

To

Mr M. C. Healion,

Pres. S. D. F. Co.

Dear Sir:-

*Capps
report*

In accordance with your request to examine into and make a report upon the present and future possibilities of the system of water works owned by your company in this county, I beg to submit for your consideration the following:

Among the few meritorious water supply properties existing in Southern California, the property of the San Diego Flume Company stands out as an equal, and in many respects superior to any other doing business in this section.

Its source of water supply, its contiguous irrigable lands, and the accessibility of both its system of conduit and irrigable lands all go to make it a very desirable property.

The source of water supply for your system could not be more favorable, the vast area of the water shed lying above your diverting dam, consists of lofty mountain ranges, in places very precipitous, and ranging in elevation from 800 feet at the diverting dam to 6500 feet. The annual precipitation on this shed is greater than is obtained upon any other equal area in the southern portion of this County. On the lower elevations of this shed the precipitation is invariably in the form of rain, while on the upper portions, snow will lie in winter several feet in depth. In these upper regions summer showers and cloud bursts are of no uncommon occurrence. The whole of this water shed tributary to your system, lies on the westerly or ocean slope of the Sierra Madre chain of mountains, and consequently receives the full benefit of the copious rains brought down the coast and wafted inland by the counter southerly winds and precipitated, very little, if any, passing over on to the desert slope.

The surface of this shed is variable. A portion consists of very precipitous mountain sides. The rain falling on this portion will of course rapidly descend into the streams and pass into the impounding reservoirs, yielding a greater percentage of reservoir water than would be otherwise obtained from the more gentle and deep earth covered areas.

On the other hand the earthen covered portions are of especial value as a water producer. It will no doubt be plainly seen that while the water does not immediately pass off as above stated, it is absorbed and held by the soil until saturation ensues; then it gradually filters out during the summer, creating many live streams of water which, if the preceding winter showers were copious, will last all summer, otherwise, partially all summer. It is evident that this water being naturally impounded by the soil and gradually released will act as a feeder to the storage reservoirs and reinforce them as the water is drawn off for use, and is therefore a valuable adjunct to the water supply for your system.

The annual precipitation in this southern country is however, subject to much deviation from normal. During most winters vast volumes of water pour out of these mountain gorges and are lost by discharging into the sea, causing many times, much loss of property, while during other seasons, the water scarcely shows above the sands in the river beds. The purpose of storage reservoirs is therefore to capture these flood waters and hold them for future use during the summer or irrigating season.

Your water shed is fortunately possessed of a number of very fine reservoir sites, of sufficient capacity to answer all purposes of your system, to-wit: The undeveloped Pine Valley site has an elevation above the sea of 3630 feet, with a water shed of 45 square miles in

area. This reservoir is very compact in form, surrounded by very high mountain peaks, covered with pine and oak trees. The precipitation on this shed is the maximum, and consists of both rain and snow.

The developed Cuyamaca reservoir lies at an elevation of 4650 feet above the sea having a water shed of some thirteen square miles of the highest mountain peaks in this section. The precipitation on this shed is also a maximum and consists of rain and snow. In the winter time this reservoir presents a beautiful sheet of water.

Dropping down to an elevation of 950 feet is a very commodious reservoir site known as Lake Helena. This site is as yet undeveloped, but when fully developed is of great value. The water shed to this proposed reservoir aggregates some 72 square miles in extent and ranges in elevation from 960 feet at the site to 7000 feet. The precipitation on the lower reaches of this shed is medium and consists of rain, and on the upper portions it is maximum and consists of rain and snow.

Dropping still lower there is the developed reservoir known as the La Mesa. This reservoir is 470 feet above the level of the sea, and is filled during the winter by discharging the surplus or flood water from the end of the flume into it. It has no material water shed; it is none the less a very capacious and necessary acquisition to your system.

The water shed directly tributary to the diverting dam and the conduit proper is a further addition to your water shed and consists of 73 square miles, elevation from 800 feet to 6000 feet; both rain and snow precipitation. The water from this shed is not provided with any reservoir but drains directly into the San Diego River and is diverted into the flume by a diverting dam placed in the bed of the river.

It can be safely said that with a very small expense at least an additional 50 square miles of fine watershed can be added, making in all a magnificent total of 253 square miles of as fine water producing territory as will be found in San Diego County.

Lying below your diverting dam, and in the bed of the San Diego River, is an immense bed of white sand. This bed of sand has been found to be highly saturated with water during the dryest of seasons and yields an apparently inexhaustible quantity of water with but little encouragement. This deposit of water is of the utmost importance to your system, acting as a safeguard and reserve to carry your system through a possible dry season, which occurs in this country at times. The plane of the water surface in this sand lies but little below the grade line of your conduit, and with a comparatively small expense a pumping plant could be constructed of sufficient capacity to elevate this water into your flume. This bed of sand will cover some thousands of acres in extent and is of unknown depth. It has been found that a cubic foot of dry sand will absorb from one third to one half of a cubic foot of water without increasing its bulk. Thus it will be seen that the quantity of water contained in this sand is of no small proportions.

Taking into consideration all that has been said above, I consider the water supply, when entirely developed, to be second to none in this county.

The lands lying under your conduits and subject to irrigation are as rich and fertile as exist in Southern California, only awaiting the application of water to make them of great value and productiveness.

The first land to be irrigated is the fertile valley of El Cajon. This valley is several thousands of acres in extent, practically level, with gentle sloping sides, and all of the very best of lands, suitable

for the production of all kinds of both the citrus and deciduous fruits. This fine body of land lying encircled on the east and south by your flume line, is admirably situated for its economical irrigation. A small portion of the valley is under cultivation at present, principally orange and lemon orchards and quite a tract of raisin grapes. The whole valley is in the warm belt and ranges in elevation from 300 to 550 feet above the sea. With an abundant supply of water this valley would prove a profitable source of revenue to your company.

Passing westerly over the rim of El Cajon Valley there is a very extensive tract of rich undulating land all capable of irrigation from your conduits. This body of land reaches westward to the limits of the City of San Diego, north to the San Diego river, and south to the Sweetwater river, and embraces within its limits all the several varieties of soil known to this section, from the deep rich black adobe to the warm red iron lands, all highly productive in the fruits and vegetables. A very small portion of this land is, at the present time, under cultivation. There are however two very highly developed districts in this territory known as Lemon Grove and La Mesa Colony, which stand forth as living examples of the possibilities and great fertility of the soil when irrigated. The elevations are from 150 to 600 feet above sea level and all in the same tropic zone. The table lands being free from frost, produce in abundance all the semi tropical fruits, which reach here their highest perfection, while in the lower valley lands some frost occasionally occurs, the deciduous fruits thrive; all of which land however, is absolutely non-productive and of no particular value without an abundant water supply. I believe I am safe in saying that the total area of the above described tracts of land will approximate 45000 acres, not more than 5000 acres of which is at the present time under orchard cultivation.

Lying to the north of the San Diego river is a splendid section of wild table land known as the Linda Vista Mesa. This mesa is practically level. It has a gentle slope to the west sufficient for irrigation purposes and is admirably conditioned for the production of all the semi-tropical as well as deciduous fruits; the soil is black adobe and red iron lands, deep and fertile. The elevations range from 300 to 500 feet above the sea and the lands are free from frost. These lands could no doubt, be purchased at an average price of not more than ten or twelve dollars per acre, and if subdivided into ten and twenty acre tracts, and your system of water works extended so as to provide an abundant water supply, I am satisfied that they would readily sell for not less than \$100 per acre including a water right, the purchasers paying an annual water rental sufficient to maintain and operate the system. The area of land that would come within the practical and economical limits of your system would approximate 30,000 acres.

As a practical example of a venture of this nature I will cite the Chula Vista District lying under the system of water works known as the Sweetwater. Prior to the development of this system of water works the lands upon which the fine groves of oranges and lemons are growing today at Chula Vista, were nothing but a sheep pasture and were of but little value only for the raising of hay. The moment that they were supplied with a sufficient water supply, they rapidly increased in value and sold at from \$250 to \$450 per acre, the purchasers paying an annual water rental of \$3.50 an acre.

It must be understood however, that this is an extreme case and could not be anticipated at the present time. These values were boom inflated far beyond their real value, but as a very conservative estimate \$100 per acre with a water right is very reasonable, and a business proposition for the orchardist.

The total area of irrigable lands that is subject to irrigation from your system is not less than 75000 acres, and with fully developed surveys would possibly reach 100,000 acres.

Under the present limited development of your water supply, no further obligations to furnish water should be incurred. The capacity of the flume is however, sufficient to carry two or three times the present supply of water. To properly develop this system it will take considerable money. The building of dams to impound the flood water, repairs and raising the sides to your flume box, repairs and extensions to pipe lines necessary to reach the irrigable lands are all expenses that are necessary to place this fine water proposition on a very profitable basis.

In making this report, I base my opinion upon an experience of fifteen years in this locality as a Civil and Hydraulic Engineer. Having in this time had occasion to examine into and report upon the several water propositions in this locality I can confidently say that none of them present the advantages for the economical and profitable distribution of water as does the system of the San Diego Flume Co.

Very truly,

Edwin M. Capps, C. E.

Hydraulic Engineer.

San Diego, Cal. May 28th, 1901.

Los Angeles, Cal. Sept. 27th, 1902.

Mr M. C. Healton,

Pres. of the San Diego Flume Co.,

San Diego, Cal.

Dear Sir:-

In considering the water power features possessed by the system of water works owned by your Company, I am of the opinion that excellent opportunities exist for the development of a fine system of electrical power works.

The great elevation of Cuyamaca Lake, and its advantageous location, affords a most promising field for development of this character.

The water from this lake upon being released flows down Boulder creek, one of the most precipitous mountain cañons in San Diego County. In a few miles the drop is from 4650 feet at the lake to about 800 feet at the point where the water is diverted into your conduits. This magnificent fall is certainly susceptible of immense power development.

If your system of water works should be extended as was originally designed, so as to take in the Dye Cañon territory, another valuable acquisition, not only in electrical power, but water supply would result. The electrical power possibilities at this point would equal, if not excel those from Cuyamaca lake.

The Pine Valley section of your system, when fully developed, is also possessed of admirable power facilities. The water in flowing from the Pine Valley reservoir, which has an elevation of 3630 feet above the sea, has several very heavy falls before it reaches your conduits, and is therefore capable of furnishing a large quantity of power.

The use of the water from any of these points would not in the least impair the quality of the water or interfere in its distribution for irrigation or domestic use.

I believe the three power sources above enumerated could be so constructed as to work into one general plan and in harmony with each other, so that the power could be transmitted into San Diego over one wire, which would reduce the cost of construction as well as operation.

As to the quantity of water supply, probably the undeveloped Dye Canon point is the first in this respect, second the partly developed Pine Valley, and lastly the Cuyamaca Lake, all of which have fine water sheds, and with an average yearly precipitation an abundant water supply could be depended upon.

In all of Southern California there are at long intervals, periods when the rain fall is considerably below the normal. The last few years has been one of exceptional drought, and cannot be taken as a criterion for the future. Such a condition as has existed during the last few years may not occur again in a generation. It may be said that there are few countries that do not have periodical droughts.

It would be impossible to even approximate the quantity of power that could be developed in advance of actual surveys for this purpose, but will give you some idea of the power of falling water in the following table.

The amounts given would probably be the net Horse Power delivered in San Diego, from any of the above points, and based upon a flow of 500 miner's inches.

500 inches falling	500 feet,	342.00 H.P.
500 "	1000 "	634.00# "
500 "	2000 "	1368.00# "
500 "	3000 "	2052.00# "

#These amounts would be reduced to some extent owing to the number of times the fall is broken.

It will be observed that the above amounts are perpetual, day and night.

Electrical power is usually measured in "Watts", and is estimated that 746 Watts per hour equals one horse power. Or in other words a one horse power motor will consume in one hour 746 Watts, in 24 hours 17904 Watts, &c. &c. The power is usually sold at a given sum per 1000 Watts consumed, and ranging in price from 2 to 15 cents per 1000 Watts, depending upon the quantity consumed by any consumer in any one month, the price decreasing very rapidly as the quantity consumed increases.

As power is generally used ten hours a day, a one horse power motor will consume 7460 Watts per day, and for 26 working days in a month, will consume 193,960 Watts, 9 cents per 1000 Watts will equal \$17.45 per month. If the same consumer had used a ten horse power motor, he would have consumed in ten hours 74,600 Watts, or 1,939,000 Watts per month, at 5 cents per 1000 Watts his bill would have been \$96.98.

The prices quoted are the prices in Los Angeles.

The above data is merely given to aid you in forming your own conclusions in regard to the value of power and the possibilities of the San Diego Flume Company's system of water works.

Assuming a net fall from the Cuyamaca lake of 3800 feet, from the Pine Valley of 2000 feet and from Dye Cañon of 1500 feet, and with a flow of 500 miner's inches at each of these points, the power from the first point would be about 2600 horse power, from the second about 1364 horse power, and from the third 1020 horse power, making in all 4984 H.P. delivered net into San Diego.

With a ten hour flow of 500 inches of water from each of the above named points, the number of Watts produced in each ten hours (a working day) would reach the sum of 37,180,640, ranging in value from 2 to 15 cents per 1000 Watts.

In conclusion I will say, that I do not think there is a more remunerative investment than in the development of electrical power, and that your system of water works offers fine inducements. It is worthy of a thorough investigation, and will prove upon such investigation to be all that is desired.

Very truly yours,

Edwin M. Capps, C. E.

Room 305 Copp Building,
Los Angeles, Cal.

Linden L. Boone,
Attorney at Law,
N. E. Corner Fifth and D Streets.

San Diego, Calif. May 28, 1901.

To M. C. Healion,

Dear sir:-

You ask me for my opinion as to what may be done with the San Diego Flume property. In order to understand the situation, it might be well to give a brief history of this enterprise.

The Flume system was undertaken in 1886. The promoters contemplated building up an enormous water system drawing upon the principal water sheds in the mountains east and northeast of this city. The coast range rises to elevations of from 4,000 to 6,500 feet in a distance of about 45 miles from the sea shore. The rainfall in the mountains is much greater than on the coast and owing to the precipitous sides and trench to the sea an enormous runoff occurs during rains even of no remarkable heaviness. They selected the San Diego River as being the largest and best water shed, and also being so situated as to elevation that by tunnelling, or fluming, several other water sheds might be turned into the San Diego basin. A flume was built along the southerly side of the river bed commencing at an elevation of about 800 feet. This flume was intended to have a capacity of about 4,000 miner's inches of water constant flow. The foundation and trestle work were built for this intended use, but the sides were not built up to the height of the standards. As it at present exists, I think the flume has a capacity of about 600 inches.

The streams in this County usually run very low in summer and sometimes become dry, especially as they near the coast. In order to provide a constant supply, it was intended to build great reservoirs at Guyamaca, Pine Valley, Dye Valley and other places.

The one at Guyamaca was the only one built. The plans of the promoters were not carried out for lack of capital.

It seems to me that if the original plans were carried out, that the flume property would be one of the finest water properties in the

land, and a good, safe business investment.

If water should be developed so as to insure a supply of 4,000 inches and the flume completed as originally designated, it ought to be profitable. Too much stress cannot be put upon the certainty of the water supply. Upon this would very largely depend the success of the enterprise. The only safe policy would be to create large storage capacity, which would mean the building of great dams at various places, which would require a large outlay of money. But such outlay would be only once for all time-- repairs would be nothing-- deterioration nothing. It would cost very little more to keep up the flume carrying 4,000 inches than it does now.

The cincome from that quantity of water at the rates fixed by the Board of supervisors would be \$480,000 per year.

But if the water ~~is~~ right is sold, say for \$600 per inch, which your company has realized for nearly all its water rights, and the rate fixed by contract at one half supervisor's rates, the annual income would be \$240,000 and the amount realized from sales of water rights would be \$2,400,000.

But I believe the better and more profitable plan would be to buy lands and put the price of the water right and more, upon the price of the lands. An inch to ten acres is a liberal allowance as shown by the experience of the past ten years.

Good lands carrying a water right of one tenth of an inch to an acre with an annual rental of \$60.00 per inch are worth from \$100 up to, in some cases, \$300 per acre. I think that "dry" lands can be bought just now very cheap. We have had three very dry seasons and the "dry" farmer has suffered almost to destruction. It has been demonstrated that this is no country for farming except by irrigation.

I would say that there are from 75,000 to 100,000 acres of land that might possibly be reached from this system. This land is now uncultivated and practically untenanted. Its possibilities for productiveness are very great. It needs only water and farmers to intelligently use it.

Of course many details and engineering features would have to be worked out but I believe the general plan of buying lands and putting water on them can be made a financial success. Of course water rights would be sold when advantageous. The full development need not be made at once, but a development say of 2,000 inches more water would be sufficient for the next few years.

It should not be lost sight of that in any water development on a large scale the use of water for power would be an incident of vast importance.

Take for example the fall from Dye Valley to the foot of Eagle Peak, about 1500 feet in 3 miles. 1000 inches of water falling this distance is the equivalent of about 3,000 horse power, which delivered to san diego would be worth about \$60 per horse power per annum. Pine Valley also offers good opportunities for the development of power.

A ready market can be found for all power that can be developed. San Diego would use 3,000 horse power now, if it could be had at the price above indicated. Along the line are great deposits of clay carrying a large percentage of Aluminum which it is believed could be profitable worked with cheap electricity.

To sum up the advantages which your company has over any other I would say:

1. It has the best water shed in the county.
2. It has its main conduit already built, which can be increased in capacity at a proportionately small cost; and hence the development of additional water would be proportionately cheap.
3. It is above a large territory near this city, which makes the lands more valuable than if farther away.
4. If the city grows to considerable size it will be compelled to draw its supply of water from this source. In fact it is my opinion that the city will always have to depend upon the San Diego River for its water.
5. In my opinion the entire cost of the additional development will be repaid in a short time from sales of water rights and profits on lands.

Very respectfully,
L. L. Boone.

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SERIES & FOLDER TITLE SAN DIEGO FLUME CO.

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Ed Fletcher Papers

1870-1955

MSS.81

Box: 53 Folder: 7

**Business Records - Water Companies - Cuyamaca
Water Company - San Diego Flume Company - San
Diego Flume Company correspondence - Boone,
Linden D. - M.C. Heilion, (President, San Diego Flume)**



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