

~~Gravel Pack Operation, Comments~~

L&U DOK.SENTER

L.NR. 30287300039

KODE Well 3 1/2 - 7 nr 21

Returneres etter bruk

1: Milling and Underreaming Operation


a) The milling of the 9 5/8", 47 lbs/ft casing and the underreaming to 20" was planned conducted as follows:

- i) Cut 9 5/8" casing at 1585.0m, using viscous mud.
- i) Mill 9 5/8" casing from 1595.0 - 1591.0m, using viscous mud.
- ii) Underream with rock type underreamer to 14", 1585,0 - 1591,0, using CaCl₂ brine and sized CaCO₃
- iii) Underream with drag type underreamer to 20", 1585,0 - 1591,0m, using CaCl₂ brine and sized CaCO₃.

The 9 5/8" casing was actually cut at 1584,0m instead of the planned 1585,0m. 0,5m of the 1m difference was due to a 0,5 m sub which was taken out of the bha. but not compensated for. The last 0,5m could not be explained.

The milling of the 9 5/8" casing was conducted in the interval 1584,0 - 1590,5m. The milling itself was successfully completed in 6 hrs. The bit was pulled above the window and the well circulated for 2,5 hrs. A clean up trip with 8 1/2" bit to top of bridge plug at 1596,0m was conducted, and the well circulated for 2 hrs.

The well was then displaced to CaCl₂ brine, containing sized CaCO₃ as fluid loss agent.

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It was believed that the formation sand was very unconsolidated. Use of drag type underreamer was then preferred to a rock type underreamer since it was possible to achieve a bigger hole size. However, the consolidation of the formation sand caused severe failure of the drag type underreamer, and only the interval 1984,0 - 1987,0 was opened. No back up tool was available on the rig, but a 18" rock type underreamer was brought to the rig, causing approximately 12 hours waiting.

The section 1987,0 - 1990,5 was then successfully underreamed.

It is doubtful that the same program will be used for later wells if a similar operation is to be conducted. A more consolidated formation sand than previously believed, indicates the following program:

- i) Cut casing
- ii) mill section
- iii) underream to 14" using rock type underreamer
- iv) underream to 18" (or max available diameter) using rock type underreamer and stabilizers plus guide nose.

The service company involved, Servco, indicated that it was believed possible to combine points iii) and iv) in one operation.

- b) Clean up of metal debris from the casing milling operation was not satisfactory even after extensive circulation both in viscous mud and CaCl_2 brine.

Metal debris was recovered inside the screen when sand bailer was run.

2: Brine System

The mud shale shakers, ditch, one of the mud pits, trip tank and some of the mud piping was used for the brine system in addition to two twin cartridge type filters (16 elements) coupled in series, 4 x 350 bbl portable tanks, 2 x 47 bbl acid tanks, paddle mixer and pump unit supplied from Dowell Schl. 4,5 hrs was spent on cleaning the mud system, but severe plugging of the filter elements due to CaCO_3 particles was experienced.

This emphasizes the problem of using the mud system for brine handling due to insufficient clean up.

The deck space used by Dowell Schl. for their equipment was 15m x 12m.

45 mins were lost in the displacement process from CaCl_2 brine containing CaCO_3 (underreaming fluid) to clean CaCl_2 brine (gravel pack fluid). This was due to that the agitator was accidentally switched on in the mud pit used as settling tank just after crew change.

In future, the brine handling system should be tried to be kept as a closed system. The only recommended connection to the mud system is the shale shakers.

Avoiding use of the mud system (pits and flowlines) will eliminate unavoidable losses of fluid caused by the system itself (e.g. suction above bottom of the pits) and also eliminate the time consuming operation of cleaning the pits.

3: Gravel Pack Operation

5200 kg gravel was mixed into the slurry and pumped into the hole. This includes 50% excess, 1730 kg, which theoretically should have been reverse circulated out after the test. However, 2800 kg were reverse circulated, indicating incomplete pack.

The length of blank pipe run is normally chosen to allow reduction in the pack volume following the effect of the viscosity breaker added in the gravel pack slurry. The volume reduction is laboratory tested to be ca. 35%. Thus, if too much gravel is reversed out after the test, this may give as result that the top of the gravel pack is lower than the top of the screen after the 35% volume reduction is experienced. This may, of course, cause complete failure of the gravel pack. The gravel pack assy. run in 31/2-7 did not have either bottom (lower) or top (upper) tell tale screens (lower tell tale screens usually used in high density gravel pack operations as 31/2-7). The gravel slurry weight of 1.46 SG compared to the displacement fluid density of 1.15 SG will cause the heavy gravel slurry to "rope" down the work string. By not using tell tale screen only one screen out is observed, - the final. After final screen out only small amounts are able to be squeezed (0,08 m³ experienced). If roping then, only little amount of gravel slurry are trapped opposite the blank pipe when the operation is believed completed. The result is too little slurry opposite the blank pipe.

4: Reversed Flapper Valve

A reversed flapper valve was used above the screen in order to reduce/eliminate fluid losses to the formation in the period between the gravel packing and flowing the well. The flapper valve was held open by the wash pipe during the gravel pack operation and closed as soon as the wash pipe was pulled. The flapper and the seat was made of a material designed to shatter when subjected to 550 kg weight originated by the mule shoe on the production string.

Regarding fluid losses, the valve is believed to have functioned. No/minor losses was experienced after shattering some fluid losses were experienced.

However, fill was falling on top of the flapper valve causing severe problems to clean out.

5: Fluid Losses

The amount of fluid lost which was able to trace back to actual operation was:

9.0 m³ (56 bbls) lost in the gravel pack operation (when the 4 m³ (25661) 15% HCl entered the formation).

3.0 m³ (20 bbls) lost when squeezing 15% HCl prior to start flowing.

0.6 m³ (4 bbls) lost when shattering the reversed flapper valve.

During flow, a total of 19-22 m³ (120 - 140 bbls) brine was "regained", indicating 6-10 m³ (40-60 bbls) lost during the milling and under reaming operation.

Date	Time	Operation
220582	2100	Rigged up Schlumberger. Ran and logged CBL/VDL/CCL/GR. No satisfactory CCL achieved. Decided to rerun CCL/GR.
	2330	Prepared, ran and logged CCL/GR.
230582	0100	Prepared and ran junk basket
	0230	Ran bridge plug. Set same with top at 1596m
	0500	Rig down Schlumberger
		<u>Milling and Under reaming Operation</u>
	0530	Make up 9 5/8" casing cutter. RIH.
	0930	Broke circulation. Tagged bridge plug at 1596m. NOTE: Installed 3 white painted singles so that the middle 5" pipe rams would close around one of them. The tool joint pin of the lower painted single was chosen to be at least be 3 - 4,5m below the 9 5/8" wear bushing.
		Closed 5" middle pipe rams for spacing out purposes while tagging bridge plug at 1596m with 10 tons.
	1000	POH until white painted singles at surface. Spaced out Marine Swivel so that casing cutter knives was at the top of the 6m interval to be milled. RIH and landed the marine swivel in the 9 5/8" wearbushing.
	1930	Cut 9 5/8" casing at 1584,5m. Flow check negative. Milling mud: 110 MF, 50 YP.

Date	Time	Operation
	2000	Displace hole with clean milling mud.
	2130	POH. Layed down casing cutter assy.
240582	0030	Made up milling assy with jars, 2 stds 6½" DC.
	0130	Slipped and cut drilling line.
	0230	RIH. Tagged top bridge plug (filled every 10 stds.) Checked location of cut-out. Spaced out kelly.
	0500	Cleand up cut. Started milling. Milled casing from 1584,5m to 1590,5m.
	1100	Pulled back to top of window and circulated hole clean with milling mud.
		Pit No. 4 used as active. Pit No. 1,2, and 3 dumped and cleaned in preparation of mixing the under reaming fluid.
		Formulation of underreaming fluid.
		0.556 bbls of 1.00 SG fresh water
		0.444 bbls of 1.15 SG calcuim chloride brine
		1 ppb HEC (viscosifier) (DOW)
		1 ppb XC-polymer (yield capacity, viscosifier) (Anchor)
		25 ppb Norcal N 40 Calcium Carbonate (DOW).
		HEC added when pH + - 4, then raised to + - 8-9.
		Boosted riser through k+c line.

Date	Time	Operation
	1330	poh and layed down mill.
	1700	Ran jet sub. Jetted well head and BOP. Picked up above BOP. Functioned rams. RIH to 420m. Circulated riser clean. POH.
	2030	Ran 8½" bit (no nozzles) on DP. Tagged btm. of window at 1590,5m. Stabbed into 9 5/8" below window. 1m fill. Washed down to plug to 1596m. Circ. 30 bbl on btm. Picked up to 1580m. Circulated hole clean at + - 26 bbl/min. Ran back to 1m above the bridge plug.
250582	0030	<u>Displaced</u> 1.18 SG mud by a 50 bbl 1.11 SG hi-vis pill followed by 100 bbl 1.15 SG formulated Calcium Chloride brine containing 50 ppb sized Calcium Carbonate. (Pit No. 3).
		Brine at surface 1000 strokes/118 bbl before expected. (Due to pill mud density difference?).
		Pulled back above the window, 1580m, and continued circulating brine from pit No. 3. When pit No. 3 empty, took mud return in same. Circulate bottoms up. POH. Gelled "fish eyes" observed over shaker together with mud. (Too fast mixing of HEC). Pick up the Servco 7200 x 14" rock type underreamer and RIH with the same string as used for milling the window. Located top of window and underream the hole to 14", using mud pumps for circulating.
	0745	Ream 3m. Pick up for check. RIH. Tagged shoulder. OK. Continue reaming. SPM: 75 SPM/8.9 bbl/min WOB: 1 - 2 tons Torq.: 120 - 200 Amps. (120 - free torquc)

Date Time Operation

0805 Pull up above window. Circ. bottom-up at 14
bbl/min, plud 50%. Sand and cement over shaker,
together with mud and some fish eyes.

Observed well static. POH.

1125 Rig up Schlumberger. Run and logged BGT/GR to
check underreamed section. 4m fill. POH. Rig
down.

1345 Pick up and run Servco 7200 x 20" drag type under-
reamer. Reamed 2,5m in 45 min.

	<u>1 m</u>	<u>1 m</u>	<u>0.5 m (= 2.5m)</u>
WOB	2 tons	3 tons	4-5 tons
SPM	85	85	85
TQ	200 Amps	2-400 Amps	400 Amps

Pulled up to top of window for checking. OK. RIH
but not possible to locate the shoulders. Locat-
ed, however lower window. POH. Experienced 2,5
tons overpull when pulled into 9 5/8" casing.

1930 Reamer to surface. Arms jammed in partly closed
position. Failed seals in piston. Body damaged.
(Ref. attached copy of telex). Worked on under-
reamer. (Complete set of arms available on rig,
but only 2 holding pins for the arms).

2100 RIH with 8½" bit plus junksub.

2300 Circulated above window. Serviced compensator.
Ran to bottom and washed out fill in sump. Worked
junk sub to 1580m. Continue circulating.

260582 0600 Pumped slug. POH.

Date	Time	Operation
	0830	At surface. Retrieved 1.5l debris from casing milling. Start rig up Schlumberger.
	1100	Ran and logged BGT. POH. Waiting on rock type underreamer to be brought out by helicopter.
	1430	Helicopter arrived with underreamer. Measured reaming diam. of tool: 17.75". Pick up kelly and functiontest arms. OK. RIH. (Use 4.4m pup joint ahead of reamer, plus centralizer above top window). Slight problems in entering the sump. Washed out fill. Picked up and started to ream.
		TQ: 120 - 150 Amps WOB: 2 - 3000 lbs Rot: 58.5 rpm SPM: 60 + 55 SPM
	1820	Completed underreaming. Pumped 1000 strokes/-118bbbls. Pulled above window and continued circulation. POH.
	2120	Stuck in the wellhead. Pulled 200 000 tons. Worked free, but continuous drag for 250m.
	2245	Rig up Schlumberger. Ran and logged BGT. (No restriction experienced in well head/riser). POH. Rig down.
270582	0005	RIH w/bit plus junk sub (and casing scraper spaced out to be 700m below surface. No restriction observed).
	0500	Circulated above window. Tried to enter sump, but negative POH. 1.0 l junk from milling operation retrieved. Rigged up centralizer. RIH.

Date	Time	Operation
	1400	Entering rathole without problems. Circulated 1 hour at 248 BPM. Pumped 50 bbl clean hi-vis (No Calcium Carbonate) plus 150 bbl clean brine (No Calcium Carbonate).
	1415	Stop circulation. Flow check negative. Disconnected kelly and added one single jt. DP. Dump pit no 2 and cleaned it, plus gumbo box, ditch, slug pit, trip tank and ditch. Cleaned shakers and changed to 2 x 100 Mesh screen. Displaced brine from Dowell tanks to pits no 1 and 2. Made up 50 bbl hi-vis pill in slug pit.
	1830	Start displacing at 26 bpm by using mud pumps. Dumping return through gumbo box.
	1852	Contaminated brine to surface (2 mins later than expected). Pumped oppr. 700 bbl.
	1853	Stop circulation, pits no 1 and 2 empty. Flow check negative.
	1900	Lower bit to bottom.
	1903	Dowell start pumping. Mixing back up 50 bbl hi-vis pill in slup pit.
	1908	Close gumbo trap and direct flow over shakers to pit No. 1 at 8 bpm. Fill up pit No. 1.
	1945	Flow through 10 um plus 3 um filters. Plug 10 umfilters after 1 min. Direct flow to 2nd filter, 10 um, but plugs after 1 min. Change to 20 um - 10 um filters.

Date	Time	Operation
	1950	Stop circulation while repairing leak on rigfloor chocks. Flow check negative.
	2005	Start circulation again to pit No. 1.
	2010	Stop circulation, pit No. 1 full and filters plugging to fast to allow continuous flow.
	2100	Direct part of flow through desilters.
	2145	15 - 20 mins. to plug 20 um filters. 10 um filters stays longer before plugging.
		Note: i) CaCO_3 collected on filter elements ii) 7 - 8 mins required to change filters in a 16 element pot.
280582	0030	Observed that agitators had been turned on accidentally in pit No. 1.
		Note: At this time the filters had been changed to 10 um - 3 um. Due to the agitation of pit No. 1, extensive plugging of the 10 filter was observed. This resulted in change to 20 um - 10 um filters. It took about 45 mins before noticing the agitators was on. After stopping the agitators it was possible to change back to 10 um - 3 um filters.
	0400	Circulated through 3 filters for approximately 30 mins without plugging. Stopped circulating and POH.

Date	Time	Operation
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Gravel Pack Operation

0645 Bit to surface. Close shear rams. Picked up the 2 joints of 5½" blank pipe in the rotary, using 2 3/8" lifting subs. Picked up, and ran through the 2 joints of 5½" blank pipe, two joints of 2 3/8" VAM wash pipe plus 2 3/8" spacer subs (in order to allow the bottom pin of the lower 2 3/8" joint to protrude from the lower end of the blank pipe joints). Clamped off the 2 3/8" VAM wash pipe onto the top joint of the blank pipe and stood assy back in the derrick.

Picked up the pre-made GP screen assembly made up of:

- a) 5½" LTC box up GP bull plug
- b) 5½" Bakerweld screens (3)

Picked up 2 3/8" wash pipe (with tapered collars), ran into screen assy and clamped 2 3/8" wash pipe with box end protruding from top. Held the flapper valve open and dropped it over the top of the clamped 2 3/8" wash pipe protruding from the screen assy.

Picked up blank pipe assy and connected to the screen assy.

0915 Set blank pipe - screen assy back in derrick. Discovered that kill and choke line had been forgotten to flush. Choke line dumped after filtration/circulation had stopped. Thus, 7 bbl viscous mud in hole. Flushed kill line. RIH with bit to + _ 700m for circulation and attempt to flush the 7 bbl mud pill.

Date	Time	Operation
	1150	Displaced annulus volume from 700m using rig pumps (26 BPM), then using Dowell.
	1400	Stop circulation. POH.
	1510	Start pick up blank pipe-screen assy. RIH.
	2045	Make up circulation head. Start circulation at 2 BPM to pit No. 1.
	2200	Drop packer setting ball. Pressure test. Dowell lines to rig floor.
	2240	Set SC-1 packer at 1547,25m (top) with 2000 psi. Kept pressure for 5 mins., and sheared ball seat with 2500 psi. Tested annulus to 500 psi for 10 mins. O.K.
290582	0015	Broke circulation and carried out circulation test.

Date Time Operation

29.05.82

		Rate <u>(6pm)</u>	p <u>(psi)</u>	Tot.bbbls <u>pumped</u>	Tot.bbbls <u>lost to</u> <u>form</u>
0047	Started pumping acid, 25bbbls	5	650-800	--	0
0052	Pumping brine, 25bbbls	5	800-850	25	0
0057	Pumping pre-pad, 25bbbls	5	850	50	0
0103	Pumping sand, 49bbbls (200 psi back pressure)	2,5	500	75	5
0106	Acid at X-over	2,5	500	83	11
0110	Gravel start roping	3,5	300-500	97	14
0115	Brine at X-over	4,0	300-500	108	19
0119	Pumping post pad	5,0	300-500	124	39
0120	Displace with brine	5,0	300-500	131	43
	Prepad at X-over	3,0	150-200	133	48
	Sand at X-over	3,0	150-300	158	56
	First screen out	---	900	171	56
	Allow pressure to drop				
	Squeeze pos., squeeze				
	0,5bbbl - final squeeze		1050	171,5	56

Date	Time	Operation
	0152	Pressured annulus to 500 psi. O.K.
	0203	Started reversing out. Pumped 200 bbls brine 2,8 tons sand retrieved in sand trap.
<u>Installation of Production String-oil zone</u>		
	0730	Picked up X-mas tree and made up connections - laid down same.
	0830	Picked up 4½" tbg. with sstt and lubricator valve spaced out in well head and stood tbg. back in derrick.
	1300	Made up and tested satisfactorily sub assemblies and RIH on 5" VAM 15,0 lbs/ft tubing to 1215m.
300582	0030	Rigged up wire line and ran Otis Q test plug in XN nipple at 1180m. Satisfactorily tested string to 3000 psi for 15 mins. Retrieved test plug and rigged down wire line.
	0330	Ran tbg. on 12 stds. DP and located G 22 seal at top of SC-1 packer by observing pressure increase while circulating. Closed MPR on white painted joint. Opened rams and poh for space out.
	0530	Picked up sand filter manifold.
	0600	Spaced out 5" tbg. and RIH with EZ tree on 4½" ph-6 tbg. and lubricator.
	0900	Rigged up wire line and ran Otis Q test plug to XN - nipple. Satisfactorily tested string to 3000 psi for 15 mins. Retrieved test plug and rigged down.

Date	Time	Operation
1200		<p>Ran remaining 4½" ph-6 tbg. and made up X-mas tree and kill line chocks. Shut lubricator valve and satisfactorily tested tubing above lubricator valve, and Xmas tree to 3000 psi. Circulated with Dowell and lowered pipe. Located lower seal assembly in seal bore of SC-1 packer. Entered packer with 19 tons weight and RIH, but stood up on fill ca. 1m above flapper valve. Circulated and attempted to work pipe down. Set off ca. 15 tons weight but unable to move down. POH till lower locator seal above seal bore.</p>
1600		<p>Rigged up wire line and ran straddle packer across perforated joint (2 runs to set straddle) rigged down.</p>
2030		<p>Mixed hi-vis brine and circulated 2 x 20 bbls visc. pills around string. After first pill stabbed through packer seal bore with locator seal using 17 tons set down weight. Continued circulating at ca. 6 bbl/min until visc. pill in riser. Then boosted riser with rig pumps and displaced dumped pills.</p>
310582	0100	<p>Attempted to shear flapper valve and enter packer with upper locator seal. Workd pipe but unable to lower pipe into packer with max 17 tons. Set 9 ton weight down on packer and pressured up to ca 1200 psi down tubing. Pressure bled off and indicated that flapper valve had given away.</p>
		<p>Attempted to lower seal into SC-1 packer. Maximum set down 27 tons weight but unable to sting into packer. Ca 9 tons overpull experienced when picking up. Continued to work pipe without success. Rechecked position of packer by pulling back above</p>

Date	Time	Operation
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packer with lower locator seal. (Re-stabbed seal with difficulty, ca 18 tons set down weight).

Attempted to sting in with upper seal locator without success, max ca 27 tons set down weight.

Picked up ca 1m above seal bore with upper seal locator.

0300 Rigged up wireline and RIH to retrieve straddle. Unable to retrieve same on first run. Successfully reran retrieving tool.

Ran impression block to top of fill at 1591,50m. Tubing all clear.

Ran sand bailer and recovered sand/debries (including metal chips) sample.

Pumped 20 bbl hi-vis brine pill and displaced with 35 bbl. Lost return. Estimate 20 bbl lost to formation.

Lowered pipe and stabbed into packer with upper seal without difficulty. Landed sstt in wear bushing and nipped up production line. Installed wireline bop and lubricator. Tested satisfactorily annulus to 1000 psi against pipe rams for 15 mins.

1155 Pressure tested lubricator and surface lines against closed lubricator valve. Repaired leaks. Finally accepted test to 3000 psi for 15 mins. Closed wire line bop to 3000 psi for 15 mins. RIH and set Otis Q plug in XN nipple POH.

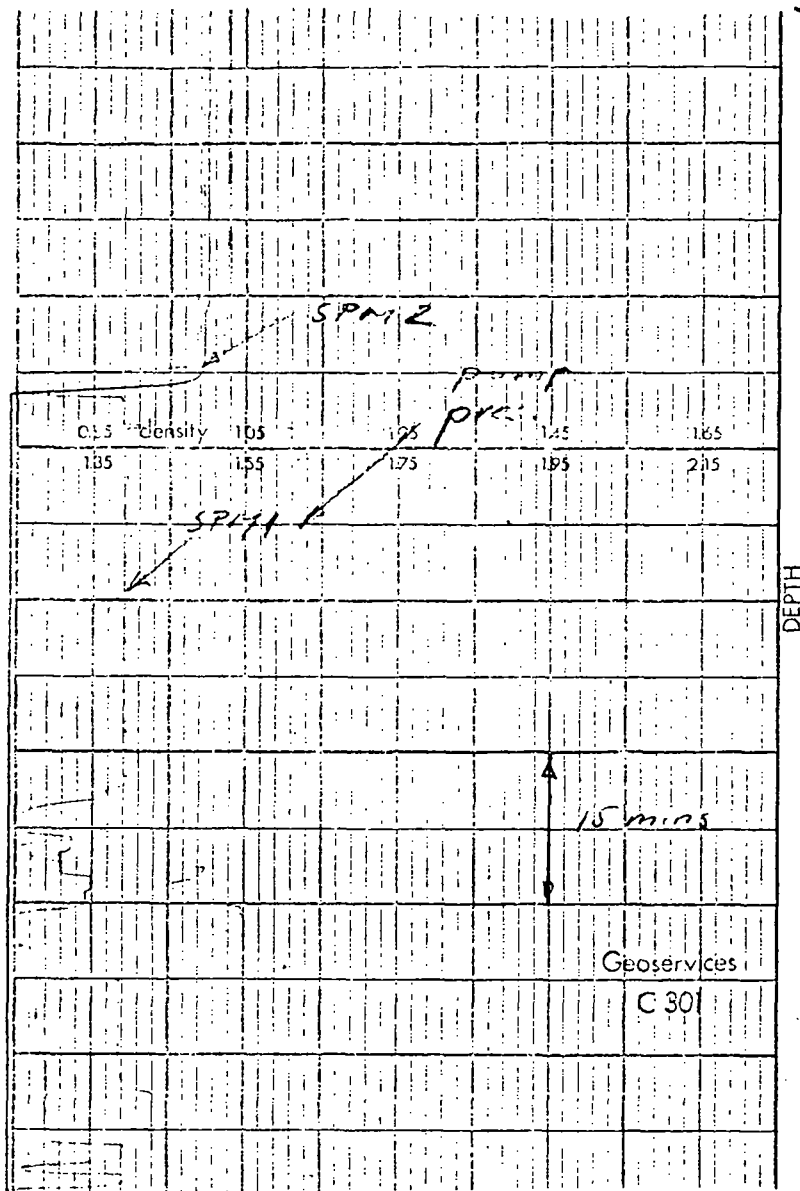
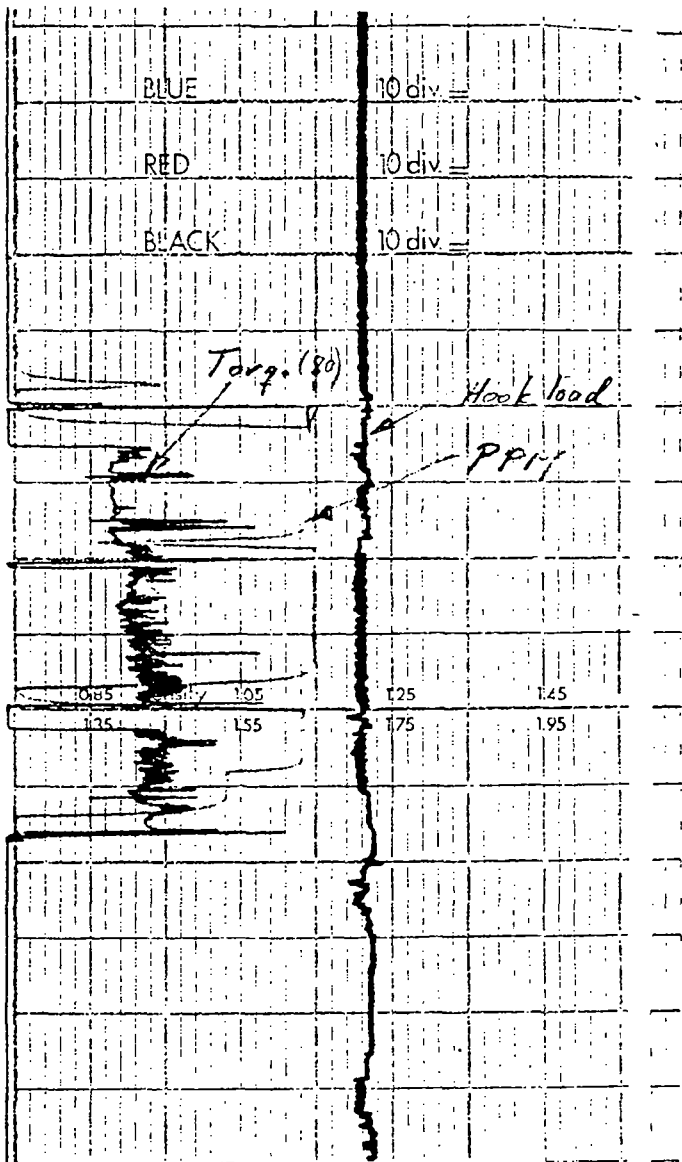
Prepare to run XA-sliding side door strifting tool. Fluid level in tubing dropped. Flush surface lines. Test lubricator. RIH.

Date	Time	Operation
	1430	Rigged up wireline. Ran and set Otis Q test plug in XN nipple. Tested plug to 3000 psi / 15 mins.
	1730	Spotted 5 bbl diesel ahead of 30 bbl 15% HCl followed by 50 bbl diesel.
	1800	RIH to close XA-ssd and recover plug. Closed ssd but unable to pull plug. POH. Ran in an pulled plug. Negative. Ran in an pulled plug. Success. Tested annulus to 500 psi for 10 mins and then held 200 psi on annulus.
	2230	Pumped 60 bbl diesel and bullheaded acid into formation. Final shut in pressure 450 psi.
	2323	Opened well on 16/64"choke for clean up flow. Initial tubing head pressure 391 psi. Initial flow rate ca 350 bbl/d, increased to max 1250 bbl/d.
010682	0255	Gas to surface
	0600	Flow reduced to 1250 bbl/d at 7 psi WHP.
	0800	Rig up and ran Otis Q plug in XN nipple. Open sliding side door. Reverse circulate to brine. 80 bbl water/brine recovered. SG 1,06. Circulate diesel down to dds, 5/ose dds and retrieve test plug.

Underreaming Operation, 14"

Rock type underreamer.

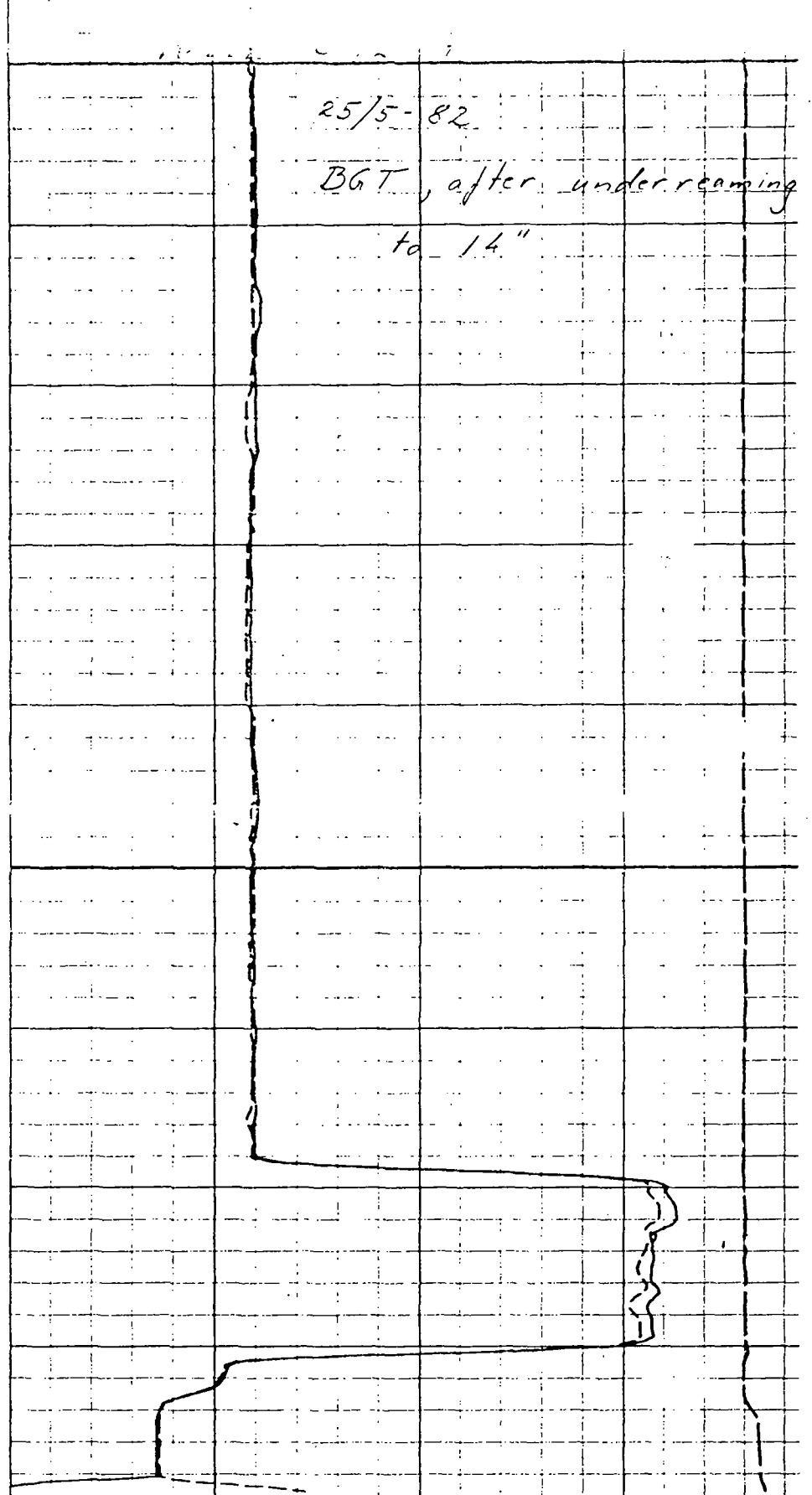
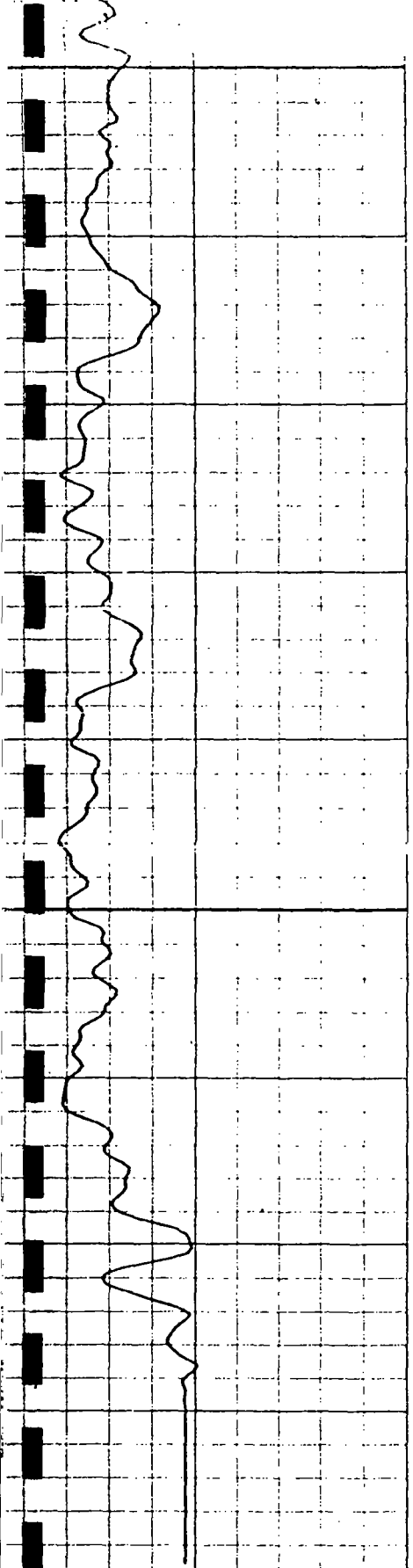
Indicative drilling parameters:



1550

25/5-82

BGT, after underreaming
to 14"



FILE

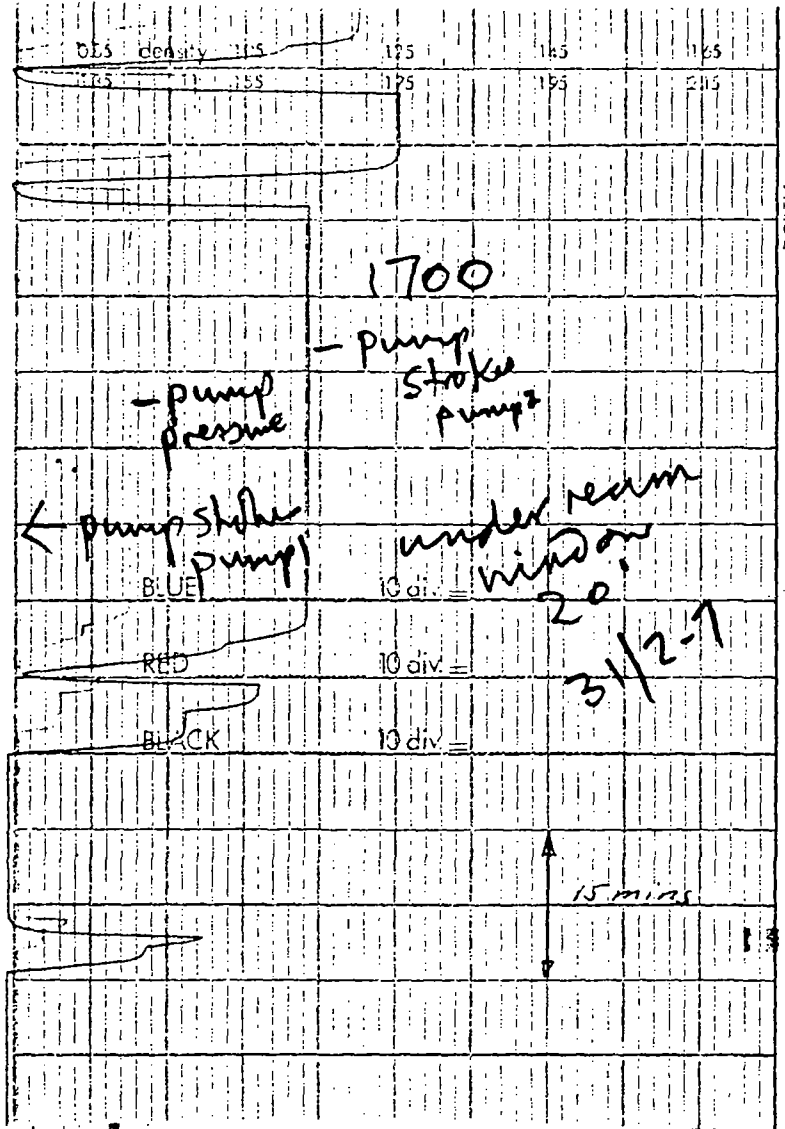
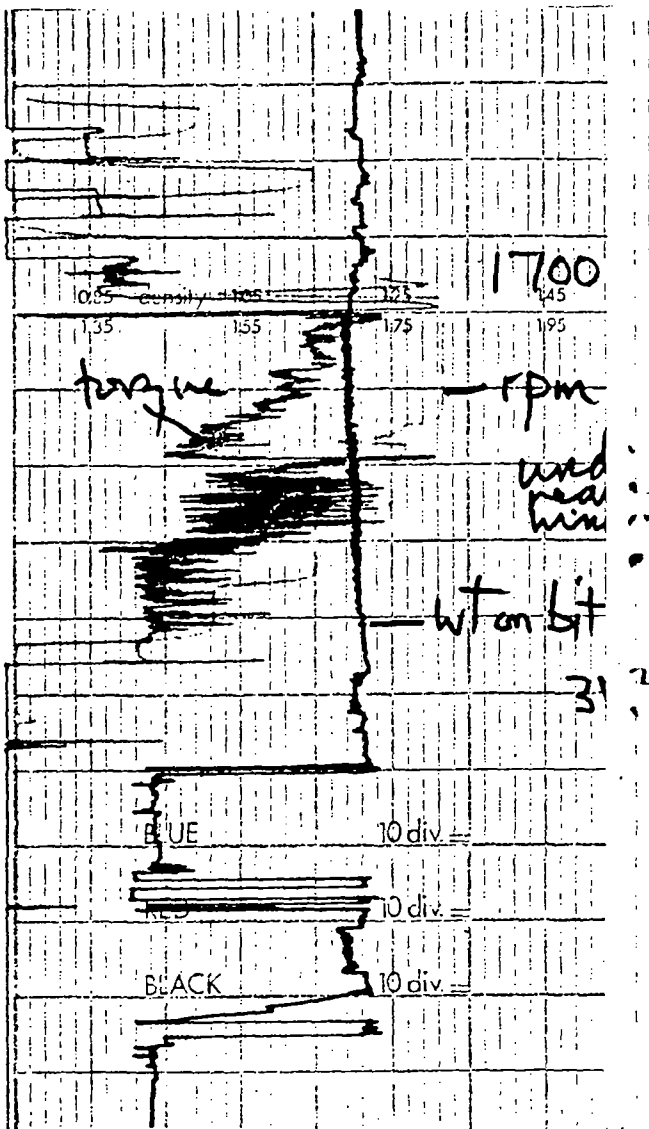
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		TENS(LB)	0.1
	10000.		
	C2 (IN)		16.01
6.000			
	C1 (IN)		16.01
6.000			
GR (GAPI)			
1.0	100.0		

SENSOR MEASURE POINT TO TENSION REFERENCE POINT

Underreaming Operation, 20" Drag type underreamer.

Indicative Drilling Parameters:



DEPTH

under ream
window
20'
3 1/2" - 1

1550

WELL 31/2-7

26/5-82

BGT, after partially
underreaming w/
Service drag type
underreamer (7200)
to 20". (Under
reaming aborted
due to eqpt.
failure)

FILE

3

TENS(LB)

10000.

0

C2 (IN)

6.000

26.

C1 (IN)

6.000

26.

GR (GAPI)

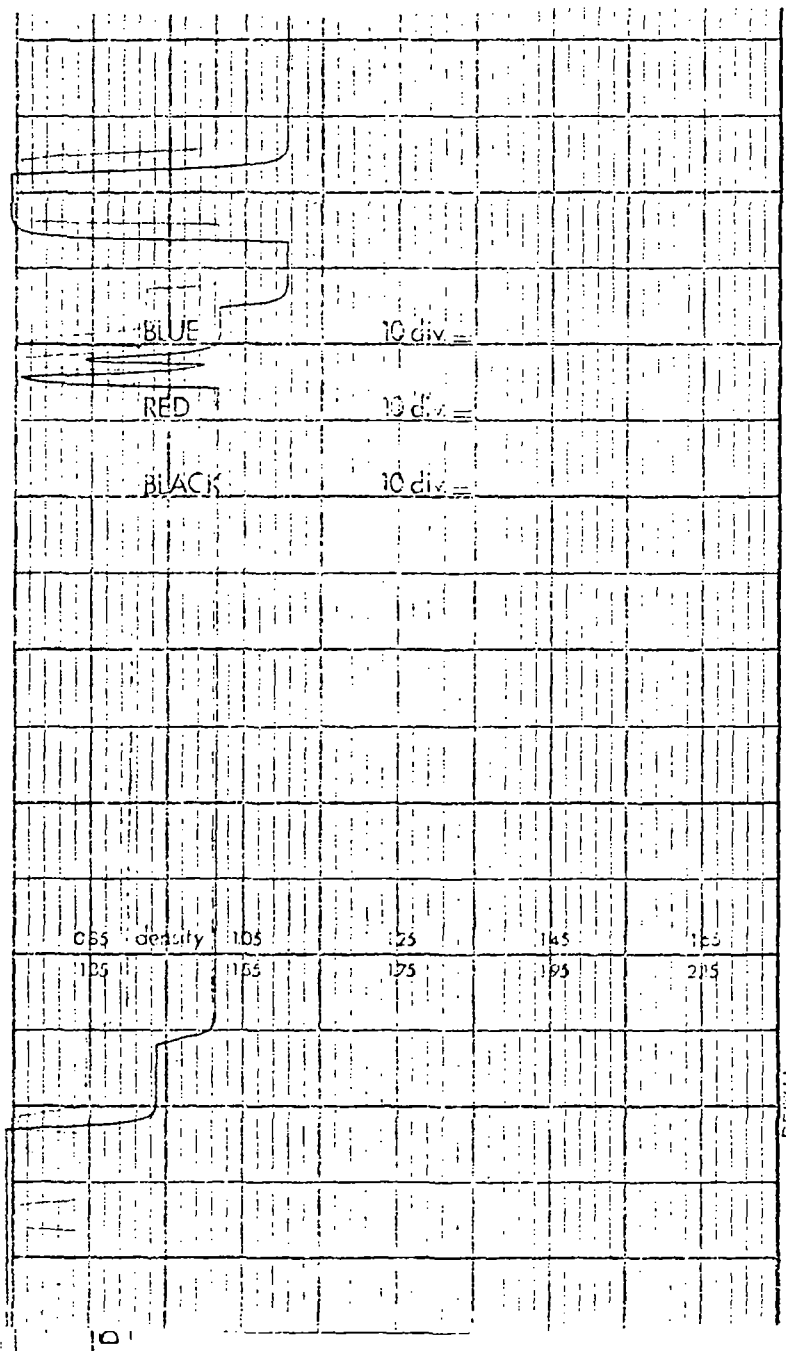
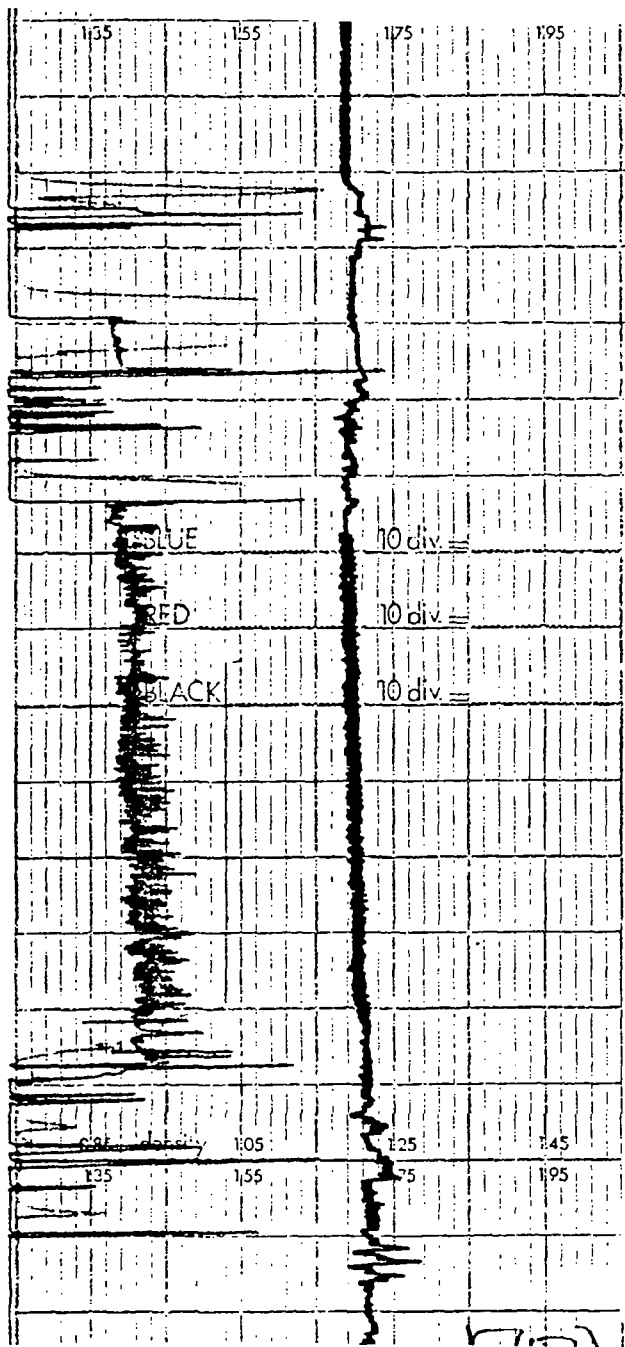
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100.0

Underreaming Operation, 20", phase II

Rock type underreamer w/ bullnose : 18"

Indicative drilling parameters:



1550

3 1/2 - F

BGT no. 3

Ran after underreaming
with 18" rock type

under reamer (1587.0-1580.5)

1575

1580

1584

FILE

7

TENS(LB)

10000.

0.0

DEVI(DEG)

CE (IN)

9.000

6.000

26.00

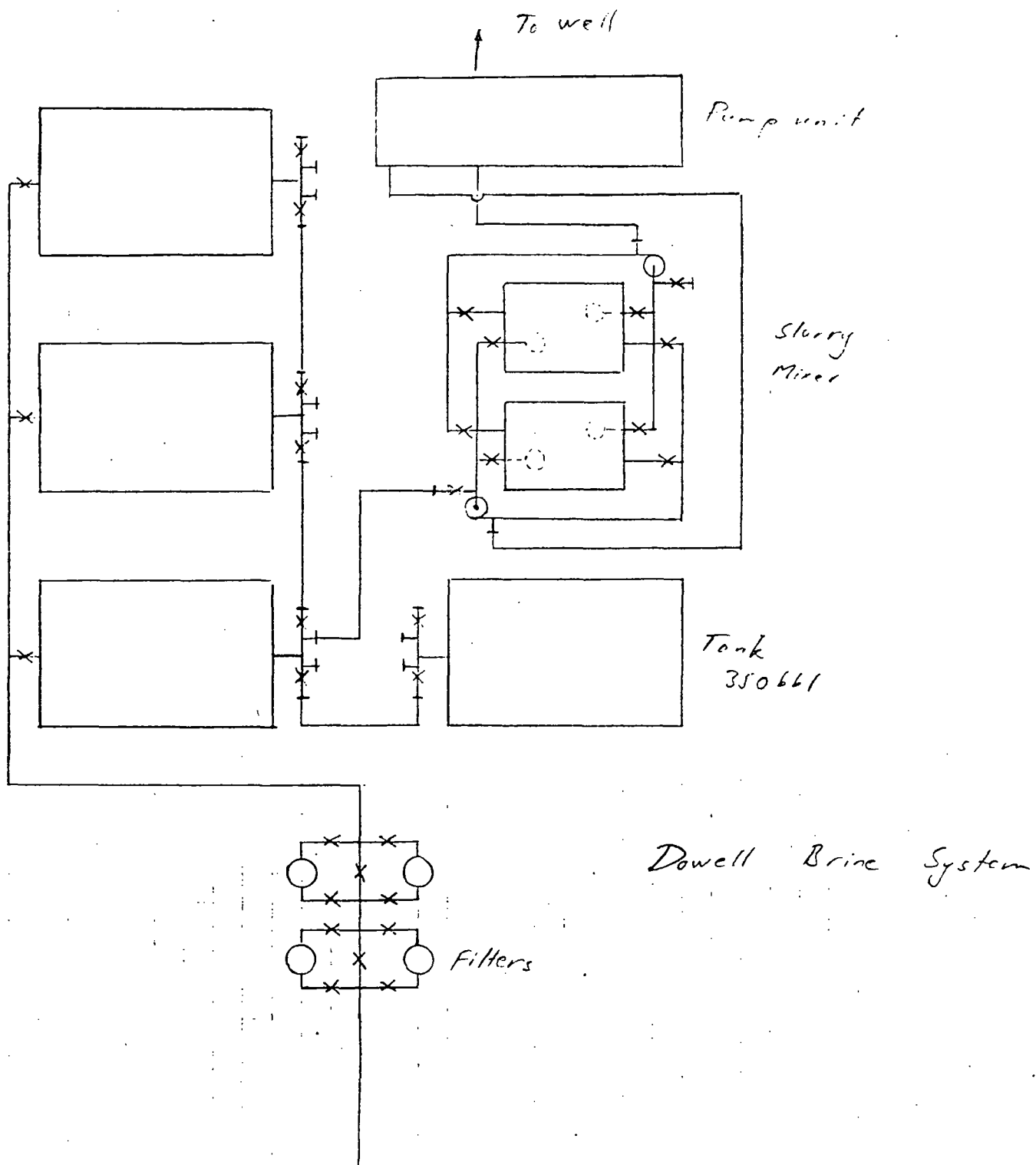
GR (GAPI)

C1 (IN)

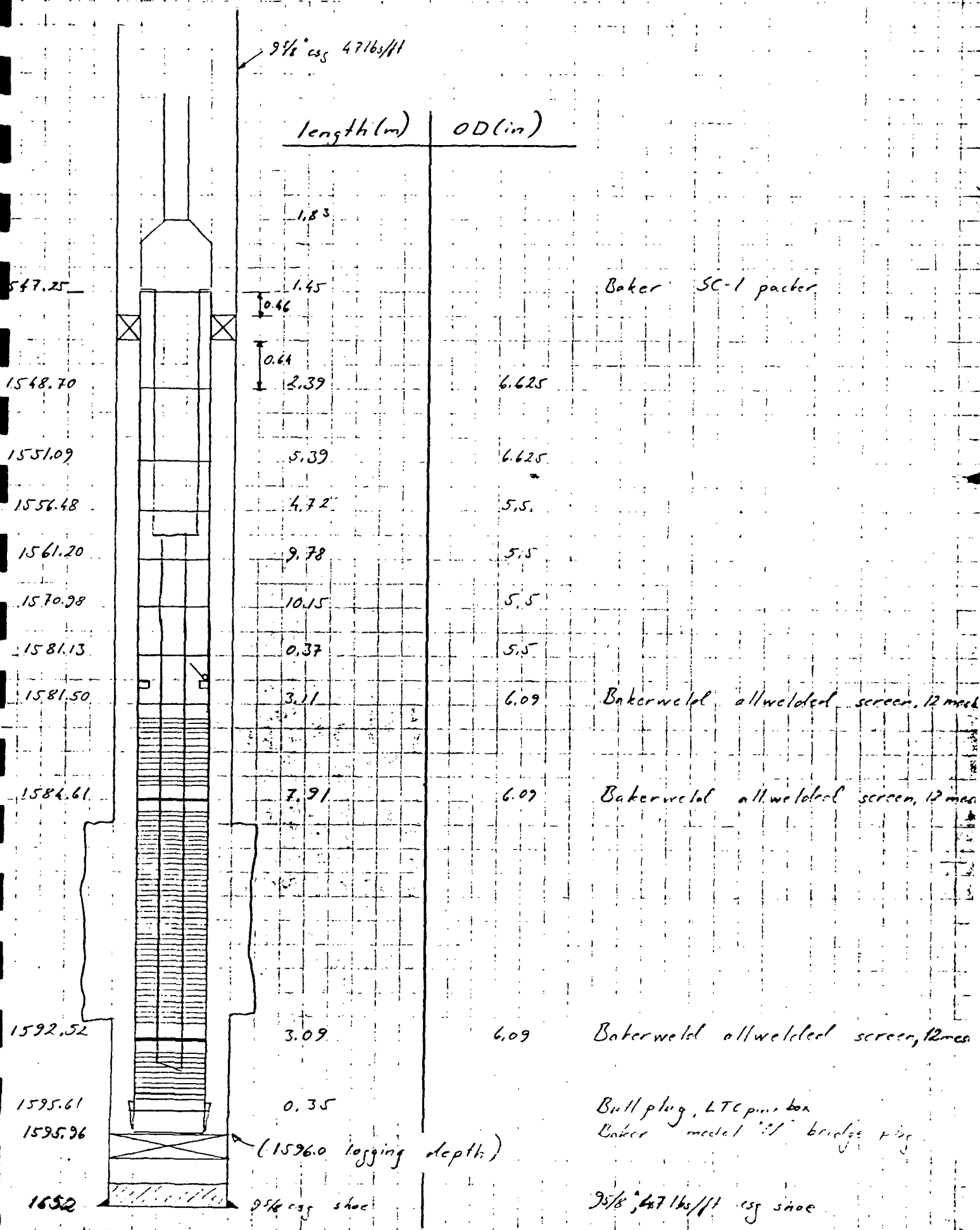
100.0

6.000

26.00



3 1/2 - 7 , GP assy



Depth (m EXB)

OD (in) ID (in)

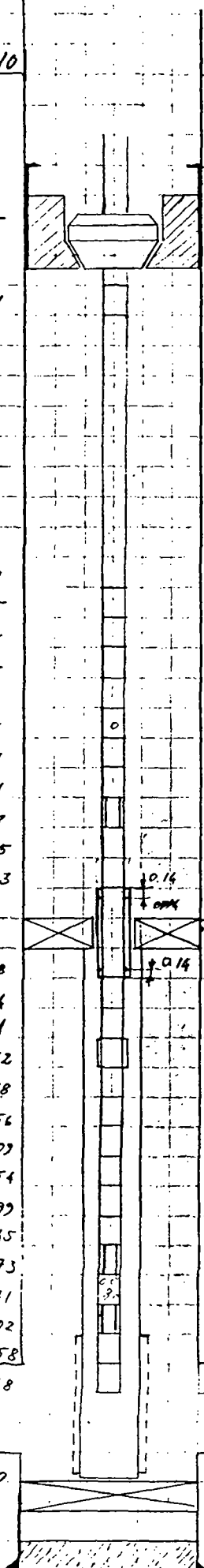
359.06
361.10
361.38
361.98
369.41

1514.61
1516.45
1516.85
1526.68
1529.63
1530.66
1533.63
1536.61
1536.98
1539.95
1542.93

1549.08
1550.54
1551.64
1552.12
1553.58
1562.56
1565.09
1566.54
1567.99
1569.45
1569.73
1572.71
1573.02
1582.58
1582.78

1590.5
1596.0

MPP



Depth (m EXB)	OD (in)	ID (in)
361.10	0.23	
361.38	0.30	0.05
361.98	0.32	7.43
369.41		
1514.61	1.84	4.723
1516.45	0.40	2.861
1516.85	9.80	2.867
1526.68	2.98	2.867
1529.63	1.03	2.750
1530.66	2.97	2.867
1533.63	2.98	2.867
1536.61	0.37	2.138 (no ga)
1536.98	2.97	2.867
1539.95	2.98	2.867
1542.93	6.15	2.867
1549.08	1.46	2.347
1550.54	0.87	2.347
1551.64	0.71	2.347
1552.12	1.46	2.347
1553.58	8.98	2.347
1562.56	2.53	2.347
1565.09	1.45	2.347
1566.54	9.45	2.347
1567.99	1.46	2.347
1569.45	0.28	2.313
1569.73	2.98	2.347
1572.71	0.31	2.250 (no ga)
1573.02	9.56	2.347
1582.58	0.20	2.347

Top Well head. Datum

Top 18 3/4" housing
Fluted hanger landed in
9 5/8" wear bushing.

Tbg jt. 134-23 (114,520m)

Pupjt, 5" V.A.P. 15 lbs/ft, L-80
X-over, 5" V.A.P. (h) + 3 1/2" HCS (p)
Tbg jt, 2 1/2" HCS, 9.3 lbs/ft, L-80
Pupjt, 3 1/2" HCS, 9.3 lbs/ft, L-80
Otis "XA" sh. dnr, 3 1/2" HCS (b.p.)
Pupjt, 3 1/2" HCS, 9.3 lbs/ft, L-80
Pupjt, 3 1/2" HCS, 9.3 lbs/ft, L-80
Otis 3 1/2" "XN" nipple, 3 1/2" HCS (b.p.)
Pupjt, 3 1/2" HCS, 9.3 lbs/ft, L-80
Pupjt, 3 1/2" HCS, 9.3 lbs/ft, L-80
Baker G-22 locator/seal assy
(190-47) 3 1/2" HCS box sp.
2 7/8 HCS pin down

Pupjt, 2 7/8 HCS, 6.5 lbs/ft, L-80
Pupjt, 2 7/8 HCS, 6.5 lbs/ft, L-80
Baker G-22 sa (190-47) 2 7/8 HCS (b.p.)
Pupjt, 2 7/8 HCS, 6 lbs/ft

Pupjoint 2 7/8 HCS, 6 lbs/ft, L-80
Otis 2 7/8 "X" nipple, 2 7/8 HCS (b.p.)
Perforated pipe, 2 7/8 HCS (b.p.), L-80
Baker "F" nipple, HCS
Tubing jt, 2 7/8 HCS, 6.5 lbs/ft, P-105
Baker half mule shoe, 2 7/8 HCS

1584.0



2 7/8" OTIS "XN" NIPPLE
SEAL BORE: 2.313"

X-OVER OTIS ACME (B) X 1.66 HCS (P)

1.66 O.D. HCS TUBING PUP JOINT

2 7/8" HCS PERFORATED PIPE

X-OVER 1.66 HCS (B) X BAKER (P)

2 7/8" BAKER "F" NIPPLE
SEAL BORE: 2.250"

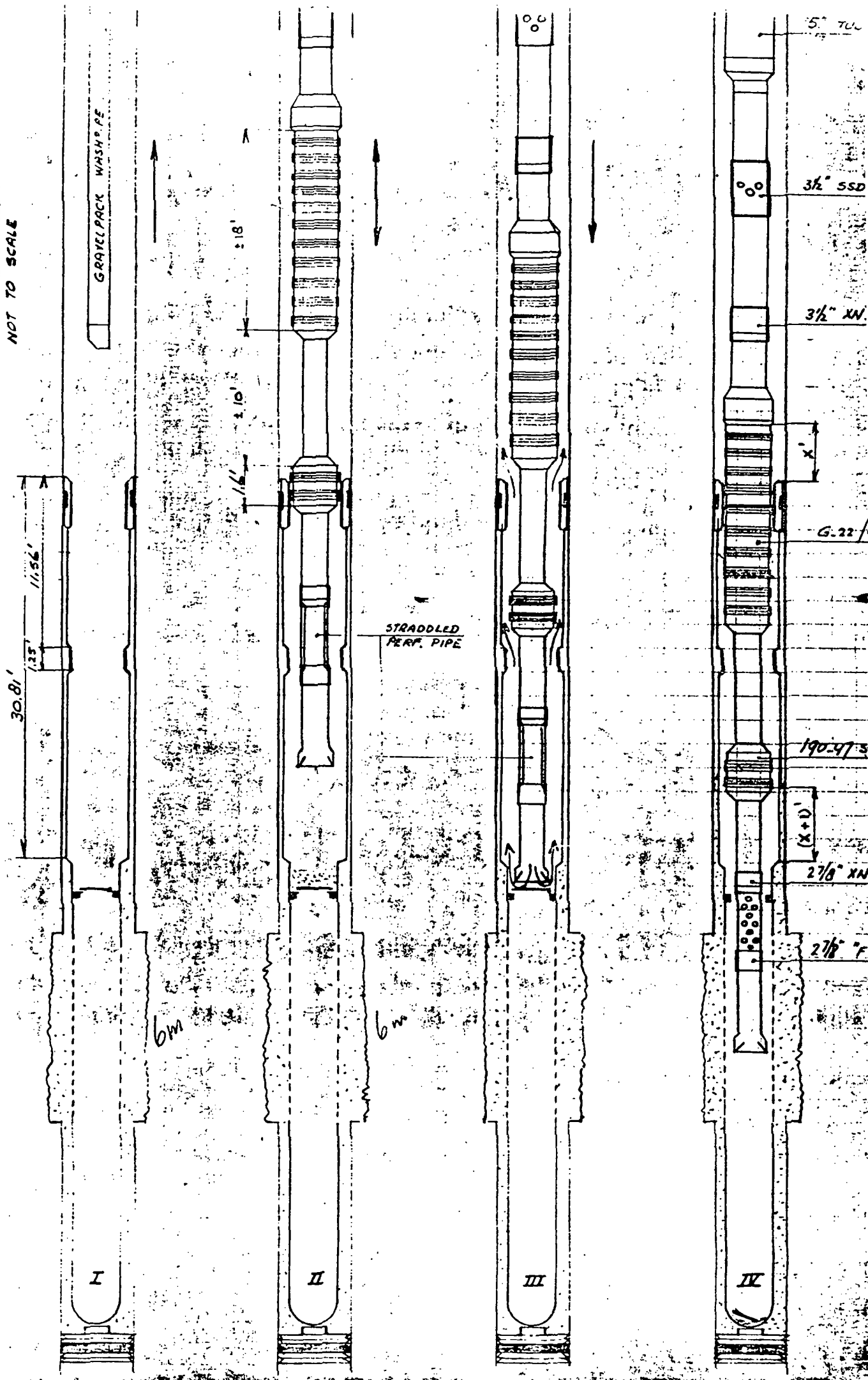
BAKER PACKING SUB
BOTTOM OF "FB-2" CHECK VALVE
PROD. NO. 809-35

STRADDLE FOR PERFORATED PROD. PIPE

WIRELINE RETRIEVABLE.

SPACE OUT C. PROD TESTSTRING IN G.P. ASSY. WITH ZONE SHUT OFF VALVE

NOT TO SCALE



GRAYELPACK WASH P.F.E.

STRADDLED PERF. PIPE

5" TVL

3/2" SSD

3/2" XN

G. 22

190.97'

(X+1)

2 7/8" F

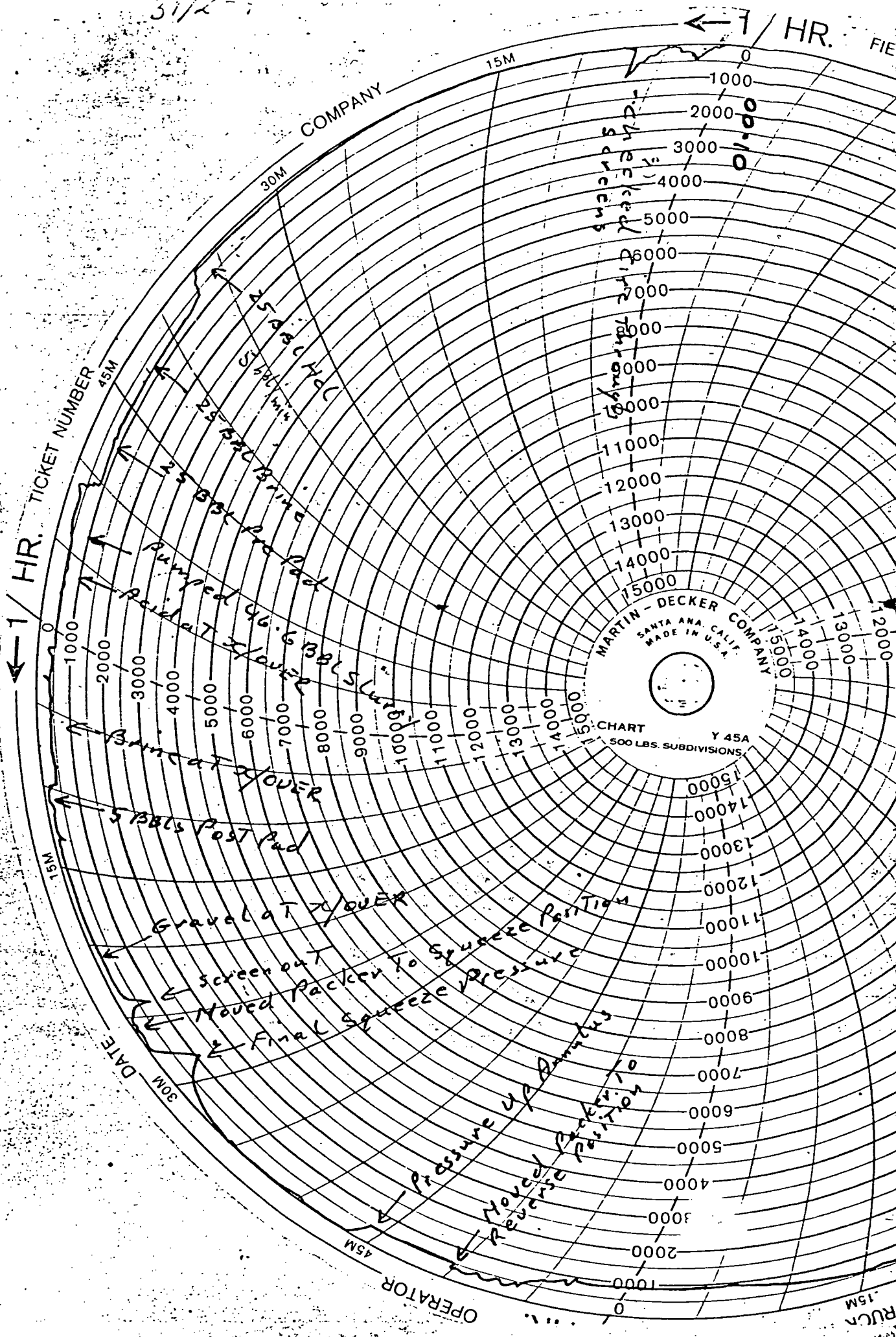
I

II

III

IV

31/2-



← 1 / HR. TICKET NUMBER

COMPANY

← 1 / HR.

FIE

Checked
Time
8000
9000
10000
11000
12000
13000
14000
15000

46.6 Bbls
 Pumped
 Gravel at 7000
 screen out
 Moved packer to squeeze position
 Final Squeeze Pressure
 5 Bbls Post Pad
 Gravel at 7000
 screen out
 Moved packer to squeeze position
 Final Squeeze Pressure

MARTIN-DECKER COMPANY
 SANTA ANA, CALIF.
 MADE IN U.S.A.
 CHART Y 45A
 500 LBS. SUBDIVISIONS

OPERATOR

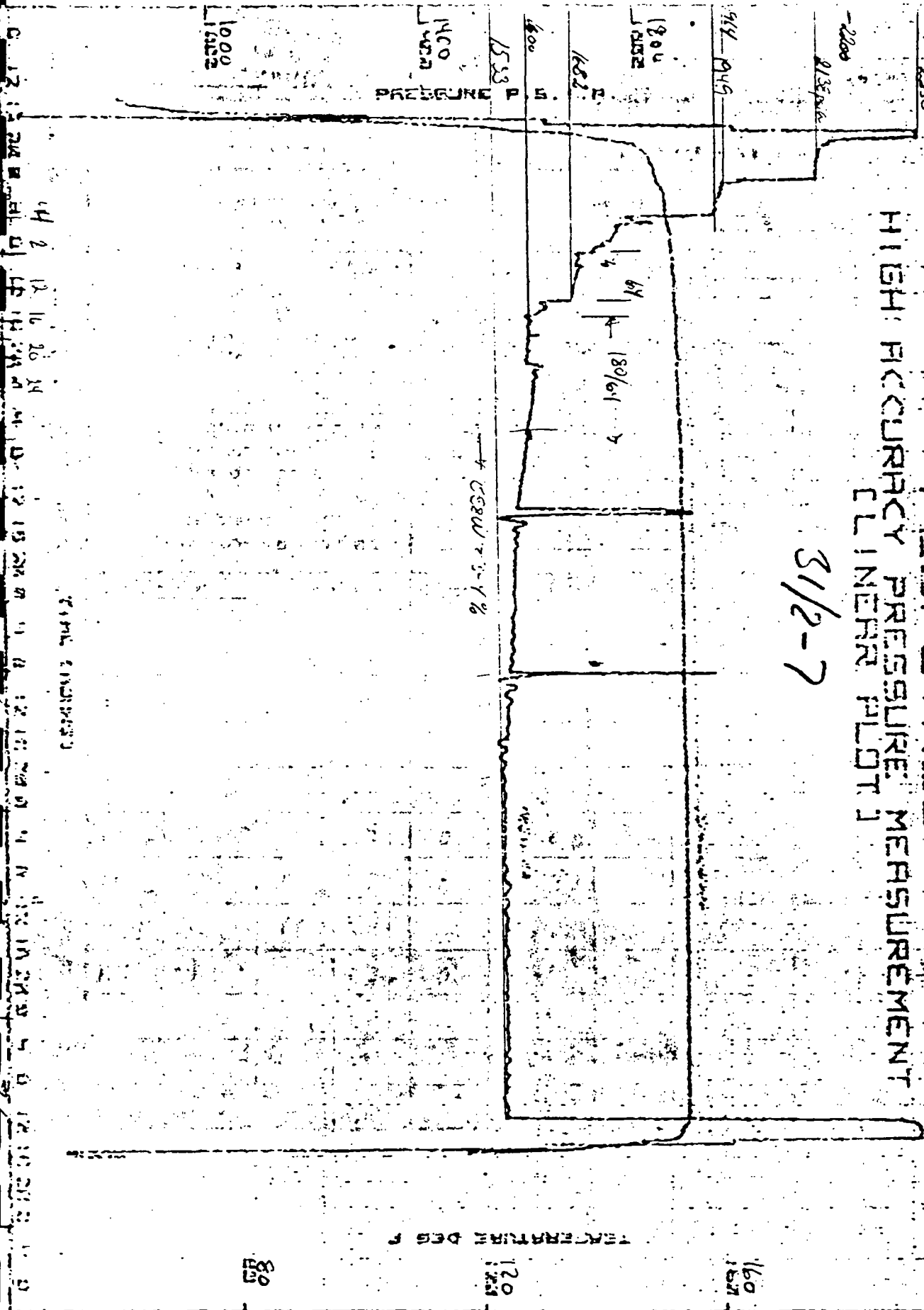
DATE

RUCN 15M

Handwritten notes and markings at the top of the page, including a date "3/12-7" and other illegible scribbles.

FLOPPETROL HIGH ACCURACY PRESSURE MEASUREMENT CLINICAL PLOT

3/12-7



Handwritten notes and markings along the left edge of the plot, including a date "3/12-7" and other illegible scribbles.