

# ALLIANCE OIL DEVELOPMENT AUSTRALIA N.L.

## COMPLETION REPORT

# CAROLINE WELL No. 1

# O.E.L.22, SOUTH AUSTRALIA

by: M. C. LoBlanc

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Juno, 1957

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### I. <u>SUMMARY</u>

Allience Caroline Well No.1 is located in the Caroline Forest, 10 miles southeast of Mount Gambier, South Australia and 11 miles northwest of Nelson, Bictoria. Geologically the well location is in the Gambier Sunklands province of the Otway Basia.

The well was drilled to a total depth of 11,061 fest during the period from 2nd September, 1956 to 29th January, 1967 and was completed as a carbon dioxide gas well on 21st February, 1967. Surface hole was drilled to a depth of 510 fest with a percussion rig and the remainder of the well was drilled with a National 80B rig owned and operated by 011 Drilling and Exploration Limited.

The well spudded in surface sands which were 10 feet thick and passed through the Glenelg Group (Gaubier formation) to 640 feet, equivalents of the "Browns Creek Group" (Nelson formation) to 652 feet, the Wangerrip Group (Dilwyn and Pobble Point formationa) to 3123 feet and the Sherbrook Group (Curdies, Paeratie and Belfact formations) to 3080 feet. The well then passed through a transition unit to 8179 feet and sediments of the Otway Group (Waarre and Euneralle formations) to total depth.

The Upper Cretaceous and upperment Lover Cretaceous sequence encountered at the Caroline well is escentially similar to that present in the Port Campbell Embayment in the eastern part of the Otway Basin. The occurrence of 1141 fest of Waarre Formation at Caroline No.1 has substantially upgraded the petroleum potential of the western and central parts of the Otway Basin. This potential reservoir unit has not been encountered in wells previously drilled in the Tyrendarra Embayment and Gambier Sunklands structural provinces of the Otway Basin.

Several small gas shows were recorded on the gas detector while drilling through the Waarre and Eumeralla formations and slight fluorescence was observed in sandstone cuttings from several zones within the Maarre Formation.

Of the eight formation tests conducted, three were "misrum" because of packer failure and two yielded recoveries of fresh water and mud from sandstones within the Wangerrip Group. The remaining three tests were of sendstone members of the Waarre Formation. Of these tests, one yielded a recovery of gassy salt water, one resulted in a moderate flow of non-combustible gas accompanied by slugs of calt water, and one resulted in a substantial flow of non-combustible gas.

Gas flowed at a maximum rate of 2,280,000 cubic feet per day and stabilised at a rate of 2,495,000 cubic feet per day during a fifteen hour test of the interval 9154 to 9182 feet within the Warre Formation. Analyses of the gas shows that it consists predominantly of carbon dioxide and includes less than one percent of hydrocarbons and about one half percent of nitrogen.

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### II. INTRODUCTION

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The Alliance Caroline Well No.1 was drilled in Oil Exploration Licence No.22, South Australia, at a location ten miles southeast of the city of Mount Gambior. The well was drilled by Alliance Oil Development Australia N.L. as part of a farmout agreement with General Exploration Company of Australia Ltd. The drilling operation was subsidised on a "test well" basis under the terms of the Petroleum Search Subsidy Act 1959-1961.

The well was located in the central part of the Gambier Trough, a west-northwesterly trending graben, in the Gambier Sunklands structural province of the western part of the Otway Basin. Nearby exploratory wells include Mount Salt No.1 (T.B. 10,044 feet), located fifteen miles to the west, and the Nelson Bore (T.D. 7305 feet) located eleven wiles to the southeast.

The Caroline structure was initially located by detailed gravity survey (Caroline-Killancola Gravity Survey 1966). The presence of closed structure above the gravity anomaly was confirmed by reflection science survey (Caroline-Killancola Science Survey 1966). The well location is near the culmination of the science structure which has an area of approximately nine square miles and a closure of about 400 feet mapped on a phantom horizon at about 4000 feet below sea level.

The Caroline wall was originally programmed for a depth of 6,000 feet to test the petroleum potential of the lower part of the Wangerrip Group and to investigate possible facies changes within the upper part of the Sherbrock Group. The target zones were found to be fresh water bearing but lithelogical and log correlation indicated that, as a result of non-deposition or erosion of a part of the Passatte Formation, the Upper Cretaceous sequence at Caroline No.1 was substantially thinner than that encountered at Mount Salt No.1. As a result the well was deepened to 11,061 foot to investigate the stratigraphy of the entire Sherbrock Group and of the upper part of the Otway Group. III. WELL HISTORY

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1. GENERAL DATA

Well Name and Number:

Alliance Caroline Well No.1

**Cperator**:

Alliance Oil Development Australia N.L. 100 Collins Street, MELEOURNE, Victoria.

### Tenement Holder:

General Exploration Company of Australia Pty.Ltd., 68 Grenfell Street, ADELAIDE. South Australia

Dotails of Petroloum Tenement: 0.E.L.22, South Australia occupies an area of 4,900 square miles in the southeastern corner of South Australia. It is bounded on the north by parallel of latitude 36<sup>0</sup>48' South, on the east by the eastern border of South Australia and on the west by a line parallel to the coast and three miles offshore. The Licence expires on 30th April, 1969.

Alliance Oil Development Australia N.L. 19 the operator for the tenemont and upon meeting certain exploration counitments will carm a 50 percent interest in the tenement.

#### District:

Hundred of Caroling, County Gray, South Australia.

Location: The co-ordinates of the well are:-

Latitudo - 37<sup>0</sup>56'30" South Longitudo - 160'54'30" East

The well location is in Allotment 573, Hundred of Carolino, County Grey, South Australia (Map Reference: Map of County Grey; scale of one inch equals two miles; Department of Lands, South Australia; 1961)

#### Elevation:

K.B. (Datum) 123.3' A.S.L.
G.L. 107' A.S.L.

#### Total Depth:

11,061 feat (Drillor) 11,060 feat (Schlunberger) Date Spudded:

Percussion hole - 2nd September, 1966. Rotary hole - 14th November, 1966.

Date Drilling Stopped:

Percussion hole - 18th October, 1966 Rotary holo - 29th January, 1967

### Date Woll Completed:

21st February, 1967

Dato Rig Released:

Percussion rig - 18th October, 1966 Rotery rig - 21st Pebruary, 1967

### Drilling Time to Total Depth:

Percussion hole - 47 days to 510 feet Rotary hole - 77 days to 11,061 feet

Status: Completed as a carbon dioxide gas well

Cost: Estimated \$300,000 (not including cost of completion)

#### 2. DRILLING DATA:

### Drilling Contractor:

a. Percussion Mole -

Department of Minon, South Australia, 169 Mandle Street, <u>ADELAIDE</u>, South Australia

b. Robary Molo -

011 Drithing and Exploration Ltd., 93 York Streat, SYMMER, Now South Malos

#### Dodlling Plant

a. Porguagion Rig

Make :	Rusten Broysus
Typo :	R. 22
Rated Cenacity:	1200 fost (6-inch hole)
Noters (one):	Ruston 22 H.P. (maximum)
Drill Cable:	75) foot; 24-Inch O.D.
Drill Sinkarbars:	One (43-in. z 15 feet)

b. Rotary Rig

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## Mast:

Make:	Ido <b>co</b>
Type:	FM 136-450 Full Viow
Rated Capaci	y: 700,000 pounds

## Pumps (2):

Make:	Ideal
Туре:	G700
Size:	S-inch by 14-inch
H.P. Eating:	700
Pumps are pevered	by the actors listed above.

### Bloy Out Proventor Equipsont:

Make:	Hydrid	Cameron
Model:	GK	GRC Double Gate
Sigo:	12-Anch	12-inch
Serice:	3000	3000

Hydril E80 Automatic Accusulator; 3-Station Control Unit.

### Hole Sizes and Depths:

(i)	22-inch to 165 foet
(i) (i1)	18-inch to 510 fest
(111)	172-inch to 761 feat
(iv)	127-inch to 3150 fact
(v)	Weinen to 11,051 leet
(vi)	7%-inch to 11,061 feet

### Casing Details:

Size:	19 <sup>1</sup> -inch	13 <sup>3</sup> -inch
Weight:	3/16-inch thick	48 1b.
Grado:	3/16-inch thick Local manufacture	H-40
Depth Landed:	163 foet	740 feet
Float Collar:		
Туре -	none used	none used
Location -	aph ann 126 Allin ann 189	المت الله عليه عليه الله
Guido Shoe:		
Type -	nong used	none used
Location -		an an the state and the
Pluge:		
Type -	none used	<b>Halliburton</b>
Location -		Top
Contralisors:		
Type -	none used	Halliburton
		"latch-on"
Location	-12 (co) (13 - 40 - 40 - 15)	730.10 feet and
		699.84 foet
Scratchorn:		
Туро -	none usød	none used
Location -		
Sacks of		
cement:	agina arigi alife agin alife data	700
Rise of		
conont:	473 CD 4.2 YO 49 PA	380 foet (logs).
		Cemented to
		surface through
		annulus
Method used:		Displacement
		(top plug only)
یده چرې بوه دیو دوه دوه دوه دوه دو درو درې دې وې وې وې وې دو وی وې		

- 9 m

Sizo: Weight: Grade: Depth Landed: Flont Cellar: Type - Location -	9%-inch 36 1b. J-55 3149 feet Halliburton Top at 3115 foet	5 <sup>1</sup> / <sub>7</sub> -inch 17 1b. J-55 and N-80 9400 feet Eaker - Type G Top at 9364.23
Guido Shoo: Type - Location -	Halliburton Top at 3157.80 feet	fest Halliburton Top at 9399.15 fest
Plugs: Type - Location - Contrulisors:	Halldburten Yop and botten	Halliburton For and bottom
Type - Location -	Helliburton 63 3045; 3072; 3098; 3132.	Hall1burton 7990; 8090; 8170; 8230; 8290; 8350; 9084; 9154; 9306; 9366.
Soratchors: Type - Location -	none usoŭ 	Halliburton RWC 8086: 8096; 8111; 8126; 8177; 8192; 3207; 8222; 8241; 8256; 8278; 8290; 9149; 9164; 9178; 9195; 9210; 9225; 9240; 9258; 9298; 9314;
Sacks of ooxont: Rise of	<b>\$80</b>	640
conent; Mothod used:	1950 (estimated) Displacement (top and hottom pluge)	7726 (logs) Displacement (top and bottom plugs)
Tubing Details:		•

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Sizo:	$2\frac{3}{6}$ -inch
Wolght:	4.7 lb.
Grade :	J-55
Depth Landed:	8136 Sect
Packer:	
Type :-	Guiberson XVL30 ·
Sizo -	5½-inch
Location -	5125 to 8136 feet
Length Tubing	
Stringor:	3.16 feat

Drilling Fluid: The drilling fluid was a fresh water and benievable und with on average weight of 9.8 lb/gal. Bolow a depth of 1700 feet 8 to 12 percent disselling was incorporated into the drilling fluid.

The following weekly averages give an approximation of the and characteristics. .

.

	ending ) au)	Depth (feet)	Veight (1b/gal.)	Viscosity (sec.)	Water Loss (cc/30 min.)	pH
28 No	ov.66	3160	9.2	50	5.0	9.5
5 Da	ec.	5396	9.4	56	4.1	10.0
12 De	90.	6016	9.6	52	4.6	10.0
19 De	90.	7099	9.9	55	4, 15	9.5
26 De	9C.	7957	9.9	53	- 4.2	9.2
2 Ja	<b>m.</b> 67	8568	9.9	65	3.9	9.1
9 Je	an.	9440	20.0	54	4.1	8.8
16 Ja	RN.	9760	10.1	60	ls , ls	9.0
23 Ja	BIL.	10383	9.8	54	13. 14	8.4
30 Ja	317.	11061	10.2	59	4.5	9.0

Mater Supply: Nator was obtained from a subartesian bore located 200 foot east of the wellsite. The bore was drilled to a depth of 120 feet and cased to 97 feet with 6-inch casing. A Pomona submersible unit, powered by a 32 H.P. International tractor, was utilised to obtain water at a rate of approximately 9000 gallons per hour from the Gambier Formation.

#### Perforation and Shooting Record:

Casing Size:	
Intervals Shot:	8204-6210; 8214-8230
	9152-9172; 9303-9321
Type of charge:	Cornwic Link-Jets
Shots por foot;	Four
Mothod Employed:	Thru-Tubing Gau
-Operator:	Welez .
· · ·	

Plugs: When completing the well the following plug was spotted in 8%-inch hole and "felt for".

Interval: Cament: Nothed upea: 9401 to 9550 foot 73 snoka Displessment

Fishing Operations: The following fishing operations were conducted:-

- 1. On 17th November, 1966, while tripping out of the hole (total depth 761 iset), a pickup sub failed and three Seinch detll collers were lost downhole. The figh was recovered on the first run with an overches.
- 2. On 15th January, 1957, while conducting D.S.T. No.8, the testing string becaus stuck in the hole as a result of differential sticking against a percus sandstene unit some 700 feet above the packer. Following an uneversaful attempt to back off the pumpout sub, two barrels of counstent grade hydrochloric soid were spotted opposite the percus zone. After allowing the acid to work for three house the testing string pulled free.

#### 3. SAMPLING AND CORING

Ditch Cuttings: In general, samples representative of each ten-foot interval were collected on a platform at the base of the shale-shaker. During coring operations and when zones of special interest were being drilled the sampling interval was reduced to five feet or less. Samples obtained from 510 feet to total depth were lagged. Lithological descriptions of the samples were made after they had been examined under the microscope and all samples were further examined under ultraviolet light for fluorescence indicative of the procence of hydrocarbons.

Sample cuts were distributed to the South Australian Department of Mimos, the B.M.R. and Alliance Oil Development Amstralia N.L.

<u>Coring</u>: A total of seventeen cores were cut utilizing both conventional and wireline coring equipment. The conventional equipment produced cores with a diameter of 34-inches and the wireline equipment produced cores with a diameter of 14 inches.

Core	Interval	Conven-	Wiro-	E.	lecovery
No.	(fost)	tional	lino	(root)	(percent)
A DAME ALON' W	n er hære personskelser er forskelser forskelser forskelser forskelser forskelser forskelser forskelser forskel	THE CONTRACT OF A DAMAGE OF	ACT HE STREET OF DEPARTURE		
1	581- 599	R		15.5	\$6.1
2	699- 719	x		11	55 .
3	2454- 2476	X		11	50
3 4	2560- 2572		x	23	33.3
5	2572- 2580		31	1 3	37.5
5 6	2580- 2582.5		X	9 1.17	46.6
	2663- 2673		X	3.5	95
7 8	2673- 2681		x	5.5	81.3
- 9	2711- 2715		R	3	75
10	3040- 3060	x		8.25	41.2
11	4091- 4102	• •	X	4.33	39.4
12 12	4102- 4114			17	58.3
13	6001-6016	<b>N</b> .	43	20.5	70
				0.22	7
14	7699- 7702	2		3.5	3.3
15	7957- 7975	· 2		1	1 -
16	10057-10067	28	l	9.17	91.7
17	11051-11061	ズ	Į	7.66	76.6

Core cuts were distributed to the Europu of Minoral Resources and the remainder of the core was shipped to the South Australian Mines Department.

Side-wall Sampling:

No side-wall samples vero obtained.

#### 4. LOGGING AND SURVEYS

Electrical and other logging: Well logging pervices ware provided by Schlubberger-Siaco Inc., and by Welex. Induction-Electric, Microlog-Caliper. and Senia-Garma Eng logs tono sup first the base of surface useding to total dopth and a continuous diphoter survey was conducted over the interval 722 to 10,799 feet. Only a Gamma Ray log was run over the cased interval 20 to 742 feet. A Temperature log, a Cament Bond log, and a Microseismegram-Gamma Collar log were run over selected intervals. Details of logs run are presented as Appendix 4A.

<u>Note</u>: Elevations shown on several of the log headings are incorrect and should be changed to :-

Ground Elevation:	107 feet
K.B. Elevetion:	123.3 foot

A velocity survey with 34 shots was conducted between 750 and 11,050 fest by Nameo International Inc. The results of the survey comprise Enclosure 3 of this report.

Penetration Rate and Gas Log: Rate of penetration was continuously recorded by usens of a Geolograph and a drilling time log was maintained continuously from 510 feet to total depth.

A Johnston Williams het-wire filament type gas detector connected to a Honeywoll recorder was used from 510 feet to total depth.

The penetration rate and the gas detection records are presented graphically on the composite log (Plate 1).

Temperature Surveys: Bottom hole temperatures taken while legging were:

Depth			Temperature
3290	÷	•	120°F
6007			135 <b>°</b> F
9412			187°F
11060		•	195 <b>°</b> F

#### 5. TESTING

Formation Testing: A total of 8 open-hole drill stem tests were run. In all tests, two Amerada B.T. pressure recorders, safety joint, hydraulic jars, and dual closed-in pressure tools were used. Of the eight tests, five are considered to have successfully evaluated the zene of interest in each interval and three were "misrun" because an adequate packer seat was not obtained.

The intervals covered and the results of all drill stam tests are shown on the composite log (Plate 1). Analyses of gas recovered from these tests are included as Appendices 2 (a), 2 (b), and 2 (c); analysis of the formation water recovered from D.S.T. No.5 is included as Appendix 2 (d). Detailed reports of drill stem tests Nos. 1 to 8 inclusive are included as Appendix 5 and reproductions of the pressure records obtained from drill stem tests Nos. 1 to 6 and 8 are included in this report as Enclosure 9.

The recults of the tests are summarised in the following table:

.S.T. Nc.	Interval	Ry yo	Results
1	30423130	Botton-hole; dual packers	Recovered 370' of and and 7530' of water (3.2 Okun at 80 F)
2	2936-2961	Straddlo; duel peckers	Recovered 2670' of mud and 300' of water (3500 ppm C1 at 80°F)
3	8094-8149	Straddie; single packor	Mile 2723
lş -	8256-8433	Bottou-hols; dual packors	GTS in 7 mins. at rate too small to measure; improased to 800 Mcf/d in 12 mins. accompanied by slugs of mud and salt water. Estimated maxi- mum flow of 2-3MMcf/d. Recovered \$335' of salt water separated by peckets of nex-combustible gas.
5	86108730	Dotton-kolo; Gual packars	Non-combinishible GTS in 20 minutes at rate too curl to measure. Showt flow of colution ges at start of second flow pariod. Recovered 279' ganay mater-out and and 5500' of gasey sait water (0.3%) Ohms at 38 Th
6	8146-3238	Straddlo; eingle packer	NA 5 7110. B
7	8163-8222	straddie: Straddie:	214 a crun
8	9154-9182	Straddle; Stal packers	Non-combustible GTS iA 2 minutes at rate too small to measure; increased to 2.29 MMcf/d at end of first flow period. Flow etablissed at 2.495 MMcf/d during second flow period

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### IV. GFOLOGY

# 1. Stratigraphic Sequence, Caroline Vell No.1

The stratigraphic sequence penetrated in the Caroline well is summarized in the table below which shows the depth to the top of each lithological unit measured from the top of the kelly bushing (123.3 feet above sea level and 16.6 feet above ground level) and from sea level together with the thickness of each formation.

Lithological Unit	Forwai: Depth K.B.	ion top (fost)  Subsea	Thickness (feet)
Quatornery sends Disconforsity	16	+ 107	10
Glenelg Group Gaubier Formation Unconformity	26	* 9 <b>7</b>	6 <b>26</b> 614
"Browns Creek Group" Equivalent Nelson Formation Unconformity	640	- 517	12 12
Wangerrip Group Dilwyn Formation BMR Unit Dbl BMR Unit Db2 Pobble Point Formation	652 1970 3040	- 529 -1847 -2917	2400 2388 1318 1070 83
Shorbrook Group Curdies Formation Disconformity ? Paaratte Formation Macdonnel Momber	3123 3970 5706	3000 3847 5583	4957 + 837 3102 1736 1366
Carolino Houber Bolfest Formation Transition Unit	7072 8080	-6949	1008 99
Otway Group Waarro Forwation Unit 1 Unit 2 Unit 3 Unit 4 Transition wait Eumoralla Forwation	8179 3565 8920 9150 9320 9450	-8056 -8442 -8797 -9027 -9197 -9197 -9367	2082 + 1141 386 355 230 170 170 1571 +
total Drpin	11061	-10936	

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#### 2. <u>Stratigraphy</u>

The lithology of the formations penetrated in the Caroline Well No.1 is sugmarised below. A detailed description of the stratigraphy is included in this report as Appendix 6.

Surface sauds:

Age: Quaternary 16 to 26 feet (thickness - 10 feet)

Fine grained, unconsolidated, subangular quartz sand.

#### GLENELG GROUP

#### Gambier Formation

Age: Oligocone - Miccens 26 to 640 feet (thickness - 614 feet)

Bioclastic linestons, calcarenite and delowite; with some warl, sandatone and chort.

26 to 46 foot - Greyish yellew to light brown, very fine grained to wedium grained, slightly argillaceous and dolouitic, peorly consolidated bioclastic LIMESTONE with abundant bryozozi fragments.

46 to 146 feet - White, croam and buff, very fine to finely crystelline DOLOMITE which generally is very friable and in part is recovered as loose rhombs. Near the base of the unit the delouite becomes buff to reddish brown and pele yellow, slightly calcareous and well consolidated.

146 to 316 foot - Gream to Light grey, poorly sorted, blockastic LIMESTONE with abundant delowitized bryezoel fragments; light grey to white, very fine grained to fine grained, fossiliferous CALCARENITE; light to dark grey CHERT; white to light grey, sparesly to medorately fossiliferous (predominantly bryezoel fragments) MARL.

<u>316 to 376 foot</u> - Cream bioclastic LIESTONE consisting of poorly sorted (very fine to grammle sized) delemitised bioclastic gramm in an abundant (30 to 60 percent) matrix of silt-sized carbonate grains; in part very delemitic with up to 20 percent delemits should. Several thin bads of delemite und chort.

<u>**276**</u> to <u>436</u> foot - Cream to pale yellow, poorly screed (very fine gradued to granule sized) CALCARENITE with abundant forsail fragments (predominantly bryszoal) and a wicrossystalline to very finely crystalline matrix. 436 to 460 foot - Buff, very fine grained to cearse grained (predominantly fine grained) SANDSTONE consisting of angular to subangular quartz grains, 35 percent delomitic carbonate grains, and loss than 5 percent fossil fragments. The quartz is predominantly clear but several grains are iron-stained.

460-530 feet - Creem, buff, reddich brown and brick red, microcrystalling to finaly crystalling DOLOMITE.

530-640 foot - No sample returns were obtained while drilling through this interval. Core 1 (581 to 599 foot) consists predominantly of a light grey, very finely crystalline, argillaccous, calcareous DOLOMITE resulting from dolomitisation of a poorly sorted bicolastic linestone. The gammaray log indicates that carbonate rock is the dominant lithological type within the interval 530 to 640 feet.

The Oligocene-Miocone succession in the southern part of the Gaubier Sunklands consists predominantly of liwestons but, as at Carolins No.1, may include a significant propertion of other reck types, particularly dolomito. Lithological variation is even more pronounced to the northwest of Mount Gambier where in a series of 24 structure holes the Oligocone-Miccone sequence was found to include a substantial propertion of clays, warls, dolowite, and some candotone. (Tartwaup Structure Drilling Project - 1966; unpublished report to Allianco Oil Development Australia N.L.). In view of these diverse lithologies it is proposed that the stratigraphic name Gambier Limestone, previouely applied to the Oligocono-Miocono succession of the Cambior Sunklands, be amended to Gaubier Formation.

#### "BROWNS CREEK GROUP" equivalent ?

#### Nolson Formation

Ago: Upper Bocene. 640 to 652 feet (thickness 12 feet)

No sample roturns were obtained while drilling through the Nelson Formation. The boundaries of the formation are defined by changes in radioactivity on the Gauma-Ray leg. At the rearby Nelson Boro the formation comprises very coarse grained conditions, with limenite pellets and a delowitic and sideritic commut, underlain by a quartz pebble conglomerate with limenite pellets in a coment of siderite and iron exide.

The Nelson Formation unconformably averlies the Dilwyn Formation and is unconformably overlain by the Gambier Formation.

#### WANGERRIP GROUP

#### Dilwyn Formation

Ago: Paleccene to Eccene. 652-3040 fect (thickness - 2388 feet)

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Three lithological units have been recognised within the Dilwyn Formation. Unit one is considered to be equivalent to the BMR subdivision Unit Dbl (BMR Record 1966/170) and Units 2 and 3 combined are thought to be equivalent to BMR Unit Bb2. Unit 3 itself is considered to be correlative with the "Rivermook Member" of the Port Campbell Embayment.

Unit 1 (652 to 1970 feet)

Poorly consolidated, poorly sorted SANDSTONE and 25 percent interbedded SILTSTONE with some CLAY and rare COAL stillagers.

The quality of samples obtained while drilling through this unit is poor. The samples consist for the most part of medium grained to granule sized discrete quartz grains. It is most probable that the matrix has washed out of the sandstones and that the finer sand fractions have passed through the shale shaker screen. The lithology of the unit as deduced from the cuttings and logs is as follows:-

SANDSTONE: white to light grey, poorly sorted, consisting predominantly of round to subangular and rare angular, very fine to granule sized grains of clear to snoky quartz. Light to dark grey chort, groy and green quartzite, pyrite, suscovite and carbonaceous grains are the most common accessories. Of these accessories chert and carbonaceous grains are more common in the upper part of the unit and quartizite near the bass. Rars pollets of glaucculto, yollow and orange tinted quartz grains and iron-stained quartz also occur. Coment, where present, consists of pyrite or in places siderite. Natrix, where present, censists of gray, broun, and black silty, pyritic clay or argillaceous silt. The cuttings and logs indicate a decrease in average grain size and/or increase in proportion of matrix towards the base of the unit.

SILTSTONE: browsish groy to modium brown; generally very finaly sandy, very argillaccous, moderately micaceous, slightly to very pyritic and only slightly carbonaceous.

CLAY: (observed in Core No.2 only) black, carbonaccous, slightly randy; with common pyrite modules and traces of limonite, glauconite, ironatene and chort.

COAL: black, lignitic; in part sandy and pyritic.

### Unit 2 (1970 to 2430 foot)

The quality of samples obtained while drilling through this unit is poor, partly as a result of caving from Unit 1. The electrical, sonic and gamma-ray logs indicate that the unit includes about 35 percent siltatone and silty clay but only sendstone and loose sand grains were recovered in the cuttings.

The SAND consists of clear to cloudy, round to subangular quarts with traces of groy quarts, light to dark groy chert and quartzite. Auber, pink,, orange and vellow timted quartz grains are common at coveral horizons. Traces of pyritic and brown silty clay matrix adhere to several of the grains.

The SANDSTONES are prodominantly gray and brown, very fine to fine grained, underately to very silty, micaccous, in part pyritic and are generally well command with delomite or less connexly with siderite. They consist of angular to subangular quartz and up to 20 percent lithic grains (including groyich brown siltatone) set in a silty matrix. Several of the conductors have as much as 50 percent delomitic carbonate matrix.

Traces of brown, silty and carbonaccous CLAY and of brown, argillaceous SINTSTONE are present in the cuttings.

#### Unit 3 (2490 to 3040 foot)

The surples are greatly contaminated by loose sand from the overlying units of the Diluyn Fernation. The unit consists predominantly of argillacsons SILTSTONE and silty CLAY and SHALE. Several thin beds of SAMISTONE are also present.

The SILISTONES are grayled brown to brownish gray, alightly michaecons, mederated y to very argillaccous, slightly sendy (very fine grained quarts) and contain abundant streaks and specks of carbonaccous matter. Interbeds of light gray to gale brown SILISTONE which is only slightly argillaccous and very slightly carbonaccous are present near the base of the unit.

The CLAYS are medium to dark brown, moderately to very corbanaceous and micheoous, are often silty and in part are pyritic. In Goroz 3, 4, 5 and 6 the CLAYS contain limings of SELTSTONE and of greenish grey, very fine grained, silty, carbonaceous SANDSTONE.

The SHALES are redium to fack brown, mederately to very carbonageous, micaseous and ailty.

The SAMPSTONES are predominantly white to light grey and brownish grey, flightly argillaceous and moderately to very alley. They consist of angular to subangular, vory fine to fine grained quartz and a zuall amount

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of dark grey to black lithic grains set in a silty, argillaccous matrix. Clean very fine to fine grained quartaose SANDSTONES with an abundant delemitic conent are not uncommon.

#### Pebble Point Fernation

Age: Falascens 3040 to 3123 feet (thicknoss-83 feet)

Liconito COLITE, colitic SANDSTONE, pobble CONGLOMERATE, poorly corted quartz CANDSTONE and sandy SIDERITE.

The top of the formation is well defined on the Electric Microleg and Gamma-Ray legs. The base was picked on the Gamma-Ray leg where the change to clean sandstone of the Curdice Fernation is charactorized by a sharp decrease in gamma-ray units.

Core 10, from the uppermost part of the formation, is described in Appendix 3.

Samples obtained from the interval 3060 to 3123 feet are not fully representative of the soction drilled. The samples consist productmently of leose, medium to very coarse arabe and some granules of angular to subangular quarts. Accessory grains consist of a few grey and yellow quarts grains and traces of chort, iron-stained quarts grains and traces of chort, iron-stained quarts grains and limenite. Traces of pyrite compute and of brown clay matrix achere to several of the grains.

The samples include a small propertion of brownish gray, fine to contoo grained, angular, quartz SANDSTONE with anabundant matrix of slity clay and argillaceous ciderite and of deak brownish grey, very sandy SIDERITE containing abundant poerly corted quartz grains and a few limonito colithe.

A small proportion of senderons similar to that in Core 10 is present in camples obtained from the bottom part of the formation.

Regionally the Rebble Fount Formation is separated from the underlang coddmonte by as unconfornity or disconformity.

#### SHENBROOK CHOIP

#### Curdies Powertian

Ago: Upper Drabassona 3123 to 3970 feet (valormene 537 rots)

SANDSTONE with some SALASTONE and SHALN interbode and rare stringers of COAL.

The SANDSTORES are prederivently white to light grey, very poorly sected and are easy weakly consisted. They consist of very fine to very carse graine, with abundant granuler and news vehicles, of engular to subround (mostly angular to antengular) quastr. Grains of medium grey siliceous rock and of grey, brown and greenich grey quartzite are the most common accessories. Pink, yellow, rod, and orange tinted quartz grains are fairly common in places. Pyrite is the dominant common in the upper part of the formation but is less common towards the base. In this part of the formation the sandstones may have a matrix of silty, carbonacoous clay or less commonly of kaolin.

Several interbeds of poorly sorted, well cemented SANDSTONE are present between 3745 and 3823 feet. These sandstones consist of fine to very coarse grains and occusional granules of quartz set in an abundant (20 to 40 percent) matrix of silics and delomite.

The SILTSTOMES are dark grey to grayish brown, alightly to moderately carbonaccous, micaceous, moderately to very argillaceous and in part grade to very silty shale.

The base of the formation, at 3970 feet, was picked at the first appearance of green clay matrix adhering to the loose quartz grains. At this same depth there also occurs a marked change in the average degree of roundness of the same grains derived from the coarser conditions members. Those of the Curdies Formation are predominantly angular to subangular and those of the underlying Pascatto Formation are predominantly subround to subangular.

At Caroline Well No.1 the Curdies Formation is separated from the Pagestte Formation by a disconformity or an unconformity.

#### Paaratte Forention

Ago: Upper Cretneeous. 3970 to 7072 feet (thickness - 3102 feet)

The Paaratte Formation has been subdivided into the Macdonnel and Caroline weaters on the basis of the marked changes in canditone to shale ratio which occur within the formation.

At Caroline No.1, the Macdonnol Member has a sandstone to chule ratio of 6 to 1 and the Caroline Member a ratio of 1.1 to 1. Sendstone to shale ratios for these members at the nearby Mount Salt No.1 are 4.5 to 1 and 1 to 1 respectively.

Macdonnel Member (3970 to 5705 feet): SANDSTONE with less than 14 percent interbedded SILESTONE and SHALE.

The most common senderbone type is a white to light grey, occasionally burf, very friable, peerly corted SANDSTOME which is recovered in the cuttings as loose, medium to very coarse grains and some granules of clear to slightly cloudy quarts. The grains range from angular to round but are most commonly subround to subangular. Tinted quarts grains are the most common accessories and in places form as much as thirty percent of the framework; they are most commonly yollow suber and place but green, red and - on the average, the constituent quartz grains are less angular.

Formation in the following respects:

- the prodominant void filler is a green chloritic clay.
- tinted quartz grains are wore common.
- grey siliceous grains, chert and quartrite are such less abundant.

The consolidated SANDSTONES for the most part are white to light grey, very fine to fine grained, slightly to wederately silty, only slightly wicaceous, and are moderately well sorted. They consist of angular to subround quartz and a variable amount of. accessory grains set in a matrix which is usually kaolinitic but is occasionally argillaceous and rerely chloritic. Coment, where present, is usually silicoous. The most common accessories are carbonaccous watter, yellets of green chloritic clay and of chlorite and indeterminate, green and grey lithic grains. Traces of coal, pyrite, feldapar, white clay and pink quarts grains are also present. Content of accessory grains varias greatly ranging from less than five percent in most sandstones to as much as twenty percent in others.

The SILTSTONES vary greatly in colour (light to dark grey, brown and in part green) but are for the most part moderately to very micaceous and carbonaceous. They are usually either very sandy (very fine to fine grained quartz) or argillaceous and grade to sandstone and shale. Below 4800 feet they often contain abundant pellets of chlorite or of green chloritic clay.

The SHALES are modium growish brown and brownish grow, slightly to moderately silty and carbonaceous, slightly micaceous, and are occasionally slightly sandy (very fine grained quarts).

Caroline Member (5706 to 7072 foot): SANDSTONE with 48 percent interbedded SILASTONE and SHALE.

The coarser grained SAMDSTONUS are poorly sorted and very friable. They are recovered as loose very fine to very coarse grains, granules and occasional pebbles of round to engular (predominently subangular to subround) clear to slightly cloudy quartz. Accessory grains which consist of yellow, asber, green and orang tinted quartz grains and rare grains of chort and pyrite are usually present only in trace emounts. Traces of kaolimitic matrix adhere to many of the quartz grains and some siliceous coment and traces of carbonate and pyritic cement are present near the base of the unit.

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The finer grained SANDSTONES are also poorly sorted but for the most part are well comented. They consist of very fine to fine grains and scattered medium to very coarse grains of angular to subround quartz and a small amount of accessory grains. The most common accessories are pellets and grains of green chloritic clay and white kaolinitic grains. Traces of chert, red grey and black lithics, tinted quartz and pyrite are also present. Some carbonaceous matter and wica occurs near the top of the unit but is not common in the lower part.

Sandstones above 6200 feet have a kaclinitic or occasionally an argillaceous matrix and are poorly cemented; those below 6200 feet contain only minor amount of kaclin and are generally moderately well cemented with silica, delomite or less commonly with siderite or pyrite.

The unit contains fairly common lenses and stringers of sandstone with an abundant coment of pyrite or of siderite.

The coarser sandstone beds of the Caroline Member lack the green chloritic clay watrix and the abundance of tinted quartz grains which are characteristic of similar sandstones in the overlying Macdonnel Member. In general, the consolidated sandstones of the Caroline Member are more poorly sorted, better cemented and contain considerably less carbonaceous matter than those of the Macdonnel Member.

The SILTSTONES are medium to dark grey, firm, micaceous carbonaceous and contain variable amounts (trace to abundant) of green chlorite and/or chloritic clay grains. Traces of glauconite, pyrite and sideritic cement are present in several of the siltstones. In the upper part of the unit the siltstones are often moderately to very sandy or argillaceous and grade to silty sandstone and shale. In general the following changes in composition of the siltstones occur towards the base of the Caroline Member.

- a. decrease in amount of carbonaceous watter and of mica.
- b. decrease in amount of argillaceous watter and of send content.
- c. increase in abundance of chloritic grains.

The SHALES are medium to dark grey, moderately to very silty, slightly to moderately carbonaceous and micaceous and are rarely kaolinitic.

The Paaratte Formation conformably overlies the Belfast Formation.

#### Belfast Formation:

Age: Upper Crothceous 7072 to 8080 feet (thickness -1008 feet) SHALE or MUDSTONE grading downwards to SILTSTONE, with minor interbedded SANDSTONE.

A large proportion of the shale or mudstone has been ground up by bit action and has washed out of the samples. The SHALES which were recovered in the samples are medium to dark grey, slightly carbonaceous and moderately to very silty. The shales from above 7400 feet are slightly micaceous (muscovite), rarely sandy, and contain traces of glauconite, pyrite and of white clay grains. Those from below 7400 feet contain fairly common shreds and grains of grey, brown, and green lithic debris (altered feldspar ?) and of carbonaceous matter and/or biotite. Traces of glauconite or chlorite are also present.

The SILTSTOMES are light to medium grey, slightly to moderately micaceous, moderately carbonaceous, and in slight part sandy or argillaceous. They contain abundant (up to 30 percent) white, brown, buff and green feldspathic/lithic grains and shreds, fairly common patchy chlorite, and possibly traces of glauconite. Several of the siltstone beds, near the base of the formation, have a moderately abundant cement of dolomite or of siderite.

The SANDSTONES are white to light grey, very fine to fine grained (with occasional medium and coarse grains) and are moderately well comented with silica and dolomite. They consist of angular to subangular quartz and variable amounts (trace to 15 percent) of white clay grains, brown buff and black feldspathic/ lithic grains and traces of muscovite, biotite, carbonaceous matter, tinted quartz grains and pyrite.

The shales and siltsones of the Belfast Formation can be distinguished from those of the Paaratte Formation by their content of foldspathic/lithic debris.

#### TRANSITION UNIT 8080 to 8179 feet (thickness -99 feet)

SILTSTONE, similar to that of the Belfast Formation, with several SANDSTONE interbods similar to those in the uppermost part of the Waarro Formation.

#### OTWAY GROUP

#### Vearre Formation

Age: Lover to Upper Cretaceous. 8179 to 9320 feet (thickness -1141 feet)

SANDSTONE with 36 percent interbedded SHALE and SILTSTONE. The sandstone to shale ratio is 1.8 to 1. Contacts with the Belfast Formation, above, and the Eumeralia Formation, below, are comformable and appear to be gradational.

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Unit One (8179 to 8565 feet): SANDSTONE (orthoquartzite) with 22 percent SILTSTONE and SHALE.

The SANDSTONES are white to light grey, poorly sorted and very friable. They consist of angular, very fine to very coarse grains, common granules and some pebbles of quartz, and traces of accessory grains. The conditions are poorly comented with silica or rarely with siderite and occasionally have a sparse matrix of kaolin. The accessory grains consist of yellow, amber and pink tinted quartz, fresh orange feldepar, white and grey chert, grey and green lithics, white and brown weathered feldepar, carbonaceous matter and mica.

The SILTSTONES are light to medium groy, moderately to very carbonaccous and contain abundant white to brown grains of weathered foldspar, occasional green chloritic grains, and traces of pyrite and glauconite. Several of the siltstones are slightly sandy (very fine to medium grained quartz).

The SHALES are medium to dark gray, slightly to moderately silty, slightly carbonaceous, occasionally slightly misaceous and contain acattered grains of white and brown weathered foldspar.

The unit includes longes of very sideritic, very fine grained candotone, siltetone and claystone.

Unit 2 (8565 to 6920 feet): SMALE with some SILTSTONE and 38 porcent interbedded SANDSTONE (orthoquartzite).

The SHALES are medium to dark grey, moderately silty, often slightly to moderately carbonaceous and micaceous (muccovite and biotite), and contain trace amounts to fairly abundant white, cream and buff grains of weathered feldspar and traces of glauconite (?).

The SILTSTONES are light to modium grey, slightly micaceous and carbonaceous and contain very abundant cream, buff and greenish grey feldspathic/lithic shreds and grains and traces of glaucenite.

The SANDSTONES are similar to those in Unit 1 but generally are finer grained and less yearly corted.

Unit 3 (8920 to 9150 feet): SANDSTONE (protoquartzite) and 27 percent SILASTONE and SHALE.

The SANDSTONES are light grey, slightly carbonaceous, very silty, moderately well sorted and compact. The framework consists of very fine to fine grains and occasional medium grains of predominantly subangular quartz and abundant (generally 10 to 20 percent) weathered feldspar, white and green clay and indeterminate lithic grains. The matrix is usually silty but is occasionally kaolinitic or argillaceous. Coment, where present, is siliceous and is rarely slightly calcareous. The SILTSTONES are medium groy, slightly to moderately carbonaceous and micaceous, moderately to very sandy and contain abundant feldspathic/ lithic shreds and grains and traces of pyrite.

The SHALES are medium to dark grey, moderately silty, slightly to moderately carbonaceous and contain traces to fairly abundant lithic/feldspathic debris.

Unit 4 (9150 to 9320 feet): SANDSTONE (protoquartzite and orthoquartzite) and 20 percent SILTSTONE.

The SANDSTONES are white, cream and buff, poorly sorted and very friable. They consist of very fine to ccarse grains and occasional very ccarse grains and granules of angular to subround quartz and 2 to 15 percent accessory grains set in a matrix consisting predominantly of powdery silica, but including some kaolin and traces of siderite. The most common accessories are white, light grey and pale green grains (weathered feldspar ?), carbonaceous matter, and red ardblack lithic grains. Chert, orange feldspar and tinted quartz grains are present in trace amounts.

The SHALES and SILTSTONES are similar to those in Unit 3.

The unit includes fairly common lenses of brown, very fine to fine grained silty sandstone with an abundant siderite coment.

Transition Unit 9320 to 9490 (?) feet (thickness -99 feet)

Interbedded SANDSTONE, SILTSTONE and SHALE.

The SANDSTONES are predominantly white to light grey, very fine to medium grained and have a ciliceous to slightly calcareous cement. The framework consists of angular to subround (predominantly subangular) quartz and from 5 to 25 percent white and brown weathered foldspar grain, grey lithics and occasional green clay grains. Traces of kaolinitic matrix are present.

The SILTSTONES are light to medium grey, slightly carbonaccous, occasionally micaceous or sandy and contain fairly abundant white and brown feldspathic/ lithic grains and shreds.

The SHALES are medium to dark grey, slightly carbonaceous and micaceous, in part slightly silty and contain occesional feldspathic/lithic grains and shreds.

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#### Eumeralla Formation

Age: Lover Cretaceous 9490 to 11,060 foot (thickness -1571+ feet)

The top of the formation has been picked at 9490 feet on the basis of electrical characteristics. ()rthequartzites are fairly common in the uppermost part of the formation and the "Transitional Unit" may in fact, extend to as deep as 9600 feet.

The formation consists of SANDSTONE with 53 percent interbedded SHALE and SILTSTONE and traces of COAL. The sandatone to shale ratio is 0.6 to 1.

The dominant SANDSTONE type is arkose E, but the formation includes some feldspathic grewacks E. Protequartzites are common in the uppermost part of the formation and are interbedded with srkews from 10,600 feet to total depth. Volcanic sendstones are not present or have not been recognized.

The ARKOSE is white to light gray and greenish gray, moderately well sorted and friable. The framework, on the average, consists of angular to subangular, very fine to fine grains of white to pale green fresh translucent feldspar (70 percent), lithic grains, knolin grains and weathered feldspar (20 percent) and quartz grains (10 percent). The arkose is generally poorly comented with silica and/or calcite. An argillaccous, silty or more rarely chloritic matrix is present in places.

The orthoguartzites below 10,600 feet are white, oream and buff and consist of very fine to fine grains and occasional medium to coarse grains of quartz with less than 10 percent wenthered feldspar. lithic and chloritic grains set in a matrix of slightly calcarecus to dolomitic powdery silica.

a Pottijoln, F.J., 1957 - Sødimentary Rocks. Harpor, New York.

The SHALES are medium light to medium dark grey, in part brownish grey, slightly to mederately micromicaceous and very slightly carbonaceous. They are often slightly to mederately slity, rarely sand and for the most part cantain only traces of feldepathic/ lithle debris.

The SILTSTONES are light to medium grey, in part brownish and greenish grey, slightly micromicaceous, very slightly carbonaceous and neuelly contain abundant grains of foldspar and some lithic grains. They are often very sandy (very fine grains) and grade in part to sandstone.

Traces of COAL are present in the uppercest part of the forwation.

Between 10,600 and 10,900 feet traces of light grey, cream and pale brown bentonite and wary bentonitic shale are present.

### PE900455

## This is an enclosure indicator page. The enclosure PE900455 is enclosure within the container PE900454 at this location in this document.

The enclosure PE600352 has the following characteristics:

ITEM_BARCODE CONT AINER_BARCODE NAME BASIN PERMIT TYPE SUBTYPE DESCRIPTION		PE900455 PE900454 Caroline 1 Correlation of Selected Wells in Otway Basin OTWAY OEL22 WELL DIAGRAM Caroline 1 Correlation of Selected Wells in Otway Basin
DATE_CREATED DATE_RECEIVED W_NO WELL_NAME CONTRATOR CLIENT_OP_CO	= = = =	Caroline 1 Alliance Oil Development Australia NL.

#### 4. Contributions to Geologial Knewledge

Caroline Well No.1 was located near the culmination of a closed structure which had been defined by reflection seismic survey (Caroline-Killanoola Seismic Survey-1966). The structure (see Plate 1) has a maximum closure of about 400 feet mapped on a phantom horizon at about 4000 feet below sea level.

The Caroline well was originally programmed for a depth of 6000 feet to test the petroleum potential of the lower part of the Wangerrip Group and to investigate possible facies changes within the upper part of the Sherbrook Group. The major target zones of the well were:-

1. A sandstone unit which at the nearby Mount Salt Woll No.1 is present between 2500 and 2950 feet and is overlain by a 400 foot thick "caprock" of siltstone. The unit occurs near the base of the Dilwyn Formation of Palgeocene to Eccene age.

2. The Pebble Point Formation of Palzeocene age. The formation was encountered between 3134 and 3242 feet at Mount Salt No.1 where it is overlain by 220 feet of shale.

The first target zone was not encountered at Caroline No.1 where the lower part of the Dilwyn Forwation (B.M.R. Unit Db.2) has changed in facies to predominantly clay and siltstone. A formation test of a thin sandstone member of Unit Db.2, present between 2928 and 2964 feet yielded a recovery of brackish water.

The top of the Pebble Point Formation was encountered at 3040 feet (-2917 subsea), only 131 feet structurally higher than at Mount Salt No.1. A test conducted over the upper part of the formation also yielded a recovery of brackish water.

Upon reaching the programmed depth of 6000 feat, electric log correlation of the Mount Salt and Caroline wells indicated that at Caroline No.1 the Paaratte Formation was substantially thinner than at Mount Salt No.1. The thinning may have resulted from non-deposition of the younger beds of the Paaratte Formation but lithological evidence suggests that a period of erosion, prior to deposition of the Curdies Forwation, is a more probable The log correlation also indicated that beds cause. within the lowermost part of the Paaratte Forwation at Caroline No.1 were about 2859 feet structurally higher than equivalent sediments at Mount Salt No.1. Accordingly the well was deepened to 11,061 feet to investigate the stratigraphy and test the petroleum potential of the entire Sherbrook Group and of the upper part of the Otway Group.

The contributions to geological knowledge of the Gambier Sunklands province of the Otway Basin which have resulted from the drilling of Caroline No.1 way be summarised as follows:- 1. The well has demonstrated the presence in the Gambier Sunklands of a well developed sequence of Belfast Formation and Waarre Formation sediments. It has provided Lithological evidence that sediments at the nearby Mount Salt No.1 well which previously had been considered to be equivalents of these formations should be included in the Paaratte Formation.

3. Sandstone members of the Eumeralla Formation consist predominantly of arkose characterised by an abundance of fresh feldspar. Volcanic sandstones, which are common in the upper part of the Eumeralla Formation at wells drilled elsewhere in the Gambier Sunklands, were not encountered at the Caroline Vell.

3. The Maarre Formation was found to include moderately thick bads of porcus and permeable sandstones, several of which contain a compercial volume of carbon dioxide gas.

4. At Carcline No.1 contacts between the Waarre Formation and both the overlying Belfast and the underlying Eumoralla formations are conformable and may in fact be gradational. At well locations on the margins of the Otway Basin, however, the boundary between the Sherbrock and Otway Groups is usually unconformable or disconformable. On the basis of lithological evidence the Bureau of Mineral Resources (B.M.R. Record 1966/170) have postulated that an unconformity or disconformity is also present between the Waarre and Eumoralla formations.

5. Shales and siltstones of the Belfast Formation can be readily differentiated from the same rock types in the overlying Paaratto Formation by their content of white, buff, grey and green weathered feldspar grains and lithic debris.

6. On the basis of differing sandstone to shale ratios the Paaratte Formation, within the Gambier Sunklands, is divisible into two members. The Macdonnel Member has a sandstone to shale ratio of 6-1 and the underlying Caroline Member a ratio of 1.1-1. Sandstone to shale ratice for these members at the nearby Mount Salt No.1 are 4.5-1 and 1-1 respectively.

7. The Macdonnel Member of the Paaratte Formation, which is 4320 feet thick at Mount Salt No.1, thins to 1756 feet above the Caroline structure and thickens again in an easterly direction. At the Nelson Bore 2805 feet of the member were penetrated without reaching the Caroline Member.

8. Lithological and stratigraphic ovidence indicate that an unconformity or disconformity is present between the Paaratte Formation and the overlying Curdies Formation. The available ovidence indicates that the tectonic movements which formed the Caroline structure occurred after deposition of the Caroline Member of the Paaratte Formation and preceded deposition of the Curdies Formation.

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# REFERENCES

A.O.D.A.H.L.	1966	Final Report - Carolino- Killenoola Scisuic Survey. By Nameo Geophysical Company for Alliance Oil Development Australia N.L.
BUREAU OF MINERAL Resources	1966	"A Proliminary Review of the Otway Basin", B.M.R. Rocord No. 1966/170
dellenbach J.	1964	"A Fetrological Study of the Sodiments from 011 Development N.L., Mount Salt No.1 Woll, Otway Basin, South Australia", B.N.R. Record No.1964/178
	1965	"A Petrological Study of the Sediments from Bonch Petroloum N.L. Gelwood Roach Vell No.1, Otway Basin, South Australia", B.N.R. Record No.1965/41
EDNORTHY K.J.	<u>1965</u>	"A Petrological Study of the Sodimonts from Freme-Broken Hill Eumeralia No.1 Well, Otway Basin, Victoria", B.M.R. Pacord No. 1965/76.
HAVKINS P.J. and DELLENBACH J.	1963	"Study of the Nelson Borc Sedimonia Otway Basin, Victoria", B.M.R. Record No.1963/167.
LAWS R.A. and WOOLLEY J.B.	1964	Reach Potroloum N.L. Goltwood Beach No.1 Vell Completion Roport.
LEBLANC M.C.	1966	Complotion Report, Tartwaup Structure Drilling Project, O.E.L.22, South Australia (unpublished report submitted to Alliance Oil Development Australia N.L.)
LESLIE R.B.	1965	"Potroloum Exploration in the Otway Basin". Eighth Commonwealth Mining and Motallurgical Congress Australia and New Zealand papers 1965.
PETTIJOHN F.J.	1957	"Sodimentary Rocks", Harpor and Brothors, New York.
STACH L.W. and CUNDELL J.R.	1962	Oil Development N.L. Mount Salt Nc.1 Vell Completion Report.

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## PE900456

This is an enclosure indicator page. The enclosure PE900456 is enclosure within the container PE900454 at this location in this document.

The enclosure PE600352 has the following	characteristics:

ITEM_BARCODE CONT AINER_BARCODE NAME BASIN PERMIT TYPE SUBTYPE	= = = = =	PE900456 PE900454 Caroline 1 Locality Map OTWAY OEL22 WELL
DESCRIPTION	=	DIAGRAM Caroline 1 Locality Map
DATE_CREATED DATE_RECEIVED W_NO	= = =	
Well_NAME CONTRATOR CLIENT OP CO	=	Caroline 1 Alliance Oil Development Australia NL.
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### PE900457

## This is an enclosure indicator page. The enclosure PE900457 is enclosure within the container PE900454 at this location in this document.

The enclosure PE600352 has the following characteristics:

ITEM_BARCODE CONT AINER_BARCODE NAME	= = =	PE900457 PE900454 Caroline 1 Regional Geology and Structural Features of the Gambier Sunklands
BASIN PERMIT TYPE SUBTYPE DESCRIPTION	= = = =	OTWAY OEL22 WELL MAP Caroline 1 Regional Geology and Structural Features of the Gambier Sunklands
DATE_CREATED DATE_RECEIVED W_NO WELL_NAME CONTRATOR CLIENT_OP_CO	= = = =	Caroline 1 Alliance Oil Development Australia NL.

### APPENDEX No.2

## ALAAMUR CAROLICE VELL No.1

CONDUCTION SEPORT

#### ANALYSES

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A) Apalyoin of Cae Sample from D.S.T. No.4, Coreline Noti No.1, by Mar and Fuel Componishes of Viotopic.

- B) Analysis of Gas Sample from D.S.T. No.5, Caroline Voll No.1, by Gas and Fuel Componistion of Victoria.
- c)
- Analysis of Gar Sample from D.S.T. No.8, Caroline Well No.1, by Gas and Fuel Corponation of Victoria.
- D) Analysis of Vater Sample from D.S.T. No.5 Caroline Voll No.1, by Gas and Fuel Corporation of Victoria.

## APPENDIX No. 2A

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## ALLTANCE CAROLINE WELL NO.1

# COMPLETION REPORT

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MALTERS OF GAS SAMPLE TROM D.S.T. No.4 (8256-8433)

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Roldana.	0.008 \$
Hydrogen	0.04
Nitragon	0.42
Mothmo	a., 31
Tthan	0.0 <b>3</b>
Propano	0.011
Tao-proseeo	0.001
Normal Enteno	0.001
<sup>CO</sup> 2	97.5 (probably 0.7% higher)
# APPENDIX No. 2B

# ALLIANCE CAROLINE WELL NO.1 COMPLETION REPORT

CONTRACTOR OF A DESCRIPTION OF A DESCRIP

#### 아이에 가지 않는 것이 있다. 그는 것을 가는 것 것은 것 것은 것은 것은 것은 가지 않는 것을 가지 않는 것이 있다. 것은 것이 있는 것이 있는 것이 있는 것이 있다. 것이 있는 것이 없는 것이 없는 것이 있는 것이 있는 것이 없는 것이 없

# AMALYSIS OF GAS SAMPLE FROM D.S.T. No.5 (8610-8730)

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Holium	0.0026
Hydrogen	0.054
Nitrogen	0.094
Methane	0.74
Ethane	0.039
Propane	0.022
1/Butone	0.003
n/Butane	0.004
C0 2	99.1

# APPENDIX No. 2C

# ALLIANCE CAROLINE WELL No.1

# COMPLETION REPORT

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ANALYSIS OF GAS SAMPLE FROM D.S.T. No.8 (9154-9182)

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Nolium	.0071
Hydrogen	。0023
Nitrogon	, 46
Methane	<b>, 93</b>
Ethane	<b>, 006</b>
<u>~</u>	
Propano less than	。001
• Jan. •	
i/Butane loss than	. 001
- the trace	
n/Butane leas than	. 001
LUDB 6021	.001
co2	93,6

# APPENDIX No.2D

# ALLIANCE CAROLINE WELL NO.1

## COMPLETION REPORT

## ANALYSIS OF WATER SAMPLE FROM D.S.T. No.5 (8610-8730)

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Ph.	8.7			
Chlorine	8 <b>,600</b>	parts	per	million
Scdium	13,300	10	"	11
Sulphates	1,480	13	13	E\$
Calcium	18	13	A	· . 80
Magnesium	15	0	)) 11	50

#### APPENNIX Ho.3

#### ALLIANCE CAROLINE WELL No.1

#### COMPLETION REPORT

LITHOLOGICAL DESCRIPTION OF CORES

By: M. LoBlanc, G. Campo and J. Gausdon

The lithology of each core is described in sequence from top to bottom of the recovered section. Oil staining was not observed in any of the cores.

- Core No.1:- Interval 581 to 599 feet Recovery - 15.5 feet (86.1%)
- 1.3 foot DOLOMITE: pale greenish grey; peerly sorted delowitized bioclastic fregments in microcrystalline to very fine crystalline matrix; rare quartz grains; slightly argillaceous; earthy texture; slight organic peresity and good earthy perceity - grades to -
- 11.0 feet DOLOMITE; light groy; very finely crystalline; dolomitised poorly sorted bioclestic limestone; moderately calcareous; in part with earthy texture ; generally olight to moderately argillaceous; moderate earthy porceity; grades in part to bioclastic limestone with abundant dolemite rhombs. - grades to -
- 3.2 foet MUDSTONE; modium groyich brown, with 40% fossil fragmonts (predeminantly bryozca); moderately calcarcous slightly glaucouttic; in part slightly pyritic.
- 3.5 foct No recovery.

Badding poorly defined. Dip not discornible

Core No.2:- Interval - 699 to 719 foot Recovery - 11 foot (55%)

11.0 feet CLAX; black cerbonaceous, slightly sandy; in part grading to very argillaceous send; firm to soft. The core contains common pyrite nodules (up to 3 cm in dismeter but generally don, or leas) and occasional clear when flakes (up to 5 mm.). The sand grains range from fine to very coarse grained (30% fine grains; 10% wery coarse grains; 20% coarse grains; 10% very coarse grains; 10% very coarse grains; 20% coarse grains; 10% very occasional yellow and pink grains and very rare grains of prismatic quartz. Other constituent grains are common (up to 1.5%) ironstone and limonito (?) and traces of chert and glauconite pellets. Finely disseminated pyrite is common in the clay.

The core is generally structureless but there are some thin fine grained sandstone laminations in the clay. The core is tight with rare zones of poor porosity.

9.0 feat No recovery.

> As the core is massive the dip of the bodding is not discornible.

Interval - 2454 to 2476 foet Coro No. 3:-Recovery - 11 feet (50%)

9.5 foot

- 2 --

Macro Description CLAY: black to dark brown, carbonaceous finely micaceous, firm to modorately hard; finely laminated with silty, sandy laminations or with colour laminations. Common lensos of very fire grained sandstone (1 mm. to 1 cm. thick); undulatory lenses; common sandstone-filled erosional scours; occasional cross-bedding in sandstone lenses with crossional trancations of these by the sandstone or clay. Common lenses and laminations of very fine grained pyritic condstono with occasional pyritic nodules and (?) delomitic sandstone nodules. Rare Lenses of modium to conress grained sandstone. Clay beds are up to 2 cms. thick. Occasional fractures with  $60^9$  dip.

#### Micro Description

CLAY: black to dark brown, commonly silty, finely micaceous with occasional mica flakes (to 8 ums), occasional plant fragments. Generally the clay is black and the silty clay is dark brown. The clay has common leases and interbeds of very fine to fine grained argillaceous asustones which are growish groon, tight, and occasionally poroug the sandstones show micro-graded badding. There are cousen sandstons-filled crosional scours. Several bods of clay which are more inducated than the remaining bods way be slightly pyritic. There are also common thin leminations of Cine to very fipo grained pyritic sandstones; these sandstone lawingtions and Levess are ofton slightly nicaccous and are generally tight but some have traces of porosivy. Difforentiel compaction in places results in undulatory bedding.

Dip of the bodding ranges between 0 and 5 degrees but is predeminantly less than 3 degrees.

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1.5 feet <u>Macro Description</u> SANDSTONE: greeni

SANDSTONE: greenish grey, fine to very fine grained with occasional coarse to granule sized grains, micaceous; occasional fine laminations of argillacoous material; occasional beds (up to 1 cm thick) of blueish grey clay and dark grey to black carbonaceous clay.

#### Micro Description

SANDSTONE: light greenish grey, very fine grained, well sorted with occasional fine to coarse grains, friable. Composed of clear to slightly cloudy, subangular to subrounded quartz grains with occasional ceal fragments and traces of wice (white) and dark green litble grains in an argillaceous matrix. There are common interbeds and laminations of black to dark brown finely micacecus clay. The sandstenes often include thin laminations with pyritic coment.

Bedding dips at from 3 to 7 degrees.

- 11.0 feet No recovery.
- Core No.4:

Interval - 2560 to 2572 feet Recovery - 4 feet (33.3%)

Core consists predominantly of CLAY: moderately brown, moderately micaccous, moderately carbonaccous to very carbonaccous, silty. The clay has common flocks of coal and coattered very fine to fine and grains. Sceur structure infilled with white, very fine to fine grained quartz carditone eccurs at several horizons.

The core includes preserve laminations (generally 0.3 to 0.5 cm. thick) of very fine grained sandstone and siltatone. Several thin laminations of pyrite occur in association with thin interbeds of SAMD-STONE: light grey, very fine grained, quartz and 5% dark grains, pyritic, silty moderabely carbonaccous, well inducated, tight.

The clay is dominantly moderately firm and has a moderately well developed fiscility as a result of planar concentvation of corbonaccous flocks.

The eleventructure of the core is obscured by a seating of clay.

Dip of the bedding is poorly defined but is in the order of 3 to 5 degrees.

8.0 foct No recovery.

Core No.5: Interval - 2572 to 2580 feet Recovery - 3 feet (37.5%)

3 foot CLAN: medium brown, mederately micaceous and silty, very carbonaceous, plastic to medorately firm. The core includes

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approximately 30% lominations of light grey, very fine grained (in part flue grained) quartz sundatione which is slightly silty and moderately to very carbonaccous.

Plant fragments and large carbonaceous fragments are present on several bodding planes. Carbonaceous flocks in both the candetone leminations and in the clay are orientated parallel to the bodding and impart a moderate fissility to the clay.

5 feet No recovery.

The dip of the bedding is not woll defined but is in the order of 3 to 5 degrees.

<u>Core Mo.6:</u> Interval - 2580 to 2582.5 feet Racevery - 1.17 feet (46.65)

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1.17 fest CLAY; chocolate brown, moderately well indurated, vory micaccous, vory carbonaccous (carbonaccous flecks prionted parallel to bedding planes), moderately to very silty and grades in part to very argiliaccous siltstens.

> The core includes about 20% lawinge and lenses of SANDSTONE: light groy, very fine graimed (occasional fine grains), quartress, silty, very carbonaccous and udezecous, tight.

1.33 feet No Recovery.

Exp of bodding is poorly defined but is in the order of 2 to 5 degrees.

- <u>Coro No.7</u>: Internal 2663 to 2673 foot Recovery - 9.5 foot (95%)
- 9.5 foot CHALS: wodien brown, suderately to very micaccoup; abundant corbinations specks: predeminantly moderately to very silty; generally firm but in part chightly plactic. The sore includes more with connect small proite convetions and zero bodded prite. The shall has a portly developed fieldly and includes accessional lominations of white, very fine grained quarts sendetens and some adjustens near the base of the core.
- 0.5 foot Ne recovery.

The badding is voterately well defined and dive at 12 to 16 degrees.

- Core No.8: Internal 2673 to 2681 Sect Recovery - 6.5 fect (81.55)
- 6.5 foot SMAD: modimu brown, moderately to very allow, very adaptors, very asrborecoust

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(carbonaccous flocks oriented parallel to fissility), moderately wall indurated but becomes plastic when wat; poorly developed ficellity. The core includes loss than 5% laminations (comerally loss than 1 mm. in thickness) of white, very fine to fine grained, silty, carbonaccous, in part symittic, candotone and siltetone. Rare quall stringers of pyrite and of fine grained candatone is a pyritic matrix are place procent.

1.5 feet No percepty. Core loss probably distributed along length of core.

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Dip of bodding is will defined at 32 degrees.

- Core No.2: Enterval 3731 to 3735 foot Boorvary - 3 foot (75%)
- 0.75 foot CREASTOND: contain bacan, wederately micessous, very conteraccous, very chellicecur, indurated.

annas 623668 20 comm

- 2.25 feet SHARE: meddum brown, moderately to very silty, microcoun and anthonaccous (earbonacerus flooks erisated particl to peerly feraloped fiscility). The sere includes correional blobs and stringers of perits and includes less than 5% lastrations of light groy estboraceous allostons.
- 1.00 foot . No pass rest.

Jackling firs at 22 Cogense.

<u>Nove No.10</u>: Industral (2000 to 5010 2000) Residence - 8.25 Part (61.4/)

5.50 York GANDERED Sould gray to callested brown, they people sould gray to callested brown, they people adout, angular to counded grains of quarks which aburdant callens of light yellowich brown linear to the light yellowich prevents and they light from tained or cooked. Shap linearts of the quarks of the linearts of the quarks of the light or periodic content which is also present as dissels proto. They of the livelite calles have a core considing of a quarks such a core considing of a quarks an dissels protoc. They of the livelite cold he have a core considing of a quarks such a core considing of a quarks such a core considing of a quarks such a core considing of a quarks

> the quests worden and identify colithe preset in an elemenat matrix (30-\$0%) which is provided valiable burns and limenitic, date brought grow and limenitic/corbonecour of it glacer black and biturksout.

> > Ŵ

Intraformational conglemorate, comprising fragmonts of loss than 1 inch in diameter is developed in several zeros within the core.

eres gradational contact ------

1.00 foet SANVEYONE: very dark gree, vory peorly served; similar to the studenters described above but includes abundant groundes and an occasional pobble. The majority of the grains are iron-coated. Pellate and/or collithe of limenite era abundant but the indeterminate white mineral present in the everying unit is absent. The matrix consists of dark yellowish grey forruginous olay.

- 5 e

moore grade ideal contact seems

2.75 foot COLIDI: modium Cark gray, find to wedium grainod, in work course grainod; Cark brown hipovite collibe and/or vellats and a much scaller proportion of poerly corted (very find to very course grained) Aronstained quarks set in an abuilant (355) yellowbrown, earthy textured, linealtic clay retria.

> The colite is provided and comprises well inducated, clargoup (generally less than I inch in length) fungenoise out in a safter livenitie and regilineeous metrix.

11.75 Soot No recovery.

The care includes neveral pythinined sones. He hydronether chart, do the cose is monitor the dip of the bridding is unknown.

Core Mo.11: Transel - 6091 is 6000 lest Recomment - 6.39 fort (39.65)

Mage Receiption Foot 6 SAMDIFIES discoloured by sud; modium implem postants connectoned or sud; modium addens and abreaks with 50 degree dip. Structures: - Ienimethens, disturbed betting and earse betting.

10 inches Subschedungted proceeds put situations and black, consensation, situation, Subschede, lenses, successfielding weakenes, lenses, successfielding, andral buyers (?) and groded bedding. Grades dereshed to a fine to medium grained social operation is more exponaccess near the top of units between the major prosional transmissions.

Rodeling disposed is Sugroome

3 inches SANOTRON: fine to working grained, discharged by end.

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1.5 inches SILTSTONE: black with, near bass, laminations of greenish-grey siltstone. Structures: - laminations, lenses. A pobble of brown, sandy and very argillaceous siltstone occurs at base of unit.

Bodding dips at 3 to 5 degrees.

- 6 inches SILFSTORD: greenish groy. Grades downwards to a coarse gruined sandstone. Common carbonacoous strooks and longes. Structures: - undulating bodding, crossbodding, graded bodding, lenson. Bodding dips at 5 to 25 degrees.
- 1 foot 1.5 inches STLASTONE: black, tough; with labinations and lenses of greenish grey to light grey eilbotone and fine grained sandstone. Structures:- lenses, lautestions, washouts, rare animal burrows, distorted bodding, bedding distrubed by compaction.

Bodding dips at 0 to 3 degrees.

Miero description SAMDSTONE: brown (and discoloured), 1 100: 6 slightly friable, fine to medium grained inches with occasional coarse grains and occasional very fine grains, generally well sorted. Grains comprise angular to subrounded quartz, 3 to 5 percent carbonaceous and lithic greins, traces brown siltstone grains, 5 percent black Lithic grains, traces mica flakes (to 5 mm.) Grains are set in 5 to 25 percent white kaolinitle matrix. Sorting varies from fair to good and poresity from poor to good. The sandstore chows peerly developed graded bodding with a decrease in perceity as the average grain size decreases and the percentage of matrix increases. Traces of green oblocitic clay are present in pers spaces.

10 inches Intertarizated Light groatish-gray siltstons and black to beers earbonaceous siltstone. The Light groat grains with up to 5 percent of a light groat, soft sineral (chlorite or glauconite), 5 percent black rounded hitble grains, traces of plan, courses as bounceous hitble grains, traces red to brown lithic grains, rare very fine to fine grained quertz not in an anguliacious (kaolimitic?) matrix. The black to brown siltstons is composed of quarkz grains and lithics as above and includes obundant carbonaceous fragments and landosions.

3 inches SANUSTONE: brown (wud discoloured); grades from the greewish-groy siltstone described above to very fine grained fine grained and wohing grained sandstone. Constituents are similar to those in subdatone unit at top of care. Foreaky increases from

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tight (at the top of the unit) to good (at the base of the unit).

1.5 inches SILTSTONE: black with greenish-grey leminations near base. The siltstone is very argillaceous (up to 50 percent argillaceous matter) and includes common fine to modium rounded quartz grains, abundant carbonaceous fragments and common wice flakes.

6 inches SILTSTONE: greenish-grey as above; grades downwards to modium grained sanistone, as above, with carbonaceous laminations and stroaks. The sandstone has good porosity. Notice 1 inch of unit is greenish-grey as above, with laminations of dark brown siltstone as above, with laminations of dark brown siltstone as above, and thin interbods of fine to coarse grained poorly corted sandstone with up to 40 percent argiliaccoup and silty matrix.

1 foot 1.5 inches SILTSTONE: black, argillaceous; grades to a very argillaceous shale. The siltstoneshale is firm, carbonaceous, micaceous and includes laminations and lenses of groonish siltstone, lenses of white siltstone with 40 percent kaclinitic matrix, and coessional burrows filled with fine to coarse grained subangular sandstone with a kaclinitic matrix.

6 feet 8 No recovery. inches

Core No.12:

Interval - 4102 to 4114 feet Recovery - 7 feet (58.5%)

2 foot 7 inches SFALF: modium dark grey, in part brownish grey, alcaceous, very alley, subfissile to blocky. The shale is generally moderately carbonaccous, but includes several cones with abundant flecks and blobs of coaly material; it grades in part to very argillacoous siltstone.

The unit contains about 10 percent of interlaminated SANDSTONE: white, very fine grained, quarteese, very silty, clightly to medorately carbonaceous, hashimibic matrix, tight and also includes seems interlaminated SINSTONE.

In the basal 4 inches the shale is dark grey and contains scattered fine to wedium angular quartz grains. This part of the unit includes several lenses ( 4 mm. thick) and patches (10 mm thick) of SANDSTONE: white, medium to coarse grained, angular to subangular quartz, keelinitic matrix, tight. At 4102'4" and at 4104'4" lenses of sandstone have a matrix of pyrite. Rare modules of pyrite are present clowhere in the unit. Bodding dips at 2 - 4 degrees.

#### ---- erosional contact -----

7 inches Irregular stringers and lonses of white to light grey sandstone and 20 percent interlaminated dark grey shale. Scours in this unit are infilled by peckets of medium light grey, peorly sorted sandstone which constitutes 30 percent of the unit.

> The white to light grey candotone is vory fine grained (in part fine grained), silty, in part slightly carbonaccous, compact tight and consists of medium well corted quartz with occasional pick and green quartz grains and black lithic grains sot in a kaolinitic matrix.

The modium light groy conditions consists of poorly sorted, very find to coarse grained angular quarts in a compact, silty to argillaceous and in part kaolinitic matrix.

1 inch Large nodule of poorly sorted, fine to coarse greined, subangular to subrounded, quartz sendstone occonted with pyrite.

2 foot 10 Interlaminated SILTSTONE and SANDSTONE inchos (40 percent)

> The siltstone is medium to dark gray, moderately to very carbonaceous, very argillaceous and in part grades to silty shale.

The conductors is light grey, compact, tight and consists of very fine grained angular quarts, conver pink quartz grains and abundant silt grains in a knolinitic and in part carbonaceous matrix.

The conditions is in part cross-laminated. Compaction structures are developed above several canditone lences and several burrows are procent.

Bodding dips at from 4 to 5 degrees.

9 inches Irregular leminations and lenses of SANDSTONE and SILFSTONE (40 percent)

> The sandstene is light grey (discoloured by mud) and consists of medium to coarge, subangular, clear quartz grains and coensional pink quartz grains set in a kaolinitic matrix. The sandstone is well sorted and in places has moderate intergranular perceity.

In the uppermost part of the unit the sandstone is more poorly corted and includes grains of granule size. In this part of the core blobs and laminae of vitreous coal (rarely replaced by pyrite) are present.

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The siltstone is medium to dark grey, moderately to very carbonaccous, very argillaccous and in part grades to SHALE.

2 inches Interlaminated very fine grained, silty sandstons and dark grey, carbonaceous, silty shale.

5 feet No recovery.

<u>Core No.13</u>: Interval - 6001 to 6016 feet Recovery - 10.5 feet (70%)

4 inches

SILTSTONE: dark grey to black, very sandy (sand consists of very fine to fine angular to subangular grains of quartz which occur discominated and also in small lenses and stringers), very argillaccous, very slightly micacoous. The core contains traces of glaucenite, green clay (?) grains, and occasional medium sized grains of quartz. Sand grains comprise about 30 percent of the volume of the core. There is no bedding definition but the orientation of several elongate sand lenses suggest that the bedding dips very gently.

3 foot 10 inchos SANDSTONE: dark gray (slightly groenichgroy when wet), very poorly sorted; consists of very fine to very coarse angular to subround quartz grains, occasional white keelinitic grains, occasional rod quartz grains and cocasional groon clay grains set in a matrix which is variably brown, argillacoous/silty or light groy kaolinitio. Prodominant grain size is fine grained. Lenses and angular fragments of shale up to pebble size are common. In parts of the core fragments of light grey, kaolinitic sandstone are set in a matrix of sandy brown clay. The sandstone is slightly micaceous and is for the most part carbonaceous. It is well concolidated and tight. Carbonacoous plant fragmonts (in part pyritised) are not uncommon.

The core exhibits a "chaotic" or "churned-up" texture suggestive of deposition under challow water conditions and of organic reworking. Animal burrews are present within the core but are not common. The dip of the bedding is not discernible.

9 inches

SANDSTONE: as above. Consists predominantly of fine to wedium quartz grains set in a medium greenich groy matrix of clay. The core contains about 30 percent of "clay balls" (up to 3 inches along their major axis) of light brownish grey, very sandy and silty clay.

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3 foot linch SANDSTONE: similar to unit at top of core. Consists of poorly sorted, predominantly fine to medium grained, subangular to subround quartz fairly common white kaolin and green clay grains set in a matrix which is variably medium brownich grey to dark grey, silty, slightly carbonaceous, or very light grey and kaolinitic. Grain size ranges from very fine grained to pobbly. The amount of matrix is in the order of 35percent but in parts of the unit, where fragments of sandstone are sot in a matrix of very candy clay, the percentage of watrix is as high as 70 percent. Several zones include groyish brown, sandy "clay balls". The condstone is tight.

> The unit exhibits a "chaotic" texture indicatave of shallow water deposition and of oxtensive re-working while in a semi-consolidated state.

SANDSTONE; light groy, slightly groenish, 7 inches poorly sorted, very fine to very coarse grained; predominantly medium to coarse grained, subrounded quartz grains, occasional tinted quartz grains, and 5 percent dark greenish grey and white clay grains; very friable, poorly cemented with 10 percent kaolin coment; excellent intergranular porosity.

---- Abrupt contact defined by pobble band ----

1 foot 7 inches Internixed SANDSTONE and very sandy SHALE.

SANDSTONE: light grey, very fine to very coarse grained; prodominantly very fine to fine grained, subangular quartz with common tinted and occasional white clay grains; moderately to very silty, slightly micaceous; in part with a brown argillaccous matrix, in part with a white kaolinitic matrix; tight.

SHALE: dark groy, slightly brownish, vory sandy (very fine grained to fine grained), very silty; grades to very argillaceous sandstone; tough and well indurated.

The core shows wall developed microstructures indicative of challow water deposition; i.e. scour and fill, interrupted bedding, compaction structure, sandstone "balls".

Bodding dips are in the order of 0 to 8 degrees but are not considered reliable.

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2 inchos SANDSTONE: light groy, vory fine grained, quartz and 5 to 10 percent green, rad and black grains, silty, well sorted, compact kaolinitic matrix, tight.

2 inches SANDSTONE and sandy SHALE as above.

4 foot 6 No recovery inches

Core No.14: Interval - 7699 to 7702 fost Recovery - 2.5 inches (7%)

0.21 feet SHALE: dark groy, firm, moderately micaceous (muscovite), abundant carbonaccous flecks (orientated parallel to bedding), abundant white, grey and pink grains and shrads of altered feldspar (?), moderately to very silty with patches of siltstene.

2.79 foot No recovery

As the core is massive the dip of the bedding is not discorrable.

<u>Core No.15</u>: Interval - 7957 to 7975 feet Recovery - 1.5 feet (8.3%)

1.0 foot SILTSTONE: madium groy; causon white to brown feldspathic grains and pale groon chloritic (?) patches; occasional carbonaccous flocks; occasional brown and white mica; traces disseminated pyrite; traces calcite focail fragmonts. The unit also includes diffuse argillacoous laminas.

Bedding is indictinct. Occasional fine subvertical fractures.

0.5 foot SILASTONE: as above but light grey and slightly sandy. Occasional poorly preserved fossil frequents. Apparent dip of argikascous lawings is 7 degrees.

> In addition to the above coveral abraded frequents were recovered. These vere largely SHALE: dark gray, with only occasional foldepathic grains but fairly common well ericated blotits or earbonaccess fleets.

16.5 feet No recovery.

<u>Core No.15</u>: Interval - 10,657 to 10,067 feet Recevery - 9.17 feet (91.7%)

- 14 inches SILTSTONE: medium light grey, very sandy (25% very fine grained and occasionally fine grained lithic/ feldspathic grains), argillacecus, very carbonaceous, slightly micaceous. The siltstone is cross-laminated; laminations are defined by abundant carbonaceous/ bituminous flakes and grains.
- 1 inch SILTSTONE: dark grey, very argillaceous, moderately to very feldspathic/lithic, slightly micaceous, moderately carbonaceous (flecks).

----- sharp contact -----

44 inches SANDSTONE: light grey, very fine grained; very abundant altered feldspar (cream, buff, grey), translucent feldspar ?, dark brown, black and carbonaceous greis; well sorted; well comented; silty/argillaceous matrix; tight. Eedding dip as defined by upper and lower surfaces of this unit is 7 degrees.

----- sherp contact ------

- 3 ft.84 inches MUDSTONE: dark grey, moderately to very micromicaceous, slightly to moderately carbonaceous (flecks), predominantly slightly silty, common silt sized feldspar/ lithic greins. Laminae of siltstone, which is in part very finely sandy, are present within the unit particularly in the uppermost foot. Dip as defined by the laminae is variable but appears to be in the order of 6 to 7 degrees.
- 44 inches SANDSTONE: light grey to greenish grey, fine grained with common very fine grains; angular to subangular grains of white to cream keolinised feldspar, translucent fresh feldspar, and common black, brown and occasional red lithic grains, with about 30 percent of quartz grains tough, well indurated, well sorted, tight.

----- gradational contact -----

- 3 inches 3 inches 5ANDSTONE: light grey; similar to above but generally very fine grained; moderately silty; cross leminated (laminae defined by concentrations of carbonaceous flecks and coal flecks and grains). Burrow 2<sup>1</sup> inches deep and 1<sup>1</sup>/<sub>4</sub> inches wide is infilled with sendstone as above.
- 10 inches SANDETONE: light grey to greenish grey, very fine to fine grained, kaolinitic, lithic; as above with occasional carbonaceous laminae.

----- gradational contact -----

10 inches SANDSTONE: light grey, similar to above, predominantly very fine grained; common irregular laminae of zandy siltstone, argillaceous siltstone and occasionally of carbonaceous to coaly matter.

----- gradational contact ------

- 6<sup>1</sup> inches SANDSTONE: light grey to very light grey. fine grained with common very fine and medium graine, angular to subangular, vitreous quartz and less than 5 percent lithic grains, slightly silty, poortly sorted, well comented with powdery silica, very slightly calcareous, tight. Rare carbonaccous laminae.
- l inch SILTSTONE: light to modium light grey, very sandy (very fine grained), very lithic/foldspathic, slightly micaceous.

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- 6<sup>1</sup>/<sub>2</sub> inches SANDSTONE: light grey, fine grained ( (common very fine grains); engular quartz, with about 5 percent feldspar and 10 to 15 percent brownish grey, greyish brown and black lithic grains; moderately well sorted, well cemented with silica, slightly calcareous, tight.
- 14 inches SILTSTONE: medium to medium dark grey, very sandy (very fine grained quartz, foldspar and lithic grains), moderately micarcous and carbonaccous.
- 1 inch SANDSTONE: Light grey, fine grained as above.
- 13 inchos SILTSTONE: medium to modium dark grey, very sendy as above.
- 1 ft 1 inch SANDSTONE: medium groy, very fine grained, quartz and abundant foldspar and lithic grains, very silty, moderately carbonaceous, slightly to moderately micaceous, well indurated, in part with patchy matrix of brown calcareous carbonate, tight.
- 10 inches No recovery.
- <u>Core No.17</u>: Interval 11,051 to 11,061 feet Resovery - 7.65 feet (76.6%)
- 7.0 feet MUDSTONE: dark grey, slightly micaceous, very carbonaceous (sparsoly distributed flecks and abundant carbonised plant and wood fragments), non-feldspathic, blocky, in part very silty; grades to 50 percent SILTSTONE: medium to medium dark grey, very argillaceous, moderately to very microscues and micromicaceous, mederately to very feldspathic (predominantly silt sized grains but occasional very fine grains), very carbonaceous (specks and plant fragments).
- 0.66 feet SANDSTONE: light greyish-green, very fine grained, foldspar and lithic grains, abundant silty and argillaceous matrix, very micaceous, very carbonaceous (flecks and plant fragments), tight; grades to soundy and argillaceous SELTSTONE.

2.34 feet No recovery

Bodding dips at 15 degrees.

## AFPENDIX No. 4A

#### ALLIANCE CAROLINE WELL. No.1

#### COMPLETION REPORT

## LIST OF LOGS RUN

Logging cervices were previded by Schlumberger-Seace Inc. and Velon.

The following bgs were run by Woler:

a na incensional menonin' professional and and and any task departments and a subserve of the same

A) <u>TEMPERATURE LOG:</u>

Run N	. <u>Interval</u> ( <u>foct K.R.</u> )	<u>Scales</u> (inches/1001	<u>Date</u>
1	30653	5	19 Nov.1966
æ B) j	ITCROSEISMOGRAM-CEMENI	BOND-GAMMA	COLLAR LOG:
<u>Run M</u>	(feet M.B.)	<u>Scales</u> (inches/100f	t)
1	7300-9239	2 and 5	14 Feb.1967

# Not subsidised

The following logs were run by Schlumberger:

## A) INDUCTION ELECTRIC

Run No.	Intervel (fcet K.B.)	Scales (inches/100ft)	Date
1.	742- 3990	2 and 5	1 Dec.1966
2	3778- 6006	2 and 5	7 Doc.1966
3	6006- 9411	2 and 5	9 Jan.1967
24	9411-11059	2 and 5	31 Jan.1967

B) MICPOLOG-CALIFER

<u>Run No</u> .		Inter (feet ]		Scale (inche	08/100f	<u>د</u> )	Date
1		742-	6007	2 an(	9 5	8	Dec.1966
2		6007-	9412	2 enc	15	9	Jan. 1967
3	ML,	8000-	8500 and	2 and	1 5	30	Jan. 1967
		9000-1	11045				

CL 7000-11045

C) SONIC-CAMMA RAY:

Run No.	Intorval (feet K.B.)	<u>Scales</u> ( <u>inches/100ft</u> )	Date
1	SL 742-6001	2 and 5 7	Dec.1966
	CRL 20-5980		
2	SL 6001-9404	2 and 5 9	Jan. 1967
	GRL 5980-9385		
3	st. 9404-11038	2 and 5 30	Jan.1967
	CRL 9385-11019		

D) CONTINUOUS DIPMETER SURVEY:

Run No.	(feet K.B.)	Rate
3.	742- 6003	8 Dec. 1966
2	600310798	31 Jan. 1967.

E) CEPENT BOND LOG:

Run No.	Intorval (foot K.B.)	Scales (inches/100f	t)	Date
1.	60-740	2 and 5	1	Dec.1966

#### F) VELOCITY SURVEY

A velocity survey was conducted over the interval 750 to 11,050 feet by Nameo International Inc. Mineteen shots were recorded on 8 December, 1966 and an additional 14 shots were recorded on 30 January, 1967. The results of the survey are included in this report as Enclosury 8.

<u>NOTE:</u> The elevations shown on soveral of the logs (refer enclosures 2 to 7) are incorrect and should be changed to:

Gerenne	1 Elevati	lon:	107	fo	oct
Kelly	Bushing	Elovation:	123.	Э	foot

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ALLIANCE CAROLINE WELL No.1

#### COMPLETION REPORT

#### INTERPRETATION OF LOGS

By: <u>M. Gahan</u> Data Analysis Pty. Ltd.

Logs available were -

Induction-Electric Log Sonic-Gauma Ray Microlog.

Permeable intervals were selected from the microlog and an Rwa interpretation made to indicate intervals where water saturation was less than 100%. The matrix velocity for sandstone at 1800 feet per second was used and the Rwa values obtained (Table 1) averaged 0.15 with the exception of the intervals from 8100 to 8248 feet and 8823 feet to total depth.

A more detailed interpretation of the zones of interest was made using the SP to obtain a more accurate value for Rw, the Induction compared to the 16" normal to obtain a second evaluation of SV, and the Gamma Ray log to obtain an estimate of the shale content. The results are shown on Table 2.

The water resistivity values of 0.15 in the interval from 8100 to 8280 feet and 0.25 from 9153 to 9305 feet are equivalent to salinitize of 16,000 ppm and 12,000 ppm respectively. The variation in water salinity seems to indicate that there are two independent reservoirs. This night be confirmed by comparison of the DST pressure charts.

The shale content was obtained assuming a linear relation between the percentage shale and the gamma ray deflection. Although this linear relation is by no means accurate, the gamma ray deflection does represent in most cases, a satisfactory measure of shale content and consequently gives an idea of permeability.

# TABLE 1

# ALLIANCE CAROLINE WELL NO.1

# Rva Plot

Depth	Thiokness	Ri 1	Sonio	SP	F	Rwa
5906	4	2	77	65	30	。07
5916	6	2	81	65	20	.10
5975	10	2	84	70	16	.12
6046	18	3	61	70	20	15
6076	13	3	78	65	27	. 11
6097	5	5	80	65	22	, 23
6118	6	2	717	70	30	o1، م
6127	14	4	81	70	20	。20
6141	20	5	82	70	18	.30
6161	12	2	82	70	18	.11
6198	11	3	77	70	30	" <b>1</b> C
6210	10	2	78	70	27	。0 <b>7</b>
6220	10	4	78	70	27	.14
6248	6	4	80	70	22	.18
6317	6	2	84	75	16	. 12
6327	14	5	84	75	16	. 12
6349	8	1	89	75	12	。 <b>06</b>
6365	14	3	80	75	22	.14
6412	29	3	76	75	33	<b>, 0</b> 9
6540	10	2	83	75	17	12
6655	9	2	84	75	16	.12
6752	10	4	80	75	22	.18
6770	6	3	75	75	36	, 08
6780	8	2	76	75	33	. <b>0</b> 5
6804	20	2	78	75	21	. <b>0</b> 7
6864	16	S	83	75	17	.12
7034	38	3	78	75	27	.11
7278	13	5	• 71	60	30	.17
7466	6	7	70	45	70	.10
6100	6	9	77	45	30	.30
9128	7	11	81	45	20	. 35
8180	4	7	77	45	30	。2 <b>3</b>
8191	5	15	78	45	27	. 35
8204	7	15	77	45	30	.50
8215	5	24	77	60	30	。80
8220	5	20	76	60	33	。60

(CD)	8	-
------	---	---

Depth	Thickness	Ril	Sonic	S P	F	Rwe
8225	5.	12	75	60	36	.33
8248	15	10	79	60	24	.42
8280	6	<b>1</b> 6 ·	72	60	50	. 32
8298	5	12	73	60	45	.2
8310	12	8	76	60	33	.24
8322	10	6	78	60	27	. 22
835 <b>3</b>	5	6	76	60	33	. 18
8385	39	7	77	60	30	. 23
8434	22	6	71	60	60	.10
8466	9	8	76	60	33	.24
8 <b>4</b> 80	22	6	76	60	33	. 1'
8520	14	5	80	60	22	, 22
8535	20	6	75	60	36	.16
8558	7	<b>6</b> <sup>°</sup>	71	60	60	.10
8612	12	6	74	65	40	.1
8776	5	25	65	20	150	.1
88 <b>23</b>	. 6	17	70	20	70	. 24
9153	19	14	84	40	16	. 88
9192	6	21	81	30	20	1.05
9216	8	18	80	30	22	. 82
9227	20	19	78	30	27	.70
9305	17	50	71	45	60	. 83

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## TABLE 2

## ALLIANCE CAROLINE WELL No. 1

Depth	Thiokness	Porosity fror Sonle	Porosity from Short Normal	Water Saturation From Sonic	Water Saturation from Induction	Shale Content
81.00	6	16	22	70	50	40
8153	7	19	21	55	40	30
8191	5	17	16	55	55	25
8204	7	16	16	55	50	20
8215	5	16	14	45	<b>4</b> Ó	20
8220	5	16	14	55	55	18
8225	5	15	17	70	55	40
8248	15	3.7	17	65	65	20
8280	6	35	15	75	60	18
9153	19	SJ	18	60	50	25
9192	6	19	17	55	40	25
9216	8	17	16	65	45 <b>m</b>	25
9227	20	17	16	60	45 <del>s</del>	30
9305	17	11	11	65	⇒ Z∓	15

#### n Invasion is probably small and water saturations satirated from the Induction not accurate.

ng The ratio of the Short Normal resistivity to the Induction resistivity is not suitable for a quantitative interpretation using the Induction,

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#### APPENDIX NO.5

# ALLIANCE CAROLINE WELL NO.1 COMPLETION REPORT

Results	of	Dril	1	Stem	Tests	
Nos	3. 1	<u>to</u>	8			

<u>D.S.T. No.1</u> Dual packer bottom-hole test in  $8\frac{3}{4}$  inch hole. Bottom-hole cheke  $-\frac{5}{3}$  inch.

Interval:	3042-3130 feet
Formation:	Pebble Point
I.S.I. period:	35 minutes
т.о.	3 minutes and 40 minutes
F.S.I. period:	45 minutes

Good initial puff; good air blow, decreased to fair ar blow after 15 winutes and died out after 21 winutes.

Recovered 370 feet of mud (9.2 lbs/U.S. gal.) and 2530 feet of water (3.2 Ohms at 80 F)

Pressures (tep recorder):-

IMP	1481	p.s.i.
ISIP	1501	p.s.i.
TEP	1034	p.s.i.
FFP	1003	p.s.i.
FSIP	1304	p.s.i.
FHP	1475	y.s.i.

Bottom pressure recorder malfunctioned.

D.S.T. No.2

Duel packer straidle test in  $8\frac{3}{4}$  inch hole. Sotten-hole choke -  $\frac{5}{2}$  inch.

n den fer i ferre fan sener rennering fer i start grifte menneringer i grifte yn de renneringer in generingen. De sener

Interval:	2936-2961 foot
Fornation:	Dilwyn
I.S.I. period:	41 minutes
T.O.	5 minutos and 30 minutes
F.S.I. period:	2 minutes

Good initial puff; good or blow, decreased to fair air blow after 10 minutes and died after 20 minutes.

Recovered 2570 feet of and and 900 feet of water (3500 ppm C1 at  $80^{\circ}$  F)

Pressures (bottom recorder) :-

	IMP	2476	p.s.i.
	ISIP	1467	p.3.1.
1.02	IFP	999	p.s.1.
1.8 0	FFP	1122	p. s. i.
2nd	TPP	1169	p.s. ź.
<b>2</b> nd	FFP	1248	p.e.i.
	FSIP	1966 1 No. 4617 448	p.s.i.
	FHP	1476	p.a.i.

Packer seat failed scon after comencement of final chut-in period. **<u>D.S.T. No.3</u>** Single packer streddle test in  $S_3^2$  inch hole. Bottom-hole choke -  $\frac{5}{3}$  inch.

Interval:	8094-8149 feet
Fervation:	Belfast-Wearre Transition
	Unit.
Mierun:	Unable to obtain packer
	seat.

Recovered 180 feet of thick and 742 feet of gas out wud.

Pressures (top recorder):

THP	4364	ĝ. <b>s.i</b> .
FHP	k367	p.s.i.

D.S.T. No.4 Duel packer bottom-hole test in 8% inch hole. Bottom-hole cheke - % inch.

Interval:	8256-84 <b>33</b>
Formation:	Wearre
I.S.I. period:	60 minutes
T.O.	54 minutos and 90 minutes
F.S.I. period:	720 minutes

Good air blow throughout test.

Non-combustible gas to surface in 7 minutes at rate too small to measure; flow increased to rate in excess of 800,000 cubic fest per day after 12 minutes; after 20 minutes gas was accompanied by sluge of mud and muddy saltwater; after b0 minutes gas was accompanied by sluge of clean saltwater. Flow rate estimated to be between 2,000,000 to 3,000,000 cubic fest per day.

Recovered 4333 feet of saltwater separated by pockets of non-combustible gas.

Resistivity of calturior produced during test was 0.266 Chas at 68 P.

Freesures (top recorder) :-

	ZHP	4452	p.e.i.
	ISTP	3546	5.8.1.
100	IFP	1.863	p.s.i.
303	red	2796	p.e.i.
20.0	TEP	3036	p. s. i.
2nd	<u>r</u> ep	3187	p.o.i.
	PSTP	3576	p.c.i.
	LHG,	<u>hà36</u>	p.s.i.

D.S.T. No.5

Duel packer betten-hole test in 8% inch hole. Bottom-hole choke - % inch.

Intorval:	8610-8730 feet	
Fernation:	Waarro	
I.S.I. period:	202 minutos	
r.o.	33 minutes and	71 minutos
F.S.I. period:	117 minutos	

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Week airblow, increasing to good airblew after 15 minutos; decreased to fair airblew after 25 minutos. Weak airblew throughout second flow yeried.

Non-combustible gas to surface in 20 minutes at rate too small to measure, flow rate steedy throughout first flow ported. During second flow period colution gas to surface inmediately at 340,000 cubic feet per day, decrements to 140,000 cubic feet per day after five minutes and too small to measure after 7 minutes.

Pencysind 279 feet of gas-out, watery and and 6603 feet of gas-out saltwater (0.341 Ohrs at 58°F)

and the second states of the

Pressures (top recorder):-

	THP	4573	p.s.i.
	ISTP	3683	p.s.i.
1.62	IFP	453	p.e.%.
lst	FFP	1833	p.e.i.
2nd	IFP	1756	p.e.1.
2nd	FFP	3091	p.8.1.
	PSIP	3672	p.e.i.
	FRP	4570	p.s.i.

Single packer straddlo test in 8% inch D.S.T. No.6 hele. 8184-8238 foot Interval: Formation: Waarro Unablo to obtain packor Missun: sest. ים אלא מערכים ביותר האינים האינים ביותר אינים ביניג הייני איני איזי איזי איזי אינים אינים אינים אינים איני אינ אני אינים אונים אינים Dual yeokar atradule toot in 8% inch D.S.T. No.7 hole. 8163-8221 feet Xuterval: Pornation: Misraa: Unable to obtain packer seat. Buhl preker straddle test in 8% inch hole. D.S.T. No.S. Postombolo shoko - & inch. 9154-9183 Treponyol:

Forwation: Nearro I.S.I. novicó: 195 minutes T.O. 93 uinutes and 669 minutes F.S.I. period: 665 minutes

Strong airblev throughout tost.

Non-combustible gas to surface is two winntes at rate too suall to measure.

- 3 -

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Flow rate increased to 1,540,000 eubic foot per day after 17 minutes and to 2,290,000 cubic feet per day at end of first flow period. During scoond flow period gas flow stabilised at 2,790,000 cubic feet per day. Flow rates were then restricted to  $\frac{1}{2}$ ,  $\frac{1}{2}$ , and  $\frac{1}{2}$  of stabilised flow rate for periods of 1 hour. The well was then flowed without restriction for the diration of the test. During this period the flow rate stabilised at 2,595,000 cubic feet per day.

Pressures (toy recorder):-

	THP	4923	p.a.i.
	ISIP	4124	p.e.i.
İst	$\mathbf{M}\mathbf{F}\mathbf{F}$	1263	p.c.i.
3.01	FFR	1.252	p.a.2.
Such	IFP	1270	p.s.i.
2nd	FFP	3.153	p.s.1.
	FSTP	3712	p.o.t.
	FEP	4496	p.s.i.

Turing test the testing string becaus etnek at 8450 fost. As it was not possible to rotate tool shut the tool was closed at curface to obtain a final closed in proceuro.

NOTE: D.S.T.No.7 is a mission not charged for by the contractor. Concequently the Formation Testing Report (Exclosure Me.9) serving D.S.T.No.8 has been incorrectly numbered D.S.T.No.7 by the contractor.

#### TABLE ONE

#### ALLIANCE CAROLINE Eq. 1

Flow Measurements D.S.T.No.8

First Flow Poriod (commenced 5:17 FM, 14 Jan. 67)

Tive	Inches of Mercury	Ricos Sizo
	M 9.3 12.0	2 <u>in</u> .
5:58 5:46	1.6.0	10 50
5:55 6:02	18.6 20.0	9

Second Plow Poried (connenced 9:20 PM, 14 Jan. 67)

Time	Inches of Moreury	Risor Sizo
9:32 Pla	3.0	3 i.a.
9:45	3.0	19
10:03	6.0	18
10:2 <sup>1</sup> / <sub>4</sub>	5.9	30
10:50	5.9	**
11:27	5.65	99

At 11:50 flow was restricted to  $\frac{1}{2}$  of stabilised flow reto (2.2 inches of mercury -- 2 in. since) and maintained at that rate until 00:58 AN, 15th Jan. 67.

The flow rate was then restricted to 4 of stabilised flow rate (3.7 inches of moreury -- 2 in. riser) and maintained at\_that rate until 2:15 AN.

The flow rate was then restricted to § of stabilised flow rate (8.4 inches of servery -- 2 in. visor) and maintained at that rate until 3:30 AN at which time the surface choice was fully around.

The following flew near means were then pecerded:

Tiue	Enclose of Mercury	Raper Size
3:50 4:20 4:30 4:53 4:53 5:21 5:21 5:42	AM 23 plus vowourr blora out of hanowober 8.1 5.6 5.3 5.9 5.9 5.9 5.9 5.9 5.9	ে j) 2.89 ए ए ए ए ए ए ए ए ए ए ए ए ए ए ए ए ए ए
	Some water present at typact of then above readings taken. Tak- taking following sendince. Tak t inch.	er rereved before
7:21 8:02 8.19 9.06 9:42 10:20 10:27	改、27 约、6 约、655 功、655 功。27 药。27 药、27 药、27	52 53 67 68 59 19 52

M.G. LeBacane

## APPENDIX No.5

## ALLIANCE CAROLINE WELL No.1

# COMPLETION REPORT

## LITHOLOGICAL DESCRIPTION OF SAMPLES

By: M.C. LeBlanc G. Campe and J. Gausdon

- Description of samples from percussion operation - pages
   "a" to "f"
- Description of complete from rotary operation - pages
   to 172

ALLIANCE CAROLINE No.1 WELL (PERCUSSION HOLE)

The interval surface to 514 feet (16-530 feet KB) was drilled with a percussion rig.

- 0-10 SAND: buff, the grained, subsugular, quartz, well sorted, uncousolidated.
- 10-20 LIMESTONE; medium light greyish yollow, poorly sorted (very fine grained to medium grained, occasional coarse grains), bioclastic, moderately oilty, slight to moderately argillaccous, abundant bryozoal fragments, excellent (30%) intergranular and methy porosity.
- 20-30 LIMESTONE; buff to light brown, dioclastic, very fine grained peorly corted with abundant fine and occasional medium grains, abundant bryozoal fragments very peerly consolidated, alight delomitic probably very good intergranular peresity.
- 30-40 BOLOMITE; white to light groy, slightly calcarsous recrystallised very fine to fine grained calcarsnite 35 SIMDSTONE: modium light groy, very fine coarse grained angular quartz, very poorly sorted, moderately silty, silicoous coment, tight.
- 40-50 BOLOMITE; white to buff, fine orystalline (abundant loose rheade), slight calcarecus, fair intercrystalline perceity (5%). 10% DOLOMITE; as above. 10% DOLOMITE; light orange brown, moderately calcareous slight forrugineus, traces organic perceity. Traces of limestene, bioclastic fragments, and sandetone as above.
- 50-60 EOLOMITE; cream, Sine crystalline, moderately friable good intercretelline perceity.
- 50-70 NOLOMITE; sreau, unconsolidated, fine to medium crystalline, probably very porous.
- 70-80 NOLOMITE; croan, pink and pale mauve, fine crystalline in part very file crystalline in part friable but prodominantly well consolidated, fair (6%) interorystalline perceity in part (20%) with good (15%) intercrystalline perceity.
- S0-90 DOLOMNTE: buff, fine crystalling, unconsolidated, probably with very good perosity.
- 90-100 DOLOMITE; as above, in part consolidated.
- 100-110 DOLOMITE; light crange brown, fime crystelline slightly calearcous, unconsolidated, very good intergranular and microvagular peresity (18%) in consolidated ships.
- 110-120 DOLCMETE: lightroddich brown, in slight part mottled pale green, fine crystalline, slightly calcareous common green (chlirite?) grains, consolidated, good (12%) interexystalline and microvugular perestty.
- 120-130 DOLCMITE; pale yellow, vory fine crystalline to fine crystalline very slightly enleareeus, poor intererystalline and microugular porosity. 10% DOLOMINE; maure, microcrystalline to very fine

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crystallino, very slightly argillaceous. 5% LIMESTONE; light grey, poorly sorted bioclastic fragments, in a very fine crystalline matrix, earthy texture.

- 130-140 LIMESTONE; white to light grey, bloclastic, very dolowitic, tight.
- 140-150 LIMESTONE; cream, bioclastic fragments (including abundant bryozozi fragments) in an abundant very fine grained to silt sized marly matrix, earthy texture.
  40% CHERT; light to cark grey.
  5% LIMESTONE; light grey, as above.
- 150-160 MARL; light grey, moderately fossiliferous (bryozoal fragments) 20% CHERT; as above.
- 160-170 MARL; as above. 15% CHERT; as above.
- 170-180 LIMESTONE; very light grey, vory fine to very coarse grained dolomitised bioclastic fragments (predominantly bryozoal) in a moderate to very argillaceous matrix, grades to fossiliferous marl. 50% CHERT; dark grey.
- 180-190 LIMESTONE; as above. 40% CHERT; as above.
- 190-200 LIMESTONE; Light grey, poorly sorted (to very coarse grained) blochastic grains (abundant bryazea) in a silt sized slightly argillaceous matrix, earthy texture; fair organic peresity and good earthy peresity; trace very fine grained glauconite pellets. 20% CMERT.
- 200-210 LIMESTONE; as above; traces of very fine to fine grained glauconite. Occasional DOLOMITE; light pink, microcrystalline to very fine crystalline, some silty. matrix, noncalcarcous, fair intercrystalline perosity. Occasional CHERT.
- 210-220 LIMESTONE; as abovo, in part with silty matrix, trace glauconitic. 10% CHERT; light to dark grey occasional translucent 10% MARL; white to light grey, 20-30% argillaceous matrix.
- 220-230 MARL: white to light gray, 20-40% argillacoous watrix, occasional fossi? fragments, trace glauconite.
  20% CHERT; as above.
  10% LIMESTONE; as above, fragmental, with up to 60% watrix.
- 230-240 LIMESTONE; as above in part consolidated but generally unconsolidated. 30% CHERT; light grey to black, grades to silicoous limestone. 20% MARL; as above.
- 240-250 CALCARENTTE: light groy to white, silt sized to fine grained with 20% fossil fragments; traces glauconite. 20% CHERT; as above.

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250-260 LIMESTONE; as above. 30% CHERT; as above. 10% DOLOMITE; light orange to light pink, very fine to fine crystalline, poor intercrystalline porosity.

- 260-270 CHERT; light to dark grey 30% LIMESTONE; as above; bioclastic grains predominantly bryoscal. 20% CLAY; light grey, slightl calcareous, moderately silicoous. Occasional DOLOMITE.
- 270-280 LIMESTONE; as above, consists predominantly of unconsolidated bioclastic fragment; trace glauconite pellets.
   30% CHERT; as above.
   10% CLAY; as above.
   Trace DOLOMITE.
- 280-290 CHERT; as above. 40% LIMESTONE; as above; rarely with fine to { mm spherical aggregates of pyrite (on fracture planes?) Traces od CLAY and DOLOMITE, as above.
- 290-300 CHERT; as above. 30% LIMESTONE; as above, silty to argillaceous matrix. 30% CLAY; light grey; soft to firm, occasional fossil fragments, vory calcareous, grades to MARL.
- 300-310 LIMESTONE; cream, consists of poorly sorted (predominantly fine to medium grained) bioclastic fragments which are dolomitised; matrix is calcareous abundant bryozoal fragments; very friable and recovered predominantly as loose grains; possibly good intergranular perosity.
  10% CHERT; light to medium dark grey.
  5% DOLOMITE; white microerystalline to fine crystallico in part altered bioclastic limestone.
- 310-320 LIMESTONE; cream, poorly sorted (predominantly medium grained) delomitised bloclastic grains, in a microcrystalline to very fine crystalline matrix, in part elightly avgillaceous.
  5% CHERT; medium to dark grey.
  5% DOLOMITE; as above, moderately calcarecus.
- 320-330 LIMESTONE; cream, poorly sorted, selectively dolomitized bioclastic fragments (predominantly bryozoml) with 50% matrix of silt sized to very fine grained clastic fragments; earthy texture; in part (10%) argillacoous; poor intergranular peresity.
- 330-340 LIMESTONE; as above.
- 340-350 LIMESTONE; cream, poorly sorted (predominantly very fine to fine grained) blochestic grains with 60% silt sized clastic carbonate matrix; moderate to very dolomitic with approximately 20% dolomite rhombs, earthy tenture, good earthy porosity; very friable; sample predominantly unconsolidated.
- 350-360 LIMESTONE; cream, bloclastic, as above; 40% silt sized matrix; sample predominantly unconsolidated.
- 360-370 LIMESTONE; cream, bioclastic (predominantly bryozoal) as above, poorly corted (predominantly medium to very coarse grained; catple predominantly unconsolidated. 20% DOLOMITE; white, crypto-crystalline altered bioclastic limestone.

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- 370-380 CALCARENITE; cream, in part pale yollow, medium to coarse subrounded grains in a siltcized to very fine grainsdumatrix; abundant bioclastic grains, very friable, poor intergranular perceity and good earthy perceity.
   5% CHERT; brown and grey.
   Trace DOLCNITE; orango, modium crystalline, calcareous.
- 380-390 CALCARENITE; cream to light yellow, loose coarse to granule sized grains and 40% bioclastic fragments (predeminantly bryozeal) rounded to angular. dolomitic, possibly with very good intergranular perosity.
  20% CHERT; dark grey.
  35% DOLOMITE white, fine to medium grains and fossil fragments, in a misrocrystalline matrix, mederately well inducated, mederate to very calcareous, recrystallised bioclastic limestone.
- 390-400 CALCARENITE; cream, peorly serted (predominantly fine to medium grained), abundant foscil fragments (predominantly bryozoz), microcrystalline to very fine crystalline matrix, trace glauconite, peor organic and intergranular perceity in chips; sample predominantly unconsolidated. 7% CHERT.
- 400-410 CALCARENTTE; light groy, very fine grained, in part fine grained, occasional coarser grains, delowitic with abundant very fine delowite rhombs; grades in part to delowitic CALCILUTITE. 5% CHERT; modium dark groy. Occasional concretions of pyrite.
- 410-420 Lithology and \$ ; as above.
- 420-430 SAND; buff, fine grained, angular quartz and 30% calcareous dologite grains and 5% foosil fragments well sorted, unconsolidated, probably excellent intergranular percepty.
- 430-440 SAND; buff, very fine to coarse grained (predeminant) fine grained) angular to subangular quartz and 40% explorate grains with occasional fossil fragments. moderately well serted, unconsolidated, probably excellent intergranular percesty; quartz grains are generally elear but conscional grains are ironstained. 15% CALCARENITE; as above.

440-450 DOLOMITE: modium lightraddish brown, microcrystalline indurated, tight: recrystallised very fine to fine grained calcarenate. 20% SAND; as above. 8% DOLOMITE: pale brown, fine crystalline, slightly silty, peer to fair intercrystalline perceity. 1% CHERT 1% Fossil fragments.

450-460 DOLOMITE; orean to buff, fine crystalline, traces calcite; fair intercrystalline perceity. 15% DOLOMITE; pale brown to reddish brown, as above.

- 470-480 DOLOMITE: buff, fine to medium crystalline, microcrystalline matrix, traces calcite, poor microvugular and intercrystalline porosity in chips but sample predominantly unconsolidated.
- 480-490 DOLOMITE; pink to buff, microcrystalling, in part fine crystelline, indurated, tight. DOLOMITE: as above.
- 490-500 DOLOMITE: cream and light groyish brown, very fine to fine cyrstalline, poor intercrystalline and microvugular perosity.
  25% DOLOMITE: pink to buff, as above.
  1% CHERT: medium grey, as above.
- 500-510 DOLOMITE: buff to light brown, in part cream, fine crystalline, moderate to very friable; only poor intercrystalline perosity evident in chips but greate: part of sample is unconsolidated.
- 510-514 DOLOMITE; cream to pale brown, fine crystalline, only poor intercrystalline porosity in consolidated chips but sample predominantly unconsolidated. Occasional chert and fossil fragments.

Percussion hole bottomed at 514 feet below ground level i.e. 530 feet K.B. Rotary drilling commenced at 510 feet K.B.

Depths which follow are all measured from the top of the Kelly Bushing

510-581 No samples. Unable to obtain circulation. Drilled "blind".

Core No.1 Interval: 581-599' Rec 15' 6"

581'00"-582'4"

DOLOMITE: pale greenish grey, poorly sorted dolomitized bioclastic fragments in microcrystalling to very fine crystalline matrix, rare quartz grains, slightly argillaceous: earthy texture; slight organic porosity; good earthy porosity. -- grades to --

582'04"-593'03"

DOLOMITE; light grey, very fine crystallino, dolomitized poorly sorted bioclastic limestone; moderately calcarcous; in part with earthy taxtures; generally slight to moderately argillaceous; moderate earthy perosity; grades in part to bioclastic limestone with abundant dolomite rhombs. -- grades to --

593'03"-596'06"

MUDSTONE; modium greyish brown, with 40% fossil fragments (prodominantly bryozoa); moderately calcareous slightly gluaconitic; in part slightly pyritic.

596'06"-59	9'00" No Samples. Bodding is not well defined; no reliable dip ovident.
599-699	No samples. Unable to obtain eireulatien. Drilled "blind".

Core No.12 Interval: 699'-719' Rec 11' Drilling time -- 15 mins.

699-710 CLAY; black carbonaceous, slightly sendy; in part grading to argillaceous cand(with 50% clay) firm to soft. The core contains cormon pyrite nodules (up to 3 cm. but generally \$ cm. or less) and occasional clear wica flakes (up to 5 wm.). The sand grains range from fine to very convee grained (30% fine grains; 40% medium grains, 20% coarse grains; 10% very coarse grains). The grains are subrounded to rounded, have poor sphericity, and are generally poliched. They are occasionally pitted and are clar to cloudy with common reddish brown and orange stained grains, occasional yellow and pink grains and very rare grains of prismatic quartz. Other constituents of the sand grains are counton (up to 15%) ironstone and limonite (?) and traces of chert and glauconite pellets. Finely discominated pyrite is common in the clay.

> The core is generally structureless but there are some thin fine grained sandstone laminations in the clay. The core is tight with rare zones of poor poresity. No shows were recorded.

As the core is massive the dip of the bedding is not discernible.

710-719 No recovery.

719-761 No samples. Unable to obtain circulation.

Drillod "blind".

#### CUTTINGS DESCRIPTIONS

- 761-770 SANDSTONE: grey; coarse to very coarse grained; in part medium grained round to subrounded; in part medium grained round to subrounded; well sorted quartz; occasional limenite costed grains, abundant pyritic coment (approximately 5% of sample consists of pyrite); probably with moderate to good intercrystalline peresity 40% CEMENT.
- 770-780 SANDSTONE: grey medium grained to granule size; round to subrounded quartz; occasionally white and black, poorly sorted; matrix predominantly pyrite (?); (approximately 5% of cample consists of pyrite).
- 780-790 SANDSTONE: grey uncensolidated, medium to very coarse grained with occasional granules; subangular to subrounded frested and polished grains, poorly sorted. Sandstone consists of quartz grains clear to cloudy, rare fossil frequents (bryozea), in a pyrite matrix with up to 20% very finely divided pyrite in sample. Fessil fragments contain limonite pellets and are possibly recirculated (?) Nelson Fermation.
- 790-800 SANDSTONE: grey silt to very coarse grained with 10% granules; poorly sorted, roundod to subangular frosted and polished grains. Sandstone consists of quartz grains, occasional liminitic pellets, rare carbonaceous matter in a pyritic matrix (40% - 50% matrix). Pyritic matrix occasionally contains some grey to brown clay. Common fossil fragments rare black chort.
- 800-810 SANDSTONE: light groy, unconsolidated generally cleanor than above, coarse to very coarse grained with 20% granulos, rounded to subrounded, modium sorting, composed of clear to cloudy quartz, rare dark gray quartz, trace micaceous trace limonite stained quartz, rare glauconite, trace carbonaceous matter. Grains generally unconsolidated, some with gray clay matrix adhering. Common finely divided pyrite aggregates.
- 810-820 SANDSTONE; light grey, unconsolidated medium to very coarse grained with 10% granules rounded to subangular fair sorting, composed of clear to slightly cloudy, frosted and fresh quartz grains rare dark grey chort grains, occasional very finely disseminated pyrite, in a dark grey silty clay matrix (or possibly the silty clay occurs as intorbeds in the sandstone). Bare sandstone with carbonaceous silty clay matrix (50% quartz 50% matrix). No shows.
- 820-830 90% SANDSTONE: unconsolidated light grey, medium to coarse grained with 20% vory coarse and 5% granule, rounded to subangular fairly sorted, fresh and frosted quartz grains, composed of clear to slightly cloudy quartz grains, common mica, rare dark grey chert flakes (clear) to 5 mms rare finely

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divided pyrite and pyrite commented with fine grained candstone. No shows. 10% clay (?) green gray, firm, speckled blach, non-calcercous but resembles coment, massive.

- 830-840 100% SANDSTONE: light gray, unconsolidated, generally coarse grained with 20% medium grains 10% very coarse grains and 10% granules. Medium sorting rounded to subangular, clear, fresh and frosted quartz grains, occasional mice flakes, rare pyrite. The sandstone in part is consolidated with a carbonaccous clay matrix (20% matrix) and with quart grains from fine to very coarse grained and with a trace of mice.
- 840-850 100% SANDSTONE: light grey, unconsolidated medium to coarse grained with 10% very coarse 10% granules, fair sorting, round to subangular fresh, frosted and polished quartz graine, cossional mica, occasional pyrite matrix, otherwise no matrix visible. Quartz grains generally clear to cloudy, occasionally light grey, occasionally orange. Trace of white quartzite.
- 850-860 100% SANDSTONE; light grey unconsolidated coarse to very coarse grained with 20% granules, rounded to subrounded fair sorting, composed of clear to cloudy quartz grains, with 5% light to dark grey chert. Natrix rare and consists of finely divided pyrite or pyritic carbonaceous material. Sandstone with matrix is tight.
- S60-870 100% SANDSTONE: light grey unconsolidated modium to very coarse grained with 10% granules rounded to subrounded occasional subangular fair sorting composed of clear to slightly cloudy fresh frosted and polished quartz, occasional light grey to dark gray chert, light grey microcrystalline argillaceous limestone to micaceous; with common pyrite matrix sandstone, pyritic to carbonaceous matrix and up to 10% grey to brown pyritic clay matrix. Sample contains one grain of fine grained sandstone with 20% kaolinitic matrix, tight.
- 870-880 90% SANDSTONE: light grey unconsolidated, medium to coarse grained with 20% very coarse and 10% granules, rounded to subangular, fair sorting, clear to cloudy fresh and frested quartz, traces of dark grey chart, to pyrite, to fossil fragments. Traces of pyritic cemented fine to modium grained sandstone, 10% silt, brown, grey, firm, clayey sandy, grades into very fine to fine conditions, finely micaceous. Silt occasionally has liminito coated quartz grains fine to medium grained.
- 880-890 100% SANDSTONE light groy, unconsolidated medium to very coarse grained with 10% granules rounded to subangular, fair sorting clear to slightly cloudy and groy quartz, frosh and frosted, rarely polished to chert, fossil fragments, pyrite. Trace carbonaceous material and carbonaceous clay matrix. Trace silt as above slightly pyritic.
- 890-900 100% SANDSTONE: light grey, unconsolidated medium to very coarse grained, with 5% granules fair to good sorting, rounded to subrounded and occasionally

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subangular clear to slightly cloudy quartz grains, occasionally light grey quartz grains and common brown stained quartz grains; traces of chert common pyrite to carbanaceous clay matrix. Traces of brown to grey pyritic clay matrix. Traces of siliceous matrix in fine quartz candstone. Traces of green pyritic fragment (?) glauconitic.

- 900-910 100% SANDSTONE; light grey, unconsolidated, medium to coarse grained with 20% fine grains, rounded to subangular, clear to slightly cloudly and occasional grey quartz, fresh to frested quartz grains, common pyrite cemented sandstone, traces mica to 3 mms, rare glaucenite pellets, occasional black clay (carby) stuck to quartz grains. /10% very coarse grains,
- 910-920 100% SANDSTOME: light grey unconsolidated, fine to coarse grained, rounded to subangular, clear to slightly cloudy quartz, fresh, frosted and polished grains, fair to well sorted occasional pyrite cemented sandstens and very finely divided pyrite aggregate, as matrix, to mica to 3 mms, trace light grey chert pebble.
- 920-930 10% Coal, black soft to moderately firm, in part sandy and slightly pyritic. 90% Sandstone; light grey unconsolidated, fine to coarse grained with 10% very coarse grains, rounded to subangular clear to slightly cloudy, fresh and frosted quartz grains, fairly sorted, occasional pyrite comented andstone, trace wich, trace greyish quartz grains, trace grey chort.
- 930-940 100% SANDSTONE: light grey, unconsolidated fine to coarse grained, with 10% vory coarse grains, rounded to subangular, clear to slightly cloudy fresh and polished quartz grains, to mica pyrite. Trace coal.
- 940-950 100% SANDSTONE: light grey unconsolidated fine to coarse grained, generally medium grained with 10-15% very coarse and 5% granules, fair sorting rounded to subangular, clear to cloudy quartz. Trace pyrite comented sendstone, wice light grey quartzite, silty matrix.
- 950-960 100% SAIDSTONE; light groy unconsolidated, medium to coarse grained with 20% vary coarse and 10% granules; trace fine groins, rounded to subangular, clear to slightly cloudy and rarely deep pink fresh and poliched quartz. Traces fossil fragments, ciliceous comented finely groined sandatone (tight) pyrite ceal, mica, light groy chert.
- 960-970 100% SANDETONE: light grey unconsolidated, wedium to very coarce grained with 10% granules and 15% fine grains, rounded to subangular, clear to slightly cloudy quartz grains, poorly sorted. Traces of pyrite, mica, chert, siliceous coarse pyrite comented fine grained to medium grained sandstone. Traces sandstone composed of limenite coated sandstone in a black hard (? sideritic matrix) tight. Traces grey brown silt.

- 970-980 100% SANDETONE; light grey unconcolidated, modium to very coarse grained with 10-15% granules, 10% fine to modium grains, rounded to subangular, clear to slightly cloudy, occasional grey, froch and policided quarts grains; traces of mice, chert, pyrite covented candstone, traces of carboneccous matter, traces pyritic glauconite, rare fossil fragments.
- 980-990 100% SAMESTONE: light grey, uncensolidated, fine to coarse grained with 10% very scores and granules poor sorting, rounded to subangular, clear to slightly cloudy, frosted and polished quarts grains, to pyrite matrix, traces dark grey quarts, to grey chert, traces carbonaccous material.
- 990-1000 Poor sample 100% SANDSTONE: light grey, unconsolidated, modium to very coarse grained with 20% greanles and traces fine grains. Feorly seried quarts with traces of chert, common pyrite and carbonacecus material.
- 1000-1010 30% SANDSTONE: light grey, unconsolidated, medium to very coarse with 30% granules, rounded to subrounded, clear to cloudy quarts, common pyrite and carbonaccous. 20% SILT: brown grey, very finely candy, firm, micaccouc, clightly carbonaccous, clayey, very slightly calcareous.
- 1010-1020 80% SANDSTONE: Light grey unconsolidated, medium to very conrec grained with 10% granules, fair sorting rounded to subangular clear to slightly cleudy and coensional light grey quarks grains, two mica pyrite and carbenaceous waterial. 20% Silt brownich grey, vicaceous, flightly pyritic, very finely candy, clayey.
- 1020-1030 90% SANDSTONE: light grey uncenselidated, coarse to granular with 10% modium grains and 20% fine grains, poorly sorted rounded to subangular, clear to slightly cloudy quarts grains, traces pyrite command sandstone, carbonaceous uniter, mice, fossil fragments. 10% silt as above.
- 1030-1040 100% SANDSTOME: light grey, unconsolidated, medium to very coarse with 15% granules, rounded to subrounded, fair serting, polished, frosted and frech clear to slightly cloudy quarts grains, traces black chart, grate, mich to 3 mis, carbonaceous matter, white massive vuggy limestene.
- 1040-1050 100% SANDSTONE: light grey, unconsolidated, medium to very coarse grained with 10% granular and 15% finely grained, rounded to subangular, clear to slightly cloudy and occasional grey quartz grains, fresh and frested occasional polished, with traces mica, pyrite, carbonaceous matter, chert. Traces silt as above.
- 1050-1060 100% SANDSTONE: light grey, unconsolidated, medium to vory coarse with 20% granules and 10% fine grains,

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rounded to salengular, clear to slightly cloudy yolished and fracted quarts grains, traces graits, corbonnesses matter, blue gray chort, common thits wide. Corpon gray brown clay, block clay and myrite adverting to grains.

106. 107. 100% CANDETCHE: light proprioencelidated medium to granular 30% granulae, rounded to subangular, clear to villy quarts, related and freeted, trace grante, esthemascus catter, vice, quartaite and clout. Traces silt as obove.

1070-1000 909 CANDERNARY light group, unconsolidated coarse to granular with 10% grounded, 10% medium and fino grains, fair to peer secting, rounded to subangular, where to steady and consistent wilky quarts grains, traces when costeneous catter, write, quartsite.

10% SIMP, tory cherey, coordicant very finely sendy, whereover, conferences, in yest slightly pyritic, first to lard, lastroted.

- 1080-1090 93% SARDETARS: light grow, uncorrectidated coarse grained to garantes, 20% granules 10% medium and fine grains, rounded to enhanceded, clear to slight clearly and willy (especially the granules) quartz graine, to errbourseeds matter, gyrite mice. Traces invisations of each and fine grained soudstone to faring time of an thick (%) silt as above.
- 1090-1100 90% SARAWING: light crey unconsolidated, medium to very ecore quained with 10% granules and 10% wery five to fine grains, fair to peorly sorted wounded to putergalar, clear to clearly quarts grains in ressibly o silty and pyritic matrix, traces vice processors raterial, gyrite.

38% silt of overe.

1302-3110 95% FARDETERS; light greet, unconcolidated coarse to very course grained with 35% granules and 10% worker to fine grains, scenic verted, founded to enhangelar freshed and school, shoar to sloudy greats gavins, broos which, purite, carbonaceous eatter.

If cilt as chore in part wory playoy.

MIL2-1120 SOF CAPESTON : light prop, unconsolidated, medium to very ecores gardned, 190 LOS granules and 15% Fine grains, possily certed, rounded to subengular clear to slovdy seconderal viller quartz grains, trace works, size.

> 20% silt, breen gree cheyey in part very finely sandy firm, in part pyritic and often very pyritic, finely missions, occasionally clightly carbonaceous. Coessionally Idminated. Grades in part to a silty clay.

1120-1150 90% SANDWYOND: light gray unconsolidated, medium to very course grained, well serted, rounded to subrounded, clear to slightly cloudy, polished and freeted quarts graine, traces mica carbonaceous untter, purite, Grains conscienally have silty clear or purite adhering to theu.

## TWN silt as above.

- 1190-1100 100% CAREFORD; light grow unconsolidated, sedium to conver orbited, with 200 very course and groundes, and provide to readed, clear to slightly elever and gray growth grains, with trease corbenceeous matter, where, during or other and grains. Trease sit as above. Trease livestore, but gray, south, carthy. Trease livestore, but gray, southlaccous enscive.
- 1100-1190 20% CONVERSE light grey, unconsolidated convecto presented with 20% converse 10% codius grains, pervise the pricementar about to slight? r cloudy three and reliance quests preises, to grey and pink querth . preise.

10% slit as share in part; early. Whis silt may he the matrin of the conduters and if so the sandstars is light.

10% Coal, black, five to sort, duil in part sandy and vicacecus, in part pyritic.

- 1190-1160 100% SAMESTONE: Light grey, unconsolidated, medium to very coarse grained with 20% granules, fair certing, rounded to subrounded clear to very slightly cloudy, polished and froch quarts grains. Traces mice pyrite, corbonasceus watter. Traces matrix to silty. Traces cilt es above. Traces coal es above.
- 1160-1170 100% SAMDETCHE: Aight grow, unconsolidated, medium to very coarse grained with 10% granules, fair sorting rounded to subrounded occasional subangular, clear ecsasionally cloudy or wilky frosted and polished quarts graine, with treess of silt matrix, traces pyrite, when, grey chart, corbonaceous matter. Traces silt as above. Traces livestone, brown grey, argillaceous massive with brazeous.
- 1170-1180 90% SAMEFONE: Light groy, unconsolidated, medium to very course grained with 10-1% greaules, fair sorting, nourded to subangular clear eccasionally cloudy, willy or grey quarts, with traces pyrite, grey chart, when to ubits. 10% Silt, cleyar, break grey, farm micaceous, cocasional slightly pyritic, laminated. Traces linestone, white finely crystelling with white earthy slightly calcarcous orgillaceous matrix. Traces perosity.
- 1180-1190 100% SANESPOND: Aight grey, unconsolidated, medium very coarse grained with 10% grenules, fair sorting, rounded to subangular, clear to slightly cloudy quarts coresionally light grey quart, traces chert black and dark grey, pyrite mice. Traces white percus very fine grained sendstone. Traces silt as above.

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- 1190-1200 100% SAUDSTONE: Light grey, unconsolidated, medium to very coarse grained with 10% granules and 20% very coarse grains, fair to good corting, rounded to subangular, clear to slightly cloudy and occasionally wilky to light grey (especially the granules), fresh and freeted quartz grains, with trace pyrite watrix, silt matrix, mica, dark grey chort and rare limenite costed quartz granules.
- 1200-1210 100% SANDETCHE: light grow, unconsolidated, modium to very coarse with 10% granules, rounded to subangular, clear to slightly cloudy fresh and frosted and polished quarks grains, traces white quartzite, mica praise as very fine crystalline aggregate, traced silty matrix.
- 1210-1220 106% SANDSTONE: light groy unconsolidated, medium to very coarse grained with 10% granules rounded to subargular, clear to slight cleady and occasional wilky fresh and frosted quarts grains, traces pyrite, white quartaite, traces black (?) chert, traces carbonaceous watter. Traces white earthy argillaceous linestone. Traces silt as above.
- 1220-1230 LOG% SAMDSTONE: Light grey unconcolidated, coarse to very cearse grained with 15% granules and 15% medium grains, fair to good sorting, rounded to good sorting, rounded to subangular, clear to slightly clear cloudy, frosted and polished quartz, traces chert white with quarts veins (?), pyrite carbonaccous matter and clevey silt matrix, traces light grey quartzite.
- 1230-1240 100% SANDSTONE: light grey unconsolidated medium to very coarse grained with 10-15% greanules, subangular to rounded, clear to slight cloudy quartz grains, rare veined and fractured quarts or chert grains, traces down grey chert, light pink quartz pyrite, dash breen iron stained silty matrix. Traces silt as above.
- 1240-1250 95% SANESTONE: Light groy uncensolidated coarse to very course grained with 20% granules, rounded to subangular clear with cloudy and wilky fresh and frested quarts grains, traces silty brown grey matrix, traces finely crystalline pyrite, aggregate traces grey chort, traces orange quartz, traces carbonaceous material. 5% silt, brown grey cloyey, very finely sandy, micaceous, firm laminated.
- 1250-1258 SANDSTONE: white to light groy, fine grained to granule size, quarks, poorly sorted, subangular to rounded, predeminantly rounded; 35% of grains are very coarse to granule sized; remainder predominantly coarse grained; grains predominantly vitreous but in part cloudy; occasionally large (2 mm) mice (nuscovite) flakes; occasionally concretionary pyrite, sample unconsolidated. 1% LIGHTTE; brown, very argilizeeous, in part samity.

- 1258-1270 SANDSTOND: light grey, uncensolidated, medium to very coarce grained; predeminantly coarse grained, rounded to subrounded quarts, moderately well corted, clear to dull grains, eccessional muscovito flahes. Pare pyrite. L/ SILASTOLD; medium brown, very carbonaccous in part pyritic, sandy.
- 1270-1280 SANDSTONE; as above, coarse to very coarse, eccesionnly granules; eccessional chart grains 1% CLAY modium brown, silty, very slightly micacocus.
- 1280-1290 SAMDSTORD: Light grow, unconsolidated, coarse grained to granule size, generally well rounded grains of eloudy (in part clear) quarts, with occasional chart grains and coonsideral notamerphic grains. Occasional cley and silt as above. Traces pyrite.
- 1290-1300 SAMESTONE: wedium light groy, unconcelidated; very poorly sorted, finely grained to very coarse grained (70% fine to notion grained; 20% coarse grained; 10% very ecoree grained); angular to rounded (coarse grains generally rounded and fine grains generally subargular.) Grains consist of cloudy to smoky quarts with traces of medium grey chort and econotionally have traces of brown carbonaceous argillecoous matrix adhering. Traces pyrite with wice.
- 1300-1310 SANDSTONE: as above, fine to very cearse grained (60% fine to medium grained, 40% cearse to very cearse grained). Minor amounts of sendatene; medium brown, very fine to finely grained with very abundant clay matrix, in part pyritic, grading to sendy clay.
- 1310-1320 SANDSTOFE: modium gray unconsolidated, finely grained to granule slatt subangular to rounded quarts. (30% granules 30% corres with very coarso 40% fine to modium); traces of brown clay coment adhering to some grains.
- 1320-1330 SAMDSTONN: as above (33% granules, 35% coarso to very coarso 30% fine to medium); finer grains generally antangular to subrounded and coarsor grains subrounded; rare consolidated chips have minor accurbs of brownich gray, very silty cement are very frictle and exhibit good intergranuler perosity.
- 1330-1340 SAFDSTONE: medium light groy, unconsolidated, poorly corted, 3% subrounded to rounded coarse grained to grownlo sized and 5% fine to medium angular to subangular gravino of clear to sucky quarts. Geossienally consolidated chips are very friable, have good intergrownlar persity and are poorly comented by greenish brown microsous silty to argillaccous coment. Traces chort, pyrite and rare coal fragments.
- 1340-1350 SANDSTOMA: Light grey unconsolidated, poorly sorted fine to very coarse grained, occationally fine grains and granules, predominantly medium to coarse grained, rounded to subrounded, frosted quart2. Traces pyrite and black vitreous coal. Occasional pyrite and very pyritic with very fine

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## grained tight condctono.

- 1350-1360 SANDSTONE; medium light grow uncersolidated, very peorly sorted, predominantly coarse grained (with 30% very coarse grained and 10% granule sized) rounded to subrounded quarty.
- 1360-1370 SANDSTONE: light groy unconsolidated, coarse to very coarse grained; coassional granules, clear to dull, rounded quarts, traces jasper, occasionally dull medium light grey quarts grains, rare consolidated chips with matrix of brown silty cley. Some grains have remembe of clay matrix adhering.
- 1370-1380 SANDSTONN: light grow unconcolidated, ecarse to very course grained, subrounded to rounded quarts, well sorted, fairly clean. Traces of gyrite adhering to several grains. Traces of brown clay.
- 1380-1399 SANDEROND; as above, predeminantly very coarse grained with about 15% granule cized, graine; traces of pyritic and argillaceous silt coment observed; clean.
- 1390-1400 SANDSTONN: light grey unconsolidated, modium to very coarse grained, occasionally granule. Rounded to subrounded quarks, well corted, clean, traces of brown elay matrix; traces of sandotone commted by pyrite and with good ingranular peresity.
- 1400+1410 SANDSTONE: Light gree, unconsolided, coarse grained to granule size, predominantly very coarse grained, subrounded, ullky quartz, codesionally orange quarts grains, flaky common modium grey smoky quarts; moderately sorbed, Trace pyrite.
- 1410-1420 SANDSTOND; as above, 25% granule sized, 25% wedium to corres grained.

Traces conditions: very fine to finaly grained 30% pyritic coment tight. Traces causive pyrite.

- 1420-1430 SANDETONE: light groy, unconsolidated, scarse to very conrect with 15% grownlos and 15% medium grains subrounded in part rounded, quartz. Vitreous to cloudy, occasionally eccessidated chips locsaly comented with silty to very fine sandy clay (brownish to sideritie?); other chips comented with pyrite and/or siderite.
- 1430-1440 SANDETONE: light groy, uncensolidated cearse to very cearse grained, rounded to subangular, quartz and occasional quartzite grains, moderately well sorted; rars yollowish or quartz and medium grey sucky quarts grains. Traces pyrite. Traces brown argillaceous sandy siltstone.
- 1440-1450 SANDSTONE; light grey, unconsolidated, coarse to very coarse, rounded to subangular quartz, well sorted; predominantly clear grains; occasionally pink and grey and yellowich quartz grains. Traces pyrite.

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- 1450-1460 SANDSTOND: white to light groy, course to very course as above.
- 1460-1479 SAMDSTONE: white, course grained, in part (15%) very coarse grained, rounded to subrounded clear to cloudy quartz, well sorted.
- 1470-1480 SAMDSTONE; white course to very course grained, subrounded, querts, well conted, cheen, uncourselideted, productivently cheer but in part freeted graine.
- 1480-1490 SAMDETOEN: white, converto very convert gradued rounded to subrounded quarts, well conted close.
- 1099-1500 SAMEGRONE; white as above.
- 1500-1510 SAMESTOND: white to light grow, coarse to very coarse grained (405) coarse grained) rounded quarts; well served; residue of silty matrix preserved on wary grains. Occessional CLAT; medium brown, mederate to very silty, in part sendy, moderate to very carbonaceouc, slightly mica.
- 1510-1520 SAMDEROND; white, conves grained, in part (105) very coarse grained, rounded to subrounded, quarts cloudy, occasional pink and rollowich orange quarks grains, troocs quarkate grains, vell corted, cloar, unconsolidated.
- 1520-1530 SAMPETCAMB; white, coares to very coaree grained (20% very coaree), as above.
- 1530-1550 98% SAMDEROUD; white, unconsolidated, coarce grained in part (30%) very coarce grained, well wounded, quarts, well burbed, clean. 2% LICHIES; black, cilty very argillaceous grading to very earbonaceous aloy. Cooncienal massive pyrite.
- 1540-1550 95% SANDSTEND; white, uncencolidated, coarse to very coarse grained (45% very coarse), rounded to subrounded quarts, well corved, cocesionally quartaite and chevit grains; quarts grains predominently clear. 1% LEREER; cocesionally pyrite.
- 1559-1560 SANDSYONE: white, unconvolidated coarce grained, in part (10%) very course grained, rounded to angular, prodominantly close guarts, well corted clean; counsidually quartaite and rare chert grains. Ocessional cassive pyrite and pyritic coment.
- 1560-1570 SANDSTONE; white, wedden to coarse grained, enbrounded, round as above. Occasional pyrite.
- 1570-1580 SANDSTOND; white uncenselidated, coarse grained, in part (30%) very coarse grained, generally well rounded, 20% angular, prodeminantly vitreeus quarts grains, well certed, clean. Trace topas. 1% black candy, very carbonaccous silty clay grading to lignite.

- 1580-1590 SANDSTONS: white, uncersolidated, finely grained to very coarse grained (10% fine 10% very coarse reveluder modium to coarse grained) rounded to subrounded, vibroons quarts, poorly sorted, clean; braces of pyritic coment; also several chips peorly comented with silica. Geoasdonal pyrite, traces quartaite grains, traces black pyritic cley.
- 1590-1600 EAMBERONE; white, uncensolidated, coarce grained, in part (5010\$) very course grained, rounded predeminently clear, currts, well corted, clean.
- 1500-1510 SANDSTOND: white, underseildeted course to very course grained, tounded to subremaded, vitroous to element quarts, well cortes, eleca. Considerel Sandstone: Light most, very fine grained, clumiant protide comont traces. Traces block pyritis and argillocous, very finely grained Sandstone; traces also
- 1610-1620 SANDSTOND; white to light groy, unconsolidated very copres gradued (20% secres grained), generally well rounded, quarte, clear to full grains, coonsional polished quarte grains, well scried, clean. Occasional chips with pyrite or cley cement. Traces pyrific Sandstons.
- 1620-1630 SANESTONE; white, uncercolidated, coarse to very coarse, reunded to subrounded as above.
- 1630..1640 GANDSTONE: white, rusenselidated, medium to very coarse grained, productionally coarse grained, rounded to subremeded, cloudy quarts, traces quertaits grains, understely sorted; many grains with remains of brown carbonaceous clay ratrix and/or prute coust adhering. Occasional massive prate, pyritic finely grained conditions and carbonaceous pyritic clay.
- 1640-1650 SAMASTONE: white, unconsolidated coarse grained, in part (20%) very coarse grained, cloudy quartz, well serbed, clean; traces of pyritic coment. Traces quartaite and chort grains, traces carbonaccous and pyritic very fine to fine grained sandebour.
- 1650-1660 SANDSTOND: white, unconsolidated, coarse grained (with 15% very coarse grained), predominantly well rounded but in wast angular, clear to cloudy quarts, well soutce, clean; eccasional chert grains. Traces of suscevite. 3% SANDSTOND; white, very fine to finely grained in part workwa grained abundant pyritic matrix generally well indurated, tight.
- 1660-1670 955 SANDSTONE: unconsolidated, light grey, coarse to very cearse grained, rounded to subrounded, clear eccessional slightly cloudy quartz traces pyrite. 5% SANDSTONE: finely grained, light grey, subangular to subrounded composed of quartz occasional black lithic in a pyritic matrix. Generally tight, occasional poor porosity.

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1670-1680 20% SANDSTONE: unconsolidated light grey, coarse to very coarse grained with 10% granules, rounded to subangular, clear to slightly cloudy quarts, traces mica. 10% SANDSTONN: finaly grained pyritic as above, Generally tight, occasional traces peresity.

1680-1693 95% SAME/COME: unconsolidated light grey, coarse to very ecorse grained with 10% granules rounded to subrammed clear to slight sloudy quarts, to mica. 5% SAMESCOME: pyritic as above, fine to pedium or very time to finally quarted, trees peer corecity.

- 1690.1960 365 SANACONNY unconsolidated, light grey, ocared to may deared grained with 35 greaules rounded to subrounded shear to slightly cloudy polished and freeted quarts graine, traces dark grey chert, light grey quartaite. Low SANDSTONS, light grey, fine to medium grained or finally greined well carbed subrogular to oubnounded quarts graines in pythic watrix, coossional traces to poor percutty.
- 1700-1710 100% SAMESTORE: light groy, unconsolidated, course to very coarse groined, with 5% granuloo well correct, rounded to subrounded clear to chightly cleady quarks grains, traces carbonaccous matter, chost and quartaite. Traces sandatone pyritic as above. Traces sailt, brewn groy, clayey micaccous, firm.
- 1710-1720 106% SAMMEYONN; light grey uncensolidated, fire to very coarse grained, peerly served, rounded to subangular, clear to slightly cloudy quartz grains with traces proite carbonaceous matter, when and ? feasil frequents. Traces pyrite comented conditions as above.
- 1720-1730 100% SAMPSHONE; light grey unconsolidated, wedium to very coarse grained wif sorting rounded to subrownled quarts grains, to light pink quartz, traces don't grey chest, mica, pyrite.
- 1730-1740 100% CANDETONE: light groy unconcolidated, fine to modulum with 30% conres to very coarse grains, subrounded to rubangular, clear occasional slightly cloudy from and froated quartz grains, traces mica carbonaceus matter pyrite, groy quartzite. Sundatone has fair corting.
- 1740-1750 100% SAMDETCER; light grey unconsolidated very fine to medium with 20% very coarse and coarse grains, subangular to subrounded clear quart grains to pyrite, carbonaccous matter chert, common white mica flakes to 2 mms.
- 1750-1760 100% SAMPSTONE; Light groy uncensolidated; very fine to medium with 25% coarse to very coarse and granules fair sorting, subangular to subrounded coensional rounded quartz grains, traces pyrite, mica, quartaite mare glauconite and fossil fragments.

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- 1760-1770 AOG CANENTONE; hight gree unconsolidated, very fine to modium grained with 15% conrecto very coarse graine. Subrounded to subangular asianal round (coarse and very coarse grains) fair sorting, clear to slight cloudy quarts, traces pyrite, mica, haematitic (7) quartzite, limenite stained quarts, traces very fine medium grained pyrite comented sandstone. Traces chart.
- 1770-1780 100% SANESTONE: Light groy uncensolidated, fine to medium grained with 20% coarse to very coarse grains subrounded to subangular and occasional argillaceous quarts grains, fair sorting, traces pyrite, quartsite mica chort. Traces pyrite matrix sandstone.
- 1780-1790 95% SANDSTONE: light grey unconsolidated, very fine to madium grained with 10% coarse to very coarse grains, subrounded to subangular clear to slightly cloudy quarts grains, fair to good corting, traces pyrite, mica. Traces pyrite comented very fine to medium grained candatone with accasional traces perceity. 5% Silt, dark brown grey, clayey firm, pyritic unsecvite.
- 1790-1800 100% SANDSTONE; very fine to medium grained unconsolidated with 10% coarse to granular graine cubrounded to subangular, clear to slight cloudy quarts grains with rare traces glaucenite, traces chort, pyrite, mice and pyritic carbonaceous matter.
- 1800-1810 100% SANDSTOND: Light grey, unceasedidated, very fine to medium grained with 5% coarse grains, subangular to subrounded clear to slightly cloudy quartz grains, traces chort grey, wice, pyrite, light pink quartz.
- 1810-1820 196% SANDSTONE; light grey unconsolidated, very fine to coarse grained with 5% very coarse grains rounded to subangular eleer to slight cloudy, rare pink quarts grains, fair sorting with traces grey, grey breun and veined chort, light grey quartisite, mice and pyrite.
- 1820-1830 100% SANDSTONE: light groy, unconsolidated updium to very coarse grained with 5% granules rounded to subrounded, clear to slightly cloudy generts, fresh and freeted quarts with traces chert rice pyrite and quertzite. Traces carbonaceous matter.
- 1830-1850 100% SANDSTONE; light gray unconsolidated, medium to very coarse grained with 10% fine and very fine grains and 5% granules, fair sorting, rounded to subangular clear to occasionally cloudy quartz grains, traces chert veined chert, mica pyrite and carbonaceous matter.
- 1840-1850 100% EANDSTONE; light grey, uncensolidated, medium to very coarse grained with 10% granules rounded to subrounded occasional subangular clear to slight cloudy fresh and polished quartz grains,

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fair to good sorting, traces wich pyrite, exart; pick and erange quarts. Chart between 1 and 3% of sample.

- 1850-1860 166% SAMDSTONE: light grey, unconcolidated, usdium to very coaree grained with 16% granules and 10% fine to very fine and cilt sized quartz, rounded to subangular clear to slightly cloudy quartz, with traces when pyrite chopt.
- 1060-1870 100% CANDETCHE: Light groy, unconcolidated notion to very coarse grained with 10% granules, cubrounded to subangular with consideral rounded, clear to cloudy and consideral light groy quartz grains, fair corting, with traces orgillacoous quarts, chart, pyrite, cortenessoons watter wice, pyrite command finally grained somistor wices porecity.
- 1870-1880 100% SANNETONE: Light gree, unconsolidated; nedium to vory coarse grained with 15% granules and 10% fine graine, rounded to subangular, clear to cloudy quarts graine, traces wica, chert, carbonaccous matter, pyrite command tight sandstone, pink quarts and light grey quartaite.
- 1880-1890 100% SANDSTONE: Light groy unconsolidated, modium to very conress grained with 10% granules, remuted to subrounded occasionally subangular clear to slightly cloudy quarks grains, fair to good corting, traces wher, chort, quartzite, pyrite, orange quarks, pyrite computed fine gradued condetone.

WINDLE CIRCULATION TIME at 1900' - 23 minutes

- 1890-1900 100% SAUMSTONE: light grey unconsolidated, modium to very coarse grained with 10% granules and 10% very fine to fine graines, fair sorting, rounded to subargular clear to slight cloudy quarts grains, traces exampt quarts, pyrite, mice conferences on exampt quarts, pyrite, mice conferences on the cleart, dark grey fine grained quartaite, pyrite consult tight fine to medium and very finely grained soulstone.
- 1900-1910 190% SAMETONE: Light grow, unconsolidated convec to very course with 15-20% granules, rounded to subscended occessional subangular, close to clightly cloudy and eccessional yellowish quarts grains with traces short, drusy quarts, pyrite excended fine ground condutone, mica, conl, chort and fine ground quartaito.
- 1910-1920 100% SANDATOND: light grey uncensolidated coarse to very coarse with 10-15% granules and 10% fine to usedium grains, rounded to subrounded clear to cloudy fresh and polished quartz grains with traces mice pyrite comented sandstone, chort, grey quartz, traces coal, blak, slightly argillaceous firm, no cleat, carthy.
- 1920-1930 100% SANDSTONE; light grey unconsolidated, coarse to very coarse with 10% medium and 10% granules, well corted, rounded to subrounded, clear to cloudy

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fresh and polished quarts grains, traces mics, pyrite, pyrite comented conditions, carbonaccous matter, erange quarts, and chart grey.

- 1930-1940 100% SAMDSTONE; light grey unconsolidated coarse to very coarse grained with 20% granules and 10% medium grains, fair sorting, rounded to subangular, clear to cloudy with traces yellow erange and limenite stained quarts grains traces dark grey very finely grained quartaite, pyrite comented sandshave and earbonaceous satter.
- 1940-1950 100% SANDETONE; light groy unconsolidated coarse to very conrec grained with 10% granules and 15% very fine to medium graine, clear slightly cloudy rounded to subangular fruch and polished quarts grains with truces pyrite, pink quarts, ironstone, chart and carbonaceous matter and pyrite comented fine grained sandstone.
- 1950-1960 100% SANDSTOME, light grey unconsolidated, fine to very coarse grained with 40% fine to medium grains and 20% very coarse grains, poerly serted, rounded to subangular clear to cloudy quarts with trace pyrite, carbonaceous matter. Traces sandstone light grey finely grained subrounded with salty matrix (30% of rock) tight.
- 1960-1970 100% SANDSTONE, light groy, unconsolidated very fine to very coarse grained with 50% fine and very fine to modium grains, rounded to subangular clear to cloudy quarks grains, traces pyrite comented finely grained sandstone, pink and light orange quarks, carbonaceous matter, mica.
- 1970-1930 100% SAMESTORE, light groy, uncensolidated course to very conress grained with 2-% granules rounded to subrounded clear to cloudy fresh and frested quarts grains with traces pyrite commented candstone, carbonaceous watter white mice, orange quarts, and chart groy.
- 1980-1990 100% SANESTONE; light grey unconsolidated modulum to very coarse grained with 10% very fine to five grains and fair to good sorting, rounded to subrounded clear to cloudy frosted quarts grains with traces carbon scatter, traces light pink and cronge quarts, and traces dark grey chert, traces wice white.
- 1990-2000 100% SANESTONE; light grey unconsolidated medium to coarse grained with 10% very coarse grains, well sorted, rounded to subrounded clear to cloudy quartz grains with traces quartz and chert, traces mice.
- 2000-2010 100% SANESTONE; light grey unconcolidated medium to very coarse grained with 10% very fine to fine grains, rounded to subrounded and occasional subangular clear to slightly cloudy quartz grains, traces chert, traces pyrite cement sandstone.
- 2010-2020 100% SANDSTONE; light grey unconsolidated medium to very coarse grained with 10% granules and 10% fine grains, fair sorted, rounded to subrounded

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2020-2023 100% SAMDETONE, clean light groy, unconcolidated modium to very coarse grained, rounded to subrounded, clear to cloudy fresh and frested quarts grains with traces pyrite comented fine to medium grained conditions, traces dark grey quartaito.

THTP 2023

At 2023 is a hard bend of light groy very fine to fine grained sendetone with 30% matrix that is delouivis. Slow Crilling. of = 2200 Mt. Salt = 2800 Glonel; (Folsen) Mo.1

- 2023-2030 96% SANDSYONE: light groy, uncousolidated, coarse to very cearse grained with winer modium grains, rounded to subreauded clear to slightly cloudy quartz grains, traces chert, pyrite carbonaceous matter. 10% Saudatona; light gray hard, very fine to finely grained, composed generally of quartz grains with some dark lithics and 20-40% dolomitic matrix. Tight.
- 2030-2040 CC% SANDSTONE; light grey, unconsolidated coarse to very coorse with 10% medium grains, rounded to subrounded eler to slightly cloudy, traces gink quarta, traces mica, pyrite. 205 Sandstone: Light groy hard, medium fine to fine grained, composed 60% quartz 10% black lithics and 30% delouitic matrix, tight. Traces silt, dark brown grey, firm, micaccous argillaceeus.
- 2040-2050 66% SAMDEROND; light gray unconcolidated, modium to very coaree grained rounded to subrounded well sorted, clear to cloudy frosted and polished quarts grains with traces grey chert, pyrive comented condstano, carbonaccous matter, 40% soudstano delovitile tight ac above. Traces suit as above.
- 2050-2060 50% SANDETONE; unconsolidated light grey course to very coarse grained rounded to subrounded well sorted quarts with traces pyrite, pink quarty. 50% conditione dolomitic as above. Argillaceons, traces linestone dark brown, very argillacacus, massivo, tracos bryozoa fossil fragments.
- 2050-2070 50% SANDSTOME, unconcollidated light grey, coarse to very course grained with 5% granules, well serted, overall mainly very coarse grained, rounded to subrounded quartz with traces orange quartz, grey chert. 50% Sandstone; dolomitic as above, very fine to fine grained, argillaceous in part with 50% matrix.

2070-2080 80% SAMESTONE; unconsolidated light grev coarse to very coarse grained with 10% medium grains, well sorted, rounded to subangular clear to slightly cloudy quarts grains, frosted and polished quarts grains with traces chert grey grains and carbonaceous matter. 20% DOLONITE SAMESTONE; as above, fine to very finely grained argiMaccous. Traces dolomite limestone, slight greenish white, with brown 7 siderite grains medium to coarse grained (composed 25% of rock).

- 2080-2090 90% SANDSTONE: unconsolidated, light grey coarse to very convex grained with % granules and 5% medium grains, rounded to subrounded clear to cloudy with traces erange and pink quarts with courson grey obert and traces erabonaceous watter. 10% Sardstone, deloutete as obeve.
- 2090-2100 SANDETONE: white, unconsolidated, coarse grained, predominantly well rounded but occasional angular, clear to slight cloudy, quarts, traces orange quarts, well sorted, clean. 25 Sandstone, dolomitic as above.
- 2100-2110 SANDSTONE; white, unconsolidated, coarse grained, in part (20%) very coarse grained, rounded to subrounded with about 20% angular, clear (in part cloudy) quarts, traces orange and yellowish stained quarts grains, well sorted, clean. Traces chert and dolouitic sandstone as above.
- 2110-2120 SAMDSTOME; white, uncensolidated, coarse grained in part (35%) very coarse grained, rounded to subrounded, clear to slightly cloudy quartz, trace yellow stained, grains, well sorted clean. 1% SAMDSTOME; light greyish brown, very fine grained, quarts, mederately silty, well sorted and consolidated, subargular to subrounded, 20% brown clay (?) grains, delemitic tight. Traces sendy wassive pyrits; traces chort grains.
- 2120-2122 SANDSTONE; as above.
- 2122-2129 SAMDSTOND; medium light growish brown, very fine grained, subangular to subrounded quartz, with 20% dark grey grains of argillaceous siltstone? well sorted, slight to moderately silty, dolomitic and in yort cilice coment, well induated, tight slightly pyritic.
- 2129-2140 SAMDSTONN: light grey, unconsolidated, very coarse grained, in part (20%) coarse grained, occasional granules, subrounded, cloudy quartz, well sorted. 35% Sandstone; as above (possibly cavings)
- 2140-2150 SANDSTONE; white, unconsolidated, medium to coarse grained, occasional very coarse grains rounded to subrounded, clear to slightly cloudy quartz, well sorted, clean. 10% Sandstone; greyish brown, dolomitic as above (cavings ?).

- SAMMENDE: this, unerachidated, evenes guained, in part (10%) may achieve grained, prederimently remains to entreprice, show the shightly alondy supply, ware place and related to beinge guains, (geneta), materiately well served. 21.70-21.60 SATECONES; 155 Sundahang as abava.
- 2160-2070 SAUDENCESS Codes, researchildness, control grained, An origin (18%) star occurs gardness cond in poar (5,) ' modern gradnes, star fad to subreaufos, cloar (5, old galant older grades tidl about 13% subour to alteriate while grades tidl about 13% subour to ola fivite van't graate graaten, unfor tole wall soutod olopt. 20% er: Lobete : a clave. Openningel ditte ef tenne engehörne, vest dino te toding grainet, verg sitt bet epuide tenteit.

- 2170-2100 EATTORIAN; Field guer, machinelidetsi, composité weer anothe graduate, adenuicated variates gatine, rowwood We entremodel, elegan entremote, Starly entremote automatic so your set automatic so your set automatic so your set automatic about garding, yourreact quares another one cherris due of them. wedended, will eached shown, very theo grained, in port finate arthres, subergales to subsecuted quarts, with apprenduately 20, desir breaked graves with electron prime, electron descent, references with, delected (1) or percitive attractio consist. franctic in part tight. In see of silly becameler and brown sugilingsone sittetens. Traces of positic containe and of wessive preide.
- 2180-2193 SAMMARY Alext gave, waarmoslideted, very coerse grained in part (SSA) sceres grained, subrounded, croits grants and consideral actor to ereage guarts graine, well corned, clean. 132 ferdetens: Light to modive deriv brown as above, productions firs produced and greding to ciltatone in years, in frank periote, thains.
- 2399-2399 SAMBLEDDA: Medic to Adgit grav, unormodidated, convoc gardnod, to road (70%) test convers gurdnad, predominantly republed to orthornwise, considered organiar grains, clear to chightly stores encode, strictly concern ambor and pink stated guards under, TH-We contatent, light to this barded guards under a first or above.
- 335643355 SIITENERIA FILLE I Light Control Trocescolidates, 80. abure, will die er er er er and, geneter graine and eccasional
  - టింగా సి.మీ.రాజు సి. తిర్దార్ ప్రకర్ణాలు: సిన్నియో గం లేలును సిట్టాడు, దర్**రింగాల.** ప్రస్తులు ప్రదర్శం, లేటుకుంగర్యాని, నాండుందరి రెడ్డార్.
- 2210-2200 SANNONCE: while, where relationed, course to very coarse greater, (16% redams revised) round (in part subrounded to arguines) close to clerit quarts, coursen grey, quartz grains, coordenal peliched quartaite grains, well served, clean. 20% SANDWACED - STLABTONE, Light to Cark brown as above (concur probably adderatic).

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2220-2250 SANDSWORN: white to light cutry, unconsolidated, occare to here course grained, rounded to subrounded quarts, well rested, siens. 10-136 CANONPOUR- SIMETONE as obvio. Traces anacovite, siderific ironsteon, brown silty clay; occasional pyrite.

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- 2230-2240 SADNSTONE: white to light gray, unconsolidated, very coarse grained, in part (205) coarse grained, 5% granules, subranded to subargular, clear to cloudy quarts, common pinkish with yellowish quartz grains, eccasional gray quant grains, moderately well sorted. 15% SANDSTONE; brown, as above, generally pyritic and micaceous. Occasional muscovite, very fine to fine grained, sandstone, pyrite. Traces of brown clay.
- 2240-2250 SANDSTONE; white, unconsolidated, coarse to very coarse grained, rounded to subrounded, milky quarts, common pinkish and auber grains. 35% SANDSTONE; light to medium brown, very fine grained in part fine grained, subangular quarts and about 20% dark lithic {?} grains, moderate to very silty, moderate micaseous. in part pyritic, dolomitic to slightly calcareous cement, indurated, tight. Common muscovite.
- 2250-2260 SANDSTONE; white to light grey, very coarse grained in part coarse grained as above. with 40% Sandstone, brown as above.
- 2260-2270 SANDSTOME; light grey, unconsolidated, medium grained to granule sized; prodominantly course (40%) to very coarse (40%); round to subangular clear to cloudy quartr, fair corting, many of grains with remnants of silty/arglileceous brown comput. 25% SANDSTOME; brown, as above, in part light grey. Occasional pyrite. Traces of chert and mica.
- 2270-2280 SANDSTONE: white, unconsolidated coarse grained, with 25% very coarse grains and 10% medium grained, subrounded, clear to slightly cloudy quarts, moderately well sorted, clean; fairly common amber and rare pink and brown quarts grains, traces of pyrite cement on several grains. 5% Sandstone; brown to grey as above.
- 2280-2290 SANDSTONE: white, unconsolidated, coarse to very coarse grained (predeminantly course grained); rounded to subcounded, clear, quarts, in part cloudy, moderately well sorted, clean, occasional groy, yellow and pink quarts grains. 55 SANDSTONE; brown to grey as above.
- 2290-2300 SANESTONE: white to light grey, unconsolidated, coarse grained, in part (30%) very coarse grained, occasional granules, subrounded cloudy quartz, common amber quartz grains, moderately well sorted, clean. 5-10% SANESTONE; light grey to brown, very fine to fine grained dolomitic as above.
- 2300-2310 SANDSTONE; white to light grey as above. 20% SANDSTONE; dolomitic as above.
- 2310-2320 SANDSTOME; white, unconsolidated, coarse to predominantly very coarse grained, 5% granules, rounded to subrounded quartz, clear to slightly milky grains,

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moderately sorted, 25% SANDSTONE; brownish grey as above.

- 2320-2330 SANDSTONE; white to light gray, unconsolidated, coarse grained to very coarse grained, 5-10% granules subround, quarts with ware chort and quartzite grains and eccesional pinkish and yollowish quartz grains. 30% SANDSTONE; gray to brown very fine grained, as above. Traces Sandstone; medium grained subangular quartz, very peerly comented, excellent intergranular peresity. Traces of pyrite.
- 2330-2340 SAMDSTOME: Light grey, unconsolidated, very coarse grained (20% granules and 10% coarse grained, rounded to subrounded quarts, accasional yellow and pinkish quarts, traces short. 15-20% Sandstone, medium grey, very fine grained as above. Occasional syrife.
- 23'0-2350 Unreliable sample SANDSTONE: white to light gray, very fine grained to very coarse grained, subargular to subrounded quartz, graine prodeminantly clear, peorly sorted. 10% SANDSTONE; as above.
- 2350-2360 Questional sample SANDSTONE; white, unconsolidated, coarse grained, in come parts modium and very coarse grained, subrounded to subangular quartz, occasional groy quartz grains, traces orange stained grains, moderately well sorted. 2% SANDSTONE; medium grey to brown as above.
- 2360-2370 Not much sample predominantly lost circulation material over the shaker. SAMESTONE, white, unconsolidated, wedium to coarse grained as above.
- 2370-2380 Poor Sample SAMESTONE: white to light grey, unconsolidated, medium to very course grained, (predominantly coarse grained) with 5% very coarse grained and 15% medium grained, subrounded to subangular, clear quartz, common medium dark grey quarts grains, traces quartzite. Traces mica, pyrite and carbonacceus clay.
- 2380-2390 SANDSTUNE; white to light grey, unconsolidated, medium to very coarse grained, as above, but 40% medium 55% coarse and 5% very coarse.
- 2390-2400 SANESTONE: white unconsolidated, coarse grained with 20% medium grains, and 5% coarse grains, rounded to subrounded, clear to cloudy quarts, well sorted clean
- 2400-2410 No sample.
- 2410-2420 100% SANDSTOND; Light grey unconsolidated coarse to very coarse grained with 10% granules, rounded to subangular occasional Angular clear to cloudy quartz grains with traces carbonaceous matter, wica Traces dolomite sandstone.
- 2420-2430 100% SANDSTONE; light grey unconsolidated fine to medium grained with 20% coarse to bery coarse grains, subrounded subangular occasional rounded clear to cloudy, traces pink quartz greins, traces mica, traces pyrite cemented sandstone, traces grey chert.

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2030-2000 100% SAMATCHE as above with trace groy quastr.

TATE TO COPE 2442 DIT UNOUR GAUGE

2440..2442 100% SAMETCHE unconsolidated light grey, very fine to fine grained with 1% medium to very course grains, subrounded to subengular clear to slightly should quarts grains, traces mice, grey quarts, Consil frequents.

Trucon delerate conditions, very fine to fine contined have, arguitheorus.

Reanos holo

2542-2530 100% SAMDFOND reconcolidated Light groy, modium to very corres grained with 3% grownles, subrounded to subregular and angular cloudy, freshed quarts graine. Commen pyrite evented soudstane and traces stlive coursed modium to very course grained querts conditions, slightly argillaceous tight. Traces when.

The silicoous conditors way be the band bands around 2000.

2450-2454 100% SANDSTONE as above coarse to very coarse grained, with traces chert, mice. Traces silicous sandstone, pyritic conditions dolorite conditione and traces dark brown sideritic (?) conditions (with 50% quarts grains coarse to very coarse grained).

TREP TO COSE

REALED APPROXIMATELY 400 2% HOLE

2454-2477 CORE Me.3 Diamotor 34" Cut 225' Rec. 12' See Core Descriptions. CORE No.3 24 54 - 76

Rec 11'

Time to Ont 225! - 21 mino

= 55 ft/hr 54-60 = 60 ft/hr 60-70 = 80 ft/hr 70-76

Macro Description

TOP 916" Clay black to dark breun, carbonoccous finely missecous, firm to medorately hard, finely lominated with silty, sendy lominations or with colour laminutions. Commen lenses very fine grained condetono - 4 cm - 1 cm thick, undulatory lonses, cousen condetone filled erosional sceure, occasional a bedding in sandatone lonses with crosional truncations of these by the sandstone or clay. Common Longer and Laminations of very fine grained pyritic sendetene with occasional pyritic modules and ? delemitic sandstone modules. Baro lonses medium to convergrained candotono. Clay beds up to 2 cms thick. Occasional fractures 60° dip. Core dips 0 5° gen. 0-3° Nottom 1'6" Sandetone groon groy fine to very fine grained with occasional coarso to granulo grains, micacoous occasional finoly laminated with argillaceous rich laminations, and coonsignally with bods to I on of blueish grey eley and dark gray to black carbonaccous clay.

## Micre Description

Top 9'6" Clay black to dark brown, commonly cilty, finely micacoous with occasional mica flakes to 8 mus, occasional plant fragmonts. Generally the clay is black and the silty clay is dark brown. The clay has common lenses and intorbods of vory fine to fine grained argillaceous sondstenes, groy groe, tight with occasional porosity and the caudatone shows wiero graded bedding. There are common condutons filled micro crestonal scours. There are occasical beds of clay which are more indurated and may be elightly pyritic. There are comen this laineticus of fine to very fino grained pyritic soudstones in the cloy. The sandstene laminations and lenses are often alightly michcoens and are generally tight, though seme instantions have trace paresity. Differential ecupaction in placon recults in undulatory bodding. Botten 1'6" Sandatone Light Green groy, very fine grained well corted with occasional fine to coarco graines; friable, composed of clear to slightly cloudy subengular to subrounded quartz grains with coccesional coal fragments, and tracos mica (white) and dark green lithic grains) in an argillacoous matriz. There are consen interbods and laminations of clay black to dark brown as above finely micacoous. The soudetone often has thin laminations of pyritic counted scudstone.

Bodding

at 3 to 7 degrees

and the set of 
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Samples lagged from 2477 enverds Lag time at 2500' approximately 25 mins

Poor Samples 2477-2560

2477-2490 100% SANDSTONE coarse to very coarse grained with 10% granules, unconsolidated light grey subangular to subrounded and occasional angular clear to slightly cloudy querts grains traces chart when coal fragments, purite commited conditions.

France delegate condetene fine to very fine grained, angiliconous hard, tight.

- 2490-2500 95% forwirtene as above convects vory coarse grained with 10% (normales 3% soudations white hard fine to wedium and coordinal coarse grained, fairly well corted followitic condition with 30% matrix, very elightly argillaccous tight.
- 2500-2510 90% SAMCOTONE as above convecto very coarse grained with 5% grownles and 5% modium grains.

105 SAMDETONE white fine to medium and occasional coerse grained, dolomitic matrix, tight hard.

- 2310-2520 90% CANESTOME, as above scarce to very conrect gandhed etc. 10% SANDSTONE white hard delevitie as above.
- 2520+2530 93% IANDETONE, light groy unconcolidated coarse terrory coarse grained with 10% guamales; well certed, chear to slightly cloudy subrounded to subersular quarks grains with short, proces pink and guay quarks, enthencocour wather, when. 10% SAME COME delesitie gray orgilizations very fine to fine grained.

HD Buch very fine to fine cill close gierts with star from Corrador comple.

- 2530-2540 90% CANE FOUR, light geor unconsolidated correto very connect grained, as cheve. 10% CANTERONS, delemitic white and opposional group. Proceed pyrite fine to medium grained condetens.
- 2540-2550 505 SAMPETORE Light grey underselidated coarse to very eccase grained coersional reduce grains as theve. 505 SAMPETORE, white, hard, very films to fine grained, with from 105 to 305 saturiz, delemitic clightly argillances, and traces carbonaccous anther, synite and shert. Tight to near perosity.
- 2450-2460 Foer carple 20% SANDETCHB; as above Prodeminantly SANDETCHB, white to buff, fine grained. in part very fine grained, angular to submapter quarts, with 2% dark groy consideral

red lithic grains, well corted, occasional muscovite flakes to 0.2 mm, traces pyrite, grains, in part with film of red clay adhering to grains; in part with poor to fair intergranular perosity.

CORE No.4 (Viroline) 2560-2572 CUP 12' Recovered 4'

2560-2564 Core concists predominantly of CLAX, unditus dark brown, nederally michecous, mederately carbonaceous to very carbonaceous, ailty. The clay has certain flocks of coal and scattered very fine to fine and grains. Secur structure infilled with white, veryfine to fine grained quartz sendctone occurs at several horizons.

> The core includes numerous leminations (generally 0.3 to 0.5 nm thick) of very firs grained endetene and elitatone. Several this leminations of pyrite occur is association with this interbods of candetone, light grey very fine grained quartz and 5% dark grains, pyritic, cilty, moderately carboneceus, well inducated, tight.

The clay is deminsuily moderately firm and has a moderately well developed finelity as a result of planar concentration of carbonaccous flocks.

The alexantructure of the core is obscured by a coating of clay.

Dip of the bodding is poorly defined but is in the order of 3 to 5 degrees.

2564-2572 No recovery.

CORD NO.5 Int: 2572'-2580' Recovered 3'

2572-2575 CLAY; modium brown, moderately micaceous and silty, very carbonaceous, plastic to moderately firm. The core includes approximately 30% Lawinations of light grey, very fine grained (in part fine grained) quartz sandstone which is slightly silty and moderately to very carbonaceous

> Figure fragments and large carbonaceous fragments are present on coveral bodding planes. Carbonaceous flecks in both the candstone laminations and in the clay are orientated parallel to the bodding and impart a moderate flecility to the clay.

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The dip of the bedding isnuot well defined but is in the order of 3 to 5 degrees.

2575-2580 No recovery.

CORE No.6 Int: 2580-25821 | Recovered 1'2" 2580-2581'2"CLAY: chocolate brown, modorately well inducated, very micaceous, very carbonaceous (carbonaceous flocks oriented parallel to bedding planee) moderate to very cilty and grades in part to very argillaceous Sillstene

> The core includes about 20% laminae and lenses of candetone; light groy, vory fine grained (occasional fine graine), quartzose, silty, very carbonaccous and micaceous, tight.

Dip of bodding is poorly defined but is in the order of 2 to 5 degrees.

## 2581'2"-2582'6"

No recovery.

2382<sup>1</sup> -2590 Very Poor cample approximitely 10% - 20% 60% conditions, light groy, unconsolidated, coarse to vory coarse with occasional granules. Subrounded to subangular, occasionally rounded clear to slight cloudy, quarts grains with traces grey chort, clear micacoous and carbonaceous matter and traces pyrite comented sandstone.

> 40% SANDSTONE, white bard, fine to medium grained occasionally with some coarse grains, delowite metrix slight argillaceous, tight.

2530-2600 Vory Peer Sample appreximately 10% 90% SANDSTONE Light gray unconsolidated coarse to very coarse grained, subangular to rounded occasionally angular, as above. 10% SANDSTONE, delowitic as above, tight. Traces siltstone firm, grey borwn, with carby streaks, occasional very fine to fine quartz grains, common very fine withcases bodding.

2600-2610 Poor Sample 20%

96% SANDETONE as above light groyyunconsolidated coarse to very coarse grained, subangular to subrounded clear to clightly cloudy quarts with traces short grey and rod, traces pyrite commented conditions, traces mice.

10% SAMUSTONE white dolemite fine to modium grained, slightly argillaceous with occasional traces peresity. Traces siltstens as above very slightly calcareous.

2610-2620 Very Peer Sample 10-20% Traces siltstons grey brown as above carby calcarceus miceccous Traces silstone, black miceosous, carby, firm to soft 70% sandstone, coarse to very coarse grained with 5% granules, as above, 30% sandstone delemitic very fine to coarse grained, fair to good corting in individual cuttings, hard, coessional traces perosity. 2620-2630 Very Very peer sample 60% sandstone light grey unconsolidated coarse to very coarse grained with occasional medium grains or granules. Composed of clear slightly cloudy rounded to subangular quartz, traces chert, carbonaceous matter and pyrite commented mandstone 20% sandstone delomitic slight argillaceous as above, traces siltetone light grey brown as above.

2630-2640 Poor sample 10-20% 50% candstone light grey uncensolidated coarse to vory coarse grained with occasional medium and granules graine, rounded to subangular cloar to slightly cloudy quarts grains well serted, with traces chart grey, pyrite comented fine to medium grained candstono. 30% candatone light groy, hard, silty to medium grained, generally very well sorted individual cuttings, coursed of quarts grains with up to 40% generally 20%, delemitic slightly argillecoous watrix. Fight with occasional traces percenty, eccesional black light grains. Traces ciltatene light brown grey, firm, alcaceous carby, traces bedding in part very finely sendy, in part cleyoy, grading to a silty clay (or shale).

- 2640-2650 40% conditione light grey unconsolidated as above 60% sandstone white to light brown, hard, silty to fine grained, occasional wodium grained composed of quarts grains with 20-40% slightly argillaceous dolomitic watrix, and traces black lithic fragments. Tight with occasional traces perceity. Generally well sorted, occasionally fair corting. Common siltstone as above clayey to very clayey.
- 2650-2670 Very poer sample approximately 10% 50% sandatone light gray unconsolidated as above. 50% sandatone light white to light brown, hard, delocitic, generally slightly argillaceous in part clean. Tight with occasional traces perceity. In part very argillaceous. 10% siltatone in part very clayey and grades to a silty clay (or shale), in part slightly eandy generally brown, firm to hard, micaceous alightly earby, traces bedding.
- 2660-2663 Very poor sample 10-20% 60% sandstone, light groy unconsolidated, very secres to coarse grained as above. 30% sandstone, light grey unconsolidated very fine to fine grained quarts graine uell serted. 10% sondstone, white to light brown, dolowitic, tight, eccasional traces percenty as above. Traces siltatone as above.

CORE No.7 2663-2673 cut 10' Roc 91'

9'6" SHALE; medium brown, moderate to very micacoous, abundant carbonaceous specks, prodominantly moderate to very silty, generally firm but in part slightly plostic. The core includes zenos with commen whell pyrite concretions 0'6" NO recovery

CORE NO.8 2679-2681 Cut 8 Rec. 63'

616"

SHALE; medium brown, moderate to very silty, very micheeous, very carbonaceous (carbonaceous flocks oriented parallel to fissility), mederately well indurated but becomes plastic when not, peerly developed fiscility. The core includes less than 5% laminations (generally less then 1 cm in thickness) of white, very fine to fine grained, silty, earbonaceous in part pyritic conditions and of siltstone. Here small stringers of pyrite and of fine grained conditions in a pyritic matrix are present. Dip of bedding is well defined at 22°.

1.6" NO recovery, Core less probably distributed along length of core.

2681-2690 SANDSTONE; white, unconsolidated, coarse to very coarse grained, occasional medium grains angular to rounded quartz. (CAVINGS) 2% Concretionary pyrite. 5% SANDSTONE: white, very fine grained angular quartz and occasional dark grains, well consolidated micacoous, silty tight. 1% siltetone white to light grey, micaceous very fine sandy slight carbonaceous, Occasional ceal and traces medium daks brown siltstone the pyrite, siltetone and consolidated sandstone probably present as laminations in CLAY and/or SHALE.

2690-2700 1. From hip to year of shakor:- (unconsolidated recidue) ELAY : checolate brown, slightly micaseous, very silty with abundant intercrystalline sand grains which are poorly serted and probably represent cavings.

> 2. From cample platform - (only dightly washed) SAUSTONE unconsolidated medium to coerse quarz grains with abundant 40% vory fine graine.

2700-2711 1. Unconsolidated residue sampled at rear of chale shaker.
60% silt: light brown, unconsolidated
40% sand: unconsolidated very fine to medium quarte grains, occasional coarse grain.
2. From sample platform (only slightly vashed)

2. From sample platform (only sightly vashed) Sandstone unconsolidated, fine grained to granule sized with abundant 35% grains of silt size to very fine grained size.

- CORE NO.9 2711-2715 Cut 4' Rec 3'
- 0'9" SILTSTONE modium brown, moderately micaceous, very carbonaceous, very argillaceous, indurated

----- grades to

2'3" SHALE: medium brewn, wederate to very silty, micacoous and carbonacoous (carbonacoous flocks oriented parallel to poorly developed fissility). The core includes occasional blobs and stringers of pyrite and includes less than 5% laminations of light grey carbonacoous siltstone.

1'0" No recovery

The bedding dips at 22°

1. From lip at rear of shakor 2715-2720 40% sand unconsolidated, medium to very come grained. 40% silt brown, slightly micaccous vory finoly sendy. 20% clay, brown, slightly slight micaceous 2. From sample platform 100% andstone light grey, unconsolidated medium to vory coarse grained rounded to subangular quartz with traces chert. Traces siltstone brown groy, slight micaceous, very argillaccous 1. From lip bohind shaker 2720-2730 Mainly brown silt, unconsolidated Approximately 20% sandstone unconsolidated medium to very coarse grained Traces sandstone very fine to fine and silty dark grey very poorly consolidated, argillaceous matrix, ? light. 2. Normal sample to poor cample 95% candstone modium to very coarse grained as above. 5% siltatone, light broy brown, firm argillaceous slightly sandy, finaly micaceous with common carbon streaks. 2730-2740 1. From Lip behind shakar Silt brown very argillaceous slightly micacoous, ? clightly carbonaceous.

2. Normal cample (very poor sample) 95% candstone medium to very coarse grained as above with traces chort, pyritic comented candstone. 5% siltations as above, very argillaceous.

2740-2750
1. Frem lip behind shaker Silt, brown, vory argillaceous grading to silty clay, as above.
2. Normal sample (very very poor sample)
80% sandstone unconsolidated, medium to very coarse grained as above.
10% sandstone, white firm, fine to medium grained, well sorted quartz with occasional

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black Lithic specks in a slightly argillaceous slightly dolowite matrix. Tight with cocasional traces perceity. 2750-2760 Very very peer cample 70% conditione unconcolidated light grey modium to very charge grained as above. 30% ciltatone light brown, fine, generally argillecous in part very finely candy (grading to a very time grained candatono, clean) finely wisseccus, carbonacceus abreaks and 6206284. 2760-2770 Very reer semple. 50% condutore unocaselisated as above. 50% STIFETONE as above, gray brown farm argillacooup scienceens, clightly carby, in part grading to very fine condctone. 2770-2780 Yery poor cemple ACA sendots no light groy unconsolidated medium to very coarse grained as shore. 60% ciltatene brown to gray brown, firm, argitlecoone, in part grading to eilty chale, in part clightly coust grading to vary fine grained cilty and argillacous sendstono. slightly michocoous, ourbonaccous strocks and oposies. Traces fine to very fine grained slightly pyzitic argillocoous candetone. Traces pyritic cenented fine to modium grained sandatone. 30% conditions light grey unconsolidated as above. 2700-2790 very peer sample 60% ciltatone as above, generally very arguaceens, grading mainly to a silty abalo. 10% cardotone white firm, very fine to fine grained quarte alightly argillaceous, with black and green lithic specie, clightly micaneous tight, work corted. 2790-2800 10% andatene light grey unconsolidated as above. very poor cample 70% ollistane, as above, very avgillaceone grades to a silty chale. 20% seadstone very Sine grained, white to light broundsh white, slightly argillacoous uilty grading to a stiltatone, skyhtly micacoous, senses block ? expensesous lithic opecks.

- 2809-2810 20% cantebone light grey, wedius to coarse grained weencedidated as above. 60% ciliatum as above. 20% conterms white to light brewnich white, very fine grained with cocasional fine grains composed of guarts grains with occasional black lithic specks and traces wice, silty to very silty, slightly argillaccore, tight with ? argillaccous matrix, slightly carby.
- 2810-2820 20% candetone light grey unconsolidated, modium to coarse grained clear quartz rounded to subrounded with traces pyritic cemented sandstone and grey chort.

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70% siltatone as above mostly very argilinecous to almost a silty shale. 16% candatone white, very fine grained siky tight as above.

2820-2830

20 20% conditions light groy unconcolidated medium to connect grained occasionally very coarse grains clear to slight cloudy quarts grains with traces pyrite concreted conditions. 40% cillatons groy breve to breve groy, firm argillacene in part clightly candy, slightly micacceus, carby strocks and specks. 40% conditions light gray to occasional brownich, first very fine to fine grained silty, composed of quarts grained with block lithte specks (5-10%) in a 7 silty and argillaceous very slightly estenceus matrix. Tight.

- 2830-2640 10% conditions light groy unconsolidated as above 50% siltetone as above in part very argillaceous 40% conditions light groy to brownish groy firm very fine grained eilty slightly argillaceous, as above. Tight with escational traces perceity. Bridence of lawinations of sillatone and very fine grained conditions.
- 2840-2850 10% sondatone light grey uncompolidated medium to very cease grained with 20% granules as above 40% siltstone as above very argillaceous (a silty shale in part). 50% sendetone as above very fine to fine grained silty, occasional fine grained. Common pyrite cemented fine to very fine grained candstone with 60% pyrite 40% quartz.
- 2850-2860 10% andctons light grey unconsolidated modium to very comes greined as above. 40% siltetone as above very argilicecous. 50% candetone as above traces perseity. Evidence in cuttings of interlining of silt and populations.
- 2860-2870 10% sandstone high goes unconcelidated as above. 36% siltaend an above very argillacoous. 66% sandstone light gray to slightly brownich gray, very five to fine grained, silty occasional very fine or fine grained, well corted, composed of every time or fine grained, well corted, composed of every time or fine grained, well corted, composed of every time or fine grained, well corted, composed of every size black little grains (? cosl) torget chips abreaks. Traces perceity but generally tight.

10% SANDETONE unconsolidated light groy, modium 2870-2880 to vory coargo grained, composed of clear to cloudy and clightly milky quarks, roundod to subrounded with traces chort. 60% SILTSTONE gray brown to brown groy firm argillacoous to vory argillaceous , in part slightly sandy, slightly micaceous common carbonacoous strocks and speeks. 30% SANDSTONE light grey to brown, firm, very fine to fine grained, silty becoming more argillacoous, composed of quartz grains with traces earbonacoous material and black specks, traces mica. Tight with occasional traces porosity. Traces pyrite, traces pyrite comented fine grained sandstone.

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- 2080-2890 10% SANDSNOWE unconsolidated as above. 50% SIL/ISTONE as above. 40% SANDSNOWE as above generally tight with occasional traces percepty, silty and argillaceous entric.
- 2890-2900 10% SAMDSTONE as above 50% STRASTONE as above very argillacoous, firm earby and micheoous. 30% SAMDSTONE as above but more argillacoous. Tight with occosional traces perceity.
- 2900-2910 10% SANDSTONE light groy unconsolidated as above 60% STLASTONE as above very orgillaceous, in part alightly orgilloceous. 30% SANDSTONE os above tight, greding to a siltutone, clean.
- 2910-2920 10% SANDSPONE light gray unconsolidated as above. 30% SILTSTONE % very argulaceous, brown grey, carby

50% hight grey, slightly sandy slightly argillaceous, generally clean, traces carbonaceous watter and wica.

10% SANDSTONE as above very fine grained cilty, tight.

- 2920-2930 NO SAMPLE
- 2930-2940 10% SANDSTONE unconsolidated medium to very coarse grained as above. Traces formil-forminifera 70% SHLTSTONE, half of sample argillacoous, half slightly sandy as above. 20% SANDSTONE as above.
- 2940-2950 30% SANDSTONE light grey unconsolidate medium to coarse grained rounded to subrounded clear to slightly cleudy quartz grains.
  50% SILTSTONE, 30% brown to grey brown very argillaceous slightly carby, slightly micaceous.
  70% light grey to slightly brownish grey, very finely sandy, slightly micaceous. Grades to a very fine sandetone.
  New 20% SANDSTONE white hard, very fine to fine grained with 30% dolomitic matrix tight.

Traces sendetone vory fine to fine grained cilty as above.

2950-2960 50% SANDETONE light grey unconsolidated fine to very coarse grained predeminantly fine to medium grained rounded to subrounded clear to slightly cloudy quartz grains. 40% SILTETONE as above brown and lith grey varieties as above. 1.0% SANDETONE, delowite as above.

2960-2970 Traces foraminifera 50% SANDSTONE, light grey unconsolidated fine to cearse grained, predominantly fine to medium grained with pyrite cemented sandstone. 40% SILTSTONE as above light grey quartzitic clean in part slightly argillaceous and brown very argillaceous slight carby. 10% SANDSTONE dolomite very fine to medium grained

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occasional coarse grained tight.

2970-2980	30% SANDETOME light grey unconsolidated as above.
	60% SILASTONE generally the grey clean variety with
	30% brown very argillacoous variety.
	10% Dolonitic candstono as above.
	Traces pyrite comonted sandstons.

2980-2990

55% SANDSTONE: light grey unconsolidated, vory fine grained to groule sized, predominantly modium to coarce grained, outangular-subrounded quarts, yearly corted.

15% SIMASTONE: light grey, slightly argillaceous slight to moderately wicesous with earbonaceous, slightly pysitic fuicble.

35 PYRETE possivo, in part order, in part with chundant oilt. Abundant very fine grained, quartz conditione with approximately 50-60% pyrite matrix and with traces of intergranular perces. Fairly common tight very fine grained conditions completely commented with pyrite, occordinal buff to light brown sideritic ironstene.

2990--3000

20% SANDSTONE light groy unconsolidated as abeve. 30% SILESTONE light groy to yale brown moderately to very friable, slightly microcous, eccasional slightly carbonaceous, slightly argillaceous, in part pyritic (dissournated). 40% SHALE; medium brown to medium light brown, moderately microcous, slightly to moderately carbonaceous, moderate to very silty, chunky. Fairly common pyrite; sideritic brown, dense sloy irenstone.

3000--3010

30% SAMESTONE: light grey, unconcolidated vory fire grained to granule cise, predominantly coarse to very course grained, subengular to subrounded quartz. SILASTONE: white to light grey, friable, moderate to very microsomo, slightly carbonaceous with argillaceous, in slight pyrite very fine to sandy. 10% SUALE or CLAY; asabeve. Occasional candetone; white consolidated fine to medium grained angular quartz, abundant (25%) pyrite comented fair perceky.

7% GLANSTONN; buff brittle, deloudtle or sideritie (?) slightly pyritic and carbonaccous. Common magnity pyrite.

3010-3020 25% SANDETONE; uncensolidated as above. 55% SILASTONE; white to light groy as above. 20% CLAY to SHALE as above. Occasional buff to undiwm light brown claystone as above. Occasional sandstone, light groy vory fine to fine grained, guartz silty, compact, dolomitic coment, tight. Common pyrite fragments, traces lignite.

3020-3030 20% SANDSTONE light grey unconsolidated, as above. 65% STLASTONE white in part pale brown, friable, kaolinitic matrix, slightly carbonaceous, micaceous in part moderately to very pyritic, in part very fine sandy and in slight part grades to very fine grained sendstone, traces of green grains (chamusite?) 10% CLAY medium light brown, moderate micromic

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carbonaceous, moderate to very cilty. 2% SANDSTONE white to light grey, fine grained common very fine grains, subangular quartz, delowitic coment, tight. 3% CLAY IRONSTONE modium light brown, sideritic (?) in part very argillaceous; grades to brittle sideritic (?) claystone. Common massive pyrite, occasional light grey, pyritic, very fine to fine graned canditone with fair intergranular peresity.

3030-3040 50% CLAY to SHALE light to medium brown, micaceous carbonaceous, moderate to very silty grades to very argillaceous siltetone. 40% STLTSTONE white, as shove, in part grades to very fine guelmed sandstone. 10% SANDSTONE; white, unconsolidated as above. Common massive pyrite, clay ironstone - occasional delogitic very fine to fine grainded candstone.

CORE No.10 3040-3060 Cut 20' Rec. 3'3"

415"

SANDSTONE dark grey to yellowish brewn, very poorly sorted; very fine grained to granule sized, angular to rounded grains, of quartz, with abundant coliths of light yellowish brewn limonite (?) - traces of chort, quartzite - other lithic grains. The quartz grains are generally iron stained or coated. Hany of the limonite coliths are surrounded by and/or partially replaced by an indeterminate coft, white mineral which is also present as discrete grains. Many of the limonite coliths have 6 core consisting of a quartz grain; limonite also occurs as irregular grains or patches. The quartz grains and limite coliths are set in

an abundant matrix (30-40%) which is variably yellowish brown, limonitic dark brownish grey, limonitic/carbonoccouc, er in places black, bituminous.

Intraformational conglowerate, comprising fragmonts of less than 1-inch in diameter is developed in several sense within the core.

---- gradetional contact -----

1'0" SAMDETONE very dark gray, very poorly sorted, similar to the sandatons described above but includes shundant granules and an occasional pabble. The majority of the grains are ironstained and sees grains are iron-coated. Pellets and/or obliths of likewite are abundant but the indeterminate white elmeral, present in the overlying unit is abcent. The matrix consists of dark yellowish grey forruginous clay.

annungeneese gradational contact measures

2:10" OOLITE; medium dark grey, fine to medium grained in part coarce grained, dark brown limenite colithe and/or pellets and a much smaller proportion of poorly sorted (very fine to very coarse grained) iron-stained quartz set in an abundant (35%) yellowish brown earthy textured, limenitic clay matrix.

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The colite is reverted and comprised well inducated, elengate (generally less than 1 inch in length) frequents set in c softer linewitic and argithereous watchs.

11:9" NO REPOVERY

The care includes several preilised sense. No hydrocarbon above recented. As the core is unacive the dip of the bedding in unknown.

3060-3070 SAUKTONN; white uncensolidated, coarse to very accrue grained, coessional granules, subergular querte, in yest ison-stained, poorly sorted. Geosslevel grains are consolidated and are in abundant medium brown wilty clay coment and are then the solidate. Fairly cosmon pyrite grains 15% SIMPFONE dark gray to brown, very argillaceous, in part carbonacecus, similar to matrix in core. Saudstone way not be percus in subsurface but drilled extractly quickly.

3070-3080 SANDETONE; white uncenselidated predominantly very course to granules sized, with 10-20% finer grains engular to subangular quartz, not iron-stained, recely corted, pyrite adhering to grains. 15% SANDETONE brownich grey, fine to coarse, ongular grains of quertz in on abundant (45%) matrix of silty slay - in part of argillaceous siderite (?).

3080-3090 SANDETONE: white unconsolidated, poorly sorted but prodominantly very coarse to coarse grained. 5% SANDETONE: brownich grey as above. Occasional siderite, occasional carboneccous clay.

3090-3100 SANDSTOFF: light grey, uncensolidated, poorly seried but predominantly coarse to very cearse grained, angular to subrounded, cloudy quartz, cornen vollowish quartz grains - eccasional medium grey querts grains, rare chart grains. 10% STDERFED; dark brewnish grey to medium grey, dense cryptecrystalline-microcrystalline appear, often very sandy (peerly seried quartz to very cearse grained size - occasional limenite celite) grades to sideritie candotone - sideritie claystene.

- 3100-3110 SAMECTONE: white, unconsolidated, peorly seried predominently connects vor coarse but 20% groundes - 10% Since sided grains, subangularto subremuled cloudy quarte, fairly common medium grow quarks grains, trace iron-stained, grains cormonly grains have traces of pyrite adhering; occasional chort - other lithic grains. 10% SIDERTHE - conditions with argillaceous matrix as in core 19. Occasional massive pyrite.
- 3110-3120 SAMDSTONE: white to light groy, unconsolidated very peerly certed, prodominantly very coarse to granule sized, prodominantly subangular quartz grains with abundant modium groy quartz grains with occceional chort grains. 5% SAMDETONE consolidated as above.

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3120-3130

SAMDSTONE; light groy, unconsolidated predominantly coarse grained angular to subangular quartz with approximately 30% light to medium grey quartz grains, abundant pyrite (in part crystalline tetrahedrums); SAMDSTONE probably percess and with pyritic covent

D S T No.1 3042-3130 Rec 370' mud - 2530' fresh water.

3130-3140

SANDSTONE: white, uncenselidated, coarse to very coarse grained, occasional medium to very coarse grains, angular to subangular, clear to slightly cloudy guests with 30% modium light to modium dark grey cloudy quests grain, pyrite coment including many well developed tetrahedruns adhering to many very fine grains, moderately well sorted, probably with excellent intergranular peresity. 1% SANDSTONE with abundant argillecoous/ferruginous matrix as in Core 10 (covings)

3140-3150 SANDSTONE; light grey, unconsolidated, coarse to very coarse grained, as above. with 30% medium light to wedium dark grey subrounded quartzite quartz graine, reve short grains, with abundant pyrite coment including common crystalline moderately well corted, excellent ingergranular percently.

- 3150-3160 SANDETONE; white, unconsolidated, predominantly coarse to very coarse grained angular to subangular vitreous to slightly cloudy quartz with 15% grey quartz - quartzite grains, with occasional round chert with other siliceous rock grains, wederately ucll sorted, probably with good intergranular peresity; very abundant pyrite coment adhering te grains.
- 31.60-31.70 SANDSTOND; white unconsolidated, prodominantly very coarse grained but ranges from medium grained to granule size, angular to subangular quarts, with 25% groonish grey with grey quarts grains, quartaite grains, with occasional chort litble grains.
- 31.70-3180 SANDSTONE; white to light groy unconsolidated, fine grained to granule size, prodominantly coarse to very course, angular to subrounded, milky quartz with 30% modum to dark groy quartz, quartzite when and other lithic graine, abundant synite coment, poerly sorted; occasionally well comented concellented obly with very poor perosity overall perosity probably very good.
- 3180-3190 CANDETONE; as above light grey with 35% dark grains as above (i.e. lithic) in part(5% ) consolidated.
- 3190-3200 SAMDSTONE: white, unconsolidated fine to very coarse grained prodominantly coarse grained angular vitroous quartz, abundant pyrite cement, moderately perted, only about 3% grey quartz grains, 3% of sample consolidated with peresity moderate.

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- 3200-3210 SANDSYCME; white, unconsolidated modium grained to very course grained with 5% granules, prodeminantly coarse to very coarse grained, angular quarts, traces gray chort, quartsite siderite graine, abundant pyritic commuincluding tetrahedrup, moderately serted clean opproximately 3% cencelifated.
- 9210-9220 SAMASYON: white to light gray, unconcolldated modium granule shoed grains, quaderdarbly vary coarso grained submights to angular slightly cloudy quarter with 10% redden to medium fash gray quarter costate ally round chart que this grains, alumbat qualter scoret. These provise wood frequent. Casesianal brown estevaceus siltetens.
- 9220-9230 SAMESONED: White, unconsolidated peorly seried, productionally vary coases grained, 10% grazules 5-10% fark groy guarts, guartaite, coonsiend chert grains, provide coront as above.
- 3230-3250 SLEDICOND; white, unconcoldented, course grained with 25% vory correction, suburgular clear quarts, moderately well sorted, 5% grey quarts grains, traces quartaite grains, abundant pyrite.
- 3240-3250 SAMUSTONU; which, uncousofillated very poorly certed, prodeminently searce grained, 25% very essage grained, 15% granules, contered rounded yebbles, enguter to subsequine, withreas quarts econotional gray quarts grains, rare quartate grains, abundant pysitic essent (erystalling) protectly with excellent percetty. 5% SAMUSTONE; consolidated (poor percetty but consolidation is probably result of increased ewent of coust) Traces Ligenitic conductors as in Core 10.
- 3250-3260 SAMESTONE: white to light grow as above but generally converse with 205 genuides - 25% very ecares grains, very abundant pyrite; scattered pettics. Occasional SAMESTONE - SILASTONE giudian to that in Core 10.
- 3260-3270 SAMDETONE: white to light grow unconcolidated, conress grained, 20% very conress grains, angular to subargular vitueous quests, with 2% groy, quests - questoite grains, abundant pyritic SAMDETONE pyrite, concept adverting to grains, eleen, sodorately woll corted.
- 3270-3230 SAMESTONE: white, unconsolidated, convec grained 20% very correct grains, % granules, angular to subangular quarts, traces quartiste grains, clean, nederately conted. % SAMESTONE white to light grow, concolidated fine to wedden grained subangular quarts; well comented with crystalline praite, - traces keelin, poor w fair intergranular percenty. Very observed praite essent with fragments with comment praite exceptals.
- 3230-3290 SANDONDI; white to light ever very poorly sorted, modium grained to public preferimently access to very correction ougsilar to subargular, guarts,

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very abundant pyrite. 60% SANDSTONE: white to light groy, as above, in part with a silty carbonaccous clar matrix. Geomsional chort and quartuite.

3290--3300

SANDETONE: light grov, unconsolidated, very coerce (60%) to granules size, angular to sub-angular quarts, with some groy quarts - lithic grains, prvitic comont.
15% SANDETONE: light grey medium grained, angular quarts; well computed with abundant (35%) pyrite, industed tight.
5% SINESTONE: buff, mederately micaccous, slight to mediate carboneceus, in part moderate to very argillacceus.
1% SANDETONE: dark brown, poorly corted angular to subargular guarts grains in a very abundant ciderate matter is carboneceus.

- 9300-3310 SAMETONE: Light grey to white, unconcolidated, eccase grained 20% very eccase grained to granule sized, argular, vitroeus quarts, traces lithic graine, clean, soderately well corted; pyritic coment. 5% SAMESTONE; light grey as abevo.
- 3310-3320 SAMDETOME: Light groy, uncenselideted, coarse grained, 30% very correc grained, eccesionally granule, angular to subangular quartz, abundant pyrite eccent.
- 3320-3330
  SAMDSTONE: Might gray to white, uncercolidated, upding grained to granic piece, prodominantly course to very prares grained engular to subengular wilky quarts, traces quartaite grains, ubundant preits.
  5-16% SAMDSTONE: light gray consolidated compand with 35% pyrite coment. Traces quartaite, chart, siltatene, siderite.
- 3330-3340 SANDSTONE: white, unconsolidated, coarse grained, in part (30%) very course grained, angular vitreous to slightly cloudy quarts, tare rose quartz, tare pink - vellow stained quarts. 5% SANDSTONE; gray, consolidated pyritic as above. Theore coul, gray chart, quartaite. Cossectural white clean SINCETONE; occasional corbonaceous SINESTONE; ware siderite.
- 3340-3350 SAMESTONE: white, unconcolidated coarse grained, in part (15%) very coarse grained, occasional gravule, angular to subangular, vitroeus, in part milly quarts, traces pink and rale green quarts, traces hachatite stained quarts, occasional wedium to dark grey chort - quartzite grains; abundant massive prrite - commut (orystalling pruite). 3% SAMESTONE grey, consolidated, as above.
- 3350-3360 SAMDSTONE: white, unconsolidated, coarse to very coarse grained, angular to subangular, vitreous quarts, occasional grey chart grans, rare quartzite rare yollow - pink quartz grains; coment is pyritic but is less abundant than in overlying cando, some carbonacoous/argillaceous coment as woll.

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Traces of pyritized wood frequents; trace coal.

- 3360-3370
  SANDSTONE: white to light grey, uncensolidated, coarse to very coarse (35%) in part granule sized (10%), subangular vitroeus to slightly milky quartz, occasional pink yellouish quartz graine, eccasional grey chort to rave quartzite graine, traces foldepar, pyritic coment, slight traces of kaolinitic carbonacecus coment.
  25 SANDSTONE: light grey, peerly serted, fine te coarse grained quartz, pyritie to corbenacecus/argillacecus coment, tight.
- 3370-3380 SAMPSYCHE: white, undersolidated, modium to very coarse grained with coercional granules, producinantly coarse grained with 30% very coarse graine subangular, vitroous to slight milly quarts, occessional grey quarts graine - grey to dark grey chart; were quartaite grains. Common pyrite pyritic andstone. Traces foldspar, siderite.
- 3380-3390 SANDSTONE: white, unconsolidated, conrest grained subengular, vitreons, quarts with tracess grey quarts - chert, breen - grey quartuite, well sorted, clean, prritic - in part corbonacecus count, probably less well command than sandstone above. 5% Massive pyrite - pyritic sandstone.
- 3390-3400 SAMDSTORE; white, uncersolidated, predominantly correct grained, with 25% very coarse grains occasional granule, angular vitreous quartz, occasional gray, pink - vellow quartz grain, trace chart grains, pyritic commt. Traces siderite, brown sideritic claystone, limonitic (colitic) candy clay.
- 3410-3420 SANDSTONE: white, unconsclidated, coarse grained to granule sized (40% coarse 40% very coarse 20% granule) angular to subsugular quarts, occasional grey chart - quartzite graine, pyritic coment.
- 3420-3430 SAMETONE; white, unconsolidated, coarse to very coarse grained, with occasional granules, angular quarts grains with fairly common chort - quartuite grains, public - in part carbonaceous commt.

BIT CHANGE LAG TIME 35 MINS

3430-3440 100% SANDSTONE; light grey uncenselidated medium to very convex grained angular to subangular cheer to slightly cloudy quarts grains with content pyrito matrix, traces chert. Fyrite comented sandstone has occasional traces perceity. Traces sandstone fine grained to very fine grained, keelinitic watrix, light. Traces siltstone, dark grey, argillaceous firm with occasional laminations of very fine grained quartz sandstone. At shaker lip sandstone uncenselidated fine to ocaree grained clear to slightly cloudy angular to subrounded quartz.

3440-3450 100% SANDSTONE; unconsolidated light grey, medium

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to coarce grained, occasionally very coarce gamined, engular to sublegular clear to slightly cloudy quarts grains, traces chort quartzite grey, traces pyrite communed medium to convec grained conditions.

3450-3460

3 100% SAMESTONE; unconcolidated light grey modium to very coarse grained well to fimly sorted, ergular to cubrounded clear to cloudy quartz grains, treese chert and quartzite, grey, traces gyrite comented modium to coarse grained conditions.

3450-3460 100% SANATONE: uncenselidated light groy medium to very course yrained well to fairly sorted, . engular to subreauded clour to cloudy quartz grains traces chort and quartzits, traces pyrite commented sondstene. Traves pink quartz. Traces sideritic notvix.

- 2460-3470 100% SANDSTONE; light grey unconsolidated, medium to coarse grained with 10% very coarse grains angular to subrounded clear to slightly cloudy trace pink quarts grains with traces common quartaite grey to dark grey and traces chort. Traces pyrite comented sandstone.
- 3470-3480 100% SANDETONE; Light gray unconsolidated medium to very coarse grained rugular to subangular as above. Treese coel, black.
  - N.B. Black to dark grey silty carby clay being vashed out on sloker.
- 3480-3490 100% SANUSTONE; light groy unconcolidated wodium to very course grained as above with 2-3% quartaite white to groy. Cousen ceal black, orgillocecus.
- 3490-3500 100% SANDSTOND; Light groy unconsolidated medium to vorr correc grained angular to subrounded quarte grains, traces reliev and pink quartz grains common chert and quartrite traces prits comented medium to course grained sandstens. Traces coal black, britishe with interbode fine grained healinitic conditions with poor percenty.
- 3500-3510 100% SAMDSYOND; light prop unconsolidated modium to very convec grained ougular to subangular considually subscruded clear to slightly cloudy quarter with traces pyrite encruted quartrite and chort. Traces cost black with traces fine grained healinktic conductors. Corress light brown grey argittecceus siltators, firm alightly carby very firely sicenceus. Generally brooks up in vater to cost clayer.
- 3510-3520 90% SAMDETOME: Light grow unconsolidated medium to very course grained, generally course to very course grained fair to good sorting, angular to subangular clear to cloudy, with yollow and pink quarte grains, common (2-3%) quartaite and chort Traces pyrite comented canditons. 10% SILASTONS, brown grey argillaccous as above.

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3520-3527

85% SANDSYOND: Light groy unconsolidated wedium to very coarse grained as above. 15% SILASYOND; as above, breaks up in weter, possibly slightly bentonitic, blocky.

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3527-3540

540 SAMDSTONE: Light groy to buff, unconsolidated madium to very coarse grained, predeminantly coarse grained, angular to subangular, vitreous, quartz, coursen gray to greenish grey chert - quartuite round grains, only siner accusts of pyrite. Traces coarse grained angular sandstone in abundant brown, tough, argilloceous/silty potrix.

3540-3550 SAMESTOME; white, uncenselidated, course grained, occasional medium - very course grains, subengular vitreene to cloudy quarts, with 1-2% medium to dork grey - greenish grey quarts grains, chert quartrite. Traces bright red lithic grains; only trace of prrite coment. Trace fine to medium grained quarts sondstone with kaclinitic matrix.

3550-3560 SANDSTOND; white, unconsolidated predeminantly coarse grained (approximately 20% modium - 5% very coarse graine) angular to subaugular, cloudy quarts with 3% modium light groy quarts grains, modium to dark grey (slightly groonish) quartsite grains - occasional chort grains, moderately well sorted, traces of pyritie - kaolinitic comont. Traces black coal; dull with conchoidal fracture Traces sandstone light grey modium grahed to coarse grained with pyritie - kaolinitic coment, tight.

3560-3570 SANDSTONE; white to light groy, unconsolidated coarse grained to granule size, (60% coarse 25% very coarse 15% granule) subangular quartz, fairly common light grey quartz grains, approximately 1% dark grey and greenish grey lithic grains. Traces sandstone; light grey fine grained, consolidated, comented with pyrite and kaolinite.

3570-3580 SANDSTONE; light grey, unconsolidated as above. Traces pyrite and pyritised wood fragments.

3580-3590 SANDSTONE; light grey, unconsolidated, medium to very coarse grained (30% medium 45% coarse 25% very coarse) subangular quarts, fairly common grey quarts grains, traces chort and occasional lithic grains; prvisic and carbonaceous matrix adhering to coveral grains. Traces of sandy lighta, and of very fine to fine grained anderses with privite habinitic to performanceous watch, poor intergranular percenty.

CONTRACTOR CONTRACTOR CONTRACTOR CONTRACTOR CONTRACTOR is you's [11]] there are contained, angular to subward quarks guards, accessional yellowish states quarks guards, traces modium grow quarks guains. Traces SANDSTONE Light grow, fine grained, quartz matrix of carbonaceous matter, pyrite and in part kaolinite.

Traces pyrite.

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- 3600-3610 SANDSTONE: white to light grey, unconsolidated coarce to very conrec grained, occasional medium grained, angular to subangular quarts, traces greenish grey, quarts and quartsite, clean, poorly sorted. Traces massive pyrite, pyritic sandstone as above, pyritized wood fragment.
- 3610-3620 SAMETORE: white, unconsclideted, very poorly corted medium grained to granule size, predominantly very coarse grained, subargular to cubrounded vitroous to cloudy quarts, traces pink yollow grey quarts grains, traces quartuite (1% or less lithic grains) only rare traces of pyritic coment. Occasional pyritic conduteres, traces pyritised wood fragment.
- 3620-3639 SAMDTTENS: white, wheenpolidated, course grained in part (15%) very course grained, subangular to subrounded, quarts, eccasional groy quartz grains, traces red and erange quartz grains; traces quartaits and other lithic grains, poorly sorted traces pyritic comput. Occasional massive prrite.
- 3630-3640 SANDSTONE; white, unconsolidated, coarse grained 10% very coarse grains and occasional granule, angular vitroous to milky quertz mare yellowish orange, orange and pink quertz, grains, rare dark grey lithic grains, moderately well sorted, clean. Bare massive pyrite.
- 3640-3650 SANDSTOME; white, unconsolidated; very poorly sorted to granule size, predominantly coarce grained angular to subangular quartz, rare pink grey and yellow quartz grains, traces greenish grey quartzite. 1% SANDSTONE; light grey, fine to medium grained quartz, kaolinitie/pyritic matrix.
- 3650-3660 SAMDETONE: white, unconsolidated, coarse grained in part (25%) very coarse grained with 10% gramules; finer grains augular to subangular conver grained subcounded, vitreous to milky quarts, corren arbor and occasional grey and pink quarts graine; traces of earbonneoous and pyritic natrix adhering to rare grains. Occasional massive grains. Occasional massive grains. Correction, keeliniti silbetone and very fine grained candetone.
- 3660-3670 SAMDSTOND; white, unconsolidated coarse grained to very ecorse grained with 20-30% granules, angular, milky quarts common yellowish pinkish and grey quartz, traces medium to dark grey quartzite and other hithic fragments, very poorly sorted, clean. 1% SANDSTOND: hight grey, very fine to medium grained quartz, angular to subangular, pyritic and in slight part kaolinitic coment, fair intergranular peresity.
- 3670-3680 SANDSTONE: white, unconsolidated poorly sorted as above with 30-40% granules and 30-40% very coarso grains, angular quartz, occasional groy quartzite.

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3680-3690 SANDSTONE: light grey, unconsolidated, very peorly sorted, predominantly very coarse grained but abundant 40% granules and occasional pobbly subrounded quartz.

3690-3700 TRIP sample (Brown clay and siltstone in teeth of pulled bit)
SANDSTONE: white, unconsolidated, predominantly coarse grained with 30% very coarse 10% medium and occasional granules, angular to subangular quartz (cloudy) cocasional gray quartz and lithic grains.
1% SILATSTONE - very fine grained sondstone, light grey to white kaclinitic, in part carbonaccous.

3700-3710 100% SANDSTONE: light grey unconsolidated medium to coarse grained with 10% very coarse grains, angular to subengular and occasional subrounded clear to slightly cloudy with traces yellow to erange and greenish grey quertz grains with traces red chert, grey chert and grey quartzite. Abundant pyrite comented medium to come and occasionally fine grained candstone, traces pyrite modules. Traces slitstone dark grey, very argillaceous, firm traces bedding micaceous, slightly carby.

- 3710-3720 95% SANDSTONE; modium to very coarse grained as above with traces chert and traces pyrite cemented sandstene. 5% SIL/FSTONE as above.
- 3720-3730
  95% SANDSTONE, medium to very coarse grained, generally coarse grained well sorted with common pyrite comented sandstone, traces coal.
  5% SILTSTONE as above.
  Traces siltstone light grey fine to medium grained with kaclinite matrix, tight.
  Traces black coal, sandy.

3730-3740 90% SANDSTONE; light groy unconsolidated medium to very coarse grained as abovo, generally coarse grained. 10% SANDSTONE: white hard fine to coarse grained well corted with delouitic/siliceous matrix. Notrix frem 20-40" of rock. Tight. Sandstone occasionally has subrounded quartz granules. Traces pyrite comented sandstone.

3740-3750 50% SANDSTONE: light grey uncensolidated medium to ecaree grained with cocasional very coarse grains or granules as above. 50% SANDSTONE: white hard as above dolomite/ silignous matrix. Common poor peresity. Traces pyrite comented sundatenc.

3750-3760 60% SANDSTONE; light grey medium to vory coarse grained as above. 40% SANDSTONE; white hard delowite/silicacous as above with traces pyrite and occasional poor porosity. Traces siltstone, grey argillaceous cafby micaceous.

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- 2760.2770 60% SANDSTONE: light gray uncencelidated medium to very coarse grained subangular to angular well corted clear to cleudy quartz graine with traces chert and greenish grey quartz and quartzite, grey. 40% SANDSTONE: white hard medium to very coarse grained generally medium to coarse grained, well sorted quartz grains in a delomitic/siliceous matrix (20.49% matrix) with traces of pyrite, chert and ceal. Tight with common traces poresity.
- 2770-2780 60% SAMDSTOME; light groy unconsolidated as above. 40% SAMDSTOME; white hard fine to very coarse grained with eccesional granules, sorting of individual outtings ranges from good to poor, silicocus/delomite matrix as above. Traces percenty.
- 3780-3790 30% SANDETONE: Light groy, unconsolidated as above, medium to coarse and occasionall very coarse grains with 5% gramules. Common chort and quartaite. 20% SANDETONE: white hard as above with common quartaite and chort lithic grains. Traces black siltatene argilinecous as above.
- 3790-3800 70% SANDSTONE light grey unconsolidated as above. 20% SANDSTONE white as above occasionally poor porosity. 10% SILTSTONE dark grey, firm, argillacoous wicaeeous, slightly carby. Balls up when wet.

Uphole time approximately 33 minutes.

From lip of shaker 60% SILTSTONE dark grey vory argillaceous, carby micaceous, soft when wet. 30% SANDSTONE; light grey unconsolidated fine to granule sized and with borken pebbles. 10% SANDSTONE; delomite/siliceous as above.

380-3810 80% SAUDSTONE; light grey unconcolidated medium to very coarse grained with 5% granules and traces chart as above. 10% SANDSTONE; defemitic/silleoous fine to coarse grained as above tight. 10% SIL/PSTOME; as above. Treeces sendctone five to medium grained subwounded to subengular clear to clightly cloudy quarts in kaolin untrin. Tight. The knellin candotone is slightly friable but the HICJ bit is probably breaking it up into grains and these are pausing through the sheker. The samplo taken at the shnker hip had approximately 60% fine to modius grains of the quartz grains. BON SANDSTONE; Light groy unconsolidated medium 3810-3820

3820 80% SAMETONE: Light gray unconsolidated medium to very coarse grained well corted angular to subrounded clear to slightly cloudy quartz grains with traces coal. Trace pyrite comented sendstone. 10% SILTETONE; dark grey as above.

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	10% CAMPSTONE; white fime to coarse grained delowite/silicoous matrix, tight. Traces sandstone very fine to fine grained slightly carby with kaolin matrix and with traces ? glauconite.
<b>3820- 3830</b>	80% SANDSTONE; light grey unconsolidated as above, with some fine grened quartz. 10% SILTSTONE; as above. 10% SANDSTONE white fine to coarse grained delomite/silicecus matrix, generally tight with occasional traces peresity. Traces kaolin matrix fine to medium grained well corted quartz canditone. Traces coal. Traces pyrite commende madistone.
38303840	90% SAMDSTONE: light grey unconsolidated wedium to coarse grained angular to subrounded cloar to slightly cloudy quartz grains. 10% SILASTONE; as above very argillaceous, dark grey, icaccous, carby with laminations siltstone white, baolinitic, grading to very fine grained sandstone. Traces delemito/siliceous sandstone, ceal, pyrite cemented sandstone.
3840-3850	60% SANDSTONE; light grey unconsolidated as above, with eccasional chort or quartzite pebbles 30% SILTSTONE as above dark grey carby and white slightly carby. 10% SANDSTONE hard white delouite/siliceous matrix, medium to very coarse grained, tight.
<b>3</b> 8503860	60% SANDSTONE; light groy unconsolidatod as above with 30% fine grains. 30% SILTSTONE; as above carby dark groy. 10% Delemite/silicoous sandstone tight. Traces koolin sendstone, fine to medium grained, poor peresity. Common pyrite comented sandstone.
<b>3860-3870</b> '	Slev drilling. Very poor sample as a slurry of and and very fine sand. 40% SILESTONE, very argillaceeus (a silty shale?) dark grey, oarby. 60% SANDETONE, grey, vory fine grained, silty, argillaceeus, firm in cuttings but generally as loose grains, micaceeus, slightly carbonaceeus. Argillaceeus matrix, generally dirty, occasional kaolin. Tight. This lithelegy the siltstone shale especially, probably represents the slow drilling where it is ground up and remains in suspension in the aud.
<b>3870-3880</b>	50% SANDETONE: unconcolidated light groy medium to granulo, generally coarse to very coarse grained, angular to subrounded clear to slightly cloudy quarts grains with traces coal, chert, and pyrite comented sandstone. 20% SANDETONE; light groy to white, very fine to fine grained semi friable, well sorted clear subangular quartz grains with traces lithics green red, common coal fragments and traces mice in an argillaceous, (kaolin) matrix approximately 30% matrix. Traces poresity but generally tight.

matrix. Traces percently but generally tight. 30% SILTSTONE; dark grey, very argillaceous as above. Carby. Common sandstone light grey to

white with dolomite/siliceous matrix.

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3880-3890

100% SANDSTOND; unconsolidated light grow, coarso grained with 15% weding to fine grains, clear to slightly cloudy with traces groy, erange pink subangular quarks graine with common pyrite comented soudstone, traces quartaite, ceal. Traces siltatene and fine grained sandstone 23 above with knolin watrix. Ears mice flakes, white.

3890-3900 100% SANDETONE; uncensolidated light groy cearee grained with 10% medium grains as above with traces quartzite groy, white and green, traces pyrite communical sandstone, traces coal and traces glaucenite.

3900-3910 95% SANDSTONE; unconsolidated light gray coarse to very conress grained with 10% wedtum grains, an segular to subangular close to cloudy traces yellow quartz grains, well sorted with traces pyrite ecconted sandstone, greenish gray quartz grains, groy quartaite. 5% SILESTONE; brownish gray to dark gray, firm argilineous carby. Traces candstone very fine to fine grained with keelin matrix, tight.

3910-3920 80% SANDSTONE; as above with traces quartaite and traces of carbonucceus cloyer silt matrix adhering to some grains. Traces yellow and orange quartz grey chort, common pyrite comented medium grained sandstone. 20% STLTSTONE; dark grey to grey brown, firm argillaceous laminated, carby, slightly micaceous blocky.

- 3920-3930 70% SANDSTONE; light grey uncenselidated coarse grained with 10% very coarse grains and occasional medium grains, subangular to angular, clear slightly cloudy with traces orange and yellow quarts graine with common coal and pyrite commond eandstone, traces quertaite. 20% SILTSTONE; dark grey to grey brown, firm blocky with cerbonneeous leminations.
- 3930-3940 50% SANDSTONE: Light grey unneacolidated modium to very coeres grained as obeve. 40% SANDSTONE: Light grey to white, firm to soul frighte very fine to fine coercional modium grained well corbod cubangular quartz grains with 5-10% dark grey Lithic grains, traces mice, 5% coal fragments and very traces glancomite ? in a clightly dirty heelin matrix, generally tight. 10% SILATONE as above.
- 3940-3950 SOM SAMETONE: Light grow unconcolidated medium to very coarse grained unimit coarse grained, well acred subangular to angular eleer to slightly cloudy with traces erange yollow greenish and grey quartz grains with traces pyrite comented sendetone and traces coal. 20% SAMETONE: Light grey and white very fine to fine grained as above with traces glaucenite? (a firm light green winerel - % may be chlorite) Traces siltene as above.
- 3950-3960 100% SANDSTONE; light grey unceaselidated medium to very coarse grained, generally cearse grained well corted, subangular occasionally angular or

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submounded clear to slightly cloudy with common yellouich, traces grea grea quartz grains, traces pyrite counted sandstone, traces conl, traces bluek seunded chert. Traces SILASTONE and fire grained SANDSTONE es abova.

100% SANDSYOND; light gver unconsolidated coarse 3960-3970 to very coarse grained, well sorted, subangular to angular clear to clightly cloudy with common yellowich, traces exange and greenish quartz grains, traces chort, pyrite eccepted sandstone and brown quartzite. Tracos green clay as matrix (? glaucomitic). Traces ciltatone as above with coarse quartz grains. Treess sandstone somifriable very time to fine grained with kaclin matrix, tight.

3970-3980 100% SAMDSTOME; Light grey unconcolidated coarse to very course grained, well corted clear to slightly cloudy, with common yellowish and groenish quartz grains, subangular to subrounded occasional angular with traces pyrite matrix, traces greenish clay matrix, traces pyrite comented audstone. Traces siltstone and fine grained sandstone as above.

3980-3990 100% SANDSTOME; as above with common yellowish and greenish, traces orange quarts grains and with traces derk grey chert greins. Traces siltatone as above, groy brown, argillaceous, carby. Traces candetone, very fine to fine grained firm, subaugular clear to cloudy quartz grains with 10% grey lithics and 5% green soft wineral (glauconite ?) with 30% keelin matrix. Tight.

> RAN VELES DRIEL PIPE ELECTRIC LOG approximately 3950 easing (7401) Mierun

անականություն է հայտում անդարում անդամաները։ Անդանությունը էն է նանականում, են՝ ուներկերը ու երգավագ դավելու երանությունը։

Mailed on orders from Mathemano

Trilling Mu6 at 9990 R = 2.9 obs  $12^{-3} + 60^{-5}$  F = 1

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1 DECIENDER 1966 - RAN TED FOLLOUING LOGS: (Schlauborger)

silty shale green.

INDUCTION STRUCTUREDAY, LOG 742-3930' K.T. 2" 5" conlos CEMENTE NAUD 1004 40-750' K.B. 2" 5" conlos RUM CHE RUN OME

3930-3000 70% SAMESTOND: Light (rev annuasticated, cearse to very senser grained subsemuded to subsegular clear to class and pressing grants grains, common green clay admoring to grains, trasse pyrite coronted candshore. 20% SAUDSTOND; Light grey unconsolidated coarse to very scarse grained quorts grains with silicoous matrix, eccasional consolidated hard chips. 10% SILTSTONE; dark gray to black, argillaccous

firm, very carbonaceous micaceous and traces firm

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4000-4010 Poor sample volume over shaker
70% SANDSTONE; light grey unconsolidated as above with traces green clay, common pyrite commented sandstone and traces coal, traces black quartaite.
10% SANDSTONE; siliceous hard as above.
10% SANDSTONE; fine to medium grained, light grey firm, composed of quarts, 5% coal fragments, traces to 50% green chlorits? in a keelinitic occessional siliceous matrix, traces perceity in 50% of chips.
10% SILSTONE; black as above.
Traces silictone very avgillaceous grey brown, slightly carby.

4010-4020 70% SANDSTONE: Light grap unceaselidated, coarse to very coarse grained subangular to subrounded obcasionally rounded or angular clear to cloudy with common yollowish, traces crange quartz grains, uell sorted with traces baolin matrix adhering to some grains, traces pyrite comented sandstone, traces grey green 20% chlorite ? matrix. 30% SANDSTONE: light grey generally uncensclidated cearse to very coarse grained engular to subangular clear to cloudy quartz grains, occasionally with evidence of secondary onlargement and traces occasionally consolidated hard chips with siliceous matrix. Traces chips of grey green firm chloritic (?) clay (shele).

4020-4030

Sample from shaker hig as little passing ever shaker.

70% SANDSTOND; light grey uncensolidated fine to very coarse grained subangular to subangular quartz grains with traces coal pyrite comented sandstone as above. 10% SANDSTONE; light grey firs, very fine to

fine grained, silty couposed of quartz with 5-10% carbonacoous and dark grey lithic fragmonts, traces greer oblerite, traces to common microcous flakes in a kaelin matrix. Generally tight with traces perceity in 20% of chips. This sendetone grades to a alightly coupy siltetone. 10% SAPLETOFE: light grey siltetone. 10% SAPLETOFE: light grey siltetone. 10% SINTETOFE: derk grey to black, very finely soudy, very carbonaccoup microcoup. argillaccous firm to hard.

4030-4040 70% SANDSTORE: light grow unconsolidated - Poor Sample - medium to very conses grained as above with more rounded and subrounded grains, as above. 20% SANDSTONE: light grey firm very fine grained, stilty as above with traces bedding. Tight. 10% SILTSTONE: dark grey to black as above occasionally dark brownish grey. 4040-4050 POOR SAMFLE 70% SANDSTONE; light grey as above with traces green chloritic clay adhering to grains. 30% SANDSTONE: light grey to dark grey, firm to very fine to fine grained, in part vory silty and grading to a siltstone, carby, micaceous traces chlorite. Tight. Traces siltstone, as above dark grey to brown, in part very argillaceous.

4050-4060 70% SANDSTONE: light grey POOR SAMPLE, unconsolidated coarse to very coarse grained, angular to rounded grains clear to cloudy, traces yellowish quartz grains with common pyrite matrix sandstone, traces fine and talline pyrite aggregates, traces ceal, black chert. 20% SANDSTONE; light grey firm to hard, brittle

very fine to fine grained, silty, composed quartz with 10% carbonaceous lithic fragments, 5-10% green chlorito (?) common micaceous in a kaolin matrix, occasional argillaceous (watrix 20-30% of rock). Generally tight. 10% SILTSTONE: brown, argillaceous, firm, carby alightly micaceous.

4060-4070 70% SANDSTONE: light grey unconsolidated as above POOR SAMPLE 10% SANDSTONE: light grey, firm, very fine to fine grained silty as above with 20% of sample with traces porosity. 20%/SILTSTONE; brown as above very argillaceous. Traces sandstone very fine grained, brown with sideritic matrix.

> From lip-spot sample at 4170. 60% SILTSTONE; unconsolidated consisting of 95% siltssized clear quartz grains and 5% carbonaceous fragments. 40% SILTSTONE; brown very argillaceous carby soft. Traces sandstone unconsolidated very fine to very coarse grained.

- 4070-4080 60% SANDSTONE; unconsolidated POOR SAMPLE light grey very fine to coarse grained angular to subrounded quartz grains as above. 20% SANDSTONE; light grey firm to hard, very fine grained, very silty, composed quartz grains with 10% lithic and rarbonaceous fragments, 5% chlorite ?, common wicaceouc, to 5% white partly decomposed feldspar? Tight. Grades to a siltstene. 10% SILTSTONE; light brown to dark grey as above. 10% SILTSTONE; unconsolidated quartz grains.
- 4080-4091 POOR SAMPLE. Contaminated by rig cils. 60% SAMDSTONE Light grey unconsolidated, medium to coarse grained subangular to subrounded clear to cloudyy quartz grains as above. 30% SANDSTONE: Light grey firm as dove with carbonaceous streaks. 10% SILTSTONE: Light brown to dark grey argillacoous as above.

4091 CORE 11

CORE No.11

4091-4102 Ree 4:2"

Macro Description

- Top 1:6" SANDSTONE; discoloured by mud, modium grained with occasional corbonaceous laminations and streaks with 10° dip. Structures - lawinations disturbed bodding and cross bodding. No show.
- Next 10" Interlaminated siljstene green grey and carbonaccous siltatone black. 5 dlp. Structures - Laminations dress bodding, unshouts, lonses, evoltional truncations, suimal burrey (?) graded bodding. Grades downward to a flue to modium grained sendetone. Between major proviouni truncations the siltatone becomes were conformated to the top.
- Noxt 3% SANDSTONE: fine to medium ground discoloured by tunt, no shows.
- Next 1<sup>1</sup>/<sub>2</sub>" SILTSTONE: black with laminotions at base of green grey siltstone. Structures laminetions lenses. Poble of brown sandy and very argillaceous siltstone at base - 2 cms long and tabular. Dips 3-5°.
- Next 6" SILISTONE; green grey grading downwards to a coarse grained sandstone. Common carbonaecous streaks and lonses. Structures - undulating beddings, crogs bedding, graded bedding, lonses, with dips 5-25. No shows.
- Eovon 2'1<sup>1</sup>"SIUESTOND: black hard with Laminotions and Lenses of group to light groy siltatone and fine grained condstans. Dips 0-3" structures - lenses Laminations, veshouts, rare snimel burrow, distorted bedding, bedding disturbed by compection.
- Top 1.6" SAMDSTOME: brown (sud discoloured) slightly friable, fine to updawn grained with openpinel coarse grains and openpional very fine grains, generally well garged. Angular to subrounded quartz grains with 3-5% corbevaceous lithic grains traces brown siltstone graine, 5% black lithic graine, traces wice flakes to 5 was (clear) with frem 5 to 25% argillaceous comments white kaolinitic matrix. Serting varies from fair to good, good to peer pressity. The sandstone shows peer graded bedding with the peresity decreasing as the average grain size decreases, due to the very fine grains and increase in matrix. Traces green chloritic clay in pero spaces.
- Next 10" Interlaminated ciltatore light greenish grey, and carbonaceous siltatore black to brown light greenish grey siltatone composed of quarts grains with to 5% light green soft wineral (chlorite or glauconite) 5% black rounded Lithic grains, traces sica, common carbonaceous lithic grains, traces sica, common carbonaceous lithic grains, traces rod to brown lithic grains, ware very fine to fine grains quartz, with an argillaceous (koolinitic?) watrix. Black to brown siltatone, very earby with quarts grains, rare fine grained quartz grains, lithics as above. Very common carbonaceous fragments. Common laminations of carbonaceous material.

- Next 3" SAMETONE brown (and discolaured) grades from the groenish grey siltstone above through very fine grained and fine grained, to medium grained. Conditionts as top 1'6" with peresity increasing from tight at the top to good at the base.
- Next 12" SILTSTOME; black, with laminations at bzse of greenish grey siltstone. Siltstone black, very argillaceous with up to 50% argillaceous matter, common fine medium rounded quartz grains, abundant carbonaceous fragments, common mica flakss. Siltstone as above.
- Mext 6" SILFSTONE; greenish groy as above grading dewnward to modine grained sandstone as above with carbonaceou: Laminations and streaks. Sandstone has good porosity. Bottom 4" is siltstone greenish groy as above with Laminations of siltstone dark brown as above and thin interbeds of five to coarse grained sandstone, peorly sorted with up to 40% argillaceous and brown silty matrix, traces porosity to tight.
- Bottom 1'12"SINTETONE; black grades to a vory avgillaccous shale black. Firm, carbonaccous, micecous with lawinations lenses ofc. of siltatone, greenish as above, lonses of white siltatone with 40% kaolin matrix, and occasional burrous filled with fine to coarse grained subengular soudstone with kaolin matrix.

## CORE No.12 4102' - 4114' Rec 7

217"

SHALE; modium dark grey, in part brownish grey, micaceous, very silty, subfissile to blocky. The shale is generally moderately carbonaceous, but includes several zones with abundant flecks and blebs of coaly material; it grades in part to very argillaceous siltabno. The unit contains about 10% interlaminated SANDSTONE; white, very fine grained, quartz, very silty, slight to moderately carbonaceous, kaolinitic matrix, tight and some interlaminated SILTSTONE. In the basal 4 inches the shale is dark grey and contains scattered fine to medium angular quartz

contains something the first to mean a quarter quarter graines. This part of the unit includes several longes, (b mm thick) and patches (longe thick) of SANDSTONE; white, medium to coarse grained, angular to subangular quarts, kaclinitic matrix, tight. At  $4102^{t}b^{m}$  and at  $8104^{t}b^{m}$  longes of canditone have a matrix of pyrite, and rare nodulos of pyrite are present elsewhere in the unit. Bodding dips at 2 - 4 degrees.

## ----- eresional contact -----

017"

Irregular stringers and lenses of white to light grey conditions and 20% interlaminated dark grey shalo Scourse in this unit are infilled by pockets of medium light grey poorly sorted conditions which constitutes 30% of the unit. The white to light grey sandstone very fine grained (in part fine grained), silty in part slight carbonaceous, compact, tight and consists of medium well sorted, quartz, with occasional pick and

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and green quartz grains - black lithic grains, set in a kaoliuitic matrix. The medium light grey sandstone consists of poorly sorted, very fine to coarse grained angular quartz in a compact, silty to argillaceous in part kaolinitic matrix.

0'1" Large nodule of peerly serted, fine to course grained, subengular to subrounded, quartz, sandstone cemented with pyrite.

2'10" Interlaminated silvstone and sendstone (40%)

The siltstone is modium to dark grey, moderate to very carbonaccous, very argillaccous and in part grades to silty shale.

The sandstone is light grey, compact, tight and consists of very fine grained angular quartz, common pink quartz grains and abundant silt grains in a kaolinitic and in part carbonaccous matrix.

The sandstone is in part cross-laminated. Compaction structures are developed above several sandstone lenses and several burrows are present.

Bodding dips at from 4 to 5 degrees.

0198 Irregular Lewinations - Lonses of sandstono and 40% siltstons. The sandstone is light groy (discoloured by mud) and consists of modium to coarse, subangular clear quastz grains, occasional pink quartz grains, in a kaolinitic matrix. The soudstone is well sorted and in places has moderate intergranular porosity. In the uppornost part of the unit the sandstone is more poorly sorted and includes grains of granule size. In this part of the core blebs and laminae of vitroous coal (rarely replaced by pyrite) are present. The siltatons is medium to dark groy, moderate to very carbonaceous, very argillaceous and in part grades to SHALE.

0'2" Interlaminated very fine grained, silty sandstone and dark groy, carbonoscus, silty shale.

5'0" No rocevery.

h11k-h120
Poor sample returns. Probably predominantly shale to siltatone as in earo No.12. Sample consists of: SANDSTONE; unconselidated light groy to buff, coarse grained, in part vory coarse grained, subangular quarts, with traces of hachinitic matrix in many grains.
Several of quarts grains have very fine to fine graine and/er silty argillaceous matrix adhering.
5% SANDSTONE; light grey, very fine grained, angular quarts, fairly common pinkish and green (chloritic?) grains, very silty, tight slightly micacoous (blotite) Traces siltatone - shale.

4120-4130 Poor sample - Described from coarser cuttings. 20% SHALE; medium brownish grey, mederate to very stity; 3% moderately microssus, carbonaccous chunky.

30% STLASTONE; medium brownish grey, micaceous very fine sandy in part, mederately argillaceous, conevally carbonaceous. 10% SAMDSTONE; buff, fine grained, subangular quarts, mederately friable (matrix to poorly forted quarts sandstons; which was recovered as loose grains in the finer part of sample). 50% SANDSTONE; uncensolidated, caree grained in part very coaree grained, subangular quartz grains. Traces pyrite.

4130-4140 SANDSTONE; buff unconsolideted, medium to very coarse grained, predeminantly coarse grained, subangular subrounded quarts; probably consolidated with knolinitic matrix in subsurface.
5% SHALE brownish grey, very silty mederate to very micaceous - enchenaceous, platy.
5% SILTSTONE light brown, micaceous carbonaceous, in part argillaccous, traces glauconite, very fine sandy - grades to siltstome.
10% SANDSTONE; buff, very fine to fine grained.
occasional medium grained, quarts, eccasional carbonaceous grains, poor to fat sorting, friablo, slightly knelinitic matrix, slightly micaceous, commenly with mederate to good intergramular peresity. (10-13%).

4140-4150 SANDSTONE; white to buff, unconsolidated, medium grained - granulo size, predeminantly coarse grained, subangular to subrounded, clear quartz, traces groy quertrite, occasional pink - yellow querts, traces lithic grains, mederatoly well sorted, clean traces of pyrite coment. 5% SILTSTONE; and very fine grained sendstone, pale brown, medium to very silty - carbonaceous, micaccous, knolinitic matrix with come green chloritic (?) graine with patcher. Occasional carbonaccous lamines with chlorite patches.

4100 Lag time 41 minutos

4150-4160 Trip Sample - 4155 Bit Change
100% SUJESTONE; Light grey unconcolidated coarse to very coarse grained with 20% modium grains 10% granules, fair sorting rounded to subangular cloudy quartz grains with traces mice pyrite communed sandatone, chort and carbonaccous matter. Quartz grains generally polished. Traces andstone light grey fixe, fine grained carbonaccous lithic grains, good percenty. Traces siltetene light green grey, quartzes, slightly carby slightly micescene.
4160-4170 90% SANDSTONE light grey unconsolidated medium to very coarse grained as above.

10% SANDSTONE; light grey firm, vory fine to fino grained silty, with 5% carbonaccous fragments, common green chlorite pellets, traces micaceous, with 30% kaolin matrix. Tight with occasional poor porosity.

4170.4180 90% SANDSTONE; light grey unconsolidated, medium to very coarse grained rounded to subrounded occasionally subangular quartz grains, poliched and frosted with traces coal, chert, mica.

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10% SANDSTONE; light groy firm very fine to fine grained, silty, carby, traces green chlorito ? with 20-40% kaolin matrix.

- h180-4190 90% SANDSTONE; Light groy unconsolidated modium to coarse grained as above subrounded to subangular 10% SANDSTONE; hight grey very fine to fine grained as above.
   Traces siltstone brown argillaceous carby and black carby micaceous, argillaceous.
- 4190-4200 70% SANDSTONE; light grey unconsolidated medium to coaree grained as above rounded to subangular 30% SANDSTONE; light grey very fine to fine grained with kaolin matrix traces coal pyrite, and traces pyrite matrix. Tight. Traces siltatone greenish grey kaolinitic, and brown argilladeeus, carby. Traces coal, black, brittle with sub conchoidal fractures.
- 4200-4210 80% SAMESTONE; light groy unconsolidated medium to very cearse grained as above. 20% SAMESTONE; light grey consolidated firm very fine to fine grained and fine to cearse grained composed of quartz grains subangular to subrounded with 5% carbonaceous fragments, common green lithic grains, traces red lithic specks, with a kaelinitic matrix appreximate 20-30% of rock. Generally tight with occasional traces peresity.
- 4210-4220 80% SANDSTONE; light grey unconsolidated medium to coarse grained with 10% very coarse grains well sorted rounded to subangular clear to slightly cloudy occasional pink or greenish quartz grains with occasional pyrite coment, traces coal. 20% SANDSTONE light grey consolidated firm, generally very fine to fine grained, occasional fine to medium grained, composed subangular to subrounded clear quartz greins with common carbonaceous mether, traces mich green and grey lithic grains, generally tight with occasional traces peresity. Traces black carby ciltatone.
- 4220-4230 80% SANDSTONE; light groy unconsolidated as above with 20% very coarse grains. 20% SANDSTONE; consolidated as move with traces grey quartzito grains, and occasional carby streaks.
- 4230-4240 80% SAMDSTONF; light gray uncencelidated as above with traces chert. 10% SANDSTONE; consolidated as above. 10% SILESTONE; dark grey firm, argillaccous carby slightly micaccous.
- h240-h250 50% SANDSTONE; light grey unconsolidated as above. 50% SANDSTONE; consolidated light grey, very fine to medium grained with chips generally well corted, composed subangular to subrounded quartz grains with traces carbonaccous matter; lithic fragments, with 5-30% kaclin or siliceous matrix. Tight with 50% poor to good poresity.
- 4250-4260 40% SANDSTONE; modium to very coarse grained light grey unconsolidated rounded to subangular quartz grains, well sorted with traces pyrite.

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	60% SANDSTONE consolidated light groy, generally fine grained fine to cearse grained well sorted quartz grains with 5-10% carboneceous matter, common mica, traces pyrite matrix, to 5% groy and green lithic grains in a generally kaolin matrix, occasional siliceous matrix. Tight with 60% peer to good percenty.
4260 <b>-</b> 4270	30% SANDSTONE; unconsolidated light gray coarse to very coarse grained rounded to subrounded quartz grains. 60% SANDSTONE; consolidated as above 50% with poor poresity. 10% SALTSTONE; brown to black firm argillaceous slightly sandy carby blocky.
4270-4280	30% SANDSTONE; unconsolidated medium to very correspondent well serted subangular to subrounded quartz grains with traces pyrite, coal, yellowish quartz, chort. 60% SANDSTONE; consolidated light gray to white. Very fine to fine grained occasional medium grained or silty well sorted quartz with traces pyrite, common carbonaceous matter, traces mica, with 10-30% kaolinitic or argillaceous watrix. Generally tight with 30% peer to trace peresity. 10% SILTSTONE; dark brown to black very carby argillaceous in part slightly cendy, firm, traces bedding.
4280-4290	30% SANDSTONE; light grey unconsolidated coarse to very coarse grained well sorted rounded to subrounded quartz grains as above traces pyrite cemented sandstone. 60% SANDSTONE; consolidated firm to friable, very fine to fine occasional modium grained, light grey to white clean. White variety composed of quartz with traces carbonaceous fragments, 10% kaolin matrix and good peresity. Light grey variety composed quartz 5-15% carbonaceous fragments, common green mineral soft, traces mica grey lithic grains with 20-30% argillaceous and slightly silty, generally kaolin matrix, tight with some peer peresity. 10% Siltstone as above very carby.

4290-4300 20% SANDSTONE; ligth grey unconsolidated as above. 60% SANDSTONE; consolidated as above. 20% SILASTONE; brown to black arglilaceous, slightly sandy, slightly micaceous grades to very fine grained sendstone.

4300-4310 30% SANDSTONE; light groy unconnelidated coarse to very coarse grained quartz. 60% SANDSTONE; consolidated, generally fine to very fine grained, with kaclin matrix. Tight with 30% of sample with poor porcelty. 10% SILTSTONE; black to dark groy, very carby as above. Common coal.

4310-4320 30% SANDSTONE; light grey unconcolidated, coarse to very coar grained as above. 70% SANDSTONE; consolidated white to light grey, very fine to fine grained, in part silty as above generally with poor to traces porosity.

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4320-4330 40% SANDETONE; unconsolidated light grey coarse to very coarse grained rounded to subrounded clear to slightly sloudy quartz grains. 50% SANDETONE; light grey to white firm to friable very fine to fine grained, occasional silty and grading to a siltstene, composed of quartz with 0-5% carbonaceous fragments and 0-5% lithic grains traces mica, generally with traces percesity occasional good percesity. 10% SILASTONE; light grey grading from very fine grained sandstone above. Traces pyrite comented very fine grained sandstone. Traces brown limestone.

4330-4340 30% SANDSTONE; Unconsolidated light grey coarse to very coarse grained, rounded to subangular quartz as above. 50% SANDSTONU: light grey etc. consolidated as above. Tight with occasional poor peresity. 20% SILTSTONE: light grey to black as shove in part very argillaceous and carbonaceous.

4340-4350 20% SANDSTONE; uncenselidated light grey coarse to very coarse grained rounded to subrounded quartz as above.
60% SANDSTONE; conselidated as above.
20% SILTSTONE; as above.

4350-4360 20% SANDSTONE; light grey unconsolidated coarse to very coarse grained as above. 50% SANDSTONE; light grey to white, often very carby very fine to fine grained, often very silty as above, generally tight. 30% SILTSTONE; greding from the sandstone, generally very carby with carbonaceous streaks, in part argillaceous.

4360-4370 20% SANDSTONE; unconsolidated coarse to very coarse grained rounded to subrounded as above. 40% SANDSTONE; consolidated as above in part very carby and slightly micaceous. 40% SILASTONE; as above with common dark grey very carby and argillaceous, slight micaceous. Traces limestone brown massive argillaceous as above.

4370-4380 90% SANDETONE: unconsolidated light grey coarse to very coarse grained with 10% medium grains, rounded to subangular clear to slightly cloudy quarte graine with common coal, traces grey groon clay, truces pyrite comented sondstone. 10% SANDSTONE; consolidated as above in part very corby.

\$380-\$390
\$0% SANDSTONE; light grey unconsolidated coarse to very coarse grained well sorted rounded to subangular quartz graine with traces coal.
\$10% SANDSTONE; light grey to white firm in part friable very fine to fine grained often silty with 5-10% carbonaceous material common green and grey lithic grains, traces mica, with 20-30% kaolin, clightly dirty, matrix generally tight.
with 20% poor perosity.
\$10% SILTSTONE; green grey and brown, green grey grades from sandstone as above, brown is very argillaceous and carby, slight micaceous, blocky.

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- 60% SANDSTONE; light grey unconsolidated as above. 4390-4400 20% SANDSTONE; consolidated as abovo. 20% SILTSTONE as above. 4400-4410 50% SANDSTONE: light grey unconsolidated, coarse to very coarse grained rounded to subangular as abovo. 30% SANDSTONE consolideed very fine to fine grained as above. 20% SILTSTONE as shove. Traces claystone groy groon hard, massive. 4410-4420 85% SANDSTONE, unconsolidated coarse to very coarse grained rounded to subrounded well corted quartz grains. 10% SANDSTONE; consolidated tight as above. 5% Claystone; as above.
- 4420-4430 100% SANDSTONE; unconsolidated light groy coarse to very coarse grained with 5-10% medium grains rounded to subangular clear to slightly cloudy with common yellowish guartz grains, traces candstone consolidated, siltstone, cloystone as above and glauconite.
- 4430-4440 95% SANDEFONE; unconsolidated as above with common grey quarts greins. 5% SILFETONE; dark grey carby argillaceous micaegous Traces claystone, sandstone consolidated as above.
- 4440.4450 100% SANDSTONE; unconsolidated light grey as above with 10% grey quartz grains and traces grey quartzite. Traces glaunconite with pyrite cross tabular. Common grey silty shale wicaccous.
- 44:50.-44:60
  85% SANDSTONE; light grey unconsolidated coarse to very coarse grained well sorted rounded to subrounded clear to slight cloudy with 10-15% grey quartz grains, traces mich, traces pyrite matrix sandstone. Traces grey quartzite.
  10% SINTSTONE; grey very argillaceous michceous, elight carby grades to shale.
  5% SANDSTONE; light grey consolidated very fine grained tight with kaolin matrix.
- 4460-4470 90% SANDSTONE; light grey as above with 10% groy quart. 5% SHALE; grey silty blocky slightly micaceous slightly carby. 5% SANDSTONN; very fine grained tight as above.
- bh70-4480
  70% SANDSTONE; light grey unconsolidated as above with 5% grey quartz grains.
  20% SANDSTONE; light grey to white, very fine grained, silty composed of quartz grains with 5% carbonaceous matter, traces grey lithic in 20-40% kaolin, ofter very dirty matrix. Tight.
  10% SILASTONE; grey, very argillaceous micaceous carby grades to a rhale.
- 4480-4490 50% SANDSTONE; light groy unconsolidated as above with traces grey quartz grains. 40% SANDSTONE; light grey to white consolidated very fine grained to occasional fine grained as above in part with green grey hard clay matrix. 10% SHALE; grey green, pyritic massive. Traces siltstone as above.

- 4490-4500 50% SANDETONE; light groy unconsolidated cearse to very cearse grained with 10% granules, rounded to subrounded quarts grains as above. 40% SANDETONE light grey consolidated very fine to fine grained as above carby. 10% STATETONE; grey as above.
- 4500-4510 70% SANDSTONE; unconsolidated coarse to very coarse grained with 5% madium grains and 10% granules rounded to subangular quartz grains. 20% SANDSTONE; light grey consolidated as above, generally tight with kaolin matrix. Occasionally with pyrite matrix. Silty. 10% SILTSTONE; grey to light grey as bove.
- 4510-4520 70% SANDSTONE; uncensolidated course to very cearse grained with 10% grahules as ibove. 10% SILASTONE: light grey, gredes from very fixe grained sandstone very carby.
- 520-530 80% SANDSTONE; unconsolidated light grey coarse to very coarse grained with coessional medium graine and grouples, rounded & subesgular clear to slightly cloudy quarts grains, traces pyrite ecconted sandstone, traces coal. 20% SANDSTONE; light grey firm very fine to fine grained occasional silvy. Tight with kaolin watris. Consists of quarts grains with 10% carboneccous fragments, traces grey lithics traces mics.
- 4530-4540 80% SANDSTONE; unconsolidated Light grey as above. 20% SANDSTONE; Light grey firm, with traces of grey to green grey clayey matrix.

BIT CHANGE 4542

4540-4550 SANDSTONE; light groy, cand buff, unconsolidated coarse to very coarse grained, subrounded quartz generally cloudy, traces of argillaceous matrix adhoring to gtains, rare lithic grains, moderately well zorted. 20% SILTSTONE: medium light groy-brown, moderately to very carbounceous, in part moderate to very argillaceous, micaceous, in part white - only slightly carbonaceous common green grains. 15% SHALE: modium grey, very micaceous, carbonaceous silty. Occasional pyrite. Fairly common mica flakes.

4550-4560 SANDSTONE; light grey, as above.

30% SANDSTONE; white to light grey slightly greenish, very fine grained, in part fine to grained, subangular quarts, common green grains blobe (chloritic). Fairly common pyrite, generally moderato micococus - carbonaccous, kaolinitic matrix, moderato to very silty - grades to very fine sandy siltotone. Kaolinitic matrix, good perosity. 15% SILTSTONE; light grey modium brownish grey, very fine sandy, carbonaccous, argillaccocus. 5% SHALE; dark greyish brown, very micaccous moderate carbonaccous, in part moderately to very silty, sub fissile. Occasional pyrite. Occasional pyrite. Occasional shale as above.

4370-4580 SANDSTOME; white to buff, unconsolidated predominantly modime to ocarse grained, subangular to subrounded cloudy quarts, moderately well corted, rare yellovish - or grains, or grains, traces of pyrits - graomish clay - were common kaolin adhoring to grains. 20% SANDSTONE; white to light grey, very fine to fine grained, subangular to subrounded quartz, fairly common pink - grains, generally moderately micaccous (blotite muscevite) slight to moderate carbonaceous, silty, with abundant kaolinitic argillaceous matrix, with some chlorite. 15% SILTSTONE; lawinas, modium dark brown, vory micaceous (biotite), moderate to very chloritic argillaceous. Occasional light groon clay, occasional pyrito.

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4580-4590 SANDSTONE; light gray to buff, unconsolidated, coarse to very coarse, subangular to subrounded, cloudy quartz. 60% SANDSTONE; light gray very fine grained angular to subangular quartz, 5% greep rod - black lithic grains or pellots, moderatoly well sorted, friable earthy porosity. 5% SILTSTONE; as above.

4590-4600 SANDSTONE; light grey, unconsolidated, prodominantly course to very coarse greinod, subangular to subrounded slightly cloudy quartz with common clear poliched round grains, many yellowish, occasionally arange tinted quarts, green well corted clean. 55% SANDSTONE; light gray, vory fine grained, rerely fine grained, and to subengular quartz, occasional round grains, common grains green, spex (chlorite ?), common black diotite carbonacoous grains, very moderately micaceous (muscovite 0 biotits) very silty, siliceous cement, good earthy porosity. 5% SILTSTONE; medium grey to brown, carbonaceous laminations, biotate rich laminations. Occasional pyrite, occasional green (chloritic?) clay.

4600-4610 SANDSTONE; light groy unconsolideated as above with 10% vollowich erange coloured grains. 40% SANDSTONE; as above very silty, shundant greenish spex - grains, good earthy peresity abundant 4% intergranular peresity grades to, 20% similar siltstens.

4610-4620 SANDSTONE: light grey, uncensolidated predominantly course grained, in part 20% very coarse grained subangular to subrounded slightly cloudy quartz, about 10% of grains with yellowish tint, many others with elightly pink tint, well sorted clean, pyritic/kaolinitic/chieritic coment (?)
7% SANDSTONE; very fine grained as above to fine to medium subangular quartz comented with green to brown argitlaceous course and showing good intergranular perceity.
5% STLTSTONE; medium grey to brown, carboraceous very micaceous (predominantly biotito) abundant grain spar, mederately. argitlaceous, generally very sandy (very fine grained).

b620-b630 SANDSTONE; light grey, as above with 20-25% coloured grains, occasional consolidated chips indicate that matrix is greyish green (chloritic?) clay,
5% SANDSTONE; greenish grey, very fine to fine grained quarts, greenish grey avgillaceous matrix, generally tight.
2% SILTSTONE; brown, argillaceous silty micaceous. Traces pyrite, micaceous silty shale, greenish grey clay.

5630-4640
SANDSTOME; light grownto white, unconsolidated, predominantly coarse grained, 20% very coarse grains, 5% medium grains, subangular to subrounded, cloudy quartz.
50% of grains with yellowish or yellow coloration or less commonly with pink colour, woderately well corted, clean, traces pyrite, kachin groon clay adhering to many grains.
5% SANDSTONE; grey greenish grey, very fine to fine grained quartz, microcoup, silty, green to brown, argillaceous matrix, in part with fair (5%) intergranular persenty.
Occasiousl pyrite, eccasional cilistene, brown silty very carbounceous, microcoup slight laminae.

4640-4650 SANDSTONE; light grov, slightly vollowish, unconsolidated, predominantly coarse grained, subangular quartz as above.
10% SUASTONE; madium grov to brounish grev, moderate to very earbonaceous in part chloritic moderate to very misaccous argillaceous, grades to.
2% SHALE; dark grovish brown, silty, carbonaceous micaccous.
3% SANDSTONE; as above poorly seried.

4650-4660 Lithology percentages approximately as above.

4660-4670 SANDSTONE; light grey, slightly yellowish, unconsolidated, coarse grained occasionally very coarse grains, subangular to subrounded, predominantly cloudy, quartz, grains, 10% ambor, yellow pink quartz grains, well sorted, greenish grey argillaceous matrix.

3% GANDETONE; modium Light groonish groy, very fine to fine grained quarty, wiescoous carboneceous, kaolinitic to chloritic ?/argillacoouc matrix, in part with fair intergranular porosity. 2% SRESTONE; medium Light groy brownish groy. very fine sandy.

1% CLAT: light grovish groon micacoous, silty.

SANDSTONE; white, unconsolidated, coarse to very 4670-4680 coarce grained subsugular, clear to cloudy quartz, 20-25% ember - yellowish greins with occesional pink red grains, 5% SANDSTONE; as above in part poorly sorted with souffed sodius grains, and abundant watrix (candetone is probably matrix to unconcolidated sandstone above). 35 SILTSTONE; shale; sundy, carbonaceous micacoous.

65% SANDSTONE; light groy, unceaselidated as 4680-4690 sbove. 27% SAMDSTONE; consolidated, light groy, very fine gualuad, in part fine grained, subangular to subrounded quartz, folirly conven green grains, common biack mice and/or carbounceous grains, moderate to very silty, slightly argillaceous, generally tight to grades be. 10% SILASTONE; light gray brownish gray, moderate to vory micaccous carbonacoous, wederate to vory sendy (very fine - occasionally fine grains) Occasional brownish grey, very carbonaccous micaceous silty shale.

40% SANDSTONE; light grey, unconsolidated, 4690-4700 coarse to very coerse grained, subengular in part subrounded, clear quartz grains, common outer, yellowish - occasional pink tinted grains. 40% SANDSTONE; consolidated, light groy, very fine to fine grained, angular to subangular quarts, come pink quartz grains; occusional white, green elay grains, friable moderately well serted, silty to argillaceous (kaolimitic in part chloritic) matrix, carbonneoous micheoous in part and grades to very fine grained conditions as in section above. 20% SILTSTOHN; modium light gray medium brown, very candy (very fine - fine guaned), earbounceous/ argillaccous micaccous grades to silty very fine eandstone.

4700-4710 60% SANDSTONE; light gray uncensolidated as above with abundant ambor yollowish grains. 30% SANDSTONE; medium Light groy, very fine to fine grained, subangular quartz, poorly sorted, moderately silty, argiliaceous (brown) matrix, in part close, slightly micacoous slightly carbonnecous in part, traces intergranular peresity grades to 10% SHLASTONE; light gray to maddum ligth brown, moderately micaccous, very carbonaccous generally very sandy in part explications - grades to silty shalo.

471.0-4720 50% SANDSTONE; Light groy, clightly yellowish, unconsolidated, ccarso grained, in part very scarse grained, cloudy quarts, common coloured quarts graize.

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	SANCETONE:		
20%	STERSTORE;	8.9	above.

b720-b750 (5% SANDSTONE; modium light yellowich groy, unconsolidated, conros grained, in part (20%) very coarse grained. subengular to subrounded quarts, occasional ember, orango - yellowish quarts,
55% SANDSTONE; Light groy very fine to fine grained, occasionally wedium graine, subrounded quarts, compact, mederately friable, slightly micaccous - argillaceous, silicoous cement, peer to fair (4%) intergranular peresity.
10% SELESTONE; as above.

4730-4740 SAMDSTONE; Light rellowich grey, unconsolidatod, coarse grained, in part (155) very coarse grained, subangular quarts, foirly common suber - yeilow quarts grains. 235 SAMESTONE; as above, being in part mederately to very silty, generally more carbonaccous than above, only peer intergranular perceity evident 55 SIMTSTONE; as above. 55 SIMTSTONE; as above. 55 SHALS; medium greyich brown, mederate to very carbonaccous - michacous, silty, platy.

- h740-4750
  SANDSTONE: light grey, unconcolidated, coarse grained as above.
  35% SANDSTOME; very light grey, very fine to medium (prodominantly fine) grained, subangular quartz, very slightly micaceous slightly carbonaceous in part, well consolidated, slight to mederately friable, siliceous coment poor intergranular perosity.
  10% SANDSTONE: light grey, carbonaceous guast 4730-4740.
- 4750-4760 95% SANDSTONE; white, unconsolidated coarse to very coarse grained, subaugular to subrounded clear to slightly cleady, quartz, fairly common amber, yollow pink - erange quartz graine, well serted, clean. 5% SANDSTONE; as above. Traces siltatone, earbonaceous very fine grained sandstone, pyrite - cerbonaceous shale.
- 4760-4770 SANDSTONE; white, unconsolidated, coarse grained with 30% very coarse graine, occasional granules subangular, in part subrounded, prodemantly clear quartz mederatoly gell sorted, clean, common ambor, pink - orange quartz grains. 2% sandstone-siltatone-shale Traces of prvite.
- 4770-9780 SANDSTDIE: white, unconsolidated, coarse to very evance graiued (50%-50%), subrounded to rounded, clear to slightly cloudy quartz, trace crystalline pyrite. 1% very fine to fine grained sandstone, carbonaceous clay, slitstone.
- 4780-4790 SANDSTONE; white, unconsolidated as above, traces obset and quertrite grains. 3-5% SILESTONE; wediwe grey to brown, micacecus arglilacoous. 2% SANDSTONE; grey, very fine to fine grained,

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	silty, argillaccous tight, moderately carbonaceous, olightly chloritic clay matrix. Occasionally possly corted sendstone comented with pyrite.	
k790 <b>-4800</b>	SANDSTONE; Light grey, uncensolidated, cearse grained, subrounded quartz, occasional pink, crange - yellow grains. 20% SANDSTONE; light grey, very fine to fine grained, predeminently very fine grained, sub- angular quartz, mederate to very silty, slightly to mederately micaceous, slightly carbonaceous, angillecous (in part chloritic matrix) generally tight. Occasional SALTSTONE; traces green chloritic clay.	
8800-88 <b>20</b>	SANDSTOND; white, unconcolidated convectingd, in part (20%) very conrectioned, subrounded clear to cloudy quarts, common tinted quartz grains, traces chest - jesper, clean, well sorted, traces of green argillaceous watrix on many of grains. Traces candetone; very fine to fine grained as above.	· · ·
4810-4820	SAMDSTOND; white, uncensolidated as above, abundant, ambor, yollow - pink quartz grains. 1% very fine grained sandstone, brewn carbonaceous shale - clitatone.	
4820-4830	SANDETONE; white to light grey, unconsolidated, coarse grained, (25% vory coarse grains - eccasional modium grains) subangular to subrounded clear quarts, 10% ember, vollow - orange quartz grains, greyish green argillaceous matrix, adhoring to many grains, mederately well sorted clean. 5% SILASTOME; very fine grained conductore medium groyish bream traces green grains, moderate carbeaceous. 5% SANDET OME; light grey very fine to fine grained subangular quartz, argillaceous/chloritic matrix tight.	
4830-4840	Lithology - pozenúagos as above.	
4840-485 <b>0</b>	SANDSTOME; light groy, unconsolidated, course to vory coerse grained, occasional wedhum graine, subangular to subrounded, quartz, 10% auber evense - pink quartz, grains, moderately well courted.	
	15% SANDSTONE; Light grov, very fine to medium grained, prodominantly fine grained, subaugular quarts, occasionally green - white clay grains corbenesseus grains, twoce round grains, very poorly corted, mederately friable, argillecous/ silicceus eccent poor perssity. 10% SILTSTONE; medium brown, very micaceous, carbonaceeus, very argillaceous, grades to SHALE Occasional wedium light grey - brownich grey soft sheb.	
4850-4860	SANDSTONE; white to light groy uncensolidated, as above. 10% SANDSTONE; light grey, dirty, very fine to medium grained, as above. 5% SILTSTOME; as above. Occasional grey clay - brown shale.	

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- 4860.4870 SANDSTONE; as above prodominantly coarse grained 5% SANDSTONE; similar to above. 5% SILTSTONE; as above grading to silty shale. Common poorly sorted sandstone with abundant pyrite matrix.
- 4870-4880 SANDSTONE; as above. 10% SANDSTONE; light groy to groyich brown, very fine to fino grained, quertz, very silty, occasionally green chlorite (?) graine - blobs, in part carbonecous, in part pritic, silty to angiliacoone matrix, carthy perceity - poor intergranular perceity. Traces pysite - pyrite comented sendatone; cocosionally cerbonecous clay - siltetene.
- 4330-4960 No encyles. Takeo dropped before sought completely circulated up.

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4900-4910 70% SANDETONE; unconsolidated coarse to very coarse grained rounded to subangular clear to clightly cloudy occasionally light groy well corted quartz grains, traces mica, pysite comented sandstone, traces black quartzite, tracos volued chart. 20% SANDSTONE: Light grey to white, occasionally dirty, very fine to fine grained, well serted composed of quarks grains with 0-5% carbonaceous matter.0-5% green and grey lithic grains, traces mice, traces green soft chlorite ? with generally a kaolin metrix, occasionally with a calcareous matrix. Generally tight. 10% SALASTONE; dark grey, very carby slightly soudy alight micaccous with a greenish clayey matrix,

5910-4920 70% SANDETONE; unconsolidated as above with corpon green elay adhering to grains. Sene consolidated chips, with green matrix, tight. 10% SANDETONE; concolidated very fine to fine grained, in part silty as above. 20% SILTETONE; grade to shale greenish black with very carby with green chloritic clay matrix.

4920-4930 50% SANDSTONE; unconsolidated modium to very coarse grained rounded to subaugular woll sorted clear to cloudy with common grey, traces yellowish quartz grains, twocos quartaite, mice, pyrito matrix candstone, with traces of green clay watrix. 30% SANDSTOME; white to light green very fine to fine grained, clightlybeilty as above with kaolin matrix or green cley matrix, tight. In part very carby. 20% SILASTONE; dark grey to black carby micacoous, very argillacoous with occasional green clay matrix. Common clayoy groon slightly carby. Interbods of very fine grained seudetone and siltstone.

4930-4940 50% SANDETONE; coarso to very coarse grained unconsolidated as above with common green clay matrix. 20% SANDETONE; very fine grained with kaclin or calcarsous/silicocus matrix with occasional green clay pollets or seme green clay matrix. 30% STLTSTONE; dark grey, sandy very earby with kaclin matrix or coecsionally with green clay matrix to grades to very fine sandsburg, silty. Common clay grey green, slightly micaceous slightly carby. Traces brown very argillaceous siltstone.

4940-4950 60% SANDSTONE: unconsolidated coarse to very coarse grained with occasional granule. 20% SANDSTONE; very fine to fine grained light grey to white, kaolin matrix tight with 10% calcarsous/silicoous matrix tight with occasional traces perosity. 10% SIL/STONE; dark grey to black, very carby very micaceous, very argillaceous with occasional green elay pellets or matrix as above.

405 SANDSTONE; uncenselidated medium to very coarse grained us above traces green clay matrix, traces chort. 40% SANDSTONE; light grey to white very fine to fine grained, angular to subrounded quartz grains with trades coal, wice, green clay pollets with 20-30% kaclin occasional dirty, matrix. Tight with 30% sample with traces percenty. 20% SILTSTONE; dark grey, firm very carby, argillaceous microseus, occasional green clay pellets.

4960-4970 40% SANDETONE; unconsolidated, with traces green clay and koolin matrix. 40% SANDSTONE; light groy very fine to fine grained as dovo, 20% traces perceity. 20% SILTSTONE; dark grey as above.

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4970-4980 60% SANDSYONE; light grey unconsolidated coarse to very coarse grained rounded to subangular elear to slightly cloudy with common vellowich and erange quarts grains, traces green elev matrix. 30% SANDSTONE; light grey, very fine to fine grained slightly silty with quarts grains -0-5% green elev pollots 0-5% corbeneceous frequents with a boolin matrix. Constally tight with 10% sample with traces perceity, traces mice. 10% SNLASTONE; deck grey carby argillecoous micecous slightly sandy with common green clay pellets.

4980-4990 60% SANDETONE; light grey unconsolidated as above with traces pink quartz. 30% SANDSTONE; light grey very fine to fine grained as above. 10% SILTSTONE; as above. Common green clay.

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- 4990-5000 50% SANDSTOHE; light grey as above with traces brown chert. 40% SANDSTONE; light to dark grey as above with dirty kaolin matrix. 10% SALTSTONE; as above slightly sendy (very fine to coarse grains) Traces green clay. Traces glaucenite (?) in siltstone.
- 50% SANDSTONE; light grey uncensolidated coarse 5000-5010 to very coarso grained rounded to angular clear to slightly cloudy with common yellowish quartz grains, with traces pyrite comented sandstone, traces groen clay watrix. 30% SANDSTONE; light to dark grey very fine to fine grained with mane modium to very coarse quartz graine, with to 5% carbonacocus fragmonts, common green elsy pellets (chlorite with possibly some glaucenite), traces mica in a grayish dirty kaelin metrix comprising 20-45% of rock, tight. Traves felspar. 20% SILTSTONE; dark grey vory carby as above, well bodded. Tracos chale mid grey firm sandy. Indications of this interbedding and laminations of very fine grained sandstone and siltatons.
- 5010-5020 50% SANDSTONE; unconsolidated asabbove with traces pyrite computed sendstone. 30% SANDSTONE; light to dark grey very fine to fine grained with dirty kaclin matrix, tight. 20% SIL/ESTONE; as above, traces green clay.
- 5020-5030 40% SANDSTONE; light groy unconsolidated to very coarce grained well sorted with 10% granules rounded to subangular clear to slightly cloudy with 25% vellowich quartz grains, traces green clay Eatrix. 50% SANDSTONE; very fine to medium grained well sorted quartz with traces kaolinised felspar, green clay pellets, common carbonaceous fragmonts, rare wice, in part very carby with clayoy kaolin matrix, tight. 10% SILTETONE; dark grey, very carby, argillaceous in part sandy, wicecoous. Exists interbedded with the sandstene.
- 5030-5040 60% SANDSTONE; light grey unconsolidated as above with traces plak quartz. 30% SANDSTONE; consolidated very fine to medium grained with 20-40% keelin clay matrix, tight. 10% SILASTONE; as above with common green clay pellets.
- 5040-5050 60% SANDSTONE; unconsolidated medium to very coarso grained with 15% vollowish quartz grains, traces grey green clay matrix. 35% SANDSTONE; light to medium grey, in part very carby, very fine medium grained, tight as above. 5% SINTSTONE; as above.
- 5050-5060 50% SANDSTONE; unconsolidated medium to very course grained as above traces brown quartz with traces brown chert. 40% SANDSTONE; very fine to fine occasionally modium grained with kaolin clayey matrix, tight. 10% SILTETONE; dark grey to medium grey, micaceous very carby occasionally finely sandy.

5060-5070 70% SANDSTONE; uncensolidated medium to very coarso grained rounded to subangular clear to slightly cloudy with traces rod, yellowish quartz grains with traces grey green silty cley matrix. 20% SANDSTONE; very fine to fine grained as above with common green clay pellets. 10% SILTSTONE; as above.

5070-5080 70% SAMDSTONE; uncenselidated as above with traces orange quartz. 20% SAMDSTONE; as above with traces glauconito ? 10% SILTSTONE; as above very carby. Traces clay grey slightly silty. green.

5080-5090 60% SANDSTONE: light groy unconsolidated coarse to very coarse grained rounded to subangular clear to slightly cloudy with traces orange and commen quarte grains, traces pyrite comented sandstone, traces green and groy silty clays as matrix. 30% SANDSTONE: very fine to fine grained with occasional modium to very coarse grains well sorted light to mid groy, subangular to subrounded quartz with 0-10% carbonaccous watter, to 5% green clay pollets, traces mice in a divty kaolin clay matrix. Tight. 10% SILFSTONE: dark grey dirty, very argillaceous, very carby, slightly micaceous, cocasional kaolinitic, with green clay pellets, interbedded with very fine to fine grained sandstone. Traces grey clay, silty, blocky, sandy.

5090-5100 70% SANESTONE: light gray unconsolidated as above with traces chort, red and orange quartz, pyrite comented sandstone. 20% SANDSTONE: very fine to fine grained, gray as above tight. 10% SIL/TSTONE: dark grey to black as above very carby, occasionally sandy, occasionally very micaceous, with matrix fine mid gray clay. Traces clay, groy, slightly sandy, silty, blocky firm.

5100-5110 80% SANDSTONE; light groy unconsolidated coarse to very coarse grained with 10% medium grains rounded to subangular well sorted clear to cloudy with traces erange, red, pink and common yellowish quarts graine, with green grey clay matrix adhering to graine. 10% SANDSTONE; very fine to fine grained slightly silty, grey, well sorted quarts grains, very carby slightly micaceous, tight with grey to light grey clayey matrix. 10% SILASTONE; as above generally very carby, in part very argillaceous and very finely micaceous.

5110-5120 20% SANDSTONE; light grey as above with traces grey and brewn quartz grains. 20% SANDSTONE; grey vory fine to fine grained as above in part with medium to very coarse quartz grains, silty. Tight. 10% SILTSTONE; as above grades to very fine grained sandstone.

60% SANDSTONE; light grey uncensolidated 5120-5130 rounded to subangular, coarse to very coarse grained with 10% granules, well sorted clear to slightly cloudy, common yellowish, with traces orange, red and grey quartz grains, traces pyrite cemented sandstone, with common green grey clay matrix. Tracer grey chert. 30% SANDETONE; very fine to fine grained, with occasional modium grains woll sorted subangular to subrounded clear to slightly cloudy quartz grains with very occuren carbonaceous matter, counce green pollets, is a cloyey watrix, tight. Occasional grains clean with kaolin matrix, strong porosity, slightly misaceous. 10% SILSTONE; dark grey to black very argillaceous in part very finely sondy, very carbonaceous, micaceous with occacional groom clay pellets.

5130-5140 50% SANDSTOND; unconsolidated as above. 50% SANDSTONE; consolidated as above with keelin clayey matrix, tight.

51ko-5150 60% SANDSTONE; unconsolidated fine to very coarse grained rounded to angular quartz grains as above 30% SANDSTONE; very fine to fine grained as above with common groy green clay pellots. 10% STLASTONE; dark grey argillaceous very carbonaceous clightly micaceous as above.

51.50-5160 80% SANDSTONE; unconsolidated medium to vory coarse grained, rounded to subangular as above. 20% SANDSTONE, very fine to fine grained, with keelin or green grey clay matrix, tight.

5160-5170 80% SANDETONE; medium to very coarse grained unconsolidated as above with common vellowish quarts grains, traces orange quarts grains. 10% SANDETONE; very fine to fine grained hight as above. 10% SILSTONE; dark groy to black, carby micaccous, vory finely sandy, well bedded as above.

5170-5180 70% SANDSTOUR: fine to very coarse grained poorly sorted unconsolidated as above. 20% SANDSTOND; very fine to fine grained as above silty. 10% SILMSTONE: as above grades to very fine grained sandstone, very carby. Traces clay gray, silty, very finely sandy.

5130-5190 SANDSTONE: buff, nuconsolidated very poorly sorted, fine to very coerse grained, proclamently coarse grained, subscunded, in part nunded cloudy quartz, common yollowish, eream and ember quarts grains, eccasionally erange quartz grains, traces brown and grey quartzite granules, 10% SANDSTONE; light grey, very fine to fine grained, angular to subangular quartz, common green clay grains, clightly to moderately carbonaceous flocked, occasionally micaceous, frieble, kaolinitic to silty matrix, good earthy perceity.
5% SILTSTONE; medium dark brown, in part grey, moderate to very micaceous, generally carbonaceous.

25 SHALD; medium brown, very picaceeus and silty. Traces punito. Slow drilling due to avgillaceeus metrin 7.

- 5190-5200 SANDSTONE: Light groy, unconcollicated fine grained to granule size, predeminently course grained, (80%) and very course grained (10%) cubrounded quarks, predeminently wilky, but fairly counten vitroous grains, fairly counten (but much fever than above) tinted grains, majority of grains retain traces of see green argillaceous matrix. 2% SANDSTONE & SILESTONE; as above. Slow drilling due to argillaceous matrix.
- 5200-5210 SANDETONE; light grey, unconsolidated, medium to very coarse grained, produmnusly course grained, outpounded cloudy quarts, 2% thated grains, traces volcande grain, remains of green ergillaceous watrix on many grains. 2% SANESTONE; as at 5180-5190. 1% SILESCOME; as above.
- 5210-5220 SANDSTONE: light goos to buff, uncenselidated, occarso grained to growule cise, prodominantly coarse grained, subrounded, vitrocus to slightly cloudy quarts, 35% of quarts grains are tinted. amber, yellow and occasionally evenge, very peorly sorted, traces of green argillaceous watrix on many grains. 10% SANDSTONE; as at 5180-5190. 3% SILFSTONE; medium dark brewn, very argillaceous micaceous, in part carbonaceous, grades to silty shale.
- 5220-5230 SANDSTONE; buff, unconsolidated coarse gramed, to gramule cise as chove with 30% ambor, yellow, pink and erange tinted grains. 7% SANDSTONE; medium light grey and brownich grey, very fine to fine grained, angular to subangular quartz, and slightly dark grains, in part very silty, generally with abundant brown and groenish argillaceous watrix. 7% SILESTONE; medium grey and brown, specked with green grains, widecous and corbenecous in part very fine to fine condy, in part very argillaceous and gredet to shale.
- 5230-5240 SANDSTONE: buff, unconsolidated, prodouinantly occarse to very coarse grained, occasionally granulo sized, subcounded quarts, 5-16% thutod grains as above. 25% SANDSTONE: as above. 15% SILTENONE: similar to above.
- 5240-5250 SAMPETONE: buff, unconsolideted as above. 20% SAMPETONE: variable, very fine grained to predominantly fine graine, rere thits clay and considered grain grains, rere thits clay and considered green clay grains, slight to wederately shity, slightly micacecue, in part wederately carbonaccous, entrix consists prodominantly of silty brown carbonaccous matter and in part of greenich clay; traces poor to fair intergranular perosity, mederate earthy perceity, eccasionally very carbonaccous and very micaccous laminae. 5% SILTETONE; as above.

52505260	35% SAMPSTONE; buff. as above. 60% SAMPSTONE; light grov, vory fine to fine eccasionally medium grained, subargular quartz, traces red quartz grains, occasional carbonaceous graine, in part slightly slity, generally vell indurated and only slightly friable, siliceous coment with slightly slity argilleous matrix, in part with poor intergrazular peresity. 5% SIL/STONE; SHALE; carbonaceous/micaceous, modium grey to Carb brown. Oceasional ansaive proite and traces pyritic sandaters.
5260-5270	40% SANDCTOME; beff, as above. 55% SANDSTORE; cimilar to above. 5% SILESTONE; codium dark groyish brown, firm moderately micaurous, carbonacoous and argillaccous.
5270-3280	TRIP SAMPLE SAMPSTONE; Light groy to buff, unconsolidated coarse to very coarse grained, subrounded, cloudy quarts, abundant inted grains, traces chert and lithic grains. NOP SAMPSTONE; as above and greenish groy, very fine grained quarts and abundant green grains, argillaceous. NOP SELASTONE; medium greenish groy, abundant carbonaceous spon and green clay grains, 5% SHALE; grey to brem, very silty.
5280-5290	SAMDETONE; buff, unconsolidated, as above. 15% SMALM; modium brown, moderate to very silty moderately micaceous and carbouaceous spocked, in part very finely sandy, grades to argillaceous SILACTOME;. 16% SAMDETONE; as above. 5% SELACTONE; as above. 5% SELACTONE; undiam brownich grow, coarse micaceous and slightly carbouaceous, abundant green clay grains, in part very five sandy.
529 <b>05300</b>	SANDETONE; buff to light grey, unconsolidated, medium to very coarso grained with occasional granules, predeminantly coarse grained, subrounded to rounded clear quartz grains, common polished quartz grains, very abundant tinted grains. 10% SHALE; medium brownish grey, mederate to very silty, microwie, carbonaceous, platy to subfissile. 5% SANDSTOME; veriable as abovs. Traces massive pyrite, trace foldspar.
5300-5310	SANDSTONE: light grey, unconsolidated, coarse to very coarse grained, predominantly cory coarse grained, 5% granules, angular to subrounded quartz, occasionally polished grains, 10% orange, pink yeller tinted grains. 5% SANDSTONE; variable, very fine to fine grained, in part clean but commonly angillacecus. 5% SHALE TO SILTSTONE as above Traces siltstone pale brown, abundant carbonnecous debris, slightly micaceous, very argillacecus.
5310-5320	SANDETONE; light groy, unconsolidated, moduum grained to granule size (60% very coarse, 25% coarse, 10% granule) predominantly subrounded, slightly cloudy quartz, 15% yellowish, amber and pink or orange quartz grains, many of grains have traces of sea green argillaceous coment adhering.

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	35 SANDSTONE; Variable 25 SILETODE - SMALE
5320 <b>-</b> 53 <b>30</b>	SANDETONE: Light grov, unconsolidated modium to very coarse quained, predominantly very coarse gualand with 10% guantly very coarse gualand with 10% guantle subrounded quarts, as above. 10% SANDETONE: Light groy, very fine to modium grained, subengular to subrounded quarts, moderately frichle, poorly sorted, abundant con groom cilty/avgillaceous matrix, good earthy perceity fair (3-6%) intergranular perceity; in part carbonaceous, in part grades to sandy siltetens. 5% SILASTONE; modium grey and growich brown, wieaceous, carbonaceous sandy, argillaceous and in part grades to shale.
5330-53h8	SANDSTONE; buff to light grey, uncenselldated coarse to very coarse grained, as above. 5% SAMESTORE; nearly sorted with abundant argilinecous cowent, as above. 5% SIMESTONE; brown carbonaceous, argillacecus, seady and some silty shale.
53405 <b>3</b> 50	90% SANDETONE; hight groy, unconsolidated coarse to very coarse groined, subreanded to subangular, clear to cloudy with very common yellowish conson evenge, traces groy and greenish quarts grains, traces pyrite compated sondstone, with ormmen tences of green, groy and black (carby) clay commute. 5% SANDETONE; very fine to fine grained as above tight. 5% SIMETONE; mid groy, missiceus, very carbonaccous slightly sondy, very argillaceous in part bodded.
53505360	90% SANDETONE; light groy unconsolidated as above traces chort. 5% SANDETONE; consolidated very fine to fine with common medium to very common quarts grains, knolin matriz, in part very clavey, tight. 5% SILMETONE; as above grades to cilty carbonaceous and micaceous shale.
5360-5370	80% SANDETONE; light grey uncorsolidated coarso to vary conves grained with 10% modium grains and 10% grazules as above. 13% SANDETONE; aid grey, very fine to fine grained with coersional vedium grains, subangular, composed of querts with to 20% carbousceaus matter, traces pyrite, traces with traces knoliniced folopar in a dirty knolin waters tight. 5% SILFETONE; as above.
5370~5380	60% SAMPSTONE; Light groy unconcolidated medium to very coarse grained with cosmen fine grains and 5% granule subrounded subangular clear to cloudy with very common yellowish, traces pink and exange quartz grains with common kaolinitic or grey to green cleyer matrix. Troces gray quartz, traces pyrite commuted sandstone. 30% SAMPSTONE; mid grey firm very fine to medium grained with occamental coarse to very coarse grains subangular to subrounded quartz grains with to 20% carbonacceus matter, in part silty and very argillecceus, generally with 20-30% kaolin or

	clayoy matrix, tight. 10% SILTSTONE; black very argillaceous, micaceous grades traces shale, in part slightly candy, well bedded. Traces shale black, slightly micaceous, hard, fissile.
5380-5390-	70% SANDSTONE; as above with traces orange and common yellowish quarts grains, traces greenish quarts grains. 30% SANDSTONE; as above consolidated, very dirty tight, traces fine pyrite erystals, traces greenish elay pellets.
53905400	70% SANDSTONE; as above with 15% granules, 30% yellowish quartz grains and traces orange quartz grains. 25% SANDSTONE; mid gray as above, grades to siltatone, tight. 5% SILTSTONE; as above in part coarsely sandy, traces bedding.
5490-5410 Poor Sample	60% SANDETONE; as above with common yellowish quarts grains. 36% SANDETONE; very fire to fine grained as above tight with to 40% matrix. 16% SILTETONE; as above grading to very fine grained sandstone, carby, micaceous. Traces pyrite comented sandstone.
5410- 5420	60% SAMPETONE; light gray unconsolidated coarse to very coarse grained with 10% granules and traces medium grains subrounded to subangular occasionally rounded quartz grains common vellowish, traces pink quartz grains with traces kaolin and clayey matrix. Common pyrite comented sandstone. 30% SAMDSTONE; very fine to fine grained occasionally medium to coarse grained as above tight. 10% SILTSTONE; as above very carby.
5420-5430	60% SANDSTONE; light grey unconsolidated medium to very coarse grained with 5% generally 20% medium grains as above. 35% SANDSTOME; very fine to fine grained tight. Generally dirty matrix, rarely ciliceous and herd. 5% SILTSTONE as above very carby, argillaceous, slightly micaceous, firm traces bodding.
5430-5440	50% SANDSTONE; light grey unconsolidated, medium to very conrespined rounded to subangular clear to cleudy with common yellowish, traces orange and grey quarks graine, traces very film pyrite crystals on quarks graine. 40% SANDSTONE; mid grey dirty very fine to fine grained with occasional medium to very coarse grains, subangular to subrounded quarts with to 10% carbouncous matter, slightly micaceous in a clayey kaclin matrix, tight. 10% SHLTSTONE; dark grey to black, firm carby, micaceous, very slightly sendy.

40% SANDSTONE: light groy unconsolidated medium to very cearse grained as above. 50% SANDSTONE: wid grey very fine to fine grained tight as above. 10% SILTSTONE: as above, grades to shale. 3440-5450 Poor Sample

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Sample probably not representative as most of sample lost through shaker or in suspension in puzd. 5450-5460 60% SANDSTONE; light grey modium to very coarse grained as above. 20% SANDETONE; very fine to fine grained tight very dirty. 10% SILTSTONE; as above. 10% SHALE; gray brown, firm, silty unstable in water. Grab sample fro htp of shakor Contains 10-20% clay, dark gray, silty, slightly carby, soft, goos into suspension in water. 40% SANDSTONE; light groy unconsolidated, madium to very coarse grained with traces fine grains, 5460-5470 subrounded to subangular clear to cloudy with traces orange yellowish and groonish quartz grains traces pyrite cevented sandstone. 10% SANDETONE; light to mid grey, coensionally dirty gray, very fine to fine occasionally medium grained, composed of quartz, counce corbenaceous matter, traces wice, in a kaolin clayey matrix, tight. 50% SHALE; brown grey soft, slightly silty, goes into suspension in water - possibly slightly boutonitie. slightly carby, in part slightly kaolinitic, traces badding. 60% SANDETONE; light gray unconsolidated fine to 5470-5480 very fine grained poorly sorted as above. 20% SANDSTONE; wid groy vory fine to medium grained with rare course graine, composed of quartz, traces carby, in a kaolin ofter very clayey matrix, tight. 20% SHALD; brown groy, soft as above. traces siltstone dark grey carby micaceous argillaceous 3480-5890 30% SILTSTOME; as above fine to very coarse grained with 15% fine to medium grains. 10% SILASTONE as above tight. 10% SILTSTONE as above. 50% SHALE, as above grades from brown grey to black. Traces pyrite comented sandstone. 54905500 50% SANDSTONE; light grey, unconsolidated modium to very ccarse grained with 5% granules subrounded subangular clear cloudy with common yollowish and traces erange quartz grains, traces pyrite cemented saudsteue. 10% SANDSTONE; very fine to fine grained, mid grey with kaclin of clayey kaclin matrix, tight. 40% SHALE; as above in part carby. 5500--5510 40% SANDSTOME; unconsolidated modium to very coarse grained as above. 10% SILTSTONE; fine to very fine occasionally medium grained with kaolin matrix, slightly earby, with 15-39% matrix, tight. 50% SHALE; as above in part very carby and city, tracos mica. 5510-5518 Poor sample; cuttings coated with film of clay. 45% SANDSTONE; light grey to buff, unconsolidated as abovo. 45% SHALE; modium brown, very slightly micacoous,

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silty, play to chunky. 10% Variable very fine to fine grained micaceous moderately clean sandstone and argillaceous SILTSTONE;/

5518-5530 SANDSTONE; buff, unconsolidand, coarse to very coarse grained, subangular to subrounded, quartz occasionally amber, yellow and orange quartz grains, residue of brown silty argillaceous coment or matrix on many grains. 10% SHALE; modium brown as above. 5% SILTSTONE; light grey, in part green, grading to silty argillaceous, very fine to finograined sandstone.

5530-5540 SANDSTONE; buff, unconsolidated coarse grained, 10-20% very coarse grains and occosional medium grains, subargular to subrounded, vitreous to slightly cloudy quartz, occasional tinted quartz grains to black lithic grains. 10% SANDSTONE; light gray, very fine medium grained, quartz and cocasional green olay graines, poorly sorted, in slight part clean but generally very cilty and argillacoous, yearly sorted, grades to sandy siltstone. 2% SHALE; as above. Occasional pyritic sandstone.

5540-5550 SANDSTONE: light grey to buff, uncensolidated, occrse grained, in part very coarse grained subrounded, cloudy unartz, occasional tinted grains. 15% SANDSTONE: grey, very fine to coarse grained, peorly sorted, predominantly fine grained, angular subrounded, quartz grains in a silty, argillaceous (in part kaolinitic) matrix, slightly to moderately micaceous (muscovite and biotite) traces intergranular percenty. 5% SILTSTONE - SHALE, brown, micaceous, slight to moderately carbonaceous, in part very fine and fine sandy.

5550.5560 SANDSTONE; light grey to buff, fine to very coarse grained, predominantly coarse grained subrounded, cloudy quartz. 30% SANDSTONE; as above clean to very silty and argillaceous, clean variety has kaolinitic/slightly chloritic coment and poor to fair intergranular peresity, dirty variety is silty, argillaceous and tight. 5% STLATED NE; as above.

- 5560-5570 SANDSTONE; unconsolidated as above. 25% SANDSTONE; similar to above. 10% SILTSTONE and SHALE as above.
- 5570-5580 Depth correction. Hole deeper by 8' than recorded on pipe tally. No sample.
- 5580-5590 SANDSTONE; light grey, unconsolidated, medium to very coarse grained, predominantly coarse grained, subangular to subrounded, cloudy quartz, 10% yellow, ambor, orange tinted grains. 15% Interlaminated sandstone, siltstone and occasional shale. sandstone is grey, predominantly very fine grained

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<ul> <li>in part fine and modium grained, quartzose, compact, with a silty to argillaceous matrix. The siltstone is medium gray, moderately carbonaceous very argillaceous.</li> <li>5590-5600 SANDSTONE: light gray, unconsolidated coarse to very coarse grained, subrounded quartz, faily cemmon tinted graine.</li> <li>17% SANDSTONE; as above.</li> <li>5% SILTSTONE; gray to brown, very fine to fine sandy argillaceous, grades to shale, siltstone, sandstone and shale are graditional and are probably interformined.</li> <li>5600-5610 Dirty sample, probably much SMALE has washed out SANDSTONE; buff to light gray unconsolidated, predominantly coarse grained, abundant very coarse grains, angular to subrounded quartz, some tinted quarts grain.</li> <li>17% SANDSTONE; light gray, dirty, very fine to fine grained, occasional modium grains, angular to subamyler, quertz graces red quarts grains and green clay grains. yoorly corted, moderately friable, slightly sitty to very silty, in large part argillaceous, wairks of kaolin and clay, probably with moderate earthy porosity and in part with poor intergramular porceity and in part with poor intergramular porceity.</li> <li>6% SILTSTONE; weidim light grey and brownied grey, slight to moderately micaceous, in part earbonaceous generally very fine sandy, occasional green clay grains, gonarally argillaceous, grades to sandstone an above and to shale.</li> <li>2% SIMDSTONE; unconsolidated, as above.</li> <li>4% SANDSTONE; unconsolidated, as above.</li> <li>4% SANDSTONE; light grey to brown, silty, micaceous, platy to sub-fissile.</li> <li>5610-5620 Dirty sample; peecible much SMALE bas washed out.</li> <li>5% SANDSTONE; as above.</li> <li>5620-5630 SANDSTONE; buff, unconsolidated, very poorly sorted very fine to very coarse grained, predominantly coarse grains.</li> <li>5620-5630 SANDSTONE; as above very fine to fine grained in part clean, corneally silty and argillaceous.</li> <li>20% SANDSTONE; as above very fine to fine grained in part clean, corneally silty and argillaceous.</li></ul>		
<ul> <li>very coarse grained, subrounded quartz, fairly common tinted grains.</li> <li>15% SANDETONE; as above.</li> <li>5% SILTETONE; grey to brown, very fine to fine sandy argillaceous, grades to shale, ailtotone, sandstone and shale are graditional and are probably interfuminated.</li> <li>5600-5610 Dirty sample, probably much SHALE has usshed out SANDETONE; buff to light grey unconsolidated, predominantly coarse grained, abundant vory coarse grains, angular to subrounded quartz, some tinted quartz graine, occasional medium graine, angular to subrounded quartz graine, angular to subrounded quartz graine, angular to subrounded quartz graine, angular to subrounded graine, angular to subrounded, occasional medium graine, angular to subrounded, wery solity in large part argillaceous, watrix of kaolin and clay, probably with woderste earthy poresity and in part with moderate graine, gonerally argillaceous, grades to sandstone as above and to shale.</li> <li>2% SHALE; medium dark grey to brown, silty, miwaceous, platy to sub-fissile.</li> <li>5610-5620 Dirty scapic; possible much SHALE has washed out.</li> <li>35% SANDETONE; buff, unconsolidated, wery poorly sorted very fine to vary coarse grains, grades to sandstone as above.</li> <li>3620-5630 SANDETONE; buff, unconsolidated, very poorly sorted very fine to vary coarse grained, predominantly coarse grained.</li> <li>3620-5630 SANDETONE; buff, unconsolidated, very poorly sorted very fine to vary coarse grained, predominantly coarse grained.</li> <li>3620-5630 SANDETONE; buff, unconsolidated, very poorly sorted very fine to vary coarse grained.</li> <li>3620-5630 SANDETONE; buff, unconsolidated, very poorly sorted very fine to vary coarse grained.</li> <li>365 SANDETONE; as above.</li> <li>365 SANDETONE; buff, unconsolidated, very poorly sorted very fine to vary coarse grained.</li> <li>365 SANDETONE; as above.</li> <li>365 SANDETONE; buff, unconsolidated, very poorly sorted very fine to vary coarse grained.</li> <li>365 SANDETONE; as above.</li> <li>365 SANDETONE</li></ul>		compact, with a silty to argillaceous matrix. The siltstone is medium groy, medorately carbonaceous
<ul> <li>SANDSTONE; buff to light groy unconsolidated, predominantly coarse grained, abundant very coarse grains, angular to subrounded quartz, some tinted quartz grains.</li> <li>15% SANDSTONE; light groy, dirty, very flue to fine grained, occasional medium grains, angular to subangular, quartz graces red quartz grains and green clay grains, poorly sorted, moderately friable, slightly silty to very silty, in large part argillaceous, watrix of kaolin and clay, probably with moderate earthy perosity and in part with poor intergranular porosity.</li> <li>8% SILTETONE; modular light grey and brownish grey, slight to moderately micaceous, in part carbonaceous generally very fine sandy, occasional green clay grains, generally argillaceous, grades to sandstone as above and to shale.</li> <li>2% SHALE; medium dark grey to brown, silty, micaceous, platy to sub-fissile.</li> <li>5610-5620 Dirty scape; possible much SHALE has washed out.</li> <li>35% SANDSTONE; light grey dirty as bove grading to 20% SILTSTONE; as above.</li> <li>5620-5630 SANDSTONE; buff, unconsolidated, very poorly sorted very fine to very coarse grained, predominantly coarse grained.</li> <li>30% SANDSTONE; as above. very fine to fine grained in part clean, consolidated, very pandy (very fine grains).</li> <li>5% SILLETONE; as above, generally very sandy (very fine grains).</li> <li>5% SILLETONE; as above, generally very sandy (very fine grains).</li> <li>5% SILLETONE; as above, generally very sandy (very fine grains).</li> </ul>	5590-56 <b>00</b>	very coarse grained, subrounded quartz, fairly common tinted grains. 15% SANDSTONE; as above. 5% SILTSTONE; grey to brown, very fine to fine sandy argillaceous, grades to shale, siltstone, sandstone and shale are graditional and are
<ul> <li>35% SANDSTONE; unconsolidated, as above.</li> <li>45% SANDSTONE; light grey dirty as dove grading to 20% SILTSTONE; as above.</li> <li>5620-5630 SANDSTONE; buff, unconsolidated, very poorly sorted very fine to very coarse grained, prodomantly coarse grained.</li> <li>30% SANDSTONE; as above very fine to fine grained in part clean, sensoly silty and argillaceous.</li> <li>20% SILTSTONE; as above, generally very sandy (very fine graine).</li> <li>5% SHALE; dark grey, silty, micaceous, in part cleane.</li> </ul>	5600~5610	SANDSTONE: buff to light gray unconsolidated, predominantly coarse grained, abundant very coarse grains, angular to subrounded quartz, some tinted quartz grains. 15% SANDSTONE: light grey, dirty, very fine to fine grained, occasional medium grains, angular to subangular, quartz graces red quartz grains and green clay grains, poorly sorted, moderately friable, slightly silty to very silty, in large part argillaceous, watrix of kaolin and clay, probably with moderate earthy perosity and in part with poor intergranular perosity. 8% SILTSTONE; medium light grey and brownish grey, slight to mederately micaceous, in part carbonaceous generally very fine sandy, occasional green clay grains; generally argillaceous, grades to sandstone as above and to shale. 2% SHALE; medium dark grey to brown, silty,
very fine to very coarse grained, prodouinantly coarse grained. 30% SANDSTONE; as above very fine to fine grained in part clean, consconly silty and argillaccous. 20% SILASTONE; as above, generally very sandy (very fine graine). 5% SHALE; dark grey, silty, micaceous, in part carbonaccous.	5610-5620	35% SANDSTONE; unconsolidated, as above. 45% SANDSTONE; light grey dirty as shove grading to
	5620-5630	very fine to very coarse grained, predominantly coarse grained. 30% SANDSTONE; as above very fine to fine grained in part clean, consonly silty and argillaceous. 20% SILASTONE; as above, generally very sandy (very fine graine). 5% SHALE; dark grey, silty, micaceous, in part carbonaceous.

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5630-5640 SANDSTONE; buff, unconsolidated, coarse to very coarse grained, commen medium grains, clear to cloudy, subangular to subrounded quartz, 25% yellow, amber and occasional erange tinted quartz grains, fairly clean, traces of green chloritic (?) clay matrix, fairly common massive pyrite. 1% SILTSTONE; light grey, micaceous very fine sandy. 3% SANDSTONE; light grey as above.

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- 5640-5650 SANDETONE; white to buff, unconsolidated, coarse grained, in part (15%) very coarse grained, angular to subangular, in part subrounded, vitreeus to cloudy quartz greins, 10% tinted quartz grains, traces green quartzite, green, brown and grey argillaceous matrix adhering to some grains.
  2% SILTSTONE; medium brown, mederately micaceous, carbonaceous, red quartz and green clay spocks, very fine sandy.
  1% SANDETONE; grey, very fine to medium grained, argillaceous matrix, traces percepty. Occasional pyrite cemented sandstone.
- 5650-5660 SANDSTONE; white, unconsolidated, coarse to very coarse grained, angular to subangular, cloudy quartz, traces chart, occasionally tinted grains clean. 1% SANDSTONE-SILTSTONE as above. Traces pyritized wood fragment.
- 5660-5670 SANDSTONE; buff to light grey, unconsolidated, coarse to very coarse grained, subangular to subrounded, cloudy quartz, traces chert, 15-20% amber and yellow and rarely erange inted quartz grains, traces pyrite cement; common green clay cement. 2% SANDSTONE; light grey, very fine to very coarse grained, predominantly fine grained quartz set in an abundant silty/argillaceous matrix, fair earthy percenty. Occasional SILTSTONE and SHALE.

5670-5680 SANDSTONE; buff to light grey unconsolidated coarse grained in part (20%) very coarse grained subangular to subrounded to subangular, cloudy quartz, occational tinted grains.. 5% SANDSTONE; as showe. 1% SHALE; dark grey, moderate to very silty play to blocky.

2% SILTSTONE; medium to dark grey, speckled green micaceous, moderate to very argillaceous. Occasional pyrite and pyritic sendetone.

5680-5690 Lithology and percentages similar to above.

- 5690-5700 SANDSTONE; light groy, uncensolidated, coarse grained, in part (30%) very cearse grained, subrounded, cloudy quartz, 3% tinted grains. 3% SANDSTONE; similar to above. Occasional black carbonaceous shale and occasional siltetone as above. Sample dirty, possibly shale waching out.
- 5700-5710 SANDSTONE; wedium light groy, unconsolidated, coarse to very coarse grained subangular to subrounded, Hull quartz, in part vitroous, fairly common tinted grains, traces pyritic coment and abundant grains with brown to grey argillaceous watrix adhering. 3% SANDSTONE; grey, vory fine to fine grained, abundant greenish and grey argillaceous/silty watrix.

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5710-5713 Very dirty sample. Percentages of component lithologies obscured shale as above. 35% SILTSTONE; dark greyish brown, slightly micaceous and carbonaceous, moderate to very argillaceous, grading to. 35% SHALE; dark brown slight to very silty, with platelets of bluish groy bentonitic (?) shale. Occasional very fine to fine grained sandstone. Occasional very fine to fine grained sandstone.

Bit change at 5718

micacoous silty.

5718-5730 70% SANDSTONE; light grey unconsolidated very fine to very coarse grained occasionally silty, sub-angular to subrounded clear to elightly cloudy quarts grains, traces orange, greenish and red quarts grains.
20% SANDSTONE; light grey very fine to fine grained silty subangular quarts grains with traces to 5% carbonaceous watter with 30-40% knolin watrix tight.
10% Shale, dark grey, carby, slightly silty, slightly wicaceous, fire, traces bedding.

- 5730-5740 50% SANDSTONE; unconsolidated fine to very coarse grained as above, traces pyrite comented sandstone. 40% SANDSTONE; light grey dirty, very fine to fine grained, in part very silty, with dirty kaolin matrix, tight. 10% SHALE dark grey carby and dark brown slightly silty.
- 5740-5750 70% SANDSTONE; unconsolidated very fine to very coarse grained, generally coarse grained as above. 20% SANDSTONE; grey, very fine to fine grained, silty with occasional medium or coarse grained, with up to 40% greenish or grey clay matrix. Traces felspar, carbonaceeus material and ? glaucenite. Common grey dirty koolin sandstone as above. 10% SHALE; dark grey as above in part very silty grading to an argillaceeus siltstone.
- 5750-5760 30% SANDSTONE; unconsolidated as above very fine to very coarse grained. 50% SANDSTONE; light grey very fine to fine grained silty arginaceous, composed of quartz with traces carbonaceous matter, with slightly keelin argillaceous matrix tight. 20% SHALE; dark grey carby very silty grades to an argillaceous siltstone; in part slightly sandy, slightly miceceous.
- 5760-5770 Poor samples since new bit. 30% SANDSTONE; unconsolidated as above traces pyrite cemented sandstone. 30% SANDSTONE; as above tight, in part very cilty 10% SILTSTONE; mid-dark grey, in part sandy, in part very argillaceous. 30% SHALE as above, grades to argillaceous siltstone carby. Occasional dark brown sandy and slightly bentonite.

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- 5770-5780 30% SANDSTONE; uncensolidated as above very fine to very coarse grained. 40% SANDSTONE; grey to white, very fine to fine grained occasionally silty, with argillaceous slightly kaolin matrix, or slightly calcareous matrix (white variety). Tight with occasional traces peresity. Slightly friable. 30% SHALE; black to dark brown, silty, and sandy grades to siltstone, carby.
- 5780-5790 10% SANDSTONE; unconsolidated modium to very coarse grained as above. 60% SANDSTONE; grey dirty very fine to fine grained silty, carby, slightly micaceous, with argillaceous in part haolin matrix, tight, fricblo. 30% SHALE; as above very silty and slightly sandy.
- 5790-5800 20% CANDETONE; nuccessilicated as above. 30% SANDETONE; dark groy very argillaceous very fine to fine grained, tight. 50% SELTSTONE - SHALE dark groy as above carby slightly sandy.
- 5800-5810 30% SANDSTONE; unconsolidated modium to vory coarse grained as above. 40% SANDSTONE; vory fine to fine grained slightly silty, argilloceous corby, slightly wicecocus tight with earby stringers and traces bedding. 30% SILTETONE; SHALE as above with traces bedding.
- 5810-5820 30% SANDSTONE; unconsolidated modium to very coarse grained subangular to subrounded quartz grains, traces erange quartz. 30% SANDSTONE; very fine to fine grained grey, silty, frieble, argillaceous, tight with occasional traces perosity, slightly earby. 30% SILASTONE; dark grey very argillaceous very carby, slightly micaceous, in part sandy, generally grades to a silty shale. Firm, well bedded. 10% SHALE; black earby slightly silty, firm, well bedded.
- 5820-5830 40% SANDSTONE; uncensolidated as above, traces chert. 40% SANDSTONE; very fine to fine grained as above with common grey, hard calcareous watrix, tight, with considual course to very coarse grains of green chert and pink quartz. 10% SILASTONE; as above. 10% SHALE; as above.
- 5830-5840 50% SANDSTONE; unconsolidated medium to very coarse grained subrounded to subangular quartz grains as above traces pyrite cemented sendstone. 30% SANDSTONE; very fine to fine grained, grey, silty, argillaceous with traces carbonaceous matter, occasionally medium to very coarse quartz grains, tight. 20% SHLTSTONE; dark grey to grey, firm, argillaceous in part condy grading to very fine grained sendstone as above, slightly micaceous. Common carby streaks in sandstone and siltstone.

- 3840-5850 40% SANDSTONE; unconsolidated medium to vory coarse grained as above. 10% SANDSTONE; very fine to fine grained as above. 50% SILTSTONE; grading to shale, dark greenish groy; very argillaceous slightly carbonaceous slightly micaceous, in part slightly sandy.
- 5850-5860 50% SAMDSTOME; unconsolidated medium to very coarse grained subangular to subrounded quartz, traces pyrite comented sandstone. 20% SAMDSTOME; light grey very fine to fine grained well sorted quartz with traces carbonaceous matter with 20-30% kaclin matrix, traces perceity. 30% STLASTOME; dark grey argillecoous. occasionally sandy firm, carby, micaceous, well bedded, grades in part to shale.
- 5860-5870 A0% SANDSTONE; light grey unconsolidated, medium to very coarse grained well sorted subrounded to subargular clear to slightly cloudy rare yellowish and orange quartz grains.
  20% SANDSTONE; very fine to fine grained in part silty light grey to white, clean or slightly carby and argillaceous, traces grey lithic grains, traces glaucenite ? with 20-40% kaolin or argillaceous matrix, generally tight with clean white variety having poor to trace peresity.
  40% SILTSTONE; dark grey to black argillaceous to very argillaceous, in part slightly sandy in part coarsely sandy, firm, slight to very carby, slightly micaceous, well bedded, grades to grey silty sandstone, tight, or black stity shale.
- 5870-5880 40% SANDSTONE; unconsolidated medium to very coarse grained, as move traces pink quartz. 20% SANDSTONE; very fine to fine grained as above generally tight with traces percently, with common green lithic spex. 40% SILTSTOME; as above grading to shale.
- 5880-5890 Trip sample (poor sample) 10% SANDSTONE; unconsolidated, coarse to very coarse grains. 40% SILTSTONE; medium groyish brown, coarse, slightly argillaceous to very argillaceous and in part grades to silty shale, slightly micaceous and carboneceous, traces green cluy spacks and rare red quarts, in part very fine candy and grades to very fine grained silty sandstens. 10% SHALE; madium groyich brown, slightly wicecoous moderately to very silty, platy. 40% SANDSTONE; light to modium brownish grey and groyish brown, very fine grained, in part fine grained subangular quartz, slightly to moderately silty, keolinitic matrix, good earthy porosity traces intergenular porosity, moderately friable in part grades to sandy siltstone.

5890-- 5900 Poor sample returns. 5% SANDSTONE; unconsolidated as above. 66% SANDSTONE; white to light gray, very fine grained, in part fine grained, subangular to subrounded quartz, rare pink quartz grains, occasionally green clay grains, slightly micaceous (biotite) or more probably slightly carbonaceous, kaolinitic cement, good earthy porosity.

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	5% SANDSTONE; greyish brown as above. 20% SILTSDDE; as above 10% SHALE; as above.
<u> 5900 5910</u>	Peor sample returns 35% SANDSYCHE: Light grey, uncensolidated, very peorly serted, fine grained to very coarse grained, cubrounded quarts, fairly common tinted graine. 35% SANDSTUME; white to light grey, as above predominantly fine grained and with fairly abundant white clay grains, peor intergranular and good to earthy peresity. 30% SILTSTOME; as above and modium light grey, moderately micaceous and carbonaceous, common green chleritic (?) patches, cearse and grades to sandstone.
<u> </u>	Poor sample returns. 65% SANDSTONE; white, unconsolidated, medium to very coarse grained, prodominantly coarse grained subangular to rounded quarts. 20% SILTSTONE; light to medium gray, mederately micaceous and carbenceous, well consolidated, clightly to mederately argilleceous, in part sandy and grades to 10% SMADSTONE; as above but generally more argilleceous. 5% SHALE; as shows.
5920-5930	Peor sample returns. 15% SANDSTONE; white, unconcolidated as above. 50% SANDSTONE; white to light grey, very fine to fine grained, rarely medium grained subangular subrounded quartz, fairly common green clay grains, friable, very good earthy and fair (3%) intergranular perecity; generally slight to moderately micaceous (suscevite and blottte) and carbonaceous. 15% SANDSTONE; light to medium grey, slightly mederately argillaceous, in part mederate to very slity, very fine to fine grained quartz with very common green flecks and grains (chloritic clay?) 20% SILTSTONE; as above. 5% SHALE; as above.
5930-5940	10% SANDSTONE: light groy, unconsolidated. 50% SANDSTONE: medium to dark groy, slightly to modoratoly micaceous and carbonaceous, slightly argillaceous in part, cearse, in part very fine and finally condy, grades to 03% SANDSTONE: light to medium groy, very fine grains in part fine grained, quartz, slightly micaceous and carbonaceous, mederately friable, silty in part clightly argillaceous, tight. 5% SHALE as above.
594c- 5950	Poor sample roturns. 10% SANDSTONE; white to light grey, unconsolidated. 60% SANDSTONE; light grey, very fine grained subangular to subrounded quarts, traces pink quarts grains and rare green grains (glauconite ?) generally slight to moderately silty, well consolidated, siliceous cement, slightly knolinitic matrix, possible with fair earthy peresity - grades to -

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25% SILTSTONE; medium dark gravish brown, green spex, moderately micaceous, moderate to very argilleccous. 5% SHALE: dark grow to black, moderate to very silty, micaceous.

5950-5960

5% SANDSTONE: light grov, uscancelidated as above. 70% SANDSTONE: light to medium light brownish grey, very fine grained, eccasionally fine grained subergular quarts, slightly missessons, slightly medium carbonacceve in part, generally only slightly plity but in part molerate to very silty and grades to silteters, well corted, very friable good earthy peresity and possibly fair intergranular peresity. 20% SIIASTONE: medium to desk grey and brownich grey, corres misseened in part mederate to very argilizecous. 5% SHALE: as above.

5960-5970 40% SHALE; Light grov, unconsolidated, coarse to vory coarse, subrounded to rounded, clear to slightly claudy, quartz, coensionally suber and rare orange tinted grains. 20% SANDSTONE; light groy to very fine grained as at 5950, occasionally green grains. 40% SILASTONE; medium to medium dark grey, slightly brownish, coarse generally very fine sandy, occasionally grownish flocks, slightly carbonaceous and micaceous, in part gradee to silty chale.

5970-5980 50% SANDSTONE: light groy, unconsolidated coarse to very coarse grained rounded to subangular querts grains with rare vollowish quartz grains. ho% SANDSTONE: very fine grained light grey hard and occessionally greenish clay pellots, tight. 10% STLTSTONE: dark grey, occasionally brownish slightly sandy argillaceous, carby slightly micacoons.

5980-5990 50% SANDSTONE; light grey unconsolidated coarse to very coarse grained subaugular to rounded clear to cloudy with traces orange tinted quartz grains. 20% SANDSTONE; light grey very fine to fine grained, slightly silty, composed of quartz grains with traces mice, green and grey lithle grains, carbonaceous streaks with haclin slightly dirty, matrix, tight. 30% SILSTONE; modium to dark grey, firm carby argillaceous, slightly condy, slightly micaceous. Common pyrite compated very fine to fine grained sandstone.

5390-6000 40% SANDSTONE; light grey uncenselidated coarse to very coarse with traces medium quartz grains, rounded to subengular clear to cloudy quartz grains, traces amber quarts. 30% SNADSTONE; very fine to fine grained as above light to mid grey, with dark variety being more carby and with a grey clayer matrix and with common green clay pellets. Tight. 30% SILESTONE; as above grades to the darker very fine grained candetene. Very common pyrite comented very fine to fine grained candetene. 6000-6001 Circulated lag tise + 1 hour 70% SANDSTONE; light grow unconsolidated course to very coarse grained, preferimently course grained, subengular to rounded elser to cloudy with evenge, pink and yellewich quartz grains, traces grey quartz. 20% SANDSTONE; very fire grained silty as above tight. 10% SILTSTONE; dark grey as above slightly candy

argillaccoup, slightly carby te carby.

CORE NO.13 6001-6016 Cut 15' recavered 101'

60011 - 600114"

STLASTONE; dark grey, black, very sundy (soud consists of very fine to fine sugular to subangular grains of quarks, which occurs disseminated and aloo in suall lonces and stringers), very argillococus, very alightly micecous. Traces of glauconic and some green grains possibly of clay. The core contains occesional medium sined grains of quarts. Sand grains comprise about 30% of the volume of the core. There is no bedding definition but the orientation of several elongate londes of sand suggest that the bedding dips very gently.

5001 h"-600512"

SANDSTOND; dark grey, (clightly greenish grey when wet), very peorly serted, consists of very fine to very coarse grained, angular to subrounded quartz grains, occasionally white kaolinitic grains, occasional red quartz grains and occasional green clay grains sot in a matrix which is variably brown, argillaceous/silty or light grey kaolimitic. Prodominant grains size is fine grained. Lenses and angular fragments of shale up to pebble size are cousion. In parts of the core fungments of light groy, kaolinitic saudstone are set in a matrix of sandy brown clay. The candetone is slightly microsous and is for the most part carbonecous. It is well consolidated and tight. Carbonaccous plant fragmonts in part pyrized, are not uncomon. The core exhibits a "chaotie" or "churned-up" toxture suggestive of deposition under shallow veter conditions and of organic reverking. Anizal burrows are procent within the core but are not consum. The dip of the bodding is not discernible.

6005'2"-6005'11"

SAPETONE: as above. Productionally fine to medium grained quarks set in a wadium grannish gray matrix of clay. The core contains about 30% "clay balls" (up to 3 inches along their major axis) of light brownish grey, very sandy and silty clay.

## 6005'11"-6009'0"

SANDSTONE; similar to that at 6001'4". Poorly sorted, predominantly fine to medium grained, subangular to subrounded quarts, with fairly common white knolin and green clay grains, set in a matrix which is variable medium brownish grey to dark grey, silty, slightly carbonaceous, or very light grey, kaolinitic. Grain size ranges from very fine grained to pebbly. The amount of matrix is in the order of 35% but in parts of the core where fragments of sendstone are set in a matrix of very sandy clay, the percentage of matrix is as high as 70%. Several zones include greyish brown, sandy "clay balle". The core is tight. The core exhibits a "chaotic" texture indicative of shallow water deposition and of extensive re-working while in a semi-consolidated state.

600910"-600917"

SANDSTONE: light grey, slightly greenish, poorly sorted, very fine to very coarse grained, predominantly medium to coarse grained, subrounded quartz grains, occasionally tinted quartz grains 5% dark greenish grey and white clay grains, very friable, poorly comented with 10% keelin coment, excellent intergranular percenty. Abrupt contact defined by pebble band.

600917"-601112"

Intermined sandstone and vory sandy shale to very argillacoous sandstons. SAMDSTONE; light grey, very fine to very coarse grained, prodominantly very fine to fine grained. subangular quartz, common tinted and occasional white clay grains, moderate to very silty, slightly micaceous, in part with a brown argillaccous matrix, in part with a white kaolinitic matrix, tight ... SHALE; dark grey, slightly brownish, very sandy (very fine grained to fine grained) very silty grades to very argillaceous sandstone, tough well indurated. The core shows well developed microstructure indicative of shallow water deposition; 1.c. scour and fill, interrupted bedding, compaction structure, sendstone "balls". Bedding dips are in the order of 0° to 8° but are not reliable.

## 6011:2"-6011:4"

SANDSTONE; light grey, very fine grained, quartz 5-10% green, red and black grains, silty, well sorted, compact, kaolinitic matrix, tight.

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6011:4"-6011:6" SANDSTONE; and sandy shale as at 6009!7"

6012:6"-6026:0"

Not recovered.

6016-6020 Very poor cample - - wuddy, 80% CEMENT 10% SILTSTONE; light groy and brownish groy, woderately micacoous, fairly frieble 5% SILTSTONE-SHALE; modium groy, slightly chloritic, slightly micaceous, vory argillaceous scattered very fine to fine sand grains. 5% SANDSTONE; unconsolidated to very coarse grained size. 6020-6030 Peer comple. SILTSTONE: modium light to medium dark grey, woll indurated, moderately argillaccous, moderately carbonaccous in part (carbonaccous fleck) some chloritic elements, in slight part sandy - grades to 10% SHALE: modium grey, very silty platy. 5% SAMESTONE: modium grey, very fine to fine grained, silty, abundant argillaccous matrix. Common massive pyrite. Abundant subrounded cearse to very cearse quartz grains.

6030-6040 SILTATONE; medium groy, slightly groonish, slight to moderately micaceous, generally with cosmen enchanceous specks, slight to moderately argillaceous, in part cease and grades to silty vary the grained candotous. 10% SMALS; medium darks to dark groy, sidecous platr. 5% Uncenselizated course to public sized subrounded to nounded quarks grains. Operatorally postly seried angillacous candotone. Neaces chart public; traces public.

5040-5050 SELESTONE: medium grey medorately to very carbonaccens, slight to mederately microscens, well informated, very ergillaceous and grades to silty obals. 15% SMALE: medium grey very silty. 10% SAIDSTONE: Light to medium grey, very fine grained, in part fine grained, silty, subrounded quarts, in part clean with white kaolinitic matrix in part argillaceous and silty with some green graine, tight. 5% Unconsolidated, medium to very coarse sand grains. Occasionally pyrite comented sandstone; occasionally massive pyrite.

- 6050-6060 30% SILTSTONE; modium groy, argillaceous as above. 10% SHALE; modium to medium dark grey, moderately micaceous, slightly carbonaceous, silty, platy 60% SANDSTONE; light groy, predominantly unconsolidated, vory fine to granule sized, prodominantly coarse grained, angular and subrounded quartz, white kachin matrix, traces pyrite coment; probably with good earthy peresity and peer intergranular peresity; mare consolidated chips include grains of pale green chloritic clay.
- 6060-6070 30% SAMDSTONE; uncensolidated, peerly sorted querts grains, ranging to pebble site, as above. SIMENTONE; undern Light to medium group, mederately to very contenderates, underably miceocous, generally moderate to very anyillecocus, chloritic grains, in clight part grades to silty very fine grained conditions. 10% SMALE; redium to medium dark groy, silty, wiceccus and carbonaceous play - chunky. Fairly cornon massive pyrite; traces crystalline pyrite aggregate.

6070-6080 Muddy sample. SILTSTONE; modium light groy, moderate to very micaccous and carbonaceous, generallymmodorately argillaceous, firm, in part very fine to fine sandy.

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## grades to 10% SHALE; modium grey, silty, micaceous and carbonacoous platy and chunky. 5% SANDSTONE; white to light grey, generally dirty, fino grained quartz with common green clay grains, kailinitic matrix, in part silty and argillaceous, earthy porosity. 20% Unconsolidated quartz grains, as above. Traces of sandstone in pale brown sideritic watrix.

6080-6090

60% SANDSTOME; light grey, uncensolidated, poorly sorted, very fine to very coarse grained subangular to subrounded quartz, traces yellow and erange quartz, traces groon elay grains, watrix, probably as in sandstone below. 25% SANDSTOME; light grey, very poerly sorted, very fine to very coarse grained, predominantly medium grained quartz and common sea-green chloritic grains in an abundant matrix of pale brown sideritic ? clay and sidezito; in part kaolinitic, slightly carbonaceous, tight. 15% SHLTSTOME; as above grading to sandstone. Traces pyrite.

6090-6100 SIL/FSTONE; medium grey, in part medium dark grey moderate to very carbonaceous, slightly micacoous slight to moderately argillaceous, chloritic elements firm, rarely pyritic grading to 10% SHALE; medium to dark grey, very silty, blecky and chunky. 10% SANDSTONE; light grey to brownish grey, poorly corted, as above. 15% SANDSTONE; unconsolidated grains as above.

- SANDSTONE; light grey, very fine to fine grained 6100--6110 (prodominantly fine grained), occasional medium grained, subangular quarts, rare groon clay grains traces black coal (?) grains, slightly silty, very slightly micaceous, moderately frinble, kaelinitic to silty matrix, moderate carthy porosity, slight )3%) intergranular porosity. grades to 20% SILESTOME; very fine grained sandstone modium light to medium groy, micaceous and elightly carbonaccons, common green specks, moderately to very kaolinitic, in part argillaceous. 5% SHALE; groy clivy. 5% SAMDETONE; unconsolidated poorly serted quarts grains. Occasional aideritic sandotone ne above.
- 6110-6120 STEASTONE; medium lightto modium grey, ccarse moderately annoty (very fine to fine grained quarts) moderate to very carbonaccous, abundant groon chloritic grains, alightly micascous. grades to 30% SANDSTONE; medium light gray, very fine grained in part fine grained, mederate to silty, chloritic and koolinitic elements, tight. 10% SANDSTONE; meancolidated, coarse to very coarse subrounded grains.
- 6120-6130 SANDSTONE; white to light grey, unconsolidated, very poorly sorted, fine grained to granules sized occasional publies, subangular to subrounded quartz probably with kaolinitic matrix and good inter-

granular and earthy peresity.

25% STL/STORM - very fine grained conditions medium light grey, as above. 10% SHALE; medium dark grey wicaceous carbonaceous very silty. Traces fine grained conditions with light brown sideritic clay matrix. Occasionally very micaceous shale lawings.

6130-6140
20% SANDSTONE; light gray, poorly sorted very fine to very cearse grained (prodemantly very fine grained with 20% cearser grains), subangular to subrounded quartz.
60% SANDSTONE; white to very light grey, very fine grained, in part fine grained subangular to subrounded quartz, traces groon grains, slight to mederately microscous, slightly silty, good earthy peresity and probably fair intergranular peresity (average 80%) friable.
20% SHALD and SIL/STOFE; as above.
Traces very fine to fine grained sandstone with sideritie (?) essent.
Common corbancesous/sidercous (bictite) partings.

6140-6150 SAMDSTONE; white to light grey, uncensolidated, very poorly sorted, fine grained to granule sized predeminantly coarse grained, subangular vitreous quarts, rare vellowish and pickish quarts grains, haplinitic and in slight part pyritic coment, probably very good perosity. 15% SAMDSTONE; white to light grey, very fine to fine grained as above. 5% SAMDSTONE; buff, very fine to fine grained, quartz eccasionally white keelin grains and green clay, grains, widescens, sideritic (?) cement, friable, slightly perous in part and occasionally sandy argillaceous siderite. Occasionally measive pyrite; commen micaceous partings.

6150-6160 50% SANOSTONE: white to light grey, unconsolidated as above with occasionally rounded quartz pobles. 40% SANDSTONE: light grey, very fine grained, in part fine grained occasionally medium to coarse grains, subangular quarts, with occasional green and round grans, poorly sorted, friable, kialinitic matrix, generally silty and slightly carbonaceous moderately michecous with very micaceous laminations grades to 10% STLESTONE; mederately grey, very fine sandy to moderate to very micaceous in part argillaceous

Occasionally monstre prite.

6160-6170 Deminantly sondstons; white to light groy, very fine to fine grained, subangular quartz occasionally green clay grains and white boolin, peorly sorted with southered medium and course grains, friable, good carthy percenty; in part clean but commonly slightly silty and argillaceous, knolinitic matrix slightly to wederately carbonaceous and micaceous, grades to siltstone. 10% SILTSTONE; as above. 5% Unconsolidated quartz grains as above. Occasionally sideritic cemented sondstone;

occasionally pyrite and pyritic sandstone.

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- 6170-6189 SILTSTONE; medium light grey, coarse, micaceous carbonaceous, kaolinitic, common green clay grains, grades to 30% SANDSTONE; as above. 25% Unconsolidated quartz grains to pebble size.
- 6180-6190 10% SHALE; dark grey, icaccous, very silty blocky 50% SILTSTONE; medium light grey coarse, kadlinitic slightly micaceous, slightly carbonaceous, in part moderate to very argillaceous and carbonaceous pink and green grains. grades to -20% SANDSTONE; medium light grey to light grey, very fine grained silty, common pink and green grains. 20% Uncensolidated poorly sorted quartz grains.
- 6190-6200 Variable sample
  15% SHALE; medium dark groy, slightly brownish moderately micaceous, moderate to very silty, slightly waxy, platy to sub fiscile.
  26% SILTSTONE; medium to light groy coarse; with micaceous and argillaceous laminations; grades to very fine grained sandstone.
  10% Unconsolidated poorly sorted, fine grained to granule sized, subangular quartz.
  45% SANDSTONE; white to light grey, fine grained, in part very fine grained, angular to subangular quartz, 5-10% pale green clay grains, rod grains, with occasional kaolin and erbonaceous grains, moderately friable, tight; in slight part dity.
- 5% SHALE: as above very silty and micaceous.
  20% SILTSTONE; medium light to medium grey, moderately micaceous, slightly argillaceous, coarse and grade to very fine to fine grained silty sandstone.
  55% SANDSTONE; light grey unconsolidated, very poorly sorted, fine grained to pebbly, angular to subrounded quartz and rare chert grains; matrix probably as below. Predominantly grain size is very coarse.
  20% SANDSTONE; white to light grey, as above. Traces andstone with sideritic cement.
- 6210-6220 SANDSTONE; white, unconsolidated, very poorly sorted medium grained to pebbly (predominantly coarse to very coarse grained with 20% granules and pebbles) subangular to subrounded quartz, possibly with haclinitic and lesser sideritic and pyritic coment. 15% SANDSTONE; white to medium light groy, very fine to medium grained quartz with minor green clay and black carbonaccous grains, in part clean but generally dirty and carbonaccous, in slight parts with traces of interganular poresity. 5% SHALE and SILUSTONE; as above. Common pyrite comented sandstone and fairly common sideritic sandstone.
- 6220-6230 SANDSTOND; light grey unconsolidated, poorly sorted, prodominantly coarse grained variably comented with kaelin, siderite and rarely pyrite 20% SANDSTONE; very light grey, fine grained, subangular to subrounded quartz, with scattered coarse to granule sized grains, very poorly sorted friable, kaelinitic/sideritic clay matrix, siliceous coment, moderate intergranular persity (12%) 10% SHALE; dark grey, moderate micaceous and carbonaceous, tough, blocky, very silty.

6230-6240 15% SHALE; dark grey, very micaceous, slightly silty, sub-fissile.
25% SILTSTOME; medium to grey, moderate to very argillaceous, moderately micaceous and carbonaceous, grades in part to sandstone and in part to shale.
5% SANDSTONE; as above.
55% SANDSTONE; light grey, unconsolidated, fine grained to pebbly, predominantly modium to coarse grained, subangular to subrounded, quartz, cement probably pyritic, sideritic and in part kaelinitic.

62h0-6250 25% SHALE; dark grey, very micaceous, moderate carbonaceous, platy to sub fissile, silty, and grades to -70% SILTSTONE; medium light to wedium dark grey, moderate to very carbonaceous, slight moderately micaceous, traces glaucenite, occasionally very finely pyritic, in part argillaceous. 5% SANDSTONE; light grey, uncensolidated, as above Occasional massive pyrite.

6250-6260 Predominantly SIL/ISTONE; medium grey, moderate to very argillaceous, very carbonaceous, with 16% SHALE as above. 40% SANDSTONE; light grey, unconsolidated very poorly sorted but predominantly fine grained, subangular to sburounded quartz. 3% SANDSTONE; light brown, poorly sorted quartz in abundant sideritic matrix, tight. Traces haematite stained round chart granules. Occasional pyrite.

6260-6270 SHALE; medium to medium dark grey, mederate micaceous and carbonaceuus, mederate to very silty grades to -30% SILTSTONE; modium light to medium grey, very argillaceous. 15% SANDSTONE; light grey, unconsolidated, poorly sorted, quartz grains. 1% light brown, sideritic sandstone and clay. Occasional massive pyrite. Occasional quartz pebbles.

SHALE; medium dark to dark groy, moderately 6270-6280 micaceous and carbonaceous, silty, slightly chlorithe graine, chunky to platy; grades to -35% SILASTOME; modium light to modium grey coarse slight to rederately micaceous and carbonaccous, in part clean but predominantly slightly argillaceous. 15% SAMDETONE; whate to light groy, very fine grained quartz, silty, kaclinitic matrix, tight. 2% SIDERITE; medium ligth brown, microcrystallinecryptocrystalline, in part sandy (fine to medium grained quartz) silty and slightly argillaceous. Occasional massive pyrite; occasional fine to medium grained, pyritic sandstone. 10% SANDSTOME: unconsolidated, modium to granule sized, subrounded quartz, in part stained yellowish and orange; traces of pyrite coment.

6280-6290 SILTSTONE; modium light groy, compact, coarse, micaceous and carbonaceous slightly argillaceous, fairly common groon chloritic grains. 20% SHALE: modium to modium dark groy, moderate to very silty, tough, slightly micaceous, platy to chunky.

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55 SANDSTONE; light groy, very fine grained, silty tight. 35 SANDSTONE; variable, light groy to white, reav fine to modium grained, in part with green chloritic shale grains, in part purific, in part with abundant sideritic coulent. 25 Unconsolidated quartz grains as above with occessional rounded quartz puble.

6290-6300 SHASTONE; wedium gror, moderately micacous, coarse, compact, slightly argillacous, slightly moderate extense econs, grades to very fine grained sandatone; 25% SANDSTONE; light to modium lgith grey, very fine grained, quarts ware green and red grains, considerably with white kanlin grain, slight to mederately with white kanlin grain, slight to mederately with white kanlin grain, slight to mederately with the second and the second (consideral sector and suderitic sendatone; consideral sector grained and the second with abundant parity maked. Traves round quarts granules and

STATETOME: redium light to modium groy, sizecous
and carbounceens, moderate to very argillacoous
in slight part sideration? - graden to STATE: understonecous.
SAMDE: understonecous.
SAMDE: light grey very fine grained, dirty
tight.
Occasional massive praise; consideral pyritic
candatone.
STEMETH; wedium brown, cryptocrystalline to

pebbles.

6318-6320 SINFFYORE; modium to modium dark grow, compact, slightly avgillaceous, traces groon grains, slightly moderate microsous, wederately carbonaceous. 155 SFME as above. Operational your fine grained and fine grained samistone; first, common siderite and sideritic slay ironshops; consional yound guart granules; traces block questaits granules.

6330-6330 20% SIIMFTONS; rodium Cark groy, modorato to yony argilloceouc, riccomum corbonaceous, in part very fine to sandy, in slight part yyritic; gredos to --

55 SUMPERAS above. 205 SAMESTONE: white to pale brown, firs grained, subrounded quarty, eccadenal very fine grains, alightly chity in part, clightly frichle, eccasionally relation and phil quarts grains, predominantly childerus eccess, some hadivitie and sideritic coment; eccasionally with fair (10%) intergranular percenty; generally with maderately cortby percenty, this conditions probably matrix for conditions below. 55% SAMESTONE: white, unconsolidated, very peorly corted, course grained to granules size, subreunded slightly cloudy quarts. Occasional pyrite computed condutions; fairly contain olderitic conduction and stady siderite.

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6339-6340	SANDSTONE; white, very fine to wadium grained, productionally wodiwn grained, subsugalar to subrounded, quarts, peorly sorted, well consolidated silicatus comput, in slight part with sideritic or kachimitic conent, in part with peor intergranular peresity. 20% SANDETONE; white, unconsolidated, wodiwn grained to gravulo sized subengular to subrounded cloudy quarts and accessional grey quartz graine, dorived from sandstone above. 2% SANDETONE; brown, peorly period, quartz and common white boolin grains, very abundant siderite common white boolin grains, very abundant siderite siderithe isonstone. Traces pyritic sandstone, pyritized wood, siltstone and shale.	
63%05350	20% SAMDSTONE; white, very fine to medium grained, as drave. 25% SAMDSTONE; white, unconsolidated, very poerly sorted quartz grains as above. 20% SAMDSTONE; light to medium brown, very poerly sorted fine grained course grained quartz and occesional white clay grains, tough, command by siderite (up to 45%) and in part by pyrite, tight. 35% SIMASTONE; medium light to medium groy, sandy argillaceous micaccous and carbonacsous, grades to shale.	
6350-6360	Variable sample. Interbedded and gradational. SHLTSTONE; modium grey, moderately micaceous, slightly carbonaceous in part. argillaceous in part, traces glauconitic, sendy in part; grades to 10% SHALE; modium grey, moderate to very silty, platy to chunky. 5% SANDSTONE; brown, sideritic, as above. 10% SANDSTONE; white to light grey, very fine to medium grained, tight, as shove. 20% Leese guartz grains. Traces massive pyrite and sideritic ironstone.	
6360-6 <b>370</b>	15% SILTETOPE; as above. 5% SHALE; as above. 30% SANDETONE; white, unconsolidated, wedium grained, angular to subangular, quartz, siliceous to siderithe coment, in slight part pyritic, poor intergranular percus. 35% SANDETONE; wedium light brown, poorly serted, quartz and occasional white sley grains, comented by an abundant watch of siderite and grading to sendy siderite.	
6370-6 <b>380</b>	10% SANDSTONE: modium light brown, an above. 15% SILTETONE: ac above. 10% SANDSTONE: white to light brown as above. 5% SHALE: medium grey, very silty, michooous. 60% SANDSTONE: white, unconsolidated, as above.	
6380-6390	10% SHALE and SILTSTONE; as above. 90% SANDSTONE; white to very light groy, very fine grained, angular quartz, 2-3% gree, reddish brown o and black accessoraes, clean, woll sorted ? ( may include scattered fine to coarse quartz grains), well comented with silica and minor amount of carbonate, slightly calcareous, tough, tight, trace delocite vein.	

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6390-6400 20% SANDSTONE; as above. 60% SANDSTONE; white, unconsolidated, very poorly sorted quartz to granule size, clear to slightly cleady, 10% SHITSTONE; as above. 10% SANDSTONE; sidevitie, as above. Occasional massive pyrite. Traces wein delomite.

6400-6410 Trip sample SHASTONE; modium to modium dark groy, slight to moderately miceaceous and carbonaceous, very finely sendy, generally moderate to very argillaceous and grades to 20% SHALE; modium to dark groy, moderate to very stity, platy to blocky. 15% SAMETORE; unconsolidated, possily sorted, modium grained to grouple sized, angular to rounded quarts grains, resoly with traces of pyrite coment. 5% SAMETORE; while to light grey, consolidated, veriable from very fine grained and clean to modium grained with abundent sideritic coment. 0ccessionally massive pyrite; occasional sideritic claystone.

6410-6420- SILTSTONE; as above, mederate combonecous. 10% SHALE; as above, very silty. 5% SANDSTONE; light grey, very fine grained quartz traces green grains, very silty and mederately argillaceous tight. 65% SANDSTONE; light grey, very fine grained, to granule sized, angular subrounded quartz, very poorly serted comprising matrix of very fine grained to fine grained quartz with 30% coarser srains, rare white kaolin grains and traces of reddish grains, traces carbonaccous and micaccous mederately silty, friable, siliceous coment, good earthy perceity and traces intergranular perceity. Traces siderite, eccasional massive pyrite.

- 5420-6430 10% SHALE; modium to dark grow, tough, silty; in part very fine and finely sandy, blocky, grades to siltetone. SAMESTORE; white to light grey, uncenselidated, fine grained to granule size, predominantly coarse grained, peorlybearted, clean, predominantly subangular but commen well rounded, clear to slightly cloudy grains; rare consolidated chips are computed with silleaceous and have traces (1%) of intergranular perceity; peoclaly with fair earthy perceity. Fairly commen chips of very fine to medium grained dirty quartz conduction with abundant pyrite comment traces of siderite and silvertic sendstone.
- 6400-6440 SAMDSTONE; as above but in part consolidated and predominantly coards to very coards grained with eccasional well rounded quarts pebbles. 25% STLASTONE; as above grading to shale. Abundant massive pyrite and pyritic sandstone, occasionel siderite and sideritic sandstone.

- 5440-6450
  SANDSTONE; white, very poorly sorted, fine grained to granule sized, 65% coarse grained to granule sized subrounded to round quartz graine in matrix of fine to medium grained subangular to subrounded quartz candetone, minor amounts of white kaolin matrix, silicoous cement tight.
  5% STLTETONE; medium greenish groy, coarse, argillaceous.
  2% SHALE; medium groy silty, sub-fissile.
  1% Pyrite and poorly sorted quartz sundatone with 40% pyrite matrix.
- 6450-6460 Very poor sample; probably as below.
- 6460-6470 Brilling time indicates section penetrated is most probably shale or clay. Sample recovered as pasts. Shale modium light brownish grey, slightly silty, in part kaclinitic.
- 6470-6480 Interlaminated and gradational siltatons and sandstons with occasional shale. SILTSTONS: dark to modium gray and brownish gray coarse, generally moderate to very carbonaccous and very county, some chloritic elements, traces of glauconite ?, moderately argillaccous. how SANDSTOND; predeminently light to modium gray, very fine grained, quartz with occasional green grains, commonly carbonaccous and very silty, slightly micecous, often dirty, tight.

6480-6490 SIL/STONE; medium light to medium groy, coarse, predeminantly very sandy (very fine and occasionally fine grained quarts); variably carbonaceous, micescous and/or argillaceous, common green chloritic grains. grades to and interlaminated with 20% SANDSTONE; light to medium grey, predeminantly very fine grained, very silty, quarte with traces green grains, micaceous, dirty, tight. Occasionally silty shale; occasionally pyrite pyritic sandstone, sideritic andstone.

6490-6500 SILTSTONE; medium light to medium groy, as above. 20% SANDSTONE; as above variable. 10% SHALD; dark groy. silty, sub-fissile to platy. Occasional loose certse to very coarse quarts graine, traces ironatome; traces massive pyrite and occasional pocaly corted dirty quarts sandatone.

6500-6510 Interbadded and gradational anndatone and siltstone. SELESTONN; modium to dark gray, moderately sendy (very fine grained quartz), alight to mederately micacoene, mederately carbonaceous, traces green chloritic grains, trace round glaucomite grain, in part argillaceous.
30% SAMDSTONN; light to medium light gray, very fine grains, friable, vell carted, mederate to very silty, kaolimitic matrix, in part with earthy perceity.
10% SHALE; dark grey very silty.
Occasional presive pyrite.

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	Fairly common very fine to medium grained
	subaugular to subroundod quartz sandstone
	with abundant pyritic and/or siderltic cenent (up to 50%).
	Traces feldspar; occasional locso quarta grains.
6510-652 <b>0</b>	SILTSTOME; modium groy, slightly micacoous,
	genorally only slightly carbonacoous, woll indur- ated in part sidevitic - grades to -
	10% SANDSTONE; as above in part sideritic ?
	5% SHALE; dark grey vory silty. 2% SANDSTOME; dark brown, poorly sorted (silt to
	fine grained? with up to 60% sideritic matrix.
	5% Unconsolidated poorly sorted quartz grains, medium grained to granks size.
	Occasional massive pyrite, pyritic sandstone;
	traco chort.
65206530	20% SILASTONE; no abovo.
	5% SHALE; dank grey silty, chunky - sub-fissile 75% SAMDSTONE; light to medium light grey, very
	fine grained, engular to subangular, quartz,
	traces of green and roddich grains, slightly carbonaceous very slightly micaceous, slight to
	moderately silty, well sorted in part slightly
	pyritic, well cemented with silica and minor amounts of kaolin, year sarthy perosity.
	1% Sideritic ironstone (very sideritic siltstone
	and very fims grained sendstene) 3% Unconsolidated quartz grains.
	Occasional zassivo yyrite; trace quartzite.
65306540	15% SAMUSTONE; as above, becoming dirty and in
	part pyritic, in part sideritic grades to -
	10% SILASTORE: as above. 75% SANDSTONE: white to light grey, poorly sorted
	predominantly unconsolidated, modium grained to
	granulo sizod, prodominently very coarse grained, subangular, cloudy quartz, tences amber and pink
	stained grains, pyritic cement adhering to many
	grains (in part crystalling), probably with excellent intergranular perceity.
	Common messive pyride. # Fich tooth. Opensionally ciderite.
6540-6550	SANDSTOME: as above but decrease in grain size to prodominantly convect grained; the conditions
	includes grains of pyrite (as well ascomont);
	consolidated ships are comented with silica and delevatic eachemete and shew little perosity in
	the finer greined veriety; the conver grained
	ships have very good intergranular perceity in part.
	Tracos of desk gray quarteito grains.
	10% EINTSTONE: SANDSTONE: as abovo. Common passive pyrite: coordinal sideritic sandstone.
6850 6860	
6550-6560	SAMDETONE: ac above but with increase in proportion of concolidated chips; in part with kaclinitic
	matrix, but some pyritic and silicoous coment;
	average perceity possibly 8-10%. 5% SANDSTONE: light brown, fine to modium grained,
	sideritie. 15% SILTSTONE; modium to medium dark grey,
	argillacoous, slightly micaceous, carbonaceous
	sandy in part - grados to - 10% SHALE; es above.
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6560-6570

25% SILTSTONE; modium to dark groy, moderately ricacoous, slight to moderately carbonaceous argillaceous. 5% SHALE; dark groy, micaceous carbonaceous and moderate to very silty, platy-churky. 20% SANDSTONE; as above, fairly common dark grey quartz. occasional tinted grains, tracos chort. 50% SANDSTONE; light groy, very fine to predominantly fine grained, occasional medium and coarse grains, angular to subangular quarts, occasional dark grains, underste friable, poorly sorted, silicoous coment with in part kaclinitic coment and rare pyrite coment, fair intergranular and earthy poresity (6%) in part grades to dirty, very silvy, argillecocus candstone. Probably matrix for saudstone above. Common sandy siderite and brown sideritic sandstons common pyrite.

Variable lithology - interbedded and gradational

6570-6580 SILESTONE; modium light to modium groy, coarse slightly microsowa, clightly argillaccous, slight to moderately carbonaccous, in slight part pyritic wall consolidated, in part very finely candy and grades to -35% SANDSTONE; light to medium light groy, very fine grained, in part fine grained, very slightly carbonaccous, slity, tight. Occasional sideritic condition and easily pyrite.

6580-6590 55% SILTSTONE; medium to modium dark grey, slightly micacoous, moderately carbonaceous, argillaceous in part very fine and finely sandy grades to. 15% SHALE; dark grey, silty sub-fissile to platy. 30% SANDSTONE; light grey, predominantly uncenselidated, very poorly sorted modium grained to granule sized, predominantly coarse grained, angular to subangular quartz. Occasional eiderite, sideritic canditone, massive pyrite.

6590-6600 Trip sample. Poor quality. Lithology and percentages similar to 6580-6590.

6600-6610 SILTSTONN; modium light to moderately energily slightly slopcoup, slight to moderately carbonpeopue (flocks have linear existation), occasional oblaritie grains, slightly arguiteoorus in part, slightly court (vory floe grained) in part, lightly court (vory floe grained) in part, lightly court (vory floe grained) in part, slightly court (vory floe grained) in p

5510-5630 1.55 SIMPERCE: re above with common chlouitic graine, converse and grades to silty very fine grained conditions. 8.55 SAMDETONE: light gray, very fine to fine gradned, angular to cubangular quarks, occasional graen chlouitic clar grains, rare black grain, well corted, moderately silty, frieble, in part pyritic, knolimitic delemitic cement, fair (5%) carthy percepty.

6620-6630 Muddy sample. 20% SHALE or CLAY; washed out of sample? 75% SILASTONE; modium light grey, firm, coarse and generally moderate to very sandy (very fine grained), slightly micaceous and carbonaceous, abundant green chloritic clay or glauconite graine, in part argillaceous in part slightly pyritic in part sideritic/dolomitic - grades to 5% sendstone; light grey, very silty. Traces massive pyrite, pyritic sandstone, sideritic siltstone and sandstone.

6630-6640

Muddy sample. 60% SHALE of CLAY; washed out of sample? 25% STLFSTONE; medium dark grey, slightly micaceous and carbonaceous, very fine sandy in part, common green chloritic (?) clay and buff to white clay flocks, mederate to very argillaceous - grades to -10% SHALE; medium dark grey, mederate to very silty. 5% Siderite and sideritic siltetone medium brown.

6640-6650

50 Nuddy sample. 50% CLAY or SHALE; ground up by bit action and washes out of sample. Probably medium dark groy, slightly microsous and chrbonacsous, slight to mederately silty. 50% SILTSTONE; medium to medium dark grey, slightly brownich as at 6630-6640, slightly sideritic or delomitic in part. Common medium brown very sideritic, argillaccous siltstene with microcrystalline appear.

## 6650-6660 SHALE and SILTSTONE; as above.

6660-6670

50% CLAY of SHALE; ground up by bit, washes out of sample SILTSYONE; modium groy, slight to modium micaceous, and carbonaceous, common groon flecks, generally well indurated; coarse and grades in part to very fine grained sandstone, scattered fine to modium quartz grains. 10% SANDSTONE; unconsolidated, very fine grained, in part fine grained (20% modium to coarse) subangular to subrounded quartz grains. The very fine grained quartz probably present as sandstone lences while coarser grains probably scattered through the siltstone.

6670-6680

40% CLAY of SHALE; ground up by bit action washes out of sample. Possibly (at locat in part) kaolinitio and very silty. 30% SILASTOME; madium to wodium dark groy, as above but no fine to medius quarte in part preillaceons and grades to -10% SHALE; dark groy, elightly to moderately micacoous, slightly oprhomacoous, very silty, platy to chunky. 20% SAMDSTONE; white to light groy, very fine grained, in part fine grained, quartz, traces groon grains, occosional reddish brown and black grains, moderatoly woll serted, slightly friable, in part kaelhitic, cfton disty, slight micaceous and carbonaccous, silty, fair carthy perceity.

6680-6690

40% CLAY or SHALE; washer out of scribe. 40% SILTSTONE; similar to above. 20% SANDSTONE; as above, predominantly very fine grained and unconsolidated.

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6690-6700 70% CLAY and SMALE; ground up by bit action, washes out of cample; probably kaolinitic. 20% SANDSTONE; white to light groy as at 6670-6680.

10% SILTETONE; as above.

70% CLAY; washes out of sample. 20% SILTSTONE; as above. 6700-6710-10% SANDSTONE; as above.

70% SILASTONE; sedium dark to dark groy, slightly 6710-6720 micacrous. moderately carbonaceous, in part argillaceous and grades to shale. 30% SANDSTONE; light groy very fine grained, augular to subaugular quartz, woll corted, friable, medorate to very silty, knolimitle matrix, good earthy percenty, in part clean but often micassous cerbonaceous and argillacoous, in part moderate to very puritie. Occasional siderite and sideritic ironstone, seattered vory coarce quarts grains.

SILASTONS; as abovo, and modium grey, coarse medium to vory carbonacocus, moderato to micacecus 6720-6730 in part argillacoous, farly comen groon chleritic (?) grains, grades to silty soudstens. 5% SHALE; dark gray, very silty, platy. how SANDSTONE; variable, light to wedlum groy, very fine groined, quarts, occasional groon and reddich grains, often very argillacoous and dirty in part clean with kaolinitic matrix and fair carthy percentry; generally micaceous and slightly te moderately carbonneoeus.

6730-6740

18% SHALE; dark groy, vory silty, platy. 15% SILTSTONE: medium to medium dark grey, in slight part greenish grey, coarse generally very finely sardy, slight to moderately earbomacocus, slightly micaceeus, commenty with groen chloritie and white clay grains, grades to snudstons. 15% SANDSTONE: light to madium light groy, very fine gradned as abave. 60% MANDSTORU; white to light groy, unconsolidated productionally modium to occase grained subsagular vitroous to slightly cloudy quests, possibly commented by preside and pair brown sideritic (?) cley in part with inclinitic cenert; probably good intergranular percenty. Convon macsive pyrite; traces sideritic ironstone.

6740-6750 Variable cauge 25% STREETONR; similar to above. 55 SHALE; shulles to above. 10% SEUESTONE; white to Eght groy, very fine to fine gradued as above. 60% SANDSTONE; white to light groy, unconsolidated predominantly scarce to your course grained.

6750-6760 25% SILETONE; medium to medium dark groy, coarse moderate to very candy (very fine grained) in part arglilaceeus, clightly micaceous, slight to moderate carbonaceous, opensional green chloritic grains; in part common white to light groy clay flocks grades to -10% SHALM: Jask grey to black, moderate to very silty carbonaceeus.

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	http:// EAUFSTONE; white to hight grow, in part hight brown, vory fine to fine grained, angular to subengular, quarks, in large part clean and wall corted, in part (30%) argillacoeus, wilty, wieneccus, and alightic carbonacceus, watrix varies from silica to keelinitie with lesser sideritie and peritic; predominantly with carthy percenty but in part with modium (10%) inter- granular percenty. 20% SAMESTONE; unconsolidated, peerly sorted quartz grains, as above. Decasional wassive pyrite; occasional sideritic ironstene.
6760-6770	20% SILFETOND; as above, in slight part with scattered fine to redium quartz grains. 10% SHALE; modern derk grey, slightly brownich slight to moderntely silty, slightly microsono fairly soft, sub-fissile. 70% SAEPETONE; thits to kight grey, consolidated fine grained, in part very fine grained, subangula r quartz, clean, well corted, well command, siliceous cenent and minor kaplicitie cenent with traces sideritic commut, poor earthy percenty.
6770 <b>6780</b>	151 SUREYOND; dark groy, similar to above. 55 SURE; as above. 754 CAREYOND; as above, very fine to usdium grained, predeminantly fine grained, in part with sidewide coments good carthy perosity in part with fair intergranular perosity. 56 SANDETONE; hight brown, very fine grained, mederate to very siderific and silkstone brown, siderific, carbonaccoup. Occasional massive pyrife; common loose coarse to very coerce querts grains.
6739 <b>6790</b>	Variable sample. 30% SELFSTONE; medium to medium dark groy, coarse haolialtic, very finely and in part finely sandy, connenty meterately embenacemus, slightly micacoous in purifie. 5% SHALE; as above. 10% CAMESTONE; light brown, very fine to fine grained quarks, traces white clay and groom chloritic grains, in put with carbonaceous flocks, very chardents alderate course, grades to sideritic silketers. 55% CAMESTONE; white to light gross predeminantly unconnected ate, predeminantly cosmes grained to granule also, predeminantly cosmes grained, cubreguine to shore whether claust quarts, connected ates shore agains, in part with preite errors. Common unclay graine.
67306800	60% SANDETOFUE; white very peorly sored, medium grained to pobble sixed, subangular, withrows quarte, (predeminantly searce grained, with 30% very correst grained to granule size) 30% SANDETOHE; white, councidented (matrix for uncensolidated grains above) very fine to fine grained quarte, subangular, very friable, minor silicoous and kaolinitic coment, for intergranular perous. 10% SINTETCHE; as above, cearse and grading to silty very fine grained sandstone.

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85% SAMESTONE: white, very poorly corted,

6800-6819

subangular to subrounded cloudy quartz grains, ranging from modium grained to pubble size (predominantly coarse grained with 30% coarsor graina) set in approximately 30% matrix of sandstone. light grey to white, very fine to fine grained, subangular to subrounded quartz, rare white clay grains and tinted quartz grains, modorate to very friable, good earthy porosity. fair intergranular poresity. 10% SILESTONE; SEALE, silty very fine grained candstone. Occessionally privite and pyritic sendatone.

6810-6820 976 SAMPSTONE: white unconsolidated, poorly sorted anarth grains at abeve, dominantly coarse to very server garined, subangular to subrounded common reliev carl suber birted quarts Grains, probably very preverend is past caseworted with

ypride. 3% Pyrthe and orrive consuted sendatone. 13% SULTEROM: SHALE to silty scalatone as above.

90% SAMUSTORE: white unconsolidated, poorly sorted 6820-6830 coarse grained be granule size, subangular cloudy quarts, zare yellowish and arange tinted grains, with ACF sandatene (metrix) very fine to fine grained as ebero. 6% SILWSTONS: weding to moderately dark grey, slightly nicecoous, argillacoous and grades to shale. 45 Massivo pyrite and pyrite comonted sandstone.

6830-6840 SANDETONE; buff, unconsolidated, poorly sorted, modium grained to growule size, prodominantly coarse to very coarse grained, subangular quartz with 20% conditions built, very fine to medium grained subangular quarts, rare pyrite green, traces red grains, well comented, well comented with silicoous dologitic conent and scuckeelin. 5% Fyrite and pyritic sendstone. 5% SILSTOFE - SHALE.

6840-6850 SAMESTOME; white, unconsolidated, course to very coarse grained, econsional redive grains and granulos, subsequinr, slightly cloudy quarts, traces pyrite sement clbesing to nome grains, 10% concollidated sundations build to white, very fine to medium grained with sillerous and in slight part public secont. is part comented with sideritic (?) corbonate, in part with pers intergranular poresity. 5% SPALE - GIL/NGCOME Fairly correct condetono light hooms, fine to modium grained, querts with some gyritic coment and abundant siderithe covent, in part with modium intergranular percepty. Occurren enceive pyrite and pyrivid sandstone.

6850-6860 SANDSTONE; white to buff, unconcolidated as above, prodomimantly ocarse to very coarse grained with 30% matrix of sandstone; buff, very fine to medium grained, prodominantly modium grained, subangular quartz, rare grey and black argillaceous grains, well cemented and siliceous dolomitic cement, predominantly tight but in part with good inter-

granular porosity.

	55 SHALE and STRASTONE as above. Occasional massive pyrite; fairly abundant sideritic sandstone.
6860-6870	Trip sample Sandstone white as above predominantly coarse to granule grained quartz with 20% sandstone white to buff, fine to medium grained fairly well sorted subangular quartz, part with common delemitic matrix, part fair to good intergranular peresity. 40% SANDSTONE; light to medium gray, very fine grained grading to siltstone micaceous, part slightly carbonaceous. Occasional massive and crystalline pyrite.
6870-6380	SANESTOND; grey to white, fine to coarse grained econsistently very eserce to granule uncenselidated ? quarts gasing, predominently subergular guartz in altheory part colosisters water. Part very gent intergranular econsity JOS SILFICONE; modium grey gruttic microcous, considerat burger of the disconducted pyrite.
<b>6880</b> 6890	50% SAMMYOND; as chove but with common pyrite commuting grains. Fight. 20% SILATOME; as shove. 30% SMALD; moduly grey unconsolidated to very fine michaecung. Traces siderite (vein?).
6890-6990	SAHONTONE; off white; predeminantly fino grained exputar to subargular quarts, in abundant dolomitic matrix. Tight. 10% SILTSTONE; Light to weddum grey slightly wicecous.
6990-6910	75% Hoturnod as oler. 15% CILASTONE: weding grey, icacoous, occasional gyritic, with norman corbonaccous specks, grading to and interbedded with skale. 10% SAMLOTONE: as about.
6910-6920	705 CAMERONE; all phile as dove but sparser mainta. Georgianal podium to course grained, especiesal year intervarial persity. Occasional applie concut. 305 CIMERONE; and chale as above.
6920-6920	60% SAMERIE: off which as chove. 20% CELATOCNO: aff which to modium grot part with accord black when; grading to shale.
6930-69ko	SameTres; off white with fire grained engular to subargular quarts in a predominately colonite matrix. Occasional modium to coarse grained objectors: discussioned gyrite. 30% SILASTORE; hight to medium grey with common black sica.
6940-6950	50% SANDSTONE; as above. 50% SILTSTONE; as above.
6950-6960	60% SANDSTONE; off white very fine to medium grained part pyritic. Occasional mica and carbonaceous specks. Minor poor to fair intergranular porosity.

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40% STLSTONE: light to modium grey, micaceous part with discominanted pyrite.

6960-6970 60% SANUSTONE; as above. 40% SILTSTONE: as above.

6970-6980

20% SANDSTONE; white to medium to coarse grained, subrounded clear quartz in a sparse delemitic watrix. 10% SANDSTONE; off white to very fine to fine grained quartz in delemitic matrix. 50% SILATOWE; light to medium grow, part microcous part with coensional wedium to coarse sand grains, wher pyrite. 20% SHALE; redium grey, part fine microcous, very occasionally containing medium to coarse cand graine.

6980--6990

15% SHALE; block alightly microsus, slight to moderately silty, fiscile to platy, grades to 30% SELENTONE; modium dash to medium gray, very angillescone, in part very finely sandy, in part pyrible, common group chlorible (?) grains, often with southered fine to wedium quartz grains. 10% Looks course grained to create sized, subenguler to subcounded, quarts grains (probably devived from condubate below). 45% SUBSCHER; white to light group, veriable, in part very fine to fine to fight group, dirty, eilty in york your fine to fixe grained, engular to entragater quarts, frieble, doin intergranular persity, theose helds, with the time to medium grained, with cildeouse matrix time to medium grained, with cildeouse matrix tight; effect gradule.

5220-7020

Trip Gengle: Endeshedded rud gerdadderal. 105 BELLY: derir grou ord Dereutel: groy, alightly standorws, in alight pdat gradile, coccainally with autrouried modime to connect guarts, grains, in gart moderate to very alight. 507 BEN/ERONE: redive of your and brounded groy, redomain to very anglike source and grades to card endermone, in personally alightly uncoccus and endermone, in personal redsheets, in part while contained in the second grades to disting the second star of personal grades to she contained and for another substant. 559 Contractions is the second grades to she contained the second grades to she contained the second grades to she contained the second grades to she to be second star to a second grades where the second star to a second grades to she to be she could be added and the reduction to a second start to a second grades where the second star to a second grades reduced a second star to a second grades and and the second start to a second problem second, she to be a second start to be attributed and any the second start to a second problem and any the second start to a second start to be attributed and any the second start, in alight parts attribute and grades (second start) and and mare the and the second grades formed propers, and to grade a second grades. Germon property to grades, should problem.

7000-7010 Indepletence out preferious?
10% SELECTORY to chore, generally tough.
55% SILECTORY; ecceptionly on above, in part grading to chole and some fine senderon.
50% SAMDFROND as above.
5% Sideritie elevation. (brown) and sideritie sandatone.

7010-7020 15% SHALN; weddau te mediam denk grey, generally moderately micaecous, common green (chleritic ?)

moderately ricascous, common groan (chleritic ?) elements, moderate to very silty, fiscile in part generally chunky, grades to

15% SILTSTONN; modium light to medium groy coarse in part argillacoous, commonly very fine sardy, green chloritic (?) grains slightly carbonaccous in part.

60% SANDSTONE; light grey, very fine grained, angular to subangular quartz, rare green clay grains, occasional black and reddich accessory grains, slight kaolimitic moderate friable, good carthy porosity and lessor (35%) sandstone light grey. fine grained, subangular quartz, truces round and green accessories, occasionel white and greenish clay grains, varoly pyritic, well concolidated colomitic/silicous comput tight.

7020-7030 SILASTONE; very light to mediam light grey, slight to moderately engillaceous, slightly ticaceous, is part very fine coudy or with peorly seried fine to mediam querts grains, profeminently tough but is slight grey healinities and friable.
10% SHALE; similar to their above.
30% SANDETONE; as above productionally silty, keelinitie very fine grained but in part delemitic.

7030-7040 10% SHALE; as above.
51% SILESTONS; modium Light to modium dark groy, as above.
35% SANDSTONS; white to light groy, very fine to fine grained, as above.
Occasionally brown siderific claystone and sandstone Occasionally poorly setted quarks grains.

7040-7050 15% SHALN; medium dark to dark gree, moderate to very silty, micaccous slightly earboneeous, fissile to chunky.
45% SILESTONE; as above.
46% SAMESTONE; light gree, fine grained common very fine grains, econstant wodium graine, angular to subangular querts, and 1% groot and white clay graine, black corboneeous graine, vell common with silispens/delevible common, fair carbon with silispens delevible common, fair constant, and a constant, fair constant, sile clay persoide; traces delevible common, soll constant, for subary delevible common, fair constant, siderible clay persoid; traces delevible velting.

7050-7060

cartly fiscile. 10% SUMSTONN; as chore. 3% Sideritic cardoteno; rodium to dark brown, aryptocrystalling appenrance in part, consists of very fine grained quarks conditions similar to that below, slightly prvitic, slightly carbonaccous

105 SHAR; modium grey, micaceous. carbonaceous

nederately chity, ebundent computed siderite, tight. 7% SAMDETONE: white to light groy in part very fine to fine grained, slightly carbonaccous and micescous. Fredericantly fine grained, subangular

to cubrounded quarts, less than 1% groan and black accossery grains (elay?) well comented with white delowitic/sideritic coment moderately friable, tight. •

7040-7070 10% SEALS; is above. 10% EEASS; is above. encloanceous micesous considers are, clipitly encloanceous micesous considered firs sand prairs. 10% EEAstain considered as there with consideral fack brown rinterst grains. 70% EEASCO : this is light they as above, bit fine grained with part developing year intergranular powerity.

7079.7080 Ref SUMLE: modium greer, contended uithoods oithe with mary minor of founds. Ref SIASDOBB; as above. Ref SiAcontate conductor, refine boost of above mark very chlig, construct brown and black ingrands. We SAMPARAN, white to light greet very fine to productiontly. Sine weiled with subsection fairly well conted quarks with delatibe compt, Concluded explications and contended to strake and specks. Warr construction for each parity. The contending the provide state of the strake. The contending the provide state of the strake.

7080-7090 105 SHALL; as above preding to sillatone as above. 30% Elderitic conditions light to active brown with very time to the grained quarks in siderite concret, part very sills part expliceeous. 70% CAMPETCHES; whith to white brown as above but part with siderite/delemite secont, gradational to sideritic sandatone above.

7090-7100 Returns 20% clay.
20% SHALE; medium groy, microsous slightly carbonaceous silty.
30% SILFSTONE: light to medium groy, microous carbonaceous, minor purite, coordinal fine sand grains.
10% Sideritic sandatoone on above, with occasional carbonaceous and microsous strenks. Part with contenues and microsous strenks. Part with contenues fine slightly inregular grains of a light groop minoral, possible of formus subpate.
20% SAMDETORS; white to white boown on above.

7100-7110 Roturns 20% Clay. 30% SHALF as above. 30% SILESTONE; as above. 20% SANDETONE; as above. but only very minor siderite. Port modium to course grained with subargular quartz in delouite coment.

7110-7120 20% Foturns of clay (washed out of sample)
20% SMALF; undiam grey alcocous slightly carboncoords accessional flue sand lawings.
30% SIMPSTONE; light to reduce gray microcous obscience carbonacceus material, part very fine sandy.
20% SAMESTONE; off white very fine to fine grained subangular quartz in delevitie matrix. Occasional mica, occasional contheracceus spocks, includes less than 5% sideritie candotone as above.

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(Trip sample) 20% of roturns clay (weshed out of sample) 7120-7130 40% SHALE: medium grey as above. 30% SILTSTONE; light to medium grey as above 10% SANDSTONE; white to white brown, vory fam to fine grained quartz in delomite/sideribe consat, occasionally micacoous. Trace dark and coloured grains. SHALE; medium to dark gray, moderate to very silty 7130-7140 slightly sicaceous, in slight part with scattered cearse to very coarse quartz graine, churky, in slight part subfissilo, grades to -35% SLITSTOME; medium to medium dark groy, moderate to very argillaccous, slightly micheoons, in part clightly earbonaceous, in part slight to moderately sandy (vory fine grained). 5% SAMESTORE: Light grey, in part brounish grey, very fine grained as above tight. Occasional pyrite. Rare sideritic candatons. Souttored correc grained to granule sided quarts grains. 20% CLAY or SHALL (we show out of sample) 7140-7130 50% SNALD; medium to medium dark groy, mederate to vory silty, slightly microsomo, Siva, chunky to platy - grudes to -21% STRETOME: modium Light to modium dark groy, very argillaceous, slightly sicecoous and carbonaccous, in slight part with accosional glauconite (?) grains. 5% SANDSTONE; vory fino grained, in part modium grained, generally with abundant silty and argillaccous matrix, rare glauconite grains, disty and tight. Traces of pyrite and of siderits. Hare loose quartz grains. 50% CLAY or SHALE; woshes out from sample. 7150-7160 35% SFALE; medium to medium dark grey, moderate to very silty, slightly micaceous, chunky to blocky, in part glaucomitic - grades to -15% SILTSTONE; as above, in slight part very slightly glauconitic. Occasionally very fine to medium grained dirty sandstone, occesional massive pyrite, pyritic sandstone and sideritic sendations. The BLAY or SHALE; mashes out from somple. 71.60-173.70 20% SMADE; wedium dank grey very silty, shightly misaucous, traces glauconito, churky grades to -55 SELISTONG: as above. Occasional fine to fine grained candstone. Traces elderitic eardstone and losso quartz grains. 50% CLAY or SHALE; washes out from sample. 7170-7180 20% SHALE: modium to medium dark gray and brownish groy as above - grades te -20% SUESTONE; ; medium to medium dark grey and brownish gray, moderate to vary argillaceous in part coarse; elightly micaceous, in slight part glauconitic.

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Occasional very fine to medium grained argillaceous sandstone; scensional sideritic sandstone, rare loose quarts grains. 7180-7150

60% GEAN on STADE: method out of semple. 20% SAMEGROUD: method light grow, very fine grained angular quarts, occasionally grown glaucenite (?) grows, in large part mederate to very silty, slightly micaseeus, in part carboneceus, generally slightly pyritic, in large part dirby and friable, in part 20% with abundant brown sideritic educat, tight (note: the sideritic conditions includes grains of eltered feldspat) 5% SHADE; as above, slightly glaucenitic. 5% SHADE; as above slightly glaucenitic.

71/30-7200

200 70% CLAR of SDAFD; washes out of sample. 20% CDARSTOND; weddaw light to weddaw grey and brownich goor, conno, slightly ulcaccous in part slightly carbon course, argillacous, abundant in grey and crange little speaks (probably altered feldepar) - grades to -5% CDAES; as above and in part lethlike; coessional gloucenttic. 5% SAMDSTONS; light to median light grey, very time grained, quarts and abundant white to grey little (foldepar) grains slive, tight. Geossional elderitic conditions and silvatene.

7200-7210 50% STALT or CLAY (mashes out of sample) 10% STALTONN; as above course and in part grades to very fine grained sandstone. 20% STALT; as above and medium green, tough, mederate to very silty, blocky.

7210-7229 70% of cample washing oway. Sample wost probably conclude prodominantly of medium brownich grey, cility cley and very fire grained very poorly comented conductors. 20% SIFASTONE; Light to medium light grey, course slight to moderately micacous, slightly carbonaccous correct white and exange spects (altered foldepar?) in get grades to very cility conditions (30%) 10% GMLE; dark grey, very slightly micacous silty platy.

- 7220-7230 80% CLAY: (enskes out of cormole) modium grow, slight to moderately micaceens, generally slight to moderately silty, in part kanlinitis. 15% SUALE; as at 7150-7160 grades to --5% SIMPSTONE; foldspathic as above.
- 7230-7240 80% CLAY or SHALE (waches out of samples) LC% SHALE; medium to wedium dark grov, slightly brownish, flecked with lithic (feldspar ?) grains, mederate to very silty, rarely glauconitic, ohunky - grades to -LO% SULTSTONE; as above.

72%0-7250 80% CLAY or SHALE (washes out of sample) 15% SHALE; medium dark grey, slightly brownsh very slightly micaceous, moderate to very silty, glauconitic in prt grades to -5% similar siltstone. Scattered fine to medium quartz grains, occasional consolidated very fine to fine grained quartz sandstone with siliceous coment.

7250-7260	55% CLAY or SHALE (washes out of <b>sample)</b> 10% SHALE; as above and dark grey slightly silty, tough, rarely glauconitic lathliko 5% siltstone as above.
	30% SHALE; light grey fine grained, in part very
	fine grained, engular to subangular quartz with
	15% pale green and greyish green clay grains
	(altored foldspar ?), traces red grains, rare
	pyrite grains, moderately micaceous (large flakes
	of muscovito and biotite), eccasionanl carbonaceous
	grains, moderately silty, well comented with
	silica and delocitie (or traces of calcaroous)
	coment, moderately friable tight.

7260-7270 60% returned as clay, washes out of sample. 10% SHALE; modium grey, slightly micaceous occasional carbonaccous specks and white clay aggregates. Traces pyrite. 15% SILTSTONE; light to medium grey, with common white brown and green, green grains (altered felspathic or lithics ?) occasional carbonaccous specks, micaceous argillaccous. 15% SANDSTONE; white to light grey very fine to fine grained, subangular clear quartz in dolomito /siliceous cement. Occasional fine to medium white mica, very occasionally dark lithics. Minor part with pyrite cement.

- 7270-7280 30% Returned as cley. 1.5% SHALE; modium grey as above. 20% SILTSTONE; light to medium grey as above but part delomitic. 3.5% SANDSTONE; white to light grey, very fine to fine grained occasionally in grained otherwise as above.
- 7280-7290 10% SHALE; modium groy as above. 10% SHALE; modium groy as above. 30% SANDSTONE; white, fine grained subangular quartz in fairly sparse dolomitic cement. Minor part with shalky delomitic matrix and possibly earthy poresity. Very occasional dark and coloured grains minor pyrite. 50% SANDSTONE; returned as individual medium to very coarse subangular clear to slightly cloudy quartz grains, probably derived from a coarser version of sandstone above. Occasional pale yellow and slightly ploured quartz grains. The presence of several cutting with interlocking quartz crystels suggests unit sandstone be tight.
- 7290-7300 40% Returned as clay, washed out of sample.
  10% HHALE; medium grey slightly micaceous slightly carbbnaceous with occasional white argillaceous specks, possibly altered feldspar.
  10% SILTSTONE; light to medium grey, with occasional carbonaceous specks and dark mica flakes. Common white to light green grains possibly altered lithics and feldspar.
  40% SANDSTONE; white fine grained and modium to very cearse grained as in previous sample. Cuttings occasional show coarse grains set in matrix of fine grained variety. Part with poor to fair intergranular perosity, no shows.

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7300-7310 Trip scruls. 36% STALS: nodius grey as above. 56% STALS: nodius grey as above. 50% STALS: nodius grey as above. 20% SAUSTORS: white to light grey very fine to fine grained subergular quarts in delesitic const. Conscionally earbonaceus specks, very occasional dark and coloured lithic ? grains.

7310-7320 20% returned as play. 20% SIMLE; weding grey plity, occasional white argittaceous specks. Miner very finely disseninsted pyrite, slightly micaceous miner part with abundant irregular dark green mineral specks. 30% SILASTONE; as above. 30% SAMPETONE; as above whit to light grey. Traces sideritic muletone, weding brown, slightly silty to very fine saudy.

7320-7330 50% returned as clay. 20% SHALS; medium grey as above. 20% SHALS; medium grey as above. 20% SHALS; medium grey argillaceous streaks, part very fine sandy and grading to sandstene below, fairly common white to brown (altered feldspar ?) and green grains, cecasional carbonaceous specks and disseminanted pyrite, partly micaceous. 20% SANDSTONE; white to light grey, very fine to fine grained as above. Part with occasional mica. Tight.

- 7330-7340 50% returned as clay. Washes out of sample. 55% Prodominantly very fine to occasionally fine grained samistone to light white grey, with clear quarts in fairly sparse silicaccous/dolouite coment. Occasional corbonaccous specks and brown mica. Trace intergranular perceity. Grades to and interbodded with siltstone with similar constituents. 54 SHALE; as above very miner glauconite.
- 7340-7350 70% returned as clay, washes out of sample. 10% SHALE; wedium grey micaceous, slightly carbonaccous, very slight glaucenite scattered white argillaccous specks. 20% very fine canditone and siketone as above.
- 7350-7360 85% CLAY or SHALE ? (washes out of comple) 12% SANDSTONE; light to wodiwn light grey, very fine grained angular quartz, abundant (15-20%) white and pastel coloured clay grained and altered foldspar (?) grains, slightly carbonaceous, slightly micaceous, in part slightly pyritic, slightly friable, siliceous coment, tight, grades to coarse siltatone. 3% SILTSTOPE; wedium to dark grey, slightly brownish slightly micaceous, slightly carbonaceous coarse. Rare shale as above.

7360-7370 90% returned as clay (washes out of sample) 10% SILTSTONE; medium grey, slightly brownish, characterised by an abundant off white, pink grey and greenish lithic grains (in part of very fine grained size and probably prodominantly feldspar) common black carbonaceous flocks, rare very fine grained quartz, slightly micaceous. Occasional shale as above. 7370-7360 90% returned as eley (mashes out of sample) 10% StHCEPOND; very fine grained canditone modimi light to modium grey, alundant (10-26%) lithic grains and orgular to subangular quarts grains, scensional fine grains, eften carbonacocus with carbonacoon flor linearly orientated. Grades is part traces shale.

7380-7300 90% of sample returned as elay. Dirty sample. 10% SIMPSYOND; sandstone medium light to mederately grey, very fine grained quartz and silt with approximately 20-25% little frequents (predominently feldagar ?) including green chlorite grains, common block carbonaceus floats; grades in part to silty, little shale; in part with sideritic coment. Fairly cormon sideritic siltstone and very fine grained conditions.

7390-7000 75% of sample recovered as day (vashes out) NOT SHALS; we dime dark grow, tough, silty, (very chundant lithic debrie) is part with lowingtions of silt and very fine grained condution, both of which are lithic, corbinaceous with carbonaceous spec linearly orientated. 5% SANDETONNE - siltatone as above.

7500-7410
7500-7410
7500-7410
7500-7410
7500 GAIRETORE; light of modium light groy, very fine grained, in yort fine grained, subengular quarts, with 10-15% lithic (followar?) grains, cornen reddish brown (altered fietite?) and elack corbunaceous grains, well consumed, moderate to very silty, silicoous and winer carbonate conent. 10% STARETORE; modium light to modium grey, very lithic, as above, 20% SUALE; dark grey, very silty, abundant lithic elements, occasional green chlorite (?) patches and grains, abundant black carbonaceous or altered biotite flocks with linear encoded. Occasional mediate grains.

7410-7420 SOF recovered as clay (wakees out of somple) 16% SAMPSTOME; as above. 5% SHALE; as above very silty. 5% SAMESTOME; unconsolidatof, prodominantly very fine subengular grains of quarts, but some grains up to corres grained size. Occasional sideritic sandatene.

- 7420-7430 80% recevered as clay. 10% SHALE; dark grey, very silty, abundant lithic specks, tough, platy subfissile abundant carbonaceous specks. 5% SANDSTONE; white to light gray, as above, with scattered grains of round poorly sorted quartz, traces calcareous tight. 5% SILTETONE; similar to above.
- 7430-7440 70% returned as clay. 20% shale medium to dark grey, silty, common carbonacsous and lithic spocks, slightly micaceous 10% SILTSTOME; to very fine sandstone white to light grey, with subangular quartz in sperse siliceous coment occasional carbonaceous specks and lithic grains.

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744C7450	This cample 20% returned of cley. 60% FLID: moduut gray, very cilby, conven 1455/Suddoper ? specie, occasional contou accous specie, alightly dicascent traces prite. 20% (LFREEORD; to very fine sendetche as above yeart conver altered feldager ? occasional conver- grains probably covings.
75507550	600 SMALS; sochus rees as above moderately wica- ceons traces glaucesite. Models/2007; to rery fibo successor, white to light grey corry theo submoder quarks in sparse siliacens consists folds conser lithic and feldspathic grains. Geoscianal wice, traces parite, part with englifocens associa. Entoplandanted with shale above.
74507770	<sup>6</sup> 00 (2000); es above. 300 0000000; light to notion grey with corbonacour floats, little and fold grains and econsional wise. 300 500000000; white the light grey, with very fisc to fine grained antropolar chess quarks in econological little grains in alight delouitic count, guet with white to been when.
<b>7470-</b> 7680	90% SPAC; reduce gas: with extended dark wice and white follower spects, coessional contensector flashe. 20% SEASANNES of obere. 20% TACENSED; wite to est thite, as shown but part with tensor intergroundar percenty.
7h10-7h90	20. SHALS: as above. 30. SDATEORS: as above. 43. SALESTORS: white a obove, when nodime grained. 34 Sidewitie colletone: hight to wellue brown, escariosel white folloper produce and corbonacoous flocks, when welte.
74907500	<ul> <li>351 SMARS; section prov, silty, alightly visacoous eligitly orthonocous courdered follows openha, pare modium quarts gridus.</li> <li>35% SERFPEED: light to weddam grey occasional angulthecous streets, becan along flates, occasional white foldoper and coloured little grains.</li> <li>35% SAMPSTONE; white to light grow, very fine to fine grained futury opares slight doloutte coment.</li> <li>5% Siderifie andstone as above.</li> </ul>
7500-751 <b>0</b>	35% SHALE; as above traces glauconite. 30% SILSTONE; as above part with abundant mica. 35% SANDSTONE; as above occessional coloured lithic grains occasional white micaceous very occasional modium grained.
75107520	30% roturned as cley, washes out of sample. 20% SHALE; medium grey, silty, as above with very occasional glauconito grains. 30% SILTSTONE; as above grading to sands tone. 20% SANDSTONE; white to light grey very fine to fine grained as above, occasionally carbonaceous flecks.
75207530	80% returned as clay (shale ?) washed out of sample.

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	<ul> <li>Shall: medium groy as above.</li> <li>105 + CHENOR: Light to undern groy componed sysches (alterned teldspar and Libbles ?) econotenal carbonacoous flocks and brown when flakes.</li> <li>56 - SARETORE; white to light groy as above.</li> </ul>
7530-7340	50% roburned as clay, washes out of sample. 20% SFMLE: modium groy silty, sinceous, secasional white foldagethic ? speaks. 30% SILCEOUS; as alove. 5% very fine to Sine samisture as above.
7540-7550	565 returned on other (whate ? salitations ?) washes one of sample. 185 FRALD: redius grow, very sality as shove but CIPROCED; light to redium grow with orientated brown wise, demonstrates and brown engillacoous system for follower) correlated green grains (glaucouite ?) trace employate.
755 <b>0-</b> -7 <b>5</b> 69	50) returned as eler. 10) returned as elers. 20) ALASTOLES: as alove, but grading to very fine supertops while to highly grad with orbangular elenr quarks in fairly sparse course with trace employed a seasteral tracgular pale groon grains occasional wice flakes. Have coloured lithlo grains.
7560-7570	30% Roturned as clay. OILAUTONE; medium to modium light groy, 10-20% white, grownish, buff Seldmar (?) should and grains and possibly lithic Eroguents, slight to redente microcous (enucerthe and black and roddish blotite) probably slight to scheretely expenseous, in part with very minor very fisch; disseminanted white, clightly candy in part (very fine grained) 55 STARE; dark groy to black, foldspathic, very silty glaty. 25 STARE; Light groy, very fine grained. Coccalence sideritie incontone.
75707580	20% CHALS; Cark grow, moderate to very silty, foldspathic, mederately carbonaccous (linear evidentation) platy to chunky. 33% SILISTONE; modium light to modium dark groy, coarse, 15-20% foldspathic shreds and grains (often very fine grained size) grades to siltstone and shale. 40% SANDSTONE; very light grey to light grey, very fine grained, 20% fine grains, angular to subangular quarte, 5-10% white clay (altored foldspar) and cocasional buff to pink grains, moderately silty, well corted, well comented traces calcite, tight.
7580-7590	55% SILTETONE; light to medium light groy, foldspathic and carbonacecus/biotikic as above, coarse and grades to - 2% SANDSTONE; light groy, very fine grained, angular quartz with 5-10% lithic (shredded and altered foldspars) and biotite flakes, very silty well sorted, well comented, tight. 20% SHALE; dark grey to black, foldspathic, tough, very silty, platy to fissile ? abundant black carbonacecus flakes or biotite shreds commonly with a linear orientation.

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- 7590-7600 SIMASTONE: modium to light grow, abundant lithis (feldspathle) groine and shreds us above but only slightly carbonaccous/micaneous in part coarso and grajes to very fine grained confetone. 20% SHALD; as above. 5% SANDETOND; as above.
- 7600-7610 SHATTONE: on above slight to moderately wivecoous (unrecvite) 355 SHALE: as above: Opensional soulstone as above. Trace pyrite and loose quarts grains.
- 7610-7620 SMALD; dense gror, moderaboly carbonaceeus/bioitic clight to moverball Calderable (9%), rederate to move cilty, plats and churdry grades to hop STARSCOME; or above. 2% SAMESTONE; rest five grained as above. Coonsignal elderibic ironateons.

7620-7630 SMALD: vodius light to modern dath groy, generally moderate to very silvy, folderedule, slightly microscone (emposite) abundant embedded environt, biotistic shreds, noterately self - subficience to platy.
257 SELECTORE: as above.
15 SARETORE: light groy very fine groined as dove.
Baro fine to recluse grained quarts with abundant siderite patrix.

- 7630-7500 SEAD; as above generally very silvy, subfissile to platy. 20% SELANCE: as above. Occasional cupicture; as above. Tranes massive pysite - a Trace peleoyped.
- 7640-7659 SILCETONE; modium light to medium groy, moderate to very folderathic, mederately earbourceous/ blotitic, slightly microsous (muccovite) in part angillecous, traces chlorite (?) grains and patcher - preces to -20\$ SELLE, as above.
- 7650-7660 SILASIONS; modium groy alightly groonich, abundent (up to 30%) foldupar grains, very carbonaceous, in part to slightly argillaceous, in part very fine sandy grades to -15% SHALE; as above. 5% SANDETONE: as above. Traces fossiliforous fragment. Occasional sideritic siltatone.
- 7660--7670 SILTSTONE; as above, ceased and in part very fine sondy. traces groon chloritic.
- 7600-7690 STREETONE: an chore part with fairly common light green deloudthe ? patches. 13% STALS; as above.
- 7690-7699 Thep sample, Frehably unrolichle cample. Prodominantly ciltulous as above.

CORE No.14 7699-7762 On: 3' Bos. 0'24" Core Jeruod.

- 24 inches SEALE: Cosh grey, firs, volom toly alsocous (uncoorder), abundant corbonaccous flashs (ordents to furnilly, to bedding) abundant white, grey and plack groups and shreds of altored falloyer (7) uncorets to very stilty with petches of allopters.
- 219% inution Me renover:

As the care is marries the Cip of the bodding is not diversible.

- 7702-7710 (BAAC); markes to mallum dark goor, suderately to very allty, alightly foldepathic grades to gor SINEBPULS; walkes to walter dark gray, waterate to very talepathic and lithic (?) alightly sizecous, malerate to very corbonaceous
- 7710-7720 10) SHALD: as above generally very silty. SHARFOND action goer to medium light groy, sitchtly adapted a medium light groy, sitchtly adapted, astronote to very foldepathic and likeds (7), according performances (flecks with linear estimated) slightly engillaceous Operation, angular measts, seenational folger graine and shoots, alightly earboraceous tight.
- 7720-7730 CHAAS; on above, redecately alive, slightly signature, platy to chunky. 20% STARSWARS; as chere aderately argillecous Traces candatons light grow, very fine to modius grain, subargular quarts, scalant, oblevito grain, argillascur satula, fair intergranular powestry.
- 7730-7740 5HALM; medium groy, generally very silty, slightly to mederately feldsystric and carbonacous, platy to chunky. Occasional siltstene; as above occasional subrounded convoc quarks grains. Traces of pyrite and chloritic, feldsysthic sideritic ironstone.
- 7740-7750 SHALD; modium to modium dark groy, slightly micacoov moderately cilty and cerbonacocus, moderately

7760-7770 35% SANDORNEY: Light proy, very fine grained, angular quarte, 15% folderar and lithic grains reducate to very silty, elightly carbonaceous, well concepted, delevitie coment, tight, grades to h5% CIFERENCIE; as above, in part very argillaceous and grades to -

20% SFALD; as above, very silty.

- 7770-7780 SUPERONE; modium swoy, scampe, slightly microcous (muscowite) claudent, strong and grains of altered folloper (of the universities gundled size), enderate to very converses, in part argillacous. 15% SULE; as there, very aller. Connecteral converses; an eleve, traces sideritic incasters.
- 7780-7790 SERVERUNE; seddur Light to medium grog, course, as above (feldepsy/lithte greine generally of very Size grained also), slightly sideritic, in part slightly scheppers, grades to -10% SUALS; as above.
- 7790-7800 SINFFORM; reduce group, coarse eligitity argillaceous very felderatio/lititle as shore, sederately carboneceous, rescing printic, irsees deloritie sideratio. Fore sideritie to rederately calcarcous ciltotens.
- 7800-7810 SIIASTONS; as above, becoming referrately argillacrour and grading to very silty shale. 15% SHALD; acdian gray, foldepathic, slightly vieweene, redenately conteneered very ality ylaty be skunky. Consideral conditions; light gray, very fine grained quarts and approximately 20% lithic/foldspathic grains, very slity, clightly coleareeus tight. Geogeienel cideritie/slightly coleareeus clay ironstons and argillaccous slitetcue.
- 7810-7820 65% SILASTOME; as above grading to shale. 35% SILASTOME; weddaw Light brewnish groy, abundant feldspathic grains and fleeks, mederate to very carbounceous (?) and/or miceoccus (bietite chreds) with an abundant comput of calcarcous siderite; grades in part to very silvy siderite.
- 7820-7830 SILESTONE; modium groy, common white to brown feldspathic grains and dark brewn mice flakes, opensional chlorith? grains, traces pyrite, grade to silty shele with similar accessories. 104 SILESTONE: light to medium brown similar to modium groy siltstone above but with abundant calcarcous siderite coment.
- 7830-7840 SILTSTONE; light to modium gray, as above but minor part very fine sandy. Occasional brown sideritic cilistene as above.
- 7840-7850 SILTSTONE: light to modium groy, abundant white and brown foldspathic and light groon chloritie ? grains. Coumon dark brown mice, occasional carbonaccoun flocks, grades to shale (40%) modium groy silty, seeasional foldspathic and chlorite grains and well exiontated blotite flakes.

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- 7850-7860 Lithology siltstenetto shale as above. Occasional light to medium grown, siltstone with common foldspar and chlorite, grains and biotite flakes in abundant calcaronus siderite coment.
- 7860-7870 SILASTONE; light to usdium grey abundant brown white foldspathic grains and light groon grey lithics? common well icated biotite, occasional argillocoous and slightly carbonaccous lamineliae and part very fine sandy. Grades to shale, medium grey occasional white feldspathic grains and biotite.
- 7870-7880 SILFSTONE; light to undimu grey, grades to shale es above. 10% Sandatono; light grey, silty, with very fine grained quarter, white to brown foldepathic grains and light green lithic ? grains, occasional biotite. Sparse clightly calerroous watrix.
- 7890-7890 SIMMETONE; Light to medium grey as above, partly very time county, eccasional glauconite grains, grades to silty shele - in part glauconitic. Truces pyrite. Traces corbonecous material.
- 7890-7900 SILTSTOND: Light to modium groy abundant white to brown foldepathic grains. Light groon chlorite? Grains, common biotite flakes, where finely disseminated pyrite, grades to shale (10%) silty occasional foldspathic and chloritic grains. Minor wart glaucomite. Occasional carbonaceous material up to 2 we dismotor.
- 7900-7910 SILTSTONM; grading to shale as above. 10% SILTSTONM; light to modium brown with abundant slightly calcarsous siderite matrix. Otherwise as for siltstone above.
- 7910-7920 SILESTONE: Light to modium groy as above, partly slightly glauconits. 10% SILESTONE: Light to medium brown, as above, part will very fine quartz grains.
- 7920-7930 Lithology as for 7910-7920.
- 7930-7940 SILTSTONE; light to modium groy, abundant white to brown foldspor and light grains chloritic ? grains occasional biotite, occasional biotite consideral corbonaccous material traces pyrite. Part very fine sandy and grading to sandstone (20%) light groy with very fine quartz grains, occasional white foldspor grains, occasional light groon irregular chlorite, dark brown mice. Tight.
- 7940-7950 SILTSTONE; light to modium gray, part veryffine sundy and as above. 30% SANDSTONE; white to light gray, very fine grained silty as above. Traces coarse quartz grains ?
- 7950-7957 Lithology as above.

Core No.15 7957' - 7975' Cut 18' Roc. 1'6" 6757' - 7958'2"

STEATONE: modium grey with common white to brown foldspathic grains and pale green chloritic ? patches, occasional carbonaceous flocks; occasional brown and white wice; traces discominated pyrite; traces calcite foscil fragment. The core also shows diffuse argillaccous lowingo. Redding is indistrinct. Occasional fine subvertebrate fractures.

79581-795816"

STLASTONE; as above but light grey, slight to very fine sandy. Occasional poorly defined fossil remnants. Apperent dip on argillaccous lamingo is 7<sup>9</sup>.

In addition to the 1'6" above, several abraided frequents were recovered. These were largely shale; dark gror, with only consistent foldspathic grains but fairly counce well eriented biotite or carbounceous flocks.

- 7953:5"-7975'No recovery. Coving camples indicate that this section is siltatons, light to medium grey ag above with minor shale as above.
- 7970-7980 Trip cauple. 595 ETHESTONE: light to mediew groy, as above with educe shale as above. 50% SANDSTONE: light groy with very fine grained suborgular quarts in sparse and in part clightly calcarcous matrix. Common white to brown grains (altered feldspar ?) fairly common carbonacoous flocks, coessional dark green irregular glauconito ? grains, coessional white wice, traces coloured lithic ? grains.
- 7980-7990 30% SILESTONE; light to modium grey, as above, 36% SANDETONE; as above with occasional brown mica, and traces pyrite, very minor part with calcercous/sideritic matrix.
- 7990-3000 70% SILFSTONE; light to medium groy, with common white to brown foldopathic grains, occasional biotite and carbonaccous flocks, secasional glauconite up to fine grain size. 10% SILFSTONE; medium brown as above but with abundant calcaroous possibly sideritic matrix. 20% SANDSTONE; light groy as above.
- 8000-8010 85% SILTSTONE; light to medium groy as above but no glaucenite. Part with fairly common brown and white mice. 5% medium brown siltstone as above. 10% SHALE; dark grey with occusional white to brown feldspathic grains and well oriented biotite or carbonaccous flooks.
- 8010-8020 SILTSTONE; light to medium groy common white to brown foldspathic grains, occasional light green chloritic ? patches, occasional brown and white mica occasional carbonacoous flocks, very minor part with fine quartz grains minor shale as above probably intorlaminatod.

- 8020-8030 SILTSTONE; light to medium grey, as above, but major part with common glauconite part vory fine sandy. Occasional (5%) brown sideritic siltstone.
- 8030-8040 SILTSTONE: light to modium grey common white to brown feldsrathic grains occasional white and brown mica and carbonaceous flocks. Part with occasional glancemite, part very fine sandy. Traces pyrite. 5% brown coloured with abundant slightly calcareous sideritic matrix.
- 8040-8050 SILTSTONE; modium light grey, coarse, in part very fine sandy, rarely with fine to medium grained quartz, moderate to very feldspathic (white, grey cream and greenish groy silt size to very fine grained size grains), mederately carbonaceous and/or micaceous (biotite) slightly micaceous (unscovite), occasionally with pale green glauconite (?) pollets. 10% SANDSTONE; very light grey, very fine grained quartz with 10-15% altered foldspar and lithic grains, very slightly calearoous tight, very silty Occasional brewn, very glauconitic (?) slightly caleareous sideritic siltstone.
- 8059-8060 30% SINETONE; as above in part slightly pyritic 60% SILASTONE; light groy, coarse woderate to very sandy (very fine grained) otherwise similar to siltstone above; grades to -10% SANDSTONE; as above.
- 8060-3070 SILTSTONE; light grey, slightly brownish, coarse very foldspathic, slight to mederately carbonaceous alightly micaccous, in part glauconitic (?), often moderate to very sandy (very fine grained) and grades to approximately 20% SANDSTONE; light grey very silty (similar to siltstone). Occasional sandy siltstone with abundant siderite coment.
- 8070-8080 SILTSTONE SANDSTONE; as above, in part pyritic, often with an abundant brounish cement of calcarcous siderite, only rarely glauconitic, generally tough grades to -10% SANDSTONE; light grey vory silty as above. Rare fine to modium loose grains of quartz, trace brownish orange soft mineral with bright yellow fluorescence.
- 8080-8090 SILTSTOME; as above but generally less sandy, commonly with sideritic coment; only traces of glauconite, grades to -10% SANDSTOME; silty, as above. Occasional fine to very coarse quartz grains.
- 8090-8100
  10% SILTSTONE; SANDSTONE; as above.
  30% SANDSTONE; white to light grey, very fine grained, angular to subangular quartz, less than 10% altered feldspar, rare green grains, occasional pyrite grain, very slightly calcareous, often pyritic, generally moderate to very silty, kaolinitic cement in part, in part with fair (5-7%) intergranular porosity.
  45% SILTSTONE; medium grey moderately feldspathic and carbonaceous, moderate to very micaceous, firm, generally moderate to very argillaceous and grades to 15% SHALE; medium grey, very silty, blocky.

Seattored leose quarts grains, abundant sidoritic calcareeus siltateno.

8100-8110

GAS SEON

Gas kick of one unit recorded for a period of five minutes after penetrating this section and was recycled. 78 winutes later. Abundant bright yellow fluorescence is related to procence of a soft brownish-grange mineral; however, afaint cut was observed when chips containing the minoral were immerced in selvent. 43% SAMPETMME: white to very light groy fine grained. occasional very fine and wedium grains, subangulor quarte; occasional earbonaceous grains and white cley grains, exten slightly peritie, in part very pyritic, occasional cerbonacoous strocks, antrix of silica with miner amounts of very slightly calcaroous siderits. probably poorly sorted, generally well consolidated and only slightly tiable, poderate carthy poresity and in part (20%) with fair intergranular peresity. 10% SANDETONE; white to light gray, unconsolidated pocily corted fine to granule sized augular to round quarts grains (finer grain sizes are more angular) avorage grains size is medium to course grains in part grobably scattered in sendsbone as above but some may result from broakup of friable porcus sendatene 40% SIL/GETONE: Light to medium light grey wederate

any SLAATURE: light to median light grey toderate micaccoup, cliphtly carbonaccoup, very foldspathic generally firm, rare green grains, in part pyritic, in part moderate to very argillaccous in part sandy (very fine to fine grained quarts) and grades to dirty, cilty sendstone. 55 SMALM - Light modium light grey, similar to ciltateme above, subfiscile. Oversional sideritic sandstone-siltateme.

8110-8120 Very veriable sample. 10% SANDSTONE: as above being very fine to fine grained dirty and tight. 10% SANDSTONE; locse quarts grains, as above. 10% SHALE; light grey to modium brownish grey modorato carbonaccous and feldspathic, generally moderate to very silty, fissile. 25% SANDSTONE; Light groy, very fine grained to fine grained subengular quart with 10% buff, cream and groy (altored foldspar ?) grains, common black grain (cerbonaccous ? may in part be biotito), eccentional green greins, set in abundant silty matrix, in part slightly to moderately pyritic and microcous, tight. 45% SILISTONE; light to madium light groy as above. course and in part candy (very fine grained) grades to very silty sendstons; in part argillaceous.

8120-8130 Variable lithology 15% Unconsolidated subangular quartz grains, predominantly fine grained, common very fine grains and occasional very coarse grains. 30% SANDSTCHE; white to light groy, fine grained, in part very fine grained, subangular quartz, occesional dark grey grains and kaolin grains, well comented with cilica and some kaolin, fair earthy percenty traces intergranular percenty. 15% SHALE; as above. ACT SIMPERNUE: nodius light to modum fork Groy on above in part grader to confetence. Twasen bright pollor wineral finerescense. Connienal efforitie sandstene and siltstene.

- B130-Sido (0% SAMESTORS; cff white with very fine to predectionally fine grained (accasional modium grained) angular to subaugular quarts in modium equival decodents control white microscopy observations. Note white microscopy close the part with poer intergrounder with recreice of twip gas.
  No hydrocarbon fluorescence.
  532 Sinffffff; modium guer balle groy green chloritic grains. Oscalaral angular brown hale groy green chloritic grains. Oscalaral angular brown hale grey green chloritic act in observation regiliaccous flocks and brown when the provide the state of the poet white folds, which is a shore but act in observation and probably sideritic matrix.
  10% SUME decide on for silvetore above, well oriented brown with foldspathic and probably sideritic.
- 3140-3190 10% CAUTERER; off minise as above part slightly argillaceons. 75% SKLASTONE; as above part very fine to fine candy. 5% Sideritic siltutene as above. 10% SKLAS; dark gror, silty, as above.
- OLYG-6160
  OLYG
- 8160-8173
  30% SANDSTONE; white to light groy with very fine to fine grained subargular quarts and fairly common white to light brown irregular foldspathic grains, in moderate sparse white siliceous part dolomitic count, very occasional white and brown wice and carbonacceus flocks.
  50% SILTSTOND; light to mediam gray part very fine sendy part argillaceous, common carbonaccous flocks occasional brown wice.
  55 Sideritic siltstone as above.
  8170-8180
  40% SAMDSTONE; white tollight groy, as above traces

Marketonk, while tolking stor, as most of acts porosity.
 Marketonk, while tolking stor, as most of acts for starting starting starting starting starting starting starting and occasional very fine quarts grains, in abundant argulaceous sideritic matrix.
 Marketone modium to dark grey silty as above.

8180-8190 20% SANDETONE; white to off white, with fine to decadenal medium ground subangular to cubrounded quarty, in fairly sparce silicoous part delemitic essent very eccadently white feldspathic ground cul when. Part with fair peresity. 30% SANDETONE; white to light groy very fine to file grained as above. 40% SILFETONE; light to medium groy, part very fine sandy, part as above, argillaceus. 5% Sidenitie silictent; as above. 5% SHALE; as above.

8190-8200

80% SANESTONE: white to off white with fine to modium grained engelar to conscionally subreunded quarte in fairly sparse siliccone slightly delevatic count. Very eccessionally white foldepathic and coloured lithic grains. Traces pyrite graine wederately friable, generally fair intergranular percenty.
Occurcionally correctly course quartz grains are probably derived from this conditions.
10% SAMESTONE: Light gray very fine grains and brown size.
10% SIMESTONE: as above including eccasional sideritic cilistene with occurcient development of peer vert percenty.

8200-6210 50% SANDETONE; white to off white fine to modium grained as above, fair intergrammer perceity and occasional coarse to very coarse loose grains as above. 10% SANDETONE: light grey very fine grained with cormon folderathic grains and pale green chloritic grains, silty, common carbonaccout flocks, part pyritte. 20% SILTSTONE; medium grey with abundant white to brown folderathic and light green chloritic grains cocasional carbonaccous flocks, part pyritic. 20% SHALE; medium to dark grey as above.

- 8210-8220 SHALE; dark grey, silty, platy fairly common well oriented bistite, occosional follopathic and chloritic grains.
   15% SAMDSTONE; and siltatone as above.
- 8220-8230 60% SANDSTONE; white with fine to occasional medium subangular slear quartz in veryb sparce siliceous comment. very occasionally grey lithic grains. Traces pyrite occasional loose coarse quartz grains. 10% SILTSTONE; light to medium grey as above part fine sandy. 30% SHALE; as above.
- 8230-8240 30% SANDSTOND; white to light groy with very fine to fine grained subangular quartz and white to brown feldepathic grains in a fairly sparse silicoous alightly dolowitic cemont, Part with common carbonacoous flocks and lawinae.
  20% SANDSTOND; white fine to modium grained as above.
  10% SHALS; dark groy, silty as above part slightly pyritic.

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135 SHALE; modium to modium dark groy, alight to 8240-8250 moderately enrocemes, flocked, generally only slightly folderathic, silty in put subfiscile to ficeile. 175 SAMPERNER: light groy, uncencolidated, predepimantly your fine to fine grained, subargular quarts grains with eccasional wodium to very coarse grains, generally angular, derived from yearly seried frickle senderous on belew. 55 SAMEFOND and CATASTONS; variable grain size but compared with chundent siderite generally moderate to very foldepathic and alightin carbonnecous, tight. 30% STREETER; modium light to undian greet, veriable but generally undernte to very Soldapathic and pederaboly environceons. in Largo cars sandy (very fine grains and occessional fine to modium grains) in part traces provide, in part vieweenes, in part nrgillaceous. 103 SANDETUIN: white, fine to medium grained, as above. 256 SAMDSPOND; light grey, vory fine greined in part fine gatined, subangular guarts, 5-20% altered foldepor, olight to mederately carbonaceous, tight, generally very silty and grades to siltstone. 10% SMALE: medium dark groy, moderate to very microsic, clicktly feldepathic and earbonaceous 8250-8260 moderate to very cilty, platy and blocky. 3% SIL2670M8; as abeve. 35 SANDSTONE; light grey silty as above. 80% SANDSTONE; white, very peorly served, sample prodeminantly uncencolidated, very fine to granule sized, procontnently nodius grained, procominatly angular querts, traces white kaolin grains. Concolldated chips include occasional rounded grains, occasional vellowish stained, grains, fairly corner kaolin grains and in part common black carbonacoous grains, some chips have kaolin matrix but condetous probably poorly comented with silles; consolidated chips show fair to vory good intergranular percelty; evenul percelty probably 15-20%. Maint rollewish fluoresconce from several quarts grains. Fairly common modium light brown condstene with abundant (90%) sideritic matrix. 8260-8270 Trip Sample. Sample unreliable. 20% SANDETONE; light groy, predeminantly fine to modium grained, in part clean quartz with occasional white keelin grain and traces fuldspar; in part with abundant foldspar grains, kaolinitic to silicocus conent, tight. 40% SILASTONE; modium light to medium groy, very foldopathic, moderate to vory carbonaceous, in part argillacoous, as above. 40% SHALE; (probably largely cavings) modium to modium dark groy, slightly foldspathic and carboncoocus, slight to moderaily silty, lathlike

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to subficult.

8270-8280

25% SANDSTONE; white fine to occasional modium grained with argular to subangular clear quartz in fairly sparse white coment to possible kaolinitic or silicoous rare included coarse to vory coarse quarts grains occasional carbonaccous grains part with fine pyrite, occasional white feldspathic grains, traces lithic fragments. Partly poor to fair intergranular percenty, part with carthy poresity in healinitic matrix. 20% SANDSTONE; off white to light groy very fine grained with common white to brown foldspathic grains fairly cormon carbonaccous flocks and lawinge silty, grades to siltstene below. 20% SILTSTOND; Light to modium groy with foldspathic and enrhouncouns grains as for sandstone above. 30% SHALE; medium to dark groy silty occesional foldopathic grains part with oriented carbonaceous flooks. 5% SANDSTONE; dark grey with fine to modium angular

quartz grairo in abundant dark grey argillacoous slightly carbonaceus matrix.

SANDSTONE; white fine to very occase and granule 8280-8290 grain size largely returned as lease engular clear to white (occasional lower yellev) quartz grains. Concolidated chips have sparse part silicoous, part kaolinitle errout and traces grey green lithic grains and orange felspar. Part show fair intergranular persenty and earthy (coment) persenty. Some coarser chips show tightly interlocking quartz crystals and overall porecity may be less than that suggested by the loose grains. 10% SANDSTONE; light grey, very fine grained grading to siltotone as above. 10% SHALE: dark groy as above probably interlaminated with sandstones above.

S290-8300 50% SAMDSTONE; white as abovebbut prodominantly fine to medium grained consolidated, and tight.
15% SANDSTONE; light grey very fine grained grading to siltetone as above common carbonaceous flecks.
5% SANDSTONE; light brown with fine to medium angular quarts in abundant argillaceous to sideritic? matrix. Traces evange feldspar and grey lithic grains.
30% SHALE; dark grey part silty traces to occasional white felderathic grains and light chloritic grains Part with eccase a criented sarbonaceous flecks.

8300-8310
SAMDSTONE; white fine to very course and grain size. Returned largely as alogle clear to white end occasional pale yellow angular quarte grains, consolidated chips show very sparce silicoous and kaclinitic coment but generally only poor intergreender peresity. Traces erange foldspar and grey green lithic graine.
20% SANDSTONE; light grey silty, very fine grained grading to silistone with abundant white to brown foldspathic and light green chloritic grains, commen carbonecous flocks and argillaceous streaks traces white mice a part of the side.
10% SHALE; dork grey as above.

8320-8330 SANDSTONE; white fine to granule size as above, but predominantly medium grained largely returned as single grins. 15% Very fine sandstone grading to siltstone as above miner part very poorly sorted with occasional medium to coarse angular quartz grains. Traces orange feldspar. Traces glaucenite ? 15% SHALE; dark grey and silty with occasional white feldspathic grains and common well oriented biotite, occasional carbonaceous flecks.

SANDSTONE; white to offwhite fine to granule size 8330-6340 mostly returned as single, angular clear to white quartz grains. Consolidated chips are predominantly fine to medium grained with very sparse siliceous and kaolinitic coment, and generally fair to very occasionally good porosity. Occasional carbonacoovs grains, occasional white foldspathic grains, traces erange feldspar and grey lithic grains. 10% SILTSTONE; light to medium grey with common white feldspathic groon chligitic grains, occasional carbonaceous flocks, traces orange foldspar. Traces glouconite? part vory (fine to modium) sandy and grading to a sandstone equivalent. 15% SHALE; dark groy as above.

8340-8350 60% SANDSTONE; white to off white as above but consolidated chips show poor sorting with quartz grains ranging from fine to granule size, slightly were common grey green fine to medium lithic grains. Poor to fair intergranular peresity. 15% SILTSTONE; Light to medium grey grading to sandatone as above. 5% Sideritic ciltatone medium brown common carbonaceous flocks and occasional white feldspathic grains in abundant slightly argillaceous sideritic matrix. 20% SHALE; dark grey as above.

8350-8360 50% SANDSTONE; white to off white as above. 30% SILTSTONE; light to medium groy with abundant white to brown foldepathic and light groon diloritic grains. Occasional carbonaceous flocks occasional brown mice traces orange foldspar traces glauconito, part very fine to fine sandy. 5% Sideritic siltstone as above. 15% SHALE; dark groy foldspathic grains occasional brown mice.

- 8360-8370 SANDSTONE; white to off white with fine to very coarse grained engular quartz and very sparse white silicoous part kaolinitic cenent, very occasionally white foldopathic grains, traces grey green lithic grain traces part with pyritic cenent. Poor to eccasionally fair intergranular perceity, probably earthy perceity in kaolinitic cenent, part returned as loose angular clear to white and very eccasionally lemon yellow quartz grains. 405 SILTETONE: light to medium grey as above with 55 sideritic siltetone as above. 105 SHALE; dark grey as above.
- 8370-38380 SANDSTONE; white to off white as above with occasional very fine to fine curbeneceous grains traces white mich flakes. 15% SILESTONE; as above but with commen carbonaccous inmeilas.

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15% SHALE; dark groy as above.

83808390 40% SANDSTONE; white to off white as above. 20% SILTSTONE; light to medium grey part very fine saud as above. 40% SHALE; dark grey silty, consional white to brown feldspathle grains occasional carbonaceous flocks and brown wice part with common carbonaceous lamellae traces pyrite.

SANDSTONE; white to off white predominantly fine 8390-8400 to medium grained with fairly well sorted angular clear quartz grains in a sparse siliceous part kaolinitic cement. Very occasional white feldspathle grains, traces orange foldspathic and grey lithic grains, traces pyrite traces unscovite fairly common very fine to micro carbonaceous speeks, occasional carbonaceou flocks and Laminao. Part with poor intorgranular porosity. 10% loose medium to very coerse quartz grains, may be cavings or forived from above. 5% SILTSTONE; light to medium grey with abundant white to brown feldspathic grains angular quartz grains in arglllaceous matrix, common carbonaceous flecks and lawollae. 5% SHALE; dark groy slightly silty with vory occasional white to brown foldspathic grains and carbunacoous spocks, part micro-micacoous.

8400-8410 SANDSTONE; white to off white part fine to medium grained as above but largely returned as loose modium to very coarse clear to white angular quartz grains occasional consolidated chips show interlocking quarts grains in very sparse siliceous coment.
5% SHALE; as above.
5% SMALE; as above.
5% SMALE; as above.
5% SMALE; as above.
5% SMALE; as above.
5% SHALE; as above.

8410-8420 SAMDSTONE; white to off white fine to very coarse grained as above approximately 60% returned as loose grains. Common carbonaceous specks occasional lamellae. Part traces poor intergranular peresity (consolidated oblps). 5% SIL/ISTONE; as above with carbonaceous lamellae 10% SHALE; dark grey flightly silty carbonaceous as above.

6420..8430
Circulated sample. Possibly unreliable.
60% SANDSTONE; white to off white fine to very coarse grained with poorly wrted clear to white angular querts in very sparse siliceous part kaolinitic cement. Fart with slightly more orange foldepar and lithic grains then above. Common carbonaceous specks. Part with poor to fair intergranular peresity. Approximately 30% returned as loose quarts grains.
20% SILTSTONE; as above, part sandy and part glauconite - are probably cavings.
20% SHALE; dark grey, carbonaceous ab above, part very silty and probably cavings.

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Trip Sample.

## 8430-8440

SANDSTONE; white fine to very coarse grained predominantly medium grained with angular clear quartz in very sparse siliceous part kaolinitic cement. Traces orange foldspar and lithic fragments; fairly common carbonaceous specks, part fair to good intergranular porosity. 40% returned as loose grains.

Fluorescence: a. Bright yellow no cut orange/ brown mineral previously described.

b. White to blue no cut white to massive kaolinitic material possibly part of sandstone matrix.

c. Dull orange to yellow no cut clear quartz with no staining possibly due to mineral inclusion.

d. Bright yellow as for a. but with slight white not attributed: Orange mineral may be a resin ?? br cut from residual hydrocarbons. 20% SHALE; dark grey silty occasional white feldspathic fine grains common carbonaceous flecks, slightly micaceous.

5% SILTSTONE; light to medium grey part sandy part argillaceous common white to brown feldspathic grains and carbonaceous flecks. 5% 'Kaolin' white massive to microcrystalline possibly earthy porosity. Probably derived from sandstone.

- 8440-8450 SANDSTONE; white fine to very coarse and occasionally granule size as above but predominantly coarse grained largely returned as loose single angular clear quartz grains. Consolidated chips show fair to good intergranular porosity in part with part tight and interlocking fluorescence. Mineral as above. 5% SHALE and SILTSTONE as above. 5% Kaolin as above.
- 8450-8460 SANDSTONE; white with poorly sorted fine to very coarse angular clear quartz in very sparse siliceous kaolinitic coment. Occasional lemon vellow quartz grains and rounded in part. Common specks of black carbonaceous/bitumin ? material. Part fair to good perosity, part tight as above, very minor shale siltstone and kaolin as above.

8460-8470 15% SHALE; modium light to modium groy, modorately wicromicacoous, moderately earbouaceous, prodominantly only slightly foldspethic, in part silty, fiscile to platy. 85% SANDSTONE; white to light gray, vary poorly sorted, matrix consists prodominantly of fine to modium grained angular quarts, rare white kaolin grains, traces pink grains and pyrite grains, commonly comented with silica but in part by a powdry white kaolinitic coment and loss commonly by brown siderite? The sendatone is slightlu silty and includes abundant vory fine grains coarser grains (approximately 35% of sample) range in size from coarse grained to pebble size and are prodominantly coarse to very coarse grained. The sandstone has moderate intergranular peresity and many chips and individual quarts grains exhibit a very pale fluorescence (mineral) but not cut in solvent and no stain. Scattered bright yellow mineral fluorosconce. Fairly common brown candy ciderite and/ or ironstono.

8470-8480 15% SHALE; as above. 85% SANDSTONE: similar to above but in general with an increase in matrix and only about 15 to 20% scattered coarser grains predominantly of coarse to very coarse grained sized. The sandstone is most commonly comented with a siliceous cement and has fair intergranular and carthy peresity It exhibits fait yellow fluorescence in part and rare bright yellow fluorescence both of which appear to abe attributable to the presence of a brownish orange mineral. Occasional carbonaceous/bitumen stringers.

8480-8490 15% SHALE; medium groy, slightly moderate carbonaceous and feldspathic silty in part moderate to very micaceous, fissile to platy. 85% SANDSTONE; as at 8460-8470 with some argillaceous grains and occasional black carbonaceous grains and generally with moderate to good intergranular and earthy perosity.

8490-8500 20% SHALE; as above. 80% SANDSTONE; white to light grey, poorly sorted matrix consists predominantly of fine to modium, angular quartz with traces of black carbonaceous grains, orange grains, white kaolin grains, friable cemented prodominantly with silica but some kaolinitic and lesser sideritic (?) coment, moderate to good intergranular and earthy percenty. Mineral fluorescence as above. Very abundant (50%) coarse grained to granule sized loose quartz grains. Average grain size coarse.

8500-8510 60% SHALE; medium light to medium grey as above, in part moderately silty. 40% SANDSTONE; similar to above, fine to medium grained but with a marked decrease in percentage of coarser grains; ;cemmon black carbonaceous to coaly flocks and grains occasional red grains; moderate earthy and interganular perceity. Occasional siltstone. Fairly common brown very fine grained sandstone and siltstone with abundant sideritic matrix.

8500-8510 50% SHALE; medium hight to medium grey moderate to very carbonaceous, slightly feldspathic (?) in part silty sub-fissile to platy - grades to. 10% SILTSTONE; medium grey, carbonaceous, argillaceous. 10% SILTSTONE; medium brown, mederate to very carbonaceous and slightly argillaceous, very abundant sideritic coment. 30% SANDSTONE; as above, fair perosity in part but in part with brown sideritic matrix; matrix predominantly fine grained; fairly common course to very cearse grains. Traces bright yellow mineral fluorescence.

- 8510-8520 75% SHALE; modium grey slightly micaceous, slightly cerboneceous, in part clightly silty, fissile. 20% SANDSTONE; white to light grey, poorly sorted, as above (50% with fair to good porosity) in part with sidoritic ? cement. 5% SILTETONE; as above.
- 3520-8530 Fast drilling break at 8525.
  35% SHALE; as above, moderately miceeoous, subfiscile to platy.
  5% SILTSTONE; modium grey, as above.

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60% SANDSTONE; white to light grey, medium grained in part fine grained, scattered coarse to granule sized grains, poorly sorted with common very fine and silt sized grains, angular quartz, traces of white kaolin, pink and orange stained quartz, green clay grains, fairly common black carbonaceous spex; friable, good to very good intergranular and earthy porosity. Scattered wineral fluorescence. Common sideritic siltstone.

8530-8540

33% SHALE; modium grey slightly micromicaceous, slightly to moderately carbonaceous, fissile to subfissile in part silty and platy.
5% Brown and brownish grey, very sideritic, argillaceous and carbonaceous siltstone and silty clay ironstone.
60% SANDSTONE; light grey, matrix similar to sandstone above but 40% of sample consists of angular to sub-angular cearse grained to granule sized (predominantly coarse grained) quartz grains.

8540-8550

10% SHALE; as above.

5% Modium light to modium greyish brown very sideritic very fine grained sandstone and CLAYSTOME. 85% SANDSTONE; white to light grey, unconcolidated, peorly serted, modium grained to granule size with rare pubble, produminantly course to very coarse grained, clear to slightly cloudy, angular in part subangular quarts, common yellow with occasional amber and pink tinted quartz grains, traces white and grey chert grains, black carbonaceous matter adhering to some grains minor consolidated chips have a siliceous coment and in part are comented with white kaclin or more rarely with a reddish brown sideritic/ delomitic coment. Consolidated chips show fair to poor peresity and overall peresity possibly moderate.

8550-856C 15% SHALE; as above. 5% Sideritic conditions and ironations, as above. 80% SANDSTONE; as above prodominantly unconsolidated, predominantly coarse to very coarse grained, quartz and traces rod jasper (?) grains. Rare pyrite. Common pale yellowish fluorescence possibly due to inclusions in quartz or to coment but perhaps hydrocarbon fluorescence. No cut in solvent.

8560-8570 10% SHALE; as above, often silty. 3% Sideritic ironstene, siltatone, very fine grained sandstone as above. 87% SANDSTONE; white, predominantly unconsolidated, very poorly corted to pebble size, predominantly coarse to very ecarse grained, angular, vitreous quartz, traces of blue grey quartz and of red jasper (?), occasional amber and yollow tinted grains, black carbonaceous watter adheres to several grains, but consolidated onlys indicate cevent probably is silicous/kaclinitic as above. Faint yollow fluerescence (as above) on way quartz grains. Traces of bright yellow mineral fluerescence.

8570-8580 25% SHALD; modium dark grey, slightly micaceous, moderately corbenaceous, slight to moderately silty, fissile to platy. 75% SAMDSTONE; similar to that at 8530-8540 but predominantly well comontod and only with poor intergranular and earthy perecity. Scattered mineral fluorescence. 8580-8590 Trip Sample

50% SANDSTONE; white poorly sorted fine to very coarse grained as above but predominantly fine grained with angular quartz in very sparse ciliceous/kaolinitic coment. Part poor to fair intergranular poresity. Trace residual hydrocarbon with pink to yellow fluorescence and slight cut. 40% SHALE; dark groy silty with occasional white to brown feldspathic grains, carbonaceous slightly wicaccous. 10% SILTSTONE; part sandy, with abundant white to brown feldspathic grains end common carbonaceous stains and specks.

8590-8600

35% SHALE; dark grey silty with well oriented brown wica, occasional white to brown feldspathic and light green chloritic grains.
10% SANDSTONE; white as above probable cavings.
35% SANDSTONE; white to light grey very fine to fine grained with angular to subangular quartz in siliceous/knolinitic coment, occasional white to brown feldspathic grains and carbonaceous specks.
Tight.
20% SILTSTONE; light to medium grey part sandy, part argillaceous and grading to shale above. Common white to brown feldspathic and light green chloritic grains. Occasional carbonaceous flecks. traces glaucenite traces mica, traces pyrite. 5% with

8600-8610 60% SHALE; dark grey, micaceous, part silty with occasional white to brown foldspathic grains part with laminad of very fine quartz sand, very occasionally with fine to very coarse quartz grains grades to to siltstone, below. 30% SILTSTONE; light to medium grey as above. 10% SANDSTONE; off white with fine to medium grained angular and occasional oriented clear quartz in silicocus slightly kaolinitic coment. Occasionally earbonaceous grains, traces grey lithic grains. Part with traces intergrenular perceity.

sideritic matrix.

- 8610-8620 30% SHALE: dark grey silty, micaceous as above. 30% SHLTSTONE: light to medium grey part argillaceous part sandy common carbonaceous flocks, as above. 40% SANDSTONE: white with fine to very coarse angular clear quarts, largely returned as single grains in concolidated chips. More sparse siliceous or kaclinitic coment. Minor part with good intergranular peresity. Occasional faint yellow fluorescence with very slight out.
- 8620-8630 70% SANDSTONE; white to off white fine to very coarse grained but prodominantly fine to medium and returned as censolidated chips, with angular clear quartz as above, but generally fair to good intergranular perceity. Traces fluerescence as above. 20% SILTSTONE; light to medium grey as above. slightly micaceous. 10% SHALE; derk grey as above very minor part with glaucenite.
- 8630-8640 30% SANDSTONE; white to off white as above. 30% SILTSTONE; light to medium grey, part sandy, common white to brown foldspathic grains and

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carbonaccous flocks, part argillacoous grading to shale below. 40% SHALE; dark grey part silty with occasional white to brown foldspathic grains cousion mica, very occasionl quartz sandsgrains.

20% SHALE; medium to medium dark grey, very slightly micaceous, rarely glauconitic, slight to medium 8640-8650 carbonaceous and feldspathic, in part silty, subfissile to platy - grades to -15% SILTSTONE; modium grey slight to moderately carbonaceous, moderate to very feldsputhic (?) (cream buff and grey altered clavey grains), in part very fine sandy. 65% SANDSTONE; white to light groy, poorly sorted, recovered prodominantly as unconsolidated grains, fino grained and very coarse grained, predominantly vory coarso grained, angular, vitroous quartz, common auber and yellow tinted quartz grains; consolidated chips are generally comented with silica and tight. Occasional brown sideritic ironstone; traces of pyrito.

8650-8660 40% SHALE; medium to medium dark gray, as above, but generally moderate to very silty and occasionally with scattored very fine to medium rounded quarts grains grades to -25% SHLTSTOME; medium groy, slightly miceecous, abundant altered foldspar and possibly lithic grains slightly carbonaccous. 35% SANDSTONE; similar to that above, consolidated chips computed with silica and tight. Traces pyrite, very fine grained glauconitic sandstone occasional sandy sideritic IRONSTONE.

- 8660-8670 40% SHALE; medium to dark grey silty as above.
  30% SILTSTONE; light to medium grey as above grades to very fine grained silty conditions with occasional glauconite.
  40% SANDSTONE; white to off white fine to very coarse grained with poorly sorted angular quarts in sparse silicoous/kaolinitie coment. Part returned as single graine consolidated chips are prodominantly fine grained with poor percenty, part tight.
- 8670-8680 53% SANDSTONE: white to off white as above but part with poor to fair perceity. 30% SHALE: medium to dark groy occasional feldspathic grains with citionted wice and corbenaceous flecks, part cilty and grading to siltatone below. 20% SHLTSTONE: light to medium grey with common altered feldspar grains, occasional carbonaceous speeks and traces glaucenite?
- 8630-8690 50% ENALE; modium to dark groy cilty, as above. 15% SILTSTONE; light to modium groy as above with 5% sideritic matrix. 25% SANDSTONE; white to off white as above to very poorly seried and with rare white feldspathic and groy lithle grains, very econsional carbonecoous flooks. Mainly tight.
- 8690-8700 60% SANDSTONE; white to off white fine to very coarse grained but predeminantly fine grained with angular quarts in silicous slightly knolimitic coment, southered with white foldopathic grains, rare lithic grains very occasional carbonacoous/bituach specks.

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Traces poer intergranular and earthy porosity. 10% SILTSTONE; as above. 30% SHALE; dark grey silty as above, but very minor part glauconite.

- 8700-8710 60% SANDSTONE; white to off white as above occasionally yellow quartz grains, very minor part with sideritic cement, traces poor perosity as above. 15% SILTSTONE; light to medium grey with abundant altered feldspathic grains. Occasional mice and carbonaceous flocks, part very fine sandy, traces glaucenite. 25% SHALE medium to dark grey silty, as above grading to siltstone above.
- 8710-8720 55% SHALE; medium to dark grey, predominantly very silty and grading to siltstone, occasional white kaolinitic grains, cormon white mica very minor part with glauconite, traces pyrite.
  1.5% SILTSTONE; light to medium grey as above.
  30% SANDSTONE; white to off white fine to very coarse grained as above.
- 8720-8730 55% SHALE; modium dark to dark groy, slight to modorately micromicaceous, prodeminantly slightly silty, rarely glauconitic, common carbonaceous flocks (or biotite shreds) with linear orientation occasional white cream and buff altered foldspar grains, reroly with scattered very fine to medium grained quartz; sub-fissile to chunky. 16% SANDSTONE; light grey, poorly sorted, very fine to medium grained, quartz with 30-40% oream buff green black altered feldspar and lithic grains, woll indurated, tight. 15% SANDSTONE; white to light grey, very fine to medium grained, predominantly fine grained, subangular quarts, traces gree, erange and black graine, well cemented with silica tight. 3% Loose fine to very coarse quartz grains, subangular to well rounded; well rounded grains probably "fleat" from siltstons and shale and remainder derived from sandstone above. 15% SILTSTONE; modium to dark groy, argillacoous predominantly very fine to fine sandy.

8730-8740 5% SANDSTONE; white to light grey, very fine to modium grey, as above.
5% SANDSTONE; light grey, very fine to modium grey, quartz and lithic grains, silty. As above.
5% Loose quartz grains as above.
20% SILTSTONE; modium to modium dark grey, carbonaceous micaceous, in part sandy and grades to very fine grained, silty sandstone, generally with abundant foldspathio/lithic grains.
65% SHALE; modium dark grey moderate to very carbonaceous and in part micaceous (biotite shrede) in part slight to moderately silty, rare poorly seried cand grains, subfissile to platy. Occasionally sideritic IRONSTONE.

8740-8750 10% SANDSTONE; white to light gray, very fine grained angular quartz, occasional lithic (?) grains, occasionally carbonaceous grains, rare mica, friable in part, silty, siliceous to slightly kaolinitic coment, predeminantly tight. 20% SILTSTONE: as above. 70% SHALE; as above. Rare angular quartz pobbles with poorly sorted sandstone adhering. Occasional sideritic ironstone.

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SHALE; medium to medium dark grey, in slight part 8750-8760 micromicacoous, slight to moderately carbonaceous, occasionally feldspathic/lithic grains, fissile with losser shale; modium to medium dark grey mederately carbonaceous, slight to moderately silty common silt to very fine grained size lithic/ feldspathic grains, chunky. 20% SILTSTONE; medium groy, in part brownish groy slight to moderately micaceous, in part argillaccous in part grades to very fine grained sandstone, slightly carbonaccous, moderate to very feldspathic lithic, in part with common green chloritic (?) grains. 5% SANDSTONE; variable, white to light grey predominantly very fine grained, quartz and occasional pink green and buff accessory grains, tight. Scattored fine to very coarse quartz graine.

8760-8770 50% SHALE; medium to dark grey, silty, common well oriented mica, occasional dark carbonaceous flecks, traces pyrite, grades to -30% SILTSTONE; light to medium grey with abundant altered feldspathic and lithic grains, fairly common white mica, and carbonaceous streaks and flocks. Minor part very fine sandy with occasional glauconite grains and minor part with sideritic matrix. 20% SANDSTONE; white, returned as single grains fine to very coarsebbut predominantly coarse grained angular to subrounded clear to cloudy quartz. Very minor fine to medium grained consolidated chips with silceous matrix, tight.

8770-8780 SANDETONE; white to off white fine to occasionally medium grained with angular clear quartz in a siliceous slightly kaolinitic cement. Very occasionally white altered feldspar carbonaccous specks, rare coloured lithics. Traces to occasional poor intergranular perosity. O.1 unit shift on gas detector similar to previous CO<sub>2</sub> shows. Traces bright yellow fluorescence due to orange brown organic matter previously described. 10% SANDSTONE; white, fine to very coarse single grains, as above. 10% SHALE; medium to dark grey, silty as above. 10% STLTSTONE; light to medium grey as above.

8780-8790 SANDSTONE; white fine to very coarse and granule size, poorly sorted made at coarse grain size. 50% returned as single angular and clear to cloudy quartz graine. Consolidated chips have sparse siliceous slightly kaolinitic coment, and very occasionally white to light brown foldspathic shreds and dark carbonaceous specks. Minor part with poor intergranular perceity. Very minor part with brown sideritic cement. Rare carbonaceous/ bitumen lamellas. 10% SHALE & SILTSTONE; as above.

8790-8800 SHALE; medium to dark grey micromicaceous, part silty occasional carbonaceous flocks. 30% SILTSTONE; light to medium grey with common white foldspathic grains and occasional mica and carbonaceous flocks, very minor part with common glauconite, rare fine to medium angular quartz grains. 10% SANDSTONE; white fine to very coarse grained as gbove.

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8800-8810

Trip sample. Poor quality.

SHALE; medium dark grey, slightly micromicaceous slightly carbonaceous (flecks), very slightly foldspathic (shreds and silt size grains) in part silty, fissile to subfissile. 35% SILTSTONE; medium light to medium grey, moderately carbonaceous, moderate to very feldspathic lithic (cream, buff, grey shreds and very fine grains of altered feldspar and/or buff lithic grains) in part very fine sandy, in part argillaceous. 5% Loose angular quartz grains predominantly of coarse to very coarse grained size (cavings?) 5% SANDSTONE; whito to light grey, variable, in part coarse to very coarse grained, clean well comented with silica, in part very fine to fine grained lithic.

8810-8820

SHALE; medium dark grey as above, slightly silty, fissile to subfiscile. 20% SILTSTONE; as above, coarse, very fine sandy in part and grades to very fine grained silty sandstone.

15% SANDSTONE; white, very fine grained to medium grained, predominantly fine grained, angular to subangular quartz, traces altered feldspar, pink fresh feldspar, black carbonaceous (?) grains, green grains and schist fragments, moderately friable, poor to medium sorting siliceous coment. tight. 5% Loose quartz grains as above. Trace black chert

rounded peobles. Fairly common modium light to medium dark brown sideritic ironstone and silty shale.

8820-8830

35% SHALE; dark grey, very slightly micaceous,
slight to moderately carbonaceous, in part medium
to very silty, occasionally kaolinitic (?) fleeks,
fissile to lathlike.
10% SILTSTONE; medium grey as above, in part sandy
(very fine to fine grained quartz).
1% Sideritic ironstone and sideritic siltstone and
shale.
50% SANDSTONE; white, fine grained, in part very
fine grained, angular to subangular quartz. Rare
reddish orango feldspar (?) grains, occasional white
kaolinitic grains, green argillaceous grains, pale
orange grains and black grains, moderately well
sorted, very friable, cemented with sparse silica
and rarely with kaolin, very slightly intergranular

porcus. 4% Loose quartz grains, prodominently subrounded but in part angular, generally coarse to very coarse grained.

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8830-8840
20% SHALE; dark grey, slightly carbonacenus, in part moderate to very silty, rarely feldspathic, subfissile chunky.
5% SILISTONE; as above.
70% SANDSTONE; white, fine grained, fairly common very fine grains and silt, angular to subangular quarta 5% accessory grains consisting predominantly of white kaolin and including grey and green argillaceous grains and black carbonaceous (?) grains, slight to moderately friable, siliceous cement. Fair to moderate intergranular perosity in part.

Common ironstone as above.

20% SHALE; medium dark groy slightly micaceous,

8840-8850

slightly carbonaceous, in large part slight to moderatelybsilty, subfissile to platy. 5% SILTSTONE; modium grey, coarse similar to that above. 2% Medium to dark brown, sideritic ironstone with cryptocrystalline texture; sandy and feldspathic in part. 3% Loose quartz grains, angular to subrounded, fine grained to granule size but predominantly coarse grained; probably derived from sandstone below. 70% SANDSTONE; white to very light grey, fine grained, with some very fine grains, angular quartz, with less than 3% accessory grains including white kaolin grains, altered motomorphics (?), common roddish orange and black grains, occasional fresh foldspar, slight to moderately friable, siliceous and in part moderate amounts of kaolinitic coment, traces intergranular porosity, fair earthy porosity.

8850-8860 15% SHALE; medium to medium dark grey, slightly carbonaceous, slight to moderate feldspathic/lithic in large part silty, sub fissile to platy.
10% Medium light medium dark brown sideritic ironstone and siltstone and sandstone with abundant sideritic coment.
45% SANDSTONE; white, very poorly sorted, in part matrix of very fine to fine grained sandstone as described above and in part of medium to coarse grained sandstone. Both types consist of angular to subangular quartz with less than 3% accessory grains, as above; the sandstone has fair (finer fraction) to moderate (coarser fraction) intergranular porosity and good earthy poresity; it is friable and only poorly cemented with silica and powdery kaolinitic coment.
30% Loose angular to subrounded quartz grans, medium to very coarse grained, predominantly coarse grained.

8860-8870 10% SHALE; as above.
10% Sideritic ironstone, sandstone and siltstone as above.
15% SILTSTONE; medium light grey to medium dark grey slightly to moderately carbonaceous, moderate to very foldspathic/lithic (ver fine and occasional fine grains of altered foldspar and/or lithics).
65% SANDSTONE; white similar to that above but less friable and with only traces of porosity. Average grain size is fine grained.

8870-8880 SHALE; as above and medium grey moderate to very silty slightly carbonaceous, chunky, grades to - 15% SILTSTONE; medium light to medium grey, tough, in part siliceous, as above. 40% SANDSTONE; white to very light grey, fine to coarse grained, predominantly fine grained, angular to subangular quartz with 1-5% black pink, orange and green accessory grains (including kaolin and feldspar) well comented with silica and in part with kaolin, indurated, traces at poor intergranularporesity. Common sideritic ironstone; as above. Fairly common poorly sorted loose quartz grains.

8880-8890 Variable sample - Interbedded and gradational. 40% SHALE; as above generally medium to very silty subfissile-platy. 40% SILTSTONE; as above grading to sandstone and shale.

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	20% SANDSTONE; white to light grey, predominantly fine grained, quartz, lithic grains and accessories range from 5-15%.
8890-8900	50% SHALE; medium to dark grey silty to very silty common while feldspathic grains and well orientated mica minor part with fine subangular to subrounded quartz grains grades to 15% SILTSTONE; light to medium grey to brown with abundant feldspathic and lithic ? grains occasional mica part with dark brown argillaceous slightly sideritic matrix grading to - 15% Sideritic mudstone, medium dark brown, argillaceous slightly sideritic part silty as above. 20% SANDSTONE; white to light grey (brown) fine to coarse grained, predominantly fine grained as above. Well comented siliceous and kaolinitic with very minor sideritic coment, generally - 5% feldspathic and lithic grains, generally tight, very minor poor porosity.
8900-8910	Gradational and variable lithology as above. 60% SHALE; medium to dark grey as above part silty, part sandy, grades to 15% SILTSTONE; light to medium grey as above grades to 5% SANDSTONE; light grey silty, with abundant altered feldspathic and lithic ? grains occasionally mica. 5% Sideritic mudstone as above part sandy. 15% SANDSTONE; white to light grey as above.
89108920	Trip sample - Interbodded and gradational. 55% SHALE; dark to medium dark grey, slightly carbonaceous, in part moderate carbonaceous, generally moderate to very silty, moderate to very feldspathic lithic, grades to - 45% SILTSTONE; light to medium light grey, very feldspathic/lithic (predominantly cream grey and greenish grey); very fine sandy (lithic/feldspathic grains) and grades to very silty very fine grained sandstone; slightly carbonaceous. 10% SAMDSTONE; as above.
8920-8930	Interbedded and gradational. 25% SHALE; modium dark grey, silty, foldspathic/ lithic, as above. 35% SANDSTOME; modium light grey, very fine to prodominantly fine grained, occasional modium grains angular to subrounded quartz, 20% foldspar (altered) and lithic grains including fairly common green chloritic clay grains, poorly sorted, very silty, in part slightly argillaceous, well consolidated, tight trace pyritic and calcareous. 40% SILTSTONE; modium light to light grey, very foldspathic/lithic, slightly carbonaceous, often very fine to finely sandy and grades to sandstone, as above

loose quartz grains. 8930-8940 15% SHALE; medium to medium dark grey, carbonaceous, clightly foldspathic/micacoous, generally slight to moderately silty, platy-blocky. 60% SANDSTOME; light to modium light grey, very fine to modium grained, prodominantly fine grained, as above, traces intergranular porosity, abundant silty matrix and grades to siltstone abundant green clay grains, slightly pyritic in part, traces calcite.

Occasionally sideritic ironstone; occasionally

as above.

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	Occasional sidentic ironstone; Trace pale yellow fluoresconce with slightly cut.
8940-8950	5% SHALE; as above. 85% SANDSTONE; light to medium light grey, very fine to fine grained, with occasional medium grains, (including common sea-green clay grains and white altered foldspar), dirty appearance, in part with carbonaceous flex, traces pyrite and pyritized plant remains, well indurated, abundant silty matrix and grades to very sandy siltstone, trace calcite, in part with sideritic coment, tight. 10% SILTSTONE; medium grey, very sandy.
8950-8960	10% SHALE; as above (cavings ?) SANDSTONE; light to medium light grey vory fine to fine grained, subangular quartz and abundant 25-30% lithic grains as above, dirty appearance, in part micaccous, generally slight to moderately carbenaceous, abundath silt matrix, in part slightly argillaceous; grades to very sandy siltstono; well consolidated tight.
89608970	Variable lithology interbedded and gradational 5% SMALE; as above. 10% SANDSTONE; as above. 45% SILTSTONE; medium light to medium grey,moderately carbonaceous, slightly micaceous, coarse generally mederately sandy (very fime grained) in slight part traces calcite. 40% SANDSTONE; as above but predominantly very fine grained with sandstone very light grey; very fine grained angular quartz, 10% lithics, moderately friable, carbonaceous and micaceous, tight. Occasional sandstone and siltstone with sideritic cement.
8970-8980	5% SHALE; as above (cavings) 65% Light groy, very fine grained, occasional fine grains, angular quartz, 10-15% feldspar (altered)and lithic grains (only rare green clay grains) slight to miceous (muscovite and reddish brown biotite) moderatel; carbonaceous with occasional plant fragments, dirty, appearance, abundant slit matrix, non-calcite, siliceous and in part sideritic cement, possibly some earthy perceity but generally tight - grades to - 30% SILTSTONE; similar to that above, very sandy.

- 8980-8990 SANDSTONE; light grey to medium light grey, very fine to fine grained, occasional medium grains, predominantly fine grained, angular to subangular quartz, with about 20% lithic grains (including very common green clay and white kaolin grains, buff altered feldspar; less common black & orange grains), poorly sorted, very silty, slightly micaceous and carbonaceous, pyritic in part tight, - grades to -30% SILTSTONE; medium light to medium grey, lithic/ feldspathic, modorately carbonaceous and micaceous, very sandy.
- 8990-9000 SANDSTONE; similar to that above but predominantly vory fine grained and very silty, slight to moderately pyritic in largo part, possibly in part with earthy porosity - grades to approximately. 20% SILTSTONE; as above. Common sideritic sandstone and siltstone; fairly common poorly sorted, loose quartz grains.

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90009010	Variable lithology. Interbedded and gradational. 10% SHALE; medium light to medium grey, elightly to moderately carbonaceous and silty, platy. 55% SANDSTONE; light to medium light grey, very fine to fine grained, predominantly fine grained, subangular quartz, with abundant 20% lithic and altered feldspar grains, (including common sea- green clay grains and white kaolin grains), poorly sorted, vory silty, dirty appearance in part, micaceous and carbonaceous, tight - in part pyritic grades to - 27% SILTSTONE; medium light to medium grey, felds- pathic/lithic, moderately carbonaceous and micaceous very sandy (very fine to fine grained quartz and lithics), in part pyritic. 3% Light to medium brown siltstone and very fine to medium grained sandstone with very abundant sideritic cement. 5% Loose poorly sorted medium to very coarse quartz grains.
9010-9020	Varied lithclogy - interbedded and gradational. SANDSTONE; as above, very fine to fine grained, silty tight in part very light grey and traces calcite grades to - 30% SILTSTONE; moderately grey, very sandy as above. 5% Sideritic sandstone and siltstone as above. 10% SHALE; as above.
9020-9030	Varied lithology - interbedded and gradational 5% SHALE: as above. 10% Modium light to dark brown sideritic sandstone and siltstone. 60% SANDSTONE; light to medium light grey, predominantly very fine grained, in part fine grained, subangular querts with 15-25% lithic/feldspathic grains, moderately to poorly sorted, very silty, generally moderately micaceous, in part carbonaceous, in part slightly pyritic and firm, siliceous to clayey coment, tight, grades to - 25% SILTSTONE; medium light to medium grey, similar constituents, in part argillaceous, coarse, very fine sandy and grades to sandstone.
9030-9040	Interbedded and gradtional. 10% SHALE; modium to dark to dark grey, slight to moderately carbonaceous, slightly micaceous, moderate to very silty. 50% SILTSTONE; modium light to modium grey, coarse very sandy (very fine grained quartz and lithics) slightly micaceous, moderately carbonaceous, grades to - 35% SANDSTONE; modium light grey, very fine grained as above, tight. 5% Brown sideritic ironstone and siltstone and sandstone white abundant sideritic coment.
90409050	SILTSTONE; medium ligth grey coarse very sandy (very fine to grained quartz and lithic grains) moderately carbonaceous and micaceous grading to - 45% SANDSTONE; medium light grey, very fine grained in part fine grained, subangular quartz, with 15-25% lithic grains and altered feldspar, very silty, moderate sorting, firm tight, slightly micaceous, slight to moderately carbonaceous, in slight part

pyritic. Common Ironstone, as above.

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- 9050-9060 10% SHALE; dark grey, slightly carbonaceous with silty, in part with subrounded medium to coarse grained quartz grains. 75% SANDSTONE; predominantly as at 9040 20% SILTSTONE; as above. 5% Ironstone and sideritic sandstone to siltstone.
- 9060-9070 No sample.
- 9070-9080 50% SANDSTONE; off white to light grey very fine to fine grained with subangular clear quartz and up to 20% white to brown and light green argillaccous grains - partly altered foldspar fairly common brown and white mica. Occasional carbonaceous specks. Matrix is genorally koolinitic but in part slightly calcaroous and slightly sideritic; also part argillaccous and silty, grading to siltstons. Traces pyrite. Traces iron stained quartz grains. Tight. 30% SILTSTONE: light grey with common altered feldspathic grains, occasional carbonaceous flocks and medium, very fine sandy and grading to sandstone above. Part slight sideritic. 20% SHALE; modium to occasionally dark grey, silty, micromicaceous slightly carbonaceous, occasional altered feldspathic grains.
- 9080-9090 50% SANDSTONE; off white to light grey, as above, 10% with brown slightly calcareous slightly sideritic argillacoous watrix. 40% SILTSTONE; light to medium grey as above grading to sandstone above. 10% SHALE; medium to dark grey silty very minor part with scattered very fine to fine quartz and feldspar grains.
- 20% SANDSTONE; off white fine grained with subangular quartz and occasional (5-10%) white to brown altered feldspathic grains in ciliceous/kaclinitic matrix, very occasionally carbonaccous specks.
  30% SANDSTONE; off white to light grey, very fine to fine grained, cilty and argilleccous as above grading to -30% SILTSTONE; light to medium grey part sandy as above 20% SHALE; medium to dark grey, micromicaceous to micceeous slightly carbonaceous.
- 9100-9110 20% SANESTONE; off white, fine grained as above. 30% SANESTONE; vory fine to fine grained as above, grading to -30% SILTSTONE; light to medium groy, as above. 20% SHALE; medium dark grey as above. Traces glauconite.
- 20% SANDSTONE; off white fine grained with subangular 9110-9120 quarts in kaolinitic/siliccous watrix. 5-10% white to brown foldspathic grains, traces light green argillaceous grains occasional carbonaceous flocks, occasional muscovite. Tight. 40% SANDSTONE; off white to light grey, vory fine to fine grained with subangular quartzaand 10-15% white to brown and light green altered feldspathic grains in kaolinitic and a silty and argillaceous matrix. 5% Slightly calcareous slightly sideritic matrix. Fairly common white and bronw mica, minor pyrite. Grades to -25% SILTSTONE; light to medium groy, argillaceous and very fine sandy with common white to light green

altered feldepathic grains and white and brown mica, occasional carbonaceous flecks, traces pyrite. 15% SHALE; medium to dark grey, partysilty with occasional white to brown and light green foldspathic grains, generally very micro to very fine micaceous

9120-9130 Trip sample - appears unreliable. Lithology as for 9110-9120

9130-9140 60% SANDSTONE; light to white grey, very fine to fine and very rarely medium grained with subangular quartz. Common 29-25% white to brown and light green foldspathic grains in a kaolinitic matrix, very minor part with sideritic matrix. Commonly argillaceous and silty, eccasionally white to brown mica, eccasional fine pyrite. Tight. 30% SILTSTONE; light to medium groy as above, grading to sandstone above. 10% SHALE medium to dark grey as above part with carbonaceous flecks.

9140-9150 60% SANDSTOME; light to white grey as above but with very occasional scattered modium to coarse quartz grains and rare fine to medium grey lithic grains. 20% SILTSTONE; light townedium grey part very fine sandy as above. 20% SHALE; medium to dark grey, part silty as above part very micro to very fine micaceous.

9150-9160 N.B. sample caught late. 20% SANDSTONE; off white fine to occasional medium grained with very occasional scattered coarse to very coarse subrounded quartz grains, but predominantly subangular clear quartz with white and occasional green altered feldspathic grains. 40% SANDSTONE; light to white grey, very fine to fine grained as above grading to siltstone. 30% SILTSTONE; light to medium grey, part very fine sandy as above, - 5% white sideritic matrix. 10% SHALE; medium dark grey silty, as above.

9160-9170 Variable sample. Interbodded and gradional.
15% SHALE; modium groy, oderately carbonaceous flocks, slightly foldopathic/lithic in part slity, platy.
30% SILTSTONE; modium dark groy, very feldopathic/lithic, moderate to vory sandy (very fine grained).
10% SANDSTONE; modium light to medium groy, prodominant fine grained, quartz and abundant feldopathic/lithic grains, dirty, tight.
45% SANDSTONE; cream to light groy, fine to coarse grained, prodominantly modium grained, subangular quartz, 5% accessory grains (including coumon pale green cley grains and cocasienal carbonaceous grains and pink grains), very friable, locely comented with silica ? and minor kaolin, very good earthy porosity and traces intergranular porosity.

9170-9175 10% SHALE; as above. 15% SILTSTONE; light grey, carbonaceous and wiceceous, coarse, moderately feldspathic/lithic, in part very fine sandy. 10% SANDSTONE; variable, light to medium grey, very fine to fine grained, gonerally silty, foldspathic/ lithic, carbonaceous and miceceous dirty - grades to 65% SANDSTONE; white to cream moderately grained, common fine grains, subangular to subrounded quartz and about 15% accessory grains (predominantly white to light grey kaolin (?) grains, common seagreen clay

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grains; occasional black to brown carbonaceous or shale grains, traces red and black grains), powdery siliceous cement, occasional brown sideritic cement or kaolinitic cement, very friable, good earthy porosity and occasional poor intergranular porosity. Scattered medium to very cearse subangular to subrounded quartz grain, traces red earthy grain.

9175-9180 15% SHALE; medium to dark grey as above in part silty grading to -15% SILTSTONE; modium grey, very foldspathic/lithic modorately carbon coous, slightly micaceous, very sandy, often with light to dark green chloritic clay (?) grains; grading to very silty dirty sandstone. 70% SANDSTONE; white to cream, very fine to medium grained, (predominantly fine grained) angular quartz and approximately 5-10% accessories (as proviously described) friable, cemented with silica and in part with some kaolinitic and sideritic cement, good earthy perceity. Questional very pale yellowish fluorescence common. Common medium to cearse subangular to subrounded locse

9180-9190 25% SHALE; dark grey, very elightly micromicaceous, slight to modorately carbonaceous (spex), generally silty, blocky - grades to -5% SHLTSTONE; medium grey, as above. 5% SANDSTONE; medium light grey, very fine to fine grained, foldspar/lithic, very silty, dirty, tight. 65% SANDSTONE; light grey, very fine to medium grained, predominantly fine grained, angular to subrounded quartz; less than 5% accessory grains (as above), carbonaceous in part, slightly calcareous, compact, traces intergranular peresity, very pale fluorescence may be due to carbonaceous material ?. Occasional sideritic ironstone; occasional poortly sorted loose quartz grains.

quartz grains; rayoly stained yellowish or reddish.

9190-9200 Sample missed.

9200-9210 Sample missed.

9210-9220 This sample is probably poorly representative of the interval 9190-9220. Drilling break (from slow to fast) encountered at 9219. 10% SHALE; medium dark grey, slightly carbonaceous, elight to moderately foldspathic/lithic, silty platy to blocky. 5% Variable eiltstone and dirty very fine to fine grained silty sandstons. 5% SANDSTONE; brown, texture and grain size obscured by abundant siderite coment. 70% SANDSTONE; white to cream poorly sorted, predominantly fine grained, angular to subangular quartz, with about 5% accessory grains (white kaolin, groon cley round and black grains). Very friable, peerly comented with silica ? and in part siderite, probably porous common patches of black carbonaceous/bitumen matter. 10% Loose quartz grains, modium to very coarse grained, predominantly coarse grained angular to subangular Traces of quartzite (pebble) and of pyrite. Sample shows common pale yellow fluorescence but has no cut. Fluorescence attributed to the presence of carbonaceous/bituminous matter in sandstone.

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- 137 -9220-9230 15% SHALE; as above. 10% SILTSTONE; modium grey, moderately carbonaceous, bitumen, moderate to very feldspathic/lithic grades to similar variable very fino to fine grained sandstone. 10% Sideritic sandstone as above. 15% Loose fine to coarse angular to subangular quartz grains; predominantly wedium grained. 50% SANDETONE; white to cronm, fino to modium grained in consolidated chips, similar to that abbve; common carbonaceous bitumen grains and partings, good earthy porosity and only poor intergranular porosity evident in cuttings but porosity probably good. Fluorescence as above; no stain, no eut. Patch of carbonacecus/bitumen matter present; however does not fluoresce. 9230-9240 10% SHALE; as above. 5% SILTSTOME and dirty sandstone as above. 10% Sideritic sundstene as above. 20% Loose subangular to round, modium to very coarso quartz grains, predominantly medium grained. 55% SANDSTONE; as above, fairly common carbonaceous/ bitument matter, very Priable, occesional pink foldspar and round grains included in the accessory grains, common siderite stained graine. Tracos of pyrito E Pale yellewish fluerosconce as above, no stain, no cut. 9240-9250 5% SHALE: AS above. 10% SILTSTONE; medium grey, moderate to very carbonaceous moderate to very lithic/feldspathic, very finely sandy and grades to similar very fine grained dirty candstone. 5% Light to modium dark brown, very fine to fine sendy, siltstone with very abundant sideritic matrix, sandy and silty siderite; eideritic sendetone all of which are very carbosaccous. BO% SANDSTOND; white to buff, fine to madium grained, subangular quarts, with abount 5-10% accossory grains (white clay grains, come green clay and black carbonaceous grains, rare pink foldspar and black minoral grains), moderate to peerly corted, friable, poorly corted with powdery silicoons conert and in part koolin or kaolin or sideritic cement, traces intergranular perceity, peer earthy perceity, fairly common carbonaccous flakes. Consignal Leess earbounceous/bitumen partings gending to onethy coal. Soudstone has southered very foint fluorescence; no cut, no stain. 9250-9260 Lithology and paraenteges escontially as above. candateno containo a occevhat greater porcentage (10-17%) of accounty grains and easly to carbonacoous flakes are more common. Only seattored fluorescence (?) as above. 9260-9270 5% SHALE; dark groy, moderately carbounceous (specks) in part foldspathic/lithic platy-blocky, silty and grades to -5% SILTSTOME; modium to medium dark groy as above. 10% Sideritic ciltatone and candetone as above. 80% Sondstone; white to cream, yearly corted (as above) very fine to very coarse grained but predominantly fine to medium grained, subangular, in part augular and subrounded, quartz with loss than 10% occossory grains (kaolin, some orenge feldspar, black carbonaccous grains, occasional red grained,

eccasional green clay grains,) poorly sorted.

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very friable, poorly comented with white powdery silica and in slight part with kaclin or siderite, probably good earthy perosity and fair intergranular perosity: fairly common earbonaceous/bitumen partings Traces quartzite pobbles.

9270-9280 5% SHALE; as above. 10% SILTSTONE; very fine to fine grained silty sandstone as above. 10% Sideritic siltsone and elaystone as above. 10% Loose quartz grains, medium to very coarse grained, prodominantly medium to coarse grained, 65% SANDSTONE; as above very fine to medium grained prodominantly fine grained.

9280-9290 10% SHALE; medium dark to dark groy, slight to moderately micromicaceous, slightly waxy in part, slightly carbon-accous and foldspathic/lithic, in part silty, fissile platy.
5% SILTSTOME; sandstone as above.
85% SANDSTONE; white to very light groy, fine to medium grained as above.
Occasional sideritic siltstone as above.
Traces of pyrite. Slight fluorescence but no cut.

9290-9300 5% SHALE; as above. 10% Variable modium light to modium dark groy siltstone and sandstone. 5% Sideritic siltstone, sandstone and clay as above. 80% SANDSTONE; white to buff, very fine to modium grained, prodominantly fine graned, angular to subrounded quartz, loss than 10% accessory grains (including kaolin, green clay; grey black and pink grains) silty, friable, comented with silice and in part by kaolin and commonly by siderite, good earthy peresity.

9300-9310 10% Variable shale, siltstone and very fine grained sandstone. 10% Sandstone; as above. 80% Sendstone, white, unconsolidated, peorly sorted, medium to very conrece grained, very angular quartz grains, generally milky but in part vitreous, probably; with good intergranular percenty. Average grain size course grained.

9310-9320 15% SHALE and SILTSTONE; very fine grained sandstone as above. 85% SANDSTONE; white unconsolidated, poorly sorted, modium grained and granule size, prodominantly very scarse grained, angular quartz; traces grew chort grain, rare yellowish tinted grains; probably with geed intergranular peresity. Ocensional sideritie ironstone.

9320-9330 3% SHALE; dark grey, slight to moderately carbonaceous (speeks with linear orientation) in part silty, platy to blocky. 10% SILTSTONE; modium to modium dark grey, moderate to very carbonaceous, feldspathic/lithic, in part glanconitic ? very fine to fine sandy grading to -5% SANDSTONE; very fine grained, similar to the siltstone and in part white, clean. 80% SANDSTONE; white, very poorly sorted, unconsolidated as above, traces of chort. Occasional sideritic ironstone, siltstone and sandstone. Occasional sandstone as at 9290-9300. 9330-9340 Trip sample - unreliable. Prodominant siltatone to very fine sandstone as above, with 20% shale as above.

9340-9350 70% SAMDSTONE; off white fine to medium grained with subangular quarts and fairly cousen white foldspathic grains in a silicoous and kaolinitic matrix. Occasional white mica, vory occasional groynlithics part very fine grained and silty. Part vory slightly calcareous. Tight. 20% SELASTONE; light to medium grey with abundant white to brown foldspathic grains. Occasional carbonaccous flocks and white mice. 10% SHALE; medium to dark grey micro to very micaceous part silty with foldspathic grains as above.

9350-9360 20% SANDSTONE; off whete as above but with occasional combenaceous laminae. 10% SANDSTONE: light termsdium grey, very fine to fine grained with subangular clear quartz and white (occasional light green) feldspathic grains in a very silty and argillaceous matrix. Occasional glauconite ? 40% SILASTONE; light medium grey, with common white to brown feldspathic grains part with common white to brown feldspathic grains part with common carbonaceous flocks. 30% SHALE; medium to dark groy, icaceous, part silty and grading to siltstone above. Part slightly carbonaceous.

- 9360-9370 40% SANDSTONE; white to light grey, fine to occasional modium grained with shale to subrounded quartz and up to 23% white foldspar with coessional grey lithics in a siliceous slightly calcereous matrix. Occasional white microceous and carbonaceous flocks. Tight. 40% SU/TSTONE; light to modium grey, as above, part very fine sandy. - 5% white sideritic matrix. 20% SHALE; modium to dark grey as above.
- 9370-9380 45% SANDSTOND; white to light grey as above but part with healinitic elightly calcaroous matrix may possess earthy perosity. 40% SNLASTOND; as above ware pyrite. 15% SHALE; medium to dark grey, as above.
- 9380-9390 40% SANDSTONE; white to light grey, as above, part very fine grained and silty with occasional light green argillaceous grains. Maor disseminated pyrite. 40% SILFSTONE; light to medium grey, as above. 20% SHALE; medium to dark grey generally silty as above.
- 9390-9400 45% SANDSTONE; light white grey, very fine to occasional medium grained, predominantly fine grained with subrounded subangular quartz and up to 20% white to light brown foldspar and occasional lithic grains in a sparse silicoous slightly calcareous matrix. Minor pyrite, occasional carbonaceous hamelise, tight. 10% SANDSTONE; light to medium grey, very fine to fine grained, as above but with commin light green argillacocus grains and with silty argills cocus watrix. 30% SILTSTONE; light to medium grey with fairly common feldspathic grains and wice, occasional carbonaccous flocks, traces pyrite. 15% SHALE; medium to dark grey, micaccous, part silty with feldspathic grains as above, including 5% black carbonaceous waterial.

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- 9400-9410 50% SANDSTONE: light white grey as above part traces intergranular peristy. 5% SANDSTONE: light to medium grey, silty as above. 25% SILPSTONE: light medium grey, as above. 20% SHALE: medium dark grey, with carbonaceous material as above.
- 9410-9420 Lithology as for previous interval minor yellow with out fluorescence noted - attributed to orange brown organic mineral
- 9420-9450 55% SANDSTONE: white to off white fine to modium grained with angular to subangular clear quartz, but - 5% feldopathic grains, in fairly sparse silicecus slightly colvareous matrix. Fraces intergranular perceity. 25% SANDSTONE: light grey very fine grained silty, with common feldopathic grains and mica, eccasional carbonaccous flocks, occasional erango/brown argillaceous mineral with yellow fluorescence and occasional cut. 15% STLASTONE: light to modium grey, as above. 5% SWALS; medium to dark grey misaccous, part carbonaccous as above.

9430-9440 50% SANDSTONE; white to off white as fine to medium grained as above, but part with up to 20% foldspathic lithic grains. 20% SANDSTONE; light groy, very fine grained silty as above. 20% SILTSTONE; light to medium groy,micaccous with common feldspathic grains, occasional carbonacecus flecks. 10% SHALE; medium to dark groy, icccous, part carbonacecus, part silty with feldspathic grains.

DEPTH CORRECTION BASED ON LOGS (MINUS 10 FT)

- 9430-9440 50% SAMESTONE; light white grey, fine grained with subargular guartz and 5-10% FELDSPATHIC/lithic grains in a silicaceous/clightly kaclinitic comont. Occasional carbonaceous (bit) lawinge and flocks, scattered white mice. Tight. 10% SANDSTOME; light groy as above but very fine to fine grained, silty and argillaceous and with light green argillaceous grains. 20% SELTSTOME; light to medium grey, with common foldepathic grains and carbonaceous specks, part very fine sandy. 20% SHALE; medium to dark groy, micaceous part carbonaceous specks, part cilty grading to siltetene above.
- 9440-9450 40% SANDSTONE; light to white groy as above but with abundant fine carbonaccous stringers. 5% SANDSTONE; light grey, very fine to fine grained silty, as above. 35% SILTSTONE; light to medium grey as above, but part micaccous. 20% SHALE; medium to dark grey as above.
- 9450-9460 Lithology as for 9440-9450 but minor part of sandstone with 10% foldspathic/lithic grains and traces pyrite.
- 9460-9470 70% SANDSTONE; white to off white fine to medium grained with angular clear quartz in a very sparse siliceous part kaolinitic matrix, rare lithic/ feldepathic grains. Poor to fair intergranular

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perceity. Faint pale voliev fluerescence ne cut. Occasional carbounceous/bitumen material. 5% SAMDSTONE; light grey, very fine to fine grained shity, argillaccous with common feldepathic grains. 10% SILTSTONE; light to medium grey, with common feldepathic grains carbonaccous flocks and mice. 15% SHALE; medium to dark grey, micesceus part carbonaccous, part cilty and grading to siltstene above.

9470-9480 50% SAMPSTONE; white to off white, as above but with very occasional coarse grains and average grains size wedium generally poor to fair percently but very minor part shows good to very good intergrenular percentr. 5% SAMESTONE; light grey, very fine to fine grained silty, as above. 15% STLASTONE; light to medium grey, as above. 30% SHALE; medium to dark grey as above.

9480-9490 30% SANDSTONE; white to off white prodominantly medium grained as above. 10% SANDSTONE; light gray to gray green very fine to fine grained cilty, with submequier clear querts, white to breen feldspathic grains and light green argillaceons grains in a silty, argillaceous matrix. Occusional corbonaceous flocks, minor pyrite, grades to siltatene. 25% SILCETOME; light to medium grey with white to brene feldspathic grains and miss, part very fine to fine sandy, minor pyrite. 45% SHALE; medium to dark grey, mederately microvery fine micaceous, silty and grading to siltatene above, part clightly carbonaceous.

9490-9500 25% SANDSTONE; white to off white as above but very fine to fine (seeasional radium) grained and generally tight. Minor part with up to 5% foldspathic/lithic grains. 25% SELESTONE; light to madium groy part very fine sandy, us above. 50% SHALE; medium to dark grey, micacecus as above but part non-cilty and medicately soft.

9500-9510 25% SAUGTORS; white to off white as above with very scattered convectors grains, part with fine stringers of corbonaccous/bitumen unterial. Tight. 25% SILASTONE; light to medium gray as above. 50% SHALE; medium to dark gray, as above, generally silty.

9510-9920 Interbedded and gradational. 55% SHALE; modium to medium dark grey, moderately micromicacoous, slight to moderately carbonaceous (flocks), generally slight to mederately foldspathic lithic (set size to very fine grained), ofter moderate to very silty, grades to -15% STLASTONE; medium grey to medium light grey, slightly carbonaccous and micaccous, moderately feldspathic/lithic in part very argillaceous, in part vory fine sandy. 35% SANDSTONE: white to light grey, very fine to medium grained, prodominantly fine grained. subangular quartz with 3-10% PALE green and white to light grey altered foldspar (?) black and brownish argillaceous grains, slightly micaceous in part, clightly carbonaceous in part, moderately well sorted siliceous coment, traces calcite, traces intergranular porosity. Occasional quartz grains, traces chort grains, traces ironstone, occasional pyrite. ÷.

9520-9530 Trip sample 60% SIL/ESTONE; medium light to medium grey, micaceous, moderate to very carbonaceous (flocks), moderate to very feldapathic/lithic (very fine grained). 15% SHALE; as above. 20% SANDSTONE; in part as above predominantly very light grey, speckled black, very fine to fine grained, silty, angular to subangular quarts, 30% altered feldspar and lithic grains, (grey, greenish grey, cream, common black, occasional round), siliccous to very slightly calcareous coment, tight. Traces of coal, pyrite and quarties grain.

9530-9540 45% SAMDSTOME; light grey to very light grey, very fine to medium grained, predominantly fine grained, angular to subengular quartz, salt and poppor texture with up to 35% altered feldspar and lithic grains as above (black coal grains fairly commen) mederate to well sorted, slightly silty, very slightly calcareous siliceous comeat, tight.
35% SIL/ISTONE; medium to medium light grey, slightly miceosous, mederately carbonaceous (in part coal flocks), slight to mederately feldspathic/lithic, in part arglllaceous, coarse and grades to very fine grained sandstone.
20% SHALE; dark grey, generally tough, slightly carbonaceous, mederately silty, blocky.

9540-9550 5% SHALE; similar to above. 65% SAMDSTONE; white to light groy, very fine to fine grained, accasional medium grains, predominantly fine grained, angular subangular quartz and 20-40% lithic graine, similar to candetone above but increase in darker accessory grains, slightly calcareous in part silty, siliccous coment, tight. 30% SELTSTONE; modium light groy, coarse, slightly micaceous, slight to moderately carbonaceous (shreds), very sandy (very fine grained and occasional fine grained quartz and very abundant lithic/feldspathic grains).

9550-9560 SANDSTONE; light grey to medium light grey, very fine to fine grained celt and pepper texture, as above, in part cilty, slightly micaceous, occasional carbonaceous blobs and stringers, other wise as above, tight. 25% SIL/STONE; as above. 10% SHALE: as above, very silty, platy to blocky.

9560-9570 40% SHLYSTONE; light grey, coarse, slightly carbonaceous slight to woderately carbonaceous stringers, slightly wicrowicaceous, moderate to very foldopathic, grades to -35% SANDSTONE; light grey, slightly greenish, very fine grained to predominantly fine grained, subangular quartz, and abundant foldopathic/lithic grains (20-30%) which are predominantly green, brown, black, with some white knolinitic graine and reare red grains, well sorted, slightly moderately silty, very slightly calcareous, slightly fieble, siliceous cement, tight. grades in part to siltstone. 25% SHALE; medium grey, slightly carbonaceous and feldspathic, chunky.

9570-9580 60% SANDSTONE; as above, salt and pepper texture, very

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fine to fine grained as above, siliceous/kaolinitic couent gith, in part sideritie. 20% SMALE; as above. 20% SILTETONE: as above.

9580-9590 15% SHALE; madium to medium dark groy, slightly whremicacoous, moderately carbonaceous, very silty, platy. 20% SILESTONE; medium Eght groy, moderately micaceous very sandy (very fine grained), moderately micaceous, slightly feldepathic, grades to -65% SANDSTONE; light groy very light groy, very fine to fine grained, predominently fine graded, angular querts and 20-25% lithic ? and stored feldspar grains (white, green, brown, black, reddish brown, cream) well sected, slightly silty, slliceous coment, occasional sideritic and kaolinitic coment, tight.

9590-9600 40% SANDSTONE: light grey, very fine to fine grained as above, salt and popper texture, tight. 40% SILTSTONE: as above, in part argillacoous, rarely slightly pyritic. 20% SHALE; as above, very silty, rarely glauconitic.

9600-9610 30% SANDSTONE; off while to light grov, very fine to fine grained, rarely medium grained, with angular to subangular clear quarts ang irregular to clengate white to off white feldepar occasional grey or brown quartz (quartzite?) occasionally light groon argillaceous grains (alterod foldspar ?) very ecoasionally carbonaccous grains and fine stringers. Feldepar content from 5 to 10%. Rare musoovite. Traces pyrite. Tight. Comont sparso generally ciliceous part slightly calcuroous. 25% SILTSTONE; light to modium grey, with common and abundant white to brownfeldspathic grains, occasional carbonaceous flocks, part vory fine micaceous. 25% SHALD; medium to dark grey, micromicaceous, occasional carbonaceous flecks, part silty and grading to siltstone above. Minor part light grey brown, and moderately soft. No sample. Returns swamped with cavings after D.S.T. 9610-9618 circulated before trip - lithology as for 9660-9610.

9620-9630 SHALE (mudstone) light to medium dark grey, massive, moderately soft, eleromicacoous, very occasionally carbonaceous flocks, Minor part silty with white and groon foldspathic grains, mica and carbonacoous flooks and grading to siltstone bolow. Minor part very fine to medium sandy with subrounded quartz grains, and occasional pale foldspar and green glauconito ? grains. Part with clear to brown moderately soft polletal graine. 10% SILTSTONE; light to modium and dark groy, with white and light green foldspathic grains, carbonacoons flocks and white and brown mica. 10% SANDSTONE; light grey to grey green very fine to fine grained with up to 80% white to light white green ungular to irregular foldspar with occasional dark lithics and subsiduary angular clear to grey quartz. Coment ranges from abundant argillaceous to very oparse and slightly calcarcous, tight.

9630-9640 60% SHALE; light to modium ad dark groy as above. 10% SILTSTONE; as above. 30% SANDSTONE; light groy to green grey, as above but prodominantly vory fine grained and argillaceous,

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with common dest gray brown corbonecoous/bitumon material.

9640-9650 30% SHALS and variables as above, but unior part silty, rawly dark grey brown and slightly addrible. 10% SHADSTOLS; light white grey, very fine to fine grained, with up to 30% angular to irregular and altered feldoper (white be white brown, white green ste) with occashered derk lithle grains and subsidiary onhangular quants in a modimitie, slight to moderately celearcous elsent, where white and brown wice, occasional carbonaccous/bitemen unboriel, traces proite. Tight.

- 9650-9660 65% SFAID: module to dert grains, micromicaceous, part silter with common foldepathic varius. 35% SAMESCOND; light gray thate, very fine to fine grained to chore, with contenerous/idtucon material . and ecostanci conf/orgillocerne fordance.
- 9660-9679 10% SHARE (light) to working dark grow on above. 13% SELATION; light grow with conven foldspathic grains and coverteral wice. 43% ELATATION; light grow that, very time to fine grained on above. - 3% Cost, probably sub-bitimon grade Curvin with without londsee.
- eac Show A 1.5 milt gas likely was recorded on the detector meth. As the interval is bight this is accured to be decided from this could have in the interval. No other churce.

9670-9606 50% IMALE (A.pht) madium to dark good or above, part with explorations floate, yast grading to carbonaccous shale. 20% ITATIONS: Light prop as shave eccestonal curbonscours floate, initis curson thet. 30% SAMPTONS: Light phits grey feldepathic, slightly lithts, slightly colorance of with eccesional curbonaccour/bitmeent retevial as chove.

- 9680-9690 50% SAMDSTOR: Light white grow, very time to weddum groined, weddum to fine grained with angular clear quarby, up to 50% engular white to off white foldspar and up to 10% dark likeline grows, is a sparse kaolinitic alight to concernship colosposes coment, part with argilinecome watrin and light rices chleritic ? graine, operatural white and brown when in very fine graine, operatural white and brown when in very fine grained variety. Here create percents only. Traces parties. Here, provide only. 15% SULLY we have be dork grow, part combeneous as above.
- 9690-9700 60% fillE; medium to nodium dark gross, clight to mederately microsone, concalent corbonaceous blobs, in mark moderately extensions (flecks), slight lithte/foldopathic, generally citty, chunky. 20% SIMFERED; medium gros, clightly uteromicaceous, slightly contenseeous, concelenal curbenaceous leminae, slightly lithte/foldoper; argithecous and grades to shale; in part very fine sandy. 20% SADDETENE; light groy, in part with salt and pepper texture, very fine to fine grained, occasional medium grain, subangular, quarts and approximately 20% altered foldopar (white) and lithic grains (including black coal and/or carbonaceous grains and brow argithecous ? grains; occasional green clay graine), moderately well corted, well consolidated

generally silty, silicoous coment, tight. Traces of modium to course loose quarts grains, trace ironstone, trace earthy cool.

9700-9710 50" SHALN; medium dark grey as above end in large part medium grey, non-calty, with abundant light brewn flocks. 25% SILESPONE; light to medium grey generally, ecore endeaceens, carboneceous and foldepathic as above; grader to -25% SANDSTONE; light grey as above, in part very edity and in part argitheceous, with minor amounts of condetene white is very light grey. The to medium greined, submypler quarks and 5-16% foldepar, grey quarks or quarks to grader, early persists from a siliceous to knelled econs, which econs to knelled econs, which address to helded and black econs graine, address to knelled econs, which address to knelled econs for the constant, address to knelled econs is dirtier than above and contains econses and strake. Troope of measure pyrite; occasional leose quarks grans.

7919-9720 SHALD; modium to modium dark gues, moderate to micromicancers, alightly corbanecous (disseminated and econoculate flocks), generally moderately silty in part very silty, clumby with traces of ecol volsing, receipt with green glamentte or chlorite pellets; gueses to -20% SELASSOFD; medium greet, in part cours, moderately econoccus and Coldepathic/ittake, underately micromicancers, in part angulaneous grades to shale and in yord to 3% SAMERODE; or above.

## 9799-9736 20% BEAUS; D.S. OSARO,

25% SIMPTONS; modane light grot, eary corbon coord -(vory fine open) moderately missecore, in part cayallacoous.

65% SAMESTORS; we dime hight bround ch giver to light grey, predectoratly fine grained, but with cosmon very the grains, organize to sub-mgular quarks with 15-25% white to areas altered foldows and lesser gree quark-life. Shock conference one areins, occasional grees and graenich gree and rate sed liking? grains, shightly recented green and rate sed liking? grains, shightly recented (subcovide) is part with carbonaccous vertices, uncorrectly shift, secondary vell control, origin, uncorrectly shift, secondary vell corbonate, bight. Traves of cost.

9730-9740 Variable Likelery - twelenderubly. 20% SEALS; roding geer, skiptly sieveriocoous, sederately orthonyesous (very fire apar), rederate

to rever off by. http: STERETHER, and an Light to light over coave, alight to redenately sincericoncous, understely carbonaccons, alighter folderable, in part very fine candy, gradies to . 30% CARETORN; light grow, very time ground in part fine graned, querte and 20-50% folderable/lithic

gredue, well served, cilty, traces caledte tight. 5% SAMASTONS; brownich groy caledte as above.

9700-9750 15% EWALE; as above.

20% SILASTONE; er abeve. 65% SANDSTONE; very light grer, predectmently very finegrained, in part fine grained, coessional modium grained, engular to submander querts, with about
20% foldspathic and occasional lithic grains, (including block carbonaceous grains) poderately well corted, slightly triable, wederets to very silty, trace to slightly calenraous, medium grained canditone has traces of percus.

9750-9760 25% FHALD; modium to dark groy slightly micaceous slightly silty, corbonaceous speeked, as above, 15% SHATSPOND; clailar to above. 60% SAMESPOND; clailar to above. 60% SAMESPOND; calcove but generally very fine to fine grained and fairly common modium grained, in part brownish groy with calcoveous eccont. Common losse redium to conver grains derived from slightly percus friable sandatone.

9760-9770 Tely Somple. After D.S.T.S. 90% cavings. Editology is probably productmently conditione, light gray, very firs to predominantly fine grained with angular to enhaugular quarks with up to 50% white to with groon foldspathic and subsidesite Gark lithic fragments, occasional eacherneeous grains very winer calchreece count.

9770-9780 50% Cavinga anaple unroliable. Lithology computava:

Lithology comprises: 565 SAPETONE: Light groy, very rise to fine grained with angular to subergalar quarts, up to 60% white faldspar lathe and white to brown and groen irregular foldspathic grains, where dask groy to brown lithics occasional carbonacoous/biturent grains. Your minor wice, very winer calcareous coment. Minor part with argillascens autria. Tight.

205 SILASTOND: Light to reding grey, foldepathic very fine micaceous. Occasional embousceous streaks, part very fine sendy and grading to sundstand above. 305 SHALE; (undstand) Light to dark grey micromicaceous part carbovaceous. Part cilty and slightly feldspathic and grading to ellistene above.

9780-9790 50% SAENSTONS; Light groy, on above but prodominantly very fine groined and soudy medica groined, and minor part with modorately calcareeus metrix. 15% SELTSTONE; as above. 35% SHALE; light to dark grey on obeve but predominantly medica grey micronicaccous.

9790-9800 50% Caringo comple appears unreliable. Lithology computers: how OFGERCONE; very five to five as above very considered redium and part with abundant argillaceous watrix. Large chips cher interlaminated sandstone/ siltatore. 20% SELEPONE; as above, part very fine to fine sandy. how SHARE; light to acdium gray as above verely dark ever and carbouccous.

9800-9810 50% SAMDETONE; grey white very fine to fine grained, with angular to cubangular quarks and white to white brown foldeper up to 80% minor dork grey to brown lithics Gensional carbonacoous/bitumen grains and flocks. Treeos white mice, traces caleproves work. 20% SIMETONE; light to usedime grey, moderately to very foldepethic consident corbonacoous/bitumen flacks part argillaceous. Fart very fine sandy and grading to condition above. Part very fine micaceous.

20% SIALS; light to modium microslanucous prodominantly and grading to siltatono above.

9810-9820 Abundant covings. 50% SHALE; modium light to medium dark gray, moderately to very micromicaccoup and silty, slight to mederately carbonaccous (silt size flacks), platy to chunky - grados to -15% SILTSTONE; Light to medium Light grey coarse, vory finely sandy, slightly enrocaceeus, vory foldspathic/lithic. 35% SAMDSTONE: light to modium light groy, fine grained common vory fine grains, angular to subangular quarts and 29-30% foldspar (groy, greenish grey, white eroon) and Lithic (abundant dark brown to black aggillaceous/carbenacoous grains), very slightly to slightly calcarcous coment, woll consolidated generally highly occasional eleanor sandote no is clightly brownish and has good earthy peresity, Types werlte compled sandstone; traces ironstone. 9820-9830 SHALE; modium to modium dark grey as above but generally less earbeneecous and silty. 30% STLEEROND; modium light to medium groy, modewately carbonaceous, moderate to very fulderatio/lithic. in part angillacoond, in part very sandy (very fine grained) and grades to 5% SATDETCIE; ac above. Tracos preste. 9830-9840 Pacy sample - abundant cavings. 55% EMALE: necium to medium deck groy, microsicacoous as above, carely fine soudy. 5% SILESROME; as above. hof SANDSTONS; very light to medium light grey, fine grained, common very fine grains and occasional medium graies, angular to unbengular quartz and - 20% foldspar and littlics (including common groon argillacoous grains and black environecous/coely gruino) slightly silty, seattored successite flakes, moderately well communed with silica and in part kaclinitic comput, come carthy powerity. Trace coal (ourings ?) wacco pyrite comented nandatene. 9840-9850 307 SHALM: medium light to actium groy, medorate to vory micacoous, ecreonaccous shightly silty, platy to ambfiordic. 10% SILUSTONS; modive light grow, in part argillageous clight to moderately corbonneeus and feldepathic/ . lithie, michonous im yert. 55% CAMDERNAD; Light gavy, in post modium light brownish gooy, salt and popper touture, vory fine to line grained, occasional medius grains, prodominantly fine grained, augularete suben mier querts, with approximately 23% alternad feldeper and lithin grains (weny grean argulinecous grains and block carbonacoous to cooly grains); occasional curbonaceous laminations silicoeus consut, voll indurated, tight, brownish sandstone has a clightly celearceus sideritic coment in part. 7/ Lesce find to coarde grained subangular to subrounded quarts. 9850-9860 20% SHALF; as above and commonly modium light greenich grow, whay terture, very plightly enchanceous, figuile to subfigsilo; traces of coaly stringers. 103 SHARTONE: similar to above. 55 COAL: dork grey to black, micaccous silty, to very fine sondy, enropneecus matter in flaky aggregates

propout as Leminae in the conditions below.

55% SANDSTONE; similar to that above but with increase in proportion of very fine grains and decrease in proportion with sideritic/calcaroous coment and slight decrease in feldspar/lithics; tight. 10% Leese fine to very coarse quartz grains, prodeminantly fine to modium grained.

9860-9870 30% SHALE; similar to above. 25% STLASTONE; medium groy as above. 45% SANDSTONE; white to medium light groy very fine grained, similar to above. Traces coal as above.

9870-9880 50% SANDSTONE: Light grey very fine to occasionally fine grained with angular to subangular quartz and up to 40% foldsper including - 10% dark grey, grey brown grey green lithic grains. Occasional enronaceous/bitument grains, occasional white and brown mich. Part with argillecoous silty matrix. Fart slightly calcarcous. Tight. 25% SNLTSTONE: light to modium grey, with abundant foldspathic grains, part very micacoous (biotite) 25% SNALE: modium grey micromicaceous, part silty and grading to siltstone above.

9880-9890 Trip sample 63% FANDSTOME; light grey, as above but predominantly fine grained. 15% SILTSTOWE; as above. 20% SHALE; light to weddum grey as above.

9890-9900 70% SANDSTONE; Light grey vory fine to fine grained with engular to subangular quartz, and up to 40% opaque, translatent white foldspar, 10% grey, grey brown and grey gree. Lithic grains. Occasional carbonaccous/bitument grains and lemellac. Minor white and brown wice. Part with moderately sparse haolinitic slightly calcaroous matrix. Tight. No shows. 15% STLASTONE; light to medium grey with abundant feldspar and green argillaceous grains, occasional carbonaccous streaks, part vory fine sandy and grading to candetone above. 15% SHALE; medium grey, silty, microwicecoous, grades to siltstone above.

9900-9910 70% SANDSTONE; as above but predominantly fino grained. 'Fight. 10% SINTETONE; as above. 20% SMAE; but only part ailty. Fluorescence. A faint vollow to orange, fluorescence with slight cut in fairly common and is attributed to resincus material. One ciltstone chip was found to contain a lenso of this material which is orengo/brown resincus/wany, with vollow fluorescence and a strong cut. A light brown waxy/resincus residue is left on eveperation of the colvent. N.E. The fluorescence and this material is not so evident in the dried sample.

9910-9920 70% SANDSTONE; light grey as above but part with argillaccous to very argillaccous matrix with occasional modium to charac angular/subangular quartz grains. Fart also with modium size light green argillaccous lithic ? greins. Hare ceal Maninao, fluorosconce as above. Tight, but part with matrix could exhibit capilliary perosity. 10% SNESTONE; as above.

20% SHALB; as above.

- 9920-9930 50% SANDSTONE; light grey very fine to prodominantly fine grained with angular to angular quartz, up to h0% feldspar as above and 15% grey and grey green lithle grains, eccasional carbonacoous bitumen material, minor white to brown mice. Generally with slightly calcareous matrix. Tight. 15% SIL/ISTONE; light grey, with abundant fridepar common very fine mice, occasional carbonacoous/ bitumen streaks. 35% SHALE; light to modium grey, micromicacoous, part silty grading to siltstone above.
- 9930-9940 50% SANDSTONE; light groy, very fine to fine grained as above. 15% SILASTONE; light groy, as above, part very fine sandy and grading to sandstone as above. 35% SHALE; light to madium groy as above.
- 9940-9950 30% SANDSTONE; light grey, as above, part with argillaceous matrix. 45% SANDSTONE; white/grey, fine to occasional medium grained with angular/subangular clear quartz, but only very scattered foldspar and lithic grains (5%) in a sparse silicoous slightly calcareous cement. Tight, but part fairly friable. 5% loose medium to coarse clear angular quartz grains probably derived from this conditione. 15% SIMPSTONE; light to mediam grey, as above. 16% SHALE; medium grey, as above.
- 9950-9960 MOS SANDSTONE; Light grey, grey green, very fire to occasionally fine grained with subengular quartz and up to 20% feldspar with grey to grey green and varely reddich lithic grains slightly calcarcous coment, occasional carbonaccous/bitusent waterial, tight. 20% SANDSTONE; white/grey fine to occasional medium grained as above. 10% SHIFSTONE; light grey (grey brewn) with abundant feldspathic grains, occasional carbonaccous material and mica. 30% SMALE; light to medium grey, ricromicaccous, part silty and grading to siltatons. Minor part dark grey and slightly carbonaccous.
- 9960-9970 40% SANDSTOME: light groy, grey green, very fine to occarionally fine grained as above. 20% SIL/STOME: light grey, as above. 40% SHALE (mudstone) light to modium and dark grey, wicremicaceous part moderately coft with waxy lustro. Part slight to medium carbonaceous minor part silty grading to siltstone as above.
- 9970-9980 30% SHALE; modium light to modium dark grey, slight to moderate microscus, slightly earbonaceous and silty, slightly foldspathic/Litble, platy. 50% SILTSTONE; light to modium grey, microcous, in part coarse and vary finely sandy, slightly carbonaceous moderate to foldspathic/Lithle, gredes to -30% SANDSTONE; white to light grey, very fine grained, in part fine grained, angular to subengular, quartz, 20% white foldspar and common greenish grey, argillaccous lithle graine, moderately well corted, well commented, tight, occasionally microsus flakes, occasionally earbonaceous grains.

9980-9990

20% SHALE; (cavings) medium grey, slightly micaccous, slightly carbonaceous, in slight part silty platy to subfissile. 20% SILATONE; medium grey, slightly micaccous slightly argillacocus, in part, moderately, carbonaccous (specks and shreds), moderately feldspathic/lithic, very fine sandy in part. 60% SANDSTONE; light grey, salt and pepper texture, in part greenish grey, very fine grained, occasional fine grains, angular to subangular quartz with 25%? altered feldspar and lithic (?) grains (including common green argillaceous grains), slightly micoccous (biotito) silty, clayey, slightly calcareous matrix, slightly friable, tight.

9990-10,000
95% SHALE (cavings ?) as above, platy to chunky.
20% SILTSTOME; modium grey, as above.
45% SANDSTONE; light grey, salt and pepper texture, very fine to fine grained angular to subangular quartz and 15% altered feldspar (white, greenish grey, cream), traces fresh pink feldspar, common dark brown to dark grains, occasional carbonaceous/ cealy grains, only traces calcareous, firm, argillaceous/silty matrix, tight; carbonaceous and micaceous in part.
Scattered well rounded quartz grains, medium cearse grained, in part clear in part stained.

## 10,000-10,010 Sample not caught. See below.

This sample covers the interval 10,000-10,020 10,010-10,020 15% SHALE; modium light grey, moderately micaceous, generally moderate to very silty, slight to uodorately carbonaceous, platy and chunky. 35% SILTSTONE; light groy, slightly groenish, coarse, very fine sandy, very lithic/feldspathic, slightly micacoous, slightly carbonaceous, grades to. 50% SANDSTONE; light groy, very fine grained, occasional fine grained, angular to subangular, quartz; 15% foldspathic/lithics as above, give sendatone a graenish tinge, very slightly micacoous, vary silty, well comented, slightly carbonaceous tight. Scattored subangular to rounded, medium to very coarse quarts grains.

10,020-10,030 10% SHALE; as above. 20% SELTSTONE; similar to that above. 70% SANDSTONE; light to medium lgith grey, slightly greenish very fine grained, in part fine grained, similar to sandstone above but less silty, slightly calcarceus, well inducated, tight. Occasional loose quarts grains.

10,030-10,040 10% SHALE; medium groy, moderately micromicaceous, clight to moderately carbonaceous, moderate to very clity, platy to chunky. 10% SILTSTONE; as above. 80% SANDSTONE; light grey, in part slightly greenish, very fine grained, in slight part fine grained, angular to subangular quartz with 10% white to cream feldspar and lesser green, brown and black lithic grains, in part micaceous (predominantly reddish brown biotite), occasional carbonaceous patches, in part slight to moderately calcareous, generally woll cemented, tight, generally slight to moderately silty.

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	sorted tight.
4+inoh@s	SANDSTONE; light groy to greenish grey fine grained, commen very fine grains, angular to subangular grains of white to cream kaolinised feldspar, translucent fresh feldspar, with common black brown to black and occasional red lithic grains about 30% quartz, tough, well indurated, well
3 ft.8 <sup>1</sup> inches	MUDSTOME; dark grey, moderate to micromicaceous, slight to moderately carbonaceous (flecks), predominantly, slightly silty, common silt sized feldspar/lithic grains; Laminae of siltstone which is in part very fine sandy are present within the unit particularly in the uppermost foot. Dip as defined by the laminae is variable but appears to be in the order of 6-7 degrees.
	Bodding dip as defined by upper and lover surfaces of this unit is 7 degrees. sharp contact
44 inches	SANDSTONE; Light grey, vory fine grained, very abundant altered foldspar (cream, buff, grey), translueent foldspar ? dark brown, black, outbonceous grains, wall sorted, well comented, silty/argillaceous metrix, tight.
	sharp contact
l inch	SILTSTONE; dark gray, vory argillaceous, moderate to very foldopathic/lithic, slightly micaceous, moderately carbonacecus (flocks).
L <sup>‡</sup> inches	SILSTONE; medium light grey, very sendy (23% very fine grained and occasionally fine grained lithic/ feldepathic grains), very lithic/feldepathic, argillaccous, very carbonaccous, slightly micaccous. The siltatono is cross-laminated; laminations defined by abundant carbonaccous/bitumen flakes and grains.
	CORE MO.16 10,057 - 10,067 Rec. 9'2"
10,050-10,057	20% SHALE; as above. 20% SILTSTONE; as above. 60% SANDSTONE; Variable but generally similar to that above, very fine to fine grained, predominantly very fine grained and silty; generally well comented with silica, tight.
	25% STLASTONE; light greenish groy, in slight part brownish groy, very feldepathic/lithic, in part micacoous, generally slight to moderately carbonecous, in part argillacoous; commonly coarse and grades to . 50% SANDSTONE; similar to that above, in part (20%) fine grained, rarely wedium grained tight.
	15% SHALE; as above, in part with carbanaceous patches. 10% Loose quartz grains, fine grained and granule size, predominantly modium grained, angular to well rounded, rarely with traces pyrite coment, traces obsidian fragment of granule size.
10,040-10,050	loose quartz grains. Variable sample, interbedded and gradational.
	Common modius to coarse predominantly woll rounded

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	gradational contact
3 inches	SANDSTONE; light grey, similar to above but generally very fine grained, mederately silty, and cross laminated; laminae defined by concentrations of carbonaceous to coal flecks and grains. Burrow 24 inches deep and 14 inches wide is infilled with sandstone as above.
10 inches	SANDSTONE; light grey to greenish grey, very fine to fine grained, kaolinitic lithic, as above with occasional carbonaceous laminae.
	gradational contact
10 inches	SANDSTONE; Light groy, similar to above, pro- cominantly very fine grained with common irregular laminae of sandy siltstone, argillaceous siltstone and occasionally of carbonecocus to coal matter.
	gradianal contact
6 <del>1</del> inches	SANDSTONE: light groy vory light groy fine grained, coumon vory fine and modium grains, angular to subangular, vitroous quartz, less than 5% lithic grains, slightly silty, poorly sorted, well cemented with powdery silica, very slightly calcareous, tight. Rare carbonaceous/lamingo.
l inch	SILTSTONE; light to modium light groy, very sandy (very fine grained) very lithic/feldspathic, slightly micaceous.
6 <sup>1</sup> inches	SANDSTONE: light groy fine grained, common very fine grained, angular quartz, with abunt 5% foldspar; 10-15% brownish grey, grey brown, black lithic greins, moderately well sorted, well comented with silica, slightly calcareous, tight.
1 <sup>1</sup> inches	SILTSTONE; medium to medium dark groy, vory sandy (very fine grained quartz, feldspar and lithic graine) noderately micaceous and carbonaceous.
1 inch	SANDSTONE; Light grey, fine grained as above.

1<sup>1</sup>/<sub>7</sub> inches SILTSTONE; medium to modium dark groy, vory sandy as above.

1 ft 1 inch SANDSTONE; modium groy, very fino grained, quartz and abundant (30% ?) foldspar and lithic grains, very cilty, moderately carbonaccous, slight to moderately micaccous, well indurated, in part with patchy matrix of brown calcareous carbonate, tight.

10 inches No recovery

10,067-10,070 Trip sample

70% SANDSTONE; light groy to groy green, very fine to fine grained with augular to subangular quartz and various amounts of white translucent and opaque feldspar up to 40% and from 5-15% dark grey, brown grey and green grey lithic grains. Occasional carbonaceous/bitumen material.

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common carbonaccous/bitumen lameline. Occasional white and brown mica very fine, sandy and grading to sandstone above. 20% SHALE(mudstone) modium to dark grey, micromicaccous. Occasional carbonaccous fleeks.

Part silty and grading to siltotone as abovo.

10,070-10-080

10-080 60% SAMDSTONE; light groy to groy groen, very fine to fine grained, as above.
 20% SILTSTONE; light grey, with abundant foldspare as above.
 20% SHALN; medium to dark grey, micromicaceous, part carbonaceous, part silty, as above.

10,080-10,090 70% SANDSTONE; light gray to green grey, very fine to predominantly fine grained, as above, with common feldspar and lithic grains up to 50% rare orange foldspar. 10% STLASTONE; as above part slightly brownish. 20% SHALE: as above.

50% SANDSTONE; light grey green very fine to 10,090-10,100 fine grained with approximately 40% angular to subaugular clear quarty, 40% white to vory pale green translucent opages feldopar, 10% off white altered foldsper, 10% dark grey, grey brown to grey green lithic grains traces orange feldspar occasional carbonacoous/bitumon material, and palo brown mica. Silica and slight to moderate calcareous cement. Tight. 20% SANDETONE; light grey brown, very fine to five grained with constituants as above but with a light brown moderately calcareous (dolomitic?) matrix. 10% SILTSTONE; light grey with common feldspar part vory fine sandy and grading to sandstones above. 20% SHALE; (mudstone) medium to dark grey, microsloaceeus, partearboucceous, part cilty and grading to siltstone above. 5% dark brown hard, moderately calcareous

10,100-10,110

15% SANDSTONN; Light gray brown, moderatoly calcaroous, as above. 15% SANDSTONE; white to white gray, vory fine grained with ongular clean quarts and 5% foldspar

mudstone.

fine grained acabove.

specks of reginous material.

10,110-10,120

60% SANDETONE; predominantly light green grey as above but predominantly fine grained, foldspathic and lithic, minor brown grey and moderately calcareous as above. Minor part white to white grey, quartesse as above, but with traces medium to coarse angular quartz. Also minoe part with argillacecus, silty matrix, and carbonaceous flecks, and wice as above. 35% SHALE; medium dark grey, part silty part carbonaceous with fine coal iswellas.

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10% SILTSTONE; light grey as above, very occasionally

50% SANDSTONE; Light green grey, very fine to

and lithics in a clacareous cement. Tight.

10% SHALE; medium to dork groy, as above.

60% SANDSTONE; Light groy graen very fine to 10,120-10,130 fine grained, with up to 80% white and pale freen foldspar and common dark grey and greenish groy lithic grains, very minor part with 5% feldspathic/lithic grains. Farly sparso calcarcous and occasional siliceous coment. Occasional carbonneous/bitumen material very occasional erange foldspar traces white mica. Tight. 20% SILTSTONE; Light to medium grey with abundant feldspethic graind, eccasional mica and carbonacoous flocks. Fart argillaceous, part very fine sandy grading to sandstone, as above. 20% SHALE; nodium to dark grey, put carbonaceous as above.

10130-10140 70% SANDSTONE: Light groy groen, very fine to fine grained as above with 5% with brown calcareous (delouitie ?) watrix. 1.5% STLASTONE: Light to wedium groy, as above, part with rare medium to coarse subrounded quarts grains. 1.5% SHALE: wedium dark grey, wicrowicaccous, part carboneccous part silty. Traces ceal.

10,140-10,150 705 SAMESTOME; Light grey graen, very fine to fine grained, as above but more quartaose with abundant 20-30% foldspar/lithic grains. 15% STAPSTOME; Light to medium grey, feldspathic, wiccoccus sandy as above. 15% SHALE; as above, but generally modium grey and sity to grading to siltstome.

10,150-10,160 25% SHALE; modium light to modium groy, slightly micromicacoouc, slightly carbonacoous, generally slightly silty, in part very silty, platy to blocky. 15% SILASTONE; light to medium light grey, in part argillacoous, generally coarse, slightly micaceous alight to moderately earbonaceous, very feldspathic/ lithio, grades to . 60% SAMESTOME; light groy, often brownish groy, very fine grained, eccasional fine grained, subangular clear to translucent foldspar (60%), quartz (20%) brown and black lithic grains (10%) opaque white altered feldspar (5%) and green and groonish groy lithic grains (5%) in part with common argillacoous grains, in part with carbonaceous/coaly grains, silty and argillaceous matrix, dirty appearance, indurated tight.

10,160-10,170 Variable sample.
25% SHALE; modium to medium dark groy, variable in part slightly micromicaceous ron-silty, generally micromicaceous, slightly carbonaceous, moderate to very silty chunky.
45% SHARTONE; light to medium light grey as above.
30% SANDSTONE; similar to above but predominantly very fine grained, moderate to very silty.
Traces massive pyrite. Trace orgillaceous con1.

10,170-10,180 Variable sample. 15% SHALE; medium to dark grey, predominantly tough and vory silty, blocky, grades to 55% SILTSTONE; medium light grey and greenish grey, tough, in part argillaceous but predominantly siliceous and very fine sandy, generally very feldspathic/lithic but in part quartzose, slightly wicromicaceous and carbonaceous - grades to shale and to -30% SANDETONE; light grey and greenish grey, very fine grained as above, in part slightly calcareous, tight. Scattered medium to very coarse angular to subaugular quartz grains.

10,180-10,190

30% SHALE; medium to medium dark groy, slight to moderately micromicaceous, trace carbonaccous non-silty platy; in part (30%) slightly carbonaccous, moderate to very silty. slightly sandy (vory fino grained) lithic/fdspathic, chunky and grades to. 20% SILTSTONE; medium light groy, slightly to moderately micromicaceous, conrec, occasional carbonaceous spocks, moderate to very foldspathic/ Lithic, in part argillaceous, commonly sandy (very fine grained) and grades to -50% SANDETONE; light grey and greenish grey, speckled black ("salt and popper" texture), very fine grained, in part fine grained, angular to subrounded pale groonich grey to translucent feldeper grains, quartz (perom tage unknown but prebably very small), 5% opaque white altered fedepar grainz, 10% modium brown to black argillaccous grains, rare carbonaccous grains, rare schist grains, woll inducated, silicoous to mederately calcaroous coment, tight. Rare modium to coarso quarts grains in shale.

10,190-10,200

Variable sample.

16% SHALE; as above in part carbonacoous, moderate to very silty. 40% SILTSTONE; medium light to medium groy, slightly carbonaceeus, slightly micromicaceous, in part argillaceous, predominantly coarse, very sandy (very fine grained) very foldspathic/ lithic and grades to -50% SANDSTONE; light groy to greenish grey, similar to that above but very fine grained, moderate to very silty in part, only trace calcareous.

10.200-10,210

10% SHALE; as above wederate to very silty grades to. 25% SILTSTORE; medium light to medium grey, in

part rederately argillaceous, predeminantly slightly microsicacous, tough, moderately felderathic/lithic and in part slightly carbonacceus i coarse and grades to -655 SANDETONE; light grownich groy, vory fine graded, is part five grained, angular subrounded quarts and very abundant (305)? grey and grownich groy trunclucout foldspar, with about 5% white keeliniced foldspar, 10-15% dark growich green, brown and black lithic graine, traces schist graine: traces pink foldspar well corted, well computed with silics, trace calcareous tight, rarely with medium grained "floating" quartz grains.

10,210-10,220 Variable sample 20% SMALE; as above and in part non-silty 40% SINTSTOME; light to medium grey, often argillaccous, as above 35% SANDSTONE; light greenish grey similar to that above, predomently very fine grained, slightly calcareous in part, tight.

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5% Unconsolidated quartz and foldspar grains, prodominantly vory fine to fine grained but including some medium to coarse quartz grains. Trace massive pyrite.

10,220-10,230 Trip sample 15% SHALE: medium to dark grey, micromicaceous part silty, part carbonaceous. 20% SILTSTONE; light to medium grey, with abundant feldspathic grains wicromicaceous, with carbonaceous material, part very fine sandy. 60% SANDSTONE; light grey green, very fine to fine grained, foldspathic as above. 5% Unconsolidated quartz and feldspar grains, very fine to cearse grained as above.

10.230-10.240 50% SANDSTOME; light grey green, vory fine to occasionally fine grained with subengular clear quartz, up to 60% foldspar including 5% lithic grains as above. Occasionally carbonaccous bitumon material and pale brown mica. Siliceous slightly calcareous cement. Tight. 25% SILVESTONE; light to medium grey as above. 25% SHALE; modium to dark grey, as above part with wary appearance, traces coal.

- 10,240-10,250 75% SAUDSTONE; light groy green, very fine to fine grained, very feldspathic as above. 5-10% lithics, traces orange feldspar, tight. 15% SILTSTONE; light to medium grey as above. 10% SHALE; medium to dark grey as above.
- 10,250-10,260 80% SANDSTONE; light grey green very fine to fine grained as above part with up to 80% white to pale green feldspar including 10-15% grey brown and grey green lithics. Part with pale brown moderately calcareous matrix. Part with argillaceous matrix. Tight. 10% SIL/FSTONE; light to medium grey as above occasionally grey brown and slightly calcareous 10% SNALE: medium to dark grey as above.
- 50% SANDETONE; Light grey green, very fine to 10.260~10,270 occusionally fine grained with 60-80% white to white green translucent feldspar including 10-15% grey brown, groy groen, and light groon liftic graine. Subsiduary subangular clear quartz occasionally white to brown mica, trace orange Adepar slightly calcarecus cement, tight. 30% SILASTONE; light grey to groy green with abundant foldspar and occasional lithic grains, minor mice. Gradational to conditione above. 15% SHALE; modium grey, micromicecoous part silty and grading to siltstone. 5% Mudatone; gray brown slight to calcareous with southored silt to very fire size quartz and foldspar grains, eccasionally carbonacoous flocks.

10,270-10,280 50% SANDSTONE; light grey green, very fine to occasionally fine grained feldspathic lithic slightly calcareous as above, minor part with 50% quartz. 30% SILTSTONE; light grey to grey green as above grading to sandstone above. 20% SHALE; medium to occasional dark grey, micromicaceous, major part silty, part slightly cabbonaceous.

10,280-10,290
40% SANDSTONE; light grey green, very fine to occasionaly fine grained feldepathic/lithic as above with part - 50% angular/subangular quartz with siliceous coment.
40% SILTSTONE; light grey to grey green, as above.
20% SHALE; medium to occasionally dark grey as above, part very silty.

40% SHALE; in part modium light groy slightly 10,290-10,300 wicromicaceous platy to chunky, prodominantly black brownish grey rarely silty, only trace feldspathic, commonly with carbonaceous fragments and in part with coal Lawinao. 30% SILTSTONE; light to medium light groy, vory slightly micacoous, slightly carbonaceous in part, often only slightly feldspathic lithic but in part very feldspathic and coarse and grades to candstone; in part argillaceous and grades to grey shalo; as above. 30% SANDSTONE; light grey, very fine grained, very lithic/feldspathic as above, rarely with carbonaceous blebs, in large part silty, in part slightly calcaroous tight, grades to siltstone.

5% SHALE; brown, as above. 10,300-10,310 10% SANDSTONE; light grey to greenish grey, very fien grained, as above. 15% SANDSTONE; modium light brownish grey, very fine grained, in slight part fine grained, subangular to subrounded eream and off white to light grey foldspar 15% lithics, 10% quartz, very calcarcous, tight. 10% SILTSTONE; light to modium light greenish grey, slight to mederately micromicaceous, moderately feldspathic/lithic, slight to moderately carbonaceous in part, in part argilleceous and grades to shale as below. 60% SHALE; medium light to medium grey, slightly micaceous, occasionally with silt size carbonaceous flocks and rare carbonaceous patches, in part slightly silty, only traces feldspathic. Traces of samistone cream, fine to medium grained rounded to subrounded quartz, well cemented, with a white powdery cement, tight, yellowish mineral ? fluorescence.

Traces coal, eccasional loose rounded to subrounded medium to coarse grained quartz.

10,310-10,320 Interbeddedand gradational.
5% SHALE; brown, as above.
10% SANDSTONE; medium light brownish groy, as above.
20% SHALE; as above, in part moderate to very silty.
30% SILTSTONE; medium light to medium greenish grey, in part as above but predominantly coarse, very feldspathic/lithic, carbonaceous slightly micromicaceous and grades to 35% SANDSTONE; light greenish grey, very fine grained, lithic/feldspathic as above, tight.
Occasional loose quartz grains; trace shell fragment?

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10,320-10,330 35% SHALE; medium grey, in part brownish grey, slight to mederately micromicaceous, slight to to mederately silty, very slightly carbonaceous, and feldepar, placy-subflestile. 45% SILTSTONE; light to medium light greenish grey, as above; grades to 20% SANDSTONE; light greenish grey very fine grained, as above, predominantly silty, tight. Scattered medium to cearse quarts and occasional translucent feldepar grains.

10,330-10,340 15% SANDSTONE: light to medium light greenish grey, as above. 50% SHALE: modium light to medium dark grey, as above. 35% SILTSTONE: wedium light to medium grey, moderately microsous, moderate to very foldspaths/ lithic, in part slight to moderately carbonaceous, in part argillaceous and in part very fine sandy. Occasional buff, modium to very coarse grained sandstone with traces intergranular percenty and eccasionally medium to coarse loose quartz grains.

- 10,340-10,350 Variable sample - interbodded and gradational 5% SANDSTONE; modium light to modium groy, very fine grained as at 10,300-10,310 20% SANDSTONE; light greenish groy, very fine grained as above slightly calcareous, tight. 30% SILTSTONE; as above, generally coarse and grades to sandotone. 45% SHALE; as above, in part carbonaceous flocked warely feldepathic in part silty. Traces coal; traces loose poorly sorted quartz graine, traces quartzose sandstone; as above.
- 10,350-10.360 65% SHALE; medium light to moduum grey, slightly brownish, slight to moderately micaceous, in part with pale bornw indeterminate flooks, predominantly non-feldepathic but in part (40%) slight to moderately silty and feldepathic/lithic slightly carbonaceous in part. 15% SILTSTONE; medium light grey, coarse, slightly microwicaceous, very sandy (very fine grained) slightly carbonaceous, in large part feldepathic/lithic, grades to silty sandstns. 25% SANDSTONE; light grey slightly greenish, very fine grained as above tight.
- 10, 360-10, 370 45% SHALE; modium light to modium groonish groy, elightly micromicaccous, slightly silty, vory elightly foldspathic rarely carbonacoous, platy to blooky. 15% SILASTONE; modium groy, slightly greenish as nheve. 40% SANDSTONE; light to modium light groonish grey vory fine grained occasional fine grained angular to subsangular, pale greenish grey translucent foldspar, 5-10% white kaclinitic grains, less than 10% quartz, 10-15% brown and occasional black argillacoous grains, very slightly micaceous commonly well comontod (with silica?) but in part moderately friable with silty partly kaolin-itic (?) matrix, tight, in part very slightly calcareous. Traces quartzose sandstone as above Traces pyrite.
- 10370-10,380 45% SHALE; similar to that above. 10% SILTSTONE; as above and in part light greenish

Trip sample.

flocks.

grey, quartzos	e, moderately	micaccous.
45% SANDSTONE	as abeve, in	part brownish
grey slightly	calcareoue.	

10,380-10,390

45% SANDSTONE: light groy green, very fine to fine grained with 50-30% white to white green feldspar 5-10% grey brown and grey green lithic grains, and subsiduary angular to subangular clear quartz. Occasionally carbonaceous/bitumen material. Occasionally light brown to green wicaceous flakes. Traces orange foldspar. Slight to moderately calcareous coment. Tight. 15% SILTSTONE; light to medium grey green with abundant poorly defined white to green feldspar and occasional lithic grains. Occasional carbonaccous bitument flecks. Grades to sandstone above. 40% SHALE; mcdium to dark grey, micromicaceous part silty with abundant feldspar grains grading to siltstone above. Part non-silty but with scattered very fine subrounded clear quartz grains. Part with peorly exentated carbonacoous

10,390-10,400 60% SANDSTUNE; light grey green, very fine to fine grained as above. 15% SHANSTONE; light grey to grey green feldspathic lithic as above. 25% SHALE; medium to dark grey, micromicaccous as above.

- 10,400-10,410 45% SANDSTONE; light groy green, very fine to fine grained, feldspathic/lithic slightly calcareous as above. Part with argillaceous matrix. 15% SILTSTONE; light groy to grey green as above. 40% SHALE; modium to dark groy, micromicaceous as above.
- 10,410-10,420
  40% SANDSTONE; light groy green, very fine to fine grained with 50-80% white to white green translucent feldspar with 5-10% off white altered feldspar, 5-10% grey brown to grey green and green lithic grains. Occasional carbonaceous/bitumen waterial and light brown wica. Traces erange feldspar slightly calcareous. Part with argillaceous matrix. Tight.
  15% SILTSTONE; light grey to light grey grean with common feldspar and eccasional lithic grains, part argillaceous grades to sandstone above.
  45% SHALE; medium to dark grey wicromicaceous. Part silty and very silty and grading to siltstone. Rare carbonaceous streaks.
- 10,420-10,430
  40% SAMDSTONE; light grey green, very fine to fine grained feldspathic/lithle slightly calcareous tight as above.
  20% SILSTONE; light grey to occasionally green grey, common feldspar, part argillaceous, occasional mica, as above.
  40% SHALE; medium to dark grey as above, predominantly silty, micro to very fine micaceous.
  10,430-10,440
  65% SANDSTONE; light grey green, as above but

10,430-10,440
65% SANDSTONE; light groy green, as above but predominantly fine grained with slight increase in lithic content.
15% SILTSTONE; light grey to grey green, as above.
20% SHALE; light medium to occasionally dark grey, as above but with part non silty scattered very fine clear to brown subrounded quartz grains.

10,440-10,450

75% SANDSTONE; light grey green fine grained, occasional very fine and medium grained, with approximately 60-70% white to white grain, feldspar as 10-15% subangular grey brown, grey grey green lithic grains 10-20% clear angular quartz grains. Occasional erange feldspar, light brown mica, and carbonaccous bitumen material. Slightly calcareous cement. Part with light brown moderately calcareous matrix. Traces intergranular perosity. Traces relative clear quartz sandstone to very fine to fine grained with traces intergranular perosity. GAS SHOW: A 0.8 unit kick was recorded by the detector unit. Pale yellow mineral fluerescence only. No cut.

15% SILASTONE; light groy to grey green with common indistinct feldspathic grains, argillaceous slightly micaceous. 10% SHALE; modium to dark grey, micromicaceous

part carbonaceous generally silty and grading to siltstone above.

10,450-10,460 35% SHALE; medium groy, slightly silty, very slightly carbonaceous specked, only trace foldspathic chunky-platy and prodominant shale dark brownish groy, slightly micacoous and carbon-accous, very slight to slightly feldspathic/lithic in part moderate to very silty, tough, blocky. 15% SILTSTOME; modium light to modium groy and greenish grey, slighly micromicaceous, coarse, feldspathic/lithic, in part argillaceous, predominantly very fine sandy and grades to sandstone. 50% SANDSTONE; light to medium light greenish grey very fine grained, occasional fine grained, angular to subangular pale greenish grey translucent foldspar, approximately 10% quartz. 5% white kaolinitic grains, 15% medium brown to black shale grains, occasional pink feldspar grains; argillaceous/slightly kaolinitic matrix, in part well comented (with silica?) in part very friable; slightly micaceous, occasional carbonaceous grains: possibly with some earthy porosity. Traces of sandstone; cream to buff, very fine grained subangular to subrounded quartz and occasional translucent foldspar white powdery matrix, very fiable, poor intergranular and good earthy perosity.

10,460-10,470 20% SNALE; similar to above. 15% SULTSTONE; similar variable, prodominantly modium light to medium grey, brownish grey, greenish grey, and essentially similar to that dove. 65% SANDSTOME; light greenish grey, very fine grained, in part fine grained, similar to abow, generally with argillaceous kaolinitic matrix with good earthy peresity. Traces sandstene; cress to buff as above, traces loose medium to very cearse quartz grains.

10,470-10,480 Not much volume of cuttings over shaker. 30% SHALE; predominantly medium dark brownish grey, in part silty, in part micaceous generally slightly carbonaceous and rarely with carbonaceous and coal blebs, sub-fiscile to chunky.

	15% SILTSTONE; variable, predominantly medium groy, slightly micacoous, slightly feldepar, very slightly carbonaceous, tough; in part argillaceous. 55% SANDSTONE; light greenish grey very fine to fine grained angular to subangular light greenish grey translucent feldepar, similar to above but with increase in quartz content and decrease in the lithic content, possibly with fairto moderate earthy perceity in large part.
10,480-20-490	<pre>30% SHALF; medium light to medium grey, moderately to very eilty, slightly carbonaceous in part, slightly feldspat in part, pley to chunky to grades to - 50% SILSTONE; medium to wedium dark groy, coarse slightly micaceous, in part argillaceous, tough, slightly carbonaceous, in large part slightly feldspathic/lithic, often very finely sandy. grades to - 20% SAMDSTONE; light to medium greenish grey very fine grained, occasional fine grained as above, generally slight to moderately silty, tight. Occasional santatone buff to very fine to fine grained, subangular to subrounded quartz, occasional enrhomaceous grains, pewdery siltecous coment, friable, good cartby and traces intergranular perceity. Traces of boutonits.</pre>
10,490-10,500	255 SHALD: medium to dark grey, and brownish grey, alightly carbonaccons slightly carbonaceous, slightly feldepathic in part, generally slightly silty. 255 SELTSTONE; medium grey, slightly greenish coarse feldepathic/litble, very andny(very fine grained) in part slightly carbonaceous, slightly micromicaceous grades to 565 SANDSTONE; light greenish grey, very fine grained, angular to subangular, pale greenish grey translucent feldepar, 5-105 quartz, 5% kaolin, 10-15% brown and black litble grains, generally slight to wederately silty, dirty appearance, well consolidated traces calcitetight.
10,500-10,510	15% SHALE; variable (cavings?) 20% SILISTOME; as above vell consolidated siliceous in part, grades to very fine grained sandstone. 65% SANDSTOME; light greenish grey, very fine grained, wederately silby, as above, grades to siltstone. Occasional quartzees sandstone, buff, very fine to fine grained as above.
19 <b>,510-10-</b> 520	13% SNALM; variable modium to dark groy, often very silty, in part silicoous, probably at least in part cavings, blocky. 15% SILASTOME; as above rarely carbonaceous. 70% SANDSTOME; light greenish grey, as above but very fine to fine grained and only slightly silty very slightly calcareous, tight; in part brewnish grey with moderate calcareous carbonate coment tight.
10,520-10,530	Interbeddod and gradational 20% SHALE; modium dark to dark grey slightly brownish in part slightly micaceous, in part carbonaceous, in part feldspathic, in part silty.

10,530-10,540	<ul> <li>30% SILTSTONE; light to wedium grey and greenish grey, slightly micromicaccous, occasional biotite flakes, in slight part argillaceous, in part sil-iceous, coarse and predominantly moderate to very sandy (very fine grained), moderate to very foldspathic/lithic - grades to -</li> <li>50% SANDSTONE; light to modium light grey as above.</li> <li>10% SHALE; as above, rarely with subangular modium to very coarse quartz grains.</li> <li>25% SANDSTONE; a above generally silty - grades to -</li> <li>65% SIL/FSTONE; wedium greenish grey, slightly micaccous, in part argillaceous, slight to moderately foldspathic/lithic, ccarse and grades to sandstopo.</li> </ul>
10,540-10,550	Sample not caught.
10,550-10,560	Trip sample. 75% SHALE; medium to modium dark grey, very slightly micaceous, in part slightly carbonaceous, rarely slightly foldspathic, in slight part eilty, platy to blocky. 16% SILTSTONE; medium light to medium grey, predominantly coarse and very sandy, (very fine grained) generally moderate to very feldspathic/ lithic, rarely argillaceous. 15% SANDSTONE; medium light grey very fine grained feldspar and ebundent lithic fragments, in slight part with abundant quarts, in part silty occasional dirty, argillaceous and chloritic, tight.
10,560-10,570	Variable Lithology interbedded and graddional. 50% SHALE; as above but generally very tough, slight to moderately silty and slightly feldspathic lithic. 35% SILTSTONE; modium grey, in part greenish grey, coarse and very saidy, as above. 15% SANDSTONE; variable but predominantly medium 1 light grey, very fine grained, angular, light grey and greenish grey and pale green feldspar with less than 16% quartz, 5-10% white to cream haolin and 10% Light brewn graine, well comented in part silty, trace calcareous, tight. Traces of coal matter.
10,570-10,500	20% SHALE; medium dark groy, tough, in slight part moderately foldepathic/lithic, in part silty in part carbonaceous, rarely with coal laminae, blocky. 20% SILASTONE: Light to medium greenish grey, coarce very sandy (very fine grains & feldspor and lithics) in part silicoous, grades to - 60% SAMDSTONE: Light greenish grey, very fine grained occasional fine grains, angular to subangular pale greenish grey, translucent foldspar 50-10% white knotin grains, less than 5% (?) quarts, 10-15% black, and brown grains, slightly silty, compact, well sorted, tough, tight. Traces creat very fine to fine grained quartz sandstone; occasional medium to very coarse loose grains of quartz and foldspar.

10,580-10,590	Variable lithology. 20% SHALE: dark grey and brownish grey, micaccous, in part silty, non-feldspathic, blocky (probably cavings) 15% SHALE; light greenish grey, trace carbonaceous very slightly feldspathic, very silty, platy. 25% SILTSTONE; medium light greenish grey, very feldspathic/lithic, tough, moderate to very sandy (very fine grained) interleminated with and grades to - 40% SAMESTONE; as above predominantly very fine grained.
10,590-10,600	Variable lithology - interbedded and gradational. 40% SHALE; predominantly dark grey and brownish groy, very slightly carbonaccous, rarely slightly silty, in slight part greenish grey as above. 40% SHLTSTOME; as above, tought. 20% SANDSTOME; as above, very fine grained, well indurated, slightly siliceous in part, tight.
10,600-10,610	60% SHALE; dark groy and groyish brown, as above and lesser medium greenish groy, alightly micaceous generally moderate to very silty, foldspathic/ lithic. 30% SANDSTONE; medium light groy and greenish groy, very fine grained, occasional fine grained as above, tight. 10% SILTSTONE; as above. Traces shale; dark brownish grey, very glauconitic.
10,610-10,620	Variable lithology to interbedded and gradational. 45% SHALE; dark brownish grey, as above, rarely candy, with occasional chale greenish grey as above. 40% SANDSTONE; variable, very fine to fine grained, feldspathic/lithic, in part argillaceous, often slightly carbonaceous or micaceous, rarely silty and with abundant chlorite pollets. Trace ccal; trace very coarse grained feldspar and quartz grains. 18% SILTSTONE; similar to that above. 2% SANDSTOFE; cream, very fine to fine grained, quartz, well cemented with powdery white silica (?) trace calcarcous, fair earthy percenty.
10, <b>62010,</b> 630	<ul> <li>\$55 SHALE; medium to dark grey and brownish grey, slightly carbonaccous, in part silty sub-fissile to platy.</li> <li>\$55 SHATSTOME; as allove.</li> <li>\$55 SANDSTOME; light to medium light grey, in part greenish grey, very finegrained, occasional fine grained, grey and greenish grey feldspar common white knolinitic grains 10-155 grey brown, and black argillaccous litble grains and less than 10% quartz, in part slightly silty, compact very slightly calcarcous, tight.</li> <li>Traces of coal, abundant candstone cream to light grey, and or solve.</li> </ul>
10,630-10,640	35% SANDSTONE; light grey to green grey, very fine to fine grained with white to light green feldepar. 10-15% lithic grains as above. Occasional white altered feldspathic grains 10-20% clear angular quartz, part argillaceous part silty, very slightly calcareous, tight. 5% SANDSTONE; cream, fine to very occasional medium

with subangular clear quarts and 5% foldspathic/ lithic grains in a powdery siliceous ? part slightly calcarsons coment, with earthy porosity 20% SILTSTONE; light to modium groy, occasional grey green with common foldspathic and lithic grains occasional carbonacoeus flecks, part argillacoous. 40% SHALE; modium to dark grey and brownish grey as abeve. Traces coal. 10,640-10,650 35% SANDSTONE; light groy to groy groon, very fine to fine grained, feldspathic/lithic as above. 20% SANDSTOND; Cream, ses above but occasional very fine graim d and part with 5% foldspathio/ lithic grains and gradational to groy groon sandstone as above. Also occasional carbonacoous coal stringers, traces intergrammler perosity. No shows. 15% SILTSTONE; as above. 30% SHALE; modium to dark groy part cilty as above, traces coal. 10,650-10,660 35% SANDSTONE; light grey green, as above but prodominantly vory fine grained and part silty. Foldspathic/lithic. Tight. 25% SANDSTONE; oream, prodominantly fine grained. quartzoec as above, with traces intergranular porosity. Very slightly increases 0.1-0.2 unit in background on detector unit. 20% SILTSTOME; light grey to light groy green foldspathle/Lithio, part very fine sandy and grading to sandstone above. Part argillacoous Part micomicaccous. 20% SHALE; medium dark grey, part carbonaceous, predominantly silty but minor part non silty with scattored vory fine quartz grains. 10,660-10,670 20% SANDSTONE; light grey green, foldspathic lithic as above, but with 50% angular to subangular cloar quartz. 30% SANDSTONE: cream, fine grained, quartzose as above, alight increase inggas background. Bright yellow fluoroconce in siltstene. No out. 20% SILASTONE; light grey to light grey green, ga above. 30% SHALE; medium to dark grey, as above part grey brown hard and mederately calcareous. 10.670-10.680 25% SANDSTOND; light groy groon very fine to fine grained with white to white green foldspar, 5-10% white altered folderar, 10-15% groy, gray groon, brown, black lithic grains and 20-50% angular to subangular slear quarts slightly colouroous coment, tight. 25% SAEDSTONE; white to cream, fine grained, with augular to subangular cloor to alightly cloudy quarte with southered (0-5%) white feldoper and lithic grains as for conditions abovo. Part with traces intergranular porosity slightly calcaroous powdery milicoous ? matrix with peosible capilliory percetty. 0.3 unit gas kick on detector. Scattered yellow fluoresconce no cut as above. 20% SILTSTONE; light to medium groy groy groon, grading to sandotone as above. 30% SHALE; modium to dark grey as above but minor part with scattered very fine to medium subangular to subrounded clear to cloudy quartz grains.

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10,680-10,690
Sampel appears unreliable and hight proportion of large cuttings.
20% SANDSTONE; light groy green, vory fine to fine grained, feldspathic/lithic as above.
30% SANDSTONE; cream, fine greined quartzose as above but occasional modium grained and moderately friable.
20% SILTSTONE; light grey to grey green as above.
30% SHALE; medium to dark grey, part very fine to medium sandy as above.

10,690-10,700 25% SANDSTONE; light groy groen, foldspathic/ lithic as above with occasional carbonaccous/ bitumon material. 25% SANDSTONE; cream, fine to occasional modium grained quartures with 5% lithic/foldspar as above. 20% SILTSTONE; light to medium grey, occasional groy groen as above. 30% SILTSTONE; modium to dark grey, micromicaceous as above increase 5% shale (mudstone) light grey moderately soft, and slightly waxy lustre, with microm size carbonaceous specks and occasional with yellow fluorescence. No cut.

46% SANDSTONE; light grey green, very fine to 10,700-10,710 fine grained with white to white green foldspar 10-20% groy, brown, black grooy otc, angular Lithic grains. 0% - 5% clear angular quartz occasional white altered foldspar very occasional orange foldepar. Occasional carbonaceous/bitumen material, very occasional pale brown mica, very sparse slightly calcareous coment. Tight. 30% SANDSTONE; white to off white prodominantly fine grained and well sorted angular clear quartz Rare lithic or foldspathic grains. Part with modium to granule size cloudy white to yellowish subrounded quarts grains and traces pebble size quarts fragment suggest congloweritic in part Generally fairly sparse white powdery matrix alightly calcaroous or delomitic ? Traces intergranular peresity, fair earthy peresity. GAS SROW. A woll dofined two unit gas kick was recorded by the detector unit in this interval. No fluorescence occurs in the sandstones. Scattered yollow fluerescones with no out occurs in the elitatonos and chalos. 16% SHASTCHE: Light to modium grey, with occasional foldopathic and lithic grains part micromicaceous.

foldspathic and lithic grains port micromicaceous. 20% SHALE; medium to dark groy, and groy brown. Ferty pility and grading to militatone above with conssional earbouaceous species. Part very micromicaceous. Part serbouaceous with coal laminac.

10,710-10,720 35% SAMDSTONE: Light grow grown, feldspathic Lithic as above but prodeminantly very fine grained, part silty and grading to siltstone, part with englilaceous matrix. 15% SANDSTONE: white to off white, fine grained quarteese as above part with traces poor intergramular perceity. 20% SULTSTONE: light to modium grey as above, part grey Green and very fine candy. 20% SHALE; medium to dark grey, as above. 10% Bentenite; grey to grey white, moderately

coft, massive, slightly wary lustre, with

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scattered silt size dark brown, possibly argillaceous specks, and light brown mica.

10,720-10,730

Variable sample. 25% SHALE; modium dark to dark groy, in part clichtly micaccous, revely slightly pyritio, rarely with ocal blobs, generally slight to moderatoly carbonaccous (flocks), in part slightly foldspathic, in part slightly silty. 3% BENTONITE; and very bentonitic shale variably cream, greenich grey, grey, and pale brown. Fluorescence moderate yellow. 10% SILTSTONE; predominantly medium greenish grey, in part moderately gray, elightly micaccous, moderately carbonsoccus (specks and occasional patches and lamineo), generally very fine sandy (feldspathic) in part argillaceous. 2% Loose modium to very coarse grained, angular to subangular quarts grains. 25% SANDSTONE; light brownish grey, very fine grained, angular to subangular foldspar with 15-25% quarts and 15-20% lithic grains (including phyllite), conerally abundant brown sideritic demomitic coment, tight. 10% SANDSTONE; light groy to buff, vory fine to fine grained. angular to subangular quartz, trace feldspar and groon chlorito grains, in alight part with siliceous coment, generally, with white to pale brown powdery slightly calcareous vory delomitic coment, rare carbonaccous grains, good earthy perosity, traces intergrammar perosity. 25% SANDSTONE; light greenish grey, very fine grained, foldspathic/lithic, as above, tight.

Traces massive pyrite.

Tripssample.

10,730-10,740

40% SHALE; dark grey, in part brownish grey, very slightly carbonaccous, in part slightly feldspathic in part elight to moderately eilty, in part fissile but predeminently chunky. 10% SILTETONE, as above. 5% SANDSTONE; light grey to buff, very fine to fine grained as above. 44% SANDETOND; light to modium light greenich gray, mottled toxiure, very fine to fine grained. engular to cubangular, pole green and greenish grey, feldepar, 3% white, clay graine, less than 13% aubangular to subrounded quartz grains, 15-20% dark grayich brown and occasional black argillaceone grains, pracos orange to red foldepar, clightly friable, argillaceous/silty matrix, compact, tight, conttored. Mica (prodominantly biobito) occasional with earbonaccous streaks.

1% Bentouite; prodominantly ereau, groy, white. Pale yellow fluorescence.

10,740-10,750

83% SHALD; dark grey and brownish grey, as above predominantly alight to moderately silty and occasional madium light grey very silty shale. 10% SILTSTONE; madium greenish grey to dark grey and brownish grey slight to micacecus, in part argillaceous, predominantly moderate to very feldspathic/lithic. 5% SANDSTONE; variable, very fine grained, silty. Common bontonite as above, traces coal, occasional loose quartz and feldspar grains.

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10,750-10,760 60%

60% SHALE; dark grey and brown groy, as above and grading to light to modium grey siltstone. 10% SIL/ISTOME; light to modium grey, occasional green grey, as above. 20% SANDSTOME; light to modium light green grey very fine to fine grained, feldepathic/lithic as above. 10% SANDSTOME; light grey and buff, quartzose as above.

10,760-10,770

20% SANDSTONE; light grey green very fine to fine grained with white to white green feldspar 10-15% grey brown, green lithic grains, variable content of angular clear quartz from 10% - 50% Occasional carbonaccous/bitumon material, traces orange foldspar slightly calcareous coment. Tight. 10% SANDSTONE; light grey white, very fine to predeminantly fine and very occasional medium grained part with slight calcareous powdery whilts matrix. Probably earthy porosity. 15% SILTSTONE; light to medium grey brown to grey green, moderatoly feldepathic part grading to sandstone above. Part with abundant fairly well orientated carbonaceous flocks. Occasional light brown mica. 55% SHALE; medium to dark grey, slight to moderately micromicaceous part silty and grading to siltstone part carbonaccous, 5% light grey and bentonite.

10,770-10,780

10,780-10,790

20% SANDSTONE: light grey green, foldspathic/ lithle as above.

50% SHALE; modium to dark grey as above 5%

20% SANDSTONE; 11ght grey groon, feldspathic/

20% SANDSTONE; light grey white, quartzose, as above part moderately friable. Traces white

10% SILTSTONE; grey brown to grey green as above.

lithic as above.

mica.

bontomitic.

35% SANDSTONE; light grey white to off white, quartrose as above, but with rare coarse to very coerse clear and cludy quartz grains. Traces massive pyrite. Octocional light green argillaceous graine. Predominantly tight. A 0.2 unit gas hick occurs in this interval. 10% SILASTONE; as above. 35% SHALE; medium to dark grey as above but minor part with scattered very fine to fine quartz grains 5% light grey bentouttic.

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20% SAMDSTONE; light groy groon, vory fine to 10,790-10,800 the grained with white to green foldspar, 10-20% Lithic grains, variable clear angular to subŗ. angular quartz and up to 50%. Slightly calcarcous matrix, occasional corbonaccous bitumen material, tight. 3 35% SANDSTONE; light groy white to off white, very fine to predemizantly fine grained and ecoasional medium grained. Rare coarse quartz grains; with angular to subangular clear to slightly brown quar z and 0-5% lithic foldspathic graine. Part with (ceasional light green ergillacoous grains Part with powdery white slight to woderately calcareous matrix. Predominantly tight, part with earthy porosity, and traces intergranule: porosity. A 0.2 unit gas

kick secure at the start of this interval. 10% SILASTORE; light to median grey with occasional foldspathic grains, part grading to guartz sandstore. 95% SHALE: medium to dank grov, part wierouleaccone. part silty with occasional foldopathic grains, part with southered very fine to fine quartz grains, traces light guer boutenitie.

19% SANDSTONE; Light groy grown, vory fine to 10,800-10,810 fine grained foldsgathio/lithic as abeve. 20% GANDSTOME: light grow whit to off white, anartsees as above. 15% SILTSTOME; Light to modium grey as above, part break groy. 50% SHAID; notion to dank grow, as above.

15% SHIDSTON: Light grov green, very fine to 10,810-10,820 fine grained as above. 30% SANDSPONE; Light gray white to off white, fine grained, guartress, as above part with cartly poresity and traves intergraular peresity. No chous. 20% STLESPCHE; Light to median groy, as above, part with brown mice. 33% SHALD; nothus to dark grey: traces boutorito as above.

20,820-10,830 25% SANDSTONE; light to modium light groy and groomich groy, very fine to fine grained, as cheve in past with brown conhousto coment. 155 SANDETONN; off vibe as above. 105 SELECTONS; as above. 50% SHASAD; as abeve. Seattored modium to very ecares quarts grains, rure pyrite, occave bantonite.

10,830~10,840 bos SEALS. nodlun desk to dark grer, in part becaulah gray, maraly green, clight to moderately rulanceors, proferiesatly usderately saity, in alight part with notion to coerse, subrounded questa assimo alightly sarboaccount, raraly foldepothing glosy to blocky - grades to 0 30% S.T.SETCER; modarm light to working groy, in perb broaden and grounded gases, plightly unessere, clagatly nerosurceers, Sollepathie/ libbio, in cars confr - in garb argilicoous. 20% SAMBERCION; Light to retilian grounish grov, your fine grained, coeccienci fine grained, . angelist by pulseoutied yale green and occasionsl alars foldepar generally in with loos than 10% quarks, up to 15% browning gury lithin grains, well oppuched word; ordering tight. nzaden te .. 5% SAUCERCIES; while to all white, vary fine to fine grained, subargular to enbrounded quarte, Time Society, manerality to subtained quarts, with up to 10% grosp Lithia grains (prodeminatly cilictons and chals) and up to 5% pale brown shared folderer ? miderately frieble in part,

10,840-10,850 40% SHALE (endotone) modium to dark groy, generally slightly silty, slight to understaly earboursees, alight to mederately foldsysthic, blocky - rarely yory fino to fino soundy. (Reliepar with minor chloritic and little grains) grades to . 20% SILTSTONE; as above.

scamen berbauite and bontonities shale.

sildeners compute puckely take earthy perceity. Conscional loose poorly served quarts grains

35% SANDSTONE; light to medium greenish grey as above.
5% SANDSTONE; white as above.
Occasional bentonite; rare coaly grains; scattered unconsolidated quartz grains (derived from quartzose lenses, comented with pyrite in sandstone above).
10,850-10,860 Trip Sample.

20% SANDSTONE; light grey to white, fine greined quartzose - 5% feldspar/lithic grains as above slight to medium onlearcous as above.
20% SANDSTONE; light grey green very fine to fine grained lithic/feldspathic with variable quartz slightly calcarosus as above.
20% STLASTOME; light to medium groy, occasional grey brown, grey green, feldspathic, part argillaccous, part sandy.
40% SHALE; medium to dark grey part silty, part slightly micromicaccous. 5% light grey bontonitic.

10,860-10,870
40% SANDSTONE; light grey green very fine to fine grained with white to white green foldspar, 10-15% Lithic grains, very variable angular to subengular clear quarts content. Occasional brown mica, and carbonaceous bitumen material. Part with slight to mederately calcareous matrix, tight.
10% SANDSTONE; light grey to white, very fine to predominantly fine grained, with angular clear quarts and 5% foldspathic/lithic grains in common white slightly calcareous matrix.
30% SILTSTONE; light to medium grey brown to grey green with common well orientated foldspathic grains and carbonaceous flocks.
20% SHALE; redium grey part silty and grading to siltstone as above 5% light grey bentonite.

- 10,870-10,880 30% SANDSTONE: Light groy green, very fine to fine gramed feldspathic lithic as above but part white argillaceous and ailty matrix and occasional carbonaccous stroaks. 20% SANDSTONE: Light groy to white quartzose as above. 30% SILTSTONE: as above. 20% SWALE; as above.
- 10,880-10,890 46% SAMDSTONE: light grow groen, as above but prodominantly very fine grained tight. 10% SAMDSTONE: light groy to white as above. 30% SILASTONE: as above grading to sandstone. 20% SNALE: medium groy, as above part dark groy carbonaccout.
- 10,890-10,900
  h0% SAMDSTONE; light groy groon fine to prodominantly very fine grained and grading to siltstone with white to white groon feldspar, 10-15% lithle Grains very variable quartz content. Occasional brown wice and carbonaccous /bitumen material Fart very slightly calcareous coment.
  10% SAMDSTONE; light grey to white, veryy fine to fine grained quartzone as above part with slightly calcareous matrix.
  25% SILTSTONE; light to medium grey green to grey brown, part with common feldspar and grading to sandstone above.
  25% SHALE; medium grey, part silty, part with carbonaceous flecks.

part medium brown, part micromicacoous.

10,900-10,910
40% SAMDSTONE; light groy green, very fine to fine grained feldspathic/lithic as above part with carbonaceous streaks.
25% SAMDSTONE; light groy white quartzese, but with rare modium to very coarse cloudy quartz grains minor part with light green argillaceous grains. Tight.
15% SILTSTONE; as above.
20% SHALE; modium to dark groy, as above.

10,910-10,920 35% SANDSTONE; light gray green, as above. 25% SANDSTONE; light gray to white, very fine to fine grained, quartzose and rarely medium grained, as above. 15% SILTSTONE; as above. 25% SHALE; medium to dark gray as above, part Light to medium grey and slightly bentonitic.

10,920-10,930 30% SANDSTOME; light grey green, very fine to fine grained feldepathic/lithic part silty with varying quartz as above. 20% SANDSTOME; light grey to white, very fine to fine grained to rarely medium grained as above. Traces medium to very coarse subrounded quartz grains. 20% SILTSTOME; as above. 30% SHALE; as above.

10,930-10,940 45% SANDSTONE; Light grey green, very fine to predominantly fine grained with white to white green foldspar, 10-15% lithic grains occasional cerbonaceous/bitumen material. Part slightly calcaroous coment tight. 15% SANDSTONE; light grey to white, very fine to prodominantly fine and vory occasionally medium grained with angular to subangular clear to cloudy quarts, in white powdery kaolimitic ? entriz, part olightly calenroous traces intergranular percelty. Bare coarse to very coarse quertz grains. 15% SILTETONE; light to modium grey to groy brown. Predeminently very fine quartz sandy. occasicual carbonaceous floks. 25% SHALD; medium to dark grey, part silty, part very fine sandy, part micromicaceous. A 0.7 unit gas blok occurs in this interval.

10,940,10,950 Lithology as for 10,930-10,940

10,950-10,960
50% Light groy green predominantly fine graned as above but part very fine grained and grading to siltatone and very eccasionally medium grained very occasionally orange foldspar, tight.
15% SAMDSTONE; light grey to thite fine grained quarteese as above. Very percely medium grained. Traces intergranular and probably earthy perceity.
10% SIL/STONE; as above.
25% SHALE; as above par light grey and elightly bentoutee.
A 0.7 unit gas kick secure in this interval.

10,960-10,970 35% SANDETONE; Light grey green, predominantly fine grained as above part grading to siltstone rarely modium grained, tight. 15% SANDETONE; Light grey to white as above, occasionally medium grained and with rare coarse to very coarse angular quertz grains, predominantly itght. •

10,970-10,980	20% STLTSTONE; as above but part with common feldapar. 35% SHALE: as above. <u>AAS SHON</u> ; A 3 unit gas block occurs at the start of this interval. Interbedded and gradational 30% SMALE: (madstone) modeum to wodium dark groy. moderate to very silty, slightly feldspathic, very slightly micaceous, in slight part carbonaceous (flecks) chunky-blocky - grades to - 45% SIL/FSTONE; medium groy and greenish grey, coarse in part slight to mederately argillaceous, rarely very slightly calcareous, slightly carbon- aceous, very feldspathic/lithic, in part very fine sandy - grades to - 25% SANDSTONE; medium light greenish grey, very fine grained. rarely fine grained, subangular to subrounded, pale green feldspar, 20% quartz, 15% white to cream altered feldspar and/or schist graine, 5-10% dark grey to black carbonaceous and argillaceous grains, well consolidated, trace
10,98010,990	calcareous, in part silty, tight. 25% SHALE (mudstone) as above. 55% SILTSTOME; coarso as above - grades to - 20% SANDSTOME; greenish grey very fine grained, silty as above rarely very fine to fine grained, with abundant pale green chloritic/argillaceous grains. Occasional sandstone white fine grained, angular quartz with/in part up to 10% white clay grains, well sorted and comented, slightly calcareous to siliceous coment tight. Scattered medium tocearse quartz grains.
10,990-11,000	35% SHALE; (mudstone) medium medium to dark grey, slightly micaceous in part, generally slight to moderately silty, occasional carbonaceous, in part feldspathic blocky. 35% SILTSTONE; medium to medium light greenish grey, coarse, moderate to very sandy (very fine grained), feldspathic/lithic, slight to moderately carbonaceous grades to 25% SANDSTONE; medium light greyish green, very fine grained as above generally very silty tight. 5% SANDSTONE; white as above but with up to 20% feldspathic and lithic grains. Occasional loose angular to subangular quartz grains.
11,000-11,010	65% SHALD (Eudstone) as above. 25% SILTSTONE; as above. 10% SAMDSTOME; as above. Traces ceal, traces white serdstone as above, traces slickensided shale.
11,010-11,020	Interbodded and gradational 65% SHALD: (undetone) modium to medium dark grey and greenich grey, slight to moderately carbonaccous, generally clightly silty, occasional slightly foldspathic, blocky. 20% SILTSTONE; as above. 15% SANDSTONE; very fine grained as above, occasional fine grained.

11,020-11,030	Interbodded and gradational 45% Mudstone; as above 25% SILTSTONE; as above. 30% SANDSTONE; light greenish grey, very fine to fine grained, subangular to subrounded, foldspar with 30% plus quartz, and 15% lithic grains, in part silty, generally very elightly calcarcous, tight. Common bontonite, common white quart2050
	sandstono; traces coul.

- 11,030-11,040 Lithology and porcentages, similar to above. Traces coal and bentenite; correct loose engular to subangular quarts grains. Conditions in general more quartzess then above.
- 11,040-11,050 76% SUALE; (mudstens) as above. 20% SILTSTONE; as above. 10% SANDETONE; as above.

CORE No.17 11,051-11,062 Roo. 7'8"

- 7'0" MUDSTONE: dark grey, slightly micaceous, very carbonaccous (sparsoly distributed flocks and abundant carbonized plant and wood fragments) non-foldspathic, blocky in part very silty, grades to 50% siltstone, medium to medium dark grey very argillaccous, moderate to very micaceous and micromicaceous moderate to very micaceous and micromicaceous moderate to very feldspathic (prodominantly silt sized grains but occasionally very fine grains) very carbonaceous (specks and plant fragments).
- 0.8" SANDSTONE: Light groyish groon, very fine grained, foldspar and lithic grains in an abundant silty and argillaceous matrix, very micaceous, very carbonaceous (flecks and plant fragments, tight - grades to sandy and argillaceous STLTSTONE)

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2:4" No recovery

( .... Bedding dips at 15°.

## ALLIANCE CAROLINE WELL MO.1

## COMPLETION REPORT

CORE AMALYSTS RESULTS CORE Mos. 1 to 17 INCLUSIVE ALLIANCE CAROLINE WELL No.1

By:' Staff of the Petroleum Technology Leboratory, Bureau of Minarel Resources

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## NOTES

- Unless otherwise stated, the percenties and permeabilities were determined on two small plugs (V and H) cut at right angles from the core. Rusks perceimeter and permeamster were used, with air at 30 p.s.i.g. and dry nitrogen, respectively, as the saturating and flowing media.
- (11) Residual oil and water saturations were determined using Souhlet type apparatus.
- (111) Acotome test procluitates and fluorescence of solvent after extraction are recorded as nul, trace, fair, setrong or very strong.

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	Core No.	Depth From:- To:-	Lithology	Porosity from	Absolute Permeability (Millidarcy)		Average Density (g=:/cc.)		Fluid Saturation (I of pore space)		Acetone Test	Core Water Salinity (P.P.M.	Solubility in 15% HC1 (% Bulk vol.)	Fluorescence of freshly broken core.
				two plugs (% Bulk Vol.)	. <b>У</b> -	H	Dry Bulk	Apparent Grain	Water	011		NaC1)		
	1	5861 8" 5871 0"	coral limestone	34	2	20	1.73	2.63*	9	Nil	Nil	N.D.	N.D.	Nil
	1	594' 8" 595' 0"	mudstone & coral 1st	35	0	3	1.66	2.55*	N.D.	N.D.	N.D.	#	n 	11
	2	704 <b>'</b> 5" 704 <b>'</b> 9"	carbonaceou shale	s Drying c	racks oc	curred;	results	unreliat	le					
	3	2464' 6" 2464'10"	Сопри	essed clay an	l other	unconsol	idated m	aterial.	Unsui	able fo	r analysis.			
	4	2560 0" 2560 10"		ficient sampl	e for en	alysis.							. 	
	5	2572' 0" 2572' 7"		17 11	11	11								
Γ	6	2580' 0" 2580' 3"	+	18 11	11	11	1							<u> </u>

\* Void space in centre of plugs not penetrated by air during grain density determination resulting in low values for apparent grain density.

General File No. 62/399. Well File No. 66/4222

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Remarks:-

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······	· · · · ·	ND NO.	CAROLINE N	io. 1	-				D	TE OF TES	. 24ti	April 1	967.	an that there at the second	
*******	WELL NAME A	ND NO	CAROLINE N	io <b>. 1</b>				•	DA	ATE OF TES	1. <u>24t</u> 1	n April 1		er - See	
•••••••••••••••••••••••••••••••••••••••	· · · · ·	Depth From:	. Lithology	Average Effective	Perm	ulute neabllity	De	verage ensity	Fluid Sa	ATE OF TES aturation re space)	Acetone	Core Water	967. Salubility In 15% HC1	Fluorescence of freshly	
	WELL NAME A	Depth		Average Effective Porosity from two plugs	Perm (Mil	leability llidarcy)	De (g	ensity m:/cc.) Apparent	Fluid Sa (X of po	aturation		Core Water Salinity (P.P.M.	967. Solubility in 15% HCl	Fluorescence	_
· · · · · · · · · · · · · · · · · · ·	WELL NAME A	Depth From:- To:- 2664 <sup>1</sup> 0"	Li thology	Average Effective Porosity from two plugs (\$ Bulk Vol.)	Perm (Mil	Heability Ilidarcy) H	De (s Dry Bulk	ensity  =:/cc. ) Apparent Grain	Fluid St (X of por Water	aturation re space) Oil	Acetone Test	Core Water Salinity (P.P.W. NaC1)	967. Solubility in 15% HC1 (% Bulk vol.)	Fluorescence of freshly broken core.	
	WELL NAME A	Depth From:	. Lithology	Average Effective Porosity from two plugs	Perm (Mil	leability llidarcy)	De (g	ensity m:/cc.) Apparent	Fluid Sa (X of po	aturation re space)	Acetone	Core Water Salinity (P.P.M.	967. Salubility In 15% HC1	Fluorescence of freshly	

. 0	2673' 6"	k	23			2.20	2.00	·					
9	2711' 0" 2711' 6"	Shale siltstone	22	. 11	17	2.29	2.89	11	n	18	11	. 11	n
10	3046' 0" 3046' 4"		32	11	11	2.58	3•77	11		_ H		11	<b>H</b>
11	4091' 0" 4091' 4"	Sandstone	28	N.D.	N.D.	1.92	2.63	B1	19	11	19	11	11
12	4106" 0" 4106" 4"	Shale; sst. part:	ngs 21	12	1	2.31	2.89	11 1	- <b>n</b> -	e ffs - Erster	11	11	- 11
13	6006 ' 6" 6006 ' 10"	Shale grit	17	Nil	Nil	- 2.44	2.91	7	Nil	Nil	18	11	Nil

Remarks:-

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General File No. 62/399. Well File No. 66/4222