation districts varies in different instances, being largely a matter of policy determined by the directors. In some districts water is supplied to the highest point of every 40 acre tract by laterals constructed and operated by the district, while in some districts only the principal laterals are constructed by the district, the smaller and less important ones being constructed and operated by individual land owners or by groups or associations of such land owners. Whatever policy is finally adopted by La Mesa, Lemon Grove and Spring Valley Irrigation District, the system of

Cuyamaca Water Company is so unfortunately located with reference to some of the higher lands of the District that several important laterals must be constructed by the District. As previously explained, a pumping plant must be installed at Grossmont (formerly Murray Hill) Reservoir and a main leading from it across the high lands forming the northern part of the District. A conduit must also be constructed from Sweetwater trestle along the Sweetwater side of the divide to a point near the east boundary of the District, where a pumping plant must be constructed with mains leading to the high lands southeast of Mt. Helix and to other high areas south of the point where this gravity main enters the District. A gravity line should also extend from this point to the Spring Valley District with capacity capable of supplying this large area in the southern portion of the District. I have prepared approximate estimates of these principal laterals and pumping plants, but I wish to note that actual surveys of their locations are not available, hence my estimates are approximate only. I also wish again to call attention to the fact that my estimates are made for only the principal laterals, and these must be supplemented by many smaller ones. If it should be the policy to construct these small laterals under the District organization, a substantial addition should be made to the estimates of this report. At the present time it does not appear to me to be advisable or necessary to make all of the surveys and plans necessary for precisely estimating the

cost of the lateral system - I believe the approximate estimates which I have prepared from available data, and from a study of conditions on the ground, will serve present purposes and will be safe for guiding the Directors, as well as the State Department of Engineering, in present consideration of the District's problems. It should be noted, however, that these particular estimates are approximate. They are as follows:

(1)	Pumping plant at Grossmont (formerly Murray Hill) Reservoir, steel pipe line to summit in northern area of District, equalizing reservoir, and concrete lines through remainder of this area ----------	$ 25,000
(2)	Conduit from Sweetwater Trestle to eastern edge of District, approximately 3 miles ---	85,000
(3)	Pumping plant near eastern edge of District, steel pipe line northerly therefrom 3800 feet, and steel pipe line southerly therefrom 6500 feet ----------	15,000
(4)	Gravity line from pumping plant, next preceding, to settlement of Spring Valley and thence southerly along west edge of Spring Valley with certain branches -------	126,000
Total pumps and mains absolutely necessary -------		$251,000

This estimate includes only such works as are absolutely necessary to afford general service throughout the District. If laterals for affording complete service to all parcels of land are to be constructed from the proceeds of bond issues shared by the District as a whole, a substantial addition must be made.

Total Cost of Irrigation System:

The total cost of the system, which must finally

be borne by the District, exclusive of possible bond discount, is:

(1)	Purchase of existing Cuyamaca system ---------	$1,440,000
(2)	Additions to Cuyamaca system necessary to supply completely developed District -------	893,000
(3)	Construction of pumps and laterals necessary to afford general service in District ------	251,000
	Total expenditure for Completely Developed District exclusive of smaller laterals ---------	$2,584,000

If such procedure be tolerated by those land owners whose lands are remote from existing service or can only be reached by pumping systems, the purchase of Cuyamaca system would supply an important area within the District and the construction of the additional pumping plants and laterals, as well as extensions to the Cuyamaca system, could be delayed if any advantage be had by such delay.

CONCLUSIONS.

My investigations lead me to the following conclusions in regard to the proposed development of La Mesa, Lemon Grove and Spring Valley Irrigation District which is to include the purchase of the existing system of Cuyamaca Water Company:

(a) The supply of water which will be available when the development of Cuyamaca Water Company's system is completed will be sufficient to irrigate the District. The District will be able to acquire the right to the use of the water necessary for its project. In acquiring the Cuyamaca system the District will also acquire certain obligations to serve consumers outside of its boundaries and, should a drought as severe as that of 1898-1904 occur after the District

is fully developed, and providing it be then obligated to continue this outside service, it would be necessary to seek additional emergency water supplies from the ground waters of San Diego River. Supplies sufficient to meet such emergencies exist.

(b) The soil is fertile and susceptible of irrigation. The probable amount of water needed for its irrigation has been well determined to average 1.0 acre foot per acre per annum. All studies of the supply of water required have been made on this basis. No serious problems of drainage will arise in the District as proposed.

(c) The District's irrigation system, as proposed, is feasible so far as governed by engineering conditions.

(d) The value of the water, water rights, canals, reservoirs, reservoir sites, and irrigation works to be acquired, or eventually developed, by the District is:

Cuyamaca System ----------	$1,440,000
Future Development, Cuyamaca System ---	893,000
Necessary Laterals, etc. ----------	251,000
Total ----------	$2,584,000

In addition to the above, the District now has a bonded indebtedness of $66,000. Its gross area is 14,794 acres.

(e) In order to provide with the requirements of the statute that the bonded indebtedness of the District shall not exceed 60% of the total value of the lands included, water, water rights, and irrigation works, the land value should be equal to, or greater than, $1,766,666.67 (discount on bonds not taken into account).

Respectfully submitted,

W. L. Huber
Civil Engineer.

San Francisco, Calif.,
April 28, 1919.

APPENDIX "A"

HYDROGRAPHIC STUDIES

Table 1.

MONTHLY RUN-OFF INTO CUYAMACA RESERVOIR FROM COMPANY'S RECORDS.

Quantities in Acre Feet.

SEASON	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1892-93										92	57	0	
1893-94	33	349	222	440	635	731	0	0	4	0	0	736	3150
1894-95	0	34	1090	6728	1411	1034	465	0	0	0	0	0	10762
1895-96	139	274	215	742	0	548	180	0	54	0	10	44	2206
1896-97	119	52	73	539	1054	2174	126	25	0	0	0	37	4199
1897-98	0	58	96	208	264	171	0	0	0	0	0	0	797
1898-99	0	0	10	189	123	233	0	0	0	0	0	0	555
1899-00	0	8	3	88	64	50	47	0	0	0	0	0	260
1900-01	0	124	0	208	2292	131	136	140	0	0	0	0	3031
1901-02	0	13	0	39	549	1516	234	0	0	0	0	0	2351
1902-03	15	52	58	73	697	690	877	54	0	0	0	0	2516
1903-04	0	0	0	3	44	421	10	14	0	0	0	0	492
1904-05	0	0	3	200	1942	3243	498	945	0	0	0	48	6879
1905-06	36	1514	370	1000	1269	6753	1031	759	5	0	265	52	13054
1906-07	0	92	1162	2278	959	2411	1528	479	33	0	0	0	8942
1907-08	129	148	17	541	1207	536	377	246	0	0	63	0	3264
1908-09	101	57	238	2186	2791	1521	161	54	0	0	70	0	7179
1909-10	0	532	1212	1860	311	858	291	0	14	12	0	44	5134
1910-11	110	139	0	576	1065	774	130	0	0	0	0	0	2794
1911-12	0	230	0	31	0	2145	1071	281	0	103	102	31	3994
1912-13	168	109	7	284	487	1345	235	93	18	22	72	1	2841
1913-14	0	74	57	786	968	132	147	25	5	8	53	2	2257
1914-15	0	0	193	1263	3053	968	625	2350	135	0	181	0	8768
1915-16	215	86	58	12300	1655	1629	528	0	56	163	5	41	16736
1916-17	0	0	209	923	953	337	473	120	154	119	119	112	3519
1917-18	89	44	13	137	325	2275	80	0	136	0	134	0	3233
1918-19	284	19	134										
MEAN 25 YEARS													4756

NOTE: Run-off computed from daily measurements of reservoir stage and draft, with the application of evaporation record for the years 1913 to 1918, inclusive.

Table 2.

DETAIL CALCULATION OF RUN-OFF INTO CUYAMACA LAKE.

Month	Gage End Month	Capacity Ac. Ft.	Gain Ac. Ft.	Draft Ac. Ft.	Gross Evap. Ins.	Rain Ins.	Net Evaporation Inches	Net Evaporation Feet	Area Acres	Net Loss Ac. Ft.	Total Run-Off Ac. Ft.
1914											
June	19' 10"	1484		---							
July	18' 3"	987	-497	278.68	9.90	.04	9.86	.82	276	226	8
Aug.	16' 4½"	562	-425	315.17	10.76	.90	9.86	.82	199	163	53
Sept.	14' 6½"	275	-287	207.87	7.53	.30	7.23	.61	133	81	2
1914-15											
Oct.	12' 9"	101	-174	54.80	6.08	1.04	5.04	.42	73	31	88
Nov.	11' 1"	31	- 70	32.73	3.28	1.28	2.00	.17	27	5	- 22
Dec.	14' 2½"	231	200	---	3.94	4.69	+ .75	+.06	122	+ 7	193
Jan.	20' 6"	1699	1468	---	3.47	10.11	+6.64	+.55	373	+205	1263
Feb.	27' 1½"	5061	3362	---	3.97	9.56	+5.59	+.47	657	+309	3053
Mar.	28' 6"	5901	840	---	4.56	2.34	2.22	.18	713	128	968
April	29' 4½"	6624	723	---	3.75	5.32	+1.57	+.13	751	+ 98	625
May	32' 4½"	9034	2410	---	4.52	5.33	+ .81	+.07	864	+ 60	2350
June	31' 9"	8495	-539	---	9.66	0.00	9.66	.80	842	674	135
July	30' 10"	7738	-757	130.91	8.74	0.00	8.74	.73	807	589	- 37
Aug.	29' 8½"	6916	-822	421.88	10.30	1.17	9.13	.76	765	581	181
Sept.	28' 7"	5970	-946	391.74	7.16	.31	6.85	.57	716	408	-146
1915-16											
Oct.	27' 6½"	5315	-655	404.23	8.30	0.00	8.30	.69	675	466	215
Nov.	27' 3½"	5177	-138	117.62	3.99	2.04	1.95	.16	665	105	86
Dec.	27' 9½"	5452	275	14.88	4.88	5.29	+ .41	+.34	684	+232	58
Jan.	35' 3"	11457	6005		0.68	31.67	+30.99	+2.58		+2508	‡12300
Feb.	34' 2"	10515	-942	2419.83	4.65	2.37	2.28	.19	932	177	1655
Mar.	34' 8"	10975	460	959.99	6.26	3.60	2.66	.22	951	209	1629
April	34' 8½"	11027	52	---	6.57	.54	6.03	.50	953	476	528
May	34' 1½"	10498	-529	---	7.21	.41	6.80	.57	932	293	-236
June	33' 5½"	9929	-569	---	8.25	0.00	8.25	.69	905	625	56
July	32' 11"	9482	-447	---	10.05	1.72	8.33	.69	885	610	163
Aug.	32' 3½"	8848	-634	122.98	8.68	1.45	7.23	.60	860	516	5
Sept.	31' 6"	8288	-560	268.36	6.11	1.32	4.79	.40	832	333	41
1916-17											
Oct.	31' 5"	8219	- 69	6.74	3.15	3.54	+ .39	+.32	829	+265	-189
Nov.	31' 1"	7944	-275	---	3.82	.07	3.75	.31	816	253	- 22
Dec.	31' 5½"	8253	309	---	2.40	3.80	+1.40	+.12	830	+100	209
Jan.	32' 9½"	9396	1143	---	2.75	5.73	+2.98	+.25	880	+220	923
Feb.	34' 5"	10745	1349	---	2.01	7.00	+4.99	+.42	942	+396	953
Mar.	34' 9"	11044	299	---	2.94	1.51	.43	.04	954	38	337
April	35' 5"	11595	551	---	2.88	3.82	+ .94	+.08	978	+ 78	473
May	35' 2½"	11405	-190	---	4.88	1.02	3.86	.32	969	310	120
June	34' 8½"	10993	-412	43.44	6.58	0.00	6.58	.55	951	523	154
July	33' 9½"	10222	-771	504.20	6.91	1.84	5.07	.42	919	386	119
Aug.	32' 7"	9207	-1015	514.12	8.54	0.00	8.54	.71	872	620	119
Sept.	31' 6½"	8322	-885	529.59	7.12	.43	6.69	.56	833	467	112
1917-18											
Oct.	30' 8½"	7617	-705	393.52	(6.00)	.02	5.98	.50	801	400	89
Nov.	30' 2½"	7266	-351	191.40	(4.00)	.84	-3.16	.26	784	204	44
Dec.	29' 11"	7049	-217	37.49	(3.00)	0.00	3.00	.25	772	193	13
Jan.	29' 11½"	7100	51	55.14	(3.00)	3.50	+ .50	+.04	775	31	137
Feb.	29' 7½"	6847	-255	662.08	3.61	4.93	+1.32	+.11	761	+ 84	325
Mar.	33' 4½"	9843	2996	---	(3.00)	12.65	+9.65	+.80	901	+721	2275
April	32' 11½"	9533	-310	---	5.24	0.00	5.24	.44	887	390	80
May	32' 5"	9069	-464	55.34	5.85	.33	5.52	.46	866	398	- 11
June	31' 9½"	8512	-557	322.91	6.20	.95	5.25	.44	842	370	136
July	30' 1½"	7215	-1297	648.99	9.02	.12	8.90	.74	781	578	- 70
Aug.	28' 11½"	6291	-924	713.26	7.11	1.43	5.68	.47	733	345	134
Sept.	27' 8½"	5383	-908	531.37	6.65	.39	6.26	.52	679	353	- 24
1918-19											
Oct.	26' 10½"	4913	-470	469.28	6.24	.95	5.29	.44	648	285	284
Nov.	26' 10"	4874	- 39	167.60	2.45	4.48	+2.03	+.17	645	+110	19
Dec.	27' 1½"	5074	200	---	2.38	3.59	+1.21	+.10	658	+ 66	134

‡ From U.S.G.S. Water Supply Paper 426.

For months showing slight negative results 0.00 has been transferred to Table 1.

Table 3.

MONTHLY RUN-OFF OF SAN DIEGO RIVER AT DIVERTING DAM FROM DRAINAGE AREA OF 92 SQUARE MILES
(EXCLUSIVE OF CUYAMACA RESERVOIR)

BASED ON OBSERVATIONS BY COMPANY AND U. S. GEOLOGICAL SURVEY.

Quantities in Acre Feet.

SEASON	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1893-94										(0)	(0)	(2060)	
1894-95	(0)	(104)	(3040)	(18565)	(3931)	(2890)	(1410)	(0)	(0)	(0)	(0)	(0)	29940
1895-96	(425)	(835)	(655)	(1910)	(0)	(1660)	(550)	(0)	(164)	(0)	(30)	(134)	6363
1896-97	(364)	(158)	(222)	(1650)	(2863)	(5867)	(386)	(76)	(0)	(0)	(0)	(113)	11699
1897-98	(0)	(177)	(300)	(635)	(805)	(530)	(0)	(0)	(0)	0	0	0	2447
1898-99	0	0	0	0	94	436	240	85	54	0	0	0	909
1899-00	0	0	0	116	32	52	170	240	0	0	0	0	610
1900-01	0	33	13	183	2432	686	357	319	0	0	64	0	4087
1901-02	0	0	0	20	266	2710	839	223	0	0	0	0	4058
1902-03	0	0	14	64	1365	2683	3562	664	23	0	0	0	8375
1903-04	0	0	0	0	0	526	85	27	0	0	0	0	638
1904-05	0	0	0	73	4086	11289	2655	2989	944	0	0	0	22036
1905-06	32	611	227	860	2614	18280	4993	1838	1382	604	586	300	32327
1906-07	203	308	1390	6517	2959	8579	6877	2283	2210	435	244	127	32132
1907-08	639	671	1262	1045	3499	1753	1209	886	321	117	43	0	11445
1908-09	105	207	220	3009	7517	3613	2457	1824	343	0	0	0	19295
1909-10	0	222	1957	5890	1422	1965	1640	565	0	0	0	0	13661
1910-11	0	30	208	1054	3141	2111	1287	480	34	0	0	0	8345
1911-12	0	1	12	78	102	2133	4649	2135	510	20	0	0	9640
1912-13	109	121	174	452	1228	2054	880	242	62	0	0	0	5322
1913-14	37	0	70	3067	6206	1565	1030	876	192	0	0	0	13043
1914-15	35	74	68	2422	11016	6036	3876	14340	2032	537	117	132	40685
1915-16	24	124	208	83764	12280	8451	4470	1910	674	360	165	148	112578
1916-17	610	450	758	2919	3696	3220	3063	2445	836	125	8	0	18030
1917-18	53	153	254	263	648	5810	946	458	126	10	56	61	8832
1918-19	96	266	402										
MEAN 24 YEARS													17354

Quantities in parenthenses estimated by Chas. H. Lee, Hydraulic Engineer. No measurements available for these months.

Table 4.

DETAIL CALCULATION OF RUN-OFF FROM AREA OF 92 SQ. MI. TRIBUTARY TO DIVERTING DAM EXCLUSIVE OF CUYAMACA RESERVOIR.

	Over Dam	In Flume	Sum	Released Cuyamaca	Reaching Diverting Dam	Run-Off Exclusive of Cuyamaca
1912						
Oct.	0	250	250	197	141	109
Nov.	0	213	213	143	92	121
Dec.	0	192	192	53	18	174
1913						
Jan.	144	311	455	35	3	452
Feb.	562	666	1228	0	0	1228
Mar.	74	1980	2054	0	0	2054
April	11	869	880	0	0	880
May	0	242	242	21	0	242
June	0	354	354	379	292	62
July	0	386	386	536	386	0
Aug.	0	221	221	394	221	0
Sept.	0	184	184	331	184	0
Oct.	0	111	111	114	74	37
Nov.	0	0	0	4	0	0
Dec.	3	67	70	0	0	70
1914						
Jan.	2910	157	3067	0	0	3067
Feb.	5340	866	6206	0	0	6206
Mar.	275	1290	1565	0	0	1565
April	137	893	1030	0	0	1030
May	144	732	876	0	0	876
June	.6	192	192	0	0	192
July	0	154	154	275	154	0
Aug.	0	207	207	313	207	0
Sept.	0	134	134	212	134	0
Oct.	0	105	105	109	70	35
Nov.	0	92	92	49	18	74
Dec.	0	68	68	0	0	68
1915						
Jan.	2080	342	2422	0	0	2422
Feb.	10100	916	11016	0	0	11016
Mar.	4366	1670	6036	0	0	6036
April	2900	976	3876	0	0	3876
May	12740	1600	14340	0	0	14340
June	582	1450	2032	0	0	2032
July	8	614	622	131	85	537
Aug.	0	443	443	422	326	117
Sept.	0	437	437	389	305	132
Oct.	0	338	338	404	314	24
Nov.	0	206	206	123	82	124
Dec.	0	208	208	14	0	208

Table 4 (continued).

	Over Dam	In Flume	Sum	Released Cuyamaca	Reaching Diverting Dam	Run-Off Exclusive of Cuyamaca
1916						
Jan.	92800	374	93174	9410	9410	83764
Feb.	14700	0	14700	2420	2420	12280
Mar.	9410	0	9410	959	959	8451
April	3530	940	4470	0	0	4470
May	570	1340	1910	0	0	1910
June	14	660	674	0	0	674
July	29	331	360	0	0	360
Aug.	0	242	242	123	77	165
Sept.	0	350	350	270	202	148
Oct.	303	307	610	7	0	610
Nov.	132	318	450	0	0	450
Dec.	530	228	758	0	0	758
1917						
Jan.	2480	339	2819	0	0	2819
Feb.	3580	116	3696	0	0	3696
Mar.	2930	290	3220	0	0	3220
April	2890	173	3063	0	0	3063
May	2140	305	2445	0	0	2445
June	472	375	847	43	11	836
July	0	521	521	504	396	125
Aug.	0	410	410	514	402	8
Sept.	0	374	374	530	374	0
Oct.	0	338	338	375	285	53
Nov.	0	285	285	187	132	153
Dec.	155	105	260	37	6	254
1918						
Jan.	2	279	281	55	18	263
Feb.	85	1090	1175	661	527	648
Mar.	4540	1270	5810	0	0	5810
April	0	946	946	0	0	946
May	0	476	476	55	18	458
June	0	371	371	323	245	126
July	0	526	526	652	516	10
Aug.	0	621	621	713	565	56
Sept.	0	481	481	531	420	61
Oct.	30	433	463	469	367	96
Nov.	76	310	386	168	120	266
Dec.	289	113	402	0	0	402

Note: Quantities in parentheses estimated by Chas. H. Lee, Hydraulic Engineer.

Table 4.

DETAIL CALCULATION OF RUN-OFF FROM AREA OF 92 SQ. MI. TRIBUTARY TO DIVERTING DAM EXCLUSIVE OF CUYAMACA RESERVOIR.

	Over Dam	In Flume	Sum	Released Cuyamaca	Reaching Diverting Dam	Run-Off Exclusive of Cuyamaca
1913						
Oct.	0	280	280	197	141	109
Nov.	0	218	218	148	93	121
Dec.	0	192	192	88	18	174
1913						
Jan.	144	311	455	88	8	486
Feb.	852	666	1518	0	0	1518
Mar.	74	1980	2054	0	0	2054
April	11	869	880	0	0	880
May	0	242	242	21	0	242
June	0	364	364	279	292	62
July	0	386	386	386	386	0
Aug.	0	221	221	394	221	0
Sept.	0	184	184	381	184	0
Oct.	0	111	111	114	74	37
Nov.	0	0	0	4	0	0
Dec.	3	67	70	0	0	70
1914						
Jan.	2910	187	3097	0	0	3097
Feb.	5340	866	6206	0	0	6206
Mar.	276	1290	1566	0	0	1566
April	137	893	1030	0	0	1030
May	144	732	876	0	0	876
June	6.	192	192	0	0	192
July	0	184	184	276	184	0
Aug.	0	207	207	312	207	0
Sept.	0	184	184	312	184	0
Oct.	0	108	108	108	70	38
Nov.	0	92	92	49	18	74
Dec.	0	68	68	0	0	68
1915						
Jan.	2080	142	2222	0	0	2222
Feb.	10100	916	11016	0	0	11016
Mar.	4866	1670	6036	0	0	6036
April	2900	976	3876	0	0	3876
May	12740	1660	14340	0	0	14340
June	882	1480	2032	0	0	2032
July	8	614	622	121	86	857
Aug.	0	443	443	422	338	114
Sept.	0	427	427	389	308	182
Oct.	0	338	338	404	314	24
Nov.	0	208	208	122	82	124
Dec.	0	208	208	14	0	208

Table 5.

MONTHLY RUN-OFF OF SOUTH FORK OF SAN DIEGO RIVER AT INTAKE OF SOUTH FORK FLUME

BASED ON OBSERVATIONS BY COMPANY AND U. S. GEOLOGICAL SURVEY

Drainage Area 44 Square Miles - Quantities in Acre Feet.

SEASON	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1893-94													
1894-95	(0)	(19)	(615)	(3819)	(790)	(580)	(262)	(0)	(0)	(0)	(0)	(415) (0)	6085
1895-96	(20)	(37)	(30)	(101)	(0)	(78)	(26)	(0)	(8)	(0)	(5)	(22)	327
1896-97	(61)	(26)	(37)	(275)	(537)	(1110)	(64)	(13)	(0)	(0)	(0)	(9)	2132
1897-98	(0)	(15)	(25)	(53)	(68)	(45)	(0)	(0)	(0)	(0)	(0)	(0)	206
1898-99	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
1899-00	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
1900-01	(0)	(5)	(2)	(29)	(390)	(110)	(58)	(51)	(0)	(0)	(7)	(0)	652
1901-02	(0)	(0)	(0)	(2)	(28)	(284)	(88)	(23)	(0)	(0)	(0)	(0)	425
1902-03	(0)	(0)	(5)	(23)	(490)	(960)	(1274)	(240)	(8)	(0)	(0)	(0)	3000
1903-04	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
1904-05	(0)	(0)	(0)	(36)	(1990)	(5524)	(1290)	(1450)	(460)	(0)	(0)	(0)	10750
1905-06	(17)	(340)	(126)	(480)	(1450)	(10217)	(2780)	(1020)	(770)	(237)	(230)	(118)	17785
1906-07	(80)	(121)	(546)	(2560)	(1160)	(3383)	(2700)	(898)	(867)	(93)	(52)	(27)	12487
1907-08	(136)	(143)	(270)	(220)	(760)	(372)	(250)	(189)	(68)	(17)	(6)	(0)	2431
1908-09	(15)	(30)	(32)	(445)	(1080)	(536)	(350)	(250)	(49)	(0)	(0)	(0)	2787
1909-10	(0)	(43)	(348)	(1163)	(282)	(388)	(324)	(112)	(0)	(0)	(0)	(0)	2660
1910-11	(0)	(9)	(66)	(334)	(1007)	(670)	(410)	(153)	(11)	(0)	(0)	(0)	2660
1911-12	(0)	(0)	(2)	(16)	(21)	(450)	(986)	(450)	(108)	(0)	0	0	2033
1912-13	0	0	6	31	229	546	310	49	11	0	0	33	1215
1913-14	0	14	10	369	1661	115	153	137	8	0	0	0	2467
1914-15	0	0	6	529	2782	1744	687	2121	498	102	14	0	8483
1915-16	0	29	187				2174				397	267	
1916-17	654	416	510										
1917-18													
MEAN 21 YEARS													3742

Note: Quantities in parentheses estimated by Chas. H. Lee, Hydraulic Engineer.

Table 6.

DISTRIBUTION OF RUN-OFF INTO CUYAMACA RESERVOIR

Quantities in Acre Feet.

Season	Total Run-Off	Winter Run-Off	Summer Run-Off
1893-94	3151	2411	740
1894-95	10762	10297	465
1895-96	2206	1918	288
1896-97	4199	4011	188
1897-98	797	797	0
1898-99	555	555	0
1899-00	260	213	47
1900-01	3031	2755	276
1901-02	2361	2117	234
1902-03	2516	1585	931
1903-04	492	468	24
1904-05	6879	5388	1491
1905-06	13054	10942	2112
1906-07	8942	6902	2040
1907-08	3264	2578	686
1908-09	7179	6894	285
1909-10	5134	4773	361
1910-11	2794	2664	130
1911-12	3994	2406	1588
1912-13	2841	2400	441
1913-14	2257	2017	240
1914-15	8768	5477	3291
1915-16	16736	15943	793
1916-17	3519	2422	1097
1917-18	3233	2883	350

Table 7.

DISTRIBUTION OF RUN-OFF FROM AREA TRIBUTARY TO DIVERTING DAM

EXCLUSIVE OF CUYAMACA RESERVOIR

Quantities in Acre Feet.

Season	Total Run-Off	Winter Run-Off	Summer Run-Off
1893-94			
1894-95	29940	28530	1410
1895-96	6363	5485	878
1896-97	11699	11124	575
1897-98	2447	2447	0
1898-99	909	530	379
1899-00	610	200	410
1900-01	4087	3347	740
1901-02	4058	2996	1062
1902-03	8375	4126	4249
1903-04	638	526	112
1904-05	22036	15448	6588
1905-06	32327	22624	9703
1906-07	32132	19956	12176
1907-08	11445	8869	2576
1908-09	19295	14671	4624
1909-10	13661	11456	2205
1910-11	8345	6544	1801
1911-12	9640	2326	7314
1912-13	5322	4138	1184
1913-14	13043	10945	2098
1914-15	40685	19651	21034
1915-16	112578	104851	7727
1916-17	18030	11553	6477
1917-18	8832	7181	1657

Table 8.

DISTRIBUTION OF RUN-OFF FROM SOUTH FORK OF SAN DIEGO RIVER.

Season	Total Run-Off	Winter Run-Off	Summer Run-Off	#Available for Diversion Winter	#Available for Diversion Summer
1893-94					
1894-95	6085	5823	262	5589	262
1895-96	327	266	61	266	61
1896-97	2132	2046	86	2046	86
1897-98	206	206	0	206	0
1898-99	0	0	0	0	0
1899-00	0	0	0	0	0
1900-01	652	536	116	536	116
1901-02	425	314	111	314	111
1902-03	3000	1478	1522	1478	1522
1903-04	0	0	0	0	0
1904-05	10750	7550	3200	5611	3200
1905-06	17785	12630	5155	5998	4220
1906-07	12487	7850	4637	6372	3782
1907-08	2431	1901	530	1901	530
1908-09	2787	2138	649	2138	649
1909-10	2660	2224	436	2224	436
1910-11	2660	2086	574	2086	574
1911-12	2033	489	1544	489	1544
1912-13	1215	812	403	812	403
1913-14	2467	2169	298	2169	298
1914-15	8483	5061	3422	5061	3422
1915-16	(49467)	(45000)	(4467)	(5800)	(3500)
1916-17	(3440)	(2400)	(1040)	(2400)	(1040)
1917-18	(3260)	(2300)	(960)	(2300)	(960)

Capacity of South Fork Flume taken to be 31 sec. ft.

Capacity of Conejos Reservoir taken to be 1680 acre ft.

Quantities in parentheses estimated.

Table 9.

VOLCAN LAND & WATER CO. — **EVAPORATION PAN RECORD** — **YEAR 1905**

Values in inches of depth. Drawing No. 517.

Month	Pan No 1. In Water Cuyamaca Reservoir Elev. 4550			Pan No 2 In Ground E. Cuyamaca Elev. 4550			Pan No 3 In Air Warner Dam Elev. 2700			Pan No 4 In Water Warner Dam Elev. 2700			Pan No 5 In Water Big Lake Warner Ranch Elev. 2700			Pan No 6 In Ground Big Lake Warner Ranch Elev. 2700		
	Gross Evap.	Rain	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Gross Evap.	Rain	Mean Temp.
JAN.	328	8.75	42.4	230	4.86		3.05	10.71	46.0	276	10.71	46.0	189	6.42	47.1	170	6.42	47.1
FEB.	516	6.09	42.5	332	5.46		5.38	8.05	47.5	378	8.05	47.5	316	5.25	46.0	257	5.25	48.6
MAR.	720	2.35	47.4	526	1.05	.77	5.55	3.10	52.2	411	3.10	50.2	360	1.20	51.2	249	1.20	52.2
APR.	960	3.80	49.4	590	1.77	.50	5.70	2.54	54.1	428	2.54	54.1	398	0.87	53.0	287	0.87	53.1
MAY.	759	.04	53.8	618	.50	.10	6.23	.09	57.0	487	.09	57.0	423	0	56.8	330	0	56.8
JUNE	899	.19	63.3	1004	.10	.10	8.35	.21	64.3	631	.21	64.3	661	.10	63.7	434	.30	63.7
JULY	976	.33	70.5	1242	.46		10.28	.04	71.3	720	.04	71.3	617	.56	70.5	505	.56	70.5
AUG.	755	.20	64.1	893	.13		8.59	.06	65.6	586	.06	65.6	455	0	64.3	353	.17	64.3
SEPT.	608	.63	54.0	676	.46		5.96	.76	57.7	546	.76	57.7	423	.17	56.4	326	.63	56.4
OCT.	328	1.18	48.0	420	1.38		5.78	1.13	50.3	395	1.13	50.7	382	.98	51.1	296	1.42	51.1
NOV.	394	5.85	35.2	272	3.53	*	.99	5.07	41.2	1.36	5.07	41.2	185	4.14	41.6	143	4.14	41.6
DEC.	285	3.60	33.6	183	1.78		.78	3.78	36.1	1.08	3.78	36.1	165	2.87	36.8	128	2.87	36.8
TOTAL	7815	33.60	553	6487	18.70	***	76.62	53.76	606	5922	53.76	606	4577	25.36	606	3535	27.12	606

Month	Pan No 7 In Water La Mesa Reservoir Elev. 600			Pan No 8 In Ground Poma Camp Elev. 600			Pan No 9 In Ground Sutherland Domestic Elev. 1200			Pan No 10 In Ground Santa Maria Domestic Elev. 1200			Pan No 11 In Ground Carroll Domestic Elev. 1200		
	Gross Evap.	Rain	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Gross Evap.	Rain	Mean Temp.
JAN.	231	4.13	51.6	279	4.50	51.5	1.58	8.48		303	5.83				
FEB.	324	3.12	60.1	2.56	4.33	58.7	2.45	5.84		243	4.05				
MAR.	615	.61	6.52	3.51	1.14	62.4	3.33	1.64		403	.93				
APR.	6.16	1.34	65.7	3.56	1.37	62.2	3.58	3.85		486	2.22				
MAY.	5.48	.30	64.9	4.72	.53	62.3	3.73	.70		4.58	.70				
JUNE	7.76	.19	70.4	6.23	2.64	71.4	6.06	.45		583	.30				
JULY	9.03	.3	73.2	10.86	0	74.6	7.65	0		877	0				
AUG.	8.26	0	73.5	9.82	0	73.6	7.83	0		823	.6				
SEPT.	6.54	0	72.7	6.66	.02	69.8	5.76	0		671	0				
OCT.	4.41	.35	71.5	4.51	.90	64.7	6.55	.34		549	.09				
NOV.	4.34	1.17	64.7	3.16	1.65	61.0	4.45	.86		469	1.15				
DEC.	2.37	2.61	55.6	1.40	2.73	48.5	3.07	3.96		183	3.61				
TOTAL	65.81	14.88	66.6	61.30	17.41	61.1	55.99	27.49		4578	21.45				

+ Mean Temperature at Warner Springs.

Month	Pan No 1. In Water Cuyamaca Reservoir Elev. 4550			Pan No 2 In Ground E. Cuyamaca Elev. 4550			Pan No 3 In Air Warner Dam Elev. 2700			Pan No 4 In Water Warner Dam Elev. 2700			Pan No 5 In Water Big Lake Warner Ranch Elev. 2700			Pan No 6 In Ground Big Lake Warner Ranch Elev. 2700		
	Gross Evap.	Rain	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Gross Evap.	Rain	Mean Temp.
JAN.																		
FEB.																		
MAR.																		
APR.																		
MAY.																		
JUNE																		
JULY																		
AUG.																		
SEPT.																		
OCT.																		
NOV.																		
DEC.																		
TOTAL																		

Month	Pan No 7 In Water La Mesa Reservoir Elev. 600			Pan No 8 In Ground Poma Camp Elev. 600			Pan No 9 In Ground Sutherland Domestic Elev. 1200			Pan No 10 In Ground Santa Maria Domestic Elev. 1200			Pan No 11 In Ground Carroll Domestic Elev. 1200		
	Gross Evap.	Rain	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Gross Evap.	Rain	Mean Temp.
JAN.															
FEB.															
MAR.															
APR.															
MAY.															
JUNE															
JULY															
AUG.															
SEPT.															
OCT.															
NOV.															
DEC.															
TOTAL															

(*) Interpolated Value.
+ Mean Temperature at Warner Springs.

Table 8.

DISTRIBUTION OF RUN-OFF FROM SOUTH FORK OF SAN DIEGO RIVER.

Season	Total Run-Off	Winter Run-Off	Summer Run-Off	Available For Diversion Winter	Available For Diversion Summer
1893-94					
1894-95	6085	5852	233	5859	226
1895-96	327	266	61	266	61
1896-97	2182	2046	86	2046	86
1897-98	206	206	0	206	0
1898-99	0	0	0	0	0
1899-00	0	0	0	0	0
1900-01	982	856	116	856	116
1901-02	456	314	142	314	111
1902-03	3000	1428	1572	1428	1572
1903-04	0	0	0	0	0
1904-05	10780	7550	3200	8211	2200
1905-06	17198	12830	8158	8398	4660
1906-07	12487	7850	4637	6842	3782
1907-08	2431	1901	830	1901	830
1908-09	2787	2138	649	2138	649
1909-10	2660	2224	436	2224	436
1910-11	2660	2086	574	2086	574
1911-12	2083	1844	489	1844	489
1912-13	1218	812	406	812	406
1913-14	2467	2169	298	2169	298
1914-15	2483	2021	3422	2021	2422
1915-16	(49467)	(45000)	(4467)	(8800)	(8800)
1916-17	(3440)	(2400)	(1040)	(2400)	(1040)
1917-18	(3860)	(2800)	(960)	(2800)	(960)

Capacity of South Fork Flume taken to be 21 sec. ft.

Capacity of Cuyamaca Reservoir taken to be 1680 acre ft.

Quantities in parentheses estimated.

Table 9, continued.

VOLCAN LAND & WATER CO.

EVAPORATION PAN RECORD

Volcano, in Inches of depth

Observer ——— Year 19—

Day	Pan No 1				Pan No 2				Pan No 3				Pan No 4				Pan No 5				Pan No 6 & 6A			
	In Water Cuyotenaca Reservoir Elev. 4500				In Ground E. Cuyotenaco Elev. 4500				In Air Warner Dam Elev 3700				In Water Warner Dam Elev 3700				In Ground Big Lake Warner Ranch Elev 3700				In Ground Big Lake Warner Ranch Elev 3700			
	Gross Evap.	Rain	Mean Temp.	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Mean Temp.
JAN	1.85	1.03	3.56	50.3	(1.40)	(.26)	2.09	47.6	2.57	.47	3.47	49.2	(1.50)	(.26)	2.09	47.6	1.28	.27	1.77	49.2				
FEB.	2.75	1.54	6.21	52.9	(2.00)	1.29	5.77	51.1	(1.80)	(.15)	5.01	51.1	(2.00)	(.15)	5.01	51.1	1.28	.27	1.77	49.2				
MAR	3.98	1.08	6.51	54.1	3.10	1.47	5.85	52.9	3.01	4.76			(2.00)	(.15)			1.28	.27	1.77	49.2				
APR	5.77	.01	6.58	54.6	3.81	1.29	6.29	53.4	4.07	.55	4.38	53.4					1.86	.39	2.25	51.1				
MAY	8.33	.10	6.60	56.1	6.17	.46	6.46	54.6	5.75	.43	6.58	54.6					2.66	.55	3.21	52.9				
JUNE	7.65	0	6.88	58.3	6.84	0	6.46	56.1	6.15	(.63)	6.58	56.1					2.66	.55	3.21	52.9				
JULY	9.90	.21	7.26	60.4	7.84	.14	7.19	58.3	.28	7.45	(.63)	58.3					2.66	.55	3.21	52.9				
AUG.	7.07	0	7.48	59.2	7.51	.02	6.56	57.5	6.22	.49	0	57.5					2.49	.51	3.00	52.9				
SEPT.	5.81	.36	7.22	57.5	7.19	.14	6.92	55.4	.29	7.49	5.01	55.4					2.32	.48	2.80	51.1				
OCT.	4.89	2.11	6.47	54.6	4.18	1.80	6.14	53.4	2.81	3.96	5.81	53.4					2.32	.48	2.80	51.1				
NOV.	2.54	.10	6.80	52.9	2.02	.16	5.76	51.1	2.57	2.80	4.72	51.1					2.32	.48	2.80	51.1				
DEC.	3.09	1.98	5.57	50.3	2.56	2.69	5.80	49.2	1.46	4.32	4.67	49.2					2.32	.48	2.80	51.1				
TOTAL	61.43	17.62	6.52	55.4	64.12	32.79	6.29	53.4	44.11	245.31	4.87	52.9					24.91	5.11	2.91	51.1				

+ Mean Temperature or Normal Service.

(—) Estimated Values

Volcano, in Inches of depth

Observer No 320

Day	Pan No 7				Pan No 8				Pan No 9				Pan No 10				Pan No 11			
	In Water La Mesa Reservoir Elev 4800				In Ground Pomo Camp Elev 4800				In Ground Sutherland Domaine Elev 4800				In Ground Santa Maria Domaine Elev 4800				In Ground Corral Domaine Elev 4800			
	Gross Evap.	Rain	Mean Temp.	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Mean Temp.
JAN	1.85	1.03	3.56	50.3	2.36	.43	3.09	47.6	2.57	.47	3.47	49.2	(1.40)	(.26)	2.09	47.6	.57	(.27)		
FEB.	2.75	1.54	6.21	52.9	(2.00)	1.29	5.77	51.1	(1.80)	(.15)	5.01	51.1	(2.00)	(.15)	5.01	51.1	(.28)	(.27)		
MAR	3.98	1.08	6.51	54.1	3.10	1.47	5.85	52.9	3.01	4.76			(2.00)	(.15)			(.28)	(.27)		
APR	5.77	.01	6.58	54.6	3.81	1.29	6.29	53.4	4.07	.55	4.38	53.4					1.86	.39	2.25	51.1
MAY	8.33	.10	6.60	56.1	6.17	.46	6.46	54.6	5.75	.43	6.58	54.6					2.66	.55	3.21	52.9
JUNE	7.65	0	6.88	58.3	6.84	0	6.46	56.1	6.15	(.63)	6.58	56.1					2.66	.55	3.21	52.9
JULY	9.90	.21	7.26	60.4	7.84	.14	7.19	58.3	.28	7.45	(.63)	58.3					2.66	.55	3.21	52.9
AUG.	7.07	0	7.48	59.2	7.51	.02	6.56	57.5	6.22	.49	0	57.5					2.49	.51	3.00	52.9
SEPT.	5.81	.36	7.22	57.5	7.19	.14	6.92	55.4	.29	7.49	5.01	55.4					2.32	.48	2.80	51.1
OCT.	4.89	2.11	6.47	54.6	4.18	1.80	6.14	53.4	2.81	3.96	5.81	53.4					2.32	.48	2.80	51.1
NOV.	2.54	.10	6.80	52.9	2.02	.16	5.76	51.1	2.57	2.80	4.72	51.1					2.32	.48	2.80	51.1
DEC.	3.09	1.98	5.57	50.3	2.56	2.69	5.80	49.2	1.46	4.32	4.67	49.2					2.32	.48	2.80	51.1
TOTAL	61.43	17.62	6.52	55.4	64.12	32.79	6.29	53.4	44.11	(58.2)	48.96	52.9					24.91	5.11	2.91	51.1

+ Mean Temperature or Normal Service.

(—) Estimated Values

Form WP-224

VOLCAN LAND & WATER. CO.

EVAPORATION PAN RECORD

YEAR – 1917.

Values in inches of depth.

Standard Pans 5'x5'x10" except No 3.

By D.A. McCLUNG - Fresno

Month	Pan No 1. In Water Cuyamaca Reservoir ELEV. 4428			Pan No 2 In Ground E. Cuyamaca ELEV. 4689			Pan No 3. In Air Warner Dam 5 gallon pan ELEV. 2700			Pan No 13 In Ground Warner Dam ELEV. 2680								
	Gross Evap.	Rain "48	Mean Temp.	Gross Evap.	Rain "46	Mean Temp.	Gross Evap.	Rain "61	Mean Temp.	Gross Evap.	Rain "61	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Gross Evap.	Rain	Mean Temp.
JAN.	2.75	2.34	33.1	0.97	4.12		1.70	5.90	40.6		5.90	40.4						
FEB.	2.01	7.86	37.5	1.86	6.05		2.25	5.20	44.8		5.20	44.8						
MAR.	2.94	1.78	38.6	3.65	1.27		4.45	1.06	45.4		1.06	45.4						
APR.	2.60	5.11	45.3	3.83	2.53		5.95	4.85	50.5		4.85	50.5						
MAY	4.88	1.46	47.6	5.16	.37		5.96	1.43	53.5		1.43	53.5						
JUNE	6.50	0	66.5	6.83	0		7.85	0	67.1	7.04	0	67.1						
JULY	6.91	1.17	72.9	8.46	2.30		7.99	.44	74.5	6.86	.44	74.5						
AUG.	6.34	0	71.0	9.06	0		8.60	0	71.9	7.52	0	71.9						
SEPT.	2.12	.46	66.7	6.52	.39		7.83	.05	68.5	5.91	.05	68.5						
OCT.	(4.00)	.03	62.9	6.85	0		5.52	0	*60.8	4.20	0	60.8						
NOV.	(2.00)	1.24	52.8	3.28	.43		3.34	.80	50.2	2.27	.80	50.2						
DEC.	(1.00)	0	46.9	3.50	0		2.71	0	47.4	1.91	0	47.4						
TOTAL	57.61	26.50	Mean 53.4	58.37	17.86	Mean	63.85	19.75	Mean 56.2		19.75	Mean 56.2			Mean			Mean

Month	Pan No 7. In Water La Mesa Reservoir ELEV. 1240			Pan No 8 In Ground Pamo Camp ELEV. 1880			Pan No 9. In Ground Sutherland Domsite ELEV. 1220			Pan No 10 In Ground Santa Maria Domsite ELEV. 1225			Pan No 11 In Ground Carroll Domsite ELEV. 960			Pan No 12 In Water Lake Elsinore ELEV.		
	Gross Evap.	Rain "68	Mean Temp.	Gross Evap.	Rain "68	Mean Temp.	Gross Evap.	Rain "61	Mean Temp.	Gross Evap.	Rain "62	Mean Temp.	Gross Evap.	Rain "60	Mean Temp.	Gross Evap.	Rain	Mean Temp.
JAN.	2.76	4.91	54.2	1.54	4.10	49.2	1.15	6.24	38.8	2.16	4.31		1.07	4.85	46.5	1.60	3.12	42.8
FEB.	2.88	3.30	58.7	2.25	2.88	54.2	1.83	6.01	44.5	1.65	3.04		1.95	3.41	51.3	1.88	3.09	48.8
MAR.	4.17	.41	60.2	4.16	.41	54.5	3.12	.80	47.8	3.27	.51		3.26	.67	53.1	3.93	.45	48.4
APR.	5.36	2.06	64.7	3.85	1.58	58.0	3.89	3.01	51.0	3.60	2.06		3.92	2.12	58.9		.99	50.0
MAY.	6.05	.45	68.8	4.52	.76	62.4	3.82	1.81	51.1	3.86	1.00		3.21	.67	62.8			
JUNE	6.98	0	64.8	6.05	0	73.0	6.56	0	66.6	6.57	0		5.91	0	73.0			
JULY	7.60	T.	71.4	8.60	0	78.8	6.64	.02	72.9	6.73	0		6.17	0	78.4			
AUG.	8.08	T.	72.8	8.50	0	75.7	6.86	T	70.5	5.18	0		5.97	.03	75.3			
SEPT.	7.98	T.	72.8	7.50	0	74.1	5.41	0	68.9	3.00	0		5.07	0	73.0			
OCT.	5.12	.02	67.8	5.42	T	67.7	3.97	0	62.1	3.01	0		3.19	.15	68.3			
NOV.	4.10	.17	61.8	3.38	.30	58.8	2.23	.72	58.8	2.44	.42		2.49	.50	62.1			
DEC.	3.45	T	59.4	3.22	0	56.4	1.91	0	48.7	2.30	0		1.94	0	58.4			
TOTAL	65.99	18.65	Mean 62.6	60.99	19.06	Mean 63.7	46.99	18.61	Mean 56.1	48.77	11.54	Mean	44.84	12.60	Mean 63.5			Mean

(–) Estimated Values

Discontinued

Form WP-224

VOLCAN LAND & WATER CO.

EVAPORATION PAN RECORD

YEAR – 1918

Values in inches of depth.

Standard Pans 5'x5'x10" except No 3.

Month	Pan No 1. In Water Cuyamaca Reservoir ELEV. 4428			Pan No 2 In Ground E. Cuyamaca ELEV. 4689			Pan No 3. In Air Warner Dam 5 gallon pan ELEV. 2700			Pan No 13 In Ground Warner Dam ELEV. 2680								
	Gross Evap.	Rain "48	Mean Temp.	Gross Evap.	Rain "46	Mean Temp.	Gross Evap.	Rain "61	Mean Temp.	Gross Evap.	Rain "61	Mean Temp.	Gross Evap.	Rain	Mean Temp.	Gross Evap.	Rain	Mean Temp.
JAN.	3.00	4.92	37.3	3.19	2.75		2.26	6.78	40.4		6.24	2.96	44.4					
FEB.	2.61	5.61	42.6	2.78	4.85		2.63	3.78	47.1		3.64	3.78	47.1					
MAR.	(3.00)	1.79	42.8	1.91	2.57		2.02	1.71	51.3		2.26	1.99	51.3					
APR.	5.00	0	—	4.75	0		4.88	.07	54.6		3.98	.07	54.6					
MAY.	5.65	.68	—	5.60	.20		4.70	.71	58.8		4.37	.72	58.8					
JUNE	6.20	.59	—	7.90	1.30		6.37	.25	72.3		5.87	.70	72.3					
JULY	7.06	.11	—	10.85	.13		7.64	0	72.8		7.27	.10	72.8					
AUG.	7.11	1.57	82.3	12.00	1.68		6.45	.81	71.4		6.06	.82	71.4					
SEPT.	4.65	.97	65.8	5.20	.40		5.70	0	69.5		5.08	0	69.5					
OCT.	6.94	1.08	—	6.68	.81		4.00	1.58	60.8		3.85	1.65	60.8					
NOV.	2.45	6.35	44.8	—	2.60		2.45	2.38	48.8		2.44	1.72	48.8					
DEC.	2.38	4.70	38.3	—	2.98		1.91	3.27	41.0		1.87	3.28	41.0					
TOTAL	60.28	28.05	Mean —	—	26.99		57.10	26.84	Mean 57.8		53.04	26.87	Mean					

Month	Pan No 7. In Water Alberhill Reservoir ELEV.			Pan No 8 In Ground Pamo Camp ELEV. 1880			Pan No 9. In Ground Sutherland Domsite ELEV. 1220			Pan No 10 In Ground ELEV.			Pan No 11 In Ground (Carroll Dam) ELEV. 960			Pan No 12 In Water ELEV.		
	Gross Evap.	Rain "68	Mean Temp.	Gross Evap.	Rain "68	Mean Temp.	Gross Evap.	Rain "61	Mean Temp.	Gross Evap.	Rain "62	Mean Temp.	Gross Evap.	Rain "60	Mean Temp.	Gross Evap.	Rain	Mean Temp.
JAN.	2.36	2.22	54.9	2.20	2.17	52.6	1.79	6.32	44.8				1.26	3.16	46.1			
FEB.	(4.00)	2.13	55.7	2.50	2.06	56.8	2.01	4.80	50.6				2.25	2.16	52.7			
MAR.	(4.00)	2.30	—	3.87	4.27	57.2	2.72	3.72	55.2				3.24	2.86	60.2			
APR.	4.02	0	—	4.00	.08	62.6	4.34	.14	56.4				3.81	.08	63.1			
MAY.	6.27	.13	63.0	5.87	1.11	64.6	4.76	1.18	60.6				4.38	.68	66.1			
JUNE	6.68	0	72.0	7.83	.01	76.1	5.97	.16	76.4				5.35	.00	76.6			
JULY	8.20	.04	74.1	8.72	0	77.0	7.78	0	74.8				6.81	.26	76.3			
AUG.	8.32	.12	74.6	8.30	.02	78.5	6.18	.18	75.1				6.06	.28	76.3			
SEPT.	6.55	.09	75.8	6.96	0	78.2	5.15	.12	72.3				6.02	.20	74.9			
OCT.	4.75	.51	70.9	6.01	.82	68.3	3.33	.47	64.3				4.85	.16	70.5			
NOV.	3.07	2.41	56.0	2.60	1.90	57.3	.68	1.48	45.6				3.42	3.14	57.0			
DEC.	1.71	1.22	53.6	2.97	2.85	51.4	No	record					2.56	2.69	52.6			
TOTAL	58.82	11.37	—	60.95	14.41	69.7	—	—	—				50.36	29.39	65.4			

(–) Estimated Values

Table 9, continued.

Table 10.

CALCULATION OF NET EVAPORATION LOSSES AT CUYAMACA RESERVOIR.

	Winter				Summer			
Season	Rain Inches	Gross Evaporation (In.)	Net Loss Inches	Net Loss Feet	Rain	Gross Evap. Inches	Net Loss Inches	Net Loss Feet
1894-95	34.4	24.0	+10.4	+.87	8.6	44.0	-35.4	-2.95
95-96	15.2	24.0	- 8.8	-.74	3.8	44.0	-40.2	-3.35
96-97	25.2	24.0	+ 1.2	+.10	6.3	44.0	-37.7	-3.15
97-98	19.2	24.0	- 4.8	-.40	4.8	44.0	-39.2	-3.26
98-99	15.9	24.0	- 8.1	-.67	4.0	44.0	-40.0	-3.33
99-00	17.4	24.0	- 6.6	-.55	4.3	44.0	-39.7	-3.30
1900-01	25.9	24.0	+ 1.9	+.16	6.4	44.0	-37.6	-3.14
01-02	21.6	24.0	- 2.4	-.20	5.4	44.0	-38.6	-3.22
02-03	21.9	24.0	- 2.1	-.18	5.4	44.0	-38.6	-3.22
03-04	14.0	24.0	-10.0	-.83	3.5	44.0	-40.5	-3.37
04-05	34.8	24.0	+10.8	+.90	8.7	44.0	-35.3	-2.94
05-06	33.8	24.0	+ 9.8	+.82	8.4	44.0	-35.6	-2.96
06-07	26.9	24.0	+ 2.9	+.24	6.7	44.0	-37.3	-3.10
07-08	18.4	24.0	- 5.6	-.46	4.6	44.0	-39.4	-3.28
08-09	27.4	24.0	+ 3.4	+.28	6.8	44.0	-37.2	-3.10
09-10	20.2	24.0	- 3.8	-.32	5.0	44.0	-39.0	-3.25
10-11	19.4	24.0	- 4.6	-.38	4.8	44.0	-39.2	-3.26
11-12	19.2	24.0	- 4.8	-.40	4.8	44.0	-39.2	-3.26
12-13	18.7	24.0	- 5.3	-.44	4.6	44.0	-39.4	-3.28
13-14	21.2	24.0	- 2.8	-.23	5.3	44.0	-38.7	-3.22
14-15	33.8	24.0	+ 9.8	+.82	8.4	44.0	-35.6	-2.96
15-16	34.4	24.0	+10.4	+.87	8.5	44.0	-35.5	-2.95
16-17	23.8	24.0	- 0.2	-.02	6.0	44.0	-38.0	-3.16
17-18	17.7	24.0	- 6.3	-.52	4.4	44.0	-39.6	-3.30

Minus sign (-) denotes a fall in reservoir surface.

Plus sign (-) " " rise " " "

Table 11.

CALCULATION OF NET EVAPORATION LOSSES AT FLETCHER RESERVOIR.

	Winter				Summer			
		Gross	Net Loss			Gross	Net Loss	
Season	Rain Inches	Evap. Inches	Inches	Feet	Rain Inches	Evap. Inches	Inches	Feet
1894-95	17.7	24.0	- 6.3	- .52	2.9	44.0	-41.1	-3.42
95-96	8.0	24.0	-16.0	-1.33	1.3	44.0	-42.7	-3.55
96-97	15.1	24.0	- 8.9	- .74	2.5	44.0	-41.5	-3.45
97-98	8.3	24.0	-15.7	-1.31	1.3	44.0	-42.7	-3.55
98-99	8.0	24.0	-16.0	-1.33	1.3	44.0	-42.7	-3.55
99-00	9.0	24.0	-15.0	-1.25	1.5	44.0	-42.5	-3.54
1900-01	14.2	24.0	- 9.8	- .82	2.3	44.0	-41.7	-3.47
01-02	9.1	24.0	-14.9	-1.24	1.5	44.0	-42.5	-3.54
02-03	13.9	24.0	-10.1	- .84	2.3	44.0	-41.7	-3.47
03-04	6.1	24.0	-17.9	-1.49	1.0	44.0	-43.0	-3.58
04-05	21.0	24.0	- 3.0	- .25	3.4	44.0	-40.6	-3.38
05-06	22.6	24.0	- 1.4	- .12	3.7	44.0	-40.3	-3.35
06-07	20.9	24.0	- 3.1	- .26	3.4	44.0	-40.6	-3.38
07-08	12.9	24.0	-11.1	- .92	2.1	44.0	-41.9	-3.48
08-09	14.1	24.0	- 9.9	- .82	2.3	44.0	-41.7	-3.47
09-10	14.5	24.0	- 9.5	- .79	2.4	44.0	-41.6	-3.46
10-11	13.7	24.0	-10.3	- .86	2.2	44.0	-41.8	-3.48
11-12	15.4	24.0	- 8.6	- .72	2.5	44.0	-41.5	-3.45
12-13	8.8	24.0	-15.2	-1.26	1.4	44.0	-42.6	-3.55
13-14	15.4	24.0	- 8.6	- .72	2.5	44.0	-41.5	-3.45
14-15	22.0	24.0	- 2.0	- .17	3.6	44.0	-40.4	-3.36
15-16	21.8	24.0	- 2.2	- .18	3.6	44.0	-40.4	-3.36
16-17	13.9	24.0	-10.1	- .84	2.3	44.0	-41.7	-3.47
17-18	12.0	24.0	-12.0	-1.00	1.9	44.0	-42.1	-3.51

Minus sign (-) denotes a fall in reservoir surface.

Table 10.

CALCULATION OF NET EVAPORATION LOSSES AT GUAYAMACA RESERVOIR.

	Winter				Summer			
		Gross	Net Loss			Gross	Net Loss	
Season	Rain Inches	Evap. Inches	Inches	Feet	Rain Inches	Evap. Inches	Inches	Feet
1894-95	24.4	24.0	+10.4	+.87	8.6	44.0	-35.4	-2.95
95-96	16.2	24.0	- 8.8	-.74	5.8	44.0	-40.2	-3.35
96-97	25.2	24.0	+ 1.2	+.10	6.2	44.0	-37.7	-3.15
97-98	19.2	24.0	- 4.8	-.40	4.8	44.0	-39.2	-3.26
98-99	16.9	24.0	- 8.1	-.67	4.0	44.0	-40.0	-3.33
99-00	17.4	24.0	- 6.6	-.55	4.3	44.0	-39.7	-3.30
1900-01	25.9	24.0	+ 1.9	+.16	6.4	44.0	-37.6	-3.14
01-02	21.6	24.0	- 2.4	-.20	5.4	44.0	-38.6	-3.22
02-03	21.9	24.0	- 2.1	-.18	5.4	44.0	-38.6	-3.22
03-04	14.0	24.0	-10.0	-.83	3.5	44.0	-40.5	-3.37
04-05	34.8	24.0	+10.8	+.90	8.7	44.0	-35.3	-2.94
05-06	33.8	24.0	+ 9.8	+.82	8.4	44.0	-35.6	-2.96
06-07	26.9	24.0	+ 2.9	+.24	6.7	44.0	-37.3	-3.10
07-08	18.4	24.0	- 5.6	-.46	4.6	44.0	-39.4	-3.28
08-09	27.4	24.0	+ 3.4	+.28	6.8	44.0	-37.2	-3.10
09-10	20.2	24.0	- 3.8	-.32	5.0	44.0	-39.0	-3.25
10-11	19.4	24.0	- 4.6	-.38	4.8	44.0	-39.2	-3.26
11-12	19.2	24.0	- 4.8	-.40	4.8	44.0	-39.2	-3.26
12-13	18.7	24.0	- 5.3	-.44	4.6	44.0	-39.4	-3.28
13-14	21.2	24.0	- 2.8	-.23	5.3	44.0	-38.7	-3.22
14-15	33.8	24.0	+ 9.8	+.82	8.4	44.0	-35.6	-2.96
15-16	34.4	24.0	+10.4	+.87	8.5	44.0	-35.5	-2.95
16-17	23.8	24.0	- 0.2	-.02	6.0	44.0	-38.0	-3.16
17-18	17.7	24.0	- 6.3	-.52	4.4	44.0	-39.6	-3.30

Minus sign (-) denotes a fall in reservoir surface.

Plus sign (-) " " rise. " " "

Table 12.

CALCULATION OF NET EVAPORATION LOSSES AT MURRAY RESERVOIR.

	Winter				Summer			
Season	Rain Inches	Gross Evap. Inches	Net Loss Inches	Net Loss Feet	Rain Inches	Gross Evap. Inches	Net Loss Inches	Net Loss Feet
1894-95	13.4	22.0	- 8.6	- .72	2.4	42.0	-39.6	-3.30
95-96	7.0	22.0	-15.0	-1.25	1.2	42.0	-40.8	-3.40
96-97	13.2	22.0	- 8.8	- .73	2.4	42.0	-39.6	-3.30
97-98	5.6	22.0	-16.4	-1.36	1.0	42.0	-41.0	-3.42
98-99	6.0	22.0	-16.0	-1.33	1.0	42.0	-41.0	-3.42
99-00	6.7	22.0	-15.3	-1.28	1.2	42.0	-40.8	-3.40
1900-01	11.7	22.0	-10.3	- .86	2.1	42.0	-39.9	-3.32
01-02	6.9	22.0	-15.1	-1.26	1.2	42.0	-40.8	-3.40
02-03	13.1	22.0	- 8.9	- .74	2.3	42.0	-39.7	-3.31
03-04	4.9	22.0	-17.1	-1.42	0.9	42.0	-41.1	-3.43
04-05	16.2	22.0	- 5.8	- .48	2.8	42.0	-39.2	-3.26
05-06	16.6	22.0	- 5.4	- .45	2.9	42.0	-39.1	-3.26
06-07	12.0	22.0	-10.0	- .83	2.1	42.0	-39.9	-3.32
07-08	9.7	22.0	-12.3	-1.02	1.7	42.0	-40.3	-3.35
08-09	11.5	22.0	-10.5	- .88	2.1	42.0	-39.9	-3.32
09-10	11.0	22.0	-11.0	- .92	2.0	42.0	-40.0	-3.33
10-11	13.4	22.0	- 8.6	- .72	2.4	42.0	-39.6	-3.30
11-12	12.1	22.0	- 9.9	- .83	2.1	42.0	-39.9	-3.32
12-13	5.9	22.0	-16.1	-1.34	1.0	42.0	-41.0	-3.42
13-14	11.7	22.0	-10.3	- .86	2.1	42.0	-39.9	-3.32
14-15	18.7	22.0	- 3.3	- .28	3.3	42.0	-38.7	-3.23
15-16	14.9	22.0	- 7.1	- .59	2.7	42.0	-39.3	-3.26
16-17	12.9	22.0	- 9.1	- .76	2.3	42.0	-39.7	-3.31
17-18	6.1	22.0	-15.9	-1.32	1.1	42.0	-40.9	-3.40

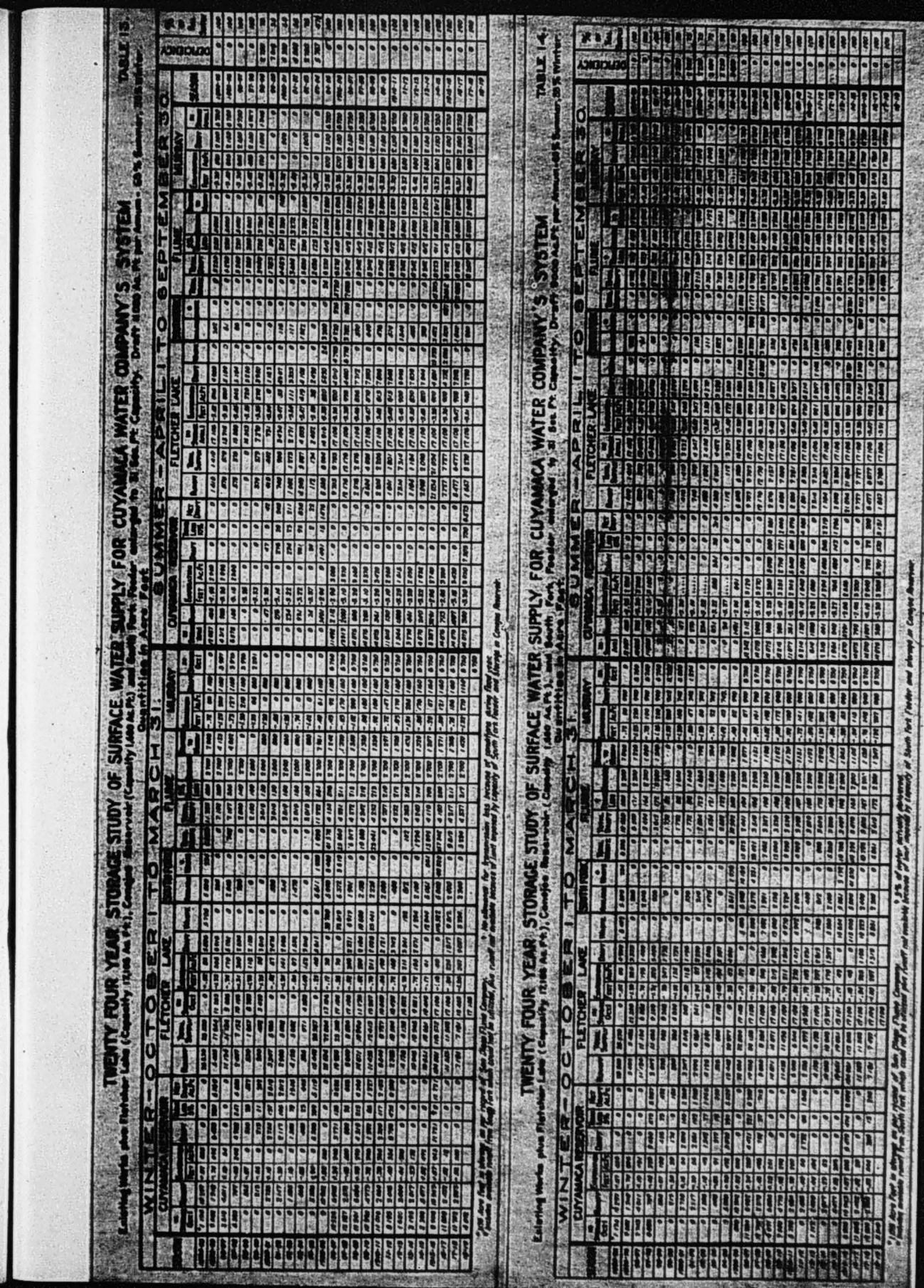
Minus sign (-) denotes a fall in reservoir surface.

Table 12.

CALCULATION OF NET EVAPORATION LOSSES AT MURRAY RESERVOIR.

Season	Winter Rain Inches	Winter Gross Evap. Inches	Winter Net Loss Inches	Winter Net Loss Feet	Summer Rain Inches	Summer Gross Evap. Inches	Summer Net Loss Inches	Summer Net Loss Feet
1894-95	12.4	22.0	- 8.6	- .72	2.4	42.0	-39.6	-3.30
95-96	7.0	22.0	-15.0	-1.25	1.5	42.0	-40.5	-3.40
96-97	12.2	22.0	- 8.8	- .73	2.4	42.0	-39.6	-3.30
97-98	8.6	22.0	-13.4	-1.36	1.0	42.0	-41.0	-3.42
98-99	6.0	22.0	-16.0	-1.33	1.0	42.0	-41.0	-3.42
99-00	6.7	22.0	-15.3	-1.28	1.5	42.0	-40.5	-3.40
1900-01	11.7	22.0	-10.3	- .86	2.1	42.0	-39.9	-3.32
01-02	6.9	22.0	-15.1	-1.26	1.5	42.0	-40.5	-3.40
02-03	13.1	22.0	- 8.9	- .74	2.5	42.0	-39.5	-3.31
03-04	4.9	22.0	-17.1	-1.43	0.9	42.0	-41.1	-3.42
04-05	13.2	22.0	- 8.8	- .73	2.0	42.0	-40.0	-3.36
05-06	13.6	22.0	- 8.4	- .70	2.0	42.0	-40.0	-3.36
06-07	12.0	22.0	-10.0	- .83	2.1	42.0	-39.9	-3.32
07-08	9.7	22.0	-12.3	-1.03	1.7	42.0	-40.3	-3.35
08-09	11.8	22.0	-10.2	- .85	2.1	42.0	-39.9	-3.32
09-10	11.0	22.0	-11.0	- .92	2.0	42.0	-40.0	-3.33
10-11	13.4	22.0	- 8.6	- .72	2.4	42.0	-39.6	-3.30
11-12	12.1	22.0	- 9.9	- .83	2.1	42.0	-39.9	-3.32
12-13	8.9	22.0	-13.1	-1.09	1.6	42.0	-40.4	-3.36
13-14	11.7	22.0	-10.3	- .86	2.1	42.0	-39.9	-3.32
14-15	13.4	22.0	- 8.6	- .72	2.4	42.0	-39.6	-3.30
15-16	14.9	22.0	- 7.1	- .59	2.7	42.0	-39.3	-3.28
16-17	12.9	22.0	- 9.1	- .76	2.3	42.0	-39.7	-3.31
17-18	6.1	22.0	-15.9	-1.32	1.1	42.0	-40.9	-3.40

Minus sign (-) denotes a fall in reservoir surface.



APPENDIX "B"

ESTIMATE OF REPRODUCTION

COST LESS DEPRECIATION

- - - - - - - -

CUYAMACA SYSTEM

DIVISION ENTIRE SYSTEM
STRUCTURE ALL

B-1

WALTER LEROY HUBER
CIVIL ENGINEER

						REPRODUCTION COST			DEPRECIATION			REPRODUCTION LESS DEPRECIATION
STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROBABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
	1	COLLECTION SYSTEM				/22,826	140,093			993	17,093	122,998
	2	TRANSMISSION SYSTEM				1,053,693	1,211,647			30,062	512,492	699,155
	3	DISTRIBUTION SYSTEM				523,003	583,161			18,400	143,136	440,025
	4	Telephone Lines				4,150	4,773			239	955	3,818
	5	MISCELLANEOUS				20,987	20,987					20,987
		GRAND TOTALS - PHYSICAL STRUCTURES				1,720,509	1,960,661			49,694	673,676	1,286,983
		Less deferred maintenance Main Flume $150,000										150,000
												1,136,983

DIVISION COLLECTION
STRUCTURE SUMMARY

B-2

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
1		Cuyamaca Reservoir				57,609	66,247			276	7,454	58,791
2		Diverting Dam				50,111	57,626			71	2,129	55,497
3		Monte Pump Station				14,106	16,220			646	7,510	8,710
		GRAND TOTALS - COLLECTION SYSTEM				122,826	140,093			993	17,093	122,998

DIVISION
STRUCTURE **COLLECTION**
CUYAMACA RESERVOIR.

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
1		DAM										
	1	Stripping	2750	Cu.Yd.	.40	1,100						
	2	Trench Excav.Clay & Earth	1690	"	.65	1,098						
	3	" " Solid Rock	50	"	3.00	150						
	4	Clay Puddle in trench	1740	"	.90	1,566						
	5	Earth Embankment	13691	"	.50	6,845						
	6	Clay Puddle	15008	"	.75	11,256						
	7	Riprap 15" thick	22375	SqFt	.15	3,356						
	8	Dry Slope Wall	254	Cu.Yd.	3.50	889						
		TOTALS				26,260	30,199	32				30,199
2		SPILLWAYS										
	1	Excavation - Earth	1700	Cu.Yd.	.40	680	782	32				782
	2	" -Solid Rock	20	"	3.00	60	69	32				69
	3	Embankment - Earth & Rock	221	"	.25	55	63	32				63
	4	Dry Rock Wall	27	"	3.50	95	110	32				110
	5	Paving 12" thick	800	Sq.Ft.	.10	80	92	32				92
	6	R. O. Pine	0.46	MBM	50.00	23	26	3	30	1	3	23
	7	Concrete	.12	Cu.Yd.	12.50	150	172	0	30			172
	8	Steel	630	Lbs.	.06	38	44	0	30			44
	9	Select R.O.Pine	0.22	MBM	55.00	12	14	0	30			14
	10	" Redwood	0.30	"	60.00	18	21	0	30			21
	11	Bolts & Iron	1	lot	4.00	4	4	0	30			4
		TOTALS				1 ,215	1,397	32		1	3	1,394

DIVISION COLLECTION
STRUCTURE CUYAMACA RESERVOIR

WALTER LEROY HUBER
CIVIL ENGINEER

B-4

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	PROBABLE LIFE	ANNUAL	TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
		REPRODUCTION COST						DEPRECIATION				
3		GATE TOWER										
	1	Excavation - clay	32	Cu. Yd.	.80	26						
	2	Rubble masonry	34	"	12.50	425						
	3	Brick masonry	31.5	M	46.00	1.449						
	4	Cement plaster	1600	Sq.Ft.	.05	80						
	5	Wood gates & platform	1	lot	115.00	115						
	6	Cast iron sluice gate	1	each	550.00	550						
	7	Gage board	1	"	7.00	7						
	8	Rough O.P.in bridge	4.63	MBM	50.00	232						
	9	Bridge iron	45	lbs.	.07	3						
		TOTALS				2,887	3,320	32				3,320
4		OUTLET										
	1	Excavation - earth	73	Cu. Yd.	.50	37	43	32				43
	2	Rubble masonry- hammer dressed	220	"	13.50	2,970	3,415	32				3,415
	3	Paving, 15" thick	399	Sq. Ft.	.75	299	344	32				344
	4	Plaster - 1/2" thick	1540	"	.05	77	88	32				88
	5	Cut-off walls, rough rubble	200	Cu. Yd.	8.00	1,600	1,840	32				1,840
	6	Concrete	6	"	12.50	75	87	32				87
	7	Trenching - earth	283	"	.50	142	164	32				164
	8	Trenching - loose rock	121	"	1.00	121	139	32				139
	9	Weir -rough redwood	1.03	MBM	60.00	62	71	2	30	3	5	66
	10	Enameled gage	1	each	2.00	2	2	2	30		0	2
		TOTALS				5,385	6,193			3	5	6,188

DIVISION COLLECTION

STRUCTURE CUYAMACA RESERVOIR

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
5		METEROLOGICAL APPARATUS										
	1	Evaporating Pans	2	each	42.00	84	97	5	20	5	25	72
	2	Rain Gage	3	"	6.50	19	22	7	20	1	7	15
	3	Max. & Min. Thermometers	1	"	8.25	8	9	7	20	0	3	6
		TOTALS				111	128			6	35	93
6		BOOM										
	1	780' Cedar Logs, aver. 17" diam.	1	lot	150.00	150	172					
	2	1/2" Chain	160	Ln.Ft.	.20	32	37					
		TOTALS				182	209	3	20	10	31	178
7		KELLEY DITCH										
	1	Clearing - Heavy	2	acres	100.00	200	230					
	2	Earth Excavation	5,000	Cu.Yd.	.65	3,250	3,737					
	3	Loose Rock Excavation	6,061	"	1.25	7,576	8,712					
	4	Solid Rock Excavation	1,000	"	3.00	3,000	3,450					
	5	Dry Rock Wall	115	"	3.00	345	397					
		TOTALS				14,371	16,526	22			2,526	14,000
8		KEEPER'S COTTAGE	1	each	2500.00	2,500	2,875	32	50	57	1,840	1,035
9		WATER SUPPLY										
	1	Spring Excavation	3	Cu.Yd.	3.00	9	10	32	50	0	6	4
	2	Concrete	1	"	13.00	13	15	32	50	0	10	5
	3	Spring House - R.O.Pine	0.5	MBM	50.00	25	29	32	50	0	19	11
	4	Rubble Masonry	2	Cu.Yd.	12.50	25	29	32	50	0	19	11
	5	3/4" Galv.Pipe	757	Ln.F.t	.25	189	217	13	25	9	113	104
	6	1/2" " "	473	"	.20	95	109	13	20	5	71	38
	7	Valves & Fittings	1	lot	5.00	5	6	13	20	0	4	2
	8	Wood Stave Tank	1	each	25.00	25	29	15	20	1	22	7
	9	Drain - 4" Vitrified	105	Ln.Ft.	.25	26	29	3	20	2	4	21
						412	473			17	268	203

DIVISION STRUCTURE COLLECTION

GUYAMACA RESERVOIR

B-6

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
10		FENCE AROUND LAKE										
	1	Barbed wire	243.7	Ln.Ft.	8.00	1,950	2,242	15	25	90	1,350	892
	2	Cedar posts	3429	each	.25	857	986	12	25	39	474	512
	3	" "	500	"	.50	250	287	12	25	12	138	149
		TOTALS				3,057	3,515			141	1,962	1,553
11		FENCE AROUND BLDGS, ETC.										
	1	Barbed wire	26.6	MLn.Ft.	8.00	213	245	8	25	10	78	167
	2	Cedar posts	462	each	.25	116	133	6	25	5	32	101
		TOTALS				329	378			15	110	268
12		BARN	1	each	400.00	400	460	32	35	13	420	40
13		WORKSHOP	1	each	150.00	150	172	15	35	5	75	97
14		COW BARN	1	each	100.00	100	115	32	35	3	105	10
15		CHICKEN HOUSE	1	each	150.00	150	172	15	35	5	74	98
16		ROADS TO BARN, COTTAGE, ETC. (grading, etc.)	1	lot	100.00	100	115	32				115

DIVISION STRUCTURE **COLLECTION**

CUYAMACA RESERVOIR

B-7

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
		SUMMARY										
1		Dam				26,260	30,199					30,199
2		Spillways				1,215	1,397			1	3	1,394
3		Gate tower				2,887	3,320					3,320
4		Outlet				5,385	6,193			3	5	6,188
5		Meterological Apparatus				111	128			6	35	93
6		Boom				182	209			10	31	178
7		Kelley Ditch				14,371	16,526				2526	14,000
8		Keeper's Cottage				2,500	2,875			57	1840	1,035
9		Water Supply				412	473			17	268	203
10		Fence around Lake				3,057	3,515			141	1962	1,553
11		Fence around Buildings				329	378			15	110	268
12		Barn				400	460			13	420	40
13		Work Shop				150	172			5	75	97
14		Cow Barn				100	115			3	105	10
15		Chicken House				150	172			5	74	98
16		Roads				100	115					115
		GRAND TOTAL - CUYAMACA RESERVOIR				57,609	66,247			276	7454	58,791

DIVISION COLLECTION
STRUCTURE DIVERTING DAM.

B-8

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
1		DAM										
	1	Excav. Solid rock	488	Cu.Yd.	3.00	1,464	1,684	30				1,684
	2	" Dis. granite	955	"	1.00	955	1,098	30				1,098
	3	Rubble masonry	4445	"	8.00	35,560	40,894	30				40,894
	4	Concrete	394	"	11.00	4,334	4,984	6				4,984
	5	Rough redwood	0.68	MBM	55.00	37	43	3	30		4	39
	6	Gage Board	1	each	5.00	5	6	3	30		1	5
	7	4" x 12' Enameled gage	1	"	8.00	8	9	1	10		1	8
	8	Iron ladder	1	"	8.00	8	9	9	100		1	8
	9	30" x 30" C.I. Gate & Stand	1	")								
	10	24"x 24" " " " " "	1	")	3000.00	3,000	3,450	9	100		345	3,105
	11	36"x 24" " " " " "	2	")								
	12	Excav. for Tumble Bay	1030	Cu.Yd.	1.75	1,802	2,072	6				2,072
	13	1-1/2" Std.Pipe Dowell Pins	600	lbs.	.10	60	69	6				69
		TOTALS				47,235	54,318				352	53,966
2		KEEPER'S HOUSE	1	each	2000.00	2,000	2,300	30	50	46	1,380	920
3		OUTHOUSES	1	each	6.00	6	7	12	25		3	4
4		BARN	1	each	150.00	150	172	30	35	5	147	25
5		CHICKEN HOUSE	1	each	60.00	60	69	30	35	2	59	10
6		CORRAL	1	each	50.00	50	58	30	35	2	50	8

DIVISION COLLECTION
STRUCTURE DIVERTING DAM

B-9

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
						REPRODUCTION COST		DEPRECIATION				REPRODUCTION LESS DEPRECIATION
7		FENCES										
	1	Barbed wire	6.24	MLn.Ft	8.00	50	57	10	25	2	23	34
	2	4 x 6 x 7 R.W.Posts	184	each	.50	92	106	10	25	4	42	64
	3	Laths	0.5	M	10.00	5	6	10	25	-	2	4
	4	36" Chicken mesh wire	393	Ln.Ft.	.06	24	28	10	25	1	11	17
	5	Rough C.Pine	0.5	MBM	55.00	27	31	10	25	1	12	19
		TOTALS				198	228			8	90	138
8		BOULDER CREEK MEASURING STATION										
	1	Excav. Earth & Boulders	3	Cu.Yd.	2.00	6						
	2	Concrete	5	"	12.50	63						
	3	Paving 12" thick,plastered	450	Sq.Ft.	.35	158						
	4	Rough redwood	.15	MBM	57.00	9						
	5	S 4 S "	.51	"	70.00	36						
	6	Painting	11	Sq.Yd.	.10	1						
	7	" - asphalt	7	"	.15	1						
	8	Gage Board	1	each	2.00	2						
	9	Enameled Gate 4" x 18"	2	"	1.50	3						
		TOTALS				279	321	6	40	8	48	273
9		SCOURING DITCH BELOW DAM										
	1	Excav. boulders & dis.granite	40	Cu.Yd.	2.00	80						
	2	Grouted paving 12" thick	180	Sq.Ft.	.25	45						
		TOTALS				125	144					144
10		RAIN GAGE										
	1	Rain gage	1	each	6.50	6						
	2	Rough redwood	.03	MBM	60.00	2						
		TOTALS				8	9					9

DIVISION COLLECTION. B-10 WALTER LEROY HUBER
STRUCTURE DIVERTING DAM. CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
						REPRODUCTION COST		DEPRECIATION				REPRODUCTION LESS DEPRECIATION
		SUMMARY										
1		**Dam**				47,235	54,318			0	352	53,966
2		**Keeper's House**				2,000	2,300			46	1,380	920
3		**Outhouses**				6	7			0	3	4
4		**Barn**				150	172			5	147	25
5		**Chicken House**				60	69			2	59	10
6		**Corral**				50	58			2	50	8
7		**Fences**				198	228			8	90	138
8		**Boulder Creek Meas.Station**				279	321			8	48	273
9		**Scouring Ditch below Dam**				125	144			0	-	144
10		**Rain Gage**				8	9			0	-	9
		GRAND TOTAL -DIVERTING DAM				50,111	57,626			71	2,129	55,497

DIVISION STRUCTURE **COLLECTION** **MONTE PUMP PLANT**

B-11 WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM.	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION TOTAL
						REPRODUCTION COST				DEPRECIATION		
1		**PUMP BUILDING**	1	each	3,500.	3,500	4,025	18	40	100	1,811	2,214
2		**STORAGE BARN**			150.	150	172	18	40	4	77	95
3		**FENCE**										
	1	Redwood Lumber	1,646	MBM	50.	82	94					94
	2	Barbed Wire	8,846	MLnFt	8.	70	80					80
	3	Smooth Wire	.567	"	6.	4	5					5
		TOTALS				3,806	4,376			104	1,888	2,488
4		**MOTOR & PUMP**										
		Complete equipment, wiring, etc.	1	lot	3,000.	3,000	3,450	4	25	138	552	2,898
5		**VACUUM PUMP & PIPING**	1	lot	750.	750	862	4	25	34	138	724
6		**GAGES, BLEEDERS, DRAINS, ETC.**	1	lot	400.	400	460	4	25	18	74	386
7		**SUCTION LINE**	1	lot	150.	150	172	4	25	7	28	144
8		**DISCHARGE LINE**	1	lot	6,000.	6,000	6,900	14	20	345	4,830	2,070
		GRAND TOTALS - MONTE PUMP PLANT				14,106	16,220			646	7,510	8,710

DIVISION TRANSMISSION
STRUCTURE SUMMARY

B-12

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROB. ABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
1		Main Flume				1,005,196	1,155,874			28,925	504,606	651,268
2		South Fork Feeder				24,225	27,858			851	3,370	24,488
3		Murray 36" Supply Line				9,473	10,893			120	718	10,175
4		La Mesa Ditch				14,987	17,237			177	3,842	13,395
		GRAND TOTALS - TRANSMISSION SYSTEM				1,053,881	1,211,862			30,073	512,536	699,326
		Less deferred maintenance - Main Flume										150,000
		Reproduction, less Depreciation and Deferred Maintenance										549,326

DIVISION TRANSMISSION. B-13 WALTER LEROY HUBER
STRUCTURE CIVIL ENGINEER

MAIN FLUME - Sec. No. 1, Div. Dam to Tunnel No.5.

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
1		CLEARING	58.6	acres	10.00	586	674					674
2		EXCAVATION										
	1	Earth	748	Cu.Yd.	.50	374						
	2	Disintegrated granite	109742	"	.80	87,794						
	3	Cemented gravel	562	"	2.50	1,405						
	4	Hard rock	14895	"	3.00	44,685						
		TOTALS				134,258	154,397					154,397
3		DRY RUBBLE WALLS (dry rubble)	915	Cu.Yd.	3.00	2,745	3,157					3,157
4		FLUME BOX										
	1	Rough redwood	1782.4	MBM	60.00	106,944	122,985	30	40	3,075	92,250	30,735
	2	Rough redwood	33.547	"	60.00	2,013	2,315	3	40	58	174	2,141
	3	Rough redwood	19.0	"	60.00	1,140	1,311	2	40	33	66	1,245
	4	S3S redwood	1594.8	"	70.00	111,636	128,381	30	40	3,210	96,300	32,081
	5	S33 redwood	12.0	"	70.00	840	966	2	40	24	48	918
	6	333 redwood	34.0	"	70.00	2,380	2,737	3	40	68	204	2,533
	7	3S3 redwood	0.44	"	60.00	26	30	30	40	1	22	8
	8	Rough C.Pine	26.0	"	55.00	1,430	1,645	3	30	55	165	1,480
	9	Wedges	34,000	each	0.015	510	586	4	40	15	60	526
	10	Caulking with oakum	39.9	MLF	8.00	319	367	10	17	22	216	151
	11	Caulking with oakum	15.0	"	8.00	120	138	8	17	8	65	73
	12	Caulking with oakum	511.82	"	8.00	4,095	4,709	7	17	217	1,939	2,770
	13	Flume lining	8609.5	Sqr.	4.00	34,438	39,604	4	8	4,950	19,802	19,802
	14	Flume lining	400.0	"	4.00	1,600	1,840	2	8	230	460	1,380
	15	Flume lining	770.3	"	4.00	3,081	3,543	1	8	443	443	3,100
		TOTALS				270,672	311,157			12,469	212,214	98,943

DIVISION TRANSMISSION
STRUCTURE MAIN FLUME - Sec.#1, Div.Dam to Tunnel #5

B-14

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
5		TRESTLES										
	1	Rough O. Pine	295.95	MBM	55.00	16,277	18,718	30	40	468	14,038	4,680
	2	" " "	2.30	"	55.00	126	145	4	40	4	15	130
	3	" " "	5.657	"	55.00	311	358	3	40	9	27	331
	4	" " "	32.30	"	55.00	1,776	2,042	2	40	51	102	1,940
	5	" " "	6.10	"	55.00	335	385	1	40	10	10	375
	6	Concrete Piers	10	CuYd	12.50	125	144	30	40	4	108	36
	7	Rubble "	17	"	11.00	187	215	30	40	5	162	53
		TOTALS				19,137	22,007			551	14,462	7,545
6		GALVD. FLUME	2530	LnFt	8.85	22,390	25,748	5	40	644	3, 218	22,530
7		WASTEWAYS										
	1	Rough Redwood	3.7	MBM	60.00	222	256	30	40	64	192	64
	2	Iron	25	lbs	.06	2	2	30	40		1	1
	3	Rough Redwood	1.7	MBM	60.00	102	117	4	40	3	12	105
	4	Iron	59	lbs	.06	4	5	4	40		1	4
	5	C I Wheel Gate Lift	1	each	50.00	50	58	4	40	2	6	52
	6	Concrete	4	CuYd	12.50	50	58	4	40	2	6	52
	7	15" Riv.Steel Pipe	123	LnFt	3.00	369	424	4	40	11	42	382
		TOTALS				799	920			82	260	660
8		HIGHWAY BRIDGES										
		Rough O. Pine	3.6	MBM	60.00	216	248	15	40	6	93	155
9		CULVERTS										
	1	Rough Redwood	7.5	MBM	60.00	450	517	30	40	13	388	129
10		SAND BOXES										
	1	Rough Redwood	0.6	MBM	70.00	42	48	30	40	1	36	12

DIVISION TRANSMISSION
STRUCTURE MAIN FLUME - Sec. #2, Tunnel #5 to Eucalyptus Reservoir B-15

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
A		**CLEARING**	61.4	acres	10.	614	706					706
B		**EXCAVATION**										
	1	Earth	7850	CuYd	.50	3,925						
	2	Disintegrated Granite	65764	"	.80	52,611						
	3	Adobe	6364	"	.60	3,818						
	4	Cemented Gravel	1801	"	2.50	4,502						
	5	Hard Rock	7513	"	3.00	22,539						
		TOTALS				87,395	100,504					100,504
C		**RIPRAP**										
	1	Riprap 12" thick	1350	SqFt	.15	203	234					234
D		**FLUME BOX**										
	1	R. Redwood	1785.8	MBM	53.70	95,897	110,282	30	40	2,757	82,771	27,511
	2	" "	149	"	53.70	8,001	9,201	30	40	230	6,900	2,301
	3	S3S Redwood	1745.3	"	67.60	117,982	135,679	303	40	3,392	101,759	33,920
	4	R O Pine	17.3	"	51.60	893	1,027	3	40	26	77	950
	5	Wedges	36000	each	.015	540	621	4	40	16	64	557
	6	Caulking with Oakum	38.9	MLF	8.00	311	358	10	17	21	210	148
	7	" " "	14.3	"	8.00	114	131	8	17	8	64	67
	8	" " "	501.7	"	8.00	4,014	4,616	7	17	272	1,900	2,716
	9	Flume Lining	8580.2	Sqr	4.00	34,320	39,468	4	8	4,933	19,734	19,734
	10	" "	438	"	4.00	1,752	2,015	1	8	252	252	1,763
		TOTALS				263,824	303,398			11,907	213,731	89,667

DIVISION TRANSMISSION
STRUCTURE MAIN FLUME -- Sec. #2, Tunnel #5 to Eucalyptus Res. B-16

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
E		TRESTLES										
	1	R O Pine	1028	MBM	51.60	53,045	61,002	30	40	1,525	45,751	15,251
	2	" "	57.9	"	51.60	2,988	3,436	4	40	86	344	3,092
	3	" "	12	"	51.60	619	712	2	40	18	36	676
	4	Concrete Piers	8.6	CuYd	12.50	107	123	30	40	3	92	31
	5	Rubble "	17	"	11.00	187	215	30	40	5	161	54
		TOTALS				56,946	65,488			1,637	46,384	19,104

DIVISION TRANSMISSION
STRUCTURE MAIN FLUME

B-17

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	PROBABLE LIFE	ANNUAL	TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
11		WATERING TROUGHS										
	1	Watering troughs	3	each	15.00	45	52					
	2	1" standard screw pipe	600	Ln.Ft.	.20	120	138					
		TOTALS				165	190	8	40	5	38	152
12		GAGES										
	1	Gage box	4	each	5.00	20	23	5	20	1	6	18
	2	Rain gage	3	each	6.50	20	23	5	20	1	6	18
		TOTALS				40	46			2	12	34
13		MEASURING BOXES (Owned)										
	1	Hoover Box	1	each	100.00	100	115	2	20	6	12	103
	2	Lakeside Box	1	each	100.00	100	115	2	20	6	12	103
	3	Hawley Box	1	each	110.00	110	126	2	20	6	13	113
	4	Standard Boxes	18	each	20.00	360	414	3	15	28	83	331
		TOTALS				670	770			46	120	650
14		BOARD WALK										
	1	Rough O.Pine	2.3	MBM	60.00	138	159	4	40	4	16	143
15		SCREEN BOX & SCREENS	1	lot	70.00	70	80	5	20	4	20	60
16		SUMP FOR PUMP NO.4.										
	1	Excav. Sand & Boulders	42	Cu.Yd.	15.00	630						
	2	Rough O.Pine	2.2	MBM	60.00	132						
		TOTALS				762	876	5	20	44	219	657
17		SAND BOX - Pump No.3.										
	1	348 redwood	0.34	MBM	70.00	24	28	5	20	1	7	21

DIVISION TRANSMISSION

STRUCTURE MAIN FLUME

B-18 WALTER LEROY HUBER, CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
18		SAND CREEK CONCRETE CONDUIT - 1097' LONG										
	1	Excav. Disint. Granite	1600	CuYd	1.50	2,400						
	2	Concrete Lining	330	"	14.00	4,620						
	3	Reinforcement 1" Mesh	1500	lbs	.10	150						
	4	" Bars	1000	"	.10	100						
	5	Grouting 2 Coats	14000	SqFt	.05	700						
	6	10" Cement Drain Pipe	30	LnFt	.50	15						
	7	8" " " "	80	"	.40	32						
	8	Wood Gates	2	each	6.00	12						
	9	30 lb. Steel Rails	480	lbs	.06	29						
	10	6" Std Screw Pipe	18	LnFt	1.36	24						
	11	6" Screw End Gate Valve	1	each	25.00	25						
		TOTALS				8,107	9,323	5	100	93	466	8,857
19		SAND CREEK SIPHON										
	1	Excav. & Backfill	2450	CuYd	1.50	3,675	4,226	5	100	42	211	4,015
	2	42" Reinf.Concrete Pipe	1137	LnFt	5.00	5,685	6,538	5	100	65	327	6,211
	3	40" No. 10 Steel Pipe	100	"	10.00	1,000	1,150	2	40	29	57	1,093
	4	Reinf.Concrete Collars	7.5	CuYd	20.00	150	172	2	100	2	3	169
	5	Piers - Concrete	20	"	12.50	250	287	2	100	3	6	281
	6	Tie Beams "	1.4	"	20.00	28	32	2	100	0	1	31
	7	6" Std Screw Pipe	24	LnFt	1.36	33	38	5	40	1	4	34
	8	6" Fittings	1	lot	26.00	26	30	2	40	1	2	28
	9	6" Screw End Gates	2	each	25.00	50	58	3	40	1	4	54
	10	20" Manhole & Frame	1	"	40.00	40	46	5	100	0	2	44
	11	16" Manhole & Frame	1	"	36.00	36	41	2	100	0	1	40
	12	Excav.& Backfill-Forebays	50	CuYd	1.25	62	71	5	100	1	4	67
	13	Concrete in Forebays	20	"	14.00	280	322	5	100	3	16	306
	14	Reinf. " "	400	lbs	.10	40	46	5	100	0	2	44
	15	Timber Screens	0.4	MBM	100.	40	46	5	20	2	12	34
	16	Drain Pipes 1"	65	LnFt	.25	16	18	5	20	1	5	13
	17	Covering ROPine	1.8	MBM	55.90	101	116	5	20	6	29	87
		TOTALS				11,512	13,237			157	686	12,551

DIVISION **TRANSMISSION**
STRUCTURE **MAIN FLUME**

B-19

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION TOTAL
			REPRODUCTION COST					DEPRECIATION				
20		**SAND CREEK WING WALL**										
	1	Rough Redwood	2.0	MBM	57.40	115						
	2	Rubble Wall (Dry)	3	CuYd	3.00	9						
	3	2" Pipe (Driven) S H	500	LnFt	.40	200						
	4	Barbed Wire	2000	"	.008	16						
		TOTALS				340	392	2	25	16	32	360
21		**SAND CREEK OUTLET FLUME**										
	1	Concrete	5	CuYd	20.00	100						
	2	Reinforcement	300	lbs	.10	30						
		TOTALS				130	150	5	100	2	8	142
22		**SQUARE CONCRETE FLUME AT INDIAN CHURCH**										
	1	Concrete	35	CuYd	20.00	700						
	2	Triangular Mesh	2000	lbs	.10	200						
	3	Bars and Braces	670	lbs	.10	67						
		TOTALS				967	1,112	5	100	11	56	1,056
23		**CONCRETE FLUME AT GROSSMONT**										
	1	Rubble Masonry	4	CuYd	8.00	32						
	2	Concrete	6.5	"	20.00	130						
	3	"Gunite" Concrete	18	"	20.00	360						
	4	1" Mesh Reinforcement	250	lbs	.10	25						
	5	Twisted Bars	350	"	.10	35						
	6	Roofing for Forms	20.2	Sqr	3.00	61						
	7	Rough O Pine Forms	0.7	MBM	51.60	36						
	8	" Redwood Forms	4.1	"	53.70	220						
	9	Plastering	1200	SqFt	.05	60						
		TOTALS				959	1,103	5	100	11	55	1,048

DIVISION TRANSMISSION
STRUCTURE MAIN FLUME

B-20 WALTER LEROY HUBER, CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
24		SOUTH FORK SIPHON - OLD										
	1	Excav. & Backfill	710	CuYd	1.50	1,065						
	2	26" No.14 Riv.Steel Pipe	286	LnFt	2.40	686						
	3	26" No.12 " " "	1134	"	2.66	3,016						
	4	Concrete	12	CuYd	12.50	150						
	5	C I Manhole & Frame	1	each	36.00	36						
	6	4" Std Screw Pipe	32	LnFt	.90	29						
	7	4" Pipe Fittings	1	lot	5.00	5						
	8	4" Screw End Gate	1	each	12.00	12						
	9	8" Saddle	1	"	10.00	10						
	10	8" Nipple	1	"	3.00	3						
	11	8" Std Screw Pipe	20	LnFt	2.00	40						
	12	8" Screw End Gate	1	each	30.00	30						
	13	Concrete in Valve Box	1	CuYd	20.00	20						
	14	Lumber " " "	0.2	MBM	70.40	14						
	15	Excav. in Inlet & Outlet	42	CuYd	1.50	63						
	16	Concrete " " "	24	"	14.00	336						
	17	Reinf. " " "	310	lbs	.10	31						
	18	Lumber in Screen	0.12	MBM	70.40	8						
	19	4" Gate & Nipples	1	lot	14.00	14						
		TOTALS				5,568	6,403	5	40	160	803	5,600
25		SOUTH FORK SIPHON - NEW										
	1	24" No. 12 Riv.Steel Pipe	732	LnFt	2.35	1,720						
	2	24" No. 10 " " "	662	"	3.10	2,052						
	3	24"x30" Taper No. 12	1	each	60.00	60						
	4	24" C I Flanges	8	"	30.00	240						
	5	Bolts & Gaskets	1	lot	28.00	28						
	6	Manhole & Frame	2	each	25.00	50						
	7	Ells & 8" Blowoff	1	lot	200.00	200						
	8	Excavation & Backfill	497	CuYd	1.50	745						
	9	Rough O Pine Cover	1.0	MBM	57.40	57						
		TOTALS				5,152	5,924	2	40	148	296	5,628

DIVISION TRANSMISSION
STRUCTURE MAIN FLUME

B-21

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROBABLE LIFE	ANNUAL	DEPRECIATION TOTAL	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
26		PIERS & ANCHOR BLOCKS - NEW SOUTH FORK SIPHON										
	1	Excav. Sand & Boulders, Very wet quick sand, etc.	106	CuYd	10.00	1,060						
	2	Concrete	85	"	12.50	1,062						
	3	Reinf. Steel	600	lbs	.10	60						
	4	" Scrap Iron	4000	"	.03	120						
	5	28" No.12 Steel Pipe(SH)	112	LnFt	2.50	280						
	6	Concrete Anchor Blocks	10	CuYd	12.50	125						
		TOTALS				2,707	3,113	2	40	78	156	2,957
27		TRUSSES & TRESTLE FOR NEW SOUTH FORK SIPHON										
	1	Select R O Pine	2.86	MBM	150.	429						
	2	Rough O. Pine	0.48	"	125.	60						
	3	Iron	620	Lbs	.10	62						
	4	1/4" x 7" Bolts	360	each	.10	36						
	5	Hardware	1	lot	10.00	10						
	6	Paint 3 coats	1	"	50.00	50						
		TOTALS				647	744	2	20	37	74	670
28		INLET & OUTLET - NEW SOUTH FORK SIPHON										
	1	Excav. Earth & Disin. granite	51	CuYd	1.50	76						
	2	Concrete	26	"	14.50	377						
		TOTALS				453	521	2	40	13	26	495

DIVISION TRANSMISSION

STRUCTURE MAIN FLUME

B-22

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	DEPRECIATION TOTAL	REPRODUCTION LESS DEPRECIATION TOTAL
		REPRODUCTION COST						DEPRECIATION				
29		CHOCOLATE SIPHON										
	1	Excav. & Backfill	2400	CuYd	1.50	3,600						
	2	30" No.12 Riv.Steel Pipe	2060	LnFt	3.07	6,324						
	3	30" No.10 " " "	600	"	3.78	2,268						
	4	30" Ells	1	lot	60.00	60						
	5	Concrete at Creek Crossing	200	CuYd	9.00	1,800						
	6	C.I. Manhole & Frame	1	each	36.00	36						
	7	Expansion Sleeves	2	"	10.00	20						
	8	8" Saddle	1	"	10.00	10						
	9	8"x10" Nipple	1	"	3.00	3						
	10	8" Screw End Gate	1	"	30.00	30						
	11	8" Close Nipple	1	"	3.00	3						
	12	Excav.for Inlet & Outlet	40	CuYd	1.50	60						
	13	Concrete " " "	24	"	14.00	336						
	14	Reinf. " " "	310	lbs	.10	31						
	15	Lumber in Screens	1	MBM	70.40	70						
	16	4" Screw End Gate	1	each	12.00	12						
	17	4"x8" Nipple	1	"	2.00	2						
	18	Leading Bands	2	"	3.00	6						
	19	Lead	300	lbs	.08	24						
	20	Concrete in Piers	4	CuYd	12.50	50						
	21	6" Std Screw Pipe	40	LnFt	1.36	54						
	22	6"x10" Nipple	1	each	2.00	2						
	23	6" Ell	1	"	2.00	2						
	24	6" Screw End Gate	1	"	25.00	25						
		TOTALS				14,828	17,052	5	40	426	2,131	14,921

DIVISION TRANSMISSION
STRUCTURE MAIN FLUME

B-23 WALTER LEROY HUBER, CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROBABLE LIFE	ANNUAL	TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION TOTAL
		REPRODUCTION COST						DEPRECIATION				
30		CHOCOLATE WING WALL										
	1	2" Std Screw Pipe	1000	LnFt	.40	400						
	2	Barbed Wire	5000	"	.008	40						
	3	Concrete	55	CuYd	9.00	495						
	4	Rough O. Pine	0.9	MBM	57.40	52						
		TOTALS				987	1,135	0	25	45		1,135
31		TUNNEL NO.1-333.5' LONG										
	1	Excavation	333.5	LnFt	12.50	4,169	4,794	30		0	0	4,794
	2	Rough Redwood Timbering	8.9	MBM	100.	890	1,050	30	40	26	767	256
	3	Rubble Walls	148.2	CuYd	8.00	1,186	1,364	30		0	0	1,364
	4	Rubble Arch & Spandrel	31.6	"	10.00	316	363	30		0	0	363
	5	Concrete Paving	21.5	"	12.50	269	309	30		0	0	309
	6	Plaster 1" thick	4.048	SqFt	.07	283	325	30		0	0	325
		TOTALS				7,113	8,178	30		26	767	7,411
32		TUNNEL NO. 1-1/2										
	1	Excavation	200	CuYd	1.50	300	345	5		0	0	345
33		TUNNEL NO. 2 - 237' LONG										
	1	Excavation	237	LnFt	12.50	2,962	3,406			0	0	3,406
	2	Backfill	100	CuYd	.50	50	58			0	0	58
	3	Rough Redwood Timbering	6.7	MBM	100.	670	770	30	40	19	578	192
	4	Rubble Walls	100.2	CuYd	8.00	802	922			0	0	922
	5	Rubble Arch & Spandrel	27.1	"	10.00	271	312			0	0	312
	6	Concrete Paving	14.9	"	12.50	186	214			0	0	214
	7	Plastering 1" thick	2789	SqFt	.07	195	224			0	0	224
		TOTALS				5,136	5,906			19	578	5,328

DIVISION TRANSMISSION
STRUCTURE MAIN FLUME

B-24 WALTER LEROY HUBER, CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
34		TUNNEL NO. 3 - 91' LONG										
	1	Excavation	91	LnFt	10.00	910	1,046			0	0	1,046
	2	Rough Redwood Timbering	2.1	MBM	100.	210	241	30	40	6	180	61
	3	Rubble Walls	48	CuYd	8.00	384	441			0	0	441
	4	Rubble Arch & Spandrel	26	"	10.00	260	299			0	0	299
	5	Concrete Paving	7	"	12.50	87	100			0	0	100
	6	Plastering 1" thick	1265	SqFt	.07	89	102			0	0	102
		TOTALS				1,940	2,229			6	180	2,049
35		TUNNEL NO. 4 - 699' LONG										
	1	Excavation	304	LnFt	12.50	3,800	4,370			0	0	4,370
	2	"	395	"	18.00	7,110	8,176			0	0	8,176
	3	Rough Redwood Timbering	7.7	MBM	100.	770	885	30	40	22	664	221
	4	Rubble Walls	114.8	CuYd	8.00	918	1,055			0	0	1,055
	5	Rubble Arch & Spandrel	36	"	10.00	360	414			0	0	414
	6	Concrete Wall	31	"	12.50	387	445			0	0	445
	7	" Paving	39.4	"	12.50	493	567			0	0	567
	8	Plastering 1" thick	3378	SqFt	.07	236	271			0	0	271
		TOTALS				14,074	16,183			22	664	15,519
36		TUNNEL NO. 5 - 320' LONG										
	1	Excavation	320	LnFt	12.50	4,000	4,600			0	0	4,600
	2	Rough Redwood Timbering	2.5	MBM	100.	230	264	30	40	7	198	66
	3	Rubble Walls	145	CuYd	8.00	1,160	1,334			0	0	1,334
	4	Rubble Arch & Spandrel	40.7	"	10.00	407	468			0	0	468
	5	Concrete Paving	20.5	"	12.50	256	294			0	0	294
	6	Plastering 1" thick	3991	SqFt	.07	279	321			0	0	321
		TOTALS				6,332	7,281			7	198	7,083

DIVISION TRANSMISSION
STRUCTURE MAIN FLUME

B-25 WALTER LEROY HUBER, CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
37		**TUNNEL NO. 6- 316' LONG**										
	1	Excavation	316	LnFt	12.50	3,950	4,542			0	0	4,542
	2	Rough Redwood Timbering	5.8	MBM	100.	580	667	30	40	17	500	167
	3	Rubble Walls	126.4	CuYd	8.00	1,011	1,163			0	0	1,163
	4	Rubble Arch & Spandrel	31.9	"	10.00	319	367			0	0	367
	5	Concrete Paving	19.0	"	12.50	237	273			0	0	273
	6	Plastering 1" thick	3603	SqFt	.07	252	290			0	0	290
		TOTALS				6,349	7,302			17	500	6,802
38		**TUNNEL NO. 7-1902' LONG**										
	1	Excavation	1292	LnFt	12.50	16,150	18,572			0	0	18,572
	2	"	610	"	16.00	9,760	11,224			0	0	11,224
	3	Rough Redwood Timbering	22.2	MBM	100.	2,220	2,563	30	40	64	1,922	641
	4	" O. Pine	10.2	"	70.00	714	821	30	40	21	616	205
	5	Rubble Walls	818	CuYd	8.00	6,544	7,526			0	0	7,526
	6	Rubble Arch & Spandrel	32.3	"	10.00	323	372			0	0	372
	7	Concrete Slabs	256	each	2.00	512	589			0	0	589
	8	Concrete Filling	42	CuYd	12.50	525	604			0	0	604
	9	Concrete Paving	104	"	12.50	1,300	1,495			0	0	1,495
	10	Plastering 1" thick	18970	SqFt	.07	1,328	1,527			0	0	1,527
		TOTALS				39,376	45,293			85	2,538	42,755
39		**TUNNEL NO. 8 - 284'**	284	LnFt	12.50	3,550	4,082			0	0	4,082
	2	Rough Redwood Timbering	7.5	MBM	100.	750	862	30	40	22	647	215
	3	Rubble Walls	131.5	CuYd	8.00	1,052	1,210			0	0	1,210
	4	Rubble Arch & Spandrel	33.7	"	10.00	337	388			0	0	388
	5	Concrete Paving	18.7	"	12.50	234	269			0	0	269
	6	Plastering 1" thick	3565	SqFt	.07	250	287			0	0	287
		TOTALS				6,173	7,098			22	647	6,451

DIVISION TRANSMISSION
STRUCTURE MAIN FLUME

B-26

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
		FLUME NO. 3 - SEC. 1										
	1	EXCAVATION	315	cu.yd.	12.00	3,780	4,347			0	0	4,347
	2	MONEY HEADBOOK TIMBERING	2.5	M.B.M.	100.	250	288	30	40	14	216	72
	3	RAPPLE WALLS	1,151	cu.yd.	8.00	9,208	10,589			0	0	10,589
	4	RAPPLE MACH. & SHOVELS	1.25	"	100.00	125	144			0	0	144
	5	CONCRETE LINING	7.0	"	12.50	88	101			0	0	101
	6	TIMBERING 1" thick	2,000	sq.ft.	.10	200	230			0	0	230
		TOTALS				13,626	15,669			14	216	15,453
		FLUME NO. 4 - SEC. 1, LONG										
	1	EXCAVATION	1,260	cu.yd.	12.00	15,120	17,388			0	0	17,388
	2	MONEY HEADBOOK TIMBERING	5.0	M.B.M.	100.	500	575	30	40	14	431	144
	3	RAPPLE WALLS	1,151	cu.yd.	8.00	9,208	10,589			0	0	10,589
	4	RAPPLE MACH. & SHOVELS	1.25	"	100.00	125	144			0	0	144
	5	CONCRETE LINING	7.0	"	12.50	88	101			0	0	101
	6	TIMBERING 1" thick	2,000	sq.ft.	.10	200	230			0	0	230
		TOTALS				25,241	29,027			14	431	28,596
		FLUME NO. 4 - SEC. 2, LONG										
	1	EXCAVATION	1,260	cu.yd.	12.00	15,120	17,388			0	0	17,388
	2	MONEY HEADBOOK TIMBERING	5.0	M.B.M.	100.	500	575	30	40	14	431	144
	3	RAPPLE WALLS	1,151	cu.yd.	8.00	9,208	10,589			0	0	10,589
	4	RAPPLE MACH. & SHOVELS	1.25	"	100.00	125	144			0	0	144
	5	CONCRETE LINING	7.0	"	12.50	88	101			0	0	101
	6	TIMBERING 1" thick	2,000	sq.ft.	.10	200	230			0	0	230
		TOTALS				25,241	29,027			14	431	28,596
		FLUME NO. 4 - SEC. 3, LONG										
	1	EXCAVATION	1,260	cu.yd.	12.00	15,120	17,388			0	0	17,388
	2	MONEY HEADBOOK TIMBERING	5.0	M.B.M.	100.	500	575	30	40	14	431	144
	3	RAPPLE WALLS	1,151	cu.yd.	8.00	9,208	10,589			0	0	10,589
	4	RAPPLE MACH. & SHOVELS	1.25	"	100.00	125	144			0	0	144
	5	CONCRETE LINING	7.0	"	12.50	88	101			0	0	101
	6	TIMBERING 1" thick	2,000	sq.ft.	.10	200	230			0	0	230
		TOTALS				25,241	29,027			14	431	28,596
		FLUME NO. 5 - SEC. 1, LONG										
	1	EXCAVATION	1,260	cu.yd.	12.00	15,120	17,388			0	0	17,388
	2	MONEY HEADBOOK TIMBERING	5.0	M.B.M.	100.	500	575	30	40	14	431	144
	3	RAPPLE WALLS	1,151	cu.yd.	8.00	9,208	10,589			0	0	10,589
	4	RAPPLE MACH. & SHOVELS	1.25	"	100.00	125	144			0	0	144
	5	CONCRETE LINING	7.0	"	12.50	88	101			0	0	101
	6	TIMBERING 1" thick	2,000	sq.ft.	.10	200	230			0	0	230
		TOTALS				25,241	29,027			14	431	28,596
		FLUME NO. 5 - SEC. 2, LONG										
	1	EXCAVATION	1,260	cu.yd.	12.00	15,120	17,388			0	0	17,388
	2	MONEY HEADBOOK TIMBERING	5.0	M.B.M.	100.	500	575	30	40	14	431	144
	3	RAPPLE WALLS	1,151	cu.yd.	8.00	9,208	10,589			0	0	10,589
	4	RAPPLE MACH. & SHOVELS	1.25	"	100.00	125	144			0	0	144
	5	CONCRETE LINING	7.0	"	12.50	88	101			0	0	101
	6	TIMBERING 1" thick	2,000	sq.ft.	.10	200	230			0	0	230
		TOTALS				25,241	29,027			14	431	28,596
		FLUME NO. 5 - SEC. 3, LONG										
	1	EXCAVATION	1,260	cu.yd.	12.00	15,120	17,388			0	0	17,388
	2	MONEY HEADBOOK TIMBERING	5.0	M.B.M.	100.	500	575	30	40	14	431	144
	3	RAPPLE WALLS	1,151	cu.yd.	8.00	9,208	10,589			0	0	10,589
	4	RAPPLE MACH. & SHOVELS	1.25	"	100.00	125	144			0	0	144
	5	CONCRETE LINING	7.0	"	12.50	88	101			0	0	101
	6	TIMBERING 1" thick	2,000	sq.ft.	.10	200	230			0	0	230
		TOTALS				25,241	29,027			14	431	28,596
		FLUME NO. 6 - SEC. 1, LONG										
	1	EXCAVATION	315	cu.yd.	12.00	3,780	4,347			0	0	4,347
	2	MONEY HEADBOOK TIMBERING	2.5	M.B.M.	100.	250	288	30	40	14	216	72
	3	RAPPLE WALLS	1,151	cu.yd.	8.00	9,208	10,589			0	0	10,589
	4	RAPPLE MACH. & SHOVELS	1.25	"	100.00	125	144			0	0	144
	5	CONCRETE LINING	7.0	"	12.50	88	101			0	0	101
	6	TIMBERING 1" thick	2,000	sq.ft.	.10	200	230			0	0	230
		TOTALS				13,626	15,669			14	216	15,453
		FLUME NO. 6 - SEC. 2, LONG										
	1	EXCAVATION	1,260	cu.yd.	12.00	15,120	17,388			0	0	17,388
	2	MONEY HEADBOOK TIMBERING	5.0	M.B.M.	100.	500	575	30	40	14	431	144
	3	RAPPLE WALLS	1,151	cu.yd.	8.00	9,208	10,589			0	0	10,589
	4	RAPPLE MACH. & SHOVELS	1.25	"	100.00	125	144			0	0	144
	5	CONCRETE LINING	7.0	"	12.50	88	101			0	0	101
	6	TIMBERING 1" thick	2,000	sq.ft.	.10	200	230			0	0	230
		TOTALS				25,241	29,027			14	431	28,596
		FLUME NO. 6 - SEC. 3, LONG										
	1	EXCAVATION	1,260	cu.yd.	12.00	15,120	17,388			0	0	17,388
	2	MONEY HEADBOOK TIMBERING	5.0	M.B.M.	100.	500	575	30	40	14	431	144
	3	RAPPLE WALLS	1,151	cu.yd.	8.00	9,208	10,589			0	0	10,589
	4	RAPPLE MACH. & SHOVELS	1.25	"	100.00	125	144			0	0	144
	5	CONCRETE LINING	7.0	"	12.50	88	101			0	0	101
	6	TIMBERING 1" thick	2,000	sq.ft.	.10	200	230			0	0	230
		TOTALS				25,241	29,027			14	431	28,596
40		CHOCOLATE SECTION HOUSE	1	each	550.	550	632	30	40	16	474	158
41		TOOL SHED, BARN, ETC., AT CHOCOLATE	1	lot	350.	350	402	30	40	10	302	100
42		FLUME FOREMAN'S HOUSE AT LOS COCHES	1	each	1000.	1,000	1,150	30	40	29	863	287
43		SHEDS, OUTHOUSES, ETC., AT LOS COCHES	1	lot	500.	500	575	30	40	14	431	144
44		SECTION HOUSE NO. 4	1	each	750.	750	862	16	40	21	345	517
45		SECTION HOUSE NO. 5	1	"	600.	600	690	6	40	17	103	587
46		SHEDS, OUTHOUSES, ETC., AT SECTION HOUSE NO. 5	1	lot	50.	50	57	6	40	1	9	48
47		EUCALYPTUS TREES	1	"	200.	200	230			0	0	230

DIVISION TRANSMISSION
STRUCTURE MAIN FLUME

B-27

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
		SUMMARY										
1-	A	Clearing				1,200	1,380			0	0	1,380
2-	B	Excavation				221,653	254,801			0	0	254,801
	C	Riprap				203	234			0	0	234
3		Dry Rubble Walls				2,745	3,157			0	0	3,157
4-	D	Flume Box				534,396	614,555			24,376	425,945	188,610
5-	E	Trestles				76,083	87,495			2,188	60,846	26,649
6		Galvanized Flume				22,390	25,748			644	3,218	22,530
7		Wasteways				799	920			82	260	660
8		Highway Bridges				216	248			6	93	155
9		Culverts				450	517			13	388	129
10		Sand Boxes				42	48			1	36	12
11		Watering Troughs				165	190			5	38	152
12		Gages				40	46			2	12	34
13		Measuring Boxes (owned)				670	770			46	120	650
14		Board Walk				138	159			4	16	143
15		Screen Box & Screens				70	80			4	20	60
16		Sump for Pump No. 4				762	876			44	219	657
17		Sand Box for Pump No. 3				24	28			1	7	21
18		Sand Creek Concrete Conduit				8,107	9,323			93	466	8,857
19		" " Siphon				11,512	13,237			157	686	12,551
20		" " Wing Wall				340	392			16	32	360
21		" " Outlet Flume				130	150			2	8	142
22		Square Concrete Flume at Indian Church				967	1,112			11	56	1,056
23		Concrete Flume at Grossmont				959	1,103			11	55	1,048
24		South Fork Siphon - Old				5,568	6,403			160	803	5,600
25		" " " - New				5,152	5,924			148	296	5,628
26		Piers & Anchor Blocks for S.F.Siphon-(New)				2,707	3,113			78	156	2,957
27		Trusses & Trestle " " " "				647	744			37	74	670
28		Inlet & Outlet " " " "				453	521			13	26	495
29		Chocolate Siphon				14,828	17,052			426	2,131	14,921
30		" Wing Wall				987	1,135			45	0	1,135

DIVISION **TRANSMISSION**
STRUCTURE **MAIN FLUME**

B-28

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
		SUMMARY (Continued)										
31		Tunnel No. 1				7,113	8,178			26	767	7,411
32		" No. 1-1/2				300	345			0	0	345
33		" No. 2				5,136	5,906			19	578	5,328
34		" No. 3				1,940	2,229			6	180	2,049
35		" No. 4				14,074	16,183			22	664	15,519
36		" No. 5				6,332	7,281			7	198	7,083
37		" No. 6				6,349	7,302			17	500	6,802
38		" No. 7				39,376	45,293			85	2,538	42,755
39		" No. 8				6,173	7,098			22	647	6,451
40		Chocolate Section House				550	632			16	474	158
41		Tool Shed, Barn, etc., at Chocolate				350	402			10	302	100
42		Flume Foreman's House at Los Coches				1,000	1,150			29	863	287
43		Sheds, Outhouses, etc., at Los Coches				500	575			14	431	144
44		Section House No. 4				750	862			21	345	517
45		" " No. 5				600	690			17	103	587
46		Sheds,Outhouses,etc., at Section House No.5				50	57			1	9	48
47		Eucalyptus Trees				200	230			0	0	230
						1,005,196	1,155,874			28,925	504,606	651,268
		Less deferred Maintenance										150,000
		GRAND TOTALS- MAIN FLUME										501,268

DIVISION TRANSMISSION
STRUCTURE SOUTH FORK FEEDER

B-29

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
1		Clearing	16.3	acres	15.00	245	282			0	0	282
2		EXCAVATION										
	1	Disintegrated Granite	2621	CuYd	.80	2,097						
	2	Shattered Rock	345	CuYd	1.50	518						
	3	Solid Rock	50	CuYd	3.00	150						
		TOTALS				2,765	3,180	28		0	0	3,180
3		WOOD FLUME										
	1	Rough O. Pine	40.8	MBM	55.00	2,244						
	2	" Redwood	3.7	"	60.00	222						
	3	33S "	16.9	"	70.00	1,183						
	4	Redwood Wedges	2366	each	.015	35						
	5	Caulking & Tarring	15.2	MLnFt	8.00	122						
		TOTALS				3,806	4,377	2	30	146	292	4,085
4		LOOSE ROCK FILL	25	CuYd	1.00	25	29			0	0	29
5		SETTLING BOX										
	1	Rough O. Pine	0.5	MBM	75.00	38						
	2	" Redwood	0.3	"	85.00	25						
		TOTALS				63	72	12	30	2	29	43
6		STEEL FLUME	2429	LnFt	3.80	9,230	10,615	5	40	265	1,327	9,288
7		TRESTLES										
		Rough O. Pine	1.6	MBM	55.00	88	101	2	30	3	7	94

DIVISION TRANSMISSION
STRUCTURE SOUTH FORK FEEDER

B-30 WALTER LEROY HUBER, CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROBABLE LIFE	ANNUAL	TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION TOTAL
			REPRODUCTION COST					DEPRECIATION				
8		SETTLING BOX AT JUNCTION WITH MAIN FLUME										
	1	Excav.Hard Dis.Granite	5	CuYd	1.50	8						
	2	Concrete	5	"	14.00	70						
	3	Reinforcement	75	lbs	.10	8						
		TOTALS				86	99	4	40	2	10	89
9		SETTLING BOX AT JUNCTION WITH STEEL FLUME										
	1	Excav.Hard Dis. Granite	38	CuYd	1.50	57						
	2	Concrete	25	"	14.00	350						
	3	Reinforcement	300	lbs	.10	30						
	4	8" O D Casing	17	LnFt	1.25	21						
	5	8" Screw End Gate	1	each	30.00	30						
	6	Excav.& Backfill for pipe	7	CuYd	1.50	10						
		TOTALS				498	572	4	40	14	57	515
10		20 INCH RIVETED STEEL PIPE										
	1	Rough O. Pine (SH)	3.4	MBM	55.00	187						
	2	20" No.12 Riv.Steel Pipe	2350	LnFt	2.65	6,228						
	3	20" Elbows	10	each	10.00	100						
	4	20" Flange Gates	1	"	190.00	190						
	5	20" Flanges	4	"	25.00	100						
	6	Excav. & Backfill	156	CuYd	1.50	234						
		TOTALS				7,039	8,094	4	20	405	1,619	6,475
11		SOUTH FORK SECTION HOUSE	1	each	300.	300	345	2	30	12	23	322
12		STORE ROOM	1	"	40.	40	46	2	30	1	3	43
13		OPEN SHED	1	"	40.	40	46	2	30	1	3	43

DIVISION TRANSMISSION
STRUCTURE SOUTH FORK FEEDER

B-31

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
		SUMMARY										
	1	Clearing				245	282			0	0	282
	2	Excavation				2,765	3,180			0	0	3,180
	3	Wood Flume				3,806	4,377			146	292	4,085
	4	Loose Rock Fill				25	29			0	0	29
	5	Settling Box				63	72			2	29	43
	6	Steel Flume				9,230	10,615			265	1,327	9,288
	7	Trestles				88	101			3	7	94
	8	Settling Box At Junction with Main Flume				86	99			2	10	89
	9	Settling Box At Junction with Steel Flume				498	572			14	57	515
	10	20" Riv. Steel Pipe				7,039	8,094			405	1,619	6,475
	11	Section House				300	345			12	23	322
	12	Store Room				40	46			1	3	43
	13	Open Shed				40	46			1	3	43
		GRAND TOTALS - SOUTH FORK FEEDER				24,225	27,858			851	3,370	24,488

DIVISION TRANSMISSION
STRUCTURE MURRAY 36" SUPPLY LINE

B-32 WALTER LEROY HUBER, CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROBABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
1		36" Reinforced Concrete Pipe Line - Flume to Murray Hill										
	1	Excav. Earth & Gravel	186	CuYd	1.00	186						
	2	Excav. Mis. Granite & Cobble	590	"	1.50	885						
	3	Excav.Cemented Gravel	987	"	2.50	2,468						
	4	Railroad Crossing	1	each	150.	150						
	5	36" Reinf.Concrete Pipe	1948	LnFt	2.50	4,870						
	6	Mass Concrete	20.9	CuYd	12.50	261						
	7	Concrete Collars	3	"	12.50	38						
	8	Reinf.Concrete Collars	5.9	"	20.00	118						
	9	Steel for Collars	400	Lbs	.10	40						
	10	Air Valves,Manhole,etc.	1	lot	60.00	60						
		TOTALS				9,076	10,437	6	100	104	626	9,811
2		FOREBAY AT FLUME										
	1	Excav. Cemented Gravel	20	CuYd	2.50	50						
	2	Concrete	8	"	14.00	112						
		TOTALS				162	186	6	100	2	11	175
3		DRAINAGE AT R R CROSSING										
	1	Excav. 50% Cement Gravel	86	CuYd	2.00	172						
	2	Backfill in Trench	2	"	1.00	2						
	3	Lumber R Redwood	.112	MBM	50.00	6						
	4	Lumber Drain Box R R W	1.100	"	50.00	55						
		TOTALS				235	270	6	20	14	81	189
		GRAND TOTAL - MURRAY 36" SUPPLY LINE				9,473	10,893			120	718	10,175

DIVISION TRANSMISSION
STRUCTURE LA MESA DITCH

B-33

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
1		LA MESA DITCH										
	1	Earth Excavation	4290	CuYd	.50	2,145	2,467	24				2,467
	2	Cemented Gravel Excav.	1098	"	2.50	2,745	3,157	24				3,157
	3	Adobe Excav.	9685	"	.60	5,811	6,683	24				6,683
	4	Rough O.Pine in Drop	0.9	MBM	47.80	43	50	4	20	2	10	40
	5	" Redwood in Wasteways	0.6	"	50.00	30	35	5	20	2	9	26
	6	" O.Pine in Bridge	1.7	"	47.80	81	93	5	20	5	23	70
		TOTALS				10,855	12,485			9	42	12,443
2		36 INCH WOOD STAVE SIPHON										
	1	Excav. Inlet & Outlet	11	CuYd	2.50	28						
	2	Concrete " " "	15.2	"	14.00	213						
	3	R W Pipe Saddles	138	each	.25	35						
	4	Concrete Piers	14.5	CuYd	12.50	181						
	5	Rough O Pine Trestles	0.5	MBM	47.80	24						
	6	36" Wood Stave Pipe	1237	LnFt	2.90	3,587						
	7	Priming Line	1	lot	64.00	64						
		TOTALS				4,132	4,752	24	30	168	3,800	952
		GRAND TOTALS - LA MESA DITCH				14,987	17,237			177	3,842	13,395

DIVISION TRANSMISSION
STRUCTURE LA MESA DITCH

B-22

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
		LA MESA DITCH										
J		**Depth Excavation**	4580	C.Yd.	.60	2,748	3,024	24				2,748
S	1	**Concrete Lining & Invert**	2838	"	2.50	7,095	7,805	24	30	260	6,240	855
S	2	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	3	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	4	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	5	**Concrete Lining Invert**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	6	**Concrete Lining Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	7	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	8	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	9	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	10	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	11	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	12	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	13	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	14	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	15	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	16	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	17	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	18	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	19	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	20	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	21	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	22	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	23	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	24	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	25	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	26	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	27	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	28	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	29	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	30	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	31	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	32	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	33	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	34	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	35	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	36	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	37	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	38	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	39	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	40	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	41	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	42	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	43	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	44	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	45	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	46	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	47	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	48	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	49	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	50	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	51	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	52	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	53	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	54	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	55	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	56	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	57	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	58	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	59	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	60	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	61	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	62	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	63	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	64	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	65	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	66	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	67	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	68	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	69	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	70	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	71	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	72	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	73	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	74	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	75	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	76	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	77	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	78	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	79	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	80	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	81	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	82	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	83	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	84	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	85	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	86	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	87	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	88	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	89	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	90	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	91	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	92	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	93	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	94	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	95	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	96	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	97	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	98	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	99	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	100	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
		TOTALS				258,215	284,037			9,225	221,400	36,815

DIVISION TRANSMISSION
STRUCTURE LA MESA DITCH

B-23

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
		LA MESA DITCH										
J		**Depth Excavation**	4580	C.Yd.	.60	2,748	3,024	24				2,748
S	1	**Concrete Lining & Invert**	2838	"	2.50	7,095	7,805	24	30	260	6,240	855
S	2	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	3	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	4	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	5	**Concrete Lining Invert**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	6	**Concrete Lining Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	7	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	8	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	9	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	10	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	11	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	12	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	13	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	14	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	15	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	16	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	17	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	18	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	19	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	20	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	21	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	22	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	23	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	24	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	25	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	26	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	27	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	28	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	29	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	30	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	31	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	32	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	33	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	34	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	35	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	36	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	37	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	38	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	39	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	40	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	41	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	42	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	43	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	44	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	45	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	46	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	47	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	48	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	49	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	50	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	51	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	52	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	53	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	54	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	55	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	56	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	57	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	58	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	59	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	60	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	61	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	62	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	63	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	64	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	65	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	66	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	67	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	68	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	69	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	70	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	71	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	72	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	73	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	74	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	75	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	76	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	77	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	78	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	79	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	80	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	81	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	82	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	83	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	84	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	85	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	86	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	87	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	88	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	89	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	90	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	91	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	92	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	93	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	94	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	95	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	96	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	97	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	98	**Concrete Lining**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	99	**Concrete Arch**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
S	100	**Concrete Floor**	1,041	"	2.50	2,602	2,862	24	30	95	2,280	322
		TOTALS				258,215	284,037			9,225	221,400	36,815

DIVISION DISTRIBUTION
STRUCTURE SUMMARY

B-34

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST REPROD. COST	REPRODUCTION COST REPROD. WITH OVERHEAD	DEPRECIATION AGE IN YRS.	DEPRECIATION PROB. ABLE LIFE	DEPRECIATION ANNUAL	DEPRECIATION TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION TOTAL
	1	Webster Reservoir				657	755			15	91	664
	2	Meters & Services - El Cajon Valley				903	1,038			52	225	813
	3	El Cajon Lines				8,998	10,348			500	2,718	7,630
	4	Grossmont Reservoirs				7,335	8,436			174	1,318	7,118
	5	Grossmont Pumping Station				6,411	7,371			170	1,538	5,833
	6	Grossmont Lines				6,620	7,613			266	1,330	6,283
	7	Miles Reservoir #1				6,452	7,415			150	2,110	5,305
	8	Miles Pump Station				2,395	2,754			285	1,122	1,632
	9	Miles Reservoir #2				1,526	1,755			18	316	1,439
	10	Murray Hill Lines				1,365	1,570			54	267	1,303
	11	Murray Hill Reservoir				23,493	27,017			62	369	26,648
	12	Murray-Eucalyptus Siphon				21,366	24,573			207	1,237	23,336
	13	Eucalyptus Reservoir				15,328	17,629			241	3,024	14,605
	14	Connection at Reservoir				763	877			22	110	767
	15	Mains - El Cajon Ave. - High Service				42,267	48,610			1,840	10,828	37,782
	16	Hewley Heights System				3,672	4,225			165	945	3,280
	17	North La Mesa Line				14,518	16,697			819	10,304	6,393
	18	La Mesa Heights Line				1,129	1,300			66	504	796
	19	Branch Lines - High Service				4,782	5,501			261	2,675	2,826
	20	Meters - El Cajon Ave.- High Service				2,076	2,391			118	596	1,795
	21	Murray Dam				130,272	131,545			244	1,467	130,078
	22	La Mesa 24" Wood Stave Pipe Line				19,142	22,013			613	13,476	8,537
	23	La Mesa Pump Station #1				6,775	7,791			242	1,420	6,371
	24	Booster Pump - Old La Mesa				1,265	1,455			68	137	1,318
	25	Mains - El Cajon Ave. - Low Service				120,172	138,201			7,249	59,351	78,850
	26	Mains - Normal Heights & Kensington Park				50,073	57,585			3,304	17,362	40,223
	27	Branch Lines - Low Service				18,901	21,697			1,071	7,667	14,030
	28	Connections with City Mains				3,200	3,680			74	234	3,446
	29	Normal Heights Shops				700	805			27	268	537
	30	Miscellaneous				447	514			23	127	387
		GRAND TOTALS				523,003	583,161			18,400	143,136	440,025

DIVISION STRUCTURE **DISTRIBUTION**
WEBSTER RESERVOIR

B-35

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
1		**EXCAVATION**										
	1	Hard rock	59	Cu.Yd.	3.00	177						
	2	Disintegrated granite	550	"	.80	440						
	3	4" S. S. Pipe	30	Lin.Ft.	.90	27						
	4	4" S. S. Gate Valve	1	each	13.00	13						
		TOTALS				657	755	6	50	15	91	664

DIVISION DISTRIBUTION

STRUCTURE METERS & SERVICE - EL CAJON VALLEY

B-36

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
1		METERS										
	1	3/4" Trident	1	each	20.00	20	23	5	20	1	6	17
	2	1" Trident	1	"	25.00	28	29	5	20	1	7	22
	3	1" Lambert	5	"	25.00	125	144	5	20	7	36	108
	4	1" Hersey	1	"	25.00	25	29	5	20	1	7	22
	5	1-1/2" Trident	2	"	45.00	90	103	5	20	5	25	78
	6	1-1/2" Lambert	3	"	45.00	135	155	5	20	8	39	116
	7	2" Gem	2	"	60.00	120	138	5	20	7	35	103
	8	2" Trident Crest	1	"	60.00	60	69	5	20	3	17	52
	9	3" Gem	1	"	100.00	100	115	5	20	6	29	86
	10	6" Hydrometric	1	"	75.00	75	86	2	15	6	11	75
	11	8" Hydrometric	1	"	85.00	85	98	2	15	7	13	85
	12	Miscellaneous fittings	1	lot	43.00	43	49					49
		TOTALS				903	1,038			52	225	813

DIVISION DISTRIBUTION
STRUCTURE EL CAJON LINES

WALTER LEROY HUBER
CIVIL ENGINEER

B-37

						REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
1		MAINS & SERVICES										
	1	3" Std.Scr.Pipe	150	Ln.Ft;	.57	86	99	4	30	3	13	86
	2	4" Casing	11,802	"	.55	6,491	7,465	4	20	373	1,493	5,972
	3	2" Std.Scr.Pipe	3,003	"	.31	931	1,071	4	20	54	214	857
	4	1-1/2" " " "	3,665	"	.26	953	1,096	15	20	55	822	274
	5	1" " " "	985	"	.22	217	250	10	20	12	125	125
	6	3/4" Galv.Std.Scr.Pipe	300	"	.18	54	62	0	20	0	0	62
	7	3" Gate	1	each	13.25	13	15	4	20	1	3	12
	8	Miscellaneous fittings	1	each	43.00	43	50			0	0	50
		TOTALS				8,788	10,108			498	2,670	7,438
2		METERS										
	1	5/8" x 3/4" Worthington	7	each	13.00	91						
	2	5/8" x 3/4" Nash	3	"	13.00	39						
	3	3/4" Trident	1	"	20.00	20						
	4	1" Lambert	2	"	25.00	50						
	5	Miscellaneous fittings	1	lot	10.00	10						
		TOTALS				210	240	4	20	12	48	192
		GRAND TOTALS - EL CAJON LINES				8,998	10,348			500	2,718	7,630

DIVISION DISTRIBUTION
STRUCTURE GROSSMONT RESERVOIRS

B-38

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
1		**RESERVOIR NO. 1.**										
	1	Excava. 50% HR 50% DG	311	Cu.Yd.	2.25	700	805	9	50	16	145	660
	2	Concrete	54	"	12.50	675	775	9	50	15	140	635
	3	Lumber R.Redwood	2.286	MBM	52.60	120	138	9	20	7	62	76
	4	Lumber redwood S1S	0.193	"	65.30	13	15	9	20	1	7	8
	5	Roofing Malthoid	11.0	Sqr.	4.00	44	50	9	20	3	23	27
	6	Wire Screen Copper 1/12"	M 42	Sq.Ft.	.08	3	4	9	20	0	2	2
	7	Supply Line	1	lot	5.00	5	6	9	20	0	3	3
	8	Reinforcement bars	600	lbs.	.10	60	70	9	50	1	12	58
		TOTALS				1,620	1,863			43	394	1,469
2		**RESERVOIR NO. 2.**										
	1	Excav. 50% HR 50% DG	284	Cu.Yd.	2.25	639						
	2	Concrete	58.8	"	12.50	735						
	3	Lumber R.redwood	1.555	MBM	52.60	82						
	4	Lumber RW S1S	0.189	"	65.30	12						
	5	Roofing Malthoid	9	Sqr.	4.00	36						
	6	Wire Screen Copper	40	Sq.Ft.	.08	3						
	7	Connection from Discharge Line to Reservoir #2.	1	lot	18.00	18						
	8	Reinforcement bars	600	lbs.	.10	60						
		TOTALS				1,585	1,823	9	50	36	330	1,493

DIVISION DISTRIBUTION
STRUCTURE GROSSMONT RESERVOIRS

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
3		RESERVOIR NO. 3										
	1	Excav. 50% DG 50% HR	334	Cu.Yd.	2.25	752						
	2	Concrete	55.6	"	12.50	695						
	3	R. redwood lumber	1.850	MBM	52.60	97						
	4	SIS redwood lumber	0.275	"	65.30	18						
	5	Roofing, 2 ply	9.0	Sqr.	4.00	36						
	6	Wire screen, copper	42	Sq.Ft.	.08	3						
	7	Measuring box	1	each	14.00	14						
	8	Reinforcement Steel bars	600	lbs.	.10	60						
	9	Reinforcement Triangular mesh	200	"	.10	20						
	10	Plastering	500	Sq.Ft.	.05	25						
	11	R.O.Pine	.200	MBM	47.80	10						
		TOTALS				1,730	1,990	8	50	40	318	1,672
4		RESERVOIR NO. 4										
	1	Excav. 50% HR 50% DG	506	Cu.Yd.	2.25	1,139						
	2	Concrete	76.7	"	12.50	959						
	3	R. Redwood	2.855	MBM	52.60	150						
	4	SIS	0.110	"	65.30	7						
	5	Eucalyptus timber	1	lot	25.00	25						
	6	Roofing	13	Sqr.	4.00	52						
	7	Wire screen copper	100	Sq.Ft.	.08	8						
	8	Reinforcing bars	600	lbs.	.10	60						
		TOTALS				2,400	2,760	5	50	55	276	2,484

DIVISION DISTRIBUTION
STRUCTURE GROSSMONT RESERVOIRS

B-40

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	PROBABLE LIFE	ANNUAL	TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
		SUMMARY										
1		Reservoir No. 1				1,620	1,863			43	394	1,469
2		Reservoir No. 2				1,585	1,823			36	330	1,493
3		Reservoir No. 3				1,730	1,990			40	318	1,672
4		Reservoir No. 4				2,400	2,760			55	276	2,484
		GRAND TOTALS - GROSSMONT RESERVOIRS				7,335	8,436			174	1,318	7,118

DIVISION DISTRIBUTION
STRUCTURE GROSSMONT PUMPING STATION

B-41

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
						REPRODUCTION COST		DEPRECIATION				REPRODUCTION LESS DEPRECIATION
1		PUMP BUILDING	1	each	500.00	500	575	9	30	19	172	403
2		MOTOR										
	1	30 HP motor	1	each	416.25	416						
	2	Shaft bearings & Fly wheel	1	lot	97.60	98						
	3	Shaft bearing castings	1	"	8.40	8						
	4	Jaw clutches	2	each	45.00	90						
	5	Wood pulley 16" x 60"	1	"	30.00	30						
	6	Steel shaft	1	"	20.00	20						
	7	Bearing supporters	1	lot	39.25	39						
	8	Bolts, grease cups, ball bearings, etc.	1	"	22.00	22						
	9	10" x 12" pulley	1	each	12.00	12						
	10	6" x 12" pulley	1	"	10.00	10						
	11	Wiring, lighting, etc.	1	lot	30.00	30						
	12	Belting 55'12" x 5 ply	1	"	135.88	136						
	13	Gen.Elec.Co. relay panel	1	each	54.68	55						
	14	G.E.Starting compensator	1	"	5.52	6						
	15	Installation			72.00	72						
	16	Transportation			25.00	25						
	17	Concrete	2	Cu.Yd.	10.00	20						
		TOTALS				1,089	1,252	0	20	0	0	1,252
3		PUMPS (OLD)										
	1	Gould triplex	1	each	750.00	750						
	2	Suction line	1	lot	21.00	21						
	3	Concrete	1	Cu.Yd.	12.50	12						
		TOTALS				783	900	9	20	45	405	495

DIVISION DISTRIBUTION
STRUCTURE GROSSMONT PUMPING STATION

B-42

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
						REPRODUCTION COST		DEPRECIATION				REPRODUCTION LESS DEPRECIATION
4		PUMP (NEW)										
	1	Deane triplex	1	each	800.00	800						
	2	Suction line	1	lot	38.00	38						
	3	Concrete	2	Cu.Yd.	12.50	25						
		TOTALS				863	992	0	20	0	0	992
5		DISCHARGE LINE -NEW										
	1	4" Standard pipe	1035	Ln.Ft.	.90	932	1,071	5	40	27	134	937
	2	5" casing	249	"	.80	199	229	8	40	6	46	183
	3	6" riveted steel pipe	143	"	.72	103	118	5	30	4	20	98
	4	4" check valve	1	each	15.00	15						
	5	4" flange unions	6	"	3.00	18						
	6	4" - 22-1/2° ells - screw	3	"	1,00	3						
	7	4" x 3" standard bushings	3	"	.60	2						
	8	4" standard scr.tees	5	"	1.50	8						
	9	4" standard scr.gate	1	"	13.00	13						
	10	4" standard scr.ell	1	"	1.00	1						
	11	5" x 4" standard bushing	1	"	1.00	1	239	0	40	0	0	239
	12	4" x 6" nipples	9	"	1.50	14						
	13	3" standard screw gates	2	"	10.00	20						
	14	3" - 45° standard scr ell	1	"	1.00	1						
	15	3" standard pipe	17	Ln.Ft.	.57	10						
	16	4" plugs	1	each	.50	1						
	17	5" flange unions	3	"	4.00	12						
	18	Measuring box	1	"	14.00	14						
	19	Excav. earth and dis.granite	29	Cu.Yd	2.25	65						
	20	Miscellaneous fittings	1	lot		10						
		TOTALS				1,442	1,657			37	200	1,457

DIVISION DISTRIBUTION
STRUCTURE GROSSMONT PUMPING STATION

B-43

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION TOTAL
						REPRODUCTION COST		DEPRECIATION				
6		DISCHARGE LINE - OLD										
	1	4" standard pipe	1,080	Ln.Ft.	.90	972						
	2	3" standard pipe	859	"	.57	490						
	3	3" casing pipe	196	"	.50	98						
	4	4" check valve	1	each	15.00	15						
	5	4" nipples	2	"	1.50	3						
	6	4" flange unions	8	"	3.00	24						
	7	4" gates	1	"	13.00	13						
	8	4" 45° ells	1	"	1.00	1						
	9	4" x 3" bushing	5	"	.60	3						
	10	4" tees	2	"	1.50	3						
	11	3" gates	2	"	10.00	20						
	12	3" nipples	1	"	1.00	1						
	13	3" flange unions	1	"	2.50	3						
	14	3" ells	3	"	1.00	3						
	15	3" bushings	5	"	.60	3						
	16	Miscellaneous fittings	1	lot	82.00	82						
		TOTALS				1,734	1,994	9	30	66	598	1,396
		SUMMARY										
	1	Pump building				500	575	9	30	19	173	402
	2	Motor				1,089	1,252			0	0	1,252
	3	Pumps (old)				783	900			30	270	630
	4	Pumps (new)				863	992			0	0	992
	5	Discharge Line (new)				1,442	1,658			55	497	1,161
	6	Discharge Line (old)				1,734	1,994			66	598	1,396
		TOTALS				6,411	7,371			170	1,538	5,833

STRUCTURE GROSSMONT PUMPING STATION
DIVISION DISTRIBUTION

B-42

WATER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	DEPRECIATION TOTAL	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
1		MAINS & SERVICES										
	1	3/4" galv. std.scr.pipe	300	Ln.Ft.	.18	54						
	2	2" blk. " " "	5,940	"	.31	1,841						
	3	3" " " " "	6,303	"	.57	3,594						
	4	4" " " " "	164	"	.90	148						
	5	2" gates	12	each	5.00	60						
	6	Miscellaneous fittings	1	lot		285						
		TOTALS				5,982	6,879	5	30	229	1,147	5,732
2		METERS										
	1	5/8" x 3/4" Lambert	5	each	13.00	65						
	2	5/8" x 3/4" Worthington	16	"	13.00	208						
	3	5/8" x 3/4" Nash	3	"	13.00	39						
	4	5/8" x 3/4" Keystone	2	"	13.00	26						
	5	3/4" Trident	3	"	20.00	60						
	6	1" Trident	4	"	25.00	100						
	7	1" Lambert	2	"	25.00	50						
	8	2" Gem	1	"	60.00	60						
	9	Miscellaneous fittings	1	lot		30						
		TOTALS				638	734	5	20	37	183	551
		GRAND TOTALS				6,620	7,613			266	1,330	6,283

DIVISION DISTRIBUTION
STRUCTURE MILES RESERVOIR NO. 1

B-45

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
1		DAM										
	1	Stripping	416	Cu.Yd	.30	125						
	2	Embankment	6,294	"	.60	3,776						
	3	Riprap 9"	15,315	Sq.Ft.	.10	1,532						
	4	6" standard pipe	175	Ln.Ft.	1.36	238						
	5	6" screw end gate valve	1	each	.25	25						
		TOTALS				5,696	6,550	14	50	131	1,834	4,716
2		INLET FLUME & DITCH										
	1	Excav. cemented gravel	211	Cu.Yd.	2.50	528						
	2	R.W.Lumber	0.078	MBM	52.60	4						
		TOTALS				532	612	14	50	12	171	441
3		BRIDGE										
	1	Rubble masonry	12	Cu.Yd.	10.00	120						
	2	R.O.P.Lumber	1.520	MBM	47.80	73						
		TOTALS				193	222	14	30	7	104	118
4		SIGNS	2	each	3.00	6	6				1	5
5		TREES & SHRUBS	1	lot	25.00	25	25				0	25
		GRAND TOTALS - MILES RESERVOIR NO. 1				6,452	7,415			150	2,110	5,305

DIVISION DISTRIBUTION
STRUCTURE MILES PUMP STATION

B-46

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION TOTAL
						REPRODUCTION COST		DEPRECIATION				
1		PUMP HOUSE	1	each	450.00	450	517	14	30	173	242	275
2		MOTOR										
	1	10 HP motor	1	each								
	2	Westinghouse auto starter	1	"								
	3	Jack shaft	1	"	400.00	400	460	5	20	23	115	345
	4	4" 4 ply belt	20	Ln.Ft.								
	5	Insulated wire	200	"								
	6	Switch, fuses, etc.	1	lot								
3		PUMP										
	1	Goulds vert.Triplex plunger pump	1	lot	650.00	650	748	14	20	37	523	225
	2	Suction line 4" WI	1	"	100.00	100	115	14	20	6	81	34
	3	Disch.line to Res.#2	1	"	600.00	600	690	3	20	35	104	586
	4	Drain pipe from disch.pipe to atmosphere 1-1/4"	1	"	14.00	14	16	14	20	1	11	5
	5	From disch.line to gauge	1	"	7.00	7	8	14	20	0	6	2
	6	Pulleys and transmission	1	"	100.00	100	115	4	20	6	23	92
	7	Miscellaneous fittings	1	"	74.00	74	85	4	20	4	17	68
		TOTALS				1,545	1,777			89	765	1,012
		GRAND TOTALS - MILES PUMP STATION				2,395	2,754			285	1,122	1,632

DIVISION DISTRIBUTION
STRUCTURE MILES RESERVOIR NO. 2

B-47

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
1		EMBANKMENT										
	1	Excav. for embankment	1,085	Cu.Yd.	1.25	1,356						
	2	Cobble riprap 4" thick	3,390	Sq.Ft.	.05	170						
						1,526	1,755	18	100	18	316	1,439

DIVISION DISTRIBUTION
STRUCTURE MILES RESERVOIR NO. 2

B-47

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION TOTAL
			REPRODUCTION COST					DEPRECIATION				
1		EMBANKMENT										
	1	Excav. for embankment	1,085	Cu.Yd.	1.25	1,356						
	2	Cobble riprap 4" thick	3,390	Sq.Ft.	.05	170						
						1,526	1,755	18	100	18	316	1,439

DIVISION DISTRIBUTION
STRUCTURE MURRAY HILL LINES

B-48

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
1		MAINS & SERVICES										
	1	3" Std Scr Pipe	1550	LnFt	.57	884						
	2	2" " " "	1200	"	.31	372						
	3	Miscellaneous Fittings	1	lot	63.00	63						
		TOTALS				1,319	1,517	5	30	51	253	1,264
2		GATES										
	1	3" Gates	2	each	10.00	10						
	2	2" Gates	3	"	5.00	15						
	3	Miscellaneous Fittings	1	lot	1.00	1						
		TOTALS				26	30	5	20	2	8	22
3		METERS										
		3/4" Lambert	1	each	20.00	20	23	5	20	1	6	17
		GRAND TOTALS - MURRAY HILL LINES				1,365	1,570			54	267	1,303

DIVISION DISTRIBUTION
STRUCTURE GROSSMONT (Formerly Murray Hill) RESERVOIR B-49 WALTER LEROY HUBER CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB-ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
1		DAM										
	1	Stripping	1182	CuYd	.40	473						
	2	Trench Excav. Earth & Gravel	90	"	1.50	135						
	3	Trench Excav. Cemented Gravel	200	"	2.50	500						
	4	Main Embankment	23934	"	.50	11,967						
	5	Clay Puddle	2669	"	.75	2,002						
	6	Riprap 9" thick	21780	SqFt	.10	2,178						
		TOTALS				17,255	19,843	6		0	0	19,843
2		SPILLWAY										
	1	Excav. Cemented Gravel	291	CuYd	2.50	727						
	2	Backfill	60	"	.35	21						
	3	36" Concrete Pipe	28	LnFt	5.00	140						
	4	Concrete	7.2	CuYd	12.50	90						
	5	Dry Cobble Paving	112	SqFt	.10	11						
	6	Lumber in Gate	.03	MBM	75.00	23						
		TOTALS				1,012	1,164	6		0	0	1,164
3		GATE TOWER										
	1	Excav. Cemented Gravel	9	CuYd	2.50	23						
	2	Concrete	51	"	12.50	638						
	3	Lumber	.075	MBM	75.00	56						
	4	C I Sluice Gates	2	each	200.	400						
		TOTALS				1,117	1,285	6	100	13	77	1,208

DIVISION **DISTRIBUTION**
STRUCTURE **Grossmont (formerly Murray Hill) Reservoir**

B-50

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
4		**GATE TOWER BRIDGE**										
	1	Concrete Piers	1.3	CuYd	12.50	16						
	2	Railing & Supports	1	lot	200.	200						
	3	Structural Steel	1722	lbs	.10	172						
	4	Rods, Bolts, etc.	42	"	.10	4						
	5	Pipe Separators	15	each	.20	3						
	6	Corrugated Galv. Iron	266	SqFt	.20	53						
	7	Concrete in Bridge Floor	3.5	CuYd	20.00	70						
	8	Reinforcing Mesh	150	lbs	.10	15						
		TOTALS				533	613	6	100	6	37	576
5		OUTLET										
	1	Excav. Earth Grv. & Cnt. Grv.	66	CuYd	2.00	132						
	2	20" Cast Iron Pipe	192	LnFt	6.00	1,152						
	3	24" Cast Iron Pipe	132	"	7.60	1,003						
	4	24" C I Rensselear Gate	1	each	265.	265						
	5	20" " " "	1	"	190.	190						
	6	2" Air Valve	1	"	6.00	6						
	7	Concrete around pipe	65.6	CuYd	10.00	656						
	8	50% Cobbles in 1:6 Cmt. Mortar	11.1	"	6.00	67						
		TOTALS				3,471	3,992	6	100	40	239	3,753
6		GATE HOUSE	1	each	70.00	70	80	6	30	3	16	64
7		RESERVOIR										
	1	Clearing	1	lot	35.00	35	40			0	0	40

DIVISION **DISTRIBUTION**

STRUCTURE **MURRAY HILL RESERVOIR**
Grossmont (formerly Murray Hill) Reservoir

B-51

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
		SUMMARY										
1		Dam				17,255	19,843			0	0	19,843
2		Spillway				1,012	1,164			0	0	1,164
3		Gate Tower				1,117	1,285			13	77	1,208
4		Gate Tower Bridge				533	613			6	37	576
5		Outlet				3,471	3,992			40	239	3,753
6		Gate House				70	80			3	16	64
7		Reservoir				35	40			0	0	40
		GRAND TOTALS - Murray Hill Reservoir				23,493	27,017			62	369	26,648

DIVISION **DISTRIBUTION**
STRUCTURE **MURRAY HILL - EUCALYPTUS SIPHON**

B-52

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROBABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
						REPRODUCTION COST		DEPRECIATION				REPRODUCTION LESS DEPRECIATION
1		**24" REINFORCED CONCRETE PIPE LINE**										
	1	Excav. Earth & Cobbles	616	CuYd	1.50	924	1,063	6	100	11	64	999
	2	" Cemented Gravel	616	"	2.50	1,540	1,771	6	100	18	106	1,665
	3	Embankment under pipe	970	"	.50	485	558	6	100	6	33	525
	4	Backfill	600	"	.35	210	241	6	100	2	14	227
	5	Railroad Crossing	1	each	100.	100	115	6	100	1	7	108
	6	Dry Rubble Wall	60	CuYd	3.00	180	208	6	100	2	12	196
	7	Reinforced Concrete pipe 30 to 60 ft. head	5322	LnFt	2.40	12,773	14,689	6	100	147	881	13,808
	8	36" Concrete Drain Pipe	18	LnFt	5.00	90	104	6	100	1	6	98
	9	24" " " "	63	"	2.40	151	174	6	100	2	10	164
	10	Air Valves, Blowoffs & Manholes	1	lot	300.	300	345	6	20	17	104	241
		TOTALS				16,753	19,268			207	1,237	18,031
2		**TUNNEL**										
	1	Excav. Cemented Gravel open cut	98	CuYd	2.50	245						
	2	Excav. Cemented Gravel tunnel	728	LnFt	6.00	4,368						
		TOTALS				4,613	5,305	6		0	0	5,305
		GRAND TOTALS				21,366	24,573			207	1,237	23,336

DIVISION DISTRIBUTION
STRUCTURE EUCALYPTUS RESERVOIR

B-53 WALTER LEROY HUBER, CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
1		DAM										
	1	Stripping	591	CuYd	.40	236						
	2	Excav. Earth & Gravel	326	"	1.50	489						
	3	Main Embankment	5038	"	.60	3,022						
	4	Puddle Clay	1964	"	.75	1,473						
	5	Riprap 15" thick	10530	SqFt	.10	1,053						
		TOTALS				6,273	7,214	26		0	0	7,214
2		OUTLET										
	1	Excav. Cemented Gravel	105	CuYd	2.50	262	302	26		0	0	302
	2	Concrete	99	"	10.00	990	1,138	26		0	0	1,138
	3	24" Riv. S. Pipe	112	LnFt	3.10	347	399	26		0	0	399
	4	20" x 15" Riv.S. Reducer	1	each	25.00	25	29	26		0	0	29
	5	15" Gate Valves	2	"	115.	330	379	26	75	5	132	247
	6	15" Tee	1	"	18.00	18	21	26		0	0	21
	7	Concrete over 15" pipe (Reinforced)	3	CuYd	20.00	60	69	5		0	0	69
	8	6" Saddle	1	each	8.00	8	9	10	30	0	3	6
	9	6" Ell	1	"	2.00	2	2	10	30	0	0	2
	10	6" Hub End Gate	1	"	25.00	25	29	10	50	1	6	23
	11	Air Vent	1	"	6.00	6	7	5	20	0	2	5
	12	10" Gate Hub End	1	"	45.00	45	52	10	60	1	9	43
	13	10" Y Branch	1	"	10.00	10	12	26		0	0	12
		TOTALS				2,128	2,448			7	152	2,296
3		BRIDGE TO TOWER			60.00	60	69	26	30	2	60	9

DIVISION DISTRIBUTION
STRUCTURE EUCALYPTUS RESERVOIR

B-22

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
1		DAM										
	1	Excav. Cemented Gravel	1,581	CuYd	.40	632						
	2	Concrete over 12" pipe (Reinforced)	20.00	Each	2.00	40		2	0	0	0	40
	3	" Manhole	1	"	8.00	8		2	0	0	0	8
	4	" Inlet Tower	1	"	5.00	5		10	30	0	0	5
	5	" Head Gate Posts	2	"	25.00	50		10	30	2	2	48
	6	" Wing Walls	2	"	3.00	6		10	30	0	0	6
	7	Hat Angle	1	"	42.00	42		10	30	1	1	41
	8	Head Gate Bars & Guide	1	"	50.00	50		10	30	2	2	48
	9	Iron Work	1	"	10.00	10		10	30	0	0	10
	10	Rubble Masonry	25	CuYd	11.00	275		10	30	9	9	266
	11	Brickwork	13	M	30.00	390		10	30	13	13	377
	12	Plastering	750	SqFt	.05	38		10	30	1	1	37
	13	R Redwood	.145	MBM	52.60	8		10	30	0	0	8
	14	C I Inlet Ells 20"	2	each	50.00	100		10	30	3	3	97
	15	Sheet Iron Covers	2	"	10.00	20		10	30	1	1	19
	16	Bolts & Nuts	15	lbs	.10	2						
		TOTALS				1,586	1,824	10		31	31	1,793
2		BRIDGE AT TOWER			60.00	60	69	30	30	2	46	23
3		CONTROL										
	1	Excav. Cemented Gravel	205	CuYd	3.50	718						
	2	Concrete	99	"	10.00	990	1,138	30		0	0	1,138
	3	24" R.C.P. Pipe	115	Lnft	8.00	920		30		0	0	920
	4	30" x 12" R.C.P. Reducer	1	each	52.00	52		30		0	0	52
	5	24" R.C.P. Ells	2	"	220	440	506	30	40	13	208	298
	6	12" " "	1	"	78	78	90	30		0	0	90
	7	Concrete Head Gate Posts	2	"	25.00	50						
	8	Metal Head Gate & Guides	1	"	200	200	230	30		0	0	230
	9	Iron Work	1	"	50.00	50						
	10	Concrete Wing Walls	2	"	25.00	50						
	11	Concrete Apron	1	"	50.00	50						
	12	Rubble Masonry	25	CuYd	11.00	275						
	13	Brickwork	13	M	30.00	390						
	14	Plastering	750	SqFt	.05	38						
	15	R Redwood	.145	MBM	52.60	8						
	16	C I Inlet Ells 20"	2	each	50.00	100						
	17	Sheet Iron Covers	2	"	10.00	20						
	18	Bolts & Nuts	15	lbs	.10	2						
		TOTALS				3,812	4,374	30		13	390	3,984

DIVISION DISTRIBUTION
STRUCTURE EUCALYPTUS RESERVOIR

B-54

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
4		GATE TOWER										
	1	Excav. Cemented Gravel	25	CuYd	2.50	63						
	2	Rubble Masonry	25	"	11.00	275						
	3	Brickwork	13	M	30.00	390						
	4	Plastering	750	SqFt	.05	38						
	5	R Redwood	.145	MBM	52.60	8						
	6	C I Inlet Ells 20"	2	each	50.00	100						
	7	Sheet Iron Covers	2	"	10.00	20						
	8	Bolts & Nuts	15	lbs	.10	2						
		TOTALS				896	1,030	26		0	0	1,030
5		WASTE DITCH										
	1	Excav. Earth & Gravel	87	CuYd	1.50	131						
	2	" Cemented Gravel	119	"	2.50	298						
	3	Riprap 9" plastered	126	SqFt	.20	25						
	4	Concrete in old gates	4	CuYd	14.00	56						
		TOTALS				510	587	26		0	0	587
6		BRIDGES AT NORTH END OF DAM			60.00	60	69	10	30	2	23	46
7		SUPERINTENDENT'S RESIDENCE			2500.	2,500	2,875	16	30	96	1,530	1,345
8		OUTHOUSES			60.00	60	69	16	30	2	37	32
9		FENCE			75.00	75	86	16	25	3	55	31
10		RESIDENCE - KEEPER'S ASSISTANT			750.	750	863	16	30	29	460	403

DIVISION DISTRIBUTION
STRUCTURE EUCALYPTUS

B-55

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
						REPRODUCTION COST		DEPRECIATION				REPRODUCTION LESS DEPRECIATION
11		OUTHOUSES	1	each	20.00	20	23	10	20	1	12	11
12		FENCE	1	lot	13.00	13	15	5	20	1	4	11
13		WORK SHED	1	each	400.	400	460	5	25	18	92	368
14		TOOL SHED	1	"	100.	100	115	15	25	5	69	46
15		GARAGE	1	"	200.	200	230	15	25	9	138	92
16		TANK TOWER	1	"	40.	40	46	12	25	2	22	24
17		WINDMILL TOWER	1	"	150.	150	173	8	25	7	55	118
18		PUMP, GAS ENGINE & FITTINGS										
	1	2 HP Fairbanks, Morse Eng.	1	each	150.	150						
	2	Pump 3 x 5 Plunger	1	"	150.	150						
	3	1-1/2" Pipe	20	LnFt	.26	5						
	4	2" "	500	"	.31	155						
	5	2,000 Gal. Tank	1	each	50.00	50						
	6	3/4" Galv. Pipe	600	LnFt	.18	108						
	7	Fittings	1	lot	25.00	25						
		TOTALS				643	739	3	20	37	112	627

DIVISION **DISTRIBUTION** B-56

STRUCTURE **EUCALYPTUS RESERVOIR**

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
19		TREES AND SHRUBS										
	1	Lawn	1500	SqFt)								
	2	Eucalyptus Trees	520	each)								
	3	Flower beds 1 lot	2	")	400	400	460	10	25	18	180	280
	4	Shade Trees	3	")								
	5	Bushes	5	")								
20		FENCES										
	1	Barbed Wire	6180	LnFt	.003	19.						
	2	4 x 4 Posts	98	each	.30	29						
	3	Smooth Wire	800	LnFt	.002	2						
		TOTALS				50	56	10	25	2	23	35

DIVISION DISTRIBUTION
STRUCTURE EUCALYPTUS RESERVOIR

B-57

WALTER LEROY HUBER
CIVIL ENGINEER

			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
		SUMMARY										
1		Dam				6,273	7,214			0	0	7,214
2		Outlet				2,128	2,448			7	152	2,296
3		Bridge to Tower				60	69			2	60	9
4		Gate Tower				896	1,030			0	0	1,030
5		Waste Ditch				510	587			0	0	587
6		Bridges				60	69			2	23	46
7		Supt's Residence				2,500	2,875			96	1,530	1,345
8		Outhouses				60	69			2	37	32
9		Fence				75	86			3	55	31
10		Residence - Keeper's Assistant				750	863			29	460	403
11		Outhouses				20	23			1	12	11
12		Fence				13	15			1	4	11
13		Work Shed				400	460			18	92	368
14		Tool Shed				100	115			5	69	46
15		Garage				200	230			9	138	92
16		Tank Tower				40	46			2	22	24
17		Windmill & Tower				150	173			7	55	118
18		Pump, Engine, etc.				643	739			37	112	627
19		Trees & Shrubs				400	460			18	180	280
20		Fences				50	58			2	23	35
		GRAND TOTALS				15,328	17,629			241	3,024	14,605

DIVISION DISTRIBUTION
STRUCTURE CONNECTION EUCALYPTUS RESERVOIR

B-58

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
1		**FITTINGS**										
	1	8" Gates	7	each	30.00	210						
	2	6" Gates	1	"	25.00	25						
	3	8"x12" Saddles	2	"	25.00	50						
	4	12" Casing Pipe	31	LnFt	2.38	74						
	5	6" Riv. Pipe	77	"	.72	55						
	6	8" x 16" Tees #10 Riv. Steel	6	each	14.00	84						
	7	16" Ell - Long Radius	1	"	32.00	32						
	8	16" Tee	1	"	19.00	19						
	9	16" Angles	2	"	12.00	24						
	10	6"x16" Brass Saddle	1	"	9.00	9						
	11	Concrete	2	CuYd	12.50	25						
	12	Air Valves	1	each	6.00	6						
	13	Miscellaneous Fittings	1	lot	150.00	150						
		TOTALS				763	877	5	40	22	110	767

DIVISION DISTRIBUTION
STRUCTURE MAINS - EL CAJON AVE. LINE - HIGH SERVICE

B-59

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
1		MAINS										
	1	16" Riv. Steel Pipe	11900	LnFt	1.76	20,944	24,086	5	20	1,204	6,021	18,065
	2	15" Concrete "	850	"	4.50	3,825	4,399	9	100	44	396	4,003
	3	12" Converse "	1505	"	2.38	3,582	4,119	5	30	137	687	3,432
	4	12" Casing "	795	"	2.38	1,892	2,176	5	30	73	363	1,813
	5	12" " "	2050	"	2.38	4,879	5,611	9	30	187	1,683	3,928
	6	11" " "	1339	"	1.82	2,437	2,803	9	30	93	841	1,962
	7	10" " "	350	"	1.75	613	705	9	30	23	212	493
	8	Miscellaneous Fittings	1	lot	1908.	1,908	2,194	9	100	22	197	1,997
		TOTALS				40,080	46,093			1,783	10,400	35,693
2		GATE VALVES										
	1	16" Gate Valves-Geared	4	each	200.	800	920	5	75	12	61	859
	2	12" " "	3	"	80.	240	276	5	60	5	23	253
	3	10" " "	1	"	45.	45	52	9	60	1	8	44
	4	8" " "	5	"	30.	150	173	9	60	3	26	147
	5	6" " "	2	"	25.	50	58	9	50	1	10	48
	6	4" " "	14	"	16.85	236	272	9	50	5	49	223
	7	3" " "	18	"	13.25	238	274	9	30	9	82	192
	8	2" " "	26	"	8.25	215	247	9	20	12	111	136
	9	1" " "	11	"	5.00	55	63	9	20	3	28	35
		TOTALS				2,029	2,335			51	398	1,937
3		STAND PIPE										
	1	16" Riv. Steel Pipe	40	LnFt	2.35	94						
	2	16" " " Tee	1	each	19.00	19						
	3	Galvd. Wire Cable	200	lbs	.10	20						
	4	Concrete	2	CuYd	12.50	25						
		TOTALS				158	182	5	30	6	30	152

WALTER LEROY HUBER
CIVIL ENGINEER

B-60

DIVISION **DISTRIBUTION**

STRUCTURE **MAINS - EL CAJON AVE. LINE - HIGH SERVICE**

REPRODUCTION COST

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST	DEPRECIATION AGE IN YRS.	DEPRECIATION PROBABLE LIFE	DEPRECIATION ANNUAL	DEPRECIATION TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION TOTAL
		SUMMARY									
	1	**Mains**				40,080			1,783	10,400	35,693
	2	**Gate Valves**				2,029			51	398	1,937
	3	**Stand Pipe**				158			6	30	152
		GRAND TOTALS				42,267			1,840	10,828	37,782

B-28

CIVIL ENGINEER
WALTER LEROY HUBER

DEPRECIATION

REPRODUCTION LESS DEPRECIATION

DIVISION **DISTRIBUTION**

STRUCTURE **HAWLEY HEIGHTS SYSTEM**

B-61

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
1		**MAINS & SERVICES**										
	1	3/4" Std Scr Pipe	220	LnFt	.18	40	46	3	30	2	5	41
	2	1" " " "	1320	"	.22	290	334	3	30	11	33	301
	3	1-1/2 " " "	905	"	.26	235	270	10	30	9	90	180
	4	2" " " "	660	"	.31	205	236	3	30	8	24	212
	5	3" " " "	200	"	.57	114	131	5	30	4	22	109
	6	3" Casing	380	"	.50	190	218	10	20	11	109	109
	7	4" Std Scr Pipe	153	"	.90	138	159	3	30	5	16	143
	8	4" Riv Steel Pipe	805	"	.50	402	462	10	30	15	154	308
	9	3-1/2" Std Scr Pipe	1170	"	.75	877	1,009	3	30	34	101	908
	10	Miscellaneous Fittings	1	lot	125.00	125	144	3	30	5	14	130
		TOTALS				2,616	3,009			104	568	2,441
2		PUMP, MOTOR, ETC.										
	1	2-1/2" D C, B J Center Pump & 5 HP Motor	1	lot	300.00	300	345	5	20	17	86	259
	2	Wiring, Switches, etc.	1	"	100.00	100	115	5	20	6	29	86
	3	Galv. Iron Pump House	1	each	50.00	50	58	5	20	3	14	44
	4	10,000 Gal. R W Tank	1	"	250.00	250	288	10	20	14	144	144
	5	Miscellaneous Fittings	1	lot	35.00	35	40	5	20	2	10	30
		TOTALS				735	846			42	283	563
3		METERS										
	1	5/8" x 3/4" Trident	5	each	13.00	65	75	5	20	4	19	56
	2	" " Worthington	2	"	13.00	26	30	5	20	2	8	22
	3	" " Nash	5	"	13.00	65	75	5	20	4	19	56
	4	3/4" Trident	2	"	20.00	40	46	5	20	2	12	34
	5	3/4" Bee	2	"	20.00	40	46	5	20	2	12	34
	6	1" Trident	1	"	25.00	25	29	5	20	1	7	22
	7	1-1/2" Bee	1	"	45.00	45	52	5	20	3	13	39
	8	Miscellaneous Fittings	1	lot	15.00	15	17	5	20	1	4	13
		TOTALS				321	370			19	94	276

DIVISION DISTRIBUTION
STRUCTURE HAMLEY HEIGHTS SYSTEM

B-62

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
		SUMMARY										
	1	Mains & Services				2,616	3,009			104	568	2,441
	2	Pump, Motor, etc.				735	846			42	283	563
	3	Motors				321	570			19	94	276
		GRAND TOTALS				3,672	4,225			165	945	3,280

DIVISION DISTRIBUTION
STRUCTURE NORTH LA MESA LINE

B-63

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
1		PIPE										
	1	8" Steel, Riveted	5000	LnFt	.96	4,800	5,520	10	20	276	2,760	2,760
	2	8" Wood	7325	"	.80	5,860	6,739	17	20	337	5,728	1,011
	3	6" Steel Riveted	957	"	.72	689	792	10	20	40	397	395
	4	4" " "	2230	"	.56	1,249	1,436	10	20	72	718	718
	5	3" " "	364	"	.35	127	146	10	20	7	73	73
	6	2" Standard Pipe	2490	"	.31	772	890	3	25	35	106	784
	7	Miscellaneous Fittings	1	lot	680.00	680	782	10	20	39	391	391
		TOTALS				14,177	16,305			806	10,173	6,132
2		GATES										
	1	8" Gates	5	each	30.00	150						
	2	4" "	3	"	16.85	51						
	3	3" "	1	"	10.00	10						
	4	2" "	26	"	5.00	130						
		TOTALS				341	392	10	30	13	131	261
		GRAND TOTALS				14,518	16,697			819	10,304	6,393

DIVISION **DISTRIBUTION**
STRUCTURE **LA MESA HEIGHTS LINES**

B-64

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
1		MAINS AND SERVICES										
	1	3" Casing	385	LnFt	.50	193	222	8	20	11	89	133
	2	2" Std Scr Pipe	1736	"	.31	538	619	8	20	31	248	371
	3	1½" " " "	789	"	.26	205	236	8	20	12	94	142
	4	1¼" " " "	188	"	.24	45	52	8	20	3	21	31
	5	1" " " "	123	"	.22	27	31	8	20	2	12	19
	6	¾" " " "	55	"	.18	10	12	8	20	1	5	7
	7	¾" " " "	314	"	.18	57	66	3	20	3	10	56
	8	Miscellaneous Fittings	1	lot	54.00	54	62	8	20	3	25	37
		TOTALS				1,129	1300			66	504	796

DIVISION DISTRIBUTION

STRUCTURE BRANCH LINES - HIGH SERVICE

B-65

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
1		MAINS & SERVICES										
	1	3/4" Std Scr Pipe	180	LnFt	.18	32	37	4	20	2	7	30
	2	1" " " "	568	"	.22	124	143	4	20	7	29	114
	3	2" " " "	1962	"	.31	608	699	4	20	35	140	559
	4	2" " " "	1000	"	.21	310	356	15	20	18	267	89
	5	2" " " "	1230	"	.21	381	438	18	20	22	394	44
	6	3" " " "	718	"	.57	409	471	4	25	19	75	396
	7	3" Casing	300	"	.50	150	173	8	20	9	69	104
	8	4" Std Scr. Pipe	596	"	.90	536	616	4	25	25	99	517
	9	4" Casing	80	"	.56	45	52	5	20	3	8	44
	10	4" "	2375	"	.56	1,330	1,530	15	20	76	1,147	383
	11	4" Riv. Steel Pipe	560	"	.56	314	362	15	20	18	272	90
	12	6" Casing	375	"	.84	315	362	8	25	14	116	246
	13	Miscellaneous Fittings	1	lot	228.	228	262	4	20	13	52	210
		TOTALS				4,782	5,501			261	2,675	2,826

DIVISION DISTRIBUTION
STRUCTURE METERS - EL CAJON AVE. - HIGH SERVICE

B-66

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
1		METERS										
	1	5/8" x 3/4" Lambert	2	each	13.00	26	30	5	20	2	8	22
	2	" " Trident	18	"	13.00	234	270	5	20	13	67	203
	3	" " Worthington	13	"	13.00	234	270	5	20	13	67	203
	4	" " Nash	4	"	13.00	52	60	5	20	3	15	45
	5	3/4" Trident	3	"	20.00	60	69	5	20	3	17	52
	6	3/4" Lambert	2	"	20.00	40	46	5	20	2	12	34
	7	1" "	12	"	25.00	275	316	5	20	16	79	237
	8	1" Trident	6	"	25.00	150	173	5	20	9	43	130
	9	1" Bee	2	"	25.00	50	58	5	20	3	14	44
	10	1-1/2" Trident	2	"	45.00	90	104	5	20	5	26	78
	11	1-1/2" Lambert	3	"	45.00	135	155	5	20	8	39	116
	12	2" Trident	1	"	60.00	60	69	5	20	3	17	52
	13	3" " Crest	2	"	120.	240	276	5	20	14	69	207
	14	3" " " #	1	"	60.00	60	69	5	20	3	17	52
	15	2" Gem	1	"	60.00	60	69	5	20	3	17	52
	16	4" Gem	1	"	210.	210	242	5	20	12	60	182
	17	Miscellaneous Fittings	1	lot	100.	100	115	5	20	6	29	86
		TOTALS				2,076	2,391	5	20	118	596	1,795

- 1/2 owned by C W Co.

DIVISION DISTRIBUTION
STRUCTURE MURRAY DAM

B-67

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION TOTAL
			REPRODUCTION COST					DEPRECIATION				
1		KEEPER'S COTTAGE	1	each	2000.00	2,000	2,300	1	30	77	77	2,223
2		FENCES	1	lot	50.00	50	58	5	20	3	14	44
3		CLUB HOUSE	1	each	900.00	900	1,035	10	30	35	345	690
4		REST ROOM	1	each	150.00	150	173	2	30	6	12	161
5		GARAGE	1	each	350.00	350	403	10	30	13	134	269
6		CHLORINATING PLANT	1	each	2000.00	2,000	2,300	3	30	77	230	2,070
7		DAM										
	1	Concrete multiple arched dam (cost)	1	each		121,788	121,788	0		0	0	121,788
8		OUTLET & INTAKE WELLS - OLD DAM STILL USED.										
	1	Excav. solid rock	40	Cu.Yd.	3.00	120	138	22		0	0	138
	2	Concrete in conduit	252	"	4.00	1,008	1,159	22		0	0	1,159
	3	Concrete in wells	18.6	"	20.00	372	427	22		0	0	427
	4	24" cast iron pipe	100	Ln.Ft.	7.60	760	874	22	100	9	193	681
	5	Cast iron flap gates	2	each	45.00	90	104	22	50	2	45	59
	6	Vitrified pipe	90	Ln.Ft.	2.00	180	207	22		0	0	207
	7	Well sections	23	each	10.00	230	264	22	30	9	194	70
	8	Well screens	2	"	18.00	36	41	5	10	4	21	20
	9	Riv.steel pipe, 20"	90	Ln.Ft.	2.65	238	274	22	30	9	202	72
		TOTALS				3,034	3,488			33	655	2,833
		GRAND TOTALS				130,272	131,545			244	1467	130,078

DIVISION DISTRIBUTION
STRUCTURE LA MESA 24" WOOD STAVE PIPE LINE

WALTER LEROY HUBER
CIVIL ENGINEER

B-68

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
1		LA MESA PIPE LINE										
	1	Excav. Earth & Gravel	267	Cu.Yd.	1.50	400	460	22	0	0	0	460
	2	" Cemented "	33	"	2.50	83	96	22		0	0	96
	3	" Adobe	1102	"	.60	661	760	22		0	0	760
	4	" Solid Rock	458	"	3.00	1,374	1,580	22		0	0	1,580
	5	Backfill	255	"	.30	76	87	22	30	3	64	23
	6	Dry Rubble Wall	213	"	3.00	639	735	22		0	0	735
	7	R O Pine Trestles	0.56	MBM	47.80	27	31	22	30	1	23	8
	8	Redwood Saddles	754	each	.25	189	218	22	30	7	160	58
	9	24" Wood Stave Pipe	5959	LnFt	2.60	15,493	17,817	22	30	594	13,066	4,751
	10	1/8" Riv. Steel Ell	1	each	28.00	28	32	22	40	1	18	14
	11	Air Valves	4	"	10.50	42	48	22	30	2	35	13
	12	Services	1	lot	30.00	30	34	22	30	1	25	9
	13	El Cajon Ave. Crossing	1	each	100.00	100	115	22	30	4	85	30
		TOTALS				19,142	22,013			613	13,476	8,537

DIVISION DISTRIBUTION
STRUCTURE LA MESA PUMP STATION NO. 1

B-69

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION TOTAL
			REPRODUCTION COST					DEPRECIATION				
1		PUMP HOUSE	1	each	350.	350	402	5	40	10	50	352
2		MOTOR										
	1	G E Ind. Motor 150 HP	1	each	1000.	1,000	1,150	7	25	46	322	828
	2	Switches, etc.	1	"	42.	42	48	5	25	2	10	38
	3	Auto Contact & Controller	1	"	650.	650	748	5	25	30	150	598
		TOTALS				1,692	1,946			78	482	1,464
3		PUMP										
	1	2 Stage 8" B J Cent.Pump	1	each	900.	900						
	2	20" Vert. Disch. Chamber	1	"	350.	350						
	3	Priming Line	1	lot	7.	7						
	4	Elec. Gage Line	1	"	12.	12						
	5	Disch.Line to Air Chamber	1	"	80.	80						
	6	Valves	1	"	250.	250						
	7	Vacuum Gage	1	"	14.	14						
		TOTALS				1,613	1,855	5	25	74	370	1,485
4		CONNECTIONS										
	1	Suction Lines	1	lot	2135.	2,135						
	2	Discharge Lines	1	"	635.	635						
		TOTALS				2,770	3,186	5	50	64	319	2,867
5		VALVE BOXES										
	1	Valve Boxes Concrete	1	lot	100.	100	115	5	50	2	12	103
6		STORE HOUSE	1	each	250.	250	287	13	20	14	187	100

DIVISION DISTRIBUTION
STRUCTURE LA MESA PUMP STATION NO. 1 B-70 WALTER LEROY HUBER, CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	PROBABLE LIFE	ANNUAL	TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
		SUMMARY										
1		PUMP HOUSE				350	402			10	50	352
2		Motor				1,692	1,946			78	482	1,464
3		Pump				1,613	1,855			74	370	1,485
4		CONNECTIONS				2,770	3,186			64	319	2,867
5		Valve Boxes				100	115			2	12	103
6		Store House				250	287			14	187	100
		GRAND TOTALS				6,775	7,791			242	1,420	6,371

DIVISION DISTRIBUTION
STRUCTURE BOOSTER PUMP - OLD LA MESA

B-71

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
1		PUMP										
	1	12" Byron Jackson Single Stage Pump	1	each	700.	700						
	2	Leather Belt	1	"	100.	100						
	3	Suction & Discharge Lines, Gates, etc.	1	lot	300.	300						
	4	Excavation	5	CuYd	3.	15						
		TOTALS				1,115	1,282	2	25	51	102	1,180
2		PUMP HOUSE	1	each	150.	150	173	2	10	17	35	138
		GRAND TOTALS				1,265	1,455			68	137	1,318

GRAND TOTALS 120,172 136,201 7,249 [illegible]

DIVISION DISTRIBUTION
STRUCTURE MAINS - EL CAJON AVE. - LOW SERVICE

B-72

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB-ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
1		MAINS										
	1	6" Cast Iron Pipe	1100	LnFt	1.54	1,694	1,948	6	75	26	156	1,792
	2	6" Casing	160	"	.84	134	154	1	20	8	8	146
	3	8" "	748	"	1.25	935	1,025	1	25	43	43	1,032
	4	10" "	1190	"	1.82	2,166	2,491	4	25	100	399	2,092
	5	12" " (Lead Jts)	500	"	2.28	1,140	1,311	1	25	53	53	1,258
	6	14" Riv. Steel Pipe	14918	"	1.60	23,869	27,449	5	10	2,745	13,725	13,724
	7	16" " " "	8568	"	1.76	15,080	17,342	5	15	1,156	5,781	11,561
	8	20" " " "	17189	"	2.65	45,550	52,383	14	20	2,619	36,667	15,716
	9	20" Reinf. Concr. Pipe	3600	"	5.00	18,000	20,700	0	100	0	0	20,700
	10	Miscellaneous Fittings				5,430	6,245	5	20	312	1,561	4,684
		TOTALS				113,998	131,098			7,062	58,393	72,705
2		GATES										
	1	1" Gate Valves	26	each	5.00	130	150	5	20	7	37	113
	2	2" " "	108	"	8.25	891	1,025	5	20	51	256	769
	3	3" " "	57	"	13.25	755	869	5	30	29	145	724
	4	4" " "	18	"	16.85	303	348	5	50	7	35	313
	5	6" " "	11	"	25.00	275	316	5	50	6	32	284
	6	8" " "	19	"	35.00	665	765	2	50	15	31	734
	7	10" " "	2	"	45.00	90	104	5	50	2	10	94
	8	12" " "	10	"	80.00	800	920	5	50	18	92	828
	9	14" " "	4	"	125.	500	575	5	50	12	58	517
	10	16" " "	3	"	135.	405	466	4	50	9	37	429
	11	20" " "	2	"	190.	380	437	14	50	9	123	314
	12	24" " "	2	"	265.	530	610	5	50	12	61	549
	13	24" " " Geared	1	"	450.	450	518	4	50	10	41	477
		TOTALS				6,174	7,103			187	958	6,145
		GRAND TOTALS				120,172	138,201			7,249	59,351	78,850

DIVISION DISTRIBUTION
STRUCTURE MAINS - NORMAL HEIGHTS & KENSINGTON PARK

B-73

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
1		MAINS										
	1	6" Cast Iron Pipe	5163	LnFt	1.54	7,951	9,144	6	75	122	732	8,412
	2	4" " " "	1680	"	1.12	1,882	2,164	6	60	36	216	1,948
	3	4" Std Screw Pipe	2163	"	.90	1,947	2,239	7	20	112	784	1,455
	4	3" " " "	300	"	.45	135	155	6	10	16	93	62
	5	3" Std Screw Pipe	500	"	.57	285	328	0	20	0	0	328
	6	3" " " "	1970	"	.57	1,123	1,291	1	20	65	65	1,226
	7	3" " " "	800	"	.57	456	525	5	20	26	131	394
	8	3" " " "	1315	"	.57	750	862	7	20	43	302	560
	9	2" " " "	3280	"	.31	1,017	1,170	0	15	0	0	1,170
	10	2" " " "	2730	"	.31	846	975	1	15	65	65	910
	11	2" " " "	3720	"	.31	1,153	1,326	2	15	86	177	1,149
	12	2" " " "	800	"	.31	248	286	3	15	19	57	229
	13	2" " " "	2180	"	.31	676	777	4	15	52	208	569
	14	2" " " "	5940	"	.31	1,841	2,117	5	15	140	703	1,414
	15	2" " " "	17580	"	.31	5,450	6,268	7	15	418	2,925	3,343
	16	2" " " "	21730	"	.31	6,736	7,746	8	15	516	4,131	3,615
	17	1-1/2" " "	400	"	.26	104	120	7	15	8	56	64
	18	1" " "	445	"	.22	98	113	0	10	0	0	113
	19	1" " " "	437	"	.22	96	110	1	10	11	11	99
	20	1" " " "	105	"	.22	23	26	2	10	3	5	21
	21	1" " " "	190	"	.22	42	48	3	10	5	14	34
	22	1" " " "	7600	"	.22	1,672	1,923	7	10	192	1,346	577
	23	Misc. Fittings	1	lot	1726.	1,726	1,985	5	20	99	496	1,489
		TOTALS				36,257	41,698			2,036	12,517	29,181
2		SERVICES	624	each	10.	6,240	7,176	3	10	718	2,153	5,023

DIVISION **DISTRIBUTION**
STRUCTURE **MAINS - NORMAL HEIGHTS & KENSINGTON PARK** B-74

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	PROBABLE LIFE	ANNUAL	TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
3		**GATES**										
	1	6" Gates	5	each	25.00	125	144	4	50	3	12	132
	2	4" "	6	"	16.85	101	116	4	50	2	9	107
	3	3" "	7	"	13.25	93	107	4	30	4	14	93
	4	2" "	94	"	8.25	776	891	4	20	45	179	712
	5	1" "	8	"	5.00	40	46	4	20	2	9	37
		TOTALS				1,135	1,304			56	223	1,081
4		**METERS**										
	1	5/8" x 3/4" Trident	226	each	13.00	2,938						
	2	" " Worthington	181	"	13.00	2,353						
	3	" " Nash	61	"	13.00	793						
	4	" " Lambert	2	"	13.00	26						
	5	1" Lambert	1	"	25.00	25						
	6	Misc. Fittings	1	lot	306.	306						
		TOTALS				6,441	7,407	5	15	494	2,469	4,938
		SUMMARY										
	1	Mains				36,257	41,698			2,036	12,517	29,181
	2	Services				6,240	7,176			718	2,153	5,023
	3	Gates				1,135	1,304			56	223	1,081
	4	Meters				6,441	7,407			494	2,469	4,938
		TOTALS				50,073	57,585			3,304	17,362	40,223

DIVISION DISTRIBUTION

STRUCTURE BRANCH LINES - LOW SERVICE

B-75

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
1		MAINS & SERVICES										
	1	3/4" Std Screw Pipe	145	LnFt	.18	26	30	3	15	2	6	24
	2	1" " " "	63	"	.22	14	16	4	15	1	4	12
	3	1-1/4" " "	515	"	.26	134	154	15	18	9	129	25
	4	2" " " "	2000	"	.31	620	713	4	18	40	159	554
	5	2" " " "	1300	"	.31	403	464	1	18	26	26	438
	6	2" " " "	1741	"	.31	540	621	15	18	35	518	103
	7	3" " " "	1056	"	.57	602	692	10	20	35	346	346
	8	3" " " "	510	"	.57	291	335	0	20	0	0	335
	9	3" Casing	2340	"	.50	1,170	1,346	4	18	75	300	1,046
	10	3" Std Screw Pipe	2002	"	.57	1,141	1,312	15	20	66	984	328
	11	4" " " "	127	"	.90	114	131	1	20	7	7	124
	12	4" Casing	1000	"	.55	550	633	1	20	32	32	601
	13	4" "	1037	"	.55	570	615	10	20	33	328	287
	14	4" "	300	"	.55	165	190	5	20	9	47	143
	15	4" "	2700	"	.55	1,485	1,708	20	22	78	1,552	156
	16	4" Riv. Steel Pipe	800	"	.56	448	515	15	18	29	428	87
	17	6" " " "	200	"	.72	144	166	3	15	11	33	133
	18	6" Std Scr Pipe	100	"	1.36	136	156	0	25	0	0	156
	19	6" Casing	200	"	.84	168	193	3	18	11	33	160
	20	8" "	1586	"	1.25	1,983	2,280	1	35	65	65	2,215
	21	10" "	1300	"	1.82	2,366	2,721	3	25	109	326	2,395
	22	Misel. Fittings	1	lot	654.	654	752	10	20	38	376	376
		TOTALS				13,724	15,743			711	5,699	10,044
2		HIGHLAND PARK										
	1	1" Std Scr Pipe	740	LnFt	.22	163	188	6	15	13	75	113
	2	2" " " "	160	"	.31	50	58	6	18	3	19	39
	3	3/4" Services	4	each	10.00	40	46	5	10	5	23	23
	4	5/8"x3/4" Trident meters	2	"	18.00	36	41	5	15	3	14	27
	5	" " Worth. meters	1	"	13.00	13	15	5	15	1	5	10
	6	" " Nash "	1	"	13.00	13	15	5	15	1	5	10
	7	Misel. fittings	1	lot	16.00	16	18	5	15	1	6	12
		TOTALS				331	381			27	147	234

DIVISION **DISTRIBUTION**
STRUCTURE **BRANCH LINES - LOW SERVICE**

B-76

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
3		**OLIVE HILL**										
	1	2" Std Screw Pipe	200	LnFt	.31	62	71	4	15	5	19	52
	2	2" " " "	2582	"	.31	800	920	8	15	61	490	430
	3	3/4" Services	12	each	10.00	120	138	5	15	9	46	92
	4	5/8"x3/4" Nash Meters	4	"	13.00	52	60	5	10	6	30	30
	5	" " Worth. "	4	"	13.00	52	60	5	15	4	20	40
	6	Misel. Fittings	1	lot	52.00	52	60	5	15	4	20	40
		TOTALS				1,138	1,309			89	625	684
4		**ORANGEWOOD**										
	1	2" Std Scr Pipe	400	LnFt	.31	124	143	4	20	7	29	114
	2	2" " " "	2430	"	.31	753	866	6	20	43	260	606
	3	3/4" Services	18	each	10.00	180	206	5	15	14	69	137
	4	5/8"x3/4" Trident meters	9	"	13.00	117	135	5	15	9	45	90
	5	" " Nash "	6	"	13.00	78	90	5	15	6	30	60
	6	" " Worth. "	3	"	13.00	39	45	5	15	3	15	30
	7	Misel. Fittings	1	lot	65.00	65	75	5	15	5	25	50
		TOTALS				1,356	1,560			87	473	1,087
5		**EDGEMONT**										
	1	3/4" Std Scr Pipe	125	LnFt	.18	23	26	4	15	2	7	19
	2	1" " " "	430	"	.22	95	109	6	18	6	36	73
	3	1-1/2" " "	1025	"	.26	267	307	4	18	17	68	239
	4	2" " " "	1150	"	.31	357	410	6	20	20	123	287
	5	3/4" Services	13	each	10.00	130	150	4	15	10	40	110
	6	5/8"x3/4" Worth. meters	2	"	13.00	26	30	5	15	2	10	20
	7	" " Nash "	11	"	13.00	143	164	5	15	11	55	109
	8	Misel. Fittings	1	lot	52.00	52	60	5	15	4	20	40
		TOTALS				1,093	1,256			72	359	897

DIVISION DISTRIBUTION
STRUCTURE BRANCH LINES - LOW SERVICE

B-77

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. ABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
6		34TH STREET										
	1	2" Std Scr Pipe	200	LnFt	.31	62	71	2	15	5	10	61
	2	1-1/2" " "	1150	"	.26	299	344	4	15	23	92	252
	3	3/4" Services	5	each	10.00	50	58	2	10	6	12	46
	4	Misc1. Fittings	1	lot	20.00	20	23	4	15	2	6	17
		TOTALS				431	496			36	120	376
7		PACIFIC BUILDING TRACT										
	1	2" Std Scr Pipe	2450	LnFt	.31	760	874	5	20	44	218	656
8		METERS NOT OTHERWISE LISTED										
	1	5/8" x 3/4" Trident	2	each	13.00	26						
	2	" " Worthington	2	"	13.00	26						
	3	" " Nash	1	"	13.00	13						
	4	Miscl. Fittings	1	lot	3.00	3						
		TOTALS				68	78	5	15	5	26	52
		SUMMARY										
	1	Branch Lines				13,724	15,743			711	5,699	10,044
	2	Highland Park				331	381			27	147	234
	3	Olive Hill				1,138	1,309			89	625	684
	4	Orangewood				1,356	1,560			87	473	1,087
	5	Edgemont				1,093	1,256			72	359	897
	6	34th St.				431	496			36	120	376
	7	Pacific Bldg. Tract				760	874			44	218	656
	8	Meters				68	78			5	26	52
		TOTALS				18,901	21,697			1,071	7,667	14,030
		GRAND TOTALS										

DIVISION DISTRIBUTION
STRUCTURE CONNECTIONS WITH CITY MAINS

B-78

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPRODUCTION COST: REPROD. COST	REPRODUCTION COST: REPROD. WITH OVERHEAD	DEPRECIATION: AGE IN YRS.	DEPRECIATION: PROBABLE LIFE	DEPRECIATION: ANNUAL	DEPRECIATION: TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION: TOTAL
1		**CONNECTIONS**										
	1	Boundary St.	1	lot	550.	550	632	5	50	13	63	569
	2	Between Pauly & VanDyke Streets	1	"	1600.	1,600	1,840	2	50	37	74	1,766
	3	Highland Avenue	1	"	1050.	1,050	1,208	4	50	24	97	1,111
		TOTALS				3,200	3,680			74	234	3,446

DIVISION STRUCTURE **DISTRIBUTION**
NORMAL HEIGHTS SHOPS

B-79

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROBABLE LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
			REPRODUCTION COST					DEPRECIATION				REPRODUCTION LESS DEPRECIATION
1		BUILDINGS, FENCES, PIPING, ETC.	1	lot	700.	700	805	10	30	27	268	537

DIVISION **DISTRIBUTION**
STRUCTURE **MISCELLANEOUS**

B-80 WALTER LEROY HUBER, CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION TOTAL
			REPRODUCTION COST					DEPRECIATION				
1		**TRESTLES**										
	1	Rough Redwood	3.0	MBM	58.00	174	200	6	30	7	40	160
2		**CONCRETE GATE BOXES**										
	1	Boxes	1	lot	25.	25	29	2	50	1	1	28
3		**WOOD GATE BOXES**										
	1	Boxes	4	each	12.	48	55	6	20	3	17	38
4		**METER BOXES - LARGE**										
	1	Boxes - Iron Covers	8	each	25.00	200	230	6	20	12	69	161
		TOTALS				447	514			23	127	387

DIVISION **TELEPHONE LINES**
STRUCTURE

B-81 WALTER LEROY HUBER, CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	REPRODUCTION LESS DEPRECIATION TOTAL
			REPRODUCTION COST					DEPRECIATION				
1		**TELEPHONE LINES**										
	1	Redwood Poles in Ground	700	each	.90	630						
	2	" " on flume	400	"	.50	200						
	3	R O Pine " " "	1000	"	.50	500						
	4	Split " in ground	250	"	1.00	250						
	5	Brackets	4.5	M	30.00	135						
	6	Insulators	4.5	M	36.00	162						
	7	No. 14 Galv. Wire	563.5	LnFt	4.00	2,254						
	8	No. 12 " "	4.2	"	4.50	19						
		TOTALS				4,150	4,773	4	20	239	955	3,818

DIVISION STRUCTURE

B-82

WALTER LEROY HUBER
CIVIL ENGINEER

STR NO.	ITEM NO.	ITEM	QUANTITY	UNIT	UNIT COST	REPROD. COST	REPROD. WITH OVERHEAD	AGE IN YRS.	PROB. LIFE	ANNUAL	TOTAL DEPRECIATION	TOTAL
1		Stock of Materials, Tools, Equipment, Etc.	1	lot		20,987	20,987					20,987

REPRODUCTION COST | DEPRECIATION | REPRODUCTION LESS DEPRECIATION

CUYAMACA WATER COMPANY

SUMMARY of INVENTORY. January 1st, 1919.

	Material & Supplies	Tools.	Equipment	Camp Equipment
Normal Heights Shop	3,033.30	209.50	965.10	
La Mesa Dam	667.75		2,188.15	2.85
La Mesa Shop	1,710.60	349.45	890.50	
La Mesa Pumping Plant	5.50	2.75		
Eucalyptus Reservoir	2,239.30	119.65	1,232.40	
Grossmont Pump House	177.40	9.25		
Lankershim Tunnel	359.00			
Los Coches Trestle	244.10	29.60	138.75	
Ruiz, J. House	13.30		185.00	
Section #4	28.40	40.10	4.25	
El Monte Pumping Plant	935.85	98.55	165.10	
Chocolate Tool House	699.65	72.00	413.50	104.20
South Fork	177.75	10.70		
El Capitan	36.65			
Tunnel #2	16.70			
Diverting Dam	366.85			103.25
Cuyamaca Reservoir	399.15	35.45	440.40	
Office Equipment & Furn.			1,448.80	
Meter Parts, La Mesa Shop	676.70			
	11,727.95	977.00	8,071.95	210.30

Grand Total - - - - - - - - -$ 20,987.20

APPENDIX "C"

STATEMENTS OF CONSTRUCTIVE AND CAPITAL EXPENDITURES, INTEREST, SURPLUSES AND DEFICITS, JUNE 1, 1910 TO DECEMBER 31, 1918.

- - - - - -

CUYAMACA WATER COMPANY

SUMMARY of INVENTORY. January 1st, 1919.

	Material & Supplies	Tools.	Equipment	Camp Equipment.
Normal Heights Shop	3,032.30	209.80	985.10	
La Mesa Dam	667.75		6,188.15	2.85
La Mesa Shop	1,710.80	849.45	890.50	
La Mesa Pumping Plant	8.80	2.75		
Eucalyptus Reservoir	2,259.30	119.85	1,282.40	
Crossmont Pump House	177.40	9.25		
Lankershim Tunnel	889.00			
Los Coches Trestle	244.10	29.80	138.75	
Rule, J. House	13.30		185.00	
Section #4	28.40	40.10	4.25	
El Monte Pumping Plant	935.85	98.85	185.10	
Chocolate Tool House	899.85	72.00	415.50	104.20
South Fork	177.75	10.70		
El Capitan	38.85			
Tunnel #2	16.70			
Diverting Dam	386.85			108.25
Cuyamaca Reservoir	389.15	35.45	440.40	
Office Equipment & Furn.			1,448.80	
Meter Parts,La Mesa Shop	678.70			
	11,727.85	977.00	6,071.85	210.30

Grand Total - - - $ - - - 20,987.20

TABLE 15.

Summary of Constructive and Capital Expenditures

June 1, 1910 to December 31, 1918

	June 1,1910 to Jan. 1,1915	Year 1915	Year 1916	Year 1917	Year 1918	Total
Purchase of physical property of San Diego Flume Company	150,000.00					150,000.00
Legal and other expense in connection with purchase	592.70					592.70
Purchase and collection of unpaid accounts	2,368.04					2,368.04
Purchasing and protecting water rights	3,462.92	4017.71				7,480.63
Engineering for proposed reconstruction, etc.	2,029.31	1669.88				3,699.19
Equipment	5,472.52	1002.28	789.69	1,355.89	232.58	8,852.76
Interest	2,551.98	3313.52	345.19	25,000.56		31,189.25
Lands and Rights of way	3,251.99	100.00	82.00	1,097.19	697.19	5,041.37
Boulder Creek, Comejos, Poverty Gulch and El Capitan Reservoirs	10,248.91	8682.24				18,931.15
Buildings	188.77				2,242.10	2,430.87
Murray Hill reservoir, pipe lines and tunnel	41,788.91	871.34				42,660.25
Cuyamaca Reservoir	13.10					13.10
La Mesa Reservoir	98.37					98.37
Eucalyptus Reservoir	75.00					75.00
Diverting Dam	12,050.46					12,050.46
Flume construction including wood flume, steel flume, concrete flume, steel and concrete siphons, lining, etc.	134,980.40	129661.18	111.15 6,995.00			271,525.43
Pipe Lines	98,328.25	86029.84	457.53	1,516.03	4,907.03	191,238.68
Meters and Services	17,571.09	319.95	370.71	1,212.20	401.09	19,875.04
Pumping Plants	30,405.50	5668.99	1,857.95	110.27	1,803.60	38,436.10
Telephone Line	2,209.57	1159.27				2,209.57
Measuring weirs, gauging stations, etc.	1,356.54					1,356.54
Miscellaneous expenses	217.90					217.90
Casualty Insurance	1,163.30	1189.81				2,353.11
Commissary - net cost	905.40					905.40
La Mesa Ditch	157.40					157.40
Cost of Plant purchased in lieu of Plant Construction		34800.00		19,000.00	680.60	16,180.60
New South Fork Siphon			7,594.83			7,594.83
New South Fork Flume			2,647.54			2,647.54
	521,428.85	276137.07	20,860.29	10,771.60	10,963.99	840,161.28

The sums thus expended are distributed over the Years 1910 to 1918 inclusive, as follows:

1910	155,890.32
1911	51,815.20
1912	55,902.63
1913	89,908.33
1914	170,411.85
1915	276,137.07
1916	20,860.29
1917	10,771.60
1918	10,963.99
Total	840,161.28

TABLE 16.

Capital Expenditures with Interest,
June 1, 1910 to December 31,1918.

Year		Investments	Interest 8 %	Total
1910	Capital Expenditures	155,390.32		
	8 % interest for 8 years 7 months		106,701.38	262.091.70
1911	Capital expenditures	51,615.20		
	8 % interest for 7 years 6 months		31,089.11	82,904.31
1912	Capital expenditures	53,902.63		
	8 % interest for 6 years 6 months		28,029.36	81,931.99
1913	Capital expenditures	89,908.33		
	8 % interest for 5 years 6 months		39,559.66	129,467.99
1914	Capital expenditures	170,411.85		
	8 % interest for 4 years 6 months		61,348.26	231,760.11
1915	Capital expenditures	276,137.07		
	8 % interest for 3 years 6 months.		77,318.37	353,455.44
1916	Capital expenditures	20,860.29		
	8 % interest for 2 years 6 months		4,172.05	25,032.34
1917	Capital expenditures	10,771.60		
	8 % interest for 1 year 6 months		1,292.60	12,064.20
1918	Capital expenditures	10,963.99		
	8 % interest for 0 year 6 months		877.12	11,841.11
	Total			1,190,549.19

TABLE 17.

Earnings vs. Maintenance and Operating Expenses as claimed by

Cuyamaca Water Company
June 1, 1910 to December 31, 1918.

Year		
1910	Surplus in earnings over maintenance and operating expenses	3,943.00
1911	Deficit in earnings over maintenance and operating expenses	5,818.00
1912	Deficit in earnings over maintenance and operating expenses	11,830.00
1913	Deficit in earnings over maintenance and operating expenses	13,707.00
1914	Deficit in earnings over maintenance and operating expenses	7,604.00
1915	Deficit in earnings over maintenance and operating expenses	27,539.35
1916	Deficit in earnings over maintenance and operating expenses	40,605.49
1917	Deficit in earnings over maintenance and operating expenses	45,391.01
1918	Deficit in earnings over maintenance and operating expenses	25,377.28

TABLE 18.

Open Capital Accounts which have not been transferred to Capital Expenditures.

	Year 1915	Year 1916	Year 1917	Year 1918	Total
Murray Dam Construction			182.30	127,267.26	127,449.56
Reinforcing 20" Steel Pipe Line				5,535.65	5,535.65
Pipe Lines Camp Kearny				3,136.92	3,136.92
Diversion Dam			179.26	1,077.47	1,256.73
Boulder Creek Reservoir	860.89	1,152.56	909.44	11.93	2,934.82
El Capitan "	2,294.83	6,091.17	267.11	2,067.97	10,721.08
Comejos "		2,891.50			2,891.50
Total	3,155.72	10,135.23	1,538.11	139,097.20	153,926.26

The sums thus expended are distributed over the Years 1915 to 1918, inclusive, as follows:

1915	3,155.72
1916	10,135.23
1917	1,538.11
1918	139,097.20
Total	153,926.26

State of California,) ss.
County of San Diego,)

Lou B. Mathews, being duly sworn, deposes and says that he is the Secretary of the Cuyamaca Water Company, and that the foregoing statements are true as shown by the books and records in the Office of the Cuyamaca Water Company.

Lou B. Mathews.

Subscribed and sworn to before me this 27th day of March, 1919.

Bertha Marshall
Notary Public in and for the County of San Diego, State of California.

San Diego, Calif.
April 8, 1919.

Mr. W. L. Huber,
First National Bank Bldg.,
San Francisco, Calif.

My dear Mr. Huber:

Answering your enquiry of April 2, 1919, we beg to hand you herewith a summary of Constructive and Capital Expenditures from June 1, 1910 to December 31, 1918, incurred by the Cuyamaca Water Company.

SUMMARY

1910	155,390.32
1911	51,815.20
1912	53,902.63
1913	89,908.33
1914	170,411.85
1915	279,292.79
1916	30,995.52*
1917	75,852.19
1918	86,518.71
Total	994,087.54

* In addition to the above there was expended on account of damages on portions of our system caused by floods in 1916, $30,711.00. Owing to these heavy expenditures very little construction work was undertaken during the year.

Capital Expenditures with interest at eight per cent per annum compounded.
June 1, 1910 to December 31, 1918

Year		Investments	Interest 8% Compounded	Total
1910	Capital Expenditures	155,390.32		
	8% interest for 8 years 7 months		145,640.73	301,031.05
1911	Capital expenditures	51,815.20		
	8% interest for 7 years 6 months		40,539.37	92,354.57
1912	Capital expenditures	53,902.63		
	8% interest for 6 years 6 months		35,055.52	88,958.15
1913	Capital expenditures	89,908.33		
	8% interest for 5 years 6 months		47,480.69	137,389.02
1914	Capital expenditures	170,411.85		
	8% interest for 4 years 5 months		70,018.38	240,430.23
1915	Capital expenditures	279,292.79		
	8% interest for 3 years 6 months		86,608.83	365,901.62
1916	Capital expenditures	30,995.52		
	8% interest for 2 years 6 months		6,603.78	37,599.30
1917	Capital expenditures	75,852.19		
	8% interest for 1 year 6 months		9,344.99	85,197.18
1918	Capital expenditures	86,518.71		
	8% interest for 0 year 6 months		3,460.75	89,979.46
	Total			1,438,840.58

Sheet #2

Earnings vs. Maintenance, Operating, and Depreciation
June 1, 1910 to December 31, 1918.

Year		
1910	Surplus in earnings over maintenance and operating expenses	5,943.00
1911	Deficit in earnings over maintenance and operating expenses	5,818.00
1912	Deficit in earnings over maintenanse andcoperating expenses	11,830.00
1913	Deficit in earnings over maintenance and operating expenses	13,707.00
1914	Deficit in earnings over maintenance and operating expenses	7,604.00
1915	Deficit in earnings over maintenance and operating expenses	27,539.35
1916	Deficit in earnings over maintenance and operating expenses	40,605.49
1917	Deficit in earnings over maintenance and operating expenses	45,391.01
1918	Deficit in earnings over maintenance and operating expenses	25,377.28

No dividends have ever been paid and no salaries to the owners, excepting a salary of $200.00 a month to Mr. Fletcher.

Yours very truly,

CUYAMACA WATER COMPANY

Lou B. Mathews.

Secretary

State of California,)
County of San Diego,) ss

Lou B. Mathews, being duly sworn, deposes and says that he is the Secretary of the Cuyamaca Water Company, and that the foregoing statements are true as shown by the books and records in the office of the Cuyamaca Water Company.

Lou B. Mathews

Subscribed and sworn to before me this 8 day of April, 1919.

Berta Manhart

Notary Public in and for the County of San Diego, State of California.

Ed Fletcher Papers

1870-1955

MSS.81

Box: 38 Folder: 6

Business Records - Reports - Huber, W.L - "Engineer's Report upon La Mesa, Lemon Grove and Spring Valley Irrigation District

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