DRILLING PROGRAMME

LOCATION 31/2-H

(WELL 31/2-13)

07.12.83

A/S NORSKE SHELL
LICENCE 054

Kopi Sendt O. Drage BOR.
K.J. & Klaar LET

HOI P5.10.02-01
Borprogram

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NORSKE SHELL E & P, FORUS.

DRILLING PROGRAMME

CONFIDENTIAL

LOCATION: 31/2-H
WELL: 31/2-13
RIG: Borgny Dolphin

PRODUCTION LICENCE No: 054
ESTIMATED DAYS: 54 (incl. prod. test)

Center of geological target Co-ordinates: 60 deg 47' 28.56" N, 03 deg 25' 37.66" E

Rig location Co-ordinates: 60 deg 47' 13.8" N, 03 deg 26' 03.31" E

DERRICK FLOOR ELEVATION: 25 M ABOVE MSL; 359 M ABOVE SEA BED

HOLE SIZE (INS)	HOLE DEPTH m TVBDF/ m AHBDF	CASING SIZE/WT/GRAD/CPLG	CEMENT Req'd on Board (Tons)	CEMENT Type/Mixwater	CEMENT REMARKS	MUD SG (PSI/1000')	MUD REMARKS	LOGGING
36"	470/ 470	30"/1"WT/310/X-52 ATD-RB Squnch	150	Class"G" S'water	See Enclsoure 2A	1.03 (446)	Seawater + Viscous Pills (+/- 100 MF)	None
26" See note 3	810/ 814	20"/129/X-52 Vetco LS-LH	220	Class"G" S'water	See Enclosure 2B	1.03 (446)	Gelled seawater + viscous pills	(In 14-3/4" pilot hole) ISF/SONIC/SP/GR LDT/CNL/CAL/GR Gyro Multi Shot Survey on 20" csg.
17½"	1515/ 1739	13-3/8"/ 72/ N-80 BTC	150	Class"G" F'water	See Enclosure 2C	1.30 (563) to 1.45 (628)	Fazekleen, low toxicity oil based mud. MF: 50 - 60 secs PV/YP:25-35/ 15-20 WL: Less than 10 cc's	ISF/SONIC/SP/GR LDT/CNL/CAL/GR Gyro Multi Shot Survey on 13-3/8" casing.
12-1/4"	1718/ 2027	9-5/8"/ 47/ N-80/ BTC	100	Class"G" F'water	See Enclosure 2D	1.25 (541) to 1.39 (602)	Fazekleen, low toxicity oil based mud. MF: 50- 60 secs PV/YP:25-35/ 15-20 WL: Less than 5 cc's	ISF/SONIC/SP/NGT LDT/CNL/CAL/GR RFT's (as required) Velocity Survey using a shooting boat. SWS (as required) CBL (on 13-3/8" and 9-5/8" casings) Gyro Multishot survey in 9-5/8" casing.

FORMATION TOP	m TVBDF
Seabed (Quarternary/ Pliocene/ Miocene)	359+/-2
Oligocene	777+/-5
Eocene	1135+/-5
Balder Formation	1325+/-10
Paleocene	
Sele Formation	1395+/-5
Lista Formation	1425+/-5
Upper Cretaceous Maureen Formation (if present)	1530+/-5
Upper Jurassic Sandstone	
* Top reservoir	1535+/-5
Sogn Formation Zone 1	1535+/-5
Zone 2	1685+/-10
TD within zone 2	1718

* Primary target

NOTES:

1) All mud weights are to be adjusted in the light of hole problems (i.e. sloughing shales, high mud gas readings etc.).

2) Formation leak off tests are required below 20" and 13-3/8" casing shoes.

3) 14-3/4" pilot hole is to be drilled to 20" casing depth, drilled deviated at 1.5°/ 30 m build up rate from 500 m TVBDF. The pilot hole will be logged for shallow gas prior to pulling the MR and opening the hole to 26".

4) Cutting Collection: Every 10 m along hole below the 30" casing shoe. Every 3 m along hole below the 13-3/8" casing shoe. See also section 4.5 on Environmental sampling.

NOTES:

5) Estimated pore pressure is +/- 2288 psi at 1535 m TVBDF.

6) Coring is to commence from top of the reservoir in the Upper Jurassic sandstone, and is to continue until just below top of continuous micaceous sands. Approximate interval to be cored is 1535 - 1620 m TVBDF (1768 - 1888 m AHBDF).

7) Testing is subject to confirmation upon receipt of logs.

8) The well will be deviated with a tangent angle of 45 deg.

SIGNED BY:

PRODUCTION ~~MANAGER~~

CHIEF PETROLEUM ENGINEER

Operations Superint.

HEAD OF DRILLING ~~E&P~~, FORUS

DATE: 7/12/83

DRILLING PROGRESS CURVE 31/2-H

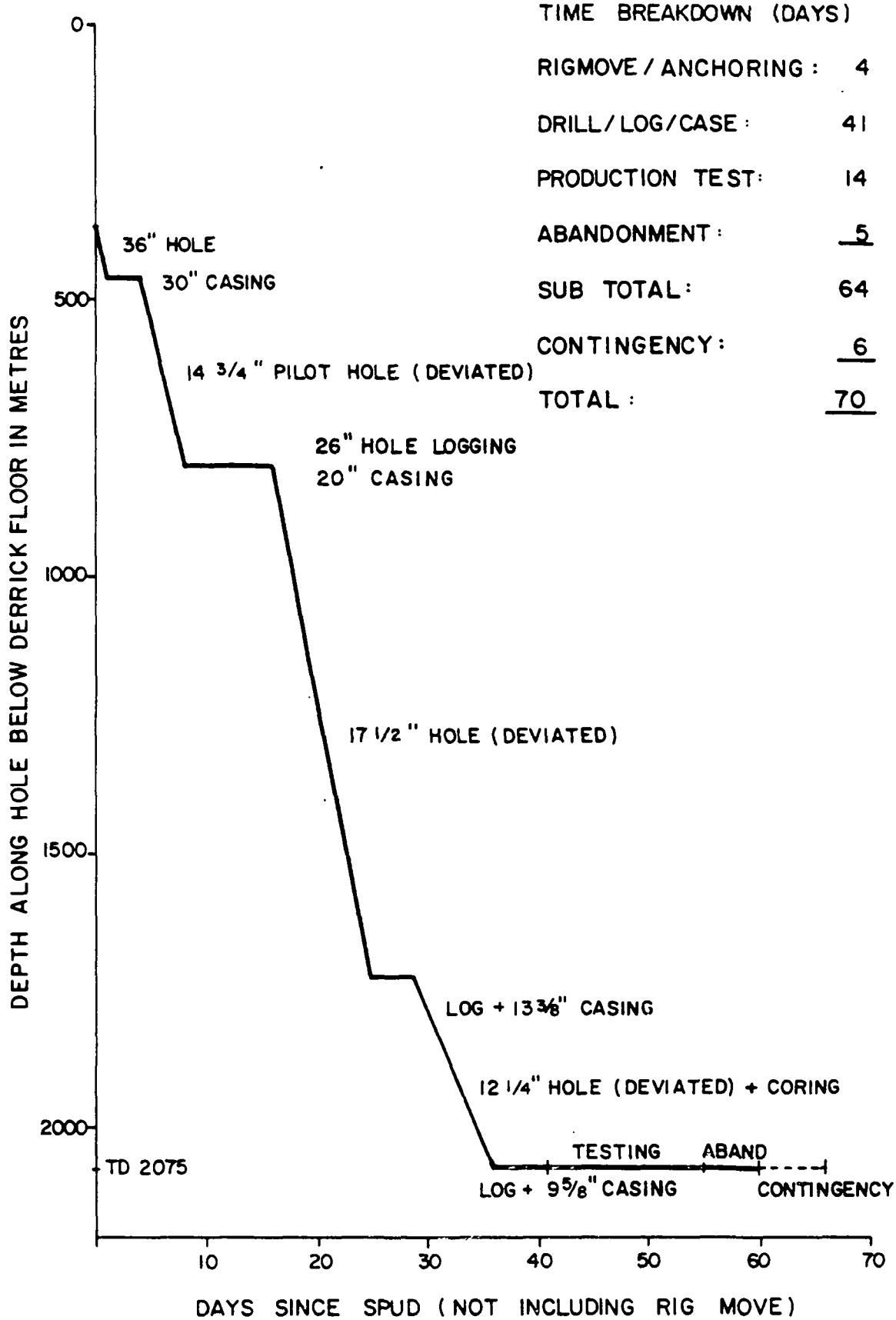

FIG. 1

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DIRECTIONAL DRILLING PLAN 31/2-H

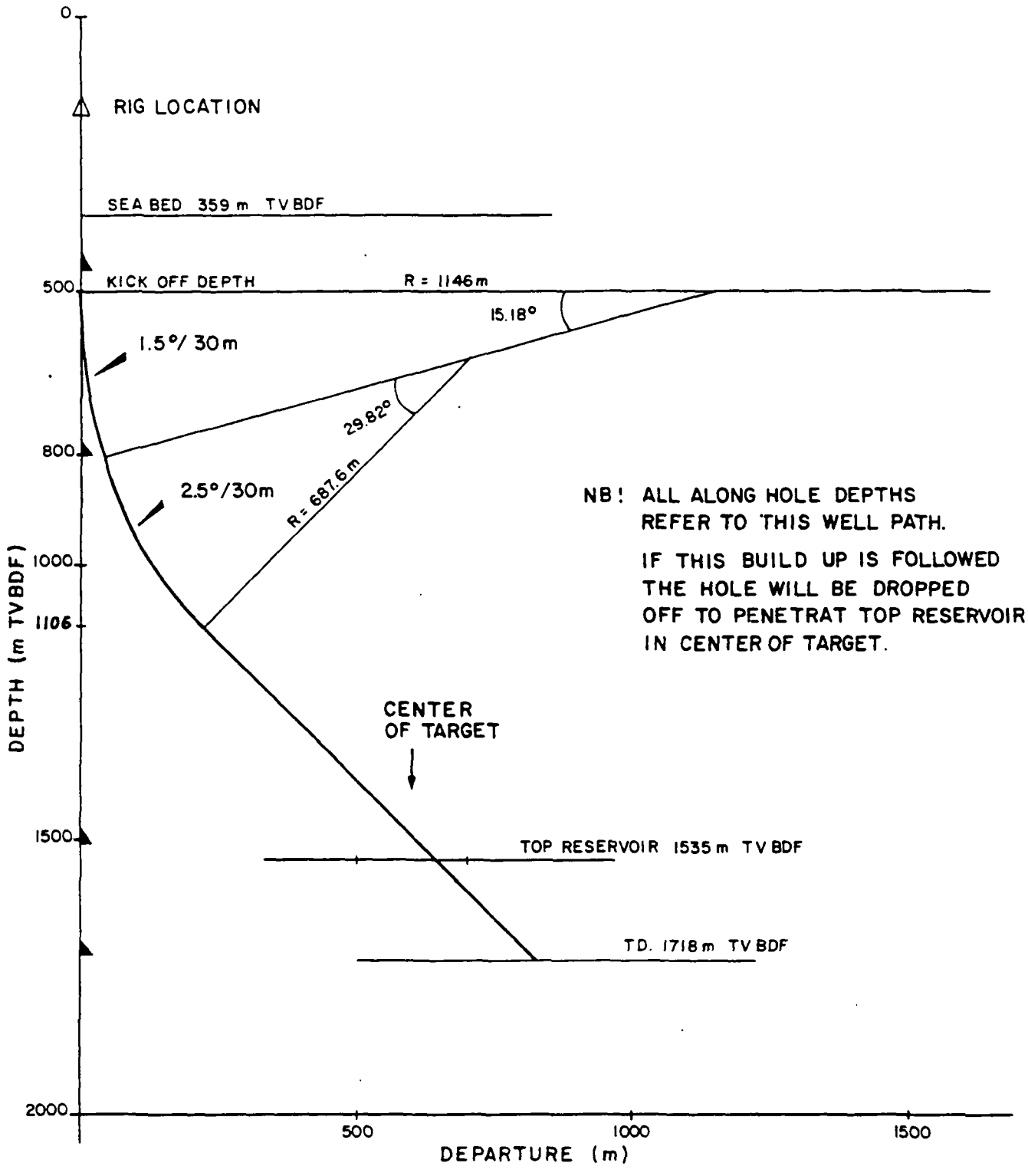

FIG. 2

NSEP 197 G1509/2

PLAN OF WELL PATH 31/2 - H

ALONG SEISMIC LINE 82-430

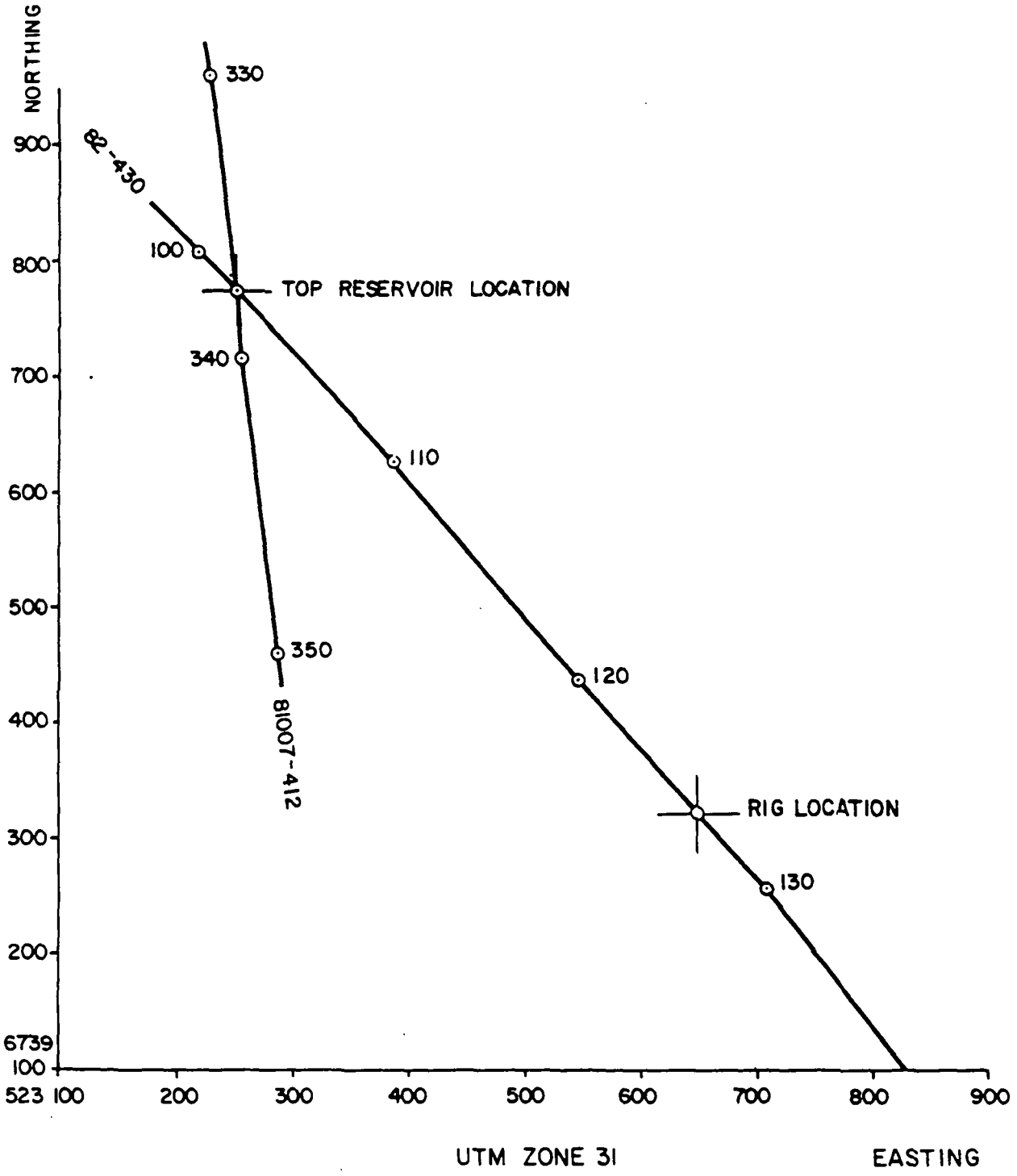

FIG. 3a

NSEP 197 G1509/3

HORIZONTAL PROJECTION OF WELL PATH

31/2-H

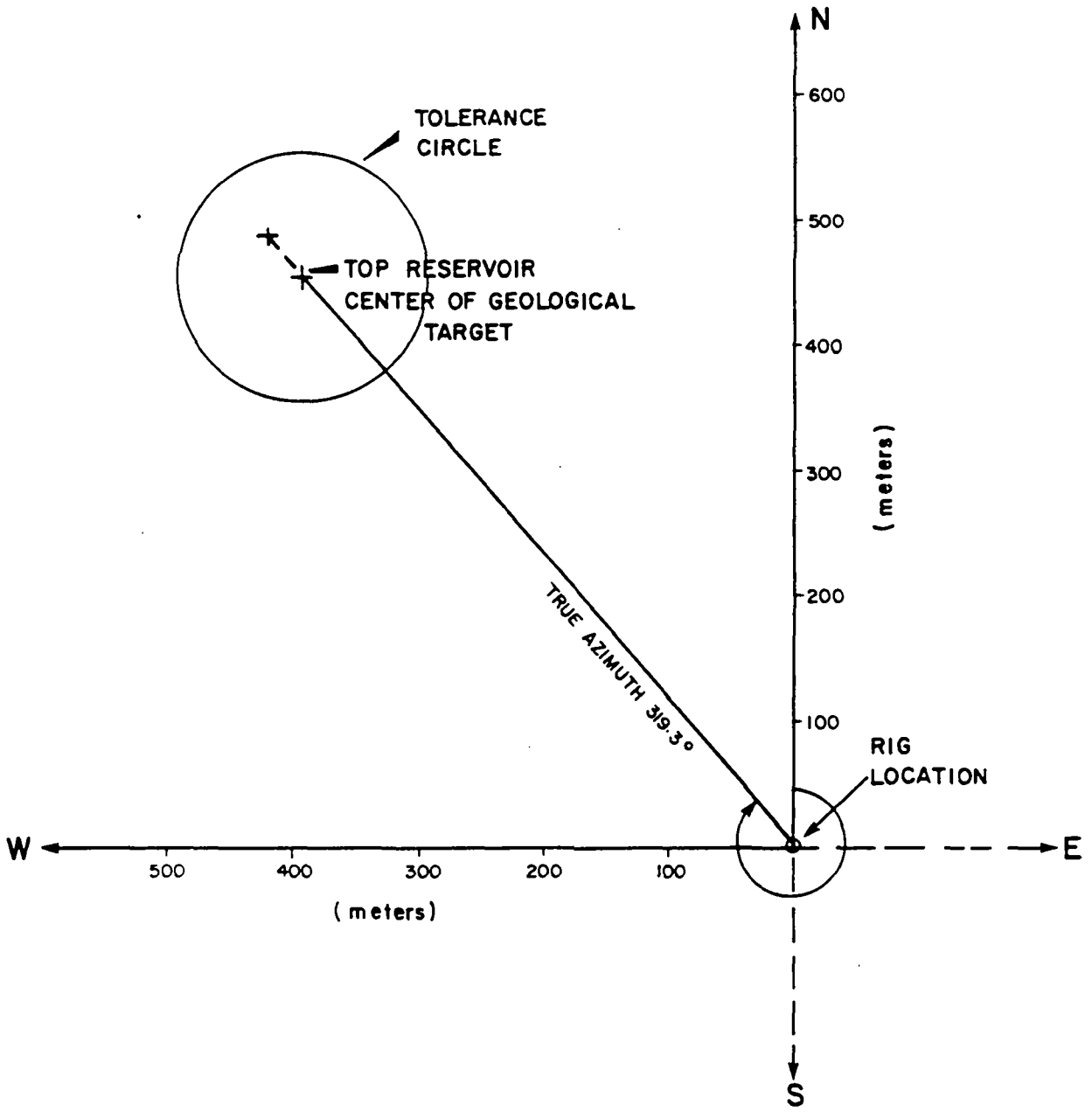

FIG. 3b

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2. Cement calculations
3. Estimated Pore pressure curve/Fracture gradient curve
4. Velocity - Time function
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6. Prognosis Appraisal well 31/2-H

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2. Directional Drilling Plan
3a. Plan of Well Path along seismic line
3b. Horizontal Projection of Well Path

A/S NORSKE SHELL

DRILLING PROGRAMME - LOCATION 31/2-H

1. GENERAL

1.1 Location

1.1.1 A/S Norske Shell - Block 31/2 - Production Licence 054

1.1.2 Center of geological target at top reservoir corresponding to SP 337.5 on seismic line 81007-412 and SP 102 on seismic line 82-430, has the following co-ordinates:

Geographical	UTM (zone 31)
60 deg. 47' 28.56" N	NORTHING 6739773 M
03 deg. 25' 37.66" E	EASTING 523254 M

Tolerance: circle with radius of 100 m.

1.1.3 Rig co-ordinates:

Rig location will be 600 m SE from top reservoir location (fig. 3b), at the following coordinates, as the well will be deviated into the target.

Geographical	UTM (zone 31)
60 deg. 47' 13.8" N	NORTHING 6739319 M
03 deg. 26' 03.31" E	EASTING 523645 M

Tolerance: circle with radius of 25 m.

1.2 Base

Tananger Shore Base to Rig Location 257 km.
Bergen Shore Base to Rig Location 120 km.

1.3 Depth References

a) All depths are given with respect to the rotary table (derrick floor) of the drilling vessel at the specified drilling draught. The depths along hole refers to fig. 2.

b) The drilling draught will be ca. 21.0 m.

c) Expected water depth at location is +/- 334 m (MSL-seabed)

d) Distance from rotary table to MSL is taken as +/- 25 m for this programme but will be measured on site. Distance from rotary table to seabed is taken as +/- 359 m for this programme but will be measured on site.

1.4 Type of well

Deviated appraisal well.

1.5 Total Depth

TD in Upper Jurassic Sandstones is anticipated to be +/- 1718 m TVBDF, or 2027 m AHBDF. (+/- 1693 m SS).

1.6 Drilling Installation

"Borgny Dolphin" - Aker H-3 semi-submersible.

1.7 Objectives

a) To provide an additional data point for the correlation and mapping of the depositional units with emphasis on evaluating the north-westward extension of the Id transgressive sands seen in 31/2-5 but missing in 31/2-11.

b) To confirm the northerly extension of the 22 m oil column.

c) To ascertain by practical test whether departures specified for development wells in the conceptual plan are realistic in view of the shallow reservoir depth and the unconsolidated reservoir.

d) To obtain additional oil production test data for input to the development studies, in particular (dependent on the sand quality), to evaluate the mobility of the aquifer system in the zone of residual oil immediately underlying the producible oil column.

e) In the event that geological conditions do not permit the realisation of a successful water coning test, the option to test the gas coning behaviour will be evaluated.

1.8 Prognosis

Formation Tops	Lithology	Depth TVBDF (m) (Thickness m)	Seismic Tolerance (m)	Depth AHBDF (m) (Thickness AH (m)
Seabed (Quarternary-Miocene)	Claystones, light to medium grey, occasionally sandy and calcareous.	359 (418)	+/- 2	359 (421)
Oligocene	Claystones, grey to brown, soft, silty, glauconitic, occasionally calcareous.	777 (358)	+/- 5	780 (417)
Eocene	"	1135 (190)	+/- 5	1202 (269)
Balder formation	Claystones, Tuffaceous claystone.	1325 (60)	+/- 10	1471 (84)
Paleocene				
Sele formation	Claystones,silty claystones.	1385 (40)	+/- 5	1556 (55)
Lista formation	Claystones, silty. Marls.	1425 (105)	+/- 5	1611 (150)
Upper Cretaceous				
Maureen formation (if present)	Mudstone,silty mudstone. Limestones.	1530 (5)	+/- 5	1761 (7)
Upper Jurassic Sandstones				
Top reservoir		1535	+/- 5	1768
Sogn formation		(150)		(212)
Zone 1	- Sand, unconsolidated to weakly consolidated fine to coarse grained, moderately to well sorted, light grey - grey, interbedded with: - sandstone/ siltstone, consolidated, fine to very fine grained, well sorted, strongly micaceous, silty, friable to moderately hard, grey. - occasionally carbonate cemented bands, hard, randomely distributed (< 1 m thick).			
GOC expected at		1572	-	1820
OWC expected at		1594	-	1851

Zone 2	- Sandstone, interbedding of light grey, fine to medium grained sandstone and grey to dark grey very fine grained sandstone/ siltstone, occasionally strongly micaceous. Carbonate cemented bands common throughout.	1685 (33)	+/- 10	1980 (47)
TD	Within zone 2.	+/- 1718 m	-	2027

1.9 Pressure Regime

Data gained from drilling, electric logging, RFT pressure measurements and production tests show that the wells drilled to-date in block 31/2 are hydrostatically pressured. (See enclosure 3)

The proposed target of location 31/2-H is some 2.25 km North of 31/2-5 and 3.7 km South of well 31/2-11 and is considered to be in the same hydrostatically pressured regime.

1.10 Mud Resumé

36" Hole

The 36" hole section is to be drilled with a seawater and viscous pill combination. Some 350 bbls of viscous mud will be used to drill the first 10 - 20 m into seabed.

26" Hole

The 14-3/4" pilot hole for the 26" hole section is to be drilled with an unweighted gelled-seawater mud combined with the frequent spotting of viscous pills. The 14-3/4" pilot hole will be opened up to 26" using seawater and viscous pills, with the riser removed and returns to seabed. (See section 2.4).

Note:

Prior to pulling out of the 14-3/4" pilot hole and 26" hole for logging and the running of 20" casing respectively, mud of 1.35 SG is to be spotted in the open hole section, to ensure hole stability.

17½" Hole

The 17½" hole section will be drilled with a low toxicity oil based mud system (Fazekleen) with a mud weight of 1.30 - 1.45 SG (.563 - .628 psi/ft).

Note:

Studies indicate that with a hole angle of 45 deg, a mud weight as high as 1.45 SG might be required to stabilize the hole.

12-1/4" Hole

For the 12-1/4" hole section the Fazekleen mud system will be used starting off with a mud weight of 1.25 SG (.541 psi/ft). Towards TD a mud weight of 1.39 SG (.602 psi/ft) could be required. The fluid loss is to be brought down to the lowest practical value but certainly below 5cc.

Note:

a) Mud weights mentioned are a guide only and are liable to change if hole conditions dictate.

b) If the 1.25 SG mud weight is used in the 12-1/4" hole when drilling into the reservoir the overbalance on top of the reservoir in the event of the riser being disconnected is +/- 290 psi.

c) The mud engineering services for this well will be provided by Dresser Norway A/S. A full mud programme for the well has been compiled by Dresser.

1.11 Environmental Aspects of Oil Based Mud

The oil based mud programme for use in this well is based on the use of a low aromatic content, low toxic type oil - a so called "Clean Oil" mud. Permission has been received from the State Pollution Authority (SFT) for the use of Dresser Fazekleen mud in well 31/2-H, permitting the direct discharge of unwashed cuttings into the sea. However, there is a requirement involving the regular collection and analysis of samples of both the mud and cuttings. The frequency for the collection of these samples is specified in section 4.5.

At the time of writing this drilling programme, discussions are underway regarding the necessity for an environmental seabed survey. The environmental survey requirement will be published as a separate document.

1.12 Well Control

A diverter will be hooked up to the riser during the drilling of the 14-3/4" pilot hole for 20" casing. In addition, 1.35 SG mud (.585 psi/ft) should be available during this diverter drilling in case flows are encountered. Cement will also be available on the rig for use in an emergency. Pressure control will be maintained from the 20" casing point to TD in accordance with the well control policy manual EP 58000.

1.13 Directional Drilling

1.13.1 Directional Plan (see figs. 2, 3a and 3b).

a) Center of geological target co-ordinates
60 deg 47' 28.56" N
03 deg 25' 37.66" E
UTM 6739773 m N
523254 m E

b) Rectangular co-ordinates of geological target center from planned rig location.
454 m N 391 m W

c) Rig location co-ordinates
60 deg 47' 13.8" N
03 deg 26' 03.31" E
UTM 6739319 m N
523645 m E

d) Required well path azimuth
319.3 deg True from planned rig location.

e) Suggested rates of build up:

- Kick off point (KOP) at 500 m TVBDF

- In 14-3/4" pilot hole from 500 m TVBDF to 20" casing depth: 1.5^{0}/30 m build up.

- In 17½" hole from 20" casing depth until a 45 deg tangent angle is reached (+/- 1106 m TVBDF, +/- 1161.5 m AHBDF): 2.5^{0}/30 m build up.

f) Geological target is a circle with a radius of 100 m. Center of geological target is at 600 m horizontal departure from the rig location.

1.13.2 Theoretical Well Path Data (Ref. fig. 2)

	Depth		Departure	Coordinates	
	m TVBDF	m AHBDF	(m)	m N	m W
Derrick Floor	0	0	0	0	0
Seabed	359	359	0	0	0
Kick off depth	500	500	0	0	0
20" shoe build to 15.18^{0}	800	803.5	40	30.3	26
End of build up 45^{0}	1106	1161.5	217.4	164.7	141.9
Reservoir top	1535	1768	646.2	489.6	421.8
Total depth	1718	2027	829.3	628.3	541.2

Note:

- Due to the shallow depth of the reservoir and the difficulties that could be encountered in building up the hole angle to 45 deg the planned well path is designed to "over shoot" the centre of the geological target by 46.2 m in anticipation that the actual path will be "below" the planned path and thus reach the target as close to the center as possible. The table above should be the aim for directional drilling, however, dropping off, or the establishment of a lower tangent angle will be considered if the build up is carried out exactly as planned.

- Departure is horizontal distance from planned rig location.

- Co-ordinates are rectangular distance from planned rig location.

1.13.3 Deviation Control

Totcos are to be taken while drilling the 36" hole and 14-3/4" pilot hole down to KOP at 500 m TVBDF. From the KOP to the end of the build up section a directional steering tool will be used. Magnetic single shots will thereafter be taken approximately every three to five singles drilled - as necessary.

Gyro Multishot surveys will be run inside the 20", 13-3/8" and 9-5/8" casings.

The well path will be calculated using the "Radius of Curvature" method.

1.14 Casing Summary

Size	Grade	Weight	Coupling	Shoe Depth TVBDF	Shoe Depth AHBDF	Casing requirement
30"	X-52,1"WT	310 lbs/ft	ATD-RB squnch	460 m	460 m	101 m
20"	X-52	129 lbs/ft	Vetco LS-LH	800 m	804 m	445 m
13-3/8"	N-80	72 lbs/ft	BTC	1505 m	1725 m	1366 m
9-5/8"	N-80	47 lbs/ft	BTC	1710 m	2015 m	1656 m

Note:

a) The 13-3/8", N-80, 72 lbs/ft, BTC casing has been specially drifted at the mill (during manufacturing) and will again be drifted on the pipe rack of the rig (before running) to ensure a 12-1/4" bit will pass. (Special drift required on site).

1.15 Wellhead Equipment

Vetco SG-5 18-3/4", 10,000 psi wellhead equipment.

1.16 Formation Leak-off Tests

Leak-off tests will be made after drilling 5 metres of new hole below 20" and 13-3/8" casing shoes.

1.17 Casing Accessories

30" Float shoe.

20" Guide shoe and baffle collar one joint above shoe. Two spring centralizers on the shoe-joint and three centralizers equally spaced between the shoe joint and the KOP at 500 m TVBDF. Two spring centralizers equally spaced inside 30" conductor. (Total of spring centralizers required: +/- 7).

13-3/8" Float shoe + float collar one joint above shoe. Use one spring centralizer per two joints on the bottom 10 joints, then one spring centralizer per 3 joints up to the end of build up section. Use one spring centralizer per joint over the build up section up to the 20" shoe, and 3 centralizers equally spaced from the 20" shoe to the KOP at 500 m TVBDF. (Total of spring centralizers required: +/- 50).

9-5/8" Float shoe + float collar 2 joints above the shoe. One spring centralizer per joint up to the 13-3/8" shoe. One centralizer per three joints inside the 13-3/8" casing up to 450 m AH above the 13-3/8" shoe. (Total of spring centralizers required: +/- 36).

Note:
The above centralizer positions are guidelines only.

1.18 Casing Test Pressures

Casing test pressures will be as follows:

20"	1000 psi for 15 mins
13-3/8"	2500 psi for 15 mins
9-5/8"	3000 psi for 15 mins

Pressure tests on the 20", 13-3/8" and 9-5/8" casings to be carried out immediately after bumping the top plug. The casing may be retested using an RTTS packer set below the top of cement around the particular casing if there is concern over the casing being worn.

1.19 Cement Calculations: See enclosure 2.

1.20 Contingency Plans - Stand-by vessel

The current A/S Norske Shell Exploration & Production Emergency Contingency Plans are valid for this drilling operation.

The name of the stand-by vessel which will be used is M/V "Sentinel Kathinka".

2. SUMMARY OF OPERATION

2.1 Pre-Spud Phase

Site Survey

a) Objectives

A/S GEOTEAM was engaged by A/S NORSKE SHELL EXPLORATION AND PRODUCTION to prepare a site survey report for well location 31/2-H in the Norwegian Sector of the North Sea, based on data from a previous survey carried out by GARDLINE SURVEYS LTD., in December 1981, and the seismic sections from this survey processed by Marlin Geophysical Norway A/S in February 1982 (A/S GEOTEAM Report No.9050).

In addition, A/S GEOTEAM data from previously performed surveys in the area were to be utilized. The survey was a combined seafloor investigation, bathymetric survey and a high resolution seismic survey. In order to map the sea floor topography and locate any debris or wrecks that might cause problems to drilling operations, profiles were run with an echo-sounder and side scan sonar.

b) Interpretation

The interpreted area is a square of dimensions 4 km x 4 km centered at the planned well location. The Side Scan Sonar data shows the seabed in the area to be mostly flat and featureless with the exception of frequent depressions (pockmarks). These pockmarks vary in diameter from 30 to 50 meters and are in general between 3 and 5 meter in depth. One small pockmark is present +/- 40 m west of the planned location. Except for these pockmarks, no debris or obstructions which might cause problems for drilling operations or anchoring were evident. The seabed consists of soft silty clay with a water depth of +/- 333.5 m at the proposed location.

Unit I	358 - 398 m BDF (40 m thick)	Soft, finely laminated clays.
Unit II	398 - 430 m BDF (32 m thick)	Stiff clays.
Unit III	430 - 475 m BDF (45 m thick)	Stiff clays.
Unit IV	475 - 495 m BDF (20 m thick)	Sand, silt and clay.
Unit V	495 - 510 m BDF (15 m thick)	Sand and gravel with possible boulders.
	510 m TVBDF and deeper:	Tertiary rocks. Clays with sandlayers dipping towards west.

At the planned drilling location 31/2-H no seabed or sub seabed hazard to a drilling operation has been detected.

2.2 Rig Positioning

The rig will be brought on to location utilizing Decca Pulse-8 with HP minicomputer. All anchors will be run out plus/minus 1400 m. The rig will be positioned with a heading of 290 deg True North. After anchors have been set, each anchor will be tested to plus/minus 400,000 lbs for 1 hour. After a satisfactory mooring test, approximately 250,000 lbs tension will be maintained on all anchor chains.

Satellite Navigation will be used to determine the final coordinates of the location, a minimum of 40 satellite passes are required.

2.3 Spudding in, drilling 36" hole and running 30" Casing

2.3.1 Check the seabed condition by lowering underwater TV on the guide lines prior to setting the TGB on seabed.

2.3.2 Set TGB (with 5 m skirt) with a Regan slope indicator installed. The TGB guide lines are to be marked at the spider deck level so that any subsequent sinking or tilting will be detected.

Note:

Calculate the DF - seabed distance and Mean Sea Level (MSL) after landing the TGB, taking into account the drilling draught and tidal variation.

2.3.3 Make up a 36" hole opener and 26" pilot bit assembly. Drill down to 30" casing setting depth, taking a survey (Totco) after the first kelly down. Additional surveys will be carried out as necessary, depending on hole angle. If hole angle is greater than 1½ degree then contact Base.

Before POH to run 30" casing circulate high viscosity mud (100 Sec MF) in the hole, using 100 % excess.

2.3.4 Run 30" casing plus PGB equipped with a Regan slope indicator (to be installed in the middle of a side beam, as close to the beam as possible). Ensure that the slope indicator is level and zeroed and will be visible on the subsea TV.

2.3.5 When the 30" casing is landed observe the angle with the subsea TV camera. If the angle is 1 degree or less, cement the casing using 150 % excess cement. (For cement calculations see enclosure 2A.)

2.3.6 WOC. RIH with jetting sub and wash in and around the wellhead housing. Divers to check around the guide bases with an observation dive, if necessary.

2.3.7 If excessive cratering is observed, re-cementing around the guide base or seabed may be considered prior to drilling out of the 30" casing.

Note:

a) For the single stack system the angle of the PGB and the BOP stack, and the base being level, are of utmost importance and good support is required to carry the heavy load of the stack.

b) Observe operations such as placing of the TGB and PGB, spudding in, stabbing in, drilling with returns to seabed, cementing of the 30" and 20" casings, with the rig's underwater TV camera.

c) Adjust anchor tension to facilitate stabbing, running and cementing of the 30" casing if deemed necessary.

d) Ensure that the tension of the guide lines is optimum (6000 lbs) so that the TGB will not be lifted on one side or be tilted by excessive uneven guide line tension.

e) In previous wells, the guide bases have sunk into the soft sea bed when landing the 30" casing/PGB. In the case that this phenomena is observed, the 30" casing should be kept in tension whilst cementing and W.O.C. Care should be taken to maintain a constant load of the casing/ PGB on the TGB, adjusting the compensator for the weight of the cement when inside the casing (+/- 80 ton), and the buoyancy effect of the cement when in the annulus.

2.4 Drilling 26" hole and running 20" casing

2.4.1 Drill out cement in 30" casing and 36" pocket with 26" hole opener and 14-3/4" pilot bit with a stabilizer at 20 m and start 14-3/4" pilot hole. POH and lay down 26" hole opener and stabilizer.

2.4.2 Run 30" hydraulic latch and dump valve complete with ball joint on 21" riser. Fill up riser with seawater and observe fluid level.

2.4.3 Make up 14-3/4" pilot hole drilling assembly. Use a float sub, with the float installed, and run in hole.

2.4.4 Close diverter around drill pipe, and circulate through both diverter lines to check the diverter equipment, gradually building up to maximum circulating rate. Open diverter packing.

2.4.5 Drill 14-3/4" pilot hole to 500 m BDF taking Totco surveys as required. From 500 m BDF the 14-3/4" pilot hole will be kicked off with a build up rate of 1.5^{o}/ 30 m at an azimuth of 319.3 deg True down to the 20" casing setting depth, using a bent sub, down hole motor assembly and steering tool.

Note:

This section is to be drilled using an unweighted gelled mud and the weight of annular returns is to be continuously monitored. If the weight of annular returns causes losses or exceeds 1.15 SG (.498 psi/ft) stop drilling and circulate the hole clean. Utmost care to be taken to avoid washouts and angle drop while conditioning mud. ROP must be controlled whilst drilling this section.

2.4.6 Perform a check trip to the 30" shoe and back to bottom, clean out any fill and spot viscous mud of 1.35 SG (.585 psi/ft) in the open hole section prior to pulling out of hole for logging.

2.4.7 Rig up Schlumberger and log as programmed.

Note:

Inspect the logs for indications of shallow gas prior to continuing with the programme. If any indications of shallow gas are observed then call Base and a revised programme will be issued.

2.4.8 Rig down Schlumberger and run in hole to 30" shoe and displace the casing and riser to seawater. Continue to RIH to TD. Circulate the hole volume to seawater and open the dump valve (close kelly cock). Observe well static for ½ hour and then spot viscous mud in the open hole section. If flow occurs, the 14-3/4" pilot hole will be under-reamed as described under "Notes on Diverter Drilling" item d page 15.

Note:

The 1.35 SG mud spotted prior to logging, should be circulated out in steps and dumped via the dump valve to prevent losses to the formation due to the heavy mud entering the marine riser.

2.4.9 Pull out of hole and retrieve the 30" hydraulic latch on riser.

2.4.10 Make up the 18-3/4" housing with running tool, B.J. stinger and top plug and stand back in derrick. Also make up the cement head on a joint of HWDP.

2.4.11 Run a pilot bull nose with +/- 1" hole and one Dp single below a 26" hole opener and open the hole up to 26" with steady weight on bit using seawater and viscous pills as required.

2.4.12 Drop a Magnetic Single Shot Survey and perform a check trip to the 30" shoe and back to bottom, clean out any fill and spot viscous mud of 1.35 SG (.585 psi/ft) in the open hole section prior to pulling out of hole for running casing.

2.4.13 Run and cement 20" casing as per programme.

Note:

a) Guide shoe and baffle collar with special profile will be used. The baffle collar will be installed between the first and second casing joints and 1 subsea plug (top plug) will be used for cement displacement and will subsequently latch into the baffle collar.

b) If gas has been encountered in the pilot hole a regular float shoe will be used instead of the guide shoe.

c) Casing to be run on HWDP only.

d) A 26" pocket of +/- 4 m is considered adequate for the 20" casing.

2.4.14 Unlatch the running tool and POH.

2.4.15 RIH with a jetting sub and wash in and around the 18-3/4" wellhead housing. POH and lay down the jetting sub.

2.4.16 Install the 18-3/4" BOP stack and 21" Marine Riser. Test BOP stack, complete with casing. For stack test procedure see "Blowout Prevention Equipment Testing" section 3. Make up drill pipe hang off assembly and circulating head assembly. Install seat protector.

2.4.17 Run a Gyro Multi Shot Survey on the 20" casing.

Notes on Diverter Drilling/ Shallow gas drilling

a) A diverter system is fitted on the "Borgny Dolphin" to provide a means of controlling the flow should shallow pressures be encountered whilst drilling for the first casing string (20" surface casing).

b) The diverter system is not a blowout preventer. It is not designed to hold pressure, but instead, to direct the flow overboard. The controls of the flowline valves are manifolded in such a way that it is impossible to hold any pressure in the diverter. The downwind blow-off line must always be open.

c) Severe Losses

If severe losses are encountered while drilling with returns to surface, restrict penetration rates to obtain the lightest possible annular returns. If severe losses continue, drilling an 8½" pilot hole with returns to seabed could be considered.

If gas is encountered whilst drilling 8½" pilot hole with seawater and returns to seabed, spot heavy mud and inform Base.

d) Gas Flow (No Losses)

If there are any signs of gas having been encountered whilst drilling the 14-3/4" pilot hole, carry out the following programme: -

i) Drill to 20" casing setting depth with the mud weight required.

ii) Circulate the hole clean and make a wiper trip to the 30" shoe and back to bottom. Circulate bottoms-up and spot weighted viscous mud as required. POH.

iii) Run logs as programmed.

iv) RIH with 14-3/4" bit and displace hole to mud with required weight for under-reaming. Dump heavy mud via dump valve. POH.

v) RIH with 26" hydraulic under-reamer with one Up single and a pilot bull nose below.

vi) Under-ream the 14-3/4" hole to 26". Check hole size with a BGT log.

vii) RIH and circulate the hole clean.

viii) Increase the weight of the mud in the interval TD - seabed, to give an overbalance to any potential gas zones and thus compensate for removing the riser.

ix) POH to seabed. Circulate the drillpipe and marine riser to seawater and close kelly cock. Open the dump valve and observe the well static for 30 mins. Unlatch the 30" hydraulic latch and pull the marine riser.

x) Make up the 18-3/4" housing with running tool, B.J. stinger and top plug and stand back in derrick.

xi) Run a BGT to check hole size.

xii) Rig up and run 20" casing.

Note:

- Regular float shoe will be used together with the baffle collar.
- Casing will be filled with mud, weight as in step viii above, whilst RIH.
- If the casing has to be circulated down and when circulating prior to cementing, weighted mud (as used in step viii) above is to be used.

e) Gas Flow and Severe Losses

If any flow of gas is encountered whilst drilling the 14-3/4" pilot hole with returns to surface, and the required increased mud weight to counteract the gas flow causes severe losses, then inform Base and the various options will be considered.

Note:

There should be sufficient barytes (200 m/t) and SAPP (1500 kg) onboard the rig to allow for the setting of baryte plugs. Further programme will be advised in this case.

2.5 Drilling 17½" hole and running 13-3/8" casing

2.5.1 Drill out shoe track and shoe with a 17½" bit. Drill 5 m of new hole, and carry out a formation leak-off test.

2.5.2 Drill 17½" hole with a 2.5°/ 30 m build up rate at an azimuth of 319.3 deg true until a tangent angle of 45 deg is reached (+/- 1106 m TVBDF, +/- 1161.5 m AHBDF).

The 17½" build up section will be initiated with bent sub, mud motor and steering tool.

When the 45 deg tangent angle is reached, change to a conventional "locked" bottom hole assembly to maintain the 45 deg tangent angle to 13-3/8" casing setting depth.

Note:

a) Consider to run a "limber" assembly over the section drilled with steering tool prior to running the "locked" assembly.

b) If dog legs in excess of 4°/ 30 m are encountered repeated reaming will be necessary to minimize dog leg severity.

c) If the build up section is achieved exactly according to plan (fig. 2), the tangent angel required is less than 45 deg, enabling the well bare to intersect the centre of the geological target.

d) This hole section will be drilled with a low toxicity oil based mud system (Fazekleen) starting off with a mud weight of 1.30 SG.

2.5.3 Log as per programme. Make up 13-3/8" casing hanger with seal assembly and subsea cementing assembly (use two plugs) and stand back in derrick.

2.5.4 Make checktrip to casing setting depth and wash wellhead area on the way out. Pull wearbushing and run 13-3/8" casing to landing point, leaving 10 m pocket below the 13-3/8" shoe.

2.5.5 Cement 13-3/8" casing as per programme. Test casing to 2500 psi after bumping the plug. Energize the seal assembly and test to 4250 psi as per "Blowout Prevention Equipment Testing" Section 3. Clean out the stack area prior to pulling out with the running string.

2.5.6 Carry out stack test as per "Blowout Prevention Equipment Testing" Section 3. Install wearbushing. Make up drillpipe hang-off assembly and circulating head assembly. Carry out a kickdrill.

2.6 Drilling 12-1/4" hole and running 9-5/8" casing

2.6.1 Circulate and condition mud reducing mud weight to 1.35 SG.

2.6.2 Drill out float collar, cement and shoe. Drill 5 m of new hole, and carry out a formation leak-off test.

2.6.3 Drill 12-1/4" hole with conventional "locked" bottom hole assembly to coring point and POH.

Note:

Take Magnetic single shots every 100 m, maximum.

2.6.4 Commence coring, using fibreglass inner corebarrel and 12-1/4" core head, from the top of the reservoir in the Upper Jurassic sandstone and continue until just below the top of the continuous micaceous sands, i.e. maximum 1620 m TVBDF. Approximate interval to be cored is 1535 - 1620 m TVBDF (1768 - 1888 m AHBDF). Total coring interval: 120 m AH.

2.6.5 Continue drilling to TD at +/- 1718 m TVBDF (2027 m AHBDF).

2.6.6 Carry out logging programme.

2.6.7 Make up 9-5/8" casing hanger with seal assembly and subsea cementing assembly (using two plugs) and stand back in derrick.

2.6.8 Make check trip and wash wellhead on the way out. Pull wearbushing and run 9-5/8" casing to landing point.

2.6.9 Cement the 9-5/8" casing as per programme. Whilst displacing, (in turbulent flow at 250 ft/min or higher), returns are to be monitored closely. If losses are observed adjust pump rates until full returns are obtained. Test casing to 3000 psi after bumping the plug. Energize the seal assembly and test to 4250 psi. Clean out the stack area prior to pulling out the running tool.

2.6.10 Carry out stack test as per "Blowout Prevention Equipment Testing" section 3. Install wearbushing. Carry out a kickdrill.

2.7 Production Testing

A short production test in the oil zone will be carried out to record performance and provide information on the oil-water coning tendency at, or close to the oil-water contact.

A separate test programme will be issued.

2.8 Abandonment

A specific abandonment/suspension programme will be prepared and issued when the well reaches total depth, but the general points below will apply:

2.8.1 If there is open hole below the last casing then all porous zones in the open hole interval will be isolated with cement plugs extending 50 m above and below each zone. In addition a cement plug, extending 50 m above and below the casing shoe, shall be set. The top of the cement plug shall be located and load tested. A mechanical bridge plug may be set in the lower part of the casing but not more than 50 m above the shoe. A 20 m cement plug must be placed on top of the bridge plug. The plugs at the last casing shoe shall be tested to 1000 psi (70 bar) differential pressure.

2.8.2 Perforations shall be isolated by means of a mechanical bridge plug and squeeze cemented, or a cement plug shall be placed across the perforations extending 50 metres above and below the perforated interval or down to a casing plug whichever is less.

2.8.3 Cement plugs of at least 50 metres shall be placed in the smallest casing string extending to seabed. These plugs shall be placed at the level of the 13-3/8" casing shoe and the 20" casing shoe.

2.8.4 A cement plug of at least 200 metres, with the top of the plug not more than 50 metres below the sea floor, shall be placed in the smallest string of casing extending to the sea floor.

2.8.5 Casing strings and other installations extending above the sea floor will be removed to a depth of at least 5 metres below the ocean floor.

2.8.6 The sea floor in the vicinity of the borehole will be inspected by underwater TV/observation dive to ensure that no obstructions remain on the sea bed which may cause danger or impediment to fishing or shipping.

3. BLOWOUT PREVENTION EQUIPMENT TESTING

3.1 18-3/4" 10.000 psi BOP stack

3.1.1 Stack configuration

Upper Annular preventer	7500 psi WP
Lower Annular preventer	7500 psi WP
Blind/ Shear Rams	10000 psi WP
Choke line outlet	
Upper Pipe Rams	10000 psi WP
Middle Pipe Rams	10000 psi WP
Variable Pipe Rams 3½" - 7-5/8"	10000 psi WP
Kill line outlet	

3.1.2 Test pressures required on test stump

Annular preventers	5000 psi
Blind/ Shear rams	10000 psi
Pipe Rams	10000 psi
Variable Pipe Rams	10000 psi
Kill/ choke lines and valves	10000 psi

3.1.3 First test after landing BOP stack on the 18-3/4" housing

Pipe Rams	5000 psi
Variable Pipe Rams	5000 psi
Blind Rams	Function test only (Will be tested to 10,000 psi at surface).
Kill/Choke lines and valves	5000 psi
Annular preventers	2500 psi

3.1.4 Subsequent tests

Pipe Rams	4000 psi
Variable pipe ram	4000 psi (Also see note c)
Blind Rams	Function test only (Also see note b).
Kill/choke lines and valves	4000 psi
Annular preventers	2500 psi around 5" DP 1500 psi around 3½" DP

Note:

a) Tests to be carried out with a test tool run on DP and landed in the wellhead.

b) Blind/shear rams will be function tested only. During the BOP test before commencing production testing the blind rams will be tested to 4000 psi by backing off the test plug.

c) The 13-3/8" and 9-5/8" seal assemblies are to be tested to 4250 psi using the variable pipe rams. Note that the collapse pressure of the 13-3/8" and 9-5/8" casings are 2670 psi and 4750 psi respectively, thus an accurate check of the volume required

to pressure up is required to ensure that any leak is observed, and a collapse situation is not created.

Accumulator Tests

The accumulators should have sufficient capacity to be able to close, open and close all preventer with both air and electric charge pumps off, and then still have enough pressure left to provide working fluid for 25% of one closing function. Minimum recharge time from above condition with both air and electric pumps running should be in accordance with manufacturer's specifications.
Accumulator tests should be performed either on request of Base, or after repairs have been made to the accumulator system, i.e. bottles, bladders, pumps, etc.

Notes on Testing

a) The BOP stack must be tested on all functions using both pods and all rams tested to the full rated WP (10,000 psi) at surface prior to running the stack. After the surface tests all Cameron clamp connections and all studded connections must be checked for tightness.

b) All presssure tests to be carried out with water, unless differently advised by Base.

c) All surface equipment (manifolds, pumps etc.) has to be satisfactorily pressure tested prior to testing the BOP stack underwater.

d) When running the Marine Riser with integral kill and choke lines, the kill and choke lines can be tested while running in at various stages. This should be done approximately every five joints, firstly as soon as the stack is below sea level, and lastly, just before landing the stack.

e) When testing the BOP stack underwater with a test tool in the wellhead, use the vented blank test sub.

f) Pressure tests on seal assemblies should be done in 1000 psi stages up to the required test pressure. Pressure tests on the BOP should be carried out at a low pressure (1000 psi) for 5 minutes and to the required test pressure for 15 mins.

g) All pressure tests to be recorded on pressure recorder charts. A record is to be kept of the volumes required to obtain the test pressure, and of the volumes returned when bleeding off.

h) For all pressure tests the Shell TP must be present at the pumping unit to monitor volumes pumped and pressures. He must also witness the operation of each function.

i) The opening/closing times and the volumes of hydraulic operating fluid required for the operation of the various underwater stack components (such as: rams, kill and choke valves, annular preventers, hydraulic connectors, etc.) should be recorded during testing of the stack underwater. These results should be compared with the normal opening/closing times and volumes

required of the hydraulic system. Any major differences are an indication that the system is not operating "normally" and may require further investigation and/ or repairs.

j) The testing of 10,000 psi BOP stack will be done to 5000 psi for the first test, and to 4000 psi only, at the subsequent weekly routine BOP test underwater. If higher test pressures are required then, depending on the well programme, the test pressure will be increased to the value required and carried out with test tool, e.g. subjecting the seals of the seal assembly to the same pressure as the BOP stack.

4. EVALUATION REQUIREMENTS

4.1 Cuttings Samples

Ditch cuttings to be collected every 10 m along hole below 30" casing down to 13-3/8" casing depth, and every 3 m thereafter. The following bags of samples are required to be taken at each sample depth to enable distribution to all partners and government bodies:

a) 5 x full large bags (2 kg each) of wet cuttings.
b) 1 x medium large bag (1 kg) of wet cuttings for biostratigraphy.

1 of the above 5 x 2 kilogram large bags of wet samples from each interval should be kept on board until the well has reached TD when the complete set should be sent in. 4 x 2 kilogram samples should be sent ashore ASAP by boat, marked for attention of EPXV/1, Tananger. Biostratigraphy samples should be in cardboard boxes and sent in by the first available helicopter.

4.2 Coring

Coring will commence from top of the reservoir in the Upper Jurassic sandstone, and will continue until just below top of the continuous micaceous sands. Approximate interval to be cored is 1535 - maximum 1620 m TVBDF (1768 - 1888 m AHBDF).

12-1/4" core-head and fiberglass innerbarrels will be used.

Note:

A 150 gram sand sample will be taken from each 90 cm length of core taken across the oil bearing sand and properly labelled. This sample will be used in sieve analysis to optimize sand size for a possible gravelpack completion.

4.3 Logging Programme

At 20" casing depth	ISF/SONIC/SP/GR (GR to seabed) LDT/CNL/CAL/GR Gyro Multi Shot Survey in 20" casing.
At 13-3/8" casing depth	ISF/SONIC/SP/GR LDT/CNL/CAL/GR Gyro Multi Shot Survey in 13-3/8" casing.
At 9-5/8" casing depth (TD logging)	ISF/SONIC/SP/NGT LDT/CNL/CAL/GR RFT's (as required) Velocity Survey using a shooting boat. SWS (as required) CBL (on 13-3/8" casing and 9-5/8" casing). Gyro Multi Shot Survey in 9-5/8"casing.

4.4 Testing Programme

Testing of the well is subject to confirmation upon receipt of logs.

The intention is to production test the oil zone if sufficient thickness of oil column is found to be present. The completion technique to be applied, will be internal gravel pack (IGP).

4.5 Environmental Sampling

4.5.1 Cutting samples: Additional cuttings samples are required as follows whilst drilling with Fazekleen mud to enable hydrocarbon analysis to be carried out. (See Mud Programme section 5 for test procedure).

- 1 kg samples of cuttings will be taken three (3) times daily when drilling is in progress (17½" and 12-1/4" hole sections only), i.e. 0800, 1600 and 2400 hours. If drilling only occupies a part of the day the sampling number can be reduced accordingly.

- The daily samples will be mixed together and analyzed for total Hydrocarbon content by retorting at midnight. Results to be reported on the daily mud report.

1 kg of the analyzed cutting samples will be sent to shore appropriately labelled for comparable analysis of total *HC-content.*

4.5.2 Mud samples: Samples of the Fazekleen mud are required for toxicity testing for comparison with the original mud specifications.

Mud samples will be taken from the active pit during the drilling of 17½" and 12-1/4" hole sections as follows:

a) After having drilled out of the previously set casing.

b) In the middle of each hole section.

c) At the end of each hole section.

d) At TD.

Samples to be properly labelled and sent to shore.

5. CASING DESIGN

Casing designs are presented for the 20", 13-3/8" and 9-5/8" casings (See Encl. 1.0.)

The following assumptions apply:

5.1 For tension, a design safety factor of 1.6 is used, neglecting buoyancy in the drilling fluid and drag forces. Bending forces are considered and are highest in the section with 2.5^{0}/ 30 m build up. The maximum tensile loads for each string are given in the casing design with corresponding depth.

Note:

The max tensile load is not the expected hook load.

5.2 Bi-axial effects have been neglected except in the case of the lowering of collapse resistance caused by tension. No allowance is given for the increase of burst resistance caused by tension.

5.3 For burst, a design safety factor of 1.1 is employed. The pressure distribution for the burst loading assumes a 40% evacuation of mud from the well by a kick. (This is equivalent to a kick volume in excess of 100 bbls).

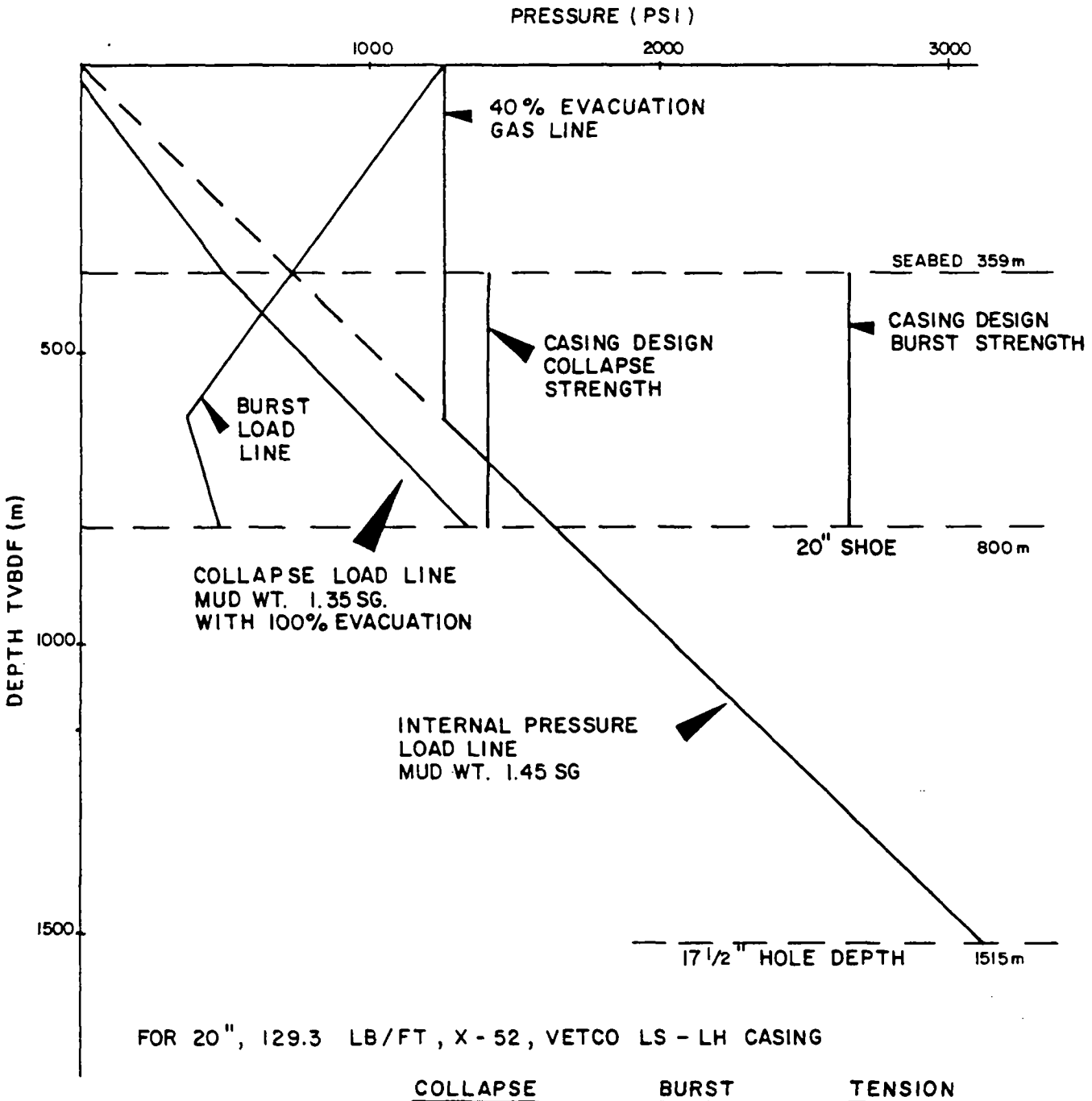
In the production test design for casing burst, a tubing leak is assumed putting full THP on the tubing/casing annulus, filled with 1.15 S.G. completion fluid.

5.4 For collapse, a design safety factor of 1.0 is employed. Total evacuation has been assumed for the 20" and 9-5/8" casings. For the 13-3/8" casing, evacuation of 75 % has been assumed for the design.

F. GLOSSARY OF ABREVIATIONS

AHBDF	:	along hole below derrick floor
BDF	:	below derrick floor
BGT	:	borehole geometry tool
BOP	:	blow out preventer
DF	:	Derrick Floor
FS	:	fail safe (as in FS valve)
GOC	:	gas oil contact
HC	:	Hydrocarbons
HWDP	:	Heavy weight drill pipe
ID	:	internal diameter
KOP	:	kick off point
MF	:	Marsh funnel (mud viscosity)
MR	:	Marine riser
MSL	:	mean sea level
MSS	:	magnetic single shot
OD	:	outside diameter
OWC	:	oil water contact
PGB	:	permanent guide base
PPG	:	pounds per US gallon
PV	:	plastic viscosity
ROP	:	rate of penetration
SS	:	sub sea
TD	:	total depth
TGB	:	temporary guide base
THP	:	tubing head pressure
TMCM	:	Transverse Mercator Central Meridian
TV BDF	:	True vertical below derrick floor
UGF	:	universal guide frame
YP	:	*yield point*
WHP	:	wellhead pressure
WP	:	working pressure
WOC	:	wait on cement
UTM	:	Universal Transverse Mercator

20" CASING DESIGN 31/2-H



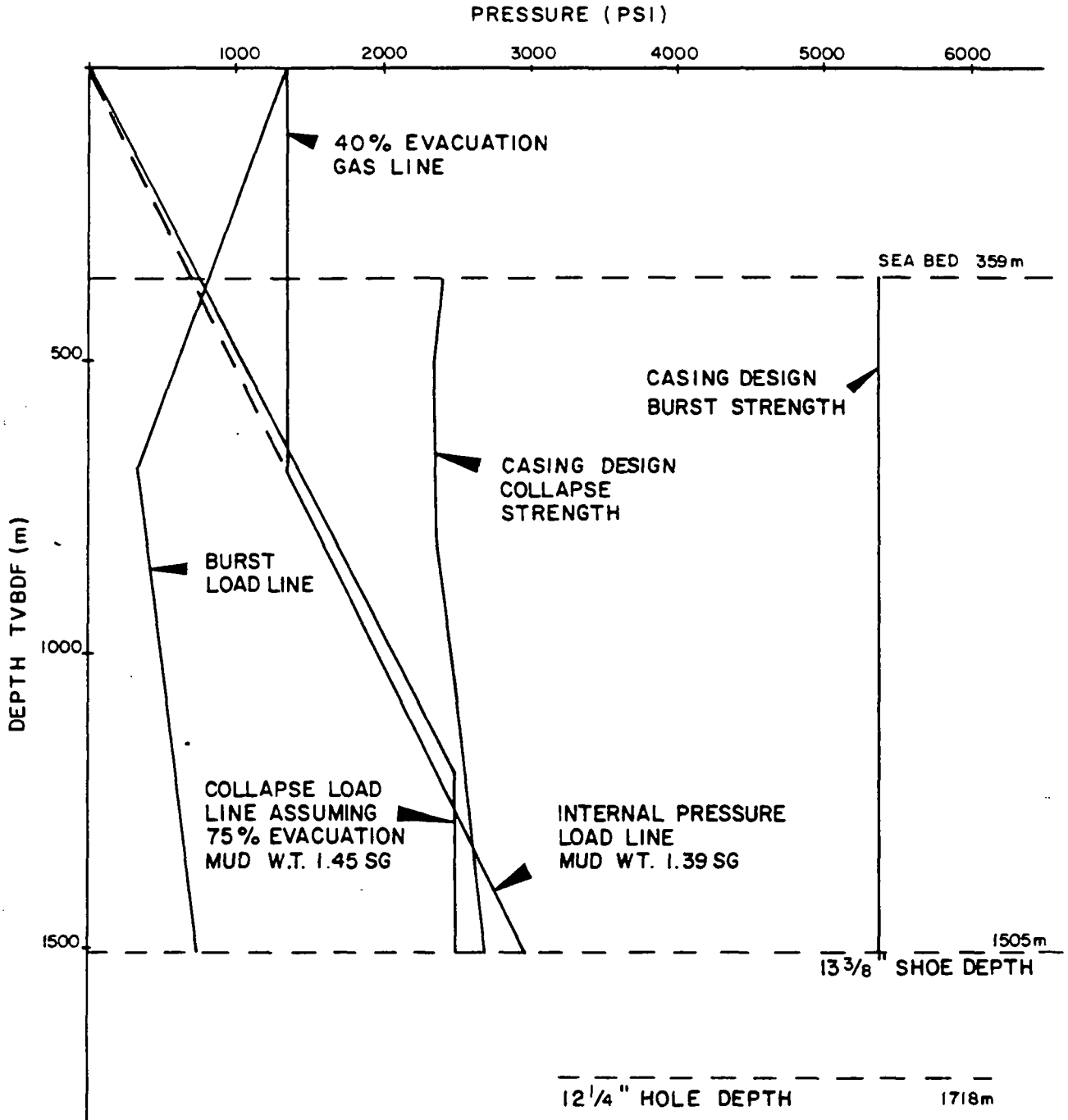
FOR 20", 129.3 LB/FT, X-52, VETCO LS-LH CASING

	COLLAPSE	BURST	TENSION
API RATING	1410	2930	1.978.000
SAFETY FACTOR	1.0	1.1	1.6
DESIGN STRENGTH	1410	2663	1.236.250

MAXIMUM TENSILE LOAD AT 500m TVBDF,
INCLUDING BENDING FORCES : 371.000 lbs

ENCL. 1a

13 3/8" CASING DESIGN 31/2-H



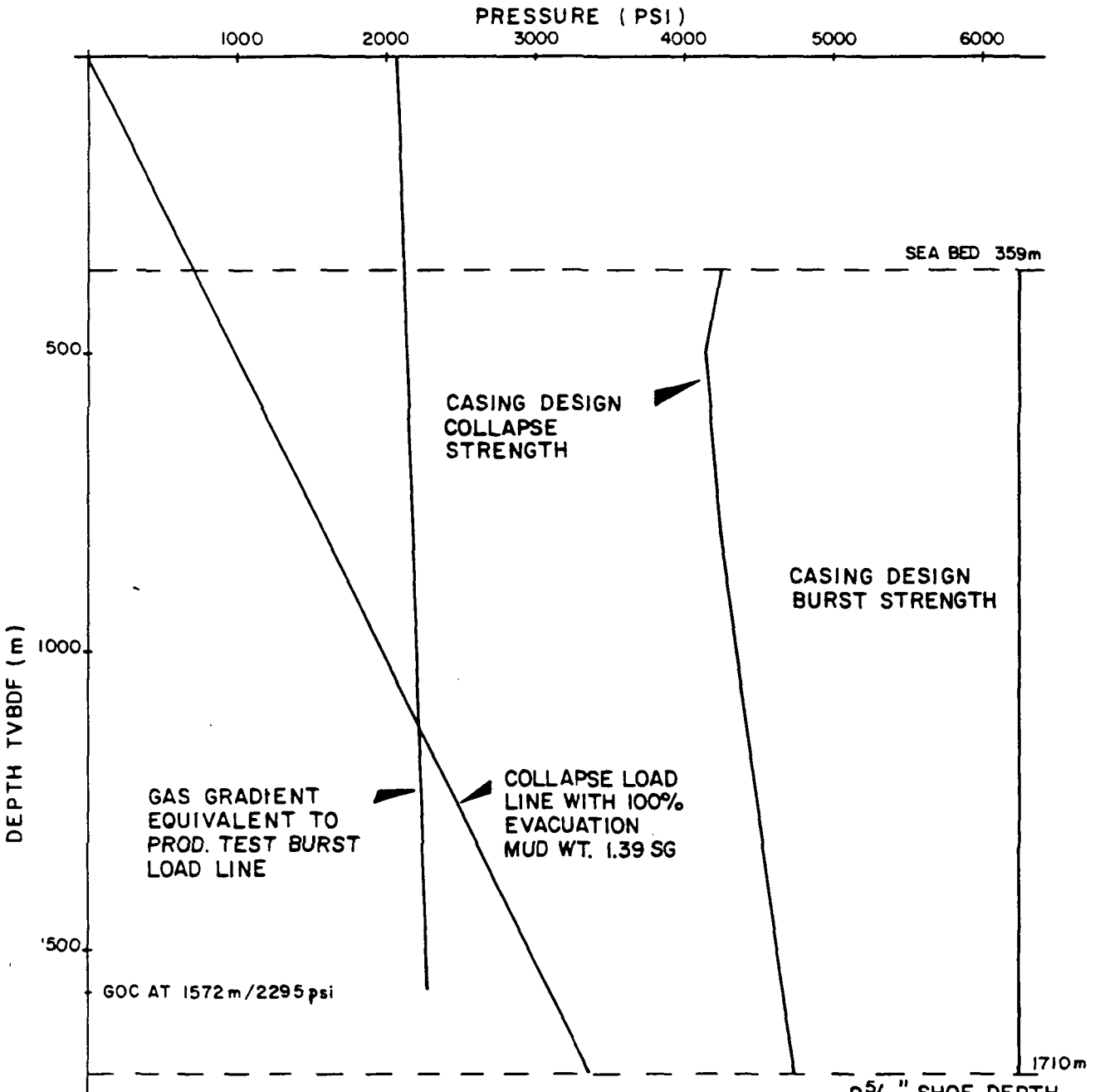
FOR 13 3/8", 72 LB/FT, N80 BTC CASING

	COLLAPSE	BURST	TENSION
API RATING	2670	5380	1.661.000
SAFETY FACTOR	1.0	1.1	1.6
DESIGN STRENGTH	2670	4891	1.083.125

MAXIMUM TENSILE LOAD AT 500m TVBDF, INCLUDING BENDING FORCES: 328 413 lbs

ENCL. 1b

9 5/8" CASING DESIGN 31/2-H



FOR 9 5/8", 47 LB/FT, N80, BTC CASING

	COLLAPSE	BURST	TENSION
API RATING	4750	6870	1.086.000
SAFETY FACTOR	1.0	1.1	1.6
DESIGN STRENGTH	4750	6245	678.750

MAXIMUM TENSILE LOAD AT 500m TVBDF,
INCLUDING BENDING FORCES : 229 339 lbs

ENCL. 1c

CEMENT CALCULATIONS

30" Cementation

Extended Norcem Class "G" cement of lead slurry weight 13.2 ppg(1.58 SG) and 10 m of 15.8 ppg(1.90 SG) tail slurry above the shoe are to be used. The casing is to be cemented back to seabed, and an excess of 150 % is to be used over open hole intervals. Cement displaced to 10 m above shoe.

Data: Casing 30" 1" WT/VETCO "ATD-RB"
Seabed 359 m BDF
30" shoe 460 m BDF
36" hole 470 m BDF

13.2 ppg Lead Slurry Volumes

i)	36" x 30" annulus	= (450-359)x3.281x2.1598x2.5	=	1612.1 cu.ft.
	Cement required	= 1612.1/1.89	=	853.0 sxs
			=	36.4 m/t
	Seawater required	= 853 x 10/42	=	203.1 bbls
	Econolite required	= 853 x 0.36	=	307.0 gals.

15.8 ppg Tail Slurry Volume

i)	36" x 30" annulus	= (460-450)x3.281x2.1598x2.5	=	177.2 cu.ft.
ii)	36" pocket	= (470-460)x3.281x7.0686x2.5	=	579.8 cu.ft.
iii)	30" casing fill	= 10 x 3.281 x 4.2761	=	140.3 cu.ft
		Total slurry	=	897.3 cu.ft.
	Cement required	= 897.3/1.17	=	766.9 sxs
			=	32.7 m/t
	Seawater required	= 766.9 x 5.15/42	=	94.0 bbls
	$CaCl_2$ required 3%(BWOC)	= 766.9 x 94 x 0.03/2205	=	0.98 m/t

20" Cementation

Extended Norcem Class "G" cement of lead slurry weight 13.2 ppg(1.58 SG), and 60 m AH of tail slurry above the shoe, of weight 15.8 ppg(1.90 SG) are to be used. The casing is to be cemented back to seabed and an excess of 100% is to be used over open hole intervals. Cement to be displaced to the baffle collar approximatly 12 m AH above the guide shoe using 1 subsea cement plug.

Data: Casing 20"/129 lbs/ft/X-52/Vetco LS-LH
30" shoe at 460 m TVBDF
36" hole at 470 m TVBDF
20" shoe at 804 m AHBDF
26" hole at 814 m AHBDF

13.2 ppg Lead Slurry Volumes

i)	30" x 20" annulus	= (460-359)x3.281x2.0944	=	694.0 cu.ft.
ii)	36" x 20" annulus	= (470-460)x3.281x4.8869x2	=	320.7 cu.ft.
iii)	26" x 20" annulus	= (744-470)x3.281x1.5053x2	=	2706.5 cu.ft.
		Total slurry volume	=	3721.2 cu.ft.
	Cement required	= 3721.2/1.89	=	1968.9 sxs
			=	84.0 mt
	Seawater required	= 1968.9 x 10/42	=	468.8 bbls
	Econolite required	= 1968.9 x 0.36	=	708.8 gals

15.8 ppg Tail Slurry Volumes

i)	26" x 20" annulus	= (804-744)x3.281x1.5053x2	=	592.7 cu.ft.
ii)	26" pocket	= 10 x 3.281 x 3.6870 x 2	=	241.9 cu.ft.
iii)	20" casing fill	= 12 x 3.281 x 1.9174	=	75.5 cu.ft.
		Total slurry volume	=	910.1 cu.ft.
	Cement required	= 910.1/1.17	=	777.9 sxs
			=	33.2 mt
	Seawater required	= 777.9 x 5.15/42	=	95.4 bbls
	$CaCl_2$ required 2% (BWOC)	= 777.9 x 94 x 0.02/2205	=	0.66 mt

ENCL. 2 C

13-3/8" Cementation

Extended Norcem Class "G" cement of lead slurry weight 13.2 ppg(1.58 SG), and 100 m of tail slurry above the shoe, of weight 15.8 ppg(1.90 SG) to be used. The casing is to be cemented back to 150 m AH inside the 20" casing using 20 % excess on open hole volumes. If caliper is available, use 10 % excess over and above the estimated caliper volume. Cement will be displaced to a float collar c. 13 m above the shoe. Sea water will be used to displace the cement.

Data: Casing 13-3/8"/72 lb/ft/N80/BTC
20" shoe at 804 m AHBDF
26" hole at 814 m AHBDF
13-3/8" shoe at 1725 m AHBDF
17-1/2" hole at 1739 m AHBDF

13.2 ppg Lead Slurry Volumes

i)	20" x 13-3/8" annulus = (804-654)x3.281x0.9377	=	461.5 cu.ft
ii)	26" x 13-3/8" annulus = (814-804)x3.281x2.7113x1.2	=	106.7 cu.ft
iii)	17½"x 13-3/8" annulus =(1625-814)x3.281x0.6946x1.2	=	2217.9 cu.ft
	Total slurry volume	=	2786.1 cu.ft
	Cement required = 2786.1/1.79	=	1556.5 sxs
		=	66.4 mt
	Freshwater required = 1556.5 x 9.47/42	=	351.0 bbls

Additives to be advised.

15.8 ppg Tail Slurry Volumes

i)	17½"x 13-3/8" annulus =(1725-1625)x3.281x0.6946x1.2	=	273.5 cu.ft.
ii)	17½" pocket = 14 x 3.281 x 1.6703 x 1.2	=	92.0 cu.ft.
iii)	13-3/8" shoe track = 13 x 3.281 x .8406	=	35.9 cu.ft.
	Total slurry volume	=	401.4 cu.ft
	Cement required = 401.4/1.17	=	343.0 sxs
		=	14.6 mt
	Freshwater required = 343.0 x 5.07/42	=	41.4 bbls

Additives to be advised.

9 5/8" Cementation

Norcem Class "G" cement at 15.8 ppg(1.90 SG) slurry weight will be used as the main slurry up to 1380 m TVBDF (1543 m AHBDF) 50 bbls (262 m) of 13.5 ppg (1.62 SG) scavenger slurry (Class "G") is to be pumped ahead of the main 15.8 ppg slurry. A 10% excess is to be used over and above estimated caliper volume over open hole intervals, and cement is to be displaced to a float collar c.24 m above the shoe.

Data: Casing 9-5/8"/47 lb/ft/N80/BTC
13-3/8" shoe at 1725 m AHBDF
17-1/2" hole at 1739 m AHBDF
9-5/8" shoe at 2015 m AHBDF
12-1/4" hole at 2027 m AHBDF

15.8 ppg Slurry Volume

i)	13-3/8"x9-5/8" annulus (1725-1543)3.281x.3262	=	194.8 cu.ft.
ii)	17-1/2"x9-5/8" annulus (1739-1725)3.281x1.1651x1.1	=	58.9 cu.ft.
iii)	12-1/4"x9-5/8" annulus (2015-1739)3.281x.3132x1.1	=	312.0 cu.ft.
iv)	12-1/4" pocket 12x3.281x0.8185x1.1	=	35.4 cu.ft.
v)	9-5/8" shoe track 24 x 3.281 x 0.4180	=	16.5 cu.ft.
	Total slurry volume	=	617.6 cu.ft.

Cement required = 617.6/1.17 = 527.9 sxs
= 22.5 mt

Freshwater required = 527.9 x 4.29/42 = 53.9 bbls

Additives to be advised.

13.5 ppg Scavenger Slurry Volumes

i)	13-3/8" x 9-5/8" annulus (1543-1281)3.281x.3262	=	280.4 cu.ft.

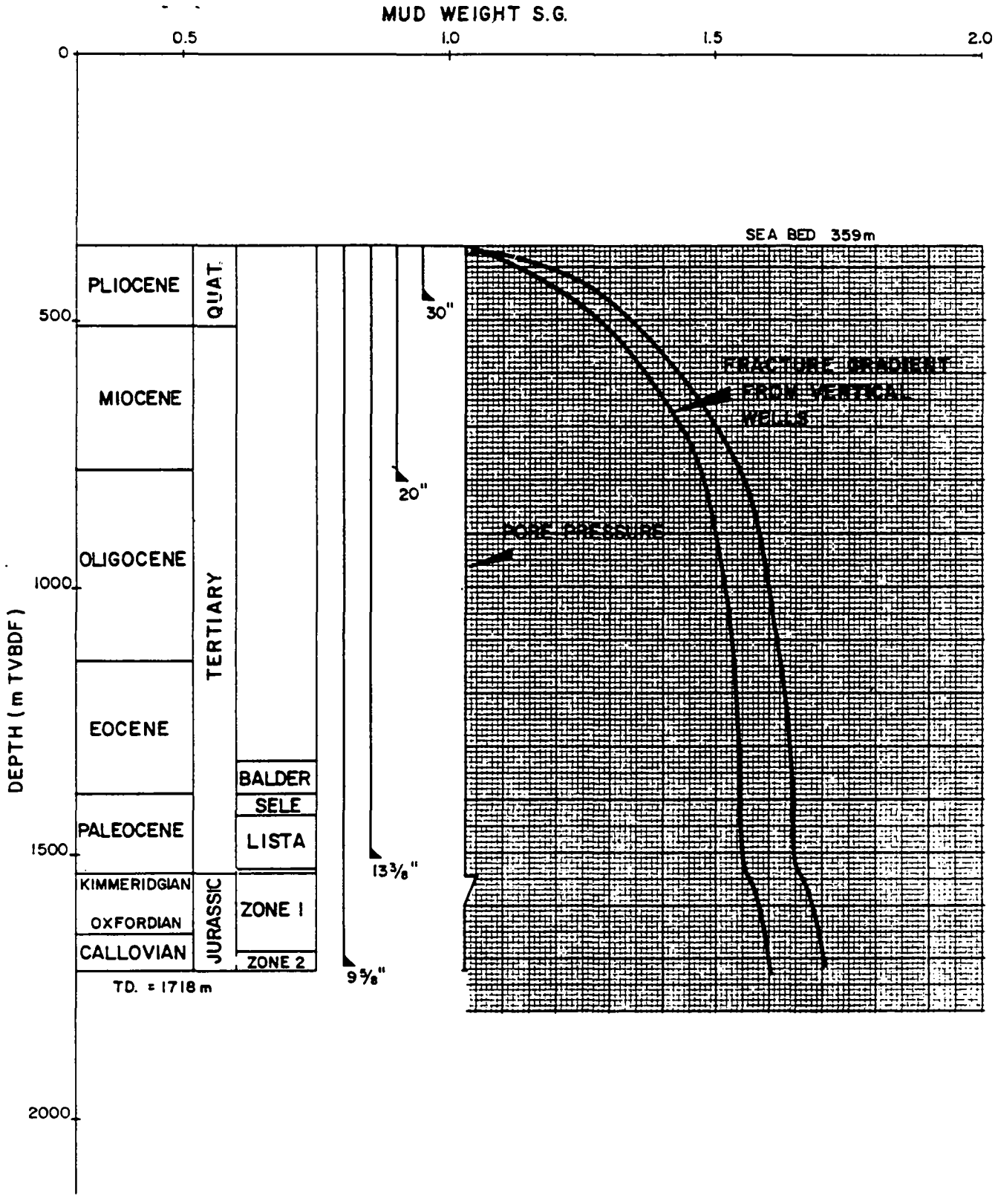
Cement required = 280.4/1.71 = 164.0 sxs
= 7.0 mt

Mixwater required = 164.0 x 7.28/42 = 28.4 bbls

Additives to be advised.

WELL 31/2-H

ESTIMATED PORE PRESSURE AND FRACTURE GRADIENTS SHOWING THE DEGREE OF UNCERTAINTY



ENCL. 3

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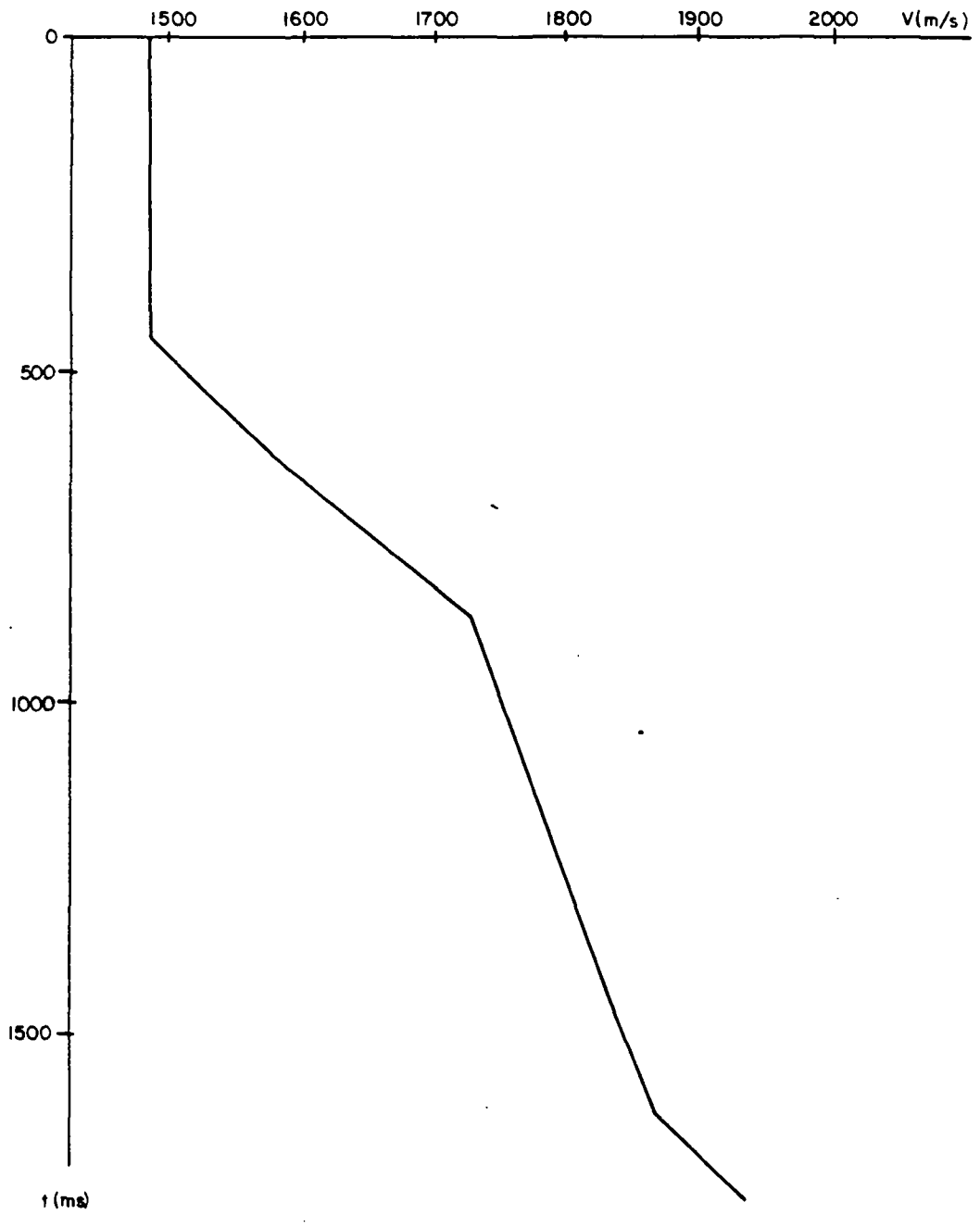
WELL 31/2-H

AVERAGE VELOCITY vs. SEISMIC TIME



ENCL. 4

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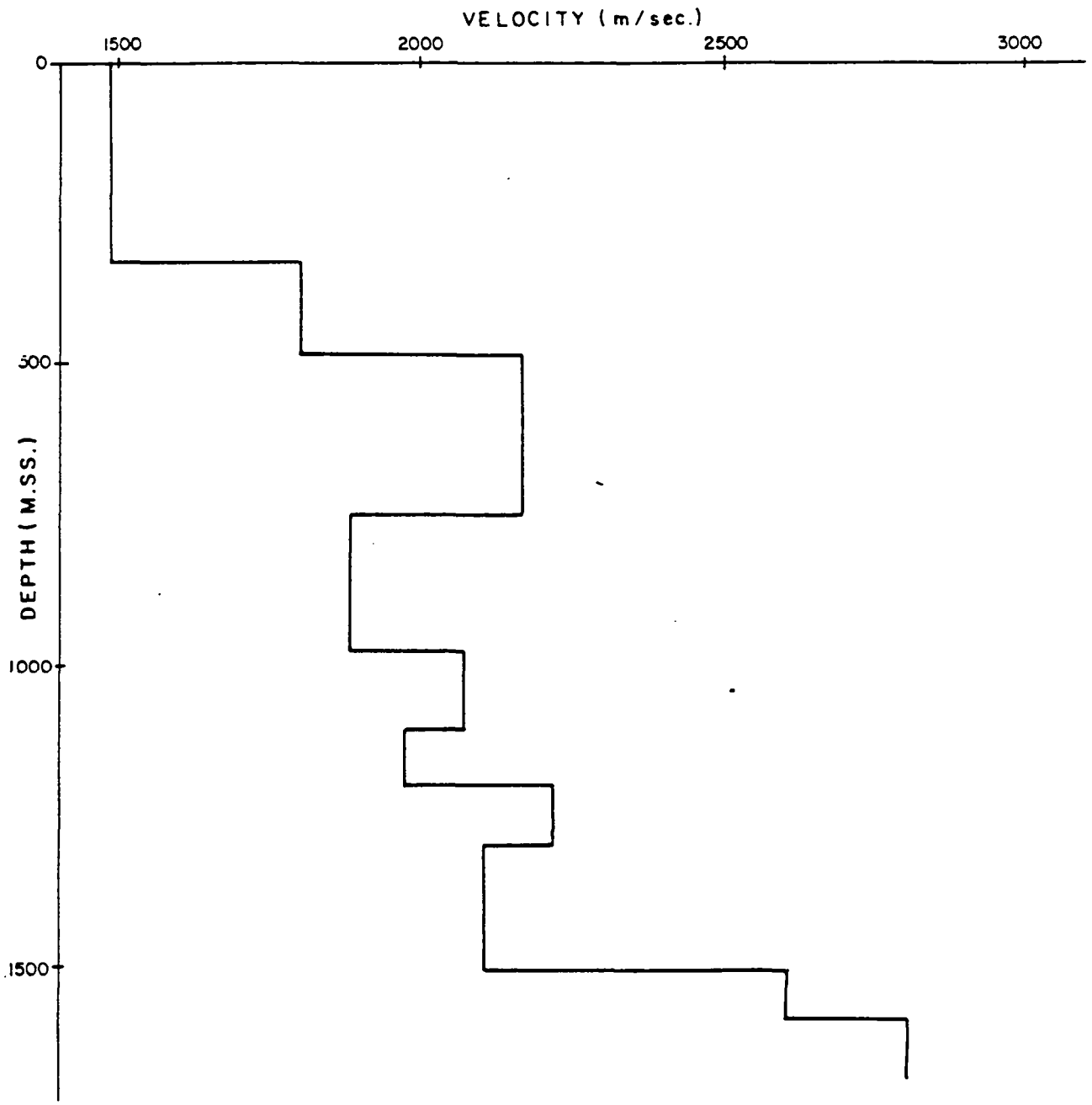
WELL 31/2-H

INTERVAL VELOCITY vs. DEPTH (SUBSEA)



ENCL. 5

NSEP 197 G1509/10