HAND SPECIMEN/THIN SECTION MICROSCOPE DESCRIPTION: MACKENZIE DELTA-BEAUFORT SEA SUBSURFACE CONVENTIONAL DRILL CORE SAMPLES.

SAMPLE IDENTIFICATION: AmaI65-N1
WELL NAME/DEPTH: Gulf *et al.* Amauligak I-65-70-10-133-30/3561.80 m

INDURATION: very poor when dry, disaggregates immediately in water
COLOUR: light brown
SEDIMENTARY STRUCTURES: massive

GRAIN SIZE/COMPOSITION (VOLUMETRIC ESTIMATES):
Terrigenous Constituent %: 85

%gravel size: tr rounded grey chert pebbles to 5 mm in size

%sand size: 50

%silt size: 25

%clay size: 10

Cement %: 5 (kaolinite cement?), 2% dispersed microspar-sized carbonate.

Porosity %: 8

Modal Size: 0.25 mm.

Sorting: 16%/84% diameter ratio=
400 micrometres/ 30 micrometres = 13

Verbal Sorting Scale: poorly sorted

GRAIN SIZE NAME: silty fine to medium sandstone

COMPOSITION: 25% monocrystalline quartz, 5% polycrystalline quartz, 25% clear chert, 5% alkali feldspar, 15% muscovite flakes (mainly silt-sized) and 5% illite(?), 5% carbonaceous flakes and grains, tr sphene, tr carbonate rhombs in chert grains, tr translucent brownish-red resinous(?) material, tr microcline.

ROCK NAME (cements, miscellaneous transported constituents, clan designation): kaolinitic(?) micaceous and carbonaceous silty fine-medium grained litharenite.

PETROGENESIS/ADDITIONAL INFORMATION: silt and clay plugs the pores between sand grains, greatly reducing porosity and especially permeability. Many of the mono and polycrystalline quartz grains have well-developed quartz overgrowths. There is also a minor amount of kaolinite cement and a trace of carbonate cement.

Sample impregnation with epoxy was inadequate because of the very low permeability. Excessive grain plucking evident during preparation required surface impregnation with clear cyanoacrylate. This was done when the section was 0.1 mm thick and saved the section from destruction. The lime green epoxy stain is of course, unreliable.

HAND SPECIMEN/THIN SECTION MICROSCOPE DESCRIPTION: MACKENZIE DELTA-BEAUFORT SEA SUBSURFACE CONVENTIONAL DRILL CORE SAMPLES.

SAMPLE IDENTIFICATION: AmaI65-N2
WELL NAME/DEPTH: Gulf *et al.* Amauligak I-65-70-10-133-30/3562.30 m

INDURATION: poor to moderately indurated when dry or in water.
COLOUR: light brown
SEDIMENTARY STRUCTURES: massive

GRAIN SIZE/COMPOSITION (VOLUMETRIC ESTIMATES):
Terrigenous Constituent %: 68

%gravel size: 0

%sand size: 58

%silt size: 5

%clay size: 5

Cement %: 5% kaolinite booklets, 2% sparry calcite

Porosity %: 25

Modal Size: 0.2 mm.

Sorting: 16%/84% diameter ratio=
400 micrometres/ 80 micrometres = 5

Verbal Sorting Scale: poorly sorted

GRAIN SIZE NAME: muddy fine sandstone

COMPOSITION: 20% monocrystalline quartz, 20% chert, 10% polycrystalline quartz, 20% phylloid clasts (some of which is pseudomatrix) with high intragranualar porosity, tr pyrite framboids, muscovite, microcline, plagioclase, and heavy minerals (sphene?).

ROCK NAME (cements, miscellaneous transported constituents, clan designation): Kaolinitic (cement) muddy fine litharenite

PETROGENESIS/ADDITIONAL INFORMATION: Mechanical compaction and pressure solution were important processes reducing primary porosity. This reduction has been more than compensated for, however by the development of secondary porosity which comprises about 15% of the rock. Mainly present as oversized and elongate pores, it also occurs as molds and as intragranular porosity in chert and phylloid clasts. Spar-sized carbonate rhomb molds are preserved in chert clasts, and together with rhomb-shaped corrosion molds at grain boundaries, provides abundant evidence for decementation of a former carbonate cement. Elongate pores extend around squeezed phylloid clasts, suggesting that the secondary porosity was formed relatively late . About 2% sparry calcite remains as a replacement of chert, phylloid clasts, alkali feldspar, monocrystalline and polycrystalline quartz. In addition, minor quartz overgrowths, booklets of pore-lining kaolinite and pyrite framboids (traces) were observed. The kaolinite lines the elongate and oversized pores of secondary porosity suggesting that it formed after decementation. The same is true of the pyrite framboids. Kaolinite also fills compaction-related grain fractures and rhomb-shaped carbonate molds in chert grains both of which relations also point to a late origin for the kaolinite.

Amout 10 micrometres of the epoxy impregnat was dissolved by the lime green concentrate because toluene was added to the epoxy in an attempt to lower the viscosity and increase the solubility of dye. This removal of epoxy has exposed the pore-lining kaolinite cement which is stained a yellowish-green.

HAND SPECIMEN/THIN SECTION MICROSCOPE DESCRIPTION: MACKENZIE DELTA-BEAUFORT SEA SUBSURFACE CONVENTIONAL DRILL CORE SAMPLES.

SAMPLE IDENTIFICATION: AmaI65-N3
WELL NAME/DEPTH: Gulf *et al.* Amauligak I-65-70-10-133-30/3563.20 m

INDURATION: poor when dry, poor when wet but does not disaggregate immediately.
COLOUR: light brown
SEDIMENTARY STRUCTURES: massive

GRAIN SIZE/COMPOSITION (VOLUMETRIC ESTIMATES):
Terrigenous Constituent %: 60

%gravel size: 0

%sand size: 50

%silt size: 5

%clay size: 5

Cement %: 5% pore-lining kaolinite

Porosity %: 25

Modal Size: 0.2 mm.

Sorting: 16%/84% diameter ratio=
400 micrometres/ 80 micrometres = 5d

Verbal Sorting Scale: poorly sorted

GRAIN SIZE NAME: muddy fine sandstone

COMPOSITION: 25% monocrystalline quartz, 10% polycrystalline quartz, 25% chert, 15% phylloid clasts (10% quartz-muscovite schist), 5% muscovite flakes, tr pyrite in chert grains, tr microspar-sized carbonate, volcanic rock fragments, alkali feldspar.

ROCK NAME (cements, miscellaneous transported constituents, clan designation): Kaolinitic (cement) muddy fine litharenite.

PETROGENESIS/ADDITIONAL INFORMATION: Mechanical compaction and pressure solution were important processes reducing primary porosity. This reduction was more than compensated for by the extensive development of secondary porosity. Elongate pores extending around deformed ductile grains clearly suggest secondary porosity development after mechanical and chemical compaction. Secondary porosity (about 15% of the rock) is primarily evidenced by oversized and elongate pores, floating grains and molds. Corroded grains, honeycombed alkali feldspar and intragranular porosity (in chert and phylloid clasts) are also important criteria but are volumetrically of lesser significance.

The lime green concentrate dissolved some of the epoxy, thereby exposing the pore-lining kaolinite, which in incident light is stained a yellowish-green.

THIN SECTION MODAL AND GRAIN SIZE ANALYSIS

Sample I.D.: AmaI65-N3

	No of Points	Percentage of Components	Percentages of Detrital Components
Detrital Components			
Monocrystalline Quartz	78	19.50	24.30
Polycrystalline Quartz	57	14.25	17.76
Clear Chert	81	20.25	25.23
Black Chert	17	4.25	5.30
Alkali Feldspar	38	9.50	11.84
Plagioclase	0	0.00	0.00
Phylloid Clasts	38	9.50	11.84
Volcanic Clasts	1	0.25	0.31
Chlorite	0	0.00	0.00
Mica	7	1.75	2.18
Siltstone Clasts	2	0.50	0.62
Coal	0	0.00	0.00
Unidentified (too small)	0	0.00	0.00
Other Clasts	2	0.50	0.62
Cements			
Kaolinite	0	0.00	
Carbonate	0	0.00	
Other	2	0.50	
Porosity			
Intergranular/ Moldic	71	17.75	

Intragranular	6	1.50

Plucked Grains=2

Total number of points counted minus plucked grains=402-2=400

GRAIN SIZE ANALYSIS

Sample I.D.: AmaI65-N3

Class Interval (phi)	No. Freq of Max Apparent Grain Dimen-sion	Percentage Frequency	Cumulative Percentage Frequency
1.0 to 0.5	2	1.0	1.00
1.5 to 1.0	31	15.5	16.5
2.0 to 1.5	70	35.0	51.5
2.5 to 2.0	61	30.5	82.0
3.0 to 2.5	26	13.0	95.0
3.5 to 3.0	4	2.0	97.0
4.0 to 3.5	3	1.5	98.5
4.5 to 4.0	2	1.0	99.5
5.0 to 4.5	0	0.0	99.5
5.5 to 5.0	1	0.5	100.0

GRAPHIC GRAIN SIZE CUMULATIVE PERCENTILES IN PHI (MICROMETRE) UNITS OF SELECTED DETRITAL COMPONENTS

Sample I.D.: AmaI65-N3

Percentiles	Phi Values	Micrometres
1	1.00	500
5	1.26	418
16	1.48	358
25	1.64	321

50	1.98	253 (medium sand-size)
75	2.36	195
84	2.55	171
95	3.00	125

$$\text{Graphic Sorting (Inman)} = \frac{\text{Phi}(84) - \text{Phi}(16)}{2} = 0.54$$

Verbal Sorting Scale= moderately sorted.

Total Number of Grains Measured=200

Note: Grain size analysis indicates a slightly coarser grain size and better sorting than is given in the qualitative estimates. In addition, modal analysis shows a slightly lower porosity, and a much larger quantity of alkali feldspar than was estimated in the qualitative description. On the other hand, kaolinite cement, which is easily identified on a fracture sample surface with incident light is invisible in thin section.

HAND SPECIMEN/THIN SECTION MICROSCOPE DESCRIPTION: MACKENZIE DELTA-BEAUFORT SEA SUBSURFACE CONVENTIONAL DRILL CORE SAMPLES.

SAMPLE IDENTIFICATION: AmaI65-N4
WELL NAME/DEPTH: Gulf *et al.* Amauligak
I-65-70-10-133-30/3563.60 m

INDURATION: moderately indurated dry or in water.
COLOUR: light brown
SEDIMENTARY STRUCTURES: massive

GRAIN SIZE/COMPOSITION (VOLUMETRIC ESTIMATES):
Terrigenous Constituent %: 70

%gravel size: 0

%sand size: 50

%silt size: 15

%clay size: 5

Cement %: 5% pore-lining Kaolinite

Porosity %: 25

Modal Size: 0.24 mm.

Sorting: 16%/84% diameter ratio=
400 micrometres/ 50 micrometres = 8

Verbal Sorting Scale: poorly sorted

GRAIN SIZE NAME: silty fine sand

COMPOSITION: 25% monocrystalline quartz grains, 15% chert grains, 20% phylloid clasts (mainly quartz-muscovite schist), 5% alkali feldspar, tr volcanic rock fragments, tr microcline, glauconite pellets(?) and carbonaceous/coaly grains.

ROCK NAME (cements, miscellaneous transported constituents, clan designation): silty fine-grained litharenite

PETROGENESIS/ADDITIONAL INFORMATION: Extreme mechanical compaction of this sample, which contains a high percentage of ductile grains, resulted in considerable reduction of primary porosity by squeezing of the soft grains between the more competent ones. Primary porosity was further reduced by pressure solution and quartz overgrowth formation. The very extensive formation of secondary porosity (perhaps 15% of the rock), however, has more than compensated for the loss of primary porosity. Oversized and elongate pores, corroded grains and grain molds account for most of this porosity . Of lesser importance is intragranular microporosity in phylloid grains, chert grains and honeycombed alkali feldspar . Kaolinite lines secondary pores, fills grain fractures and rhomb-shaped carbonate dissolution molds in chert grains. Other diagenetic features include muscovite flakes in part altered to carbonate and/or chlorite. Pyrite fills secondary pores produced by dissolution of muscovite/chlorite lamellae and was therefore formed relatively late. Elsewhere, pyrite fills rhombic carbonate dissolution molds (or it pseudomorphically replaced carbonate). Although carbonate is now present only as traces in chert grains, abundant rhomb-shaped partial molds at grain boundaries attest to its former presence. Carbonate decementation undoubtedly was responsible for the high percentage of secondary porosity.

Most of the impregnating epoxy was dissolved by the fluorescent lime green concentrate, again, because toluene had been added to the epoxy. This dissolution has re-exposed the pore-lining Kaolinite (stained a light yellow-green).

THIN SECTION MODAL AND GRAIN SIZE ANALYSIS

Sample I.D.: AmaI65-N4

	No of Points	Percentage of Components	Percentages of Detrital Components
Detrital Components			
Monocrystalline Quartz	78	26.00	29.43
Polycrystalline Quartz	45	15.00	16.98
Clear Chert	44	14.67	16.60
Black Chert	10	3.33	3.77
Alkali Feldspar	25	8.33	9.43
Plagioclase	0	0.00	0.00
Phylloid Clasts	40	13.33	15.09
Volcanic Clasts	3	1.00	1.13
Chlorite	0	0.00	0.00
Mica	7	2.33	2.64
Siltstone Clasts	5	1.67	1.89
Coal	1	0.33	0.38
Unidentified (too small)	4	1.33	1.51
Other Clasts	3	1.00	1.13
Cements			
Kaolinite	0	0.00	
Carbonate	0	0.00	
Other	0	0.00	
Porosity			
Intergranular/ Moldic	32	10.67	

Intragranular 3 1.00

Plucked Grains=2

Total number of points counted minus plucked grains=200

GRAIN SIZE ANALYSIS

Sample I.D.: AmaI65-N4

Class Interval (phi)	No. Freq of Max Apparent Grain Dimension	Percentage Frequency	Cumulative Percentage Frequency
1.5 to 1.0	15	7.5	7.5
2.0 to 1.5	52	26.0	33.5
2.5 to 2.0	75	37.5	71.0
3.0 to 2.5	38	19.0	90.0
3.5 to 3.0	6	3.0	93.0
4.0 to 3.5	6	3.0	96.0
4.5 to 4.0	1	0.5	96.5
5.0 to 4.5	2	1.0	97.5
5.5 to 5.0	1	0.5	98.0
6.0 to 5.5	2	1.0	99.0
6.5 to 6.0	1	0.5	99.5
7.0 to 6.5	1	0.5	100.0

GRAPHIC GRAIN SIZE CUMULATIVE PERCENTILES IN PHI (MICROMETRE) UNITS OF SELECTED DETRITAL COMPONENTS

Sample I.D.: AmaI65-N4

Percentiles	Phi Values	Micrometres
1	-	-
5	-	-
16	1.73	301

25	1.88	272
50	2.22	215 (fine sand size)
75	2.57	168
84	2.79	145
95	3.80	72

$$\text{Graphic Sorting (Inman)} = \frac{\text{Phi}(84) - \text{Phi}(16)}{2} = 0.53$$

Verbal Sorting Scale= moderately sorted

Total Number of Grains Measured=200

Note: The quantity of silt and clay as well as pore-lining kaolinite and porosity (best observed with incident light on a sample fracture surface) is underestimated in the quantitative thin section analysis. This also explains the difference in sorting. On the other hand, the qualitative analysis ignores polycrystalline quartz grains and overestimates phylloid clast content.

HAND SPECIMEN/THIN SECTION MICROSCOPE DESCRIPTION: MACKENZIE DELTA-BEAUFORT SEA SUBSURFACE CONVENTIONAL DRILL CORE SAMPLES.

SAMPLE IDENTIFICATION: AmaI65-N5
WELL NAME/DEPTH: Gulf *et al.* Amauligak
I-65-70-10-133-30/3564.20 m

INDURATION: moderate both when dry and immersed in water
COLOUR: light brown
SEDIMENTARY STRUCTURES: massive

GRAIN SIZE/COMPOSITION (VOLUMETRIC ESTIMATES):
Terrigenous Constituent %: 65

%gravel size: 0

%sand size: 55

%silt size: 5

%clay size: 5

Cement %: 5% pore-lining kaolinite, 1% quartz overgrowths

Porosity %: 30

Modal Size: 0.15 mm.

Sorting: 16%/84% diameter ratio=
300 micrometres/ 50 micrometres = 6

Verbal Sorting Scale: poorly sorted

GRAIN SIZE NAME: muddy fine sandstone

COMPOSITION: 20% monocrystalline quartz, 15% chert, 5% polycrystalline quartz, 25% phylloid clasts, 2% muscovite flakes (some altered to chlorite), tr alkali feldspar, tr pyrite mainly in chert grains but also as framboids between grains, tr heavy minerals, tr coal grains, microcline, glauconite, plagioclase.

ROCK NAME (cements, miscellaneous transported constituents, clan designation): kaolinitic and quartzitic (cements) muddy fine grained litharenite

PETROGENESIS/ADDITIONAL INFORMATION: Mechanical compaction was the main process by which primary porosity was reduced, as evidenced by widespread squeezing of ductile phylloid grains and muscovite flakes. This reduction was offset by the extensive development of secondary porosity (20% of the rock), primarily as intergranular oversized pores, elongate pores, and molds. Intragranular porosity (about 5% of the rock) occurs as leached alkali feldspar, phylloid and chert grains. In the phylloid clasts and chert grains rhombic carbonate dissolution molds attest to the former presence of carbonate cement. The rhomb-shaped impressions at grain margins provide supporting evidence for the former presence of carbonate cement and also supports the notion that the decementation giving rise to secondary porosity was relatively late. Vermicular booklets of Kaolinite cement line these secondary pores, as well as the fractures of compactionally fractured grains and in addition, fill the carbonate dissolution molds in chert and phylloid grains. The Kaolinite is therefore an even later diagenetic cement. Similarly pyrite framboids have formed lining and filling oversized and elongate pores of secondary origin. Quartz overgrowths are relatively common but it is not clear when they formed. Some are bounded by squeezed ductile grains, others by pore space (of secondary porosity).

The blue dye in the epoxy has faded and changed in areas to a pink colour, possibly as a result of overheating during curing.

THIN SECTION MODAL AND GRAIN SIZE ANALYSIS

Sample I.D.: AmaI65-N5

	No of Points	Percentage of Components	Percentages of Detrital Components
Detrital Components			
Monocrystalline Quartz	75	25.00	31.65
Polycrystalline Quartz	25	8.33	10.55
Clear Chert	29	9.67	12.24
Black Chert	17	5.67	7.17
Alkali Feldspar	14	4.67	5.91
Plagioclase	0	0.00	0.00
Phylloid Clasts	55	18.33	23.21
Volcanic Clasts	0	0.00	0.00
Chlorite	2	0.67	0.84
Mica	10	3.33	4.22
Siltstone Clasts	4	1.33	1.69
Coal	1	0.33	0.42
Unidentified (too small)	5	1.66	2.11
Other Clasts	0	0.00	0.00
Cements			
Kaolinite	0.00	0.00	
Carbonate	0.00	0.00	
Other	0.00	0.00	
Porosity			
Intergranular/ Moldic	57	19.0	

Intragranular	6	2.00

Plucked Grains=0

Total number of points counted minus plucked grains= 300

GRAIN SIZE ANALYSIS

Sample I.D.: AmaI65-N5

Class Interval (phi)	No. Freq of Max Apparent Grain Dimen-sion	Percentage Frequency	Cumulative Percentage Frequency
0.5 to 0.0	2	1.0	1.0
1.0 to 0.5	2	1.0	2.0
1.5 to 1.0	6	3.0	5.0
2.0 to 1.5	21	10.5	15.5
2.5 to 2.0	45	22.5	38.0
3.0 to 2.5	44	22.0	60.0
3.5 to 3.0	44	22.0	82.0
4.0 to 3.5	17	8.5	90.5
4.5 to 4.0	10	5.0	95.5
5.0 to 4.5	3	1.5	97.0
5.5 to 5.0	3	1.5	98.5
6.0 to 5.5	3	1.5	100.0

GRAPHIC GRAIN SIZE CUMULATIVE PERCENTILES IN PHI (MICROMETRE) UNITS OF SELECTED DETRITAL COMPONENTS

Sample I.D.: AmaI65-N5

Percentiles	Phi Values	Micrometres
1	0.50	707
5	1.50	354
16	2.03	245

25	2.25	210
50	2.78	146 (fine sand size)
75	3.34	99
84	3.61	82
95	4.44	46

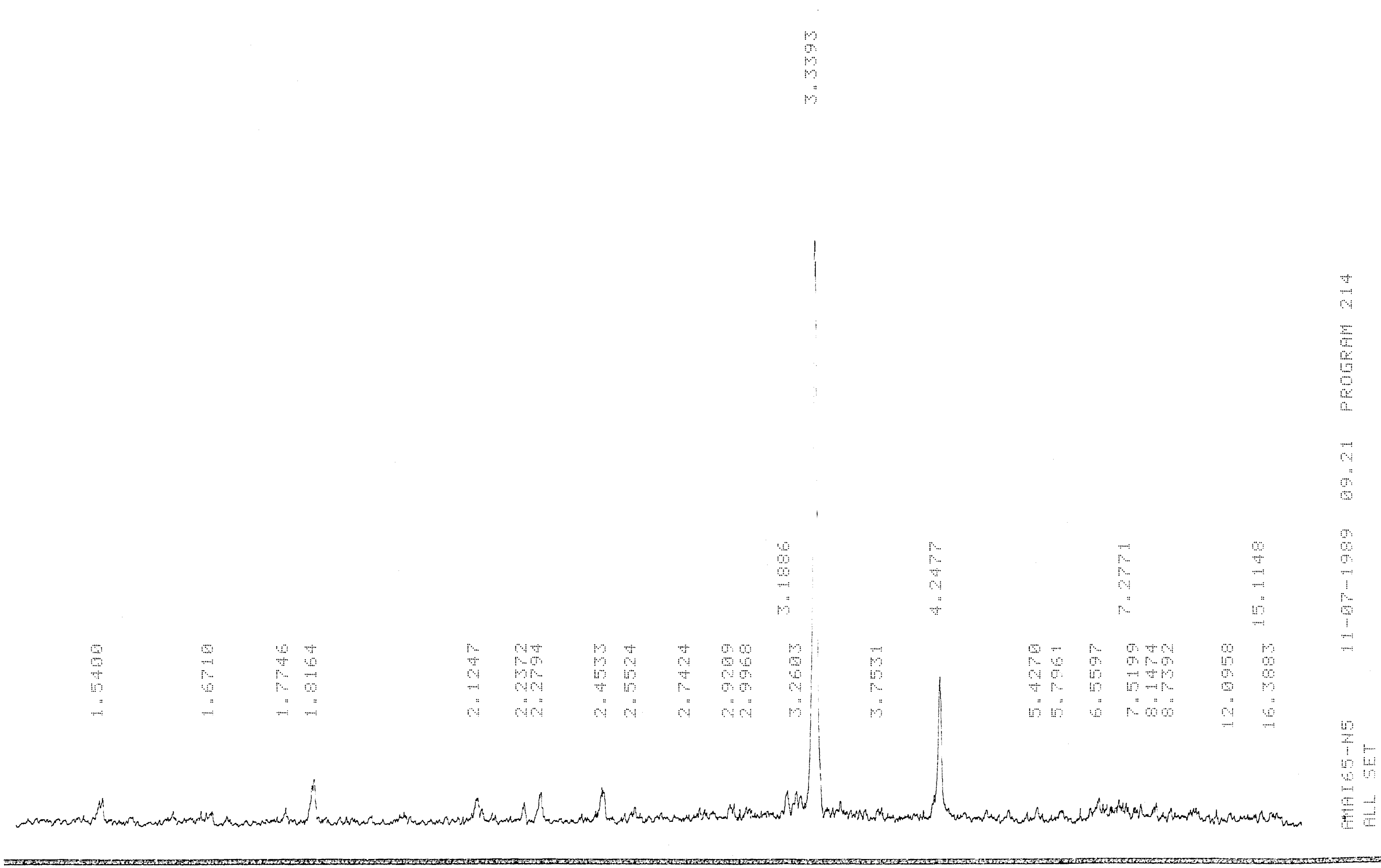
$$\text{Graphic Sorting (Inman)} = \frac{\text{Phi(84)} - \text{Phi(16)}}{2} = 0.79$$

Verbal Sorting Scale= moderately sorted.

Total Number of Grains Measured=200

Note: More alkali feldspar grains were determined by modal than by qualitative analysis. A better sorting is suggested by the grain size analysis because clay-sized material is underestimated in thin section. Pore-lining kaolinite, easily observed in a sample fracture surface, was not identified in the modal analysis because of small grain size. Porosity also appears to be underestimated in the modal analysis.

X-RAY DIFFRACTION ANALYSIS
SAMPLE IDENTIFICATION: AMAI65-N5
WELL NAME: GULF ET AL. AMAULIGAK I-65-70-10-133-30
SAMPLE DEPTH: 3564.20 METRES
NOTE: TRACE CLAY MINERALS, ALKALI FELDSPAR AND QUARTZ ARE PRESENT.



HAND SPECIMEN/THIN SECTION MICROSCOPE DESCRIPTION: MACKENZIE DELTA-BEAUFORT SEA SUBSURFACE CONVENTIONAL DRILL CORE SAMPLES.

SAMPLE IDENTIFICATION: AmaI65-N6
WELL NAME/DEPTH: Gulf et al. Amauligak I-65-70-10-133-30/3567.50 m
INDURATION: good when dry, moderate when wet (disaggregates by itself when immersed in water).
COLOUR: very light brown
SEDIMENTARY STRUCTURES: vague planar laminae are defined by slightly higher concentrations of carbonaceous flakes

GRAIN SIZE/COMPOSITION (VOLUMETRIC ESTIMATES):
Terrigenous Constituent %: 67

%gravel size: 0

%sand size: 42

%silt size: 20

%clay size: 5?

Cement %: 5% kaolinite cement, 3% sparry carbonate cement, 5% quartz overgrowths

Porosity %: 20

Modal Size: 0.080 mm.

Sorting: 16%/84% diameter ratio=
125 micrometres/ 40 micrometres = 3

Verbal Sorting Scale: moderately sorted

GRAIN SIZE NAME: silty very fine sandstone

COMPOSITION: 2% carbonaceous flakes/coal grains, 15% monocrystalline quartz, 10% chert, 25% phylloid clasts, 5% muscovite flakes, 1% alkali feldspar, 3% ductile microspar-rich carbonate clasts, 1% pyrite (within grains and as framboids), 1% unaltered glauconite pellets, tr chlorite grains (stained pink by the oil-blue dye), tr heavy minerals. Unidentifiable silt and clay sized material comprises the remainder.

ROCK NAME: (cements, miscellaneous transported constituents, clan designation): kaolinitic/carbonate/quartz cemented glauconitic silty very fine litharenite.

PETROGENESIS/ADDITIONAL INFORMATION: Mechanical and chemical compaction was extreme, judging by the high degree of deformation of the ductile phylloid clasts, probably reducing primary porosity to 5 or 10%. Pressure solution is evidenced by flat grain contacts between quartz grains and is accompanied by a relatively high percentage of quartz overgrowths. The extensive development of secondary porosity (about 15% of the rock), mainly as oversized and elongate pores was relatively late. Intragranular secondary porosity accounts for about 5% of the rock, mainly as leached chert grains and phylloid clasts, but also as honeycombed alkali feldspar grains. Relict sparry carbonate cement and abundant rhomb-shaped carbonate dissolution molds (actually partial molds) along grain boundaries attests to the development of this secondary porosity by decementation of a former carbonate cement. The good induration is undoubtedly a result of quartz and carbonate cementation.

THIN SECTION MODAL AND GRAIN SIZE ANALYSIS

Sample I.D.: AmaI65-N6

	No of Points	Percentage of Components	Percentages of Detrital Components
Detrital Components			
Monocrystalline Quartz	106	35.33	39.70
Polycrystalline Quartz	23	7.67	8.61
Clear Chert	25	8.33	9.36
Black Chert	8	2.67	3.00
Alkali Feldspar	17	5.67	6.37
Plagioclase	0	0.00	0.00
Phylloid Clasts	59	19.67	22.10
Volcanic Clasts	0	0.00	0.00
Chlorite	11	3.67	4.12
Mica	9	3.00	3.37
Siltstone Clasts	3	1.00	1.12
Coal	1	0.33	0.37
Unidentified (too small)	1	0.33	0.37
Other Clasts	4	1.33	1.50
Cements			
Kaolinite	0	0.00	
Carbonate	1	0.33	
Other	2	0.67	
Porosity			
Intergranular/ Moldic	30	10.00	

Intragranular 0 0.00

Plucked Grains = 3

Total number of points counted minus plucked grains= 300

GRAIN SIZE ANALYSIS

Sample I.D.: AmaI65-N6

Class Interval (phi)	No. Freq of Max Apparent Grain Dimension	Percentage Frequency	Cumulative Percentage Frequency
2.5 to 2.0	3	1.5	1.5
3.0 to 2.5	15	7.5	9.0
3.5 to 3.0	39	19.5	28.5
4.0 to 3.5	72	36.0	64.5
4.5 to 4.0	39	19.5	84.0
5.0 to 4.5	21	10.5	94.5
5.5 to 5.0	10	5.0	99.5
6.0 to 5.5	1	0.5	100.0

GRAPHIC GRAIN SIZE CUMULATIVE PERCENTILES IN PHI (MICROMETRE) UNITS OF SELECTED DETRITAL COMPONENTS

Sample I.D.: AmaI65-N6

Percentiles	Phi Values	Micrometres
1	-	-
5	2.82	142
16	3.23	107
25	3.44	92
50	3.80	72 (very fine sand size)
75	4.24	53
84	4.50	44

95	5.02	31

$$\text{Graphic Sorting (Inman)} = \frac{\text{Phi}(84) - \text{Phi}(16)}{2} = 0.64$$

Verbal Sorting Scale= moderately sorted.

Total Number of Grains Measured=200

ELECTRON MICROPROBE CARBONATE ANALYSES

SAMPLE I.D.: AmaI65-N6.
WELL NAME/DEPTH (M): Amauligak I-65/3567.50 m.
LEGEND FOR ANALYZED MATERIAL (COLUMN HEADINGS): CC1b.1 and CC2b.1 are analyses in different areas of carbonate cement near the edge of framework grains. CC1a.1 and CC2c.1 are analyses in different areas of carbonate cement midway between framework grains.

	CC2B.1	CC2C.1	CC1A.1	CC1B.1
OXIDE WEIGHT PERCENT				
MGO	15.37	15.06	19.55	18.64
FEO	10.68	9.27	.17	.90
MNO	.76	.67	.11	.19
CAO	27.60	28.14	32.52	32.20
TOTAL	54.41	53.14	52.35	51.93

ATOMIC PROPORTIONS.
FORMULA (BASIS 2 OXYGENS).

MG	.738	.737	.907	.879
FE	.288	.254	.004	.024
MN	.021	.019	.003	.005
CA	.953	.990	1.085	1.092
TOTAL	2.000	2.000	1.999	2.000

HAND SPECIMEN/THIN SECTION MICROSCOPE DESCRIPTION: MACKENZIE DELTA-BEAUFORT SEA SUBSURFACE CONVENTIONAL DRILL CORE SAMPLES.

SAMPLE IDENTIFICATION: AmeO09-1
WELL NAME/DEPTH: Esso Home PCI et al. Amerk O-09-70-00-133-30/1312.0 m.

INDURATION: very poor when dry, a small chip disagregates by itself a few seconds after immersion in water.
COLOUR: light brown.
SEDIMENTARY STRUCTURES: vague planar lamination is defined by flat-lying coal flakes, bioturbation is represented by 5% 0.5 mm diameter worm(?) tubes.

GRAIN SIZE/COMPOSITION (VOLUMETRIC ESTIMATES):
Terrigenous Constituent %: 63

%gravel size: 0

%sand size: 43

%silt size: 15

%clay size: 5

Cement %: 2% kaolinite(?), trace pyrite.

Porosity %: 35

Modal Size: 0.07 mm.

Sorting: 16%/84% diameter ratio=
120 micrometres/ 20 micrometres = 6

Verbal Sorting Scale: poorly sorted.

GRAIN SIZE NAME: silty very fine sandstone.

COMPOSITION: 25% monocrystalline quartz grains, 1% polycrystalline quartz grains, 5% chert clasts, 15% phylloid and siltstone clasts, 5% coal grains, 2% muscovite flakes (in part altered to chlorite and clays), 1% chlorite flakes, 1% alkali feldspar grains, trace unaltered glauconite pellets, trace high-birefringent/high relief minerals, trace plagioclase. Unidentified clay- and silt-sized material comprises the remainder.

ROCK NAME (cements, miscellaneous transported constituents, clan designation): glauconite-bearing coaly and silty very fine grained litharenite.

PETROGENESIS/ADDITIONAL INFORMATION: The porosity is distributed approximately as follows; 5% occurs in unfiled worm(?) tubes, 2% is moldic, 2% (at least) is intragranular and 26% is intergranular. Secondary porosity accounts for about half of the porosity, mainly as elongate and oversized pores between grains. These pores are associated with partial rhombic molds at grain margins, suggesting that the dissolution of carbonate-replaced grain margins was the means by which secondary porosity was formed. Porosity within grains is present mainly as leached chert and phylloid clasts. Mechanical and chemical compaction was of minor importance, judging by the nature of grain contacts. Compaction after the formation of secondary porosity was negligible. Some of the secondary pores, including the intragranular pores of leached mica flakes, are lined with framboidal pyrite, suggesting a relatively late origin. On the other hand, framboidal pyrite in some of the coal clasts was formed relatively early because in a few cases, the cellular structure of the coal is deflected around the framboidal pyrite spheroids.

THIN SECTION MODAL AND GRAIN SIZE ANALYSIS

Sample I.D.: Ame009-1

	No of Points	Percentage of Components	Percentages of Detrital Components
Detrital Components			
Monocrystalline Quartz	79	26.33	41.36
Polycrystalline Quartz	5	1.67	2.62
Clear Chert	20	6.67	10.47
Black Chert	7	2.33	3.66
Alkali Feldspar	19	6.33	9.95
Plagioclase	0	0.00	0.00
Phylloid Clasts	20	6.67	10.47
Volcanic Clasts	0	0.00	0.00
Chlorite	6	2.00	3.14
Mica	14	4.67	7.33
Siltstone Clasts	1	0.33	0.52
Coal	14	4.67	7.33
Unidentified (too small)	3	1.00	1.57
Other Clasts	3	1.00	1.57
Cements			
Kaolinite	0	0.00	
Carbonate	0	0.00	
Other	6	2.00	
Porosity			
Intergranular/ Moldic	99	33.00	

Intragranular	4	1.33

Plucked Grains=5

Total number of points counted minus plucked grains= 300

GRAIN SIZE ANALYSIS

Sample I.D.: Ame009-1

Class Interval (phi)	No. Freq of Max Apparent Grain Dimension	Percentage Frequency	Cumulative Percentage Frequency
2.0 to 1.5	1	0.5	0.5
2.5 to 2.0	2	1.0	1.5
3.0 to 2.5	17	8.5	10.0
3.5 to 3.0	40	20.0	30.0
4.0 to 3.5	69	34.5	64.5
4.5 to 4.0	36	18.0	82.5
5.0 to 4.5	15	7.5	90.0
5.5 to 5.0	7	3.5	93.5
6.0 to 5.5	5	2.5	96.0
6.5 to 6.0	4	2.0	98.0
7.0 to 6.5	1	0.5	98.5
7.5 to 7.0	1	0.5	99.0
8.0 to 7.5	1	0.5	99.5
8.5 to 8.0	1	0.5	100.0

GRAPHIC GRAIN SIZE CUMULATIVE PERCENTILES IN PHI (MICROMETRE) UNITS OF SELECTED DETRITAL COMPONENTS

Sample I.D.: Ame009-1

Percentiles	Phi Values	Micrometres
1	2.30	203

5	2.79	145
16	3.20	109
25	3.41	94
50	3.79	72 (very fine sand size)
75	4.26	52
84	4.58	42
95	5.78	18

$$\text{Graphic Sorting (Inman)} = \frac{\text{Phi}(84) - \text{Phi}(16)}{2} = 0.69$$

Verbal Sorting Scale= moderately sorted

Total Number of Grains Measured= 200

Note: Moderate sorting was determined by thin section analysis whereas a poor sorting estimate was determined qualitatively. The discrepancy may be because clay-sized material was underestimated in thin section. Modal analysis suggests fewer phylloid clasts (6.7% instead of 15%) and more alkali feldspar grains (6.3% rather than 1%) than were estimated qualitatively. Kaolinite cement, which was qualitatively estimated as 2% in a sample fracture surface was not indentified in thin section.

HAND SPECIMEN/THIN SECTION MICROSCOPE DESCRIPTION: MACKENZIE DELTA-BEAUFORT SEA SUBSURFACE CONVENTIONAL DRILL CORE SAMPLES.

SAMPLE IDENTIFICATION: AmeO09-4
WELL NAME/DEPTH: Esso Home PCI et al. Amerk
O-09-70-00-133-30/2069.43 m.

INDURATION: poor when dry, a small chip disaggregates by itself about 3 minutes after immersion in water.
COLOUR: light brown.
SEDIMENTARY STRUCTURES: planar and rare cross-lamination. Parting along lamination is well developed.

GRAIN SIZE/COMPOSITION (VOLUMETRIC ESTIMATES):
Terrigenous Constituent %: 68

%gravel size: 0

%sand size: 19

%silt size: 29

%clay size: 20

Cement %: 1% sparry carbonate, trace pyrite framboids, 1% quartz overgrowths, trace vermicular kaolinite.

Porosity %: 30

Modal Size: 0.03 mm.

Sorting: 16%/84% diameter ratio=
70 micrometres/ 3? micrometres = 23

Verbal Sorting Scale: very poorly sorted.

GRAIN SIZE NAME: sandy mudstone.

COMPOSITION: 30% monocrystalline quartz grains, trace polycrystalline quartz grains, 3% chert clasts, 2% alkali feldspar grains, 5% muscovite flakes (partly altered to carbonate, chlorite, and clays), 10% phylloid clasts, 5% coal clasts, 1% clasts of microcrystalline carbonate, 1% chlorite flakes, trace plagioclase grains, trace unaltered glauconite pellets. Unidentified silt and clay sized material comprises the remainder.

ROCK NAME (cements, miscellaneous transported constituents, clan designation): carbonate/quartz-cemented glauconite/coal-bearing sandy (litharenitic) mudstone.

PETROGENESIS/ADDITIONAL INFORMATION: The presence of unaltered glauconite pellets (assuming they are in place) suggests a marine origin, in spite of the presence of coal grains. Mechanical compaction of the relatively high proportion of ductile mica and phylloid clasts greatly reduced primary porosity. Pressure solution between quartzose grains was relatively insignificant, judging by the mainly unsutured grain contacts. The porosity reduction was offset by the extensive development of secondary porosity, especially in laminae with a slightly larger grain size. The porosity distribution is approximately as follows; 1% is moldic, 2% (at least) is intragranular and 27% is intergranular. At least half of the total porosity occurs as elongate and oversized pores of secondary origin. Relict sparry carbonate that fills intergranular pores and in part replaces the extremities of grains suggests that the dissolution of a former carbonate cement was responsible for the formation of secondary porosity. The secondary pores are lined with framboidal pyrite, suggesting a relatively late diagenetic origin for this mineral. Peculiar spores(?) are present that have the shape of spheroids up to 35 microns in diameter and are held to grains by long filaments about 2 micrometres in diameter. It is assumed that these grew after the core was brought to surface.

HAND SPECIMEN/THIN SECTION MICROSCOPE DESCRIPTION: MACKENZIE DELTA-BEAUFORT SEA SUBSURFACE CONVENTIONAL DRILL CORE SAMPLES.

SAMPLE IDENTIFICATION: Ame009-5
WELL NAME/DEPTH: Esso Home PCI et al. Amerk
O-09-70-00-133-30/3860.17 m.

INDURATION: moderate both when dry and when immersed in water.
COLOUR: light brown.
SEDIMENTARY STRUCTURES: planar laminae are defined by coaly films, parting is well developed.

GRAIN SIZE/COMPOSITION (VOLUMETRIC ESTIMATES):
Terrigenous Constituent %: 74

%gravel size: 0

%sand size: 61

%silt size: 8

%clay size: 5

Cement %: 5% kaolinite, 1% pyrite framboids (especially concentrated in and near the coaly zone), 5% quartz overgrowths (well-developed), trace amounts of poikilotopic sparry carbonate.

Porosity %: 15

Modal Size: 0.150 mm.

Sorting: 16%/84% diameter ratio=
300 micrometres/ 80 micrometres = 3.75

Verbal Sorting Scale: moderately sorted.

GRAIN SIZE NAME: muddy fine sandstone.

COMPOSITION: 35% monocrystalline quartz grains, 3% polycrystalline quartz grains, 20% chert clasts, 10% phylloid and siltstone clasts, 1% alkali feldspar grains, 3% grains and flakes of coal (especially concentrated in a 1.5 mm thick zone), trace flakes of chlorite, trace plagioclase, trace unaltered glauconite pellets. Unidentified silt- and clay-sized material comprises the remainder.

ROCK NAME (cements, miscellaneous transported constituents, clan designation): kaolinite/quartz-cemented coal/glauconite-bearing muddy fine grained litharenite.

PETROGENESIS/ADDITIONAL INFORMATION: Pressure solution and quartz cementation were among the most important diagenetic events, as evidenced by concavo-convex suture contacts between quartz and other grains. This contrasts sharply with most of the other samples and may be related to the depth of burial (almost 4 kms).

If one ignores kaolinite the decrease in porosity to 15% is due to pressure solution, quartz cementation and to a minor extent, mechanical compaction of ductile mica and phylloid clasts. The presence of unaltered glauconite pellets suggests a marine origin, assuming they are in place. The porosity distribution is approximately as follows; 5% is moldic, 3% (at least) is intragranular, and 7% is intergranular. Secondary porosity accounts for over half of the total porosity, as moldic and enhanced intergranular pores. The intergranular porosity occurs as oversized and elongate pores, commonly lined or filled with kaolinite booklets. Similarly, moldic pores are in some cases filled with kaolinite booklets. It is of considerable interest that kaolinite lines grains but does not occur on quartz overgrowths, indicating a relatively late origin for the overgrowths. Sparry carbonate cement abuts against the quartz overgrowths and also forms part of the margins of grain molds, suggesting an origin after the development both of secondary porosity and the formation of quartz overgrowths. Further, there are places where the carbonate abuts against the concavo-convex sutured contacts of quartz grains, suggesting that the carbonate also formed after pressure solution. The pyrite framboids line quartz overgrowths and are especially common in and near the coaly lamina, indicating a relatively late formation, with nucleation probably influenced by gas emanating from the coal. The moderate induration can undoubtedly be attributed to pressure solution and exensive quartz cementation.

THIN SECTION MODAL AND GRAIN SIZE ANALYSIS

Sample I.D.: Ame009-5

	No of Points	Percentage of Components	Percentages of Detrital Components
Detrital Components			
Monocrystalline Quartz	99	33.00	38.52
Polycrystalline Quartz	30	10.00	11.67
Clear Chert	41	13.67	15.95
Black Chert	10	3.33	3.89
Alkali Feldspar	12	4.00	4.67
Plagioclase	0	0.00	0.00
Phylloid Clasts	42	14.00	16.34
Volcanic Clasts	3	1.00	1.17
Chlorite	5	1.67	1.95
Mica	3	1.00	1.17
Siltstone Clasts	4	1.33	1.56
Coal	0	0.00	0.00
Unidentified (too small)	4	1.33	1.56
Other Clasts	4	1.33	1.56
Cements			
Kaolinite	4	1.33	
Carbonate	3	1.00	
Other	2	0.67	
Porosity			
Intergranular/ Moldic	33	11.00	

Intragranular	1	0.33

Plucked Grains=2

Total number of points counted minus plucked grains= 300

GRAIN SIZE ANALYSIS

Sample I.D.: Ame009-5

Class Interval (phi)	No. Freq of Max Apparent Grain Dimension	Percentage Frequency	Cumulative Percentage Frequency
1.5 to 1.0	2	1.0	1.0
2.0 to 1.5	28	14.0	15.0
2.5 to 2.0	88	44.0	59.0
3.0 to 2.5	45	22.5	81.5
3.5 to 3.0	22	11.0	92.5
4.0 to 3.5	3	1.5	94.0
4.5 to 4.0	6	3.0	97.0
5.0 to 4.5	2	1.0	98.0
5.5 to 5.0	0	0.0	98.0
6.0 to 5.5	1	0.5	98.5
6.5 to 6.0	2	1.0	99.5
7.0 to 6.5	1	0.5	100.0

GRAPHIC GRAIN SIZE CUMULATIVE PERCENTILES IN PHI (MICROMETRE) UNITS OF SELECTED DETRITAL COMPONENTS

Sample I.D.: Ame009-5

Percentiles	Phi Values	Micrometres
1	1.50	354
5	1.77	293
16	2.02	247

25	2.14	227
50	2.42	187 (fine sand size)
75	2.83	141
84	3.09	117
95	4.14	57

$$\text{Graphic Sorting (Inman)} = \frac{\text{Phi}(84)-\text{Phi}(16)}{2} = 0.54$$

Verbal Sorting Scale= moderately sorted

Total Number of Grains Measured= 200

Note: Clay-sized material (about 5%) was not identified by thin section grain size analysis, though it is easily seen in a sample fracture surface. Modal analysis suggests more polycrystalline quartz grains (10% rather than 3%), more alkali feldspar (4% instead of 1%) and more chlorite (1.7% compared to a trace) than was visually estimated for qualitative purposes. Coal, glauconite and pyrite framboids were not detected, however by modal analysis and kaolinite and quartz overgrowth proportions were underestimated in thin section. Kaolinite (5%) and quartz overgrowths (5%) are best estimated in a sample fracture surface.

HAND SPECIMEN/THIN SECTION MICROSCOPE DESCRIPTION: MACKENZIE DELTA-BEAUFORT SEA SUBSURFACE CONVENTIONAL DRILL CORE SAMPLES.

SAMPLE IDENTIFICATION: Ame009-11
WELL NAME/DEPTH: Esso Home PCI et al. Amerk O-09-70-00-133-30/4378.77 m.
INDURATION: excellent, either when dry or immersed in water.
COLOUR: medium grey.
SEDIMENTARY STRUCTURES: massive.

GRAIN SIZE/COMPOSITION (VOLUMETRIC ESTIMATES):
Terrigenous Constituent %: 55

%gravel size: 0

%sand size: 52

%silt size: 3 (in part replaced by carbonate).

%clay size: 0? (replaced by carbonate?)

Cement %: 3% thick quartz overgrowths, 40% sparry carbonate (partly replacing grains), Kaolinite(?), trace pyrite framboids.

Porosity %: 2

Modal Size: 0.2 mm.

Sorting: 16%/84% diameter ratio=
300 micrometres/ 90 micrometres = 3.3

Verbal Sorting Scale: moderately sorted.

GRAIN SIZE NAME: fine sandstone.

COMPOSITION: 15% monocrystalline quartz grains, 5% polycrystalline quartz grains, 10% chert clasts, 10% phylloid and siltstone clasts, 1% chlorite flakes, 2% alkali feldspar grains, 1% volcanic rock fragments (with feldspar laths), 3% coal grains, 1% plagioclase (partly altered to clays), trace unaltered glauconite pellets, trace muscovite flakes, trace translucent orange-brown material (amber?). Unidentified sand and mud sized material comprises the remainder.

ROCK NAME (cements, miscellaneous transported constituents, clan designation): carbonate/quartz-cemented glauconite/coal-bearing fine grained litharenite.

PETROGENESIS/ADDITIONAL INFORMATION: A marine origin is suggested by the trace quantities of unaltered glauconite pellets, in spite of the presence of coal grains. Carbonate cement has almost occluded porosity, has replaced grains (especially of the margins), and has to a lesser extent completely replaced grains. In addition, original mud-sized matrix and perhaps early Kaolinite cement has been replaced. Ductile grains squeezed between more competent grains and concavo-convex contacts between quartz grains suggest that both mechanical and chemical compaction (pressure solution) were important porosity-reducing processes. The evidence for pressure solution is undoubtedly related to the burial depth of over 4 km. The carbonate cement was probably late diagenetic because it abuts against grains with thick quartz overgrowths. The porosity distribution is peculiar by comprising mainly grain molds (with boundaries defined by carbonate cement) and intragranular pores (leached chlorite, honeycombed alkali and plagioclase feldspar grains, and phylloid clasts). Some of these grain molds contain kaolinite booklets which must be very late diagenetic. Pyrite framboids line grain margins and are contained in the carbonate cement which of course suggests formation prior to carbonate cementation.

THIN SECTION MODAL AND GRAIN SIZE ANALYSIS

Sample I.D.: Ame009-11

	No of Points	Percentage of Components	Percentages of Detrital Components
Detrital Components			
Monocrystalline Quartz	70	23.33	42.17
Polycrystalline Quartz	18	6.00	10.84
Clear Chert	30	10.00	18.07
Black Chert	8	2.67	4.82
Alkali Feldspar	6	2.00	3.61
Plagioclase	0	0.00	0.00
Phylloid Clasts	23	7.67	13.86
Volcanic Clasts	2	0.67	1.20
Chlorite	2	0.67	1.20
Mica	2	0.67	1.20
Siltstone Clasts	1	0.33	0.60
Coal	1	0.33	0.60
Unidentified (too small)	1	0.33	0.60
Other Clasts	2	0.67	1.20
Cements			
Kaolinite	1	0.33	
Carbonate (includes replacement)	129	43.00	
Other	1	0.33	

Porosity

Intergranular/ Moldic	2	0.67
Intragranular	1	0.33

Plucked Grains=7

Total number of points counted minus plucked grains= 300

GRAIN SIZE ANALYSIS

Sample I.D.: Ame009-11

Class Interval (phi)	No. Freq of Max Apparent Grain Dimen-sion	Percentage Frequency	Cumulative Percentage Frequency
0.5 to 0.0	1	0.5	0.5
1.0 to 0.5	2	1.0	1.5
1.5 to 1.0	20	10.0	11.5
2.0 to 1.5	52	26.0	37.5
2.5 to 2.0	66	33.0	70.5
3.0 to 2.5	35	17.5	88.0
3.5 to 3.0	15	7.5	95.5
4.0 to 3.5	7	3.5	99.0
4.5 to 4.0	0	0.0	99.0
5.0 to 4.5	2	1.0	100.0

GRAPHIC GRAIN SIZE CUMULATIVE PERCENTILES IN PHI (MICROMETRE) UNITS OF SELECTED DETRITAL COMPONENTS

Sample I.D.: Ame009-11

Percentiles	Phi Values	Micrometres
1	0.81	570
5	1.27	415
16	1.61	328

25	1.79	289
50	2.18	221 (fine sand size)
75	2.60	165
84	2.86	138
95	3.44	92

$$\text{Graphic Sorting (Inman)} = \frac{\text{Phi}(84) - \text{Phi}(16)}{2} = 0.63$$

Verbal Sorting Scale= moderately sorted

Total Number of Grains Measured= 200

Note: Quantitative and qualitative grain size and modal estimates are in close agreement.

ELECTRON MICROPROBE DATA

SAMPLE I.D.: Ame009-11
WELL NAME/DEPTH: Amerk O-09/4378.77 m.
LEGEND FOR ANALYZED MATERIAL (COLUMN HEADINGS): RF2b.1 & RF2b.2 are analyses of a volcanic rock or phylloid fragment, perhaps partly replaced by dolomite. RF4a.1 and RF4a.2 are analyses of a plagioclase grain. RF6.1 is an analysis of a volcanic rock fragment containing feldspar laths. In addition, analyses of heavy mineral grains suggest the presence of chromite, zircon, rutile, and tourmaline (HM9.1).

	RF2B.1	RF2B.2	RF4A.1	RF4A.2	RF6.1
OXIDE WEIGHT PERCENT					
SIO2	53.81	67.51	85.38	85.38	30.41
AL2O3	25.94	19.73	6.25	6.25	11.05
MGO	1.13	1.33	.32	.32	.00
TIO2	.72	.63	.53	.53	6.95
CR2O3	.16	.19	.20	.20	.00
MNO	.10	.07	.07	.07	.00
FEO	1.63	1.66	.34	.34	1.45
ZNO	.00	.00	.01	.01	.00
NA2O	.12	.30	.28	.28	2.72
K2O	3.30	3.19	1.33	1.33	1.24
CAO	1.02	.79	.27	.27	9.24
P2O5	.00	.00	.00	.00	5.62
SO3	.23	.21	.02	.02	.00
TOTAL	88.16	95.61	95.00	95.00	68.68

ATOMIC PROPORTIONS.
FORMULA (BASIS 32 OXYGENS).

SI	10.646	12.126	14.759	14.759	8.300
AL	6.051	4.176	1.273	1.273	3.556
MG	.332	.357	.083	.083	.000
TI	.108	.085	.068	.068	1.426
CR	.026	.027	.028	.028	.000
MN	.017	.011	.010	.010	.000
FE	.270	.250	.050	.050	.330
ZN	.000	.000	.001	.001	.000
NA	.046	.105	.093	.093	1.437
K	.832	.730	.293	.293	.433
CA	.216	.152	.051	.051	2.703
P	.000	.000	.000	.000	1.299
S	.034	.028	.002	.002	.000
TOTAL	18.578	18.047	16.711	16.711	19.484

ELECTRON MICROPROBE DATA

SAMPLE I.D.: Ame009-11.
WELL NAME/DEPTH: Amerk O-09/4378.77 m.
LEGEND FOR ANALYZED MATERIAL (COLUMN HEADINGS): RF7.1 and RF7.2 are analyses of porous clay-rich masses stained pink from the dye added to the epoxy. RF6.2 and RF6.3 are more analyses in different areas in the matrix of the volcanic rock fragment (see also analysis RF6.1). RF8.1 is an analysis of the matrix of a volcanic rock fragment containing feldspar laths. In addition, the matrix of one volcanic rock fragment with feldspar lath texture was determined to be silicified (pure SiO2).

	RF7.1	RF7.2	RF6.2	RF6.3	RF8.1
OXIDE WEIGHT PERCENT					
SIO2	28.28	42.91	27.67	30.73	65.75
AL203	22.75	33.97	10.38	11.30	12.07
MGO	.34	.32	.00	.00	3.93
TIO2	.05	.14	2.94	10.21	5.79
CR203	.06	.12	.00	.00	.37
MNO	.11	.06	.00	.00	.09
FEO	.47	.86	1.52	2.42	5.24
ZNO	.06	.06	.00	.00	.00
NA20	.33	.52	.75	2.51	.32
K20	.14	.28	.88	1.29	.65
CAO	.36	.37	18.06	8.58	.22
P205	.00	.00	11.45	5.08	.00
SO3	.34	.24	.00	.00	.24
TOTAL	53.29	79.85	73.65	72.12	94.67

ATOMIC PROPORTIONS.
FORMULA (BASIS 32 OXYGENS).

	RF7.1	RF7.2	RF6.2	RF6.3	RF8.1
SI	9.094	9.207	7.124	8.059	12.104
AL	8.624	8.591	3.152	3.493	2.620
MG	.162	.103	.000	.000	1.078
TI	.011	.022	.570	2.014	.802
CR	.016	.020	.000	.000	.054
MN	.030	.011	.000	.000	.014
FE	.127	.155	.328	.532	.807
ZN	.013	.009	.000	.000	.000
NA	.204	.217	.377	1.278	.116
K	.057	.077	.288	.432	.152
CA	.122	.086	4.983	2.410	.044
P	.000	.000	2.496	1.128	.000
S	.082	.038	.000	.000	.034
TOTAL	18.542	18.536	19.318	19.346	17.825

ELECTRON MICROPROBE DATA

SAMPLE I.D.: AMEO09-11
WELL NAME/DEPTH: AMERK O-09/4378.77 M
LEGEND FOR ANALYZED MATERIAL (COLUMN HEADINGS): RF8.2 is a repeat analysis of a different area of matrix in the volcanic rock fragment containing feldspar laths. HM9.1 is tourmaline(?), RF10.1 and RF10.2 are analyses of different areas on a semi-opaque squeezed grain of low reflectivity. Dolomite replaces what may have been feldspar laths (now poorly defined if at all). Intragranular porosity occurs in part of the grain.

	RF8.2	HM9.1	RF10.1	RF10.2
OXIDE WEIGHT PERCENT				
SIO2	69.32	35.77	46.04	59.55
AL2O3	8.78	35.76	23.92	21.24
MGO	4.20	7.17	2.83	1.12
TIO2	5.42	.73	.71	1.90
CR2O3	.32	.21	.22	.17
MNO	.13	.09	.09	.12
FEO	6.00	6.59	1.88	1.20
ZNO	.00	.00	.05	.02
NA2O	.00	1.77	.00	.16
K2O	.49	.15	5.34	4.68
CAO	.22	1.79	4.24	.61
P2O5	.00	.00	.00	.00
SO3	.11	.19	.08	.19
TOTAL	94.98	90.22	85.40	90.96

ATOMIC PROPORTIONS.
FORMULA (BASIS 32 OXYGENS).

SI	12.684	7.312	9.839	11.429
AL	1.894	8.616	6.025	4.806
MG	1.144	2.184	.901	.319
TI	.747	.112	.115	.274
CR	.046	.034	.036	.026
MN	.020	.015	.016	.019
FE	.918	1.126	.337	.193
ZN	.000	.000	.008	.003
NA	.000	.700	.000	.058
K	.114	.039	1.456	1.145
CA	.043	.393	.972	.126
P	.000	.000	.000	.000
S	.016	.030	.013	.028
TOTAL	17.626	20.561	19.718	18.426

ELECTRON MICROPROBE DATA

SAMPLE I.D.: AMEO09-11.
WELL NAME/DEPTH: AMERK 009/4378.77 M
LEGEND FOR ANALYZED MATERIAL (COLUMN HEADINGS): RF11.1 is an analysis of a volcanic rock fragment (with feldspar lath texture preserved) that has been replaced by dolomite and sericite(?). The sericite has stained purple from the blue dye added to the epoxy. RF15A.1 and RF15A.2 are analyses in different areas of a brown semi-opaque volcanic rock fragment (with feldspar lath texture preserved). The fragment is of low reflectivity.

	RF11.1	RF15A.1	RF15A.2
OXIDE WEIGHT PERCENT			
SIO2	44.16	33.44	27.95
AL2O3	33.41	22.10	18.01
MGO	1.25	.79	.29
TIO2	.39	10.39	21.95
CR2O3	.17	.15	.12
MNO	.11	.07	.16
FEO	1.69	1.00	.88
ZNO	.01	.02	.01
NA2O	1.02	.00	.00
K2O	8.59	1.84	1.84
CAO	2.25	1.33	2.67
P2O5	.00	.11	.97
SO3	.07	.49	.41
TOTAL	93.12	71.73	75.26

ATOMIC PROPORTIONS.
FORMULA (BASIS 32 OXYGENS).

	RF11.1	RF15A.1	RF15A.2
SI	8.801	8.373	6.921
AL	7.848	6.523	5.257
MG	.370	.297	.106
TI	.059	1.957	4.088
CR	.026	.030	.023
MN	.018	.015	.035
FE	.281	.209	.183
ZN	.002	.004	.001
NA	.396	.001	.000
K	2.185	.589	.580
CA	.480	.356	.709
P	.000	.024	.204
S	.010	.091	.076
TOTAL	20.476	18.469	18.183

ELECTRON MICROPROBE CARBONATE ANALYSES

SAMPLE I.D.: AME009-11
WELL NAME/DEPTH: AMERK O-09/4378.77 M.
LEGEND FOR ANALYZED MATERIAL (COLUMN HEADINGS): CC1C.1, CC1C.2 and CC4D.1 are analyses of carbonate cement midway between framework grains. CC1b.1 and CC4C.1 are analyses of carbonate near the edge of a grain.

	CC1C.1	CC1C.2	CC1B.1	CC4D.1	CC4C.1
OXIDE WEIGHT PERCENT					
MGO	15.63	15.74	15.24	15.78	15.36
FEO	3.57	3.47	3.59	3.48	4.49
MNO	.11	.17	.12	.21	.15
CAO	32.52	33.35	33.36	33.77	33.42
TOTAL	51.83	52.73	52.31	53.24	53.42

ATOMIC PROPORTIONS (FORMULA ON THE BASIS 2 OXYGENS)

	CC1C.1	CC1C.2	CC1B.1	CC4D.1	CC4C.1
MG	.761	.754	.738	.749	.732
FE	.098	.093	.097	.093	.120
MN	.003	.004	.003	.006	.004
CA	1.138	1.148	1.161	1.152	1.144
TOTAL	2.000	1.999	1.999	2.000	2.000

LEGEND FOR ANALYZED MATERIAL (COLUMN HEADINGS): CC5.1 is an analysis of carbonate cement filling a fracture in a quartz grain. CC16b.1 and CC16b.2 are analyses of carbonate cement midway between grains in different areas. CC16C.1 is a cement composition near a grain margin. CC18.1 and CC18.2 are analyses of carbonate replacing matrix in a volcanic rock fragment.

	CC5.1	CC16B.1	CC16B.2	CC16C.1	CC18.1	CC18.2
OXIDE WEIGHT PERCENT						
MGO	14.32	16.55	15.11	15.20	16.70	14.11
FEO	5.11	3.07	4.82	3.86	3.31	5.10
MNO	.11	.14	.16	.17	.09	.09
CAO	33.02	33.57	33.99	34.03	32.46	32.67
TOTAL	52.56	53.33	54.08	53.26	52.56	51.97

ATOMIC PROPORTIONS (FORMULA ON THE BASIS 2 OXYGENS)

	CC5.1	CC16B.1	CC16B.2	CC16C.1	CC18.1	CC18.2
MG	.699	.779	.714	.725	.796	.697
FE	.140	.081	.128	.103	.088	.141
MN	.003	.004	.004	.005	.002	.003
CA	1.158	1.136	1.154	1.167	1.113	1.160
TOTAL	2.000	2.000	2.000	2.000	1.999	2.001