

STATE OF CALIFORNIA
DEPARTMENT OF ENGINEERING

SACRAMENTO February 14, 1918.

Colonel Ed. Fletcher,
President San Dieguito Mutual Water Company,
920 Eighth Street,
San Diego, California.

Subject: Report of Mr. Frank Adams, Manager Irrigation Investigations.

Dear Colonel:

Enclosed herewith please find copy of letter of transmittal of Mr. Frank Adams, Manager Irrigation Investigations, dated January 26th; also, copy of his report referred to in the letter.

On page 4 of Mr. Adams' report, we find this statement: "For one use or another, practically all of the 72% making up the agricultural lands may be considered tillable and valuable under irrigation. Differences in value obviously exist, but the lands of distinct agricultural value constitute the bulk of the 72%."

Rumor comes to me that some individual in ^{Sacramento} ~~Sacramento~~ has seriously questioned the agricultural value of these lands along the coast. Will take this up with you during my next visit south.

Very truly yours,

W. F. McClure
State Engineer.

WFM:R
Enc.

Opinion of Adams

C O P Y

UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF PUBLIC ROADS AND RURAL ENGINEERING

WASHINGTON, D.C.

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January 26th., 1918.

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

Dear Mr. McClure:

Under separate cover there is being forwarded to you today my report on the matters relating to the proposed San Diego County irrigation district on which you asked my judgment. Attached to the report are a number of letters and papers relating to the question of duty of water in San Diego County, some of which have been supplied by Col. Fletcher's office. There is also being sent an extra copy of the report for Col. Fletcher, subject to your decision as to its being forwarded to him.

In reaching a conclusion about the matters referred to me, I have not deemed it wise to utilize general figures which I had no opportunity to trace back to their origin for a study of the factors on which they have been based. It seemed to me that my best service could be performed by studying the question presented on their own merits on the basis of such data as we could ourselves gather, leaving you to make such application as you deem wise. I have therefore submitted only general observations as to what seem to me principles governing application of the data.

Some of the data forwarded by Col. Fletcher have dealt with the agricultural productiveness of the section involved. It has not seemed to me necessary to go into that question very far. No one that I know of questions the suitability of San Diego soil and climate to agriculture.

I hope Col. Fletcher will not feel that my judgment is far afield. No one not directly involved financially could be more anxious than I am to see development of the kind proposed go forward, I can not, however, look upon such questions as are involved in this project in any other way than impersonally.

I hope I am not too late in getting this report to you. The matter has required a good deal of study. Some of the data needed only reached me yesterday.

Yours truly,
(SGD) Frank Adams,
Irrigation Manager.

Report on Agricultural Value of Lands
and Duty of Water in Proposed Irrigation
District extending from Del Mar to South Oceanside,
San Diego County, California.

by
Frank Adams

26-Jan-1918

Cooperative Irrigation Investigations in California

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Agricultural Value of Lands

The proposed irrigation district to which this report refers extends in a narrow strip along the coast of San Diego County from Del Mar to Oceanside and is said to comprise a total of about 22,000 acres. Topographic features are fully covered by U. S. Geological Survey La Jolla, Oceanside, and Escondido quadrangles. Elevations are generally under 250 feet. Outside of elevations and direct coastal exposure, the significant topographic characteristics, agriculturally, are the relatively even slopes of the lower coastal plain and of the flatter areas back of and lower than the higher portions of the coastal plain, the frequent abrupt breaks in the coastal plain made by stream channels and coastal inlets, and the frequent occurrence, especially on portions of the Santa Fe Ranch, of rough, monagricultural areas.

Agriculturally, the more important and the more valuable portions of the proposed district seem to be those constituting the direct coastal plain. These are obviously of especial importance from the standpoint of truck growing, which seems likely to be an

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important industry in the transition of the area to a typical settled San Diego County community. While thus far mainly dry-farmed, the suitability of the lands there for growing almost, if not every, annual truck and field crop common to the Southern California coastal plain seems fully demonstrated by the plantings along the coast where water has already been made available, as at La Jolla, Del Mar, South Oceanside, etc. Whether citrus plantings can be profitably made on this direct plain need not be gone into, for it is not understood that that is contemplated except in scattered areas where individual tastes of ultimate purchasers of land may run in that direction. The similarity of the coastal plain to the Chula Vista section, and of some of the higher lands to the west, as on the upper mesas of the Santa Fe Ranch, to the La Mesa section, suggests sufficient warrant for expecting results from citrus comparable with results from those other citrus areas. From a frost standpoint, which it was not the province of this report to consider except very generally, it is obvious, as suggested by Mr. H. F. Alciatore, Meteorologist of San Diego Office of the Weather Bureau, that in the absence of any particular topographic dissimilarity between the sections north and south of San Diego, there is nothing other than purely local cause for temperature differences. What local differences there are that are meteorologically significant is a matter purely for the meteorologist.

In connection with the matter of soil types within the proposed district, through courtesy of Professor Chas. F. Shaw, of the

Summary of Soil Classification

Soil type	Designation on map	Percentage in district	Soil Description from Reconnaissance Soil Survey
Tidal Marsh	2	3.6	
Rough Broken Land	4	22.0	
Kimball Sandy Loams	13	30.0	:Sandy loam and loamy sand surface soils with heavy textured subsoil 18 to 36 in. below surface. Friable when moist or when properly tilled but have a tendency to bake if improperly handled.
Montezuma Adobe	30	4.7	:Very heavy textured subsoil, frequently more or less mottled or marked by high concentrations of lime.
Coastal Beach and Dune Sand	38	2.1	
Los Flores and Kimball loams, undifferentiated	40	23.0	:For Kimball loams see above. Los Flores loams similar in many ways to Kimball loams but are light gray or light brownish gray instead of typical brown or red brown of Kimball loams. Surface soils of Los Flores loams 12 to 30 in. deep overlaid by heavy compact subsoil extending to 6 or more feet deep.
San Joaquin sandy loams	43	7.3	:Loamy surface soil averaging about 10 in. deep with sticky red or light red clay extending from about 10 to about 20 in. and underlaid by a very compact cemented hardpan.
Olympic loams	8)		
Rough stony land	9)		
Yolo clay loams	15)		
Hanford sandy loams	18)		
Yolo loams and sandy loams	31)	7.3	
Aiken stony loams	44)		
Hanford fine sandy loams	49)		
Dublin loams and clay loams	140)		

University of California, access has been had to the as yet unpublished Soil Survey of San Diego County, prepared by the College of Agriculture of the University of California and the Bureau of Soils of the U.S. Department of Agriculture. The soil classification within the district as made by the Bureau of Soils and the University of California is given on the attached blueprint from tracing from the manuscript map at Berkeley. Summarizing these, as in the table above, it is found that the soils classified as Kimball sandy loams and as Kimball and Los Flores sand loams, undifferentiated (Nos. 13 and 40 on the map), comprise 53 per cent of the total. Rough broken land, coastal beach and dune sands, and rough stony lands, all nonagricultural, comprise approximately 28 per cent. Miscellaneous other agricultural lands, chiefly San Joaquin sandy loams (No. 43) and Montezuma adobe (No. 30) make up the remaining 19 per cent.

For one use or another, practically all of the 72 per cent making up the agricultural lands may be considered tillable and valuable under irrigation. Differences in value obviously exist, but the lands of distinct agricultural value constitute the bulk of the 72 per cent.

Rainfall and Irrigation Season.

A 65-year seasonal (July-June) rainfall record, 1851-1915, is available for San Diego. The average seasonal precipitation for this period was 9.67 inches, the minimum 3.75 inches in 1876-1877, and the maximum 25.97 inches in 1883-1884.

The summer season being practically rainless, the length of irrigation season, particularly for annuals such as truck, depends largely on the fall and winter rainfall.

While deep-rooting plantings, such as trees, will carry over rainless months during late fall, winter, or early spring without great injury, vegetables suffer or are set back to an unprofitable degree by lack of moisture at any time.

Except in months following a relatively heavy precipitation, therefore, say a monthly fall of 2 inches or more, irrigation may reasonably be deemed necessary for truck and frequently for groves, in each of the fall to spring months in which the precipitation is less than one inch. The only exception that might be necessary to this and be in the case of much more than normal monthly precipitation, which the records indicate are too infrequent to give much weight to.

During the 65 years 1851-1915, and after omitting months preceded by months with at least 2 inches of precipitation, less than one inch fell in October in 58 seasons, in November in 38 seasons, in December in 22 seasons, in January in 17 seasons, in February in 14 seasons, and in March in 20 seasons.

In other words for plantings still actively growing, and particularly truck, irrigation would seem quite sure to be necessary through October and also likely to be needed more than one-half of the seasons in November, about one-third of the seasons in December, about one-quarter of the seasons in January, about one-fifth of the seasons in February, and about one-third of the seasons in March.

The normal irrigation season in San Diego County for citrus groves is locally considered to be 7 or 8 months. It seems clear, however, from the above analysis of the rainfall records, that counting full cropping the normal maximum irrigation season for truck will be in excess of that, say 8 or 9 months. With less than full croppings, or with the growth without irrigation during the summer of Lima, white or other standard beans that have proven profitable in normal years along the coastal plain, this period might of course be reduced. In such an event, the land would be less productive than if fully cropped to truck or rotative between truck and Lima or other beans and the beans irrigated, and consequently less valuable and economically subject to a less capital charge for irrigation works.

Duty of Water.

The amount of water necessary to grow crops under irrigation, commonly called the "duty of water", is primarily measured by the amount required to raise and maintain in the soil moisture percentage sufficiently above the so-called "wilting point" (the point below which plants begin to wilt) to care for the needs of the plants throughout the growing season plus evaporation and deep percolation losses. The only wholly satisfactory method of determining this amount is by soil moisture studies in planted, growing fields throughout at least one, and preferably several, seasons. This method has, of course, not been possible in the case at hand, although we have very fortunately

had access to results of studies of this nature by the U. S. Bureau of Plant Industry on three citrus groves in the Chula Vista section during 1917. In the absence of following this method the common and often quite satisfactory method of taking account actual use has had to be resorted to. Because of the small present use within the proposed district, the principal data have had to be collected from the Chula Vista, La Mesa, and Lemon Grove sections. But little truck being raised in the La Mesa and Lemon Grove sections, it has been necessary to use data on this class of plantings chiefly from Chula Vista, supplemented by such short time records as could be obtained from truck farms under the San Diego City water system about Pacific Beach and La Jolla and under the Oceanside Mutual Water Company's pumping system at South Oceanside and Carlsbad. Unfortunately the truck gardens under these systems have not yet become sufficiently established to give records of great value, yet they are suggestive. The soil at Pacific Beach and La Jolla is sufficiently like much of that in the proposed district to be fully comparable, and the South Oceanside and Carlsbad sections are within the district. The soil at Chula Vista, while having frequently a more compact subsoil, is generally comparable with the major soils from Del Mar to Oceanside. A tabulation of the data assembled is appended. Only fields have been included which we were able to visit, whose owners we were able to interview, or both, or for which we were

able satisfactorily to check figures given through the advice of water company operating officials or employees. The years 1916 and 1917 are locally considered, when taken together, to represent average requirements.

In the absence of more data it is not considered prudent to recommend any lower net figures for the proposed district than shown by the averages given in the summary, viz: About 1.10 acre-feet per acre per annum for citrus fruits, and about 1.6 acre-foot per acre for truck farming. Even then some doubt is felt as to the sufficiency of these amounts for maximum yields. In this connection the information obtained from the Bureau of Plant Industry for Tracts 18, 53 and 55 at Chula Vista is especially significant. While 1917, to which year this information relates, was abnormally dry, the use on those three tracts, 1.57, 1.14, and 1.67, averaging 1.46, acre-feet per net acre irrigated, is very considerably above the 1.1 acre-feet suggested herein. Alfalfa is not considered at all in arriving at the figures given, because obviously the cost of water will in any event be too high to justify its production.

The area given by the proponents as lying within the proposed district boundaries is about 22,000 acres. Applying the soil percentage taken from the reconnaissance soil map, the agricultural area is about 15,800 acres. In many cases, as is the custom about such sections as Del Mar and La Mesa, residences in the proposed district may be expected to be built on rough land classed as nonagricultural,

and this will to that extent reduce the percentage of agricultural land in roads, buildings, and vacant spaces under full development. Assuming, however, a 10 percent reduction for such purposes, leaves about 14,500 acres that would need water under full development.

No one is wise enough to read accurately the future of such a section as is included in the proposed irrigation district after water has been made available. The plantings chosen depend far more on the personal tastes of the landowners in such a section than in a section devoted to agricultural staples. Nor is it easy to determine in advance how little water, i.e., how much less than the requirements for maximum yields, landowners will be satisfied with. If the section were to develop strictly as an agricultural one, which admittedly can not be expected, the settlers could not afford to demand less than necessary for best results. San Diego communities do not, however, develop as do communities devoted to agricultural staples. On the contrary, they are largely suburban, with domestic use frequently as important as agricultural use. While investigations by the water administration of Los Angeles indicate that domestic and irrigation requirements, when reduced to an acreage basis, do not vary widely, possibly residents within such a district as is proposed might be willing to reduce domestic use considerably below normal requirements in the dry years that occasionally come to all southwestern sections. The extent to which this can be assumed as permissible, the extent to which residential values will govern over agricultural values,

and the reduction below normal irrigation requirements under full development it is safe to assume permissible in a project of this kind in figuring safe yield for the system, are not considered directly within the purpose of this report. These matters have, however, been given some consideration; and the following in relation thereto is presented:

To any thoughtful observer of San Diego County agriculture the conclusion seems warranted that the various conditions and characteristics that, summed up, make San Diego County communities what they are, are based fundamentally on residential values rather than on net money returns from the soil. Too many people are attracted by the climatic, geographical, and social advantages of San Diego County to permit the relatively meagre water supplies of the county to be devoted merely to the most economic agricultural use. The warrant for departing from standards necessary in sections of larger water supply therefore seems clear. If this is done, however, and a less water supply per irrigated acre figured on than safe culture warrants, the distinctively special basis on which the project is to be promoted should be clearly set forth. This, it seems to the writer, is due not only to those ^{who} supply necessary funds, but also those who are to develop the main lands and tracts that will be made available if the contemplated water supply is provided. In other words, in the opinion of the writer they should understand that the project goes forward as one only partially dependent for the financial success on economic agricultural returns.

As a practical question, the project or "gross" water duty for systems with which the proposed irrigation district is comparable is in some cases less than the net agricultural duty found from the data given in the attached summary. For instance, 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 computations of the Cuyamaca Water Company, presented in connection with this present investigation, show a gross duty for 1915 and 1916, respectively, of 0.84 and 1 acre-foot per acre, the latter being increased to include some pumped water. On the other hand, Mr. Tait reports that Lake Hemet Water Company figuring from its own computations of delivery, shows a gross duty of 1.1 acre-foot per acre for citrus and deciduous fruits and some alfalfa.

The question of water rates to be charged by Cuyamaca Water Company, and other matters relating to that Company in many instances involving water duty have on numerous occasions been before that State Railroad Commission. (Decisions 536, 764, 1186, 1609, 1738, 2525, 2527, 2528, 2529, 2531, 2669, 2670, 2671, 3299, 4058.)

These decisions have been read in connection with this study by F. J. Veihmeyer. In connection with Decision No. 4058 the Commission seems to accept a duty of one acre-foot per acre "for such crops as prevail in this territory". Possibly more significant, however, are the words of the Commission in Decision No. 536 with the broader question of what constitutes a safe yield. This report will be concluded with the following quotation from its remarks:

In determining the safe net yield of a system for irrigation it is testified that much more difficulty is encountered than to obtain the same fact with reference to a domestic supply.

In the case of water supplied for domestic purposes the system must be capable of supplying at all times sufficient water for its consumers, and the safe net yield must be based upon the minimum possibility of this supply because the demand is continuing and any substantial diminution works great hardship upon the consumers. This, however, is not the case with an irrigation system. In periods of shortage it is possible for crops to get along with a supply below that which they normally require. The determination of this minimum amount for crop requirements which may be used as a basis for determining the safe net yield must be a combination of measurement and judgment. This problem is the result of the following considerations.

If in California, where the rainfall varies greatly from year to year, each irrigation system will be limited in its operation to supplying that number of consumers only whose reasonable requirements would be met in the driest year, the result would be that most all of the water companies in this state would in by far the majority of years be allowing a great portion of the water supply to waste, and also by reason of this fact raise the cost for each unit of water used. While on the other hand, if the water company be permitted to take on consumers up to the limit of its ability to serve in the year of maximum supply, and this has been too often the case in California, we would have a condition wherein almost every year the consumers' crops would suffer for water. Good judgment will indicate a medium amount which, while not perhaps actually the average, will insure in the driest year which the history of the region in question for a sufficient number of years shows is likely to occur, a sufficient amount of water to carry crops through the year without serious or permanent injury, if as is the case, the crops are trees and vines. A somewhat different rule perhaps might be followed

with crops of different character. Therefore, while in the case of Palmer vs. Southern California Mountain Water Company, we were inclined to take as the basis for the safe yield the maximum precipitation and run-off, which is necessary when considering domestic service, yet I believe for the reasons I have already pointed out, such a rule here where irrigation is being considered, would be to the advantage either of the company or to the irrigators and would be contrary to public policy if applied to a company whose consumers, as here, are largely irrigators.

Ed Fletcher Papers

1870-1955

MSS.81

Box: 46 Folder: 6

Business Records - Water Companies - Volcan Land and Water Company - San Dieguito System - Report of Frank Adams of U.S. Department of Agriculture (irrigation, investigation, agricultural land values)



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