

- Mr. Irey: The idea is to let the thing stand as it has until the completion of the system, to deliver them water at cost. Would this water coming from the Dulzura Conduit at ten cents at the Dulzura Conduit, would that add to the cost there - - -
- Mr. Cosgrove: A riparian owner in the San Diego River watershed would have no legitimate claim against the delivery of water from the Barrett reservoir, or the Morena reservoir, so that in turning this matter over in your mind and meditating upon the problem as it is tendered by this suggestion of Mr. Savage's, that water could be brought from the end of the Dulzura conduit to a point over in the vicinity of Mt. Helix, you can eliminate from the consideration of that matter the possibility of any successful objection by riparian owners in the San Diego River watershed.
- Mr. Irey: We could deliver the water from Morena and Barrett to the District, but in order to fix the cost of that water it would be necessary to have the cost of the water in the Cuyamaca to the City?
- Mr. Cosgrove: It wouldn't be necessary. If you are in a position, if you have the physical ability to deliver the Barrett water at a point on Mt. Helix to the distributing system of the Irrigation District, the question of the price is a question of barter and sale.

. . . . .

October 21, 1931.

Honorable C. L. Byers,  
City Attorney,  
San Diego, California.

Subject: San Diego River Project, Diversions and  
Use of Water by La Mesa, Lemon Grove &  
Spring Valley Irrigation District.

My dear Mr. Byers:

Referring to memorandum dated September 25, 1931, submitted by Assistant City Attorney H. B. Daniel outlining a tentative basis of agreement between the City of San Diego and the La Mesa Lemon Grove & Spring Valley Irrigation District, and requesting that the engineering data indicated in the memorandum be considered and reacted to with especial reference to the effect the suggested agreement would have upon the net safe yield of water remaining available in El Capitan reservoir for the City of San Diego's use.

A general examination indicates that about one-half of the assumed premises are reasonable statements, and that about one-half either cannot be accomplished or are much more favorable to the District than to the City.

The figures 8,000 were inserted in the blank on Page 4, Item V for comparative study purposes only.

Page 2, Item I-B, was probably included to make possible a saving of evaporation at Cuyamaca Reservoir for the District. However, when the remainder of the premises are taken into account, it appears that the District would profit most by holding water in Cuyamaca Reservoir as long as there was the least possibility of the assumed 8,000 acre feet of permanent storage being inadequate for control of annual runoff and diversion.

Page 3, Item II would give the District credit for water delivered to El Capitan Reservoir in excess of the capacity of their present works.

Page 3, Item III would give the District water in excess of capacity of present works and in addition an assumed 8,000 acre feet of storage per year on an average five year basis which is impracticable of consideration unless it should be conceded that the District has sufficient capacity in the reservoir to hold water over from several wet years to several dry years, which might involve, in order to bring the average up to 8,000 acre feet, a storage at times of 20,000 acre feet.

October 21, 1931.

Honorable C. L. Byers,  
City Attorney,  
San Diego, California.

Subject: San Diego River Project, Diversions and  
Use of Water by La Mesa, Lemon Grove &  
Spring Valley Irrigation District.

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10/21/31

Page 3, Item III-B, proportional spillway loss of the District's water is inconsistent with reasonable management of the reservoir. If the District has no primary storage in the reservoir, their secondary storage would be the first to waste over the spillway. If they have primary storage, none of it would waste over the spillway.

Page 4, Item V, permanent or primary storage can not be had by the District in the El Capitan Reservoir unless the net safe yield of the reservoir is decreased or the capacity of the reservoir is increased. The increase would necessarily add to the cost of the reservoir development.

Page 4, Item VII, any operation by the City of San Diego of the reservoirs on any other basis than that which may be expected to produce a maximum net safe yield of all reservoirs jointly will decrease to some extent the total net safe yield of the City's reservoir system.

The average yield of any other reservoir may be built up at the expense of others by overdrawn when the reservoir is full.

No reference is made as to responsibility of either party for pump lifting the water from the reservoir to the flume in the vicinity of the El Capitan Dam.

No reference is made to payment by the District to the City for either interest and amortization on capital investment and/or for annual operation and maintenance of the impounding and carrying works required to be constructed and operated and maintained by the City of San Diego in order to develop and deliver at the places indicated the quantity of water suggested to be allocated and delivered to the Irrigation District.

It is understood that Engineer F. D. Fyle invited Attorney Daniel's attention to the majority of the above engineering inconsistencies at the time of their conference.

Very truly yours,

H. N. Savage,  
Hydraulic Engineer.

HNS/f

September 25, 1931.

SUGGESTED BASIS OF SETTLEMENT WITH  
LA MESA, LEMON GROVE & SPRING VALLEY  
IRRIGATION DISTRICT.

The problem of an equitable adjustment between the City and the District is approached, bearing in mind the following facts:

(1) That the City has the paramount right to all the waters of the San Diego River and its tributaries for the use of its inhabitants; and it has the right and intends to construct at El Capitan a dam to the height of 197 feet above stream bed.

(2) That heretofore, over a period of years, the District has diverted for beneficial use certain portions of these waters - the total gross average annual diversions (computed upon the preceding ten-year period) amounting, roughly, to about eight thousand (8,000) acre feet per year, or some what in excess of an average of seven (7) m. g. d., which has yielded an average consumptive duty of 3.57 m. g. d.

(3) That the net safe duty of the contemplated El Capitan Dam is 11.6 m.g.d.; and that this net safe duty is exclusive of the above mentioned total gross diversions by the district.

(4) That the City desires to work out with the dis-

trict a plan whereby said gross average diversions by the district may for the future be protected to the extent that this can be accomplished equitably and with due regard for the rights and interests of the City; and further, that the city wishes to co-operate with the district in enabling the latter to secure a larger consumptive duty or beneficial use from its said total gross average diversions, always provided that this end can be achieved without expense or danger or serious loss to the City.

Subject then to the foregoing controlling principles, the following basis is tentatively suggested:

I

That the district retain, operate and maintain, except in the respects hereinafter indicated, its present system.

(a) El Monte pumping plant to be maintained as a "stand-by" plant, and pumping operations to be resorted to at this point only upon the exhaustion by the district of other resources.

(b) Cuyamaca Reservoir to be operated in conjunction with El Capitan in a manner to increase the net safe yield from Cuyamaca source to the greatest extent consistent with efficient and economical methods. By way of example, it might be desirable to provide that when the water in El Capitan is above a certain level, Cuyamaca Reservoir would be kept practically full, in order to reduce possible spill at El Capitan, but when water in El Capitan

drops below a certain level Cuyamaca Reservoir might be drained into El Capitan in order to reduce evaporation; or, some other balanced or compensating arrangement.

## II

All water diverted by the district above El Capitan dam site to be passed into El Capitan Reservoir, including Cuyamaca Lake waters (handled as suggested in I-(b)); such water to be gauged or measured at point of delivery into El Capitan Reservoir.

(a) District to abandon its flume and siphons between a point below its present diverting dam and El Capitan Dam.

## III

District to receive credit for all water delivered by it into El Capitan Reservoir, up to but not exceeding a total average (computed on a five-year period basis) of eight thousand (8,000) acre feet per year.

(a) Subject to a proportional deduction for evaporation loss;

(b) Subject to proportional spillway loss.

## IV

District to be entitled to make periodical or seasonal withdrawals of water to be charged against its total water in the reservoir credited to it under Paragraph III, up to but not exceeding the total amount of water then standing to its credit.

## V

The District to enjoy, without charge, year to year, or "permanent" storage rights in El Capitan Reservoir for an amount of water represented by the district's unused credit balance of water; i.e., the difference between the amount of water delivered into El Capitan Reservoir by the district, as provided and limited by paragraphs II and III, and the total amount of water withdrawn; provided, however, that such "permanent" storage shall not exceed (8,000) acre feet.

## VI

The District to deed to the City approximately 320 acres of the El Capitan Dam and Reservoir sites, and 420 acres in the Mission Gorge Reservoir site. The District to retain title to all its other properties.

## VII

The City might agree, in event El Capitan Reservoir and Cuyamaca Reservoir should both be full, and the City should have other storage available, that the City would make the major portion of its withdrawals from El Capitan Reservoir in order to reduce spillway losses to both the City and the District and conserve storage space at El Capitan for the joint benefit of the parties.



STATISTICAL MEMORANDUM.

For the ten-year period ending September 30, 1928, the total average diversions of the District have been 7.18 m.g.d.

Average deliveries to all consumers,  
same period, 3.57 m. g. d.

Total transmission loss, therefore,  
appears to be 3.61 m. g. d.

7.18 m. g. d. is the equivalent, roughly, of 8,000 acre feet per year.

The mean actual catchment at Cuyamaca, according to the annual report of the District for 1930, is about 4,250 acre feet, which equals, roughly, 3.825 m. g. d.

Total capacity of reservoir is 11,595 acre feet.

From the same source it appears that the evaporation loss at Cuyamaca is 56% of the water impounded; also that the loss in drawing water from Cuyamaca down Boulder Creek, for a distance of 12.5 miles (which ordinarily occurs in the dry season when the main river is not flowing), ranges anywhere from 15% to 34% of the total draft on Cuyamaca, and averages about 30% to 35%. That owing to these losses the net safe yield at Cuyamaca is only about 1 m. g. d.

Main Flume.

26.3 miles of wooden flume now operated; balance of the 36.34 miles of main transmission line consists

--2/

of steel flume, concrete flume, concrete pipe, siphons,  
and a ditch, the latter being 3.46 miles long.

Murray Dam.

Capacity, 6,085 acre feet; now used to furnish a  
supply of water for the westerly portion of the District.

November 13, 1931

Honorable C. L. Byers  
City Attorney  
San Diego, California.

Subject: San Diego River Project, El Capitan  
Feature. Effect of suggested settlement  
with La Mesa, Lemon Grove & Spring Valley  
Irrigation District on amount of water  
available to City of San Diego.

My dear Mr. Byers:

Consideration has been given to the memorandum "Note No. 3" dated November 9, entitled "Revised basis for suggested settlement with the La Mesa, Lemon Grove & Spring Valley Irrigation District, and your request of November 9 for information as to the effect of such a settlement on the net safe duty of the projected El Capitan reservoir.

The allotment for the use of the Irrigation District of 10,000 acre feet of the 118,000 acre feet capacity of El Capitan reservoir constructed to store water to elevation 750, reservoir contour 197, as proposed by your Article III, would have reduced the net safe duty of the reservoir available to the City of San Diego by about one million gallons daily, or from 11.6 to about 10.6 million gallons daily.

In addition the increase allowed in diversions as proposed by your Article II would have caused a further decrease of about 0.6 million gallons daily in the net safe duty available to the City, leaving a total of about 10.0 million gallons daily.

Very truly yours,

H. N. Savage,  
Hydraulic Engineer.

FDP/p

Office of  
City Attorney  
City of San Diego

San Diego, California

Nov. 9, 1931.

Mr. H. N. Savage,  
Engineer in Charge,  
Water Development Dept.,  
San Diego, California.

Dear Sir:

Inclosed find outline of the proposition which we are considering in the matter of adjustment of water usage on the San Diego River.

I should like to be informed of the effect such an agreement, if entered into, would have on the net safe duty of the El Capitan Reservoir, dam to be 197 feet. You have heretofore estimated that with a dam 197 feet above stream bed the net duty would be about 11.6. Will the operation under this agreement reduce the figure 11.6, and, if so, to what extent?

In answering the question may I emphasize that under the plan the parties only refer to such water to be used by the District as the District may be enabled by its own system to divert and deliver to the Reservoir, and in no event does the agreement contemplate any obligation on the part of the City to guarantee delivery of any amount of water to the District but to only permit withdrawal from the reservoir of such water as the District may be enabled to put into the reservoir up to the maximum amount set.

Yours very truly,

C. L. BYERS (Signature)

C. L. Byers,  
City Attorney.

CLE/M

Note No. 3.

November 9, 1931.

REVISED BASIS OF SUGGESTED SETTLEMENT  
WITH LA MESA, LEMON GROVE AND SPRING  
VALLEY IRRIGATION DISTRICT.

The problem of an equitable adjustment between the City and the District must be approached, bearing always in mind certain fundamental facts:

(1) That the City has the paramount right to all the waters of the San Diego River and its tributaries for the use of its inhabitants; and it has the right and intends to construct at El Capitan a dam to the height of 197 feet above stream bed.

(2) That heretofore, over a period of years, the District has diverted for beneficial use certain portions of these waters - the total gross average annual diversions into the flume (computed upon the preceding ten-year period) amounting, roughly, to about eight thousand (8,000) acre feet per year, or some what in excess of an average of seven (7) m.g.d., which has yielded an average consumptive duty of 3.57 m.g.d.

(3) That the net safe duty of the contemplated El Capitan Dam is 11.6 m.g.d.; and that this net safe duty is exclusive of the above mentioned total gross diversions by the District.

(4) That the City desires to work out with the District a plan whereby said gross average diversions by the District may for the future be protected, to the extent that this can be accomplished equitably and with due regard for the rights and interests of the City; and further, that the City wishes to co-operate with the District in enabling the latter to secure a larger consumptive duty or beneficial use from its said total gross diversions, always providing that this end can be achieved without expense or danger or serious loss to the City; but the City cannot accede to any arrangement which would result in an increased diversion of water from the drainage area by the District, or that would entail upon the City any obligation to compensate the District for any of the water lost by it through evaporation or transmission.

The controlling principle of the contemplated following agreement is, that whenever it is agreed that the District may divert into and draw out of El Capitan Reservoir any water up to a maximum amount, the parties only

refer to such water as the district may be enabled by its own system to divert and deliver into the reservoir, and in no event does the agreement contemplate any obligation on the part of the city to guarantee delivery of any water to the District other than such water up to a certain maximum amount that the District may be able to place in the reservoir; and such maximum amount to be based on past diversion by the District into its flume.

Subject then to the foregoing controlling principles, and having in mind the criticisms and propositions embodied in "Note A," dated October 7, 1931, submitted by the District, the following basis is tentatively suggested to meet such objections:

### I.

That the District retain, operate and maintain, except in the respects hereinafter indicated, its present system.

(a) El Monte pumping plant to be maintained as a "stand-by" emergency plant, and pumping operations to be resorted to at this point only upon the exhaustion by the District of other resources; provided, however, that the District may be permitted to operate its pumping system at El Monte to the extent necessary in order to protect and preserve whatever appropriative water rights it may now by law be entitled to enjoy; provided, further, that whenever the District operates its El Monte pumping system as above permitted, the amount of water diverted to the flume shall be deducted from the maximum amount which the District is entitled to draw from the amount standing to its credit from El Capitan Reservoir in that year as hereinafter provided, and during that year the District shall be entitled to draw from El Capitan Reservoir not to exceed that amount represented by the difference between the amount diverted at El Monte and the eight thousand (8,000) acre feet hereinafter provided for in Article IV.

(b) The District to deed to the City approximately three hundred twenty (320) acres of the El Capitan Dam and Reservoir sites, and four hundred twenty (420) acres in the Mission Gorge Reservoir Site. The District to retain title to all its other properties.

(c) District to abandon its flume and siphons between a point below its present diverting dam and El Capitan Dam.

### II.

District to have the right to pass into El Capitan Reservoir, and receive credit therefor, any water diverted

by it into its system above El Capitan Dam, up to a maximum of eight thousand (8,000) acre feet per year, except such additional water as might be permitted to be placed into the reservoir under Article VI; such water so passed into El Capitan Reservoir to be gauged or measured at point of delivery into the Reservoir.

III.

The District to enjoy, without charge, year to year, or permanent storage rights, for the total amount of water then standing to its credit to El Capitan Reservoir to an amount not exceeding ten thousand (10,000) acre feet at any one time, except such additional storage as might be permitted under Article VI.

IV.

The District to be entitled to draw out from the amount passed in any amount of water up to a maximum of eight thousand (8,000) acre feet per year from the total amount standing to its credit in El Capitan Reservoir; such withdrawal subject to:

(a) Proportional deduction for evaporation, leakage and siltage.

(b) Payment by District of its own cost in transfer of water to its system.

V.

The City to enjoy, without charge, year to year, or permanent storage rights, in Murray Reservoir to an amount not exceeding five thousand (5,000) acre feet at any one time, or such additional amount as might be permitted by the District, if in its opinion additional space is available.

VI.

Cuyamaca Reservoir to be operated in conjunction with El Capitan in a manner to increase the net safe yield from Cuyamaca source to the greatest extent consistent with efficient and economical methods. By way of example, it might be desirable to provide that when the water in El Capitan is above a certain level, Cuyamaca Reservoir would be kept practically full, in order to reduce possible spill at El Capitan, but when water in El Capitan drops below a certain level Cuyamaca Reservoir might be drained into El Capitan in order to reduce evaporation; or, some other balanced or compensating arrangement.

VII.

The City might agree, in event El Capitan Reservoir and Cuyamaca Reservoir should both be full, and the City

should have other storage available, that the City would make the major portion of its withdrawals from El Capitan Reservoir, either for immediate consumption, or for storage in Otay, in order to reduce spillway losses to both the City and the District and conserve storage space at El Capitan for the joint benefit of the parties.



November 28, 1931.

TO THE HONORABLE, THE MAYOR AND THE COMMON  
COUNCIL OF THE CITY OF SAN DIEGO, CALIFORNIA.

Subject: San Diego River Project Water Re-  
sources. Negotiations with the La  
Mesa, Lemon Grove and Spring Valley  
Irrigation District.

Gentlemen:

1. It is understood that negotiations are in progress between representatives of the City of San Diego and Representatives of the La Mesa, Lemon Grove and Spring Valley Irrigation District involving the water resources of the San Diego River Drainage Basin.

2. No notice has been officially received by me from the Mayor or the City Council to attend meetings and/or otherwise to take part in these negotiations.

3. As the negotiations between the representatives of the City and the representatives of the Irrigation District may involve technical and hydraulic matters in which the City's interests are at stake, it is respectfully suggested that you advise me whether you wish me to take part in the negotiations.

4. In the event that a contract or agreement between the City and the Irrigation District involves technical and/or hydraulic questions concerning the City's water resources, it is respectfully suggested that such questions be given adequate consideration in the interests of both the City and the Irrigation District and to that end I hold myself in readiness to review such questions should you desire to have me do so.

Very respectfully yours,

H. N. Savage,  
Hydraulic Engineer.

HNS/b.

November 30, 1931

**M E M O R A N D U M**

**SUGGESTED BASIS OF AGREEMENT BETWEEN THE CITY OF  
SAN DIEGO AND LA MESA, LEMON GROVE AND SPRING  
VALLEY IRRIGATION DISTRICT. Dated November 27, 1931.**

Incident to the brief time available to consider the draft of the suggested basis of agreement, the following matters should be given appropriate consideration:

Page 1, Paragraph (2) "That the City shall construct a dam at El Capitan damsite to a height of 197 feet above stream bed."

This is obviously conditioned upon the United States Congress granting to the City of San Diego additional reservoir lands in the Capitan Grande Indian Reservation above reservoir contour 160 feet.

Page 3, Division I, Paragraph (b) "The District shall consent to the City flooding that portion of its flume and siphons upstream from the proposed El Capitan Dam and below the 197 foot contour of said proposed El Capitan Reservoir."

The District's consent should be advanced up to reservoir contour 210. In case of a major flood peak runoff from the river drainage above the El Capitan reservoir, water may automatically impound in the reservoir to a depth of up to reservoir contour 210 while automatically discharging thru the spillways.

Page 4, Division I, Paragraph (d) "The District . . . . shall assign to the City options which it now holds upon lands, in the amount of 37.6 acres, which lands are within or contiguous to said dam and reservoir sites."

Should be free of reservations, if any, account recreation use - boating, fishing, hunting, etc.

H. N. Savage  
Hydraulic Engineer.

HNS/p

December 1, 1931.

From : Hydraulic Engineer  
To : City Attorney  
Subject: Suggested basis of agreement between the City of San Diego and La Mesa, Lemon Grove & Spring Valley Irrigation District.

Receipt is acknowledged of your letter dated November 30, 1931, enclosing, "Note No. 5, Suggested Agreement between the City of San Diego and La Mesa, Lemon Grove and Spring Valley Irrigation District, dated November 27, 1931", and requesting information on the following questions concerning the suggested agreement:

Q. 1. "What effect will the agreement have on the net safe duty of the El Capitan Reservoir as projected? You have heretofore estimated that with a dam 197 feet above streambed the net duty would be about 11.6; will operation under this agreement reduce the figure 11.6, and, if so, to what extent?"

A. 1. It is estimated that the suggested agreement if entered into will reduce the net safe yield to the El Capitan reservoir constructed to Elevation 750, reservoir contour 197, from 11.6 million gallons a day to about 10 million gallons a day.

Q. 2. "You will note that the agreement provides in paragraph 9 thereof that an enlarged El Capitan pipeline may be constructed from the El Capitan Dam to a point near the El Monte Pumping system. May I inquire whether there are any difficulties involved in such an enlarged pipeline of a serious physical, engineering or practical nature. Assuming for the purpose of the answer that the present projected plant for pipeline will be altered to provide for a pipeline between those points of an increased capacity so as to handle not to exceed 25 m.g.d. instead of 15 m.g.d."

A. 2. Confirming my oral reply to a similar inquiry from you and Special Water Counsel T. B. Cosgrove in your office Friday, November 27, P.M., the answer was and is "No".

However, based on my understanding of the Irrigation District's needs, it is my impression that they should provide themselves with an increased carrying capacity over the City's proposed capacity of about 15 million gallons a day.

H. N. Savage.

HNS/f

Office of  
City Attorney  
City of San Diego

San Diego, California  
November 30, 1931

Mr. H. N. Savage,  
Hydraulic Engineer,  
San Diego, Calif.

Dear Sir:

Attached hereto find copy of the proposed agreement between The City of San Diego and the La Mesa, Lemon Grove & Spring Valley Irrigation District, which has this date been submitted to the Common Council for consideration.

With respect to the proposed agreement, I desire to be informed on the following questions:

1. What effect will the agreement have on the net safe duty of the El Capitan Reservoir as projected? You have heretofore estimated that with a dam 197 feet above streambed the net duty would be about 11.6; will operation under this agreement reduce the figure 11.6, and, if so, to what extent?

In connection with the answer to the above question may I emphasize that under the plan in no event does the City contemplate any obligation on its part to guarantee delivery of any amount of water to the District whatever, but to only permit 10,000 acre feet storage; and withdrawal of such water as the District may be enabled to place in said storage space from its own diverting system at the present rates of diversion, and never in any event is the District entitled to any increase over prior past diversions from the watershed; but is limited to a gross average annual total diversion from the entire watershed of the San Diego River, to 10,000 acre feet.

2. You will note that the agreement provides in paragraph 9 thereof that an enlarged El Capitan pipeline may be constructed from the El Capitan Dam to a point near the El Monte Pumping system. May I inquire whether there are any difficulties involved in such an enlarged pipeline of a serious physical, engineering or practical nature. Assuming for the purpose of the answer that the present projected plan for pipeline will be altered to provide for a pipeline between those points of an increased capacity so as to handle not to exceed 25 m.g.d. instead of 15 m.g.d.

Yours very truly,

C. L. BYERS (Signature)

City Attorney.

December 5, 1931.

Honorable Alfred Stahel, Jr.,  
Councilman, City of San Diego,  
San Diego, California.

Subject: Suggested basis of Agreement between the  
City of San Diego and La Mesa, Lemon Grove  
and Spring Valley Irrigation District.

My dear Mr. Stahel:

Receipt is acknowledged of your letter dated November 28,  
1931, regarding certain facts in connection with the El Capitan  
water situation.

Q. "(1) Is the net duty of 11.6 m.g.d. furnished by a dam at  
El Capitan, constructed 197 feet above streambed, exclu-  
sive of the diversions enjoyed from the water shed by  
the Cuyamaca Water Company and/or its successors in  
interest?"

A. In determining the net safe yield of about 11.6 million  
gallons a day for El Capitan dam constructed to store water to  
elevation 750, reservoir contour 197, only the water in the River  
that passed the dam site was taken into account. No addition  
was made for water stored, diverted or lost in drainage basin  
above the damsite by the Irrigation District.

Q. "(2) In the event a contemplated agreement is entered  
into with the La Mesa, Lemon Grove & Spring Valley  
Irrigation District which provides that the District  
may have permanent storage in El Capitan Reservoir  
of 10,000 acre feet, but which provides that in no  
event under the terms of the agreement shall the Dis-  
trict be entitled to any increase in diversions from  
the water shed over that enjoyed as an average over  
the last 30 years, but are specifically limited in  
amount of diversions from the watershed to that  
average amount heretofore enjoyed by said Cuyamaca Water  
Company and its successors in interest--what effect will  
such an agreement have on the net safe duty of El Capitan  
Reservoir?"

A. It is estimated that the contemplated agreement will re-  
duce the net safe duty of water to the City of San Diego of El  
Capitan reservoir constructed to store water to elevation 750,  
reservoir contour 197 from about 11.6 million gallons a day to  
about 10 million gallons a day.

Q. "(3) In the event such an agreement is entered into, as  
outlined above, what will remain to the City of San

Honorable Alfred Stahel, Jr.

--2

12/5/31

Diego as a daily safe net yield?"

A. About 10 million gallons of water a day.

Very respectfully,

H. N. Savage,  
Hydraulic Engineer.

HNS/T

CITY OF SAN DIEGO  
Office of Alfred Stahel, Jr. Councilman  
San Diego, California

Nov. 28, 1931.

Mr. H. N. Savage,  
Hydraulic Engineer,  
San Diego, Calif.

Dear Sir:

So that I may intelligently discuss the El Capitan water situation, I wish to ascertain from you certain facts which, if they are in my possession, will enable me to understandingly discuss the issues. Let me ask you the following questions:

(1) Is the net duty of 11.6 m.g.d. furnished by a dam at El Capitan, constructed 197 feet above stream bed, exclusive of the diversions enjoyed from the water shed by the Cuyamaca Water Company and/or its successors in interest?

(2) In the event a contemplated agreement is entered into with the La Mesa, Lemon Grove & Spring Valley Irrigation District which provides that the District may have permanent storage in El Capitan Reservoir of 10,000 acre feet, but which provides that in no event under the terms of the agreement shall the District be entitled to any increase in diversions from the water shed over that enjoyed as an average over the last 30 years, but are specifically limited in amount of diversions from the watershed to that average amount heretofore enjoyed by said Cuyamaca Water Company and its successors in interest--what effect will such an agreement have on the net safe duty of El Capitan Reservoir?

(3) In the event such an agreement is entered into, as outlined above, what will remain to The City of San Diego as a daily safe net yield?

I hope I have made my questions clear, and if you can give me the information desired your compliance will be very much appreciated.

Yours very truly,

ALFRED STAHEL, JR. (signature)

Alfred Stahel, Jr.,  
Councilman.

AGREEMENT GOVERNING THE DIVERSION AND USE  
OF THE WATER OF THE SAN DIEGO RIVER

THIS AGREEMENT entered into this 30th day of January, 1933, by and between THE CITY OF SAN DIEGO, a municipal corporation in the State of California, hereinafter in this Agreement referred to as the City, and the LA MESA, LEMON GROVE & SPRING VALLEY IRRIGATION DISTRICT, a state agency, organized and operating under the provisions of the California Irrigation District Act, hereinafter referred to as the District, WITNESSETH:

FOR THAT, WHEREAS, heretofore on or about November 27, 1931, representatives of said City and said District prepared, approved and executed, on behalf of said parties, a "Suggested Basis of Agreement between The City of San Diego and La Mesa, Lemon Grove and Spring Valley Irrigation District"; that attached hereto, marked Exhibit 1, made a part hereof, and incorporated herein as though in this paragraph fully set forth, is a copy of said suggested basis of agreement; and

WHEREAS, on or about the 30th day of November, 1931, the Common Council of said City of San Diego at regular meeting, by its resolution No. 57624 duly passed and adopted, approved and ratified said suggested basis of agreement; that a copy of said resolution of said Common Council is attached hereto, marked Exhibit 2, made a part hereof, and incorporated herein as though in this paragraph fully set forth; and

WHEREAS, heretofore on or about the 1st day of December, 1931, the directors of the La Mesa, Lemon Grove & Spring Valley Irrigation District, at meeting duly and regularly called and held, by its resolution entitled, "Resolution and order accepting terms of agreement for the joint use of the water of the San Diego River and El Capitan Reservoir by the City of San Diego and the La Mesa, Lemon Grove & Spring Valley Irrigation District," approved and ratified said suggested basis of agreement; that a copy of said resolution of said Board of Directors is attached hereto, marked Exhibit 3, made a part hereof, and incorporated herein as though in this paragraph fully set forth.

I

Purposes to be Accomplished

Sec. 1 The purpose of this contract is to fully carry into effect the written basis of agreement between said City and said District, as approved and ratified by the Common Council of said City by Resolution No. 57624, passed and adopted on the 30th day of November, 1931, and as approved and ratified by the Board of Directors of said District by resolution passed and adopted on the 1st day of December, 1931, which said written basis of agreement by reference herein-



above has been embodied herein and made a part of this contract, marked Exhibit 1.

II

Rights and Property to Pass from the District to City

Sec. 1 The District hereby grants and conveys to The City of San Diego, a municipal corporation, all that real property situated in the County of San Diego, State of California, together with all water, mineral and other rights, easements, reservations and privileges attached to each and every, or any, or all, of said parcels of land, described as follows:

All that portion of the SE 1/4 of the NE 1/4 of Section 7 and the S 1/2 of the NW 1/4, the SW 1/4 of the NE 1/4, the NW 1/4 of the SE 1/4 except the east 1 rod thereof, and Lot 3 (SW 1/4 of SE 1/4), all in Section 8, Township 15 south, Range 2 east, S. B. B. & M., and lying and being below the 710 foot contour line above sea level U. S. G. S. datum as recorded in Book 1149 of Deeds at page 342 containing about 152.72 acres.

Sec. 2 The District hereby grants and conveys to The City of San Diego, a municipal corporation, all that real property situated in the County of San Diego, State of California, being lands in the Mission Gorge Reservoir site, described as follows:

All of Tract "C" of the Rancho El Cajon, in the County of San Diego, State of California, according to Partition Map thereof on file in the office of the County Clerk of San Diego County.

Also, all that portion of Tract "T" of said Rancho El Cajon, according to said partition map thereof described as follows:

Commencing at a redwood post, the most easterly corner of Tract "C", according to said Partition Map, said redwood post being the section station mentioned in the description of said Tract "C" as per Referee's report filed in the Partition Suit of Lenkershim et al vs. Crane, et al; thence running due North thirty-seven and twenty-seven hundredths (37.27) chains to North boundary line of Section 30, Township 15 south, Range 1 west, San Bernardino Meridian, as same is shown on said Partition Map; Thence west along the north line of said Section 30, thirtyseven and sixty-five hundredths (37.65) chains to the northwest corner of

said Section; thence west along the north boundary line of Section 25 of said Township, thirty-four and sixty-five hundredths (34.65) chains to a point due north of the northwest corner of said Tract "C"; thence south seventeen and forty-four hundredths (17.44) chains to a redwood post at the northwest corner of Tract "C"; thence north  $61^{\circ}30'$  East along the northerly line of said Tract "C" twenty-four (24) chains; thence continuing along the northerly line of said Tract "C" north  $70^{\circ}30'$  east seventeen and forty hundredths (17.40) chains; thence South  $49^{\circ}30'$  East forty-five and sixty-five hundredths (45.65) chains to the point of commencement.

Also, all that certain strip of land adjoining the south side of the east half of said Tract "C" and north of a straight line drawn from the southeast corner of said Tract "C" westerly to the Third Station on said Southern line, west of said corner as shown on said Partition Map, EXCEPTING from said Tracts "C" and "T" all that portion thereof conveyed by Levi Chase to Hosmer McKoon, January 19th, 1903, by deed recorded in Book 326, page 19 of Deeds, records of said County, described as follows:

Being a part of Lot "C" of the El Cajon Partition Map on file in the office of the Recorder of said County and being Lot "A" as shown on a map made by Benj. McLaren, Surveyor, on the 12th day of January, 1903, on file in Recorder's office aforesaid.

Also,

(a) All of Tract Seven (7) of the Fanita Rancho, in the County of San Diego, State of California, according to map thereof No. 790, filed in the office of the County Recorder of said San Diego County, December 21st, 1894, EXCEPTING therefrom that portion thereof conveyed by Fannie McKoon et al to Mackie H. Scripps, January 25th, 1913, by deed recorded in Book 597, page 93 of Deeds, described as follows:

Bounded by a line commencing in the southwest quarter section of Section 29, Township 15 south, Range 1 west, San Bernardino Meridian, at the point where the center meridian line of Section 29, Township 15 south, Range 1 west, San Bernardino Meridian intersects the center line of the County road also known as and called Woodside Avenue; thence westerly and along the center of said County Road, or Woodside Avenue, for a distance of twenty feet or more to a point; thence northerly parallel to and twenty feet distant from

said center meridian line of Section 29 for a distance of fourteen hundred eighty-five (1485) feet more or less to the center of San Diego River; thence easterly and along said center line of said San Diego River and following the meanderings thereof to its intersection with the said center meridian line of Section 29, Township 15 south, Range 1 West, San Bernardino Meridian; thence southerly along said center meridian line of section 29 to the point of commencement.

Also, EXCEPTING any portion thereof that may be within Lot Seven (7), in Block "G" of the Fanita Rancho, in said County, according to map thereof No. 688, filed in the office of the County Recorder of said San Diego County, October 22nd, 1891.

(b) Also, all of Lots One (1) and Two (2), in Block "H" and Lots One (1) to Six (6), both inclusive, in Block "G" of Fanita Rancho, in said County, according to map thereof No. 688, filed in said Recorder's office August 22nd, 1891, EXCEPTING from said Lot Six (6), in Block "G", the easterly thirty (30) feet thereof, said excepted portion sometimes known as Lot "C", according to Licensed Surveyor's Map No. 136, filed in said County Recorder's office, January 20th, 1903.

Also, EXCEPTING that portion of Lots Two (2) and Three (3), in Block "G", according to said Map No. 688 that lies within Tract "C" according to the Partition Map of the Rancho El Cajon, made in the action of Lankershim versus Crane, et al., filed in the office of the County Clerk of San Diego County.

(c) Also, all of Lot "A", according to the plat of the "Chase McKeon Stock Line", in said County, according to Licensed Surveyor's map thereof No. 136, filed in said County Recorder's office January 20th, 1903.

Certificate of Title

Sec. 4 The District agrees to furnish and deliver to the City certificates of title to all the lands herein granted showing the vesting of title in the City free and clear of all encumbrances.

Sec. 5 The District hereby grants to the City a permanent right to the use of Murray Dam Reservoir for the purpose of storing water therein to the extent and subject to the conditions of said written agreement so approved and ratified by the parties hereto on the said 30th day of November, 1931, and the 1st day of December, 1931, respectively.

Sec. 16. The District hereby agrees to compensate the City in money for the right to permanently transmit, through the City's pipe line from the intake thereof at the El Capitan Reservoir to a point on the City's right of way in the immediate vicinity of the present El Monte Pumping Plant, water withdrawn by the District in amounts as fixed and determined in said written agreement and stored in or passed through the El Capitan Reservoir; such sum of money shall be equal to the amount of the increased cost to the City of constructing and installing a pipe line of 48 inches in diameter instead of a pipe line of 36 inches in diameter, as originally contemplated. Such payment shall be made as follows:

Immediately upon the opening of bids and within not to exceed ten (10) days thereafter, and at all events prior to the award by said City of any contract for the construction of said pipe line so increased in size, said District shall pay to and deposit with the City Treasurer of said City an amount of money equal to one-half of said increased cost of construction. The remaining one-half of said increased cost of construction shall be paid in two equal yearly payments or installments, the first of which shall be paid one year from the date of the execution of a contract for the installation of said 48 inch pipe line, and the second installment shall be paid two years from the date of the execution of said contract; said installments shall bear interest at the rate of five per centum (5%) per annum. To insure the payment of said two installments, said District agrees to establish and maintain a reserve or sinking fund, into which it shall pay from its receipts for water distributed by it to consumers, and from any other source of income it may desire, an amount sufficient to pay in full said installments when due. Said reserve or sinking fund shall be established by said District not later than thirty (30) days following the execution of said contract for the installation of said 48 inch pipe line.

III

Rights and Property to Pass from the City to the District

Sec. 1 The City hereby grants to the District a permanent right to store in and pass through the El Capitan Reservoir the water which the District is conceded the right to divert, impound, store in, and pass through said reservoir by said written agreement so ratified and approved by the parties hereto on the said 30th day of November, 1931, and the 1st day of December, 1931, respectively, and the said City agrees to complete said dam and reservoir in accordance with said written agreement and to the height therein provided.

Sec. 2 The City hereby grants to the District a permanent right to the use of that portion of the City's pipe line referred to and described in Section 6 of Title II hereof, and the City hereby agrees to construct said pipe line with diameter thereof increased as specified in said Section 6, Title II, as provided for by said written basis of agreement herein referred to.

IV

Dismissal of Actions

Sec. 1 Upon the formal execution of this Agreement, all actions now pending between the parties hereto in any State or Federal court involving the subject matter hereof shall be dismissed by stipulation of the parties, which stipulation shall recite that all matters of controversy in said actions have been fully adjusted and settled by this agreement and that neither party shall be entitled to recover costs.

IN WITNESS WHEREOF, this contract is executed by The City of San Diego, acting by and through the members of the Council of said City, under and pursuant to a resolution authorizing such execution, and the said La Mesa, Lemon Grove & Spring Valley Irrigation District has caused this instrument to be executed, and its corporate name and seal to be hereunto affixed, by its proper officers, thereunto duly authorized by resolution of its Board of Directors, the day and year in this agreement first above written.

THE CITY OF SAN DIEGO,

By JOHN F. FORWARD JR. (Signature)

\_\_\_\_\_

ALBERT W. BENNETT (Signature)

JOSEPH J. RUSSO (Signature)

JOHN R. BLAKISTON (Signature)

DAN ROSSI (Signature)

CHAS. E. ANDERSON (Signature)  
Members of the Council

(SEAL)

ATTEST:

ALLEN H. WRIGHT  
City Clerk

By AUGUST H. WADSTROM (Signature)  
Deputy

LA MESA, LENON GROVE & SPRING  
VALLEY IRRIGATION DISTRICT,

By F. R. BEATTY (Signature)  
President

(SEAL)

RUTH C. DREW (Signature)  
Secretary.

STATE OF CALIFORNIA, }  
County of San Diego. } ss.

On this 14th day of January, A. D. Nineteen Hundred and Thirty-three, before me, Adah B. Campbell a Notary Public in and for said County, residing therein, duly commissioned and sworn, personally appeared F. R. Beatty, known to me to be the President, and Ruth C. Drew, known to me to be the Secretary of the Corporation that executed the within instrument, known to me to be the persons who executed the within instrument on behalf of the Corporation within named, and acknowledged to me that such Corporation executed the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my Official Seal, in the County of San Diego, State of California, the day and year in this certificate first above written.

ADAH B. CAMPBELL (Signature)  
Notary Public in and for the County  
of San Diego, State of California.  
My Commission Expires Sept. 16, 1934

(SEAL)

I HEREBY APPROVE the form of the foregoing Agreement this 30 day of January, 1933.

C. L. BYERS (Signature)  
City Attorney.

November 27, 1931.

Note. No. 5.

SUGGESTED BASIS OF AGREEMENT BETWEEN THE CITY OF SAN DIEGO AND LA MESA, LEMON GROVE AND SPRING VALLEY IRRIGATION DISTRICT.

The solution of the problem involved in the development of the waters of the San Diego River should be approached always bearing in mind the following fundamentals:

(1) That the City has the paramount right to the waters of the San Diego River and its tributaries for the use of its inhabitants.

(2) That the City shall construct a dam at El Capitan damsite to a height of 197 feet above stream bed.

(3) That heretofore over a period of years the District has diverted the waters of the San Diego River to the extent of a total gross average annual diversion from the watershed of approximately ten thousand (10,000) acre feet.

(4) That the net safe duty of the projected El Capitan Dam and Reservoir, exclusive of the above mentioned total gross diversions of the District, is 11.6 m.g.d.

(5) That the City desires to co-operate with the District in formulating a plan whereby said gross average annual diversions by the District may be continued in the future, to the extent that the same may be accomplished equitably and with due regard for the rights of the City; and, further, that the City wishes to co-operate with the District to the end that ways and means may be devised of securing to the District a larger consumptive and beneficial use from its said total gross diversion without providing for increased diversion of water from the drainage area by the District, or obligating the City to compensate the District in kind for water lost through evaporation or transmission, or otherwise obligating the City other than as herein provided.

A controlling principle of the following proposal is that whenever it is agreed that the District may divert water into and draw water out of the El Capitan Reservoir up to a stated maximum amount, the parties refer only to such water as the District may be enabled by its present diverting and transmission works (including betterments and improvements as herein provided for), to divert and deliver into the Reservoir. In no event does the agreement contemplate any obligation on the part of the City to guarantee delivery of the water to the District. The obligation of the City is to supply the District with reservoir facilities at the proposed El Capitan Reservoir.

(Exhibit "1".)

Subject, then, to the foregoing controlling principles, the following proposal is tentatively suggested:

I

That the District retain, operate and maintain, except in the respects herein indicated, its present water system.

(a) The flume and siphons of the District upstream from the proposed El Capitan Dam shall be maintained and operated by said District during the construction period of said proposed El Capitan Dam and thereafter until water shall have been impounded in said proposed El Capitan Reservoir to such gauge height as will interfere with the practical maintenance of said flume and siphons. Construction work by said City shall be carried on in such manner as to impose upon the District no additional cost of maintenance or operation of said flume and siphons.

(b) The District shall consent to the City flooding that portion of its flume and siphons upstream from the proposed El Capitan Dam and below the 197 foot contour of said proposed El Capitan Reservoir.

(c) El Monte pumping plant shall be maintained by said District as a stand-by plant, and as such, pumping operations may be resorted to by said District at such times and to the extent as in the opinion of its General Manager shall seem necessary to protect and preserve its existing rights to the diversion of water at said plant against other riparian owners and appropriators; provided, however, that whenever said District operates said El Monte pumping plant as herein provided for, the amount of water by it in this manner diverted from the San Diego River watershed, to that extent and for that seasonal year, (October 1st to September 30th), shall reduce the maximum amount, to-wit: ten thousand (10,000) acre feet, of permanent storage allowed said District in said El Capitan Reservoir.

(d) The District shall deed to the City all lands to which it holds title, totaling 152.72 acres within or contiguous to El Capitan Dam and Reservoir sites, and shall assign to the City options which it now holds upon lands, in the amount of 37.6 acres, which lands are within or contiguous to said El Capitan Dam and Reservoir sites, and shall convey or assign to said City title to or options upon lands within or contiguous to said dam and reservoir sites which it may hereafter acquire or obtain; and shall also deed to the City lands to which it now holds title in the Mission Gorge Reservoir site, being approximately 420 acres in extent.

II.

The District shall have the right to permanently store in El Capitan Reservoir water diverted by it by means of those portions of its water system upstream from El Capitan Dam; provided, however, that the rate of diversion shall not exceed twenty-seven



(27) cubic feet per second, and that the total amount of water belonging to said District, permanently stored by said District in said Reservoir, shall never at any one time exceed ten thousand (10,000) acre feet; provided, further, that whenever during the period from the first day of May, of any year, to the succeeding 31st day of October, of the same calendar year, there exists, in the opinion of the Hydraulic Engineer of The City of San Diego, sufficient temporary storage capacity in El Capitan Reservoir to permit the same to be done without interference with the efficient and economic operation of said reservoir by said City, the District shall have the right to withdraw water from the Cuyamaca Reservoir and store the same temporarily during said period in said El Capitan Reservoir. The purpose of the immediately preceding provision providing for temporary storage during the irrigation period mentioned is to provide greater economies in the storage and distribution of water by said District, and it is not intended that the District shall ever claim to have in storage in said El Capitan Reservoir an amount of water in excess of ten thousand (10,000) acre feet at any time subsequent to October 31st of any calendar year and preceding May 1st of the immediately succeeding calendar year. All water passed into El Capitan Reservoir by said District to be measured at the point of delivery into said Reservoir.

III.

The District shall be entitled to draw out from said El Capitan Reservoir during any year the whole or any part of the water stored therein by it, as herein provided for, subject to the provision of Article I, Subdivision (c) hereof, respecting the operation of El Monte pumping system, and subject to the diminution of such water caused by evaporation or leakage, and subject to the further restriction that the water shall not be withdrawn by the District from said El Capitan Reservoir at a rate in excess of the demands upon the water system of said District at the time of such withdrawals. Expense incident to the withdrawal of such water by said District and the facilities for the withdrawal and transmission thereof by the District shall be borne and provided for by said District.

IV.

The City shall enjoy, without charge, year to year permanent storage rights in Murray Reservoir, to an amount not exceeding five thousand (5,000) acre feet at any one time, subject to the same conditions and restrictions as to operation as applies to the District's use of El Capitan Reservoir, meaning thereby that said City in availing itself of storage facilities in Murray Reservoir shall do so at its own expense through its own pipe lines and other transmission and diversion facilities, and subject to the same rule as to evaporation and loss as applies to said District in its use of storage facilities at said El Capitan Reservoir.

V.

Guyamaca Reservoir to be operated in conjunction with El Capitan in a manner calculated to increase the net safe yield from Guyamaca to the extent consistent with the efficient and economical operation of both reservoirs. In passing water from Guyamaca Reservoir to El Capitan Reservoir, under the provisions of this paragraph, the District shall not be limited to twenty-seven (27) cubic feet per second, as heretofore mentioned in paragraph II, but may accomplish such transfer of water at a rate or intensity of flow provided by the discharge and outlet units of the Guyamaca Dam and Reservoir.

VI.

Whenever both the El Capitan and Guyamaca Reservoirs are filled to capacity (meaning to the spillway lip of the dam or independent spillway), the City shall make the larger portion of its withdrawals for consumptive use from said El Capitan Reservoir to the end that possibility of spillway losses may be avoided and storage facilities provided for the joint benefit of the parties hereto.

SPILL

VII.

The District shall agree to limit its distribution of water to supplying the demands within the boundaries of the District, as said boundaries now exist or hereafter from time to time may exist, and to contracts and consumers existing at this date outside the boundaries of said District. The contract between the parties hereto of date \_\_\_\_\_, providing for the delivery of water by the District to said City, to be cancelled.

VIII.

Under the terms of the agreement, including all economies of operation calculated to increase the amount of water available for consumptive use, the District shall be limited to a total gross average annual diversion from the entire watershed of not to exceed ten thousand (10,000) acre feet over a ten-year period. The District, in the operation and maintenance of its existing diversion facilities located upstream from said El Capitan Dam, shall be permitted to make alterations, betterments or improvements as in its judgment are deemed necessary or advisable, but such additions, betterments or improvements shall be made so that there shall be no increase in the rate of diversion provided by the existing diversion facilities.

IX.

The projected El Capitan pipe line leading from said El Capitan Reservoir, will have a diameter of thirty-six inches. The District desires the diameter of said pipe line increased sufficiently to enable it to withdraw through said pipe line (in addition to the City's withdrawals) the water which said

District may store in said El Capitan Reservoir, as herein provided. The City agrees to such increase in diameter of that portion of said pipe line beginning at said El Capitan Dam and terminating at a point on the City's right of way in the immediate vicinity of the El Monte pumping plant to be selected by said District, upon condition that the increased cost of installation due to the increased size of said pipe line shall be borne entirely by said District.

X.

All pending litigation between said City and said District shall be terminated and dismissed as to the parties to this agreement upon the taking effect of any agreement based upon this tentative proposal.

## RESOLUTION No. 57624

BE IT RESOLVED by the Common Council of the City of San Diego, as follows:

That the basis of agreement between The City of San Diego and the La Mesa, Lemon Grove and Spring Valley Irrigation District this date submitted by the City Attorney, be, and it is hereby approved and ratified; and

BE IT FURTHER RESOLVED that the City Attorney be, and he is hereby authorized and directed to proceed with the preparation of a detailed contract embodying the principles and terms of the draft this date submitted.

RESOLUTION AND ORDER ACCEPTING  
TERMS OF AGREEMENT FOR THE JOINT  
USE OF THE WATER OF THE SAN DIEGO  
RIVER AND EL CAPITAN RESERVOIR BY  
THE CITY OF SAN DIEGO AND THE LA  
MESA, LEMON GROVE & SPRING VALLEY  
IRRIGATION DISTRICT.

WHEREAS, the Common Council of the City of San Diego, on the 27th day of August, 1931, directed the legal department of said City to proceed to take necessary steps to clear the way for the construction of a dam at El Capitan to a height of 197 feet above stream bed; and

WHEREAS, at the date of such resolution there was pending in the United States Circuit Court of Appeals for the Ninth Circuit a suit brought by said Irrigation District to enjoin the said City from constructing a dam at said place, and said Irrigation District was claiming the right to the use of the water of said river and contesting the city's claim of a paramount right thereto, and the right to flood property belonging to said District at the site of said proposed dam; and

WHEREAS, in order to dispose of said controversy the legal department of the City of San Diego initiated a series of conferences with the attorneys for said District, which said attorneys had theretofore been authorized by the Board of Directors of said District to enter into negotiations with said City; and

WHEREAS, as a result of said conferences the attorneys representing said City and the attorneys representing said District agreed to submit for the approval of said City and said District the following proposed terms of settlement, to-wit:

(Proposed terms of settlement OMITTED here).

AND WHEREAS, on the 30th day of November, 1931, the Common Council of the City of San Diego passed and adopted a resolution, which said resolution was as follows:

(Resolution OMITTED here)

AND, WHEREAS, said terms of settlement so referred to approved and ratified by said Common Council, have been fully and duly considered by the Board of Directors of said District, and it appearing to said Board that it would be for the best interests of said District to approve, accept and carry out the agreement as outlined and stated in said statement of terms hereinbefore recited;

(Exhibit "3")

NOW, THEREFORE, BE IT AND IT IS HEREBY RESOLVED by the Board of Directors of the LA MESA, LEMON GROVE AND SPRING VALLEY IRRIGATION DISTRICT THAT said District hereby approves and ratifies the terms of agreement hereinbefore recited, and that the attorneys representing this District be and they are hereby authorized and directed to proceed to cooperate with the City Attorney of The City of San Diego in the preparation of a detailed contract embodying the principles and terms of said settlement as hereinabove set forth, it being the purpose and intent of said Board of Directors by the passage of this resolution to fully accept and put into operation each and all of the terms and provisions of said plan of settlement; and

BE IT FURTHER RESOLVED that a copy of this resolution, certified by the Secretary of this Board, be forthwith sent to the Common Council of the City of San Diego.

6185 A. N. W.

DOCUMENT NO. 280889

Filed JAN 30 1933

Allen H. Wright, City Clerk

Fred W. Sick, Deputy

AGREEMENT GOVERNING THE  
DIVERSION AND USE OF THE WATER  
OF THE SAN DIEGO RIVER BY  
CITY OF S. D. AND L.M.L.O.M.S.V.  
INS. DIST.

RECORDED  
FEB 16 1933  
52 Min. past 9 A.M.  
in Book 191  
at Page 287  
of official records,  
San Diego Co., Cal

La Mesa, Calif.

April 27, 1934

Mr. H. M. Savage, Hydraulic Engineer  
City of San Diego, City Hall  
San Diego, California

Dear Sir:

I enclose you herewith bill for cost of pumping at El Monte during the discontinuance of the gravity supply while by-passing the flume through the El Capitan Dam. This bill is in the total amount of \$712.50.

For your personal information I would say that it was necessary to operate this plant a total of seven days from the time it became necessary to decrease the gravity flow to permit the installation of head boards until the resumed gravity flow had reached the El Monte pumping plant; that the total kilowatt-hours consumed were 71,250; that the labor cost of operating the plant and installing the head boards was \$253.00 exclusive of compensation insurance and other incidentals. The use of power during this period was partially under our last year's contract which was based upon the P 3 agricultural rate and partially under this year's contract, I believe, which is based upon the P 1 general power rate. The total cost of the power under these rates varied from \$997.50 under one rate to \$1,030.00 under the other.

However, in view of the fact that we have continued pumping although it is at a somewhat greater capacity and in view of the further fact that during this period of pumping we accumulated a small amount of excess water and that in any event the District would have had to pay the block rate which run the power costs for the period up, and the cost of installation of the header boards, I believe that it is fair to both the City and ourselves to eliminate all charges against the City other than  $1\frac{1}{2}$  per kilowatt hour for the power used during the period.

Yours very truly,

C. Harritt  
General Manager

LA MESA, LEMON GROVE & SPRING VALLEY  
IRRIGATION DISTRICT

CH RD



BIBLIOGRAPHY

## SAN DIEGO RIVER PROJECT, EL CAPITAN FEATURE

CHRONOLOGICAL BIBLIOGRAPHY OF REPORTS, LETTERS  
AND OTHER DATA PERTAINING TO CONSERVATION AND  
USE OF THE WATERS OF THE SAN DIEGO RIVER.

Document numbers refer to those given by the City Clerk when document filed with his office.

Resolution numbers refer to Resolutions of the Council of the City of San Diego.

- 1-16-88 Copy of contract between the United States and the San Diego Flume Company (by Jos. W. Preston, U.S. Indian Agent) U. S. gave Flume Company reservoir and water rights and right of way; Flume Company was to supply Indians with water.
- 1888 Wm. Ham Hall, State Engineer, San Diego River water works and projects being portion of "Irrigation in California" part 2, pages 55-85. Published by State of California
- 8-27-94 San Diego Flume Company (T.W. Sefton, President) offered to sell City, in perpetuity, 1000 miners inches of water, delivered at University Heights, for \$600 per inch, with maintenance fee of \$45 per inch per annum, or 500 inches at \$600 plus \$60 with 5-year option on 500 more at same rate. (40 miners inches equals 1 cubic foot per second, 1000 miners inches equals 16.15 m.g.d.).
- 2-11-95 San Diego Flume Company in letter to C C Brandt offered to sell entire plant for \$900,000.
- 7-15-95 San Diego Flume, San Diego Water Company offered to sell "complete systems of both companies jointly for \$1,500,000".
- 2-1-04 Board of Public Works recommended as an "absolute necessity" that water be purchased from the Flume Company "for a few days at 12½ cents per 1000 gallons, until we get our extra well and pump installed, which will be several days yet."  
Document  
4889
- 1-5-05 J B Lippincott report filed with Council showed 3100 acres optioned by City in San Diego River bottom; pumping proposition only; advised City purchase these lands and others.
- 4-10-11 California Legislature approved Act (Stats. 1911, p. 854) holding cities may sell water to outside consumers only if "excess" exists.  
Document  
214472

- 12-31-11 W B Hamilton filed claim for 40 billion gallons per year and all flood waters, of San Diego River to be diverted and stored on Capitan Grande Reservation and used on both sides of river from point of diversion to mouth; including all "cities, towns, villages, settlements and lands" for irrigation, household and domestic purposes.
- 9-5-13 Ed Fletcher questioned Hamilton-Boone El Capitan water claims.  
Document  
67000
- 9-6-13 W B Hamilton replied to criticism of Ed Fletcher.  
Document  
66999
- 10-27-13 T B Cosgrove appointed City Attorney, succeeding W R Andrews, resigned.
- 11-3-13 Council directed City Attorney to "investigate the rights of the City of San Diego in and to the waters of the San Diego River".  
Resolution  
15534
- 1-1-14 H A Whitney, Hydraulic Engineer: "San Diego River Preliminary Investigations". Contains history of events; some hydraulic data on sub-surface supply also description of San Diego Water Company properties.
- 1- -14 J B Lippincott reported: "Plans and Estimates for obtaining a water supply for the La Mesa, Lemon Grove & Spring Valley Irrigation District" - "The lower end of the Cajon Valley offers enormous opportunities for the impounding of surface waters. The damsite is good and the valley is broad and with a flat grade. The height to which the dam may be built is largely a financial question."
- 1-5-14 T B Cosgrove. An opinion of the right of the City of San Diego to the waters of the San Diego River. Presidio of San Diego founded July 16, 1769 by Serra. Political existence unbroken to date. Became pueblo under order of October 27, 1791. City had and has "prior and paramount right to the waters of the entire river, from bedrock to surface, and from the tiny rivulet that trickles down from the rim of the great watershed, to the shimmering sands where the bed of the San Diego meets the sea."  
Document  
71750
- 5-27-14 Council passed resolution declaring City had "prior and paramount right" to waters of San Diego River, as successor to the Pueblo; intends to exercise this right when sees fit; gave notice to others that their water works are subordinate.  
Resolution  
17321

- 6-1-14  
Document  
77403 Ed Fletcher referred to Sackett-Hagen history in connection with Judge Boone's offer to sell Hamilton's rights to the City for \$14,000.
- 6-13-14  
Document  
77979 L L Boone offered all of Hamilton's rights, interests and claims on San Diego River to City for \$10,000.
- 6-24-14  
Document  
78284 Edwin Duryea Jr., Consulting Engineer, San Francisco, reported to Board of Water Commissioners (re bond issue items of October and December 1913, but also discussed damsites) - stated that El Cajon damsite good for high masonry dam; reservoir lands high in value; evaporation large; low elevation; El Capitan bedrock deep but probably safe; more costly than El Cajon; Indian lands might complicate; high elevation; and that City could probably get flood water rights; but if legal-financial obstacles developed on San Diego River it would be better to go to Barrett-Cottonwood system first; urged full exploration of dam sites.
- 6-25-14  
Document  
78397 Hamilton furnished list of maps and documents and other data concerning his water rights and claims which he had offered to the City.
- 7-8-14 Water Commission recommended City buy Fanita water-bearing lands, install pump and pipeline; buy El Capitan damsite and reservoir lands; explore El Capitan and Barrett dam sites to see if safe dams could be built there.
- 7-28-14 Chas H Lee reported on underground water resources of San Diego River.
- 8-12-14  
Document Ed Fletcher offered on behalf of self and Jas A Murray to sell Cuyamaca Water Company for Railroad Commission valuation plus \$150,000. City to assume company's obligations and provided deal is made by September 1914.
- 8-17-14 C S Alverson, hydraulic study of San Diego River; favored El Capitan, or a "high line" reservoir. Indicated 7-23-05 people defeated bond issue to buy 2100 acres river channel and adjacent section from west line of Fanita ranch to a point near Lakeside "for pumping" for \$75,000.
- 9-3-14  
Resolution  
18098 Council created "Citizens Advisory Committee" of nine members to advise on water supply
- 10-10-14  
Document  
81915 L L Boone offered 700 acres of land (5 miles of stream-bed above Cape Horn) plus Hamilton water rights for \$44,000.

- 10-14-14  
Document  
82054 Ed Fletcher questioned action of President Chamber of Commerce in wiring the Department of the Interior on 8-22-14 asking if anybody had applied for reservoir rights of way in Capitan Grande Indian reservation, requesting that if so it be held until City could protest, as City was contemplating such action.
- 10-19-14  
Document  
81830 City leased from Ed Fletcher & Jas A Murray the El Monte, Chocolate and Indian Reservation pumping plants for one year, plus flume space to bring water to City; 3¢ per 1000 gallons.
- 12-30-14  
Document  
84913 Department of Interior rejected W B Hamilton's application for reservoir easement on Capitan Grande Indian Reservation. Copy of rejection furnished Council by Ed Fletcher "for future reference if desired".
- 5-20-15 H A Whitney resigned as Hydraulic Engineer (since 1912) when departments were consolidated, his position abolished and duties put under Manager of Operation (Fred M. Lockwood 5-11-14).
- 6-9-15  
Document  
90713 W B Hamilton deeded to City all water rights and any reservoir rights acquired by his application for same on San Diego River.
- 6-12-15  
Document  
90321 L L Boone wrote Council that he desired to transfer to City certain rights on San Diego River which may be very valuable "matters are in such shape just now that action on the part of the City must be taken very quickly, in order to secure the greatest advantages."
- 6-21-15  
Document  
90712 Agreement (Hamilton-City) that City pay Hamilton for deed of June 9 "such amount....as the Common Council may fix and allow". If property and rights are deemed of no value - nothing to be paid.
- 7-26-15 City, as assignee of W B Hamilton, filed with Secretary of Interior "a motion for the exercise of supervisory power in the matter of the application of W B Hamilton LA/014683, and petitioned for a hearing before the local Land Office at Los Angeles".
- 10-26-15 Department of Interior set aside previous order adverse to Hamilton application; directed new hearing before Register and Receiver of the U S Land Office at L A on November 3, 1915 date of hearing set for 12-20-15.
- 11-22-15  
Resolution  
20701 Council directed City Attorney T B Sessgreve to proceed with preparation and presentation of City's application re El Capitan dam and reservoir site; "now pending before Register and Receiver of U S Land Office at L A set for hearing December 20, 1915" and to incur the necessary expense.

- 12-15-15  
Resolution  
20823 Council approved Document 95487, proposed Act for Congressional action as drawn by T B Cosgrove. "Sec. 2. That said dam and reservoir when constructed shall be maintained and controlled by the municipal authorities of said City of San Diego for the exclusive use and benefit of said City of San Diego and the inhabitants thereof, and of such other municipalities within the County of San Diego, State of California, as may be now or hereafter furnished with water by said City of San Diego."
- 1-21-16  
Document  
96804 Secretary of the Interior Franklin R. Lane asked that changes in proposed bill be made; (a) file maps and data on rights of way (b) Forest Service to have use of rights of way (c) provide payment for Indians' lands and their location after removal.
- 2-7-16  
Resolution  
21064 Document 95487 (original proposed Act) was amended. Indian lands "not over \$100,000"; water no longer "exclusively" for San Diego and cities it furnishes.
- 2-15-16 H.R.11540 introduced by Congressman William Kettner giving San Diego reservoir right at El Capitan (\$100,000 for Indians) went to Public Lands Committee.
- 3-30-16 U S Land Office (L A) approved City's application to build El Capitan and impound water.
- 4-3-16  
Resolution  
21302 T B Cosgrove ordered to Washington to advance "before Congress" H R 11540 and appear before "such committees as necessary".
- 5-26-16  
Resolution  
21520 T B Cosgrove ordered to Washington for oral argument before Secretary of Interior, June 7, re application for El Capitan reservoir lands.
- 7- -16 Commissioner of General Land Office dismissed appeal of Cuyamaca Water Company against City's application for El Capitan lands, but found application could not be granted under General Acts of Congress; application must be made under Act of January 18, 1891.
- 7-2-17 H N Savage appointed Hydraulic Engineer
- 1-9-18  
Resolution  
23429 T B Cosgrove ordered to Washington to represent City at hearing (House lands committee) on El Capitan bill, to be held 1-28-18.
- 1-14-18  
Resolution  
23433 Council adopted amendments to H R 4037 as proposed by Gato Sells, Commissioner of Indian Affairs, as "wishes and desires of Municipality", Title "A Bill to grant rights of way...for water to be used by the City of San Diego, California and adjacent communities."

- 1-28-18 Transcript-House, Land Committee Hearing, Page 15  
(Cosgrove) "Just where the dam will be located is a  
matter for the hydraulic engineers to determine."
- 5-2-18 Board of Trustees, City of La Mesa, passed resolution:  
Document Effort be made to induce San Diego City Council to  
115645 "welcome private development of San Diego River" - if  
not successful, to oppose passage of El Capitan bill in  
Congress.
- 8-28-18 La Mesa having protested vs. El Capitan Bill, T B Cosgrove  
Document transmitted form of resolution outlining City's inten-  
117293 tions. Resolution 23919 passed August 30 provided  
City has not and never has had any intention of inter-  
fering with appropriations of water from the San Diego  
River heretofore made; City has no intiction of inter-  
fering with further bona fide water appropriations by  
the City of La Mesa or by any other person, firm or  
corporation, private or public; that it is the desire  
of the City to see all of the water of the San Diego  
River put to beneficial use and the needs of the City  
of La Mesa, as well as the many other suburban commu-  
nities adjacent to the City of San Diego amply provided  
for.
- 11-21-18 Mayor L J Wilde appointed a Water Development Board:  
Document Councilmen Wm Palmer, Horace Aughe and A P Johnson, Jr  
118558 without pay to expedite Otay Dam work and submit plan  
for additional water supply.
- 2-17-19 City accepted terms and conditions set forth in El  
Resolution Capitan Bill (S 3646 and H R 10587).  
24354
- 2-28-19 Grant by U S Government of 1940 acres in the Capitan  
Grande Indian Reservation and 141 acres in Cleveland  
National Forest.
- 4-8-19 Charter amendment created Water Commission with "exclu-  
Election sive control of the management, operation and develop-  
ment of the water system lying outside the City limits,  
or used for the impoundment or conservation of water".  
Vote - 6,563 for; 5,537 against.
- 8-25-19 Ordinance 7833 declared intention build El Capitan;  
Document ordered City Attorney to condemn necessary lands.  
123860
- 9-26-19 Core drilling at El Capitan damsite No. 1 started.  
Document 10-day reports made on this exploration, C O Johnson  
124695 and Jack Head, drillers. Until February 17, 1921  
When site No. 1 was explored by 25 holes; drill moved  
to site No. 2 (Document 133843) Exploration lasted  
17 months; 52 reports made to Council.

- 10-10-19 City filed suit vs Government and El Capitan Grande  
S D County Indians to condemn lands under Enabling Act.  
31799
- 11-30-19 Council accepted resignation of T B Cosgrove as City  
Attorney; effective above date. S J Higgins appointed  
to succeed him, 11-30-19.
- 1919 Charles H Lee, Geology and ground waters of the western  
part of San Diego County, United States Geological  
Survey Water-Supply Paper 446.
- 2- -20 J H Longwell, preliminary report to United States  
Reclamation Service on water supply studies San Diego  
River.
- 12-7-20 Abolishment of Water Commission failed to carry at  
Election polls. Vote - 5,697 for; 5,278 against.
- 1-13-21 Water Commission (Chandler, Wangenheim, White) placed  
Hydraulic Engineer in charge of entire impounding  
system. Previously Hydraulic Engineer had been in  
charge of building Lower Otay and Barrett dams and the  
Commission had managed the impounding system with  
Supervisor.
- 2-17-21 Core drilling at El Capitan damsite No. 1 completed;  
Document drilling rig moved to site No. 2.  
133843
- 2-22-21 Drilling at El Capitan damsite No. 2 started.  
Document  
134002
- 2-23-21 W C Earle reported to City Attorney S J Higgins, con-  
firmed data in Lippincott Mission Gorge No. 2 report  
to La Mesa District (as Chief Engineer of District);  
strongly opposed Mission Gorge No. 2, stated cost  
of 2½ to 3½ million dollars for net safe yield of  
1.5 m.g.d.; El Capitan for 3 to 5 million dollars  
would give 8 m.g.d. of net safe yield.
- 4-20-21 City Attorney Higgins ordered by Council to do all  
Resolution necessary to "protect and safeguard" City's rights at  
26403 El Capitan as granted by Congress.
- 4-20-21 City Attorney Higgins directed by Council to secure  
Resolution from H N Savage information re El Capitan damsite.  
26404
- 4-21-21 City Attorney Higgins "Within 3 weeks at the latest  
the City should be in possession of the El Capitan  
Indian lands as a site for a reservoir. While legal  
kinks are being straightened out, the Hydraulic  
Engineer is to furnish engineering data as to best  
location for dam, cost, type, etc."



- 4-28-21  
Document  
135683

H. N. Savage to City Attorney Higgins re El Capitan borings. Site No. 1 - center and south bedrock shallow, with bedrock below streambed but geologically o.k. Site No. 2 drilling under way.
- 5-9-21  
Resolution  
26448

Council asked Water Commission for information re El Capitan
- 6-10-21  
S D County  
31799

Superior Court gave City right to condemn El Capitan lands on payment of \$75,000 together with such additional sum as may be required by the Secretary of the Interior.
- 6-19-21

M M O'Shaughnessy wrote report and recommendations on San Diego water situation for J D Spreckels based on "personal investigation" June 8 and 9; recommended City purchase Cuyamaca system "at fair price; build 210' dam at Mission Gorge No. 3; 9 billion gallons; 7,000 acres submerged; 4.5 m.g.d.; 12.8 cents per 1000 gallons; total cost \$3,000,000. El Capitan bedrock 60'-150' deep; straight gravity concrete dam would be prohibitive, exceeding \$4,000,000". With Indians and pipe line, project would cost \$6,000,000 for 140' dam; 4.55 or 5.09 m.g.d. 22 cents per 1000 gallons; cites litigation and drying out of El Monte gravels as arguments vs El Capitan.
- 8-15-21  
Resolution  
26731

Council directed H N Savage to "furnish...as soon as possible a proposed outline for the development of the water system".
- 11-5-21  
Document  
138921

Hydraulic Engineer Savage reported negotiations with San Diego & Arizona for railway spur, Lakeside to El Capitan, to aid in dam construction.
- 11-16-21  
Document  
139173

Hydraulic Engineer Savage reported on meeting of riparian owners held at Lakeside. 200 present. "insurance of gravity water for riparian lands in case of any temporary lowering of the underground sands;" Mayor Bacon "gave assurances that the needs of the municipalities and the rights of riparian land owners would be recognized, adjudicated and provided for in a fair and equitable manner". "A spirit of mutual recognition of respective rights and of cooperation was evidenced and announced by all the speakers and by the audience".
- 1-11-22

City filed suit vs Fletcher, Henshaw and Cuyamaca Water Company for paramount right to San Diego River water. City Attorney Higgins says "City does not intend to deprive the ranchers and others along the river who are now using water, of their water supply. The city intends to look after all users of water. The city expects to soon develop the waters of the river by dam construction at either El Capitan or Mission damsites, or perhaps at both".

- 1-14-22  
Document  
140165  
Hydraulic Engineer Savage - Additional municipal water supply, San Diego River resources, conclusions, recommendations. Estimate 140' dam El Capitan No. 2; gravity masonry; 10 m.g.d. pipe line; filter plant; \$4,500,000 exclusive cost of lands (except \$75,000 for Indians). Mission Gorge No. 2 initial masonry dam to 116', final 156'. 20 m.g.d. pipe line, filter, \$5,250,000 including lands. Recommended acquisition of lands for Mission Gorge No. 2; building 1st step, 116' reservoir contour; gravity masonry dam; building filter plant; installing 10 m.g.d. gravity conduit to 11th & B Streets.
- 1-16-22  
Resolution  
27239  
Hydraulic Engineer directed to furnish additional information (supplement to report of 1-14-22) maps of lands to be flooded and various damsites; lists of property owners, cost of lands, plans and specifications of dams.
- 3-24-22  
Document  
141324  
Drilling at El Capitan damsite No. 2 completed.
- 6-22-22  
Document  
143689  
Core drilling begun at Mission Gorge damsite No. 2.
- 10-6-22  
Document  
145787  
Core drilling at Mission Gorge damsite No. 2 completed. 8 holes, "disclosing satisfactory excellent bedrock throughout the...streambed and both abutments to be everywhere not to exceed 10 feet below the surface of the ground and averaging less".
- 11-27-22  
Document  
146596  
H N Savage report on additional water supply for San Diego River resources, recommended bond issue for Mission No. 2, acquisition of lands below elevation 370, build dam as high as bond fund permits; 10 m.g.d. pipe conduit to 11th & B filter plant and sedimentation basin.
- 12-22-22  
Document  
258256  
A B Fall, Secretary of Interior, approved condemnation of Indian lands; set cost of relocating Indians at \$236,428, making total of \$361,428.00.
- 12-29-22  
Water Commission (White, Chandler) filed report with Council opposing Mission Gorge No. 2. Favored Mission Gorge No. 3, Sutherland and purchase of Cuyamaca System.
- 1-2-23  
San Diego Sun - Paramount right case dismissed without prejudice so that City may file a new amended and improved complaint. Judge J. Perry Wood, in dismissal, indicated belief that Pueblo water right theory is contrary to law and justice.

- 1-2-23 Mayor Bacon relieved Water Commissioners White and Chandler.
- 1-22-23 City Clerk instructed to enter negotiations to obtain services of A P Davis, Director of the U S Reclamation Service to make report on development of water of San Diego river.  
Resolution 28761
- 2-5-23 Mayor proposed names of water commissioners: Geo H Stone, C C Haines; C F Atkinson. No action was taken by the Council.  
Document 148040
- 3-6-23 City filed second suit (under amended complaint) for paramount right vs Cuyamaca Water Company, et al. Hunseker, Britt and Cosgrove appointed special water counsel.
- 3-20-23 Vote of people amended Sec. 1 Chapter 1, Article 5 of City Charter and placed manager of operation in full charge of water development, including all details and policies; abolished Water Commission. Vote - 7,656 for; 6,484 against.
- 4-3-23 City Attorney, in letter to Manager of Operation Rhodes, said charter vests him with full water development responsibility.
- 4-23-23 City Attorney instructed to communicate with John R Freeman "with view toward employing Mr. Freeman to investigate and advise this Common Council as to the development of the San Diego River, for the purpose of securing additional water".  
Resolution 29189
- 4-24-23 Francis G Sellow reported on Mission Gorge damsite No. 3. Disagreed with H N Savage on net safe yield figures for Mission Gorge No. 2. Also his selection of No. 2. Stated that M M O'Shaughnessy, T H King and W C Earle favored No. 3. Sellow 230' dam 8.3 m.g.d. delivered, estimated cost \$1,800,000.  
Document 152086
- 5-9-23 Lakeside Chamber of Commerce appraisement committee (G G Nelson, Homer F Aker, H S Kibbey) valued Mission Gorge No. 2 lands below 370 elevation at \$3,340,935; exclusive of highway, railway, telephone company, gas company, Fenton Parker companies properties.  
Document 151078
- 5-28-23 John R Freeman stated "It would be safe to reckon that my charge would be somewhere between \$6,000 and \$7,500..." City Attorney transmitted form of ordinance authorizing employment of Freeman. Ordinance passed same date.  
Document 151512
- 6-15-23 Manager of Operation relieved H N Savage. Communications Rhodes to Savage and Rhodes to Council. Rhodes stated he assumed charge of water development.  
Document 151842

- 6-23-23 Document 192085 Fletcher submitted proposal to sell City 11/12ths interest in Cuyamaca Water Company for \$1,400,000.
- 7- -23 Undocumen- ed Office safe 2 and El Capitan without preference. Clerk J B Lippincott reported on future water supply City of San Diego. City must look beyond San Diego River for additional supplies. Discussed Mission Gorge No. 2 and El Capitan without preference.
- 8-6-23 John R Freeman arrived in San Diego.
- 8-8-23 Document 153128 H N Savage filed exhaustive report on Additional Water Supply for City of San Diego, including rainfall, runoff, data of all known watersheds and net safe duty studies of San Diego County streams, etc.
- 9-7-23 Resolution 29801 J W Williams, survey and map made adopted by Council as definite location of El Capitan reservoir and dam site.
- 1-2-24 Document 156669 City Attorney Higgins filed letter from Freeman: Expenses and fees To December 15, 1923, totaling \$21,044.20.
- 455-24 La Mesa District entered contract to purchase Cuyamaca Water Company.
- 4-7-24 Document 159701 1/2 Mayor Bacon submitted estimated cost of Freeman Report: \$41,434.03.
- 4-16-24 City filed 190-acre condemnation suit (El Capitan dam site) against Cuyamaca Water Co. Ed Fletcher, C F Stern, La Mesa District (intervenor) (L A No. 9216).
- 5-24-24 Document 160932 J R Freeman report filed with Council recommended Mission Gorge No 2 now, El Capitan "15-20 years hence" when City can afford it.
- 6-15-24 J R Freeman - Future extensions of water supply for City of San Diego.
- 7-28-24 Document 162750 City Auditor H L Moody and City Attorney S J Higgins recommended that Freeman's claim for \$22,329.93 (\$7,500 already paid) be disallowed pending further details; several items not within his scope of employment.
- 8-29-24 Document 163706 Councilman H K Weitzel in communication to Council Stated that Mission Gorge No. 2 bond issue set for 9-10-24 "does not carry the approval of this council, and we are asking the citizens to vote on a question of a municipal bond issue which we cannot recommend". Also recommended purchase of Cuyamaca Water Company as City's first step.

- 9-2-24  
Resolution  
32152      Manager of Operation designated as City Hydraulic Engineer, to furnish plan for water development.
- 9-3-24      T H King reported on water requirements of La Mesa District to its Board: "The building of a dam at El Capitan would eliminate the effective storage of the Lakeside basin. This would reduce the safe yield of the Cuyamaca system by 4,700 acre feet annually". Points out "benefits of El Capitan reservoir site to City of San Diego (low evaporation; gravity delivery). Says: "Should water from the Colorado River....be brought into San Diego County....the El Capitan reservoir site will be invaluable as it supplies the only feasible storage on the San Diego River, or for that matter in San Diego County, large enough to equalize the enormous amount of water which will undoubtedly eventually be brought into San Diego County from the Colorado River".
- 9-10-24  
Election      Savage-Freeman Mission Gorge No. 2 bond issue defeated. Vote - 4,750 for; 7,485 against.
- 9-12-24  
Document  
164378      City Attorney Higgins advised that, unless City takes steps toward El Capitan bond issue by December 22, 1924, rights to Indian lands will lapse. (Enabling Act stipulated "within 2 years" of Secretary of Interior's approval 12-22-22).
- 9-24-24  
Document  
164757      City Attorney Higgins ruled City liable for Freeman's bill of \$22,329.93 on "implied contract" to examine water resources of San Diego River.
- 9-28-24  
Document  
272140      G W Goethals reported to Manager of Operation giving tentative, provisional opinion that safe concrete dam could be built at El Capitan.
- 10-2-24      Manager of Operation Rhodes reported recommending gravity arch dam at El Capitan; also recommended City acquire Cuyamaca Water Company and Sutherland dam and reservoir site. El Capitan estimate \$4,499,250.
- 10-2-24  
Resolution  
32378      Resolution calling election for \$4,500,000 El Capitan bond issue to develop water according to plan of F A Rhodes in Document 164902 adopted.
- 10-3-24  
Ordinance  
9664      Council passed ordinance calling bond election for \$4,500,000 bond issue for "construction and completion of a dam, of the arched, gravity section, masonry type, at a point known as El Capitan Damsite No. 2".... (appurtenant works, etc.); "all as more particularly set forth in that certain report of F A Rhodes, Manager of Operation....marked Document No. 164902...."

- 10-28-24 El Capitan Citizens Committee organized: P F O'Rourke, F F Grant, John Held, Charles Small, Carl Winter, Ed Head, Ira S Irely.
- 11-6-24 Mayor Bacon, in statement to newspapers, opposed El Capitan bond issue.
- 11-7-24 San Diego Union - La Mesa District voted \$2,500,000 bond issue to buy Cuyamaca Water System with its obligations and its lawsuits over paramount right to the water it uses. \$1,100,000 is purchase price; \$1,400,000 for repairs to flume, building Fletcher dam, enlargement of El Monte pumping plant, distribution lines. District now 14,000 acres - 5,000 expected to come in, 600 expected to go out.
- 11-8-24 J R Freeman wired Committee of 50: "I have carefully studies the Rhodes El Capitan report and the many arguments given in my fairly complete file of clippings from San Diego newspapers from May to November; also I have studied the Citizens Compromise report and have again carefully reviewed my records in my report of May 16, 1924. In the light of all recent evidence accessible in these newspaper files I find myself convinced that compromise plan for Mission Two Dam flowing to contour 360 is far better for economy and abundance of supply and for facility and economy of extensions when required for increased consumption than is any plan requiring immediate construction of El Capitan reservoir."
- 11- -24 Ku Klux Klan (E F Allen, Cyclops, Chairman of Advisory Board) issued printed card urging El Capitan bond issue; duty demands that for the time being we waive our objections to the type of dam mentioned, in favor of the paramount question of maintaining and preserving the great heritage granted us by an Act of Congress and by our Pueblo rights".
- 11-18-24 San Diego Sun - Engineer T H King said "unwise to vote El Capitan bonds because (a) City does not own damsite; (2) "The cost of constructing El Capitan dam is excessive for the amount of water produced. The bill, by which the City would have the right to flood the lands of the El Capitan Indian reservation...distinctly states that if the City builds the dam it must supply water to the riparian lands below and to cities or private corporations using water from the river. Cheaper, quicker water can be had from Sutherland."
- 11-24-24 Rhodes in communication to Council asked for M M Document O'Shaughnessy as Consulting Engineer El Capitan Dam.  
166182

- 11-24-24 Resolution declaring results of El Capitan bond issue held November 18, 1924. Vote: 18,131 for; 6,624 against.  
32692
- 12-3-24 Riverview Farms Mutual Water Company notified Council that it is a "fixed and positive" riparian owner on San Diego River; has developed much water for small farms depending on it; "You should not lose sight of this fact when making your plans for the taking of water from the river."  
Document  
166997  
fa
- 1-7-25 San Diego Union quoted City Attorney Higgins announcing that condemnation suit need not delay City in starting work on its own half of El Capitan damsite; as soon as bond money is available, "the work of stripping the City's side of the dam site may be started."
- 1-12-25 Lars Jorgensen, Constant Angle Arch Dam Company, submitted to Council plans for 3 heights of dam at El Capitan.  
Document  
168373
- 2-24-25 State Railroad Commission proposed settlement with District, City to sell District water at 6¢ per 1000 gallons, domestic 16¢. Area of district limited to 18,000 acres.  
Document  
169726
- 3-2-25 Letter - Cuyamaca Water Company to La Mesa District; Fletcher approved Railroad Commission plan of 2-24-25; subject to drawing of regular contract.  
Document  
170011
- 3-9-25 Manager of Operation Rhodes and City Attorney Higgins directed to secure, prepare necessary data re properties involved in Railroad Commission proposed settlement.  
Resolution  
33449
- 3-30-25 F A Rhodes filed Cuyamaca Water Company report. Joint report with Wm Stava, Assistant Engineer State Railroad Commission, C. Harritt, Superintendent Cuyamaca Water Company, A P Lovell, Superintendent City Distribution System; Rudolph Wueste, Superintendent City Impounding System. Stated cost of properties to City would be about \$1,521,323 of which all but about \$300,000 would be paid for through sale of water. States repair of flume would be about \$100,000 making it good for 10 to 15 years, eliminating need for El Capitan pipe line.
- 4-21-25 Wm Fitzherbert West, owner of Mission Gorge damsite No. 1 and No. 2, formally notified City that El Capitan would injure him as riparian owner, and that he will go to court for protection.  
Document  
172115

4-28-25  
Document  
172329

Board of Directors La Mesa District in letter to Council refused to accept (without conference) contract re compromise as drawn by City Attorney but pointed out District's option on Cuyamaca Water Company expires 6-15-25 and urged Railroad Commission settlement be submitted to voters "as soon as permissible under the law," the contract itself to be worked out "during, pending of such election".

7-28-25

San Diego Union - Council directed Manager of Operation F A Rhodes to prepare plans and specifications for pipe line El Capitan to University Heights.

1-18-26  
Document  
184202

J B Lippincott, Consulting Engineer, to "examine plans and specifications prepared by Rhodes" for El Capitan pipe line.

2-1-26

J B Lippincott reported on El Capitan pipe line; recommended omission of El Capitan-Lakeside reach until ready to build dam; interest and depreciation would run "to the extent of possibly 7% per annum". Signed by Lippincott, Rhodes and Mills.

2-13-26  
Document  
185223

Carl H Heilbron urged immediate 150' dam at San Vicente; "3 1/2 m.g.d. for \$1,000,000;" then El Capitan; then Sutherland.

- -26

F A Rhodes report "How San Diego has provided for population growth by storing water for decades ahead.

5-1-26  
Document  
188395

Mayor Bacon recommended re-hire H N Savage.

-  
Document  
188861

Councilman Don M Stewart replied to Mayor's recommendation.

7-20-26

R C Wueste, Supervisor Impounding System, furnished F A Rhodes with statement of cost of water 28.8¢ per 1000 gallons - all sources.

8-26-26

San Diego Evening Tribune - City Attorney Higgins informed directors of Lakeside Water District that city could supply them with water by tapping El Capitan pipe line, at 15¢ instead of Cuyamaca Company's 26¢ per 100 cubic feet.

10-19-27  
Election

Election for \$2,000,000 bond issue for Sutherland-San Vicente. Vote - 16,417 for; 1,381 against.

1-10-27

California Appellate Court (2d District; Div.1) ruled on El Capitan condemnation suit; sustained trial court in setting aside \$600,000 verdict and granted new trial on damages but reversed judgment of trial court on right to condemn, holding City "without right to acquire title in eminent domain proceedings".



- 2-14-27  
Resolution  
40635 Council authorized contract with Riverview Farms Mutual Water Company to deliver water to Company if City, by pumping, lowered San Diego River water plane so that Company can not get enough.
- 2-28-27 City Manager's annual report to Council on water development, page 5 gave water right for El Capitan pipe line easements 3,000 gallons daily per mile at City rate - 4 miles involved. 1927 flood damaged construction - caused extra work. About 200 acres bought for Riverview pumping plant - \$73,895.63 - net safe yield of 1 m.g.d. expected - peak draft of 10 m.g.d. planned.
- 5-14-27  
Document  
207081 City agreed with Bruce and Madge B. Waring (Bell-Lloyd Tract) to furnish "when said pipe line is filled, 685 gallons per minute" subject to conditions binding upon other users from pipe line.
- 8-22-27 C F Tolman, Consulting Geologist, reported on Geology of Damsites: San Vicente - "most satisfactory dam location observed". El Capitan - Strongly impressed with "necessity for dam". "astonishing depth of decomposition" over 200' at No. 1; 150' at No. 2; "upper site has been rightly rejected for lower".
- 1-20-28 J W Williams refused request of A R Hivener for irrigation water on his ranch along El Capitan pipe line; quoted opinion from City Attorney O'Keefe, stating "can not be done since no excess of water exists."
- 3-3-28  
Document  
220845 Mayor Harry C Clark, Councilman L C Maire submit their proposed compromise with La Mesa District; City to sell District 4 m.g.d. 1st year; 5 m.g.d. 2nd; 6 m.g.d. 3rd; not over 10 m.g.d. thereafter at 4¢ per 1000 gallons (1st 3 years); 5 ¢ thereafter. Receipt acknowledged by District.
- 5-7-28  
Document  
223733 Special committee ( R A Hill, J W Williams, J F Bruha) report on suggested compromise with La Mesa, Lemon Grove & Spring Valley Irrigation District.
- 5-9-28  
Document  
225074 Supplementary agreement by La Mesa, Lemon Grove & Spring Valley Irrigation District; "The District will agree not to demand in any one year an amount of water in excess of 30% of the actual consumption of the City of San Diego in the same year."
- 5-14-28  
Document  
224024 R A Hill wired "City will obtain an amount of cheap water from Cuyamaca system in almost 90% of years which will average 3 m.g.d. over long period and under terms of proposed compromise. City will never have to supply District at costly rates more than 3 m.g.d. throughout and year from sources other than Cuyamaca system, even assuming recurrence of critical drought starting next year."

- 6-18-28 Report by F E Green, Water resources of San Diego River.
- 7-2-28 H N Savage employed as Engineer in Charge of Water Development under a five year contract.
- 9-6-28 Document 230515 La Mesa, Lemon Grove & Spring Valley Irrigation District terminated negotiations, withdrawing all offers because H N Savage advised City Council he will not recommend proposed compromise until State Supreme Court rules on paramount right case; Council approved Savage's view, except for Councilman E H Dowell.
- 9-6-28 San Diego Union - La Mesa Irrigation District applied to Appellate Court to set aside El Capitan condemnation proceedings and clear District's title to dam site, on grounds City has other water sources and has dropped El Capitan No. 2 in favor of El Capitan No. 3 damsite.
- 9-17-28 H N Savage, report to Council, "Sources of additional water supply".
- 9-19-28 Document 231195 H N Savage recommended low diverting dam at Mission Gorge No. 2; pumping proposition; "average of over one billion gallons per season" over 11-year period.
- 1-9-29 H N Savage, report to Council, estimated water requirement for 1929 and sources from which obtainable.
- 3-19-29 Election Electors failed to pass \$2,750,000 bond issue for: Otay-University Heights pipeline; enlarge Chollas reservoir; develop underground water resources along the San Diego River; improve the filter plants; investigate water development projects and acquire rights of way. Vote - For 16,734; Against 9,470.
- 6-20-29 California Supreme Court decision gives City paramount right to the use of all the water (surface and underground), of the San Diego river, including its tributaries, from its source to its mouth.
- 7-16-29 Election Voters pass \$2,100,000 bond issue for Otay Reservoir-San Diego second main pipe line. Vote 17,551 for; 3,433 against. \$250,000 acquisition of rights of way, additional wells, etc. along San Diego river; additional filtration and purification units; acquisition of lands for pumping plants, etc. Vote 16,496 for; 4,251 against.
- 3-31-30 Document 255970 La Mesa, Lemon Grove & Spring Valley Irrigation District asked conference re compromise also announcing intention to appeal paramount right case to U S Supreme Court.

- 5-12-30  
Document  
257197  
El Capitan Citizens Committee (P F O'Rourke, Ed L Head) presented resolution to Council calling for immediate construction of El Capitan; condemnation of lands; requested competition of engineers for dam designs.
- 5-16-30  
Document  
258256  
La Mesa, Lemon Grove & Spring Valley Irrigation District petitioned Secretary of Interior for rescission of his order of approval, dated 12-22-22 which approved Superior Court's permission to condemn El Capitan Indian lands because money not paid; claimed District's rights infringed; Section 5 of Enabling Act repudiated by paramount right case; District bound to supply Indians and own district, etc.
- 5-22-30  
Document  
234137  
La Mesa, Lemon Grove & Spring Valley Irrigation District reacted to El Capitan Citizens Committee with letter to Council objecting to statements of El Capitan Citizens Committee and pointed out how and why El Capitan would cut off Monte gravels and ruin District. Offered City its 434 acres in Mission Gorge No. 2 at prevailing price.
- 7-10-30  
Document  
258908½  
City's reply to rescission or modification of order of approval, in fixing amount to be paid the United States for Capitan Grande Indian Reservation.
- 9-26-30  
H N Savage reported on San Diego River Project, Questions propounded by Attorney Chas C Crouch.
- 10-13-30  
Paramount right case decided by U S Supreme Court. Denied La Mesa, Lemon Grove & Spring Valley Irrigation District's petition for writ of certiorari. Cosgrove and Conkling believe it "the very end" of the fight.
- 10-14-30  
Document  
261978  
La Mesa Irrigation District proffered City joint use of Murray reservoir on "terms mutually advantageous"; would cut out City's need to build Chollas reservoir. (See Document 262211 10-24-30) Savage proposes conferences; warning Murray dam safety is now under consideration of State Engineer; advised await results.
- 11-6-30  
Document  
262848  
T H King report on San Diego River to El Capitan Citizens Committee recommended acquisition of Capitan Grande Indian lands and El Capitan damsite; build El Capitan as high as funds permit up to 160'; build San Vicente.
- 11-6-30  
Document  
262830  
El Capitan Citizens Committee submitted 22 questions to Savage re Mission Gorge No. 2 project.

- 11-8-30 M H O'Shaughnessy to Mrs Maud O'Rourke, advised El Capitan-San Vicente development. Did not specify type of dam to be built at El Capitan.
- 11-10-30 T B Cosgrove directed to submit written opinion as to whether riparian owners and cities lower down have any rights as against the City to the waters of the river; also opinion as to advisability of necessity of the City proceeding now to acquire the Indian lands.  
Resolution 55210
- 11-10-30 Meeting of Council and El Capitan Citizens Committee re H N Savage's Mission Gorge recommendation.  
Document 262951
- 11-13-30 M W Conkling, City Attorney, ruled City not bound to supply any water to District or others; opinion close to private opinion of Gray, Cary, Ames & Driscoll; "shall" permissive only; paramount water right decision is ruling factor.  
Document 263226½
- 11-17-30 T B Cosgrove written opinion that City will decide for itself how much of its water and at what rate it will furnish to others. Nobody has any rights as against City. Advised immediate payment for Indian lands.  
Document 263249
- 11-22-30 H N Savage general statement and answers to series of questions submitted by El Capitan Committee at conference November 6, 1930.  
Document 263392
- 11-28-30 District reacted to City's request for written basis of compromise.  
Document 263571
- 12-29-30 H N Savage report on El Capitan damsite No. 2 foundation geological formation. El Capitan No. 1 impossible, bedrock on right or north slope below streambed, tunnel ended in boulder. El Capitan No. 2, streambed deep; left abutment shattered and decomposing; right abutment shattered below streambed; Conclusions: safe concrete dam economically impossible; safe rock or dirt-rock relatively and financially economically impracticable and certainly unwise. Again stressed relative economy and advantages of Mission Gorge No.2.  
Document 264380
- 1-17-31 H N Savage, City of San Diego municipal water supply resources - answer to P F O'Rourke letter of 12-26-30.
- 1-27-31 T H King, memorandum concerning water development for San Diego and vicinity.
- 1-25-31 John F Covert, analysis and comparison
- 2-6-31 T B Cosgrove, conference with Common Council - paramount water rights.

- 2-6-31  
Document  
265454 H N Savage filed with Council plans and specifications, cost estimates for dams to various heights at El Capitan Dam.
- 3-3-31 Chamber of Commerce recommendations.
- 3-4-31 John R Freeman, telegram to Chamber of Commerce, restated his conclusion that Mission Gorge No. 2 will give the "most water and best insurance against water shortage for smallest expenditure and at earliest date".
- 3-20-31 Savage, Cromwell, Harritt report on cost of production of water, El Capitan and El Capitan-San Vicente combined.
- 3-23-31  
Document  
266493 H N Savage report cost of water Mission Gorge No. 2, El Capitan, San Vicente. "Economically impracticable" to build hydraulic rock dam at El Capitan to 160' then raise to 190'.
- 6-20-31  
Document  
269484 City Attorney Frank H Heskett advised Council to ask return of \$361,000 paid to the United States for the Capitan Grande Indian reservation lands about 2-21-31; added: "It is also my confirmed belief that any action taken....that could....be recognized as a ratification or approval of previous action taken by the City in connection with the acquisition and development of a reservoir at El Capitan, may prove very injurious to the best interests of the City".
- 8-11-31  
Election Mission Gorge No. 2 defeated. Votes - 10,272 for; 11,151 against.
- 8-27-31  
Document  
271158 Conference on El Capitan called August 17 by Resolution No. 57059. Cosgrove answered questions verbally. Resulted in Resolution No. 57121 ordering Hydraulic Engineer H N Savage to bring in plans and specifications for 197-foot hydraulic earth and rock fill dam at El Capitan.
- 9-14-31  
Document  
271450 H N Savage filed El Capitan cost estimate; 197 foot hydraulic fill rock embankment dam, pipe line, lands etc. including expended to date total \$6,013,631.
- 10-10-31  
Document  
272063 H N Savage response to Resolution 57200; estimated total cost Lakeside-El Capitan pipe line at \$442,000; discouraged proposal of pumping plant just below El Capitan dam site and immediate construction of pipe line; referred to proposed pumping plant at San Diego River-San Vicente Creek junction.
- 11-18-31  
Document  
272758 C D Marx and C F Tolman engineering and geological report on the proposed dam at El Capitan dam site No. 2. Tolman held site ok for earth-rock dam at reasonable cost. Marx stated original design made by Freeman, incorporated in Savage plans. "Plans...will provide for construction of a safe dam at El Capitan site No. 2."

- 11-23-31 Robt L Wing report to State Engineer on probable size and frequency of floods at El Capitan dam site.
- 11-30-31 Acceptance by the City of suggested basis of agreement between the City of San Diego and La Mesa, Lemon Grove & Spring Valley Irrigation District as to the development of the San Diego River.
- Resolution  
57624
- 12-7-31 State Engineer Edward Hyatt gave general approval of plans for construction of El Capitan reservoir dam.
- 12-7-31 Plans for hydraulic fill-rock embankment dam at El Capitan filed by Hydraulic Engineer Savage with Council.
- Document  
273259
- 12-12-31 L C Hill report to State Engineer urged changes in Savage designs.
- Document  
273923
- 12-15-31 Election carried to transfer unexpended funds to El Capitan; and changing type of dam. Vote - 17,295 for; 3,460 against.
- 12-21-31 El Capitan Citizens Committee requested O'Shaughnessy be retained to prepare alternate plans and specifications for rock fill dam; and to be submitted to C D Marx, L C Hill and C F Tolman in competition with Savage type; if found equal in feasibility and safety recommended bids be called on both types.
- Document  
273469
- 1-8-32 Letter M M O'Shaughnessy to P F O'Rourke expressed doubt as to safety of El Capitan as planned.
- Document  
273810
- 4-14-32 H N Savage transmitted tabulation of bids received on El Capitan.
- Document  
275656
- 4-16-32 H N Savage recommended Rohl-Connolly bid be accepted; contract awarded and work begin "at the very earliest practicable date to insure maximum progress and advancement of the work before the next winter season of potential runoff".
- Document  
275691
- 4-21-32 H N Savage recommended acceptance of Rohl-Connolly bid; an unofficial bid of Daley-Fenton would be "unworkable, inadvisable and unjustifiable".
- Document  
275734
- 4-21-32 G R Daley, Henry G Fenton (C G Crouch) brought suit against City, requested injunction on basis of plans and specifications insufficient; not enough money available; requested City be enjoined from entering Rohl-Connolly contract; Auditor enjoined from certifying funds available and from paying contractors; City enjoined from proceeding with dam until money and right of way in hand; (City cited to appear April 29, Judge C N Andrews). Injunction not granted.
- Document  
70858  
(County  
Clerk)

4-23-32

Contract entered into with H W Rohl & T E Connolly  
for construction of El Capitan Reservoir Dam,  
Spillway and Outlet Works.

Fred D. Pyle  
Hydraulic Engineer

DEDICATION



# PROGRAM

## Dedication of El Capitan Dam

City of San Diego, California

February 22, 1935, 10:00 A. M.

---

CHAIRMAN OF PROGRAM COMMITTEE

Albert V. Mayrhofer, Chairman Water Commission

---

Music by SERA Band—J. B. Larkin, Director

---

Salute to the San Diego Fair - - - J. B. Larkin

The Desert Song - - - - - Romberg

Dance of the Hours - - - - - Bonchielli

---

Invocation - Rt. Rev. Monsignor John M. Hegarty, V. F.

Introductions by Chairman -

Albert W. Bennett, Acting Mayor

George L. Buck, City Manager

Chester Harritt, General Manager,  
La Mesa, Lemon Grove & Spring  
Valley Irrigation District

George W. Hawley, Deputy State Engineer

Fred D. Pyle, Hydraulic Engineer

---

The Mill in the Forest - - - - - Eilenberg

Address, Dedication and Unveiling of Plaque by  
T. B. Cosgrove, Special Water Counsel

The Star Spangled Banner

CITY OF SAN DIEGO, CALIFORNIA  
WATER DEPARTMENT

3084

DIVISION OF DEVELOPMENT AND CONSERVATION

SAN DIEGO RIVER PROJECT, EL CAPITAN FEATURE

FRED D. PYLE, *Hydraulic Engineer*

EL CAPITAN RESERVOIR DAM

Rock embankment hydraulic fill type  
Streambed elevation 553  
Spillway crest elevation 750  
Top of dam elevation 770  
Height spillway crest above streambed 197 feet  
Height top of dam above streambed 217 feet  
Bottom of stripping elevation 530  
Bottom of cutoff elevation 501  
Bottom of grout holes elevation 475  
Thickness at base 1150 feet  
Length on top 1170 feet  
Width on top 26 feet  
Bypass tunnel 25 foot horseshoe section 1173 feet long of which  
570 feet has a circular inner lining  
Reservoir capacity 116,500 acre feet or 38,000,000,000 gallons  
Reservoir area 1574 acres  
Reservoir drainage area 190 square miles inclusive of Cuyamaca  
Average annual runoff 44 years—24,658 acre feet  
Net safe annual yield 11.6 m.g.d. or 13,000 acre feet per year,  
10 m.g.d. available for City of San Diego  
Maximum annual runoff 44 years—194,335 acre feet  
Minimum annual runoff 44 years—5 years none  
Maximum flood of record, 1916—38,000 c.f.s.  
Estimated maximum peak flood flow  
Once in 100 years—48,200 c.f.s.  
Once in 1000 years—102,500 c.f.s.  
Spillway capacity, elevation 763—75,000 c.f.s.  
Shore line at spillway level 23 miles  
Spillway capacity with storage above spillway crest capable of  
regulating flood having peak flow of 102,500 cubic feet per  
second  
First bonds voted—1924—\$4,500,000 for 160 foot masonry dam  
Contract for construction dated April 23, 1932

COSTS

Contracts:	
El Capitan Reservoir Dam .....	\$ 2,705,003
Spillway Extension .....	197,836
Tunnel Inner Lining .....	58,500*
Contingencies, appurtenances and miscellaneous.....	95,161*
Engineering .....	192,000
Rights of way .....	474,000
Clearing reservoir basin .....	55,000*
Road south side of reservoir .....	130,000*
Lakeside-San Diego pipe line .....	1,284,500
El Capitan-Lakeside pipe line .....	550,000*
University Heights filter plant .....	48,000
	Total.....\$ 5,790,000

\*Estimated

QUANTITIES

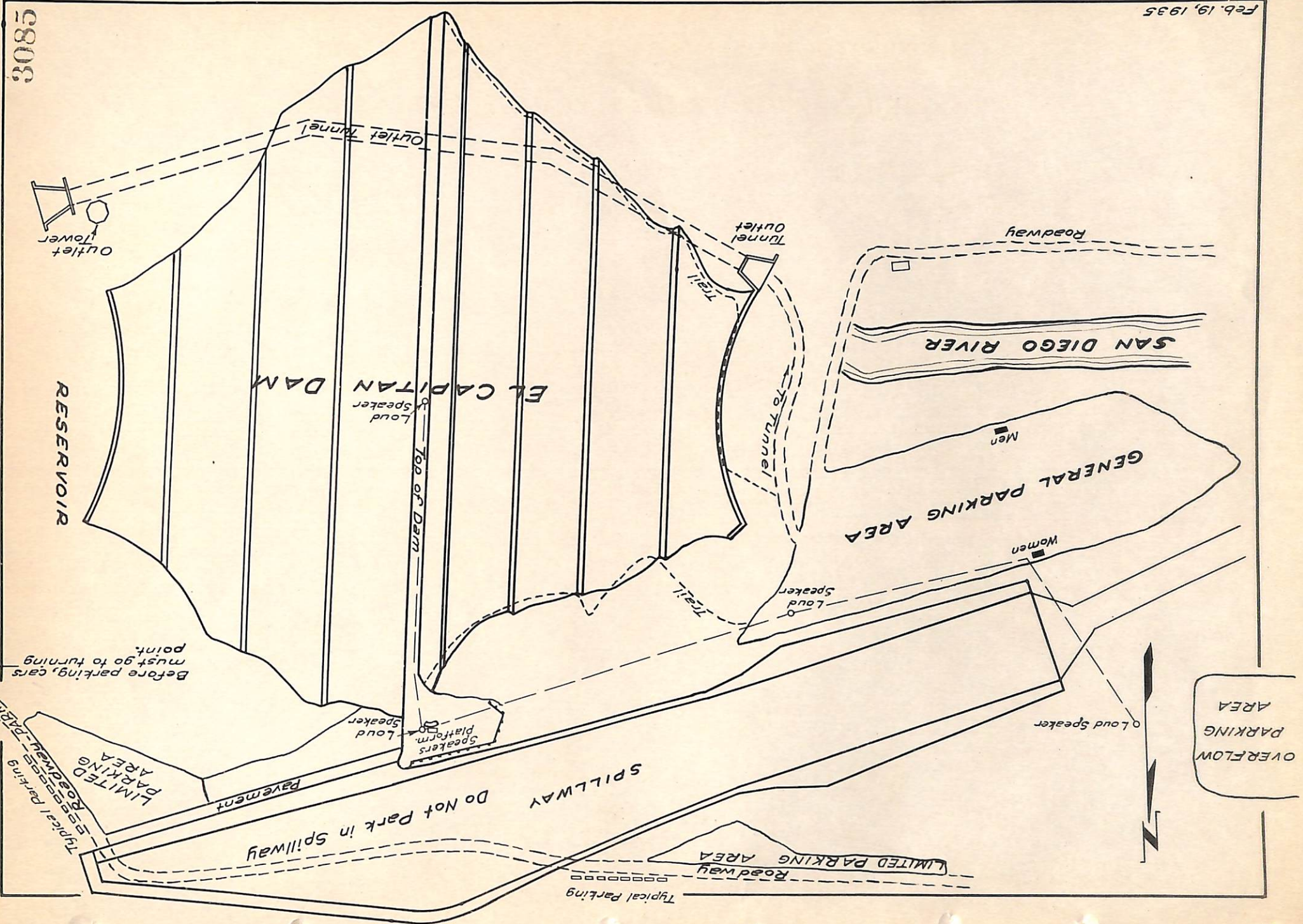
Excavation and stripping .....	282,749 cu. yds.
Spillway excavation .....	745,386 "
Tunnel excavation .....	31,319 "
Other excavation .....	45,957 "
Rock embankment .....	951,962 "
Hydraulic fill .....	1,587,937 "
Rolled fill .....	162,599 "
Concrete all classes .....	66,400 "
Cement .....	93,000 bbls.

CONTRACT PRICES

Tunnel Excavation.....	\$5.00 cu. yd.
Excavation Class 1 rock—wasted.....	1.00 "
Excavation Class 2 other materials—wasted.....	.25 "
Excavation Class 1 rock—in dam .....	1.00 "
Excavation Class 2 other materials—in dam.....	.40 "
Hydraulic fill material—borrow .....	.40 "
Rock embankment material—quarried .....	1.00 "
Concrete exclusive of cement, steel—average.....	6.40 "
Cement in place in work—average .....	2.00 bbl.

3085

Feb. 19, 1935



Before parking, cars must go to turning point.

LIMITED PARKING AREA  
Typical Parking  
ROADWAY

LIMITED PARKING AREA  
ROADWAY  
Typical Parking

# The MUNICIPAL EMPLOYEE

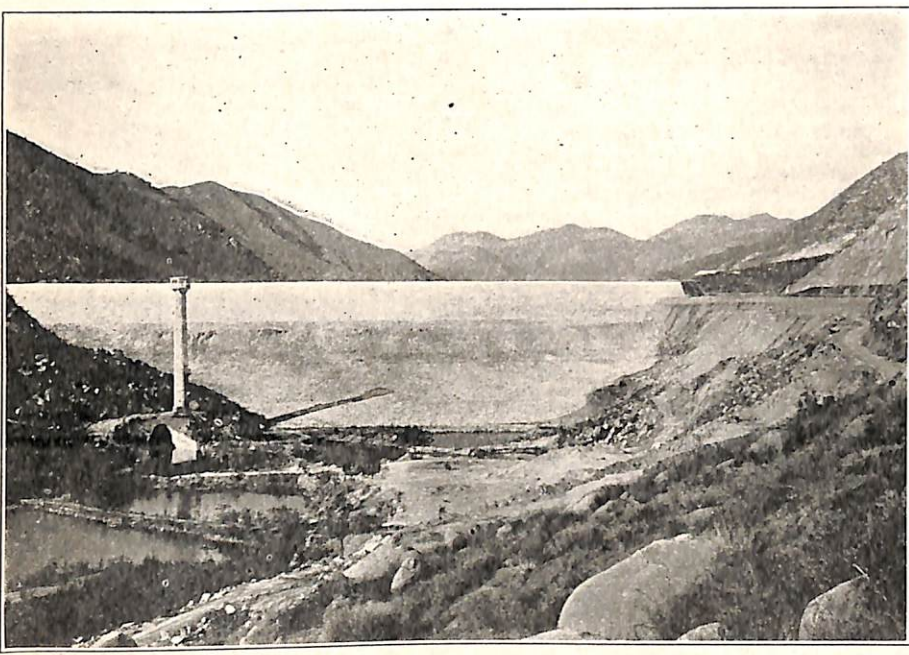


PUBLISHED IN THE INTERESTS OF CITY EMPLOYEES BY  
 THE SAN DIEGO MUNICIPAL EMPLOYEES' ASSOCIATION

Volume III

FEBRUARY, 1935

No. 8



*View of El Capitan Dam and Appurtenances from Upstream Side*

## El Capitan Dam and Reservoir

*By Fred D. Pyle,  
 Hydraulic Engineer*

**H**ISTORICAL—About 340 years ago the first white men sailed into the harbor of San Diego to take on fresh water, and since that time water has been a major problem for the inhabitants of this promising locality. In fact, the first irrigation development in San Diego County was constructed about 1800, by the Franciscan Mission Fathers, of which Junipero Serra was the leader. This development consisted of a small diversion dam across the San Diego River, where it enters Mission Gorge fourteen miles above its mouth, and a ditch six miles long, of which three miles were mortar and tile lined, to carry water to the mission lands. Today the City of San Diego, with a population of 170,000, has a water supply system valued at more than \$20,000,000, and has just constructed the first large reservoir for storage of water on the San Diego River. The total estimated cost of this reservoir, and a 25-mile reach of conduit to connect with existing University Heights standby reservoir in San Diego, is \$5,800,000.

When the Pueblo of San Diego and Mission San Diego del Alcalá were established under Spanish grant as the first settlement of Alta California in 1769, all the water of the

San Diego river was made the property of the pueblo. For many years this fact was forgotten, but when recalled it led to serious legal complications in water rights. After extended court action the City was decreed to possess in fee simple the prior and paramount right to use all surface and underground waters of the San Diego river from its source to its mouth. The present El Capitan development will provide a net safe duty of 11.6 million gallons of water a day with 10 million gallons a day available for the City's use, or enough water for nearly 100,000 people.

**Population and Water Use**—Since establishment of the Pueblo, the average population growth has been 1,000 per year, but more than half of the present population has come in the last twelve years. This has required a great increase in water facilities. The El Capitan development is the first of three reservoirs in the San Diego river drainage basin which will eventually supplement existing sources of supply.

In 1929 the City had a developed supply of about fifteen million gallons of water a day from the Morena, Barrett, Otay and Hodges reservoirs, supplemented by underground development along the San Diego river.

Population growth in the past forty years

is indicative of the rapid growth of San Diego:

Year	Population	Gallons per capita per day	Gallons total year
1890	16,159	—	—
1900	17,700	74	478,000,000
1910	40,748	111	1,650,000,000
1920	74,361	136	3,691,000,000
1925	121,000	111	4,902,000,000
1930	147,995	116	6,266,000,000
1935*	170,000	120	7,446,000,000

\*Estimated

A general increase in the per capita consumption of water may be noted. Many European cities use only forty to sixty gallons per capita per day. The extensive use made of water for gardens, lawns, parking and horticulture in Southern California, aided by the exceptionally fine climate, is in a large measure responsible for the increase in population. These same factors will result in further growth and development, which will continue as long as there is water to be developed.

**Preliminaries**—The present development of the El Capitan feature of the San Diego River Project, was made possible by the following:

1. A grant by the United States Government approved February 28, 1919, of 1940

(Continued on Page 4)

**AN APPRECIATION**

By A. V. Mayrhofer, Chairman, Water Commission of San Diego

The completion of El Capitan dam is the greatest achievement in the history of the City of San Diego. It is the largest unit in our water system, almost twice the capacity of the next largest reservoir, the Morena dam. When once filled, it will give the City water enough for 100,000 people, which means that San Diego can safely increase its population with an ample water supply to care for it.

After many years of litigation and planning the San Diego river has at last been harnessed, and will now give us water for many people, as well as giving us flood control which will, for all time, protect the lands located below the reservoir.

The Water Commission of San Diego is most appreciative and deeply grateful to the Hydraulic Engineer and his staff for the satisfactory completion of the dam, and to Mr. T. B. Cosgrove, special water counsel, and to the City Attorney and his staff for their efficient and successful settlement of the legal phase of the contract with the contractors.

San Diego can well celebrate the splendid manner in which the El Capitan dam was built and brought to such a successful completion. We have a structure paid for, with no legal entanglements, and with fair prospects of storing much water the first year of its operation.

**WORTH HAVING**

The San Diego Municipal Employees Association may consider itself fortunate to be able to present to the readers of the Municipal Employee the two valuable and scholarly articles on the El Capitan Dam Project which appear in this issue. Unquestionably the present number of the Municipal Employee will gain a permanent place in the reference files of libraries, engineers' offices and San Diegans in general.

The mimeograph insert in this issue contains facts and figures relating to Hydraulic Engineer Pyle's article on El Capitan Dam, which should be of considerable interest.

**THE COMING EXPOSITION**

It was said that, in comparison, although on a smaller scale, the San Diego exposition of 1915, was much more beautiful than the one farther north. The setting was much more delightful, and this will be further emphasized when the 1935 exposition is opened. In 1915, the trees and shrubs in Balboa Park had just been planted, but during the intervening years the park has become one of the beauty spots of America.

VISTA PRESS.

**S. D. M. E. AUXILIARY OFFICERS**

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Councilman Will Cameron, incurred a fracture of the right leg near the hip recently and is confined to his home for the next ten weeks.



ELIZABETH SEYMOUR, Editor  
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Apply for membership in San Diego Municipal Employees' Credit Union to Howard Ogden, Secretary and Treasurer, City Engineer's Office.

Printed in San Diego

**CIVIL SERVICE EXAMINATIONS**

Painter (Motor Vehicles)—Salary \$99.75. Last date to file, February 20. Date of tests: By appointment.

Patrolman—Salary \$126.00. Last date to file February 15. Date of tests, February 23, 8:30 A. M.

**CREDIT UNION CORNER**

**RANDOM OBSERVATIONS**

By G. A. Anderson, Pres., S.D.M.E. Credit Union

A Credit Union member recently received a circular letter from a newly established local salary loan concern soliciting business. He inquired as to the terms upon which he could borrow \$300.00 and found he would have to sign a note for \$354.00 and make 12 monthly principal payments of \$29.50 each plus interest on the reducing balance at 10 per cent per annum. Interest on this basis figures \$19.18 for the term of the loan, making total payments \$373.18. The cost of the loan to the borrower is therefore \$73.18 which is 52.35 per cent on the average amount made available for the borrower's use. By the end of the tenth month he will have paid back all but \$5.00 of the amount advanced to him. Nevertheless he must continue to pay \$29.50 each month for two more months. Interest is computed, of course, on the reducing balance of the note, which, by the way, is always \$54.00 more than the borrower has available for his use until it too is paid at the end. For example at the beginning the note is for \$354.00 and the borrower has the use of \$300.00. The first payment of \$29.50 reduces the note to \$324.50 and the amount in use to \$270.50 and so on for all payments. It will be observed that the borrower pays 10 per cent on that extra \$54.00 for the entire term of the loan except the last month when it has been reduced to the amount of the final payment. In the absence of co-signers, security in the form of furniture or other tangibles is required.

A Credit Union loan of \$300.00 on the other hand, repayable in 12 equal monthly installments of \$25.00 each will cost the borrower \$19.50 in interest. That is the entire cost, there being no extras of any kind. The borrower pays interest only on the amount he has in use from month to month.

City employees are to be congratulated on the step they have taken to make credit available to such of their numbers as have need for it, on such reasonable terms. Borrowers must be members of the Credit Union. Requirements are easily complied with.

Let it be always remembered, however, that Credit Union loans are available only for provident or productive purposes. This limitation still leaves the Credit Committee a wide latitude in considering loan applications for there are innumerable legitimate reasons for borrowing. Unlike many loan concerns, the Credit Union does not encourage borrowing unless the borrower has constructive purposes to serve. One of the principal reasons for borrowing so far has been to consolidate and pay off scattering past due obligations. Where these are due to causes over which the borrower had no control, the loan is of a constructive character. But where such obligations are due to ill-advised commitments or seeming inability of the borrower to properly budget his income and stay within it, only his ability to profit by the lesson will determine the ultimate benefit of a loan to him. Such a borrower needs help to put his financial house in order. But if he persists in getting into further difficulties as soon as the burden is lightened, later Credit Union loans can only assist in his downfall and should and will doubtless be withheld. The keynote and keystone of every Credit Union loan is the temporary relief of the borrower on the one hand and his ultimate financial well-being on the other. Of the two, the latter is by far of the greater importance.

Note—This is the first of a series of short articles on the Credit Union which will appear in each issue of the *Municipal Employee*.

# El Capitan Dam Spillway

By Paul Beermann, Engineer

Spillways of hydraulic fill dams are of the utmost importance because failure to carry the flood flow would result in destruction of the dam by overtopping.

The Lower Otay dam in 1916, when the spillway overflow capacity was not sufficient to take care of the flood, was totally destroyed by water flowing over its crest and cutting away the dam so that almost no vestige remained. The failure of the dam caused considerable loss of life and property.

The El Capitan spillway required the excavation of nearly 750,000 cubic yards of earth, disintegrated granite and solid granite, and the placing of about 30,000 cubic yards of concrete. The expenditure of more than \$500,000 indicates the magnitude and importance of the spillway and reasons for making careful studies were apparent.

Investigation of the various factors involved was made and the development naturally fell into the following steps:

(1) Determination of maximum flood flow; (2) Determination of type of spillway structure; (3) Determination of hydraulic characteristics; (4) Checking theoretical computations by means of model; (5) Structural design of the various portions; (6) Construction as designed with changes depending on local conditions.

## Flood Flow

A thorough study of all known previous floods, and of the watershed characteristics of the runoff area tributary to the El Capitan dam site was made by the State of California Division of Water Resources. By comparison with neighboring watersheds, their characteristics and known floods it was determined by the State that once in 1,000 years there would be a great flood which would bring into the El Capitan reservoir 102,500 cubic feet of water per second at the maximum rate of flow. It is of interest to note that such an inflow, assuming that it could occur when reservoir was empty, and if sustained at this rate, would fill this 38 billion gallon reservoir to overflowing in about 12 hours. The peak of a flood of this magnitude was found to be very short, not exceeding two hours. Due to the flood characteristics and to the storage in the reservoir above the spillway crest the maximum flood of 102,500 cubic feet per second would cause a discharge of only 75,000 cubic feet per second over the spillway crest. With such a discharge the water surface in the reservoir would be 13 feet above the crest of the spillway.

## Spillway Structure

With the reservoir empty at the beginning of the winter runoff past discharge records show that the reservoir would have filled and spillway functioned only during winters of 1861-62, 1883-84 and 1915-16, and that with ordinary use after filling of the reservoir, the spillway would function for short periods about twenty years apart.

In order to obtain the best spillway, considering all the factors involved, consideration was given by the Hydraulic Engineer's office not only to various types of spillway structures that might have been used, but also to their relative location and to estimated cost of each.

These spillway studies included straight overflow spillways, side channel spillways, spillways with automatic floating type gates, with manually operated gates and with siphons.

The advantages and disadvantages of each type of spillway studied were closely scrutin-

ized and the present side channel spillway without gates, offering no obstruction to floating driftwood and debris, was decided upon as being best suited for the purpose.

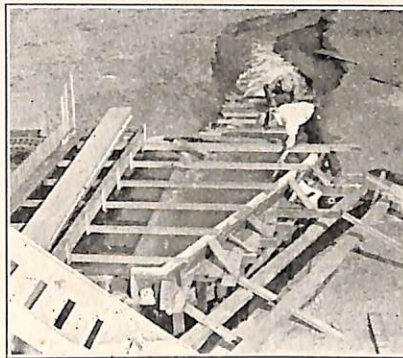
## Hydraulic Characteristics

Exceptionally lengthy computations were required to ascertain the width, depth and grade of the side channel to carry the required amount of water without choking itself. In making the computations certain assumptions as to velocities, slopes and widths had to be made. After many hours of work requiring approximately 1,000 separate computations, all inter-connected, when some of the assumed factors checked, one portion of the problem was solved. But when the answers did not check sufficiently close to the assumptions, it became necessary to make new assumptions and re-compute.

## Scale Model

In order to check the reasonable accuracy of the computations and assumptions, it has become the custom to make scale models, run water over them and make measurements as to velocity, depth of water, location of waves, entrained air, directions of flow and other factors indicating the capacity or affecting the design of the structure.

This was one of the most interesting stages of the work because it was visual and one is naturally more convinced as to the results to expect after seeing the actual operation of the model.



Model Spillway, El Capitan Dam

A model of the El Capitan spillway was made at the City's Riverview pumping station, using a reduction scale of one foot in model equal to 48 feet natural size. The relative velocity of water in the model was 1/7 of that of the natural flow and the relative quantity of water was 1/16000 of the natural flood flow.

The experiments indicated remarkable closeness to computed results and showed conclusively that the 75,000 cubic feet of water per second for 13 feet of water over the crest, and for which it was designed, could be carried by the spillway. A picture of the model carrying full flow is shown.

## Structural Design

The spillway crest which is 510 feet long represents quite a dam itself being about 20 feet high at the upper end and about 35 feet at the lower end which is nearest the dam. This portion of the structure was designed as a regular gravity overflow dam.

The spillway crest is at elevation 750 or 197 feet above streambed and 20 feet below the top of the dam. The spillway channel is 220 feet wide opposite the lower end of the crest and 150 feet wide at the end which is

at elevation 542. The concrete floor and side lining is 12 inches thick except at the bottom of the slope where it is 24 inches thick. The incline has a grade of 31.4 feet in 100, so that very high velocities will occur which made it necessary to extend the lining for a distance of 370 feet past the bottom of the incline. A flood flow of 75,000 cubic feet per second passing over the spillway is capable of developing 1,700,000 theoretical horsepower.

Studies were made of the uplift which might come under the concrete lining due to seepage and proper provision was made to drain this part of the structure. Tile drains were used and openings were made through the sidewall of the spillway to relieve any pressure which might occur. In addition, a regular forest of 15,000 1 by 1 inch steel anchors spaced 4 to 6 feet on centers each way and extending 3.5 to 5.5 feet into the foundation were provided to tie the concrete of the floor and sidewall lining to the foundation.

In designing the structure, it was shifted on paper several times in order to best fit the lay of the ground and to avoid excessive excavation.

## Construction

The spillway is located in a natural saddle at the north end of the dam and extends downstream for 1550 feet. The excavation of materials progressed rapidly and a very large amount of spillway excavation was used in the dam. The geologic formation is decomposed granite with a considerable portion of fresh rock masses and boulders scattered throughout.

To find the actual strength of the 1 by 1 inch anchors which were used to anchor the lining, tests were made to determine their resistance to pull. It took more than 20 tons to pull each of several 1 by 1 inch anchors and a number of anchors could not be pulled with the equipment available which was capable of exerting pulls of over 26 tons. The results confirmed the design assumptions.

The deepest cut on the north side of the spillway is about 200 feet, which, if translated into building comparison, is as high as the Bank of America building. On the ground, however, by comparison with the massive mountain background it appears comparatively small.

A large portion of concrete aggregate used in the spillway was manufactured by the contractors at the junction of Chocolate Creek and the San Diego river nearly a mile upstream from the dam.

The contractors for the dam, H. W. Rohl and T. E. Connolly, did the upper, about 60 per cent of this work; and the lower 40 per cent, known as the Spillway Extension, was let under contract to Bodenhamer Construction Company. Spillway construction was completed on December 1, 1934. All work was done under the general direction of the City's Hydraulic Engineer.

## SUBSCRIPTIONS

We are pleased to report that our subscription list has been increased by seven, making the total subscribers to *The Municipal Employee* 42. Subscriptions are going to New York City and Honolulu, and our latest point of contact is Panama, J. C. Kneeshaw, formerly in the employ of our Water Department, but now risen during 12 years of employment in the Canal Zone to engineer in charge of dredging.

## EL CAPITAN DAM AND RESERVOIR

(Continued from Page 1)

acres of land in the Capitan Grande Indian Reservation, and 141 acres in the Cleveland National Forest for reservoir purposes, which permitted the construction of El Capitan reservoir dam to store water to elevation 713, reservoir contour 160. The price for this land was subsequently fixed by the courts at \$75,000, to which the Secretary of the Interior added \$286,428 for moving and re-establishing the Indians in a new location.

2. A bond issue of \$4,500,000 authorized by the electors of the City of San Diego on November 18, 1924, by a vote of 18,131 for and 6,624 against, provided funds for the construction of a masonry dam to store water to elevation 713, reservoir contour 160.

3. A decision of the California State Supreme Court on June 20, 1929, confirmed the City's paramount right to the use of all the water, surface and subsurface, of the San Diego river, including its tributaries, from its source to its mouth.

4. Favorable reports by the City's Consulting Geologist, Professor C. F. Tolman, and Consulting Engineer, C. D. Marx, made November 18, 1931, on the safety of a dam at El Capitan, if constructed in accordance with the drawings and specifications submitted by the Hydraulic Engineer, for a hydraulic fill rock embankment dam, to store water to elevation 750, reservoir contour 197, and after favorable report from the State's Consulting Engineer, L. C. Hill, and Geologist, Chester Marliave, general approval was given by State Engineer Edward Hyatt December 7, 1931.

5. An agreement reached between officials of the City of San Diego and officials of the La Mesa, Lemon Grove & Spring Valley Irrigation District was ratified by the Council of the City of San Diego and by Directors of the Irrigation District on November 30, 1931. In accordance with this agreement certain lands owned by the Irrigation

District in the El Capitan reservoir basin and elsewhere were transferred to the City of San Diego, and in return the District was given the right to continue taking its water supply from the natural flow of the San Diego river, and was granted storage rights in El Capitan reservoir up to 10,000 acre feet, and the right to participate in the cost of installation and use of the El Capitan-Lakeside pipe line to the District's El Monte pumping plant. The City was given the right by the District to permanent storage in Murray reservoir in an amount not exceeding 5,000 acre feet.

6. The electors of the City of San Diego on December 15, 1931, by a vote of 17,295 for and 3,460 against, authorized the development of the water resources of the San

Diego river by the construction of a dam at the El Capitan site, and initiated the work by transferring \$893,873.43, remaining in the Pipe Line and Reservoir Bond Fund after completion of Morena Reservoir Dam and Spillway and Safe Duty Enlargement, the installation of the Otay Reservoir-San Diego Second Main Pipe Line, and abandonment of Chollas reservoir enlargement, made possible by the right to use 5,000 acre feet of storage space in Murray reservoir.

7. The electors on December 15, 1931, also authorized a change in the type and height of El Capitan Dam. The foundation conditions were deemed such as to make the construction of a safe high masonry dam economically inadvisable and it was found desirable to increase the net safe duty of the development by storing water to elevation 750, reservoir contour 197.

8. The City of San Diego's drawings and specifications for the construction of the El Capitan Reservoir Dam, Spillway and Outlet Works were approved by State Engineer Edward Hyatt on February 29, 1932.

9. Bids received on April 11, 1932, for the construction of El Capitan Reservoir

\$2,350,000 of El Capitan bonds at par plus accrued interest.

### The El Capitan feature consists of:

El Capitan Reservoir Dam, Spillway and Outlet Works, which have been completed.

Clearing of reservoir basin, which is practically completed.

Construction of a road around south and east sides of the reservoir to replace the County road which will be flooded by the reservoir. Only a portion of this road can be undertaken until the reservoir is partially filled and the Irrigation District abandons the old Cuyamaca flume.

Twenty-five-mile reach of El Capitan-San Diego pipe line, of which 17 miles constructed of 36" Lockbar steel pipe was installed in 1927-28; and 6 miles of 48" pipe to be installed between El Capitan Dam and the La Mesa, Lemon Grove & Spring Valley Irrigation District's El Monte pumping plant and 2 miles of 36" pipe between here and the present pipe at Lakeside. The additional cost of constructing a 48" pipe line over the cost of constructing a 36" pipe line is to be borne by the district.

University Heights filter plant, constructed in 1928, gravity type, capacity, 16 million gallons daily.

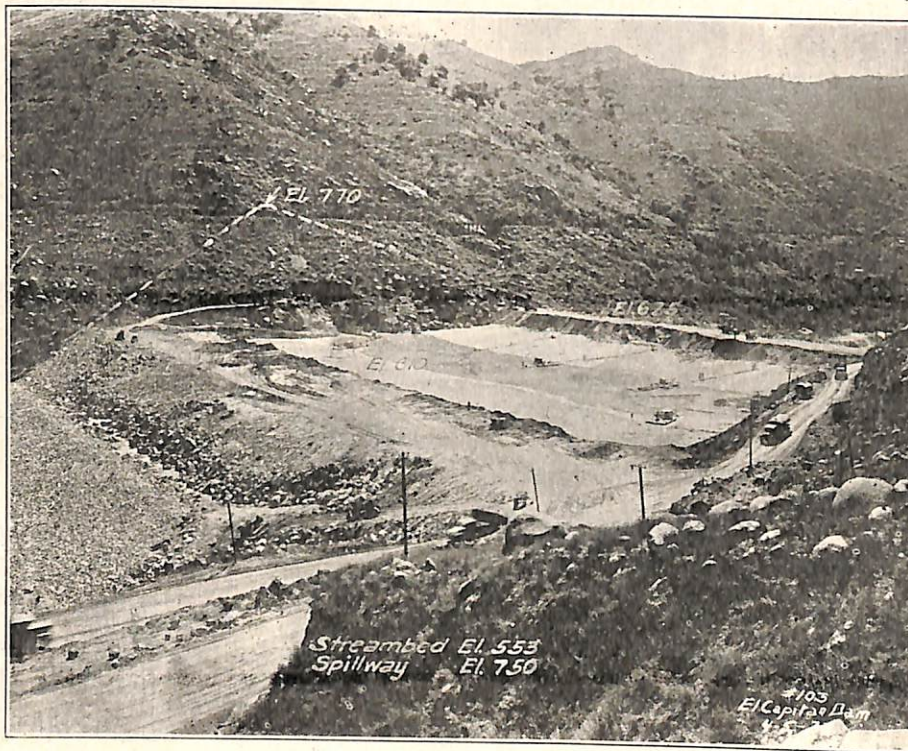
**Location**—The dam is located about eight miles easterly of Lakeside, California, on the San Diego river, and can be easily reached by driving through El Monte Park.

**Construction**—The dam of the hydraulic fill-rock embankment type with its 217 feet above streambed and 23 feet below streambed and contents of about 2,700,000 cubic yards, is the second highest dam of its type in the world, trailing the highest (Cobble Mountain, Springfield, Massachusetts), by only a few feet. The cubic contents is half again as much as Cobble Mountain dam with its 1,800,000 cubic yards.

The design is based on heavy rock embankments on the upstream and downstream sides filled in between with hydraulically placed materials grading from rock

and coarse sand adjacent to the embankments which form the stability section, to fine clay materials in the impervious puddle core section which extends into the foundation by a concrete core and cutoff wall.

The construction operations in general consisted of building up rock embankments and then dumping earthy material on the inside slopes. From the center of the pool, which was maintained as shown on the accompanying picture, hydraulic giants were operated, throwing water with great force against the earthy material on the rock slopes. The earth, when it came in contact with the water, melted away like sugar. The water, heavily charged with earthy material, flowed down over the beaches, where the coarse materials were deposited and only the finest of the material reached the central pool



Placing the Puddle Core, El Capitan Dam, Spillway and Outlet Works were as follows:

H. W. Rohl & T. E. Connolly	\$2,332,860.00
The Utah Construction Co.	2,594,050.00
Northern States Contracting Company and Butler Bros.	2,853,065.50
L. E. Dixon Company and Hall-Johnson Company	2,999,260.00
Foley Brothers, Inc.	3,633,271.50

10. A second grant by the U. S. Government, approved May 4, 1932, of 920 acres additional land in the Capitan Grande Indian Reservation, to permit reservoir storage to elevation 788, reservoir contour 235, for which the City paid \$35,567.20.

11. An agreement was accomplished whereby the Reconstruction Finance Corporation on December 12, 1932, agreed to purchase

February, 1935

## MUNICIPAL EMPLOYEE

## EL CAPITAN RESERVOIR DAM

and settled to form the impervious clay core. This core prevents future percolation of water through the dam. For comparison it is of interest to note that the grains of the fine clayey material are so small that one-half of them will pass through a screen having 40,000 openings to the square inch. Such a screen is so fine that it will hold water.

Alternate operations between raising the rock embankments and filling in the fine materials gradually raised the dam on an average about one-half foot a day.

As the work progressed it became necessary, in the fall of 1933, when the water in the summit pool was at elevation about 682 or 129 feet above original streambed, to change from the semi-hydraulic process which consisted of the method above described, to the full hydraulic method. This consisted of dumping the earthy material into a "hog box" in the spillway and when mixed with water, working the wet soupy material into pumps which forced the water and mud through 16-inch diameter pipes onto the dam where it was permitted to discharge adjacent to the rock embankments.

This method was used until August 11, 1934, when the surface of the summit pool reached elevation 718, or 165 feet above original streambed, when the beaches or the area between the rock and the edge of the summit pool became so narrow that it was necessary to construct the beach section by rolled-fill methods. The impervious puddle core was carried up to elevation 763 by importing select material from vicinity of Lakeside. Above elevation 763 the earth fill was constructed entirely by the rolled-fill method.

Frequent tests were made of materials in the core to determine if sand layers were being deposited in the impervious puddle core section. Over 2,000 actual samples were analyzed in the City's Testing Laboratory in Balboa Park to determine the relative amount of fine clay materials in the impervious puddle core and to guard against sand strata in the core. Further tests were made to indicate the rate of seepage through various core materials. It is indicated that more tests have been made on the El Capitan dam materials than on any other similar dam in existence. In many instances sand strata were found which had to be corrected by the contractor. This was done by removing the sand by clam shell dragline or slackline operated buckets or mixing with other adjacent fine material by a rotating mixer operated on pontoons.

Along the contact between the impervious puddle core and the foundation and abutments of the dam and extending into each a distance of from 20 to 30 feet, is a concrete cutoff wall to prevent the percolation of water under the dam. This concrete wall was heavily reinforced with steel and besides extending into the foundation, has holes 5 feet apart and 25 feet deep drilled in the bottom of the trench under the wall, into which cement grout was forced under high pressure to seal any open seams.

At each upstream and downstream toes of the dam, heavy concrete walls were constructed as an added safety factor. The surfaces of the rock embankments were placed by hand and present a very neat appearance. To protect the work during construction from floods, and to serve as a permanent outlet for the pipes leading into the City, a 25-foot diameter horseshoe-shaped tunnel was

driven under the south embankment and was concrete lined. The portion of this tunnel located between the tunnel plug and the axis of the dam is now receiving a circular diameter inner lining to withstand the full water pressure from the reservoir.

The wasteway or spillway, serving as an overflow when the reservoir is full, is an enormous structure over 1500 feet long with a crest of 510 feet and a capacity of 75,000 cubic feet per second. The excavation required therefor amounted to about 750,000 cubic yards; about 15,000 anchors were used to tie the lining to the foundation and 30,000 cubic yards of concrete were used in the overflow curb, cutoff walls and lining.

The 12-foot inside diameter concrete outlet tower serves as an intake to the pipe lines which will lead to the City. It is about 200 feet high above foundation and has the appearance of a high chimney. Water is taken into the tower through six 30-inch saucer valves located at various levels, and one 30 by 30-inch slide gate and may be drawn out through the bottom of the tower through two 36-inch and two 42-inch pipes. Only the two 36-inch pipes will be used for the present. The outlet tower, with its smooth appearance, is an unusually fine piece of concrete work.

The dam was completed on November 27, and the Spillway Extension on December 1, 1934. The tunnel was sealed by means of a solid concrete plug 30 feet long, the last section of which was poured on December 23, 1934. The installation of the tunnel inner lining is still in progress and will be completed about the middle of February, 1935.

About 15 inches of rain has fallen on the watershed above El Capitan dam in the last three months. If this water had not soaked into the ground but had all run off, the reservoir would now be full and spilling, but due to dry ground conditions and because the rainfall each day has been light the reservoir is less than 1.5 per cent full.

A comprehensive feature history of the design and construction of the El Capitan reservoir dam as initiated by the late H. N. Savage is being compiled.

## DEDICATION

El Capitan Dam will be formally commissioned on February 22, with appropriate ceremonies, which have been prepared by a dedication committee composed of leading citizens of the city and city officials. Albert V. Mayrhofer is general chairman and City Clerk Allen Wright, secretary.

Terence B. Cosgrove, former City Attorney and special water counsel for the city, who handed down in 1914, the opinion that led to the confirmation of the paramount water rights on the San Diego river and the construction of the dam, is expected to make the dedicatory address.

## STUDENTS (?)

This article is for the benefit of those doubting "Tomisses" who sit at home (I hope) on Wednesday nights while Glenn Rick, Ted Kenney, Harry Helsig, and Pinkey Parker attend a class at the City Hall on reinforced concrete beam design with Gene Freeland acting as lecturer and professor. Proof of our presence can be obtained, if necessary, from the night janitor, who, after 10 p. m., looks in on us with an "I wonder when" expression, and sighs a sigh of relief when books and papers are wrapped and put away for the night.

## Personnel

- H. N. Savage—Hydraulic Engineer to June 24, 1934.  
 Fred D. Pyle—Assistant Hydraulic Engineer to June 30, 1934; Hydraulic Engineer since July 1, 1934.  
 D. W. Albert—Engineer, Hydraulic Fill.  
 Harold Wood—Resident Engineer to October 15, 1934.  
 J. W. Williams—Assistant Engineer to October 15, 1934; Resident Engineer since October 16, 1934.

## San Diego Office—All Employees Part Time

Paul Beerman, Assistant Engineer and Engineer; Norman Coote, Senior Draftsman; Evan L. Burk, General Clerk; Evelyn I. Fraser, Secretary-Stenographer; Frances T. Patten, Secretary-Stenographer; T. L. Knott, Personnel Investigator.

## El Capitan Office

E. D. "Gene" Williams, Chief Clerk-Accountant; H. V. Newcomb, Senior Draftsman; P. O. Gottschling, Topographer; L. H. Hill, Chief of Party; G. W. Converse, Chief of Party; W. H. Simpson, Instrumentman; M. D. Elliott, Instrumentman to July 31, 1934; Harold Soper, Chainman; J. C. Salgado, Chainman; A. L. Remmen, Chainman; Frank Osborne, Chainman; Robert E. Lowden, Chainman to July 31, 1934; F. E. Brachmann, Excavation Inspector; H. L. Harper, Rock Fill Inspector; R. L. Carter, Concrete Inspector to November 16, 1933; Otto von Seggern, Concrete Inspector since November 6, 1933; W. E. Roberts, Hydraulic Fill Inspector; J. S. Bunch, Repair and Maintenance Man.

## HIRAM NEWTON SAVAGE

H. N. Savage, for many years the City's Hydraulic Engineer, passed away on June 24, 1934.

Mr. Savage first entered the service of the City of San Diego on July 2, 1917, to replace the Lower Otay Dam which had been completely destroyed by the disastrous flood of 1916. Upon the completion of this work he constructed the Barrett dam, which, when completed, held a full reservoir.

On August 8, 1923, he filed with the City Council an exhaustive report on Rainfall, Runoff and Yield of the various San Diego County watersheds, which, to this day, remains the Water Development Department's "Bible." He left the City's service officially a short time prior to filing his report.

Mr. Savage was called back to the City's service July 2, 1928, to further the City's water program and construction. Since this time the Otay Reservoir-San Diego Second Main Pipe Line has been constructed; Morena reservoir dam raised and flood gates installed and the El Capitan reservoir dam, spillway and outlet works carried a long way towards completion.

In recognition of his outstanding service to the City of San Diego, the Council, on July 9, 1934, renamed Lower Otay Dam "Savage Dam," in his honor, and a bronze plate expressing the City's appreciation of his splendid service has been placed thereon.

Boost the San Diego International Exposition with your Eastern friends and relatives.



**M. E. A. MINUTES**

The regular meeting of the Board of Representatives, San Diego Municipal Employees' Association was called to order at 7:30 p. m., February 7, by President Bryant Kearney.

*Sickness and Distress:* Mr. Sisney reported that his mother had passed away recently; Mr. Hinkley, boiler inspector, was reported ill; Mr. LaPorte, of the Auditor's office, was absent on account of illness.

*Report of Officers:* The Financial Secretary reported a balance of \$571.94 in the insurance fund and \$806.24 in general the fund.

Recording Secretary reported that a more satisfactory arrangement had been worked out by the Credit Union whereby an accurate check could be made on whether or not an applicant for Credit Union Membership was a member of the Association.

*Bills and Communications:* Herman Sisney was named by the President as an additional member of the Auditing Committee. Bills amounting to \$109.19 were approved and ordered paid.

*Reports of Committees:* Mr. Wueste, reporting for the Magazine Committee gave the cheering news that receipts for the magazine last month exceeded expenditures.

*Good and Welfare:* Mr. Sisney suggested inquiries be made regarding reduced rates on admissions to the Exposition for city employees. A motion was made and passed to appoint a committee to look into this matter. President Kearney named Mr. Schaper and Mr. Lindsay as the committee.

*Board of Governors:* Miss Edna Baughman tendered her resignation from the Board of Governors, to become effective immediately. Resignation was accepted.

As the terms of three members of the Board of Governors had expired, and reference to minutes of meetings in 1932 and 1933, did not reveal definitely which three members were due to be replaced, it was decided to draw lots from the list of members of the Governors to get names of two persons to be replaced, and add one more name to fill the vacancy created by the resignation of Miss Baughman. The names of Mr. Brems and Mr. Beale were drawn, and their positions declared vacant. Nominations were called for to fill the two vacancies, plus the one made by Miss Baughman's resignation. Mr. Beale and Mr. Brems were promptly nominated to succeed themselves, and in addition, Mr. Lloyd Stove of the General Office and Capt. Clarence Woodson, of the Fire Department were proposed. The vote was as follows:

Beale 10, Brems 9, Woodson 13, Stove 7. Beale, Brems, and Capt. Woodson were thereupon declared elected. The full membership of the Board of Governors now includes J. F. Vaughan, J. A. Gordon, E. A. Beale, A. E. Brems and Capt. Clarence Woodson.

Regular order of business was suspended to hear talks by Dr. Hall G. Holder, chairman of the Central Clinic Service, explaining the services offered by that institution to people of low incomes. Mr. Latham, representing the Western Beneficial Society, explained the health insurance service offered by his society. After lengthy discussion, an motion, the whole matter of health insurance and hospitalization investigation by the Board of Governors was tabled.

*Unfinished Business:* Mr. Gordon, reporting for the Board of Governors, said no action had as yet been taken by the Governors regarding the proposal to place on the ballot a City Charter amendment having to do

**PUBLIC WORKS DEPARTMENT**

The annual report of the Public Works Department rendered by Fred A. Rhodes, Director, has just come off the press of our Print Shop, and is a piece of work to be proud of from two angles. First: the statistical and technical information contained in the report, as well as the insight it gives into the importance of the work of this Department, and, second: as a piece of fine printing. This report makes an excellent reference book and is worth preserving by those who have been its recipients.

**PUBLIC WORKS NOTES**

T. T. Baines and Claude Waldon are late vacationers. Bains took a short trip to Imperial Valley via Riverside, returning by the southern route. Waldon on the other hand thought home was a good place for a vacation.

Another vacationer was Leo Ackley, who returned early in January.

We are sorry to learn that George Silverhorn, of the Retired Club, is sick at the Soldier's Home at Sawtelle.

Joe Gordon returned January 2, from his vacation which he spent visiting the Carlsbad Caves in New Mexico. He says they are wonderful and a sight worth visiting again. It's a sensation to have your lunch 700 feet below the earth's surface says Joe.

John Canfield, night watchman, has been seriously ill, but at this writing it looks as though he will be returning to work soon.

Fred Koch will soon return to work after suffering a broken wrist, while cranking a truck one cold morning.

There is considerable talk around the Shops and Yards about efficiency ratings passed out lately. Several of the men received "A's" and we are happy to report that no one received a "D".

These rainy days are busy days for the men in the Street Department with plugged drains, wash outs and plenty of sand on the pavement.

**AUXILIARY NEWS**

The business meeting of the S. D. M. E. Social Auxiliary, held January 23, was very well attended. Ten new members were added to the roll of membership. It is hoped many more will join.

Mrs. J. W. Fisher was the speaker for the day. She gave a very interesting and descriptive talk on the coming exposition.

The members of the hostess committee for the meeting to be held February 27, 1935, are Mrs. E. W. Nevett, Mrs. H. I. Hagman, Mrs. James Barber and Mrs. J. W. Scott.

**THIRTY YEARS CELEBRATED**

An unusual event was celebrated last Saturday night commemorating the completion of 30 years' service in the Engineering Department of E. H. Brooks, Right-of-Way Agent.

The party was held at the home of Mr. Brooks and was a surprise given by Mrs. Brooks. Approximately thirty guests were present and enjoyed cards and a dutch luncheon. A fine fountain pen was presented by the employees of the Engineering Department, through Howard Ogden, master of ceremonies.

Poker claimed the attention of the guests until 2 in the morning. A fine time was had by all.

with fixing a sliding scale for city employees' pay.

*New Business:* Mr. Hanna called attention to the plight of employees in his department,

**"Calling All Cars"****Bosch Radios**

Used in City Cars exclusively  
Use it in Your car or house

**MOTOR HARDWARE  
& EQUIPMENT CO.**

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and other departments as well, with average yearly incomes of less than \$900. A motion to refer the matter of pay scales to the Board of Governors was passed, and the Secretary was instructed to notify the Governors of the action.

There being no further business, the meeting adjourned at 10:30 p. m.

R. S. ROBINSON, Secretary.

**PENNINGS OF THE PEST**

Frank Stanley was off work for several days with a very bad hand. Also a bad cold didn't help him feel any better, but he's better now and hard at work again.

O. B. Usher was under the weather with a sore throat for a few days.

Have you seen Oscar Knecht's new hair cut? We wonder if it's a new fad amongst our big men. Very few of the first floor employees were able to recognize him when he came to work.

Walter Cook, our "hard working" printer, tells us he had a tooth pulled the other day. We wonder whether the dentist did the job or his wife. How's about it Walter.

Were you at the surprise party to celebrate the 25th anniversary for Frances Lockwood, given at her home? If you weren't, you missed out on a swell time. Frances was presented with a beautiful wrist watch by her many friends. She confesses that receiving the watch was the biggest surprise in her life. Just in case those of you who didn't get up to personally congratulate Frances are interested, we'll let you know that hot Tom and Jerry's were served, and we might say, they were very good. Now folks, aren't you sorry you didn't call?

They tell me Clare Baker our phone gal, has been kidded so much about her coming marriage to Jimmy Todd, that her face has been red ever since. Buck up Clare, 'cause it can't last forever.

Allene McLeod out at East San Diego is lonesome these days since Tommy Steigerwalt has left. She also states her office did a tremendous business during the past month. Things must be getting better out her way. Good work, Allene, and keep it up.

C. B. Rodman's pet spider "Susie," must have gotten mad at her little room-mate during the past month. The little fellow is now among the missing in the little glass home.

The Pest wonders if we could get enough men together to form a softball team this season, and to enter one of the leagues. Think it over men and watch this column for future announcements.

Well, folks, as Claypool would say, "Three strikes and you're out." J.W.C.

**CAN WE TAKE IT?**

Jane France, nifty daughter of my friend Bill France, does a nice column in the Municipal Employee, official journal of the city employees. Good reading, too. That whole paper's good for that matter and we'd all know more about our city if we read it.  
*The Sunnyside, S. D. Sun.*

**A PERFECT SCORE**

V. R. Donnahue, Safety Engineer, State Department of Compensation-Insurance, walked into the Auto Repair Shop, Twentieth and B streets, broke out his pad and cracked down on John Seuss about a pair of safety goggles that were unfit for service. Johnny told him that they were condemned, went over to the post where they hung, transferred them from their hook to a trash can, slid into his office, got out a new pair and put them into service. Donnahue walked around the shop twice, looking for trouble, found none and exclaimed, "This is the best equipped auto shop I have ever inspected; the safety laws are complied with in every respect, and I have no recommendations. Just keep up the good work, and all other departments would do well to pattern after the auto shop."

**NEWLYWEDS**

Announcement comes to us of the marriage last month in Phoenix, Ariz., of our own Norman T. Van Pelt, son of the late Mrs. Alice Smith, to Miss Kathleen L. Higgins, daughter of Mr. and Mrs. C. A. Higgins of Denver, Colorado. The bridal party was attended by Mr. and Mrs. Fred A. Steiner and Miss Dorothy A. Smith of San Diego, and Mrs. Jean L. Keiser of Denver.

Miss Clare Baker, one of the City Hall telephone operators was honored with a bridal shower, February 6th, at the home of Mrs. Elmer Schneider (Ruby Watt). Miss Baker is leaving the City service to become the bride of Jim Todd, motorcycle officer of the Police Department. She is the daughter of Mrs. F. E. Parrott of the Police Department.

**CIVIL SERVICE NOTES**

In the month of January, the Civil Service Commission established eligible lists for Police Surgeon and Repair and Maintenance man. The Commission has issued bulletins announcing examinations for Patrolman and Painter (Motor Vehicles).

The fish were biting fine at Miss Judy's fish whist party on January 12. Although Mrs. Wicks was the only one who wore a fishing license button, Dick Smith was the best angler and landed the biggest catch. No casualties from seasickness or drowning and no arrests for having too many fish. (What is the limit on fish cookies?)

**PURCHASING DEPARTMENT PERSONALS**

Marie Dunne celebrated her twenty-first birthday January 31. Our admonition to her is "stay as sweet as you are."

February 1, Maurice Sloper said he was hot as—well, you know—and getting hotter. We presume he referred to the atmospheric temperature which on that date went to 85°—a new record for San Diego.

V. R. Donnahue from the State Compensation Insurance office at Los Angeles, was working out of the Purchasing Department last month surveying conditions in all departments, with the object in view of preventing accidents. Two hundred and nine recommendations were made consisting of "general cleanup," "place guards on power equipment where necessary," and "remove or condemn or repair rickety saw-horses, ladders and benches." V. A. P.

**DOG SHOW**

One of the most interesting and successful dog show was held in San Diego, January 27, with approximately 200 entries with every popular breed represented and a few new ones from tiny pocket size to an Alaskan Huskie. Of course, being a breeder of Irish terriers, I thought the honors should go to them, but the judges and I disagreed there, ribbons going to a pair of Newfoundlands, the Huskie taking first and last prize, and prize for best in the show to a Kerry Blue, with an English setter, favorite of the galleries, a close contender.

A. V. Goeddel, Mgr. Hagerty and Tom Armstrong, were among the dog enthusiasts present. A.V. leaning heavily toward prizes for the Great Danes. City employees represented were Harry Helzig and wife, O. B. Usher from the Water Department, Ida Rauch and boy friend, and Eileen Robertson from the Treasurer's office. Mrs. V. A. Parker had an entry on the bench that took several ribbons. V. A. P.

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**EXCHANGOGRAMS**

A New York City physician contends that from a psychological viewpoint, red and green traffic lights are badly chosen, since red stimulates to action and green soothes and retards, thus accounting for failures to stop for red lights and a hesitancy in starting on the green.—(*Tacoma Civil Service Bulletin.*)

Kansas City has found that depriving a driver of his license when he is arrested under influence of liquor or narcotics and impounding his machine has proved the most effective force in controlling the accident evil.—(*Tacoma Civil Service Bulletin.*)

The San Diego Consolidated Gas and Electric Company reports in its monthly magazine, *The News-Meter*, a marked decrease in auto accidents on part of employees of the company. Their statement in part follows:

"Increasing courtesy and caution in the operation of motor vehicles by our employees are reflected in a reduction of 52 per cent in the number of company motor vehicle accidents this year over last year. There were 35 such accidents in 1934, as compared with 73 for the same period in 1933. These totals cover all automobile accidents, however trivial, including company cars damaged while properly parked."

With No. 101 (January) the Natural History Museum Bulletin embarks on a second "century." Starting primarily as a mere calendar of events, this little leaflet has developed quite a wide reputation for itself, in addition to serving as an information sheet for our members and friends. It is apparently sufficiently valued as a file in distant museums and libraries that if a number mis-carries we are promptly requested to fill the gap, as in the case of such a request from the British Museum received within the last few days. While insignificant enough in its individual issues, we have been doing a little figuring calculate that some 1,652,500 words have gone into the hundred numbers of the Bulletin, which, in the aggregate, would make quite a sizeable book.—(*The Natural History Museum Bulletin.*)

**SAN DIEGO STATISTICS**

**Building Permits (January):**

Dwellings, Apts, Garages	\$ 76,240	23
Commercial	55,506	35
Signs and Miscellaneous	20,765	78
Alterations and Repairs	36,776	114

Total	\$189,287	250
Electric Wiring Permits		262

**Water Figures:**

January Consumption	341.8 m.g.
Reservoir Storage, Jan. 31	26,735.3 m.g.
Maximum possible storage	105,822.3 m.g.
*Active Services, January 31	40,276

**Harbor Department (October):**

Tonnage over docks	48,104
Vessels in and out of Port	75
Passengers in and out of Port	949

**Health Department (January):**

Births	197
Deaths	219
Plumbing Permits	147
Gas Permits	57

**Weather Figures (January):**

Rainfall	2.15 inches
Mean Temperature	56.0 degrees

\*Multiply by 4 1/2 for population.

The Exposition Grounds will be closed after Feb. 15 until the opening, May 29, to all except those on official business.

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SAN DIEGO, CALIFORNIA

## M E M O R A N D U M

SAN DIEGO RIVER PROJECT, EL CAPITAN FEATURE  
DEDICATION OF DAM - FEBRUARY 22, 1935

Remarks by Fred D. Pyle, Hydraulic Engineer

Mr. Chairman, Citizens of San Diego and Friends:

Another step has been taken in the development of the water resources of San Diego and of San Diego County and we are now approaching the half way mark for such development.

The completion of each reservoir dam--Sweetwater, Lower Otay, now the Savage dam in memory of Mr. Savage, Morena, Hodges, Barrett and Henshaw have in the past marked such a step forward. Each million gallons per day of net safe yield conserved has made it possible to supply water to 10,000 people or to 1,000 acres of citrus and other crops.

When all San Diego County streams flowing into the ocean are fully reservoired and the water used, there will still be thousands of acres of good land without water and thousands of wonderful building sites on the hilltops still unoccupied.

San Diego climate and soil when combined with a dependable safe water supply makes possible homes on the City lot and on the acreage tracts such as can be found nowhere else in the United States.

Each project heretofore developed has required years to plan; to overcome opposition; to purchase rights of way and water rights; to finance and to construct.

Eleven years have passed since the bonds were voted for El Capitan and while the reservoir has been completed, 8 miles of pipe line remain to be financed and constructed before the water may be delivered to the City.

Great reservoir dams such as El Capitan are not only as enduring as the pyramids of Egypt but instead of monuments to some forgotten ruler this dam will serve the people and lands of this community for many generations.

It is proper that credit be given to those who have taken part in the actual construction of the El Capitan Dam:

D. W. Albert, Hydraulic Fill Engineer  
Harold Wood, Resident Engineer  
J. W. Williams, Resident Engineer  
Paul Beermann, Office Engineer  
L. C. Hill, Consulting Engineer  
H. W. Rohl & T. E. Connolly, Contractors  
O. C. Steves, Contractor's Superintendent

J. B. Lippincott and E. Alan Rowe, Consulting  
Engineers for the Contractor  
F. M. Bodenhamer, Contractor  
M. H. Golden, Contractor

It is also proper that credit be given to City officials, State officials, many City employees, hundreds of skilled men and laborers, legions of voters and taxpayers--but above all to Dr. Hiram Newton Savage, who, out of abundant caution for the vagaries of nature and the uncertainty of men, insisted in a change of type and height of the dam for the greatest good for the largest number of people throughout the longest time consistent with the least expenditure--and who died as he lived "in the harness".

Fred D. Fyle  
Hydraulic Engineer

M E M O R A N D U M

SAN DIEGO RIVER PROJECT, EL CAPITAN FEATURE  
DEDICATION OF DAM - FEBRUARY 22, 1935

Address, Dedication and Unveiling of Plaque by  
T. B. Cosgrove, Special Water Counsel

Mr. Chairman, Gentlemen of the Council, my friends of San Diego. I owe you an apology for keeping you here this period of time. I regret it exceedingly. I have been at the airport in Los Angeles since five minutes to six this morning. I observed the planes pulling out for Oakland; even Mr. Post starting off for New York City. I understand he did not get very far. The delay I assure you, was no fault of mine.

I am more than ordinarily honored--I am more than ordinarily happy, in being accorded the privilege of joining with the citizens and officials of this community at this time, in the dedicating of this edifice.

I have, in the capacity of an employee of this city, representing the citizens, observed through the years, the efforts, constant, continuous, enduring and unselfish, made by a great host of private individuals, as well as the great number of true and loyal public officers and officials, in bringing about this very wonderful occasion.

As I contemplated today, coming down here, the various steps that were taken in the years past in connection with the construction of this dam, I could not but smile to think of how dangerously near, so often, we were to failure. What just a little thing could have defeated the project. On the other hand, I thrilled with admiration at the contemplation of the long and continuous, untiring and unselfishly willing effort many scores of men and women of this community made to consummate this structure; to make it really possible.

This is not the work of any one man, or any one group of men. I turned over in my mind the names of those who, through the years, as I have known this project, worked in their efforts to bring about this very occasion. It would be a hopeless task to mention even the more prominent of these men who have gone on; whose labors have passed; who worked ceaselessly, untiringly, in order to bring about the structure of this El Capitan dam. It would be a far greater task to endeavor to mention the names of those still living today who have given their all to this work, and I know you are--you must be; thrilled, as you stand here now, on top of this completed project.

There are in this county, many other such structures; several that will mean perhaps as much to the welfare of the community as will this, but I believe there is no other that has met with such sincere and such honest opposition as did this particular structure. I do not know of a single instance through the

twenty years I have been connected with such projects, where a man or any group of men were so opposed to the project either at the time or at any time, really actuated by a sincere and honest belief that what they were opposing should be opposed. I know a man exceedingly well informed on hydraulics who was seriously opposed to this project because of his honest conviction that this was not the proper place and time to proceed with water development for this community, but when the matter was once agreed upon; - when the people finally by their vote authorized the issuance of the bonds, gave his whole hearted support in a cooperative spirit on behalf of the people of this community and continued to do so on every occasion.

I will not keep you long, my friends. Really I will make a bid for your gratitude by being exceedingly brief, but I would not be performing my public duty to this community--I would not be loyal and true to my fellow man, if I did not today pay a tribute to one who has gone, but whose last act was dedicated to the completion of this structure. I speak now of Hiram N. Savage. There are, throughout this county, a number of structures that long after the youngest person here will have passed to his rest, will stand as enduring monuments of loyalty and devotion and proper appreciation of the public's trust in Mr. Savage. The Sweetwater, Otay, Barrett and this, the El Capitan, are all monuments of money well invested. You do not find them everywhere; so far as I know, you do not find them anywhere. For many years I worked with that man; for many years in this section of the State I have been privileged and it has been my duty to work with public officials and I would like to say here and now as my honest conviction and let it go down on record that I have yet to find one more loyal; more true, more diligent. I have worked with many engineers and it is no disparagement to anyone to say that I have never encountered one who was more loyal to the public trust; more sincere in his convictions; more honest in his untiring efforts than was Mr. Savage on behalf of this community.

I have been with him on this project and on others. He has gone to his rest. As proud as I am to be connected with this city as an employee; as proud as I am to be chosen to be here at this dedication; the dedication of this most worthy monument to the industry and far-sightedness of the people of this entire community, my friends I would not be honest with you if I did not say that my greatest pleasure is in being able to be here at this time and pay my debt by word of respect and love to him whose spirit is embodied in this structure.

I understand you are about to expose this tablet, and if these two little boys sitting here will remove the weights and the covering, we will now view the tablet commemorating the structure. I thank you.

Municipal Water System

Z L C A P I T A N D A M

Members of the City Council

Rutherford B. Irones - Mayor

A. V. Bennett      Will H. Cameron      A. S. Davis

Dante F. Rossi      Richard I. Scollin      Harry Warburton

C. L. Byers - City Attorney      George L. Buck - City Manager

Members of Water Commission

A. V. Haythofer      Charles T. Chandler      Samuel I. Fox

Hiram Newton Savage - Hydraulic Engineer      Fred D. Pyle - Hydraulic Engineer

D. W. Albert - Hydraulic Fill Engineer

H. W. Kohl and T. E. Connolly, Contractors - 1932-34

Bodehauer Construction company      M. H. Golden

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DEPTH FOUNDATION BELOW STREAMBED - 25 FEET      ELEVATION SPILLWAY ABOVE SEA LEVEL - 750 FEET

SPILLWAY REGULATION - 100,000 SECOND FEET      AREA RESERVOIR AT SPILLWAY LEVEL - 1,580 ACRES

CAPACITY OF RESERVOIR - 38,000,000 GALLONS



# El Capitan Dedicated With Ceremony

## GIANT DAM MARKS NEW ERA FOR S. D.

Speakers Pay Tribute to Engineer Savage, Others Who Battled Through Years to Complete Work.

With pleas that community energy which concentrated on building the dam be utilized to the full in future advancement of the city, El Capitan dam, great structure which will hold back vast water storage for the city, was dedicated yesterday.

Amplified by mechanical means, the dedicatory words rolled up and down the valley of the San Diego river as speakers paid tribute to the builders of the dam and the energy of the city that built it.

### Cosgrove Unveils Plaque

Appropriately enough Terence B. Cosgrove, who in 1914 dictated the opinion upholding the city's rights to the waters of the river, unveiled the dedicatory plaque in a brief address. His audience was a widespread one, with hundreds listening from atop the giant dam, and many others heard the dedication speeches far down in the valley at the special parking areas. There was not room at the top, where the dedication was staged.

"I am more than ordinarily honored in being accorded opportunity to take part in the dedication of this edifice," Cosgrove said.

I have in the capacity of employe and citizen observed through the years, the efforts, constant and untiring and unselfish, made by a great host of private individuals and a great number of true and loyal public officials to bring about this occasion.

### Close to Failure

"As I contemplate the various steps in commencing construction of this dam, I cannot help but think how dangerously close to failure it so often came; what a little thing it would have taken at those times to defeat it.

"I shall not attempt to outline the long efforts of those who made this structure. It was not the work of any one man or group of men.

"As I turn over in my mind the names of those who through the years worked to bring about this occasion, new names come to mind. It would be a hopeless task to mention even the most prominent who worked untiringly to build this dam.

"Of all the dams in this county I do not believe there is one that met with such sincere and honest opposition as did this structure. Men high and low, hydraulic and legal, opposed it on the belief that it was not the place or time to proceed.

"But once agreed, there was nothing but wholehearted cooperative spirit on behalf of the people and by every organ through which its voice is heard.

"I would not be paying my public duty to a comrade loyal and true if I did not pay tribute to one who is gone but whose last act was dedicated to completion of this structure.

"I speak of Hiram Newton Savage."

There was a ripple of applause that spread across the mighty sweep of El Capitan and down the valley of the San Diego.

"After the youngest one of us here is gone, this dam with Sweetwater, Savage and Barrett dams will stand as an enduring monument to the public trust of Mr. Savage.

### Tribute to Savage

"It has been my privilege and my duty to work with many public officials and it is my honest conviction that I have yet to find one disloyal or untrue. It is no disparagement to say that I never encountered one more loyal to his public trust, sincere in his convictions and honest in his efforts than Hiram Newton Savage.

"He has gone to his reward. I am proud to be chosen to take part in this dedication. But my greatest pleasure is to be here at this time to pay my debt by word of respect to him whose spirit is embedded in this structure."

At a word, small boys aided Cosgrove in unveiling the dedicatory plaque, which contains the names of Savage, Hydraulic Engineer Pyle, city councilmen and also data on the dam.

A. V. Mayrhofer, chairman of the city water commission, acted as master of ceremonies at the dedication.

Msgr. Hegarty, introduced by Mayrhofer as of the same faith as the padres who first began development of the San Diego river, gave the invocation.

He pleaded with San Diego to mellow the partisanship that obstructs community effort and called on the citizens to recall that a higher power than their guides and makes possible the great efforts of mankind.

### Official Flag Presented

Only by sincere, unselfish effort, he said, can the people harvest the blessings that God has provided.

Acting Mayor Bennett cited the dam as the climax to the long effort of many hands, naming many who took part in the task and said it was finally made possible through the leadership of City Attorney Byers and Hydraulic Engineers Sav-

age and Pyle.

Mayrhofer, on behalf of the Native Sons of the Golden West, presented the city's official flag and a California Republic banner, stating that the city's work on the dam is in line with the Native Sons' policy of developing natural resources.

City Manager Buck paid tribute to those who have worked to complete the dam and said the result is especially gratifying in view of great expenditures made by neighboring communities without any dams being built. He called attention to the city industrial camp for rehabilitation of jail prisoners and invited those present to inspect the workings.

Speaking on behalf of La Mesa, Lemon Grove and Spring Valley Irrigation district Sen. Ed Fletcher said that he new dam will supply water for 100,000 persons. He recalled early days of water development, pointed out mistakes and pledged co-operation in development of county water resources, especially San Diego river.

Tribute was paid to John R. Freeman, chief designer of the dam and Savage, who developed the design by W. H. Holmes, deputy state engineer, who was present during the major part of the dam's construction. He represented Edward Hyatt, state engineer. Holmes also took occasion to advise citizens that their water work is not yet over, that they still must safeguard Hodges dam.

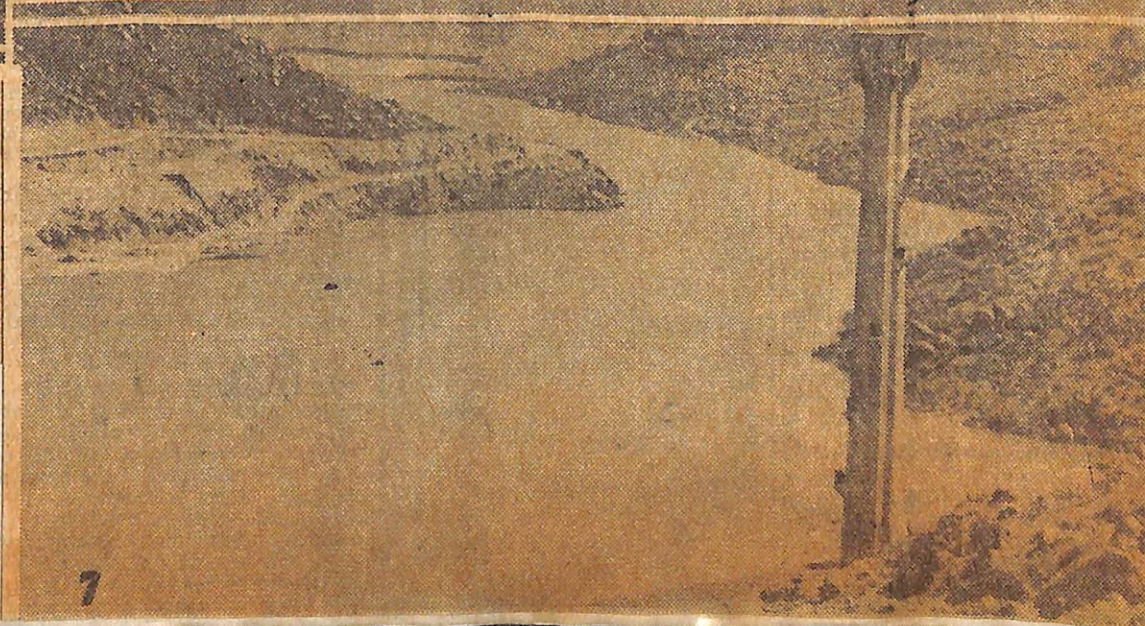
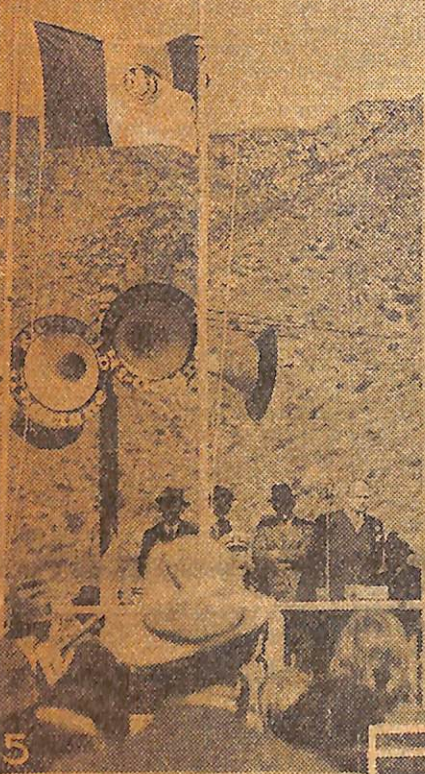
### Pipeline Is Needed

El Capitan is another step in the water development of the county, which now approaches the half-way mark, Hydraulic Engineer Fred D. Pyle said. Every million gallons developed gives water for 10,000 more persons and many more persons are coming to enjoy the climatic advantages, he said. He told the people that they still have to build eight miles of pipeline before El Capitan can be of service. Names of D. W. Albert, hydraulic fill engineer; Harold Wood, former resident engineer; J. W. Williams, Paul Beerman, Louis C. Hill, H. W. Rohl, T. E. Connolly, O. C. Steves, Art Bodenhamer, J. B. Lippincott, Allan Rowe and M. H. Golden were mentioned as having large parts in the dam's construction, along with Mr. Savage, whom Pyle said, died as he lived, in the harness.

Pyle did not forget the legions of voters and taxpayers who are paying the bills for the big project.

Maj. Gen. J. E. Kuhn, retired, spoke briefly to congratulate the citizens on completion of the dam, as did Sam I. Fox, water commissioner, Councilmen Harry Warburton and Dan Rossi, Supervisor Edgar F. Hastings, Carl Heilbron, the Reverend Brown and others.

Councilmen who in the past dedicated their efforts to the task that was climaxed yesterday were present in numbers. Don M. Stewart, Fred Heilbron, Ira S. Irey, Wayne Hood, Virgilio Bruschi sr., James V. Alexander and others took bows,



scenes when El Capitan dam was dedicated yesterday. 1. Terence B. Cosgrove, special water counsel, making dedicatory address. 2. Sen. Ed Fletcher who represented La Mesa irrigation district. 3. A. V. Layrhofer, chairman of the day. 4. People crossing top of El Capitan. National colors, state flag and city flag flying over speakers platform. 5. Dedicatory plaque on boulder in top of dam. 7. El Capitan reservoir from top of dam, with outlet tower in right foreground.

tan citizens' committee.

A guest of honor at the dedication ceremonies was Mrs. Savage, widow of San Diego's great hydraulic engineer.

Rear Adm. W. T. Tarrant represented the navy.

El Capitan water project is estimated to cost \$5,790,000 and is now complete except for an 8-mile pipeline to connect the dam with the pipeline which now extends to Lakeside. In addition a roadway is to be built around the south side of the lake later, probably utilizing the old flume bench of the La Mesa, Lemon Grove and Spring Valley Irrigation district.

#### Shore Line 23 Miles

The lake to be created by the dam will extend about 10 miles up from the dam and will have a shore line of 23 miles. The reservoir capacity is 38,000,000,000 gallons, almost twice as much as the largest of the other city reservoirs, and is designed to produce for San Diego a net safe yield of 10,000,000 gallons a day, enough for 100,000 persons.

The dam itself towers 217 feet above the stream bed. However, water will be stored only to the 197-foot level, where the spillway will begin to operate. The dam extends underground for a distance of 78 feet.

The dam is 1150 feet thick at streambed and 26 feet at the top. The length of the dam along the crest is 1170 feet. Into its making went 4,000,000 tons of material, including 93,000 barrels of cement, 66,400 yards of concrete, 162,599 yards of rolled fill, 1,587,937 yards of hydraulic fill and 951,962 yards of rock embankment.

The giant spillway, designed to accommodate the largest flood ever expected, cost half a million dollars and is a spectacular feature of the dam. Standing sentinel-like somewhat upstream from the dam and near the upper part of the outlet tunnel is the outlet tower through which water will pass from the reservoir to pipes conducting it to the city.

El Capitan is the third water project on the river involving use of dams whose traces still remain.

#### Early Dam Efforts

The Franciscan fathers started things with a dam at the upstream end of Mission gorge and conveyed the water to their lands by a tile-lined flume. Years later in Mission gorge a development designed to supply water to the Pacific Beach section started but was never finished.

Attorney Cosgrove's opinion in 1914, holding the city had a right to the river water, started a 15-year legal battle and made the dam possible. The city got government permission to flood Indian lands at El Capitan in 1919 and followed this in 1924 with a \$4,500,000 bond issue for a cement dam 160 feet high.

Additional funds were diverted for the dam in 1931 and the type was changed from cement to hydraulic fill and rock embankment as the most practicable for the site. The contract was awarded in April 1932 for the main structure. Additional contracts for spillway extension and tunnel plugging were awarded later.

First work on the dam was the outlet tunnel, designed to carry stream flow during the construction period and also to serve as conveyance for water piped from the dam. The tunnel is 1173 feet long and 25 feet in diameter; a wall of concrete now seals the upstream end.

Hydraulic Engineer Savage was in charge of the dam at the start and

with his boots on directing the work last summer. His assistant, Fred Pyle, thereupon became hydraulic engineer and carried on.

TEN DAY REPORTS

with .

PHOTOGRAPHS

February 5, 1932.

CIRCULAR LETTER NO. 65.

Subject: San Diego River Project, El Capitan  
Feature, Ten Day Reports, Allocation.

1. Copies of the official ten day reports comprehending the El Capitan Feature work, after responsible editing, each accompanied by about two photographs should be mailed promptly after each ten day period;

One copy to the State Engineer, 401 Public Works Building, Sacramento, California, and

One copy to Assistant Deputy State Engineer W. H. Holmes, 1025 Associated Realty Building, Los Angeles, California.

2. The reports should commence with and include the last ten day period of December, 1931.

3. Photographs showing the initiation of the work December 23, 1931, 8:00 A.M. should be included with the first ten day report.

4. Draft of Resident Engineer's ten day reports may be typed by Mrs. Patten, which after being edited should be re-typed for mailing.

5. Photographs for each ten day report to be furnished by the File Clerk.

6. Also, one copy of edited ten day report should be given to the Accountant for insertion in regular ten day report.

HNS/f

cc F. D. Pyle  
H. Wood  
F. M. Stanley  
Mrs. Patten  
E. L. Burk

December 20, 1931

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Common Council  
of the City of San Diego, California  
Subject: San Diego River Project, El Capitan Dam and Reservoir  
and Accessory Structures.

DECEMBER - SECOND TEN DAY REPORT

WEATHER: Rain to the extent of 2.06 inches total fell at the dam site on December 8 and 9. The river was discharging about 60 feet per second at the dam site on the morning of December 10. Rain also fell in the afternoons of December 11 and 14.

FIELD ENGINEERING:

A force of 7 men divided into one 3-man party and one 4-man party have been engaged in surveying during this period.

Complying with requirement for location of the 10-acre tract corners along the east and west center line of the northeast quarter of Section 7 in the vicinity of and below the El Capitan dam site, these points were marked by 5-foot redwood stakes and red flags with corresponding red flags along the public highway on the extension of the subdivision lines southerly. Clearing lines make the corner flags visible from the road. The point at the center of Section 7 and the east quarter corner have been similarly marked in the field.

One field party of 3 men has been engaged on topographic survey of road route down the west side of Chocolate Creek from Highway No. 80. This work was interrupted to carry on the location of property ties vicinity of the dam site, but is within about two days of being complete.

The second field party has been engaged on relocation of pipe line at several places in the canyon above El Monte Park. Property lines are being established and ties run to the pipe line location.

No construction work has been done.

CAMP:

Sites for the contractor's construction camp, and the City's temporary engineer's and inspectors' camp were tentatively located. A campsite was located on the south side of the San Diego River one-half mile downstream from the damsite and on United

States Forest area. The site has been staked, inspected by Forest Service officials, and a formal use application filed with the local Forest Service office with assurance that the application will be granted within a few days.

**ROAD:**

Extensive work is immediately required to put the public highway between El Monte Park and the El Capitan damsite in reasonably suitable and safe condition for the heavy travel it will have to carry.

**POWER LINE:** Mr. Kirk B. Ayres, Superintendent of electric distribution of the San Diego Consolidated Gas & Electric Company, inspected the work preliminary to determining a location for electric energy and transmission line for the construction work.

**TELEPHONE SERVICE:** Mr. R. P. Thompson, Engineer for the Southern California Telephone Company, has indicated the Telephone Company may erect its line poles south of the La Mesa, Lemon Grove & Spring Valley Irrigation District's flume.

**POLICY AND PROVISIONS FOR FUTURE WORK:**

The field engineering work for the next period will consist of completion of topographic survey of road route down Chocolate Creek from Highway 80. The property line ties to pipe line location will be completed. Survey 560, 600 and 650 foot elevation contours at the dam site will be made.

As soon as funds are made available a crew of unemployed laborers will be put to work clearing the dam and camp site.

**VISITORS:** Messrs. L. E. Dixon, Contractor, accompanied by E. M. Whipple and M. J. Eichhorn; L. H. Anderson, Forest Supervisor.

Fiscal account classifications have been made for coordinating the work between field and office.

Respectfully submitted,

H. N. Savage,  
Hydraulic Engineer.

HNS/p

cc Honorable Edward Hyatt, State Engineer  
cc Honorable W. H. Holmes, Assistant Deputy State Engineer

December 31, 1931

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Common Council  
of the City of San Diego, California  
Subject: San Diego River Project, El Capitan Dam and Reservoir  
and Accessory Structures.

DECEMBER - THIRD TEN DAY REPORT

WEATHER: Rain fell during the day and evening of December 28. The San Diego River was discharging about 600 second feet at the damsite at 2 P.M. on December 29. The water had been 2.5 feet higher during the night.

ENGINEERING: The engineering organization in the field during this period consisted of one 3-man party working on topographic surveys at the damsite and one 4-man party running out property lines for Section 7, Township 15 south, Range 2 east, and Section 12, Township 15 south, Range 1 east. The City's camp site was surveyed. A paper location of a road on a six per cent grade was made on the topography survey vicinity of Chocolate Creek from Highway 80 northerly to old flume crossing Chocolate Creek.

FORCE: The following average force per day other than engineering force has been engaged on the work and are the former unemployed men of San Diego:

<u>No. Laborers</u>	<u>Chief of Party</u>	<u>Foreman</u>	<u>Timekeeper</u>	<u>Truck-Driver</u>
22	1	1	1	1

In addition a crew of 8 men has been engaged at the Sutherland City Camp on dismantling the buildings to be moved to El Capitan.

ACCOMPLISHINGS: Following the ground breaking ceremony on the morning of December 23, 1931, at the El Capitan damsite, the brush and trees, except large oaks, have been cleared from the entire damsite and piled ready for burning. Burning has been done to the extent of about 10 per cent of the requirement on this area of 28 acres. The City's camp site one-half mile west of El Capitan damsite has been cleared to the extent of about 4 acres. A 50-foot fire break totaling 1400 feet in length has been cleared on the side hill above the camp and the sites. The brush is piled and ready for burning. The clearing is estimated to be about 80 per cent complete on the 32 acres.

Two latrines have been moved from Sutherland and set up - one at the camp site and one at the damsite. The wash house



from the Sutherland camp has been dismantled, cut into panels and moved to the El Capitan camp site. The guest house at Sutherland is being dismantled and will be moved next to make an office at El Capitan camp site.

Four men were engaged 3 days during this period on maintenance and repair work on the County road between El Monte Park and the dam site following the heavy rain of December 28. This work was necessary to enable cars and trucks to travel.

A latrine was constructed at the damsite from lumber salvaged from a shed on City property on Chocolate Creek.

A door was constructed on the entrance to the exploration tunnel in the south abutment and shelves were provided therein for tools and equipment.

A blacksmith outfit was assembled and set up at the damsite to care for the tools used in clearing. The marking of City tools is under way.

Dr. M. N. Carlisle of Lakeside has treated several men for poison oak infection and one man with influenza was taken to the County Hospital by Dr. Carlisle.

Photographs at 1/4 mile intervals showing condition of the County road between the damsite and El Monte Park were taken December 24.

Progress photographs at the damsite were taken December 30 showing the clearing at the dam and camp sites.

A foot bridge was constructed over the San Diego River at the damsite with a height of about 3.5 feet above the water surface. This bridge serves the clearing crew, field engineering forces and visiting contractors inspecting the damsite.

The truck time between the City Barn and El Capitan camp site for December 30 and 31 has been as follows:

Date		To City		To Camp
12-30-31	Leave Camp	4:32	P.M.	
	" Cape Horn	4:46	"	
	" Lakeside	5:09	"	
	Arrive Yard	6:00	"	
12-31-31	Leave Camp	4:35	"	Leave Yard 6:30 A.M.
	" Cape Horn	4:49	"	
	" Lakeside	5:09	"	Arrive Lakeside 7:24 "
	Arrive Yard	6:00	"	" Cape Horn 7:44 "
				" Camp 7:56 "

The first truck of materials from Sutherland arrived at the El Capitan City camp site December 28. The second load arrived December 30.

WORK CONTEMPLATED DURING NEXT TEN DAYS:

- Complete burning brush at dam and camp sites.
- Grade camp building site and set sills.
- Start water pipe and sewer trench excavation.
- Erect wash house building (to be used for tool and store house for supplies delivered from Sutherland camp, for protection from weather.)
- Progress clearing upstream from the damsite.
- Start exploration tunnels excavation on south abutment of dam.

VISITORS:

The following were in attendance at the ground breaking ceremony on the morning of December 23:

H. N. Savage, Hydraulic Engineer; Mayor Walter W. Austin; Councilmen J. V. Alexander, Ira S. Irey, L. C. Maire, J. J. Russo and Alfred Stahel, Jr.; A. V. Goeddel, Purchasing Agent; R. M. Gregory, Manager of Operation; Edgar F. Hastings, County Supervisor; Samuel I. Fox; Ed Fletcher; Hugo Kunsted of the Daley Corporation; Phil H. Martin, rancher, Santee; John Vogt, Supervisor District No. 3 Road Foreman; George White, photographer; and H. I. Wood, Resident Engineer.

- December 23, P.M. - County Supervisor, Leroy H. Aul
- December 24 - M. N. Carlisle, Physician, Lakeside
- December 30 - J. L. Brook, San Diego Consolidated Gas & Electric Company.
- December 31 - W. A. Stebbins and Hugo Kunsted.  
J. Weidel, valuation engineer from Chicago  
H. N. Savage

DISMANTLING BUILDINGS AT SUTHERLAND CITY ENGINEERS CAMP:

On December 23 crew of 1 carpenter, 5 repair and maintenance men, one cook, was started on dismantling building at the City Engineers Camp at Sutherland Dam Site and moving same to El Capitan Dam Site. This crew was increased by two laborers December 28.

All pipe and other material for which there is no immediate need at El Capitan was moved to Chollas Heights Station for storage.

One building has been completely dismantled and moved to

the camp site near El Capitan, and two more are in process of dismantling and moving, which will be completed within the next ten days.

Respectfully submitted,

H. N. Savage,  
Hydraulic Engineer

HNS/w

cc Honorable Edward Hyatt, State Engineer  
cc Honorable W. H. Holmes, Assistant Deputy State Engineer

Encls. Photo Prints Nos. E.C. 4, 5 & 6



12-23-31. C.S.D. El Capitan Dam. Inauguration of Work. First Laborers Arriving. E.C-4.

3110



12-23-31 C.S.D. El Capitan Dam Inauguration of Work E.C-5.



12-23-31. C.S.D. El Capitan Dam. Inauguration of Work

E.C-6.

3111

January 10, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Common Council  
of the City of San Diego, California.  
Subject: San Diego River Project, El Capitan Dam and Reservoir  
and Accessory Structures.

JANUARY - FIRST TEN DAY REPORT

**WEATHER:** The weather has been clear during this period with the exception of about one hour of rain January 2. The San Diego River has been gradually falling. The flow was about 50 Second feet on January 4 and decreased to about half this amount January 10.

**ENGINEERING:** The engineering organization in the field during this period consisted of one 3-man party working on topographic survey 560, 600, 650, 700 and 766 foot contour elevations at the dam site, and on reservoir basin clearing classification. A second field party of 4 men has completed the location of property lines in Sections 7 and 12 and has made survey of dam axis, located exploration tunnel 5 and begun the referencing of P. I. points along the pipe line location survey, working up stream from El Monte Park in advance of road widening operations.

Ownerships of record of the various properties affected by the contemplated work particularly in vicinity of Chocolate Creek, have been secured. Application for permanent occupancy of certain public lands within the U. S. Forest are being prepared, the lands to embrace lands required for roads, camps, quarries, etc.

The contours as surveyed at the dam site were plotted, comparative quantity computations were made for several positions of the dam and the axis of the dam was established in the field and flagged with 3-foot square yellow flags on each abutment. Flags marking the upstream and downstream toes of slopes of the dam were also set. Computations for excavation quantities for County road improvement work was begun. The County road improvement work between El Monte Park and vicinity of the dam site was organized.

**FORCE:** The following force, other than engineering force, has been engaged on the work and are the former unemployed men of the City of San Diego:

An average daily force of 88 men has been employed on the El Capitan work.

**ACCOMPLISHINGS:** In addition to the engineering work, the following work has been accomplished during this period:

**Camp:** The wash house, guest house, resident engineer's house and clerk's house at the Sutherland Camp have been dismantled, and the wash house and 60 per cent of the guest house has been hauled to the site of the City's El Capitan camp.

**Clearing:** 28 large trees have been felled and limbed within the reservoir basin. The dam site, or about 30 acres, has been cleared with the exception of large oaks, and the brush 90 per cent burned. About 29 acres of the reservoir basin have been cleared with the exception of the large oaks along the San Diego River. About 13 acres of this area have been burned and are completely cleared. Sufficient clearing has been done by City forces on the County road on January 8 and 9 to permit the shovel for road improvement work to move onto the work on January 11. The City camp site to the extent of about 4 acres has been cleared and the brush 50 per cent burned.

**Public Highway:** Road maintenance has been continued between El Monte Park and the dam site with City forces to permit City traffic to move without delay. This maintenance work was ordered stopped on January 8 as the County road work will replace this. Arrangements have been made for County road reconstruction and a 1-1/4 cubic yard shovel and a 3/4 cubic yard shovel, 1 air compressor, 1 scarifier arrived on the work January 9 ready for work January 11. Mile post markers have been painted and are being set. A powder house for powder for road work was begun on January 9.

**Exploration Tunnel:** Exploration tunnel 5, which is about 290 feet upstream from the axis of the dam in the south abutment, was begun on January 4 and has progressed about 7 feet under cover in addition to the open cut approach. A door is being constructed for the south exploration tunnel at dam site No. 1 for use as a powder house for powder used on exploration tunnels.

**Accidents:** Dr. M. N. Carlisle, of Lakeside, has treated a maximum of 6 men for poison oak infection; 1 man for infected foot cut on tree stump; 1 man for cactus in arm; and 1 man for contusion of finger.

**WORK CONTEMPLATED DURING NEXT TEN DAYS:**

Complete burning of brush at dam and camp sites.  
Grade camp building sites and set sills.  
Start water and sewer trench excavation.  
Progress clearing upstream from dam site.  
Continue exploration tunnel 5 and start exploration tunnels 6 and 7.  
Start widening County road to 30 feet.  
Continue setting mile post markers.  
Continue dismantling Sutherland camp and begin erection of office, wash house and engineer's house.

VISITORS:

- January 4 - R. S. Ruffin, San Diego Consolidated Gas & Electric Company.  
C. Sparks, Superintendent for John Hanson.
- " 5 - H. N. Savage, Councilmen J. J. Russo,  
Dr. C. E. Rees.
- " 6 - H. N. Savage, L. E. Dixon and E. H. Whipple.
- " 8 - L. H. Anderson, Forest Supervisor, and  
officials of his office.
- " 9 - H. N. Savage, Elmer J. Kennedy - municipal  
bonds.

MOVING BUILDINGS FROM SUTHERLAND:

Dismantling of buildings at Sutherland continued throughout the period. On January 4, crew was increased by addition of 4 laborers.

Clerk's house and Resident Engineer's house were completely dismantled and the Guest house about 95% dismantled. Hauling to El Capitan Dam site was not progressed as rapidly as might have been account unserviceability of City Truck #472.

Arrangements were made with the Purchasing Department to hire an outside truck for hauling salvaged material and houses from Sutherland to El Capitan.

The 3" water line leading from the water tank near the City camp to the pumping plant below the damsite was completely excavated ready to be cut up and salvaged.

Contemplated Work:

Continue dismantling and hauling buildings;  
Salvage water pipe and sewer pipe where practical.

Respectfully submitted,

H. N. Savage,  
Hydraulic Engineer.

HNS/p

cc Honorable Edward Hyatt, State Engineer  
cc Honorable W. H. Holmes, Assistant Deputy State Engineer

Encls. Photo Prints Nos. E.C. 8 & 12





12-30-31. C.S.D. El Capitan Dam. Clearing Streambed at Damsite.

E.C.-8.

3115



1-6-32. C.S.D. El Capitan Dam. Exploration Tunnel No. 5, South Abutment.

E.C.-12.

January 20, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Common Council  
of the City of San Diego, California.  
Subject: San Diego River Project, El Capitan Dam and Reservoir  
and Accessory Structures.

JANUARY - SECOND TEN DAY REPORT

**WEATHER:** Rain fell during the nights and forenoons of January 12 and 13. Rain fell most of January 15 and this was particularly heavy in the vicinity of the dam site and washed considerable material over the road. The river was flowing continuously to the amount of about 25 second feet but increased to about 40 second feet for a few hours following this rain. The flow decreased to about 10 second feet on January 20.

**ENGINEERING:** Topographic surveys at the dam site were continued in the vicinity of spillway and proposed location thru south abutment of outlet tunnel entrance and exit. The dam has been staked on the ground and marked on the south abutment with white water paint. Cross section along the axis of the dam is being taken and ties of the axis to the property lines has been made. Classification of clearing was continued into Chocolate Creek area. Soil samples from abutment areas have been taken and delivered to Mr. J. Y. Jewett.

**CLEARING:** All but two trees have been cut from the dam site and the brush and slashings burned to the east line of Section 7. Trees and brush have been cut from 85 acres in the northwest quarter of Section 8 and from 7 acres in the southwest corner of the northeast quarter of Section 8. About 4 acres of clearing was done on the County Road previous to stopping of this road work. Also 4 acres have been cleared at the City's El Capitan camp site, making a total to date of 48 acres 100 per cent cleared and 92 acres 75 per cent cleared.

**CITY CAMP:** The following materials have been hauled from the Sutherland camp to the El Capitan camp site. Guest house, office, resident engineer's house, clerk's house, water tank, 50 per cent of the water and sewer pipe and wash house. It is expected that all will be hauled by January 30. The wash house has been re-erected in which to store materials and tools. A road approach to the mess house site has been graded.

**COUNTY ROAD:** The County Board of Supervisors passed a resolution January 13 instructing that bids be invited for the construction of a 24-foot road between El Monte Park and El Capitan dam. Following this resolution the equipment with exception of the two power shovels was removed from the site of

the work. The two Watson power shovels are parked just above Cape Horn.

January 18 Mr. J. W. Cole and Mr. C. Richards, of County Surveyor's office, W. M. Bonham and Harold Wood inspected the road. January 19 a survey party under Mr. C. Richards began a road location survey at Cape Horn. On January 20, one-half mile had been located. Complete survey for road is being made by the County. The grade is to be at least 3 feet above high water marks of 1927 flood.

**EXPLORATION TUNNELS:** Exploration tunnel No. 4 driven at elevation 650 on the axis on the south abutment of the dam reached hard granite boulders and was stopped at 30.5 feet.

Work was begun on tunnel No. 6 at elevation 700 feet on the axis in the south abutment on January 20.

Tunnel No. 5 is being driven at elevation 566 into the south abutment 290 feet upstream from the axis of the dam and has progressed 41 feet thru alternate hard boulders and decomposed granite somewhat similar to formation old tunnel No. 1 in south abutment.

**FORCE:** An average daily force of 90 men was employed during the period.

**ACCIDENTS:** Dr. M. N. Carlile of Lakeside has treated 10 men during this ten day period; 5 men for poison oak infection; 1 for contusion of elbow; 1 contusion head; 1 contusion right foot; 1 sprained wrist and 1 laceration of right heel.

**WORK CONTEMPLATED DURING NEXT TEN DAYS:**

Complete burning of brush already cut south side of river in the west half of Section 8 and on the 7 acres in the northeast quarter of Section 8.  
Progress clearing of trees upstream;  
Continue exploration tunnels 5 and 6;  
Continue and complete hauling camp from Sutherland.

**VISITORS:** January 11 - Kerr Brothers and L. Atkinson,  
E. M. Moore, engineer from Saluda, N.C.  
January 13 - H. N. Savage  
January 18 - J. W. Cole and C. Richards, County  
Surveyor's office  
O. U. Miracle, Miracle Construction  
Company  
Carol Abbott, Water Works Supply  
Company

**MOVING BUILDINGS FROM SUTHERLAND:** Force was reduced to 8 men January 18. All buildings except the mess hall and garage have

been dismantled and about 95 per cent of the material has been moved to El Capitan. All sewer and water pipe has been salvaged and about 50 per cent moved to El Capitan. The men required to dismantle and move the mess hall and garage at Sutherland will move from Sutherland to Ramona January 25, 1932. Arrangements were made through the Purchasing Department to quarter these men at Kenilworth Inn in Ramona.

Work contemplated: Complete dismantling and moving from Sutherland to El Capitan. Start erection of buildings at El Capitan under direction of Engineer Wood.

Respectfully submitted,

H. N. Savage,  
Hydraulic Engineer

HNS/p

CC Honorable Edward Hyatt, State Engineer

CC Honorable W. H. Holmes, Assistant Deputy State Engineer

Encls. Photo Prints Nos. E.C. 24 & 25



1-22-32. C.S.D. El Capitan Dam site. Right or North Abutment.

E.C.-24.

3119



1-29-32. C.S.D. El Capitan Dam site. Left or South Abutment.

E.C.-25.

January 30, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Common Council  
of the City of San Diego, California.  
Subject: San Diego River Project, El Capitan Dam and Reservoir  
and Accessory Structures.

JANUARY - THIRD TEN DAY REPORT

**WEATHER:** Weather has been clear with frost in the mornings except January 27 and 30 when light rain fell in the forenoons. The San Diego River has been gradually decreasing in discharge from 10 second feet to about 3 second feet.

**FIELD ENGINEERING:** Topographic surveys at the dam site were continued to complete over the spillway area and proposed location thru south abutment of outlet tunnel entrance and exit. The cross sectioning of the dam site was begun on the coordinate system of 10 foot squares using the axis of the dam (center line of core wall) as base line east 5000 and its south end at elevation 766 as north 3000. The clearing classification was continued into the upper reservoir basin but was discontinued to carry on the cross sectioning at the dam site. One man has been engaged with the County survey parties to assist and report on this County road work.

**CLEARING:** Clearing has advanced easterly to the north and south center line of Section 8. This is complete with the exception of three trees cut but not burned. Seven acres in the southwest corner of the northeast quarter of Section 8 is cut over but not burned. A total of 157 acres have been cleared to date at a total cost of about \$47. per acre. During this period the clearing has been mostly in the heavy oaks, sycamore and cottonwood trees along both sides of the San Diego River in the south half of the northwest quarter of Section 8.

**CITY CAMP:** All materials have been hauled from Sutherland except one truck load. Mess house equipment and the remaining supplies were hauled to Chollas Heights for storage. Work on re-erection has consisted in unloading the trucks and piling the lumber and materials.

**COUNTY ROAD:** The County survey party under Mr. C. Richards completed the County road location survey on January 26. On January 22 a second party under Mr. R. Judson began cross sectioning the road and has progressed about one mile. No data on rates for equipment or men has been received from the County. Mr. Savage's letters of January 12 and 13 requesting this data were placed on file with the Board of Supervisors per minutes of said Board January 13.

**EXPLORATION TUNNELS:** Exploration tunnel No. 5 driven at elevation 566 into the south abutment, 290 feet upstream from the axis of the dam, has progressed a total of 56 feet thru alternate hard boulders and decomposed granite very similar to formation in tunnel No. 1 in south abutment.

Exploration tunnel 6 at elevation 700 feet on the axis in the south abutment was stopped at 40 feet in hard granite boulders.

Work preparatory to resumption of driving exploration tunnel No. 3, under the spillway location in the north abutment is under way. A trail was completed, portal timbering repaired and pipe line for air is being laid across the river.

**FORCE:** An average daily force of 87 men was employed during the period. An efficiency record of the crews is being kept for basis of comparison with work accomplished for each ten-day period as follows:

Efficiency percentage	December 23- January 10	Number of men	
		January 11-20	January 21-30
80 or better	12	4	5
70 to 80	8	10	20
60 to 70	25	26	18
under 60m	12	17	11

**ACCIDENTS:** Dr. M. N. Carlile of Lakeside has treated 50 cases during this period. 34 for poison oak and 16 for cuts, and contusions, eyes, etc. The first aid man has treated 14 poison oak cases and 25 minor cuts, contusions, eyes, etc., all under the direction of Dr. Carlile. Four cases of poison oak were treated by other physicians. No serious accidents occurred. Man with eye injured by twig last period has recovered.

**WORK CONTEMPLATED DURING NEXT TEN DAYS:**

- Continue the clearing of reservoir basin up San Diego River to north line Sections 8 and 9.
- Continue exploration tunnels 5 and 3.
- Complete hauling camp from Sutherland and erect office and dormitory buildings.

**VISITORS:**

- January 21 - F. D. Pybe
- " 22 - Mr. O'Shausenck, State Engineer's office
- " 23 - F. D. Pyle, D. W. Albert, P. Beermann
- " 25 - Malcolm Rogers, Curator San Diego Museum
- " 26 - J. W. Correll, Inspector
- " 27 - J. W. Wiley & Son, Rancher-Chocolate Creek, General Joseph E. Kuhn
- " 28 - W. E. Kier, contractor

H. N. Savage, Hydraulic Engineer, left San Diego January 14, for Washington, D.C., to collaborate in presenting the City of San Diego's application to the Bureau of Indian Affairs for 920 acres of additional reservoir lands in the Capitan Grande Indian Reservation, featuring obtaining the best terms that could be secured from the Office of Indian Affairs for the City of San Diego in the acquisition of the required lands. The Hydraulic Engineer was scheduled to leave Washington January 28, returning.

Respectfully submitted,

H. N. Savage,  
Hydraulic Engineer.

HNS/p

cc Honorable Edward Hyatt, State Engineer  
cc Honorable W. H. Holmes, Assistant Deputy State Engineer.

Encls. Photo Prints Nos. E.C. 26 & 27.





1-25-32. C.S.D. El Capitan Damsite. Looking Downstream.

E.C.26.

3123



1-25-32. C.S.D. El Capitan Damsite. Looking Upstream.

E.C.-27.

February 10, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Common Council  
of the City of San Diego, California.  
Subject: San Diego River Project, El Capitan Reservoir Dam  
Spillway and Outlet Works

FEBRUARY - FIRST TEN DAY REPORT

**WEATHER:** On February 1, heavy rain fell from 2 to 3 P.M. also all February 2 A.M. Chocolate Creek culvert and road crossing was washed out during the night of February 2. A slide and water near Mile 1.5 caused the road to be blocked and washed out at this point. Heavy rain also fell in the forenoon of February 8 and caused the river to rise 3.0 feet at the dam site. Heavy rains also fell during the night and at noon February 9. The river was flowing about 6000 second feet, the maximum during this winter. Both foot bridges and compressed air line were carried away by floating drift. The river was completely over the road near Mile 3/4.

**FIELD ENGINEERING:** Cross sectioning of the dam site has continued, working north from the south end of the axis. A total of about 15 per cent of this cross sectioning has been completed. A survey of the reservoir lands actually occupied or at some time occupied or cultivated has been made for lands below reservoir contour 235. Exploration tunnel 7, 190 feet downstream from the axis and in the south abutment, was staked.

**OFFICE ENGINEERING:** Drawings and specifications of the El Capitan dam showing the revisions as requested by the State Engineer were completed and forwarded on February 6 to the State Engineer, and to Regional Engineer of U. S. Forest Service, for approval. Computations of excavation quantities for cost estimate of road are being progressed.

**CLEARING:** Clearing of the reservoir basin has progressed upstream and during this period 22 acres of heavy clearing, 9 acres of medium clearing and 32 acres of light clearing, or a total of 63 acres were cleared, and 50 per cent burned. 249 trees were cut. A total of 220 acres has been cleared to date. 7.5 days were worked with an average of 44 men on this clearing.

The tool and first aid house was moved to a point just east of Chocolate Creek and a foot bridge constructed across Chocolate Creek and San Diego River on February 6.

Resolution No. 57956 passed by the Common Council on February 1, 1932, directs the Bureau of Water Development to furnish wood to all applicants who have obtained an order from the Adjutant of the Salvation Army, wood to be loaded and hauled by

the applicant. The Hydraulic Engineer is directed to make certain that no wood is delivered to any individual or firm who intends to sell same.

**CITY CAMP:** All materials have been hauled from the Sutherland Camp. The work on re-erection of the buildings is being progressed. The office, mess house and dormitory building foundations have been excavated and the office and dormitory are being completed.

**COUNTY ROAD:** The County Surveyor's two survey parties completed the location and cross section survey of the proposed new County road from El Monte Park easterly to intersection of proposed road over south abutment, on February 6. It is expected that plans and specifications for this work will be completed for the Board of Supervisors' meeting February 15, 1932.

**EXPLORATION TUNNELS:**

Work on exploration tunnel 5, 290 feet upstream from the axis and in the south abutment, was progressed a total of 90 feet and work was stopped on February 5.

Work on exploration tunnel 7, located in south abutment 190 feet downstream from the axis, was begun February 6, and has been advanced 10 feet.

Tunnel 3 under the proposed spillway has been continued an additional 17 feet making a total length of 124 feet.

Tunnel 1 near the axis of the south abutment has been cleaned out and was advanced 13 feet, making a total of 81 feet.

**FORCE:** An average daily force of 78 men was employed during the period.

**ACCIDENTS:** Dr. M. N. Carlile of Lakeside has treated 6 men for poison oak infection and 3 men for minor injuries. Mr. A. V. Thompson was badly burned February 8 on the hands and forearms while helping to prime the compressor motor. He is in Mercy Hospital under care of Dr. C. E. Rees. Mr. J. Goodpaster was burned on the right hand at the same time.

**WORK CONTEMPLATED DURING NEXT TEN DAYS:**

- Continue clearing of reservoir basin up San Diego River to south line of Indian Reservation.
- Continue exploration tunnels 3 and 7.
- Repair old road up west side Chocolate Creek for about one mile for use in clearing operations.
- Complete office and dormitory buildings at camp and erect mess house and begin installation of water tank and pipe lines.

VISITORS:

- February 3 - H. N. Savage, W. H. Holmes, Assistant Deputy State Engineer.
- " 4 - Geo. Nelson, Contractor, Seattle, Washington  
Paul Walcott, Surety Bonds, San Diego
- " 5 - C. O. Taylor, Adjutant Salvation Army,  
San Diego.

On February 10, Mayor W. W. Austin and the Hydraulic Engineer traveled to Los Angeles in response to an invitation from the State Engineer and had conference with State Engineer Edward Hyatt, Deputy State Engineer Geo. W. Hawley and Assistant Deputy State Engineer W. H. Holmes regarding the San Diego River Project, El Capitan Reservoir dam, spillway and outlet tower drawings and specifications.

Respectfully submitted,

H. N. Savage,  
Hydraulic Engineer.

HNS/p  
Encls.

Photo prints Nos. E.C. 30 and 31

VISITORS:

- February 3 - H. N. Savage, W. H. Holmes, Assistant Deputy State Engineer.
- " 4 - Geo. Nelson, Contractor, Seattle, Washington  
Paul Walcott, Surety Bonds, San Diego
- " 5 - C. O. Taylor, Adjutant Salvation Army,  
San Diego.

On February 10, Mayor W. W. Austin and the Hydraulic Engineer traveled to Los Angeles in response to an invitation from the State Engineer and had conference with State Engineer Edward Hyatt, Deputy State Engineer Geo. W. Hawley and Assistant Deputy State Engineer W. H. Holmes regarding the San Diego River Project, El Capitan Reservoir dam, spillway and outlet tower drawings and specifications.

Respectfully submitted,

H. N. Savage,  
Hydraulic Engineer.

HNS/p  
Encls.

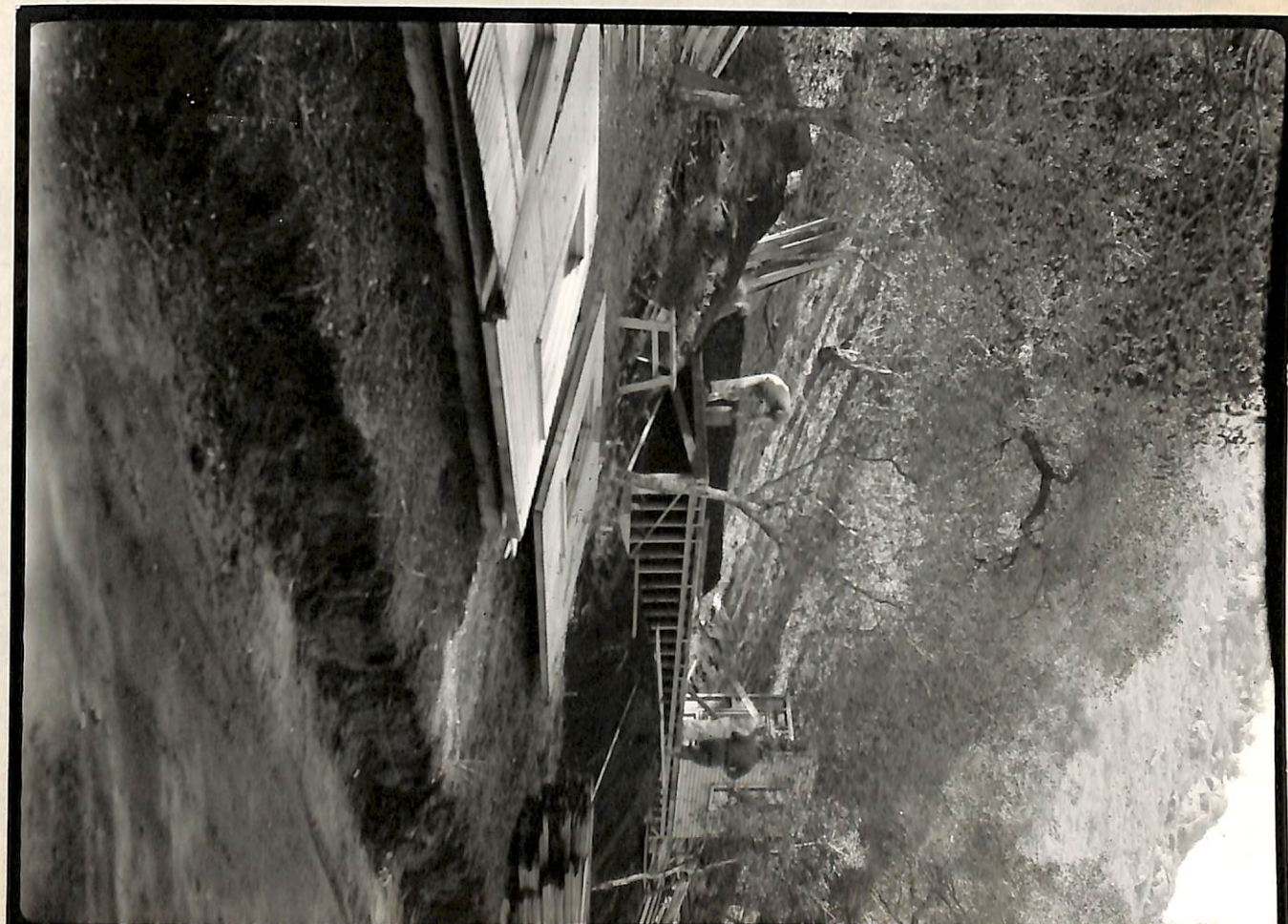
Photo prints Nos. E.C. 30 and 31



3127

2-2-32. C.S.D. El Capitan Dam site. Looking Downstream.

E.C.-30.



2-4-32. C.S.D. El Capitan Dam, Constructing Office Building, City Camp.

E.C.-31.

February 23, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Common Council  
of the City of San Diego, California.  
Subject: San Diego River Project, El Capitan Reservoir Dam  
Spillway and Outlet Works.

FEBRUARY - SECOND TEN DAY REPORT

**WEATHER:** The weather during this period has been wet. Rain fell on 4 days of the 8 days worked. Rain fell on February 13, and 15 most of these days. Heavy rains fell all February 16 A.M. and from 2 to 4 P.M. also on February 18 in the P.M. This rain has materially lowered the efficiency of the work and has necessitated very material road maintenance work.

**FIELD ENGINEERING:** Cross sectioning of the dam site has continued and the south abutment has been completed. One 4-man field party only has been engaged on this work during this period.

**OFFICE ENGINEERING:** Drawings for the outlet tunnel portal structures are being prepared. Data necessary for the surveys of United States public lands to be acquired outside the Capitan Grande Indian Reservation is being secured and assembled preparatory to the necessary field surveys.

**CLEARING:** Clearing of the reservoir basin has progressed upstream on south side of the San Diego River and into the east side of the Chocolate Creek basin. During this period 10 acres of heavy clearing, involving cutting of 227 trees, also 29 acres of medium clearing and 23 acres of light clearing, or a total of 62 acres of clearing accomplished this period, making a total of 282 acres cleared. Only 2 acres were burned over this period because of rain, but the brush and slashings on 25 acres has been piled. 7 days were worked with an average of 26 men on the clearing during the period.

To date only 5 orders for wood signed by C. O. Taylor, Adjutant of the Salvation Army, have been received by the City and filled.

A foot bridge across the San Diego River above Chocolate Creek and a foot bridge across Chocolate Creek were constructed. Trucks could not pass Chocolate Creek until February 19 due to the flow in this creek.

**CITY CAMP:** The office building is complete except for chimney spark arrester, electric fixtures and plumbing. The wash house, mess house and dormitory are complete except for plumbing, electric fixtures, interior finish and sheathing at base. Excavation for clerk's residence and resident engineer's residence complete. Excavation for water tank two-thirds complete.

COUNTY ROAD: No work done by County of San Diego forces in the field. The plans and specifications were reviewed by the resident engineer on February 20. They are in a partly finished state but will be completed and presented to the Board of Supervisors for action on February 23. City forces have installed 25 small pole or small pipe culverts and an average of 15 men have been employed this period on County road maintenance.

EXPLORATION TUNNELS:

No work has been done since February 5 on tunnel 5.

Work on tunnel 7 has been progressed 52 feet during this period making a total of 62 feet of tunnel and 6 feet open cut.

No work has been done in tunnel 3.

Tunnel 1 has been progressed 31 feet making a total of 112 feet.

A cable suspension bridge has been erected at the dam site to carry the air line and foot walk across the San Diego River.

The following table shows the total length of tunnels driven to date:

Tunnel No.	Length previous to 1932 feet	Length driven 1932 feet	Total Length feet
1	50	62	112
2	92	0	92
3	86	38	124
4	0	30	30
5	0	90	90
6	0	40	40
7	0	62	62
Totals	228	322	550

FORCE: Engineering force 7 men. An average daily force of 76 was employed during the period.

ACCIDENTS: Dr. M. N. Carlile of Lakeside treated 4 men for poison oak, and 3 men for minor injuries. The first aid man treated 2 men for poison oak and 7 men for minor injuries. A. V. Thompson, who was burned on the arms and hands on February 6, is still in Mercy Hospital. He had his left hand and arm out of bandages on February 17. He is recovering nicely according to reports received.



WORK CONTEMPLATED DURING NEXT TEN DAYS:

Continue clearing reservoir basin up both sides San Diego River to south line of the Capitan Grande Indian Reservation (north line Sections 8 and 9).

Continue exploration tunnels 1, 3 and 7 and begin tunnel 8 about 290 feet west of axis in north abutment.

Repair old road up west side Chocolate Creek for about one mile for use in clearing operations.

Complete office, dormitory, wash house and mess house buildings and begin clerk's and resident engineer's residences. Install water tank and begin laying water lines.

VISITORS: None.

Respectfully submitted,

H. N. Savage,  
Hydraulic Engineer.

HW/P

February 29, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Common Council  
of the City of San Diego, California  
Subject: San Diego River Project, El Capitan Feature

FEBRUARY - THIRD TEN DAY REPORT

WEATHER: The weather during this entire period has been clear. The San Diego River has been flowing about 200 second feet during this period.

FIELD ENGINEERING: One 4-man field party has been engaged on land surveys for application to the United States General Land Office for permanent use of lands in Sections 7, 8 and 5.

OFFICE ENGINEERING: Drawings for the inlet and exit portal structures for the outlet tunnel were completed and tracings delivered to State Engineer's office. These drawings and tracings for the dam and tunnel were approved and signed by the State Engineer on March 1, 1932 - Tracings WD-382 Plan, WD-383 Cross Section, and WD-390 Sheet 1 Outlet Tunnel Approach, Sheet 2 Outlet Tunnel Outlet.

CLEARING: Clearing of the reservoir basin has progressed upstream on both sides of the San Diego River to the east and west center line thru the north halves of Sections 8 and 9. During this period 15 acres of heavy clearing, involving cutting of 265 trees all over 18 inches in diameter, also 27 acres of medium clearing and 3 acres of light clearing, or a total of 45 acres of clearing was accomplished this period, making a total of 327 acres cleared. 33 acres of this period's clearing was burned and 80 acres remaining of the clearing of the previous clearing was burned.

Six days were worked with an average of 48 men during this period.

To date 21 orders for wood signed by C. O. Taylor Adjutant of the Salvation Army, have been received by the City and filled. 6 truck loads of wood have been delivered by the City truck to the Salvation Army's yard at 13th and G Streets.

There have been about 16 cords of wood removed and there remains about 4000 cords on the ground. This wood is drying and will be very difficult to split unless worked up soon. The trees on the north or right side of the San Diego River in Section 8 are being cut into 18 and 20 foot lengths instead of 6 to 8 foot lengths to facilitate future handling or piling for burning.

A road up the west side of Chocolate Creek has been reconstructed for about 3/4 mile.

CITY CAMP: No work has been done this period on completion of office building. The engineering materials and instruments were moved into this building on February 23. The erection of the dormitory has been completed and this building is done except for electric fixtures and paint. The mess house has been erected and the interior sheathing is being put on. No partitions are erected in this pending decision relative to this being used as mess or cottage. The resident engineer's residence - the rear half of the Sutherland guest house - has been erected and is about 50 per cent completed. The excavation for two other residences have been completed. Foundation for the water tank has been completed. An average of 14 men were engaged on this work this period.

COUNTY ROAD: The maintenance of the County Road by City forces was continued with an average of 6 men during this period. The County Surveyor presented drawings and specifications to the Board of Supervisors on February 29. The work involves about 44,500 cubic yards of excavation and 29 culverts ranging in size from 15 to 36 inches in diameter. The cost estimate made by the County was \$26,000. No official action was taken by the City or County.

EXPLORATION TUNNELS:

Tunnel 7 - in the west side of the south abutment has been progressed 32 feet during this period, making a total of 102 feet of tunnel.

Tunnel 8 - 290 feet west of the axis in the north abutment at elevation 577 feet was begun February 24 and has been progressed a total of 43 feet with 26 feet of open cut. This tunnel is in decomposed granite material similar to that in the lower original tunnel - tunnel 2 - in the north abutment.

Tunnel 3 - under the spillway has been progressed 25 feet to the line of the axis of the dam and then angled and progressed 6 feet in a northerly direction on line of the axis of the dam produced. This tunnel is in decomposed granite except that three hard boulders were encountered near the angle point.

The following table shows the total length of tunnels driven to date:

Tunnel No.	Length		Total length feet
	1932. feet	driven 1932. feet	
1	50	62	112
2	92	0	92
3	36	68	154
4	0	30	30
5	0	90	90
6	0	40	40
7	0	102	102
8	0	43	43

The average force on this work during this period was 13 men.

FORCE: Engineering force - 7 men.

An average daily force of 89 was employed during the period.

ACCIDENTS: Dr. M. N. Carlile of Lakeside treated 2 men for poison oak and 6 for minor injuries. The first aid man treated 4 men for poison oak and 2 for minor injuries. Mr. A. V. Thompson is recovering from burns received February 17 and is out of the hospital.

WORK CONTEMPLATED DURING NEXT TEN DAYS:

Continue clearing reservoir basin up both sides of San Diego River to south line of Indian Reservation (north line Sections 8 and 9, and proceed with clearing south of Chocolate Creek Siphon.

Continue and complete exploration tunnels 3 and 7 and continue tunnel 8.

Complete resident engineer's residence, mess house and clerk's residence and erect water tank and remove the excavated foundation material to the north side of the County Road.

VISITORS: None.

Respectfully submitted,

H. N. Savage,  
Hydraulic Engineer.

HW/p

cc State Engineer Edward Hyatt  
cc Assistant Deputy State Engineer W. H. Holmes

Enclosures:

Photo Prints Nos. E.C. 37 & 39



3-1-32. C.S.D. El Capitan Dam. Tunnel No. B.

E.C-37

3134



3-1-32. C.S.D. El Capitan Dam. Mess House and Resident Engineers House, City Camp. E.C.39.

March 10, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Common Council  
of the City of San Diego, California.  
Subject: San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

MARCH - FIRST TEN DAY REPORT

**WEATHER:** The weather has been clear during this entire period. The San Diego River has been flowing about 100 second feet on an average.

**FIELD ENGINEERING:** One 3-man field party has been engaged 3 days on surveys for application to the United States General Land Office for permanent use of lands in Section 5. One 4-man field party has been engaged 5 days and one 3-man field party 4 days on cross sectioning on the coordinate system at the dam site. The cross sectioning work is now about 50 per cent complete at the dam site.

**OFFICE ENGINEERING:** The printed drawings and specifications for the El Capitan Reservoir Dam, Spillway and Outlet Works were completed. Detail structural designs are being made for the dam and outlet works.

**CLEARING:** Clearing of the reservoir basin has progressed upstream on both sides of the San Diego River to the south boundary line of the Capitan Grande Indian Reservation. A road was completed up the west side of Chocolate Creek for transporting men and tools. Clearing was begun at the proposed road crossing the south end of the reservoir at Chocolate Creek. During this period 69 acres were cleared, involving cutting 410 trees on 38 acres of heavy clearing, 21 acres of medium clearing and 10 acres of light clearing, making a total to date of 396 acres. Burning was done on 56 acres. All slashings made by the survey and road crews along the County road were burned. About 2 acres were cleared to facilitate survey work at the south end of the reservoir at the proposed Chocolate Creek road crossing. Clearing was continued at the City's El Capitan camp. Nine days were worked with an average of 55 men and 1 team.

**CITY CAMP:** The office and dormitory are completed except for electric and plumbing fixtures. The clerk's residence was erected, wired, and the plumbing roughed in. The resident engineer's house had the plumbing roughed in, and the electric wiring done. The inspector's residence was erected, wired and roughed in for plumbing. The mess house has been ceiled and wired. No partition is being erected pending decision as to whether this will be used as a residence or a mess house. Materials for the water tank have been taken up the hill ready for erection. Electric light lines

between the building are being erected. Grading of the excavated material from the building sites is being moved by the team and slip into fill on the San Diego River side of the road, thus providing additional road width in front of the camp.

COUNTY ROAD: On March 8, Manager of Operation Gregory and Supervisor Leroy H. Aul inspected the County Road from Mile 1 to Cape Horn. Mr. Gregory said he was not in favor of spending any money on the County road. He was reluctant to have the City of San Diego assume any obligations in connection with a County road.

EXPLORATION TUNNELS:

Tunnel 7 - in the west side of south abutment has been progressed 27 feet during this period, making a total of 129 feet, all in decomposed granite. This tunnel is wet. There is an open cut of 6 feet.

Tunnel 8 - in the west side of the north abutment has been progressed 23 feet during this period, making a total of 66 feet. Some hard boulders were encountered the last two days but this is mostly thru decomposed granite. There are 27 feet of open cut.

Tunnel 3 - under the spillway has been completed to the axis of the dam and then northerly 50 feet on the line of the axis produced. This material was decomposed granite with the exception of about 6 boulders. The total length of tunnel is 174 feet.

Tunnel 9 - in the east side of the north abutment was completed with 15 feet of open cut and 14 feet of tunnel, all in decomposed granite.

Tunnel 2 - in the center of the lower portion of the north abutment has been cleared out and progressed 5 feet, making a total of 97 feet of tunnel and 11 feet of open cut.

The following table shows the total lengths of tunnels driven to date:

Tunnel No.	Length previous to 1932. Feet	Length driven 1932. Feet	Total length Feet
1	50	62	112
2	92	16	108
3	86	88	174
4	0	30	30
5	0	90	90
6	0	40	40
7	0	129	129
8	0	66	66
9	0	29	29

The average force on this work during this period was 15 men.

FORCE: Engineering force - 10 men. An average daily force of 97 men was employed during the period.

ACCIDENTS: Dr. M. N. Carlile of Lakeside treated 6 cases for poison oak, one case for snake bite, 6 for minor injuries. The first aid man treated 3 men for poison oak and 9 men for minor injuries.

WORK CONTEMPLATED DURING NEXT TEN DAYS:

Continue clearing reservoir basin in Chocolate Creek area south of Chocolate Creek Siphon.

Continue tunnels 5 and 7 and complete tunnels 8 and 2.

Complete carpenter work on camp buildings, plumbing installation and erect tank, lay 3-inch water pipe and complete disposal of excavated material along road.

VISITORS:

March

- 1 V. R. Dennis, V. D. Dennis Construction Company
- 4 W. H. Tolson  
Natt McDougall, Vice President and Secretary, and  
R. F. Hoffmark, Vice President, A. Guthrie & Company,  
Incorporated, contractors and engineers, St. Paul  
Portland.  
R. E. Hazard, President R. E. Hazard Contracting Company  
San Diego  
M. G. White, Bonds and Insurance, San Diego  
F. W. Stiefel, Chief Engineer, Rosoff Subway Construction  
Incorporated, 521 Fifth Avenue, New York  
Fred L. Souther, representative Southern Machinery  
Company, 666 State Street, San Diego  
Hilton Blackburn, Salesman for Ingersoll-Rand Company  
of California, 1460 East Fourth Street, Los Angeles
- 5 J. B. Bonny, Assistant District Manager, Morrison-  
Knudsen Company, General Contractors, Title Guaranty  
Building, 411 West 5th Street, Los Angeles  
Mason D. Pratt, Fidelity & Deposit Company,  
405 Montgomery Street, San Francisco  
R. B. Muir, visiting with Mr. Bonny - no official  
connection
- 7 H. Stanley Bent, Vice President Bent Bros. Inc.  
L. T. Grider, General Superintendent, Bent Bros. Inc.  
L. S. Oakes, President, Winston Bros. Company  
C. S. Whittaker, Vice President, Winston Bros. Co.  
F. C. Hillman, Engineer, Winston Bros. Company
- 8 City Manager of Operation, R. H. Gregory



## Visitors (Continued)

## March

9 Walter W. Austin, Mayor, City of San Diego  
G. F. Waterbury, Auditor and Controller, City of  
San Diego

Respectfully submitted

H. N. Savage,  
Hydraulic Engineer.

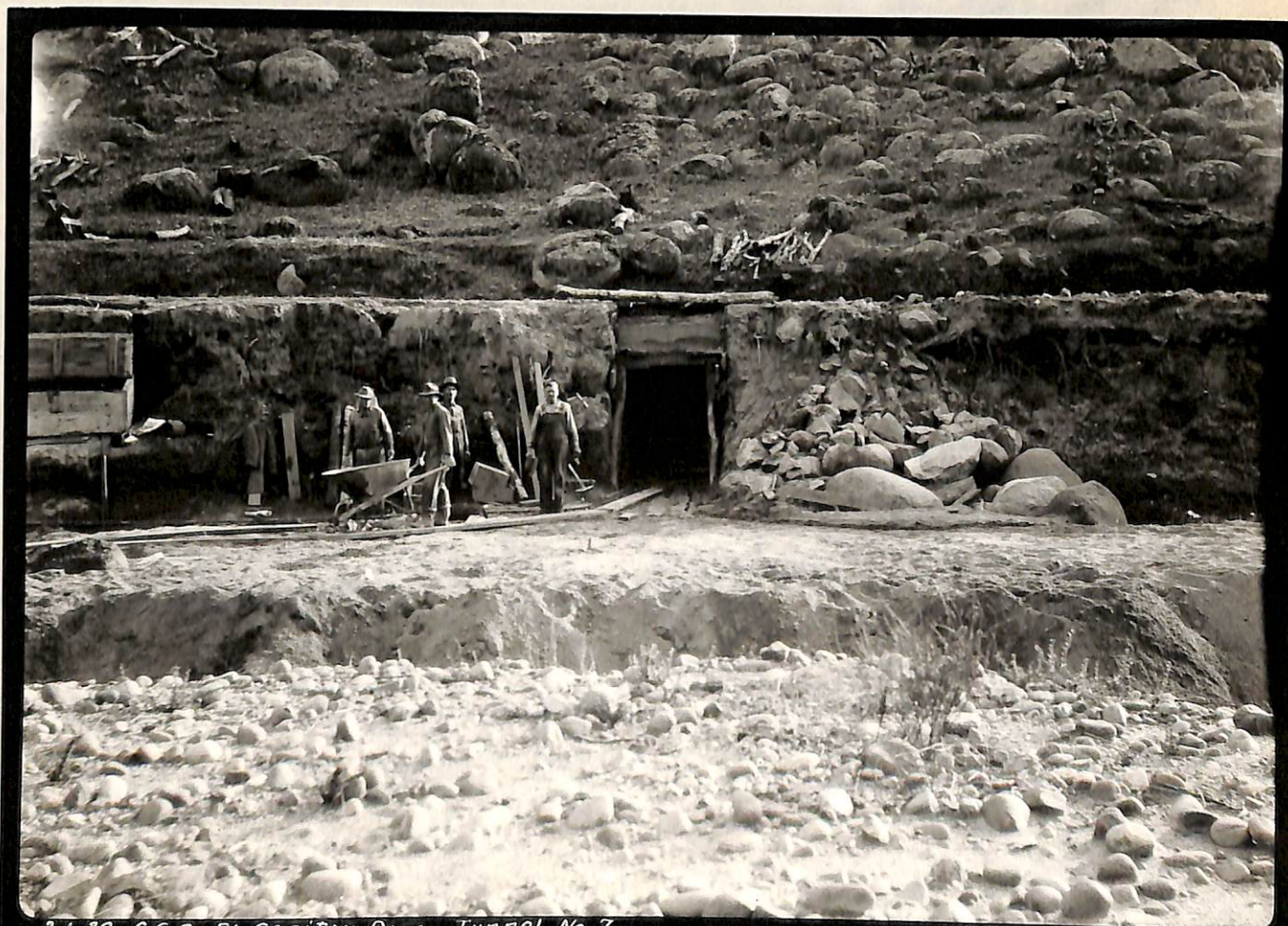
HNSp

Encl. Photo prints Nos. EC 34 & 35  
cc to Edward Hyatt, State Engineer  
cc W. H. Holmes, Assistant Deputy State Engineer



3-1-32. C.S.D. El Capitan Dam. Clearing Reservoir Basin, Looking up River from Chocolate Creek, E.C. 34

3189



3-1-32. C.S.D. El Capitan Dam. Tunnel No. 7.

E.C.-35

March 20, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Common Council  
of the City of San Diego, California.  
Subject: San Diego River Project, El Capitan Reservoir  
Dam Feature.

MARCH - SECOND TEN DAY REPORT

WEATHER:

The weather has been clear every day during this period except March 15 when some rain fell. The San Diego River has continued to flow about 100 second feet on an average. The rain brought it up 0.2 foot for a few hours.

FIELD ENGINEERING:

One 3-man field party has been engaged this period on surveys for application to the U. S. General Land Office for permanent use of lands in Section 5.

One 4-man field party and one 3-man field party have been engaged this period on cross sectioning on the coordinate system at the dam site. The cross sectioning at the dam site proper is now complete. The cross sectioning of the areas at the outlet tunnel entrance and exit, and the spillway remains to be cross sectioned.

OFFICE ENGINEERING:

Preliminary designs and comparative cost estimates based thereon for the outlet tower have been made. Tracings for right-of-way map for Chocolate Creek Road and for El Capitan Pipe Line are being prepared. Cost estimates for a 20-foot and a 12-foot food down Chocolate Creek have been made.

CLEARING:

Clearing of the reservoir basin has been progressed southerly up Chocolate Creek over the borrow pit area "B" and also some along the west side of Chocolate Creek.

On March 16 instructions were given to remove the scattered trees near Chocolate Creek road and syphon crossing, the grove of oaks left north of the road about 1/2 mile east of the dam site and complete the burning of existing piles of brush. The wood is to be hauled with the two trucks in the Salvation Army in San Diego each day.

There were 380 trees cut on 40 acres of heavy clearing. There were 10 acres of medium clearing and 21 acres of light

clearing making a total of 71 acres for the period, and a total of 467 since December 23, 1931. There remains 5 acres of the brush and slashings to burn.

Eight days were worked with an average of 44 men on the clearing. Eight loads of wood; about 12 cords, were hauled with City trucks.

CITY CAMP:

The resident Engineer's residence, clerk's residence and inspectors' residence are being completed. The water tank was erected and filled. The 3-inch water pipe lines are being welded and installed. The sewer trenches have been dug. The excess material from the excavations for buildings has been moved to widen the road in front of camp and the bank along the upper side of the road has been excavated about 3 feet. The plumber is completing the roughing in. Partitions are being erected in the mess house for rooms to make this into a cottage. An average of 24 men and one team were used on this work.

COUNTY ROAD:

No maintenance work has been done except two trips were made over the road between El Monte Park and Chocolate Creek with a drag behind the City's truck on March 15 after the morning rain. The shovel moved onto the work near El Monte Park was removed on March 18 by Mr. P. Watson.

EXPLORATION TUNNELS AND PITS:

Tunnel 1 was progressed 12 feet, making a total of 124 feet. Tunnel 2 was progressed 8 feet making a total of 116 feet. Some boulders were encountered. Tunnel 7 was progressed 20 feet making a total of 149 feet. All in decomposed granite, except for a few boulders just encountered. Tunnel 8 was progressed 9 feet making a total of 102 feet, all in decomposed granite with an occasional boulder. Tunnel 5 was progressed 19 feet making a total of 109 feet in granite with some decomposed granite seams. The following table shows the total lengths of tunnels driven to date:

Tunnel No.	Length previous to 1932. Feet	Length driven 1932. Feet	Total length Feet
1	50	74	124
2	92	24	116
3	86	117	193
4	0	30	30
5	0	109	109
6	0	40	40
7	0	149	149
8	0	102	102
9	0	29	29

All work on tunnels north of the San Diego River has been completed.

9 test pits are dug up the center of the gravel bar west of the San Diego River and north of Chocolate Creek.

2 test pits are being dug in the San Diego River bed material at the dam site, one downstream from the axis about 125 feet and the other about the same distance upstream from the axis.

FORCE:

Field engineering force - 10 men. An average daily force of 93 men was employed during the period.

ACCIDENTS:

Dr. M. N. Carlile of Lakeside treated 11 cases for poison oak, and 6 men for minor injuries. The first aid men treated 3 men for poison oak and 10 men for minor injuries.

VISITORS:

March

- 9 Frank J. Anderson, President Foley Construction Co.  
St. Paul, Minnesota, and his assistant H. E. Williams
- 11 D. W. Albert, Consulting Engineer  
Wm. P. Mahedy, representing State Compensation Insurance  
Fund of the State of California, New California  
Building, 1122 4th Street, San Diego, Telephone F1933  
Richard Smith, Secretary City Civil Service Commission
- 12 D. W. Albert, Consulting Engineer
- 14 D. W. Albert, Consulting Engineer
- 15 Mayor Walter W. Austin and Councilmen J.V. Alexander,  
L.C. Maire, J.J. Russo, Alfred Stahel, Jr. Ira S. Irey  
Hydraulic Engineer H. N. Savage  
R. W. Spencer, Civil Engineer  
Hoag & Collins, Contractors, Toledo, Ohio
- 18 C. R. Ross, President Ross Construction Company,  
Pasadena, California  
J. C. Greely, General Superintendent, Puget Sound  
Bridge and Dredging Company, Seattle, Washington
- 19 E. Hazard, Engineer for V.R. Dennis Construction  
Company, San Diego, and V.R. Dennis

WORK CONTEMPLATED DURING NEXT TEN DAYS:

Continue tunnels 1, 5 and 7.  
Complete carpenter, plumbing and electrical work on camp

Lay sewer pipe, test and cover water pipes, concrete  
the septic tank, and lay drain tiles.  
Continue hauling wood to Salvation Army yard.

Respectfully submitted,

H. N. Savage,  
Hydraulic Engineer.

HNS/p  
Encls. Photo prints EC 42 and 43



3-14-32. C.S.D. El Capitan Dam. Looking Upstream from Vicinity Damsite No. 1. EC-42.

3144



3-14-32. C.S.D. El Capitan Dam. Looking Downstream Material Area "A"

EC-43.

March 31, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Common Council  
of the City of San Diego, California  
Subject: San Diego River Project, El Capitan Reservoir Dam  
Spillway and Outlet Works.

MARCH - THIRD TEN DAY REPORT

WEATHER:

The weather has been clear during this entire period. The San Diego River flow has been gradually decreasing from about 100 to about 50 second feet.

FIELD ENGINEERING:

One 3-man field party was engaged two days this period on surveys for application to the U. S. General Land Office for permanent use of lands in Section 5. One 4-man field party and one 3-man party have been engaged this period on cross sectioning on the coordinate system at the dam site. The cross sectioning has been completed over the entrance and exit areas of the outlet tunnel and about 75 per cent of the spillway area. One 4-man field party was engaged seven days this period on location and property surveys for road down Chocolate Creek.

OFFICE ENGINEERING:

Designs for the outlet tower and reinforcing steel for the tunnel outlet details are being progressed. The cross section field notes for dam site are being checked and put on a map of scale 1 inch equals 50 feet. The calculations for the property surveys have been made.

CLEARING:

Work on actual clearing stopped March 17. 13 loads of wood amounting to about 20 cords have been hauled to the Salvation Army yard in San Diego this period. The tool house was moved to the City's El Capitan Camp and all tools and equipment delivered to Chollas Heights, except a few tools left for camp.

The clearing operations from December 23, 1931 to March 17, 1932, involved the cutting of 2676 trees classified as 60 per cent oak, 15 per cent cottonwood, 25 per cent sycamore, alder and willow. Trees over 6 inches only were counted. A total of 484 acres was cleared. 6 acres of brush and slashings remain to be burned - 5 acres near the south end of the clearing east of Chocolate Creek and 1 acre below the flume caretaker's residence on the west side of the creek.



CITY CAMP:

All 10 camp buildings have been advanced to completion with the exception of a little finishing work yet to be done. During this period the sewer system, septic tank and tile drains have been completed. The garage and one other house have been erected. The water mains have been welded, laid and tested. The distribution water pipes have been laid to all buildings. The spoil banks from the building excavations have been removed and material used to widen the road thru camp. Some rocks have been blasted to widen the road opposite the guest house. The buildings have been painted except the garage and one small house. All electrical work has been completed. The plumbing work is about 90 per cent complete. There remains the cleaning up, trail building and installation of water pump and connections.

COUNTY ROAD:

There has been no work done on the County road by either City or County forces this period.

EXPLORATION TUNNELS AND PITS:

A 4-day delay to exploration tunnel driving was occasioned by air compressor bearing trouble which occurred March 21. The repairs were completed and the compressor again started at noon March 25. 5 men from the tunnel crew were used at the camp on the septic tank and sewer system installation and 4 men were used to excavate the test pits in the San Diego River bed at the dam site. The compressorman A. V. Thompson, who was burned, returned to operate the compressor on March 28.

During this period tunnel 1 was progressed 1 foot, making a total of 125 feet; tunnel 5 progressed 20 feet in hard granite with narrow decomposed granite seams, making a total of 129 feet; tunnel 7 progressed 12 feet in harder material with decomposed granite seams making a total of 161 feet. The following table shows the total lengths of tunnels driven to date:

Tunnel No.	Length previous to 1932 Feet	Length driven 1932 Feet	Total Length Feet
1	50	75	125
2	92	24	116
3	86	117	193
4	0	30	30
5	0	129	129
6	0	40	40
7	0	161	161
8	0	102	102
9	0	29	29

Pipe has been relaid from the air compressor to tunnel 3 for resumption of driving this tunnel.

FORCE:

Field Engineering force - 11 men.

An average force of 40 men was employed during this period.

ACCIDENTS:

Three poison oak cases and 4 minor injuries were treated by Dr. M. N. Carlile of Lakeside.

VISITORS:

March

- 21 Hydraulic Engineer H. N. Savage and Testing Engineer J. Y. Jewett
- 22 J. M. Martin, Attorney, Ben Wells, General Superintendent, Geo. Leisher, E. A. Rowe, E. Hazard, Engineer, all of H. W. Rohl Company  
V. R. Dennis, George Pollock and John Gist
- 23 Ben Wells, Geo. Leisher and E. A. Rowe
- 24 Albert E. Deegan, The Giant Powder Company, Central Building, Los Angeles, and Norman E. Sears, The Giant Powder Company  
Mr. Hardin, Trojan Powder Company, Los Angeles  
Ed Fletcher Jr. Trojan Powder Company, San Diego  
Burr Prentice, President Smilge Gas Company, San Diego
- 25 W. H. Morrison, C. R. Shinn and J. B. Bonny of Morrison-Knudsen Company, Boise, Idaho  
Tom Connley, Contractor, San Francisco  
Hydraulic Engineer H. N. Savage
- 26 P. M. Mahedy, Representative State Compensation Insurance Fund
- 28 D. A. Daley, B. E. Barnhill and H. Liese, all of Foley Bros. Inc., St. Paul, Minnesota
- 29 H. E. Williams, P. J. Lowelling of V. Lawler-Maguire Company, Butte, Montana, with  
D. J. O'Rourke representing Worthington Company, Los Angeles
- 30 W. A. Johnson and W. E. Hall, of Hall-Johnson Paving Contractors, Los Angeles, with  
B. W. Belyea of Belyea Trucking Company, Los Angeles
- 31 W. L. McClune, Superintendent on Calaveras Dam, with  
A. V. Bechtel and J. F. Barber, Engineer of  
W. A. Bechtel Company  
H. W. English and M. A. Rose of Trinity Farm Construction Company, Dallas, Texas.

WORK CONTEMPLATED DURING NEXT TEN DAYS:

Continue tunnels 3, 5 and 7 as required.

Complete plumbing work and general cleaning up at camp.

Continue hauling wood to Salvation Army to the extent practicable.

Respectfully submitted,

H. N. Savage,  
Hydraulic Engineer.

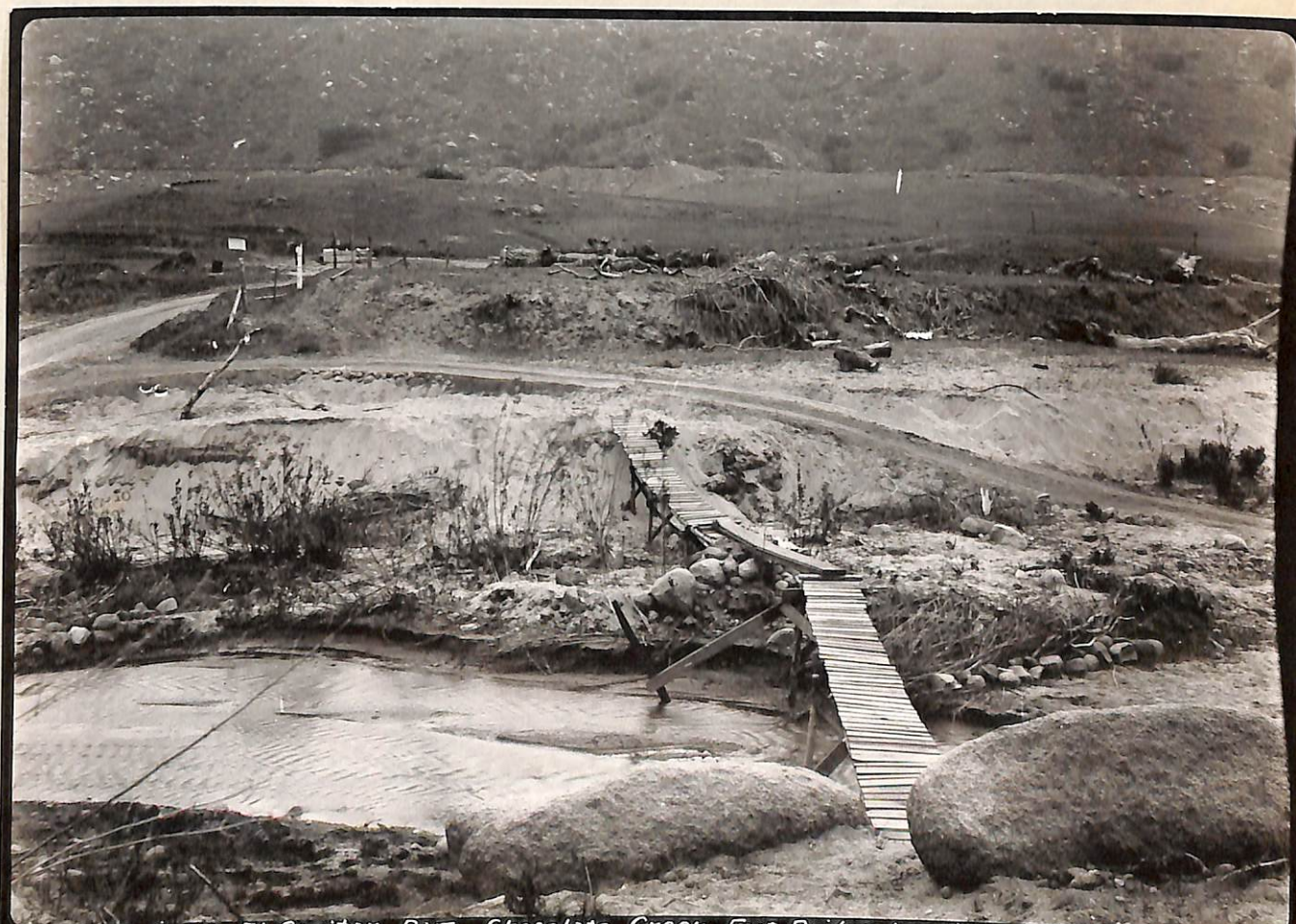
HNS/p  
Encls.  
Photograph prints Nos. EC 40 and 47



3-14-32. C.S.D. El Capitan Dam. City Camp.

EC-40.

3149



3-29-32. C.S.D. El Capitan Dam. Chocolate Creek Foot Bridge Looking EAST.

EC-47.

April 10, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Common Council  
of the City of San Diego, California  
Subject: San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

APRIL - FIRST TEN DAY REPORT

WEATHER:

The weather has been clear during the entire period. Flow of the San Diego River at the dam site has gradually decreased from about 50 second feet to about 30 second feet. A flow of 36 second feet was measured by F. E. Green, Hydrographer, on April 3.

FIELD ENGINEERING:

One 3-man and one 4-man field party have been engaged on cross sectioning on the coordinate system at the dam site. The work during this period has been mainly over the spillway cut area. One 4-man party has been engaged during this period on location and property surveys for road down Chocolate Creek. The field surveys for application to the United States General Land Office for permanent use of lands in Sections 7, 8 and 5 have been completed and the field notes delivered to the main office.

OFFICE ENGINEERING:

Designs for the outlet tower and reinforcing steel details are being progressed. Tracing and survey data for application to the United States General Land Office for permanent use of lands are being prepared. Tracings for the tabulation of the bids for construction El Capitan Dam and Accessory Structures have been prepared.

CLEARING:

No actual work by City forces has been done on clearing. Resolution 58253 by the Common Council, authorizing citizens of San Diego to take fallen wood from the reservoir basin above the dam and outside the Indian Reservation providing that one out of five loads be delivered to the Salvation Army, was passed April 4. There has been 96 loads amounting to about 84 cords hauled out since the passing of this resolution, and during the time that City forces have been at the work, of this amount 8 loads or 6-1/2 cords have been delivered to the Salvation Army. It is estimated that there are 6600 cords of wood remaining on the ground.

CITY CAMP:

During this period the widening of the road in front of the City Camp buildings has been completed. The painting of buildings and fire hose racks was completed. Cleaning up the grounds storing scrap lumber and completing interiors of the buildings has been continued to completion. The plumbing has been completed except in 3 buildings. All trenches for sewer and water lines have been backfilled.

COUNTY ROAD:

No work has been done on the County road between El Monte Park and Chocolate Creek by City or County forces, except that the road was widened in front of City camp buildings as part of the requirement to provide safe parking space for cars.

EXPLORATION TUNNELS AND PITS:

On April 4 work of driving tunnel 7 was discontinued at a total length of 168 feet to a point 6 feet from the side wall of the proposed outlet tunnel. This tunnel penetrated decomposed granite and boulders to within 29 feet of its face. The last 29 feet was in boulders.

On April 6 work on driving tunnel 5 was discontinued at a total length of 131 feet. The face is within 104 feet of the side of the proposed outlet tunnel.

On April 4 work was resumed on the driving of tunnel 3 and to date a total length of 228 feet has been driven as follows: 143 feet to an angle point on the line of the axis of the dam produced, thence along said line produced northerly 73 feet; thence angling to the right 25 degrees for 12 feet.

A cross cut in the ravine east of tunnel 3 portal at coordinates N 4540 - E 5380 was begun on April 9.

A total of 965 feet of exploration tunnels have been driven to date.

FORCE:

Field Engineering force 12 men. An average force of 28 men was employed during this period.

ACCIDENTS: - None.

VISITORS: April

1 L. E. Dixon, E. M. Whipple  
Mr. and Mrs. W. J. Bowen of San Diego  
C. F. Guthridge, Vice-President United Dredging  
Company, 325 Central Building, Los Angeles  
Captain W. J. Knight and F. H. Green of United  
Dredging Company

VISITORS: (Continued)

April

- 2 T. A. Allen, N. J. Gannon, E. L. Marsh, J. P. Gilmore, all of Sharp & Fellows Construction Company, 553 Central Building, Los Angeles
- 3 Hydraulic Engineer H. N. Savage  
L. M. Klauber, Manager San Diego Consolidated Gas & Electric Company  
Major General Joseph E. Kuhn  
H. Lawler and J. Q. Barlow of Utah Construction Co.
- 4 E. L. Marsh, T. A. Allen, N. J. Gannon and J. P. Gilmore, all of Sharp & Fellows Construction Co.  
Leo Butler, Vice-President, and Francis Butler Secretary, Northern States Construction Company, St. Paul, Minnesota.
- 6 James Spencer of James Spencer & Son Construction Company, Brownwood, Texas  
J. I. Hallett, Los Angeles and T. P. Lowelling, Los Angeles, associated with James Spencer & Son  
Chester Marliave, State Geologist  
Gerald McKinley, Associate Engineer of Dams, State Department of Public Works.
- 9 Members San Diego Section American Society Civil Engineers and visitors:
 

H. N. Savage	J. Y. Jewett
Captain D. C. Webb	F. Callender
Commodore A. B. Fry and Son	A. McCarty
Lieutenant A. D. Alexis	Lieutenant Commander
Fred D. Pyle	H. W. Johnson
Harold Wood	Lieutenant Commander
Paul Beermann	F. D. Bedell
W. H. Bectis	Lieutenant Commander
E. A. Ingham	H. S. Ervay
E. R. Lower	C. E. Grafton

Respectfully submitted,

H. N. Savage,  
Hydraulic Engineer.

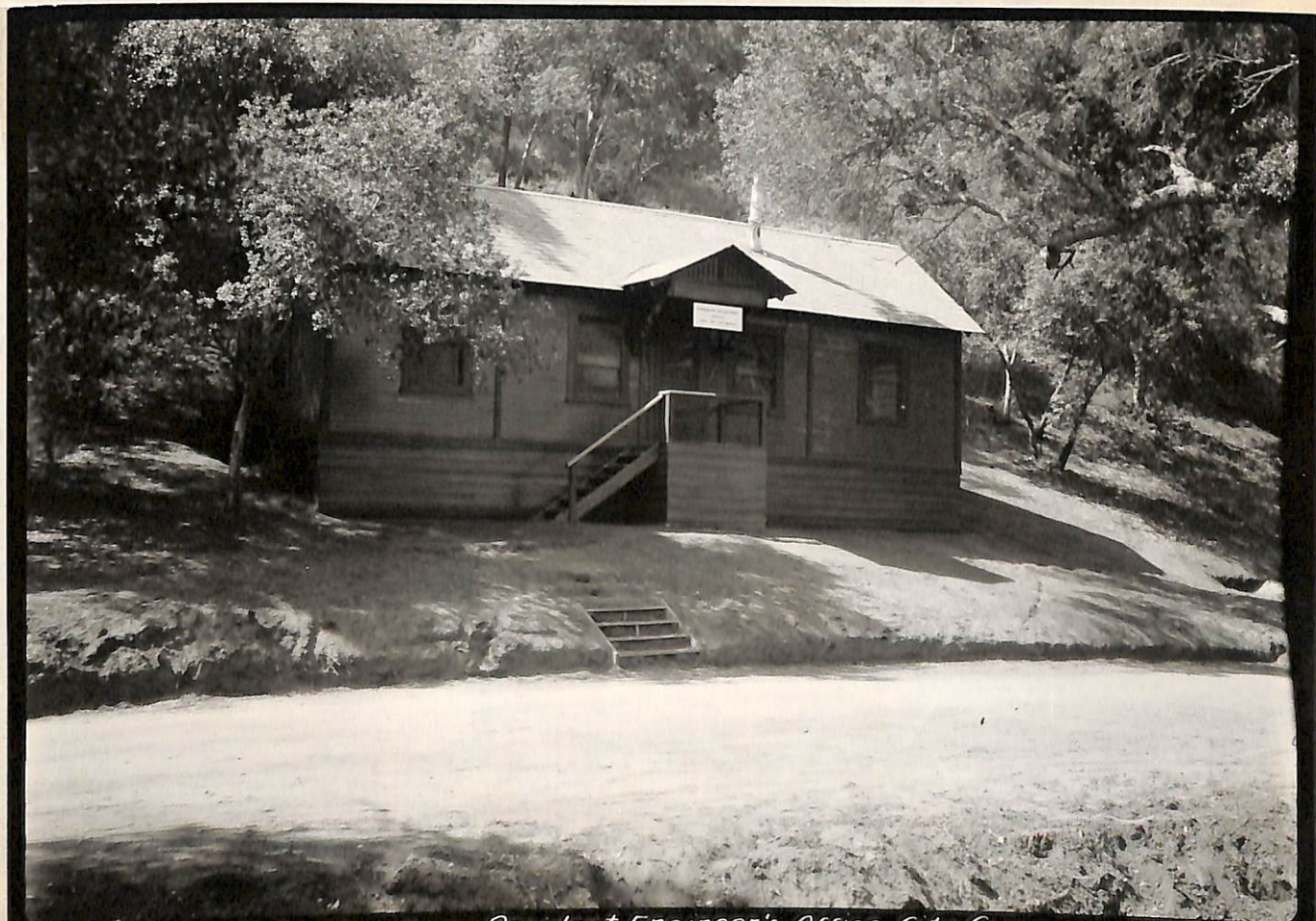
HNS/p  
Encls. Photo Prints EC 52 and 53



4-6-32. C.S.D. El Capitan Dam. Chocolate Creek Foot Bridge Looking North.

EG-52

3153



4-6-32. C.S.D. El Capitan Dam. Resident Engineer's Office, City Camp.

E.C-53



April 20, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Common Council  
of the City of San Diego, California  
Subject: San Diego River Project, El Capitan Reservoir, Dam Feature

APRIL - SECOND TEN DAY REPORT

WEATHER:

The weather has been clear during the entire period. Flow of the San Diego River at the dam site, during the period had gradually decreased to about 25 second feet.

FIELD ENGINEERING:

On April 15 the field forces were reduced by laying off all chainmen, to 5 men. The cross-sectioning on the coordinate system at damsite and over the spillway area has been completed. Permanent sights and monuments marking the axis of the dam (center line of core wall) berms, toe walls and the center lines of the two outer outlet tunnel tangents are being set. The property lines along Chocolate Creek from State Highway 80 to the reservoir basin have been run out and flagged in the field.

OFFICE ENGINEERING:

Right of way maps for road along Chocolate Creek and along the County road 389 between El Monte Park and the west boundary of City property near the City's camp, are being prepared. Maps to accompany the application to the United States General Land Office for permanent use of lands are being prepared. The five bids received for the construction of El Capitan reservoir dam, spillway and outlet works, on April 11, were reviewed and tabulated on tracings.

CLEARING:

There have been 215 loads of wood, or 175 cords hauled from the reservoir basin during the period, making a total to date of 311 loads or 259 cords. There has been a total of 29 loads or 24 cords delivered to the Salvation Army yard. The above record only covers wood removed from the reservoir basin between the hours of 8 A.M. and 4:30 P.M. on week days.

CITY CAMP:

The work on the City camp was completed on April 16. The watchman has been cleaning the windows, completing the trails and generally cleaning up the buildings and grounds.

COUNTY ROAD:

There has been no work done by either City or County forces on the County road between El Monte Park and the damsite.

EXPLORATION TUNNELS:

On April 19 work on driving exploration tunnels stopped with the completion of tunnel 3. The pipe, tools and runway planks are being removed and this tunnel cleaned up. The air compressor was returned to the City's Operating Department on April 16. There were 35 feet driven in tunnel 3 during this period. A total of 1035.5 feet of exploration tunnels with open cuts have been driven to date.

FORCE:

Field engineering force - 5 men. An average force of 16 men was employed during this period.

ACCIDENTS:

Laborer N. J. Velarde was treated April 16 for knee infection. One man was treated for gravel in ear.

VISITORS:

April 19 - Hydraulic Engineer H. N. Savage  
Councilman J. J. Russo

Respectfully submitted,

H. N. Savage,  
Hydraulic Engineer.

HNS/p  
Encl. Photoprint EC 54



4-15-32. C.S. D. El Capitan Dam. Removal of Wood by The Public.

EG-54.

3156

April 30, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Common Council  
of the City of San Diego, California.  
Subject: San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

APRIL - THIRD TEN DAY REPORT

WEATHER:

The weather has been clear during this period except for showers on April 25, 26, and 27. This rain increased the flow in the San Diego River at the damsite from about 25 second feet to a measured flow of 70 second feet on April 29. This flow has decreased to about 35 second feet at the end of the period.

FIELD ENGINEERING:

One field party of 3 men has been engaged on setting permanent monuments and metal targets for sights to mark the axis of the dam, the tangents for the toe walls and outer tangents of the outlet tunnel. One field party of 3 men has been engaged on final location of Chocolate Creek road.

OFFICE ENGINEERING:

Continued the progress on tracings of maps for application to the U. S. General Land Office. The field notes taken on the natural ground and referenced to the coordinate system are being tabulated, in field books. Outlet tower detail drawings are being progressed. Calculation of quantities for contractor's progress schedule were made.

TRAIL BUILDING:

There have been 5 men of the City force employed on building trails over the south abutment of the dam during this entire period. A trail was constructed up the south abutment and east of the proposed dam, also up the south abutment and just west of the proposed dam. About 1800 feet of a third trail, leading from a point on the County Road 389 about 700 feet east of the City's camp, has been constructed. This trail follows along near the alignment of the projected ultimate 6 per cent grade road over the south abutment.

CONTRACTORS BEGIN WORK:

On April 21 the Common Council awarded the contract for El Capitan Reservoir Dam, Spillway and Outlet Works to H. W. Fohl and T. E. Connolly. The first of the contractor's equipment arrived at Cape Horn on April 24. This consisted of 2 auto trucks, one 60 H.P.

tractor and one McMillan 4 cubic yard grader. On April 26 a 1-1/2 cubic yard gasoline shovel No. 6 arrived on the road near Pipe Line Mile 1.9.

COUNTY ROAD 389:

One air compressor and crew began at noon on April 27 drilling the rock at pipe line Mile 1.7. A crew began erecting drill sharpening equipment near pipe line Mile 2.0. The contractors erected a temporary tool house and timekeeper's office near the drill sharpening equipment.

On April 27, the gas shovel No. 6 began widening County Road 389 near Mile 1.9. This work has been carried on the remainder of the period by shooting down just enough material each day for the shovel to clean up by about 4 P.M., this leaving the road open and passable during the hours 4 P.M. to 8 A.M.

The contractor's third shovel, a Thew, arrived at Lakeside on April 30 and was being unloaded to take to the damsite. The contractor's force at the end of this period consisted of about 30 men in addition to force in other counties loading equipment for this work.

CITY FORCE:

An average force of 5 men has been employed on building the trails over the south abutment of the dam. The engineering force in the field has averaged 7 men. The caretaker at the City's camp has also been continuously employed making a total average City force of 13 men.

ACCIDENTS: No accidents to any City employees.

- VISITORS: April 24 - H. N. Savage, Hydraulic Engineer  
 John Brophy, Pacific Coast Metropolitan Life Insurance Company representative  
 Ben Wells, Superintendent for Rohl and Connolly
- " 25 - Chester Harritt, Manager La Mesa, Lemon Grove & Spring Valley Irrigation District  
 J. S. Wordie, friend of Mr. Harritt  
 Mr. Stevenson, U. S. Fire Warden
- " 27 - H. N. Savage, Hydraulic Engineer  
 S. P. McMullen, County Supervisor
- " 29 - H. N. Savage, Hydraulic Engineer  
 Jack Millan, City Treasurer
- " 30 - H. N. Savage, Hydraulic Engineer  
 J. M. Martin, Attorney for Rohl & Connolly

Respectfully Submitted,

H. N. Savage,  
Hydraulic Engineer.

HNS/P  
Encls. Photoprints Contractor's Outfit Arriving



4-24-32. C.S.D. El Capitan Dam. Contractor's Outfit Arriving.

3159



4-24-32. C.S.D. El Capitan Dam. El Monte Park.

May 10, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council  
of the City of San Diego, California  
Subject : San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

## MAY - FIRST TEN DAY PERIOD REPORT

**WEATHER:** The weather has been clear during this period except for showers on May 4 and 5. The flow in the San Diego River has averaged about 40 second feet for this period.

**FIELD ENGINEERING:** One five-man survey party has been engaged during this period on completion of setting permanent monuments. Permanent bench marks have been established. The outlet tunnel entrance and exit cuts have been staked. Reference points for the berms on the dam have been set.

**OFFICE ENGINEERING:** Development of the City's application for U. S. Public Lands has been continued. Reinforcing steel detailing of tunnel approach structures has been progressed. Tabulation of field data of original ground elevations at dam site has been continued.

**CITY FORCE WORK:** The trail to the top of south abutment of the dam, located along the 6 per cent road alignment, is 98 per cent completed. It is expected this work will be complete May 12. Four men have been engaged this period making a total of 10 men on City's work.

**CONTRACTOR'S OPERATIONS:** The contractor's shovel moved onto the work May 2, and began excavation on widening County Road 389 near pipe line Mile 1.2 and proceeded with necessary widening for its passage to the San Diego River crossing opposite Pipe Line Mile 0.4.

On May 4, four 24-inch diameter 30-foot corrugated iron culverts were placed in the river crossing and material from the north bank was excavated by the shovel and hauled in trucks for fill over these temporary culverts.

The road from the contractor's camp site on the north side of the river at the west edge of borrow pit area "C" was constructed and the camp site cleared with a grader and tractor.

The first four loads of lumber for the contractor's construction dormitory and mess camp arrived at the camp site on May 10. On May 9 the contractor started his survey party on a contour survey of the dam site. On May 6 clearing of the river bar along the north side of the river and west of the damsite was begun. This area is to be used for waste dump for spoil from outlet cut and tunnel and from downstream toe wall excavation.

5-10-32

**COUNTY ROAD 389:** The contractor has continued as extra work the joint widening of the County Road 389 between pipe line Mile 1.5 and 1.8 with the 1-1/2 cubic yard shovel No. 6. Upon completion of the contractor's river crossing at noon May 6, the shovel was moved to the County road and began widening between pipeline Mile 1.1 and 1.3. This shovel was moved on May 10 to pipeline Mile 1.0 and began road widening, progressing easterly. The drilling with 3 compressors and crews has continued in advance of the shovel operations and on May 10 two compressors and crews were at work opposite pipeline Mile 0.75. One compressor and crew has been engaged for two days on drilling at Cape Horn Point.

The grader and tractor after completing the contractor's camp and road on May 6, moved to County road 389 and began working at pipeline Mile 1.3 to 1.5 and from 1.6 to 1.8. The second grader and tractor was put to work on May 7 on leveling fill between pipeline Mile 1.0 to 1.3.

**CHOCOLATE CREEK ROAD:** The 1-1/2 cubic yard shovel No. 9 has been engaged during this entire period on excavating the Chocolate Creek public road from State Highway 80 working northerly from road mile 0.0 and has completed the excavation to road mile 0.30. A fill across the ravine northeast of Mr. J. W. Wiley's house was constructed over a 24-inch diameter 80-foot iron culvert. The grader and 60 H.P. tractor has been engaged since April 29 to 10 A.M. May 5 on excavating public road from San Diego River up Chocolate Creek 1-1/4 mile. The excavation on Chocolate Creek public road is now 68 per cent complete and should be completed about May 18.

**WORK CONTEMPLATED BY THE CONTRACTOR DURING NEXT TEN DAYS:**

Complete work on County Road 389 and Chocolate Creek Road.

Complete portion of dormitory and mess camp.

Begin excavation for stream diversion channel.

**ACCIDENTS:** No accidents to City forces.

**VISITORS:**

May 3 - H. N. Savage, Hydraulic Engineer  
P. P. Pine, San Diego Consolidated Gas & Electric Company.

" 5 - H. N. Savage,  
Councilmen A. W. Bennett and  
Dan Rossi

" 6 - H. N. Savage, Hydraulic Engineer  
Councilman J. J. Russe  
Chief of Police Scott  
Judge L. H. Turrentine - Superior Court Dept 5.  
John Snyder  
G. W. Hawley, Deputy State Engineer in Charge of Dams  
Gerald McKinley, Associate Engineer of Dams



5-10-32

## Visitors (continued)

May 7 - H. N. Savage, Hydraulic Engineer  
Councilman J. R. Blakiston

" 10 - H. N. Savage, Hydraulic Engineer  
E. D. Williams, Contract Construction Accountant  
G. F. Waterbury, Auditor and Controller, City

Respectfully submitted

H. N. Savage,  
Hydraulic Engineer.

HNS/p

Encl. Photoprints EC 73  
5-3-32, Road P.L.Mile 1-1/2

cc Edward Hyatt, State Engineer  
cc Gerald McKinley, Associate Engineer of Dams, Los Angeles.



4-30-32. C.S.D. El Capitan Dam. El Capitan - El Monte Park Road, Mile 1.6.

EC-73.

3163



5-3-32. C.S.D. El Capitan Dam - El Monte Park Road, P.L. Mile 1 1/2.

May 20, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council of the  
City of San Diego, California  
Subject : San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works

## MAY - SECOND TEN DAY PERIOD REPORT

**WEATHER:** The weather has been clear during this period. The San Diego River flow at the dam site has averaged about 15 second feet for this period. A flow of 15 second feet was measured on May 15.

**FIELD ENGINEERING:** One 5-man survey party has been engaged during this period on staking out inlet and exit portal structures to outlet tunnel. Topography of the spoil areas west of the dam and north of the river channel and east of the damsite has been taken. Two days were spent on a survey of the west line of Section 7 to conform to corners established by patents granted. One man has been engaged the last half of the period on computations in the field office.

**OFFICE ENGINEERING:** Development of the City's application for United States Public Lands has been continued. A topographic map of the dam site on a scale of 1 inch equals 50 feet with 5-foot contour intervals has been completed from the field notes.

**CITY FORCE WORK:** The trail to the top of the south abutment of the dam, located along the alignment of the projected 6 per cent grade road, has been completed. The tent houses remaining at Sutherland Camp were removed and from the lumber, 3 tent houses were erected at the west end of the City's El Capitan camp. Two signs are being made, one for the El Capitan road at Lakeside, and one for the Chocolate Creek road at State Highway 80.

**CONTRACTOR'S OPERATIONS:** Contractor's Camp Construction: Office mess house for 250 men, superintendent's and engineer's residence houses are nearing completion. Eight dormitory tent houses are under construction. Excavation for a septic tank at about the center of the dormitory area of the camp is nearly complete. Shovel and drilling crew improving contractor's road from river crossing to his camp. Hall Drilling Company drilling a well in river bar north of river and south of mess house.

**COUNTY ROAD 389 WIDENING:** The shovel work on County Road 389 is completed except between pipeline Mile 0.3 to Mile 1.0. A 2300 gallon tank truck, 30 caterpillar and road grader began blading road May 16. A 3 H.P. gasoline engine and 1-1/2 inch centrifugal pump was installed at the river bank opposite about pipeline Mile 1.0 to furnish water for the sprinkling of the road for blading work.

**CHOCOLATE CREEK ROAD CONSTRUCTION:** The shovel excavation on Chocolate Creek road from Wiley's Station at State Highway 80 to County Road 389 was completed May 18. An 8-foot span, 16 feet wide timber bridge was built over the Irrigation District's Chocolate Creek siphon on this road. 21 culverts are being installed on this road.

**POWER TRANSMISSION LINE CONSTRUCTION:** The San Diego Consolidated Gas and Electric Company has erected poles about 200 feet south of County Road 389 from Pipeline Mile 0.1 to Pipeline Mile 0.7 and wire has been strung on these poles. Pole holes are dug to Pipeline Mile 3.0. The erection forces are housed in a camp at El Monte Park.

**DAM CONSTRUCTION:**

**STRIPPING:** Stripping of stumps and surface vegetation from the river bed bar at the northerly end of the upstream toe wall excavation area was begun May 16 with the No. 6 shovel rigged with 1-1/2 cubic yard dragline bucket. The caterpillar 60 with grader also was used in this stripping.

**UPSTREAM TOE WALL:** On May 18 No. 6 dragline began excavation for the upstream toe wall. Excavation began south of the river and downstream of the toe wall and is being progressed southerly and to a depth to about elevation 547. Gravel and boulders are encountered with some stumps and roots in the top 7-foot layer. The excavated material is being hauled with trucks and deposited in the spoil area upstream from the toe wall and downstream from the entrance approach cut to the outlet tunnel.

**OUTLET TUNNEL ENTRANCE:** Shovel No. 9 after completing excavation for Chocolate Creek road began work May 19 on the entrance approach cut to the outlet tunnel. This shovel worked 2 shifts each on May 19 and 20 and removed about 4,000 cubic yards which was hauled in trucks and wasted along County Road 389 east of the entrance approach cut. The shifts are 5 A.M. to 1 P.M. and 1:30 P.M. to 9:30 A.M. The shovel has dug on elevation 574 feet and advanced to the entrance portal face. Some boulders have been encountered amounting to about 5 per cent of the excavation to date.

**WORK CONTEMPLATED BY THE CONTRACTOR DURING NEXT TEN DAYS:**

Upon completion of the contractor's road from the river crossing to his camp, the County Road 389 widening from pipeline Mile 0.7 to 0.3 will be continued and this road from Mile 0.3 (foot of 6 per cent road over south abutment) to El Monte Park will be completed and surfaced with decomposed granite.

Upon completion of culverts in Chocolate Creek road, this road will be bladed to crown. Roots and brush cleared along the upper cut side and culvert marker posts and mile posts set and the road completed.

Continue excavation for upstream toe wall and inlet approach to outlet tunnel.

Progress construction of contractor's camp, water supply, sewage system and shop building.

-3-

Two more power shovels will be put to work on the contractor's roads.

ACCIDENTS: There were no accidents to City forces. Two minor accidents to contractor's men.

## VISITORS:

- May 11 - H N Savage, Hydraulic Engineer  
L M Klauber  
Hugo Klauber
- " 12 - H W Rohl and T E Connolly  
Councilmen  
J J Russo  
Dan Rossi  
Lester Ready  
John M Martin
- " 14 - H N Savage, Hydraulic Engineer  
E D Williams, Construction Accountant City  
F H Stanley, Accountant, City
- " 18 - H N Savage, Hydraulic Engineer  
Walter Barnes, U S Employment Service  
Walter Dexter, Manager Standard Iron Works  
Mr. Ruggs, State Housing Inspector  
John Vogt, Superintendent Roads
- " 19 - H N Savage, Hydraulic Engineer  
John Boal, National City  
Ira S Ireys, former Councilman

Respectfully submitted

H. N. Savage,  
Hydraulic Engineer.

HNS/p

cc Edward Hyatt, State Engineer  
cc Gerald McKinlay, Senior Engineer of Dam Inspection

Encls. Photoprints EC 84, 85



5-19-32. G.S.D. El Capitan Dam. Upstream Toe Wall Excavation.

EG-84

3167



5-19-32. G.S.D. El Capitan Dam. Progress of Work Looking Downstream.

EG-85

May 31, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council  
of the City of San Diego, California  
Subject : San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works

## MAY - THIRD TEN DAY PERIOD REPORT

**WEATHER:** The weather has been clear during this period. The flow in the San Diego River at the damsite has averaged about 5 second feet.

**FIELD ENGINEERING:** One 5-man survey party has been engaged on extension of coordinate system of cross sections covering a strip 500 feet wide by 900 feet long, west of the downstream toe of the dam, and covering a strip 200 feet wide by 500 feet long, east of the upstream toe of the dam.

One party chief in the office made computations for monthly estimate No. 1. One party chief has been engaged on supervision of construction of Chocolate Creek Road and checking time of men and equipment. One man engaged since May 23 on inspection of excavation and stripping. One party chief has been listing contractor's equipment and supervising the construction of widening County Road El Monte Park-El Capitan damsite and checking time of men and equipment used. One man in the field office this period making and checking triangulations to permanent transit points and sights, calculating distances and angles for tunnel portal structures. Field office accounting system is being installed and records and reports being prepared.

**OFFICE ENGINEERING:** A detail topographic map of the El Capitan damsite has been completed and checked. Progress estimate No. 1 has been completed and checked. Tabulations of original ground elevations at damsite have been continued. Maps of right of way over private lands for Chocolate Creek road are in progress.

**CITY FORCE WORK:** The labor crew used on erection of the three tent houses were laid off on May 24. One carpenter has been engaged on completing these buildings and rearranging partition in field engineering office. Six road signs have been made and the required clearing and cleaning up around the tent houses accomplished.

**CONTRACTOR'S OPERATIONS:** The contractor has continued his camp construction and has completed concreting of two septic tanks. About 10 toilet fixtures and lavatories have been installed. Six more dormitory tent houses were erected, making a total of 14, each accomodating 6 men. A 50 x 100 foot machine shop is being erected. The electric lighting installation has been installed and is being supplied by electricity by the contractor's 1500 watt Kohler plant. The first meals were served at the mess house at noon May 26.

5-31-32

The contractor completed his road from the river crossing at the City's camp to his camp. A shovel, caterpillar and grader were started May 27, 1/4 mile east of the dam on excavation of a road along the north or right side of the river, working east from the dam. This road is for hauling concrete aggregates and borrow pit materials to the dam. Installation of 2 wye type electric driven air compressors was begun at a point due west of the exit portal of the outlet tunnel and at the grade of the old County Road.

#### DAM CONSTRUCTION:

Dragline No. 6 excavating for upstream toe wall. Three 5-yard autocar trucks with 60 H.P. caterpillar and grader are hauling spoil to east of the damsite.

Shovel No. 9 has excavated entrance cut to outlet tunnel down to within 11 feet of the invert grade. Two 10-yard and one 7-yard trucks are hauling spoil east of the cut and along County Road to the east.

Shovel No. 9 is now excavating the west cut to the outlet tunnel. Three trucks are hauling the spoil to a west dump adjacent to the County Road and west of the exit cut. This west dump is on a grade from an elevation of 11 feet above the west portal invert grade ascending in a westerly direction to a junction with the County Road.

The road thru the damsite was completed across the river and a 36-inch culvert is passing the river.

An 8-inch centrifugal pump with 60 H.P. gas engine has been installed and operating near the northwest corner of the upstream toe wall excavation unwatering the excavation and adjacent river bed fill.

CHOCOLATE CREEK ROAD CONSTRUCTION: The 21 culverts have been installed, the road leveled with grader and the road crowned with a road grader. Watering and compacting of the surface is under way with a small truck hauling water and a light drag and caterpillar. This road will be completed and ready for traffic in a few days.

COUNTY ROAD 389: The power shovel at pipeline Mile 1.6 completed excavation of decomposed granite for surfacing road on May 31. The other power shovel was moved to the road cut east of the City's camp and has been excavating material for completion of fills west of the City's camp west to El Monte Park, except for final blading. The excavation and blading will be completed June 2.

POWER COMPANY'S OPERATIONS: The Consolidated Gas & Electric Company made power connections so power was available on May 24. Power poles and new transmission copper has been installed by this Company from the compressor plant to El Monte pumping plant substation. A new substation is being erected at Lakeside and at the contractor's compressor plant. This work is being carried on from headquarters camp established at El Monte Park.



5-31-32

## WORK CONTEMPLATED DURING NEXT TEN DAYS:

Begin road along the north side of the river from the  
damsite to the quarry site.  
Complete powder house.  
Complete road up the right side of the river to the  
gravel bar.  
Extend camp and increase facilities therein.  
Begin culvert for river diversion installation  
Begin tunnel heading excavations.

ACCIDENTS: No accidents occurred.

## VISITORS:

May 21 - Gerald McKinlay, Senior Engineer of Dam Inspection  
State Department of Public Works  
Fred D. Pyle, Engineer Bureau of Water Development  
H. N. Savage, Hydraulic Engineer

" 24 - H. N. Savage, Hydraulic Engineer

" 29 - R. R. Bradley  
M. G. White, insurance

" 30 - H. N. Savage, Hydraulic Engineer.

Respectfully,

H. N. Savage,  
Hydraulic Engineer.

HNS/p

cc Edward Hyatt, State Engineer  
cc Gerald McKinlay, Senior Engineer of Dam Inspection

Encls. Photoprints EC 87 and 88



5-26-32. C.S.D. El Capitan Dam. Upstream end of Diversion Tunnel.

EC-87.

3171



5-26-32. C.S.D. El Capitan Dam. Upstream Toe Wall Excavation.

EC-88

June 10, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council  
of the City of San Diego, California  
Subject : San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

## JUNE - FIRST TEN DAY PERIOD REPORT

**WEATHER:** The weather has been clear during this period except for light showers on June 2, 3 and 4. The flow in the San Diego River at the damsite has averaged about 15 second feet for the period.

**FIELD ENGINEERING:** One 5-man survey party has been engaged on laying out the downstream toe wall and drains, setting permanent points at each end of the tunnel and extending the coordinate system of cross sections both upstream and downstream of the damsite to include spoil bank areas. The temporary diversion culvert thru the damsite has been located after being constructed. One man has been engaged in the field office on calculations of the coordinates of reference points which have been recently moved or reset to avoid contractor's plant.

**OFFICE ENGINEERING:** Additional contours with one foot intervals have been added to the topographic map of the damsite. Tabulations of original ground elevations at the damsite have been continued. Maps of right of way over private lands for Chocolate Creek road are being completed.

**CITY FORCE WORK:** One carpenter has been engaged on work about camp buildings. A partition was added to the house No. 11 occupied by U. S. Forest Service Fire Warden to satisfy State Housing requirements. Brush and slashings along the road at camp resulting from road construction have been disposed of. The caretaker has made permanent steel survey monuments and hand drill steel required by the survey forces.

**CONTRACTOR'S OPERATIONS:** The contractor has continued his camp construction by the addition of three dormitory tent houses, a septic tank to care for sewage from the office and engineer's residence. The machine shop has been completed, equipped and put into operation. The stock room, in which about \$10,000 worth of equipment parts will be stored, has been fitted up with bins and racks. Electric energy for lights and power for the camp was turned on June 9.

A double width truck road is 30 per cent complete from the damsite toward the quarry site. This road ascends in a westerly direction crossing along the north edge of borrow area "C". A road is being constructed easterly toward the borrow pits areas "A" and "B" from the concrete plant site, which is on the high bar north of the river and east of the damsite.

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The tunnel compressor plant with 2 compressor units and two 100 H.P. electric motors is about 95 per cent complete. Power lines are being erected by the contractor to furnish electric energy for lights and power for the entrance end of the tunnel and upstream toe wall. A 5 H.P. gasoline pumping plant was installed on the south bank of the river about 600 feet east of the upstream toe of the dam. This pumping plant supplies water for tunnel driving purposes from the river, thru a 2-inch pipeline to tanks on the south abutment. A 2-car capacity powder house has been completed about 1/4 mile north of the contractor's road river crossing.

#### DAM CONSTRUCTION:

Both entrance and exit cuts to outlet tunnel down to within 11 feet of the invert grade have been completed. The 10-foot by 12-foot top heading for the outlet tunnel was begun by the first shot at the exit portal on June 6. A mucking machine, pipe lines and track are being made ready at the exit portal cut and 3 square sets of 10-inch by 12-inch timbers have been set at the exit portal heading. The quarry road has been extended easterly thru the damsite along the north abutment at about elevation 575 to connect with the upstream spoil bank from the upstream toe wall excavation. The 8-inch centrifugal pump has been operated continuously to unwater the upstream toe wall excavation and adjacent river bed fill.

A 1-1/2 cubic yard dragline has continued on the stripping of the river bed area downstream from the cutoff wall and has been excavating for the downstream toe wall and rock fill. The spoil from this excavation is being wasted downstream of the damsite and north of the river. A 24-inch diameter corrugated diversion culvert 2180 feet long has been installed in the river bed adjacent to the foot of the south abutment. This culvert is for the diversion of the low flow of the river and for the pumped water from the excavations. The culvert entrance flow line is at elevation 560.8 and 1130 feet east of the axis of the dam. The exit flow line is at elevation 550.0 and 1480 feet west of the axis of the dam.

**CHOCOLATE CREEK ROAD:** The Chocolate Creek road has been completed and opened for traffic.

**COUNTY ROAD 389:** County Road 389 from El Monte Park to pipe line mile 0.34 or 900 feet east of the City's camp which is the foot of the future 6 per cent grade road over the south abutment of the dam, has been completed except for burning of brush and slashings which work is being done evenings after 6 P.M.

**POWER COMPANY'S OPERATIONS:** The Power Company's substations near the contractor's compressor plant and at Lakeside have been completed and the new power line between the two stations completed. Electric energy at 22,000 volts was turned on June 10. The electric energy service to the City's camp has been ordered in but the work not yet begun.

6-10-32

## WORK CONTEMPLATED BY THE CONTRACTOR DURING NEXT TEN DAYS:

Progress road to quarry.  
 Begin gravel washing, crushing and screening plant erection.  
 Extend camp and increase facilities therein.  
 Progress excavation for both toe walls.  
 Install electric driven pump to unwater toe wall excavations.  
 Continue driving and timbering outlet tunnel headings.

ACCIDENTS: No accidents except one badly mashed finger.

## VISITORS:

- June 4 - Councilman John R Blakiston  
 D W Albert, Consulting Engineer for contractors  
 arrived on the job.
- " 5 - W N Ballard, Engineer Rancho Santa Fe
- " 7 - Gerald McKinlay, Senior Engineer of Dam Inspection
- " 8 - Lawrence Klauber and party of Power Company officials  
 from San Diego and San Francisco
- " 9 - Henry Love, Reporter San Diego Union
- " 10 - H N Savage, Hydraulic Engineer  
 H H Esselstyne, City Manager  
 Major General Joseph E Kuhn  
 Newell Jones, Reporter San Diego Sun

Respectfully submitted,

H. N. Savage,  
 Hydraulic Engineer.

HNS/p

cc Edward Hyatt, State Engineer  
 cc Gerald McKinlay, Senior Engineer of Dam Inspection

Encls. Photoprints EC



6-7-32. C.S.D. El Capitan Dam. Contractor's Electrically Operated Tunnel Excavator. E.C.-95.

3175



6-7-32. C.S.D. El Capitan Dam. S.D. Cons. G & E. Co's. Transformer Station at Damsite. E.C.-97.

June 21, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council  
of the City of San Diego, California.  
Subject : San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works

## JUNE - SECOND TEN DAY REPORT

**WEATHER:** The weather has been clear during this period with increased temperature the last two days. The discharge of the San Diego River at the damsite has averaged about 10 second feet for the period.

**FIELD ENGINEERING:** One 5-man survey party has been engaged extending the coordinate cross sections on an area 800 feet long by 500 feet wide downstream from the downstream toe wall. Permanent points were set at the entrance and exit ends of the outlet tunnel headings. One man has been engaged in the field office on platting coordinate cross sections for the computations of schedule item quantities for the monthly estimate. Stakes have been set for the upstream ends of the drains under the downstream toe of the dam.

**OFFICE ENGINEERING:** Tracings of the concrete lining for the outlet tunnel and for the drains under the downstream toe of the dam are being progressed. Tracings of the reinforcing steel for the portal structures are also being progressed.

**CITY FORCE WORK:** One carpenter has been engaged about the camp buildings. A call bell has been installed from the resident engineer's office to the field drafting office. A double window has been cut into this office over the drafting table. The entrance has been rearranged to facilitate storage of survey stakes. An opening between the entrance way in the resident engineer's office and the accountant's office has been made. Steps have been built to two of the residences.

**CONTRACTOR'S OPERATIONS:** The contractor has continued his camp construction by the addition of dormitory tent houses, making a total of 22 dormitory tent houses. The double width truck road from the damsite westerly toward the quarry site is 50 per cent complete. Excavation for the newly selected site for the concrete plant is under way. This plant will be north of the borrow area "C". The road up the river to the gravel bar is completed. The electrically actuated air compressor plant has been completed and put into service. A second blacksmith shop for tunnel steel and drill repairs has been completed at the compressor plant. Power lines for electric energy about the damsite have been extended and flood lighting of the works was begun June 20 by lights on the north abutment. The upstream spoil bank has been fanned out northerly to join the road along the north abutment making this road passable thru the damsite at about elevation 575.

6-21-32

3177

**DAM CONSTRUCTION:**

**OUTLET TUNNEL:** Entrance portal: Two sets of 10-inch by 12-inch timbers have been set at the entrance portal and 11 feet of heading driven but no further work done pending arrival of the second mucking machine.

Exit portal: The exit portal timbered with square sets of 10-inch by 12-inch timbers, has been progressed for 67 feet. The mucking machine has been discharging since June 18 into 5-yard cars hauled by a gasoline locomotive. Previous to June 18 the tunnel muck was hauled in a 10-yard truck. The spoil from the exit portal is being wasted along the County road west of the outlet tunnel and south of the river.

**MASONRY TOE WALL EXCAVATION:** Upstream toe wall excavation has been progressed thru river bed gravels and sand to a maximum depth to elevation about 540, or 26 feet below the top of the river bed fill. A 5-inch electrically driven sinking pump has been erected and suspended by chain blocks from a timber tripod. This pump is used to unwater the excavation. Dragline No. 9 has been converted into a shovel and has continued the excavation.

Downstream toe wall excavation has been progressed thru river bed gravel and sand and a small lense about 18 inches thick of sandy clay to about elevation 544 at the deepest part or a maximum depth of about 17 feet. An 8-inch gasoline driven centrifugal pump and a 3-inch direct connected horizontal electrically driven pump, formerly at the upstream toe wall excavation, are being used to unwater this excavation.

The downstream end of the 24-inch diversion culvert has been extended about 100 feet by a wooden flume.

**STRIPPING FOUNDATION:** Dragline No. 10 has continued the stripping of the river bed between the toe wall excavations, removing all material containing vegetable matter, stumps and roots. Mr. Gerald McKinlay, Senior Engineer of Dam Inspection for the State, inspected the stripping work on June 20.

**COUNTY ROAD 389:** Burning of brush and slashings along the County road from the end of the road at pipeline mile 0.34 to El Monte Park or pipeline mile 0.2, has been completed. This road is now complete except for the installation of culverts which will be done later as required.

**SAN DIEGO CONSOLIDATED GAS & ELECTRIC COMPANY OPERATIONS:** The Company's construction camp was moved from El Monte Park on June 16 when the line work between the damsite and Lakeside was completed. Electric energy was installed in the City's camp on June 11.

**WORK CONTEMPLATED BY THE CONTRACTOR DURING THE NEXT TEN DAYS:** Progress road to the quarry; begin erection of gravel washing, crushing and screening plant; continue driving and timbering outlet tunnel portals; increase camp dormitory facilities.

**ACCIDENTS:** No accidents to life or property have occurred.



6-21-32

## VISITORS:

- June 11 - Fred D. Pyle, Executive Engineer Bureau of  
Water Development,  
P. Beermann, Senior Draftsman
- " 14 - H N Savage, Hydraulic Engineer  
Wm R Wheeler, Second Street, San Diego  
Gerald Ingle, 426 B Street, San Diego  
F M Lockwood, 1234 Upas Street, San Diego
- " 17 - H N Savage, Hydraulic Engineer  
Dr C E Rees  
Mr and Mrs John Martin, Attorney for contractors  
T E Connolly, contractor
- " 18 - Mr and Mrs H N Savage  
Mr and Mrs J Y Jewett
- " 19 - C G Clapp, superintendent Los Angeles County  
Flood Control San Gabriel Dam No. 2  
Mrs C G Clapp
- " 20 - H N Savage, Hydraulic Engineer  
Gerald McKinlay, Senior Engineer of Dam Inspection

Respectfully submitted,

H N Savage,  
Hydraulic Engineer.

HNS/p

cc Edward Hyatt, State Engineer  
cc Gerald McKinlay, Senior Engineer of Dam Inspection  
Encls. Photoprints ED 98 and 100



6-9-32. C.S.D. El Capitan Dam. Upstream end of Diversion Tunnel.

E.C.-98

3179



6-9-32. C.S.D. El Capitan Dam. Downstream End of Diversion Tunnel.

E.C.-100

June 30, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council  
of the City of San Diego, California.  
Subject : San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works

## JUNE - THIRD TEN DAY PERIOD REPORT

**WEATHER:** The weather has been clear during this period and slightly cooler than earlier in the month. The discharge of the San Diego River at the contractor's road crossing about 0.4 mile west of the damsite has gradually decreased to about one second foot at the end of the period.

**FIELD ENGINEERING:** One 5-man survey party has been engaged on extending the coordinate cross sections on the area west of the damsite. Stakes and flags for the upstream and downstream toe walls were set in the bottom of the excavations. Line and grade points were established in the tunnel headings. Surveys for the determination of quantities for the monthly estimate No. 2 were made and the quantities computed. The contract cost accounting was continued. Cross sections within the dam area are being platted.

**OFFICE ENGINEERING:** The reinforcing steel details for the outlet tunnel portal structures have been advanced. The drawing for the timbered tunnel section for the outlet tunnel has been completed. This drawing also shows the concrete lining within the timbered section. Drawings for the outlet tower details are being advanced.

**CITY FORCE WORK:** On June 22 two repair and maintenance men were added making 3 men. A single window and a double window were cut into the east end of the field engineering building No. 2. Installation of tent house dormitories is complete and the City's force laid off June 3.

**CONTRACTOR'S OPERATIONS:** The contractor has continued his camp construction by the addition of 4 tent houses, making a total of 26 dormitory tent houses each capable of housing 8 men, but now housing 7 men each. A 2-room emergency hospital building 12 feet by 24 feet has been erected in the contractor's camp north of the superintendent's cottage. No equipment has arrived as yet. The contractor's road between the dam and the quarry is about 90 per cent complete. The surfacing of this road with decomposed granite is about 75 per cent complete. Erection of the sand and gravel plant, located about one mile upstream from the dam, is about 75 per cent complete. Batteries of flood lights have been installed on each abutment of the dam and put into operation for illuminating the work at night. The contractor is hauling in two 3-1/2 cubic yard electric shovels for use in quarry. Excavation is being made north of borrow area "C" for erection of concrete plant.

6/30/32

**DAM CONSTRUCTION:**

**OUTLET TUNNEL:** The contractor is erecting an electric energy transformer station south of the entrance portal cut. A small powder house and cap house has all been erected here. A tunnel excavation machine, a locomotive and five 5-yard cars, rails, ties and timbers have been delivered to the entrance portal for a resumption of the entrance heading excavation. There has been no heading excavation done at the entrance end this period.

The exit heading has been advanced a total of 196 feet faced in hard granite. Timbering is being continued. An air operated ventilation fan and air conductor has been installed at the exit portal, also an air hoist for hauling cars into the heading.

**TOE WALL EXCAVATION:** Upstream toe wall excavation has been progressed thru riverbed gravels and sand, sandy clay and cemented gravel and boulders, and 5 feet into decomposed granite and boulders for the northerly 350 feet of the length of the toe wall. An automatic electric driven sump pump has been installed in this pit to replace the 5-inch sinking pump.

Downstream toe wall excavation has been progressed thru the same materials as the upstream toe wall. The area for the rockfill downstream of the toe wall is being cleared off preparatory to placing rockfill. The large boulders in the decomposed granite in this area are not being moved. An automatic sump pump has been substituted for the other pumps at this excavation for unwatering.

**STRIPPING FOUNDATION:** The stripping of the old river channel of all material containing vegetable matter has been completed. stripping of the river bed fill material under the puddle core area has been progressed full 125 feet in width from about 30 feet north of the toe of the slope of the south abutment northerly for about 150 feet and down into the cemented gravel to about elevation 545.

Both the toe wall excavation and the stripping of foundation were inspected by Geo. W. Hawley, Deputy State Engineer in Charge of Dams and Samuel A. Hart, Associate Engineer State Supervision of Dams, on June 23, 1932. Gerald McKinlay again inspected this work on June 30, 1932.

**WORK CONTEMPLATED BY THE CONTRACTOR DURING NEXT TEN DAYS:**

- Complete contractor's road to the rock quarry and assemble two electric shovels.
- Begin operation of sand and gravel plant.
- Increase camp dormitory facilities.
- Erect and put into operation the 1300 cubic foot compressor
- Put into operation three shifts tunnel driving machinery at entrance to outlet tunnel.
- Continue cleaning toe wall foundations and river bed stripping.

**ACCIDENTS:** One contractor's employee had a hand punctured by a bar. Two stitches were taken.

The contractor's organization has been in full operation during this month. The daily distribution of labor and equipment on the different units of construction have been lined out so that costs can be obtained. Contractor's daily labor distribution on the different units as kept by him are obtained but they do not cover the necessary segregation for unit cost accounting covered by the schedules in the specifications. Invoices for all materials, supplies, new equipment and repairs are being received from the contractor once a month.

The necessity for City forces gathering the daily distribution of labor and equipment on the different units of construction has been shown very conclusively the past month. The daily records received from the contractor show all dam area operations carried under one head - excavation, and include only labor - no equipment, but have material and repairs charged direct to this account. Camp construction also covers mess hall operations. No records kept of powder used on the different units.

The contractor's daily labor for the last 10 days averaged about 160 men daily.

Additional equipment received during this period:

- |                        |                  |
|------------------------|------------------|
| 1 8-ton locomotive     | 1 250 H.P. motor |
| 1 1300-foot compressor | 6 5-yard trucks  |

VISITORS:

- June 20 - H N Savage, Hydraulic Engineer  
Gerald McKinlay, Senior Engineer of Dam Inspection
- " 21 - H N Savage, Hydraulic Engineer  
Allen H Wright, City Clerk of San Diego  
Wm Stell, Mayor City of El Cajon  
MacArthur Yorton, Manager San Diego Club
- " 22 - Councilman J R Blakiston  
John Covert, Civil Engineer  
Messrs. Harper, Parker, Sauer
- " 23 - Geo W Hawley, Deputy State Engineer in Charge Dams  
Gerald McKinlay, Senior Engineer of Dam Inspection  
Samuel A Hart, Associate Engineer Division of Dams  
H Wolf, E H Dowell  
H N Savage, Hydraulic Engineer
- " 29 - H N Savage, Hydraulic Engineer  
Paul Edwards, Editor San Diego Sun  
Walter B Dexter, Manager Standard Iron Works  
F Kelly  
E C Eaton, Chief Engineer Los Angeles County  
Flood Control  
O C Heitman, San Diego Labor Commissioner

6/30/32

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Visitors (continued)

June 30 - H N Savage, Hydraulic Engineer  
Gerald McKinlay, Senior Engineer of Dam Inspection  
E C Eaton, Chief Engineer Los Angeles County  
Flood Control  
Dr C E Rees  
Dr J W Ravenscroft  
Fred D Pyle, Engineer Division Water Development  
and Conservation

Respectfully submitted,

H. N. Savage,  
Hydraulic Engineer.

HNS/p

cc Edward Hyatt, State Engineer  
cc Gerald McKinlay, Senior Engineer of Dam Inspection

Encls. Photoprints EC



3184



6-25-32 G.S.D. El Capitan Dam. Assembling Sand and Gravel Recovery Plant. Eg-105.

July 10, 1932

From : Hydraulic Engineer

To : The Honorable, the Mayor and Council of the  
City of San Diego, California

Subject : San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

## JULY - FIRST TEN DAY PERIOD REPORT

**WEATHER:** The weather has been clear during this period. The discharge of the San Diego River at the contractor's road crossing about 0.4 mile west of the damsite has been about one second foot for this period.

**FIELD ENGINEERING:** One 5-man survey party has been engaged on laying out the excavation work being carried on in the river bed. Slope stakes were reset for the puddle core excavation and for downstream toe of the rock fill at the downstream toe of the dam. Permanent monuments were set for line and elevation in the exit heading of the outlet tunnel. Stakes were also set for the downstream toe wall and for the cutoff trench for the upstream toe wall. Profiles were run in both toe wall excavations to establish the top of the decomposed granite and the bottom of the excavations. The center lines of the three drains were established and the slope stakes for the excavations for these drains were set.

**OFFICE ENGINEERING:** Two men have been engaged three days on establishing coordinates for dam abutment contact line. One man has been engaged during this period on coordinate system cross sections for estimating schedule item quantities, also on calculation of quantities involved in stripping river bed under rock embankment. Detail drawings for the outlet tunnel plugs and outlet tower are being progressed.

**CITY FORCE WORK:** There have been no repair and maintenance men employed at the camp during this period. All such work is now being done by the caretaker in addition to the blacksmithing required for the survey party.

**CONTRACTOR'S OPERATIONS:** The contractor has continued his camp construction by the addition of three tent houses, making a total of 29 dormitory tent houses, each capable of housing 8 men but now housing 7 men each. The emergency hospital has been equipped. Dr. J. W. Ravenscroft is in charge as resident doctor. He arrived July 7. The road between the dam and the quarry has been excavated to the quarry and surfaced to within about 1000 feet of the lower quarry floor level. The two electric 3-1/2 yard shovels for the quarry are being assembled.

The installation of the sand and gravel plant has continued. The plant has been run without material for a trial. One 60 H.P. one 75 H.P. and one 185 H.P. gasoline engines have been erected to drive this plant. The plant represents an investment of about \$30,000.

The contractor's force on the job averaged about 170 men.



DAM CONSTRUCTION:

FLOOD BYPASS TUNNEL: Entrance heading: The contractor resumed the driving of the entrance heading of the outlet tunnel on July 1 with one shift. July 6 two shifts were put to work here. The entrance heading has advanced a total of 48 feet.

Exit heading: The exit heading has been advanced a total of 271 feet. The City's exploration tunnel 7 was extended by the contractor to connect with bypass tunnel for ventilation purposes. The exit heading is being widened out for room for side track at this point. The rock in the exit heading is sufficiently hard so that the last 72 feet has not required timbering.

Three 150 KVA - 2400 volt transformers have been installed at the compressor plant to replace the 6 small ones. The 1200 cubic foot compressor and its 200 H.P. motor have been installed and housed.

TOE WALL EXCAVATION: Excavation for the upstream toe wall has been progressed down into the decomposed granite about 8 feet along the bottom portion. This excavation is now ready for final hand trimming which will be done just in advance of the concreting. The excavations at either end of this toe wall will be carried on with air tools and hand mucking into skips.

Excavation for the downstream toe wall has been progressed down into decomposed granite about 4 feet. The cutoff trench below the wall and the toe trench at the downstream toe of the rock embankment remain to be excavated. The extreme south end has not been completed. Excavation for the three drains was begun July 8.

STRIPPING FOUNDATION: The stripping of the river bed fill material under the puddle core area has been progressed full width downward and northerly from the toe of the slope of the south abutment. This excavation has now progressed into decomposed granite at its south end. The foundation excavations were inspected on July 10, 1932 by Deputy State Engineer Geo. W. Hawley, Senior Engineer of Dam Inspection Gerald McKinlay, and State Geologist Chester Marliave.

WORK CONTEMPLATED BY THE CONTRACTOR DURING NEXT TEN DAYS:

- Complete and put into operation the sand and gravel plant.
- Continue the assembly of the two electric shovels.
- Extend the camp and dormitory facilities.
- Continue foundation and stripping and
- Begin quarry operations.

ACCIDENTS: No accidents occurred to the contractor's nor to the City's forces.

VISITORS:

July 2 - J. Y. Jewett, Testing Engineer City of San Diego

" 3 - D B Gumensky, Engineer Metropolitan Water District of Southern California

7/10/32

## Visitors (continued)

- July 5 - H N Savage, Hydraulic Engineer  
 A G Rogers, Editor  
 Ed Cormack  
 J Goodpaster
- " 6 - H N Savage, Hydraulic Engineer  
 A J Lee, Attorney  
 M D Fowler, with San Diego Consolidated Gas & Electric  
 Company
- " 9 - H N Savage, Hydraulic Engineer  
 John F Forward, Mayor City of San Diego  
 Mrs. John F Forward  
 Mrs. H. B Day
- " 10 - Fred D Pyle and P Beermann, Engineers Division of  
 Development and Conservation, Water Department  
 J Y Jewett, Testing Engineer, City of San Diego  
 Geo W Hawley, Deputy State Engineer in Charge of Dams  
 Chester Marliave, State Geologist  
 Gerald McKinlay, Senior Engineer of Dam Inspection

Respectfully submitted,

H. N. Savage,  
 Hydraulic Engineer.

HNS/p

cc Edward Hyatt, State Engineer  
 cc Gerald McKinlay, Senior Engineer of Dam Inspection

Encls. Photoprints NC



7-30-32. C.S.D. El Capitan Dam. Upstream Toe Wall Excavation Looking Northerly. EG-111.

3188



7-1-32. C.S.D. El Capitan Dam. Core Wall and Puddle Core Excavation Looking Southerly. EG-112.

July 21, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council  
of the City of San Diego, California  
Subject : San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

## JULY - SECOND TEN DAY PERIOD REPORT

**WEATHER:** The weather has been clear during this period. The discharge of the San Diego River at the contractor's road crossing about 0.4 mile west of the damsite, has decreased to about 0.5 second feet this period.

**FIELD ENGINEERING:** One 5-man survey party has been engaged on triangulation and setting points to establish coordinate system of cross sectioning on borrow pit areas "A" and "B". Finishing stakes for the excavations for the drains were set. Measurements were made on the decomposed granite in the bottom of the puddle core area below the river bed and slope stakes for this work were reset below elevation 565. Stakes for the stripping of the rock fill foundation areas both upstream and downstream are being set as this work progresses. Permanent points for line and grade in the outlet tunnel heading drifts have been set as the work progresses.

**OFFICE ENGINEERING:** Three men have been engaged this period on the cross sections for estimating schedule item quantities, also on quantity calculations for earth fill graphs showing anticipated progress of building hydraulic fill. Detail drawings for the outlet tunnel plugs and outlet tower are being progressed.

**CONTRACTOR'S OPERATIONS:** The contractor is continuing his camp construction by the addition of four tent houses making a total of 29 tent houses, capacity 8 men each. A three room residence is also being erected just west of the contractor's field office and between his camp road and the river.

The contractor's road to the rock quarry site has been excavated and surfaced.

The erection of the two electric shovels has progressed and one shovel has been completely assembled and equipped with a 2-cubic yard bucket which is in stock.

The sand and gravel plant was operated on a trial run with material and produced a good grade of sand and gravel for concrete aggregate. The road from the gravel plant is being extended westerly to about the location selected for the concrete mixing plant which is on the north or right side of the river about 600 feet upstream from the dam. The concrete plant is being erected including steel frame and steel bunkers.

The contractor's force on the job averaged about 180 men per day for this period.

DAM CONSTRUCTION:

OUTLET TUNNEL: The two headings of the outlet tunnel have been driven a total of 534 feet or 45 per cent of the total length. The two ends of the tunnel are being progressed each with three shifts.

The exit heading has been advanced 165 feet beyond the timbering as the rock encountered is sufficiently hard to require no timbering.

The final air and water piping and electrical connections are being completed on the 1200 cubic foot compressor.

TOE WALL EXCAVATION: No excavation on the toe wall trenches has been done this period.

EXCAVATION FOR DRAINS: Excavation for the three downstream drains has been completed into decomposed granite and boulders and is now ready to be finally trimmed up by hand.

STRIPPING FOUNDATION: The stripping of the river bed fill material under the puddle core area has been progressed northerly to about the center of the stream bed width. On July 14 shovel No. 9 was taken upstream to begin stripping in the river bed under rock fill area above elevation 550. On July 13 shovel No. 8 began stripping in the river bed under rock fill area between the downstream drains and east of these drains and above elevation 546. A third shovel, No. 6, was started July 15 on stripping under the rock fill area downstream from the upstream toe wall and above elevation 550. On July 11 shovel No. 7 was put to stripping along the toe of the south abutment above elevation 570. All this stripping has continued until the end of this period.

WORK CONTEMPLATED BY THE CONTRACTOR DURING NEXT TEN DAYS:

- Continue the operation of sand and gravel plant.
- Continue assembly of two electric shovels.
- Extend camp and dormitory facilities.
- Continue outlet tunnel driving.
- Continue foundation stripping under rock fill and puddle core areas.
- Continue concrete plant erection.

ACCIDENTS: Dr. J. W. Ravenscroft in charge of the contractor's emergency hospital reports that there were no serious accidents this period. Only minor cuts, bruises and sprains occurred during this period.

VISITORS:

- July 11 - H H Savage, Hydraulic Engineer  
Patrick Francis O'Rourke
- " 14 - H H Savage, Hydraulic Engineer  
Major General Joseph E Kuhn  
Harry Warburton, Realtor

Visitors (continued)

- July 15 - A J Lee, Attorney La Mesa, Lemon Grove & Spring Valley Irrigation District  
Mrs A J Lee  
W D Wagner, President Association of Irrigation Districts of California
- " 17 - H N Savage, Hydraulic Engineer  
Ross White, Construction Engineer, City of Pasadena  
Mrs and Miss White
- " 19 - H N Savage, Hydraulic Engineer  
Don Stewart, Ex-Common Councilman City of San Diego  
Henry Love, Union Reporter  
Professor W T Skilling, State College  
Major General Joseph E Kuhn  
Lester G Bradley  
Harry T Bishop
- " 20 - W H Holmes, Assistant Deputy State Engineer in charge of Dams  
W L Wright, San Diego Union  
W H Waine, Associated Press  
John Yateman, Hydraulic Engineer United Iron Works of Oakland, California.

Respectfully submitted

H. N. Savage,  
Hydraulic Engineer.

HNS/p

cc Edward Hyatt, State Engineer  
cc Gerald McKinlay, Senior Engineer of Dam Inspection

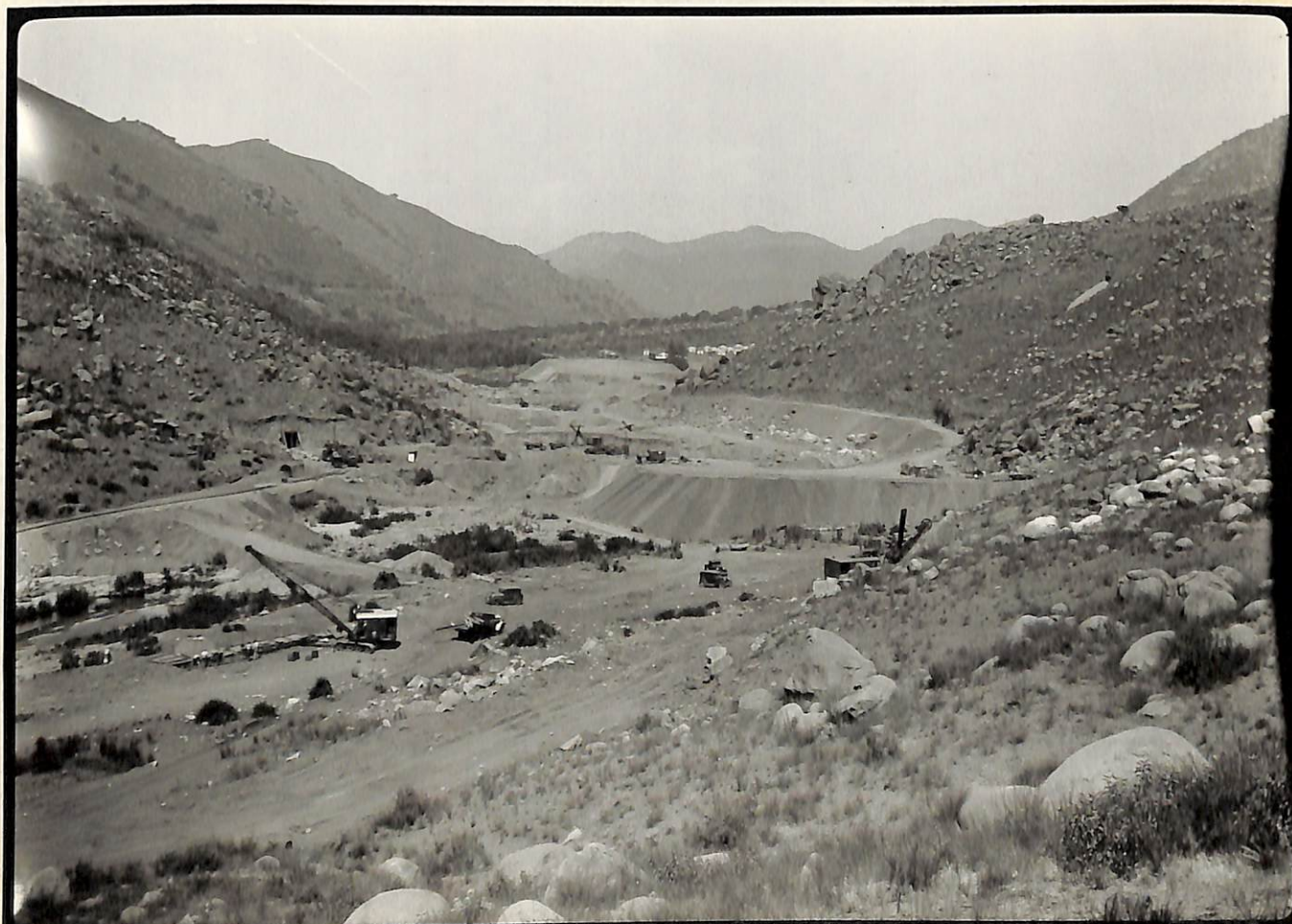
Encls. Photoprints EC



7-11-32 C.S.D. El Capitan Dam site Looking Upstream.

EC-116.

3192



7-19-32 C.S.D. El Capitan Dam site No 2, Looking Downstream.

EC-117.

July 31, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council of the  
City of San Diego, California  
Subject: San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works Feature.

JULY - THIRD TEN DAY REPORT

**WEATHER:** The weather has been clear during this period. The discharge of the San Diego River at the Contractor's road crossing about 0.4 mile west of the damsite decreased to about 0.3 second feet during this period.

**FIELD ENGINEERING:** One 5-man survey party has been engaged on setting coordinate points for cross sectioning in borrow pit area A; setting stakes for neat line excavation of concrete toe walls; securing clayey samples from near northwest corner of Section 9; resetting coordinate points for cross sectioning excavations for monthly estimate and setting permanent center line and grade points at entrance end of the outlet tunnel and at the angle point near the exit end. Final cross sections were taken for the base of the rock embankment.

**OFFICE ENGINEERING:** Three men have been engaged this period on plotting the cross sections for estimating schedule item quantities; also on making layout map of dam, camp, roads, borrow areas, quarry, etc. Calculations of quantities for the monthly estimate No. 3 were made. Detail drawing for the drains at the lower toe of the dam was made.

**CONTRACTOR'S OPERATIONS:** The Contractor has continued his camp construction by the completion of two more 8-men capacity tent house dormitories making a total of 31. Work on the Contractor's guest and residence houses has been continued.

Work of erection of the second electric shovel has been progressed. Vandals had cut and removed all electrical connections while these shovels were enroute to the job.

The Contractor's sand and gravel plant has been operated during this period. The aggregates are being stock piled about 300 feet to the south of the plant. The road from the gravel plant has been extended westerly to the ramp at the concrete plant bunkers.

The erection of the concrete mixing plant has continued. Two 1-cubic yard mixers and weigh batcher have been set. The cement storage platform has been constructed and 2,000 sacks of cement have been hauled and piled. This cement had previously been tested by the City's Testing Engineer and found satisfactory. A water tank has been set on the hill above and east of the concrete mixing plant. A pump driven by a 75 H.P. electric motor has been



erected on the north bank of the river. A 4-inch pipeline is being laid from the pump to the tank. This water system is to supply water for the concrete and other operations.

There are two coyote holes being driven about 150 feet apart in the toe of the quarry site. These holes are for purpose of placing explosives for shooting quarry rocks for the placing in the dam embankment.

The Contractor has developed and opened up a sectional spring on the easterly slope of El Cajon Mountain about 1/4 mile north-easterly of the quarry site. A concrete reservoir about 10 feet in diameter and about 5 feet deep has been constructed at the spring. About 3.5 gallons of water per minute are delivered to the pipe outlet of the reservoir. A 2-inch pipeline is being laid from this reservoir to the tanks at the camp.

The Contractor's forces have erected the telephone line poles from El Monte Park easterly via the City's camp to the Contractor's office.

The Contractor's force has averaged about 245 men per day for this period.

#### DAM CONSTRUCTION:

**OUTLET TUNNEL:** The pilot headings of the outlet tunnel has been driven a total of 700 feet or 60 per cent of the total length. The two ends of the pilot tunnel are being progressed each with three shifts.

The exit heading has been advanced 244 feet beyond the timbering as the rock encountered requires no timbering in the heading.

**TOE WALL EXCAVATION:** A crew of men has been excavating to final neat lines for the upstream toe wall.

A power shovel has put into the downstream toe wall trench to excavate more nearly to final grade preparatory to the hand trimming.

**EXCAVATION FOR DRAINS:** Excavation for the three drains under the downstream portion of the dam has not been advanced during this period. There only remains the hand excavating and trimming for the final foundation under these drains.

**STRIPPING FOUNDATION:** The stripping of riverbed objectionable material in place in preparation for rock embankment area above elevation about 550 upstream of the puddle core area has been progressed in a northerly direction to the toe of the north abutment road slope. The stripping area above elevation about 546 downstream of the puddle core area has been progressed in a northerly direction to the toe of the truck ramp. The stripping of material vicinity puddle core area has been resumed and has progressed

northerly to the toe of the slope of the road along the north abutment. A second shovel has been put to work excavating the decomposed bedrock in the bottom of this puddle core area preparatory to work on the core wall trench excavation.

**ROCK EMBANKMENT:** Rock encountered in the stripping has been deposited on the foundation of the upstream rock embankment portion of the dam, which foundation area was inspected and approved on July 21 by State Inspector of Dams. The first rock was placed in the embankment on July 22.

**WORK CONTEMPLATED BY THE CONTRACTOR DURING NEXT TEN DAYS:**

- Continue the operation of sand and gravel plant;
- Continue to completion erection of concrete mixing plant;
- Continue erection of electric shovel;
- Extend camp and dormitory facilities;
- Continue outlet tunnel driving;
- Continue excavation for toe walls and drains by hand;
- Continue foundation stripping under rock fill and puddle core areas;
- Begin concreting of upstream toe wall.

**ACCIDENTS:** One man was caught between two auto trucks and sustained a broken pelvic bone. He is recovering nicely. No other accidents except cuts and bruises.

**VISITORS:**

- July 22 - H. N. Savage, Hydraulic Engineer  
P. C. Smith, La Mesa
- " 25 - H. N. Savage, Hydraulic Engineer  
Senator Leroy A. Wright, Attorney, San Diego  
Colonel W. W. Crosby, Coronado
- " 27 - H. N. Savage, Hydraulic Engineer  
Chas. L. Williams, San Diego
- " 29 - Chester Marliave, State Geologist
- " 30 - Engineers of San Diego, invited guests of the Contractor and the Hydraulic Engineer, as follows:  
Arno Myer, Draftsman City Planning Department  
H. D. Trounce, Building materials  
Ernest A. Britton, Messenger  
Zalorus Rungee, Engineer Southern Title & Trust Co.  
A. E. Brems, Asst. Engineer City Engineer's Office  
Herman L. Bodmer, Architect  
Sr. Jose L. Favela, Secretary of Agriculture and Public Works, Baja, California  
Sr. Gomez-Perez, Engineer Rodriguez Dam  
A. B. Wood, retired  
J. A. Durkee, retired  
C. E. Grafton, retired  
T. H. Tulloch, Draftsman, City Water Department  
Wm. M. McCarty, Draftsman, City Engineer's Office

Visitors (continued)

July 30 - W. M. Butts, Structural Engineer  
C. B. Hough, Draftsman, City Engineer's Office  
Tom J. Allen, Civil Engineer  
E. L. Freeland, Civil Engineer  
F. F. Evenson, Consulting Electrical Engineer  
Wm. Darby, Construction Foreman  
Jack Hart, General Foreman, City of San Diego  
B. Richardson, guest  
C. O. Dowell, guest  
Dr. G. F. McEwen, Professor Scripps Institute of  
Oceanography, La Jolla  
J. C. Hampton, Public Works, Air Station  
H. L. Taylor, Forest Service, retired  
L. B. Henderson, Draftsman, City Engineer's office  
John S. Siebert, Architect  
Herbert P. Chase, Draftsman, City Engineer's office  
Daniel Boyle, Engineering Aid, U.S. Public Works  
Henry Wade, guest  
Harry Haelsig, Draftsman, City Engineer's office  
George R. Hayler, Assistant Engineer, City Engineer's  
Arthur Hayler, guest office  
Alfred Pierce, Draftsman, City Engineer's office  
Louis R. Johnson, President Rodney Stokes Company  
Nicholas Hess, National Iron Works  
Wm. E. Beilherz, Structural Engineer  
H. H. Allen, Construction Estimator  
H. D. Reinhold, Mining Engineer  
Fred D. Fyle, Engineer, City of San Diego  
Paul Boermann, Engineer, City of San Diego  
H. I. Wood, Resident Engineer, El Capitan Dam  
H. N. Savage, Hydraulic Engineer

Respectfully submitted,

H. N. Savage,  
Hydraulic Engineer.

HNS/p

cc Edward Hyatt, State Engineer  
cc Gerald McKinlay, Senior Engineer of Dam Inspection

Encls. Photoprints EC 119 and 120



7-25-32. C.S.D. El Capitan Dam. Excavation for Core Wall and Puddle Core.

E.G-119.

3197



7-25-32. C.S.D. El Capitan Dam. Start of Rock Embankment in Upstream Section. E.G-120.

August 11, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council  
of the City of San Diego, California  
Subject: San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

AUGUST - FIRST TEN DAY PERIOD REPORT

**WEATHER:** The weather has been clear during this period. The discharge of the San Diego River at the contractor's road crossing about 0.4 mile west of the damsite, has decreased to about 0.1 second foot this period.

**FIELD ENGINEERING:** One 5-man survey party has been engaged on profile and stakes for the north end of the river bottom puddle core excavation. The center line of the road from El Monte Park to the west boundary of the Cleveland National Forest was surveyed. Neat line excavation points were set and elevations for bottom of excavation taken for both toe walls. Permanent center line and elevation in exit heading of the outlet tunnel were set. The neat line excavation stakes for the three drains were set. Flags marking the puddle core limits on the south abutment were set for stripping operations. Final cross sections on the foundation under the rock fill area upstream of the puddle core were continued.

**OFFICE ENGINEERING:** The progress charts were posted and a tracing showing formations exposed in the foundation stripping was made. Estimate of rock embankment quantities for this year's progress was made. The alignment of the road from El Monte Park to the west boundary of the Cleveland National Forest was plotted. Sketches were made of equipment for cross sectioning or "scaling" the tunnel to determine the overbreakage quantities.

**CONTRACTOR'S OPERATIONS:** The contractor has continued his camp construction and now has 36 tent houses. The contractor's residence has been completed. The contractor's camp water supply is being augmented by water pumped from the river about 1/4 mile upstream from the damsite.

Transformers and electric power line have been erected for service at the quarry. Both electric shovels were moved to the quarry August 7 and are stripping the overburden. 12 steel bodies for hauling rock have been delivered and mounted on the large trucks. The quarry operations have been conducted two shifts per day since August 5.

The contractor has completed his concrete plant and a cement shed 60 feet by an average width of 38 feet has been erected. 8000 sacks of cement have been received. Placing of concrete began on August 5 forming the foundation of the upstream toe wall.

About 36,000 pounds of reinforcing steel for the drains has arrived on the job.

The gravel plant has not been operated since August 6. The dragline has been used to load concrete aggregates into the trucks.

A "highline" or cableway is being erected over the upstream toe wall for placing concrete.

The Contractor's force has averaged 280 men this period.

#### DAM CONSTRUCTION:

**OUTLET TUNNEL:** The heading drift of the outlet tunnel has been driven a total of 915 feet. There remains 258 feet to drive. Rock sufficiently hard to require no timbering was encountered in the entrance heading 253 feet in. This heading has been driven 93 feet ahead of the timbering. The 1300 cubic foot compressor was put into service on August 10. This is a stand-by unit equal in capacity to the two smaller units. The exploration tunnel 1 was opened into the exit heading drift on August 9 for ventilation.

**TOE WALLS:** Concreting of the upstream toe wall was begun on August 5, and the downstream toe wall on August 9. About 1300 cubic yards of concrete have been placed to date in the toe walls. Excavation for the toe walls was progressed in the bottom of the south ends of both walls.

**DRAINS:** No work has been done. 36,000 pounds of reinforcing steel for the drains has arrived.

**STRIPPING FOUNDATION:** The stripping overburden from the south abutment hydraulic fill and puddle core areas has been progressed. The final stripping and hand excavation of the foundation area between the puddle core and the upstream toe wall adjacent to and below the road along the north abutment has been nearly completed. The widening of this road for a passing point has been accomplished about midway between the puddle core and the upstream toe wall. The stripping of the riverbed overburden from the rock embankment area near the south side of the upstream portion has been completed except for the hand work required.

**ROCK EMBANKMENT:** All sound rock encountered in the stripping operations is being placed in the rock embankment section of the dam on the foundation area approved by the State's Senior Engineer of Dam Inspection. A few loads of sound rock from the stripping in the quarry have been hauled and placed in the downstream toe of the rock embankment.

## WORK CONTEMPLATED BY THE CONTRACTOR DURING NEXT TEN DAYS:

Continue and complete stripping of foundation below  
elevation 575  
Continue excavation for ends of toe walls  
Continue concreting of toe walls  
Continue tunnel driving  
Continue quarry development  
Begin concreting of drains  
Continue gravel and concrete plant operation  
Continue hauling rock for rock embankment

ACCIDENTS: 1 case lacerations and contusions left arm and hand; caught in belt conveyor of mucking machine. 1 case fractured right shoulder - taken to hospital; fell from rock. 1 case lacerations and contusions of finger; caught in mucking machine. 1 case back injury; slipped while lifting pipe in tunnel. 1 case back injury; truck turned over.

## VISITORS:

August 1 - Mr. and Mrs. O. M. Draper, Miss Parkwith,  
Miss McClenathen, Mr. and Mrs. Colthart - School  
Teachers.  
Hydraulic Engineer and Mrs. H. N. Savage

" 2 - H. N. Savage, Hydraulic Engineer  
Gerald McKinlay, Senior Engineer of Dam Inspection

" 4 - Robert Bent, San Diego & Arizona Railroad  
E. E. Anthony, Concrete technician

" 7 - D. B. Gumensky, Engineer Metropolitan Water  
District of Southern California

" 8 - H. N. Savage, Hydraulic Engineer  
L. C. Maire, Ex-Councilman

" 9 - H. N. Savage, Hydraulic Engineer  
Stanley Andrews, San Diego

" 10 - H. N. Savage, Hydraulic Engineer  
Fred D. Pyle, Assistant Hydraulic Engineer  
J. Y. Jewett, Testing Engineer, City of San Diego

Respectfully submitted,

H. N. Savage,  
Hydraulic Engineer.

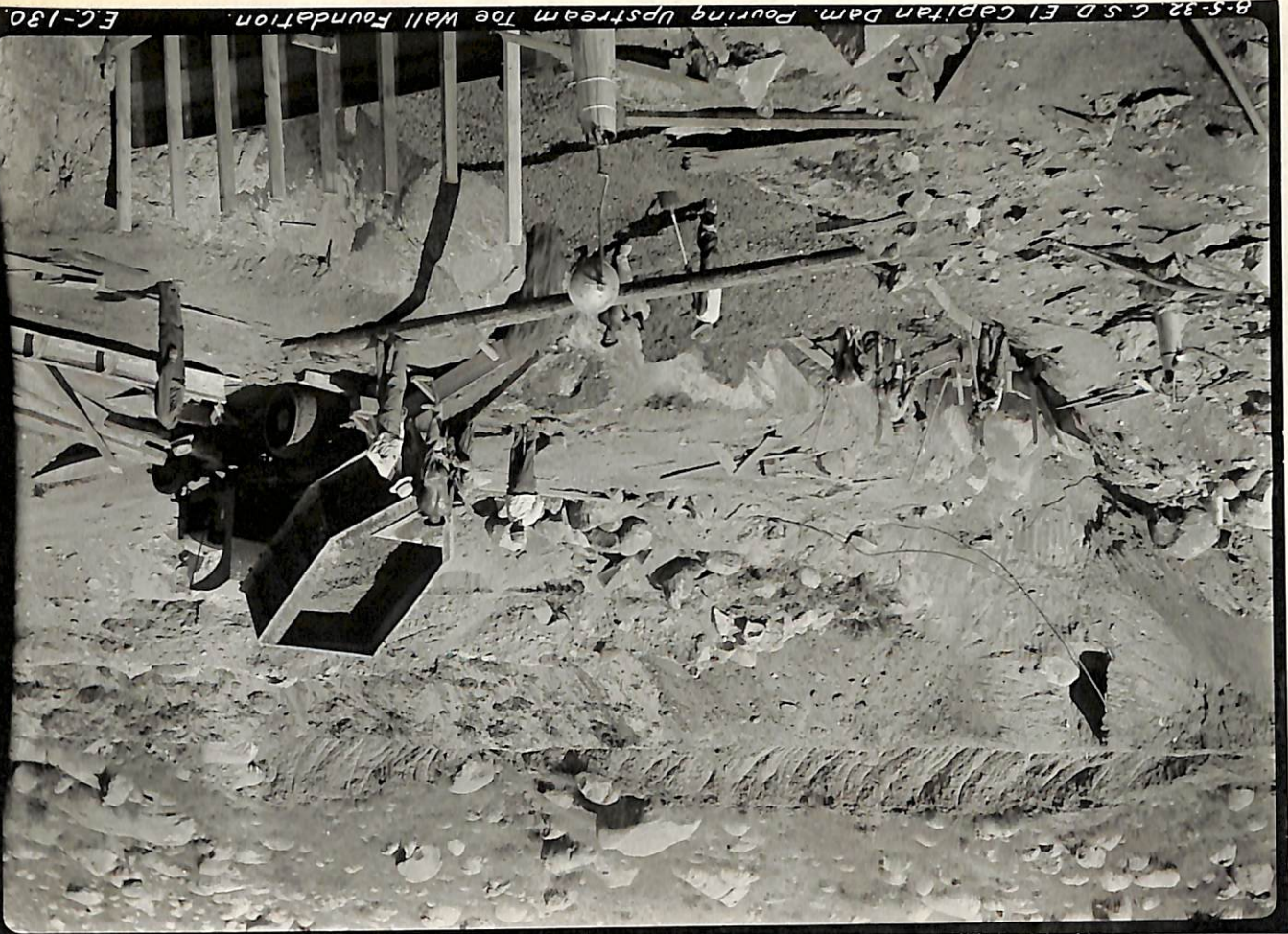
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Encl.  
Photoprints EC-130, EC-135



EC-135

B-12-32 C.S.D. El Capitan Dam Site Number 2, Looking Downstream

3201



EC-130

B-5-32 C.S.D. El Capitan Dam, Pouring Upstream Toe Wall Foundation



August 21, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council of the  
City of San Diego, California.  
Subject: San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

AUGUST - SECOND TEN DAY PERIOD REPORT

WEATHER: The weather has been clear during this period. The discharge of the San Diego River at the contractor's road crossing about .4 mile west of the damsite has reduced to about .1 second foot this period.

FIELD ENGINEERING: One 5-man survey party has been engaged on the setting of points for the concrete forms on the downstream and upstream toe walls. The final profile and cross sections on the bottom of the upstream toe wall trench were taken. Permanent center line and elevations were set in the bypass tunnel. Flags were set for the downstream toe of the rock embankment near the exit portal. Excavation stakes were set for the ends of the toe wall excavations. Final stakes for the excavations for the drains were set.

OFFICE ENGINEERING: The progress charts for the bypass tunnel excavation and toe walls were posted. Final coordinate cross sections of the stripped area under the rock embankment portions of the dam from North 3350 to North 3780 were plotted. Also the cross sections for the upstream toe wall footing trench were plotted and the end areas and volumes of both toe walls and trench excavations were computed. Equipment for scaling the tunnel for overbreak measurement was made.

CONTRACTOR'S OPERATIONS:

The gravel plant has been operated this entire period on the day shift.

The cableway erected across the river valley over the upstream toe wall has been in use this period for placing concrete.

A new 4" pipeline has been laid along the slope of the south abutment at an elevation of about 650 feet for the purpose of bypassing the water pumped from the upstream toe wall excavation.

The contractor's drill sharpening shop immediately south of the machine shop was moved to the quarry and is being used at this point to sharpen the jackhammer steel. The contractor has continued the quarry stripping and operations with the two electric shovels and the No. 9 gas shovel.

About 7500 sacks of cement have been delivered to the concrete plant warehouse.

A line of electric energy transmission poles about 100 feet apart has been erected along the south side of the road leading to the quarry, cross arms and insulators have been erected in preparation for mounting lights at each pole for illuminating the road for night truck hauling operation.

The State Accident Industrial Commission's Inspector Mr. J. Wesley Gebb, visited the work and inspected the gravel plant, tunnel headings, excavation work, concrete plant and quarry operations on August 18, 1932.

A portable gasoline operated truck loader has been delivered to the job and placed in operation at the gravel plant.

The contractor's force has averaged about 300 men daily.

#### DAM CONSTRUCTION:

**OUTLET TUNNEL:** The pilot heading drifts of the outlet tunnel has been driven a total of 1151 feet. There remains 22 feet to drive. Timbering in the exit heading was required near Station 6 for a distance of 34 feet due to the rather soft nature of the rock. Wing excavation enlargement on either side of the exit heading drift was begun on August 18 and one 16-foot length of wall plate with the segments thereon has been set at the exit portal. The outlet tunnel headings are expected to meet on August 22.

A 5/8 cubic yard air operated shovel was delivered to the job on August 20 and will be used for excavation in the enlargement of the tunnel. It is anticipated that the muck will be hauled by motor truck.

**TOE WALLS:** Placing of concrete in the upstream and downstream toe walls has continued during this period. About 2500 cubic yards have been placed to date in these walls. Excavation for the toe wall foundations at the ends of the walls has been continued.

**DRAINS:** Reinforcing steel has been placed in the center and south drains and the floor has been concreted in the center drain. Forms are being prepared for these drains.

**STRIPPING FOUNDATION:** The stripping of the foundation under the rock embankment has been confined during this period to that portion in the vicinity of the exit portal structure. Some hand work has been done, preparing the foundation for the rock embankment along the south abutment and upstream from the puddle core.

**ROCK EMBANKMENT:** Material encountered in the quarry stripping operations suitable for the rock embankment has been hauled and placed in the rock embankment section of the dam adjacent to the north abutment and east of the puddle core. On August 17

18 and 19 the shovel was used to load the boulders encountered along the side of the quarry road. On August 20 two shovels were placed on the excavation of the boulders along the west side of the ravine due north of the contractor's camp. These boulders are being placed in the rock embankment. The rock material being encountered in the exit heading of the outlet tunnel is being dumped adjacent to the portal and is being rehandled and loaded into trucks and hauled to place in the rock embankment. The finer portions of this material is being used to surface the roadway areas on this embankment.

**WORK CONTEMPLATED BY THE CONTRACTOR DURING THE NEXT TEN DAYS:**

- Continue the foundation excavation for the tunnel exit portal structure.
- Continue the hand excavation for the ends of the toe walls.
- Continue concreting of toe walls.
- Continue enlargement of the outlet tunnel to full size.
- Continue quarry development and hauling of rock to rock embankment.
- Continue the concreting of the drains.
- Continue gravel and concrete plant operations.

**ACCIDENTS:** Two cases of cement burn and one case contusion of hand. Usual minor cuts and bruises.

**CITY FORCE:** One inspector for the City has been placed on the work during this period. Mr. H. L. Harper on August 20 as inspector at the rock quarry.

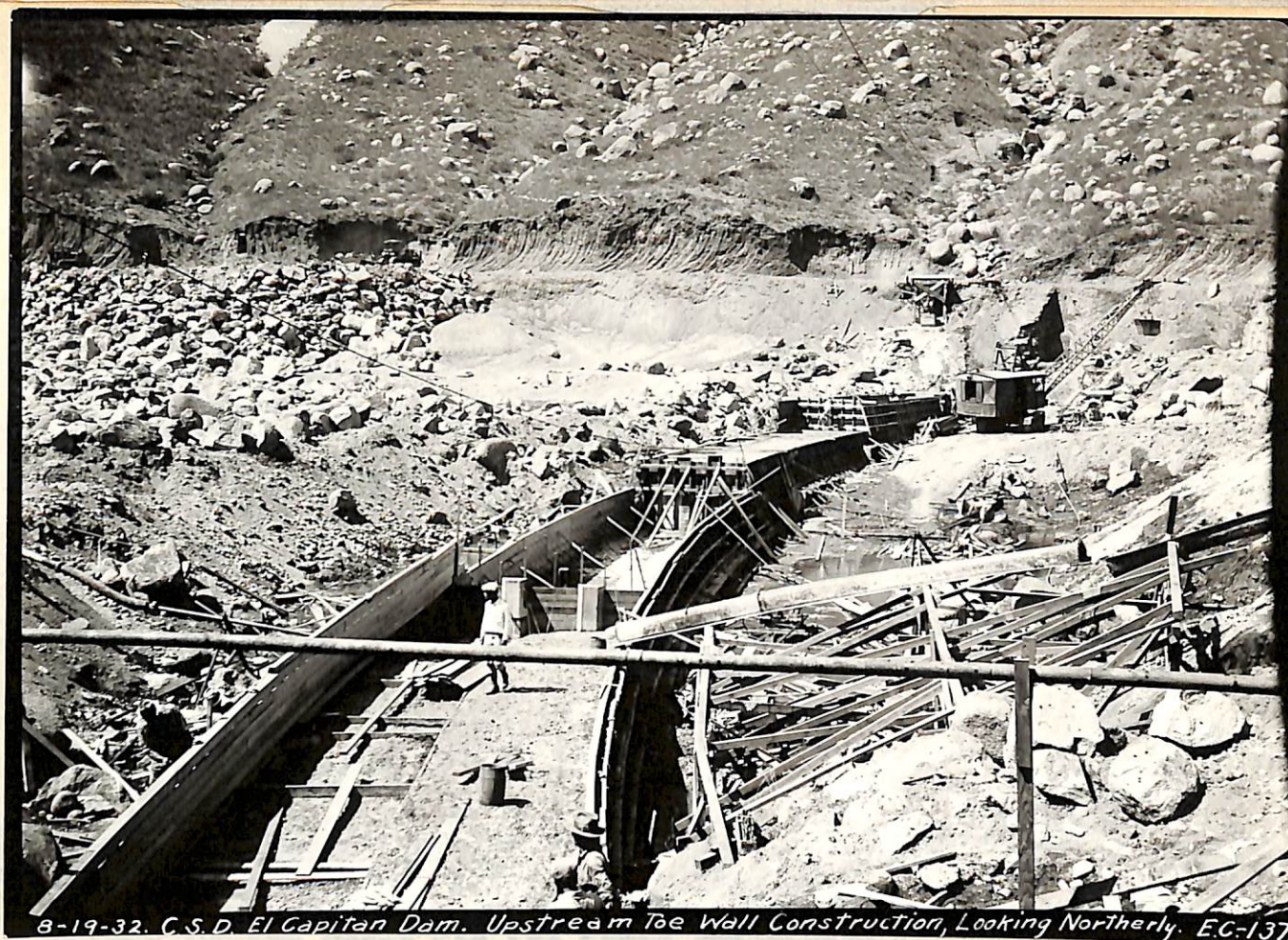
**VISITORS:**

- August 11 - Hydraulic Engineer and Mrs. H. N. Savage
- " 14 - Wayne Hood, former Civil Service Commissioner
- " 16 - Melville Klauber  
Allan Klauber  
H. N. Savage, Hydraulic Engineer
- " 18 - A. D. Jessop, Coronado  
C. O. Richards, San Diego  
H. N. Savage, Hydraulic Engineer
- " 19 - Geo. W. Hawley, Deputy State Engineer  
Frank W. Siefert, former Common Councilman  
H. N. Savage, Hydraulic Engineer
- " 20 - Hydraulic Engineer and Mrs. H. N. Savage

Respectfully submitted,

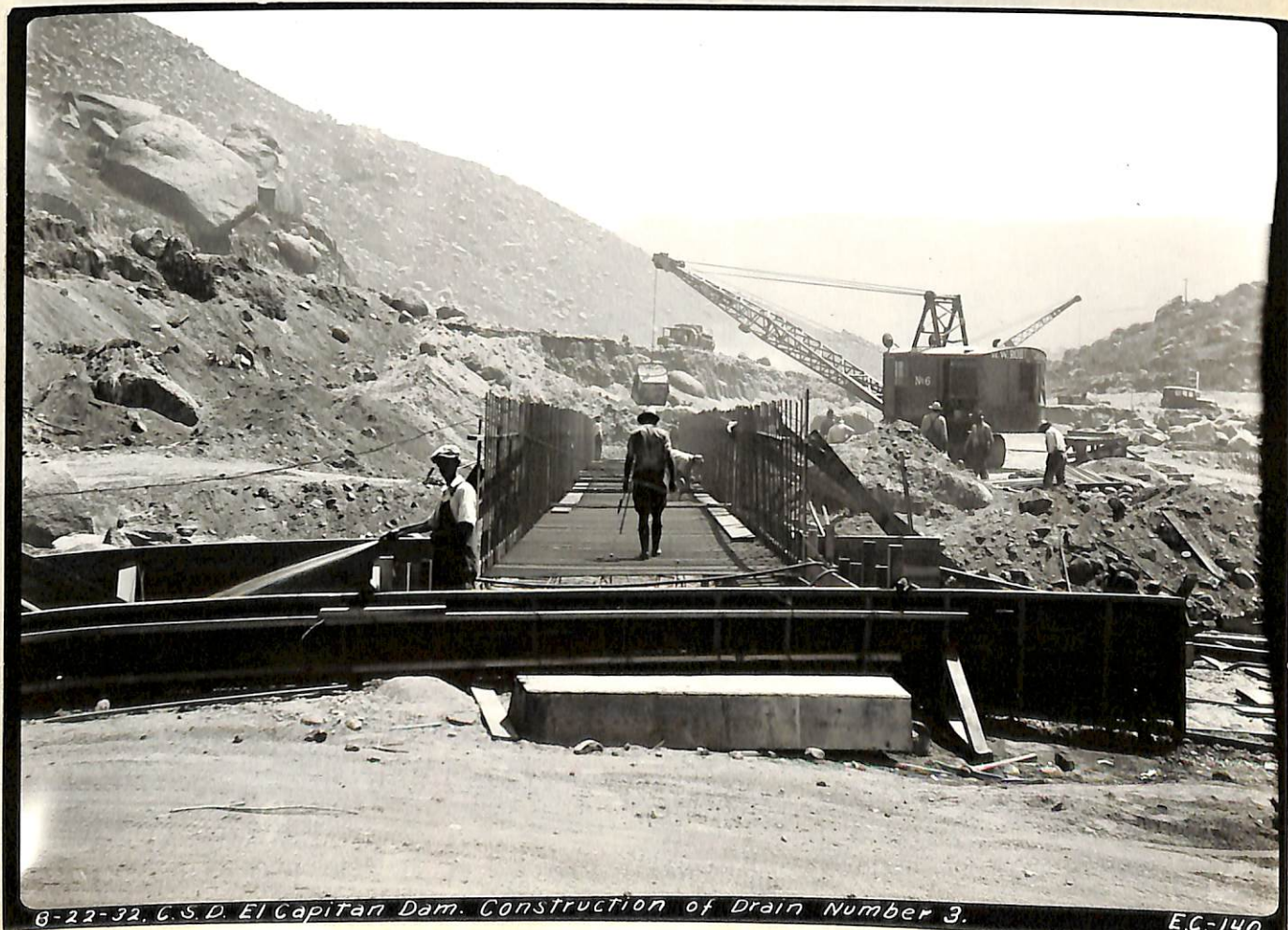
H. N. Savage,  
Hydraulic Engineer

HNS/p  
Encl. Photoprints EC 137 and 140



8-19-32. C.S.D. El Capitan Dam. Upstream Toe Wall Construction, Looking Northerly. EC-137.

3205



8-22-32. C.S.D. El Capitan Dam. Construction of Drain Number 3.

EC-140.

September 2, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council  
of The City of San Diego, California  
Subject: San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

AUGUST - THIRD TEN DAY PERIOD REPORT

**WEATHER:** The weather has been clear during this period. The discharge of the San Diego River at the contractor's road crossing about .4 mile west of the damsite has been about .2 second foot this period.

**FIELD ENGINEERING:** One 5-man survey party has been engaged on the cross sections and points for the neat trench for the downstream toe wall. Points were also set for the forms on both toe walls and for the trench on the south end of the upstream toe wall. Final elevations over the stripped area from the base of the dam were taken. Permanent points were established for line and grade at the angle point near the entrance end of the outlet tunnel. Points for the forms for the three downstream drains were set. Cross sections for the approach cuts for the drains and exit ends of the outlet tunnel were set, also points for the excavation for the foundation for the portal structures. Offset points were established for the 6-foot core wall trench excavation.

The force was increased by the addition of a rock fill inspector and a concrete inspector.

**OFFICE ENGINEERING:** The progress charts for the outlet tunnel excavation and timbering and for the concreting of the toe walls were posted. Calculations for the final stripping for the base of the rock embankment in the river bed were made. Cross section tracings of the concrete lined and timbered tunnel sections were made for the purpose of plotting and computing the tunnel "over-break".

Computations for the concrete yardage in the toe walls and for the concrete in the drains for the monthly estimate were made. Computations for the tunnel excavation, rock embankment, tile drains stripping excavation, rock classification, reinforcing steel and cement were made for the regular monthly estimate. Final summary for the monthly estimate No. 4 was prepared.

**CONTRACTOR'S OPERATIONS:** The gravel plant continued in operation this entire period on the day shift.

The contractor has continued the quarry stripping and quarrying operations and has erected a supply building 14' x 40' near the side of the quarry and now has completed the erection of the 1300 cubic feet per minute air compressor formerly stored at a

standby near the exit portal of the outlet tunnel. This compressor will furnish the air for the "water liner" drills being used in the quarry. The compressor plant is located southeast of the east end of the quarry. A complete street lighting system with lights at about 100 foot intervals has been installed and put in service along the quarry road. The site for a new powder house for quarry operations has been excavated in the north side of the quarry road about due north of the City's El Capitan Camp.

About 9,000 barrels of cement have been delivered on the work; also

About 85 tons of reinforcing steel for the drains and portal structures.

The machine shop equipment has been augmented by the installation of one large hydraulic press and one large machine lathe.

A 5/8 yard air operated power shovel was delivered to the job, completely overhauled and is now being used for tunnel excavation.

The contractor's force has averaged about 300 men daily.

#### DAM CONSTRUCTION:

**OUTLET TUNNEL:** The heading drift of the outlet tunnel was holed thru on August 22. Complete reorganization of the tunnel driving for the enlargement was immediately begun. The drains and exit portal cuts were excavated, enlargement of the tunnel was begun and to date has progressed a total of 49 feet. Permanent tunnel timbering consisting of 5 segment arch timbers with wall plates and plumb posts are being erected as the enlargement excavation is progressed. The excavation for the tunnel enlargement at the entrance is being done by a mucking machine loading into 5-yard railroad cars. At the exit end the enlargement excavation is being done by a 5/8 cubic yard air operated power shovel loading into 5-yard dump trucks.

**TOE WALLS:** Placing of the concrete in the upstream and downstream toe walls was continued during this period; total of about 7,000 cubic yards has been placed to date. The excavation for the toe wall trench at the south ends of both upstream and downstream walls has been completed.

**DRAINS:** The concrete for the floors for the three drains under the downstream portion of the dam has been placed. Forms for the drains and reinforcing steel are being placed.

**STRIPPING FOUNDATION:** Practically no work has been done on the stripping of foundation for the period. The work adjacent to the exit portal structure has been completed with the exception of hand work.

**ROCK EMBANKMENT:** In the development of the rock quarry all suitable rock for the rock embankment has been hauled and placed in the rock embankment of the dam adjacent to the north abutment.

and east of the puddle core. About 12,000 yards of this material was placed to date.

**WORK CONTEMPLATED BY THE CONTRACTOR DURING THE NEXT TEN DAYS:**

Continue and complete the excavation of the exit portal cut.  
 Continue concreting of the toe walls.  
 Continue enlargement of the outlet tunnel.  
 Continue quarry development and hauling of rock to rock embankment.  
 Continue concreting of drains  
 Continue gravel and concrete plant operation.

**ACCIDENTS:** One contusion of the hand. Usual minor cuts and bruises.

**VISITORS:**

August 22 - H. N. Savage, Hydraulic Engineer  
 " 24 - Gerald McKinlay, Senior Engineer of Dam Inspection  
 " 25 - H. N. Savage, Hydraulic Engineer  
 Admiral Simms  
 Commander Robinson  
 Mayor John Forward Jr.  
 J. A. Frap, Engineer in Charge of Dams, State of Arizona  
 " 26 - C. B. Allen  
 Stephen Brown  
 W. P. Meyer  
 F. A. Rhodes, Director of Public Works  
 Fred Marsh, Superintendent Merritt Chapman Scott  
 " 27 - H. N. Savage, Hydraulic Engineer  
 J. Y. Jewett, Testing Engineer  
 " 29 - Harry E. Willis, San Diego PROGRESS, North Park  
 H. N. Savage, Hydraulic Engineer /JOURNAL  
 O. U. Miracle, San Diego Contractor

Respectfully submitted,

H. N. Savage,  
 Hydraulic Engineer.

HNS/p



8-29-37 C.S.D. El Capitan Dam. Pouring Upstream Toe Wall - Looking North

EC 143

3209



9-1-37 C.S.D. El Capitan Dam - Rock Embankment North Abutment

EC 147



September 10, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council of the  
City of San Diego, California  
Subject: San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

SEPTEMBER - FIRST TEN DAY PERIOD REPORT

**WEATHER:** The weather has been clear during this period. The discharge of the San Diego River at the contractor's road crossing about .4 mile west of the damsite has been about 0.4 second foot during the period.

**FIELD ENGINEERING:** One 5-man survey party has been engaged this period on setting points for the forms for the toe walls. Flags were set across the damsite for the west toe of the upstream rock embankment below elevation 580. A profile of the center line of the County Road 389 from El Monte Park to the west line of the Cleveland National Forest was run.

The spillway area was flagged out. Stakes were set for the south end trench at the downstream toe wall. Final stakes for the neat line excavation for the drains and exit portal structures of the outlet tunnel were set. Reference points for the south end of the downstream wall were set. Reference elevations were established along the main core trench.

The inspection staff has been engaged on the work carried on by the contractor. Necessary segregations of labor and equipment used in various parts of the work was continued.

**OFFICE ENGINEERING:** Progress charts have been posted. The calculations of quantities for excavation and concrete in the upstream and downstream toe walls have been made. Graphs of possible progress of rock embankment placement have been prepared. Standard size tracing of the topography of the spillway area has been made and computations to determine the most economical position of this structure are being prepared. Computations for the various tunnel sections for excavation and concrete quantities have been made. 5 standard size tracings show the various types of clearing and the cleared cultivated areas. Computations of the areas in the final stripped portions of the dam foundation were prepared.

**CONTRACTOR'S OPERATIONS:** The gravel plant continued in operation during the period on the day shift. Stock-piling of concrete aggregate just west of the present concrete plant was begun. A new powder house has been constructed on the north side of the quarry road about due north of the City's camp.

Three 8" bit well drilling rigs, electrically operated, with all tools and tool sharpening machinery were received September 8 and 9 and are being moved to the top of the quarry site.

A 40-foot extension westerly on the machine shop and warehouse building has been completed to house the heavy equipment.

Two water trucks and a power grader have been used continuously on quarry and other road maintenance and in and about the damsite.

About 4,000 barrels of cement were received during the period. This cement is being shipped by rail from Colton, California, to Lakeside.

July invoices for materials and supplies received by the Contractor amounted to \$44,118.24.

The contractor has employed an average force of about 300 men daily.

#### DAM CONSTRUCTION:

**OUTLET TUNNEL:** The full enlargement of the outlet tunnel except the invert structure has been progressed a total of 38 feet at the entrance end making a total of 106 feet. The permanent timber segments on wall plates in the top of the outlet tunnel have been progressed a total of 49 feet at the entrance end and 111 feet at the exit end making a total of 160 feet.

Two mucking machines are now being used for excavating the enlargement of the entrance end of the outlet tunnel. A caterpillar mounted bulldozer is being used in the heading drift to clear the material excavated from the sign enlargement.

**TOE WALL:** Placing of the concrete in the upstream and downstream toe walls has been continued. A total of about 8500 cubic yards has been placed to date. There remains about 400 cubic yards of concrete to be placed in the upstream toe wall. The excavation for the toe wall trench at the extreme ends of the upstream toe wall is being completed.

**UNDERDRAINS:** No work has been done this period on the drains.

**STRIPPING FOUNDATION:** No work has been done stripping the foundation during this period.

**MAIN CORE TRENCH:** The excavation of the trench for the main core wall is being carried on across the extreme lowest portion of the river bottom. About 300 feet of this trench in length has been opened up to an average depth of about 10 feet.

Timber cribbing to support the side of the trench has been installed and the water encountered in the trench is being continuously pumped out. No predictions as to the depth of this trench are possible at this time. However, the formation is approaching harder formation.

**ROCK EMBANKMENT:** As the work of developing the quarry has progressed, all rock suitable for the rock embankment has been hauled and placed in the upstream rock embankment. The fill is progressing southerly from the road along the north abutment building out from elevation about 580. To date there has been about 20,000 yards of rock embankment material placed.

**WORK CONTEMPLATED BY THE CONTRACTOR DURING NEXT TEN DAYS:**

- Excavation for the exit portal structure footings will be progressed.
- The outlet tunnel enlargement will be continued.
- Concreting of the toe walls will be continued and the upstream toe wall completed.
- The quarry development and hauling of rock for the rock embankment will be continued.
- Gravel and concrete plant operation will continue.
- Stock piling of concrete aggregates east of the concrete plant will continue.
- Excavation of the core trench will be continued.

**ACCIDENTS:** One man had his face bruised by timber while working on a truck. There were three cases of broken fingers - one on a tunnel man and two on concrete workers. There were three cases of strained backs. 75 men regularly employed by the contractor have passed physical examination.

**VISITORS:**

- September 1 - Walter P. Dexter, Manager Standard Iron Works  
Olive R. Best  
Harry Warburton  
J. W. Williams  
W. H. Holmes, Asst. Deputy State Engineer  
H. N. Savage, Hydraulic Engineer
- " 2 - P. D. Pearson, 4352 McClintock Street  
J. Isbell & Isbell Construction Company  
D. Riley, Isbell Construction Company
- " 3 - Hydraulic Engineer and Mrs. H. N. Savage  
Miss Ellen Murray, billing machine operator-City  
Miss Evelyn Fraser, Secretary Water Department  
Division of Development and Conservation
- " 4 - William Whiting - Superintendent American  
Concrete Pipe Co.  
F. D. Pyle, Engineer
- " 5 - Hydraulic Engineer and Mrs. H. N. Savage

## Visitors (Continued)

- September 7 - Colonel Ira C. Copley, Union & Tribune  
 James McMullen, Union & Tribune  
 Lester G. Bradley, Union & Tribune  
 Major General Joseph E. Kuhn  
 H. S. Wolf  
 H. N. Savage, Hydraulic Engineer
- " 8 - A. R. Sauer, San Diego Herald  
 M. V. Depew, San Diego Sun  
 Henry Love, San Diego Union  
 H. N. Savage, Hydraulic Engineer
- " 9 - S. D. Bechtel, Six Companies, Contractors  
 Hoover Dam
- " 10 - Lyman D. Wilbur, Morrison-Knudsen-Company  
 A. L. Johnson, Monarch Drug Company  
 H. F. Allison, Manager Crane Co., San Diego  
 H. N. Savage, Hydraulic Engineer

Respectfully submitted,

H. N. Savage,  
 Hydraulic Engineer.

HNS/p

Encl. Photoprints EC 151 and 152



9-8-32 C.S.D. El Capitan Dam - Looking Upstream From Downstream Spoilbank. EC151

3214



9-9-32 C.S.D. El Capitan Dam - Core Wall Trench. Looking N. From S. Abutment

EC152

September 21, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council  
of the City of San Diego, California.  
Subject: San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

SEPTEMBER - SECOND TEN DAY PERIOD REPORT

WEATHER: The weather has been clear during this period. The discharge of the San Diego River at the contractor's road crossing about .4 mile west of the damsite has been about 0.4 second foot this period.

FIELD ENGINEERING: A 5-man survey party has been engaged on the checking of the forms for the upstream toe wall and setting of points for forms for the downstream toe wall. Elevation and alignment points were established for the core wall. Permanent points were established on the upstream toe wall for reference points for the coordinate system. Points for the crown grade and center line were established for about 700 feet at 50-foot intervals thru the center portion of the outlet tunnel. Cross sections of the recently completed stripping of the foundation area immediately downstream of the north end of the upstream toe wall and of the upstream toe wall were completed. Final profile was run for the extreme south end of the downstream toe wall. The point marking the intersection of the downstream toe wall and the exit portal structure was set.

OFFICE ENGINEERING: Two men have been engaged during this period on plotting a profile of the base of the dam on coordinate N 3600 and on studies for the economic position of the spillway structure.

Two men have been engaged on computations of schedule item quantities for tunnel and portal structures.

One man has been engaged on making a map showing clearing classification of the reservoir basin. This involved the making of five standard size tracings. A tracing showing the details of the structural steel columns for the core wall was completed.

Checking of the wood cutting by private parties within the reservoir basin has continued.

A complete check of the calculation of final quantities in the toe walls has been made.

**CONTRACTOR'S OPERATIONS:** The daily maintenance by water trucks and blade operations of the quarry road and the gravel plant roads has continued.

A new powder house on the north side of the quarry road has been completed. The camp water supply has been augmented by tank truck hauling from the San Diego River. Two new tent houses have been erected in the contractor's camp making a total of 38 tent houses.

The gravel plant has continued this entire period and has produced 3500 cubic yards of rock and 3200 cubic yards of sand. The sand not required at this time for the concrete mix has been stock piled east of the concrete mixing plant.

There has been delivered a total of 13,770-1/4 barrels of cement to the job.

There was an average of about 300 men employed.

#### DAM CONSTRUCTION:

**OUTLET TUNNEL:** The enlargement to full size of the outlet tunnel, except the invert, has been progressed a total of 82 feet at the entrance end and 133 feet at the exit end making a total of 215 feet out of a total of about 1200 feet. The permanent timber segments on wall plates in the top of the outlet tunnel have been progressed a total of 110 feet at the entrance end and 152 feet at the exit end making a total of 262 feet.

On September 19 the two mucking machines being used at the entrance end of the outlet tunnel were replaced by power shovel No. 7 with a rebuilt shorter boom and dipper sticks. This shovel with two trucks hauling the material from it replaced the two mucking machines, the two locomotives and the cars and tracks, all of which were removed.

The extreme care with which the enlargement work in the outlet tunnel is being pursued by the contractor is reducing the "overbreak" to the minimum practicable.

**TOE WALLS:** Placing of the concrete in the upstream toe wall was completed on September 17. About 2500 cubic yards have been placed during this period in both walls making a total of about 11,000 cubic yards to date. Placing of concrete in the downstream toe wall has continued throughout the period. The last of the excavation in the extreme south end of this wall was completed on September 20.

**DRAINS:** No work has been done this period on the drains.

**STRIPPING FOUNDATION:** That portion of the north abutment foundation between elevations 580 and 550 and coordinates E 5480 and the upstream toe wall was completed this period and rock embankment has been placed over this.

**MAIN CORE TRENCH:** The excavation of the trench for the main core wall has been progressed so that its extreme lowest part is now at elevation 508 which is 45 feet below original stream bed surface elevation. The decomposed granite encountered in the trench excavation is progressively harder as depth increases.

**ROCK EMBANKMENT:** The contractor has three electrically operated well drilling rigs at work in the quarry. These are drilling 6-inch holes for blasting purposes.

Quarry rock to the extent of 3078 loads has been hauled from September 11 to 19 inclusively, and placed in the rock embankment upstream of the core wall and downstream from the upstream toe wall. This rock is being dumped from the elevation of 580. Rock excavated from the entrance end of the tunnel since September 19 has been deposited in the rock embankment upstream from the upstream toe wall. A total of about 35,000 cubic yards of rock embankment material has been placed to date. The proportion of quarry waste to the rock entering the dam has materially reduced this last ten day period.

**WORK CONTEMPLATED BY THE CONTRACTOR DURING NEXT TEN DAYS:**

Excavation for the exit portal structure footings.  
 Outlet tunnel enlargement.  
 Concreting of the downstream toe wall.  
 Quarry development and hauling of rock.  
 Gravel and concrete plant operation.  
 Stock piling of concrete aggregates east of the concrete plant.  
 Excavation of the core trench.

**ACCIDENTS:** One case of broken arm. Average number of cuts and bruises. 125 men regularly employed by the contractor have passed physical examination.

**VISITORS:**

September 12 - A. L. Johnson, Monarch Drug Company  
 R. S. Allison, Manager Crane Co. San Diego  
 Hydraulic Engineer H. N. Savage

" 14 - Paul C. Edwards, Editor San Diego Sun  
 Ira S. Irely  
 Hydraulic Engineer H. N. Savage

" 15 - Chester Harritt, General Manager La Mesa,  
 Lemon Grove & Spring Valley Irrigation District  
 E. P. Hyatt, Engineer and Assistant Manager  
 La Mesa, Lemon Grove & Spring Valley Irrigation  
 District  
 B. J. Primmer, Concrete Pipe Company  
 R. B. Edwards  
 H. Jenkins

" 16 - R. M. Gregory, Superintendent of Streets  
 City of San Diego



## Visitors (Continued)

September 16 - State Highway Division Engineers and Contractors

R. J. Hatfield

B. J. Carroll

R. J. Norris

J. H. Lamb

Robert Olsen

G. S. Kibbey

Gerald McKinlay, Senior Engineer of Dam Inspection

L. N. Slater, Vice President Western Pipe &  
Steel Company

Hydraulic Engineer H. N. Savage

"

17 - City Councilmen

Charles E. Anderson

A. W. Bennett

John R. Blakiston

L. E. Goodbody

Dan Rossi

Joseph J. Russo

Assistant City Attorney H. B. Daniel

City Manager A. V. Goeddel

Alfred Stahel, Jr.

Sergeant at Arms Henry Heise

John Seuss

Henry Love, San Diego Union

Newell Jones, San Diego Sun

Engineer Fred D. Pyle

Hydraulic Engineer H. N. Savage

"

19 - Engineer Fred D. Pyle

Hydraulic Engineer H. N. Savage

Respectfully submitted,

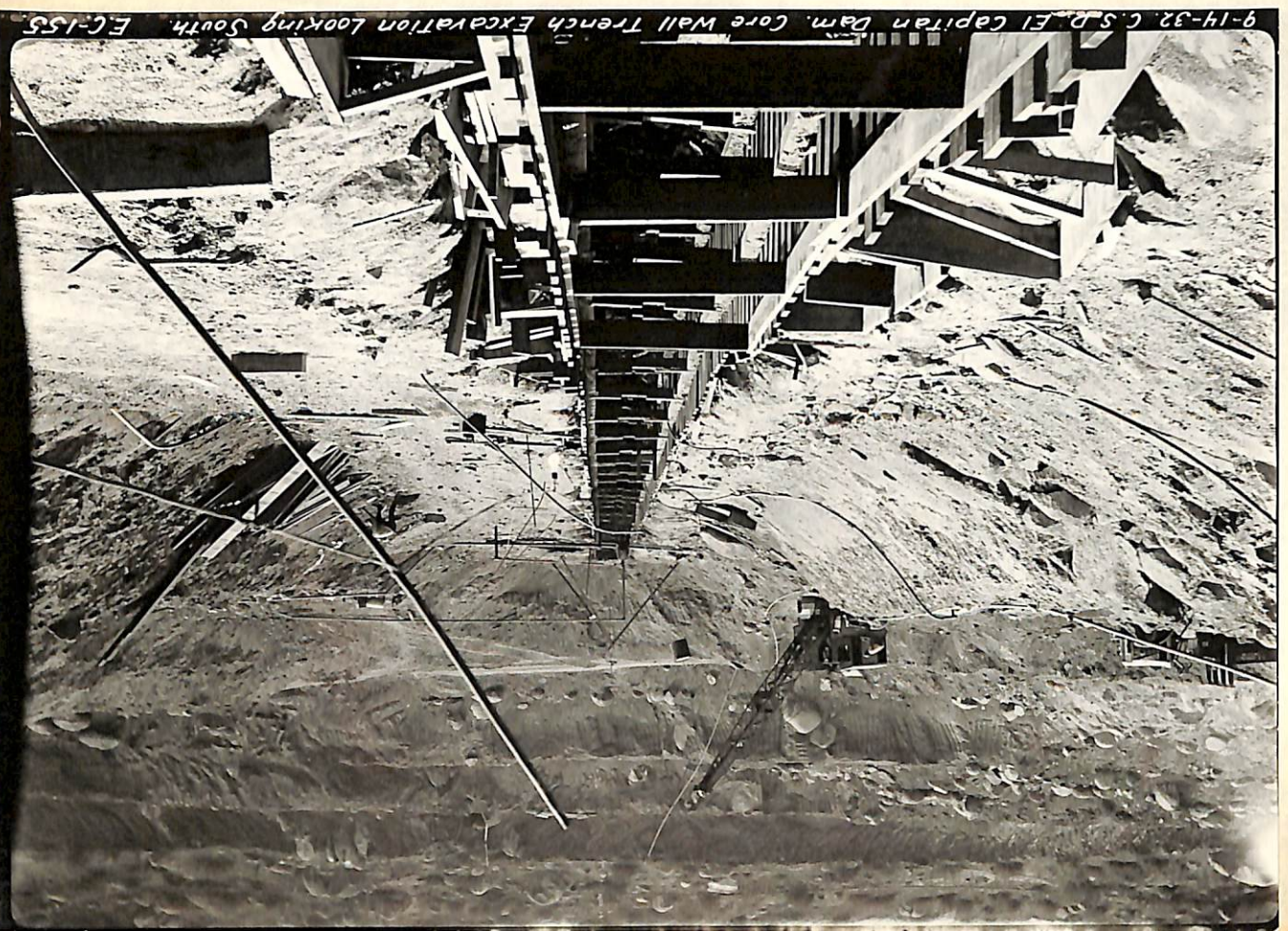
H. N. Savage,  
Hydraulic Engineer.

HNS/p

Encls. Photoprints EC-155 and 164



9-21-32. C. S. D. El Capitan Dam. Completed Upstream Toe Wall, Looking Southerly. EC-164



9-14-32. C. S. D. El Capitan Dam. Core Wall Trench Excavation Looking South. EC-155

3219

September 30, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council of the  
City of San Diego, California.  
Subject: San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

SEPTEMBER - THIRD TEN DAY PERIOD REPORT

WEATHER: The weather has been clear during this period. The discharge of the San Diego River at the Contractor's road crossing about 0.4 mile west of the damsite has been about 0.5 second feet this period.

FIELD ENGINEERING: One 5-man survey party has been engaged on re-setting neat line cut stakes south end of the downstream toe wall. Final cross sections, below the downstream toe wall adjacent to the tunnel outlet, and final profile of trench for the downstream toe wall were taken. Lines and grades for steel stubs into the outlet tunnel portal structure were set at the south end of this wall. Final cross sections upstream from the upstream toe wall were taken. Tunnel center line and grade on crown points 8+17 to 7+14 were set. The measurements were made for the monthly estimate No. 5 for September. Re-staked entrance and exit outlet tunnel portal structures. Bench marks were set on the northwest corner of wiers of upstream toe wall. Corewall profile from N 3320 to N 3460 was run.

OFFICE ENGINEERING: The overbreak in the outlet tunnel has been measured and plotted as the enlargement work progressed. A study of the core wall trench and outlet tunnel geology was made for record. A standard size tracing of the lower portion of the core wall was made showing progress of this work to September 26, 1932. The computations were made for the monthly estimate No. 5 for September. A report on questions for the Reconstruction Finance Corporation was prepared. Progress charts were posted. Wood cutting permits were issued and progress on this checked. A review of specifications for valves for the outlet tower was made and recommendations were made. The usual construction costs were kept. The records of labor hired and discharged were made. Four men were engaged on the above work. Samples of concrete were taken and compressive strength tests have been made. Samples of reinforcing steel have been taken and bending and tensile strength tests have been made.

CONTRACTOR'S OPERATIONS: The daily maintenance of the contractor's roads has continued. One new tent house has been erected in the contractor's camp making a total of 39 tent houses. A three car garage is being erected east of the contractor's residence.

The gravel plant has continued operating this entire period, and has produced 4375 cubic yards of rock and 2580 cubic yards of sand during this period. The total production for the month of September was rock - 6705 cubic yards and sand - 7606 cubic yards.

1623 batches of concrete were placed this period in toe walls and drains. 13,000 sacks of cement have been received by the contractor during this period, making a total of 29,000 sacks for the month.

The contractor has employed an average force of 348 men per day.

#### DAM CONSTRUCTION:

**OUTLET TUNNEL:** The full enlargement of the outlet tunnel, except the invert, has been progressed 140 feet at the entrance and 197 feet at the exit making a total of 337 feet. All of this has been timbered. This represents 28 per cent of the total length of the outlet tunnel. The material excavated from the entrance end of the outlet tunnel is being deposited upstream of the upstream toe wall. About 1600 cubic yards have been placed to date or about 15 per cent of the total of 10,600 cubic yards required.

**DRAINS:** The side walls and arch of the center drain were concreted on September 30. The drains are about 35 per cent complete.

**MAIN CORE:** The excavation of the trench for the main core wall has been progressed so that its extreme lowest part is now at elevation 501. The decomposed granite is progressively harder as depth increases.

**ROCK EMBANKMENT:** The three drilling rigs have completed 800 linear feet of 6-inch hole for blasting in the quarry. 11 holes were completed to an average depth of about 63 feet and 3 holes are being progressed. One hole was lost at a depth of 40 feet by heavy shooting in the quarry. Another hole was abandoned at a depth of 50 feet when drill steel was lost and could not be removed. A log of the holes shows all in hard granite except at the top. A third shift was put on the drilling on September 28, 1932.

Quarry rock to the extent of 4652 truck loads has been hauled this period and placed in the rock embankment upstream of the core wall and downstream from the upstream toe wall. There have been 37,570 cubic yards placed to September 25, and a total of 49,470 cubic yards, or 5.1 per cent of the total required.

Rock excavated from the entrance end of the outlet tunnel is being deposited upstream of the upstream toe wall. About

2000 cubic yards have been placed here, or about 19 per cent of that required to fill the space upstream of the upstream toe wall.

ACCIDENTS: One man received a badly cut hand and bruises by driving on the wrong side of the road to the quarry. The usual minor injuries were treated.

WORK CONTEMPLATED BY THE CONTRACTOR DURING NEXT TEN DAYS:

Excavation for the exit portal structure footings.  
 Outlet tunnel enlargement.  
 Concreting of downstream toe wall.  
 Quarry development and hauling of rock for rock embankment.  
 Gravel and concrete plant operation.  
 Stock piling of concrete aggregates east of the concrete plant.  
 Excavation of core trench.  
 Concreting of drains.

CLEARING: 15 permits for cutting wood in the reservoir basin have been granted. These permits cover about 644 acres. There have been 11.5 cords hauled from this area to September 30, 1932.

VISITORS:

September 21 - Gilmore Tillman, Assistant City Attorney  
 H. N. Savage, Hydraulic Engineer

" 22 - Frank W. Siefert  
 Chas. E. Arnold, Foreman Grand Jury  
 Leon H. Fish, Secretary Grand Jury  
 W. F. Raber, San Diego Con. Gas & Electric Co.

San Diego Chamber of Commerce Party:

Joseph Dryer, President  
 Major W. H. Lanagan, District Army Engineer  
 F. L. Annable  
 Harvey Atherton  
 John E. Boal  
 Frank Forward  
 Sam I. Fox  
 Milton F. Heller  
 Hal G. Hotchkiss  
 Geo. Kerrigan  
 Allen Klauber and Mrs. Allan Klueber  
 E. Payson  
 W. L. Van Schaick  
 Guilford Whitney  
 Jerry Sullivan Jr.  
 Thomas O. Scripps  
 Stephen Dove  
 Paul Edwards, San Diego Sun  
 A. C. Bartlett, Editor, San Diego Sun  
 O. U. Miracle  
 Fred Hanson  
 Emil Klicka  
 J. R. Russell

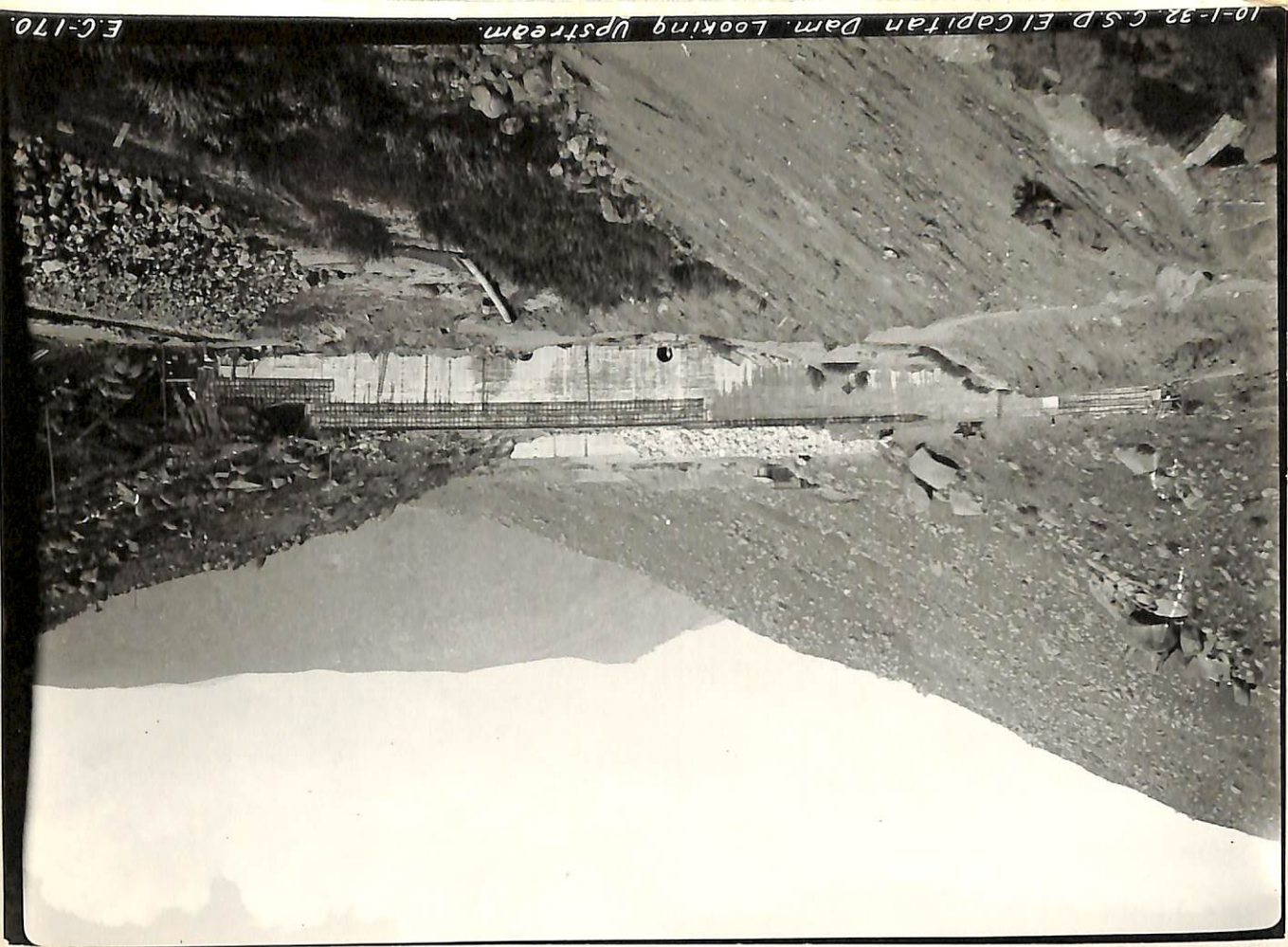
## Visitors:

September 22 - (Continued)

- Gus Johnson  
Lester Bradley  
T. C. McCauley  
Joe Brennan, Harbor Master  
H. N. Savage, Hydraulic Engineer
- " 24 - J. B. Lippincott, Hydraulic Engineer, Los Angeles  
Leroy A. Wright, Attorney, San Diego  
H. N. Savage, Hydraulic Engineer
- " 26 - C. F. Guthridge, Standard Dredging Company  
F. H. Green  
W. R. Osborn  
R. M. Allen  
Harry M. Folsom, Manager Brunswick Drug Co. San Diego  
Chester Marliave, State Geologist  
Gerald McKinley, Senior Engineer of Dam Inspection  
H. N. Savage, Hydraulic Engineer.
- " 27 - J. V. Alexander  
C. H. Willman  
Geo. W. Hawley, Deputy State Engineer  
Chester Marliave, State Geologist  
Gerald McKinley, Senior Engineer of Dam Inspection  
H. N. Savage, Hydraulic Engineer
- " 28 - T. W. Osgood, Industrial Accident Commission  
J. Wesley Gebb, " " "  
A. G. Darwin, Western Construction News
- " 29 - H. T. Johnson, Paso Robles, California  
Virgilio Bruschi  
H. N. Savage, Hydraulic Engineer

Respectfully submitted,

H. N. Savage,  
Hydraulic Engineer.HNS/p  
Encls. Photoprints EC-168, EC-170



10-1-32 C.S.D. El Capitan Dam. Looking Upstream.

EC-170



10-1-32 C.S.D. El Capitan Dam. Reservoir Portal of Diversion Tunnel.

EC-168

3224

October 11, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council  
of The City of San Diego, California  
Subject: San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

OCTOBER - FIRST TEN DAY PERIOD REPORT

WEATHER: The weather has been clear this period up to the night of October 9 when rain began to fall and continued until midnight of October 10. The discharge of the San Diego River at the contractor's road crossing about 0.4 mile west of the dam site has been about 0.5 second feet except during the rain when the discharge increased to about 15 second feet.

FIELD ENGINEERING: One 5-man survey party has been engaged on setting points for forms for the downstream toe wall, entrance and exit portal structures, core wall and for south drain. Points for line and grade were set on plugs in the roof of the untimbered section of the outlet tunnel. "Overbreak" measurements were made in this portion of the tunnel.

The upstream toe wall has been checked for deflection which might occur due to placing of rock embankment west of this wall, and also for water pressure on the upstream face. The progress of excavation of the core wall trench was taken daily. Coordinate cross sections were taken on the completed foundation upstream of the upstream toe wall. Stakes were set for the stripping for rock embankment near the north end of the downstream toe wall.

One man has been engaged the last four days on checking up on the contractor's equipment. One man has been engaged on supervision of reservoir clearing operations.

OFFICE ENGINEERING: A detail statement of expenditures, labor and materials was prepared forming a part of the report to the Reconstruction Finance Corporation. Concrete and excavation quantity computations are being made for the downstream toe wall, outlet tunnel portal structures and drains. Tracing of the outlet tunnel cross sections computations was prepared. Outlet tunnel "overbreak" was plotted. Drawing for core wall concrete and reinforcing steel is being prepared.

CONTRACTOR'S OPERATIONS: The daily maintenance of contractor's roads has continued. The 3-car garage at the contractor's residence was completed.

The gravel plant has continued in operation until 10 A.M. October 10 when it was stopped because of high water in the river,



requiring the moving of the pump. About 3400 cubic yards of aggregate or about 60 per cent gravel and about 40 per cent sand was produced this period.

The concrete plant operation produced 282 batches for the downstream toe wall, 126 batches for the drains, 262 batches for the core wall (first placement). 16 batches of grout were also mixed for the core wall and 22 batches for the north drain. 3775 sacks of cement were used. 4000 sacks of cement were received at the cement warehouse. A total of 57,700 cement sacks have been cleaned and 343 sacks of cement have been salvaged to date and used.

The contractor has employed an average force of 250 men per day during this period. The classification of his force employed up and including October 7 was: certified residents - 268; non-residents - 61; key-men - 28.

#### DAM CONSTRUCTION:

**OUTLET TUNNEL:** The full enlargement of the outlet tunnel, except the invert, has been progressed 214 feet at the entrance and 313 feet at the exit end making a total of 527 feet, or 45 per cent of the total length. The enlargement at the exit end has progressed 101 feet ahead of the permanent timbering. There has been 2443 cubic yards excavated from the entrance end and deposited upstream of the upstream toe wall since September 19, 1932 (Station O+82 in the outlet tunnel.)

**DRAINS:** The north under drain, except for stripping forms, was completed this period. The three under drains are now about 70 per cent complete.

**STRIPPING:** Stripping of foundation under rock embankment at the north abutment and east of the upstream toe wall was completed.

**MAIN CORE WALL:** The excavation for the main core wall foundation between coordinates N 3470 and N 3660 was inspected and approved by the State's Inspector on October 6. The first concrete was placed on October 7 between N 3480 and N 3649, and from the foundation elevation about 501 to about elevation 510. Copper water stops were placed. Drilling of grout holes was begun on October 10 and five holes were drilled during the day. Excavation for the core wall on the south abutment up to elevation 590 was begun. Excavation for the core wall has been progressed from coordinate N 3670 to about N 3750. This section should be ready for final State inspection about October 15.

**TOE WALLS:** About 200 cubic yards of concrete remain to be placed in the south end to complete the downstream toe wall. The toe walls are 99.4 per cent complete.

**ROCK EMBANKMENT:** The three drilling rigs completed 18 8-inch vertical holes to an average depth of 65 feet. The drills drilled 25 29-foot holes. There were placed into all these holes 240 cases of 60 per cent powder, 89 cases of 70 per cent powder, 34 cases of 40 per cent powder and 23 cases of 60 per cent stick dynamite. These holes were shot at 7:30 P.M. October 6, and developed an estimated amount of 8000 cubic yards of rock. 3174 truck loads, or about 16,187 cubic yards of rock have been loaded, hauled and placed in the rock embankment of the dam this period. 2443 cubic yards have been excavated from the entrance end of the outlet tunnel and placed east of the upstream toe wall, making a total of 76,700 cubic yards or 8 per cent of the total required in the rock embankment.

**RIVER DISCHARGE:** On October 10 about 10 A.M. the water from the San Diego River flooded the gravel pit and pump sump at the gravel plant, washed out the two contractor's road crossings between the dam and the gravel plant and flooded the entrance end of the outlet tunnel. All tools, materials, machinery etc. were removed in advance of the water. The water reached a maximum stage at elevation 573.9 and began flowing thru the pilot drift of the outlet tunnel. The water discharging thru the pilot tunnel drift impounded in the enlarged tunnel outlet section until the contractor deepened the adjacent below river channel. An 8-inch pump was installed, discharging to the river, and lowered the water in this area so that tunnel work was resumed at 3 P.M. October 11. Water is gradually seeping into the excavation and rising against the upstream toe wall and rock embankment is being progressed downstream and adjacent to this wall.

**ACCIDENTS:** One man received a broken toe; one man in the quarry a broken leg and head cuts; and a shovel operator in the tunnel had a fractured pelvis and spine from falling rock. The usual minor injuries were treated.

**WORK CONTEMPLATED BY THE CONTRACTOR DURING NEXT TEN DAYS:**

The outlet tunnel enlargement will be continued.  
 The quarry development and hauling of rock for the rock embankment will be continued.  
 Gravel and concrete plant operation will continue.  
 Stock piling of concrete aggregates will be continued adjacent to the concrete plant.  
 Excavation and concreting of the core trench will be continued.  
 Concreting of the downstream toe wall and the south drain will be completed.  
 Continue drilling grout holes at core wall.

**CLEARING:** There have been two permits granted for cutting wood in the reservoir basin this period making a total of 17 permits granted. All these permits cover about 660 acres. There have been a total of 29 cords of wood hauled from this

area to October 10, 1932. No permits have been issued since October 8 because of conflict with Indians residing in the reservoir basin.

**SAMPLES:** During this period sand samples Nos. 153, 164 and 165 reinforcing steel samples from steel for the tunnel Nos. 154, 155, 156 and 157, and concrete samples Nos. 158, 159 160, 161, 162 and 163 were delivered to the testing laboratory for testing.

**VISITORS:**

- October 1 - Major General Joseph E. Kuhn  
Fred D. Pyle, Engineer  
Paul Beermann, Assistant Engineer
- " 3 - Gerald McKinlay, Senior Engineer of Dam Inspection  
Chester Marliave, State Geologist  
H. N. Savage, Hydraulic Engineer
- " 5 - Clive Armitage, Civil Engineer, Santa Maria
- " 6 - Gerald McKinlay, Senior Engineer of Dam Inspection  
C. Leon de Aryan, Editor BROOM  
Allen Rowe, Civil Engineer, Los Angeles  
Henry Love, SAN DIEGO UNION  
John M. Martin, Attorney for Contractors  
H. N. Savage, Hydraulic Engineer
- " 7 - H. R. Krames, 1526 Meade Avenue, San Diego  
Chas. Griffith, 25th & G Streets, San Diego  
S. D. Fraser, Carlsbad  
A. L. Sonderegger, Consulting Engineer, Los Angeles
- " 8 - Dr. C. E. Rees  
H. N. Savage, Hydraulic Engineer
- " 10 - Geo. Kingston, Fallbrook  
George Moore, Reporter LOS ANGELES TIMES  
H. N. Savage, Hydraulic Engineer

Respectfully submitted,

H. N. Savage,  
Hydraulic Engineer.

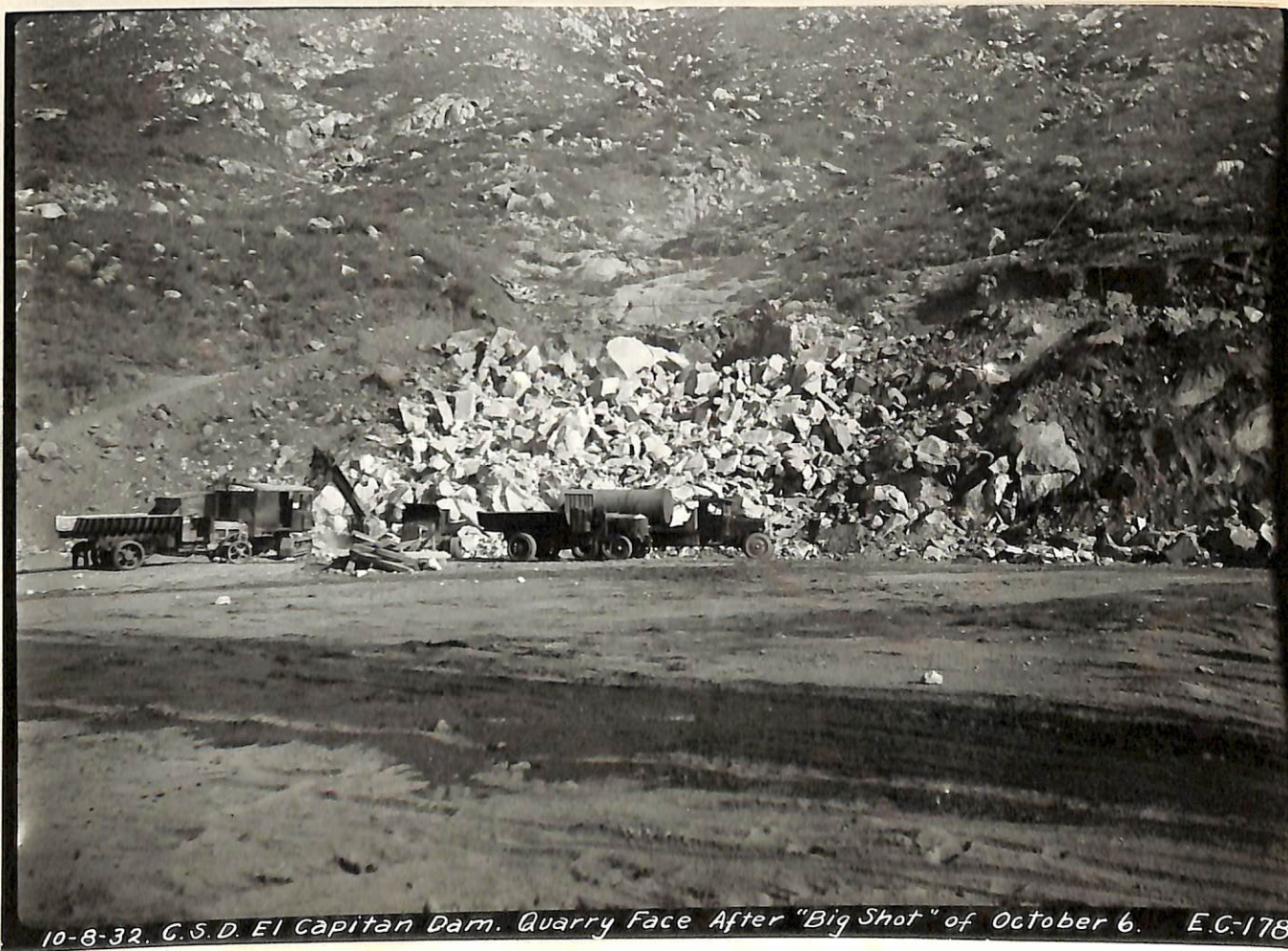
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Encl. Photoprints EC-176 and EC-178



10-7-32. G.S.D. El Capitan Dam. Core Wall Trench Excavation Completed. E.C-176.

3229



10-8-32. G.S.D. El Capitan Dam. Quarry Face After "Big Shot" of October 6. E.C-178.

October 20, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council of the  
City of San Diego, California.  
Subject: San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

OCTOBER - SECOND TEN DAY PERIOD REPORT

**WEATHER:** The weather has been clear during the period. The discharge of the San Diego River at the contractor's road crossing about 0.4 mile west of the damsite has varied from 0.5 second feet to about 10 second feet due to pumping to un-water portions of the construction work. The San Diego River above the dam site flowed 138. second feet as a peak during the runoff of the forenoon of October 10. The majority of the flood runoff which automatically impounded in pools and percolated down decreased within about 24 hours to about 10 second feet.

**FIELD ENGINEERING:** One 5-man survey party has been engaged this period on measurements for depth to core wall foundation excavation and grout holes, setting points for the concrete placing, steel erection and contraction and construction joints in the core wall, setting water stage gauging staffs for records of water elevations of the river above the contractor's gravel plant, above the diversion dam, above the outlet tunnel entrance and downstream of the downstream toe wall. Lead plugs and copper tacks were set in the top of the downstream toe wall for permanent reference points.

The upstream masonry toe wall was checked by measurements on similar points set for possible movement during placement of rock embankment and for movement during the rise of flood waters against the upstream face. No movement whatever occurred.

Coordinate stakes were re-set around the exit portal for final cross sections for quantity measurements. Points were set for the exit portal structure excavation and concrete.

**OFFICE ENGINEERING:** Computing quantities of the rock embankment, core wall excavation, concrete, grout holes, grout pipes and copper water stops. The outlet tunnel "overbreak" measurements were plotted. Posting progress charts and records required by the State. Tracing 8-1/2 inches by 11 inches was prepared of typical section of core wall showing construction and contraction joint details, steel reinforcement and details. The list of contractor's equipment has been brought up to date. Specifications have been prepared for sliding gate and bronze valve for the outlet tower. Construction cost accounts, progress records and data required by the State have been kept.

**CONTRACTOR'S COOPERATION:** The daily maintenance of the contractor's roads has continued. The two breaks in the road to the gravel plant made by the river have been repaired. A new road has been begun along the right or north bank of the river from damsite #1 toward the gravel plant.

The triplex pump for the water supply from the river was re-erected east of the dam. The earth dam east of the entrance end of the outlet tunnel was rebuilt to about elevation 577, or about 5 feet above the water in the river. An 8-inch horizontal centrifugal, electric motor driven pump was installed near the north end of this earth dam to unwater the entrance portal excavation and approaching road to the entrance of the outlet tunnel. A 16-inch horizontal, centrifugal, electric motor driven pump was installed near the south end of this earth dam. This pump is to pump from the river and discharges thru a 16-inch diameter steel pipeline laid along the south abutment and discharging downstream of the hydraulic fill area of the dam.

The gravel plant, shut down on October 10 because of the high water in the river, resumed operation on October 18. Concrete aggregates were hauled from the stock piles to the concrete plant. About 1055 cubic yards of aggregates were produced this period.

The concrete plant produced 1053 batches of concrete and 28 batches of grout for the core wall. The concrete operations have been put on a "call" basis and the concreting has been done mostly at night during this period. 5,000 sacks of cement have been received at the cement warehouse making a total to date of 77,081 sacks. A total of 59,950 cement sacks have been cleaned and 381 sacks of cement have been salvaged.

The contractor has employed an average force of 332 men per day during this period. The contractor's payroll October 1 to 15 inclusive, was \$25,706.37. Invoices for supplies and materials purchased by the contractor totaled \$67,845.72 for the month of September.

#### DAM CONSTRUCTION:

**OUTLET TUNNEL:** The full enlargement of the outlet tunnel except the invert, has been progressed 226 feet at the entrance and 421 feet at the exit end making a total of 647 feet, or 55.1 per cent of the total length. The bench excavation in the entrance end stopped by high water on October 10 was resumed on October 20. The enlargement at the exit end has progressed 209 feet ahead of the permanent timbering. There has been 2803 cubic yards excavated from the entrance end and deposited upstream of the upstream toe wall since September 19, 1932 (Station O+82 in the outlet tunnel.)

**DRAINS:** The center and north underdrains are completed. The drains are now 80 per cent complete.

**STRIPPING FOUNDATION:** Stripping of foundation under rock embankment east of coordinate E 5400 and to the upstream toe wall and up to elevation 575 was completed this period.

**MAIN CORE WALL:** Excavation for the core wall foundation from coordinates N 3660 to N 3770 was inspected and approved by the State Inspector on October 13.

Concrete has been placed to the top of the 6-foot trench from N 3480 for 160 feet, or to N 3640. Concrete has been placed to within 6 feet of the top of the 6-foot trench from N 3640 to N 3762.

Steel columns and reinforcing steel for a height of 18 feet has been placed for the length of 160 feet between N 3480 and N 3640.

Copper water stops are set between all contraction and construction joints.

56 grout holes have been drilled in the foundation of the concreted portion of the core wall to an average depth of about 24 feet below the bottom of the concrete. Grout pipes have been set in these holes and extended up to above the top of the trench.

Excavation for the core trench is being progressed southerly to coordinate N 3320. This section will be ready for State inspection during the next ten day period. A wooden shaft tower and trestle is being erected for excavation of core wall foundation at the toe of the north abutment north of N 3770.

The concreting of the most difficult portion of the core wall has been accomplished across the river bed and to a depth of 52 feet below the old river channel. The core wall footing is 23 per cent in length complete.

**TOE WALLS:** The upstream masonry toe wall is complete and there remains only about 200 cubic yards of concrete to be placed to complete the downstream toe wall. No work has been done on this wall except stripping of forms, during this period. The toe walls are 99.5 per cent complete.

**ROCK EMBANKMENT:** 6188 truck loads, or about 31,560 cubic yards of rock have been loaded, hauled and placed in the rock embankment of the dam this period. 2803 cubic yards have been excavated from the entrance end of the outlet tunnel and placed east of the upstream toe wall making a total of 111,060 cubic yards or 11.6 per cent of the total required in the rock embankment.

**ACCIDENTS:** The first fatality occurred on October 19. Wm. White, single, age 23, was, in some manner not known, crushed by a rock truck and died within a few minutes after being taken to the emergency hospital at the contractor's camp. One man had a fractured spine by being hit by rock falling from a rock truck at the quarry. The usual minor injuries were treated.

**CLEARING:** The 17 to whom permits have been issued, to cut wood in the reservoir basin have cut and hauled 38.3 cords of wood.

**SAMPLES:** During this period concrete samples Nos. 166, 167, 168, 169, 170 and 171, and sand samples Nos. 172 and 173 have been delivered to the testing laboratory for testing.

**VISITORS:**

- October 11 - H.D. Aspland, Associated Indemnity Company  
975 Subway Terminal Building, Los Angeles  
(Insurance carrier for contractor)  
Wallace Hamilton, San Diego Union
- " 12 - H.D. Aspland, Associated Indemnity Company  
Dr. C. E. Rees  
W. W. Austin  
H. N. Savage, Hydraulic Engineer
- " 13 - J. I. Ballard, Engineer News-Record  
Gerald McKinlay, Senior Engineer of Dam Inspection  
D. W. Albert, Contractor's Engineer (arrived back on job)  
H N Savage, Hydraulic Engineer
- " 15 - Edward Hyatt, State Engineer  
Colonel Ed Fletcher, San Diego  
Fred D. Pyle, Assistant Hydraulic Engineer  
Paul Beermann, Assistant Engineer  
R. H. Wilcoomb, Division Engineer, Montana  
State Highway Department  
John E. Boal, National City  
H. N. Savage, Hydraulic Engineer
- " 17 - J. A. Writer, San Diego  
Stearns Cook, San Diego  
S. S. Cook, San Diego  
Carl Lamb, San Diego  
L. C. Rideout, San Diego Union  
A. L. Volk, San Diego Union  
R. R. Bradley  
Fred D. Pyle, Assistant Hydraulic Engineer  
H. N. Savage, Hydraulic Engineer
- " 19 - Tom Allen, Civil Engineer, San Diego  
H. N. Savage, Hydraulic Engineer
- " 20 - G. R. Osterman, McGraw-Hill Publishing Company



## WORK CONTEMPLATED BY THE CONTRACTOR DURING NEXT TEN DAYS:

The outlet tunnel enlargement will be continued.  
The quarrying of rock and hauling to the rock embankment will be continued.  
Gravel and concrete plant operation will continue.  
Stock piling of concrete aggregates will be continued.  
Excavation for and concreting of the core wall will be continued.  
Concreting of the downstream toe wall will be completed.  
Drilling and grouting of grout holes will be progressed at the core wall.  
Concreting of the south drain will be completed.  
Concreting of shafts to drains will be continued.

Respectfully submitted

H. N. Savage,  
Hydraulic Engineer.

HNS/p

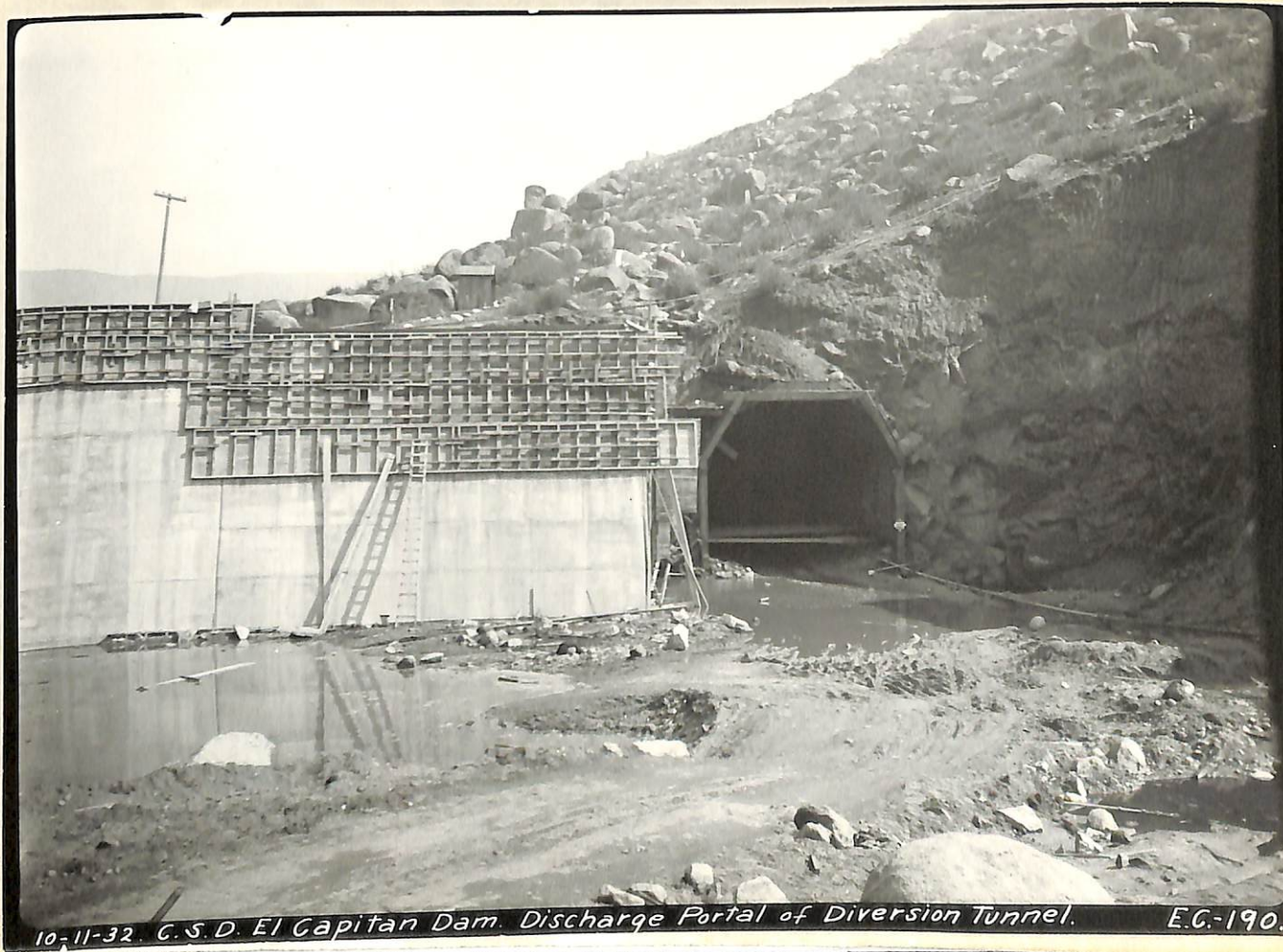
Encls. Photoprints EC-185 and EC-190



10-11-32. C. S. D. El Capitan Dam. Reservoir Portal of Diversion Tunnel.

E.C.-185.

3235



10-11-32. C. S. D. El Capitan Dam. Discharge Portal of Diversion Tunnel.

E.C.-190.

November 1, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council  
of the City of San Diego, California.  
Subject: San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

OCTOBER - THIRD TEN DAY REPORT

**WEATHER:** The weather has been clear this period. The discharge of the San Diego River at the contractor's road crossing about 0.4 mile west of the dam has varied from 0.5 second feet to about 10 second feet due to intermittent pumping operations of the contractor.

**FIELD ENGINEERING:** One 5-man survey party has been engaged this period on setting points for the footings for the two portal structures of the outlet tunnel; location and depth of grout holes under the core wall, for the core wall concrete and columns. Points were set for 32 expansion joints in the core wall. Points were set for line and grade at each header for the outlet tunnel invert. Points were set for the downstream rock toe of the dam. Final coordinate cross sections were taken on stripped area near the north end of downstream toe wall. The trim line was painted on the south side wall in portion of untimbered section of outlet tunnel. Final cross sections were taken of the excavation for the exit portal structure and approach. Center line points were set in the concrete invert of the outlet tunnel. Profile of the core trench along the south abutment was run.

**OFFICE ENGINEERING:** Five tracings for the core wall were prepared and one tracing completed showing the bottom portion of core wall as concreted and drilled for grout. Computations for schedule item quantities for the monthly estimate have been advanced. A tracing showing the typical core wall section as constructed was prepared. The following thru of administrative affairs has consumed considerable time. Progress charts have been posted and routine records of the work and reports made.

**CONTRACTOR'S OPERATIONS:** The daily maintenance of the contractor's roads has continued. The gravel plant has continued operation. About 3525 cubic yards of aggregates were produced this period. The concrete plant produced 458 batches of 1:2:4 mix concrete, for the outlet tunnel portal structures footings and 116 batches for the south drain and 84 batches of 1:2½:5 mix concrete for the downstream toe wall.

10,000 sacks of cement have been delivered at the cement warehouse, making a total to date of 81,081 sacks. A total of 67,050 cement sacks have been cleaned and 440 sacks of cement have been salvaged to date. 17,837 sacks have been used this month.

The contractor has employed an average force of 348 men this period.

#### DAM CONSTRUCTION:

**OUTLET TUNNEL:** The full enlargement of the outlet tunnel, except the invert, has been progressed 326 feet at the entrance and 489 feet at the exit end making a total of 815 feet, or 70 per cent of the total length. The enlargement at the exit end was made 261 feet without timbers. There was 334 feet of the invert excavated and concreted between the angle point at the exit end and the exit portal.

**DRAINS:** The under drains are complete, except the wells, and are 60 per cent backfilled with rock and gravel.

**STRIPPING FOUNDATION:** Stripping of foundation under rock embankment along the north abutment was completed from the downstream rock toe to about 200 feet upstream of the upstream toe wall and to about elevation 568.

**MAIN CORE WALL:** Excavation for the core wall footing from coordinates N 3470 to N 3340 was completed from State inspection. Steel columns have been erected and concrete has been placed to the top of the trench from coordinates N 3480 to N 3720. Copper water stop has been set between all contraction and construction joints. About 37 per cent of the length of the core wall footing has been excavated to completion and about 23 per cent of the length has been drilled for grouting. 65 grout holes have been drilled in the foundation of the concreted portion of the core wall. Grout pipes have been set in these holes and 12 holes have been grouted.

**TOE WALLS:** The upstream toe wall is complete and there remains 21 cubic yards of concrete to be placed to complete the downstream toe wall. The toe walls are 99.9 per cent complete.

**ROCK EMBANKMENT:** 6776 truck loads, or about 34,558 cubic yards of rock have been loaded, hauled and placed in the rock embankment of the dam this period. 4480 cubic yards have been excavated from the entrance end of the outlet tunnel and placed east of the upstream toe wall. 660 cubic yards have been excavated from the exit end of the outlet tunnel and placed upstream of the downstream toe wall. There have been a total of about 147,955 cubic yards, by truck measurement, placed in the rock embankment or about 15 per cent of the total required.

**ACCIDENTS:** Two tunnel men received strained backs from lifting. The usual minor cuts and bruises were treated.

**CLEARING:** The 17 citizens of San Diego to whom permits have been issued to cut wood in the reservoir basin have cut and hauled 56 cords of wood. 5.5 cords of wood have been cut under contract for the City's El Capitan Camp.

SAMPLES: During this period sand samples 174 and 177; and concrete samples 178, 179 and 180; and steel samples 175 and 176 have been delivered to the testing laboratory for testing.

WORK CONTEMPLATED BY THE CONTRACTOR DURING NEXT TEN DAYS:

The outlet tunnel enlargement will continue.  
 The quarrying and hauling of rock to the rock embankment will be continued.  
 Gravel and concrete plant operation will continue.  
 Stock piling of concrete aggregates will continue.  
 Concreting of the wells to the drains will be progressed.  
 Excavation for and concreting of the core wall will be progressed.  
 Drilling and grouting of the grout holes under the core wall will be progressed.  
 Concreting of the two outlet tunnel portal structures will be progressed.

VISITORS:

October 24- H N Savage, Hydraulic Engineer  
 Lester Bradley, San Diego Union  
 W.L Wright, San Diego Union

" 25- H N Savage, Hydraulic Engineer  
 Gilmore Tillman, Assistant City Attorney

" 26- C E Anderson, City Councilman  
 Geo W Hawley, Deputy State Engineer  
 Gerald McKinlay, Senior Engineer of Dam Inspection  
 H N Savage, Hydraulic Engineer

" 27- H A Van Norman, Chief Engineer & General Manager  
 Los Angeles Bureau of Water Works & Supply  
 W W Harlbut, Engineer Distribution & Operation,  
 Los Angeles Bureau of Water Works & Supply  
 J E Phillips, District Engineer  
 Los Angeles Water Development  
 Fred Fischer, Mechanical Engineer  
 Los Angeles Water Development  
 C E Angilly, Assistant District Division Engineer  
 Los Angeles Bureau of Water Works & Supply  
 R W Lawton, Pacific States Sales Manager and  
 Consulting Engineer Nye Oderless Incinerator  
 Corporation  
 L N Slater, Manager Western Pipe & Steel Company  
 W H Cates, Western Pipe & Steel Company  
 Peter Dorderick, Water Superintendent, Glendale  
 K A Wilbur, Assistant Water Superintendent,  
 Glendale  
 M B Hart, San Diego  
 H N Savage, Hydraulic Engineer

## Visitors (Continued)

October 29- Geo A Elliott, Consulting Engineer, San Francisco  
N A Eckart, General Manager & Chief Engineer  
San Francisco Water Department  
Geo Tracy, Manager Distribution, San Francisco  
Water Supply  
S B Morris, Chief Engineer, Pasadena Water  
Department  
H N Savage, Hydraulic Engineer  
John Treanor

" 31- N T Stacy, Contractor San Francisco  
Member firm Jasper-Stacy Company

Respectfully Submitted

H. N. Savage,  
Hydraulic Engineer.

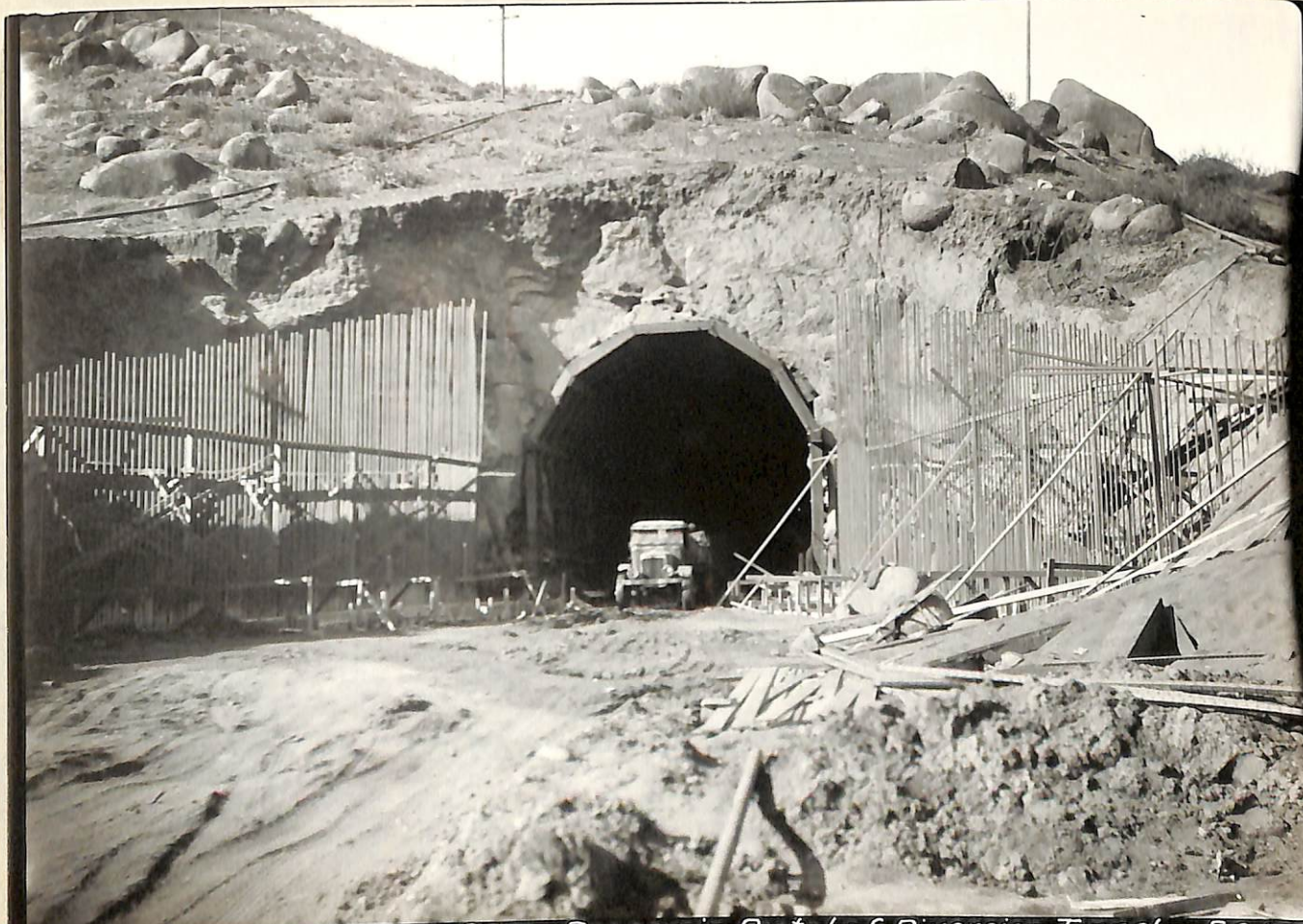
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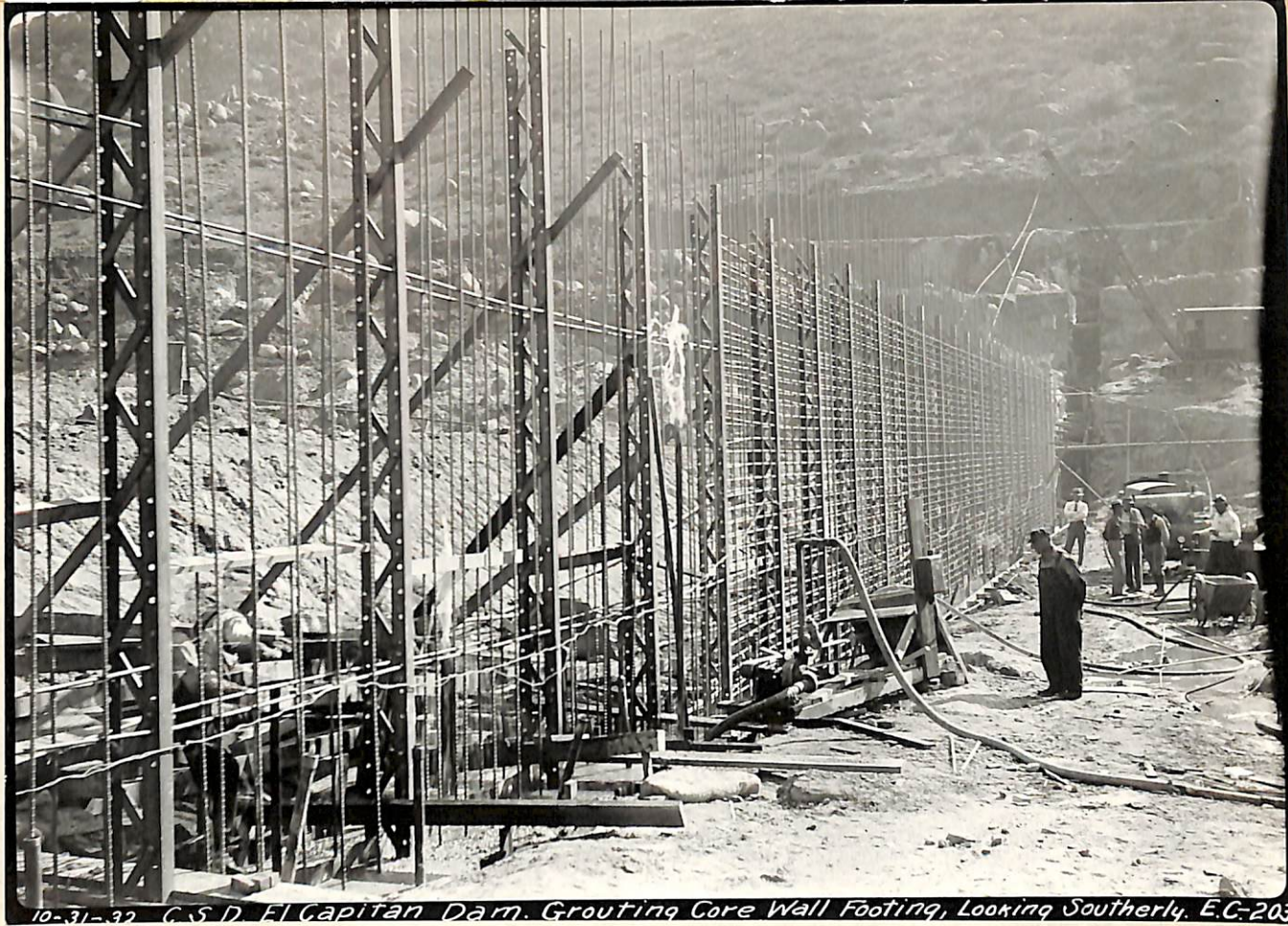


10-28-32. C.S.D. El Capitan Dam. Discharge Portal of Diversion Tunnel. E.C.198

3240



10-31-32. C.S.D. El Capitan Dam. Reservoir Portal of Diversion Tunnel. E.C.199



10-31-32 G.S.D. El Capitan Dam. Grouting Core Wall Footing, Looking Southerly, E.C-203

3241



November 10, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council of the  
City of San Diego, California.  
Subject: San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

NOVEMBER - FIRST TEN DAY PERIOD REPORT

WEATHER: The weather has been clear this period. The discharge of the San Diego River at the contractor's road crossing about 0.4 mile west of the dam has varied from 0.5 second feet to about 10 second feet due to pumping operations of the contractor.

FIELD ENGINEERING: One 5-man survey party has been engaged this period on the taking of cross sections of the rock embankment, final elevations on the bottom of the core wall trench as approved by the State from coordinate N 3480 to N 3334. Grades were set for the forms for the core wall and for entrance portal structures. Final cross sections were taken for the excavation at the entrance portal structure.

Classification division lines were laid out and painted at each of the portal excavations.

Grout holes were located for the core wall from coordinate N 3480 to N 3385.

The neat tunnel excavation line was indicated on the side walls of the tunnel by paint lines for about 110 feet in the rock section. The invert subgrade was staked in the outlet tunnel.

Stakes were set for the downstream toe rock embankment trench. The center line of the core wall was established in the small drift to coordinate N 3780. Final cross sections were taken on the stripped area under the rock embankment above the downstream toe wall and south of the drains. Center line and grade points were set for 40 feet at the exit portal of the outlet tunnel.

One man has been engaged within the reservoir basin on inspection of the wood cutting and wood removal.

OFFICE ENGINEERING: The computations of quantities for the monthly estimate were made; progress charts were posted and cross sections of the tunnel approaches were computed. The outlet tunnel overbreak is being plotted and computed as the work progresses. Progress tracings showing the core wall details have been posted to date. Computations of weight of reinforcing and structural steel have been made.

**CONTRACTOR'S OPERATIONS:** The daily maintenance of the contractor's roads has continued. A new road extending from the quarry road east of the contractor's camp is being built across the north abutment of the dam at elevation 640. This road to date has been extended to the axis of the dam. A roadway has been constructed leading over the south end of the upstream toe wall and descending into the puddle core area along the south toe of the upstream rock embankment.

The gravel plant has continued in operation and has produced 1416 cubic yards of rock and 610 cubic yards of sand. About 1100 cubic yards of rock were produced by crushing the 2-1/2 inch rock previously stock piled.

4053 sacks of cement were used this period. 15,900 sacks were cleaned and 132 sacks of salvaged cement were obtained. 3,000 sacks of cement were received on the job this period. 23,250 sacks were returned to the cement manufacturer.

**DAM CONSTRUCTION:**

**OUTLET TUNNEL:** The full enlargement of the outlet tunnel, except the invert, has been progressed 420 feet at the entrance end, and 565 feet at the exit end, making a total of 985 feet or 84 per cent of the total length. The enlargement of the exit end is having to be timbered leaving 261 feet of the enlargement of the exit end of the tunnel untimbered. 334 feet of the invert of the exit end of the tunnel has been concreted. The footings and 5-1/2 feet of height of both walls of the entrance portal have been concreted. Both footings and floor of the exit portal have been concreted.

**DRAINS:** The underdrains are complete and the up raising wells have been concreted to within about 6 feet of their top.

**STRIPPING FOUNDATION:** No stripping of foundation has been done this period except that the contractor has excavated a portion of his road along the north abutment of the dam at elevation 640.

**MAIN CORE WALL:** On November 1 the State's Inspector inspected the excavation for the core wall footing and approved it from N 3470 to N 3340. The first placement of concrete over this foundation has been completed and the grout holes for about 80 feet of this length have been completed. Excavation for the core wall footing from coordinate N 3760 to N 3800 has been progressed. 46 grout holes which were drilled in the foundation of the center portion of the core wall footing have been pressure grouted with Portland cement. 40 per cent of the length has been excavated.

**TOE WALLS:** Both upstream and downstream toe walls are now complete.

**ROCK EMBANKMENT:** 8160 truck loads of rock embankment material, or about 41,616 cubic yards of rock have been loaded, hauled and placed in the rock embankment of the dam this period. Rock excavated from both ends of the outlet tunnel is being placed in the rock embankment. There have been a total of about 194,343 cubic yards placed in the rock embankment, or about 20 per cent of the total required.

**CLEARING:** The 17 persons to whom permits have been issued to cut wood within the reservoir basin have cut and hauled a total of 80 cords. 11.4 cords of wood have been cut under contract for the City's El Capitan camp and have been hauled.

**SAMPLES:** During this period, rock sample No. 181 and concrete samples Nos. 182, 183 and 184 have been delivered to the testing laboratory.

**WORK CONTEMPLATED BY THE CONTRACTOR DURING NEXT TEN DAYS:**

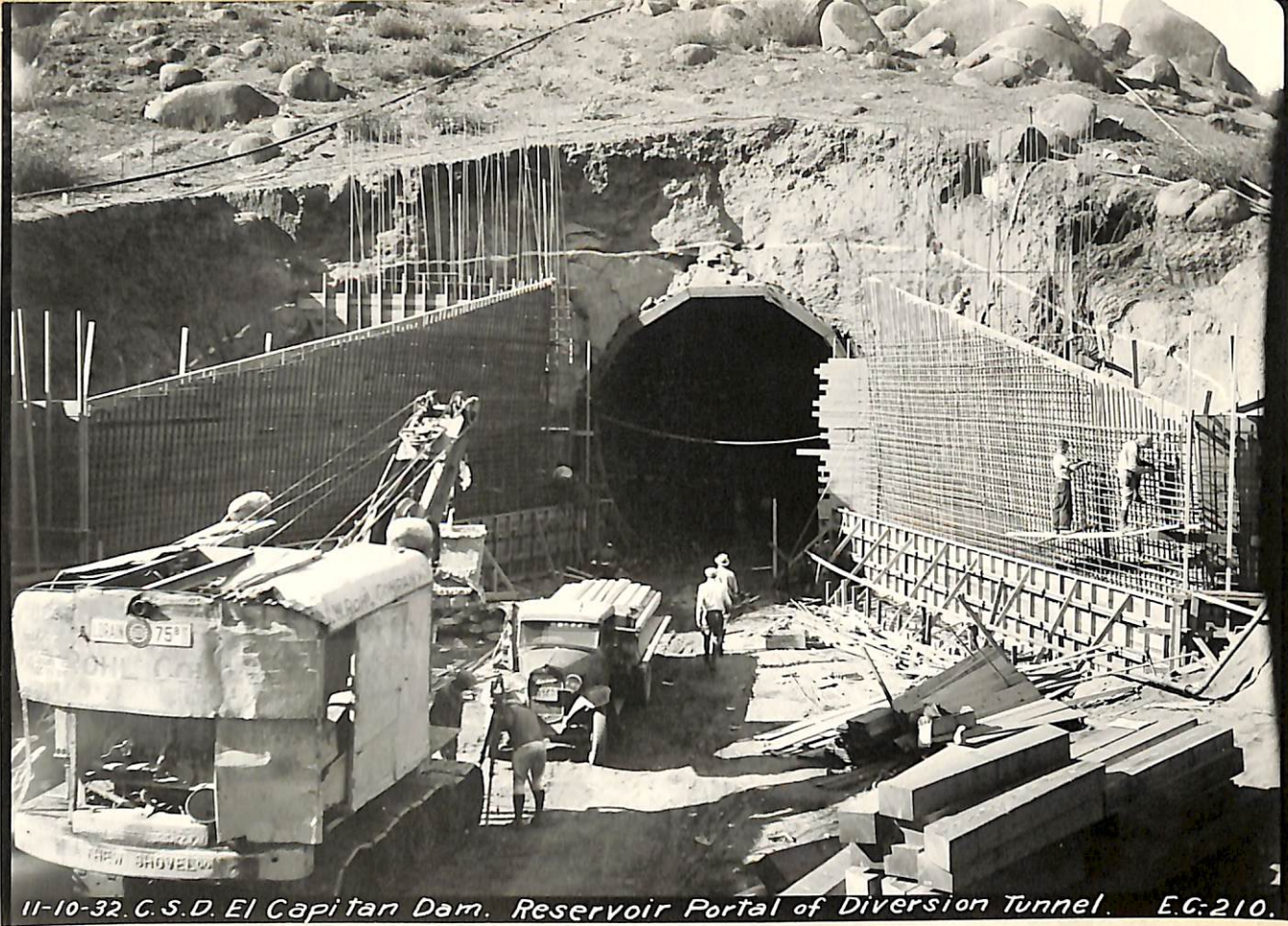
Outlet tunnel enlargement.  
 Quarrying and hauling rock to the rock embankment.  
 Gravel and concrete plant operation.  
 Stock piling of concrete aggregates.  
 Excavation for and concreting of core wall.  
 Drilling and grouting of grout holes under the core wall.  
 Concreting of the two outlet tunnel portal structures.

**VISITORS:**

November 1 - H.N.Savage, Hydraulic Engineer  
 Senator Leroy A. Wright, Attorney of San Diego  
 " 2 - H.N.Savage, Hydraulic Engineer  
 Councilman J. J. Russo  
 Engineer Fred D. Pyle  
 " 4 - H.N.Savage, Hydraulic Engineer  
 " 5 - Charles Small, Manager National Biscuit Co.  
 H. N. Savage, Hydraulic Engineer  
 " 7 - H.N.Savage, Hydraulic Engineer  
 " 8 - H.N.Savage, Hydraulic Engineer  
 Gilmore Tillman, Assistant City Attorney  
 Fred D. Pyle, Engineer  
 John M. Martin, Attorney for Rohl & Connolly  
 " 9 - H.N.Savage, Hydraulic Engineer  
 W.A.Stebbins  
 Dr. A. J. Thornton, San Diego  
 Ned Guyman, San Diego  
 " 10 - H.N.Savage, Hydraulic Engineer  
 Fred D. Pyle, Engineer  
 John M. Martin, Attorney for Rohl & Connolly  
 Chas. C. Crouch, San Diego.

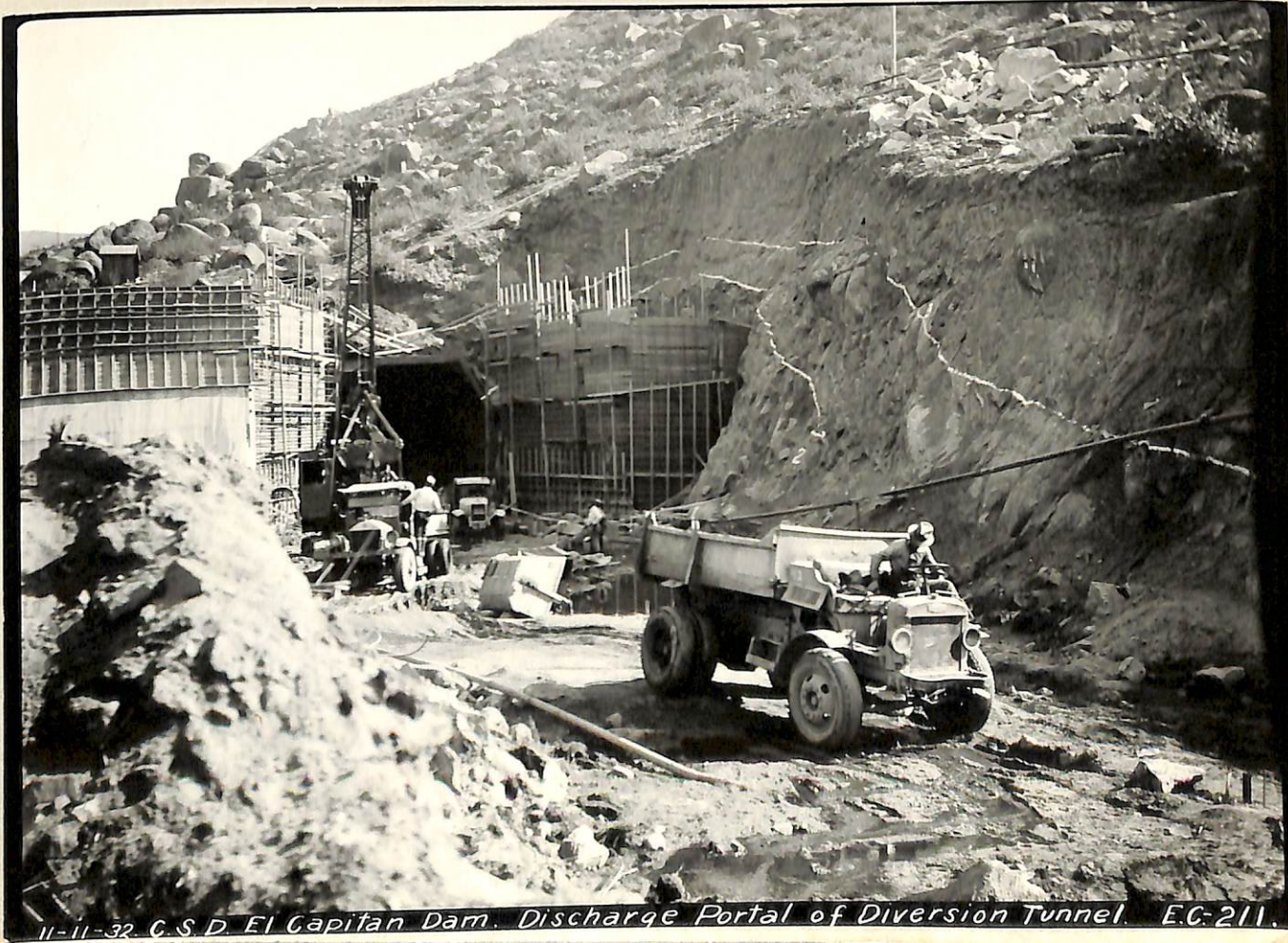
Respectfully submitted,

H. N. Savage,  
 Hydraulic Engineer



11-10-32 C.S.D. El Capitan Dam. Reservoir Portal of Diversion Tunnel. E.G.210.

3215



11-11-32 C.S.D. El Capitan Dam. Discharge Portal of Diversion Tunnel. E.G.211.

November 20, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council of the  
City of San Diego, California.  
Subject: San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

NOVEMBER - SECOND TEN DAY PERIOD REPORT

**WEATHER:** The weather has been clear this period with warm days. The discharge of the San Diego River below the dam has been only the water pumped by the contractor and varied from 0.5 second foot to about 8 second feet.

**FIELD ENGINEERING:** One 5-man survey party has been engaged during this period in checking timber segments for minimum concrete coverage and marking same in west 280 feet of the outlet tunnel, setting spring line and center and side line points in east 330 feet, taking elevations of top segments in east 420 feet, setting center and side line points from Station 6+50 to 8+17.5 and painting trim line in untimbered portion of tunnel.

Final cross sections were taken below the downstream toe wall adjacent to the tunnel exit channel, along the 580 contour road on the north abutment and below the upstream toe wall in the vicinity of N 3900 E 5300.

Typical cross sections were taken of the 640 contour road along the north abutment and construction points were set for the core wall from N 3335 to N 3385. Points marking the limits of the rock embankment below downstream toe wall were set.

**OFFICE ENGINEERING:** Three field office men have been engaged during this period in posting core wall trench tracings as required by the State Engineer, plotting final cross sections taken on the stripped areas, plotting cross sections of the tunnel entrance and exit channels and portal structure excavations, calculating the elevations of rock embankment slopes below the downstream toe wall on the coordinates for plotting and calculating volumes, plotting tunnel overbreak sections. Estimating amount of stripping done and amount under the rock embankments.

**CONTRACTOR'S OPERATIONS:** The daily maintenance of the contractor's roads has continued. The new road extending from the quarry road east of the contractor's camp has been built across the north abutment of the dam at elevation 640 and is being extended to join the road over the bunkers of the concrete plant.

The gravel plant operated November 11 only this period and produced 355 cubic yards of sand and 330 cubic yards of rock. 3553 sacks of cement were used this period. 1800 sacks were cleaned and 16 sacks of cement were salvaged. 2000 sacks of cement were delivered to the job this period.

The contractor's force has averaged 354 men for this period. The force was reduced by about 40 men on November 18. These men were mostly employed in the tunnel. Eleven men were paid off the last two days of this period.

#### DAM CONSTRUCTION:

**OUTLET TUNNEL:** The full enlargement of the outlet tunnel, except the invert, has been progressed 506 feet at the entrance end, and 642 feet at the exit end, making a total of 1148 feet, or 98 per cent of the total length. The remaining 25 feet of the tunnel enlargement will be completed by November 22.

Both wing walls at the entrance portal have been concreted. The footings, floor and 5.5 feet of the walls at the exit portal have been concreted. 265 batches of concrete have been placed this period. Two 10-foot sections of steel tunnel lining forms have been erected at the exit portal. Reinforcing steel for tunnel lining has been erected from the exit portal for about 200 feet.

**DRAINS:** The drains are complete and the wells have been concreted to within about 6 feet of their tops. No work on the wells has been done this period.

**STRIPPING FOUNDATION:** The stripping of the north abutment under the upstream rock embankment is being accomplished from the road descending from the road at elevation 640 to about elevation 620. This area is about 60 per cent stripped below elevation 620.

**MAIN CORE WALL:** The core wall concreting has been extended southerly to coordinate N 3340 and concrete placed up to the base of the structural steel columns from N 3480 to N 3380. 29 vertical grout holes have been drilled into the foundation between these coordinates. The excavation of the core wall trench has been progressed from the north end of the concrete at N 3762 to N 3840. This portion of the excavation will be ready for State inspection on November 23. This will make the excavation complete from N 3340 to N 3840 or 43 per cent of the total length of the core wall. The concrete has been brought up to elevation 543 from N 3480 to N 3704. 29 batches of grout were used in the foundation grouting. 257 batches of concrete were placed in the core wall this period.

**ROCK EMBANKMENT:** 6396 truck loads of rock or about 32,620 cubic yards have been loaded, hauled and placed in the rock embankment of the dam this period. This has completed the upstream rock embankment to elevation about 580 except for the narrow ramp at the south abutment and has completed the downstream rock embankment upstream of the upstream toe wall to elevation 575 except the backfill at the north exit portal wing and at the north road ramp. About 80 per cent of the volume required downstream of the downstream toe wall has been placed. There has been a total of 226,963 cubic yards placed or 24 per cent of the total required.

-3-

**ACCIDENTS:** No serious accidents occurred this period. There were the usual number of minor cuts and bruises treated.

**CLEARING:** The temporary permission heretofore granted 17 permittees was suspended by letters to each on November 15, 1932. The removal of wood already cut by the permittees is to be completed by December 1, 1932. About 18 cords of wood have been cut under contract and hauled to the City's El Capitan camp.

**SAMPLES:** During this period concrete samples 185, 186 and 187 have been taken and delivered to the testing laboratory for testing.

**WORK CONTEMPLATED BY THE CONTRACTOR DURING NEXT TEN DAYS:**

Trimming of walls and roof and excavation for invert in the outlet tunnel will be carried on upon the completion of the enlargement.

Quarrying and hauling rock to the rock embankment.

Excavation for the concrete core wall.

Drilling and grouting of core wall foundation.

Concreting entrance and exit portal structures.

Stripping along the abutments.

**VISITORS:**

November 12 - Judge C. Haines and Mrs. Haines  
 Melville Klauber  
 H.N.Savage, Hydraulic Engineer  
 E.C.Eaton, Chief Engineer Los Angeles  
 County Flood Control District  
 " 15 - Gerald McKinlay, Senior Engineer of Dam  
 Inspection  
 Fred D. Pyle  
 Paul Beermann

Hydraulic Engineer H. N. Savage left for Washington, D.C. November 16, 1932 pursuant to instructions of the Council, to cooperate in presenting application for funds before the Reconstruction Finance Corporation.

Respectfully submitted

H. N. Savage,  
 Hydraulic Engineer.

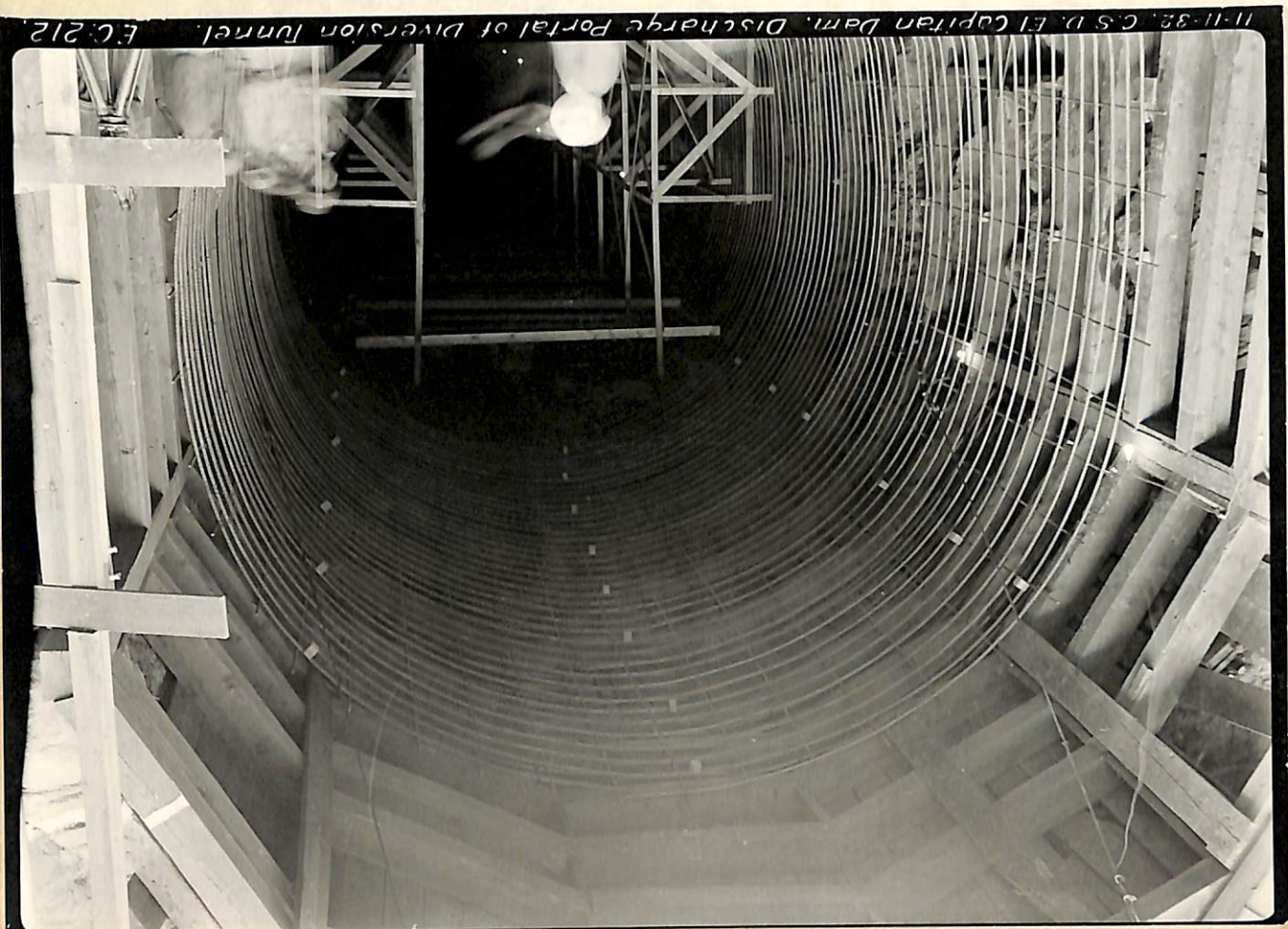
FDP/p

Encl. Photoprints EC-212 and EC-215



11-21-37 C.S.D. El Capitan Dam. Start of 2nd Lift Upstream Rock Embankment. EC-215

3249



11-11-38 C.S.D. El Capitan Dam. Discharge Portal of Diversion Tunnel. EC-212



November 30, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council of the  
City of San Diego, California.  
Subject: San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

NOVEMBER - THIRD TEN DAY PERIOD REPORT

WEATHER: The weather has been clear this entire period, except rain in the evening of November 30. The discharge of the San Diego River below the dam has been only the water pumped by the contractor and varied from 0.5 second foot to about 8 second feet.

FIELD ENGINEERING: One 5-man survey party has been engaged this period on final cross sections of stripping of north abutment under upstream rock embankment below elevation 625. Points were set for the core wall concrete and steel columns at the south abutment to coordinate N 3412. Profile of the core wall trench at the north abutment to N 3840 was taken. The final cross sections for the excavation at the entrance of the outlet tunnel were completed. The stationing of tunnel timbering and grade points on the segment timbers were set. The abutment areas for stripping below elevation 640 were flagged. A permanent bench mark was set on the south end of the downstream toe wall. Points for the upper forms for the exit portal structure were set. Points for the concrete invert in the outlet tunnel were set from 8+17 to 0+20. The work in the outlet tunnel has been occupying the major portion of the field party's time this period.

The usual inspection of quarry, rock embankment, stripping, steel and concrete placement, and reservoir basin clearing operations have been carried on as usual.

OFFICE ENGINEERING: Three field office men have been engaged during this period on calculation of schedule item quantities. Area of foundation stripping, as approved by the State, was plotted for record. Final coordinate cross sections and calculations of stripping yardage are being progressed. The concrete yardage in the exit portal structure has been computed. Records of mill heats and corresponding samples of reinforcing steel bars for the tunnel have been identified and tags and report forms prepared therefor. The routine posting of records and progress as required by the State has continued.

CONTRACTOR'S OPERATIONS: The daily maintenance of contractor's roads has continued. The road across the north abutment at elevation 640 has been extended to join the road over the concrete plant bunkers.

The gravel plant was operated 6 days this period and produced 1160 cubic yards of rock and 770 cubic yards of sand.

6,000 sacks of cement were received and 4,848 sacks of cement were used. 80,900 sacks were cleaned and 645 sacks of cement were salvaged to date. A total of 98,081 sacks of cement have been delivered to the job to December 1.

The contractor has delivered to the work this period 120 tons of reinforcing steel for use in the outlet tunnel.

#### DAM CONSTRUCTION:

**OUTLET TUNNEL:** The full enlargement of the outlet tunnel, except the invert, was completed on November 22. The excavation for the invert has been completed except 165 feet at the entrance portal. The concrete invert is complete except for 372 feet at the entrance portal. The invert is 68 per cent complete. The exit portal is 98 per cent complete - only the parapet wall remains to be concreted. There was no concrete placed at the entrance portal this period. The footings and wings are completed. Preparations for continuing the tunnel lining at the exit portal are progressing.

**DRAINS:** The concrete of the drains and wells is completed. There remains the stripping of inside forms and setting of steel covers to complete these structures. 78 batches of concrete were placed this period.

**STRIPPING FOUNDATION:** The area of the north abutment under the upstream rock embankment to elevation 625 has been stripped and accepted by the State. Stripping is being continued along the south abutment under the upstream rock embankment and below elevation 575.

**MAIN CORE WALL:** The concrete has been placed 6 feet in elevation above the base of the steel columns from N 3480 to N 3412. The excavation during this period has been confined to the trench north from the end of the concrete at N 3762 and to N 3840. This portion of the trench is ready for State inspection on December 1. 43 per cent of the length of the core wall trench has been completed. 712 batches of concrete were placed in the core wall this period.

**ROCK EMBANKMENT:** 6460 truck loads of rock, or about 32,946 cubic yards have been loaded, hauled and placed in the rock embankment of the dam this period. Dumping from the north abutment into the upstream rock embankment area from elevation 620 was begun on November 21. As the stripping along the northeast slope upstream of this first dump was completed, then the fill was raised to elevation 625. The full width of the embankment is not being made at this time - only the downstream portion is

being progressed southerly. Scarifying of the top of the rock embankment at elevation 580 is being completed ahead of the placement of additional rock embankment. All tunnel excavated material is being deposited on the upstream rock embankment above the 580 elevation. About 259,909 cubic yards have been placed in the rock embankment to date or about 27 per cent of the total required.

ACCIDENTS: There were no accidents during this period. The usual number of minor cuts and bruises were treated at the emergency hospital at the contractor's camp.

CLEARING: On November 21 a City force of 11 men and tractor began the clearing and piling for burning of dead and down brush, slashings and timber in the reservoir basin. On November 22, the force was increased and has been maintained at 16 men and foreman. The piling has been completed from the entrance of the outlet tunnel up the San Diego River to opposite the contractor's gravel plant, the Chocolate Creek area and up the east side of the river to the south boundary of the Indian Reservation. Burning will not be undertaken until written permission is granted by the Forest Service which will be on December 2. 26 cords of wood have been cut under contract with the City and 20 cords have been hauled to the City's camp.

SAMPLES: During this period concrete samples 188, 189 and 190 have been made and delivered to the testing laboratory for testing. Samples 191 to 199 inclusive were cut from reinforcing steel bars for the outlet tunnel, delivered to the job November 22 to 29 inclusive. These samples were delivered to the testing laboratory November 30.

WORK CONTEMPLATED BY THE CONTRACTOR DURING NEXT TEN DAYS:

- Trimming of walls and roof and completion of outlet tunnel invert will be accomplished. The tunnel lining will be progressed.
- The quarrying and hauling of rock for rock embankment will be continued.
- Excavation for the concrete core wall will be progressed.
- Drilling and grouting of core wall foundation will continue
- The concreting of the entrance portal floor and headwall will be progressed.
- The stripping of the abutments of the dam below elevation 640 will be progressed.

VISITORS:

- November 21 - Major General Joseph E. Kuhn
- " 23 - Gerald McKinlay, Senior Inspector of Dams for State.
- " 25 - Geo. F. Cuthbert, 510 W 6th St. Los Angeles  
Mr. Cuthbert, Jr. Geologist with Los Angeles County Flood Control District.

Hydraulic Engineer in Washington, D. C., collaborating in advancing the City of San Diego's application before the Reconstruction Finance Corporation for funds with which to accomplish the completion of the El Capitan Reservoir Dam, Spillway and Outlet Works.

Respectfully submitted

H. N. Savage,  
Hydraulic Engineer.

FDP/p

Encls. Photoprints EC-220 and 221



11-22-32. C.S.D. El Capitan Dam. Core Wall Looking Northerly.

EC-220.

3254



11-22-32 C.S.D. El Capitan Dam. Looking Downstream.

EC-221.

December 10, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council of the  
City of San Diego, California.  
Subject: San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

DECEMBER - FIRST TEN DAY PERIOD REPORT

**WEATHER:** The weather has been clear this period, except for rain on December 9 and 10. The discharge of the San Diego River has varied with a maximum of about 8 second feet which was mostly in consequence of pumping done at the downstream toe of the dam and from the core wall trench.

**FIELD ENGINEERING:** One 5-man survey party has been engaged this period on cross sectioning of the foundation stripped areas and rock embankment for the monthly estimate. Points were set for the outlet tunnel invert, entrance portal floor, steel columns and grout holes for core wall, and upstream rock embankment range flags at elevation 625. The trim line for the excavation of the untimbered section of the outlet tunnel was painted. One man has been engaged on inspection of reservoir basin wood cutting and clearing and burning operations.

The usual inspection of quarry, rock embankment, overburden stripping of foundation and steel and concrete placement has been carried on as usual.

**OFFICE ENGINEERING:** Four field office men have been engaged during the major portion of this period on calculations of schedule item quantities for Estimate 7 for work done during November. Routine posting of records of progress as required by the State has continued.

**CONTRACTOR'S OPERATIONS:** The daily maintenance of contractor's roads has continued. Clearing away of construction materials has been done at both portals of the outlet tunnel. The principal work has been on the tunnel during this period.

The gravel plant was operated 7 days this period and produced 2586 cubic yards of aggregates.

On December 10, a dragline excavator was put to work lowering the bottom of the river below the downstream toe of the dam. This is being done to relieve the pumping requirement.

The contractor's force on December 8 totaled 302 men with 19 keymen, 18 non-residents and 265 certified residents. Of the non-residents 14 were miners and 4 shovel operators.

3,000 sacks of cement were received and 5,516 sacks of cement were used. 1,150 sacks were cleaned and 11 sacks of cement were salvaged. A total of 101,081 sacks of cement have been delivered to the job to December 10.

**DAM CONSTRUCTION:**

**OUTLET TUNNEL:** The excavation for the invert has been completed and the entire invert and entrance portal floor has been concreted except the two enlargement sections at the tunnel plug location near the entrance portal. 60 feet of steel tunnel lining forms have been erected at the exit end of the outlet tunnel and concrete placement by pneumatic process began at noon on December 8 under the personal direction of T. E. Connolly. The concrete is delivered pre-mixed by transit mix trucks to discharge on a belt conveyor which elevates the concrete to a hopper over the concrete "gun". The discharge from the "gun" is thru 6 inch hose and pipe sections to the crown of the arch. The belt conveyor, concrete "gun", pipe support and steel forms rest each on a separate car on track laid on the invert of the tunnel. 5 per cent of the outlet tunnel has been lined. The trimming of the untimbered tunnel section of 261 feet has been carried on this period as has also the excavation for the enlarged section of the tunnel at the plug near the entrance portal.

**DRAINS:** No work was done on the removal of the forms from the wells. This is the only work remaining to be done except the covers.

**STRIPPING FOUNDATION:** Stripping of the overburden with a power shovel has been continued at the south abutment of the upstream rock embankment. The material excavated from the north end of the lower portion of the core wall trench and deposited upstream from the core wall and on the hydraulic fill foundation, was removed. A power shovel has been stripping the overburden from the north abutment of the downstream rock embankment.

**MAIN CORE WALL:** Steel columns are now set from N 3412 to N 3756. Eight columns N 3484 to N 3540 now reach to elevation 569. The top of the concrete across the river channel is up to elevation 543 between N 3440 and 3704. Concrete between N 3340 and the south column now set at N 3412 is up to elevation of the base of the columns. The lowest concrete across the river channel is now adjacent to the north abutment in hard ledge rock between N 3776 and N 3808, which is concreted to elevation 532. This portion was concreted after the trench was approved by the State on December 1. 40 percent of the length of the core wall trench has now been concreted. 262 batches of concrete were placed in the core wall this period. 33 grout holes from N 3508 to N 3350 were grouted, with 185 cubic feet of grout.

**ROCK EMBANKMENT:** 6069 truck loads of rock, or about 31,862 cubic yards have been loaded, hauled and placed in the rock embankment of the dam this period. About 273,251 cubic yards have been placed in the rock embankment to date or about 29 per cent of the total required.

ACCIDENTS: There were no serious accidents during this period. The usual number of minor cuts and bruises were treated at the emergency hospital at the contractor's camp. One of the City's inspectors received a strained back while moving tunnel invert template.

CLEARING: Eighteen men and one foreman have been engaged this period on clearing and piling for burning of dead and down brush, slashings and timber in the reservoir basin. This work has progressed to the south boundary of the Indian Reservation. Burning was begun on December 3 after written permission was granted by the U. S. Forest Service. The burning continued until the rain of December 9 quenched the fires. The Chocolate Creek area is cleaned with exception of a few large logs which will be refired after the rain. The logs in the balance of the reservoir basin south of the Indian Reservation line are about 70 per cent consumed. The 30 cords of wood have been cut under contract for the City and 27 cords have been hauled to the City's camp.

SAMPLES: The samples 191 to 199 of steel cut from the reinforcing steel bars for the outlet tunnel, delivered to the testing laboratory on November 30, were reported as satisfactory. Concrete samples 200, 201 and 202 were delivered to the laboratory on December 5.

WORK CONTEMPLATED BY THE CONTRACTOR DURING NEXT TEN DAYS:

- Completion of trimming of outlet tunnel and enlargement of plug section of outlet tunnel.
- The tunnel lining will be progressed,
- The quarrying and hauling of rock for rock embankment will be continued.
- Concreting of the entrance portal of the outlet tunnel will be progressed.
- Concreting of the core wall will be progressed.
- Stripping of the abutments of the dam below elevation 640 will be progressed.

VISITORS:

- December 1 - Fred D. Pyle, Engineer  
Gerald McKinley, Senior Inspector of Dams,
- " 3 - W. Templeton Johnson, Architect, S. D.  
Miss Porter, La Jolla  
S. I. Fox, S. D.
- " 8 - Fred D. Pyle, Engineer  
Rev. W. L. Goldsmith, Pastor of City Mission  
Hills Congregational Church  
Councilman J. J. Russo and Councilman  
C. E. Anderson  
Gerald McKinley, Senior Inspector of Dams  
A. H. Ayres, Chief Engineer, Six Companies  
Contractors Hoover Dam, Colorado River Project
- " 9 - Paul Beermann, Assistant Engineer.

Respectfully submitted

H. N. Savage  
Hydraulic Engineer





12-2-32 C. S. D. El Capitan Dam. Looking Downstream.

E.C. 227.

3258



12-3-32 C. S. D. El Capitan Dam. Looking Westerly Along Quarry Floor.

E.C. 228.

December 20, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council of the  
City of San Diego, California.  
Subject: San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

DECEMBER - SECOND TEN DAY PERIOD REPORT

**WEATHER:** Rain fell on December 11, 12 and 13. The discharge of the San Diego River at the dam increased from about 2 second feet before the rain on December 9 to a maximum of 325 second feet at 2 P.M. December 12. The discharge has gradually decreased to about 15 second feet. The weather has been clear since the rain on December 13.

**FIELD ENGINEERING:** One 5-man survey party has been engaged this period on cross sectioning foundation stripped areas, data on tunnel timbering and overbreak. During the rain the field party overhauled instruments and indexed field books and helped on by-pass tunnel overbreak platting. Coordinate points were set in the river bed between the rock embankments for cross sectioning. The tunnel timbering was checked for side wall concrete clearance. Cut stakes for the south abutment stripping were set across the width of the base of the dam on coordinates N 3250 and N 3300, and on the north abutment up to elevation 640, except for puddle core area. Progress data was secured as usual for records required by the State. One man has been engaged on the reservoir basin clearing and river discharge data.

**OFFICE ENGINEERING:** Excavation depths, grout and grout hole data was posted on tracings showing core wall records required by the State. Tracings were prepared showing stripping done on the river bed area between the rock embankments, also stripping done on the south abutment along coordinates E 5020, E 5050 and E 5200. One man reported temporarily to the San Diego office on December 13. Concrete quantities for the entrance portal structure were computed. Coordinates for the spillway location were computed and shown on Drawing WD-430. Calculations of tunnel overbreak quantities were being made. A statement of stations and schedule item quantities for the contractor as required is being prepared.

**CONTRACTOR'S OPERATIONS:** Practically all construction activities had ceased December 11 except shop work on equipment and keeping the outlet tunnel free of trash and floating debris. The contractor's road crossing the San Diego River was replaced and 6 additional 24-inch diameter culverts were added. On December 15 the contractor restored the diversion dam across the river above the outlet tunnel, installed a spillway and resumed pumping the river past the dam. A road up the north side of the river on high ground has been constructed to the gravel plant to replace the old lower road which was washed out.

The river channel below the outlet tunnel has been deepened and its bottom is now only about 2 feet above the floor of the exit portal of the tunnel. The sand deposited at the exit portal by the water running thru the outlet tunnel during the runoff of December 10 to 16 has been piled adjacent to the south side of the channel below the exit portal. The river discharge after being pumped over the diversion dam now flows by gravity down the river channel.

The gravel plant resumed operations on December 17 after the storm and has produced 755 cubic yards of rock and 660 cubic yards of sand. Beginning December 18, the crushed rock is being stock piled near the mixer.

The contractor's force was reduced during the storm period; reassembled on December 18 the force totaled 254 men.

4,000 sacks of cement were delivered to the mixer plant and 3,437 sacks of cement were used. A total of 105,081 sacks of cement have been delivered to the job to December 20.

#### DAM CONSTRUCTION:

**OUTLET TUNNEL:** A total of 137 feet of reinforced concrete tunnel lining has been placed by the pneumatic process at the exit portal. This is about 12 per cent of the total length. The portion of the south side wall, back of the reinforced concrete lining and for a height of 7 feet has been concreted from Station 6+88 to 0+18, except at the enlargement sections at the plug. A total of 664 feet of length or 82 per cent of the timbered tunnel section has been concreted in advance of the reinforced concrete lining. No damage was done in the tunnel by the high water of the river passing thru. It removed the loose material and left the concrete invert cleaned off.

**DRAINS:** These are complete except for removal of forms from the walls and setting the steel covers.

**STRIPPING FOUNDATION:** Stripping of the overburden with a power shovel has been continued on the north abutment under the downstream rock embankment and hydraulic fill areas. The rocks have been blasted and are being removed.

**MAIN CORE WALL:** The only work on the core wall was placing of 27 cubic yards of concrete in the trench from N 3408 to N 3440.

**ROCK EMBANKMENT:** 4,642 truck loads of rock, or about 24,370 cubic yards have been loaded, hauled and placed in the upstream rock embankment of the dam the last 5 days of this period. Beginning December 18, rock excavated from the north abutment foundation above elevation 575, has been hauled and deposited in the downstream rock embankment. A total of about 3,500 cubic yards of this material has been placed in the dam. About 301,121 cubic yards have been placed in the rock embankments of the dam, or about 31

per cent of the total required. On December 15 a "Coyote Hole" blast was shot at 4:50 P.M. of 25.25 tons black powder and 1.5 tons of 60 per cent gelatine. This was estimated to have broken 50,000 cubic yards of rock.

ACCIDENTS: On December 12, two of the contractor's workmen attempted to go into the outlet tunnel with a boat. The boat was smashed to pieces, the men were thrown into the water and carried down against the belt conveyor. One man was nearly drowned and badly bruised. Several minor cuts and bruises were treated at the emergency hospital at the contractor's camp. One of the City's resident engineers has been in the hospital with threatened pneumonia.

CLEARING: A city force averaging eighteen men and one foreman has been engaged this period on clearing and piling for burning of dead and down tress, logs and brush in the reservoir basin. This work has progressed into the South Fork area and up the San Diego River for about 4 miles. This work was delayed by the rain and the requirement of repairs to the new fills on the Chocolate Creek road. No wood has been hauled to the City's camp this period.

SAMPLES: Concrete samples 203, 204 and 205 were delivered to the testing laboratory on December 10.

WORK CONTEMPLATED BY THE CONTRACTOR DURING NEXT TEN DAYS:  
Completion of trimming of outlet tunnel and enlargement of the plug sections.  
Advance concrete reinforced tunnel lining.  
Quarrying and hauling of rock for the upstream rock embankment.  
Concreting of the entrance portal of the outlet tunnel, and  
Concreting of the core wall.  
Stripping of the abutments of the dam below elevation 640.

VISITORS:

- December 14 - H. N. Savage, Hydraulic Engineer  
Fred D. Pyle, Engineer  
Geo. W. Hawley, Deputy State Engineer  
Gerald McKinlay, Senior Engineer Dam Inspection
- " 16 - Allen H. Wright, City Clerk  
Fred Sick, Assistant City Clerk  
H. N. Savage, Hydraulic Engineer
- " 17 - W. W. Hockaday, Colorado River, Hoover Dam  
Miss Virginia Hockaday
- " 18 - Dr. and Mrs. Harvey N. Jackson, San Diego
- " 19 - H. N. Savage, Hydraulic Engineer  
Fred D. Pyle, Engineer  
Louis C. Hill, Consulting Engineer, Los Angeles

The Hydraulic Engineer returned to San Diego from Washington, D. C. on December 11, 1932, after having successfully collaborated in securing a loan from the Reconstruction Finance Corporation of \$2,350,000 with which to complete the El Capitan Reservoir Dam.

Respectfully,

H. N. Savage  
Hydraulic Engineer.

December 31, 1932

From : Hydraulic Engineer  
To : The Honorable, the Mayor and Council of the  
City of San Diego, California  
Subject: San Diego River Project, El Capitan Reservoir Dam,  
Spillway and Outlet Works.

DECEMBER - THIRD TEN DAY PERIOD REPORT

**WEATHER:** The weather has been clear and cold this period. The discharge of the San Diego River at the dam varies, due to contractor's pumping. The discharge has been about 20 second feet average for the period.

**FIELD ENGINEERING:** Two 3-man survey parties have been engaged this period on setting toe stakes for the upstream rock embankment. The puddle core limits were staked on the north abutment between the riverbed and elevation 640; also hydraulic fill area 3-foot cut stakes were set on the north abutment to elevation 640. Cross sections are being secured for determination of spoil bank quantities. Outlet tower connections to tunnel lining were located. Cross sections were taken of stripping for upstream rock embankment on south abutment to N 3440 and for downstream rock embankment on north abutment. Center line and grade points have been set on tunnel timbers and clearance points set on segments and posts for trimming same. Entrance portal structure center line and grades reestablished. Flags were set for limits of approved stripping at south end of upstream rock embankment and for north end of downstream rock embankment.

**FIELD OFFICE ENGINEERING:** Cut-off wall progress drawings and records have been posted. Original ground elevation cross sections are being plotted for determination of spoil bank quantities. Computations for elevations for settlement allowance for rock embankment have been made. Calculations of quantities in outlet tunnel portal structures were made. Computations have been made for outlet tower-tunnel connections. Quantity calculations are being made for Estimate No. 3.

**CONTRACTOR'S OPERATIONS:** The daily maintenance of contractor's roads has continued. The road along the north abutment has been completed easterly to the road over the concrete aggregate bunkers. All transportation to upstream of the dam goes over this road as the lower road has been covered by the upstream rock embankment.

The gravel plant continued in operation on part time basis and produced 2050 cubic yards of rock and 1935 cubic yards of sand this period. This material is being stock piled east of the concrete plant. The stock piles on the sand bar near the gravel plant are being used up.

Two steel barges, 9 feet x 18 feet, are being fitted with pumps and motors for the hydraulic fill placement.

18,100 sacks of cement were delivered to the mixer plant and 8,751 sacks were used this period. A total of 123,181 sacks of cement have been delivered to the job to December 31, 1932.

The contractor's force has averaged about 260 men.

**DAM CONSTRUCTION:**

**OUTLET TUNNEL:** 641 feet of the side wall back of inside face of posts has been concreted in the upstream timbered section of the outlet tunnel. The 212 feet of timbered section from the exit portal has been lined with reinforced concrete. 70 feet of the lower end of the upstream timbered section has been lined with reinforced concrete. The total of 282 feet of reinforced concrete lining accomplished is 24 per cent of the length of the tunnel or 31 per cent of the length of the timbered section.

**DRAINS:** The drains are complete except for removal of forms from the wells and setting the steel covers.

**STRIPPING FOUNDATION:** Stripping of the south abutment under the upstream rock embankment to elevation 600 has been continued with a dragline excavator. The rock encountered has been placed in the rock embankment. The riverbed gravels downstream of the puddle core area are being leveled preparatory to start of hydraulic fill placement.

**CUTOFF WALL:** The cutoff wall trench has been concreted from coordinate N 3340 at elevation 576 to N 3875 at elevation 554 or 46 per cent of its length. The center portion across the riverbed has been concreted to within 16 feet of its ultimate height.

**ROCK EMBANKMENT:** 7348 truck loads of rock, or about 38,577 cubic yards have been loaded, hauled and placed in the upstream rock embankment this period. Rock excavated from the stripping for the foundation has been loaded, hauled and placed in the downstream rock embankment. About 339,698 cubic yards or 35 per cent of the total rock required has been placed. A second "Coyote Hole" is being excavated in the east face of the quarry for blast purposes.

**ACCIDENTS:** One man slipped in the quarry and injured his back. Three men were injured in the outlet tunnel on December 30 by an explosion. Two of these men were seriously injured but are reported to have a chance to recover. The usual minor cuts and bruises were treated at the emergency hospital at the contractor's camp. One of the City's engineers has been in the hospital recovering from threatened pneumonia.

**CLEARING:** An average force of eighteen men and one foreman has been engaged this period on clearing and burning of dead and down brush, slashings and timber in the reservoir basin. This work has progressed 4.7 miles above the dam.

SAMPLES: Concrete samples 206, 207 and 208 were delivered to the testing laboratory on December 20.

WORK CONTEMPLATED DURING NEXT TEN DAYS:

- Continue concrete lining in outlet tunnel,
- Concrete entrance portal structure,
- quarrying, loading and hauling rock for rock embankments,
- Complete leveling riverbed under downstream hydraulic fill,
- Concrete core wall,
- Strip abutments.

PERCENT COMPLETE: The entire job, based on expenditures, is now 29 percent complete.

VISITORS:

- December 21 - H. N. Savage, Hydraulic Engineer  
A. Ray Sauer, City Purchasing Agent  
Fred F. McLeod, San Diego
- " 28 - H. N. Savage, Hydraulic Engineer  
Dean Blake, U. S. Weather Bureau  
C. O. Richards, San Diego  
E. B. Belt, San Diego
- " 29 - A. B. Wood, Civil Engineer, San Diego  
J. A. Durkee, Civil Engineer, San Diego  
Fred D. Fyle, Assistant Hydraulic Engineer
- " 30 - H. N. Savage, Hydraulic Engineer  
Louis Almgren, Fire Chief, City of San Diego  
Dr. C. E. Rees, and son, San Diego
- " 31 - Mr. and Mrs. John Fraser, and Miss Evelyn  
Fraser, San Diego  
Paul Beerman, Engineer, City of San Diego  
M. S. Holloway, student Stanford University  
M. S. Holloway Sr., U.S.N. retired.

Respectfully submitted,

H. N. Savage,  
Hydraulic Engineer.

HNS/f  
Photoprints EC 233 and 236



12-27-32. C. S. D. El Capitan Dam. Core Wall Construction, Looking Southerly. EC-233

3265



12-27-32. C. S. D. El Capitan Dam. Looking Upstream.

EC-236