1729

GEOLOGICAL WELL LOGGING
PETROLEUM INDUSTRIAL LABORATORIES

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OSLO 2

LITHOLGIC DISCRIPTION, POROSITY/PERMEABILITY, RESIDUAL LIQUID SATURATION, GRAIN DENSITY, CALCI/DOLOMETRY AND FLUORESCENCE.

WELL 30/7-2, INTERVAL 1753,0 - 1821,7
AND 1970,0 - 1989,17 (CORES 1 - 8).

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Date: 27.10.1975

File I.D.: NHy 1

CORE HANDLING PROCEDURE

A Unconsolidated samples

1. Samples (250 - 300 g) were taken at prescribed intervals (0,5 m) and sealed in plastic bags.
2. The samples were brought to the laboratory where retort analyses for residual liquid saturation analyses were conducted immidiately.
3. The samples were studied in fluoroscope.
4. Lithologic description was carried out.
5. Samples for specific gravity and grain size distribution were washed overnight in Soxhlet extractor. and dried in oven at 50°C.
6. Grain Density was detemined by pycnometer.

B Consolidated samples

1. The procedure for residual liquid saturation is identical to A 1-2.
2. The cores were slabbed and plugs drilled out and cut to size.
3. The plugs were washed in Soxhlet extractor to minimize stresses on them as they were very friable.
4. The plugs are dried overnight in drying oven at about 50°C.
5. Porosity measurements were conducted.
6. Permeability measurements were conducted.
7. Grain density was calculated from the porosity measurements.

LABORATORY PROCEDURES

A Residual liquid saturation by retort

1. 1st core was used for calibration purposes for the water analysis. Measured volume of water versus time to get the first plateau of the vol. water/time curve; this to get the free mobile water. See fig. 353F5, p. 22 in API: Recommended Practice for Core analysis Procedure (API RP 40, 1960).
   The temperature where this occured was 600°F (316°C) and the temperature for the free water was set at 600°F for the rest of the analysed cores.
2. The temperature was then raised to 1200°F (649°C) according to §3531, pp. 20 - 22 in API RP 40 (1960). To get the correct oil recovery we made an oil calibration curve similar to fig. 3.53.F4 in API RP40. The oil used was, for this purpose, 30°API. All oil volumes recorded are calibrated according to this calibration curve.

B Fluorescence by fluoroscope

The fluorescence was determined by visual inspection.

C Lithologic description by binocular microscope

See separate description for the classification system used.

D Grain Density by pycnometer

A portion of a weighed crushed extraction sample (bulk volume is measured prior to pulverizing) is used to displace an equivalent volume of liquid - e.g., toulene- in a volumetric flash. This displaced volume is determined, and knowing the weight of the core sample, the grain density may be calculated from the relationship:

Density = weight of sample/volume of sample (1)

The procedure should be reproducible to within + 0,5 of 1 porosity percent, provided the bulk volume measurement is equally precise.

E. Effective porosity measurements by Boyles law, single cell method

The effective pore volume is measured by compression of a known volume of gas (air) at atmospheric pressure into a core originally at atmospheric pressure.
See §3.3221, p. 17 and §3.5.10, p. 28 in API RP40.

The porosity measurements are conducted by 2 engineers and if the values differ with more than 1 % the analysis is repeated. The final porosity is the arithmethric mean of the accepted values.

F Gas permeability

For routine permeability measurements a Fancher core holder is used. Ruska permeameter, having a permeability range of approx. 0,5 mD to 3000 mD. Dry nitrogen (N_2) is used as gas.
For further information see § 3.4, p. 18 and § 3.5.15, p. 33-38 in API RP40.
The permeability measurements are performed by 2 engineers and analyses that differ more than 2 % are repeated. Recorded vale for permeability is the arithmetric mean of 2 measurements.

G Grain density calculated from porosity measurements

1. The plug is weighed on analytical balance.
2. Effective grainvolume (V_G) is calculated from the porosity measurements (Boyles law):
   Bulk vol. - interconnected porevol. = V_G
   $gamma_{grain}$ (g/cc) = (Weight plug)/V_G
   The method is quick and reliable in sandstones where effective and total pore volume for practical purposes can be taken as identical.
   When cement is present, the members for grain density may be too high because of trapped air. Crushed samples could have given more true values.

H Calci/dolometry

1. A constant pressure burette method is used (modified Bernard), where the reaction gasvolume is recorded. 50% HCl is used.

2. The reaction between $CaC0_3$ and HCl is fairly quick, and the volume measured after 1 min. reaction is recorded as calcite and the reaction volume after 15 min. minus the reaction volume after 1 min. is termed as dolomite content.

3. A calibration curve of reaction volumes with known quantities of calcite and dolomite is made. The air pressure is recorded during the calibration, and the recorded reaction volume can be corrected by using

$$Vcorr = \frac{Pcal\ Vcal}{Pcorr}$$

where Pcal = air pressure when cal. curve is made
Vcal = reaction vol. from known quantity of calcite or dolomite

Pcorr = pressure when measurements are conducted.

4. Using the calibration curve on Vcorr one may find the quantities of carbonates present in weighted sample which gives:

$$\text{Calci/dolometry \%} = \frac{\text{Quantities carbonates}}{\text{weight of sample.}}$$

NOTES

Mudcontamination

The unconsolidated cores 1-6 were received in sealed plastic bags and were contaminated by mud/mudfiltrate. The unconsolidated cores 7 and 8 were received unsealed and only slight mud contamination was observed. The contamination will give too high residual water values and probable displacement of oil will cause too low values for the residual oil content.

All the sealed cores were "overpressurized" at arrival. The bags looked like balloons.

Grain Density measurements

These measurements were first conducted by use of a Le Chatelier flask. The medium in the flask was destilled water, and although there was placed a few droplets wetting agent (NaOH) in the destilled water the results obtained were very unconsistent.

The unconsistency of the result could possibly be a result of oilwet surfaces, since all the samples used for grain density measurements were cleaned in cold solvent (toluene).

Before taking new measurements of grain density all the samples were cleaned in the Soxhlet extractor with boiling toluene.

Grain density measurements conducted with the pycnometer method, using oil as the medium, gave fairly consistent results. The listed values are pycnometer values.

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The SCANWELL Laboratory Classification System

and Terms are based upon:

COLOUR : Rock-colour Chart, 1970
Distributed by the
Geological Society of America

SORTING : FOLK, 1968 (see fig. A.1)

GRAIN SIZE : WENTWORTH, 1922

ROUNDNESS : POWERS, 1953 (see fig. A.2)

CLASSIFICATION: DOTT, 1964 ; FOLK, 1968
Reference in:
PETTIJOHN, POTTER, SIEVER, 1972
(see fig. 5.3)

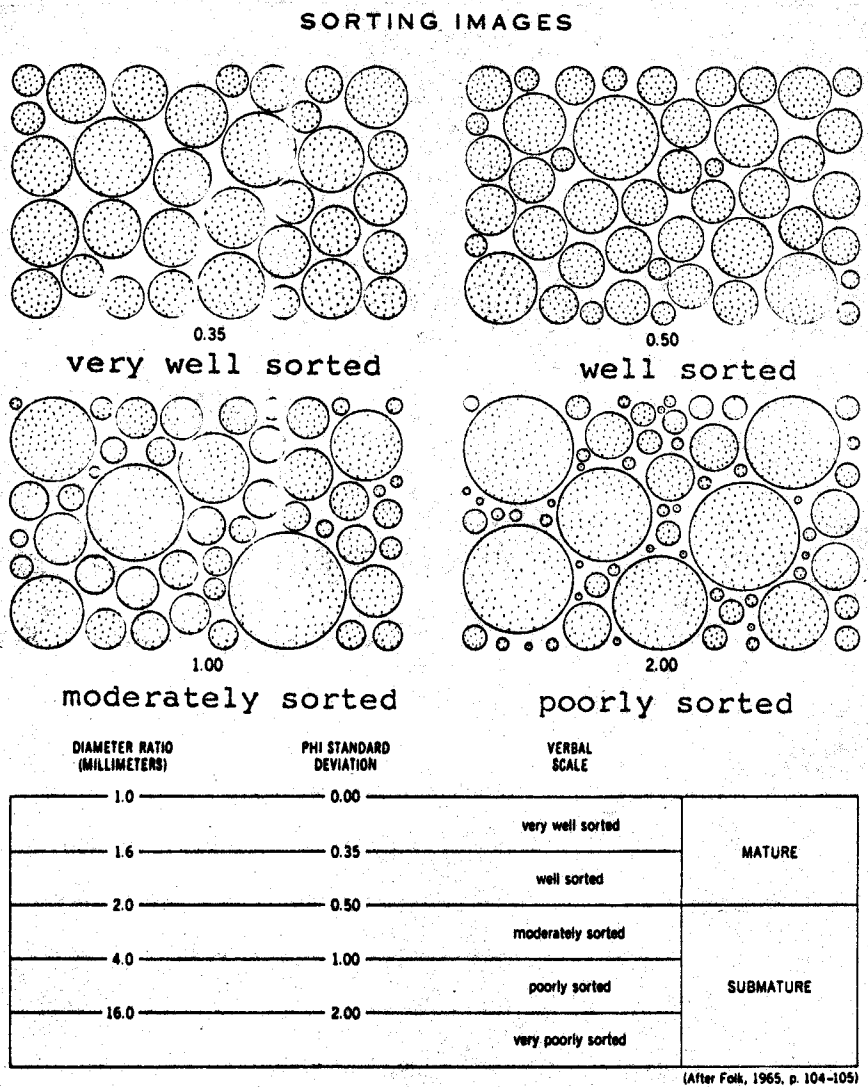

Fig. A-1. Comparison chart for sorting and sorting classes (Modified from Folk, 1968, p. 102)

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	U.S. Standard sieve mesh	Millimeters	Phi (ϕ) units	Wentworth size class
GRAVEL	Use wire squares	4096	−12	
		1024	−10	Boulder
		256	256 −8	
		64	64 −6	Cobble
		16	−4	Pebble
	5	4	4 −2	
	6	3.36	−1.75	
	7	2.83	−1.5	Granule
	8	2.38	−1.25	
	10	2.00	2 −1.0	
SAND	12	1.68	−0.75	
	14	1.41	−0.5	Very coarse sand
	16	1.19	−0.25	
	18	1.00	1 0.0	
	20	0.84	0.25	
	25	0.71	0.5	Coarse sand
	30	0.59	0.75	
	35	0.50	1/2 1.0	
	40	0.42	1.25	
	45	0.35	1.5	Medium sand
	50	0.30	1.75	
	60	0.25	1/4 2.0	
	70	0.210	2.25	
	80	0.177	2.5	Fine sand
	100	0.149	2.75	
	120	0.125	1/8 3.0	
	140	0.105	3.25	
	170	0.088	3.5	Very fine sand
	200	0.074	3.75	
	230	0.0625	1/16 4.0	
SILT	270	0.053	4.25	
	325	0.044	4.5	Coarse silt
		0.037	4.75	
		0.031	1/32 5.0	
		0.0156	1/64 6.0	Medium silt
	Use	0.0078	1/128 7.0	Fine silt
	pipette	0.0039	1/256 8.0	Very fine silt
MUD	or hydrometer	0.0020	9.0	
		0.00098	10.0	Clay
		0.00049	11.0	
		0.00024	12.0	
		0.00012	13.0	
		0.00006	14.0	

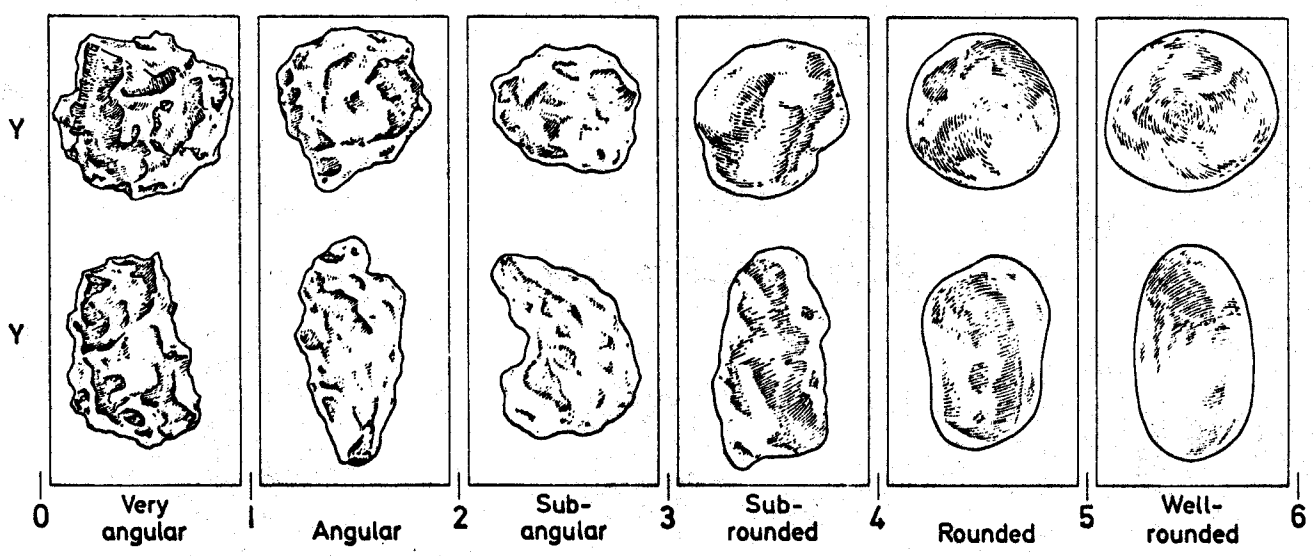

Fig. A-2. Roundness images and classes. Columns show grains of similar roundness but different sphericity (Redrawn from Powers, 1953, Fig. 1)

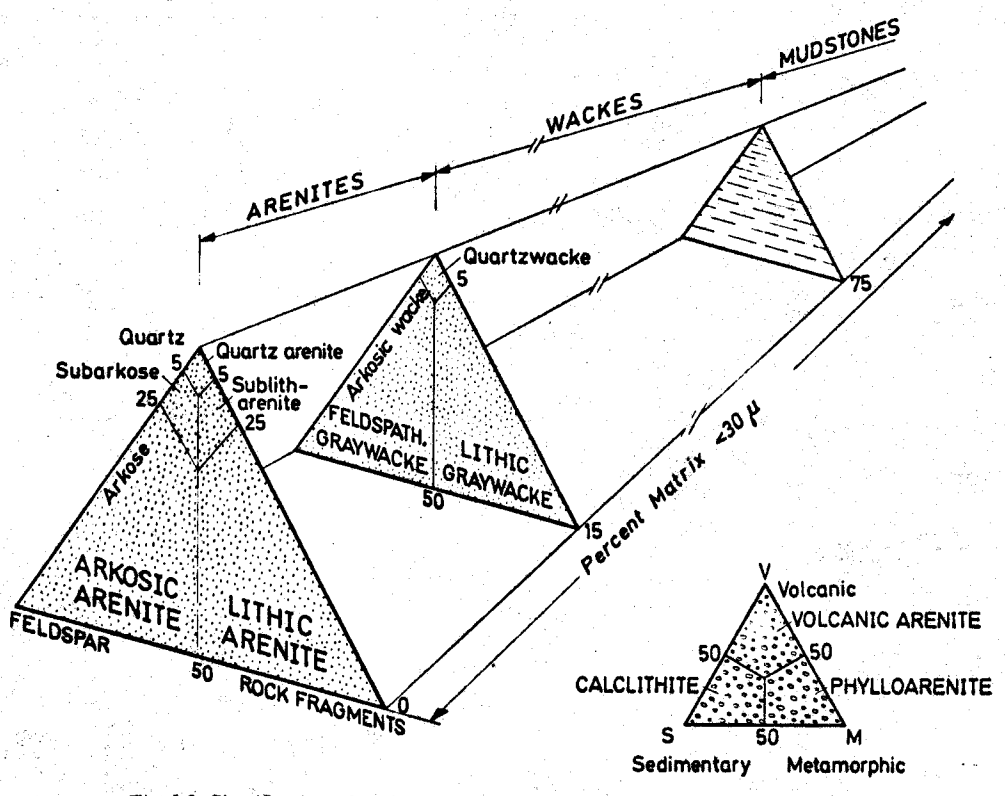

Fig. 5-3. Classification of terrigenous sandstones (Modified from Dott, 1964, Fig. 3)

References:

Dott, R.L., Jr., 1964. Wacke, graywacke and matrix - What approach to immature sandstone classification?
Jour. Sed. Petrology, 34: 625 - 632.

Folk, R.L., 1968. Petrology of sedimentary rocks.
Hemphills, Austin, Texas. 170 p.

Pettijohn, F.J., Potter, P.E. and Siever, R., 1972
Sand and Sandstone.
Springer-Verlag, Berlin-Heidelberg-New York.
618 p.

Powers, M.C., 1953. A new roundness scale for sedimentary particles.
Journ. Sed. Petrology, 23 : 117-119.

Wentworth, C.K., 1922. A scale of grade and class terms for clastic sediments.
Journ. Geology., 30: 377 - 392

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COMPANY NORSK HYDRO A/S

WELL 30-7-2

CORE No.1

RETORT ANALYSIS

DEPTH	WEIGHT WET SAMPLE g	WEIGHT DRY SAMPLE g	WEIGHT OF PORELIQUID %	TEMP: 600°F RECOVERY H_2O ml	TEMP: 1200°F RECOVERY OIL ml	REMARKS
1753,9	100,0	79,2	26,3	15,0	trace	Sulphur present [First recovery @ 450° F-470° F]
1754,2	50,0	41,3	21,1	6,8	trace	Trace of Sulphur -"-
1754,7	50,0	40,5	23,5	5,7	0,25	Sulphur present -"-
1755,2	100,0	80,8	23,8	14,4	0,4	-"- -"-
1755,7	100,0	80,9	23,6	14,6	0,5	-"- -"-
1756,2	100,0	83,7	19,5	14,0	0,75	Trace of Sulphur -"-
1756,7	100,0	86,6	15,5	11,7	0,9	-"- -"-
1757,2	100,0	88,4	13,1	6,2	0,25	-"- -"-
1757,7	100,0	89,2	12,1	9,8	0,6	-"- -"-
1758,2	100,0	86,3	15,9	12,3	1,4	-"- -"-
1758,7	100,0	86,7	15,3	4,3	0,5	-"-
1758,7 1759,0	100,0	84,8	17,9	6,6	2,35	-"-
1759,25	100,0	83,6	19,6	11,8	4,2	-"-
1759,75	100,0	85,1	17,5	11,2	0,5	-"-
1760,0-1760,24	100,0	83,3	20,0	11,0	3,4	-"-
1760,74	100,0	86,6	16,8	8,2	5,5	-"-
1761,24	100,0	84,2	18,8	10,0	2,6	-"-
1761,74	100,0	85,4	17,1	9,6	4,2	-"-
1762,24	100,0	86,0	16,3	9,5	4,8	-"-
1762,74	100,0	87,7	14,0	6,4	4,8	-"-

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CORE No.1

RETORT ANALYSIS

DEPTH	WEIGHT WET SAMPLE g	WEIGHT DRY SAMPLE g	WEIGHT OF PORELIQUID %	TEMP: 600 °F RECOVERY H_2O ml	TEMP: 1200 °F RECOVERY OIL ml	REMARKS
1763,2	100,0	87,5	14,3	trace	4,3	First recovery @ 450° F-470° F
1763,7	100,0	87,5	14,3	8,4	5,5	-"-
1764,2	100,0	87,2	14,7	7,3	5,5	-"-

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CORE No.2

RETORT ANALYSIS

DEPTH	WEIGHT WET SAMPLE g	WEIGHT DRY SAMPLE g	WEIGHT OF PORELIQUID %	TEMP: 600 °F RECOVERY H_2O ml	TEMP: 1200 °F RECOVERY OIL ml	REMARKS
1765,5	100,0	80,2	24,7	16,0	3,4	Sulphur present [First recovery 460° F-500° F
1765,7	100,0	79,5	25,8	16,0	4,4	-"- -"-
1766,5	100,0	81,4	22,9	7,7	3,7	-"- -"-
1767,0	100,0	81,6	22,5	12,0	4,4	-"- -"-
1767,5	100,0	80,7	23,9	14,3	5,1	-"- -"-
1768,0	100,0	80,1	24,8	8,6	2,75	-"-
1768,5	100,0	81,7	22,4	13,2	4,6	-"-
1769,0	100,0	82,7	20,9	13,0	4,5	-"-
1769,5	100,0	71,4	40,1	24,2	1,1	Sulphur present diffic.read.oillev. -"-
1770,0	100,0	79,6	25,6	17,2	0,5	-"- -"-
1770,5	100,0	80,1	24,8	15,8	0,6	-"- -"-
1771,0	100,0	83,6	19,6	8,0	0,75	-"- -"-
1771,5	100,0	83,7	19,5	5,4	2,6	-"-
1772,0	100,0	81,9	22,1	14,8	0,4	Sulphur present xln.sulphur diff.read.oillev. -"-
1772,5	100,0	81,3	23,0	13,3	3,75	Sulphur present -"-
1773,0	100,0	80,7	23,9	15,4	3,5	Sulphur present diff.read.oillev. [First rec. 530°-550° F
1773,5	100,0	80,7	23,9	13,1	4,4	-"- -"-
1774,0	100,0	81,5	22,7	12,6	4,5	-"- -"-
1774,5	100,0	84,8	17,9	10,6	4,75	-"- -"-
1775,0	100,0	85,1	17,5	9,4	5,1	-"- -"-

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CORE No.2

RETORT ANALYSIS

DEPTH	WEIGHT WET SAMPLE g	WEIGHT DRY SAMPLE g	WEIGHT OF PORELIQUID %	TEMP: 600 °F RECOVERY H_2O ml	TEMP: 1200 °F RECOVERY OIL ml	REMARKS
1775,5	100,0	81,6	22,5	14,0	appr.1,5	Recovery of oil difficult to determ.d.t.Sulphur cont. xln.sulphur-first rec.530° F
1776,0	100,0	83,5	19,8	10,3	trace	Sulphur present xln.Sulphur first rec. 530° F-550° F
1776,5	100,0	82,5	21,2	14,5	0,3	-"- -"-
1777,0	100,0	79,6	25,6	17,2	1,5	Sulphur present -"-
1777,5	100,0	86,7	15,3	7,7	4,5	-"- -"-
1778,0	100,0	85,8	16,6	0,9	0,75	-"- -"-
1778,5	100,0	84,6	18,2	9,6	5,2	-"- -"-
1779,0	100,0	83,8	19,3	10,7	4,9	-"- -"-
1779,5	100,0	83,1	20,3	9,7	4,9	-"- -"-
						NOTE: xln.):crystal form
						d.t.):due to
						diff.):difficult
						read.):reading
						oillev.):oil level
						cont.):content

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CORE No.3

RETORT ANALYSIS

DEPTH	WEIGHT WET SAMPLE g	WEIGHT DRY SAMPLE g	WEIGHT OF PORELIQUID %	TEMP: 600 °F RECOVERY H_2O ml	TEMP: 1200 °F RECOVERY OIL ml	REMARKS
1780,5	100,0	80,7	23,9	14,8	4,6	First recovery 500° F-530° F
1781,0	100,0	81,8	22,2	11,2	3,0	-"-
1781,5	100,0	82,3	21,5	14,2	3,75	-"-
1782,0	100,0	80,7	23,9	15,2	3,5	-"-
1782,5	100,0	79,1	26,4	16,4	3,0	-"-
1783,0	100,0	78,6	27,2	19,6	trace	-"-
1783,5	100,0	83,4	19,9	17,5	trace	-"-
1784,0	100,0	82,7	20,9	14,8	trace	-"-
1784,5	100,0	82,2	21,7	15,8	0,25	-"-
1785,0	100,0	83,2	20,2	14,5	0,25	-"-
1785,5	100,0	81,8	22,2	5,8	0,15	-"-
1786,0	100,0	82,2	21,7	17,4	0,25	-"-
1786,5	100,0	81,5	22,7	16,2	0,4	-"-
1787,0	100,0	82,1	21,8	15,6	1,0	Sulphur present -"-
1787,5	100,0	81,3	23,0	16,2	1,1	-"- -"-
1788.0	100,0	82,2	21,7	14,8	0,5	-"- diff.read.oill. -"-
1788,5	100,0	83,7	19,5	12,8	3,8	-"-
1789,0	100,0	82,5	21,2	14,0	2,8	-"-
1789,5	100,0	83,8	19,3	14,2	1,0	-"-
1790,0	100,0	83,7	19,5	14,8	0,75	-"-

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CORE No.3

RETORT ANALYSIS

DEPTH	WEIGHT WET SAMPLE g	WEIGHT DRY SAMPLE g	WEIGHT OF PORELIQUID %	TEMP: 600 °F RECOVERY H_2O ml	TEMP: 1200 °F RECOVERY OIL ml	REMARKS
1790,5	100,0	82,7	20,9	15,4	0,5	First recovery 500° F-530° F
1791,0	100,0	84,4	18,5	12,3	0,9	-"-
1791,5	100,0	83,7	19,5	14,3	0,75	-"-
1792,0	100,0	83,2	20,2	14,3	1,4	-"-

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CORE NO.4

RETORT ANALYSIS

DEPTH	WEIGHT WET SAMPLE g	WEIGHT DRY SAMPLE g	WEIGHT OF PORELIQUID %	TEMP: 600°F RECOVERY H_2O ml	TEMP: 1200°F RECOVERY OIL ml	REMARKS
1793,0	100,0	82,4	21,4	13,8	3,0	First recovery 450° F-470° F
1793,5	100,0	81,1	23,3	17,2	trace	-"-
1793,95	100,0	80,7	23,9	11,8	2,0	-"-
1794,5	100,0	81,6	22,5	14,6	1,4	-"-
1795,0	100,0	80,4	24,4	17,0	0,9	-"-
1795,5	100,0	82,8	20,8	15,0	1,1	-"-
1796,0	100,0	82,8	20,8	14,7	1,1	-"-
1796,5	100,0	80,7	23,9	17,2	1,75	-"-
1797,0	100,0	81,7	22,4	16,8	0,25	-"-
1797,5	100,0	82,4	21,4	16,0	0,4	-"-
1798,0	100,0	81,6	22,5	14,8	appr.1,5	Recovery of oil difficult to determ.d.t.Sulphur cont.
1798,5	100,0	87,3	14,5	8,8	appr. 1	Recovery of oil difficult to determ.d.t.Sulphur cont.
1799,0	100,0	82,2	21,7	16,8	0,15	-"-
1799,5	100,0	82,3	21,5	17,2	0,15	-"-
1800,0	100,0	81,8	22,2	16,3	0,25	-"-
1800,5	100,0	82,5	21,2	15,8	0,25	-"-

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WELL 30-7-2

CORE No.5

RETORT ANALYSIS

DEPTH	WEIGHT WET SAMPLE g	WEIGHT DRY SAMPLE g	WEIGHT OF PORELIQUID %	TEMP: 600°F RECOVERY H_2O ml	TEMP: 1200°F RECOVERY OIL ml	REMARKS
1802,5	100,0	84,5	18,3	8,2	0,4	Sulphur present [First recovery 520° F-540° F
1803,0	100,0	76,4	30,9	20,5	0,15	Sulphur present xln.sulphur diff.read.oill. -"-
1803,5	100,0	79,5	25,8	15,5	0,15	-"- -"-
1804,0	100,0	85,8	16,6	10,5	0,15	-"- -"-
1804,5	100,0	82,8	20,8	13,7	2,8	Sulphur present -"-
1805,0	100,0	79,7	25,5	15,3	3,8	-"- -"-
1805,5	100,0	84,1	18,9	10,3	5,4	-"-
1806,0	100,0	84,4	18,5	10,7	4,8	-"-
1806,5	100,0	85,1	17,5	10,5	4,2	-"-
1807,0	100,0	81,4	22,8	10,4	4,1	-"-
1807,5	100,0	79,7	25,5	9,9	4,3	-"-
1808,0	100,0	83,7	19,5	9,8	4,4	-"-
1808,5	100,0	83,8	19,3	11,6	3,75	-"-
1809,0	100,0	83,3	20,0	12,8	3,75	Sulphur present [First recovery @ 500° F
1809,5	100,0	80,1	24,8	14,2	3,4	-"- -"-
1810,0	100,0	82,2	21,7	13,2	4,0	-"- -"-
1810,5	100,0	81,7	22,4	14,3	4,0	-"- -"-
1811,0	100,0	82,6	21,1	13,6	4,0	-"- -"-
1811,5	100,0	82,1	21,8	12,8	4,6	-"- -"-
1812,0	100,0	79,5	25,8	15,8	4,1	-"- -"-

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The Continental Shelf Division
of The Royal Norwegian Council for Scientific and Industrial Research

COMPANY NORSK HYDRO A/S

WELL 30-7-2

CORE No.5

RETORT ANALYSIS

DEPTH	WEIGHT WET SAMPLE g	WEIGHT DRY SAMPLE g	WEIGHT OF PORELIQUID %	TEMP: 600 °F RECOVERY H_2O ml	TEMP: 1200 °F RECOVERY OIL ml	REMARKS
1812,5	100,0	81,2	23,2	14,7	4,5	Sulphur present [First recovery @ 500° F]
1813,0	100,0	81,9	22,1	14,1	4,75	-"- -"-
1813,5	100,0	84,3	18,6	12,0	3,75	-"- -"-
1814,1	100,0	67,1	49,0	28,8	1,4	Sulphur present diff.read.oillev. -"-
1814,5	100,0	85,3	17,2	10,7	2,2	-"- -"-
1815,0	100,0	85,4	17,1	10,0	3,1	-"- -"-
1815,5	100,0	86,5	15,6	8,9	4,5	Sulphur present -"-
1816,0	100,0	79,3	26,1	14,3	1,4	-"- -"-

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COMPANY NORSK HYDRO A/S

WELL 30-7-2

CORE No.6

RETORT ANALYSIS

DEPTH	WEIGHT WET SAMPLE g	WEIGHT DRY SAMPLE g	WEIGHT OF PORELIQUID %	TEMP: 600 °F RECOVERY H_2O ml	TEMP: 1200 °F RECOVERY OIL ml	REMARKS
1819,0	100,0	81,9	22,1	8,9	0,9	First recovery 500° F-520° F
1819,5	100,0	86,0	16,3	3,3	trace	-"-
1820,0	100,0	83,5	19,8	5,4	trace	-"-
1820,5	100,0	80,8	23,8	15,6	0,25	-"-
1821,0	100,0	80,1	24,8	18,4	0,4	-"-
1821,5	100,0	80,7	23,9	17,5	0,25	-"-

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COMPANY NORSK HYDRO A/S

WELL 30-7-2

CORE No.7

RETORT ANALYSIS

DEPTH	WEIGHT WET SAMPLE g	WEIGHT DRY SAMPLE g	WEIGHT OF PORELIQUID %	TEMP: 600 °F RECOVERY H_2O ml	TEMP: 1200 °F RECOVERY OIL ml	REMARKS
1970,0	50,0	41,0	22,0	6,3	trace	NOTE:CORE NO.7 ARRIVED UNSEALED FROM RIG
1970,5	50,0	41,8	19,6	6,2	0	
1971,0	50,0	41,3	21,1	6,2	0	
1971,5	50,0	38,2	30,9	0,6	trace	
1972,0	50,0	40,9	22,2	5,2	0	
1972,5	50,0	34,6	44,5	8,2	0	Sulphur in crystalline form
1973,0	50,0	41,1	21,7	6,9	0	
1973,5	50,0	42,1	18,8	3,8	0	
1974,0	50,0	41,8	19,6	6,1	trace	
1974,5	50,0	40,5	23,5	6,4	0	Sulphur present in sample
1975,0	50,0	40,8	22,5	7,8	trace	-"-
1975,5	50,0	38,1	31,2	5,9	0,15	-"-
1976,0	50,0	41,3	21,1	3,6	0,3	
1976,5	50,0	41,8	19,6	1,7	0	
1977,0	50,0	44,8	11,6	4,5	trace	
1977,5	50,0	46,1	8,5	1,9	trace	Sulphur present in sample
1978,0	50,0	45,7	9,4	3,7	trace	
1978,5	50,0	45,3	10,4	3,0	trace	
1979,0	50,0	45,8	9,2	3,1	trace	

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COMPANY NORSK HYDRO A/S

WELL 30-7-2

CORE No.8

RETORT ANALYSIS

DEPTH	WEIGHT WET SAMPLE g	WEIGHT DRY SAMPLE g	WEIGHT OF PORELIQUID %	TEMP: 600°F RECOVERY H_2O ml	TEMP: 1200°F RECOVERY OIL ml	REMARKS
1983,7	50,0	43,0	16,3	5,1	trace	NOTE: CORE NO.8 ARRIVED UNSEALED FROM RIG
1984,2	50,0	42,9	16,6	4,6	trace	Trace Sulphur in sample
1984,7	50,0	43,2	15,7	5,0	trace	
1985,2	50,0	42,5	17,6	3,4	0,3	(Possible Sulphur present)
1985,7	50,0	45,1	10,9	2,6	0	
1986,2	50,0	46,0	8,7	1,9	0	Sulphur in Sample
1986,7	50,0	48,9	2,2	0	0	
1987,2	50,0	46,0	8,7	2,8	trace	
1988.0	50,0	38,6	29,5	9,2	trace	Sulphur in Sample
1988,7	50,0	44,0	13,6	2,2	trace	-"-
1989,2	50,0	44,1	13,4	3,8	trace	-"-

COMPANY NORSK HYDRO A/S

COUNTRY NORWAY

WELL I.D. 30/7-2

CORE NO. 1 INTERVAL 1753,0 m - 1764,5 m

ENGINEERS F.E.S./R.K.B./K.S./E.H./A.M.M.

DATE 27/10-75 FILE I.D. NHy-1

Sand, Sandstone
Silt
Quartzite
Conglomerate
Shale
Clay
Silty Shale

Limestone
Dolomite
Salt
Gypsum
Anhydrite
Coal, Lignite

Métamorphic rock
Extrusive rock
Intrusive rock

DEPTH Meter	SAMPLE	HORIZ. PERM. MD	VERT. PERM. MD	POROSITY %	Liquid SATURATION PORE SPACE ml OIL	TOTAL WATER	GRAIN DENSITY g/cc	CALCI/DOLOMETRY % 100 0	COMPLETION COREGRAPH PERMEABILITY MILLIDARCYS scale 1 scale 2 POROSITY % PERCENT 40 30 20 10 0 oil/water ratio % 0 30 40 60 80	FLUOR ESCENCE TRACE FAIR GOOD	LITHOLOGY	DESCRIPTIONS ENGINEERING REMARKS
1753,9	←	—	—	—	Tr.	15,0				X		1753,0 — 1753,6 LITHIC GREYWACKE Greyish olive green, poorly sorted very fine to medium sized sand. Grains are subangular to angular. The sand is friable with very small amount of cement. Quartz (50 %), mica (10 - 15 %), glauconite (35 %), heavy minerals (1-2 %). Mica and glauconite in layers. Visual porosity is bad to fair. No oil and fossils.
1754,2	←	—	—	—	Tr.	13,6				X		
1754,7	←	—	—	—	0,5	11,4				X		Approx. 1753,6 — 1754,78 MUDSTONE Dark greenish grey, poorly cemented clay with layers of very fine silt. Layers of very fine silt consisting of quartz, mica and glauconite in quantities similar to lithic greywacke above. Visual porosity bad. No oil and fossils.
1755,2	←	—	—	—	0,4	14,4				X		1754,78 — 1756,38 LITHIC GREYWACKE Similar to top section 1753,0- approx. 1753,6 , except that there is no cement. Porosity is fair to good and free oil is observed. No fossils.
1755,7	←	—	—	—	0,5	14,6				X		
1756,2	←	—	—	—	0,75	14,0	2,78			X		1756,38 — 1759,38 QUARTZ ARENITE Light grey, well sorted medium grained loose sand subrounded quartz(95 %) mica (2-3 %). Glauconite (1%). Good porosity and free oil observed. No fossils.
1756,7	←	—	—	—	0,9	11,7				X		
1757,2	←	—	—	—	0,25	6,2				X		
1757,7	←	—	—	—	0,6	9,8				X		
1758,2	←	—	—	—	1,4	12,3				X		
1758,7	←	—	—	—	0,5	4,3	2,66			X		
	←	—	—	—	2,4	6,6				X		
1759,25	←	—	—	—	4,2	11,8				X		1759,38 — 1759,5 MUDSTONE As section 1753,6 - 1754,78. No oil. No fossils observed. 1759,5 — 1759,8 LITHIC GREYWACKE As top section.
1759,75	←	—	—	—	0,5	11,2				X		
1760,24	←	—	—	—	3,4	11,0				X		
1760,74	←	—	—	—	5,5	8,2				X		QUARTZ ARENITE As section 1756,38 - 1759,38 with slight variations in grain size distribution and quantities oil observed.
1761,24	←	—	—	—	2,6	10,0	2,67			X		
1761,74	←	—	—	—	4,2	9,6				X		
1762,24	←	—	—	—	4,8	9,5				X		
1762,74	←	—	—	—	4,8	6,4				X		
1763,2	←	—	—	—	4,3	Tr.				X		
1763,7	←	—	—	—	5,5	8,4	2,66			X		
1764,2	←	—	—	—	5,5	7,3				X		

COMPANY NORSK HYDRO A/S

COUNTRY NORWAY

WELL I.D. 30/7-2

CORE NO. 2 INTERVAL 1765,2 m - 1780,2 m

ENGINEERS F.E.S./R.K.B./K.S./E.H./A.M.M.

DATE 27/10-75 FILE I.D. NHy-1

Sand, Sandstone
Silt
Quartzite
Conglomerate
Shale
Clay
Silty Shale

Limestone
Dolomite
Salt
Gypsum
Anhydrite
Coal, Lignite

Métamorphic rock
Extrusive rock
Intrusive rock

DEPTH Meter	SAMPLE	HORIZ. PERM. MD	VERT. PERM. MD	POROSITY %	Liquid SATURATION PORE SPACE ml OIL	TOTAL WATER	GRAIN DENSITY g/cc	CALCI/DOLO-METRY % 100 0	COMPLETION COREGRAPH PERMEABILITY MILLIDARCYS scale 1 scale 2 POROSITY PERCENT 40 30 20 10 0 oil/water ratio % 0 20 40 60 80	FLUOR ESCENCE TRACE FAIR GOOD	LITHOLOGY
1765,5	◄	—	—	—	3,4	16,0					X
1765,7	◄	—	—	—	4,4	16,0	2,67				X
1766,0											
1766,5	◄	—	—	—	3,7	7,7					X
1767,0	◄	—	—	—	4,4	12,0					X
1767,5	◄	—	—	—	5,1	14,3					X
1768,0	◄	—	—	—	2,8	8,6					X
1768,5	◄	—	—	—	4,6	13,2	2,68				X
1769,0	◄	—	—	—	4,5	13,0					X
1769,5	◄	—	—	—	1,1	24,2					X
1770,0	◄	—	—	—	0,5	17,2					X
1770,5	◄	—	—	—	0,6	15,8	2,71				X
1771,0	◄	—	—	—	0,8	8,0					X
1771,5	◄	—	—	—	2,6	5,4					X
1772,0	◄	—	—	—	0,4	14,8					X
1772,5	◄	—	—	—	3,8	13,3					X
1773,0	◄	—	—	—	3,5	15,4					X
1773,5	◄	—	—	—	4,4	13,1	2,66				X
1774,0	◄	—	—	—	4,5	12,6					X
1774,5	◄	—	—	—	4,8	10,6					X
1775,0	◄	—	—	—	5,1	9,4					X
1775,5	◄	—	—	—	1,5	14,0					X
1776,0	◄	—	—	—	Tr.	10,3	2,63				X
1776,5	◄	—	—	—	0,3	14,5					X
1777,0	◄	—	—	—	1,5	17,2					X
1777,5	◄	—	—	—	4,5	7,7					X
1778,0	◄	—	—	—	0,8	0,9					X
1778,5	◄	—	—	—	5,2	9,6					X
1779,0	◄	—	—	—	4,9	10,7	2,67				X
1779,5	◄	—	—	—	4,9	9,7					X
1780,0	—	—	—	—	—	—					

1765,2 — 1769,4

SUBLITHARENITE Light olive grey, loose, moderately sorted medium sized sand with subrounded grains. Quartz (90 %), mica (10 %). No fossils. Free oil between the grains.

1769,4 — 1771.0

LITHIC GREYWACKE Dark greenish grey, layered, friable, poorly sorted silt with large blades of mica. Besides quartz and mica, zircon is a prominent heavy mineral. No smell of oil.

1771.0 — 1772.0

QUARTZ ARENITE Light brownish grey, loose, well sorted, medium sand of rounded quartz grains. Free oil between the grains.

1772.0 — 1772.5

LITHIC GREYWACKE As 1769.4 - 1771.0

1772.5 — 1775.5

SUBLITHARENITE Light olive grey, loose, well sorted, medium sized sand with rounded quartz grains. Pockets of greenish silt with glauconite.

1775.5 — 1777.0

LITHIC GREYWACKE Dark greenish grey, layered, friable, poorly sorted, sandy silt with angular grains. Quartz, mica and glauconite. No smell of oil.

1777.0 — 1780.2

QUARTZ ARENITE Light olive grey, loose, moderately sorted, medium sand of subrounded quartz grains. Free oil between the grains.

COMPANY NORSK HYDRO A/S

COUNTRY NORWAY

WELL I.D. 30/7-2

CORE NO. 3 INTERVAL 1780,2 m - 1792,4 m

ENGINEERS F.E.S./R.K.B./K.S./E.H./A.M.M. DATE 27/10-75 FILE I.D. NHy-1

Sand, Sandstone
Silt
Quartzite
Conglomerate
Shale
Clay
Silty Shale

Limestone
Dolomite
Salt
Gypsum
Anhydrite
Coal, Lignite

Métamorphic rock
Extrusive rock
Intrusive rock

DEPTH Meter	SAMPLE	HORIZ. PERM. MD	VERT. PERM. MD	POROSITY %	Liquid SATURATION PORE SPACE ml OIL	TOTAL WATER	GRAIN DENSITY g/cc	CALCI/DOLOMETRY % 100 0	COMPLETION COREGRAPH PERMEABILITY MILLIDARCYS scale 1 scale 2 POROSITY PERCENT 40 30 20 10 0 oil/water ratio % 0 20 40 60 80	FLUORESCENCE TRACE	FAIR	GOOD	LITHOLOGY	DESCRIPTIONS ENGINEERING REMARKS
1780,5	←	—	—	—	4,6	14,8						X		1780.2 — 1782.7 QUARTZ ARENITE Light olive grey, loose, moderately sorted, medium sand. Subrounded to rounded grains. Quartz (98 %), mica (1 %), heavy minerals (1 %). No visible fossils. Free oil is flowing on the sand.
1781,0	←	—	—	—	3,0	11,0	2,67					X		
1781,5	←	—	—	—	3,8	14,2						X		
1782,0	←	—	—	—	3,5	15,2						X		
1782,5	←	—	—	—	3,0	16,0						X		
1783,0	←	—	—	—	Tr.	19,6						X		1782.7 — 1783.3 QUARTZ ARENITE As above. No oil.
1783,5	←	—	—	—	Tr.	17,5	2,63					X		1783.3 — 1787.0 SUBLITHARENITE As above, but with more mica.
1784,0	←	—	—	—	Tr.	14,8						X		
1784,5	←	—	—	—	0,3	15,8						X		
1785,0	←	—	—	—	0,3	14,8						X		
1785,5	←	—	—	—	0,2	5,8						X		
1786,0	←	—	—	—	0,3	17,4	2,62					X		
1786,5	←	—	—	—	0,4	16,2						X		
1787,0	←	—	—	—	1,0	14,2						X		1787.0 — 1792.4 SUBLITHARENITE As above. Mica up to 2-3 mm size.
1787,5	←	—	—	—	1,1	16,2						X		
1788,0	←	—	—	—	0,5	14,8						X		
1788,5	←	—	—	—	3,8	12,8						X		
1789,0	←	—	—	—	2,8	14,0	2,68					X		
1789,5	←	—	—	—	1,0	14,2						X		
1790,0	←	—	—	—	0,8	14,8						X		
1790,5	←	—	—	—	0,5	15,4						X		
791,0	←	—	—	—	0,9	12,3	2,68					X		
91,5	←	—	—	—	0,8	14,3						X		
,0	←	—	—	—	1,4	14,3						X		

COMPANY NORSK HYDRO A/S

COUNTRY NORWAY

WELL I.D. 30/7-2

CORE NO. 4 INTERVAL 1792,4 m - 1800,5 m

ENGINEERS F.E.S./R.K.B./K.S./E.H./A.M.M. DATE 27/10-75 FILE I.D. NHy-1

Sand, Sandstone
Silt
Quartzite
Conglomerate
Shale
Clay
Silty Shale

Limestone
Dolomite
Salt
Gypsum
Anhydrite
Coal, Lignite

Métamorphic rock
Extrusive rock
Intrusive rock

DEPTH Meter	SAMPLE	HORIZ. PERM. MD	VERT. PERM. MD	POROSITY %	Liquid SATURATION PORE SPACE ml OIL	TOTAL WATER	GRAIN DENSITY g/cc	CALCI/DOLOMETRY % 100 0	COMPLETION COREGRAPH PERMEABILITY MILLIDARCYS scale 1 scale 2 POROSITY PERCENT oil/water ratio %	FLUORESCENCE TRACE FAIR GOOD	LITHOLOGY	DESCRIPTIONS ENGINEERING REMARKS
1793,0	←	—	—	—	3,0	138				X		1792,4 — 1796,75 QUARTZ ARENITE Light olive grey, loose, moderately sorted, medium sand with subrounded grains. Quartz (98 %), mica 1-2 mm (1%). Few heavy minerals. No visible fossils. Free oil between the grains.
1793,5	←	—	—	—	Tr.	172	2,66			X		
1793,95	←	—	—	—	2,0	118						
1794,5	←	—	—	—	1,4	146				X		
1795,0	←	—	—	—	0,9	170				X		
1795,5	←	—	—	—	1,1	150				X		
1796,0	←	—	—	—	1,1	14,7	2,64			X		
1796,5	←	—	—	—	1,8	172						1796.75 — 1797,25 QUARTZ ARENITE As above but with less free oil, only tracen.
1797,0	←	—	—	—	0,3	168				X		
1797,5	←	—	—	—	0,4	160						1797.25— 1798.0 QUARTZ ARENITE As above but less well sorted. No oil
1798,0	←	—	—	—	Ca. 1,5	148				X		1798.0 — 1798.7 LITHIC GREYWACKE Mottled siltstone. Pockets of light grey medium grained sand in dark greenish grey, friable, poorly sorted silt to fine sand. Angular grains, quartz glauconite and mica in larger blades up to 1 mm in size. No visible oil.
1798,5	←	—	—	—	Ca. 1,0	88	2,76					
1799.0	←	—	—	—	0,2	16,0				X		1798.7 — 1800,5 QUARTZ ARENITE Light olive grey, loose, well sorted, medium grained sand of subrounded grains. Quartz (95 %), mica (1-2 %), glauconite (2 %), heavy minerals (1 %). No visible fossils, good porosity, no oil.
1799,5	←	—	—	—	0,2	172				X		
1800,0	←	—	—	—	0,3	163				X		
1800,5	←	—	—	—	0,3	158	2,64			X		

COMPANY NORSK HYDRO A/S

COUNTRY NORWAY

WELL I.D. 30/7-2

CORE NO. 5 INTERVAL 1802,5 m - 1816,2 m

ENGINEERS F.E.S./R.K.B./K.S./E.H./A.M.M. DATE 27/10-75 FILE I.D. NHy-1

Sand, Sandstone
Silt
Quartzite
Conglomerate
Shale
Clay
Silty Shale

Limestone
Dolomite
Salt
Gypsum
Anhydrite
Coal, Lignite

Métamorphic rock
Extrusive rock
Intrusive rock

DEPTH Meter	SAMPLE	HORIZ. PERM. MD	VERT. PERM. MD	POROSITY %	Liquid SATURATION PORE SPACE ml OIL	TOTAL WATER	GRAIN DENSITY g/cc	CALCI/DOLOMETRY % 100 0	COMPLETION COREGRAPH PERMEABILITY MILLIDARCYS scale 1 scale 2 POROSITY PERCENT 40 30 20 10 0 oil/water ratio % 0 20 40 60 80	FLUORESCENCE TRACE FAIR GOOD	LITHOLOGY
1802,5		—	—	—	0,4	8,2				X	
1803,0		—	—	—	0,2	20,5	2,67			X	
1803,5		0,1	0,1	5,1 6,4 7,1	—	—	—			X	
1804,0		—	—	—	0,2	10,5				X	
1804,5		—	—	—	2,8	13,7				X	
1805,0		—	—	—	3,8	15,3				X	
1805,5		—	—	—	5,4	10,3	2,65			X	
1806,0		—	—	—	4,8	10,7				X	
1806,5		—	—	—	4,2	10,5				X	
1807.0		—	—	—	4,1	10,4				X	
1807,5		—	—	—	4,3	9,9				X	
1808,0		—	—	—	4,4	9,8	2,68			X	
1808,5		—	—	—	3,8	11,6				X	
1809,0		—	—	—	3,8	12,8				X	
1809,5		—	—	—	3,4	14,2				X	
1810,0		—	—	—	4,0	13,2				X	
1810,5		—	—	—	4,0	10,5	2,70			X	
1811,0		—	—	—	4,0	13,6				X	
1811,5		—	—	—	4,6	12,8				X	
1812,0		—	—	—	4,1	15,8				X	
1812,5		—	—	—	4,5	14,7				X	
1813,0		—	—	—	4,8	14,1	2,64			X	
1813,5		—	—	—	3,8	12,0				X	
1814,0		—	—	—	1,4	28,8				X	
1814,5		—	—	—	2,2	10,7				X	
1815,0		—	—	—	3,1	10,0				X	
1815,5		—	—	—	4,5	8,9	2,70			X	
1816,0		—	—	—	1,4	14,3				X	

DESCRIPTIONS
ENGINEERING REMARKS

1802.5 — 1803.05
LITHIC GREYWACKE Dark olive grey, friable, silt and very fine sand. Rich in mica and glauconite. Fair porosity, no smell of oil.

1803.05 — 1803.5
SUBLITHARENITE Light grey, hard, silty, finegrained sandstone with subrounded grains. Quartz (90 %) and mica (10 %). Low visual porosity, calcite cement No oil.

1803.5 — 1804.9
LITHIC GREYWACKE Like 1802.5 - 1803.05

1804.9 — 1805.3
SUBLITHARENITE Brownish grey, loose, well sorted fine sand with subrounded grains. Quartz (90 %). Free oil is flowing on the sample.

1805.3 — 1806.5
QUARTZ ARENITE Brownish grey, loose, moderately sorted, medium sand. Rounded grains of quartz (95 %). Mica, glauconite and others make up about 5 %. Free oil is flowing on the sample.

1806.5 — 1806.9
SUBLITHARENITE Light grey, loose, micaceus, well sorted, fine sand. Rounded grains of quartz (90 %). Mica and glauconite (10 %). Oil stains.

1806.9 — 1807.55
SUBLITHARENITE Brownish grey, loose, poorly sorted, fine sand. Subrounded grains of quartz (90 %) and mica (10 %). Lots of free oil is flowing on the sample.

1807.55 — 1809.2
SUBLITHARENITE As 1806.5 - 1806.9

1809.2 — 1813.2
QUARTZ ARENITE Light grey, loose, well sorted, fine grained. Subrounded grains. Quartz (99 %), mica and accessory minerals (1 %). No fossils. Traces of oil stick to the grains.

1813.2 — 1813.5
SUBLITHARENITE Light grey, loose, poorly sorted silt and finegrained sand alternating. Subrounded grains. Quartz-sand and glauconite-rich silt. No visible fossils. Free oil between the grains.

1813.5 — 1814.1
QUARTZ ARENITE Light grey, loose, well sorted, medium sand. Subrounded grains. Quartz (99 %) mica and glauconite (1 %). No visible fossils. Trace of oil.

1814.1 — 1814.3
MUDSTONE Dark olive grey, cohesive clayey silt. Sandsized nodules of glauconite are common. Low visual porosity. No visible fossils. Smell of oil.

1814.3 — 1814.5
LITHIC GREYWACKE Medium olive grey, micaceous, poorly sorted, friable silt to very fine sand. Rich in mica and glauconite. Low visible porosity, no visible fossils, no smell of oil.

1814.5 — 1814.9
LITHIC ARENITE Medium brownish grey, loose, moderately sorted fine sand with dark greenish grey nodules of cohesive silt with glanconite. Smell of oil.

1814.9 — 1815.0
MUDSTONE As 1814.1 - 1814.3

1815.0 — 1816.2
LITHIC ARENITE As 1814.5 - 1814.9

scanwell AKSJESELSKAP

COMPANY NORSK HYDRO A/S

COUNTRY NORWAY

WELL I.D. 30/7-2

CORE NO. 6 INTERVAL 1819,0 m - 1821,7 m

ENGINEERS F.E.S./R.K.B./K.S./E.H./A.M.M. DATE 27/10-75 FILE I.D. NHy-1

Sand, Sandstone
Silt
Quartzite
Conglomerate
Shale
Clay
Silty Shale

Limestone
Dolomite
Salt
Gypsum
Anhydrite
Coal, Lignite

Métamorphic rock
Extrusive rock
Intrusive rock

DEPTH Meter	SAMPLE	HORIZ. PERM. MD	VERT. PERM. MD	POROSITY %	Liquid SATURATION PORE SPACE ml OIL	TOTAL WATER	GRAIN DENSITY g/cc	CALCI/DOLOMETRY % 100 0	COMPLETION COREGRAPH PERMEABILITY MILLIDARCYS scale 1 scale 2 POROSITY PERCENT 40 30 20 10 0 oil/water ratio % 0 20 40 60 80	FLUORESCENCE TRACE	FAIR	GOOD	LITHOLOGY
1819,0	←	—	—	—	0,9	8,9					X		
1819,5	←	—	—	—	Tr.	3,3					X		
1820,0	←	—	—	—	Tr.	5,4	2,64				X		
1820,5	←	—	—	—	0,3	15,6					X		
1821,0	←	—	—	—	0,4	18,4						X	
1821,5	←	—	—	—	0,3	17,5	2,68				X		

DESCRIPTIONS
ENGINEERING REMARKS

1819.0 — 1821.70

QUARTZ ARENITE Light grey, loose, poorly to moderately sorted, medium sand. Quartz (99 %), mica (1 % or less). No heavy minerals observed. No fossils, no free oil.

COMPANY NORSK HYDRO A/S

COUNTRY NORWAY

WELL I.D. 30/7-2

CORE NO. 7 INTERVAL 1970,0 m - 1979,0 m

ENGINEERS F.E.S./R.K.B./K.S./E.H./A.M.M.

DATE 27/10-75 FILE I.D. NHv-1

Sand, Sandstone
Silt
Quartzite
Conglomerate
Shale
Clay
Silty Shale

Limestone
Dolomite
Salt
Gypsum
Anhydrite
Coal, Lignite

Métamorphic rock
Extrusive rock
Intrusive rock

DEPTH Meter	SAMPLE	HORIZ. PERM. MD	VERT. PERM. MD	POROSITY %	Liquid SATURATION PORE SPACE % OIL	TOTAL WATER	GRAIN DENSITY g/cc	CALCI/DOLO-METRY % 100 0	COMPLETION COREGRAPH PERMEABILITY MILLIDARCYS scale 1: 0-2500 scale 2: 0-500 POROSITY % PERCENT 40 30 20 10 0 TOTAL WATER PERCENT PORE SPACE 0-100 OIL SATURATION % PERCENT PORE SPACE 0 20 40 60 80	FLUOR ESCENCE TRACE FAIR GOOD	LITHOLOGY	DESCRIPTIONS ENGINEERING REMARKS
1971,15	2049	—	34,7	Tr.	80,5	2,65		Scale 1	X		1970,0 — 1971,3 Quarts arenite Grayish olive green,loose,moderately sorted medium sized sand,with subangular to subrounded grains.Quarts (98%),mica (1%),acc.(1%).Some of the mica flaces are 0.5-1.0 in size.Visual porosity good.No visible free oil,but smell of oil.Grains are 100% water wet.No fossils observed.
											1971,3 — 1971,8 Mudstone Dusky blue green,cohesive clay to fine silt.Pockets of coarse silt,fine sand are common.Visuals porosity are poor. No fossile.No smell of oil.
											1971,8 — 1972,0 Lithic greywacke Dusky blue green to grayish olive green pooly sorted cohesive medium sized sand.Glauconite nodules observed. Visual porosity poor.Smell of oil,but no free oil observed.No fossils.
											1972,0 — 1972,65 Mudstone Dusky,blue green cohesive very fine silt to clay.Small pockets of very fine sand.Poorly consolidated,and splits readily along bedding planes.Visual porosity poor.No smell of oil.No fossils observed.
											1972,65 — 1974,2 Sublith arenite Grayish olive green,fine to medium sized,easily freeable poorly sorted sand.Sandgrains are subangular to angular. Quartz (90%),mica (3-5%),glauconite (1-3%),acc.(2-6%).Visual porosity fair to good.Smell of oil,but no free oil observed.
1973,75	1463	—	34,1	Tr.	79,2	2,64					
1974,0	1647	—	34,7	Tr.	79,2	2,64					1974,2 — 1974,7 Mudstone Dusky blue green consolidated very fine interbedded silt to clay.Pockets of fine sand observed.No smell of oil.No fossils observed.
											1974,7 — 1975,6 Lithic greywacke Greenish black,poorly consolidated,poorly sorted cohesive medium sand.Quartz (50%),mica (10-15%),glauconite (10-15%). Clay matrix 20-30%.Visual porosity poor to fair.Smell of oil,but no free oil observed.
											Mudstone Similar to 1974,5
1976,5	855	—	29,5	Tr.	32,7	2,66					1975,9 Lithic arenite Grayish olive green consolidated easily freeable, moderately sorted medium sized sand.Grains are subangular to sub-rounded.Quartz (80%),mica (5%),glauconite (5%).Calcite cement.Visual porosity fair to good.Visible stains of oil.No fossils
											1976,5 — 1979, Lithic arenite Same as above,but harder because of more cementing material.Cement is probably dolomite.Visual porosity poor because of cementation.Stains of oil visible.No fossils.
1977,2	155	—	20,0	Tr.	44,2	2,70		Scale 2			
1977,5	160	—	18,0	Tr.	55,9	2,70					The rest of core is consisting of lithic arenite with minor variations in mineral content and grainsize distribution.
1978,0	165	—	20,1	Tr.	88,1	2,69					
1978,35	224	—	19,8	Tr.	76,9	2,69					
1978,75	46,4	—	15,1	Tr.	79,5	2,70					
1979,0											

COMPANY NORSK HYDRO A/S

COUNTRY NORWAY

WELL I.D. 30/7-2

CORE NO. 8 INTERVAL 1983,7 m - 1989,17 m

ENGINEERS F.E.S./R.K.B./K.S./E.H./A.M.M. DATE 27/10-75 FILE I.D. NHy-1

Sand, Sandstone
Silt
Quartzite
Conglomerate
Shale
Clay
Silty Shale

Limestone
Dolomite
Salt
Gypsum
Anhydrite
Coal, Lignite

Métamorphic rock
Extrusive rock
Intrusive rock

COMPLETION COREGRAPH
PERMEABILITY MILLIDARCYS scale 1: 0-2500 scale 2: 0-500
TOTAL WATER PERCENT PORE SPACE 0-100
POROSITY PERCENT 40 30 20 10 0
OIL SATURATION PERCENT PORE SPACE 0 20 40 60 80

DEPTH Meter	SAMPLE	HORIZ. PERM. MD	VERT. PERM. MD	POROSITY %	Liquid SATURATION PORE SPACE % OIL	TOTAL WATER	GRAIN DENSITY g/cc	CALCI/DOLO-METRY % 100 0	FLUORESCENCE TRACE	FAIR	GOOD	LITHOLOGY
1984,05	←	334	—	27,9	Tr.	78,7	2,66				X	
1984,5	←	443	—	26,6	Tr.	88,0	2,67				X	
1985,1	←	488	—	30,3	3,4	57,4	2,65				X	
1985,65	←	94,6	—	20,1	0	66,3	2,69		X			
1986,2	←	15,5	—	16,0	0	65,5	2,85		X			
1986,5	←	0	—	6,8	0	0	2,75		X			
1988,0	←	442	—	32,1	2,7	39,6	2,83				X	
1988,15	←	0	—	8,0	Tr.	-	2,89		X			
1988,7	←	19,7	—	15,9	Tr.	77,5	2,85		X			

1983,7

Lithic arenite Light olive grey,hard,poorly sorted fine sized sand.Grains are subangular to angular.Quarts (60%),mica (5%), glauconite (20-25%).Glauconite evevly distributed as nodules with medium to fine sand size.Calcite cement makes visual porosity poor to fair.

From 1985,7 more cement and therefor harder.Minor quantities of biotite and heavy minerals.

1986,0 — 1986,1

Mudstone Similar to1971,3-1971,8

Intraformational cgl. Pebbles consisting of mudstone and lithic greywacke (siltic) in a groundmass of lithic arenite to lithic greywacke (sandy).The groundmass is cemneted by calcite cement. The pebbles are varying in size between 1cm up to as much as 6cm. Mean about 2 cm.The pebbles have been stressed along the bedding plane making elongated needles as a result.Visual porosities are poor to fair in groundmass,and very poor in pebbles.No smell of oil. No fossils.

1986,5 — 1987,0

Lithic greywacke-mudstone Light greenish grey,massive,cemented very fine silt to clay.The major constituents of the grains are quarts.The grains are cemented with calcite,which are plugging all pore spaces.No smell of oil.

Lithic greywacke Colour as above.Poorly sorted fine sized sand. Sandgrains are subangular to angular.Quartz (70%),glauconite (10%) biotite (5%),mica (2-3%).Calcite cement (10-15%).Visual porosity fair.No smell of oil.

1987,3 — 1987,5

Intraformational cgl. Similar to 1986,1-1986,5.

1987,5-1988,0 No recovery

1988,0 — 1988,2

Lithic greywacke similar to 1987,0-1987,3

1988,2

Intraformational cgl. similar to1986,1-1986,5

1989 — 1989,17

Lithic Arenite Greenish grey consolidated poorly sorted fine sized sand.Fragments of mudstone similar to level 1971,5.Quarts (60%), glauconite (10-15%),biotite (1-3%),mica (5-10%),less than 1% heavy minerals.No calcite cement,which makes the sample easily freeable.Visual porosity good.No smell of oil.No fossils.