

Denne rapport
tilhører



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KODE well 30/2-1 nr 56

Returneres etter bruk

TIME BREAKDOWN
AND
REVIEW OF OPERATIONS ACTIVITIES

WELL 30/2-1
NORWAY

1238250-0075
GOR

ST 06-P5.10-01
30/2-1

DD1

Unionoil Norge A/S
November 1982
R. Hustoft
RH/imr/406B

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INTRODUCTION

Well 30/2-1 is located on the Alpha structure common to blocks 30/2 and 30/3. It is the second well on the structure and the first exploration well in the block 30/2. The well was drilled to a total depth of 4243m - RKB (4213m - MSL), and it tested significant quantities of hydrocarbons from the Brent group. The rig Dyvi Delta, equipped with a 15,000 psi BOP-stack, was used. The well was spudded on May 17, 1982, and the rig was released October 14, 1982.

A detailed time breakdown has been prepared in order to pinpoint those areas where delays occurred, and where improvements can or should be expected in future wells on this structure. The operations are broken down in five different phases:

- Pre-spud
- Drilling
- Evaluation
- Testing
- Abandonment

The overall time breakdown for these phases is shown in Table 2. Tables 3-7 present the same data in more detail with brief explanations. Figure 1 shows status of the suspended well, and a drilling time vs. depth curve is shown in figure 2.

This report is a summary and does not include a detailed discussion of the operations. The testing results are not discussed either.

CONCLUSION

Analysis of the time breakdown for this well shows several activities that can be improved or eliminated especially in the drilling phase. Exploration in this area is very expensive, and proper planning of future wells on the structure is essential to cut costs. A 25% (38 days) reduction in total well time can realistically be expected with minor improvements in the drilling program and drilling performance (learning curve effects, i.e. bit selection, mud type, mud treatment etc.).

Looking at the pre-spud phase, anchor handling boats with sufficient horse power are required for a smooth anchoring job. It is also important to soak the anchor sufficiently long prior to testing in order to reduce/eliminate resetting.

In the drilling phase the activities "fishing", "working stuck pipe", "well kick" and "treating gas cut cement above 7" liner lap" contributed with 353 hours (14.7 days). An additional 133.5 hours (5.6 days) are mechanical downtime. This is 19.0% of drilling phase time and 13.3% of total time.

Circulating and conditioning mud contributed with 239.5 hours (19.2 days) which is 9.4% of drilling phase time and 6.6% of total time. This was principally due to spotting LCM while drilling in the Brent group and circulating in the transition zones Tertiary/Cretaceous and Cretaceous/Upper Jurassic. Lost circulation requires attention in the drilling program for future wells. In well 30/3-1 on the same structure, lost circulation occurred just above the Brent. Lost circulation may be in the same section in this well. Casing points must be carefully selected in view of formation integrity, and it is recommended to set 9-5/8" casing in the Upper Jurassic within the Kimmeridgian clay formation. This procedure is successfully used on the 30/7, 30/4, 29/6 structure which is in a similar structural setting to the Alpha structure, but at the west side of the Viking Graben axis. The Kimmeridgian clay

formation has a high integrity. The "kick" in this well on August 5 may have been due to spotting LCM (less weight than the mud) and not circulating out same. The effect of the LCM on the hydrostatic column was not taken into account.

Drilling performance was generally satisfactory. The drilling of the Cretaceous section with turbine and 12-1/4" diamond bit was very successful.

Better knowledge of the structure can reduce logging. Better hole condition, mud maintenance and pore pressure prediction will eliminate conditioning trips and intermediate log runs. In future wells on the structure it will not be necessary to extensively evaluate the Paleocene. Consequently costly logging, coring, hole opening and conditioning will be reduced.

The testing of this well went very well. The testing program was very simple and more extensive testing of each zone (several flow/build-up periods) may be considered in future wells. Mechanical downtime was mainly due to poor maintenance of service companies' testing tools. A study of bottom hole gauges is also required. Several bottom hole gauges failed and recorded data appears to be unreliable. The principal cause is thought to be a combination of high temperature and pressure. Running Amerada gauges as back up should be considered. Also using surface read out gauges needs to be considered.

Too much downtime was caused by the BOP-stack. Insufficient maintenance and little experience with the equipment is suspected to be the main reason, and for future operations it should be considered to have "a service hand" from the vendor on the rig while handling underwater equipment.

The rig Dyvi Delta (excl. BOP-stack) performed very well and this office will be happy to get this rig back for future wells. This was the third well it drilled, and there has been significant improvement. Dyvi Delta will also be the cheapest rig in Statoil's fleet in the years to come.

The well is suspended with the option to be completed as a producer. If this option is not used, it has to be re-entered for final abandonment. NPD has approved suspension for 6 months, and then an extension has to be applied for.

A summary of the time breakdown is presented below.

TABLE 1

SUMMARY SHEET, TIME BREAKDOWN

<u>PHASE</u>	<u>ACTUAL TIME (HRS)</u>	<u>PERCENTAGE</u>
PRE-SPUD (w/o downtime)	83.0	(2.3)
Drilling (w/o downtime)	2413.0	(66.0)
Evaluation (w/o downtime)	267.0	(7.3)
Testing (w/o downtime)	487.5	(13.3)
Abandonment (w/o downtime)	195.0	(5.3)
<u>SUB-TOTAL TIME</u>	<u>3445.5</u>	<u>(94.2)</u>
(w/o downtime)	(143 days 12.5 hrs)*	
Waiting on daylight (testing)	9.5	(0.3)
Mechanical downtime	172.5	(4.7)
<u>Weather downtime</u>	<u>29.0</u>	<u>(0.8)</u>
<u>TOTAL WELL TIME</u>	<u>3656.5</u>	<u>(100.0)</u>
	(152 days 7.5 hrs)*	

* 1 day with 25 hours due to change over from summertime.

TABLE 2

TIME BREAKDOWN

	<u>HOURS</u>	<u>PERC.</u> <u>PER</u> <u>PHASE</u>	<u>PERC.</u> <u>OF</u> <u>TOTAL</u>
1. PRE-SPUD PHASE:			
Rig move	16.0	(19.3)	(0.5)
Anchoring	67.0	(80.7)	(1.8)
Mechanical downtime	-	-	-
Weather downtime	-	-	-
SUB-TOTAL PRE-SPUD PHASE	83.0	(100.0)	(2.3)
2. DRILLING PHASE			
Hours drilling (on bottom)	546.5	(21.4)	(14.9)
Hours tripping, connections etc.	353.5	(13.9)	(9.7)
Hours coring	41.0	(1.6)	(1.1)
Hours tripping, coring	132.5	(5.2)	(3.6)
Reaming, wiper trips	138.0	(5.4)	(3.8)
Circ. and cond. mud	239.5	(9.4)	(6.6)
Deviation surveys	38.0	(1.5)	(1.0)
UWE-handling and BOP-testing	246.0	(9.6)	(6.7)
Casing/cementing	152.5	(6.0)	(4.2)
Drilling csg. shoe, leak-off, CBL	225.5	(8.8)	(6.2)
Fishing	33.0	(1.3)	(0.9)
Working stuck pipe	169.0	(6.6)	(4.6)
Well kick	98.0	(3.8)	(2.7)
Mechanical downtime	133.5	(5.2)	(3.7)
Weather downtime	7.5	(0.3)	(0.2)
SUB-TOTAL DRILLING PHASE	2554.0	(100.0)	(69.9)

	<u>HOURS</u>	<u>PERC.</u> <u>PER</u> <u>PHASE</u>	<u>PERC.</u> <u>OF</u> <u>TOTAL</u>
3. EVALUATION PHASE:			
Logging	100.5	(35.7)	(2.8)
CST	15.5	(5.5)	(0.4)
RFT	30.0	(10.6)	(0.8)
Rigging, roundtrips etc.	117.0	(41.5)	(3.2)
Circ. for samples	4.0	(1.4)	(0.1)
Mechanical downtime	15.0	(5.3)	(0.4)
Weather downtime	-	-	-
SUB-TOTAL EVALUATION PHASE	282.0	(100.0)	(7.7)
4. TESTING PHASE:			
Testing, flow/build-up	115.5	(21.3)	(3.2)
Preparation, RIH/POOH	241.5	(44.5)	(6.6)
Squeezing perms. - isolation	80.5	(14.8)	(2.2)
CBL, perforating, setting packer	34.0	(6.3)	(0.9)
BOP-testing	16.0	(2.9)	(0.4)
Waiting on daylight	9.5	(1.8)	(0.3)
Mechanical downtime	24.0	(4.4)	(0.6)
Weather downtime	21.5	(4.0)	(0.6)
SUB-TOTAL TESTING PHASE	542.5	(100.0)	(14.8)
5. ABANDONMENT PHASE:			
Plugging and abandoning	130.5	(66.9)	(3.6)
Working stuck pipe	1.5	(0.8)	-
UWE-handling	20.0	(10.3)	(0.5)
Anchor handling, preparation	43.0	(22.0)	(1.1)
Mechanical downtime	-	-	-
Weather downtime	-	-	-
SUB-TOTAL ABANDONMENT PHASE	195.0	(100.0)	(5.3)
TOTAL WELL TIME	3656.5		(100.0)

(152 days 7.5 hrs)

TABLE 3

REVIEW OF PRE- SPUD PHASE

ACTIVITY	HOURS	COMMENTS
Rig move	16.0	Moving time from ship yard, Leirvik Sveis, to new location, 30/2-1. Rig under tow at 19.20 hours May 14, 1982 and it was on 30/2-1 location 11.45 hours May 15, 1982.
Anchoring	67.0	Anchoring includes tensioning/soaking anchors. Had to reset anchor no. 8 and no. 12. DnV required all 12 anchors tested to 180 tons. 2 of 3 anchor handling boats had insufficient horsepower (6500 HP) to pull out all anchor chain. Had to jerk out the rest. The third anchor handling boat (10,000 HP) performed well.
Mechanical downtime	-	No mechanical downtime.
Weather downtime	-	No weather interruptions during rig move and anchoring.

TABLE 4

REVIEW OF DRILLING PHASE

ACTIVITY	HOURS	COMMENTS
Hours drilling (on bottom)	546.5	Satisfactory drilling performance. The Cretaceous section was successfully drilled with turbine and 12-1/4" diamond bit (2209-3463m). Average penetration was 5 m/hr in this section. Sticking problems in the lower Cretaceous and in the Statfjord sand. A packed bottom hole assembly was used, and directional problems were avoided.
Hours tripping, connections etc.	353.5	Time off bottom for connections and round tripping. This operation includes picking up drill pipe and making up/breaking out BHA. Satisfactory round tripping.
Hours coring	41.0	Cut 11 cores of total 115.5m. 2 cores (17.5m) cut in Paleocene and 9 cores (98m) cut in Jurassic. Some problems with core barrels (poor recovery).
Hours tripping, coring	132.5	Tripping time from bit off bottom until back on bottom. This operation includes recovery of core.
Reaming, wiper trips	138.0	Opening 12-1/4" pilot hole to 26" for 20" casing. Wiper trips to retrieve surveys.

ACTIVITY	HOURS	COMMENTS
Circulating and conditioning of mud	239.5	Circulating to increase mud weight in transition zones Tertiary/Cretaceous and Cretaceous/Upper Jurassic. Spotting LCM on several occasions while drilling in the Jurassic. (Lost circulation zone just above Jurassic in well 30/3-1. Lost circulation <u>may be</u> in the same section in this well. It is recommended to set 9-5/8" casing in the Upper Jurassic within the Kimmeridgian clay formation in future wells to obtain satisfactory formation integrity).
Deviation surveys	38.0	NPD requires directional survey to be run every 90m.
UWE-handling and BOP-testing	246.0	Principally due to weekly testing of stack. This operation includes under water equipment (UWE) handling, plus setting/drilling cement plugs inside casing to change BOP-stack/rams. NPD requires two barriers when pulling BOP-stack.
Casing/cementing	152.5	Running and cementing casing generally satisfactory except for 13-3/8" casing which became differentially stuck due to casing hanger and running tool not ready.

ACTIVITY	HOURS	COMMENTS
Drilling csg. shoe, leak-off, CBL	225.5	This operation includes testing of casing, drilling cement inside casing and running cement bond log (CBL) to evaluate the cement job. Also of testing the fracture gradient immediately below the casing shoe. About 25% (53 hours) of the time was due to circulation and increase of mud weight to drill out gas cut cement above 7" liner lap. Subsequent reduction of mud weight prior to drilling out 7"liner shoe is also included.
Fishing	33.0	Time lost due to survey catcher left in drill string, RTTS packer backed off incorrectly and 7" liner packer running tool dropped in the hole.
Working stuck pipe	169.0	13-3/8" casing became differentially stuck while making up casing hanger and running tool. (Casing hanger and running tool were made up, but not stood back in derrick). Also stuck drill string with bit at 3765m - RKB while circulating out kick in the Brent and some sticking problems in the Statfjord sand.
Well kick	98.0	On August 5, 1982 at 13.30 hours the well kicked while POOH at 3166m - RKB. The well was shut-in and the kick circulated out. The well may have taken a gas influx due to spotting LCM-pill (less weight than the mud) and not circulating out same.

ACTIVITY	HOURS	COMMENTS
Mechanical downtime	133.5	Principally due to failure on several occasions in the acoustic control system for the BOP-stack and leaks in the BOP control system. Also some downtime due to several changes of liners in the mud pumps while drilling with turbine (wear due to high pressure).
Weather downtime	7.5	Waiting on weather to run 11" BOP-stack after changing to 3-1/2" pipe rams.

TABLE 5

REVIEW OF EVALUATION PHASE

ACTIVITY	HOURS	COMMENTS
Open hole logging	100.5	A set of logs run at each casing depth and at TD. Intermediate logs run at 3696m - RKB (top Jurassic sand) and 4217m. Some downtime during logging due to tool failure and hole condition (bridges).
Sidewall sampling (CST)	15.5	Made 3 runs with CST. Fired 72 shots - recovered 48 samples.
Repeat Formation Testing (RFT)	30.0	4 RFT runs made for pressure readings and samples. No pressure readings in Paleocene due to tight formation. Obtained 16 pressure points from 3682 - 3791m in the Brent group. Took 2-3/4" gallon and 1 gallon samples at 3791m and took 2-3/4 gallon and 1 gallon samples from 3769m. No pressure readings on the Statfjord due to no seal and tight formation.
Rigging, round-trips etc.	117.0	This operation includes tripping for logging, trips to condition mud between log runs and rigging up/rigging down logging equipment.
Circ. for samples	4.0	Circulating bottom up for samples for geologist. (Drilling break).
Mechanical downtime	15.0	Alum. protector around caliper on HDT dropped in hole. Trip to check hole prior to further logging.
Weather downtime	-	No weather interruptions.

TABLE 6

REVIEW OF TESTING PHASE

ACTIVITY	HOURS	COMMENTS
Testing, flow/ build-up	115.5	Testing time from well opened for flow until end of build-up. The well was tested from three zones in the Brent group. DST no. 1 was executed with an initial (one minute) and a final single rate flow period with subsequent build-up periods. DST no. 2 and 3 were executed with a two-rate flow period and final build-up.
Preparation, RIH/POOH	241.5	This activity includes picking up test equipment, pressure testing same and RIH/POOH test string. Also circulating out gas in test string. Some problems to open LPR-valve in DST no. 3 (LPR-valve opened in 4th attempt).
Squeezing, perfs. - zone isolation	80.5	Squeezing of perforations after testing and isolation squeezes between tests.
CBL, perforating, setting production packer	34.0	CBL-runs to evaluate the zone isolation, perforating for drill stem testing and setting of production packer. Some time lost as one gun misfired and top half of DST no. 3 interval had to be reperforated.
BOP-testing	16.0	Testing of BOP-stack prior to each DST.
Waiting on daylight	9.5	Waiting on daylight to open well on flow.

ACTIVITY	HOURS	COMMENTS
Mechanical downtime	24.0	Lost time due to leaks/wash outs in test string for DST no. 1. Downtime due to rig repair and CCL failure on perforating gun.
Weather downtime	21.5	WOW while RIH with test string for DST no. 1. Time lost to pull string to reset clocks on Sperry Sun gauges is included.

TABLE 7

REVIEW OF ABANDONMENT PHASE

ACTIVITY	HOURS	COMMENTS
Plugging and abandonment	130.5	Plugging back for testing and further plugging after last DST finished. (Plugging between tests is included in the testing phase). The well was suspended with the option to be completed as a producer. Consequently casings were not cut and the well head left with a corrosion cap.
Working stuck pipe	1.5	Working stuck pipe free on bottom prior to start plugging back for testing.
UWE-handling	20.0	Pulling BOP-stack and riser. Also running corrosion cap. Some time lost due to corrosion cap falling off running tool.
Anchor handling, preparation	43.0	Principally laying down drilling tools, debalasting rig and pulling anchors. Last anchor off bottom and rig under tow at 03.00 hours, October 14 1982.
Mechanical downtime	-	No mechanical downtime.
Weather downtime	-	No weather interruptions during abandonment.

STATUS OF SUSPENDED WELL 30/2-1

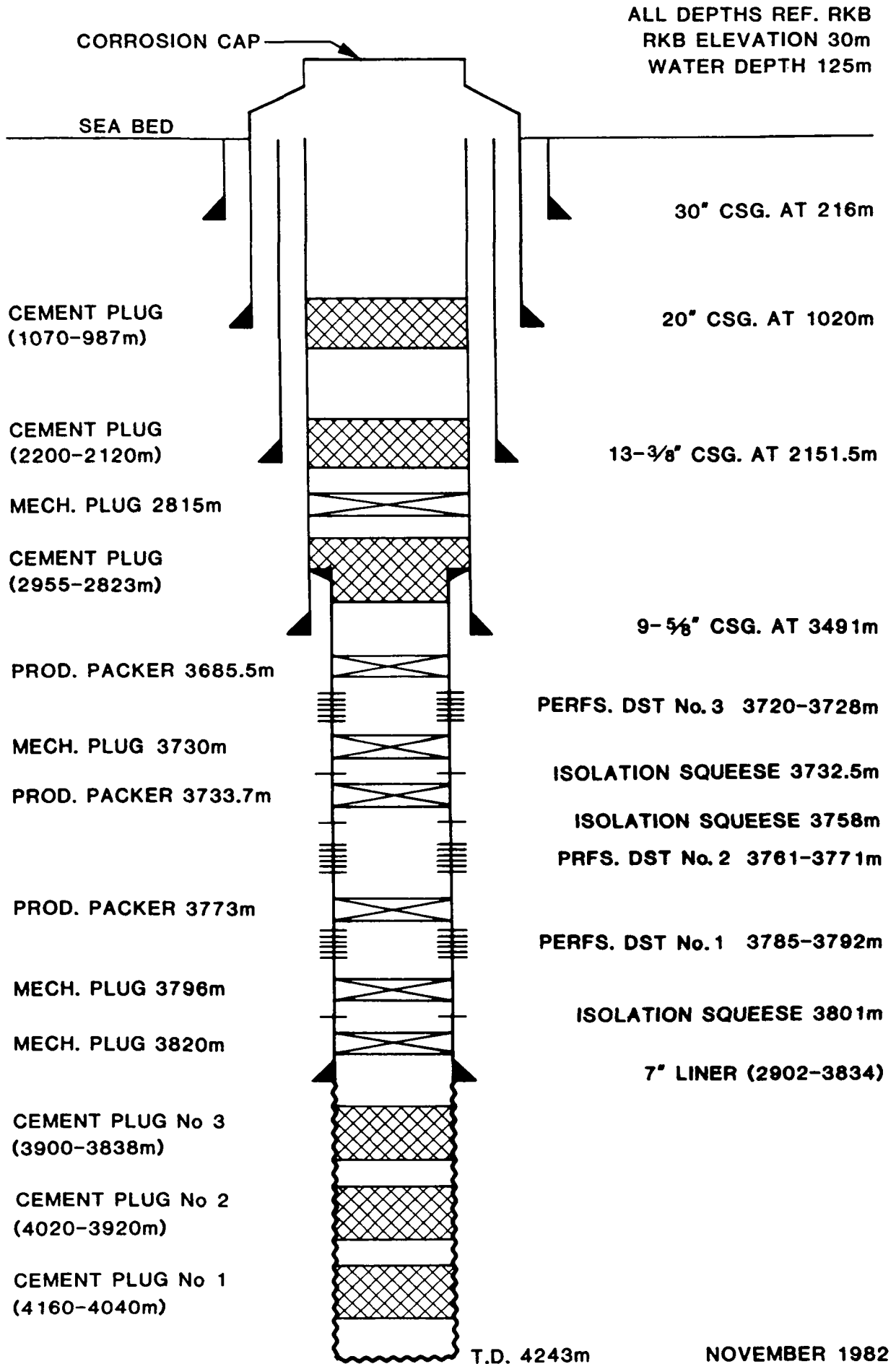


FIGURE I

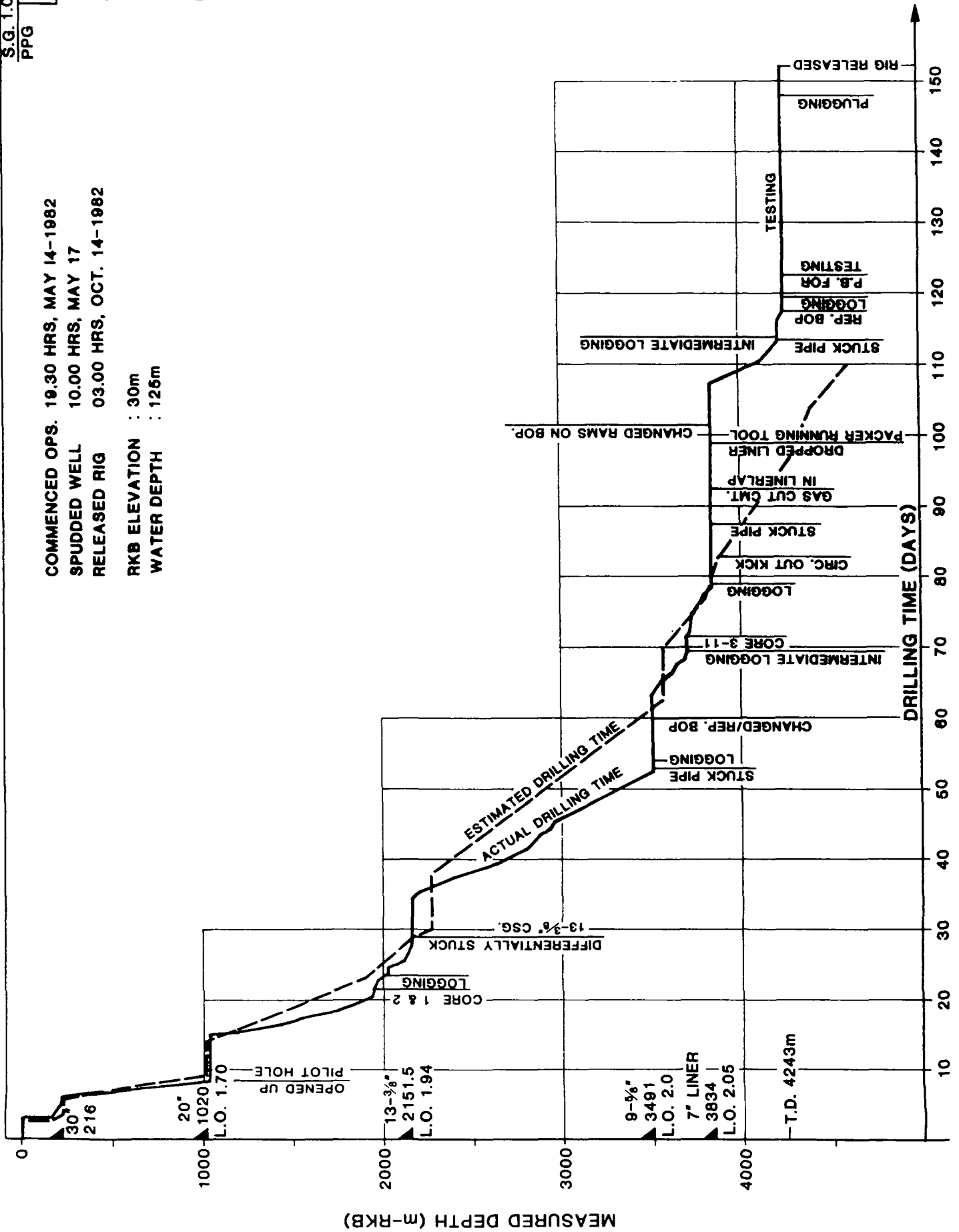
WELL 30/2-1 DRILLING TIME VS. DEPTH

MUD WEIGHT

S.G. 1.0 1.2 1.4 1.6 1.8 2.0
PPG 10 12 14 16

COMMENCED OPS. 19.30 HRS, MAY 14-1982
SPUDDED WELL 10.00 HRS, MAY 17
RELEASED RIG 03.00 HRS, OCT. 14-1982

RKB ELEVATION : 30m
WATER DEPTH : 126m



NOVEMBER 1982

FIGURE II