

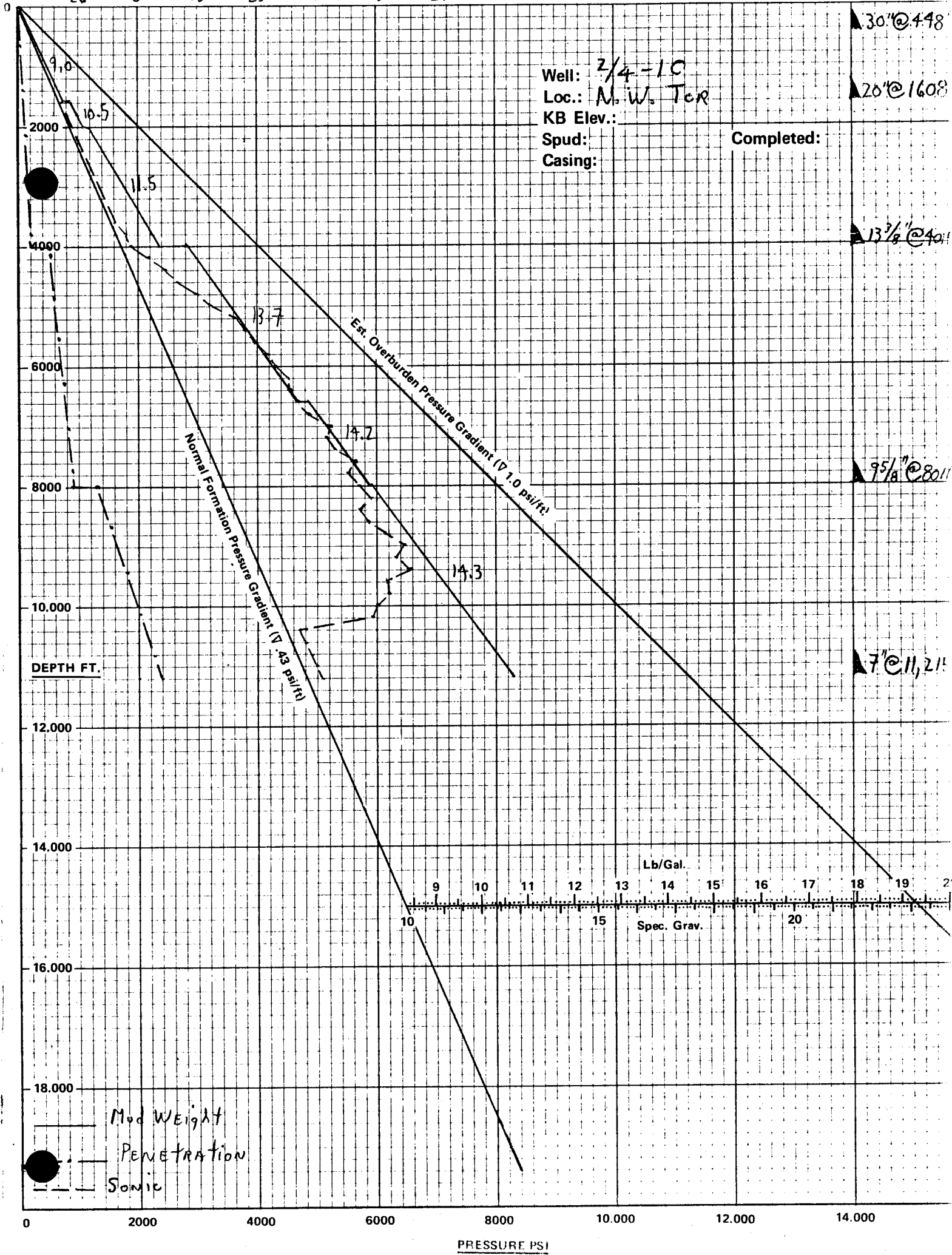
PRESSURE vs. DEPTH PLOT

16 10 11 12  
26 5 15 25 5 15 25

Well: 2/4-1C  
 Loc.: N.W. Tex  
 KB Elev.:  
 Spud:  
 Casing:

Completed:

30" @ 448  
 26" @ 1608  
 13 3/8" @ 4011  
 9 5/8" @ 8011  
 7" @ 11,211



Mod Weight  
 Penetration  
 Sonic

PRESSURE (PSI)

WELL: 2/4-10  
 FIELD: N.W. Tor 13 OKT. 1973 - 24 DES. 1973 - 72 DAYS

P. M. Co. - NORWAY  
 WELL RECAP

1	MUD TYPE		Shaletrof	Shaletrof	Lignosulfonate	
2	MUD WEIGHT	PPG	10.5-11.5	12.6-14.2	14.3	10.5-14.3
3	INTERVAL EXAMINED	ft	1630-4030	4030-8046	8046-11,215	1630-11,215
4	TOTAL FOOTAGE	ft	2400	4016	3,169	9585
5	HRS DRILLING	hrs	26.5	58	210.5	295
6	PENETRATION (4÷5)	ft/hr	90.6	69.2	15.05	32.5
7	MUD COST <sup>CURRENT</sup> (1973)	\$	40,636	63,074	31,848	135,558
8	MUD COST/FT (7÷4)	\$/ft	16.93	15.70	10.04	14.14
9	HRS. CONDITIONING HOLE	hrs	8	—	—	8
10	CONDITIONING COST (9X Rig Cost)	\$	15,200	—	—	15,200
11	CONDITIONING COST/FT (10÷4)	\$/ft	6.33	—	—	1.58
12			28 OKT. 1973	29 OKT. 1973	12 NOV. 1973	12 NOV. 1973
13	ROTATING COST (5XRIG COST)	\$	50,350	110,200	399,950	560,500
14	ROTATING COST/FT (13÷4)	\$/ft	20.97	27.44	126.20	58.47
15	FISHING HRS	hrs	—	—	—	—
16	FISHING COST (15X RIG COST)	\$	—	—	—	—
17	FISHING COST/FT (15÷4)	\$/ft	—	—	—	—
18	TOTAL COST (7+10+13+16)	\$	106,186	173,274	431,798	711,258
19	TOTAL COST/FT (18÷4)	\$/ft	44.24	43.14	136.25	74.20
20	COMMENTS					

RIG COST \$1900/HR.

17 1/2"

17 1/4"

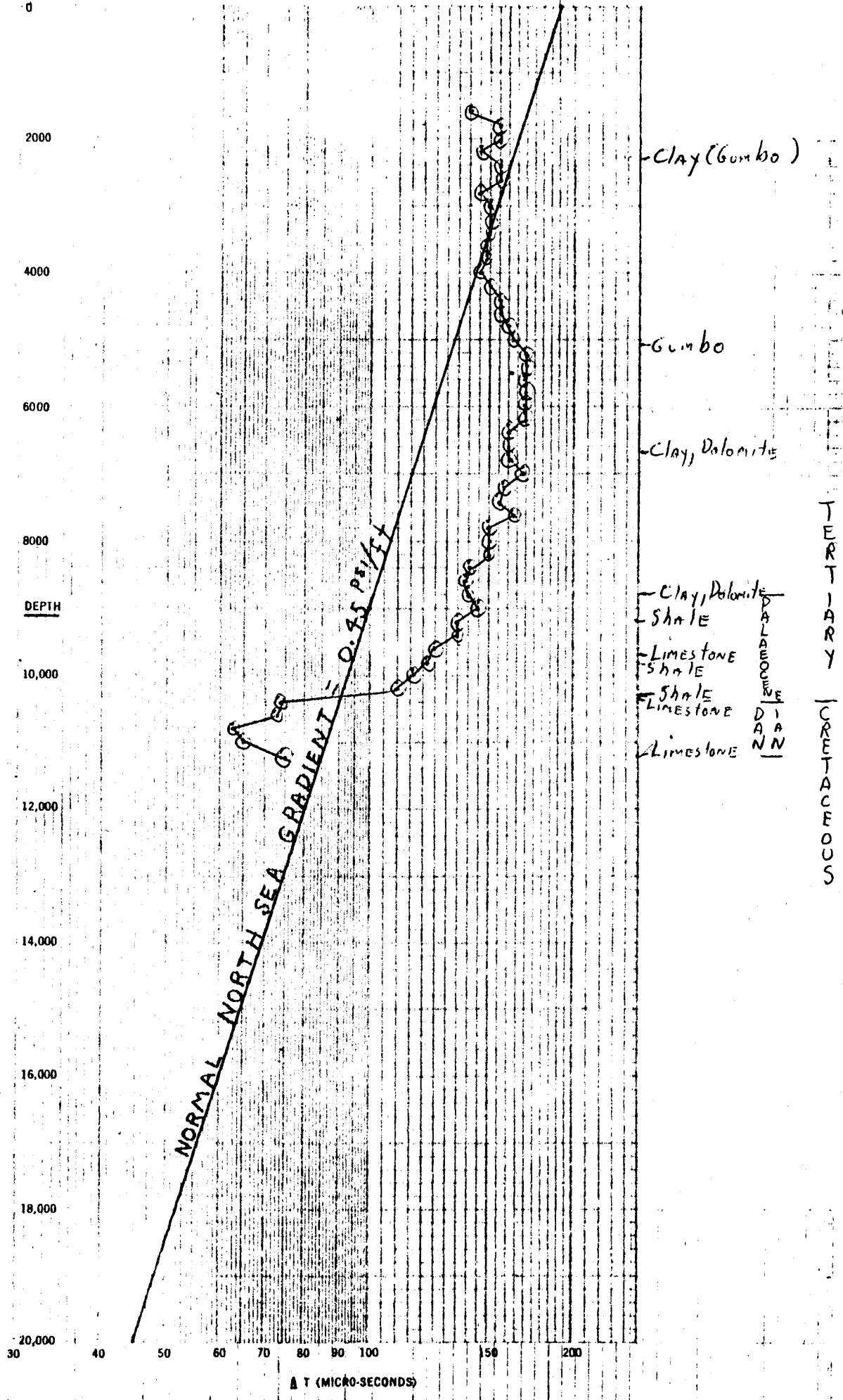
8 1/2"

30 Days

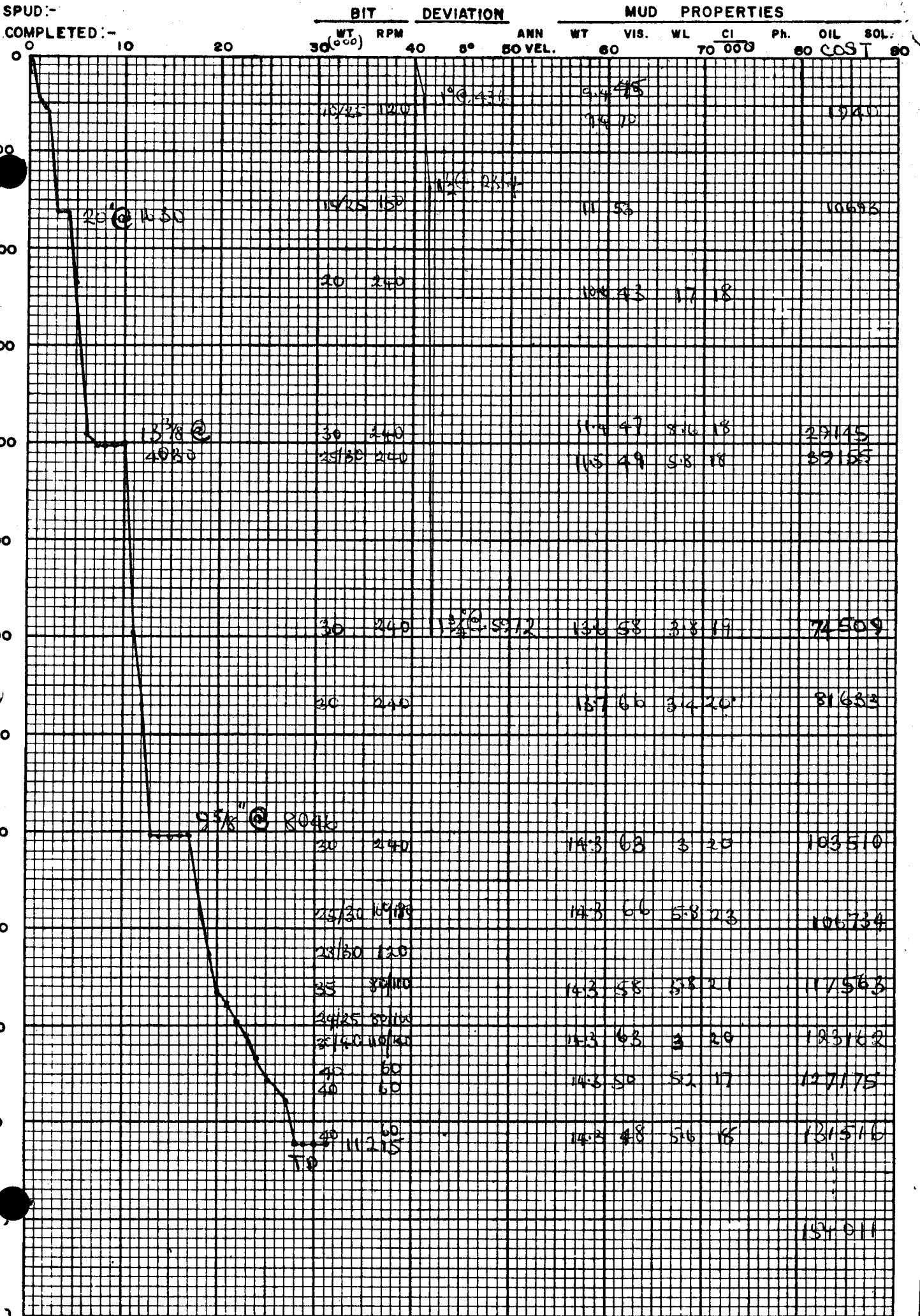
WELL: 2/4-10  
 LOCATION: N.W. TOR  
 KB ELEV:

Data Sheet For Well Log Values  
 Shale  $\Delta t$ , Pressure Gradient, and Mud Weight

Depth	$\Delta t$	$\nabla P$	MW	Depth	$\Delta t$	$\nabla P$	MW	Depth	$\Delta t$	$\nabla P$	MW
				1600	140	.450	8.65	7200	157	.715	13.7
				1800	155	.450	8.65	7400	155	.715	13.7
				2000	155	.450	8.65	7600	163	.745	14.3
				2200	145	.450	8.65	7800	150	.707	13.6
				2400	155	.450	8.65	8000	150	.715	13.75
				2600	155	.450	8.65	8200	150	.717	13.75
				2800	145	.450	8.65	8400	140	.680	13.08
				3000	150	.450	8.65	8600	138	.680	13.08
				3200	150	.450	8.65	8800	140	.695	13.36
				3400	150	.450	8.65	9000	145	.720	13.85
				3600	148	.450	8.65	9200	135	.685	13.17
				3800	148	.470	9.04	9400	135	.695	13.36
				4000	145	.465	8.94	9600	125	.645	12.40
				4200	150	.515	9.90	9800	122	.635	12.21
				4400	155	.560	10.77	10,000	116	.605	11.63
				4600	155	.580	11.15	10,200	110	.580	11.15
				4800	160	.625	12.02	10,400	74	.450	8.65
				5000	163	.650	12.50	10,600	73	.450	8.65
				5200	170	.700	13.46	10,800	63	.450	8.65
				5400	170	.705	13.56	11,000	65	.450	8.65
				5600	169	.710	13.65	11,200	75	.450	8.65
				5800	170	.717	13.79				
				6000	169	.717	13.79				
				6200	170	.727	13.98				
				6400	160	.705	13.56				
				6600	160	.710	13.65				
				6800	160	.715	13.75				
				7000	168	.747	14.36				



WELL: 2/4-10 Contractor: ZAPATA N.S INC Country: NORWAY Area: NORTH SEA.



MUD PROGRAM

30 inch casing at 450 ft RKB

Drill and drive the 30 inch casing as per Drilling Procedure. Drill with sea water with returns to the sea. Pump slugs of thick mud through the hole frequently to clean and to seal off surface sands. Mix the thick mud as follows:

<u>Material</u>	<u>Properties</u>
Sea Water	Weight - 8.8 to 9.4 ppg.
Attapulgate clay - 10 ppb.	Viscosity - thick
Flosal - 2 ppb.	Fluid loss - No control

Run the shearing device on pit using 400 to 500 psi, to shear flosal.

20 inch casing at 1600 ft RKB - 26 inch hole

Drill the 26 inch hole with sea water with returns to the sea. Pump slugs of thick mud through the hole to clean and to seal off the surface sands. After the 26 inch hole has been drilled, pump in 600 barrels of 11.0 ppg mud prior to making wiper trip. After circulating out after the wiper trip fill the hole with 800 barrels of 11.0 ppg mud. Mix the thick mud as outlined above and increase the weight to 11.0 ppg with barite for wiper trip and to run 20 inch casing.

13 3/8 inch casing at 4000 ft RKB (17 1/2 inch Hole)

Drill the cement with sea water. While drilling the shoe displace the hole with mud previously mixed in the pits as follows:

<u>Material</u>	<u>Properties</u>
Sea water	Weight - 10.5 ppg.
Bentonite - 5 ppb	Viscosity - 38 to 45 SEC/qt
Caustic - 1 ppb	Fluid loss - 10 to 15 cc/30 min
Flosal - 2 ppb	Ph - 10.5 to 11.5
Barite - As needed	

While drilling the shoe, start mixing Shale Trol and caustic to bring Shale Trol concentration to 1/2 to 1 ppb excess at the flowline. From the 20 inch shoe to 4000 ft maintain the mud properties as follows:

<u>Depth ft RKB</u>	<u>wt. ppg</u>	<u>viscosity sec/qt</u>	<u>Ph.</u>	<u>Shale Trol Excess - out/ppb</u>
1600 - 3000	10.5	38 - 45	11.0	1/2 - 1
3000 - 4000	11.5	40 - 50	11.0	1/2 - 1

Lignosulfonate and lime added as needed for Rheology control.

Run centrifuge for barite recovery to prevent dumping of excess mud.  
For viscosity requirements - use flosal.

9 5/8 inch casing at 8000 ft RKB - 12 1/4 inch Hole

Drill the cement and shoe with the mud in the system. Below the 13 3/8 inch casing control the mud as follows:

<u>Depth ft RKB</u>	<u>wt. ppg.</u>	<u>Viscosity sec/qt</u>	<u>Fluid Loss cc/30 min</u>	<u>Shale Trol Excess - out/ppb</u>
4000-4500	11.5 to 12.0	40 - 50	6 - 8	1/2 to 1
4500-5500	13.5 to 13.7	40 - 50	4 - 6	1/2 to 1
5500-8000	13.7 to 14.0	40 - 50	4 - 6	1/2 to 1

Run the centrifuge for barite recovery as needed. Add Lignasulfonate and Lime as needed for Rheology control.

7 inch Limer to Total Depth - 8 1/2 inch hole

Drill the cement and shoe with the existing mud. Convert the system to a sea water lignasulfonate mud and maintain as follows to total depth:

<u>Material</u>		<u>Properties</u>	
Barite	- As needed	Weight	- 14.3 ppg
Bentonite	- 18 - 20 ppg	Viscosity	- 40 - 50 sec/qt.
Oil	- 3 - 4 %	Oil	- 3 - 4 %
Soltex	- 4 - 5 ppb	Soltex	- 5 ppb

Maintain 4 ppb soltux to total depth.

Prehydrate bentonita before adding to system. Control high pressure - high temperature fluidloss below 10.0 cc-250 F - from 9700 ft to total depth. Pilot tests are to be run to determine the best formulation to control the high pressure - high temperature fluid loss.

Use the Methyl-Blue test for clay content.

From below the 9 5/8 inch casing to total depth maintain 100 PPM excess nitrate ion in the mud for a mud filtrate tracer.

Packer Fluid

Condition the mud in the system to leave behind the packer for testing and completion.

<u>Material</u>		<u>Properties</u>	
Barite	- As needed	Weight	- 14.3 ppg
Bentonite	- As needed	Ph.	- 11.0 to 11.5
Caustic Sale	- As needed	YP	- 12 to 18
Flosal	- 2 ppb	Bentonite	- 15 to 20 ppb.
Desco	- 1 ppb		

Check Bentonite by Methyl-Blue test. No starch or Lignasulfonate is to be added to condition for Packer fluid.

Mechanical Equipment

Rig - Shale Shapers - Use 14 or 16 mesh screens on 26 inch, 17½ inch and 12 1/4 inch hole. Use 30 mesh on the 8½ inch hole.

Milchem High Speed Shakers. - Use tap 40/40 - 30/30 - 30/30 - 30/30 mesh screens on the 26 inch, 17½ inch and 12 1/4 inch holes. Use 80/80 mesh screens on the 8½ inch hole.

Centrifuge

Run the centrifuge for barite recovery.



PHILLIPS PETROLEUM COMPANY NORWAYGEOLOGICAL PROGNOSIS

SEPTEMBER , 1973

Well No: 2/4-10.Location: Shotpoint 65 on  
seismic line  
PS 031310Prospect: TorN 56° 40' 44"  
E 03° 13' 25"Classification: WildcatRKB: + 110'AFE: NW 5670A. Projected Total Depth 11,200' Water Depth 218'B. Anticipated Formation Tops:

PALAEOCENE -9800'

TOP DANIAN(Seismic)-10300'

C. Principal Zones of Interest:

The Danian Limestone is the expected pay zone, and if porosity is present, the Upper Cretaceous Limestone could also be hydrocarbon bearing.

D. Logging Program:

Run 1 - 17½ inch hole, 1600-4000' : IES, BHCS - GR - CAL; (Run GR up to sea floor)

Run 2 - 12 1/4" hole, 4000-8000' : IES, BHCS-GR-CAL; FDC<sup>x</sup> SNP<sup>x</sup> MML<sup>\*</sup>.  
<sup>x</sup>Run over potential reservoir zones only.Run 3 - 8½" hole, 8000'-TD : IES, BHCS-GR-CAL; SNP<sup>x</sup>, FDC<sup>x</sup> MML<sup>\*</sup>, HDT<sup>\*\*</sup> Velocity Survey<sup>x</sup>Run over pay section only.<sup>\*\*</sup>Note: Run HDT from TD to 1000' above Danian.E. Casing Program: (for details see Drilling Prognosis)

Estimated

	30"	at 410'
	20"	at 1600'
13 3/8"		at 4000'
9 5/8"		at 8000'
7"		at T.D. if required.

F. Sample Program:

1. Catch 6 sets of washed and dried cuttings from below 20" casing  $\pm$  1600'. Catch samples at each connection (approx. every 30' down to 9 5/8" csg point  $\pm$  8000'), then at 10' intervals thereafter, if possible.

The geologist may change to 5' intervals through zones of interest. Store samples on rig until well reaches T.D. Then ship all samples at one time to Stavanger shorebase for storage and/or distribution. Samples should be sorted into six complete sets prior to shipping in order to facilitate handling.

2. Catch one set of unwashed samples and put in plastic bags to Norges Geologiske Undersøkelse starting at 4000'. Boxes should be marked "Kontinental Sokkelen", stored on rig until well is finished, then shipped to Phillips shorebase, Stavanger. The geologist will alert shorebase when samples are due to arrive in Stavanger.

G. Anticipated Coring and Testing:

1. Conventional coring is not planned on this test. However, unexpected circumstances may alter this plan, therefore, a core barrel should be available.
2. Sidewall cores will be considered in zones of interest that were not cored conventionally.
3. DST's should be made of all significant hydrocarbon shows. Testing will be through perforations after running casing.

H. Anticipated Hole Problems:

Heaving shale and high pressure can be expected throughout most of the Tertiary.

Washouts can be expected throughout most of the section down to the Danian Limestone.

I. Daily Geological Reports:

A daily geological report will be given to the Tananger Base every morning between 8:30 and 9:00 a.m. This report should be given to F.A. Parada.

Home telephone for weekends and nights: Parada 38 347  
Schriber 27 520 Room 912

J. Miscellaneous:

Detailed well site instructions will be given separately to those concerned.

CONTRACTOR ZAPATA RIG NO. 16  
 COMPANY PHILLIPS FIELD NW Tor  
 LEASE 2/4 WELL NO. 10  
 STATE NORWAY COUNTY \_\_\_\_\_  
 SEC./ \_\_\_\_\_  
 TOWNSHIP/RANGE \_\_\_\_\_

RIG MAKE OILWELL  
 RIG SIZE 1300  
 PUMP NO. 1 1700-P  
 PUMP NO. 2 1700-P  
 MUD TYPE \_\_\_\_\_

COLLARS: OD X ID X LENGTH  
 \_\_\_\_\_ X \_\_\_\_\_  
 \_\_\_\_\_ X \_\_\_\_\_  
 DRILL PIPE 5" 19.50  
 TOOL JOINT 4 1/2 IF

MO. / DAY / YR. 10 / 13 / 73  
 SPUD \_\_\_\_\_  
 UNDER SURFACE \_\_\_\_\_  
 UNDER INTER. \_\_\_\_\_  
 TOTAL DEPTH \_\_\_\_\_

T.P.-DRILLERS \_\_\_\_\_  
 WATER SOURCE SEA/BOAT  
 FUEL SOURCE BOAT

RUN NO.	SIZE	MAKE	TYPE	SERIAL NO.	JETS - 32nds Reg. R or RO			DEPTH OUT	FEET	HOURS	FEET PER HOUR	CUM. HOURS	WT. 1000 LBS.	R.P.M.	PUMP PRESS.	PUMP NO. 1		PUMP NO. 2		MUD PROPERTIES						Ver. Dev.	Dull. Cond. 1/4 1/8			Date							
					Liner	SPM	Liner									SPM	WT.	WL	F.V.	P.V.	Y.P.	T	B	G													
1	26	SMITH	DS.	MV621	REG		436	100	3	33.3	3	9/10	60	300	7	60					WATER & mud slugs	1	1	1							Pre-drill 30" oct 19 72						
2	26	SMITH	DS.	MV621	REG		1630	1194	19 1/2	61.2	22 1/2	10/25	160	1200	7	60	7	60			SEA WATER mud slugs	1	1	1							oct 15 72						
2	17 1/2	SEC	S35J	444658	22	22	22	4030	2400	26 1/2	90.5	48 1/2	30	240	2100	7	60	7	60	1158	1920		1	4	4												
3	12 1/4	MURPHY	VT3A	NCV022	20	20	20	5972	1942	26 1/2	73.2	75	30	240	3100	7	48	7	48	132	2022		6	7								23. oct 73					
4	12 1/4	SEC	S335	451507	18	18	18	8046	2074	31.5	65.5	106 1/2	30	240	3100	7	40	7	40	143	4016 1/2																
5	8 1/2	SMITH	DGH	KD241	13	13	13	9140	1094	48 1/2	48.3	128 1/2	2 3/30	160	3100	7	40			143	58	35	10	6	8							Oct 30 73					
6	8 1/2	SEC.	M44N	384270	11	11	11	9688	548	24	23	152 1/2	3 1/35	110	3100	7	34			143	58	60	38	10	7	4						Nov. 1. 73					
7	8 1/2	SEC.	M44N	388504	10	10	10	9715	27	4	6.7	156 1/2	35	110	3100	7	34			143	58	38	9														
8	8 1/2	SMITH	SVH	NH420	12	12	12	9800	85	12.5	6.8	169	35	89	3100	7	32			"	"	"	"	6	8												
7	8 1/2	SMITH	SVH	NH516	10	10	10	9986	196	13.5	14.5	182.5	35	"	"	"	"			"	"	"	"	5	8												
0	8 1/2	SMITH	V2S	CX941	10	10	10	10233	237	20.5	11.5	203	40	100	"	6	59			"	"	"	"	8	8												
1	8 1/2	H.T.C	J33	HU595	13	13	13	11215	982	96	10.2	299	40	60	"	6	59			143	48	35	8	3	3												
2	6	SEC	MHLG	380256	0	0	0	CLEAN OUT FLAPPER VALVE & LINER.																													