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ENFORCEMENT

DATE:

10-16-1968

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
October 16, 1968

REGULAR HEARING

IN THE MATTER OF:

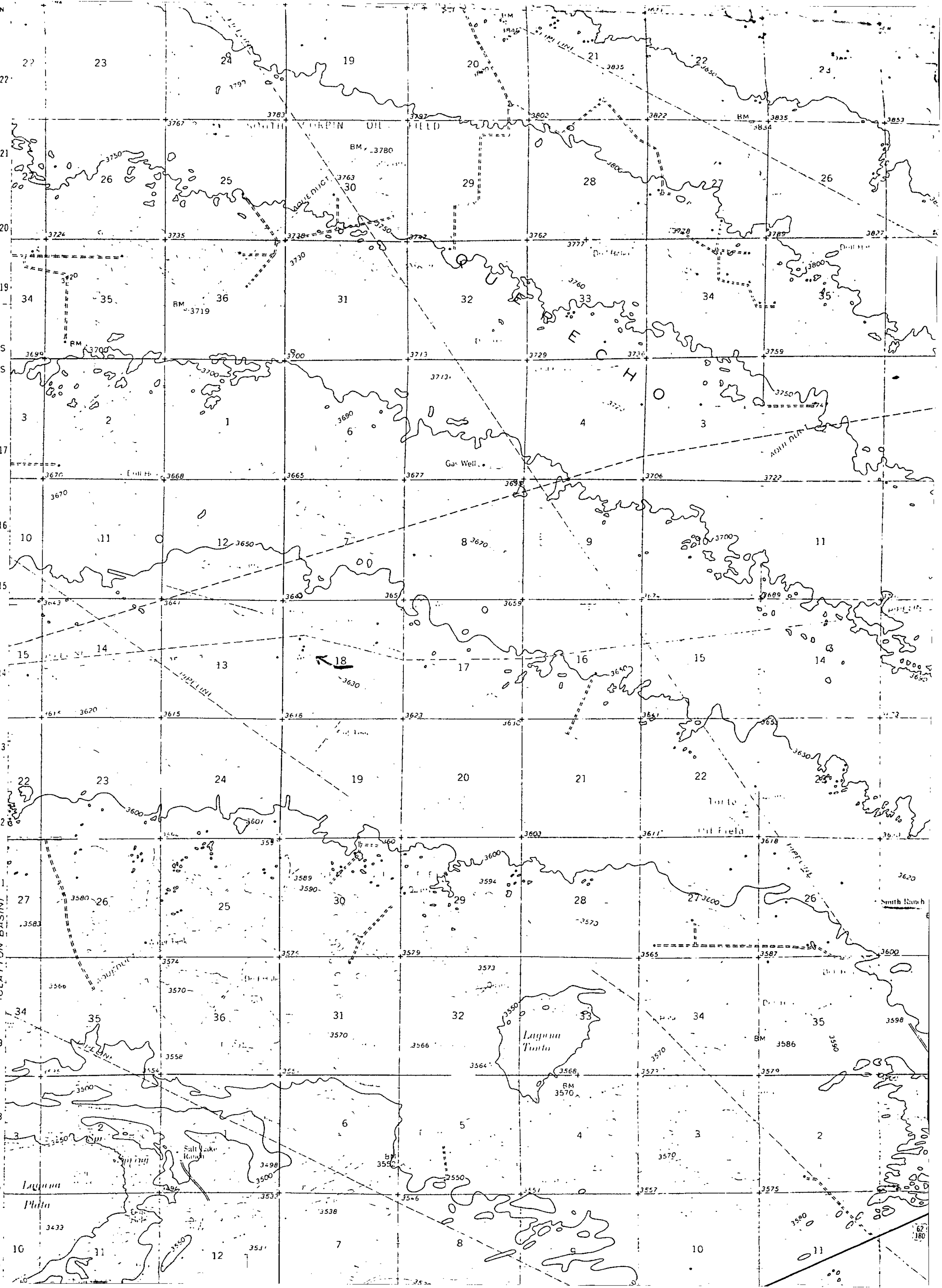
Application of William A. and Edward R. Hudson for an exception to Order No. R-3221, as amended, Lea County, New Mexico.

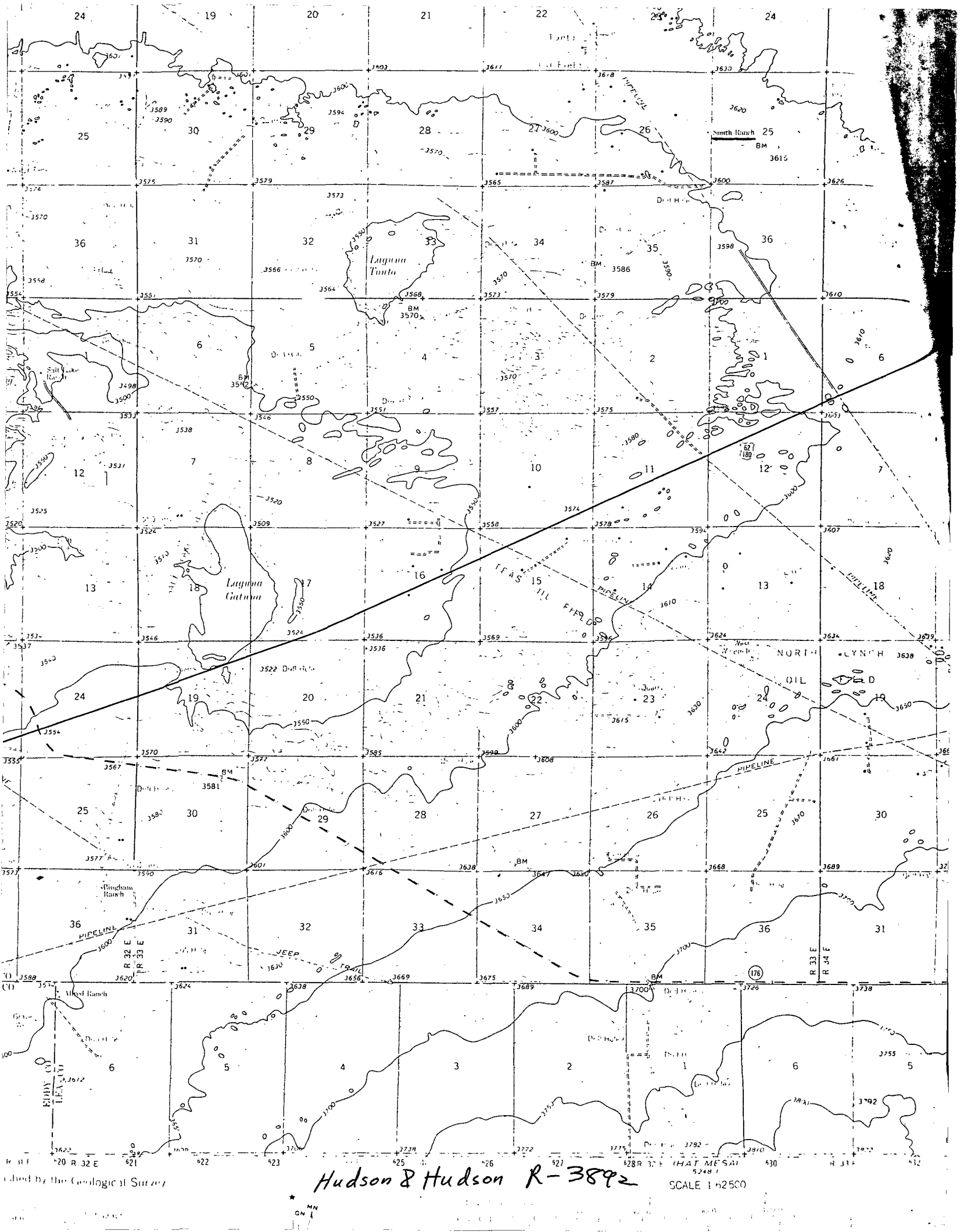
Case 3892

BEFORE: A. L. PORTER, JR.
Examiner

TRANSCRIPT OF HEARING

Hudson & Hudson R-3872




Laguna Tonta
Laguna Gatuna
Salt Creek Ranch
Bingham Ranch
Mead Ranch
South Ranch
TEAS FIELD
NORTH LYNCH OIL FIELD
PIPELINE
JEEP TRAIL
EDDY CO
LEA CO
R 32 E
R 33 E
R 34 E
(HAT MESA)
Hudson & Hudson R-3892
SCALE 1:62500

MR. PORTER: We'll take up Case 3892.

MR. HATCH: Case 3892. Application of William A. and Edward R. Hudson for an exception to Order Number R-3221, as amended, Lea County, New Mexico.

MR. KELLAHIN: If the Examiner please, Jason Kellahin of Kellahin & Fox of Santa Fe appearing for the applicant. We have one witness and I would like to have him sworn.

(Witness sworn.)

(Whereupon, Applicant's Exhibits Numbered 1, 2, 3, 4, 5, 6, 7, 8, 9, 9-A and 9-B were marked for identification.)

MR. KELLAHIN: If the Commission please, this is the application of William A. and Edward R. Hudson for relief in the alternative from the provisions of Order Number R-3221, as amended, to permit the continued use of surface disposal unlined pits of produced salt water from wells in the West Tonto-Yates-Seven Rivers Pool.

As the Commission will recall, subsequent to the adoption of Order Number R-3221, the Commission has granted two exceptions: One on the application of William A. and Edward R. Hudson, the Applicant in this case, permitting surface disposal of produced waters in an area in which potash companies have been historically using for many years some natural salt lakes for the disposal of salt water.

Subsequent to the hearing on that case, the Commission adopted its Order 3221-B which declared an area in which a general exception to the provisions of 3221 were granted for the same reason; that is, that there was disposal of highly concentrated solutions of salt water in the vicinity and no damage would occur from the continued use of surface pits by the oil operators in the same area.

In connection with our presentation in this case and to refresh the recollection of the Commission on the reasons for adopting Order R-3221-B, I would like to read into the record the findings in that Order for I feel our evidence will fit directly into the provisions or the findings that were made at that time.

The Finding Number 4: the major portions of Clayton Basin and North Draw, broad depressions caused by the slumping of the surface due to the removal of the underlying salt by solution lie within the above-described area.

That the general direction of movement of both ground water and surface water in the subject area is toward and into said basins, thence southwest in Nash Draw toward Malaga Bend.

That a substantial amount of water is produced in conjunction with the production of oil and gas, or both, by the oil and gas wells located in the above-described area. That said produced water is presently being disposed of in surface pits

located in the above-described area, that a number of large surface ponds or lakes containing extremely high concentrations of chlorides are located in the above-described area; that in relation to said surface lakes, said disposal pits are inconsiderable in volume of water received and seepage underground, that the aforesaid disposal pits and surface lakes are located within the same surface and subsurface drainage system as described in Finding 5 above, and that the purposes of Order R-3221 to afford reasonable protection against contamination of fresh water supplies by surface disposal of produced water would not be advanced by the enforcement of said Order as to the above described area.

We feel that the evidence we will present in this case will amply support the same identical findings for an area which would include the William A. and Edward R. Hudson leases in the Tonto Pool.

MR. PORTER: Do you agree with those findings, Mr. Kellahin?

MR. KELLAHIN: We agree with those findings, Mr. Porter. We agree with that because conservation is being served and the exception, likewise, has served and will continue to serve because of conservation of oil and gas and the waters, if any, in this area are amply protected. We have filed the application, however, in the alternative if the Commission does not see fit

to grant an extension of the exempt area as provided under Order R-3221-B. In the alternative, we ask for an exception to the provisions of R-3221, as amended, for the leases operated by William A. and Edward R. Hudson in this pool.

MR. PORTER: Maybe we'd better go off the record on this one.

(Whereupon, off-the-record discussion was had.)

RALPH L. GRAY

called as a witness, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Would you state your name, please?

A Ralph Gray.

Q What business are you engaged in, Mr. Gray?

A Consulting Engineer.

Q Where are you located?

A Artesia, New Mexico.

Q In connection with your work as a Consulting Engineer, do you handle any work for the Applicant in this case, William A. and Edward R. Hudson?

A Yes, sir, I do.

Q Are you familiar with the application that has been

filed by William A. and Edward R. Hudson in this case now before the Commission?

A Yes, sir.

Q Did I correctly state the purpose of this application in my statement to the Commission?

A Yes, sir.

Q Have you made a study of the area involved in this application, Mr. Gray?

A Yes, I have.

Q Now, referring to what has been marked as --

MR. PORTER: This is the same Mr. Gray that testifies every month before the Commission?

MR. KELLAHIN: This is the same Mr. Gray who has frequently appeared before the Commission. Are his qualifications acceptable?

MR. PORTER: Yes, sir, they are.

Q Now, referring to what has been marked as Exhibit Number 1, Mr. Gray, would you identify that exhibit, please?

A Exhibit Number 1 is a map of the area. This shows leases and wells in the West Tonto-Yates-Seven Rivers Pool. William A. and Edward R. Hudson have four wells which are presently producing on their Federal 18 Lease and one well which is temporarily abandoned, shut-in.

MR. PORTER: That's four wells on the Federal 18?

THE WITNESS: Yes, sir.

MR. PORTER: Thank you.

A And one temporarily abandoned well. The Hudson Federal 18 Lease occupies all of Section 18 of Township 19 South, Range 33 East.

The only other operator in the pool is Pan American and they presently have one well producing and one well is shut-in, temporarily abandoned, their Number 2 Well.

Q Where are they located?

A These wells are located adjacent to the west of the Hudson lease.

Q Is that all the production then from the West Tonto-Yates-Seven Rivers Pool?

A Yes, sir.

Q Would you continue. Do you have anything else in connection with Exhibit 1?

A No, sir.

Q Referring to what has been marked as Exhibit 2, would you identify that exhibit?

A Exhibit Number 2 is a tabulation showing well data for each of the Hudson wells. These wells were drilled and completed in 1960. The total depths are approximately at 3300

feet, five and a half casing has been cemented to a total depth in all of these wells and completion has been made by perforating the Dolomite Pay Zones. Very little treatment was required. Usually, a few hundred gallons of acid were used to clean up the wells. The Number 7 Well was temporarily abandoned March 23, 1967.

Q Do you anticipate that that well will revert or be put back on production?

A We don't have any plans at this time.

Q Now, referring to what has been marked as Exhibit Number 3, would you identify that exhibit?

A Exhibit Number 3 is a structure map. This shows the structure in the West Tonto-Yates-Seven Rivers Pool. The contours are on top of the forced Dolomite which is the pay section in this reservoir. This is an anticlinal-type structure. It's a very small structure.

This map also shows producing wells and wells that have been temporarily abandoned and the dry holes in the area.

Q Have the limits of the pool been well-defined in this pool?

A Yes, sir. We feel that the structure has been very well-defined and we don't anticipate any more additional drilling.

Q The pool is fully developed then, in your opinion?

A Yes, sir.

Q Now, referring to what has been marked as Exhibit Number 4, would you identify that exhibit?

A Exhibit Number 4 is a portion of the Gamma-ray Neutron Log for the Hudson Federal 18 Number 2 Well. This exhibit has been presented to show a typical well log through the pay section.

This exhibit also shows the total depth and the intervals that have been perforated. The reservoir is a typical Yates-Seven Rivers Dolomite type, reef-type reservoir, in which there is a natural water drive present.

Q Referring to what has been marked as Exhibit Number 5, would you identify that exhibit?

A Exhibit Number 5 is a table showing oil and water production for the Hudson Federal 18 Lease. Annual oil production figures are shown from 1960 through 1967 by wells and monthly oil and water production figures are shown for 1968 or January through September.

Also, we've shown cumulative oil production figures. You will note that the wells are producing a high percentage of water at this time. The lease, as a whole, is producing from 89 to 94% water, and we consider that this property is in

the latter stage of depletion, as far as the life of the pool is concerned.

Q Mr. Gray, you do not show the water production for the years 1960 through 1967. For what reason do you omit that from the exhibit?

A Well, in the past, we haven't really made a very good effort to measure the water accurately. It's been rather difficult with the facilities that were on the lease and, although we did report water on our state forms, we do not have enough confidence in our knowledge of the water that's been produced to -- We just haven't -- That's the reason we left that figure out, is because we don't think we have an accurate figure on past performance.

Q This is a matter of practice to make an estimate of water in a situation like this?

A Yes. This isn't unusual. Wells of this type generally, throughout the oil industry, you'll find that the operators periodically may make tests, but the water is changing and it's an exception rather than the rule for an operator to know accurately how much water is being produced.

Now, in the early part of 1968, we did rent some equipment to make some tests with, and we have made accurate tests, but several times during 1968, you will note that there's been quite a change especially within the last two or three-month

period.

Q Before we get into that, I'd like to ask you one more question about your past performance, Mr. Gray. You have been responsible for the operation of these wells for William A. and Edward R. Hudson during the period of 1960 through 1967, have you not?

A Yes, sir.

Q You are familiar with the water production, actual water production?

A Yes, sir.

Q Do you feel that there has been a substantial increase in water production from 1960 to 1968, or has it been fairly level?

A Oh, yes.

Q In general terms, what would it be?

A In general terms, the water has been increasing, yes, sir, through the life.

Q You started to comment on the sudden increase in water production on some of these wells.

A Well, first of all, I'd like to call attention to the very rapid decline in oil production in most of these wells, and you'll notice that during the month of July, the Number 1 Well actually didn't make any oil at all.

Now, this pool is or has a very highly corrosive

water. This corrosive character has been increasing within the last year or two, and during all of 1966, 1967 and 1968, we have had a great deal of mechanical trouble because of corrosive action that has been occurring.

We've had to replace a lot of rods and we've had to replace tubing, so this mechanical trouble is due or reflects the shutdown time and is the explanation for much of the erratic performance of the oil shown on each of these individual wells.

Now, in August of 1968, the operator decided that we would have a good chance to get additional oil by putting in some larger pumping equipment on some of these wells and we installed larger pumping equipment on the Number 2 Well and also the Number 1 Well in the early part of August.

You will note that production for August increased and also for the month of September. We had a very substantial increase in oil production and this is as a result of putting in larger pumping equipment.

Q You also had a substantial increase in water production?

A Yes, sir, that's true.

Q Now, I note you said this was due to new pumping equipment installed on your Number 1 and 2 Wells, but there was also an increase in production, water production, of oil and water in your Number 3 Well. Can you explain that?

A Yes, sir. That's correct. We didn't make any change

in the equipment on the Number 3 Well, but because of putting in the larger equipment on Number 1 and Number 2 and withdrawing larger volumes of fluid from the reservoir, this has the effect of livening up Number 3, is one terminology we use.

I would like to go into this a little more thoroughly. Very often, some operators and perhaps some of the regulatory body people will see some wells available in a pool, for instance, some temporarily abandoned wells or perhaps some dry holes, and very often, people right away think that it would be very easy to use these wells for disposal and there shouldn't really be any reason why they shouldn't be used for disposal.

I'd like to explain a little bit about this type of reservoir mechanism that we have here. This natural water drive condition, early in the life of this type of pool, we like to hold our withdrawals as low as possible and withdraw the oil relatively slow. We don't like to take large quantities of oil out of any particular well. The reason for this is to delay as long as possible the coning of water into these producing wells and this creates an increased water production.

Now, when we get into the later stages of depletion of this type of reservoir, usually, our oil production decreases, our water production increases and the properties, if continued to be operated by, for instance, the same pipe or pumping equipment, they tend to be watered out. We have found by

experience that it's necessary at this stage to put on larger pumping equipment to withdraw larger volumes from the reservoir, thereby reducing the pressure in the reservoir in order to get this additional oil.

Now, our concept of the reason why this is necessary is this: The reef formation has a very erratic pattern of porosity and permeability. It differs from the sand to a large degree because, generally, a sand is laid down in a more uniform manner and there isn't such a great degree of pattern variation. We can visualize pockets of porosity that go up and down in this reef type thing. We know that occurs because very often we find that our porosity, as we encounter it in each well, very often is found at different depths.

So whenever we withdraw large quantities of fluid from the reservoir, this has the effect of reducing the reservoir pressure and this causes gas to come out of solution from oil in the reservoir. The gas has a tendency to collect into these higher pockets which contain oil and the gas tends to force the oil out into these high pockets out into the flow channel which makes it recoverable.

I just go into this explanation because I think, very often, we fail to consider under what conditions these reservoirs should be produced at this stage of depletion. So under those conditions, we certainly would not want to pump this produced

water back into any of these wells that are not being used; at least, not in the close proximity because that would be defeating the purpose of our large pumping equipment.

So if we were to inject any water at all, we feel that it would have to be done into a separate reservoir than the one we're producing from.

Q Is such a reservoir available to you in this area?

A Well, the only probably location, I'd say, the most probably location would be at some deeper depth.

Q You don't know at this point whether such a reservoir is available or not, do you?

A At this point, we don't know really what the lower depth of this particular reservoir is.

Q But your explanation of the effect of producing high volumes from your Number 1 and 2 Well, does that account for the increase in production from your Number 3 Well?

A Yes, sir. I'd like to read some actual figures here that we have accumulated. These two large pumping units were installed on the Number 1 and Number 2 Wells on August 12. They were started up on August 12th and we took daily readings of lease production and data readings of casing pressure on the Number 1 and Number 2 and Number 3 Wells after this time, and I'd like to read some of these for the record.

On August 12th, the casing pressure for the Number 1 Well was 10 pounds. The Number 2 Well was 10 pounds. Number 3 Well was 20 pounds per square inch.

The lease production was 32 barrels per day. The production over the next several days started increasing and the casing pressure on some of the wells started increasing.

On August the 19th, one week later, the casing pressure on the Number 1 Well had increased from 10 pounds up to 590 psi. The casing pressure on the Number 2 Well had increased from 10 pounds up to 80 psi. The casing pressure on the Number 3 Well, where no change was made in the equipment, remained the same at 20 psi. The oil production for August the 19th was up to 58 barrels per day.

On August the 25th, almost a week later, the casing pressure on the Number 1 Well was 580 psi. Casing pressure on the Number 2 Well was 140 psi, and the casing pressure on the Number 3 Well was still 20 psi.

The day before this, we installed a water meter to measure the water, total water being produced from the lease, and the production for August the 25th was 117 barrels of oil and 1722 barrels of water per day.

Now, the next day, August the 26th, the casing pressure on the Number 3 Well increased from 20 psi up to 460 psi. So you can see that the Number 3 Well now is starting to show a

response to the installation of larger pumping equipment on the other two wells, and it took from August 12th to August 26th for this to be reflected in the Number 3 Well.

The production for the lease on August 26th was 123 barrels of oil and 1706 barrels of water per day.

On August 30th, the oil production was 130 barrels per day, and the water production was 1558 barrels per day and casing pressure on the Number 1 Well was 510, Number 2 Well was 120, Number 3 Well was 650 psi.

Now, since that time, we've had very little change in casing pressures, and our oil and water production is approximately the same up to this time. So you can see very clearly that in order to get the oil, it's absolutely necessary to reduce the reservoir pressure and withdraw these large volumes of fluid.

Q Do you have have any idea, Mr. Gray, as to how long you will be able to maintain this level of oil production from these wells?

A No, sir.

Q Assuming you can produce this volume of water.

A We don't know, really. We don't feel that there's been sufficient time to elapse that we can judge. Of the behavior of our oil and water for various wells, we can quote

you some figures on the Pan American Bondurant Lease which offsets our lease to the west. Pan American informed me that they also installed some larger pumping equipment and we have gone back and studied their production figures in 1967. They had a low oil production of 198 barrels for the month of May and then, in July, this was up to 823 and, in August, it was up to 1849 barrels for the month.

Then the oil decreased after that time and, in May of 1968, oil production had dropped to 261 barrels for the month. Production for July was 306 barrels of oil, so in their case, at least, it didn't hold up very long. But we don't necessarily think ours will act exactly like theirs. We look at the reef as a very erratic formation and it is very difficulty to predict just what sort of behavior we might expect. It's very possible that we can maintain a high or very good rate of oil production for several months or possibly a year, or it's possible that within a very few months, the oil production may start dropping. We just can't tell at this stage.

Q With that degree of uncertainty, Mr. Gray, can you justify the completion of a salt water disposal well, assuming you find a reservoir to put it in?

A No, sir, coupled with the fact that we also have some unfavorable economical conditions which we will go into later.

Q Now, referring to what has been marked as Exhibit Number 6, would you identify that exhibit?

A Exhibit Number 6 shows a water analysis for water which is being produced from the Federal 18 Lease. This was at a specific gravity of 1.012. It has a very low chloride content, as far as produced waters go. The chloride content is 99 hundred and 50 milligrams per liter. The sulfide content is 2400 milligrams per liter. Hydrogensulfide is present and it is very corrosive.

Q Would you say that accounts for some of the problems you had in the operation of this lease?

A Yes.

Q Referring to what has been marked as Exhibit Number 7, would you discuss that, please?

A Exhibit Number 7 is a table which shows pulling jobs which have been performed on Wells Numbers 1, 2 and 3 during recent times. We started this table back in the middle of 1966.

You will note that during 1967, twelve pulling jobs were required for Well Number 2. Most of these were broken rods, and for the period of 1968 up to the present time, we have had twelve pulling jobs in this year.

During this period, we've actually replaced two complete strings of rods in this well. In Well Number 3, during 1968 up to the present time, we've already had six pulling jobs so you can

see that we are having a very difficult time trying to operate this lease because of the highly corrosive conditions.

MR. PORTER: Corrosion is what is causing these rods to break?

THE WITNESS: Corrosion is the big factor. Now, we've considered the use of chemical in the past, and we've gone into the cost for the program where you produce large quantities of water well. Usually, these chemical programs are very expensive but it became evident to us in June or July that we were going to have to make some kind of a change or else shut the lease down because we couldn't continue to operate with this many pulling jobs.

So on August the 12th, when we put in the larger pumping units and put in new strings of rods in the Number 2 Well and in the Number 3 Well -- No. The new rods in Number 3 Well were put in in May. We elected to start a chemical program to see if we could control the corrosion, and this program was started August the 12th.

Recently, we had the chemical company to check on some coupons that they had installed, and after 58 days of treating, the coupon check showed that we were getting protection at the Number 2 Well. However, the coupon in the flow stream of the Number 3 Well showed that we were still getting attacked and we were not getting adequate protection at this well.

So we're presently spending approximately $200.00 a month for corrosion chemicals and we're going to have to increase that in order to try to control corrosion better at the Number 3 Well.

Q Now, does that affect the net return from these wells?

A Yes, it has a very decided effect on the economics of operation.

Q Referring to what has been marked as Exhibit Number 8, would you discuss that exhibit, please?

A Exhibit Number 8 is a table showing the operating costs for the Federal 18 Lease for 1968 through August. The total costs, the total operating cost for August was $20,208. I would like to comment further on that.

This cost does not include any administration or overhead cost nor does this include any capital investment cost. For example, we installed this one large unit on the Number 2 Well at a cost of $8,736.00, which isn't shown in any of these cost figures.

Also, you will note that under chemicals, we only show a cost of $1111.00 for this period, but this will be increased very substantially now. This chemical in this case was paraffin-controlled chemical and the chemicals which we're now using for corrosion control are not included in this chemical

cost figure.

During the same eight-month period of 1968, the working interests income amounted to $17,930.00 which, you can see, is a loss in economics of operation for the year.

We've gone back to get the total operating cost for the year 1967 and this figure was $24,743.00.

Q You do anticipate your cost for 1968 will be higher, will they not?

A Yes, they will be higher and we expect that for the remainder of the life of the project, we will continue to have these high operating costs.

Q Now, Mr. Gray, in connection with the installation of the additional pumping equipment, would you anticipate you could increase your revenue from these leases?

A Yes, sir, we have been able to increase our oil production by installing these larger units. We do not know at this time whether the increase will be sufficient to pay for the equipment or not, but we feel we had to do it to keep operating the property.

Q But the cost of your additional equipment is not reflected on your Exhibit Number 8, is it?

A No, sir.

Q And the cost of your chemical treatment for corrosion treatment is not reflected on Exhibit 8?

A It's not. Administration and overhead costs are not

included, either.

Q And without those operating figures, you are showing an operating loss on this lease?

A So far, for 1968.

Q Would you say this lease is at a critical point in its productive history?

A I think it is pretty evident that we are at a critical point and we have to be very careful from now on on what money is spent for operation, certainly, if we're required to install a water disposal system. These systems usually cost a very substantial amount of money for investment of the original equipment, as well as the cost for operating these facilities, and if we add such a cost onto the present unfavorable economical picture, well, I think it's pretty evidence that we're going to have some premature abandonment occur and will certainly leave oil in the reservoir.

Q You heard my statement to the Commission at the opening of this case and my reference to the findings contained in Order Number R-3221-B. Have you made a study, Mr. Gray, of the drainage area as it relates to the present exempt area and the area involved in this application?

A Yes, sir, I have.

Q Referring to what has been marked as Exhibit Number 9, would you discuss that exhibit?

MR. PORTER: Before we get into that exhibit, Mr. Kellahin, let's take a short recess.

(Whereupon, recess was had.)

MR. PORTER: The hearing will come to order, please.

Q (By Mr. Kellahin) Mr. Gray, just before the recess, we were discussing the problem of the drainage area involved in the area under consideration in this application as related to the exempt area. I direct your attention to Exhibit Number 9. Would you discuss that exhibit, please?

A Exhibit Number 9 is a map that shows several Townships in this general area, and we have an enlarged map on the wall of Exhibit 9 that is identical except for one little variation which I'll describe later.

We have consulted the Ground Water Report Number 6 of Lea County which Mr. Nutter has previously referred to, and the authors have prepared a structure map on top of the Red Beds in this area and our Exhibit Number 9 is a copy of contour lines on top of those Red Beds.

This report describes the nature of the Red Beds and states that in general, the Red Beds are impervious and that, generally, the Red Beds structure controls the movement of any surface waters.

Now, on our map, this Red Bed structure is indicated

by these blue contour lines. I'd also call your attention to this yellow boundary line on Exhibit Number 9, and this indicates the present boundaries of the area that's exempt under Order Number R-3221-B.

MR. PORTER: That's the boundary, Mr. Gray?

THE WITNESS: Yes, sir. In general, it's the east or northeast.

MR. PORTER: North?

THE WITNESS: Northeast boundary.

MR. PORTER: Yes.

THE WITNESS: Of the exempt area. Now, the location of the Hudson Federal 18 Lease is indicated on Exhibit Number 9 by the green square located in Township 19 South, Range 33 East, and, of course, you can see that we are just a short distance outside of the present boundary of the exempt area.

Now, our enlarged map on the wall doesn't show surface contours, but your Exhibit 9, the smaller version, shows surface contour lines that have been copies from topographic quadrangle maps which have been published by the United States Geological Survey, and these two quadrangle maps are designated as Clayton Basin and Laguna Gatuna Maps by the U. S. G. S. We didn't have but one copy of each of these maps, but we have submitted them to the Commission and these are designated as Exhibits 9-A and 9-B.

It's evident from a comparison of these red dashed lines on our map, which are the surface contour lines, that the surface structure is practically identical to the structure on top of the Red Beds. So it makes a little difference whether you want to believe that the drainage of surface waters are controlled by the surface or Red Bed structure. They are both, for all practical purposes, the same.

Now, there are several natural salt lakes in this area and these are indicated on our map. One of them is Williams Sink in which the National Potash Company dumps something like 22,000 barrels of salt water per day. Also, this potash company puts in excess of 3,000 barrels of salt water per day into the Laguna Plata salt lake which is located in Township 20 South, Range 32 East. And as we proceed on east, there is another natural salt lake which is designated on the map as Laguna Gatuna. This is in Township 20 South, Range 33 East.

In the lower part of our township, Township 19 South, Range 33 East, there's a small salt lake called Laguna Tuna. Now, the exempt area includes this big depression area which is designated as Clayton Basin and then this drains on down into Nash Draw. You will note from the structural conditions on both the surface and the Red Bed Formation that this big depression area extends on out past the present limits of the

exempt area and that the location of the Hudson Federal 18 Lease is within this same broad depression area, so that any drainage, if there's movement of surface waters from the Hudson Federal 18 Lease, it would be in a direction south and west down into this same depression area that's included in the exempt area and the same area that these potash companies are putting their salt water in.

I call your attention to the fact that this Laguna Plata Lake is being used by the potash companies for disposal and it is outside the limits of the present exempt area. Now, I think if we study this structural map and tie it in with Clayton Basin and Nash Draw, which you can do from the topographic maps, that you would have to conclude that this Federal 18 Lease is in this same depression area and that the drainage will be down into this same area and will probably be the same drainage that these other salt waters will follow.

Q You say that the potash company is putting water into the Laguna Plata Lake; is that the same quality of water they're putting into the Williams Sink?

A Yes, it's the same water.

Q The same water. Now, do you have any information on the quality of the water in the Laguna Gatuna?

A Yes. We have an analysis of water that was taken out

of that Lake and this water shows a chloride content of 158,000 milligrams per liter.

Q Now, that would be in excess of the chloride content of your produced water, would it not?

A Yes, sir. That's highly concentrated salt water, very much in excess of the salt content of our produced water.

Q If any pollution were going to occur in the area, it would be more apt to be polluted by the natural water than any produced water, is that not so?

A Yes, sir. This natural, highly salty water exists in this lake and rainfall and natural water that's deposited into this highly salty lake is going to wash this highly salty water into the ground, and it's going to be a lot more significant than the type of water that we're putting into the ground.

Q Now, at the present time, are you disposing of your produced water in open pits?

A Yes, sir.

Q And how long have you been doing this?

A Well, ever since the first water was produced. I don't have the date, actually, that we first started producing water.

Q But ever since you have been producing water, you have been disposing of it in these pits?

A Yes.

Q Now, in connection with this application, Mr. Gray, did you make any investigation to determine what fresh waters were available in the area of the Hudson Lease in Section 18?

A Yes, sir.

Q What did you do in that connection?

A We consulted the records of the State Engineer's Office and, also, on October the 14th, 1968, I made a trip out in to the area. Mr. Mark Smith is the owner of a ranch in the area. His ranch house is located in Section 26 of Township 19 South, Range 33 East, and I had a discussion with Mr. Smith. He has a shallow water well at the ranch house that is being used for watering his cattle. This well is a little more than five miles from our Federal 18 Lease and it's in a location on the structure that certainly wouldn't be affected in any way by drainage from the Hudson Lease.

MR. PORTER: Is that southeast?

THE WITNESS: Section 26 would be down in the southeast part of the Township, and would be roughly parallel with the contour lines that we show on the map. So that if we're willing to acknowledge that water goes downhill when it moves, well, then certainly, there couldn't be any movement of water from our lease to the Smith well.

Q Now, the Smith well, as I understand it, is a shallow well, is it not?

A Yes. It's a shallow well.

Q Completed above the Red Beds?

A Yes, and I further asked Mr. Smith if he was getting any water for his house use or domestic use from this water well and he told me, "No," that they weren't. He described the water as being, having a high gyp content, and he said it wasn't suitable for his domestic use and that they were getting water from one of the potash company supply lines that exists in the area.

Now, I had quite a discussion with Mr. Smith in regard to the nature of the shallow waters in this area and he offered the information very freely. He told me that the shallow waters were very spotty in the area. He's been ranching for many years in this area and has drilled, I don't know how many water wells, but he stated that these waters were very spotty, unpredictable. They don't appear at any certain depth, and that in most cases, the wells have very small capacities with very low fluid levels and that this water is generally high in gyp content and is not suitable for domestic use.

Q Now, in relation to Section 18, are the shallow wells at the Smith Ranch house in Section 26 closer to shallow wells to your acreage?

A No.

Q What other shallow wells are there in the area?

A There's a shallow well in the Northeast Quarter of the Northwest Quarter of the Northwest Quarter of Section 17. This well has a total depth of 131 feet. The depth to water is 131 feet, so there's only ten feet of water standing in the hole.

The well is not being used. This well is located up structure from our water pits.

Q Are there any other shallow wells in the area?

A If you'd like, I'll just give you a complete description of all of the wells in this township.

Q Well, I was going back to the deep wells. Just go ahead and describe all of the wells of which you have knowledge in this township.

A All right. These water sources in this area are very similar to waters that we find within the exempt area. We have two sources of water: one is the shallow surface waters that we've described as very spotty and of very limited use. The other water is a deep water that's found in this area at depths ranging from about 600 to about 900 feet. This water is below the Red Beds and it has very limited use, also. It has a high gyp content and is not suitable for domestic use.

The records of the State Engineer shows that there is

a deep well in the Northeast Quarter of the Northwest Quarter of Section 5. This well has watersand located from 600 to 800 feet. Their records reflect this shallow well that we just mentioned in Section 17 which is not being used, that well had ten feet of water and this low fluid level is characteristic of shallow wells in this area.

There are two deep wells owned by Pan American Oil Company located in the Southwest Quarter of the Southwest Quarter of the Northwest Quarter of Section 18 and the watersand is found at a depth of 800 to 900 feet. These wells are not being used and the equipment on the wells have been removed.

There are two shallow wells at the Smith Ranch in the Northeast Quarter of the Northeast Quarter of the Southeast Quarter of Section 26. The records of the State Engineer's Office reflect that one of these wells is not being used. The other well is being used for stock. The well has a depth of 98 feet. The depth to water is 90 feet, so there's only eight feet of water standing in this well.

Now, in drilling the Hudson Federal 18 Number 1 Well which is the discovery well in West Tonto Pool, this well was drilled with cable tools down to the top portion of the pay, and the first water that was encountered in this hole was at 642 to 670 feet. So we can state that in this township, there are no

wells that are being used for domestic purpose and there's only one shallow well being used for stock use and this is five miles from our lease and it is located in such a position that it, I'd say, it would be impossible for drainage to occur from the Hudson Lease down to this area in Section 26.

Q Do you find any water wells in the adjoining townships?

A Yes. We've made a study of wells in the adjoining townships. In Township 19 South, Range 32 East, which is adjacent to our township to the west, there are no wells in this township that are being used for domestic purposes and there are no shallow wells that are being used for stock use.

There are connections to potash connection lines that the ranchers use for stock use. In the township adjacent to our township to the south, which is Township 20 South, Range 33 East, there are no wells in this township being used for domestic purpose and no shallow wells being used for stock use.

I would like to point out that the records of the State Engineer's Office reflected that a well in Section 4 of this township was being used for stock purpose, but Mr. Smith informed me that this well was abandoned. He said that they noticed the stock in this particular area, rather than drinking the water from the well, would walk clear over to Section 26 to their ranch house to get their water. And he says that the water

from this well is gyppy. It has apparently a higher gyp content than some of the other water wells and that he has abandoned that well.

Q Did you look at the wells in 19 South, 33 East? Well, I believe we covered those.

A Well, we covered those.

Q 19 South, 32 East; 19 South, 32 East and 20 South, 33 East, do you find any water being used for domestic use?

A No, sir.

Q And only a limited use for stock water, is that right?

A Yes, sir. In fact, I found this: that in the past, there have been some shallow wells used for stock purposes, and a lot of these have been abandoned, so it's very evident that the ranchers prefer to use this potash company water, either because it's too high in gyp content or other reasons, but the tendency is to abandon many of these shallow stock wells.

Q Now, is this situation substantially the same as you find in the area for which the Commission has granted an exemption?

A Yes, sir. We think that as far as the water conditions are concerned, we can't see any difference between that existing in our area and the conditions that exist within the exempt area.

Q Now, in your opinion, Mr. Gray, would the continued

use of surface disposal pits, unlined surface disposal pits in Section 18 of Township 19 South, Range 33 East cause any contamination to any fresh water supplies?

A No, sir. It is my opinion that there will be no contamination.

Q Would the drainage of any water disposed out on the surface be towards the presently existing salt lakes?

A Yes, sir.

Q And not towards any fresh water supplies?

A Yes, sir.

Q In the event this application is not granted, what alternative is left to the Applicant?

A I'd rather not go into the alternatives that we may have left at this hearing.

Q Do you have any alternatives?

A We haven't crossed that bridge. Yes, sir, we have several alternatives, but we haven't crossed that bridge yet and I'd rather not make any statement as to what our alternatives might be. We think we have a case that certainly justifies inclusion in this area or setting up separate exempt area and we're going on the basis that this will be granted.

Q Now, the application in this case is for, in the alternative, an exemption to the provisions of Order 3221, as amended, for Section 18 Lease, is that correct, and you're asking

for an exemption, or in the alternative, for an extension of the exempt area?

A Yes, sir.

Q Now, as an extension of the exempt area, what would you propose to the Commission?

A Well, let's say that if the Commission asked me for an opinion, I would give it them.

Q Well, I suspect the Commission will ask you for an opinion, Mr. Gray, but would you just briefly outline what you think would be justified on the basis of what you know about this area.

A Well, without actually making a study of the area, I would say, certainly, that the last row of sections on the east side of Township 19 South, Range 32 East, should be --

MR. PORTER: Would you indicate with your pointer, Mr. Gray, on this large map, roughly, what you might recommend?

THE WITNESS: Yes, sir. To go further, I might just draw some dashed red line in here. I'm in the wrong township.

I think that you would have to say that the Sections 1, 12, 13, 24, 25 and 36 in Township 19 South, Range 32 East should be included since Pan American has one well producing in Section 13.

You might draw the line across the north edge of Township 19 South, Range 33 East to the northeast corner of

Section 4.

MR. PORTER: In other words, about the West Half of the township?

THE WITNESS: Yes. You might take in the West Half of Township 19 South, Range 33 East, the West Half of Township 20 South, Range 33 East, and then tie this back into the nearest corner of our presently exempt area there. That would be one suggestion. I don't say that that's the final answer, and the Commission may see fit after they study this area a little more, to alter this a little bit in some way, but certainly, all of this area is under the same conditions, you might say, that we find in the area that's presently exempt.

Q Would it fall within the same drainage pattern?

A Yes, sir.

Q All of it.

MR. PORTER: What other productive area in this West Tonto would this include?

THE WITNESS: I can give you some of them. I can't definitely say all of them because I haven't made that thorough a study, but I'm aware of the salt lake pool which is a very old pool and it is in the last stages of depletion. This pool is located, I think generally, in parts of Section 7 and 18, Township 20 South, Range 33 East. And I think that maybe the

West T's Pool would come into this area. Other than that, I haven't really made a study.

Q Were Exhibits 1 through 9 prepared by you or under your supervision?

A Yes, sir.

Q And 9-A and 9-B are the U. S. Geological Survey quadrangle maps?

A Yes, sir, that's correct.

MR. KELLAHIN: At this time, I'd like to offer into evidence Exhibits 1 through 9 and 9-A and 9-B.

MR. PORTER: If there's no objection, the exhibits will be admitted.

(Whereupon, Applicant's Exhibits Numbered 1 through 9 and 9-A and 9-B were admitted in evidence.)

Q (By Mr. Kellahin) Have you contacted Pan American in connection with this application, Mr. Gray?

A Yes. Since Pan American operates one well in this pool, we made contact with them two or three months ago and, at that time, I asked someone in their local Hobbs office if they had any plans for the operation of their well, and at that time, they told me that they hadn't come to a final determination, but that it was very possible that they may have to abandon their one well. However, they stated that the well is making ten barrels

of oil a day and that they would hate very much to have to abandon it and, quite frankly, they were hoping that we would be granted an exception, I think, so that they could continue operating that well.

Q Do you know whether they have written to the Commission in support of the application?

A Yes, sir. We have a letter, a copy of a letter which Pan American directed to the Oil Commission.

Q Do you have anything further to add?

A No, sir.

MR. KELLAHIN: That's all I have on Direct Examination, Mr. Porter.

MR. PORTER: Does anyone have a question of Mr. Gray? Mr. Nutter.

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Gray, what was the original bottom hole pressure in this pool?

A I'm sorry. I don't have that information.

Q What's the present bottom hole pressure in the pool?

A I don't have that information. These wells have been pumping for years and there are not very many operators in the business that will go to the trouble and expense of getting

bottom hole pressure once their wells get on the pump.

Q Well, was a fluid analysis run on the oil in this pool when the well was new, when the pool was new?

A I'm not certain of that. You, I'm sure, can check that feature of it because early in the life of this pool, we did have a hearing on the pool and I'm sure that if we obtained a sample, a reservoir sample, that it was included within the evidence at that time.

Quite frankly, I've forgotten. I don't recall whether we got a sample, a bottom hole sample, or not. I don't think so.

Q So you wouldn't know what the bubble point on the oil was then?

A No.

Q I presume that your Exhibit Number 3, showing a gas-oil contact of approximately 395 feet, that you do have a secondary gas cap as formed here or else you had a primary gas cap to start with?

A Well, originally, we had a primary gas cap in this reservoir and, originally, our producing gas-oil ratios were fairly high and we were able to make a contract with Phillips Petroleum Company to gather the casing head gas; later on, this gas cap seemed to deplete. Apparently, it was not very large in volume and our gas-oil ratios decreased down to the range of

something like 200 to 500 cubic feet per barrel. Within the last year or two, our gas production became so small that Phillips Petroleum Company quit taking our gas and took up their casing head gasline to the field.

Q Well, now, do you have a gas cap there at the present time above this gas-oil --

A If we have one, it's very insignificant.

Q During your Direct testimony, you were relying on the expansion that this gas cap would drive the oil out of this upper sand down into the main portion of the pay to produce the oil.

A Yes.

Q So I wondered what the significance of the gas cap was at this time.

A Well, from the performance of the reservoir, I would say that the volume of the original gas cap evidently was very small. That would account for the rapid depletion.

Q Well, now, you mentioned that in order to attain the maximum effect of the expansion of the gas cap, you would have to withdraw from the reservoir at a rate that would permit the gas cap to expand to drive the oil out, and to do this, you would have to lower the pressure in the reservoir. For this reason, you did not want to reinject the fluid into this structure, is that correct?

A At a present stage of depletion, yes, sir.

Q Well, now, if the expansion of the gas cap has become negligible, what is going to be the detrimental effect of re-injecting the water into the reservoir?

A The detrimental effect is this: In order to get this reservoir pressure to decrease and thus allow gas to come out of solution from the oil in the reservoir, we have to withdraw these large quantities of fluid. Now, if we're going to go in this same vicinity and inject water into this same reservoir, we're defeating our purpose. We're building up pressure rather than --

Q Mr. Gray, sir, you would not be injecting water that came from anywhere else except the reservoir. You'd be producing a total amount of "X" barrels of oil and "Y" barrels of water and reinjecting "Y" barrels of water back into the reservoir. You're not going to build up pressure, are you?

A Yes, sir.

Q By injecting less fluid?

A Compared to not injecting, yes, sir.

Q Compared to not injecting?

A Yes, sir.

Q But actual effect on the reservoir, you're still going to be decreasing the pressure in the reservoir by the amount of

gas that you're withdrawing and the amount of oil that you're withdrawing.

A No, I'd say we're not going to be decreasing the pressure in the reservoir by injecting fluid, no, sir.

Q Are you going to inject more water than you withdrew?

A No.

Q You're not going to reinject the oil back in the reservoir, are you?

A No.

Q You will then, in that respect, be reducing the pressure, won't you, Mr. Gray?

A We're not going to decrease pressure in the reservoir by injecting fluid into the reservoir. It doesn't work that way.

Q I'm not saying you're going to reduce the pressure in the reservoir by injecting fluid, but the net overall effect on the reservoir will be a decrease in pressure, won't it?

A I don't follow your reasoning.

Q By removing oil, gas and water from the reservoir and reinjecting water, only, the same amount of water that was taken out, isn't the net effect on the reservoir going to be a reduction in the pressure?

A I can't follow your reasoning.

Q Mr. Gray, I don't mean that it's going to be a reduction of the pressure to a lower point than it would have been, had you

not injected the water; but after you have removed "X" barrels of oil, "Y" barrels of water and some number of cubic feet of gas, you have reduced the reservoir pressure by the amount that the voidage occurred, right?

A That's correct.

Q Now, if you place back into the reservoir, just the water, and you keep the oil out and sell it and I'd guess you'd keep the gas out and probably have to flare it or picked up at the lines, and you reinject the water, now, isn't the reservoir pressure going to be lower than it was before you removed that oil and gas and water?

A Mr. Nutter, you're disregarding the influx of water from this water drive into this reservoir. When you produce water, there's water coming back in to take that place in the reservoir.

Q It's coming back in, but is it coming back in as rapidly as you're withdrawing it?

A I don't know of any way we can determine that, really.

Q Well, you've had an overall reduction in the reservoir pressure in this reservoir over the life of it, have you not?

A I can't state that. We don't have a record of the bottom hole pressures.

Q Natural water drives very frequently do not keep up

with the amount of withdrawal from the reservoir, and the natural water drive frequently is augmented by the reinjection of water into the reservoir, is that correct?

A That happens sometimes, yes, sir.

Q It hasn't been tried here, however, and you can't categorically state that it would not increase the production from this reservoir to reinject that water, can you?

A I can make this statement to you: that we have pretty definite proof, I think, by performance that in order to get the oil from the reservoir, we have to withdraw as large -- these large volumes of fluid out of there and thereby reduce the pressure and that by injecting fluid into this proximity, we're defeating the purpose of this and that we would tend to bring these pressures up in relation to not injecting fluid.

Q Well, I agree with you, the pressure would be higher if you didn't inject.

A Yes, sir.

Q The pressure would still be lower than it was, if you didn't.

A No, I can't say that because we may be replacing every barrel of water we're producing by influx into the reservoir from the natural water drive.

Q You may or may not.

A Yes, sir.

Q You do have two wells on the structure that were dry: the Number 5 on the south side and the Number 6 on the south side. What is the condition of those two wells at the present time?

A They're plugged and abandoned. The casing has been pulled.

Q Casing has been pulled.

A Yes, sir.

Q How about the Number 7 Well? That's over in the southwest side of the flank of the pool.

A Rods and tubing have been pulled. We haven't pulled the casing yet, and we haven't plugged the well, yet.

Q What is the status of Number 8 on the northeast flank of the pool?

A It's been plugged and abandoned and the casing has been pulled. It's possible that we've had such good luck with the larger equipment on this Number 1 and 2 Well, it's possible that we may go back into this Number 7 Well and put some large equipment on that well and see if we can get enough oil production to justify operating the well again.

Q You say that the Pan American Well is making about ten barrels a day. How much water is it making?

A The reports for the month of July, 1968, show that this

well produced 10,364 barrels of water.

Q Now, that was for what period?

A For the month of July.

Q So they already have a high volume pump, I presume, on their well.

A They have a large pump, yes, sir.

MR. PORTER: I believe you testified that they installed a larger pump and got an increase, and the increase now has leveled off. They actually have a decline at the present time.

THE WITNESS: Oh, yes. It declined very shortly after the larger equipment had been put on there. We hope our decline won't be quite as quick. Pan American, of course, is out on the very edge of the pool and maybe we'll have a little bit longer period of flush production than they had.

Q (By Mr. Nutter) Well, your Number 7 Well is structurally identical to the Pan American Well, isn't it?

A Approximately, yes.

Q Is there any standard water-oil contact in here?

A No, sir.

Q What direction is the influx of water, do you know?

A I can't say.

Q Well, now, in mentioning your operating costs versus

your working interest income for the first eight months of 1968, Mr. Gray, you had a total operating cost less administration and overhead of $20,208.00 and a total working interest income of $17,930.00, thereby resulting in a loss there of a couple thousand dollars for the eight-month period.

I added up the production on Exhibit 5 for those first eight months and found that only 7,205 barrels of oil were produced. Evidently, the wells had some very drastic curtailments in production during the latter half of the eight-month period, but once you went into that program and re-worked the wells, you established production in the month of September of a total of 4,133. Now, the overall picture for 1968 will be much improved over what it appeared to be in the first eight months.

A Yes, sir.

Q And when you stated that this was a very critical period in the time of lease operation here, you meant the first eight-month period when you were losing money, I presume.

A No, I mean from now on. It's going to be very critical from now on. We're going to have to be very careful about what expense we incur. Now, just as an example, when we put the big unit on Number 2 Well, before we put the unit on there, we had a 25-Horsepower Motor on there. Now, we have a 60-Horsepower Electric Motor. And if you know anything at all about the cost

of power for oilfield pumping, you know that the cost for operating a 60-Horsepower Motor is very substantial and these are costs that aren't even shown in our table here. Our power costs will be much greater from now on than they were for the period that we show in Exhibit 8, and we don't know how successful we're going to be with our chemical program now, how successful that will be in controlling corrosion, but I think it's perfectly evident from all of these facts that we've presented that anyone that might own this property would certainly be very careful about any future expenditures.

Q The financial outlook is better than it was prior to the work-over program.

A Yes, sir.

MR. HAYS: Approximately, what is the cost of operating that 60-Horsepower Motor?

THE WITNESS: I would say that it would probably be close to two hundred, $250.00 a month, somewhere in that vicinity.

MR. HAYS: Thank you.

THE WITNESS: That's a guess.

MR. HAYS: Fine.

THE WITNESS: Just an offhand guess.

Q (By Mr. Nutter) Well, now, Mr. Gray, did you give us

an estimate of your future operating plans, I mean, your operating costs, a total estimate of the future operating costs?

A No, sir. We haven't made any estimate of the future operating costs. I don't think any one can reliably make any.

Q You haven't also determined what your chemical cost will be?

A Well, we know what we can guess pretty close what our chemical cost will be, but beyond certain things and pulling jobs and the material that will have to be replaced and such as that, those items are very difficult or they're impossible to predict, really.

Q Well, if the chemical treatment program is successful, you should experience less pulling costs and rod replacements than you have in the past?

A Yes.

Q And so far, the indications are that the chemical program is a success on at least one well?

A The first examination shows that we're protecting one well. The other well is not being protected.

Q Are they producing approximately the same amount of water or is there a difference in the water volume?

A Well, no. Let's see. There's a difference in the amount of fluid that they're producing.

Q Is the corrosion coupon test that's indicating -- I believe it's the Number 3 Well which is in need of more corrosion inhibitor -- is that the well that makes the most water?

A No, the Number 2 Well is the one that makes the most water.

Q So the well with the most water is the one that's --

A That we're getting the most success with at this time.

Q The most success with. Are you using more chemical in that well?

A Yes.

Q So you'll have to increase the chemical then in the other well?

A Yes, sir.

Q Now, Mr. Gray, you referred to the Lea County Ground Water Report, are you acquainted with Exhibit Number 2 or Plate Number 2 from that report?

A Yes, sir.

Q Now, if you will examine Plate Number 2 from that report, there's an indication there that the water table in this area apparently has a high of 3200 feet.

A Would you restate that?

Q The water table contours there in the area of Township 19 South, 32 and 33 East and 20 South and 32 and 33 East, there

appears to be a high in the water table there, is that not correct? It swings in from the southwest.

A You said water table. These contours are Red Bed structural contours.

Q No. On page two, Mr. Gray.

A I'm sorry. I had Plate 1. Now, what's your question?

Q You see that 3200 foot contour that swings in from the southwest to this general area?

A Yes, sir.

Q That is the high, as far as the water table is concerned in the area, is it not?

A That's the low, isn't it?

Q Well, it's 3200 feet.

A Plus 3200. That's the low.

Q Well, all right. If it's the low then, the drainage would be from the southwest through this area, would it not?

A Yes, sir.

Q And then if you'll refer to Plate Number -- Well, it doesn't have a number -- Plate 1 of the Eddy County Report.

A I don't have the Eddy County Report.

Q If you have the low swinging in through this little corner of Eddy County, which it apparently does from the Lea County Report, wouldn't that low be swinging into Eddy County

in this area of Eddy County?

A Yes.

Q And before that low could reach Nash Draw, which is indicated by the hatchering marks on the Eddy County map, would not that low encounter Livingston Ridge prior to the time it would reach Nash Draw?

A Well, now, you're talking about top of water table. You're not stating anything that relates to drainage direction.

Q The water table indicates the level of the water underground, is this correct?

A To the top of the water.

Q And this is the low spot in the water table?

A Yes, sir.

Q And the low spot in the water would have to reflect the ground water movements, would it not?

A Your drainage will be controlled by the -- rather than the top of the water, it's going to be controlled by the bottom of the water.

Q But wouldn't the level of the water reflect the underground movements of the water?

A No, sir.

Q How can we have a low in the water that isn't the reflection of underground movements?

A The movement of surface waters will be controlled, so state the author in Ground Water Report Number 6, by the structural conditions in the Red Bed.

Q How do you reconcile the fact that the water table contours don't coincide with the Red Bed contours here?

A Because the top of the water table has no relationship to the bottom of the water or the structural conditions.

Q What is it a relationship to then?

A The top of the water is controlled to some extent by the hydraulics of the water system, how much head the watersand has back to the source, or the bed that's exposed on the surface, and in which the aquifer is being replenished.

Q This is what I thought, Mr. Gray. The top of the water is a reflection of the ground water movements. It's the hydrology of the thing. It's the hydraulics. The movement of it, the water from the source.

A Not the direction.

Q It would have to be moving towards the low. You said, yourself, during your Direct testimony, we have to assume that water goes downhill.

A Structurally low, yes.

Q It is a low facet in there. There's a low facet in there that's reflected by the low in the ground water levels,

is that correct? It's shown on Plate Number 2 there.

A You're trying to relate top of water table with direction of drainage and the two don't relate.

Q If you didn't have the movement of the water, the water table would establish itself as a flat plain, wouldn't it, Mr. Gray?

A I don't know.

Q Doesn't water ~~seep at~~ creek a flat plained surface?

A Not always. Sometimes it does. It depends on the permeability.

Q The only time that water is not on a perfectly flat plain is when the water is moving, is that not correct?

A I don't know that that's necessarily true, no, sir.

Q Have you ever seen a bowl of water sitting still with a hollow in the bottom of it, Mr. Gray?

A Well, I've seen tilted water tables in oil reservoirs and my experience in water tables is that I very seldom see any that are perfectly still.

Q Those are moving waters, though, aren't they, Mr. Gray?

A Sometimes they are. Sometimes they're not.

Q But at any rate, the depression in the water table shown in the area immediately south and southwest of your subject area, the depression in this water table is to the southwest and

would be intersected by Livingston Draw as shown on the Eddy County map prior to the time it reached Nash Draw, is that not correct? You don't have the Eddy County map there?

A You're correct in that Plate 1 shows there's a depression in the water level.

Q Plate Number 2 of the Lea County Report.

A Yes.

Q And Plate Number 1 of the Eddy County Report, in this area, the jog in the county line, shows that that depression which is shown on Plate 2 of the Lea County Report and comes down through the area that I'm indicating would be intersected by Maroon Cliffs and Livingston Ridge prior to reaching Nash Draw.

A Now, this Maroon Cliffs and Livingston Ridge, are those surface features?

A Yes, they are, and they're also a reflection of the -- As we heard in the testimony of the case that resulted in the exemption for the entire area up here, those surface features are a reflection of the underground features as a result of leaching and sloughing of the salt.

A Generally speaking, but these particular surface features that you referred to here have no relationship at all to the top of the water levels or the drainage because your drainage,

as the authors of Ground Water Report Number 6, point out the drainage of surface waters is controlled by this impervious Red Bed structure. Now, any surface feature, you may have a lot of little local surface features that have no relationship whatever to the movement of ground waters.

Q Well, didn't the Commission rely on the surface features known as Clayton Basin and Nash Draw, being a reflection of underground conditions in entering the Orders that created the exempted area?

A You're asking me what the Commission did.

Q Did you hear the case that Mr. Stamets put on?

A Yes, sir.

Q Wasn't the testimony that the surface conditions reflected the underground conditions?

A I don't recall. He may have said that. If he did, he's not absolutely correct, I don't think.

Q You think he was incorrect enough that the Commission should rescind its Order?

A Oh, I wouldn't go so far as to say that.

Q You think the Commission was incorrect, though, in not making the area big enough?

A Yes, sir.

MR. NUTTER: That's all I have. Thank you.

MR. PORTER: Anyone else have a question of Mr. Gray?

Mr. Kellahin, do you have anymore questions?

MR. KELLAHIN: Nothing.

MR. HATCH: The Commission did receive a letter from Pan American Petroleum Corporation.

MR. PORTER: It's the letter to which Mr. Gray referred.

MR. HATCH: Yes, and in that letter, they state that Pan American hereby supports Hudson in their request for an exception for all wells in the field and also will support their alternative proposal that the area excepted from the provisions or Order 3 or Order R-3221 by Order Number R-3221-B be extended to include the lands comprising the Tonto-Yates and Seven Rivers Western Pool.

Signed D. L. Ray.

MR. PORTER: All right.

CROSS EXAMINATION

BY MR. PORTER:

Q Mr. Gray, I believe you testified as to how long the Pan American well held up after that large pumping installation, and I don't recall what it was. It is down to ten barrels a day at the present time.

A Mr. Porter, I'll just go back and read some monthly figures here, which we have taken from the published reports. We haven't gotten these directly from Pan American, but in 1967,

in May, they report a production of 198 barrels of oil.

In June, 367.

In July, 823.

In August, 1449.

September, 963.

October, 907.

November, 537.

December, 907, and then in 1968, in January, 324.

February, 328.

March, 279.

April, 212.

May, 261.

June, 372.

July, 306.

Q Is it possible this could be caused by corrosion, the decrease?

A Well, of course, I don't have any knowledge of the number of pulling jobs they have had. I don't know how severe their corrosion problem is.

Q You would expect it to be pretty similar to yours?

A Well, the thing of it is, when corrosion hits you, you're shut down, and if they're still producing, it means that their rod swings all together, they'll have a leak in the

tubing. These mechanical things happen and they shut you down. You have to make the repairs or replacement in order to continue operating.

MR. PORTER: Anyone else have a question? The witness may be excused. I believe we've already entered the exhibits. Is there anything further to be offered in the case? Mr. Kellahin?

MR. KELLAHIN: I'd like to make a very few statements, if I may.

If the Commission please, I believe we have shown that the surface water in the area involved in this application is quite spotty and none of it is suitable for domestic purposes, just a limited use for stock purposes at a substantial distance from the location of the Hudson lease.

As to the deep water, there, again, it is not widely used in the area. It's below the Red Beds which the report and the geology of the ground water conditions in southern Lea County, the Ground Water Report Number 6, to which reference has been made shows that this is an impervious layer which does control the flow of the surface waters and while there may be some surface features, as was brought out by Mr. Nutter's Cross Examination of the witness, I think that the evidence that has been presented to the Commission which shows the contours on

top of the Red Beds, as taken from the report to which Mr. Nutter has made reference, coupled with the statement of the author that this is the feature that controls the movement of the surface waters, this leads us to the inescapable position that the flow of the waters is towards the salt lakes which exist there. And, certainly, as a matter of logic, I think you would have to say that waters flowing in there is certainly the thing that created the salt lakes, so there is a movement of water in that direction.

The Applicant has shown that the surface water conditions in the area involved here are practically identical to the conditions which exist in the area for which the Commission granted an exception to Order R-3221-B. We're also under similar conditions here in that a salt lake located outside the exempt area is being used by the potash companies for the disposal of waters with a very high concentration of salt, and that was one of the reasons for granting the exemption in the other area. This calls for an extension to improve in the area that is affected by this little water disposition.

Now, as far as the economics are concerned, certainly, we have presented the economics on these wells for the first eight months and there was some questioning as to the effect of the installation of the additional pumping equipment or new

pumping equipment on the two wells as improving the economics. Well, certainly, I'm sure that William A. and Edward R. Hudson were hopeful that their economics situation would be improved by the installation of these pumps or they wouldn't have installed them. For the first eight months, they were showing a loss of between two and $3,000.00 and they wouldn't have attempted to improve the situation by spending more money unless they were hopeful that the situation would improve.

On the other hand, I think the Commission should bear in mind that the production figures which have been presented to the Commission do not reflect the cost of these pumps, do not reflect the increase in cost of operating this type of equipment and they do not reflect the chemical cost that has been attempted to reduce the number of pulling jobs and the replacement of rods which has been experienced in these wells from corrosion.

So from the economic point of view, I think the only conclusion we can reach is that the future of this area is, at best, speculative as has been shown by the production history on the Pan American Well. They put on increased pumping equipment, achieved a greater production for a period of time, and then the production declined and it is certainly possible that the Hudsons may have the same experience. At best, we're

speculating on what the future may be and, under those circumstances, and with the economic situation we have here, an expensive salt water disposal system is just not indicated, particularly where we feel we have shown no adverse effect can be had on any fresh water supplies by the continued use of these surface pits.

So we submit that the Commission should grant Hudson an exception to the provisions of the rules of Order R-3221, as amended, or in the alternative, that the exempt area covered by R-3221-B be extended to include the Hudson Lease and such other areas as the Commission may see fit based on the testimony we have offered.

MR. PORTER: Anyone else have anything further? The Commission will take the case under advisement. The hearing is adjourned.

I N D E X

E X H I B I T S

Number	Marked for Identification	Received in Evidence
Applicant's Exhibits Numbers 1 through 9, 9-A and 9-B.	2	38

STATE OF NEW MEXICO)
) ss.
COUNTY OF BERNALILLO)

I, CHARLOTTE MACIAS, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Hearing before the New Mexico Oil Conservation Commission was reported by me; and that the same is a true and correct record of the said proceedings, to the best of my knowledge, skill and ability.

Witness my Hand and Seal this 22nd say of October, 1968.

Charlotte Macias
Notary Public

My Commission Expires:

February 10, 1971.

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE No. 3892
Order No. R-3554

APPLICATION OF WILLIAM A. AND
EDWARD R. HUDSON FOR AN EXCEPTION
TO ORDER NO. R-3221, AS AMENDED,
LEA COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 a.m. on October 16, 1968, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 18th day of November, 1968, the Commission, a quorum being present, having considered the testimony presented and the exhibits received at said hearing, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That the applicants, William A. and Edward R. Hudson, are the operators of certain oil wells producing from the West Tonto Yates-Seven Rivers Pool, Lea County, New Mexico.

(3) That the West Tonto Yates-Seven Rivers Pool as presently designated comprises the following-described acreage:

TOWNSHIP 19 SOUTH, RANGE 32 EAST, NMPM
Section 13: E/2

TOWNSHIP 19 SOUTH, RANGE 33 EAST, NMPM
Section 18: N/2 and SW/4

(4) That effective January 1, 1969, Order (3) of Commission Order No. R-3221, as amended, prohibits in that area encompassed by Lea, Eddy, Chaves, and Roosevelt Counties, New Mexico, the disposal, subject to minor exceptions, of water produced in conjunction with the production of oil or gas, or both, on the surface of the ground, or in any pit, pond, lake, depression, draw, streambed, or arroyo, or in any watercourse, or in any other place or in any manner which will constitute a hazard to any fresh water supplies and said disposal has not previously been prohibited.

(5) That the aforesaid Order No. R-3221 was issued in order to afford reasonable protection against contamination of fresh water supplies designated by the State Engineer through disposal of water produced in conjunction with the production of oil or gas, or both, in unlined surface pits.

(6) That the State Engineer has designated, pursuant to Section 65-3-11 (15), N.M.S.A., 1953 Compilation, all underground water in the State of New Mexico containing 10,000 parts per million or less of dissolved solids as fresh water supplies to be afforded reasonable protection against contamination; except that said designation does not include any water for which there is no present or reasonably foreseeable beneficial use that would be impaired by contamination.

(7) That the applicants seek an exception to the provisions of the aforesaid Order (3) to permit the continued disposal of salt water, produced by all of the wells in the West Tonto Yates-Seven Rivers Pool in unlined surface pits located within the horizontal limits of said pool.

(8) That there is an abandoned shallow water well, the water from which has been reported as impotable, approximately 4 1/2 miles from the subject pits.

(9) That the evidence presented indicates that the nearest existing shallow water well is more than five miles from the subject pits.

(10) That there appears to be no water in the vicinity of the subject unlined surface pits for which a present or reasonably foreseeable beneficial use is or will be made that would be impaired by contamination.

(11) That approval of the subject application will not cause waste nor violate correlative rights.

IT IS THEREFORE ORDERED:

(1) That the operators of oil and/or gas wells, both existing and prospective, producing from the West Tonto Yates-Seven Rivers Pool and located in the E/2 of Section 13, Township 19 South, Range 32 East, and the N/2 and SW/4 of Section 18, Township 19 South, Range 33 East, NMPM, Lea County, New Mexico, are hereby granted an exception to Order (3) of Commission Order No. R-3221, as amended, to continue to dispose of water produced in conjunction with the production of oil or gas, or both, by said wells in unlined surface pits located within the boundaries of the West Tonto Yates-Seven Rivers Pool as presently designated.

(2) That the Commission may by administrative order rescind such authority whenever it reasonably appears to the Commission that such rescission would serve to protect fresh water supplies from contamination.

(3) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

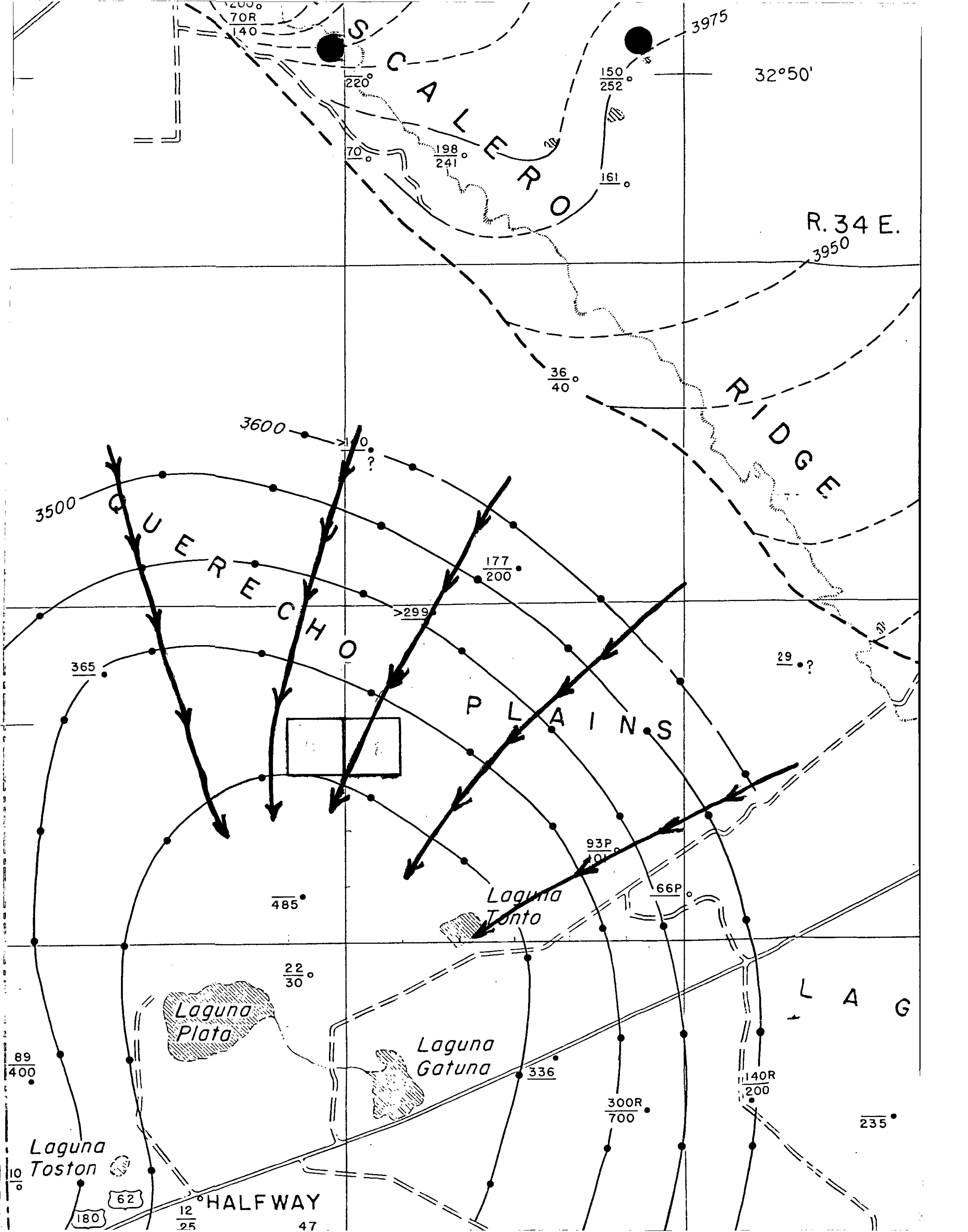
DAVID F. CARGO, Chairman

GUYTON B. HAYS, Member

A. L. PORTER, Jr., Member & Secretary

S E A L

esr/



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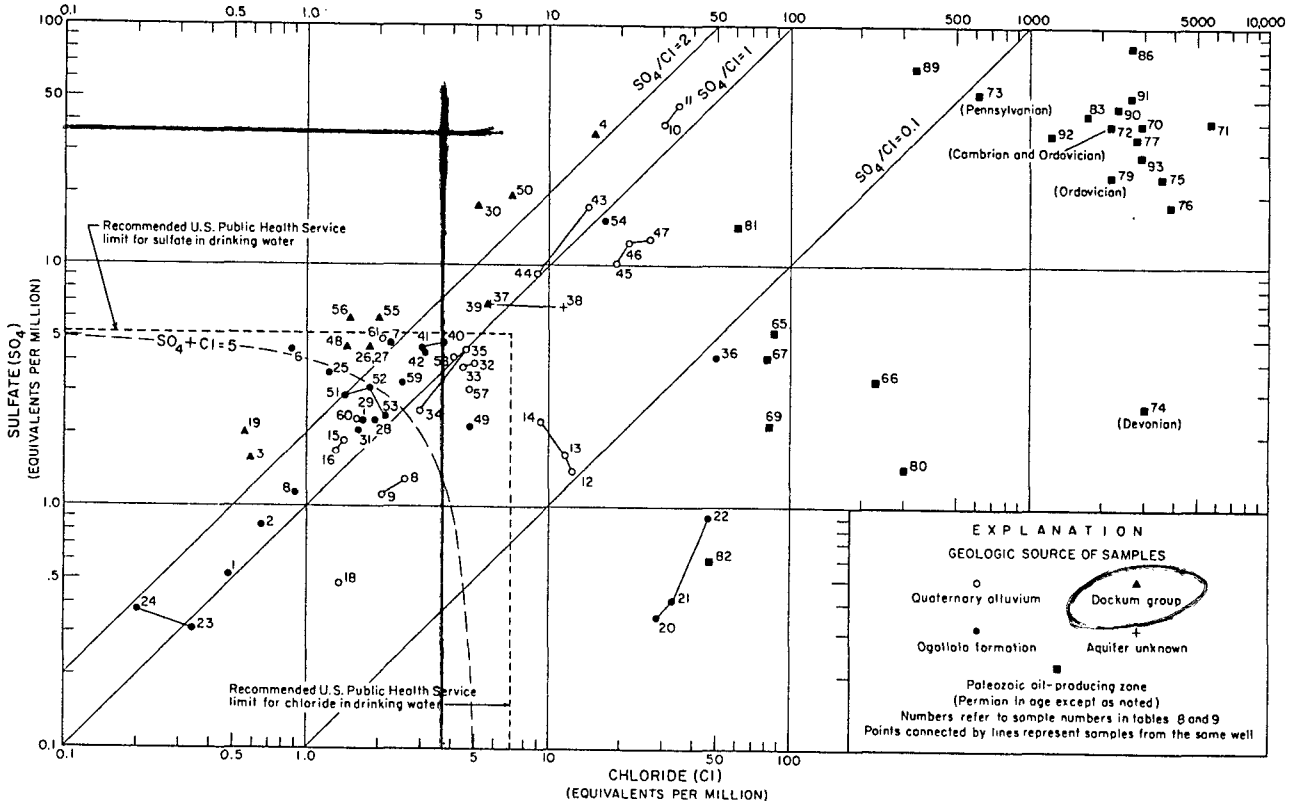
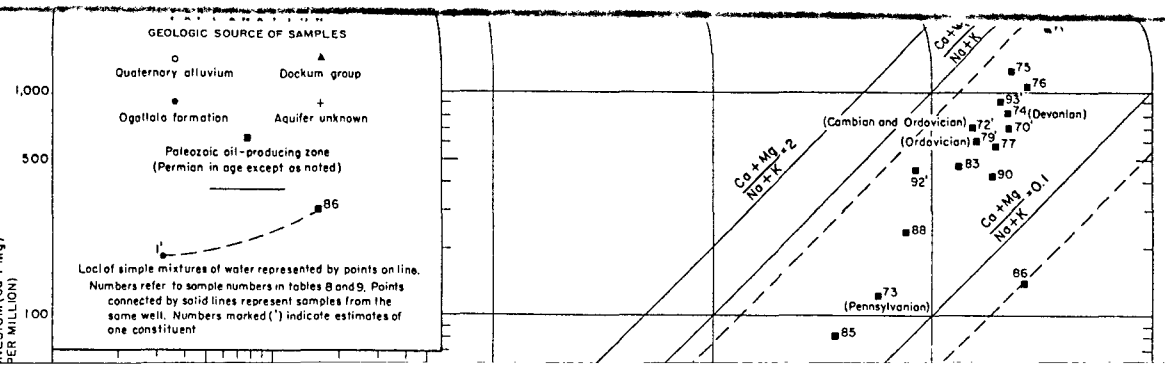


Figure 29.

RELATION OF SULFATE TO CHLORIDE IN SAMPLES OF GROUND WATER FROM SOUTHERN LEA COUNTY, N. MEX.



WILLIAM A. & EDWARD R. HUDSON - WEST TONTO (Y-SR) POOL

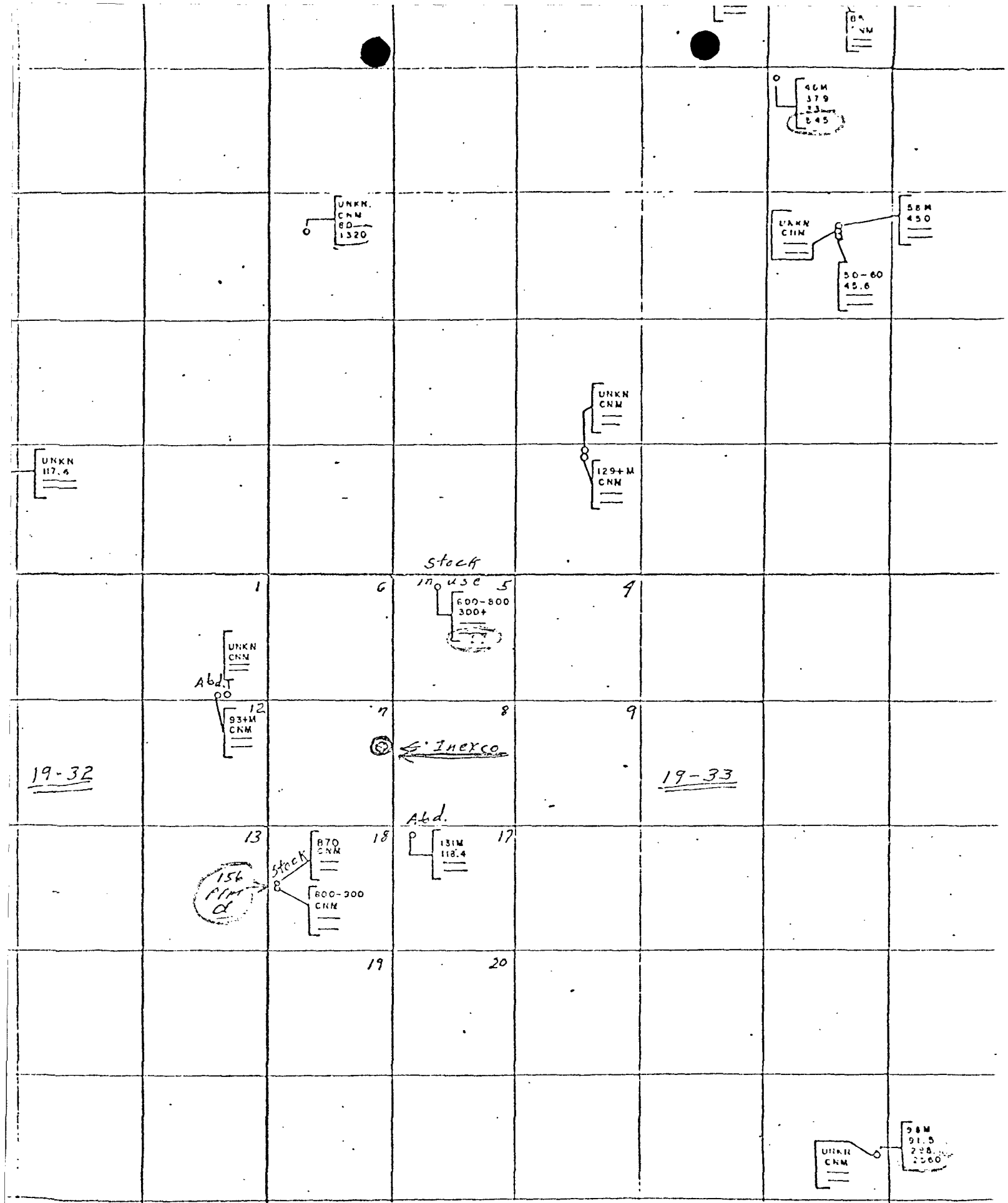
WELL DATA

WELL	COMPLETION DATE	TOTAL DEPTH	INITIAL POTENTIAL	5½" CASING	PERFORATED INTERVALS	TREATMENT
Federal 18 #1	5/23/60	3280	F 40 BO/1½ hrs. 20/64" ch.	3280	3259-63	300 gals. acid.
Federal 18 #2	6/13/60	3280	F 153 BO/16 hrs. 22/64" ch.	3280	3247-49 3252-56	None.
Federal 18 #3	6/20/60	3283	F 40 BO/5 hrs. 23/64" ch.	3283	3250-54 3266-70	500 gals. acid.
Federal 18 #4	8/20/60	3349	27 BO + 14 BW/24 hrs. on pump.	3349	3282-85 3287-90 3293-3300 3305-10	500 gals. acid, then 2,000 gals. in Aug. 1960. 6,000 gals. acid in Dec. 1960
Federal 18 #7	10/17/60 Temporarily Abandoned March 23, 1967.	3290	F 203 BO/24 hrs. 10/16" ch.	3290	3268-80	300 gals. acid.

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Applt. Exhibit No. 2
Case No. 3892

EXHIBIT #2.

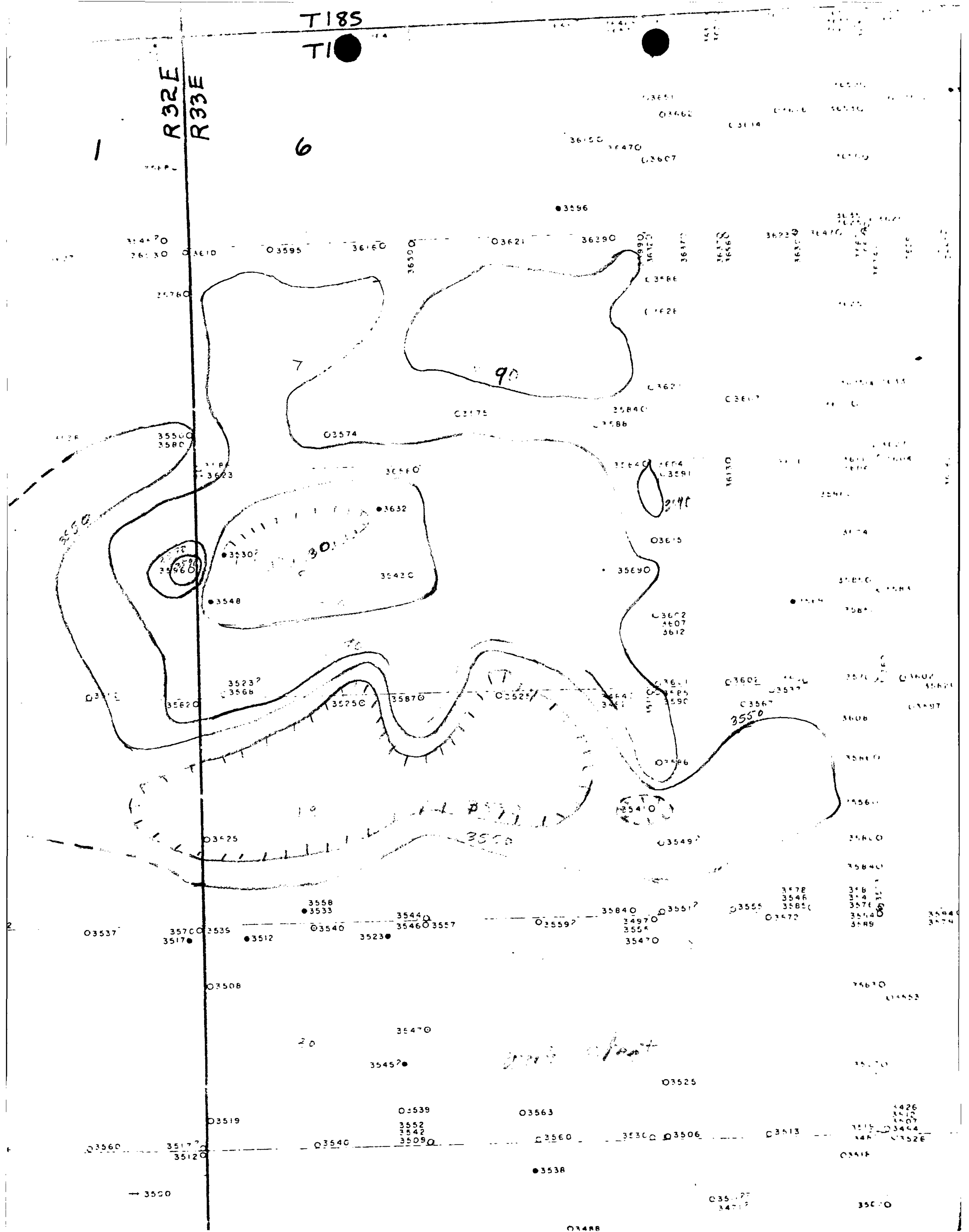
RALPH L. GRAY
PETROLEUM ENGINEERING



WATER WELLS

WATER RESOURCE DIVISION
CAPITAN UNDERGROUND WATER BASIN" MAP

OCD-JKR
1-10-80



T18S
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3488

ROOSEVELT COUNTY

LEA COUNTY

This map approved by U.S. Internal Revenue Service for tax purposes.

R. 30E. R. 31E. R. 32E. R. 33E. R. 34E. R. 35E. R. 36E. R. 37E. R. 38E.

T. 9S. T. 10S. T. 11S. T. 12S. T. 13S. T. 14S.

Caprock Four Lakes Crossroads Tatum McDonald Hillburn City Williams

CHAVES COUNTY

EDDY COUNTY

NEW MEXICO

TEXAS

R. 31 E. R. 32 E. R. 33 E. R. 34 E. R. 35 E. R. 36 E. R. 37 E. R. 38 E.

Base from New Mexico State Highway Department planning maps, 1951.
Roads revised 1956.

Prepared by the U.S. Geological Survey, W.A. Mourant, Project Chief, in cooperation with the New Mexico State Engineer, 1971

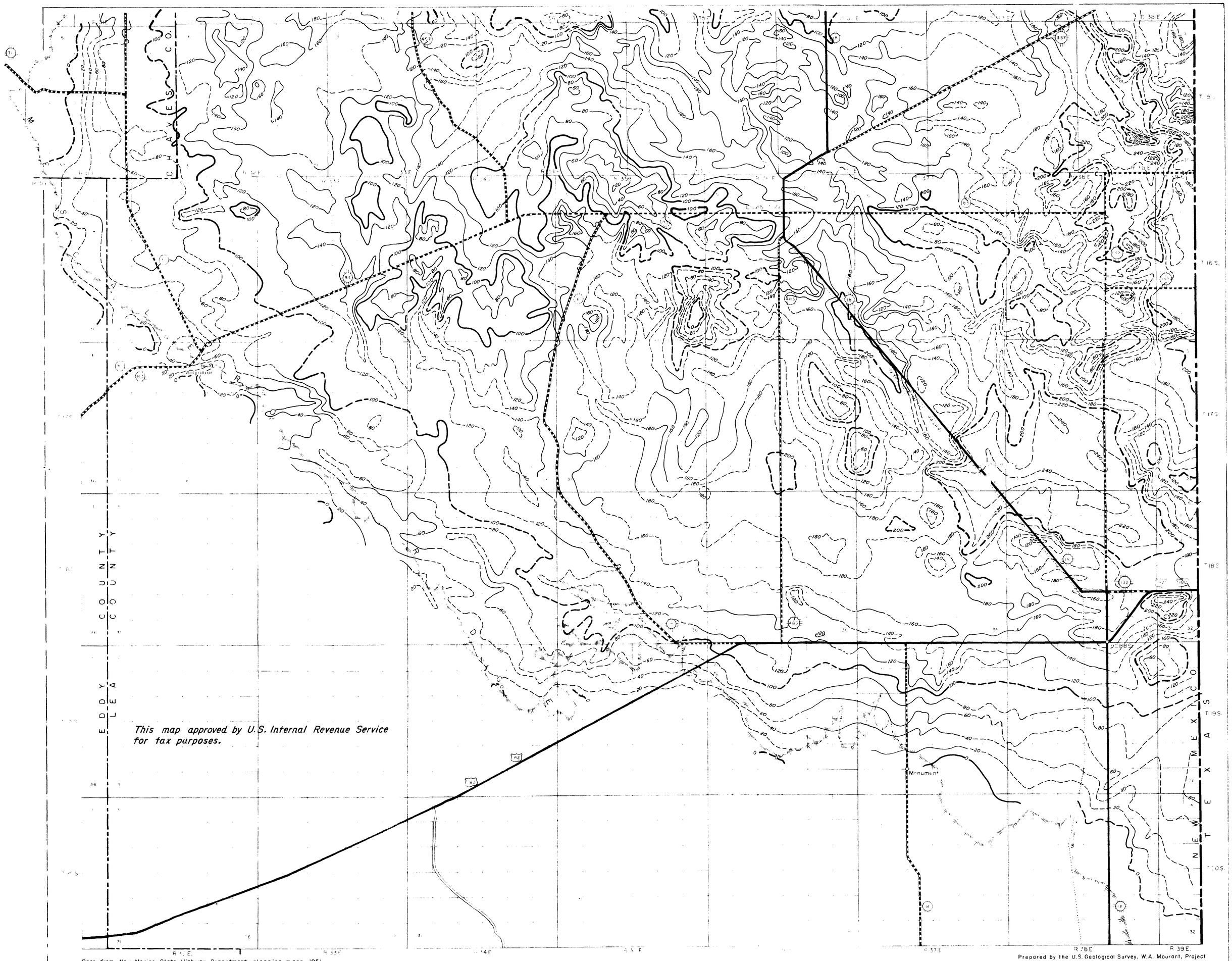
SATURATED THICKNESS OF POST-MESOZOIC DEPOSITS IN THE NORTHERN PART OF LEA COUNTY, NEW MEXICO, JANUARY 1962

LINES CONNECT POINTS OF APPROXIMATE EQUAL SATURATED THICKNESS, IN FEET; DASHED WHERE INFERRED; INTERVAL 20 FEET.

0 1 2 4 6
SCALE IN MILES

N. MEX. STATE ENGINEER
MAP LN - 4

ST-6-D



Base from New Mexico State Highway Department planning maps, 1951.
Roads revised 1956.

Prepared by the U.S. Geological Survey, W.A. Mourant, Project Chief, in cooperation with the New Mexico State Engineer, 1961.

SATURATED THICKNESS OF POST-MESOZOIC DEPOSITS IN THE CENTRAL PART OF LEA COUNTY, NEW MEXICO, JANUARY 1962

LINES CONNECT POINTS OF APPROXIMATE EQUAL SATURATED THICKNESS, IN FEET; DASHED WHERE INFERRED, INTERVAL 20 FEET.

0 1 2 4 6
SCALE IN MILES

N. MEX. STATE ENGINEER
MAP LC-4

ST-7-D