Case No.

225

Application, Transcript,
Small Exhibits, Etc.

, 22, 1951

Tide Water Associated Oil Co.
[illegible] for New Mexico Oil
Conservation Hearing

LOCATION

Tide Water Associated Oil Company's State 'C' Lease is located in the North 1/2 of the North 1/2 of Section 15 and the Southeast 1/4 of the Southeast 1/4 of Section 10, Range 37 East, Township 21 South, Lea County, New Mexico. The Lease consists of approximately 200 acres.

At present, there are five producing wells on the lease. Two wells, #1 and #2, produce from the Drinkard Zone. Wells #3 and #4 are presently producing from the Ellenberger Zone. Well #5 is presently producing from the McKee Zone.

Well Number 4 is located 660' from both the North and South Lines of the lease and 2080' East of the West line of Section 15, T-21S, R-37E.

Well Number 5 is located 660' from both the North and South lines of the lease and 990' East of the West line of Section 15, T-21S, R-37E.

HARE FIELD -McKEE FORMATION

Discovery Date and Well - 5-27-47, Amerada et. G. Hare #6, located in Section 33, T. 21S, R. 37E. Initial Potential 572 BOPD thru 1/2" Choke. T. D. 8165' P.B.T.D. 7893'

Producing Formation - Simpson (McKee) Ordovician System. Geological description: clear to frosted, medium to coarse semi-unconsolidated sand.

Type Reservoir Drive - The Structure of this reservoir is approximately the same as the Brunson (Ellenberger) being approximately 400' higher. A solution gas type drive is present in the reservoir.

BRUNSON FIELD - ELLENBERGER FORMATION

Discovery Date and Well: 9-14-45, N.G. Penrose Penrose #1, located in Section 9, T.-2S, R.37E. Initial Potential 1680 BOPD.

Producing Formation - Ellenberger (Lime). Geological description: tan, medium crystalline, granular, sucrosic dolomite with numerous rounded coarse quartz grains.

Type Reservoir Drive: The average producing depth ranges between 7770' and 8130'. A solution gas type drive with a partial water drive on the North end is present in the reservoir.

Stratigraphy: As shown on the attached cross-section, both wells 4 and 5 contain complete Schlumberger sections. Well No. 5 contains a complete McKee section; however, approximately 100' of the upper McKee is missing in Well No. 4, this upper section having been eroded away and the Permian deposited directly on top of the eroded surface.

WELL COMPLETION DATA
State 'S' #4

Location: 660' South of North line and 2310' East of West line of N/2 of N/2 of Sec. 15, T 21S, R 37E, Lea County, New Mexico
Total Depth 7896
Elevation 3459 D. F.
Casing

Surface	13-3/8" O. D.	set	295'	w/300 sx.
Intermediate	8-5/8" O. D.	set	2999	w/1700 sx.
Oil	5-1/2" O. D.	set	7895	w/500 sx.

Acidized with 2500 gal. 15% HCL on 1-17-51 thru perfs 7800 to 7825 prior to acid treatment well would not flow; after treatment well flowed.

Perforations 7800 - 7825

Initial Potential (Ellenberger)
Date: 1-24-51
Test: Flowed 96.37 Bbls. Oil in 4 hrs. 0min thru 1/4" Choke, 2-3/8" Tbg. set @ 7870'
Tbg. pressure 580#, Csg. Press. 0 GOR 1151/1
Gravity of crude 42° API
Calculate Daily Potential 578 BOPD

Drill Stem Tests data as shown in the attached table indicated that the McKee sand was capable of flowing 50 BOPH.

PRODUCTIVITY INDEX & DATA
State S# 4

Ellenberger Zone
Date 2-22-51 thru 2-24-51
Perforated Zone 7800-7825
Datum 7759 (-4300)

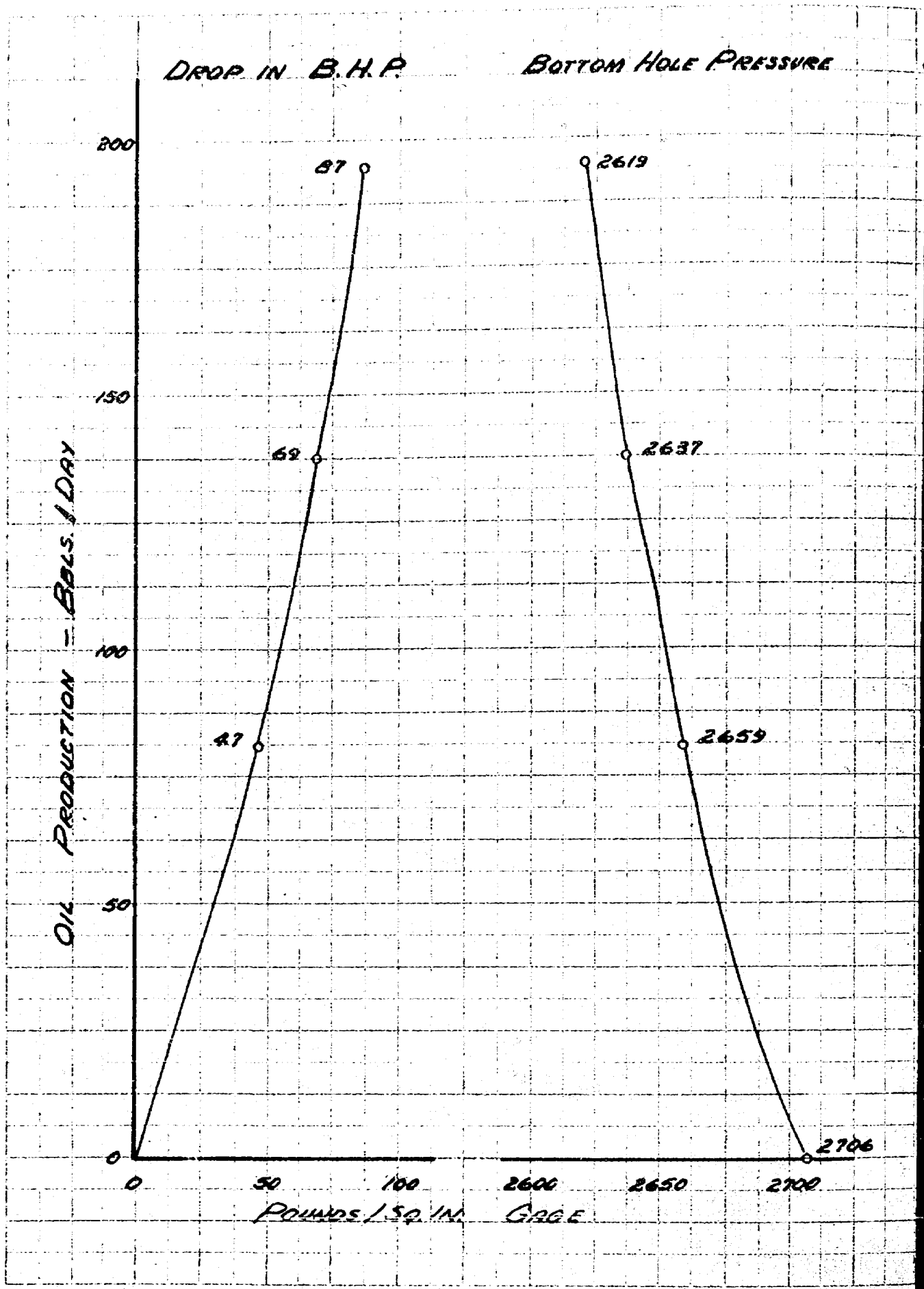
Static Build Up

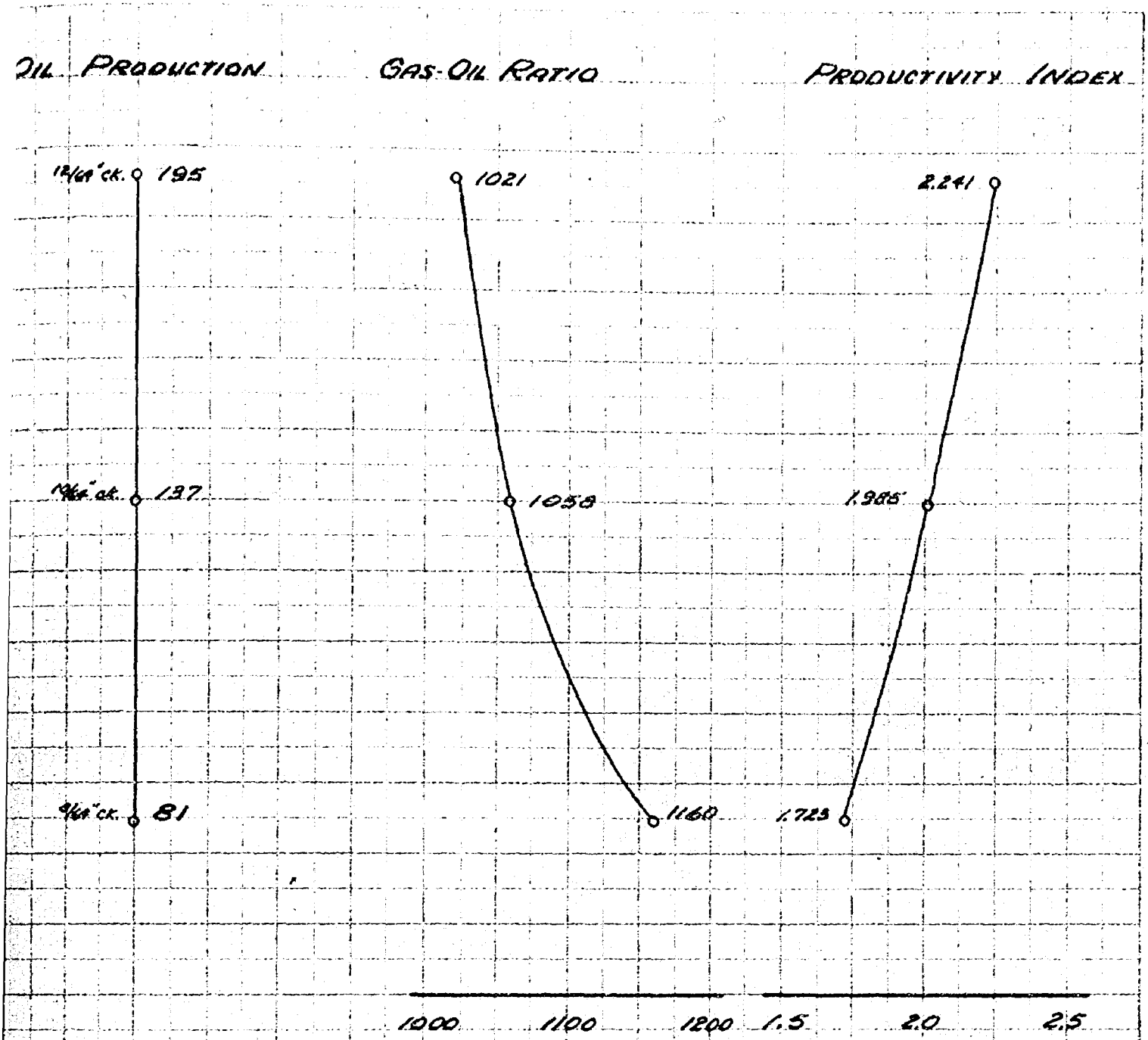
Hours Shut In	Pressure Datum	Pressure Change
49:20	2699	Initial Test
51:20	2706	8# gain

Flow Tests

Size Choke	Hours Flowing	Datum Pressure Initial	Final	Oil B/D	Gas-Oil Ratio	PI B/D/psi
12/64"	12:20	2706	2619	195	1021	2.241
10/64"	10:10	2706	2637	137	1058	1.585
8/64"	8:20	2706	2659	81	1160	1.723

McKee Zone
Drill stem test data as shown by the included tabulation indicated the McKee Zone flowed 50 BOPH.


DROP IN B.H.P.
BOTTOM HOLE PRESSURE
OIL PRODUCTION = BBLS. / DAY
200
150
100
50
0
87
69
47
2619
2637
2659
2706
0
50
100
2600
2650
2700
POUNDS / SQ. IN. GAGE



PRODUCTION CURVES
TIDE WATER ASSOC. OIL CO.
STATE "S" NO. 4
BRINSON ELLENBERGER
2-22-51 2-24-51

State "A" #4

Drill Stem Tests

DST #	#1	#2	#3	#4
Formation Tested	McKee	Connell	Ellenburger	Ellenburger
Total Depth	7520	7646	7896	7896
Packer Set At	7398	7556	7739	In 5-1/2 csg. or 4 77 6-32 672
Total No. Ft. Tested	22'	90	157	
Size Hole	6-3/4	No	6-3/4	
Size Drill Pipe	3-1/2 Reg	Test	3-1/2	2 Eue
Choke Size:				
(1) Top	1"		1"	1"
(2) Bottom	5/8"		5/8"	5/8"
Blanket	None		None	None
Total Time tool Open	1 hr-13 min		1 hr-18 min	1 hr.
Gas to Surface (Time)	3 min.		5 min.	Slight blow
Mud " " "	11-1/2 min.		40 min	
Oil " " "	12-1/2 min		48 min	
Flowing Data				Did not
(1) Total Time Flowed	1 hr-6 min		30 min.	flow
(2) Rate of Flow	50 BPH		36.6 BPH	
(3) % Oil	100		100	
(4) % Water				
(5) Flowing Surf. Press.	7			
(6) Total Bbls. Flowed	55		28.29	
Recovered (When Pulled)				
(1) Oil	180'		900'	
(2) Water				
(3) Mud				730' Drlg.
Flowing (Final) BHP	1366#		1160	350#
Length of Time Tool Closed	15 min		15 min	15 min.
Static BHP	2730		2845	
Initial Hydrostatic Mud Wt.	3995		3550	3455
Final Hydrostatic Mud Wt.	3995		3405	3455
Mud Wt, #/gal.	9.8#		9.2	9.0
Date Tested	1-4-51	1-6-51	1-12-51	1-16-51

[illegible]
State "B" #5

Location 660' South of North line and 790' East of West line of Section 1, T 21S, R 37E, Lea County, New Mexico.

Total Depth 8148

[illegible] 7436

Elevation 3458 D. F.

Casing

Surface	13-3/8" O. D.	set @	294	w/300 sx.
Intermediate	8-5/8" O. D.	set @	2974	w/2000sx.
Oil	5-1/2" O. D.	set @	8147	w/500 sx.

Acidized

Ellenberger 7968 to 92 and 8062 to 8120 thru perfs with 2000 gal low surface tension acid on 4-11-51
7968 to 8020 and 8062 to 8120 thru perfs with 3000 gal. acid on 4-13-51
7968 to 8020 and 8062 to 8120 thru perfs with 10,000 gal. 15% HCl on 4-16-51

McKee 7610 to 7660 thru perfs with 500 gal. mud acid on 4-21-51

Perforations

Ellenberger	7968 to 7992 - 4 jet shots/ft	
	8062 to 8120 - 4 jet shots/ft	
	7968 to 8020 - 4 bullet shots/ft	
McKee	7610-7660	4 shots/ft
	7682-7710	4 bullet shots/ft

Initial Potentials

Ellenberger

Date: 4-17-51

Test: Flowed 353 Bbls. Oil in 24 Hrs. thru 1/2" choke, 2-3/8 Tog. shake out last 3 Hrs. 2% water Tbg. Pressure 165# Csg. Pressure 0 GOR 740/1

McKee

Date: 4-23-51

Test: Flowed 308.37 Bbls. Oil in 24 Hrs. Gmin thru 1/4" choke, 2-3/8" Lbg. set @ 7709
Tog. Pressure 590# Csg. Press. 0
GOR 1097/1
Gravity of Crude 44.6° API

The Ellenberger Zone has been plugged off and the well is presently producing from the McKee.

PRODUCTIVITY TEST
State "A" #2

Ellenburger Zone
Date: 4-27-51 thru 4-[illegible]-51
Perforated Zone: 7968 to [illegible] and 8002 to 8120
Datum 7758 (-4300)

Static Build-Up

Hours Shut In	Pressure @ Datum	Pressure Change
0:25	1973	Initial Test
1:25	2088	115# gain
2:25	2164	76# gain
3:25	2205	41# gain
4:25	2226	21# gain
5:25	2295	19# gain
6:25	2262	17# gain
Estimated Maximum Static Pressure		2386#

Flow Tests

Size Choke	Hours Flowing	Datum Pressure Initial	Datum Pressure Final	Oil B/D	Gas-Oil Ratio	PI B/D/psi
1/2"	24	2386 est.	1073	346	751	0.2635
3/8"	5:11	2386 est.	1388	260	835	0.2605
1/4"	4	2386 est.	1701	187	690	0.2730

This PI test was not conducted in the conventional manner. Static build-up tests are usually run prior to flow tests and after a well has been shut in some 48 to 72 hours. Due to lack of time in this particular case, the flow tests were run first after the well had been flowing for several days on 1/2" choke. The well was then shut in and a 6-hour static build up test was run. The maximum static pressure used in the PI calculations is an estimated figure.

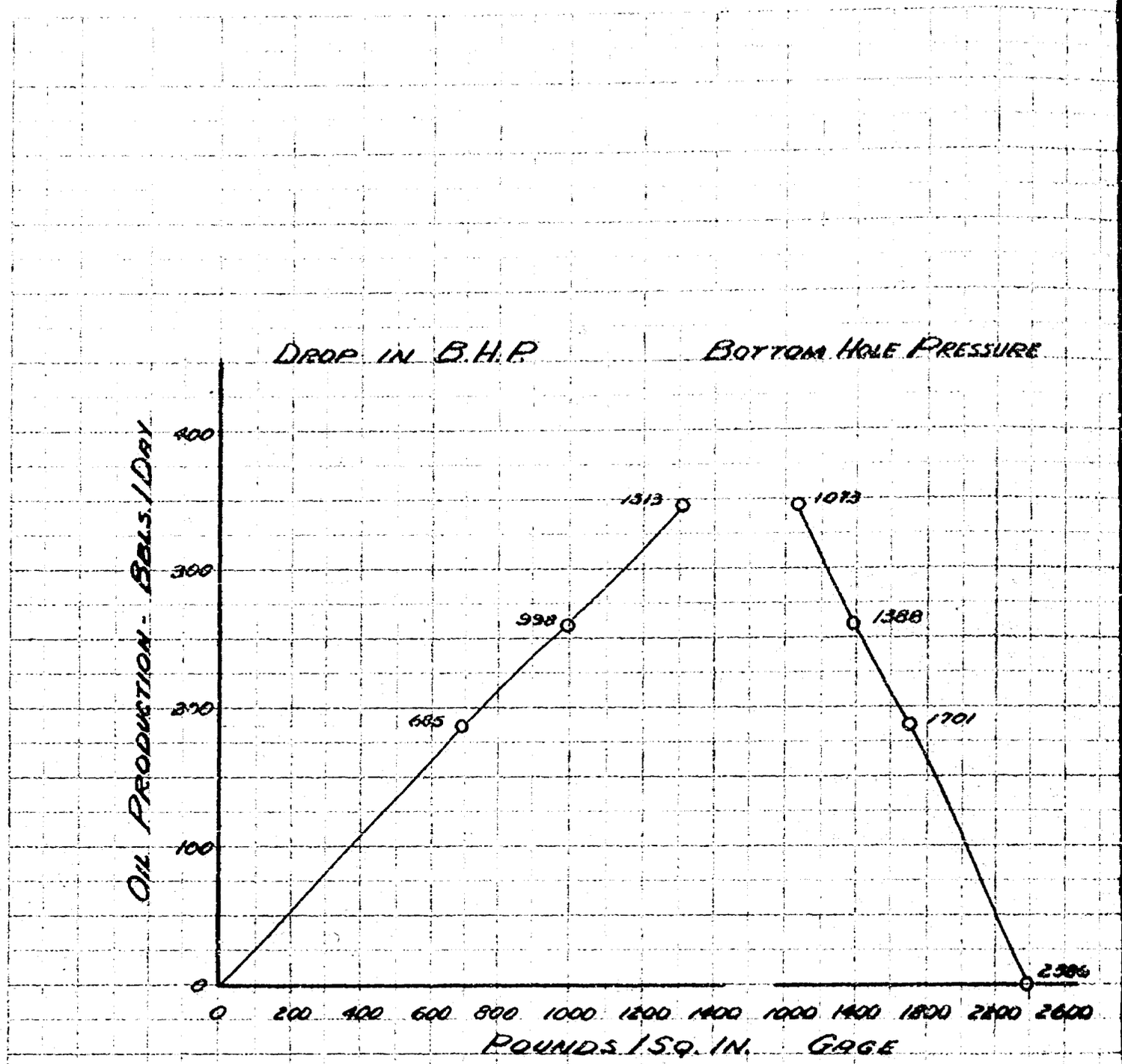
McKee Zone
Date: 4-27-51 thru 4-30-51
Perf. Zone: 7610-7660 and 7682 to 7710
Datum 7758 (-4300)

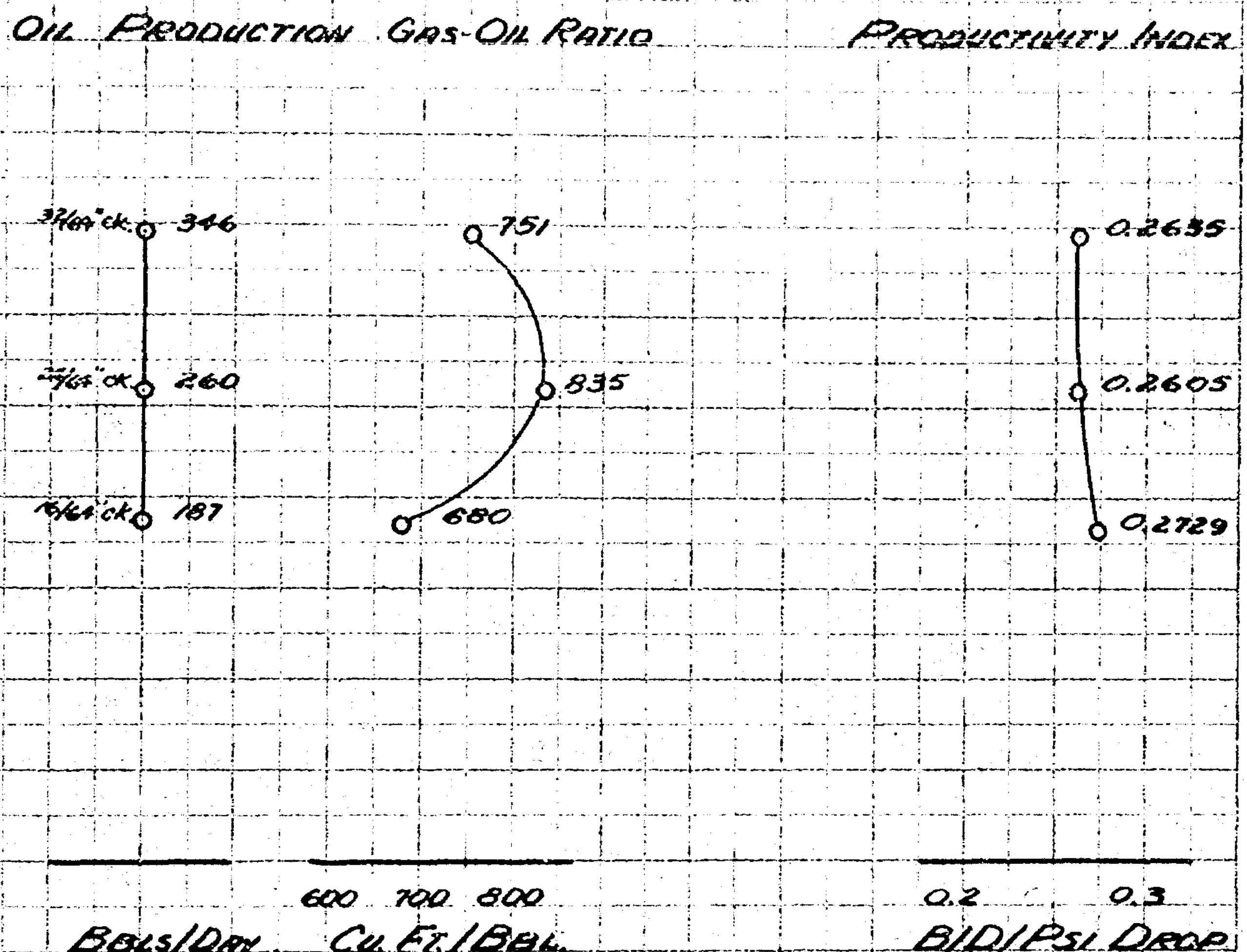
Static Build-Up

Hours Shut In	Pressure @ Datum	Pressure Change
68:42	2950	Initial Test
74:45	2955	5# gain

Flow Tests

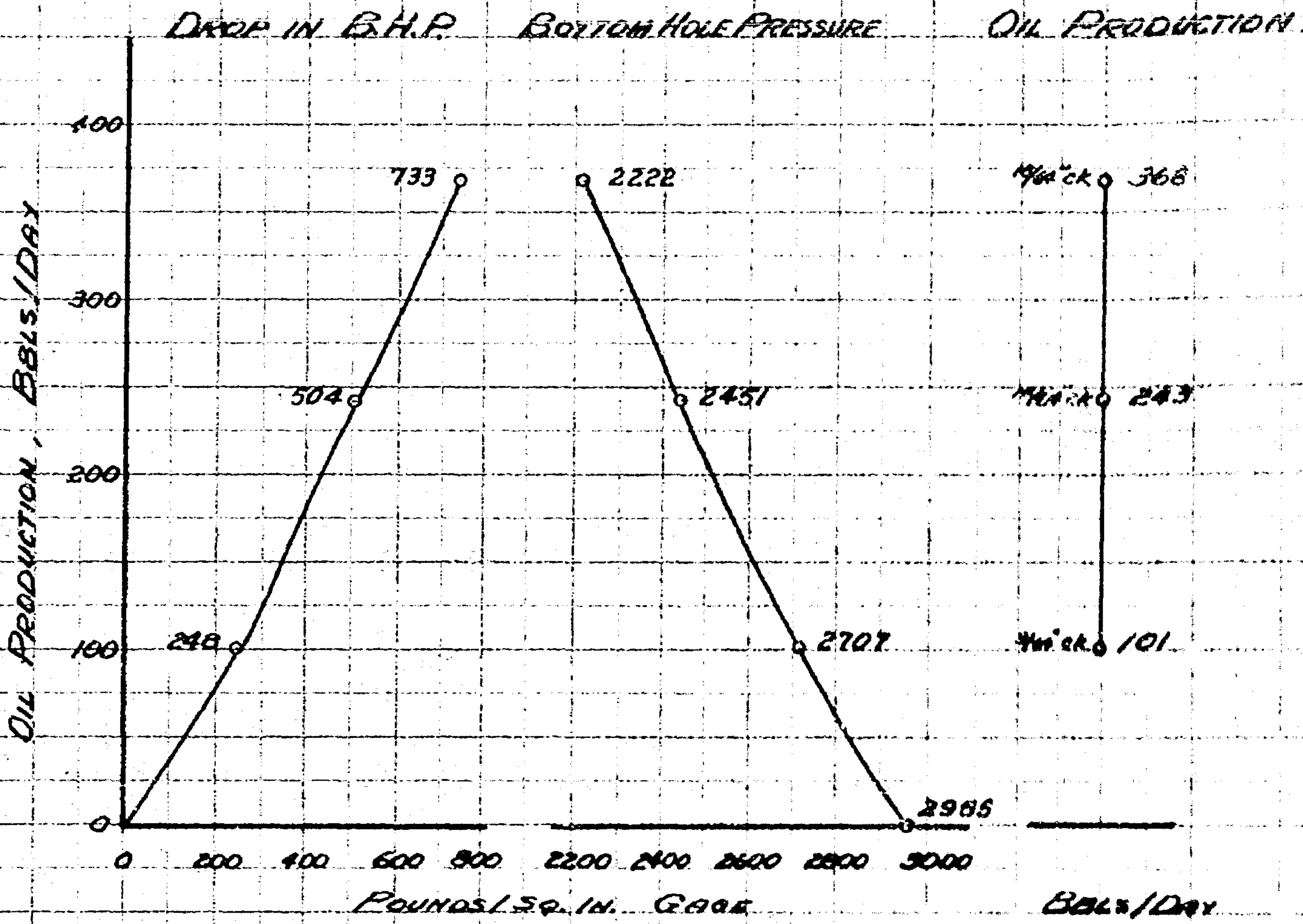
Size Choke	Hours Flowing	Datum Pressure Initial	Datum Pressure Final	Oil B/D	Gas-Oil Ratio	PI B/D/psi
9/64"	18:15	2955	2707	101	1352	0.407
14/64"	20:45	2955	2451	243	1277	0.482
18/64"	17:22	2955	2222	368	1233	0.502


DROP IN B.H.P.
BOTTOM HOLE PRESSURE
OIL PRODUCTION - BBLS./DAY
400
300
200
100
0
1313
1073
998
1388
685
1701
2386
0
200
400
600
800
1000
1200
1400
1000
1400
1800
2200
2600
POUNDS/SQ. IN. GAGE



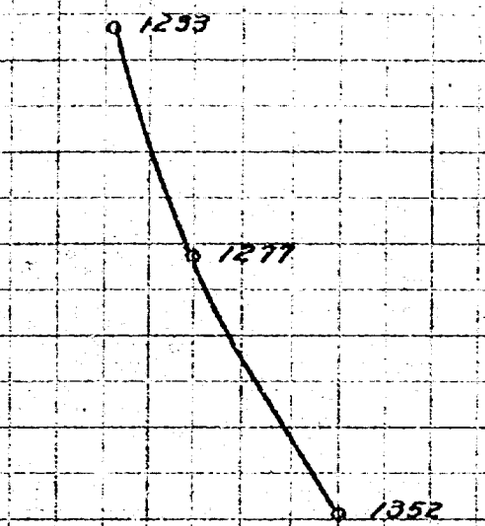
Production Curves
Tide Water Assoc. Oil Co.
State "S" No. 5

Brunson Ellenberger
4-18-51 4-19-51

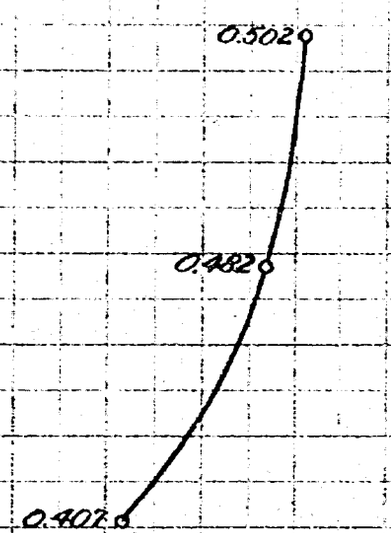

DROP IN B.H.P.
BOTTOM HOLE PRESSURE
OIL PRODUCTION
OIL PRODUCTION, BBLS./DAY
400
300
200
100
0
733
504
248
2222
2451
2707
2985
366
243
101
0
200
400
600
800
2200
2400
2600
2800
3000
POUNDS/SQ. IN. GAGE
BBLS/DAY

Case #275
Tide W. #4

Gas-Oil Ratio



Productivity Index



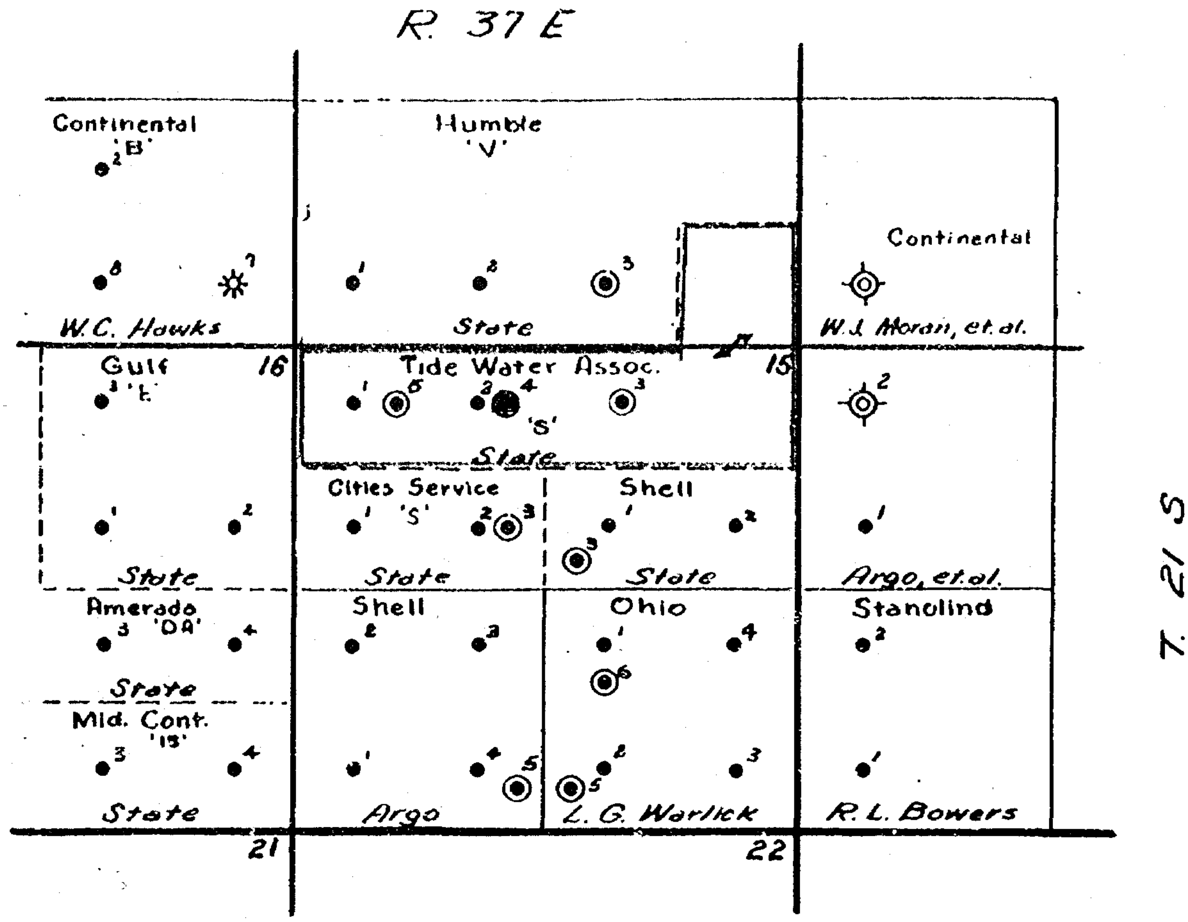
Production Curves
Tide Water Assoc. Oil
State "S" No. 5
Hare Field - McKee Form
4-27-51 4-30-51

Page 13 of 22

Drill Stem Tests

DST #	#1	#2	#3	#4	#5	#6
Formation Tested	McKee	McKee	McKee	Connell	Schlumberger	Schlumberger
Total Depth	7700	7700	7800	7380	8148	8148
Packer Set At	7579	7606	7704	7844	8005	7960
Total No. Ft. Tested	121	94	96'	36'	143'	188'
Size Hole		6-3/4"	6-3/4"	6-3/4"	6-3/4"	6-3/4"
Size Drill Pipe	No Test	3-1/2 IF	3-1/2 IF	3-1/2 IF	3-1/2 IF	3-1/2 IF
Choke Size						
(1) Top		1	1"	1"	1"	1"
(2) Bottom		1/2"	1/2"	1/2"	1/2"	1/2"
Blanket		None	None	None	None	None
Total Time Tool Open		1 hr. 13 min.	4 hrs.	1 hr.	3 hr.	5 hr.
Gas to Surface (Time)		5 min.	3 min.	Light Blow	6 min.	6 min.
Mud " " "						
Oil " " "		13 min.	13 min.			
Flowing Data						
(1) Total Time Flowed		1 hr.	4 hr.	Did		Gas Headed
(2) Rate of Flow		6 BPH	218 BPH	Not		and Flowed
(3) % Oil		100 %	100 %	Flow		Approx. 3 BPH
(4) % Water		0	0			Oil
(5) Flowing Surface Press.						
(6) Total Bbls. Flowed		65	84			3
Recovered (when pulled)						
(1) Oil					6600'	30 Bbls.
(2) Water						
(3) Mud				35'		
Flowing (Final) B.H.P.		1761	926	28	1141	665
Length of time tool closed		15 min.	15 min		15 min	15 min
Static BHP		2682	2205		1432	1169
Initial Hydrostatic Mud Wt.		3640	3681	3842	3812	3842
Final Hydrostatic Mud Wt.		3640	3681	3720	3789	3821
Mud Wt, #1 gal.		9.1	9.4	9.2	9.0	9.3
Date Tested	3-25-51	3-26-51	3-28-51	3-30-51	4-4-51	4-5-51

Case # 275
TWA Ex #6



Ellenberger Well

Drinkard Well

~~Ellenburger Proved Productive~~ Completed in Mckee

Mckee Proved Productive Completed in Ellenberger

PLAT SHOWING TIDE WATER ASSOCIATED OIL CO.
STATE "S" LEASE & VICINITY, LEA CO, N. M.

Scale: 1" = 2000'   Date: 5-1-51

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

IN THE MATTER OF AMENDED APPLICATION OF TIDE WATER ASSOCIATED OIL COMPANY FOR AUTHORITY TO TRANSFER ALLOWABLE PRODUCTION OF ITS STATE "S" NO. 5 WELL TO STATE "S" NO. 4 FOR ELLENBURGER PRODUCTION AND THE ALLOWABLE FOR A McKEE COMPLETION IN ITS STATE "S" NO. 4 TO STATE "S" NO. 5 FOR McKEE SAND PRODUCTION, BOTH WELLS BEING REGULARLY LOCATED IN N/2 NW/4 SEC. 15 Twp. 21 S, R. 37 E, NMPM, IN BRUNSON-HARE POOL, LEA COUNTY, NEW MEXICO: OR, IN THE ALTERNATIVE, FOR AN ORDER TO DUALLY COMPLETE EACH SUCH WELL IN THE McKEE AND ELLENBURGER FORMATIONS.

CASE NO. 275
ORDER NO. R-79

ORDER OF THE COMMISSION

BY THE COMMISSION:

This matter came on for hearing upon amended application 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 testimony adduced at the hearing, and being fully advised in the premises,

FINDS:

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

(2) That transfer of allowables between producing horizons under the New Mexico practice would be conducive to waste and adversely affect correlative rights.

(3) That continued experimentation with dual completions tends to show that mechanical packers and other devices are now available for successful dual completions; however, this Commission is yet to be convinced of the overall soundness of oil - oil dual or multiple completions in New Mexico,

IT IS THEREFORE ORDERED:

1. That Tide Water Associated Oil Company's application for transfer of allowable Ellenburger production from its State "S" No. 5 to its State "S" No. 4, and McKee production from its State "S" No. 4 to its State "S" No. 5, be, and the same hereby is denied.

2. That Tidewater Associated Oil Company's application for dual completion of its State "S" No. 5 and State "S" No. 4 located in Section 15, Twp. 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 SHEPARD, Member

R. R. Spurrier

R. R. SPURRIER, Secretary

SEAL

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

CASE NO. 221
ORDER NO. R-21

IN THE MATTER OF THE APPLICATION OF CONTINENTAL OIL COMPANY FOR AN ORDER GRANTING PERMISSION TO DUALLY COMPLETE ITS "M.E. WANTZ NO. D" WELL LOCATED IN THE NW/4 SE/4 SECTION 21, TWP. 21 SOUTH, R. 37 EAST, N.M.P.M., LEA COUNTY, NEW MEXICO, FOR PRODUCING GAS FROM THE TUBB SAND, AND OIL FROM THE DRINKARD FORMATION.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This matter came on for hearing at 10:00 o'clock A. M., on May 23, 1950 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 although recent experiments tend to show that mechanical packers and other devices are now available for engineering successful dual completion, the Commission is yet to be convinced of the soundness of dual and multiple completion as a general practice in New Mexico without specific control of each such project, and

IT IS THEREFORE ORDERED that effective May 23, 1950, the Continental Oil Company the applicant herein, be and it is hereby authorized to dually complete and produce its "M. E. Wantz No. D" well located in the NW/4 SE/4 of Section 21, Township 21 South, Range 37 East, N. M. P. M., Lea County, New Mexico in order that gas from the Tubb Sand (6120' to 6195') may be produced through the annulus between the casing and tubing, and oil from the lower Drinkard formation (6546' to 6584') through the tubing by proper perforation and proper packer or packers;

PROVIDED, HOWEVER, that said "M. E. Wantz No. 3-D" well shall be completed and produced in such a manner that there will be no commingling within the well bore of the said well of gas, or oil and gas produced from the two separate strata, and

PROVIDED FURTHER that said well shall be equipped in such a manner that reservoir pressures may be determined separately for each of the two separate strata, and further be equipped with all necessary connections required to permit recording meters to be installed and used at any time as may be required by the Commission or its representatives, in order that natural gas, or oil and oil and gas, from each separate stratum may be accurately measured and the gas-oil ratio determined and

PROVIDED FURTHER that the operator shall make any and all tests including segregation tests by not excluding other tests and/or determinations at any time and in such manner as may be deemed necessary by the Commission.

The original and all subsequent tests shall be witnessed by a representative of the Commission and by representatives of offset operators if any there be, and the results of each test properly attested to by the applicant and all witnesses and shall be filed with the Commission within ten (10) days after the actual completion of each such test and,

PROVIDED FURTHER that prior to the time said well is dually completed, the applicant shall supply the Commission, for its approval, with plat or drawing showing the proposed method and manner of completion, together with an electrical or radioactivity log showing the location and extent of each separate stratum and the proposed perforations, and

PROVIDED FURTHER that upon the dual completion of the well the applicant shall submit to the Commission a diagrammatic sketch of the mechanical installation which was actually used to produce the seal from both zones or strata, showing tube and location of packers, other devices used, location and extent of perforations, name and depth of each producing zone or strata and special report of production, gas-oil ratio and reservoir pressure determination of each horizon or stratum at the time of completion.

IT IS FURTHER ORDERED that jurisdiction of this case is hereby retained by the Commission for such further order or orders in the premises as may from time to time seem necessary or convenient to the Commission and this case shall not be considered as establishing a precedent for authorizing general dual completions in the Drinkard Pool, and upon failure of the applicant to comply with any provision or provisions of this order, by the authority hereunder shall terminate, upon ten (10) days' written notice by the Commission.

DONE at Santa Fe, New Mexico this 13th day of July, 1950.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

THOMAS J. MABRY, CHAIRMAN

GUY SHEPARD, MEMBER

R. R. SPURRIER, SECRETARY

SEAL

Distributed by:
N. M. OIL & GAS ENGINEERING COMMITTEE
HOBBS, NEW MEXICO
December 26, 1950

TIDE WATER ASSOCIATED OIL COMPANY
MID-CONTINENT DIVISION
MELLIE ESPERSON BLDG. POST OFFICE BOX 1404
HOUSTON 1, TEXAS

April 20th, 1951

In re: Case No. 260

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

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

Gentlemen:

Pursuant to authority granted by Order No. R-65, Case No. 260, we are enclosing herewith three copies of Tide Water Associated Oil Company's amended application in which we have requested permission to produce an 80-acre allowable from State "S" No. 4, completed in the Ellenberger and an 80-acre allowable for State "S" No. 5 which has been proven productive in the McKee sand and will be completed in that zone. Well No. 5 was also proven to be productive in the Ellenberger.

An alternative request is made to dually complete the two wells if the Commission is not disposed to grant the 80 acre allowables.

Yours very truly,

TIDE WATER ASSOCIATED OIL COMPANY,

By J B Holloway

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF AMENDED APPLICATION OF TIDE WATER ASSOCIATED OIL COMPANY FOR AUTHORITY TO TRANSFER ALLOWABLE PRODUCTION OF ITS STATE "S" NO. 5 TO STATE "S" NO. 4 FOR ELLENBERGER PRODUCTION, AND THE ALLOWABLE OF A MCKEE SAND COMPLETION IN STATE "S" NO. 4 TO STATE "S" NO. 5 FOR MCKEE SAND PRODUCTION, BOTH OF SAID WELLS BEING LOCATED IN THE N/2 NW/4 SECTION 15, T-21-S, R-37-E, BRUNSON-HARE FIELDS, LEA COUNTY, NEW MEXICO, OR IN THE ALTERNATIVE FOR AUTHORITY TO DUALLY COMPLETE EACH WELL IN THE MCKEE AND ELLENBERGER FORMATIONS.

CASE NO. 260

Amended Application

Comes now Tide Water Associated Oil Company, a Delaware Corporation, with district office located at Hobbs, New Mexico, and acting upon authority granted by Order No. R-63, hereby files its amended application for authority to transfer the allowable production of its State "S" No. 5, located in the NW/4 NW/4 Section 15, T-21-S, R-37-E, to its State "S" No. 4, located in the NE/4 NW/4 Section 15, T-21-S, R-37-E, for Ellenberger production; and upon recompletion of State "S" No. 5 in the McKee sand to transfer the allowable of a McKee sand completion in State "S" No. 4 to State "S" No. 5; or in the alternative that it be granted authority to dually complete the two wells in each of the two aforementioned pools. In support of this application, applicant respectfully shows to the Commission as follows:

1. That the applicant is the owner of that certain oil and gas lease from the State of New Mexico bearing No. B-9188 embracing all of the N/2 N/2 of Section 15, and the SE/4 SE/4 Section 10, 21-S, 37-E.

2. That on January 19, 1951, applicant completed its State "S" No. 4 at a location 100 feet east of center of the NE/4 NW/4 Section 15, which well flowing through perforations opposite the Ellenberger formation from 7800 to 7825 feet produced 96.37 barrels of 42 gravity oil in 4 hours on 1/4" choke, with gas-oil ratio of 1131:1, tubing pressure 580 p.s.i.

3. That State "S" No. 4 penetrated the McKee sand in the Simpson zone, which sand had an overall thickness of approximately 150 feet. That a one hour drill stem test was made in the McKee sand from 7422 to 7534 feet, during which time the well produced 50 barrels of 45.8 gravity oil with pressure ranging from 470 to 970 p.s.i.

4. That on April 18, 1951, applicant was in the process of completing its State "S" No. 5 well at a location 990 feet east and 660 feet south of the northwest corner of NW/4 NW/4 Section 15, 21-S, 37-E. That State "S" No. 5 in initial tests for production in the Ellenberger, producing from the Ellenberger through casing perforations 7968-8020 and 8062-8120 feet flowed at the rate of 353 barrels per day of 38 gravity oil with gas-oil ratio of 740:1.

5. That in drilling State "S" No. 5 approximately 280 feet of McKee sand was penetrated, which on a drill stem test in the interval 7606 to 7700 feet flowed 62.22 barrels of 43.6 gravity oil in one hour, or at the rate of 1493 barrels a day, with gas-oil ratio of 611:1.

6. That the McKee sand in the Simpson zone and the Ellenberger lime are separate common sources of supply, separated by impermeable shale and lime, and in this area have been designated by the Commission as the Hare and Brunson pools, respectively.

7. That permission is hereby requested to transfer the allowable production between the two wells with the result that State "S" No. 4 may produce from the Ellenberger lime with an allowable commensurate to that of two 40-acre units producing from the Brunson pool and that permission be granted to plug back and recomplete State "S" No. 5 in the McKee sand and that it be given an allowable commensurate to that of two 40-acre units producing from the Hare pool.

8. That it has been proven that under certain conditions and circumstances, it is in the interest of conservation to transfer the allowable production from one well to another on the same lease, and applicant respectfully submits the proposition that having established the fact the State "S" No. 4 and State "S" No. 5 are each productive in both the McKee sand and Ellenberger lime that it would follow that the NE/4 NW/4 and the NW/4 NW/4 of Section 15, 21-S, 37-E, should be entitled to a proportionate share in the allowable production from the common source of supply in both instances.

9. That in the event the Commission is not disposed to grant applicant an allowable commensurate to that of two 40-acre units, as requested, then an alternative request is hereby made for authority to dually complete both State "S" No. 4 and State "S" No. 5.

10. That it has been frequently demonstrated that mechanical packers and other devices are available to effectively separate two productive zones in one well bore, in such manner that one zone is produced through the tubing and the other zone is produced through the annulus between the tubing and casing. That applicant would install such a packer 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. 4 and 5 and in such manner produce the Ellenberger lime through the tubing and produce the McKee sand through the annulus.

11. Applicant further alleges that in drilling these wells, approximately 125 tons of steel are required to properly case and equip each well. Steel is now in scarce supply and critically needed in our Country's defense preparations. Applicant believes and so represents to the Commission that either of the two means suggested to alleviate the further immediate need of steel would be equitable and fair in all respects, and will not in any manner disturb correlative rights or cause reservoir waste. That in so doing, it would enable applicant to make readily available the additional amount of oil which would accrue to a McKee sand well and an Ellenberger lime completion, all of which will be of benefit to our Country's defense efforts, to the State of New Mexico as royalty owner and to the applicant.

12. Your applicant respectfully suggests to the Commission that it take into consideration the state of emergency which now exists in our Government and the urgent demand now being made for the establishment of additional and immediate producible reserves of oil, with the minimum use of steel. To that end it is requested that this application be given favorable consideration.

13. That a plat is attached hereto marked Exhibit "A" showing the location of all wells on applicant's lease, and all offset wells and ownership of adjoining properties.

Respectfully submitted,

TIDE WATER ASSOCIATED OIL COMPANY

By J. B. Holloway

April 20, 1951

BEFORE THE

OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

TRANSCRIPT OF CASE 275.

May 23, 1951.

Original

E. E. GREESON
ADA DEARNLEY
COURT REPORTERS
BOX 1302
PHONE 2-4547
ALBUQUERQUE, NEW MEXICO

BEFORE THE
OIL CONSERVATION COMMISSION

May 23, 1951

CASE NO. 275: (This is the amended application of Tide Water Associated Oil Company to dually complete its State S No. 4 and S No. 5, N/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.)

MR. SPURRIER: We will now take up Case No. 275 with the understanding that some of the remarks that will be made at the presentation of this case will apply to both 274 and 275. Is that agreeable?

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

MR. SPURRIER: All right. Mr. Armstrong.

MR. ARMSTRONG: I would like to have included in this case the transcript of the evidence and the testimony introduced in the May 22, 1951 hearing in connection with case No.--that date was March 20, 1951, in case No. 260.

MR. SPURRIER: It will be accepted.

MR. HUGHSTON: That will be the entire record, will it not, Mr. Commissioner, and the same will be done in the Cities Service case, considering the entire record.

MR. SPURRIER: That is correct.

MR. ARMSTRONG: I would like to call Mr. Shackleford. Mr. Holloway, will you be sworn at the same time too, please, sir?

(Both gentlemen sworn.)

H. P. SHACKELFORD,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. ARMSTRONG:

Q MR. ARMSTRONG: Mr. Shackelford is a Petroleum Engineer and has testified before the Commission before, and has been qualified as an engineer, and if there is no question with regard to his qualifications we will dispense with that.

MR. SPURRIER: His qualifications are accepted.

Q Mr. Shackelford, state your initials please, for the record.

A H. P. Shackelford.

Q I believe you testified in this case in March?

A Yes, sir.

Q At that time I believe you testified that the Tide Water State No. 5 was in the process of being drilled, is that right?

A That's right.

Q Has that well been completed sime the date of that hearing?

A Yes, sir.

Q When was it completed?

A Well, it was completed 4-23-51, was the date we took the potential test.

Q Have you prepared the well completion data on that well?

A Yes, sir.

Q And do you have it available for the purpose of introduction as an exhibit?

A Yes, sir.

MR. ARMSTRONG: If it please the Commission, I will hand you here a little bulletin in which we have numbered all the exhibits that we are now going to introduce.

Q Will you explain to the Commission very briefly what that exhibit shows?

A Well, the exhibit shows the completion of State S well No. 4, which we had in our March hearing, and also the completion of our State S well No. 5.

Q Pardon me right there.

MR. ARMSTRONG: If it please the Commission, all evidence which regards the completion of well No. 4 was introduced on the occasion of the last hearing.

MR. SPURRIER: Okay.

MR. ARMSTRONG: It just happens it is included within that bulletin but it is all previously in the record and we will not reintroduce it.

Q Proceed with your statement.

A Well No. 5 was drilled to a total depth of 8148, 13 and three-eighths inch casing set at 394 feet and cemented with 300 sacks; and eight and five eighths OB set at 2974, cemented with 2000 sacks of cement; and five and a half set at 8147 and cemented with 500 sacks. We perforated that well in the Ellenberger and it was acidized and on potential test the 4-17-51 it produced 353 barrels of oil through a half inch choke. Tubing pressure was 165 and the ratio 74021. A plug was laid in the 5½ inch

casing at 7950 and 15 feet of cement was placed on top of the plug. A Lane Wells breeching plug. And the McKee formation, zone, was tested and is now completed in the McKee. The potential test on the McKee was 308 barrels of oil through a quarter-inch choke, with a tubing pressure of 590 pounds and a ratio of 1097. The gravity of the crude was 44.6 corrected.

Q Was that a twenty-four test?

A Twenty-four hour test.

MR. ARMSTRONG: We would like to introduce that as Exhibit No. 1, if it please the Commission.

MR. SPURRIER: It will be accepted.

Q Have you prepared another exhibit designated Productivity Index Data on well No. 5?

A Yes, sir, we did.

Q Will you briefly outline what that contains?

A Well, in our McKee Sand we shut that well in for a period of a little over 74 hours, and got a bottom hole pressure of 2955 pounds. We flowed the well at three different rates; first at the rate of 101 barrels per day; at the rate of 243; and at the rate of 368; and the corresponding ratios were 1352, 1277, and 1233, and the PI was .407, .482, and .502.

Q Your next exhibit is Production Curve on State No. 5, I believe. Will you briefly outline what that contains?

A Well, on the right it shows the Productivity Index. Next, to the left, is the Gas-Oil Ratios and the oil production, and the bottom hole pressure and the drop in bottom hole pressure at the various rates of flow.

Q Will you tell us what that drop is at the various rates of flow again?

A At 308 barrels, which was the top rate, our drop was 733 pounds. At the 243 barrel rate, the drop was 504; and at the 101 rate the drop was 248.

Q Have you also prepared the production--another production curve--on the Hare field in the McKee. I believe the first one was the Brunson-Ellenberger.

A I gave the McKee just now.

Q Will you give us the one on the Brunson-Ellenberger?

A On the 5?

Q Yes, sir.

A You mean this graph here?

Q Yes, sir.

A This shows the same thing. Reading from right to left. The productivity index, gas-oil ratios, oil production, bottom hole pressure, and drop in the bottom hole pressure at the various rates of flow.

Q What are those figures?

A Well, it--we flowed the well at the rates of 346 barrels a day, 360 barrels a day, and 187 barrels a day.

Q And what were the respective drops?

A At the high rate the drop was 1513, at the 13--I mean at the 260 barrel rate, the drop was 998, and at the 187 barrel rate the drop was 685.

Q Did you take any drill stem tests in this well?

A Yes, sir.

Q That is your next exhibit? It is on Well No. 5?

A Yes.

Q Can you tell us what that exhibit shows?

A Well, we took five tests on that well. The first one, we had a packer failure. And the second time it was some 77 hundred, which was total depth, the packer set at 7606. The well produced at the rate of 65 barrels of oil per hour. The next test was from 7800 total depth--7784, and in that section the well produced 21 barrels per hour. And the next one, I think a total depth of 7880, with the packer set at 7844 and we got a light blow.

Q Got what?

A Just a very light blow. That was the Connell section. We tested the Ellenberger, the total depth 8148 with the packer at 8005 and we recovered, oh, I believe about 66 hundred feet of oil in the test. We had a good blow throughout. And we moved up the hole and set a packer at 7960 on the second test, and as we were coming out of the oil, the well didn't flow, but we estimated it blew out about three or four barrels of oil.

Q Is that all the pertinent information contained on that exhibit?

A I believe so, except the graph of the cross sections at the last.

Q Your next exhibit is a plat showing Tide Water leases and other leases in the immediate vicinity.

A Yes, sir, that's right.

Q Your last exhibit, I believe, is a west-east cross section?

A Yes, sir.

Q Of the State S lease?

A Yes, sir.

Q Will you explain to the Commission briefly what that exhibit portrays?

A This shows our perforations in the wells Nos. 5, 4, and 3. And it also shows the section that we drill stem tested and estimated water level in the Ellenberger and the McKee.

Q Starting with Well No. 5, just outline briefly to the Commission where the respective zones are found and estimate--what completion has been made--and where the water level is.

A The well No. 5, the elevation is 3458 and the top of the McKee there -410 -- oh, about 18 -- and it is perforated from 7--

Q That is already in evidence, I believe.

A Well, 7610 to 60 and 7682 to 7710. And the Ellenberger, we tested, was plugged off and perforated at 7968 and 8020 and 8062 to 8120. The water level in the McKee at -4400 and the estimated water level in the Ellenberger at -4775. And the well No. 4 showed the same information as No. 3 except we just have the Ellenberger open there, which is the same case as Well No. 3.

Q Then well No. 5 is presently completed in the McKee Sand?

A Yes, sir.

Q And well No. 4 in the Ellenberger?

A Yes, sir.

MR. ARMSTRONG: You consider all those exhibits marked and in evidence please sir?

MR. SPURRIER: Yes, and they will be accepted.

Q Mr. Shackelford, the application of Tide Water Associated Oil Company, asks in effect for the transfer of allowables as between wells 4 and 5?

A Yes, sir.

Q Based upon your study of this field, and your experience in its actual production, do you have any opinion as to whether or not if this is granted by the Commission and 180 barrel allowable is granted on the McKee, is that right?

A No., 240.

Q And the Ellenberger. That it will or will not result in any damage to the reservoir.

A Well, based upon the information that we have in our No. 4 and the height of that well above the water level, I do not believe it will hurt the reservoir.

Q You don't think there is any danger in coning in water from the bottom?

A No, it is approximately 450 feet above the water level and I don't believe it will cone in.

Q Is that not considered a pretty good distance from the water level?

A I would say it was.

Q Do you have any opinion as to the transfer of allowables, if this Commission should grant the transfers, as to whether or not the Ellenberger could stand a production rate of 240 barrels per day for a reasonable period of time without--or for indefinite time--without resulting in any physical waste in the reservoir and damage to the reservoir or any physical waste?

A Well, what we have right now, information, I would say it wouldn't hurt at the present time. Now, indefinitely, I wouldn't, no. I wouldn't say how long. From the information we have to date I could say they could stand it.

Q Mr. Shackelford, do you recommend to this Commission it accept an order permitting the transfer of allowables between wells 4 and 5 as requested in the application?

A I would, yes, sir.

Q Now, Mr. Shackelford, would you be willing if this transfer of allowable was granted, to come before this Commission in six months or any other reasonable period of time that the Commission might ask and make a stand as to the then existing facts with regard to those reservoirs and in the bottom hole pressure and other factors that effect the production from them?

A I would be glad to.

Q As a practical matter, could you within a reasonable period of time and after these transfers of allowable have been granted test those wells to ascertain these facts?

A Yes, sir.

Q It is customary in the industry to do that, isn't it?

A I would say it is information a person should have, yes, sir. It is customary.

Q Mr. Shackelford, you testified at length in March about your experience with Dual completions?

A Yes, sir.

Q And testified that in your opinion dual completions could be safely adopted in this field, is that right?

A Yes, sir.

Q Now, you have heard--

A Wait a minute.

Q Excuse me.

A Safely adopted in the wells we have in mind.

Q Yes, sir, in our wells. You don't know anything about any other wells in the field except ours?

A That's right.

Q You have heard the testimony that has been offered here the last couple of days? Have you heard anything that has been offered here that would change your opinion about the feasibility and practicability of adopting a dual completion as to our wells in this field?

A No, sir.

Q Are you of the same opinion now as you were then, that we could safely adopt dual completions without any damage resulting to the reservoir?

A Yes, sir.

Q MR. ARMSTRONG: That is all for the present.

CROSS EXAMINATION

By MR. HUGHSTON:

Q Are you still asking for transfer on a temporary basis only, just during the period of the emergency?

A I believe that's right.

Q When will the emergency end? The Commission will have to write some kind of order and we know it won't end until the steel situation is improved, but when will you wish the transfer of allowables to end with reference to when you get steel to drill the well?

A Mr. Commissioner, I think that is a question I shouldn't attempt to answer. I think the emergency will end when the Commission determines it has ended. Whether sixty days or six months or six years.

MR. ARMSTRONG: This order like all other orders issued by the Commission are necessarily under your law temporary orders. They can be changed upon the request of any interested party or upon the motion of the Commission itself, and I think the question of how long this order will remain in effect is in the sole prerogative of this Commission.

MR. HUGHSTON: I am not asking you to estimate when our defense efforts will be over or anything of the sort. But I think they are basing their application primarily upon the

steel shortage and if they can get steel to drill without effecting another program the emergency will have ended as to them.

A I think in further answer the request of the Commission is that it be upon a temporary one year basis or such other period as the Commission may determine.

MR. HUGHSTON: We expect the Petroleum Administrator for Defense to come out with another priority order for another six months, and if they allow drilling for offset purposes they will then have steel available.

THE WITNESS: I think in answer to that question, if that happens Tide Water will probably be willing to drill those wells on 40 acre spacing. That will be determined and controlled by a lot of other things we do not have the answer to today. It will be controlled largely by the production history from this well we are able to get in the meantime.

MR. HUGHSTON: Now, what do you mean by that, just for the purpose of enlightening the Commission.

A I think it is entirely possible if and when the emergency is over in the opinion of this Commission that we would then ask for dual completions but we would be controlled in that by the production history and what we have learned about this field. We are dealing with a field about which we know very little. We have had no production history and we are contending one well will drain or will not drain 80 acres. We can determine that only when sufficient wells have been produced to give us that information. We are not in a position

today to say what Tide Water's position will be six months or one year from now. We are asking for a temporary order based on the emergency to transfer allowable.

MR. HUGHSTON: Because steel isn't available?

A That's right.

MR. HUGHSTON: And when stell is available for it it should be reconsidered at that time.

A I think that should be reconsidered, but what we will ask for at that time I am not in a position to say.

MR. SPURRIER: Anyone else?

MR. HUGHSTON: I want to ask some more questions.

MR. SPURRIER: Excuse me.

Q Mr. Armstrong said you don't have any information about this field. How long has the Ellenberger been producing, Mr. Shackelford?

A Well, now the wells we have in mind, I think was completed in January of '51.

Q Sir?

A The wells, that we are speaking of, the Ellenberger No. 4 was completed January '51.

Q I am talking about the field as a whole.

A Oh, I don't-- Just a minute.

Q Do you know how many wells there are in the field?

A I do not.

Q Have you studied any of the reservoir data compiled by the

New Mexico Oil and Gas Engineering--

A (Interrupting) I am basing my information upon our wells and our ability to produce.

Q Your wells only?

A That's right. We are just interested in ours.

Q You would be interested in reservoir conditions generally in making a recommendation to this Commission, would you not.

A We are recommending during a steel shortage that we transfer the allowable on our wells purely on the basis of the steel shortage, and we feel the wells are capable of producing it.

Q And will not cause any waste for the temporary period?

A We don't think it will.

Q What effect will it have upon correlative rights?

A Well, I don't know. I am not qualified to answer that question I would say.

Q You are not prepared to state in your opinion to the Commission then that it will not effect correlative rights?

A We have drilled two wells on the 80 acre tract and we have proved that both zones and both wells are capable of producing, Consequently, by proving they are capable of producing I think we are entitled to that amount of oil from that lease.

Q Now, your S-5, you had to acidize. How much did you use?

A We used 15 thousand. I understand a lot of people had trouble with wells in that area.

Q What about your S-4?

A Two thousand.

Q Based on the relative amounts of acid you had to get in and get the flow, would you say the formation varied in permeability from area to area?

A I would say it would.

Q Is it your opinion the Ellenberger is an innerconnected homogeneous reservoir or not?

A What do you mean?

Q Well, is it uniform throughout its area?

A Well, I don't believe anything is uniform throughout its whole area, is it?

Q Well, if there were relatively permeable areas and relatively impermeable areas, in the relatively impermeable areas drainage will be a matter of local concern, will it not?

A Ask that question again.

Q If there are relatively permeable areas and relatively impermeable areas, in the relatively impermeable areas drainage will be a matter of local concern will it not?

A It would--we are not producing from a relatively impermeable area.

Q Well, you are producing from variable impermeable areas are you not?

A I would say so.

Q And one less permeable would be of more concern locally than it would to the field as a whole in so far as drainage is concerned.

A Will you ask the question again please?

Q Well, I am driving at correlative rights and the matter of drainage. Where you are producing from a relatively less permeable area drainage is going to be of more local concern than it would be of field concern.

A I would say so.

Q Sir?

A It would be, probably.

MR. HUGHSTON: I believe that is all.

CROSS EXAMINATION

By MR. NESTOR:

Q Mr. Shackelford, I wasn't able to keep up with you while you were giving the data regarding the productivity index test obtained in your State S-5 well from the McKee and the Ellenberger formations. At this time I would like to ask you some questions on those tests please.

A All right.

Q Relative to the McKee test, what was the shut-in period prior to the testing?

A The shut-in period was 74 hours and 45 minutes.

Q A_t which time you had a bottom hole pressure of 2950?

A Five.

Q 2955. In your test, you stated that it was flowed at the rate of 101 barrels per day. Would you tell me how long it flowed at that rate? How many hours and days?

A It flowed for 18hours and 15 minutes.

Q At the rate of 101?

A It was based--we have everything constant.

Q It was stabilized?

A It was stabilized.

Q Your ratios and PI will be determined from the point of stabilization?

A Yes.

Q How long was the second rate maintained?

A The 243 barrels, 20 hours and 45 minutes.

Q And the third rate?

A 17 hours and 22 minutes.

Q 17 hours and 22 minutes. All right. And then refer now to the Ellenberger formation, I didn't get the gas-oil ratio and the PI result on that.

A Ellenberger?

Q Yes, sir.

A It is right there in the book. Want me to tell you?

Q No. If we have it.

A VOICE: Read it then please. We didn't get it here.

A What do you want to know?

Q The Ellenberger testing, if you will go through your flow rates.

MR. SPURRIER: (To the reporter) You don't need to take this.

(Off the record.)

MR. SPURRIER: We will be in recess until 1:15.

(Recess.)

MR. SPURRIER: The meeting will come to order please.

(Continued cross examination of Mr. Shackelford by Mr. Nestor.)

MR. NESTOR: I believe we were proceeding with information regarding the productivity index test in the Ellenberger. Is that correct?

A On well No. 5.

Q The gas-oil ratios which were not read at that time, varied from 690 to 835, is that correct?

A Ellenberger, on No. 5?

Q Yes.

A From 680 to 835.

Q I got that wrong.

A Is that what it shows on the graph?

(Off the record.)

Q Your comment in here that these tests were not made in the conventional manner. What do you mean?

A You know. In a conventional manner would be like the McKee on No. 5, you would be shut-in for a period of time and then start out on it, is what we mean by conventional manner. Due to our rig time we cut it off short.

Q Would you comment to the Commission the relative time of the Ellenberger PI testing with respect to the final acid treatment of the Ellenberger zone in your S-5? Just the relationship of the flow tests from the time standpoint?

A I believe it was roughly 40 hours, something like that, 48, I don't know exactly.

Q According to the records here this well was acidized on the 16th of April, is that correct? I believe there might be some confusion there if what you say is correct.

A Yes, it was on the 16th.

Q And what date did you show the PI testing commenced?

A 17th. But it could be--I believe it was acidized the morning of the PI or sometime at night on the other.

Q Have you any comment to make on the time at which the whole load had been removed from this well following your acid job?

A How long it was produced before we had the PI test?

Q Right.

A Well, the well started flowing about 9 p. m. on the 16th and we waited until afternoon of the 17th. In other words, we recovered enough to empty the annulus of the hole several times before we started the PI test.

Q Within approximately 30 hours, is that it?

A Yes.

Q During this final acid treatment job, was there any appreciable break in the treating pressure during the trdatment?

A No, there wasn't any great break.

Q Do you recall roughly what the treating pressures were?

A Around 3500.

Q Quite high then. What would you estimate the total Ellenberger production from your well during the testing period prior to the setting the bridge block and attempting the work on the McKee. What would you estimate the total production was?

A Oh, I don't know that the different size chokes and all it was flowed on and I would estimate--I wouldn't estimate until I went over therecords--I wouldn't even give an estimate of production.

Q You wouldn't even give an estimate?

A No, I would have to check the figures.

Q From the dates given in your here, it appears from the time you commenced testing, from the time that you had already perforated the McKee, and treated the perforations with acid, which was on the 21st, it was something only like 4 days in total to again cure the well and perforate and treat with acid. You had to set your plug in there. So, it appears possibly you had something less than 3 days production.

A No, it doesn't take long to lay the plug in there and put your stuff on it and perforate the McKee.

Q But you only had 4 days.

A You could do it all within a period of probably 8 or 10 hours.

Q Did you have to cure the well?

A Sure.

Q How many days would you say your Ellenberger well produced?

A Let's see here. It was around 3 or 4 days. I don't have the exact data on that.

Q It couldn't have been over 4?

A Right.

Q You started on the 17th and quit on the 21st. So it couldn't be over 4?

A No.

Q Do you feel that is adequate testing to establish the conditions of the Ellenberger reservoir in that well?

A Yes, I sure do.

Q You feel you could predict the future behavior of that well on the basis of those few days testing?

A Now, what do you mean by future?

Q The future performance. You feel you could predict if necessary approximately the probability of that well after one month or six months time were it necessary to produce? You feel you could do that?

A I fell I can say it would produce for six months or a year, yes.

Q At what approximate rates?

A At allowable rates.

Q All right. Mr. Shackelford, how many wells does your company operate in the Brunson field?
A Well, three, four and five in the Ellenberger zone and on our State S lease. And I haven't had the opportunity to check on the other wells. There is some more that we have produced in the Ellenberger in the Brunson field.
Q Yes. But you haven't checked into the data on those wells. Do you know whether they produce at top allowable rate?
A No, I don't know about that. I think one of them has-- I am speaking of just 4 and 5 here.
Q You feel it is sound engineering to predict the probability of a new well in the field simply on the basis of that well and not take into consideration the data available to you on your other wells in the field?
A I am basing ours on the ability of this one particular well to produce, that I think it will produce, at its allowable rate.
Q Have you ever studied any of the other wells, offset operators wells, or other wells in the field?
A No.
BY MR. SAVAGE:
Q Mr. Shackelford, you say you believe this well will produce at its allowable rate?
A Yes.
Q Well, under the understanding shouldn't this well be able to produce double the allowable rate?

A No, sir.

Q Then, as I understand, you are not prepared to transfer those allowables back and forth.

A We are asking the well No. 5 be given to No. 5 and the McKee allowable in No. 4 be given to No. 5. That is the way they are completed.

MR. NESTOR: Would you have any objection to completing them the other way? If No. 5 is a good well in the Ellenberger, would you have any objection if the Commission granted permission to complete that well in the Ellenberger and the other in the McKee?

A Evidently would if we have them completed that way. Wouldn't you?

MR. NESTOR: I am not testifying right now. The question I have in mind is that possibly the objection should have been left up after the Commission had heard some other testimony in the case.

MR. ARMSTRONG: I will object to the argument with the witness.

MR. SPURRIER: Objection sustained.

MR. NESTOR: How many wells do you operate in the Hare field, Mr. Shackelford?

A I believe the No. 5 we have got here is the one I am familiar with right now.

MR. NESTOR: Have you any other wells in the Hare field?

A I am not sure about that.

MR. NESTOR: Do you know how many wells there are all told, roughly, in the Hare field?

A No, I don't believe I do.

Q Have you ever studied any information, and bottom hole pressure data, available on other wells in the Hare field?

MR. ARMSTRONG: I want to object to that. It has been gove over before and he has testified he wasn't familiar with the other wells in the Hare field.

MR. NESTOR: We were talking about the Brunson field before.

MR. ARMSTRONG: I beg your pardon. Go ahead.

Q Producing from the section which is producible in the Hare field. Excuse me. You testified this morning I believe--

MR. HUGHSTON: (Interrupting) I don't believe we ever got the answer from the witness.

MR. ARMSTRONG: We will withdraw our objection.

MR. NESTOR: Would you read the question back to the witness, please?

(Reporter reads the question.)

A No.

MR. NESTOR: I believe you testified this morning that Tide Water would expect to drill wells on 40 acre spacing after the tubular goods situation eased.

A No. I didn't say that. I believe Mr. Armstrong testified to that.

Q It is mixed in here. I believe you are right. I will wait then. You stated this morning you were interested only in the Tide Water wells and, therefore, you were presenting this case without any consideration of correlative rights of offset operators and so on, is that correct?

MR. ARMSTRONG: I don't believe the witness answered that. I think the record of the reporter will show what he testified to and it is objected to as being incompetent and irrelevant and immaterial to any issue in this case.

MR. SPURRIER: Do you want to rephrase your question?

Q During completion testimony this morning, it was indicated that your State S-4 well was treated with a total of 2000 gallons of acid, is that correct?

A That's right.

Q And your State S-5 well, during the treating, testing, of the Ellenberger horizon, was treated with 15,000 gallons?

A That's right.

Q You have stated that the final treating pressure in the State S-5 well was approximately 3500 pounds per square inch. What does that indicate to you, Mr. Shackelford?

A Well, it indicates to me it is a little tight.

Q You would say a little tight?

A Yes.

Q I wonder if you would tell us what the acid entered the formation in your S-4 well had. Do you have any indication on the treating pressure in the S-4 well?

A Well, it seemed that the acid treatment in that area is quite irregular. We have one well, I think was 4900. Four was 400 and this was 4500.

Q That was final treating pressure?

A Yes.

Q No. 4 was 400.

A Yes.

Q Would that seem to indicate to you there was much local variation in reservoir condition between wells, that is, with reservoir development?

A I would think it is a local condition all up and down through that Ellenberger section there.

Q You think there is considerable variation from well to well?

A Yes, and through the section.

MR. NESTOR: I think that is all.

MR. SPURRIER: Anyone else?

MR. ARMSTRONG: I have one more question I would like to ask.

REDIRECT EXAMINATION

By MR. ARMSTRONG:

Q Mr. Shackelford, is it your opinion that Tide Water could produce well No. 5 in the McKee at twice the allowable for a 40 acre tract without creating physical waste and underground damage?

A I believe that we could.

Q Is it your opinion that they would produce well No. 4 in the Allenberger and be given twice the allowable granted to a 40 acre tract without resulting in waste and physical damage to the reservoir?

A I think so.

MR. ARMSTRONG: That's all.

MR. NESTOR: Mr. Commissioner?

MR. SPURRIER: Yes.

MR. NESTOR: Mr. Shackelford, you believe that these wells could be produced at twice the allowable rate. What study have you made to convince you such production could be sustained at twice the allowable?

A Because of the local situation with relation to the water level and the production tests we have on the wells.

MR. NESTOR: That is the only engineering data you have to offer in support of that?

A On those wells, that's right.

MR. NESTOR: In transfer of allowables, pulling a well at twice the allowable rate, do you believe that one well on 80 acres could ultimately recover as much oil as two wells drilled in more or less the center of each of the varying 40 acre units?

A State that again. Will you please?

Q Do you believe that a well drilled, well off center on 80 acres, such as your State S-4 well, --

MR. ARMSTRONG: I will object to that, if it please the Commission. It is irrelevant, immaterial and incompetent. We are not contending one well will drain 80 acres except on a temporary basis.

MR. NESTOR: Do you then admit it won't drain the 80 acres effectively?

MR. ARMSTRONG: No, sir, I will not. That question isn't before this Commission at this time.

MR. HUGHSTON: For an indeterminate transfer of allowable, it is before the Commission for a number of years.

MR. ARMSTRONG: We don't ask for an indeterminate transfer of allowable. We propose to come back here at the end of a year. I stated this morning we are willing to come back at the end of six months or any other period the Commission might determine to be proper and make a showing at that time as to what our experience indicates.

MR. SPURRIER: Do you want to answer the question?

MR. ARMSTRONG: I have no objection to answering the question except we can go along, all along this line all afternoon and never get through. I don't think it is pertinent.

MR. NESTOR: I will withdraw the question. I think that is all I have at this time, Mr. Commissioner.

MR. HUGHSTON: Did you sustain the objection?

MR. NESTOR: I withdrew the question.

MR. HUGHSTON: All right.

MR. SPURRIER: Do you have anymore questions?

MR. NESTOR: No, sir.

MR. SPURRIER: Mr. Savage?

MR. SAVAGE: No, sir.

MR. SPURRIER: Mr. Armstrong?

MR. ARMSTRONG: I rest subject to rebuttal.

MR. SPURRIER: Mr. Campbell?

MR. CAMPBELL: No, sir.

MR. SPURRIER: The witness may be excused.

(witness excused.)

MR. ARMSTRONG: I would like to ask Mr. Nestor a question or two here.

MR. NESTOR: I will take the stand in time. You have no more witnesses now?

MR. NESTOR: Have you completed your case?

MR. ARMSTRONG: I have, yes, sir.

MR. HUGHSTON: Mr. Commissioner, just for my own information, do you take judicial knowledge of the number of wells in a field and of bottom hole pressure reports that have been made to you with reference to those wells?

MR. SPURRIER: Well, I might say that it would depend on the case. If we need to, we certainly will, yes.

MR. HUGHSTON: It is all within your own files?

MR. SPURRIER: That's right.

MR. HUGHSTON: And I was thinking you would want any argument based on those that could be made?

MR. SPURRIER: That's right, because itis in our files.

MR. CAMPBELL: Mr. Nestor, I would like to request any evidence or testimony you plan to give that you want to stipulate into the first case that you designateit before you start you testimony so that we can be prepared to cross examine.

MR. NESTOR: You mean anything that would deal with your well as not compared with the other wells.

MR. CAMPBELL: No, I don't understand just exactly what you plan to do. We have rested our case and as far as I know you have rested in Case No. 274 except for such testimony as you give in this case you might want to apply to our case.

MR. NESTOR: Correct.

MR. CAMPBELL: If you plan to give any testimony to apply to Case No. 274 by stipulation here, I would like to know when you testify so I can cross examine.

MR. NESTOR: Yes, sir.

MR. SPURRIER: You will do that?

MR. NESTOR: Yes, sir.

MR. SPURRIER: Well, let's get on with the case, gentlemen.

MR. NESTOR: I wish to enter an exhibit showing the Brunson and Hare pool wells andthe location of the wells in

the pools, pressures, submitted by the operators, as in the most recent surveys, bottom hole pressure surveys of these wells. Is that admissible?

MR. SPURRIER: Certainly.

MR. NESTOR: It isn't numbered. We will put it in as S-5. We will make this for both cases, 274 and 275.

(Off the record discussion between counsel as to the numbering of exhibits.)

MR. NESTOR: I will number this S-5 in 274 and S-1 in this case if desired.

MR. SPURRIER: I think we ought to keep the records separate. There are different factors in the cases and we ought to as much as we can keep them separate.

(Marked S-1, 275 and S-5, 274.)

MR. SPURRIER: What is the source of your information on this matter?

MR. NESTOR: These are the pressures as submitted.

MR. SPURRIER: To whom?

MR. NESTOR: To the New Mexico Oil and Gas Engineering Committee, submitted by the companies theoretically or as run by the Committee operators.

MR. CAMPBELL: I understand the testimony you are now going to give applies to both cases?

MR. NESTOR: Yes, sir.

MR. CAMPBELL: I think the reporter ought to show in the record at this point that it was stipulated and agreed between the parties that the testimony of Mr. Nestor in Case No. 275 should be entered in the record in Case. No. 274.

MR. HUGHSTON: I understood we were to consider everything in general in either case in both cases.

MR. CAMPBELL: The Commission can, of course. But I would like, just for the sake of an orderly record, I would like to keep two separate transcripts on these cases. I think the parties involved are entitled to it. There are some elements a little different. The emphasis in the cases may be a little different in certain respects. You don't expect the testimony on cross examination of Tide Water witnesses to be used in the Cities Service Case. He wasn't a witness in that case.

MR. HUGHSTON: Not to show the weakness of their case but insofar as it would bring out any element that would show transfer of allowable as a bad practice, we would expect it to be considered.

MR. CAMPBELL: Isn't that going to be brought by your witnesses?

MR. HUGHSTON: I don't know how much will be brought out by him.

MR. SPURRIER: It seems to me that Mr. Campbell has a good point I am sure. Unless the reporter shows what is being taken here now in both case records, then you don't know if you have the full record of the case when you are reading the record for Case No. 274.

MR. HUGHSTON: I would think they would both have to be read to know you had a full record.

MR. SPURRIER: Of course. From now on, according to Mr. Campbell's suggestion or request, we are considering that we are listening to your objections to both cases, is that right?

MR. HUGHSTON: That's right. And everything we have put in here is expressed as to both of them except as to the particular data we introduced as to Cities Service S-4 this morning.

MR. CAMPBELL: That is all right. I don't want to have in my case the cross examination of another witness in another case. I don't object to your putting into my case your objections to the transfer of allowables. I don't think it is good procedure to put in the testimony of the Tide Water witness in our case on the cross examination of it. The Commission has both transcripts to read.

MR. SPURRIER: That's right. Let's proceed.

BY MR. HUGHSTON:

Q What are the numbered wells in the Brunson field, Mr. Nestor?

A Approximately 93. New completions not available to me at this time possibly number two or three.

Q What percentage of the field has been developed?

A As presently defined, I would judge somewhere in excess of 85 percent of the field is developed. I take the presently defined limits. That would include the in field drilling which

remains.

Q And about the Hare field, how many wells in the Hare field?

A There are approximately 32 wells in the Hare field.

Q And what percentage of that field is complete at this time?

A I would estimate that roughly 30 per cent of the Hare field has been developed.

Q Are any of the Brunson field wells on pumpers yet?

A Yes, sir, there are a number of wells on artificial lift in the Brunson field at this time.

Q Do you have the figures on those there?

A Yes, sir. This information, again, comes from data submitted by the operators and incorporated in the monthly reports of the New Mexico Oil and Gas Engineering Committee. Their report for January 1951, showed about 9 wells on gas lift and about six wells on beam pump. Two wells were listed as dead, not producing.

Q Are any of those wells producing water?

A Yes, sir. From records obtained, that same month, for the month of January this year, 18 of 93 wells then producing were approximately, or approximately 19 per cent of all producing produced more than 2 per cent water during the month. The month of January 1951.

Q Do you have the highest rate that any well is producing water?

A Well, I have here a break-down by percentage of the per cent water, roughly. The data is available to go into the other if we want to take them. One-third of the wells made from 2 to

10 per cent water, another third of the wells made varying rates from 10 to 50 per cent water, and the final third of the wells was above 75 per cent water.

Q How many wells in the Hare field are on artificial lift of any kind?

A From my knowledge, from the most recent information, one well was on artificial lift. And consideration was being given to installation of artificial lift on one other well.

Q Do the present average--do the present bottom hole pressures in the Brunson field indicate any wide variation between the top and bottom figures?

A Yes, sir. As shown on the Exhibit S-5 in Case 274 and Exhibit S-1 in Case 275 there is a wide variation of pressures in the Brunson field at this time.

Q Give us the top figure, you can readily pick up on the bottom figure.

A I would say from examination that possibly the Tide Water State S-4 figure of 2650 psi is the highest figure in the field, and the Amerada Walden 3 with a bottom hole pressure of 556 psi is the lowest bottom hole pressure in the field.

Q Did you find any wells in the field near the Tide Water S-4 that are very much different from the figure you gave for it.

A Yes, sir. There is a fairly marked difference between the pressure in the Tide Water State S-4 and the pressure in the

fide Water State S-3. The State A has a bottom hole pressure of 650 psi while that for the S-3 was 2020 psi.

Q You don't have to drop very far down to find some that went under 2000 pounds, do you?

A No, sir. It would be in the order of 1 and three-quarter miles, I would say.

Q And do some of the Ellenberger wells in the Brunson field come in flowing?

A Yes, sir.

Q Do some have to be acidized?

A Yes, sir. A number of these wells have to be acidized.

Q Based on your studies of bottom hole pressures and the way the wells come in, and other factors in the field, what is your opinion as to whether or not the Ellenberger reservoir is an innerconnected reservoir of uniform permeability?

A I would say it from my knowledge and my opinion, the Ellenberger is not uniformly connected here over the entire limits of the producing pool.

Q Well, if it isn't, what effect will that have on the drainage from any particular well?

A I would say that the drainage from any one particular well could not necessarily be correlated with the drainage from other wells even nearby in the field.

Q Would that not make the granting of a double allowable

of particular concern to offset operators?

A In my opinion I believe that the granting of such a double allowable might tend to disturb correlative rights.

BY MR. SAVAGE:

Q Mr. Nestor, expand on the subject of what you believe happens when a well is being produced at a rate two times that of the other wells in the field, from the standpoint of the pressure in the bottom of the hole, the possible location of gas caps.

A Possibly, since I am going to use data presented by the Tide Water Associated Oil Company for this answer, this might not be applicable to your case.

MR. HUGHSTON: We want it applicable to both.

MR. SAVAGE: It applies to any dual completion and any transfer of allowable.

A From analysis of bottom hole samples made by other companies in the Hare field, an approximate saturation pressure of roughly 29 pounds was established. This would mean that this field is very near the saturation pressure when wells are drilled, even back to the original wells in the field. The productivity index data established in the Tide Water State S-5 well in the McKee showed that on reasonably long flow periods that the pressure drop at the bottom of the hole during the PI testing was approximately three times as great at the flow rate of 368 barrels daily as it was at the flow rate of 101 barrels daily. And slightly more than two times as great

at the flow rate of 243 barrels daily as compared with the rate of 101 barrels daily. To me, this would pose an interesting problem. If we are very near the bubble point on completion of these wells, it would appear to me that the greater the drop in bottom hole pressure during production of the well, the more likely it would be for gas to leave solution and then to form secondary gas caps. If this were true, a small amount of gas contained in solution would be available for moving oil to the well bore. Thus flow at your high rate might tend to leave some of your recoverable oil in the formation, which might otherwise be recovered at a lower rate.of flow.

Q Would not in your opinion the formation of a secondary gas cap around the well, would that not work to the detriment of offset operators?

A Yes, sir. The tendency of gas caps to migrate has been observed, and it isn't reasonable to assume that the secondary gas cap formed in the immediate vicinity of a well being pulled at a much higher rate would necessarily remain in the vicinity of that well. It has been established, I believe, in many reservoirs that gas tends to migrate through the highest part of the structure. And, therefore, any wells of structure from a well producing at such a rate as to form a secondary gas cap might relatively suffer from such drainage.

MR. SAVAGE: That's all.

MR. SPURRIER: Mr. Armstrong?

BY MR. ARMSTRONG:

Q Mr. Nestor, you don't have any fear that these dire consequences you have just spoken about are going to occur in the near distant future?

A In the near distant future?

Q Yes, sir.

A Well, sir, I will submit that any flow at a higher rate, at a rate sufficiently high, to drop the pressure approximately 500 pounds psi below the bubble point would tend to form secondary gas caps more rapidly than flow at a lower rate, and such formation would begin immediately.

Q You don't mean to testify to this commission, if they were to grant the transfer of allowable on these two Tide Water wells that within the next month those wells being given the transfer of allowable, that that would occur?

A That what would occur?

Q The creation of your secondary gas caps would occur?

A From my understanding of subsurface mechanics I believe that the formation would begin immediately.

Q Begin immediately?

A That is my opinion. As soon as we drop the pressure below the bubble point the gas begins to leave solution and it comes out in the reservoir.

Q Assuming this transfer of allowable is granted, when will we reach the point where the gas starts coming out of solution?

A When?

Q Yes.

A Well, again, I just repeat my previous statement.

Q Wouldn't that depend entirely on the field wide production as to when it comes out of solution?

A No, sir. Not in my understanding of PVT analysis.

Q Just explain that to us a little further.

A Well, sir, it is my understanding from PVT analysis of hydro-carbons samples that at anytime you drop a producing pressure or static pressure of the hydro-carbon mixture below the bubble point, there tends immediately to be separation of the gas in solution from the hydro-carbon mixture.

Q Well, assuming a contuation of the same field outlet that we have here, the same amount of production, from the field that we now have, when is that drop in pressure going to reach the saturation point?

A For the entire field?

Q Yes, sir.

A I would say that that pressure has already been reached.

Q Already reached?

A Yes, sir.

Q Now, you have been talking about acidizing these Ellenberger wells. Isn't that the rather customary practice out here in New Mexico and Texas to acidize the Ellenberger formation?

A Yes, sir, it is.

Q And the amount of acid we used in our wells, as we testified, isn't an unusually large amount of acid for the Ellenberger.

A Yes, sir, I would say it is an unusually large amount for the wells in the vicinity of your well.

Q Didn't you have one well about a half mile from this well where you used some 45,000 gallons of acid recently?

A I would say that was a most unusual well.

Q But it does occur out here?

A It has occurred twice.

Q Mr. Nestor, do you know off hand how many dual completions the Shell Oil Company has in Texas?

A No, sir, I do not.

Q Do you have any oil-gas dual completions here?

A No, sir, to my knowledge we do not.

Q Would it surprise you to know you have more than fifty dual completions in Texas?

A No, sir, it wouldn't surprise me.

Q Now, Mr. Nestor, is Andrews County and Hartley County in your area here?

MR. NESTOR: If it please the Commission, is this a cross examination period here?

MR. SPURRIER: Yes.

MR. NESTOR: Am I forced to answer questions on areas I haven't discussed?

MR. ARMSTRONG: If you don't know--

MR. HUGHSTON: We have no objection to his answering the question if you want to ask them, but strictly we didn't

ask a single question about dual completions.

MR. ARMSTRONG: I think you are here today fighting dual completions.

MR. HUGHSTON: Yes, sir.

MR. ARMSTRONG: And I think by your own conduct elsewhere in your field of operations you have repudiated the position you have taken here today.

MR. SPURRIER: If you can answer the question, the Commission would like to have you do it.

MR. HUGHSTON: The insinuation that we have repudiated our position, I want him to bring in evidence to show that. We think it is inconsistent.

MR. ARMSTRONG: I think we will be able to show by this witness that the Shell Oil Company, just like Tide Water and Cities Service and most other companies, sought and obtained dual completions in their operations throughout Texas and elsewhere. Now, they take the position today they are against dual completions and I say they have not always been against dual completions.

MR. HUGHSTON: If you are operating in a state where wells are dually completed, you might still dually complete and still be against them.

MR. ARMSTRONG: That's right.

Q Do you know whether or not you have any dual completions in the Jordan field in Hartley County Texas?

A Yes, sir, I know we have.

Q How many?

A I couldn't say.

Q If the records show you have two, would that be correct?

A I couldn't say.

Q Do you know what Sands or zones they are completed in?

A No, sir.

Q Do you know whether or not you have any dual completions in Andrews County in the Budford field?

A No, sir.

Q Do you know how many you have there?

A No, sir.

Q If the record shows you have about 4, would that be right?

A If the record shows it, it would be correct.

Q You don't know what zones those are dually completed in?

A I believe--this is my opinion--I believe those wells were dually completed from the Devonian and the Ellenberger.

Q Do you know whether or not your company has any other dual completions in West Texas?

A Of myself, I have no knowledge.

Q You have no knowledge. Whatever the record shows, you would abide by that?

A If it is a sworn record it is good enough for me.

MR. ARMSTRONG: No further questions.

BY MR. HUGHSTON:

Q Do you know whether or not those dual completions were on

account of one of the horizons not being such as to justify the development in and of itself?

A I believe that is the case in the Jordan-Connell field. I believe the dual completions were made because it was thought the Connell Sand wouldn't support primary development on its own merits in that area.

Q And that is the time when we think any dual completion is a good practice with reference to waste?

A Well, sir, if it would tend to recover more oil, possibly in such a case, I think, possibly, it would be worth it.

MR. HOLLOWAY: May I ask a question?
MR. SPURRIER: Yes, sir.

BY MR. HOLLOWAY:

Q Do you have knowledge at what rates these dually completed wells are being permitted to produce?

A No, sir, I do not.

Q If the proration schedule in Texas shows each zone getting 122 barrels per day, you would accept that?

A Yes, sir.

MR. SPURRIER: Mr. Holloway, is that what the record does show?

MR. HOLLOWAY: The record shows the Connell Sand is producing 122 barrels.

by MR. HUGHSTON:

Q Mr. Nestor, will you state for the Commission your opinion of dual completions, since it has been gone into, insofar as

they effect the waste of oil and gas and correlative rights?
A Yes, sir. My own personal opinion, which is formulated by discussion with other members of my company and with engineers and operating personnel of other companies in this area, leads me to believe that dual completions are not always an efficient way to recover oil from separate reservoirs.
Q In what ways are they not always efficient?
A I believe that possibly the high cost of remedial work in certain of these wells, which has been discussed in these same off the record conversations with other people, might tend to cause premature abandonment of possibly one producing zone in an oil well.
Q Well do packers tend to wear out in time?
A Yes, sir. Again, just in conversation with personnel with whom I am in contact, I have heard much discussion of packer failures. A failure can separate effectively one producing zone from another.
Q Can that cause waste?
A Yes, sir. In my opinion, such a packer failure if unnoticed and unremedied, promptly might tend to prevent migration of fluid from one reservoir to another, thus resulting in damage to a reservoir.
Q Can correlative rights be effected thereby?
A Yes, sir, I believe correlative rights can be effected.

A case which possibly might have some effect would be where you were producing two zones, one of which produced water and one of which did not. The packer failure between those two zones might lead to invasion of water into the zone that did not have water and possibly could result in disturbing correlative rights.

Q Also, a low gravity reservoir might be recharged and two allowables obtained where before the well would produce only one.

A I don't believe I understand the question.

Q Well, if one reservoir had deteriorated where it was incapable of making its allowable and by virtue of leakage past the packer, it was recharged, that reservoir might again become capable of producing its allowable. And the effect of that would be, that operation would be producing more than the allowable from the reservoir from which the oil is escaping.

A Yes, in that case.

Q Any other elaboration you want to make on dual completions at this time?

A No, sir, I believe not.

BY MR. ARMSTRONG:

Q Did you ever testify before the Texas Railroad Commission in a dual completion hearing?

A No, sir, I haven't.

Q Now, if Shell has sought and obtained in excess of fifty

dual completion permits in the State of Texas, then you would assume, I am sure, that your opinion of dual completions is contrary to the opinions of your company, wouldn't you?

A I would assume my opinion reflects the opinion of my company in these two fields.

Q In these two fields?

A Yes, sir.

MR. ARMSTRONG: I believe that is all.

BY MR. CAMPBELL:

Q Mr. Nestor, if I understood you correctly, you are basing your comments concerning the operation of dually completed wells only upon what other people have told you? You have had no personal experience?

A No, sir, I have had no personal experience.

Q And I believe you stated your company's attitude was that dual completions are not always the most efficient way to recover all the oil from the reservoir. When do they become the most efficient way?

A I explained there was one possible case where that might recover more oil from one bore hole. I believe that would be in a case where a zone which wouldn't sufficiently produce in the opinion of the operators in the field to justify primary development. If that zone were to be dually produced it would result in more oil being ultimately recovered from the bore hole.

Q In that event, your company would be willing to overlook all these potential dangers in dually completing the well?

A I would say in that case the company has made dual completions.

Q And these wearing out of packers and various other operational problems in dual completions, your company has operational problems, and material was out on all types of completions, single and otherwise, doesn't it.

A Yes, sir. But there isn't the danger of migration of fluids that exist in dually completed wells.

Q Do you think any of these dangers you speak about are insurmountable and cannot be corrected?

A I would say from my conversation, again, with people in the industry they have not always been remedied. There have been some cases where it appeared impossible and uneconomical to remedy these conditions.

Q But in the fifty or so dual completions you have in Texas, you company has been able to overcome them?

A I know we have had much trouble with them and have been forced to spend much money in repairing those wells. Several of those wells, I should say.

Q Despite these potential dangers you speak about, it is true, isn't it, in Texas or other oil producing states, these dual completions are permitted under proper operational controls?

A Yes, sir, I think they are.

MR. CAMPBELL: I think that is all.

MR. LOVERING: I am willing to testify and give the answers to unanswered questions in regard to the Bedford dual completions asked here awhile ago.

MR. SPURRIER: Do you desire to question him?

MR. ARMSTRONG: We have no desire to question.

MR. LOVERING: I would like to make a statement on behalf of Shell.

MR. ARMSTRONG: I would like to ask this witness one more question.

MR. SPURRIER: All right.

BY MR. ARMSTRONG:

Q You were speaking of the danger of migration of oil in connection with these dual completions. You have a danger of migration of oil, do you not, in any multiple sand fields even with single completions.

A Yes, sir, there is some danger.

Q And it is up to the operator in those cases to keep close check on those wells and correct those situations?

A Yes, sir.

Q Shell trys to correct those situations as they develop in your single completion wells?

A Yes, sir.

Q Isn't it logical to assume Tide Water and Cities Service could do the same thing in connection with their dual completion

wells in this multiple zone field?

A I can't comment. I haven't worked for Tide Water and Cities Service.

MR. HUGHSTON: The danger is greater in a dual completion than a single completion.

A Yes, sir. Immediately the mechanism which separates the two reservoirs fails, there is a direct communication between the fluids in the two reservoirs. It results in having to kill production from two zones and consequent loss of production from one zone while reworking the other.

Q The operational cost is greater.

A Yes, sir.

BY MR. ARMSTRONG:

Q You can't make any assumptions for either Tide Water or Cities Service not having worked for either, and had no experience in actual operations for Shell. You would assume that Shell in its operations in dual completion wells would use due diligence in ascertaining conditions present in their wells?

A Yes, sir.

Q If anything is wrong you think they would go fix them?

A Yes, sir.

MR. ARMSTRONG: That's all.

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

(Witness excused.)

(Mr. Lovering sworn.)

FRANK R. LOVERING,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. HUGHSTON:

Q Mr. Lovering, will you state your name to the reporter?

A Frank R. Lovering.

Q By whom are you employed, Mr. Lovering?

A Shell Oil Company.

Q Where?

A Hobbs, New Mexico.

Q What is your position there?

A Division Production Superintendent.

Q Have you had contact with the West Texas-New Mexico area of Shell over a period of years?

A Yes, sir.

Q Some question was asked here awhile ago about dual completions by Shell in Andrews County, I believe it was. Do you wish to make a statement in connection with those operations?

A The question was asked, why were they using dual completions in that particular area. I state first of all that I, personally, as an engineer could not have recommended them. The wells were drilled dually because at that time there was also a great shortage of steel. That was the influencing factor in deciding to drill them. Dually. We produced those wells for five years

and produced a lot of production. But by the end of the first year, with all the precautions we took with dual packers and all, which was more than anybody else was doing, we still found evidence of communication as the pressures began to differ in the reservoirs. That communication increased over the next two or three years. We took remedial steps to correct those. We put in new packers and later we found that the wells failed to flow through the tubing or through the annulus as the case might be, and took corrective steps to fix that. Pulled stuff out of the wells and put in cross over packers and reversed the flow. At this particular time every dually completed well in that field is dead and at least one horizon. It behooves us now to take steps to further remedy that situation, and which will result in the permanent abandonment of one zone or the other. Bear in mind that your artificial lift problems there are aggravated by the conditions of a great amount of water. Both zones in some of those wells produce in excess of fifty per cent of water.

You can visualize the problems we now have. So, as a result some wells we necessarily will have to go in and abandon the Ellenberger completely and produce to the Devonian after shutting off the water in that formation, and vice versa. And in other wells we will have to shut off water in one zone and try to produce as a single oil well through a single zone completion.

I would like you gentlemen here to bear in mind the fact that we have fifty or ninety of the one thousand wells dually completed in Texas and elsewhere would not mean they are entirely satisfactory, are satisfactory to some degree in other fields. It depends on reservoir conditions. No doubt we have fields in Texas where dual completions are suitable and do not cause too much trouble. But from an engineering standpoint and actual knowledge they do cause premature abandonment, as is being done in the Bedford field and as I understand is being done in the Jordan and Dollar-Hyde, and in other fields by other operators.

Q Based on your experience in the Bedford field, do you consider joint operations sound from a waste viewpoint?

A Will you please state the question again?

Q In view of your experience in the Bedford field and other fields in West Texas and New Mexico--not in New Mexico, I do not believe there are any in New Mexico--would you say that dual completions of wells is unsound from a waste viewpoint?

A I would so far as the known reservoirs in this state are concerned, and as far as the reservoirs in West Texas are concerned. I am not speaking now of East Texas duals or from some in South Texas.

Q I am just talking about West Texas. Under what circumstances do you consider a joint operation a sound operation, a dual

completion operation, a sound operation from a waste viewpoint?

A I would say when it becomes uneconomical to develop initially one pay horizon as an economic venture. If you drill a single well, if you had a zone there that wasn't productive enough to give you a return on your investment by drilling a single well, then you would be justified in a dually completed well with another zone that would give you a profitable venture.

Q What is the situation in that connection in the Brunson-Hare pools?

A It is an established fact that either zone can be developed economically as single zone completion.

MR. HUGHSTON: That's all.

BY MR. ARMSTRONG:

Q Talking about those abandonments over in the Bedford field. With your dual completions you produced both zones as long as they would flow?

A That's right.

Q And then you started pumping one of the zones?

A That's right.

Q Now, you pumped that zone as long as you could pump oil from it?

A Economically, yes.

Q Economically. Now, if you had had all single well completions in the Bedford field there would have already been abandonment

of some of those wells?

A There would not.

Q They would all still be pumping today if you made them single completions?

A That's right, may be flowing.

Q If that is true, why can't you go on and produce those wells now in the zone abandoned?

A There are no artificial lift methods that are considered adequate or suitable and thoroughly tested that can go on and artificially lift those two zones. Bear in mind you may have to produce 500 barrels upward to 1000 barrels of fluid out of each zone. If there is any equipment available to do that I don't know it.

Q There is equipment available to produce one zone at a time isn't there?

A That's right.

Q As long as there is any oil in the well bore?

A That's right.

Q There isn't any reason after you get ready to abandon the present zone that you are pumping that will prevent you from going back and pumping the other zone, is there?

A In order to produce those wells at the present time, to take one example, it would be necessary that you go in there and completely cement off one of the horizons. We will say the Ellenberger. And in so doing we believe we would harm the well where we couldn't get it back to where it was. In

the second place, after having done that, you have to come up and work on the other zone in the casing, through the casing, and attempt to cement off water in the devonian, which you will grant is a very difficult proposition.

Q That is being done pretty generally in the oil producing states, isn't it?

A It isn't generally done. It has been tried a number of times but not very successfully.

Q Not very successfully in your experience.

A In my experience and in many others.

Q Now, at the time you dually completed these wells in the Bedford field, I beleive it was said we had a pipe shortage, which was one of the motivating concerns for asking for dual completions. You think you were justified in asking for that at the time you did so?

A I didn't ask for it. I wouldn't think so.

Q Your company did, didn't it?

A The company did.

MR. ARMSTRONG: That's all.

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

(Witness excused.)

MR. SPURRIER: Mr. Dewey left a statement for me to put in the record.

MR. ARMSTRONG: I think I will object to that as being self-serving and calling for conclusions. The witness

is not making himself subject to cross examination. He knew the hearing was going on and apparently left. I had some questions to ask Mr. Dewey. I object to it unless the Commission will give me about five minutes to put Mr. Holloway on to answer some of the things he states in there as well as some of the other things he has stated.

MR. SPURRIER: You are perfectly welcome to read it--

MR. ARMSTRONG: (Interrupting) I have read it.

MR. SPURRIER: And put Mr. Holloway on.

MR. ARMSTRONG: I wish to clear up a few points.

MR. SPURRIER: Go ahead and put Mr. Holloway on.

I am sure most of the stuff that is in this statement is already in our record.

J. B. HOLLOWAY,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. ARMSTRONG:

Q Mr. Holloway you were present here in March at the hearing we had?

A Yes, sir.

Q You heard Mr. Dewey testify?

A I did.

Q I believe you heard him read into the record the Humble policy on dual completions, is that correct?

A Yes, sir, I did.

Q I will ask you if you remember his statement from the witness stand and as it appears in the transcript of the hearing of March 20, 1951, to the effect that the first dual completions granted in any field was just like the first rotten apple in a barrel of apples?

A I remember very well.

Q And since that time have you had occasion to check the records of the Railroad Commission of Texas in an attempt to ascertain whether or not the Humble Company, which Mr. Dewey represents, has sought and obtained the first dual completion permit in any single field in Texas?

A I have.

Q What did you find out?

A I found out in the Bateman Ranch field they were the first to ask for a dual completion.

Q When was that?

A On June 7th, 1950.

Q Do you have the excerpt there from the statehouse reporter?

A Yes, sir.

Q Will you please read it into the record?

"Bateman Ranch:

Dual Completions.

Dual completion permits for its Batemen Ranch well

no. 31 and its Bateman State well No. 1, Bateman Ranch field, King County, were sought at a Railroad Commission hearing Wednesday by Humble Oil and Refining Company.

K. B. Davidson, Division Petroleum Engineer for the applicant, told the Commission that both wells are now single oil producers in the 5100-foot zone. He said it is planned to dually complete them by perforating the 3700-foot horizon for oil production.

Evidence indicates that the crude from both zones is under-saturated with gas. Both zones appear to have a water drive but that in the lower does not seem to be as effective as that in the upper, said the witness. Reservoir pressure in the upper, originally 1613 pounds, was 1589 in April. Pressure in the lower had declined from an original of 2265 pounds to 1400 in April.

Davidson told Examiner Clyde Keithly that his company plans to use an Humble dual pump for producing both zones, through two strings of 2.5-inch tubing. He said there are no dual completions in this field at this time."

Now, I looked at the proration schedule on that field and I found that there were 66 wells in it and Humble owned all but three.

Q And then, that was the first dual completion granted in that field?

A Yes, sir.

Q Would it be your opinion in relation to Mr. Dewey's testimony in this case, that Humble had in that case at least deposited the first rotten apple in the barrel?

A They had.

Q Did you make any further search of the records of the Railroad Commission of Texas to ascertain what,if any, other dual completion permits had been granted Humble since April 15, 1947, at the time he testified before this commission? By way of refreshing your recollection the record in this case showed Mr. Dewey testified in April, April 15, 1947, before this Commission; that Humble at that time had 36 dual completions. He testified on March of this year that since the 1947 date the Humble had completed 11 additional dual completions.

Now, Mr. Holloway, did you make any search of the records pertaining to San Ynagcio County?

A My attention was called to a hearing received notice of to be held June 7.

Q What was the hearing for?

A They asked for permission to dually complete their Beverly Co.o.

Q What field was that in?

A The Plymouth field.

Q What county?

A San Ynagcio.

Q Now, I believe you found some records that were interesting to you relative to San Ynagcio County, Texas, did you not?

A Yes. There are numerous dually completed wells that Humble has. But this one particularly attracted my attention because it was their King Ranch lease. It is one of the largest leases they have. The King Ranch is famous. They have on that lease something more than 140 wells. And I looked down through the schedule -- and the Commission flags the dually completed wells by either a C or F indicating they are producing either through tubing or casing,-- and I counted on that schedule 11 dually completed wells and 14 wells on which the allowable had been transferred to other wells on the lease.

Q Is that the same thing we are asking for here before this Commission?

A It just happens they have on this lease some 25 examples of justwhat we are asking for.

BY MR. HUGHSTON:

Q Mr. Holloway, is the State House Reporter an official reporter?

A No, sir. It is a publication issued in Austin.. It is pretty widely subscribed to and it briefs all hearings held

before the Commission.

Q It is possible the reports it makes are not certified as being true and correct?

A No, it isn't.

Q And it is possible some part of the report--

A It is possible there are typographical errors, but it isn't possible that the sense--

Q (Interrupting) It is possible you could misunderstand the sense.

A I haven't found that to have been true.

Q The well on the Bateman Ranch was completed in what zone?

A 5100 feet.

Q What zone were they wanting to dually complete in?

A 3700 feet.

Q Do you know whether or not the 3700 foot zone was commercial or not?

A From the schedule and from my recollection about half the wells in one zone and half in the other.

Q Both in the same field?

A Yes, sir.

Q Same reservoir.

A In the 5100 and 3700 foot.

Q You don't know whether there was commercial production in this particular well?

A That is what we wanted to ask Mr. Dewey.

Q Humble had not drilled a well to that zone?

A Yes, they had other wells in that zone.

Q But on this particular location they had not.

A This brief stated both wells were completed in the 5100 foot sand and not drilled through the 5100 foot. They had penetrated the 3700 foot and wanted to dually complete it.

Q Do you have a certified copy of their application?

A No, sir.

Q Do you know whether or not the testimony showed those zones were both commercial zones?

A Obviously they were because there were completed wells in both zones.

Q In that particular location?

A I don't know about that particular location.

Q What about the location where one operator owns 58 of the 61 wells in the field?

A What is this?

Q What about these operations by offset operators where 58 of the 61 wells in the field are owned by the same operator?

A He didn't have any offset operators because only three other wells were in the field.

MR. ARMSTRONG: If the commission please, the testimony was offered solely for the purpose of showing that the Humble Oil and Refining Company, its policy, which had been dictated

into the record in this case is not so carefully followed as this Commission was lead to believe by the witness. Whether it was intentional or otherwise.

MR. HUGHSTON: Purely for the purpose of going to the weight of thing, the wells in the 3700 foot zone, you said there was several.

A Yes, sir.

Q Do you know whether or not they were completed as a salvage operation?

A No. It is a pumping field.

Q Do you know whether they originally drilled to the 5100 foot zone and plugged back?

A I don't know. I don't believe that happened. I don't know. It doesn't sound logical.

Q And you do not know in this field where you were talking about this transfer of allowable by Humble, whether they were doing that on the ground it was in the interest of prevention of waste?

A It probably was asked for on that ground. Because the only way the Commission grants--you have to have some reason for it. The reason for it here is the conservation of oil.

MR. HUGHSTON: Yes, sir. That is all.

MR. SPURRIER: Does anyone have any further question of Mr. Holloway? If not, he may be excused.

(Witness excused.)

MR. SPURRIER: Anything further to be heard in this case?

MR. HUGHSTON: We have some statements to make. If the proponents have some statements to make first we will be glad to have them do that.

MR. SPURRIER: Mr. Lovering.

MR. LOVERING: When they are through, I would like to make a statement as an individual and citizen of the State of New Mexico.

MR. SPURRIER: Are you through?

MR. ARMSTRONG: Yes, sir.

MR. HUGHSTON: Are you going to read that into the record?

MR. SPURRIER: I don't think I will read it. Practically everyone interested has read it, and in the interest of time, I will let the reporter include it in the record. As I say, practically everything in this statement here has been put in previous records by Mr. Dewey.

"Statement of Mr. Dewey on behalf of the Humble Oil and Refining Company. Case No. 274-275.

We desire to call to the Oil Conservation Commission's 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 when such units over-ly both the McKee and Ellenberger formations.

We feel that there are very definite physical limitations to the amount of fluid which can be produced through a dually completed oil well and that there is not sufficient flexibility in the equipment to permit the changing of production rates to meet changing reservoir conditions. These limitations often lead to premature abandonment either permanently or temporarily of one producing horizon. We do not subscribe to the suggestion offered in testimony that oil be comingled under ground. We believe that conservation is best served by keeping oil reservoirs entirely separate and in such condition that some form of secondary survey 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 fields leads us to believe that many of the wells will require workovers. Such workovers can be accomplished at the proper time

at less cost and more effectively in single completions than in dual oil well completions. The working over of a singly completed well will not adversely effect the productive capacity of a twin well. Such is not always the case in dually completed oil wells were 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 may prevent the producing of a mudded off horizon at a sufficient rate to facilitate 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 the packing element increases, the hazard of leakage is also incurred, and the greater the amount of fluid which can leak past the packing element where failure exists. Packing element fail through wear, deterioration and defective material. Our 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 invaded 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 matter of taking periodic bottom hole pressures 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 correlative 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 dually completed oil wells in New Mexico best serve the interests of conservation, we request that the Oil Conservation Commission deny the applicants request to dually complete wells in the Brunson and Hare fields.

If the Oil Conservation Commission find that the Cities Service State S-4 well is producing oil or is capable of producing oil from below the oil string from both the Connell and the Ellenberger formation, request is made that the Oil Conservation Commission order the well to be so recompleted as to excluded the production of oil from the Connell and the possibility of the undergound comingling of oil from the two separate reservoirs.

MR. SPURRIER: All right, Mr. Lovering.

MR. LOVERING: I would like to make this statement as an individual and citizen of this state.

As a registered professional engineer with 25 years experience in production and production practices, the statement I make here may or may not coincide with the views of my company or any other company.

Aside from the saving of oil and considering the present stage of development in the Drinkard area, neither of these cases seem to have much marit from an economic or engineering standpoint. At least 25 years experience in oil field practices in California, Arkansas, Louisiana, Texas and New Mexico, experience dictates that duals are **impractical** except for the small operator who by necessity must have a quick return on his initial investment.

I have experienced dual completions, the installation of them, and the production ofthem through their flowing stages and down to near depletion where artificial lift was required to produce them. I witnesses the costly efforts to maintain production by artificial lift in these dually completed wells. Costly workover programs that were to cause the failure of one zone or the other. I have witnessed the abandonment of one zone or another prematurely, as is being done by various operators not very far from here at the

present time, or within the permian basin. All those figures are not readily available, it is believed that the recoverable reserves that are prematurely abandoned in these wells may range from as much as 2 per cent to 10 per cent of the ultimately recoverable oil; which, in view of the capacity of the wells to produce amounts to considerable fluid, many of them in excess of 30,000 barrels and upwards.

Although a lot of individuals and engineers and so on have been here to speak their piece freely, it is general information that in particular fields duals have permitted waste as far as recoverable oil is concerned.

Now, as for the transfer of allowables. Based on experience and knowledge of our various production practices that have been carried on throughout the fields in the past, it is my opinion from the standpoint of the conservation of oil by drainage, it is the most vicious practice that could be instituted in our fields today. Except in those cases where secondary recovery methods warrants such operation under unitization agreements where all operators share in the recoverable oil.

I feel that if these two applications are granted, one for dual completion and the other for transfer of allowable, it would be just as sensible for any operator to come in here

and ask for one dual completion to 80 acres with a double allowable in each zone. Then, I don't think there is a witness here today in his right mind who would ask for such a thing as that.

That is all, thank you.

MR. HUGHSTON: You waived opening and closing statements, I judge.

MR. CAMPBELL: Yes.

MR. SPURRIER: You intend to make closing arguments?

MR. CAMPBELL: I would like to make a brief statement, but I don't care when it is.

MR. HUGHSTON: I have a few remarks I would like to make too.

MR. SPURRIER: You want these in the record?

MR. HUGHSTON: Yes, sir. We want the Commission to consider them.

MR. ARMSTRONG: If it is in order, why not have Shell or anyone else that wants to make remarks be permitted to do so now, and let us, in keeping with the usual practice, close; and I will waive my opening statement.

MR. HUGHSTON: Yes.

MR. SPURRIER: Very well. Let's take a break.

(Recess.)

MR. WHEELER: We would just like to make a brief statement. At the hearing in March I made a brief statement summarizing the reasons that Ohio opposed dual completions

in these particular reservoirs. And since that record has been made a part of this hearing, I will just state that we still have the same position in the matter. And one other thing I would like to mention at this time. That is, in regard to Cities Service S-4 well.

We would sincerely urge the Commission to make an investigation as soon as possible to determine whether or not the Ellenberger and the basal Simpson are, in fact, open below the pipe in this well in order that a situation which we believe exists may be remedied at as early a date as possible.

MR. SPURRIER: Thank you. Now, off the record.

(Off the record discussion.)

(After the above off the record discussion between the interested parties and the Commission, it was agreed that Mr. Nestor might submit a written statement in lieu of argument, Mr. Nestor agreeing to send copies of the statement to the reporter and all interested parties as well as to the Commission.)

MR. ARMSTRONG: I assume it will be in the nature of a statement and not go into evidence which will be subject to cross examination.

MR. NESTOR: No, sir.

MR. HUGHSTON: How soon should it be in, Mr. Spurrier, in connection with the rest of the record?

THE REPORTER: About two weeks.

MR. SPURRIER: Mr. Campbell, do you have something?

Mr. CAMPBELL: I think we have to agree there are differences of opinion about the practicability of dual completions, for which Cities Service has applied in two of its wells. I believe that the record will show it was established by the Cities Service witnesses there are two proper zones for dual completions in this area for which they are applying. I think they also established that they have the S-4 well mechanically set up to dually complete, and although there was some testimony and difference of opinion as to whether there was a dual zone exposed below the shoe, the position of Cities Service when it bottomed the well was that it had of course, come into the Ellenberger and out of the Connell. And its completion was based on that assumption, naturally.

They still believe that the evidence they have in connection with the samples will establish that, but they want the record to show that in the event the Commission should find that such is not the case, then, of course, they propose to make any mechanical corrections to complete the well in accordance with the Commission's findings.

With regard to the exceptions to dual completions, generally, as made, I think as a matter of principle that the evidence has been simply that there are mechanical difficulties encountered in dual completions. Everyone will agree with that, I am sure. But I think those difficulties apparently

have been surmounted in the state of Texas, at least where 894 dually completed wells in 95 fields exist.

And the application of Cities Service is based upon the existing shortage of field pipe and it has been testified here that has been the reason for dual completions elsewhere by companies apparently opposed to these. There was an indication that the position of Cities Service in making this application is a sound one.

MR. SPURRIER: Mr. Armstrong.

MR. ARMSTRONG: When we initially made our application here we were faced of course, with a steel shortage, which we all know about.

We felt that were a transfer of allowables that were requested or dual completions that were requested in the alternative would serve that end. There isn't any evidence we know of today that would change our opinion that it is essential to conserve steel. We believe we have made out a prima facie case for transfer of allowable as between these two wells and in the alternative we think we have made out a prima facie case for dual completions.

We recognize, of course, the difficulty in dual completions. Those diffucilties, however, are primarily economic and we are willing to take the chance and spend the money to see that the dual completions are effective and operate efficiently. We do urge, however, upon the Commission,

that if it can see fit to grant our first request for transfer of allowables--we know of course, that would be an advantage to us--it would eliminate all the difficulties or any anticipated difficulties we might have with dual completions, and we earnestly insist no evidence has been introduced in this hearing or Cities Service hearing that would overcome the evidence presented on behalf ofTide Water and Cities Service in support of these requests.

MR. CAMPBELL: So that the record will be straight, does the reporter understand the testimony subsequent to the cross examination of the engineering witness for Tide Water will be included in the transcript in Case No. 274?

MR. SPURRIER: I am sure he does now.

(Off the record.)

MR. HUGHSTON: I would like to make a very short statement to save having to write up something as Mr. Nestor is going to do.

In the first place the recommendation which the PAD made to the Oil and Gas Conservation Commissions of the various states--we suggested water spacing where profitable. We think that where profitable to an Oil and Gas Conservation Commission means where it would be in line with the fulfillment of their duties to prevent waste and protect correlative rights. And if they are in any way concerned that a recommendation made to them for water spacing wouldn't assist one in the performance of their duties, they wouldn't be interested in it.

It is suggested that wider spacing is not practicable where it would result in an undrilled area. The evidence which they brought in, the exhibits, most of them, were competent to testify with reference to the reservoir as a whole. They based their testimony on a very limited part of it and the Commission would certainly be interested in the reservoir as a whole and not just their opinion with reference to producing 4 or 5 wells. As a matter of fact, the value of an opinion, an experts opinion, is based upon two things; one is his knowledge of the facts bearing on the particular case, and the other is his education and general experience. And without havingvery much knowledge about the field generally, their opinion wouldn't amount to much.

I would say that wider spacing is not practicable from the Commission's viewpoint where the permeability is such that drainage in the area is local. And I believe every witness testified that the drainage area of these fields probably was quite local around particular wells. Because of the correlative rights and adjoining owners are adversely effected than when you transfer double allowable to one of the wells and take from the other.

The drainage pattern is presumably circular. And whenever transferring to another well its drainage area will be twice the normal area and it is natural it will effect the offset operator where the field's permeability is poor and

the drainage quite local. I don't think it will be practicable from the Commission's viewpoint where a waste of reservoir energy is caused.

The Commission has cut back the Brunson field to 90 barrels because of a rapid drop in pressure while on an experimental basis. And there is still to be additional evidence in that connection. And it is argued that is on a field wide basis.

Nevertheless, because the permeability is poor, why a high production rate would be apt to cause a particularly bad situation in a local area and cause a waste of reservoir energy.

As pointed out, it might cause the formation of an early gas cap. And we think finally, it isn't practicable from the Commission's viewpoint where a field is developed on another spacing. There is just too many problems to come up concerning equitable rights. The other operators have developed where they have twice the economic capital invested. There are too many problems concening correlative rights and too many speculations concerning waste, from inadequate drainage.

So, there are just so many questions raised that it is hardly practicable from the Commission's viewpoint in the fulfillment and enforcement of our duties for them to depart from a standard practice which they have heretofore set up.

Another thing, on wider spacing, I would like to call to the Commission's attention, during the last war when the steel shortage was much greater than it is now, when they were cut back to at least 50 per cent for civilian use, whereas less than one-third has been taken away so far, I believe. The allocation formulas set up by the basis of allocating steel on the basis of one well for 40 acres, which is the spacing already in this field.

We have no reason to suspect with a smaller steel shortage this time there will be any wider spacing. So, that recommendation is hardly directed to New Mexico which has the widest spacing of any state in the Union. But some of these states, and it is in Texas fields, where spacing gets down to less than an acre. And on multiple completions, they are not asking for something during the emergency. They are asking the Commission to abandon the position it has taken after detailed hearings and consider the deliberation. They have come in with no showing of any fact in the art of dual completions since the Commission last considered the matter.

We do suggest there is a dual pump now in an experimental stage which has been granted the right to operate in the STate of Texas for a year. But it isn't generally accepted as yet. The arguments they have made are there fore the same

that the Commission has heretofore considered.

Now, it is suggested that the principle argument against dual completions is that of the mechanical difficulties and mechanical failures. That is one of the arguments. Also, there is the argument of area abandonment which causes waste because of expensive workovers. That has been brought out in the case and it is one the proponents say themselves may occur. And it has been suggested that there is a difference of opinion with reference to the completion of the Cities Service well. We would like to point out there is nothing but hearsay statements made about that and there is no sworn testimony before the Commission as to the fact that the samples showed that the Ellenberger was present. They said they got that information from their geologist. But there is no sworn testimony in the record. We allowed it to come in for whatever benefit it might be. We think the thing isn't practicable from the Commission's viewpoint. The Commission's viewpoint being they are charged with the duty of preventing the waste of oil and gas and protecting the correlative rights.

MR. HOLLOWAY: Mr. Hughston, you mentioned just now during the last war the PAW permitted operators to use steel to drill one well to each 40 acres. Do you know whether on their permit it was stated, also one well in 40 acres on which there are no other wells producing or being capable of

producing? The point I am getting at is, did they allow dual and wells on 40 acres during the war?

MR. HUGHSTON: I think they did--

MR. HOLLOWAY: They didn't then?

MR. HUGHSTON: Are you saying it is or isn't a fact?

MR. HOLLOWAY: No, I am not. Except I had to write the applications to get the wells, and I vaguely remember we could not put two wells on 40 acres.

A VOICE: I am prepared to substantiate that.

(Off the record discussion.)

MR. SPURRIER: As far as I am concerned, gentlemen, the case is closed.

(Off the record discussion.)

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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. 275, taken on May 23, 1951, at Santa Fe, is a true and correct record to the best of my knowledge, skill and ability.

Dated at Albuquerque this 16th day of June, 1951.

E. E. Gleason
REPORTER

My Commission Expires: August 4, 1952.

SM-35P (7-43)

SHELL OIL COMPANY
INCORPORATED

THIS LETTER IS FROM OUR
FIELD OFFICE

AT Box 1457
Hobbs, New Mexico

June 4, 1951

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

Re: Case Numbers 274 and 275 - Applications of Cities Service Oil Company and Tide Water Associated Oil Company to dually 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

Gentlemen:

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 offset 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 those positions were taken because it considered that transfers of allowable and oil-oil dual completions

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. Shackleford 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 R-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

hole pressures in the Bronson 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 recondition effects 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 botton hole pressure was 2451 psi gauge (about 2466 psi absolute) or 308 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 S-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 S-5 is considered almost completely valueless as a measure of the ability of the well to produce.

The productivity index data submitted by Tide Water for the State S-4 well indicate again the failure to employ good testing technique as the tests were of such short duration as almost to preclude stable conditions and again the tests were made from the highest to the lowest flow rate instead of from the lowest to the highest.

7. P-V-T data from an analysis of a sample obtained in Penrose Federal Fee 1 in 1945 established a saturation pressure of 2918 psi absolute for Brunson Pool crude.

The production curves submitted by Tide Water for the State S-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 Brunson 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 S-5 Tide Water is proposing 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.

6. The Brunson Pool is more than 90 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

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 Brunson 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 Brunson 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 Brunson 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 Brunson 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 Brunson Pools has been entered as Exhibit S-5 in Case 274 and Exhibit S-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

policing group in checking packer tests on newly 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 BY 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 Brunson 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