BP AMOCO NORGE AS
6507/5-5
WEST ALPHA

GEOLOGICAL AND PETROLEUM ENGINEERING
COMPLETION REPORT

6507/5-5

NORWEGIAN SEA

NORWAY

Inge H. H. Eikelmann

May 2002

GCR APPROVAL

PROSPECT: SKARV

TARGET: MIDDLE JURASSIC GARN FORMATION.

LOCATION ID:

DATE: MAY 2002

AUTHOR _____
Inge H. H. Eikelmann (OPERATIONS GEOLOGIST)

Approved By _____
Mike Follis (LICENCE GEOLOGIST)

Approved By _____
Grete Block Vagle (SUBSURFACE TEAM LEADER)

Indexing Information

Country(s):	**NORWAY**
Situation:	Offshore
Region(s):	Norwegian Sea
Well name(s):	6507/5-5

Regional Reports:

Well report subject code:	Geological Completion Report W28.48
File name:	FINAL 6507_5_5_W28 Geol comp.report.doc
Server Location:	\\EUSTVS20F\Projects\P0001 Exploration Drilling Projects\Skarv 4\04 Review\01 Final Well Reports
Subjects:	Well Summary Geology/Lithology Pore Pressure/Fracture Gradient Wireline Operations

CONTEXT, WELL OBJECTIVE AND RESULT

Strategic Well Objective

- To deliver the well objectives with world class operational performance in full compliance with statutory requirements and BP Amoco Policy commitments
- To ensure that the PL212 licence's reputation is not compromised.
- To gather the necessary data to ensure a rigorous evaluation of the 6507/5-5 and to allow a more confident resource evaluation of the Skarv discovery hydrocarbon content. The aim is to prove the resource potential of oil and gas in the B block segment of the field. This will impact development decisions and project economics.
- Estimate the resource potential of any significant secondary targets in the Cretaceous formations encountered in the well bore.

Technical Well Objective

Jurassic Primary Targets

To gather the necessary data required allowing for a confident reserve estimate of the Jurassic age Garn, Ile and Tilje Formations in the Skarv B segment. Of highest priority is to appraise the predicted oil reserves in the Garn Formation of the B segment.

- Definition of the fluid type in the Garn Formation in the B segment. The well is positioned to test the predicted oil leg (OWC 3750 m TVDSS) and to establish if segment B is in pressure communication with segment C. The location is positioned so that it should not be below the structural spill to the east from the C segment.
- Reservoir parameters: porosity, permeability, quality and reservoir controls: diagensis / petrology.
- Pressure and pressure gradients.
- Accurate fluid properties of gas, oil and water for geochemistry, PVT analysis, facilities design, and production chemistry
- Biostratigraphic information for age dating and correlation.
- Confident tie of seismic to the subsurface
- Seismic response to rock properties and fluid fill
- Be able to sidetrack updip if oil volume not defined with sufficient degree of certainty.

Cretaceous Secondary Targets

To determine the presence or absence and phase of any significant hydrocarbon columns (>10m of continuous net pay) in the Cretaceous Lange Formation (Cromer Knoll Group). To gather information to allow for an improved understanding of the Cretaceous sandstone distribution and reservoir characteristics for additional Skarv development resource potential. Significant resource potential is defined as greater than 10 m of continuous net pay.

This will require gathering the key data if significant pay is recognized in the Cretaceous:

- Identification of hydrocarbon phase.
- Reservoir parameters: porosity, permeability, quality and quality controls, petrology.
- Pressure and pressure gradients (based on availability of full tool suite).
- Fluid samples of gas and liquid hydrocarbons (based on availability of full tool suite).
- Biostratigraphic information for age dating and correlation.
- Confident tie of seismic to the subsurface
- Seismic response to rock properties and fluid fill

Timing

Well 6507/5-5 was drilled with the semi submersible rig West Alpha. The rig started on contract for the 6507/5-5 well on the 20th of November, 2001 (04:00 hrs) and arrived on the location November 24th. The well was spudded on the second attempt, November the 28th. TD was reached on the 5th of January, 2002 at a depth of 3950m BRT. When logging operations were completed, it was decided to test the well. After troubleshooting a leakage in the 9 5/8" casing, perforation guns were picked up on January 24th. Testing was completed on the 2nd of February and the well was P&A. The rig was undertow from the Skarv location to Haugesund from the 9th of February and went off contract with the PL212 on February 14, 2002.

Well Result

Well 6507/5-5 successfully completed a logging program across Cretaceous secondary targets in the 12.25" hole and a logging and coring programme of the primary Jurassic target in 8.5" hole. Oil (down to) was discovered in the primary Garn reservoir target while Ile and Tilje formations were water-wet. In addition, slight shows were seen in poor quality Cretaceous Lange sands. The thin Lysing Formation was tight without shows.

Previous Drilling

Block 6507/6 was previously operated by Saga in the PL123 Licence. Two exploration wells were drilled by Saga in the period 1986 to 1991, the 6507/6-1 and 6507/6-2. Both wells were plugged and abandoned as dry wells with shows. The Amoco operated exploration well 6507/5-1 well, drilled on the A segment of the Donnatello structure, was completed in 1998 and was suspended as an oil and gas discovery in the Jurassic and Cretaceous. The Jurassic discovery was named Skarv and the Cretaceous discovery Gråsel. In 1999, well 6507/5-2 was drilled on the A segment by BP Amoco to appraise the Skarv discovery. The well was plugged and abandoned as a gas well. In 2001, BP Amoco drilled additional exploration/appraisal wells 6507/5-4 & 4A in the C segment of the Skarv Field area. The wells proved up additional hydrocarbon resources within the field and were suspended as oil and gas discoveries.

Regional Setting

The Skarv structure is a Jurassic tilted fault block located to the west of the Nordland Ridge at the eastern edge of the Dønna Terrace. Play concept is similar to the existing fields in the Mid Norway area e.g. Heidrun, Norne and Smørbukk. The main structural events to create these traps occurred during Late Jurassic rifting.

Mapping and Trap Definition

The Skarv structure is mapped on the recently reprocessed combined 3D surveys (bpn00m1_PL212 seisworks project). The structure is a tilted fault block bounded to the northwest by a major normal fault down-throwing to the northwest. The remaining part of the structure is dip closed. Skarv is split into three main fault segments, A, B and C, by two normal faults that trend northwest – southeast. Well 6507/5-5 is located in the downfaulted B segment. Seismic quality over Skarv is fair to good quality. The Jurassic targets can be tied and mapped with high confidence, but there is uncertainty in the depth conversion. Amplitude anomalies are identified and show good structural conformance over the three fault segments of Skarv. The seismic is not of sufficient quality to enable hydrocarbon phase prediction from these amplitude anomalies. In addition to the Jurassic primary targets, high-risk secondary targets have been identified in the Cretaceous Lange Formation.

Reservoir

The main reservoir anticipated in the 6507/5-5 well is the Early and Middle Jurassic sandstones of the Fangst and Båt Groups (Garn, Ile and Tilje Formations). The Top Garn reflector is tied to the 6507/6-2, 6507/5-1, 6507/5-2 and 6507/5-4 & 4A wells and is easily tied across segment B. The top Tilje reflector is mapped with equal confidence. The reservoirs are widely distributed across the basin. The greatest resources are expected to be contained within the high quality Garn Formation with a smaller contribution from the poor to moderate Ile and Tilje Formations.
High-risk secondary reservoir targets are present in the Lower Cretaceous Lange Formation. Well 6507/5-5 will likely penetrate intra-Lange sandstones, however, the exact stratigraphic location of these sandstones are difficult to predict. Generally the intra-Lange sandstones are discontinuous and variable in thickness and quality. Thus they are thin, but high quality in 6507/5-1, tight in /5-2, thin and moderate quality in /5-4 and poor quality in /5-4A.
Intra-Lange sandstones within 6507/5-1 constitute the reservoir for the Gråsel oil discovery. Well 6507/5-4 also discovered oil in intra-Lange sandstones. However, pressure data shows that the intra-Lange sandstones in the two wells are not in pressure communication. Well 6507/5-5 may penetrate oil-filled intra-Lange sandstones in pressure communication with either 6507/5-1 (i.e. Gråsel) or 6507/5-4 or they could occur in yet a different stratigraphic level.

FIGURES

Enclosures

1/500 Measured Depth Composite Log

1 WELL DATA SUMMARY

1.1 GENERAL DATA

Well Name	6507/5-5	
Status	Plugged and abandoned, Oil Discovery	
Licence	PL 212	
Operator	**BP Amoco**	**30.00%**
Partners	Statoil	30.00%
	Enterprise	25.00%
	ExxonMobil	15.00%

Surface Location		**TD Location**	
Latitude	65° 42’ 08.01” N	**Latitude**	65° 42’ 10,114” N
Longitude	07° 35’ 45.36” E	**Longitude**	07° 35’ 43,054” E
Grid	7 287 624 mN 435 533 mE	**Grid**	7 287 689,48 mN 435 505,09mE

Projection	UTM 32N; Common Meridian 09° E
Spheroid	ED 50, 1924 International
Seismic Location	Reprocessed final cube bpn00m1 PL2112 seisworks project. Xline 1765. Inline 1203.

Offset from Nearest Wells (surface location).	BP Amoco well 6507/5-4: 1.39 km south-west	BP Amoco well 6507/5-2: 2.52 km north-east	Amoco well 6507/5-1: 5.2 km north north-east

Drilling Rig:	West Alpha	**Rig Type:**	Semi-submersible.
RTE	18 m MSL	**Total Depth**	3950 mBRT
Depth Datum	RT	**Loggers Depth**	3946.5 mBRT
Water Depth	375 m	**Maximum Inclination**	6.6° @ 3939 mBRT
Rig on Contract	20th November 2002	**Spud Date**	28th November 2002 Respud 3rd December
TD Date	5th January 2002	**Rig Released:**	14th February 2002

Report Number	W28.48
Authors	Inge H. H. Eikelmann

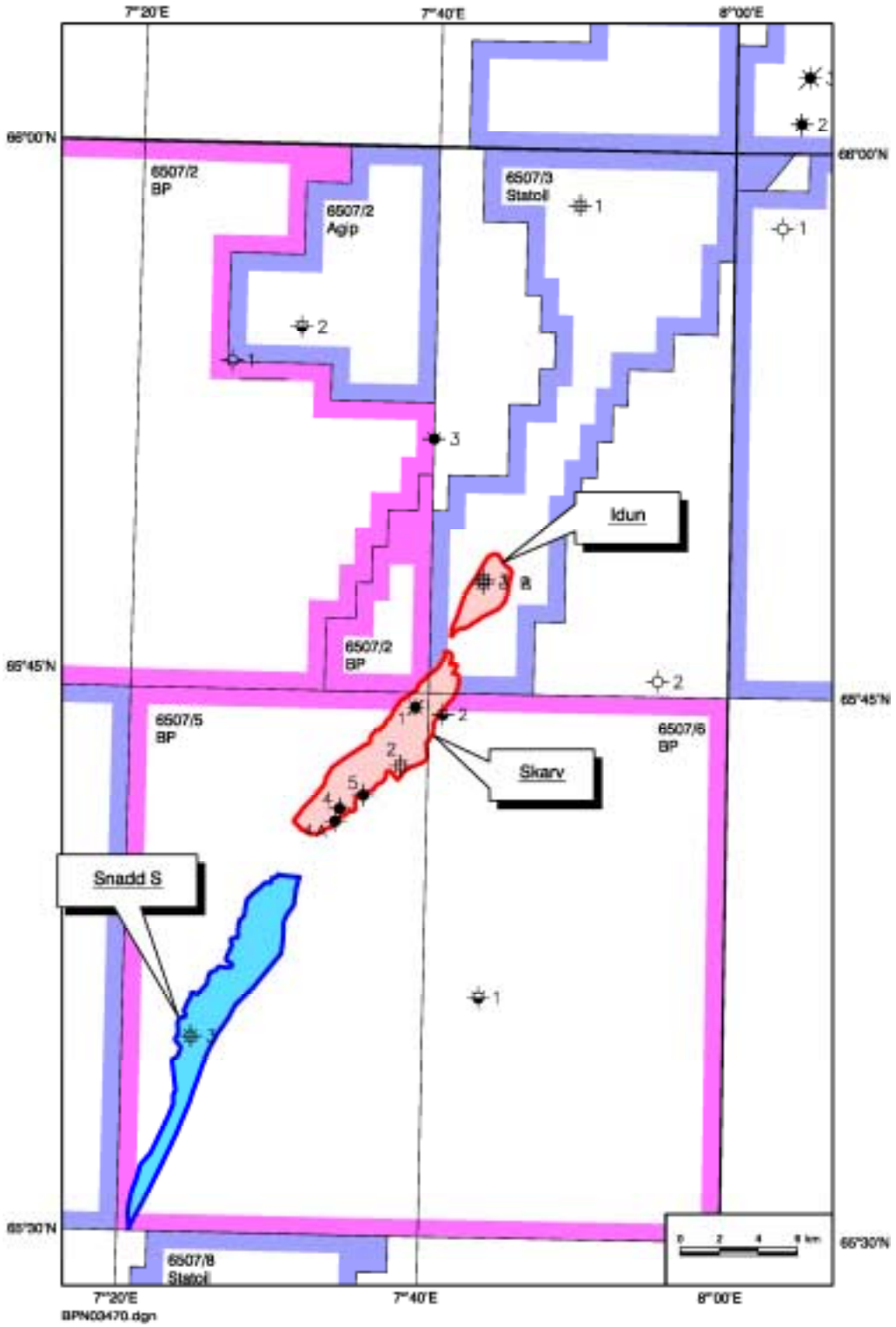

Figure 1: Location Map

1.2 STRATIGRAPHY

Chrono/Lithostratigraphy		Tops			
		Depth	**Depth**	**Depth**	**Thickness**
		mMDBRT	mTVDBRT	mTVDSS	m
Middle Miocene - Recent	**Nordland Group**				
	Quaternary	393.0	393.0	375.0	472,7
	Naust Fm	865.7	865.6	847.6	527,9
	Kai Fm	1393.6	1393.4	1375.4	495.3
Late Palaeocene – Late Oligocene	**Hordaland Group**				
	Brygge Fm	1888.9	1888.7	1870.7	132.8
Late Campanian - Late Palaeocene	**Rogaland Group**				
	Tare Fm	2021.7	2021.5	2003.5	41.2
	Tang Fm	2062.9	2062.7	2044.7	44.3
Coniacian – Late Campanian	**Shetland Group**				
	Springar Fm	2107.2	2107.0	2089.0	73.9
	Nise Fm	2181.1	2180.9	2162.9	375.0
	Kvitnos Fm	2556.2	2555.9	2537.9	197.7
Coniacian - Late Aptian	**Cromer Knoll Group**				
	Lysing Fm	2753.9	2753.6	2735.6	2.8
	Lange Fm	2756.7	2756.4	2738.4	570.0
	Lyr Fm.	3326.7	3326.4	3308.4	12.1
Late- middle Kimmeridgian – late/latest early Bajocian	**Viking Group**				
	Spekk Fm	3338.8	3338.5	3320.5	32.6
	Melke Fm	3371.5	3371.1	3353.1	276.4
Aalenian	**Fangst Group**				
	Garn Fm	3648.2	3647.5	3629.5	74.6
	Not Fm	3723.0	3722.1	3704.1	18.4
	Ile Fm	3741.5	3740.5	3722.5	31.9
Late/Middle Toarcian – early Plensbachian	**Båt Group**				
	Ror Fm	3773.4	3772.4	3754.4	57.2
	Tilje Fm	3831.0	3829.6	3811.6	93.6
	Åre Fm	3925.2	3923.2	3905.2	
	TD	3950.0	3948.0	3930.0	

Skarv Well 6507/5-5 Well Schematic

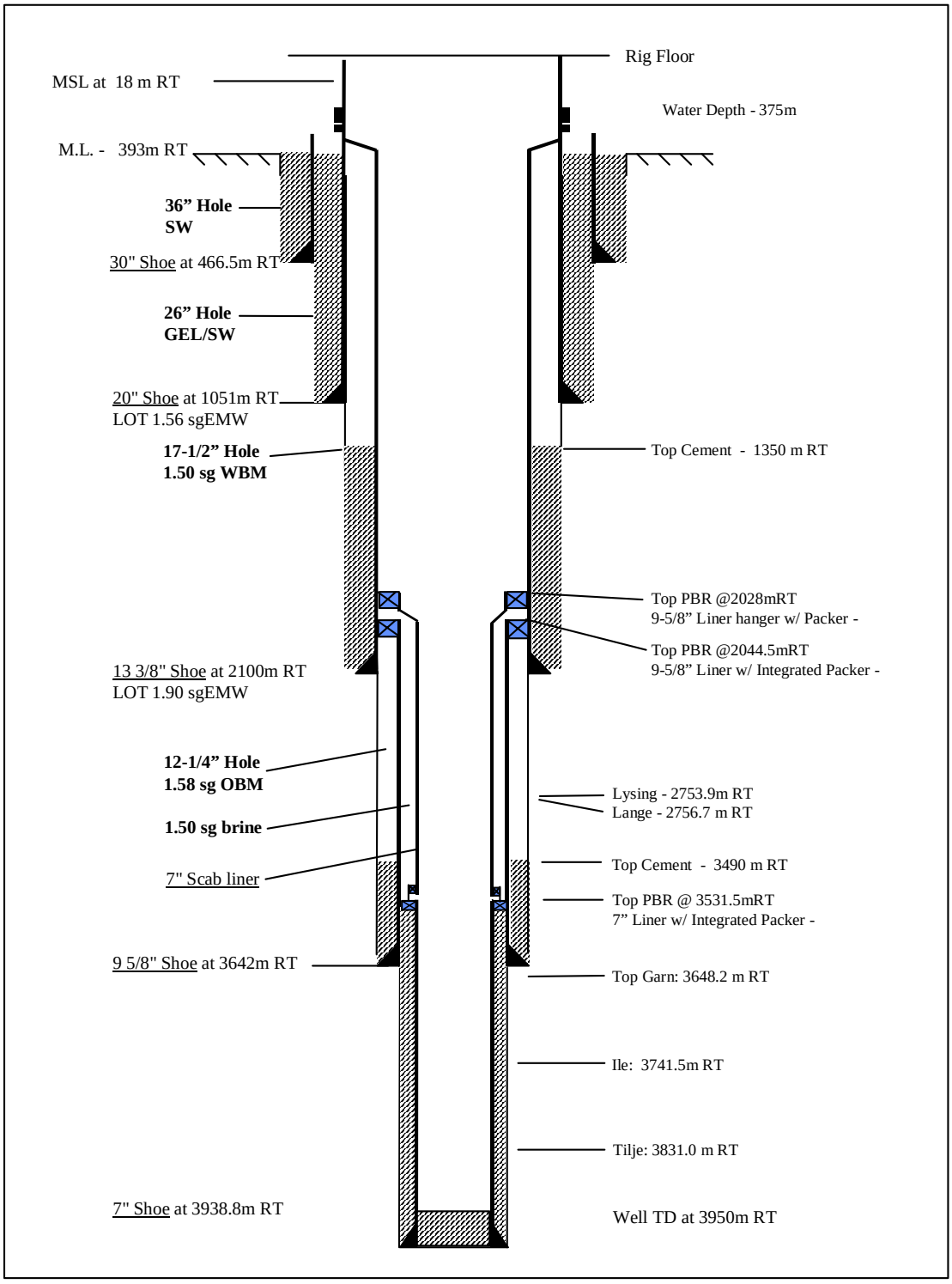

Figure 2. Well schematic

1.3 CASING

Casing Size	Section TD mBRT	Casing Depth mBRT	Test Depth mBRT	Lithology	Formation	Comments
30”	471.0	466.5	-	Mudstone	Undifferentiated Quaternary	Surface conductor.
20”	1060.0	1051.3	1063.0 LOT	Mudstone	Naust Formation	LOT: 1.56sg EMW @1063m BRT. 1.20sg mud Leak off Pressure 538 psi
13 3/8”	2106.0	2100.4	2109.0 LOT	Mudstone	Tang Formation	LOT: 1.90sg EMW @2109m BRT. 1.58sg mud Leak off Pressure 960 psi
9 5/8” Liner	3643.0	3642.0	-	Mudstone	Melke Formation	Top of liner set at 2044.5m BRT
7” Liner	3950.0	3938.8	-	Mudstone	Åre Formation	Top of liner set at 3531.5m BRT Top of Scab liner set at 2028.0m BRT

1.4 CORE

1.4.1 SUMMARY

Core Number	Cut		Recovered		Percent Recovery	Remarks
	From	To	From	To		
1 (81m inner barrel)	3655.0 –	3736.0m	3655.0 –	3736.0m	100%	Core ejected at rig floor due to gas expansion. 12.2m of core damaged (puzzled together onshore).

1.4.2 CORE SHIFTS

Core	Drilled Depth		Shifted to loggers Depth		Shift	Remarks
Number	From	To	From	To	Applied	
1	3655	3736	3651	3733.4	-3m	2.6m in the lower part.

1.4.3 CORE DESCRIPTIONS

Well Number:	**6507/5-5**	**Core Number:**	1							
Date:	4 January 2002	**Core diameter**	4½"							
Coring Witness:	R. Bulman, A. Hiksdal									
Cored interval:	**3655.0 – 3736.0m**	**Hole size: 8½"**	8½"							
Recovered length	3655.0 – 3736.0m	**Percentage recovery 100% (81.0m)**								
Chip Depth	**Lithology and shows**		**∅**			**Shows**				
			P	**F**	**G**	**T**	**P**	**F**	**G**
3655 – 3676.9m **(extruded from core barrel on deck. Collected pieces have no depth reference)**	SANDSTONE: light grey, light brown oil stain, moderately hard to hard, hackly to angular break, fine (U) to medium (L), subangular, subspherical, moderately well sorted, abundant quartz overgrowths, rare lithic clasts, strong siliceous cement, very occasional coalified plant fragments, fair porosity. SHOWS: strong oil bleed from core, strong petroliferous odour, uniform light brown oil stain, uniform bright yellow direct fluorescence, intermediate streaming white cut fluorescence, bright white residual fluorescence, very faint medium brown visible residue.			x					x
3677m	SANDSTONE: very light grey, light brown oil stain, moderately hard to hard, angular break, fine (L - U), occasionally medium (L), subangular, subspherical, common quartz overgrowths, well sorted, occasional lithoclasts, coarse (L), round, subspherical, moderately well sorted, occasional muscovite, rare garnet, fair to poor porosity. SHOWS: strong petroliferous odour, uniform light brown oil stain, uniform dull yellow direct fluorescence, slow streaming bright white cut fluorescence, bright white residual fluorescence, very faint medium brown visible residue.		x	x					x
3667.7m	SANDSTONE: very light grey, light brown oil stain, moderately hard to hard, angular break, fine (U), occasionally medium (L), subangular, subspherical, common quartz overgrowths, well sorted, common lithoclasts, light grey, coarse (L), round, subspherical to spherical, moderately well sorted, occasional muscovite, fair to poor porosity. SHOWS: strong petroliferous odour, uniform light brown oil stain, uniform dull yellow direct fluorescence, slow streaming bright white cut fluorescence, bright white residual fluorescence, very faint medium brown visible residue.		x	x					x
3669m	SANDSTONE: very light grey, light brown oil stain, moderately hard to hard, angular break, fine (U), occasionally medium (L), subangular, subspherical, abundant quartz overgrowths, well sorted, frequent lithoclasts, light to medium grey, coarse (L), round, subspherical to spherical, moderately well sorted, occasional muscovite, fair to poor porosity. SHOWS: strong petroliferous odour, uniform light brown oil stain, uniform dull yellow direct fluorescence, slow streaming bright white cut fluorescence, bright white residual fluorescence, very faint medium brown visible residue		x	x					x

Well Number:	**6507/5-5**	**Core Number:**	1						
Date:	4 January 2002	**Core diameter**	4½"						
Coring Witness:	R. Bulman, A. Hiksdal								
Cored interval:	**3655.0 – 3736.0m**	**Hole size: 8½"**	8½"						
Recovered length	3655.0 – 3736.0m	**Percentage recovery 100% (81.0m)**							
Chip Depth	**Lithology and shows**		**∅**			**Shows**			
			P	**F**	**G**	**T**	**P**	**F**	**G**
3669.7m	SANDSTONE: light grey to off white, light brown oil stain, moderately hard to hard, angular break, fine (U) to medium (L), subangular, subspherical, common quartz overgrowths, well sorted, occasional lithoclasts, moderately well sorted, occasional muscovite, fair to poor porosity, frequent micaceous planar parallel laminae, 1 – 2 mm thick, abundant muscovite & carbonaceous debris. SHOWS: moderate petroliferous odour, uniform light brown oil stain, uniform dull yellow direct fluorescence, intermediate streaming bright white cut fluorescence, bright white residual fluorescence, very faint medium brown visible residue	x	x					x
3671m	SANDSTONE: light grey to off white, light brown oil stain, moderately hard to hard, angular break, predominantly medium (L), occasionally fine (U), subangular, occasionally subround, subspherical, very common quartz overgrowths, well sorted, strong siliceous cement, frequent kaolinitic matrix, locally common microcrystalline pyrite, fair porosity. SHOWS: moderate petroliferous odour, light brown oil stain, uniform dull yellow direct fluorescence, intermediate streaming bright white cut fluorescence, dull white residual fluorescence, none to very faint light brown visible residue.		x					x
3671.7m	SANDSTONE: very light grey to off white, light to medium brown oil stain, moderately hard to hard, hackly to angular break, medium (L) to coarse (U), subangular, occasionally subround, subspherical, well sorted, frequent quartz overgrowths, strong siliceous cement, minor local strong calcareous cement, minor kaolinitic matrix, frequent microcrystalline pyrite, occasional scattered muscovite, fair to good porosity. SHOWS: moderate petroliferous odour, light to medium brown oil stain, uniform dull yellow direct fluorescence, intermediate streaming bright white cut fluorescence, dull white residual fluorescence, very faint light brown visible residue		x	x				x
3673m	SANDSTONE: very light grey to white, light to medium brown oil stain, moderately hard to hard, angular break, predominantly coarse (L), occasionally medium (U), subangular to subround, occasionally round, subspherical, moderately well sorted, common quartz overgrowths, strong siliceous cement, occasional coalified plant remains, fair to good porosity. SHOWS: moderate to weak petroliferous odour, light to medium brown oil stain, uniform dull yellow direct fluorescence, intermediate streaming bright white cut fluorescence, dull white residual fluorescence, very faint light brown visible residue		x	x				x

Well Number:	**6507/5-5**	**Core Number:**	1
Date:	4 January 2002	**Core diameter**	4½”
Coring Witness:	R. Bulman, A. Hiksdal		
Cored interval:	**3655.0 – 3736.0m**	**Hole size: 8½"**	8½"
Recovered length	3655.0 – 3736.0m	**Percentage recovery 100% (81.0m)**	

Chip Depth	**Lithology and shows**	**∅**			**Shows**			
		P	**F**	**G**	**T**	**P**	**F**	**G**
3673.7m	SANDSTONE: very light grey to off white, light brown oil stain, moderately hard, angular break, medium (L), occasionally fine (U), occasionally coarse (L), subangular, occasionally subround, fair sorting, common quartz overgrowths, strong siliceous cement, patchy kaolinitic matrix, frequent muscovite, rare garnet, moderate porosity. SHOWS: moderate to weak petroliferous odour, light brown oil stain, uniform dull yellow direct fluorescence, intermediate to slow streaming bright white cut fluorescence, dull white residual fluorescence, none to very faint light brown visible residue		x					x
3675m	SANDSTONE: very light grey to off white, light brown oil stain, moderately hard, angular break, coarse (L), occasionally medium (U – L), subround to round, subspherical to elongate, moderately sorted, strong siliceous cement, local kaolinitic matrix, occasional garnet, fair to good porosity. SHOWS: moderate to weak petroliferous odour, light brown oil stain, uniform dull yellow direct fluorescence, intermediate to slow streaming bright white cut fluorescence, dull white residual fluorescence, none to very faint light brown visible residue		x	x				x
3675.7	SANDSTONE: very light grey to off white, light brown oil stain, moderately hard, angular to hackly break, coarse (L), occasionally medium (U – L), subround to round, subspherical to sub elongate, moderately sorted, strong siliceous cement, occasional kaolinitic matrix, occasional garnet, fair to good porosity. SHOWS: moderate to weak petroliferous odour, light brown oil stain, uniform dull yellow direct fluorescence, intermediate to slow streaming bright white cut fluorescence, dull white residual fluorescence, none to very faint light brown visible residue		x	x				x
3677m	SANDSTONE: light grey to off white, light to medium brown oil stain, moderately hard, angular to hackly break, medium (U) to coarse (L), occasionally medium (L), subangular to subround, subspherical, common quartz overgrowths, strong siliceous cement, moderately well sorted, occasional garnet, rare muscovite, fair porosity. SHOWS: strong petroliferous odour, patchy light to medium brown oils stain, uniform dull yellow direct fluorescence, intermediate streaming bright white cut fluorescence, bright white residual fluorescence, very werak faint medium brown visible residue.		x					x

Well Number:	**6507/5-5**	**Core Number:**	1
Date:	4 January 2002	**Core diameter**	4½"
Coring Witness:	R. Bulman, A. Hiksdal		
Cored interval:	**3655.0 – 3736.0m**	**Hole size: 8½"**	8½"
Recovered length	3655.0 – 3736.0m	**Percentage recovery 100% (81.0m)**	

Chip Depth	**Lithology and shows**	**∅**			**Shows**			
		P	**F**	**G**	**T**	**P**	**F**	**G**
2677.7m	SANDSTONE: light grey to off white, light brown oil stain, hard, angular break, medium (L) to fine (U), subangular to subround, subspherical, occasionally subelongate, moderately well sorted, abundant quartz overgrowths, strong siliceous cement, common kaolinitic matrix, local tight very well cemented laminae, 2 – 5 mm thick, poor porosity. SHOWS: weak petroliferous odour, patchy light brown oil stain, dull yellow direct fluorescence, slow streaming faint white cut fluorescence, weak dull white residual fluorescence, no visible residue.	x					x	
3679m	SANDSTONE: light grey to off white, light brown oil stain, hard, angular break, fine (U) to medium (U), subangular, subspherical, occasionally subelongate, moderately well sorted, common quartz overgrowths, extensive siliceous cement, occasional kaolinitic matrix, generally homogeneous, very poor porosity. SHOWS: very weak petroliferous odour, patchy light brown oil stain, patchy dull yellow direct fluorescence, very slow streaming faint white cut fluorescence, weak dull white residual fluorescence, no visible residue.	x					x	
3769.7m	SANDSTONE: light grey to off white, light brown oil stain, hard, angular break, medium (L) to coarse (L), subangular, subspherical, , moderately sorted, common quartz overgrowths, strong siliceous cement, occasional kaolinitic matrix, poor porosity. SHOWS: very weak petroliferous odour, patchy light brown oil stain, patchy dull yellow direct fluorescence, very slow streaming faint white cut fluorescence, weak dull white residual fluorescence, no visible residue.	x					x	
3681m	SANDSTONE: light grey to off white, light brown oil stain, hard, fine (L) to coarse (U), subangular to rounded, subspherical to elongate, poorly sorted, strong siliceous cement, common kaolinitic matrix, occasional muscovite, poor porosity. SHOWS: weak petroliferous odour, uniform light brown oil stain, slow streaming dull white cut fluorescence, dull white residual fluorescence, no visible residue.	x					x	
3681.7m	SANDSTONE: light grey to off white, light browm oil stain, hard, angular break, fine (U) to medium (U), subangular to subrounded, occasionally rounded, subspherical to subelongate, moderate sorting, extensive siliceous cement, occasional garnet, very poor porosity, occasional thin (<1mm) muscovite & carbonaceous rich sub-parallel laminae. SHOWS: weak petroliferous odour, patchy light brown oil stain, patchy dull yellow brown direct fluorescence, very slow streaming dull white cut fluorescence, very faint dull white residual fluorescence, no visible residue.	x				x		

Well Number:	**6507/5-5**	**Core Number:**	1
Date:	4 January 2002	**Core diameter**	4½"
Coring Witness:	R. Bulman, A. Hiksdal		
Cored interval:	**3655.0 – 3736.0m**	**Hole size: 8½"**	8½"
Recovered length	3655.0 – 3736.0m	**Percentage recovery 100% (81.0m)**	

Chip Depth	**Lithology and shows**	**∅**			**Shows**			
		P	**F**	**G**	**T**	**P**	**F**	**G**
3683m	SANDSTONE: light grey to off white, light brown oil stain, hard, angular break, fine (U) to medium (L), occasionally coarse (L), subrounded, subspherical, moderately sorted, strong siliceous cement, common kaolinitic matrix, poor porosity. SHOWS: weak petroliferous odour, uniform light brown oil stain, uniform dull yellow brown direct fluorescence, slow streaming dull white cut fluorescence, dull white residual fluorescence, no visible residue.	x				x		
3683.7m	SANDSTONE: light grey to off white, light brown oil stain, hard, angular break, fine (U) to medium (L), subrounded, subspherical, occasionally very coarse (L), rounded, poorly sorted, strong siliceous cement, occasional kaolinitic matrix, poor porosity. SHOWS: weak petroliferous odour, uniform light brown oil stain, uniform dull yellow brown direct fluorescence, very slow streaming dull white cut fluorescence, dull white residual fluorescence, no visible residue.	x				x		
3685m	SANDSTONE: light grey to off white, light brown oil stain, hard, angular break, fine (U) to medium (L), subrounded, subspherical, occasionally coarse (U) to very coarse (L), rounded, poorly sorted, strong siliceous cement, very occasional kaolinitic matrix, poor porosity. SHOWS: weak petroliferous odour, uniform light brown oil stain, uniform dull yellow brown direct fluorescence, very slow streaming dull white cut fluorescence, dull white residual fluorescence, no visible residue	x				x		
3685.7	SANDSTONE: light grey to off white, light brown oil stain, hard, angular break, medium (U) to coarse (L), subrounded, subspherical, moderate sorting, common quartz overgrowths, strong siliceous cement, common kaolinitic matrix, with laminations, 3 – 6 mm thick of coarse (U) to granule, rounded, subelongate, well sorted, strong siliceous cement, minor kaolinitic matrix, poor porosity. SHOWS: weak petroliferous odour, uniform light brown oil stain, uniforn dull yellow brown direct fluorescence, very slow streaming dull white cut fluorescence, weak dull white residual fluorescence, no visible residue.	x				x		
3687m	SANDSTONE: light grey to off white, light brown oil stain, hard, angular break, medium (U) to coarse (L), subangular to subrounded, subspherical, occasionally subelongate, common quartz overgrowths, moderately well sorted, extensive siliceous cement, frequent kaolinitic matrix, very poor porosity. SHOWS: weak petroliferous odour, uniform faint brown oil stain, uniform dull yellow brown direct fluorescence, very slow streaming dull white cut fluorescence, weak dull white residual fluorescence, no visible residue.	x				x		

Well Number:	**6507/5-5**	**Core Number:**	1
Date:	4 January 2002	**Core diameter**	4½”
Coring Witness:	R. Bulman, A. Hiksdal		
Cored interval:	**3655.0 – 3736.0m**	**Hole size: 8½"**	8½"
Recovered length	3655.0 – 3736.0m	**Percentage recovery 100% (81.0m)**	

Chip Depth	**Lithology and shows**	**∅**			**Shows**			
		P	**F**	**G**	**T**	**P**	**F**	**G**
3687.8m	SANDSTONE: light grey to off white, light brown oil stain, hard, angular break, medium (L), occasionally coarse (L), subangular to subrounded, subspherical, occasionally subelongate, common quartz overgrowths, moderately well sorted, strong siliceous cement, common patchy kaolinitic matrix, very poor porosity. SHOWS: weak petroliferous odour, uniform faint brown oil stain, uniform dull yellow brown direct fluorescence, very slow streaming dull white cut fluorescence, weak dull white residual fluorescence, no visible residue	x				x		
3689m	SANDSTONE: light grey to off white, light brown oil stain, hard to moderately hard, medium (L) to coarse (L), subrounded, subspherical to subelongate, common quartz overgrowths, poorly sorted, extensive siliceous cement, very common kaolinitic matrix, very poor porosity. SHOWS: weak petroliferous odour, uniform light brown oil stain, uniform dull yellow brown direct fluorescence, slow streaming dull white cut fluorescence, faint dull white residual fluorescence, no visible residue.	x					x	
3689.7m	SANDSTONE: light grey to off white, light brown oil stain, hard to moderately hard, fine (U) to coarse (L), subrounded, subspherical, common quartz overgrowths, poorly sorted, strong siliceous cement, common kaolinitic matrix, very poor porosity.SHOWS: weak petroliferous odour, uniform light brown oil stain, uniform dull yellow brown direct fluorescence, slow streaming dull white cut fluorescence, faint dull white residual fluorescence, no visible residue.	x					x	
3691m	SANDSTONE: light grey to off white, light brown oil stain, moderately hard, hackly to angular break, medium (U) to coarse (L), subround, occasionally rounded, subspherical, occasionally spherical, well sorted, common quartz overgrowths, strong siliceous cement, common kaolinitic matrix, fair porosity. SHOWS: weak petroliferous odour, uniform light brown oil stain, uniform light yellow brown direct fluorescence, intermediate streaming dull white cut fluorescence, dull white residual fluorescence, very faint dull light brown visible residue.		x				x	
3691.7m	SANDSTONE: light grey to off white, light brown oil stain, moderately hard, angular break, medium (U) to coarse (L), subround, occasionally rounded, subspherical, well sorted, common quartz overgrowths, strong siliceous cement, patchy kaolinitic matrix, fair porosity. SHOWS: weak petroliferous odour, uniform light brown oil stain, uniform light yellow brown direct fluorescence, intermediate streaming dull white cut fluorescence, dull white residual fluorescence, very faint dull light brown visible residue.		x					x

Well Number:	**6507/5-5**	**Core Number:**	1						
Date:	4 January 2002	**Core diameter**	4½"						
Coring Witness:	R. Bulman, A. Hiksdal								
Cored interval:	**3655.0 – 3736.0m**	**Hole size: 8½"**	8½"						
Recovered length	3655.0 – 3736.0m	**Percentage recovery 100% (81.0m)**							
Chip Depth	**Lithology and shows**		**∅**			**Shows**			
			P	**F**	**G**	**T**	**P**	**F**	**G**
3693m	SANDSTONE: light grey to off white, light brown oil stain, moderately hard to hard, friable in part, hackly, medium (U) to coarse (U), occasionally very coarse (L), subround, subspherical to occasionally subelongate, common quartz overgrowths, moderate to strong siliceous cement, patchy kaolinitic matrix, moderate to poor sorting, fair porosity. SHOWS: moderate petroliferous odour, uniform light brown oil stain, uniform dull yellow direct fluorescence, intermediate streaming dull white cut fluorescence, faint dull white residual fluorescence, very faint dull brown visible residue.		x					x	
3693.7	SANDSTONE: light grey , light brown oil stain, moderately hard to hard, hackly, medium (U) to coarse (U), subround, subspherical to occasionally subelongate, common quartz overgrowths, moderate to poor sorting, strong siliceous cement, patchy kaolinitic matrix, fair porosity. SHOWS: moderate petroliferous odour, uniform light brown oil stain, uniform dull yellow direct fluorescence, intermediate streaming dull white cut fluorescence, faint dull white residual fluorescence, very faint dull brown visible residue.			x				x	
3695m	SANDSTONE: light grey, light brown oil stain, moderately hard to hard, friable in part, medium (L) to very coarse (U), occasionally granule, subround, occasionally rounded, subspherical, moderate to strong siliceous cement, common kaolinitic matrix, occasional microcrystalline pyrite, fair porosity. SHOWS: moderate to weak petroliferous odour, patchy dull medium brown oil stain, patchy dull yellow brown direct fluorescence, intermediate streaming dull white cut fluorescence, very faint dull light brown visible residue.			x				x	
3695.7m	SANDSTONE: light to medium grey, light brown oil stain, moderately hard, hackly to angular break, very coarse (U) to granule, subround to round, subelongate, moderately well sorted, moderate siliceous cement, extensive kaolinitic matrix, occasional coalified plant debris, poor porosity. SHOWS: moderate to weak petroliferous odour, patchy dull medium brown oil stain, patchy dull yellow brown direct fluorescence, intermediate streaming dull white cut fluorescence, very faint dull light brown visible residue.		x					x	

Well Number:	**6507/5-5**	**Core Number:**	1
Date:	4 January 2002	**Core diameter**	4½"
Coring Witness:	R. Bulman, A. Hiksdal		
Cored interval:	**3655.0 – 3736.0m**	**Hole size: 8½"**	8½"
Recovered length	3655.0 – 3736.0m	**Percentage recovery 100% (81.0m)**	

Chip Depth	**Lithology and shows**	**∅**			**Shows**			
		P	**F**	**G**	**T**	**P**	**F**	**G**
3697	SANDSTONE: light to medium grey, light brown oil stain, moderately hard to hard, angular break, fine (U) to medium (L), occasionally coarse (L), subangular to subrounded, subspherical, occasionally subelongate, moderately well sorted, strong siliceous cement, common kaolinitic matrix. SHOWS: moderate to weak petroliferous odour, patchy dull yellow brown oil stain, patchy dull yellow brown direct fluorescence, intermediate streaming dull white cut fluorescence, faint dull white residual fluorescence, no visible residue.		x				x	
3697.7	SANDSTONE: light to medium grey, light brown oil stain, moderately hard to hard, angular break, fine (U) to medium (L), occasionally coarse (L), sunangular to subrounded, subspherical, occasionally subelongate, moderately well sorted, strong siliceous cement, common kaolinitic matrix. SHOWS: moderate to weak petroliferous odour, patchy dull yellow brown oil stain, patchy dull yellow brown direct fluorescence, slow streaming dull white cut fluorescence, faint dull white residual fluorescence, no visible residue		x				x	
3699	SANDSTONE: light to medium grey, light brown oil stain, moderately hard to hard, friable I.P, fine (U) to medium (L), occasionally coarse (L), subangular to subrounded, subspherical, occasionally subelongate, moderately well sorted, strong siliceous cement, common kaolinitic matrix. SHOWS: moderate to weak petroliferous odour, patchy dull yellow brown oil stain, patchy dull yellow brown direct fluorescence, slow streaming dull white cut fluorescence, faint dull white residual fluorescence, no visible residue		x				x	
3699.7	SANDSTONE: light to medium grey, light brown oil stain, moderately hard to hard, angular break, fine (U) to medium (L), occasionally coarse (L), subangular to subrounded, subspherical, occasionally subelongate, moderately well sorted, strong siliceous cement, common kaolinitic matrix, trace of mica. SHOWS: moderate to weak petroliferous odour, patchy dull yellow brown oil stain, patchy dull yellow brown direct fluorescence, slow streaming dull white cut fluorescence, faint dull white residual fluorescence, no visible residue		x				x	
3701	SANDSTONE: light to medium grey, light brown oil stain, hard, angular break, fine (U) to medium (L), occasionally coarse (L), subangular to subrounded, subspherical, occasionally subelongate, moderately well sorted, strong siliceous cement, common kaolinitic matrix, trace of mica. SHOWS: moderate to weak petroliferous odour, patchy dull yellow brown oil stain, patchy dull yellow brown direct fluorescence, slow streaming dull white cut fluorescence, faint dull white residual fluorescence, no visible residue		x				x	

Well Number:	**6507/5-5**	**Core Number:**	1
Date:	4 January 2002	**Core diameter**	4½"
Coring Witness:	R. Bulman, A. Hiksdal		
Cored interval:	**3655.0 – 3736.0m**	**Hole size: 8½"**	8½"
Recovered length	3655.0 – 3736.0m	**Percentage recovery 100% (81.0m)**	

Chip Depth	**Lithology and shows**	**∅**			**Shows**			
		P	**F**	**G**	**T**	**P**	**F**	**G**
3701.7	SANDSTONE: medium to dark grey, patchy light brown oil stain, hard, angular break, fine (U) to medium (L), occasionally coarse (L), subangular to subrounded, subspherical, occasionally subelongate, moderately well sorted, common quartz overgrowths, strong siliceous cement, occasional kaolinitic matrix, trace of mica, thin laminated streaks of carboniferous material SHOWS: moderate petroliferous odour, patchy dull yellow brown oil stain, patchy dull yellow brown direct fluorescence, slow streaming dull white cut fluorescence, faint dull white residual fluorescence, no visible residue.		x			x		
3703	SANDSTONE: medium to dark grey, patchy light brown oil stain, hard, angular break, medium (L) to coarse (L), occasionally very coarse (L), subangular to subrounded, subspherical, occasionally subelongate, moderately well sorted, common quartz overgrowths, strong siliceous cement, occasional kaolinitic matrix, trace of mica, SHOWS: moderate petroliferous odour, patchy dull yellow brown oil stain, patchy dull yellow brown direct fluorescence, slow streaming dull white cut fluorescence, faint dull white residual fluorescence, no visible residue		x				x	
3703.7	SANDSTONE: light to medium grey, patchy light brown oil stain, hard, angular break, fine (U) to medium (L), occasionally coarse (L), subangular to subrounded, subspherical, occasionally subelongate, well sorted, common quartz overgrowths, strong siliceous cement, occasional kaolinitic matrix, trace of mica, trace of lithic clasts SHOWS: weak petroliferous odour, patchy dull yellow brown oil stain, patchy dull yellow brown direct fluorescence, slow streaming dull white cut fluorescence, faint dull white residual fluorescence, no visible residue		x			x		
3705	SANDSTONE: medium to dark grey, patchy light brown oil stain, hard, angular break, medium (L) to coarse (L), occasionally very coarse (L), subangular to subrounded, subspherical, occasionally subelongate, moderately well sorted, common quartz overgrowths, strong siliceous cement, occasional kaolinitic matrix, trace of mica, SHOWS: moderate petroliferous odour, patchy dull yellow brown oil stain, patchy dull yellow brown direct fluorescence, slow streaming dull white cut fluorescence, faint dull white residual fluorescence, no visible residue		x				x	

Well Number:	**6507/5-5**	**Core Number:**	1
Date:	4 January 2002	**Core diameter**	4½"
Coring Witness:	R. Bulman, A. Hiksdal		
Cored interval:	**3655.0 – 3736.0m**	**Hole size: 8½"**	8½"
Recovered length	3655.0 – 3736.0m	**Percentage recovery 100% (81.0m)**	

Chip Depth	**Lithology and shows**	**∅**			**Shows**			
		P	**F**	**G**	**T**	**P**	**F**	**G**
3705.7	SANDSTONE: light grey, patchy light brown oil stain, hard, angular break, medium (L) to coarse (L), occasionally fine (U), subangular to subrounded, subspherical, occasionally subelongate, moderately well sorted, common quartz overgrowths, strong siliceous cement, occasional kaolinitic matrix, trace of mica, lenses of plant debris and coal. SHOWS: moderate petroliferous odour, patchy dull yellow brown oil stain, patchy dull yellow brown direct fluorescence, very slow streaming dull white cut fluorescence, faint dull white residual fluorescence, no visible residue	x				x		
3707	SANDSTONE: light grey, patchy light brown oil stain, moderate hard, angular break, fine (U), occasionally medium (U), subangular to subrounded, subspherical, well sorted, common quartz overgrowths, strong siliceous cement, occasional kaolinitic matrix, trace of mica. SHOWS: weak petroliferous odour, patchy light yellow brown oil stain, patchy dull yellow brown direct fluorescence, very slow streaming dull white cut fluorescence, faint dull white residual fluorescence, no visible residue	x				x		
3707.7	SANDSTONE: light grey, patchy light brown oil stain, moderate hard, angular break, fine (U), occasionally medium (U), subangular to subrounded, subspherical, well sorted, common quartz overgrowths, strong siliceous cement, occasional kaolinitic matrix, trace of mica. SHOWS: weak petroliferous odour, patchy light yellow brown oil stain, patchy dull yellow brown direct fluorescence, very slow streaming dull white cut fluorescence, very faint dull white residual fluorescence, no visible residue	x				x		
3709	SANDSTONE: light grey, patchy light brown oil stain, moderate hard, angular break, fine (U), occasionally medium (U), subangular to subrounded, subspherical, well sorted, common quartz overgrowths, strong siliceous cement, occasional kaolinitic matrix, trace of mica. SHOWS: weak petroliferous odour, patchy light yellow brown oil stain, patchy dull yellow brown direct fluorescence, slow streaming dull white cut fluorescence, faint dull white residual fluorescence, no visible residue	x					x	
3709.7	SANDSTONE: light grey, hard, angular break, fine (U), occasionally medium (U), subangular to subrounded, subspherical, well sorted, common quartz overgrowths, strong siliceous cement, occasional kaolinitic matrix, common mica concentrated in thin lamina. SHOWS: None	x			x			

Well Number:	**6507/5-5**	**Core Number:**	1
Date:	4 January 2002	**Core diameter**	4½”
Coring Witness:	R. Bulman, A. Hiksdal		
Cored interval:	**3655.0 – 3736.0m**	**Hole size: 8½"**	8½"
Recovered length	3655.0 – 3736.0m	**Percentage recovery 100% (81.0m)**	

Chip Depth	**Lithology and shows**	**∅**			**Shows**			
		P	**F**	**G**	**T**	**P**	**F**	**G**
3711	SANDSTONE: light grey, hard, angular break, fine (U), occasionally medium (U), subangular to subrounded, subspherical, well sorted, common quartz overgrowths, strong siliceous cement, occasional kaolinitic matrix, common mica concentrated in thin lamina. SHOWS: None	x			x			
3711.7	SANDSTONE: light grey, hard, angular break, fine (U), occasionally medium (U), subangular to subrounded, subspherical, well sorted, common quartz overgrowths, strong siliceous cement, occasional kaolinitic matrix, common mica concentrated in thin lamina. SHOWS: None	x			x			
3713	SANDSTONE: light grey to medium dark grey, hard, angular break, fine (U), occasionally medium (U), subangular to subrounded, subspherical, well sorted, common quartz overgrowths, strong siliceous cement, very common mica concentrated in thin lamina. SHOWS: None	x			x			
3713.7	SANDSTONE: medium dark grey to dark grey, hard, angular break, fine (U), occasionally medium (U), subangular to subrounded, subspherical, well sorted, common quartz overgrowths, strong siliceous cement, occasional kaolinitic matrix, very common mica concentrated in thin lamina. SHOWS: None	x			x			
3715	SANDSTONE: medium dark grey to dark grey, hard, angular break, fine (U), occasionally medium (U), subangular to subrounded, subspherical, well sorted, common quartz overgrowths, strong siliceous cement, very common mica concentrated in thin lamina. SHOWS: None	x			x			
3715.7	SANDSTONE: medium dark grey to dark grey, hard, angular break, fine (U), subangular to subrounded, subspherical, well sorted, common quartz overgrowths, strong siliceous cement, very common mica concentrated in thin lamina. SHOWS: None	x			x			
3717	SANDSTONE: light grey to medium dark grey, hard, angular break, fine (U), subangular to subrounded, subspherical, well sorted, common quartz overgrowths, strong siliceous cement, micro micaceous, laminated. SHOWS: None	x			x			
3717.7	SANDSTONE: light grey to medium dark grey, hard, angular break, fine (U), subangular to subrounded, subspherical, well sorted, common quartz overgrowths, strong siliceous cement, micro micaceous, laminated. SHOWS: None	x			x			

Well Number:	**6507/5-5**	**Core Number:**	1						
Date:	4 January 2002	**Core diameter**	4½"						
Coring Witness:	R. Bulman, A. Hiksdal								
Cored interval:	**3655.0 – 3736.0m**	**Hole size: 8½"**	8½"						
Recovered length	3655.0 – 3736.0m	**Percentage recovery 100% (81.0m)**							
Chip Depth	**Lithology and shows**		**∅**			**Shows**			
			P	**F**	**G**	**T**	**P**	**F**	**G**
3718	SANDSTONE: light grey to medium dark grey, hard, angular break, fine (U), subangular to subrounded, subspherical, well sorted, common quartz overgrowths, strong siliceous cement, micro micaceous, laminated. SHOWS: None		x			x			
3718.7	SANDSTONE: light grey to medium dark grey, hard, angular break, fine (U), subangular to subrounded, subspherical, well sorted, common quartz overgrowths, strong siliceous cement, micro micaceous, laminated. SHOWS: None		x			x			
3719	SANDSTONE: light grey to medium dark grey, hard, angular break, fine (U), subangular to subrounded, subspherical, well sorted, common quartz overgrowths, strong siliceous cement, micro micaceous, laminated. SHOWS: None		x			x			
3719.7	SANDSTONE: light grey to medium dark grey, hard, angular break, fine (U), subangular to subrounded, subspherical, well sorted, common quartz overgrowths, strong siliceous cement, micro micaceous, laminated. SHOWS: None		x			x			
3721	SANDSTONE: light grey to medium dark grey, hard, angular break, fine (U), subangular to subrounded, subspherical, well sorted, common quartz overgrowths, strong siliceous cement, micro micaceous, laminated. SHOWS: None		x			x			
3721.7	SANDSTONE: light grey to medium dark grey, hard, angular break, fine (U), subangular to subrounded, subspherical, well sorted, common quartz overgrowths, strong siliceous cement, micro micaceous, laminated. SHOWS: None		x			x			
3723	SANDSTONE: light grey to medium dark grey, hard, angular break, fine (U), subangular to subrounded, subspherical, well sorted, common quartz overgrowths, strong siliceous cement, micro micaceous, laminated. SHOWS: None		x			x			
3723.7	MUDSTONE: light grey to medium dark grey, hard, silty, occasionally sandy, splintery, occasionally fissile, micromicaceous, laminated SHOWS: None		x			x			

Well Number:	**6507/5-5**	**Core Number:**	1
Date:	4 January 2002	**Core diameter**	4½”
Coring Witness:	R. Bulman, A. Hiksdal		
Cored interval:	**3655.0 – 3736.0m**	**Hole size: 8½"**	8½"
Recovered length	3655.0 – 3736.0m	**Percentage recovery 100% (81.0m)**	

Chip Depth	**Lithology and shows**	**∅**			**Shows**			
		P	**F**	**G**	**T**	**P**	**F**	**G**
3725	MUDSTONE: light grey to medium dark grey, hard, silty, occasionally sandy, splintery, occasionally fissile, micromicaceous, laminated SHOWS: None	x			x			
3725.7	MUDSTONE: dark grey, hard, silty, occasionally sandy, fissile, very micaceous, laminated SHOWS: None	x			x			
3727	MUDSTONE: dark grey, hard, silty, occasionally sandy, fissile, very micaceous, laminated SHOWS: None	x			x			
3727.7	MUDSTONE: dark grey, hard, silty, occasionally sandy, fissile, very micaceous, laminated SHOWS: None	x			x			
3729	MUDSTONE: dark grey, hard, silty, occasionally sandy, fissile, very micaceous, laminated SHOWS: None	x			x			
3729.7	MUDSTONE: light grey to dark grey, hard, silty, occasionally sandy, fissile, very micaceous, laminated SHOWS: None	x			x			
3731	MUDSTONE: light grey to dark grey, hard, silty, occasionally sandy, fissile, very micaceous, laminated SHOWS: No	x			x			
3731.7	MUDSTONE: mediumt grey to dark grey, hard, silty, occasionally sandy, fissile, very micaceous, laminated SHOWS: Non	x			x			
3733	MUDSTONE: dark grey, hard, silty, occasionally sandy, fissile, very micaceous, laminated SHOWS: None	x			x			
3733.7	MUDSTONE: dark grey, hard, silty, occasionally sandy, fissile, very micaceous, laminated SHOWS: None	x			x			
3735	MUDSTONE: light grey to medium grey, hard, silty, occasionally very sandy, micaceous, irregular lamina SHOWS: None	x			x			

1.5 SHOWS

Interval (m BRT)	Lithology	Formation /sequence	Background Gas	Gas Show	Oil Show Description
2969 – 3003	Limestone	Lange Formation	0.9 %	2.4 %	Drilled cuttings: no visible porosity, fair speckled bright pale yellow direct, fair streaming moderate pale yellow white cut, uneven bright light yellow white UV residue, no visible residue NB! Drilled w/OBM.
3040 – 3048	Limestone	Lange Formation	0.7 %	2.6 %	Drilled cuttings: no visible porosity, poor speckled bright light yellow direct, moderate streaming pale yellow white cut, patchy bright light yellow white UV residue, no visible residue NB! Drilled w/OBM.
3450 - 3468	Mudstone	Lange Formation	0.2 %	0.35 %	Drilled cuttings: occasional spotted dark brownish black globules of bitumen and dead oil; no odour, no direct fluorescence, very weak white streaming cut and milky white crush cut, milky white to yellow white residue, trace straw coloured visible residue. NB! Drilled w/OBM.
3468 - 3487	Limestone	Lange Formation	0.25 %	0.35%	Drilled cuttings: common bitumen staining on surfaces and in fracture plane, also dead oil seen; no odour, no direct fluorescence, very weak milky white streaming and crush cut, milky white to yellow white residue, trace straw coloured visible residue.
3648 - 3660	Sandstone	Garn Formation	4.4 %	1.0 %	Drilled cuttings: strong petroliferous odour, uniform light brown oil stain, uniform bright yellow direct fluorescence, intermediate streaming white cut fluorescence, bright white residual fluorescence, very faint medium brown visible residue
3660 - 3681	Sandstone	Garn Formation	5.4 %	2.5 %	Drilled cuttings: moderate petroliferous odour, uniform light brown oil stain, uniform dull yellow direct fluorescence, intermediate streaming dull white cut fluorescence, faint dull white residual fluorescence, very faint dull brown visible residue.

1.6 TESTS

1.6.1 MDT PRESSURE TEST DATA

Run	Test	Depth mMDBRT	Depth mTVDSS	Mud Hydrostatic (psia)		Formation Pressure (psia)	Comment
				Before	After		
2A	1	3712.0	3693.1.1	6370.0	6367.7	-	Pressure drop
"	2	3712.0	3693.1.1	6370.0	6367.7	-	Tight
"	3	3742.0	3723.0	6419.1	6418.9	-	Dry test
"	4	3750.0	3731.0	6434.9	6435.1	5745.4	Good Test
"	5	3754.0	3735.0	6441.8	6441.5	5835.3	Tight
"	6	3761.0	3741.9	6454.2	6454.0	5732.7	Good Test
"	7	3764.0	3744.9	6458.6	6460.3	-	Supercharged
"	8	3770.0	3750.9	6469.8	6471.2	-	Tight
"	9	3833.0	3813.6	6577.2	6577.6	5792.7	Tight
	10	3837.0	387.6	-	6586.6	5815.0	
"	11	3849.0	3829.6	6604.8	6404.8	-	Supercharged
"	12	3865.0	3845.5	6634.1	6629.7	5863.4	Tight?
"	13	3878.0	3858.4	6656.2	6654.6	5856.7	Tight?
"	14	3889.0	3869.4	6672.6	6675.0	5947.2	Tight?
"	15	3649.5	3630.8	6263.9	6262.9	5419.9	Tight-no stabilisation
"	16	3650.0	3631.3	6263.9	6262.9	5420.1	Tight-no stabilisation
2B	1	3653.2	3634.5	-	6328.2	5423.7	Sample
2A	17	3655.0	3636.3	6273.4	6271.7	5424.6	Good-no stabilisation
"	18	3660.0	3641.3	6279.9	6280.6	-	Lost seal
"	19	3660.5	3641.8	6283.1	6282.9	5429.7	Good Test
"	20	3665.0	3646.2	6290.8	6290.9	5433.8	Good Test
2B	2	3668.0	3649.2	-	6320.0	5436.4	Sample
2A	21	3670	3651.2	6297.5	6298.1	5438.3	Good Test
"	22	3675.0	3656.2	6306.5	6307.2	5442.8	Tight-no stabilisation
"	23	3680.0	3661.2	6314.8	6315.5	5448.1	Tight-no stabilisation
"	24	3685.0	3666.2	6323.9	6324.8	5452.7	Tight-no stabilisation
"	25	3690.0	3671.1	6333.6	6332.3	5456.3	Tight-no stabilisation
"	26	3692.0	3673.1	6335.6	6335.8	5458.5	Tight
"	27	3694.0	3675.1	6338.7	6340.1	-	Tight-no stabilisation
"	28	3696	3677.1	6343.0	6342.8	5461.9	Good Test
"	29	3696.5	3677.7	-	6339.9	5462.5	Good Test
"	30	3698.0	3697.1	6345.6	6346.2	-	Tight - no seal
"	31	3698.5	3679.6	6345.5	6343.8	5464.8	Good Test
"	32	3700	3681.1	6348.4	6348.3	5466.2	Tight - no seal
"	33	3701.5	3682.6	6350.5	6350.5	-	Tight - lost seal
2B	3	3701.8	3682.9	-	6348.8	5468.9	Unsuccessful sample
2A	34	3702.0	3683.1	6351.0	6351.6	-	Tight - lost seal
"	35	3702.5	3683.6	6351.8	6351.9	5468.8	Good Test
2B	4	3702.5	3683.6	-	6351.1	5473.2	Tight
2A	36	3704.0	3685.1	6355.9	6356.1	5546.5	Tight
"	37	3705.5	3686.6	6357.8	6358.0	-	Tight
"	38	3706.0	3687.1	6358.3	6357.9	-	Dry test
2B	5	3707.2	3688.3	-	6357.2	5579.6	Tight
2A	39	3707.5	3688.6	6360.2	6360.9	-	Dry test
"	40	3707.5	3688.6	6359.8	6361.2	5597.6	Good Test
"	41	3708.0	3689.1	6361.9	6362.9	-	Tight

2B	6	3708.2	3689.3	-	6359.1	5555.8	Tight
2A	42	3708.3	3689.4	6361.3	6360.3	5571.6	Good Test
“	43	3709.5	3690.6	6364.2	6364.4	5613.9	Tight
“	44	3710.0	3691.1	6365.6	6365.6	-	Tight
“	45	3710.2	3691.3	6365.5	6366.0	-	Dry test

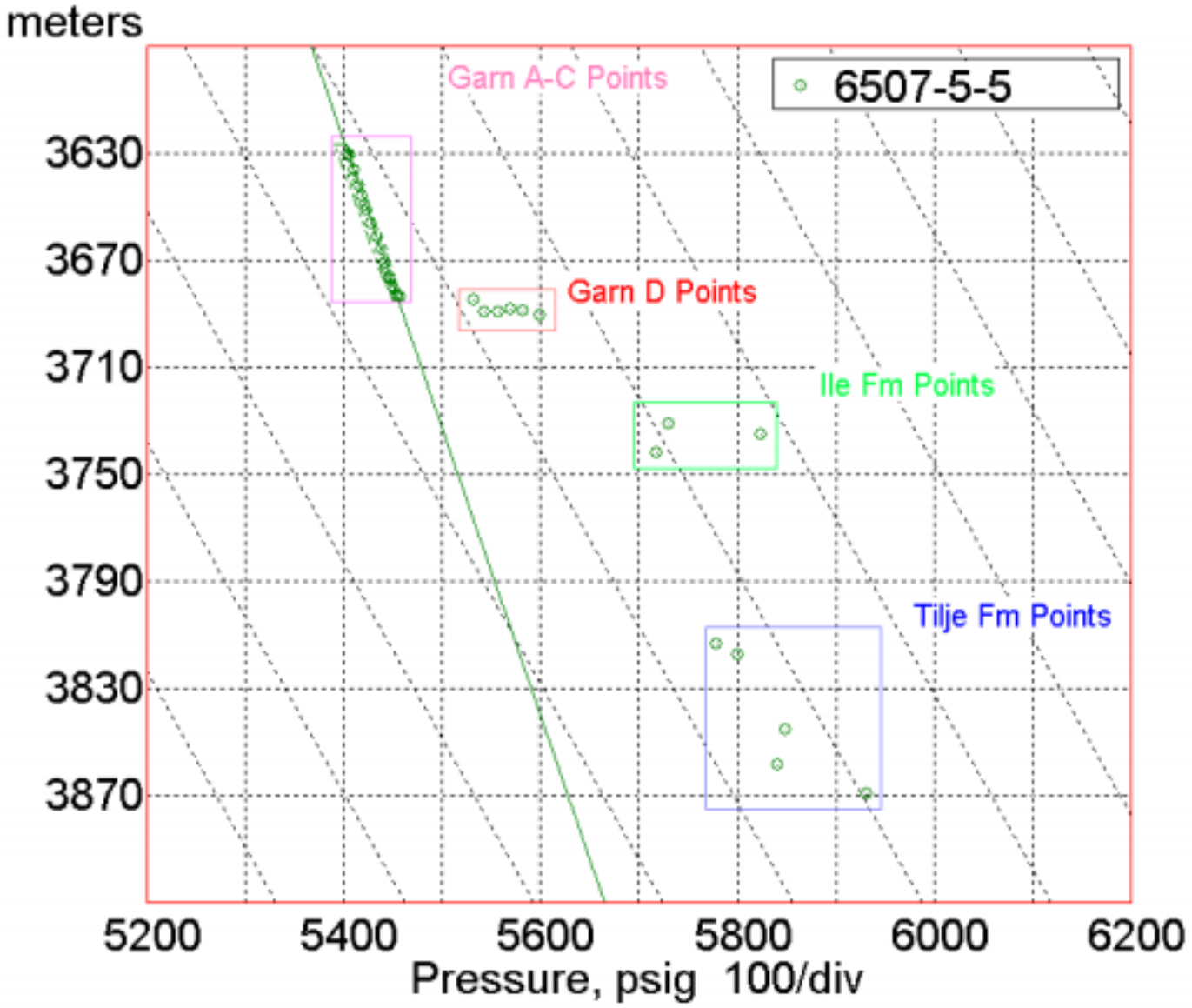

Figure 3: MDT Pressure Data plot

1.6.2 MDT SAMPLING DATA

Sample No.	Depth mBRT	Depth mTVDSS	Mobility Md	Initial Hydrostatic P psia	Formation Pressure psia	Final Hydrostatic P psia	Draw Down Min.	Vol. cm^3	Comments
1.02	3653.2	3634,5	41.1	6265,1	5423,7	6328.2	1.20	435	T 123.4º C, dd 20.0
1.05	3653.2	3634,5	41.1	6265,1	5423,7	6328.2	1.20	435	T 123.7º C, dd 20.0
1.10	3653.2	3634,5	41.1	6265,1	5423,7	6328.2	1.20	420	T 123.4º C, dd 20.0
1.11	3653.2	3634,5	41.1	6265,1	5423,7	6328.2	1.20	600	T 123.7º C, dd 20.0
1.12	3653.2	3634,5	41.1	6265,1	5423,7	6328.2	1.20	600	T 123.7º C, dd 20.0
1.13	3653.2	3634,5	41.1	6265,1	5423,7	6328.2	1.20	600	T 123.7º C, dd 20.0
1.14	3653.2	3634,5	41.1	6265,1	5423,7	6328.2	1.20	600	T 123.7º C, dd 20.0
1.15	3653.2	3634,5	41.1	6265,1	5423,7	6328.2	1.20	600	T 123.7º C, dd 20.0
1.16	3653.2	3634,5	41.1	6265,1	5423,7	6328.2	1.20	600	T 123.7º C, dd 20.0
1.17	3653.2	3634,5	41.1	6265,1	5423,7	6328.2	1.20	600	T 123.7º C, dd 20.0
1.18	3653.2	3634,5	41.1	6265,1	5423,7	6328.2	1.20	600	T 123.7º C, dd 20.0
1.19	3653.2	3634,5	41.1	6265,1	5423,7	6328.2	1.20	600	T 123.7º C, dd 20.0
1.20	3653.2	3634,5	41.1	6265,1	5423,7	6328.2	1.20	600	T 123.7º C, dd 20.0
1.21	3653.2	3634,5	41.1	6265,1	5423,7	6328.2	1.20	600	T 123.7º C, dd 20.0
1.22	3653.2	3634,5	41.1	6265,1	5423,7	6328.2	1.20	600	T 123.7º C, dd 20.0
1.23	3653.2	3634,5	41.1	6265,1	5423,7	6328.2	1.20	600	T 123.7º C, dd 20.0
1.24	3653.2	3634,5	41.1	6265,1	5423,7	6328.2	1.20	175	T 123.7º C, dd 20.0
1.03	3668.0	3649.2	41.1	6316.0	5436.4	6320.0		210	T 123.5º C, dd 20.0
1.04	3668.0	3649.2	41.1	6316.0	5436.4	6320.0		335	T 123.7º C, dd 20.0
1.07	3668.0	3649.2	41.1	6316.0	5436.4	6320.0		3500	T 123.7º C, dd 20.0
1.08	3668.0	3649.2	41.1	6316.0	5436.4	6320.0		3500	T 123.7º C, dd 20.0
1.09	3668.0	3649.2	41.1	6316.0	5436.4	6320.0		1900	T 123.7º C, dd 20.0
1.01	3701.8	3682.9	10.8	6346.9	5468.9	6348.8	5.58	230	T 127.0º C, dd 20.0
1.06	3701.8	3682.9	10.8	6346.9	5468.9	6348.8	5.58	385	T 126.9º C, dd 20.0
1.25	3701.8	3682.9	10.8	6346.9	5468.9	6348.8	5.58	400	T 126.9º C, dd 20.0

1.6.3 DST PRESSURE TEST DATA

For full details of the well test and well test procedure see 6507/5-5 Well Test Completion report and the Schlumberger 6507/5-5 Well Test Report

Test Outline

The perforation guns were picked up on 24th January 2002 at 6:00am. The string was run in the hole and, after correlation, 55m of TCP guns were set with the top shot set at 3648m RKB.
The well was perforated on the 28th January at 10:04 and after a 30min build up the well was opened on a 16/64" choke. Over the next seven and a half hours the well was cleaned up and several different choke sizes were tried to obtain needed data to predict the best choke size to use during the main flow period. The well was flowed at a rate of approximately 6,000 bbls /day on a maximum choke setting of 64/64". A safety set of samples was taken.
At 18:01 the down hole valve (IRDV) was shut and the initial build up of 11.62 hours begun.
The well was re-opened on January 29th at 5:33 and quickly beaned up to a fixed choke size of 52/64". The surface samples were taken and, four hours into the flow, the Metrol activated Oilphase bottom hole samples activated and bottom hole samples were obtained. (Activation was by annulus pressure pulses to a transceiver above the packer and acoustic coupling to the below packer samplers. Two of the four samples look good; two are undergoing further investigation.)
The well was shut in after a 14-hour flow at the IRDV at 19:40 on 29th January and allowed to build up for thirty hours.
The well kill began on 31st January at 1:35 and the bottom hole assembly was out of the hole on February 2nd at 6:30.
All eight of the Schlumberger bottom hole pressure recorders worked as planned and a full set of bottom hole pressure data obtained.

Flow Rate, duration and cumulative production

Summary Flow Data of the Test
(Note: Post test review may change some of the preliminary results shown below; See Schlumberger Well Test Report for final results.)

Flow Period	Duration Hrs	Oil Rate bbls/day (average)	Cumulative Oil flowed bbls	Gas Rate mmscf/d	Cumulative Gas flowed mmscf
Post perforation build up	0.66	0	0	0	0
Clean up flow	7.27	6,000	1,817	5.9	1.78
Initial Build up	11.62	0	1,817	0	1.78
Main Flow	14.07	5880	5,264	5.8	5.18
Main Build up	29.90	0	5,264	0	5.18

Down Hole Pressure recording

6 x Schlumberger Gauges and 2x Metrol Gauges were run on the DST string to record bottom hole pressures below the tester valve and in the annulus.

Sampling

Single-phase bottom hole sampling:
Bottom hole samples were taken By Schlumberger BH-chambers fixed on the testing string and activated from surface by way of Metrol Acoustic coupling.
Surface sampling
During Clean-up flow, samples were taken at the wellhead.
During Main Flow, sampling was performed at the gas and oil outlet of the separator and at the well head (See Oilphase Sampling Report).

1.7 TEMPERATURE PLOT

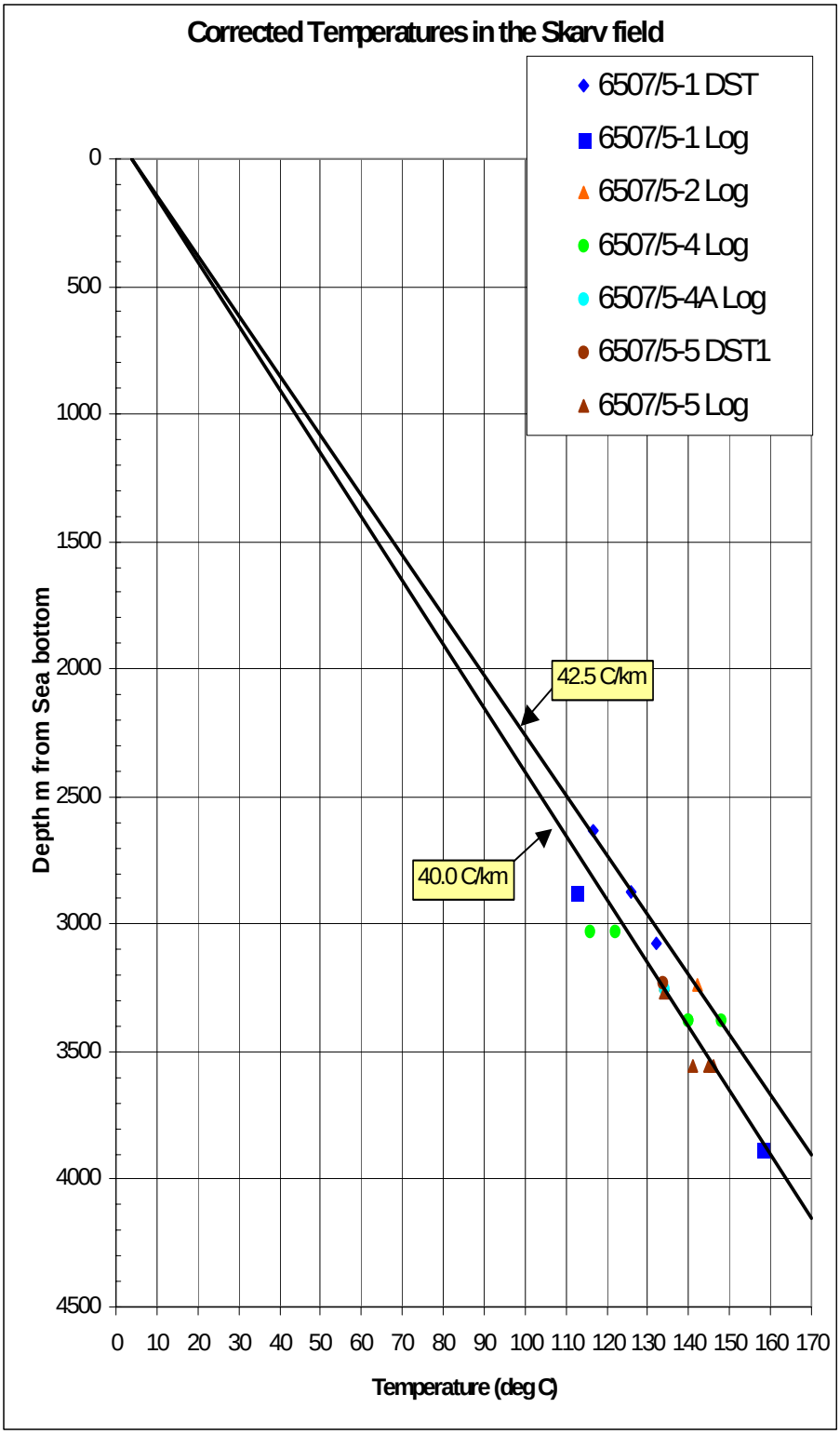

Figure 4: Temperature plot

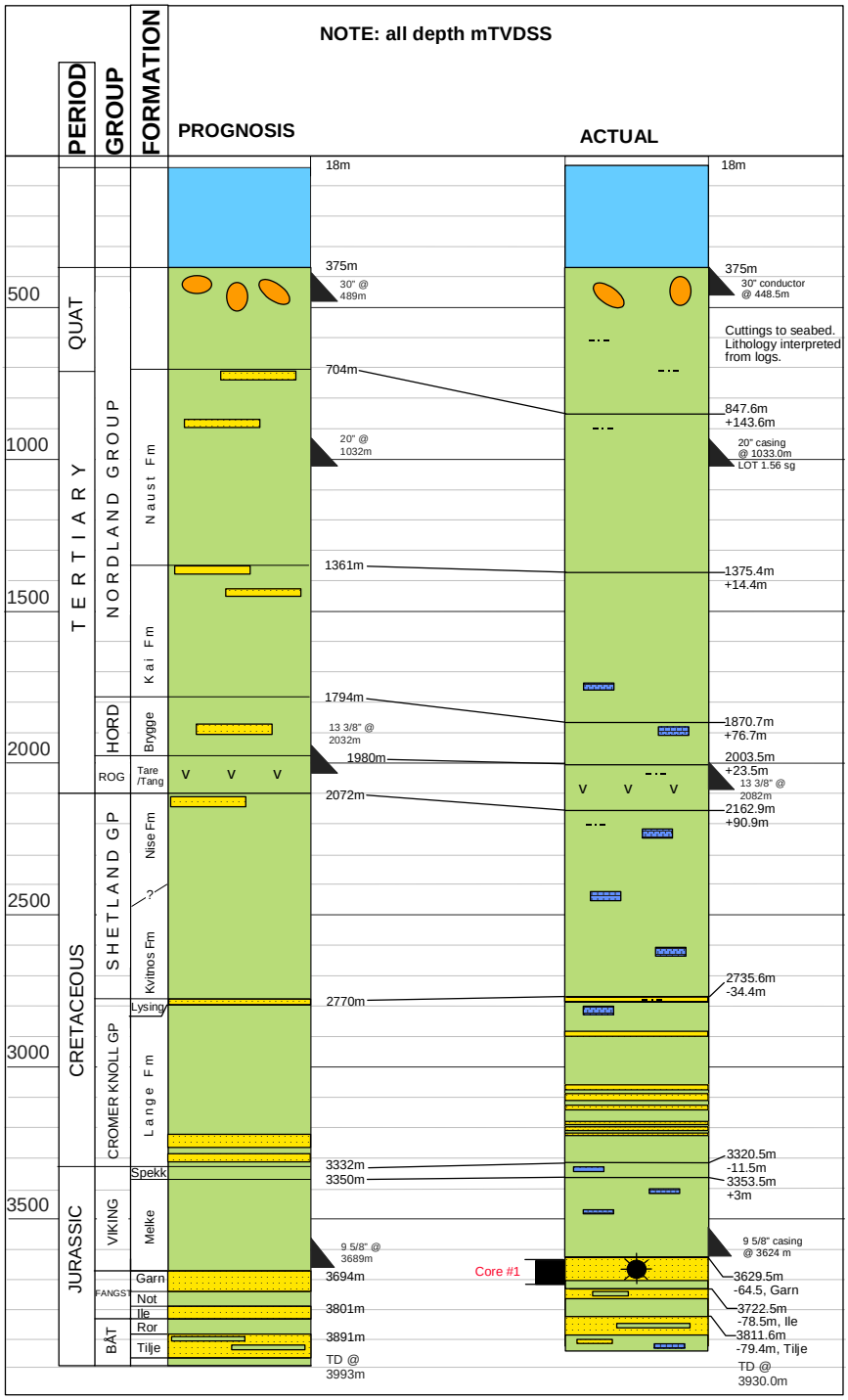

Figure 5: Prognosed versus Actual Stratigraphy.

2 GEOLOGY

2.1 NORDLAND GROUP (393.0 – 1888.9 mBRT)

2.1.1 UNDIFFERENTIATED QUATERNARY (393.0 – 865.7 mBRT)

Age	Middle Miocene to Early Pliocene
Upper boundary pick	Seabed.
Lithology and shows	Returns to seabed. Lithology interpreted from drilling characteristics. The upper section from seabed to 460 mBRT is interpreted to consist of mudstone with some boulders. From 460 mBRT unconsolidated mudstone and siltstone with some sandy interbeds
Logging tools	Wireline: Only GR logged inside casing in this section up to sea bed at 393 m MDBRT.
Drilling characteristics	Average ROP: 20.1 m/hr. From 471 mBRT to 1051 mBRT, the interval was drilled with a 26" BHA. Average ROP: 40 m/hr (ranging from 7 to 95 m/hr.) Gas readings: The Quaternary was drilled riserless. - 36" hole was drilled from seabed to 471 mBRT (17½" to 474 mBRT) with BHA optimised for drilling boulders which had been encountered in offset wells. -the Quaternary was drilled riserless using seawater and hi-vis sweeps every 15 m.

2.1.2 NAUST FORMATION (865.7 – 1393.6 mBRT)

Age	Middle Miocene to Early Pliocene
Upper boundary pick	Slight drop in resistivity and a increasing GR

Lithology and shows

The greater part of this formation was drilled riserless down to 1060m and lithology was interpreted from drilling parameters. over that interval and is inferred to consist of : Soft mud's with sandy interbeds and occasional concentrations of small boulders.

First cuttings returns were achieved after setting 20" casing at 1051m. The interval 1060 – 1822m consists of very sandy mudstones that became less arenaceous towards the base of the section. Cuttings and LWD log character suggested that the interval 1186 – 1206m was occupied by poorly consolidated sandstone with frequent shell layers.

Mudstone: light to medium olive grey, soft, sticky in part, becoming firm with depth, very sandy, fine (L) to medium (L), subround to angular, subelongate in part, moderately sorted, frequent metamorphic lithic fragments, local thin bivalve beds.

Logging tools

LWD: gamma ray and resistivity tool
Wireline: GR to seabed - logged through casing during the 12¼" logging run.

Drilling characteristics

Average ROP: 43m/hr, with occasional thin (1-2m) drill breaks to between 80-105m/hr.

The upper part of the Naust Formation from 865.7m to 1060m BRT, drilled with a 26" BHA, was drilled riserless using seawater and hi-vis sweeps every 15 m.

Average ROP - 26" section: 30 m/hr, with occasional drill breaks (1m) up to 80 m/hr.

Average ROP - 17½" section; 45 m/hr, with occasional drill breaks (1m) up to 105 m/hr.

Gas readings from 1051.0m (20" shoe)m BRT: -drilled gas averages 0.9%
-max of 2.67 % at 1153.0m BRT.

- only C_1 alkanes were recorded in this interval.
- between 1295m and 1335m no gas data recorded due to computer crash.
- Drilled out 20" casing shoe with 1.21 S.G MW.

2.1.3 KAI FORMATION (1393.6 – 1888.9m BRT)

Age

Middle Miocene to Early Pliocene

Upper boundary pick

Picked on the inflection of the LWD resistivity curves trending from higher to lower values. Also characterised by a subtle change in lithology to lighter coloured mudstones.

Lithology and shows

Series of fairly homogeneous mudstones that become increasingly firm with depth. The upper part of the formation is distinguished from the overlying unit by a subtle change to light creamy grey mudstone, which is very calcareous in the uppermost 100m, becoming steadily less calcareous through the remainder of the section.

Mudstone: light grey to light cream grey, soft to firm, very calcareous, moderately sandy, fine (L), angular, sub-elongate, well sorted, becoming medium grey, firm, sub-blocky, slightly silty to very finely sandy, weakly to moderately calcareous with depth. No shows.

Logging tools

LWD: gamma ray and resistivity tool
Wireline: GR to seabed - logged through casing during the 12¼" logging run.

Drilling characteristics

Average ROP: approx 50m/hr (ranging from 5m/hr to 160m/hr)

Gas readings from: -drilled gas averages 2.2%
-maximum of 40.75% at 1547.8m BRT.
- Alkanes up to iC_2 were recorded.

- continued to raise the mud weight to maximum 1.41 S.G .
- Several major gas peaks were recorded but no sands were seen in returns.
- Mudstones throughout this section tend to be slightly hygrofissile and was responsible for blocking the shaker header box on occasion, especially during intervals of higher ROP.

2.2 HORDALAND GROUP (1888.9 – 2021.7m BRT)

2.2.1 BRYGGE FORMATION (1888.9 – 2021.7m BRT)

Age	Late Palaeocene to Late Oligocene
Upper boundary pick	Picked at the lowest point of a drop in GR and slightly deeper than an observed drop in resistivity. Also characterized by a change in lithology from a thin layer of glauconite cemented siltstone at base of Kai Formation to a medium brownish mudstone.
Lithology and shows	The formation consists of a series of varicoloured homogenous slightly to non-calcareous glauconitic mudstones becoming less glauconitic and harder with depth. In the upper part a thin zone of slightly argillaceous limestone coincide with a marked drop in resistivity values. Near the bottom of the formation a thin layer of chert is developed. Mudstone: medium brownish grey, medium light to medium grey, light greenish grey to light to medium grey green, yellowish grey, firm to moderately hard with depth, blocky to subblocky with depth, hackly towards depth, occasionally slightly silty, glauconitic specks toward top. Limestone: Off white to yellowish grey, firm, blocky, mudstone texture, dolomitic, argillaceous streaks. Chert: Very dark grey to black, very hard, angular, brittle. No shows.
Logging character	LWD: gamma ray and resistivity tool Wireline: GR to seabed - logged through casing during the 12¼" logging run.
Drilling characteristics	Average ROP: - arenaceous mudstones drilled at approx 20-40m/hr - siltier mudstones drilled at rates around and above 60m/hr. - ROP occasionally exceeded 90 m/hr. Gas readings : -drilled gas averages 0.3% -no peaks recorded -only C_1 were recorded throughout interval. -continued to raise the mud weight to maximum 1.44 S.G. -Significant ROP ranges were seen, though values were generally lower towards the middle of the formation, where limestone beds were encountered between 1870m to 1880m

2.3 ROGALAND GROUP (2021.7 – 2107.2m BRT)

2.3.1 TARE FORMATION (2021.7 – 2062.9m BRT)

Age	Late Palaeocene
Upper boundary pick	The top of this interval is marked by an increase in resistivity values. MWD GR failure prevented the upper boundary of the Tare formation from being picked. The mudstones also became dark brownish to greyish black, having been blue grey in colour.
Lithology and shows	The formation comprised variably tuffaceous mudstones, grading to siltstone, with possible rare stringers of limestone. Mudstone Grey black, brown black, occasionally green grey, speckled white and brown when tuffaceous, soft to firm, subblocky to occasionally subfissile, generally homogenous, with rare traces of pyrite, calcareous in part. Limestone Not seen in samples, though suspected from ROP curve, and offset well information, where it was seen to be off white to yellow brown and argillaceous No shows.
Logging	LWD: gamma ray and resistivity tool Wireline: GR to seabed - logged through casing during the 12¼" logging run.
Drilling characteristics	Average ROP: ROP ranged between 20 – 40m/hr, averaging approx. 25 m/hr. Gas readings : -drilled gas averages 0.1% -no peaks recorded -only C_1 were recorded throughout the intervals. - Maximum ROP of 80m/hr was seen in a thin (1m) bed. - Generally slower ROP was observed through sections of tuffaceous mudstones. - Mud weight was raised and maintained at 1.50 S.G.

2.3.2 TANG FORMATION (2062.9 – 2107.2m BRT)

Age	Late Campanian to Late Palaeocene
Upper boundary pick	The Tang Formation is normally picked through seeing a rise in GR, by the factor of some 30% above Tare Formation levels. The failure of the MWD tool prevented this observation, though grey black mudstones were seen, which is commonly diagnostic.

Lithology and shows	Predominantly represented by mudstone, which was tuffaceous in part. Mudstone Light grey, greyish black in part, occasionally speckled, when tuffaceous, firm to moderately hard, blocky to sub blocky, occasionally silty, homogenous, trace glauconite. No shows.
Logging	LWD: gamma ray and resistivity tool Wireline: GR to seabed - logged through casing during the 12¼" logging run.
Drilling characteristics	Average ROP: fairly uniform, averaging 30m/hr. In the lower part of the formation, the ROP increased over a 20 m interval to 20 to 60 m/hr, Gas readings : - Gas levels were negligible (0.1-0.2%). - no peaks recorded. - only C_1 were recorded throughout the formation. - Mud weight was maintained at 1.50 SG.

2.4 SHETLAND GROUP (2107.2 – 2753.9m BRT)

2.4.1 SPRINGAR FORMATION (2107.2 – 2181.1m BRT)

Age	Santonian to Campanian
Upper boundary pick	A sharp rise in GR is accompanied by an observed rise in resistivity value
Lithology and shows	Homogenous sequence of mudstones with minor limestone stringers throughout. Mudstone: Olive black, dark grey, firm to moderate hard, sub blocky to blocky, non to slightly calcareous. Limestone: off white, greyish or medium light grey, soft to firm, subblocky to blocky, argillaceous in part, microcrystalline. No shows.
Logging	LWD: gamma ray and resistivity tool Wireline: DSI/IPLT/GR.
Drilling characteristics	Average ROP: 58.6 m/hr Gas readings: -drilled gas averages 0.2% -maximum of 0.2% at 2177.0 mBRT. - only C_1 were recorded throughout the formation. - 12 ¼" section start at 2100.4m BRT – displaced well to 1.58 SG OBM.

2.4.2 NISE FORMATION (2181.1 – 2556.2m BRT)

Age	Santonian
Upper boundary pick	A Limestone bed creating a sharp negative GR spike accompanied by an density spike.

Lithology and shows	Mudstones with limestone stringers throughout. The limestones are slightly dolomitic towards the top of the formation. Mudstone: Olive grey, light brownish grey, dark grey, soft to moderately firm, sub blocky to platy in part, occasionally silty, commonly dull, slightly hygroturgid, non to slightly calcareous. Limestone: Wackestone to packstone texture, yellowish brown, orange grey, light brown, firm, blocky, crumbly, argillaceous in part, occasional fine grained quartz, rarely dolomitic, no visible porosity. No shows.
Logging	LWD: gamma ray and resistivity tool Wireline: DSI/IPLT/GR.
Drilling characteristics	Average ROP: 90m/hr, and peaked at 195m/hr, with slower limestone beds causing ROP to drop to an average of 20m/hr. Gas readings: - very low, at approx 0.2-0.4%. - no significant gas peaks, with slight rises above background only being seen on occasion, and these did not exceed 0.5% - only C_1 were recorded throughout the formation. - in this interval the mud weight was maintained at 1.58 SG.

2.4.3 KVITNOS FORMATION (2556.2 – 2753.9m BRT)

Age	Early Santonian to Coniacian.
Upper boundary pick	The top is marked by a GR peak, a minor increase in resistivity.
Lithology and shows	Mudstone with common limestone stringers. Mudstone: Olive grey, olive black, dark grey, soft to moderately firm, sub blocky to sub platy, occasionally silty, commonly dull, slightly hygroturgid, occasional micro pyrite, non to slightly calcareous. Limestone: Wackestone to packstone texture, light olive grey, yellowish brown, orange grey, greyish brown, firm, blocky, crumbly, argillaceous in part, occasionally slightly dolomitic, no visible porosity. No shows.
Logging	LWD: gamma ray and resistivity tool Wireline: DSI/IPLT/GR.

Drilling characteristics

Average ROP: varies widely, averaging 90m/hr, but reaching 160m/hr at 2573m and slowing to 10m/hr in occasional limestone stringers.

Gas readings: -drilled gas lower than 0.5%
- no gas peaks recorded

-C_1 were recorded throughout, with C_2 in some narrow intervals.

Mud weight was maintained at 1.58 SG in this interval.

-The section appears 'ratty' with regard to ROP, and this owes its character to the many thin (0.5-1.5m) limestone beds that characterise the section. Thin limestone beds occurred more frequent towards the base of the formation with corresponding slower ROP.

2.5 CROMER KNOLL GROUP (2753.9 – 3338.8m BRT)

2.5.1 LYSING FORMATION (2753.9 – 2756.7m BRT)

Age	Coniacian
Upper boundary pick	Gamma ray decrease corresponding to a resestivity peak.
Lithology and shows	Comprised of limestone. Limestone: medium to light gray, light to medium yellow brown, off white, firm to crumbly, cryptocrystalline to microcrystalline, slightly dolomitic, trace pyrite, occasional argillaceous streaks, occasional calcite crystal material, no visible porosity. Shows: no shows
Logging	LWD: gamma ray and resistivity tool Wireline: DSI/IPLT/GR.
Drilling characteristics	Average ROP: 72.2m/hr Gas readings: -drilled gas average 1.2% -maximum of 1.3% at 2756m BRT. -C_1 and C_2 were recorded throughout. Mud weight was maintained at 1.58 SG.

2.5.2 LANGE FORMATION (2756.7 – 3326.7m BRT)

Age	Coniacian to Late Aptian.
Upper boundary pick	A GR spike is diagnostic of this unconformable top Lange Formation, and a rise in the resistivity is also seen. The top of the Lange Formation is also marked by the occurrence of several significant limestone beds.

Lithology and shows

2752.5 – 3057m

Mudstone: Dark grey, medium dark grey, light brownish grey, becoming greyish black with depth, soft to moderately firm, sub blocky to platy in part, occasionally silty, commonly dull, homogenous, slightly hygroturgid, non calcareous.
Limestone: Wackestone to packstone texture, dark yellowish brown, greyish brown, light brown, firm, blocky, crumbly, commonly argillaceous in part, occasional fine grained quartz, rarely dolomitic, no visible porosity, poor to trace show seen sporadically from 2991m. Fair speckled to pinpoint pale yellow direct, moderate streaming pale yellowish white cut, patchy bright yellow white UV residue, no visible residue.
Sandstone: Transparent to translucent, colourless, loose, fine to rarely coarse, angular to subrounded, subspherical, poorly to moderately sorted, no shows.

UPPER INTRA LANGE SANDSTONE SEQUENCE;

The top is marked by a change in lithology from predominantly mudstone to mudstone interbedded with sandstone. The logging motif demonstrates a drop in GR, and a rise in resistivity, corresponding with the sandstones.
Mudstones with locally significant sandstone beds and interbedded limestone

3057- 3127m
Mudstone with limestone and rare sandstone beds
Mudstone: Dark grey, medium dark grey, locally greyish black, soft to firm, commonly blocky to sub blocky, also sub platy in part, slightly hygroturgid, non to slightly calcareous.
Limestone: Wackestone to packstone texture, medium brown, dark yellowish brown, yellowish orange, soft to firm, blocky, crumbly, microcrystalline to cryptocrystalline, slightly argillaceous, local pyrite and glauconite, trace calcite, no visible porosity, no shows.
Sandstone: Translucent, colourless, predominantly loose, commonly very fine to fine, locally ranging from medium to coarse, subangular to subrounded, subspherical, poorly to moderately well sorted, rare carbonaceous material, no shows.
3127 – 3212m
Mudstone with thin limestone and sandstone beds
Silty mudstones, with thin interbedded limestone and sandstone beds
Mudstone: Dark grey, medium dark grey, soft to firm, commonly blocky to sub blocky, sticky, locally silty and sandy, slightly hygroturgid, non calcareous.
Limestone: Wackestone to packstone texture, yellowish brown, pale yellow brown, off white, very light grey, soft to firm, blocky, crumbly, microcrystalline to cryptocrystalline, slightly argillaceous, no visible porosity, no shows.
Sandstone: Translucent, colourless, , predominantly loose, commonly very fine to fine, locally ranging to medium, rarely coarse, subangular to subrounded, subspherical, poorly to moderately well sorted, rare carbonaceous material, no shows.
3212 –3290m
Significant sandstone and limestone beds
Mudstone: Medium grey, medium dark grey, occasionally dark greenish grey, greyish brown, commonly soft and sticky, locally firm to moderately hard (greyish brown), blocky to sub blocky, slightly hygroturgid, silty and very sandy from 3212-3250m, with local thin sandstone lenses, rare glauconite and pyrite, non to slightly calcareous, with the greyish brown Mudstone being very calcareous.
Sandstone: Seen in samples to 3250m, and not seen below; transparent to translucent, colourless, predominantly loose, commonly very fine to fine, rarely medium and coarse, subangular to subrounded, subspherical, poorly to moderately sorted, rare glauconite, occasional calcareous grain coating no shows.
Limestone: Traces, very light grey to light grey, off white, pale yellow brown, locally pale olive grey, soft to firm, crumbly, microcrystalline to cryptocrystalline, rare glauconite, locally sandy, occasional argillaceous streaks, no visible porosity, no shows

Logging	LWD: gamma ray and resistivity tool Wireline: DSI/IPLT/GR.
Drilling characteristics	Average ROP: In general 60m/hr from the top of the Lange, down to the top of the Upper Intra Lange Sandstone sequence. Within the latter, the ROP was seen to rise dramatically within the thin (< 2m) sandstone beds. Below 3127m, the drilling was more uniform, averaging first 30m/hr, then 18m/hr, as the top of the Lyr Formation was approached. Gas readings: - drilled gas averages of 0.5% and 1%. - Gas peaks of 2.86% and 3.03% occurred at 3233m and 3237m. . -C_1 and C_2 were recorded throughout the formation and C_3 notably increasing from 3350m BRT. -The drilling was highly erratic, reflecting the heterogeneity of the sediments, with values ranging from 200m/hr to 2m/hr. -Drilled gas was generally low throughout the section. - Samples were taken and stored in Teflon bags from the gas peaks at 3233m and 3237m. -Below 3250 m in the basal Lange Formation, background gas values diminished whilst drilling a thick mudstone section. -Mud weight was maintained at 1.58 SG.

2.5.3 LYR FORMATION (3326.7 – 3338.8 mBRT)

Age	Late Barremian
Upper boundary pick	A negative spike is seen in the resistivity at this unconformity bounded top. An interval with decreasing GR values coincides with an interval with increasing density and sonic velocity.
Lithology and shows	Predominantly mudstone, with thin limestone stringers. Mudstone: greyish black, dark grey, rarely dark greenish grey, commonly soft to locally firm, blocky to sub blocky, rarely subplaty, slightly hygroturgid, silty in part, trace glauconite, non to slightly calcareous. Limestone: Traces, pale to medium yellow brown, soft to firm, crumbly, argillaceous, microcrystalline to cryptocrystalline, no visible porosity. Shows: no shows.
Logging	LWD: gamma ray and resistivity tool Wireline: DSI/IPLT/GR.

Drilling characteristics

Average ROP: 25m/hr, with slower sections being encountered towards the top and the base of the Lyr Formation, where limestone stringers slowed drilling to 2-5m/hr.

Gas readings: -drilled gas averages of 0.3%.
- were no gas peaks recorded.

-C_1 were recorded throughout, minor C_2 was seen locally.

Mud weight was maintained at 1.58 SG.

2.6 VIKING GROUP (3338.8 – 3648.2m BRT)

2.6.1 SPEKK FORMATION (3338.8 – 3371.5m BRT)

Age	Late - middle Kimmeridgian
Upper boundary pick	Picked on a rapid increase in the gamma ray to high values and also on higher resistivities compared to the overlying Lyr Formation.
Lithology and shows	Mudstone: Greyish black, dark brownish black towards the top, dark brownish grey, rarely greenish black, commonly firm, also moderately hard to very rarely soft, blocky to rarely sub platy, uniform, dull to sub vitreous, slightly plastic and sticky in part, carbonaceous, trace very fine sand, to silty in part, non swelling, rare trace pyrite and micro pyrite, non to slightly calcareous. Limestone: Pale to medium yellowish brown, also off white, soft to firm, crumbly, slightly to moderately argillaceous, microcrystalline, no visible porosity, no show Shows: no shows.
Logging	LWD: gamma ray and resistivity tool Wireline: DSI/IPLT/GR.
Drilling characteristics	Average ROP: 30 m/hr with maximum ROP of 60m/hr peaking in the mudstone, and slower ROP seen whilst drilling through limestone beds ranging from 5-20m/hr. Gas readings: - drilled gas averages of 2.5%. - maximum of 3.26% at 3352m BRT. - C_1, C_2, C_3 were recorded throughout. Mud weight was maintained at 1.58 SG.

2.6.2 MELKE FORMATION (3371.5 – 3648.2 mBRT)

Age	Middle - early Oxfordian to late - latest early Bajocian
Upper boundary pick	Picked on a decrease in GR.
Lithology and shows	Mudstone with silty/sandy intervals. Limestone stringers. Mudstone: Brownish grey, grey black, medium dark grey, brownish black to dark brownish black, greenish black, olive grey, greenish grey to dark greenish grey, dark brown, soft to firm, blocky to sub platy, dull, locally sticky, variably silty, becoming earthy in part, occasionally sandy with very fine sandstone lenses, locally carbonaceous, generally non swelling, common micro pyrite, rare nodular pyrite, trace micromicaceous, non to very slightly calcareous. From 3471 m to 3501 m, occasional spotted dark brown globules of biodegraded bitumen and dead oil seen on mudstone cuttings, and within sandy/siltier lenses of mudstone; no odour, no direct fluorescence, very weak white streaming cut and milky white crush cut, milky white to yellow white residue, trace straw coloured visible residue Limestone: Light to medium brownish grey, pale yellow brown, rarely off white, locally very light grey to light grey, soft to firm, crypto to microcrystalline, occasional argillaceous streaks, slightly dolomitic, no visible porosity. From 3471m to 3498m, common bitumen staining on surfaces and in fracture plane, also dead oil seen; no odour, no direct fluorescence, very weak milky white streaming and crush cut, milky white to yellow white residue, trace straw coloured visible residue. Sandstone: Trace to 15% (3486m), translucent, occasionally transparent, medium to very fine grained, subround to rounded, subspherical, loose occasionally well sorted, common calcareous grain coating, commonly dispersed as very fine grained quartz within siltier units, no show.
Logging	LWD: gamma ray and resistivity tool Wireline: DSI/IPLT/GR.
Drilling characteristics	Average ROP: 20 m/hr in the upper Melke Formation down to 3419m BRT. Below ROP averaged approximately 7 m/hr with slower drilling seen in thin limestone beds of 2-5 m/hr. Gas readings: -drilled gas averages of 2.3% at the top dropping to 1.1% below 3419m BRT and decreasing to gas negligible gas levels, ranging from 0.3% to 0.8%, averaging 0.6%. - no gas peaks recorded. - C_1, C_2, and C_3 were recorded throughout. Mud weight was maintained at 1.58 SG.

2.7 FANGST GROUP (3648.2 – 3773.5m BRT)

2.7.1 GARN FORMATION (3648.2 – 3723.0m BRT)

Age	Aalenian
Upper boundary pick	The top was picked at the inflection point of the corresponding GR drop and resistivity increase from 3647.5 – 3648.5m MD. Sediments changie from very dark grey mudstones in Melke Formation to light grey sandstones in Garn Formation.
Lithology and shows	Sandstone. Sandstone: very light grey to light grey, light brown oil stain, moderately hard to hard, angular break, fine (U), occasionally medium (L), occasional coarse(L), subangular, subspherical, abundant quartz overgrowths, well sorted to moderately well sorted, frequent lithoclasts, occasional mica, rare garnet, fair to poor porosity. The sandstone becomes medium dark grey, hard and more fine grained in the lowest 10 m of the section. Shows: Strong oil bleed from core, moderate petroliferous odour, uniform light brown oil stain, patchy towards bottom of zone, uniform dull yellow direct fluorescence, intermediate to moderate streaming bright to dull white cut fluorescence, bright white residual fluorescence, faint medium brown visible residue, no visible residue near bottom of zone (3709m).
Logging	LWD: gamma ray and resistivity tool Wireline: DSI/HRLA/IPLT/MDT/VSI/GR.
Drilling characteristics	Average ROP: First 5 m drilled to pick coring point. Negative drilling break identified when drilling into top of Garn Formation. ROP less than 5 m/hr Cut core from cut 3655 to 3736m with an average ROP of 30 m /hr. Gas readings: -drilled gas averages of 2.8%. -maximum of 5.1% at 3665.0 mBRT - gas readings affected from 3670 to 3736m BRT due to coring. -C_1, C_2 , C_3 and NC_4 were recorded throughout. - 5.4% gas peak recorded at 3665m BRT while reaming for lost data after coring. -Mud weight was lowered to 1.20 SG and the mud was changed back to WBM before entering the reservoir section. -Core No. 1 cut; 3655 – 3736m, recovered 81m (100%). - Pronounced gas peaks down to 3690m.

2.7.2 NOT FORMATION (3723.0 – 3741.5m BRT)

Age	Aalenian
Upper boundary pick	Picked on GR-peak at start of GR recession and coincident change in formation from sandstone to mudstone.
Lithology and shows	Mudstone Mudstone: light grey to dark grey, hard, silty, occasionally sandy, fissile, very micaceous and laminated which becomes very dark grey to dark olive grey, moderately hard, subfissile to sub-platy, finely carbonaceous, moderately silty in part, commonly micromicaceous, rare chlorite with frequent carbonaceous debris towards lower half of section. Shows: No shows.
Logging	LWD: gamma ray and resistivity tool Wireline: DSI/HRLA/IPLT/MDT/VSI/GR.
Drilling characteristics	Average ROP: Cored from 3719 – 3736 m with an average ROP of 30 m/hr. Gas readings: -drilled gas averages of less than 0.1%. -no gas peaks recorded -Only C_1 were recorded throughout the formation. -gas readings affected from 3723 to 3736m BRT due to coring. Mud weight was maintained at 1.20 SG.

2.7.3 ILE FORMATION (3741.5 – 3773.5m BRT)

Age	Aalenian – Late Toarcian
Upper boundary pick	Picked at coincident GR and resistivity drop and change in formation from mudstone to sandstone.
Lithology and shows	Sandstone with interbedded mudstone: Sandstone: off white, occasionally light grey, moderately hard to hard, translucent, fine (L) to coarse (U), occasionally very coarse (U), subangular to rounded, subspherical to spherical, poorly sorted, moderate to strong siliceous cement, minor kaolinitic matrix, rare muscovite, fair porosity, no shows. Mudstone: very dark grey to dark olive grey, moderately hard, subfissile to sub-platy, finely carbonaceous, moderately silty in part, commonly micromicaceous, rare chlorite, frequent carbonaceous debris.
Logging	LWD: gamma ray and resistivity tool Wireline: DSI/HRLA/IPLT/MDT/VSI/GR.

Drilling characteristics

Average ROP: Drilled with an average ROP 22 m/hr with doubling of ROP in mudstone beds.

Gas readings: -drilled gas averages of lower than 0.1%.
-maximum of 0.2% at 3744.0 mBRT

-Only C_1 were recorded throughout the formation.

Mud weight was maintained at 1.20 SG.

2.8 BÅT GROUP (3773.5 – TD 3950m BRT)

2.8.1 ROR FORMATION (3773.5 – 3831.0m BRT)

Age	Late/Middle Toarcian
Upper boundary pick	A strongly pronounced increase in GR values accompanied by an increase in resistivity, followed by a sharp decrease in values over 4 metres, returning to very stable readings of 7 – 8 ohmms
Lithology and shows	Siltstone. Siltstone: very dark grey to black, hard, hackly, arenaceous, locally grading to very fine sandstone, strong siliceous cement, common argillaceous matrix, rare glauconite, no visible porosity, no shows.
Logging	LWD: gamma ray and resistivity tool Wireline: DSI/HRLA/IPLT/MDT/VSI/GR.
Drilling characteristics	Average ROP: Very steady ROP, averaging 20 m/hr Gas readings: -drilled gas average of less than 0.1%. -maximum of 0.4% at 3795.0 mBRT -C_1 were recorded throughout with C_2 , C_3 and NC_4 in some narrow intervals.. -Mud weight was maintained at 1.20 SG.

2.8.2 TILJE FORMATION (3831.0 – 3925.0m BRT)

Age	Middle Toarcian – early Pliensbachian
Upper boundary pick	Picked primarily on a significant change in lithology causing GR, resistivity and density values to decrease sharply (GR from 115 AAPI to 50 AAPI, resistivity from 8 ohmms to less than 2 ohmms and density from 2.65 to2.45g/cc).

Lithology and shows	Consists principally of sandstone with rare, thin mudstone interbeds. The top of the Tilje Formation is characterised by a three (3) metre thick bed of very coarse sandstone. Sandstone: 3824 – 3837m, white, translucent to opaque, moderately hard to hard, coarse (U) to very coarse (L), subrounded to rounded, spherical, well sorted, moderate siliceous cement, occasional floating grains in light brown dolomitic cement, generally moderate porosity, no shows. Sandstone: over the remainder of the section, white, translucent, moderately hard, fine (U) to medium (L), subangular to subrounded, spherical, well sorted, local strong siliceous cement, occasional white kaolinitic matrix, moderate to poor porosity, no shows. Mudstone: medium brown to medium grey brown, moderately hard, subfissile, common finely disseminated dark brown carbonaceous debris, slightly silty in part, occasional very finely disseminated pyrite.
Logging	LWD: gamma ray and resistivity tool Wireline: DSI/HRLA/IPLT/MDT/VSI/GR.
Drilling characteristics	Average ROP: The sandstones were drilled at 20 – 28 m/hr while the mudstone interbeds drilled at approximately 15 m/hr. Gas readings: -drilled gas average of 0.1% -no gas peaks recorded. -C_1 were recorded throughout with C_2 and C_3 in some narrow intervals. Mud weight was maintained at 1.20 SG.

2.8.3 ÅRE FORMATION (3925.0 – TD 3950.0m BRT)

Age	Early Pliensbachian
Upper boundary pick	The top is picked at the top of a relatively thin sandstone bed that gives a clean, negative GR signature.
Lithology and shows	Mudstone with interbedded sandstone and occasional limestone interbeds. Mudstone: medium greyish brown, moderately hard, subfissile, slight to moderate silty, common finely distributed carbonaceous material, rare microcline pyrite. Sandstone: white, translucent, hard, fine (U) to medium (L), occasional coarse (L), subangular, subspherical, well sorted, strong silica cement, occasional mod – extensive calcareous cement, poor porosity, no shows. Limestone: off white to light yellow grey, firm, blocky to sub-blocky, argillaceous, occasionally arenaceous, locally grading to calcareous mudstone.
Logging	LWD: gamma ray and resistivity tool Wireline: DSI/HRLA/IPLT/MDT/VSI/GR.

Drilling characteristics

Average ROP: 11 m/hr.

Gas readings: -drilled gas average of 0.05%.
-no gas peaks recorded.

-C_1 were recorded throughout with C_2 in some narrow intervals.

Mud weight was maintained at 1.20 SG .

3.0 PORE PRESSURE AND FRACTURE GRADIENT

3.1 INTRODUCTION

A pore pressure evaluation of the previous Skarv wells was the base for the pore pressure prognosis, prepared by Knowledge System Inc./Eamonn Doyle, before spud of the 6507/5-5 well. DxC Exponent, realtime LWD, formation gases and hole conditions were reviewed to provide information on formation pressure variations while drilling. Post well analysis has been carried out using wireline logs, drilling data, gas data and information acquired from pressure tests using MDT to refine the pore pressure estimation in 6507/5-5.

Summary of Work Processes

Data analysis for Pore Pressure
Because there was no MDT values in the 12 ¼" section there was no option to calibrate the semi-quantitative indications from Corrected Drilling Exponent (DxC - calculated offshore while drilling), Sonic and Resistivity data. All available data was gathered to give the most complete picture of the actual pore pressure versus estimated pore pressure. BP software Presgraf was used to calculate the final values.

Drilling exponent:

No MDT values were available in the 12 ¼" section and no option to correct the pore pressure calculated from DxC for the 6507/5-5 well. The trend shows a fairly good match with the prognoses but the values for the pore pressure is lower than prognosed and equivalents from sonic and resistivity.

Sonic:

In the 6507/5-5 well sonic data was available from 12 ¼" casing shoe to 8 ½" TD (2100 to 3950m BRT). A pore pressure dataset, '55data D45', was created from the 'DT shale'. Because no MDT values was available in the 12 ¼" section there was no option to correct the values calculated from the sonic values.

Resistivity:

The pore pressure curve has been calculated from the shale resistivity dataset for the 6507/5-5 well. Resistivity values were used over intervals where sonic data was not available. No MDT values was available to correct the values calculated from resistivity.

Gas:

All reported gas peak values were extracted from the daily geological reports and included in the project, together with total gas and chromatograph data. No confirmed CG peaks were reported.

Caliper and Hole Condition:

The wellbore is in gauge through almost all of the intervals covered by the caliper logs, except for a small interval with maximum hole gauge of about 13" in the 12.25" hole section at around 3300m.
Instances of tight hole, drag and fill on bottom during trips and/or connections were gathered from reports and logs.

3.2 OVERBURDEN GRADIENT

An OBG curve had been created previously for the Dønna Terrace and used in the PP prognosis for the 6507/5-5 well. This Dønna Terrace average OBG compares well with the OBG calculated from Presgraf used for this PP evaluation.

3.3 PORE PRESSURE

Pore pressure indicators are not calibrated due to no direct measurements in the interval.
Main features of the final pore pressure profile are:

- Normal hydrostatic pressure from seabed to approximatly1550mTVD BRT
- Steady increase in PP from 1550m to 1.45sg at 2150m, within the Shetland group.
- Calculated pressure of approximately 1.33sg in the upper part of the Cromer Knoll group in the 6507/5-5 well represents the likely minimum pore pressure of the Cretaceous.
- Pressure increase from 1.33sg at approximately 2850m to a maximum of 1.51g at 3350m at the base of the Cretaceous.
- Pressure drops from the top of Upper Jurassic Viking group. Experience puts the main decrease in the lower part of the Viking but the sonic log indicates that the drop starts right at top of the Viking Group and continues throughout the Viking.
- Maximum measured pressure in the Fangst Group was 1.083sg at 3754.0m RKB..

3.4 FRACTURE GRADIENT

The final fracture gradient curve was calculated using the Presgraf (Eaton/Penebaker). The graph shows a fairly good match with the prognosed curve, although the LOT at 2109m BRT is 1.9SG EMW.

This FG indicates minimum formation strengths of 1.57SG in the Kai Formation, 1.74GSG in the top of the Brygge Formation, and 1.91sg in the basal Cretaceous. All match fairly well with prognosed values, even though the calculations above 12 ¼" are based on resistivity only (above 1450m BRT calculations are non conclusive).

3.5 CONCLUSIONS

The well OBG is very similar to the average OBG for the Dønna Terrace.

The pore pressure prognosed for the well before drilling is generally slightly higher than the final calculated pressure profile, although the prognosed curve itself match all the pressure events very well.

Increased gas readings in the Kai Formation are not believed to be a function of mismatch between MW and PP but an effect of gas created by cuttings. The same effect was seen in the 6507/5-4 well, but with lower gas values, caused by different way of measuring the gas (equipment related).

Pore pressure calculated from surface pressures detected when the well was shut in because of the casing leakage; match fairly well the pore pressure calculated for the formation (Lange sands) which caused the inflow.

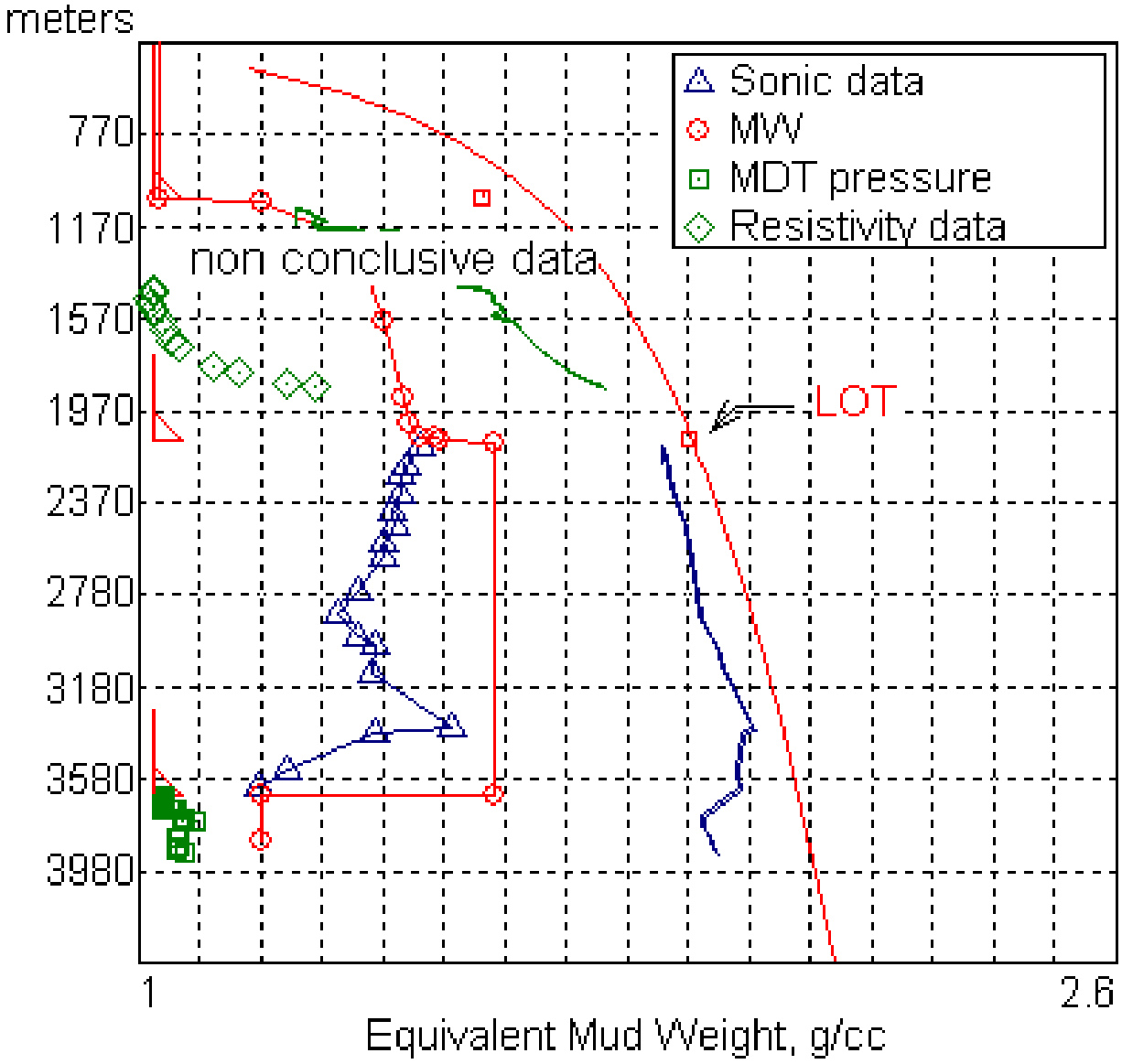

Figure 6: Formation Pressure Evaluation (figure from Pressgraf)

4.0 FORMATION EVALUATION

4.1 WIRELINE LOGGING

Run No.	Date	Tool String	Hole Size ins	Max Temp (°C)	Time since circ. (hrs:min)	Logged interval m BRT	Logged interval m BRT	Remarks
1A	26/12/01	DSI-IPLT-GR	12.25	115.0	12:45	3644.5	2100.0	GR all the way to seabed – 393m BRT
2A	06/01/02	DSI-HRLA-GR-EMS	8.5	122.0	13.5	3946.5	3440.0	Communication with the DSI failed during the repeat section.
2B	06/01/02	IPLT-GR	8.5	130.0	22.5	3946.5	3644.0	
2A	06-07/01/02	MDT-GR	8.5	129.5	33.16	3946.5	3644.0	OFA failed prior to taking first sample.
2B	07-08/01/02	MDT-GR	8.5	132.0	62.0	3885.0	3653.3	Sampling run -3 sample depths (2 good, 1 tight). Minor communication problems with the tool.
2A	08/01/02	VSI	8.5			-	-	Communication problems with the tool - POOH.
2B	09/01/02	VSI	8.5			3946.5	1322.5	VSP data; 3422.5 - 3922.5m BRT Check shots data; 1322.5 - 3422.5m BRT Poor data due to bad cement job between; 2022.5 - 3422.5m BRT. Minor communication problems with the tool.

4.2 FORMATION TEMPERATURE SUMMARY TABLE

(See Figure 4 for temperature plot – Section 1.6)

Hole size	Run/hole size	Loggers TD (mBRT)	Date/Time on TD	Time since last circulation	Mud Density (sg)	Rm (Ohmm)	Rmf (Ohmm)	Rmc (Ohmm)	BHT (deg C)
12 ¼"	1A	3644.5	06:20 26/12/01	12.45 hrs	1.58	-	-	-	115
8 ½"	2A	3946.5	10:01 06/01/02	13.5 hrs	1.20	0.072 @ 19 deg C	0.070 @ 19 deg C	0.020 @ 19 deg C	122
8 ½"	2B	3946.5	16:58 06/01/02	22.5 hrs	1.20	0.072 @ 19 deg C	0.070 @ 19 deg C	0.020 @ 19 deg C	130
8 ½"	2A (MDT run)	3946.5, temp @ 3889.0	05:40 07/01/02	33.16 hrs	1.20	0.072 @ 19 deg C	0.070 @ 19 deg C	0.020 @ 19 deg C	129.5
8 ½"	2B (MDT run)	3946.5, temp @ 3837.0	10:30 08/01/02	62.0 hrs	1.20	0.072 @ 19 deg C	0.070 @ 19 deg C	0.020 @ 19 deg C	132.0

4.3 WIRELINE OPERATIONS SUMMARY

Wireline logging in the 12 1/4" intermediate open hole section
See appendix 1; Wireline Operation time breakdown for detail timing.

Mobilization:
Based on experience from previous Skarv wells, mobilization of tools was done in a timely fashion. The tools arrived at the wellsite on time, giving the crew adequate time to check and prepare the tools prior to logging.

Logging:
The rig up was delayed approximately 5.5 hours due to ice falling from the derrick. It was decided to clear this ice prior to attempting to rig up.
Run lA: DSI-LDS-APS-HNGS-ACTS run without major problem. The time difference was 1.25 hours more than planned. Most of this was due to more time required for safety meeting and rig up.

Data Delivery:
The log was reprocessed at the wellsite prior to delivery. Due to the long logging interval and the large amount of DSI data this took approximately 2 hours. Due to the slow connection from offshore it took considerable time to transmit the LAS data to shore.
The final data was prepared in Bergen. Due to a miscommunication between the offshore crew and the office personnel this data CD was not prepared when the office personnel returned to work. As a follow up to this experience, the procedures for final data delivery are being reviewed.

8 ½" Logging
See appendix 1; Wireline Operation time breakdown for detail timing.

Mobilization:
All the equipment that was onboard for the 12 1/4" logging run remained on board and additional equipment was mobilized for the 8 1/2" logging. The crew arrived well before the logging date, giving enough time to thoroughly check all the equipment. OilPhase went on a later date but still had time to prepare their equipment.
Logging run 2A: The HRLA-DSI was faster mainly because less time was required to record the log.
Run 2B: IPLT went as planned. After the IPLT run there was a delay waiting for needed equipment to be offloaded from the supply boat.

Run 2C: The MDT run took approximately 11 hours longer than planned for in the logging program. Two primary reasons: 1) additional sampling time due to the tight formations in the Early Jurassic and, 2) a MRFA failure that resulted in the tool string having to be pulled out of hole and changed.
Run 2D: VSI seismic run. In the logging program, it had been planned to launch the seismic guns at the end of the MDT run to save time. This was not possible because the crane was needed to lift down the MDT tools before it could be used to launch the seismic guns. The final run of VSI took approximately 9.5 hours longer than planned. A VSI shuttle failure that required the tool string be pulled out and reconfigured took up most of this unplanned down time.

Data Delivery:

At the wellsite the data delivery was improved from the 12 1/4" section. This was because of the shorter logging interval (300m) and by minimizing the data channels sent in the LAS file thus reducing the data size and reducing the time taken to send it.

MRFA Failure

After the pre-tests, when going to the first point, it was found the MRFA became stuck in calibration mode. The tool is calibrated prior to the start of each sampling point. On investigation it was found that the solenoid that controls the mode of the tool had failed, the solenoid had became stuck in calibration mode. The controller board was damaged due to the solenoid failure. Both the solenoid and the controller board needed to be replaced.
The investigation after the tool failure resulted in a design modification of the part that failed.

VSI Shuttle Failure

When running the VSI, the bottom shuttle had an electronics problem that created a network problem with the other shuttles. This affected the communication to all the shuttles and meant that data could not be acquired from any of the shuttles. The tool string was pulled out and the problem shuttle removed. The shuttle was returned to Aberdeen for repair of the electronics.

4.4 COMPARISION LOGGERS AND DRILLERS DEPTHS

Casing	Driller's Depth	Logger's depth
	m BRT	m BRT
30" Casing	466.5	N/A
20" Casing	1051.0	N/A
13 3/8" Casing	2100.0	2100
9 5/8" Casing	3642.0	3641.0
7" Casing	3938.8	N/A
TD	3950.0	3946.5

4.5 TIME BREAKDOWN

Run No.	Date	Tool String	Logged interval		Opr. Time	Lost time
			m BRT	m BRT	(hrs:min)	(hrs:min)
1A	26/12/01	DSI-IPLT-GR	3644.5	2100 (with GR to 393m (seabed)	13:00	-
2A	06/01/02	HRLA-DSI-GR-EMS	3946.5 (TD)	3440.0 Upper radioactive casing marker.	7:20	-
2B	06/01/02	IPLT-GR	3946.5 (TD)	3596.0m Caliper into 9 5/8" casing	6:30	-
2A	06-07/01/02	MDT-GR	3946.5 (TD)	3644.0 9 5/8" casing shoe	16:05	7:00
2B	07-08/01/02	MDT-GR	3885.0	3653.5	23:00	-
2A	08/01/02	VSI	-	-	7:10	7:10
2B	09/01/02	VSI	3946.5 (TD)	1322.5	14:00	1:20

4.6 LWD LOGS RUN

Run No.	Tool String	Hole Size Inch	Logged interval (relative to GR)		Remarks
			m BRT	m BRT	
5	MWD (Baker Hughes Inteq)	26”	471.0	1060.0	Directional only.
6	MPR/GR (Baker Hughes Inteq)	17 ½”	1060.0	2106.0	No ROP restrictions resulted in varying data density and lost realtime data in some areas. Memory fine. GR failure at 2000m BRT – no realtime or memory data between 2000 and 2106m BRT. GR API corrections (GR-APICF) due to adding KCL to increase MW.
7	MPR/GR (Baker Hughes Inteq) 8 was a clean out trip without LWD	12 ¼”	2106.0	3643.0	No ROP restrictions above Cretaceous formations resulted in varying data density and lost realtime data in some areas. Memory data - good. Section was drilled with OBM and MPR resistivity was corrected for mud-resistivity (Rm).
9	MPR/GR (Baker Hughes Inteq) 10 was a coring run without LWD	8 ½”	3643.0	3655.0	Controlled drilling to core point. Realtime and memory data - good.
11	MPR/GR (Baker Hughes Inteq)	8 ½”	3736.0	3950.0	Reamed cored interval for data (3655-3736) at 30m/hrs. Good realtime and memory data in whole section. GR API corrections (GR-APICF) due to KCL mud.

REFERENCES

6507/5-5 Drilling Programme	BP Amoco, September 2001
6507/5-5 Data Acquisition Plan	BP Amoco, December 2001
Petrophysical Report Well 6507/5-5	Simon Thomas, BP, May 2001
A lithostratigraphic scheme for the Mesozoic and Cenozoic succession offshore mid- and northern Norway	NPD Bulletin No 4, Edited by Dalland, Worsley and Ofstad, Jan 1988
Pore Pressure Prognosis 6507/5-5, Skarv 3	Eamonn Doyle Knowledge System Inc. September 2001
Bp Skarv Exploration well 6507/5-5 Well Test Completion Report	Colin Black Mars 2002
Schlumberger Well Test report	Schlumberger Mars 2002
Oilphase Sampling Report	Oilphase Mars 2002

APPENDIX 1; FORECAST VERSUS ACTUAL TRAVLE TIME.

Marker Horizon	Forecast			Actual		
	Depth	Seismic	Error Bar	Depth	Checkshot	Error
		TWT			TWT	
	m TVDSS	msec	m	m TVDSS	Msec	m
Sea Bed	375	506	+/- 2	375		-
Nordland Group						
Naust Fm	704	840	+/- 5	847.6		143.6
Kai Fm	1361	1425	+/- 15	1375.4	1425	14.4
Hordaland Group						
Brygge Fm	1794	1856	+/- 20	1870.7	1890	96.0
Rogaland Group						
Tare Fm						
Tang Fm	2024	2061	+/- 20	2044.7	2054	20.7
Shetland Group						
Springar Fm						
Nise Fm						
Kvitnos Fm						
Cromer Knoll Group						
Lysing Fm	2770	2659	+/- 25	2735.6	2633	-34.4
Lange sst	3098	2893	+/- 25			
Viking Group						
Spekk Fm	3332	3054	+/- 30	3320.5	3038	-11.5
Melke Fm	3350					
Fangst Group						
Garn Fm	3694	3284	+/- 30	3629.5	3227	-64.5
Not Fm	3767					
Ile Fm	3801					
Båt Group						
Ror Fm	3828					
Tilje Fm	3891	3378	+/- 35	3811.6	3314	-79.4

Shallowest check-shot data point = 1322.0m tvdss

APPENDIX 2: WIRELINE OPERATIONS TIME BREAKDOWN

12 ¼" hole section
Run Number 1A: DSI-IPLT-GR

Date	Time/Date	Comments/Activities
26.12.01	01:45	Rig floor to Schlumberger
	01:50	Commence Rig Up Sheaves etc
	02:35	Finish Rig Up, commence check tools
	02:55	Install Radioactive source
	03:10	Rig up Compensator
	03:30	Commence RIH
	03:40	Tool hung up in BOP whilst passing (for 5 mins)
	03:55	Minitron powerup and checked, below seabed.
	04:25	At Shoe, RIH open hole recording DSI in P&S, and Lower Dipole mode, plus IPLT, at 3500ft/hr. (APS minitron source not activated)
	04:55	Tension value = 3400lbs as RIH
	06:00	Still RIH, depth 3415m, tool responding well
	06:20	Tagged bottom, depth 3644,5m. Temp 120degC. Commence Repeat log (minitron source bombardment not activated). Tension up = 6000 lbs
	06:50	Finish Repeat Section. RIH to bottom at 6000 ft/hr.
	07:05	Software problem. Rebooting undertaken
	07:09	Software problem solved. Ready to start main uplog.
	07:15	Compensating system down. Kept tool moving up slowly.
	07:28	Compensating system fixed. RIH from 3565m to bottom.
	07:35	Start main log slowly at 600 ft/hr. Tension = 6000 lbs. ACT = 1470 lbs. Increased logging speed to 1700 ft/hr from 3538m, main log events 2.2m shallower than downlog.
	10:53	Tool passing through 13 3/8" casing shoe at 2100m. Tension = 4500 lbs. Caliper reading in casing 12.5". Continued logging with GR inside casing at increased logging speed of 2500 ft/hr.
	13:15	Tool at seabed (393m) and passing through BOP. Tension = 2600 lbs.
	13:20	Start POOH at 5000 ft/hr from ~350m.
	13:30	Stopped tool at 100m. De-activated compensator, SJA meeting on rig floor re. unloading of radioactive sources.
	14:05	tool at surface, removing radioactive sources, lay down tools
	15:15	Rig down complete
		Notes: Last circulation ended at 05:35hrs,25/12/01, duration 2hrs, 05mins. Temperature recorded at TD (3644.5m at 06:20hrs) = 115degC. Casing Shoe depth 2100m

8 ½" section

Run Number 2A: DSI/HRLA/GR/EMS

Date	Time	Comments/Activities
06.01.02	06:30	R/U sheave wheels
	07:05	R/U DSI/HRLA/GR/EMS
	07:30	Power up & check tool string
	07:40	RIH to 100m, activate wave motion compensator
	07:55	RIH to 9-5/8" shoe
	09:30	At shoe, calibrate HRLA. **Temperature 107°C**
	09:40	RIH from shoe at 3500 ft/hr
	10:00	Reach TD, 3950m (depth pre stretch corrections) (later corrected to 3946.5m)
	10:01	Log up from TD at 1500 ft/hr. **Temperature 122°C, 13.5 hrs ALC**
	10:02	Increase **speed to 2000 ft/hr at 3935m**
	10:05	Increase speed to 2200 ft/hr at 3905m
	10:30	Log through shoe at 3644m (later depth corrected to 3641.0m)
		Logged up through casing to identify radioactive markers. Lower marker tagged at 3628 – 3629m (theoretically at 3628.6m). Upper marker tagged at 3477 – 3478m (theoretically at 3463.5m). Subsequently found that casing tally was inaccurate.
	10:46	Continued logging to 3440m while closing calipers
	10:47	Calipers closed, RIH to 3750m to perform repeat section.
	11:01	Tagged TD, logged up to 3742m. Unable to communicate with DSI, RIH to 3765m, corrected wireline spool jump.
	11:06	Log up slowly, powered down & re-powered system, unable to communicate with DSI.
	11:11	Logged up repeat section at 1500 ft/hr from 3761m without DSI
	11:14	Increased speed to 2000 ft/hr, good duplication of curves compared to main pass.
	11:29	Logged up to 3593m, closed caliper.
	11:30	Start POOH.
	12:55	Stop at 100m, de-activate wave motion compensator.
	13:05	At surface, perform after calibrations.
	13:15	Start R/D tool.
	13:50	Complete R/D

Run Number 2B: IPLT/GR

Date	Time	Comments/Activities
06.01.02	13:50	Start R/U IPLT/GR
	14:10	Load radioactive sources
	14:30	RIH
	14:40	Stop at 100m, activate wave motion compensator, continue RIH at 3500 ft/hr
	16:40	At 9-5/8" shoe
	16:58	Reach TD. **Temperature 130° C, 22.5 hrs ALC**
	17:00	Log up at 1800 ft/hr
	17:36	Log through shoe at 3644m
	17:40	Log up to 3596m, close caliper, RIH to 3935m
	17:55	Log up repeat section from 3935 – 3824m
	18:07	Close caliper, POOH.
	19:30	Stop at 100m, de-activate wave motion compensator.
	20:00	Out of hole, remove sources, start R/D
	20:20	Complete R/D.

Run Number 2A: MDT/GR Pretest run

Date	Time	Comments/Activities
06.01.02	21:35	Start R/U MDT
	22:05	Finish R/U, Oilphase check tools at surface
	22:30	Oilphase checks complete, start RIH.
07.01.02	00:10	Stop at 9-5/8" shoe for temperature calibration & tool stabilization.
	00:20	RIH, open hole
	00:25	RIH to 3740m, record correlation log
	00:38	Take pre-test 1 at 3712m
	02:35	Take pre-test 14 at 3657.5m
	02:42	Pull up to 3630m, inside casing, test MDT packer seal integrity for both probes. Both probes & seal integrity functioning correctly.
	02:55	RIH, perform correlation. Tools on depth.
	03:00	Take pre-test 15 at 3698m
	10:14	Take pre-test 44 at 3710.2m
	05:40	Take pre-test 28 at 3889m. **Temperature 129.5°C, 33.16 hrs ALC**
	10:26	RIH, correlate from 3770 – 3740m
	10:29	Take pre-test 45 at 3742m
	11:25	Pull up to 3668m to take first oil sample.
	11:30	Status errors recorded on OFA.
	11:45	Pull up to shoe while attempting to correct OFA errors.
	12:05	Unable to repair OFA fault. After consulting shore base, start POOH.
	13:40	MDT on surface

Run Number 2B: MDT/GR Sampling run

07.01.02	15:40	RIH with MDT
	17:30	Stop in casing. Checking tool. Problems with communication.
	17:50	Re-established communication
	18:30	Moved to sample point 3668m MD. Performed pretest at 3668 m.
	18:40	Start pumping to establish flowrate. Pump speed 1400 RPM
	18:54	Increased pump speed to 1500 RPM
	21:40	Clean up for 3 hrs. Parameters showed no clear improvements last 30 mins. Decided to go for sampling. Flowrate lowered in 3 steps before sampling.
	22:25	Started sampling SPMC-1
	22:37	Started sampling MPSR-1
	22:51	Started sampling MPSR-2
	23:07	Started sampling 2,75 gallon bottle
	23:55	Stopped pumps
	23:58	Retracted and moved to next sample point. No overpull
08.01.02	00:05	Performed pretest at 3653,3 m MD for oil samples
	00:22	Started pumping to establish flowrate. RPM at 1500
	02:10	Decided to go for sampling. Reduced flowrate in steps to prepare sampling
	02:37	Started sampling SPMC-1
	02:50	Started sampling MPSR-1
	02:58	Started sampling MPSR-2
	03:12	Started sampling 2,75 gallon bottle
	04:00	Stopped pumps
	04:05	Retracted probe. No overpull when moving off station.
	04:10	Re-powered system due to communication problems
	04:35	Moved to sample point no.3 (water) at 3702,5 m MD
	04:40	Performed pretest. No success. Tight formation

	04:55	Moved to 3701.8 m MD. Performed pretest. OK.
	05:10	Started pumping to establish flowrate. RPM at 1500.
	08:10	Reduce pump rate to 1200 RPM. OFA indicates increasing oil content. Confirmed with BP Stavanger to take this sample.
	08:18	Open SPMC-3 on MRS 2, chamber filled in 1.83 mins.
	08:35	Open MPSR 1, chamber filled in 9.0 mins
	08:44	Open MPSR 2, chamber filled in 6.92 mins
	08:49	Stop pumping, start to retract
	08:53	RIH to 3750m
	08:59	Log up from 3750m to correlate, apply 0.6m depth shift
	09:10	On station at 3707.2m
	09:25	Start clean up , pump speed 1000 RPM
	09:28	Reduce pump speed to 800 RPM due to overload in tight formation.
	09:32	Stop pump, retract due to low permeability
	09:33	RIH to 3720m
	09:39	Pull up to 3708.2m
	09:40	On station at 3708.2m, start pumping at 700 RPM
	09:53	Retracted due to tight formation. Talked to BP Stavanger. Agreed to attempt water sample in Tilje Fm.
	09:55	Pull up to 3660m
	10:07	RIH to 3885m
	10:19	Log up from 3885m to correlate, apply 0.5m depth correction.
	10:30	On station at 3837.0m **Temperature132.0°C 62.0 hrs ALC**
	10:34	Set probe.
	10:45	Started pumping at 800 RPM. Drawdown to 2128 PSI, lowered pump speed to 600 RPM. Stopped pumping after 13.5 mins due to tight formation.
	11:00	Retract probe, start POOH.
	13:00	At surface, start R/D.
	14:40	Complete R/D
		Re-dress cable and tool head due to swelling caused by gas.

Run Number 2A: VSI

08.01.02	17:20	RIH with VSI tool
	17:30	RIH to 100m, activate wave motion compensator
	17:35	Continue RIH.
	18:55	Checkshot at 1822 m
	19:30	Checkshot at 2560
	20:25	At 9 5/8 casing shoe. Entering open hole.
	20:30	Indications of tool / communication problems. Troubleshooting.
	21:55	At TD.
	22:05	Start to pull up. Still problems.
	22:15	Decided to POOH due to communication problems.
	22:30	Pulled carefully into 9 5/8 shoe due to calipers was not retracted.
	00:30	At surface with tools. Troubleshoot tools.
	01:15	Replaced all connections on head due to swelling caused by gas
	01:30	R/U USI to test on drill floor
	02:15	Identified that the bottom shuttle (#4) was the problem
	02:30	Rechecked with 4 shuttles and reproduced problem
	02:40	R/U tool with 3 shuttles.
	02:55	RIH
	03:05	Stopped at 100m. Tried to activate heave compensator. Compensator line was broken at weak point. Line was repaired.

	03:30	Continue RIH to 1822 m
	04:40	Checkshot at 1822 m.
	04:45	Continue RIH to TD.
	05:30	Detected communication problems once more at 3150 m MD.
	05:40	Started POOH. After short time tools started working again. Decided to RIH to 3591 m MD.
	06:10	Checkshot at 3591 m MD
	06:15	RIH to TD
	06:30	Logged check shot surveys every 100m from 3946.4m TD.
	12:30	POOH with tool string (VSI)
	13:15	R/D tool string and wireline equipment.
	14:30	Well over to drilling.

Appendix 3: VSP &CHECKSHOT SURVEY.

LEVEL NUMBER	VERTICAL DEPTH FROM m SS	MEASURED DEPTH FROM KB m	OBSERVED TRAVEL TIME s (owt), s	VERTICAL TRAVEL TIME-SRD s (owt), s	DELTA DEPTH m	DELTA TIME s	ACOUSTIC INTERVAL VELOCITY m/s	ACOUSTIC AVERAGE VELOCITY m/s	REMARKS
1									
2	1304.5	1322.5	0.6791	0.6839			1907	1907	
3	1314.5	1332.5	0.683	0.6878	10	0.0039	2549	1911	
4	1324.5	1342.5	0.6868	0.6916	10	0.0038	2664	1915	
5	1404.5	1422.5	0.7202	0.725	80	0.0335	2391	1937	
6	1414.5	1432.5	0.7249	0.7298	10	0.0047	2114	1938	
7	1424.5	1442.5	0.7298	0.7346	10	0.0049	2053	1939	
8	1504.5	1522.5	0.7683	0.7732	80	0.0386	2073	1946	
9	1514.5	1532.5	0.7739	0.7788	10	0.0056	1785	1945	
10	1524.5	1542.5	0.7796	0.7845	10	0.0057	1765	1943	
11	1604.5	1622.5	0.8203	0.8252	80	0.0407	1965	1944	
12	1614.5	1632.5	0.8256	0.8306	10	0.0054	1865	1944	
13	1624.5	1642.5	0.8305	0.8354	10	0.0049	2046	1944	
14	1704.5	1722.5	0.865	0.8699	80	0.0345	2320	1959	
15	1714.5	1732.5	0.8694	0.8744	10	0.0044	2263	1961	
16	1724.5	1742.5	0.8738	0.8788	10	0.0044	2256	1962	
17	1796.5	1814.5	0.9052	0.9102	72	0.0314	2292	1974	
18	1804.5	1822.5	0.9083	0.9133	8	0.0031	2569	1976	
19	1806.5	1824.5	0.9093	0.9143	2	0.0009	2110	1976	
20	1814.5	1832.5	0.9128	0.9178	8	0.0036	2251	1977	
21	1816.5	1834.5	0.9139	0.9189	2	0.001	1875	1977	
22	1824.5	1842.5	0.9174	0.9224	8	0.0035	2301	1978	
23	1904.5	1922.5	0.9559	0.9609	80	0.0385	2074	1982	Brygge Fm
24	1914.5	1932.5	0.9606	0.9656	10	0.0047	2146	1983	
25	1924.5	1942.5	0.9654	0.9704	10	0.0048	2085	1983	
26	2004.5	2022.5	1.004	1.009	80	0.0386	2072	1987	Tare Fm
27	2014.5	2032.5	1.0081	1.0132	10	0.0041	2415	1988	
28	2024.5	2042.5	1.0119	1.0169	10	0.0038	2645	1991	
29	2104.5	2122.5	1.0521	1.0572	80	0.0403	1987	1991	Springar Fm
30	2114.5	2132.5	1.0548	1.0599	10	0.0027	3704	1995	
31	2124.5	2142.5	1.0583	1.0634	10	0.0035	2863	1998	
32	2204.5	2222.5	1.0913	1.0964	80	0.033	2423	2011	
33	2214.5	2232.5	1.0975	1.1026	10	0.0062	1616	2008	

34	2224.5	2242.5	1.1037	1.1088	10	0.0062	1616	2006	
35	2304.5	2322.5	1.1363	1.1414	80	0.0326	2454	2019	
36	2314.5	2332.5	1.1419	1.147	10	0.0057	1768	2018	
37	2324.5	2342.5	1.1472	1.1523	10	0.0052	1909	2017	
38	2404.6	2422.6	1.1668	1.1719	80.1	0.0196	4086	2052	
39	2414.6	2432.6	1.1694	1.1745	10	0.0027	3772	2056	
40	2424.6	2442.6	1.1721	1.1772	10	0.0027	3772	2060	
41	2504.5	2522.5	1.204	1.2091	79.9	0.0319	2505	2071	
42	2514.5	2532.5	1.2062	1.2113	10	0.0022	4532	2076	
43	2524.5	2542.5	1.2081	1.2132	10	0.0019	5178	2081	
44	2604.5	2622.5	1.2436	1.2487	80	0.0355	2253	2086	
45	2614.5	2632.5	1.2463	1.2514	10	0.0027	3665	2089	
46	2624.5	2642.5	1.2491	1.2543	10	0.0028	3543	2092	
47	2704.5	2722.5	1.2786	1.2838	80	0.0295	2712	2107	
48	2714.5	2732.5	1.2811	1.2863	10	0.0025	4029	2110	
49	2724.5	2742.5	1.2841	1.2893	10	0.003	3297	2113	Lysing Fm
50	2804.5	2822.5	1.3195	1.3247	79.9	0.0354	2258	2117	
51	2814.5	2832.5	1.3253	1.3305	10	0.0058	1732	2115	
52	2824.5	2842.5	1.3292	1.3344	10	0.0039	2537	2117	
53	2904.4	2922.4	1.3648	1.37	80	0.0356	2249	2120	
54	2914.4	2932.4	1.3676	1.3728	10	0.0028	3543	2123	
55	2924.4	2942.4	1.3733	1.3784	10	0.0056	1772	2122	
56	3002.5	3020.5	1.4071	1.4123	78.1	0.0339	2306	2126	
57	3012.5	3030.5	1.4093	1.4144	10	0.0021	4673	2130	
58	3022.5	3040.5	1.4128	1.4179	10	0.0035	2853	2132	
59	3104.5	3122.5	1.4404	1.4456	82	0.0277	2963	2148	
60	3114.5	3132.5	1.4433	1.4485	10	0.0029	3464	2150	
61	3124.5	3142.5	1.4461	1.4513	10	0.0028	3521	2153	
62	3204.5	3222.5	1.472	1.4772	80	0.0259	3094	2169	
63	3214.5	3232.5	1.4776	1.4828	10	0.0056	1772	2168	
64	3224.5	3242.5	1.4851	1.4903	10	0.0075	1333	2164	
65	3304.5	3322.5	1.5059	1.5111	80	0.0207	3859	2187	
66	3314.5	3332.5	1.5097	1.5149	10	0.0038	2620	2188	
67	3324.5	3342.5	1.5159	1.5211	10	0.0063	1599	2186	Spekk Fm
68	3404.5	3422.5	1.5399	1.5451	80	0.024	3338	2203	
69	3414.5	3432.5	1.5449	1.5501	10	0.005	2002	2203	
70	3424.5	3442.5	1.5496	1.5548	10	0.0047	2128	2203	
71	3434.5	3452.5	1.5511	1.5563	10	0.0015	6753	2207	

72	3444.5	3462.5	1.557	1.5622	10	0.0059	1687	2205	
73	3454.5	3472.5	1.5587	1.5639	10	0.0017	5775	2209	
74	3464.4	3482.4	1.5621	1.5673	9.9	0.0034	2944	2210	
75	3474.4	3492.4	1.5638	1.569	10	0.0017	5816	2214	
76	3484.4	3502.4	1.5661	1.5713	10	0.0022	4450	2218	
77	3494.5	3512.5	1.5702	1.5754	10.1	0.0041	2423	2218	
78	3504.5	3522.5	1.5739	1.5791	10	0.0037	2732	2219	
79	3514.5	3532.5	1.5765	1.5817	10	0.0026	3854	2222	
80	3524.5	3542.5	1.5802	1.5854	10	0.0038	2673	2223	
81	3534.5	3552.5	1.5827	1.5879	10	0.0024	4089	2226	
82	3544.5	3562.5	1.5853	1.5905	10	0.0027	3749	2228	
83	3554.5	3572.5	1.5885	1.5937	10	0.0032	3125	2230	
84	3564.5	3582.5	1.5912	1.5964	10	0.0027	3772	2233	
85	3574.5	3592.5	1.5943	1.5996	10	0.0032	3162	2235	
86	3584.5	3602.5	1.5967	1.602	10	0.0024	4193	2238	
87	3594.5	3612.5	1.5995	1.6047	10	0.0028	3577	2240	
88	3604.5	3622.5	1.6022	1.6074	10	0.0027	3747	2242	
89	3614.5	3632.5	1.6057	1.611	9.9	0.0035	2805	2244	
90	3624.5	3642.5	1.608	1.6132	10	0.0023	4442	2247	
91	3634.5	3652.5	1.6112	1.6165	10	0.0033	3075	2248	Garn Fm
92	3644.5	3662.5	1.6135	1.6187	10.1	0.0022	4494	2252	
93	3654.5	3672.5	1.6162	1.6215	10	0.0028	3617	2254	
94	3664.5	3682.5	1.6183	1.6236	10	0.0021	4725	2257	
95	3674.5	3692.5	1.6208	1.626	10	0.0024	4108	2260	
96	3684.5	3702.5	1.6239	1.6291	10	0.0031	3225	2262	
97	3694.5	3712.5	1.6255	1.6308	10	0.0017	5978	2265	
98	3704.5	3722.5	1.6278	1.633	10	0.0022	4458	2268	
99	3714.5	3732.5	1.6304	1.6356	10	0.0026	3866	2271	
100	3724.5	3742.5	1.6326	1.6378	10	0.0022	4457	2274	
101	3734.5	3752.5	1.6347	1.64	10	0.0021	4758	2277	
102	3744.5	3762.5	1.6364	1.6416	10	0.0016	6071	2281	
103	3754.5	3772.5	1.6398	1.6451	10	0.0035	2877	2282	Ror Fm
104	3764.5	3782.5	1.6423	1.6475	10	0.0025	4052	2285	
105	3774.5	3792.5	1.645	1.6502	10	0.0027	3752	2287	
106	3784.5	3802.5	1.6472	1.6524	10	0.0022	4573	2290	
107	3794.5	3812.5	1.6499	1.6552	10	0.0028	3593	2292	
108	3804.5	3822.5	1.6515	1.6568	10	0.0016	6212	2296	
109	3814.5	3832.5	1.6549	1.6602	10	0.0034	2945	2298	

110	3824.5	3842.5	1.6573	1.6625	10	0.0023	4278	2300	
111	3834.5	3852.5	1.659	1.6642	10	0.0017	5943	2304	
112	3844.5	3862.5	1.6614	1.6666	10	0.0024	4112	2307	
113	3854.5	3872.5	1.665	1.6703	10	0.0036	2770	2308	
114	3864.5	3882.5	1.6676	1.6728	10	0.0026	3878	2310	
115	3874.5	3892.5	1.6695	1.6748	10	0.0019	5131	2313	
116	3884.5	3902.5	1.672	1.6773	10	0.0025	4046	2316	
117	3894.5	3912.5	1.6729	1.6782	10	0.0009	10646	2321	
118	3904.5	3922.5	1.674	1.6792	10	0.0011	9479	2325	