

Case No.

274

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Application, Transcript,  
Small Exhibits, Etc.

BEFORE THE OIL CONSERVATION COMMISSION  
STATE OF NEW MEXICO  
SANTA FE, NEW MEXICO

IN THE MATTER OF THE AMENDED  
APPLICATION OF THE CITIES SERVICE  
OIL COMPANY FOR AN ORDER AUTHOR-  
IZING OIL-OIL DUAL COMPLETION AND  
PRODUCTION OF ITS STATE "S" NO. 3  
AND STATE "S" NO. 4 WELLS LOCATED  
REGULARLY ON THE S/2 NW/4 SEC. 15,  
TWP. 21 S, R. 37 E, NMPM, IN THE  
BRUNSON-HARE POOL, LEA COUNTY,  
FROM THE MCKEE SAND AND ELLENBURGER  
LIME COMMON SOURCES OF SUPPLY.

CASE NO. 274  
ORDER NO. R-78

ORDER OF THE COMMISSION

BY THE COMMISSION:

This matter came on for hearing at 10 o'clock A. M. on May 22, 1951, pursuant to legal notice, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

The Commission having heard the evidence 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 the subject matter and of the interested parties.
2. That continued experimentation tends to show that mechanical packers and other devices are now available for engineeringly successful dual completions. However, the Commission is yet to be convinced of the soundness of oil-oil dual or multiple completions as a general practice in New Mexico.

IT IS THEREFORE ORDERED, that the application of Cities Service Oil Company for dual completion of its State "S" No. 3 and No. 4 wells, located in Section 15, township 21 S, R. 37 E, NMPM, Lea County, New Mexico be and the same is hereby denied.

DONE at Santa Fe, New Mexico, this 5th. day of June, 1951.

STATE OF NEW MEXICO  
OIL CONSERVATION COMMISSION  
*Edwin L. Mechem*  
EDWIN L. MECHEM, Chairman

GUY SHERARD, Member

*R. R. Spurrer*  
R. R. SPURRIER, Secretary

SEAL

CITIES SERVICE OIL COMPANY  
Producers-Refiners-Marketers Of Petroleum Products

D. D. BODIE, Superintendent  
Oil Production Division  
West Texas & New Mexico

Drawer G  
Hobbs, New Mexico

August 9, 1951



Case 274  
Mr. R. R. Spurrier  
New Mexico Oil Conservation Commission  
Santa Fe, New Mexico

Dear Dick:

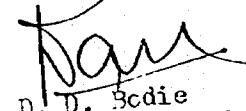
Re: Cities Service Oil Company's State "S" No. 4

You will recall at the hearing on Case 274, Cities Service's application to dually complete it's State "S" No. 4 and State "S" No. 3, evidence was introduced by opponent's witnesses to show that the Connell sand was below the casing point in our well No. 4 and that we therefore were producing the Connell sand along with the Ellenburger. Cities Service witnesses could not identify any part of the formation below the casing seat as Connell sand but did express our willingness to correct the situation if convinced we were mistaken or were so ordered by the Commission. You have since been requested by one operator in the field to issue an order for the wells repair. Our Geologists are still of the opinion that the controversial formation is Pre-Simpson in age as attested to by the attached copy of our Mr. Patterson's memorandum of July 26.

However, since our application for multiple completion was denied, it will be necessary for us to drill another well in the SW NW of Section 6, and in order that there will be no question as to the proper completion of well No. 4, we are herewith submitting Forms C101-Application to drill State "S" No. 6 to the Ellenburger, and Forms C102-Repair well No. 4 by plugging off the Ellenburger to 8070' and converting it into a McKee well.

Inasmuch as both of these applications cover routine operations, I do not suppose it will be necessary to hold a hearing. I will appreciate having your approval to our proposal at your earliest convenience as we wish to move the rig now drilling well No. 5 direct to the No. 6 location as soon as No. 5 is finished.

Yours very truly,

  
D. D. Bodie  
Supt. of Oil Production

DDB:nms

Attachments

COPY

## Notegram

For Mr. Frank T. Clark

From L. E. Patterson

Date July 26, 1951

Room Bartlesville, Oklahoma

Room Midland, Texas

Re: Controversy as to age of the sandy zone below casing point our State #4-S, Lea County, New Mexico.

The attached cross-sections have been prepared to establish on a regional basis our opinion that the sandy zone on top of which casing was set in our State #4-S is of Pre-Simpson age. As you know, this sandy zone was referred to at the New Mexico Commission hearing as "Connell" sand of Simpson age.

The route of these cross-sections is shown on the right margin in each case. Section 1 commences with Texas #33 Connell in the Jordan Pool, Ector County, which is the type section for the Connell Sand. This section was routed through the Phillips #1-J TXL and Phillips #2 Balish in order to show complete Ellenburger sections on which we have insoluble residue data to sub-divide the Ellenburger into what is generally considered to be the Cambrian age material in the Lower Ellenburger, and the Ordovician age material above that point. The logs on Section 1 are lined up with the top of the Simpson formation as the datum point. In addition to the electric logs we have plotted in color scheme indicated on the Section, the material logged in our sample logs for the portion of the hole critical to this study.

It seems to be very obvious that the Simpson is an over-lapping formation as it approaches the Eunice high, and that the decrease in thickness is without any doubt due to pinch-out of older members and not to thinning of individual members of the formation. This is obvious in following the well developed McKee and Waddell sand zones as well as the upper most limestone section and the underlying shale section above the McKee Sand in the Simpson section. On Cross-section 1 I have indicated this over-lap by tracing the course of the principal sand body in the McKee zone and the Waddell sand to its pinch-out somewhere south of the Stanolind test in Section 15-248-37E. The Connell sand probably pinches out south and east of the Richard-son and Bass #1 Wallace in Winkler County. I believe this Section demonstrates beyond any reasonable doubt that the Connell sand is not present within many miles of the Eunice up-lift and that to that extent the New Mexico hearing was erroneous. As I mentioned to you on the 'phone, I felt that we could prove that the sand in question in our #4-S State was not Connell in age, and I also advised you that it would be considerably more difficult, if not impossible, to prove that this zone is not Simpson.

My next approach to this problem is a study of what appears to happen to the upper Ellenburger section as the Eunice high is approached. There is, of course, a gradual decrease in Ellenburger thickness north from the Keystone Pool in Winkler County, but a very abrupt further thinning at the Eunice up-lift. On Section 1 I have drawn a violet line which corresponds approximately with the top of the Ellenburger dolomite section, and a line in blue somewhat higher, which corresponds roughly with what has been called Joins. You will note that I have made this blue line wavy beyond the Phillips #1-J TXL to indicate my conception of the position of the major unconformity along which Simpson beds over-lap. You will note the presence of a considerable amount of limestone beneath this unconformity and above dolomite throughout the section and in the Magnolia #1 May the whole section above granite which we have logged is limestone rather than dolomite.

Some geologists who have studied this Ellenburger problem believe that in the area of the Eunice high that only the oldest Ellenburger of Cambrian age was ever deposited across that high. Others feel that the major up-lift probably occurred at or near the end of Ellenburger time and the thin section remaining was left from a period of erosion

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which removed all the younger Ellenburger material which may have been deposited in the area. Regardless of which conception one may favor, there definitely was a very long period of erosion involved which left the top of the present Ellenburger material exposed to aeration and undoubtedly ground water action for a very long period. It is my feeling that the zone between the dolomite and the blue line is material actually Ellenburger in age, and that by reason of the long weathering endured this calcareous material was never converted to a dolomite, or if originally deposited as dolomite it was chemically transformed during this period of weathering to a limestone.

As far as the question of it being Joins is concerned, I am not yet convinced that the so-called Joins is not more appropriately a part of Ellenburger than of Simpson, but regardless of that, I do not believe this is Joins material unless Joins should turn out to be a unit which crosses time lines, because if Joins is either very late Ellenburger in age or is very early Simpson in age, I do not believe it could be present along this unconformity near the Eunice up-lift.

There is of course considerable sand logged in this post-dolomite section, which I account for in two ways. First, Simpson sand and shale caves very badly and most wells have to change bits when they reach the top of limestone or dolomite sections below the Simpson permitting a very large amount of cave material to accumulate in cuttings at that point. Secondly, we know that the Cambrian portion of the Ellenburger contains a great deal of sand in present out-cropping areas which represent positive areas for a long time. Since the Eunice high has been a positive area for a very long time I think it is logical to expect a larger amount of sand in the Ellenburger section in its vicinity than in the basinward areas. Accordingly, I do not feel that the presence of sand in this section can be considered proof of the Simpson age of this zone.

At well #12 in Cross-section 1 I arrived at these conclusions: First, that the Simpson formation over-lap to the extent that all members below and including the Waddell sand are not present, and that a portion of the so-called McElish is also cut out. Two, that the top of the Ellenburger is probably at approximately 8695' and most certainly no lower than 8725', and third, that the predominance of limestone in the Ellenburger section is probably due to the process of weathering to which this thin section was subjected for a very long period of time.

## Cross-section #2

Cross-section #2 was prepared to carry with close control the information arrived at in Cross-section #1 through the area of the Eunice high to include the log on the well in question and to present further evidence on tow wells somewhat to the north of the Eunice high. The datum on which these logs were lined up is the top of what I regard as definitely Pre-Simpson beds. You will note that above that line I have shown a wavy blue line which corresponds with the top of a persistent zone of a high resistivity which is present throughout this area. I am prone to regard the blue line as base of the Simpson and the top of the Pre-Simpson, although the evidence of that correlation is not conclusive. You will observe that Continental #2 Warren #B-29# shows further evidence of Simpson over-lap, with material very little older than the McKee sand. In the case of the Stanolind #1 State #1, #14 in this section, Vanderpool has identified the portion of this section, which he called Ellenburger, as entirely Cambrian in age.

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On the basis of this Section, the casing point in our State #4-S would be at the top of Pre-Simpson beds, or somewhat below that point depending on whether the blue line is taken to represent the top of Pre-Simpson material.

My conclusions as result of Cross-section #2 are, first, that the Ellenburger section, which is present around the Eunice high, is Cambrian in age. Second, that the Ellenburger age material contains considerable sand as well as a persistent limestone section. Third, that the persistent sand, whose resistivity is much higher than any Simpson sand, at the top of which casing was set in our State #4-S, is a Cambrian sandstone much older than any Simpson sand present in this area.

COPY

## Notegram

Date July 27, 1951

For Mr. Frank T. Clark

Room Bartlesville, Oklahoma

From L. E. Patterson

Room Midland, Texas

Re: Conference with Mr. R. L. Boss relative to casing point in our State #4-S, Lea County N.M.

On Friday, July 20th, I made a trip to Roswell, New Mexico and conferred with Mr. R. L. Boss, Gulf's Senior Geologist in New Mexico, relative to the problem of the casing point in our #4-S State. Mr. Boss has worked in New Mexico for a period of 15 years with Gulf, and probably has had as much detailed experience in this area as any man in the area. He is evidently very highly regarded by the New Mexico Oil Conservation Commission. As I previously advised you, Mr. Bodie felt that if he could be convinced of our correlations, we would have no further difficulty with this well.

The information in the attached memorandum was gone over in considerable detail with Mr. Boss and explained on the cross-sections. Mr. Boss stated that he had not attempted to correlate the New Mexico Simpson section into the Texas #33 Connell, or to any other standard section, and he was prepared to admit that probably the sand in question was not actually Connell. As had been anticipated, however, he was not prepared to concede that this zone was Pre-Simpson in age. His primary reason, as given to me, was that they had cored this particular zone in the Gulf #8 Carson "C", Section 28-21S-37E, a well which is approximately 1/2 mile northeast of the Magnolia #17 Carson, shown on Cross-section #2. He showed me the core description on this section and it recorded green shale as having been recovered both above and below this zone.

Mr. Boss further informed me of a fact of which I was not previously aware, that several wells in this area have been completed to include the McKee sand zone, and this particular zone has one reservoir which has been recognized by the Commission as Simpson. Mr. Boss advised me that his company would have to oppose in principal the classifying of this zone as Ellenburger on the basis of this core information and the established practice in the field, and while he was impressed with our position, he could not agree to accept it as proof of the Ellenburger age of this horizon.

As result of this conference, I concluded first that since the burden of proof of the Ellenburger age of this horizon would be on us rather than the burden of proof of it's Simpson age being on other people, that our position would be extremely difficult in a hearing before the Commission, for as I previously had advised you, I doubted that it would be possible to actually prove the Ellenburger age of this zone.

While I am not prepared to concede that the presence of green shale in this zone is proof of the Simpson age of the horizon, at the same time I am of the opinion that the type of geological advice available to the Commission would be more impressed by such a core record than by our cross-sections, and I further believe that the geologists of other operators would generally side against us for the reason that if this zone could be established to have an Ellenburger age, the correction and remedial work which would be involved in the wells which now produce therefrom, as well as the prospect for the necessity of drilling additional holes, would as a practical matter over shadow any technical geological evidence which we could present.

After this conference, I returned by way of Hobbs and conferred with Mr. Bodie in this matter. He advised me that it would be necessary to move in a rig to squeeze off the Simpson perforations as the result of the finding of the Commission on our application for a permit for dual completion, and that there would be little, if any, more expense involved in plugging this hole back.

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It is therefore recommended that the State #4-S be plugged back to 8070', and that it be there completed as a Simpson producer from both the McKee sand, through perforations, and this questionable zone in open hole, and that a twin well be drilled and completed in what general field practice concedes to be Ellenburger without any doubt. This twin well would of course be in lieu of the twin which we would necessarily have to drill as a Simpson producer if the action recommended above were not taken on the State #4-S. It is further recommended that this twin hole be cored from the top of the McKee sand to the top of the Ellenburger, in order that we may have additional information on the McKee sand zone and on the many sand stringers below that zone in what we know to be Simpson, as well as on the sandy zone involved in this controversy. It is further recommended that a drillstem test be run on this questionable zone if it shows oil in order to determine out this oil compares with the Simpson oil above and with the Ellenburger oil below.

The above recommendations have been discussed with Mr. Bodie and he is in complete agreement with them.

LEP:dr

cc: Mr. A. E. Dietert  
Fort Worth, Texas

OIL CONSERVATION COMMISSION  
SANTA FE, NEW MEXICO

August 15, 1951

Mr. D. D. Bodie  
Cities Service Oil Company  
Drawer G  
Hobbs, New Mexico

Dear Mr. Bodie:

This is in reply to your letter of August 9, in which you refer to Cities Service Oil Company's State #4, which was a subject of a recent hearing.

We agree that the enclosed applications do cover routine operations and the forms have been forwarded to Mr. Yarbrough at Hobbs with my recommendation for approval.

Very truly yours,

R. R. SPURRIER,  
Secretary-Director

RRS/ir

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P  
Y

# SHELL OIL COMPANY



THIS LETTER IS FROM OUR  
FIELD OFFICE

AT

Hobbs, New Mexico  
P. O. Box 1457  
June 5, 1951

*file*  
*G. R. Bickel*  
Oil Conservation Commission  
State of New Mexico  
Santa Fe, New Mexico.

Subject: New Mexico Oil Conservation  
Commission Cases 274 and 275.

Attention: Mr. R.R. Spurrier

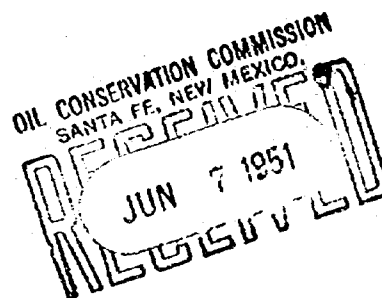
Gentlemen:

We enclose one (1) copy of statement forwarded to the Court Reporter to be included in the official records in Cases Nos. 274 and 275. This enclosure is in line with discussions at the conclusion of the Commission hearing in Santa Fe on May 23, 1951.

Yours very truly,

*C. R. Bickel*  
C. R. Bickel  
Division Manager

Attachment (1)



SECRET  
COPY

Box 1457  
Hobbs, New Mexico

June 4, 1951

Oil Conservation Commission  
State of New Mexico  
Santa Fe, New Mexico

Gentlemen:

Re: Case Numbers 274 and 275 - Applications  
of Cities Service Oil Company and Tide  
Water Associated Oil Company to dual  
complete wells in the Hare and Brunson  
Pools or in the alternative to transfer  
allowable between wells in said pools  
and thereby effect 80 acre spacing

These applications were made on the basis of conservation of steel and not on the basis that the granting of them would help this Commission in the performance of its duties to conserve oil and gas and to protect correlative rights. Both Cities Service's Mr. Adams and Tide Water's Mr. Holloway stated at the hearings in March, 1951, with reference to these applications (then Case Numbers 260 and 261) that the applications were based on the conservation of steel and both admitted that the granting of them would not in any way prevent the waste of oil and gas. The only argument that was made with reference to the protection of correlative rights was that their companies did not have enough steel with which to drill all required development and effect wells and to conduct a desired exploration program and that therefore they might be delayed for some time in drilling all their wells in the Hare and Brunson Pools. Obviously such argument is not valid. The steel shortage is applicable to all alike just as are individual fluctuations in cash positions. Clearly this Commission would not consider that it should grant exceptions to practices established in the interest of conservation of oil and gas and the protection of correlative rights because an operator was short of money or credit or chose to put his efforts in another field. Correlative rights as used in the Commission's Rules and Regulations means the equal opportunity afforded to each owner of property in a pool to produce without waste his just and equitable share of the oil or gas or both in the pool and does not require that he be placed on an exceptional basis because he wishes to use his resources in some other area.

Heretofore, this Commission has abolished all transfers of allowable (see Order No. 850, The Oil Conservation Commission, State of New Mexico Rules and Regulations, December 9, 1949, effective January 1, 1950) and has never allowed oil-oil dual completions. Apparently, both these positions were taken because it considered that transfers of allowable and oil-oil dual completions

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SANTA FE, N.M.  
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were not sound from the viewpoint of oil and gas conservation and the protection of correlative rights. We think that the recommendations of the Petroleum Administration for Defense for wider spacing and wider use of dual completions in the interest of conservation of steel were not requests that the Conservation Commission depart from practices which were established in the interest of the performance of their duties. Certainly, a commission should not at the request of anyone, even PAD, do anything that would adversely affect the conservation of oil and gas or the protection of correlative rights; things which that commission has the duty to oversee. At most, such a commission should go no farther than to follow PAD's recommendation where no waste of oil or gas will result therefrom and no correlative rights will be invaded thereby.

With reference to the proposed departures from the Commission's established practice, we think that Cities Service and Tide Water not only failed to show that those departures would help the Commission in the performance of its duties but, in addition, failed to show that the Commission would not be hindered thereby for the following reasons, to-wit:

**RELATIVE TRANSFER OF ALLOWABLE**

1. The applicants made no adequate showing that transfer of allowable would not result in waste of oil and gas. They offered no witness who knew anything concerning the Brunson and Hare reservoirs on a pool-wide basis and their histories or performances to date. Their witnesses stated that their information of the pools was based on the completion of the wells involved in these hearings and one or two other wells, the testing of those wells and that their applications were based on the shortage of steel and that they did not have any general information concerning either pool. Neither company indicated that it was interested enough in what might occur in the future to have studied the history of performance of any wells in the Brunson and Hare Fields although Cities Service has two producing wells in the Brunson Field (both of which are high gas oil ratio wells producing at a penalized allowable rate below 50 per cent of top allowable) and Tide Water has one producing well in the Brunson Field (not on the State S lease) which has a penalized allowable of 80 barrels of oil daily. Mr. Shackelford speaking for Tide Water stated he knew little about the pools involved, that he was interested only in the Tide Water wells and admitted he did not know how the dual completions would preserve correlative rights.

2. This Commission has heretofore reduced the allowable for the Brunson Pool from the regular unit allowable with deep well adaptation to a top well allowable of 90 barrels oil per day (see Order Numbers B-4 January 11, 1950 and R-30 September 29, 1950). Those orders were granted upon the application of Rowan Oil Company and the Commission found that such reduction in allowable should be granted to prevent waste and to conduct tests and gather data as to the characteristics of the reservoir. It was shown that the bottom

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hole pressures in the Prunson Pool wells varied widely (see Shell Oil Company's Exhibits S-1 in the Tide Water Case and S-5 in the Cities Service Case) and thereby that the pool was not of uniform permeability and that undoubtedly there are local areas where production affects but little of the field generally. Under such facts, certainly there has been no showing that the per well allowable if doubled would not result in waste from water coning and gas migration and that the field-wide rules should be departed from.

3. If one well will adequately drain only 40 acres as the Commission has heretofore impliedly found in establishing the 40-acre spacing in the field, one well on 80 acres would fail to recover during any reasonable economic period an amount of oil from the reservoir equivalent to that which would be recovered by two wells thereon. Neither of applicants was willing to say that one well would drain 80 acres as efficiently as two wells.

4. Obviously a well producing at a rate greater than the surrounding wells will create pressure differentials and in the same length of time drain a greater area than the surrounding wells; cross line drainage will result therefrom and correlative rights thereby be affected. Cities Service's Mr. Adams testified that he favored dual completions rather than transfers of allowable because he considered transfers of allowable not as fair from the viewpoint of correlative rights.

5. Pressure-volume-temperature (P-V-T) data from a bottom hole sample obtained in Gulf King 16 in August, 1949 established a saturation pressure of 2774 psi absolute for Hare Pool crude. This sample was obtained at a pressure of 2834 psi absolute and accuracy of results should be high as the sampling pressure was above the saturation pressure.

The production curves submitted by Tide Water for the State S-5 well show that, at a flow rate of 243 barrels of oil daily from the McKee, the flowing bottom hole pressure was 2451 psi gauge (about 2466 psi absolute) or 303 psi below the saturation pressure. At the lower flow rate of 101 barrels of oil daily, the flowing bottom hole pressure in the McKee was 2707 psi gauge (about 2722 psi absolute) or only 52 psi below the saturation pressure. Even without a detailed knowledge of reservoir mechanics, it is evident from a simple application of Boyle's Law that during flow at the 243 barrel daily rate solution gas was liberated from each unit volume of reservoir fluid much faster than at the 101 barrel daily rate. Tide Water, therefore, is proposing a practice which would cause the formation of a secondary gas cap at a rate much greater than that which would occur with the production of oil at the regular 40-acre unit allowable rate with deep-well adaptation. As testified, this secondary gas cap is free to move about in the reservoir and will result ultimately in damage not only to Tide Water's wells but to wells operated by competitors who are producing in a more prudent manner. This violates the principle of correlative rights and is in direct opposition to the statements, unsupported by any data, that Tide Water made concerning the maintenance of correlative rights.

6. A productivity index test normally consists of a static build-up period of at least 48 hours to determine the maximum static bottom hole pressure followed by a flow period of such duration that the well will be flowed until stable and then gauged for 24 hours at the stable rate. If the productivity index is to be determined at varying flow rates, the first test is made at the lowest rate and succeeding tests at progressively higher rates in order that the well will be drawing down during the tests rather than building up. As admitted by Tide Water on the sheet tabulating Productivity Index Data for State 2-5 the Ellenburger PI test was not conducted in a conventional manner. Actually there was no PI test since there was no shut-in period before the flow tests. Further, the test on the 1/2-inch choke, which should have followed the tests on the 1/4-inch and 3/8-inch chokes instead of preceding these tests, was apparently initiated the day following treatment with 10,000 gallons of acid before the well had settled to a stable flow rate. The tests on the 3/8-inch and 1/4-inch chokes are of such short duration that it is questionable that stable flow had been achieved even at the conclusion of the test. Also, it is difficult to see how the well could have been flowing for several days on a 1/2-inch choke between the acid treatment and the initiation of testing, when Tide Water's own data state that the well was treated on 4-16-51 and the testing period ended 4-19-51. Therefore, the data obtained during the Ellenburger flow test in Tide Water State 2-5 is considered almost completely valueless as a measure of the ability of the well to produce.

7. P-V-T data from an analysis of a sample obtained in Penrose Federal No 1 in 1945 established a saturation pressure of 2918 psi absolute for Bronson Pool crude.

The production curves submitted by Tide Water for the State 2-4 well show that, at a flow rate of 195 barrels of oil daily from the Ellenburger the flowing bottom hole pressure was 2619 psi gauge (about 2634 psi absolute) or 284 psi below the saturation pressure for Ellenburger crude in the Brumson Pool. At the lower flow rate of 81 barrels of oil daily, the flowing bottom hole pressure was 2659 psi gauge (about 2674 psi absolute) or 244 psi below the saturation pressure. As in the case of the McKee in State 2-5 Tide Water is progressing the formation of a secondary gas cap at a rate greater than would occur if the well were produced at the 90 barrel daily allowable presently in effect. Again, this violates the principle of correlative rights which Tide Water states would be maintained.

SHELL

June 4, 1951

Oil Conservation Commission

8. The Brunson Pool is more than 60 per cent developed, the Hare Pool approximately 50 per cent developed and rules so long established should not be disregarded after development has progressed so far, for otherwise those who have followed the rules of the Commission are placed at a competitive disadvantage.

#### RELATIVE DUAL COMPLETIONS

It was admitted by applicants' witnesses that dual completions do not in any way assist the Commission in performance of its duties to prevent waste except in the instance where one of the pools would not justify development on its own merit. The most applicants could say was that dual completions are not any more conducive to waste than ordinary completions if properly watched and mechanical failures around packers are promptly remedied. On the other hand, Humble and Shell offered testimony to the effect and common sense makes such obvious even without testimony, that dual completions are conducive to waste in the following respects:

1. As admitted in sworn testimony by Mr. Massey, an engineer for Cities Service, annular flow (flow through the casing-tubing annulus) is not as efficient as flow through two-inch tubing. As oil is flowed to the surface by the energy of expanding gas, as the Hare reservoir has a solution gas type drive (see Tide Water data for Case 275), as the Brunson reservoir has a solution gas type drive with a partial water drive, as energy from solution gas is not replaced by nature in a solution gas type drive and, as annular flow is inefficient when compared with flow through tubing, the production of oil through the casing-tubing annulus from reservoirs having primarily solution gas type drive will cause the waste of irreplaceable gas energy, thus resulting in the loss of recoverable oil from the underground reservoir or reservoirs.
2. Workovers on dual completions are always more expensive than workovers on a single completion and the expense may become such that one of the horizons will be abandoned prematurely.
3. Packers deteriorate with age and exposure to various conditions and failures therein do occur and as a result thereof oil may be transferred from an efficient reservoir to a relatively inefficient one and thereby ultimately lost.
4. At some time during the life of the Brunson and Hare Fields it seems probable that both horizons will be on artificial lift at the same time. Equipment now available for simultaneous artificial lifting of both zones in a dually completed well was shown by the testimony of applicants to be in the experimental stage of development. If such does not work out, probably one zone would have to be prematurely abandoned. As explained by Mr. Massey, the system used for dual pumping in the Shafter Lake Field in Texas would not be legal in New Mexico. Mr. Massey stated he thought that

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one zone was pumped for approximately ten days while the second zone was unproduced; this process was reversed and the second zone was pumped for a similar period while the first zone was unproduced. New Mexico rules do not permit daily production at a rate exceeding one hundred twenty five per cent of the daily allowable assigned the well. As many wells, not capable of flowing production, can be pumped at the allowable rate, the system explained by Mr. Massey would result in a constant loss of production.

That both zones will ultimately require artificial lifting is an established fact. Although the Brumson Pool was discovered as recently as September 1945, the January 1951 Engineering Report of the New Mexico Oil and Gas Engineering Committee shows that 17 of the 93 producing wells listed in the Brumson Pool, over 18 per cent, are being artificially lifted or the installation of lifting equipment is pending in a well or wells reported dead. It is noteworthy that 18 of the 93 Brumson wells, 19.4 per cent, produced more than 2.5 per cent water during January 1951. Of these 18, one-third produced from 2.5 to 10 per cent water, one-third produced from 10 to 50 per cent water, and one-third produced from 75 to 100 per cent water. Ten of the 18 wells producing water are now on artificial lift.

Further, the Hare Pool, which was discovered in July 1947, had one well on artificial lift and preparations were being made to install lifting equipment in a second well. This would represent over six per cent of the 31 wells in the field.

5. It is interesting to note that all five companies having both McKee and Ellenburger wells on the same 40-acre drilling unit elected to drill twin wells in order to establish the most efficient drainage pattern. In the Hare Pool 20 of the 31 producers, 65 per cent, have been drilled as twin wells to Brumson Pool producers, six wells were salvaged from Ellenburger failures, four were not drilled below the McKee probably because the Ellenburger was indicated as too deep to produce and one well was recompleted after the Ellenburger was depleted. A plat showing the location of all McKee and Ellenburger wells in the Hare and Brumson Pools has been entered as Exhibit 3-5 in Case 274 and Exhibit 3-1 in Case 275.

It does not appear likely that these five companies (Continental, Gulf, Magnolia, Ohio and Shell), who might be considered as prudent operators, would have drilled twin wells if each operator did not consider such a program as more efficient from the standpoint of preventing waste and maintaining correlative rights.

6. Tide Water inserted into the record a number of statements regarding dual completions in the State of Texas but failed to point out that the Texas Railroad Commission, unlike the Oil Conservation Commission of the State of New Mexico, has many engineers and technical employees to act as a

SHELL

Oil Conservation Commission

- 7 -

June 4, 1951

policing group in checking packer tests on finally completed wells thereby protecting the correlative rights of offset operators. We do not feel that it is the duty of an oil company to police the actions of a competitor in such cases.

RELATIVE THE MANNER OF COMPLETION EMPLOYED IN CITIES SERVICE STATE S-4

It should be apparent to the Commission from testimony and Exhibits S-1 through S-4 submitted by Shell Oil Company, testimony and exhibits submitted by Ohio Oil Company, testimony offered by the Gulf Oil Corporation, testimony offered by the Humble Oil and Refining Company and the geologic cross-section submitted by Tide Water Associated Oil Company that Cities Service Oil Company has inadvertently completed their State S-4 well in such a manner as to have a sand member of the lower Simpson Series (production from which has been included in the Hare Pool) and the Ellenburger dolomite (production from which is included in the Drumsen Pool) open in the same bore-hole below the casing shoe thus permitting commingling of fluids from both pools prior to sale and also violating the integrity of each pool thereby endangering greatly the correlative rights of nearby operators. Since the hearings in Santa Fe Shell has had the opportunity to analyze drill cuttings from the producing interval in State S-4. Results of this study support our electrical log interpretation. Accordingly, Shell respectfully requests that the Commission immediately orders the Cities Service to cease production from the lower Simpson sand and Ellenburger dolomite sections in their State S-4 well until such time as Cities Service has repaired this well so as to exclude production from one or the other of these horizons in the open hole or until Cities Service has established in a show cause hearing that it has the right to commingle the fluids from these two horizons in the same bore hole.

Yours very truly,

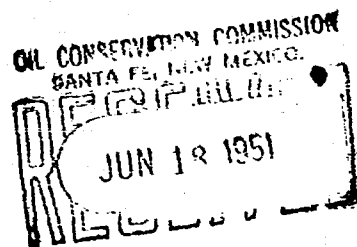
*J. D. Savage*

for C. R. Bickel  
Division Manager

EWN:mb

cc: General Attorney  
Midland Area  
cc: Production Manager  
Midland Area

BEFORE THE  
OIL CONSERVATION COMMISSION



TRANSCRIPT OF PROCEEDINGS IN

CASE NO. 274

May 22, 1951

May 23, 1951

E. E. GREESON  
COURT REPORTER  
UNITED STATES COURTHOUSE  
TELEPHONE 2-0672  
ALBUQUERQUE, NEW MEXICO

Statement on behalf of the Humble Oil & Refining Co.

Case 274-75

We desire to call to the Oil Conservation Commission attention that there are approximately 92 producing wells in the Brunson field and 31 producing wells in the Hare field. Both these fields have been developed by drilling single well completions. Many of the 40 acre tracts in these fields have twin wells. The operators have made this investment in twin wells in good faith and in accordance with good completion practice. In justice to these operators we feel that the few remaining wells to be drilled should conform to the established practice of drilling twin wells on 40 acre units <sup>where such units</sup> ~~overlying~~ both the McKee and Edinburg formations.

We feel that there are very definite physical limitations to the amount of fluid which can be produced through a ~~single~~ <sup>single</sup> completed oil well and that there is not sufficient flexibility in the equipment to permit of changing production rates to meet changing reservoir conditions. These limitations often lead to the premature abandonment either permanently or temporarily of one producing horizon. We do not subscribe to the suggestion offered in testimony that oil be <sup>under ground</sup> commingled. We believe that conservation is best served by keeping oil reservoirs entirely separate and in such condition that some form of secondary recovery can be effected in the most efficient and least costly manner. There are numerous instances where as much or more oil has been recovered in secondary operation as was recovered in primary production to so called depletion.

Our experience in working over two wells in the Brunson field leads us to believe that many of the wells will require workovers. Such workovers can be accomplished at the proper times at less cost and more effectively in single completions than in dual oil well completions. The workover

of a singly completed well will not adversely affect the productive capacity of a twin well, but is not always the case in dually completed oil wells where it is necessary to mud off both producing horizons in the dually completed well to work on one of them. The mechanical equipment required in a dual completion ~~process~~ may prevent the producing of a mudbed off horizon at a sufficient rate to substitute it cleaning the injected mud fluid to the well bore. \*\*\*

As dually completed oil wells are produced it may be anticipated that the differential pressure across the packing elements separating the two productive formations will increase.

As the differential pressure across a packing element increases, the hazard of leakage is also increased, and the greater the amount of fluid which can leak past the packing element where failure exists. Packing elements fail through wear, deterioration and defective material. Out of seven dually completed wells, we have noted two mechanical failures which have occasioned migration of fluid from one reservoir to another with damage to the involved reservoir. We know of no effective way to determine leakage soon after its occurrence. It is very possible for it to go undetected for a protracted period of time. After leakage has been determined it is difficult and costly to determine whether the source of leakage is due to a cement job, casing leak or in the dual completion equipment.

The notion of taking periodic bottom hole pressure is complicated and often precluded in dually completed wells.

We do not concur in applicants' contention that dually completed oil wells tend to prevent waste, increase the ultimate recovery, and protect consecutive rights.

as we believe that oil is an irreplaceable asset to both the State and the Nation, every effort should be made to protect and conserve this asset. As we do not believe that doubly completed oil wells in New Mexico best serve the interests of conservation, we ~~request~~ request that the Oil Conservation Commission deny the applicants request to doubly complete ~~the~~ wells in the Burren and Hone fields x

If the Oil Conservation Commission finds that the Cities Service <sup>State 5-4</sup> well is producing oil or is capable of producing oil from below the oil string from both the Connell and the Ellensburg formations, request is made that the Oil Conservation Commission order the well to be so recompleted as to exclude the production of oil from the Connell and the possibility of the underground mingling of oil from the separate reservoirs x

BEFORE THE  
OIL CONSERVATION COMMISSION

May 22, 1951

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Case No. 274: This is the amended application of Cities Service Oil Company to dually complete its State S No. 3 and S No. 4 S/2 NW/4 section 15, T. 21 S, R. 37 E; or in the alternative for the authority to transfer allowable between said wells, thereby effecting 80-acre spacing.

(Notice of Publication read by Mr. Graham.)

MR. HOUSTON: Mr. Commissioner, I realize that it is unorthodox and I don't want to interfere in anyway with the Cities Service handling of its case or Tidewater, but the following case will involve the same general proposition. We were wondering if they could be heard together. It would save quite a bit of repetition of evidence, I think.

MR. ARMSTRONG: We would have no objection/<sup>to</sup>that except as I understand from Mr. Adams, he is expressing a preference for dual completions, whereas Tidewater is expressing its preference for allowables.

We have no objection if you would like to hear it altogether, but we would like it to be made clear that there is that difference in opinion as to Cities Service and Tidewater.

MR. ADAMS: Cities Service has no objection.

MR. SPURRIER: I think, gentlemen, we had better put it this way. In view of the difference in the two cases, let's hear them separately, and the Commission will certainly recognize the testimony of 274 applies to 275 and, if it is all right with Tidewater, we suggest you limit your testimony as much as possible.

MR. ARMSTRONG: It might be all right after Cities Service has completed its case for us to proceed with ours and let all of those who are going to object, let them voice their objection.

MR. McCORMICK: That will be all right.

MR. SPURRIER: That is all right.

MR. ADAMS: My name is R. E. Adams, proration engineer for the Cities Service Oil Company. This is an amended application of the Cities Service for authorization to dually complete and produce its State S No. 3 and 4 wells located in the Brunson-Hare fields of Lea County, and the McKee Sand of the Simpson group and the Ellenberger Lime, common source of supply.

In the event the Commission finds that the request to dually complete these stated wells is impractical and/or not feasible, it is asked that a transfer of allowables be authorized so that one well may produce from the McKee Sand and the other well from the Ellenberger, each with allowables

commensurate to those of two 40-acre units.

If this later request should be approved by the Commission, it is further suggested that before such allowable transfer be authorized that the wells be definitely shown capable of producing from each of their respective common sources of supply.

I wish at this time to state however it is very definitely the recommendation of the Cities Service Oil Company that dual completions in its opinion are more practical and feasible than transfer of an allowable.

In Case No. 261 which was heard on March 20, 1951 we submitted data relative to the dual completion of our State S No. 3 well. Commission action on this matter was deferred due to the fact that our State S No. 4 was at that time drilling and had not at that time encountered either the McKee or the Ellenberger sands and had not proven its productive possibilities in those horizons.

In order to expedite this hearing, I would like to request that the transcript made in that case be made a part of this record with all the Exhibits and data that we submitted at that time.

MR. SPURRIER: It will be done.

R. E. ADAMS,  
having been previously duly sworn, testified as follows:

DIRECT EXAMINATION

MR. ADAMS: The location of our well Number 4 is 100 feet east of the center of the southwest quarter of the northwest quarter of Section 21.

It was completed on April 17, 1951, at a total depth of 8182 feet subsea depth of 4719 feet. The top of the McKee sand was encountered at 7650 feet subsea depth of 4187; top of the Ellenberger was 8030 feet subsea depth of 456 to 7. Three hundred and eleven feet of 13-3/8 surface pipe was set. An intermediate string of 2818 feet of 8-5/8 was set and cemented and the oil string was set and cemented on top of the Ellenberger at 8030 feet. In drilling the well, when the McKee sand was encountered a drill stem test was made from 7720 to 7852 feet with one inch top choke and 5/8 inch bottom choke. Gas came to the surface in four minutes, oil in 13 minutes and the well flowed 134 barrels of clean oil in two hours with the gas-oil ratio of 910 cubic feet per barrel. That production would be at a 24 hour rate of 1628 barrels. Gravity of the oil was taken at the time of this test and was 43-1/10 degree.

The Ellenberger lime, the well was completed in open hole from 8030 feet to 8182 feet. Upon potential the well flowed 205 barrels of oil in 7 hours through a 29/64 inch choke giving it a rated 24 hour potential of 696 barrels of oil. Gas-oil ratio was 975 cubic feet per barrel and the gravity was 41.4 degrees corrected.

The number four well has been dually completed. That is, the packer has been set and both formations have been tested. In our opinion the dual completion is not affected until such time as the Commission authorizes an allowable for that formation.

The packer was set and the test made in order to prove that dual completions were impractical in this area. The packer installation which we have used in the number 4 well and which we propose to use in the number 3 is a model "D" Baker Retainer Production Packer which Cities Service Oil Company has found to be mechanically efficient and extremely satisfactory for the purposes for which it was designed, and other state regulatory agencies in which the packer has been set under their supervision have also approved it.

In Texas alone we have over 40 dual completions in some six different fields. The Dollar-Hyde field of Texas as we stated at the hearing on March 20th, we have around 18 dual completions in the Clear Fork and Devonian formations. This field borders on the New Mexico line and there may be some possibility of its extension into New Mexico.

In this field, Dollar-Hyde, the Railroad Commission permits dual completion in two of any five different producing horizons, the Wichita limestone, the Clear Fork, the Devonian, the Silurian and the Ellenberger formations.

Our primary reason for requesting authorization to

dual complete the two State S wells is to prevent waste and to protect correlative rights for the confiscation of property with a minimum expenditure of critical material.

I beleive that it is well known that by reason of the national emergency tubular goods have reached the stage where they are extremely difficult to get. On March 13th, Secretary of the Interior Chapman issued a four point program of the Petroleum Administration for Defense for stepping up oil and gas yield for the minimum use of oil. They involved wider spacing, increased use of pressure maintenance and re-pressure operation in oil and gas.

It is my personal opinion compliance with these recommendations is just a step closer to the federal control of our oil operations. If this application is granted Cities Service Oil Company will fully comply with Rule 304 and any other rules that may be applicable to the use of dual completions.

We will have surface connections designed for the installation of all gauges to make any possible tests that the Commission might require to insure that the wells are producing from separate reservoirs.

In regard to the dual completion of our State S No. 4 well, the packer was set at 7965 feet on May 8th following a standard form for pack electrical testing.

The shut-in casing pressure was 1020, the shut-in

tubing pressure was 650 pounds. The well flowed from the McKee Sand through a 14/64 inch choke 470 barrels of oil in 24 hours. The gravity was 42, gas-oil ratio 980 cubic feet per barrel and the tubing pressure held constant.

The well was produced through the annular space through the tubing and casing. After another shut-in period of 24 hours, the shut-in casing pressure was 1000 pounds. The shut-in tubing pressure 65 and the well was flowed through the Ellenberger lime through a choke 22/64 inch, 607 barrels of oil in 24 hours. The gravity was 41.8. The gas-oil ratio was 933 cubic feet per barrel and the casing pressure held constant.

In our opinion that showed that the two formations were definitely sealed apart.

I would like to give just a brief resume of the oil completions in Texas. In going through the proration reports of the Railroad Commission, not their orders or anything, but the actual proration reports, it shows where these wells are getting allowables. I found 944 wells had been dually completed in some 95 fields. In those 95 fields, in a number of them, there were innumerable producing pools, one of them I think had as high as 37 different pools under the same field.

In the dual completion practice there in Oklahoma and in other areas, where we operate, has received a decided stimulus and we feel that it is one of the best ways in the world to save steel and man hours.

In the drilling of our No. 3 well, we used 134 tons of tubular goods. The 1200 sacks of cement all of which is listed as critical at this time and the total labor in drilling that well was 10,000 man hours. While dual completion of a well increases recoverable reserves in development, that figure can be cut in half by dual completion.

I think that is all I have.

By way of exhibits, I would like to introduce as our exhibit No. 1, the plat of the Brunson and Hare fields, showing the lease ownerships in that area. As Exhibit No. 2, an electric log along with a micro-log of our No. 4 well. You already have in that previous hearing, our electric log on the No. 3. Exhibit No. 3, a diagramatic sketch showing a dual completion installation which has been made of the No. 4 well. Exhibit No. 4, the Packer Leak Test which was made showing the---along with the charts, showing that there was no leakage. Exhibit No. 5 and also as Exhibit No. 5, packer setting affidavit that follows the forms that are generally used. I believe in our previous hearing we have introduced the special order of the Texas Railroad Commission showing pools in which all oil completions were approved. I would like to point out at this time, however, that this order shows only some of the pools in which this has been done. There is a number of other fields that have been covered by special field rules that are not set out in this special order. That order which is also a part of the exhibits

in our other hearing shows the requirements made by that regulatory agency in regard to testing the wells.

MR. SPURRIER: You have offered all these exhibits?

MR. APAMS: Yes.

MR. SPURRIER: They will be received. Does anyone desire to question the witness?

R. L. HUGHSTON: I have some questions in be half of Shell Oil Company.

CROSS EXAMINATION

By MR. HUGHSTON:

Q Mr. Adams, if I understand your application correctly, the application of Cities Service, it is for a dual completion and in the alternative for the transfer of allowable you ask for the dual completion on a permanent basis, is that right?

A Yes, sir.

Q In the event the wells are completed so that one is in one horizon and the one in the other, you would ask for a transfer of allowable as between the wells only on an emergency basis?

A Now, our application says nothing about the application. I think you will find that in the Tidewater, but our company does not.

Q I just want to understand because it wasn't in the application with Tidewater, but they made the statement at the last hearing and I wanted to know what is your position with reference to that.

A We feel that if you make a dual completion installation that it is going to be permanent. I don't believe anyone can say, and I certainly wouldn't attempt to conjecture how long this present emergency is going to last. As far as I know, we are still in World War II.

Q Sir?

A As far as I know, we are still in World War II.

Q Never been a Peace Treaty signed?

A Never has.

Q Has any statements come from the President within the last month or so that we may be in a state of emergency for 20 years or a long period of time?

A I have seldom read anything he puts out.

Q Have you seen any such statements?

A No, sir.

Q Have you seen any statements made by any of our responsible military authorities that we may be in a state of emergency for a good long period of time?

A I think that is their opinion, yes, sir.

Q Well, then, you take the position that a transfer of allowable, if such was made, would be on a permanent basis, is that right?

A It would be on a permanent basis to this extent, if it is granted, It is very probable that later on Cities Service would come in again and ask for dual completions.

Q And any request for dual completion since it is on a permanent basis is in effect asking the Commission to depart from its more or less established practice against all oil dual completions in this state.

A That is my understanding of the position of the Commission. Any order that the Commission issues is subject to change. All you have to do is file an application and ask for an amendment, to that order.

Q You completed your No. 3 well in a different way than you completed your No. 4, did you not, in the Ellenberger?

A I believe the No. 3 in the Ellenberger, we set the casing through it and perforated.

Q In No. 4, you set the casing on top?

A Set the casing on top.

Q Why did you make that difference in completion methods.

A I don't know. We have an engineer here, I think, that could probably answer that question.

Q We would like to know the company's reason, whether you give it or the engineer.

MR. ADAMS: Mr. H. E. Massey, Division Engineer for the Cities Service Oil Company. I don't believe he has been sworn.

(Witness sworn.)

H. E. MASSEY,  
having been first duly sworn, testified as follows:

MR. MASSEY: On the State S No. 3 well as has been testified, we set casings through perforated and acidized in completing No. 4 at approximately the same time Tidewater was in the process of completing State S. No. 5. We then changed our policy to set on top for two reasons.

First, from the drill stem test we had definite indications that the Ellenberger was a good producing well. By setting casing on top, we eliminated putting cement on the formation and also having to make the choice of just exactly where to perforate the casing for production.

The second reason, we desired to complete the well naturally and not use a side on the formation.

Does that answer your question?

MR. HUGHSTON: It is also further down the structure is it not?

MR. MASSEY: That's right.

MR. HUGHSTON: The higher in the formation you could complete it the better off you would be?

MR. MASSEY: Possibly. I say that because it depends on how high on the structure.

MR. HUGHSTON: Mr. Adams, now you stated awhile ago that you thought dual completions, or that you proposed dual completions in this case because it would prevent waste. Will you tell us how it will prevent waste?

MR. ADAMS: I am speaking primarily of economic waste. As I stated afterwards it will save 135 tons of tubular goods, critical material; 10,000 hours of man labor, and 1000 sacks of cement.

MR. HUGHSTON: Would not prevent any waste of oil or gas, do you think?

MR. ADAMS: No.

MR. HUGHSTON: You said it would protect correlative rights, in what way will it do that?

MR. ADAMS: It will protect correlative rights because the north offset of our No. 4 well has been completed in the Simpson zone and will be--and we will have to drill a dual well making the third well, we already have a Drinkard well on that 40, and we have an Ellenberger well and we would have to drill a third well, a McKee well, to offset that one.

MR. HUGHSTON: Well, how would that protect correlative rights? You can't drill the well under the present rule.

MR. ADAMS: We can if we can get the material.

MR. HUGHSTON: Do you not have the material?

MR. ADAMS: I couldn't answer that. I know we are pretty well pressed for it and we are trying to use everything that we have got in expanding fields and our exploratory work.

MR. HUGHSTON: It would involve a choice but you could have the steel for it, could you feel certain?

MR. ADAMS: I don't feel certain.

MR. HUGHSTON: Cities Service has some steel in which to drill wells?

MR. ADAMS: Well, yes, but we prefer to use it in exploratory fields.

MR. HUGHSTON: It is a matter of choice?

MR. ADAMS: Yes.

MR. HUGHSTON: Is it your position that the P. A. D. in asking the state regulatory bodies to make wider use of multiple completions was asking them to do so even though thereby they would not be fulfilling their duty to prevent waste of all our gas and to protect correlative rights?

MR. ADAMS: I don't believe so, no. I think they just wanted to take another look at it. It was found practical and feasible in a lot of areas where it had been more or less condemned. They wanted to go back and reconsider the matter. That is why we are here today.

MR. HUGHSTON: Do you contend that a dual completion will make the Commission's task of policing, with reference to prevention of waste, any easier?

MR. ADAMS: No, it won't make it any easier. I don't think it will make it any harder either.

MR. HUGHSTON: Well, is it very difficult to determine whether or not there has been communication as between the different zones?

MR. ADAMS: Well, we have these, I gave you this packer leakage test report. As far as the Ellenberger and the McKee is concerned, it is my understanding, that all the Ellenberger is a green oil and the McKee is a more or less

black; the Ellenberger gas is sour and the McKee is sweet. And, there is probably a two degree differential in gravity and I can't see where it would be more difficult to police something like that than it would be to police between wells producing into approximately the same tank battery.

MR. HUGHSTON: You stated awhile ago that you would comply with any rules which the Commission might promulgate with reference to making tests. What tests would you suggest that the Commission should require?

MR. ADAMS: I would suggest that they follow more or less the procedure of the Texas Railroad Commission, which has been more or less proven to be satisfactory in my opinion.

MR. HUGHSTON: What is that?

MR. ADAMS: That is just taking these packer leak test reports, making these packer leak test gauges, if there is any differential, if they show up any leakage, just go in and set another packer and--or do some remedial work.

MR. HUGHSTON: How often should they be required?

MR. ADAMS: Well, in a flowing well, I don't think they should be required very often.

MR. HUGHSTON: Is there any possibility that the Commission would find in the performance of its duty preventing waste, more difficult by reason of the fact of, that the workings in your completed well?

MR. ADAMS: I don't understand your question.

Q MR. HUGHSTON: Well, is it ever possible, or have you ever heard of a situation where one horizon was abandoned before the limit of commercial had been reached, by reason of the fact of the cost of dual completed wells.

MR. ADAMS: Yes, that has been done.

MR. HUGHSTON: Then, if the two horizons are each capable of production that would pay for a well to that horizon and by virtue of the dual completion, one was abandoned before it was exhausted there would be waste that would have been recovered by twin wells.

MR. ADAMS: Not necessarily. When they would reach that exhausted stage, my recommendation would be to co-mingle production. We do that in Oklahoma right along; throw two reservoirs together.

MR. HUGHSTON: It is possible correlative rights might be effected by that?

MR. ADAMS: Not when they reach the completion stage, no. In fact, you are preventing waste.

MR. HUGHSTON: You are assuming that the whole field or area will reach completion at the same time, are you not?

MR. ADAMS: No, sir, not necessarily. As long as the reservoir pressure, whether one is commercial or whether one is not, if there is not any substantial pressure differential there will be a migration of fluids from one to the other. I don't see any reason in the world why you couldn't

throw them together.

MR. HUGHSTON: Did I understand you there would be migration of fluids as between the reservoirs?

MR. ADAMS: There would be if there was considerable pressure differential.

MR. HUGHSTON: Where would that occur?

MR. ADAMS: From the high pressure area to the low.

MR. HUGHSTON: Where would it occur around the packer?

MR. ADAMS: I thought we were talking about co-mingling production here, not around dual completions. I am not talking about packers leaking. When they leak, we fix them.

MR. HUGHSTON: As I understand you, as to--say, after the one was completed and one was under high pressure, there would be co-mingling?

MR. ADAMS: No, I--I misunderstood your question. I thought we were talking about having the two reservoirs open together. If the packer is in there, there wouldn't be any co-mingling.

MR. HUGHSTON: It is possible that there would be if not waste, correlative rights affected, if you allowed one operator to co-mingle two reservoirs?

MR. ADAMS: I don't believe so.

MR. HUGHSTON: Well, if the--

MR. ADAMS: (Interrupting) I think you would produce oil which you otherwise wouldn't get.

MR. HUGHSTON: Sir?

MR. ADAMS: I think in my opinion you would produce oil that you otherwise wouldn't get if you did it. You can produce a reservoir that is economical along with one, that is, you are getting more oil which otherwise wouldn't produce.

MR. HUGHSTON: If you are producing oil what sort of allowable would you fix in a case like that?

MR. ADAMS: Where co-mingling--

MR. HUGHSTON: (Interrupting) Yes.

MR. ADAMS: Just set it for one reservoir.

MR. HUGHSTON: In this case, if the Ellenberger and McKee were involved and the McKee were depleted or substantially so, to the point where it would not be economically possible to work your dual completed well over it so as to produce more from it, you would base your allowable for the well on the Ellenberger?

MR. ADAMS: Base it on the horizon that gets the highest allowable. That is what we do in Oklahoma.

MR. HUGHSTON: You spoke of some oil completions in Texas, 904 wells and 95 fields, how many of those duals were necessary as salvage operation where one of the horizons would not have been commercially productive but for the fact it was produced through a dually completed well?

MR. ADAMS: I have no way of answering that question. I don't know.

MR. HUGHSTON: Do you have any reason to think that there weren't quite a lot of them?

MR. ADAMS: No, because if they were they wouldn't show up on the proration report. They all had allowables, most of them substantially in each formation.

MR. HUGHSTON: A're you a geologist?

MR. ADAMS: No, sir.

MR. HUGHSTON: Is this gentleman a geologist?

MR. MASSEY: No, sir.

MR. HUGHSTON: Do you have anyone here capable of correlating electric logs?

MR. ADAMS: No, sir, we don't. Tidewater, do you have anybody?

MR. HUGHSTON: Mr. Adams, have you all ever filed a report on your dual completion with your No. 4?

A MR. ADAMS: No, sir, it is just a test that was made. We didn't file any report because the well is not dually completed until we get an allowable for it.

MR. HUGHSTON: You perforated the casing in that connection?

MR. ADAMS: Yes, sir, it is perforated. Yes, sir.

MR. HUGHSTON: How does the packer in the Baker packer hole--is it a friction packer or what?

MR. ADAMS: It has got two sheets of slips in there. You put one in, it is stuck, you can't pull them.

MR. HUGHSTON: It has a lock of some sort on it?

MR. ADAMS: Well, these slips - I will be glad to introduce an Exhibit showing the Baker packer.

MR. SPURRIER: Is there anyone here that is technically educated in the oil business that doesn't know how a Baker packer works? Do you want to pursue that question?

MR. HUGHSTON: No, sir, I don't know myself, you see.

MR. SPURRIER: I AM sorry, go right ahead.

MR. ADAMS: Mr. Massey can give you -

MR. SPURRIER: We have had lots of testimony on these Baker packers before. I thought we may save some time.

MR. HUGHSTON: IF you wish to consider that testimony that will be agreeable with us.

MR. ADAMS: That is Exhibit No. 6 or 7, whichever it is.

MR. SPURRIER: Six.

MR. ADAMS: It is a diagramatic sketch of the Baker packer.

MR. HUGHSTON: What is the present difference between the bottom hole pressure in your number four well and the Ellenberger and Simpson?

MR. ADAMS: We have no bottom hole pressures in the Simpson.

MR. HUGHSTON: You found that you had a 1020 pounds casing pressure when you were flowing the Simpson, is that right?

MR. ADAMS: YES, that was the shut-in pressure on the casing.

MR. HUGHSTON: The shut-in pressure?

MR. ADAMS: Yes.

MR. HUGHSTON: You had 650 pounds in the Ellenberger in the tubing?

MR. MASSEY: 650 shut-in pressure on the tubing.

MR. HUGHSTON; As the field is produced the variance between the pressure will probably become more, is that correct?

MR. ADAMS: I imagine that it will, but I wouldn't want to answer that for sure either. I don't know. It depends on how it is produced.

MR. HUGHSTON: That is all.

QUESTIONS BY MR. E. W. NESTOR, Shell Oil Company:

Q Mr. Adams, do you think it not irregular to, after completing your well in the Ellenberger, to perforate the casing without having given any notification to the Conservation Commission?

A Notice was given to them. We asked them if we could make the test and we received their approval.

Q On what form was that filed?

A It wasn't filed on any forms. As I understand it was just a telephone conversation.

Q Should that not have been filed on a form?

A I don't think there is any form provided for that purpose.

Q Yes, it comes under the miscellaneous reports covered in Rule 1110. The point I wish -

A (Interrupting) If you think there is any irregularity, we will be glad to file a form.

Q The fact is we would have no way of being notified if such form were not filed as required. We sometimes have to get

information from the Commission.

A I didn't know any form was provided for that purpose.

MR. NESTOR: That is all.

MR. SPURRIER: Anyone have anything further.

MR. McCORMICK: I would like to ask Mr. Adams a few questions.

Q (By Mr. McCormick) You are actually producing this from the McKee now?

A No, the Ellenberger. The McKee oil that was made during that test is still in the tanks. It is sitting out there now.

Q You are producing at the rate of 90 barrels per day?

A Yes, sir. There has been no McKee production run to my knowledge.

Q Do you have more than one producing shown in the McKee?

A In this field I don't believe we do. The McKee is part of the Simpson series. It is the sand in the Simpson and under the McKee I think there is the Waudel and the lower Simpson, but all this production is from the McKee which is the upper sand of the Simpson zone.

MR. McCORMICK: That is all.

MR. SPURRIER: Anyone else?

MR. DEWEY: I would like to ask some questions of

Mr. Adams.

Q (By Mr. Dewey) Mr. Adams, you failed to state the size of casing that was set in your number four well?

A We set five and half inch in both of the wells.

Q And could you tell me the size of the open hole below the five and a half?

A I don't have that figure. I would be glad to get it for you.

MR. MASSEY: Six and three quarters, I believe. We drilled a big hole to total depth.

Q That is, that the five and a half was swung and cemented.

A I didn't hear your question.

Q That means that the five and a half must have been swung and cemented, is that right.

A MR. MASSEY: That's correct.

Q You think that is a preferable method of setting pipe?

A (by Adams) I would like to refer that question to Mr. Massey. He is in charge of the work out there.

MR. SPURRIER: Do either one of you know the answer?

MR. ADAMS: I don't know.

MR. MASSEY: Generally our policy is to drill shoulder and ran hole ahead and set the casing on the shoulder. But as testified earlier, in the completion of the well and the difficulty at the time with the offset well, we changed the policy after the large holes had been drilled.

Q Mr. Massey, in your estimation then, it is preferable in getting good cement jobs to set your pipe on the shoulder and cemented place and attempt to cement rather than attempt to cement it in the open hole. Aren't you sure of a better cement job around your pipe as a rule?

MR. MASSEY: In the over all picture, I wouldn't say that was necessarily so. In this job we used a packer type shoe and we are satisfied that the cement job was just as successful.

Q If it becomes necessary to later on to do some remedial work of some kind in the open hole below the casing, which I understand is six and three quarters and the casing is five and a half, the hole size is larger than the casing, doesn't that require that you set a liner or some sort of inside string rather than depending on a packer in there?

A That is true, the type of work over or remedial work would depend on the job desired. The liner could be set. A temporary bridge put into the hole and cement squeeze job performed certainly would eliminate at this time the use of formation packers.

Q The reason I asked was to determine whether you contemplated that it would ever be necessary or possibly necessary in the future to do any remedial work in the open hole in the Ellenberger. Or, whether you thought that the well would produce its productive life without requiring a work over job.

A We believe so.

Q You believe that it will produce to completion without necessity to work over?

A As we see it now, yes, sir.

Q Is it your opinion that the production from the McKee formation will be obtained primarily from gas expansion or water drive or the combination of both?

A We **feel** at this time it will be obtained from gas expansion.

Q If it is obtained from the gas expansion type of drive, then you anticipate that the reservoir pressures will decline progressively as the oil is removed from the reservoir?

A Yes, sir.

Q Get lower and lower as production takes place?

A That's correct.

Q And that as the pressures are reduced that it will be a -- for a time at least the gas-oil ratio will increase progressively?

A I would think so.

Q Get higher and higher to reach some sort of a peak before it tends <sup>to</sup> decline, is that right?

A Yes.

Q In your opinion, do you think that you will ever have any water at all to handle in the McKee formation in conjunction with your production?

A That is, of course, just an estimate or guess, at this time we do not anticipate it.

Q You don't anticipate sufficient water that the McKee formation, the production from the McKee formation will not be stopped due to the well loading up with water in the annulus?

A I can't answer that question because I cannot tell you.

Q It is a possibility that sometime in the life of the well sufficient water may come into the well bore in conjunction with the oil so that there will be difficulty to flow the water and oil combination through the annulus between the tubing and casing, is that right?

A If it should start making sufficient water, that is true.

Q In that event it would be necessary to use some means of artificial lift to produce the oil from the McKee formation?

A If the cut becomes high enough to.

Q In that event, how would you propose to lift that oil and water in the annulus?

A At the present time it would be done with gas lift.

Q You would have to run a small string of pipe parallel to your tubing and inject gas, is that it?

A That's right.

Q That rather restricts the area of the annulus, doesn't it, whatever size of inside string you run?

A Normally the size of casing or the oil string in the well has some effect on what you can do with gas lift installations.

Q If you have to run an additional string of tubing to produce your Ellenberger, you would further reduce the effective area within the casing so that you are limiting the amount of production that you can take out, are you not?

A That's right.

Q Did you say what size tubing you had in this well?

A Two inch tubing.

Q Is it your opinion that the reservoir pressures of the McKee will decline faster or slower than the reservoir pressures of the Ellenberger?

A I cannot answer that. It depends upon the production rate, the number of wells drilled in the reservoir, the type and size of the reservoir.

Q It would be a coincidence if the production rate from both reservoirs were such that the one reservoir's pressure wouldn't decline more rapidly than the other?

A It would be a coincidence.

Q It usually doesn't happen that way, is that right? You take two reservoirs, the reservoir pressures don't decline at the same rate, isn't that right?

A I think that in lime type reservoirs there have been different ones where the pressure declined for oil produced has been quite similar.

Q Similar, but they don't keep in step.

A If you are talking about pound for pound, obviously you would have to say it would be a pure coincidence.

Q If that is--unless it is a coincidence then the differential pressure across whatever packers that you have in the well to segregate the two horizons, that differential pressure is increased with whatever differential takes place due to the

difference in the decline in pressure, is that right?

A In shut-in conditions, yes.

Q Well, wouldn't that be applicable to flowing conditions too?

A Flowing rates would determine to a certain extent the differential you would have across your packer.

Q Aren't the draw downs greater in the McKee than they are in the Ellenberger?

A I cannot answer that because we have not run a P.I. test on the McKee.

Q You haven't tested it? Is it your opinion that the production from the Ellenberger be obtained primarily from gas expansion or water drive or combination?

A Only thing I have is the evidence and the study that we have made of the Brunson pool or Ellenberger formation, the producing rate that we now have. I don't believe that we can draw the conclusion that we have an active water drive. There definitely does seem to be some water encroachment.

Q Do you know the apparent production rate of the Ellenberger?

A 90 barrels per day.

Q And do you know whether that is the production rate that one would normally anticipate for a well of that depth under the New Mexico ordinance?

A No, sir. It is less.

Q Do you believe that certain wells in the Brunson-Ellenberger pool will make sufficient water during their life time so that it might be difficult to produce them flowing through two inch tubing?

A No, sir, I do not.

Q That condition might exist, might it not?

A It might.

Q Without your knowledge?

A It might.

Q In that event would it or wouldn't it be necessary to install some sort of artificial lift equipment to produce the Ellenberger oil?

A Yes. It could possibly be that an artificial lift would have to be applied to the Ellenberger formation.

Q Would it be your recommendation under those circumstances that gas lift be employed or that some type of pumping equipment would be employed?

A I think that would depend--in dual installation, if the upper zone were still flowing by annulus, you could have a choice of producing the lower zone with gas lift or with pump.

Q Again, if the upper zone were producing by gas lift, would you still have the same opportunity to gas lift the Ellenberger oil?

A You mean a dual gas lift installation?

Q A dual gas lift.

A Yes, sir.

Q You would have your annulus pretty well crowded up with valves and one thing and another, would you not?

A Not necessarily so. If you want an example, the Union Oil Company in the Dollar Hyde field have five and a half inch casing and are dually gas lifting the Siluro and Ellenberger

formation from respectively around 8 thousand and 10 thousand feet deep with strings of tubing which means two strings dually gas lifting those two formations.

Q Do you know what size strings or tubing they are using?

A Two and a half strings with the inside one quarter inch Macaroni.

Q Doesn't that kind of an installation rather restrict the amount of fluid that can be produced? Isn't there a definite limit as to how much fluid you can put through a two and a half inch tubing with a Macaroni string inside it.

A I would say offhand that a minimum of approximately 150 barrels per day from each zone could be produced.

Q In the event it were necessary to produce more fluid from a dually completed well in the Brunson area, you would be definitely limited to fluid rights of approximately what you stated?

A With the type of installation that I stated, yes.

Q Well, now if single completions were made in that area, all other conditions being equal, all relative to the fluid, size of casing, would it not be possible to install equipment that would handle a great deal more fluid?

A You would then have to be assuming that the formations had been depleted to such a state that comparable situations, that gas lift had to be installed. I don't know whether you would produce any more fluid or not.

Q They pleaded to the state that in order to get the allowable,

let us put it, it would be necessary to produce greater amounts of fluid progressively as time went on?

A I don't believe that, of course, you are assuming that the percentage of water has increased making volumes larger and larger.

Q That's right.

A I believe earlier in my testimony I said that I didn't believe that the McKee would be a water drive and that the Ellenberger would be only water encroachment. I do not believe that under those conditions that the cuts by the time the well has depleted, the cuts would go to such a high figure that we could not handle the fluid.

Q As I understood Mr. Adams, this was to be a permanent order to the Commission that was your intention and if it is a permanent order of the Commission, would it in your estimation be equitable to let other operators to dually complete in other fields in New Mexico?

A As far as we are concerned, each field would have to stand on its own merits and we would see no objection.

Q In other fields you might not encounter the same ideal conditions of limitation of fluid to be produced from a dually completed well such as you have limited your testimony to, is that right?

A If the Commission decided that it would create waste, it appears obvious that they would disprove the application.

Q My question--

MR. ADAMS: (Interrupting) I would like to interject one thing that in my opinion, no order that the Commission issues is permanent. They have these hearings every month and what they find one month, they might change their minds on it next month, due to changed conditions or something.

Q Due to--what I object to--

A We aren't specifying any time limit, if that is what you mean by permanent.

Q What I meant is if you have a semi-permanent order, we will put it that way, then that is a precedent, is it not, for some other operator to ask for a similar--

MR. ADAMS: I think they should be entitled to it, yes, sir.

Q And the conditions that that operator is confronted might not be as ideal as the conditions as Mr. Massey is testifying to?

MR. ADAMS: That's correct and that would be up to the Commission to decide.

Q The point of my question of Mr. Massey is that a singularly completed well to either the McKee or the Ellenberger formation has a great deal more flexibility in production rate due to the ability to put in larger pumping equipment it doesn't have the limitation, say of one hundred fifty barrels of fluid through the tubing, the tubing put in, larger tubing, you can go to casing pump, you can put in intermediate pumps, you have a wide range of operation that you do not have

with an inside five and a half inch casing with the necessity to produce two reservoirs through one string of casing. That is, it wouldn't, that I wanted to bring out for Mr. Massey. Would you agree with that, Mr. Massey?

MR. MASSEY: I think, generally speaking the larger size casing or the single completions.

Q They are much more practical?

A You could produce at this time greater quantities of fluid as an example with a Reeder pump.

Q You can produce a lot more through a single completion than through a dual completion. In the event that it is found that there is leakage or migration from one reservoir to another through the forms that Mr. Adams proposes to submit or otherwise, what position is the operator--does he know whether the mechanism or the dual completion is at fault or does he know that the leak is coming through some poor cement job and run the casing through some leak in the casing? How can you identify where the leak comes from in a dual completion?

MR. BODIE: Mr. Chairman?

MR. SPURRIER: Mr. Bodie.

MR. BODIE: E. E. Bodie from the Cities Service Oil Company. I object to the line of questioning of the operators here. There has been no testimony, direct testimony from these witnesses in regard to the line of testimony he is cross

examining on if the gentleman wishes to put on testimony of his own let him get his own witness up there and put his witness on in that manner. If not, I move that we adjourn today until we can hire a lawyer and carry this out in regular court procedure.

MR. SPURRIER: Gentlemen, we will recess until 9:30 in the morning.

Recess.

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STATE OF NEW MEXICO )  
COUNTY OF BERNALILLO ) SS.

I HEREBY CERTIFY, that the foregoing and attached transcript of proceedings before the Oil Conservation Commission, in Case No. 269, on May 22, 1951, at Santa Fe, is a true and correct record of this portion of the same to the best of my knowledge, skill and ability.

Dated at Albuquerque, this 13th, day of June, 1951.

  
Reporter

(Proceedings of May 23, 1951, beginning at 9:30 A. M.  
before Honorable R. R. Spurrier, Secretary and Member.)

(Case 274, continued.)

MR. SPURRIER: The meeting will come to order, gentlemen. Yesterday evening Mr. Bodie made a protest on the method of the kind of questioning by Mr. Dewey. I think Mr. Bodie's protest or objections will be sustained, and if Mr. Dewey desires to testify, why, we will put him on the witness stand. If you care to cross examine in line with the direct examination of Mr. Massey or Mr. Adams, you may proceed.

MR. CAMPBELL: Mr. Commissioner, I would like the record to show the appearance of Jack M. Campbell of Atwood, Malone and Campbell, Roswell, New Mexico, for Cities Service Oil Company. Unfortunately, I did not stay for the first portion of this hearing yesterday. I have been over it--with the Cities Service Witnesses, the testimony and the exhibits they presented.

We feel that sufficient evidence and opinions, ample evidence as to the mechanical set up of these wells, is an evidence to justify the Commission in granting this application. And for the sake of maintaining some order in the record, we feel that if there are those who have testimony to present to the contrary or as to the mechanical features or as to dual completions generally, then they should take the witness

stand and present testimony for the Commission's consideration, and to give us an opportunity to determine what their views are in the matter so that we can bring out their views the differences of viewpoint, and the Commission will have then some order in the record. We have no objections to cross examination of our witnesses, but feel it should be confined to the testimony offered. And feel as far as we are concerned we are ready to rest our case.

We may want to put on some rebuttal after hearing the objections of those who appear to be in opposition to the application.

MR. SPURRIER: You may proceed, Mr. Dewey.

MR. DEWEY: Mr. Spurrier, I apologize if the line of questioning is out of order and caused the Commission any embarrassment or Mr. Massey. We felt that the burden of the application rested with the applicant, and with no intention-- we did not intend to over step the bounds of propriety. If the Commission will accept it, I would like to make a statement at the end of the hearing summarizing the views of the Humble Oil and Refining Company.

MR. SPURRIER: Very well. Mr. Campbell, I understand now your case is complete?

MR. CAMPBELL: We feel we have made out, and the burden has been accepted by us, and we have made a *prima facie* case.

MR. HUGHSTON: We would like to ask Mr. Adams one or

two more questions.

MR. SPURRIER: All right.

BY MR. HUGHSTON:

Q Mr. Adams, you stated yesterday it was your company's preference that dual completions rather than transfer of allowable be granted.

A That's correct.

Q How do you favor dual completions over transfer of allowable?

A In the first place, the Commission has found that in the Brunson pool 90 barrels of oil a day is more or less the MER for that reservoir. In this north extension, it probably could be produced at a higher rate, but I don't believe it could sustain a production of 180 barrels very long. And we do feel mechanically, dual completions are practical and feasible and that is the best solution to the problem.

Q Is it part based on the fact that it complies with spacing already in the field?

A Not necessarily. If we felt we had a reservoir that could drain more than 40 acres, we would certainly come in and try for wider spacing.

Q Sir?

A If we felt we had a reservoir that would drain more than 40 acres we certainly would come in and try for wider spacing.

Q Well, is it your opinion one well will adequately drain

80 acres in the Brunson pool?

A I don't know.

Q Have you made any study in that connection?

A No, sir.

Q Would it be your opinion that a dual completion is fairer to the other operators in the field than transfer of allowable?

A Yes, sir.

Q Does Cities Service study of the Ellenberger field indicate it is an innerconnected homogeneous formation or heterogeneous formation?

A I can't answer the question.

Q Can you answer with reference to the McKee horizon?

A No, sir.

MR. HUGHSTON: That's all.

MR. SPURRIER: Anyone else?

MR. NESTOR: Mr. Adams, yesterday during our discussion of the reservoirs, I believe that you or Mr. Massey, I can't recall which, stated that you had reason to believe that the McKee reservoir and possibly the Ellenberger were gas drive or depletion type reservoirs.

A That was my personal opinion, not necessarily that of the company.

MR. NESTOR: Mr. Chairman, am I at liberty to question Mr. Massey now?

MR. CAMPBELL: If the Commission please, you wish to excuse this other witness?

MR. NESTOR: We questioned both simultaneously yesterday.

MR. CAMPBELL: I think for the record, if you wish to excuse Mr. Adams, if that is all your questions.

MR. NESTOR: We may have other questions from Mr. Adams, neither one is qualified to comment, on what they stated, and we questioned both simultaneously yesterday.

MR. CAMPBELL: I think it would be much easier if you had to bring Mr. Adams back, why, then, do it. But I think we ought to let the record show that Mr. Massey takes the stand and you are questioning him so that it won't be a matter of a debating society here. Go ahead and question him as far as we are concerned.

(Further testimony by Mr. Massey.)

BY MR. NESTOR:

Q How does oil reach the bore hole in a gas drive reservoir?

A Well, generally speaking from pressure differential.

Q Now, to induce flow, does there have to be some expenditure of energy?

A That is correct.

Q Then after the oil has reached the bore hole, how does it reach the surface in a gas drive reservoir during the period of flow?

A By means of bottom hole pressure and the gas breaking out of solution as the fluid travels upward.

Q In flowing oil to the surface is there any energy expended?

A Certainly.

Q In a depletion type reservoir, is this energy ever replaced?

A You mean the gas dissolved?

Q Yes. The energy we are using up to get this oil to the surface, first moving to the bore hole and then getting to the surface.

A There is no outside replacement of energy, no.

Q Is annular flow as efficient as flow through two inch tubing?

A Repeat that.

Q Is annular flow as efficient as flow through two inch tubing?

A Generally speaking, no.

Q Now we are using energy, gas energy, to move the oil to the surface and therefore if annular flow isn't as efficient as flow through tubing, are we not wasting some of the gas energy?

A As long as the gas-oil ratios remain comparable, I would say you are not.

Q Well, we have just commented that the flow, the annular flow, isn't as efficient and it is a function of energy.

A That is correct. But in measuring the consumption of that energy, you only have the drop in bottom hole pressure which shows up, plus the fact of the amount of gas produced per barrel. As long as the barrels produced per pound bottom hole pressure drop and the gas-oil ratio is the same, and the maintenance of flow is the same, I cannot see where you have used more energy.

Q If it isn't as efficient, how can they be the same, that is the question.

A Well, it may be the definition of efficiency--that may qualify the point more as far as I am concerned. In other words, it is possible to flow this particular well through tubing, a smaller annular space, when it will not flow through a larger annular space.

Q That in itself then would be some indication of efficiency, wouldn't it?

A That would be an indication of the ability of the well to produce.

Q Or the efficiency. That is another way of saying efficiency. The ability of the well to produce is the efficiency.

A If you desire to put it that way.

Q Now if energy is wasted in annular flow which we must have in a dual completion, wouldn't this result in the loss of recoverable oil?

A I do not particularly agree energy is wasted in annular flow.

MR. NESTOR: I have no more questions.

BY MR. CAMPBELL:

Q Mr. Massey, in connection with the point apparently being brought out here, is that same thing true for oil-gas dual completions, as far as the oil reservoir is concerned?

A Yes, it is in oil.

Q And oil-gas dual completions have been approved by this Commission, is that correct?

A That is correct.

MR. CAMPBELL: That is all.

MR. NESTOR: A question please.

BY MR. NESTOR:

Q I think you are confusing the issue here in that the Commission has never gone on record as having permitted annular flow of the oil in a dual completion in the State of New Mexico. Am I correct?

A That is correct, as I understand it.

BY MR. SAVAGE:

Q I believe you stated yesterday, Mr. Massey, that failing natural flow, the next thing would be gas lift in your opinion?

A I said, if I remember correctly, that some type of artificial lift which could at this time possibly be gas lift or by means of a pump.

Q Assuming that gas lift will not be satisfactory, can you tell us of any nationally advertised and accepted oil tools to lift oil by pumping means through dually completed wells? Is such an accepted technique.

A You mean pumping from both zones?

Q Yes. In, oil, wells of the type that have a, say, five and a half inch casing.

A At the present time we are using in the Shafter Lake pool in Texas a pump with which we can pump one zone, and by means

of raising or lowering the sucker rod strip open and close ports, which allows us then to pump the other zone.

Q Are both pumped simultaneously?

A Not at the same time, no, sir.

Q And is the equipment not still in the experimental stage?

A As far as we are concerned in respect to the pump, it isn't. We have used it a sufficient length of time and it has proved satisfactory, and the Commission in Texas has given us authority to install it in five wells and produce them.

Q As I understand this is still not a usual technique, let us say.

MR. CAMPBELL: If the Commission please, he has testified as far as his company is concerned, it is an acceptable piece of equipment. I don't see any point in arguing with him.

MR. SAVAGE: I am trying to bring out the thing isn't nationally advertised and in wide use and generally accepted within the industry as ordinary deep well pumps now manufactured.

MR. CAMPBELL: If he knows whether it is or not he can answer.

THE WITNESS: At the present time the reason is that in the design and development of the pump by the concern that makes it, the pump has not been released to any particular manufacturer to make it and market it.

MR. ADAMS: May I elaborate a little bit on that?  
The Gulf Oil Corporation at the present time has an application pending in this particular field for the same type of pump. Sinclair is also using it. At the present time the Fluid Pack Pump Corporation in Los Angeles is making it. It is for sale to the public but it is comparatively new.

MR. SPURRIER: Mr. Massey, if the Texas Railroad Commission allowed use of it on an experimental basis or gave you more or less--

A (Interrupting) They gave us, as I understand it, one year in which certain tests and information was to be gathered and presented.

MR. SPURRIER: Do you have anything more?

MR. SAVAGE: I think your statement proves that at least some authorities hold it is still of an experimental nature.

MR. ADAMS: It was in use at least a year before the Texas Commission approved it.

MR. NESTOR: Many are in use longer than that before they are approved.

MR. ADAMS: That's right. And the only way it can be proved is to use it.

MR. NESTOR: Mr. Massey, you stated that you pumped the two zones alternately. I wonder if you can give us some detail as to how you produced those two zones?

A I can't tell. That field isn't under my jurisdiction.

MR. NESTOR: I see.

A And other than the fact that I stated before about the operation of it is about the extent of my knowledge. I haven't actually been on the job day in and day out.

MR. NESTOR: Would it be your opinion that producing the zones alternately, I assume you don't change the setting of the pump every day, in such case would such production be the most efficient way of stripping your reservoirs, in your opinion?

A Well, again it depends upon the reservoir, and the stage of depletion and so forth.

Q I wonder if you could tell me what you mean by that?

A Well, as an example, I can see no objection to producing any particular zone for ten days and then switching to another zone, particularly as it applies in this field in which it is operating.

MR. NESTOR: Is that normal practice in any of your wells in the State of New Mexico, to produce them say ten days and at double the amount of oil?

A No, it isn't. Not at the present ruling.

MR. NESTOR: That is all.

MR. SPURRIER: Does anyone have anything further?

MR. LOVERING: If the Commission please, I want to ask a question as to the suitability of this dual<sup>producing</sup>/equipment if either zone would make any quantity of water. Would it

be desirable to pump a well only part time if it was making any quantity of water. Could they handle any appreciable quantity of fluid in five and a half inch casing with that type of equipment.

A I think that would depend upon the action of the reservoir and the well. If you are referring to the point that by not producing it daily the particular well would load up with water and it might take you then five or ten days of pumping before getting oil back, that would particularly be a condition and a problem.

MR. CAMPBELL: Mr. Massey, based upon your knowledge and the mechanical situation of the wells included in your application, and a knowledge of the reservoirs involved, and the experience of your company in dual completions, is it your opinion that these wells can be dually completed in the manner which you have recommended without damage to the reservoir and without waste of oil?

A Yes, I believe they can.

MR. CAMPBELL: That is all.

MR. SPURRIER: Does anyone have any further question?

Mr. Nestor?

BY MR. NESTOR:

Q Mr. Massey, to your knowledge do any wells in the Ellenberger reservoir make water at this time?

A Yes, sir, they do.

Q Would you give an estimate as to the number of wells that make water, just roughly, or a per cent?

A Not having made that particular survey, I can't tell you. I know there are some, located particularly down ~~the~~ structure which obviously there seems to be water encroachments.

Q To your knowledge, do those wells make considerable volumes of water, some of them?

A To my recollection, not too much water. Percentage-wise, perhaps, yes.

Q Could you give an estimate as to the volume since we are worrying about having to get fuel out?

A The estimate would be purely guess with me at this time.

MR. NESTOR: That is all.

MR. SPURRIER: If there are no further questions the witness may be excused.

MR. NESTOR: May they be recalled for further questioning?

MR. SPURRIER: At what time?

MR. NESTOR: After we present part of our case.

MR. CAMPBELL: They probably will be recalled by us after you present your case.

MR. NESTOR: All right.

MR. SPURRIER: You have witnesses to put on the stand?

MR. HUGHSTON: That is what I wish to state. Whether you would wish us to proceed or wait until Tide Water presents its case.

MR. ARMSTRONG: We will put on our case. If they desire to rebut in each case reply to both cases, whatever the Commission desires is agreeable to us.

MR. CAMPBELL: There may be some other testimony confined to this particular case and perhaps it would be better to get it in and then put the Tide Water evidence on.

MR. SPURRIER: Yes, I would rather put this whole case on, then come to yours.

MR. ARMSTRONG: It is perfectly all right with us.

MR. SPURRIER: You may proceed.

E. W. NESTOR,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. HUGHSTON:

Q State your name please.

A E. W. Nestor.

Q By whom are you employed, Mr. Nestor?

A Shell Oil Company.

Q In what capacity?

A As Exploratory Engineer in the Hobbs Office.

Q Are you a geologist also?

A Yes, sir.

Q Have you ever qualified to testify before the Commission?

A No, sir, I haven't.

Q What is your educational background for your profession?

A I hold a degree of Bachelor of Science in Petroleum Engineering and Natural Gas from Pennsylvania State College and graduated in 1941.

Q How much experience have you had in the practice of your profession?

A I have been in the oil fields since '46, approximately five years.

Q Have you made any study of the Brunson area, had any contacts with it?

A Yes, sir, I have.

Q For how long?

A For the past several years.

Q Have you made any study of the completion of the Cities Service S-4 well?

A Yes, I have.

Q Will you detail to the commission the study you made and your findings as a result thereof?

A Yes, sir, I will. From my study and the testimony entered in the record by representatives of the Cities Service Oil Company yesterday, I find that the well in question, Cities Service State S-4, at this time is already producing in a dually completed condition. And that this--such a completion--is not permitted presently by any rules or regulations in effect by the New Mexico Oil Conservation Commission.

MR. CAMPBELL: Mr. Commissioner, he is testifying in

connection with the violation of the rules and regulations of the Commission. Is that correct? And testifying--

A (Interrupting) I am testifying, sir, on evidence given yesterday in this case--

MR. CAMPBELL: (Interrupting) The Commission it seems to me can determine what is in evidence in this case. I don't believe it needs to be advised of the testimony.

MR. SPURRIER: Are you making an objection?

MR. CAMPBELL: I am making an objection to him making statements that his evaluation of the testimony is that these people are violating rules and regulations of the Commission.

MR. SPURRIER: The objection is sustained, because the Commission did give the company permission to dually complete the well.

THE WITNESS: I haven't been fully heard. If you will wait and then object. My argument is this. Even though a packer separates the perforations through the casing in the upper part of the well, this well is already producing dually from the open hole. General practice in the Brunson field area has been do one of two things. A well may be completed by running casing to total depth and completing the well through perforations of the casing opposite the Ellenberger formation. An alternate way is to set casing on top of the Ellenberger formation, as recognized by geologists, and completing such a well from an open hole. This well has been completed by setting casing in the open hole and above the top of the

Ellenberger lime formation in such a manner as to leave members of the Simpson Sand, or a member of the Simpson Sand open to production in the open hole along with the Ellenberger formation.

MR. CAMPBELL: I wish the witness would state, as he renders these opinions, whether he bases them on any study of conditions in the field. Would you mind stating what your studies consisted of before you make estimates of the situation?

THE WITNESS: If you will state the question, I will try to answer the question for you. I don't know just what you have in mind.

MR. CAMPBELL: Mr. Commissioner, I believe before he renders the opinions in this argument, the basis of them should be established. In other words, whether obtained from micro-magnetic logs or samples or what else you have to base opinions on. Otherwise, they are just opinions and we are entitled to know what he bases them on.

THE WITNESS: I base my findings, my understanding, my opinion of this completion, on copies of the electrical survey run in this well and the data presented in evidence, and on the applicable state forms by the Cities Service Oil Company.

Q (by Mr. Hughston) Have you compared the electric logs of the State S-4 well with the electric logs of other wells in the field?

A I have.

Q With several other wells in the field?

A Yes, sir. Will all adjacent wells in the field.

Q And what particular horizon have you noticed that is below the depth of 8030 feet where, I believe, casing is set in the S-4 well that isn't a part of the Ellenberger.

A That is a part of the Simpson Sand section as indicated by the electrical log and by comparison of electrical logs of other wells already completed in the Hare field and so recognized by the Conservation Commission.

Q Do you have the electrical logs you have compared it with?

A Yes, sir, I do.

Q I suggest you take those out and offer them to the Commission. The log of the State S-4 well with which we will compare and the logs of the other wells, and we will mark it as Shell Exhibit No. 1. Those three will be sufficient. You have several more there and you may be interrogated about them if anyone wishes to. Now, will you take the log of the Cities Service S.-4 and compare it with one of the logs which you have there and state which log it is. Which log are you making the comparison--

A This first log which I lay beside it is the Cities Service S-3 well.

Q Where do you find the top of the Ellenberger in the S-3 well?

A At approximately 7828.

Q And how did you base that.

A I base that on a correlation with samples obtained in other wells, in correlation with their logs, and then by transferring the correlation from the other logs to this log.

Q All right. What are the wells in which you have the samples which with/you correlated the logs?

A Our State S-3, the east offset to the State S-3.

Q Do you have that log there?

A Yes, sir, I do.

Q Now will you mark the portions of those three logs which you consider to be at the Connell by including them in a bracket of some sort? And put beside those brackets the word Connell.

Now, what is the Connell formation?

A It is a cemented sand member in the lower Simpson series.

Q Based on your correlation of the Cities Service S-4, where is the top of the Ellenberger?

A According to my correlation, the top of the Ellenberger in the Cities Service S-4 is at approximately 8098.

Q And I believe it is in evidence that their casing is set to 8030. And where is the Connell?

A The Connell Sand, according to my interpretation is encountered in the Cities Service State S-4 at the approximate depth of 8033 to 8062.

MR. HUGHSTON: That is all.

CROSS EXAMINATION

By MR. CAMPBELL:

Q Mr. Nestor, these conclusions of yours are based upon your own interpretation? Isn't that right?

A Yes, sir.

Q And isn't it correct also that the interpretation of geologists and engineers of structures of this kind can differ?

A Yes, sir.

Q I believe you stated that according to your interpretation the top of the Ellenberger was at 8098, and the top of the Connell was 8033?

A Yes, sir.

Q Will it change your opinion in connection with this matter if you could be shown samples in place in the Ellenberger at 8030?

A Change my opinion? It would not change my interpretation of the electrical surveys which have already been run.

Q Even though Ellenberger samples were spotted at 8030 feet?

A Well, sir, in my experience with this field, I have seen Ellenberger samples as high as--roughly--7400 feet in these wells.

Q Samples in place or reworked?

A Reworked samples.

Q I am referring to samples in place.

A You asked if it would change my opinion. Nothing is going to change my opinion on electrical surveys.

Q Now in reference to this Connell you say it is part of the Simpson, is that correct?

A Yes, sir.

Q A lower portion of the Simpson?

A Yes, sir.

Q And in this area is it correct there are only the McKee and the Connell present in the Simpson?

A There is some variation of opinion as to the top and base of the McKee among the various companies. So far as I know, those companies which recognize the Connell Sand all place it in approximately the same position within two or three feet.

Q Well, now, what separates the Connell Sand from the McKee Sand?

A The same thing that separates different members of the McKee sand from each other, shale breaks.

Q Is it an impervious separation?

A Yes, sir.

Q They are, in fact, two different reservoirs?

A They are zones in the Simpson Sands. The State Commission is already on record as permitting production from the lower Simpson Sand known as the Connell in the Hare field.

Q But even assuming that to be true except for the fact that the Connell appears to be in the sand and the Ellenberger in limestone, and assuming your interpretation of the structures is correct, there is no essential difference in dual completing the upper--the Simpson altogether with separate zones--and the Ellenberger and the Connell?

A I am afraid I don't quite understand the question/

Q If this well were dually completed, you would have no objection I take it, to the inclusion of the Connell Sand in the Simpson, produced with the Simpson?

A No, sir, I could not.

Q But you do have if produced with the Ellenberger?

A In the open hole, yes. I think that is not proper.

MR. CAMPBELL: I think that is all.

CROSS EXAMINATION

By MR. SAVAGE:

Q Mr. Nestor, is this a comparable situation--has this comparable situation happened before in the Brunson area?

A Yes, sir. To my knowledge at least one other case of this sort has occurred in the Ellenberger field, known as the Brunson field.

Q Which well was that?

A That well was in the Gulf Oil Corporation--this occurred in the Gulf Oil Corporation Carson C-8.

Q Would you elaborate further as <sup>to</sup> the operators actions there?

A Yes.

MR. CAMPBELL: Mr. Commissioner, I object. On what do you base your knowledge of Gulf's operations there?

A From reports released by the Gulf in the scout check which are printed records. Information released by their company to all members participating in the New Mexico

check.

MR. CAMPBELL: I believe the Gulf representatives are present and it would be better to have them explain what happened in that well. They can testify.

MR. SAVAGE: I see no reason why we can't bring it out.

MR. CAMPBELL: It is hearsay with you.

MR. SAVAGE: No, it is recorded.

THE WITNESS: It is recorded on the electrical surveys.

MR. CAMPBELL: I have no objection to testifying about the surveys, but what Gulf did about it is another proposition.

MR. SAVAGE: Very well.

MR. SPURRIER: Mr. Boss, are you prepared to keep the record straight here?

MR. BOSS: Yes, sir.

MR. SPURRIER: Will you come up and testify?

(Mr. Nestor excused.)

R. L. BOSS,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. NESTOR:

Q Mr. Boss, do you recall the conditions attendant to the completion of your Carson C-8 well in the Brunson field?

A Yes, sir.

Q I wonder if you would explain to the Commission those

conditions which occurred during the completion of the well in the Brunson field?

A Prior to the drilling of the Carson C-8 well, Gulf had completed a well immediately south as an Ellenberger producer, in which instance there was no part of the Simpson formation present in that well. It had been removed by truncation on the high part of the ~~structure~~. The No. 8 well was drilled and approximately the same type of section had been anticipated. And when a depth was reached at which it was the interpretation that the Ellenberger had been reached, the casing was run and cemented and an electrical survey made prior, of course, to the running of the casing. And from the evidence of the electric log, it appeared that the two wells were comparable. However, coring operations were started subsequent to the drilling of the cement plug and the core recoveries indicated that the Ellenberger had not been reached and a basal portion of the Simpson was present. Within this portion of the Simpson was this lower Sand member which is commonly referred to as the Connell, and on a drill stem test this Sand produced at the rate--I don't recall exactly--but it was in the approximation of 40 barrels per hour. The coring was continued until it was definite that the Ellenberger formation had been reached, and then a liner was run to seal off the exposed portion of the Simpson formation, and the well then completed from the open hole below the liner, which was cemented in the top of the

Ellenberger dolomite.

MR. SPURRIER: Do you know what the formation pressure of the Connell is?

A No, sir.

Q Mr. Boss, could you from your knowledge of the Simpson obtained by coring a head in this well and the subsequent correlation with the electrical survey, identify this member of the Simpson known as the Connell Sand on an electrical survey of that well?

A Yes, I think so.

Q Would you oblige the Commission by correlating that location at this time for us please?

A The Gulf Carson C-8?

Q Yes, sir.

A In this copy of the electrical log from the Gulf Carson C-8 it would be my interpretation that the Connell member there included between 7415 and 7445. I do not have the record here of our core recovery through that particular interval, but it is my recollection that the cores from which we had very good recoveries corroborated this electrical survey very closely.

MR. SPURRIER: Do you mean that the Connell is 30 feet thick there when you say between 15 and 45, that those are the limits?

A That would be approximately. It would be dependent on how an individual would interpret.

MR. SPURRIER: Yes.

A Acutally, as I recall from the cores, the Sand was in excess of 20 feet in thickness.

MR. SPURRIER: Very well.

Q Mr. Boss, are you acquainted with the electrical characteristics of this Connell Sand and other wells in the Brunson field area?

A Yes, sir.

Q Would you for the Commission take these same surveys which have already been offered in evidence and mark off the Connell Sand interval in your opinion and place your initials beside them please?

(Witness complies with the request.)

Q Mr. Boss, I would ask now that you mark similarly your opinion as to the top of the Ellenberger in these same logs and at the same time, beginning with the Cities Service State S-3 and the Cities Service State S-4 and the Shell Oil No. 3 wells? Would you read into the record your opinion of the limits of the Connell Sand and the top of the Ellenberger in each case? We will get them on the record and then there will be no chance for confusion.

A In the Cities Service State S-3 well it would be my interpretation from the electrical log that the top of the Ellenberger formation was encountered at approximately 7825 feet. And the Cities Service State S-4 well, solely from the electrical log, it would be my interpretation that the Ellenberger formation

was encountered at 8100 feet.

Q Would you give the Connell Sand that way?

A I marked it on the log.

Q I see.

A In the Shell State No. 3 well, it would be my interpretation that the Ellenberger formation was encountered at 7590 feet.

Those are the three?

Q I believe your own well, the Carson, just for purposes of correlation.

A It would be our interpretation that the Ellenberger was encountered at 7485 feet in this well.

MR. NESTOR: No more questions.

CROSS EXAMINATION

By MR. CAMPBELL:

Q Mr. Boss, are you in a position to state what the attitude of Gulf is in connection with this application?

A Yes. Gulf wish to make a statement in this particular instance. The statement has no bearing on the particular case in that they have no comment to make as to the transfer of allowable or as to the dual completions. But they did wish to object to the manner in which this particular well was completed since in their opinion from the available evidence the casing was cemented to expose a portion of the Simpson formation, which included the basal sand member which is producing as a portion of the Hare pool in other wells in the area.

Q Your objection then is confined to the method of completion of Cities Service S-4?

A That is correct.

Q And that objection does not apply to Cities Service S-3?

A No, sir.

Q And I believe you stated that the--your interpretation-- of the Connell was based upon electric logs only?

A That is true.

Q You haven't had available samples which may have been taken?

A We haven't had available samples from this particular well. We always make a practice of attempting to corroborate samples evidence against the electrical logs evidence. In most instances there is a very close correlation. So that with the available evidence from the pool as a whole, one or the other seems substantial evidence. And since, in this particular well we didn't have samples available, although an attempt was made to secure them, the only evidence is the electrical survey.

MR. CAMPBELL: That is all.

MR. SPURRIER: Any further questions of Mr. Boss?

Thank you very much.

(Witness excused.)

(Recess.)

MR. DEWEY: Mr. Commissioner?

MR. SPURRIER: Mr. Dewey.

MR. DEWEY: Is it permissible at this time to ask a

question about procedure on or off the record with respect to the recent testimony about the electric logs?

MR. SPURRIER: Yes, off the record, Mr. Dewey.

(Off the record discussion.)

MR. HUGHSTON: The Ohio Oil Company has some evidence they would like to put on.

MR. SPURRIER: All right.

MR. WHEELER: I would like to have Mr. Spellman sworn as a witness.

D. K. SPELLMAN,  
having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. WHEELER:

Q State your name please.

A D. K. Spellman, Jr.

Q Have you ever testified before this Commission?

A No, sir.

Q What is your formal education and educational background?

A I have a Bachelor of Science in Petroleum Engineering and Production at the University of Tulsa and graduated in 1941.

MR. SPURRIER: Did you qualify the other day before this Commission?

A No, sir.

MR. SPURRIER: Very well.

Q How long have you been employed by the Ohio Oil Company?

A Approximately ten years, on July 1, ten years.

Q What is your present position?

A With the Ohio Oil Company I am District Petroleum Engineer in Midland.

Q As District Petroleum Engineer, as part of your duties you supervise the Ohio well completions in proven areas?

A Yes, sir.

Q You are familiar with their coring program in the Warlick C-7?

A Yes, sir. Warlick C-7 is located on our Warlick C lease which is in the SE $\frac{1}{4}$  of Section 15, Township 21 South and Range 37 East.

Q And it is approximately what distance from Cities Service well No. 4?

A About a half mile.

Q In the coring of this well, did the core analysis reveal two sand zones to be productive in the Simpson series?

A Yes, sir, two different sand zones.

Q And the basal one of these is the sand commonly referred to as the Connell Sand?

A Yes, sir.

Q You have before you there copies of the Schlumberger on our Warlick C-7 and also the Cities Service No. 4, have you not?

A I have. I have the logs put out by the West Texas Electric Log Service.

Q On these logs have you made a correlation of the Connell Sand

between our C-7, which was cored and with which you are familiar, and the Cities Service No. 4 well?

A Yes, sir, I have.

Q Where does the Connell Sand occur in the Cities Service well, based on this correlation?

A Based on the correlation the Cities Service top of the Connell would be at 8034. And I will give the lower also. The base would be at 8060.

Q Is this below the pipe?

A Yes, sir. They testified that the casing was set at 8030.

Q Is it your experience that the top of the Ellenberger is either limestone or dolomite and not a sandstone?

A It definitely is. It is generally a very hard lime.

Q Based on this, then, is it your conclusion that in the Cities Service well No. 4 at the present time the basal Simpson Sand member and the Ellenberger oil is being co-mingled?

A It definitely is.

MR. WHEELER: I believe that is all.

CROSS EXAMINATION

By MR. CAMPBELL:

Q Is your Warlick C-7 well producing from the Connell?

A Yes, sir.

Q Is that the only well in that area producing solely from the Connell?

A We are not producing solely from the Connell, also producing

from the McKee.

Q Aren't those two separate zones?

A They are Simpson Sand members that have been opened up by the majority of the operators in that area, and it is considered one reservoir.

Q Assuming you are agreeable in principal with dual completions-- I don't know what your company's attitude is--but you would have no objection to producing the Connell and the McKee as one portion of the dual completion, would you?

A You mean provided they perforate, for example, as we have done? We will take our well. We have the McKee and the Connell both open. Provided we had opened up the Ellenberger, you are talking about, would we produce the two sands together from one of the completions in the Ellenberger through another, is that right?

Q You would have no objection to that?

A Well, you generally don't--mixing the two sands, no, because they are one reservoir.

Q Well are they?

A They are now.

Q But by definition or in fact?

A In fact. Because they are open in the majority of the wells in that area.

Q That doesn't constitute a common reservoir, does it?

A Now it does.

Q They are producing at the same time is what you mean?

A Well, they are open in the casing. I mean, in most cases in that area and the fact that they are opening the casing in wells in that area, and lots of them, makes them one reservoir now.

Q Where do you show the top of the Ellenberger in your Warlick C-7?

A Warlick C-7. The top of the Ellenberger would be at 7680 feet. They only drilled into it a couple of feet and put the pipe.

Q You must be mistaken about that aren't you. Didn't you give the top of the Connell at 8034?

A That is in the S-4 well.

Q What is the top of the Connell in your well?

A 7612 in our well to 7640 feet would be the base.

Q If you saw samples taken at 8030 feet, samples in place, in the Cities Service S-4 well, and they were Ellenberger samples, would it change your view of the--

A No, sir, it wouldn't.

MR. CAMPBELL: That is all.

MR. SPURRIER: Does anyone have any further question of Mr. Spellman? Mr. Lovering?

BY MR. LOVERING:

Q Isn't it true that in most of our reservoirs that the reservoirs which we consider common reservoirs actually are

number or series of lenses separated by impenetrable streaks of varying thickness.

A Right. That is true in a lime, yes.

MR. LOVERING: That is all.

MR. SPURRIER: Any further questions? If not, the witness may be excused.

(Witness excused.)

(MR. DEWEY, having been duly sworn, made the following atatement.)

MR. DEWEY: The evidence I am about to read into the record has been given to me by our geologists. I realize that I am incompetent, not being a geologist, to check the information and comment on it very much. Beginning with the Shell State No. 3 well, their interpretation from the electric logs is that the top of the Connell formation is encountered at 7520 feet, the base of the Connell at 7550, and the top of the Ellenberger at 7585. Proceeding to the Cities Service State S-3, which is a west offset, their interpretation of the electric log is that the top of the Connell is found at 7760 and the base at 7785; and the top of the Ellenberger at 7820. Proceeding to the next location to the west, which is the Cities Service State S-4, they found from their interpretation of the electric the top of the Connell was found at 8030 and the base at 8060, and the top of the Ellenberger at 8095. From their interpretation the Connell formation appears to be--to have-- a thickness varying between 25 and 30 feet and to overlie

the Ellenberger formation at a fairly constant interval.

I do not know that they checked their electric interpretation of the log in this part of the Brunson against coring with a diamond bit that was done in our Humble State B-3 well.

That is all I have.

MR. LOVERING: I would like to question Mr. Nestor here.

BY MR. LOVERING:

Q Mr. Nestor, as stated and one of the witnesses implied, if they saw evidence of Ellenberger samples in the younger members above the Ellenberger, it wouldn't change their opinion as to the true top of the Ellenberger. How is the presence of the Ellenberger in the younger formations explained?

MR. NESTOR: That is the result of the detrital zone, which occurs at the base of the permian. Normally present in these wells, it separates the permian from the pre-permian formations. It isn't a full geological sequence in the wells in the Brunson field. This is the result of truncation of the earlier beds, washing of material from the earlier formations, and the deposition of this material is what is known as a detrital zone. This apparently occurred immediately prior to the deposition or formation of the permian beds. Consequently, this detrital zone may contain remnants and reworked material from the earlier deposited formations.

Q That answers one question. I have one other. Doesn't our study in geology teach us that this deposition of older beds on top of younger beds in such a fashion is rather a common

occurrence?

A Yes, sir. I would say that normally where there wasn't a full sequence of geologic formations, it would be anticipated that there would be detrital zones.

MR. LOVERING: That is all.

BY MR. SAVAGE:

Q Mr. Nestor, what are the dangers now present in this well of having the basal Simpson and the Ellenberger co-mingles in the same bore hole?

A The danger I see there largely would be the result of co-mingling this oil. Or from the Ellenberger formation which appears productive and the Connell member of the basal Simpson which is known to be productive in other wells and which appears productive in this well, and from the electrical survey data. It would be the tendency of the oil to migrate were there a variation in pressures in these two formations. It is impossible to say whether any variation exists inasmuch as no pressures have been offered in evidence. In similar wells of our own we have noted some variations in pressures.

Q What then, should the next step be with reference to this well?

A I believe that <sup>it</sup> were/our well we would take steps to isolate the Connell member of the Simpson series from the open hole such that it would not be in contact with the Ellenberger production. Then proceed with whatever work was necessary to restore the well to production.

MR. SAVAGE: Nothing else.

BY MR. CAMPBELL:

Q Am I to gather, Mr. Nestor, if this situation is correct as you interpret it, and if that were done, you would have no objections to the dual completion of this well?

A No, I am not saying that.

MR. CAMPBELL: That is all.

MR. HUGHSTON: That is all we have with reference to this particular situation. Anything else we have would be general and can wait the presentation of the Tide Water matter.

MR. SPURRIER: Do you have anything more in this case?

MR. CAMPBELL: Yes. I would like to ask Mr. Adams to come back as a rebuttal witness in connection with this well No. 4.

(Further testimony by Mr. Adams.)

BY MR. CAMPBELL:

Q Mr. Adams, you have heard the testimony here in connection with the interpretation of various geologists as to the top-- as to the Connell and the Ellenberger formations--in your Cities Service S-4, have you not?

A Yes, sir.

Q Do you know, Mr. Adams, the basis upon which the completion was made on your S-4?

A We had samples on the well, and those physical samples show, in the opinion of our geologist, that the top of the Ellenberger was 8030 feet.

Q And where do you place the bottom of the Connell?

A At 8020.

Q That was the information furnished by your geology department, is that correct?

A Yes, sir.

Q And are those samples to which you referred taken at 8030 feet available to the Commission and to interested parties?

A Yes, sir, they are.

MR. CAMPBELL: That is all.

BY MR. HUGHSTON:

Q Have they been released as yet, Mr. Adams?

A I can't answer that. If you ask for them you get them.

Q You say you know this was done. It is pure hearsay as far as you are concerned? Somebody told you that.

A Yes, sir, that's right.

Q You didn't examine any samples yourself?

A No, sir, I am not a geologist.

MR. HUGHSTON: That is all I have.

BY MR. NESTOR:

Q Mr. Adams, did your company have any objection to running an electrical survey in that well below the casing or securing sidewall samples from the formation in the open hole in order

to ascertain definitely what is open?

A In my opinion, that isn't necessary. I think there is sufficient information now. We have these samples. They are available for you study if you want to see them. I can't see where a sidewall core would do any good at this time.

Q Did I understand that it is your company's position then that you have a dual completion there?

A We don't have a dual completion until we have an allowable given us by the Commission. Our position is this. That the well isn't dually completed. We are producing from the Ellenberger.

Q You maintain there is no production from the Simpson section open in your well?

A No, sir, there isn't.

Q You would not be willing to have any electrical surveys run or to permit sidewall sampling of your well in the open hole?

A I don't say we wouldn't permit it, now. But I think there is sufficient data without going into that.

Q You have heard the evidence offered by geologists of other companies?

A Yes. And the samples are available for your study if you want to see them.

Q Have you known of cases where samples have been known to be confused by improper sacking of the pieces in the well by the drilling contractors?

A Yes, sir.

A Yes, sir, we know. And then I have rough-necked and taken samples myself.

MR. NESTOR: No more questions.

BY MR. CAMPBELL:

Q Mr. Adams, in the event the Commission should find, based upon the evidence presented at this hearing, that the Connell Sand was actually exposed in this well, would your company be willing to take the necessary steps to correct the situation?

A They certainly would, yes, sir.

MR. CAMPBELL: That's all.

MR. SPURRIER: No further questions? I believe the case is completed.

(Off the record.)

MR. WHEELER: Mr. Spurrier.

MR. SPURRIER: Mr. Wheeler.

MR. WHEELER: May we introduce in evidence these two logs which Mr. Spellman referred to in his testimony. They are marked Case 274. Shall I also put on Ohio exhibit?

MR. SPURRIER: Yes, please.

(Off the record.)

MR. SPURRIER: We will now take up Case 275, with the understanding that some of the remarks that will be made after a presentation of this case will apply to both 274 and 275. Is that agreeable?

MR. HUGHSTON: Some of the remarks and general evidence. Yes, sir, that is agreeable.

STATE OF NEW MEXICO     )  
                              :   SS  
COUNTY OF BERNALILLO   )

I HEREBY CERTIFY, that the foregoing and attached transcript of proceedings before the Oil Conservation Commission, in Case No. 274, on May 23, 1951, at Santa Fe, is a true and correct record of this portion of the same to the best of my knowledge, skill and ability.

Dated at Albuquerque, this 16<sup>th</sup> day of June, 1951.

G. G. Guran  
REPORTER

My Commission Expires:

August 4, 1952.





# CITIES SERVICE OIL COMPANY

PRODUCERS-REFINERS-MARKETERS OF PETROLEUM PRODUCTS

BARTLESVILLE  
OKLAHOMA

April 17, 1951

Oil Conservation Commission  
State of New Mexico  
P. O. Box 871  
Santa Fe, New Mexico

Attention: Mr. R. R. Spurrier  
Secretary and Director

Dear Mr. Spurrier:

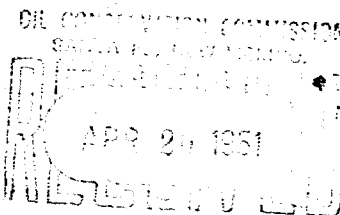
Pursuant to Order No. R-64 in Case No. 261 issued under date of March 21, 1951, Cities Service Oil Company herewith submits four copies of its amended application requesting authorization to dual complete its State "S" Nos. 3 and 4 Wells located in the Brunson-Hare Fields in the McKee Sand and Ellenberger Lime reservoirs, or an alternative request to transfer the allowables between these wells so as to permit production on the basis of 80 acre units from each of the respective reservoirs. You will recall that action on this matter was deferred at the March hearing as the State "S" No. 4 well was then drilling, and had not at that time tested either the McKee or Ellenberger. Drill stem tests have subsequently established its productiveness in these two zones.

It will be greatly appreciated if this case is docketed and set for hearing as soon as your rules and regulations governing such matters permit. I assume that this will be at the time of the statewide hearing in May.

With kindest personal regards, I am,

Sincerely yours,

R. E. Adams  
Proration Engineer

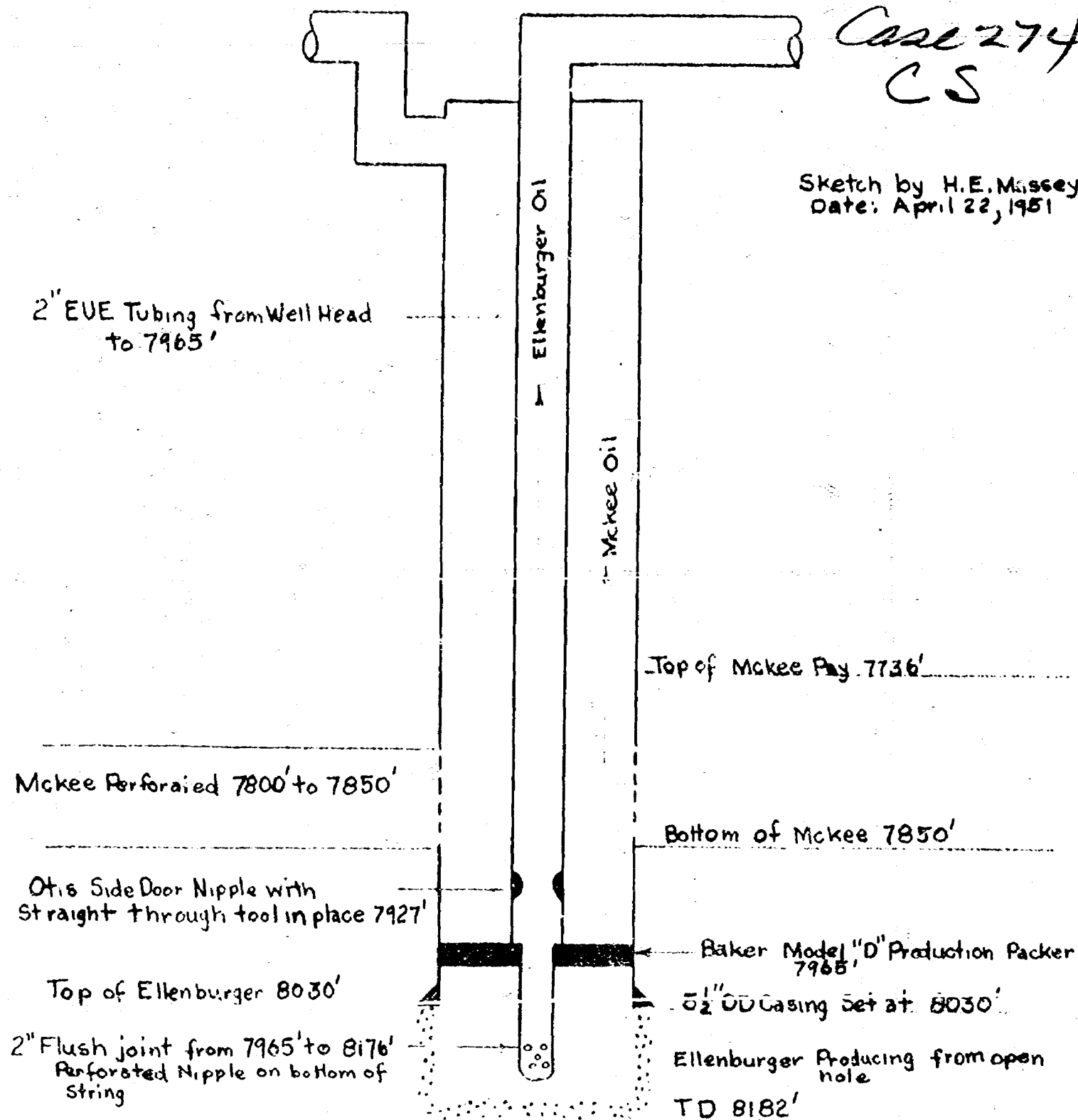


REA/mc

DIAGRAMMATIC SKETCH SHOWING DUAL COMPLETION INSTALLATION  
 CITIES SERVICE OIL COMPANY STATE "S" No. 4  
 ELLENBURGER AND MCKEE  
 BRUNSON POOL, LEA COUNTY, NEW MEXICO

EX. #3  
 Case 274  
 CS

Sketch by H.E. Massey  
 Date: April 22, 1951



Ex # 4  
Case 274  
CS

PACKER LEAKAGE TEST

CITIES SERVICE OIL COMPANY

STATE "S" NO. 4 (Ellenburger & McKee Formations)

BRUNSON AND HARE POOLS - LEA CO., NEW MEXICO

Using a Bristol 2000# - 2000# two pin pressure recording gauge a packer leakage test was run on this well in the following manner to determine if there was any leakage or communication between the Ellenburger and McKee formations.

On April 26, 1951 the well was shut in to allow the zones to build up and reach maximum shut in static conditions. By May 1, 1951 the tubing pressure (Ellenburger) was 650 psig and the casing pressure (McKee) was 1020 psig. Twenty-four hours later on May 2, 1951 the pressures were the same.

The two pin pressure recorder was hooked up with one side to record the tubing or Ellenburger pressure and the other side to record the casing or McKee pressure. The casing (McKee) was flowed for 24 hours on a 14/64" choke while the tubing (Ellenburger) was left shut in. The shut in tubing (Ellenburger) pressure remained at 650 psig and no drop in pressure was observed. Production from the McKee was 470 barrels of pipe line oil with a GOR of 908 cu. ft. per barrel. Oil gravity was 42.8 degrees API at 60° F.

The casing (McKee) was then shut in to allow it to build back to maximum shut in conditions. At the end of 24 hours the pressure had built up to 1000 psig.

Next the tubing (Ellenburger) was flowed for 24 hours on a 22/64" choke while the casing (McKee) was left shut in. The shut in casing (McKee) pressure remained at 1000 psig and no drop in pressure was observed. Production from the Ellenburger was 607 barrels of pipe line oil with a GOR of 933 cu. ft. per barrel. Oil gravity was 40.6° API at 60° F.

Results of the tests show no communication between the Ellenburger and McKee formation.

Attached please find the details of the test along with the pressure charts made by the Bristol recording pressure gauge.

Tests conducted by Mr. H. E. Massey  
District Engineer for Cities Service Oil Company

DETAILS OF PACKER LEAKAGE TEST

Test No. 1

Date Shut-in: 4-26-51 Length of time shut-in prior to test 144-3/4 hours.

DATA ON PRODUCING COMPLETION

Completion producing: Casing Reservoir: McKee Choke Size: 14/64 inches.

Twenty-four-hour shut-in pressure prior to test: 1020 psi.

Stabilized flowing pressure during test 400 psi.

Length of time for stabilized flowing pressure: 15 hours

Shut-in pressure at the end of the test: 400 psi.

Length of time in obtaining this shut-in pressure 0 hours.

DATA ON SHUT-IN COMPLETION:

Completion shut-in Tubing Reservoir Ellenburger

Twenty-four-hour shut-in pressure prior to test 650 psi.

Minimum shut-in pressure during test: 650 psi. Maximum 650 psi

Shut-in pressure at the end of the test: 650 psi.

Length of time required for pressure at the end of the test: 0 hours.

Maximum pressure change of shut-in completion during test 0 psi.

Test No. 2

Same well bore as in Test No. 1, but with Ellenburger completion, producing  
and McKee completion shut-in.

Date shut-in: 5-3-51 Length of time shut-in prior to test: 24 hours.

DATA ON PRODUCING COMPLETION:

Completion producing Tubing Reservoir Ellenburger Choke Size 22/64 inches.

Twenty-four hour shut-in pressure prior to test: 650 psi.

Stabilized flowing pressure during test: 440 psi.

Length of time for stabilized flowing pressure: 14 hours.

Shut-in pressure at the end of the test 440 psi.

Length of time in obtaining this shut-in pressure 0 hours.

DATA ON SHUT-IN COMPLETION:

Completion Shut-in Casing Reservoir McKee.

Twenty-four hour shut-in pressure prior to test 1000 psi.

Minimum shut-in pressure during test 1000 psi; Maximum 1000 psi.

Shut-in pressure at the end of the test: 1000 psi.

Length of time required for pressure at the end of the test 0 hours.

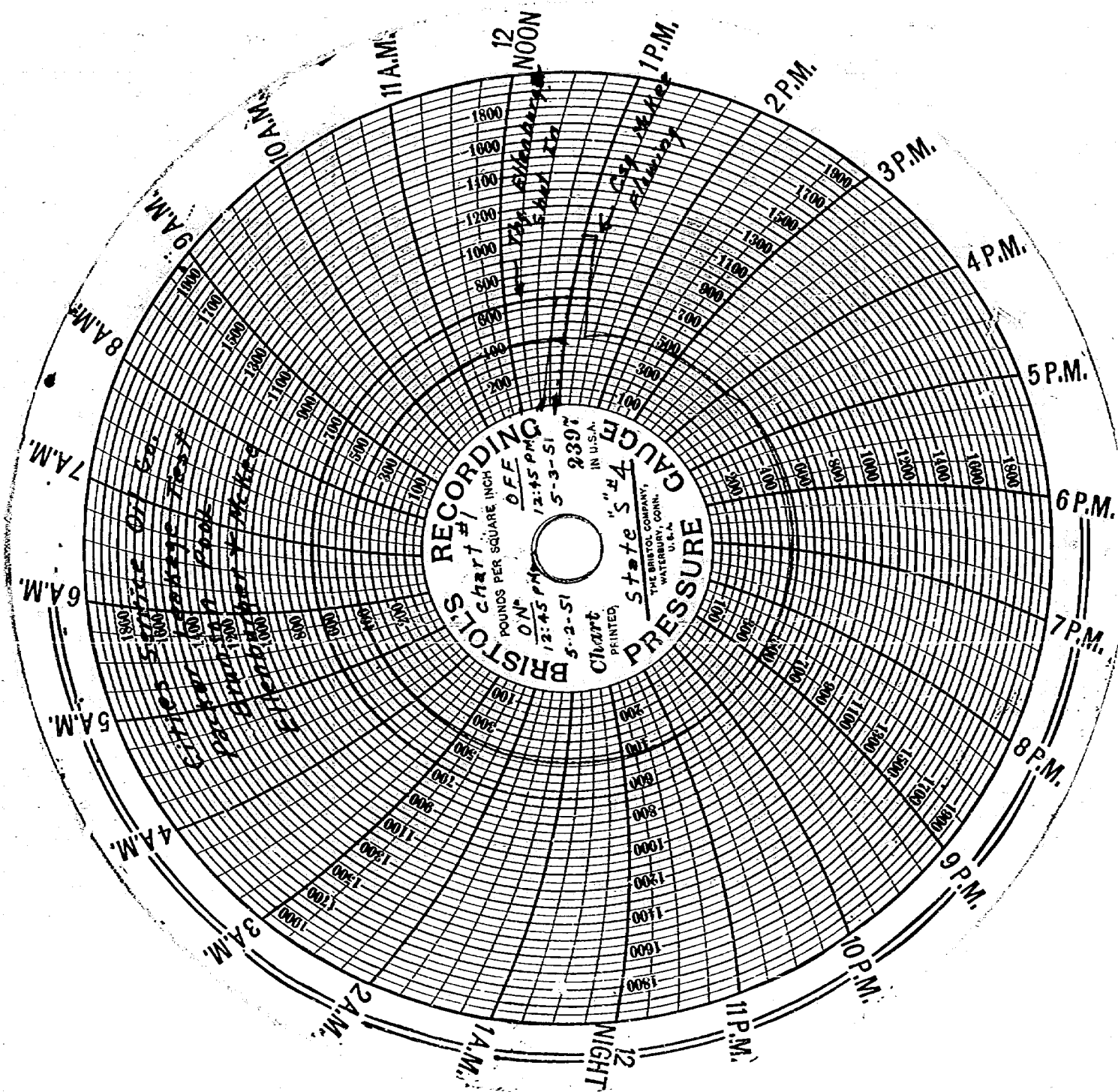
Maximum pressure change of shut-in completion during test 0 psi.

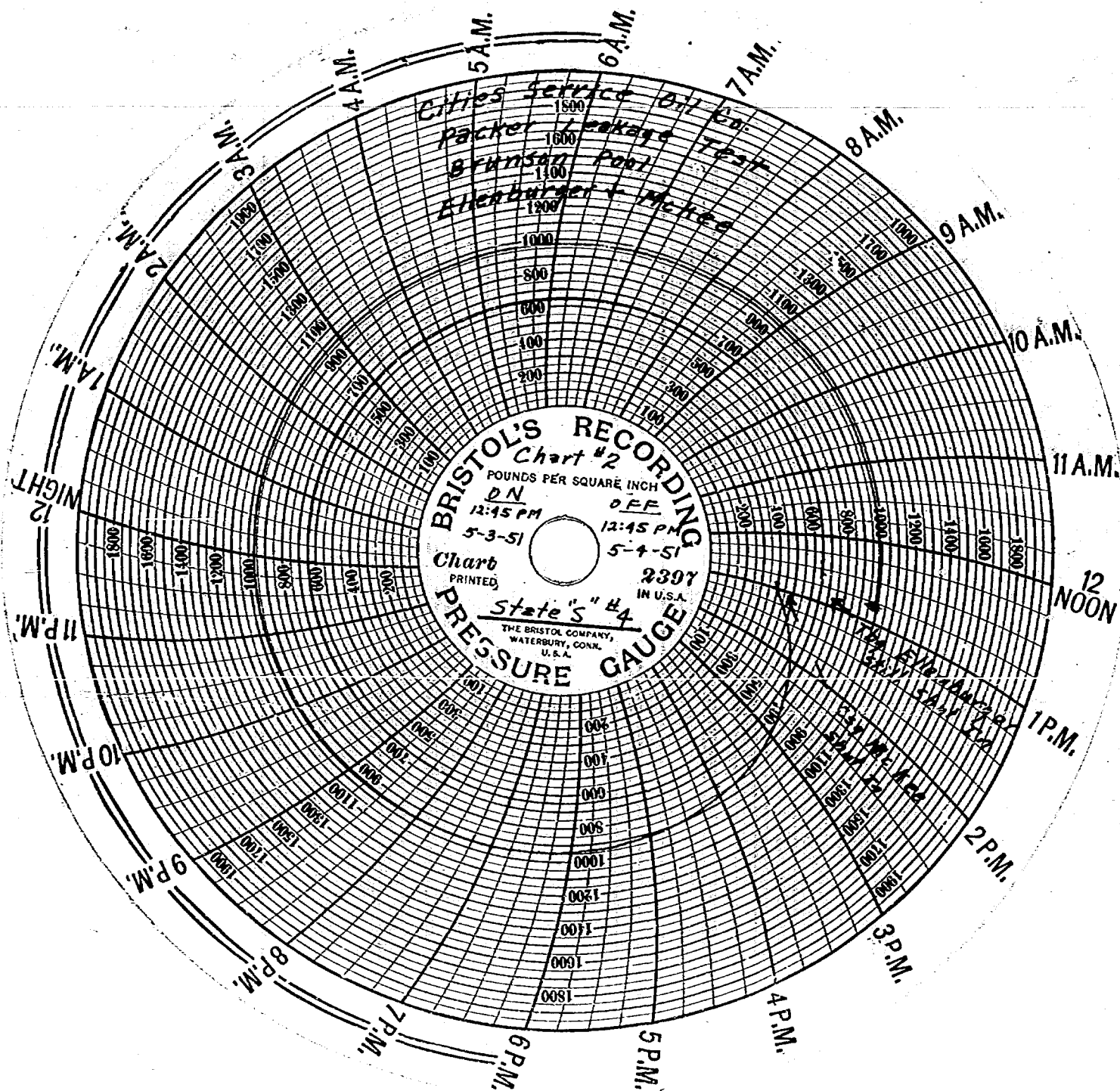
Classification of completion testing, whether oil well or gas well: Tubing Oil

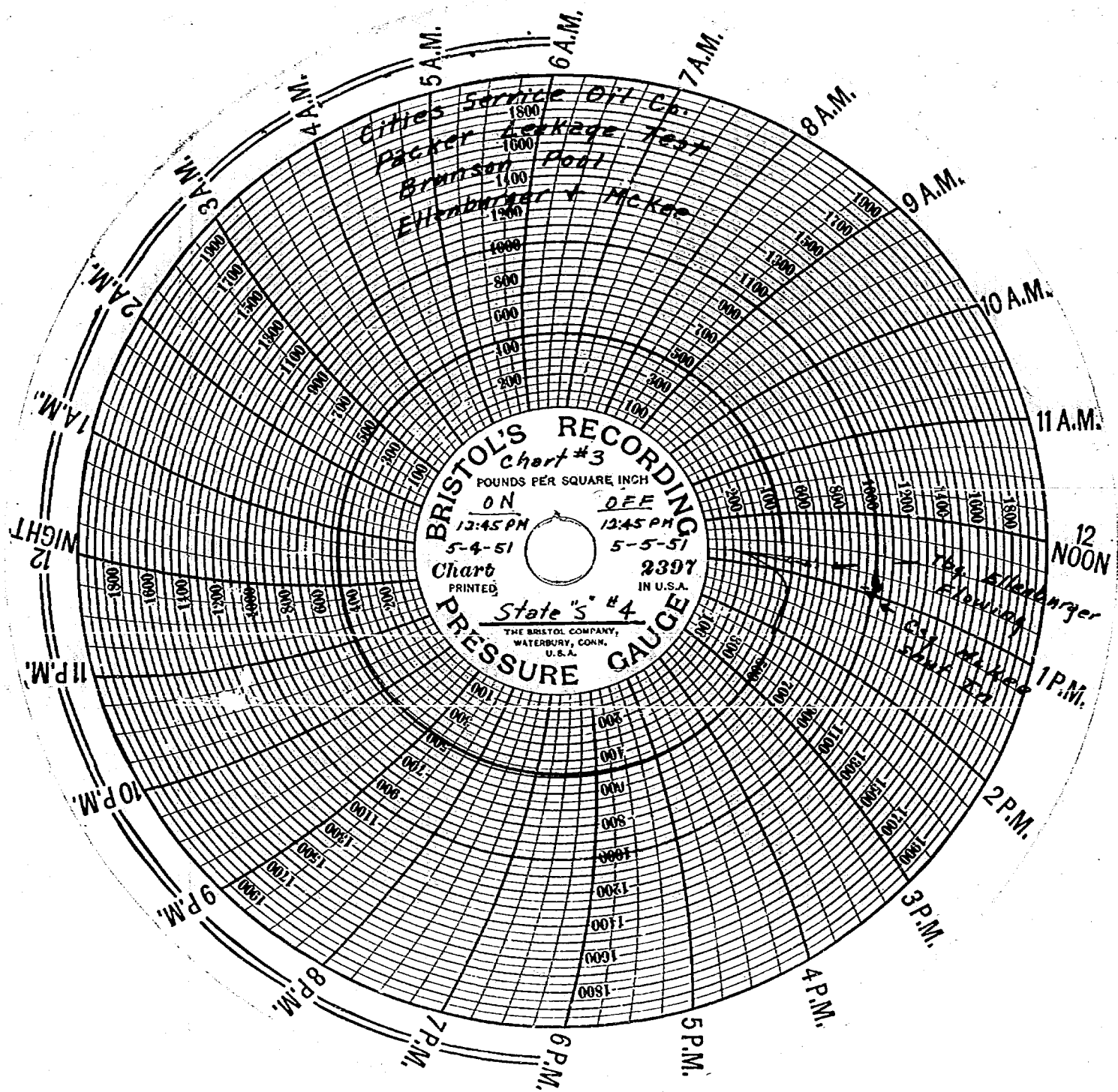
Casing Oil

Remarks: 24 hour test on McKee-Produced 470 bbls oil, no water, GOR 908.

24 hour test on Ellenburger-Produced 607 bbls. oil, no water, GOR 933.







PACKER SETTING AFFIDAVIT

EX 5  
Case 274  
CS

I, W. M. Dickey, being of lawful age  
Name of Party Making Affidavit  
and having full knowledge of the facts hereinbelow set out do state:

That I am employed by Cities Service Oil Company in the  
capacity of Production Foreman, that on 4-21, 1951,  
Date  
I personally supervised the setting of a Baker Model-D Prod. Packer  
Make and Type of Packer  
in Cities Service Oil Co, State "S",  
Operator of Well Lease Name  
Well No. 4 located in the Brunson, Lea  
Pool  
County, New Mexico at a subsurface depth of 7965 feet, said depth  
measurement having been furnished me by Lane Wells Co;  
that the purpose of setting this packer was to effect a seal in the annular  
space between the two strings of pipe where the packer was set so as to pre-  
vent the commingling, in the bore of this well, of fluids produced from a  
stratum below the packer with fluids produced from a stratum above the packer;  
that this packer was properly set and that it did, when set, effectively and  
absolutely seal off the annular space between the two strings of pipe where  
it was set in such manner as that it prevented any movement of fluids across  
the packer.

STATE OF NEW MEXICO  
COUNTY OF Lea

Before me, the undersigned authority on this day personally appeared

W. M. Dickey, known to me to be the person whose name is  
subscribed to this instrument, who after being by me duly sworn on oath,  
states that he has knowledge of all the facts stated above and that the  
same is a true and correct statement of the facts therein recited.

W. M. Dickey

Subscribed and sworn to before me on this the 22 day of  
May, 1951.

Fred L. Lusk  
Notary Public in and for Lea  
County, New Mexico

My Commission Expires Feb. 6, 1954

BEFORE THE OIL CONSERVATION COMMISSION OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE AMENDED APPLICATION )  
OF THE CITIES SERVICE OIL COMPANY TO DUAL )  
COMPLETE AND PRODUCE ITS STATE "S" NO. 3 )  
AND NO. 4 WELLS LOCATED IN THE S/2 NW/4 )  
SECTION 15, T-21-S, R-37-E, BRUNSON-HARE )  
FIELDS, LEA COUNTY, NEW MEXICO, IN THE )  
McKEE SAND AND ELLENBERGER LIME COMMON )  
SOURCES OF SUPPLY, OR, IN THE ALTERNATIVE, )  
TO AUTHORIZE THE TRANSFER OF ALLOWABLES )  
BETWEEN SAID WELLS IN SAID COMMON SOURCES )  
OF SUPPLY. )

A M E N D E D A P P L I C A T I O N

Comes now the Cities Service Oil Company, a Corporation, and respectfully shows to the Commission as follows:

1. That applicant is the owner of an oil and gas lease described as the S/2 NW/4 Section 15, T-21-S, R-37-E, Brunson-Hare Fields, Lea County, New Mexico.
2. That applicant's State "S" Well No. 3 located 75 feet North and 75 feet East of the Center of the SE/4 NW/4 of Section 21 has been drilled to a total depth of 8034 feet in the Ellenberger Lime, top of which was encountered at 7725 feet and has been completed as an oil well in that reservoir through perforations from 7860-7900 feet and 7960-8000 feet. That said well was completed on February 11, 1951, and produced flowing through a 36/64" choke 321.75 barrels of oil in 5 hours for a rated 24 hour potential of 1540 barrels with a gas-oil ratio of 915 cu. ft. per barrel.
3. That in the drilling of said State "S" No. 3 well the McKee Sand of the Simpson Zone was found from 7467-7575 feet. That on a drill stem test from 7454-7530 feet in the McKee Sand the well flowed at the rate of 99 barrels of oil per hour with a gas-oil ratio of 968 cu. ft. per barrel. That said test demonstrated the McKee Sand to be commercially productive of oil in said well. That the McKee Sand and Ellenberger Lime are separate common sources of supply separated by impermeable shale and lime in excess of 150 feet in thickness.
4. That applicant's State "S" Well No. 4 is located 100 feet East of the Center of the SW/4 NW/4 of Section 21, on the same lease as said State "S" Well No. 3, and on an adjacent 40 acre drilling unit. That said Well No. 4 has been drilled to a total depth of 8182 feet in the Ellenberger Lime, top of which was encountered at 8030 feet, and is now in the process of completion in that formation. That on a drill stem test from 8015-8182 feet in the Ellenberger Lime the well flowed at the rate of 70 barrels of oil per hour with a gas oil ratio of 658 cu. ft. per barrel. That said initial test has demonstrated the Ellenberger Lime to be commercially productive of oil in said well.
5. That in the drilling of said State "S" No. 4 Well the McKee Sand of the Simpson Zone was encountered at 7720 feet. That on a drill stem test from 7720-7852 feet the well flowed at the rate of 67 barrels of oil per hour with a gas-oil ratio of 910 cu. ft. per barrel. That said test demonstrated the McKee Sand to be commercially productive of oil in said well. That the McKee Sand and Ellenberger Lime are separate common sources of supply separated by impermeable shale and lime in excess of 150 feet in thickness.
6. That applicant proposes to install a packer, of approved mechanical design, in the interval between the base of the McKee Sand and the top of the Ellenberger Lime, in each of said State "S" Wells Nos. 3 and 4, so as to produce the Ellenberger Lime reservoir through the tubing, and the McKee Sand reservoir through the annulus between the tubing and casing. That said two common sources of supply can be separately produced through the same well bore, simultaneously or intermittently, by the use of such approved mechanical devices which will prevent any commingling of fluids therefrom or migration thereof between

the reservoirs.

7. That the production of these two reservoirs by this means and in this manner will tend to prevent waste; increase the ultimate recovery of the respective reservoirs; protect correlative rights; prevent the drilling of unnecessary wells; is in compliance with the four point program to conserve tubular goods as announced by the Petroleum Administration for Defense, and will utilize to the fullest extent materials made critical by the demand of additional wells for the defense effort, and other war production projects, all to the benefit of your applicant, other producers, royalty owners and the State of New Mexico.

8. That and in the event this Commission finds that the dual completion of applicant's State "S" No. 3 and No. 4 Wells is impractical and/or infeasible as herein proposed, it is respectfully requested that a transfer of allowables be authorized so that one well may produce from the McKee Sand with an allowable commensurate to that of two 40 acre units, and that the other well be produced from the Ellenberger with an allowable also commensurate to that of two 40 acre units. That before such allowable transfer be authorized the productive ability of each of said reservoirs in each of said wells be tested to the satisfaction of this Commission. That the Commission shall designate the respective common source of supply from which to produce each of said wells.

9. That applicant believes and so represents to this Commission that preferably the dual completion of wells in the McKee Sand and Ellenberger Lime reservoirs, in the Brunson-Hare Fields, or in the alternative the transfer of allowables between said wells in said reservoirs would not result in reservoir waste or impair correlative rights, but would establish additional, immediately producible reserves of oil with a minimum expenditure of critical material, and is in the best interests of the nation's preparedness program.

10. That a plat is attached hereto marked as Exhibit "A" showing the location of all wells on applicant's lease, and the location and ownership of all wells on offsetting leases.

11. That this amended application is submitted pursuant to Order No. R-64 issued in Case No. 261 under date of March 21, 1951.

WHEREFORE, Applicant prays that this cause be docketed and set for hearing, that notice thereof be given as required by law, and that upon such hearing an order be promulgated authorizing the dual completion of the States "S" No. 3 and No. 4 wells of applicant so as to produce the McKee Sand of the Simpson Zone and the Ellenberger Lime common sources of supply through the same well bore, or, in the alternative, a transfer of allowables be authorized so as to produce one well from the McKee Sand and the other well from the Ellenberger Lime each being situated on 80 acre units with allowables commensurate to the unit size.

Dated: April 17, 1951.

CITIES SERVICE OIL COMPANY

By R. E. Adams  
R. E. Adams  
Proration Engineer

<p>Cont'l, etal</p> <p>4</p> <p>E.C. Hill</p> <p>348 6730</p> <p>-U.S. W.C. Hawk</p>	<p>Bennett Stano.</p> <p>Texas</p> <p>33 1 6690</p> <p>J.C. Estlack</p>	<p>142 1 6674 6657</p>	<p>3</p> <p>W.C. Hawk - U.S.</p> <p>Cont'l</p> <p>1584 2 6747 6742 6753 6748</p> <p>34 2 6674 6615</p> <p>692 5 6749 1-E 1344-B 7915</p>	<p>435 289 5 6746 7956</p> <p>179 4 438 6718 1306</p>	<p>Sta</p>
<p>Cont'l, etal</p> <p>141 19W 3 6782 6724</p> <p>"B"</p> <p>418 1-A 6710</p> <p>1080 1 6675</p>	<p>Jas. W. Owen</p> <p>Stanolind</p> <p>136 2 6750 6735</p> <p>301 1 6664</p>	<p>Cont'l</p>	<p>F.T. Bennett</p> <p>Cont'l, etal</p> <p>244 1 6723 6719</p>	<p>W.C. Hawk</p> <p>Astec</p> <p>264 101 1 6775 7463</p> <p>F. Osuron</p>	<p>Cont'l</p> <p>1532 1-E 7751 7747</p>
<p>9</p> <p>J.W. Owen</p> <p>456 4 6690</p> <p>125 5 6707</p> <p>1200 2 6695 6693</p>	<p>Cont'l, etal</p> <p>1152 9 6770</p> <p>189 6 6730</p> <p>624 1 6770</p> <p>424 7 6750</p>	<p>W.C. Hawk - U.S.</p>	<p>10</p> <p>Humble</p> <p>224 1 6660</p> <p>22 174W 2 6751</p> <p>1500 3 7673</p>	<p>W.C. Hawk - U.S.</p> <p>Tide Water</p> <p>40 1 7523 6592</p>	<p>Lockhart</p> <p>Cont'l</p>
<p>Stanolind</p> <p>98 7 6690</p> <p>120 6-X 6699 6670</p> <p>"C"</p> <p>108 1-C 6660</p> <p>271 4 6657</p>	<p>Gulf</p> <p>211 3 6710</p> <p>7.1 + 3.3W 4 6699</p> <p>"E"</p> <p>30 1 6670</p> <p>194 2 6614</p>	<p>Tide Water</p> <p>97 1 6660</p> <p>69 17W 516 2 8662 7696</p> <p>324 3 7629</p>	<p>Cities Service Oil</p> <p>890 1000 1 6669</p> <p>392 163W 1540 2 6676 8634</p>	<p>Shell</p> <p>462 1 6641</p> <p>32 2 6641</p>	<p>Moran, etal</p> <p>184 1 6643</p>
<p>16</p> <p>Amersda</p> <p>149 16W 1 6686</p> <p>97 2 6700</p> <p>322 3 6630</p> <p>196 4 6644 6582</p>	<p>Mid-Cont.</p> <p>432 1 6700</p> <p>311 2 6700</p> <p>952 2 6660</p> <p>661 4 6665</p>	<p>State</p> <p>106 2 6654 6651</p> <p>341 3 6645</p> <p>65 1 6646</p> <p>904 4 6630 148 5 8031</p>	<p>13</p> <p>Shell</p> <p>106 2 6654 6651</p> <p>341 3 6645</p> <p>848 1 504 6629 6 7847</p> <p>488 4 6622</p>	<p>Ohio</p> <p>848 1 504 6629 6 7847</p> <p>488 4 6622</p>	<p>Era on 21 S</p> <p>152 2 6622</p> <p>140 1 6617</p>
<p>U.S.</p> <p>Trinity Prod.</p> <p>360 2 6629</p> <p>432 3 6624</p> <p>360 4 6612</p> <p>23M 720 60-14W 5 6639 3872</p> <p>264 6 6620</p> <p>228 7 6628</p> <p>1-E 16M 8365 6781</p>	<p>Barnsdall</p> <p>200 1 6630</p> <p>127 2 6635</p>	<p>Shell</p> <p>239 1-A 6636 6633</p> <p>732 3 6628</p> <p>"A"</p> <p>143 131 2 6629 8090</p> <p>510 30 4 7810 6633 7599</p>	<p>Argo Oil Corp.</p> <p>240 2 316 6616 8 7885 7 7357 8180</p> <p>10 7502 12 6626 9 7951</p> <p>342 11 7782 13 6833</p> <p>201 4 7396 6632</p>	<p>L.G. Warlick</p> <p>85 5 7759</p> <p>Gulf</p> <p>624 1 6620</p> <p>547 2 6614</p> <p>122 6 7687</p> <p>3 316 6620</p> <p>504 4 6615</p>	<p>R.L. Boners</p> <p>Tide Water</p> <p>200 1 6620</p> <p>52 2 6615</p> <p>240 1 6660</p> <p>5675</p>
<p>A.M. York</p> <p>Trinity Prod.</p> <p>2 3775 2-D 480 6674</p> <p>360 4-D 6709 6640</p> <p>240 3-D 6630 6586</p>	<p>21</p> <p>Cont'l D/R</p> <p>7-0 001 6639 3872</p> <p>2-E 3230 4-S 7872 7854</p> <p>1-E 5270 1-S 1616-B 7818</p> <p>1128 1-S 3304 7925</p> <p>Mary Wentz</p>	<p>Ellicott - U.S.</p> <p>S.E. Cone</p> <p>729 2 8250</p> <p>Anderson</p>	<p>22</p> <p>Shell</p> <p>240 2 316 6616 8 7885 7 7357 8180</p> <p>10 7502 12 6626 9 7951</p> <p>342 11 7782 13 6833</p> <p>201 4 7396 6632</p>	<p>L.G. Warlick</p> <p>217 14 7758</p> <p>184 5 6612</p> <p>148 1 6610</p>	<p>D.A. Will</p> <p>Shell</p> <p>119 1 6612</p> <p>240 2 6610</p> <p>165 1 6603</p> <p>239 4 6606</p>
<p>Gulf</p> <p>210 22 6638 15 7835 7720 7300 7665</p> <p>11 23 6650 10 8040</p> <p>1C 281 13 6643 12 7975</p> <p>Cities Service "L.T." &amp; Roy Int.</p> <p>520 14 7721 7873</p> <p>26 1650 21 7603 7935</p> <p>Eunice King</p>	<p>28</p> <p>Gulf</p> <p>375 21 7353 6611 5173</p> <p>Gulf</p> <p>528 14 7721 7873</p> <p>26 1650 21 7603 7935</p> <p>Gulf</p> <p>444 228 8 40</p>	<p>36 Southern</p> <p>7774 616 4 6660</p> <p>273 3 6570</p> <p>712 6 6560</p> <p>864 8 6570</p>	<p>Cont'l, etal</p> <p>1232 3-E 7652 7635</p> <p>120 6 6570 6565</p> <p>360 5 6567</p> <p>"A"</p> <p>1624 1 6669</p> <p>1568 2 6570</p>	<p>Tide Water</p> <p>241 2 6565 6557</p> <p>529 1 6560</p> <p>231 + 15W 4 6586</p>	<p>S.J. Sarkey</p> <p>EXHIBIT "A"</p> <p>529 1 6560</p> <p>231 + 15W 4 6586</p> <p>S.J. S</p>
<p>Magnolia</p> <p>375 21 7353 6611 5173</p>	<p>Gulf</p> <p>528 14 7721 7873</p> <p>26 1650 21 7603 7935</p>	<p>36 Southern</p> <p>7774 616 4 6660</p> <p>273 3 6570</p> <p>712 6 6560</p> <p>864 8 6570</p>	<p>Cont'l, etal</p> <p>1232 3-E 7652 7635</p> <p>120 6 6570 6565</p> <p>360 5 6567</p> <p>"A"</p> <p>1624 1 6669</p> <p>1568 2 6570</p>	<p>Tide Water</p> <p>241 2 6565 6557</p> <p>529 1 6560</p> <p>231 + 15W 4 6586</p>	<p>S.J. Sarkey</p> <p>EXHIBIT "A"</p> <p>529 1 6560</p> <p>231 + 15W 4 6586</p> <p>S.J. S</p>

R 37E

