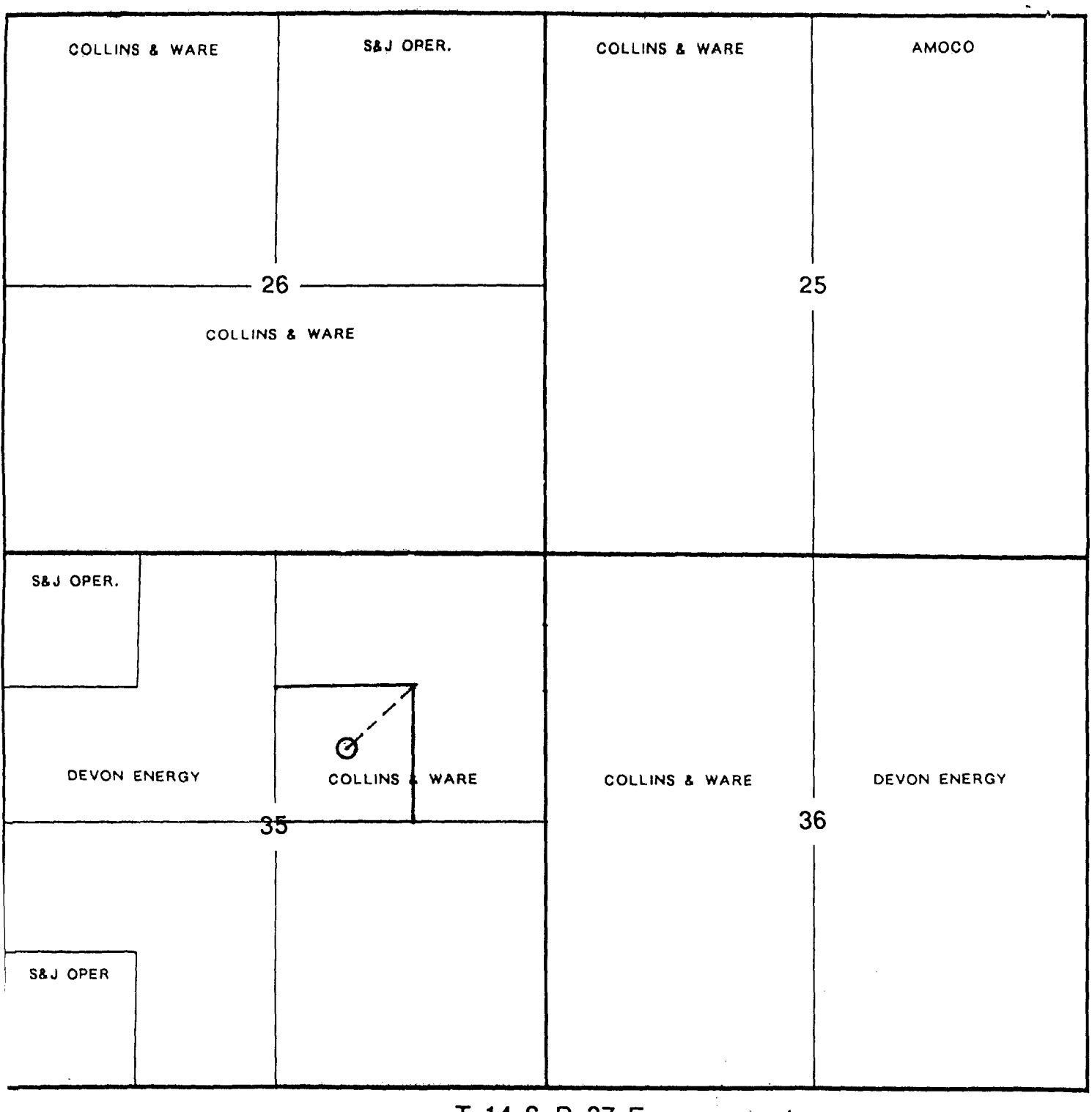


T-14-S R-37-E

Exhibits 1 through 6
Complete Set

BOTTOM HOLE LOCATIONS:

WELL NO. 5 : THE BOTTOM HOLE LOCATION WILL BE IN THE NE QUADRANT OF THE 40 AC. UNIT OF SAID WELL.

COLLINS & WARE

DENTON DEVONIAN PROSPECT

Lea Co., New Mexico

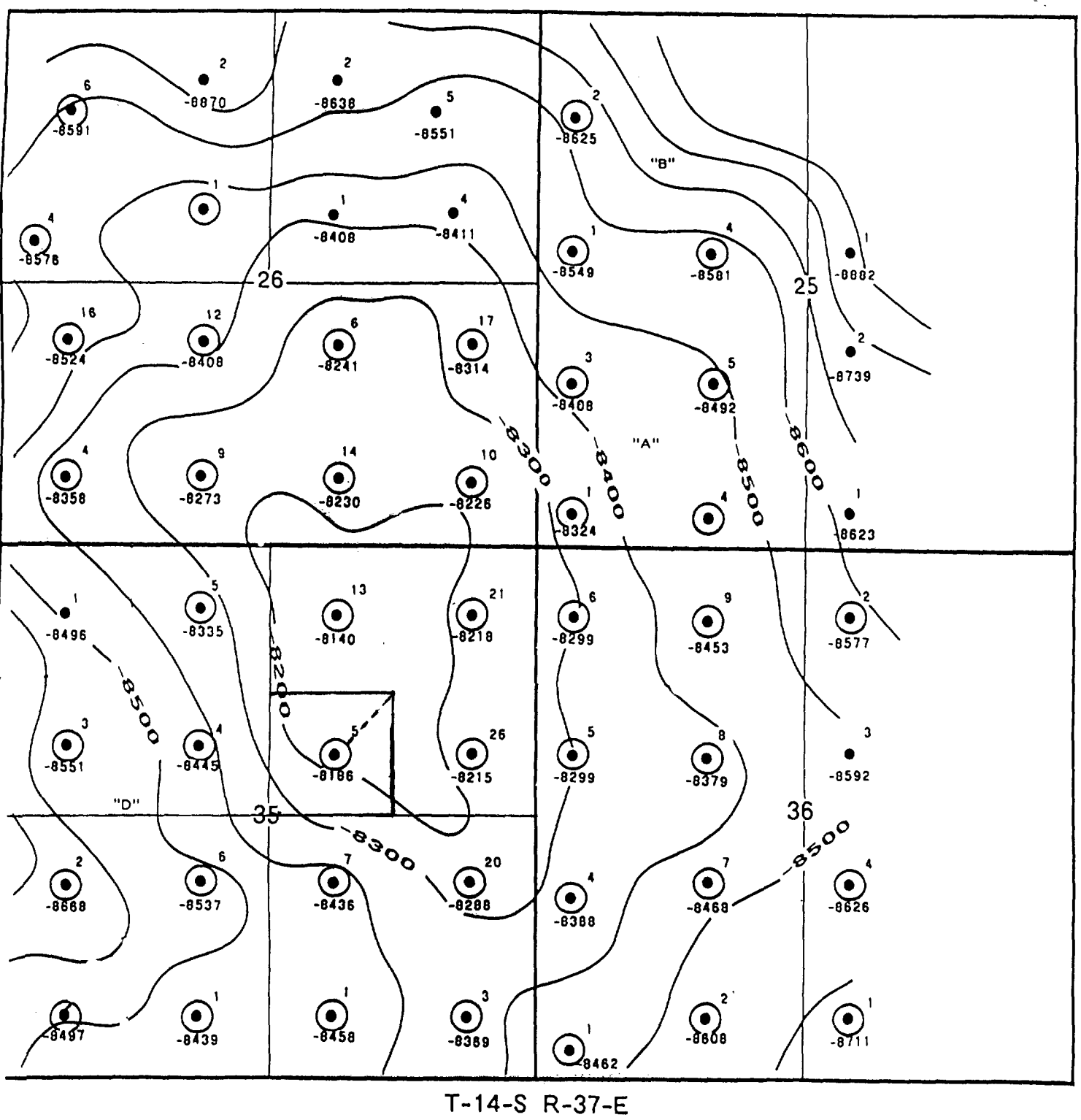
OWNERSHIP PLAT

BEFORE THE
OIL CONSERVATION DIVISION
Santa Fe, New Mexico

Case No. 10861 Exhibit No. 1

Submitted by: Collins & Ware, Inc.

Hearing Date: November 4, 1993



T-14-S R-37-E

○ DEVONIAN PRODUCER

COLLINS & WARE

DENTON DEVONIAN PROSPECT
Lea Co., New Mexico
TOP DEVONIAN
CI : 100'

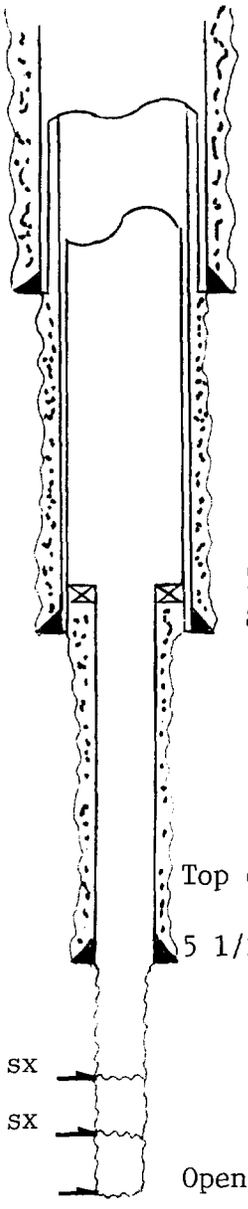
1"=1000'

BEFORE THE
OIL CONSERVATION DIVISION
Santa Fe, New Mexico

Case No. 10861 Exhibit No. 2

Submitted by: Collins & Ware, Inc.

Hearing Date: November 4, 1993



BEFORE THE
OIL CONSERVATION DIVISION
Santa Fe, New Mexico

Case No. 10861 Exhibit No. 3

Submitted by: Collins & Ware, Inc.

Hearing Date: November 4, 1993

COLLINS & WARE

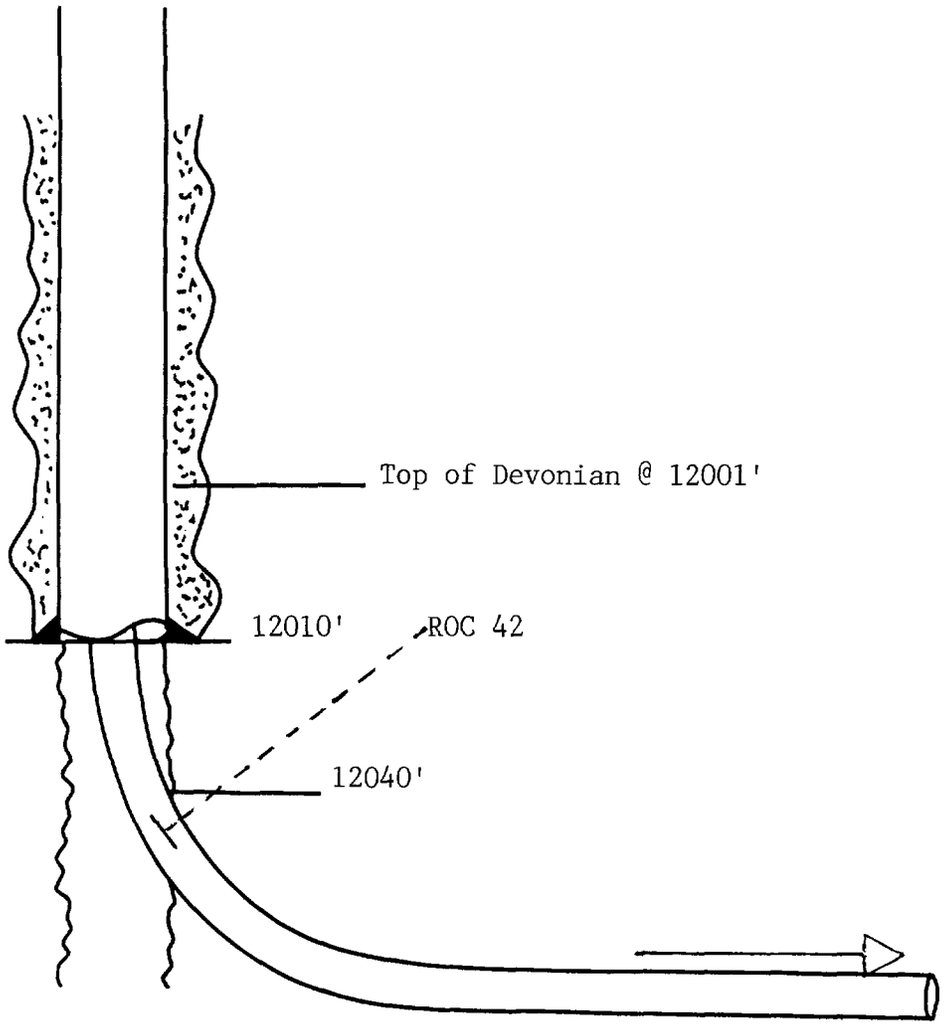
DENTON DEVONIAN PROSPECT
LEA CO. NEW MEXICO

T. D. POPE # 5

M, Sec. 35, T14S, R37E

COLLINS & WARE, INC.

HORIZONTAL WELLBORE PLAN
DENTON DEVONIAN FIELD
LEA COUNTY NEW MEXICO



BEFORE THE
OIL CONSERVATION DIVISION
Santa Fe, New Mexico

Case No. 10861 Exhibit No. 4

Submitted by: Collins & Ware, Inc.

Hearing Date: November 4, 1993

COLLINS & WARE

DENTON DEVONIAN FIELD
T. D. POPE # 5
660' FWL & 660' FSL
M, Sec. 35, T14S, R37E
Lea County, New Mexico

BEFORE THE

OIL CONSERVATION DIVISION

NEW MEXICO DEPARTMENT OF ENERGY, MINERALS AND NATURAL RESOURCES

IN THE MATTER OF THE APPLICATION
OF COLLINS & WARE, INC., FOR
A HIGH ANGLE/HORIZONTAL DIRECTIONAL
DRILLING PILOT PROJECT AND
SPECIAL OPERATING RULES THEREFOR,
LEA COUNTY, NEW MEXICO. CASE NO. 10861

AFFIDAVIT

STATE OF NEW MEXICO)
) ss.
COUNTY OF SANTA FE)

William F. Carr, attorney in fact and authorized representative of Collins & Ware, Inc., the Applicant herein, being first duly sworn, upon oath, states that in accordance with the notice provisions of Rule 1207 of the New Mexico Oil Conservation Division the Applicant has attempted to find the correct addresses of all interested persons entitled to receive notice of this application and that notice has been given at the addresses shown on Exhibit "A" attached hereto as provided in Rule 1207.

William F. Carr

SUBSCRIBED AND SWORN to before me this 3rd day of November, 1993.

Notary Public

My Commission Expires:

August 19, 1995

EXHIBIT A

S & J Operating Company
Post Office Box 2249
Wichita Falls, TX 76307

Devon Energy Corporation
20 North Broadway
1500 Mid-America Tower
Oklahoma City, Oklahoma 73102-8260

Polaris Production Corp.
415 W. Wall, Suite 2010
Midland, TX 79701

BEFORE THE
OIL CONSERVATION DIVISION
Santa Fe, New Mexico

Case No. 10861 Exhibit No. 5

Submitted by: Collins & Ware, Inc.

Hearing Date: November 4, 1993

CAMPBELL, CARR, BERGE
& SHERIDAN, P.A.
LAWYERS

MICHAEL B. CAMPBELL
WILLIAM F. CARR
BRADFORD C. BERGE
MARK F. SHERIDAN
WILLIAM P. SLATTERY

PATRICIA A. MATTHEWS
MICHAEL H. FELDEWERT
DAVID B. LAWRENZ
TANYA M. TRUJILLO

JACK M. CAMPBELL
OF COUNSEL

JEFFERSON PLACE
SUITE 1 - 110 NORTH GUADALUPE
POST OFFICE BOX 2208
SANTA FE, NEW MEXICO 87504-2208
TELEPHONE: (505) 988-4421
TELECOPIER: (505) 983-6043

October 13, 1993

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

S & J Operating Company
Post Office Box 2249
Wichita Falls, TX 76307

Re: Application of Collins & Ware, Inc. for a High Angle/Horizontal Directional Drilling Pilot Project and Special Operating Rules, Lea County, New Mexico

Gentlemen:

This letter is to advise you that Collins & Ware, Inc., has filed the enclosed application with the New Mexico Oil Conservation Division seeking approval to horizontally drill a well in Section 35, Township 14 South, Range 37 East, N.M.P.M., in the Denton-Devonian Pool.

This application has been set for hearing before an Examiner of the Oil Conservation Division on November 4, 1993. You are not required to attend the hearing, but as the owner of an interest that may be affected by this application, you may appear at the hearing and present testimony. Failure to appear at that time or otherwise become a party of record will preclude you from challenging this application at a later date.

Parties appearing in cases before the Division have been requested to file a Pre-hearing Statement substantially in the form prescribed by the Division (Oil Conservation Division Memorandum 2-90). Pre-hearing statements should be filed by 4:00 o'clock p.m., on the Friday before a scheduled hearing.

Very truly yours,

William F. Carr

WILLIAM F. CARR
ATTORNEY FOR COLLINS & WARE, INC.
WFC:mlh
Enclosure

SENDER: Complete items 1 and 2 when additional services are desired, and complete items 3 and 4.
Put your address in the "RETURN TO" Space on the reverse side. Failure to do this will prevent this card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for additional service(s) requested.
1. ☐ Show to whom delivered, date, and addressee's address. *(Extra charge)* 2. ☐ Restricted Delivery *(Extra charge)*

3. Article Addressed to:	4. Article Number
S & J Operating Company Post Office Box 2249 Wichita Falls, TX 76307	P 176 017 059 Type of Service: ☐ Registered ☐ Insured ☒ Certified ☐ COD ☐ Express Mail ☒ Return Receipt for Merchandise Always obtain signature of addressee or agent and DATE DELIVERED.
5. Signature — Address X	8. Addressee's Address *(ONLY if requested and fee paid)*
6. Signature — Agent X	
7. Date of Delivery OCT 18 1993	

PS Form 3811, Mar. 1988 * U.S.G.P.O. 1988-212-865 DOMESTIC RETURN RECEIPT

P 176 017 059

Receipt for Certified Mail

No Insurance Coverage Provided
Do not use for International Mail
(See Reverse)

S & J Operating Company	
Post Office Box 2249	
Wichita Falls, TX 76307	
$	$

October 13, 1993

PS Form 3800, June 1988

CAMPBELL, CARR, BERGE
& SHERIDAN, P.A.
LAWYERS

MICHAEL B. CAMPBELL
WILLIAM F. CARR
BRADFORD C. BERGE
MARK F. SHERIDAN
WILLIAM P. SLATTERY

PATRICIA A. MATTHEWS
MICHAEL H. FELDEWERT
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JACK M. CAMPBELL
OF COUNSEL

JEFFERSON PLACE
SUITE 1 - 110 NORTH GUADALUPE
POST OFFICE BOX 2208
SANTA FE, NEW MEXICO 87504-2208
TELEPHONE: (505) 988-4421
TELECOPIER: (505) 983-6043

October 13, 1993

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Polaris Production Corporation
415 W. Wall, Suite 2010
Midland, TX 79701

Re: Application of Collins & Ware, Inc. for a High Angle/Horizontal Directional Drilling Pilot Project and Special Operating Rules, Lea County, New Mexico

Gentlemen:

This letter is to advise you that Collins & Ware, Inc., has filed the enclosed application with the New Mexico Oil Conservation Division seeking approval to horizontally drill a well in Section 35, Township 14 South, Range 37 East, N.M.P.M., in the Denton-Devonian Pool.

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Very truly yours,

WILLIAM F. CARR
ATTORNEY FOR COLLINS & WARE, INC.
WFC:mlh
Enclosure

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3. Article Addressed to:

Polaris Production Corp.
415 W. Wall, Suite 2010
Midland, TX 79701

4. Article Number
P 176 017 060

Type of Service:
☐ Registered ☐ Insured
☒ Certified ☐ COD
☐ Express Mail ☒ Return Receipt for Merchandise

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature – Address
X

6. Signature – Agent
X Dave Myers

7. Date of Delivery
10-14-93

8. Addressee's Address *(ONLY if requested and fee paid)*

PS Form **3811**, Mar. 1988 * U.S.G.P.O. 1988-212-865 **DOMESTIC RETURN RECEIPT**

P 176 017 060

...ed Mail

...nce Coverage Provided ...e for International Mail ...erse)

Polaris Production Corp.
415 W. Wall, Suite 2010
Midland, TX 79701

$

$

October 13, 1993

...S Form 3800

CAMPBELL, CARR, BERGE
& SHERIDAN, P.A.
LAWYERS

MICHAEL B. CAMPBELL
WILLIAM F. CARR
BRADFORD C. BERGE
MARK F. SHERIDAN
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SANTA FE, NEW MEXICO 87504-2208
TELEPHONE: (505) 988-4421
TELECOPIER: (505) 983-6043

October 13, 1993

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Devon Energy Corporation
20 North Broadway
1500 Mid-America Tower
Oklahoma City, Oklahoma 73102-8260

Re: Application of Collins & Ware, Inc. for a High Angle/Horizontal Directional Drilling Pilot Project and Special Operating Rules, Lea County, New Mexico

Gentlemen:

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Very truly yours,

WILLIAM F. CARR
ATTORNEY FOR COLLINS & WARE, INC.
WFC:mlh
Enclosure

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2. ☐ Restricted Delivery *(Extra charge)*

3. Article Addressed to:

Devon Energy Corporation
20 North Broadway
1500 Mid-America Tower
Oklahoma City, Oklahoma 73102-8260

4. Article Number

P 176 017 061

Type of Service:

- ☐ Registered
- ☐ Insured
- ☒ Certified
- ☐ COD
- ☐ Express Mail
- ☒ Return Receipt for Merchandise

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature — Address

X

6. Signature — Agent

X B. Reynolds

7. Date of Delivery

10/18/93

8. Addressee's Address *(ONLY if requested and fee paid)*

PS Form **3811**, Mar. 1988 ★ U.S.G.P.O. 1988-212-865 **DOMESTIC RETURN RECEIPT**

P 176 017 061

for
ed Mail

Devon Energy Corporation
20 North Broadway
1500 Mid-America Tower
Oklahoma City, OK 73102-8260

$

$

October 13, 1993

SHORT RADIUS HORIZONTAL PROPOSAL
COLLINS AND WARE INC.
MR. JIM ORSETH

S AND J POPE NO. 5
LEA COUNTY, NEW MEXICO

BEFORE THE
OIL CONSERVATION DIVISION
Santa Fe, New Mexico

Case No. 10861 Exhibit No. 6

Submitted by: Collins & Ware, Inc.

Hearing Date: November 4, 1993

BAKER HUGHES INTEQ

TABLE OF CONTENTS

COVER LETTER

BAKER HUGHES

BAKER HUGHES INTEQ

2105 Market Street Midland, Texas 79703
915-694-9517 Fax 915-694-5648

October 28, 1993 CW102893.SJK

Collins and Ware Inc.
Mr. Jim Orseth
303 West Wall Avenue, Suite 2200
Midland, Texas 79701

RE: S & J Pope No. 5, Lea County New Mexico

Dear sir;

Baker Hughes *INTEQ* is pleased to have the opportunity to present the following preliminary proposal for providing horizontal drilling services on your above referenced well.

Baker Hughes *INTEQ* pioneered the development of Horizontal Drilling as known today. Our engineers and drilling personnel are the leading experts in planning and executing horizontal wells. Our company is the world's largest supplier of horizontal drilling services, offering three general profiles for horizontal drilling. They are: Short-Radius, Medium-Radius and Long-Radius. We continue to strive for improved quality and service to each customer on each drilling application.

We would like to discuss the project in more detail before finalizing any contractual or technical aspects of this proposal. Please contact us at your convenience, if we can assist you in any way.

Sincerely,
Baker Hughes *INTEQ*

Scott King
Drilling Engineer
SJK/cas

PROJECT DISCUSSION

Collins and Ware Inc.
Mr. Jim Orseth

October 28, 1993
CW102893.SJK

PROJECT DISCUSSION
S AND J POPE NO. 5
LEA COUNTY, NEW MEXICO

This project is a re-entry of the Pope No. 5 in the Denton field of Lea County, New Mexico. The purpose is to drill a short radius wellbore with the upper Devonian as the objective.

The 5-1/2" liner shoe will be drilled out and a cement plug will be spotted and dressed off to the kick-off point of 12,030'. A short radius angle build assembly will be used to drill the curve to an inclination of 90° and a 45° azimuth with a 4-1/2" tri-cone insert bit.

The short radius angle hold assembly will then be run and the lateral portion of the hole drilled from 12,101' to 12,756' with a 4-1/2" Ballaset bit while maintaining 90° inclination and a direction of 45° azimuth.

WELL DESIGN

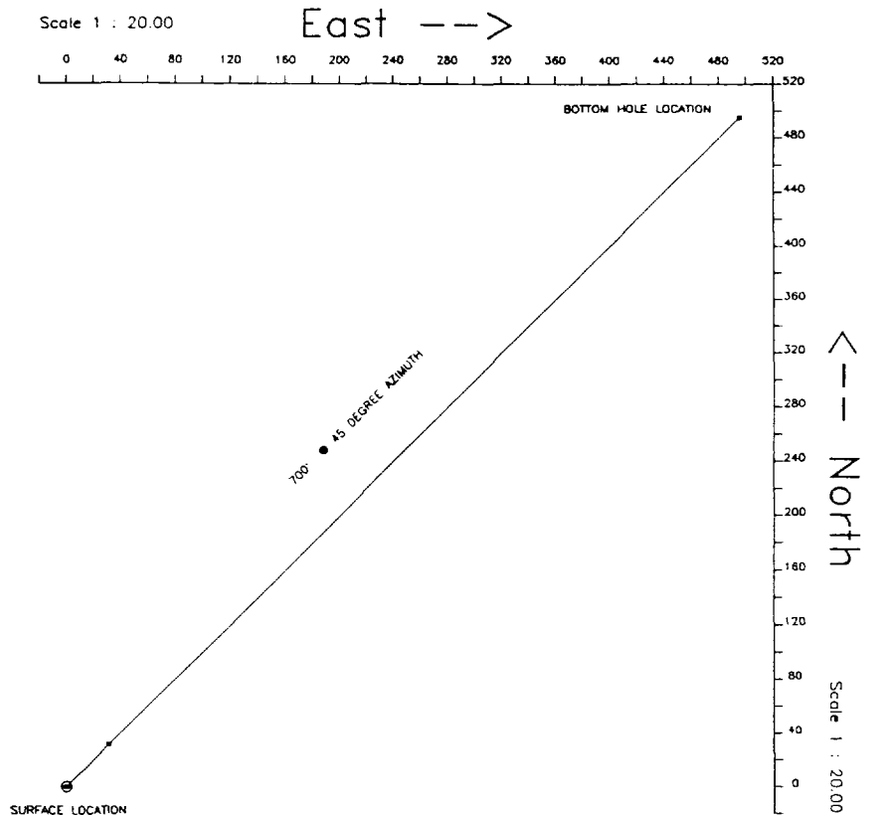
COLLINS & WARE

Structure : S. & J. POPE #5 Well : #5

Field : DENTON Location : LEA COUNTY, NEW MEXICO

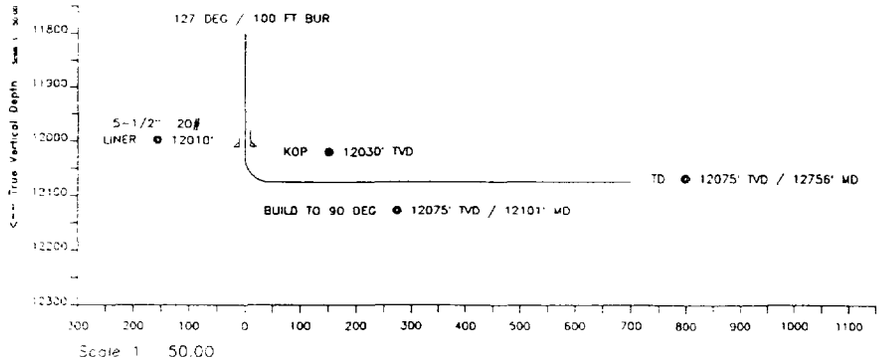
WELL PROFILE DATA

Point	MD	Inc	Dir	TVD	North	East
Tie on	0	0.00	45.00	0	0	0
KOP	12030	0.00	45.00	12030	0	0
End of Build	12101	90.00	45.00	12075	32	32
Target	12756	90.00	45.00	12075	495	495



MAGNETIC DECLINATION
8 DEGREES EAST

BAKER HUGHES INTEQ



Scale 1 : 50.00

Vertical Section on 45.00 azimuth with reference 0.00 N, 0.00 E from structure

COLLINS & WARE
S. & J. POPE #5

#5
slot #1
DENTON
LEA COUNTY, NEW MEXICO

P R O P O S A L L I S T I N G

by
Baker Hughes INTEQ

Your ref :
Our ref : prop574
License :

Date printed : 28-Oct-93
Date created : 28-Oct-93
Last revised : 28-Oct-93

Field is centred on 0.000,0.000,0.00000,+
Structure is centred on 0.000,0.000,0.00000,N

Slot location is n0 0 0.000,w4 29 18.843
Slot Grid coordinates are N 0.000, E 0.000
Slot local coordinates are 0.00 N 0.00 E
Reference North is Grid North

Measured Depth	Inclin. Degrees	Azimuth Degrees	True Vert. Depth	RECTANGULAR COORDINATES	Dogleg Deg/100Ft	Vert Sect
0.00	0.00	45.00	0.00	0.00 N 0.00 E	0.00	0.00
500.00	0.00	45.00	500.00	0.00 N 0.00 E	0.00	0.00
1000.00	0.00	45.00	1000.00	0.00 N 0.00 E	0.00	0.00
1500.00	0.00	45.00	1500.00	0.00 N 0.00 E	0.00	0.00
2000.00	0.00	45.00	2000.00	0.00 N 0.00 E	0.00	0.00
2500.00	0.00	45.00	2500.00	0.00 N 0.00 E	0.00	0.00
3000.00	0.00	45.00	3000.00	0.00 N 0.00 E	0.00	0.00
3500.00	0.00	45.00	3500.00	0.00 N 0.00 E	0.00	0.00
4000.00	0.00	45.00	4000.00	0.00 N 0.00 E	0.00	0.00
4500.00	0.00	45.00	4500.00	0.00 N 0.00 E	0.00	0.00
5000.00	0.00	45.00	5000.00	0.00 N 0.00 E	0.00	0.00
5500.00	0.00	45.00	5500.00	0.00 N 0.00 E	0.00	0.00
6000.00	0.00	45.00	6000.00	0.00 N 0.00 E	0.00	0.00
6500.00	0.00	45.00	6500.00	0.00 N 0.00 E	0.00	0.00
7000.00	0.00	45.00	7000.00	0.00 N 0.00 E	0.00	0.00
7500.00	0.00	45.00	7500.00	0.00 N 0.00 E	0.00	0.00
8000.00	0.00	45.00	8000.00	0.00 N 0.00 E	0.00	0.00
8500.00	0.00	45.00	8500.00	0.00 N 0.00 E	0.00	0.00
9000.00	0.00	45.00	9000.00	0.00 N 0.00 E	0.00	0.00
9500.00	0.00	45.00	9500.00	0.00 N 0.00 E	0.00	0.00
10000.00	0.00	45.00	10000.00	0.00 N 0.00 E	0.00	0.00
10500.00	0.00	45.00	10500.00	0.00 N 0.00 E	0.00	0.00
11000.00	0.00	45.00	11000.00	0.00 N 0.00 E	0.00	0.00
11500.00	0.00	45.00	11500.00	0.00 N 0.00 E	0.00	0.00
12000.00	0.00	45.00	12000.00	0.00 N 0.00 E	0.00	0.00
12030.00	0.00	45.00	12030.00	0.00 N 0.00 E	0.00	0.00
12100.68	90.00	45.00	12075.00	31.82 N 31.82 E	127.32	45.00
12500.00	90.00	45.00	12075.00	314.18 N 314.18 E	0.00	444.31
12755.68	90.00	45.00	12075.00	494.97 N 494.97 E	0.00	700.00

All data is in feet unless otherwise stated
Coordinates from structure and TVD from wellhead.
Vertical section is from wellhead on azimuth 45.00 degrees.
Declination is 0.00 degrees, Convergence is 0.00 degrees.
Calculation uses the minimum curvature method.
Presented by Baker Hughes INTEQ

All data is in feet unless otherwise stated
Coordinates from structure and TVD from wellhead.
Bottom hole distance is 700.00 on azimuth 45.00 degrees from wellhead.
Vertical section is from wellhead on azimuth 45.00 degrees.
Declination is 0.00 degrees, Convergence is 0.00 degrees.
Calculation uses the minimum curvature method.
Presented by Baker Hughes INTEQ

RECOMMENDED BIT: S-725

COMPANY: COLLINS & WARE, INC.
WELL NAME: POPE #5
FORMATION: DEVONIAN

FIELD: DENTON
COUNTY (PARISH): LEA
STATE: NEW MEXICO

HOLE SIZE:	4.500	TYPE SURFACE CONNECTION:	3
DEPTH IN:	12030	MAXIMUM OPERATING PRESSURE:	3000
DEPTH OUT:	12756	MOTOR TYPE:	3.75
CALCULATED DEPTH IN:	12030	PUMPING RANGE (gpm):	106-185
CALCULATED DEPTH OUT:	12756	BIT SPEED RANGE (rpm):	210-370

	O.D.	WEIGHT	EQUIV. I.D.	LENGTH
TOP DRILL PIPE:	2.8750	10.70	2.1520	11483
BOTTOM DRILL PIPE:	0.0000	0.00	0.0000	0
TOP HEAVY WEIGHT:	0.0000	0.00	0.0000	0
BOTTOM HEAVY WEIGHT:	0.0000	0.00	0.0000	0
TOP DRILL COLLARS:	2.8750	8.70	2.2500	530
BOTTOM DRILL COLLARS:	3.7500	25.00	1.5000	17

PIPE DEPTH: 12030

FLOW RATE 10.00 GPM INCREMENTS:	165.00	175.00	185.00
TOTAL AVAILABLE HYDRAULIC HORSEPOWER:	288.80	306.30	323.80
ANNULAR VELOCITY (FT/MIN):			
TOP DRILL PIPE:	277.57	294.40	311.22
BOTTOM DRILL PIPE:	0.00	0.00	0.00
TOP HEAVY WEIGHT:	0.00	0.00	0.00
BOTTOM HEAVY WEIGHT:	0.00	0.00	0.00
TOP DRILL COLLARS:	277.57	294.40	311.22
BOTTOM DRILL COLLARS:	461.12	489.06	517.01
SURFACE EQUIPMENT PRESSURE LOSS:	4.80	5.36	5.94
TOP DRILL PIPE BORE PRESSURE LOSS:	1432.06	1597.69	1771.66
BOTTOM DRILL PIPE BORE PRESSURE LOSS:	0.00	0.00	0.00
TOP HEAVY WEIGHT BORE PRESSURE LOSS:	0.00	0.00	0.00
BOTTOM HEAVY WEIGHT BORE PRESSURE LOSS:	0.00	0.00	0.00
TOP DRILL COLLARS BORE PRESSURE LOSS:	53.23	59.39	65.86
BOTTOM DRILL COLLARS BORE PRESSURE LOSS:	12.25	13.67	15.16
TOP DRILL PIPE ANNULAR PRESSURE LOSS:	423.93	476.87	532.92
BOTTOM DRILL PIPE ANNULAR PRESSURE LOSS:	0.00	0.00	0.00
TOP HEAVY WEIGHT ANNULAR PRESSURE LOSS:	0.00	0.00	0.00
BOTTOM HEAVY WEIGHT ANNULAR PRESSURE LOSS:	0.00	0.00	0.00
TOP DRILL COLLARS ANNULAR PRESSURE LOSS:	19.57	22.01	24.60
BOTTOM DRILL COLLARS ANNULAR PRESSURE LOSS:	3.21	3.61	4.03
MOTOR PRESSURE DIFFERENTIAL:	200.00	200.00	200.00
TURBINE PRESSURE DIFFERENTIAL (MWD):	0.00	0.00	0.00
TOTAL PRESSURE DROP FOR SYSTEM (LESS BIT):	2149.05	2378.59	2620.17
AVAILABLE PRESSURE FOR BIT (PSI):	850.95	621.41	379.83
FLOW RATE 10.00 GPM INCREMENTS:	165.00	175.00	185.00
GIVEN TOTAL FLOW AREA: 3-15/32	0.5175	0.5175	0.5175
PRESSURE DROP ACROSS BIT (PSI):	80.52	90.57	101.22
TOTAL PRESSURE EXPENDITURE FOR SYSTEM (PSI):	2229.56	2469.16	2721.39
STANDPIPE PRESSURE AVAILABLE (PSI):	770.44	530.84	278.61
JET VELOCITY ACROSS BIT FACE (FT/SEC):	102.35	108.55	114.75
HYDRAULIC IMPACT FORCE (LBS):	75	85	94
HYDRAULIC HORSEPOWER AT BIT (HHP):	8	9	11
HYDRAULIC HORSEPOWER PER SQUARE INCH (HSI):	0.49	0.58	0.69
MAXIMIZED TOTAL FLOW AREA WITHOUT TOOLS:	0.1432	0.1718	0.2162
PRESSURE DROP ACROSS BIT (PSI):	1050.96	821.41	579.83
JET VELOCITY ACROSS BIT FACE (FT/SEC):	369.76	326.90	274.65
HYDRAULIC IMPACT FORCE (LBS):	272	255	226
HYDRAULIC HORSEPOWER AT BIT w/o TOOLS:	101	84	63
HYDRAULIC HORSEPOWER PER SQUARE INCH w/o TOOLS:	6.36	5.27	3.94
MAXIMIZED TOTAL FLOW AREA WITH TOOLS:	0.1592	0.1976	0.2671
PRESSURE DROP ACROSS BIT (PSI):	850.95	621.41	379.83
JET VELOCITY ACROSS BIT FACE (FT/SEC):	332.72	284.33	222.29
HYDRAULIC IMPACT FORCE (LBS):	244	221	183
HYDRAULIC HORSEPOWER AT BIT WITH TOOLS:	82	63	41
HYDRAULIC HORSEPOWER PER SQUARE INCH w/ TOOLS:	5.15	3.99	2.58

DEPTH IN

RECOMMENDED BIT: S-725

COMPANY: COLLINS & WARE, INC.
WELL NAME: POPE #5
FORMATION: DEVONIAN

FIELD: DENTON
COUNTY (PARISH): LEA
STATE: NEW MEXICO

HOLE SIZE:	4.500	TYPE SURFACE CONNECTION:	3
DEPTH IN:	12030	MAXIMUM OPERATING PRESSURE:	3000
DEPTH OUT:	12756	MOTOR TYPE:	3.75
CALCULATED DEPTH IN:	12030	PUMPING RANGE (gpm):	106-185
CALCULATED DEPTH OUT:	12756	BIT SPEED RANGE (rpm):	210-370

	O.D.	WEIGHT	EQUIV. I.D.	LENGTH
TOP DRILL PIPE:	2.8750	10.70	2.1520	12209
BOTTOM DRILL PIPE:	0.0000	0.00	0.0000	0
TOP HEAVY WEIGHT:	0.0000	0.00	0.0000	0
BOTTOM HEAVY WEIGHT:	0.0000	0.00	0.0000	0
TOP DRILL COLLARS:	2.8750	8.70	2.2500	530
BOTTOM DRILL COLLARS:	3.7500	25.00	1.5000	17

PIPE DEPTH: 12756

FLOW RATE 10.00 GPM INCREMENTS:	165.00	175.00	185.00
TOTAL AVAILABLE HYDRAULIC HORSEPOWER:	288.80	306.30	323.80
ANNULAR VELOCITY (FT/MIN):			
TOP DRILL PIPE:	277.57	294.40	311.22
BOTTOM DRILL PIPE:	0.00	0.00	0.00
TOP HEAVY WEIGHT:	0.00	0.00	0.00
BOTTOM HEAVY WEIGHT:	0.00	0.00	0.00
TOP DRILL COLLARS:	277.57	294.40	311.22
BOTTOM DRILL COLLARS:	461.12	489.06	517.01
SURFACE EQUIPMENT PRESSURE LOSS:	4.91	5.48	6.08
TOP DRILL PIPE BORE PRESSURE LOSS:	1553.00	1732.62	1921.28
BOTTOM DRILL PIPE BORE PRESSURE LOSS:	0.00	0.00	0.00
TOP HEAVY WEIGHT BORE PRESSURE LOSS:	0.00	0.00	0.00
BOTTOM HEAVY WEIGHT BORE PRESSURE LOSS:	0.00	0.00	0.00
TOP DRILL COLLARS BORE PRESSURE LOSS:	54.30	60.58	67.17
BOTTOM DRILL COLLARS BORE PRESSURE LOSS:	12.50	13.94	15.46
TOP DRILL PIPE ANNULAR PRESSURE LOSS:	459.73	517.14	577.93
BOTTOM DRILL PIPE ANNULAR PRESSURE LOSS:	0.00	0.00	0.00
TOP HEAVY WEIGHT ANNULAR PRESSURE LOSS:	0.00	0.00	0.00
BOTTOM HEAVY WEIGHT ANNULAR PRESSURE LOSS:	0.00	0.00	0.00
TOP DRILL COLLARS ANNULAR PRESSURE LOSS:	19.96	22.45	25.09
BOTTOM DRILL COLLARS ANNULAR PRESSURE LOSS:	3.27	3.68	4.11
MOTOR PRESSURE DIFFERENTIAL:	200.00	200.00	200.00
TURBINE PRESSURE DIFFERENTIAL (MWD):	0.00	0.00	0.00
TOTAL PRESSURE DROP FOR SYSTEM (LESS BIT):	2307.66	2555.89	2817.13
AVAILABLE PRESSURE FOR BIT (PSI):	692.34	444.11	182.87
FLOW RATE 10.00 GPM INCREMENTS:	165.00	175.00	185.00
GIVEN TOTAL FLOW AREA: 3-15/32	0.5175	0.5175	0.5175
PRESSURE DROP ACROSS BIT (PSI):	82.39	92.68	103.58
TOTAL PRESSURE EXPENDITURE FOR SYSTEM (PSI):	2390.06	2648.57	2920.70
STANDPIPE PRESSURE AVAILABLE (PSI):	609.94	351.43	79.30
JET VELOCITY ACROSS BIT FACE (FT/SEC):	102.35	108.55	114.75
HYDRAULIC IMPACT FORCE (LBS):	77	87	97
HYDRAULIC HORSEPOWER AT BIT (HHP):	8	9	11
HYDRAULIC HORSEPOWER PER SQUARE INCH (HSI):	0.50	0.59	0.70
MAXIMIZED TOTAL FLOW AREA WITHOUT TOOLS:	0.1572	0.1963	0.2692
PRESSURE DROP ACROSS BIT (PSI):	892.34	644.11	382.88
JET VELOCITY ACROSS BIT FACE (FT/SEC):	336.82	286.17	220.63
HYDRAULIC IMPACT FORCE (LBS):	253	228	186
HYDRAULIC HORSEPOWER AT BIT w/o TOOLS:	86	66	41
HYDRAULIC HORSEPOWER PER SQUARE INCH w/o TOOLS:	5.40	4.13	2.60
MAXIMIZED TOTAL FLOW AREA WITH TOOLS:	0.1785	0.2364	0.3895
PRESSURE DROP ACROSS BIT (PSI):	692.34	444.11	182.87
JET VELOCITY ACROSS BIT FACE (FT/SEC):	296.69	237.62	152.48
HYDRAULIC IMPACT FORCE (LBS):	223	189	128
HYDRAULIC HORSEPOWER AT BIT WITH TOOLS:	67	45	20
HYDRAULIC HORSEPOWER PER SQUARE INCH w/ TOOLS:	4.19	2.85	1.24

DEPTH OUT

TIME STUDY & PROGNOSIS

BAKER HUGHES

SHORT RADIUS HORIZONTAL DRILLING TIME ESTIMATE

OPERATOR: **COLLINS & WARE, INC.** **DATE:** 10-29-93
PROSPECT: **S & J POPE #5**

DEPTH INTERVAL	SECTION	BHA	PROPOSED BIT	EST. ROP FT./HR.	DRILLING HOURS	TRIP HOURS	CIRC. HOURS	RMNG/CONN/ SURV. HOURS	TOTAL HOURS	STD-BY HOURS
11830 TO 12130	GYRO TO KOP SET CMT PLUG								0.0	
11830 TO 12030	STD-BY DRESS CMT		4-5/8" MT	1-1.5 MIN/FT 10,000# 45 RPM					0.0	24.0
12030 TO 12101	BUILD CURVE TO 90.0 DEG.	3-3/4" SRAB	4-1/2" STC M88F	3	23.7	12.0	5.0	5.0	45.7	0.0
12101 TO 12756	DRILL LATERAL @ 90.0 DEG.	3-3/4" SRAH	4-1/2" HTC S-725	4	163.8	30.0	20.0	20.0	233.8	0.0
TO									0.0	0.0
TO									0.0	0.0
					DRILLING HOURS	TRIP HOURS	CIRC. HOURS	RMNG/CONN/ SURV HOURS	TOTAL HOURS	STD-BY HOURS
				TOTAL	187.4	42.0	25.0	25.0	279.4	24.0

*TTL DRLG DAYS : 11.6
TTL STAND-BY DAYS: 1.0
TTL JOB DAYS : 12.6

COMMENTS : THE USE OF A POLYMER DRILLING FLUID IS STRONGLY RECOMMENDED.
TUBULARS SHOULD BE COMPLETELY FREE OF RUST AND SCALE.
A FINE MESH FLOWLINE CLEANER IS HIGHLY RECOMMENDED.

SHORT RADIUS HORIZONTAL DRILLING PROGNOSIS

OPERATOR: **COLLINS & WARE, INC.**
PROSPECT: **POPE #5**
DATE: 10-29-93

STEP	DEPTH FEET	HOLE SIZE	CASING	MUD	OPERATION
1	11830.00 TO 12130.00		5-1/2" 20# @ 12010'	8.3 - 8.4# FW	GYRO TO KOP SPOT CEMENT PLUG WOC
2	11830.00 TO 12030.00	4.625	OH	8.3-8.4# FW	DRESS CMT TO KOP
3	12030.00 TO 12101.00	4.5	OH	8.4-8.6# POLYMER	DRILL CURVE @ 1.36 DEG./ FT TO 90 DEG. INCLINATION
4	12101.00 TO 12756.00	4.5	OH	8.4-8.6# POLYMER	DRILL LATERAL @ 90 DEG INC. TD @ 12075' TVD / 12756' MD
5	TO				
6	TO				
7	TO				

COST ESTIMATE

BAKER HUGHES

SHORT RADIUS HORIZONTAL DRILLING COST ESTIMATE

OPERATOR: COLLINS & WARE, INC.
PROSPECT: S & J POPE #5
DATE: 10-29-93

SHORT RADIUS HORIZONTAL DRILLING DAY RATE

	Qty	UNIT PRICE	TOTAL PRICE
MOB/DEMOB	1	$3,000.00	$3,000.00
DAY RATE	12	$9,700.00	$116,400.00
STAND-BY	1	$2,500.00	$2,500.00
COMPUTER/ENGINEERING CHARGE	1	$1,000.00	$1,000.00
INSPECTION AND REPAIR, ESTIMATE	1	$4,000.00	$4,000.00
PARTIAL LIH COVERAGE (50%)	12	$700.00	$8,400.00
ESTIMATED TOTAL DRILLING CHARGE:			**$135,300.00**

BITS

HUGHES CHRISTENSEN DRILL BITS			
1 SEC M88F - 4-1/2"	1	$4,200.00	$4,200.00
1 HTC S-725 - 4-1/2"	1	$14,300.00	$14,300.00
ESTIMATED TOTAL BIT COST			**$18,500.00**

SURVEY CHARGES

SURFACE TO KOP	1	$4,500.00	$4,500.00
ESTIMATED TOTAL SURVEY CHARGE:			**$4,500.00**

ESTIMATED GRAND TOTAL CHARGES: $154,100.00

CASE HISTORIES

	SR MOTOR CASE HISTORIES WEH				
CASE HISTORY #	WEH/CH/1	WEH/CH/2	WEH/CH/3	WEH/CH/4	WEH/CH/5
SPUD DATE	Mar-89	May-89	Sep-89	Nov-89	Jan-90
COUNTRY	CALIFORNIA	MICHIGAN	NEW YORK	CALIFORNIA	ILLINOIS
FORMATION	SST/SHALE	SALT	SALT	TITE SST	LST
K.O. POINT (FT)	3442	3560	2398	1617	2349
K.O. METHOD	OPEN HOLE/ MAGNETIC	OPEN HOLE/ MAGNETIC	OPEN HOLE/ MAGNETIC	OPEN HOLE/ HIGH SIDE	OPEN HOLE/ MAGNETIC
RADIUS (FT)	40	40	40	40	40
HOLE SIZE	6"	6"	6"	6"	4-3/4"
WELL TYPE	NEW	NEW	NEW	NEW	NEW
HOR. LENGTH (FT)	164	394	659	364	581
CASING SIZE	7"	7"	7"	7"	5-1/2"
BIT TYPE	R433G	R433G	R433G/J3	R433G/J2	Z433G/MP433
COMPLETION	4-1/2" SL. LNR.	OPEN HOLE	OPEN HOLE	3-1/2" SCREEN	OPEN HOLE
APPLICATION	OVERLYING FORMATION	SOLUTION MINING	SOLUTION MINING	GRAVITY DRAINAGE	LEASE RESTRICTION
MUD TYPE	FW/GEL	BRINE/GEL	BRINE/GEL	THIX/SALT	HEC/KCL
RIG TYPE		WORKOVER	WORKOVER	CONV.	WORKOVER
PROJECT DAYS	8	18	18	13	10
SURVEY METHOD	ST	ST	ST	ST	ST

CASE HISTORY #	WEH/CH/6	WEH/CH/7	WEH/CH/8	WEH/CH/9	WEH/CH/10
SPUD DATE	Jan-90	Jan-90	Jan-90	Mar-90	Apr-90
COUNTRY	ALBERTA CND	ALBERTA CND	TEXAS	ALBERTA CND	CALIFORNIA
FORMATION	SST	SST	SST	CARBONATE	SST
K.O. POINT (FT)	1198	1234	2467	8255	1247
K.O. METHOD	OPEN HOLE/ MAGNETIC	OPEN HOLE/ MAGNETIC	OPEN HOLE/ MAGNETIC	CMT. PLUG/ GYRO	CMT. PLUG/ GHIGH SIDE
RADIUS (FT)	40	40	40	40	40
HOLE SIZE	6″	6″	4-3/4″	6″	6″
WELL TYPE	NEW	NEW	NEW	REENTRY	NEW
HOR. LENGTH (FT)	732	928	338	164	535
CASING SIZE	7″	7″	7″	7″	7″
BIT TYPE	R433G/J4	R433G/J33/J4	Z433G/T55	M44NF/S725	HP12/HP51
COMPLETION	4-1/2″ SL. LNR.	4-1/2″ SL. LNR.	2-7/8″ TBG	OPEN HOLE	4-1/2″ SL. LNR
APPLICATION	SHALLOW KOP	SHALLOW KOP	TEST TECHNOLOGY	SAVE COMPLETION	GRAVITY DRAINAGE
MUD TYPE	KCL/POL	KCL/POL.	KCL/POL	OIL BASE	KCL/POL
RIG TYPE	CONV.	CONV.	WORKOER	WORKOVER	CONV.
PROJECT DAYS	18	11	14	9	4
SURVEY METHOD	ST	ST	ST	ST	ST

CASE HISTORY #	WEH/CH/11	WEH/CH/12	WEH/CH/13	WEH/CH/14	WEH/CH/15
SPUD DATE	Apr-90	Jun-90	Jun-90	Jul-90	Jul-90
COUNTRY	TEXAS	CALIFORNIA	TEXAS	CANADA	TEXAS
FORMATION	LST	MIOCENE	SST	LST	DOL
K.O. POINT (FT)	7260	1096	3091	5052	1421
K.O. METHOD	OPEN HOLE/ MAGNETIC	OPEN HOLE/ MAGNETIC	SECTION/ MAGNETIC	SECTION/ GYRO	SECTION/ ROTARY
RADIUS (FT)	40	40	40	40	40
HOLE SIZE	6″	6″	6″	6″	4-3/4″
WELL TYPE	NEW	NEW	REENTRY	REENTRY	REENTRY
HOR. LENGTH (FT)	659	499	230	233	177
CASING SIZE	7″	9-5/8″	5-1/2″	7″	7″
BIT TYPE	HP51/J2/R433	R433	R523	R435/J4/J33	J4/S725
COMPLETION	4-1/2″ SL. LNR.	4-1/2″ SL. LNR	4-1/2″ SL. LNR	OPEN HOLE	2-7/8″ TBG.
APPLICATION	DUAL LATERAL	GRAVITY DRAINAGE	LEASE RESTRICTION	MISSED REEF W/ VERTICAL	LEASE/DEPTH RESTRICTION
MUD TYPE	FW/POL	FW/POL	CACL	POLYMER	POLYMER
RIG TYPE	CONV.	WORKOVER	WORKOVER	WORKOVER	WORKOVER
PROJECT DAYS	23	5	17	24	18
SURVEY METHOD	ST	ST	ST	ST	ST

CASE HISTORY #	WEH/CH/16	WEH/CH/17	WEH/CH/18	WEH/CH/19	WEH/CH/20
SPUD DATE	Nov-90	Dec-90	Dec-90	Jan-91	Jan-91
COUNTRY	N. DAKOTA	TEXAS	TEXAS	TEXAS	ALBERTA CND
FORMATION	SHALE	DOL	DOL	DOL	SST
K.O. POINT (FT)	10479	1572	1355	1699	2979
K.O. METHOD	SECTION/ MAGNETIC	SECTION/ ROTARY	SECTION/ ROTARY	SECTION/ ROTARY	SECTION/ GYRO
RADIUS (FT)	40	40	40	40	40
HOLE SIZE	4-1/2"	4-3/4"	4-3/4"	6"/4-3/4"	4-3/4"
WELL TYPE	REENTRY	REENTRY	REENTRY	REENTRY	REENTRY
HOR. LENGTH (FT)	N/A	417	253	112	262
CASING SIZE	5-1/2"	7"	7"	7"	5-1/2"
BIT TYPE	R435	S248	R435/L1/R435	L1	L1/R435/S725
COMPLETION	OPEN HOLE	2-7/8" TBG	2-7/8" TBG	2-7/8" TBG	2-7/8" TBG
APPLICATION	OVERLYING FORMATION	LEASE/DEPTH RESTRICTION	LEASE/DEPTH RESTRICTION	LEASE/DEPTH RESTRICTION	WELL SPACING
MUD TYPE	SALT/GEL	POLYMER	POLYMER	POLYMER	POLYMER
RIG TYPE	WORKOVER	WORKOVER	WORKOVER	WORKOVER	WORKOVER
PROJECT DAYS	15	14	10	15	7
SURVEY METHOD	ST	ST	ST	ST	ST

CASE HISTORY #	WEH/CH/21	WEH/CH/22	WEH/CH/23	WEH/CH/24	WEH/CH/25
SPUD DATE	Feb-91	Apr-91	Apr-91	May-91	Jun-91
COUNTRY	ALBERTA CND	CALIFORNIA	TEXAS	TEXAS	TEXAS
FORMATION	CARB.	SST	LST	LST	DOL
K.O. POINT (FT)	5013	1237	8471	8094	1699
K.O. METHOD	OPEN HOLE/ MAGNETIC	OPEN HOLE/ MAGNETIC	SECTION/ MAGNETIC	OPEN HOLE/ MAGNETIC	SECTION/ ROTARY
RADIUS (FT)	40	40	40	40	40
HOLE SIZE	6″	6″	4-1/2″	6″	4-3/4″
WELL TYPE	REENTRY	NEW	REENTRY	NEW	REENTRY
HOR. LENGTH (FT)	279	427	423	659	361
CASING SIZE	7″	8-5/8″	5-1/2″	7″	7″
BIT TYPE	J4	HP51	HP12/R433	S248/R481	S248
COMPLETION		4-1/2″ SL. LNR			OPEN HOLE
APPLICATION	INTERSECT REEF	GRAVITY DRAINAGE	LEASE RESTRICTION	DELINIATION	LEASE RESTRICTION
MUD TYPE	GEL/XCD	XAN/VIS	FW/POL	XAN/VIS	HEC
RIG TYPE	WORKOVER	CONV.	WORKOVER	CONV.	WORKOVER
PROJECT DAYS	6	4	11	43	7
SURVEY METHOD	ST	ST	ST	ST	ST

CASE HISTORY #	WEH/CH/26	WEH/CH/27	WEH/CH/28	WEH/CH/29	WEH/CH/30
SPUD DATE	Jul-91	Aug-91	Aug-91	Aug-91	Aug-91
COUNTRY	CALIFORNIA	INDIANA	COLORADO	TEXAS	TEXAS
FORMATION	SST	DOL	COAL	DOL	DOL
K.O. POINT (FT)	1243	1585	3684	1188	1657
K.O. METHOD	OPEN HOLE/ MAGNETIC	SECTION/ GYRO	SECTION/ MAGNETIC	SECTION/ ROTARY	SECTION/ ROTARY
RADIUS (FT)	40	40	40	40	40
HOLE SIZE	6″	4-1/2″	4-3/4″	4-3/4″	4-3/4″
WELL TYPE	NEW	REENTRY	REENTRY	REENTRY	REENTRY
HOR. LENGTH (FT)	712	253	233	410	627
CASING SIZE	8-5/8″	5-1/2″	5-1/2″	7″	7″
BIT TYPE	Z433G/ATJ33	HP12	R433G	M88F	R435G
COMPLETION		4-1/2″ SL. LNR	OPEN HOLE	OPEN HOLE	OPEN HOLE
APPLICATION	GRAVITY DRAINAGE	SMALL LEASE/ GAS STORAGE	OVERLYING FORMATION	LEASE/ GAS CAP	LEASE/ GAS CAP
MUD TYPE	XAN/VIS	SW/POL	WATER	BRINE GEL	BRINE GEL
RIG TYPE	WORKOVER	WORKOVER	CONV.	WORKOVER	WORKOVER
PROJECT DAYS	13	9	9	13	
SURVEY METHOD	ST	ST	ST	ST	ST

CASE HISTORY #	WEH/CH/31	WEH/CH/32	WEH/CH/33	WEH/CH/34	WEH/CH/35
SPUD DATE	Sep-91	Sep-91	Oct-91	Oct-91	Oct-91
COUNTRY	TEXAS	TEXAS	TEXAS	UTAH	COLORADO
FORMATION	DOL	DOL	DOL	LST	SHALE
K.O. POINT (FT)	4570	1512	1657	5157	6299
K.O. METHOD	CMT.PLUG/ GYRO	SECTION/ ROTARY	SECTION/ ROTARY	SECTION/ MAGNETIC	OPEN HOLE/ MAGNETIC
RADIUS (FT)	40	40	40	40	60
HOLE SIZE	4-3/4"	4-3/4"	4-3/4"	4-3/4"	6"
WELL TYPE	REENTRY	REENTRY	REENTRY	REENTRY	NEW
HOR. LENGTH (FT)	472	571	627	203	N/A
CASING SIZE	5-1/2"	7"	7"	5-1/2"	9-5/8"
BIT TYPE	L1/R435G	L1/ATJ33	J55		
COMPLETION	OPEN HOLE	OPEN HOLE	OPEN HOLE	OPEN HOLE	
APPLICATION	OVERLYING FORMATION	LEASE/ GAS CAP	LEASE/ GAS CAP	LEASE/ OVERL. FORM.	OVERLYING FORMATION
MUD TYPE	MF 55 POL	BRINE GEL	BRINE GEL	KCL	
RIG TYPE	WORKOVER	WORKOVER	WORKOVER	CONV.	CONV.
PROJECT DAYS	6	14	10	11	
SURVEY METHOD	ST	ST	ST	ST	ST

CASE HISTORY #	WEH/CH/36	WEH/CH/37	WEH/CH/38	WEH/CH/39	WEH/CH/40
SPUD DATE	Oct-91	Nov-91	Nov-91	Dec-91	Dec-91
COUNTRY	TEXAS	TEXAS	TEXAS	TEXAS	TEXAS
FORMATION	DOL	DOL	DOL	LST	DOL
K.O. POINT (FT)	1339	1417	1253	10932	1654
K.O. METHOD	SECTION/ ROTARY	SECTION/ GYRO	SECTION/ ROTARY	SECTION/ GYRO	SECTION/ ROTARY
RADIUS (FT)	40	40	40	40	40
HOLE SIZE	4-3/4"	4-3/4"	4-3/4"	4-3/4"	4-3/4"
WELL TYPE	REENTRY	REENTRY	REENTRY	REENTRY	REENTRY
HOR. LENGTH (FT)	781	627	430	0	509
CASING SIZE	7"	7"	7"	5-1/2"	7"
BIT TYPE	STJ33	ATJ33	ATJ33		ATJ33
COMPLETION	OPEN HOLE	OPEN HOLE	OPEN HOLE		OPEN HOLE
APPLICATION	LEASE/ GAS CAP	LEASE/ GAS CAP	LEASE/ GAS CAP	WATER CONING	LEASE/ GAS CAP
MUD TYPE	BRINE GEL	BRINE GEL	BRINE GEL	HEC POLY.	BRINE GEL
RIG TYPE	WORKOVER	WORKOVER	WORKOVER	CONV.	WORKOVER
PROJECT DAYS	9	10	9	6	12
SURVEY METHOD	ST	ST	ST	ST	ST

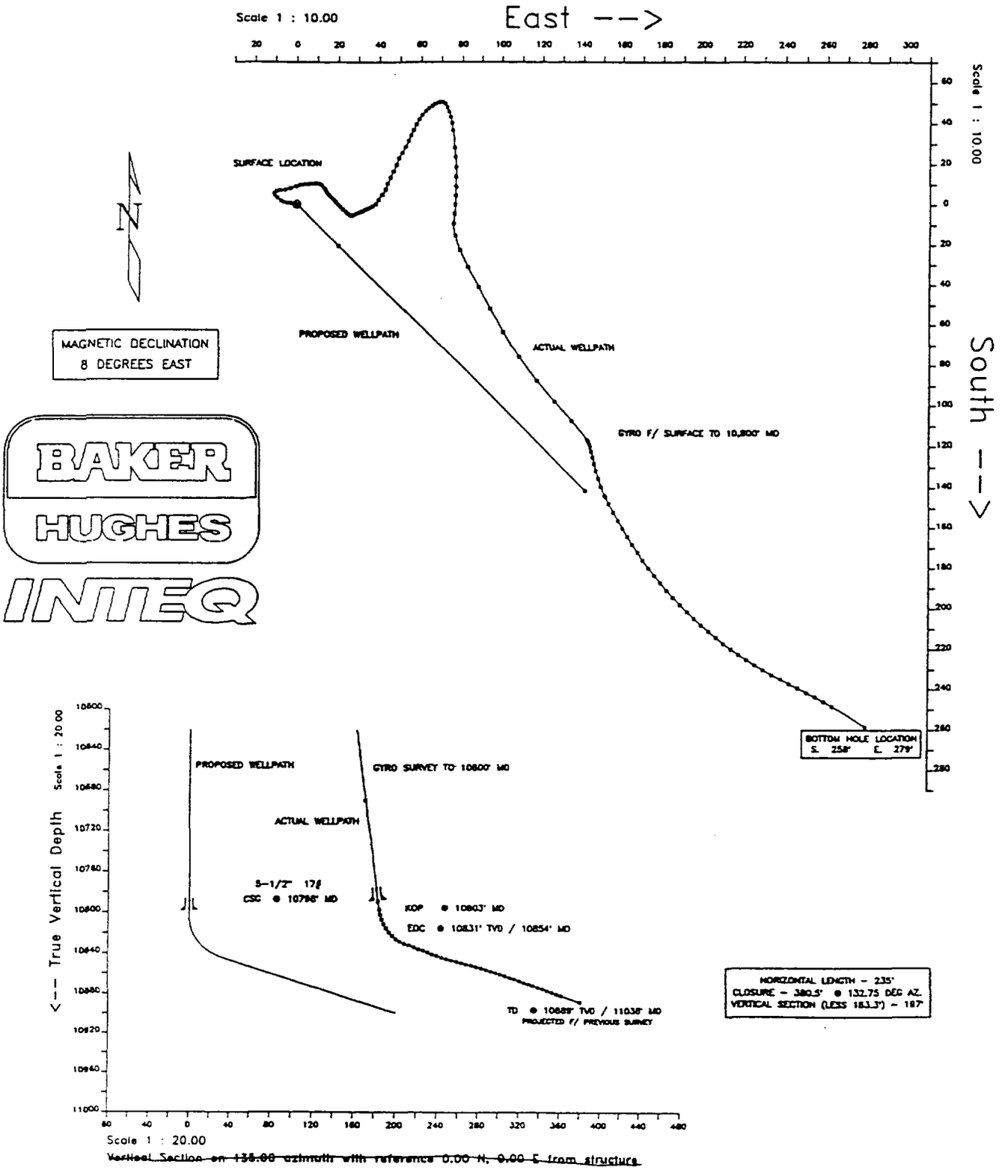
CASE HISTORY #	WEH/CH/41	WEH/CH/42	WEH/CH/43	WEH/CH/44	WEH/CH/45
SPUD DATE	Jan-92	Feb-92	Feb-92	Feb-92	Mar-92
COUNTRY	TEXAS	CANADA	CANADA	CANADA	CANADA
FORMATION	DOL	DOL	LST	DOL	DOL
K.O. POINT (FT)	1329	3937		3793	3980
K.O. METHOD	SECTION/ ROTARY	OPEN HOLE/ MAGNETIC	OPEN HOLE/ MAGNETIC	OPEN HOLE/ HIGH SIDE	OPEN HOLE/ HIGH SIDE
RADIUS (FT)	40	40	40	40	40
HOLE SIZE	4-3/4"	6"	4-3/4"	6"	6"
WELL TYPE	REENTRY	NEW	NEW	NEW	NEW
HOR. LENGTH (FT)	741	95	0	371	295
CASING SIZE	7"	7"	5-1/2"	7"	7"
BIT TYPE					
COMPLETION	OPEN HOLE	OPEN HOLE		OPEN HOLE	OPEN HOLE
APPLICATION	LEASE/ GAS CAP	WATER CONING	WATER CONING	WATER CONING	WATER CONING
MUD TYPE	BRINE GEL	BRINE GEL	BRINE GEL	BRINE GEL	BRINE GEL
RIG TYPE	WORKOVER	WORKOVER	CONV.	CONV.	CONV.
PROJECT DAYS	9			6	5
SURVEY METHOD	ST	ST	ST	ST	ST

CASE HISTORY #	WEH/CH/46	WEH/CH/47	WEH/CH/48	WEH/CH/49	WEH/CH/50
SPUD DATE	Mar-92	Mar-92	Feb-92	Mar-92	Apr-92
COUNTRY	CANADA	CANADA	TEXAS	UTAH	TEXAS
FORMATION	DOL	DOL	DOL	LST	DOL
K.O. POINT (FT)			12269	5248	1478
K.O. METHOD	OPEN HOLE/ HIGH SIDE	OPEN HOLE/ HIGH SIDE	OPEN HOLE/ GYRO	SECTION/ MAGNETIC	SECTION/ ROTARY
RADIUS (FT)			40	40	40
HOLE SIZE	6"	6"	4-1/2"	4-3/4"	4-3/4"
WELL TYPE	NEW	NEW	REENTRY	REENTRY	REENTRY
HOR. LENGTH (FT)			390	528	307
CASING SIZE	7"	7"	5-1/2"	5-1/2"	7"
BIT TYPE			ECS225	ATJ33	ATJ33
COMPLETION	OPEN HOLE	OPEN HOLE	OPEN HOLE	OPEN HOLE	OPEN HOLE
APPLICATION	WATER CONING	WATER CONING	MISSED STRUCTURE	INCREASE kH	LEASE/ GAS CAP
MUD TYPE	BRINE GEL	BRINE GEL	XC POLY	FW GEL	BRINE
RIG TYPE	CONV.	CONV.	CONV.	CONV.	WORKOVER
PROJECT DAYS	3	3	22	24	12
SURVEY METHOD	ST	ST	ST	ST	ST

CASE HISTORY #	WEH/CH/51	WEH/CH/52	WEH/CH/53	WEH/CH/54	WEH/CH/55
SPUD DATE	Jun-92	Aug-92	Aug-92	Aug-92	Sep-92
COUNTRY	TEXAS	TEXAS	TEXAS	TEXAS	TEXAS
FORMATION	DOL	DOL	DOL	DOL	DOL
K.O. POINT (FT)	10621	1364	1287	1418	1281
K.O. METHOD	OPEN HOLE/ MAGNETIC	SECTION/ ROTARY	SECTION/ ROTARY	SECTION/ ROTARY	SECTION/ ROTARY
RADIUS (FT)	45	40	40	40	40
HOLE SIZE	6"	4-3/4"	4-3/4"	4-3/4"	4-3/4"
WELL TYPE	NEW	REENTRY	REENTRY	REENTRY	REENTRY
HOR. LENGTH (FT)	180	263	796	858	650
CASING SIZE	7"	7"	7"	7"	7"
BIT TYPE	ATJ33/44/S248	ATJ33	ATJ33	ATJ33	ATJ33
COMPLETION	OPEN HOLE	OPEN HOLE	OPEN HOLE	OPEN HOLE	OPEN HOLE
APPLICATION	INCREASE kH	LEASE/ GAS CAP	LEASE/ GAS CAP	LEASE/ GAS CAP	LEASE/ GAS CAP
MUD TYPE	BRINE	BRINE	XCD-POLY	XCD-PLOY	XCD-POLY
RIG TYPE	WORKOVER	WORKOVER	WORKOVER	WORKOVER	WORKOVER
PROJECT DAYS	12	6	8	8	7
SURVEY METHOD	ST/MWD	ST	ST	ST	ST

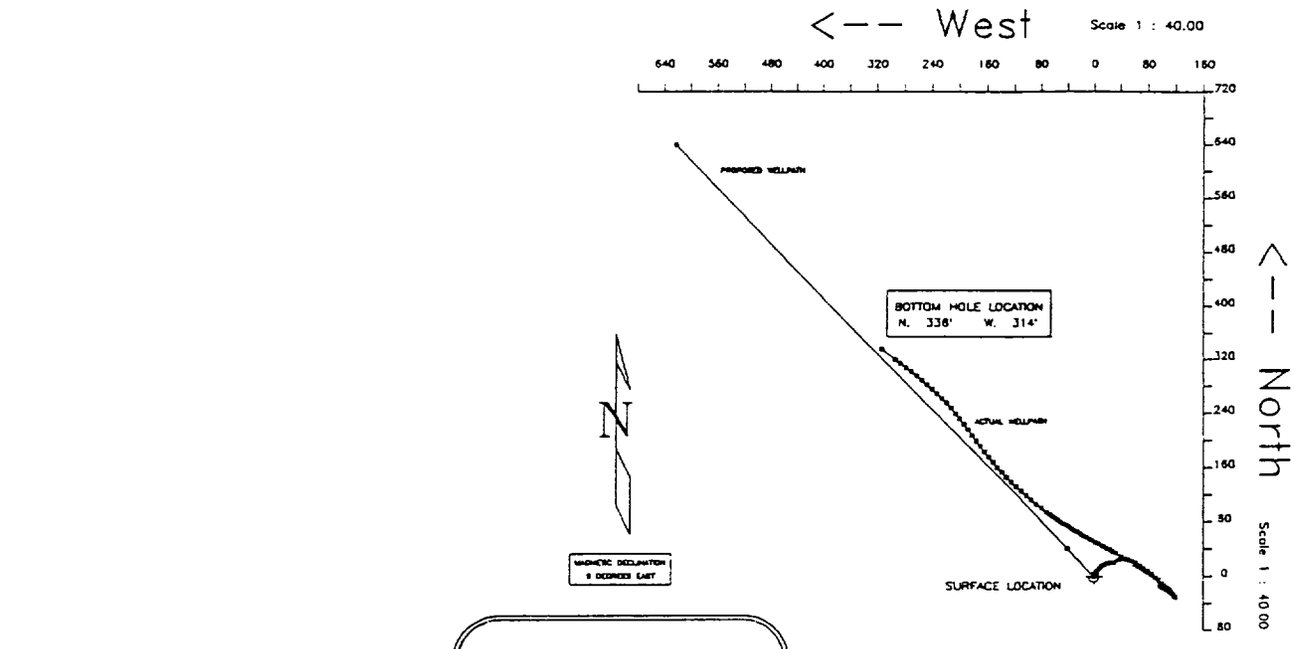
COMPLETED WELL PROFILES

BAKER HUGHES

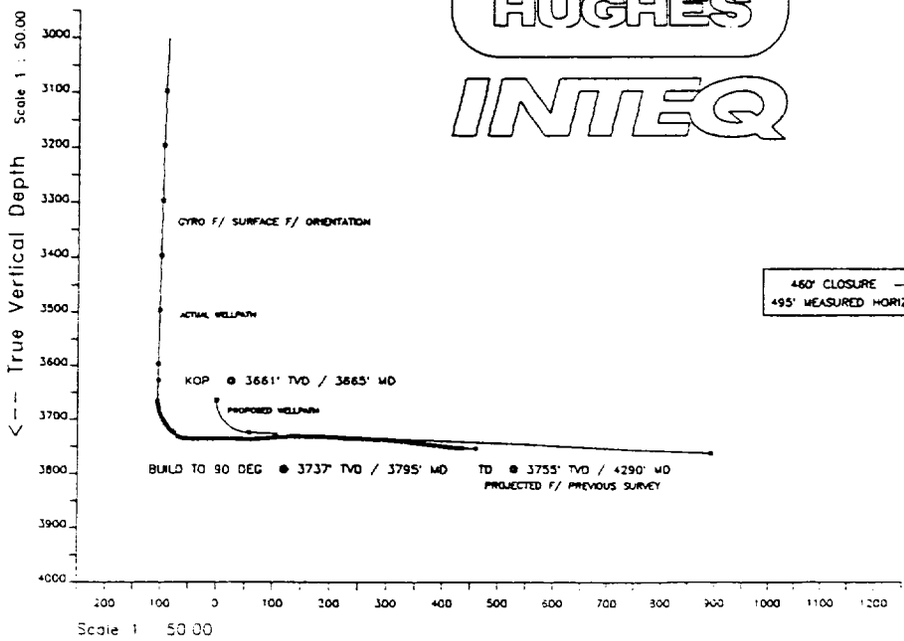

Scale 1 : 10.00
East -->
Scale 1 : 10.00
South -->
SURFACE LOCATION
PROPOSED WELLPATH
ACTUAL WELLPATH
GYRO F/ SURFACE TO 10,800' MD
BOTTOM HOLE LOCATION
S. 258' E. 279'
MAGNETIC DECLINATION
8 DEGREES EAST
BAKER
HUGHES
INTEQ
<-- True Vertical Depth
Scale 1 : 20.00
PROPOSED WELLPATH
GYRO SURVEY TO 10800' MD
ACTUAL WELLPATH
5-1/2" 17#
CSC @ 10796' MD
KOP @ 10803' MD
EOC @ 10831' TVD / 10854' MD
TD @ 10889' TVD / 11035' MD
PROJECTED F/ PREVIOUS SURVEY
HORIZONTAL LENGTH = 235'
CLOSURE = 380.5' @ 132.75 DEG AZ.
VERTICAL SECTION (LESS 183.3') = 197'
Scale 1 : 20.00
Vertical Section on 135.00 azimuth with reference 0.00 N, 0.00 E from structure

WELL PROFILE DATA

Point	MD	Inc	Dir	TVD	North	East
Tie on	3664	0.00	315.82	3664	0	0
KOP	3665	0.00	315.82	3665	0	0
End of Build	3756	87.33	315.82	3725	41	-40
Target	4594	87.33	315.82	3784	641	-623



BAKER HUGHES INTEQ

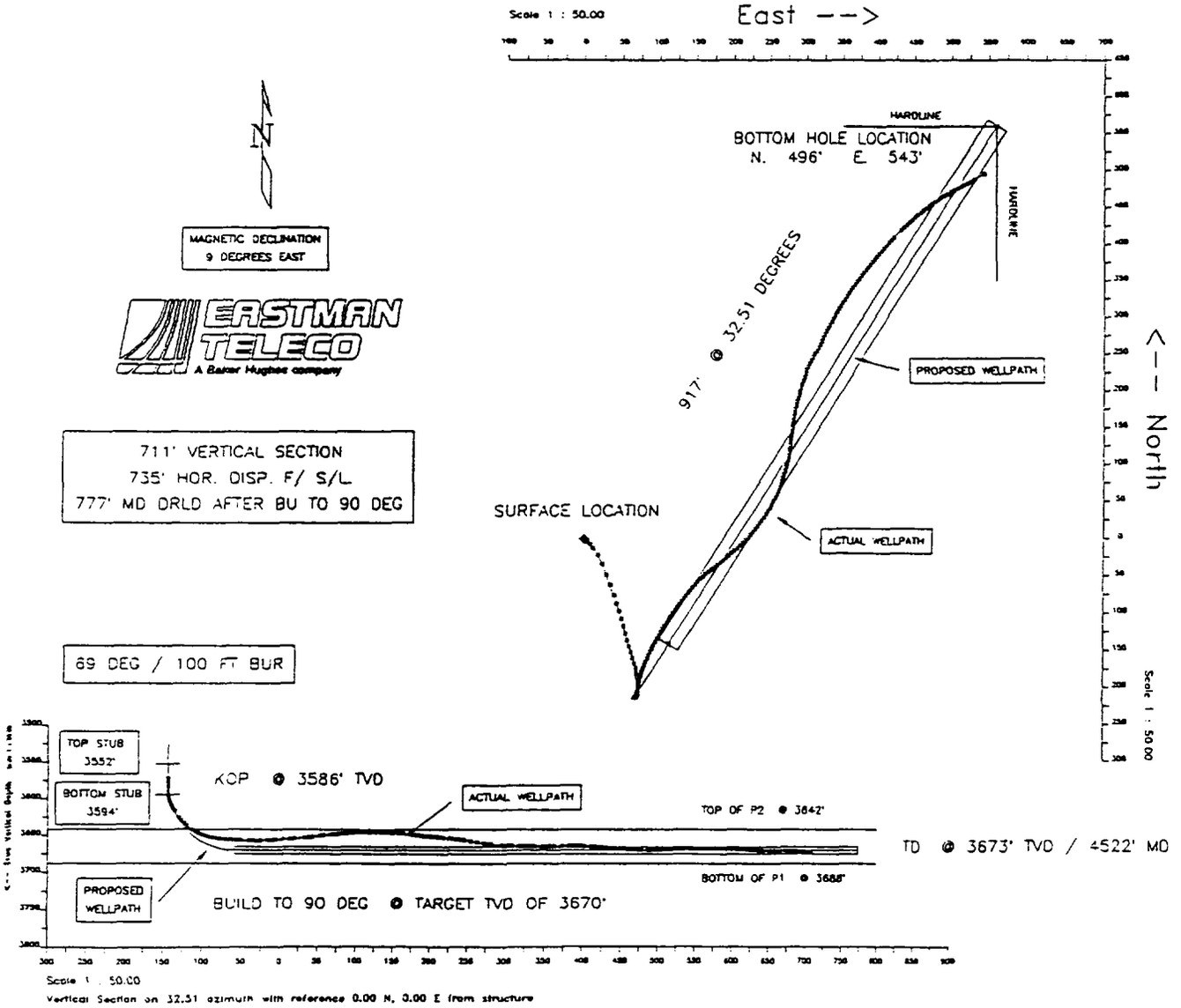


460' CLOSURE — 565' VERTICAL SECTION
495' MEASURED HORIZONTAL DISPLACEMENT IN ZONE

Vertical Section on 315.32 azimuth with reference 0.00 N, 0.00 E from structure

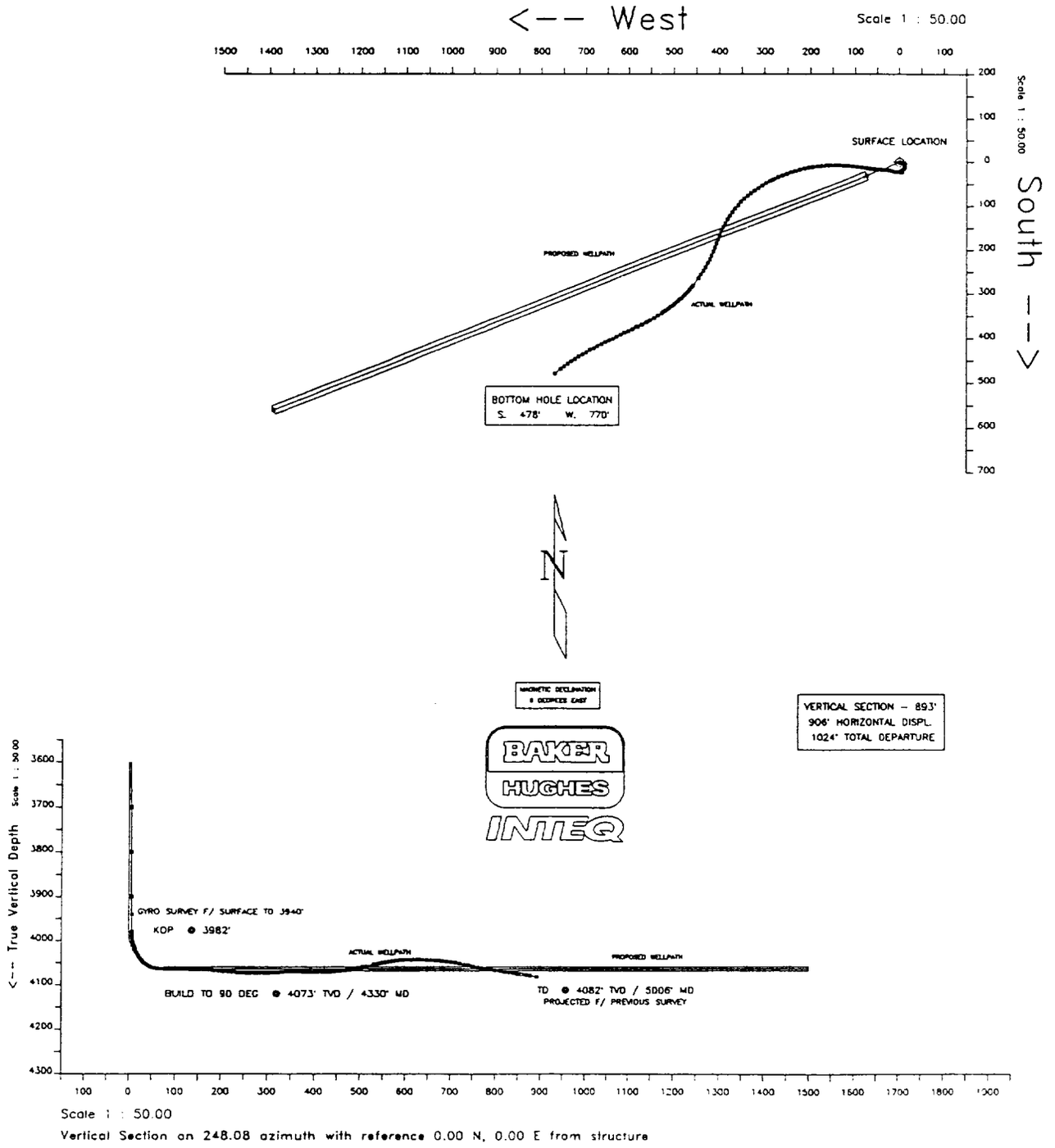
WELL PROFILE DATA

Point	MD	Inc	Dir	TVD	North	East
Tie on	3556	1.01	32.51	3545	-213	67
End of Hold	3597	1.01	32.51	3586	-213	68
End of Build	3730	90.00	32.51	3670	-141	113
End of Hold	4561	90.00	32.51	3670	580	560



WELL PROFILE DATA

Point	MD	Inc	Dir	TVD	North	East
Tie on	0	0.00	248.08	0	0	0
KOP	3984	0.00	248.08	3984	0	0
End of Build	4110	90.00	248.08	4064	-30	-74
Target	5530	90.00	248.08	4064	-560	-1392

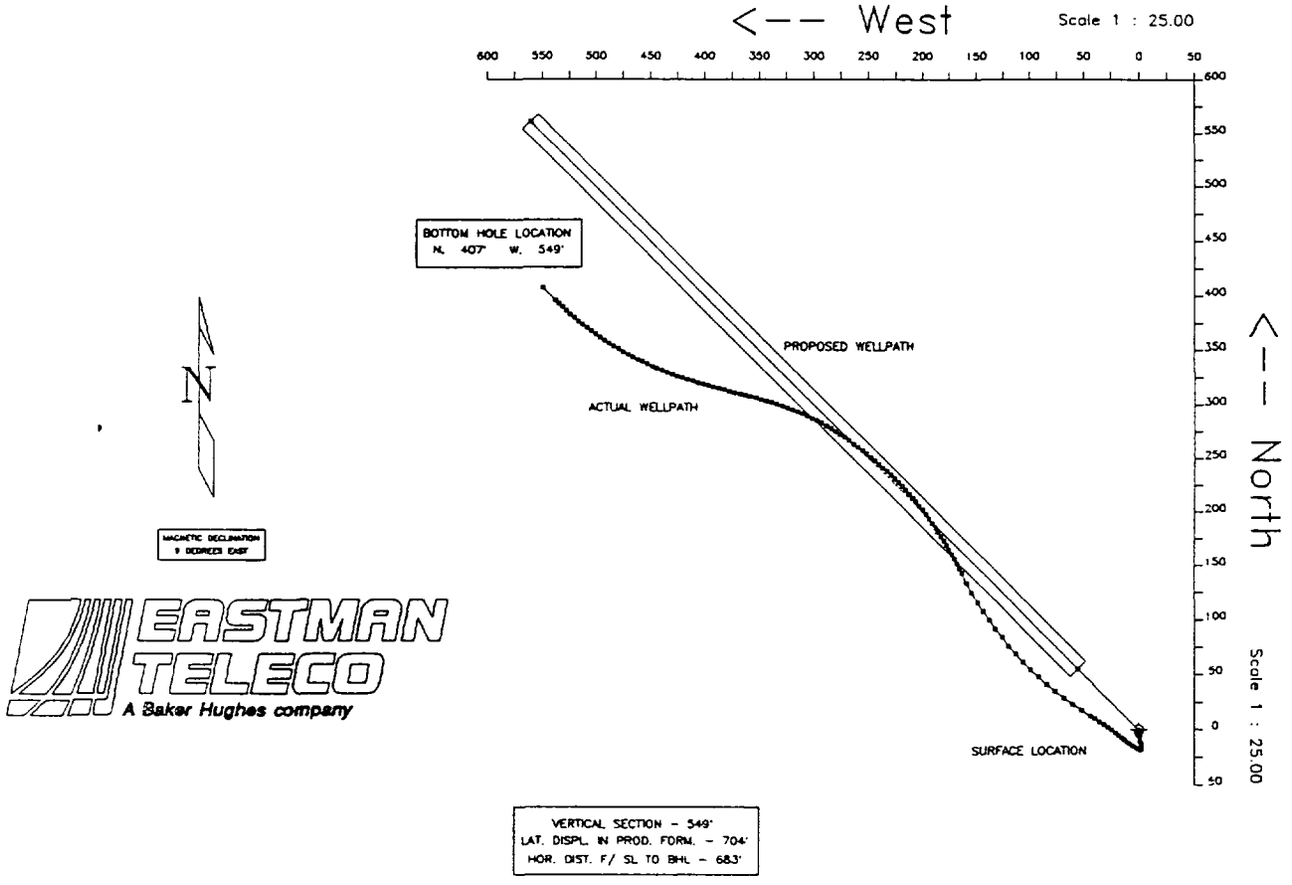


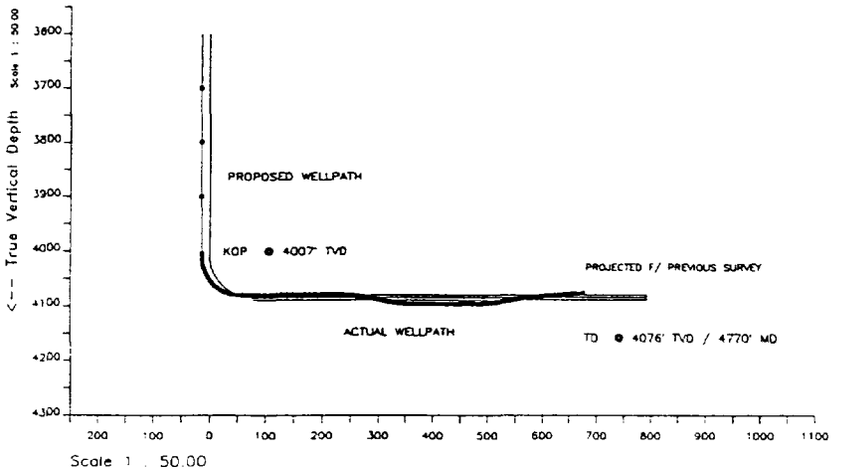
Scale 1 : 50.00

Vertical Section on 248.08 azimuth with reference 0.00 N, 0.00 E from structure

WELL PROFILE DATA

Point	MD	Inc	Dir	TVD	North	East
Tie on	0	0.00	315.00	0	0	0
KOP	4007	0.00	315.00	4007	0	0
End of Build	4130	90.00	315.00	4085	55	-55
Target	4844	90.00	315.00	4085	581	-581



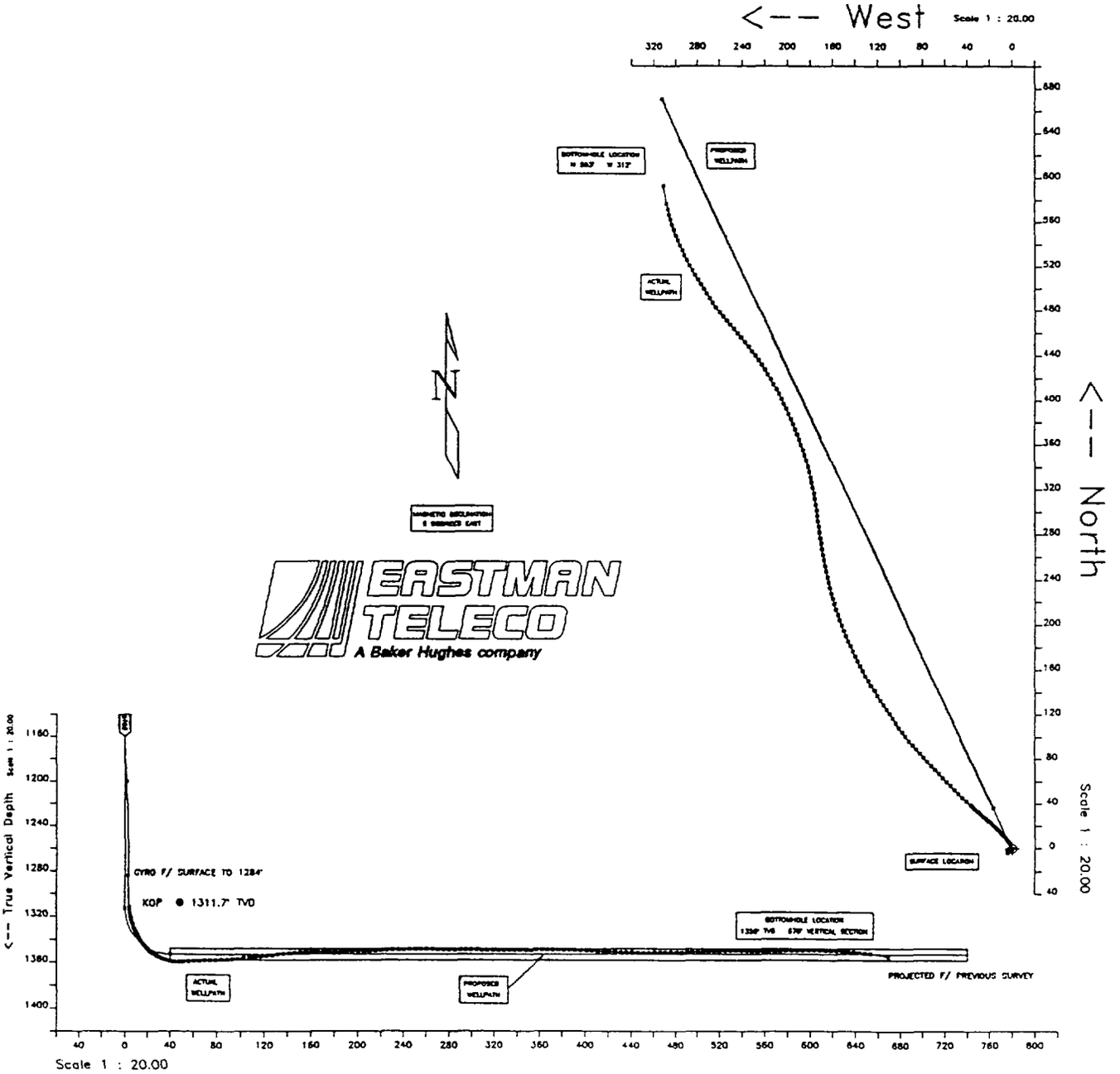


Scale 1 : 50.00

Vertical Section on 315.00 azimuth with reference 0.00 N, 0.00 E from structure

WELL PROFILE DATA

Point	MD	Inc	Dir	TVD	North	East
Tie on	0	0.00	335.00	0	0	0
KOP	1313	0.00	335.00	1313	0	0
End of Build	1376	90.00	335.00	1353	38	-17
Target	2076	90.00	335.00	1353	671	-313



Scale 1 : 20.00

Vertical Section on 335.00 azimuth with reference 0.00 N, 0.00 E from structure

POLYMER FLUID INFORMATION

BAKER HUGHES

Kelco Oil Field Group

XANVIS®

Horizontal Drilling Applications

TECHNICAL BULLETIN

Xanvis Improves Horizontal Drilling Operations

XANVIS is a completion grade, xanthan biopolymer, field-proven to be a cost effective viscosifier for drilling and completing horizontal wells. XANVIS formulated fluids, initially proven successful in the Austin Chalk in Central Texas, have reduced operational costs by:

- Improving down-hole motor performance and penetration rates due to enhanced hydraulic efficiency.
- Increasing cuttings transport and suspension properties of the fluid to reduce stuck pipe.
- Minimizing solids accumulation in the annulus to improve lubricity and allow predictable pipe movement.
- Providing formation protection to maintain production potential.

Horizontal Drilling Applications

In the horizontal section, turbulent flow has been proposed as the ideal flow profile for solids transport. In many cases, however, turbulent flow may not be possible due to limited pump rates, pipe eccentricity, or hole enlargement which reduces annular velocity. In addition, turbulent flow may not be desirable where unstable hole conditions exist, including unconsolidated or severely fractured formations. To achieve turbulent flow at typical annular velocities requires a low viscosity fluid. During non-circulating periods, however, low viscosity fluids allow solids to settle rapidly. In the horizontal section, this can be detrimental. Well-bore simulations show that when flow is initiated, settled solids tend to move along the bottom of the hole as waves or dunes. This solids build-up can result in increased torque, drag, and the inability to transfer weight to the bit. In addition, it can lead to erratic pipe movement and sudden changes in hole direction.

To prevent solids build-up during non-circulating periods requires high suspension properties, measured at extremely low shear rates of less than 0.1 sec^{-1}. XANVIS formulated fluids provide this type of viscosity for exceptional suspension properties as indicated in Table 1. This feature is unique to XANVIS and is not common to the cellulosics or polyacrylamides often used as substitute additives for rheology control. Under dynamic conditions, XANVIS fluids maintain their functionality by providing effective annular viscosity for optimum solids transport.

A key issue in the application of XANVIS for horizontal drilling is to minimize solids settling from the onset. This is best accomplished by mudding-up early with XANVIS at a concentration of 1.25 to 1.5 lb/bbl. Preferably, this should be done mid-way through the angle-building section, at 45° to 60° deviation. In so doing the drilling related problems associated with inadequate hole cleaning can be avoided.

Xanvis — Properties and Performance

Fluid efficiency is based primarily on the unique rheology XANVIS provides to a wide variety of drilling fluids, ranging from fresh water to saturated sodium chloride brines. Significantly, viscosity is provided where needed, that is, at the lower shear rates. High viscosity at the lower shear rates provides optimum solids transport under a variety of annular conditions. It is also the feature that describes true suspen-

Table 1
RHEOLOGICAL PROPERTIES OF XANVIS
(2% KCl, 80°F)

XANVIS lb/bbl	FUNNEL VISCOSITY sec/qt	PLASTIC VISCOSITY cP	YIELD POINT $lb/100ft^2$	VISCOSITY @ 5.1 sec cP^{-1}	VISCOSITY @ 0.06 sec^{-1} cP
.5	28	2	4	100	250
1.0	31	4	9	340	5.500
1.25	32	5	12	500	11.500
1.5	34	5	16	700	21.500
2.0	41	7	23	1.140	47.500

Kelco Oil Field Group

XANVIS®

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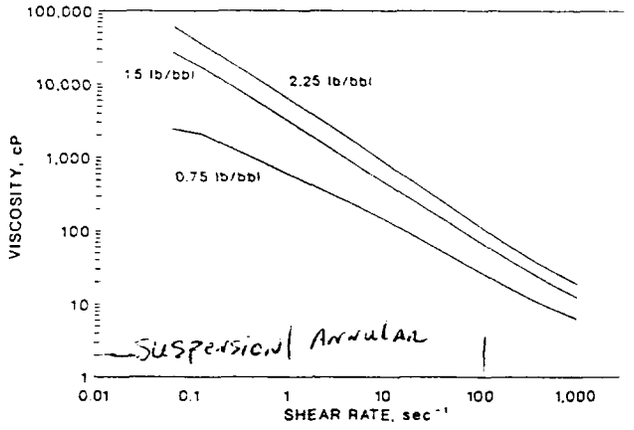
1.0	31	4	9	340	5,500
1.25	32	5	12	500	11,500
1.5	34	5	16	700	21,500
2.0	41	7	23	1,140	47,500

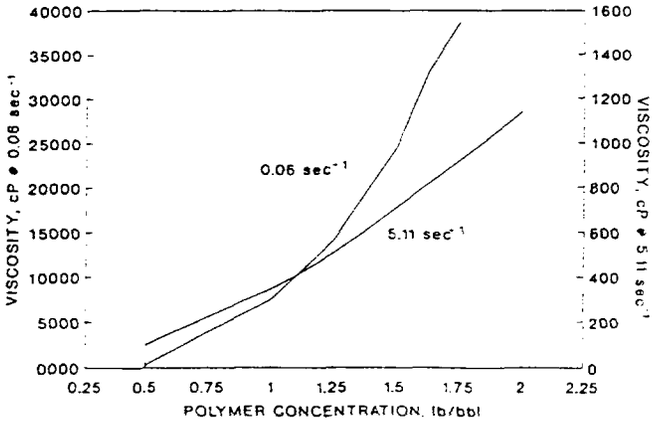
Figure 1
VISCOSITY VS SHEAR RATE WITH XANVIS
(Fresh water, 80°F)



sion properties of a fluid. As depicted in Figure 1, XANVIS exhibits highly pseudoplastic rheology. At 1.5 lb/bbl, XANVIS provides over 20,000 cP at 0.067 sec^{-1} while at 1,022 sec^{-1}, the same fluid provides 12 cP. This demonstrates how readily viscosity decreases with increasing flow rates such as inside the drill pipe. As a result, friction pressure losses are greatly reduced. This feature allows more hydraulic horsepower to be delivered to the down-hole motor and bit for maximum efficiency and optimum penetration rates. When displacing native mud or water with a XANVIS formulated fluid, a reduction in circulating pressure of up to 35% can be expected. This is usually the first evidence of improved fluid efficiency. Typically, it is followed by an increase in penetration rate, and a more immediate and predictable transfer of weight to the bit. Shortly afterwards, fluid returns at the flowline show a steady delivery of drilled cuttings. When circulation is interrupted, solids left in the annulus will more readily remain in suspension as a direct result of the high viscosity developed under static conditions.

Polymer concentration is essential in developing fluid functionality and achieving the benefits made possible with XANVIS formulated fluids. Laboratory testing indicates that a significant increase in viscosity occurs after a critical concentration of XANVIS has been attained (see Figure 2). Above this concentration, polymer chains associate with each other to form a physical network. This molecular entanglement explains the excellent suspension properties of XANVIS based fluids.

Figure 2
VISCOSITY VS POLYMER CONCENTRATION
(XANVIS IN FRESH WATER @ 80°F)



The amount of polymer required to reach this critical concentration is dependent on fluid temperature, the presence of other solids and salinity. Elevated temperatures will increase the amount of polymer required. The presence of solids usually decreases the amount of polymer needed and is directly related to the activity of the solids present. Under high salinity conditions, increased shear is required to fully develop low shear rate viscosity.

The desired concentration of XANVIS will depend on the application. If friction pressure reduction is of prime importance, then 0.75 to 1.0 lb/bbl should be adequate. However, in most applications, concentrations of 1.25 to 1.5 lb/bbl are recommended since solids suspension during non-circulating periods is more critical in the horizontal rather than the vertical section. Even at the higher polymer concentrations, high shear rate viscosity remains relatively unchanged, allowing hydraulic efficiency to be maintained. In general, hole conditions should determine the need to increase polymer concentration.

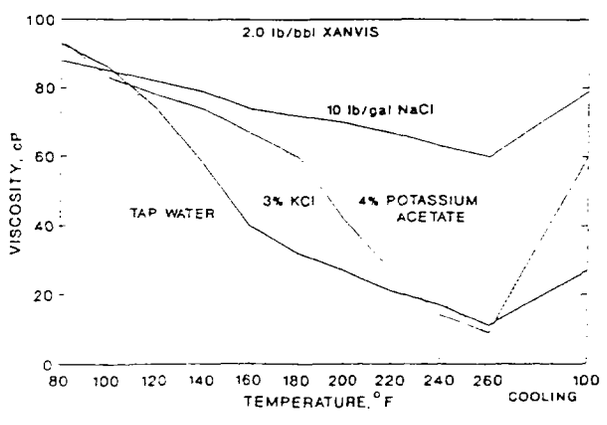
Components of the System

Fluid formulations will vary dependent on the ultimate requirements of the fluid and the type of formation being drilled horizontally. Assuming the formation under consideration is the pay zone, the fluid should be treated as a drill-in or completion fluid. Bentonite should be avoided and other additives used in the system should be chosen based on their impact on formation damage. Each product serves a specific function and its concentration should depend on fluid properties required for optimum performance under existing hole conditions. The system may be a fresh or salt water base and weight materials can vary from soluble salts to suspended solids, dependent once again on the need for formation protection.

XANVIS — Used as the primary viscosifier and suspending additive with minimum formation damage potential. Optimum concentration is 1.25 to 1.5 bb/bbl.

SALTS — The preferred method of increasing density and providing formation protection is to use salts such as sodium or potassium chloride. Calcium chloride can also be used, however, for maximum polymer stability the use of XANVIS should be limited to less than saturated brines, that is, in the 10.5 to 11.0 ppg range. The addition of salt, even at low concentrations of 2% will also improve temperature stability of XANVIS, offering better viscosity retention under down hole conditions (Figure 3).

Figure 3
EFFECTS OF SALT AND TEMPERATURE
ON VISCOSITY @ 100 sec^{-1}



WEIGHT MATERIALS — Most types of conventional weight materials including calcium and iron carbonate, hematite and barite can be used. Material preference will depend on requirements for acid solubility, impact on mud rheology, formation damage concerns and overall system objectives.

FLUID LOSS CONTROL ADDITIVES — Fluid loss control additives similar to those recommended for workover and completion fluids would be the preferred additives, including sized salts and certain resins. Consideration should be given first to water or acid soluble materials in combination with small amounts of polymeric additives. In addition, the viscous nature of XANVIS at low shear rates will help impede fluid flow in the formation.

pH CONTROL ADDITIVES — Caustic soda and potassium hydroxide can be used in this system to increase the pH. They should always be added as a dilute solution through a chemical barrel. Maintain the system pH from 7-9 and do not exceed 10.5 for maximum polymer stability. The pH should not be adjusted in the calcium brines.

BIOCIDES — A preservative may be required in this system under some environmental conditions. A biocide should always be used to insure maximum polymer stability or if a system is to be stored. Effective biocides include sodium dimethyl-dithiocarbamate, formaldehyde and glutaraldehyde. however the two latter additives may be incompatible with the oxygen scavengers, ammonium bisulfite and sodium sulfite. Other additives commonly used to preserve starch in conventional drilling fluids can also be applied with XANVIS.

CORROSION CONTROL ADDITIVES — Corrosion control and polymer stability is best obtained in this system through the use of oxygen scavengers. An oxygen scavenger is recommended for polymer stability when the bottom hole temperature exceeds 200°F. Ammonium bisulfite and sodium sulfite will work effectively in this fluid. Some of the coating amines (cationics) are incompatible with XANVIS, therefore pilot tests should be conducted prior to their use.

DEFLOCCULANTS — These should be used only when increased viscosity is due to high solids concentrations such as in high density systems. Since the clay content of these fluids is typically low, only small concentrations of deflocculants are generally required. Low molecular weight acrylates are functional in these systems at concentrations of 0.5 to 1.0 lb/bbl.

Maintaining the System

1. Material additions should be based on water dilution and the need to maintain desired product concentrations and fluid properties. Whole mud dilution is an effective technique with this system.
2. An effective solids control program is important in maintaining optimum mud properties. If undesirable solids build up in the fluid, rheology will be compromised and formation damage potential may increase. High speed shakers with 100 mesh screens or finer are highly recommended with this system.
3. While rheological properties should be based on overall hole conditions and the need to maintain hole cleaning efficiency, the following guidelines can be applied.
   - Plastic viscosity & funnel viscosity - these values are typically indicators of high shear rate viscosity and possible solids contamination. They will generally run lower than those values obtained with conventional clay based systems. *Do not use funnel viscosity* to predict hole cleaning capacity.
   - Yield Point - With a XANVIS based fluid this value is usually maintained in the 10-20 lb/100 ft² range.
   - Initial gel or 3 rpm reading - Typically this property is an indicator of low shear rate viscosity, and is essential for suspension during non-circulating periods. To increase this property use XANVIS, not cellulosics. A minimum value of 5 is desirable in unweighted systems and as high as 10-15 in high density fluids. The 10 minute gel should not exceed 3 times the initial gel. High 10 minute gels would be an indicator of solids contamination.
4. Solids - maintain low gravity (drilled) solids at less than 4% by volume or 35 lb/bbl to optimize rheological performance of the system.
5. Fluid loss - in many cases fluid loss additives have not been used. Products added to the system should have minimal effect on formation permeability since the system is treated as a completion fluid as opposed to a conventional drilling fluid.
6. Formation Damage. Since damage to the production zone is a primary concern in most horizontal drilling applications, the use of efficient polymer mixing equipment to assure proper hydration of all additives is highly recommended. Complete polymer hydration and the elimination of "fish-eyes" is essential in order to minimize particulate plugging of the formation.

TECHNICAL SERVICE — Kelco has a highly trained and experienced technical staff who welcome the opportunity to discuss XANVIS with you. Fully equipped laboratories in Houston and San Diego are available to help you in the development of the most effective fluid system.

BOTTOM HOLE ASSEMBLIES

BAKER HUGHES

BOTTOM HOLE ASSEMBLY

OPERATOR: **COLLINS & WARE, INC.**
PROSPECT: **S & J POPE #5**
DATE: **10-29-93**

ITEM NO.	DESCRIPTION	GUAGE OD	BODY OD	BODY ID	CONNECTION	WEIGHT #/ft	ITEM WEIGHT	ACCUM WEIGHT	LENGTH	ACCUM LENGTH	SUPP BY
1	BIT SEC M88F	4.500			2.875Rp	50.0	35.00	35.00	0.70	0.70	HTC
2	SRAB MOTOR	4.375	3.750		2.875Rb x 2.875PH6b	25.0	375.00	410.00	15.00	15.70	EC
3	2, 2-7/8" NON-MAG TBG	3.668	2.875	2.250	2.875 PH6 p x b	8.7	269.70	679.70	31.00	46.70	EC
4	2, 2-7/8" P-105 TBG	3.668	2.875	2.250	2.875 PH6 p x b	8.7	539.40	1219.10	62.00	108.70	OP
5	CROSS-OVER	3.875	2.875	2.250	2.875PH6p x 2.875 AOHb	10.0	20.00	1239.10	2.00	110.70	OP
6	400, 2-7/8" AOH DP	3.875	2.875	2.250	2.875 AOH p x b	10.4	124800.00	126039.10	12000.00	12110.70	OP
7	SIDE ENTRY SUB	3.875	2.875	2.250	2.875 AOH p x b	10.4	83.20	126122.30	8.00	12118.70	OP
8	8, 2-7/8" AOH DP	3.875	2.875	2.250	2.875 AOH p x b	10.4	2496.00	128618.30	240.00	12358.70	OP
9											
10											
11											
12											
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19											
20											

*** THE ABOVE ASSEMBLY IS ONLY AN APPROXIMATION.

COMMENTS: BHA FOR DRILLING THE CURVE. AN MWD MAY BE USE INSTEAD OF A STEERING TOOL.

BOTTOM HOLE ASSEMBLY

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PROSPECT: **S & J POPE #5**
DATE: **10-29-93**

ITEM NO.	DESCRIPTION	GUAGE OD	BODY OD	BODY ID	CONNECTION	WEIGHT #/ft	ITEM WEIGHT	ACCUM WEIGHT	LENGTH	ACCUM LENGTH	SUPP BY
1	BIT HTC S-725	4.500			2.875Rp	50.0	35.00	35.00	0.70	0.70	HTC
2	SRAH MOTOR	4.375	3.750		2.875Rb x 2.875PH6b	25.0	375.00	410.00	15.00	15.70	EC
3	2, 2-7/8" NON-MAG TBG	3.668	2.875	2.250	2.875 PH6 p x b	8.7	269.70	679.70	31.00	46.70	EC
4	22, 2-7/8" P-105 TBG	3.668	2.875	2.250	2.875 PH6 p x b	8.7	5742.00	6421.70	660.00	706.70	OP
5	CROSS-OVER	3.875	2.875	2.250	2.875PH6p x 2.875 AOHb	10.0	20.00	6441.70	2.00	708.70	OP
6	380, 2-7/8" AOH DP	3.875	2.875	2.250	2.875 AOH p x b	10.4	118560.00	125001.70	11400.00	12108.70	OP
7	SIDE ENTRY SUB	3.875	2.875	2.250	2.875 AOH p x b	10.4	83.20	125084.90	8.00	12116.70	OP
8	8, 2-7/8" AOH DP	3.875	2.875	2.250	2.875 AOH p x b	10.4	2496.00	127580.90	240.00	12356.70	OP
9											
10											
11											
12											
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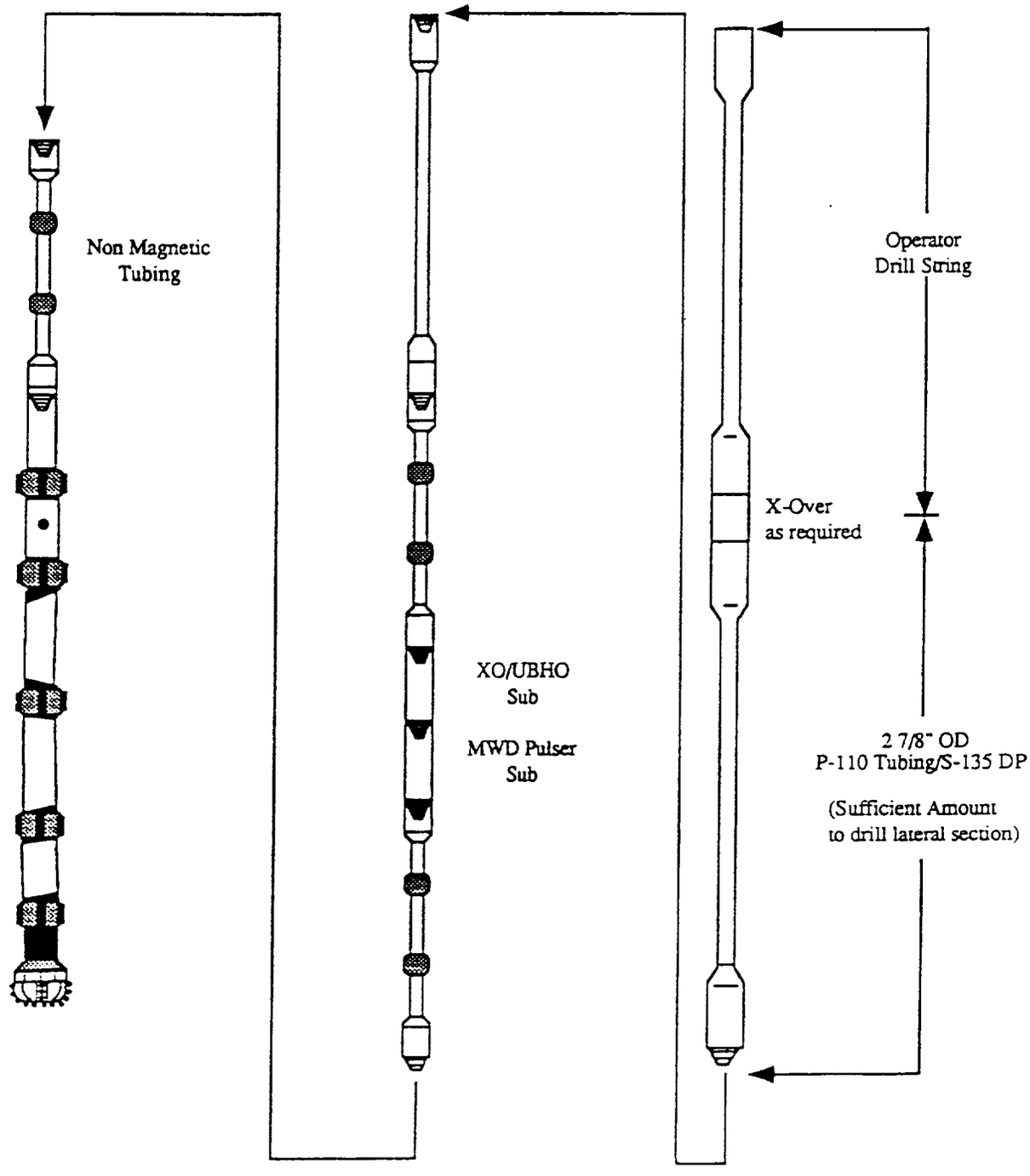
19											
20											

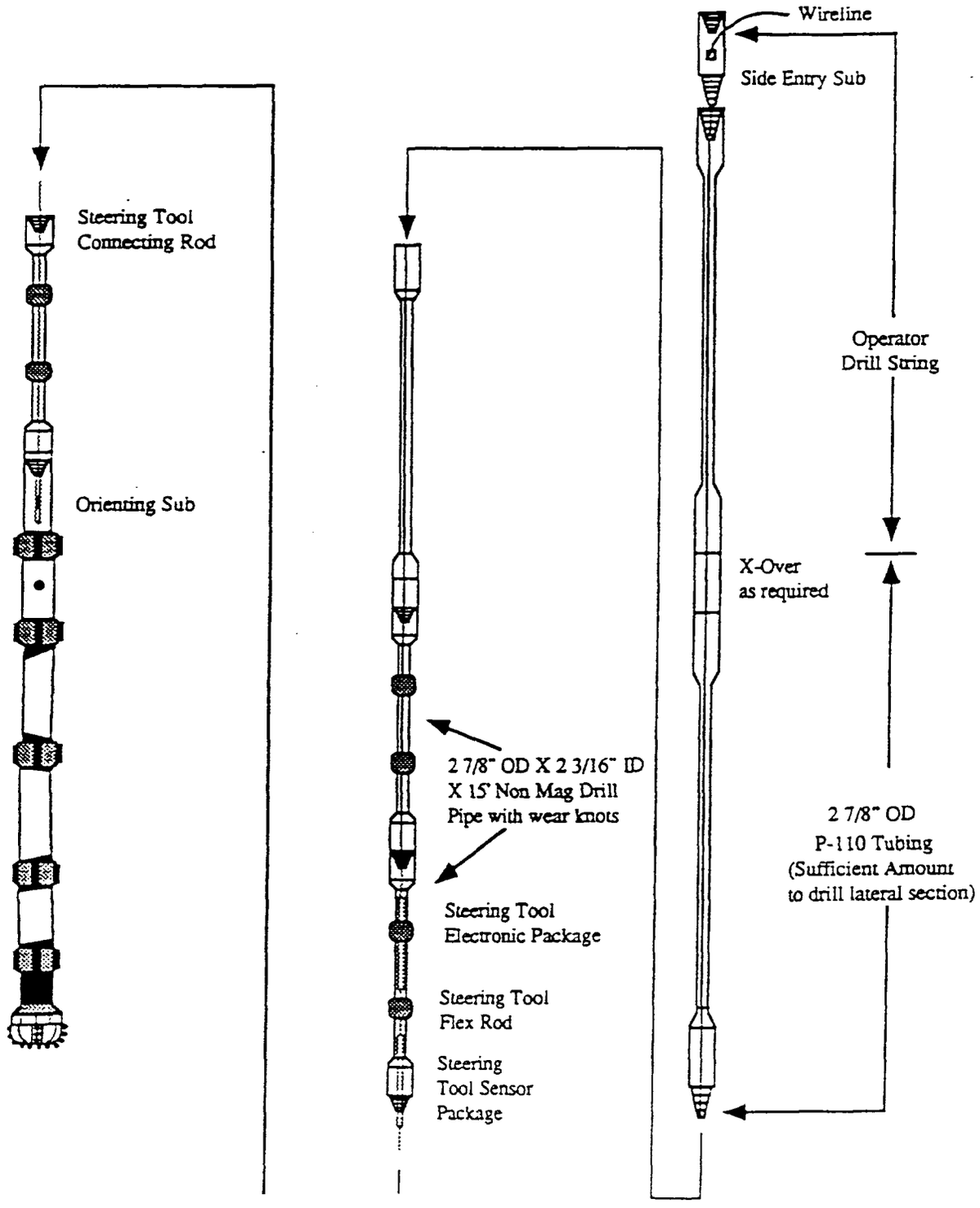
*** THE ABOVE ASSEMBLY IS ONLY AN APPROXIMATION.

COMMENTS: BHA AT TD. AN MWD MAY BE USE IN PLACE OF THE SIDE ENTRY SUB AND STEERING TOOL.

Bottomhole Assembly
MWD



Bottomhole Assembly
Steering Tool



BAKER HUGHES INTEQ

3 3/4" Short Radius Motor

	U.S. UNIT	COMMON	METRIC
DESIGN RADIUS	40 ft.		12.2 m
HOLE SIZES		4 1/2" - 4 3/4"	
MIN. HOLE SIZE ABOVE KOP		1/8" over curve size	
MIN. CASING SIZE ABOVE KOP		5 1/2" - 17#	
FLOW RATE	105 - 185 gpm		400 - 700 lpm
MAX. HOLE TEMP.	260° F		127° C
MAX. DIFF. PRESS.	696 psi		48 bar
MAX OP. TORQUE *	700 ft/lb		950 Nm
OPERATING SPEED		210 - 370 rpm	
LENGTH	± 17 ft		± 5.2 m
WEIGHT	330 lb		150 Kg
		CONNECTIONS	
BOX UP		2 7/8" PH6 Hydril	
MAKEUP TORQUE	3500 ft/lb		4745 Nm
BOX DOWN		2 3/8" or 2 7/8" Reg	
MAKEUP TORQUE	3500 - 5700 ft/lb		4745 - 7726 Nm

* Based on Dynamometer Test. Downhole values may differ.

SHORT RADIUS MOTOR

A DESCRIPTION

The Short Radius Motor utilizes short but conventional motor sections joined by an articulated coupling. The motor is a PDM (positive displacement motor) which operates on the Moineau principle. The lower section houses the bit sub and bearing assembly as well as being the angle producing housing with stabilization. The following section is the rotor/stator assembly and the design for Short Radius motors is a 7/8 rotor/stator fit. This means that the stator has one more lobe than the rotor. The 7/8 rotor/stator design affords maximum torque and low rotational speed which is necessary in controlled drilling. The upper section is comprised of the dump valve and the orientation sub which seats the steering tool during drilling.

The PDM relationship between speed and torque changes depending on the number of lobes in the motor. The torque of PDM is a function of pressure drop, which is a function of bit weight. Therefore, when the PDM reaches the weight-on-bit which will cause it to stall, the pressure dramatically increases at the surface. Surface indicators, i.e. gauges, allow the horizontal supervisor to know that the motor has stalled. The following formulas allow for calculating mechanical horsepower at the bit when utilizing a PDM:

$$\text{HP created} = \frac{T \times N}{5252}$$

Where: HP is horsepower
T is torque in ft/lbs
N is rotary speed in rpm

Further, data from a performance diagram for a specific motor can be used to calculate the HHP consumed by the motor, and the motor efficiency:

$$\text{HHP} = \frac{P \times Q}{1714}$$

Where: P is motor pressure drop
Q is maximum flow rate

Given HP created as described above, the motor efficiency is calculated as follows:

$$\text{Efficiency} = \frac{\text{HP created}}{\text{HHP consumed}}$$

It is critical that planned hydraulic needs be met so that the PDM can operate at its maximum designed capability. The afforded steerability offered by the Short Radius motors allows for longer, more controlled horizontal reach when drilling a Short Radius project.

SHORT RADIUS ARTICULATED MOTOR

DESCRIPTION

The Short Radius motor utilizes short but yet conventional motor sections joined together by an articulated coupling. The lower section houses the bit sub and bearing assembly. This section also contains the steering device (angle producing housing) and stabilizer configuration. The following section(s) is the rotor/stator assembly. The motor itself is a positive displacement mud motor. The operating principle is that of a Moineau rotor/stator configuration. This allows maximum torque with a considerably shortened motor section and low rotational speed. The upper sections include a dump valve and orientation crossover sub.

The Short Radius Motor is used in two basic configurations. The Angle Build configuration is used to build angle from kick-off-point to desired inclination, and the Angle Hold configuration is used to keep the horizontal borehole within the target constraints. The tools differ only in the lower section which contains the steering device (bent housing). The Angle Hold Motor builds angle at about 1/10th the rate of the Angle Build Motor rates.

These two motor configurations comprise the two major bottom hole assemblies. both of these Bottom Hole Assemblies are steerable from the surface via a wireline conveyed real-time steering tool. This steering tool is placed so as to provide directional and inclination data to the driller. The driller can then make real-time decisions allowing control of hole placement and direction.

The angle build section of the project is drilled in two steps. For initial kick off, the steering tool is spaced approximately 5' above the motor in the vertical hole above KOP.

This section of the hole is drilled using magnetic or high side guidance. In holes where end of curve direction is critical, it may be necessary to survey the first 60° of the curve before the final section can be drilled. This survey can be accomplished by removing the downhole assembly and replacing it with a bullnose assembly which allows the steering tool to be run much nearer the bottom of the hole. This assembly can then survey within 3 feet of bottom and continue uphole as a magnetic multishot would.

The horizontal section is drilled and steered in much the same manner as the curve, remaining an oriented method beginning to end. String rotation is not required other than rotation of the drill string periodically in small increments to facilitate steering.

The steering tool can be spaced back from the motor in non-mag tubulars to facilitate acquisition of directional heading data. The tool can also be close coupled to the motor so as to monitor hole inclination as near the bit as possible, (about 22 feet). This close coupled arrangement may be required so that any inclination variances can be corrected as soon as possible. Directional data, (i.e.) azimuth reading will be lost, but can be verified by respacing the steering device for short periods, or just for directional survey purposes.

Baker Hughes *INTEQ*
Short Radius Motor
Basic Rig Requirements

The optimum operating environment for Baker Hughes *INTEQ*'s Short Radius Motor System should be configured around a rotary drill rig. The size of the rig is much less important than the rotary requirement. As 100 percent of the short radius motor hole will be drilled in an oriented mode, (i.e.) tool face controlled, it is imperative that a rig with a lockable rotary table is specified. Power swivels have, and can be used, but job efficiency may decline. The following points should also be given consideration:

Mast Height: Not important as long as 30 foot tubulars can be handled.

Mast Capacity: Overpull on SRM tools is limited to 50,000 pounds (work string limit). Ultimate mast capacity should handle drill string, weight pipe, BHA and overpull noted.

Rotary Table/Kelly: Rotary table should lock/unlock easily from rig floor, and should have as many lock positions as feasible. The greater number of lock positions, the closer tool face can be controlled. In order to accommodate wireline at the surface, a split kelly bushing, or kelly bushing extension will be necessary in order to allow the wireline to pass through the rotary table with bushings in place. If the operator desires to use Baker Hughes *INTEQ*'s kelly bushing extension, a 13-1/4" square bushing drop pocket will be required. Other arrangements will need to be made if the rig is equipped with a pin drive rotary table. Kelly size should be specified to ensure that lower kelly sub will pass into BOP and top hole casing with at least 1" clearance to allow wireline to pass without undue risk of pinching.

For operations out of 7" casing, a 3-1/2" OD kelly with a lower tool joint OD of 5" or less will be required.

Floor Size: Floor size should allow all pipe to be racked and still leave room for floor crew and 2 Baker Hughes *INTEQ* supervisors to work freely on BHA assembly.

Efficiency is further improved if wireline sheaves can be left in place during trip operations. One sheave will be hung from the crown, a second sheave will ride a tag line anchored to the BOP. This sheave must allow the wireline to exit rig floor out the Vee door.

Sub Height: Not critical, and will not affect Baker Hughes *INTEQ* operations. BOP safety equipment and flowline layout should define. Rotating head should not be used to allow low lever flow line to be used. Rotating head required for blowout/safety requirements can be accommodated with increased risk of wireline damage.

Handling Tools: Elevators are needed for all drill pipe tubulars supplied by rig and/or operator. In addition, elevators for flat face lifting sub 2-7/8" and/or 3-1/2" tube body are necessary. Baker Hughes *INTEQ* work string will be 2-7/8" premium tubing with PH-6 Hydril connections. Tubing joints are integral and 3-1/2" OD.

Tongs: Mechanical line pull tongs will be required to handle Baker Hughes *INTEQ* BHA. Baker Hughes *INTEQ* BHA will be composed of several O.D.'s Tongs must handle 2-7/8" tubing through 8" slick OK (for 4-3/4" motor system). Power tongs can be used as long as mechanical tongs are rigged for use with Baker Hughes *INTEQ* BHA. Both lead tong and power tongs should be equipped with a calibrated line pull indicator.

Rig Floor Instrumentation: The Baker Hughes *INTEQ* SRM system is powered by hydraulic power extracted from the drilling mud. It is, therefore, necessary to have a standpipe pressure gauge, readable to 25 psi installed and located so as to be readable by the driller and Baker Hughes *INTEQ* supervisors. A 6" gauge size is recommended. The standard standpipe gauge will not serve this purpose. Weight indicator should be sensitive to 1000 pounds and recently calibrated. A tong line pull gauge is required, and should be calibrated. A geolograph is useful, but not required. Floor readable pump stroke counter is required.

Rig Pumps: The Baker Hughes *INTEQ* SRM system is hydraulic powered, deriving energy from the mud flow. The pressure drop required to extract this power can be as much as 500 psi at motor stall. As much as 250 psi may be consumed across bit jets. During normal drilling 350 - 400 psi over and above normal drill string pressure drop will be required. Pressure drops as high as 850 - 900 psi can occur at motor stall. Again, this stall pressure must be added tot the normal drill string pressure losses.

Flow Rates:	7" Casing	180-240 gpm Range
	(4-3/4" Motor)	190-220 gpm Normal

SURVEYING PROCEDURES

The surveying methodology of the short radius motor project consists of an articulated steering tool. The steering tool is a real-time wireline conveyed electronic instrument, with the ability to withstand the rigors of bending around a short radius curve. The steering tool provides data on hole direction, hole inclination, and tool face orientation of the downhole motor. The motor tool face can be obtained by two different methods, relative to the magnetic hole direction or relative to the high side of the hole. A high side orientation is only accurate if over 5° of inclination exists in the borehole. Magnetic orientation is only valid if no magnetic interference exists within close proximity of the steering tool.

The steering tool is run inside the 2-7/8" non-magnetic tubing that is coupled to the top of the articulated motor. The steering tool may be seated directly on top of the motor to provide only inclination surveys or spaced further away from the motor for full directional survey capability, (i.e.) hole inclination and azimuth.

Since the steering tool is providing survey data on a real-time basis and is used to make decisions on hole placement, the steering tool surveys are submitted to State Commissions as the Survey of Record.

RESPONSIBILITIES

TERMS AND CONDITIONS

U.S. Locations

Orders for rental equipment ("Equipment"), services ("Services"), and products ("Products") to be provided by BAKER HUGHES INTEQ to CLIENTS are subject to acceptance by BAKER HUGHES INTEQ, and any orders so accepted will be governed by the terms and conditions stated in these terms and conditions and any additional terms proposed or agreed to by BAKER HUGHES INTEQ. Any additions to or modifications of these terms and conditions, or any terms and conditions contained in CLIENT'S order inconsistent herewith, shall not bind BAKER HUGHES INTEQ unless accepted in writing by an authorized representative of BAKER HUGHES INTEQ.

1. PAYMENT TERMS

With approval of the BAKER HUGHES INTEQ Credit Department, all charges, including applicable transportation costs, billed by BAKER HUGHES INTEQ are payable within thirty (30) days of the date of invoice. Interest will be charged at the maximum rate allowed by law on all overdue accounts. Well conditions which prevent satisfactory operation of Equipment, Services or Products do not relieve CLIENT of its payment responsibility.

2. CANCELLATION

Products: Orders for Products cancelled after acceptance by BAKER HUGHES INTEQ will be subject to a twenty-five percent (25%) restocking charge, plus any actual transportation costs. Products specially built to CLIENT specifications, or orders for substantial quantities manufactured specially for CLIENT, may only be cancelled subject to payment of a cancellation fee to be determined solely by BAKER HUGHES INTEQ. Credit will not be allowed for Products returned without prior written authority.

Equipment/Services: In the event CLIENT terminates an order for Services and/or Equipment, CLIENT shall be liable for all costs incurred by BAKER HUGHES INTEQ in the mobilization/demobilization of people and Equipment, and any other reasonable termination costs incurred by BAKER HUGHES INTEQ incident to such termination. In addition, a restocking charge of up to 25% of the original order may be applied at BAKER HUGHES INTEQ's sole discretion.

3. THIRD-PARTY CHARGES, TAXES

CLIENT shall pay all third-party charges, as contained in BAKER HUGHES INTEQ's current price list, and any sales, use, rental or other taxes that may be applicable to transactions hereunder. CLIENT shall pay all applicable customs, excise, import and other duties unless otherwise agreed to by BAKER HUGHES INTEQ. CLIENT shall provide necessary import licenses and extensions thereof.

4. SHIPPING TERMS, TRANSPORTATION AND DELIVERY

Shipping terms shall always be understood to be F.O.B. BAKER HUGHES INTEQ's point of origin. All shipments will be packed for domestic delivery, unless otherwise specified by CLIENT or otherwise required under governmental regulations for safe transport. Where applicable, skidding charges, and export or domestic packing charges shall be for the account of CLIENT. All transportation charges (from BAKER HUGHES INTEQ's point of origin to the wellsite or other point of destination specified by CLIENT) shall be borne by CLIENT based on common carrier rates. Unless otherwise specified, risk of loss, including transportation delays and losses shall pass to CLIENT as soon as the Products or Equipment depart BAKER HUGHES INTEQ's point of origin.

5. TITLE AND SECURITY

Title to Products shall only pass to CLIENT when the purchase price therefor has been paid in full. Until such time, BAKER HUGHES INTEQ shall retain a lien on the Products as security for payment of the purchase price, and CLIENT shall not permit further encumbrance by any other liens or security interests. BAKER HUGHES INTEQ may retain as liquidated damages any payments made hereunder and may peaceably repossess the Products from CLIENT's premises without prejudice to any further claims. In the event that legal action is necessary to enforce BAKER HUGHES INTEQ's interests, BAKER HUGHES INTEQ shall be entitled to recover from CLIENT all costs incurred in respect of such legal action should it prevail.

6. LIABILITY

Except to the extent caused by BAKER HUGHES INTEQ'S negligence, CLIENT shall indemnify BAKER HUGHES INTEQ for liability arising from (i) injury to or death of any person or, (ii) any third party liability. Notwithstanding the above, in no event (including BAKER HUGHES INTEQ'S sole or concurrent negligence) shall BAKER HUGHES INTEQ be liable for, and CLIENT agrees to indemnify BAKER HUGHES INTEQ, its parent, subsidiary and affiliated companies and each of their respective directors, officers, employees, agents and insurers against, all claims and associated costs (including but not limited to property damage, bodily injury or death), resulting from (i) loss of hole, blowout, fire, explosion or cratering, reservoir damage or pollution of any kind or character; (ii) loss or damage to any of CLIENT'S property in excess of US $250,000 in the aggregate; (iii) consequential and/or special damages, loss of profits, loss of production or use; and (iv) use of radioactive sources or contamination resulting therefrom (including containment and cleanup). CLIENT shall either repair BAKER

HUGHES INTEQ'S equipment damaged while in the well, or reimburse BAKER HUGHES INTEQ for the full replacement value of equipment lost in hole, even if claimed to have been caused by BAKER HUGHES INTEQ'S concurrent negligence.

7. DIRECTIONAL DRILLING

CLIENT will defend, indemnify and hold BAKER HUGHES INTEQ harmless from and against any manner of liability, claim, damage, penalty or cost arising out of or related to subsurface trespass arising out of directional drilling operations or other operations performed by BAKER HUGHES INTEQ or its employees, CLIENT or its employees, other contractors, and their employees. CLIENT shall furnish BAKER HUGHES INTEQ with a well location plan (legally certified by CLIENT as correct) setting out the surface location of the well on the customer's property or leasehold, the lease or property boundary lines, and the bottom hole location of CLIENT's directionally drilled well. If in the course of drilling the well, it becomes evident that the certified plan is in error, BAKER HUGHES INTEQ shall at once notify CLIENT of the error, and CLIENT shall be responsible to regulate all directional drilling factors so that CLIENT's well bottom hole location will be situated on CLIENT's property or leasehold at total depth of the well being drilled.

8. RADIOACTIVE SOURCES

Radioactive sources which may be used in BAKER HUGHES INTEQ's services are potentially dangerous. CLIENT agrees to comply with all federal, state and local regulations governing the use and handling of radioactive sources. In the event a radioactive source becomes stuck in a well, CLIENT will use special precautions to prevent damaging the source during recovery operations. If the source cannot be recovered, CLIENT will isolate the radioactive material by cementing it in place or by other means consistent with applicable regulations.

9. WARRANTY

It is recognized that conditions in and about any well or work may involve hazards to life and property and obstacles to the functioning of products and the performance of services over which BAKER HUGHES INTEQ has no control. Such conditions, are not subject to inspection by BAKER HUGHES INTEQ. Additionally, BAKER HUGHES INTEQ will not be liable for concealed and unusual conditions at the work site, either above or underground, where such conditions were not reasonably discoverable through normal visual inspection, not indicated by CLIENT, or where inadequate or incomplete information has been supplied by CLIENT. In the event such concealed or unusual conditions result in delays and extra expense to BAKER HUGHES INTEQ, an equitable adjustment shall be made in the contract price and schedule. CLIENT will at all times have complete care, custody, supervision and control of the work and well and the recommendations of BAKER HUGHES INTEQ are advisory only and without representations as to results. Therefore, notwithstanding any other provision herein to the contrary, it is understood by CLIENT that BAKER HUGHES INTEQ does not warrant that its Services, Equipment or Products will accomplish any particular result and that the warranties offered by BAKER HUGHES INTEQ are expressly limited to the following:

BAKER HUGHES INTEQ warrants that Services, Equipment and Products provided pursuant to this Agreement shall be free from defects in workmanship and materials, comply with the applicable scope of work document, conform to BAKER HUGHES INTEQ's published specifications and shall otherwise be supplied in accordance with sound and generally accepted industry practice by competent personnel in a workmanlike manner. This warranty is exclusive of any other liability, particularly in respect of any damage suffered because of defective Product or Equipment. In the event that BAKER HUGHES INTEQ'S Services, Equipment or Products fail to comply with the foregoing standards, BAKER HUGHES INTEQ shall (i) perform such corrective services of the type originally performed, provided that BAKER HUGHES INTEQ is notified thereof in writing by CLIENT prior to the departure of BAKER HUGHES INTEQ from the worksite and/or (ii) repair or replace Equipment as may be necessary to correct any such deficiencies provided BAKER HUGHES INTEQ is promptly notified in writing thereof and/or (iii) replace the Product returned for inspection and proven to be defective. Liability will only be accepted if the Product concerned was used for the purpose for which it was designed. This warranty expires one year after the date of shipment of the Product from BAKER HUGHES INTEQ's stock point.

BAKER HUGHES INTEQ shall have no responsibility for the design and/or engineering of work performed hereunder, even though BAKER HUGHES INTEQ may have participated in its development, nor for any CLIENT-furnished materials. With regard to materials furnished by third-party suppliers, BAKER HUGHES INTEQ's liability shall be limited to the assignment of such third-party supplier's warranty to CLIENT.

In making interpretations of data, BAKER HUGHES INTEQ's employees will give CLIENT the benefit of their best judgment as to the correct interpretation, but BAKER HUGHES INTEQ cannot and does not guarantee the accuracy or correctness of these interpretations.

THE PARTIES AGREE THAT ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY ARE EXCLUDED. ALL WARRANTIES AND OBLIGATIONS OF BAKER HUGHES INTEQ SHALL TERMINATE IF: 1) CLIENT FAILS TO PERFORM ITS OBLIGATIONS UNDER THIS OR ANY OTHER AGREEMENT BETWEEN THE PARTIES; 2) CLIENT FAILS TO PAY ANY CHARGES OTHERWISE DUE BAKER HUGHES INTEQ; 3) CLIENT USES THE EQUIPMENT OR PRODUCTS FOR AN UNAUTHORIZED OR UNINTENDED PURPOSE; OR 4) CLIENT ALTERS OR REPAIRS THE EQUIPMENT OR PRODUCTS WITHOUT THE PRIOR WRITTEN CONSENT OF BAKER HUGHES INTEQ.

10. EQUIPMENT OPERATION/LOSS OR DAMAGE

CLIENT shall provide BAKER HUGHES INTEQ with all information concerning well conditions required for the safe and efficient performance of its Equipment. CLIENT shall notify BAKER HUGHES INTEQ of any hazardous or unusual circumstances existing in the well in advance of actual operation of the Equipment. The Equipment shall not be operated, serviced, altered, or in any way modified, without prior written approval of BAKER HUGHES INTEQ. The elevator sub is designed to lift BAKER HUGHES INTEQ Equipment only. Notwithstanding anything contained in these terms and conditions to the contrary, in the event BAKER HUGHES INTEQ's Equipment is lost, destroyed, damaged beyond repair, or abandoned, regardless of the cause (including "acts of God") after departure of the Equipment from BAKER HUGHES INTEQ's point of origin and before its redelivery to BAKER HUGHES INTEQ's point of origin, CLIENT shall pay BAKER HUGHES INTEQ for such loss up to the maximum applicable loss charge. Lost Equipment subsequently recovered shall be returned to BAKER HUGHES INTEQ. All rights in and to Equipment shall at all times remain that of BAKER HUGHES INTEQ, notwithstanding payment of loss charges.

Lost-in-hole coverage is available for some Equipment. Such coverage must be purchased by CLIENT prior to the Equipment leaving BAKER HUGHES INTEQ's point of origin for the coverage to take effect. BAKER HUGHES INTEQ reserves the right not to offer coverage under certain conditions.

All Equipment is to be returned to BAKER HUGHES INTEQ by CLIENT in the same good order and condition as when it left BAKER HUGHES INTEQ's premises, less ordinary wear and tear normal in oilfield use within BAKER HUGHES INTEQ recommended environmental and operating parameters. CLIENT is liable for costs to repair Equipment damaged beyond such normal wear and tear.

11. INSURANCE

Upon written request, each party shall furnish to the other party certificates of insurance evidencing the fact that adequate insurance to support each party's obligations hereunder has been secured. Such insurance policies and certificates must provide that at least thirty (30) days prior written notice will be mailed to the affected party if the policies are materially changed or cancelled, and to the extent of each party's indemnity obligations hereunder, each certificate shall name, as an additional insured, the other party, its parent, its affiliated companies, and each of their respective officers, agents and employees, and waive all rights of subrogation against the other party hereto, its parent, its affiliated companies, and each of their respective officers, agents and employees.

12. CHANGE OF DESIGN

BAKER HUGHES INTEQ expressly reserves the right to change or modify the design and construction of any of its Products without obligation to furnish or install such changes or modifications on Products previously or subsequently sold.

13. PATENTS

BAKER HUGHES INTEQ warrants that the use or sale of Equipment or Products hereunder will not infringe patents of others by reason of the use or sale of such Equipment or Products per se, and hereby agrees to hold CLIENT harmless against judgment for damages for infringement of any such patent, provided that CLIENT shall promptly notify BAKER HUGHES INTEQ in writing upon receipt of any claim for infringement, or upon the filing of any such suit for infringement, whichever first occurs, and shall afford BAKER HUGHES INTEQ full opportunity, at BAKER HUGHES INTEQ's option and expense, to answer such claim or threat of suit, assume the control of the defense of such suit, and settle or compromise same in any way BAKER HUGHES INTEQ sees fits. BAKER HUGHES INTEQ does not warrant that such Equipment or Products: (a) will not infringe any such patent when not of BAKER HUGHES INTEQ's manufacture, or specially made, in whole or in part, to the CLIENT's design specifications; or (b) if used or sold in combination with other materials or apparatus or used in the practice of processes, will not, as a result of such combination or use, infringe any such patent, and BAKER HUGHES INTEQ shall not be liable and does not indemnify CLIENT for damages or losses of any nature whatsoever resulting from actual or alleged patent infringement arising pursuant to clauses (a) and (b) above. **THIS PARAGRAPH STATES THE ENTIRE RESPONSIBILITY OF BAKER HUGHES INTEQ CONCERNING PATENT INFRINGEMENT.**

14. CONFIDENTIALITY

BAKER HUGHES INTEQ shall maintain all data and information obtained from CLIENT in strict confidence, subject only to disclosure required by law or legal process. The design, construction, application and operation of BAKER HUGHES INTEQ's Services, Equipment and Products embody proprietary and confidential information. CLIENT shall maintain this information in strict confidence and shall not disclose it to others.

15. LIENS, ATTACHMENTS AND ENCUMBRANCES

Should CLIENT violate any terms and conditions of this Agreement, become bankrupt, insolvent, go into receivership or should any creditor or other person attach or levy CLIENT's property or equipment, BAKER HUGHES INTEQ shall immediately have the right without notice to retake and remove any of its Equipment wherever it may be found. CLIENT shall defend, indemnify and hold BAKER HUGHES INTEQ harmless from any and all liens and encumbrances against Equipment furnished hereunder and shall return same promptly to BAKER HUGHES INTEQ free of any liens or encumbrances.

16. FORCE MAJEURE

If either party is unable by reason of Force Majeure to carry out any of its obligations under this Agreement, other than obligations to pay money, then on such party giving notice and particulars in writing to the other party within a reasonable time after the occurrence of the cause relied upon, such obligations shall be suspended. "Force Majeure" shall include acts of God, laws and regulations, government action, war, civil disturbances, strikes and labor problems, delays of vendors or carriers, lightening, fire, flood, washout, storm, breakage or accident to equipment or machinery, shortage of raw materials, and any other causes that are not reasonably within the control of the party so affected.

17. INDEPENDENT CONTRACTOR

It is expressly understood that BAKER HUGHES INTEQ is an independent contractor, and that neither BAKER HUGHES INTEQ nor its principals, partners, employees or subcontractors are servants, agents or employees of CLIENT.

18. APPLICABLE AND GOVERNING LAW

Both BAKER HUGHES INTEQ and CLIENT agree to be subject to all laws, rules and regulations, whether federal, state or municipal, which now or in the future may be applicable to any work performed hereunder or are applicable to BAKER HUGHES INTEQ's or CLIENT's business or employees engaged in or in any manner connected with its performance hereunder. The validity, construction, interpretation and effect of this Agreement shall be governed by the laws of Oklahoma, excluding any choice-of-law rules which would otherwise require the application of the laws of any other jurisdiction.

19. ARBITRATION

Any controversy, claim or dispute arising out of or relating to this Agreement, or the breach thereof, shall be settled by arbitration. Within 30 days after one party has filed a Demand for Arbitration, the parties, or their representatives, shall choose one arbitrator to preside over the arbitration. If the parties fail to choose an arbitrator within 30 days after initiation of arbitration, then an arbitrator shall be chosen by the chief officer of the American Arbitration Association in Houston Texas, and the parties shall share equally the fee for such service. In conducting the arbitration proceedings, the arbitrator may refer to the Commercial Arbitration Rules of the American Arbitration Association which are in effect at the time arbitration proceedings are initiated. The arbitration hearing shall occur in Houston, Texas. Judgment upon the award rendered by the arbitrator may be entered in any court having jurisdiction thereof. Each party shall be responsible for its own costs, expenses and attorneys' fees. The parties shall share equally the fees and expenses of the arbitrator. The arbitrator shall not make any award of exemplary or punitive damages.

20. GENERAL

Failure of CLIENT or BAKER HUGHES INTEQ to enforce any of the terms and conditions of this agreement shall not prevent a subsequent enforcement of such terms and conditions or be deemed a waiver of any subsequent breach. Should any provision of this Agreement, or a portion thereof, be unenforceable or in conflict with governing country, state, province, or local laws, then the validity of the remaining provisions, and portions thereof, shall not be affected by such unenforceability or conflict, and this Agreement shall be construed as if such provisions, or portion thereof, were not contained herein. This Agreement contains all representations of the parties and supersedes all prior oral or written agreements or representations. CLIENT acknowledges that it has not relied on any representations other than those contained in this Agreement. This Agreement shall not be varied, supplemented, qualified, or interpreted by any prior course of dealing between the parties or by any usage of trade.