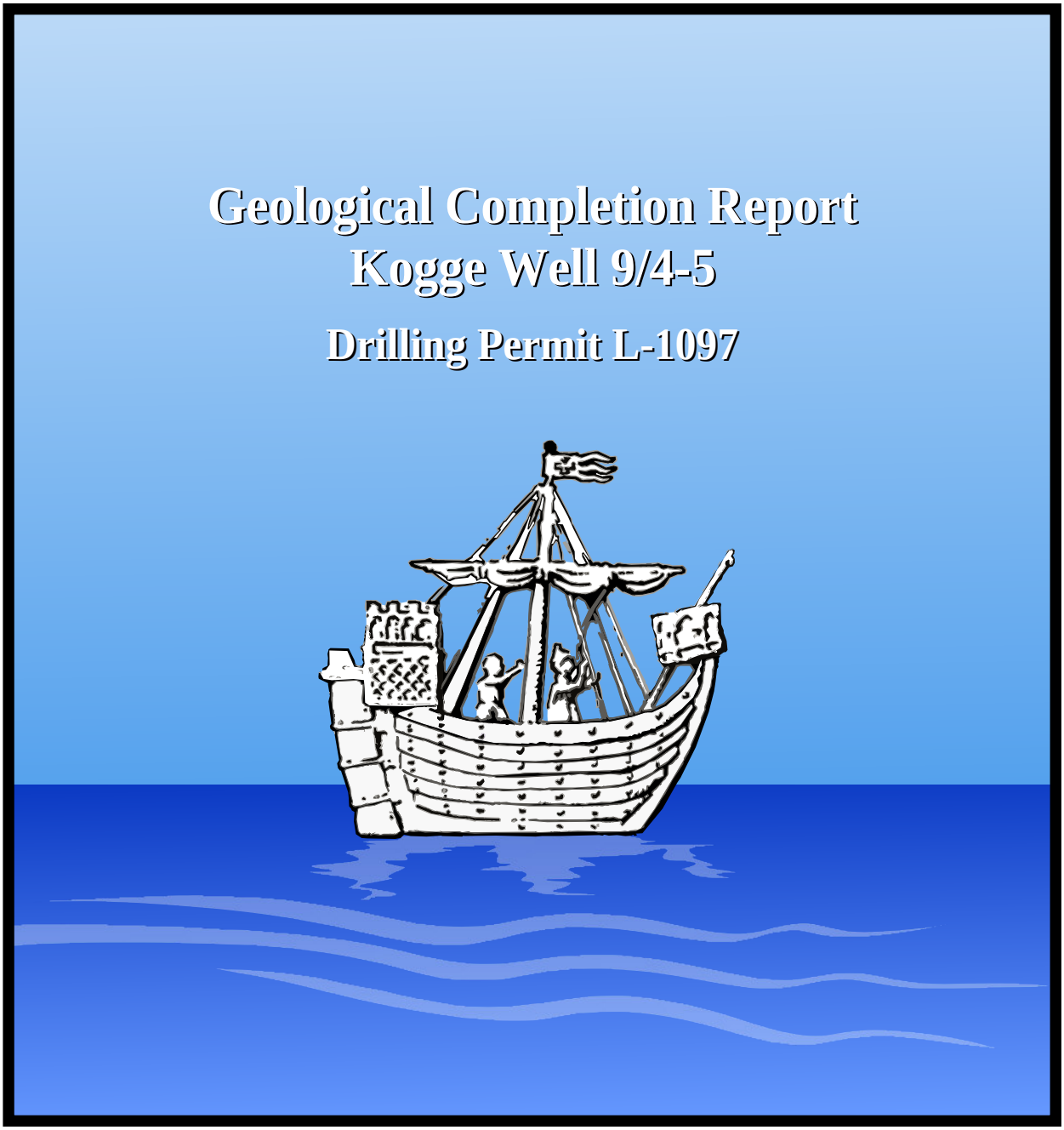
ExxonMobil

Geological Completion Report
Kogge Well 9/4-5

Drilling Permit L-1097



January 2007

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ExxonMobil Exploration and Production Norway AS

GEOLOGICAL COMPLETION REPORT

WELL 9/4-5

Drilling Permit L- 1097

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1. GENERAL INFORMATION

1.1 Well Results

Well 9/4-5 was drilled to TD of 5882mMDRT in volcanic tuffs below the base of the Rotliegendes Group. The well was dry. Two conventional cores were cut in the Rotliegendes section.

Extensive wireline logging was done at TD, including Earth Imager, MREX (Magnetic Resonance), XMAC (Sonic), HDIL (Resistivity) and Checkshots. Formation pressures and samples were attempted with the RCI Probe and RCI Straddle Packer tools.

1.2 Well Summary

The Kogge 9/4-5 well was spudded Jan 8, 2006 and drilled to TD on June 24, 2006, and final rig release was August 1, 2006. The well was drilled to 5882mMDRT (5831mTVDSS), the deepest well drilled on the Norwegian Shelf. TD was in Pre-Rotliegendes volcanic tuffs.

The Kogge prospect was located in PL315 in the Norwegian-Danish Basin in Blocks 8/6, 9/4 and 9/5. The PL315 license was awarded in conjunction with the 18th Round awards in June 2004 (Figure 1.1).

The main objective for the well was a faulted four way anticlinal structure (rotated faultblock) with Late Permian Rotliegendes sandstones (Figures 1.2 and 1.3). About 400m of Rotliegendes sandstone was expected. The key risks were the Paleozoic source and reservoir adequacy and top seal. Dry gas was expected.

The well encountered the Top Rotliegendes at 5278.5mMDRT (5227.9mTVDSS), 138m deep to prognosis. The total Rotliegendes was 559m thick, consisting of about 500m of tight sandstones and conglomerates. A few meters of the sandstone beds had porosity up to about 8%. These porous beds were water wet. The lowest part of the Rotliegendes consists of 60m with brown to red claystones, with a sharp log contact to varicoloured tuffs.

Two cores were cut in different reservoir facies, the first core showing grey tight sandstones and the second core, deeper down in the reservoir, showing red tight conglomerates and red sandstones with 8% porosity. Rotliegendes drilling was very slow, about 1-2 m/hour.

Pre-drill formation pressure in the Rotliegendes was expected to be in the 10.4-13.7 ppg range, and the well was drilled with 13 ppg mud weight in the upper part of the reservoir. When drilling at 5503mMDRT with 13 ppg mud weight, a salt water kick occurred. ECD at this time was 13.7 ppg. The mud weight was gradually increased to 15.5 ppg to stop the

salt water influx into the well. The salt water was contaminating the mud, making it too saline and lighter.

The well encountered a five meters thick halite bed at the base of the Zechstein in the 9 7/8" hole. On several bit trips in and out of the hole, the halite was seen slowly moving into the well, giving some problems coming into the well and pulling out of hole, most of the times this interval needed to be reamed. The BHA was stuck in the halite once for more than one hour before it was worked free. This was the reason for picking up extra LWD tools, Density, Neutron and Sonic when drilling to TD to secure log data in the event of hole problems.

Wireline logging performed before the well was plugged and permanently abandoned was XMAC (sonic), Earth Imager (resistivity image log), MREX (magnetic resonance), HDIL (induction resistivity log), Checkshots, RCI Single Probe tool and RCI Straddle Packer tool.

RCI pressures were attempted with the RCI single probe tool, but due to tight formation, no valid formation pressures were obtained. Two RCI Straddle Packer runs were made to record formation pressure. Both tests built up pressures in excess of hydrostatic pressure, but both tests failed after 3-4 hours of build-up time due to packer and communication failures. The Rotliegendes pore pressure based on the RCI Straddle Packer was on the order of 16 ppg.

1.3 License History

Well 9/4-5 was drilled in the Kogge Prospect, located in PL315. This license comprises 11 blocks which was awarded in conjunction with the 18th Round on June 18, 2004 (Figure 1.1). The license was awarded to ExxonMobil (operator) and partners Statoil, RWE Dea and Petoro. The well was a firm commitment well for the PL315 license. Four wells have previously been drilled on the 9/4 block during 1968 to 1977 (Figure 1.2). Primary objectives of these wells were the Middle Jurassic sandstones.

1.4 Well Objectives

The main objectives of the Kogge 9/4-5 well were:

- Test the hydrocarbon potential of the Rotliegendes Group of Late Permian age at a prognosed depth of 5134mMDRT (Figure 1.2)
- Drill the well as a straight hole, and complete operations with zero personnel injuries and zero environmental incidents within the budgeted AFE
- Gather sufficient data to establish the nature of the reservoir and fluid content and in the event of a discovery, enable assessment of field size, and acquire data to influence future appraisal and development decisions

- TD the well just below the base Rotliegendes (Saalian Unconformity) to obtain full stratigraphic and lithological control for the Rotliegendes

Predrill pore pressure was expected to increase from the Middle Tertiary to about 10.3 ppg (1.24 g/cm^3) in the Middle Jurassic. The Rotliegendes pore pressure range was estimated to 10.4-13.7 ppg (1.25-1.65 g/cm^3) mud weight equivalent with a 11.6 ppg (1.4 g/cm^3) base case. If a high side gas column was added to the pore pressure curve, the high side pore pressure could be as high as 14.4 ppg (1.73 g/ cm^3). If a pressure transition zone existed this was expected to occur in the lower part of the Smith Bank Triassic shales and across the Zechstein evaporites.

The predrill base case temperature at the top of the Rotliegendes at 5134mMDRT was estimated to 144ºC at the well location, with a range 124-167ºC. The temperature at the predicted TD of 5564mMDRT was estimated to about 154ºC with a 131-178ºC uncertainty range.

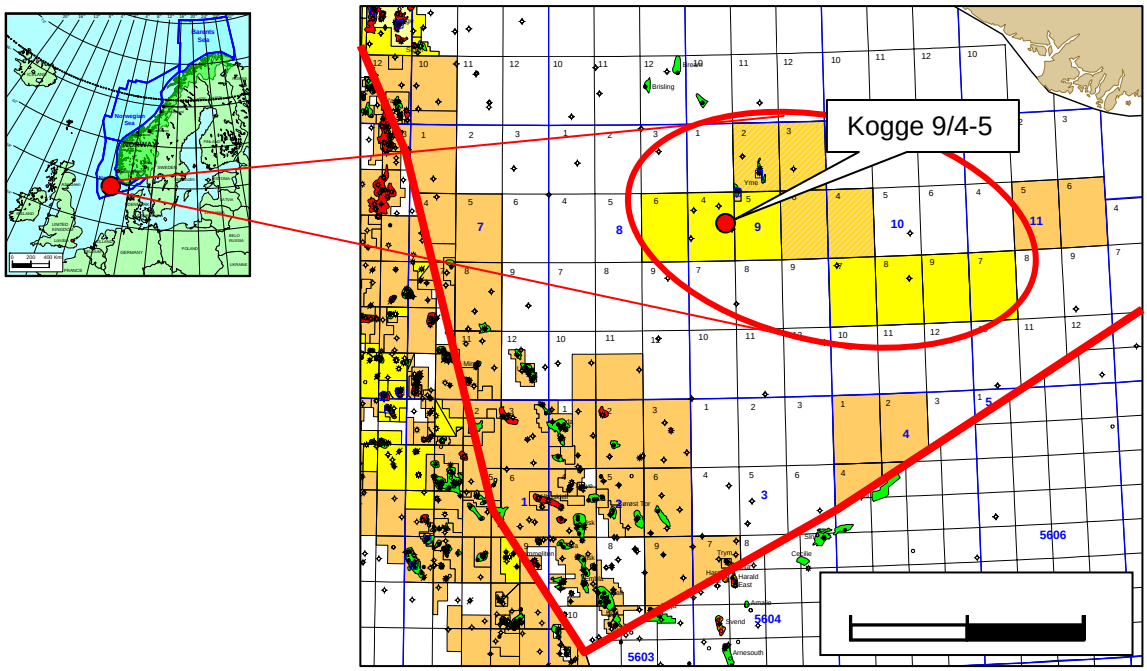


Figure 1.1 PL315 Licensed area and 9/4-5 location in Norwegian-Danish Basin

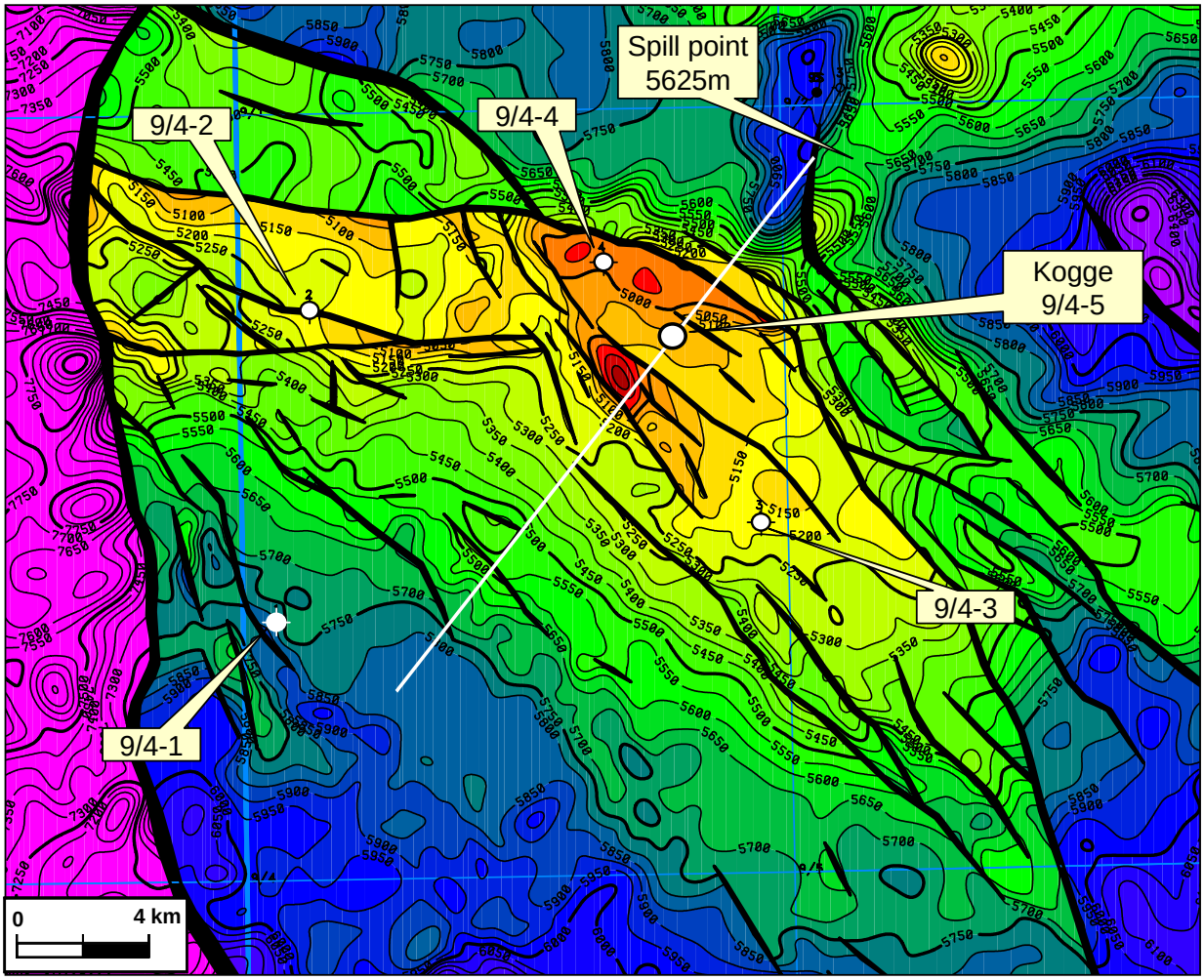


Figure 1.2 Base Zechstein depth structure map (line location of Figure 1.3 shown)

Well location

Seismic line:	NSR04-42321 2D Survey, sp 2900
Surface location:	57º 40’ 38.907’’ N and 04º 16’ 08.369’’ E
(ED50, UTM Zone 31):	6 393 656.20 mN and 575 683.41 mE
TD location	57º 40’ 36.232’’ N and 04º 16’ 01.838’’ E
(ED50, UTM Zone 31):	6 393 571.65 mN and 575 576.77 mE

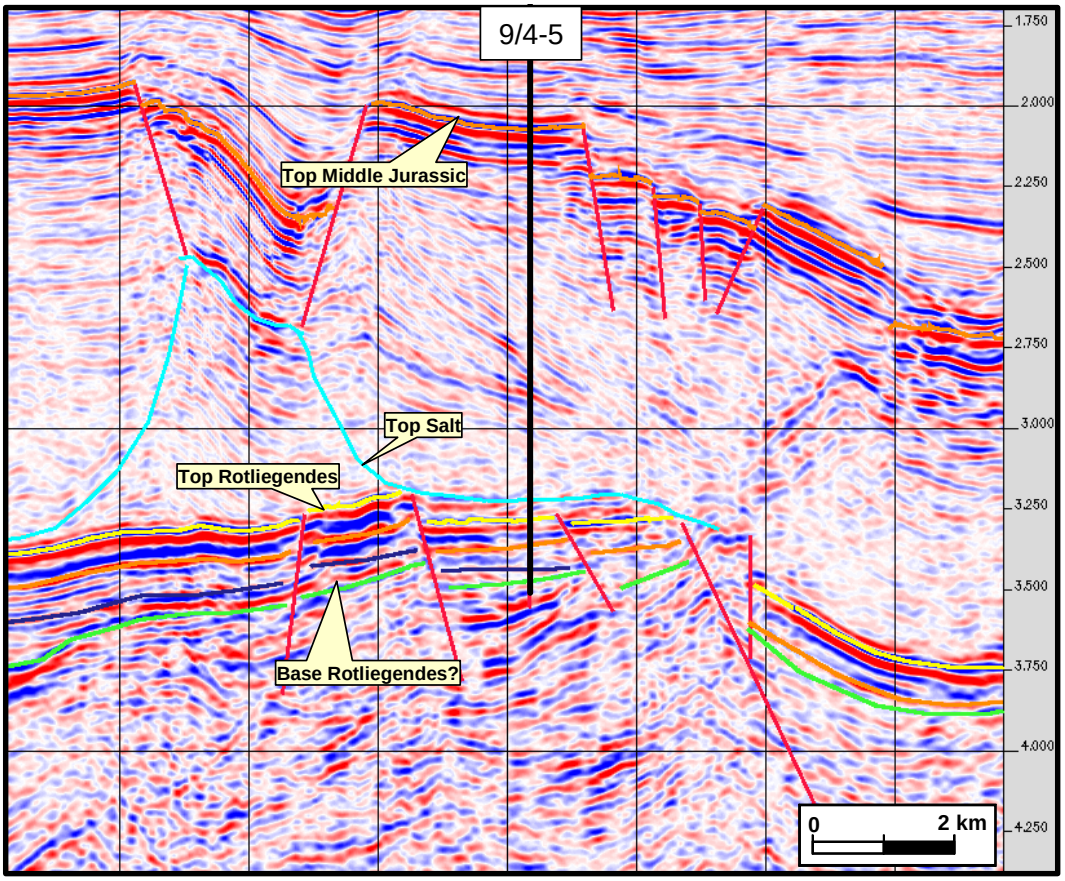


Figure 1.3 2D seismic line NSR04-42321 through Kogge well location

1.5 Key Well Data

Well Name	9/4-5
Prospect Name	Kogge
Production License	PL315
Drilling permit	L-1097
Blocks	9/4, 9/5 and 8/6
Operator	ExxonMobil 30%
Partners	Statoil 30%, RWE Dea 10% and Petoro 30%
Primary Objective	Late Permian Rotliegendes Sandstones
Trap	Faulted 4-way anticlinal structure/rotated fault block
Key Risks	Paleozoic source and Rotliegendes reservoir facies/quality
Secondary Objective	None
Wellhead Location	X: 575 683.41mE Longitude: 04° 16’ 08.369” E Y: 6 393 656.20mN Latitude: 57° 40’ 38.907” N Datum: ED-50 Projection: UTM Zone 31
Seismic Location	NSR04-42321 at shot point 2900
Drilling Rig	Maersk Gallant, Maersk Gallant Norge AS
RT to Sea Level	43.9m
Water Depth	77.1 m
Top Rotliegendes	5278.5mMDRTRKB (5227.9mTVDSS)
Rig on day rate	January 6, 2006
Spud date	January 8, 2006
Drilled to TD	June 24, 2006
Age at TD	Paleozoic
Plugged and abandoned	August 1, 2006
Total Depth	5881mMDRT, 5830mTVDSS drillers depth (5882mmMDRT, 5831.1mTVDSS, wireline loggers depth)
Coring	Core No 1: 5294.7-5297.4mMDRT, cut 2.7m, rec 2.15m Core No 2: 5535.2-5550.7mMDRT, cut 15.5m, rec 16.4m
TD Location	X: 575 576.77mE Longitude: 04° 16’ 01.838” E Y: 6 393 571.65mN Latitude: 57° 40’ 36.232” N

Hole size (inches)	Drillers Depth (mMDRT)	Casing size (inches)	Drillers Depth (mMDRT)	Mud type	Mud weight (ppg)	LOT/FIT (ppg)
42	213.4	36	206.7	Seawater	8.7	
26	605	20	598.6	Seawater	8.7	13.2
17	2534.4	13 5/8	2526.2	Glydrill WBS	10.0-10.3	15.7 at 2526m
12 ¼	5234.6	9 7/8	5209	OBM, Paratherm	10.0-10.3	18.4 at 5238m
9 7/8	5294.7			OBM, Paratherm	13.0	
8 ½	5881			OBM, Paratherm	13.0-15.5	

Well status:	P&A, Dry Hole

Table 1.1 Kogge 9/4-5 key well data

2 OPERATION SUMMARY

For more details about Operations Summary and Learnings, please see Drilling's Final Well Report. All measuring instruments at the rig were in feet, and American units were used for the daily operation offshore. This Operations summary uses American units as they were used during the operation.

2.1 Mobilisation

2.1.1 Tow and Setup at Åmøyfjorden

The Maersk Gallant was released by ConocoPhillips at the 500m point off the Embla Platform at 0500 hrs 28 November 2005 and towed to an inshore location at Åmøyfjorden, 3km outside Dusavik to conduct the 5-year recertification and upgrade of the BOP equipment, repairs and preparations to drill the Kogge HPHT well and all the work to meet Regulatory and Contractual requirements. The rig arrived at Åmøyfjorden at 1930 hrs 29 November 2005.

The rig was jacked up and stayed at Åmøyfjorden for 18.75 days to carry out the upgrade.

2.1.2 Positioning

The rig was towed to Kogge on 24 December 2005 commencing at 12:00hrs and arrived on location on 25 December 2005 at 10:00hrs. The rig was positioned based on a 20 ft cantilever distance with the well location at X = 575 673 mE and Y = 6 393 652 mN (57° 40' 38.77" N and 04° 16' 07.74" E). For operational and practicality reasons, the cantilever distance was increased from 20 ft to 33.8 ft along the centerline.

Final surface position was X = 575 683.41 mE, Y = 6 393 656.2 mN (57° 40' 38.907" N and 04° 16' 08.369" E).

The rig was jacked up to 11.5 ft air gap for preloading. Preloaded was completed on 27 December 2005 at 06:00 hrs and leg penetrations recorded were Leg #1 = 5.7 ft, Leg #2 = 5.7 ft and Leg #3 = 4.6 ft and the rig was jacked up to the operating air gap of 70.2 ft.

The rig continued with shipyard carried over work for another 10 days at zero day rate and the rig was finally accepted on 6 January 2006 at 12:00hrs for well operations to commence. Equipment essential for the commencement of operations like the Texas Deck, tensioning yoke and bushing was rigged up. BHA and drill pipes were picked up and the 42" hole was spudded on 8 January 2006 at 03:30 hrs.

2.2 Drilling

Shallow gas was not expected at Kogge based on Shallow Hazard Seismic Survey. No 9-7/8" pilot hole was drilled.

2.2.1 Drilling 42” Hole

At the well location, the seabed was tagged at 397 ft MDRT (RT – MSL = 144 ft, Water Depth = 253 ft), while monitored with the ROV. The 42” hole was spudded on 8 January 2006 at 03:30 hrs. The 42" hole was drilled with the tandem 42” x 42" x 36" x 26" x 22” x 17-1/2" (Smith XRiV, 1-1-5) hole-opener rotary BHA to 700 ft MDRT using seawater and sweep, with the ROV monitoring. The hole was drilled in 25 hours and a very hard boulder bed was encountered from 659 – 679 ft. Weight on the assembly was kept low, 1 - 2 kips at the top and 4 - 7 kips to keep the hole straight and to prevent risk of twist off or skidding of the bit. The Anderdrift tool was used and 1.0 degree hole inclination was recorded.

After drilling, the hole was swept with a Hi-Vis pill and displaced to 10 ppg mud.

2.2.2 Running and Cementing 36" Structural Casing

The ROV video of the seabed showed the 36” casing fully cemented at mudline with cement spreading out and level over the crater. There was no gap between the casing and the cement which indicated a good cement job. There was no evidence of cement settling out over the top 15 ft.

2.2.3 Drilling 26" Hole

A 26" Smith MSDSSHC (1-1-5) bit on a rotary BHA was run to drill the 26" hole to section TD at 1985 ft. The initial section 78 ft out of the shoe was boulder bed, but did not cause a lot of problem to the bit. The hole was initially drilled with 9.5ppg spud mud made up of Soda Ash, Duotec NS, Defoam AL, CMC EHV, Polypac R + seawater. There was a lot of problem with sand blinding off the shaker screen and causing severe mud losses. The well was circulated to seawater and drilled successfully in 21 hours in a single bit run (average 61.5 ft/hr).

2.2.4 Running and Cementing 20” Casing

The casing was run and cemented as per the plan.

2.2.5 Wellhead and BOP Running and Testing

After the casing was cemented and the annulus washed clean, the 20” was centralized by making up 4 centralizing bolts as planned. The 36” Landing Plate and Adjustable Landing Ring (in 2 halves) was installed. 50000 lbs tension was pulled on the casing and the Adjustable Landing Ring turned to transfer the casing weight above the mud line to the 36” casing.

The 3-Ram BOP stack was subsequently nippled up and the choke and kill lines installed. The BOP connector was tested.

Although the BOP stack was rebuilt and re-certified for 5-Year Class in the shipyard, many outstanding hookup and commissioning task relating to the choke and kill lines, diverter and overshot packers needed to be completed. More than 80 hours were spent to complete the rig-up and testing.

2.2.6 20” Casing Test

Due to the wet shoe, the plan was to test the casing with a TAM packer which was mobilized on the rig as part of the original plan. However, the packer was configured wrongly with the steel weave placed above the rubber packer element which resulted in a lower pressure rating. Consequently, a cement plug had to be set to test the casing. A total of 28 hrs NPT was incurred.

2.2.7 Drilling 17" Hole

A rotary assembly with GR/RES was used to drill the section. A 10.5 ppg Glydril Water Based Mud was used. After cleaning out the 20” shoe and drilling 10 ft of new formation a LOT was conducted to 13.2 ppg EMW.

A Security FS2663Z3 6-blade PDC bit was used to drill the cement plug, shoe track and 17" hole section from 1873 - 4197 ft. The bit drilled new hole, mainly the Hordaland and Rogaland Shale at 122 ft/hr until 34% chert formation was encountered at 4166 ft. The bit became 5” undergauged and the near-bit stabilizer was severely undergauged when pulled (8–8–NR–A–X–16–NR–PR).

A Security XT-02 (4-1-5) bit was run to clean out the section with chert and drilled chalk from 4197 - 4600ft at 17.7 ft/hr. Top of chalk was 4265 ft. The bit graded 1–1–WT–A–E–1–BT–BHA when pulled.

Once the section was clear of chert (base chert 4545 ft), a Reed Hycalog SpeedDrill (SD244) was ran and drilled from 4600 – 5909 ft. The bit drilled the chalk at 81.8 ft/hr and with very high torque (18-30 Kft-lbs) due to the low rake angle (15°) of the cutters. Normal PDC bit uses a rake of up to 20° and in motor application is 25° to 30°. The ROP dropped off to 5 ft/hr after drilling 1309ft of very hard chalk and the bit was pulled and graded 1–3–WT–G–X–2–BT–PR.

Due to concern that there may be further sections with chert, a Hughes Christensen MX-T09H (4-3-5) was run to drill the chalk section from 5909 – 6006 ft in 15 rotating hours. ROP was slow at 6.5 ft/hr and the bit was pulled and graded 1–1–NO–A–E–I–NO–PR. There was no sign of shock damage.

A Hughes Christensen MX-3 (1-3-5) was ran and drill from 6006-6564 ft in 72 rotating hours to the base of chalk at 7.8 ft/hr. Some sign of chert was seen. This bit was graded 3–4–WT–A–F–I–NO–PR.

As soon as the base chalk was seen, a Smith MRS89 PDC bit was run and drilled the Lower Jurassic Shale to casing point (6564-8315 ft) in 8.1 hrs at 216 ft/hr. The bit was graded 1–1–NO–A–X–I–NO–TD. Static losses was experienced while POOH.

While drilling the massive chalk section, some sign of borehole instability was observed (cavings) from the Hordaland and Rogaland shale above so Glydril MC concentration was increased from 3-4% to 4.5%. In addition KCl content was increased to 56ppb.

No hydrocarbon bearing sand was encountered in this section. No intermediate wireline logs were run.

2.2.8 Running and Cementing 13-5/8” Casing

The 13-5/8” casing was ran. 16.0 ppg Dyckerhoff “G” cement was used to cement the casing and 25% of the measured depth was cemented.

After WOC, the casing was tested to 3,000psi and the 3-Ram BOP stack was nippled down. The Single Ram BOP and 3-Ram BOP Stack was installed and tested. The diverter was installed and ready for the next phase.

In preparation to drill the 12-1/4” section with HPHT Well Control Procedure from 14,765ft, fingerprinting had to be completed prior to drilling out the casing shoe and after the WBM was changed to the NAF to be used. In addition, the block was restrung to 14 lines for running the 1 million pound 9-7/8” casing and the BOP tested per the HPHT Well Control Procedure. The mud system was changed to Paratherm NAF.

2.2.9 Drilling 12-1/4" Hole

Once 10ft of new formation was drilled, a LOT was taken to 15.7ppg with the 11.5ppg NAF in the hole.

The plan was to use heavy set PDC bits to drill the very hard and abrasive Skagerrak and Smith Bank Shale in the 12-1/4” section with packed hole rotary assembly. A DPI/Reed Hycalog Speed Drill SDX 644 on a rotary assembly was used to drill 403 ft of cement in the shoe track and new formation to 10392ft. The bit drilled with ROP up to 160 ft/hr.

Due to the building tendency of the BHA and dipping bed, a decision was made to run in the Vertitrak assembly (vertical drilling system with 5/6 X-Treme motor) and the 7-blade DSX56 PDC bit for higher RPM performance drilling and with the ability to correct any building tendency if desired. The Vertitrak systems incorporate a high performance power section and pad steering technology similar to the AutoTrak® RCLS. Steering was

accomplished by stopping drill string rotation. The surface equipment limitation, 5,000 psi standpipe and the inability to use a full string of 5-1/2" drill string caused the motor to work at sub-optimal performance (RPM, flowrate and torque). The rig could only rack back 9,500ft of 5-1/2" drill pipe so 5" drill pipe had to be used in addition which resulted in higher pressure loss. The X-Treme motor was not suitable due to the high pressure drop required. The Vertitrak/Motor assembly building tendency overtook the correction capability of the Vertitrak. The dipping bed also exacerbated the problem. When more weight was put on to increase ROP, the pressure went up and the popoff went off. The WOB had to be backed off and the flowrate also had to be lowered to reduce the differential pressure resulting in drop of ROP.

A target extension was obtained from the Exploration Department in the event that directional control became untenable and drilling persevered in rotary and mainly sliding modes and the angle built up to a maximum of 3.27^{o}. The projected penetration of the target was still within the original box.

The Vertitrak BHA drilled from 10392-13264ft at an average ROP of 9-24.9 ft/hr. The bit was pulled due to performance and the requirement for a BOP test and graded 1-1-WT-A-X-I-NO-PR.

The strategy was to use heavy set PDC bit in lieu of diamond impregnated bit with hi-speed motor due to the pressure limitation of the surface equipment. Drilling continued with 7 and 8 blades PDC bits with 13mm and 16mm cutters using different configuration of BHA components. A shock sub was placed directly above the near bit stabilizer to minimize axial vibration. BHA #12 was a DSX813M PDC bit with a shock sub which drilled from 13264-14285ft in 62.2hr. Axial and lateral vibration level was reduced to Severity Level 1 due to the use of the shock sub. The main founder point was directional control (angle build at a rate of 0.3^{o} to 0.4^{o} per stand from 2° - 4.15^{o} - 8° normal to the dip, north-easterly dip and south-westerly inclination build) and WOB had to be reduced to control the angle build. The BHA was pulled due to MWD failure. The bit was graded 3-1-WT-T-X-I-NO-BHA. The near bit stabilizer was 3/16" UG, stabilizer above the shock sub was 5/8" UG and the top stabilizer was ½" UG.

Due to the excessive wear of the stabilizer and the angle build tendency when higher WOB was applied, it was felt that the shock sub was a limber tool and a stiffer assembly was required. BHA #13 was run with a E1001-B3 PDC bit with a stabilized pony collar and the shock sub above it. This assembly drilled from 14285-14538ft in 15.5hr and the BHA was pulled due to failure of the MWD pulser to send signals to the surface. Lithology was the main founder point and throughout the 12-1/4" section, this has proved extremely difficult to drill the interbedded sandstone and siltstone. At several points, the TDS stalled out due to the bit entering some soft sand sections and with 40Klbs WOB, the bit was taking a big bite. A drilling optimization test was conducted and it was found that 35K WOB provided the most efficient drilling and ROP. No shock and vibration data was available due to the failed MWD tool. The bit was graded 1-2-WT-T-X-I-NO-DTF. The NBS was 3/8" UG and the 1st stabilizer above was 1/8" UG. It was felt that the excessive WOB caused the BHA to buckle and the worn against the hard and abrasive borehole wall.

BHA #14 with a DSX713M-A6 PDC Bit and 2 NBS above the bit to provide a stiffer assembly, a stabilized pony DC and shock sub above followed by LWD/MWD tools and drilled from 14538-15374ft. The lithology was interbedded sandstone and siltstone making drilling conditions extremely difficult. Average ROP over the section was 10.6 ft/hr. The top drive stalled out several times when the bit took a larger bite of the softer section ahead of the harder formation. Again WOB had to be varied between 20-45Klbs to optimize ROP. The packed assembly with 2 NBS has caused the angle to level out at 8.2^{o}. The dip had also appeared to have leveled out based on the measurement of the previous BHA #12. Lateral vibration continued to be high but axial vibration was low due to the shock sub. The ORD and MPR tool quit, possibly due to high lateral vibration. Drilling continued to the Smith Bank Shale at 15300ft. The BHA was pulled to conduct the regular 14-day BOP test. The bit was graded 1-3-WT-T-X-I-NO-BOP. The NBS was 5/16" UG and the 4 stabilizers above were 1/16" UG and the top 2 stabilizers were 1/8" UG. Again, it is felt that excessive WOB caused the whole BHA to buckle and worn against the hard and abrasive borehole.

BHA #15 with a E1001M-E PDC bit was run with similar stabilization as BHA #14 and drill from 15374-16771ft in 208.2hr at 6.7ft/hr. The formation changes to siltstone and shales with sandy stringers in the Smith Bank and some improvement in the drilling parameter was seen and a smoother ROP trend. The formation was 80% claystone and 20% siltstone. The inclination also continued to drop to 3.6^{o} at the end of this bit run. The claystone was very well compacted and ROP remained low in spite of increasing WOB to 70Klbs.

Real time pore pressure monitoring started when the Smith Bank was penetrated and it indicated a pressure of 10.3ppg and gas was 0.15%. A drilling break was observed at 15883ft and it was found to be siltstone and sandstone stringers. It was not possible to get surveys at 15866ft due to metal in the mud. Operation was suspended at 16098ft when a crack was found in the UIBOP (auto) and the bit was pulled to the shoe to change out the UIBOP and LIBOP which took 39.25hr.

From 16222ft to 16740ft, drilling BG increase to 0.5% to 1% with no connection gas. Pore pressure was estimated at 10.7ppg and the mud weight was maintained at 11.5ppg. All signals were lost form the MWD tool and the bit was pulled for a regular BOP test and to change logging tools. The bit was graded 6-8-WT-A-X-1-RO-PR (rung out). There was a lot of wear on all the stabilizers and the bit was also 1/16" UG. The Sonic, CCN and ORD tools were also badly worn (flattened on one side) and were ultimately junked.

BHA #16 was run in super packed with a full gauge stabilizer between the shock sub and the LWD tool (21ft between stabilizers) to make the assembly much stiffer. In BHA #15, the length of the LWD tool and shock sub was 51 ft in between stabilizers. This assembly drilled from 16771-17174ft in 17.3hr, with 35Klb WOB, ROP=23.3 ft/hr. A drilling break was seen at 17117ft and drilling continued to 17174ft. Bottoms up samples showed salt and the Top of Zechstein was picked at 17139ft. Interbedded halite/claystone was seen from 17139 to 17174ft. There was slight loss of 2 bbls/hr. Bottoms up gas was very low at

0.03%. The bit was graded 1-1-WT-N-X-I-TD and there was no wear on any of the 8 stabilizers.

2.2.10 12-1/4" Logging

No hydrocarbon bearing sands were encountered so no wireline logging program was carried out. LWD GR/RES/Density/Neutron and Sonic were obtained to compare with seismic data and estimate formation tops. A number of tool failures were experienced and the sections were relogged during BHA changes. Continuous pore pressure monitoring was carried out. The pressure in this section was estimated to 11.3ppg at the time of drilling.

2.2.11 9-7/8” Casing

Due to presence of salt from 17117ft, it was decided to run the 9-7/8” casing to 17090ft to ensure there is minimal risk in landing the casing. There was little incentive to case off the salt as there could be more salt below 17140ft.

2.2.12 Drilling 8-1/2” x 9-7/8" Hole

The predicted pore pressure from the previous hole section was 11.3ppg. With the salt open below the 9-7/8” shoe, it was decided to use a 13ppg mud to drill the section for salt stability consideration.

After setting the 9-7/8" casing at 17,090ft, a bi-center bit, a V-stab with bi-center bit (BHA #17) from ReedHycalog/DPI was run to drill the 8-1/2” x 9-7/8” hole. Cement was tagged at 16,809ft and 260ft of cement was drilled with no problems. ROP through the cement ranged from 60-85 ft/hr. The rat hole was cleaned to 17,174ft and new formation was drilled to 17,371ft. A PIT equivalent to 18.4ppg was taken with 13ppg NAF in the hole after 10ft new formation was drilled.

Interbedded halite/claystone was seen from 17174-17283ft. At the base there was a 16.5ft of massive halite bed. This formation was relatively hard (probably 15,000-20,000psi), but the bit with V-stab performed very well when drilling the claystone/limestone at 15-20 ft/hr. As soon as it hit the hard silty sandstone, ROP dropped to 3-4 ft/hr.

Top Rotliegendes was picked at 17318ft. Vibrations were in line with the 8-1/2" drilling assembly further down in the hole as measured by MWD and MSE. The density caliper (on a later run) showed that on average a 9-1/2" - 9-7/8" hole was cut, with a minimum of approximately 9-1/8". This run was judged to be a success. Once it was ascertained that the contingency 7-5/8" liner was not needed, a conventional 8-1/2" bit was picked up and continued drilling. The bi-center bit was graded 1-3-WT-A-X-I-LN-CP and all the stabilizers were in gauge.

2.2.13 Drilling 8-1/2" Hole

After drilling the 9-7/8” hole, the first core in 8-1/2” hole was cut and it was assessed that a liner may not be required, so drilling in 8-1/2” hole continued. If the salt subsequently would give a lot of trouble and a liner is required, the hole would be opened with an Andergauge AnderReamer.

A Reed Hycalog DSX811M-A14 PDC bit was run in a super packed BHA #19 and drilled from 17380-17602ft in 80hr at a ROP=2.8 ft/hr. Towards the end of the run, ROP dropped to 0.8 ft/hr. Unstabilized collar lengths were limited to less than 21ft to protect the BHA. Gas unit continued to be low at 0.12-0.17% and CBU max gas = 0.07%. Formation was mainly siltstone and very fine sandstone. The bit was graded 2-2-WT-A-X-I-NO-PR but Reed Hycalog graded the bit 4-3-WT-C-X-I-LT-PR. The bit was rung out and the gauge cutters were half worn. The stabilizers were also worn. Again, the high WOB of 45K caused the BHA to buckle and the stabilizer to wear against the abrasive borehole wall. The gauge protection of the stabilizers was far inferior to that of the PDC bit.

It was then decided to run the Hughes Christensen Hedgehog diamond impregnated bit on an X-Treme motor, BHA #20, which drilled from 17602-17721ft (119ft) in 21.5hr, average ROP=5.5 ft/hr. The ROP dropped from 7ft/hr to below 1 ft/hr and it was decided to pull out of hole. Tight spots at 17365ft and 17315ft were encountered corresponding to the salt at 17283ft and had to be jarred free. The bit was graded 8-8-WT-A-X-I-NO-PR. The stabilizers on the motor were 3/16” and ¼” UG while the upper stabilizers were in gauge as the drilling was carried out with 15-25 Klbs WOB.

BHA #21 was ran in with a Smith KGR50BCTPX diamond impregnated bit on the X-Treme motor and drilled from 17721-17828ft (107ft) in 27.5hr and average ROP=3.9 ft/hr with 10-15 Klbs WOB. ROP averaged 6ft/hr at the start and dropped to zero. The bit was graded 8-8-WT-A-X-I-BT-PR. The stabilizers were 1/16” UG due to the low WOB.

BHA #22 was ran in with a Security Ti 3123 diamond impregnated bit on the X-Treme motor and drilled from 17828-17866ft (38ft) in 11.4hr and average ROP=3.3 ft/hr with 2-10 Klbs WOB. ROP averaged 3ft/hr at the start and dropped to zero. The bit was graded 4-8-RO-S-X-I-WT-PR and rung out. The motor had 1/8” wear and the stabilizers were in gauge again due to the low WOB. Figure 2.1 shows how the diamond impregnated bit performed in the 8-1/2” hole.

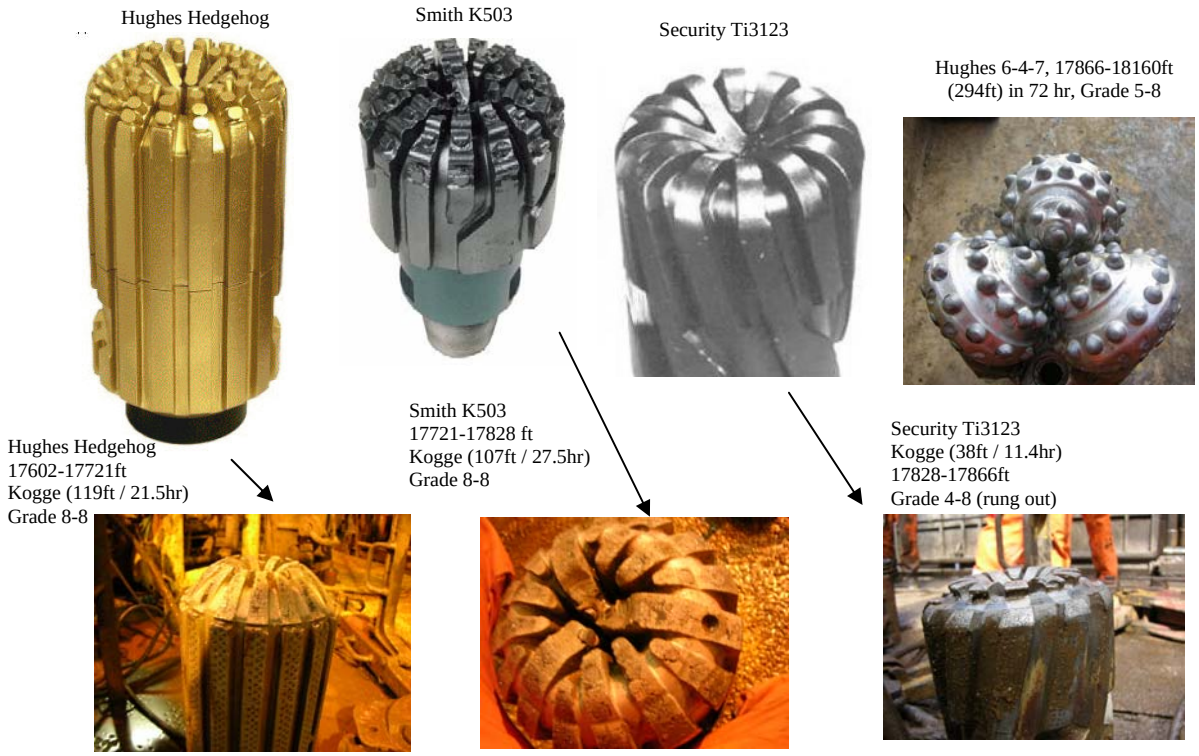


Figure 2.1 Kogge 8 ½" diamond impregnated bits and insert bits

It was concluded that the formation was not drillable with PDC bit or diamond impregnated bits and be better drilled with heavy set insert bits that could last 60-90hrs in hole at 3-4ft/hr. The lesser trips and cheaper bits make these bits more attractive.

BHA #23 was run with a Hughes Christensen MX-DX55DX3 (6-3-7) insert bit on a super packed BHA and drilled from 17866-18160ft (294ft) in 72.3hr at ROP=4.1ft/hr with 60 Kips WOB. At 18054ft, a 2 bbl salt water kick was taken while drilling with 13.7ppg ECD. The well was flow checked for 1hr and it gained another 2.5 bbl indicating that the formation was extremely tight. The kick was circulated out using the 1st Circulation of the Driller's Method. Max gas was very low at 0.3%. The well was circulated clean and drilling continued without weighing up with the 2nd circulation. The bit was graded 5-8-BT-G-1-I-CT-CP and there was no stabilizer wear. The outer gauge row of cutters was totally wiped out.

The mud weight was increased to 14ppg due the kick taken earlier and a 2nd core was cut with coring BHA #24 from 18160-18211ft. After coring and while pulling out it was noted that the well started to flow 0.8 bbl/hr. It was decided to increase the mud weight on the fly to 14.5ppg to counter the salt water flow. Gas unit was low at 0.15%.

BHA #25 with a Smith GF65YBOD (6-4-7) insert bit on a super packed BHA and drilled from 18211-18554ft (343ft) in 84.8hr at an average ROP=4ft/hr and 60 kips WOB. When the bit was on bottom, bottoms up gas increased to 0.95%. The mud weight was increased to 15.0ppg as we continued to see salt water flow. After the change of the UIBOP and

LIBOP, bottoms up gas of 2.5% was seen and in consultation with operations geologist the mud weight was increased to 15.5 ppg. The bit was graded 4-8-BT-G-2-I-CT-HR. We continued using insert bits to TD.

BHA #26 used a Smith GF65YBOD (6-4-7) insert bit from 18554-18818ft. BHA #27 used a Hughes Christensen MX-DX55DX3 (6-3-7) insert bit from 18818-19096ft. BHA #28 with a Smith GF30OD (5-3-7) insert bit was used to drilled from 19096-19295ft (Total Depth). From 19046ft drilling was predominantly shale.

On a number of the trips out of the hole to change BHA or to do BOP tests, the salt crept in and reaming was required to pull out through the salt and when going back in hole. The salt creep was slow and by carefully working through each time, we managed to drill to TD without running the 7-5/8” liner.

2.2.14 Coring in 8-1/2" Hole

When fine silty sandstone was encountered at 17371ft, it was decided to cut the 1st core. Security DBS ran a 90ft core conventional barrel with fluted aluminum inner tube and a FCi204RILI PDC Core Head (BHA #18). A 90ft core barrel was chosen for the HPHT well so as to be able to pull the whole core barrel above the drillfloor and shut in the blind/shear ram in the event of a well control incident.

The lock nut that keeps the inner barrel from rotating while coring was inadvertently left out of the tool during the workshop assembly and 13hrs NPT was incurred waiting on the nut on the next chopper. Coring commenced at 17371-17380ft and the core jammed. The core barrel was recovered by pumping out of hole. At 17269ft, at the point where there was 16.5ft of clean salt, overpull of 20kips was seen. This was due to the salt squeezing in slowly. At 3280ft below the surface, the core barrel was pulled out of hole in accordance with the HPHT manual by the yo-yo method. The corehead was graded 0-2-WT-S-X-I-LT-CBJ.

A total of 7.3ft of core was recovered corresponding to 88% recovery. The core was mainly very hard grey sandstone and siltstone.

Drilling continued in 8-1/2” hole and the 2nd core was cut from 18160-18211ft using a 90ft conventional core barrel and fluted aluminum inner tube and a CBT 303 Diamond Core Head (BHA #24). The core was jammed after cutting 51ft and 106% recovery was achieved (core expanded). The corehead was graded 2-4-WT-1-I-PN-CBJ. The core was mainly conglomerate with granule, pebble to cobble size clasts of quartz, metamorphic rocks, shale in sandstone matrix interbedded with sandstones layers. The conglomerate made drilling with PDC or diamond impregnated bits very difficult and with very low ROP of 3-4 ft/hr.

2.2.15 Wireline Logging in 8-1/2" Hole

Wireline logging was conducted in the 8 ½” hole by Baker Atlas, see Chapter 4 and Table 4.5 for details regarding wireline logging.

The wireline logging program was planned and conducted to minimize the risk of sticking through the salt section, 5262-67mMD. The centralized tool string, XMAC-Earth Imager was run first. Fortunately, the salt section did not cause problems during the wireline program, but salt water kept coming in when logging.

MREX/HDIL was run and failed after 175m of logging. A second MREX/HDIL was run and completed the logging interval.

A cleanout trip was made prior to the RCI runs. There was no sign of salt creep so it was decided to run the RCI with Single Probe on wireline. The Single Probe was run first because it was considered to be the fastest way of getting pressures and the least chance of getting stuck, compared to the RCI Straddle Packer.

RCI Single Probe for pressures and samples were run in hole three times. First run attempted 10 pressures and 5 repeats, second run lost communication with tool before it came to the open hole and the third run attempted 35 pressures and 21 repeats. The formation was too tight and it was decided to pull out and run Straddle Packer.

Checkshots were run and failed after 8 checkshots.

A 7.8bbl salt water gain was recorded during the last 24 hrs when running the checkshots. Saltwater kept coming in during all the wireline logging.

The RCI Straddle Packer tool was run in hole. The well continued to flow salt water in spite of the 15.5ppg mud in the hole. The first RCI Straddle Packer tool recorded 15.62ppg formation pressure which was still rising. The Packer failed after 4 hours, before the pressure had stabilized.

The tool was pulled and a wiper trip made to circulate and condition the hole. Salt water flow continued at a manageable rate. The mud was contaminated as evidenced by the drop in oil water ratio and mud activity.

The 2nd RCI Straddle Packer tool was run in and inflated. Pressure built up steadily indicating formation pressure to be higher than hydrostatic. Then after 3.5 hours communication with the tool was lost and the packer was deflated. An electrical short from the wire to the armor was subsequently found.

While pulling out of hole at about 4,000ft, the operator noticed the pulling speed slowed from 200ft/min to 185ft/min and increased the torque limit which caused the speed to increase to 300 ft/min. In an effort to throttle down by the operator, the tool was pulled out of its weak point and fell 15,000ft to the bottom of the well.

An attempt was made to fish out the Straddle Packer tool. The top of the fish was tagged 4.5 feet low. Multiple attempts to latch onto the fish were made, but all were unsuccessful. Pieces of straddle packer rubber were observed coming across the shale shakers (12" x 6" and 12" x 4"). It appeared that rubber was on top of the fish or partially jammed up inside of the overshot/grapple which prevented engaging the fish.

2.3 Plug back & Final Abandonment

The plug back and abandonment of the well commenced on 8 July 2006 at 09:30hr in several stages: the plug back of the open hole with cement plug, the cutting and recovery of the 9-7/8”, 13-5/8", 20” and 36” casings, casing hangers, seal assemblies and recovery of the 18-5/8” low pressure and 13-5/8” high pressure wellhead.

2.3.1 Open Hole Cement Plug

A Straddle Packer logging tool was lost in the hole at the end of the formation evaluation program and the top of fish was 19,175.5 ft. A 52.6 bbl 16ppg “G” + 35% silica flour cement plug #1 was placed from 18,220-17,470ft. This plug was not tagged and tested. The 9-7/8” casing shoe plug #2, 62.5 bbl 16ppg “G” + 35% silica flour was placed from 17,255-16,560ft, 530ft inside the casing shoe. The plug was tagged at 16,287ft with 10 tons and pressure tested to 3,590psi with 15.5ppg NAF. The 15.5ppg NAF in the hole was displaced to 11.5ppg NAF such that it is the same weight as the mud in the annulus for the next stage of the P&A.

2.3.2 9-7/8” Casing

Attempts to pull the seal assembly failed as the starting threads on the casing hanger was damaged when the pulling tool was ran to turn the split ring on top of the seal assembly. The crew managed to make 4 turns out of the 5 turns required and the lock ring moved up 1.5” versus the 2” required. A Weatherford mechanical cutter was ran and cut the 9-7/8” casing at 8,520ft in 3 minutes. Positive indication of the cut was felt; the casing jumped and the gap was checked with the knives to be 5ft. A spear had to be used to pull the casing and seal assembly together instead of using the pulling tool had the seal assembly been pulled out separately.

2.3.3 13-3/8" Casing

Cement plug #3, 110.4 bbl 16ppg “G” + 35% silica flour was placed from 8,570-7,870ft above a cement support tool (CST) at 8,585ft. While WOC, 5” drill pipe was laid down. No hard cement was tagged when pipe was run in to expected TOC and to the base of the plug.

A 2nd cement plug #3, 116 bbl 16ppg “G” + 35% silica flour was set from 8,575-7,825ft with the same recipe while the problem with the 1st plug was being investigated. Again, no hard cement was tagged after WOC. Immediate investigation carried out after the first attempt to set the shoe plug revealed that the retarder volume had to be reduced from 0.12 to 0.05gal/sx. It appears that the original sample used for the slurry design had 25% silica flour and required more retarder. The actual cement in the silo had 35% silica flour. The higher amount of retarder, 0.12gal/sx resulted in the cement plug not setting at the design WOC time.

A 3rd cement plug #3 was set in two parts; plug #3a, 74 bbl 16ppg “G” + 35% silica flour from 8,570-8,190ft and plug #3b, 73.6 bbl 16ppg “G” + 35% silica flour from 8,190-7,695ft. After WOC, the plug was tagged at 7,818ft with 10 tons and tested to 2,780psi with 11.5 ppg NAF. A total of 62 hrs NPT was lost as a result of the cement plug failures.

The 11.5ppg NAF was displaced to seawater and a bridge plug was set at 2,255ft. The hole above the bridge plug was swapped to 10.5ppg WBM as the annulus was filled with 10.5ppg water based mud. The 4-Ram BOP was nippled down, the 13-5/8” high pressure wellhead, neck seal and seal assembly lock ring were removed and the 3-Ram BOP was nippled up.

Attempted to back out the seal assembly was not successful and Weatherford’s mechanical cutter was run and cut the 13-5/8” casing at 2,194ft. A gap of 1 ft was verified with the knives after the cut.

2.3.4 20” Casing, Surface Cement Plug and BOP Recovery

Cement plug #4, 208bbl 16ppg “G” + 35% silica flour was placed from 2,255-1,634ft. The plug was tagged at 1,594ft with 10 tons and tested to 1,300psi with 10.5ppg WBM. The well was displaced to seawater. The Surface Plug #5a, 215bbl 15.5ppg “HMR” cement was set from 1,594-964ft and upper Surface Plug #5b, 165bbl 16ppg “G” + 35% silica flour was placed from 964-480ft. The Surface Plug #5b was tagged at 492ft with 10 tons.

Due to the limited success with Dril-Quip’s seal assembly pulling tool, it was decided not to run Dril-Quip’s Clutch Tool to break the connection above the 20” MLS Running Tool below the mudline. Weatherford’s mechanical cutter was run and cut the 20” casing at 418ft. The 3-Ram BOP and diverter was nippled down and the 18-5/8” wellhead and 20” casing was pulled without any problem.

2.3.5 Cutting and Pulling 36" Structural Casing

The Weatherford’s mechanical cutter was run and cut the 36” casing at 416ft. However, there were no indications of cut so the casing was cut a 2nd time at 413ft. The tensioner load was increased and the cylinder traveled up about 30”. The casing was pulled free with 230kips overpull. The connectors were made up to 36,000ft-lbs and torque up to

120,000ft-lbs was applied to breakout. However, attempts to break the top D-90MT connection were unsuccessful despite applying heat and a decision was made to cut the casing just above the connector. The cut took 15 minutes so it was decided to cut the remaining 8 joints.

2.4 Rig Release

During preparation to demobilize the rig, the single Ram BOP was offloaded onto a boat in the following sequence:

i. Bring the single ram BOP transport plate and set down on the Texas Deck. Using the 2 BOP cranes on the middle padeyes, lower the single ram BOP to the Texas Deck and over the transport plate.

ii. Connect the transport plate to the single ram BOP using wire slings or chains. Rig up lifting arrangement from the traveling block using the 4 padeyes in the 4 corners of the transport frame.

iii. Lift the single ram BOP as high as possible to be able to skid in the cantilever. Leave the BOP hanging in double lifts.

iv. Skid in the cantilever and remove the Texas Deck center infill panels.

v. Remove the BOP cranes from the BOP. Skid out the cantilever far enough to be able to lower the single ram BOP safely to the boat. Lower the BOP to the boat using the blocks.

vi. Skid the port and starboard Texas Deck sections to stowage position, raise and secure.

vii. Skid cantilever in to towing position.

The cantilever was skidded in and the rig jacked down. The Normand Neptune and the Tor Viking AHSTs were used to tow the rig to the 500m point (demobilization point for rig handover). The rig demobilization took 4.5 days.

The rig was released to Maersk Contractors and ConocoPhillips at 14:00 hrs on 1 August 2006. The seabed survey was conducted on 7 September 2006 using the Stril Power with a ROV.

3 STRATIGRAPHY

3.1 Lithostratigraphy

Well stratigraphic prognosis and results are shown in Table 3.1 and Figure 3.1.

Stratigraphic Top	Lithology (Actual)	Actual TWT* (msec)	Prognosed Depth (mTVDSS)	Prognosed Depth (mMDRT)	Actual Depth (mMDRT)	Actual Depth (mTVDSS)
Seabed	Sandstone/Clayst.	104	77±1	121	121	77.1
Base Pleistocene	Claystone	315	294±25	338	316	272.1
Base Pliocene	Claystone	341	294±25	338	340	296.1
Top Lower Miocene	Claystone	499	432±15	476	485	441.1
Top Eocene	Claystone	780			791	747.1
Top Balder	Tuff/Claystone	1072	1027±20	1071	1076.5	1032.6
Base Balder	Claystone	1097	1050±30	1094	1098	1054.1
Top Chalk	Chalk	1233	1208±30	1252	1261	1217.1
Top Cretaceous	Chalk	1300	1245±30	1289	1396.5	1352.6
Base Chalk	Claystone	1603	1945±40	1989	2006	1962.1
Base Cretaceous	Claystone	1865	2320±50	2364	2387	2343
Top Tau or Hot Shale	Claystone	2011	2535±60	2579	2602.5	2558.5
Top Egersund/ Heather	Claystone w/ silt and limestones	2036	2595±60	2639	2654	2610
Top M. Jurassic sandstones Sandnes Formation	Sandstone w/ coals at base	2061	2655±60	2699	2703	2659
Bryne Formation	Sandstone	2099			2782.5	2738.5
Top Triassic Skagerrak sandstones	Sandstone and shale	2124	2805±60	2849	2835.5	2791.5
Top Smith Bank shales	Shale	2999	4440±500	4484	4638	4589
Top Zechstein evaporites	Halite and shale	3239	4930±350	4974	5224	5173.4
Base Zechstein/ Top Rotliegendes sandstones	Sandstone/ conglomerates/ shales	3261	5090±250	5134	5278.5	5227.9
Base Rotliegendes (Saalian Unc)	Volcanic tuff	3474	5470±300	5514	5838	5787
Total Depth	Volcanic tuff	3490	5520±300	5564	5882	5831.1

Table 3.1 Stratigraphic prognosis and actual for Kogge well 9/4-5

* Limited checkshot information, see Chapter 6.2 Checkshot Survey. Actual TWT for tops down to B. Cret. are therefore based on seismic ties from 9/4-3 and 9/4-4, while TWT for the deepest tops are based on a combination of tie and checkshot information.

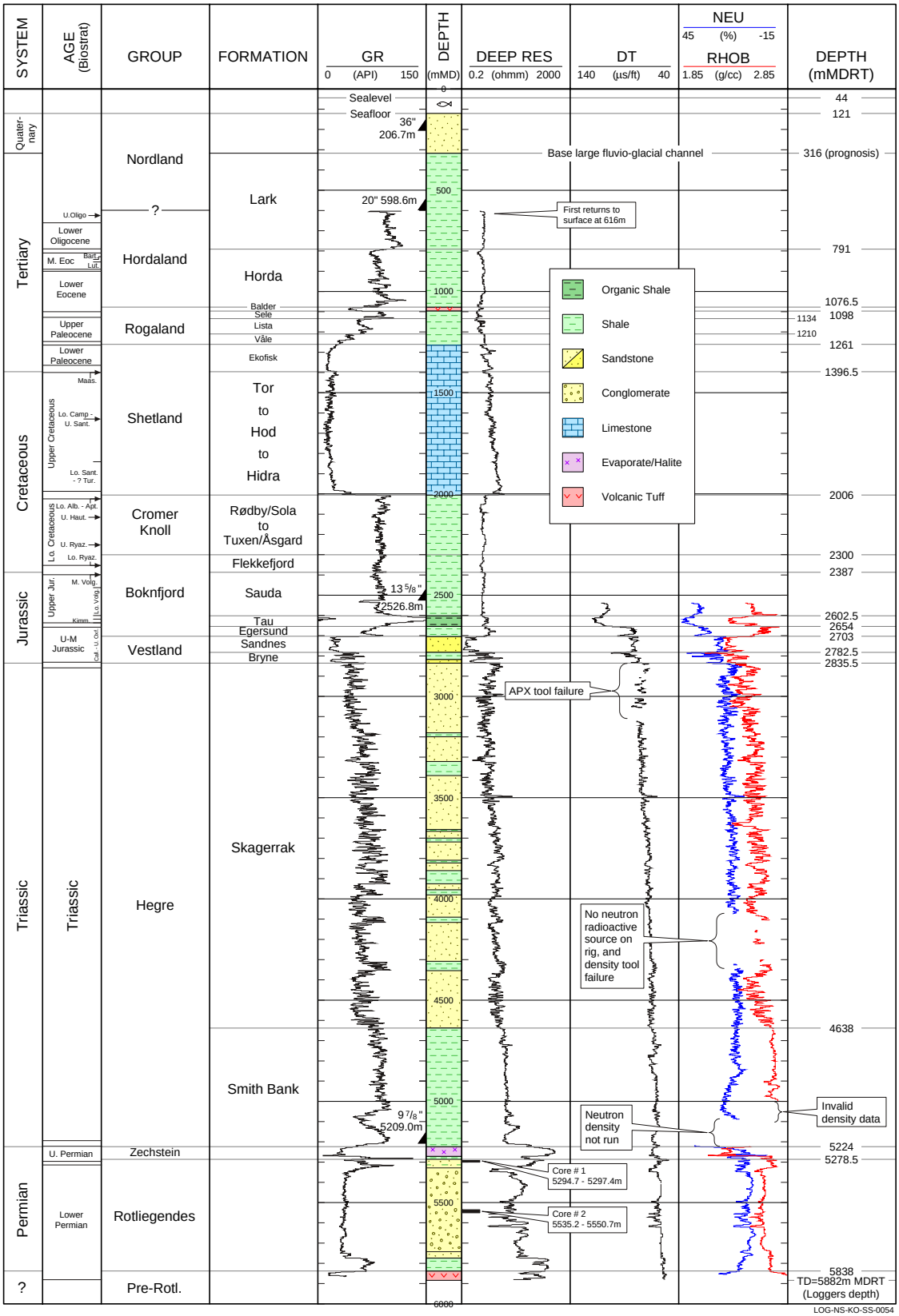


Figure 3.1. Stratigraphic summary for Kogge Well 9/4-5

3.2 Chronostratigraphy

The biostratigraphic work was done by Fugro Robertson Limited, UK. Semi-quantitative micropaleontology was done on 71 ditch cuttings and quantitative palynology was done on 88 ditch cuttings and two core pieces.

The last samples of the deepest intervals were sent to Robertson on July 11, and infill samples were sent on August 31, 2006. Final report was received December 2006.

STRATIGRAPHIC SUCCESSION

Age		**Interpreted Top (mMDRT)**	
Upper Oligocene	Chattian	625	
Lower Oligocene	Rupelian	661-790	
Middle Eocene	Bartonian	810-828	
	Lutetian	854-880	
Lower Eocene	Ypresian	900-1100	
Upper Paleocene	Selandian	1128-1247	
Lower Paleocene	Danian	1265-1365	
Upper Cretaceous	upper Maastrichtian	1402	1396.5(log)
	lower Campanian - upper Santonian	1630	
	lower Santonian - ?Turonian	1841-1987	
Lower Cretaceous	lower Albian - Aptian	2024	2006(log)
	upper Hauterivian	2115	
	upper Ryazanian	2252	
	lower Ryazanian	2353	
Upper Jurassic	middle Volgian	2399	
	lower Volgian	2463-2600	
	Kimmeridgian	2618-2636	
Upper - Middle Jurassic	upper Oxfordian - Callovian	2658-2831	
----------Stratigraphic break----------			2835.5(log)
Triassic		2859-5190	
Upper Permian		5222-5296.73(core)	5224(log)
Lower Permian		5312-5881TD	5278(log)

Table 3.2 Kogge 9/4-5 chronostratigrahpy

3.3 Lithological Descriptions

The following sections contain a lithostratigraphical summary for the well. Detailed descriptions of cuttings samples are included in Appendix I.

NORDLAND GROUP (121 – 607 mMDRT)

Reference is made to site survey report (OIMS Shallow Drilling Hazards Evaluation Kogge Prospect NOCS 9/4-5). No returns to surface were collected for this section of the well. The 20" casing was set at 598.6mMDRT below which samples were collected. The base of the Nordland group is probably in reality shallower than the depth reported.

HORDALAND GROUP (607 – 1076.5 mMDRT)

Sample collecting started at 607m. The lithology consisted of claystone with a few stringers of sandstones. Traces of limestone and chert were also encountered in this formation.
Claystone: The claystone was olive black, olive grey, greyish black, greenish black, dark greenish grey, and brownish grey. It was predominantly soft, occasionally moderately hard. It was sub-blocky to blocky in shape, in parts sticky and silty. It varied from non-calcareous to very calcareous at the bottom of this formation. It contained minor traces of pyrite and glauconite. Traces of mica and sand were also present.
Limestone: The limestone was brownish grey, hard, brittle and blocky to angular. In part it was slightly to moderately argillaceous.
Sand: The sand grains was clear to translucent, very fine to coarse, predominantly fine to medium. The quartz grains were sub-angular to rounded and moderately sorted.

ROGALAND GROUP (1076.5 – 1261 mMDRT)

<u>BALDER FORMATION (1076.5 – 1098 mMDRT)</u>
The lithology consisted of claystone.
Claystone: The claystone was multicoloured; brownish grey, dark greenish grey, greenish black and olive black. It was soft, sub-blocky to sub-rounded, slightly silty and non-calcareous. Glauconite inclusion was encountered in the claystone.

<u>UNDIFF. SELE/LISTA/VÅLE FORMATIONS (1098 – 1261 mMDRT)</u>
This interval consisted of claystone.
Claystone: The claystone was dark grey to dark greenish black at the top and olive grey to medium grey, occasionally olive black towards the base. It was soft and grading between amorphous to sub-rounded in shape. Glauconite grains were encountered in the claystone. Towards the base, the claystone was increasingly calcareous, grading to marl.

SHETLAND GROUP (1261 – 2006 mMDRT)

The lithology consisted of limestone and marl with traces of chert and claystone.
Limestone: The limestone was white to very light grey, soft to hard, predominantly soft to firm. It was brittle and blocky to angular in shape. The limestone was occasionally striated with claystone and carbonaceous material. Micro pyrite was also encountered. At the bottom of this formation, the limestone becomes darker, and due to high content of glauconite, the limestone also becomes greenish grey.
Marl: At bottom of this formation an influx of marl was encountered. The marl was moderate brown to light brown, soft to firm. It was blocky to sub-blocky in shape.
Chert: The chert was light grey, translucent to opaque and very hard. The chert had a conchoidal fracture and was brittle.

CROMER KNOLL GROUP (2006 – 2387 mMDRT)

This formation consisted of claystone and traces of dolomite.
Claystone: The claystone was greenish black, olive grey to medium dark grey and soft to firm. It was blocky to sub blocky and slightly silty.
Dolomite: The dolomite was predominantly dark yellowish brown and moderately hard. It was blocky and slightly argillaceous.

BOKNFJORD GROUP (2387 – 2703 mMDRT)

<u>UNDIFF. SAUDA-FLEKKEFJORD FORMATIONS (2387 – 2602.5 mMDRT)</u>
This interval consisted of claystone with traces of dolomite.
Claystone: The claystone was dark grey to greenish grey and olive black to greenish black. It was soft to firm, occasionally moderate hard, sub-blocky to blocky and calcareous. In parts there were micro pyrite and glauconite.
Dolomite: The dolomite was dark yellowish brown, moderate hard, blocky and microcrystalline.

<u>TAU FORMATION (2602.5 – 2654 mMDRT)</u>
The lithology consisted of black to olive black claystone, which was moderate hard, blocky, slightly silty and calcareous in part.

<u>EGERSUND FORMATION (2654 – 2703 mMDRT)</u>
This formation consisted of claystone and siltstone.
Claystone: The claystone was olive black to brownish black and greyish black. It was moderate hard to hard in part, blocky and slightly calcareous. The claystone was very silty, grading into argillaceous siltstone. It contained micro pyrite.
Siltstone: The siltstone was olive grey to olive black, moderate hard and it had a blocky to crumbly break. It was slightly calcareous.

VESTLAND GROUP (2703 – 2835.5 mMDRT)

BRYNE AND SANDNES FORMATIONS (2703 – 2835.5 mMDRT)

The lithology consisted of sandstone with traces of coal, siltstone and claystone.

Sandstone: The sandstone was recovered as loose quartz grains, which were clear and transparent, and sub-rounded and sub-spherical. At first the sand was very fine to medium and occasionally coarse, and poorly sorted. Then the sand was predominantly very fine to fine and moderate to well sorted. There were traces of weak dolomitic cement, moderate argillaceous cement and weak ferruginous cement.

Coal: The coal was black, hard, brittle and angular with a blocky break. It contained pyrite.

Siltstone: The siltstone was olive black, dark greenish grey to greenish grey, and firm to hard. It was blocky, argillaceous, calcareous and it graded into very fine sandstone.

Claystone: The claystone was greyish black, firm and micropyritic, with a blocky break.

HEGRE GROUP (2835.5 – 5224 mMDRT)

SKAGERRAK FORMATION (2835.5 - 4638 mMDRT)

The lithology consisted of sandstone, siltstone, claystone and traces or thin layers of limestone. It was difficult to separate the different lithologies as the sandstone and claystone were silty and the siltstone was sandy.

Sandstone: The sandstone was multi-coloured, with various grades of brown and grey. The main colours were dark greenish grey, dusky brown, pale yellowish brown, greyish brown and moderate brown. The hardness was soft to firm and the texture was sub-blocky to crumbly. The sandstone was silty, grading to siltstone, argillaceous and slightly, to moderately calcareous and/or dolomitic. The quartz grains were clear to translucent and very fine to fine in size. The grain shape was sub-rounded and rounded in the top section, grading to sub-angular and sub-rounded towards the base. The grains were predominantly sub-spherical and spherical.

Siltstone: The siltstone was multicoloured, predominantly greyish brown, dusky or moderate brown and very dusky red. It was firm, sub-blocky and blocky towards the base. It was sandy, sometimes grading to sandstone and slightly, to moderately calcareous and/or dolomitic. The siltstone was argillaceous.

Claystone: The claystone was grading in colour from olive grey to very dusky red. The predominant colours was greyish brown, dusky brown and moderate brown. The hardness was firm to moderate hard; the texture was sub blocky and blocky. The claystone was silty, grading to siltstone and slightly, to moderately calcareous and/or dolomitic.

Limestone: The limestone was light olive grey, pale yellowish brown and moderate brown. The hardness was soft, firm and moderately hard, sub-blocky to blocky and crumbled. The crystal texture was microcrystalline and cryptocrystalline. The limestone was glauconitic in part.

SMITH BANK FORMATION (4638 - 5224 mMDRT)

The lithology consisted of claystone, siltstone, limestone stringers and thin layers of sandstone. It was difficult to separate between claystone and siltstone.

Claystone: The claystone was predominantly moderate to greyish brown in colour. It was firm to moderately hard, occasionally very hard. The texture was blocky to sub-blocky. The claystone was silty/sandy and slightly calcareous/dolomitic. The amount of calcite/ dolomite increased towards the base of the formation.

Siltstone: The predominant colour of the siltstone was moderate brown to grayish brown. It was firm and blocky. The siltstone was sandy, argillaceous and slightly calcareous/ dolomitic. Mica was seen at times. Occasionally quartz grains were seen. The grains were transparent to translucent, the size was very fine to fine and the shape was sub-rounded and sub-spherical. It was well sorted.

Limestone: The colour of the limestone was pale yellowish brown and yellowish grey. It was soft, blocky and dolomitic. The limestone was in parts very argillaceous, grading into marl.

Sandstone: The sandstone was brownish grey to moderate dark grey, greyish brown and dusky to yellowish brown. The hardness was moderate, sometimes very hard. The texture was blocky and brittle. The quartz grains were clear, brownish, translucent and opaque in colour and very fine to fine in size. The shape was sub-rounded to rounded and sub-spherical to spherical. It had occasionally calcareous cement. The grains were moderate to well sorted.

ZECHSTEIN GROUP (5224 – 5278.5 mMDRT)

ZECHSTEIN EVAPORITES (5224 - 5268 mMDRT)

The lithology consisted of halite, claystone and traces of anhydrite.

Halite: The colour of the halite was pale yellowish brown, clear to translucent and occasionally reddish brown towards the base of formation. It was hard, brittle and crystalline.

Claystone: The claystone was predominantly dark grey to brownish grey in colour. It was soft. The texture was blocky to sub-blocky. The claystone was silty and slightly calcareous/dolomitic.

Anhydrite: The anhydrite was dark grey to pale grey and mottled. It was firm, blocky and very argillaceous. The anhydrite were grading into anhydritic claystone.

ZECHSTEIN NON-EVAPORITES (5268 – 5278.5 mMDRT)

The lithology consisted of claystone and limestone stringers and thin layers of sandstone.

Claystone: The claystone was predominantly dark grey, olive black and black in colours. It was firm to moderately hard. The texture was blocky. The claystone was silty in parts and moderately calcareous/dolomitic. The claystone were very carbonaceous and increased towards the base of the formation. Traces of micropyrite were seen.

Limestone: The colour of the limestone was light grey to white. It was soft to moderately hard, blocky and argillaceous. The limestone was in parts carbonaceous.

ROTLIEGENDES GROUP (5278.5 - 5838 mMDRT)

The lithology consisted mainly of sandstone with horizons of siltstone, marl and limestone. Towards the base of the section claystone became more abundant. Tuffaceous horizons occurred, mainly towards the end of the section.

Sandstone: The sandstone was brownish grey to moderate dark grey, greyish brown and dusky to yellowish brown. The hardness was moderate, sometimes very hard. The texture was blocky and brittle. The quartz grains were clear, brownish, translucent and opaque in colour and very fine to fine in size. The shape was sub-rounded to rounded and sub-spherical to spherical. It had occasionally calcareous cement. The grains were moderate to well sorted. Towards the end of the section the sandstone turned moderate brown and greyish brown, the sandstone was soft to firm, sub-blocky, with a crumbly break. The grain size was primarily very fine to fine, but coarse, and very coarse sand grains and rock fragments were very common in the samples. The grains were mainly transparent and colourless quartz, that were occasionally reddish probably from being coated with iron minerals. The fine grains were sub-rounded and rounded with the angularity increasing with particle size such that the coarse grains were angular to splintery in shape, probably reflecting that parts of the section is conglomeratic (the core cut at 5535.2-5550.7m contained dominantly conglomerates with thin sandstone interbeds). The sorting was generally moderate to fair. The cement was a moderate strength siliceous and calcareous. In some horizons dolomite dominated over calcite. In places there were an argillaceous matrix and a considerate amount of silt.

Siltstone: The predominant colour of the siltstone was moderate brown to grayish brown. It was firm and blocky. The siltstone was sandy, argillaceous and slightly calcareous and/or dolomitic. Mica was seen at times. The grains were transparent to translucent, the size was very fine to fine and the shape was sub-rounded and sub-spherical. The siltstone was well sorted.

Claystone: Towards the base of the section claystone became more abundant. The claystone was dark reddish brown and moderate brown always with considerable amounts of silt and sand. The claystone was slightly calcareous to non-calcareous.

Marl and Limestone: The colour of the limestone was pale yellowish brown and yellowish grey. It was soft, blocky and often dolomitic. The limestone was in parts very argillaceous, grading into marl. In most places the sandstone was grading into a sandy, silty, argillaceous marl, which again was seen to grade into a sandy, silty, argillaceous limestone.

Tuff: Tuffaceous horizons were present especially in the lower part of the section. The tuff was dark grey with an ashy texture. The tuff was mottled with dark and white angular spots. It was also firm, crumpled and sub-blocky.

PRE-ROTLIEGENDES SECTION (5838 - 5882 mMDRT)

The lithology consisted dominantly of tuff with some layers of claystone and siltsone.
Tuff: The tuff was varicoloured with colours like greenish and bluish grey, dark greenish grey, olive grey and olive black with an ashy like texture. The tuff was mottled with dark and white angular spots. It was firm and crumpled, sub-blocky and argillaceous.
Claystone: The claystone was varicoloured with colours like reddish brown, moderate brown, brownish grey and dark yellowish grey always with considerable amounts of silt and sand and graded to siltstone. It was firm to moderately hard, blocky, calcareous to very calcareous and very tuffaceous.
Siltstone: The siltstone was varicoloured with colours like dusky yellowish brown, dark greenish grey, dark reddish grey and pinkish. It was firm and sub-blocky. The siltstone was very argillaceous and graded to claystone. It was very calcareous and very tuffaceous.

4 FORMATION EVALUATION

4.1 Geological Sampling

Cuttings Samples

Cuttings and mud samples for the Kogge well were collected according to plan from the drilling program. Cuttings were sent to Reslab and treated and distributed from there. An overview of the samples is shown in Table 4.1.

Interval	**Approx. Depth (mMDRT)**	**Sampling Interval (m)**
Cuttings, dry, wet and 5 liter bucket Upper reservoir section	606-5881	9 3
Geochemical canned cuttings	606-5215 5215-5881 Selected intervals	30 9 3
Mud samples At 9 different depths, 2 samples per depth level	2534-5881	

Table 4.1 Cuttings and mud sampling for Kogge well 9/4-5

For each cuttings sample collected at the well site, the following sets were made:

- One dry set (50g) to ExxonMobil
- One wet set (0.5 kg) to ExxonMobil
- One 5 liter bucket with wet samples (4.0 kg)

The 5 liter buckets was split at Reslab as follows:

- NPD (1 kg)
- Sampling set for Statoil (0.5 kg)

Eleven sets of washed and dried samples will be prepared as follows:

- NPD (50 g)
- Esso (50 g)
- RWE (50g)
- Statoil (100 g)
- 7 trade sets (50g)

Canned Geochemical samples
One one liter canned geochemical sample was collected every 30m from the first sample returns down to top Zechstein. From top Zechstein to TD every 9m interval was sampled, and in some cases every 3m.

Mud samples
Two one liter cans were collected at TD of each hole section and at the top and base of each cored section.

4.2 Cores and Core Description

Two conventional cores were cut in the Rotliegendes section in the Kogge well (Table 4.2). Unfortunately both cores jammed before the core barrels were full. Detailed core descriptions and core photos are found in Appendix II. No sidewall coring was performed in this well.

Core #	Interval (mMDRT)	Recovery (m)	Recovery (%)	Comment
1	5294.7-5297.4	2.15	80	Core barrel jammed
2	5535.2-5550.7	16.4	106	Core barrel jammed

Table 4.2. Well 9/4-5 conventional coring

Core No 1 (5294.7-5296.85m)
This 2.15m core (Figure 4.1) consists of grey sandstones and grey to dark grey silty mudstones. In general the unit coarsens upward from mudstone to fine to medium sandstone, but each building block (ie. bed) fines upward. The coarsening up is consistent with both the wireline gamma ray log and the core gamma log (Figure 4.2).

The more muddy lower part (5296.15 - 96.85m) contains sandstone beds up to 10cm thick which are fining up, have massive to planar parallel bedding in the lower part and partly current rippled tops. The mudstones which are slightly bioturbated are silty and contain thin siltstone/sandstone beds (mm to cm thick) displaying starved ripples. Some of the beds also contain numerous delicate clay clasts/plant fragments. Burrows identified are *Planolites* and possible *Palaeophycus*.

The sandier upper part of the core (5294.7 - 5296.15m) contains significantly thicker beds than the unit below. The beds fine upward and are massive to planar parallel bedded and contain plant fragments and occasionally slumped bases.

The fining upward beds which are arranged in an overall coarsening upward sequence for core no 1, were likely deposited in a prodelta to delta front setting. Whether the deposits of core no 1 represent marine deltaic deposition or a delta building into a bay or a lake is uncertain. The low abundance and low-diversity trace assemblage from core 1 is typical of marine deltas, but could also occur in freshwater to brackish deltas. The trace at depth 5296.8m is probably, but not definitely, *Palaeophycus* and this trace indicates marine to

brackish conditions. The *Planolites* burrows are non-diagnostic in terms of distinguishing between these environments.

Biostratigraphic analysis of two core chips taken in the dark mudstones found a single algae at 5296.4m suggestive of freshwater to brackish conditions. The algae in question, although widely considered to prefer a freshwater/brackish environment, can also be found in marine assemblages and it is uncertain whether such occurrences are transported in or if the salt tolerance of the alga is greater than generally assumed.

The grey to dark grey sediments (in contrast to the reddish sediments below in core no 2), and the content of organic material suggests a climatic change at the very late Rotliegendes time possibly in conjunction with the Zechstein transgression.

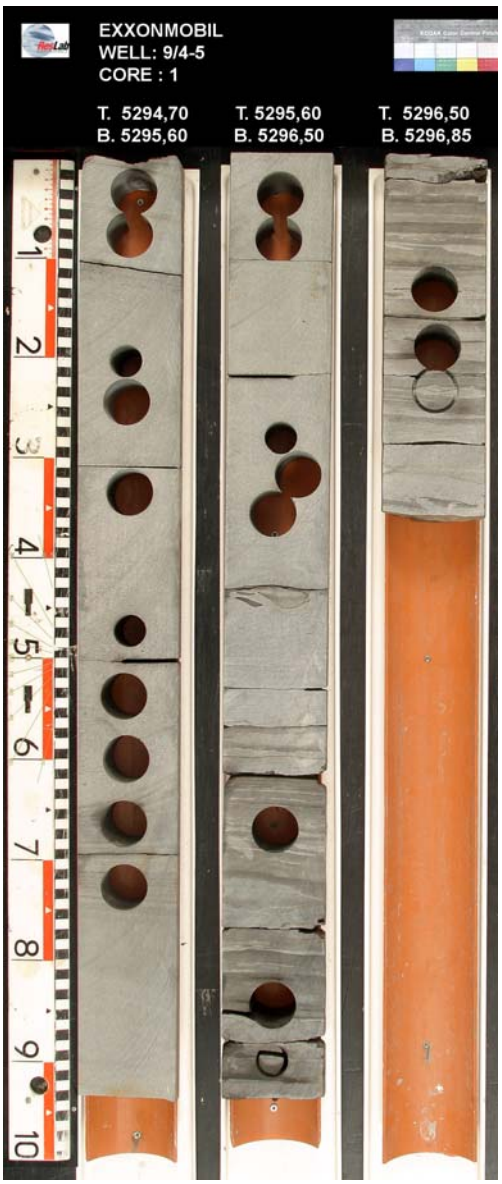


Figure 4.1 Core no 1, coarsening-up grey sandstones

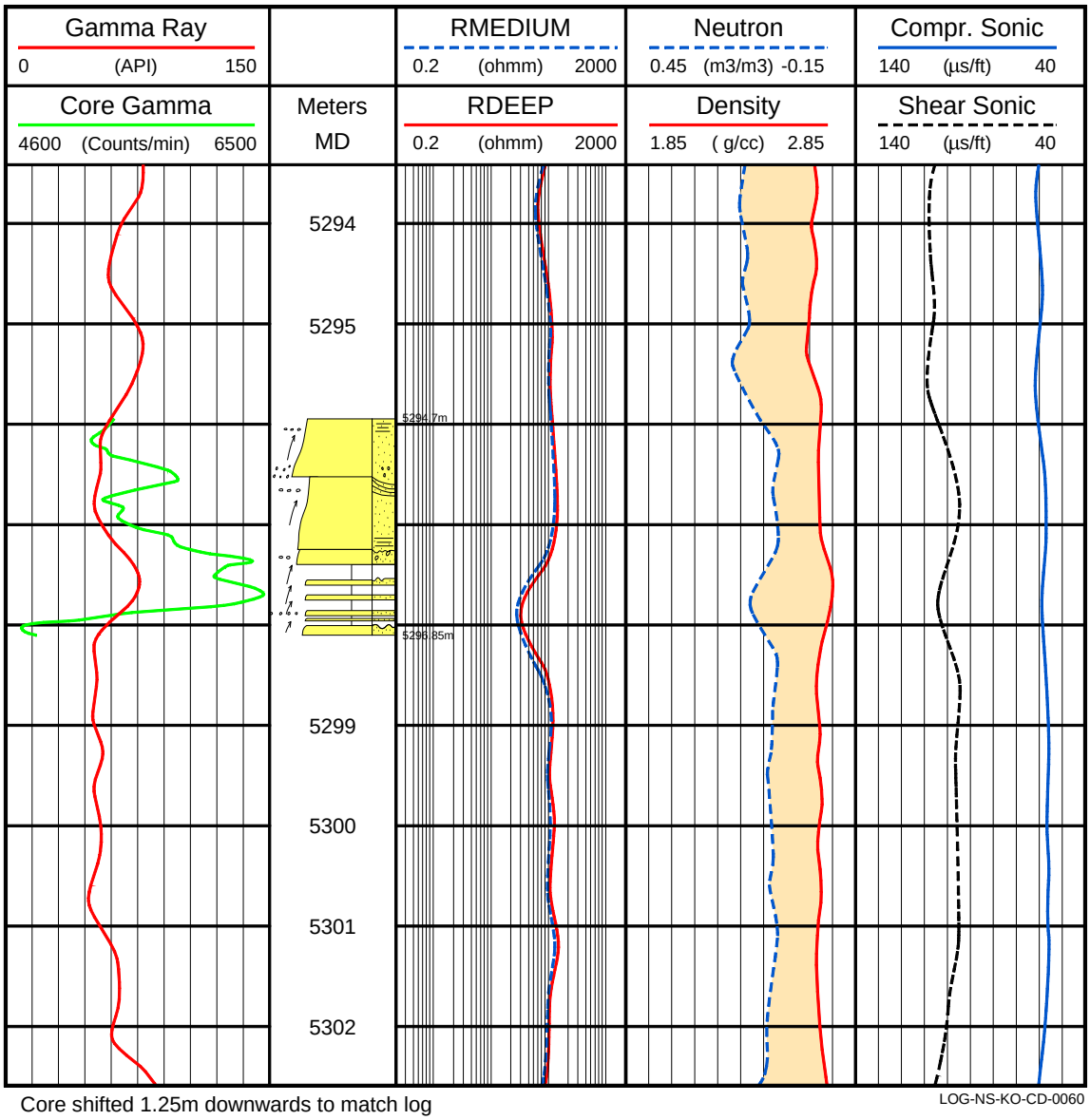


Figure 4.2 Description for core no 1 correlated to log response

Core No 2 (5535.2 – 5551.6m)

This 16.4m core consists of 13m conglomerates interbedded with 3.4m thin beds of well to poorly sorted red-brown sandstones (Figure 4.3).

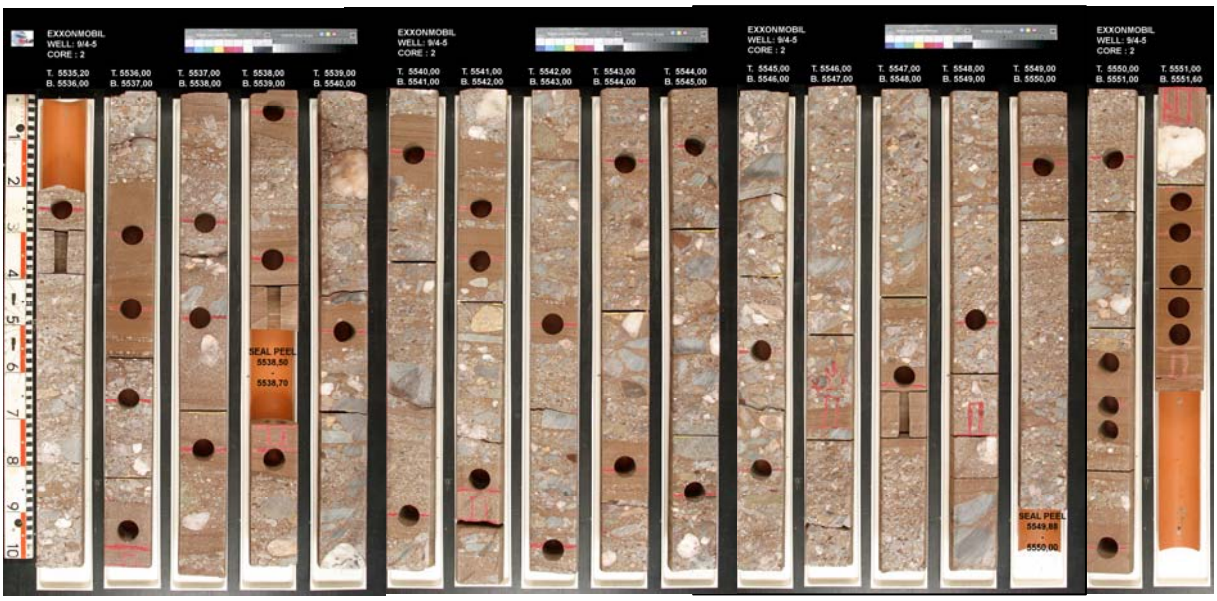


Figure 4.3 Core no 2, conglomeratic section with thin sandstone beds

Conglomeratic Facies

The conglomerates have varying clast types of quartz and generally metamorphic origin. The clast size ranges from granules to boulders and are generally fairly well rounded. Most of the conglomerates appear to be clast supported, however, examples occur where large clasts are matrix supported, where the matrix consists of coarse sand. Many of the conglomeratic units appear to fine upward.

The fining upward conglomeratic beds are generally on the order of 10 to 50cm, occasionally up to 80cm. Clast orientation is generally sub-horizontal, however, dips up to 30-45º frequently occur. Occasionally cobbles exceeding 10cm in diameter are found. Sand matrix supported cobble beds may have been deposited in channels where the cobbles have been eroded from nearby bars and is likely not deposited by debris flows. The conglomerates have in general variable clast orientation, however, some of the beds have fairly consistent clast orientation displaying imbrication. Scour surfaces within the conglomeratic sections are sometimes evident due to preservation of thin silt/mud lining the scour.

The presence of clast imbrication, fining upward beds, and curvilinear scour surfaces suggest that these deposits were most likely deposited subaqueously, i.e., a gravelly fluvial system in channels or as part of bar complexes. Core no 2 is interpreted to represent deposition in an up-dip paleogeographic position, not far from a basement terrain.

Sandstone Facies

The sandstone units which make up about 20% of the cored section are generally thin and occasionally well sorted. Many of the beds are horizontally to sub-horizontally laminated. Occasionally pebble lags are present within the sandstones.

Some of the planar beds and lamina that are intercalated with the gravel beds also show a fining upward character, contain a number of pebbly lamina, and appear to be only moderately well sorted. These laminas could be interpreted as upper-flow regime plane beds that most likely represent waning stages of discharge during deposition of a braid bar.

The laminated sandstones at the base of core no 2 that appear well sorted could be interpreted as laminations of eolian deposits and represent an eolian sand sheet that could possibly be associated with dune deposition in the area.

Core to Log Correlations

The core description has been correlated to wireline logs and the core gamma in Figure 4.4. Overall the sandstone versus conglomerate is best discriminated by the resistivity/porosity logs and not the gamma ray log. The sandstones generally have better porosity and appear as low resistivity zones for sandstone beds greater than 1m in thickness. For thinner sandstone beds the decrease in resistivity compared to the high resistivity conglomerates appears to correlate fairly well to the thin sandstones in the cored section.

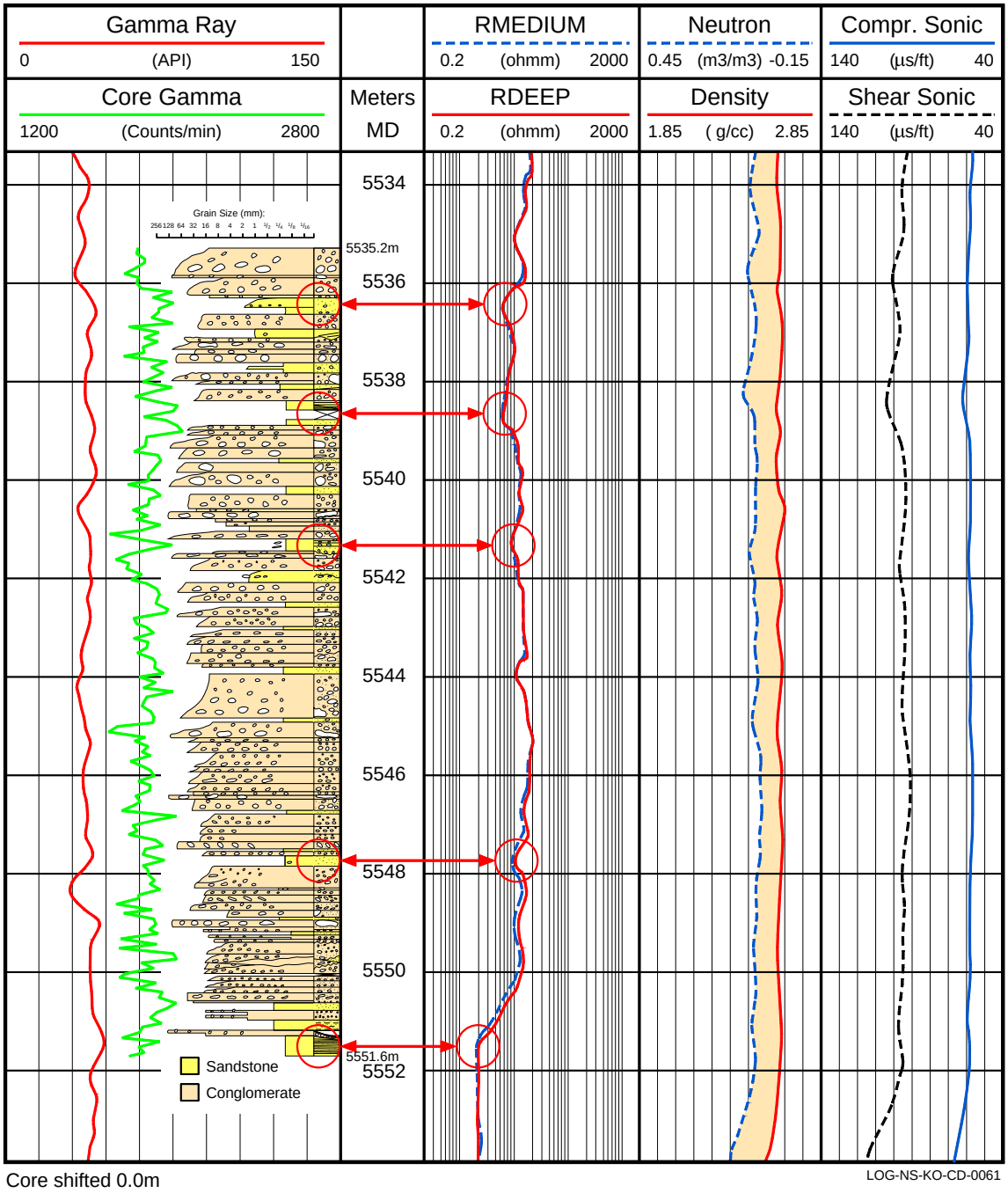


Figure 4.4 Description for core no 2 correlated to log response

4.3 Openhole Logging Overview

Generally, the pre-drill FE plan included the primary use of LWD to save the cost of extra time running wireline logs, to give early information for pore pressure prediction and seismic ties, and to avoid the operational risk of running wireline in the well. Specifically, only LWD was planned in the 12 ¼" (GR/RES/DEN/NEU/SON) and 9 7/8" (GR/RES/DEN/NEU) hole sections. Different programs were planned for below that point depending on the presence of salt, whether the well was a discovery, and for hole size (as a 6 inch hole at TD was possible). But in the case with no salt, no discovery, and in 8 ½" hole, LWD GR/RES was planned with DEN/NEU run at least for 1 bit run below any coring. Then standard logs would be run on wireline, including GR/RES/DEN/NEU/ SON and RCI with other logs being contingent.

The actually logging program generally followed the pre-drill plan, though many minor changes were made depending on the situation. Table 4.3 shows an overview of the openhole logging actually performed in the well.

Hole size	LWD Logs Run	Wireline Logs Run
42"	None	None
26"	None	None
17"	GR/Res	None
12 1/4"	GR/Res/Den/Neu/Sonic	None
8 1/2" opened to 9 7/8" hole	GR/Res/Sonic	WL logs run in 8 ½" hole were logged up to the 9 7/8" casing point above this hole section
8 1/2"	- GR/Res/Den/Neu - (Core no 1) - GR/Res/Den/Neu - (Core No 2) - GR/Res/Den/Neu/Sonic	- XMAC – Earth Imager-GR - MREX- HDIL-GR - RCI, pressures and samples - Checkshot – GR - RCI , Straddlepacker, pressures and samples

Table 4.3 Overview of LWD and Wireline logging in Kogge Well 9/4-5

4.4 Logging While Drilling (LWD)

Baker Hughes Inteq and Pathfinder (CLSS only) provided the LWD logging tools for the well. A detailed summary of the LWD runs is shown in Table 4.4.

Run No	Diam. Hole (inch)	Diam. Tool (inch)	Start Depth (m)	End Depth (m)	Drilled (m)	Tool in Date	Tool In Time	Tool out Date	Tool Out Time	Hours D'hole	Hours Circ	LWD Tool Suite	Off-Bottom Logged Interval (m)
1	17	8.25	608	1279	671	26/01/06	2:00	28/01/06	14:00	60	31.8	GR/MPR	
2	17	8.25	1279	1402	123	28/01/06	17:00	30/01/06	9:00	40	28.4	GR/MPR	
3	17	8.25	1402	1801	399	30/01/06	12:00	01/02/06	5:00	41	26	GR/MPR	
4	17	8.25	1801	1831	30	01/01/06	10:30	03/02/06	5:30	787	24.7	GR/MPR	
5	17	8.25	1831	2001	170	03/02/06	6:00	07/02/06	6:30	96.5	80.4	GR/MPR	
6	17	8.25	2001	2534	533	07/02/06	9:30	10/02/06	9:00	71.5	31	GR/MPR	
7	12.25	8.25	2534	3167	633	20/02/06	9:20	26/02/06	23:15	157.9	104.1	GR/MPR/CCN/ORD/APX	
8	12.25	8.25	3167	4043	876	27/02/06	1:30	10/03/06	10:00	272.5	207.4	GR/MPR/CCN/ORD/APX	3080-3167
9	12.25	8.25	4043	4354	311	12/03/06	7:00	18/03/06	14:00	151	99.6	GR/MPR/ORD/APX/CLSS (no CCN)	3925-4043
10	12.25	8.25	4354	4431	77	18/03/06	15:00	21/03/06	23:30	80.5	32.4	GR/MPR/CCN/ORD/APX/CLSS	3540-4060
11	12.25	8.25	4431	4686	255	22/03/06	14:00	28/03/06	22:30	152.5	99.4	GR/MPR/CCN/ORD/APX/CLSS	4365-4431
12	12.25	8.25	4686	5112	426	30/03/06	1:00	11/04/06	20:00	307	208.2	GR/MPR/CCN/ORD/APX/CLSS	4511-4686
13	12.25	8.25	5112	5235	123	12/04/06	16:00	18/04/06	8:30	136.5	52.2	GR/MPR/APX/CLSS	5040-5112
14	9.88	6.75	5235	5295	60	27/04/06	4:45	01/05/06	21:00	112.3	63	GR/OTK/CLSS	
15	8.5	6.75	5297	5365	68	05/05/06	11:00	10/05/06	5:30	114.5	102.4	GR/OTK/CCN/ORD	5243-5297
16	8.5	6.75	5365	5401	36	11/05/06	23:00	15/05/06	1:00	74	40.2	GR/OTK/CCN/ORD	5261-5365
17	8.5	6.75	5401	5433.7	32.7	15/05/06	1:30	18/05/06	2:30	73	36.4	GR/OTK/CCN/ORD	
18	8.5	6.75	5433.7	5445.5	11.8	18/05/06	4:30	20/05/06	12:45	56.3	20	GR/OTK/CCN/ORD	
19	8.5	6.75	5445.5	5535	89.5	20/05/06	16:45	26/05/06	20:10	147.4	102	GR/OTK	5437-5445
20	8.5	6.75	5551	5655	104	31/05/06	13:10	07/06/06	23:00	177.8	120.5	GR/OTK	5511-5551
21	8.5	6.75	5655	5735.8	80.8	08/06/06	2:00	13/06/06	19:00	137	95.3	GR/OTK/CCN/ORD/CLSS	5283-5655
22	8.5	6.75	5735.8	5820.5	84.7	14/06/06	21:00	21/06/06	2:00	149	112	GR/OTK/CCN/ORD/CLSS	5695-5735.8
23	8.5	6.75	5820.5	5881	60.5	21/06/06	11:00	25/06/06	9:50	94.8	53.8	GR/OTK/CCN/ORD/CLSS	5782-5820.5

MPR	Multiple Propagation Resistivity	APX	Acoustic Properties eXplorer (Sonic)
CCN	Caliper Corrected Neutron	OTK	OnTrak containing MPR
ORD	Optimized Rotational Density	CLSS	Compensated Long Space Sonic

All tools were supplied by Baker Hughes INTEQ except for the CLSS which was provided by Pathfinder

Table 4.4. Well 9/4-5 LWD logging summary

The performance of the LWD tools was generally poor because of the hard, abrasive formation, slow drilling and high number of trips needed. Nevertheless, the plan of providing most of the log data with LWD rather than wireline was followed. But more time than planned was spent re-logging hole-sections off-bottom to make up for failed LWD tools. Significant re-logging, depth-shifting, and curve editing was required to provide a complete set of curves. The off-bottom logging intervals, if any, are shown for each run in Table 4.4. Many times, these were the result of a request to acquire re-log data over specific intervals and other times they were data acquired over a portion of the hole in the normal process of reaming and preparing to drill ahead.

BHI's APX tool was the preferred sonic tool going-in, but because of insufficient backup tools in the 12 ¼" hole and no tools for the 8 ½" hole, we also ran Pathfinder's CLSS tool. Together, there was sufficient sonic log coverage for the long and difficult 12 ¼" hole section. Also, the formation was sufficiently fast to provide a shear sonic arrival over the interval 4000-4900mMD from the LWD tools.

Whole mud was reported to intrude into the Long Spacing detector window on the density tool during run 7. The resulting bulk density drifted about 0.25 g/cm^3 too high. The density correction also showed high values. The problem apparently got worse with depth, especially below 2830mMD. The run 7 bulk density, only over the interval 2833-3153mMD, was reduced by the amount that the density correction was over 0.03 g/cm^3, and the density correction was re-set to 0.03 g/cm^3. This provided a bulk density curve that matches the overlap interval of the density of run 8.

LWD GR/RES provided basically complete coverage over the hole sections for which they were run. The LWD GR had to be re-computed because of errors in the initial tool calibrations over LWD runs 1-13 (down to 5235mMD). The LWD GR has been reduced by the factor 0.55 in intervals 558.9-598.5m and 602.9-5043.7m, by 0.17 in interval 598.9-602.3m and by 0.65 in interval 5043.8-5207.1m. The GR values shallower than 5209m are interpreted to be generally consistent with lithologies encountered, but there is more than the standard level of uncertainty in the GR values in this interval.

There was also good hole-coverage by LWD DEN/NEU except for the interval 4100-4300mMD. Because of a mix-up, there was no nuclear source available on the rig for the neutron tool for LWD run 9, over the interval 4043-4354mMD. The interval was not re-logged because of the prioritization of the re-logging of the shallower interval 3540-4060mMD and because there was sufficient GR/RES/SON over this interval to properly characterized the formation. Also, there is no density over 5000-5090mMD where the tool was damaged and there was no DEN/NEU over 5090-5234mMD where they was not run.

4.5 Wireline Logging

Wireline logging was conducted in the 8 ½" hole by Baker Atlas (Table 4.5).

Date	Run	Wireline Tool Suite	Interval (m MDRT)	Comment
26 June, 2006	1A	XMAC-Earth Imager-GR	5160-5882	Successful run; XMAC run in full waveform, Inline dipole mode
26 June, 2006	2A	MREX-HDIL-GR	5600-5775	Logged 175m, then had a communication failure and POOH
27 June, 2006	2B	MREX-HDIL-GR	5275-5687	Completed logging interval of interest
30 June, 2006	3A	RCI-GR-Single Probe	5292-5554	Attempted 10 pressures and 5 repeats, fm. too tight; POOH to change pump and packer
1 July, 2006	3B	RCI-GR-Single Probe		Lost communication with tool while RIH at shoe
1 July, 2006	3C	RCI-GR-Single Probe	5292-5616	Attempted 35 pressures and 21 repeats, fm. too tight; POOH to change packer
3 July, 2006	4A	VSP(Checkshot)-GR	2547-5882	Failure after 8 checkshots
4 July, 2006	5A	RCI-GR-Straddle Packer	5568-5569	Lost packer pressure after 4 hours
6 July, 2006	5B	RCI-GR-Straddle Packer	5331-5332	Lost communication after 3.5 hours; weakpoint failed when POOH; fishing unsuccessful

Table 4.5 Well 9/4-5 wireline logging summary

The wireline logging program was planned and conducted to minimize the risk of sticking through the salt section, 5262-67mMD. The centralized tool string, XMAC-Earth Imager was run first. Fortunately, the salt section did not cause problems during the wireline program.

The wireline logs were tied into the depth of the LWD logs at TD. Baker Atlas depth-aligned the HDIL and XMAC data to one another on the rig, as these tools were not run together, but the final depth-alignment does not use the correlations made by Baker Atlas.

There is an unexpected response on the deep resistivity curve (M2RX) in the high resistivity beds from 5722 to TD below the Rotliegendes Fm. There is a resistivity profile in these beds, from shallow to deep, but there is a larger difference in the value of the M2RX with the next shallowest curve, M2R9, than the trend of differences between the shallower curves. Baker Atlas could not explain this difference. The LWD resistivity does not help much with this interval as the RACELM is generally off scale, but the RPCEHM is closer to, though slightly less than the M2R9, which is interpreted to be the best estimate of formation resistivity.

4.5.1 Magnetic Resonance Logging

The MREX was run to investigate the few porous zones in the Rotliegendes interval. The tool was run in PoroPerm+Gas mode in order to give the standard porosity curves and investigate whether measurable gas content could be sensed in the rock volume observed by the tool. No gas signal was observed on inspection by Baker Atlas, and no processing for fluid identification was conducted. The MREX data are discussed in the Porosity, Water Saturation, and Permeability sections of this report.

4.5.2 Earth Imager Logging

The Earth Imager was run to give resistivity images in the cored and non-cored Rotliegendes interval and provide structural dip information that is covered in another section.

4.6 Composite Logging Curve Set

The curves from LWD and wireline were painstakingly depth-aligned, edited, and spliced to create the most complete set of curves possible. The primary depth reference is the on-bottom LWD GR. Wherever necessary, LWD data acquired off-bottom were depth-aligned to the on-bottom GR. Because the LWD resistivity measurements were close to the GR in the BHA, the resistivity and GR are on depth with one another. But usually, the DEN/NEU and SON have been depth-aligned to the GR/RES. The wireline depth was tied into the LWD depth by the wireline engineer. From then on, the wireline resistivity depth was used as the depth reference for the interval logged with wireline (>5295mMD). On-

bottom LWD data were preferred, but where necessary, off-bottom LWD data were spliced into the composite curves and are generally of good quality because of the hard formation and in-gauge hole. The specific curves used in each interval of the well to create the composite curve set are shown in Table 4.6.

The original LWD GR curve was spliced into the wireline GR over the interval 5268-5289mMD over two thin peaks of very high radioactivity. On LWD and wireline GR measurements over this interval obtained days after drilling, the peaks are not present, presumably because of minor hole washout of the radioactive material. The original LWD curve is, therefore, spliced-in to preserve what is believed to be the accurate radioactivity.

Main Services	Input curve	Run no.	Date (start)	Interval (meters)	Merge depth (meters)
The composite output curve **GR** consists of the following:					
MWD OTK-ORD-CCN-APX	GRCFM	1-8	26-JAN-06	558.9-3552.9	3553.0
MWD OTK-ORD-CCN-APX	GRCFM	10*	19-MAR-06	3553.0-4078.3	4078.4
MWD OTK-ORD	GRCFM	9	13-MAR-06	4078.4-4346.6	4346.7
MWD OTK-ORD-CCN-APX	GRCFM	10	19-MAR-06	4346.7-4352.0	4352.1
MWD OTK-ORD-CCN-APX	GRCFM	11*	24-MAR-06	4352.1-4518.5	4518.6
MWD OTK-ORD-CCN-APX	GRCFM	12*	31-MAR-06	4518.6-5043.7	5043.8
MWD OTK-APX	GRCFM	13	14-APR-06	5043.8-5207.1	5207.2
XMAC-HDIL-GR	GR	1	26-JUN-06	5207.2-5267.7	5267.9
MWD OTK	GRCFM	14	28-APR-06	5267.9-5288.6	5288.7
XMAC-HDIL-GR	GR	1	26-JUN-06	5288.7-5862.7	
The composite output curve **CALI** consists of the following:					
MWD OTK-ORD-CCN-APX	CALCM	7	22-FEB-06	2511.9-3155.1	3155.2
MWD OTK-ORD-CCN-APX	CALCM	8	27-FEB-06	3155.2-3550.0	3550.1
MWD OTK-ORD-CCN-APX	CALCM	10*	19-MAR-06	3550.1-4076.2	
MWD OTK-ORD	CALCM	9	13-MAR-06	4076.9-4311.9	
MWD OTK-ORD-CCN-APX	CALCM	10*	19-MAR-06	4317.8-4327.2	4327.3
MWD OTK-ORD	CALCM	9	13-MAR-06	4327.3-4340.2	4340.3
MWD OTK-ORD-CCN-APX	CALCM	10	19-MAR-06	4340.3-4343.6	4343.7
MWD OTK-ORD-CCN-APX	CALCM	11*	24-MAR-06	4343.7-4505.9	4506.0
MWD OTK-ORD-CCN-APX	CALCM	12*	31-MAR-06	4506.0-5087.7	
XMAC-HDIL-GR	CAL	1	26-JUN-06	5200.0-5861.0	
The composite output curve **RDEP** consists of the following:					
MWD OTK-ORD-CCN-APX	RACEHM	1-7	26-JAN-06	599.2-3158.9	3159.0
MWD OTK-ORD-CCN-APX	RACEHM	8	27-FEB-06	3159.0-3552.9	3553.0
MWD OTK-ORD-CCN-APX	RACEHM	10*	19-MAR-06	3553.0-4079.7	4079.8
MWD OTK-ORD	RACEHM	9	13-MAR-06	4079.8-4344.8	4344.9
MWD OTK-ORD-CCN-APX	RACEHM	11*	24-MAR-06	4344.9-4513.8	4513.9
MWD OTK-ORD-CCN-APX	RACEHM	12*	31-MAR-06	4513.9-4750.9	4751.1
MWD OTK-ORD-CCN-APX	RPCH	12	31-MAR-06	4751.1-5041.1	5041.2
MWD OTK-APX	RACEHM	13	14-APR-06	5041.2-5208.7	5208.9
XMAC-HDIL-GR	M2R9	1	26-JUN-06	5208.9-5879.1	

The composite output curve **RMED** consists of the following:

MWD OTK-ORD-CCN-APX	RPCEHM	1-7	26-JAN-06	599.2-3158.9	3159.0
MWD OTK-ORD-CCN-APX	RPCEHM	8	27-FEB-06	3159.0-3552.9	3553.0
MWD OTK-ORD-CCN-APX	RPCEHM	10*	19-MAR-06	3553.0-4079.7	4079.8
MWD OTK-ORD	RPCEHM	9	13-MAR-06	4079.8-4344.8	4344.9
MWD OTK-ORD-CCN-APX	RPCEHM	11*	24-MAR-06	4344.9-4513.8	4513.9
MWD OTK-ORD-CCN-APX	RPCEHM	12*	31-MAR-06	4513.9-4750.9	4751.1
MWD OTK-ORD-CCN-APX	RPCH	12	31-MAR-06	4751.1-5041.1	5041.2
MWD OTK-APX	RPCEHM	13	14-APR-06	5041.2-5208.7	5208.9
XMAC-HDIL-GR	M2R3	1	26-JUN-06	5208.9-5879.1	

The composite output curve **DEN** consists of the following:

MWD OTK-ORD-CCN-APX	BDCFM	7	22-FEB-06	2535.6-3151.1	3151.2
MWD OTK-ORD-CCN-APX	BDCFM	8	27-FEB-06	3151.2-3550.0	3550.1
MWD OTK-ORD-CCN-APX	BDCFM	10*	19-MAR-06	3550.1-4075.3	
MWD OTK-ORD	BDCFM	9	13-MAR-06	4076.1-4310.9	
MWD OTK-ORD-CCN-APX	BDCFM	10*	19-MAR-06	4316.9-4326.5	4326.6
MWD OTK-ORD	BDCFM	9	13-MAR-06	4326.6-4340.2	4340.3
MWD OTK-ORD-CCN-APX	BDCFM	10	19-MAR-06	4340.3-4343.6	4343.7
MWD OTK-ORD-CCN-APX	BDCFM	11*	24-MAR-06	4343.7-4505.9	4506.0
MWD OTK-ORD-CCN-APX	BDCFM	12*	31-MAR-06	4506.0-4999.5	
MWD OTK-ORD-CCN	BDCFM	16	12-MAY-06	5213.2-5223.9	5224.0
MWD OTK-ORD-CCN	BDCFM	15	06-MAY-06	5224.0-5276.8	5276.9
MWD OTK-ORD-CCN	BDCFM	16	12-MAY-06	5276.9-5375.4	5375.5
MWD OTK-ORD-CCN	BDCFM	17	15-MAY-06	5375.5-5407.8	5407.9
MWD OTK-ORD-CCN	BDCFM	18	19-MAY-06	5407.9-5415.7	5415.8
MWD OTK-ORD-CCN	BDCFM	21	09-JUN-06	5415.8-5709.5	5709.6
MWD OTK-ORD-CCN	BDCFM	22	15-JUN-06	5709.6-5796.8	5796.9
MWD OTK-ORD-CCN	BDCFM	23	22-JUN-06	5796.9-5857.3	

The composite output curve **NEU** consists of the following:

MWD OTK-ORD-CCN-APX	NPLFM	7	22-FEB-06	2485.3-3151.1	3151.2
MWD OTK-ORD-CCN-APX	NPLFM	8	27-FEB-06	3151.2-3547.0	3547.1
MWD OTK-ORD-CCN-APX	NPLFM	10*	19-MAR-06	3547.1-4073.0	
MWD OTK-ORD-CCN-APX	NPLFM	10	19-MAR-06	4314.7-4341.9	4342.0
MWD OTK-ORD-CCN-APX	NPLFM	11*	24-MAR-06	4342.0-4663.0	4663.1
MWD OTK-ORD-CCN-APX	NPLFM	12*	31-MAR-06	4663.1-5088.6	
MWD OTK-ORD-CCN	NPLFM	16	12-MAY-06	5208.9-5220.7	5220.8
MWD OTK-ORD-CCN	NPLFM	15	06-MAY-06	5220.8-5273.2	5273.3
MWD OTK-ORD-CCN	NPLFM	16	12-MAY-06	5273.3-5371.7	5371.8
MWD OTK-ORD-CCN	NPLFM	17	15-MAY-06	5371.8-5403.2	5403.3
MWD OTK-ORD-CCN	NPLFM	18	19-MAY-06	5403.3-5414.7	5414.8
MWD OTK-ORD-CCN	NPLFM	21	09-JUN-06	5414.8-5706.5	5706.6
MWD OTK-ORD-CCN	NPLFM	22	15-JUN-06	5706.6-5794.5	5794.6
MWD OTK-ORD-CCN	NPLFM	23	22-JUN-06	5794.6-5854.6	

The composite output curve **PEF** consists of the following:					
MWD OTK-ORD-CCN-APX	DPEFM	7	22-FEB-06	2535.6-3151.1	3151.2
MWD OTK-ORD-CCN-APX	DPEFM	8	27-FEB-06	3151.2-3550.0	3550.1
MWD OTK-ORD-CCN-APX	DPEFM	10*	19-MAR-06	3550.1-4075.3	
MWD OTK-ORD	DPEFM	9	13-MAR-06	4076.1-4310.9	
MWD OTK-ORD-CCN-APX	DPEFM	10*	19-MAR-06	4316.9-4326.5	4326.6
MWD OTK-ORD	DPEFM	9	13-MAR-06	4326.6-4340.2	4340.3
MWD OTK-ORD-CCN-APX	DPEFM	10	19-MAR-06	4340.3-4343.6	4343.7
MWD OTK-ORD-CCN-APX	DPEFM	11*	24-MAR-06	4343.7-4505.9	4506.0
MWD OTK-ORD-CCN-APX	DPEFM	12*	31-MAR-06	4506.0-5050.0	
MWD OTK-ORD-CCN	DPEFM	16	12-MAY-06	5213.2-5246.1	5246.2
MWD OTK-ORD-CCN	DPEFM	15	06-MAY-06	5246.2-5276.8	5276.9
MWD OTK-ORD-CCN	DPEFM	16	12-MAY-06	5276.9-5375.4	5375.5
MWD OTK-ORD-CCN	DPEFM	17	15-MAY-06	5375.5-5407.8	5407.9
MWD OTK-ORD-CCN	DPEFM	18	19-MAY-06	5407.9-5415.7	5415.8
MWD OTK-ORD-CCN	DPEFM	21	09-JUN-06	5415.8-5709.5	5709.6
MWD OTK-ORD-CCN	DPEFM	22	15-JUN-06	5709.6-5796.8	5796.9
MWD OTK-ORD-CCN	DPEFM	23	22-JUN-06	5796.9-5857.3	
The composite output curve **AC** consists of the following:					
MWD APX post processed	DTC	7	22-FEB-06	2462.2-3144.5	3144.6
MWD APX post processed	DTC	8	27-FEB-06	3144.6-4011.3	4011.5
MWD CLSS	DTP	12	N/A	4011.5-4301.1	4301.2
MWD CLSS	DTP	13	N/A	4301.2-4372.5	4372.7
MWD APX post processed	DTC	11	24-MAR-06	4372.7-4657.3	4657.4
MWD APX post processed	DTC	12	31-MAR-06	4657.4-5032.4	5032.5
MWD APX post processed	DTC	13	14-APR-06	5032.5-5204.9	5205.1
XMAC-HDIL-GR	DTC	1	26-JUN-06	5205.1-5874.7	
The composite output curve **BS** consists of the following (depths from MWD log heading):					
Bit Size, 26”				558.1-605.0	
Bit Size, 17”				605.0-2534.0	
Bit Size, 12.25”				2534.0-5235.1	
Bit Size, 9.875”				5235.1-5295.0	
Bit Size, 8.5”				5295.0-5881.0	

*Table 4.6 Curves Used to Construct Composite Curve Set Well 9/4-5. Runs marked with * included some off-bottom or re-logging.*

4.7 Petrophysical Interpretation

A petrophysical interpretation has been conducted for the 8 ½” hole-section of the well using the information from logs, cores, and auxiliary information, such as salt-water flows. Shale volume was calculated by both linear GR and density-neutron separation methods, total porosity was calculated with bulk density and matched to core data, and water saturation was calculated with the Archie equation and formation resistivity. The petrophysical equations and parameter values shown in Tables 4.7 and 4.8 were used in the interpretation. A CPI log is found in Appendix VII.

Shale Volume (Linear GR)	$VshGR = \frac{(GR - GRCL)}{(GRSH - GRCL)}$
Shale Volume (Neutron-Density Difference)	$NPHI_SS = NPHI + 0.044$ $ndif = NPHI_SS - PHID$, $VshDN = \frac{(ndif - DNdelta_\min)}{(DNdelta - DNdelta_\min)}$
Total Porosity from Volume-Weighted Density Porosity	$PHID = \frac{(RHOMA - Bulk_Density)}{(RHOMA - RHOFL)}$
Total Porosity from Sonic	$PHIS_1 = \frac{(DT - DTMA)}{(DTFL - DTMA)}$ $PHIS=PHIS_1 * (1-Vsh) * Shfactor$
Total Water Saturation (Archie)	$Sw = \sqrt[n]{\frac{a.Rw}{\phi^m.Rt}}$

Table 4.7 Equations used in the petrophysical interpretation of the 8 ½" hole section

topd	5214	5223.5	5230	5262	5268	5293	5323	5347	5556	5734	5772.4	5838	5843.5	5854
botd	5223.5	5230	5262	5268	5293	5323	5347	5556	5734	5772.4	5838	5843.5	5854	5861
grcl	5	5	5	5	30	30	30	30	30	30	0	0	0	0
grsh	60	120	120	120	120	120	120	120	120	120	65	18	18	18
dndelta	0.24	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.18	0.2	0.2	0.18
dndelta_min	0	0.03	0.03	0.08	0.03	0.03	0.06	0.05	0.05	0.06	0	0	0	0
vshtype	1	1	1	1	1	1	1	1	1	1	2	2	2	1
lith	1	2	2	2	1	1	1	1	1	1	1	1	1	1
rhoma	2.55	2.33	2.33	2.1	2.7	2.73	2.7	2.7	2.68	2.73	2.7	2.75	2.85	2.68
rhofl	0.9	1	1	1	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
dtma	55.6	63	63	67	55.6	55.6	55.6	55.6	55.6	55.6	50	48	48	48
dtfl	189	189	189	189	189	189	189	189	189	189	189	189	189	189
shfactor	1	1	1	1	1	1	1	1	1	1	1	1	1	1
phit_source	0	1	1	1	0	0	0	0	0	0	0	0	0	2
nacl (kppm)	160	160	160	160	160	160	160	160	160	160	160	160	160	160
bht	140.0	140.0	140.0	140.0	140.0	140.0	140.0	140.0	140.0	140.0	140.0	140.0	140.0	140.0
shal_temp	140.0	140.0	140.0	140.0	140.0	140.0	140.0	140.0	140.0	140.0	140.0	140.0	140.0	140.0
temp_td	5870	5870	5870	5870	5870	5870	5870	5870	5870	5870	5870	5870	5870	5870
shal_temp_dep	5200	5200	5200	5200	5200	5200	5200	5200	5200	5200	5200	5200	5200	5200
m	2.3	2.3	2.3	2.3	2.3	2.3	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
n	2.3	2.3	2.3	2.3	2.3	2.3	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
min_swt	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
vshcut	0	0	0	0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
phicut	1	1	1	1	0.08	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06

Table 4.8 Petrophysical parameter values used in the interpretation of the 8 ½" hole section. These are explained in the text.

A petrophysical interpretation has not been conducted for sands in the shallower intervals of the well. There is a Middle Jurassic interval containing porous sands (2703-2830mMD), though they are clearly water-bearing. Porosity in these sands is about 20%. The Triassic interval contains quite a bit of gross sand, but the porosity decreases with depth, the permeability is probably low, and are interpreted to also be water-bearing.

4.7.1 Shale Volume Interpretation

Shale volume was calculated with both the linear GR and density-neutron separation methods. The values for 100% sand and shale were chosen to provide the desired interpretation of sand vs. shale. For VshDN, DNdelta is the separation in NPHIss and PHID for interpreted 100% VSH and DNdelta_min is the separation for 0% VSH. The final VSH curve was assigned either the VshGR or VshDN values as listed with values "1" or "2", respectively, in the "vshtype" row of Table 4.8. The "lith" flag in Table 4.8 was used to create lithology curves for the CPI plot for salt and clastics with values of 2 and 1, respectively.

4.7.2 Porosity Interpretation

The primary inputs for the total porosity interpretation were the core porosity and MREX and bulk density logging data. The core porosity measured at 300 bar net confining stress (NCS) was used as the ground truth porosity. Total porosity from the MREX tool, MPHS, was found to match the core porosity quite well, though with some scatter, that is probably the result of the different volume of rock measured by the core plug vs. the smoothed MREX measurement. Grain density measurements from the core were used to guide the calculation of density porosity (PHID) which is the final interpretation of total porosity (PHIT) for the well. Table 4.8 shows the matrix density (RHOMA) and fluid density (RHOFL) values used in the interpretation. The measured grain density core data are shown on the CPI log and are quite high for clastic intervals and are of the range 2.68-2.80 g/cm^3 (Figures 4.5 and 4.6). RHOMA values were chosen to generally match the core grain density and yield PHID values that generally match the core porosity and MPHS. The PHIT interpretation and comparison to MPHS and core porosity are shown in Figure 4.5 and 4.6 and the CPI log. The core porosity data and interpretation are believed to give a reasonable and accurate porosity interpretation for the Rotliegendes interval. The high grain densities are probably the result of heavy minerals, though there is no information yet available on this. The "phit_source" parameter in Table 4.8 identifies where the density porosity ("0") and sonic porosity, corrected with VSH ("2") or not corrected with VSH ("1") were assigned to the final PHIT curve.

4.7.3 Water Saturation Interpretation

The interpretation for water saturation in the Rotliegendes used the resistivity analysis, MREX measurements, water flow data, and inferences on permeability from the RCI tool operation.

As described elsewhere in this report, the well had a saltwater influx of about 2 barrels while drilling at a depth of 5503mMD. It is not known which zone the water came from, though the well had just drilled a moderately porous zone, 5492-99mMD, with porosity up to 7 p.u. Resistivity is lower in this interval than the surrounding low-porosity

formation. Also, the water could have come from a fracture rather than the matrix, though there was no long-term problem with the flow once the mud weight was increased.

Also, the resistivity logs suggest that the porous zones are water-bearing. The most porous zones at 5553m and 5615mMD have resistivity of about 2 ohmm, and unreasonable values for formation water salinity and porosity and saturation exponent would be necessary to yield low values for Sw. On the contrary, Sw values of approximately 100% can result from the use of reasonable values of Rw of 0.015 ohmm (160 kppm NaCl equiv. at 140degC), porosity exponent of 2.1, and saturation exponent of 2.1. These values were fine-tuned to give Sw of +/- 100% in the most porous intervals. Figures 4.5 and 4.6 and the CPI log contain an SW.ARCHIE curve in the intervals with PHIT > 6 p.u. Any spikes in the calculated Sw that show gas saturation are interpreted to be caused by different resolution effects of the porosity and resistivity logs or otherwise should be ignored.

The MREX data indicates that the total bound water content of even the porous intervals is high. The track to the right of the porosity track in the log figures shows the amount of clay-bound water (brown shading), capillary-bound water (blue shading), and the amount of larger-pore ("free-fluid") porosity (yellow shading). The amount of free-fluid porosity is quite low. An irreducible water saturation (Swi) curve has been calculated from the MREX data. Swi is (MPHE-MBVI)/MPHS or is the amount of yellow shading divided by the total porosity and calculates the amount of bound water that is present. Swi is shown in the water saturation track, on a scale from 2-0, and is generally very high at 80-90% in most of the porous zones. The standard T2 cutoffs were used as no NMR measurements of the core has been taken, but the interpretation would not be expected to significantly change with more data. Therefore, the MREX indicates that there is little to no pore volume with pore sizes large enough to hold moveable fluids (such as hydrocarbons). This is consistent with the very low permeability measured with core plugs and the experience with the probe and straddle packer configurations of the RCI which indicated low permeability. The saltwater flow involved sufficient permeability, though potentially from a fracture.

4.7.4 Permeability Interpretation

Data used in the interpretation of permeability include the core plug measurements, MREX and bulk density log data, and RCI experience. Permeability is believed to be very low in all intervals of the Rotliegendes. Only three plugs yielded air permeability measurements (taken at 20bar NCS) over 0.05 mD and covered the range 0.07-0.55 mD. These values, from near the top of core 2, are not believed to represent the permeability of the Rotliegendes, as all of the other plugs give permeability values so low that Reslab reported the perm as "<0.05mD" because the standard steady-state equipment has a large amount of uncertainty with such low permeability measurements. There is no indication on the logs that the interval from which these three plugs came is any different than the remainder of core 2. No permeability curve was calculated because of the lack of ground truth data and the interpretation that there are no intervals in the Rotliegendes that have

permeability high enough to be considered reservoir-quality. The measurements from the mini-permeameter are shown in the log figures (far right track). These data were obtained on the core slab face and, although they do not give calibrated permeability measurements of the reservoir, they give a pseudo-permeability profile along the core. Formation resistivity (the RDEP curve) is shown in the same track, to illustrate the good correlation between the mini-perm data and resistivity (for core 2 only). This indicates that the mini-permeameter measures a real property of the rock and there is probably variation in the permeability that also controls the formation resistivity. The most significant feature is at the base of core 2 where the mini-perm increases as the core entered a higher porosity bed. Unfortunately, the core jammed at this point and no more core was obtained. But even the core plugs from this interval measured permeability "<0.05 mD". The non-filtered and filtered mini-perm curves are shown, and note that these curves are the logarithm(10) of the mini-perm measurements and shown on a scale of 0.5 to -2.0. The profile in the mini-perm measurements are believed to have more significance than the actual values in milli-Darcies.

4.7.5 CPI Interpretation and Netting

A computer-processed interpretation (CPI) is included in Appendix VII and intervals are shown in Figures 4.5 and 4.6. A net summary is shown in Table 4.9. Net sand was calculated with a Vsh cutoff of 50%. No Net Reservoir category is calculated because it is believed there is no interval in the Rotliegendes of sufficient reservoir quality to be so classified. But there are several short intervals with porosity higher than most of the remaining Rotliegendes. These beds have been identified with a porosity cutoff of 6 p.u. and resulting nets are shown in Table 4.9. There are 47.4m of such beds and they have an average porosity of 8.1 p.u.

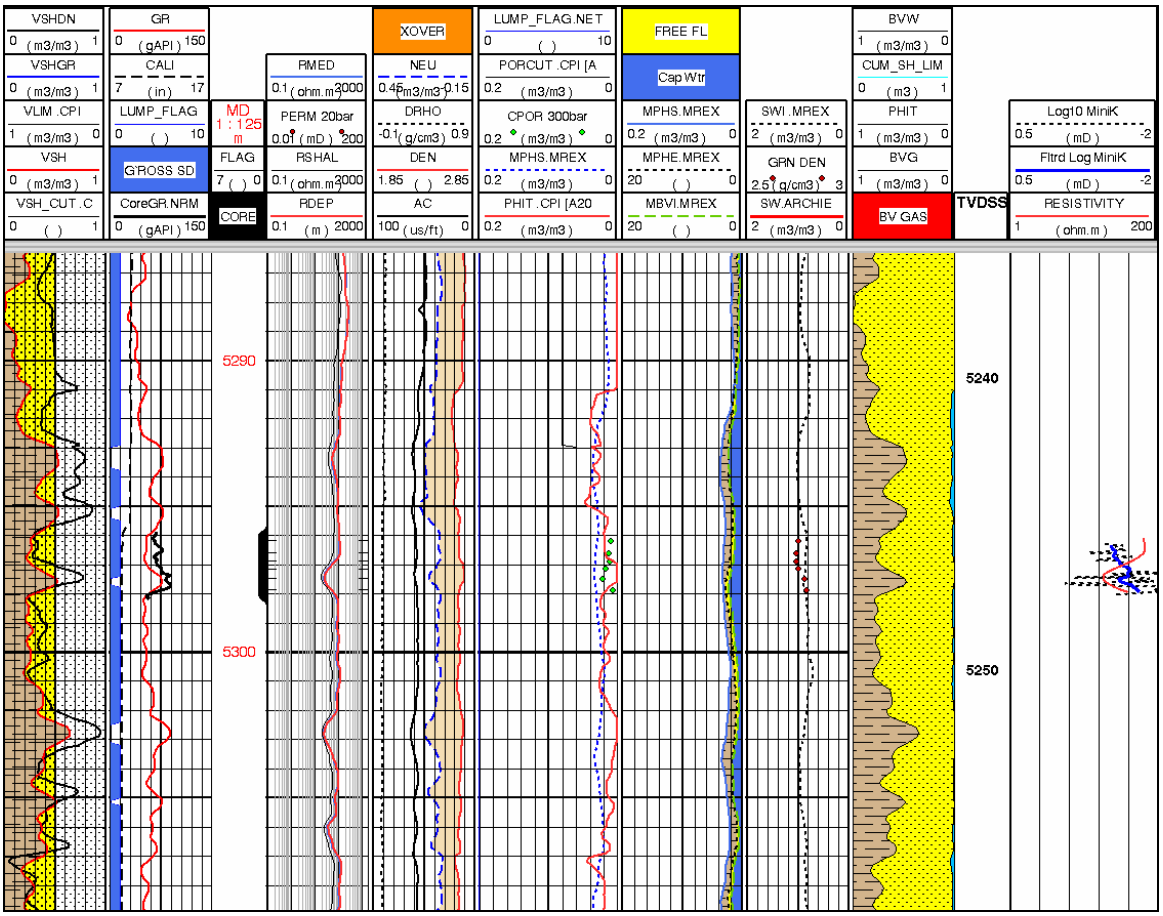


Figure 4.5 Petrophysical interpretation, including core interval 1

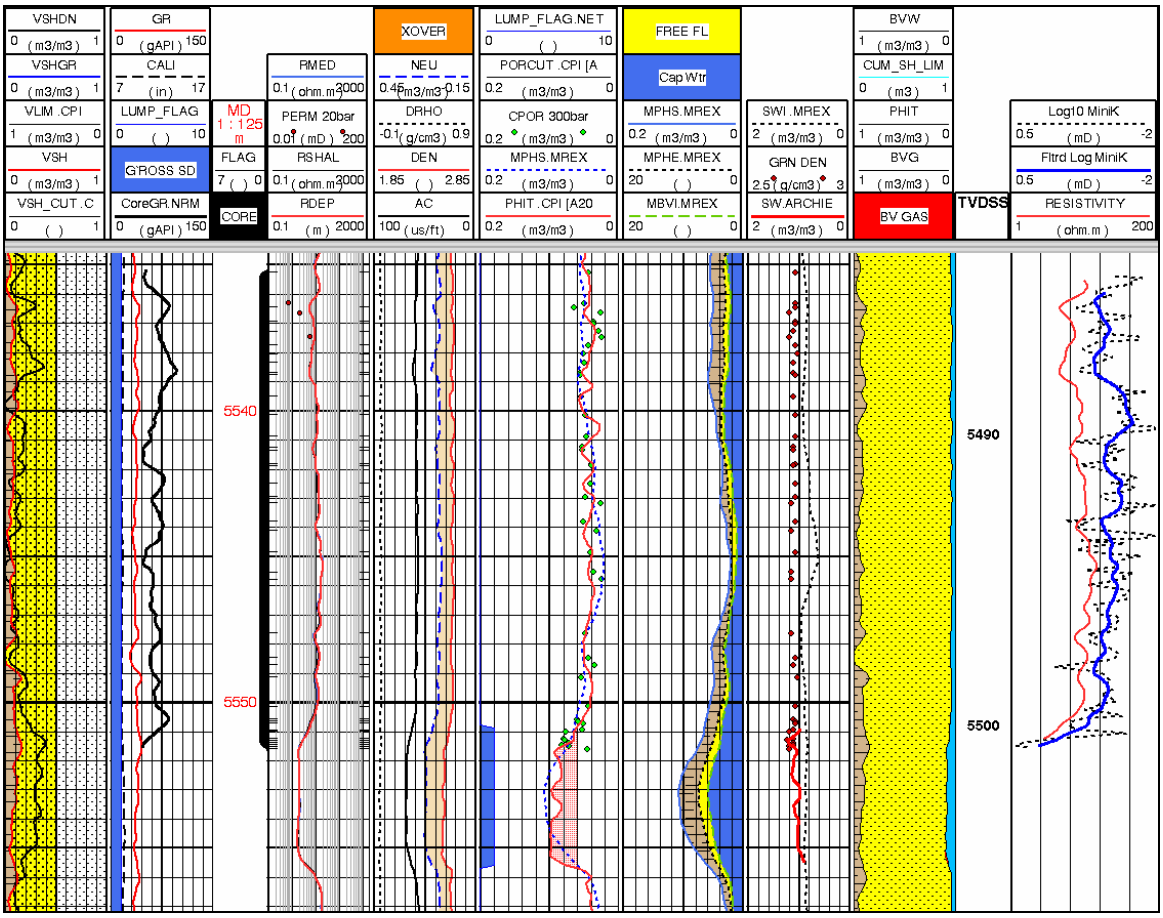


Figure 4.6 Petrophysical interpretation, including core interval 2

Kogge 9/4-5 Net Summary
Geological Completion Report
January 24, 2007

Measured Depth						Gross Sand (MD) (Vsh < 50%)		Gross Sand with PHIT=6 p.u. (MD) (Vsh < 50% and PHIT > 6%)					
Zone	**Top MD m**	**Base MD m**	**Top TVDSS m**	**Base TVDSS m**	**Gross MD Interval Thickness m**	**Gross Sand Thickness m**	**Gross Sd to Gr. Interval m**	**Gross Sd w/PHI>6pu Thickness m**	**Gross Sd to Gr. Interval frac**	**Avg. Vsh frac**	**Avg. Porosity frac**	**Porosity Thickness m**	**Water Sat. frac**
Gray Beds	5278.5	5346.0	5227.9	5295.3	67.5	**50.3**	0.744	**11.9**	0.176	0.189	0.083	0.985	1.000
Red Beds	5346.0	5772.5	5295.3	5721.5	426.5	**426.4**	1.000	**35.5**	0.083	0.076	0.080	2.831	1.000
TOTALS	5278.5	5772.5	5227.9	5721.5	494.0	**476.6**	0.965	**47.4**	0.096	0.104	0.081	3.817	1.000

- The terms "Net Sand or Net Reservoir" are not used because all the evidence suggests no intervals have sufficient permeability.

Table 4.9 Log analysis summary for well 9/4-5

4.8 RCI Pressure Data

4.8.1 RCI Single Probe Pressure Data

A total of 44 RCI Single Probe pressure points were attempted (Table 4.10) in search for true formation pressures in the Rotliegendes section. A total of 39 points recorded build-up pressures, whereas the remaining 5 points failed for various reasons (eg. no seal). The pressure points attempted were located in the most porous and permeable parts of the section indicated by low density and low resistivity (Figure 4.7).

Pressure Pt	Depth (mMDRT)	Depth (mTVDSS)	Before Hydrostat (psia)	Highest Build-up Pressure (psia)	After Hydrostat (psia)	Comment
3a #1	5292,00	5241,40	13987,3	9675,9	13991,1	Tight test
3a #2	5292,00	5241,40	13995,0	9754,2	13980,3	Tight test
3a #3	5331,20	5280,57	14111,4	9926,7	14113,6	Tight test
3a #4	5498,60	5447,86	14560,5	10367,5	14560,0	Tight test
3a #5	5498,80	5448,06	14560,9	10364,6	14559,9	Tight test
3a #6	5552,30	5501,51				No data recorded
3a #7	5553,00	5502,21	14695,5	10547,3	14695,6	Tight test
3a #8	5552,30	5501,51				No seal
3a #9	5554,40	5503,61	14704,9	11643,5	14690,4	Tight test
3a#10	5552,80	5502,01	14695,5	11091,1	14695,5	Tight test
3c #1	5292,00	5241,40	14020,2	12426,5	14022,8	Tight test
3c #2	5327,50	5276,87	14120,2	11863,9	14119,3	Tight test
3c #3	5331,20	5280,57	14129,8			Reset tool
3c #4	5331,20	5280,57	14129,8	12265,6	14130,4	Tight test
3c #5	5338,00	5287,37	14149,7	10470,5	14148,7	Tight test
3c #6	5342,00	5291,36	14160,0		14159,3	Tight test
3c #7	5344,00	5293,36	14164,4	11629,0	14162,2	Tight test
3c #8	5477,00	5426,27	14512,7	12478,7	14500,0	Tight test
3c #9	2455,00	2411,05	6554,0		6539,5	Set tool in casing
3c #10	5616,00	5565,16	14862,5	14790,0	14877,0	Extended test
3c #11	5611,00	5560,16	14862,5	14865,4	14861,1	Extended test
3c #12	5568,00	5517,20	14736,4	14526,1		Extended test aborted
3c #13	5498,60	5447,86	14529,7			No seal
3d #1	5568,20	5517,40	14746,5	13715,6	14745,1	Tight test
3d #2	5569,00	5518,20	14740,7	12939,8	14743,6	Tight test
3d #3	5570,00	5519,20	14743,5	12048,1	14743,5	Tight test
3d #4	5570,50	5519,70	14741,7	11782,7	14752,2	Tight test
3d #5	5568,50	5517,70	14746,5	11642,1	14745,2	Tight test
3d #6	5615,50	5564,66	14827,4	12612,1	14843,5	Tight test
3d #7	5614,50	5563,66	14830,6	12390,3	14830,6	Tight test
3d #8	5613,50	5562,66	14829,7	11979,9	14837,9	Tight test
3d #9	5612,50	5561,66	14839,3	12278,6	14836,4	Tight test
3d #10	5611,50	5560,66	14832,1	11584,1	14836,0	Tight test
3d #11	5553,80	5503,01	14656,7	11328,9	14660,4	Tight test
3d #12	5553,40	5502,61	14665,3	11163,6	14667,3	Tight test
3d #13	5552,80	5502,01	14668,6	11733,4	14675,5	Tight test
3d #14	5552,40	5501,61	14675,7	11714,6	14678,4	Tight test
3d #15	5551,80	5501,01	14677,6	11104,1	14682,7	Tight test
3d #16	5589,50	5538,68	14795,2	10703,9	14798,7	Tight test
3d #17	5498,50	5447,76	14511,2	10573,4	14516,5	Tight test
3d #18	5498,17	5447,43	14517,3	10580,7	14522,3	Tight test
3d #19	5494,25	5443,51	14511,3	10543,0	14515,8	Tight test
3d #20	5493,40	5442,66	14515,8	10553,1	14518,0	Tight test
3d #21	5280,15	5229,57	13940,3	11141,8	13949,3	Tight test
3d #22	5279,94	5229,36	13951,0	9871,6	13949,0	Tight test

Table 4.10 Pressure data acquired with the RCI Single Probe tool in well 9/4-5

None of the points gave reliable pressure data due to very tight formation. The selected pressure points were drawn down multiple times in search for pressure build-ups that would indicate true formation pressure. Most of the tests were run for about 10 to 20

minutes and had maximum draw-downs of about 250-300 bar (3600-4300 psi). Three of the tests were run for more than 6 hours (extended tests). During two of these extended tests (at 5611 and 5616mMDRT) pressures built-up very close to the hydrostatic mud pressure (Figure 4.7), indicating a situation where there was pressure communication from the mud column through a very low permeability rock to the measuring probe.

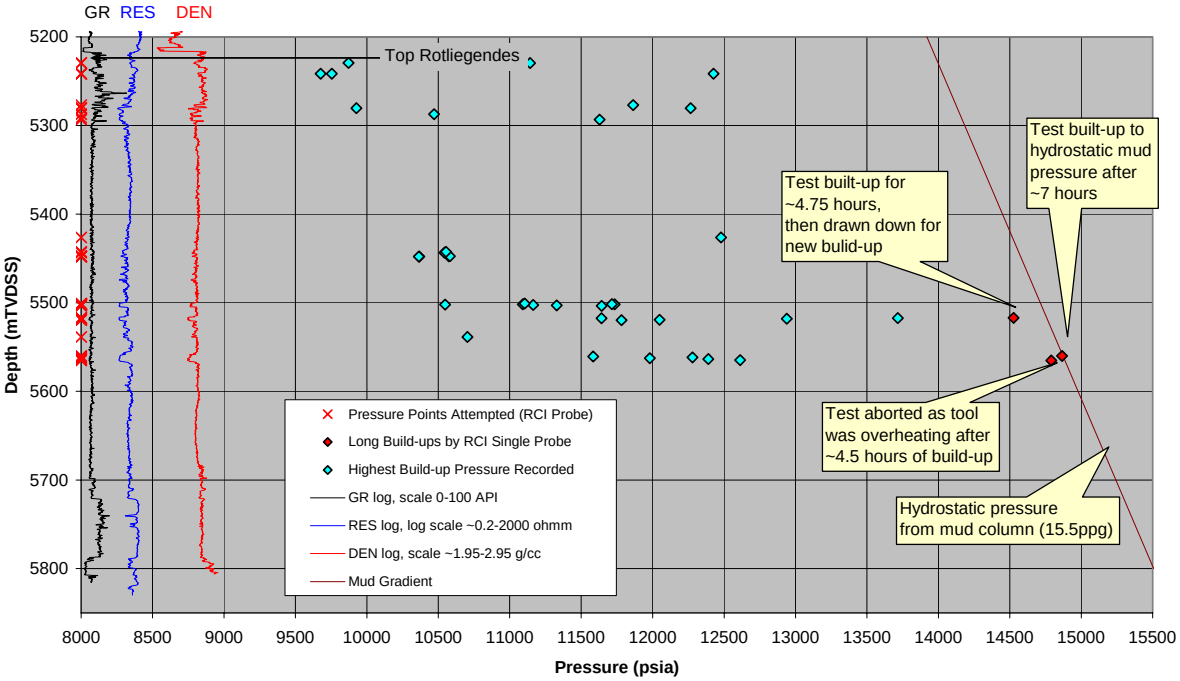


Figure 4.7 RCI single probe tests with highest recorded pressures during build-up (cyan/red points)

Out of the 39 tests, three examples of tests will be discussed. The test at 5611.0mMDRT (Figure 4.8) was a multiple draw down extended test using 2cc and 3cc pumps to draw down the pressure. The initial hydrostatic pressure was 1025.2 bar and was drawn down to 912 bar before the pressure was allowed to build up. After about 53 minutes the pressure had built up to 971 bar. A second draw-down followed by a short build-up was performed, before a third draw-down was made. At this time the test was allowed to build-up until it reached the initial hydrostatic pressure at 1025.2 bar after about 7 hours of build-up time. This data indicates that pressure communication from the mud column through the rock to the probe existed, at least during the latter stages of the buildup (ie. likely no mud cake capable of limiting communication between the mud column and the probe). The zoomed insert on the Horner plot (Figure 4.9) shows that the pressure was apparently building to a higher pressure but turned over towards hydrostatic later in the buildup period.

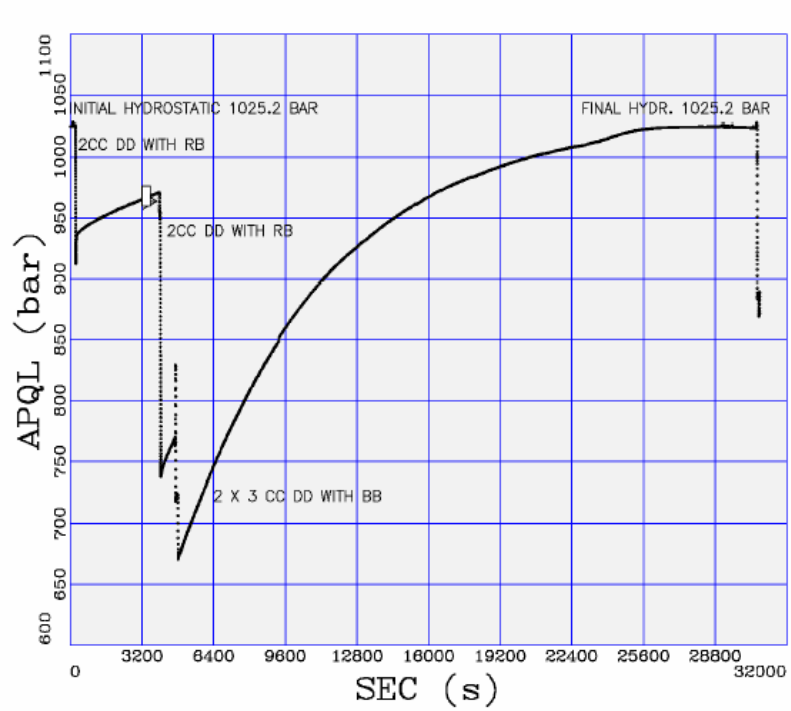


Figure 4.8. RCI single probe test at 5611.0m (draw down with RB pump) building to hydrostatic pressure

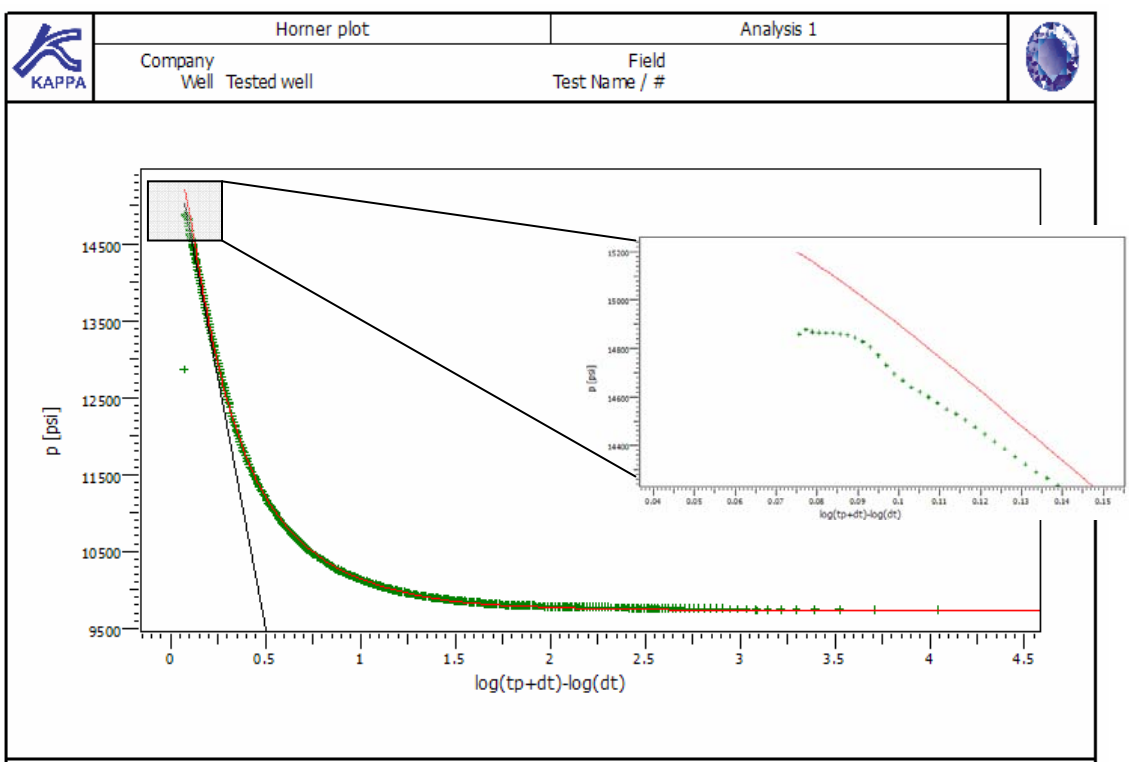


Figure 4.9 RCI single probe test at 5611.0m (draw down with RB pump) Horner plot from SAPHIR

The test at 5494.25mMDRT (Figure 4.10) used a 4cc pump to draw down the pressure from hydrostatic (1000.5 bar) to 715 bar. The pressure was rising over the next 5 minutes to 727 bar. Just before the test was ended, the pressure increase was 0.004bar/sec (3.5 psi/min). This pressure response can be interpreted to represent a tight formation with very low permeability. Given sufficient build-up time (on the order of days?), the hydrostatic pressure of the mud column might eventually have been reached.

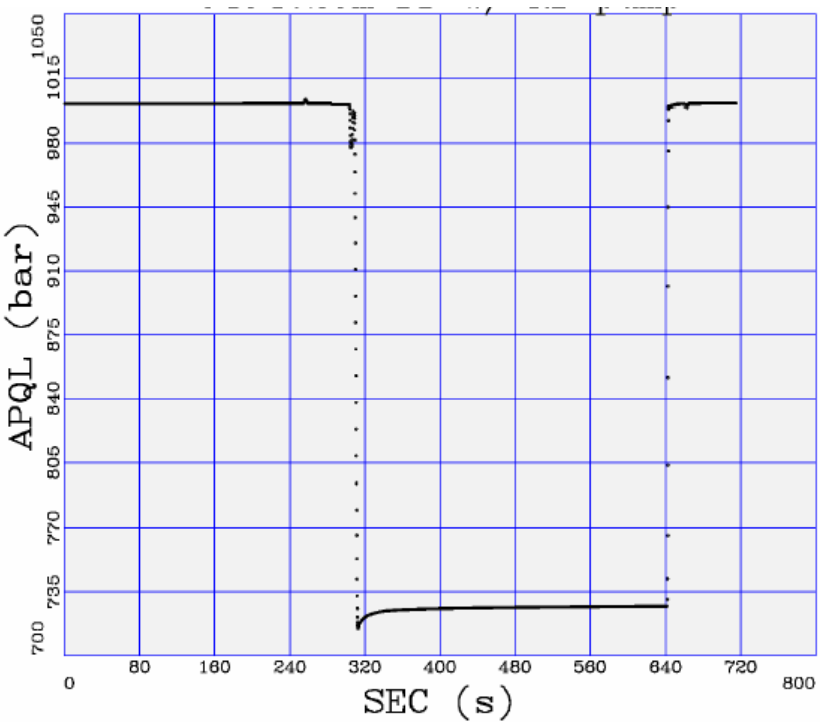


Figure 4.10 RCI single probe test at 5494.25m (draw down with RB pump - 4cc)

The test at 5477.0mMDRT (Figure 4.11) shows a test with multiple pressure drawn downs from hydrostatic pressure (1000.9 bar) to 633 bar. For each of the three build-ups the pressure is leveling off with time likely indicating a very tight rock response. For the last build-up, the pressure was rising to 637 bar during 2 minutes before the test was abandoned.

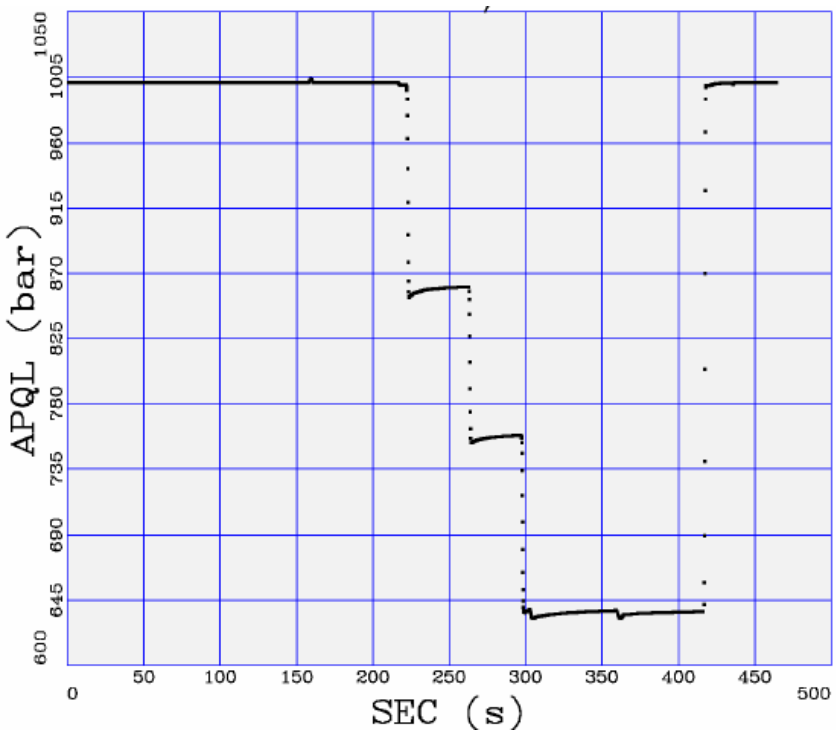


Figure 4.11 RCI single probe test at 5477.0m (draw down with BB pump)

All the pressure build-up curves can be found in the RCI log.

A comparison of the before and after hydrostatic pressures (Figure 4.12) shows that 70% of the tests repeated within ±5psi, and for the remainder 30% the pressure difference was in the range 5-16 psi.

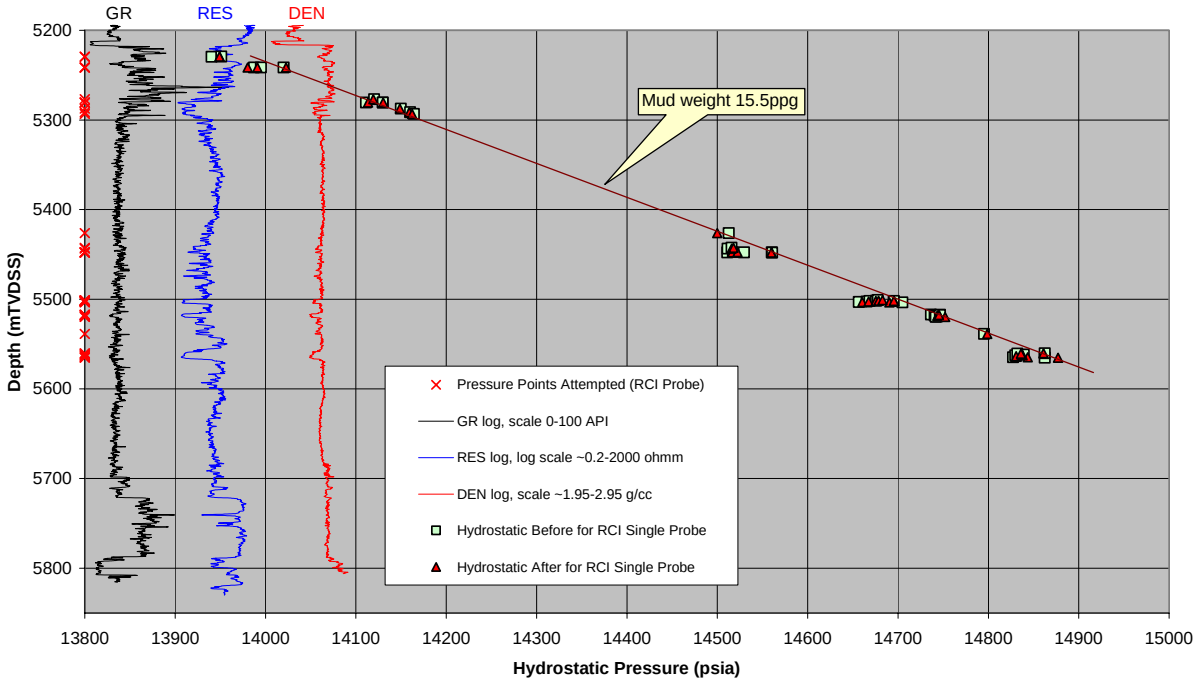


Figure 4.12 Comparison of hydrostatic pressure before and after tests

When the before and after hydrostatic pressure for the tests are plotted versus time (Figures 4.13 and 4.14), it is apparent that the later tests often measured lower pressure than the first tests. This is seen by red points (third run) being in general located to the left of the green (first run) and yellow points (second run). This may be due to a pressure effect of formation water entering the well bore during the logging and thereby diluting the mud resulting in a slightly lower mud density as it turns out that the well was drilled underbalanced.

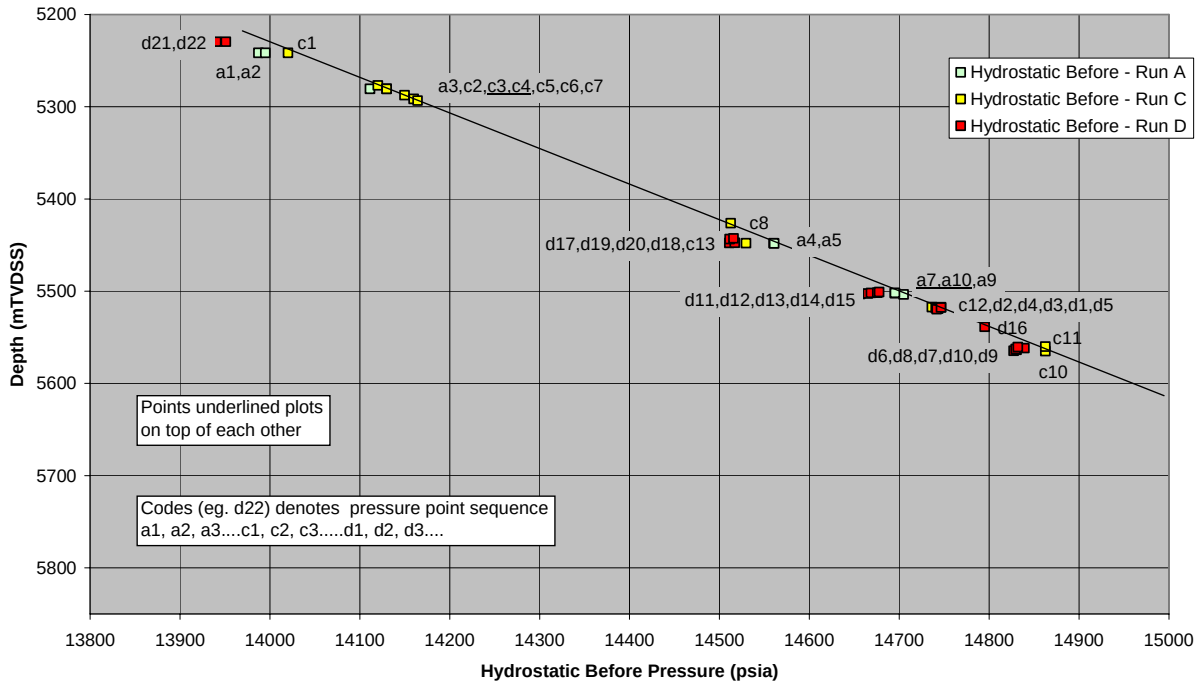


Figure 4.13. Hydrostatic before pressure versus time

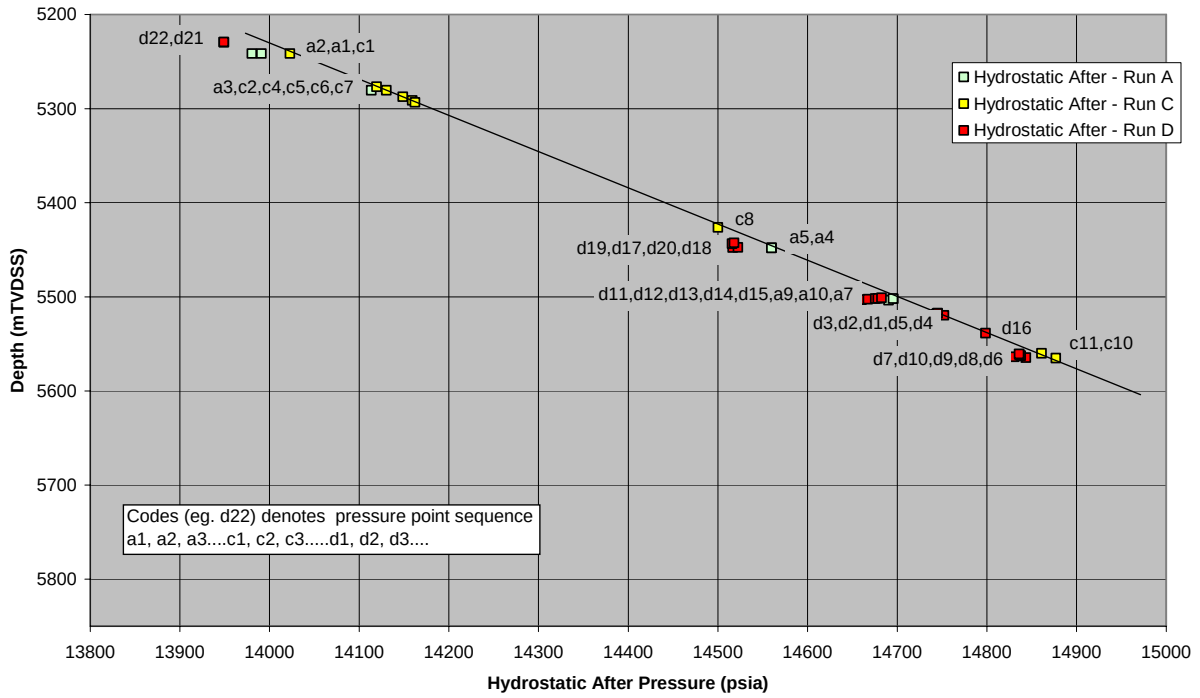


Figure 4.14 Hydrostatic after pressure versus time

After the RCI Straddle Packer runs, it became apparent that the true formation pressure was higher than the pressure exerted by the mud column. Based on this information it would be interesting to extrapolate the extended RCI Single Probe pressures to see if a consistent picture of overpressure could be established. Therefore the three extended RCI single probe tests were loaded into SAPHIR in an attempt to extrapolate to true formation pressure. There is quite a bit of uncertainty in the extrapolations especially since the straight line part of the build-up curves were not seen (likely still in wellbore storage part of build-up). Table 4.11 below summarizes the interpretation range of the extrapolated formation pressures. Please note that different points were averaged for establishing trends to give an estimate of the range. It turns out when these extrapolated RCI Single Probe pressures are compared with the extrapolated RCI Straddle Packer pressures (Figure 4.15), that the former is significantly higher than the Straddle Packer pressures, even for the same zones tested. Therefore the extrapolated RCI Single Probe tests are deemed unreliable and should not be used.

Depth (mMDRT)	**Last Measured Pressure (psia)**	**Low Extrap. Pressure (psia)**	**Low extrapolation based on**	**High Extrap. Pressure (psia)**	**High extrapolation based on**
5616	14788	15567	11 last pts	15798	Regression of 30-40 last points
5611	14860	15879	44 last pts excluding the 14 very last pts	16574	14 pts last pts excluding the 10 very last pts
5568	13704	15540	last 35 pts	15921	last 6 pts

Table 4.11 Range of extrapolations for RCI Single Probe tests

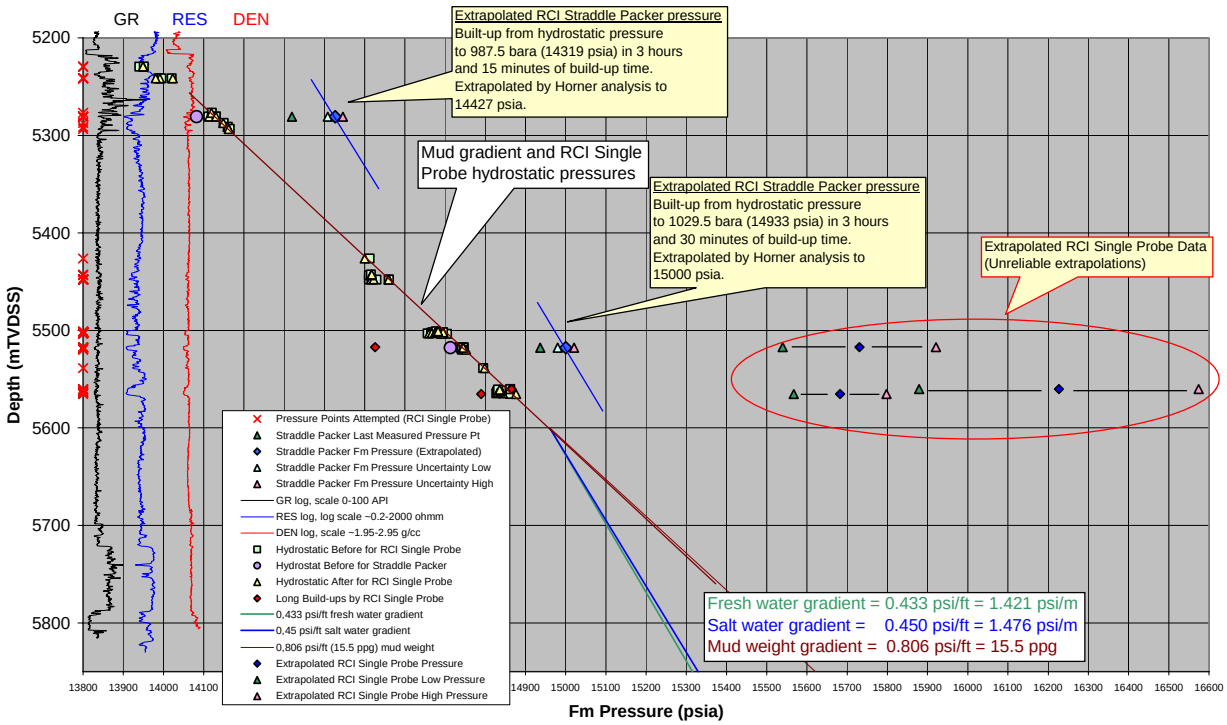


Figure 4.15 Comparison of extrapolated RCI Single Probe pressures with RCI Straddle Packer pressures

SAPHIR plots for the extended RCI test can be found in Appendix IV.

4.8.2 RCI Straddle Packer Pressure Data

The Baker Atlas RCI wireline formation tester was run in the well to measure formation pressure and to collect formation samples. The RCI Single Probe tool gave no reliable formation pressure data due to a very tight formation and the RCI Straddle Packer tool was subsequently run at 5568-69m and 5331-32m to attempt to measure formation pressure and capture formation fluid samples.

In both Straddle Packer zones tested (Figures 4.16 and 4.17), the pressure increased above the hydrostatic mud pressure of the well after setting the packers. The behaviour was interpreted to be a result of the well being underbalanced at the respective test intervals. This is consistent with minor losses during wireline logging operations (ca. 1-2 bbls/day). Baker Atlas RCI experts investigated alternative explanations including temperature effects on the drilling fluid between the packers. It was concluded that the gauge is reading formation pressure, but the buildup is dominated by wellbore storage effects. Unfortunately both Straddle Packer runs failed after about 4 and 3.5 hours of pressure build-up respectively, and it was not possible to attempt drawdowns and formation fluid sampling.

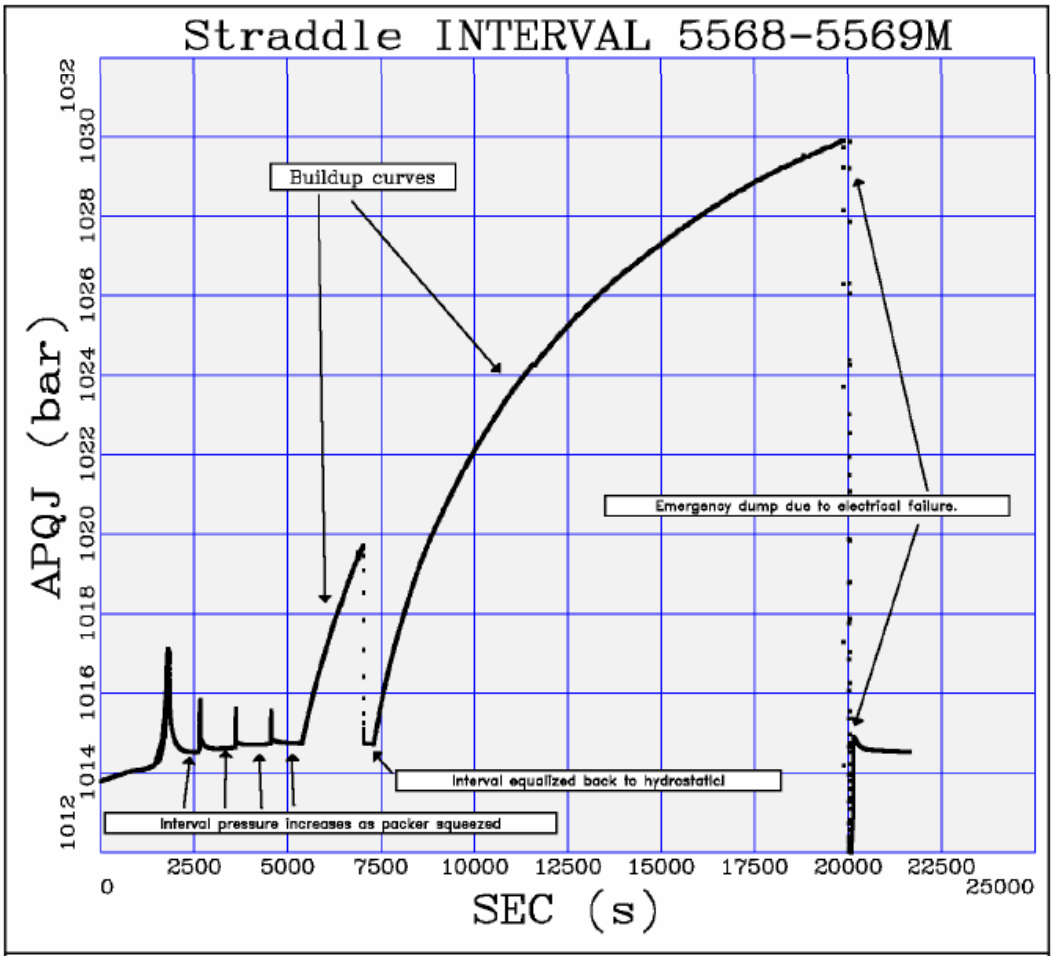


Figure 4.16. RCI Straddle Packer test 5568-69m

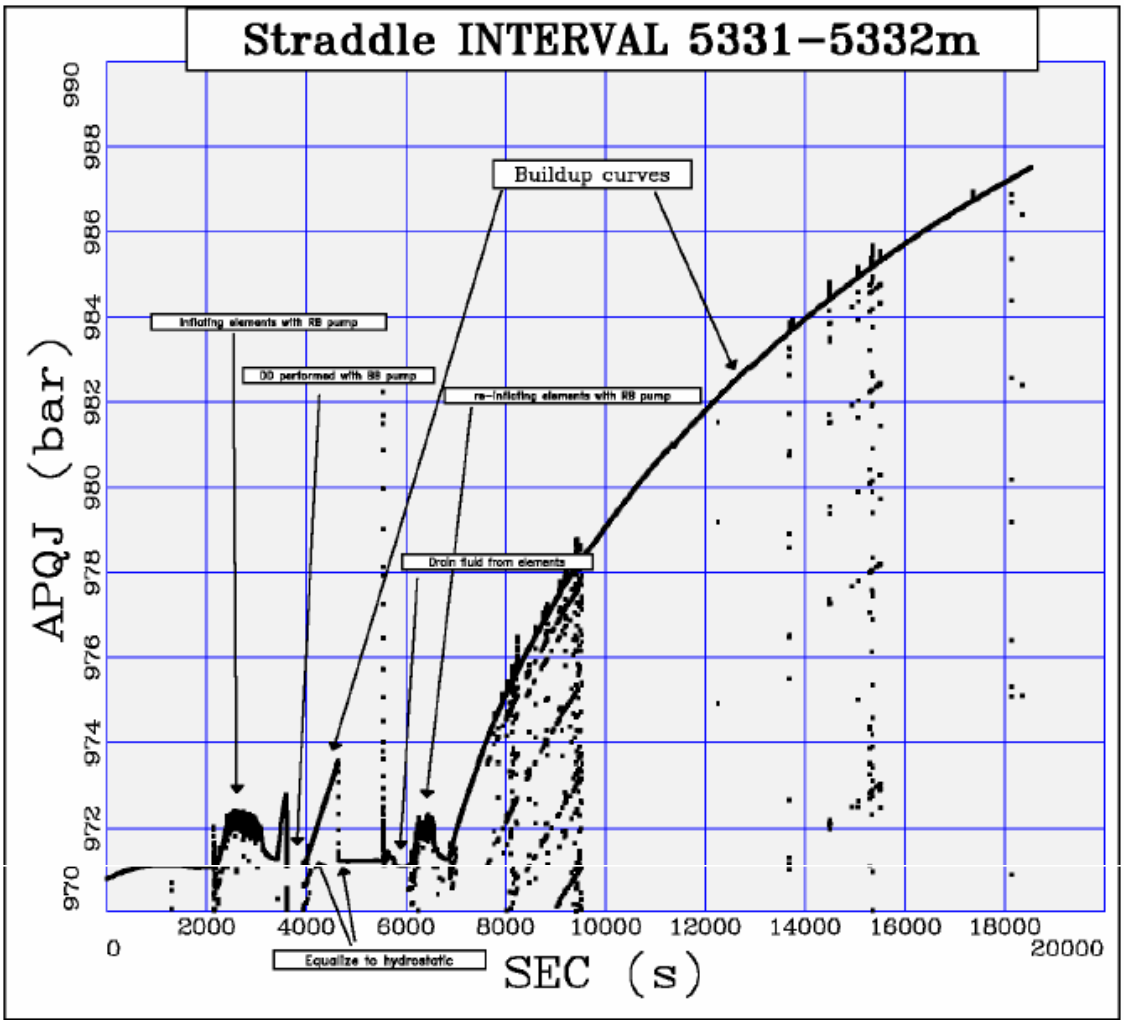


Figure 4.17 RCI Straddle Packer test 5331-32m

The pressure data have been loaded into SAPHIR to attempt a pressure transient analysis (Figures 4.18 and 4.19). However, there are several limitations to this analysis:

1. The dominance by wellbore storage effects prevents a reliable estimate of near wellbore properties or extrapolation to reservoir pressure.
2. Without drawdowns, no reliable rate can be estimated for the 1m interval tested. For this interpretation, an estimate of the daily influx was arbitrarily allocated to the the 1m interval tested. Consequently, reservoir parameters such as permeability and skin are not reliable. At these low permeabilities, a significantly longer shut in time would be required (possibly more than 24 hours) with limited benefit.
3. The pressure analysis software has not been modified to deal with the characteristics of the testing tool, the reservoir model to be used etc. As an aside, following discussions at the SPE Mini-DST technology workshop in Holland in November 2006, Kappa Engineering (the SAPHIR vendor) have raised the priority of modifying their software to better represent mini-DSTs.

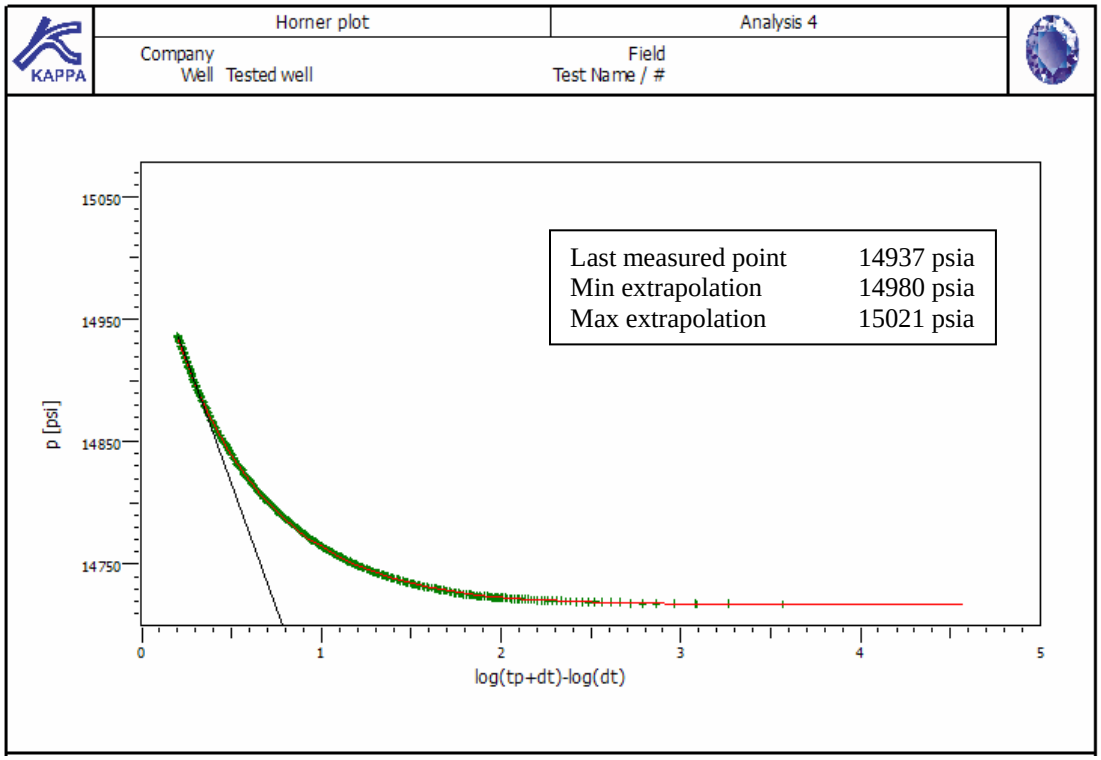


Figure 4.18. Horner plot of RCI Straddle Packer test 5568-69m

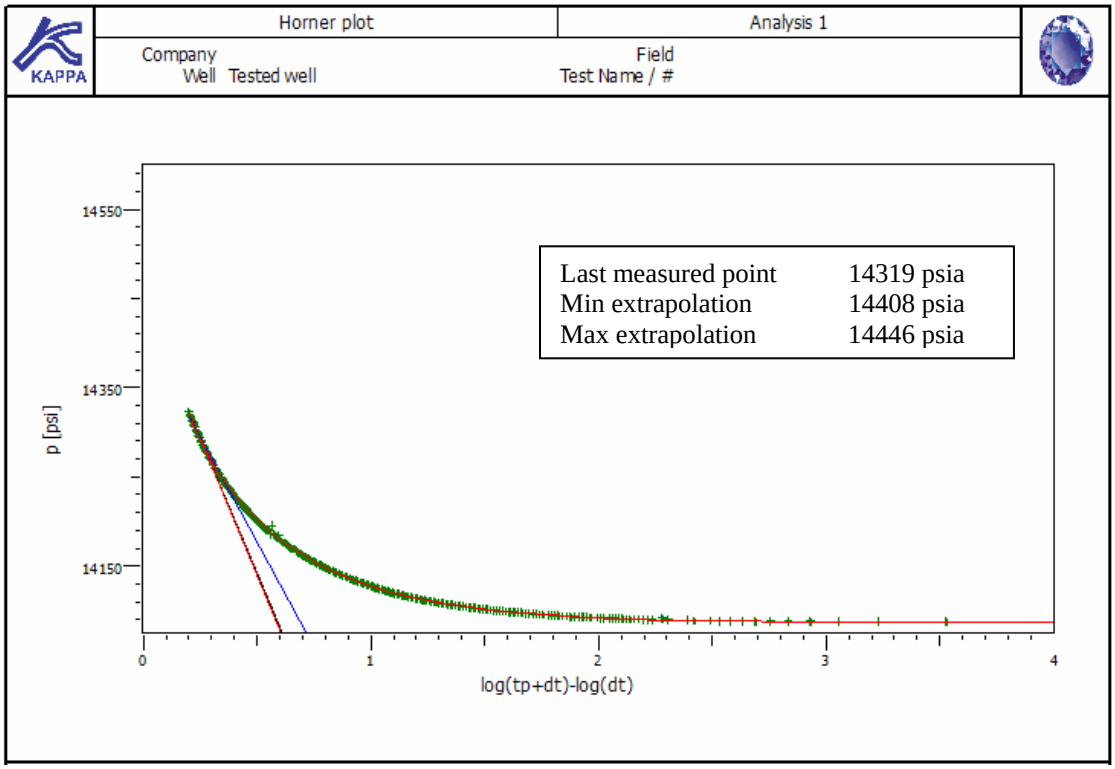


Figure 4.19 Horner plot of RCI Straddle Packer test 5331-32m

Both Straddle Packer tests had a very similar pressure build-up curve versus time (Figure 4.20), however, the last test (5331-32m) appears to be heading to higher pressure above the hydrostatic mud pressure than the first one.

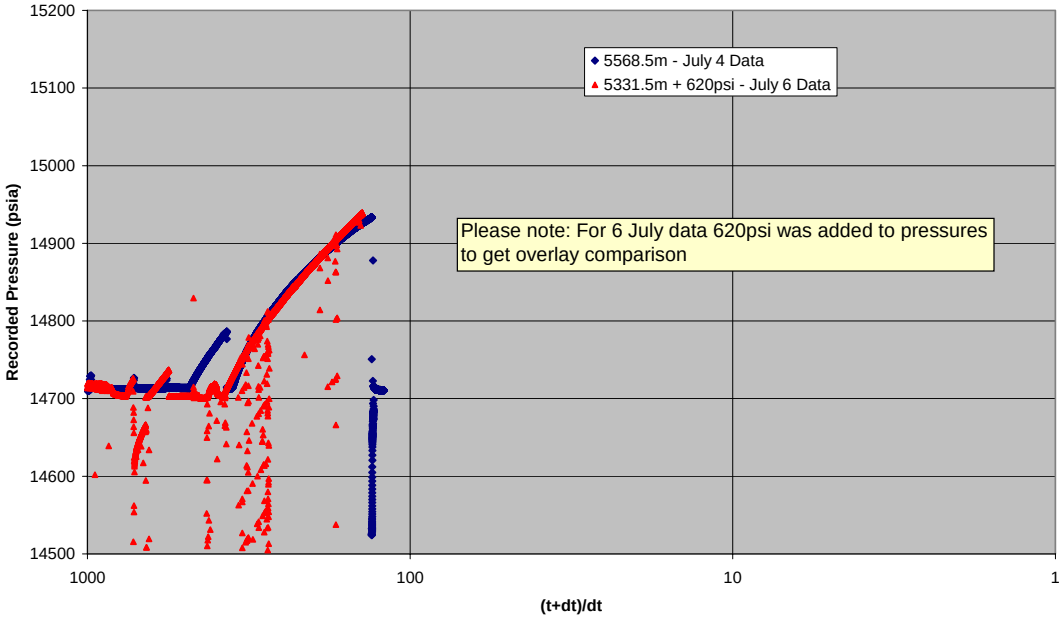


Figure 4.20 Comparison of preliminary Horner plots for RCI Straddle Packer tests 5331-32m and 5568-69m (t=30 days)

A range of Horner extrapolations for the tests is provided in Table 4.12. The limitations described above should be taken into account when using these extrapolations (particularly for the minimum values).

Interval (m)	Last Measured Pressure (psia)	Min. Extrapolated Pressure (psia)	Max. Extrapolated Pressure (psia)	Min. Extrapolated Pressure (ppg)	Max. Extrapolated Pressure (ppg)
5568 - 69	14937	14980	15021	15,80	15,84
5331 - 32	14319	14408	14446	15,87	15,91

Table 4.12 Range of extrapolations for RCI Straddle Packer tests

When the Straddle Packer formation pressures are plotted versus depth (Figure 4.21) they show that the well was drilled about 300psi underbalanced. From the plot it can be seen that it is not possible to fit a water gradient between the two Straddle Packer pressure points. It is therefore concluded that the interval between these two tests must be a seal. The sealing interval is most likely represented by the high resistivity zone (approximately 5300-5400mTVDSS) which most likely contains a very tight conglomeratic section with no permeable sandstone beds. The pressure difference across this conglomeratic section is on the order of 230 psi (pressure difference between the extrapolation of the two blue lines in Figure 4.21).

The SAPHIR plots for the Straddle Packer analysis are included in Appendix IV.

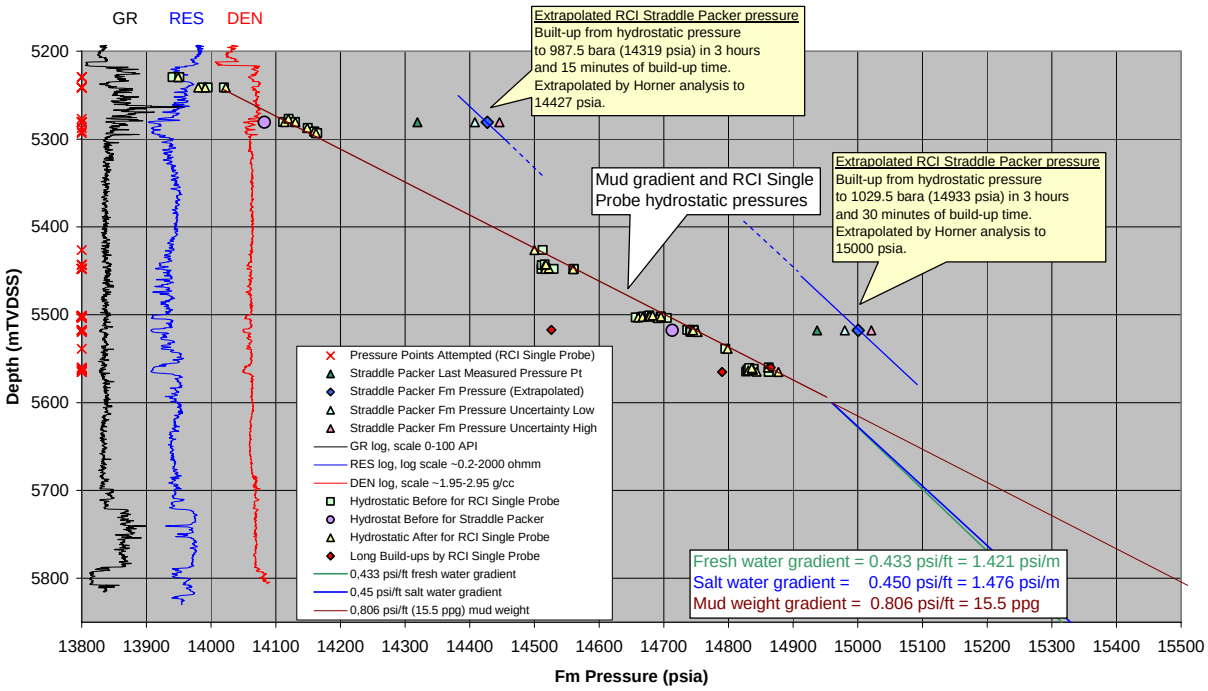


Figure 4.21 RCI Straddle Packer formation pressures from Horner analysis compared to mud pressure

4.9 Temperature Data

Several wireline logging runs were performed at TD of the Kogge well and are tabulated in Table 4.13. Before wireline logging at TD, circulation was stopped on 24 June at 13:45 after circulating the hole clean for 2 hours. Logging runs 1A and 2B were run and subsequent to this a wiper trip was run prior to RCI logging. Circulation stopped on 29 June at 6:50 after 1 hour and 20 minutes of TD circulation. RCI Single Probe logging as well as the first RCI Straddle packer run were then carried out before a second wiper trip were made before the last RCI Straddle Packer run.

Date	Run	Wireline Tool Suite	Measured Temperature (ºC)	Time since Circulation Stopped (hours)	Interval (m MDRT)	Interval (m TVDSS)
26 Jun, 2006	1A	XMAC-Earth Imager-GR	147	40.4	5160-5882	5109.5-5831.0
27 Jun, 2006	2B	MREX-HDIL-GR	148	76.8	5155-5882	5104.5-5831.0
30 Jun, 2006	3A	RCI-GR	147	33.5	5292-5554	5241.4-5503.2
2 Jul, 2006	3D	RCI-GR	146	77.7	5280-5800	5229.4-5749.0
3 Jul, 2006	4A	VSP-GR	147	96.1	2547-5882	2503.0-5831.0
4 Jul, 2006	5A	RCI-GR-Straddle Packer	145	120	5568-5569	5517.3-5518.3
6 Jul, 2006	5B	RCI-GR-Straddle Packer	140	17.3	5331-5332	5280.4-5281.4

Table 4.13 Temperature summary of logging tool thermometers in well 9/4-5

Temperatures from the two first logging runs were extrapolated to a static BHT by the Horner method (Figure 4.22).

ExxonMobil **Horner BHT Calculation**

Well: 9/4-5 Field: Kogge Prospect Location: NDB

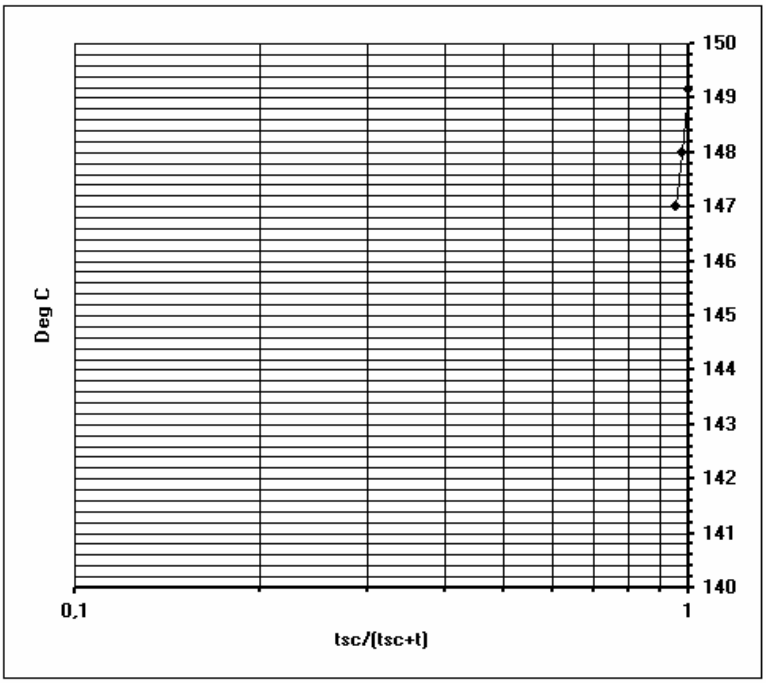
Date: 21-sep-06 Comment: XMAC and MREX logging runs

Depth, Circulation and Temperature Data

			Date	Time
Depth:	5881 mBRT	Circulation stopped:	24-jun-06	13:45
TVD:	5830 mTVDSS			
WD:	77 m			

Seabed Temperature: 5 (5 deg C is default)

Log	Run No	Date (ddmmmyy)	Bottom Log Interval	Max Temp	Time Since Circ stopped	Circulation Time	Log to Bottom?
XMAC-Earth Imager-GR	1A	26-jun-06	5881	147	40,4	2	n
MREX-HDIL-GR	2B	27-jun-06	5881	148	76,8	2	n



BOTTOM HOLE TEMPERATURE =	149,2	deg C
GEOTHERMAL GRADIENT =	25,1	deg C/km

Figure 4.22 Extrapolated Horner plot for bottom hole temperature in well 9/4-5

Based on the RCI Single Probe logging, temperatures were measured at similar depths at different times. These temperatures were also used for Horner extrapolation (Table 4.14). Figure 4.23 shows which temperatures were averaged (oval circled temperatures) and used in the Horner analysis. This figure also shows the Horner extrapolated temperatures in red solid circles. Based on gradients between the points it is possible that the static BHT for the Kogge well is slightly above 150ºC (ie. 152ºC).

Date	**Time**	**Wireline Tool Suite**	**Measured Temperature Average (ºC)**	**Time since Circulation Stopped (hours)**	**Depth (m MDRT)**	**Depth (m TVDSS)**
30 Jun, 2006	15:15	RCI-GR	137.2	32.4	5292.0	5241.4
30 Jun, 2006	15:30	RCI-GR	138.9	32.7	5498.7	5448.0
30 Jun, 2006	16:30	RCI-GR	141.7	33.7	5553.4	5502.6
2 Jul, 2006	20:45	RCI-GR	144.5	85.9	5552.8	5502.1
2 Jul, 2006	23:10	RCI-GR	144.7	88.3	5496.1	5445.3
3 Jul, 2006	00:30	RCI-GR	140.4	89.7	5280.0	5229.5
4 Jul, 2006	10:00	RCI-GR-Straddle Packer	143.3	123.2	5568-5569	5517.3-5518.3
6 Jul, 2006	17:00	RCI-GR-Straddle Packer	136.5	25.3	5331-5332	5280.4-5281.4

Table 4.14 Temperature data from RCI pressure logging in well 9/4-5

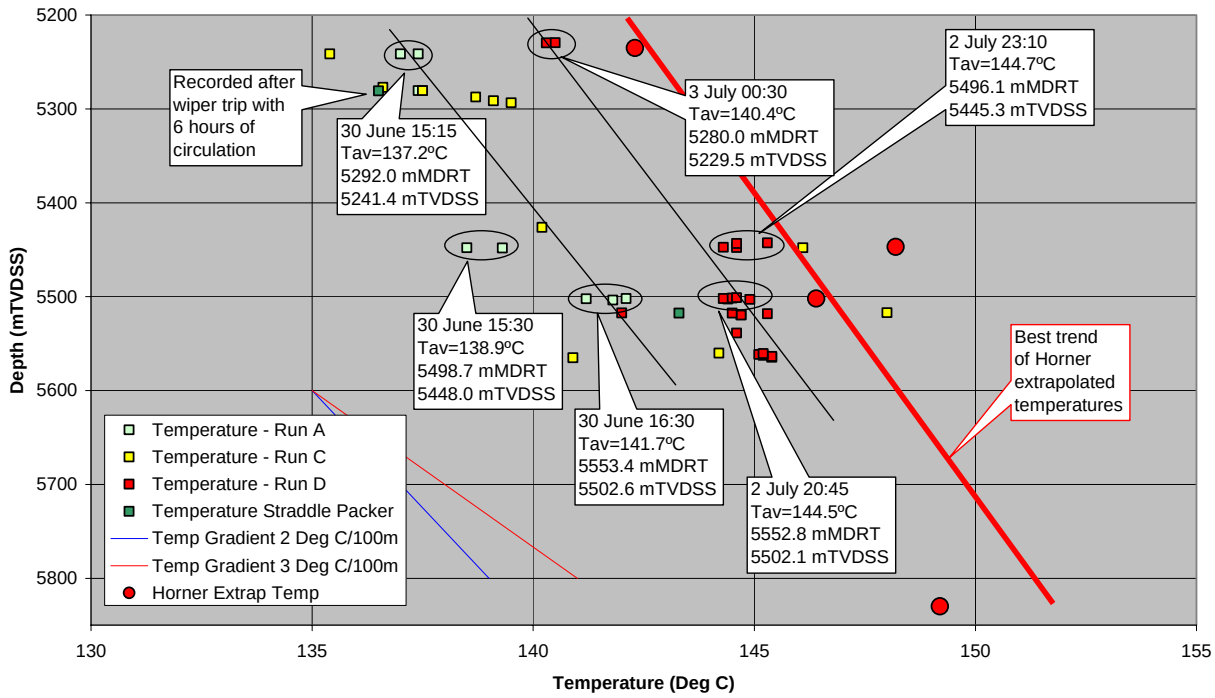


Figure 4.23 RCI temperatures and extrapolated Horner plot for RCI and wireline temperatures in well 9/4-5

4.10 Pre-drill Pressure Prediction

Predrill the pore pressure prediction for the Kogge well was based on analysis of offset well data including direct pressure measurements (Table 4.15), drilling data (mud weights, kicks, trip gas etc), physical properties modeling, burial history modeling and integrated pore pressure modeling (Figure 4.24).

Well	Direct Pore Pressure Measurements	Completed	Total Depth (m)
Felicia	No RFT pressure data	December 87	5330
Ibenholt	One possible valid RFT point in Rotliegendes	September 87	2599
1/3-5	RFT pressure data, 6 points in Rotliegendes	February 85	4850
2/1-7	RFT pressure data, 14 points in Rotliegendes	March 85	5464
3/5-1	No RFT pressure data	June 78	3425
7/3-1	No RFT pressure data	June 69	4700
10/5-1	No RFT pressure data	June 76	1843

Table 4.15 Availability of direct pore pressure measurements for key offset wells

No pore pressure prediction using seismic was performed for the Kogge prospect. The seismic surveys available, in general have too short cables to predict pressure at a depth of 5000m.

Based on integration of all available data, along with 1D pressure modeling of wells in the area, a pressure prediction was generated for the Kogge prospect (Figure 4.24). Low, base case and high case pore pressure curves were generated.

Seabed to Mid Oligocene at about 760mMDRT

This section was interpreted to be normally to very close to normally pressured. The 20" casing was planned to be set at about 600mMDRT.

Mid Oligocene to top Chalk at about 1252mMDRT

Increase in pore pressure was expected for this section. The pore pressure was expected to increase to about 9.5ppg (1.14 g/cm^3) at the top of the Chalk at 1252mMDRT. The range in pore pressure at the top Chalk is expected to be between 9.3 to 9.8ppg (1.12-1.18 g/cm^3).

Top Chalk to Middle Jurassic Sandstone at about 2699mMDRT

The base case pore pressure was expected to further increase through this section to about 10.3ppg (1.24 g/cm^3) at the Middle Jurassic. This interpretation was based on offset well data from the Kogge 9/4 block. The range in pore pressure at the Middle Jurassic was expected to be between 9.8 to 11.0ppg (1.18-1.32 g/cm^3).

Middle Jurassic to top Zechstein at about 4974mMDRT

The base case pore pressure was expected to further increase through this section to about 11.6ppg (1.39 g/cm^3) at the top Zechstein. This interpretation was based on poorly connected Triassic Skagerrak sandstones and undercompacted Smith Bank shales as the top Zechstein is approached. The range in pore pressure at the top Zechstein is estimated to be between 10.4 to 13ppg (1.25-1.56 g/cm^3).

It was possible that sandstones would be encountered within the Smith Bank shale section and that these sandstones could contain gas. The gas column associated with these sandstones, although unlikely due to fault juxtaposition relationships, could potentially be similar to the Rotliegendes high case gas column of more than 500m. If this was the case, the gas column adjusted base case pore pressure could approach 12.3ppg (1.48 g/cm^3). If such a gas charged sandstone was encountered along the high side pore pressure trend, the pressure could be up to 13.7 ppg (1.64 g/cm^3).

Top Zechstein to base Rotliegendes at about 5514mMDRT

In the base case, no significant pore pressure increase was expected across the Zechstein evaporites. However, in the high case prediction a pressure seal was incorporated amounting to a 0.7ppg (0.09g/cm^3) pressure increase. Below the Zechstein, the Rotliegendes was expected to be in vertical pressure communication resulting in an overall decrease in the mud weight required to balance the pore pressure. The range in pore pressure at the top Rotliegendes was estimated to be between 10.4 to 13.7ppg (1.25-1.64 g/cm^3). The gas column at the well associated with the Rotliegendes sandstones, could be up to 535m, which corresponds to the spill point of the structure. If this was the case, the gas column adjusted base case pore pressure could approach 12.3ppg (1.48

g/cm^3). If such a gas column in Rotliegendes sandstone was encountered along the high side pore pressure trend, the pressure could be up to 14.4 ppg (1.73 g/cm^3).

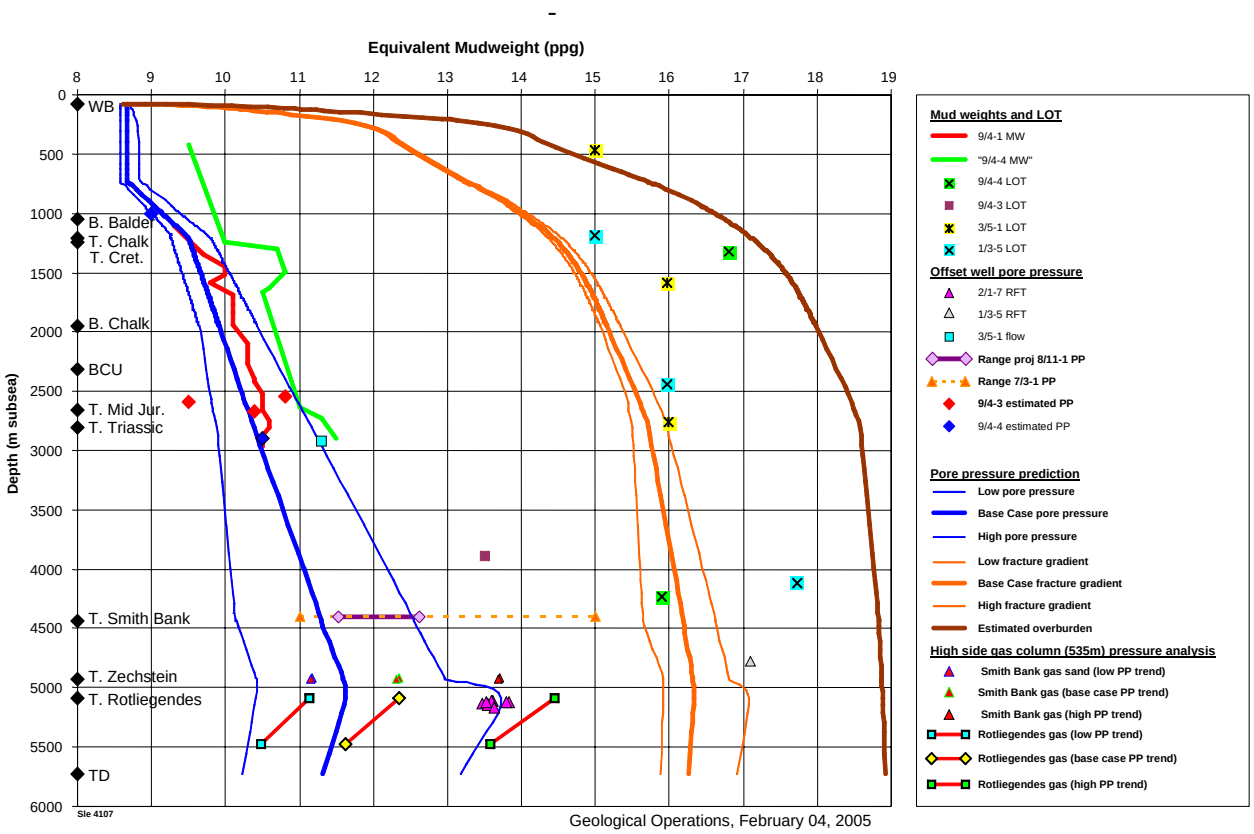


Figure 4.24 Kogge well pore pressure prediction

4.11 Pressure Prediction During Drilling

The pore pressure in the Jurassic was well known from the previous drilling in the block. The pre-drill basic assumption was that the expected pressure at the top Rotliegendes could be from 10.4 to 14.4 ppg in the gas case, and the pressure in the Rotliegendes would most likely be linked to the pressure above the Zechstein, that is if low case Triassic – then low case Rotliegendes. There was also a chance that the pressures were not related.

There was also a small chance if we had a gas bearing sandstone in the Lower Triassic Bunter Sandstone that this could have a large gas column and have very high pressure, if the sandstone was gas charged it could be up to 13.7 ppg (Figure 4.24).

To be prepared for the possible Triassic 'Bunter' sandstone with gas and the different cases for the Rotliegendes, it was decided to have real time LWD Sonic to help with the pressure prediction in the Triassic section (12 ¼" hole).

The Drillworks Predict program (Knowledge Systems Inc.) was chosen to help in the pressure prediction. Compaction trends for Triassic shales were collected, evaluated and plotted to have ready for the actual work.

During drilling of the 12 ¼" hole, one expert pore pressure analyst from Knowledge Systems were on the rig dedicated to the pore pressure evaluation.

Mudlogging data and LWD data were used in the evaluation. LWD runs included gamma ray, resistivity, density, neutron, sonic and pressure while drilling. It was intended to have real time sonic for the pore pressure prediction, but due to repeated failures and lack of available new tools from BHI, sonic from Pathfinder CLSS memory were used. The pressure evaluation was updated with the sonic data after each bit run.

The real-time pore pressure monitoring began after drilling out of the 13 5/8" casing in the upper Jurassic. The mud weight was 11.5 ppg after drilling out of 13 5/8" casing. Most likely pore pressure in the Jurassic sandstone to Top Smith Bank was estimated to be 9.7 ppg pre-drill.

Pore pressure in the Jurassic and Triassic was interpreted to be less than the mud weight due to the lack of drilling events, connection gas, kicks or flow back. So using an old mudlogging rule of thumb, where connection gas occurs when pore pressure is within 0.5 ppg, the maximum pore pressure is less than 10.9 ppg.

The pore pressure in the claystone in the Jurassic to Triassic section was interpreted to be approximately 10.3 ppg. This is based on the pre-drill trend line for sonic (Bowers) and the resistivity trend for this well. The pore pressure calculated using the pre-drill trend lines (sonic and resistivity) and the DXC trends converge on this value in the claystone. Overall the sonic and the DXC calculations are in close agreement, with the resistivity calculation running a higher value. Typically, sonic data tends to be more reliable than resistivity data because resistivity values can be influenced by various environmental factors such as water salinity, hydrocarbons, mineralogy, etc.

Based on pressure predicted in the Jurassic and Triassic during drilling, the pressure prediction for the Rotliegendes was updated at the 9 5/8" casing point. Figure 4.25 is showing this updated prediction, taking into account the lower Triassic pressure. The Rotliegendes prediction was also lower than the pre-drill estimate.

Density and sonic were used to make a synthetic to tie to the seismic, and were used to update the depth prognosis as drilling progressed. During drilling the velocity of the Jurassic and Triassic beds were found to be higher than predicted, so the prognosis for the Top Smith Bank and the deeper horizons were updated to about 300 m deeper. Figure 4.25 shows the updated formation tops with red square diamonds, and the revised low, most likely and high case pressures at the time of setting the 9 7/8" casing.

No Bunter sandstone was found at the base of the Triassic section.

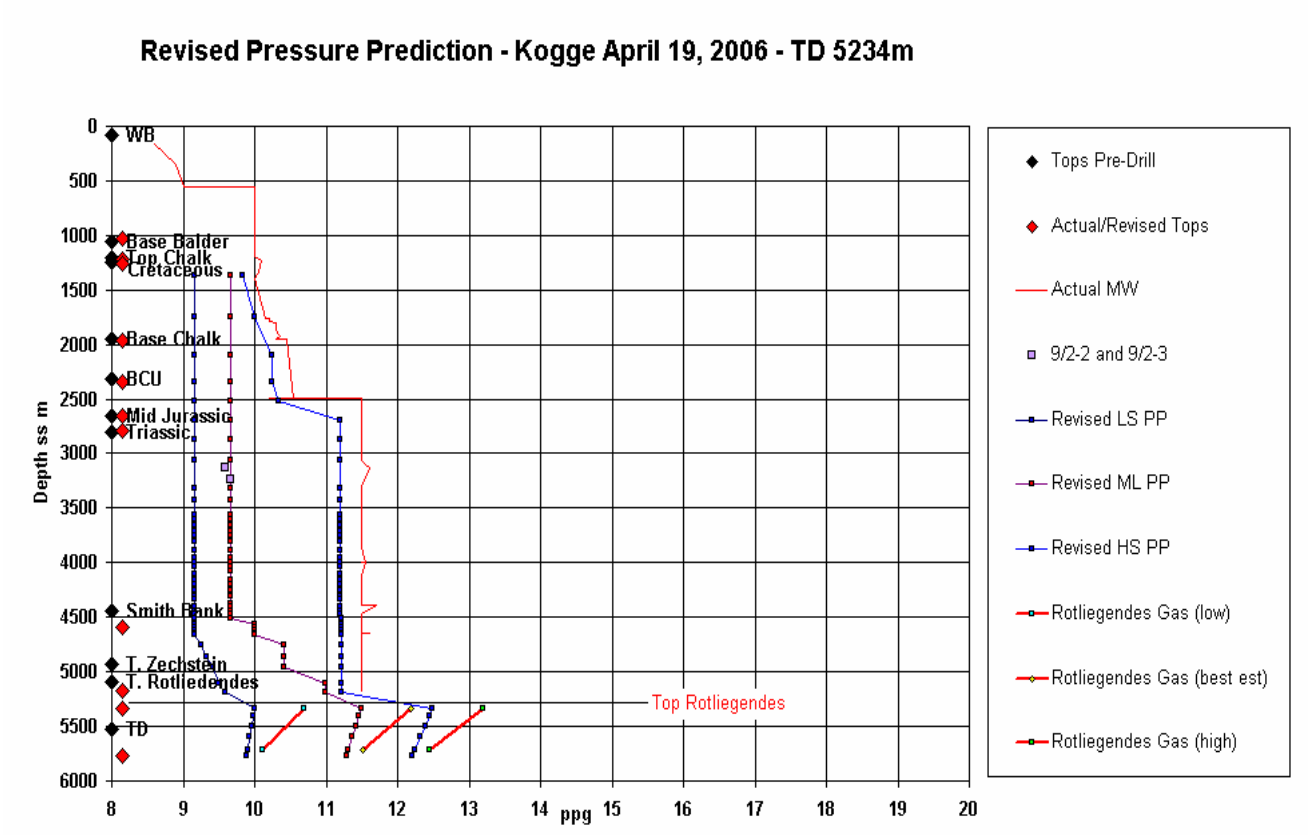


Figure 4.25 Kogge pore pressure prediction with updated prognosis for reservoir 300m deeper

Below the top Zechstein no accurate transformations of sonic/resistivity data for pore pressure estimates were expected due to lack of shales for analysis. The LWD Sonic would also be too far behind the bit to be of any help for accurate pressure prediction in the top Rotliegendes. The LWD sonic was laid out of the assembly for this reason, and the Drillworks Predict pore pressure expert was demobilized.

The 9 5/8" hole was drilled with a bicentered bit and gamma ray, resistivity and density-neutron into the top of the Rotliegendes to the core point. With the salt beds open in the lower part of the 12 ¼" hole below the 9 7/8" casing, it was decided to drill out the Zechstein section with 13 ppg mud to keep the salt from flowing. A 13 ppg mud would also be enough for the most likely gas column in the Rotliegendes, at the time estimated to be about 12.3 ppg. The well was drilled carefully through the Zechstein, watching the gas parameters. As no increase in gas was seen, the drilling continued with the 13 ppg mud.

Drilling continued into top Rotliegendes, which consisted of tight sandstone. One core was cut, and drilling continued with 13 ppg mud. In the Rotliegendes at 5352m, most likely pore pressure was estimated to be 11ppg with a 10-12ppg range. The drilling of the well was continued with several bit trips in very tight sandstones.

On 23 May 2006 a kick was taken at 5503mMDRT with 2 bbl pit gain while drilling with 13.6 ppg ECD mud weight. The well was flow checked, with additional 2.5bbl pit gain in 1 hour. The well was shut in and circulated bottoms up through the choke. No sign of gas or water influx was observed. No increase in casing pressure and pit gain was seen during circulation. Maximum bottoms up gas was 0.18%. Pressure was then bled off, the well opened and bottoms-up circulated twice with max gas of 0.38% and 0.05%. Drilling continued.

On May 24, a BOP test was due to be done. The mud weight was increased to 14 ppg at 5535mMDRT before pulling out of hole. After the wipertrip to the shoe and back to TD 1.3% gas was seen when circulating bottoms up, before pumping out of hole. The BOP test was done and it was decided to run back in with core barrel number two.

The core barrel was run in hole to the 9 5/8” casing shoe, and bottoms up was circulated and the gas reading was 0.42%. The BHA was then run in hole to TD and bottoms up was circulated again, and the gas was 0.86%.

On May 28, at 5535m, a decrease in mud weight from 14 ppg to 13.6ppg was observed due to water influx during coring. It was estimated a 8 bbls of pit gain in 10 hrs. The mud weight was increased to 14.5ppg to stop the water influx. When the core was coming out of hole, gas up to 0.15% was seen.

At 5551mMDRT the mud weight was raised to 14.5 ppg to keep the water from coming in, and further increased to 15 ppg at 5560m.

At 5650mMDRT the mud weight was increased further to 15.5ppg. At the start of the new bit run, the water influx was still continuing: 15-20 bbls per day, then 10bbls and then decreasing. Mud properties were being continually treated. There was some difficulty in pinning down exact volumes of water influx involved due to the fact that we were adding treated base oil to the system to counteract the water and estimates being made for factors such as evaporation rates, thermal expansion etc. The well was drilled to TD with the 15.5 ppg mud.

At the end of the RCI Straddle Packer logging at TD it was confirmed that the well was slightly underbalanced. The Rotliegendes pore pressure based on the RCI Straddle Packer was on the order of 16 ppg, measured at 5331 and 5568 mMDRT.

Figure 4.26 shows Kogge post-drill pore pressure prediction for Smith Bank and Rotliegendes. It includes the mud weight used, trip and connection gas and the two straddle packer points matching the pre-drill pressure estimate.

The top of the Rotliegendes had been drilled underbalanced. Due to the very tight formation the well did not give any indication of being underbalanced until the small salt water kick at 5503mMDRT was encountered, just before cutting core no 2. The two straddle packer points are shown as red squares at about 16 ppg, and the final pore pressure prediction has been adjusted to fit these points.

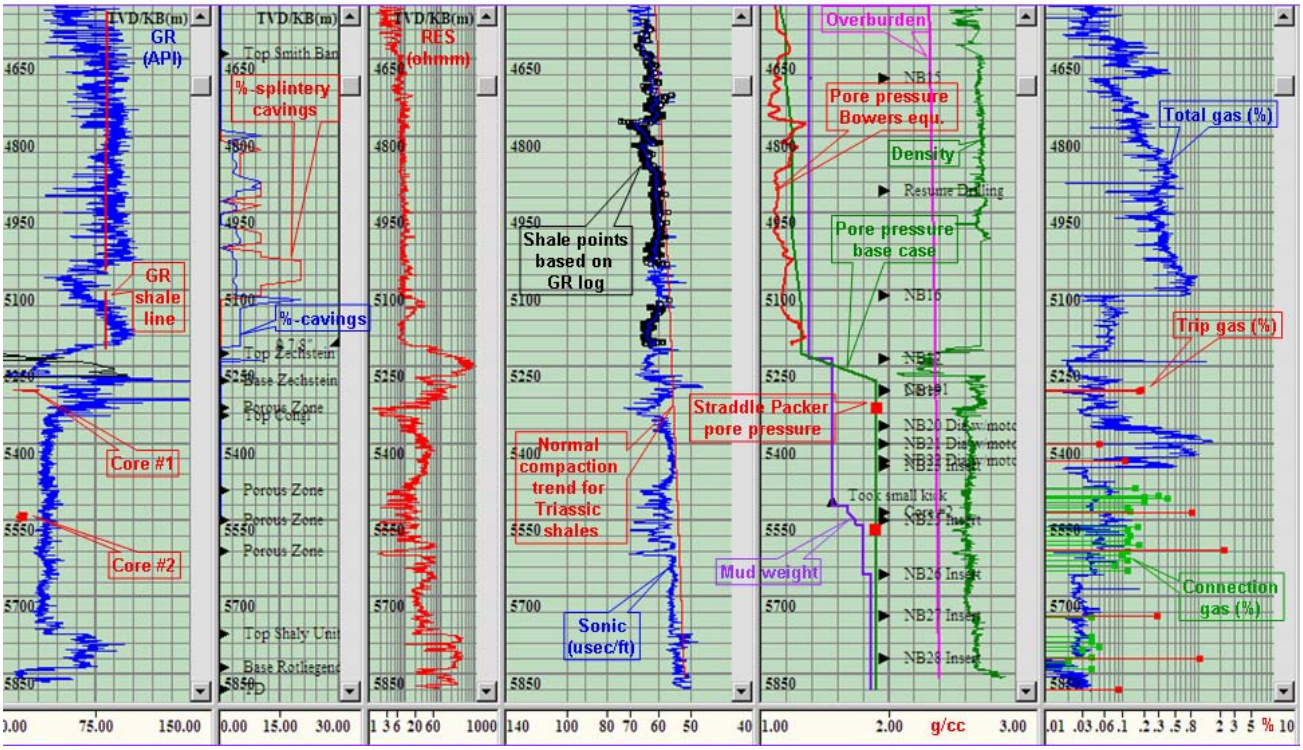


Figure 4.26 Kogge post-drill pore pressure prediction for Smith Bank and Rotliegendes

4.12 Earth Imager Structural Interpretation

For the structural interpretation performed by Eriksfiord AS, five planar dip types were distinguished (Table 4.16).

Dip Type	Interpretation
Plane parallel bedding (lamination)	Lamination, mostly of plane-parallel nature, but also showing minor-scale undulatory or irregular nature
Lithological or bed boundary	Relatively sharp boundary between two different lithological units
Erosional surface	Sharp bed boundary, which is clearly erosive into sub-stratum
Fracture	Planar anomaly, which is discordant to bedding. Probably represent natural fracture plane
Fault plane	Planar anomaly, discordant to bedding and associated with juxtaposition of different image facies types. May disturb adjacent bedding.

Table 4.16 Dip types used for the structural interpretation

Mean-values for lamination, fractures and faults were calculated (Table 4.17) for the individual lithological units derived from the log interpretation, using interactive stereograms and cluster analysis.

Lithological Unit	**Top Depth (m)**	**Bottom Depth (m)**	**Azimuth (°)**	**Dip (°)**	**Feature**
Zechstein1	5241.4	5243.1	266	49	lamination
Zechstein1	5246.3	5256.0	92	33	lamination
Halite	5262.5	5267.0	no data	no data	
Zechstein2	5268.0	5278.2	162	2	lamination
Rotliegendes Greybeds	5278.7	5321.6	118	4	lamination
Rotliegendes Redbeds	5347.8	5771.3	88	3	lamination
Rotliegendes Shaly Unit	5773.4	5833.0	236	35	lamination/ limb 1
Rotliegendes Shaly Unit	5780.6	5836.8	39	39	lamination/ limb 2
Volcanics	5838.2	5844.2	191	33	lamination
Volcanics	5846.6	5852.7	110	7	lamination
Volcanics	5854.6	5867.8	268	17	lamination
Rotliegendes Shaly Unit	5773.6	5834.6	253	55	fracture set 1
Rotliegendes Shaly Unit	5778.7	5829.9	68	50	fracture set 2
Rotliegendes-Shaly Unit	5823.3	5827.0	82	73	fault
Volcanics	5838.5	5865.3	13	47	fracture

Table 4.17 Means for lamination, fractures and faults of the different lithological units

The orientation of lamination and bed boundaries in the entire image interval is shown as a rose diagram in Figure 4.27. The results point to a weak predominance of easterly dip directions and slightly less northwesterly orientations. In general, dip angles are flat to moderately inclined, only few exceptions show steep orientations. However, these steep orientations are restricted to the deformed Shaly Unit of the Rotliegendes. The entire interval can be roughly subdivided into four sections, see Table 4.18.

A summary log of the dip interpretation can be found in Appendix III.

Interval	Unit	Top Depth (m)	Bottom Depth (m)	Description and azimuth/dip
Section 1	Zechstein1	5224	5262.5	lamination mean of 266°/49° in the upper part and 092°/33° below
Section 2	Zechstein2, Rotliegendes-Greybeds and Redbeds	5267	5772.5	lamination mean of 088°/03°
Section 3	Rotliegendes Shaly Unit and Upper Volcanics	5772.5	5846	two fold limbs 236°/35° and 038°/39°, and upper part of Volcanics with lamination mean 191°/33°
Section 4	Middle and lower part of Volcanics	5846	5882	lamination mean of 260°/04°

Table 4.18 Dip summary of Zechstein, Rotliegendes and pre-Rotliegendes sections

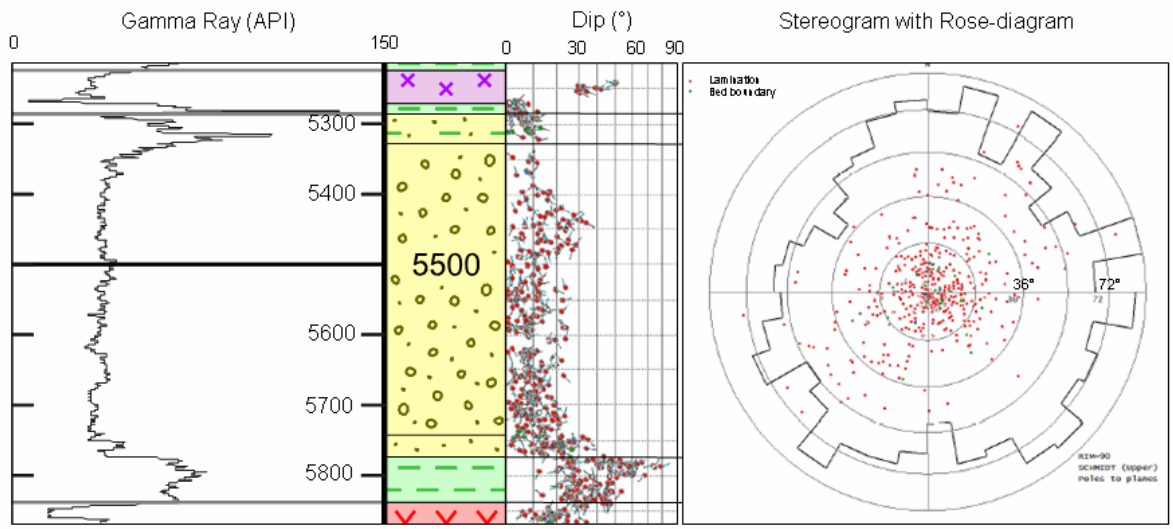


Figure 4.27 Stereogram with rose diagram and depth plot of all lamination and bed boundary dip picks

5 DRILLING HAZARDS

A 7 x 4km site survey was acquired over the area of the Kogge well location in December 2004 by Fugro Survey AS. The survey comprised single beam echo sounder, multibeam echo sounder, side scan sonar, sub-bottom profiler, deep tow sparker and 2D high resolution (2DHR) multi-channel seismic.

5.1 Seabed Conditions and Shallow Geology

The water depth at the planned well location was interpreted to be 77±1m, actual water depth was 77m. The seabed was interpreted to be essentially flat within an area of 500x500m of the well location (gradient < 0.1º). The seabed was interpreted to be covered with a veneer of fine/silty sand with shell fragments. Scattered outcrops of underlying dense sand was predicted. The near surface soils were expected to comprise predominantly dense sand. No obstructions were observed at the planned well location.

While drilling the 17 ½" by 42" hole from 120-209m, very hard boulders were drilled at 201-206mMDRT. When drilling the 26" hole, very slow drilling at 213-267 mMDRT, indicated layers of boulders.

5.2 Shallow Gas

Based on the interpretation of the site survey data no shallow gas was expected at the well location. No shallow gas was encountered while drilling the four wells on block 9/4 during 1968-77, and no shallow gas was observed while drilling the 9/4-5 well. No pilot hole was drilled in this well.

5.3 Hydrogen Sulfide (H_2S)

No H_2S was observed while drilling the Kogge 9/4-5 well. However, no fluid samples were recovered to surface in sample chambers. At the influx of water from 5503mMDRT and downwards to TD, no H_2S was observed. When the cores were pulled out, no H_2S was observed.

5.4 Carbon Dioxide (CO_2)

No pre-drill information on the carbon dioxide (CO_2) level for the Norwegian-Danish Basin was available as there were no Rotliegendes discoveries in the area. Based on data from the Southern Permian Basin, the CO_2 content is generally below 5%, however, anomalies with high CO_2 is occasionally present. In the event that the Kogge well would turn out as a gas discovery, the CO_2 content was expected to be low and below 5%.

The Kogge well was dry, but had high CO_2 content in samples from sealed cans and gas bags collected at the gas trap. In the canned cutting samples from the lower part of the Rotliegendes there were more than 90% CO_2 and less than 10% hydrocarbon gas.

5.5 Saltwater Influx

Pre-drill formation pressure in the Rotliegendes was expected to be in the 10.4-13.7 ppg range, and the well was drilled with 13 ppg at the top of the reservoir. After core no 1 had been cut and during drilling at 5503mMDRT with a 13 ppg mud weight, a saltwater kick was taken. The ECD was 13.7 ppg.

During drilling the mud weight was gradually increased to 15.5 ppg to stop the salt water influx into the well. The salt water was contaminating the mud, making it too saline and lighter. Due to very low permeability, the amount of water influx into the well was very low.

However, at the end of the RCI Straddle Packer logging, it was confirmed that the well was drilled slightly underbalanced. The Rotliegendes pore pressure based on the RCI Straddle Packer was in the order of 16 ppg.

Details on water influx are taken from the MI Drilling Fluid report. It is difficult to estimate how much water influx was encountered due to evaporation from the mud system at the same time. Table 5.1 shows mud weights, estimated water influx and mud treatment during drilling. A short summary is described here:

At 5503mMDRT the influx was estimated to be 2 bbls. The kick was circulated out, no gas was seen, but saltwater contamination of the mud from bottoms up was evident. The mud weight was increased to 14 ppg, and drilling continued to 5535mMDRT, where the bit was pulled for a BOP test.

At 5535mMDRT it was decided to run a second core barrel. When circulating bottoms up at the shoe, mud weights at 13.6ppg were observed and water contamination of the system was again evident. The tight spots were reamed through and the bit was run to TD without problems. Bottoms-up was circulated and light mud weight was observed due to salt water contamination. It was estimated that 6 bbls of water influx into mud system had occurred during the trip.

The mud system was weighted up to 14.5 ppg to stop further water influx to the well. Core no 2 was cut from 5535mMDRT. The core jammed at 5551mMDRT. The hole was circulated clean before pulling out of hole. The core was recovered.

A new conventional insert (button) bit with smaller teeth was run. Bottoms-up was circulated at shoe and a 3 - 4% increase in water fraction was observed with a mud weight of 14.4 ppg. When reaming in through a tight spot at 5262-70m, the pipe became stuck and had to be jarred free. The tight spot was reamed and running into hole continued. The well was reamed down from 5450m to TD. The well was circulated and the mud

conditioned to lower the rheology (high due to water influx with +/-40 bbl calculated water influx during trip).

The well was drilled ahead to 5557mMDRT, where the mud weight was weighted up to 15.0 ppg as a new pore pressure prognosis indicated a pore pressure of 14.5 ppg. Drilling continued to 5609mMDRT where the bit was pulled to the casing shoe to work on the top drive. A volume increase of 6 bbl was seen while working on the top drive although the water and chlorides content of the bottoms up sample showed a slight decrease rather than an increase as would be expected.

Drilling proceeded to 5655mMDRT where a trip was made to change the bit and BHA. The mud was weighted up to 15.5 ppg after circulating bottoms up. A new BHA and button bit was run. When circulating bottoms up after the trip the OWR dropped from 82/18 to 80/20, indicating an apparent influx of 25 bbl to the well.

Drilling proceeded with evidence of small decreasing flows of water from the formation (<10 bbl/day). At 5736mMDRT the string was pulled to change the bit and test BOPs. No significant influx of water was seen on the trip, although the OWR of the mud from bottoms up at the shoe was slightly lower than the active system (80/20 vs. 82/18 for the rest of the system).

New hole was drilled to 5820m without any problems other than slow drilling. The hole was circulated clean and POOH to change bit. The bit was changed and RIH, and a tight spot at 5233mMDRT was reamed through. The bit was run to bottom and drilling was continued to TD of the well at 5881mMDRT.

DATE	Depth (ft)	Depth (mMD RT)	MW (ppg)	Cl (mg/l)	OWR	Operations	Mud Treatment
19.05			13	230400	85/15	test bop, rih impreg, drill, pooh	treatment
20.05	17866	5446	13	226100	85/15	pooh, rih	no treatment
21.05	17898	5455	13	230400	85/15	rih, drill	treatment
22.05	17964	5475	13	236400	85/15	drill	treatment
23.05	18054	5503	13			2 bbls plus 2.5 bbls pit gain	
24.05	18090	5514	14	259100	85/15	drill, incr MW=14, water influx	higher Cl, treat
25.05	18160	5535	14	271300	84/16	wiper trip, slip & cut	treatment
26.05	18160	5535	14	262500	83/17	rih, cbu, pooh, test bop	no treatment
27.05	18160	5535	14	258300	83/17	test bop, rih coring	no treatment
28.05	18183	5542	14	248100	81/19	coring	10bbl water inflow, mw dropped to 13.6, treatment with rich premix
29.05	18211	5551	14.5	257100	80/20	coring to 18211, pooh, weighup to 14.5 to counter water influx	weighup
30.05	18211	5551	14.5	257100	80/20	pooh	no treatment
31.05	18211	5551	14.5	259300	81/19	mu bha, rih	treatment
01.06	18234	5558	15	234500	80/20	drill to 18234	treatment, incr mw to 15ppg, 3% incr in water from retort
02.06	18321	5584	15	259300	80/20	drilling	treatment to improve owr

03.06	18401	5609	15	276900	81/19	drilling	treatment to improve owr, small response in owr, indicates water influx at least equal rate of evaporation 9-10bbl/24hr
04.06	18430	5617	15	241400	79/21	drilled to 18404, pooh to repair TDS, rih, drilled to 18430, 6 bbl gain while working TDS	ES=640mV on cbu, mw=14.9, weigh up to 15, treat to improve owr. Water influx
05.06	18506	5641	15	274100	81/19	drilling	water influx about 15 bbl, treatment
06.06	18554	5655	15	304000	81/19	drill, cub, pooh	10 bbl water influx, weighup to 15.5
07.06	18554	5655	15.5	304000	81/19	cbu, pooh	no treatment
08.06	18554	5655	15.5	288900	80/20	mu bha, rih	at bottoms up, ES=743, mw=15.3, owr decreased from 82/18 to 80/20, approx 25 bbl water into active pit
09.06	18590	5666	15.5	250000	82/18	rih, drilled to 18590	treatment, approx 15bbl water influx
10.06	18668	5690	15.5	250000	82/18	drilling	bleed from slop pit to active to counter evaporation
11.06	18752	5716	15.5	281800	83/17	drilling	add slops to maintain MW due to evaporation, approx 10 bbl influx
12.06	18818	5736	15.5	241700	82/18	drilling, pooh for bop test	bled in slop to control mw drop due to evaporation
13.06	18818	5736	15.5	260900	83/17	washed to td, pooh, bop test	no treatment
14.06	18818	5736	15.5	260900	83/17	bop test, rih	no treatment
15.06	18837	5742	15.5	240000	81/19	rih, drilled	Treatment
16.06	18891	5758	15.5	252200	83/17	drilling	Treatment
17.06	18958	5778	15.5	237500	82/18	drilling	added premix, no treatment
18.06	19039	5803	15.5	247800	83/17	drilling	treatment
19.06	19096	5820	15.5	247800	83/17	drilling, increased flowout, shutin & check	added premix, no treatment
20.06	19096	5820	15.5	252200	83/17	cbu, pooh	treatment
21.06	19096	5820	15.5	252200	83/17	pooh, mu & rih	no treatment
22.06	19170	5843	15.5	288400	84/16	rih, drilled	no treatment
23.06	19275	5875	15.5	271400	84/16	drilling	treatment
24.06	19295	5881	15.5	280000	85/15	drilled to TD, cbu, pooh	no treatment
25.06	19295	5881	15.5	280000	85/15	pooh	no treatment
26.06	19295	5881	15.5	273200	85/15	wireline	no treatment
27.06	19295	5881	15.5	269000	84/16	wireline	no treatment
28.06	19295	5881	15.5	269000	84/16	test bop, rih wiper trip	no treatment
29.06	19295	5881	15.5	257800	83/17	rih, cbu, pooh	water increased from 10.5-12% while logging, MW=15.2, treatment
30.06	19295	5881	15.5	257800	83/17	pooh, rih wireline	no treatment
01.07	19295	5881	15.5	257800	83/17	logging	no treatment
02.07	19295	5881	15.5	257800	83/17	logging	no treatment
03.07	19295	5881	15.5	257800	83/17	logging	no treatment
04.07	19295	5881	15.5	257800	83/17	logging, rih wipertrip	no treatment

05.07	19295	5881	15.5	263800	84/16	rih , cbu	treatment
06.07	19295	5881	15.5	263800	84/16	lost log tool, prepare for fishing	no treatment
07.07	19295	5881	15.5	265500	84/16	fishing	treatment
08.07	19295	5881	15.5	265500	84/16	pooh, prepare for p&A	backload
09.07	19295	5881	15.5	225800	83/17	p&a	backload

Table 5.1 Water influx summary and mud weights

5.6 Halite – Mobile Halite

Thin layers of halite were encountered towards the base of the 12 ¼” hole. Towards the base of the Zechstein in the 9 7/8” hole a five meters thick halite bed was encountered. On several bit trips in and out of the hole, the halite was seen slowly moving into the well, giving some problems running into the well and when pulling out of hole. Most of the times this interval was reamed through. The BHA was stuck in the halite once for more than one hour before it was worked free.

6 GEOPHYSICS

6.1 Acoustic and Density Logs

Sonic and density data were obtained in the 12 ¼" and 8 ½" sections of this well (from 2536mMDRT down to 5878mMDRT and 5857mMDRT, respectively). Figure 6.1 shows these two logs in addition to a synthetic trace and 2D seismic data at the well location. As shown on this figure, a few intervals are missing sonic or density data due to failure of these tools.

6.2 Checkshot Survey

A conventional rig sourced vertical check-shot survey was acquired at TD in this well. The survey was acquired by Baker Atlas and processed by Baker Hughes (VSFusion). Separate field (acquisition) and processing reports were produced by the contractors for these services.

The survey used dual-level ASR receiver tool string and one 150cu inch sleeve airgun as source (5m below sea level). The plan was to have three 150 cu inch sleeve airguns in a cluster, but due to a misunderstanding, this configuration was not available at the well site when the acquisition started. The survey plan was to acquire reliable checkshot times (at least 3 good repeatable shots) at intervals of no greater than 500m down to 2700m and no greater than 200m from 2700m to TD.

A few checkshot levels were acquired on the way into the hole. This was done for QC purposes and to secure a minimum of information in case the equipment got stuck in the halite around 5260mMDRT. The tool was run to TD of the hole, and the main program started. At 4780mMDRT, on the way out of the hole, the recorded seismograms became corrupted, due to too much noise at the receiver levels, and the survey was abandoned for the remaining levels. The checkshot data recorded on the way into the well was therefore included in the data processing. Total number of levels with useable checkshot data recorded is therefore limited. The quality of the checkshot data is fair.

6.3 Tie of Well Logs to Seismic Data

Figures 6.1 and 6.2 show some logs and a synthetic seismogram (based on a 20Hz Ricker wavelet) tying the seismic data to Middle Jurassic, Triassic and Permian. A 7msec time shift was applied between the checkshot TWT and the seismic TWT. This gave a fair tie at Top Middle Jurassic, Top Smith Bank and Base Zechstein levels, but a poor tie of the Upper Triassic section. The mistie in Upper Triassic is difficult to explain. Part of the mistie in the deeper part of Triassic, with structural dips between 5 and 10 degrees, could be due to 2D effects, like reflections coming from out of the plane and wrong migration of the data. However, the overall seismic tie is relative good, and gives confidence that the main stratigraphic formations are tied correctly to the 2D seismic line.

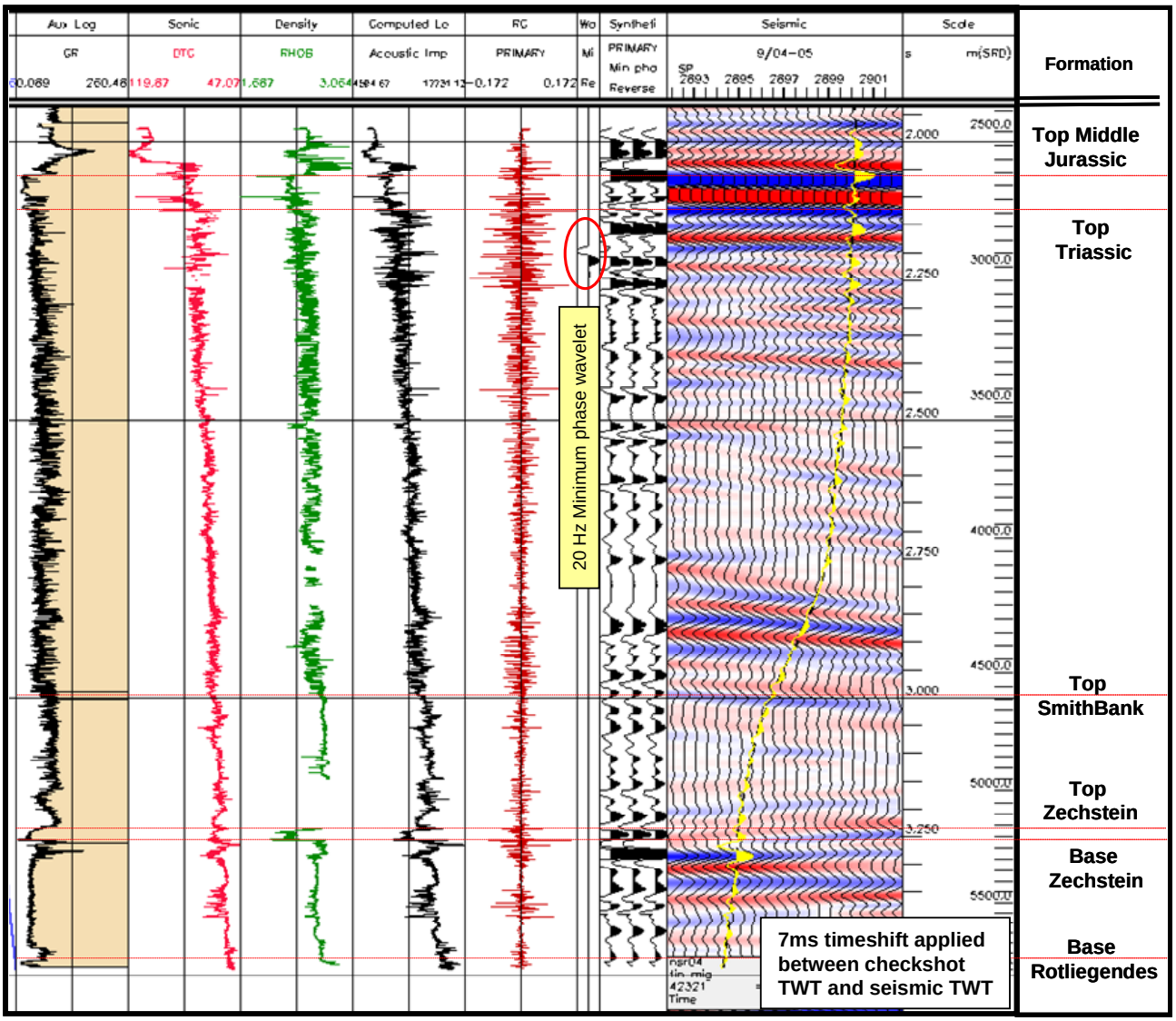


Figure 6.1 Well logs, synthetic seismogram and seismic tie of well 9/4-5 (Kogge)

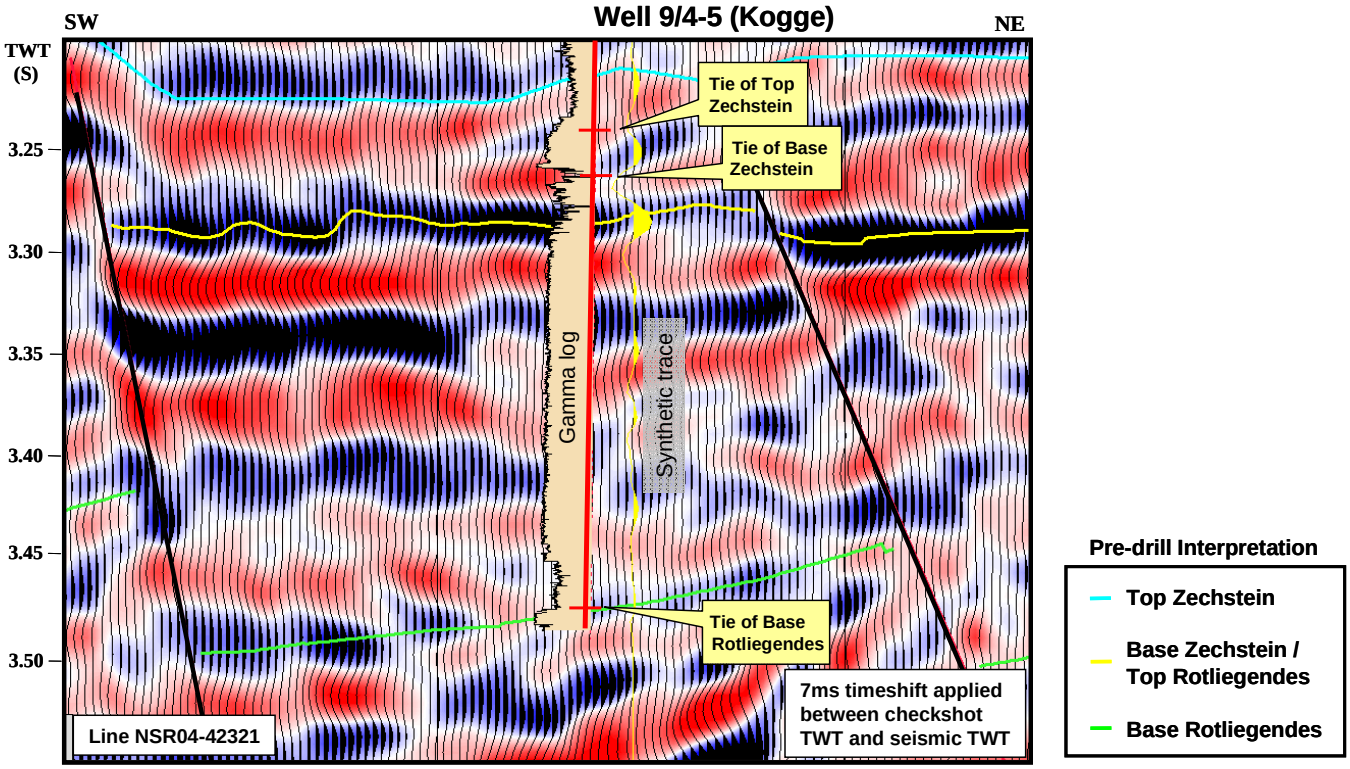


Figure 6.2 Seismic tie of well 9/4-5 (Kogge)

7 STANDARD AND SPECIAL STUDIES

7.1 List of Reports

- Preliminary Site Clearance for Soil Boring, ExxonMobil, Jan 2005
- Rapport Grunnboringsoperasjoner, G. Hodnefjell, Feb 2005
- Geohazard Report, Fugro Survey AS, Feb 2005
- Operations Report Kogge 2005, Geotechnical Site Investigation, Fugro Ltd, Apr 2005
- Shallow Drilling Hazard Evaluation, ExxonMobil, May 2005
- Site Survey, Fugro Survey AS, June 2005
- Geotechnical Report Soil Parameters and Engineering, Fugro Ltd, July 2005
- Realtime Geopressure Analysis, Knowledge Systems Drillworks Services, May 2006
- Borehole Seismic Report, VsFusion, 2006
- Quality Control for Checkshot Survey, RPS Energy, July 2006
- Triaxial Test of a Sample, Reslab, June 2006
- Triaxial Tests of Two Samples from Core No. 2, Reslab, Aug 2006
- Core Photographs Images of A-cut & 3/4-cut Core, Reslab, Oct 2006
- Cementing Post Well Report, Halliburton, Oct 2006
- Biostratigraphy of the interval 625-5881m, Fugro Robertson Ltd, Dec 2006
- Final Well Report, ExxonMobil, Oct 2006
- MWD End of Well Report, Pathfinder, Oct 2006
- End of Well Report MWD and Directional Drilling, Baker Hughes Inteq, Sep 2006
- End of Well Report, Surface Data Logging, Halliburton, Sept 2006
- Geochemical analysis, Applied Petroleum Technologies AS, Jan 2007
- Conventional Core Analysis, Reslab
- Mineralogical Analysis of Tuff Samples, University of Oslo
- Petrographic thin section study, Gudrun Berchelmann

Appendix I

Cuttings Sample Descriptions

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
2020	616	100 Tr	CLAYSTONE: olive grey, occasionally light olive grey, very soft, amorphous, very silty, grading to SILTSTONE, non calcareous, abundant glauconite. SAND: quartz, loose, unconsolidated, colourless, very fine, sub angular.
2050	625	100 Sl Tr	CLAYSTONE: olive grey, occasionally light olive grey, very soft, amorphous, very silty, grading to SILTSTONE, non calcareous, abundant glauconite. SAND: quartz, loose, unconsolidated, colourless, very fine, sub angular.
2080	634	100	CLAYSTONE: olive grey, occasionally light olive grey, very soft, amorphous, very silty, grading to SILTSTONE, non calcareous, good trace glauconite.
2110	643	100	CLAYSTONE: olive grey to brownish grey, soft, amorphous, moderately silty, non calcareous, good trace glauconite. SAND: quartz, loose, unconsolidated, colourless, very fine, sub angular.
2140	652	100	CLAYSTONE: olive grey to brownish grey, rarely dark greenish grey, soft, amorphous, moderately silty, non calcareous, glauconitic.
2170	661	100 RTr	CLAYSTONE: olive grey to brownish grey, rarely dark greenish grey, soft, amorphous, moderately silty, non calcareous, glauconitic. LIMESTONE: brownish grey, hard, brittle, blocky to angular, cryptocrystalline, argillaceous.
2200	670	100	CLAYSTONE: brownish grey to olive grey, soft, amorphous, silty, sandy, common glauconite, trace pyrite
2260	689	100	CLAYSTONE: brownish grey to olive grey, soft, amorphous, silty, sandy, common glauconite, trace pyrite
2290	698	100	CLAYSTONE: brownish grey to olive grey, light olive grey, soft, amorphous, silty, sandy, common glauconite, trace mica.
2350	720	100	CLAYSTONE: brownish grey to olive grey, light olive grey, soft, amorphous, silty, sandy, glauconitic, trace mica.
2380	728	100	CLAYSTONE: brownish grey to olive grey, soft, amorphous, very silty, very sandy, grading to argillaceous SANDSTONE, glauconitic, trace mica, trace coarse well rounded sand grains.
2440	743	100	CLAYSTONE: brownish grey, olive grey, light olive grey, very soft, amorphous, very silty and sandy, grading to argillaceous SILTSTONE, glauconitic, good trace mica.
2470	752	100	CLAYSTONE: brownish grey to olive grey, rarely yellowish brown, very soft, amorphous, silty, sandy, commonly micaceous and glauconitic, moderately to slightly calcareous.
2530	771	100	CLAYSTONE: olive grey, olive black, soft to moderately firm, amorphous to blocky, very silty – sandy, common glauconite nodules, micaceous, moderately calcareous.
2560	780	100	CLAYSTONE: olive grey to olive black, soft to moderately firm, amorphous to blocky, silty, very sandy, occasional coarse grains, abundant glauconite, common pyrite, moderately calcareous.
2590	790	100	CLAYSTONE: olive grey to olive black, soft to moderately firm, amorphous to blocky, silty, very sandy, occasional coarse grains, abundant glauconite, common pyrite, moderately calcareous.
2620	800	80 20	CLAYSTONE: olive grey to olive black, soft to moderately firm, amorphous to blocky, silty, very sandy, occasional coarse grains, abundant glauconite, common pyrite, moderately calcareous. SANDSTONE: quartz, loose, unconsolidated, colourless, fine to very coarse, sub angular to sub rounded poor sorting.
2650	810	100	CLAYSTONE: olive grey to olive black, soft to moderately firm, amorphous to blocky, silty, very sandy, occasional coarse grains, abundant glauconite, common pyrite, moderately calcareous.
2710	828	100	CLAYSTONE: olive grey to olive black, soft, amorphous, very sandy, grading to argillaceous SANDSTONE, abundant glauconite, loose sand very fine to medium, angular to sub rounded, slightly calcareous.
2740	835	100	CLAYSTONE: olive grey to olive black, soft, amorphous, very sandy, grading to argillaceous SANDSTONE, abundant glauconite, loose sand very fine to medium, angular to sub rounded, slightly calcareous.
2800	854	100	CLAYSTONE: olive grey to olive black, soft, amorphous to sub-blocky, slightly calcareous, very silty and sandy, grading to argillaceous SILTSTONE, common glauconite, mica and pyrite.
2830	863	100	CLAYSTONE: olive grey to olive black, soft, amorphous to sub-blocky, slightly calcareous, very silty and sandy, grading to argillaceous SILTSTONE, common glauconite, mica and pyrite.
2890	880	100	CLAYSTONE: olive grey to olive black, soft, amorphous to sub-blocky, slightly calcareous, very silty and sandy, grading to argillaceous SILTSTONE, common glauconite, mica and pyrite.
2920	890	100	CLAYSTONE: olive grey to olive black, soft, amorphous, very silty and sandy, grading to argillaceous SANDSTONE, common glauconite, mica and pyrite, slightly calcareous.
2950	900	100	CLAYSTONE: olive grey to olive black, soft, amorphous, very silty and sandy, common glauconite, mica, trace pyrite.
2980	908	100	CLAYSTONE: olive grey to olive black, soft, amorphous, very silty and sandy, common glauconite, mica, trace pyrite.
3040	926	100	CLAYSTONE: olive grey to olive black, soft, amorphous, very silty and sandy grading to SANDSTONE, very argillaceous, common glauconite and mica.
3070	935	100	CLAYSTONE: olive grey olive black, occasionally dark greenish grey, very soft, amorphous, micaceous, glauconitic, very sandy, grading to sandstone, occasional trace very coarse sand grains.
3100	945	60 40	CLAYSTONE: olive grey olive black, occasionally dark greenish grey, very soft, amorphous, micaceous, glauconitic, very sandy, grading to sandstone, occasional trace very coarse sand grains. LIMESTONE: very light grey, speckled green, soft, amorphous to blocky, argillaceous, glauconitic.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
3130	954	90 10	LIMESTONE: very light grey, speckled green, soft, amorphous to blocky, argillaceous, glauconitic. CLAYSTONE: olive grey olive black, occasionally dark greenish grey, very soft, amorphous, micaceous, glauconitic, very sandy, grading to sandstone, occasional trace very coarse sand grains.
3160	963	100	LIMESTONE: very light grey, speckled green, soft, amorphous to blocky, argillaceous, glauconitic.
3190	972	100	LIMESTONE: very light grey to light grey to light grey green, soft, amorphous, silty, argillaceous, glauconitic, occasionally micaceous.
3220	980	100	CLAYSTONE: green grey speckled, soft, blocky to amorphous, very glauconitic.
3250	990	100	CLAYSTONE: green grey speckled, soft, blocky to amorphous, very glauconitic.
3280	999	100	CLAYSTONE: green grey speckled, soft, blocky to amorphous, very glauconitic.
3310	1008	100	LIMESTONE: very light grey green, soft, amorphous to blocky, very argillaceous, glauconitic.
3370	1027	100	CLAYSTONE: green grey speckled, soft, blocky to amorphous, very glauconitic.
3400	1036	100	CLAYSTONE: green grey to dark green grey, soft to slightly firm, blocky, calcareous, glauconitic. Trace of olive grey olive black Claystone, blocky firm non calcareous.
3430	1045	100	CLAYSTONE: green grey to dark green grey, soft to slightly firm, blocky, calcareous, glauconitic. Trace of olive grey olive black Claystone, blocky firm non calcareous.
3490	1063	100	CLAYSTONE: grey green to light grey green, firm, blocky to sub blocky, slightly to moderately calcareous, glauconitic. Minor Dark olive grey to olive black Claystone.
3520	1072	100	CLAYSTONE: varicoloured, light grey green olive grey, yellow brown, blocky, sub fissile, firm, slightly calcareous.
3550	1082	100	CLAYSTONE: varicoloured, light grey green olive grey, yellow brown, blocky, sub fissile, firm, slightly to non-calcareous.
3580	1091	100	CLAYSTONE: medium to dark grey to dark greenish grey, soft to firm, amorphous, occasionally firm to moderately hard, blocky, predominantly non calcareous, locally slightly dolomitic.
3610	1100	60 40	CLAYSTONE: medium to dark grey to dark greenish grey, soft to firm, amorphous, occasionally firm to moderately hard, blocky, predominantly non calcareous, locally slightly dolomitic. TUFF: light to dark grey, speckled, moderately hard, blocky to crumbly, non calcareous.
3640	1109	70 30	CLAYSTONE: medium to dark grey to dark greenish grey, occasionally light to medium grey, soft to firm, amorphous, occasionally firm to moderately hard, blocky, predominantly non calcareous, locally slightly dolomitic. TUFF: light to dark grey, speckled, moderately hard, blocky to crumbly, non calcareous.
3670	1118	100	CLAYSTONE: light to medium grey to greenish grey, brownish grey, soft to occasionally firm, amorphous, silty, very glauconitic, non calcareous, locally slightly dolomitic.
3700	1128	100 Gd Tr	CLAYSTONE: brownish grey to olive grey, occasionally greenish grey, soft to occasionally firm, amorphous, non calcareous. TUFF: light to dark grey, speckled, moderately hard, blocky to crumbly, non calcareous.
3730	1137	100	CLAYSTONE: olive grey to dark greenish grey, soft to occasionally firm, amorphous, silty, very glauconitic, non calcareous, non to very slightly dolomitic.
3760	1146	100	CLAYSTONE: olive grey to dark greenish grey, soft to occasionally firm, amorphous, silty, very glauconitic, non calcareous, non to very slightly dolomitic.
3790	1155	100	CLAYSTONE: olive grey to dark greenish grey, soft to occasionally firm, amorphous, silty, very glauconitic, non calcareous, non to very slightly dolomitic.
		Tr	LIMESTONE: light olive grey, firm to occasionally moderately hard, blocky to crumbly, argillaceous, glauconitic.
3850	1173	100	CLAYSTONE: olive grey to dark greenish grey, soft to occasionally firm, silty with traces of very fine sand, good traces of glauconite
3880	1183	100 RTr	CLAYSTONE: olive grey to brownish grey, occasionally dark greenish grey, soft to firm, amorphous, occasionally firm, blocky, non silty, non calcareous. LIMESTONE: light olive grey, firm to occasionally moderately hard, blocky to crumbly, argillaceous, glauconitic.
3910	1192	100 R Tr	CLAYSTONE: olive grey to greenish grey, occasionally brownish grey, medium to dark grey, soft amorphous, occasionally firm, blocky, non silty, locally glauconitic. SANDSTONE: quartz, loose, unconsolidated, colourless, transparent, fine to medium, sub rounded.
3970	1210	100	CLAYSTONE: light grey to light olive grey to olive grey, soft, amorphous, moderate to very calcareous, grading in part to argillaceous LIMESTONE.
4000	1219	100	CLAYSTONE: light grey, soft, amorphous, occasionally firm, non silty, very calcareous, grading to argillaceous LIMESTONE.
4030	1228	100	CLAYSTONE: light grey, soft, amorphous, occasionally firm, non silty, very calcareous, grading to argillaceous LIMESTONE.
4060	1237	70 30	CLAYSTONE: light grey, soft, amorphous, occasionally firm, non silty, very calcareous, grading to argillaceous LIMESTONE. LIMESTONE: white to very light grey, soft, amorphous, locally very slightly argillaceous.
4090	1247	80 20	CLAYSTONE: light grey, soft, amorphous, occasionally firm, non silty, very calcareous, grading to argillaceous LIMESTONE. LIMESTONE: white to very light grey, soft, amorphous, locally very slightly argillaceous.
4120	1256	50 50	CLAYSTONE: very light grey to light grey, soft, amorphous, very calcareous, grading to argillaceous LIMESTONE. LIMESTONE: white, soft, amorphous.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
4150	1265	20 70 10	CLAYSTONE: very light grey to light grey, soft, amorphous, very calcareous, grading to argillaceous LIMESTONE. LIMESTONE: white, soft, amorphous. CHERT: colourless to pale yellowish grey, translucent to occasionally transparent, very hard, very angular.
4180	1274		
4210	1283	90 10	LIMESTONE: white, soft to firm, amorphous, locally firm to hard, blocky. CHERT: pale yellow grey translucent, very hard, very angular.
4240	1292	100 TR	LIMESTONE: white, rare very light grey, soft to firm, amorphous, locally firm to hard, blocky, rarely glauconitic, good trace CHERT : light translucent grey to translucent yellow.. Trace CLAYSTONE: medium dark grey dark green grey, firm, blocky, glauconitic, micaceous.
4270	1301	100 TR TR	LIMESTONE: white, firm to soft locally hard, blocky. CHERT: light translucent grey. CLAYSTONE: medium dark grey dark green grey, firm blocky glauconitic, micaceous.
4300	1310	100 TR TR	LIMESTONE: white, firm to soft locally hard, blocky. CLAYSTONE: dark green grey, firm, blocky, glauconitic. CHERT: light translucent grey, very angular.
4330	1320	100 TR TR	LIMESTONE: white, firm to soft locally hard, blocky. CLAYSTONE: dark green grey to green black, firm, blocky, glauconitic. CHERT: light translucent grey, very angular.
4360	1329	100 Gd Tr	LIMESTONE: white, firm to soft locally hard, blocky. CHERT: light translucent grey, very angular.
4390	1338	100 Gd Tr	LIMESTONE: white, firm to soft locally hard, blocky. CHERT: light translucent grey, very angular.
4420	1347	100 Gd Tr	LIMESTONE: white, soft to firm, amorphous, occasionally moderately hard, blocky to crumbly. CHERT: colourless to yellowy grey, occasionally white, very hard, very angular shards.
4450	1356	100 Tr	LIMESTONE: white, soft to firm, amorphous, occasionally moderately hard, blocky to crumbly. CHERT: colourless to yellowy grey, occasionally white, very hard, very angular shards.
4480	1365	100 RTr	LIMESTONE: white, soft to firm, amorphous, occasionally moderately hard to hard, brittle, blocky, microcrystalline. CHERT: yellowy grey to white, translucent, very angular.
4510	1375	100	LIMESTONE: white, soft to firm, amorphous, occasionally moderately hard to hard, brittle, blocky, microcrystalline.
4540	1384	100	LIMESTONE: white, soft to firm, amorphous, locally firm to moderately hard, blocky to crumbly
4570	1393	100	LIMESTONE: white, soft to firm, amorphous, locally firm to moderately hard, blocky to crumbly
4600	1402	100	LIMESTONE: white, soft to firm, amorphous, locally firm to moderately hard, blocky to crumbly
4630	1411	100	LIMESTONE: white, soft to occasionally firm, amorphous.
4660	1420	100	LIMESTONE: white, soft to occasionally firm, amorphous.
4690	1429	100	LIMESTONE: white, predominantly soft to firm, amorphous, occasionally firm to moderately hard, blocky.
4720	1439	100	LIMESTONE: white, predominantly soft to firm, amorphous, occasionally firm to moderately hard, blocky.
4750	1448	100	LIMESTONE: white, predominantly soft to firm, amorphous, occasionally firm to moderately hard, blocky
4810	1466	100	LIMESTONE: white, predominantly soft to firm, amorphous, occasionally firm to moderately hard, blocky.
4840	1475	100	LIMESTONE: white, predominantly soft to firm, amorphous, occasionally firm to moderately hard, blocky.
4870	1484	100	LIMESTONE: white, soft to firm, amorphous to occasionally blocky, rarely firm to moderately hard, blocky.
4900	1493	100	LIMESTONE: white, soft to firm, amorphous to occasionally blocky, rarely firm to moderately hard, blocky. CHERT: (very rare trace): colourless to very pale grey, translucent.
4930	1503	100	LIMESTONE: white, soft to firm, amorphous to occasionally blocky, rarely firm to moderately hard, blocky. CHERT: (very rare trace): colourless to very pale grey, translucent.
4960	1512	100	LIMESTONE: white, soft to firm, amorphous, occasionally firm to moderately hard, blocky.
4990	1521	100	LIMESTONE: white, soft to firm, amorphous, occasionally firm to moderately hard, blocky.
5020	1530	100	LIMESTONE: white, soft to firm, amorphous, occasionally firm to moderately hard, blocky.
5050	1539	100	LIMESTONE: white, soft to friable to firm, amorphous, blocky,
5080	1548	100	LIMESTONE: white, soft to friable to firm, amorphous, blocky,
5110	1557	100	LIMESTONE: white, friable to firm, rare hard, blocky to amorphous, very rare CHERT.
5140	1567	100	LIMESTONE: white, friable to firm, rare hard, blocky to amorphous. Trace of CLAYSTONE: light grey to light grey green
5170	1576	100	LIMESTONE: white, friable to firm, rare hard, blocky to amorphous.
5200	1585	100	LIMESTONE: white rare very light grey, friable to firm, amorphous. Minor laminae of CLAYSTONE: light grey to light grey green, soft, calcareous.
5230	1594	100 TR	LIMESTONE: white rare very light grey, friable to firm, amorphous. CLAYSTONE: light grey to light grey green, soft, calcareous.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
5260	1603	100	LIMESTONE: white, rare very light grey, friable to firm, amorphous.
5290	1612	100	LIMESTONE: white, rare very light grey, friable to firm, amorphous.
5320	1621	100	LIMESTONE: white, rare very light grey, soft to friable, amorphous, blocky.
5350	1630	100	LIMESTONE: white, rare very light grey, soft to friable to firm, amorphous to blocky. Minor laminae of CLAYSTONE: light grey, soft.
5380	1640	100	LIMESTONE: white, rare very light grey, soft to friable, amorphous, blocky.
5410	1648	100	LIMESTONE: white, rare very light grey, soft to friable, amorphous, blocky.
5440	1659	100	LIMESTONE: white, rare very light grey, soft to friable to firm, amorphous to blocky. Rare laminae of CLAYSTONE: light grey, soft.
5470	1667	100	LIMESTONE: white, rare very light grey, soft to friable, amorphous, blocky.
5500	1676	100	LIMESTONE: white, rare very light grey, soft to friable, amorphous, blocky.
5530	1685	100	LIMESTONE: white, rare very light grey, soft to friable, amorphous, blocky.
5560	1695	100	LIMESTONE: white, rare very light grey, soft to friable, amorphous, blocky.
5590	1704	100	LIMESTONE: white, rare very light grey, soft to friable, amorphous, blocky.
5620	1713	100	LIMESTONE: white, soft to friable occasionally firm, amorphous to blocky.
5650	1722	100	LIMESTONE: white, soft to friable occasionally firm, amorphous to blocky.
5680	1731	100	LIMESTONE: white, soft to friable occasionally firm, amorphous to blocky.
5710	1740	100	LIMESTONE: white, soft to friable occasionally firm, amorphous to blocky.
5740	1750	100	LIMESTONE: white, soft to friable occasionally firm, amorphous to blocky.
5770	1759	100	LIMESTONE: white, rare very light grey, mostly soft to firm amorphous to blocky. Good trace DOLOMITE: pale translucent grey to grey brown, micro to cryptocrystalline, hard.
5800	1768	100	LIMESTONE: white, rarely off white to very pale grey, soft to firm, friable, amorphous, occasionally blocky
5830	1776	100	LIMESTONE: white, rarely off white to very pale grey, soft to firm, friable, amorphous, occasionally blocky
5860	1785	100	LIMESTONE: white, rarely off white to very pale grey, soft to firm, friable, amorphous, occasionally blocky
5890	1795	100	LIMESTONE: white, soft to firm, amorphous, rarely firm, blocky.
5920	1804	100	LIMESTONE: white occasionally, very light grey, friable to firm, amorphous to blocky, mostly chalky, occasionally micro crystalline rarely dolomitic.
5950	1813	100	LIMESTONE: white occasionally, very light grey, friable to firm occasionally hard, amorphous to blocky, mostly chalky, occasionally microcrystalline, rarely dolomitic.
5980	1822	100 Tr	LIMESTONE: white to very light grey, soft to firm, hard in part, blocky occasionally amorphous, angular to brittle in part, chalky texture, microcrystalline in part. CLAYSTONE: light grey, soft, amorphous to sub blocky, very calcareous.
6007	1830	100	LIMESTONE: white to very light grey, soft to firm, hard in part, blocky occasionally amorphous, angular, brittle in part, chalky texture, microcrystalline in part.
6040	1841	100	LIMESTONE: very pale grey, occasionally pale grey, rare light grey, soft to firm, occasionally moderately hard, amorphous to sub blocky, mostly chalky texture, rarely microcrystalline.
6070	1850	100	LIMESTONE: white to very pale grey, occasionally light grey, firm to moderately hard, soft in part, amorphous to sub blocky, brittle in part, chalky texture, microcrystalline in part.
6100	1859	100	LIMESTONE: very pale grey, occasionally pale grey, firm to moderately hard, sub blocky, occasionally brittle break, chalky texture, microcrystalline in part, slightly argillaceous in part.
6130	1868	100	LIMESTONE: very pale grey, occasionally pale grey, firm to moderately hard, sub blocky, occasionally brittle break, chalky texture, microcrystalline in part, slightly argillaceous in part, trace glauconite
6160	1877	100	LIMESTONE: white to light grey, soft to firm, occasionally hard, amorphous to blocky, chalky in part, microcrystalline in part, rare trace of Chert.
6190	1887	100	LIMESTONE: white to light grey, soft to firm, occasionally hard, amorphous to blocky, chalky in part, microcrystalline in part.
6220	1896	100	LIMESTONE: white to light grey, soft to firm, locally hard, amorphous to blocky, chalky in part, microcrystalline in part occasionally dolomitic.
6250	1905	100	LIMESTONE: white to very pale grey, occasionally light grey, firm to hard, blocky occasional brittle break, chalky to microcrystalline texture.
6280	1914	100	LIMESTONE: white to very pale grey, occasionally light grey, firm to hard, blocky occasional brittle break, chalky to microcrystalline texture.
6310	1923	100	LIMESTONE: white to very pale grey, occasionally light grey, firm to hard, blocky occasional brittle break, chalky to microcrystalline texture.
6340	1932	100	LIMESTONE: white to light grey, soft to hard, amorphous to blocky, mostly chalky occasionally microcrystalline.
6370	1941	100	LIMESTONE: white to light grey, soft to hard, amorphous to blocky, mostly chalky occasionally microcrystalline. Rare trace Glauconite.
6400	1950	100	LIMESTONE: white to light grey, soft to hard, amorphous to blocky, mostly chalky occasionally microcrystalline. Rare trace Glauconite.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
6430	1960	100	LIMESTONE: white to very pale grey, occasionally light grey, firm, occasionally hard, blocky break, occasionally angular to brittle break, chalky texture, occasionally microcrystalline, rare sparry calcite.
6460	1969	100	LIMESTONE: white to very pale grey, occasionally light grey, firm to hard, blocky to angular break, brittle in part, chalky to microcrystalline texture, argillaceous in part, occasional sparry calcite.
		Tr	CHERT: pale grey, translucent, very hard, brittle to conchoidal break, crystalline pearly lustre.
6466	1971	100	LIMESTONE: white to very pale grey, occasionally light grey, firm to hard, blocky to angular break, brittle in part, chalky to microcrystalline texture, argillaceous in part, occasional sparry calcite and glauconite.
6471	1972	100	LIMESTONE: white to very pale grey, occasionally light grey, firm to hard, blocky to angular break, brittle in part, chalky to microcrystalline texture, argillaceous in part, occasional sparry calcite and glauconite.
		tr	CHERT: pale grey, translucent, very hard, brittle to conchoidal break, crystalline pearly lustre.
6480	1975	100	LIMESTONE: white, rarely pale grey, firm occasionally moderately hard, crumbly to blocky break, chalky texture, microcrystalline in part, slightly glauconitic in part.
		Tr	CHERT: pale grey, translucent, very hard, brittle to conchoidal break, crystalline pearly lustre.
6490	1978	100	LIMESTONE: white rarely very light grey, friable to firm to hard, blocky mostly chalky, locally microcrystalline, trace Glauconite, trace Chert.
6520	1987	100	LIMESTONE: white rarely very light grey, friable to firm to hard, blocky mostly chalky, locally microcrystalline, locally glauconitic, locally slightly argillaceous, trace Chert.
6550	1996	60	LIMESTONE: white to light grey, soft to friable occasionally hard, amorphous to blocky, slightly argillaceous, chalky to microcrystalline, locally very glauconitic.
		40	LIMESTONE: grey brown to moderate brown to grey pink, soft to very soft, argillaceous to very argillaceous. Grades to MARL.
6563	2000	80	MARL: pale brown to moderate brown, mottled with white to pale grey inclusions, soft, sub blocky to amorphous.
		20	Limestone white to very pale grey, occasionally grey orange pink, firm, sub blocky, chalky texture. Very glauconitic
6564	2001	90	MARL: pale brown to moderate brown, mottled with white to pale grey inclusions, soft, sub blocky to amorphous.
		10	Limestone white to very pale grey, occasionally grey orange pink, firm, sub blocky, chalky texture. Very glauconitic
		Tr	CLAYSTONE: grayish brown, firm blocky, homogeneous, occasionally dark greenish black and very glauconitic.
6580	2005	30	LIMESTONE: white to light grey, firm to hard, blocky, chalky texture, microcrystalline in part, occasionally glauconitic.
		30	CLAYSTONE: dark greyish green, greenish black, speckled, glauconitic, firm, blocky, slightly to non calcareous.
		40	MARL: pale brown, to moderate brown, mottled with white to pale grey inclusions, soft, sub blocky to amorphous.
6610	2015	30	LIMESTONE: white to light grey, firm to hard, blocky, chalky texture, microcrystalline in part, occasionally glauconitic.
		30	CLAYSTONE: dark greyish green, greenish black, speckled, glauconitic, firm, blocky, slightly to non calcareous.
		40	MARL: pale brown, to moderate brown, mottled with white to pale grey inclusions, soft, sub blocky to amorphous.
6640	2024	40	CLAYSTONE: medium dark grey, occasionally greenish grey, soft, sub blocky to amorphous, calcareous, glauconitic, with rare disseminated pyrite, silty in part.
		30	LIMESTONE: white to light grey, firm to hard, blocky, chalky texture, microcrystalline in part, occasionally glauconitic.
		30	MARL: pale brown, to moderate brown, mottled with white to pale grey inclusions, soft, sub blocky to amorphous.
6670			Sample Missed due to high ROP
6700	2042	80	CLAYSTONE: dark grey, occasionally greenish grey, soft, sub blocky to amorphous, calcareous, glauconitic, with rare disseminated pyrite, silty in part.
		10	LIMESTONE: white to light grey, firm to hard, blocky, chalky texture, microcrystalline in part, occasionally glauconitic.
		10	MARL: pale brown, to moderate brown, mottled with white to pale grey inclusions, soft, sub blocky to amorphous.
6730	2051	100	CLAYSTONE: dark grey, occasionally medium to dark grey, soft, sub blocky, amorphous, sticky in part, calcareous, rare pyrite.
6760	2060	100	CLAYSTONE: medium to dark grey, occasionally greenish grey, soft occasionally firm, sub blocky, amorphous, sticky in part, calcareous with rare finely disseminated pyrite.
6790			Sample Missed due to High ROP
6820			Sample Missed due to High ROP
6850	2087	100	CLAYSTONE: dark grey, occasionally dark greenish grey, soft to firm, sub blocky to amorphous, occasionally glauconitic, fine disseminated pyrite.
6880			Sample Missed due to High ROP
6910			Sample Missed due to High ROP

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
6940	2115	100	CLAYSTONE: dark grey, occasionally dark greenish grey, soft to firm, sub blocky to amorphous, occasionally glauconitic, fine disseminated pyrite.
6970			Sample Missed due to High ROP
7000			Sample Missed due to High ROP
7030	2143	100 Tr	CLAYSTONE: medium to light grey, very soft, amorphous, slightly silty in part. Dolomite: dark brown to brownish yellow, hard blocky, cryptocrystalline
7060			Sample Missed due to High ROP
7090			Sample Missed due to High ROP
7120	2170	100 Tr	CLAYSTONE: medium to light grey, rare dark grey, to brownish black, very soft, amorphous, glauconitic, non to very slightly calcareous. DOLOMITE: dark yellowish brown, to dusky yellowish brown, hard, blocky to angular break, argillaceous, cryptocrystalline, crystalline in part.
7150			Sample Missed due to Lunch break
7180			Sample Missed due to Lunch break
7210	2197	100 Tr	CLAYSTONE: medium to light grey, rare dark grey, to brownish black, very soft, amorphous, glauconitic, non to very slightly calcareous, common pyrite nodules. DOLOMITE: dark yellowish brown, to dusky yellowish brown, hard, blocky to angular break, argillaceous, cryptocrystalline, crystalline in part, vitreous lustre.
7240			Sample Missed due to High ROP
7270	2215	100	CLAYSTONE: medium to light grey, rare dark grey, to brownish black, very soft, amorphous, glauconitic, non to very slightly calcareous, glauconitic.
7300	2225	100 Tr	CLAYSTONE: light grey, occasionally medium grey, very soft, amorphous to sticky, glauconitic occasional nodular pyrite, silty in part. DOLOMITE: pale brownish yellow, hard, angular break, cryptocrystalline to microcrystalline, argillaceous.
7330			Sample Missed due to High ROP
7360	2243	100 Tr	CLAYSTONE: light to medium grey, very soft, amorphous to sticky, common pyretic nodules, glauconitic. Dolomite: pale yellowish brown, hard to very hard, blocky to angular break, crystalline to microcrystalline, vitreous luster in part.
7390	2252	100 Tr	CLAYSTONE: light to medium grey, very soft, amorphous to sticky, common pyretic nodules, glauconitic. Dolomite: pale yellowish brown, hard to very hard, blocky to angular break, crystalline to microcrystalline, vitreous luster in part.
7420	2262	90 10	CLAYSTONE: medium to light grey, very soft, amorphous, very glauconitic, silty in part. DOLOMITE: pale orange to pale yellowish brown, with dusky yellowish brown inclusions in part, hard, blocky, argillaceous, very hard, argillaceous with vitreous lustre in part.
7450			Missed sample due to High ROP
7480	2280	100	CLAYSTONE: light grey, very soft, amorphous, very glauconitic, silty in part. DOLOMITE: pale orange to pale yellowish brown, with dusky yellowish brown inclusions in part, hard, blocky, argillaceous, very hard, argillaceous with vitreous lustre in part.
7510	2289	90 10	CLAYSTONE: light to medium grey, very soft, amorphous, glauconitic, with occasional nodular pyrite. DOLOMITE: pale yellowish brown, to dark yellowish brown, hard, blocky to angular break, brittle in part, argillaceous to crystalline, sucrosic in part, occasional vitreous lustre.
7540			Missed sample due to high ROP
7570	2307	100	CLAYSTONE: light to medium grey, very soft, amorphous, glauconitic, with occasional nodular pyrite. DOLOMITE: pale yellowish brown, to dark yellowish brown, hard, blocky to angular break, brittle in part, argillaceous to crystalline, occasional vitreous lustre.
7600			Missed sample due to High ROP
7630			Missed sample due to High ROP
7660	2334	100 Tr	CLAYSTONE: Light to medium grey, soft to slightly firm, sub blocky to amorphous, silty in part. DOLOMITE: pale yellow brown, to very pale orange, hard, blocky to angular break, argillaceous to microcrystalline texture.
7690	2344	100 Tr	CLAYSTONE: medium grey to grey green, soft, amorphous to sub blocky, slightly glauconitic, silty in part. DOLOMITE: pale yellow brown, to very pale orange, hard, blocky to angular break, argillaceous to microcrystalline texture.
7720	2353	100 Tr	CLAYSTONE: medium grey to grey green, soft, amorphous to sub blocky, slightly glauconitic, silty in part. DOLOMITE: very pale orange to pale yellowish brown, hard, blocky to angular break, microcrystalline to argillaceous texture.
7750			Missed sample due to High ROP
7780	2371	100 Tr	CLAYSTONE: medium grey to dark greenish grey, soft to slightly firm, sub blocky, slightly silty, trace glauconite. DOLOMITE: very pale orange to pale yellowish brown, hard, blocky to angular break, microcrystalline to argillaceous texture.
7810			Missed sample due to High ROP
7840			Missed sample due to High ROP

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
7870	2399	100 Tr	CLAYSTONE: medium grey to dark greenish grey, soft, amorphous to sub blocky, glauconitic. DOLOMITE: very pale orange to pale yellowish brown, hard, blocky to angular break, microcrystalline to argillaceous texture, sucrosic in part.
7900	2408	100 r Tr	CLAYSTONE: medium grey to dark greenish grey, soft to amorphous, slightly silty, amorphous. DOLOMITE: very pale orange to pale yellowish brown, hard, blocky to angular break, microcrystalline to argillaceous texture, sucrosic in part.
7930	2417	100	CLAYSTONE: medium grey becoming light greenish grey, soft amorphous, slightly silty, occasionally very silty, glauconitic, trace micro pyrite.
7960			Missed sample due to high ROP
7990	2435	100	CLAYSTONE: medium grey becoming light greenish grey, soft amorphous, slightly silty, occasionally very silty, glauconitic, trace micro pyrite.
8020	2444	100	CLAYSTONE: light to medium grey, medium blue grey in part, soft, amorphous, in part firm and sub blocky, very glauconitic.
8050			
8080	2463	100	CLAYSTONE: light to medium grey, occasionally blue grey, soft, amorphous, sticky, glauconitic, rare nodular pyrite.
8110			Missed sample due to high ROP
8140			Missed sample due to high ROP
8170	2490	100 Tr	CLAYSTONE: light to medium grey, occasionally blue grey, soft, amorphous, sticky, glauconitic, rare nodular pyrite. DOLOMITE: pale to yellowish brown, hard, blocky to angular break, microcrystalline.
8200	2499	100	CLAYSTONE: medium blue grey, to greenish grey, soft occasionally firm, amorphous to sub blocky, slightly silty.
8230			Missed sample due to high ROP Missed sample due to high ROP Missed sample due to high ROP
8260	2518	100	CLAYSTONE: medium blue grey, to greenish grey, soft occasionally firm, amorphous to sub blocky, slightly silty.
8290	2527	100	CLAYSTONE: medium blue grey, to greenish grey, soft occasionally firm, amorphous to sub blocky, slightly silty, rare trace nodular pyrite. DOLOMITE: pale to yellowish brown, hard, blocky to angular break, argillaceous to microcrystalline, vitreous lustre in part.
8315	2534	100	CLAYSTONE: medium blue grey, to greenish grey, soft occasionally firm, amorphous to sub blocky, slightly silty, rare trace nodular pyrite.
8325	2537	100	CLAYSTONE: grey black to olive black, blocky to sub blocky, firm, slightly silty.
8350	2545	100	CLAYSTONE: grey black to olive black, blocky to sub blocky, firm, slightly silty.
8380	2554	100	CLAYSTONE: grey black to olive black, blocky to sub blocky, firm, slightly silty. Trace DOLOMITE: yellow brown, microcrystalline.
8410	2563	100	CLAYSTONE: grey black to olive black, blocky to sub blocky, firm, slightly silty. Trace DOLOMITE: yellow brown, microcrystalline
8440	2572	100	CLAYSTONE: grey black to olive black, blocky to sub blocky, firm, slightly silty.
8450	2575	100	CLAYSTONE: grey black to olive black, blocky to sub blocky, firm, slightly silty.
8470	2581	100	CLAYSTONE: grey black to olive black, blocky to sub blocky, firm, slightly silty. Good trace DOLOMITE: pale grey brown, microcrystalline.
8490	2588	90 10	CLAYSTONE: medium dark grey to grey black, blocky, firm to hard, slightly silty slightly calcareous, micromicaceous. DOLOMITE: pale grey brown, microcrystalline, friable.
8510	2594	100	CLAYSTONE: medium dark grey to grey black, blocky, firm to hard, slightly silty slightly calcareous.
8520	2597	100	CLAYSTONE: grey black to olive black, blocky to sub blocky, firm to hard, slightly silty, slightly calcareous.
8530	2600	100	CLAYSTONE: grey black to olive black, blocky to sub blocky, firm to hard, slightly silty, slightly calcareous.
8560	2609	100	CLAYSTONE: grey black to olive black, blocky to sub blocky, firm to hard, slightly silty, slightly calcareous.
8580	2615	100	CLAYSTONE: grey black to olive black, blocky to sub blocky, firm to hard, slightly silty, very slightly calcareous.
8590	2618	100	CLAYSTONE: grey black to black, occasionally olive black to olive grey, moderately hard to hard, blocky to angular, slightly silty, micropyritic, slightly calcareous.
8610	2624	100	CLAYSTONE: grey black to black, occasionally olive black to olive grey, moderately hard to hard, blocky to angular, slightly silty, micropyritic, slightly calcareous.
8620	2627	100	CLAYSTONE: grey black to black, occasionally olive black to olive grey, moderately hard to hard, blocky to angular, slightly silty locally moderately silty, micropyritic, slightly calcareous.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
8650	2636	100	CLAYSTONE: grey black to black, occasionally olive black to olive grey, moderately hard to hard, blocky to angular, slightly silty locally moderately silty, micropyritic, slightly calcareous.
8700	2652	40	CLAYSTONE: grey black to black, occasionally olive black to olive grey, moderately hard to hard, blocky to angular, slightly silty locally moderately silty, micropyritic, slightly calcareous.
		60	LIMESTONE: olive grey, moderately hard to hard, blocky, occasionally crumbly, silty texture, abundant glauconite.
8720	2658	80	CLAYSTONE: grey black to black, occasionally olive black to olive grey, moderately hard to hard, blocky to angular, slightly silty locally moderately silty, micropyritic, slightly calcareous.
		20	LIMESTONE: light yellow grey, moderately hard, blocky to crumbly, silty texture, occasionally hard, brittle, blocky to angular, microcrystalline, argillaceous.
8740	2664	40	CLAYSTONE: grey black, moderately hard, blocky, silty, micropyritic, slightly calcareous.
		60	LIMESTONE: light yellow grey, moderate to dark yellowish brown, moderately hard, blocky to crumbly, silty texture, argillaceous.
8770	2673	30	CLAYSTONE: grey black, moderately hard, blocky, silty, micropyritic, slightly calcareous.
		70	LIMESTONE: light yellow grey, moderate to dark yellowish brown, moderately hard, blocky to crumbly, silty texture, argillaceous.
8790	2679	70	CLAYSTONE: olive black to brownish black, hard, blocky to angular, very silty, grading to siltstone with traces very fine sand.
		20	SILTSTONE:
		10	LIMESTONE: moderate to dark yellowish brown, moderately hard, blocky, argillaceous.
8810	2685	40	SILTSTONE: olive black to brownish black, moderately hard, blocky to crumbly, slightly calcareous, micropyritic.
		60	LIMESTONE: light yellow grey, moderate to dark yellowish brown, moderately hard, blocky to crumbly, silty texture, argillaceous.
8820	2688	80	SILTSTONE: olive black to brownish black, moderately hard, blocky to crumbly, slightly calcareous, micropyritic.
		20	LIMESTONE: light yellow grey, moderate to dark yellowish brown, moderately hard, blocky to crumbly, silty texture, argillaceous.
8830	2691	90	SILTSTONE: olive black to brownish black, moderately hard, blocky to crumbly, slightly calcareous, micropyritic.
		10	LIMESTONE: light yellow grey, moderate to dark yellowish brown, moderately hard, blocky to crumbly, silty texture, argillaceous.
8880	2706	20	CLAYSTONE: dark grey black to olive black, moderately hard to hard, brittle, blocky to angular, occasionally silty, micropyritic.
		80	SANDSTONE: quartz, loose, unconsolidated, colourless, transparent, very fine to medium, occasionally coarse, sub rounded, poorly sorted, no visible cement, no show.
8900	2713	100	SANDSTONE: quartz, loose, unconsolidated, colourless, transparent, very fine to medium, occasionally coarse, sub rounded, poorly sorted, no visible cement, no show.
		Tr	COAL: black, hard, brittle, blocky to angular, vitreous lustre, pyritic.
8920	2719	100	SANDSTONE: quartz, loose, unconsolidated, colourless, transparent, fine to medium, occasionally very fine, coarse, sub rounded to occasionally sub angular, poorly sorted, no visible cement, no show.
8940	2725	100	SANDSTONE: quartz, loose, unconsolidated, colourless, transparent, very fine to fine, occasionally medium, rarely coarse, sub rounded to occasionally sub angular, poorly sorted, no visible cement, no show.
8960	2730	100	SANDSTONE: light grey non calcareous rock flour with abundant loose sand, colourless, transparent, predominantly fine to medium, occasionally very fine, coarse, sub rounded, moderate to poorly sorted.
8980	2737	100	SANDSTONE: quartz, loose, unconsolidated, colourless, transparent, fine to medium, sub angular to sub rounded, moderate sorting, with abundant off white to light grey rock flour, non calcareous, no show.
9020	2749	100	SANDSTONE: quartz, loose, unconsolidated, colourless, transparent, very fine to fine, sub angular to sub rounded, moderate sorting, with abundant off white to light grey rock flour, non calcareous, no show.
9050	2758	100	SANDSTONE: quartz, loose, unconsolidated, colourless, transparent, very fine to fine, sub angular to sub rounded, moderate sorting, with abundant off white to light grey rock flour, non calcareous, no show.
9080	2767	100	SANDSTONE: quartz, loose, unconsolidated, colourless, transparent, fine to medium, occasionally very fine, sub angular to sub rounded, moderate sorting, with abundant off white to light grey rock flour, non calcareous, no show.
9110	2777	100	SANDSTONE: quartz, loose, unconsolidated, colourless, transparent, fine to medium, occasionally very fine, sub angular to sub rounded, moderate sorting, with abundant off white to light grey rock flour, non calcareous, no show.
9140	2786	100	SANDSTONE: quartz, loose, unconsolidated, colourless, transparent, fine to medium, occasionally very fine, sub angular to sub rounded, moderate sorting, with abundant off white to light grey rock flour, non calcareous, no show.
		Tr	COAL: black, moderately hard, blocky to crumbly, pyritic.
9150	2789	100	SANDSTONE: quartz, loose, unconsolidated, colourless, transparent, fine to medium, occasionally very fine, sub angular to sub rounded, moderate sorting, with abundant off white to light grey rock flour, non calcareous, no show.
		Tr	COAL: black, moderately hard, blocky to crumbly, pyritic.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
9160	2792	60	SANDSTONE: off white to light grey, yellowish grey soft to firm amorphous rock flour with traces of loose sand, medium, sub rounded, well sorted.
		20	SILTSTONE: dark yellowish brown, olive brown to olive black, moderately hard to hard, blocky, carbonaceous.
		20	CLAYSTONE: olive black, olive grey, moderately hard to hard, blocky, very carbonaceous.
		Tr	COAL: black, moderately hard, brittle, blocky to angular, pyritic.
9170	2795	100	SANDSTONE: predominantly off white to yellowish grey, soft to firm amorphous rock flour with traces very fine to fine sand, non to very slightly calcareous.
		Tr	CLAYSTONE: olive black, olive grey, moderately hard to hard, blocky, very carbonaceous.
		Tr	COAL: black, moderately hard, brittle, blocky to angular, pyritic.
9180	2798	100	SANDSTONE: predominantly off white to yellowish grey, soft to firm amorphous rock flour with traces very fine to fine sand, non to very slightly calcareous.
9200	2804	70	SANDSTONE: yellow grey to light grey, very fine to fine grained, friable to firm,
		20	SANDSTONE: olive grey to dark green grey, blocky, very fine to fine grained, firm to hard, silty, argillaceous glauconitic in part.
		10	CLAYSTONE: olive grey to brown black, mottled, blocky, firm, silty.
9230	2813	80	SANDSTONE: light grey to light brown grey to olive grey, blocky, very fine to fine grained, friable, trace dead oil/ bitumen, good trace of pyrite.
		20	CLAYSTONE: olive grey to brown grey to brown black, blocky, firm, (imbricated cuttings). Trace COAL : black, blocky, friable.
9260	2822	80	SANDSTONE: light grey to light brown grey to olive grey, blocky, very fine to fine grained, friable, trace dead oil, good trace of pyrite.
		20	CLAYSTONE: olive grey to brown grey to brown black, blocky, firm, (imbricated cuttings). Trace COAL : black, blocky, friable.
9290	2831	100	SANDSTONE: off white, light grey, yellowish grey to light olive grey, soft to firm, amorphous, crumbly rock flour, with abundant loose quartz grains, colourless, transparent, very fine to occasionally fine, non to slightly calcareous.
9304	2836	80	SANDSTONE: off white, light grey, yellowish grey to light olive grey, occasionally greenish grey, soft to firm, amorphous, crumbly rock flour, with abundant loose quartz grains, colourless, transparent, very fine to occasionally fine, non to slightly calcareous.
		20	CLAYSTONE: olive black, grayish black to black, moderately hard, blocky, occasionally micropyritic, very carbonaceous, grading to coal.
9325	2842	50	SANDSTONE: off white, light grey, yellowish grey to light olive grey, soft to firm, amorphous, crumbly rock flour, with abundant loose quartz grains, colourless, transparent, very fine to occasionally fine, non to slightly calcareous.
		50	SILTSTONE: grayish brown, moderately hard, blocky to crumbly, occasional trace very fine sand grains, micromicaceous, non calcareous/dolomitic.
9340	2847	100	SANDSTONE: off white to very light grey, occasionally streaked and mottled light grey to greenish grey, firm, friable, moderately calcareous, with sand, very fine to fine.
9350	2850	50	SANDSTONE: off white to very light grey, occasionally streaked and mottled light grey to greenish grey, firm, friable, moderately calcareous, with sand, very fine to fine.
		40	SILTSTONE: grayish brown to dusky brown, moderately hard to hard, blocky to angular, occasionally crumbly, occasional trace very fine sand, grading to silty claystone.
		10	CLAYSTONE: grayish brown to dusky brown, moderately hard to hard, blocky, silty in part, non calcareous/dolomitic.
9370	2856	100	SANDSTONE: off white, occasionally light to medium bluish grey to greenish grey, firm friable rock flour, with very fine to fine sand, moderately calcareous.
9380	2859	100	SANDSTONE: off white, occasionally light to medium bluish grey to greenish grey, firm friable rock flour, with very fine to fine sand, moderately calcareous.
9390	2862	30	SANDSTONE: off white, occasionally light to medium bluish grey to greenish grey, firm friable rock flour, with very fine to fine sand, moderately calcareous.
		50	SILTSTONE: grayish brown to dusky brown, moderately hard, blocky to crumbly, micaceous, occasional trace very fine sand, non calcareous/dolomitic, grading in part to silty claystone.
		20	CLAYSTONE: grayish brown to dusky brown, moderately hard, locally silty.
9410	2868	100	SANDSTONE: light grey to medium light grey, to light brown grey, mottled, quartz, very fine to fine grained, sub angular to sub rounded, trace of Glauconite. Trace SILTSTONE: red brown to moderate brown.
9440	2877	100	SANDSTONE: light grey to medium light grey, to light brown grey, mottled, quartz, firm to friable, very fine to fine grained, sub angular to sub rounded, trace of Glauconite.
9460	2883	70	SILTSTONE: grey brown to moderate brown to dusky brown occasionally mottled white, blocky, firm to friable, moderately calcareous (Caliche) sandy, argillaceous.
		30	SANDSTONE: light grey to medium light grey, to light brown grey, mottled, quartz, firm to friable, very fine to fine grained, sub angular to sub rounded.
9470	2886	100	SANDSTONE: light grey to medium light grey, to light brown grey, mottled, quartz, firm to friable, very fine to fine grained, sub angular to sub rounded, trace of Glauconite.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
9500	2895	80 20	SANDSTONE: light grey to light green grey to light olive grey, mottled, quartz, very fine to medium grained, sub angular to sub rounded, silty in part, friable, very calcareous, trace of dead oil/bitumen. SILTSTONE: grey brown to moderate brown, mottled white, blocky, firm, sandy, argillaceous, calcareous (Caliche).
9530	2905	100	SANDSTONE: light grey to light green grey to green grey to olive grey, mottled, quartz, very fine to medium grained, sub angular to sub rounded, silty in part, friable, moderately calcareous, trace of dead oil/bitumen.
9560	2914	100	SANDSTONE: light grey to light green grey to green grey to olive grey, mottled, quartz, very fine to medium grained, sub angular to sub rounded, silty in part, friable, moderately calcareous.
9590	2922	90 10	SANDSTONE: light grey to light green grey to green grey to olive grey, mottled, quartz, very fine to medium grained, sub angular to sub rounded, silty in part, friable, moderately calcareous. SILTSTONE: grey brown to moderate brown, mottled white, blocky, firm, sandy, argillaceous, calcareous (Caliche).
9620	2932	100 Tr	SANDSTONE: light grey to light green grey to green grey to olive grey, mottled, quartz, very fine to medium grained, sub angular to sub rounded, silty in part, friable, moderately calcareous. SILTSTONE: grey brown to moderate brown, mottled white, blocky, firm, sandy, argillaceous, calcareous (Caliche).
9650	2941	100	SANDSTONE: light grey to light green grey to green grey to olive grey, mottled, quartz, very fine to medium grained occasionally coarse grained, sub angular to sub rounded, silty in part, friable, moderately calcareous, rare trace pyrite.
9680	2950	60 40	SANDSTONE: light grey to light green grey to green grey to olive grey, mottled, quartz, very fine to medium grained, sub angular to sub rounded, silty in part, friable, moderately calcareous, rare trace pyrite. SILTSTONE: grey brown to moderate brown to red brown, blocky, friable, sandy, argillaceous, calcareous.
9710	2959	80 20	SILTSTONE: grey brown to moderate brown to red brown, blocky, friable, sandy, argillaceous, calcareous. SANDSTONE: very light grey, green grey to olive grey, mottled, quartz, very fine to medium grained, sub angular to sub rounded, friable, moderately calcareous, glauconitic.
9740	2969	100	SANDSTONE: white to light bluish grey, occasionally medium bluish grey, firm, friable, amorphous rock flour with abundant sand, colourless, very fine to fine, well sorted, predominantly non to slightly calcareous, locally very calcareous.
9770	2978	100	SANDSTONE: white to light bluish grey, occasionally medium bluish grey, greenish grey, firm, friable, amorphous rock flour with abundant sand, colourless, very fine to fine, well sorted, predominantly non to slightly calcareous, locally very calcareous.
9800	2987	60 40	SANDSTONE: white to light bluish grey, occasionally medium bluish grey, firm, friable, amorphous rock flour with abundant sand, colourless, very fine to fine, well sorted, predominantly non to slightly calcareous, locally very calcareous. SILTSTONE: grayish brown, moderately hard, blocky to crumbly, sandy, very fine, non to slightly calcareous.
9810	2990	100	LIMESTONE: white, heavily mottled grayish brown, moderately hard to hard, blocky, argillaceous.
9820	2993	40 50	SANDSTONE: white to light bluish grey, occasionally medium bluish grey, firm, friable, amorphous rock flour with abundant sand, colourless, very fine to fine, well sorted, predominantly non to slightly calcareous, locally very calcareous. LIMESTONE: white, mottled grayish red, light to medium bluish grey, moderately hard to hard, blocky, argillaceous. SILTSTONE: grayish brown, moderately hard, blocky to crumbly.
9830	2996	100	LIMESTONE: white, heavily mottled grayish brown, moderately hard to hard, blocky, argillaceous in part.
9860	3005	90 10	SANDSTONE: white, mottled light grey, light olive grey, occasionally grayish brown, firm, friable, rock flour, slight to moderately calcareous and argillaceous. SILTSTONE: grayish brown to grayish red, moderately hard, blocky to crumbly, micaceous, slightly calcareous.
9890	3014	50 50	SANDSTONE: light grey, mottled bluish grey, occasionally greenish grey, firm to moderately hard, crumbly rock flour with traces very fine sand, slight to locally moderately calcareous, argillaceous. SILTSTONE: grayish brown to grayish red, moderately hard, blocky to crumbly, micaceous, slightly calcareous.
9920	3023	90 10	SANDSTONE: light grey, mottled bluish grey, occasionally greenish grey, firm to moderately hard, crumbly rock flour with traces very fine sand, slight to locally moderately calcareous, argillaceous. SILTSTONE: grayish brown to grayish red, moderately hard, blocky to crumbly, micaceous, slightly calcareous.
9950	3033	70 30	SANDSTONE: olive grey grayish brown, grayish red, firm to moderately hard, blocky to crumbly, rock flour with very fine sand, micaceous, silty, grading to siltstone, moderately calcareous. SILTSTONE: grayish brown to grayish red, moderately hard, blocky to crumbly, micaceous, slightly calcareous.
9980	3042	100	SANDSTONE: grayish red, grayish brown, mottled white, firm friable crumbly rock flour, with very fine sand, micaceous, silty, grading to siltstone, moderately calcareous, with occasional fragments very calcareous, grading to limestone.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
10010	3051	100	SANDSTONE: moderate brown to red brown to grey brown, fine to coarse grained, occasionally very coarse, angular to sub rounded, friable poorly cemented, silty, argillaceous, slightly calcareous, grading to sandy siltstone.
10040	3060	80	SANDSTONE: light grey, moderate brown to red brown to grey brown, quartz, fine to coarse grained, occasionally very coarse, angular to sub rounded, friable, poorly cemented, silty, argillaceous, moderately calcareous, micaceous, grading to sandy siltstone.
		20	SILTSTONE: grey brown to moderate brown, blocky, firm, very sandy, argillaceous, slightly calcareous, micaceous.
10070	3069	60	SANDSTONE: light grey, moderate brown to red brown to grey brown, quartz, fine to coarse grained, occasionally very coarse, angular to sub rounded, friable, poorly cemented, silty, argillaceous, moderately calcareous, micaceous, grading to sandy siltstone.
		40	SILTSTONE: grey brown to moderate brown, blocky, firm, very sandy, argillaceous, slightly calcareous, micaceous
10100	3078	60	SANDSTONE: light grey, moderate brown to red brown to grey brown, quartz, fine to coarse grained, occasionally very coarse, angular to sub rounded, friable, poorly cemented, silty, argillaceous, moderately calcareous, micaceous, grading to sandy siltstone.
		40	SILTSTONE: grey brown to moderate brown, blocky, firm, very sandy, argillaceous, slightly calcareous, micaceous
10130	3087	60	SILTSTONE: grey brown to moderate brown, blocky, firm, very sandy, argillaceous, slightly calcareous, micaceous.
		40	SANDSTONE: light grey, moderate brown to red brown to grey brown, quartz, fine to coarse grained, occasionally very coarse, angular to sub rounded, friable, poorly cemented, silty, argillaceous, moderately calcareous, micaceous, grading to sandy siltstone.
10160	3097	50	SILTSTONE: grey brown to moderate brown mottled, blocky, firm, very sandy, argillaceous, slightly calcareous, micaceous, grades to silty Sandstone.
		50	SANDSTONE: light grey, moderate brown to red brown to grey brown, quartz, very fine to medium grained, angular to sub rounded, friable, silty, argillaceous, moderately calcareous.
10190	3105	80	SILTSTONE: grey brown to moderate brown mottled, blocky, firm, very sandy, argillaceous, slightly calcareous, micaceous, grades to silty Sandstone.
		20	SANDSTONE: light grey, moderate brown to red brown to grey brown, quartz, very fine to medium grained, angular to sub rounded, friable, silty, argillaceous, moderately calcareous.
10220	3115	70	SILTSTONE: grey brown to moderate brown mottled, blocky, firm, very sandy, argillaceous, slightly calcareous, micaceous, grades to silty Sandstone.
		30	SANDSTONE: light grey, moderate brown to red brown to grey brown rare light green grey, quartz, very fine to medium grained, angular to sub rounded, friable, silty, argillaceous, moderately calcareous.
10250	3124	80	SILTSTONE: grey brown to moderate brown mottled, blocky, firm, very sandy, argillaceous, slightly calcareous, micaceous, grades to silty Sandstone.
		20	SANDSTONE: light grey, moderate brown to red brown to grey brown rare light green grey, quartz, very fine to medium grained, angular to sub rounded, friable, silty, argillaceous, moderately calcareous.
10280	3133	100	SILTSTONE: moderate brown to red brown, rare green grey, blocky, firm to friable, sandy, increasingly argillaceous, slightly calcareous, grades to sandy Claystone.
10310	3142	90	SILTSTONE: moderate brown to red brown, rare green grey, blocky, firm to friable, sandy, argillaceous, slightly calcareous, grades to sandy Claystone.
		10	SANDSTONE: light grey, moderate brown to red brown to grey brown rare light green grey, quartz, very fine to medium grained, angular to sub rounded, friable, silty, argillaceous, moderately calcareous.
10340	3151	100	SILTSTONE: moderate brown to red brown to grey brown, rare green grey mottled, blocky, firm to friable, sandy, argillaceous, slightly calcareous, grades to sandy Claystone.
10370	3161	90	SILTSTONE: moderate brown to red brown, green brown, mottled, firm, friable, micaceous, very sandy, grading to silty sandstone.
		10	SANDSTONE: red brown, light grey, friable, very fine to medium, sub angular to round, micaceous, calcareous.
10392	3167	70	SILTSTONE: moderate brown to red brown, firm to moderately hard, crumbly, micaceous, slightly calcareous, very sandy, grading to very silty Sandstone.
		30	SANDSTONE: moderate brown to red brown, firm to moderately hard, crumbly, very fine, micaceous, very silty grading to very sandy Siltstone.
10400	3170	70	SILTSTONE: moderate brown to red brown, firm to friable, sandy to very sandy, grading to silty sandstone, slightly calcareous, micaceous.
		30	SANDSTONE: moderate brown to red grey to light grey, mottled, rare light green-grey, firm to friable, very fine to medium grained, sub angular to rounded, moderately calcareous, micaceous.
10430	3179	90	SILTSTONE: moderate brown to red brown, firm to friable, sandy, argillaceous, slightly calcareous, micaceous.
		10	SANDSTONE: moderate brown to red grey to light grey, mottled, rare light green-grey, firm to friable, very fine to medium grained, sub angular to rounded, moderately calcareous, micaceous.
10460	3188	80	SILTSTONE: grey brown to moderate brown to red brown mottled, firm to friable, sandy in part, argillaceous to very argillaceous, moderately calcareous micaceous.
		20	SANDSTONE: moderate brown to red grey to light grey, mottled, rare light green-grey, firm to friable, very fine to medium grained, sub angular to rounded, moderately calcareous, micaceous.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
10490	3197	100	SILTSTONE: moderate brown to red brown to dusky brown, mottled, firm to friable, sandy to very sandy, grading to silty sandstone, slightly calcareous, micaceous.
10520	3206	70	SILTSTONE: moderate brown to red brown to dusky brown, mottled, firm to friable, sandy to very sandy, grading to silty sandstone, slightly calcareous, micaceous.
		30	SANDSTONE: moderate brown to red grey to light grey, mottled, rare light green-grey, firm to friable, very fine to medium grained, sub angular to rounded, moderately calcareous, micaceous.
10550	3215	90	SILTSTONE: moderate brown grey brown to dusky brown, mottled, firm sandy to very sandy, moderately to slightly calcareous.
		10	SANDSTONE: moderate brown to red grey to light grey, mottled, very fine to fine grained moderately to slightly calcareous.
10580	3225	80	SILTSTONE: moderate brown grey brown to dusky brown, mottled, firm sandy to very sandy, moderately to slightly calcareous.
		10	SANDSTONE: moderate brown to red grey to light grey, mottled, very fine to fine grained moderately to slightly calcareous.
		10	CLAYSTONE: moderate brown to red brown, moderately hard to hard, blocky, slightly calcareous, occasionally silty, grading to Siltstone.
10610	3234	10	CLAYSTONE: moderate brown to red brown, moderately hard to hard, blocky, slightly calcareous, occasionally silty, grading to Siltstone.
		70	SILTSTONE: moderate brown grey brown to dusky brown, mottled, firm sandy to very sandy, moderately to slightly calcareous.
		20	SANDSTONE: pale red brown, occasionally off white to light grey green, moderately hard, crumbly rock flour, trace very fine sand, argillaceous in part.
10640	3243	90	SILTSTONE: moderate brown grey brown to dusky brown, mottled, firm sandy to very sandy, moderately to slightly calcareous.
		10	SANDSTONE: pale red brown, occasionally off white to light grey green, moderately hard, crumbly rock flour, trace very fine sand, argillaceous in part.
10670	3252	80	SILTSTONE: moderate brown grey brown to dusky brown, mottled, firm sandy to very sandy, moderately to slightly calcareous.
		20	SANDSTONE: pale red brown, occasionally off white to light grey green, moderately hard, crumbly rock flour, trace very fine sand, argillaceous in part.
10700	3261	70	SILTSTONE: moderate brown grey brown to dusky brown, mottled, firm sandy to very sandy, moderately to slightly calcareous.
		30	SANDSTONE: orange brown to moderate brown, reddish grey, rarely light bluish grey, moderately hard, blocky, silty, grading to Siltstone, slightly calcareous.
10730	3270	60	SILTSTONE: moderate brown, grayish brown, moderately hard, blocky to crumbly, micaceous, slightly calcareous, sandy, grading to silty Sandstone.
		40	SANDSTONE: reddish grey, moderately hard, blocky, crumbly, rock flour with traces very fine sand.
10760	3279	60	SILTSTONE: moderate brown, grayish brown, moderately hard, blocky to crumbly, micaceous, slight to moderately calcareous, sandy, grading to silty Sandstone.
		40	SANDSTONE: reddish grey, moderately hard, blocky, crumbly, rock flour with traces very fine sand.
10790	3289	60	SILTSTONE: moderate brown, grayish brown, moderately hard, blocky to crumbly, micaceous, moderately calcareous, sandy, grading to silty Sandstone.
		40	SANDSTONE: reddish grey, moderately hard, blocky, crumbly, rock flour with traces very fine sand.
10820	3298	50	SANDSTONE: very light grey, moderate brown to light brown to red brown rare light grey green, mottled, firm to friable, quartz, very fine to fine grained, moderately to slightly calcareous.
		50	SILTSTONE: moderate brown to red brown, blocky, firm , argillaceous occasionally sandy, moderately to slightly calcareous.
10850	3307	80	SANDSTONE: very light grey, grey brown to red grey, rare dark green grey, very fine to medium grained, sub angular to rounded, quartz, friable, micaceous, moderately calcareous.
		20	SILTSTONE: moderate brown to red brown, blocky, firm , argillaceous occasionally sandy, moderately to slightly calcareous.
10880	3316	80	SANDSTONE: white to light grey to grey brown, red brown, mottled, friable very fine to fine grained, moderately calcareous.
		20	SILTSTONE: moderate brown to red brown, blocky, firm , argillaceous occasionally sandy, moderately to slightly calcareous
10910	3325	90	SILTSTONE: dusky brown to red brown blocky, firm, sandy, locally argillaceous, grading to silty Claystone, moderately calcareous.
		10	SANDSTONE: white to light grey to grey brown, red brown, mottled, friable very fine to fine grained, moderately calcareous.
10940	3334	80	SILTSTONE: dusky brown to red brown blocky, firm, sandy to very sandy, locally argillaceous, grading to silty Claystone, moderately calcareous
		10	CLAYSTONE: dusky brown, blocky, firm, silty, moderately calcareous.
		10	SANDSTONE: very light grey , light red brown to moderate brown mottled, very fine to fine grained, sub angular to sub rounded, moderately calcareous.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
10970	3343	100	SILTSTONE: dusky brown to red brown blocky, firm, sandy to very sandy, locally argillaceous, grading to silty Claystone, moderately calcareous
		Tr	CLAYSTONE: dusky brown, blocky, firm, silty, moderately calcareous.
		Tr	SANDSTONE: very light grey , light red brown to moderate brown mottled, rare grey green to light grey green, very fine to fine grained, sub angular to sub rounded, moderately calcareous.
11000	3353	100	SILTSTONE: dusky brown to red brown blocky, firm, sandy to very sandy, locally argillaceous, grading to silty Claystone, moderately calcareous
		Tr	CLAYSTONE: dusky brown, blocky, firm, silty, moderately calcareous.
		Tr	SANDSTONE: very light grey , light red brown to moderate brown mottled, rare grey green to light grey green, very fine to fine grained, sub angular to sub rounded, moderately calcareous
11030	3362	90	SILTSTONE: dusky brown to red brown blocky, firm, sandy to very sandy, locally argillaceous, grading to silty Claystone, moderately calcareous
		10	SANDSTONE: very light grey , light red brown to moderate brown mottled, rare grey green to light grey green, very fine to fine grained, sub angular to sub rounded, moderately calcareous
11060	3371	90	SILTSTONE: dusky brown to red brown blocky, firm, sandy to very sandy, locally argillaceous, grading to silty Claystone, moderately calcareous
		10	SANDSTONE: very light grey , light red brown to moderate brown mottled, rare grey green to light grey green, very fine to fine grained, sub angular to sub rounded, moderately calcareous
11090	3380	70	SILTSTONE: moderate brown to red brown blocky, friable, sandy, locally argillaceous, moderately to slightly calcareous.
		30	SANDSTONE: very light grey-light red grey to red brown, mottled, rare light green grey, very fine to fine grained, friable, moderately calcareous.
11120	3389	60	CLAYSTONE: dusky brown, occasionally medium to dark grey, firm to moderately hard, blocky break, silty in part , grading to SILTSTONE, poorly calcareous.
		30	SILTSTONE: moderate brown, firm, sandy to very sandy, locally argillaceous, grading to silty claystone, moderately calcareous
		10	SANDSTONE: very light grey to moderate brown, moderately hard blocky to sub blocky lithic fragments, comprised from, translucent, pitted in part, very fine to fine quartz grains, sub angular to sub round, well sorted, well cemented with calcareous cement, Poor inferred porosity.
11150	3399	30	CLAYSTONE: dusky brown, occasionally medium to dark grey, firm to moderately hard, blocky break, silty in part , grading to SILTSTONE, poorly calcareous.
		40	SILTSTONE: moderate brown, firm to moderately hard, sub blocky, sandy in part, moderately to slightly calcareous.
		30	SANDSTONE: white to very pale grey, moderate brown in part, moderately hard blocky break, composed of translucent , very fine, rarely fine quartz grains, sub angular to sub rounded, well sorted with strong calcite cement and common glauconite.
11180	3408	40	CLAYSTONE: dusky brown, occasionally medium to dark grey, occasionally greenish grey, firm to moderately hard, blocky break, silty in part , grading to SILTSTONE, poorly calcareous.
		30	SILTSTONE: moderate brown, firm to moderately hard, sub blocky, sandy in part, moderately to slightly calcareous.
		30	SANDSTONE: white to very pale grey, moderate brown in part, occasionally greenish grey, moderately hard blocky break, composed of translucent, very fine, rarely fine quartz grains, sub angular to sub rounded, well sorted with strong calcite cement and very common glauconite. Poor inferred porosity.
11210	3417	80	SANDSTONE: white to pale grey, moderate brown, moderate greenish grey in part, mod hard blocky, composed from translucent quartz grains, very fine rarely fine, sub angular to sub rounded, well sorted. With abundant strong limestone cement, grading to Limestone in part, common glauconite, poor inferred porosity.
		10	CLAYSTONE: dusky brown, occasionally medium to dark grey, occasionally greenish grey, firm to moderately hard, blocky break, silty in part , grading to SILTSTONE, poorly calcareous.
		10	SILTSTONE: moderate brown, firm to moderately hard, sub blocky, sandy in part, moderately to slightly calcareous.
11240	3426	80	SANDSTONE: very light grey, moderate brown red brown, mottled, rare green grey, firm to friable, very fine to fine grained, moderate to slightly calcareous.
		10	SILTSTONE: moderate brown to red brown to grey brown, blocky, friable, sandy, argillaceous, slightly calcareous.
		10	CLAYSTONE: dusky brown blocky, silty slightly calcareous.
11270	3435	90	SILTSTONE: moderate brown to red brown to grey brown, blocky, friable, sandy, argillaceous, slightly calcareous.
		10	SANDSTONE: very light grey, moderate brown red brown, mottled, rare green grey, firm to friable, very fine to fine grained, moderate to slightly calcareous.
11300	3444	60	SILTSTONE: moderate brown to red brown to grey brown, blocky, friable, sandy, argillaceous, slightly calcareous.
		30	CLAYSTONE: dusky brown blocky, silty slightly calcareous.
		10	SANDSTONE: very light grey, moderate brown red brown, mottled, rare green grey, firm to friable, very fine to fine grained, moderate to slightly calcareous.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
11330	3453	70	CLAYSTONE: dusky brown, moderately hard, blocky, occasional fine disseminated pyrite, moderately calcareous, very silty in part.
		20	SILTSTONE: moderate brown, firm blocky, argillaceous to sandy in part, slightly calcareous.
		10	SANDSTONE: white to very light grey, occasionally moderate brown, firm blocky, composed of quartz grains in strong calcareous cement, Grading to sandy LIMESTONE in part. The Quartz grains are clear to translucent, very fine, rarely fine, sub angular, spherical, well sorted. With poor inferred porosity.
11360	3462	70	CLAYSTONE: dusky brown, occasionally moderate greenish grey, firm to moderately hard, blocky, silty in part, moderately calcareous.
		20	SILTSTONE: moderate brown, firm blocky, very argillaceous , calcareous.
		10	SANDSTONE: white to very light grey, occasionally moderate brown, firm blocky, composed of quartz grains in strong calcareous cement, Grading to sandy LIMESTONE in part. The Quartz grains are clear to translucent, very fine, rarely fine, sub angular, spherical, well sorted. With poor inferred porosity.
11390	3472	40	SANDSTONE: white to very light grey, occasionally moderate brown, firm blocky, composed of quartz grains in strong calcareous cement, Grading to sandy LIMESTONE in part. The Quartz grains are clear to translucent, very fine, rarely fine, sub angular, spherical, well sorted. With poor inferred porosity.
		40	SILTSTONE: moderate brown, firm blocky, very argillaceous , calcareous.
		20	CLAYSTONE: dusky brown, occasionally moderate greenish grey, firm to moderately hard, blocky, silty in part, moderately calcareous.
11420	3481	60	SANDSTONE: very light grey pale red grey, moderate brown, friable, very fine to fine grained, slightly calcareous.
		40	SILTSTONE: moderate brown to grey brown, dusky brown, blocky, friable sandy, argillaceous, slightly calcareous.
		Tr	CLAYSTONE: dusky brown, blocky, firm, silty.
11450	3490	70	SILTSTONE: moderate brown to grey brown, dusky brown, blocky, friable sandy, argillaceous, slightly calcareous.
		30	SANDSTONE: very light grey pale red grey, moderate brown, friable, very fine to fine grained, slightly calcareous.
11480	3499	70	SANDSTONE: very light grey pale red grey, moderate brown, friable, very fine to fine grained, slightly calcareous.
		30	SILTSTONE: moderate brown to grey brown, dusky brown, blocky, friable sandy, argillaceous, slightly calcareous.
11510	3508	50	SANDSTONE: very light grey pale red grey, moderate brown, friable, very fine to fine grained, slightly calcareous.
		50	SILTSTONE: moderate brown to grey brown, dusky brown, blocky, friable, sandy, argillaceous, slightly calcareous.
11540	3517	60	SANDSTONE: very light grey pale red grey, moderate brown, friable, very fine to fine grained, slightly calcareous.
		40	SILTSTONE: moderate brown to grey brown, dusky brown, blocky, friable, sandy, argillaceous, slightly calcareous
11570	3526	60	SANDSTONE: very light grey pale red grey, moderate brown, friable, very fine to fine grained, slightly calcareous.
		40	SILTSTONE: moderate brown to grey brown, dusky brown, blocky, friable, sandy, argillaceous, slightly calcareous
11600	3536	60	SILTSTONE: moderate brown to grey brown, dusky brown, blocky, friable, sandy, argillaceous, slightly calcareous
		30	SANDSTONE: very light grey pale red grey, moderate brown, friable, very fine to fine grained, slightly to moderately calcareous.
		10	CLAYSTONE: dusky brown, moderate brown, blocky, friable to firm, silty, slightly calcareous.
11630	3545	60	SILTSTONE: moderate brown, firm to moderately hard, sub blocky to slightly crumbly break, commonly micromcaceous, occasional fine disseminated micropyrite, non calcareous, argillaceous, sandy in part.
		30	CLAYSTONE: moderate brown to dusky brown, firm blocky break, occasional moderately hard with blocky to angular break, silty in part.
		10	SANDSTONE: : very light grey pale red grey, moderate brown, friable, very fine to fine grained, slightly to moderately calcareous.
11660	3554	70	SILTSTONE: moderate brown, firm to moderately hard, sub blocky to slightly crumbly break, commonly micromcaceous, occasional fine disseminated micropyrite, non calcareous, argillaceous, sandy in part.
		20	SANDSTONE: : very light grey pale red grey, moderate brown, friable, very fine to fine grained, slightly to moderately calcareous.
		10	CLAYSTONE: moderate brown to dusky brown, firm blocky break, occasional moderately hard with blocky to angular break, silty in part.
11690	3563	70	SILTSTONE: moderately brown to light brown, firm to moderately hard, sub blocky to slightly crumbly break, micromicaceous in part, generally argillaceous, grading to a very fine sandstone in part.
		30	SANDSTONE: white to light brown, firm to friable composed from clear to translucent occasionally red brown stained quartz grains, very fine rarely fine grained, becoming silty in part, sub angular to sub round, well sorted, poor inferred porosity with a good calcareous or argillaceous matrix.
		Tr	CLAYSTONE: moderate brown to dusky brown, firm blocky break, occasional moderately hard with blocky to angular break, silty in part.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
11720	3572	60	SILTSTONE: moderately brown to light brown, firm to moderately hard, sub blocky to slightly crumbly break, micromicaceous in part, increasingly argillaceous, grading to a very fine sandstone in part.
		30	SANDSTONE: white to light brown, firm to friable composed from clear to translucent occasionally red brown stained quartz grains, very fine rarely fine grained, becoming silty in part, sub angular to sub round, well sorted, poor inferred porosity, common mica and glauconite, with a good calcareous or argillaceous matrix.
		10	CLAYSTONE: moderate brown to dusky brown, firm blocky break, occasional moderately hard with blocky to angular break, silty in part, occasionally micromicaceous.
11750	3581	60	SILTSTONE: moderately brown to light brown, firm to moderately hard, sub blocky to slightly crumbly break, micromicaceous in part, increasingly argillaceous, grading to a very fine sandstone in part.
		30	SANDSTONE: white to light brown, firm to friable composed from clear to translucent occasionally red brown stained quartz grains, very fine rarely fine grained, becoming silty in part, sub angular to sub round, well sorted, poor inferred porosity, common mica and glauconite, with a good calcareous or argillaceous matrix.
		10	CLAYSTONE: moderate brown to dusky brown, firm blocky break, occasional moderately hard with blocky to angular break, silty in part, occasionally micromicaceous.
11780	3590	50	SILTSTONE: moderately brown to light brown, firm to moderately hard, sub blocky to slightly crumbly break, micromicaceous in part, increasingly argillaceous, grading to a very fine sandstone in part.
		50	SANDSTONE: white to light brown, firm to friable, mainly seen as rock flour, occasional clear to translucent or y red brown stained quartz grains can be observed , they are very fine or rarely fine grained, becoming silty in part, sub angular to sub round, well sorted, poor inferred porosity, common mica and glauconite, with a good calcareous or argillaceous matrix.
11810	3600	80	SANDSTONE: white to light brown, firm to friable, mainly seen as rock flour, occasional clear to translucent or y red brown stained quartz grains can be observed , they are very fine or rarely fine grained, becoming silty in part, sub angular to sub round, well sorted, poor inferred porosity, common mica and glauconite, with a good calcareous or argillaceous matrix.
		20	SILTSTONE: moderately brown to light brown, firm to moderately hard, sub blocky to slightly crumbly break, micromicaceous in part, increasingly argillaceous, grading to a very fine sandstone in part
11840	3609	9	SANDSTONE: white to light brown, firm to friable, mainly seen as rock flour, occasional clear to translucent or y red brown stained quartz grains can be observed , they are very fine or rarely fine grained, becoming silty in part, sub angular to sub round, well sorted, poor inferred porosity, common mica and glauconite, with a good calcareous or argillaceous matrix.
		10	SILTSTONE: moderately brown to light brown, firm to moderately hard, sub blocky to slightly crumbly break, micromicaceous in part, increasingly argillaceous, grading to a very fine sandstone in part
11870	3618	60	SILTSTONE: moderate brown, occasionally dusky brown, firm to moderately hard, blocky to crumbly break, sandy in part, rarely micromicaceous.
		40	SANDSTONE: white to moderate brown, generally seen as rock flour, occasionally seen as colourless to translucent, occasionally red brown stained, very fine quartz crystals, grading to siltstone in part, in a silica or calcareous matrix.
11900	3627	80	SILTSTONE: moderate brown, occasionally dusky brown, firm to moderately hard, blocky to crumbly break, sandy in part, rarely micromicaceous.
		20	SANDSTONE: white to moderate brown, generally seen as rock flour, occasionally seen as colourless to translucent, occasionally red brown stained, very fine quartz crystals, grading to siltstone in part, in a silica or calcareous matrix.
11930	3636	60	SANDSTONE: moderate brown to light brown, grey brown, mottled, friable, very fine to fine grained, sub angular to sub rounded, silty, moderately calcareous, grades to sandy siltstone.
		40	SILTSTONE: moderate brown to grey brown, blocky, friable, sandy, argillaceous, slightly calcareous.
11960	3645	60	SANDSTONE: moderate brown to light brown, grey brown, mottled, friable, very fine to fine grained, sub angular to sub rounded, silty, moderately calcareous, grades to sandy siltstone.
		40	SILTSTONE: moderate brown to grey brown, blocky, friable, sandy, argillaceous, slightly calcareous.
11990	3654	70	SANDSTONE: very light grey moderate brown, mottled, firm to friable, very fine to fine grained, sub angular to sub rounded, silty, moderately to slightly calcareous, grading to sandy siltstone.
		30	SILTSTONE: moderate brown to grey brown, blocky, friable, sandy, argillaceous, slightly calcareous.
12020	3663	40	SANDSTONE: very light grey moderate brown, mottled, firm to friable, very fine to fine grained, sub angular to sub rounded, silty, moderately to slightly calcareous, grading to sandy siltstone.
		30	SILTSTONE: moderate brown to grey brown, blocky, friable, sandy, argillaceous, slightly calcareous.
		30	CLAYSTONE: dusky brown, blocky, firm silty slightly calcareous.
12050	3672	20	LIMESTONE: white to very light grey, amorphous to cryptocrystalline, locally anhydritic.
		30	SANDSTONE: very light grey moderate brown, mottled, firm to friable, very fine to fine grained, sub angular to sub rounded, silty, moderately to slightly calcareous, grading to sandy siltstone.
		30	SILTSTONE: moderate brown to grey brown, blocky, friable, sandy, argillaceous, slightly calcareous.
		20	CLAYSTONE: dusky brown, blocky, firm silty slightly calcareous.
		Tr	TUFF: grey brown to grey blue, speckled black, microcrystalline.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
12080	3682	50	SANDSTONE: white to pale grey, moderate to light brown, composed of clear to translucent, very fine to silty quartz grains, sub angular, spherical, well sorted, with common white calcareous matrix, or red brown argillaceous matrix, poor inferred porosity.
		30	SILTSTONE: moderate brown, firm to moderately hard, sub blocky, crumbly break, very argillaceous, occasionally micaceous.
		20	CLAYSTONE: moderate brown to dusky brown, firm to moderately hard, blocky, slightly silty in part.
12110	3691	60	SILTSTONE: moderate brown, firm to moderately hard, sub blocky, crumbly break, very argillaceous, occasionally micaceous.
		30	CLAYSTONE: moderate brown to dusky brown, firm to moderately hard, blocky and slightly silty in part.
		20	SANDSTONE: white to pale grey, moderate to light brown, composed of clear to translucent, very fine to silty quartz grains, sub angular, spherical, well sorted, with common white calcareous matrix, or red brown argillaceous matrix, anhydritic in part, poor inferred porosity.
12140	3700	70	SILTSTONE: moderate brown, occasionally medium grey, moderately hard, sub blocky to crumbly break, micromicaceous, argillaceous.
		20	CLAYSTONE: moderate brown to dusky brown, firm to moderately hard, blocky break, slightly silty in part.
		10	SANDSTONE: white to pale grey, moderate to light brown, composed of clear to translucent, very fine to silty quartz grains, sub angular, spherical, well sorted, with common white calcareous or anhydritic matrix, or red brown argillaceous matrix, poor inferred porosity.
12170	3709	60	SILTSTONE: moderate brown, occasionally medium grey, moderately hard, sub blocky to crumbly break, micromicaceous, argillaceous.
		20	CLAYSTONE: moderate brown to dusky brown, firm to moderately hard, blocky break, slightly silty in part.
		20	SANDSTONE: white to pale grey, moderate to light brown, composed of clear to translucent, very fine to silty quartz grains, sub angular, spherical, well sorted, with common white calcareous or anhydritic matrix, or red brown argillaceous matrix, poor inferred porosity.
12200	3718	60	SILTSTONE: moderate brown, grey brown blocky, firm to friable, sandy, argillaceous, very slightly calcareous,
		20	CLAYSTONE: dusky brown, blocky, firm, firm slightly calcareous.
		20	SANDSTONE: moderate brown to light brown rare light grey, mottled, friable, very fine to fine grained, sub angular to rounded, mostly Quartz, slightly calcareous.
12230	3728	50	SILTSTONE: moderate brown, grey brown blocky, firm to friable, sandy, argillaceous, very slightly calcareous,
		40	SANDSTONE: very light grey, light brown to moderate brown, friable, very fine to fine grained sub angular to rounded, mostly Quartz, locally argillaceous, locally silty, slightly calcareous.
		10	CLAYSTONE: dusky brown, blocky, firm, firm slightly calcareous.
12260	3737	60	SILTSTONE: moderate brown, grey brown blocky, firm to friable, sandy, argillaceous, very slightly calcareous,
		30	SANDSTONE: very light grey, light brown to moderate brown, friable, very fine to fine grained sub angular to rounded, mostly Quartz, locally argillaceous, locally silty, slightly calcareous.
		10	CLAYSTONE: dusky brown, blocky, firm, firm slightly calcareous.
		TR	TUFF: green grey, grey brown, speckled, firm, vitreous to microcrystalline.
12290	3746	60	SILTSTONE: moderate brown, grey brown blocky, firm to friable, sandy, argillaceous, very slightly calcareous,
		30	SANDSTONE: very light grey, light brown to moderate brown, friable, very fine to fine grained sub angular to rounded, mostly Quartz, locally argillaceous, locally silty, slightly calcareous.
		10	CLAYSTONE: dusky brown, blocky, firm, firm slightly calcareous.
		Tr	TUFF: green grey, grey brown, speckled, firm, vitreous to microcrystalline.
12320	3755	80	SILTSTONE: dusky brown to moderate brown, moderately hard, blocky to crumbly break, slightly brittle in part, very argillaceous, occasionally micaceous.
		10	SANDSTONE: very light grey, light brown to moderate brown, friable, very fine to fine grained sub angular to rounded, mostly Quartz, locally argillaceous, locally silty, slightly calcareous.
		10	CLAYSTONE: dusky brown, moderately hard, blocky break slightly brittle in part, occasionally silty.
12350	3764	70	SILTSTONE: dusky brown to moderate brown, moderately hard, blocky to crumbly break, slightly brittle in part, very argillaceous, occasionally micaceous.
		20	SANDSTONE: very light grey, light brown to moderate brown, friable, very fine to fine grained sub angular to rounded, mostly Quartz, locally argillaceous, locally silty, slightly calcareous.
		10	CLAYSTONE: dusky brown, moderately hard, blocky break slightly brittle in part, occasionally silty.
12380	3773	70	SILTSTONE: dusky brown to moderate brown, moderately hard, blocky to crumbly break, slightly brittle in part, very argillaceous, occasionally micaceous.
		20	SANDSTONE: very light grey, light brown to moderate brown, friable, very fine to fine grained sub angular to rounded, mostly Quartz, locally argillaceous, locally silty, slightly calcareous.
		10	CLAYSTONE: dusky brown, moderately hard, blocky break slightly brittle in part, occasionally silty.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
12410	3782	70	SILTSTONE: dusky brown to moderate brown, moderately hard, blocky to crumbly break, slightly brittle in part, very argillaceous, occasionally micaceous.
		30	CLAYSTONE: dusky brown, moderately hard, blocky break slightly brittle in part, occasionally silty.
		Tr	SANDSTONE: very light grey, light brown to moderate brown, friable, very fine to fine grained sub angular to rounded, mostly Quartz, locally argillaceous, locally silty, slightly calcareous.
12440	3792	80	SILTSTONE: moderate brown to grey brown to red grey, mottled, friable to firm sandy, argillaceous, slightly dolomitic/calcareous.
		10	CLAYSTONE: dusky brown, blocky, firm to very firm, locally silty, slightly calcareous.
		10	SANDSTONE: very light grey, light brown, red grey, very fine to fine grained, sub angular to sub rounded, slightly to moderately dolomitic/calcareous.
12470	3801	60	SILTSTONE: moderate brown to grey brown to red grey, mottled, friable to firm sandy, argillaceous, slightly dolomitic/calcareous.
		30	SANDSTONE: very light grey, light brown, red grey, very fine to fine grained, sub angular to sub rounded, locally silty slightly dolomitic/calcareous.
		10	CLAYSTONE: dusky brown, blocky, firm to very firm, locally silty, slightly calcareous.
12500	3810	50	SILTSTONE: moderate brown to grey brown to red grey, mottled, friable to firm sandy, argillaceous, slightly dolomitic/calcareous.
		30	CLAYSTONE: dusky brown, blocky, firm to very firm, locally silty, slightly calcareous.
		20	SANDSTONE: very light grey, light brown, red grey, very fine to fine grained, sub angular to sub rounded, locally silty slightly dolomitic/calcareous.
		Tr	TUFF: green grey to dark green grey, microcrystalline, micaceous.
12530	3819	70	SILTSTONE: moderate brown to grey brown to red grey, mottled, friable to firm sandy, argillaceous, slightly dolomitic/calcareous.
		20	CLAYSTONE: dusky brown, blocky, firm to very firm, locally silty, slightly calcareous.
		10	SANDSTONE: very light grey, light brown, red grey, very fine to fine grained, sub angular to sub rounded, locally silty slightly dolomitic/calcareous.
12560	3828	60	SILTSTONE: moderate brown to grey brown to red grey, mottled, friable to firm sandy, argillaceous, slightly dolomitic/calcareous.
		30	CLAYSTONE: dusky brown, blocky, firm to very firm, locally silty, slightly calcareous.
		10	SANDSTONE: very light grey, light brown, red grey, very fine to fine grained, sub angular to sub rounded, locally silty slightly dolomitic/calcareous.
12590	3837	70	SILTSTONE: moderate brown, mottled white to very pale grey, firm to crumbly break, occasional mica. Moderately calcareous, sandy in part.
		30	CLAYSTONE: dusky brown, firm to moderately hard, blocky break, non calcareous.
12620	3847	60	SILTSTONE: moderate brown, firm to moderately hard, sub blocky to crumbly break, very argillaceous in part, grading to silty Claystone, micaceous in part.
		30	SANDSTONE: very light grey, light brown, red grey, clear to translucent quartz grains, very fine to fine grained, sub angular to sub rounded, locally silty, in good calcareous cement.
		10	CLAYSTONE: dusky brown, blocky, firm to very firm, locally silty, slightly calcareous.
12650	3856	50	SILTSTONE: moderate brown, firm to moderately hard, sub blocky to crumbly break, very argillaceous in part, grading to silty Claystone, micaceous in part.
		40	SANDSTONE: very light grey, light brown, red grey, clear to translucent quartz grains, very fine to fine grained, sub angular to sub rounded, locally silty, in good calcareous cement.
		10	CLAYSTONE: dusky brown, blocky, firm to very firm, locally silty, slightly calcareous.
12680	3865	80	SILTSTONE: moderate brown to grey brown, blocky firm to hard, locally argillaceous, locally sandy, moderately calcareous.
		10	SANDSTONE: light grey, light brown, moderate brown, very fine grained, silty, moderately to slightly calcareous.
		10	CLAYSTONE: dusky brown, blocky, firm to hard, occasionally brittle, silty in part, moderately to slightly calcareous.
12710	3874	80	SILTSTONE: moderate brown to grey brown, blocky firm to hard, locally argillaceous, locally sandy, moderately calcareous.
		20	CLAYSTONE: dusky brown, blocky, firm to hard, occasionally brittle, silty in part, moderately to slightly calcareous.
		Tr	SANDSTONE: light grey, light brown, moderate brown, very fine grained, silty, moderately to slightly calcareous.
12740	3883	60	SILTSTONE: moderate brown to grey brown, blocky firm to hard, locally argillaceous, locally sandy, moderately calcareous.
		40	CLAYSTONE: dusky brown, blocky, firm to hard, occasionally brittle, silty in part, moderately to slightly calcareous.
		Tr	SANDSTONE: light grey, light brown, moderate brown, very fine grained, silty, moderately to slightly calcareous.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
12770	3892	70	CLAYSTONE: dusky brown, blocky, firm to hard, occasionally brittle, silty in part, moderately to slightly calcareous
		30	SILTSTONE: moderate brown to grey brown, blocky firm to hard, locally argillaceous, locally sandy, moderately calcareous.
		Tr	SANDSTONE: light grey, light brown, moderate brown, very fine grained, silty, moderately to slightly calcareous.
12800	3901	100	CLAYSTONE: dusky brown, occasionally medium grey, firm to very firm, blocky to sub blocky, occasional mica, locally silty.
		Tr	SILTSTONE: moderate brown to grey brown, blocky firm to hard, locally argillaceous, locally sandy, moderately calcareous.
12830	3910	90	CLAYSTONE: dusky brown, occasionally medium grey, firm to very firm, blocky to sub blocky, occasional mica, locally silty.
		10	SILTSTONE: moderate brown to grey brown, blocky firm to hard, locally argillaceous, locally sandy, moderately calcareous.
12860	3920	90	CLAYSTONE: dusky brown, occasionally medium grey, firm to very firm, blocky to sub blocky, occasional mica, locally silty.
		10	SILTSTONE: moderate brown to grey brown, blocky firm to hard, locally argillaceous, locally sandy, moderately calcareous.
12890	3929	60	SILTSTONE: moderate brown to grey brown, mottled, blocky to sub blocky, friable, sandy, locally argillaceous, moderately to slightly calcareous.
		30	CLAYSTONE: dusky brown, blocky, firm to hard, often brittle, silty, moderately to slightly calcareous.
		10	SANDSTONE: very light grey, light brown to moderate brown, mottled very fine to fine grained, friable, moderately to slightly calcareous.
12920	3938	70	SILTSTONE: moderate brown to grey brown, mottled, blocky to sub blocky, friable, sandy to very sandy, locally argillaceous, slightly calcareous.
		20	CLAYSTONE: dusky brown, blocky, firm to hard, often brittle, silty, moderately to slightly calcareous.
		10	SANDSTONE: very light grey, light brown to moderate brown, mottled very fine to fine grained, friable, moderately to slightly calcareous.
12950	3947	80	SILTSTONE: moderate brown to grey brown, mottled, blocky to sub blocky, friable, sandy to very sandy, locally argillaceous, slightly calcareous.
		10	CLAYSTONE: dusky brown, blocky, firm to hard, often brittle, silty, moderately to slightly calcareous.
		10	SANDSTONE: very light grey, light brown to moderate brown, mottled very fine to fine grained, friable, moderately to slightly calcareous.
12980	3956	60	SILTSTONE: moderate brown to grey brown, mottled, blocky to sub blocky, friable, sandy to very sandy, locally argillaceous, slightly calcareous.
		30	SANDSTONE: very light grey, light brown to moderate brown, mottled/speckled, very fine to fine grained, friable, moderately to slightly calcareous.
		10	CLAYSTONE: dusky brown, blocky, firm to hard, often brittle, silty, moderately to slightly calcareous.
13010	3965	60	SILTSTONE: moderate brown to dusky brown, in part mottled with white to pale grey patches, firm sub blocky, slightly calcareous in part.
		20	CLAYSTONE: dusky brown, blocky, firm to hard, often brittle, silty, moderately to slightly calcareous.
		20	SANDSTONE: very light grey, light brown to moderate brown, seen as rock flour, mottled very fine to fine grained, friable, moderately to slightly calcareous.
13040	3975	50	CLAYSTONE: dusky brown, blocky, firm to hard, often brittle, silty, moderately to slightly calcareous.
		30	SILTSTONE: moderate brown to dusky brown, in part mottled with white to pale grey patches, firm sub blocky, slightly calcareous in part.
		20	SANDSTONE: very light grey, light brown to moderate brown, seen as rock flour, mottled very fine to fine grained, friable, moderately to slightly calcareous.
13070	3984	40	SANDSTONE: pale grey to white, mottled light brown to moderate brown, firm, blocky . Predominantly seen as rock flour, occasional very fine translucent quartz grains, sub angular, spherical, well sorted, with occasional calcareous matrix, poor inferred porosity.
		30	SILTSTONE: moderate brown to dusky brown, in part mottled with white to pale grey patches, firm sub blocky, slightly calcareous in part.
		30	CLAYSTONE: dusky brown, blocky, firm to hard, often brittle, silty, moderately to slightly calcareous.
13100	3993	40	SANDSTONE: pale grey to white, mottled light brown to moderate brown, firm, blocky . Predominantly seen as rock flour, occasional very fine translucent quartz grains, sub angular, spherical, well sorted, with occasional calcareous matrix, poor inferred porosity.
		30	SILTSTONE: moderate brown to dusky brown, in part mottled with white to pale grey patches, firm sub blocky, slightly calcareous in part.
		30	CLAYSTONE: dusky brown, blocky, firm to hard, often brittle, silty, moderately to slightly calcareous.
13129	4002	70	SILTSTONE: moderate brown, occasionally moderate red brown, pale grey mottled in parts, occasionally slightly black speckled in parts, slightly soft to slightly firm, sub blocky, commonly slightly calcareous.
		20	SANDSTONE: light grey, light to moderate brown grey, occasionally light to moderate yellow grey, commonly opaque, occasionally slightly translucent, soft, amorphous to sub blocky, seen as rock flour
		10	CLAYSTONE: commonly moderate red brown to dusky brown, firm, blocky to angular, commonly slightly silty

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
13160	4011	70	SILTSTONE: moderate brown, occasionally moderate red brown, pale grey mottled in parts, occasionally slightly black speckled in parts, slightly soft to slightly firm, sub blocky, commonly slightly calcareous.
		20	SANDSTONE: light grey, light to moderate brown grey, occasionally light to moderate yellow grey, commonly opaque, occasionally slightly translucent, soft, amorphous to sub blocky, slightly calcareous, seen as rock flour
		10	CLAYSTONE: moderate red brown to dusky brown, occasionally moderate to dark grey green, firm, blocky to angular, commonly slightly silty
13190	4020	50	SILTSTONE: moderate brown, occasionally moderate red brown, pale grey mottled in parts, occasionally slightly black speckled in parts, slightly soft to slightly firm, sub blocky, commonly slightly calcareous.
		40	SANDSTONE: light grey, light to moderate brown grey, occasionally light to moderate yellow grey, commonly opaque, occasionally slightly translucent, soft, amorphous to sub blocky, slightly calcareous, seen as rock flour
		10	CLAYSTONE: moderate red brown to dusky brown, firm, blocky to angular, commonly slightly silty
13220	4029	50	SANDSTONE: light brown, light to moderate brown grey, occasionally light grey, commonly opaque, occasionally slightly translucent, soft, amorphous to sub blocky, slightly calcareous, seen as rock flour mixed with argillaceous material
		40	SILTSTONE: moderate brown, moderate red brown, occasionally becoming slightly dusky brown, occasionally slightly black speckled in parts, slightly soft to slightly firm, sub blocky to blocky, commonly slightly calcareous.
		10	CLAYSTONE: moderate red brown to dusky brown, soft to slightly firm, blocky, commonly slightly silty
13250	4039	80	SILTSTONE: predominantly moderate brown, occasionally becoming slightly dusky brown, commonly slightly black speckled in parts, slightly soft to slightly firm, sub blocky to blocky, commonly slightly calcareous.
		20	SANDSTONE: light brown, light to moderate brown grey, occasionally light grey, commonly opaque, occasionally slightly translucent, soft, amorphous to sub blocky, slightly calcareous, seen as rock flour mixed with argillaceous material
		tr	CLAYSTONE: moderate red brown to dusky brown, soft to slightly firm, blocky, commonly slightly silty
13264 B/U	4043	70	SANDSTONE: pale grey to pale brown, mottled in parts, firm, sub blocky, argillaceous, moderately calcareous, seen as rock flour
		20	SILTSTONE: moderate brown, moderate red brown, occasionally becoming slightly dusky brown, slightly soft to slightly firm, sub blocky to blocky, commonly slightly calcareous.
		10	CLAYSTONE: moderate red brown to dusky brown, soft to slightly firm, blocky, commonly slightly silty
13280	4048	90	SILTSTONE: pale brownish grey to moderate brown, with pale grey to pale brownish grey mottling, firm, sub blocky, slightly calcareous, argillaceous in part.
		10	SANDSTONE: very pale grey to greyish red, soft friable, sub blocky to amorphous, ca Calcareous in part, generally seen as rock flour, rare colourless very fine to fine sub angular quartz grains.
13310	4057	50	SILTSTONE: pale brownish grey to moderate brown, with pale grey to pale brownish grey mottling, firm, sub blocky, slightly calcareous, occasionally micaceous, argillaceous in part.
		50	SANDSTONE: very pale grey to greyish red, soft friable, sub blocky to amorphous, calcareous in part, generally seen as rock flour, rare colourless very fine to fine sub angular quartz grains.
13340	4066	60	SILTSTONE: moderate brown, mottled light reddish grey, firm, blocky to sub blocky, calcareous, argillaceous in part.
		40	SANDSTONE: white to pale reddish brown, firm, rock flour, occasional very fine quartz grains.
13370	4075	70	SANDSTONE: pale red brown, moderate brown, hard, sub blocky, lithic fragments composed of red brown stains, translucent quartz grains, very fine rarely fine grained, angular to occasionally sub angular, spherical to elongated, well sorted, silica cement, moderate inferred porosity.
		30	SILTSTONE: moderate brown, mottled light reddish grey, firm, blocky to sub blocky, calcareous, argillaceous in part.
13400	4084	70	SANDSTONE: white to pale grey, red brown, firm friable, composed from colourless to red brown stained, translucent, very fine, rarely fine quartz grains, angular to sub angular, sub elongated to spherical, well sorted, good silica cement with an occasional argillaceous matrix , calcareous in part, moderate inferred porosity.
		30	SILTSTONE: moderate brown, firm sub blocky, argillaceous in part, sandy in places.
13430	4093	80	SANDSTONE: white to pale grey, red brown, firm friable, composed from colourless to red brown stained, translucent, very fine, rarely fine quartz grains, angular to sub angular, sub elongated to spherical, well sorted, good silica cement with an occasional argillaceous matrix , calcareous in part, moderate inferred porosity.
		20	SILTSTONE: moderate brown, moderate red brown, occasionally becoming slightly dusky brown, slightly soft to slightly firm, sub blocky to blocky, commonly slightly calcareous
		Tr	CLAYSTONE: moderate brown to dusky brown, firm to moderately hard, sub blocky, argillaceous.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
13460	4102	60	SILTSTONE: moderate brown, moderate red brown, occasionally becoming slightly dusky brown, slightly soft to slightly firm, sub blocky to blocky, commonly slightly calcareous
		30	SANDSTONE: : white to pale grey, red brown, firm friable, composed from colourless to red brown stained, translucent, very fine, rarely fine quartz grains, angular to sub angular, sub elongated to spherical, well sorted, good silica cement with an occasional argillaceous matrix , calcareous in part, moderate inferred porosity.
		10	CLAYSTONE: moderate brown to dusky brown, firm to moderately hard, sub blocky, argillaceous.
13490	4112	50	SILTSTONE: moderate brown, moderate red brown, occasionally becoming slightly dusky brown, slightly soft to slightly firm, sub blocky to blocky, commonly slightly calcareous
		30	SANDSTONE: white to pale grey, red brown, firm friable, Mainly seen as rock flour, calcareous in part.
		20	CLAYSTONE: moderate brown, dusky brown, occasionally dark grey, firm to moderately hard blocky non calcareous.
13520	4121	50	SILTSTONE: moderate brown, moderate red brown, occasionally becoming slightly dusky brown, slightly soft to slightly firm, sub blocky to blocky, commonly slightly calcareous
		40	CLAYSTONE: moderate brown, dusky brown, occasionally dark grey, firm to moderately hard blocky non calcareous.
		10	SANDSTONE: white to pale grey, red brown, firm friable, Mainly seen as rock flour, calcareous in part.
13550	4130	50	SILTSTONE: moderate brown, moderate red brown, occasionally becoming slightly dusky brown, slightly soft to slightly firm, sub blocky to blocky, commonly slightly calcareous
		40	SANDSTONE: white to pale grey, red brown, firm friable, Mainly seen as rock flour, calcareous in part.
		10	CLAYSTONE: moderate brown, dusky brown, occasionally dark grey, firm to moderately hard blocky non calcareous.
13580	4139	70	SILTSTONE: moderate brown to dusky brown, occasionally moderate yellow brown to moderate red brown, commonly slightly black speckled, predominantly soft to slightly firm, friable, blocky, non calcareous, commonly sandy, grading very fine Sandstone
		30	SANDSTONE: pale to medium yellow brown, medium red brown, occasionally pale yellow grey, commonly opaque, rarely slightly translucent, soft, very friable, blocky, commonly seen as rock flour, rare visible very fine grade quartz grains
		Tr	CLAYSTONE: medium brown to medium red brown, occasionally grading dusky brown, soft to firm, slightly friable in part, blocky, non calcareous, very silty in part, grading siltstone
13610	4148	60	SILTSTONE: moderate brown to dusky brown, occasionally moderate yellow brown to moderate red brown, commonly slightly black speckled, predominantly soft, friable, blocky, non calcareous, commonly sandy, grading very fine Sandstone
		40	SANDSTONE: pale to medium yellow brown, medium red brown, occasionally pale yellow grey, commonly opaque, rarely slightly translucent, soft, very friable, blocky, commonly seen as rock flour, rare visible very fine grade quartz grains
		Tr	CLAYSTONE: medium brown to medium red brown, occasionally grading dusky brown, soft to firm, slightly friable in part, blocky, non calcareous, very silty in part, grading siltstone
13640	4157	50	SILTSTONE: moderate brown to dusky brown, occasionally moderate yellow brown to moderate red brown, slightly to moderately black speckled, predominantly soft, friable, blocky, non calcareous, commonly sandy, grading very fine Sandstone
		50	SANDSTONE: pale to medium yellow brown, medium red brown, occasionally pale yellow grey, commonly opaque, rarely slightly translucent, soft, very friable, blocky, commonly seen as rock flour, rare visible very fine grade quartz grains
		Tr	CLAYSTONE: medium brown to medium red brown, occasionally grading dusky brown, soft to firm, slightly friable in part, blocky, non calcareous, very silty in part, grading siltstone
13670	4167	80	SANDSTONE: pale to medium yellow grey, occasionally red grey mottled, rarely medium to dark greenish grey, soft to slightly firm, very friable, blocky, very silty grading quartzose siltstone in parts, moderately calcareous, commonly as rock flour
		20	SILTSTONE: moderate brown to dusky brown, occasionally moderate yellow brown to moderate red brown, commonly slightly black speckled, predominantly soft, friable, blocky, non calcareous, commonly sandy, grading very fine Sandstone
		Tr	CLAYSTONE: medium brown to medium red brown, occasionally grading dusky brown, soft to firm, slightly friable in part, blocky, non calcareous, very silty in part, grading siltstone
13700	4176	100	SANDSTONE: pale to moderate brown to grey brown, firm, crumbly rock flour, with trace very fine sand, colourless, transparent, well sorted non to very slightly calcareous.
		Tr	SILTSTONE: moderate brown to dusky brown, occasionally moderate yellow brown to moderate red brown, commonly slightly black speckled, predominantly soft, friable, blocky, non calcareous, commonly sandy, grading very fine Sandstone.
13740	4188	70	SANDSTONE: pale to moderate brown to grey brown, firm, crumbly rock flour, with trace very fine sand, colourless, transparent, well sorted non to very slightly calcareous.
		30	SILTSTONE: moderate brown, moderately hard, blocky, slight to moderately calcareous, micaceous, sandy, very fine, grading to very fine silty Sandstone.
		RTr	CLAYSTONE: moderate brown to dark reddish brown, moderately hard, silty in part, slightly calcareous.
13760	4194	80	SANDSTONE: pale to moderate brown to grey brown, firm, crumbly rock flour, with trace very fine sand, colourless, transparent, well sorted non to very slightly calcareous.
		20	SILTSTONE: moderate brown, moderately hard, blocky, slight to moderately calcareous, micaceous, sandy, very fine, grading to very fine silty Sandstone.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
13790	4203	80	SANDSTONE: moderate brown, moderate grey brown, commonly slightly speckled in parts, occasionally slightly red brown mottled, opaque, slightly soft to slightly firm, friable, sub blocky to blocky, slightly calcareous, very silty, grading sandy Siltstone in parts
		20	SILTSTONE: moderate brown, rarely dark grey, commonly slightly speckled, soft to slightly firm, blocky, friable, slightly calcareous, grading very fine sandy in parts
13820	4212	90	SANDSTONE: moderate brown, moderate grey brown, commonly slightly speckled in parts, occasionally slightly red brown mottled, opaque, slightly soft to slightly firm, friable, sub blocky to blocky, slightly calcareous, very silty, grading sandy Siltstone in parts
		10	SILTSTONE: moderate brown, rarely dark grey, commonly slightly speckled, soft to slightly firm, blocky, friable, slightly calcareous, grading very fine sandy in parts
13827 Spot @ Flow-chk	4214	90	SANDSTONE: moderate brown, moderate grey brown, commonly slightly speckled in parts, occasionally slightly red brown mottled, opaque, slightly soft to slightly firm, friable, sub blocky to blocky, slightly calcareous, very silty, grading sandy Siltstone in parts
		10	SILTSTONE: moderate brown, rarely dark grey, commonly slightly speckled, soft to slightly firm, blocky, friable, slightly calcareous, grading very fine sandy in parts
13850	4221	70	SANDSTONE: moderate brown, moderate grey brown, commonly slightly speckled in parts, occasionally slightly red brown mottled, opaque, slightly soft to slightly firm, friable, sub blocky to blocky, slightly calcareous, very silty, grading sandy Siltstone in parts
		10	SILTSTONE: moderate brown, rarely dark grey, commonly slightly speckled, soft to slightly firm, friable, slightly calcareous, grading very fine sandy in parts
		20	CLAYSTONE: medium to dark green grey, firm, blocky to sub angular, slightly silty, non calcareous
13880	4231	40	SANDSTONE: moderate brown, moderate grey brown, pale to medium yellow grey, medium grey, commonly slightly speckled in parts, occasionally slightly red brown mottled, opaque, slightly soft to slightly firm, friable, sub blocky to blocky, slightly calcareous, very silty, grading sandy Siltstone in parts
		60	SILTSTONE: moderate brown, occasionally moderate red brown, commonly slightly speckled, soft to slightly firm, blocky, friable, slightly calcareous, grading very fine sandy in parts.
13910	4240	30	SANDSTONE: moderate brown, moderate grey brown, pale to medium yellow grey, medium grey, commonly slightly speckled in parts, occasionally slightly red brown mottled, opaque, slightly soft to slightly firm, friable, sub blocky to blocky, slightly calcareous, very silty, grading sandy Siltstone in parts
		60	SILTSTONE: moderate brown, occasionally moderate red brown, commonly slightly speckled, soft to slightly firm, blocky, friable, slightly calcareous, grading in part to very fine sandstone.
		10	CLAYSTONE: dark reddish brown, moderately hard, blocky, silty in part, non to very slightly calcareous.
13940	4249	30	SANDSTONE: moderate brown to grey brown, firm to moderately hard, blocky crumbly rock flour, with occasional traces of very fine sand, silty, grading in part to sandy Siltstone.
		60	SILTSTONE: moderate brown to dark reddish brown, moderately hard, blocky, crumbly, non to slightly calcareous, micaceous, in part sandy, grading to Sandstone, occasionally grading to silty Claystone.
		10	CLAYSTONE: dark reddish brown, moderately hard, blocky, occasionally silty, non calcareous.
13970	4258	90	SANDSTONE: moderate brown to grey brown, firm to moderately hard, blocky crumbly rock flour, with occasional traces of very fine sand, silty, grading in part to sandy Siltstone.
		10	SILTSTONE: moderate brown to dark reddish brown, moderately hard, blocky, crumbly, non to slightly calcareous, micaceous, in part sandy, grading to Sandstone, occasionally grading to silty Claystone.
14000	4267	60	SANDSTONE: moderate brown, occasionally pale to moderate yellow grey to brown grey, commonly slightly mottled, slightly to moderately firm, blocky, friable, non to slightly calcareous, occasional traces of very fine sand, silty, grading in part to sandy Siltstone, commonly seen as rock flour
		40	SILTSTONE: moderate brown, medium to dark reddish brown, moderately to very firm, blocky, commonly crumbly, non to slightly calcareous, commonly sandy, grading to silty Sandstone, occasionally grading to silty Claystone.
		tr	CLAYSTONE: moderate to dusky brown, occasionally slightly reddish brown, firm to slightly hard, blocky, non to slightly calcareous, silty, grading argillaceous Siltstone in parts
14030	4276	60	SANDSTONE: moderate brown, occasionally pale to moderate yellow grey to brown grey, commonly slightly mottled, slightly to moderately firm, blocky, friable, non to slightly calcareous, occasional traces of very fine sand, silty, grading in part to sandy Siltstone, commonly seen as rock flour
		40	SILTSTONE: moderate brown, medium to dark reddish brown, moderately to very firm, blocky, commonly crumbly, non to slightly calcareous, commonly sandy, grading to silty Sandstone, occasionally grading to silty Claystone.
		Tr	CLAYSTONE: moderate to dusky brown, occasionally slightly reddish brown, firm to slightly hard, blocky, non to slightly calcareous, silty, grading argillaceous Siltstone in parts
14060	4285	40	SANDSTONE: moderate brown, occasionally pale to moderate yellow grey to brown grey, commonly slightly mottled, slightly to moderately firm, blocky, friable, non to slightly calcareous, occasional traces of very fine sand, silty, grading in part to sandy Siltstone, commonly seen as rock flour
		60	SILTSTONE: moderate brown, medium to dark reddish brown, moderately to very firm, blocky, commonly crumbly, non to slightly calcareous, commonly sandy, grading to silty Sandstone, occasionally grading to silty Claystone.
		Tr	CLAYSTONE: moderate to dusky brown, occasionally slightly reddish brown, firm to slightly hard, blocky, non to slightly calcareous, silty, grading argillaceous Siltstone in parts

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
14090	4295	40	SANDSTONE: moderate brown, occasionally pale to moderate yellow grey to brown grey, commonly slightly mottled, slightly to moderately firm, blocky, friable, non to slightly calcareous, occasional traces of very fine sand, silty, grading in part to sandy Siltstone, commonly seen as rock flour
		60	SILTSTONE: moderate brown, medium to dark reddish brown, moderately to very firm, blocky, commonly crumbly, non to slightly calcareous, commonly sandy, grading to silty Sandstone, occasionally grading to silty Claystone.
		Tr	CLAYSTONE: moderate to dusky brown, occasionally slightly reddish brown, firm to slightly hard, blocky, non to slightly calcareous, silty, grading argillaceous Siltstone in parts
14120	4303	50	SANDSTONE: moderate brown, occasionally pale to moderate yellow grey to brown grey, commonly slightly mottled, slightly to moderately firm, blocky, friable, non to slightly calcareous, occasional traces of very fine sand, silty, grading in part to sandy Siltstone, commonly seen as rock flour
		50	SILTSTONE: moderate brown, medium to dark reddish brown, moderately to very firm, blocky, commonly crumbly, non to slightly calcareous, commonly sandy, grading to silty Sandstone, occasionally grading to silty Claystone.
14150	4313	30	SANDSTONE: moderate brown, occasionally pale to moderate yellow grey to brown grey, commonly slightly mottled, slightly to moderately firm, blocky, friable, non to slightly calcareous, occasional traces of very fine sand, silty, grading in part to sandy Siltstone, commonly seen as rock flour
		40	SILTSTONE: moderate brown to dark reddish brown, moderately hard, blocky crumbly, non calcareous, sandy, grading to silty Sandstone.
		30	CLAYSTONE: dark reddish brown, moderately hard, blocky, non calcareous, occasionally silty, grading to Siltstone.
14180	4322	50	CLAYSTONE: medium brown to dusky brown, rarely medium grey, slightly hard, blocky to angular, non calcareous, slightly silty, commonly grading to Siltstone.
		30	SILTSTONE: moderate brown to dusky brown, commonly slightly speckled in parts, firm to slightly hard, slightly friable, blocky, non calcareous, sandy, grading to silty Sandstone.
		20	SANDSTONE: moderate brown, occasionally pale to moderate yellow brown, opaque, firm to slightly hard, blocky, slightly friable, slightly calcareous, very silty, silty, grading in part to sandy Siltstone, commonly seen as rock flour, occasional traces of very fine sand.
14210	4331	70	CLAYSTONE: medium brown to dusky brown, rarely medium grey, slightly hard, blocky to angular, non calcareous, slightly silty, commonly grading to Siltstone.
		20	SILTSTONE: moderate brown to dusky brown, commonly slightly speckled in parts, firm to slightly hard, slightly friable, blocky, non calcareous, sandy, grading to silty Sandstone.
		10	SANDSTONE: moderate brown, occasionally pale to moderate yellow brown, opaque, firm to slightly hard, blocky, slightly friable, slightly calcareous, very silty, silty, grading in part to sandy Siltstone, commonly seen as rock flour, occasional traces of very fine sand.
14240	4340	50	CLAYSTONE: medium brown to dusky brown, rarely medium grey, slightly hard, blocky to angular, non calcareous, slightly silty, commonly grading to Siltstone.
		40	SANDSTONE: moderate brown, occasionally pale to moderate yellow brown, opaque, firm to slightly hard, blocky, slightly friable, slightly calcareous, very silty, silty, grading in part to sandy Siltstone, commonly seen as rock flour occasional traces of very fine sand,
		10	SILTSTONE: moderate brown to dusky brown, commonly slightly speckled in parts, firm to slightly hard, slightly friable, blocky, non calcareous, sandy, grading to silty Sandstone.
14270	4349	60	CLAYSTONE: medium brown to dusky brown, rarely medium grey, slightly hard, blocky to angular, non calcareous, slightly silty, commonly grading to Siltstone.
		30	SILTSTONE: moderate brown to dusky brown, commonly slightly speckled in parts, firm to slightly hard, slightly friable, blocky, non calcareous, sandy, grading to silty Sandstone.
		10	SANDSTONE: moderate brown, occasionally pale to moderate yellow brown, opaque, firm to slightly hard, blocky, slightly friable, slightly calcareous, very silty, silty, grading in part to sandy Siltstone, commonly seen as rock flour, occasional traces of very fine sand.
14287	4354	20	CLAYSTONE: medium brown to dusky brown, rarely medium grey, slightly hard, blocky to angular, non calcareous, slightly silty, commonly grading to Siltstone.
B/U		40	SILTSTONE: moderate brown to dusky brown, commonly slightly speckled in parts, firm to slightly hard, slightly friable, blocky, non calcareous, sandy, grading to silty Sandstone.
		40	SANDSTONE: moderate brown, occasionally pale to moderate yellow brown, opaque, firm to slightly hard, blocky, slightly friable, slightly calcareous, very silty, silty, grading in part to sandy Siltstone, commonly seen as rock flour, occasional traces of very fine sand.
14300	4358	70	SANDSTONE: pale to medium yellow grey, yellow brown, brown grey, occasionally medium brown, commonly slightly mottled in parts, firm, slightly friable, blocky, occasional transparent colourless very fine to fine grade sand grains, slightly to moderately calcareous, commonly grading sandy Siltstone, commonly slightly argillaceous, commonly as rock flour.
		20	SILTSTONE: commonly medium brown, occasionally slightly speckled, firm to slightly hard, blocky, slightly calcareous, commonly sandy grading silty Sandstone, commonly argillaceous grading silty Claystone in parts.
		10	CLAYSTONE: medium brown to slightly reddish brown, occasionally grading dusky brown in parts, firm to slightly hard, blocky, non calcareous, commonly silty grading argillaceous Siltstone

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
14330	4368	50	SANDSTONE: pale to medium yellow grey, yellow brown, brown grey, occasionally slightly medium green grey, commonly slightly dark grey mottled in parts, firm, slightly friable, blocky, occasional transparent colourless very fine to fine grade sand grains, slightly to moderately calcareous, commonly grading sandy Siltstone, commonly slightly argillaceous, commonly as rock flour.
		30	SILTSTONE: commonly medium brown, occasionally slightly speckled, firm to slightly hard, blocky, slightly calcareous, commonly sandy grading silty Sandstone, commonly argillaceous grading silty Claystone in parts.
		20	CLAYSTONE: medium brown to slightly reddish brown, occasionally grading dusky brown in parts, rarely pale to medium grey green, firm to slightly hard, blocky, non calcareous, commonly silty grading argillaceous Siltstone
14360	4377	70	SANDSTONE: pale to medium yellow grey, yellow brown, brown grey, occasionally medium brown, commonly slightly mottled in parts, firm, slightly friable, blocky, occasional transparent colourless very fine to fine grade sand grains, slightly to moderately calcareous, commonly grading sandy Siltstone, commonly slightly argillaceous, commonly as rock flour.
		20	CLAYSTONE: medium brown to slightly reddish brown, occasionally grading dusky brown in parts, firm to slightly hard, blocky, non calcareous, commonly silty grading argillaceous Siltstone
		10	SILTSTONE: commonly medium brown, occasionally slightly speckled, firm to slightly hard, blocky, slightly calcareous, commonly sandy grading silty Sandstone, commonly argillaceous grading silty Claystone in parts.
14390	4386	50	SANDSTONE: pale to medium yellow grey, yellow brown, brown grey, occasionally medium brown, commonly slightly mottled in parts, firm, slightly friable, blocky, occasional transparent colourless very fine to fine grade sand grains, slightly to moderately calcareous, commonly grading sandy Siltstone, commonly slightly argillaceous, commonly as rock flour.
		30	SILTSTONE: commonly medium brown, occasionally slightly speckled, firm to slightly hard, blocky, slightly calcareous, commonly sandy grading silty Sandstone, commonly argillaceous grading silty Claystone in parts.
		20	CLAYSTONE: medium brown to slightly reddish brown, occasionally grading dusky brown in parts, firm to slightly hard, blocky, non calcareous, commonly silty grading argillaceous Siltstone
14420	4395	50	SANDSTONE: pale to medium yellow grey, yellow brown, brown grey, occasionally medium brown, commonly slightly mottled in parts, firm, slightly friable, blocky, occasional transparent colourless very fine to fine grade sand grains, slightly to moderately calcareous, commonly grading sandy Siltstone, commonly slightly argillaceous, commonly as rock flour.
		50	SILTSTONE: commonly medium brown, occasionally slightly speckled, firm to slightly hard, blocky, slightly calcareous, commonly sandy grading silty Sandstone, commonly argillaceous grading silty Claystone in parts.
		Tr	CLAYSTONE: medium brown to slightly reddish brown, occasionally grading dusky brown in parts, firm to slightly hard, blocky, non calcareous, commonly silty grading argillaceous Siltstone
14450	4404	70	SANDSTONE: pale to medium yellow grey, yellow brown, brown grey, occasionally medium brown, commonly slightly mottled in parts, firm, slightly friable, blocky, occasional transparent colourless very fine to fine grade sand grains, slightly to moderately calcareous, commonly grading sandy Siltstone, commonly slightly argillaceous, commonly as rock flour.
		30	SILTSTONE: commonly medium brown, occasionally slightly speckled, firm to slightly hard, blocky, slightly calcareous, commonly sandy grading silty Sandstone, commonly argillaceous grading silty Claystone in parts.
14480	4413	40	SANDSTONE: pale to medium yellow grey, yellow brown, brown grey, occasionally medium brown, commonly slightly mottled in parts, firm, slightly friable, blocky, occasional transparent colourless very fine to fine grade sand grains, slightly to moderately calcareous, commonly grading sandy Siltstone, commonly slightly argillaceous, commonly as rock flour.
		60	SILTSTONE: medium brown, becoming medium to dark grey brown in parts, occasionally slightly speckled, firm to slightly hard, blocky, slightly calcareous, commonly sandy grading silty Sandstone, commonly argillaceous grading silty Claystone in parts.
		tr	CLAYSTONE: medium brown to slightly reddish brown, occasionally grading dusky brown in parts, firm to slightly hard, blocky, non calcareous, commonly silty grading argillaceous Siltstone
14510	4422	30	SANDSTONE: moderate brown to grayish brown, occasionally pale to dark yellowish brown, mottled in part, firm to moderately hard, blocky, crumbly, rock flour with very fine sand, slightly calcareous, silty, grading to sandy Siltstone.
		70	SILTSTONE: moderate brown, firm, occasionally moderately hard, blocky, crumbly, slightly calcareous, sandy, grading to silty Sandstone.
14538	4431	40	SANDSTONE: moderate brown to grayish brown, occasionally pale to dark yellowish brown, mottled in part, firm to moderately hard, blocky, crumbly, rock flour with very fine sand, slightly calcareous, silty, grading to sandy Siltstone.
		40	SILTSTONE: moderate brown, firm, occasionally moderately hard, blocky, crumbly, slightly calcareous, sandy, grading to silty Sandstone.
		20	CLAYSTONE: moderate brown, firm to moderately hard, blocky, non to very slightly calcareous, silty, grading to Siltstone.
14540	4432	80	SANDSTONE: very light grey to light grey brown to light brown, mottled, very fine to medium grained, sub angular to rounded, moderately to slightly calcareous.
		20	SILTSTONE: light brown to moderate brown, firm, slightly calcareous.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
14570	4441	70	SANDSTONE: very light grey to light grey brown to light brown, mottled, very fine to fine grained, sub angular to rounded, moderately to slightly calcareous.
		30	SILTSTONE: light brown to moderate brown, firm, slightly calcareous, sandy
14600	4450	80	SANDSTONE: moderate brown, occasionally mottled with light to medium grey to grey brown, firm to moderately hard, blocky, crumbly, rock flour with occasional very fine sand, colourless, orange stained, non to slightly calcareous, silty in part grading to Siltstone.
		20	SILTSTONE: moderate brown, firm, blocky, crumbly, non to slightly calcareous, sandy, grading to Sandstone.
14630	4459	80	SANDSTONE: moderate brown, occasionally mottled with light to medium grey to grey brown, firm to moderately hard, blocky, crumbly, rock flour with occasional very fine sand, colourless, orange stained, non to slightly calcareous, silty in part grading to Siltstone.
		20	SILTSTONE: moderate brown, firm, blocky, crumbly, non to slightly calcareous, sandy, grading to Sandstone, occasionally grading to silty Claystone.
14660	4468	90	SANDSTONE: moderate brown, occasionally mottled with light to medium grey to grey brown, firm to moderately hard, blocky, crumbly, rock flour with occasional very fine sand, colourless, orange stained, non to slightly calcareous, silty in part grading to Siltstone.
		10	SILTSTONE: moderate brown, firm, blocky, crumbly, non to slightly calcareous, sandy, grading to Sandstone.
14690	4477	70	SANDSTONE: moderate brown, occasionally mottled with light to medium grey to grey brown, firm to moderately hard, blocky, crumbly, rock flour with occasional very fine sand, colourless, orange stained, non to slightly calcareous, silty in part grading to Siltstone.
		30	SILTSTONE: moderate brown, firm, blocky, crumbly, non to slightly calcareous, sandy, grading to Sandstone.
14720	4486	50	SANDSTONE: moderate brown, occasionally mottled with light to medium grey to grey brown, firm to moderately hard, blocky, crumbly, rock flour with occasional very fine sand, colourless, orange stained, non to slightly calcareous, silty in part grading to Siltstone.
		50	SILTSTONE: moderate brown, firm, blocky, crumbly, non to slightly calcareous, sandy, grading to Sandstone, occasionally grading to silty Claystone.
14750	4496	60	SANDSTONE: light grey to medium grey to pinkish grey to moderate brown, very fine to fine grained, slightly calcareous.
		40	SILTSTONE: moderate brown to grey brown, blocky, firm, slightly calcareous, sandy.
14810	4514	50	SANDSTONE: light grey to medium grey to pinkish grey to moderate brown, very fine to fine grained, slightly calcareous.
		40	SILTSTONE: moderate brown to grey brown, blocky, firm, slightly calcareous, sandy.
		10	CLAYSTONE: moderate brown to grey brown blocky firm silty grading to argillaceous siltstone.
14840	4523	40	SANDSTONE: moderate brown grey brown rare medium grey, very fine to fine grained, slightly calcareous, silty to very silty.
		40	SILTSTONE: moderate brown to grey brown, blocky, firm, slightly calcareous, sandy.
		20	CLAYSTONE: moderate brown to grey brown blocky, firm silty grading to argillaceous siltstone.
14870	4532	70	SANDSTONE: moderate brown, light to medium grey to grey brown, mottled, firm, blocky, crumbly, rock flour with traces very fine sand, non to very slightly calcareous, silty, grading in part to very sandy Siltstone.
		30	SILTSTONE: moderate brown to occasionally grey brown, firm to moderately hard, blocky, crumbly, non to very slightly calcareous, sandy, grading to Sandstone.
14900	4541	60	SANDSTONE: moderate brown, light to medium grey to grey brown, mottled, firm, blocky, crumbly, rock flour with traces very fine sand, non to very slightly calcareous, silty, grading in part to very sandy Siltstone.
		40	SILTSTONE: moderate brown to occasionally grey brown, firm to moderately hard, blocky, crumbly, non to very slightly calcareous, sandy, grading to Sandstone.
14930	4550	30	SANDSTONE: moderate brown, light to medium grey to grey brown, mottled, firm, blocky, crumbly, rock flour with traces very fine sand, non to very slightly calcareous, silty, grading in part to very sandy Siltstone.
		20	SILTSTONE: moderate brown to occasionally grey brown, firm to moderately hard, blocky, crumbly, non to very slightly calcareous, sandy, grading to Sandstone.
		50	CLAYSTONE: moderate brown, moderately hard, blocky, non calcareous, predominantly non to slightly silty, locally moderate to very silty, grading to Siltstone.
14960	4560	30	SANDSTONE: moderate brown, light to medium grey to grey brown, mottled, firm, blocky, crumbly, rock flour with traces very fine sand, non to very slightly calcareous, silty, grading in part to very sandy Siltstone.
		40	SILTSTONE: moderate brown to occasionally grey brown, firm to moderately hard, blocky, crumbly, non to very slightly calcareous, sandy, grading to Sandstone.
		30	CLAYSTONE: moderate brown, moderately hard, blocky, non calcareous, predominantly non to slightly silty, locally moderate to very silty, grading to Siltstone.
14990	4569	20	SANDSTONE: light grey to light brown grey, pink grey, moderate brown, very fine to fine grained, firm to friable, very slightly calcareous, silty in part.
		50	SILTSTONE: medium brown to light brown, firm to friable, sandy, argillaceous, very slightly calcareous.
		20	CLAYSTONE: moderate brown, blocky, hard to firm, very slightly calcareous, silty.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
15020	4578	30	SANDSTONE: light grey to light brown grey, pink grey, moderate brown, very fine to fine grained, firm to friable, very slightly calcareous, silty in part.
		40	SILTSTONE: medium brown to light brown, firm to friable, sandy, argillaceous, very slightly calcareous.
		30	CLAYSTONE: moderate brown, blocky, hard to firm, very slightly calcareous, silty.
15050	4587	30	SANDSTONE: moderate brown to grey brown, very fine to fine grained, sub angular to rounded, firm, very slightly calcareous, silty.
		30	SILTSTONE: medium brown to light brown, firm to friable, sandy, argillaceous, very slightly calcareous.
		40	CLAYSTONE: moderate brown, blocky, hard to firm, very slightly calcareous, silty.
15080	4596	20	SANDSTONE: moderate brown to grey brown, very fine to fine grained, sub angular to rounded, firm, very slightly calcareous, silty.
		30	SILTSTONE: medium brown to light brown, firm to friable, sandy, argillaceous, very slightly calcareous.
		50	CLAYSTONE: moderate brown, firm to moderately hard, very slightly calcareous, silty, grading in part to Siltstone.
15110	4605	50	SANDSTONE: moderate brown, occasionally mottled grey brown, firm, crumbly, occasionally moderately hard, blocky, rock flour with occasional very fine sand grains, non calcareous, silty, grading to Siltstone.
		40	SILTSTONE: medium brown to light brown, firm to friable, sandy, argillaceous, very slightly calcareous.
		10	CLAYSTONE: moderate brown, firm to moderately hard, very slightly calcareous, silty, grading in part to Siltstone.
15140	4614	50	SANDSTONE: moderate brown, occasionally mottled grey brown, firm, crumbly, occasionally moderately hard, blocky, rock flour with occasional very fine sand grains, non calcareous, silty, grading to Siltstone.
		40	SILTSTONE: medium brown to light brown, firm to friable, sandy, argillaceous, very slightly calcareous.
		10	CLAYSTONE: moderate brown, firm to moderately hard, very slightly calcareous, silty, grading in part to Siltstone.
15170	4623	30	SANDSTONE: moderate brown, occasionally mottled light grey to light grey brown, firm to moderately hard, very fine to fine grained, sub angular to rounded, very slightly calcareous.
		40	SILTSTONE: moderate brown to grey brown, blocky, firm, sandy, argillaceous, very slightly calcareous,
		30	CLAYSTONE: moderate brown, grey brown, moderately hard, blocky, silty, very slightly calcareous.
15200	4633	10	SANDSTONE: moderate brown, occasionally mottled light grey to light grey brown, firm to moderately hard, very fine to fine grained, sub angular to rounded, very slightly calcareous.
		40	SILTSTONE: moderate brown to grey brown, blocky, firm, sandy, argillaceous, very slightly calcareous,
		50	CLAYSTONE: moderate brown, grey brown, moderately hard, blocky, silty, very slightly calcareous, rare trace carbonate nodules (Caliche)
15230	4642	30	SANDSTONE: moderate brown, occasionally mottled light grey to light grey brown, firm to moderately hard, very fine to fine grained, sub angular to rounded, very slightly calcareous.
		40	SILTSTONE: moderate brown to grey brown, blocky, firm, sandy, argillaceous, very slightly calcareous,
		30	CLAYSTONE: moderate brown, grey brown, moderately hard, blocky, silty, very slightly calcareous, rare trace carbonate nodules (Caliche)
15260	4651	30	SILTSTONE: moderate brown, firm to moderately hard, blocky, non calcareous, occasionally sandy, grading in part to silty Claystone.
		70	CLAYSTONE: moderate brown, moderately hard, non calcareous, non to moderately silty, in part very silty grading to Siltstone.
15290	4660	20	SANDSTONE: moderate brown, locally mottled grey to grey brown, firm, friable, rock flour with traces very fine sand, non to very slightly calcareous, silty, grading to sandy Siltstone.
		50	SILTSTONE: moderate brown, firm to moderately hard, blocky, non calcareous, occasionally sandy, grading in part to silty Claystone.
		30	CLAYSTONE: moderate brown, moderately hard, non calcareous, non to moderately silty, in part very silty grading to Siltstone.
15320	4669	10	SANDSTONE: moderate brown, locally mottled grey to grey brown, firm, friable, rock flour with traces very fine sand, non to very slightly calcareous, silty, grading to sandy Siltstone.
		40	SILTSTONE: moderate brown, firm to moderately hard, blocky, non calcareous, occasionally sandy, grading in part to silty Claystone.
		50	CLAYSTONE: moderate brown, moderately hard, non calcareous, non to moderately silty, in part very silty grading to Siltstone.
15350	4679	20	SANDSTONE: moderate brown, medium grey, mottled, firm, very fine to fine grained, very slightly calcareous.
		50	SILTSTONE: moderate brown, grey brown, firm, sandy, argillaceous, micaceous, grading in part to silty claystone, very slightly calcareous.
		30	CLAYSTONE: moderate brown, firm, silty in part, very slightly calcareous.
15374 (B.U)	4686	10	SANDSTONE: moderate brown, medium grey, mottled, firm, very fine to fine grained, very slightly calcareous.
		30	SILTSTONE: moderate brown, grey brown, firm, sandy, argillaceous, micaceous, grading in part to silty claystone, very slightly calcareous.
		60	CLAYSTONE: moderate brown, firm, silty in part, very slightly calcareous.
15380	4688	100	CLAYSTONE: moderate brown to dusky yellow brown, firm moderately hard, sub blocky, calcareous in part, silty in part.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
15410	4697	80	CLAYSTONE: moderate brown to dusky yellow brown, firm moderately hard, sub blocky, calcareous in part, silty in part
		20	LIMESTONE: white, mottled moderate brown, occasionally dusky yellowish brown, mod hard, crumbly break, very argillaceous, cryptocrystalline.
15440	4706	40	CLAYSTONE: moderate brown to dusky yellow brown, firm moderately hard, sub blocky, calcareous in part, silty in part.
		30	SILTSTONE: medium brown to dusky yellow brown, firm, very argillaceous, occasionally micaceous.
		30	LIMESTONE: white, mottled moderate brown, occasionally dusky yellowish brown, mod hard, crumbly break, very argillaceous, cryptocrystalline.
15470	4715	70	CLAYSTONE: moderate brown, occasionally dusky yellowish brown, firm to moderately hard, sub blocky to blocky, slightly calcareous in part, silty in part, occasionally micaceous.
		30	LIMESTONE: white, mottled moderate brown, occasionally dusky yellowish brown, mod hard, crumbly break, very argillaceous, cryptocrystalline.
15500	4724	80	CLAYSTONE: moderate brown, occasionally dusky yellowish brown, firm to moderately hard, sub blocky to blocky, slightly calcareous in part, silty in part, occasionally micaceous.
		20	LIMESTONE: white, mottled, moderate brown hard brittle to crumbly break, occasionally sandy inclusion generally cryptocrystalline, occasionally microcrystalline.
15530	4773	60	CLAYSTONE: moderate brown to grey brown, blocky firm to hard, silty, slightly to moderately calcareous.
		30	SANDSTONE: moderate brown to grey brown to light grey, mottled, firm to friable, very fine to medium grained sub angular to sub rounded, moderately calcareous.
		10	SILTSTONE: moderate brown sandy argillaceous, slightly to moderately calcareous.
15550	4742	80	CLAYSTONE: moderate brown to grey brown, blocky firm to hard, silty, slightly to moderately calcareous.
		10	SANDSTONE: moderate brown to grey brown to light grey, mottled, firm to friable, very fine to fine grained sub angular to sub rounded, moderately calcareous.
		10	SILTSTONE: moderate brown sandy argillaceous, slightly to moderately calcareous.
15590	4752	80	CLAYSTONE: moderate brown to grey brown, blocky firm to hard, silty, slightly to moderately calcareous.
		10	SANDSTONE: moderate brown to grey brown to light grey, mottled, firm to friable, very fine to fine grained sub angular to sub rounded, moderately calcareous.
		10	SILTSTONE: moderate brown sandy argillaceous, slightly to moderately calcareous.
15620	4761	80	CLAYSTONE: moderate brown to grey brown, blocky firm to hard, silty moderately to very slightly calcareous.
		10	SANDSTONE: moderate brown to light grey to pink grey, mottled, firm to hard, very fine to fine grained, moderately to slightly calcareous.
		10	SILTSTONE: moderate brown sandy argillaceous, slightly to moderately calcareous.
15637	4766	90	CLAYSTONE: moderate brown, firm to moderately hard, sub blocky to blocky, moderately to very slightly calcareous.
		10	SILTSTONE: moderate brown, greyish brown and mottled, firm sub blocky to crumbly break, sandy in part, very argillaceous, calcareous,
		Tr	CLAYSTONE: medium to dark grey, very hard, brittle occasionally flaky to hackly break, slightly calcareous, with abundant very fine disseminated pyrite.
15650	4770	100	CLAYSTONE: greyish brown, to dusky brown, dark grey to medium grey, firm to moderately hard, blocky break, non calcareous.
		Tr	SANDTSONE: moderate brown, hard, friable, composed of clear or red brown stained clear to translucent quartz grains, very fine to fine, sub angular, spherical, well sorted, with hard siliceous cement and moderate brown argillaceous matrix.
15680	4779	80	CLAYSTONE: greyish brown, to dusky brown, rarely dark grey to medium grey, firm to moderately hard, blocky break, non calcareous.
		20	SILTSTONE: moderate brown, greyish brown and mottled, firm sub blocky to crumbly break, sandy in part, very argillaceous, calcareous,
15710	4788	90	CLAYSTONE: moderate brown to grey brown, blocky, firm to hard, slightly calcareous, silty, grading to siltstone.
		10	SANDSTONE: moderate brown to grey brown to light grey, mottled, firm to friable very fine to fine grained rare medium grained, sub rounded to rounded, slightly calcareous, silty, argillaceous.
15740	4798	90	CLAYSTONE: moderate brown to grey brown, blocky, firm to hard, slightly calcareous, silty, grading to siltstone.
		10	SANDSTONE: moderate brown to grey brown to light grey, mottled, firm to friable very fine to fine grained rare medium grained, sub rounded to rounded, slightly calcareous, silty, argillaceous.
15770	4807	90	CLAYSTONE: moderate brown to grey brown, moderately hard, blocky, slightly calcareous, silty in part.
		10	SANDSTONE: moderate brown, hard, sub blocky, formed from colourless occasionally red brown stained, clear to translucent, very fine occasionally fine grained quartz grains, angular to sub angular, slightly elongate, well sorted, with micropyrite cement in an argillaceous matrix.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
15800	4816	90 10	CLAYSTONE: moderate brown to grey brown, moderately hard, blocky, slightly calcareous, silty in part SANDSTONE: moderate brown, very hard, brittle, in thin doggers composed from colourless occasionally red brown stained, clear to translucent, very fine occasionally fine grained quartz grains, angular to sub angular, slightly elongate, well sorted, with calcareous cement in an argillaceous matrix.
15830	4825	100 Tr	CLAYSTONE: moderate brown to grey brown, blocky, firm to very hard, silty grading to siltstone, slightly to moderately calcareous. SANDSTONE: moderate brown to grey brown, very fine to fine grained, firm to friable, slightly calcareous.
15860	4834	100 Tr	CLAYSTONE: moderate brown to grey brown, blocky, firm to very hard, silty grading to siltstone, slightly to moderately calcareous. SANDSTONE: moderate brown to grey brown, very fine to fine grained , firm to friable, slightly calcareous.
15890	4843	50 30 20	SILTSTONE: moderate brown to grey brown, speckled, blocky to sub blocky, firm to friable, sandy, argillaceous, grading to silty sandstone, slightly calcareous. SANDSTONE: moderate brown to grey brown, speckled, friable, very fine to medium grained angular to sub rounded, silty, slightly calcareous, trace of Chlorite mica. CLAYSTONE: moderate brown to grey brown, blocky, firm to very hard, silty grading to siltstone, slightly to moderately calcareous.
15898	4846	60 40	CLAYSTONE: moderate brown, brown grey, rarely dark grey, moderately hard, generally blocky occasionally very hard with a tabular to hackly break, silty in part, slightly calcareous. SILTSTONE: moderate brown to grey brown, speckled, blocky to sub blocky, firm to friable, sandy, argillaceous, grading to silty sandstone, slightly calcareous.
15920	4852	70 30	CLAYSTONE: moderate brown, brown grey, rarely dark grey, moderately hard, generally blocky occasionally very hard with a tabular to hackly break, silty in part, slightly calcareous. SILTSTONE: moderate brown to grey brown, speckled, blocky to sub blocky, firm to friable, sandy, argillaceous, grading to silty sandstone, slightly calcareous.
15950	4862	100	CLAYSTONE: moderate brown brownish grey, rarely dark grey, moderately hard, generally blocky occasionally very hard with a tabular to hackly break, variably calcareous, slightly anhydritic, with minor white or translucent inclusions. Silty in part occasionally grading to siltstone.
15980	4870	70 30 Tr	CLAYSTONE: moderate brown to grey brown, firm to friable, sandy, argillaceous, grading to siltstone, SILTSTONE: moderate brown to grey brown, firm to friable, sandy, argillaceous, grading to silty sandstone. Very slightly calcareous. SANDSTONE: moderate brown to grey brown, to medium grey, friable, very fine to medium grained, angular to sub rounded, very silty, very slightly calcareous.
16010	4879	60 40 Tr	CLAYSTONE: moderate brown to grey brown, firm to friable, sandy, argillaceous, grading to siltstone, SILTSTONE: moderate brown to grey brown, firm to friable, sandy, argillaceous, grading to silty sandstone. Very slightly calcareous. SANDSTONE: moderate brown to grey brown, to medium grey, friable, very fine to medium grained, angular to sub rounded, very silty, very slightly calcareous.
16040	4889	40 60 Tr	SILTSTONE: moderate brown to grey brown, blocky, hard to friable, sandy, locally argillaceous, trace of mica, very slightly calcareous, grading to silty sandstone. CLAYSTONE: moderate brown grey brown, blocky to platy, firm to hard, very silty, grading to siltstone. SANDSTONE: moderate brown to grey brown, to medium grey, firm to hard, very fine to medium grained, angular to sub rounded, very silty, trace mica, very slightly calcareous.
16062	4895	40 60 Tr	SILTSTONE: moderate brown to grey brown, blocky, hard to friable, sandy, locally argillaceous, trace of mica, very slightly calcareous, grading to silty sandstone. CLAYSTONE: moderate brown grey brown, blocky to platy, firm to hard, very silty, grading to siltstone. SANDSTONE: moderate brown to grey brown, to medium grey, firm to hard, very fine to medium grained, angular to sub rounded, very silty, locally very micaceous, very slightly calcareous.
16070	4898	70 30 Tr	SILTSTONE: moderate brown to grey brown, blocky, hard to friable, sandy, locally argillaceous, trace of mica, very slightly calcareous, grading to silty sandstone. CLAYSTONE: moderate brown grey brown, blocky to platy, firm to hard, very silty, grading to siltstone. SANDSTONE: moderate brown to grey brown, to medium grey, firm to hard, very fine to medium grained, angular to sub rounded, very silty, locally very micaceous, very slightly calcareous.
16084	4902	60 40 Tr	CLAYSTONE: moderate brown to grey brown, blocky to platy, firm to hard very hard in part , very silty, grading to siltstone, slightly calcareous. SILTSTONE: moderate brown to grey brown, blocky, hard to friable, sandy, locally argillaceous, trace of mica, very calcareous in part, grading to silty sandstone. SANDSTONE: moderate brown to grey brown, to medium grey, firm to hard, occasionally very hard, very fine to medium grained, angular to sub rounded, very silty, locally very micaceous, very calcareous, in part.
16098			Not circulated up due to pressure drop in system.
16118	4913	80 20	CLAYSTONE: moderate brown, occasionally dark grey, firm to moderately hard, occasionally very hard, blocky to flaky break, very silty in part, calcareous in part. SILTSTONE: moderate brown to brown grey, slightly olive brown in part, firm to mod hard, generally crumbly break, occasionally very hard with blocky to flaky break, calcareous to very calcareous, common calcareous inclusions, occasionally micaceous.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
16130	4916	80	CLAYSTONE: moderate brown, moderate grey brown, commonly slightly speckled / mottled in parts, rarely dark grey to grey black, firm to slightly hard, occasionally moderately to very hard, predominantly blocky, occasionally slightly flaky break, rarely brittle break, non to very silty, grading argillaceous Siltstone in parts, occasional pale grey calcareous and possibly rare minor anhydritic inclusions.
		20	SILTSTONE: moderate brown, moderate grey brown, occasional yellow brown to olive brown, commonly slightly mottled, firm to hard, blocky, brittle to slightly friable break, occasional pale grey calcareous inclusions, occasionally slightly sandy
		Sl Tr	SANDSTONE: colourless, rarely red brown, transparent, very fine to fine grade, well rounded where identifiable, seen as rare loose grains within silty matrix.
16160	4926	60	CLAYSTONE: moderate brown, moderate grey brown, commonly slightly speckled / mottled in parts, rarely dark grey to grey black, firm to slightly hard, occasionally moderately to very hard, predominantly blocky, occasionally slightly flaky break, rarely brittle break, non to very silty, grading argillaceous Siltstone in parts, occasional pale grey calcareous inclusions.
		40	SILTSTONE: moderate brown, moderate grey brown, occasional yellow brown to olive brown, commonly slightly mottled, firm to hard, blocky, brittle to slightly friable break, occasional pale grey calcareous inclusions, occasionally slightly sandy, occasionally becoming moderately calcareous.
		Tr	SANDSTONE: medium brown, medium grey to medium olive grey, commonly slightly speckled / mottled, soft, amorphous, very friable (rock flour), grading sandy Siltstone, also seen as rare loose grains within silty matrix: colourless, rarely red brown, transparent, very fine to fine grade, well rounded where identifiable.
16190	4935	60	CLAYSTONE: moderate brown, moderate grey brown, commonly slightly speckled / mottled in parts, rarely dark grey to grey black, firm to slightly hard, occasionally hard to very hard, predominantly blocky, occasionally slightly flaky break, rarely brittle break, non to very silty, grading argillaceous Siltstone in parts, occasional pale grey calcareous inclusions.
		40	SILTSTONE: moderate brown, moderate grey brown, occasional yellow grey, commonly slightly mottled, firm to hard, blocky, brittle to slightly friable break, occasional pale grey calcareous inclusions, occasionally slightly sandy, occasionally becoming moderately calcareous.
		Tr	SANDSTONE: medium brown, medium grey to medium olive grey, commonly slightly speckled / mottled, soft, amorphous, very friable (rock flour), grading sandy Siltstone, also seen as rare loose grains within silty matrix: colourless, rarely red brown, transparent, very fine to fine grade, well rounded where identifiable.
16220	4944	80	CLAYSTONE: moderate brown to dusky brown, rarely dark grey, firm to slightly hard, occasionally very hard, blocky to tabular break, very silty in part non to very slightly calcareous occasional calcareous inclusions.
		20	SILTSTONE: moderate brown to olive grey, occasionally mottled moderate brown, soft to firm occasionally hard, blocky to crumbly break, generally very calcareous, occasional clear calcite cement. rarely micaceous.
		Tr	SANDSTONE: moderate brown to olive grey, generally hard, with pale olive or red brown stained, translucent to opaque occasionally translucent very fine quartz and possibly feldspathic grains, angular generally spherical, well sorted with calcite cement in a moderate brown argillaceous matrix, grading to siltstone in part. poor inferred porosity.
16250	4953		Circulated up after circulation stopped for approximately three hours
		70	CLAYSTONE: moderate brown to dusky brown, occasionally dark grey, firm to slightly hard, occasionally very hard, blocky to tabular break, very silty in part non to very slightly calcareous occasional calcareous inclusions.
		30	SILTSTONE: moderate brown to olive grey, occasionally mottled moderate brown, soft to firm occasionally hard, blocky to crumbly break, generally very calcareous , occasional clear calcite cement, rarely micaceous.
		Tr	SANDSTONE: moderate brown to olive grey, generally hard, with pale olive or red brown stained, translucent to opaque occasionally translucent very fine quartz and possibly feldspathic grains, angular generally spherical, well sorted with calcite cement in a moderate brown argillaceous matrix, grading to siltstone in part poor inferred porosity.
16280	4962	70	CLAYSTONE: moderate brown to slightly reddish brown, occasionally moderate grey brown & slightly mottled, firm to slightly hard, blocky, commonly non to slightly calcareous, locally very calcareous grading argillaceous calcretic Limestone, occasionally silty, grading argillaceous Siltstone.
		30	SILTSTONE: moderate brown to moderate grey brown, commonly slightly speckled / mottled, firm to slightly hard, commonly slightly friable, blocky, slightly to very calcareous, commonly slightly sandy.
		Tr	SANDSTONE: moderate red brown, soft to firm, crumbly, blocky, with transparent to translucent frosted colourless to red stained grains, predominantly medium grade, moderate to well rounded, sub elongate to sub spherical, moderately well sorted, in silty argillaceous matrix
16310	4971	80	CLAYSTONE: moderate brown to slightly reddish brown, occasionally moderate grey brown & slightly mottled, firm to slightly hard, blocky, commonly non to slightly calcareous, locally very calcareous grading argillaceous calcretic Limestone, occasionally silty, grading argillaceous Siltstone.
		20	SILTSTONE: moderate brown to moderate grey brown, commonly slightly speckled / mottled, firm to slightly hard, commonly slightly friable, blocky, slightly to very calcareous, commonly slightly sandy.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
16340	4980	100	CLAYSTONE: moderate brown, occasionally dark grey, moderately hard occasionally very hard, blocky to brittle break, tabular in part, dark grey claystone generally very hard with a fissile break, non to slightly calcareous, common mica, very silty grading to argillaceous siltstone.
16370	4989	100	CLAYSTONE: moderate brown, occasionally dark grey, moderately hard occasionally very hard, blocky to brittle break, tabular in part, dark grey claystone generally very hard with a fissile break, non to slightly calcareous, common mica, very silty grading to argillaceous siltstone.
		Tr	SANDSTONE: loose sand grains, colourless to pale red brown, occasionally olive grey, transparent to opaque, rounded, moderately well sorted.
16400	4999	90	CLAYSTONE: moderate brown, occasionally dark grey, moderately hard to very hard, blocky to tabular break, slightly calcareous to non calcareous, silty in part.
		10	SILTSTONE: moderate brown, occasionally mottled olive grey, moderately hard to very hard, sub blocky with an occasional crumbly break, calcareous with occasional clear calcite cement, commonly micaceous.
16430	5008	100	CLAYSTONE: moderate brown, occasionally dark grey, moderately hard to very hard, blocky to tabular break, slightly calcareous to non calcareous, silty in part.
		Tr	SILTSTONE: moderate brown, occasionally mottled olive grey, moderately hard to very hard, sub blocky with an occasional crumbly break, calcareous with occasional clear calcite cement, commonly micaceous.
16460	5017	80	CLAYSTONE: moderate brown, firm to slightly hard, occasionally moderately hard, blocky, occasionally slightly tabular, occasionally slightly brittle break, non calcareous, locally becoming very silty grading argillaceous Siltstone.
		20	SILTSTONE: medium brown, occasionally medium to dark brown, medium grey brown, commonly slightly speckled / mottled, firm to moderately hard, occasionally very hard, blocky, locally slightly micaceous, locally slightly calcareous.
16490	5026	60	CLAYSTONE: moderate brown, firm to slightly hard, occasionally moderately hard, blocky, occasionally slightly tabular, occasionally slightly brittle break, non calcareous, locally becoming very silty grading argillaceous Siltstone.
		40	SILTSTONE: medium brown, occasionally medium to dark brown, medium grey brown, commonly slightly speckled / mottled, firm to moderately hard, occasionally very hard, blocky, locally slightly micaceous, locally slightly calcareous.
16520	5035	60	SILTSTONE: medium brown, occasionally medium to dark brown, medium grey brown, commonly slightly speckled / mottled, firm to moderately hard, occasionally very hard, blocky, locally slightly micaceous, locally slightly calcareous, becoming coarser, locally becoming sandy
		40	CLAYSTONE: moderate brown, firm to slightly hard, occasionally moderately hard, blocky, occasionally slightly tabular, occasionally slightly brittle break, non calcareous, locally becoming very silty grading argillaceous Siltstone.
		Tr	SANDSTONE:, red brown stained to colourless, translucent with frosted surfaces, medium grade, well rounded, sub elongate to sub spherical, seen as loose grains in a silty matrix,
16550	5044	70	CLAYSTONE: moderate brown, firm to slightly hard, occasionally moderately hard, blocky, occasionally slightly tabular, occasionally slightly brittle break, non calcareous, locally becoming very silty grading argillaceous Siltstone.
		30	SILTSTONE: moderate brown, occasionally dusky yellowish brown, firm to moderately hard, very hard in part, sub blocky to crumbly break, slightly calcareous, locally slightly sandy.
16580	5054	50	SILTSTONE: moderate brown, occasionally dusky yellowish brown, firm to moderately hard, very hard in part, sub blocky to crumbly break, slightly calcareous, locally slightly sandy.
		50	CLAYSTONE: moderate brown, firm to slightly hard, occasionally moderately hard, blocky, occasionally slightly tabular, occasionally slightly brittle break, non calcareous, locally becoming very silty grading argillaceous Siltstone.
16610	5063	80	CLAYSTONE: moderate brown, occasionally dark grey, rare moderate greenish grey, firm to moderately hard, occasionally very hard, generally sub blocky to tabular, the dark grey Claystone is occasionally seen in thin fissile lamellae, the Claystone is silty in parts and occasionally micromicaceous.
		20	SILTSTONE: moderate brown occasionally mottled pale grey to olive grey, firm to moderately hard, sub blocky to crumbly break, occasionally very hard with tabular break; very argillaceous, with occasional mica and abundant slightly dolomitic olive brown cement.
16640	5072	60	SILTSTONE: moderate brown, moderate to dark grey brown, occasionally moderate grey, commonly slightly mottled / speckled, firm to hard, occasionally very hard, blocky, commonly slightly friable, occasionally brittle, angular, locally moderately calcareous, locally slightly sandy with rare loose quartz grains.
		40	CLAYSTONE: moderate brown, occasionally moderate to dark grey, moderate grey brown, rarely light grey to light greenish grey, occasionally slightly speckled in parts, firm to hard, occasionally very hard, blocky, slightly tabular, occasionally slightly brittle break, non to very slightly calcareous, commonly silty, occasionally very silty grading argillaceous Siltstone, trace micro mica, locally moderately calcareous in parts.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
16670	5081	80	SILTSTONE: moderate brown, moderate to dark grey brown, occasionally moderate grey, commonly slightly mottled / speckled, firm to hard, occasionally very hard, blocky, commonly slightly friable, occasionally brittle, angular, locally moderately calcareous, locally slightly sandy with rare loose quartz grains
		20	CLAYSTONE: moderate brown, occasionally moderate to dark grey, moderate grey brown, occasionally slightly speckled in parts, firm to hard, occasionally very hard, blocky, slightly tabular, occasionally slightly brittle break, non to very slightly calcareous, commonly silty, occasionally very silty grading argillaceous Siltstone, locally moderately calcareous in parts.
16700	5090	70	SILTSTONE: moderate brown, moderate to dark grey brown, occasionally moderate grey, commonly slightly mottled / speckled, firm to hard, occasionally very hard, blocky, commonly slightly friable, occasionally brittle, angular, locally moderately calcareous.
		30	CLAYSTONE: moderate brown, occasionally moderate to dark grey, moderate grey brown, occasionally slightly speckled in parts, firm to hard, occasionally very hard, blocky, slightly tabular, occasionally slightly brittle break, non to very slightly calcareous, commonly silty, occasionally very silty grading argillaceous Siltstone, trace micro mica, locally moderately calcareous in parts.
16730	5099	40	CLAYSTONE (1) dark grey brown, occasionally medium grey, very hard to brittle in thin flaky laminations with a hackly break, non calcareous, some signs of bit cinderisation.
		20	CLAYSTONE (2) moderate brown, firm to moderately hard, occasionally very hard, sub blocky, silty in part, occasionally micromicaceous.
		40	SILTSTONE: moderate brown, mottled pale red brown, firm to moderately hard, occasionally very hard, sub block to crumbly break.
		Gd Tr	Loose quartz grains, colourless to pale pink stained, occasionally pale olive grey, clear to translucent, occasionally opaque, very fine to fine occasionally medium grained, angular to sub angular with common broken grains, medium to well sorted, slightly elongated in part, occasional argillaceous cement , poor inferred porosity.
16760	5108	20	CLAYSTONE (1) dark grey brown to medium grey, very hard to brittle in thin flaky laminations with a hackly break, non calcareous, some signs of bit cinderisation.
		20	CLAYSTONE (2) moderate brown, firm to moderately hard, occasionally very hard, sub blocky, silty in part, occasionally micromicaceous.
		60	SILTSTONE: moderate brown, mottled pale red brown, firm to moderately hard, occasionally very hard, sub block to crumbly break.
		Gd Tr	Pale grey, hard, friable, composed from, colourless to moderate brown stained, clear to translucent occasionally opaque, very fine occasionally fine, rarely medium quartz grains, sub round spherical, moderately well sorted, with silica or argillaceous cement, poor inferred porosity.
16770	5111	20	CLAYSTONE (1) dark grey occasionally medium grey, very hard to brittle in thin flaky laminations, with a hackly break, non calcareous, with some signs of bit cinderisation,
		10	CLAYSTONE (2) moderate brown, firm to moderately hard, occasionally very hard, sub blocky, silty in part, occasionally micromicaceous.
		70	SILTSTONE: moderate brown, occasionally dusky yellowish brown, firm to moderately hard, occasionally very hard, blocky to crumbly break, locally slightly calcareous, micaceous slightly sandy in part.
		Gd Tr	SANDSTONE: moderate brown, hard, friable, composed from, colourless to moderate brown stained clear to translucent , very fine occasionally fine, rarely medium quartz grains, sub round spherical, moderately well sorted, with silica or argillaceous cement, poor inferred porosity
16771	5112	20	CLAYSTONE (1) dark grey to medium grey, occasionally pale yellowish brown, firm moderately hard to very hard, sub blocky occasionally fissile break, non calcareous.
		10	CLAYSTONE (2) moderate brown, firm to moderately hard, occasionally very hard, sub blocky, silty in part.
		60	SILTSTONE: moderate brown, occasionally dusky yellowish brown, firm to moderately hard, occasionally very hard, blocky to crumbly break, locally slightly calcareous, micaceous, locally sandy.
		10	SANDSTONE: common loose grains quartzose an possibly feldspathic, colourless to mod brown stained, occasionally olive grey, clear to translucent, occasionally opaque, fine to medium grained, angular to sub angular, poorly sorted, elongated with common broken grains, moderate inferred porosity, argillaceous matrix, grading to siltstone in part.
16780	5114	80	SILTSTONE: moderate brown, firm to moderately hard, blocky to crumbly, non to occasionally very slightly calcareous, micromicaceous, occasionally grading to silty Claystone, silty Sandstone.
		10	CLAYSTONE: moderate brown, moderately hard, blocky, silty.
		10	SANDSTONE: moderate brown , rarely medium to dark grey, firm, crumbly rock flour with traces very fine sand.
16790	5117	60	SILTSTONE: moderate brown, occasionally grey brown, firm to moderately hard, blocky to crumbly, very micaceous, very sandy, very fine, grading to Sandstone.
		40	SANDSTONE: moderate brown, occasionally grey brown, firm, friable, crumbly, very fine, occasionally fine, very micaceous, silty, grading to siltstone.
16800	5120	80	SILTSTONE: medium grey brown, occasionally medium brown, firm to slightly hard, blocky, rarely slightly crumbly, occasionally slightly calcareous in parts, grading to silty Claystone in parts, commonly sandy, grading to silty fine Sandstone.
		20	SANDSTONE: medium to dark brown grey, occasionally dark grey, firm to slightly hard, commonly slightly friable, poorly sorted, poorly to moderately cemented, in very silty / argillaceous matrix.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
16810	5124	90	SILTSTONE: medium grey brown, occasionally medium brown, firm to slightly hard, blocky, rarely slightly crumbly, occasionally slightly calcareous in parts, grading to silty Claystone in parts, commonly sandy, grading to silty fine Sandstone.
		10	SANDSTONE: medium to dark brown grey, occasionally dark grey, firm to slightly hard, commonly slightly friable, poorly sorted, poorly to moderately cemented, in very silty / argillaceous matrix.
16820	5127	80	SILTSTONE: medium grey brown, occasionally medium brown, firm to slightly hard, blocky, rarely slightly crumbly, occasionally slightly calcareous in parts, occasionally slightly micaceous, grading to silty Claystone in parts, commonly sandy, grading to silty fine Sandstone.
		10	SANDSTONE: medium to dark brown grey, occasionally dark grey, firm to slightly hard, commonly slightly friable, poorly sorted, poorly to moderately cemented, in very silty / argillaceous matrix.
		10	CLAYSTONE: medium brown, slightly red brown, firm to slightly hard, blocky, non calcareous, slightly silty in parts.
16830	5130	90	SILTSTONE: medium grey brown, occasionally medium brown, firm to slightly hard, blocky, rarely slightly crumbly, occasionally slightly calcareous in parts, grading to silty Claystone in parts, commonly sandy, grading to silty fine Sandstone.
		10	SANDSTONE: medium to dark brown grey, occasionally dark grey, firm to slightly hard, commonly slightly friable, poorly sorted, poorly to moderately cemented, in very silty / argillaceous matrix.
		Sl Tr	ANHYDRITE: pale grey, occasionally mid grey mottled, opaque to slightly translucent in parts, slightly to very firm, blocky to angular, microcrystalline, slightly to very argillaceous in parts, grading anhydritic Siltstone in parts.
16840	5133	80	SILTSTONE: medium grey brown, occasionally medium brown, firm to slightly hard, blocky, rarely slightly crumbly, occasionally slightly calcareous in parts, grading to silty Claystone in parts, commonly sandy, grading to silty fine Sandstone.
		10	SANDSTONE: medium to dark brown grey, occasionally red brown, firm to slightly hard, commonly slightly friable, poorly sorted, poorly to moderately cemented, in very silty / argillaceous matrix.
		10	CLAYSTONE: medium brown, slightly red brown, firm to slightly hard, blocky, non calcareous, slightly silty in parts.
		Sl Tr	ANHYDRITE: pale grey, occasionally mid grey mottled, opaque to slightly translucent in parts, slightly to very firm, blocky to angular, microcrystalline, slightly to very argillaceous in parts, grading anhydritic Siltstone in parts
16850	5136	70	SILTSTONE: medium grey brown, occasionally medium brown, firm to slightly hard, blocky, rarely slightly crumbly, occasionally slightly calcareous in parts, grading to silty Claystone in parts, commonly sandy, grading to silty fine Sandstone.
		20	CLAYSTONE: medium brown, slightly red brown, firm to slightly hard, blocky, non calcareous, very silty in parts, grading argillaceous Siltstone.
		10	SANDSTONE: medium to dark brown grey, occasionally red brown, firm to slightly hard, commonly slightly friable, poorly sorted, poorly to moderately cemented, in very silty / argillaceous matrix.
16860	5139	90	SILTSTONE: medium brown, medium brown grey, dark grey mottled in parts, occasionally medium to dark bluish grey, firm to moderately hard, blocky, occasionally micromicaceous
		10	CLAYSTONE: predominantly medium to dark brown, medium to dark grey brown, firm to slightly hard, blocky, angular, silty, non calcareous.
		Tr	SANDSTONE: dark brown grey, occasionally red brown, slightly hard, commonly slightly friable, very poorly sorted, poorly to moderately cemented, occasional loose grains, in very silty / argillaceous matrix.
16870	5142	90	SILTSTONE: medium brown, medium brown grey, dark grey mottled in parts, occasionally medium to dark bluish grey, firm to moderately hard, blocky, occasionally micromicaceous
		10	CLAYSTONE: predominantly medium to dark brown, medium to dark grey brown, firm to slightly hard, blocky, angular, silty, non calcareous.
		Tr	SANDSTONE: dark brown grey, occasionally red brown, slightly hard, commonly slightly friable, very poorly sorted, poorly to moderately cemented, occasional loose grains, in very silty / argillaceous matrix.
16880	5145	100	SILTSTONE: medium brown, medium brown grey, dark grey mottled in parts, occasionally medium to dark bluish grey, firm to moderately hard, blocky, occasionally micromicaceous
		Tr	CLAYSTONE: predominantly medium to dark brown, medium to dark grey brown, firm to slightly hard, blocky, angular, silty, non calcareous.
		Tr	SANDSTONE: dark brown grey, occasionally red brown, slightly hard, commonly slightly friable, very poorly sorted, poorly to moderately cemented, occasional loose grains, in very silty / argillaceous matrix.
16890	5148	90	SILTSTONE: medium brown, medium brown grey, dark grey mottled in parts, occasionally medium to dark bluish grey, firm to moderately hard, blocky, occasionally micromicaceous
		10	CLAYSTONE: predominantly medium to dark brown, medium to dark grey brown, firm to slightly hard, blocky, angular, silty, non calcareous.
		Tr	SANDSTONE: dark brown grey, occasionally red brown, slightly hard, commonly slightly friable, very poorly sorted, poorly to moderately cemented, occasional loose grains, in very silty / argillaceous matrix.
16900	5151	90	SILTSTONE: medium brown, medium brown grey, dark grey mottled in parts, occasionally medium to dark bluish grey, firm to moderately hard, blocky, occasionally micromicaceous
		10	CLAYSTONE: predominantly medium to dark brown, medium to dark grey brown, firm to slightly hard, blocky, angular, silty, non calcareous.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
16910	5154	70 30	SILTSTONE: medium brown, medium brown grey, dark grey mottled in parts, occasionally medium to dark bluish grey, firm to moderately hard, blocky, occasionally micromicaceous CLAYSTONE: predominantly medium to dark brown, medium to dark grey brown, occasionally medium to dark bluish grey, firm to slightly hard, blocky, angular, silty, slightly calcareous.
16920	5157	70 30	SILTSTONE: medium brown, medium brown grey, dark grey mottled in parts, occasionally medium to dark bluish grey, firm to moderately hard, blocky, occasionally micromicaceous CLAYSTONE: predominantly medium to dark brown, medium to dark grey brown, occasionally medium to dark bluish grey, firm to slightly hard, blocky, angular, silty, slightly calcareous.
16930	5160	80 20	SILTSTONE: medium brown, occasionally medium grey, medium to dark bluish grey, firm to moderately hard, blocky, argillaceous, slightly calcareous. CLAYSTONE: predominantly medium to dark brown, medium to dark grey brown, occasionally medium to dark bluish grey, firm to slightly hard, blocky, angular, silty, slightly calcareous.
16940	5163	70 30	SILTSTONE: medium brown, occasionally medium grey, medium to dark bluish grey, firm to moderately hard, blocky, argillaceous, moderately to very calcareous, grading silty argillaceous Limestone. CLAYSTONE: predominantly medium to dark brown, medium to dark grey brown, occasionally medium to dark bluish grey, firm to slightly hard, blocky, angular, silty, slightly calcareous.
16950	5166	70 30 Sl tr	CLAYSTONE: medium to dark bluish grey, occasionally medium brown, firm to slightly hard, blocky, angular, slightly calcareous, occasionally very calcareous grading argillaceous Siltstone, commonly silty grading argillaceous Siltstone. SILTSTONE: medium grey, medium grey brown, medium bluish grey, firm to moderately hard, blocky, argillaceous, moderately to very calcareous, grading silty Claystone. LIMESTONE: pale grey, occasionally medium grey mottled, firm, blocky, very argillaceous
16960	5169	70 30	SILTSTONE: medium brown, firm to moderately hard, blocky, argillaceous, moderately to very calcareous, grading silty Claystone. CLAYSTONE: medium brown, firm to slightly hard, blocky, angular, slightly calcareous, occasionally very calcareous grading argillaceous Siltstone, commonly silty grading argillaceous Siltstone.
16970	5172		Not Caught (high ROP)
16980	5176	80 20	SILTSTONE: medium brown, firm to slightly hard, blocky, slightly calcareous, argillaceous, grading silty Claystone. CLAYSTONE: medium brown, firm to slightly hard, blocky, angular, slightly calcareous, occasionally very calcareous grading argillaceous Siltstone, commonly silty grading argillaceous Siltstone.
16990	5179	90 10	SILTSTONE: medium brown, firm to slightly hard, blocky, slightly calcareous, argillaceous, grading silty Claystone. CLAYSTONE: medium brown, firm to slightly hard, blocky, angular, slightly calcareous, occasionally very calcareous grading argillaceous Siltstone, commonly silty grading argillaceous Siltstone.
17000	5182	90 10	SILTSTONE: medium brown, medium to dark grey, occasionally slightly dark grey mottled, firm to slightly hard, blocky, slightly calcareous, increasingly argillaceous, grading silty Claystone. CLAYSTONE: medium brown, medium to dark grey brown, firm to slightly hard, blocky, angular, slightly calcareous, occasionally very calcareous grading argillaceous Siltstone, commonly silty grading argillaceous Siltstone.
17010	5185	90 10	SILTSTONE: predominantly medium to dark grey brown, firm to slightly hard, blocky, slightly calcareous, argillaceous, grading silty Claystone. CLAYSTONE: medium brown, medium to dark grey brown, firm to slightly hard, blocky, angular, slightly calcareous, occasionally very calcareous grading argillaceous Siltstone, commonly silty grading argillaceous Siltstone.
17020	5188	80 20	SILTSTONE: predominantly medium brown, occasionally medium to dark grey brown, firm to slightly hard, blocky, slightly calcareous, argillaceous, grading silty Claystone. CLAYSTONE: medium brown, medium to dark grey brown, firm to slightly hard, blocky, angular, slightly calcareous, occasionally very calcareous grading argillaceous Siltstone, commonly silty grading argillaceous Siltstone.
17030	5191	80 20	SILTSTONE: predominantly medium brown, occasionally medium to dark grey brown, firm to slightly hard, blocky, slightly calcareous, becoming coarser grained in parts, argillaceous in parts, grading silty Claystone. CLAYSTONE: medium brown, medium to dark grey brown, firm to slightly hard, blocky, angular, slightly calcareous, occasionally very calcareous grading argillaceous Siltstone, commonly silty grading argillaceous Siltstone.
17040	5194	90 10	SILTSTONE: predominantly medium brown, occasionally medium to dark grey brown, firm to slightly hard, blocky, slightly calcareous, becoming coarser grained in parts, argillaceous in parts, grading silty Claystone. CLAYSTONE: medium brown, medium to dark grey brown, firm to slightly hard, blocky, angular, slightly calcareous, occasionally very calcareous grading argillaceous Siltstone, commonly silty grading argillaceous Siltstone.
17050	5197	100 Tr	SILTSTONE: medium bluish grey to medium grey, occasionally medium olive grey, firm to slightly hard, blocky to angular, slightly micromicaceous, non to slightly calcareous, grading silty Claystone. CLAYSTONE: medium bluish grey to medium grey, firm to slightly hard, blocky, angular, slightly calcareous, occasionally very calcareous grading argillaceous Siltstone, commonly silty grading argillaceous Siltstone.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
17060	5200	100	SILTSTONE: predominantly medium grey, occasionally medium brownish grey, firm to slightly hard, blocky to angular, slightly micromicaceous, non to slightly calcareous in parts, argillaceous, grading silty Claystone.
17070	5203	100	SILTSTONE: predominantly medium grey, occasionally medium brownish grey, firm to slightly hard, blocky to angular, slightly micromicaceous, non to slightly calcareous in parts, argillaceous, grading silty Claystone.
17080*	5206	100	SILTSTONE: predominantly medium grey, occasionally medium brownish grey, firm to slightly hard, blocky to angular, slightly micromicaceous, non to slightly calcareous, silty, grading silty Claystone.
17090*	5209	100	SILTSTONE: predominantly medium grey, occasionally medium brownish grey, firm to slightly hard, blocky to angular, slightly micromicaceous, non to slightly calcareous in parts, argillaceous, grading silty Claystone.
17100*	5212	100 Sl Tr	SILTSTONE: predominantly medium grey, occasionally medium brownish grey, firm to slightly hard, blocky to angular, slightly micromicaceous, non to slightly calcareous in parts, argillaceous, grading silty Claystone. HALITE: colourless, translucent, slightly hard, blocky, brittle, fine crystalline, sucrosic texture
17110*	5215	100 Sl Tr	SILTSTONE: predominantly medium grey, occasionally medium brownish grey, firm to slightly hard, blocky to angular, slightly micromicaceous, slightly calcareous, argillaceous, grading silty Claystone. HALITE: colourless, translucent, slightly hard, blocky, brittle, fine crystalline, sucrosic texture
17115*	5216	100 Sl Tr	SILTSTONE: predominantly medium grey, occasionally medium brownish grey, firm to slightly hard, blocky to angular, slightly micromicaceous, slightly calcareous, argillaceous, grading silty Claystone. SANDSTONE: red brown, soft to firm, blocky, friable, poorly sorted, loose fine quartz grains in a silty argillaceous matrix.
17120*	5218	100	CLAYSTONE: medium brown, soft to firm, blocky, occasionally slightly amorphous, non to very slightly calcareous, grading argillaceous Siltstone in parts.
17125*	5219	20 80	CLAYSTONE: medium brown, soft to firm, blocky, occasionally slightly amorphous, non to very slightly calcareous, grading argillaceous Siltstone in parts. SILTSTONE: moderate brown, soft to firm, amorphous, occasionally blocky, non to very slightly calcareous/dolomitic,
17130*	5221	40 60	CLAYSTONE: medium brown, soft to firm, blocky, occasionally slightly amorphous, non to very slightly calcareous, grading argillaceous Siltstone in parts. SILTSTONE: moderate brown, soft to firm, amorphous, occasionally blocky, non to very slightly calcareous/dolomitic, locally grading to very silty Sandstone.
17135*	5222	100 Sl Tr	CLAYSTONE: moderate brown, soft to occasionally firm, amorphous, locally blocky, non to very slightly calcareous, silty in part grading to Siltstone. HALITE: colourless to pale orangey grey, translucent, moderately hard, brittle, crystalline.
17140*	5224	100 Gd TR	CLAYSTONE: light grey to light olive grey, soft, amorphous, silty in part, non calcareous/dolomitic. HALITE: colourless to pale orangey grey, translucent, moderately hard, brittle, crystalline.
17145*	5226	90 10	CLAYSTONE: light grey to light olive grey, soft, amorphous, silty in part, non calcareous/dolomitic. HALITE: colourless to pale orangey grey, translucent, moderately hard, brittle, crystalline.
17150*	5227	90 10	CLAYSTONE: light grey to light olive grey, soft, amorphous, silty in part, non calcareous/dolomitic. HALITE: colourless to pale orangey grey, translucent, moderately hard, brittle, crystalline.
17155*	5229	80 20	CLAYSTONE: light grey brown to light olive grey, soft, amorphous, silty in part, non calcareous/dolomitic. HALITE: colourless to pale orangey grey, translucent, moderately hard, brittle, crystalline.
17160*	5230	60 40	CLAYSTONE: light grey brown to light olive grey, soft, amorphous, silty in part, non calcareous/dolomitic. HALITE: colourless to occasionally pale orangey grey, translucent, moderately hard, blocky, brittle, crystalline. K SALT: very rare trace, pinkish red, moderately hard, crystalline.
17165*	5232	60 40	CLAYSTONE: light grey brown to light olive grey, soft, amorphous, silty in part, non calcareous/dolomitic. HALITE: colourless to occasionally pale orangey grey, translucent, moderately hard, blocky, brittle, crystalline.
17170*	5233	50 50	CLAYSTONE: light grey brown to light olive grey, soft, amorphous, silty in part, non calcareous/dolomitic. HALITE: colourless to occasionally pale orangey grey, translucent, moderately hard, blocky, brittle, crystalline.
17174*	5234	60 40	CLAYSTONE: light grey brown to light olive grey, soft, amorphous, silty in part, non calcareous/dolomitic. HALITE: colourless to occasionally pale orangey grey, translucent, moderately hard, blocky, brittle, crystalline.
			N.B: 10 feet / 5 feet 'spot' sampling was undertaken from 16770ft. Samples marked in red from 16769ft indicate that full wet + dry sample collection was undertaken. N.B. Spot samples marked * were dried and preserved, but wet samples were not collected
17180	5236	90 10	CEMENT CLAYSTONE + HALITE: grey brown to dusky brown, brown grey, blocky, firm to hard, moderately calcareous, halitic, visible colourless NaCl crystals in an argillaceous matrix

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
17190	5240	60 40	HALITE: pale grey to pale brown grey, occasionally slightly pinkish grey to pinkish brown, predominantly translucent, occasionally becoming opaque, occasionally becoming slightly transparent, slightly to moderately hard, brittle, crystalline, blocky to angular, sucrosic texture, commonly seen as crystalline inclusions in a strongly silty / argillaceous matrix, grading halitic Claystone in parts CLAYSTONE: medium grey, occasionally medium brown to dusky brown, rarely slightly bluish grey, slightly speckled in parts, very firm to moderately hard, blocky, commonly silty, very halitic grading silty / argillaceous Halite in parts.
17200	5243	70 30	HALITE: pale grey to pale brown grey, occasionally slightly pinkish grey to pinkish brown, predominantly translucent, occasionally becoming opaque, occasionally becoming slightly transparent, slightly to moderately hard, brittle, crystalline, blocky to angular, sucrosic texture, commonly seen as crystalline inclusions in a strongly silty / argillaceous matrix, grading halitic Claystone in parts CLAYSTONE: medium grey, occasionally medium brown to dusky brown, rarely slightly bluish grey, slightly speckled in parts, very firm to moderately hard, blocky, commonly silty, very halitic grading silty / argillaceous Halite in parts.
17210	5246	80 20	HALITE: pale grey to pale brown grey, occasionally slightly pinkish grey to pinkish brown, predominantly translucent, occasionally becoming opaque, occasionally becoming slightly transparent, slightly to moderately hard, brittle, crystalline, blocky to angular, sucrosic texture, commonly seen as crystalline inclusions in a strongly silty / argillaceous matrix, grading halitic Claystone in parts CLAYSTONE: medium grey, occasionally medium brown to dusky brown, rarely slightly bluish grey, slightly speckled in parts, very firm to moderately hard, blocky, commonly silty, very halitic grading silty / argillaceous Halite in parts.
17220	5249	80 20	HALITE: pale grey to pale brown grey, occasionally slightly pinkish grey to pinkish brown, predominantly translucent, occasionally becoming opaque, occasionally becoming slightly transparent, slightly to moderately hard, brittle, crystalline, blocky to angular, sucrosic texture, commonly seen as crystalline inclusions in a strongly silty / argillaceous matrix, grading halitic Claystone in parts CLAYSTONE: medium grey, occasionally medium brown to dusky brown, rarely slightly bluish grey, slightly speckled in parts, very firm to moderately hard, blocky, commonly silty, very halitic grading silty / argillaceous Halite in parts.
17230	5252	90 10	HALITE: pale grey to pale brown grey, occasionally slightly pinkish grey to pinkish brown, predominantly translucent, occasionally becoming opaque, occasionally becoming slightly transparent, slightly to moderately hard, brittle, crystalline, blocky to angular, sucrosic texture, commonly seen as crystalline inclusions in a strongly silty / argillaceous matrix, grading halitic Claystone in parts CLAYSTONE: medium grey, occasionally medium brown to dusky brown, rarely slightly bluish grey, slightly speckled in parts, very firm to moderately hard, blocky, commonly silty, very halitic grading silty / argillaceous Halite in parts.
17240	5255	90 10	HALITE: pale grey to pale brown grey, occasionally slightly pinkish grey to pinkish brown, predominantly translucent, occasionally becoming opaque, occasionally becoming slightly transparent, slightly to moderately hard, brittle, crystalline, blocky to angular, sucrosic texture, commonly seen as crystalline inclusions in a strongly silty / argillaceous matrix, grading halitic Claystone in parts CLAYSTONE: medium grey, occasionally medium brown to dusky brown, rarely slightly bluish grey, slightly speckled in parts, very firm to moderately hard, blocky, commonly silty, very halitic grading silty / argillaceous Halite in parts
17250	5258	90 10	HALITE: pale grey to pale brown grey, occasionally slightly pinkish grey to pinkish brown, predominantly translucent, occasionally becoming opaque, occasionally becoming slightly transparent, slightly to moderately hard, brittle, crystalline, blocky to angular, sucrosic texture, commonly seen as crystalline inclusions in a strongly silty / argillaceous matrix, grading halitic Claystone in parts CLAYSTONE: medium grey, occasionally medium brown to dusky brown, rarely slightly bluish grey, slightly speckled in parts, very firm to moderately hard, blocky, commonly silty, very halitic grading silty / argillaceous Halite in parts
17260	5261	70 30	HALITE: predominantly pale brown, translucent, slightly to moderately hard, brittle, crystalline, blocky to angular, seen as euhedral crystals in a pale brown argillaceous matrix. CLAYSTONE: pale brown to pale grey brown, soft to firm, amorphous to blocky, slightly hygroturgid, non calcareous, with common Halite inclusions, grading argillaceous Halite in parts.
17270	5264	100 Tr	HALITE: colourless to very pale brown, translucent to slightly transparent, coarse crystalline, firm to slightly hard, brittle, blocky to angular, CLAYSTONE: pale brown to pale grey brown, soft to firm, amorphous to blocky, slightly hygroturgid, non calcareous, with common Halite inclusions, grading argillaceous Halite in parts.
17280	5267	100 Tr	HALITE: colourless to very pale brown, translucent to slightly transparent, coarse crystalline, firm to slightly hard, brittle, blocky to angular, coarse sucrosic texture ANHYDRITE: dark grey, pale grey mottled, slightly to very firm, blocky, occasionally slightly crumbly, strongly argillaceous, grading anhydritic Claystone.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
17290	5270	60	CLAYSTONE: dark grey to grey black, occasionally grading pale to medium grey mottled, very firm to slightly hard, blocky to angular, slightly calcareous, grading argillaceous Limestone in parts, occasionally slightly silty.
		40	LIMESTONE: pale grey, occasionally slightly pale brownish grey, commonly medium to dark grey mottled, firm to slightly hard, micritic, mudstone, blocky to angular, commonly argillaceous grading calcareous Claystone.
		Tr	HALITE: colourless to very pale brown, translucent to slightly transparent, coarse crystalline, firm to slightly hard, brittle, blocky to angular, coarse sucrosic texture
17300	5273	100	CLAYSTONE: medium to dark grey to olive black to black, blocky, firm to friable, moderately calcareous, very carbonaceous. Trace micro pyrite.
17310	5276	100	CLAYSTONE: medium to dark grey to olive black to black, blocky, firm to friable, moderately calcareous, very carbonaceous. Trace micro pyrite.
		Tr	LIMESTONE: pale brown grey, blocky, argillaceous.
17320	5279	90	SANDSTONE: light grey to medium grey mottled, firm to friable, fine to medium grained, sub angular to sub rounded, moderately to slightly calcareous. Rare trace Pyrite.
		10	CLAYSTONE: medium to dark grey to olive black to black, blocky, firm to friable, moderately calcareous, very carbonaceous. Trace micro pyrite.
17330	5282	100	SANDSTONE: light grey to medium grey to dark grey mottled, firm to friable, fine to medium grained, sub angular to sub rounded, moderately to slightly calcareous.
17340	5285	90	SANDSTONE: light grey to medium grey to dark grey, mottled, firm to friable, fine to medium grained, rare coarse angular to sub rounded, moderately to slightly calcareous. Silty in part.
		10	CLAYSTONE: medium to dark grey to olive black to black, blocky, firm to friable, moderately calcareous, very carbonaceous.
17345*	5287	50	SANDSTONE: light grey medium grey, to dark grey, mottled, firm to friable, very fine to fine grained very silty, moderately calcareous, carbonaceous/organic, grading to Siltstone.
		40	LIMESTONE: light grey, friable, amorphous, argillaceous in part, traces of Calcite.
		10	SILTSTONE: medium grey to medium brown grey, friable, organic, moderately calcareous.
17350	5288	90	SILTSTONE: medium grey to medium brown grey, friable, organic, moderately calcareous.
		10	CLAYSTONE: medium to dark grey to olive black to black, blocky, firm to friable, moderately calcareous, very carbonaceous
17353*	5289	80	SILTSTONE: medium grey to medium brown grey, friable, organic, moderately calcareous.
		20	CLAYSTONE: medium to dark grey to olive black to black, blocky, firm to friable, moderately calcareous, very carbonaceous
17356*	5290	90	SILTSTONE: medium grey, dark grey mottled, slightly firm to firm, friable, blocky, slightly sandy in part, argillaceous, moderately to very calcareous.
		10	CLAYSTONE: dark grey to grey black, firm, blocky, sub angular, very calcareous grading argillaceous Limestone, in parts.
17360	5291	80	SILTSTONE: medium grey, commonly slightly dark grey mottled, slightly soft to slightly firm, blocky, friable, slightly sandy in part with rare loose fine colourless quartz grains, argillaceous, moderately calcareous, interpreted as rock flour in part.
		10	CLAYSTONE: dark grey to grey black, firm, blocky, sub angular, very calcareous grading argillaceous Limestone, in parts.
		10	SAND: loose, colourless, transparent, very fine to fine grained, moderately to well rounded where visible.
17363*	5292	60	SANDSTONE: pale to medium grey, medium to dark grey mottled, slightly soft, blocky, friable, very fine, silt grade to fine sand grade, poorly sorted, moderately calcareous, commonly argillaceous in part, interpreted as rock flour in part.
		30	SILTSTONE: medium grey, commonly slightly dark grey mottled, slightly soft to slightly firm, friable, blocky, slightly sandy in part with rare loose fine colourless quartz grains, argillaceous, moderately calcareous, interpreted as rock flour in part.
		10	CLAYSTONE: dark grey to grey black, firm, blocky, sub angular, very calcareous grading argillaceous Limestone, in parts.
17366*	5293	60	SANDSTONE: pale to medium grey, occasionally medium to dark grey, slightly black speckled in parts, slightly soft to slightly firm, rarely hard, blocky, friable, very fine to fine sand grade, poorly sorted, moderately calcareous, commonly argillaceous in part, very silty commonly grading sandy Siltstone, interpreted as rock flour in part.
		40	CLAYSTONE: dark grey to grey black, slightly speckled, slightly to moderately firm, blocky, sub angular, occasionally slightly tabular, slightly calcareous, carbonaceous, very silty, grading argillaceous Siltstone.
17370	5294	70	Pale to medium grey, commonly dark grey mottled, soft to slightly firm, blocky, friable, very fine to fine sand grade, poorly sorted, very calcareous, commonly argillaceous in part, commonly grading sandy Siltstone, interpreted as rock flour in part.
		30	CLAYSTONE: dark grey to grey black, slightly speckled, slightly to moderately firm, blocky, sub angular, occasionally slightly tabular, slightly calcareous, carbonaceous, very silty, grading argillaceous Siltstone.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
17372	5295	50	SANDSTONE: Pale to medium grey, commonly dark grey mottled, soft to slightly firm, blocky, friable, very fine to fine sand grade, poorly sorted, very calcareous, commonly argillaceous in part, commonly grading sandy Siltstone, interpreted as rock flour in part.
		50	CLAYSTONE: dark grey to grey black, slightly speckled, slightly to moderately firm, blocky, sub angular, occasionally slightly tabular, slightly calcareous, carbonaceous, very silty, grading argillaceous Siltstone.
		Sl tr	CLAYSTONE: medium brown to pale grey brown, soft to firm, slightly amorphous to blocky, slightly calcareous, slightly silty.
			Cuttings from Coring
17374*	5296	50	SANDSTONE: medium grey to light brownish grey, mottled, generally soft, friable, possibly disaggregated, partially reduced to rock flour, hard and calcite cemented in parts, very fine to fine, grading to siltstone in parts, clear to rare pale reddish brown quartz grains, well sorted, very calcareous, argillaceous, poor visible porosity SHOWS: dull yellow direct fluorescence, fast, blooming, yellowish white cut (possibly from OBM).
		50	CLAYSTONE: dark grey to grey black, moderately firm, blocky, sub angular, occasionally, slightly calcareous, carbonaceous, very silty, grading argillaceous Siltstone.
		Sl Tr	CLAYSTONE: medium brown to pale grey brown, soft to firm, slightly amorphous to blocky, slightly calcareous, slightly silty.
17377*	5297	80	SANDSTONE: medium grey to light brownish grey, mottled, generally soft, friable, possibly disaggregated, partially reduced to rock flour, hard and calcite cemented in parts, very fine to fine, grading to siltstone in parts, clear to rare pale reddish brown quartz grains, well sorted, very calcareous, argillaceous, poor visible porosity SHOWS: dull yellow direct fluorescence, fast, blooming, yellowish white cut (possibly from OBM).
		20	CLAYSTONE: dark grey to grey black, moderately firm, blocky, sub angular, occasionally, slightly calcareous, carbonaceous, very silty, grading argillaceous Siltstone.
		Sl Tr	CLAYSTONE: medium brown to pale grey brown, soft to firm, slightly amorphous to blocky, slightly calcareous.
17380	5297,5	60	SANDSTONE: medium grey to light brownish grey, mottled, generally soft, friable, possibly disaggregated, partially reduced to rock flour, hard and calcite cemented in parts, very fine to fine, grading to siltstone in parts, clear to rare pale reddish brown quartz grains, well sorted, very calcareous, argillaceous, poor visible porosity SHOWS: dull yellow direct fluorescence, fast, blooming, yellowish white cut (possibly from OBM).
		40	CLAYSTONE: dark grey to grey black, moderately firm, blocky, sub angular, occasionally, slightly calcareous, carbonaceous, very silty, grading argillaceous Siltstone.
		Sl Tr	CLAYSTONE: medium brown to pale grey brown, soft to firm, slightly amorphous to blocky, slightly calcareous.
			Cuttings from Drilling
17385*	5299	90	SANDSTONE: medium grey to medium brownish grey, commonly pale grey & dark grey mottled, commonly very fine grained, occasionally grading fine grained, soft, amorphous to sub blocky, very friable with primary structure obliterated, commonly seen as rock flour, moderately calcareous, very silty, commonly grading sandy siltstone, occasional loose quartz grains, colourless, transparent, very fine, rarely fine grade, well rounded, well sorted, trace micro mica, no shows over OBM, no visible porosity.
		10	SILTSTONE: dark grey, slightly speckled, slightly soft to firm, blocky, slightly friable, non to slightly calcareous, strongly argillaceous, grading silty Claystone in parts.
		V sl Tr	HALITE: colourless, pale pinkish brown, translucent to transparent, slightly hard, brittle, crystalline, water soluble
17387	5300	100	SANDSTONE: medium grey to medium brownish grey, commonly pale grey & dark grey mottled, very rarely pale pinkish brown, commonly very fine grained, occasionally grading fine grained, soft, amorphous to sub blocky, very friable with primary structure obliterated, commonly seen as rock flour, moderately calcareous, very silty, commonly grading sandy siltstone, occasional loose quartz grains, colourless, transparent, very fine, rarely fine grade, well rounded, well sorted, trace micro mica, no shows over OBM, no visible porosity.
		Tr	SILTSTONE: dark grey, slightly speckled, slightly soft to firm, blocky, slightly friable, non to slightly calcareous, strongly argillaceous, grading silty Claystone in parts.
17390	5300	100	SANDSTONE: becoming pale grey to pale brownish grey, commonly medium grey & dark grey mottled, commonly very fine grained, occasionally grading fine grained, soft, amorphous to sub blocky, very friable with primary structure obliterated, commonly seen as rock flour, moderately calcareous, very silty, commonly grading sandy siltstone, occasional loose quartz grains, colourless, transparent, very fine, rarely fine grade, well rounded, well sorted, trace micro mica, no shows over OBM, no visible porosity.
		Tr	SILTSTONE: dark grey, slightly speckled, slightly soft to firm, blocky, slightly friable, non to slightly calcareous, strongly argillaceous, grading silty Claystone in parts.
		V sl Tr	HALITE: colourless, pale pinkish brown, translucent to transparent, slightly hard, brittle, crystalline, water soluble

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
17400*	5303	70	SANDSTONE: becoming pale grey to pale brownish grey, commonly medium grey & dark grey mottled, commonly very fine grained, occasionally grading fine grained, soft, amorphous to sub blocky, very friable with primary structure obliterated, commonly seen as rock flour, slightly calcareous, very silty, commonly grading argillaceous siltstone & silty Claystone, occasional loose quartz grains, colourless, transparent, very fine, rarely fine grade, well rounded, well sorted, trace micro mica, no shows over OBM, no visible porosity.
		30	SILTSTONE: dark grey, slightly speckled, slightly soft to firm, blocky, slightly friable, non to slightly calcareous, strongly argillaceous, grading silty Claystone in parts.
		Gd Tr	CLAYSTONE: grey black to black, slightly soft to slightly firm, blocky, non to slightly calcareous, carbonaceous, silty in parts, grading argillaceous Siltstone in parts. CLAYSTONE (2) pale pinkish brown, medium reddish brown, pinkish white in parts, soft, sub blocky to amorphous, slightly to very calcareous, grading argillaceous Limestone in part.
17405*	5305	60	SANDSTONE: becoming pale grey to pale brownish grey, commonly medium grey & dark grey mottled, commonly very fine grained, occasionally grading fine grained, soft, amorphous to sub blocky, very friable with primary structure obliterated, commonly seen as rock flour, slightly calcareous, very silty, commonly grading argillaceous siltstone & silty Claystone, occasional loose quartz grains, colourless, transparent, very fine, rarely fine grade, well rounded, well sorted, trace micro mica, no shows over OBM, no visible porosity.
		40	SILTSTONE: dark grey, slightly speckled, slightly soft to firm, blocky, slightly friable, non to slightly calcareous, strongly argillaceous, grading silty Claystone in parts.
		Gd Tr	CLAYSTONE: grey black to black, slightly soft to slightly firm, blocky, non to slightly calcareous, carbonaceous, silty in parts, grading argillaceous Siltstone in parts.
17410	5306	60	SANDSTONE: medium grey to pale brownish grey, commonly medium grey & dark grey mottled, commonly very fine grained, occasionally grading fine grained, soft, amorphous to sub blocky, very friable with primary structure obliterated, commonly seen as rock flour, calcareous, very silty, commonly grading argillaceous siltstone & silty Claystone, occasional loose quartz grains, colourless, transparent, very fine, rarely fine grade, surrounded, well sorted, trace micro mica, no shows over OBM, no visible porosity.
		40	SILTSTONE/CLAYSTONE: dark grey, slightly speckled, firm, blocky, slightly friable, non to slightly calcareous, strongly argillaceous.
17415	5308	70	SANDSTONE: medium grey to pale brownish grey, commonly medium grey & dark grey mottled, commonly very fine grained, occasionally grading fine grained, soft, amorphous to sub blocky, very friable with primary structure obliterated, commonly seen as rock flour, calcareous, very silty, commonly grading argillaceous siltstone & silty Claystone, occasional loose quartz grains, colourless, transparent, very fine, rarely fine grade, surrounded, well sorted, trace micro mica, no shows over OBM, no visible porosity.
		30	SILTSTONE/CLAYSTONE: dark grey, slightly speckled, firm, blocky, slightly friable, non to slightly calcareous, strongly argillaceous.
17420	5310	70	SANDSTONE: medium grey to pale brownish grey, commonly medium grey & dark grey mottled, commonly very fine grained, occasionally grading fine grained, soft, amorphous to sub blocky, very friable with primary structure obliterated, commonly seen as rock flour, calcareous, very silty, commonly grading argillaceous siltstone & silty Claystone, occasional loose quartz grains, colourless, transparent, very fine, rarely fine grade, surrounded, well sorted, trace micro mica, no shows over OBM, no visible porosity.
		30	SILTSTONE/CLAYSTONE: dark grey, slightly speckled, firm, blocky, slightly friable, calcareous.
		Tr	SILTSTONE: moderate brown to brownish grey, firm to hard, very calcareous, dolomitic in parts.
17425	5311	50	SANDSTONE/SILTSTONE: medium grey to pale brownish grey, commonly medium grey & dark grey mottled, commonly very fine grained, occasionally grading fine grained, soft, amorphous to sub blocky, very friable with primary structure obliterated, commonly seen as rock flour, calcareous, very silty, commonly grading argillaceous siltstone & silty Claystone, occasional loose quartz grains, colourless, transparent, very fine, surrounded, well sorted, trace micro mica, no shows over OBM, no visible porosity.
		50	CLAYSTONE: dark grey, slightly speckled, firm, blocky, slightly friable, calcareous
17430	5313	50	SANDSTONE/SILTSTONE: medium grey to pale brownish grey, commonly medium grey & dark grey mottled, commonly very fine grained, occasionally grading fine grained, soft, amorphous to sub blocky, very friable with primary structure obliterated, commonly seen as rock flour, calcareous, very silty, commonly grading argillaceous siltstone & silty Claystone, occasional loose quartz grains, colourless, transparent, very fine, surrounded, well sorted, trace micro mica, no shows over OBM, no visible porosity.
		50	CLAYSTONE: dark grey, slightly speckled, firm, blocky, slightly friable, calcareous
17435	5314	90	CLAYSTONE: dark grey to grey black, slightly soft to slightly firm, blocky, slightly to very calcareous in parts, carbonaceous, commonly silty, grading argillaceous Siltstone.
		10	SILTSTONE: medium grey, dark grey, rarely pale to medium brown, slightly speckled, slightly soft to slightly firm, occasionally very firm, very slightly calcareous, commonly argillaceous, grading silty claystone.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
17440	5316	50	CLAYSTONE: pale to medium brown, medium grey brown, occasionally pale to medium grey, soft to slightly firm, blocky, slightly friable, slightly calcareous, occasionally moderately calcareous, silty, grading argillaceous Siltstone.
		40	SILTSTONE: medium to dark grey, pale to medium brown, medium grey brown, commonly slightly speckled, slightly soft to slightly firm, occasionally very firm, very slightly calcareous, commonly argillaceous, grading silty Claystone.
		10	SANDSTONE: medium grey to medium brownish grey, commonly firm, occasionally hard, blocky, commonly slightly friable, very fine grained, angular sub spherical grain shape, moderately well sorted, poorly to moderately & rarely well cemented, sparse argillaceous matrix, non to slightly calcareous, commonly silty grading Siltstone, poor visible porosity, no shows over OBM.
		Tr	CLAYSTONE: dark grey to grey black, slightly soft to slightly firm, blocky, slightly to very calcareous in parts, carbonaceous, commonly silty, grading argillaceous Siltstone.
17445	5317	70	CLAYSTONE: medium brown, soft to slightly firm, blocky, slightly friable, slightly calcareous, occasionally moderately calcareous, silty, grading medium brown argillaceous Siltstone.
		30	SILTSTONE: medium brown, occasionally medium grey brown, commonly slightly speckled, slightly soft to slightly firm, occasionally very firm, very slightly calcareous, commonly argillaceous, grading silty Claystone.
		Tr	SANDSTONE: pale to medium grey, commonly firm, occasionally hard, blocky, commonly slightly friable, very fine grained, angular sub spherical grain shape, moderately well sorted, poorly to moderately & rarely well cemented, sparse argillaceous matrix, non to slightly calcareous, commonly silty grading Siltstone, poor visible porosity, no shows over OBM.
17450	5319	30	CLAYSTONE: medium brown, soft to slightly firm, blocky, slightly friable, slightly calcareous, occasionally moderately calcareous, silty, grading medium brown argillaceous Siltstone.
		70	SILTSTONE: medium brown, occasionally medium grey brown, occasionally pale grey, commonly slightly speckled, slightly soft to slightly firm, occasionally very firm, very slightly calcareous, commonly argillaceous, grading silty Claystone.
		Tr	SANDSTONE: pale to medium grey, commonly firm, occasionally hard, blocky, commonly slightly friable, very fine grained, angular sub spherical grain shape, moderately well sorted, poorly to moderately & rarely well cemented, sparse argillaceous matrix, slightly calcareous, commonly silty grading Siltstone, poor visible porosity, no shows over OBM.
			Tr LOOSE SAND: loose sand grains, clear to translucent, fine grained, well sorted, good sphericity.
17455	5320	100	CLAYSTONE: medium brown, soft to slightly firm, blocky, slightly friable, slightly calcareous, occasionally moderately calcareous, silty, grading medium brown argillaceous Siltstone.
		Tr	SILTSTONE: medium brown, occasionally medium grey brown, occasionally pale grey, commonly slightly speckled, slightly soft to slightly firm, occasionally very firm, very slightly calcareous, commonly argillaceous, grading silty Claystone.
17460	5322	70	CLAYSTONE: medium brown, soft to slightly firm, blocky, slightly friable, slightly calcareous, occasionally moderately calcareous, silty, grading medium brown argillaceous Siltstone.
		30	SILTSTONE: medium brown, occasionally medium grey brown, occasionally pale grey, commonly slightly speckled, slightly soft to slightly firm, occasionally very firm, very slightly calcareous, commonly argillaceous, grading silty Claystone.
17465	5324	90	CLAYSTONE: moderate brown, soft to firm, blocky, slightly friable, slightly calcareous, occasionally moderately calcareous, silty, grading medium brown argillaceous Siltstone.
		10	SILTSTONE: moderate brown, occasionally medium grey brown, occasionally pale grey, commonly slightly speckled, soft to slightly firm, slightly calcareous to calcareous, commonly argillaceous, grading silty Claystone.
17470	5325	80	CLAYSTONE: moderate brown, soft to firm, blocky, slightly friable, slightly calcareous, occasionally moderately calcareous, silty, grading medium brown argillaceous Siltstone.
		20	SILTSTONE: moderate brown, occasionally medium grey brown, occasionally pale grey, commonly slightly speckled, soft to slightly firm, slightly calcareous to calcareous, commonly argillaceous, grading silty Claystone.
17475	5327	100	SANDSTONE: pale yellowish brown to pale brown, very fine to fine grained, well sorted, well rounded to surrounded, silty, grading to siltstone, argillaceous, very calcareous cement, mainly disaggregated into rock flour, moderate to poor visible porosity, fluorescence probably mainly due to OBM fluorescence.
17480	5328	70	SANDSTONE: pale yellowish brown to pale brown, very fine to fine grained, well sorted, well rounded to surrounded, silty, grading to siltstone, argillaceous, very calcareous cement, mainly disaggregated into rock flour, moderate to poor visible porosity, fluorescence probably mainly due to OBM fluorescence.
		30	CLAYSTONE: moderate brown, soft to firm, blocky, slightly friable, slightly calcareous, occasionally moderately calcareous, silty, grading medium brown argillaceous Siltstone.
17485	5330	80	CLAYSTONE: moderate brown, soft to firm, blocky, slightly friable, slightly calcareous, occasionally moderately calcareous, silty, grading medium brown argillaceous Siltstone.
		20	SILTSTONE: moderate brown, occasionally medium grey brown, occasionally pale grey, commonly slightly speckled, soft to slightly firm, slightly calcareous to calcareous, commonly argillaceous, grading silty Claystone.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
17490	5331	80 20	SANDSTONE: pale yellowish brown to pale brown, very fine to fine grained, well sorted, well rounded to surrounded, silty, grading to siltstone, argillaceous, very calcareous cement, mainly disaggregated into rock flour, moderate to poor visible porosity, fluorescence probably mainly due to OBM fluorescence. CLAYSTONE: moderate brown, soft to firm, blocky, slightly friable, slightly calcareous, occasionally moderately calcareous, silty, grading medium brown argillaceous Siltstone.
17495	5332	70 30	SANDSTONE: pale yellowish brown to pale brown, very fine grained to silt grade, well sorted, well rounded to sub-rounded, silty, grading to siltstone, argillaceous, moderately calcareous cement, mainly disaggregated into rock flour, poor visible porosity, no shows over OBM fluorescence. CLAYSTONE: moderate brown, soft to firm, blocky, slightly friable, slightly calcareous, occasionally moderately calcareous, silty, grading medium brown argillaceous Siltstone.
17500	5334	50 50	SANDSTONE: pale yellowish brown to pale brown, very fine grained to silt grade, well sorted, well rounded to sub-rounded, silty, grading to siltstone, argillaceous, very calcareous cement, mainly disaggregated into rock flour, poor visible porosity, no shows over OBM fluorescence. CLAYSTONE: moderate brown, soft to firm, blocky, slightly friable, slightly calcareous, occasionally moderately calcareous, silty, grading medium brown argillaceous Siltstone.
17505	5335	70 30	CLAYSTONE: moderate brown, soft to firm, blocky, slightly friable, slightly calcareous, occasionally moderately calcareous, silty, grading medium brown argillaceous Siltstone. SANDSTONE: pale yellowish brown to pale brown, very fine grained to silt grade, well sorted, well rounded to sub-rounded, silty, grading to siltstone, argillaceous, moderately calcareous cement, mainly disaggregated into rock flour, poor visible porosity, no shows over OBM fluorescence.
17512	5338	100	SANDSTONE: Pale to moderate yellow grey, pale to moderate brown grey, occasionally medium brown mottled, commonly opaque, occasionally slightly translucent in parts, soft, sub blocky, very friable, predominantly disaggregated to rock flour, very fine grading to silt grade, well sorted, slightly calcareous, occasionally slightly argillaceous, occasional loose quartz grains: colourless, transparent, very fine to fine grained, well rounded, good sphericity. no shows over OBM, no to poor visible porosity.
17515	5339	100	SANDSTONE: Pale to moderate brown grey, commonly medium brown mottled, soft, sub blocky, very friable, predominantly disaggregated to rock flour, very fine grading to silt grade, well sorted, slightly calcareous, becoming argillaceous, occasional loose quartz grains: colourless, transparent, very fine to fine grained, well rounded, good sphericity, no shows over OBM, no to poor visible porosity.
17520	5340	70 30	SANDSTONE / SILTSTONE: pale to moderate grey brown, moderate brown mottled in parts, soft, sub blocky, very friable, disaggregated (rock flour), very fine sand grading to silt grade, predominantly quartzose, partially argillaceous, slightly calcareous, no shows over OBM, no to poor visible porosity. CLAYSTONE: moderate brown, soft to firm, blocky, slightly friable, slightly calcareous, occasionally moderately calcareous, silty in parts, grading medium brown argillaceous Siltstone.
17525	5342	90 10	SILTSTONE: predominantly moderate brown, grey brown mottled in parts, soft, sub blocky, very friable, disaggregated (rock flour), very fine sand to coarse silt grade, becoming increasingly argillaceous, slightly calcareous, no shows over OBM, no to poor visible porosity. CLAYSTONE: moderate brown, soft to firm, blocky, slightly friable, slightly calcareous, occasionally moderately calcareous, silty in parts, grading medium brown argillaceous Siltstone
17530	5343	100	SILTSTONE: predominantly moderate brown, grey brown mottled in parts, soft, sub blocky, very friable, disaggregated (rock flour), contains trace very fine sand grains, becoming increasingly argillaceous, slightly calcareous, no shows over OBM, poor inferred porosity.
17535	5345	100	SILTSTONE: predominantly moderate brown, grey brown mottled in parts, soft, sub blocky, very friable, disaggregated (rock flour), contains trace very fine sand grains, very argillaceous, slightly calcareous, no shows over OBM, poor inferred porosity.
17540	5346	80 20	SILTSTONE: predominantly moderate brown, grey brown mottled in parts, soft, sub blocky, very friable, disaggregated (rock flour), contains trace very fine sand grains, very argillaceous, slightly calcareous, no shows over OBM, poor inferred porosity CLAYSTONE: moderate brown, firm, blocky, silty, slightly calcareous.
17545	5348	80 20	SILTSTONE: predominantly moderate brown, grey brown mottled in parts, soft, sub blocky, very friable, disaggregated (rock flour), contains trace very fine sand grains, very argillaceous, slightly calcareous, no shows over OBM, poor inferred porosity CLAYSTONE: moderate brown, firm, blocky, silty, slightly calcareous.
17550	5349	100 Tr	SILTSTONE: predominantly moderate brown, grey brown mottled in parts, soft, sub blocky, very friable, disaggregated (rock flour), contains trace very fine sand grains, very argillaceous, slightly calcareous, no shows over OBM, poor inferred porosity. SANDSTONE: pale to moderate brown, very soft, very fine grained, well sorted, abundant disaggregated (rock flour) calcareous matrix, poor inferred porosity, no shows above OBM
17555	5350	100	SILTSTONE: predominantly moderate brown, grey brown mottled in parts, soft, sub blocky, very friable, disaggregated (rock flour), contains trace very fine sand grains, very argillaceous, calcareous, no shows over OBM, poor inferred porosity
17560	5352	100	SILTSTONE: predominantly moderate brown, grey brown mottled in parts, soft, sub blocky, very friable, disaggregated (rock flour), contains trace very fine sand grains, very argillaceous, calcareous, no shows over OBM, poor inferred porosity

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
17565	5354	100	SILTSTONE: moderate brown to grey brown, occasionally pale yellow brown, rarely moderate grey to dark grey, commonly slightly mottled, soft, sub blocky, friable, occasionally grading very fine Sandstone in parts, very argillaceous in parts, slightly calcareous in parts, abundant rock flour, no visible porosity, no shows over OBM.
		Tr	SAND: predominantly colourless, transparent, occasionally milky white, red brown, transparent to translucent, commonly slightly frosted, predominantly fine grained, occasionally medium grained, sub rounded to sub angular, sub spherical, loose, inferred silica cementation, commonly cracked / shattered by PDC, poor to moderate inferred porosity.
17570	5355	90	SILTSTONE: moderate brown to grey brown, occasionally pale yellow brown, rarely moderate grey to dark grey, commonly slightly mottled, soft, sub blocky, friable, occasionally grading very fine Sandstone in parts, very argillaceous in parts, slightly calcareous in parts, abundant rock flour, no visible porosity, no shows over OBM.
		10	SAND: predominantly colourless, transparent, occasionally milky white, red brown, transparent to translucent, commonly slightly frosted, predominantly fine grained, occasionally medium grained, sub rounded to sub angular, sub spherical, loose, inferred silica cementation, commonly cracked / shattered by PDC, poor to moderate inferred porosity.
17575	5356	70	SILTSTONE: moderate brown to grey brown, occasionally pale yellow brown, rarely moderate grey to dark grey, commonly slightly mottled, soft, sub blocky, friable, grading very fine Sandstone in parts, very argillaceous in parts, slightly calcareous in parts, abundant rock flour, no visible porosity, no shows over OBM.
		30	SAND: predominantly colourless, transparent, occasionally milky white, red brown, transparent to translucent, commonly slightly frosted, predominantly fine grained, occasionally medium grained, sub rounded to sub angular, sub spherical, loose, inferred silica cementation, commonly seen as rock flour, and commonly cracked / shattered by PDC, poor to moderate inferred porosity.
		Tr	SANDSTONE: medium to dark grey, hard, occasionally very hard, blocky to angular, Silt to very fine Sand grade, silica cemented, slightly argillaceous, no visible porosity, no to poor inferred porosity, no shows over OBM.
17580	5358	60	SILTSTONE: moderate grey brown, moderate yellow brown, pale to moderate yellow grey, rarely dark grey, commonly slightly mottled, soft, sub blocky, friable, grading very fine Sandstone in parts, grading argillaceous in parts, slightly calcareous, partly rock flour, no visible porosity, no shows over OBM.
		40	SAND: colourless, milky white, red brown stained, translucent to transparent, partly slightly frosted, commonly fine, occasionally medium, rarely coarse grained, sub rounded to angular when shattered by PDC, inferred Silica cementation, poor to moderate inferred porosity, no shows over OBM
17585	5360	60	SILTSTONE: predominantly moderate brown, commonly moderate yellow brown, pale to moderate yellow grey, rarely dark grey, occasionally slightly mottled, soft, sub blocky, friable, grading very fine Sandstone in parts, grading argillaceous in parts, slightly calcareous, abundant rock flour, no visible porosity, no shows over OBM.
		40	SAND: colourless, milky white, red brown stained, translucent to transparent, partly slightly frosted, commonly fine, occasionally medium, rarely coarse grained, sub rounded when whole, to angular when commonly shattered by PDC, inferred Silica cementation, poor to moderate inferred porosity, no shows over OBM
17590	5361	50	SILTSTONE: predominantly moderate brown, commonly moderate yellow brown, pale to moderate yellow grey, rarely dark grey, occasionally slightly mottled, soft, friable, grading to very fine Sandstone in parts, generally slightly calcareous where soft, but very hard and calcareous cemented in parts, abundant rock flour, no visible porosity, no shows over OBM.
		50	SAND: colourless, milky white, red brown stained, translucent to transparent, partly slightly frosted, commonly fine, occasionally medium, rarely coarse grained, sub rounded when whole, to angular when commonly shattered by PDC, angular fragments of silica, inferred Silica cementation, poor inferred porosity, no shows over OBM
17595	5363	50	SILTSTONE: predominantly moderate brown, commonly moderate yellow brown, pale to moderate yellow grey, rarely dark grey, occasionally slightly mottled, soft, friable, grading to very fine Sandstone in parts, generally slightly calcareous where soft, but very hard and calcareous cemented in parts, abundant rock flour, no visible porosity, no shows over OBM.
		50	SAND: colourless, milky white, red brown stained, translucent to transparent, partly slightly frosted, commonly fine, occasionally medium, rarely coarse grained, sub rounded when whole, to angular when commonly shattered by PDC, angular fragments of silica, inferred Silica cementation, poor inferred porosity, no shows over OBM
17600	5364	20	SILTSTONE: predominantly moderate brown, commonly moderate yellow brown, pale to moderate yellow grey, rarely dark grey, occasionally slightly mottled, soft, friable, grading to very fine Sandstone in parts, generally slightly calcareous where soft, but very hard and calcareous cemented in parts, abundant rock flour, no visible porosity, no shows over OBM.
		80	SAND: colourless, milky white, red brown stained, translucent to transparent, partly slightly frosted, very fine to fine, occasionally medium to very coarse grained, sub rounded when whole, to angular when commonly shattered by PDC, poorly sorted, angular fragments of silica, inferred Silica cementation, slightly calcareous/dolomitic, poor inferred porosity, no shows over OBM.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
17602	5365	30	SILTSTONE: predominantly moderate brown, commonly moderate yellow brown, pale to moderate yellow grey, rarely dark grey, occasionally slightly mottled, soft, friable, grading to very fine Sandstone in parts, generally slightly calcareous where soft, but very hard and calcareous cemented in parts, abundant rock flour, no visible porosity, no shows over OBM.
		70	SAND: colourless, milky white, red brown stained, translucent to transparent, partly slightly frosted, very fine to fine, occasionally medium to very coarse grained, sub rounded when whole, to angular when commonly shattered by PDC, poorly sorted, angular fragments of silica, inferred Silica cementation, slightly calcareous/dolomitic, poor inferred porosity, no shows over OBM.
17605	5366	100	SAND/SANDSTONE: light olive grey, very hard cemented in parts, loose grains in parts, very fine grained, grading to siltstone, rare medium, angular quartz fragments, silica cementing, argillaceous matrix, non calcareous, to slightly calcareous (dolomitic) in parts. (evidence of very fine rock flour being lost into mud). Very poor inferred porosity, no shows above OBM.
17610	5367	20	SAND/SANDSTONE: light olive grey, very hard cemented in parts, loose grains in parts, very fine grained, grading to siltstone, rare medium, angular quartz fragments, silica cementing, argillaceous matrix, non calcareous, to slightly calcareous (dolomitic) in parts. (evidence of very fine rock flour being lost into mud). Very poor inferred porosity, no shows above OBM.
		80	SILTSTONE/CLAYSTONE: dark grey to olive black, very hard, brittle, quartzose texture,(very hard, crenulated, “bit metamorphosed” thin cuttings, caused by action of “Hedgehog type bit), non calcareous to slightly dolomitic.
17620	5370	10	SAND/SANDSTONE: light olive grey, very hard cemented in parts, loose grains in parts, very fine grained, grading to siltstone, rare medium to coarse in parts, angular quartz fragments, silica cementing, argillaceous matrix, non calcareous, to slightly calcareous (dolomitic) in parts. (evidence of very fine rock flour being lost into mud). Very poor inferred porosity, no shows above OBM.
		90	SILTSTONE/CLAYSTONE: dark grey to olive black, very hard, brittle, quartzose texture,(very hard, crenulated, “bit metamorphosed” thin cuttings, caused by action of “Hedgehog type bit), non calcareous to slightly dolomitic.
		Tr	CLAYSTONE: moderate brown, soft to firm, amorphous, to brittle in parts, black “
17630	5373	10	SAND/SANDSTONE: light olive grey, very hard cemented in parts, loose grains in parts, very fine grained, grading to siltstone, rare medium to coarse in parts, angular quartz fragments, silica cementing, argillaceous matrix, non calcareous, to slightly calcareous (dolomitic) in parts. (evidence of very fine rock flour being lost into mud). Very poor inferred porosity, no shows above OBM.
		80	SILTSTONE/CLAYSTONE: dark grey to olive black, very hard, brittle, quartzose texture,(very hard, crenulated, “bit metamorphosed” thin cuttings, caused by action of “Hedgehog type bit), non calcareous to slightly dolomitic.
		10	CLAYSTONE: moderate brown, soft to firm, amorphous, to brittle in parts, black “baked” crenulated surfaces in parts
17640	5376	20	SAND/SANDSTONE: light olive grey, very hard cemented in parts, loose grains in parts, very fine grained, grading to siltstone, rare medium to coarse in parts, angular quartz fragments, silica cementing, argillaceous matrix, non calcareous, to slightly calcareous (dolomitic) in parts. (evidence of very fine rock flour being lost into mud). Very poor inferred porosity, no shows above OBM.
		80	SILTSTONE/CLAYSTONE: dark grey to olive black, very hard, brittle, quartzose texture,(very hard, crenulated, “bit metamorphosed” thin cuttings, caused by action of “Hedgehog type bit), non calcareous to slightly dolomitic.
17650	5379	30	SAND/SANDSTONE: light olive grey, very hard cemented in parts, loose grains in parts, very fine grained, grading to siltstone, rare medium to coarse in parts, angular quartz fragments, silica cementing, argillaceous matrix, non calcareous, to slightly calcareous (dolomitic) in parts. (evidence of very fine rock flour being lost into mud). Very poor inferred porosity, no shows above OBM.
		70	SILTSTONE/CLAYSTONE: dark grey to olive black, very hard, brittle, quartzose texture,(very hard, crenulated, “bit metamorphosed” thin cuttings, caused by action of “Hedgehog type bit), non calcareous to slightly dolomitic.
17660	5383	30	SAND/SANDSTONE: light olive grey, very hard cemented in parts, loose grains in parts, very fine grained, grading to siltstone, rare medium to coarse in parts, angular quartz fragments, silica cementing, argillaceous matrix, non calcareous, to slightly calcareous (dolomitic) in parts. (evidence of very fine rock flour being lost into mud). Very poor inferred porosity, no shows above OBM.
		70	SILTSTONE/CLAYSTONE: dark grey to olive black, very hard, brittle, quartzose texture,(very hard, crenulated, “bit metamorphosed” thin cuttings, caused by action of “Hedgehog type bit), non calcareous to slightly dolomitic.
17670	5386	10	SAND/SANDSTONE: predominantly quartz, loose, unconsolidated, very fine to fine, with rare trace medium to coarse, sub angular, with occasional very angular fractured grains, moderate to poorly sorted, with traces Sandstone, light grey with occasional reddish purple argillaceous inclusions, hard, blocky to angular, very fine to fine, sub angular well sorted, well siliceously cemented, trace argillaceous inclusions, no visible porosity, no show.
		90	SILTSTONE/CLAYSTONE:(bit metamorphosed Sandstone) dark grey to olive black, very hard, brittle,(very hard, crenulated, “bit metamorphosed” thin cuttings, caused by action of “Hedgehog type bit), non calcareous to slightly dolomitic.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
17680	5389	Tr	SAND/SANDSTONE: predominantly quartz, loose, unconsolidated, very fine to fine, with rare trace medium to coarse, sub angular, with occasional very angular fractured grains, moderate to poorly sorted, with traces Sandstone, light grey with occasional reddish purple argillaceous inclusions, hard, blocky to angular, very fine to fine, sub angular well sorted, well siliceously cemented, trace argillaceous inclusions, no visible porosity, no show.
		100	SILTSTONE/CLAYSTONE:(bit metamorphosed Sandstone) dark grey to olive black, very hard, brittle,(very hard, crenulated, “bit metamorphosed” thin cuttings, caused by action of “Hedgehog type bit), non calcareous to slightly dolomitic.
17690	5392	100	SILTSTONE/CLAYSTONE:(bit metamorphosed Sandstone) dark grey to olive black, very hard, brittle,(very hard, crenulated, “bit metamorphosed” thin cuttings, caused by action of “Hedgehog type bit), non calcareous to slightly dolomitic.
17700	5395	100	SILTSTONE/CLAYSTONE:(bit metamorphosed Sandstone) dark grey to olive black, very hard, brittle,(very hard, crenulated, “bit metamorphosed” thin cuttings, caused by action of “Hedgehog type bit), non calcareous to slightly dolomitic.
17710	5398	100	SILTSTONE/CLAYSTONE:(bit metamorphosed Sandstone) dark grey to olive black, very hard, brittle,(very hard, crenulated, “bit metamorphosed” thin cuttings, caused by action of “Hedgehog type bit), non calcareous to slightly dolomitic.
17720	5401	70	SILTSTONE/CLAYSTONE:(bit metamorphosed Sandstone) dark grey to olive black, very hard, brittle,(very hard, crenulated, “bit metamorphosed” thin cuttings, caused by action of “Hedgehog type bit), non calcareous to slightly dolomitic.
		30	SAND/SANDSTONE: predominantly quartz, loose, unconsolidated, very fine to fine, with rare trace medium to very coarse, sub angular, with occasional very angular fractured grains, moderate to poorly sorted, with traces Sandstone, light grey, mottled reddish purple, with occasional reddish purple argillaceous inclusions, hard, blocky to angular, very fine to fine, occasionally medium, sub angular, moderate to well sorted, well siliceously cemented, trace argillaceous inclusions, no visible porosity, no show.
17730	5404	100	SANDSTONE: cuttings have been completely bit metamorphosed and now have a Siltstone / Claystone appearance, dark grey to olive black, very hard, very hackly.
17740	5407	100	SANDSTONE: cuttings have been completely bit metamorphosed and now have a Siltstone / Claystone appearance, dark grey to olive black, very hard, very hackly.
17750	5410	100	SANDSTONE: cuttings have been completely bit metamorphosed and now have a Siltstone / Claystone appearance, dark grey to olive black, very hard, very hackly.
17760	5413	100	SANDSTONE: cuttings have been completely bit metamorphosed and now have a Siltstone / Claystone appearance, dark grey to olive black, very hard, very hackly.
17770	5416	100	SANDSTONE: cuttings have been completely bit metamorphosed and now have a Siltstone / Claystone appearance, dark grey to olive black, very hard, very hackly.
17780	5419	100	SANDSTONE: cuttings have been completely bit metamorphosed and now have a Siltstone / Claystone appearance, dark grey to olive black, very hard, very hackly.
17790	5422	100	SANDSTONE: cuttings have been completely bit metamorphosed and now have a Siltstone / Claystone appearance, dark grey to olive black, very hard, very hackly
17800	5425	100	SANDSTONE: cuttings have been completely bit metamorphosed and now have a Siltstone / Claystone appearance, dark grey to olive black, very hard, very hackly
		Tr	SAND/SANDSTONE: light grey, rare reddish grey, very fine grained, rare medium grained, moderately sorted, well cemented, very hard, silica cement, also angular quartz fragments, rare coarse fractured grains, very poor visible porosity, no shows.
17810	5428	100	SANDSTONE: cuttings have been completely bit metamorphosed and now have a Siltstone / Claystone appearance, dark grey to olive black, very hard, very hackly
		Tr	SAND/SANDSTONE: light grey, rare reddish grey, very fine grained, rare medium grained, moderately sorted, well cemented, very hard, silica cement, also angular quartz fragments, rare coarse fractured grains, very poor visible porosity, no shows.
17820	5431	80	SANDSTONE: cuttings have been completely bit metamorphosed and now have a Siltstone / Claystone appearance, dark grey to olive black, very hard, very hackly
		10	SAND/SANDSTONE: light grey, rare reddish grey, very fine grained, rare medium grained, moderately sorted, well cemented, very hard, silica cement, also angular quartz fragments, rare coarse fractured grains, very poor visible porosity, no shows.
		10	SILTSTONE: moderate brown, reddish brown, generally soft, amorphous, argillaceous, also rare hard to very hard, calcite cemented.
17826	5433	90	SANDSTONE: cuttings have been completely bit metamorphosed and now have a Siltstone / Claystone appearance, dark grey to olive black, very hard, very hackly.
		10	SAND: quartz, loose, unconsolidated, colourless, transparent to translucent, very fine to fine, sub round to very angular, well sorted.
		Tr	ROCK FLOUR: pale grey brown, very soft, amorphous.
17830	5434	20	SAND/SANDSTONE: clear, white, occasionally pink, medium to very coarse grained, angular to sub rounded, quartz, with trace feldspar, in part well cemented, otherwise loose grains.
		80	SANDSTONE: bit metamorphosed cuttings, black to dark grey.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
17835	5436	10	SAND/SANDSTONE: clear, white, medium to very coarse grained, angular to rounded, quartz, in part well cemented, otherwise loose grains.
		90	SANDSTONE: bit metamorphosed cuttings, black to dark grey.
		Tr	CLAYSTONE: red brown, blocky, hard, (may be lithic clasts from conglomerate)
17840	5437	90	SANDSTONE: cuttings have been completely bit metamorphosed and now have a Siltstone / Claystone appearance, very dark grey to olive black, very hard, very hackly.
		10	SAND: quartz, loose, unconsolidated, colourless, transparent to translucent, very fine to fine, sub angular to sub round, with abundant very angular fractured grains, well sorted.
17845	5439	90	SANDSTONE: cuttings have been completely bit metamorphosed and now have a Siltstone / Claystone appearance, very dark grey to olive black, very hard, very hackly.
		10	SAND: quartz, loose, unconsolidated, colourless, transparent to translucent, very fine to fine, sub angular to sub round, with abundant very angular fractured grains, well sorted.
17850	5440	100	SANDSTONE: cuttings have been completely bit metamorphosed and now have a Siltstone / Claystone appearance, very dark grey to olive black, very hard, very hackly.
		Tr	SAND: quartz, loose, unconsolidated, colourless, transparent to translucent, very fine to fine, sub angular to sub round, with abundant very angular fractured grains, well sorted.
17855	5442	100	SANDSTONE: cuttings have been completely bit metamorphosed and now have a Siltstone / Claystone appearance, very dark grey to olive black, very hard, very hackly.
		Tr	SAND: quartz, loose, unconsolidated, colourless, transparent to translucent, very fine to fine, sub angular to sub round, with abundant very angular fractured grains, well sorted.
17860	5443	100	SANDSTONE: cuttings have been completely bit metamorphosed and now have a Siltstone / Claystone appearance, very dark grey to olive black, very hard, very hackly.
17865	5445	100	SANDSTONE: cuttings have been completely bit metamorphosed and now have a Siltstone / Claystone appearance, very dark grey to olive black, very hard, very hackly.
17870	5447	80	SAND: clear to translucent, rare white and opaque, fine to coarse grained rare very coarse, angular to sub angular occasionally sub rounded, frequent quartz overgrowths from siliceous cement.
		20	SANDSTONE: light grey, mottled purple red, hard, blocky, very fine to fine grained, well sorted, siliceous cement.
17875	5448	80	SANDSTONE: moderate brown to red brown, mottled grey white, friable, very fine to very coarse grained, angular to sub rounded, very silty and argillaceous, grading to sandy claystone. Common lithic clasts, trace mica, slightly calcareous.
		20	CLAYSTONE: red brown to moderate brown, mottled white, friable, sandy, slightly calcareous.
17880	5450	90	CLAYSTONE: red brown to moderate brown, mottled white, friable, occasionally sandy, slightly calcareous, halitic
		10	SANDSTONE/SAND: clear to translucent grey, occasionally moderate brown to red brown, quartz, mostly loose grains, very fine to coarse grained, angular to sub rounded, occasional lithic clasts, trace mica.
17885	5451	80	CLAYSTONE (Caliche): varicoloured, moderate grey to red brown to white, mottled, blocky friable, silty, halitic, anhydritic, slightly dolomitic, calcareous.
		20	SANDSTONE/SAND: varicoloured, clear to translucent grey, to red brown, fine to very coarse grained, angular to sub angular.
17890	5453	70	CLAYSTONE: varicoloured, moderate grey to red brown to white, mottled, blocky, friable, caliche, silty, halitic, anhydritic, slightly dolomitic, calcareous.
		30	SANDSTONE/SAND: varicoloured, clear to translucent grey, to red brown, fine to very coarse grained, angular to sub angular, good trace lithic clasts.
17895	5454	60	CLAYSTONE (Caliche) : varicoloured, moderate grey to red brown to white, mottled, blocky, friable, silty, halitic, anhydritic, slightly dolomitic, calcareous, occasional sand grains.
		40	SANDSTONE/SAND: varicoloured, clear to translucent grey, to red brown, fine to very coarse grained, mostly fine to coarse, angular to sub angular rarely rounded, occasional lithic clasts, mica, occasional argillaceous/caliche matrix.
17900	5456	60	CLAYSTONE (Caliche): varicoloured, moderate grey to red brown to white, mottled, blocky, friable, silty, halitic, anhydritic, slightly dolomitic, calcareous.
		40	SANDSTONE/SAND: varicoloured, clear to translucent grey, to red brown, fine to very coarse grained, mostly fine to coarse, angular to sub angular rarely rounded, occasional lithic clasts, mica, occasional argillaceous/caliche matrix.
17905	5457	80	CLAYSTONE (Caliche): varicoloured, moderate grey to red brown to white, mottled, blocky, friable, silty, halitic, anhydritic, slightly dolomitic, calcareous.
		20	SANDSTONE/SAND: varicoloured, clear to translucent grey, to red brown, fine to very coarse grained, mostly fine to coarse, angular to sub angular rarely rounded, occasional lithic clasts, mica, occasional argillaceous/caliche matrix.
17910	5459	80	SANDSTONE/SAND: varicoloured, clear to translucent grey, to red brown, fine to very coarse grained, mostly fine to coarse, angular to sub angular rarely rounded, occasional lithic clasts, mica, occasional argillaceous/caliche matrix.
		20	CLAYSTONE (Caliche): varicoloured, moderate grey to red brown to white, mottled, blocky, friable, silty, halitic, anhydritic, slightly dolomitic, calcareous.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
17915	5460	80	SANDSTONE: quartz, loose, unconsolidated, predominantly colourless, occasionally pale grey, with local reddish purple staining, predominantly fine to medium, occasionally very fine, coarse, rarely very coarse, angular to sub angular, with frequent quartz overgrowths, frequent very angular fractured grains, poorly sorted, also occasional light grey brown, firm, amorphous rock flour, slight to moderately calcareous, slightly dolomitic.
		20	CLAYSTONE (Caliche): varicoloured, moderate grey to red brown to white, mottled, blocky, friable, silty, halitic, anhydritic, slightly dolomitic, calcareous.
17920	5462	80	SANDSTONE: off white, grey brown, occasionally reddish brown, mottled, firm to moderately hard, blocky to crumbly rock flour, with occasional loose sand.
		20	CLAYSTONE (Caliche): varicoloured, moderate grey to red brown to white, mottled, blocky, friable, silty, halitic, anhydritic, slightly dolomitic, calcareous.
17925	5463	90	SANDSTONE: off white, grey brown, occasionally reddish brown, mottled, firm to moderately hard, blocky to crumbly rock flour, with occasional loose sand, fine to medium, occasionally coarse, angular to sub angular, poorly sorted.
		10	CLAYSTONE (Caliche): varicoloured, moderate grey to red brown to white, mottled, blocky, friable, silty, halitic, anhydritic, slightly dolomitic, calcareous.
17930	5465	90	SANDSTONE: off white, grey brown, occasionally reddish brown, mottled, firm to moderately hard, blocky to crumbly rock flour, with occasional loose sand, fine to medium, occasionally coarse, angular to sub angular, poorly sorted.
		10	SILTSTONE: reddish brown, reddish purple, soft to firm, amorphous, sandy, very fine to fine.
17935	5466	100	SANDSTONE: off white, grey brown, occasionally reddish brown, mottled, firm to moderately hard, blocky to crumbly rock flour, with occasional loose sand, fine to medium, occasionally coarse, angular to sub angular, poorly sorted.
		Tr	SILTSTONE: reddish brown, reddish purple, soft to firm, amorphous, sandy, very fine to fine.
17940	5468	100	SANDSTONE: predominantly grey brown, occasionally reddish brown, rarely off white, mottled, firm to moderately hard, blocky to crumbly rock flour, moderately calcareous, with occasional loose sand, fine to medium, occasionally coarse, angular to sub angular, poorly sorted, rare lithic fragments.
		Tr	SILTSTONE / CLAYSTONE: reddish brown, reddish purple, soft to firm, amorphous, sandy, very fine to fine.
17945	5469	80	SANDSTONE: grey brown, reddish brown, rarely off white, mottled, firm to moderately hard, blocky to crumbly rock flour, moderately calcareous, with occasional loose sand, fine to medium, occasionally coarse, rarely very coarse, angular to sub angular, poorly sorted, rare lithic fragments.
		20	SILTSTONE: reddish brown, reddish purple, soft to firm, amorphous, sandy, very fine to fine.
17950	5471	80	SANDSTONE: grey brown, reddish brown, rarely off white, mottled, firm to moderately hard, blocky to crumbly rock flour, moderately calcareous, with occasional loose sand, fine to medium, occasionally coarse, very rare trace very coarse, angular to sub angular, occasionally surround, poorly sorted, rare lithic fragments.
		20	SILTSTONE: reddish brown, reddish purple, soft to firm, amorphous, sandy, very fine to fine.
17955	5472	100	SANDSTONE: varicoloured, red brown to moderate brown to grey white, mottled, fine to very coarse grained, angular to sub rounded, very argillaceous/silty, common anhydrite, moderately dolomitic/calcareous. Grades to sandy claystone.
17960	5474	100	SANDSTONE/SAND: clear to translucent grey to red brown, fine to coarse grained, rare very coarse, angular to sub rounded, poorly cemented, mostly loose grains, argillaceous matrix in part, common anhydrite, slightly calcareous/dolomitic.
17965	5476	100	SANDSTONE/SAND: clear to translucent grey to red brown, fine to medium grained, rare coarse, angular to sub rounded, poorly cemented, mostly loose grains, argillaceous matrix in part, traces of anhydrite and halite, slightly calcareous/dolomitic.
17970	5477	100	SANDSTONE/SAND: clear to translucent grey to red brown, fine to coarse grained, rare very coarse, angular to sub rounded, poorly cemented, mostly loose grains, argillaceous matrix in part, traces of anhydrite and halite, slightly calcareous/dolomitic.
17975	5479	100	SANDSTONE/SAND: clear to translucent grey to red brown, fine to coarse grained, rare very coarse, angular to sub rounded, poorly cemented, mostly loose grains, argillaceous matrix in part, traces of anhydrite and halite, slightly calcareous/dolomitic.
17980	5480	100	SANDSTONE/SAND: clear to translucent grey to red brown, fine to coarse grained, rare very coarse, angular to sub rounded, poorly cemented, mostly loose grains, argillaceous matrix in part, traces of anhydrite and halite, also traces of litihic fragments, slightly calcareous/dolomitic.
17985	5482	100	SANDSTONE/SAND: clear to translucent grey to red brown, fine to coarse grained, rare very coarse, angular to sub rounded, poorly cemented, mostly loose grains, argillaceous matrix in part, traces of anhydrite and halite, slightly calcareous/dolomitic.
17990	5483	100	SANDSTONE/SAND: clear to translucent grey to red brown, fine to coarse grained, rare very coarse, angular to sub rounded, poorly cemented, mostly loose grains, argillaceous matrix in part, trace lithic fragments, traces of anhydrite and halite, slightly calcareous/dolomitic.
17995	5485	100	SANDSTONE/SAND: clear to translucent grey to red brown, fine to coarse grained, rare very coarse, angular to sub rounded, poorly cemented, mostly loose grains, argillaceous matrix in part, trace lithic fragments, traces of anhydrite and halite, slightly calcareous/dolomitic.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
18000	5486	100	SANDSTONE: abundant rock flour, light grey to grey brown, mottled red brown, occasional trace off white, soft to firm, amorphous, argillaceous in part, moderately calcareous. SANDSTONE: quartz, loose, unconsolidated, colourless, pale grey, occasional reddish purple staining, predominantly fine to medium, occasionally very fine, angular to subangular, occasionally subround, with quartz overgrowths, very angular fractured grains.
18005	5488	100	SANDSTONE: abundant rock flour, light grey to grey brown, mottled red brown, occasional trace off white, soft to firm, amorphous, argillaceous in part, moderately calcareous. SANDSTONE: quartz, loose, unconsolidated, colourless, pale grey, occasional reddish purple staining, predominantly fine to medium, occasionally very fine, angular to subangular, occasionally subround, with quartz overgrowths, very angular fractured grains.
18010	5489	100	SANDSTONE: abundant rock flour, light grey to grey brown, mottled red brown, occasional trace off white, soft to firm, amorphous, argillaceous in part, moderately calcareous. SANDSTONE: quartz, loose, unconsolidated, colourless, pale grey, occasional reddish purple staining, predominantly fine to medium, occasionally very fine, angular to subangular, occasionally subround, with quartz overgrowths, very angular fractured grains, rare trace lithic grains. Trace coarse to very coarse subround to round grains
18015	5491	100	SANDSTONE: abundant rock flour, light grey to grey brown, mottled red brown, occasional trace off white, soft to firm, amorphous, argillaceous in part, slight to moderately calcareous. SANDSTONE: quartz, loose, unconsolidated, colourless, pale grey, occasional reddish purple staining, predominantly fine to medium, occasionally very fine, angular to subangular, occasionally subround, with quartz overgrowths, very angular fractured grains.
18020	5492	100	SANDSTONE: abundant rock flour, light grey to medium grey brown, mottled red brown, occasional trace off white, soft to firm, amorphous, argillaceous in part, slight to moderately calcareous. SANDSTONE: quartz, loose, unconsolidated, colourless, pale grey, occasional reddish purple staining, predominantly fine to medium, occasionally very fine, angular to subangular, occasionally subround, with quartz overgrowths, very angular fractured grains.
18025	5494	100	SANDSTONE: abundant rock flour, light to medium grey to grey brown, mottled red brown, occasionally off white, soft to firm, amorphous, argillaceous in part, slight to moderately calcareous. SANDSTONE: quartz, loose, unconsolidated, colourless, pale grey, occasional reddish purple staining, transparent to translucent, predominantly very fine to fine, occasionally medium, subangular to subround, moderate sorting.
18030	5495	100	SANDSTONE: abundant rock flour, light grey to grey brown, mottled red brown, occasionally off white, soft to firm, amorphous, argillaceous in part, slight to moderately calcareous. SANDSTONE: quartz, loose, unconsolidated, colourless, pale grey, occasional reddish purple staining, transparent to translucent, predominantly very fine to fine, occasionally medium, subangular to subround, moderate sorting.
18035	5497	100	SANDSTONE: rock flour, moderate brown to grey brown, mottled off white, firm crumbly, argillaceous, slight to moderately calcareous, sandy, very fine to fine. SANDSTONE: quartz, loose, unconsolidated, colourless, transparent to translucent, occasional red brown staining, very fine to fine, subangular to subround, well sorted.
18040	5498	100	SANDSTONE: rock flour, moderate brown to red brown, grey brown, mottled off white, firm crumbly, argillaceous, slight to moderately calcareous, sandy, very fine to fine. SANDSTONE: quartz, loose, unconsolidated, colourless, transparent to translucent, occasional red brown staining, very fine to fine, occasionally medium to coarse, subangular to subround, moderate to poorly sorted.
18045	5500	100	SANDSTONE: moderate brown to red brown to grey brown, to white, mottled, fine to medium grained, rare coarse grained, angular to sub rounded, argillaceous/calcareous matrix, very argillaceous, grading to sandy claystone.
18050	5501	100	SANDSTONE: red brown to moderate brown, to white, mottled, fine to coarse grained, angular to sub rounded, friable, common argillaceous/calcareous matrix, traces of Mica, Anhydrite and Halite,
18052	5502	100	SANDSTONE: red brown to moderate brown, to white, mottled, fine to very coarse grained, angular to rounded, friable, common argillaceous/calcareous matrix, traces of Mica, good trace lithic clasts.
18053	5502.5	100	CLAYSTONE (Caliche): red brown to moderate brown, mottled white, grey, blocky, moderately calcareous, common Anhydrite inclusions, sandy in part.
18054	5503	80 20	HALITE: clear to translucent grey, crystalline. SANDSTONE: red brown to moderate brown, to white, mottled, fine to very coarse grained, angular to rounded, friable, common argillaceous/calcareous matrix, traces of Mica, good trace lithic clasts.
18060	5505	90 10	HALITE: clear to translucent grey, crystalline. SANDSTONE: red brown to moderate brown, to white, mottled, fine to medium grained, angular to rounded, friable, common argillaceous/calcareous matrix, traces of Mica, trace lithic clasts.
18065	5506	90 10	HALITE: clear to translucent grey, crystalline. SANDSTONE: red brown to moderate brown, to white, mottled, fine to medium grained, angular to rounded, friable, common argillaceous/calcareous matrix, traces of Mica, trace lithic clasts.
18070	5508	90 10	HALITE: clear to translucent grey, crystalline. SANDSTONE: red brown to moderate brown, to white, mottled, fine to medium grained, angular to rounded, friable, common argillaceous/calcareous matrix, traces of Mica, trace lithic clasts.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
18080	5511	80 20	HALITE: clear to translucent grey, crystalline. SANDSTONE: red brown to moderate brown, to white, mottled, fine to medium grained, angular to rounded, friable, common argillaceous/calcareous matrix, traces of Mica, trace lithic clasts.
18085	5512	50 50	HALITE: clear to translucent grey, crystalline. SANDSTONE: red brown to moderate brown, to white, mottled, very fine to medium grained, angular to rounded, friable, common argillaceous/calcareous matrix, traces of Mica, traces of anhydrite associated with red brown claystone, trace lithic clasts.
18090	5514	60 40	SANDSTONE: red brown to moderate brown, to white, mottled, very fine to medium grained, angular to rounded, friable, common argillaceous/calcareous matrix, traces of Mica, traces of anhydrite associated with red brown claystone, trace lithic clasts. Grades to sandy Claystone. HALITE: clear to translucent grey, crystalline.
18095	5515	100 Tr	HALITE: clear to translucent grey, crystalline. SANDSTONE: red brown to moderate brown, to white, mottled, very fine to medium grained, angular to rounded, friable, common argillaceous/calcareous matrix, traces of Mica, traces of anhydrite associated with red brown claystone, trace lithic clasts. Grades to sandy Claystone.
18100	5517	100 Tr	HALITE: clear to translucent grey, crystalline. SANDSTONE: red brown to moderate brown, to white, mottled, very fine to medium grained, angular to rounded, friable, common argillaceous/calcareous matrix, traces of Mica, traces of anhydrite associated with red brown claystone, trace lithic clasts. Grades to sandy Claystone.
18105	5518	70 30 Tr	SANDSTONE: red brown to moderate brown, to white, mottled, very fine to medium grained, angular to rounded, friable, common argillaceous/calcareous matrix, traces of Mica, traces of anhydrite associated with red brown claystone, CLAYSTONE: red brown moderate brown, blocky, silty to sandy (very fine grained) in part, common Halite, Anhydrite.
18110	5520	70 30 Tr	SANDSTONE: red brown to moderate brown, very fine to medium grained occasionally coarse, angular to rounded, common lithic clasts. CLAYSTONE: red brown moderate brown, blocky, silty to sandy (very fine grained) in part, common Halite, Anhydrite. LIMESTONE: white to very light grey, soft to firm, blocky, microcrystalline.
18115	5521	100	CLAYSTONE: red brown, moderate brown, grey, white, mottled, clay/calcareous matrix with abundant Halite and Anhydrite inclusions, very sandy: medium to very coarse grained angular to rounded. Grades to argillaceous Sandstone.
18120	5523	100	CLAYSTONE: red brown, moderate brown, grey white mottled, clay/calcareous matrix with abundant Halite and Anhydrite inclusions,very calcareous, very sandy: medium to very coarse grained angular to rounded Quartz with good trace of lithic clasts. Grades to argillaceous Sandstone.
18125	5525	80 20	SANDSTONE: red brown moderate brown, white, grey mottled, very fine grained to medium grained, rare very coarse grained, silty, argillaceous matrix, calcareous, halitic, common Anhydrite inclusions. Grades to Sandy Claystone. HALITE: clear, translucent grey.
18130	5526	90 10	SANDSTONE: red brown moderate brown, white, grey mottled, very fine grained to medium grained, rare very coarse grained, silty, argillaceous matrix, calcareous, halitic, common Anhydrite inclusions. Grades to Sandy Claystone. CLAYSTONE: red brown moderate brown, blocky, silty to sandy (very fine grained) in part, common Halite, Anhydrite, calcareous.
18135	5528	80 20	HALITE: clear, translucent grey, translucent brown. CLAYSTONE: red brown moderate brown, blocky, silty to sandy (very fine grained) in part, common Halite, Anhydrite, calcareous
18140	5529	80 20 TR	HALITE: clear, translucent grey, translucent brown. CLAYSTONE: red brown moderate brown, blocky, silty to sandy (very fine grained) in part, common Halite, Anhydrite, calcareous. SAND
18145	5531	70 20 10	HALITE: clear, translucent grey, translucent brown. CLAYSTONE: red brown moderate brown, blocky, silty to sandy (very fine grained) in part, common Halite, Anhydrite, calcareous. SAND: clear to translucent grey to red brown, loose Quartz and lithic clasts, fine to medium grained, occasionally coarse to very coarse, angular to sub rounded.
18150	5532	80 20	HALITE: clear, translucent grey, translucent brown. SANDSTONE: red brown moderate brown, white, grey, mottled, fine to medium grained, occasionally coarse to very coarse, angular to sub rounded, quartz and lithic clasts, argillaceous/calcareous matrix, common Halite and Anhydrite, grades to sandy claystone.
18155	5534	90 10	HALITE: clear, translucent grey, translucent brown. SANDSTONE: red brown moderate brown, white, grey, mottled, fine to medium grained, occasionally coarse to very coarse, angular to sub rounded, quartz and lithic clasts, argillaceous/calcareous matrix, common Halite and Anhydrite, grades to sandy claystone.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
18160	5535	10 90	HALITE: clear, translucent grey, translucent brown. SANDSTONE(argillaceous): red brown moderate brown, white, grey, mottled, fine to medium grained, occasionally coarse to very coarse, angular to sub rounded, quartz and lithic clasts, silty in part, common argillaceous/calcareous matrix, common Halite and Anhydrite, grades to sandy claystone. No visual porosity.
18165	5537	80 20	HALITE: clear, translucent grey, translucent brown. SANDSTONE(argillaceous): red brown, moderate brown, white, grey, mottled, very fine to fine grained, sub rounded to rounded, silty in part, common argillaceous, grades to sandy claystone. No visual porosity.
18170	5538	60 40	HALITE: clear, translucent grey, translucent brown. SANDSTONE(argillaceous): red brown, moderate brown, greyish brown, white, grey, mottled, very fine to fine grained, sub rounded to rounded, silty in part, common argillaceous, grades to sandy claystone. No visual porosity.
18175	5540	Tr 100	HALITE: clear, translucent grey, translucent brown. SANDSTONE(argillaceous): greyish brown, red brown, moderate brown, white, grey, mottled, very fine to fine grained, sub rounded to rounded, silty in part, common argillaceous, grades to sandy claystone. No visual porosity.
18180	5541	80 20 Tr	HALITE: clear, translucent grey, translucent brown. SANDSTONE(argillaceous): greyish brown, red brown, moderate brown, white, grey, mottled, very fine to fine grained, sub rounded to rounded, silty in part, common argillaceous, grades to sandy claystone. No visual porosity. LIMESTONE: white, very light grey, hard, blocky, microcrystalline
18185	5543	60 40 Tr	HALITE: clear, translucent grey, translucent brown. SANDSTONE(argillaceous): greyish brown, red brown, moderate brown, white, grey, mottled, very fine to fine grained, sub rounded to rounded, silty in part, common argillaceous, grades to sandy claystone. No visual porosity. LIMESTONE: white, very light grey, hard, blocky, microcrystalline
18190	5544	100	HALITE: clear, translucent grey, translucent brown.
18195	5546	100 Tr Tr	HALITE: clear, translucent grey, translucent brown. SANDSTONE/SAND: clear Quartz, very fine to fine grained, sub angular to rounded. CLAYSTONE: red brown to moderate brown.
18200	5547	80 10 10	HALITE: clear, translucent grey, translucent brown. CLAYSTONE: red brown to moderate brown, amorphous. SAND/SANDSTONE: clear Quartz, very fine to fine grained, sub angular to rounded.
18205	5549	90 10 Tr	HALITE: clear, translucent grey. SAND/SANDSTONE: clear Quartz, very fine to fine grained, sub angular to rounded. CLAYSTONE: red brown to moderate brown, amorphous.
18210	5550	100 Tr	HALITE: clear, translucent grey. SAND/SANDSTONE: clear Quartz, very fine to fine grained, sub angular to rounded.
18211	5551	60 20 20	HALITE: clear, translucent grey SANDSTONE/SAND: red brown, clear quartz, very fine to fine grained, sub angular to sub rounded, friable to loose, argillaceous /halitic matrix, grades to Claystone. CLAYSTONE: red brown to moderate brown, amorphous, sandy.
18220	5555	100 Tr	SANDSTONE: red brown, firm to hard, clear to translucent occasionally red brown stained, very fine to fine, angular, well sorted equant, argillaceous matrix grades to Sandy Claystone in part. Clear halite crystals very fresh possibly recrystalised from mud.
18230	5558	70 30	SANDSTONE: dark grey red to grey red, firm composed of very fine to fine, sub angular quartz grains, with occasional very coarse rounded quartz, poorly sorted, with abundant dark grey red argillaceous matrix, occasional white calcareous matrix. CLAYSTONE: dark grey red to grey red, soft, sub blocky to crumbly break, silty to sandy in part, slightly calcareous.
18240	5561	90 10 Tr	SANDSTONE: dark grey red to grey red, firm composed of fine to medium , sub angular quartz grains, with occasional very coarse rounded quartz, poorly sorted, with abundant dark grey red argillaceous matrix, occasional white calcareous matrix. CLAYSTONE: dark grey red to grey red, soft, sub blocky to crumbly break, silty to sandy in part, slightly calcareous. Halite colourless, clear, slightly pitted crystalline, fractured.
18250	5563	80 20 Tr	SANDSTONE: dark grey red to grey red, firm composed of fine to medium, sub angular quartz grains, with occasional very coarse rounded quartz, poorly sorted, with abundant dark grey red argillaceous matrix, occasional white calcareous matrix. CLAYSTONE: dark grey red to grey red, soft, sub blocky to crumbly break, silty to sandy in part, slightly calcareous. LIMESTONE: white, very light grey, soft to firm, sub-blocky to blocky, argillaceous in places

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
18260	5566	70	SANDSTONE: dark grey red to grey red, firm composed of fine to medium, sub angular quartz grains, with occasional very coarse rounded quartz, poorly sorted, with abundant dark grey red argillaceous matrix, occasional white calcareous matrix.
		20	CLAYSTONE: dark grey red to grey red, soft, sub blocky to crumbly break, silty to sandy in part, slightly calcareous.
		10	LIMESTONE: white, very light grey, soft to firm, sub-blocky to blocky, argillaceous in places
18270	5569	100	SANDSTONE: predominantly medium grey, also dark grey red to grey red, firm composed of very fine to medium, sub angular quartz grains, with occasional very coarse rounded quartz, poorly sorted, with abundant dark grey red argillaceous matrix, occasional white calcareous matrix.
		Tr	CLAYSTONE: dark grey red to grey red, soft, sub blocky to crumbly break, silty to sandy in part, slightly calcareous.
		Tr	LIMESTONE: white, very light grey, soft to firm, sub-blocky to blocky, argillaceous in places
18280	5572	100	SANDSTONE: predominantly medium grey, also dark grey red to grey red, firm composed of very fine to medium, sub angular quartz grains, with common very coarse subangular to subrounded quartz, poorly sorted, with abundant dark grey red argillaceous matrix, occasional white calcareous matrix.
		Tr	CLAYSTONE: dark grey red to grey red, soft, sub blocky to crumbly break, silty to sandy in part, slightly calcareous.
		Tr	LIMESTONE: white, very light grey, soft to firm, sub-blocky to blocky, argillaceous in places
18290	5575	90	SANDSTONE: dark grey red to grey red, occasionally medium grey, firm composed of fine to medium, sub angular quartz grains, with occasional very coarse rounded quartz, poorly sorted, with abundant dark grey red argillaceous matrix, occasional white calcareous matrix.
		Tr	CLAYSTONE: dark grey red to grey red, soft, sub blocky to crumbly break, silty to sandy in part, slightly calcareous.
		10	LIMESTONE: white, very light grey, soft to firm, sub-blocky to blocky, argillaceous in places
18300	5578	60	SANDSTONE: dark grey red to grey red, occasionally medium grey, firm composed of fine to medium, sub angular quartz grains, with occasional very coarse rounded quartz, poorly sorted, with abundant dark grey red argillaceous matrix, occasional white calcareous matrix.
		30	CLAYSTONE: dark grey red to grey red, soft, sub blocky to crumbly break, silty to sandy in part, slightly calcareous.
		10	LIMESTONE: white, very light grey, soft to firm, sub-blocky to blocky, argillaceous in places
18310	5581	50	SANDSTONE: dark grey red to grey red, occasionally medium grey, firm composed of fine to medium, sub angular quartz grains, with occasional very coarse rounded quartz, poorly sorted, with abundant dark grey red argillaceous matrix, occasional white calcareous matrix.
		30	CLAYSTONE: dark grey red to grey red, soft, sub blocky to crumbly break, silty to sandy in part, slightly calcareous.
		10	LIMESTONE: white, very light grey, soft to firm, sub-blocky to blocky, argillaceous in places
		10	HALITE: translucent, colourless, crystaliine, fractured. Pitted surface.
18320	5584	100	SANDSTONE: dark grey red to grey red, occasionally medium grey, firm composed of very fine to fine, sub angular quartz grains, with occasional very coarse rounded quartz, poorly sorted, with abundant dark grey red argillaceous matrix, occasional white calcareous matrix.
		Tr	LIMESTONE: white, very light grey, soft to firm, sub-blocky to blocky, argillaceous in places
18330	5587	100	SANDSTONE: dark grey red to grey red, occasionally medium grey, firm composed of very fine to fine, sub angular quartz grains, with occasional very coarse rounded quartz, poorly sorted, with abundant dark grey red argillaceous matrix, occasional white calcareous matrix.
18340	5590	100	SANDSTONE: dark grey red to grey red, occasionally medium grey, firm composed of very fine to fine, sub angular quartz grains, with occasional very coarse rounded quartz, poorly sorted, with abundant dark grey red argillaceous matrix, occasional white calcareous matrix.
		Tr	CLAYSTONE: dark grey red to grey red, soft, sub blocky to crumbly break, silty to sandy in part, slightly calcareous.
		Tr	LIMESTONE: white, very light grey, soft to firm, sub-blocky to blocky, argillaceous in places
18350	5593	100	SANDSTONE: dark grey red to grey red, occasionally medium grey, firm composed of very fine to fine, sub angular quartz grains, with occasional very coarse rounded quartz, poorly sorted, with abundant dark grey red argillaceous matrix, occasional white calcareous matrix.
		Tr	CLAYSTONE: dark grey red to grey red, soft, sub blocky to crumbly break, silty to sandy in part, slightly calcareous.
		Tr	LIMESTONE: white, very light grey, soft to firm, sub-blocky to blocky, argillaceous in places
18360	5596	90	SANDSTONE: dark grey red to grey red, occasionally medium grey, firm composed of very fine to fine, sub angular quartz grains, with occasional very coarse rounded quartz, poorly sorted, with abundant dark grey red argillaceous matrix, trace to abundant white calcareous matrix and grading to a sandy LIMESTONE in places.
		Tr	CLAYSTONE: dark grey red to grey red, soft, sub blocky to crumbly break, silty to sandy in part, slightly calcareous.
		10	LIMESTONE: white, very light grey, soft to firm, sub-blocky to blocky, argillaceous in places and occasionally sandy, grading to a calcareous SANDSTONE in places

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
18370	5599	90	SANDSTONE: dark grey red to grey red, occasionally medium grey, firm composed of very fine to fine, sub angular quartz grains, with occasional coarse and very coarse broken quartz and lithic fragments, poorly sorted, with abundant dark grey red argillaceous matrix, trace to abundant white calcareous matrix and grading to a sandy LIMESTONE in places.
		Tr	CLAYSTONE: dark grey red to grey red, soft, sub blocky to crumbly break, silty to sandy in part, slightly calcareous.
		10	LIMESTONE: white, very light grey, soft to firm, sub-blocky to blocky, argillaceous in places and occasionally sandy, grading to a calcareous SANDSTONE in places
18380	5602	90	SANDSTONE: dark grey red to grey red, occasionally medium grey, firm composed of very fine to fine, sub angular quartz grains, with common coarse and very coarse broken quartz and lithic fragments, poorly sorted, with abundant dark grey red argillaceous matrix, trace to abundant white calcareous matrix and grading to a sandy LIMESTONE in places.
		Tr	CLAYSTONE: dark grey red to grey red, soft, sub blocky to crumbly break, silty to sandy in part, slightly calcareous.
		10	LIMESTONE: white, very light grey, soft to firm, sub-blocky to blocky, argillaceous in places and occasionally sandy, grading to a calcareous SANDSTONE in places
18390	5607	100	SANDSTONE: (conglomeratic) greyish red occasionally moderate grey, composed from clear to translucent, occasionally opaque, fine to medium grained,sub round to sub angular quartz grains common very coarse angular / broken grains as well, poor sorting, with abundant greyish red argillaceous matrix, and common white to pale olive grey calcareous matrix grading to a sandy limestone in part.
18400	5610	100	SANDSTONE: (conglomeratic) greyish red occasionally moderate grey, composed from clear to translucent, occasionally opaque, fine to medium grained, sub round to sub angular quartz grains common very coarse angular / broken grains as well, poor sorting, with abundant greyish red argillaceous matrix, and common white to pale olive grey calcareous matrix grading to a sandy limestone in part.
18410	5611	100	SANDSTONE: greyish red, to grey brown, often with pale grey laminations, firm friable, composed from, colourless to pale grey, translucent to opaque, very fine to fine quartz grains, sub angular to sub round, moderate sorting, with abundant grey red argrillaceous matrix, poor inferred porosity.
18420	5614	100	SANDSTONE: greyish red, to grey brown, often with pale grey laminations, firm friable, composed from, colourless to pale grey, translucent to opaque, very fine to fine quartz grains, sub angular to sub round, moderate sorting, with abundant grey red argrillaceous matrix, poor inferred porosity.
18430	5617	60	SANDSTONE: greyish red, to grey brown, often with pale grey laminations, firm friable, composed from, colourless to pale grey, translucent to opaque, very fine to fine quartz grains, sub angular to sub round, moderate sorting, with abundant grey red argrillaceous matrix, poor inferred porosity.
		40	CLAYSTONE: moderate brown, to grey red, also pale greyish white, soft, sub blocky to crumbly break, sticky in part, slightly dolomitic, possibly saltiferous. (sample heavily contaminated by salt assumed to break out from mud)
18440	5621	90	SANDSTONE: greyish red, to grey brown, often with pale grey laminations, firm friable, composed from, colourless to pale grey, translucent to opaque, very fine to fine quartz grains, sub angular to sub round, moderate sorting, with abundant grey red argrillaceous matrix, poor inferred porosity.
		10	CLAYSTONE: moderate brown, to grey red, also pale greyish white, soft, sub blocky to crumbly break, sticky in part, slightly dolomitic, possibly saltiferous.
18450	5624	90	SANDSTONE: greyish red, to grey brown, often with pale grey laminations, firm friable, composed from, colourless to pale grey, translucent to opaque, very fine to fine quartz grains, sub angular to sub round, moderate sorting, with abundant grey red argrillaceous matrix, poor inferred porosity.
		10	CLAYSTONE: moderate brown, to grey red, also pale greyish white, soft, sub blocky to crumbly break, sticky in part, slightly dolomitic, possibly saltiferous.
18460	5627	100	SANDSTONE: greyish red, to grey brown, often with pale grey laminations, firm friable, composed from, colourless to pale grey, translucent to opaque, very fine to fine quartz grains, sub angular to sub round, moderate sorting, with abundant grey red argrillaceous matrix, poor inferred porosity.
		Tr	LIMESTONE: white, very light grey, soft to firm, sub-blocky to blocky, argillaceous in places and occasionally sandy, grading to a calcareous SANDSTONE in places
18470	5630	100	SANDSTONE: greyish red, to grey brown, often with pale grey laminations, firm friable, composed from, colourless to pale grey, translucent to opaque, very fine to fine quartz grains, sub angular to sub round, moderate sorting, with abundant grey red argrillaceous matrix, poor inferred porosity.
		Tr	LIMESTONE: white, very light grey, soft to firm, sub-blocky to blocky, argillaceous in places and occasionally sandy, grading to a calcareous SANDSTONE in places (sample heavily contaminated by salt assumed to break out from mud - after sitting in riser during connection???)
18480	5633	100	SANDSTONE: greyish red, to grey brown, often with pale grey laminations, firm friable, composed from, colourless to pale grey, translucent to opaque, very fine to fine quartz grains, sub angular to sub round, moderate sorting, with abundant grey red argrillaceous matrix, poor inferred porosity.
		Tr	CLAYSTONE: moderate brown, to grey red, also pale greyish white, soft, sub blocky to crumbly break, sticky in part, slightly dolomitic, possibly saltiferous and anhydritic.
		Tr	LIMESTONE: white, very light grey, soft to firm, sub-blocky to blocky, argillaceous in places and occasionally sandy, grading to a calcareous SANDSTONE in places

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
18490	5636	100	SANDSTONE: (conglomeratic) composed from colourless to pale grey, translucent to opaque, bimodal , fine to medium occasionally coarse to very coarse quartz grains, fine to medium grains are sub angular occasionally sub round, the Coares grains tend to be angular to broken, also common angular, red brown volcanic? Clasts. All are contained within an abundant greyish red argillaceous matrix, occasional silaceous matrix and rare white calcareous matrix.
		Tr	CLAYSTONE: moderate brown, to grey red, also pale greyish white, soft, sub blocky to crumbly break, sticky in part, slightly dolomitic in part.
18500	5639	100	SANDSTONE: (conglomeratic) composed from colourless to pale grey, translucent to opaque, bimodal , fine to medium occasionally coarse to very coarse quartz grains, fine to medium grains are sub angular occasionally sub round, the coarse grains tend to be angular to broken, also common angular, red brown volcanic? Clasts. All are contained within an abundant greyish red argillaceous matrix, occasional silaceous matrix and rare white calcareous matrix. Sample heavily contaminated with graphite mud attitive (G seal)
18510	5642	100	SANDSTONE: (conglomeratic) composed from colourless to pale grey, or dark red stained, translucent to opaque, bimodal, quartz grains, either; very fine to medium grained, sub angular generally spherical, or coarse to very coarse,very angular and occasionally elongate. Common hard angular dark reddish grey, angular lithic fragments and occasional pale grey firm to amorphous sub blocky kaolin Minerals. The fine to medium grained quartz is bound in an argillaceous grey red matrix with occasiona silica cementation. Poor visual porosity.
		Tr	Limestone, white moderately hard, blocky to angular, microcrytaline. G seal contamination (graphite)
18520	5645	100	SANDSTONE: (conglomeratic) composed from colourless to pale grey, or dark red stained, translucent to opaque, bimodal quartz grains, either; very fine to medium grained, sub angular generally spherical, or coarse to very coarse,very angular and occasionally elongate. Common hard angular dark reddish grey, angular lithic fragments and occasional pale grey firm to amorphous sub blocky kaolin Minerals. Rare mica. The fine to medium grained quartz is bound in an argillaceous grey red matrix with occasiona silica cementation. Poor visual porosity. G seal contamination (graphite)
18530	5648	100	SANDSTONE: (conglomeratic) composed from colourless to pale grey, or dark red stained, translucent to opaque, bimodal quartz grains, either; very fine to medium grained, sub angular generally spherical, or coarse to very coarse,very angular and occasionally elongate. Common hard angular dark reddish grey, angular lithic fragments and occasional pale grey firm to amorphous sub blocky kaolin Minerals. Rare mica. The fine to medium grained quartz is bound in an argillaceous grey red matrix with occasiona silica cementation. Poor visual porosity.
		Tr	LIMESTONE, white moderately hard, blocky to angular, microcrystaline. G seal and recrystalised salt contamination (graphite)
18540	5651	100	SANDSTONE: (conglomeratic) composed from colourless to pale grey, or dark red stained, translucent to opaque, bimodal quartz grains, either; very fine to medium grained, sub angular generally spherical, or coarse to very coarse,very angular and occasionally elongate. Common hard angular dark reddish grey, angular lithic fragments and occasional pale grey firm to amorphous sub blocky kaolin Minerals. Rare mica. The fine to medium grained quartz is bound in an argillaceous grey red matrix with occasiona silica cementation. Poor visual porosity.
		Tr	LIMESTONE, white moderately hard, blocky to angular, microcrystalline occasionally associated with red brown CLAYSTONE G seal and recrystalised salt contamination (graphite)
18550	5654	100	SANDSTONE: (conglomeratic) composed from colourless to pale grey, or dark red stained, translucent to opaque, bimodal quartz grains, either; very fine to medium grained, sub angular generally spherical, or coarse to very coarse,very angular and occasionally elongate. Common hard angular dark reddish grey, angular lithic fragments and occasional pale grey firm to amorphous sub blocky kaolin Minerals. Rare mica. The fine to medium grained quartz is bound in an argillaceous grey red matrix with occasiona silica cementation. Poor visual porosity.
		Tr	LIMESTONE, white moderately hard, blocky to angular, microcrystalline occasionally associated with red brown CLAYSTONE
		Tr	CLAYSTONE: moderate brown, to grey red, also pale greyish white, soft, sub blocky to crumbly break, occasionally associated with LIMESTONE G seal contamination (graphite)

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
18554	5655	100	SANDSTONE: (conglomeratic) composed from colourless to pale grey, or dark red stained, translucent to opaque, bimodal quartz grains, either; very fine to medium grained, sub angular generally spherical, or coarse to very coarse,very angular and occasionally elongate. Common hard angular dark reddish grey, angular lithic fragments and occasional pale grey firm to amorphous sub blocky kaolin Minerals. Rare mica. The fine to medium grained quartz is bound in an argillaceous grey red matrix with occasiona silica cementation. Poor visual porosity.
		Tr	LIMESTONE, white moderately hard, blocky to angular, microcrystalline occasionally associated with red brown CLAYSTONE
		Tr	CLAYSTONE: moderate brown, to grey red, also pale greyish white, soft, sub blocky to crumbly break, occasionally associated with LIMESTONE G seal contamination (graphite)
18560	5658	100	SANDSTONE: Colourless occasionally pale pink, clear to translucent, fine to very coarse quartz grains, very angular to angular, equant, poorly sorted, generally loose. Also numerous lithic clasts, pink to pale grey, soft to firm, occasionally hard,sub blocky, occasional red brown soft argillaceous matrix. Very heavy G seal graphite contamination.
18570	5660	100	SANDSTONE: (conglomeratic), quartz, loose, unconsolidated, colourless, pale grey, occasionally red brown to reddish purple stained, translucent to opaque, predominantly medium to coarse, subangular to subround, moderately spherical, occasionally very coarse, rarely granular, subangular to predominantely angular, fractured grains, poorly sorted. Rare lithic grains and fragments, pale grey, reddish purple, orange brown.
18580	5663	100	SANDSTONE: (conglomeratic), quartz, loose, unconsolidated, colourless, pale grey, occasionally red brown to reddish purple stained, translucent to opaque, predominantly medium to coarse, subangular to subround, moderately spherical, occasionally very coarse, rarely granular, subangular to predominantely angular, fractured grains, poorly sorted. Rare lithic grains and fragments, pale grey, reddish purple, orange brown.
18590	5666	100	SANDSTONE: (conglomeratic), quartz, loose, unconsolidated, colourless, pale grey, occasionally red brown to reddish purple stained, translucent to opaque, predominantly fine to coarse, subangular to subround, moderately spherical, occasionally very coarse, rarely granular, subangular to predominantely angular, fractured grains, very poorly sorted, traces red brown argillaceous matrix. Rare lithic grains and fragments, pale grey, reddish purple, orange brown.
18600	5669	100	SANDSTONE: (conglomeratic), quartz, loose, unconsolidated, colourless, pale grey, occasionally red brown to reddish purple stained, translucent to opaque, predominantly fine to coarse, subangular to subround, moderately spherical, occasionally very coarse, rarely granular, subangular to predominantely angular, fractured grains, very poorly sorted, traces red brown argillaceous matrix. Rare lithic grains and fragments, pale grey, reddish purple, orange brown.
18610	5672	100	SANDSTONE (conglomeratic) quartz, loose, unconsolidated, colourless, pale greenish grey rarely milky white, clear to translucent, occasionally opaque, medium to very coarse grained, occasionally granular, very angular broken grains elongate, poorly sorted, occasional grey red, moderate brown lithic fragments, occasional grey red argillaceous matrix, poor inferred porosity,
		Tr	LIMESTONE: white, firm to moderately hard, sub blocky to angular, microcrystalline.
18620	5675	100	SANDSTONE (conglomeratic) quartz, loose, unconsolidated, colourless, pale greenish grey rarely milky white , clear to translucent, occasionally opaque, medium to very coarse grained, occasionally granular, very angular broken grains elongate, poorly sorted, common grey red, moderate brown lithic fragments, occasional grey red argillaceous matrix, poor inferred porosity,
		Gd Tr	LIMESTONE: white, firm to moderately hard, sub blocky to angular, microcrystalline.
18630	5678	100	SANDSTONE: (conglomeratic) composed of loose quartz grains, colourless, white, pale pink, pale green, translucent to opaque, coarse to very coarse, occasionally granular, angular broken grains, elongate, poorly sorted. abundant lithic clasts coarse to very coarse, red brown to medium brown, occasionally mrdium grey, rarely dark green,
		Gd Tr	LIMESTONE: white, firm to moderately hard, sub blocky to angular, microcrystalline.
18640	5681	100	SANDSTONE: (conglomeratic) composed of loose quartz grains, colourless, white, pale pink, pale green, translucent to opaque, coarse to very coarse, occasionally granular, angular broken grains, elongate, poorly sorted. common lithic fragments, moderate brown to grey red, firm, crumbly break, with occasional green / white speckled inclusions.
		Gd Tr	LIMESTONE: white, firm to moderately hard, sub blocky to angular, microcrystalline.
18650	5684	100	SANDSTONE: (conglomeratic), quartz, loose, unconsolidated, predominantly colourless, transparent to translucent, occasionally pale grey, pinkish grey, translucent to opaque, traces reddish brown to reddish purple staining, fine to coarse, locally very coarse, rarely granular, subangular, occasionally subround, with abundant angular fractured grains, very poorly sorted, good trace soft red brown argillaceous matrix, abundant varicoloured lithic grains and fragments.
		R Tr	LIMESTONE: white, firm to moderately hard, sub blocky to angular, microcrystalline.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
18660	5687	100	SANDSTONE: (conglomeratic), quartz, loose, unconsolidated, predominantly colourless, transparent to translucent, occasionally pale grey, pinkish grey, translucent to opaque, traces reddish brown to reddish purple staining, very fine to coarse, locally very coarse, rarely granular, subangular, occasionally subround, with abundant angular fractured grains, very poorly sorted, good trace soft red brown argillaceous matrix, abundant varicoloured lithic grains and fragments.
18670	5690	100	SANDSTONE: (conglomeratic), quartz, loose, unconsolidated, predominantly colourless, transparent to translucent, occasionally pale grey, pinkish grey, translucent to opaque, traces reddish brown to reddish purple staining, very fine to coarse, locally very coarse, rarely granular, subangular, occasionally subround, with abundant angular fractured grains, very poorly sorted, good trace soft red brown argillaceous matrix, abundant varicoloured lithic grains and fragments.
18680	5693	100	SANDSTONE: (conglomeratic) red brown, to moderate brown, firm crumbly break, composed from very fine to fine, quartz grains, colourless, clear to translucent, sub angular, equant, moderately sorted, in abundant red brown argillaceous matrix, occasional calcareous matrix and rare dark green mineralistion. Also Common loose, colourless pale pink pale green coarse to very coarse, angular broken quartz grains, with occasional lithic clasts. LIMESTONE: white, firm to moderately hard, sub blocky to angular, microcrystalline.
18690	5696	100 Tr	SANDSTONE: (conglomeratic) red brown, to moderate brown, firm crumbly break, composed from very fine to fine , quartz grains, colourless, clear to translucent, sub angular, equant, moderately sorted, in abundant red brown argillaceous matrix, occasional calcareous matrix and rare dark green mineralistion. Also Common loose , colourless pale pink pale green coarse to very coarse, angular broken quartz grains, with occasional lithic clasts. LIMESTONE: white, firm to moderately hard, sub blocky to angular, microcrystalline.
18700	5699	100 Tr	SANDSTONE: red brown, firm crumbly break, composed from, colourless, translucent to opaque, quartz grains, fine to medium wilth rare loose corse grains, angular to very angular, equant, poor sorting, in an abubdant argillaceous matrix, grading to Claystone in part. Also common loose lithic fragments, coarse, angular abundant pink, medium grey, soft to firm. LIMESTONE: white, firm to moderately hard, sub blocky to angular, microcrystalline
18710	5703	100 Tr	SANDSTONE: red brown, firm crumbly break, composed from, colourless, translucent to opaque, quartz grains, fine to medium with occasional loose coarse to very coarse grains, angular to very angular, equant, poor sorting, in an abundant argillaceous matrix, grading to Claystone in part. Also common loose lithic fragments, coarse, angular abundant pink, medium grey, soft to firm. LIMESTONE: white, firm to moderately hard, sub blocky to angular, microcrystalline
18720	5706	100 R Tr	SANDSTONE: (conglomeratic), predominantly quartz, loose, unconsolidated, colourless, transparent to translucent, occasionally pale grey, translucent to opaque, frequently red brown to reddish purple stained, fine to medium, in part very fine, coarse, rarely very coarse to granular, subangular occasionally subround, with abundant very angular fractured grains, poorly sorted, abundant red brown soft amorphous claystone matrix. Occasional Sandstone red brown, firm, crumbly, very fine to fine, argillaceous matrix. Good trace varicoloured lithic grains and fragments. LIMESTONE: off white, firm to moderately hard, sub blocky to angular, microcrystalline
18730	5709	100	SANDSTONE: (conglomeratic), predominantly quartz, loose, unconsolidated, colourless, transparent to translucent, occasionally pale grey, translucent to opaque, frequently red brown to reddish purple stained, fine to medium, in part very fine, coarse, rarely very coarse to granular, subangular occasionally subround, with abundant very angular fractured grains, poorly sorted, abundant red brown soft amorphous claystone matrix. Occasional Sandstone red brown, firm, crumbly, very fine to fine, argillaceous matrix. Good trace varicoloured lithic grains and fragments.
18740	5712	100	SANDSTONE: (conglomeratic), predominantly quartz, loose, unconsolidated, colourless, transparent to translucent, occasionally pale grey, translucent to opaque, frequently red brown to reddish purple stained, fine to medium, in part very fine, coarse, rarely very coarse to granular, subangular occasionally subround, with abundant very angular fractured grains, poorly sorted, abundant red brown soft amorphous claystone matrix. Occasional Sandstone red brown, firm, crumbly, very fine to fine, argillaceous matrix. Good trace varicoloured lithic grains and fragments.
18750	5715	100	SANDSTONE: (conglomeratic), predominantly quartz, loose, unconsolidated, colourless, transparent to translucent, occasionally pale grey, translucent to opaque, frequently red brown to reddish purple stained, very fine to medium, occasionally coarse, rarely very coarse to granular, subangular occasionally subround, with abundant very angular fractured grains, poorly sorted, abundant red brown soft amorphous claystone matrix. Occasional Sandstone red brown, firm, crumbly, very fine to fine, argillaceous matrix. Good trace varicoloured lithic grains and fragments.
18760	5718	100 R Tr	SANDSTONE: (conglomeratic), predominantly quartz, loose, unconsolidated, colourless, transparent to translucent, occasionally pale grey, translucent to opaque, frequently red brown to reddish purple stained, very fine to medium, occasionally coarse, rarely very coarse, subangular occasionally subround, with abundant very angular fractured grains, poorly sorted, abundant red brown soft amorphous claystone matrix. Occasional Sandstone red brown, firm, crumbly, very fine to fine, argillaceous matrix. Good trace varicoloured lithic grains and fragments. LIMESTONE: off white, firm to moderately hard, sub blocky to angular, microcrystalline

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
18770	5721	100 Tr	SANDSTONE: (conglomeratic) composed from loose quartz grains, translucent to opaque, medium to very corse, angular to very angular broken grains, generally equant occasionally elongated, poorly sorted. abundant red brown argillaceous matrix firm, crumbly break, with very fine to fine angular quartz grains, silty in part, with occasional white calcareous inclusions in argillaceous matrix. Common varicoloured lithic fragments. LIMESTONE: off white, firm to moderately hard, sub blocky to angular, microcrystalline
18780	5724	100 Tr	SANDSTONE: (conglomeratic) composed from loose quartz grains, translucent to opaque, medium to very corse, angular to very angular broken grains, generally equant occasionally elongated, poorly sorted. abundant red brown argillaceous matrix firm, crumbly break, with very fine to fine angular quartz grains, silty in part, with occasional white calcareous inclusions in argillaceous matrix. Common varicoloured lithic fragments. LIMESTONE: off white, firm to moderately hard, sub blocky to angular, microcrystalline
18790	5727	100 Tr	SANDSTONE: (conglomeratic) composed from loose quartz grains, translucent to opaque, medium to very corse, angular to very angular broken grains, generally equant occasionally elongated, poorly sorted. abundant red brown argillaceous matrix firm, crumbly break, with very fine to fine angular quartz grains, silty in part, with occasional white calcareous inclusions in argillaceous matrix. Common varicoloured lithic fragments. LIMESTONE: off white, firm to moderately hard, sub blocky to angular, microcrystalline
18800	5730	100	SANDSTONE: (conglomeratic) composed from loose quartz grains, translucent to opaque, predominantely fine to medium, subangular to subround, occasionally coarse to very coarse, angular to very angular broken grains, generally equant occasionally elongated, poorly sorted. abundant red brown argillaceous matrix firm, crumbly break, with very fine to fine angular quartz grains, silty in part, with occasional white calcareous inclusions in argillaceous matrix. Common varicoloured lithic fragments.
18810	5733	100	SANDSTONE: (conglomeratic) composed from loose quartz grains, translucent to opaque, predominantely very fine to medium, subangular to subround, occasionally coarse to rarely very coarse, angular to very angular broken grains, generally equant occasionally elongated, poorly sorted. abundant red brown argillaceous matrix firm, crumbly break, with very fine to fine angular quartz grains, silty in part, with occasional white calcareous inclusions in argillaceous matrix. Common varicoloured lithic fragments.
18818	5735	100	SANDSTONE: (conglomeratic) composed from loose quartz grains, colourless, occasionally orange stained, translucent to opaque, predominantely very fine to medium, subangular to subround, occasionally round, rarely coarse to very coarse, angular to very angular broken grains, poorly sorted. abundant red brown argillaceous matrix firm, crumbly break, with very fine to fine sub angular quartz grains, silty in part, with occasional white calcareous inclusions in argillaceous matrix. Rare trace varicoloured lithic fragments.
18818	5736	100	SANDSTONE: varicoloured, moderate brown to red brown, soft to firm , crumbly, very fine to fine. Very silty and argillaceous, with abundant very fine –fine rare medium loose sand grains, clear to orange stained, sub rounde to rounded, grading in part to sandy argillaceous siltstone.
18820			Sample unrepresentative 100% Halite
18830	5739	100	SANDSTONE: varicoloured, moderate brown to red brown mottled grey white black,very fine to fine grained rare coarse to very coarse, sub angular to rounded, very silty and argillaceous, soft to moderately firm, occasionally friable, slightly calcareous, trace lithic fragments, grades to silty Claystone.
18840	5742	100	SANDSTONE: varicoloured, moderate brown to red brown mottled grey white black,very fine to fine grained rare coarse to very coarse, sub angular to rounded, very silty and argillaceous, soft to moderately firm, occasionally friable, slightly calcareous, good trace lithic fragments, grades to silty Claystone.
18850	5745	100	SANDSTONE: moderate brown to red brown, occasionally mottled light to medium grey, rarely white, firm, friable, very fine to fine occasionally medium, colourless, frequently orange stained, subangular to subround, locally round, moderate to poorly sorted, slight to moderately calcareous, silty, argillaceous, grading in part to sandy Siltstone.
18860	5748	100	SANDSTONE: moderate brown to red brown, occasionally mottled light to medium grey, rarely white, firm, friable, very fine to fine occasionally medium, rarely coarse, colourless, frequently orange stained, subangular to subround, locally round, moderate to poorly sorted, slight to moderately calcareous and dolomitic, silty, argillaceous, grading in part to sandy Siltstone, good trace lithic grains and fragments.
18870	5751	100	SANDSTONE: moderate brown to red brown, firm, friable, very fine occasionally fine, rarely medium, subangular ro subround, rarely round, slightly calcareous, silty, argillaceous, frequently grading to rock flour with traces of sand, very rare trace lithic grains and fragments.
18880	5754	100	SANDSTONE: moderate brown to red brown, mottled grey, white, black, very fine to medium grained, rare coarse to very coarse, angular to rounded, abundant silty/argillaceous matrix, moderately firm to soft, occasionally friable, moderately calcareous, with common calcareous nodules. Good trace of lithic fragments, often weathered.
18890	5757	100	SANDSTONE: moderate brown to red brown, mottled grey, white, black, very fine to medium grained, rare coarse to very coarse, angular to rounded, abundant silty/argillaceous matrix, moderately firm to soft, occasionally friable, moderately calcareous, with common calcareous nodules. Good trace of lithic fragments, often weathered.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
18900	5760	100	SANDSTONE: moderate brown to red brown, very fine to fine grained, rare medium grained, angular to rounded, abundant argillaceous matrix, firm to soft, to slight to moderately calcareous and dolomitic, rare trace lithic fragments, often very weathered. Very argillaceous, grading to sandy claystone.
18910	5763	100	SANDSTONE: moderate brown to red brown, very fine to fine grained, rare medium grained, angular to rounded, abundant argillaceous matrix, firm to soft, slight to moderately calcareous and dolomitic, rare trace lithic fragments.
18920	5766	100	SANDSTONE: moderate brown to red brown, very fine to fine grained, rare medium grained, angular to rounded, abundant argillaceous matrix, firm to soft, slight to moderately calcareous and dolomitic, rare trace lithic fragments.
		Gd Tr	CLAYSTONE: moderate brown to red brown, soft to firm, amorphous, occasionally blocky, silty, slightly calcareous.
18930	5770	80	SANDSTONE: moderate brown to red brown, very fine to fine grained, rare medium grained, angular to rounded, abundant argillaceous matrix, firm to soft, slight to moderately calcareous and dolomitic, rare trace lithic fragments.
		20	CLAYSTONE: moderate brown to red brown, soft to firm, amorphous, occasionally blocky, silty, slightly calcareous.
18940	5773	60	SANDSTONE: moderate brown to red brown, very fine to fine grained, rare medium to coarse grained, angular to rounded, firm to soft, slightly calcareous, silty, very abundant argillaceous matrix, common lithic fragments of weathered igneous rock, plus trace unweathered vitreous tuff. Grades to sandy claystone.
		40	CLAYSTONE: moderate brown to red brown, amorphous, soft, silty to sandy.
18950	5776	60	SANDSTONE: moderate brown to red brown to grey brown to grey, very fine to medium grained, rare coarse to very coarse, angular to sub rounded, loose quartz grains , common lithic fragments of weathered igneous rock.
		40	CLAYSTONE: dark yellow brown to grey brown, amorphous, firm, silty, moderately calcareous.
18960	5779	60	CLAYSTONE: grey brown to dark yellow brown, mottled white, blocky, amorphous, firm to friable occasionally soft, moderately calcareous.
		40	SANDSTONE: grey brown to red brown to grey, very fine to medium grained, friable to hard, calcareous, mostly rock flour. Trace lithic fragments.
18970	5782	70	CLAYSTONE: pale yellow brown to dark yellow brown, grey brown, rarely mottled red brown, soft to firm, amorphous, occasionally firm to moderately, blocky, silty in part, grading to Siltstone, moderately calcareous.
		30	SILTSTONE: grey brown, yellow brown, firm, friable, with occasional traces very fine sand.
18980	5785	70	CLAYSTONE: pale yellow brown to dark yellow brown, grey brown, soft to firm, amorphous, occasionally firm to moderately, blocky, silty in part, grading to Siltstone, moderately calcareous.
		30	SILTSTONE: grey brown, yellow brown, firm, friable, with occasional traces very fine sand.
18990	5788	80	CLAYSTONE: pale yellow brown to dark yellow brown, grey brown, rarely mottled red brown, soft to firm, amorphous, occasionally firm to moderately, blocky, silty in part, grading to Siltstone, moderately calcareous.
		20	SILTSTONE: grey brown, yellow brown, firm, friable, with occasional traces very fine sand.
19000	5791	90	CLAYSTONE: pale yellow brown to dark yellow brown, grey brown, rarely mottled light to medium grey, soft to firm, amorphous, occasionally firm to moderately, blocky, silty in part, grading to Siltstone, moderately calcareous.
		10	SILTSTONE: grey brown, yellow brown, firm, friable, with occasional traces very fine sand.
19010	5794	80	CLAYSTONE: pale yellow brown to dark yellow brown, grey brown, occasionally mottled light to medium grey, soft to firm, amorphous, occasionally firm to moderately, blocky, silty in part, grading to Siltstone, moderately calcareous.
		20	SILTSTONE: grey brown, yellow brown, firm, friable, grading to silty Claystone.
19020	5797	90	CLAYSTONE: grey brown to light grey to dark yellow brown, occasionally mottled red brown, friable to firm, amorphous to blocky, occasionally silty, calcareous to moderately calcareous.
		10	SILTSTONE: grey brown, yellow brown, firm, friable, grading to silty Claystone.
		G Tr	Lithic Fragments, part weathered to unweathered volcanics, dark green (with metallic lustre) red brown, mottled red brown, purple grey
19030	5800	100	CLAYSTONE: grey brown, dark yellow brown, red brown, mottled, blocky, firm to friable, occasionally soft, moderately to very calcareous.
		G Tr	Lithic Fragments, part weathered to unweathered volcanics, dark green (with metallic lustre) red brown, mottled red brown, purple grey.
19040	5803	100	CLAYSTONE: red brown to moderate brown, amorphous to blocky, soft to firm moderately to very calcareous
		G Tr	Lithic Fragments, part weathered to unweathered volcanics, dark green (with metallic lustre) red brown, mottled red brown, purple grey.
19050	5806	100	CLAYSTONE: grey brown, pale to occasionally dark yellow brown, red brown to moderate brown, soft to firm, moderately calcareous, non dolomitic.
19060	5809	100	CLAYSTONE: moderate brown to dark yellow brown, grey brown, rarely red brown, soft to firm, amorphous, locally firm to moderately hard, blocky, moderately calcareous, slightly dolomitic.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
19070	5812	80 20	CLAYSTONE: dark yellow brown to grey brown, rarely red brown, occasionally light to medium grey, soft to firm, amorphous, occasionally firm to moderately hard, blocky, in part silty, locally grading to Siltstone, moderately calcareous, slightly dolomitic. SILTSTONE: dark yellow brown to grey brown, occasionally light to medium grey, firm, crumbly, calcareous, dolomitic, grading to silty Claystone.
19080	5815	90 10	CLAYSTONE: dark yellow brown to grey brown, rarely red brown, occasionally light to medium grey, soft to firm, amorphous, occasionally firm to moderately hard, blocky, in part silty, locally grading to Siltstone, moderately calcareous, slightly dolomitic. Slightly tuffaceous in part SILTSTONE: dark yellow brown to grey brown, occasionally light to medium grey, firm, crumbly, calcareous, dolomitic, grading to silty Claystone.
19090	5818	100 R Tr	CLAYSTONE: grey brown, dark yellow brown, red brown, mottled, blocky, firm to friable, rarely silty, moderately to very calcareous. Slightly tuffaceous in part Lithic Fragments, part weathered to unweathered volcanics, dark green (with metallic lustre), mottled red brown.
19096 (BU)	5821	100 R Tr	CLAYSTONE: grey brown, dark yellow brown, red brown, mottled, blocky, firm to friable, rarely silty, moderately to very calcareous. Slightly tuffaceous in part Lithic Fragments, part weathered to unweathered volcanics, dark green (with metallic lustre), mottled red brown.
19110	5825	100	CLAYSTONE (Tuffaceous) : varicoloured, dark grey , dark yellow brown, red brown, grey green mottled, blocky, firm to friable, moderately calcareous.
19120	5828	100	CLAYSTONE (Tuffaceous): varicoloured, dark grey , dark yellow brown, red brown, grey green mottled, blocky, firm to friable, moderately calcareous.
19130	5831	100	CLAYSTONE: (Tuffaceous) varicoloured, dark grey , dark yellow brown, red brown, grey green mottled, blocky, firm to friable, moderately calcareous.
19140	5834	100 G Tr	TUFF: varicoloured, grey blue, red brown, green grey, grey brown, mottled, blocky, firm to friable, moderately calcareous. Weathered volcanics, grey blue, grey brown, dark green, red brown.
19150	5837	100 G Tr	TUFF : Varicoloured, predominantly mottled dark blue grey, with occasional vitreous/metallic lustre, with red brown patches and laminations, occasional moderate brown, occasional white, Firm to hard, blocky occasional layered concentric appearance, tuffaceous in part with common white calcic inclusions; hard, sub blocky microcrystalline. Weathered volcanics, grey blue, grey brown, dark green, red brown.
19160	5840	100 G Tr	TUFF: mottled blue grey, occasionally dark green grey, occasionally light blue grey, firm to moderately hard, sub blocky, with common calcareous inclusions, white, hard, blocky microcrystalline. Lithic Fragments: (volcanic) medium red brown, moderate orange pink, rare dark red brown, firm, sub blocky, commonly seen as laminations in the tuff.
19170	5843	80 20	TUFF: Mottled blue grey, occasionally dark green grey patches or laminations, common pale blue grey, to very pale blue grey laminations, firm to moderately hard, sub blocky, with common white calcic inclusions, moderately hard, sub blocky, microcrystalline. CLAYSTONE: dusky red, moderately hard, blocky to angular break, uniform non calcic.
19180	5846	80 20	CLAYSTONE: red brown, occasionally laminated medium dark grey, rare slightly mottled appearance, firm sub blocky, silty in part, calcareous. TUFF: mottled blue grey, occasionally dark greenish gey, common calcareous inclusions, firm sub blocky, slightly crumbly break,
19190	5849	80 20	TUFF: (weathered) varicoloured, red brown, light grey, light blue grey, dark green, mottled, blocky, firm to friable, occasionally hard. CLAYSTONE: red brown blocky to sub blocky, firm to friable, non to slightly calcareous.
19200	5852	100	TUFF: (weathered in part) varicoloured, red brown, light grey, light blue grey, dark green, mottled, blocky, firm to friable, occasionally hard.
19210	5855	100	TUFF: (weathered in part) varicoloured, red brown, light grey, light blue grey, dark green, mottled, blocky, firm to friable, occasionally hard.
19220	5858	100	TUFF: (weathered in part) varicoloured, red brown, light grey, light blue grey, black, mottled, blocky, firm to hard, occasionally friable.
19230	5861	100	TUFF: (weathered in part) light grey, light blue grey, black, red brown, mottled speckly appearance, blocky, firm to hard, occasionally friable
19240	5864	100	TUFF: (weathered in part) light grey, light blue grey, black, red brown, mottled speckly appearance, blocky, firm to hard, occasionally friable
19250	5867	90 10	TUFF: dark blue grey to dark greenish grey, mottled / laminated appearance, light grey to light blue grey, with pale grey laminations, moderately hard, sub blocky, numerous dark, glassy inclusiuons. CLAYSTONE / Weathered TUFF: red brown, occasional mottled appearance, firm to hard, sub blocky, non calcic.
19260	5870	100 Tr	TUFF: dark blue grey to dark greenish grey, mottled / laminated appearance, light grey to light blue grey, with pale grey laminations, moderately hard, sub blocky, numerous dark, glassy inclusiuons, occasional pale green micaceous mineral with vitreous / satin lustre. CLAYSTONE / Weathered TUFF: red brown, occasional mottled appearance, firm to hard, sub blocky, non calcic.

WELL: 9/4-5 (KOGGE)

Depth (ft)	Depth (m)	%	LITHOLOGY DESCRIPTION
19270	5873	100 Tr	TUFF: dark blue grey to dark greenish grey, mottled / laminated appearance, light grey to light blue grey, with pale grey laminations, moderately hard, sub blocky, numerous dark, glassy inclusiuons, occasional pale green micaceous mineral with vitreous / satin lustre. CLAYSTONE / Weathered TUFF: red brown, occasional mottled appearance, firm to hard, sub blocky, non calcic.
19280	5876	100	TUFF: varicoloured, red brown, dark grey blue, common mottled appearance, blue grey to dark greenish grey with white to very pale grey laminations, occasionally pale blue grey, firm to moderately hard, sub blocky top crumbly break, Occasional white calcareous inclusions.
19290	5879	100	TUFF: varicoloured, red brown, dark grey blue, common mottled appearance, blue grey to dark greenish grey with white to very pale grey laminations, occasionally pale blue grey, firm to moderately hard, sub blocky top crumbly break, Occasional white calcareous inclusions.
19295	5881	100	TUFF: varicoloured, red brown, dark grey blue, common mottled appearance, blue grey to dark greenish grey with white to very pale grey laminations, occasionally pale blue grey, firm to moderately hard, sub blocky top crumbly break, Occasional white calcareous inclusions.

Appendix II

Core Descriptions and Core Photos

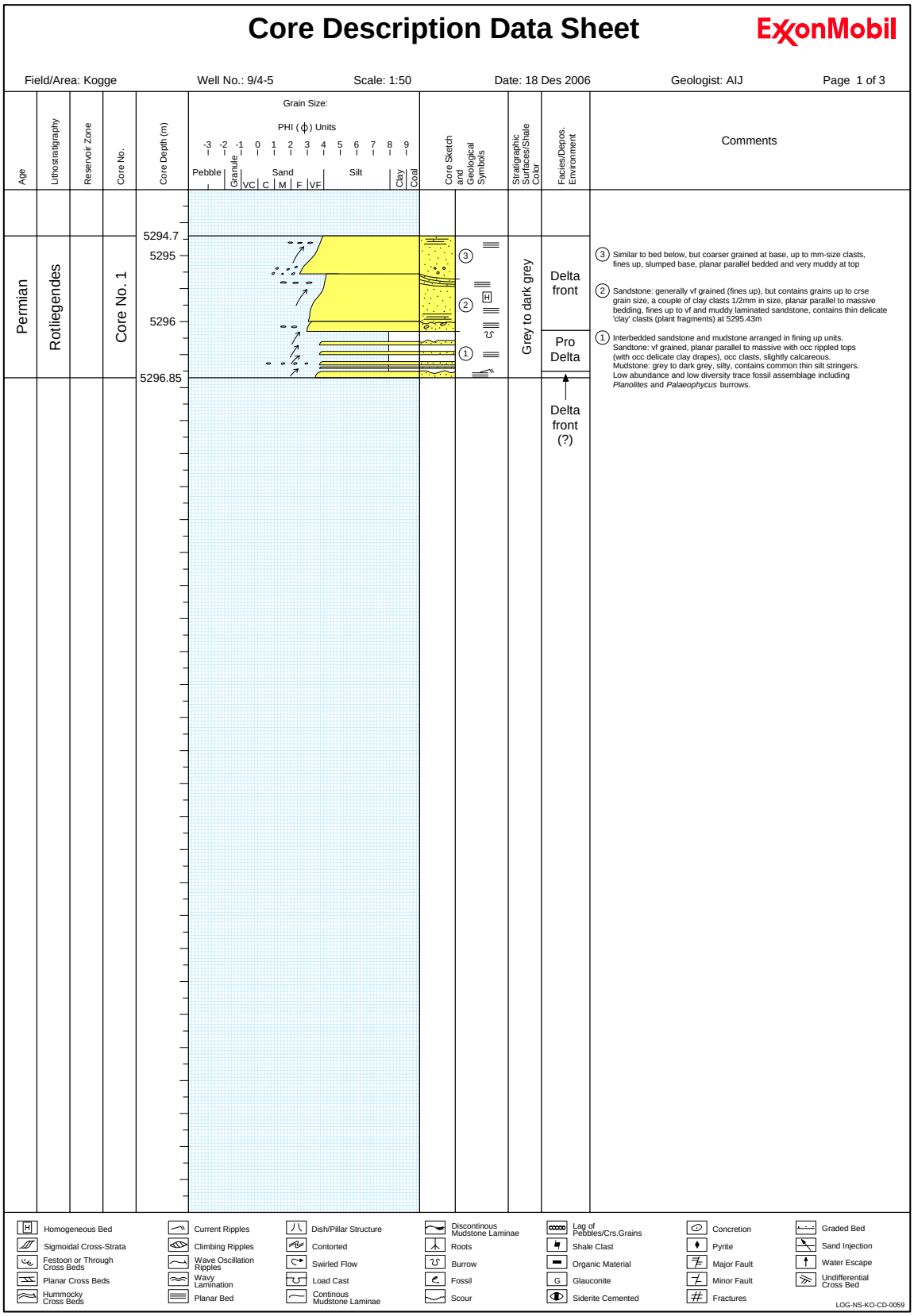


Figure AII.1 Core description for Core no 1, 5294.7-5296.85m

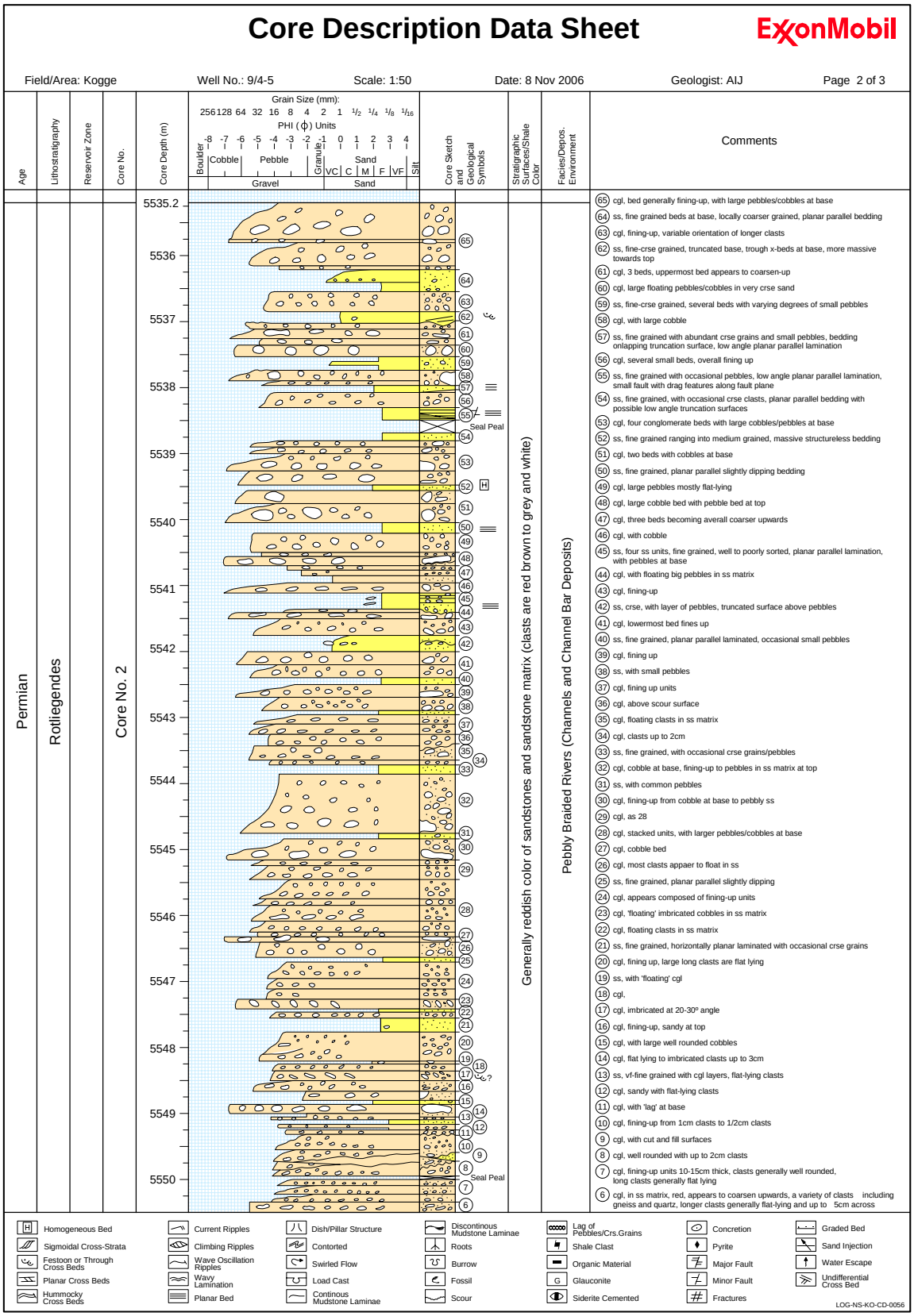


Figure AII.2 Core description for Core no 2, 5535.2-5550.5m

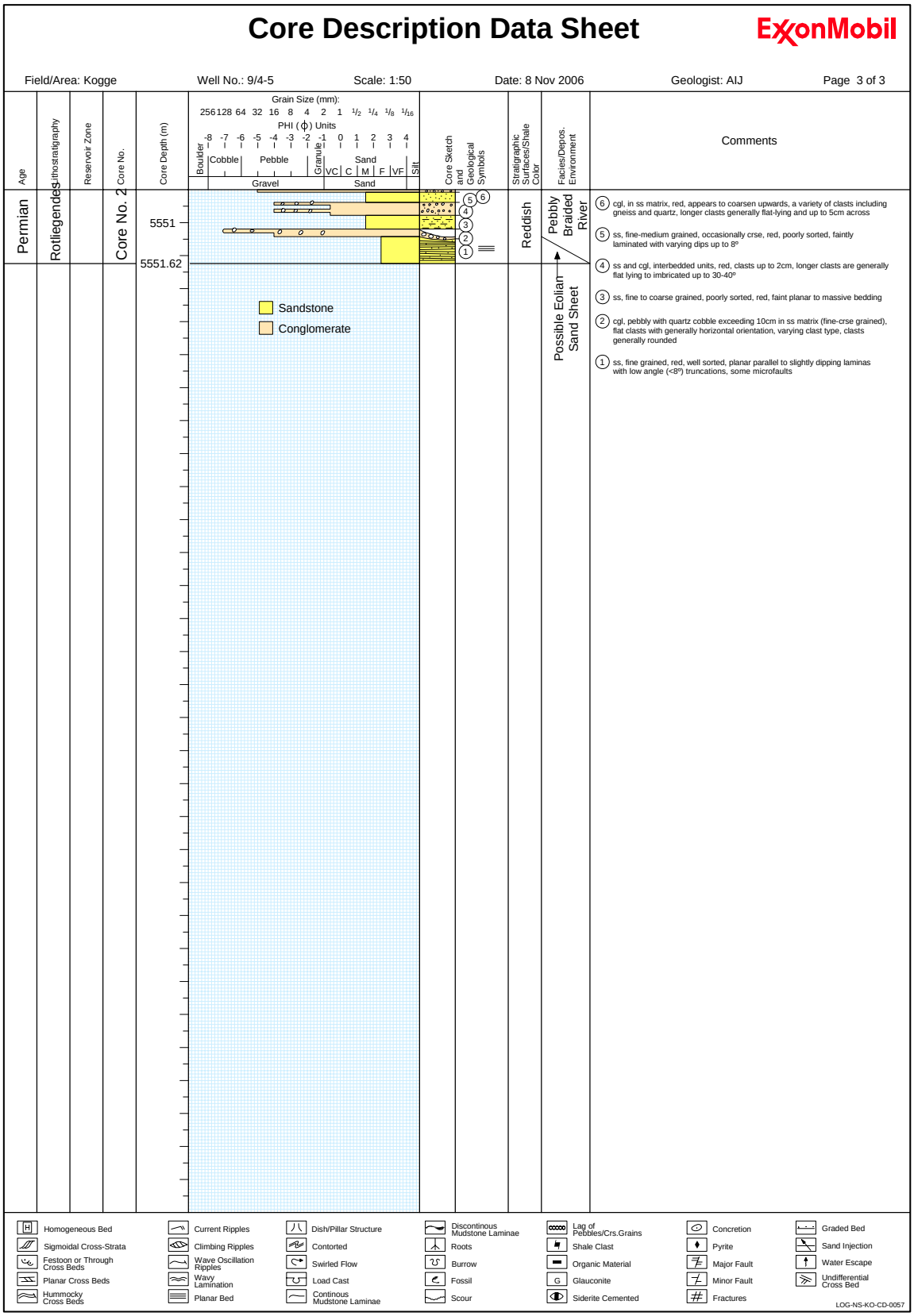


Figure AII.3 Core description for Core no 2, 5550.5-5551.6m

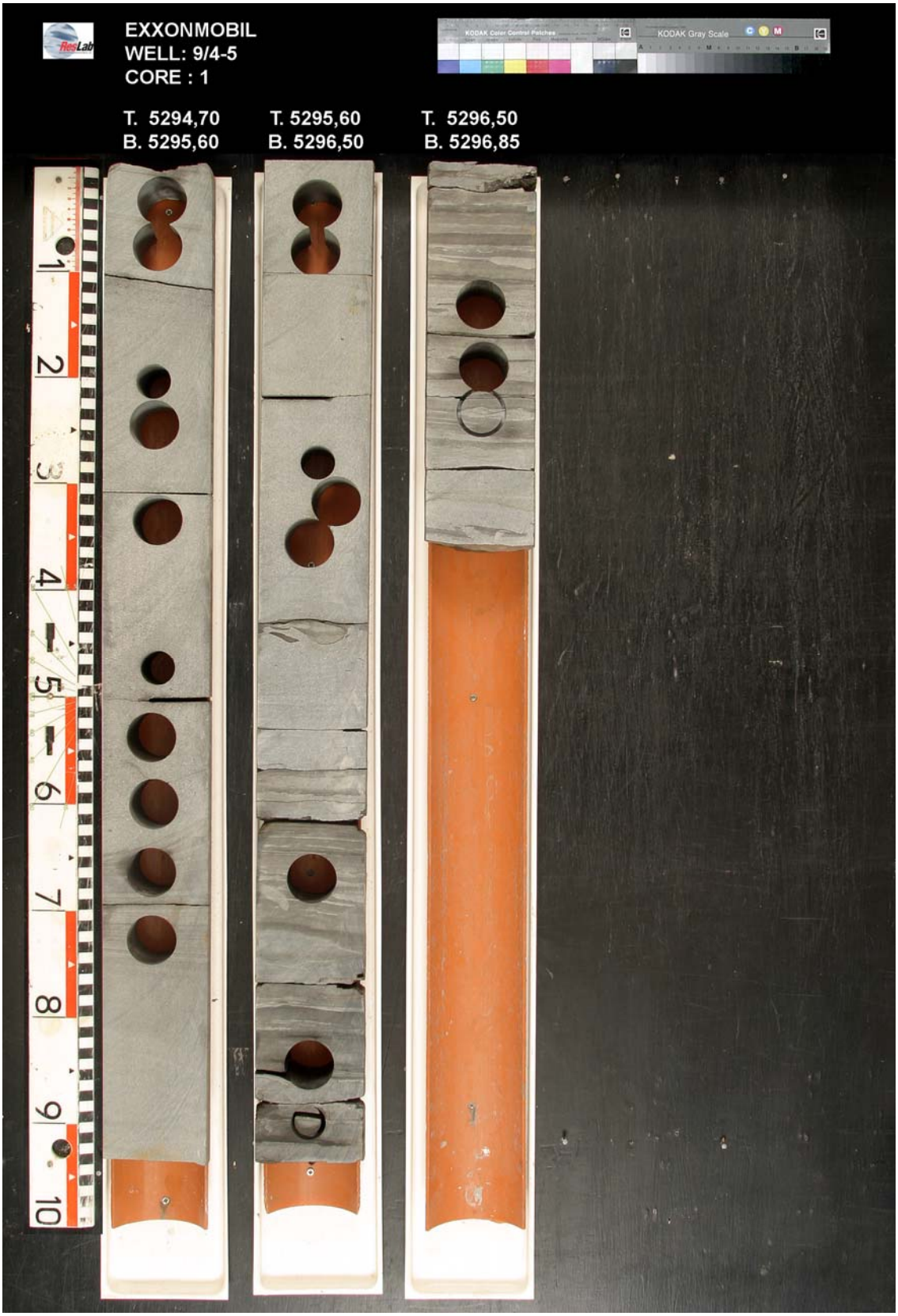


Figure AII.4 Core no 1, 5294.7-5296.85m under white light after plugging of core

Figure AII.5 Core no 2, 5535.2-5540.0m under white light after plugging of core

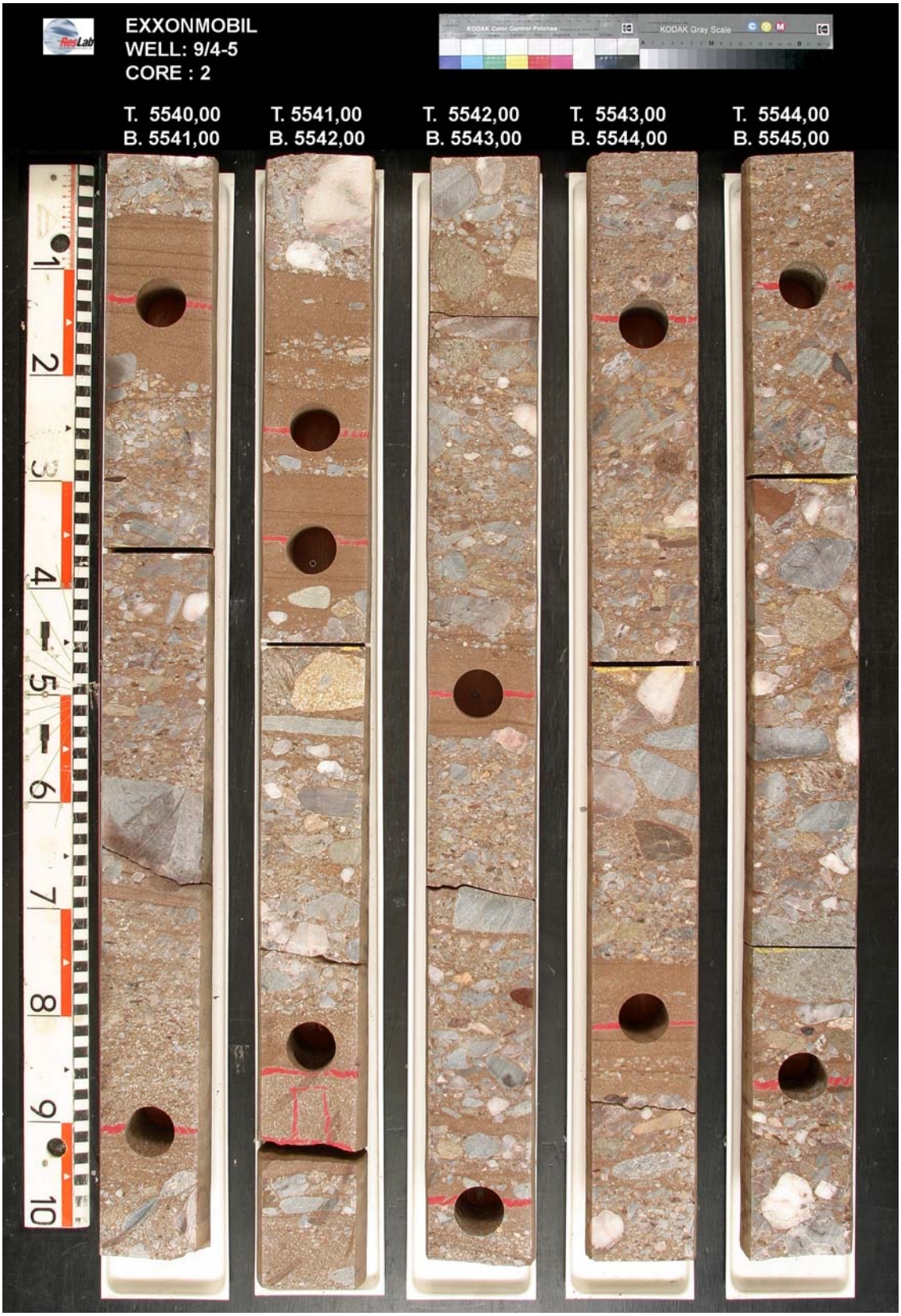


Figure AII.6 Core no 2, 5540.0-5545.0m under white light after plugging of core

Figure AII.7 Core no 2, 5545.0-5550.0m under white light after plugging of core

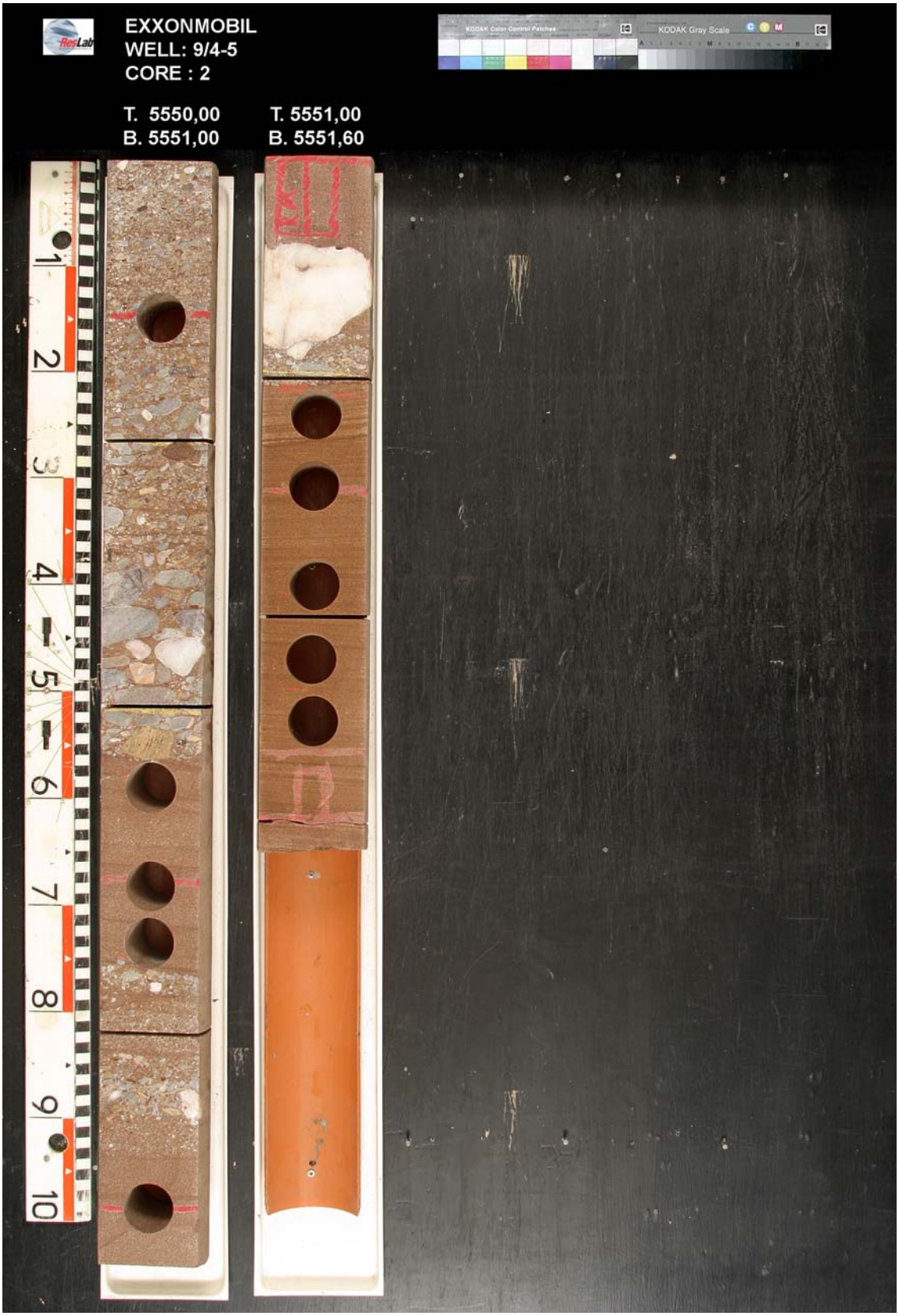


Figure AII.8 Core no 2, 5550.0-5551.6m under white light after plugging of core

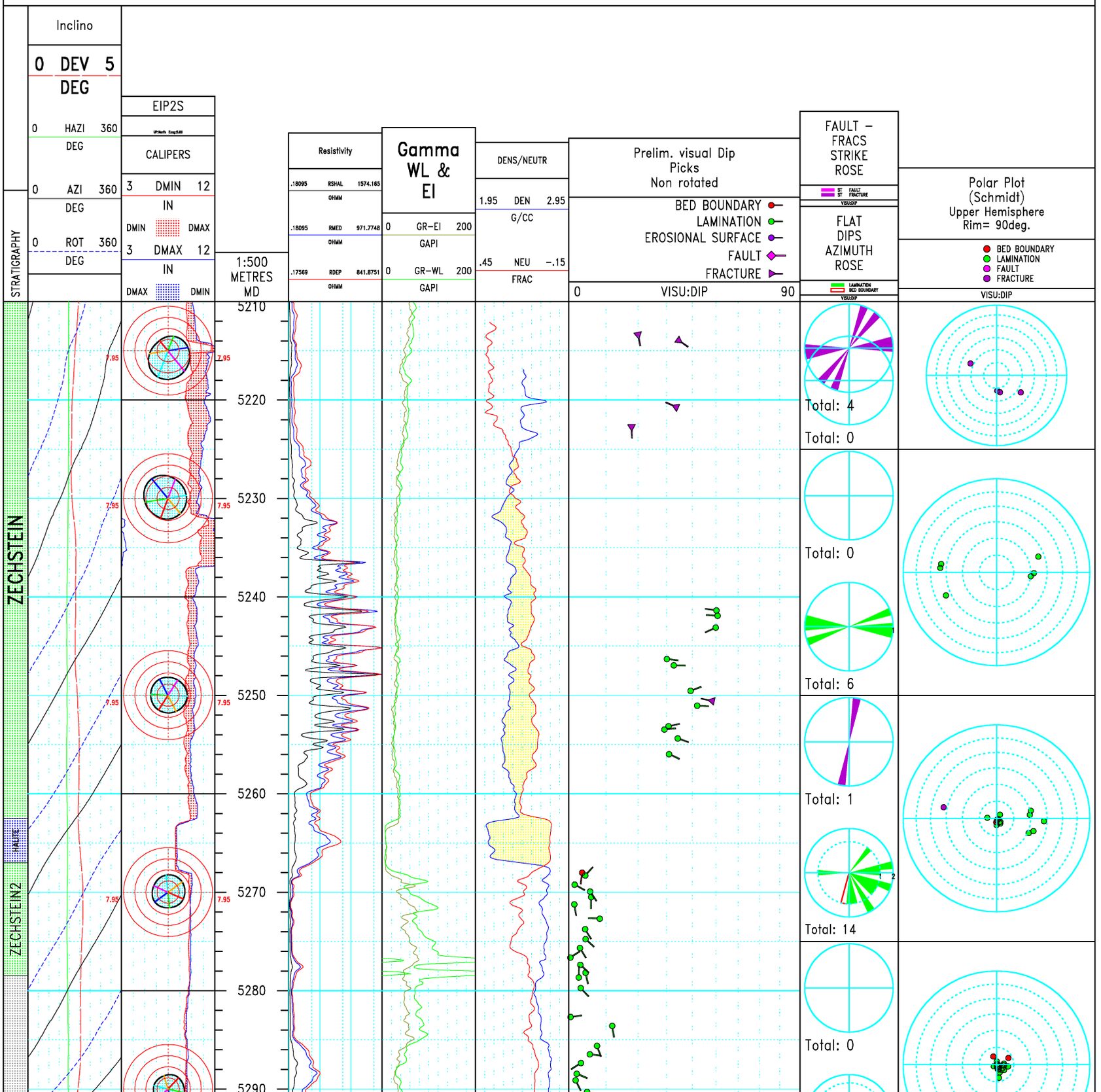
Appendix III

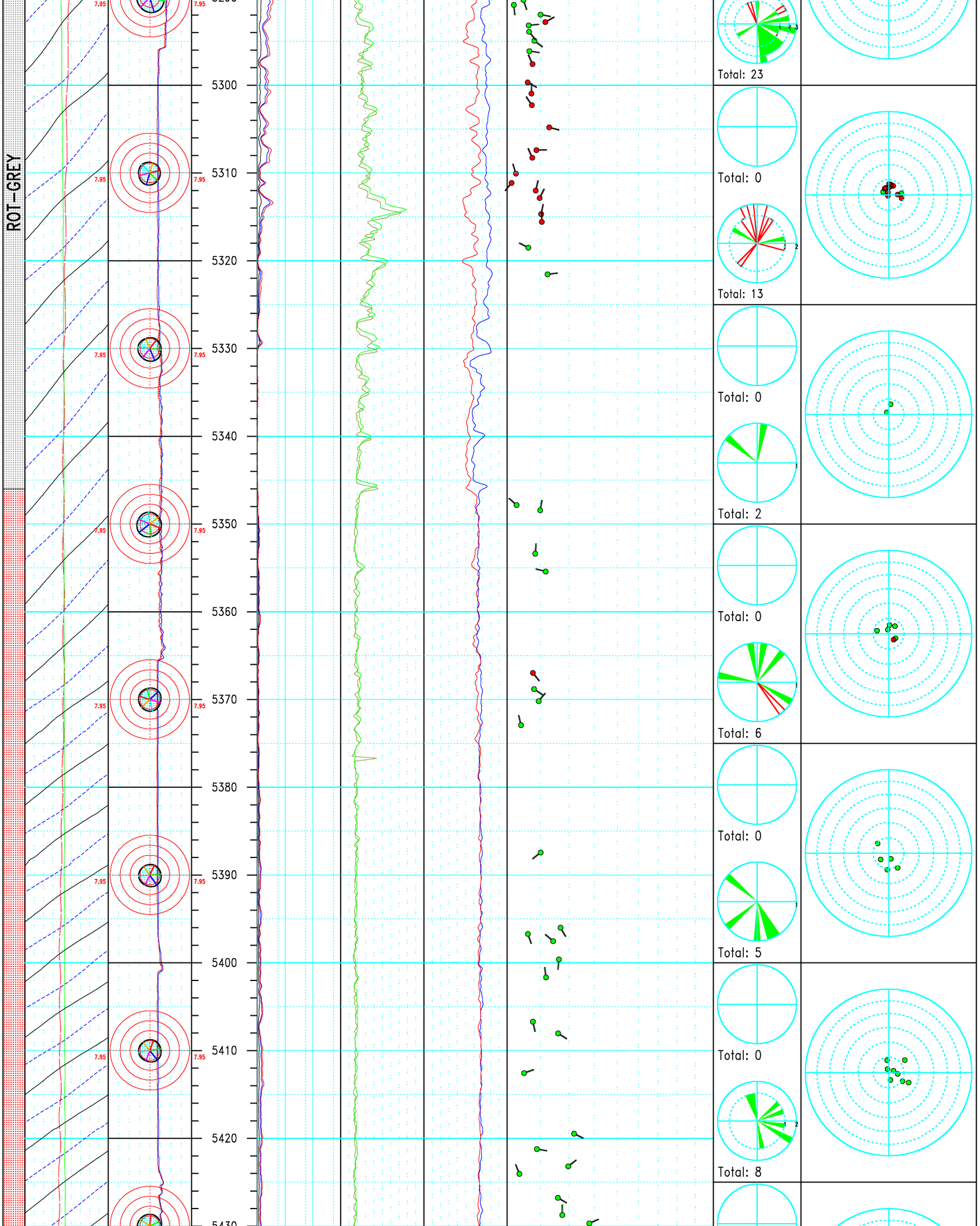
Rotliegendes Structural Dip Analysis

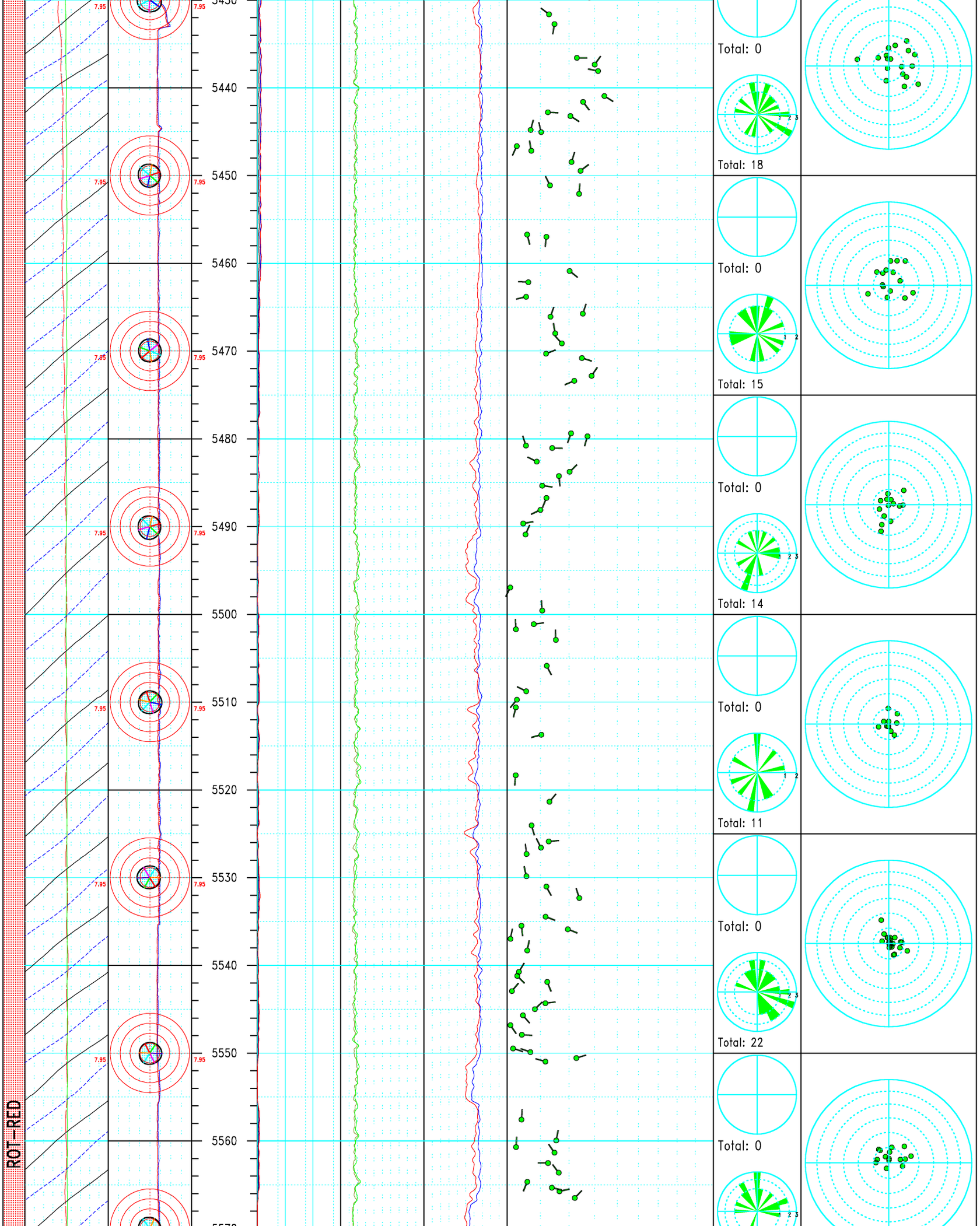
ERIKSFIORD AS -- ESSO NORGE AS

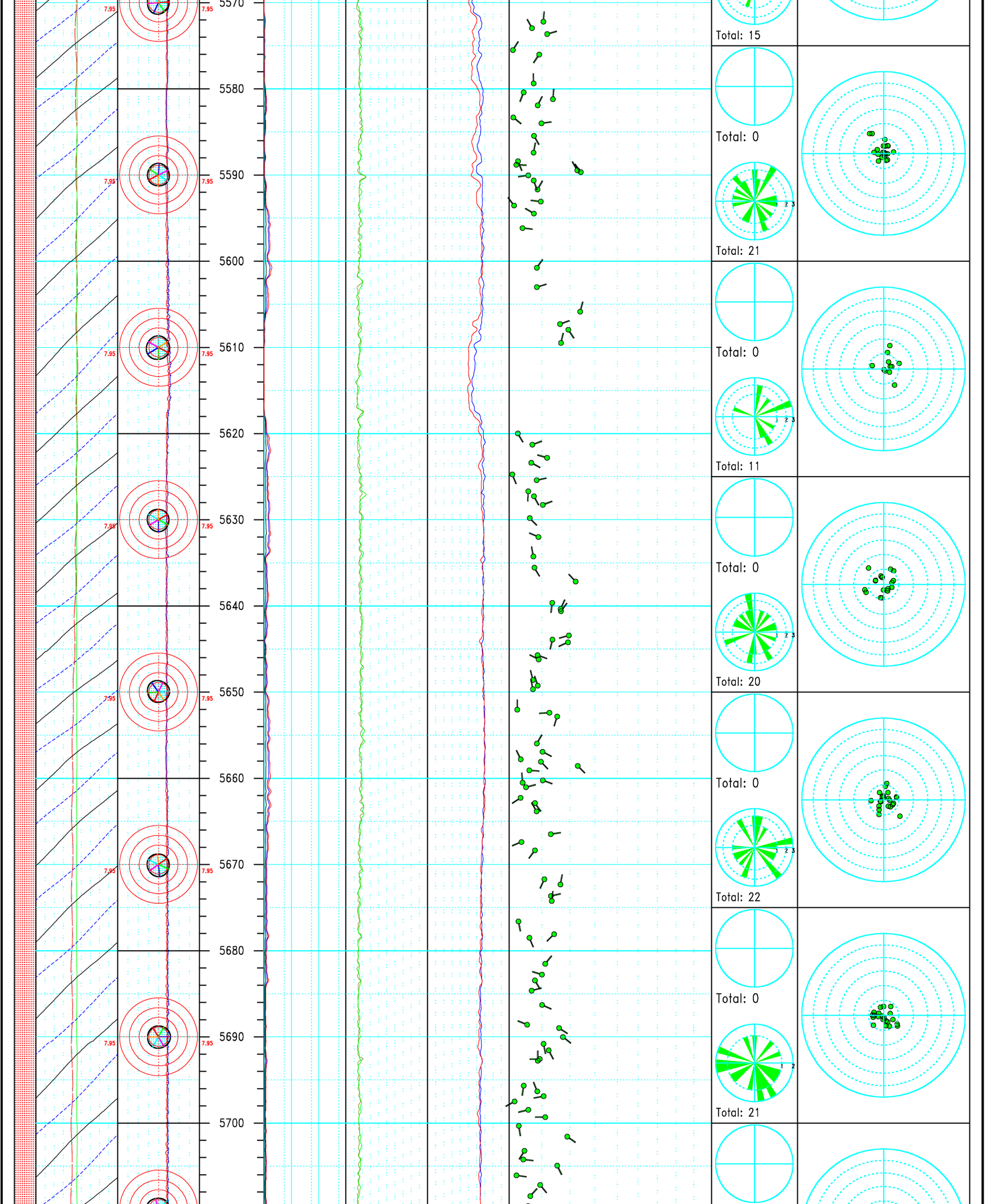
Well: 9/4-5 Kogge Prospect
EI image log
LQC-plot, scale 1:500
DEPTH RANGE: 5210.00-5875.00 METRES

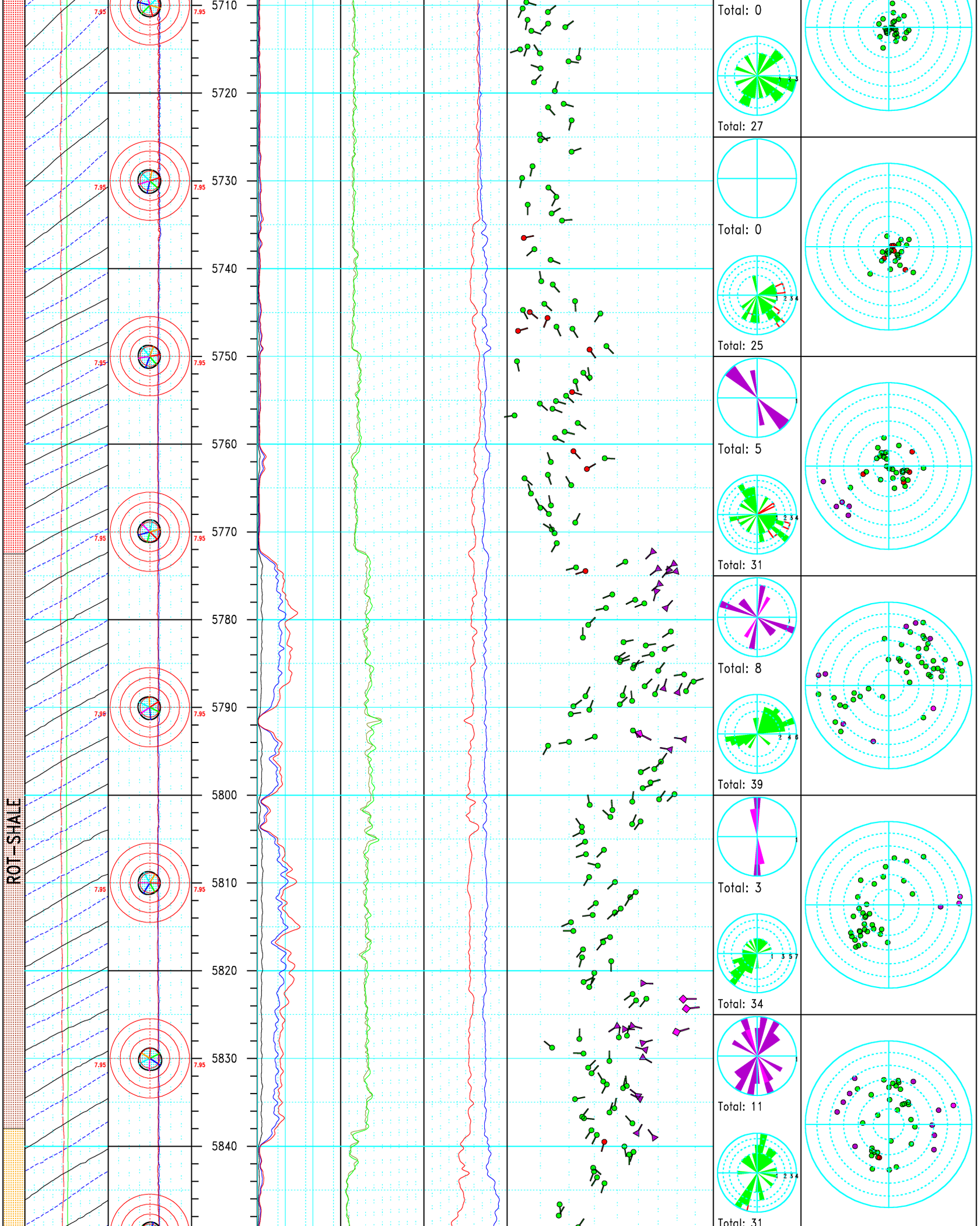
Enclosure 1 17. 01. 2007

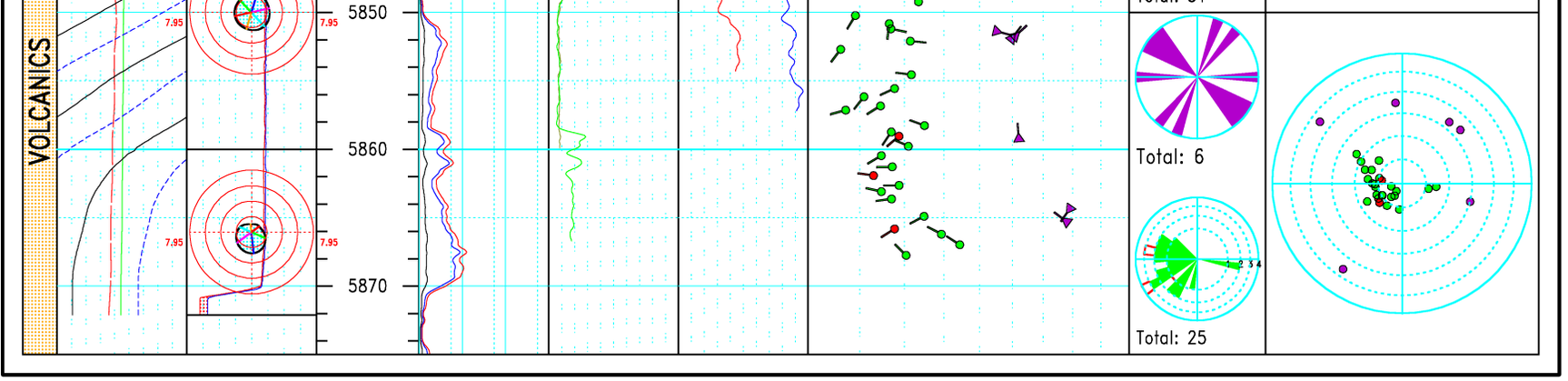



ROT-GREY
7.95
5300
5310
5320
5330
5340
5350
5360
5370
5380
5390
5400
5410
5420
5430
Total: 23
Total: 0
Total: 13
Total: 0
Total: 2
Total: 0
Total: 6
Total: 0
Total: 5
Total: 0
Total: 8


ROT-RED
7.95
5440
5450
5460
5470
5480
5490
5500
5510
5520
5530
5540
5550
5560
Total: 0
Total: 18
Total: 0
Total: 15
Total: 0
Total: 14
Total: 0
Total: 11
Total: 0
Total: 22
Total: 0


5570
5580
5590
5600
5610
5620
5630
5640
5650
5660
5670
5680
5690
5700
7.95
Total: 15
Total: 0
Total: 21
Total: 0
Total: 11
Total: 0
Total: 20
Total: 0
Total: 22
Total: 0
Total: 21


ROT-SHALE
5710
5720
5730
5740
5750
5760
5770
5780
5790
5800
5810
5820
5830
5840
7.95
Total: 0
Total: 27
Total: 0
Total: 25
Total: 5
Total: 31
Total: 8
Total: 39
Total: 3
Total: 34
Total: 11
Total: 31


VOLCANICS
7.95
7.95
7.95
7.95
5850
5860
5870
Total: 6
Total: 25

Appendix IV

RCI Plots from Saphir

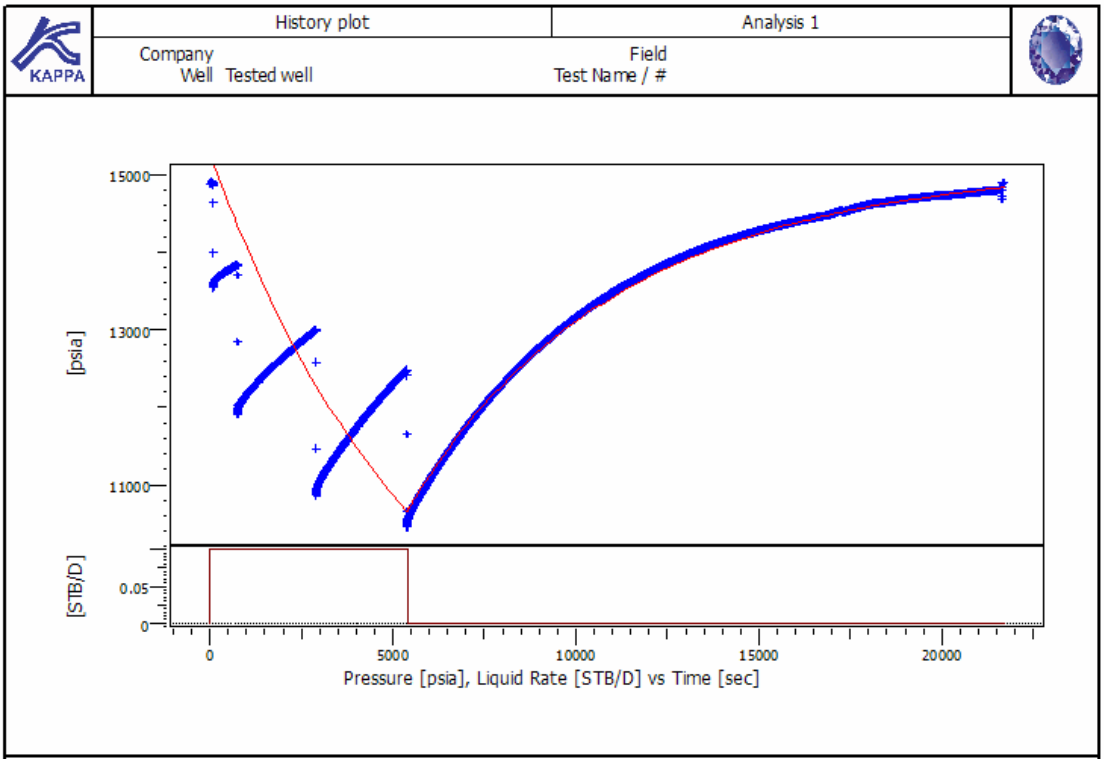


Figure AIV.1 History plot for extended RCI Single Probe test at 5616m

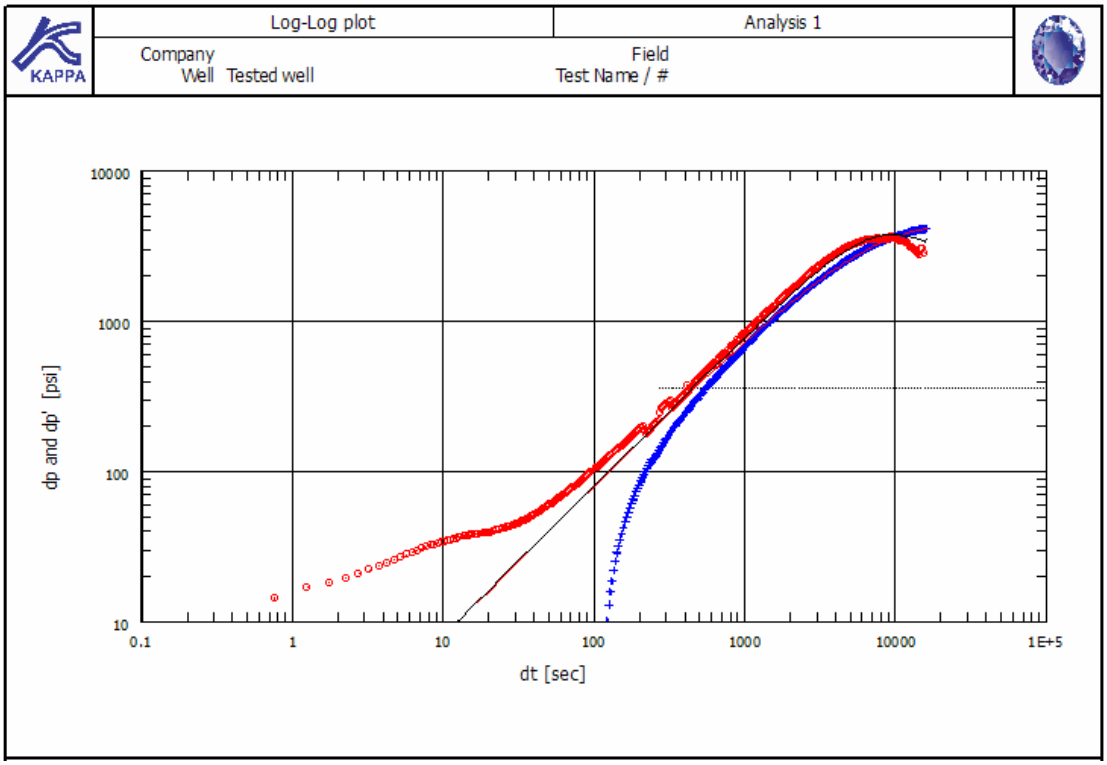


Figure AIV.2 Log-log plot for extended RCI Single Probe test at 5616m

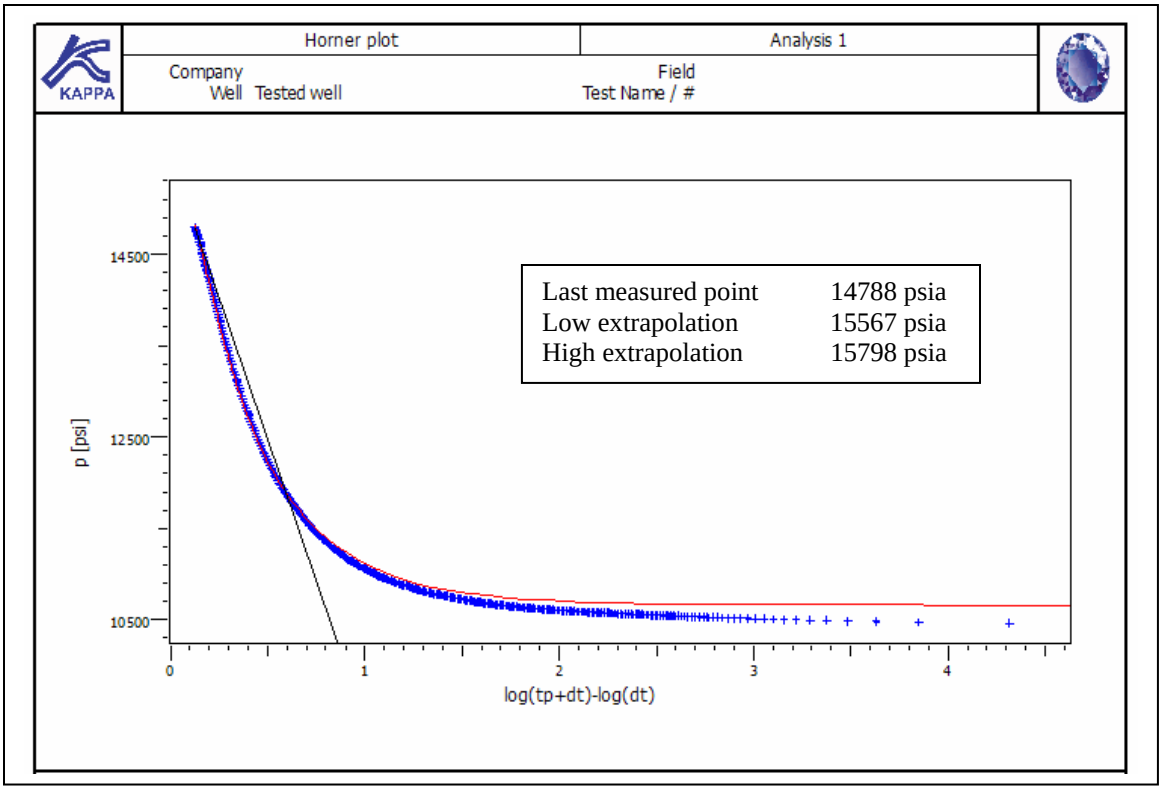


Figure AIV.3 Horner plot for extended RCI Single Probe test at 5616m

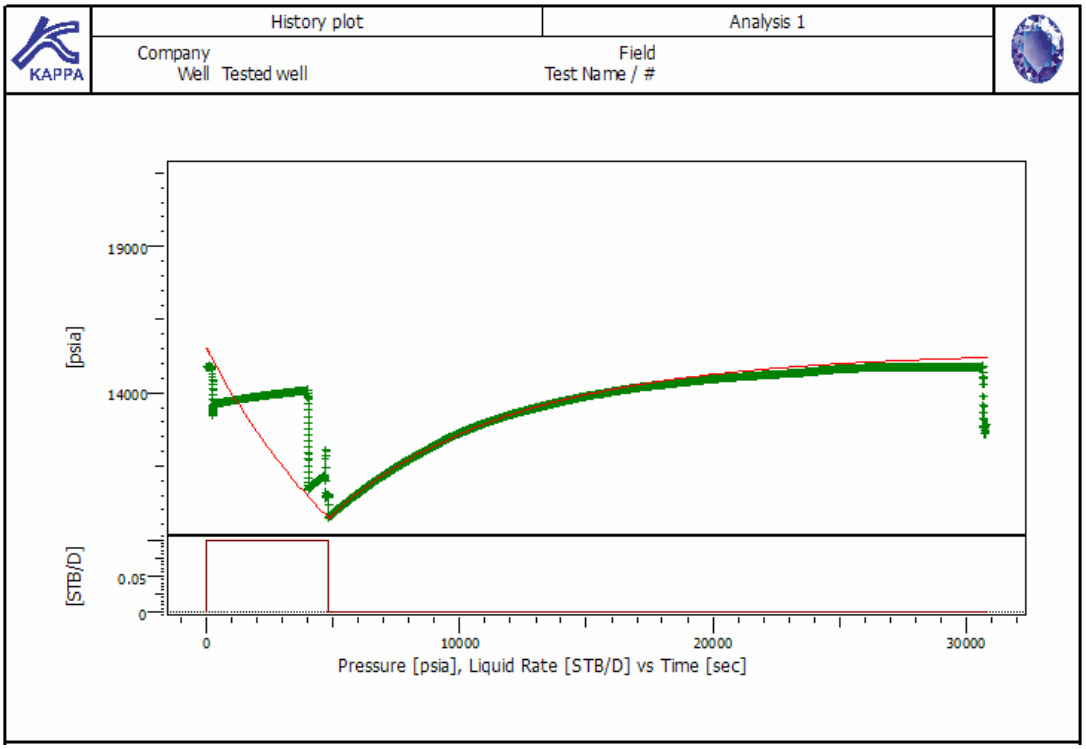


Figure AIV.4 History plot for extended RCI Single Probe test at 5611m

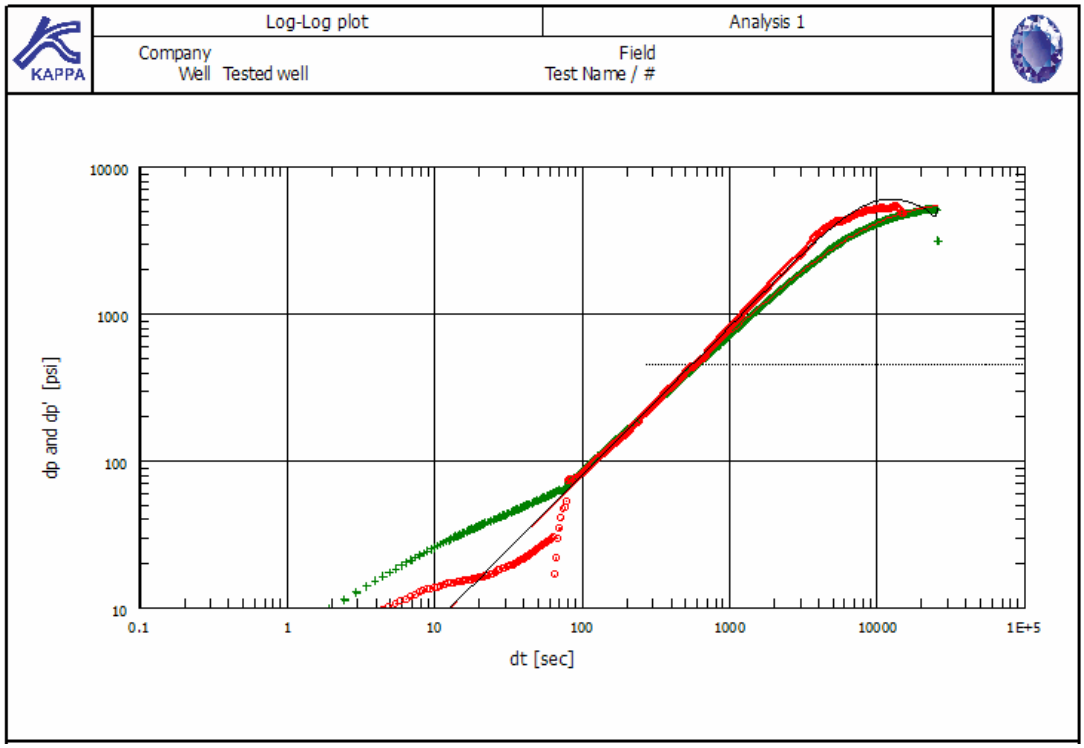


Figure AIV.5 Log-log plot for extended RCI Single Probe test at 5611m

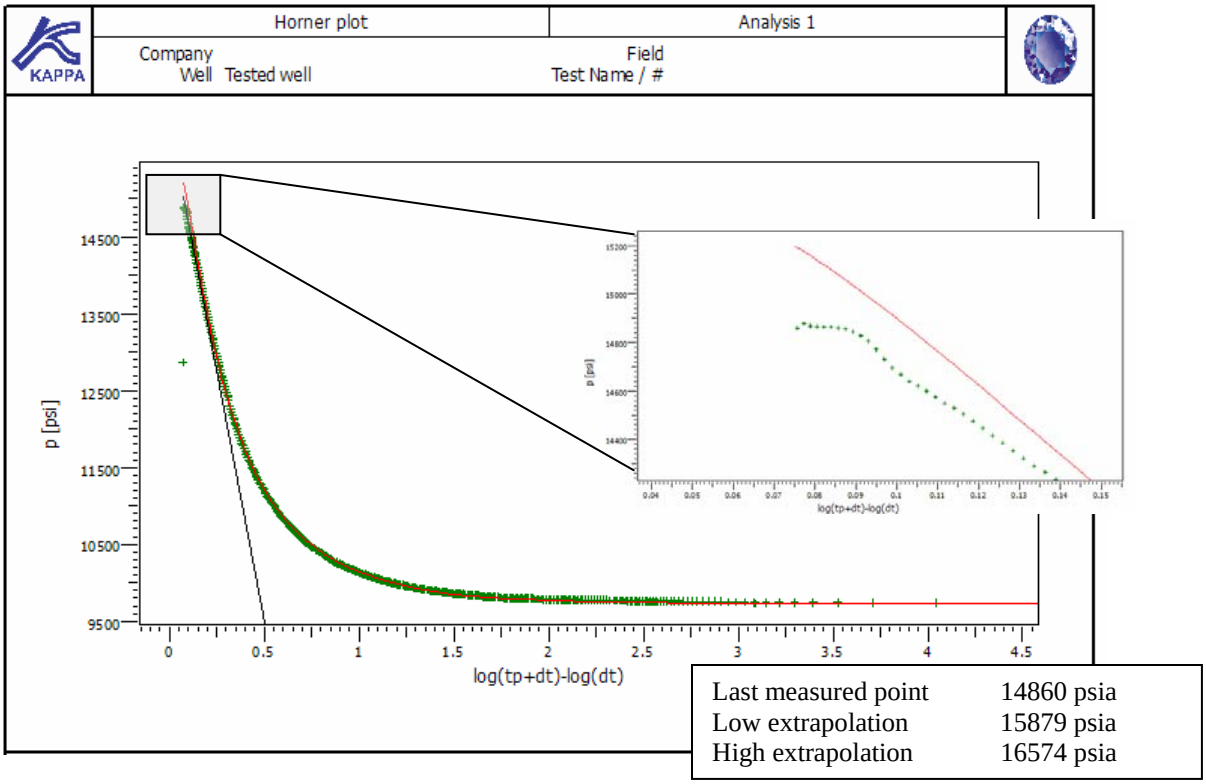


Figure AIV.6 Horner plot for extended RCI Single Probe test at 5611m

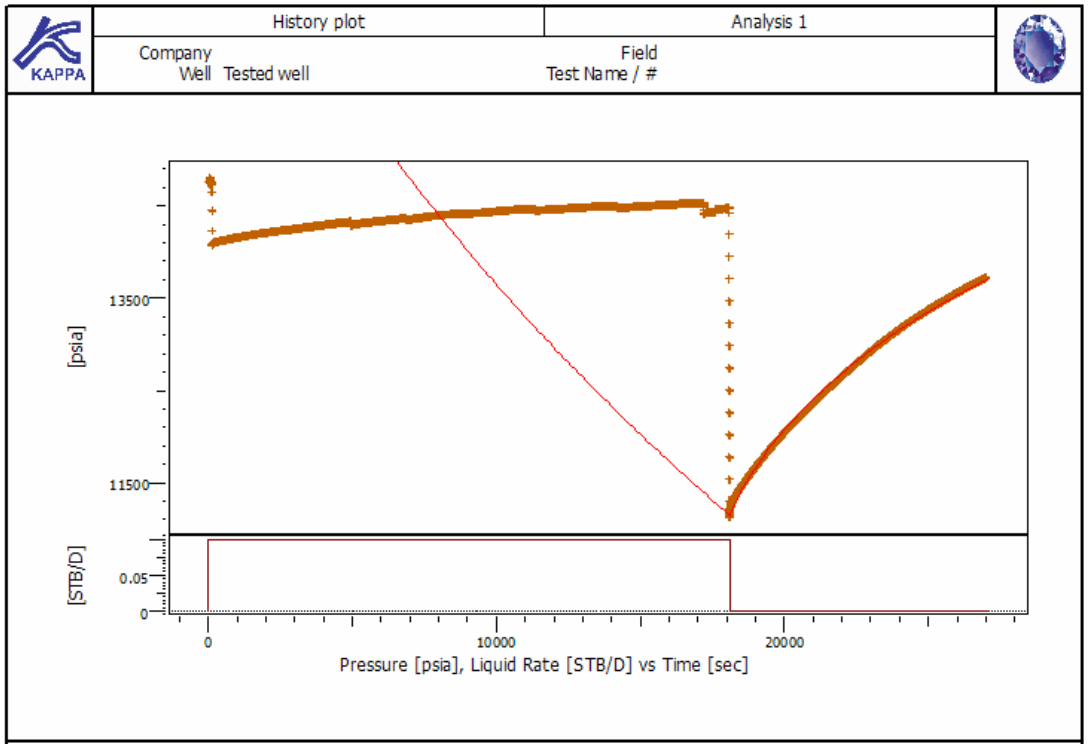


Figure AIV.7 History plot for extended RCI Single Probe test at 5568m

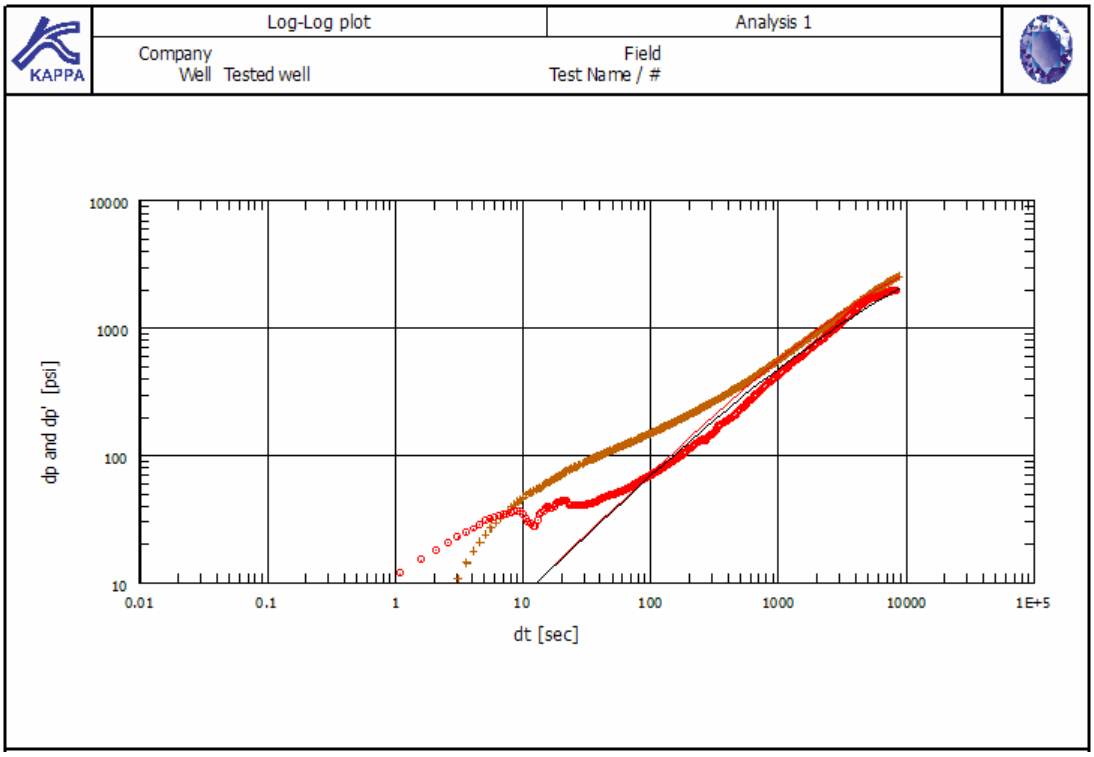


Figure AIV.8 Log-log plot for extended RCI Single Probe test at 5568m

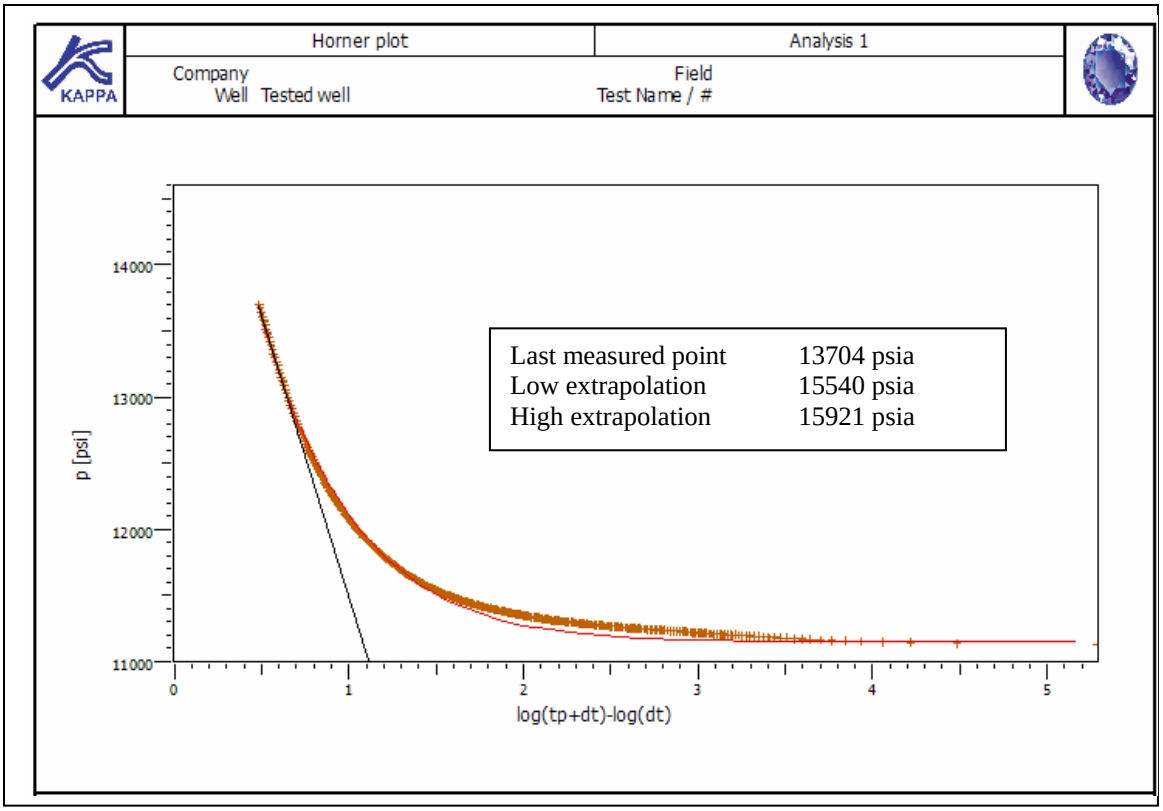


Figure AIV.9 Horner plot for extended RCI Single Probe test at 5568m

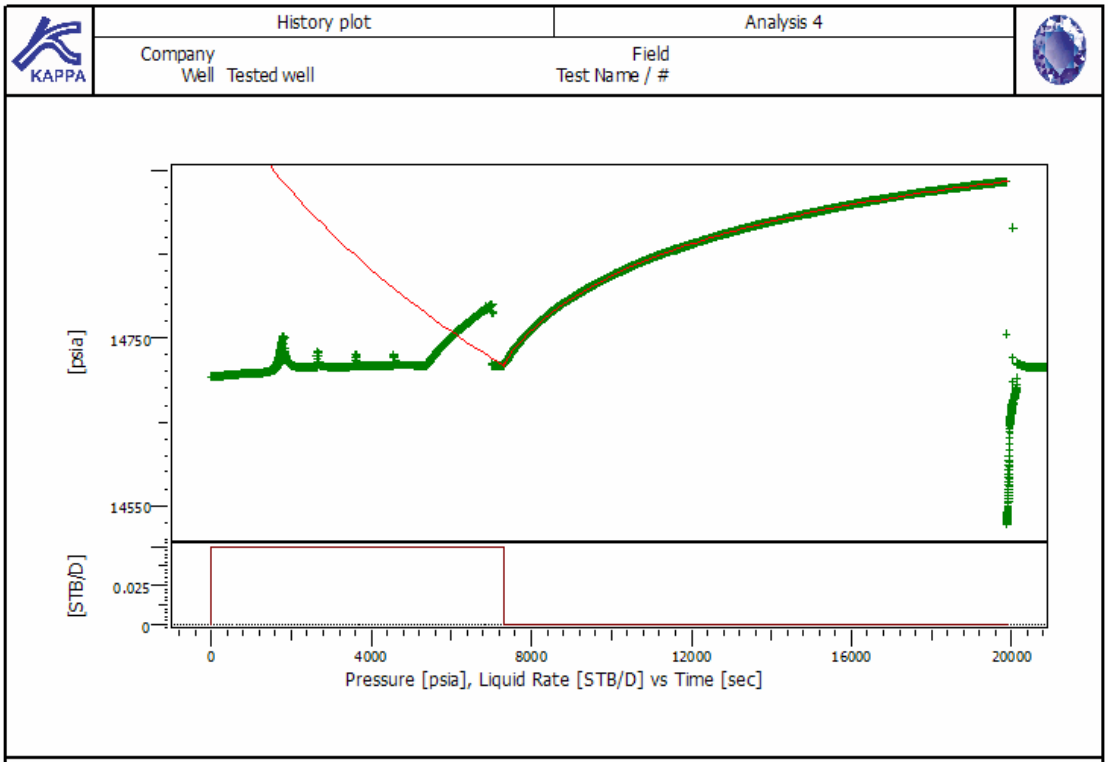


Figure AIV.10 History plot for RCI Straddle Packer test 5568-69m

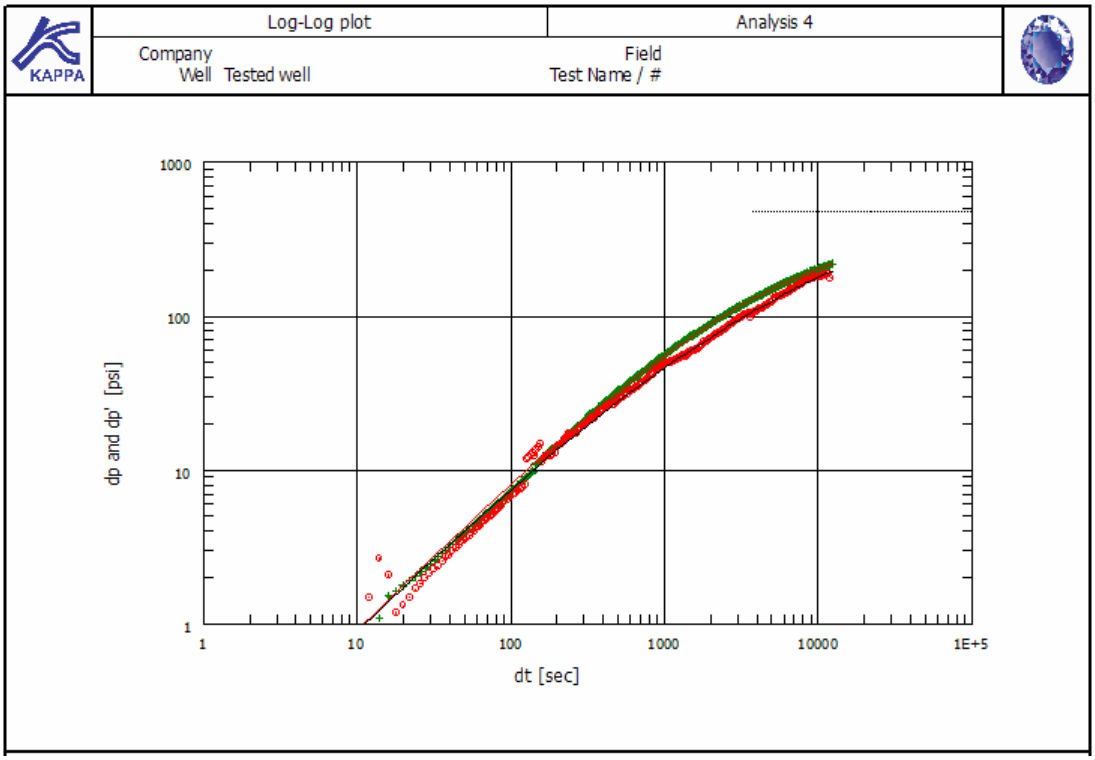


Figure AIV.11 Log-log plot for RCI Straddle Packer test 5568-69m

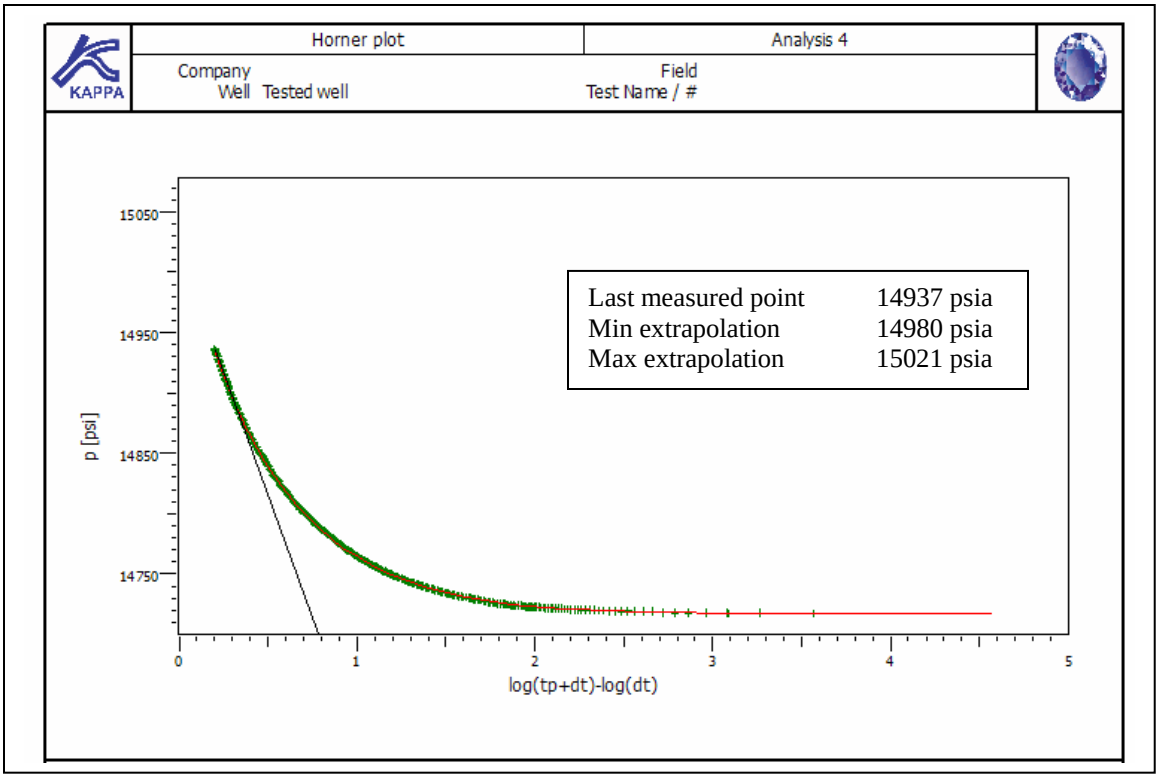


Figure AIV.12 Horner plot for RCI Straddle Packer test 5568-69m

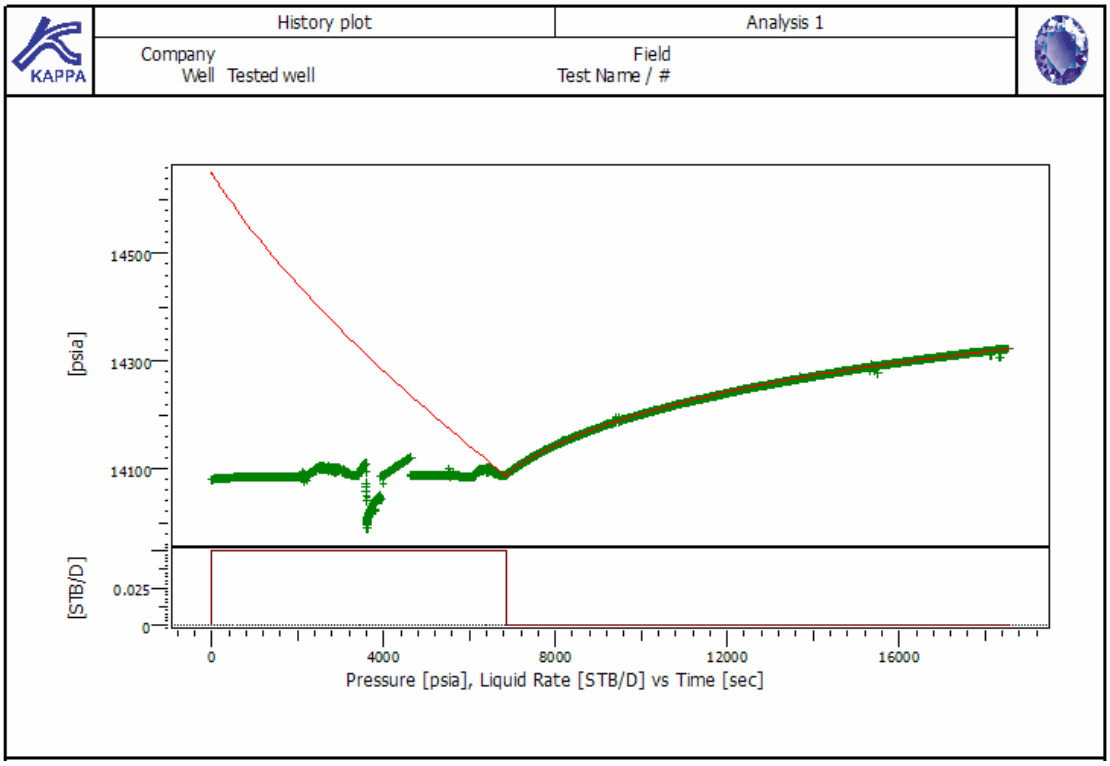


Figure AIV.13 History plot for RCI Straddle Packer test 5331-32m

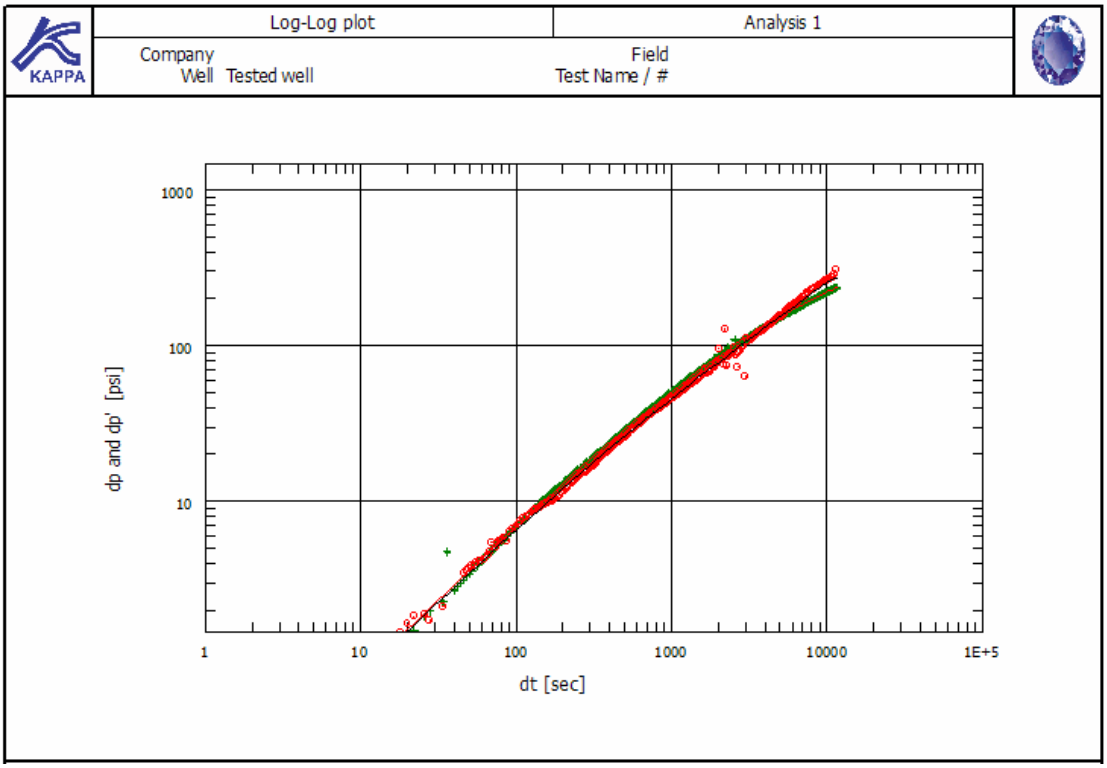


Figure AIV.14 Log-log plot for RCI Straddle Packer test 5331-32m

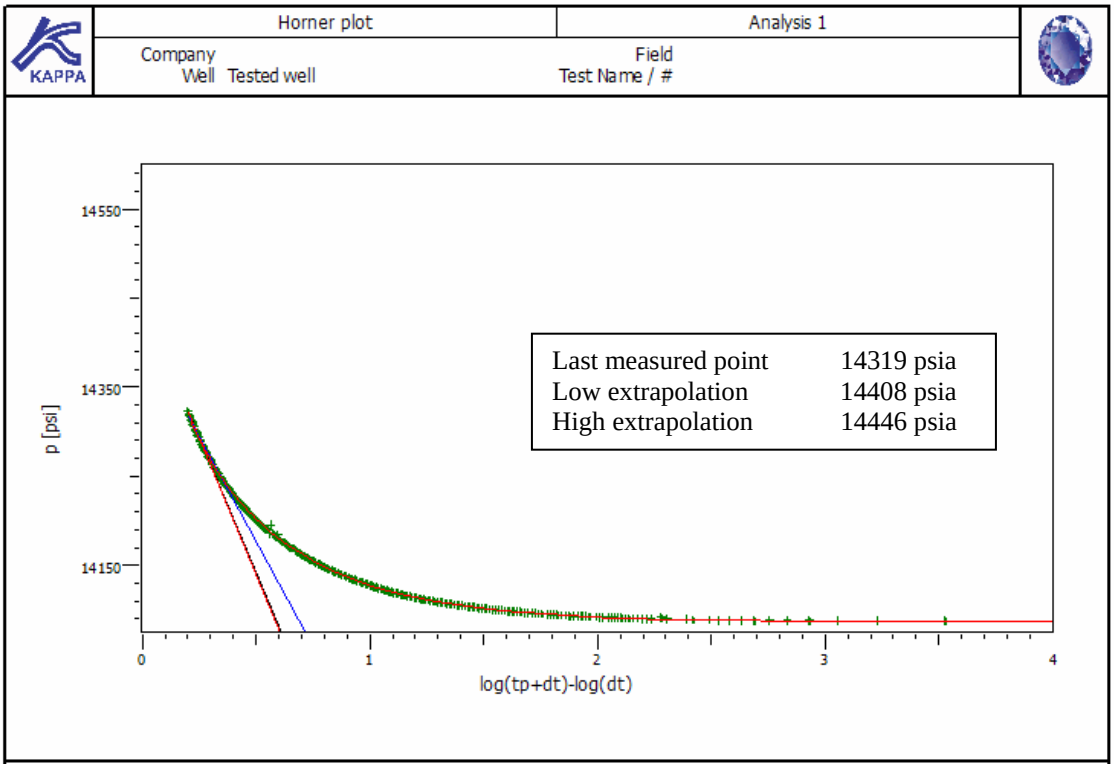


Figure AIV.15 Horner plot for RCI Straddle Packer test 5331-32m

Appendix V

Deviation Survey

Actual Wellpath Report

Definitive 9/4-5 (Preliminary)

REFERENCE WELLPATH IDENTIFICATION			
Operator	**Esso Norge AS**	Slot	**Actual location: 9/4-5**
Area	**North sea, Norwegian sector.**	Well	**9/4-5**
Field	**EXPLORATION 9/4 (Kogge)**	Wellbore	**9/4-5**
Facility	**Maersk Gallant**		

REPORT SETUP INFORMATION			
Projection System	**ED50 / UTM Zone 31 North**	Software System	**WellArchitect™ 1.2**
North Reference	**Grid**	User	**Kallsve**
Scale	**0.99967**	Report Generated	**07/11/06** at **10:14:28**
Wellbore last revised	**06/06/06**	Database/Source file	**WellArchitect_Esso_Server/9_4-5.xml**

WELLPATH LOCATION						
	Local coordinates		**Grid coordinates**		**Geographic coordinates**	
	North [meters]	**East [meters]**	**Easting [meters]**	**Northing [meters]**	**Latitude [°]**	**Longitude [°]**
Slot Location	4.20	10.41	**575683.41**	**6393656.20**	57 40 38.907N	4 16 08.369E
Facility Reference Pt			**575673.00**	**6393652.00**	57 40 38.777N	4 16 07.736E
Field Reference Pt			**575673.00**	**6393652.00**	57 40 38.777N	4 16 07.736E

WELLPATH DATUM			
Calculation method	**Minimum curvature**	Rig on Actual location: 9/4-5 (RT) to Installation Vertical Datum	**45.00 meters**
Horizontal Reference Pt	**Installation Centre**	Rig on Actual location: 9/4-5 (RT) to Mean Sea Level	**45.00 meters**
Vertical Reference Pt	**Rig on Actual location: 9/4-5 (RT)**	Installation Vertical Datum to Mud Line (Facility)	**77.00 meters**
MD Reference Pt	**Rig on Actual location: 9/4-5 (RT)**	Section Origin	**N 0.00, E 0.00 m**
Field Vertical Reference	**Mean Sea Level**	Section Azimuth	**230.14°**

Actual Wellpath Report

Definitive 9/4-5 (Preliminary)

REFERENCE WELLPATH IDENTIFICATION			
Operator	**Esso Norge AS**	Slot	**Actual location: 9/4-5**
Area	**North sea, Norwegian sector.**	Well	**9/4-5**
Field	**EXPLORATION 9/4 (Kogge)**	Wellbore	**9/4-5**
Facility	**Maersk Gallant**		

WELLPATH DATA (177 stations) † = interpolated/extrapolated station

MD [meters]	Inclination [°]	Azimuth [°]	TVD [meters]	Vert Sect [meters]	North [meters]	East [meters]	DLS [°/30m]
0.00†	0.000	0.000	0.00	-10.69	4.20	10.41	0.00
122.00	0.000	0.000	122.00	-10.69	4.20	10.41	0.00
607.68	0.390	64.920	607.68	-12.28	4.90	11.91	0.02
666.57	0.360	9.560	666.56	-12.62	5.17	12.12	0.18
695.68	0.400	0.280	695.67	-12.75	5.36	12.14	0.08
753.65	0.300	349.160	753.64	-12.96	5.71	12.11	0.06
782.03	0.390	348.200	782.02	-13.04	5.88	12.08	0.10
811.19	0.630	26.570	811.19	-13.23	6.12	12.13	0.42
840.67	0.630	18.400	840.66	-13.52	6.42	12.25	0.09
870.17	0.580	28.310	870.16	-13.80	6.70	12.37	0.12
899.16	0.880	38.620	899.14	-14.15	7.01	12.58	0.34
928.12	0.720	34.630	928.11	-14.54	7.33	12.83	0.18
958.41	0.740	34.120	958.39	-14.91	7.65	13.04	0.02
986.82	0.700	35.660	986.80	-15.26	7.94	13.25	0.05
1015.46	0.490	24.790	1015.44	-15.54	8.20	13.40	0.25
1044.82	0.570	17.940	1044.80	-15.78	8.45	13.50	0.10
1074.51	0.540	20.590	1074.49	-16.02	8.72	13.59	0.04
1103.50	0.590	17.180	1103.47	-16.27	8.99	13.68	0.06
1131.13	0.530	4.890	1131.10	-16.48	9.25	13.74	0.15
1160.45	0.530	11.240	1160.42	-16.68	9.52	13.78	0.06
1190.51	0.530	350.310	1190.48	-16.86	9.80	13.78	0.19
1219.93	0.590	355.750	1219.90	-17.01	10.08	13.75	0.08
1248.90	0.610	7.980	1248.87	-17.21	10.38	13.76	0.13
1276.50	0.560	26.530	1276.46	-17.45	10.65	13.84	0.21
1305.25	0.420	26.210	1305.21	-17.67	10.87	13.95	0.15
1334.25	0.340	26.860	1334.22	-17.85	11.04	14.03	0.08
1364.22	0.260	330.570	1364.18	-17.94	11.18	14.04	0.29
1424.08	0.280	11.100	1424.04	-18.08	11.44	14.00	0.09
1453.12	0.390	356.710	1453.08	-18.19	11.61	14.01	0.14
1511.07	0.350	349.980	1511.03	-18.40	11.98	13.97	0.03
1569.79	0.310	358.350	1569.75	-18.59	12.32	13.93	0.03
1598.69	0.350	338.440	1598.65	-18.66	12.48	13.89	0.13
1623.51	0.310	345.770	1623.46	-18.72	12.61	13.85	0.07
1656.52	0.420	349.520	1656.48	-18.81	12.82	13.81	0.10
1686.16	0.360	2.320	1686.12	-18.93	13.02	13.79	0.11
1715.29	0.300	10.450	1715.25	-19.05	13.18	13.81	0.08
1744.33	0.290	11.970	1744.28	-19.17	13.33	13.84	0.01
1773.17	0.370	2.360	1773.13	-19.29	13.49	13.86	0.10
1802.34	0.260	18.440	1802.30	-19.40	13.65	13.88	0.14
1830.94	0.300	19.500	1830.89	-19.52	13.78	13.93	0.04
1860.37	0.290	13.860	1860.33	-19.65	13.93	13.97	0.03
1890.06	0.500	15.200	1890.02	-19.82	14.13	14.02	0.21
1918.39	0.420	352.750	1918.34	-19.97	14.35	14.04	0.21
1947.67	0.400	16.100	1947.62	-20.12	14.55	14.06	0.17
1976.42	0.330	353.020	1976.38	-20.25	14.73	14.07	0.17

Actual Wellpath Report

Definitive 9/4-5 (Preliminary)

REFERENCE WELLPATH IDENTIFICATION			
Operator	**Esso Norge AS**	Slot	**Actual location: 9/4-5**
Area	**North sea, Norwegian sector.**	Well	**9/4-5**
Field	**EXPLORATION 9/4 (Kogge)**	Wellbore	**9/4-5**
Facility	**Maersk Gallant**		

WELLPATH DATA (177 stations)

MD [meters]	Inclination [°]	Azimuth [°]	TVD [meters]	Vert Sect [meters]	North [meters]	East [meters]	DLS [°/30m]
2006.19	0.600	359.000	2006.14	-20.39	14.97	14.06	0.28
2035.76	0.600	353.200	2035.71	-20.57	15.28	14.04	0.06
2064.72	0.500	6.400	2064.66	-20.75	15.56	14.04	0.17
2091.54	0.400	4.000	2091.48	-20.89	15.77	14.06	0.11
2122.32	0.400	351.000	2122.27	-21.02	15.98	14.05	0.09
2151.89	0.500	4.000	2151.83	-21.17	16.21	14.04	0.14
2181.45	0.600	347.800	2181.40	-21.33	16.49	14.02	0.19
2210.41	0.600	347.000	2210.35	-21.47	16.79	13.95	0.01
2325.93	0.600	339.600	2325.86	-21.94	17.94	13.60	0.02
2354.88	0.600	340.800	2354.82	-22.05	18.23	13.50	0.01
2383.84	0.800	351.000	2383.77	-22.20	18.57	13.42	0.24
2413.71	0.600	345.500	2413.64	-22.38	18.93	13.35	0.21
2443.28	0.800	343.200	2443.20	-22.52	19.28	13.25	0.20
2472.11	0.600	348.540	2472.04	-22.67	19.62	13.16	0.22
2502.04	0.790	337.140	2501.97	-22.81	19.96	13.05	0.23
2517.37	0.800	331.870	2517.30	-22.86	20.15	12.96	0.14
2564.25	0.510	327.460	2564.17	-22.96	20.62	12.69	0.19
2592.93	0.760	305.960	2592.85	-22.93	20.84	12.47	0.36
2622.10	1.040	297.800	2622.02	-22.78	21.07	12.08	0.32
2650.69	1.330	286.400	2650.60	-22.49	21.29	11.53	0.39
2679.80	1.320	288.290	2679.70	-22.13	21.49	10.89	0.05
2708.51	1.360	283.810	2708.41	-21.75	21.67	10.24	0.12
2737.29	1.270	279.840	2737.17	-21.34	21.81	9.60	0.13
2795.63	1.280	278.950	2795.50	-20.50	22.02	8.32	0.01
2824.25	1.360	281.320	2824.11	-20.07	22.14	7.67	0.10
2853.99	1.390	286.040	2853.85	-19.65	22.31	6.97	0.12
2883.74	1.510	283.720	2883.59	-19.22	22.50	6.25	0.13
2912.85	1.620	283.490	2912.68	-18.74	22.69	5.47	0.11
2942.17	1.900	282.410	2941.99	-18.20	22.89	4.60	0.29
2971.43	1.870	288.120	2971.24	-17.65	23.14	3.67	0.19
2999.63	1.970	288.910	2999.42	-17.15	23.44	2.77	0.11
3058.97	1.810	281.160	3058.73	-16.03	23.95	0.89	0.15
3087.84	1.560	283.590	3087.58	-15.51	24.13	0.06	0.27
3116.92	1.100	310.520	3116.65	-15.23	24.41	-0.54	0.79
3141.09	1.160	301.520	3140.82	-15.11	24.69	-0.92	0.23
3170.59	1.620	290.030	3170.31	-14.81	24.99	-1.57	0.54
3198.45	1.560	285.300	3198.16	-14.40	25.22	-2.31	0.16
3228.90	1.680	279.750	3228.60	-13.87	25.41	-3.14	0.19
3258.28	1.640	274.680	3257.97	-13.29	25.51	-3.99	0.16
3287.54	1.700	276.200	3287.22	-12.69	25.59	-4.84	0.08
3317.26	1.920	270.070	3316.92	-12.00	25.64	-5.77	0.30
3345.24	2.290	268.130	3344.88	-11.20	25.62	-6.80	0.40
3374.38	2.510	266.080	3373.99	-10.23	25.56	-8.02	0.24
3404.56	2.560	257.910	3404.14	-9.10	25.38	-9.34	0.36
3432.90	1.910	246.640	3432.47	-8.08	25.06	-10.39	0.83

Actual Wellpath Report

Definitive 9/4-5 (Preliminary)

REFERENCE WELLPATH IDENTIFICATION			
Operator	**Esso Norge AS**	Slot	**Actual location: 9/4-5**
Area	**North sea, Norwegian sector.**	Well	**9/4-5**
Field	**EXPLORATION 9/4 (Kogge)**	Wellbore	**9/4-5**
Facility	**Maersk Gallant**		

WELLPATH DATA (177 stations)

MD [meters]	Inclination [°]	Azimuth [°]	TVD [meters]	Vert Sect [meters]	North [meters]	East [meters]	DLS [°/30m]
3461.77	1.500	235.710	3461.32	-7.25	24.65	-11.14	0.54
3490.97	0.540	210.960	3490.51	-6.74	24.32	-11.53	1.06
3520.81	0.200	194.730	3520.35	-6.56	24.15	-11.62	0.35
3550.34	0.830	244.120	3549.89	-6.31	24.00	-11.82	0.73
3579.02	1.680	249.400	3578.56	-5.71	23.77	-12.40	0.90
3608.01	2.530	249.160	3607.53	-4.71	23.39	-13.40	0.88
3636.57	2.990	247.800	3636.05	-3.40	22.88	-14.68	0.49
3643.58	3.090	246.090	3643.05	-3.05	22.74	-15.02	0.58
3653.36	3.270	242.700	3652.82	-2.52	22.50	-15.51	0.80
3665.52	3.100	237.540	3664.97	-1.85	22.17	-16.09	0.82
3693.93	2.670	231.610	3693.34	-0.43	21.34	-17.26	0.55
3724.23	1.700	228.750	3723.61	0.72	20.61	-18.15	0.97
3753.40	1.750	217.660	3752.77	1.59	19.97	-18.75	0.35
3781.84	1.360	208.800	3781.20	2.33	19.33	-19.18	0.48
3810.37	1.560	209.040	3809.72	3.01	18.70	-19.53	0.21
3839.87	0.850	201.310	3839.21	3.57	18.14	-19.80	0.74
3868.98	1.030	201.150	3868.32	3.99	17.70	-19.97	0.19
3898.12	1.730	220.220	3897.45	4.65	17.12	-20.35	0.85
3927.96	1.720	219.840	3927.27	5.54	16.43	-20.93	0.02
3956.79	1.460	217.290	3956.10	6.32	15.80	-21.43	0.28
3985.93	2.010	224.210	3985.22	7.19	15.14	-22.01	0.60
3997.54	1.720	222.620	3996.83	7.57	14.87	-22.27	0.76
4039.88	1.870	221.280	4039.15	8.88	13.88	-23.16	0.11
4068.14	1.900	228.350	4067.39	9.80	13.22	-23.81	0.25
4097.49	3.130	233.690	4096.71	11.09	12.42	-24.82	1.28
4126.99	4.150	233.690	4126.15	12.96	11.32	-26.33	1.04
4150.80	4.260	235.360	4149.89	14.70	10.30	-27.75	0.21
4157.08	4.210	234.570	4156.16	15.16	10.04	-28.13	0.37
4186.70	4.710	238.100	4185.69	17.45	8.76	-30.05	0.58
4201.33	5.060	238.670	4200.27	18.68	8.11	-31.11	0.72
4215.11	5.300	239.900	4213.99	19.91	7.48	-32.18	0.58
4244.71	6.050	237.440	4243.44	22.81	5.95	-34.68	0.80
4273.17	6.930	237.820	4271.73	26.00	4.23	-37.40	0.93
4289.60	7.140	239.570	4288.03	27.98	3.18	-39.12	0.55
4302.31	7.430	239.630	4300.64	29.57	2.37	-40.51	0.68
4332.09	7.990	237.150	4330.15	33.53	0.27	-43.91	0.66
4380.40	8.270	237.870	4377.97	40.30	-3.40	-49.67	0.19
4410.06	8.240	239.820	4407.32	44.51	-5.60	-53.31	0.28
4439.20	8.300	235.760	4436.16	48.66	-7.83	-56.86	0.60
4467.45	8.460	234.570	4464.11	52.76	-10.19	-60.24	0.25
4498.06	8.470	235.690	4494.38	57.25	-12.76	-63.93	0.16
4528.60	8.400	235.270	4524.59	61.71	-15.30	-67.62	0.09
4555.97	8.280	234.710	4551.67	65.67	-17.58	-70.87	0.16
4614.58	7.700	235.360	4609.72	73.79	-22.25	-77.55	0.30
4639.64	7.190	234.150	4634.56	77.02	-24.12	-80.20	0.64

Actual Wellpath Report

Definitive 9/4-5 (Preliminary)

REFERENCE WELLPATH IDENTIFICATION			
Operator	**Esso Norge AS**	Slot	**Actual location: 9/4-5**
Area	**North sea, Norwegian sector.**	Well	**9/4-5**
Field	**EXPLORATION 9/4 (Kogge)**	Wellbore	**9/4-5**
Facility	**Maersk Gallant**		

WELLPATH DATA (177 stations)

MD [meters]	Inclination [°]	Azimuth [°]	TVD [meters]	Vert Sect [meters]	North [meters]	East [meters]	DLS [°/30m]
4646.40	6.990	236.990	4641.28	77.85	-24.59	-80.89	1.79
4675.33	6.340	233.770	4670.01	81.19	-26.49	-83.65	0.78
4703.98	5.940	232.770	4698.49	84.25	-28.33	-86.11	0.43
4733.82	5.410	229.680	4728.19	87.20	-30.17	-88.41	0.61
4762.84	4.920	228.990	4757.09	89.82	-31.87	-90.40	0.51
4788.41	4.510	227.570	4782.57	91.92	-33.27	-91.96	0.50
4819.50	4.200	227.430	4813.57	94.27	-34.87	-93.71	0.30
4849.00	3.800	226.910	4843.00	96.33	-36.26	-95.22	0.41
4878.23	3.630	226.730	4872.17	98.22	-37.56	-96.60	0.17
4907.68	3.460	225.820	4901.56	100.04	-38.82	-97.91	0.18
4937.39	3.130	221.350	4931.23	101.73	-40.05	-99.09	0.42
4965.77	3.030	213.130	4959.57	103.22	-41.26	-100.01	0.48
4995.00	3.130	200.230	4988.75	104.65	-42.66	-100.71	0.72
5023.71	3.210	189.110	5017.42	105.93	-44.19	-101.11	0.65
5053.64	3.650	175.300	5047.30	107.11	-45.96	-101.16	0.93
5114.42	4.090	167.000	5107.94	109.21	-50.00	-100.52	0.35
5143.80	3.670	167.460	5137.25	110.11	-51.94	-100.08	0.43
5173.37	2.920	161.340	5166.77	110.82	-53.58	-99.63	0.84
5229.70	2.350	147.800	5223.04	111.49	-55.92	-98.56	0.45
5258.84	2.680	151.660	5252.15	111.71	-57.02	-97.92	0.38
5341.16	2.180	167.400	5334.40	112.81	-60.24	-96.66	0.30
5377.74	2.090	171.100	5370.95	113.47	-61.58	-96.41	0.13
5399.23	2.000	171.300	5392.43	113.87	-62.34	-96.29	0.13
5423.92	1.990	174.570	5417.10	114.33	-63.19	-96.18	0.14
5450.98	2.090	180.490	5444.15	114.92	-64.15	-96.14	0.26
5482.71	2.320	180.490	5475.86	115.71	-65.37	-96.15	0.22
5513.41	2.380	180.070	5506.53	116.52	-66.63	-96.16	0.06
5543.76	2.360	182.850	5536.86	117.35	-67.89	-96.19	0.12
5567.48	2.340	179.780	5560.55	117.99	-68.86	-96.21	0.16
5597.62	2.400	179.350	5590.67	118.78	-70.11	-96.20	0.06
5625.08	2.310	177.000	5618.11	119.47	-71.23	-96.17	0.14
5654.71	2.110	179.580	5647.71	120.18	-72.37	-96.13	0.23
5686.81	2.060	180.690	5679.79	120.93	-73.54	-96.14	0.06
5702.26	2.080	180.920	5695.23	121.29	-74.10	-96.14	0.04
5709.51	2.000	180.930	5702.48	121.46	-74.36	-96.15	0.33
5740.85	2.000	179.620	5733.80	122.17	-75.45	-96.15	0.04
5758.01	2.080	183.870	5750.94	122.57	-76.06	-96.17	0.30
5777.09	2.060	183.290	5770.01	123.05	-76.75	-96.21	0.05
5795.47	2.000	178.980	5788.38	123.47	-77.40	-96.23	0.27
5827.20	2.130	187.350	5820.09	124.25	-78.54	-96.29	0.31
5857.71	1.900	175.440	5850.58	124.96	-79.61	-96.33	0.47
5881.12	1.900	175.440	5873.98	125.41	-80.38	-96.26	0.00

Actual Wellpath Report

Definitive 9/4-5 (Preliminary)

REFERENCE WELLPATH IDENTIFICATION			
Operator	**Esso Norge AS**	Slot	**Actual location: 9/4-5**
Area	**North sea, Norwegian sector.**	Well	**9/4-5**
Field	**EXPLORATION 9/4 (Kogge)**	Wellbore	**9/4-5**
Facility	**Maersk Gallant**		

HOLE & CASING SECTIONS Ref Wellbore: 9/4-5 Ref Wellpath: Definitive 9/4-5 (Preliminary)

String/Diameter	Start MD [meters]	End MD [meters]	Interval [meters]	Start TVD [meters]	End TVD [meters]	Start N/S [meters]	Start E/W [meters]	End N/S [meters]	End E/W [meters]
42in Open Hole	122.00	213.36	91.36	122.00	213.36	4.20	10.41	4.23	10.47
36in Conductor	122.00	206.65	84.66	122.00	206.65	4.20	10.41	4.22	10.46
26in Open Hole	213.36	605.03	391.67	213.36	605.02	4.23	10.47	4.89	11.89
20in Casing	122.00	598.63	476.63	122.00	598.62	4.20	10.41	4.88	11.86
17in Open Hole	605.03	2534.41	1929.38	605.02	2534.33	4.89	11.89	20.35	12.85
13.625in Casing	122.00	2526.00	2404.00	122.00	2525.92	4.20	10.41	20.26	12.90
12.25in Open Hole	2534.41	5234.33	2699.92	2534.33	5227.67	20.35	12.85	-56.08	-98.46
9.625in Casing	122.00	5208.70	5086.70	122.00	5202.06	4.20	10.41	-55.13	-98.99
8.5in Open Hole	5234.33	5567.48	333.15	5227.67	5560.55	-56.08	-98.46	-68.86	-96.21

WELLPATH COMPOSITION Ref Wellbore: 9/4-5 Ref Wellpath: Definitive 9/4-5 (Preliminary)

Start MD [meters]	End MD [meters]	Positional Uncertainty Model	Log Name/Comment	Wellbore
122.00	2354.88	NaviTrak (Magcorr1, DLS)	9/4-5 BHI MWD 17" (1993.70-7726ft)	9/4-5
2354.88	5173.37	NaviTrak (Magcorr1, DLS)	9/4-5 BHI MWD 12 1/4" (7726-16973ft)	9/4-5
5173.37	5857.71	NaviTrak (Magcorr1, DLS)	9/4-5 BHI MWD 8 1/2" (16973-19218.2ft)	9/4-5
5857.71	5881.12	Unknown Tool (Standard)	9/4-5 Extrapolation to (TD@19295ft)	9/4-5

NORWEGIAN PETROLEUM DIRECTORATE (NPD) DATA TRANSFER REPORT

Contractor: INTEQ
Software : WellArchitect(TM)
Operator : Esso Norge AS
Area : North sea, Norwegian sector.
Field : EXPLORATION 9/4 (Kogge)
Facility : Maersk Gallant
Slot : Actual location: 9/4-5
Well : 9/4-5
Wellbore : 9/4-5
Wellpath : Definitive 9/4-5 (Preliminary)
MD Ref Pt : Rig on Actual location: 9/4-5 (RT)
TVD Ref Pt: Rig on Actual location: 9/4-5 (RT)
Date :

MD meters	DEVIATION deg	AZIMUTH deg	TVD meters	NORTH meters	EAST meters	DOGLEG deg/30m
0.00	0.00	0.00	0.00	6393656.20	575683.41	0.00
122.00	0.00	0.00	122.00	6393656.20	575683.41	0.00
607.68	0.39	64.92	607.68	6393656.90	575684.91	0.02
666.57	0.36	9.56	666.56	6393657.17	575685.12	0.18
695.68	0.40	0.28	695.67	6393657.36	575685.13	0.08
753.65	0.30	349.16	753.64	6393657.71	575685.11	0.06
782.03	0.39	348.20	782.02	6393657.88	575685.07	0.10
811.19	0.63	26.57	811.19	6393658.12	575685.12	0.42
840.67	0.63	18.40	840.66	6393658.42	575685.25	0.09
870.17	0.58	28.31	870.16	6393658.70	575685.37	0.12
899.16	0.88	38.62	899.14	6393659.01	575685.58	0.34
928.12	0.72	34.63	928.11	6393659.33	575685.82	0.18
958.41	0.74	34.12	958.39	6393659.65	575686.04	0.02
986.82	0.70	35.66	986.80	6393659.94	575686.24	0.05
1015.46	0.49	24.79	1015.44	6393660.19	575686.40	0.25
1044.82	0.57	17.94	1044.80	6393660.45	575686.49	0.10
1074.51	0.54	20.59	1074.49	6393660.72	575686.59	0.04
1103.50	0.59	17.18	1103.47	6393660.99	575686.68	0.06
1131.13	0.53	4.89	1131.10	6393661.25	575686.73	0.15
1160.45	0.53	11.24	1160.42	6393661.52	575686.77	0.06
1190.51	0.53	350.31	1190.48	6393661.79	575686.77	0.19
1219.93	0.59	355.75	1219.90	6393662.08	575686.74	0.08
1248.90	0.61	7.98	1248.87	6393662.38	575686.75	0.13
1276.50	0.56	26.53	1276.46	6393662.65	575686.83	0.21
1305.25	0.42	26.21	1305.21	6393662.87	575686.94	0.15
1334.25	0.34	26.86	1334.22	6393663.04	575687.03	0.08
1364.22	0.26	330.57	1364.18	6393663.18	575687.03	0.29
1424.08	0.28	11.10	1424.04	6393663.44	575686.99	0.09
1453.12	0.39	356.71	1453.08	6393663.61	575687.00	0.14
1511.07	0.35	349.98	1511.03	6393663.98	575686.96	0.03
1569.79	0.31	358.35	1569.75	6393664.31	575686.93	0.03
1598.69	0.35	338.44	1598.65	6393664.47	575686.89	0.13
1623.51	0.31	345.77	1623.46	6393664.61	575686.85	0.07
1656.52	0.42	349.52	1656.48	6393664.81	575686.80	0.10
1686.16	0.36	2.32	1686.12	6393665.01	575686.79	0.11
1715.29	0.30	10.45	1715.25	6393665.18	575686.80	0.08
1744.33	0.29	11.97	1744.28	6393665.33	575686.83	0.01
1773.17	0.37	2.36	1773.13	6393665.49	575686.85	0.10
1802.34	0.26	18.44	1802.30	6393665.65	575686.88	0.14
1830.94	0.30	19.50	1830.89	6393665.78	575686.92	0.04
1860.37	0.29	13.86	1860.33	6393665.92	575686.97	0.03
1890.06	0.50	15.20	1890.02	6393666.12	575687.02	0.21
1918.39	0.42	352.75	1918.34	6393666.34	575687.04	0.21
1947.67	0.40	16.10	1947.62	6393666.55	575687.05	0.17
1976.42	0.33	353.02	1976.38	6393666.73	575687.07	0.17
2006.19	0.60	359.00	2006.14	6393666.97	575687.06	0.28
2035.76	0.60	353.20	2035.71	6393667.28	575687.04	0.06
2064.72	0.50	6.40	2064.66	6393667.55	575687.03	0.17
2091.54	0.40	4.00	2091.48	6393667.76	575687.05	0.11
2122.32	0.40	351.00	2122.27	6393667.98	575687.04	0.09
2151.89	0.50	4.00	2151.83	6393668.21	575687.03	0.14
2181.45	0.60	347.80	2181.40	6393668.49	575687.01	0.19
2210.41	0.60	347.00	2210.35	6393668.78	575686.94	0.01
2325.93	0.60	339.60	2325.86	6393669.94	575686.60	0.02
2354.88	0.60	340.80	2354.82	6393670.22	575686.50	0.01
2383.84	0.80	351.00	2383.77	6393670.57	575686.41	0.24
2413.71	0.60	345.50	2413.64	6393670.92	575686.34	0.21

2443.28	0.80	343.20	2443.20	6393671.27	575686.24	0.20
2472.11	0.60	348.54	2472.04	6393671.61	575686.16	0.22
2502.04	0.79	337.14	2501.97	6393671.95	575686.04	0.23
2517.37	0.80	331.87	2517.30	6393672.15	575685.95	0.14
2564.25	0.51	327.46	2564.17	6393672.61	575685.69	0.19
2592.93	0.76	305.96	2592.85	6393672.83	575685.46	0.36
2622.10	1.04	297.80	2622.02	6393673.07	575685.07	0.32
2650.69	1.33	286.40	2650.60	6393673.28	575684.53	0.39
2679.80	1.32	288.29	2679.70	6393673.48	575683.88	0.05
2708.51	1.36	283.81	2708.41	6393673.67	575683.24	0.12
2737.29	1.27	279.84	2737.17	6393673.80	575682.59	0.13
2795.63	1.28	278.95	2795.50	6393674.01	575681.31	0.01
2824.25	1.36	281.32	2824.11	6393674.13	575680.66	0.10
2853.99	1.39	286.04	2853.85	6393674.30	575679.97	0.12
2883.74	1.51	283.72	2883.59	6393674.49	575679.24	0.13
2912.85	1.62	283.49	2912.68	6393674.68	575678.47	0.11
2942.17	1.90	282.41	2941.99	6393674.88	575677.59	0.29
2971.43	1.87	288.12	2971.24	6393675.13	575676.67	0.19
2999.63	1.97	288.91	2999.42	6393675.43	575675.77	0.11
3058.97	1.81	281.16	3058.73	6393675.95	575673.89	0.15
3087.84	1.56	283.59	3087.58	6393676.13	575673.06	0.27
3116.92	1.10	310.52	3116.65	6393676.40	575672.46	0.79
3141.09	1.16	301.52	3140.82	6393676.68	575672.08	0.23
3170.59	1.62	290.03	3170.31	6393676.98	575671.43	0.54
3198.45	1.56	285.30	3198.16	6393677.21	575670.70	0.16
3228.90	1.68	279.75	3228.60	6393677.40	575669.86	0.19
3258.28	1.64	274.68	3257.97	6393677.50	575669.01	0.16
3287.54	1.70	276.20	3287.22	6393677.59	575668.16	0.08
3317.26	1.92	270.07	3316.92	6393677.63	575667.23	0.30
3345.24	2.29	268.13	3344.88	6393677.62	575666.20	0.40
3374.38	2.51	266.08	3373.99	6393677.55	575664.98	0.24
3404.56	2.56	257.91	3404.14	6393677.37	575663.67	0.36
3432.90	1.91	246.64	3432.47	6393677.05	575662.61	0.83
3461.77	1.50	235.71	3461.32	6393676.64	575661.86	0.54
3490.97	0.54	210.96	3490.51	6393676.31	575661.47	1.06
3520.81	0.20	194.73	3520.35	6393676.14	575661.39	0.35
3550.34	0.83	244.12	3549.89	6393676.00	575661.18	0.73
3579.02	1.68	249.40	3578.56	6393675.76	575660.60	0.90
3608.01	2.53	249.16	3607.53	6393675.38	575659.61	0.88
3636.57	2.99	247.80	3636.05	6393674.88	575658.33	0.49
3643.58	3.09	246.09	3643.05	6393674.73	575657.99	0.58
3653.36	3.27	242.70	3652.82	6393674.49	575657.50	0.80
3665.52	3.10	237.54	3664.97	6393674.16	575656.91	0.82
3693.93	2.67	231.61	3693.34	6393673.34	575655.75	0.55
3724.23	1.70	228.75	3723.61	6393672.60	575654.86	0.97
3753.40	1.75	217.66	3752.77	6393671.96	575654.26	0.35
3781.84	1.36	208.80	3781.20	6393671.33	575653.83	0.48
3810.37	1.56	209.04	3809.72	6393670.69	575653.48	0.21
3839.87	0.85	201.31	3839.21	6393670.13	575653.20	0.74
3868.98	1.03	201.15	3868.32	6393669.69	575653.03	0.19
3898.12	1.73	220.22	3897.45	6393669.11	575652.65	0.85
3927.96	1.72	219.84	3927.27	6393668.42	575652.08	0.02
3956.79	1.46	217.29	3956.10	6393667.80	575651.58	0.28
3985.93	2.01	224.21	3985.22	6393667.14	575651.00	0.60
3997.54	1.72	222.62	3996.83	6393666.86	575650.74	0.76
4039.88	1.87	221.28	4039.15	6393665.88	575649.85	0.11
4068.14	1.90	228.35	4067.39	6393665.22	575649.20	0.25
4097.49	3.13	233.69	4096.71	6393664.42	575648.19	1.28
4126.99	4.15	233.69	4126.15	6393663.31	575646.68	1.04
4150.80	4.26	235.36	4149.89	6393662.30	575645.26	0.21
4157.08	4.21	234.57	4156.16	6393662.03	575644.88	0.37
4186.70	4.71	238.10	4185.69	6393660.76	575642.96	0.58
4201.33	5.06	238.67	4200.27	6393660.11	575641.90	0.72
4215.11	5.30	239.90	4213.99	6393659.47	575640.83	0.58
4244.71	6.05	237.44	4243.44	6393657.95	575638.33	0.80
4273.17	6.93	237.82	4271.73	6393656.23	575635.62	0.93
4289.60	7.14	239.57	4288.03	6393655.18	575633.90	0.55
4302.31	7.43	239.63	4300.64	6393654.37	575632.51	0.68
4332.09	7.99	237.15	4330.15	6393652.27	575629.11	0.66
4380.40	8.27	237.87	4377.97	6393648.60	575623.35	0.19
4410.06	8.24	239.82	4407.32	6393646.40	575619.71	0.28
4439.20	8.30	235.76	4436.16	6393644.17	575616.16	0.60
4467.45	8.46	234.57	4464.11	6393641.82	575612.78	0.25
4498.06	8.47	235.69	4494.38	6393639.24	575609.09	0.16
4528.60	8.40	235.27	4524.59	6393636.71	575605.40	0.09
4555.97	8.28	234.71	4551.67	6393634.43	575602.15	0.16

4614.58	7.70	235.36	4609.72	6393629.76	575595.48	0.30
4639.64	7.19	234.15	4634.56	6393627.89	575592.82	0.64
4646.40	6.99	236.99	4641.28	6393627.42	575592.14	1.79
4675.33	6.34	233.77	4670.01	6393625.51	575589.37	0.78
4703.98	5.94	232.77	4698.49	6393623.68	575586.92	0.43
4733.82	5.41	229.68	4728.19	6393621.84	575584.62	0.61
4762.84	4.92	228.99	4757.09	6393620.14	575582.63	0.51
4788.41	4.51	227.57	4782.57	6393618.74	575581.07	0.50
4819.50	4.20	227.43	4813.57	6393617.15	575579.33	0.30
4849.00	3.80	226.91	4843.00	6393615.75	575577.82	0.41
4878.23	3.63	226.73	4872.17	6393614.45	575576.44	0.17
4907.68	3.46	225.82	4901.56	6393613.19	575575.12	0.18
4937.39	3.13	221.35	4931.23	6393611.96	575573.94	0.42
4965.77	3.03	213.13	4959.57	6393610.75	575573.02	0.48
4995.00	3.13	200.23	4988.75	6393609.36	575572.32	0.72
5023.71	3.21	189.11	5017.42	6393607.83	575571.92	0.65
5053.64	3.65	175.30	5047.30	6393606.05	575571.87	0.93
5114.42	4.09	167.00	5107.94	6393602.01	575572.52	0.35
5143.80	3.67	167.46	5137.25	6393600.07	575572.96	0.43
5173.37	2.92	161.34	5166.77	6393598.44	575573.40	0.84
5229.70	2.35	147.80	5223.04	6393596.10	575574.48	0.45
5258.84	2.68	151.66	5252.15	6393595.00	575575.12	0.38
5341.16	2.18	167.40	5334.40	6393591.78	575576.37	0.30
5377.74	2.09	171.10	5370.95	6393590.44	575576.63	0.13
5399.23	2.00	171.30	5392.43	6393589.68	575576.74	0.13
5423.92	1.99	174.57	5417.10	6393588.83	575576.85	0.14
5450.98	2.09	180.49	5444.15	6393587.87	575576.89	0.26
5482.71	2.32	180.49	5475.86	6393586.65	575576.88	0.22
5513.41	2.38	180.07	5506.53	6393585.39	575576.87	0.06
5543.76	2.36	182.85	5536.86	6393584.14	575576.84	0.12
5567.48	2.34	179.78	5560.55	6393583.16	575576.82	0.16
5597.62	2.40	179.35	5590.67	6393581.92	575576.83	0.06
5625.08	2.31	177.00	5618.11	6393580.79	575576.86	0.14
5654.71	2.11	179.58	5647.71	6393579.65	575576.90	0.23
5686.81	2.06	180.69	5679.79	6393578.48	575576.90	0.06
5702.26	2.08	180.92	5695.23	6393577.92	575576.89	0.04
5709.51	2.00	180.93	5702.48	6393577.67	575576.88	0.33
5740.85	2.00	179.62	5733.80	6393576.57	575576.88	0.04
5758.01	2.08	183.87	5750.94	6393575.96	575576.86	0.30
5777.09	2.06	183.29	5770.01	6393575.28	575576.82	0.05
5795.47	2.00	178.98	5788.38	6393574.62	575576.80	0.27
5827.20	2.13	187.35	5820.09	6393573.49	575576.74	0.31
5857.71	1.90	175.44	5850.58	6393572.42	575576.71	0.47
5881.12	1.90	175.44	5873.98	6393571.65	575576.77	0.00

Appendix VI

Completion Log

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Page 00 of 1
CORE DESCRIPTION - PAGE 1

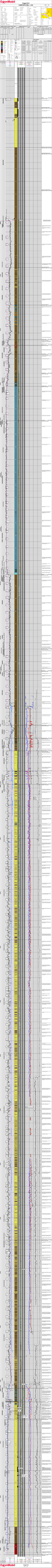
Well Name:		Core Number:	1
Field:		Date Cored:	
Country:		Cored Interval:	
Rig:		Total Cored:	
Core Diameter:		Recovery:	
Core Orientation:		Preservation:	
Depth Reference:		Core Depth Shift:	
Core Depth Shift Reference:		Core Depth Shift Method:	
Core Depth Shift Comment:			

Core Depth Shift Table		
Depth	Shift	Comment

Legend	
Lithology	
Sedimentary Structures	
Bioturbation	
Other Features	
Depositional Environment	
Facies	
Sample Type	
Sample Number	
Sample Depth	
Sample Comment	

Sample Number	Sample Depth	Sample Comment

Depth	Lithology	Sedimentary Structures	Bioturbation	Other Features	Depositional Environment	Facies	Sample Type	Sample Number	Sample Depth	Sample Comment



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Appendix VII

Log Analysis CPI Log

Kogge ds94-45
Petrophysical Interp.

Data Provided by:
COMPANY : Exploration
WELL : Kogge ds94-45
FIELD : Wildcat
COUNTY : Sublette
STATE : Wyoming
COUNTRY : USA
API # : 49-035-21-00-00
Date Logged : 11-Jul-1994
Date Processed : 11-Jul-1994
Depth Reference : KB
Elevation : KB 6127 GL 6107
Log Interval : 7100 - 7700
Data Interval : 7100 - 7700
Max Hole Angle : 0.0 Deg. @ 0
Bit Size : 7.875 in.
Fluid Type : Fresh Water
Max Temp : 0 Deg. F
Max Rec Temp : 0 Deg. F
Equipment : Schlumberger
Logging Unit : 5
Logging Engineer : Jones
Witnessed By : Mr. Kogge

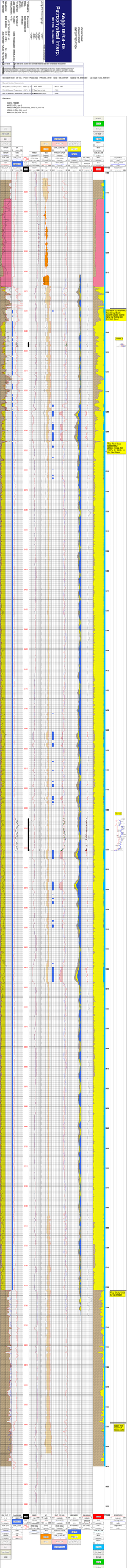
Disclaimer: Schlumberger makes no warranties or representations as to the accuracy of the information contained in this report.

Run Date & Time: 29-Jul-94 07:00:00 Process Date: PROCESS_DATE3 Cycle: v3.2_DEFAULT Baseline: v3.2_DEFAULT Log Scale: v3.2_DEFAULT

Run on Workstation Name: ds94-45

Pre or Measured Temperature: 0000.00 @ 0000.00 ° Bottom Hole: 0000.

Pre or Measured Temperature: 0000.00 @ 0000.00 ° Bottom Hole: 0000.

Pre or Measured Temperature: 0000.00 @ 0000.00 ° Bottom Hole: 0000.

Remarks:
DATA FROM
DIGITAL LAS
WELL.DPT and processed run 7 & 10-13
WELL.DPT
MWD CLEG run 12-13