OIL CONSERVATION DIVISION P. O. Box 2088 SANTA FE, NEW MEXICO 87501

STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT

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INFILL DRILLING FINDINGS PURSUANT TO SECTION 271.305(b) OF THE FEDERAL ENERGY REGULATORY COMMISSION REGULATIONS, NATURAL GAS POLICY ACT OF 1978 AND OIL CONSERVATION DIVISION ORDER NO. R-6013-A

Operator	Amerada	Hess Cor	p •	_ Well Name	e and No.	State	LM "I" We	11 No. 9
Location:	Unit_C	_Sec36		35 Rng.	36E	_Cty	Lea	·
II.								•
THE DIVIS	ION FINDS:		٠.				•	
pursuant as a new of infill we by the pro	to the Natur onshore prod ll is necess oration unit	al Gas Poluction well ary to efformation which can	icy Act of l under Sec ectively an not be so d	1978 provious tion 103 of defficient rained by	des that, f said Ac tly drain any exist	in order t, the Di a portio ing well	for an infivision must on of the resount that	ns promulgated ll well to qualify find that the ervoir covered unit. an administrative
procedure Division	whereby the and find tha	Division late an infil	Director an l well is n	d the Divi	sion Exam	iners are	empowered to	o act for the
(3) That	the well fo					_		 ·
(4) That	Pool, a 160		andard spac cre prorati				640-acre 1/4	acres.
of Sec.	36 . Two	. 23 S	Rng. 3	6 E .	mprising is curren	tly dedic	ated to the	State LM "T"
	Well No.	2	located in	Unit F	of .	said sect	ion.	State LM "T"
(5) That	this prorat by Order No.	ion unit i	s () stand	ard (X) no	nstandard	; if nons	tandard, said	d unit was previously
(6) That well(s) or	said prorat n the unit.	ion unit i	s not being	effective	ly and ef	ficiently	drained by	the existing
(7) That	the drillin	g and comp	letion of t	he well for	r which a	finding	is sought she	ould result in
the production otherwise	ction of an be recovere	additional d.	U.987 B	CF XXXX	of gas f	rom the p	roration uni	t which would not
for which	a finding i	s sought is	s necessary	to effect	ively and	efficien	tly drain a	that the well portion of the g well within the
	in order to on should be		fective and	efficient	drainage	of said	proration un	it, the subject
IT IS THE	REFORE ORDER	ED:			1 +			• .
infill we for infil reservoir	ll on the ex l drilling g	isting pro ranted by said prora	ration unit this order	described is necessa	in Secti ry to per	on II(4) mit the d	above. The rainage of a	n I above as an authorization portion of the ly drained by
	jurisdictio may deem nec		cause is re	tained for	the entr	y of such	further ord	ers as the
DONE at Sa	anta Fe, New	Mexico, o	n this 23	rd day o	f <u>Feb</u> i	uary	, 1981	•
. 2					A()	KATA.	res	*
		**		DIVISION	DIRECTOR	X	EXAMINER	

OIL CONSERVATION DIVISION P. O. Box 2088 SANTA FE, NEW MEXICO 87501

STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT

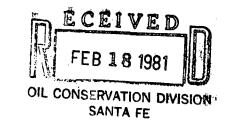
ADMINISTRATIVE ORDER
NFL 24

AMENDED FOR POOL DESIGNATION

INFILL DRILLING FINDINGS PURSUANT TO SECTION 271.305(b) OF THE FEDERAL ENERGY REGULATORY COMMISSION REGULATIONS, NATURAL GAS POLICY ACT OF 1978 AND OIL CONSERVATION DIVISION ORDER NO. R-6013-A

I.								ч		
Operator _	Amerada	Hess	Corp.	W	ell Name	and No.	State	LM "T" We	11 No.	9 .
Location:	Unit_C	_Sec	36 _{Twp.}	235	_Rng	36E	Cty	Lea		
II.						,	-	*		
THE DIVISI	ON FINDS:							•		
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procedure	whereby the	e Divisi	l3-A, dated ion Directo nfill well	r and th	ne Divis:	80, the Dion Exami	oivision e ners are	established a empowered to	act for	trative the
(3) That	the well fo	or which	a finding	is soug	ght is o	mpleted	in the _	Jalmat	Gas	<u> </u>
								640-acre		_ acres
(4) That	a 160		acre pro	ration w	unit comp	prising t	he NW	1/4		
of Sec	Well No.	$\frac{23}{2}$	S , Rng located	. <u>36 E</u>	, is	s current of s	ly dedica	ated to the _	State	LM "T
(5) That		tion uni						tandard, said		
	said prorat the unit.	ion uni	t is not b	eing eff	ectively	y and eff	iciently	drained by t	he existi	n g
the produc	the drillir tion of an be recovere	additio	completion onal 0.98	of the w	ell for	which a of gas fr	finding i	is sought sho coration unit	uld resul which wo	t in uld not
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	in order to n should be			and eff	icient d	lrainage	of said p	proration uni	t, the su	bject
IT IS THER	EFORE ORDER	RED:			•			; ;		
infill well for infill reservoir (l on the ex drilling g	isting ranted said pr	proration to by this or	ınit des Ter is n	cribed i	n Sectio , to perm	n II(4) a it the dr	ed in Section bove. The a ainage of a ad efficientl	uthorizat portion o	ion f the
	jurisdictio ay deem nec			s retain	ed for t	he entry	of such	further orde	rs as the	
DONE at Sam	nta Fe, New	Mexico	, on this_		(·)	Febru	lam	, 19_81	- ·	
				DI	ATSTON P	TYPCION,		WHITHOU	_	

AMERADA HESS CORPORATION



P. O. BOX 840 SEMINOLE, TEXAS 79360 915-758-6700

February 10, 1981

Mr. R. L. Stamets
Technical Support Chief
New Mexico Energy and Minerals Department
Oil Conservation Division
P.O. Box 2088
State Land Office Building
Santa Fe, New Mexico 87501

Re: Request for Infill Findings State LMT Well No. 9 Jalmat Gas Pool Lea County, New Mexico

Dear Mr. Stamets:

Enclosed please find the information you requested in your letter of November 14, 1980. We sincerely hope this will meet with your approval and will allow you to make a ruling in our favor on the subject filing.

Sincerely yours,

William A. Merrick Operations Engineer

WAM/eh

State LM "T" No.9 Jalmat Gas Pool 780 FNL, 1860 FWL, Sec. 36, T23S, R36E Lea County, New Mexico

Completion Summary

Elevation: 3333 G.L., 3342 D.F., 3343 K.B.

Total Depth: 3340'

Casing: Surface: 8-5/8" 24# K-55, @ 341', 275 sx cement

circulated cement.

Production: 5-1/2" 17# K-55, @ 2895', 900 sx cement

circulated cement.

<u>Tubing</u>: 1-1/2" @ 3340' set open ended.

Producing Interval: Open hole; 2895' to 3340', 445' air drilled

open hole, no stimulation.

<u>Logging Program</u>: Open hole producing interval. Schlumberger F.D.C.

w/G.R., Caliper & collars; S.N.P. w/G.R.; single

induction.

Log Analysis: Gross Interval; 445'

Net Producible Pay (Ø greater than 6%); 172'

Average Porosity Ø; 14.8%

Average Water Saturation; 36.9%

Production Tests: Drilling gas guages (orifice well tester)

2895', 1,377 MCF/D, 48/64" choke, 80 psi

3140', 1,933 MCF/D, 1" choke, 65 psi

Pressure readings

3140', 2 minute SITP 100 PSIG

4 minute SITP 110 PSIG

12 hour SITP 135 PSIG

3340' T.D.

12 hour SITP 145 PSIG

120 hour shut-in BHP 162 PSI

Northern Natural Gas 4 Point Test:

Final Flow Rate 151 MCF/D, FTP 110 PSI

CAOF. 800 MCF/D

Initial Gas Sales - Northern; 530 MCF/D FTP 59 PSI

State LM "T" No.9 Jalmat Gas Pool

Volumetric Reserves 160 Acres

$$N = \frac{43560 \text{ A h } \emptyset (1 - S_W) (P_i) 35.35 (R.F.)}{T_i (Z_i) 1 \times 10^9} \text{ B.C.F.}$$

N = Gas in Place in B.C.FA = Acreage 160 h = Net Pay 172' Ø = Porosity (average) 14.8% S_W = Water Saturation 36.9% P_j = Initial Pressure 162 psi R.F.= Recovery Factor
T_i = Initial Temperature 90% 5450 R. Z_i = Gas Compressibility .985 43560 & 35.35 Numericle Constants.

$$N = \frac{43560 (160)(172)(.148)(1 - .369)(162)(35.35)(.9)}{(545)(.985)(1 \times 10^9)}$$

N = 1.074 BCF Gas in Place.

State LM "T" No.9 Jalmat Gas Pool

Anticipated Recovery

The anticipated recovery has been calculated using the time rate curves of several adjacent wells in the Jalmat Pool (curves attached). A decline rate was calculated for each well using the following formula;

$$a = \left[\frac{-\ln\left(\frac{Q_i}{Q_t}\right)}{T} \right]$$

a = Monthly Decline Rate

Q_i = Rate at Beginning of Period

Qt = Rate at End of Period T = Period in Months

Anticipated recovery was calculated using the equation;

$$N = \frac{Q_i - Q_a}{a}$$

N = Cumulative Gas Production

Qi = Initial Production Rate MCF/Mo.

 Q_a = Abandonment Rate MCF/Mo.

a = Monthly Decline Rate for Area

The following rates were calculated.

Amerada Hess, State LM "T" No. 2	.0173
ARCO, John P. Combest, No. 1	.0195
Cities Service, State "Q" No. 1	.0153
Conoco, Lynn B. 25 No. 2	.0118
Average decline rate for area	.0159

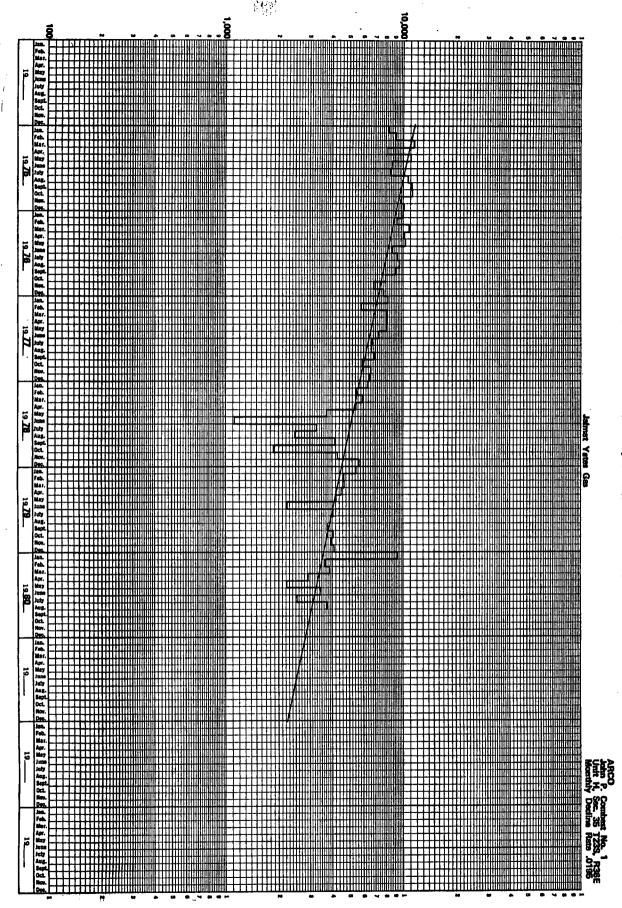
The State LM "T" No. 9 had an initial rate of 16,000 MCF/Mo. applying this to the preceding equation we calculate the following recovery.

$$N = \left(\frac{16,000 - 300}{0159}\right)$$

N = .987 BCF gas

Recovery was also calculated using the shut in pressure recorded after the completion of the well. The pressure was plotted on a BHP/z vs cumulative production graph and the same slope exhibited by the State LM "T" No. 2 was applied to it. (plot attached) This method showed anticipated recovery to be 1.2 BCF.

Since the two methods closely agree a reasonable anticipated recovery figure is 1.0 BCF.

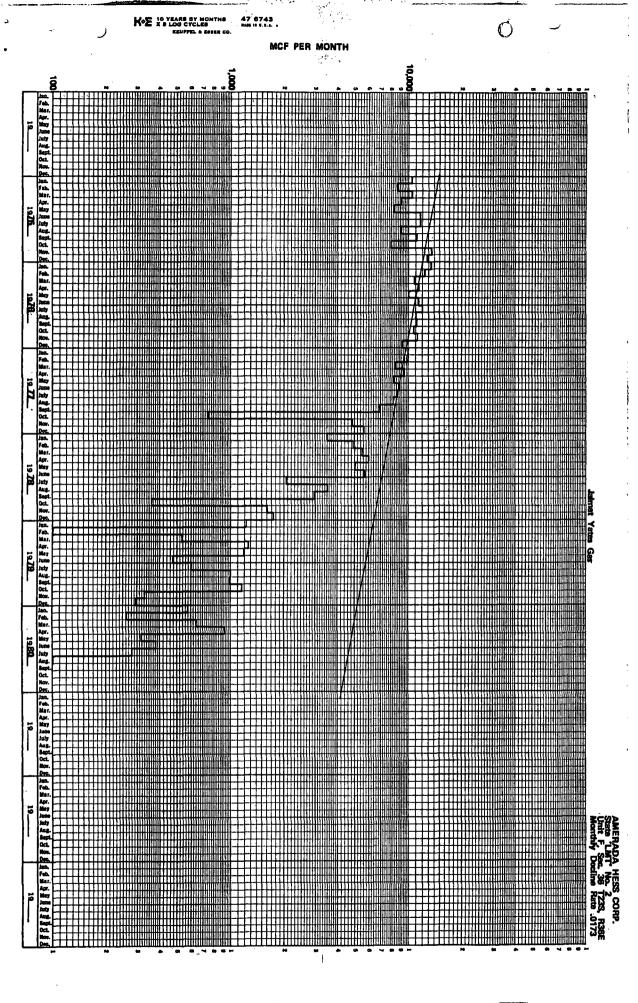


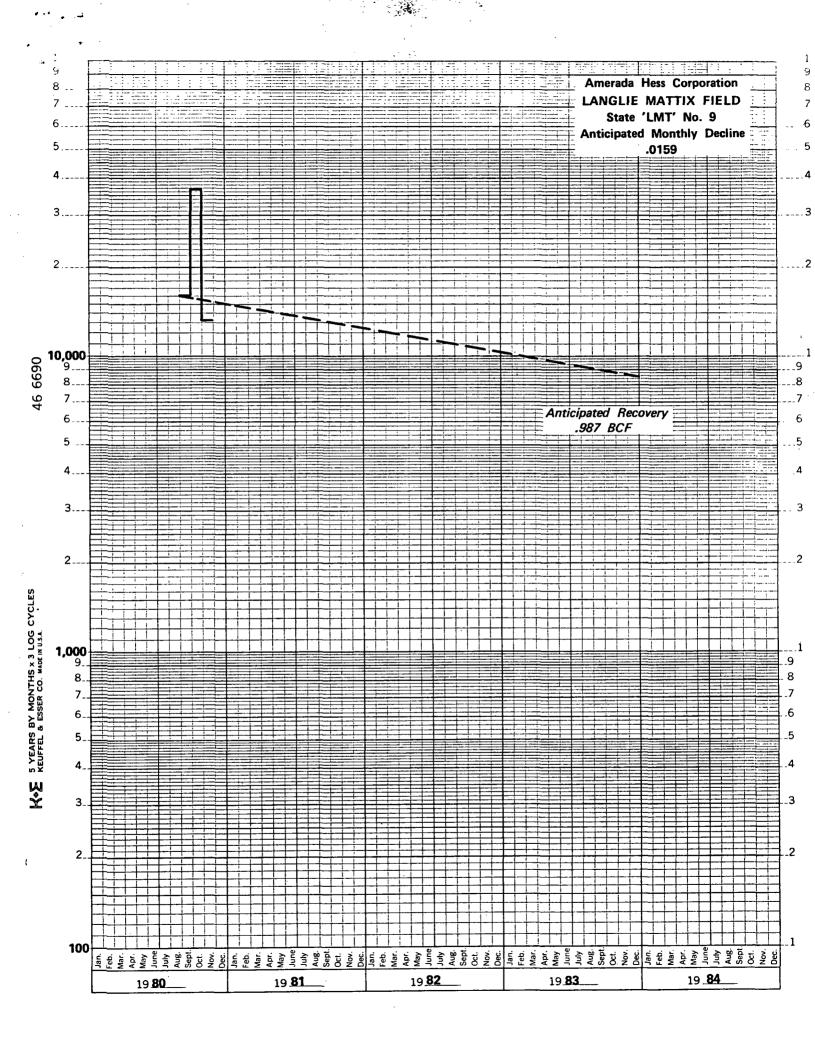


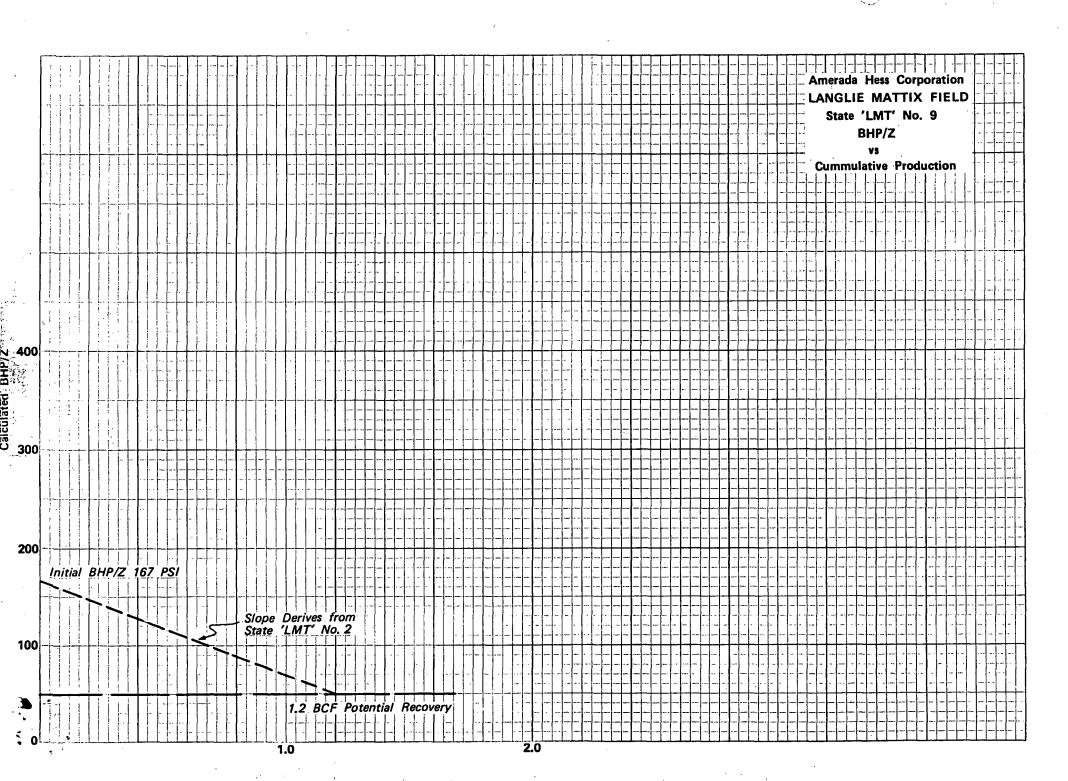
MCF PER MONTH

47 6743

MCF PER MONTH







AMERADA HESS CORPORATION

P. O. BOX 840 SEMINOLE, TEXAS 79360 915-758-6700

New Mexico Oil Conservation Division P.O. Box 2088 Santa Fe, New Mexico 87501

Re: Request for Administrative NGPA infill well finding, State LM "T" Well No. 9, Eumont Gas Pool, Lea County.

Attn: Mr. R. L. Stamets

Technical Support Chief

Gentlemen:

The Amerada Hess Corporation respectfully requests that an administrative finding be made under the Oil Conservation Division Order R-6013 that the drilling of the AHC State LM "T" Well No. 9 infill well was necessary to effectively and efficiently drain a portion of the Eumont Gas Pool (Yates, Seven Rivers and Queen formations) covered by a proration unit which cannot be drained by any existing well within the unit.

The following data is submitted to comply with the filing requirements of the order:

- 1. (Rule 5.) A copy of the approved Form C-101 for the infill well and Form C-102 showing the proration unit dedicated to the infill well is attached.
- 2. (Rule 6.) The standard proration unit size for the Eumont Gas Pool is 640 acres as designated by Order R-521, dated August 12, 1954, succeeded by Order R-1670.
- 3. (Rule 7.) The non-standard proration unit dedicated to the subject well was approved by Division order NSP-1194, dated May 26, 1980.
- 4. (Rule 8.) There are two wells drilled on this proration unit that are, or have been completed in the Eumont Gas Pool. The data on the first well is as follows:
 - a. The AHC State LM "T" Well No. 2, located 1980' FNL and 1980' FWL Sec. 36-23S-36E, Lea County.
 - b. Spud date: October 29, 1948. c. Completion date: November 19, 1948 (Eumont, March, 1959).



The Eumont Gas zone was an annular completion of a water injection - gas zone dually completed well, producing through the 2-3/8" tubing and 5-1/2" casing annular area. On September 10, November 1, and November 27, 1979 the tubing was pulled. This is indicative of past tubing problems (corrosion) due to the oil zone operations. The Eumont Gas zone has apparently been damaged by injection and load water during these operations. Beginning in 1977 the completion experienced a sharp decline in PEH report in Lile production.

The Eumont Gas zone was abandoned August 13, 1980. e.,f.

The well would have been incapable of draining all of the reserves covered by this proration unit. The following geological and reservoir data discussion indicates that Well No. 2 would have been capable of effectively and efficiently draining only 6.9 Bcf of the estimated 10.5 Bcf of recoverable gas underlying this proration unit, even is the formation had not been damaged during the operation to repair the tubing.

The data on the second (infill) well completed in the Eumont Gas Pool on this proration unit is as follows:

> The State LM "T" No. 9, located 780' FNL and 1860' FWL, Sec. 36-23S-36E, Lea County.

Spud date: February 1, 1980. b.

Completion date: March 31, 1980.

- This well was completed by the open hole method using air as the drilling fluid. This method of completion may have resulted in a higher well bore permeability and/or additional productive stringers available to the well bore to contribute additional production that is not available to the well bore of the first well.
- Well No. 9 has been shut-in since completion waiting on the e.,f. sales line connection. The well has a shut-in tubing pressure of 164 psi and an indicated open flow potential of 800 Mcf/day.
 - It is apparent from a projection of the producing history of the existing well in this proration unit that only 6.9 Bcf of the total calculated recoverable 10.5 Bcf underlying the unit could have been produced by that well. The new well No. 9 has the potential of producing the calculated 4.93 Bcf remaining under the unit that has been developed by a superior completion method. In addition, Well No. 9 is thirteen feet higher on structure than Well No. 2 and in a more advantageous location to drain the reserves underlying the unit.
- 5. (Rule 9.) Geological and reservoir information presented in support of a finding as to the necessity for an infill well includes:
 - A Yates formation structure map with the subject proration unit outlined is attached.
 - It is anticipated that the State LM "T" Well No. 9 will recover 4.93 Bcf of gas that could not be recovered by the existing gas well on the proration unit. This increase was determined from the difference of the volumetric calculations of the recoverable

gas reserves contained in this 160 acre proration unit and the estimated ultimate reserves that may have been recovered from Well No. 2, described as follows:

 One accepted method of reserve determination for a volumetric (depletion-type) gas reservoir is the application of the principle of conservation of mass in the standard material balance equation:

$$G_i = Q_t \frac{(P_i/Z_i)}{P_i/Z_i - P_t/Z_t}$$

The solution of this equation at any time, t, and cumulative gas production, Qt, will result in a single value for original gas in place, Gi. Values for Gi derived from calculations at different times may be averaged to determine an average value of the original gas in place.

A more convenient expression of the equation is:

$$P_t/Z_t = P_i/Z_i - CQ_t$$
, where $C = \frac{(P_i/Z_i)}{G_i}$

As indicated by the equation, a graph on coordinate paper of BHP/Z versus cumulative gas production will yield a linear plot. Extrapolation of a best fitting straight line to a zero value of P_t/Z_t will determine the gas-in-place in the reservoir. Recoverable gas would be a fraction of this amount as dictated by the abandonment pressure.

The Eumont Gas Pool has performed as a depletion-type reservoir as is demonstrated by the linear plot of P/Z versus cumulative production on Well No. 2 included in the attached. As this decline indicates no departure from its established trend, it can be assumed that the drainage volume of the well has remained constant and it is reasonable to expect it would not have changed in the short remaining life of the well. An extrapolation of the trend to the abandonment pressure of 50 psi dictated by sales line pressure in the area indicates the well could have recovered an ultimate 6.9 Bcf of gas before the well was unable to flow into the sales line.

2. A volumetric calculation of the recoverable gas reserves contained in this 160 acre proration unit is included in the attached. The calculations yield an estimation of 10.5 Bcf for the unit which is 4.93 Bcf more than the above estimated ultimate gas recovery from Well No. 2.

- c. A cumulative production/pressure decline curve for Well No. 2 is attached.
- d. Calculations for initial recoverable gas for Well No. 2 are also attached.
- 6. (Rule 11.) All operators of proration units offsetting the unit for which this infill finding is sought have been notified of this application by certified mail.

Thank You, Amerada Hess Corporation

Norman A. Garrett

Regional Operations Engineer

Reserve Calculations State LM "T" Well No. 2 160-Acre Proration Unit

Initial recoverable gas in unit, Gi:

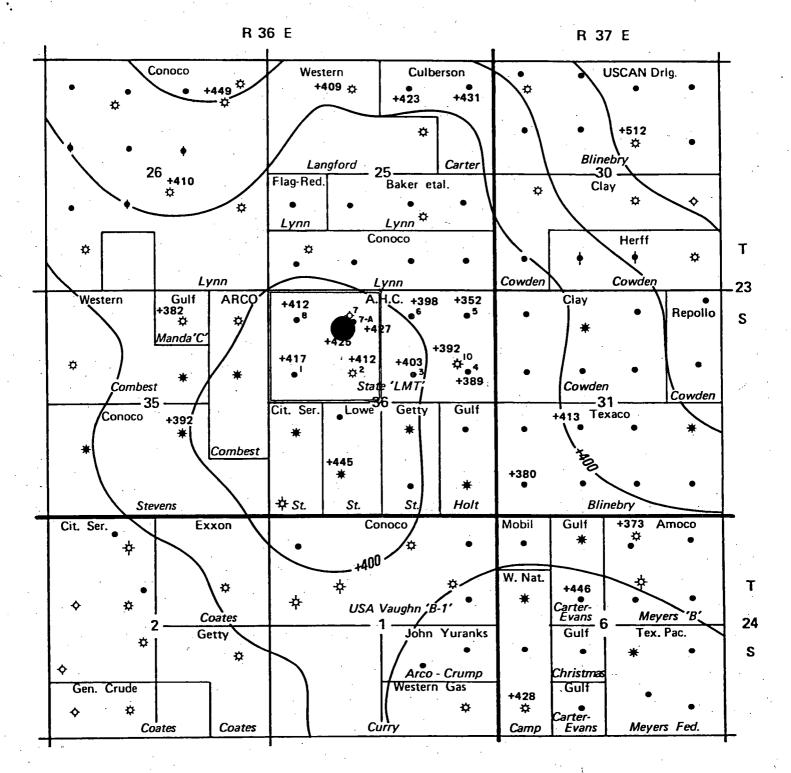
$$G_i = 43560$$
 A h Ø (1 - SW) B_{g_i} R
= 43560 (160)(250)(.130)(1 - .300)(73.59)(.9)
= 10.50 Bcf

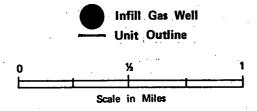
Where:

Area (a) = 160 acres Net pay thickness (h) = 250 average Porosity (0) = 15.6% Water Saturation (SW) = 30.0% Initial reservoir pressure = 1100 psi Gas gravity = .691 Formation temperature = 98° F. Initial compressibility factor (Z_i) = .947 Recovery efficiency (R) = 90° Reservoir volume factor (B_{gi}) = 73.59 scf/ft³

from:
$$Bg_i = 35.35 \frac{P_i}{Z_i T_i}$$

$$= 35.35 \frac{1100}{.947(558)} = 73.59$$

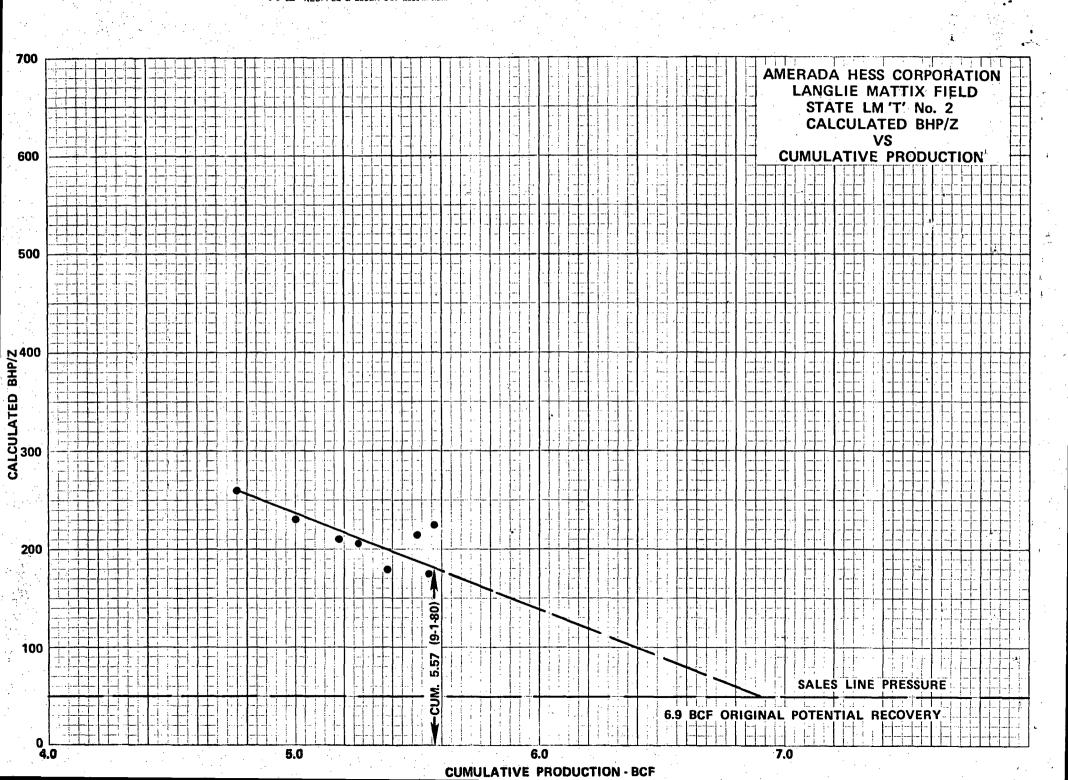




SOUTHWEST PRODUCTION REGION LANGLIE MATTIX FIELD STATE 'LMT' LEASE

Lea County, New Mexico

STRUCTURE
TOP / YATES
Contour Interval = 50'
Geology by P. E. Nelson 9/1/80



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DISTRIBUTION ANTA FE		NEW MEXICO OIL CON	SERVATION COMMISSION	N	Form C-101		
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.5.G.S.							<u> </u>
AND OFFICE PERATOR	- - 	•			B 141	& Gas Lease No.	
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Type of Work	· · · · · · · · · · · · · · · · · · ·				7. Unit Agr	rement Name	7777
_ DRILL X		DEEPEN	PLUG (BACK []		<u> </u>	
Type of Well	1			_	,	_ease Name	
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Amerada Hess Co	orporatio	n			9. 4611 140.	n	:
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Elevations (Show whether DF,	RT, etc.) (21)	A. Kind & Status Plug. Bond	3500 Y	ate-7		Rotary Date Work will start	
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	·	PROPOSED CASING AN			·		
SIZE OF HOLE	SIZE OF CA		T SETTING DEPTH		CEMENT		
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7 7/8	5 1/2	2 15#	3500	750		Circulate	
			•	1			
Drill 12 1/4 in	ch hole a	and set $85/8$ si	urface pipe, c	irculat	te ceme	ent.	
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cement. Comple	te in the	e Yates-7 River	s Sands.	. •			
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by certify that the information	n above is true ar	nd complete to the best of by	spowledge and belief.				
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ITIONS OF ARTHOVAL, IF							

NEW MEXICO OIL CONSERVATION COMMISSION E. LOCATION AND ACREAGE DEDICATI. PLAT All distances must be from the outer boundaries of the Section

Form C-102 Supersedes C-128 Effective 1-1-65

Operator AMERADA HESS CORP.		State LMT		Well No.
Init Letter Section	Township 23 South	Acmge 36 East	County	
Actual Footage Location of Well:			1 1202	'5
780 feet from the	north line and	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	t from the west	line
Ground Lyvel Elev. Producing Fo		Pool		Dedicated Acresse:
	ven Rivers Oueen		- 1 - 1 1 1	160 Acres
1. Outline the acreage dedica	ited to the subject w	ell by colored pencil o	r hachure marks on the	ne plat below.
2. If more than one lease is	dedicated to the wel	l, outline each and ide	ntify the ownership t	hereof (both as to working
interest and royalty).				
3. If more than one lease of c			nave the interests of	all owners been consoli-
dated by community and				
Yes No If a	nswer is "yes," type o	of consolidation		
			. 11 1	
If answer is "no," list the	owners and tractideso	criptions which have ac	tually been consolid	ated. (Use reverse side of
this form if necessary.) No allowable will be assign	ed to the well until al	l interests have been c	onsolidated the com	ununitization unitization
forced-pooling, or otherwise				
sion.				
				CERTIFICATION
的设备的现在分词形势				CERTIFICATION
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1860			best of m	y knowledge and belief.
			Name	
 				
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			Supv	. Adm. Ser.
			Company	a Hess Corporation
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		1	11	certify that the well location
			1 1	this plat was plotted from field actual surveys made by me or.
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T.ECEI	VED	(is true	and correct to the best of my
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0 330 660 '90 1320 1680 19	80 231C 2640 2000	n 1500 1030 8	00	Ronald J. Eidson 323

AMERADA HESS CORPORATION

P. O. BOX 840 SEMINOLE, TEXAS 79360 915-758-6700

New Mexico Oil Conservation Division P.O. Box 2088 Santa Fe. New Mexico 87501

Re: Request for Administrative NGPA infill well finding, State LM "T" Well No. 9, Eumont Gas Pool, Lea County.

Attn: Mr. R. L. Stamets

Technical Support Chief

Gentlemen:

The Amerada Hess Corporation respectfully requests that an administrative finding be made under the Oil Conservation Division Order R-6013 that the drilling of the AHC State LM "T" Well No. 9 infill well was necessary to effectively and efficiently drain a portion of the Eumont Gas Pool (Yates, Seven Rivers and Queen formations) covered by a proration unit which cannot be drained by any existing well within the unit.

The following data is submitted to comply with the filing requirements of the order:

- 1. (Rule 5.) A copy of the approved Form C-101 for the infill well and Form C-102 showing the proration unit dedicated to the infill well is attached.
- (Rule 6.) The standard proration unit size for the Eumont Gas Pool is 640 acres as designated by Order R-521, dated August 12, 1954, succeeded by Order R-1670.
- 3. (Rule 7.) The non-standard proration unit dedicated to the subject well was approved by Division order NSP-1194, dated May 26, 1980.
- 4. (Rule 8.) There are two wells drilled on this proration unit that are, or have been completed in the Eumont Gas Pool. The data on the first well is as follows:
 - a. The AHC State LM "T" Well No. 2, located 1980' FNL and 1980' FWL Sec. 36-23S-36E, Lea County.

b. Spud date: October 29, 1948.

c. Completion date: November 19, 1948 (Eumont, March, 1959).

d. The Eumont Gas zone was an annular completion of a water injection - gas zone dually completed well, producing through the 2-3/8" tubing and 5-1/2" casing annular area. On September 10, November 1, and November 27, 1979 the tubing was pulled. This is indicative of past tubing problems (corrosion) due to the oil zone operations. The Eumont Gas zone has apparently been damaged by injection and load water during these operations. Beginning in 1977 the completion experienced a sharp decline in production.

e.,f. The Eumont Gas zone was abandoned August 13, 1980.

g. The well would have been incapable of draining all of the reserves covered by this proration unit. The following geological and reservoir data discussion indicates that Well No. 2 would have been capable of effectively and efficiently draining only 6.9 Bcf of the estimated 10.5 Bcf of recoverable gas underlying this proration unit, even is the formation had not been damaged during the operation to repair the tubing.

The data on the second (infill) well completed in the Eumont Gas Pool on this proration unit is as follows:

a. The State LM "T" No. 9, located 780' FNL and 1860' FWL, Sec. 36-23S-36E, Lea County.

b. Spud date: February 1, 1980.

c. Completion date: March 31, 1980.

- d. This well was completed by the open hole method using air as the drilling fluid. This method of completion may have resulted in a higher well bore permeability and/or additional productive stringers available to the well bore to contribute additional production that is not available to the well bore of the first well.
- e.,f. Well No. 9 has been shut-in since completion waiting on the sales line connection. The well has a shut-in tubing pressure of 164 psi and an indicated open flow potential of 800 Mcf/day.
 - g. It is apparent from a projection of the producing history of the existing well in this proration unit that only 6.9 Bcf of the total calculated recoverable 10.5 Bcf underlying the unit could have been produced by that well. The new well No. 9 has the potential of producing the calculated 4.93 Bcf remaining under the unit that has been developed by a superior completion method. In addition, Well No. 9 is thirteen feet higher on structure than Well No. 2 and in a more advantageous location to drain the reserves underlying the unit.
- 5. (Rule 9.) Geological and reservoir information presented in support of a finding as to the necessity for an infill well includes:
 - a. A Yates formation structure map with the subject proration unit outlined is attached.
 - b. It is anticipated that the State LM "T" Well No. 9 will recover 4.93 Bcf of gas that could not be recovered by the existing gas well on the proration unit. This increase was determined from the difference of the volumetric calculations of the recoverable

gas reserves contained in this 160 acre proration unit and the estimated ultimate reserves that may have been recovered from Well No. 2, described as follows:

 One accepted method of reserve determination for a volumetric (depletion-type) gas reservoir is the application of the principle of conservation of mass in the standard material balance equation:

$$G_i = Q_t \frac{(P_i/Z_i)}{P_i/Z_i - P_t/Z_t}$$

The solution of this equation at any time, t, and cumulative gas production, Qt, will result in a single value for original gas in place, Gi. Values for Gi derived from calculations at different times may be averaged to determine an average value of the original gas in place.

A more convenient expression of the equation is:

$$P_t/Z_t = P_i/Z_i - CQ_t$$
, where $C = \frac{(P_i/Z_i)}{G_i}$

As indicated by the equation, a graph on coordinate paper of BHP/Z versus cumulative gas production will yield a linear plot. Extrapolation of a best fitting straight line to a zero value of P_t/Z_t will determine the gas-in-place in the reservoir. Recoverable gas would be a fraction of this amount as dictated by the abandonment pressure.

The Eumont Gas Pool has performed as a depletion-type reservoir as is demonstrated by the linear plot of P/Z versus cumulative production on Well No. 2 included in the attached. As this decline indicates no departure from its established trend, it can be assumed that the drainage volume of the well has remained constant and it is reasonable to expect it would not have changed in the short remaining life of the well. An extrapolation of the trend to the abandonment pressure of 50 psi dictated by sales line pressure in the area indicates the well could have recovered an ultimate 6.9 Bcf of gas before the well was unable to flow into the sales line.

 A volumetric calculation of the recoverable gas reserves contained in this 160 acre proration unit is included in the attached. The calculations yield an estimation of 10.5 Bcf for the unit which is 4.93 Bcf more than the above estimated ultimate gas recovery from Well No. 2.

- c. A cumulative production/pressure decline curve for Well No. 2 is attached.
- d. Calculations for initial recoverable gas for Well No. 2 are also attached.
- 6. (Rule 11.) All operators of proration units offsetting the unit for which this infill finding is sought have been notified of this application by certified mail.

Thank You, Amerada Hess Corporation

Norman A. Garrett

Regional Operations Engineer

Reserve Calculations State LM "T" Well No. 2 160-Acre Proration Unit

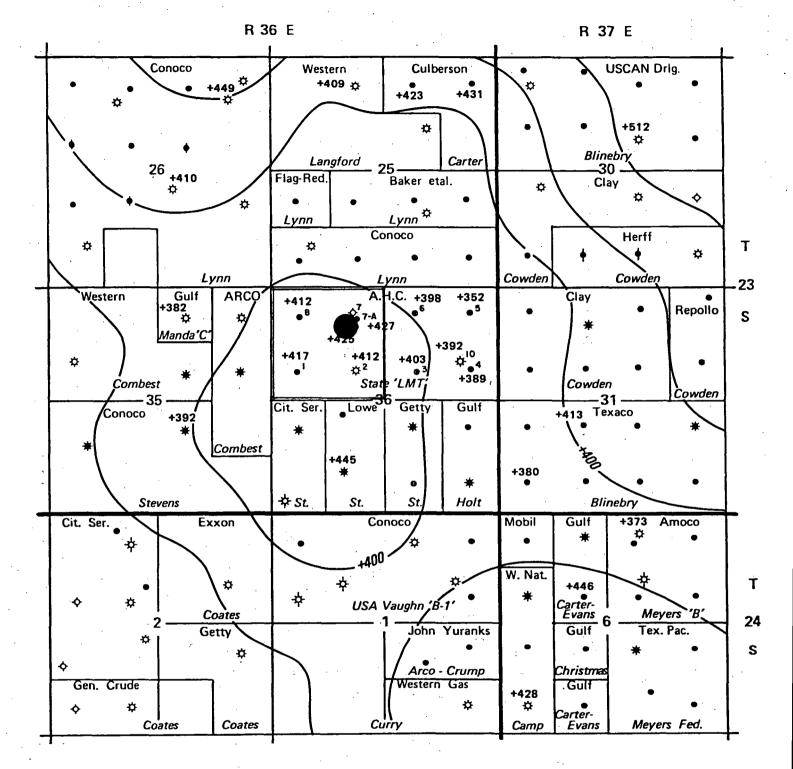
Initial recoverable gas in unit, Gi:

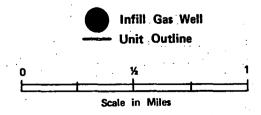
Where:

Area (a) = 160 acres Net pay thickness (h) = 250 average Porosity (0) = 15.6% Water Saturation (SW) = 30.0% Initial reservoir pressure = 1100 psi Gas gravity = .691 Formation temperature = 98° F. Initial compressibility factor (Z_i) = .947 Recovery efficiency (R) = 90%Reservoir volume factor (B_{gi}) = 73.59 scf/ft³

from:
$$Bg_i = 35.35 \frac{P_i}{Z_i T_i}$$

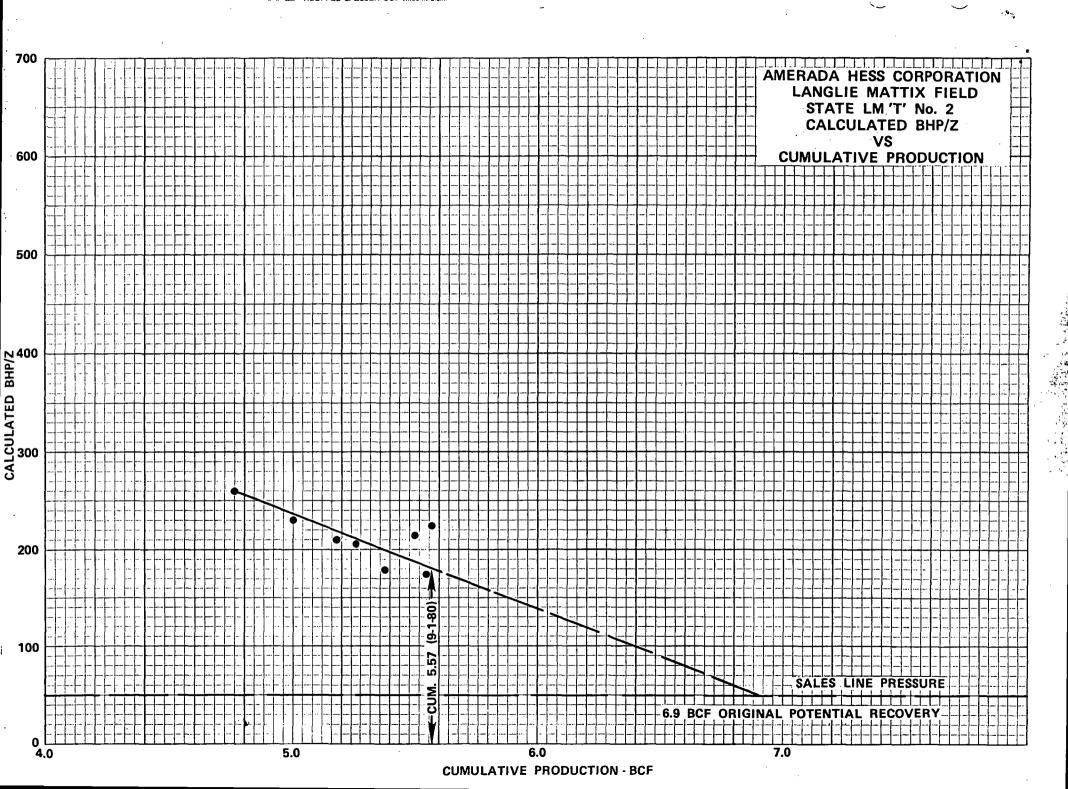
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SOUTHWEST PRODUCTION REGION
LANGLIE MATTIX FIELD
STATE 'LMT' LEASE
Lea County, New Mexico

STRUCTURE
TOP / YATES
Contour Interval = 50'
Geology by P. E. Nelson 9/1/80



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NEW MEXICO OIL CONSERVATION COMMISSION WE LOCATION AND ACREAGE DEDICATI PLAT All distances must be from the outer boundaries of the Section

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AMERADA HESS CORPORATION

RECEIVED

OCT 20 1980

6H Conservation

P. O. BOX 840 SEMINOLE, TEXAS 79360 915-758-6700

New Mexico Oil Conservation Division P.O. Box 2088
Santa Fe, New Mexico 87501

Re: Request for Administrative NGPA infill well finding, State "W" Well No. 5, Eumont Gas Pool,

Lea County.

Attn: Mr. R. L. Stamets

Technical Support Chief

Gentlemen:

The Amerada Hess Corporation respectfully requests that an administrative finding be made under the Oil Conservation Division Order R-6013 that the drilling of the AHC State "W" Well No. 5 infill well was necessary to effectively and efficiently drain a portion of the Eumont Gas Pool (Yates, Seven Rivers and Queen formations) covered by a proration unit which cannot be drained by any existing well within the unit.

The following data is submitted to comply with the filing requirements of the order:

- 1. (Rule 5.) A copy of the approved Form C-101 for the infill well and Form C-102 showing the proration unit dedicated to the infill well is attached.
- 2. (Rule 6.) The standard proration unit size for the Eumont Gas Pool is 640 acres as designated by Order R-521, dated August 12, 1954, suceeded by Order R-1670.
- 3. (Rule 7.) The non-standard proration unit dedicated to the subject well was approved by Division Order NSP-1192, dated May 19, 1980.
- 4. (Rule 8.) There are two wells drilled on this proration unit that are or have been completed in the Eumont Gas Pool. The data on the first well is as follows:
 - a. The State "W" Well No. 2, located 1980' FNL and 1980' FEL Sec. 30-20S-37E, Lea County.
 - b. Spud date: January 13, 1937
 - c. Completion date: February 20, 1937 (Eumont Gas Pool perforated February 19, 1954).

d. The Eumont Gas zone is produced as a single well through 2-3/8" tubing. Present production is low and due to poor mechanical condition any remedial work is impossible.

e.,f. The well produced an average of 101 Mcf/day during July, 1980.

g. The well is incapable of draining all of the reserves covered by this proration unit. The geological and reservoir data discussion that follows the data information on Well No. 5 indicates that Well No. 2 will be capable of effectively and efficiently draining only 0.10 Bcf of the estimated 0.81 Bcf of recoverable gas underlying this proration unit.

The data on the second (infill) well completed in the Eumont Gas Pool on this proration unit is as follows:

- a. The State "W" Well No. 5, located 1980' FNL and 780' FWL Sec. 30-20S-37E, Lea County.
- b. Spud date: February 21, 1980.

c. Completion date: April 4, 1980.

d. This well was completed by the open hole method using gas as the drilling fluid. A comparison of the permeability-thickness (kh) calculations at initial conditions on both wells on the unit indicate a higher value for the infill Well No. 5. This higher value may be due to the open hole completion method resulting in a higher permeability and for additional productive stringers contributing to the new well.

e.,f. Well No. 5 has been shut-in since completion waiting on the recent sales line connection. The well has a shut-in tubing pressure of 254 psi and an indicated open hole flow potential

of 355 Mcf/day.

- g. It is apparent from a projection of the producing history of the first well in this proration unit that only 0.10 Bcf of the total calculated 0.81 Bcf underlying the unit can be produced by that well before the flowing pressure declines to the sales line pressure. The higher shut-in pressure and better permeability encountered in Well No. 5 indicates that it has the potential of producing the calculated 0.81 Bcf of gas remaining under the unit.
- 5. (Rule 9.) Geological and reservoir information presented in support of a finding as to the necessity for an infill well includes:

a. A Yates formation structure map with the subject proration

unit outlined is attached.

0.71 Bcf of gas that could not be recovered by the existing gas well on the proration unit. This increase was determined from the difference of the volumetric calculation of the recoverable gas reserves contained in this 159 acre proration unit and the estimated ultimate reserves that can be recovered from Well No. 2, described as follows:

 One accepted method of reserve determination for a volumetric (depletion-type) gas reservoir is the application of the principle of conservation of mass in the standard material balance equation:

$$G_i = Q_t \frac{(P_i/Z_i)}{P_i/Z_i - P_t/Z_t}$$

The solution of this equation at any time, t, and cumulative gas production, Qt, will result in a single value for the original gas in place, Gi. Values for Gi derived from calculations at different times may be averaged to determine an average value of the original gas in place.

A more convenient expression of the equation is:

$$P_t/Z_t = P_i/Z_i - CQ_t$$
, where $C = \frac{P_i/Z_i}{G_i}$

As indicated by the equation, a graph on coordinate paper of BHP/Z versus cumulative gas production will yield a linear plot. Extrapolation of a best fitting straight line to a zero value of P_t/Z_t will determine the gas-in-place in the reservoir. Recoverable gas would be a fraction of this amount as dictated by the abandonment pressure.

The Eumont Gas Pool has performed as a depletion-type reservoir as is demonstrated by the linear plot of P/Z versus cumulative production on Well No. 2 included in the attached. As this decline indicates no departure from its established trend, it can be assumed that the drainage volume of the well has remained constant and it is reasonable to expect it will not change in the short remaining life of the well. An extrapolation of the trend to the abandonment pressure of 120 psi dictated by the sales line pressure in the area indicates the well could have recovered an ultimate 0.10 Bcf of gas before the well was unable to flow into the sales line.

2. A volumetric calculation of the recoverable gas reserves contained in this 159 acre proration unit is included in the attached. The calculations yield an estimation of 0.81 Bcf for the unit which is 0.71 Bcf more than the above estimated ultimate gas recovery from Well No. 2.

- c. A cumulative production/pressure decline for Well No. 2 is attached.
- d. Calculations for initial recoverable gas for Well No. 2 are also attached.
- 6. (Rule 11.) All operators of proration units offsetting the unit for which this infill finding is sought have been notified of this application by certified mail.

Sincerely, Amerada Hess Corporation

Norman A. Garrett

Regional Operations Engineer

Reserve Calculations State "W" Well No. 2 160-Acre Proration Unit

Initial recoverable gas in unit, G_i:

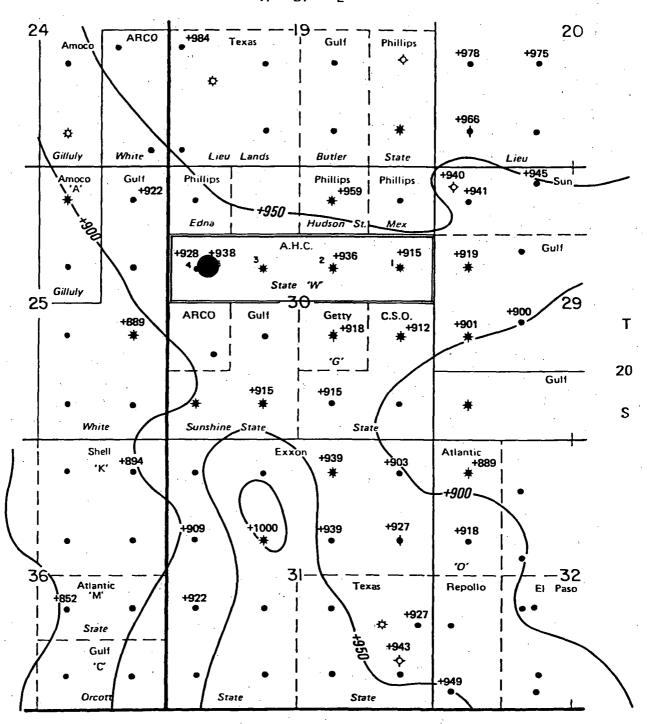
$$G_i$$
 = 43560 A h Ø (1 - SW) Bg_i R
= 43560 (159)(64)(.154)(1-.271)(79.86)(.9)
= 3.58 Bcf

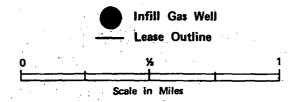
Where:

Area (a) = 159 acres
Net pay thickness (h) = 64' average
Porosity (\emptyset) = 15.4%
Water Saturation (SW) = 27.1%
Initial reservoir pressure = 1050 psi
Gas gravity = .65
Formation temperature = 100° F
Initial compressibility factor (Z_i) = .83
Recovery efficiency (R) = 90%Reservoir volume factor (Bg_i) = 79.86 scf/ft³

from: Bg_i = 35.35 $\frac{P_i}{Z_i T_i}$ $= 35.35 \frac{1050}{.83(560)} = 79.86$

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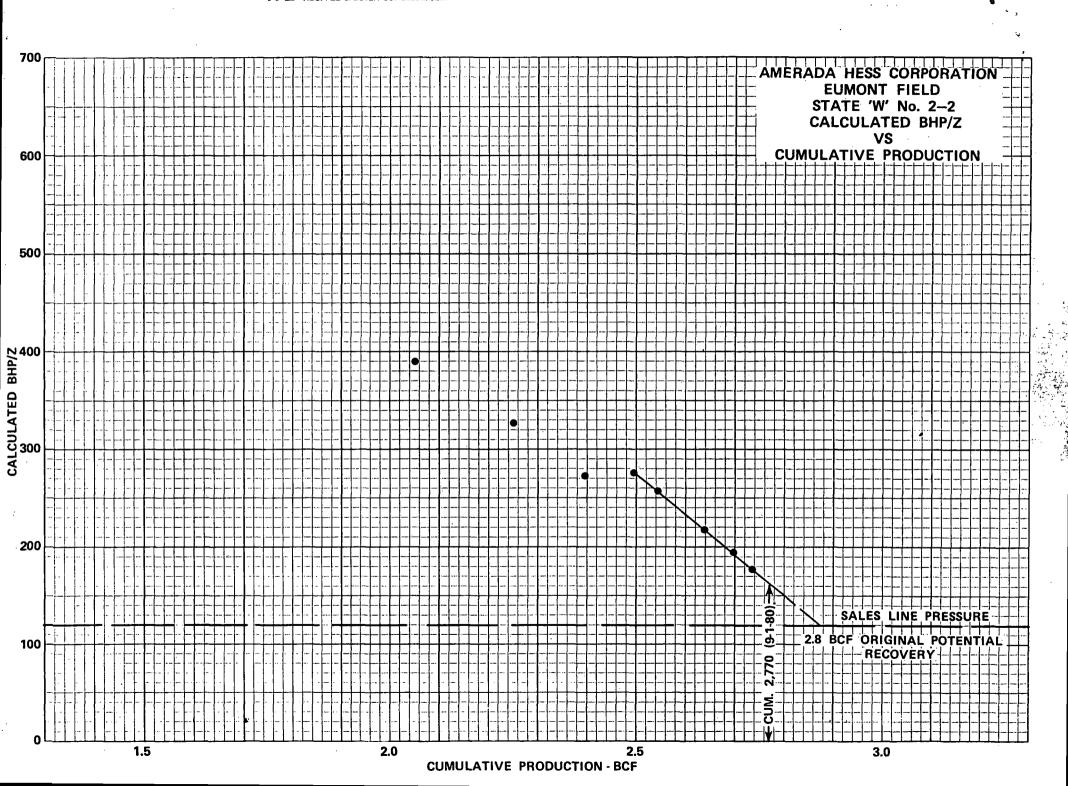




SOUTHWEST PRODUCTION REGION
EUMONT FIELD
STATE 'W' LEASE
Lea County, New Mexico

STRUCTURE TOP / YATES

Contour Interval = 50' Geology by P. E. Nelson 9/1/80



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NEW XICO OIL CONSERVATION COMMISSION FLAT

Form C-132 Supersedes C-128 Effective 1-1-65

All distances must be from the outer boundaries of the Section Amerada Hess Corp. State: W 20 South 37 East Lea 1980 North line and 780 feet from the Producing Formation **3538.**0 Yates Seven Rivers Oueen Eumont 1. Outline the acreage dedicated to the subject well by colored pencil or hachure marks on the plat below. 2. If more than one lease is dedicated to the well, outline each and identify the ownership thereof (both as to working interest and rovalty). 3. If more than one lease of different ownership is dedicated to the well, have the interests of all owners been consultdated by communitization, unitization, force-pooling, etc? If answer is "yes," type of consolidation If answer is "no," list the owners and tract descriptions which have actually been consolidated. It se reverse side of this form if necessary.) No allowable will be assigned to the well until all interests have been consolidated (by communitization, unitization, forced-prolling, or otherwise) or until a non-standard unit, eliminating such interests, has been approved by the Commission. CERTIFICATION Supv. Adm. Ser 78Oʻ AMerada Hess Corporation 4-15-80 <u>December 7,1979</u> 676



STATE OF NEW MEXICO

ENERGY AND MINERALS DEPARTMENT

OIL CONSERVATION DIVISION

BRUCE KING GOVERNOR LARRY KEHOE

SECRETARY

November 14, 1980

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-2434

Mr. Norman A. Garrett Amerada Hess Corporation P. O. Box 840 Seminole, Texas 79360

> Re: Request for Infill Findings State LM "T" Well No. 9 Eumont Gas Pool, Lea County, New Mexico

Dear Mr. Garrett:

Referring to the subject infill findings application received October 20, 1980, supplemental information is hereby requested as follows:

- (1) Full completion detail on Well No. 9, including pay thickness, porosity, water saturation, pressure, etc.
- (2) A volumetric calculation of the reserves under the 160-acre tract at this time based upon completion data from Well No. 9.
- (3) A demonstration of what may reasonably be expected to be recovered from Well No. 9. This may be based upon completion data and the performance of nearby or similar wells.

Upon receipt of this additional information we shall proceed to the final processing of the application.

Sincerely,

R. L. STAMETS
Technical Support Chief

RLS/dr