DRILLING PROGRAMME

LOCATION 31/2-C (31/2-2)

A/S NORSKE SHELL
LICENCE 054

NORSKE SHELL E&P, FORUS.

DRILLING PROGRAMME

CONFIDENTIAL

LOCATION: 31/2-C

WELL :

RIG:

PRODUCTION LICENCE No.: 054

ESTIMATED DAYS: 100 (inc. Production Test)

CO-ORDINATES OF LOCATION — Tolerance: 50 m round.

60° 46' 47.1" — TMCM (5°) N 6739202

03° 37' 22.4" — E 425002

HOLE SIZE (INS)	HOLE DEPTH (metres)	CASING SIZE/WT/GRAD/CPLG	CEMENT Req'd on Board (Tons)	CEMENT Type/Mixwater	CEMENT REMARKS	MUD S.G. (PSI/1000')	MUD REMARKS	LOGGING
36"	440	30"/1" WT/310 LBS/FT ATD-RB Squnch	150	Class G/ F' water+ 0.36 gps Econolite	Theoretical fill to seabed + 200 % excess. 13.2 ppg Lead Slurry; 15.8 ppg Tail slurry (10 m)	1.03 (445)	Seawater + viscous pills (+/- 100 MF)	None.
26" (Note 4)	810	20"/133/K55/ Vetco LS-LH	150	Class G/ F' water + 0.36 gps Econolite	Theoretical fill to seabed + 100 % excess. 13.2 ppg Lead + 60 m of 15.8 ppg tail slurry.	1.03 (445)	Seawater + viscous pills (+/- 100 MF)	ISF/SONIC/GR/SP FDC/CNL/GR/CAL LSS (in 17 ½" pilot hole)
17 ½"	1485	13 3/8"/72/N80/BTC	150	Class G/ F' water+ 0.36 gps Econolite	Theoretical fill to 150 m inside 20" casing, 20 % excess on O.H. volume. 13.2 ppg Lead slurry. 15.8 ppg Tail Slurry to be 75 m above 13 3/8 shoe.	1.22 (530) to 1.31 (565) Note 1	Gypsum/Lignosulphonate MF 50-60 secs PV/YP 20-25/15-20 API WL: less than 10 ccs. Ex Gypsum: 4-6 ppb.	ISF/SONIC/GR/SP FDC/CNL/GR/CAL LSS SWS as required
12 1/4"	2625	9-5/8"/47/L80/VAM	100	Class G/ F' water 0.1 gps Econolite 0.15 gps "HLXC248" 0.22 gps "CFR-2"	Theoretical fill to 150 m inside 13 3/8" Casing 20% excess on OH volumes. A 15.4 ppg slurry to be used with 50 bbls of 13.5 ppg lead scavenger slurry.	1.19 (515) to 1.22 (530)	Gypsum/Lignosulphonate (as above with API FL at 5 ccs)	ISF/SONIC/GR/SP FDC/CNL/GR/CAL MSFL/DLL/CAL LSS HDT SWS Velocity survey CBL (on 13 3/8" and 9 5/8" casing)

DERRICK FLOOR ELEVATION. 25 M. ABOVE MSL

353 M. ABOVE SEA BED

FORMATION TOP	m. T.V. B.D.F
Seabed (Quaternary/Eocene)	353
Palaeocene	1185 +/- 20
Cretaceous	1378 +/- 20
Late Kimmerian Unconformity	1427 +/- 20
U-M Jurassic sand *	1534 +/- 20
Seismic Flatspot	1587
M. Jurassic sand	1615 +/- 30
M-L Jurassic sand	1930 +/- 30
L. Jurassic claystone	2095 +/- 30
L. Jurassic sand **	2205 +/- 30
Triassic	2425 +/- 30
T.D.	2625

* Denotes Primary Target.

** Denotes Secondary Target.

NOTES:

1. In 31/2-1 a mud weight of 1.31 was needed to stabilize a squeezing interval in this section.
2. All mud weights are to be adjusted in the light of hole problems (sloughing shale, tight hole, high mud gas readings etc).
3. Formation leak off tests are to be performed below the 20", 13 3/8", and, if required, the 9 5/8" casing.
4. The 17 ½" pilot hole is to be drilled to 20" casing depth and logged for shallow gas, prior to pulling the riser and opening the hole to 26".
5. Cuttings Collection: Every 10 m below the 30" casing. Every 3 m below 1155 m.
6. Coring will commence in the U. Jurassic clays to ensure the coring of the clay/sand interface. Core to 30 m below the HWC in the U-M Jurassic. Coring will resume in the L. Jurassic sand if hydrocarbons are encountered, then coring will continue until at least one core is taken in the water zone.
7. Production testing will be required.
8. Estimated pore pressure at 1534 m BDF is 2290 psi.

SIGNED BY

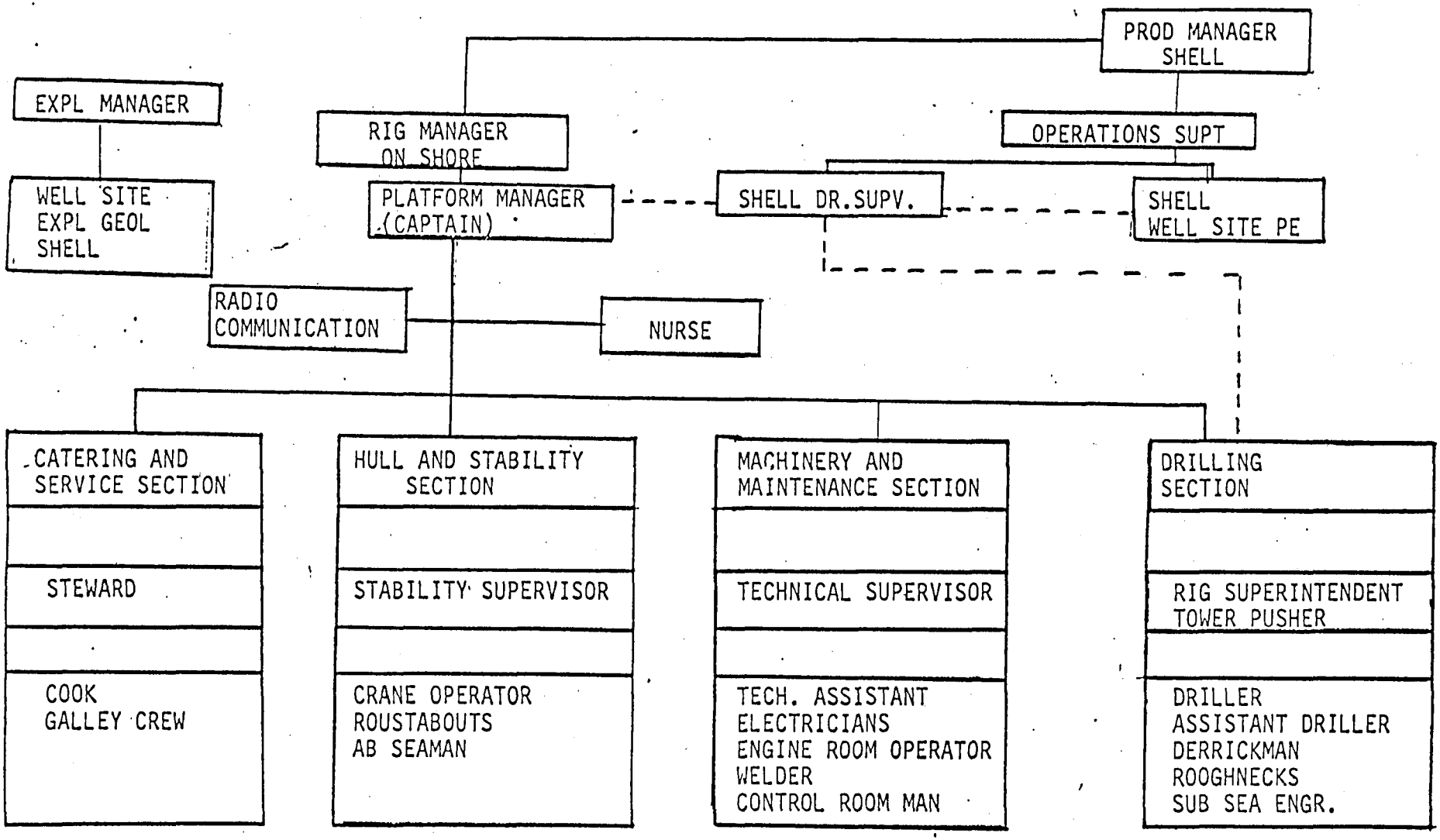
PRODUCTION MANAGER

CHIEF PETROLEUM ENGINEER — EXPLORATION MANAGER — HEAD OF DRILLING

DATE: — EP SERVICES, FORUS.

G 566

GENERAL ORGANIZATION CHART



A/S NORSKE SHELL

DRILLING PROGRAMME - LOCATION 31/2-C

A. GENERAL

1. Location

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

b) Preliminary surface co-ordinates (centre of location corresponding to SP 200 on seismic line 79-416)

Geographical	TMCM 5^{o}
60^{o} 46 47.1" N	6739202
03^{o} 37' 22.4" E	425002

Tolerance: 50 metres all round

The tight tolerance given for this location is necessary to avoid fault complications in the SW and to ensure an adequate gas column is encountered to allow testing to be carried out.

2. Base

Tananger Shore Base to Location	262 kms
Bergen Shore Base to Location	112 kms

3. Depth References

a) All depths are given with respect to the rotary table of the drilling vessel at the specified drilling draught.

b) Expected water depth at location is +/-328 m metres (MSL-seabed)

c) For drilling, the barge draught will be c. 25.0 metres.

d) Distance from rotary table to MSL is taken as +/-25 metres for this programme but will be measured on site.
Distance from rotary table to seabed is taken as +/-353 metres for this programme but will be measured on site.

4. Type of Well

Exploration well.

5. Total Depth

TD in Triassic Red Beds is anticipated to be +/-2600 m SS (2625 m BDF).

6. Drilling Installation

"Borgny Dolphin" - Aker H-3 semi-submersible, or
"West Venture" - a Norrig-5 design semisubersible, dependent on rig availability.

7. Objectives

i) To evaluate lateral variation of reservoir parameters eastwards on the flank of the accumulation.

ii) To test the zone of oil shows seen in 31/2-1 in a better reservoir.

iii) To test the gas accumulation in a downdip location.

iv) To evaluate the nature of the flatspot in a location where very strong amplitude is seen.

v) To get reliable geologic tie to the seismic reflectors above the reservoir for a better regional evaluation.

See attached seismic section, velocity time function, structure map and prognosis sheet.

8. Prognosis

FORMATION TOPS	LITHOLOGY	DEPTH TVBDF METRES	SEISMIC TOLERANCE
Seabed (Quarternary-Eocene)	Clay, claystones, silts, and thin sands	353	
Palaeocene	Silty claystones with thin sandstones	1185	+/-20
Cretaceous	Marls and claystones, thin argillaceous limestones	1378	+/-20
U. Jurassic (L. Kimmerian Unconformity)	Organic shales	1427	+/-20
U. and M. Jurassic Sand*	Coarse partly unconsolidated sandstones with finer argillaceous bands	1534	+/-20
Seismic flatspot		1587	
M. Jurassic	Fine silty, micaceous sandstones with thin shales, becoming massive fine to coarse sandstones locally thin sandy limestones.	1615	+/-30
M-L Jurassic	Sandstones, shale content increasing downwards	1930	+/-30
L. Jurassic	Silty claystones with thin sandstones and marls	2095	+/-30
L. Jurassic Sand **	Sandstones, fine-coarse with shale bands and coals	2205	+/-30
'C' Reflection		2325	+/-40
Triassic	Fine sandstones with siltstones and grey/red-brown claystones	2425	+/-30
T.D.		2625	

* Primary target
** Secondary target

9. Pressures

From experience gained in the drilling, the subsequent electric logging, and RFT pressure measurements made in 31/2-1, that well was found to be hydrostatically pressured, with no overpressured regimes encountered.

The proposed location 31/2-C is located in a separate fault block some 4 km to the eastwards of 31/2-1. Various seismic events can be traced across this fault, indicating the fault is non sealing. Therefore the location 31/2-C is considered to be in the same hydrostatically pressured regime (See Encl. 1).

10. Mud Resume

The 36" and 26" hole sections (including the 17½" pilot hole for the 26" hole) are to be drilled with a seawater and viscous pills combination. If hole conditions dictate then a weighted seawater gelled mud will be used.

The 17½" hole section is to be drilled with a Gypsum /Lignosulphonate mud system, with a mud weight of S.G. 1.22 - 1.31 (.530 - .565 psi/ft). Note: From experience gained in 31/2-1 a mud weight of S.G. 1.31 was required to stabilize an incompetent squeezing interval in this section.

The 12-1/4" hole section is to be drilled to TD with a Gypsum/Lignosulphonate mud system, with a weight of S.G. 1.19 - 1.22 (.515 - .530 psi/ft).

The mud weights mentioned and other mud parameters are liable to change as hole conditions dictate.

Detailed mud properties and parameters will be specified in a separate mud programme.

11. Well Control

A diverter will be hooked up to the riser during the drilling of the 17½" pilot hole for the 20" casing. In addition, 1.3 - 1.4 SG mud (.570 - .600 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.

12. Deviation Control

Magnetic single shot surveys will be taken every 90 metres, to coincide with bit trips where possible. The well path is to be calculated using the "Minimum Radius of Curvature" Method.

13. Casing Summary

Size	Grade	Weight	Coupling	Interval BDF
30"	X-52, 1" WT	310 lbs/ft	ATD-RB Squnch	Seabed - 430 m
20"	K-55	133 lbs/ft	Vetco LS-LH	Seabed - 800 m
13-3/8"	N-80	72 lbs/ft	BTC	Seabed - 1475 m
9-5/8"	L-80	47 lbs/ft	VAM	Seabed - 2615 m

N.B. The 13-3/8", N80, 72 lbs/ft, BTC casing must be specially drifted at the mill (during manufacture) and again at the rig (before running) to ensure it will pass a 12-1/4" bit.

14. Wellhead Equipment

Cameron wellhead equipment will be used.

15. Formation Gradient Tests

Leak off tests will be made after drilling 5 metres of new hole below the 20", 13-3/8" and , if required, the 9-5/8" casing shoe.

16. Casing Accessories

The 30", 20", 13-3/8", 9-5/8" casing scheme will be used. Casing attachments will be as follows:

30" Float shoe

20" Float shoe
Two rigid centralizers equally spaced inside 30" conductor.

13-3/8" Float shoe + float collar one joint above shoe.10 spring centralizers - 2 on shoe joint, 6 on the next 12 joints (one every second joint) and 2 inside 20" shoe, spaced 1 joint apart.

9-5/8" Float shoe + float collar 2 joints above the shoe. Two spring centralizers on the shoe track, 1 centralizer per 3 joints up to the base of the reservoir, 1 centralizer per joint across the reservoir, 1 centralizer per 3 joints up to the 13-3/8" shoe and 1 rigid centralizer per 3 joints over the first 100 m of 9-5/8" inside the 13-3/8" casing.

Casing test pressures will be follows:

20"	1000 psi for 15 mins
13-3/8"	3000 psi for 15 mins
9-5/8"	4000 psi for 15 mins

Pressure tests on the 13-3/8" and 9-5/8" casings to be done 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 resulting from excessive rotating hours inside the casing. Alternatively, McCullough casing wear logs may be used to determine the extent of wear damage to the casing strings.

Cement calculations, see Encl. 2

B. SUMMARY OF OPERATIONS

1. Pre-Spud Phase

Site Survey

A seabottom/shallow gas survey has been carried out over the well location by A/S Geoteam (see Site Survey Report). Analog sparker, deep tow boomer, echo sounder and side scan sonar surveys were made within a 4 x 6 km grid centred on the location. Digital sparker profiles were also shot in a 4 x 1 km grid centred on the well location. Three gravity cores will be taken. (Some of this data has been processed and a report is expected in the near future)

Rig positioning

The rig will be brought on to location utilizing Decca Pulse-8 with HP minicomputer. All anchors will be run out to plus/minus 1450 m. The rig will be positioned with a heading of 315° (T). After anchors have been set, each anchor will be tested to plus/minus 400 000 lbs for 2 - 3 hours. After satisfactory mooring test, approx 250 000 lbs will be held on all anchor chains.

The final coordinates will be determined with an accuracy of 10 m (RMS) using Satnav (JRM-1).

2. Spudding

General

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

ii) Observe operations such as the penetration test placing of TGB and MGB, spudding in, stabbing in, drilling with returns to seabed, cementing of 30" and 20" casing, with the rig's underwater TV camera.

Procedure

1. Check the seabed condition by an observation dive.

2. Carry out a penetration test. If the seabed is hard, drill plus/minus 5 m with the 36" hole opener and 26" pilot bit assembly. Circulate at plus/minus 200 GPM.

3. Calculate the DF - seabed distance and Mean Sea Level(MSL) from the penetration test, the drilling draught, and prevailing tidal variation.

4. Decide from the penetration test if extra horizontal plates are to be welded on to the TGB, to reduce settling and/or tilting.

The steps above can be performed whilst preloading the anchors, the steps below are to be performed once the anchors are proven.

5. Set TGB at slack tide. A Regan slope indicator is to be run on the TGB running tool to give an indication of the TGB angle. The TGB guide lines are to be marked at the spider deck level so that any subsequent sinking or tilting will be detected.

6. MU a 36" hole opener and 26" pilot bit assembly (a monel collar to be included for MSS). Drill down to 30" casing setting depth, taking a MSS after the first Kelly down. Additional surveys will be carried out as necessary, depending on angle. If hole angle is greater than 1½ degree then contact base, where the various options will be considered.

   Before POH to run 30" casing circulate high viscosity mud in the hole, using 200% excess.

7. Run 30" casing plus MGB equipped with a Regan slope indicator (to be installed in the middle of a side beam, as close to the beam as possible). Install a second Regan slope indicator on the 30" running tool. Ensure that the slope indicators are properly level and zeroed and will be visible to the TV.

8. When the 30" casing is landed observe the angle with the TV camera. If the angle is 1 degree or less, cement the casing using 200% excess cement.

9. WOC. Divers to check cratering around the guide bases, with an observation dive. Run a check-totco in 30" running tool. (Install a totco ring in a sub below the running tool.)

10. If excessive cratering is observed, re-cementing around the guide base or seabed may be considered prior to drilling out of the 30" casing. Or if this problem is anticipated, consider using 300% excess cement instead of 200%.

N.B. Maintain a tension in the anchor lines/chains at the upper limits until the 30" casing is cemented, in order to minimize rig offset. Otherwise, the stack + conductor could be set under an angle which could lead to serious damage to the U.W. equipment.

   Ensure that the tension of the guide lines is optimum so that the TGB will not be lifted on one side or be tilted by excessive un-even guide line tenstion.

   It is evident that the weather conditions should be moderate for most of these operations.

3. Drilling 26" hole and running 20" casing

Diverter System used

Diverter systems are fitted on offshore rigs to provide a means of controlling the flow should shallow pressures be encountered whilst drilling for the first casing string (surface casing).

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.

Drill out cement in 30" casing and 36" pocket with 26" hole opener and 17½" pilot bit with a stabilizer at 20 m and start 17½" pilot hole. Pull out of hole and lay down 26" hole opener.

Run 30" pin connector complete with flex joint on 21" riser. Use minimum required tension on ruckers. Fill up riser with seawater and observe fluid level. Use required riser tension for existing sea state and determine limitations.

Make up 17½" bit on drilling assembly. Use a float sub with the float installed and run in the hole.

Close diverter around drillpipe, and circulate through diverter lines to check diverter equipment; gradually build up to maximum circulating rate. Open diverter packing.

Drill to 20" casing point using seawater allowing 10 m pocket. Circulate 5 to 15 minutes prior to each connection, or longer if abnormal drag is experienced, or make wiper trip to the shoe. If hole troubles are severe use a gelled water mud, weight 1.04 SG (450 psi/1000 ft) Visc 50 secs MF. Observe returns from annulus continuously. If weight of annular returns causes losses or exceeds 1.10 SG (475 psi/1000') stop drilling and circulate hole clean first. If conditions are normal when casing point is reached, log as required, change hole volume to water and observe well. Open dump valve to equalise water level in and outside Marine Riser. Observe well, drop MSS, pull out of hole, retrieve Marine Riser, 30" pin connector, etc.

RIHand open hole to 26" using a pilot bit and 26" hole opener with a 26" or 25" stabiliser at 10 m and 30 m above bit.

Use seawater to drill with, but slug hole as required with gel mud. On check trip and final trip out prior to running 20" casing spot viscous mud using 150% excess over open hole volume.

Conditions in the 26" hole, as well as in the 36" hole, may warrant spotting mud of ca. 1.11 SG (480 psi/1000 ft). before wiper trips or running casing. Repositioning the stabilisers prior to reaming may also help to counter difficult conditions.

Problems whilst diverter drilling

a) Severe losses

If severe losses are encountered while drilling with returns to surface pull out and drill a 12-1/4" hole instead of 17½" and restrict penetration rates and obtain the lightest possible annular returns. If severe losses are continuing, open the dumpvalves and drill a 12-1/4" pilot hole with returns to seabed.

If gas flow is encountered whilst drilling 12-1/4" pilot hole with seawater and returns to seabed, spot heavy mud and follow up with cement to kill well. Have a cementer on board for this eventuality, as long as diverter is in use.

b) Gas Flow (No losses)

If any flow of gas is encountered whilst drilling the 17½" pilot hole, drill to 20" casing point with required mud weight. Circulate hole clean and make check trip. Circulate, drop Totco and pull out of hole. Run logs as required. Make up 26" hydraulic under-reamer with 18½" stabilizer 60 ft above under-reamer.

Under-ream 17½" hole to 26". Circulate and increase mud weight on bottom to compensate for the loss in hydrostatic head as a result of the removal of the Marine Riser later on. Check trip to shoe. Run back to bottom. Circulate, if required, Observe well. Open dump valve. Fill up Marine Riser with seawater to give a column equal to the water depth. After level in Marine Riser is equalised to sea level, observe well in Marine Riser and check flow on open dump valve with TV. Close dump valve. Make another check trip circulate and pull back to pin connector, circulate to seawater. POH. Retrieve Marine Riser. Stand back 18-3/4" housing in derrick. Make additional check trip prior to running 20" casing.

c) Gas Flow and Severe Losses

If any flow of gas is encountered whilst drilling the 17½" pilot hole with returns to surface, and the required increased mud weight to counteract the gas flow causes severe losses, then pump cement to kill the well.

Further programme will be advised in this case.

Run land and cement 20" casing as per programme. Use subsea cementing plug system (top plug), unless otherwise advised.

After releasing running tool, pick up until bottom of stinger is just below 18-3/4" housing and wash in and around the housing with seawater before retrieving running tool.

Install 18.3/4" BOP stack and 21" Marine Riser.

Test stack, complete with casing. For stack test procedure see "Stack Testing" Item C. Make up drill pipe hang off assembly and circulating head assembly. Install wearbushing.

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

1. Drill 17½" hole to programmed depth. Use maximum annular velocities. Design the drilling assembly for maximum penetration rate. NB: Leak off test to be performed after drilling 5 m new hole below 20" shoe.

2. Log as per well programme. Make up 13-3/8" hanger with subsea cementing assembly and top plug only, and stand back in derrick.

3. Make checktrip, pull wearbushing and run 13-3/8" casing to landing point, leaving a 10 m pocket at bottom below the 13-3/8" shoe.

4. Cement 13-3/8" casing. Subsea plug system to be used (top plug), unless otherwise advised by Base. Clean out the stack area with water prior to pulling out the running string.

5. Carry out stack and casing tests as per "Stack Testing" Item C. Install wearbushing. Make up drillpipe hang-off assembly and circulating head assembly. Carry out a kickdrill.

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

1. Drill out float collar, cement and shoe and drill 5 m of hole. Carry out a leak off test not exceeding 90% of over-burden gradient.

2. Drill 12-1/4" hole to 2625 m. Bit weight, RPM, bit selection and bottom hole assembly to be determined on site for optimum penetration rate.

NB. Coring will commence in the Upper Jurassic (Kimmeridge) Clays to ensure coring of the clay/sand interface. Coring will continue to at least 30 m below the hydrocarbon/water contact in the Upper and Middle Jurassic Sands. Coring will resume in the Lower Jurassic Sands if hydrocarbons are encountered. Coring will continue in the Lower Jurassic Sands, if the reservoir is hydrocarbon bearing, until at least one core is taken in the water zone.

3. Carry out logging programme, including wire line tests if necessary. (See Evaluation Requirements Section 3)

Note If the L. Jurassic sands are found to be hydrocarbon bearing then the 9-5/8" casing will be run to TD (2625 m). If no hydrocarbons are encountered then the open hole section will be abandoned as outlined below in (6) Abandonment, to +/-75 m below the base of the U-M Jurassic reservoir, and 9-5/8" casing will be run. A specific testing programme will be issued.

4. Make scheck trip. Pull wearbushing. Run circulating tool and wash inside the 18-3/4" housing. When washing out the wellhead with seawater prior to running of casing, seal assemblies or wearbushings (using circulating tool), limit te jet-velocities to 20 m/sec. maximum, and move the tool while cleaning to prevent damage in the wellhead or the BOP stack.

5. Run, land and cement 9-5/8" casing leaving a pocket of 6-10 m below the 9-5/8" shoe. The casing will be extended to the rig floor and a conventional cement head used, unless advised differently from Base. Whilst displacing, returns are to be monitored closely. If losses are observed adjust pump rates accordingly.

6. Carry out stack and casing tests as per "Stack Testing" Item C. Install wearbushing. Make up drillipe hang-off assembly and circulating head assembly. Carry out a kickdrill.

6. Abandonment

1. Prior to running 9-5/8" casing, non-hydrocarbon bearing porous zones in te open hole interval will be isolated with cement plugs extending 30 m above and below each zone.

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 30 meters above and below the perforated interval or down to a casing plug whichever is less.

3. A cement plug of at least 30 meters shall be placed in the smallest casing string. This plug shall be placed at the level of the 13-3/8" casing shoe.

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

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

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

7. A specific abandonment program will be prepared and issued when the well reaches total depth.

C. STACK TESTING

The regular tests of the BOP Stack in service have to be limited to the following pressures, unless differently advised by the base.

18-3/4" 10 000 psi BOP Stack

1. Pipe Rams : 5000 psi

2. Blind Rams : Casing test pressure, as specified in Item A-15

3. Kill/choke lines and valves: 5000 psi

4. Annular preventers : 2000 psi around 5" DP
1500 psi around 3½" DP

a) Tests 1, 3 and 4 to be carried out with a boll weevil run on DP and landed in the wellhead.

b) Test 2 to be carried out only when the cement of the last casing is not yet drilled out.

Accumulator Tests

The accumulators must have sufficient capacity to be able to close, open and close all preventers 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. A note that this test was carried out (and results) must be made in the Drilling Report and on the weekly BOP - test checklist. For frequency see (this Section) item 10.

Notes on Testing

1. The BOP stack has to be tested on all functions and all rams tested to the full rated WP at the surface prior to running the Stack. However, the blind/shear rams will be tested only on orders of Base, but at least once per month during a routine Stack test.

   After the surface test all Cameron clamp connections and all studded connections must be checked for tightness.

2. All pressure tests to be carried out with water, unless differently advised by Base.

3. All surface equipment has to be satisfactorily pressure tested prior to testing the BOP Stack underwater.

4. 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 at least twice; firstly, as soon as the stack is below sea level and, secondly, just before landing the stack.

5. When testing the BOP stack underwater with a boll weevil test tool in the wellhead, use the vented red-painted test single - see "Requirements" section in "Routine Testing of the BOP Stack".

6. The test pressure should be kept on for 15 minutes, and the acceptable pressure drop over this 15 minutes period is 10% of the initial test pressure, provided that the pressure remains constant for the next 5 to 10 minutes.

7. 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.

8. 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 investigations and/or repairs.

9. The testing of 10 000 psi BOP Stacks will be done to 5000 psi only, at the 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 a boll weevil test tool, e.g. subjecting the seals of the seal assembly to the same pressure as the BOP Stack; or by means of a weight set tester, subjecting only the Stack to the required test pressure.

Run 2 stands drill collars below the weight set tester to assist in shearing the pins with set down weight.

See item 1 on blind/shear rams.

10. Accumulator tests (as described previously) should be done either on request of Base, or after repairs have been done to the accumulator system, i.e. bottles, bladders, pumps, etc.

Routine Testing of the BOP Stack

To prevent continuous loading of the choke and kill-line to 5000 psi adhere to the following standard procedure.

Requirement

1 5" DP single painted red, with a hole drilled in the tool-joint of the pinend (5/8" hole is OK) Red is for easy recognition.

1 pc Hydril kelly cock tested to 5000 psi.

Procedure

a) Run in the Boll weevil with the Hydril kelly cock underneath it in the closed position.

Above the Boll weevil, install the red single with the hole and the drillpipe spaced out such that the distance above derrick floor is plus/minus 10 feet.

b) Circulate wellhead and choke and kill-line to water.

c) Close outer choke and outer killvalve and open inner choke and inner kill valve. Test choke and kill-line to 5000 psi.

Choke line, kill-line and outer choke and outer killvalve tested.

d) Close bottom pipe rams. Circulate until water comes out of DP on DF. Test via drillpipe and circulating head to below rams to 5000 psi. Outer kill valve inside bottom connector, top annular seal, bottom pipe rams and kelly cock tested. Bleed off pressure.

e) Open bottom rams, close middle pipe rams. Open outer FS kill valve and close inner failsafe kill valve. Open outer failsafe choke valve and close inner failsafe choke valve. Test 5000 psi. Middle rams, inside FS valve of choke and kill-line tested. Bleed off pressure.

f) Open middle pipe rams and close top pipe rams. Close both kill FS valves and outer choke valve. Open inner failsafe valve on the choke-line. Test 5000 psi. Outer choke failsafe valve and top pipe rams tested.

g) Close bottom annular preventer. Close all FS valves. Test annular to 2000 psi. Bleed offpressure. Bottom annular tested.

h) Open bottom annular preventer. Close top annular preventer. Repeat as under (g).

Only the outside of the inner kill and choke valve are not tested, but if all pressures are holding from the inside, this is immaterial. An additional advantage is the direct way of testing, eliminating leaks in surface lines. Test on blind rams is only done on test stump and against cement plug, if required, on initial casing test.

The initial stack test after bumping the plugs can be done using the seal assembly running and testing tool, and pressurizing via choke and/or kill lines. Always measure first the amount of fluid required to test against the closed failsafe valves, to be able to check more accurately on the total volume needed when testing the ram cavities. Subsequent tests are to be carried out as described above.

If at any time a leak develops (or the pressure does not hold) during a test, then repeat it the "normal way", leaving out the single with the hole and using just the boll weevil + drillstring, and pressurize via the kill line.

From time to time it may be advised by base to run the seal assembly running and testing tool on these weekly tests to check the seals from the hanger to seal assembly.

Use TV observation at all times. In case of an undetectable leak when testing with plain water, change to mud or dyed water, so that a leak can easily be recognised on the TV screen.

N.B. Depending on stack configuration, this procedure may be changed on a particular rig after consultation with Base.

D. EVALUATION REQUIREMENTS

1. Cutting Samples

Ditch cuttings to be collected every 10 m below 30" casing down to 1155 m , and every 3 m thereafter. The following samples will be required for partners/government bodies:

a) 6 x small cuttings bags of washed dried samples.

b) 3 x 1/2 kilograms bags of wet samples.

c) 1 x 2 kilogram bag of wet samples.

One ½ kilogram bag 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. Otherwise samples should be sent ashore ASAP, marked for attention of EPXV/1, Tananger.

2. Coring

a) Upper/Middle Jurassic reservoir section

Coring is to commence in Upper Jurassic Shales below the Late Kimmerian Unconformity and to continue at least 30 m below the hydrocarbon/water contact. Approximate interval is 1509-1562 m SS (1534-1587 m BDF).

b) Lower Jurassic reservoir section

Coring will resume in the Lower Jurassic Sands if the reservoir is hydrocarbon bearing. Coring is to continue until at least one core is taken in the water zone.

3. Logging Programme

a) At 20" depth (in 17-1/2" pilot hole):
ISF/SONIC/GR/SP
FDC/CNL/GR/CAL
LSS

b) At 13-3/8" depth:
ISF/SONIC/GR/SP
FDC/CNL/GR/CAL
LSS
SWS as required

c) At 9-5/8" depth (T.D.)
ISF/SONIC/GR/SP
FDC/CNL/GR/CAL
MSFL/DLL/CAL
LSS
HDT
SWS
VELOCITY SURVEY
CBL (on 13-3/8" and 9-5/8" casing)

Note: Intermediate logs may be run in 12-1/4" hole if required.

E. CASING DESIGN - WELL 31/2-C

Casing designs are presented for the 20", 13-3/8" and 9-5/8" casings. (Encl. 3.0).

The following assumptions apply:

1. For tension, a design safety factor of 1.6 is used, neglecting buoyancy in the drilling fluid. The 20" and 13-3/8" casings are only considered to extend to seabed for the tension calculation as the subsea cementing system will be employed with the casing landed on DP. In the case of the 9-5/8" casing, the casing will be landed using an extension string back to surface, and hence the tension calculation incorporates the length of casing from seabed to the drill floor.

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.

3. For burst, a design safety factor of 1.1 is employed. The pressure distributions for the burst loading assumes a 40% evacuation of mud from the well by a kick.

4. For collapse, a design safety factor of 1.0 is employed. Total evacuation of the casings is assumed for the design.

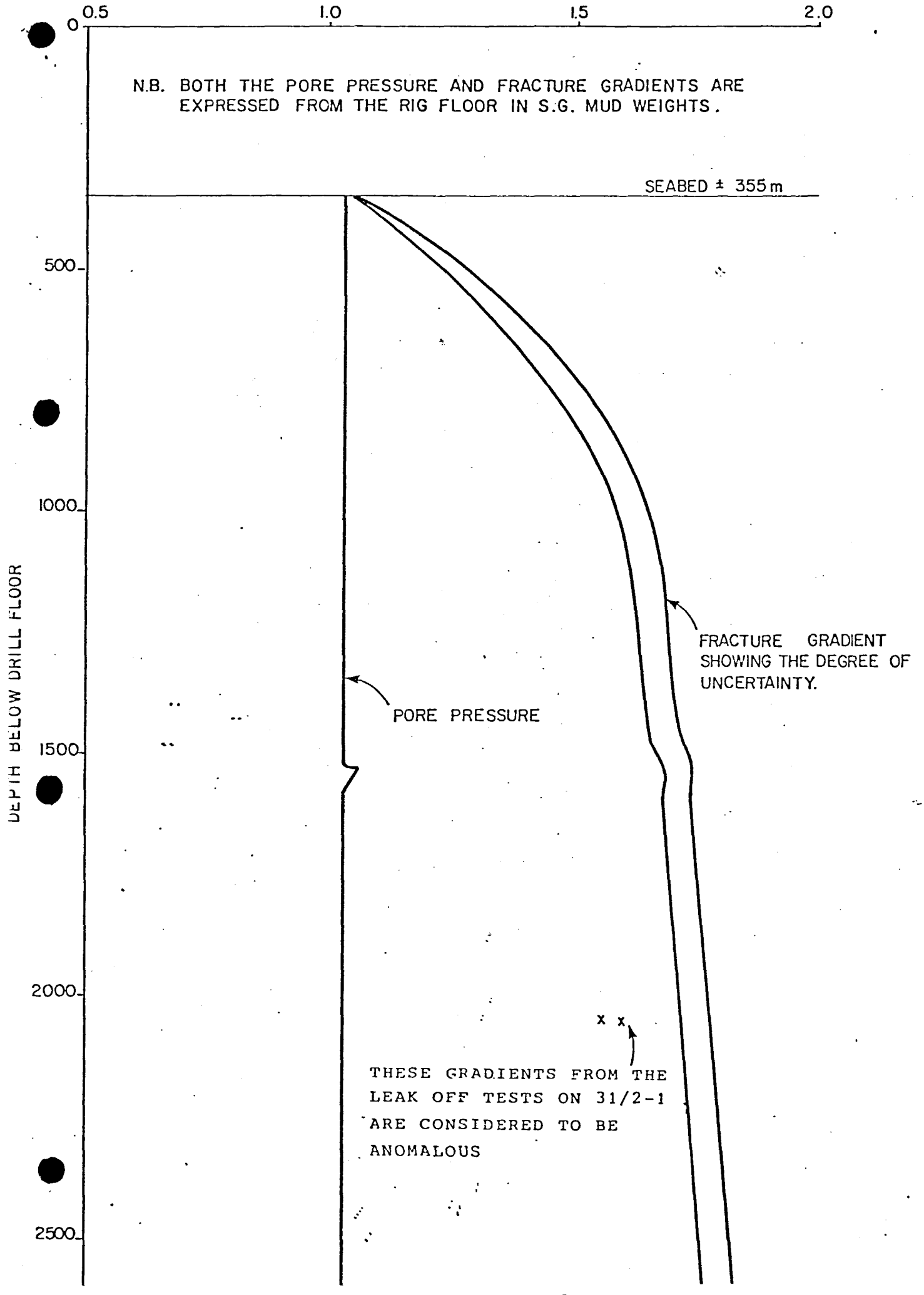
5. In the production test design for casing burst, a tubing leak is assumed putting full THP on the tubing-casing annulus.

F. GLOSSARY OF ABBREVIATIONS

BDF	:	below derrick floor
BGT	:	borehole geometry tool
BOP	:	blow out preventer
FS	:	fail safe (as in FS valve)
ID	:	internal diameter
MF	:	Marsh funnel (mud viscosity)
MGB	:	main guide base
MSL	:	mean sea level
MSS	:	magnetic single shot
OD	:	outside diameter
PPG	:	pounds per US gallon
PV	:	plastic viscosity
SS	:	sub sea
TGB	:	temporary guide base
TMCM	:	Transverse Mercator, Central Meridien
UGF	:	universal guide frame
YP	:	yield point

WELL 31/2-C

ESTIMATED PORE PRESSURE AND FRACTURE GRADIENTS SHOWING THE DEGREE OF UNCERTAINTY.



CEMENT CALCULATIONS (Encl. 2)

30" Cementation

Extended Norcem Class 'G' cement of lead slurry weight 13.2 ppg and 10 m of tail slurry weight of 15.8 ppg to be used. The casing is to be cemented back to seabed, and an excess of 200% is to be used over open hole intervals. Cement displaced to 10 m above shoe.

Data

Casing 30" 1" WT
30" shoe 430 m BDF
36" hole 440 m BDF

Lead slurry volumes

i) 36" x 30" annulus = (420 - 353) x 3.281x2.1598x3 = 1424.3 cu.ft

Cement required = 1424.3/1.89 = 753.6 sxs
= 32.1 m/t

Mixwater required = 753.6 x 10/42 = 179.4 bbls

Econolite required= 753.6 x .36 = 271.3 gallons

Tail slurry volume

i) 36" x 30" annulus = (430-420)x3.281x2.1598x3 = 212.6 cu.ft.

ii) 36" pocket = (440-430)x3.281x7.0686x3 = 695.8 cu.ft

iii) 30" casing fill = 10x3.281x4.2761 = 140.3 cu.ft

Total slurry 1048.7 cu.ft

Cement required = 1048.7/1.17 = 896.3 sxs
= 38.2 mt

Mixwater required = 896.3 x 5.15/42 = 109.9 bbls

20" Cementation

Extended Norcem Class 'G' cement of lead slurry weight 13.2 ppg, and 60 m of tail slurry above the shoe, of weight 15.8 ppg to be used, The casing is to cemented back to seabed and an excess of 100% is to be used over open hole intervals. Cement to be displaced to 10 m above the shoe.

Data

Casing 20"/133 lbs/ft/K55/VETCO LS-LH
30" shoe at 430 m BDF
36" hole at 440 m BDF
20" shoe at 800 m BDF
26" hole at 810 m BDF

Lead Slurry Volumes

i)	30" x 20" annulus = (430-353)x3.281x2.0944	=	529.1 cu.ft
ii)	36" x 20" annulus = (440-430)x3.281x4.8869x2	=	320.7 cu.ft
iii)	26" x 20" annulus = (740-440)x3.281x1.5053x2	=	2963.3 cu.ft
	Total slurry volume	=	3813.1 cu.ft
	Cement required = 3813.1/1.89	=	2017.5 sxs
		=	86.0 mt
	Mixwater required = 2017.5x 10/42	=	480.4 bbls
	"Econolite" required = 2017.4 x .36	=	726.3 gallons

Tail slurry volumes

i)	26" x 20 "annulus = (800-740)x 3.281x1.5053x2	=	592.7 cu.ft
ii)	26" pocket = 10 x 3.281x3.6870x2	=	241.9 cu.ft
iii)	20" casing fill =10x3.281 x 1.9133	=	62.8 cu.ft
	Total slurry volume	=	897.4 cu.ft

Cement required	897.4/1.17	=	767.0 sxs
		=	32.7 mt
Mixwater required	767.0 x 5.15/42	=	94.0 bbls

13-3/8" Cementation

Extended Norcem Class 'G' cement of lead slurry weight 13.2 ppg and 75 m of tail slurry above the shoe, of weight 15.8 ppg to be used. The casing is to be cemented back to 150 m inside the 20" casing using 20% excess on open hole volumes. Cement will be displaced to a float collar c. 13 m above the shoe.

Data:

Casing 13-3/8"/72 lb/ft/N80/BTC
20" shoe 800 m BDF
26" hole 810 m BDF
13-3/8" shoe 1475 m BDF
17-1/2" hole 1485 m BDF

Lead Slurry Volumes

i) 20" x 13-3/8" annulus = (800-650)x3.281x0.9377 = 461.5 cu.ft

ii) 26" x 13-3/8" annulus = (810-800)x3.281x2.7113x1.2= 106.7 cu.ft

iii) 17½" x 13-3/8" annulus=(1400-810)x3.281x0.6946x1.2 = 1613.5 cu.ft

Total slurry volume = 2181.8 cu.ft.

Cement required 2181.8/1.89 = 1154.4 sxs
= 49.2 mt
Mixwater required 1154.4 x 10/42 = 274.8 bbls
"Econolite required" 1154.4x.36 = 415.6 gallons

Tail slurry volumes

i) 17½" x 13-3/8" annulus=(1475-1400)x3.281x0.6946x1.2 = 205.1 cuft

ii) 17½" pocket = 10x3.281x1.6703x1.2 = 65.8cuft

iii) 13-3/8" shoe track= 13x3.281x.8314 = 35.5 cuft

Total slurry volume = 306.4 cuft

Cement required 306.4/1.17 = 261.8 sxs
= 11.2 mt
Mixwater required 261.8 x5.15/42 = 32.1 bbls

9-5/8" Cementation

Norcem Class 'G' cement at 15.4 ppg slurry wt will be used as the main slurry up to 1325 m 50 bbls (262 m) of 13.5 ppg scavenger slurry (Class 'G') is to be pumped ahead of the main 15.4 ppg slurry. A 20% excess is to be used over open hole intervals, and cement is to be displaced to a float collar c. 25 m above the shoe.

Data:

Casing 9-5/8"/47 lb/ft/L80/VAM
13-3/8" shoe 1475 m
17-1/2" hole 1485 m
9-5/8" shoe 2615 m
12-1/4" hole 2625 m

15.4 ppg slurry volume

i) 13-3/8" x 9-5/8" annulus (1475-1325)3.281x.3262 = 160.5 cu.ft

ii) 17½" x 9-5/8" annulus (1485-1475) 3.281x1.1651x1.2 = 45.9 cu.ft

iii) 12-1/4" x 9-5/8" annulus(2615-1485)3.281x.3132x1.2 =1393.4 cu.ft

iv) 12-1/4" pocket 10x3.281x0.8185x1.2 = 32.2 cu.ft

v) 9-5/8" shoe track 25 x 3.281 x 0.4110 = 33.7 cu.ft

Total slurry volume = 1665.7 cu.ft

Cement required 1665.7/1.24 = = 1343.4 sxs
= 57.3 mt
Mixwater required 1343.4 x 5.24/42 = 167.6 bbls
"Econolite" 1343.4 x .1 = 134.3 gallons
"CFR-2" 1343.4 x .22 = 295.5 gallons
"HLX" C248" 1343.4 x .15 = 201.5 gallons

13.5 ppg scavenger slurry volumes

i) 13-3/8" x 9-5/8" annulus(1325-1063)3.281x.3262 =280.4 cu.ft

Cement required 280.4/1.68	=	166.9 sxs
	=	7.12 mt

Mixwater required 166.9 x 8.29/42	=	32.9 bbls
"Econolite" 166.9 x .16		26.7 gallons
"CFR-2" 166.9 x .35	=	58.4 gallons
"HLX-C248" 166.9 x .24	=	40.1 gallons

N.B.

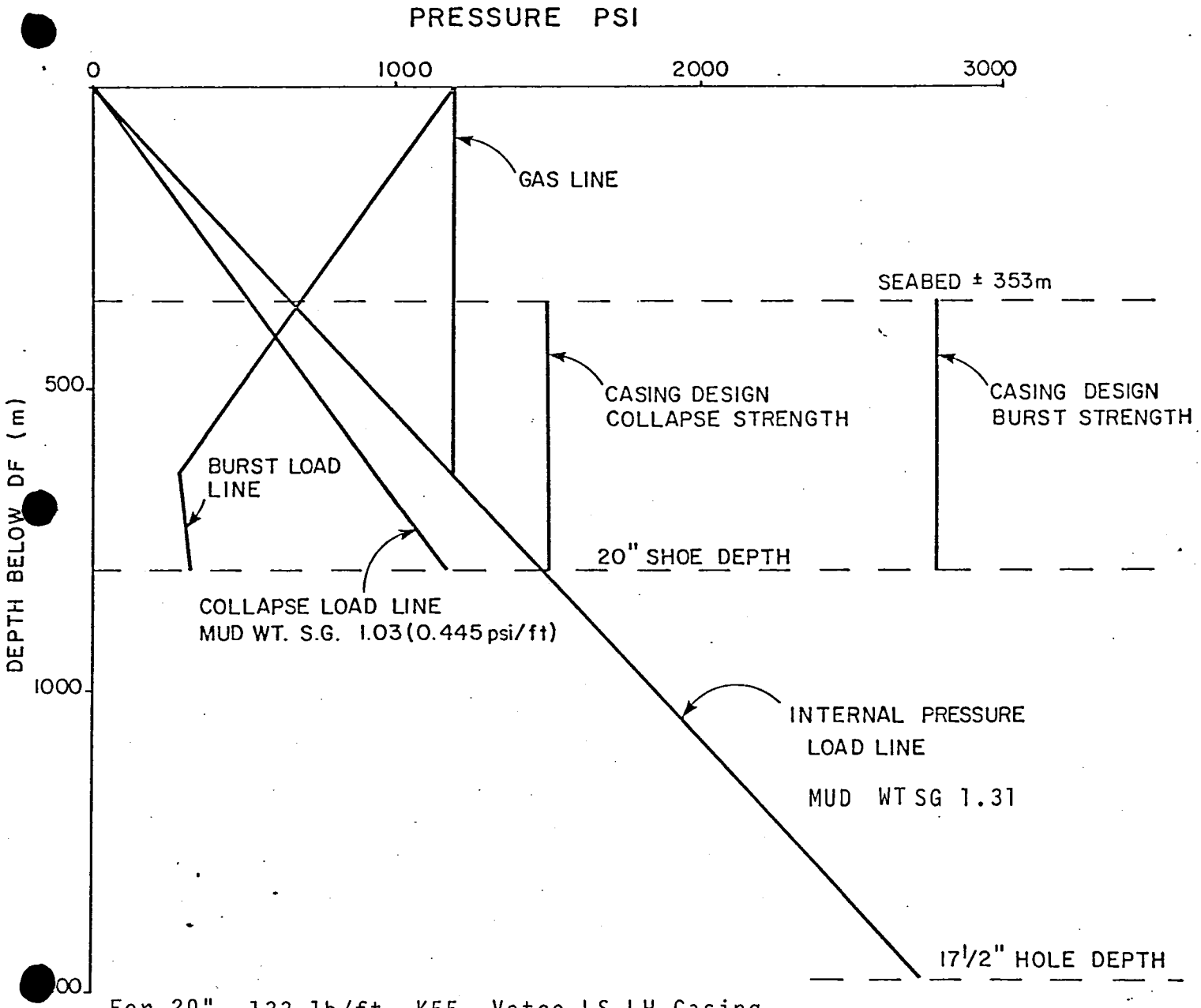
1. In the light of hole conditions and estimates of fracture gradients whilst drilling, the 9-5/8" casing may be cemented in two stages, with a DV collar placed c.100 m below the base of the main reservoir (plus/minus 1715 m) A detailed programme will be issued if this is the case.

2. For each cementation where possible the slurry volumes are to be calculated using caliper logs, and adjusting the percentage of excess accordingly.

3. As mentioned in B.5.3, 12-1/4" open hole may be plugged back to plus/minus 75 m below the base of the main U. and M. Jurassic Sand reservoir prior to running 9-5/8" casing, if the lower reservoirs are not found to be hydrocarbon bearing. In this event, the 9-5/8" casing string will be considerably shorter than envisaged in the calculations above.

Encl. 3

20" CASING DESIGN GRAPH 31/2-C



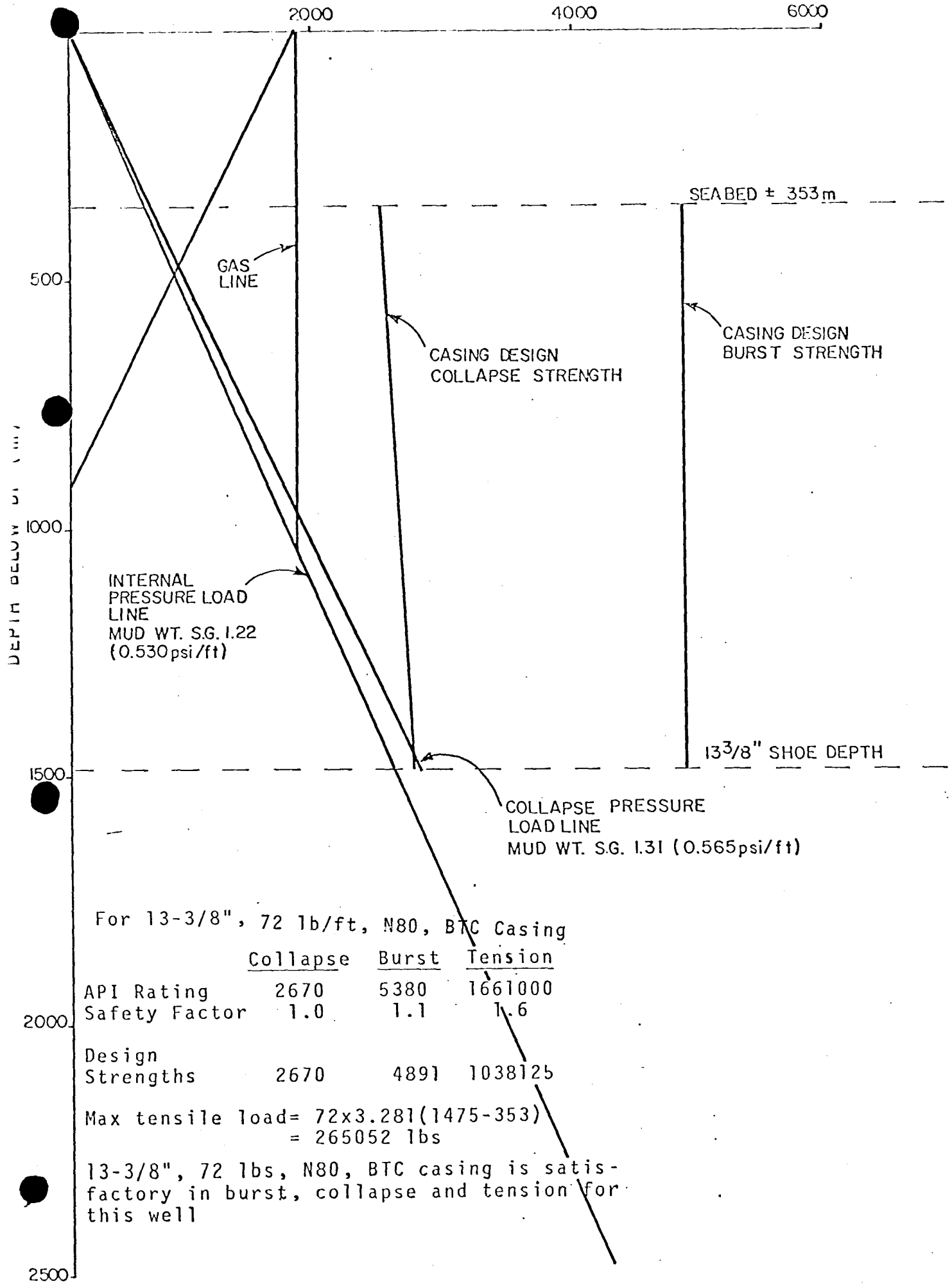
For 20", 133 lb/ft, K55, Vetco LS-LH Casing

	Collapse	Burst	Tension
API Rating	1500	3060	2123000 lbs
Safety Factor	1.0	1.1	1.6
Design Strengths	1500	2782	1326875 lbs

Maximum Tensile Load = 133 x 3.281 (800-353)
= 195058 lbs

20" 133 lb/ft, K55, Vetco LS-LH is satisfactory in burst, collapse and tension for this well

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



For 13-3/8", 72 lb/ft, N80, BTC Casing

	Collapse	Burst	Tension
API Rating	2670	5380	1661000
Safety Factor	1.0	1.1	1.6
Design Strengths	2670	4891	1038125

Max tensile load= 72x3.281(1475-353)
= 265052 lbs

13-3/8", 72 lbs, N80, BTC casing is satisfactory in burst, collapse and tension for this well

29.01.80 EPPP/11/agh

FROM: EPPP/11
TO: EPPP/11, EPPD, EPXV/1, Shell TP/WSPE "West Venture"

Subject: Drilling Time Breakdown for 31/2-C

Please find attached a Drilling Time Breakdown and a Drilling Progress Curve for 31/2-C.

In the Drilling Time Breakdown, column A shows the figures used for the planning of 31/2-C, and column B shows the "target" days for completion of each section.

F. Hardinges

F. Hardinges
Operations Engineer

Drilling Time Breakdown 31/2-C

	A (In days)	Actual	B (in days)
Rigmove/Anchoring	7	12.73	7
26"/36" section (87 m)	2	1.46	1
30" Casing	4		2
17 1/2"/26" hole section (370 m)	3		2
20" Casing	7		4
17 1/2" hole section (675 m)	6		3
13 3/8" Casing	4		3
12 1/4" hole section (15 m) drlg.	1		1
12 1/4" hole section (107 m) core.	8		5
12 1/4" hole section (598 m) drlg.	7		3
12 1/4" hole section (50 m) core.	3		3
12 1/4" hole section (370 m) drlg.	4		3
9 5/8" Casing	4		3
TOTAL DAYS	60	TOTAL DAYS	40

NORSKE SHELL E&P, FORUS.

DRILLING PROGRAMME

CONFIDENTIAL

LOCATION: 31/2-C

WELL: 31/2-2

RIG: W.V.

PRODUCTION LICENCE No.: 054

ESTIMATED DAYS: 100 (inc. Production Test)

CO-ORDINATES OF LOCATION — Tolerance: 50 m round.

60° 46' 47.1" N 6739202

03° 37' 22.4" E 425002

TMCM (5°)

HOLE SIZE (INS)	HOLE DEPTH (metres)	CASING SIZE/WT/GRAD/CPLG	CEMENT Reqd on Board (Tons)	CEMENT Type/Mixwater	CEMENT REMARKS	MUD S.G. (PSI/1000')	MUD REMARKS	LOGGING
36"	440	30"/1" WT/310 LBS/FT ATD-RB Squnch	150	Class G/ F' water+ 0.36 gps Econolite	Theoretical fill to seabed + 200 % excess. 13.2 ppg Lead Slurry; 15.8 ppg Tail slurry (10 m)	1.03 (445)	Seawater + viscous pills (+/- 100 MF)	None.
26" (Note 4)	810	20"/133/K55/ Vetco LS-LH	150	Class G/ F' water + 0.36 gps Econolite	Theoretical fill to seabed + 100 % excess. 13.2 ppg Lead + 60 m of 15.8 ppg tail slurry.	1.03 (445)	Seawater + viscous pills (+/- 100 MF)	ISF/SONIC/GR/SP FDC/CNL/GR/CAL LSS (in 17 ½" pilot hole)
17 ½"	1485	13 3/8"/72/N80/BTC	150	Class G/ F' water+ 0.36 gps Econolite	Theoretical fill to 150 m inside 20" casing, 20 % excess on O.H. volume. 13.2 ppg Lead slurry. 15.8 ppg Tail Slurry to be 75 m above 13 3/8 shoe.	1.22 (530) to 1.31 (565) Note 1	Gypsum/Lignosulphonate MF 50-60 secs PV/YP 20-25/15-20 API WL: less than 10 ccs. Ex Gypsum: 4-6 ppb.	ISF/SONIC/GR/SP FDC/CNL/GR/CAL LSS SWS as required
12 1/4"	2625	9-5/8"/47/L80/VAM	100	Class G/ F' water 0.1 gps Econolite 0.15 gps "HLXC248" 0.22 gps "CFR-2"	Theoretical fill to 150 m inside 13 3/8" Casing 20% excess on OH volumes. A 15.4 ppg slurry to be used with 50 bbls of 13.5 ppg lead scavenger slurry.	1.19 (515) to 1.22 (530)	Gypsum/Lignosulphonate (as above with API FL at 5 ccs)	ISF/SONIC/GR/SP FDC/CNL/GR/CAL MSFL/DLL/CAL LSS HDT SWS Velocity survey CBL (on 13 3/8" and 9 5/8" casing)

DERRICK FLOOR ELEVATION: 25 M. ABOVE MSL

353 M. ABOVE SEA BED

FORMATION TOP	m. T.V. B.D.F
Seabed (Quaternary/Eocene)	353
Palaeocene	1185 +/- 20
Cretaceous	1378 +/- 20
Late Kimmerian Unconformity	1427 +/- 20
U-M Jurassic sand *	1534 +/- 20
Seismic Flatspot	1587
M. Jurassic sand	1615 +/- 30
M-L Jurassic sand	1930 +/- 30
L. Jurassic claystone	2095 +/- 30
L. Jurassic sand **	2205 +/- 30
Triassic	2425 +/- 30
T.D.	2625

* Denotes Primary Target.
** Denotes Secondary Target.

NOTES:

1. In 31/2-1 a mud weight of 1.31 was needed to stabilize a squeezing interval in this section.
2. All mud weights are to be adjusted in the light of hole problems (sloughing shale, tight hole, high mud gas readings etc).
3. Formation leak off tests are to be performed below the 20", 13 3/8", and, if required, the 9 5/8" casing.
4. The 17 ½" pilot hole is to be drilled to 20" casing depth and logged for shallow gas, prior to pulling the riser and opening the hole to 26".
5. Cuttings Collection: Every 10 m below the 30" casing. Every 3 m below 1155 m.
6. Coring will commence in the U. Jurassic clays to ensure the coring of the clay/sand interface.
   Core to 30 m below the HWC in the U-M Jurassic. Coring will resume in the L. Jurassic sand if hydrocarbons are encountered, then coring will continue until at least one core is taken in the water zone.
7. Production testing will be required.
8. Estimated pore pressure at 1534 m BDF is 2290 psi.

SIGNED BY

PRODUCTION MANAGER

CHIEF PETROLEUM ENGINEER — EXPLORATION MANAGER — HEAD OF DRILLING

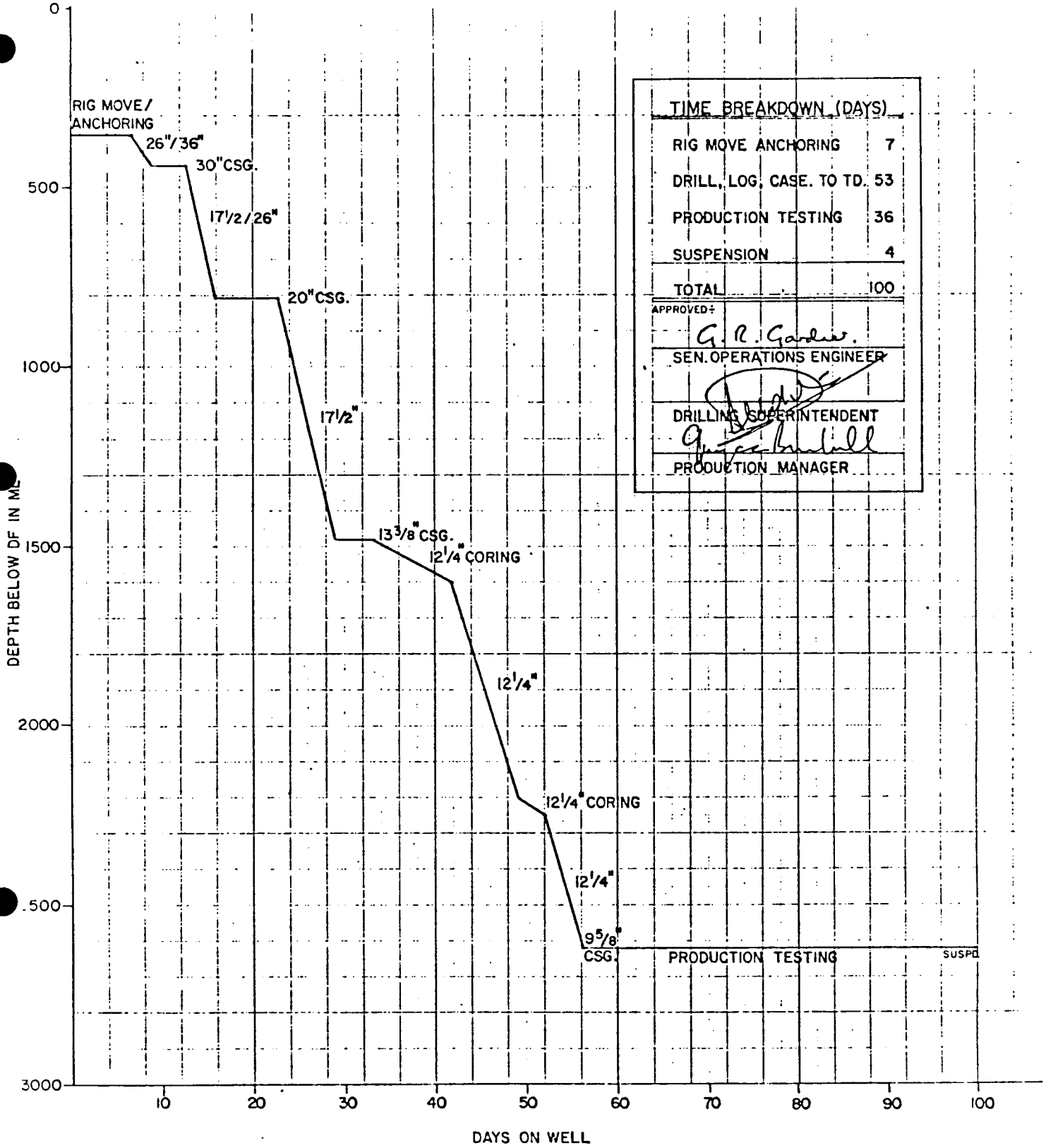
DATE:

FORUS.

G 566

31/2-2

31/2-C DRILLING PROGRESS CURVE



TIME BREAKDOWN (DAYS)	
RIG MOVE ANCHORING	7
DRILL, LOG, CASE. TO TD.	53
PRODUCTION TESTING	36
SUSPENSION	4
TOTAL	100

APPROVED÷

G. R. Gardner.

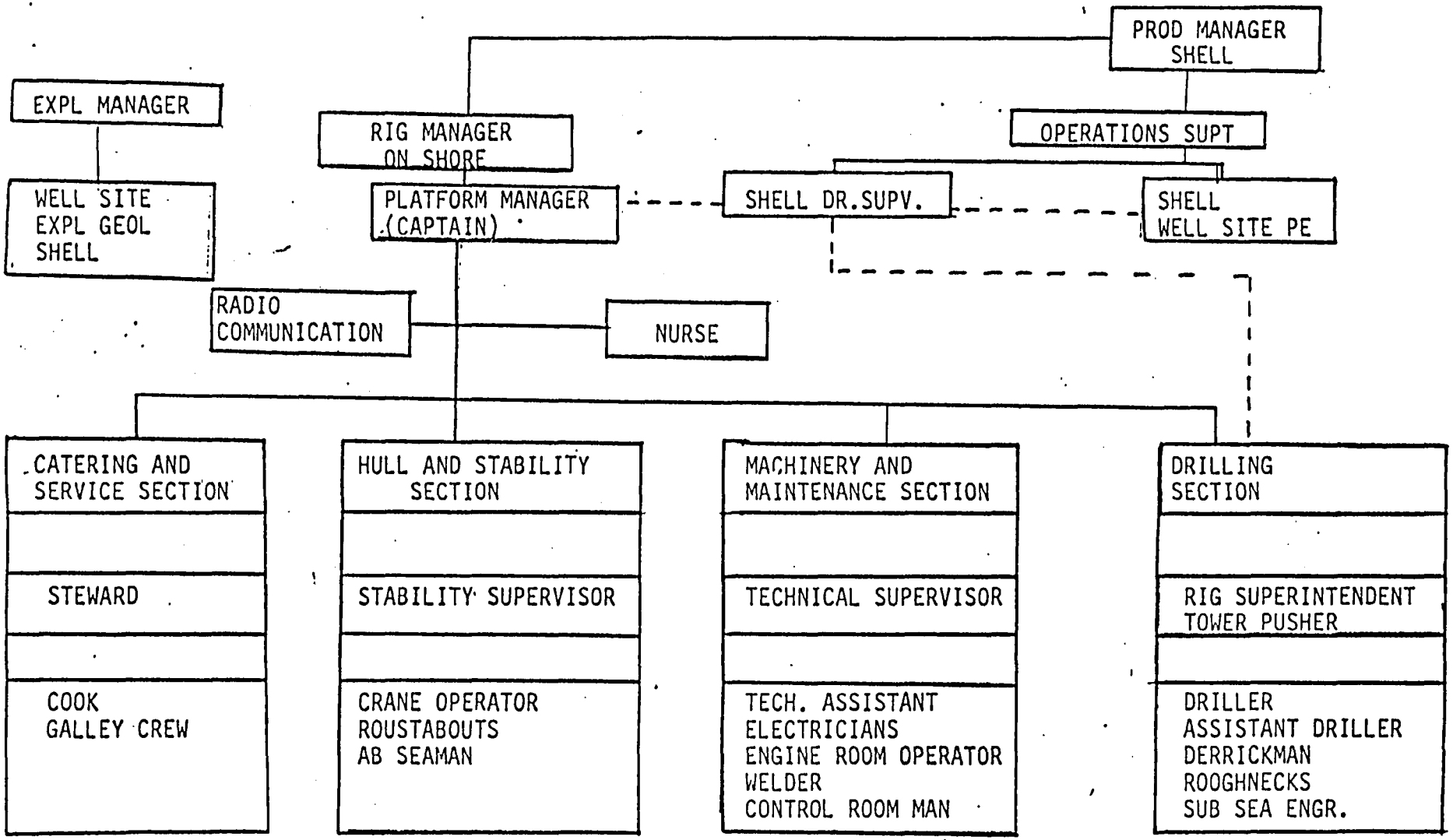
SEN. OPERATIONS ENGINEER

DRILLING SUPERINTENDENT

PRODUCTION MANAGER

a/s Norske Shell

NERAL ORGANIZATION CHART



A/S NORSKE SHELL

DRILLING PROGRAMME - LOCATION 31/2-C

A. GENERAL

1. Location

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

b) Preliminary surface co-ordinates (centre of location corresponding to SP 200 on seismic line 79-416)

Geographical	TMCM 5°
60° 46 47.1" N	6739202
03° 37' 22.4" E	425002

Tolerance: 50 metres all round

The tight tolerance given for this location is necessary to avoid fault complications in the SW and to ensure an adequate gas column is encountered to allow testing to be carried out.

2. Base

Tananger Shore Base to Location	262 kms
Bergen Shore Base to Location	112 kms

3. Depth References

a) All depths are given with respect to the rotary table of the drilling vessel at the specified drilling draught.

b) Expected water depth at location is +/-328 m metres (MSL-seabed)

c) For drilling, the barge draught will be c. 25.0 metres.

d) Distance from rotary table to MSL is taken as +/-25 metres for this programme but will be measured on site.
Distance from rotary table to seabed is taken as +/-353 metres for this programme but will be measured on site.

4. Type of Well

Exploration well.

5. Total Depth

TD in Triassic Red Beds is anticipated to be +/-2600 m SS (2625 m BDF).

6. Drilling Installation

"Borgny Dolphin" - Aker H-3 semi-submersible, or
"West Venture" - a Norrig-5 design semisubersible, dependent on rig availability.

7. Objectives

i) To evaluate lateral variation of reservoir parameters eastwards on the flank of the accumulation.

ii) To test the zone of oil shows seen in 31/2-1 in a better reservoir.

iii) To test the gas accumulation in a downdip location.

iv) To evaluate the nature of the flatspot in a location where very strong amplitude is seen.

v) To get reliable geologic tie to the seismic reflectors above the reservoir for a better regional evaluation.

See attached seismic section, velocity time function, structure map and prognosis sheet.

8. Prognosis

FORMATION TOPS	LITHOLOGY	DEPTH TVBDF METRES	SEISMIC TOLERANCE
Seabed (Quarternary-Eocene)	Clay, claystones, silts, and thin sands	353	
Palaeocene	Silty claystones with thin sandstones	1185	+/-20
Cretaceous	Marls and claystones, thin argillaceous limestones	1378	+/-20
U. Jurassic (L. Kimmerian Unconformity)	Organic shales	1427	+/-20
U. and M. Jurassic Sand*	Coarse partly unconsolidated sandstones with finer argillaceous bands	1534	+/-20
Seismic flatspot		1587	
M. Jurassic	Fine silty, micaceous sandstones with thin shales, becoming massive fine to coarse sandstones locally thin sandy limestones.	1615	+/-30
M-L Jurassic	Sandstones, shale content increasing downwards	1930	+/-30
L. Jurassic	Silty claystones with thin sandstones and marls	2095	+/-30
L. Jurassic Sand **	Sandstones, fine-coarse with shale bands and coals	2205	+/-30
'C' Reflection		2325	+/-40
Triassic	Fine sandstones with siltstones and grey/red-brown claystones	2425	+/-30
T.D.		2625	

* Primary target
** Secondary target

9. Pressures

From experience gained in the drilling, the subsequent electric logging, and RFT pressure measurements made in 31/2-1, that well was found to be hydrostatically pressured, with no overpressured regimes encountered.

The proposed location 31/2-C is located in a separate fault block some 4 km to the eastwards of 31/2-1. Various seismic events can be traced across this fault, indicating the fault is non sealing. Therefore the location 31/2-C is considered to be in the same hydrostatically pressured regime (See Encl. 1).

10. Mud Resume

The 36" and 26" hole sections (including the 17½" pilot hole for the 26" hole) are to be drilled with a seawater and viscous pills combination. If hole conditions dictate then a weighted seawater gelled mud will be used.

The 17½" hole section is to be drilled with a Gypsum /Lignosulphonate mud system, with a mud weight of S.G. 1.22 - 1.31 (.530 - .565 psi/ft). Note: From experience gained in 31/2-1 a mud weight of S.G. 1.31 was required to stabilize an incompetent squeezing interval in this section.

The 12-1/4" hole section is to be drilled to TD with a Gypsum/Lignosulphonate mud system, with a weight of S.G. 1.19 - 1.22 (.515 - .530 psi/ft).

The mud weights mentioned and other mud parameters are liable to change as hole conditions dictate.

Detailed mud properties and parameters will be specified in a separate mud programme.

11. Well Control

A diverter will be hooked up to the riser during the drilling of the 17½" pilot hole for the 20" casing. In addition, 1.3 - 1.4 SG mud (.570 - .600 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.

12. Deviation Control

Magnetic single shot surveys will be taken every 90 metres, to coincide with bit trips where possible. The well path is to be calculated using the "Minimum Radius of Curvature" Method.

13. Casing Summary

Size	Grade	Weight	Coupling	Interval BDF
30"	X-52, 1" WT	310 lbs/ft	ATD-RB Squnch	Seabed - 430 m
20"	K-55	133 lbs/ft	Vetco LS-LH	Seabed - 800 m
13-3/8"	N-80	72 lbs/ft	BTC	Seabed - 1475 m
9-5/8"	L-80	47 lbs/ft	VAM	Seabed - 2615 m

N.B. The 13-3/8", N80, 72 lbs/ft, BTC casing must be specially drifted at the mill (during manufacture) and again at the rig (before running) to ensure it will pass a 12-1/4" bit.

14. Wellhead Equipment

Cameron wellhead equipment will be used.

15. Formation Gradient Tests

Leak off tests will be made after drilling 5 metres of new hole below the 20", 13-3/8" and , if required, the 9-5/8" casing shoe.

16. Casing Accessories

The 30", 20", 13-3/8", 9-5/8" casing scheme will be used. Casing attachments will be as follows:

30" Float shoe

20" Float shoe
Two rigid centralizers equally spaced inside 30" conductor.

13-3/8" Float shoe + float collar one joint above shoe 10 spring centralizers - 2 on shoe joint, 6 on the next 12 joints (one every second joint) and 2 inside 20" shoe, spaced 1 joint apart.

9-5/8" Float shoe + float collar 2 joints above the shoe. Two spring centralizers on the shoe track, 1 centralizer per 3 joints up to the base of the reservoir, 1 centralizer per joint across the reservoir, 1 centralizer per 3 joints up to the 13-3/8" shoe and 1 rigid centralizer per 3 joints over the first 100 m of 9-5/8" inside the 13-3/8" casing.

Casing test pressures will be follows:

20"	1000 psi for 15 mins
13-3/8"	3000 psi for 15 mins
9-5/8"	4000 psi for 15 mins

Pressure tests on the 13-3/8" and 9-5/8" casings to be done 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 resulting from excessive rotating hours inside the casing. Alternatively, McCullough casing wear logs may be used to determine the extent of wear damage to the casing strings.

Cement calculations, see Encl. 2

B. SUMMARY OF OPERATIONS

1. Pre-Spud Phase

Site Survey

A seabottom/shallow gas survey has been carried out over the well location by A/S Geoteam (see Site Survey Report). Analog sparker, deep tow boomer, echo sounder and side scan sonar surveys were made within a 4 x 6 km grid centred on the location. Digital sparker profiles were also shot in a 4 x 1 km grid centred on the well location. Three gravity cores will be taken. (Some of this data has been processed and a report is expected in the near future)

Rig positioning

The rig will be brought on to location utilizing Decca Pulse-8 with HP minicomputer. All anchors will be run out to plus/minus 1450 m. The rig will be positioned with a heading of 315° (T). After anchors have been set, each anchor will be tested to plus/minus 400 000 lbs for 2 - 3 hours. After satisfactory mooring test, approx 250 000 lbs will be held on all anchor chains.

The final coordinates will be determined with an accuracy of 10 m (RMS) using Satnav (JRM-1).

2. Spudding

General

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

ii) Observe operations such as the penetration test placing of TGB and MGB, spudding in, stabbing in, drillin with returns to seabed, cementing of 30" and 20" casing, with the rig's underwater TV camera.

Procedure

1. Check the seabed condition by an observation dive.

2. Carry out a penetration test. If the seabed is hard, drill plus/minus 5 m with the 36" hole opener and 26" pilot bit assembly. Circulate at plus/minus 200 GPM.

3. Calculate the DF - seabed distance and Mean Sea Level(MSL from the penetration test, the drilling draught, and prevailing tidal variation.

4. Decide from the penetration test if extra horizontal plates are to be welded on to the TGB, to reduce settling and/or tilting.

The steps above can be performed whilst preloading the anchors, the steps below are to be performed once the anchors are proven.

5. Set TGB at slack tide. A Regan slope indicator is to be run on the TGB running tool to give an indication of the TGB angle. The TGB guide lines are to be marked at the spider deck level so that any subsequent sinking or tilting will be detected.

6. MU a 36" hole opener and 26" pilot bit assembly (a monel collar to be included for MSS). Drill down to 30" casing setting depth, taking a MSS after the first Kelly down. Additional surveys will be carried out as necessary, depending on angle. If hole angle is greater than 1½ degree then contact base, where the various options will be considered.

   Before POH to run 30" casing circulate high viscosity mud in the hole, using 200% excess.

7. Run 30" casing plus MGB equipped with a Regan slope indicator (to be installed in the middle of a side beam, as close to the beam as possible). Install a second Regan slope indicator on the 30" running tool. Ensure that the slope indicators are properly level and zeroed and will be visible to the TV.

8. When the 30" casing is landed observe the angle with the TV camera. If the angle is 1 degree or less, cement the casing using 200% excess cement.

9. WOC. Divers to check cratering around the guide bases, with an observation dive. Run a check-totco in 30" running tool. (Install a totco ring in a sub below the running tool.)

10. If excessive cratering is observed, re-cementing around the guide base or seabed may be considered prior to drilling out of the 30" casing. Or if this problem is anticipated, consider using 300% excess cement instead of 200%.

N.B. Maintain a tension in the anchor lines/chains at the upper limits until the 30" casing is cemented, in order to minimize rig offset. Otherwise, the stack + conductor could be set under an angle which could lead to serious damage to the U.W. equipment.

   Ensure that the tension of the guide lines is optimum so that the TGB will not be lifted on one side or be tilted by excessive un-even guide line tenstion.

   It is evident that the weather conditions should be moderate for most of these operations.

3. Drilling 26" hole and running 20" casing

Diverter System used

Diverter systems are fitted on offshore rigs to provide a means of controlling the flow should shallow pressures be encountered whilst drilling for the first casing string (surface casing).

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.

Drill out cement in 30" casing and 36" pocket with 26" hole opener and 17½" pilot bit with a stabilizer at 20 m and start 17½" pilot hole. Pull out of hole and lay down 26" hole opener.

Run 30" pin connector complete with flex joint on 21" riser. Use minimum required tension on ruckers. Fill up riser with seawater and observe fluid level. Use required riser tension for existing sea state and determine limitations.

Make up 17½" bit on drilling assembly. Use a float sub with the float installed and run in the hole.

Close diverter around drillpipe, and circulate through diverter lines to check diverter equipment; gradually build up to maximum circulating rate. Open diverter packing.

Drill to 20" casing point using seawater allowing 10 m pocket. Circulate 5 to 15 minutes prior to each connection, or longer if abnormal drag is experienced, or make wiper trip to the shoe. If hole troubles are severe use a gelled water mud, weight 1.04 SG (450 psi/1000 ft) Visc 50 secs MF. Observe returns from annulus continuously. If weight of annular returns causes losses or exceeds 1.10 SG (475 psi/1000') stop drilling and circulate hole clean first. If conditions are normal when casing point is reached, log as required, change hole volume to water and observe well. Open dump valve to equalise water level in and outside Marine Riser. Observe well, drop MSS, pull out of hole, retrieve Marine Riser, 30" pin connector, etc.

RIHand open hole to 26" using a pilot bit and 26" hole opener with a 26" or 25" stabiliser at 10 m and 30 m above bit.

Use seawater to drill with, but slug hole as required with gel mud. On check trip and final trip out prior to running 20" casing spot viscous mud using 150% excess over open hole volume.

Conditions in the 26" hole, as well as in the 36" hole, may warrant spotting mud of ca. 1.11 SG (480 psi/1000 ft). before wiper trips or running casing. Repositioning the stabilisers prior to reaming may also help to counter difficult conditions.

Problems whilst diverter drilling

a) Severe losses

If severe losses are encountered while drilling with returns to surface pull out and drill a 12-1/4" hole instead of 17½" and restrict penetration rates and obtain the lightest possible annular returns. If severe losses are continuing, open the dumpvalves and drill a 12-1/4" pilot hole with returns to seabed.

If gas flow is encountered whilst drilling 12-1/4" pilot hole with seawater and returns to seabed, spot heavy mud and follow up with cement to kill well. Have a cementer on board for this eventuality, as long as diverter is in use.

b) Gas Flow (No losses)

If any flow of gas is encountered whilst drilling the 17½" pilot hole, drill to 20" casing point with required mud weight. Circulate hole clean and make check trip. Circulate, drop Totco and pull out of hole. Run logs as required. Make up 26" hydraulic under-reamer with 18½" stabilizer 60 ft above under-reamer.

Under-ream 17½" hole to 26". Circulate and increase mud weight on bottom to compensate for the loss in hydrostatic head as a result of the removal of the Marine Riser later on. Check trip to shoe. Run back to bottom. Circulate, if required, Observe well. Open dump valve. Fill up Marine Riser with seawater to give a column equal to the water depth. After level in Marine Riser is equalised to sea level, observe well in Marine Riser and check flow on open dump valve with TV. Close dump valve. Make another check trip circulate and pull back to pin connector, circulate to seawater. POH. Retrieve Marine Riser. Stand back 18-3/4" housing in derrick. Make additional check trip prior to running 20" casing.

c) Gas Flow and Severe Losses

If any flow of gas is encountered whilst drilling the 17½" pilot hole with returns to surface, and the required increased mud weight to counteract the gas flow causes severe losses, then pump cement to kill the well.

Further programme will be advised in this case.

Run land and cement 20" casing as per programme. Use subsea cementing plug system (top plug), unless otherwise advised.

After releasing running tool, pick up until bottom of stinger is just below 18-3/4" housing and wash in and around the housing with seawater before retrieving running tool.

Install 18.3/4" BOP stack and 21" Marine Riser.

Test stack, complete with casing. For stack test procedure see "Stack Testing" Item C. Make up drill pipe hang off assembly and circulating head assembly. Install wearbushing.

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

1. Drill 17½" hole to programmed depth. Use maximum annular velocities. Design the drilling assembly for maximum penetration rate. NB: Leak off test to be performed after drilling 5 m new hole below 20" shoe.

2. Log as per well programme. Make up 13-3/8" hanger with subsea cementing assembly and top plug only, and stand back in derrick.

3. Make checktrip, pull wearbushing and run 13-3/8" casing to landing point, leaving a 10 m pocket at bottom below the 13-3/8" shoe.

4. Cement 13-3/8" casing. Subsea plug system to be used (top plug), unless otherwise advised by Base. Clean out the stack area with water prior to pulling out the running string.

5. Carry out stack and casing tests as per "Stack Testing" Item C. Install wearbushing. Make up drillpipe hang-off assembly and circulating head assembly. Carry out a kickdrill.

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

1. Drill out float collar, cement and shoe and drill 5 m of hole. Carry out a leak off test not exceeding 90% of over-burden gradient.

2. Drill 12-1/4" hole to 2625 m. Bit weight, RPM, bit selection and bottom hole assembly to be determined on site for optimum penetration rate.

NB. Coring will commence in the Upper Jurassic (Kimmeridge) Clays to ensure coring of the clay/sand interface. Coring will continue to at least 30 m below the hydrocarbon/water contact in the Upper and Middle Jurassic Sands. Coring will resume in the Lower Jurassic Sands if hydrocarbons are encountered. Coring will continue in the Lower Jurassic Sands, if the reservoir is hydrocarbon bearing, until at least one core is taken in the water zone.

3. Carry out logging programme, including wire line tests if necessary. (See Evaluation Requirements Section 3)

Note If the L. Jurassic sands are found to be hydrocarbon bearing then the 9-5/8" casing will be run to TD (2625 m) If no hydrocarbons are encountered then the open hole section will be abandoned as outlined below in(6) Abandonment, to +/-75 m below the base of the U-M Jurassic reservoir, and 9-5/8" casing will be run. A specific testing programme will be issued.

4. Make scheck trip. Pull wearbushing. Run circulating tool and wash inside the 18-3/4" housing. When washing out the wellhead with seawater prior to running of casing, seal assemblies or wearbushings (using circulating tool), limit te jet-velocities to 20 m/sec. maximum, and move the tool while cleaning to prevent damage in the wellhead or the BOP stack.

5. Run, land and cement 9-5/8" casing leaving a pocket of 6-10 m below the 9-5/8" shoe. The casing will be extended to the rig floor and a conventional cement head used, unless advised differently from Base. Whilst displacing, returns are to be monitored closely. If losses are observed adjust pump rates accordingly.

6. Carry out stack and casing tests as per "Stack Testing" Item C. Install wearbushing. Make up drillipe hang-off assembly and circulating head assembly. Carry out a kickdrill.

6. Abandonment

1. Prior to running 9-5/8" casing, non-hydrocarbon bearing porous zones in te open hole interval will be isolated with cement plugs extending 30 m above and below each zone.

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 30 meters above and below the perforated interval or down to a casing plug whichever is less.

3. A cement plug of at least 30 meters shall be placed in the smallest casing string. This plug shall be placed at the level of the 13-3/8" casing shoe.

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

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

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

7. A specific abandonment program will be prepared and issued when the well reaches total depth.

C. STACK TESTING

The regular tests of the BOP Stack in service have to be limited to the following pressures, unless differently advised by the base.

18-3/4" 10 000 psi BOP Stack

1. Pipe Rams : 5000 psi

2. Blind Rams : Casing test pressure, as specified in Item A-15

3. Kill/choke lines and valves: 5000 psi

4. Annular preventers : 2000 psi around 5" DP
1500 psi around 3½" DP

a) Tests 1, 3 and 4 to be carried out with a boll weevil run on DP and landed in the wellhead.

b) Test 2 to be carried out only when the cement of the last casing is not yet drilled out.

Accumulator Tests

The accumulators must have sufficient capacity to be able to close, open and close all preventers 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. A note that this test was carried out (and results) must be made in the Drilling Report and on the weekly BOP - test checklist. For frequency see (this Section) item 10.

Notes on Testing

1. The BOP stack has to be tested on all functions and all rams tested to the full rated WP at the surface prior to running the Stack. However, the blind/shear rams will be tested only on orders of Base, but at least once per month during a routine Stack test.

   After the surface test all Cameron clamp connections and all studded connections must be checked for tightness.

2. All pressure tests to be carried out with water, unless differently advised by Base.

3. All surface equipment has to be satisfactorily pressure tested prior to testing the BOP Stack underwater.

4. 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 at least twice; firstly, as soon as the stack is below sea level and, secondly, just before landing the stack.

5. When testing the BOP stack underwater with a boll weevil test tool in the wellhead, use the vented red-painted test single - see "Requirements" section in "Routine Testing of the BOP Stack".

6. The test pressure should be kept on for 15 minutes, and the acceptable pressure drop over this 15 minutes period is 10% of the initial test pressure, provided that the pressure remains constant for the next 5 to 10 minutes.

7. 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.

8. 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 investigations and/or repairs.

9. The testing of 10 000 psi BOP Stacks will be done to 5000 psi only, at the 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 a boll weevil test tool, e.g. subjecting the seals of the seal assembly to the same pressure as the BOP Stack; or by means of a weight set tester, subjecting only the Stack to the required test pressure.

Run 2 stands drill collars below the weight set tester to assist in shearing the pins with set down weight.

See item 1 on blind/shear rams.

10. Accumulator tests (as described previously) should be done either on request of Base, or after repairs have been done to the accumulator system, i.e. bottles, bladders, pumps, etc.

Routine Testing of the BOP Stack

To prevent continuous loading of the choke and kill-line to 5000 psi adhere to the following standard procedure.

Requirement

1 5" DP single painted red, with a hole drilled in the tool-joint of the pinend (5/8" hole is OK) Red is for easy recognition.

1 pc Hydril kelly cock tested to 5000 psi.

Procedure

a) Run in the Boll weevil with the Hydril kelly cock underneath it in the closed position.

Above the Boll weevil, install the red single with the hole and the drillpipe spaced out such that the distance above derrick floor is plus/minus 10 feet.

b) Circulate wellhead and choke and kill-line to water.

c) Close outer choke and outer killvalve and open inner choke and inner kill valve. Test choke and kill-line to 5000 psi.

Choke line, kill-line and outer choke and outer killvalve tested.

d) Close bottom pipe rams. Circulate until water comes out of DP on DF. Test via drillpipe and circulating head to below rams to 5000 psi. Outer kill valve inside bottom connector, top annular seal, bottom pipe rams and kelly cock tested. Bleed off pressure.

e) Open bottom rams, close middle pipe rams. Open outer FS kill valve and close inner failsafe kill valve. Open outer failsafe choke valve and close inner failsafe choke valve. Test 5000 psi. Middle rams, inside FS valve of choke and kill-line tested. Bleed off pressure.

f) Open middle pipe rams and close top pipe rams. Close both kill FS valves and outer choke valve. Open inner failsafe valve on the choke-line. Test 5000 psi. Outer choke failsafe valve and top pipe rams tested.

g) Close bottom annular preventer. Close all FS valves. Test annular to 2000 psi. Bleed offpressure. Bottom annular tested.

h) Open bottom annular preventer. Close top annular preventer. Repeat as under (g).

Only the outside of the inner kill and choke valve are not tested, but if all pressures are holding from the inside, this is immaterial. An additional advantage is the direct way of testing, eliminating leaks in surface lines. Test on blind rams is only done on test stump and against cement plug, if required, on initial casing test.

The initial stack test after bumping the plugs can be done using the seal assembly running and testing tool, and pressurizing via choke and/or kill lines. Always measure first the amount of fluid required to test against the closed failsafe valves, to be able to check more accurately on the total volume needed when testing the ram cavities. Subsequent tests are to be carried out as described above.

If at any time a leak develops (or the pressure does not hold) during a test, then repeat it the "normal way", leaving out the single with the hole and using just the boll weevil + drillstring, and pressurize via the kill line.

From time to time it may be advised by base to run the seal assembly running and testing tool on these weekly tests to check the seals from the hanger to seal assembly.

Use TV observation at all times. In case of an undetectable leak when testing with plain water, change to mud or dyed water, so that a leak can easily be recognised on the TV screen.

N.B. Depending on stack configuration, this procedure may be changed on a particular rig after consultation with Base.

D. EVALUATION REQUIREMENTS

1. Cutting Samples

Ditch cuttings to be collected every 10 m below 30" casing down to 1155 m , and every 3 m thereafter. The following samples will be required for partners/government bodies:

a) 6 x small cuttings bags of washed dried samples.

b) 3 x 2 kilograms bags of wet samples.

c) 1 x 1 kilogram bag of wet samples.

One 1 kilogram bag 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. Otherwise samples should be sent ashore ASAP, marked for attention of EPXV/1, Tananger.

2. Coring

a) Upper/Middle Jurassic reservoir section

Coring is to commence in Upper Jurassic Shales below the Late Kimmerian Unconformity and to continue at least 30 m below the hydrocarbon/water contact. Approximate interval is 1509-1562 m SS (1534-1587 m BDF).

b) Lower Jurassic reservoir section

Coring will resume in the Lower Jurassic Sands if the reservoir is hydrocarbon bearing. Coring is to continue until at least one core is taken in the water zone.

3. Logging Programme

a) At 20" depth (in 17-1/2" pilot hole):
ISF/SONIC/GR/SP
FDC/CNL/GR/CAL
LSS

b) At 13-3/8" depth:
ISF/SONIC/GR/SP
FDC/CNL/GR/CAL
LSS
SWS as required

c) At 9-5/8" depth (T.D.)
ISF/SONIC/GR/SP
FDC/CNL/GR/CAL
MSFL/DLL/CAL
LSS
HDT
SWS
VELOCITY SURVEY
CBL (on 13-3/8" and 9-5/8" casing)

Note: Intermediate logs may be run in 12-1/4" hole if required.

E. CASING DESIGN - WELL 31/2-C

Casing designs are presented for the 20", 13-3/8" and 9-5/8" casings (Encl. 3.0).

The following assumptions apply:

1. For tension, a design safety factor of 1.6 is used, neglecting buoyancy in the drilling fluid. The 20" and 13-3/8" casings are only considered to extend to seabed for the tension calculation as the subsea cementing system will be employed with the casing landed on DP. In the case of the 9-5/8" casing, the casing will be landed using an extension string back to surface, and hence the tension calculation incorporates the length of casing from seabed to the drill floor.

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.

3. For burst, a design safety factor of 1.1 is employed. The pressure distributions for the burst loading assumes a 40% evacuation of mud from the well by a kick.

4. For collapse, a design safety factor of 1.0 is employed. Total evacuation of the casings is assumed for the design.

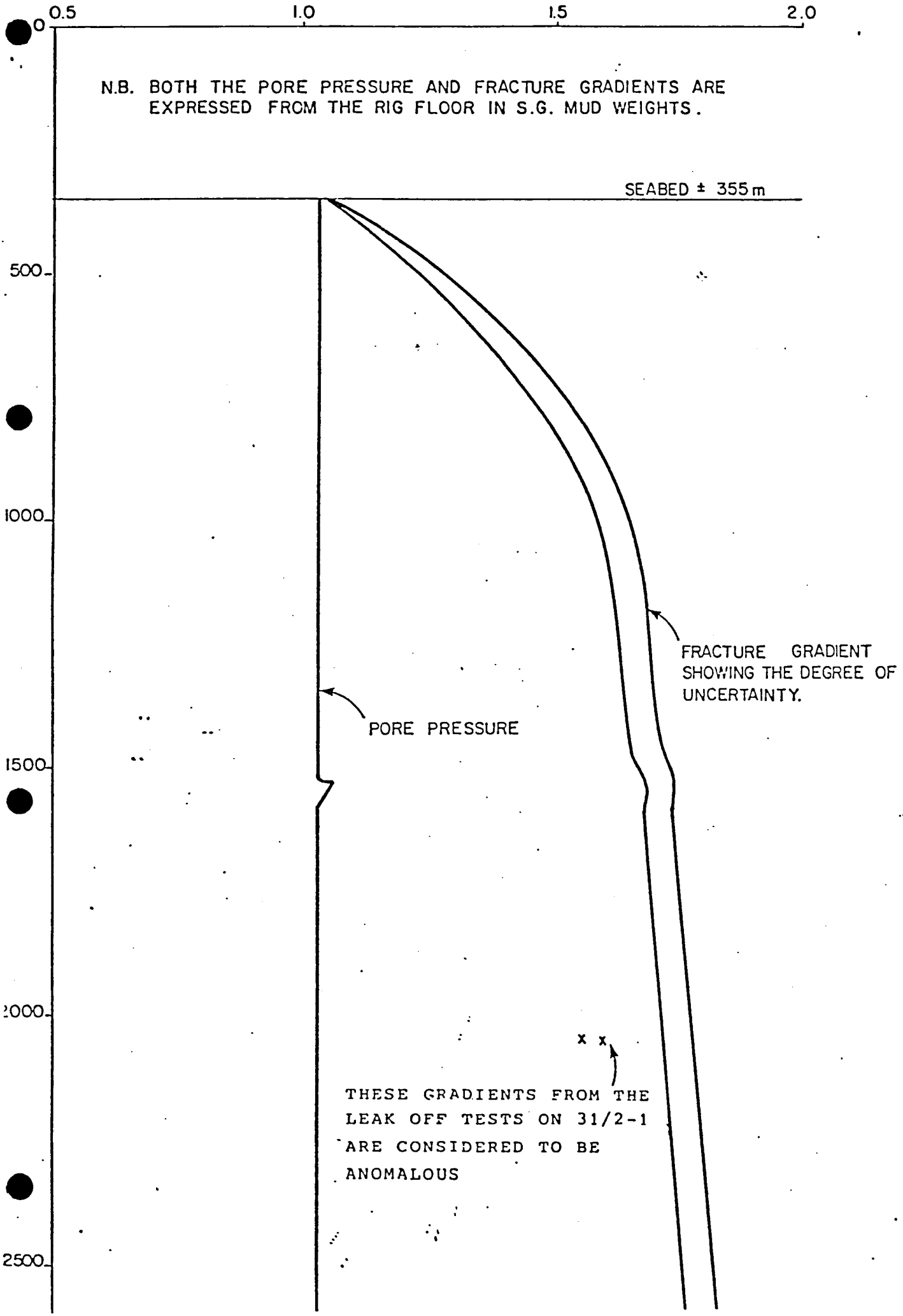
5. In the production test design for casing burst, a tubing leak is assumed putting full THP on the tubing-casing annulus.

F. GLOSSARY OF ABBREVIATIONS

BDF	:	below derrick floor
BGT	:	borehole geometry tool
BOP	:	blow out preventer
FS	:	fail safe (as in FS valve)
ID	:	internal diameter
MF	:	Marsh funnel (mud viscosity)
MGB	:	main guide base
MSL	:	mean sea level
MSS	:	magnetic single shot
OD	:	outside diameter
PPG	:	pounds per US gallon
PV	:	plastic viscosity
SS	:	sub sea
TGB	:	temporary guide base
TMCM	:	Transverse Mercator, Central Meridien
UGF	:	universal guide frame
YP	:	yield point

WELL 31/2-C

ESTIMATED PORE PRESSURE AND FRACTURE GRADIENTS SHOWING THE DEGREE OF UNCERTAINTY.



CEMENT CALCULATIONS (Encl. 2)

30" Cementation

Extended Norcem Class 'G' cement of lead slurry weight 13.2 ppg and 10 m of tail slurry weight of 15.8 ppg to be used. The casing is to be cemented back to seabed, and an excess of 200% is to be used over open hole intervals. Cement displaced to 10 m above shoe.

Data

Casing 30" 1" WT
30" shoe 430 m BDF
36" hole 440 m BDF

Lead slurry volumes

i) 36" x 30" annulus = (420 - 353) x 3.281x2.1598x3 = 1424.3 cu.ft

Cement required = 1424.3/1.89 = 753.6 sxs
= 32.1 m/t

Mixwater required = 753.6 x 10/42 = 179.4 bbls

Econolite required= 753.6 x .36 = 271.3 gallons

Tail slurry volume

i) 36" x 30" annulus = (430-420)x3.281x2.1598x3 = 212.6 cu.ft.

ii) 36" pocket = (440-430)x3.281x7.0686x3 = 695.8 cu.ft

iii) 30" casing fill = 10x3.281x4.2761 = 140.3 cu.ft

Total slurry 1048.7 cu.ft

Cement required = 1048.7/1.17 = 896.3 sxs
= 38.2 mt

Mixwater required = 896.3 x 5.15/42 = 109.9 bbls

20" Cementation

Extended Norcem Class 'G' cement of lead slurry weight 13.2 ppg, and 60 m of tail slurry above the shoe, of weight 15.8 ppg to be used, The casing is to cemented back to seabed and an excess of 100% is to be used over open hole intervals. Cement to be displaced to 10 m above the shoe.

Data

Casing 20"/133 lbs/ft/K55/VETCO LS-LH
30" shoe at 430 m BDF
36" hole at 440 m BDF
20" shoe at 800 m BDF
26" hole at 810 m BDF

Lead Slurry Volumes

i)	30" x 20" annulus = (430-353)x3.281x2.0944	=	529.1 cu.ft
ii)	36" x 20" annulus = (440-430)x3.281x4.8869x2	=	320.7 cu.ft
iii)	26" x 20" annulus = (740-440)x3.281x1.5053x2	=	2963.3 cu.ft
	Total slurry volume	=	3813.1 cu.ft
	Cement required = 3813.1/1.89	=	2017.5 sxs
		=	86.0 mt
	Mixwater required = 2017.5x 10/42	=	480.4 bbls
	"Econolite" required = 2017.4 x .36	=	726.3 gallons

Tail slurry volumes

i)	26" x 20 "annulus = (800-740)x 3.281x1.5053x2	=	592.7 cu.ft
ii)	26" pocket = 10 x 3.281x3.6870x2	=	241.9 cu.ft
iii)	20" casing fill =10x3.281 x 1.9133	=	62.8 cu.ft
	Total slurry volume	=	897.4 cu.ft

Cement required	897.4/1.17	=	767.0 sxs
		=	32.7 mt
Mixwater required	767.0 x 5.15/42	=	94.0 bbls

13-3/8" Cementation

Extended Norcem Class 'G' cement of lead slurry weight 13.2 ppg and 75 m of tail slurry above the shoe, of weight 15.8 ppg to be used. The casing is to be cemented back to 150 m inside the 20" casing using 20% excess on open hole volumes. Cement will be displaced to a float collar c. 13 m above the shoe.

Data:

Casing 13-3/8"/72 lb/ft/N80/BTC
20" shoe 800 m BDF
26" hole 810 m BDF
13-3/8" shoe 1475 m BDF
17-1/2" hole 1485 m BDF

Lead Slurry Volumes

i) 20" x 13-3/8" annulus = (800-650)x3.281x0.9377 = 461.5 cu.ft

ii) 26" x 13-3/8" annulus = (810-800)x3.281x2.7113x1.2= 106.7 cu.ft

iii) 17½" x 13-3/8" annulus=(1400-810)x3.281x0.6946x1.2 = 1613.5 cu.ft

Total slurry volume = 2181.8 cu.ft.

Cement required 2181.8/1.89 = 1154.4 sxs
= 49.2 mt

Mixwater required 1154.4 x 10/42 = 274.8 bbls

"Econolite required" 1154.4x.36 = 415.6 gallons

Tail slurry volumes

i) 17½" x 13-3/8" annulus=(1475-1400)x3.281x0.6946x1.2 = 205.1 cuft

ii) 17½" pocket = 10x3.281x1.6703x1.2 = 65.8cuft

iii) 13-3/8" shoe track= 13x3.281x.8314 = 35.5 cuft

Total slurry volume = 306.4 cuft

Cement required 306.4/1.17 = 261.8 sxs
= 11.2 mt

Mixwater required 261.8 x5.15/42 = 32.1 bbls

9-5/8" Cementation

Norcem Class 'G' cement at 15.4 ppg slurry wt will be used as the main slurry up to 1325 m 50 bbls (262 m) of 13.5 ppg scavenger slurry (Class 'G') is to be pumped ahead of the main 15.4 ppg slurry. A 20% excess is to be used over open hole intervals, and cement is to be displaced to a float collar c. 25 m above the shoe.

Data:

Casing 9-5/8"/47 lb/ft/L80/VAM
13-3/8" shoe 1475 m
17-1/2" hole 1485 m
9-5/8" shoe 2615 m
12-1/4" hole 2625 m

15.4 ppg slurry volume

i) 13-3/8" x 9-5/8" annulus (1475-1325)3.281x.3262 = 160.5 cu.ft

ii) 17½" x 9-5/8" annulus (1485-1475) 3.281x1.1651x1.2 = 45.9 cu.ft

iii) 12-1/4" x 9-5/8" annulus(2615-1485)3.281x.3132x1.2 =1393.4 cu.ft

iv) 12-1/4" pocket 10x3.281x0.8185x1.2 = 32.2 cu.ft

v) 9-5/8" shoe track 25 x 3.281 x 0.4110 = 33.7 cu.ft

Total slurry volume = 1665.7 cu.ft

Cement required 1665.7/1.24 = = 1343.4 sxs
= 57.3 mt

Mixwater required 1343.4 x 5.24/42 = 167.6 bbls

"Econolite" 1343.4 x .1 = 134.3 gallons

"CFR-2" 1343.4 x .22 = 295.5 gallons

"HLX" C248" 1343.4 x .15 = 201.5 gallons

13.5 ppg scavenger slurry volumes

i) 13-3/8" x 9-5/8" annulus(1325-1063)3.281x.3262 =280.4 cu.ft

Cement required 280.4/1.68	=	166.9 sxs
	=	7.12 mt
Mixwater required 166.9 x 8.29/42	=	32.9 bbls
"Econolite" 166.9 x .16		26.7 gallons
"CFR-2" 166.9 x .35	=	58.4 gallons
"HLX-C248" 166.9 x .24	=	40.1 gallons

N.B.

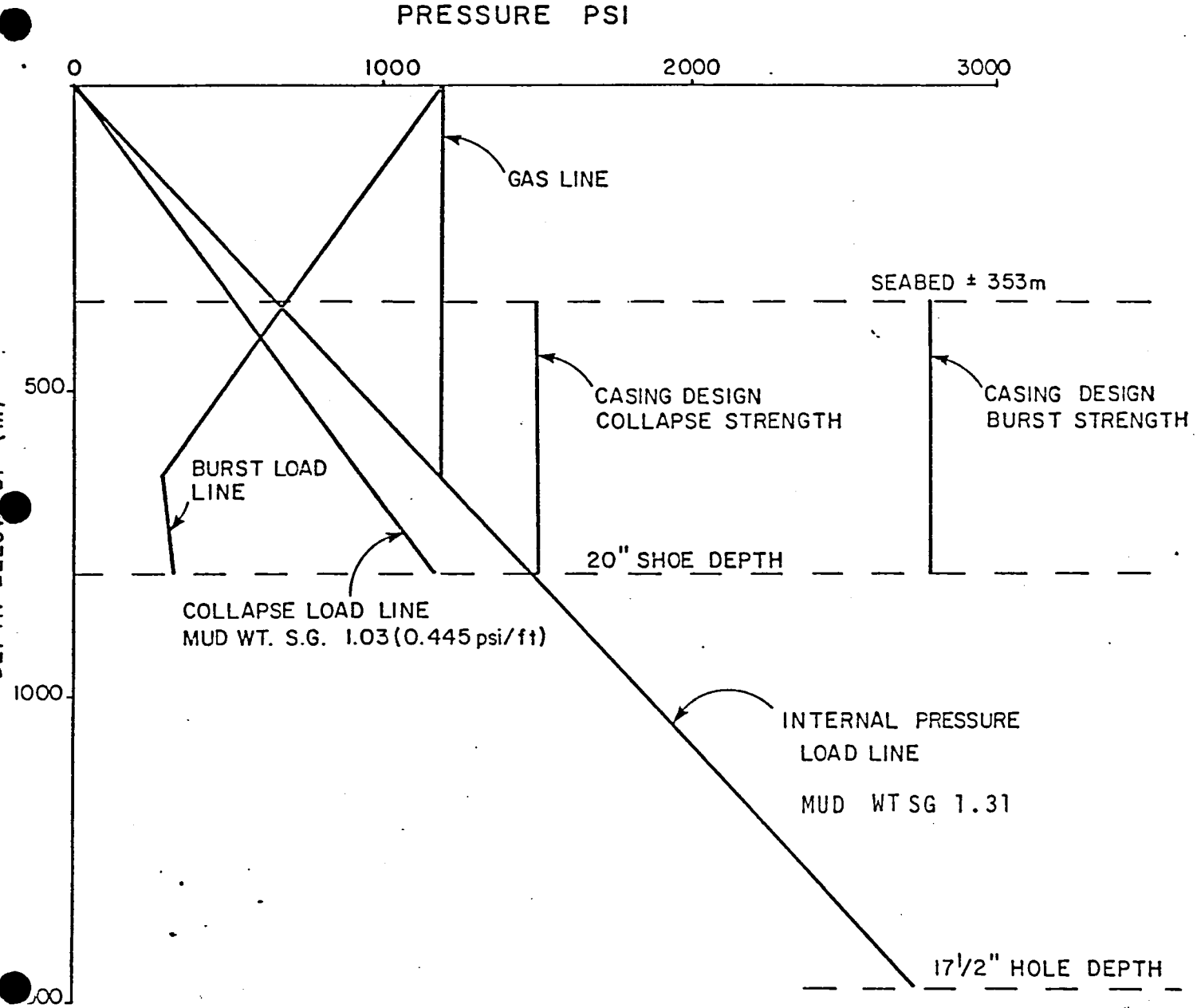
1. In the light of hole conditions and estimates of fracture gradients whilst drilling, the 9-5/8" casing may be cemented in two stages, with a DV collar placed c.100 m below the base of the main reservoir (plus/minus 1715 m) A detailed programme will be issued if this is the case.

2. For each cementation where possible the slurry volumes are to be calculated using caliper logs, and adjusting the percentage of excess accordingly.

3. As mentioned in B.5.3 12-1/4" open hole may be plugged back to plus/minus 75 m below the base of the main U. and M. Jurassic Sand reservoir prior to running 9-5/8" casing, if the lower reservoirs are not found to be hydrocarbon bearing. In this event, the 9-5/8" casing string will be considerably shorter than envisaged in the calculations above.

Encl. 3

20" CASING DESIGN GRAPH 31/2-C



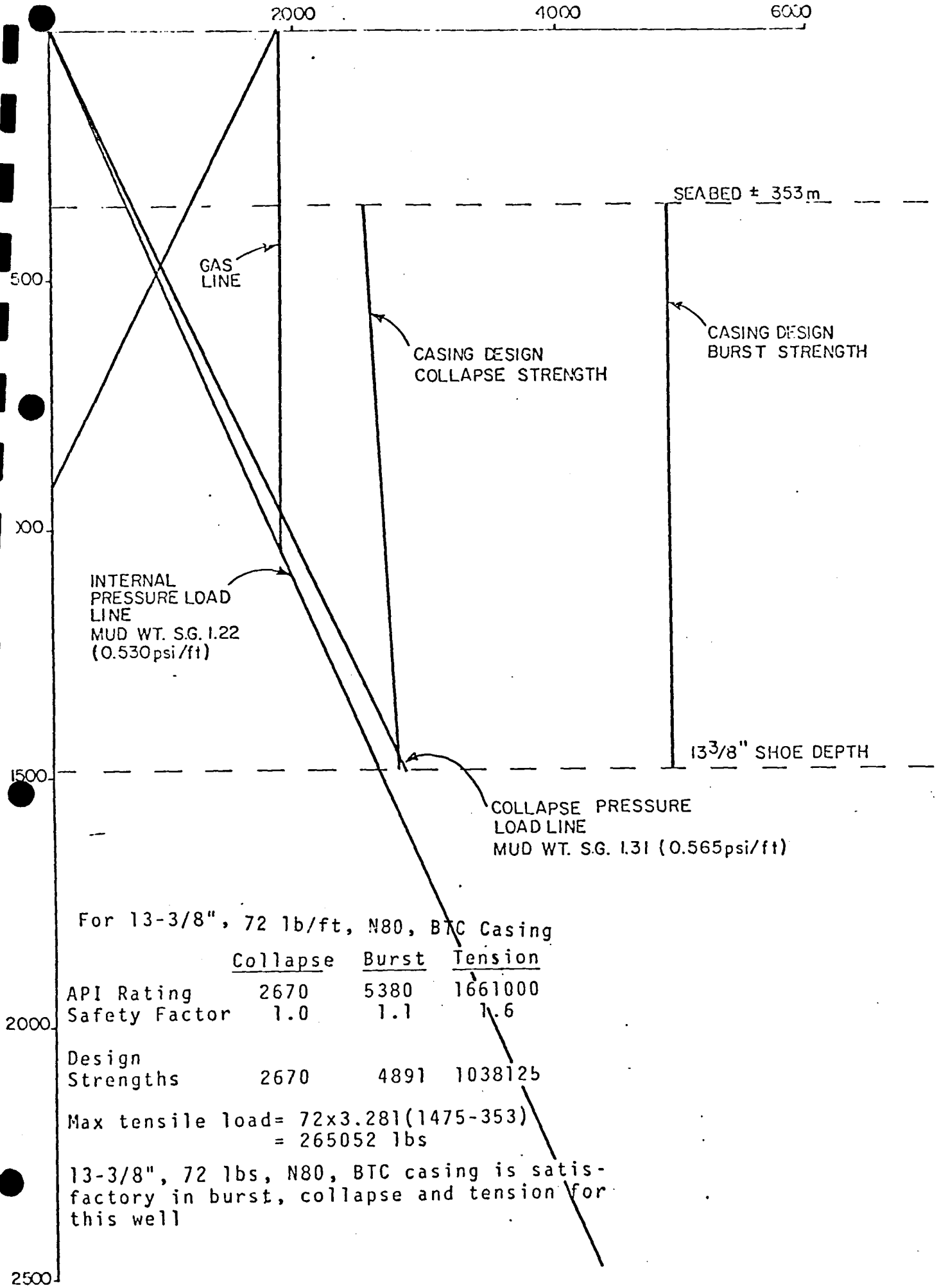
For 20", 133 lb/ft, K55, Vetco LS-LH Casing

	Collapse	Burst	Tension
API Rating	1500	3060	2123000 lbs
Safety Factor	1.0	1.1	1.6
Design Strengths	1500	2782	1326875 lbs

Maximum Tensile Load = 133 x 3.281 (800-353)
= 195058 lbs

20" 133 lb/ft, K55, Vetco LS-LH is satisfactory in burst, collapse and tension for this well

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



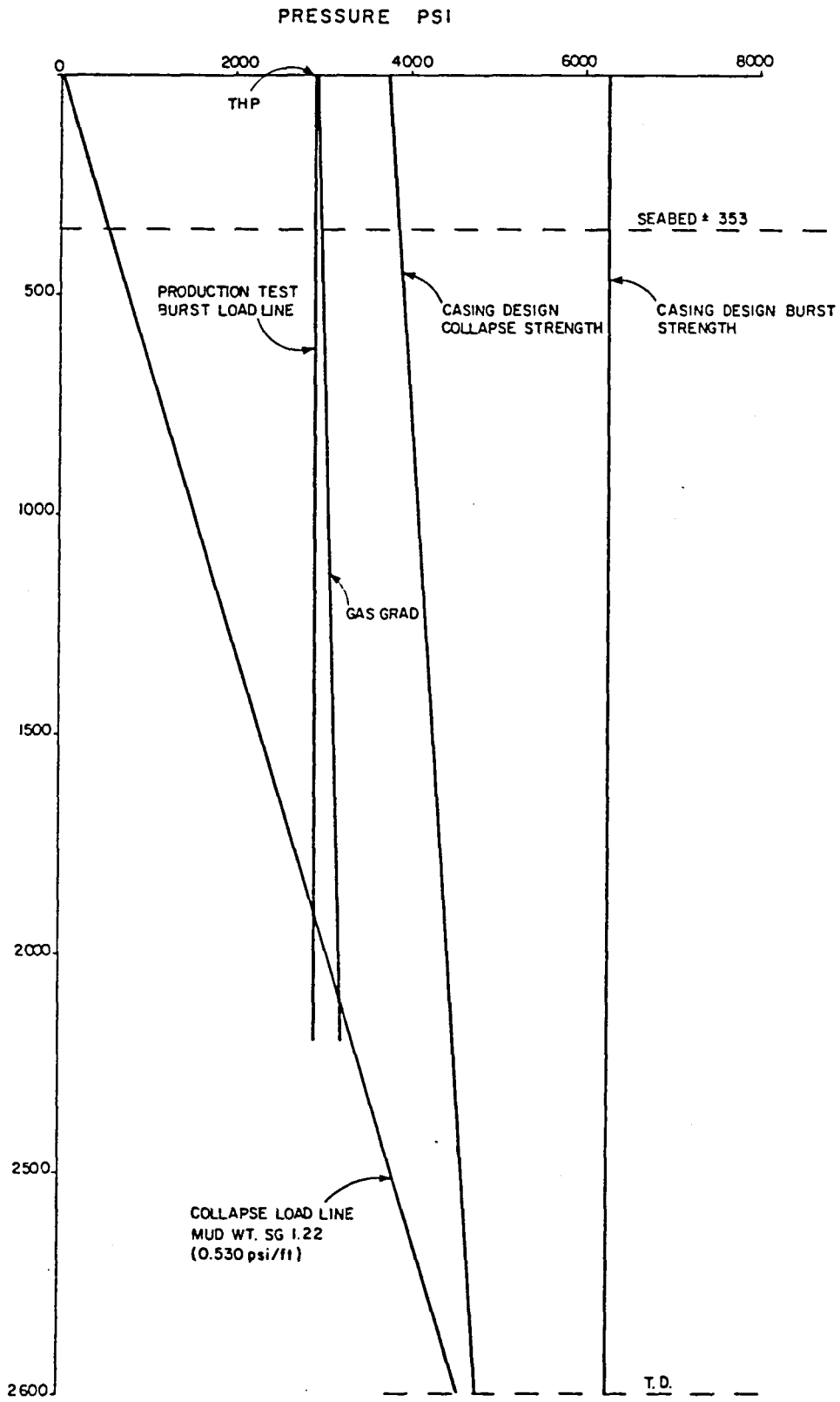
For 13-3/8", 72 lb/ft, N80, BTC Casing

	Collapse	Burst	Tension
API Rating	2670	5380	1661000
Safety Factor	1.0	1.1	1.6
Design Strengths	2670	4891	1038125

Max tensile load= 72x3.281(1475-353)
= 265052 lbs

13-3/8", 72 lbs, N80, BTC casing is satisfactory in burst, collapse and tension for this well

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



For 9-5/8", 47 lb/ft, L80, VAM Casing

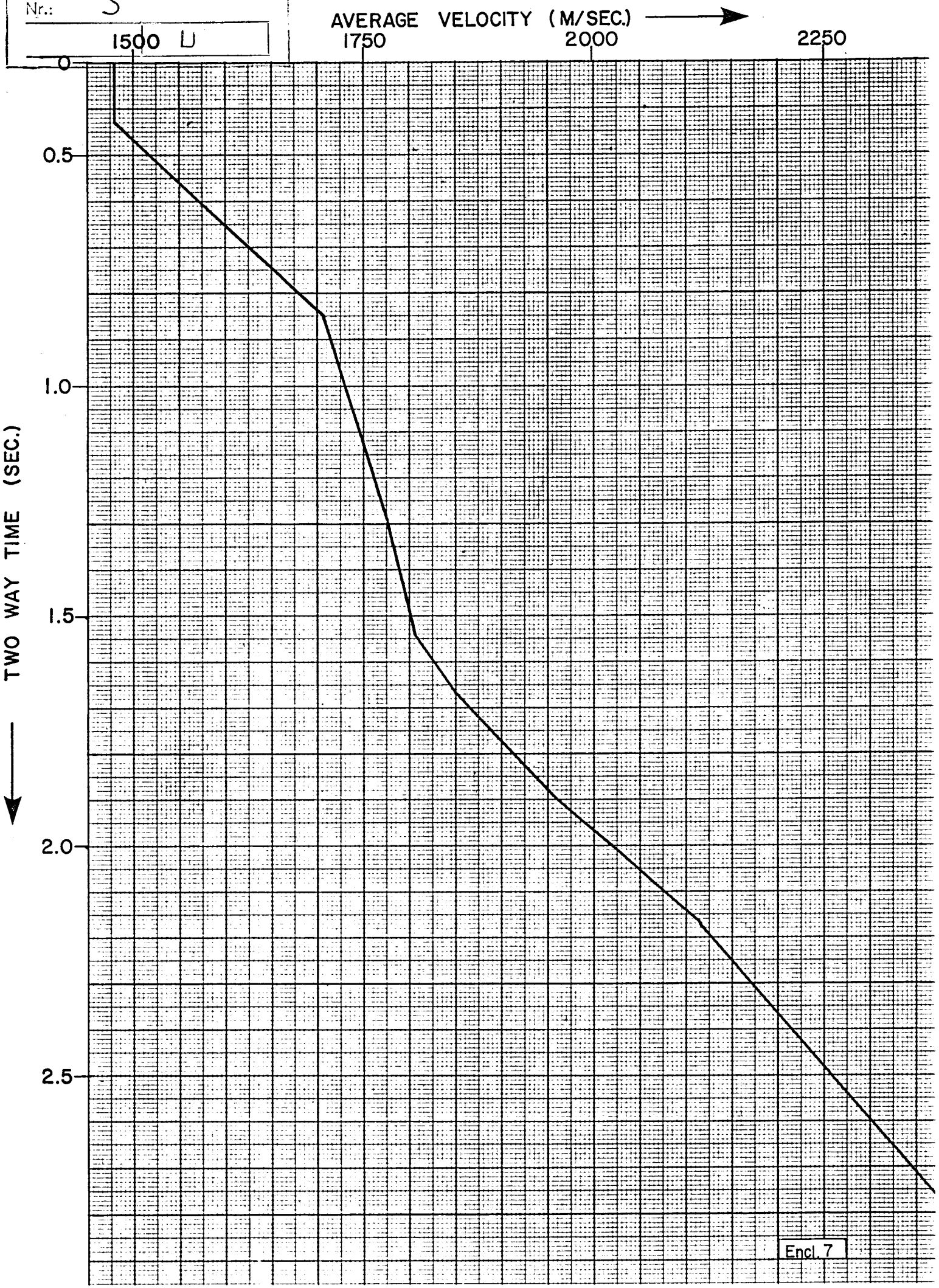
	Collapse	Burst	Tension
API Rating	4750	6870	1086000 lbs
Safety Factor	1.0	1.1	1.6
Design Strength	4750	6245	678750 lbs

Max tensile load =47 x 2600 x 3.281
=400938 lbs

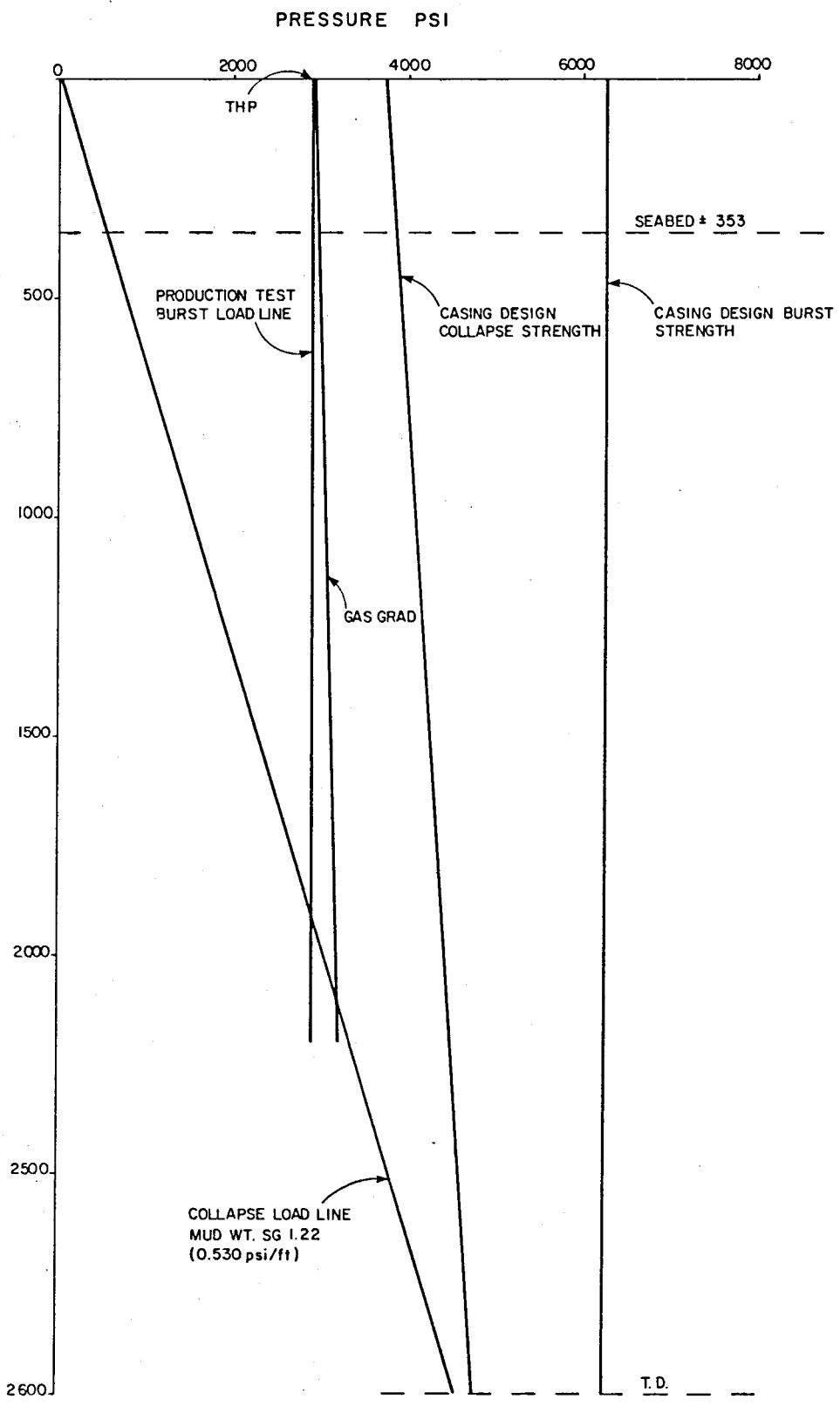
9-5/8" 47 lb/ft L80, VAM casing, is satisfactory in all respects of burst, collapse and tension (N.B. If the L. Jurassic is not hydrocarbon bearing the hole will be plugged back to +/- 2030 m and 9-5/8" casing run)

The design shows that the casing can withstand a Production Test from an assumed gas bearing L. Jurassic Sand.

BLOCK 31/2 WELL 31/2-C



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



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9-5/8" 47 lb/ft L80, VAM casing, is satisfactory in all respects of burst, collapse and tension (N.B. If the L. Jurassic is not hydrocarbon bearing the hole will be plugged back to +/- 2030 m and 9-5/8" casing run)

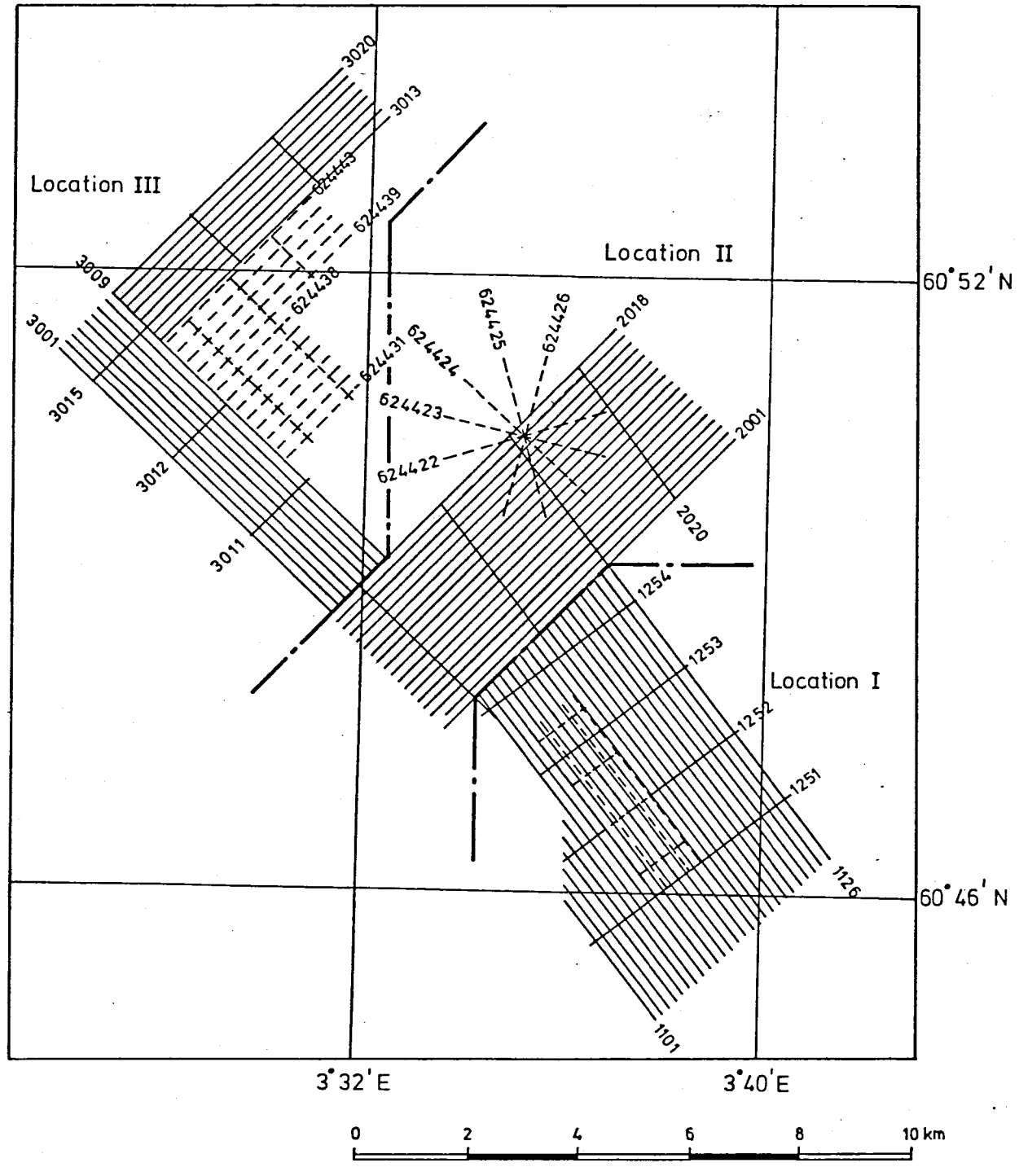
The design shows that the casing can withstand a Production Test from an assumed gas bearing L. Jurassic Sand.

GEOTEAM NORWAY

Appendix no.: 1.3

Project no.: 624.4.01

SURVEY PROGRAMME



LEGEND:

——— Lines with analog equipment

– – – – – Lines with digital sparker equipment