

MINUTES OF THE

13th Meeting

COLORADO RIVER COMMISSION

The thirteenth meeting of the Colorado River Commission was held at Bishop's Lodge, Santa Fe, New Mexico, on Monday morning, November 13th, 1922, at 10:00 A.M.

There were present:

Herbert Hoover,	representing the U.S.,	Chairman
R. E. Caldwell,	"	Utah
Delph E. Carpenter	"	Colorado
Stephen B. Davis, Jr.,	"	New Mexico
Frank C. Emerson,	"	Wyoming
W. F. McClure,	"	California
W. S. Norviel,	"	Arizona
James G. Scrugham,	"	Nevada
Clarence C. Stetson,	"	Executive Secretary.

In addition there were present:

Governor Thomas E. Campbell of Arizona
Edward W. Clark, Joint Commissioner and Advisor for Nevada
Arthur P. Davis, Director, United States Reclamation Service, Department of the Interior and Advisor to Federal Representative
Ottomar Hamele, Chief Counsel, United States Reclamation Service, Department of the Interior and Advisor to Federal Representative.
C. C. Lewis, Assistant State Water Commissioner and Advisor for Arizona.
R. T. McKisick, Deputy Attorney General and Advisor for California
R. I. Meeker, Deputy State Engineer and Advisor for Colorado.
Richard E. Sloan, Legal Advisor for Arizona
Charles P. Squires, Joint Commissioner and Advisor for Nevada
Dr. John A. Widtsoc, Advisor for Utah.

The meeting was called to order at 10:00 A.M. by Mr. Hoover.

MR. HOOVER: Last evening we left off in discussion of the

general principle whether we could accept, - whether we could accept a general principle of a division between the upper and lower states as the primary basis of compact and Mr. Norviel wanted to await this morning before he came to a decision as to whether we could discuss it in principle, without any obligation at all as to detail.

MR. NORVIEL: Mr. Secretary and Gentlemen of the Commission. We from Arizona are perfectly willing to accept in principle the division of the basin into two divisions, and I may say in this that we do not do so reluctantly, nor do we do so with avidity, but calmly, facing a serious proposition, for we feel in this principle that we are conceding a right that is ours by all established rules of law and precedent. However, we will accept the principle and try to adjudicate the matters on the basis of a division as suggested, a division of the waters.

MR. HOOVER: That will bring us to the discussion of detail. In order that we might have as constructive a discussion as possible we might consider for a moment the problems involved in the detail and attempt to dissolve them into their component parts. For instance, such a division as this implies a point of division. It has been suggested that Lee's Ferry shall be the point. The second point involves a method of what, for lack of a better word, we might call averaging, and the third point, in my mind, would involve a principle of a quantitative character as to the volume of water, - not as to the method of actual division of the water itself.

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MR. NORVIEL: I don't know whether I was quite clear, Mr. Chairman. The discussion last night was on the point of a fifty-fifty partition of the waters. So far as we have concluded up to this time, as I understand it, we have only agreed that we would consider a partition of the water, without agreeing that it would be on any particular basis. As for myself, I think that I would like to have it understood with the Commission that in the discussions that may come up now that it should not be overlooked that I myself, speaking for my state, have not committed myself, nor my State, to a fifty-fifty proposition. I haven't any present intention of committing myself to that proposition. I would like to explain that I think the fifty-fifty proposition is infeasible and impossible, as a matter of exactitude. I adhere, so far as I am concerned now, from the information which I have, to the idea that there is water enough in the river, if properly conserved, to answer all the needs of both basins. My idea in partitioning the water was that we might get together on some figure which may be turned down to the lower states, arbitrarily if you please, to which they may attach priorities and it does seem to me that much of the discussion which we had last night, if this idea is adopted, could be obviated; or necessity for it could be obviated, as taking place in this Commission.

Personally, I think I can conclude for myself and for my State what amount I think should go past Lee's Ferry. I think the lower states, or the lower basin may determine for themselves

what amount of water must go past Lee's Ferry. On that basis it may be we can trade, and it may be we cannot.

By "trade" I mean maybe our ideas may be brought together on that proposition.

I want to disavow any intention on my part of doing anything that is in any way harmful to the lower basin and as a matter of principle I think any harm that might work to the lower basin would be harm to the upper basin. I believe sincerely we are a unit, but we must get to some basis on which we can partition the water for the present.

In the proposition which I have before the Commission I have suggested that the compact may be changed in any particular that is thought necessary. I believe at least that we can arrive at an arbitrary figure, if you please, for the partition of the water so that nobody will be in any danger for fifty or sixty or possibly a hundred years, - it may be never, - I really think never, and if we can get to that position we can change the compact as necessity may require at some future time.

MR. CARPENTER: The suggestion of the Chairman that the line or point of demarcation should be the initial fact to be considered seems to me to be well taken. Whatever basis of division or allocation of the water, as between the two natural divisions of the territory involved, may be adopted by this Commission, - after all it will naturally resolve itself down to a point of demarkation between the two divisions.

Might I call attention to the fact that in the memorandum

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of compact which I presented, and to which I am not committed at all, - having prepared the same as other commissioners have, by way of basis of discussion, - I took the old Lee's Ferry, original Lee's Ferry, as the point of demarkation, first because it was accessible; second, because it was the mouth of the neck of the funnel, if I may so term it. It was the natural point where the waters coming in from the catchment basin all account for themselves before passing down through the neck of the funnel and to the country below. Because, further, it included the Paria, which is essentially a stream of the upper basin, while if the present Lee's Ferry were taken it would eliminate the Paria and to that degree eliminate a stream that has its source primarily in the State of Utah.

The matter of elimination or inclusion of the Paria is a matter of the exercise of discretion of the Commission, of course, but the appealing considerations that led to my suggestion on this point primarily result from the natural condition in the topography location, or result primarily from the geographical location and the accessibility of the point. As I am advised, the river in that vicinity is easy to gauge, and may be approached from either side.

MR. EMERSON: Mr. Carpenter, wouldn't there ever come a time when this station might be flooded by the creation of reservoirs?

MR. CARPENTER: Yes, sir. If the station were flooded by

the creation of reservoirs, then of course the discharge from that reservoir could be actually ascertained, the only difference being there would be evaporation loss immediately above the point of discharge as compared with no evaporation loss in the natural river.

MR. EMERSON: Then it would be just a case of changing the means of measurement?

MR. CARPENTER: Yes, and that is what led me in my suggestion to the saying that if a reservoir or reservoirs were created by the erection of dams, a dam or dams, at any point between the mouth of the San Juan and ten miles below Lee's Ferry, then a certain condition should obtain, it being suggested that ten miles below Lee's Ferry would cover the territory within which any dams would be feasible. The canyon drops very rapidly before the ten miles are reached and, in fact, the principal dam sites are immediately above Lee's Ferry.

MR. EMERSON: Would it be practical to establish a gauging station below a possible dam, --

MR. CARPENTER: I am advised they are not as accessible. I am not familiar with the country. The Executive Secretary and others made a trip of inspection there so they are better informed than I.

MR. NORVIEL: Mr. Chairman, we are only here to assist, I suppose, in this matter. It is not our principal proposition, but I may say that at present and for many years Lee's Ferry has been practically a mile above the confluence of the Paria with

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the Colorado. There is a measuring gauge or station a little above Lee's Ferry at this time. A stilling well has been decided upon, to cost several thousand dollars, and the most feasible place or point for its construction is above Lee's Ferry.

MR. A. P. DAVIS: No, Mr. Norviel.

MR. NORVIEL: I don't mean above Lee's Ferry, but above the confluence of the Paria. It will be below Lee's Ferry, but above the junction of the Paria.

MR. S. B. DAVIS: Do you mind telling me what a stilling well is?

MR. NORVIEL: Well, a stilling well is a structure within which the float operates an automatic gauge, for the measuring of water.

MR. CARPENTER: Where the water is stilled.

MR. NORVIEL: Yes, where the water is still. The most feasible damsite, so far as our information goes; for a reservoir, dam and reservoir, in the neighborhood of Lee's Ferry will be above that point. In all probability there will be no dam within a distance of forty or fifty miles, whatever the distance may be, below Lee's Ferry at Marble Canyon and that will be so guarded that it will never back the water up to the present Lee's Ferry. That point I deem will be held sacred in its practical present condition so far as the river is concerned. It will, however, no doubt, in order to gain the greatest drop, or save the fall of the river for the manufacture of power, back

water up into the Paria Creek, or up to Lee's Ferry, leaving the space of two or three miles unaffected by the storage of water below. There is no good place for the erection of a stilling well within a reasonable distance below the inflow of the Paria. That matter has been carefully studied and the decision made by the Geological Survey and the point of construction of the stilling well has been fixed upon so that it seems to me, if the measuring point between the two divisions is to be established at the point of demarkation, so-called, it should be immediately above the inflow of the Paria Creek.

MR. CARPENTER: You believe that is the best place for a station, Mr. Norviel, I take it?

MR. NORVIEL: I have to stand on the record, Mr. Carpenter.

MR. CARPENTER: I mean that is the gist of your thought, is it not?

MR. NORVIEL: It certainly is, or I wouldn't have stated it.

MR. CARPENTER: It is perfectly feasible to include in the upper territory the flow of the Paria by separate station, if you want to create it, isn't it?

MR. NORVIEL: I suppose so.

MR. CARPENTER: You know topographically, that is all I was inquiring about.

MR. NORVIEL: Yes, sir.

MR. HOOVER: Is there any possibility of a gauging station for this purpose below the Grand Canyon?

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MR. NORVIEL: There is a gauging station now being constructed in the Grand Canyon just above the terminus of the Bright Angle Trail. That is being constructed at a cost of some \$15,000 by the Geological Survey as a result of exploration of the river, for the purpose of finding a good place for a stilling well required by Mr. Girard and is the outcome of the investigation demanded of Mr. Girard by the Federal Power Commission that he establish a stilling well and gauging station in conjunction with his proposition. The material is on the ground and I suppose the stilling well is under way.

MR. EMERSON: That would be below the mouth of the Little Colorado?

MR. NORVIEL: Yes, fifty miles, I imagine, about fifty miles below the inflow of the Little Colorado. It is to be an up-to-date, - as perfect a gauging station as probably can be made.

MR. CALDWELL: Mr. Chairman, could not the states be asked one at a time whether or not they favor the point of division being at Lee's Ferry?

MR. HOOVER: I think so. I was going to ask Mr. Arthur P. Davis what his impression was, that we may have all the information on the subject.

MR. A. P. DAVIS: Mr. Chairman, the account given by Mr. Norviel concerning the gauging station is correct. I was there recently. The point selected by the Geological Survey is above the present Lee's Ferry and consequently above the mouth of the

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Paria.

MR. NORVIEL: Mr. Davis, the new stilling well, so-called, you don't mean it is above the present Lee's Ferry?

MR. A. P. DAVIS: The present gauging station.

MR. NORVIEL: The present gauging station, but the one they are constructing as a stilling well,--

MR. A. P. DAVIS: Yes, that is below the present Ferry, but it is above the mouth of the Paria, but I have no doubt that that was selected largely on account of its accessibility. It is right by the road, by the Ferry and near the buildings. There are two things possibly concerning this, if the Commission desires to include the Paria with the upper basin. It certainly is feasible to measure the river below that and the small amount of the cost of a new gauging station is negligible in comparison with the importance of the question you are considering, and if my opinion in that respect should be erroneous, as it might be, it is still possible to include the Paria by a separate gauging station, as suggested by Mr. Carpenter, and the desirability, from a physical standpoint, of including, if a division is to be made into two basins, the Paria belongs in the upper basin, and being so easy to put it there, that seems the logical thing to do, to hold the point of division where suggested by Mr. Carpenter by either method, both of which I think are feasible.

The next tributary of importance below there is the Little Colorado, which gets its water from the lower basin and can be

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used only in the lower basin and must be used largely before it gets to the river. The inclusion of the Paria in the upper basin is the logical thing and can be done under either method suggested by Mr. Carpenter, or by means of a separate gauging station.

MR. CARPENTER: Mr. Davis, where is the Grand Canyon station mentioned by Commissioner Norviel, above or below the Little Colorado?

MR. A. P. DAVIS: Below.

MR. CARPENTER: So the station at that point would cover not only the waters from the upper natural basin, but also the inflow from a stream of the lower basin?

MR. A. P. DAVIS: And the most important stream of the lower basin except the Gila.

MR. EMERSON: Mr. Davis, which method, in your opinion, would be more desirable, from your present knowledge? One gauging station below the mouth of the Paria, or the station above the mouth of the Paria upon the Colorado and the additional station on the Paria?

MR. A. P. DAVIS: The station below the mouth of the Paria, if feasible, would be preferable to one above because you would get a more accurate measurement of the whole thing at less expense.

MR. EMERSON: Can you state definitely at this time whether a station would be practical below the mouth of the Paria?

MR. A. P. DAVIS: I have no doubt of it. The point directed

by the Geological Survey is above, but they are limited in funds and by existence of buildings in which to quarter the observer and it is a very difficult matter to raise funds to either install it or observe and that has doubtless had some weight with them, but there is a considerable distance below the mouth of the Paria in which to make a selection.

I haven't seen the river, below, and they say there are rapids in there, but there are doubtless stretches between the rapids where I have no doubt a good gauging station could be obtained at some additional expense, both for the establishment and for the building of the necessary quarters. After it is provided, of course, an observer could be at one place as well as the other because the road passes close to both points.

MR. CALDWELL: I was going to say perhaps Utah is interested maybe as much as any other one state in the location of this point because of those streams that arise in Utah and out of the headwaters of which we must secure irrigation. The fact is, from my observation with respect to Lee's Ferry country that a station at or very near the present Lee's Ferry would be the best place to locate it.

MR. A. P. DAVIS: Most convenient.

MR. CALDWELL: Excluding the other streams coming in below at this station.

MR. A. P. DAVIS: The Paria you mean?

MR. CALDWELL: Yes, As for myself and my state, I am not concerned as to whether the station is above or below Lee's Ferry

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because the adjustments can easily be made.

MR. A. P. DAVIS: Yes, that is true.

MR. CALDWELL: And inasmuch as the natural, logical place for a gauging station is about where it is now, I would favor that location.

MR. HOOVER: Perhaps we could make it read, --

MR. CALDWELL: (Interrupting) Pardon me just a moment. The fact is that very soon after you leave Lee's Ferry as it is located now the river breaks into rapids and continues for some miles down river. It is very steep and it is very likely that there may be a continual changing of the cross-section in those places unless some expensive cross section is provided, some protection for a cross section is provided, which I think wouldn't be necessary at all at Lee's Ferry.

MR. A. P. DAVIS: Well, I recognize the difficulty of accurate measurement in rapids, but in a canyon beset with rapids there is much less likelihood of changing cross sections than in the upper canyon.

MR. CALDWELL: It seems there may be a difference in this particular section. If you would see the rapids I think you would possibly agree that the channel changes at this point notwithstanding the rapids.

MR. A. P. DAVIS: They have that trouble very seriously ^{now} where the gauging station/is. The sand bars are continually shifting, which isn't the case at a rapid.

MR. CALDWELL: The river where the rapids are now is very

wide and it shifts from one side to the other, depending on the stage of the water.

MR. HOOVER: We might formulate this into some expression of division at or near Lee's Ferry, either by separate gauging or one gauging, so as to include the Paria. We could perhaps designate somebody to determine that, as for instance the Reclamation Service. The important matter is the principle that the water is to be determined as at a point below the Paria, whether gauged there or not.

MR. NORVIEL: I think that would be satisfactory. I don't desire to quibble in this matter because we deem that ^{im}very/material, as to where the point of demarkation is to be. It may be above or below. The flow of the Paria may be taken care of, whether it be a stream in the upper or lower basin. However, I would not like to tie the river up in such a way that we may not utilize the full fall of the river because it drops rapidly from Lee's Ferry. If the river is to be limited we shall want to utilize all of the drop in the river so that it may necessitate the measuring of the river above the Paria and then measuring the Paria itself. That will not be excessively expensive, but I suggest that we leave the point of demarkation just where Mr. Carpenter has put it so far as we are concerned, and that the measurement of the water may be made at the most accessible point and, if necessary, at two points, one in the river itself and one in the Paria Creek to take care of that.

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MR. CALDWELL: I understand, Mr. Carpenter has located a point of division below the Paria.

MR. NORVIEL: Yes.

MR. CALDWELL: I think your argument favored the point of division above the Paria with separate measurement of the Paria.

MR. NORVIEL: No, it may be below or above or anywhere, it is absolutely immaterial to us.

MR. CALDWELL: I can't say that it is quite immaterial to me.

MR. HOOVER: Your idea is to include the Paria in the measurement, whether made separately or together?

MR. CALDWELL: I think it would be more satisfactory if we make the measurement separately, measure the Paria separately and put the gauging station above the mouth of the Paria because that will conserve the river resources Mr. Norviel speaks of, and it has other advantages.

MR. CARPENTER: The thought was the more gauging of the stream instead of a gauging station would be adapted to the conditions of development and the line of demarkation was not intended to fix absolutely and forever the place of gauging. That would be wherever good engineering dictated and could be changed from time to time. It might be changed by natural erosion or other conditions.

MR. A. P. DAVIS: It occurs to me, Mr. Chairman, that the matter as left in the draft of compact by Mr. Carpenter, leaving the determination of the flow to the Geological Survey without

any restrictions as to how or where they shall determine, that is the safest and most flexible and less likely to run into difficulties in the future.

MR. HOOVER: All that we may do for the moment is to agree on the point that we include the flow of water of the Paria and of the Colorado at Lee's Ferry. The question of where the gauging station is to be set is secondary.

MR. NORVIEL: I think so.

MR. HOOVER: That is the proximate point of division. Is that satisfactory to you Mr. Emerson?

MR. EMERSON: Entirely.

MR. HOOVER: Mr. Caldwell?

MR. CALDWELL: Yes, sir.

MR. HOOVER: I think we could accept that as the proximately point where we are going to divide. We could settle the detail as to where the gauging is to be done later on. Mr. Davis, is it satisfactory to you that we fix the division point proximately at Lee's Ferry and include the Paria?

MR. S. B. DAVIS: Yes, sir.

MR. HOOVER: We can determine where the gauging station is to be by some device later on, or method of gauging. That satisfies you Mr. Scrugham? (Mr. Scrugham assented)

The next point I had suggested is method of averaging the flow. Mr. Carpenter's proposal is the average of ten years.

MR. McCLURE: What is the objection of using a twenty year period inasmuch as the Yuma flow has been established for that

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period of time?

MR. NORVIEL: I don't believe Mr. McClure understands what we are driving at.

MR. McCLURE: Maybe not.

MR. HOOVER: The objection raised last evening by Mr. Norviel was that on a ten year average it was possible to have three dry years in which there was no delivery of water at all and to bet on the total of the other seven years supplying the average and that such an interval of three years, taking the extreme case, that would be disastrous to the lower states. That was your thought, was it not?

MR. NORVIEL: Yes, and twenty years would be that much more of a burden, - ten years added to that would be that much more of a burden. We might receive all our water then in five years and none at all in the other fifteen and it might be disastrous to the lower states.

MR. McCLURE: That could be very well covered by the language we would use.

MR. HOOVER: The question as to whether there should be a positive delivery every year, or whether there should be only a delivery of a total over ten years or over three or over five or any other period.

MR. NORVIEL: Well, Mr. Secretary, that is a very serious question in this division and with my present knowledge I would like to have Mr. Carpenter explain it a little further, how he arrived at such a period of time and what his purpose was. With

the knowledge that I have and the study I have been able to give it since receiving this paper, I do not think that we can afford to agree on a longer period than three years to average the flow to be turned down the river. I think that would be as long as would give us any safety, that would be satisfactory at all to our people below,- and I think when California studies this question carefully and seriously they will come to the same conclusion; so, I at this time, without further information on the subject and more analysis of the situation in that river, will oppose anything longer than a three year period of averaging the flow.

MR. EMERSON: How about the suggestion of a stipulation as to minimum yearly flow?

MR. NORWIEL: That will be possible, - I would be very glad to include that in it, and when the time comes to discuss that question, we will suggest it.

MR. EMERSON: It has a direct bearing upon the proposition and is probably worthy of consideration now.

MR. HOOVER: Looking at it from an engineering point of view, the whole of this proposal consists of watering of the lower states by flood flow and using the minimum regular flow in the upper states.

MR. NORWIEL: We think, not from what Mr. Carpenter said, that they would be, of necessity, compelled to construct large dams and store large quantities of water throughout the basin in Colorado, Utah and New Mexico which will control the floods

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to a great extent and utilize the water in the upper basin, leaving only the excessive floods to the lower basin.

MR. HOOVER: That was the thought.

MR. NORVIEL: I suppose it would work out to that.

MR. CARPENTER: No, Mr. Chairman, you are in part right and in part in error. Mr. A. P. Davis stated last night, you will recall, that do what we may in the upper basin, approximately 50 per cent of the flow of the river could not be diverted. Our diversions are above the territory in which that water rises and that water will flow anyhow, that is in low river water as well as in high.

MR. HOOVER: Would that apply to the minimum flow of the river?

MR. CARPENTER: Yes, it will. It applies to the very lowest flow of the river. The topography is such that our diversions must come out well upstream and therefore the territory below the geographic points at which we will divert is left free from interferences and its flow is bound to pass in any event at Lee's Ferry.

Mr. Norviel is correct, furthermore, in that we must store within the upper territory for our future development. Looking at the map, New Mexico must develop the San Juan territory by reservoirs on the San Juan, which would primarily catch the June floods, if I may use the month as an easy designation of the annual flood flow. On the Dolores the same is true. All of the country, all the territory, both in Colorado and Utah, which

may be served from the Dolores will depend upon a reservoir similar to that on the San Juan, New Mexico, and the same obtains throughout the upper territory so that the upper states will be developing from now on upon the water stored from the flood flows, ^{and} we will depend more upon the flood flow than will the lower basin because fifty per cent of our minimum flow is bound to go down anyhow past Lee's Ferry so that it isn't predicated upon the thought of leaving the lower area to look entirely to the salvation of floods. The lower area, however, as well as the upper area, must, when it does construct its reservoirs, provide for adequate storage to carry over from the low to the high and high to low years.

MR. HOOVER: What is passing through my mind, if I might suggest it simply as a matter of discussion, is as to whether there is a meaning here. I have a conception of rivers as a series of retaining vessels of which a large vessel, or several vessels, will be in the territory of the lower division. That the primary object of the lower division is to secure into this receptacle a sufficiency of water to give them a constant flow of eight or nine or seven million acre-feet per annum; that that being the case, their desire must be to keep this receptacle filled to a point of security in that light and that the basis of averaging might be entirely reversed onto the same basis whereby instead of penalizing the situation at some point in a ten year average, the thing be thrown into a position of keeping those vessels filled up to a point which would allow

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such a regularity of flow there, when once constructed.

Perhaps, to get that clear, supposing we said that the flow was to be for an average of three years and that the flow in the fourth year was to be such a minimum as with the total flow during the previous three years would give a sufficiency to have kept these lower reservoirs up to a constant flow from their discharge.

MR. CARPENTER: You arrive at the same conclusion, Mr. Chairman, because the control of the discharge from the lower reservoirs is entirely within the keeping of the lower users and you would have to guard against the wastage and the careless withdrawals in order to prevent the withdrawal of extra water from the upper territory for replacement.

Now I might explain this to Mr. Norviel. The selection of a ten year period was the result of consideration of periods from single year to twenty years. The best average, of course, and the fairest average of the flow of any river is that obtained from the twenty year period as compared with one. A study of the flow of Laguna Dam, which appears on page 5 of the document No. 142 of the 67th Congress, "Problems of the Imperial Valley and Vicinity," will show that to take a three year period would impose a harsh and unnecessary burden on the upper territory, in the low cycle, - in a cycle of low years. These years tend to run in cycles. On the other hand, a twenty year period was considered unfair to the lower basin as prolonging the reckoning and too remote a period. A consideration of this table and

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a consideration of the stream flow tables of many other streams, indicates that a ten year period gave a fair and reasonably accurate average of the flow of the river, taking both high and low cycles, and that a ten year period would reach into both cycles and largely include them, and that as the future development in both the upper and the lower basin must rely upon storage, the storage facilities would care for that rise and fall.

MR. NORVIEL: Both in the upper and lower basins?

MR. CARPENTER: Both. It would all be taken care of automatically because of the amount to be delivered at Lee's Ferry and any shortage would adapt itself.

MR. HOOVER: I didn't mean to convey this method would mean the control of reservoir discharge, but of supplies to reservoirs. Perhaps I would get my notion more clearly on a quantitative basis. Supposing the desire is to furnish to the lower division a flow of eight million acre-feet, or some such amount, and supposing that in a given three years thirty million feet had been delivered, or six million in excess of the total assured them for the fourth year there would be a relief to the upper states of six million feet out of the eight million. Thus they would have satisfied the situation for the fourth year if they delivered only two million acre-feet. The average would then progress to another three years in which you have ten and ten and two or twenty-two million feet or a deficiency for the year of two million feet in order to give

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the full twenty-four million feet. That sort of measure would not give some relief on erratic flows of famine years and at the same time would impose upon the lower division the necessity of providing a storage so that they would get their security from the great excess of flow.

MR. HOOVER: In one case you are providing in advance for the security of the lower states and the other case you have an advance provision. You may have had a period when the flow was actual average for five years and then three famine years, and during the famine years the lower states may have been seriously injured.

MR. CARPENTER: That carries also with it the fact that the visitation of famine also strikes primarily the source states, the states of origin. Any shortage of flow in the river strikes the states of origin much harder than the lower states, because that very famine is what causes the shortage in the upper territory. It seems to me incumbent upon the lower states to be reasonable in the demand of guarantee. In other words an absolutely preferred delivery should not run wholly to the lower states. In making a division of the water it should rather be the disposition to lay the burden of water shortage, a drouth, upon the whole territory, and also to permit the enjoyment of excess flows to the whole territory. Another thought, any student of the river must realize that the future development in

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both areas will be that predicated upon the construction of reservoirs. Nevertheless, we have no power to say by whom these reservoirs shall be constructed, in what localities or when they shall be constructed. That should be left free to both communities to use such instrumentalities as may be at hand, and the division of the water should be so made that either area may build, or neglect to build, of its own motion, and as it may believe construction or lack of construction is at any one time justified. The suggestion you make presupposes the construction of reservoirs in the lower countries, and along with it there should be concurrently a like construction of reservoirs in the upper territory to permit the deliveries as you suggest to the lower territory. The suggestion I have made leaves that matter to be worked out entirely by the two divisions.

MR. NORVIEL: Continuing the thought expressed, and the facts that we have before us that the river is erratic in its natural state, Mr. Carpenter's suggestion that it would be necessary for them to develop the river by storage at every conceivable point where the water can be utilized, I concede that to be the true development for the future, and will be, of course; so that the full use of the water in the upper states under any consideration of a period of time of averaging the flow, will make the river more erratic than it now is or accentuate the erratic condition of the river, to the extent that in cycles of dry years on a period of average of anything more than 2 or 3 years would permit all of the water or practically all of the

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water to be utilized in the upper division, or perhaps put a disastrous situation on the lower division, so that any period of average flows to any considerable number of years would certainly be disastrous to the lower states.

MR. CARPENTER: I fear that the Commissioner from Arizona fails to recognize the condition that has proven to be almost universally true; that the equalization of stream flow, both seasonal, and over a period of years, including the wets and the dries, the fat and the lean, has been best accomplished and most accurately approached, by the first use, and a resultant conservation of waters at the heads of the streams, and that the upper development instead of making a stream more erratic will tend to avoid the other contingency of lean years that we are now discussing. It will improve the condition of these lean years and flatten the peaks of high years so that a graph, if you please, of the flow of the river over ten years as it now flows as compared with a graph of the river flow made as it would flow ten years after the reservoir development has occurred through the entire area, would hardly be comparable, as the depressions would be much modified and the peaks much reduced. In truth, the best possible safeguard for the lower states to insure a delivery at Lee's Ferry within reasonable inclusive figures from year to year would be the immediate development of the reservoir storage of the upper area. To do it all at once might shock the stream flow at first, and probably the word "immediate" is too drastic, but the early development of

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that upper area, the withholding of the water at the source, the releasing of these waters gradually in the very season when the return flows and waste run off would turn back to the stream their various excess, would supply the stream below. If you presuppose an adjustment upon reservoir construction below, in as much if not more, you should presuppose reservoir construction above, so that the reservoir construction below may work in co-ordination with that above.

MR. NORVIEL: I am very glad to hear that argument from our friend at the top of the hill for it puts us in a better situation. The statement/a while ago that they should not take more than 50% of the flow of the stream for use in the upper states, and now his argument is that the more use they make of the water in the upper basin by the return flow the river will be increased, or the water will be increased and stabilize a flow in excess of that which now obtains in the river. Therefore he would have no objection to including in the average of the flow for a period, the establishment of a considerable minimum flow of the river, for his argument is that the more water is used above, the greater will be the minimum flow in the river, positively established; therefore, I see no reason why we cannot include a minimum flow to be included with the average that will give some satisfaction and stabilization to the water that comes to us, and I think perhaps that ought to be now discussed and fixed upon.

MR. CARPENTER: If it is found and considered to be advisa-

ble by us, that an assurance of the proper minimum be set, well and good. It is not within the range of my thought to even conceive of a condition where the upper states would strip the stream and deliberately paralyze the country below, but if that minimum is established then the objection to the ten year average is immediately dissipated.

MR. NORVIEL: No, you couldn't say that.

MR. CALDWELL: It seems to me that it is not possible to think of this problem with respect to the partition of the waters, and divorce from our thoughts the idea of the control of the river. If this river were under control, or if it flowed uniformly, we could divide it. It doesn't flow uniformly and that is our great difficulty. The only way to bring about anything like a uniform flow is to provide storage in the river. We do know something of the amount in acre feet that that river will deliver. What we want to do is to divide up that river on the basis of acre feet between the Upper and lower divisions. If you consider it in connection with storage and control, we can do it; if you don't consider it in connection with storage and control, we are going to have difficulty. Averages over years are difficult. We don't know what it is going to be in advance and we should know something about what the aggregate is going to be, and what the annual is going to be to the lower states. I believe we can do it by control of the river. I don't conceive that it is necessary immediately to control the river entirely in order to reach the conclusion of this proposition. For instance, if six, seven, eight, nine million acre feet is deter-

mined to be the proportion of the river that is going past Lee's Ferry annually to the lower states, it is not necessary that storage be provided at this time. The development may take place according to the necessities of the case in either basin, but we can proceed to divide the river as if it were controlled and when the exactions of the compact are imposed upon either basin, control must be had accordingly, so that the compact can be lived up to.

MR. NORWELL: You agree with Mr. Carpenter's idea that the greater use of the water above will have a tendency to regulate and establish a better flow in the river, less erratic than it now is.

MR. CALDWELL: I think that's obvious.

MR. NORWELL: So that you would have no objection to the agreement of a minimum.

MR. CALDWELL: If storage is presupposed, I think I just said what that storage idea should be, and I think it can be worked out.

MR. HOOVER: I think it is obvious that the whole possibility of division rests on the premise of storage, otherwise it is quite impossible.

MR. CARPENTER: Either reservoir or land storage - storage of some sort.

MR. CALDWELL: Personally I would not wish to bind the upper states to an agreement whereby they are dependent upon land storage. I don't regard it as uncertain, but I do regard it as uncertain as to when it will occur, as to when the benefits from it will accrue so we couldn't compact on that. We must come to

a very positive basis of storage. That positive storage may never be required if in the upper basin the land storage is provided as practical necessities compel.

MR. NORVIEL: By land storage you mean the use of the water for reservoir irrigation.

MR. CALDWELL: Someone used that; I don't know its technical meaning. I mean the return flow that comes after irrigation.

MR. HOOVER: When we consider the question of storage, not only from the seasonal flow of year to year, but the flow over we are looking to a term of years, the equalization. Therefore, you want a term of years for average so as to include the second form of retention.

MR. CALDWELL: My thought is that we provide in the compact for a certain definite amount of reserve storage. By that I mean storage capacity to catch the water from wet to dry years. We can obviate the necessity of going further into averages because we don't know in the first place what the average is now. The reason I make that statement is this. Mr. Carpenter made the statement a while ago that the fairest way to gauge a river is a 20 year average, or some other term of years. Certainly that would be true if the river ran from year to year and time to time without interference, but in the case of the Colorado River we have a 20 year period covering the last preceding 20 years, and during that 20 years very much of the water has been diverted and we have our average disturbed by the diversions which have taken place during these 20 years. I say the 20 year average is

very uncertain on which to base a calculation as to what the Colorado River actually flows or will flow in the next 20 years.

MR. NORVIEL: From the basis of the arguments up to date, without committing ourselves to it, I suggest that we include in the - if an average period of any kind is to be left in the compact - that we include in it also the minimum flow of not less than 7,000 second feet. Not to commit ourselves, but 7,000 second feet at the measuring point.

MR. CARPENTER: More than now flows?

MR. NORVIEL: Including every day in the year. I will insert the word "constant" minimum flow of 7,000 second feet.

MR. HOOVER: That's to be the average for the year?

MR. NORVIEL: Not to be reduced below that point.

MR. CALDWELL: There is really no necessity for doing that.

MR. HOOVER: What would that represent in acre feet, supposing it never got over 7,000?

MR. A. P. DAVIS: About 5,000,000 acre feet annually.

MR. CALDWELL: Suppose it came to five, six, or seven million acre feet annually - suppose it does - what would be your object in requiring that that be a constant flow?

MR. NORVIEL: To avoid the possibility of having the river dry up for one, two or three years, which I understand from Mr. Carpenter it cannot/^{do} in the first place, that they cannot take all the water, that 50 per cent of it will be available in the first place, and that the establishment of a return flow by

virtue of the use in the upper basin will increase the amount, and add to that 50 per cent a very large portion of the amount of water that you will divert and use. Thereby the longer it runs the greater will be the increased flow of constant water in the stream.

MR. EMERSON: Would you be satisfied with a minimum flow in acre feet per year rather than tie it down to flow that would be operative every day?

MR. NORVIEL: It works out to the same thing.

MR. EMERSON: No, entirely different. The whole thing is predicated upon a large storage and carry over reservoirs from the fat years to the lean.

MR. NORVIEL: Averages are a favorite thing here. We'll say an amount that this number of second feet would average during the year.

MR. EMERSON: The average is quite different from the minimum.

MR. NORVIEL: Any amount that this average flow would produce.

MR. S. B. DAVIS: What would that average in acre feet?

MR. CALDWELL: 7,000 second feet is about 5 million acre feet per year.

MR. HOOVER: Assuming that the Laguna gaugings are approximately correct at the worst period at Lee's Ferry, in which the average flow was 10 million acre feet - that was the worst that has ever happened in the river and 5 million feet would be approximately half at Lee's Ferry.

MR. NORVIEL: Which is slightly below the mouth of the canyon. It is approximately a million and a half acre feet more than the flow at Laguna, showing a loss there of more than a million and a half acre feet in the river, so that, and I assume since the evaporation loss where the river runs through and adjacent to Arizona, equals the inflow, that the flow at Lee's Ferry would probably be a little greater, or about the same, as it is at Topock, so that the flow there at that point would be considerably more than the flow at Yuma.

MR. CARPENTER: As I understood Director Davis last night, and checking the data since that time confirms it, certain spot measurements have been made, and not altogether complete investigations made, as a result of which I thought he conceded that the inflow between Lee's Ferry and Laguna about offset the losses in that river between Lee's Ferry and Laguna and not merely between Lee's Ferry and Topock.

MR. NORVIEL: I didn't say that. Lee's Ferry and Laguna. The conclusions I arrived at is that the flow at Lee's Ferry is practically the same as the flow at Topock.

MR. CARPENTER: Topock is at the mouth of the canyon. Then you wish to add or deduct from it a loss between Topock and Laguna.

MR. NORVIEL: We are talking about the flow past Lee's Ferry; that's where we have fixed this flow. The flow past Lee's Ferry is approximately a million and a half acre feet more than at Laguna.

MR. CARPENTER: My understanding is that the inflow between Lee's Ferry and Laguna offsets the loss in the river between Lee's Ferry and Laguna.

MR. NORVIEL: That's right; that leaves us then with the flow at the top of the river about the same, whether at Topock or at Lee's Ferry.

MR. EMERSON: Is there any objection to the establishment of a minimum flow as a principle?

MR. CARPENTER: I have no objection.

MR. HOOVER: My personal thought is there would be no providing that a reasonable number of years be taken, the minimum flow objection to the establishment of some minimum flow/being as-

insurance merely that in that period of years there would not be that hard application that might otherwise be feared.

MR. EMERSON: The word "yearly" should always be understood in the expression of minimum flow.

MR. CARPENTER: In preparing my draft, I at one time had a minimum flow, but I feared it would provoke opposition that should be discussed here, and hence I left it out because I thought that was a proper factor for discussion. The opinions might well vary as to what that minimum flow would be. Some might say it was fixed too low and others that I had fixed it too high, and so I left it out completely, presuming it would come up at this time, and I felt the more I thought of it that it was a dangerous factor to consider in one way. If you get that minimum too high and in some one particular year it dropped below, it might be the source of unnecessary friction. Most

interstate, like international strife, is the result of heated action. However, if it is low enough so that there would be no question of ability to deliver and no danger of violation, I can see no objection of putting some such proposition in as an assurance against the exhaustion of the stream above to the detriment of the people below.

MR. CALDWELL: I can agree with that partially. If you mean a minimum flow guaranteed the lower states without any further qualification, I don't think it would be wise, although I think a guarantee could safely be made so far as the practical divisions are concerned. A guarantee or something that amounts to a guarantee, which is both a maximum and a minimum. A minimum to the lower states and a maximum to the upper states. That might be arrived at with some minor qualifications.

MR. CARPENTER: Wouldn't that really be an average?

MR. CALDWELL: Not necessarily; it may be based on an average and upon our knowledge of the river now.

MR. NORVIEL: By that you mean a certain percentage of the—

MR. CALDWELL: No, not percentage. A certain amount.

MR. NORVIEL: A certain amount of acre feet of water to be used in the upper states without any relation to the lower states?

MR. CALDWELL: No. I mean this; there is a certain amount of water which that river contributes which is unappropriated. What we are trying to do is to give a portion of that water to the lower states, and retain a portion for the upper states. We

dont know exactly what the river will produce, but we do know that whatever it produces, storage will be necessary in order to divide the aggregate of the water between the upper and the lower basin. Now, then, we may say that that river produces say 16 million acre feet and we want to give you 8 million. The upper states would agree, say the upper basin would agree to turn past Lee's Ferry 8 million acre feet annually provided storage is provided so that we may control the river sufficiently to give you that, but the people of the lower states would not wish at this time to be compelled to build that storage if it were unnecessary just to fulfill some arbitrary agreement whereby there must pass Lee's Ferry, whether used or not, a certain number of acre feet annually.

MR. S. B. DAVIS: I dont like the idea of a joint guarantee by the upper states at all. It puts New Mexico in this position, assuming there is a guarantee of 5 million acre feet for the sake of argument; that is more water than flows through New Mexico, and we would not be in a position to sign a joint guarantee which the state itself could not carry out. It seems to me from our standpoint that we would want something in the way of an understanding as to just what portion of that Guarantee should fall upon New Mexico.

MR. NORWELL: Judge Davis has the idea of co-partnership in which each party is responsible for the whole debt.

MR. S. B. DAVIS: If the 5 upper states will guarantee to the lower states, that is a joint guarantee. I have no objection

if it is segregated as to just what I am guaranteeing. It is like asking me to sign a note of John D. Rockefeller if that feature is worked out.

MR. NORVIEL: It seems to me that we are agreeing upon the principle of a minimum flow and that the minimum flow should be established with a minimum annual flow and then that there be a period of average, during which period another flow, larger of course, should pass the point of demarkation. The establishment of the latter we have not reached.

MR. HOOVER: You would not object to a ten year average if there was a minimum for any one year.

MR. NORVIEL: It would depend upon the minimum. If we can have what we demand, a fair minimum, we might not raise the period. However, I would not want to commit myself to that until I have more time and discuss it, knowing perhaps a little better when I approximate the minimum that shall be guaranteed. Of course, the larger minimum flow, the longer the period we might consider.

MR. HOOVER: We can bring our second point down to this, that the basis of average should be a term of years and a minimum flow.

MR. NORVIEL: Yes, if we are to have a period at all then there must be included in it a minimum flow.

MR. CALDWELL: I would have to dissent from that, but I would like to think the matter over.

MR. HOOVER: We might tentatively agree to that; the quanti-

tative question would involve that whole problem. Is that suggestion satisfactory to you? (All assent)

MR. S. B. DAVIS: It is to me with the understanding I stated.

MR. NORVIEL: I would like to hear from California.

MR. McCLURE: I answered yes.

MR. HOOVER: Then we come to the third problem, the quantitative division.

MR. NORVIEL: Mr. Secretary; gentlemen: We have apparently arrived at a point or period of this discussion that bids us pause and look and listen. This question that we are now entering upon is the crucial point of the whole institution. It is crux of the situation, and it must be considered with extreme care. I have given a great deal of thought to this subject. I considered it quite carefully, as I thought, before our first meeting at Washington. I worked it over as carefully as I could from the data at hand and finally arrived at the conclusion that such a division of water would be impracticable except upon an acreage basis, and so presented my thoughts in writing at our first meeting upon that basis. In the studies prior to that time I used every available bit of information that I could obtain in that time, and with my limited knowledge of affairs and conditions. I had available, so far as I know, the information that was to be supplied from the Reclamation Service and Geological Survey. I went to the several states, to the engineers and to others whom I thought had any knowledge of the situation

to obtain as best I could the amount of water in the several states necessary. In our own state we were not prepared; we did not know what our needs might be out of the Colorado River. We had a vision of an empire within our state to be irrigated and reclaimed from the waters of the Colorado River. We know that we have an abundance of land to utilize a very large volume of water from the Colorado River, but just how much we did not know - we do not yet know - we have an engineering commission now in the field and I hope by the first of the year or soon thereafter they will give us a fairly accurate report upon the number of acres that can^{be} irrigated from the Colorado River. We have, however, gone far enough into this question since our meeting in Washington, that I can confidently say, or rather I say with a great deal of confidence, that we will be able to place upon land from the Colorado River the waters of that stream to the extent of 860,000 acres, approximately. I don't mean by that the irrigation of lands within the state from the smaller streams like the Little Colorado or the Gila. The inland streams, the Little Colorado and the Gila are, I might say, already appropriated; projects covering the full amount of water have been initiated and the water applied for. These rivers are not large; they do not give a very great amount of water. The flow of the Gila river at San Carlos is approximately 400,000 acre feet per annum. The project which has appropriated the Gila at that point cannot more than half be supplied with an ample supply from the river

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because the water isn't there. There will be 2 or 3 times - there is 2 or 3 times the number of acres that could be included within that project of the finest land in the state if the water available was sufficient. At other points below the Gila the return flow can be taken care of and will be, eventually, and yet not half the available irrigable lands can be supplied with water along the Gila from all the inflow of the Gila below San Carlos. So that it is impossible for us to cover all the irrigable lands within our state from the waters of the rivers that rise within or flow across our state aside from the Colorado. I think the number of acres is fairly limited and know in the State of California Mr. McClure is satisfied that a certain acreage in California shall be the limit of requirement from the Colorado River. Just what that is I don't remember, but we have the figures. I ascertained as best I could from Mr. Davis' reports, from other reports and from the engineers, and I made my calculations in Utah of something less than 500,000 acres of new land and in New Mexico about the same amount. In Wyoming near the same amount. In Colorado, the best information that I could obtain, and I will say that I obtained this from Mr. Conkling and I think Mr. Meeker at Riverside in December in last year, and the amount as I remember now - I don't want to commit Mr. Meeker to this, but I am quite well satisfied that this was the amount he told me. I know Mr. Conkling gave me the figures of 1,018,000 acres of new land. That was in December. In the last of January at

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Washington when your Honor appointed myself and others to find out the requirements of water, I asked the various commissioners what their requirements would be and between the middle of December and the 26th of January, during which period the hills of Colorado were covered deep in snow, I doubt if any further engineering measurements were taken, the amount there required was 1,825,000 acres, an increase of 810,000 acres, perhaps out of abundance of caution. I asked Mr. Caldwell what his requirements would be and he frankly told me he didn't know, but that if he must say how much, why one million acres.

MR. CALDWELL: In order that we may be straight. I said one million acres was the minimum below which Utah would not go.

MR. NORVIEL: You didn't like to be committed to that, but you gave me that number of acres upon which I might place the foundation of our figures. I asked the representative from New Mexico and the reply was 1,400,000 acres. In Nevada the amount had been raised slightly from 2,000 to 82,000 acres. In our own state I did not know and under my proposition of dividing the water in a way between the upper and lower basins, I thought it did not matter, because it was necessary that a large storage dam or dams should be built in the river and that reasonable use of the water in the upper basin would permit an ample flow to go to the lower basin, so that our wants would be supplied upon the basis that I had figured before. Checking

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the figures that were given me at that time and estimating the amount of diversion for use upon certain bases, which I think all were ready at that time to admit were correct, or nearly so, and the result was that far above the average flow of the river would be necessary for diversion and the consumptive use, the amount of which I had figured, and I think was acceptable to all the commissioners, and would amount to more than the flow in the river, assuming that some water would go to Mexican lands, so that as my friend Caldwell has insisted all the time, there is water enough for all, and I am here to say at this time and have always said that there may be water enough for all, but none to waste.

MR. CALDWELL: If you quote me in that matter, say this: that I think there is water enough in the river for all if properly conserved.

MR. NORVIEL: I will accept the amendment. I also am satisfied that there will be water enough for all if properly and beneficially used and conserved, and we don't expand beyond our present knowledge of the limitations, but we don't know what the future may bring forth. We don't know what devices may be invented to divert or lift water in order that it may be taken out of the basin or be used on lands now entirely infeasible. With this view in mind I am struck with awe and admonished to be very cautious in what we are now about to undertake. Having these things in mind and looking to the future as we must, I anticipate there will come a time not too

far in the future when the water for power will be of more cash value than much of the water used for irrigation. However the social question of providing homes in the basin must necessarily supersede at least for a period of years the use of water for power. The beneficial use of water must be guarded. Perhaps it would be properly guarded by the authorities within the states, but some provision I deem it necessary to put into this pact in the guardianship over the use of the water, so that infeasible and impractical uses of water, bearing little or no return, must be prohibited, my friend Emerson to the contrary notwithstanding. Let me say that -- or before, within our state we are in need of immediate power. It is costing our people now practically \$100 per horse power to make it in hydro-electric, or to make it from the old methods. Ten tons of coal on the average will create 1 h.p. year. On the valuation of \$10 per ton gives us a valuation or cost of \$100 per h.p. year, so that for every h.p. that we create at this time in the river we will release \$100 worth of coal for other uses or oil, no matter which, and we must look to the future and conserve the supply of coal and oil for other uses while the water is now going to waste, and the use of it for power does not waste it, nor take it from other uses of irrigation and domestic supply. The creation of 1 h.p. year also will release \$100 worth of coal carrying railway equipment for other uses. So that 100,000 h.p., or I will take the Girand/^{project}as a basis, 200,000 h.p. created at that one point,

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upon which the heavy hand of opposition has been laid, though it has been financed and ready to go for a long time, would create within our state 200,000 h.p., and would release or save for other uses 20,000,000 worth of railway coal carrying equipment to other uses. We might multiply that by the number of h.p. that can be created within our state, conservatively estimated at 5 million h.p. The figures become staggering, yet this is only the beginning of the real value to be created within the vicinity to be reached or covered by the power from these several points. Eventually our state will be able to furnish power to turn every wheel of industry from the sewing machines to the railways within a distance or radius of 500 miles from the points of creation of power. This will build up this section of the country beyond my comprehension. I only speak of this to show that it necessitates at this time a careful consideration of the use of the water of this river and especially the diversion of the water out of the reach of the users within the basin. 100,000 acre feet per annum diverted throughout the basin means 137 second feet of water, approximately. That 137 second feet of water passing down the river when fully developed with power plants within our state would create an enormous power and would eventually amount to \$10 per h.p. at the base bar or switch board, an increased figure of more than 65 millions of dollars per annum. It may be that the creation of homes outside the basin, and the growth of vegetation by agriculture would be worth more than that. It

certainly would be if it were necessary to sustain life and provide homes. No other consideration I think could enter into it to compete with the valuation of power. Now, I cannot think, cannot get the consent of my mind, that there shall be any arbitrary consideration given to the division of the waters at the point of demarkation. It is abhorrent to me to think that we will give any consideration at all to the gambler's chance of 50-50. It is without reason and should not be given consideration. What we must do, and I conceive it a duty that I owe to my State, that before we enter upon the discussion of any definite amount of water to be divided between the upper and lower basins we must know how much consumptive use is necessary in each of the states above and below, and adjudicate upon an equitable apportionment - the equitable apportionment must be adjudicated upon the needs of the several states, the actual needs, present and to be. Equitable apportionment as I conceive it does not mean that one state would have any advantage over the other, and the good Lord knows that I ask for no advantage for our State over any other State. We want to be absolutely fair and right in what we say and do in this agreement so far ^{as} our State is concerned. I believe, if we find that sort of a position and take it and agree to it, that our legislature will adopt it. I dont believe they will ask for anything more, and I know that they will not be satisfied, nor agree, to anything less. So that what we do now, and having reached the crux of the situation, can be based upon

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our actual absolute needs, as near as they can be ascertained. I know of no way to reach that point than before proceeding further that we have a table of actual needs set down of acreage to be served with water, present and future, and whatever other needs the several states may have for the water that they can conscientiously ask for with the idea of being accepted.

MR. S. B. DAVIS: Doesn't that come back to the very idea of distribution to each state which I understood was rejected yesterday?

MR. NORVIEL: I want to add this; this was the stonewall we came up against at Washington. It was an impassable barrier it appeared at this time, but we cannot afford to take the gambler's chance of flipping a copper at this time when it may be an everlasting document under which we can never emerge after once entered into. If we are going to follow this program we must find out just what our needs are and adjudicate accordingly. There is no other way, no escape from it.

MR. CALDWELL: How are you going to find them out?

MR. CARPENTER: I fear the Commissioner of Arizona overlooks the fundamental fact that the proposed delivery at Lee's Ferry is in fact but an outside barrier against the upper states and not necessarily a limitation upon the lower states. It doesn't mean that because a certain outside barrier were beyond which we could not go, in diminishing the flow of the river, we would ever reach that barrier, every drop of

water that we do not beneficially use will go on its way down through Lee's Ferry. We cannot prevent it. For example, excess applications above return and arrive at Lee's Ferry, but when the necessities of the upper states become so great that they reach the limit or the barrier, then they can go no further. That is the actual condition. As far as comparing the benefits obtained from the use of water in one region with the benefits to be obtained in another, those might be considered, but in the final analysis the homes of the people, the interests of the communities are the first consideration. I might say that it was my privilege to aid in urging this very doctrine before the Supreme Court in the suit brought against Colorado by Wyoming and we were very properly defeated. Finally again, because we fix a limit beyond which we shall not go, does not mean that we will control the water down to that limit. And then the development above will not be made for amusement, it will be made for human necessity, and every drop that isn't extracted for human necessity passes automatically down to Lee's Ferry and thence to the sea.

MR. NORVIEL: I understand that was the situation Wyoming found itself in. All water not used at the Laramie was to pass down to them and they should be satisfied. I understand they were not satisfied, and, then, I have a hazy recollection there was some sort of decision that was somewhat favorable to the lower states. We do not want to place ourselves in the position that Wyoming was in.

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MR. HOOVER: I understand the basis of the compact is necessary - a limitation or a maximum on the upper states, and that it does not from the nature of things provide a minimum for the lower states simply on account of the physical necessity.

MR. NORVIEL: We are perfectly willing to take second hand water, provided the amount is sufficient.

MR. HOOVER: Dont I understand this from your argument, that whatever the upper states can use properly is an equitable use. If there is enough water with conservation for all, the determination of that which they can use within 50 years hence is an equitable division, isn't it?

MR. NORVIEL: Whatever they can use. No, I don't think I so expressed myself; I didn't intend that. Not that the upper states may take all they can possibly use and if there is any left the lower states may have it. That isn't what I understand as equity.

MR. HOOVER: We are trying to fix a maximum up to which the upper states can develop and what is left for the lower states. If the upper states are not able to use that maximum it necessarily flows down to the lower ones.

MR. NORVIEL: That isn't my idea. That is a condition that has always existed and would always exist whether we enter into an agreement or not; that whatever they do not use will go down to us, but that isn't what I am here for, to take what they cannot use. What I want - the question I think it is my duty

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to raise at this time is our necessities and their necessities and then adjudicate according to those necessities the available supply.

MR. CALDWELL: Speaking of this word "adjudicate". It seems to me that it is impossible for us to adjudicate, in advance, rights based on necessity with respect to water especially. We adjudicate rights to water after we have determined the uses to which they are put. I don't think there is any possibility of determining in advance with any exactitude what Arizona can use, how many cities she can build because of this power she is going to develop, how many acres of land she can irrigate. Assuming that Arizona had land enough to use all the water of the Colorado River, I would still think that a partition of the water should be made somewhere from the river to protect the development of the upper states for the benefit of Arizona. It would be a very great misfortune to have Arizona develop alone. The upper states must be permitted to develop, and the only way we can get to that is by the very simple matter of partitioning the water on some more or less arbitrary basis at this time.

MR. NORVIEL: That would be to my mind more than a temporary adjudication. We could not afford to present a proposition of that kind as a permanent institution of that kind in our state.

MR. CALDWELL: I appreciate the force of what Mr. Norviel says and it appeals to me. At the present time we are trying to work out a compact between the states, and the reason for it

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did not grow primarily out of the fact that the upper states had to have the compact. It grew out of the necessities of the lower river which I think everybody frankly admits. We probably could go on for many years if it were not for the crying necessities in the Imperial Valley for protection and irrigation and the necessity for power. As a matter of fact, notwithstanding the needs for power, except in a very limited way, we could still go on and develop the Colorado River without a compact, and the upper states would be in a position to do so by spending their money without a compact. The upper states have entered into this thing with spirit, with zest, with all good feeling for the Colorado River basin, and even with compassion for the citizens of the United States who are now in jeopardy in the lower region of the stream. That's my chief motive for considering what I think is a correct method of developing the Colorado River to the point of agreeing to a partition of the water. I don't think that this river should be cut up, sliced up and partitioned forever regardless of whether this state or the other state could use it or not. To me, that's as abhorrent as it can be to Mr. Morviel. The principle of beneficial use is fundamental and is correct; the water should go to the people who can use and benefit by the water. There is also the question of greatest benefit to the greatest number within the basin, or a given area which must be considered. I do not think that it is at all necessary to suppose that this compact cannot at some future time, or that

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it will not at some future time be modified to meet exigencies of the case as they develop. Just as we have met now to meet the exigencies of this case. It isn't conceivable to me that any state in this basin would wish to corral and forever hold when it could not use it, any portion, not a quart or cupfull of the water of the Colorado River. I believe it is entirely possible and feasible to suppose that these states can, as the exigencies arise, meet again for the purpose of modifying the pact which we may enter into, when we will have very much greater knowledge of the situation than we have now. I think that that is a reason why we may be able to partition the water now without the necessity of determining with exactitude the needs of the various and sundry states.

MR. NORVIEL: One statement in reply to Mr. Caldwell. He told us a truth, but he did not tell it all, and unless we have that impression remain with us, I desire to add that the work of this Commission was initiated by the lower states; that is only a part of the truth. It came about in this way, the necessities of the lower states demand development in the lower river, for protection and development, and we were about to begin some large development when the heavy hand of opposition was laid upon us from the upper states, and I might add and that that opposition naturally still rests upon us and therefore it became necessary to discuss the question that we are now discussing, so that this is not wholly the outgrowth of a desire on the part of the lower states. If we had been left

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with our own sweet will to do as we might, perhaps this matter would not be here at this time or for discussion.

MR. HOOVER: I think Mr. Norviel's argument and Mr. Caldwell's too, is directed against the word 'perpetual' in this compact, and that if there should be an injection of a time where under proper circumstances this pact would be subject to revision, the whole process of the pact would become much easier. A pact in perpetuity for centuries is a considerable undertaking for any body of men and perhaps it would ease the whole process of discussion if we could consider some basis under which this pact could be subject to revision.

MR. McCLURE: Perhaps California is in a better position to accept a pact providing for perpetual use than any other state because we have a more definite estimate of our needs than other states have been able to furnish, but it would be under very great pressure I assure you as California's Commissioner, that I might be prevailed upon to sign a pact for perpetual usage.

MR. CALDWELL: I think that if the Commissioners have read the draft which I submitted, they may have overlooked a suggestion that this pact can be modified under certain circumstances.

I would like to make a suggestion aside from the subject in hand. This is just an observation. We accomplish much at these meetings undoubtedly and much comes up in every session which requires, as far as I am concerned, thinking, and I have

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come to the conclusion that perhaps we should not be too eager to be meeting all the time but leave time for work and thought on the outside. I just offer that as a suggestion.

MR. HOOVER: One member has suggested that we have no night meetings; perhaps we could take a longer time for noon recess because it is pretty difficult to sit here for more than 2 hours and a half and if we began at three we would still have plenty of time.

Adjournment taken until three o'clock.

Clarence C. Stetson
Executive Secretary.

The above minutes were approved at the 27th meeting of the Commission, held at Santa Fe, New Mexico, Friday afternoon, November 24, 1922.