

# FINAL WELL REPORT

SGL # 2

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#### 8.4.3.1 Lithological Description

#### 8.4.3.2 Gas Peaks

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## SUMMARY

STRUCTURE : LANGATALA  
BLOCK : RJ-ON/6  
FIELD : JAISALMER BASIN  
NAME OF WELL : SGL # 2  
WELL CATEGORY : EXPLORATORY  
WELL TYPE : VERTICAL  
LOCATION : LATTITUDE – 27° 09' 21.97"  
LONGTITUDE – 69° 45' 50.30"  
UTM X 575693.73  
UTM Y 3003955.67  
ELEVATION : GL – 76.825 MSL  
KB – 84.325 MSL  
SPUDDED ON : 28.12.2006 @ 23:00 hours  
REACHED DRILLED DEPTH ON : 01.04.2007 @ 21:00 hours  
RIG : ZJ70 LC  
DRILLED DEPTH : 3275.21 m  
PROJECTED DEPTH : 4400 m  
FORMATIONS PENETRATED : SHUMAR, BANDAH, KHUIALA, SANU, PARH  
GORU AND PARIWAR.

### CASING AND CEMENTATION :

DATE	HOLE DIA (inches)	CSG. DIA (inches)	WELL DEPTH (meter)	CSG. SHOE (meter)	CMT RISE (meter)
02.01.07 -03.01.07	17 ½"	13 ¾"	760.24	755.13	Surface
06.02.07- 07.02.07	12 ¼"	9 5/8"	2902.20	2899.08	1900
02.04.07	8 ½"	7"	3275.21	3272.60	50 m above TBR top (2782.75 m)
14.04.07	6"	--	3274.21	Plug Back	Plug top @ 3224 m

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CORES : NIL

SIDE WALL CORES : NIL

DST : 1. TEST INTERVAL (3057 – 3068 m)  
Weak to strong air blow in 3 minutes.  
Mud dropped in annulus continuously (lost seat).  
: 2. TEST INTERVAL (2899.08 m – 3210.50 m)  
Weak to strong air blow in 3 minutes, Fluid spray  
(Water mist with gas) flowed from well.

COMPLICATIONS : 17 ½" PHASE: No complications  
  
12 ¼" PHASE: Cavings, Held Up, Reaming,  
Tight spot,  
8 ½" PHASE: Held Up, Reaming, and Tight spots

WELL STATUS : Due for production testing

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## GEOLOGY

Jaisalmer Basin constitutes the part of western Rajasthan shelf, which represents the westerly dipping eastern flank of the shelf portion of Indus Basin. Western Rajasthan shelf has evolved through vertical uplifts and subsidence during and after the Proterozoic Delhi orogeny. The important Phanerozoic sedimentary basins developed on this shelf are the Bikaner-Nagaur, Jaisalmer and Barmer basins.

Jaisalmer basin is a peri-cratonic shelf and is separated from Bikaner-Nagaur basins by Pokhran-Nachna high to the northwest and Barmer Basin by Barmer-Birmana-Nagar Paikar high in the south. The geological sequence started with the depositional cycle of Permian shallow marine Karampur Formation overlying unconformably on metamorphic schist of Pre-Cambrian basement. Later the Triassic and early Jurassic phase indicated a major regression and deposition of predominantly fluvial to brackish deltaic clastic represented by Sumarwali and Lathi formations. The Jaisalmer and Baisakhi-Bedasar (shallow marine) Formations of Middle and Upper Mesozoic Era represent the marine environment. During this phase, the transgression took parts and continued till the end of the Mesozoic. The beginning of Pariwar Formation marks the regression with shallow marine and brackish type depositional environment during Lower Cretaceous. The Goru and Parh Formations of Upper Cretaceous represent the start of marine transgression. The Tertiary Period saw the continuation of the regression. The Sanu Formation of this period enjoyed fluvial brackish to shallow environment while the Khuiala and Bandah Formations deposited on stable shelf under shallow marine condition. The recent Shumar Formation of Quaternary age is deposited under fluvial sedimentary environment. The oldest NE-SW trending lineament parallels to Aravalli are offset by younger NW-SE sublatitudinal lineaments.

The Jaisalmer basin occupies an area of 30,000 sq. km and has been classified as “Category II type” basin. Jaisalmer basin is bounded by Devikot-Nachna uplift in east and south east and Barmer high marks the southern limit. The Jaisalmer basin is separated from Nagaur-Bikaner basin by Pokhran-Nachna high to the north-west and Barmer basin by Barmer-Birmana-Nagar Paikar high in the south. Jaisalmer basin experienced sedimentation since Late Proterozoic-Early Cambrian to Quaternary with intervening hiatuses. Most of the sedimentations were under marine stable platform conditions with carbonates dominating over clastics during mid Jurassic and Eocene. The basin deepens towards west and north-west with a gentle dip of 3 to 5 degrees.

Jaisalmer basin is divided from North to South into four sub-basins.

- (i) Kishangarh sub-basin
- (ii) Jaisalmer Mari high
- (iii) Shahgarh sub-basin
- (iv) Maijler sub-basin

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Bouguer anomaly depicts deepening of basin towards north-west in Kishangarh sub-basin and south-west in Shahgarh sub-basin. These two sub-basins are separated by Jaisalmer Mari high. Jaisalmer Mari High, which separates the Kishangarh and Shahgarh sub-basins, is out come of a system of NW-SE trending enechlon step faults, wrench faults on either side.

## GENERAL WELL DATA

Structure	: Langatala
Block	: RJ-ON/6
Field	: Jaisalmer Basin
Name of well	: SGL # 2
Well Category	: Exploratory
Well Type	: Vertical
Location	: Latitude - 27° 09' 21.97" Longitude - 69° 45' 50.30" UTM X 575693.73 UTM Y 3003955.67
Elevation	: GL – 76.825 MSL KB – 84.325 MSL
Spudded on	: 24.12.2006 @ 23:00 hours
Reached Drilled Depth on	: 01.04.2007 @ 21:00 hours
Rig	: ZJ70LC
Projected depth	: 4400 m
Present Drilled depth	: 3275.21 m

## OBJECT OF DRILLING

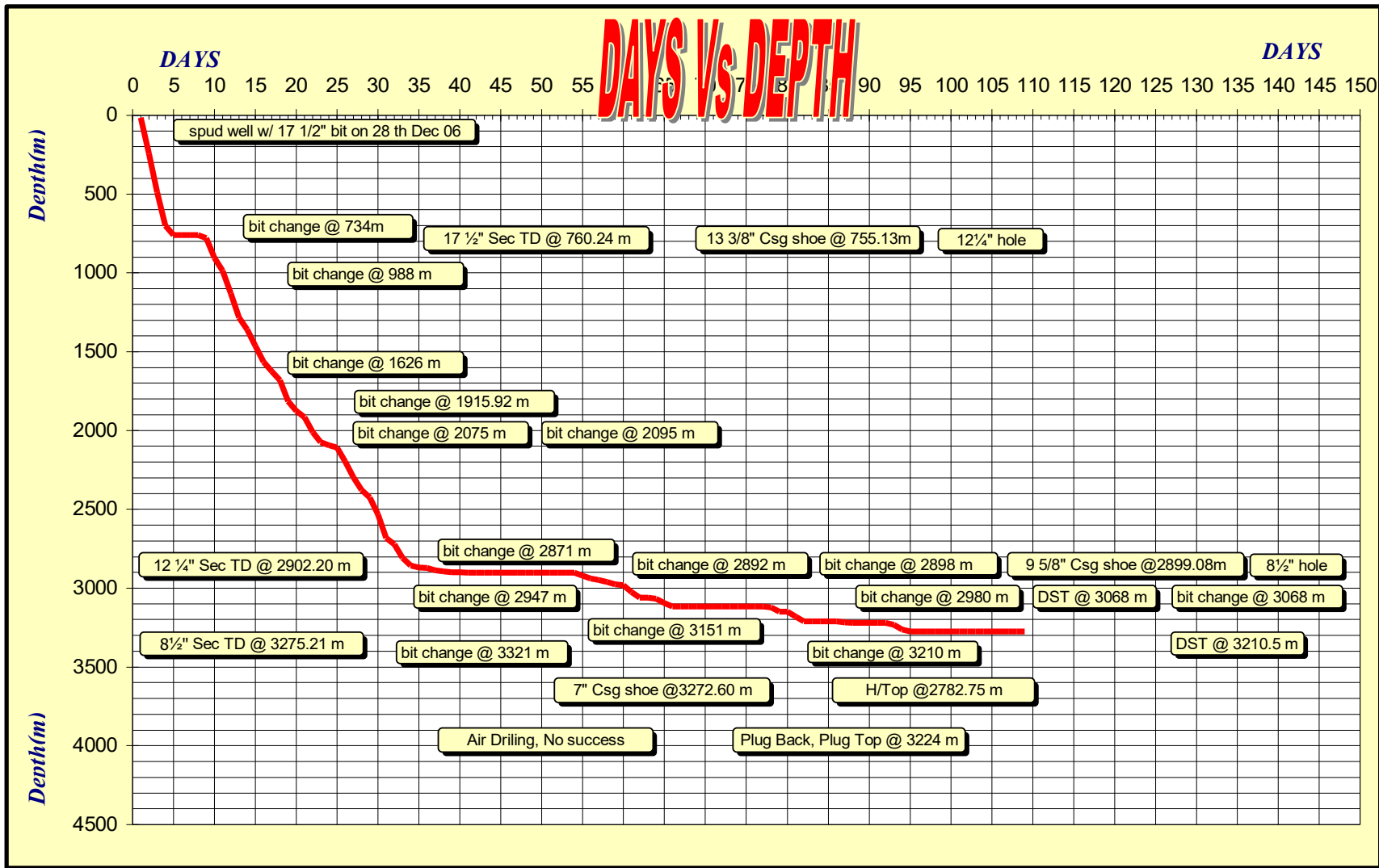
The well SGL # 2 was drilled to explore and evaluate the hydrocarbon potential in Sanu (Middle-Lower Paleocene) and Pariwar (Lower Cretaceous) formations.

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## WELL HISTORY

### DAYS Vs DEPTH



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## BIT RECORD

BIT RECORD																			
SGL # 2																			
Run	Bit No	Size	Make	Type	IADC	Serial no	Nozzles	Depth In (m)	Depth Out (m)	Meterage (m)	Bit Hrs (hrs)	ROP (m/hr)	WOB (tons)	RPM	K rev	SPP (psi)	Flow (lpm)	M.Wt. (SG)	Dull Grading
17 1/2" Phase (Spudded with 17 1/2" bit on 28th Dec. 2006 @ 23:00 hrs)																			
1RR	1	17 1/2"	Reed (Tricone)	S11G	1-1-5	D69770	20 x 3, 18 x 1	0	357	357	14.08	25.36			51.38			1.06	
2RR	1	17 1/2"	Reed (Tricone)	S11G	1-1-5	D69770	20 x 3, 18 x 1	357	734	377	26.55	14.20	1-13	60-89	111.49	1015-1463	2760-3136	1.06-1.08	
1RR	2	17 1/2"	China (Tricone)	7-0095	1-1-5	15	22 x 3	734	760	26	8.11	3.21	6-12	63-75	33.59	1399-1460	3003-3075	1.08	
12 1/4" Phase																			
1RR	3	12 1/4"	China (Tricone)	LHT117GC	1-1-7	13380	22 x 4	760.24	988.57	228.33	33.08	6.90	8-16	60-110	176.24	700-1100	2585-2620	1.13-1.25	
1	4	12 1/4"	Hughes (Insert)	MXCR03D	4-1-7	U95YF/M22-03D-A1	18 x 3, 16 x 1	988.57	1626	637.43	91.01	7.00	8-15	50-70	315.93	1698-2150	2585-2620	1.25-1.34	
1	5	12 1/4"	China (Tricone)	LHT437GC	4-3-7	14143	22 x 4	1626	1915.92	289.92	64.59	4.49	10-16	50-55	208.54	1820-2158	2377-2620	1.34-1.36	2-2-WT/NR-A-E-I-NO-PR
1	6	12 1/4"	New Tech (PDC)	NTS 605			16 x 7	1915.92	2075	159.08	17.82	8.93	1-11	54-68	67.13	1662-2195	2352-2663	1.36	1-2-RO-A-X-I-CT-PR
1	7	12 1/4"	China (Tricone)	LHA417GC	4-1-7	13487	18 x 3, 20 x 1	2075	2095	20	18.14	1.10	8-16	48-60	55.45	1915-2245	2141-2399	1.36-1.37	2-2-WT/NR-A-E-I-NO-PR
1	8	12 1/4"	Compass (PDC)	G536-XLK		H86095	14 x 6	2095	2871	776	187.14	4.15	5-10	50-65	687.14	1988-2590	2165-2342	1.36-1.37	8-8-WT/CT/RO-A-X-1/8"-BT/HC-PR
1RR	9	12 1/4"	Hughes (Insert)	MXGTC03	4-1-7	D09DJ /X220355	18 x 3, 16 x 1	2871	2892	21	30.70	0.68	8-12	40-55	89.53	2195-2220	2024-2227	1.36+	5-5-BT/LT-M/H-E-1/8"-CT/ER-PR/TQ
1	10	12 1/4"	Hughes (Insert)	ATJ-28	5-2-7	K23DJ	18 x 3	2892	2898	6	13.67	0.44	12-14	50	39.98	2412-2567	2098-2182	1.36+	
1	11	12 1/4"	New Tech (PDC)	NT 408		21400	18 x 10	2898	2902	4	13.86	0.29	2-12	30-100	47.44	2356-2389	2292-2326	1.36-1.37	
8 1/2" Phase																			
1	12	8 1/2"	Reed (Insert)	HP43AKPRD	4-3-7	DX 6794	14 x 3	2902	2947	45	55.92	0.80	8-12	31-51	133.91	1535-1862	1399-1521	1.25-1.26	1-1-WT-A-E-I-NO/RR-PR
1	13	8 1/2"	China (Tricone)	7-0095	3-1-7	225	12x1, 14x1, 16x1	2947	2980	33	44.99	0.73	11-15	34-48	104.77	1594-1810	1479-1547	1.26	7-6-WT-A-E-I-NR-PR
1	14	8 1/2"	China (Tricone)	7-0095	5-1-7	276	13 x 3	2980	3068	88	50.24	1.75	10-14	32-59	134.11	1629-2162	1339-1479	1.26-1.18	1-1-WT-A-E-I-NO-DST
1	15	8 1/2"	China (Tricone)	7-0095	5-2-7	718	13 x 3	3068	3151	83	49.74	1.67	8-13	34-57	145.48	1709-1979	1393-1496	1.18-1.19	1-2-BT (1)/CT (4)-H-E-I-NO/RR-AD
2RR	14	8 1/2"	China (Tricone)	7-0095	5-1-7	276	13 x 3	3151	3210.5	59.5	34.16	1.74	10-13	50-56	111.28	1737-2027	1415-1536	1.19-1.21	2-6-BT (15)-H/M-E-1/6"-NO-AD/PR
2RR	15	8 1/2"	China (Tricone)	7-0095	5-2-7	718	13 x 3	3210.5	3210.5	0	0.00								To clean btm & displ w/water
1	16	8 1/2"	China (Tricone)	7-0095	5-3-7	151	13 x 3	3210.5	3221	10.5	30.89	0.34	11-15	35-52	86.87	1883-2025	1410-1485	1.30-1.31	0-0-NO-H-E-1/12"-RR-LOG
RR	17	8 1/2"	China (Tricone)	7-0095	1-1-7	019	OPEN	3221	3221									1.3	To prove hole
18	18	8 1/2"	China (Tricone)	LHJ517G	5-1-7	05480	14 x 3	3221	3275	54	59.16	0.91	8-10	34-51	132.36	1728-1937	1457-1537	1.28-1.31	3-3-CT (4)-H-E-1/12"-RR-TD
2RR	17	8 1/2"	China (Tricone)	7-0095	1-1-7	019	OPEN	3275	3275										To clear cmt upto TBR top
6" Phase																			
1	19	6"	Smith (Tricone)	MFDSH	1-1-7	MP8292	OPEN	3275	3275										4-6-BT (6)-N-E-I-NR-TD (drld cmt)
1	20	6"	China (Tricone)	LHA 637D	6-3-7	11860	OPEN	3275	819										P/O after 819 m
2RR	20	6"	China (Tricone)	LHA 637D	6-3-7	11860	OPEN	3275	3274										Drilled cmt. shoe
3 RR	20	6"	China (Tricone)	LHA 637D	6-3-7	11860	OPEN	3275	1986										P/O after RIH upto 1986 m
1	21	6"	China (Tricone)	LHA 637D	6-3-7	11202	OPEN	3275	3269										P/O after RIH upto 3269 m



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## TOTAL TIME ANALYSIS

**TOTAL TIME ANALYSIS: (28.12.06 to 15.04.07)**

ACTIVITY	TOTAL HOURS	PERCENT
Drilling	923.00	35.45
Reaming	92.25	3.54
Circulation	120.50	4.63
Tripping	476.00	18.28
Repairs	114.00	4.38
Cut & Slip Drill line	10.75	0.41
Wireline Logging	29.50	1.13
Casing & Cementation	97.00	3.73
WOC	70.50	2.71
Nipple Up BOP	34.00	1.31
Test BOP	5.75	0.22
DST	9.50	0.36
Plug Back	1.75	0.07
Miscellaneous	619.50	23.79
<b>TOTAL</b>	<b>2604.00</b>	<b>100.00</b>

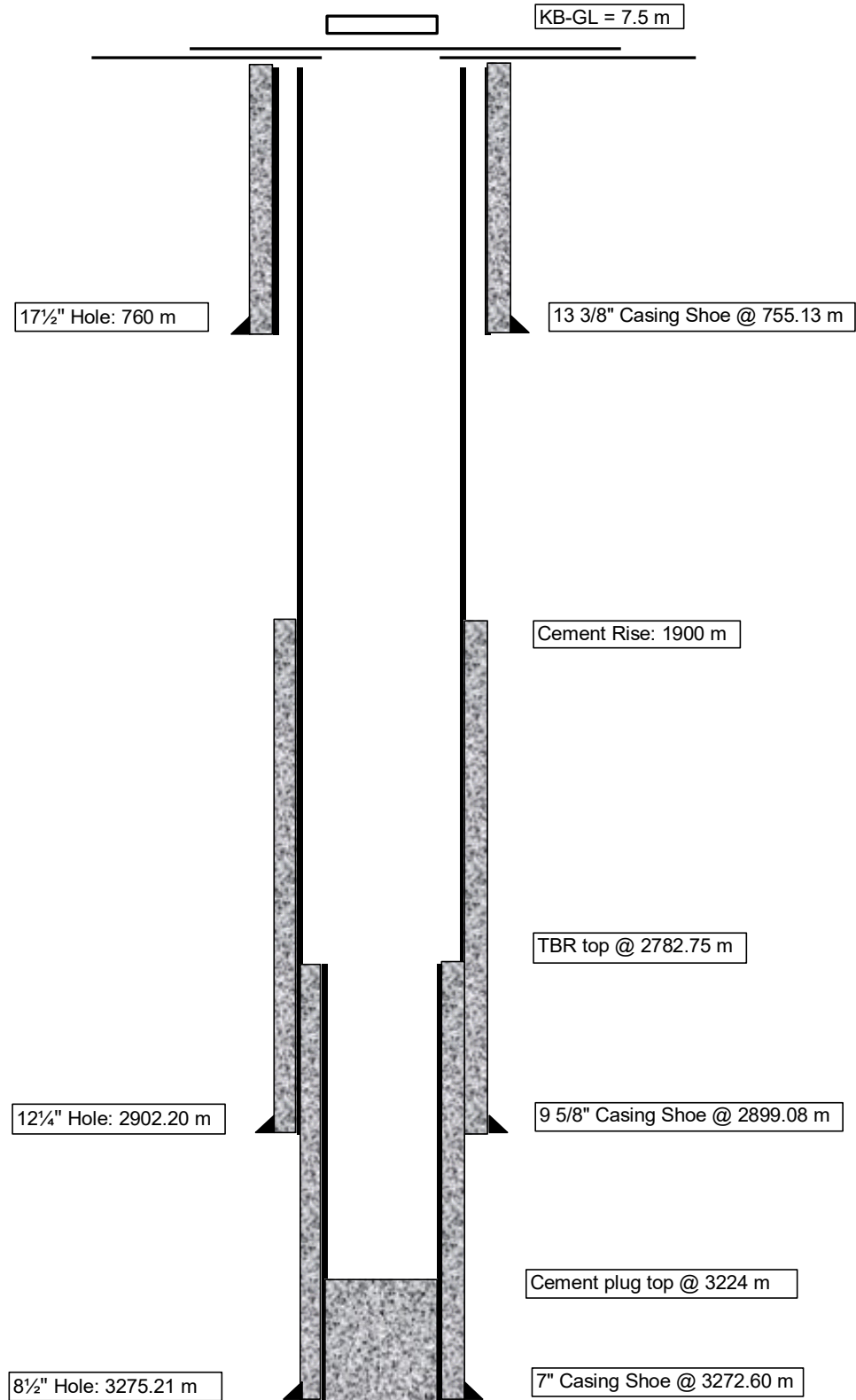
**N.B: As per IADC**

Misc.: includes arrangements for spudding, preparation of KCl mud, TOTCO, flow check, General/Mechanical maintenance, servicing and arrangements for next operation.

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## WELL PROFILE



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## WELL DIARY

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28/12/06                      DEPTH @ 00:00 hr.: 0 m                      DEPTH @ 24:00 hr.: 14 m

**DRILLING DAY: 01**

**PROGRESS: 48m**

Made arrangements to spud the well SGL#2. Make up 17 ½" bit, bit sub, X/O and spudded the well at 23:00 hrs on 28th Dec.2006. Drilled down to 14.6 m and observed leakage in wash pipe.

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29/12/06                      DEPTH @ 00:00 hr.: 14 m                      DEPTH @ 24:00 hr.: 245 m

**DRILLING DAY: 02**

**PROGRESS: 231m**

Replaced the washpipe and drilled ahead to 34 m. B/off kelly, POOH and removed X/O and M/up string stablizer and RIH. Resumed drilling ahead from 34 m and drilled down to 54 m. After connection of 6 ½" DC, started both pumps and observed leakage in dresser coupling of suction line, repaired the same. Resumed drilling from 54 m and drilled down to 102 m. Continued drilling ahead 17 ½" hole from 102 m and drilled down to 245 m. FDIP.

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30/12/06                      DEPTH @ 00:00 hr.: 245 m                      DEPTH @ 24:00 hr.: 490 m

**DRILLING DAY: 03**

**PROGRESS: 245 m**

Continued drilling ahead 17 ½" hole from 245 m to 261.66 m. Repaired MP#2, changed piston swab and drilled ahead to 357.37 m. Circulate prior to POOH, pumped 4.5 m<sup>3</sup> hi-vis pill to clean hole. Dropped TOTCO and POOH, bit on surface. B/off bit and recovered TOTCO, the TOTCO deviation recorded at 357 m was 0°. M/up same bit and RIH upto 347 m; further reamed and washed down to 357.37 m. Resumed drilling ahead 17 ½" hole from 357.37 m and drilled down to 490 m. FDIP.

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31/12/06                      DEPTH @ 00:00 hr.: 490 m                      DEPTH @ 24:00 hr.: 700 m

**DRILLING DAY: 04**

**PROGRESS: 210 m**

Continued drilling and drilled ahead 17 ½" hole from 490 m to 520 m. Pumped 4 m<sup>3</sup> hi-vis pill to clean hole. Replaced piston of MP#2, resumed drilling and drilled ahead 17 ½" hole from 549 m to 644 m; changed piston of MP#2, meanwhile circulate with one pump. Drilled ahead 17 ½" hole from 644 m to 700 m. FDIP.

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01/01/07                      DEPTH @ 00:00 hr.: 700 m                      DEPTH @ 24:00 hr.: 760 m

**DRILLING DAY: 05**

**PROGRESS: 60 m**

Continued drilling and drilled ahead 17 ½" hole from 700 m to 734.31 m; circulate the hole clean prior to POOH due to poor ROP, dropped TOTCO and POOH. Cleaned stablizer, bit on surface, recovered TOTCO, the TOTCO deviation was 0°. The bit was dull graded as 6-5-WT/ER-A-E-1/16"-FC/NR-PR. M/up RR bit (China, 1-1-5) and RIH upto 728 m, further washed down to bottom and drilled ahead 17 ½" hole from 734.31 m to 760.24 m. Circulate prior to POOH for lowering of 13 3/8" casing, circulation in progress.

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02/01/07

DEPTH @ 00:00 hr.: 760 m

DEPTH @ 24:00 hr.: 760 m

### DRILLING DAY: 06

PROGRESS: 0 m

Continued circulation, pumped 6.5 m<sup>3</sup> of hi-vis pill to flush hole. Dropped TOTCO and POOH. P/O upto 335 m and while P/O observed extra drag at some intervals, so decided to RIH. RIH to bottom, circulate and condition mud, pumped slug and POOH for lowering 13 3/8" casing. Bit on surface, B/off bit, bit sub, X/O, stablizer, X/O and laid down the same. The TOTCO deviation was 0°. M/up X/O and 5"DP with 8"DC to rack stand. R/up 13 3/8" casing gear for lowering 13 3/8" casing. Lower 65 joints of 13 3/8" casing (68 PPF) with casing shoe at 755.13 m. R/up cementing head and chickens lines, circulate and condition mud prior to cementation, circulation in progress.

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03/01/07

DEPTH @ 00:00 hr.: 760 m

DEPTH @ 24:00 hr.: 760 m

### DRILLING DAY: 07

PROGRESS: 0 m

Continue to circulate and condition mud prior to cementation. Line up cementing lines with cementing unit, drop bottom plug, flush and pressure test cementing lines at 2000 psi. Pump 20 bbls of water as pre flush, mix and pump 386 bbls of lead slurry of 12 ppg and 86 bbls of tail slurry of 15.8 ppg. Drop top plug and pump 10 bbls of water as after flush. Displace cement slurry with 351 bbls mud of 9.09 ppg (1.09 S.G) by rig pumps (2910 strokes). Bump plug at 1600 psi, found float holding. WOC, meanwhile R/dn cementing head and chickens lines and cut flow line and false conductor.

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04/01/07

DEPTH @ 00:00 hr.: 760 m

DEPTH @ 24:00 hr.: 760 m

### DRILLING DAY: 08

PROGRESS: 0 m

WOC, Cut 13 3/8" casing and L/dn the same, cleaned cellar pit, final cut 13 3/8" casing and grinded the same to fit well head. Installed well head, casing head spool and N/up BOP stack and fitted choke line and kill line, welded base plate with well head. Fitted P-boy degassser and lines, put concrete under well head supporting base plate. Test well head, Blind RAM, Pipe RAM, Annular BOP, choke and kill line at 2000 psi, found okay. Welded bell nipple with flow line. RIH with RR bit (China, 1-1-7) making up new BHA, upto 247 m, further RIH in progress. tagged cement at 734 m. B/off and L/dn 7 singles of 5"DP. Slipped the drill line (9.00 m), prepared KCl mud and further preparation of KCl mud in progress.

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05/01/07

DEPTH @ 00:00 hr.: 760 m

DEPTH @ 24:00 hr.: 779 m

### DRILLING DAY: 09

PROGRESS: 19 m

RIH and tagged cement at 735 m. B/off and L/dn 7 singles of 5"DP. Slipped the drill line (9.00 m), prepared KCl mud, M/up kelly and tagged cement at 735 m, pumped 50 bbls of fresh water as buffer and displaced old mud with new KCl mud. Drill cement, top and bottom plug, FC and casing shoe. Further drilled ahead 12 1/4" hole from 760.24 m to 779 m. FDIP

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06/01/07

DEPTH @ 00:00 hr.: 779 m

DEPTH @ 24:00 hr.: 905 m

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## DRILLING DAY: 10

**PROGRESS: 126 m**

Continued drilling and drilled ahead 12 ¼" hole from 779 m to 882 m, changed piston#1 of MP#1, greased wash pipe and repaired kelly spinner hose. Further drilled ahead 12 ¼" hole from 882 m to 901 m, changed piston #2 of MP#2. Further drilled ahead 12 ¼" hole from 901m to 905 m, FDIP.

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07/01/07

DEPTH @ 00:00 hr.: 905 m

DEPTH @ 24:00 hr.: 988 m

## DRILLING DAY: 11

**PROGRESS: 83 m**

Continued drilling and drilled ahead 12 ¼" hole from 905 m to 906 m, changed piston of MP#1. Drilled ahead 12 ¼" hole from 906 m to 911 m, changed piston of MP#2. Drilled ahead 12 ¼" hole from 911 m to 921 m, repaired MP#2. Drilled ahead 12 ¼" hole from 921 m to 950 m and repaired MP#2. Further drilled ahead 12 ¼" hole from 950 to 988.57 m, circulate prior to POOH, while POOH observed continuous tight pull of 20-35 tons, reciprocated and cleared the same. B/off string stabilizer and L/dn the same, B/off bit. M/up new bit (Hughes, 4-1-7) and RIH upto 246 m. During R/I serviced all joints of drill string, further RIH in progress.

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08/01/07

DEPTH @ 00:00 hr.: 988 m

DEPTH @ 24:00 hr.: 1130 m

## DRILLING DAY: 12

**PROGRESS: 142 m**

Continued RIH and R/I from 246 m to 973 m. During R/I serviced all joints of drill string, M/up Kelly, washed down to bottom (988.57 m), circulate and condition mud. Resumed drilling and drilled ahead 12 ¼" from 988.57 m to 1015 m, repaired MP#1 (changed piston). Further drilled ahead 12 ¼" hole from 1015 m to 1030 m. FDIP.

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09/01/07

DEPTH @ 00:00 hr.: 1130 m

DEPTH @ 24:00 hr.: 1284 m

## DRILLING DAY: 13

**PROGRESS: 154 m**

Continued drilling and drilled ahead 12 ¼" from 1030 m to 1092 m, changed piston of MP#1, meanwhile circulate and reciprocate with one pump. Further drilled ahead 12 ¼" from 1092 m to 1149.75 m and circulate prior to wiper trip, pumped slug and made a wiper trip upto casing shoe. Circulate the hole clean at bottom and drilled ahead 12 ¼" hole from 1149.70 m to 1178.80 m, changed piston of MP#1, meanwhile circulate and reciprocate with one pump. Drilled ahead 12 ¼" hole from 1178.80 m to 1260 m, changed piston of MP#2, meanwhile circulate and reciprocate with one pump. Drilled ahead 12 ¼" hole from 1260 m to 1274 m, change piston of MP#1, meanwhile circulate and reciprocate with one pump. Further drilled ahead 12 ¼" hole from 1274 m to 1284 m, FDIP.

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10/01/07

DEPTH @ 00:00 hr.: 1284 m

DEPTH @ 24:00 hr.: 1359 m

## DRILLING DAY: 14

**PROGRESS: 75 m**

Continued drilling and drilled ahead 12 ¼" from 1284 m to 1322.22 m, circulate prior to wiper trip and made a wiper trip upto 990 m (11 stands). Resumed drilling and drilled ahead 12 ¼" hole from 1322.22 m to 1331 m, changed piston of MP#1, meanwhile circulate and reciprocate with one pump. Drill ahead 12 ¼" hole from 1331 m to 1348 m, changed piston of MP#2, meanwhile circulate and reciprocate with one pump. Further drilled ahead 12 ¼" hole from 1348 m to 1359 m, FDIP.

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11/01/07

DEPTH @ 00:00 hr.: 1359 m

DEPTH @ 24:00 hr.: 1462 m

# FINAL WELL REPORT

SGL # 2

## DRILLING DAY: 15

**PROGRESS: 103 m**

Continued drilling and drilled ahead 12 ¼" from 1359 m to 1370 m, changed piston of MP#2, meanwhile circulate and reciprocate with one pump. Drilled ahead 12 ¼" hole from 1370 m to 1399 m, changed piston of MP#2. Further drilled ahead 12 ¼" hole from 1399 m to 1446.90 m, circulate the hole clean prior to wiper trip. Made a wiper trip upto 1146 m (10 stands), washed down last single. During P/O observed continuous tight pull of 5-10 tons upto 1300 m. Resumed drilling and drilled ahead 12 ¼" hole from 1446.90 m to 1462 m, FDIP.

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12/01/07

DEPTH @ 00:00 hr.: 1462 m

DEPTH @ 24:00 hr.: 1563 m

## DRILLING DAY: 16

**PROGRESS: 101 m**

Continued drilling and drilled ahead 12 ¼" from 1462 m to 1475.80 m, changed piston of MP#2, meanwhile circulate and reciprocate with one pump. Drilled ahead 12 ¼" hole from 1475.80 m to 1485.45 m, changed piston of MP#1. Further drilled ahead 12 ¼" hole from 1485.45 m to 1542.81 m, circulate the hole clean prior to wiper trip. Made a wiper trip upto 1242 m (10 stands). During P/O observed tight spots at 1493 m (10-12 T), 1471 m (10-12 T), 1454 m (10 T), 1442 m (18-20 T), 1422-1421 m (8-20 T), 1417-1411 m (20-30 T), 1389 m (20-21 T), 1309 m (10-12 T) and during R/I observed held up at 1520 m, reamed and washed down from 1520 m to bottom (1542.81 m). Resumed drilling and drilled ahead 12 ¼" hole from 1542.81 m to 1563 m, FDIP.

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13/01/07

DEPTH @ 00:00 hr.: 1563 m

DEPTH @ 24:00 hr.: 1626 m

## DRILLING DAY: 17

**PROGRESS: 63 m**

Continued drilling and drilled ahead 12 ¼" from 1563 m to 1590.84 m, serviced and changed liner and piston of MP#1, meanwhile circulate and reciprocate with one pump. Drilled ahead 12 ¼" hole from 1590.84 m to 1626.18 m, circulate the hole clean prior to POOH for bit change due to poor ROP/TQ. Pumped Hi-vis pill and circulate out the same. Dropped TOTCO and POOH. While P/O encountered tight pull at interval 1418-1408 m (10-30 T) and 838-815 m (8-11 T), reciprocated and cleared the same. POOH to surface, B/off bit, retrieved TOTCO. The TOTCO deviation recorded at 1626 m was 1 ¼° and the pulled out bit was found to be re-runnable (1 insert broken). M/up new bit China (4-3-7) and RIH upto 189 m, further RIH in progress.

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14/01/07

DEPTH @ 00:00 hr.: 1626 m

DEPTH @ 24:00 hr.: 1679 m

## DRILLING DAY: 18

**PROGRESS: 53 m**

Continued RIH and R/I from 189 m to 1585 m, encountered held up at 1585 m (15-16 T), reamed and washed down single by single to bottom (1626.18 m). Resumed drilling and drilled ahead 12 ¼" hole from 1626.18 m to 1679 m. FDIP.

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15/01/07

DEPTH @ 00:00 hr.: 1679 m

DEPTH @ 24:00 hr.: 1814 m

## DRILLING DAY: 19

**PROGRESS: 135 m**

Continued drilling and drilled ahead 12 ¼" hole from 1679 m to 1686.25, changed piston of MP#1. Drilled ahead 12 ¼" hole from 1686.25 m to 1785.43 m, changed piston of MP#1. Further drilled ahead 12 ¼" hole from 1785.60 m to 1792 m. Circulate the hole clean prior to wiper trip, made a wiper trip upto 1490 m (10 stands), while R/I observed H/up at 1783 m, reamed and washed down from 1780 m to bottom (1792 m). Further drilled ahead 12 ¼" hole from 1792 m to 1814 m. FDIP.

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# FINAL WELL REPORT

SGL # 2

16/01/07 DEPTH @ 00:00 hr.: 1814 m

DEPTH @ 24:00 hr.: 1877 m

**DRILLING DAY: 20**

**PROGRESS: 63 m**

Continued drilling and drilled ahead 12 ¼" hole from 1814 m to 1820.60, changed piston of MP#2, meanwhile circulate with one pump. Drilled ahead from 12 ¼" hole from 1820.60 m to 1824.16 m, changed piston of MP#1, meanwhile circulate with one pump. Drilled ahead 12 ¼" hole from 1824.16 m to 1832 m, changed piston of MP#1, meanwhile circulate with one pump. Drilled ahead 12 ¼" hole from 1832 m to 1870 m, changed piston of MP#1. Drilled ahead 12 ¼" hole from 1870 m to 1877 m. FDIP.

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17/01/07 DEPTH @ 00:00 hr.: 1877 m

DEPTH @ 24:00 hr.: 1915 m

**DRILLING DAY: 21**

**PROGRESS: 38 m**

Continued drilling and drilled ahead 12 ¼" hole from 1877 m to 1915.92 m. Circulate the hole clean prior to POOH due to poor ROP. Dropped TOTCO and POOH. The TOTCO deviation recorded at 1915 m was ¾°. The pulled out bit was dull graded as 2-2-WT/NR-A-E-I-NO-PR. M/up new PDC bit (New Tech), RIH upto 1396 m, further RIH in progress.

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18/01/07 DEPTH @ 00:00 hr.: 1915 m

DEPTH @ 24:00 hr.: 2009 m

**DRILLING DAY: 22**

**PROGRESS: 94 m**

Continued RIH and R/I from 1396 m to 1768 m, encountered H/up (20 T), reamed and washed down from 1768 m to bottom. Resumed drilling and drilled ahead 12 ¼" hole from 1915.92 m to 1938.57 m. Changed piston of MP#2, meanwhile circulate with one pump. Drilled ahead 12 ¼" hole from 1938.57 m to 1964.29 m, changed piston of MP#1, meanwhile circulate with one pump. Drilled ahead 12 ¼" hole from 1964.29 m to 2002.45 m, changed piston of MP# 2 and MP#1, meanwhile circulate with one pump. Drilled ahead 12 ¼" hole from 2002.45 m to 2009 m, FDIP.

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19/01/07 DEPTH @ 00:00 hr.: 2009 m

DEPTH @ 24:00 hr.: 2075 m

**DRILLING DAY: 23**

**PROGRESS: 66 m**

Continued drilling and drilled ahead 12 ¼" hole from 2009 m to 2045.59 m, changed piston of MP#1, meanwhile circulate with one pump. Further drilled ahead 12 ¼" hole from 2040.59 m to 2073.93 m and circulate the hole clean prior to wiper trip. Made a wiper trip upto 1776 m (10 stands), circulate at bottom prior to drilling ahead. Resumed drilling and drilled ahead 12 ¼" hole from 2073.93 m to 2074.12 m, changed piston of MP#1. Further drilled ahead 12 ¼" hole from 2074.12 m to 2075 m. Circulate the hole clean, prior to POOH for bit change due to poor ROP, dropped TOTCO and POOH. Bit on surface, B/off bit, retrieved TOTCO, the TOTCO deviation recorded at 2075 m was 2°. The pulled out bit was dull graded as 1-2-RO-A-X-I-CT-PR. M/up new bit (China 4-1-7), RIH upto 273 m, slipping of drill line in progress.

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20/01/07 DEPTH @ 00:00 hr.: 2075 m

DEPTH @ 24:00 hr.: 2094 m

**DRILLING DAY: 24**

**PROGRESS: 19 m**

Slip drill line 17.4 m, greased D/works, R/T-transmission, Elmaco and adjusted crown-o-matic device. Further RIH from 273 m to 2062 m, encountered held up, reamed and washed down from 2062 m to bottom (2075 m). Resumed drilling and drilled ahead 12 ¼" hole from 2075 m to 2094 m. FDIP.

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# FINAL WELL REPORT

SGL # 2

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21/01/07                    DEPTH @ 00:00 hr.: 2094 m                    DEPTH @ 24:00 hr.: 2107 m

**DRILLING DAY: 25**

**PROGRESS: 13 m**

Continued drilling and drilled ahead 12 ¼" hole from 2094 m to 2095 m. Circulate the hole clean, prior to POOH for bit change due to poor ROP, dropped TOTCO and POOH . While POOH, L/dn 12 singles. Bit on surface, B/off bit, retrieved TOTCO, the TOTCO deviation recorded at 2095 m was 2°. The pulled out bit was dull graded as 2-2-WT/NR-A-E-I-NO-PR. M/up new PDC bit (Compass, G536-XLK), RIH upto 2078 m, encountered held up at 2078 m, reamed and washed down from 2078 m to bottom (2095 m). Resumed drilling and drilled ahead 12 ¼" hole from 2095 m to 2107 m. FDIP.

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22/01/07                    DEPTH @ 00:00 hr.: 2107 m                    DEPTH @ 24:00 hr.: 2197 m

**DRILLING DAY: 26**

**PROGRESS: 90 m**

Continued drilling and drilled ahead 12 ¼" hole from 2107 m to 2117.18 m. Replaced piston and gasket of MP#2. Drilled ahead 12 ¼" hole from 2117.18 m to 2175.54 m. Replaced piston of MP# 2, meanwhile circulate and reciprocate with one pump. Drilled ahead 12 ¼" hole from 2175.54 m to 2184 m and changed kelly saver sub. Drilled ahead 12 ¼" hole from 2184 m to 2197 m. FDIP.

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23/01/07                    DEPTH @ 00:00 hr.: 2197 m                    DEPTH @ 24:00 hr.: 2298 m

**DRILLING DAY: 27**

**PROGRESS: 101 m**

Continued drilling and drilled ahead 12 ¼" hole from 2197 m to 2232 m and replaced 2 piston and 2 liner of MP#2, meanwhile circulate and reciprocate with one pump. Further drilled ahead 12 ¼" hole from 2232 m to 2251m, circulate for bottoms up prior to wiper trip. Made a wipe trip upto 1979 (9 stands), washed down kelly length and drilled ahead 12 ¼" hole from 2251 m to 2282.24 m. Replaced piston of MP# 1, meanwhile circulate and reciprocate with one pump. Drilled ahead 12 ¼" hole from 2282.24 m to 2298 m. FDIP.

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24/01/07                    DEPTH @ 00:00 hr.: 2298 m                    DEPTH @ 24:00 hr.: 2378 m

**DRILLING DAY: 28**

**PROGRESS: 80 m**

Continued drilling and drilled ahead 12 ¼" hole from 2298 m to 2370, observed leakage in load cell, rectified and charged the same. Drilled ahead 12 ¼" hole from 2370 m 2372.97 m, observed leakage in load cell, rectified the same. Further drilled ahead 12 ¼" hole from 2372.97 m to 2375.39 m. Circulate the hole clean and made a wipe trip upto 2074 m (10 stands), resume drilling and drilled ahead 12 ¼" hole from 2375.39 m to 2378 m. FDIP.

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25/01/07                    DEPTH @ 00:00 hr.: 2378 m                    DEPTH @ 24:00 hr.: 2427 m

**DRILLING DAY: 29**

**PROGRESS: 49 m**

Continued drilling and drilled ahead 12 ¼" hole from 2378 m to 2414.05 m, replaced piston of MP#2. Drilled ahead 12 ¼" hole from 2414.05 m to 2423.50 m, replaced 1 liner and 1 piston of MP#1, meanwhile circulate with one pump. Drilled ahead 12 ¼" hole from 2423.50 m to 2427 m. FDIP.

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26/01/07                    DEPTH @ 00:00 hr.: 2427 m                    DEPTH @ 24:00 hr.: 2532 m



# FINAL WELL REPORT

SGL # 2

## DRILLING DAY: 30

**PROGRESS: 105 m**

Continued drilling and drilled ahead 12 ¼" hole from 2427 m to 2439 m, replaced piston of MP#2, meanwhile circulate with one pump. Drilled ahead 12 ¼" hole from 2439 m to 2478 m. Replaced piston of MP#1, meanwhile circulate with one pump. Resumed drilling and drilled ahead 12 ¼" hole from 2478 m to 2499.77 m. Circulate the hole clean prior to wiper trip, made a wiper trip upto 2198 m (10 stands), meanwhile replaced diaphragm of pulsation dampner of MP#1. Resumed drilling and drilled ahead 12 ¼" hole from 2499.77 m to 2529 m and observed leakage in washpipe, replaced the same. Drilled ahead 12 ¼" hole from 2529 m to 2532 m. FDIP.

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27/01/07

DEPTH @ 00:00 hr.: 2532 m

DEPTH @ 24:00 hr.: 2682 m

## DRILLING DAY: 31

**PROGRESS: 150 m**

Continued drilling and drilled ahead 12 ¼" hole from 2532 m to 2576.41 m, replaced piston of MP#2, meanwhile circulate with one pump. Drilled ahead 12 ¼" hole from 2576.41 m to 2643.58 m, circulate the hole clean prior to wiper trip, made a wiper trip upto 2314 m (10 stands). Resumed drilling and drilled ahead 12 ¼" hole from 2643.58 m to 2682.05 m, replaced piston of MP#2, meanwhile circulate with one pump, greased washpipe.

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28/01/07

DEPTH @ 00:00 hr.: 2682 m

DEPTH @ 24:00 hr.: 2722 m

## DRILLING DAY: 32

**PROGRESS: 40 m**

Resume drilling and drilled ahead 12 ¼" hole from 2682.05 m to 2720.47 m. Circulate the hole clean prior to short trip upto shoe. P/O in shoe (753.19 m), slipped drill line 8.80 m and cut 24.00 m, replaced rotary torque sensor with new, greased T/Block, hook, washpipe, kelly bush and rotary clutch, rotary universal joint and carden shaft, checked oil of rotary table and top up 2 lts, checked oil level of swivel and hook, found okay, serviced the pneumatic cylinder of locking gear and set crown-o-matic. RIH from shoe to bottom and drilled ahead 12 ¼" hole from 2720.47 m to 2722 m, FDIP.

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29/01/07

DEPTH @ 00:00 hr.: 2722 m

DEPTH @ 24:00 hr.: 2807 m

## DRILLING DAY: 33

**PROGRESS: 85 m**

Resume drilling and drilled ahead 12 ¼" hole from 2722 m to 2749.36 m, replaced one piston of MP#2, meanwhile circulate with one pump. Drilled ahead 12 ¼" hole from 2749.36 to 2764.61 m, replaced two piston of MP#1, meanwhile circulate with one pump. Drilled ahead 12 ¼" hole from 2764.61 m to 2807 m, FDIP.

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30/01/07

DEPTH @ 00:00 hr.: 2807m

DEPTH @ 24:00 hr.: 2855m

## DRILLING DAY: 34

**PROGRESS: 48m**

Continue drilling and drilled ahead 12 ¼" hole from 2807 m to 2820.16 m, replaced two piston, one seat and one valve of MP#2, meanwhile circulate with one pump. Drilled ahead 12 ¼" hole from 2820.16 m to 2855 m, circulate the hole clean prior to wiper trip, while reciprocating string observed tight spots at 2846 m, 2839 m and 2836 m (7-8 T), cleared the same by reciprocation. Carried out a wiper trip upto 2581 m (9 stands) and drilled ahead 12 ¼" hole from 2855 m to 2855.30 m.FDIP.

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31/01/07

DEPTH @ 00:00 hr.: 2855m

DEPTH @ 24:00 hr.: 2869m

# FINAL WELL REPORT

## SGL # 2

### DRILLING DAY: 35

**PROGRESS: 14m**

Continued drilling and drilled ahead 12 ¼" hole from 2855.30 m to 2855.57 m, replaced two piston of MP#2, meanwhile circulate with one pump. Drilled ahead 12 ¼" hole from 2855.57 m to 2858.67 m, replaced two piston of MP#1. Further drilled ahead 12 ¼" hole from 2858.67 m to 2864.50 m, replaced piston of MP#2. Drilled ahead 12 ¼" hole from 2864.50 m to 2868 m, replaced 1 piston, 1 liner of MP#2, meanwhile circulate with one pump. Further drilled ahead 12 ¼" hole from 2868 m to 2869.90 m. FDIP.

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01/02/07

DEPTH @ 00:00 hr.: 2869 m

DEPTH @ 24:00 hr.: 2873 m

### DRILLING DAY: 36

**PROGRESS: 4 m**

Continued drilling and drilled ahead 12 ¼" hole from 2869.90m to 2870.60 m. replaced three piston of MP#1, meanwhile circulate with one pump. Drilled ahead 12 ¼" hole from 2870.60 m to 2871.21 m, circulate the hole clean prior to POOH for bit change due to poor ROP. Dropped TOTCO and POOH, bit on surface. The pulled out bit was dull graded as 8-8-WT/CT/RO-A-X-1/8"-BT/HC-PR and the TOTCO was mis run (baffle plate broken). M/up 12 ¼" RR bit (Hughes,4-1-7) and RIH upto 273.25 m, slipped drill line 8.8 m, adjusted hydraulic disc brake and replaced one cylinder spring, adjusted spider guide pulley, set crown-o-matic. Further RIH upto 2861 m, M/up kelly, washed down kelly length and drilled ahead 12 ¼" hole from 2871.21 m to 2872.26 m, changed valve of MP#1. Drilled ahead 12 ¼" hole from 2872.26 m to 2872.45 m, replaced 1 piston of MP#1, meanwhile circulate with one pump. Drilled ahead 12 ¼" hole from 2872.45 m to 2872.60 m, observed leakage in washpipe, rectified the same. Drilled ahead 12 ¼" hole from 2872.60 m to 2873 m. FDIP.

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02/02/07

DEPTH @ 00:00 hr.: 2873 m

DEPTH @ 24:00 hr.: 2888 m

### DRILLING DAY: 37

**PROGRESS: 15 m**

Continued drilling and drilled ahead 12 ¼" hole from 2873 m to 2873 m.71 m, repaired hydraulic power unit, replaced washpipe, meanwhile reciprocate and circulate. Drilled ahead 12 ¼" hole from 2873.71 m to 2877.74 m, replaced 2 piston of MP#2, meanwhile circulate with one pump. Drilled ahead 12 ¼" hole from 2877.74 m to 2888.50 m. FDIP.

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03/02/07

DEPTH @ 00:00 hr.: 2888 m

DEPTH @ 24:00 hr.: 2888 m

### DRILLING DAY: 38

**PROGRESS: 0 m**

Continued drilling and drilled ahead 12 ¼" hole from 2888.50 m to 2892.12 m, decided to POOH due to poor ROP. Circulate and condition mud prior to POOH, dropped TOTCO and POOH, Bit on surface, 19 broken inserts left in hole and TOTCO was mis run as baffle plate got damaged. (bent). The pulled out bit was dull graded as 5-5-BT (18)/LT-M/H-E-1/8"-CT/ER-PR/TQ. M/up new insert bit (Hughes, 5-2-7), incorporated junk sub in BHA and RIH upto 2881m, M/up Kelly, established circulation, washed down Kelly length and work on junk sub.

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04/02/07

DEPTH @ 00:00 hr.: 2894 m

DEPTH @ 24:00 hr.: 2898 m

### DRILLING DAY: 39

**PROGRESS: 4 m**

Resumed drilling and drilled ahead 12 ¼" hole from 2892.12 m to 2898 m, decide to POOH due to poor penetration rate. Circulate the hole clean, dropped TOTCO and POOH. Bit on surface, B/off bit, retrieved TOTCO. The pulled out bit was dull graded as 1-1-NO-E-I-RR-PR. The TOTCO deviation

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# FINAL WELL REPORT

## SGL # 2

recorded at 2898 m was 1½°. Recovered 429 g of broken inserts and 3 kgs of rock piece from junk sub.

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**05/02/07**                      **DEPTH @ 00:00 hr.: 2898 m**                      **DEPTH @ 24:00 hr.: 2900 m**

**DRILLING DAY: 40**

**PROGRESS: 2 m**

Make arrangements and RIH w/ new PDC bit (New Tech, NT 408) upto 446 m and slip drill line 8.8 m. Further RIH from 446 m to 1941 m, encountered held up (10 T), L/dn one single, reamed and washed down from 1934 m to 1944 m. M/up one single and RIH upto 1554 m. Subsequently RIH from 1954 m to 1973 m, encountered held up (15-18 T), reciprocate and cleared tight spot. Further reamed and washed down from 1989 m to 2012 m. Further RIH from 2012 m to 2861 m, encountered held up (4 T), further reamed and washed down from 2861 m to bottom (2898 m). Further drilled ahead 12 ¼" hole from 2898 m to 2900 m.

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**06/02/07**                      **DEPTH @ 00:00 hr.: 2902 m**                      **DEPTH @ 24:00 hr.: 2902 m**

**DRILLING DAY: 41**

**PROGRESS: 0 m**

Continued drilling and drilled ahead 12 ¼" hole from 2900 m to 2902 m. Decided to lower 9 5/8" casing. Circulate and condition mud prior to POOH for lowering 9 5/8" casing. R/up casing lowering gear and lowered 90 joints of 9 5/8" casing upto 833 m. Further lowering of 9 5/8" casing in progress.

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**07/02/07**                      **DEPTH @ 00:00 hr.: 2902 m**                      **DEPTH @ 24:00 hr.: 2902 m**

**DRILLING DAY: 42**

**PROGRESS: 0 m**

Continued lowering of 9 5/8" casing and lowered from 833 m to 2899.08 m (casing shoe). TOTAL 283 joints (L80 / 47 PPF = 135 joints and N80 / 43.5 PPF = 148 joints) of 9 5/8" casing lowered in hole. R/up cementing head, chickens lines, established circulation, circulate and condition mud prior to cementation. R/up chickens lines with cementing unit and pressure test cementing lines at 2000 psi. Pumped 50 bbls of spacer, dropped bottom plug, mixed and pump of cement slurry of 15.8 ppg. Cementation in progress.

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**08/02/07**                      **DEPTH @ 00:00 hr.: 2902 m**                      **DEPTH @ 24:00 hr.: 2902 m**

**DRILLING DAY: 43**

**PROGRESS: 0 m**

Continued to mix and pump 210 bbls of cement slurry of 15.8 ppg. Dropped top plug and pumped 10 bbls water behind and displaced cement slurry with 724.10 bbls of mud of 11.42 ppg by rig pumps (6300 strokes). Bumped plug at 2000 psi and found float holding. WOC.

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**09/02/07**                      **DEPTH @ 00:00 hr.: 2902 m**                      **DEPTH @ 24:00 hr.: 2902 m**

**DRILLING DAY: 44**

**PROGRESS: 0 m**

WOC, released 9 5/8" casing, N/dn BOP, set 9 5/8" casing slip, cut 9 5/8" casing and N/up well head spool, test well head at 3000 psi, N/up BOP and fixed choke line.

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**10/02/07**                      **DEPTH @ 00:00 hr.: 2902 m**                      **DEPTH @ 24:00 hr.: 2902 m**

# FINAL WELL REPORT

SGL # 2

## DRILLING DAY: 45

PROGRESS: 0 m

Fixed kill line, L/dn 8" Drill collar (4 nos), M/up stands of 6 ½" Drill collar (3 nos.) and 5" HWDP, carried out general maintenance and house keeping job, weld flow line. Tested kill line valves and Blind RAM at 2000 psi. Found O.K. Tested mechanical valve of HCR valve side, HCR valve and all choke manifold valves including both choke (one by one) at 2000 psi. Found O.K. Function test Pipe RAM and Annular RAM, found O.K. Made arrangements for next operation meanwhile carried out general maintenance and house keeping jobs.

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11/02/07

DEPTH @ 00:00 hr.: 2902 m

DEPTH @ 24:00 hr.: 2902 m

## DRILLING DAY: 46

PROGRESS: 0 m

Fabricated choke manifold outlet line, shifted poor boy degasser and fabricated lines to choke manifold. Carried out servicing and mechanical / general maintenance job, meanwhile made arrangements for next operation.

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12/02/07

DEPTH @ 00:00 hr.: 2902 m

DEPTH @ 24:00 hr.: 2902 m

## DRILLING DAY: 47

PROGRESS: 0 m

Carried out servicing and mechanical / general maintenance, painting and house keeping jobs; meanwhile made arrangements for next operation.

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13/02/07

DEPTH @ 00:00 hr.: 2902 m

DEPTH @ 24:00 hr.: 2902 m

## DRILLING DAY: 48

PROGRESS: 0 m

Carried out servicing and mechanical / general maintenance, painting and house keeping jobs; meanwhile made arrangements for next operation.

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14/02/07

DEPTH @ 00:00 hr.: 2902 m

DEPTH @ 24:00 hr.: 2902 m

## DRILLING DAY: 49

PROGRESS: 0 m

Carried out servicing and general maintenance, painting and house keeping jobs; meanwhile made arrangements for next operation.

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15/02/07

DEPTH @ 00:00 hr.: 2902 m

DEPTH @ 24:00 hr.: 2902 m

## DRILLING DAY: 50

PROGRESS: 0 m

Carried out servicing and general maintenance, painting and house keeping jobs; meanwhile made arrangements for next operation.

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16/02/07

DEPTH @ 00:00 hr.: 2902 m

DEPTH @ 24:00 hr.: 2902 m

## DRILLING DAY: 51

PROGRESS: 0 m

Carried out servicing and general maintenance, painting and house keeping jobs; meanwhile made arrangements for next operation.

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17/02/07

DEPTH @ 00:00 hr.: 2902 m

DEPTH @ 24:00 hr.: 2902 m

# FINAL WELL REPORT

SGL # 2

## DRILLING DAY: 52

**PROGRESS: 0 m**

Carried out servicing and general maintenance, painting and house keeping jobs; meanwhile made arrangements for next operation.

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18/02/07            DEPTH @ 00:00 hr.: 2902 m

DEPTH @ 24:00 hr.: 2902 m

## DRILLING DAY: 53

**PROGRESS: 0 m**

Carried out servicing and general maintenance, painting and house keeping jobs; meanwhile made arrangements for next operation.

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19/02/07            DEPTH @ 00:00 hr.: 2902 m

DEPTH @ 24:00 hr.: 2902 m

## DRILLING DAY: 54

**PROGRESS: 0 m**

Carried out servicing and general maintenance, painting and house keeping jobs; meanwhile made arrangements for next operation. M/up new 8 ½" bit (Reed, 4-3-7) and RIH upto 2866 m, further reamed and washed down to float collar, drilled float collar, cement and shoe and tagged formation at 2902.20 m.

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20/02/07            DEPTH @ 00:00 hr.: 2902 m

DEPTH @ 24:00 hr.: 2920 m

## DRILLING DAY: 55

**PROGRESS: 18 m**

Drilled ahead formation from 2902.20 m to 2920 m. FDIP.

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21/02/07            DEPTH @ 00:00 hr.: 2920 m

DEPTH @ 24:00 hr.: 2939 m

## DRILLING DAY: 56

**PROGRESS: 19 m**

Continued drilling and drilled ahead 8½" hole from 2920 m to 2939 m. FDIP.

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22/02/07            DEPTH @ 00:00 hr.: 2939 m

DEPTH @ 24:00 hr.: 2947 m

## DRILLING DAY: 57

**PROGRESS: 8 m**

Continued drilling and drilled ahead 8½" hole from 2939 m to 2947 m. Circulate prior to POOH for bit change due to poor ROP/TQ. Dropped TOTCO, and POOH. Bit on surface, B/off bit, the rubber of FC and shoe was found stuck between rollers. The pulled out bit was dull graded as 1-1-WT-A-E-I-NO/RR-PR. The TOTCO deviation recorded at 2947 m was 1°. M/up new bit (China, 3-1-7) and RIH upto 973 m, further R/I in progress.

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23/02/07            DEPTH @ 00:00 hr.: 2947 m

DEPTH @ 24:00 hr.: 2960 m

## DRILLING DAY: 58

**PROGRESS: 13 m**

Continued RIH and R/I from 973 m to 2937 m, reamed and washed down kelly length. Resume drilling and drilled ahead 8 ½" hole from 2947 m to 2960 m. FDIP.

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24/02/07            DEPTH @ 00:00 hr.: 2960 m

DEPTH @ 24:00 hr.: 2977 m

## DRILLING DAY: 59

**PROGRESS: 17 m**

Continued drilling and drilled ahead 8 ½" hole from 2960 m to 2977.05 m. FDIP.

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# FINAL WELL REPORT

SGL # 2

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25/02/07                      DEPTH @ 00:00 hr.: 2977 m                      DEPTH @ 24:00 hr.: 2981 m

**DRILLING DAY: 60**

**PROGRESS: 4 m**

Continued drilling and drilled ahead 8 ½" hole from 2977.05 m to 2980 m. Circulate the hole clean prior to POOH for bit change due to poor ROP. Dropped TOTCO and POOH, B/off bit, retrieved TOTCO. The TOTCO deviation recorded at 2980 was 1°. The pulled out bit was dull graded as 7-6-WT-A-E-I-NR-PR. M/up new bit (China, 5-1-7), RIH upto 282 m, cut and slip drill line (slipped 60 m and cut 68 m) and set crown-o-matic. Further RIH upto 2975 m, reamed and washed down kelly length. Resume drilling and drilled ahead 8 ½" hole from 2980 m to 2981.34 m. FDIP.

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26/02/07                      DEPTH @ 00:00 hr.: 2981 m                      DEPTH @ 24:00 hr.: 3023 m

**DRILLING DAY: 61**

**PROGRESS: 42 m**

Continued drilling and drilled ahead 8½" hole from 2981.34 m to 3023.15 m. FDIP.

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27/02/07                      DEPTH @ 00:00 hr.: 3023 m                      DEPTH @ 24:00 hr.: 3062 m

**DRILLING DAY: 62**

**PROGRESS: 39 m**

Continued drilling and drilled ahead 8½" hole from 3023.15 m to 3062 m. FDIP.

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28/02/07                      DEPTH @ 00:00 hr.: 3062 m                      DEPTH @ 24:00 hr.: 3068 m

**DRILLING DAY: 63**

**PROGRESS: 6 m**

Continued drilling and drilled ahead 8½" hole from 3062 m to 3062.64 m. Observed gas cut mud (MW In 1.18 S.G and MW out 1.15 S.G), Check flow, + ve, circulate bottoms up. Resumed drilling and drilled ahead 8 ½" hole from 3062.64 m to 3068 m, circulate prior to wiper trip upto shoe. P/O upto shoe, checked flow, function test Pipe RAM and Annular BOP, found okay. R/I upto bottom, circulate and condition mud prior to POOH for DST. Dropped TOTCO and POOH. The TOTCO was mis run (baffle plate broken) and the pulled out bit was dull graded as 1-1-WT-A-E-I-NO-DST. M/up conventional DST assembly with BHA, R/I upto 82 m, changed wash pipe. Further R/I DST assembly from 82 m to 772 m, further RIH in progress.

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01/03/07                      DEPTH @ 00:00 hr.: 3068 m                      DEPTH @ 24:00 hr.: 3068 m

**DRILLING DAY: 64**

**PROGRESS: 0 m**

Continued RIH, R/I from 772 m to bottom (3068 m), R/up chickens lines and DST floor manifold, set packer, opened tool, observed weak to strong blow of air and no inflammable gas, observed mud level dropping in annulus. Kept hole full and kept tool open for 40 mins, found mud level continuously dropping. Closed tool, released packer, R/dn DST floor manifold and chickens lines and P/O DST assembly inside casing shoe (2899 m). Pumped out reverse circulating sub and circulate and condition mud, B/off kelly and POOH DST assembly to surface. Found both top and bottom packer damaged (half the rubber of both packer left in hole). B/off and L/dn DST assembly. M/up new bit (China, 5-2-7) and RIH, incorporated drilling jar in BHA. RIH upto 1208.96 m, further RIH in progress.

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02/03/07                      DEPTH @ 00:00 hr.: 3068 m                      DEPTH @ 24:00 hr.: 3095 m

# FINAL WELL REPORT

SGL # 2

## DRILLING DAY: 65

**PROGRESS: 27 m**

Continued RIH, R/I from 1208.96 m to 3075 m. M/up Kelly, established circulation, observed held up at 3057.50 m. L/dn 2 singles and reamed and washed down to bottom (3068 m) to circulate out the DST packer left in hole. Resumed drilling and drilled ahead 8½" hole from 3068 m to 3095.50 m.

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03/03/07                    DEPTH @ 00:00 hr.: 3095 m

DEPTH @ 24:00 hr.: 3117 m

## DRILLING DAY: 66

**PROGRESS: 22 m**

Continued drilling and drilled ahead 8½" hole from 3095.50 m from 3117.40 m. After P/C while going to bottom, prior to resume drilling, suddenly travelling block hook lock got free, so picked up Kelly, B/off and racked kelly. POOH upto 2884m (shoe). Removed link and elevator, checked the lock assembly found ok, but inside of hook (locking position) got free. Repair in progress.

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04/03/07                    DEPTH @ 00:00 hr.: 3117 m

DEPTH @ 24:00 hr.: 3117 m

## DRILLING DAY: 68

**PROGRESS: 0 m**

L/dn travelling block and removed hook for repair. Continued trying to open B/pin of T/Block but could not succeed, again fixed up the B/pin. Fixing of T/Block with hook in progress, meanwhile filled hole full every one hour.

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05/03/07                    DEPTH @ 00:00 hr.: 3117 m

DEPTH @ 24:00 hr.: 3117 m

## DRILLING DAY: 69

**PROGRESS: 0 m**

Continued trying to fix up the Hook with T/Block, but no success. Removed hook from traveling block and laid down the same. Circulate and condition mud through C/head, carried out house keeping job, filled hole every hour with mud. Made arrangements for hook.

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06/03/07                    DEPTH @ 00:00 hr.: 3117 m

DEPTH @ 24:00 hr.: 3117 m

## DRILLING DAY: 69

**PROGRESS: 0 m**

Made arrangements for hook, meanwhile carried out house keeping and preventive maintenance job. Serviced core barrel and D/line spooler. Filled hole at regular interval, every two hours.

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07/03/07                    DEPTH @ 00:00 hr.: 3117 m

DEPTH @ 24:00 hr.: 3117 m

## DRILLING DAY: 70

**PROGRESS: 0 m**

Made arrangements for hook, fixed D/line spooler. Circulate and condition mud for 1 hour. Filled hole every two hours, again circulate and condition mud for 3 hours.

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08/03/07                    DEPTH @ 00:00 hr.: 3117 m

DEPTH @ 24:00 hr.: 3117 m

## DRILLING DAY: 71

**PROGRESS: 0 m**

Made arrangements for hook, changed safety lines of cat head, meanwhile carried out house keeping job. Filled hole every two hours, again circulate and condition mud.

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# FINAL WELL REPORT

SGL # 2

**09/03/07                  DEPTH @ 00:00 hr.: 3117 m**

**DEPTH @ 24:00 hr.: 3117 m**

**DRILLING DAY: 72**

**PROGRESS: 0 m**

Made arrangements for hook, meanwhile carried out house keeping, servicing and preventive maintenance job. Circulate and condition mud for 3 hours, filled hole every two hours.

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**10/03/07                  DEPTH @ 00:00 hr.: 3117 m**

**DEPTH @ 24:00 hr.: 3117 m**

**DRILLING DAY: 73**

**PROGRESS: 0 m**

Made arrangements for hook, meanwhile carried out house keeping, servicing and preventive maintenance job, filled hole every two hours.

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**11/03/07                  DEPTH @ 00:00 hr.: 3117 m**

**DEPTH @ 24:00 hr.: 3117 m**

**DRILLING DAY: 74**

**PROGRESS: 0 m**

Made arrangements for hook, meanwhile carried out house keeping, painting, servicing and preventive maintenance job. Circulate and condition mud for 3 hours, filled hole every two hours.

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**12/03/07                  DEPTH @ 00:00 hr.: 3117 m**

**DEPTH @ 24:00 hr.: 3117 m**

**DRILLING DAY: 75**

**PROGRESS: 0 m**

Made arrangements for hook, meanwhile carried out house keeping, painting, servicing and preventive maintenance job, filled hole every two hours.

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**13/03/07                  DEPTH @ 00:00 hr.: 3117 m**

**DEPTH @ 24:00 hr.: 3117 m**

**DRILLING DAY: 76**

**PROGRESS: 0 m**

Made arrangements for hook, meanwhile carried out house keeping, painting, servicing and preventive maintenance job. Circulate and condition mud for 3 hours, filled hole every two hours.

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**14/03/07                  DEPTH @ 00:00 hr.: 3117 m**

**DEPTH @ 24:00 hr.: 3117 m**

**DRILLING DAY: 77**

**PROGRESS: 0 m**

Made arrangements for hook, meanwhile carried out house keeping, painting, servicing and preventive maintenance job, filled hole every two hours. Received hook at drill site (09:45 hrs) and fixed hook assembly with travelling block and cut welding pads. Pick up kelly to test swivel, found swivel not rotating. B/off kelly, opened swivel for repairing, found one inside bearing broken, repair of swivel in progress. Filled hole every two hours interval.

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**15/03/07                  DEPTH @ 00:00 hr.: 3117 m**

**DEPTH @ 24:00 hr.: 3122 m**

**DRILLING DAY: 78**

**PROGRESS: 5 m**

Continued repair of swivel, replaced all three bearings of swivel, tested swivel, fixed kelly, hose pipe and kelly bushing and circulate and condition mud (1cycle). Observed oil leaking from hook, arrest leak and repair hook lock. Filled hole every two hours interval. RIH from 2884.91 m to 3114 m, reamed and washed down to bottom (3117 m) and drilled ahead 8 1/2" hole from 3117.40 m to 3122.90 m. FDIP.

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# FINAL WELL REPORT

SGL # 2

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16/03/07                    **DEPTH @ 00:00 hr.: 3122 m**                    **DEPTH @ 24:00 hr.: 3151 m**

**DRILLING DAY: 79**

**PROGRESS: 29 m**

Continued drilling and drilled ahead 8 ½" hole from 3122.90 m to 3146.36 m. Circulate for hole flushing, further drilled ahead 8 ½" hole from 3146.36 m to 3155 m, circulate and condition mud prior to POOH for air drilling. Dopped TOTCO, checked flow, P/O upto 2856 m and repaired hook lock. Further P/O upto 85 m and POOH in progress.

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17/03/07                    **DEPTH @ 00:00 hr.: 3151 m**                    **DEPTH @ 24:00 hr.: 3151 m**

**DRILLING DAY: 80**

**PROGRESS: 0 m**

Continued POOH, bit on surface, B/off bit, retrieved TOTCO. The pulled out bit was dull graded as 1-2-BT (1)/CT (4)-H-E-I-NO/RR-AD and the TOTCO deviation recorded at 3151 m was 1½°. While P/O laid down 4 joints of 6 ½" Drill collar and D/Jar. Closed Blind RAM, removed riser and laid down the same. Fabricate spacer spool, fixed spacer spool, rotating head, fixed flow line and blooie line to spacer spool. Remove stripper rubber of rotating head, M/up RR bit (China, 5-1-7) and RIH upto 119 m, further RIH in progress.

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18/03/07                    **DEPTH @ 00:00 hr.: 3151 m**                    **DEPTH @ 24:00 hr.: 3181 m**

**DRILLING DAY: 81**

**PROGRESS: 30 m**

Continued RIH, R/I from 119 m to 3144 m, reamed and washed down kelly length, C & C mud and drilled ahead 8 ½" hole from 3151m to 3181 m. FDIP.

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19/03/07                    **DEPTH @ 00:00 hr.: 3181 m**                    **DEPTH @ 24:00 hr.: 3210 m**

**DRILLING DAY: 82**

**PROGRESS: 29 m**

Continued drilling and drilled ahead 8 ½" hole from 3181m to 3210.50 m, circulate the hole clean and POOH for air drilling / poor penetration rate. Checked flow, -ve, L/dn 2 singles and POOH, P/O upto 1458 m, further POOH in progress.

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20/03/07                    **DEPTH @ 00:00 hr.: 3210 m**                    **DEPTH @ 24:00 hr.: 3210 m**

**DRILLING DAY: 83**

**PROGRESS: 0 m**

Continued POOH, bit on surface, B/off bit, and the pulled out bit was dull graded as 2-6-BT(15)-H/M-E-1/6"-NO-AD/PR. RIH with RR bit (China, 5-2-7) and new BHA with junk sub upto 2861 m, checked drill pipe float valve. M/up kelly and filled string, observed pressure shoot upto 2000 psi, close pipe RAM and pumped through annulus to clear drill pipe float, found float okay. Further RIH, encountered held up at 3189 m (14 Tons), washed down to 3189 m, observed tight spot, subsequently P/O one single and reamed from 3177 m to bottom (3210.50 m). Work on Junk sub, P/O upto shoe, made arrangements for displacement line, test lines, and displaced mud with water by cementing unit, displacement in progress.

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21/03/07                    **DEPTH @ 00:00 hr.: 3210 m**                    **DEPTH @ 24:00 hr.: 3210 m**

# FINAL WELL REPORT

SGL # 2

## DRILLING DAY: 84

PROGRESS: 0 m

Continued displacement of mud with water by cementing unit, stopped pumping, observed self flow, found well active. Opened HCR valve, closed pipe RAM, SCIP 550-950 psi. Circulate the well through choke to kill the same, observed the well static, opened pipe RAM and circulate and condition mud inside shoe, increased M.W from from 1.22 S.G to 1.26 S.G. B/off kelly, RIH from 2890 m to 3206 m, M/up kelly, tagged bottom, circulate and condition mud, increased MW from 1.27 S.G to 1.30 S.G and POOH for DST. P/O upto 2887.68 m, checked flow, -ve, continued P/O upto 2479.48 m, subsequently checked flow, -ve. Further P/O upto 2050.40 m, checked flow, further POOH in progress.

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22/03/07

DEPTH @ 00:00 hr.: 3210 m

DEPTH @ 24:00 hr.: 3210 m

## DRILLING DAY: 85

PROGRESS: 0 m

Continued P/O from 2050.40 m to 1733.75 m, checked flow, -ve, further P/O upto 954.24 m, checked flow, -ve. POOH, bit on surface, B/off bit and J/Sub, recovered 93 g of broken inserts from J/Sub. M/arrangements to RIH with conventional DST assembly with tail pipe of 306.86 m (32 singles) and packer seal at 2892 m (in casing). R/I with conventional DST assembly upto 839 m, filled string with water having 500 m of water cushion, Further R/I from 839 m to bottom and tagged bottom (3210.50m) . R/up DST rotating head, chickens lines and DST floor manifold, set packer, opened tool, observed weak to strong blow of air in 3 minutes during pre flow of 15 minutes. Initial Shut In (ISI) for 1hr and opened tool for main flow, main flow in progress.

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23/03/07

DEPTH @ 00:00 hr.: 3210 m

DEPTH @ 24:00 hr.: 3210 m

## DRILLING DAY: 86

PROGRESS: 0 m

Continued main flow, flowed the well for 1.25 hrs, water surfaced after 7 minutes. Fluid spray (water mist along with gas) flowed from well. Final Shut In for 2.5 hours, the gas was flared after Final Shut In at the flare pit. Released packer, R/dn DST surface equipments and POOH. The fluid (water w/trace of condensate) was encountered after pulling out 91 stands (P/O Depth 580 m). DST assembly on surface, found both packers damaged, B/off DST assembly and L/dn the same, further POOH tail pipe (32 singles). M/up new bit (China, 5-3-7) and RIH, encountered H/up @ 3132 m (7-8 Tons), reamed and washed down from 3125 m to 3194.83 m.

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24/03/07

DEPTH @ 00:00 hr.: 3210 m

DEPTH @ 24:00 hr.: 3218 m

## DRILLING DAY: 87

PROGRESS: 8 m

Continued reaming, ream and washed down from 3194.83 m to bottom (3210.50m). Resume drilling and drilled ahead 8½" hole from 3210.50 m to 3218.55 m. FDIP.

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25/03/07

DEPTH @ 00:00 hr.: 3218 m

DEPTH @ 24:00 hr.: 3221 m

## DRILLING DAY: 88

PROGRESS: 3 m

Continued drilling and drilled ahead 8½" hole from 3218.55 m to 3221.21 m. Circulate and condition mud prior to wipe trip, made a wiper trip upto 9 5/8" casing shoe (11 stands). Circulate and condition mud prior to POOH for logging. B/off kelly and dropped TOTCO and POOH. P/O upto 767m, repaired drill line spooler guide and further POOH. B/off bit, retrieved TOTCO, the TOTCO deviation recorded at 3221 m was 1 ¼°. The pulled out bit was dull graded as 0-0-NO-H-E-1/12"-RR-

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# FINAL WELL REPORT

## SGL # 2

LOG. Well under logging party, R/up logging gears and RIH logging tools, recorded DLL-MFSL-GR-CALI-SP in the 1st run, tool on surface.

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26/03/07                      DEPTH @ 00:00 hr.: 3221 m                      DEPTH @ 24:00 hr.: 3221 m

**DRILLING DAY: 89**

**PROGRESS: 0 m**

R/dn of DLL-MSFL-GR-CALI-SP and subsequently R/up DSN-SDL-GR-CALI tool and recorded the same in the 2nd run. Further recorded GR-FWS in the 3rd run and R/dn Logging tool and logging gears. Made arrangements for VSP, assembled 7" liner hanger, meanwhile cut and slip of drill line (32.5 m) and arrangements of VSP in progress.

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27/03/07                      DEPTH @ 00:00 hr.: 3221 m                      DEPTH @ 24:00 hr.: 3221 m

**DRILLING DAY: 90**

**PROGRESS: 0 m**

Made arrangements of VSP, RIH VSP tool and recorded check shot at 100 m interval, check shot in progress.

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28/03/07                      DEPTH @ 00:00 hr.: 3221 m                      DEPTH @ 24:00 hr.: 3221 m

**DRILLING DAY: 91**

**PROGRESS: 0 m**

Continued recording check shot and recorded check shot from 3200 m to 600 m at 100 m interval, and Rig down VSP Tool and logging gear. M/up RR bit (China, 1-1-7), RIH upto bottom, circulate and condition mud and POOH for lowering 7" liner. POOH, Bit on surface, B/off bit and bit sub, while P/O L/dn 2 joints of 6 ½" DC and D/jar. R/up casing gear, lowered 35 joints of 7" casing (29 PPF) with shoe and shear out landing collar and 9 centralizers. M/up casing hanger tool and RIH with 5" DP upto 757.53 m, further RIH in progress.

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29/03/07                      DEPTH @ 00:00 hr.: 3221 m                      DEPTH @ 24:00 hr.: 3221 m

**DRILLING DAY: 92**

**PROGRESS: 0 m**

Continued R/I of casing liner with 5" DP from 757.53 m upto 3219.27 m, fixed chickens line and circulating head and circulate. Dropped ball and and pressurized upto 1900 psi and shear the ball seat @ 2700 psi, found hanger not set. Circulate and tried to set hanger, but no success. B/off and L/dn chickens line, P/O Liner Hanger Tool to surface, found tool faulty. Decided to POOH casing liner, B/off Liner Hanger and L/dn the same. Further POOH 7" casing, recovered all 9 centralizers and R/dn casing gears.

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30/03/07                      DEPTH @ 00:00 hr.: 3221 m                      DEPTH @ 24:00 hr.: 3233 m

**DRILLING DAY: 93**

**PROGRESS: 12 m**

M/up new bit (China,5-1-7), RIH upto 3210 m, M/up kelly, ream and washed down to bottom (3221.21 m) and drilled ahead 8 ½" hole from 3221.21 m to 3233.28 m.FDIP.

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31/03/07                      DEPTH @ 00:00 hr.: 3233 m                      DEPTH @ 24:00 hr.: 3262 m

**DRILLING DAY: 94**

**PROGRESS: 29 m**

Continued drilling and drilled ahead 8 ½" hole from 3233.28 m to 3262 m. FDIP.

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# FINAL WELL REPORT

SGL # 2

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01/04/07                    DEPTH @ 00:00 hr.: 3262 m                    DEPTH @ 24:00 hr.: 3275 m

**DRILLING DAY: 95**

**PROGRESS: 13 m**

Continued drilling and drilled ahead 8 ½" hole from 3262 m to 3275.21. Circulate and condition mud prior to POOH for lowering 7" liner, B/off kelly, dropped TOTCO and POOH. P/O upto 2635.25 m and further POOH in progress.

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02/04/07                    DEPTH @ 00:00 hr.: 3275 m                    DEPTH @ 24:00 hr.: 3275 m

**DRILLING DAY: 96**

**PROGRESS: 0 m**

Continued POOH, P/O from 2635.25 m to surface, B/off bit, retrieved TOTCO, the TOTCO deviation recorded at 3275 m was 1°. The pulled out bit was dull graded as 3-3-CT (4)-H-E-1/12"-RR-TD. R/up casing gear and lowered 42 joints of 7" casing (29 PPF) upto 483.81 m, M/up liner hanger assembly and further RIH with 5" DP upto 2878 m. Circulate in shoe, further RIH from 2878 m to 3271.90 m. Circulate, dropped the ball and set hanger, open R/Tool, and C & C mud prior to cementation. R/up cementing lines, pressure test lines at 2000 psi, pumped 5 bbls of pre flush, mixed and pumped 80 bbls of cement slurry of 15.8 ppg. Dropped DPWP and displaced cement slurry with 218.5 bbls mud of 11.00 ppg by Rig pumps. Bumped plug at 2000 psi, bleed pressure, found float holding. Set packer, L/dn 2 sgls, P/O 12 stands and circulate. Further P/O from 2416 m to 2223 single by single (L/dn 20 sgls). Further POOH in progress.

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03/04/07                    DEPTH @ 00:00 hr.: 3275 m                    DEPTH @ 24:00 hr.: 3275 m

**DRILLING DAY: 97**

**PROGRESS: 0 m**

Continued POOH, P/O from 2223 m to 1983 m single by single (L/dn 15 sgls, TOTAL 45 sgls L/dn), subsequently POOH stands from 2223 m to surface and L/dn R/tool. M/up RR bit (China, 1-1-7), RIH upto 2411 m and WOC. Subsequently RIH and tagged cement at 2723 m, drilled cement and tagged TBR top at 2782.75 m. Circulate the hole clean, POOH upto 2354 m and further POOH in progress.

---

04/04/07                    DEPTH @ 00:00 hr.: 3275 m                    DEPTH @ 24:00 hr.: 3275 m

**DRILLING DAY: 98**

**PROGRESS: 0 m**

Continued P/O from 2354 m to surface, while POOH L/dn 5" HWDP (9 nos) and 6 ½" DC (12 nos). M/up new 6" bit (Smith, 1-1-7), RIH upto 2771 m, M/up kelly and drilled cement and DPOB. Subsequently RIH upto 3240 m. M/up kelly and tagged L/collar at 3247.92 m, drilled LWP, DPWP and drilling of shear out landing collar upto 3248.75 m, further drilling of landing collar in progress.

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05/04/07                    DEPTH @ 00:00 hr.: 3275 m                    DEPTH @ 24:00 hr.: 3275 m

**DRILLING DAY: 99**

**PROGRESS: 0 m**

Continued drilling landing collar, cement from 3248.75 m to 3267.60 m. Circulate the hole clean, displaced mud with water by cementing unit and POOH. While POOH L/dn 24 singles of 5" drill pipe. The pulled out bit was dull graded as 4-6-BT (6)-N-E-I-NR-TD. M/up new 6" bit (Lilin, 6-3-7), RIH upto 556 m and further RIH in progress.

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# FINAL WELL REPORT

## SGL # 2

06/04/07

DEPTH @ 00:00 hr.: 3275 m

DEPTH @ 24:00 hr.: 3275 m

### DRILLING DAY: 100

PROGRESS: 0 m

Continued RIH from 556 m to 819 m, fixed stripper rubber of rotating head, removed return diverter gate and fixed gate in flow line side. M/up kelly, displaced water with air, no returns (pressurized upto 950 psi). P/O from 819 m to 720, try to displace water with air, no success. Further P/O from 720 m to 480 m; try to displace water with air but no success (pressurised upto 900 psi). Closed BOP, pressurized from annulus, no returns. Pressurized through mist pump upto 1900 psi, no returns. Closed BOP, pressurized through annulus upto 1500 psi by mist pump, no returns. POOH, B/off bit and X-Over, found X/O and drill collar plugged with rust and mud chemicals fines. RIH open end upto 516 m and knocked out water from annulus by air mist. Further RIH upto 1006 m, tried to displace water but no success. P/O from 1006 m to 719 and knocked out water by air mist, futher resumed RIH.

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07/04/07

DEPTH @ 00:00 hr.: 3275 m

DEPTH @ 24:00 hr.: 3275 m

### DRILLING DAY: 101

PROGRESS: 0 m

RIH and knocked out water every 100 m by air mist upto 2715 m, further displacement of water by air mist in progress.

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08/04/07

DEPTH @ 00:00 hr.: 3275 m

DEPTH @ 24:00 hr.: 3275 m

### DRILLING DAY: 102

PROGRESS: 0 m

Continue to knock out water every 100 m by air mist from 2715 m to 3266 m. Line up the second booster pump and try knock out water at 3266 m, no returns. P/O from 3266 m to 3086 m, pump air mist, and knocked out water. Further RIH from 3086 m to 3172 m, knocked out water by air mist. RIH from 3172 m to 3258 m and knocked out water by air mist and POOH. POOH upto 1554 m, further POOH in progress.

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09/04/07

DEPTH @ 00:00 hr.: 3275 m

DEPTH @ 24:00 hr.: 3275 m

### DRILLING DAY: 103

PROGRESS: 0 m

Continue to POOH from 1554 m to surface. M/up same 6" bit (Lilin, 6-3-7) and RIH upto 2934 m, fixed stripper rubber of rotating head, M/up kelly and circulate air to check the same, found okay. Further RIH from 2934 to 3259.61 m, M/up kelly, circulate air to clean the hole. Drilled cement, shoe from 3267.60 to 3274.21 m, observed increase in pressure while circulating air and subsequently no returns. Initially some loose coarse-very sand with cement was observed in sample and subsequently observed formation water influx. The water sample from blooey line sampling point had salinity of 54500 ppm. (The mist water and technical water had salinity of 13000 ppm). P/O upto 3210 m (2 stands), circulate air mist, observed increase in pressure and no returns. Decided to POOH, P/O upto 2700 m, circulate air, observed no returns. POOH upto 2924 m, further POOH in progress.

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10/04/07

DEPTH @ 00:00 hr.: 3275 m

DEPTH @ 24:00 hr.: 3275 m

### DRILLING DAY: 104

PROGRESS: 0 m

Continue to POOH from 2924 m to surface, encountered water at 632 m and found both float valve and drill collar (#1) plugged with cement cuttings and pipe scales. M/up same bit (China, 6-3-7), RIH upto 1986 m. Serviced float valves, cleaned 4 ¾" DC and rabbit 3 ½" DP prior to RIH. M/up kelly,

# FINAL WELL REPORT

## SGL # 2

circulate air, no returns. P/O from 1986 m to 1500 m, M/up kelly, circulate air, no returns. Further P/O from 1500 m to 748.78 m, circulate air and knocked out water from well and kept well under observation. The water sampled from blooey line had salinity of 55200 ppm.

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11/04/07                      DEPTH @ 00:00 hr.: 3275 m                      DEPTH @ 24:00 hr.: 3275 m

**DRILLING DAY: 105**

**PROGRESS: 0 m**

Continue well under observation for 9.50 hours, further P/O from 748.78 m to 403 m, circulate air and knocked out water from well and futher POOH to surface. RIH open end upto 115 m and POOH the same. M/up new bit (Lilin, 6-3-7) and RIH upto 3269.18 m, M/up kelly, circulate water by mud pumps, circulation in progress.

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12/04/07                      DEPTH @ 00:00 hr.: 3275 m                      DEPTH @ 24:00 hr.: 3275 m

**DRILLING DAY: 106**

**PROGRESS: 0 m**

Continue to circulate water by mud pumps, observe pressure shoot upto 3000 psi, bleed pressure and tried thrice, no success. POOH and filled annulus after every 5 stands through kill line. After POOH found first single of Drill Collar (#1) and bit plugged with pipe scales and cement cuttings. RIH open end 5" Drill Pipe upto 287.35 m (10 stands) and meanwhile made arrangements for logging (CBL-VDL).

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13/04/07                      DEPTH @ 00:00 hr.: 3275 m                      DEPTH @ 24:00 hr.: 3275 m

**DRILLING DAY: 107**

**PROGRESS: 0 m**

Made arrangements for next operation, meanwhile carried out house keeping job and removed air drilling rotating head kelly bush. Well under observation, meanwhile made arrangements for next operation. POOH open end 5" Drill pipe from 287.35 m to surface. RIH open end 3 ½ " Drill pipe (63 singles) upto 604 m for cement plug, further RIH in progress.

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14/04/07                      DEPTH @ 00:00 hr.: 3275 m                      DEPTH @ 24:00 hr.: 3275 m

**DRILLING DAY: 108**

**PROGRESS: 0 m**

Continued RIH open end 3 ½ " Drill pipe (9 singles, Total 24 stands) from 604 m to 691.42 m, further RIH with 5" Drill pipe upto 3260 m. M/up kelly and displaced well water with mud, circulate and condition mud prior to cement plug. B/off kelly and add one single (3270 m). R/up cementing head and cementing lines and pressure test lines at 2000 psi. Pumped 10 bbls of water ahead, mixed and pumped 6.1 bbls of cement slurry of 15.8 ppg. Pumped 2.9 bbls of water behind and displaced with 164 bbls of mud to balance the plug by rig pumps (1492 strokes). R/dn cementing head and cementing lines, P/O from 3270 m to 3021 m (2 singles + 8 stands), circulate to clean Drill pipe, WOC, meanwhile POOH. While P/O L/dn 15 singles of 3 ½ " Drill pipe.

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15/04/07                      DEPTH @ 00:00 hr.: 3275 m                      DEPTH @ 24:00 hr.: 3275 m

**DRILLING DAY: 109**

**PROGRESS: 0 m**

WOC, meanwhile arrangements for next operation in progress.

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# FINAL WELL REPORT

SGL # 2

## PHASE SUMMARY

### 17 ½" PHASE

Period : 28.12.2006 to 03.01.2007  
Interval : Surface – 760.24 m  
No. of bits : 2  
Mud type : Water based bentonite suspension  
Time taken : 7.38 days

### DRILLING REVIEW OF 17 ½" PHASE

This phase commenced with the spudding of the well SGL # 2 with 17 ½" RR bit (Reed,1-1-5) at 23:00 hrs on December 28, 2006 and drilled down 17 ½" hole to 14.6 m, observed leakage in wash pipe, repartsd the same and drilled ahead to 34 m. POOH and removed X/O and M/up string stablizer and RIH. Resumed drilling ahead 17 ½" hole from 34 m and drilled down to 54 m. After connection of 6 ½" DC, started both pumps and observed leakage in dresser coupling of suction line, repaired the same. Resumed drilling from 54 m and drilled down to 261.66 m. Repaired MP#2, changed piston swab and drilled ahead to 357.37 m. Circulate prior to POOH, pumped 4.5 m3 hi-vis pill to clean hole. Dropped TOTCO and POOH. The TOTCO deviation recorded at 357 m was 0°. M/up same bit having the same BHA [Bit (0.41 m) + Bit sub (0.91 m) + 2 joints of 8" Drill Collar (18.80 m) + X-Over (0.30 m) + Stablizer (2.48 m) + X-Over (0.33 m) + 2 joints of 8" Drill Collar (18.78 m) + X-over (0.80 m) + 7 joints of 6 ½" Drill Collar (65.57 m) + 9 joints of 5" HWDP (83.57 m) i.e. Total BHA 191.95 m ], RIH upto 347 m, further reamed and washed down to 357.37 m. Resumed drilling ahead 17 ½" hole from 357.37 m and drilled down to 520 m. Pumped 4 m3 hi-vis pill to clean hole and further drilled ahead 17 ½" hole to 644 m; circulated, meanwhile changed piston of MP#2. Resumed drilling ahead 17 ½" hole from 664m and drilled down to 734.31m. Circulated prior to POOH for bit change due to poor ROP, dropped TOTCO and POOH. The TOTCO deviation recorded at 734 m was 0°. The bit was dull graded as 6-5-WT/ER-A-E-1/16"-FC/NR-PR.

RIH with RR bit (China, 1-1-5) having the same BHA [Bit (0.41 m) + Bit sub (0.91 m) + 2 joints of 8" Drill Collar (18.80 m) + X-Over (0.30 m) + Stablizer (2.48 m) + X-Over (0.33 m) + 2 joints of 8" Drill Collar (18.78 m) + X-over (0.80 m) + 7 joints of 6 ½" Drill Collar (65.57 m) + 9 joints of 5" HWDP (83.57 m) i.e. Total BHA 191.95 m ], R/I upto 728 m, further washed down to bottom (734.31 m) and drilled ahead 17 ½" hole from 734.31 m to 760.24 m. Circulated prior to POOH for lowering of 13 3/8" casing. Pump 6.5 m3 of hi-vis pill to flush hole, dropped TOTCO and POOH. POOH upto 335 m, while P/O observed extra drag at some intervals, so decided to RIH. RIH to bottom, circulate and condition mud, pumped slug and POOH for lowering 13 3/8" casing. Bit on surface, B/off bit, bit sub, X/O, stablizer, X/O and laid down the same. The TOTCO deviation recorded at 760 m was 0°.

R/up 13 3/8" casing gear for lowering 13 3/8" casing. Lowered 65 joints of 13 3/8" casing (68 PPF) with shoe @ 755.13 m. R/up cement head and chickens lines, circulated prior to cementation, dropped bottom plug, flushed and tested cement lines at 2000 psi. Pumped 20

## FINAL WELL REPORT

### SGL # 2

bbls of water as pre flush; mixed and pumped 386.41 bbls of lead slurry of 12 ppg and 86.02 bbls of tail slurry of 15.8 ppg. Dropped top plug and pumped 10 bbls of water as after flush. Disparts cement slurry with 351 bbls mud of 9.09 ppg (1.09 S.G). Bump plug at 1600 psi, found float holding. WOC, R/dn cement head and chickens lines and cut flow line and false conductor.

Cut 13 3/8" casing and laid down the same, cleaned cellar pit, final cut 13 3/8" casing and grinded the same to fit well head. Installed well head, casing head spool and N/up BOP stack and make up choke line and kill line, welded base plate with well head. Fixed Poor-boy degasser and lines and put concrete under well head supporting base plate.

Test well head, Blind RAM, Pipe RAM, Annular BOP, choke and kill line at 2000 psi, found okay. Weld bell nipple with flow line.

This section was represented by Shumar Formation of Quaternary age, and Bandah (Middle Eocene) of Tertiary age, constituting lithology of unconsolidated sands and clay and limestone.

### DRILLING PARAMETERS IN 17 1/2" PHASE

DEPTH (m)	WOB (Tons)	RPM (rpm)	TRQ (f*lbs)	SPP (psi)	Flow Pumps (lts/min)	Av. ROP (m/hr)	ROP max (m/hr)	ROP min (m/hr)
K.B – 102	2 – 3	45 – 67	--	150 – 700	1775 – 3191	42.68	--	--
102 – 357	4 – 7	60 – 65	--	950 – 1090	3153 – 3274	21.70		
357 – 632	6 – 12	70	--	1200–1290	3157 – 3195	21.72		
632 – 734	10 – 12	70	--	1300	3157	7.37		
734 – 760	10 – 12	65 – 70	--	1400	3157	3.21		

### DEVIATION SURVEY IN 17 1/2" PHASE

S.No.	Depth (m)	TOTCO Readings (degrees)
1	357	0°
2	734	0°
3	760	0°



# FINAL WELL REPORT

## SGL # 2

### MUD PARAMETERS IN 17 ½" PHASE

DEPTH	M.W	F.V	P.V	Y.P	Gel	Water Loss	Solids	pH	Sand	Oil/Water
(m)	(sg)	(sec)	(cP)		0 / 10	(cc/30')	(%)		(%)	(%)
K.B – 8	1.04	65	--	--	--	--	--	--	--	--
8 – 85	1.05	64	10	37	--	--	--	9.5	--	--
85 – 130	1.05	63	9	46	--	--	--	9.0	--	--
130 – 291	1.06	60	11	46	--	--	--	9.5	--	--
291 – 399	1.06	66	10	24	--	--	--	9.0	--	--
399 – 540	1.08	63	10	22	--	--	--	9.0	--	--
540 – 665	1.07	63	11	21	--	9.2	--	9.0	--	--
665 – 731	1.08	58	8	30	--	--	--	9.0	--	--
731 – 733	1.08	58	8	23	--	--	--	9.0	--	--
733 – 760	1.09	60	8	31	--	12.6	--	9.0	--	--

### BIT DATA OF 17 ½" PHASE

Bit #	Size (inch)	Make	Type	IADC	Serial	Nozzle	In m	Out m	Metrage m	Hrs
1RR	17 ½"	Reed	S11G	1-1-5	D69770	20 x 3 18 x 1	0	357	357	14.08
1RR (2Run)	17 ½"	Reed	S11G	1-1-5	D69770	20 x 3 18 x 1	357	734	377	26.55
2RR	17 ½"	China	7-0095	1-1-5	015	22 x 3	734	760	26	8.11

### CASING AND CEMENTATION IN 17 ½" PHASE

#### Casing Data

Date of casing : 02.01.07  
Size of casing : 13 3/8"  
Inner Diameter : 12.415"  
Weight : 68 PPF  
Grade : J-55 (64 Joints)  
Well depth : 760.24 m  
Well diameter : 17 ½"  
Casing shoe @ : 755.13 m

#### Cementation Data

Date of cementation : 03.01.07  
Type of cement : G - Grade  
Volume of lead cement slurry : 368.41 bbls  
Av. sp.gr of lead cement slurry : 12.00 ppg  
Volume of tail cement slurry : 86.02 bbls  
Av. sp.gr of tail cement slurry : 15.80 ppg  
Av. sp.gr of displacing mud : 9.09 ppg  
Cement Rise : Upto surface

**TIME ANALYSIS OF 17 ½" PHASE : ( 28.12.06 – 04.01.07)**

# FINAL WELL REPORT

## SGL # 2

ACTIVITY	TOTAL HOURS	PERCENT
Drilling	66.25	37.43
Reaming	6.00	3.39
Circulation	10.75	6.07
Tripping	19.75	11.16
Repairs	5.50	3.11
Casing and Cementation	16.25	9.18
WOC	20.00	11.30
N/up BOP	12.00	6.78
Test BOP	1.50	0.85
Miscellaneous	19.00	10.73
<b>TOTAL</b>	<b>177.00</b>	<b>100.00</b>

**N.B: As per IADC**

Misc.: includes arrangements for spudding, TOTCO, preparation of KCl mud.

**12 1/4" PHASE**

# FINAL WELL REPORT

## SGL # 2

Period : 04.01.2007 to 19.02.2007  
Interval : 760.24 m – 2902.20 m.  
No. of bits : 9  
Mud type : KCl-PHPA mud system  
Time taken : 45.63 days

## DRILLING REVIEW

This phase constituted Tertiary and part of Mesozoic sedimentary column. The Tertiary was represented by Bandah (Middle Eocene), Khuiala (Lower Eocene) and Sanu (Middle-Lower Paleocene) Formations and Mesozoic were represented by Parh (Upper Cretaceous) Formation.

This phase commenced with the lowering of new 12 ¼" bit (China 1-1-7). RIH 12 ¼" RR bit China (1-1-7) with the following BHA [ Bit (0.30 m) + Bit sub (0.91 m) + 2 joints of 8" Drill Collar (18.80 m) + Stabilizer (2.35 m) + 2 joints of 8" Drill Collar (18.78 m) + X-over (0.80 m) + 13 joints of 6 ½" Drill Collar (121.90 m) + 9 joints of 5" HWDP (83.57 m) i.e. Total BHA 247.41 m ], and tagged cement at 735 m, B/off and L/dn 7 singles of 5"DP. Slipped the drill line (9.00 m) and meanwhile prepared KCl mud. M/up kelly and tagged cement at 735 m; pumped 50 bbls of fresh water as buffer and displaced old mud with new KCl mud.

Resumed drilling and drilled cement, top and bottom plug, float collar, casing shoe and drilled ahead 12 ¼" hole from 760.24 m to 988.57 m, observed some pressured cavings on shale shaker and decided to raise MW from 1.25 S.G. to 1.30 S.G. Circulate and condition mud, and P/O for wiper trip upto casing shoe, subsequently decided to POOH to check bit, meanwhile made arrangements for next operation. While POOH observed continuous tight pull of 20-35 tons, reciprocated and cleared the same.

RIH with new bit (Hughes, 4-1-7), and removed string stabilizer from BHA having the following elements [ Bit (0.30 m) + Bit sub (0.91 m) + 4 joints of 8" Drill Collar (37.58 m) + X-over (0.80 m) + 13 joints of 6 ½" Drill Collar (121.90 m) + 9 joints of 5" HWDP (83.57 m) i.e. Total BHA 245.06 m ], RIH upto 973 m servicing all joints of drill string, circulate and condition mud, observed some cavings on shaker. Further drill ahead 12 ¼" from 988.57 m to 1149.75 m, and while drilling some cavings were observed from 988.57 m to 1030 m which was subsequently controlled by raising MW from 1.25 to 1.32 S.G. Circulate the hole clean prior to wiper trip, pumped slug and made a wiper trip upto casing shoe. Circulate the hole clean at bottom and drilled ahead 12 ¼" from 1149.70 m to 1322.22 m, circulate prior to wiper trip and made a wiper trip upto 990 m (11 stands). Subsequently drill ahead 12 ¼" hole from 1322.22 m to 1447 m, circulate the hole clean prior to wiper trip. Made a wiper trip upto 1146 m (10 stands), washed down last single. During P/O observed continuous tight pull of 5-10 tons upto 1300 m. Resumed drilling and drilled ahead 12 ¼" hole from 1447 m to 1543 m, circulate the hole clean prior to wiper trip. Made a wiper trip upto 1242 m (10 stands), and while P/O observed tight spots at 1493 m (10-12 T), 1471 m (10-12 T), 1454 m (10 T), 1442 m (18-20 T), 1422-1421 m (8-20 T), 1417-1411 m (20-30 T), 1389 m (20-21 T), 1309 m (10-12 T). During R/I observed held up at 1520 m, reamed and washed down from 1520 m to bottom. Resumed drilling and drilled ahead 12 ¼" hole from 1543 m to 1626 m, and decided to POOH due to poor ROP and torque. Circulate the hole clean, pumped hi-

## FINAL WELL REPORT

### SGL # 2

vis pill and circulate out the same. Dropped TOTCO and POOH. While P/O encountered tight pull at interval 1418-1408 m (10-30 T) and 838-815 m (8-11 T), reciprocated and cleared the same. POOH to surface, B/off bit, retrieved TOTCO. The TOTCO deviation recorded at 1626 m was  $1\frac{1}{4}^{\circ}$  and the pulled out bit was found to be re-runnable (1 insert broken).

RIH with new bit (China, 4-3-7), having the following BHA elements [ Bit (0.30 m) + Bit sub (0.91 m) + 4 joints of 8" Drill Collar (37.58 m) + X-over (0.80 m) + 13 joints of 6  $\frac{1}{2}$ " Drill Collar (121.90 m) + 9 joints of 5" HWDP (83.57 m) i.e. Total BHA 245.06 m ], RIH upto 1585 m, encountered held up at 1585 m, reamed and washed down single by single to bottom. Resumed drilling and drilled ahead 12  $\frac{1}{4}$ " hole from 1626 m to 1791.73 m. Circulate the hole clean prior to wiper trip, made a wiper trip upto 1490 m, while R/I observed H/up at 1783 m, reamed and washed down from 1780 m to bottom (1791.73 m). Further drilled ahead 12  $\frac{1}{4}$ " hole from 1791.73 m to 1915.92 m, and decided to POOH due to poor ROP. Circulate the hole clean, dropped TOTCO and POOH. The TOTCO deviation recorded at 1626 m was  $\frac{3}{4}^{\circ}$ . The pull out bit had locked cones (all three) and worn inserts. The bit was dull graded as 2-2-WT/NR-A-E-I-NO-PR.

RIH with new PDC bit (New Tech), having the following BHA elements [Bit (0.35 m) + Bit sub (0.91 m) + 4 joints of 8" Drill Collar (37.58 m) + X-over (0.80 m) + 13 joints of 6  $\frac{1}{2}$ " Drill Collar (121.90 m) + 9 joints of 5" HWDP (83.57 m) i.e. Total BHA 245.11 m] and RIH upto 1768 m. While R/I encountered held up at 1723 m (5 Tons), 1729 m (7 Tons), 1736 m (7-8 Tons), 1738 m (8-10 Tons), 1740-1743 m (10-15 Tons), 1751-1752 m (14-20 Tons), 1759 (11 Tons), 1767-1769 (19-22 Tons), reciprocated and cleared tight spots, further reamed and washed down from 1768 m to bottom (1915.92 m). Resumed drilling and drilled ahead 12  $\frac{1}{4}$ " hole from 1915.92 m to 2073.93 m, circulate the hole clean prior to wiper trip. Made a wiper trip of 10 stands (upto 1776 m), circulate at bottom prior to drilling ahead. Subsequently drilled ahead 12  $\frac{1}{4}$ " hole from 2073.93 m to 2075 m. Circulate the hole clean, prior to POOH for bit change due to poor ROP, dropped TOTCO and POOH. While POOH encountered overpull at intervals 1756-1754 m (8 -12 Tons), 1749 m (5-6 Tons), 1741m (10-12 Tons), 1693 m (20-21 Tons). The pulled out bit was dull graded as 1-2-RO-A-X-I-CT-PR. The TOTCO deviation recorded at 2075 m was  $2^{\circ}$ .

RIH with new insert bit (China, 4-1-7), having the following BHA elements [Bit (0.30 m) + Bit sub (0.91 m) + 4 joints of 8" Drill Collar (37.58 m) + X-over (0.80 m) + 13 joints of 6  $\frac{1}{2}$ " Drill Collar (121.90 m) + 9 joints of 5" HWDP (83.57 m) i.e. Total BHA 245.06 m], RIH upto 273 m, slip drill line 17.4 m, further RIH upto 2062 m, encountered held up interval 2060-2061 m (25-30 Tons), reamed and washed down from 2061 m to bottom (2075 m). Resume drilling and drilled ahead 12  $\frac{1}{4}$ " hole from 2075 m to 2095 m, circulate the hole clean, prior to POOH for bit change due to poor ROP, dropped TOTCO and POOH. The pulled out bit was dull graded as 2-2-WT/NR-A-E-I-NO-PR. The TOTCO deviation recorded at 2095 m was  $2^{\circ}$ .

RIH with new PDC bit (Compass), having the following BHA elements [Bit (0.40 m) + Bit sub (0.91 m) + 4 joints of 8" Drill Collar (37.58 m) + X-over (0.80 m) + 13 joints of 6  $\frac{1}{2}$ " Drill Collar (121.90 m) + 9 joints of 5" HWDP (83.57 m) i.e. Total BHA 245.16 m], R/I upto

## FINAL WELL REPORT

### SGL # 2

2078 m, encountered held up at 2078 m (6-7 Tons), reamed and wash down to bottom (2095 m) and drilled ahead 12 ¼" hole from 2095 m to 2251 m, circulate the hole clean prior to wiper trip. Made a wiper trip upto 1979 m (9 stands), further drilled ahead 12 ¼" hole from 2251 m to 2375.39 m. Circulate the hole clean and made a wipe trip upto 2074 m (10 stands), resume drilling and drilled ahead 12 ¼" hole from 2375.39 m to 2499.77 m. Circulate the hole clean and made a wipe trip upto 2200 m (10 stands). Further drilled ahead 12 ¼" hole from 2499.77 m to 2643.58 m, and circulate the hole clean prior to wiper trip upto 2314 m (10 stands). Resumed drilling and drilled ahead 12 ¼" hole from 2643.58 m to 2720.47 m, circulate the hole clean prior to short trip upto shoe to prove hole. P/O upto shoe, slipped drill line 8.80 m and cut 24.00 m, replaced rotary torque sensor with new, greased T/Block, hook, washpipe, kelly bush and rotary clutch, rotary universal joint and carden shaft, checked oil of rotary table and top up 2 lts, checked oil level of swivel and hook, found okay, serviced the pneumatic cylinder of locking gear and set crown-o-matic. RIH from shoe to bottom and drilled ahead 12 ¼" hole from 2720.47 m to 2855 m, circulate the hole clean prior to wiper trip, while reciprocating string observed tight spots at 2846 m, 2839 m and 2836 m (7-8 T), cleared the same by reciprocation. Made a wiper trip upto 2581 m (9 stands), subsequently drilled ahead 12 ¼" hole from 2855 m to 2871.20 m, and decided to POOH for bit change because of poor penetration rate. Circulate the hole clean prior to POOH, dropped TOTCO and POOH, bit on surface. The pulled out bit was dull graded as 8-8-WT/CT/RO-A-X-1/8"-BT/HC-PR and the TOTCO was mis run (baffle plate broken).

RIH with RR insert bit (Hughes, 4-1-7), having the following BHA elements [Bit (0.29 m) + Bit sub (0.91 m) + 4 joints of 8" Drill Collar (37.58 m) + X-over (0.80 m) + 13 joints of 6 ½" Drill Collar (121.90 m) + 9 joints of 5" HWDP (83.57 m) i.e. Total BHA 245.05 m], RIH in 273.25 m, slip drill line, carried out mechanical maintenance and further RIH upto 2861 m, washed down kelly down length. Subsequently drilled ahead 12 ¼" hole from 2871.21 m to 2892 m, and decided to POOH due to poor ROP. Circulate and condition mud, dropped TOTCO and POOH. The pulled out bit was dull graded as 5-5-BT (18)/LT-M/H-E-1/8"-CT/ER-PR/TQ and the TOTCO was mis run as baffle plate got damaged.

RIH with new insert bit (Hughes, 5-2-7), incorporated Junk sub in BHA, having the following BHA elements [Bit (0.30 m) + Junk (1.09 m) + Bit sub (0.91 m) + 4 joints of 8" Drill Collar (37.58 m) + X-over (0.80 m) + 13 joints of 6 ½" Drill Collar (121.90 m) + 9 joints of 5" HWDP (83.57 m) i.e. Total BHA 246.15 m], R/I upto 2881 m, washed down Kelly length and work on junk sub. Subsequently drilled ahead 12 ¼" hole from 2892.12 to 2898 m and decided to POOH due to poor penetration rate. Circulate and condition mud, dropped TOTCO and POOH. The pulled out bit was dull graded as 1-1-NO-E-I-RR-PR. The TOTCO deviation recorded at 2898 m was 1½°. Recovered 429 g of broken inserts and 3 kgs of rock piece from junk sub.

RIH with new PDC bit (New Tech, NT 408) with the following BHA [Bit (0.40 m) + Bit sub (0.91 m) + 4 joints of 8" Drill Collar (37.58 m) + X-over (0.80 m) + 13 joints of 6 ½" Drill Collar (121.90 m) + 9 joints of 5" HWDP (83.57 m) i.e. Total BHA 245.16 m], R/I upto 446 m and slip drill line 8.8 m. Further RIH from 446 m to 1941 m, encountered held up (10 T), reamed and washed down from 1934 m to 1944 m. Subsequently RIH from 1944 m to 1973 m, encountered held up (15-18 T), reciprocate and cleared tight spot. Further reamed and

## **FINAL WELL REPORT**

### **SGL # 2**

washed down from 1989 m to 2012 m. Further RIH from 2012 m to 2861 m, encountered held up (4 T), further reamed and washed down from 2861 m to bottom (2898 m). Further drilled ahead 12 ¼" hole from 2898 m to 2902 m and decide to lower casing. Circulate and condition mud prior to POOH for lowering of casing. The pulled out bit was partially balled and the TOTCO deviation recorded at 2902 m was 1½°.

R/up 9 5/8" casing lowering tool and lowered 283 joints (L80 / 47 PPF = 135 joints and N80 / 43.5 PPF = 148 joints ) of 9 5/8" casing with shoe at 2899.08 m. R/up cementing head, chickens lines, established circulation and circulate and condition mud. R/up chickens lines with cementing unit and pressure test cementing lines at 2000 psi. Pumped 50 bbls of spacer, dropped bottom plug, mix and pump 210 bbls of cement slurry of 15.8 ppg. Dropped top plug and pumped 10 bbls water behind and dispartsd cement slurry by rig pumps with 724.10 bbls of mud of 11.42 ppg (6300 strokes). Bumped plug at 2000 psi and found float holding. WOC.

Released 9 5/8" casing, N/dn BOP, set 9 5/8" casing slip, cut 9 5/8" casing and N/up well head spool, test well head at 3000 psi, N/up BOP and fixed choke line.

Fixed kill line, L/dn 8" Drill collar (4 nos), M/up stands of 6 ½" Drill collar (3 nos.) and 5" HWDP, weld flow line. Tested kill line valves and Blind RAM at 2000 psi. Found O.K. Tested mechanical valve of HCR valve side, HCR valve and all choke manifold valves including both choke (one by one) at 2000 psi. Found O.K. Function test Pipe RAM and Annular RAM, found O.K. Made arrangements for next operation meanwhile carried out general maintenance and house keeping jobs

### **DRILLING PARAMETERS IN 12 ¼" PHASE**

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## SGL # 2

DEPTH	WOB	RPM	TRQ	SPP	Flow Pumps	Av. ROP	ROP max	ROP min
(m)	(Tons)	(rpm)	(f <sup>3</sup> lbs)	(psi)	(lts/min)	(m/hr)	(m/hr)	(m/hr)
760 – 837	10 – 12	80 – 110	--	700 – 735	2585 – 2620	5.28	17.27	2.22
837 – 972	15 – 16	60 – 72	--	820 – 1064	2620	7.82	29.51	2.91
972 – 988	8 – 15	65 – 70	--	1100	2620	13.07	22.43	7.24
988 – 1034	8 – 10	65 – 70	--	1698	2620	13.77	19.25	5.73
1034 – 1205	10 – 12	60 – 70	--	1740 – 1784	2620	11.17	26.47	2.81
1205 – 1328	8 – 12	55 – 60	--	1800 – 1850	2585	7.09	15.55	2.35
1328 – 1412	10 – 12	50 – 55	--	1800 – 1960	2585 – 2620	4.15	14.78	1.85
1412 – 1525	10 – 12	50 – 60	--	2000 – 2050	2585	6.69	21.82	2.75
1525 – 1620	10 – 12	50 – 70	--	2068 – 2150	2585	5.82	9.34	2.66
1620 – 1626	10 – 15	50 – 55	--	2150	2585	3.78	4.04	2.85
1626 – 1637	10 – 12	50 – 55	--	1980	2585	2.21	4.57	1.64
1637 – 1763	10 – 16	50 – 55	--	2040 – 2158	2585 – 2620	6.33	24.57	1.11
1763 – 1848	12 – 16	50 – 55	--	1700 – 2000	2377 – 2585	5.21	21.30	2.32
1848 – 1911	14 – 16	50 – 55	--	1720 – 1859	2377 – 2411	2.96	19.00	1.02
1911 – 1915	14 – 16	50 – 55	--	1820 – 1848	2377 – 2411	2.35	10.11	0.95
1915 – 1935	6 – 8	60 – 65	--	1820 – 1845	2377 – 2411	11.09	37.11	1.75
1935 – 2073	3 – 7	50 – 65	--	1940 – 2120	2411 – 2479	10.29	84.56	2.84
2073 – 2075	9 – 11	54 – 60	--	1996 – 2024	2412 – 2424	0.41	0.85	0.40
2075 – 2079	12 – 14	50	--	1960 – 2040	2411 – 2479	1.09	1.83	0.95
2079 – 2095	12-14	50	--	1915 – 2005	2141 – 2228	1.11	5.22	0.27
2095 – 2145	6 – 8	50 – 60	--	1859 – 2057	2120 – 2269	2.91	7.44	1.33
2145 – 2251	5 – 7	60 – 65	--	2120 – 2196	2165 – 2203	5.68	13.02	2.49
2251 – 2362	6 – 8	50 – 65	--	2100 – 2120	2203	5.87	15.09	1.98
2362 – 2406	6 – 8	50 – 60	--	2100 – 2120	2165 – 2203	2.48	6.27	0.66
2406 – 2478	8 – 10	60 – 65	--	2300 – 2480	2237 – 2342	3.54	15.48	1.06
2478 – 2614	6 – 10	60 – 65	--	2200 – 2320	2167 – 2237	8.41	17.52	2.98
2614 – 2720	8 – 10	60 – 65	--	2300	2202 – 2237	7.96	19.35	2.40
2720 – 2768	5 – 10	60 – 65	--	2300 – 2320	2167 – 2202	4.50	15.75	1.17
2768 – 2847	5 – 10	50 – 65	--	2330 – 2360	2202 – 2237	3.87	14.46	0.66
2847 – 2862	6 – 10	50 – 65	--	2340 – 2360	2202	0.78	4.75	0.51
2862 – 2871	5 – 10	55 – 100	--	2400	2202	0.62	0.95	0.43
2871 – 2879	8 – 10	40 – 50	--	2195 – 2200	1992 – 2132	0.69	1.11	0.55
2879 – 2892	11 – 12	40 – 50	--	2200 – 2220	2167 – 2202	0.68	1.35	0.43
2892 – 2896	12 – 14	50	--	2412 – 2476	2098 – 2138	0.42	0.65	0.41
2896 – 2898	10 – 12	48	--	2489 – 2567	2165 – 2182	0.48	0.33	0.33
2898 – 2902	2 – 12	30 – 100	-	2356 – 2389	2326 – 2292	0.29	0.59	0.22

### DEVIATION SURVEY IN 12 ¼" PHASE

S.No.	Depth (m)	TOTCO Readings (degrees)
1	1626	1 ¼ °
2	1915	¾ °
3	2075	2 °

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4	2095	2 °
5	2898	1 ½ °
6	2902	1 ½ °

### MUD PARAMETERS IN 12 ¼" PHASE

DEPTH (m)	M.W (sg)	F.V (sec)	P.V (cP)	Y.P	Gel (0 / 10)	Water Loss (cc/30')	Solids (%)	pH	Sand (%)	Oil/Water (%)
760 – 762	1.13	44	17	17	--	12.0	--	9.5	--	--
762 – 800	1.13	45	16	26	--	14.0	--	8.5	--	--
800 – 870	1.19	45	12	26	2 / 3	8.8	--	8.5	--	--
870 – 921	1.22	46	18	17	2 / 3	6.2	10	8.5	0.4	--
921 – 961	1.24	46	19	25	3 / 5	6.4	--	8.5	0.4	--
961 – 1015	1.31	60	27	26	3 / 6	4.2	--	8.5	--	--
1015 – 1080	1.32	65	35	44	5 / 9	3.6	10	8.5	--	--
1080 – 1149	1.33	60	31	33	4 / 6	4.2	--	--	0.4	--
1149 – 1246	1.33	59	35	35	3 / 6	4.8	9	--	--	--
1246 – 1310	1.33	54	29	23	2 / 4	4.0	15	--	--	--
1310 – 1346	1.33	60	33	29	--	3.6	14	--	--	--
1346 – 1380	1.33	55	32	25	3 / 6	3.8	15	--	--	--
1380 – 1438	1.33	61	41	33	4 / 7	3.6	12	--	0.5	--
1438 – 1480	1.34+	55	30	23	3 / 4	3.4	16	--	--	--
1480 – 1520	1.34+	55	29	21	2 / 5	4.0	16	--	--	--
1520 – 1543	1.34	58	39	28	3 / 7	4.2	13	--	0.5	--
1543 – 1590	1.34+	65	39	28	3 / 7	3.2	17	--	--	--
1590 – 1626	1.35	68	42	38	4 / 7	4.0	13	--	0.5	--
1626 – 1636	1.34+	75	46	39	4 / 7	2.8	17	--	0.5	--
1636 – 1654	1.35	68	57	51	5 / 8	2.2	--	--	0.6	--
1654 – 1695	1.34+	71	42	34	3 / 6	3.4	18	--	--	--
1695 – 1756	1.34+	68	43	43	4 / 7	3.4	18	--	--	--
1756 – 1792	1.35	65	45	40	4 / 6	3.1	--	--	0.5	--
1792 – 1826	1.36	66	40	30	3 / 6	3.4	18	--	--	--
1826 – 1844	1.35+	64	44	30	3 / 6	2.8	18	--	--	--
1844 – 1864	1.37	63	47	38	4 / 7	3.6	16	--	--	--
1864 – 1874	1.34+	68	50	39	4 / 7	3.2	16.5	--	--	--
1874 – 1890	1.35+	68	39	30	3 / 7	2.8	18	--	--	--
1890 – 1910	1.36	67	45	40	4 / 7	2.8	18	--	--	--
1910 – 1915	1.36+	68	40	30	3 / 6	1.28	17	--	--	--
1915 – 1958	1.36+	64	45	36	4 / 7	2.0	16	--	--	--
1958 – 1968	1.36	60	44	34	--	2.0	--	--	--	--
1968 – 2058	1.36+	60	40	27	3 / 7	2.8	18	--	--	--
2058 – 2074	1.37	63	46	39	5 / 7	2.9	17.5	--	0.5	--
2074 – 2078	1.36+	60	37	24	3 / 6	3.0	18	--	--	--
2087 – 2083	1.35	60	48	32	4 / 7	3.0	18	--	--	--
2083 – 2095	1.37	61	40	21	3 / 6	2.4	18	7	0.5	--
2095 – 2103	1.35	59	42	28	4 / 7	2.0	18	7	0.5	--
2103 – 2120	1.36+	60	38	17	2 / 6	3.2	18	< 8.5	--	--
2120 – 2141	1.36+	71	48	26	3 / 6	2.6	18	< 8.5	--	Tr / 82



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DEPTH	M.W	F.V	P.V	Y.P	Gel	Water Loss	Solids	pH	Sand	Oil/Water
2141 – 2169	1.36+	68	58	47	5 / 6	3.0	18	--	--	--
2169 – 2230	1.36+	73	51	32	4 / 7	2.0	18	< 8.5	--	Tr / 82
2230 – 2251	1.36+	74	49	37	3 / 7	3.0	18	< 8.5	--	Tr / 82
2251 – 2317	1.36+	63	52	28	3 / 6	2.2	18	< 8.5	--	Tr / 82
2317 – 2360	1.36+	61	50	34	3 / 6	2.4	18	< 8.5	--	Tr / 82
2360 – 2371	1.35	63	62	36	5 / 7	2.9	17	--	--	Tr / 82
2371 – 2390	1.36	64	47	23	3 / 6	2.6	17	--	--	Tr / 83
2390 – 2404	1.35+	68	46	23	3 / 6	2.6	17	--	--	Tr / 83
2404 – 2439	1.36	73	52	27	3 / 7	2.8	17	< 8.5	--	Tr / 83
2439 – 2471	1.35+	72	51	33	4 / 7	2.8	17	< 8.5	--	--
2471 – 2528	1.35	65	46	39	5 / 7	2.9	16	< 8.5	--	Tr / 84
2528 – 2566	1.35	63	50	27	3 / 6	2.4	18	--	--	Tr / 82
2566 – 2606	1.35+	66	49	25	3 / 6	2.4	18	--	--	Tr / 82
2606 – 2669	1.35+	60	51	33	3 / 6	2.0	18.5	< 8.5	--	Tr / 82
2669 – 2712	1.37	73	44	23	3 / 6	2.8	18	--	--	Tr / 82
2712 – 2739	1.37	61	50	28	3 / 6	2.8	18	--	--	--
2739 – 2764	1.37	64	52	24	3 / 5	2.8	18	--	--	--
2764 – 2780	1.36	58	42	16	3 / 5	3.0	--	--	--	--
2780 – 2797	1.36+	61	50	24	4 / 6	3.0	18.2	< 8.5	--	--
2797 – 2821	1.36+	62	52	25	3 / 5	2.2	18	--	--	--
2821 – 2845	1.36+	60	47	23	3 / 5	--	--	--	--	--
2845 – 2853	1.37	60	67	26	3 / 6	3.0	18	< 8.5	--	--
2853 – 2858	1.36+	62	51	26	3 / 6	2.4	18	--	--	--
2858 – 2865	1.36+	60	54	22	3 / 6	2.8	18	< 8.5	--	Tr / 82
2865 – 2869	1.36+	65	53	33	3 / 6	2.8	18	< 8.5	--	Tr / 82
2869 – 2871	1.36+	62	52	24	3 / 6	2.8	18	< 8.5	--	Tr / 82
2871 – 2872	1.36	66	49	25	3 / 6	2.4	18	< 8.5	--	Tr / 82
2872 – 2875	1.36	65	53	29	3 / 5	2.4	18	< 8.5	--	Tr / 82
2875 – 2881	1.36	60	48	24	3 / 5	2.8	18	< 8.5	--	Tr / 82
2881 – 2890	1.36	59	50	21	3 / 5	3.0	18	< 8.5	--	Tr / 82
2890 – 2894	1.36	60	48	21	3 / 5	2.4	18	< 8.5	--	Tr / 82
2894 – 2898	1.36+	60	50	21	3 / 5	2.6	18	< 8.5	--	Tr / 82
2898 – 2899	1.37	60	54	22	3 / 5	3.0	18	< 8.5	--	Tr / 82
2899 – 2902	1.37	60	49	20	3 / 4	3.0	18	< 8.5	--	Tr / 82

### BIT DATA IN 12 ¼" PHASE

Bit #	Size (inch)	Make	Type	IADC	Serial	Nozzle	In (m)	Out (m)	Mtg (m)	Hrs
3 RR	12 ¼"	China	LHT 117GC	1-1-7	13380	22 x 4	760.24	988.57	228.33	33.08
4	12 ¼"	Hughes	MXCR03D	4-1-7	U95YF/ M22-03D-A1	18 x 3 16 x 1	988.57	1626	637.43	91.01
5	12 ¼"	China	LHA 437GC	4-3-7	14143	22 x 4	1626	1519.92	289.92	64.59
6	12 ¼"	NewTech (PDC)	NTS 605	--	--	16 x 7	1519.92	2075	159.08	17.82

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7	12 ¼"	China	LHA 417GC	4-1-7	13487	18 x 3 20 x 1	2075	2095	20	18.14
8	12 ¼"	Compass (PDC)	G536 XLK	--	H86095	14 x 6	2095	2871	776	187.14
9 RR	12 ¼"	Hughes	MXGT03	4-1-7	D09DJ / X220355	18 x 3 16 x 1	2871	2892	21	30.70
10	12 ¼"	Hughes	ATJ-28	5-2-7	K23DJ	18 x 3	2892	2898	6	13.67
11	12 ¼"	NewTech (PDC)	NT 408	--	21400	18 x 10	2898	2902	4	13.86

### CASING AND CEMENTATION IN 12 ¼" PHASE

#### Casing Data

Date of casing	: 06.02.07 to 07-02.07
Size of casing	: 9 5/8"
Inner Diameter	: 8.681" (47 PPF) and 8.755" (43.5 PPF)
Weight	: 47 PPF and 43.5 PPF
Grade	: L-80 (135 Joints) and N-80 (148 joints)
Well depth	: 2902.20 m
Well diameter	: 12 ¼"
Casing shoe @	: 2899.08 m

#### Cementation Data

Date of cementation	: 07.02.07 to 08.02.07
Type of cement	: G - Grade
Volume of cement slurry	: 210.11 bbls
Av. sp.gr of tail cement slurry	: 15.80 ppg
Av. sp.gr of displacing mud	: 11.42 ppg
Cement Rise	: Upto 1900 m

### TIME ANALYSIS OF 12 ¼" PHASE: (04.01.07 – 19.02.07)

ACTIVITY	TOTAL HOURS	PERCENT
Drilling	501.00	45.75
Reaming	60.25	5.50
Circulation	35.50	3.24
Tripping	132.75	12.12
Repairs	32.25	2.95
Cut & Slip Drill line	5.75	0.53
Casing & Cementation	33.75	3.08
WOC	24.25	2.21
N/Up BOP	22.00	2.01

# FINAL WELL REPORT

## SGL # 2

Test BOP	4.00	0.37
Miscellaneous	243.50	22.24
<b>TOTAL</b>	<b>1095.00</b>	<b>100.00</b>

### **N.B: As per IADC**

Misc. includes KCl mud preparation, TOTCO, General/Mechanical maintainence, servicing and arrangements for next operation.

## **8 ½" PHASE**

Period : 19.02.2007 to 04.04.2007  
Interval : 2902.20 m – 3275.21 m.  
No. of bits : 7  
Mud type : KCl-PHPA mud system  
Time taken : 43.75 days

## **DRILLING REVIEW OF 8 ½" PHASE**

# FINAL WELL REPORT

## SGL # 2

This phase constituted of drilling Mesozoic sedimentary column. Mesozoic was represented by Goru (Upper Cretaceous) and Pariwar (Late Cretaceous) and Baisakhi & Badesar (Upper Jurassic) formations.

After the WOC of 9 5/8" casing, RIH with with new 8 1/2" bit (Reed, 4-3-7) with the following BHA elements [Bit (0.26 m) + Bit sub (0.93 m) + 16 joints of 6 1/2" Drill Collar (150.12 m) + 11 joints of 5" HWDP (102.21 m) i.e. Total BHA 253.52 m] and RIH upto 2866 m, further reamed and washed down to float collar, drilled float collar, cement and shoe and drilled formation from 2902.20 m to 2947 m. Circulate prior to POOH for bit change due to poor penetration and increase in torque. Dropped TOTCO, and POOH, Bit on surface, B/off bit, the rubber of FC and shoe was found stuck between rollers. The pulled out bit was dull graded as 1-1-WT-A-E-I-NO/RR-PR. The TOTCO deviation recorded at 2947 m was 1°.

RIH with with new 8 1/2" bit (China, 3-1-7) with the same BHA elements [Bit (0.25 m) + Bit sub (0.93 m) + 16 joints of 6 1/2" Drill Collar (150.12 m) + 11 joints of 5" HWDP (102.21 m) i.e. Total BHA 253.51 m], RIH upto 2937 m, reamed and washed down kelly length. Resume drilling and drilled ahead 8 1/2" hole from 2947 m to 2980 m. Circulate the hole clean prior to POOH for bit change due to poor ROP. Dropped TOTCO and POOH, the TOTCO deviation recorded at 2980 was 1°. The pulled out bit was dull graded as 7-6-WT-A-E-I-NR-PR.

RIH with with new 8 1/2" bit (China, 5-1-7) with the same BHA elements [Bit (0.24 m) + Bit sub (0.93 m) + 16 joints of 6 1/2" Drill Collar (150.12 m) + 11 joints of 5" HWDP (102.21 m) i.e. Total BHA 253.50 m], RIH upto 282 m, cut and slip drill line (slipped 60 m and cut 68 m) and set crown-o-matic. Futher RIH upto 2975 m, reamed and washed down kelly length, and drilled ahead 8 1/2" hole from 2980 m to to 3062.64 m. Observed gas cut mud (MW in 1.18 S.G and MW out 1.15 S.G), Check flow, + ve, and circulate bottoms up. Resumed drilling and drilled ahead 8 1/2" hole from 3062.64 m to 3068 m, circulate prior to wiper trip upto shoe. P/O upto shoe, checked flow, function test Pipe RAM and Annular BOP, found okay. R/I upto bottom, circulate and condition mud prior to POOH for DST. Dropped TOTCO and POOH. The pulled out bit was dull graded as 1-1-WT-A-E-I-NO-DST and the TOTCO was misrun as baffle plate was broken.

RIH with **conventional DST assembly to test interval 3057-3068 m**, having the following elements [Bull nose (0.71 m) + Spacing (3.12 m) + Outside Recorder Carrier (2.62 m) + Perforated Spacing (3.00 m) + Packer Stick down (1.55 m) + Packer Stick up (1.64 m) + Packer Stick down (1.55 m) + Packer Stick up (1.64 m) + Safety Joint (0.80 m) + Inside Recorder Carrier (1.70 m) + Hydraulic shut in valve (2.86 m) + Rotary shut in tool (1.89 m) + Recovery Recorder Carrier (1.43 m) + X-Over Sub (0.80 m) + 1 joints of 6 1/2" Drill collar (9.38 m) + Impact Reversing Sub (0.39 m) + 1 joints of 6 1/2" Drill collar (9.34 m) + Pump out Reversing Sub (0.39 m) + 12 joints of 6 1/2" Drill collar (112.61 m) + Drilling Jar (5.30 m) + 2 joints of 6 1/2" Drill collar (18.79 m) + 11 joints of 5" HWDP (102.21 m) i.e. TOTAL 283.72 m ]; R/I to bottom (3068 m), R/up chickens lines and DST floor manifold, set packer, opened tool, observed weak to strong blow of air and no inflammable gas, observed mud level dropping in annulus. Kept hole full and kept tool open for 40 minutes, found mud level continuously dropping. Closed tool, released packer, R/dn DST floor manifold and chickens lines and P/O DST assembly inside casing shoe (2899 m). Pumped out reverse circulating

## FINAL WELL REPORT

### SGL # 2

sub and circulate and condition mud, and POOH DST assembly to surface. Found both top and bottom packer damaged (half the rubber of both packer left in hole). B/off and L/dn DST assembly.

RIH with new 8 ½" bit (China, 5-2-7), incorporated drilling jar in BHA having the following elements [Bit (0.24 m) + Bit sub (0.93 m) + 14 joints of 6 ½" Drill Collar (131.33 m) + Drilling Jar (5.30 m) + 2 joints of 6 ½" Drill Collar (18.79 m) + 11 joints of 5" HWDP (102.21 m) i.e. Total BHA 258.80 m], R/I upto 3075 m, M/up Kelly, established circulation, observed held up at 3057.50 m. L/dn 2 singles and reamed and washed down to bottom (3068 m) to circulate out the DST packer left in hole. Resumed drilling and drilled ahead 8½" hole from 3068 m to 3117.40 m. After P/C while going to bottom, prior to resume drilling, suddenly travelling block hook lock got free, so picked up kelly, B/off and racked kelly. POOH upto 2884m (shoe). Removed link and elevator, checked the lock assembly found ok, but inside of hook (locking position) got free. Tried to repair the same but no success.

Replaced old hook with new and pick up kelly to test swivel, found swivel not rotating. B/off kelly, opened swivel for repairing, found one inside bearing broken, repaired swivel (replaced all three bearings), tested swivel, fixed kelly, hose pipe and kelly bushing and circulate and condition mud (1cycle). Observed oil leaking from hook, arrest leak and repair hook lock. Filled hole every two hours interval. RIH from 2884.91 m to 3114 m, reamed and washed down to bottom (3117 m) and drilled ahead 8½" hole from 3117.40 m to 3146.36 m. Circulate for hole flushing, further drilled ahead 8 ½" hole from 3146.36 m to 3155 m, circulate and condition mud prior to POOH for air drilling. P/O upto 2856 m and repaired hook lock. Continued POOH, bit on surface, B/off bit, retrieved TOTCO. The pulled out bit was dull graded as 1-2-BT (1)/CT (4)-H-E-I-NO/RR-AD and the TOTCO deviation recorded at 3151 m was 1½°. While P/O laid down 4 joints of 6 ½" Drill collar and D/Jar. Closed Blind RAM, removed riser and laid down the same. Fabricate spacer spool, fixed spacer spool, rotating head, fixed flow line and blooie line to spacer spool and removed stripper rubber of rotating head.

RIH with RR 8 ½" bit (China, 5-1-7) with new BHA having the following elements [Bit (0.24 m) + Bit sub (0.93 m) + 12 joints of 6 ½" Drill Collar (112.54 m) + Drilling Jar (5.30 m) + 2 joints of 6 ½" Drill Collar (18.55 m) + 9 joints of 5" HWDP (83.63 m) i.e. Total BHA 221.19 m], R/I upto 3144 m, reamed and washed down kelly length, C & C mud and drilled ahead 8½" hole from 3151m to 3210.50 m, circulate the hole clean and POOH for air drilling / poor penetration rate. Checked flow, -ve, POOH, the pulled out bit was dull graded as 2-6-BT (15)-H/M-E-1/6"-NO-AD/PR.

RIH with RR 8 ½" bit (China, 5-2-7) with new BHA having the following elements [Bit (0.24 m) + Bit sub (0.93 m) + Junk Sub (1.08 m) + X-Over (0.89 m) + X-Over (0.81 m) + X-Over (0.80 m) + 5 joints of 6 ½" Slick Drill Collar (46.86 m) + Drilling Jar (5.30 m) + 2 joints of 6 ½" Slick Drill Collar (18.75 m) + 9 joints of 5" HWDP (83.63 m) i.e. Total BHA 159.29 m], R/I upto 2861 m, checked drill pipe float valve. M/up kelly and filled string, observed pressure shoot upto 2000 psi, close pipe RAM and pumped through annulus to clear drill pipe float, found float okay. Further RIH, encountered held up at 3189 m (14 Tons), reamed from 3177 m to bottom (3210.50 m). Work on Junk sub, P/O upto shoe, and dispartsd

## FINAL WELL REPORT

### SGL # 2

mud with water by cementing unit, stopped pumping, observed self flow, found well active. Opened HCR valve, closed pipe RAM, SCIP 550-950 psi and circulate the well through choke to kill the same, observed the well static, opened pipe RAM. Circulate and condition mud inside shoe, increased M.W from from 1.22 S.G to 1.26 S.G. B/off kelly, RIH from 2890 m to 3206 m, M/up kelly, tagged bottom, circulate and condition mud, increased MW from 1.27 S.G to 1.30 S.G and POOH for DST. P/O upto 2887.68 m, checked flow, -ve, continued P/O upto 2479.48 m, subsequently checked flow, -ve. Further P/O upto 2050.40 m, checked flow, P/O from 2050.40 m to 1733.75 m, checked flow, -ve and further P/O upto 954.24 m, checked flow, -ve. POOH, bit on surface, B/off bit and J/Sub, recovered 93 g of broken inserts from J/Sub.

RIH with **conventional DST assembly** with tail pipe and packer seal at in casing at 2892 m. RIH having the following elements [Bull nose (0.60 m) + X-Over (0.84 m) + 32 joints of 5" Drill pipe (306.86 m) + X-Over (0.84 m) + Spacing (2.41 m) + Outside Recorder Carrier (2.19 m) + Perforated Spacing (2.98 m) + Packer Stick down with X-Over (1.78 m) + Packer Stick up (1.39 m) + Packer Stick down (1.37 m) + Packer Stick up with X-Over (1.80 m) + Safety Joint (0.67 m) + Inside Recorder Carrier (1.50 m) + Hydraulic shut in valve (2.39 m) + Rotary shut in tool (1.62 m) + Recovery Recorder Carrier (1.20 m) + X-Over Sub (0.80 m) + 1 joints of 6 ½" Drill collar (9.38 m) + Impact Reversing Sub (0.32 m) + 1 joints of 6 ½" Drill collar (9.34 m) + Pump out Reversing Sub (0.32 m) + 10 joints of 6 ½" Drill collar (93.82 m) + Drilling Jar (5.30 m) + 2 joints of 6 ½" Drill collar (18.55 m) + 9 joints of 5" HWDP (83.63 m) i.e. TOTAL 551.90 m ]; R/I with conventional DST assembly upto 839 m, filled string with water having 500 m of water cushion, subsequently R/I from 839 m to bottom and tagged bottom (3210.50m). R/up DST rotating head, chickens lines and DST floor manifold, set packer, opened tool, observed weak to strong blow of air in 3 minutes during pre flow of 15 minutes. Initial Shut In (ISI) for 1hr and opened tool for main flow, and flowed the well for 1.25 hrs, water surfaced after 7 minutes. Fluid spray (water mist along with gas) flowed from well. Final Shut In for 2.5 hours, the gas was flared after Final Shut In at the flare pit. Released packer, R/dn DST surface equipments and POOH. The fluid (water w/trace of condensate) was encountered after pulling out 91 stands (P/O Depth 580 m). DST assembly on surface, found both packers damaged, B/off DST assembly and L/dn the same, further POOH tail pipe (32 singles).

RIH with new bit (China, 5-3-7) with the following BHA [Bit (0.24 m) + Bit sub (0.93 m) + 12 joints of 6 ½" Drill Collar (112.54 m) + Drilling Jar (5.30 m) + 2 joints of 6 ½" Drill Collar (18.55 m) + 9 joints of 5" HWDP (83.63 m) i.e. Total BHA 221.19 m], RIH and encountered held up @ 3132 m (7 – 8 Tons), reamed and washed down from 3125 m to bottom (3210.50m). Subsequently drilled ahead 8½" hole from 3210.50 m to 3221.21 m. Circulate and condition mud prior to wipe trip, made a wiper trip upto 9 5/8" casing shoe (11 stands). Circulate and condition mud prior to POOH for logging and POOH for logging. The pulled out bit was dull graded as 0-0-NO-H-E-1/12"-RR-LOG and the TOTCO deviation recorded at 3221 m was 1 ¼°.

R/up logging gears and R/I logging tools, recorded DLL-MFSL-GR-CALI-SP in the first run, DSN-SDL-GR-CALI in the second run and subsequently recorded GR-FWS in the final run and R/dn Logging tool and logging gears. Made arrangements for VSP, assembled 7" liner hanger, meanwhile cut and slip of drill line (32.5 m).

## **FINAL WELL REPORT**

### **SGL # 2**

RIH VSP tool and recorded check shot from 3200 m to 600 m at 100 m interval, and R/dn VSP tool and logging gear.

RIH with RR bit (China, 1-1-7), with same BHA [Bit (0.24 m) + Bit sub (0.93 m) + 12 joints of 6 ½" Drill Collar (112.54 m) + Drilling Jar (5.30 m) + 2 joints of 6 ½" Drill Collar (18.55 m) + 9 joints of 5" HWDP (83.63 m) i.e. Total BHA 221.19 m], RIH upto bottom, circulate and condition mud and POOH for lowering 7" liner.

Lowered 35 joints of 7" casing liner (29 PPF) with shoe and shear out landing collar and 9 centralizers. M/up casing hanger tool and RIH with 5" DP upto 3219.27 m, fixed chickens line and circulating head and circulate. Dropped ball and and pressurized upto 1900 psi and shear the ball seat @ 2700 psi, found hanger not set. Circulate and tried to set hanger, but no success. B/off and L/dn chickens line, P/O Liner Hanger Tool to surface, found tool faulty. Decided to POOH casing liner, B/off Liner Hanger and L/dn the same. Further POOH 7" casing, recovered all 9 centralizers and R/dn casing gears.

RIH with new bit (China, 5-1-7), with same BHA [Bit (0.25 m) + Bit sub (0.93 m) + 12 joints of 6 ½" Drill Collar (112.54 m) + Drilling Jar (5.30 m) + 2 joints of 6 ½" Drill Collar (18.55 m) + 9 joints of 5" HWDP (83.63 m) i.e. Total BHA 221.20 m], R/I upto 3210 m, further ream and washed down to bottom (3221.21 m) and drilled ahead 8 ½" hole from 3221.21 m to to 3275.21. Circulate and condition mud prior to POOH for lowering 7" liner, B/off kelly, dropped TOTCO and POOH. The pulled out bit was dull graded as 3-3-CT (4)-H-E-1/12"-RR-TD and the TOTCO deviation recorded at 3275 m was 1°.

R/up casing gear and lowered 42 joints of 7" casing (29 PPF) upto 483.81 m, M/up liner hanger assembly and further RIH with 5" DP upto 2878 m. Circulate in shoe, further RIH from 2878 m to 3271.90 m. Circulate, dropped the ball and set hanger, open R/Tool, and C & C mud prior to cementation. R/up cementing lines, pressure test lines at 2000 psi, pumped 5 bbls of pre flush, mixed and pumped 80 bbls of cement slurry of 15.8 ppg. Dropped DPWP and displaced cement slurry with 218.5 bbls mud of 11.00 ppg by Rig pumps. Bumped plug at 2000 psi, bleed pressure, found float holding. Set packer, P/O 2 singles and 12 stands, circulate and subsequently POOH and L/dn R/tool.

RIH with RR bit (China, 1-1-7), to clear cement upto TBR top, with the following BHA [Bit (0.24 m) + Bit sub (0.93 m) + 12 joints of 6 ½" Drill Collar (112.54 m) + 9 joints of 5" HWDP (83.63 m) i.e. Total BHA 197.34 m], RIH upto 2411 m and WOC. After WOC, subsequently RIH and tagged cement at 2723 m, drilled cement and tagged TBR top at 2782.75 m. Circulate the hole clean and POOH.

### **DRILLING DATA IN 8 ½" PHASE**

# FINAL WELL REPORT

## SGL # 2

DEPTH	WOB	RPM	TRQ	SPP	Flow Pumps	Av. ROP	ROP max	ROP min
(m)	(Tons)	(rpm)	(f*lbs)	(psi)	(lts/min)	(m/hr)	(m/hr)	(m/hr)
2902 – 2914	8 – 11	32 – 51	--	1535 – 1862	1399 – 1521	1.07	1.92	0.70
2914 – 2927	8 – 12	32 – 51	--	1669 – 1766	1440 – 1499	0.57	1.19	0.30
2927 – 2947	9 – 12	31 – 51	--	1548 – 1734	1425 – 1504	0.92	1.41	0.37
2947 – 2950	11 – 15	34 – 37	--	1622 – 1666	1532 – 1539	0.61	0.74	0.71
2950 – 2968	13 – 15	34 – 48	--	1594 – 1738	1479 – 1547	0.78	0.96	0.59
2968 – 2980	12 – 15	34 – 47	--	1670 – 1810	1485 – 1544	0.71	0.86	0.56
2980 – 3001	11 – 12	42 – 52	--	1766 – 2041	1359 – 1452	1.75	2.28	1.35
3001 – 3040	7 – 13	33 – 59	--	1637 – 2162	1339 – 1477	1.74	3.88	0.85
3040 – 3068	10 – 15	32 – 48	--	1629 – 1989	1413 – 1479	1.77	5.62	1.11
3068 – 3070	10 – 11	46 – 47	--	1912 – 1958	1456 – 1458	1.37	2.23	1.83
3070 – 3107	9 – 13	34 – 57	--	1802 – 1979	1393 – 1468	1.64	4.75	0.81
3107 – 3117	11 – 13	37 – 47	--	1791 – 1968	1428 – 1479	1.21	1.44	0.86
3117 – 3146	9 – 12	50 – 56	--	1756 – 1912	1425 – 1476	1.93	5.06	1.02
3146 – 3151	11 – 12	54 – 56	--	1709 – 1887	1396 – 1495	2.16	3.12	1.25
3151 – 3161	11 – 12	50 – 55	--	1781 – 1855	1422 – 1462	2.21	3.48	1.02
3161 – 3200	10 – 13	50 – 56	--	1737 – 2013	1415 – 1506	1.75	3.35	0.97
3200 – 3210	11 – 12	53 – 56	--	1951 – 2027	1489 – 1536	1.35	4.07	0.88
3210 – 3214	11 – 12	36 – 52	--	1908 – 2005	1455 – 1485	0.40	2.03	0.32
3214 – 3221	13 – 15	35 – 50	--	1883 – 2025	1410 – 1471	0.33	0.46	0.21
3221 – 3223	9 – 10	35	--	1842 – 1866	1499	0.45	0.60	0.44
3223 – 3247	8 – 10	34 – 51	--	1768 – 1905	1471 – 1521	1.05	4.26	0.28
3247 – 3272	9 – 10	35 – 42	--	1728 – 1851	1472 – 1526	1.09	3.92	0.32
3272 – 3275	9 – 10	36 – 38	--	1821 – 1937	1457 – 1537	0.34	0.99	0.23

### DEVIATION SURVEY IN 8 ½" PHASE

S.No.	Depth (m)	TOTCO Readings (degrees)
1	2947	1 °
2	2980	1 °
3	3151	1 ½ °
4	3221	1 ¼ °
5	3275	1 °

### MUD PARAMETERS IN 8 ½" PHASE

DEPTH	M.W	F.V	P.V	Y.P	Gel	Water Loss	Solids	pH	Sand	Oil/Water
(m)	(sg)	(sec)	(cP)		(0 / 10)	(cc/30')	(%)		(%)	(%)
2902 – 2911	1.25+	66	50	23	3 / 4	2.8	15	<8.5	--	Tr / 85
2911 – 2915	1.25+	60	39	24	3 / 4	3.9	15	<8.5	--	Tr / 85
2915 – 2924	1.26	64	37	30	3 / 5	3.4	15	<8.5	--	Tr / 85
2924 – 2932	1.25+	56	39	28	3 / 5	3.6	15	<8.5	--	Tr / 85



# FINAL WELL REPORT

## SGL # 2

DEPTH	M.W	F.V	P.V	Y.P	Gel	Water Loss	Solids	pH	Sand	Oil/Water
2932 – 2944	1.26	56	41	24	3 / 4	3.4	15	<8.5	--	Tr / 85
2944 – 2947	1.25	58	47	26	3 / 4	3.4	15	<8.5	--	Tr / 85
2947 – 2948	1.26	58	37	30	4 / 6	3.4	15	<8.5	--	Tr / 85
2948 – 2956	1.25+	54	35	22	3 / 4	3.6	14	<8.5	--	Tr / 86
2956 – 2964	1.26	55	37	25	3 / 4	3.4	14	<8.5	--	Tr / 86
2964 – 2972	1.25+	58	43	27	3 / 4	3.4	14	<8.5	--	Tr / 86
2972 – 2980	1.26	57	37	22	3 / 4	3.4	14	<8.5	--	Tr / 86
2980 – 2989	1.26	55	38	22	3 / 4	3.4	14	<8.5	--	Tr / 86
2989 – 3011	1.25+	54	39	20	3 / 4	3.2	14	<8.5	--	Tr / 86
3011 – 3033	1.26	55	36	25	3 / 5	3.2	13	<8.5	--	Tr / 87
3033 – 3050	1.19	56	38	22	4 / 5	5.0	12	<8.5	--	Tr / 88
3050 – 3067	1.17+	69	36	30	4 / 6	3.6	11	<8.5	--	Tr / 89
3067 – 3068	1.19	69	46	43	5 / 7	3.9	11	<8.5	--	Tr / 89
3068 – 3081	1.19	55	32	28	4 / 6	3.7	12	<8.5	--	Tr / 89
3081 – 3102	1.19+	55	36	32	5 / 7	1.8	12	<8.5	--	Tr / 88
3102 – 3113	1.19	56	35	31	4 / 6	1.8	12	<8.5	--	Tr / 88
3113 – 3121	1.19	52	27	27	5 / 7	3.9	--	--	--	--
3121 – 3140	1.19+	50	24	23	4 / 6	3.9	--	--	--	--
3140 – 3156	1.19+	54	20	32	4 / 6	3.2	12.5	--	--	--
3156 – 3172	1.21	56	33	38	8 / 13	3.7	13	--	--	--
3172 – 3188	1.20	55	28	35	7 / 10	3.1	11	--	--	--
3188 – 3209	1.20+	54	33	37	8 / 11	3.8	13	--	--	--
3209 – 3212	1.29+	55	25	26	4 / 5	2.9	15	--	--	--
3212 – 3218	1.31	51	32	47	9 / 13	2.6	13	--	--	--
3218 – 3219	1.30	53	30	35	7 / 10	3.0	15	--	--	--
3219 – 3221	1.30+	57	39	47	9 / 13	3.2	16	--	--	--
3221 – 3223	1.30	53	29	37	7 / 10	2.8	15.5	--	--	--
3223 – 3231	1.31	51	33	38	8 / 10	3.0	--	--	--	--
3231 – 3235	1.30+	53	32	31	6 / 8	2.9	16	--	--	--
3235 – 3257	1.29+	54	35	45	9 / 12	3.1	16	--	--	--
3257 – 3266	1.29	55	25	46	7 / 10	3.0	15.5	--	--	--
3266 – 3275	1.29	54	36	45	9 / 12	3.3	16	--	--	--

### BIT DATA IN 8 ½" PHASE

Bit #	Size (inch)	Make	Type	IADC	Serial	Nozzle	In (m)	Out (m)	Mtg (m)	Hrs
12	8 ½"	Reed	HP43 AKPRD	4-3-7	DX6794	14 x 3	2902	2947	45	55.92
13	8 ½"	China	7-0095	3-1-7	225	12 x 1 14 x 1 16 x 1	2947	2980	33	44.99
14	8 ½"	China	7-0095	5-1-7	276	13 x 3	2980	3068	88	50.24
15	8 ½"	China	7-0095	5-2-7	718	13 x 3	3068	3151	83	49.74

# FINAL WELL REPORT

## SGL # 2

14RR	8 ½"	China	7-0095	5-1-7	276	13 x 3	3151	3210.50	59.5	34.16
15RR	8 ½"	China	7-0095	5-2-7	718	13 x 3	3210.50	3210.50	--	--
16	8 ½"	China	7-0095	5-3-7	151	13 x 3	3210.50	3221	10.50	30.89
17RR	8 ½"	China	7-0095	1-1-7	019	OPEN	3221	3221	--	--
18	8 ½"	China	LHJ517G	5-1-7	05480	14 x 3	3221	3275	54	59.16
17RR	8 ½"	China	7-0095	1-1-7	019	OPEN	3275	3275	--	--

### CASING LINER AND CEMENTATION IN 8 ½" PHASE

#### Casing liner Data

Date of casing liner : 02.04.07  
Size of casing liner : 7"  
Type / Grade : N-80  
Total No of Joints : 42  
Weight : 29 PPF  
Well depth : 3275.21 m  
Well diameter : 8 ½"  
Casing liner shoe @ : 3272.60 m  
TBR Top @ : 2783 m

#### Cementation Data

Date of cementation : 02.04.07  
Type of cement : G - Grade  
Volume of preflush : 5.00 bbls  
Volume of tail cement slurry : 80.09 bbls  
Av. sp.gr of tail cement slurry : 15.80 ppg  
Volume of displacing mud : 218.50 bbls  
Av. sp.gr of displacing mud : 11.00 ppg  
Bump plug @ : 2000 psi  
Cement Rise : 2733 m (Calculated 50 m above TBR top)

N.B. Annular volume as per caliper logs + 20 % excess

### TIME ANALYSIS OF 8 ½" PHASE: (19.02.07 – 04.04.07)

ACTIVITY	TOTAL HOURS	PERCENT
Drilling	340.25	32.40
Reaming	26.00	2.48
Circulation	60.25	5.74
Tripping	200.50	19.10
Repairs	74.50	7.10
Cut & Slip Drill line	5.00	0.48
Wireline Logging	29.50	2.81

## FINAL WELL REPORT

### SGL # 2

Casing & Cementation	47.00	4.48
WOC	9.50	0.90
Test BOP	0.25	0.02
DST	10.25	0.98
Miscellaneous	247.00	23.52
<b>TOTAL</b>	<b>1050.00</b>	<b>100.00</b>

#### **N.B: As per IADC**

Misc.: includes TOTCO, flow check, arrangements for next operation, General/Mechanical maintenance and servicing.

## **6" PHASE (Air Drilling)**

Period : 04.04.2007 to 15.04.2007  
No. of bits : 3  
Fluid type : Air  
Time taken : 11.75 days

### **DRILLING REVIEW OF 6" PHASE**

## FINAL WELL REPORT

### SGL # 2

This phase constituted of drilling Mesozoic sedimentary column. Mesozoic was represented by Pariwar (Late Cretaceous) and Baisakhi & Badesar (Upper Jurassic) formations.

After clearing cement upto TBR top (2782.75 m), RIH with new 6" bit (Smith, 1-1-7) with the following BHA elements [6" Bit (0.19 m) + Bit sub (0.93 m) + 7 joints of 4 ¾" Drill Collar (65.87 m) + 9 joints of 3 ½" HWDP (84.86 m) i.e. Total BHA 151.85 m]. RIH upto 2771 m, M/up kelly and drilled cement and DPOB. Subsequently RIH upto 3240 m, M/up kelly and tagged L/collar at 3247.92 m. Drilled LWP, DPWP, shear out landing collar and cement upto 3267.60 m. Circulate the hole clean, displaced mud with water by cementing unit and POOH. The pulled out bit was dull graded as 4-6-BT (6)-N-E-I-NR-TD.

RIH with new 6" bit (Lilin, 6-3-7), with the following BHA [Bit (0.19 m) + Bit sub (0.93 m) + X-Over (0.83 m) + 7 joints of 4 ¾" Drill Collar (65.87 m) + 9 joints of 5" HWDP (84.86 m) i.e. Total BHA 152.68 m], RIH upto 819 m, fixed stripper rubber of rotating head, removed return diverter gate and fixed gate in flow line side. M/up kelly, displaced water with air, no returns (pressurized upto 950 psi). P/O from 819 m to 720, try to displace water with air, no success. Further P/O from 720 m to 480 m; try to displace water with air but no success (pressurised upto 900 psi). Closed BOP, pressurized from annulus, no returns. Pressurized through mist pump upto 1900 psi, no returns. Closed BOP, pressurized through annulus upto 1500 psi by mist pump, no returns. POOH, B/off bit and X-Over, found X/O and drill collar plugged with pipe scales and mud chemicals fines.

RIH open end upto 516 m and knocked out water from annulus by air mist. Further RIH upto 1006 m, tried to displace water but no success. P/O from 1006 m to 719 and knocked out water by air mist, further RIH and knocked out water every 100 m by air mist upto 3266 m. Line up the second booster pump and try knock out water at 3266 m, no returns. P/O from 3266 m to 3086 m, pump air mist, and knocked out water. Further RIH from 3086 m to 3172 m, knocked out water by air mist. RIH from 3172 m to 3258 m and knocked out water by air mist and POOH.

RIH with same 6" bit (Lilin, 6-3-7) with the following BHA [Bit (0.19 m) + Bit sub with Float Valve, Plunger Type (0.93 m) + X-Over with Float Valve, Flapper (0.83 m) + 7 joints of 4 ¾" Drill Collar (65.87 m) + 9 joints of 5" HWDP (84.86 m) i.e. Total BHA 152.68 m], and RIH upto 2934 m, fixed stripper rubber of rotating head, M/up kelly and circulate air to check the same, found okay. Further RIH from 2934 to 3259.61 m, M/up kelly, circulate air to clean the hole. Drilled cement, shoe from 3267.60 to 3274.21 m, observed increase in pressure while circulating air and subsequently no returns. Initially some loose coarse-very sand with cement was observed in sample and later observed formation water influx. The water sample from blooey line sampling point had salinity of 54500 ppm. (The mist water and technical water had salinity of 13000 ppm). P/O upto 3210 m (2 stands), circulate air mist, observed increase in pressure and no returns. Decided to POOH, P/O upto 2700 m, circulate air, observed no returns. POOH upto 2924 m, further POOH in progr Continue to POOH from 2924 m to surface, encountered water at 632 m and found both float valve and drill collar (#1) plugged with cement cuttings and pipe scales.

## FINAL WELL REPORT

### SGL # 2

RIH with same bit (China, 6-3-7), with the following BHA [Bit (0.19 m) + Bit sub (0.93 m) + X-Over with Float Valve, Flapper (0.83 m) + 7 joints of 4 ¾" Drill Collar (65.87 m) + 9 joints of 5" HWDP (84.86 m) i.e. Total BHA 152.68 m], RIH upto 1986 m. Serviced float valves, cleaned 4 ¾" DC and rabbit 3½" DP prior to RIH. M/up kelly, circulate air, no returns. P/O from 1986 m to 1500 m, M/up kelly, circulate air, no returns. Further P/O from 1500 m to 748.78 m, circulate air and knocked out water from well and kept well under observation for 9.50 hours. The water sampled from blooey line had salinity of 55200 ppm. P/O from 748.78 m to 403 m, circulate air and knocked out water from well and futher POOH to surface.

RIH open end with 5" Drill pipe upto 115 m and POOH the same.

RIH with new bit (Lilin, 6-3-7) with the same BHA [Bit (0.19 m) + Bit sub (0.93 m) + X-Over with Float Valve, Flapper (0.83 m) + 7 joints of 4 ¾" Drill Collar (65.87 m) + 9 joints of 5" HWDP (84.86 m) i.e. Total BHA 152.68 m], RIH upto 3269.18 m, M/up kelly, circulate water by mud pumps, observed pressure shoot upto 3000 psi, bleed pressure and tried thrice, no success. POOH and filled annulus after every 5 stands through kill line. After POOH found first single of Drill Collar (#1) and bit plugged with pipe scales and cement cuttings.

RIH open end 5" Drill Pipe upto 287.35 m (10 stands), kept well under observation, and meanwhile made arrangements for next operation. POOH open end 5" Drill pipe from 287.35 m to surface.

RIH open end 3 ½ " Drill pipe (72 singles) upto 691.42 m, further RIH with 5" Drill pipe upto 3260 m for cement plug. M/up kelly and displaced well water with mud, circulate and condition mud prior to cement plug. The maximum trip gas recorded was 34.75 % having C<sub>1</sub> 317212 ppm, C<sub>2</sub> 13322 ppm, C<sub>3</sub> 1046 ppm, iC<sub>4</sub> 34 ppm, nC<sub>4</sub> 74 ppm, iC<sub>5</sub> 5 ppm and nC<sub>5</sub> 1 ppm. B/off kelly and add one single (3270 m). R/up cementing head and cementing lines and pressure test lines at 2000 psi. Pumped 10 bbls of water ahead, mixed and pumped 6.10 bbls of cement slurry of 15.8 ppg. Pumped 2.90 bbls of water behind and displaced with 164 bbls of mud to balance the plug by rig pumps (1492 strokes). R/dn cementing head and cementing lines, P/O from 3270 m to 3021 m (2 singles + 8 stands), circulate to clean Drill pipe, WOC, meanwhile POOH.

### BIT DATA IN 6" PHASE

Bit #	Size (inch)	Make	Type	IADC	Serial	Nozzle	In (m)	Out (m)	Mtg (m)	Hrs
19	6"	Smith	MFDSH	1-1-7	MP8292	OPEN	3275	3275	--	--
20	6"	China	LHA637D	6-3-7	11860	OPEN	3275	819	--	--
20 RR2	6"	China	LHA637D	6-3-7	11860	OPEN	3275	3274	--	--
20 RR3	6"	China	LHA637D	6-3-7	11860	OPEN	3275	1986	--	--
21	6"	China	LHA637D	6-3-7	11202	OPEN	3275	3269	--	--

## FINAL WELL REPORT

SGL # 2

### CEMENTATION (PLUG BACK) IN 6" PHASE

**CEMENT PLUG** : **50 m**  
Drilled Depth (8 ½" Section T.D) : 3275.21 m  
Drilled Depth (Air drilling, 6" Phase) : 3274.21 m  
Well diameter : 6"  
7" Casing shoe @ : 3272.60 m  
**Cementation Data**  
Date of cement plug : 14.04.07  
Type of cement : G - Grade  
Volume of preflush : 10.00 bbls  
Volume of cement slurry : 6.10 bbls  
Av. sp.gr of cement slurry : 15.8 ppg  
Volume of after flush : 2.90 bbls  
Volume of displacing mud : 164 bbls  
Av. sp.gr of displacing mud : 10.84 ppg  
Top of cement plug : 3224 m  
Bottom of cement plug : 3274 m

### TIME ANALYSIS OF 6" PHASE: (04.04.07 – 15.04.07)

ACTIVITY	TOTAL HOURS	PERCENT
Drilling	15.50	5.50
Circulation	14.00	4.96
Tripping	123.00	43.62
Repairs	1.00	0.35
WOC	16.75	5.94
Plug Back	1.75	0.62
Miscellaneous	110.00	39.01
<b>TOTAL</b>	<b>282.00</b>	<b>100.00</b>

### N.B: As per IADC

Misc.: includes displacement of mud with water by cementing unit, knock out of annulus water, well under observation, arrangements for air drilling and next operation.

### ELECTRO-LOGGING

Wire line logs were run in this well at the following intervals:

### 8 ½" PHASE: (Logged by HLS Asia Ltd.)

Run	Date	Log Interval (m)	Logs Recorded	Remarks
1	25.03.07	3218 – 2896	GR-SP-CALI-LLD-MSFL	
2	26.03.07	3218 – 2896	GR-DSN-SDL-CALI	
3	26.03.07	3218 – 2896	GR-FWS	

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### 8 ½" PHASE: (Logged by Focus Energy Ltd.)

Run	Date	Log Interval (m)	Logs Recorded	Remarks
1	27.03.07 - 28.03.07	3200 – 600	VSP	Recorded check shot at 100 m interval

## DRILL STEM TEST

### DST in 8 ½" Phase

Run#	Test #	DATE	INTERVAL TESTED(m)	REMARKS
1	1	01-03-07	3057 – 3068	Weak to strong blow of air in 3 minutes, observed mud level dropping in annulus.
1	1	22-03-07 – 23-03-07	2899.08 – 3210.50	Weak to strong blow of air in 3 minutes, Fluid spray (water mist + Gas) flowed from well

### Stratigraphy:

The well SGL # 2 was drilled in Langatala area of Shahgarh sub basin within the Jaisalmer Basin. During the drilling of this well, the Shumar Formation of Quarternary age, Bandah, Khuiala and Sanu formations of the Tertiary age, Parh, Goru, Pariwar formation of Mesozoic age were penetrated. The formation tops marked based on lithological description studies are given below:





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## SGL # 2

### INTRODUCTION

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The block is located within the vast Indo-Pakistan subcontinent, within slope of Indian platform, which is locally known as Shahgarh sub-basin of Lower Indus basin, close to the boundary between India and Pakistan. Thickness of sedimentary cover within the block ranges from 3300 m. near the eastern boundary up to more than 8 km in the western part.

Prospective part of sedimentary succession includes Paleogene (thickness up to 1400 m.), Late- and Early-Cretaceous (thickness 850-1400 m.) and Jurassic (thickness from 1.6 up to more than 3 km) formations. This interval of succession is represented predominantly by shallow-shelf formations with rather favorable distinct differentiation on reservoir horizons and cap-rocks screening fluids movement.

Several unconformities are marked in sedimentary cover, out of which unconformity between Paleogene and Upper Cretaceous (sometimes clearly angular) is most prominent.

Source rock studies indicate that clay beds of Lower Cretaceous Pariwar & Goru formations are the main source due to the advantageous organic carbon percentage, level of vitrinite reflectance and thermal maturity. The stratigraphic succession contains numerous reservoir beds composed both by carbonates (Bandah, Khuiala and Jaisalmer formations) and terrigenous deposits.

Principal terrigenous reservoirs are connected to Sanu formation (Paleocene) and especially to Pariwar (Lower Cretaceous) and Bedesir-Baisakhi (Upper Jurassic) formations. According to cuttings and few core samples reservoirs within most promising Lower Cretaceous - Upper Jurassic interval are represented by sands, sandstones and siltstones with evidences of near-shore and rapid sedimentation.

Intervals with predominant development of reservoirs are distinctly separated by rather thick clay/claystone sequences (in Khuiala formation, Sanu formation, Goru formation, central portion of Baisakhi- Bedesir formation) forming regionally persistent cap rocks, preventing vertical movement of fluids.

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### QUATERNARY SEQUENCE

This sequence consists of only Shumar Formation in Jaisalmer Basin, which is the upper most formation of the basin. The Quaternary is the most recent age of the geological time scale. This sequence consists of Pleistocene to recent age.

#### SHUMAR FORMATION: (SURFACE TO 733 m)

The Shumar Formation is the most recently continental series of Quaternary sediments deposited formation in the Jaisalmer basin and is exposed at the well SGL #2. The sedimentation took parts throughout Quaternary Period, from Pleistocene age to recent.

The Shumar formation is having thickness of 733 m. This formation unconformably overlies the Bandah Formation of Tertiary. This formation lithologically constitutes fine, medium to coarse-grained Sand/Sandstone with occasional argillaceous and microcrystalline Limestone and interbeds of Clay/Claystone.

#### Lithological Description (Shumar Formation):

- 200 – 220 m**      **Sand/Sandstone (80 – 90 %):** Light yellowish to light yellowish brown, color less, clear, transparent to translucent, light grey to grey, white to dirty white; loose to friable, in parts moderately hard; dominantly medium grain, coarse grained to very coarse grained, in parts fine grained, sub angular to sub rounded, sub spherical to spherical, poorly to moderately sorted; argillaceous matrix, calcareous cement, weak cement; in parts loose, in parts consolidated; fair visible porosity; in parts silty; micaceous, specks of dark colour mineral; occasionally fossiliferous.  
**Clay/Claystone (10 – 20 %):** Light grey to grey, dirty white to white, yellowish white, occasionally brownish, moderately hard to firm, amorphous, calcareous.  
**Fossil:** In traces.
- 220 – 230 m**      **Sand/Sandstone (70 %):** Light greenish white, light grayish, white to dirty white, in parts colourless, friable to moderately hard, medium to fine grained, occasionally coarse to very coarse grained, sub angular to sub rounded, sub spherical, poorly sorted, argillaceous matrix, calcareous cemented, weak cement, poor visible porosity, inclusion of green colour mineral, glauconitic, specks of dark colour mineral, silty, micaceous.  
**Clay/Claystone (20 %):** Light grayish, light greenish grey, dirty white to white, occasionally light brownish, light yellowish, moderately hard, in parts firm, amorphous, feebly calcareous to calcareous, in parts silty.  
**Limestone (10 %):** Dirty white, off white, milky white; moderately hard, microcrystalline; tight; fossiliferous, foram.  
**Siltstone:** In traces
- 230 – 260 m**      **Sand/Sandstone (70 – 80 %):** Light greenish white, light grayish, white to dirty white, colourless, yellowish white, in parts smoky white, friable to moderately hard, in parts hard, fine to coarse grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, calcareous cemented, weak cement, loose, poor visible porosity, in parts inclusion of green colour mineral, silty, micaceous.  
**Clay/Claystone (20 – 30 %):** Light grayish, light greenish grey, dirty white to white, light brownish, light yellowish, moderately hard, non sticky, washable, in parts firm, amorphous, feebly calcareous to calcareous, in parts silty.

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*Siltstone and Limestone:* In traces.

### 260 – 300 m

**Sand/Sandstone (70 – 80 %):** Light greenish white, light grayish, white to dirty white, colourless, transparent to translucent, light grey, light yellowish to yellowish, friable to moderately hard, in parts hard, fine to medium grained, in parts coarse to very coarse grained, compact, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, calcareous cemented, weak cement, loose, poor visible porosity.

**Clay/Claystone (10 – 20 %):** Light grayish, light greenish grey, dirty white to white, light brownish, light yellowish, moderately hard, non sticky, washable, in parts firm, amorphous, feebly calcareous to non calcareous, in parts silty.

**Limestone (10 – 20 %):** Dirty white to white, off white, milky white, in parts light grey, light yellowish, moderately hard to hard, microcrystalline, compact, fossiliferous, foram.

*Siltstone and Fossil:* In traces.

### 300 – 320 m

**Sand/Sandstone (70 %):** Light greenish white, light grayish, white to dirty white, colourless, transparent to translucent, light grey, light yellowish to yellowish, moderately hard to hard, in parts friable, fine to medium grained, in parts coarse grained, rounded to sub rounded, sub spherical to spherical, poorly sorted, argillaceous matrix, calcareous cemented, weak cement, loose, poor visible porosity.

**Limestone (20 – 30 %):** Dirty white to white, off white, milky white, in parts light grey, light yellowish, moderately hard, in parts hard, microcrystalline, and compact.

**Clay/Claystone (Tr – 10 %):** Light grayish, light greenish grey, dirty white to white, light brownish, light yellowish, moderately hard, non sticky, washable, in parts firm, amorphous, feebly calcareous to calcareous, in parts silty.

### 320 – 330 m

**Sand/Sandstone (60 %):** Light greenish white, light grayish, white to dirty white, colourless, transparent to translucent, light grey, light yellowish to yellowish, moderately hard to hard, in parts friable, fine to medium grained, in parts coarse grained, rounded to sub rounded, sub spherical to spherical, poorly sorted, argillaceous matrix, calcareous cemented, weak cement, loose, poor visible porosity.

**Limestone (20 %):** Dirty white to white, off white, milky white, in parts light grey, light yellowish, moderately hard, in parts hard, microcrystalline, and compact.

**Clay/Claystone (10 %):** Light grayish, light greenish grey, dirty white to white, light brownish, light yellowish, moderately hard, non sticky, washable, in parts firm, amorphous, feebly calcareous to calcareous, in parts silty.

**Siltstone (10 %):** Light brownish to brownish, light yellowish, hard, in parts moderately hard, non calcareous.

### 330 – 350 m

**Sand/Sandstone (60 – 70 %):** Light greenish white, light grayish, white to dirty white, colourless, transparent to translucent, light grey, light yellowish to yellowish, moderately hard to hard, in parts friable, fine to medium grained, rounded to sub rounded, sub spherical to spherical, poorly to moderately sorted, argillaceous matrix, calcareous cemented, weak cement, loose, poor visible porosity.

**Clay/Claystone (10 – 20 %):** Light grayish, light greenish grey, dirty white to white, light brownish, light yellowish to yellowish, moderately

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hard, non sticky, washable, in parts firm, amorphous, feebly calcareous to calcareous, in parts silty.

**Siltstone (10 – 20 %):** Light brown to brownish, yellowish, hard, in parts moderately hard, compact, non calcareous.

**Limestone (Tr. – 10 %):** Dirty white, off white, milky white, moderately hard, compact, brittle and microcrystalline.

#### 350 – 360 m

**Limestone (50 %):** Dirty white, off white, milky white, yellowish white, light brownish, moderately hard to hard, compact, microcrystalline, tight, fossiliferous, occasionally sandy inclusion, occasionally chalky.

**Sand/Sandstone (20 %):** Light grayish white, grayish white, dirty white, moderately hard, consolidated, very fine to fine grained, occasionally medium grained, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous cemented, moderately cement, tight, poor visible porosity, silty.

**Clay/Claystone (20 %):** Light brownish, light yellowish brown, firm, amorphous, calcareous.

**Siltstone (10 %):** Light brownish, cream, moderately hard to hard, compact, non calcareous to feebly calcareous.

**Fossil:** In Traces.

#### 360 – 370 m

**Clay/Claystone (50 %):** Light brownish, in parts light grayish, dirty white, grayish white, firm, in parts plastic, in parts sticky, amorphous, feebly calcareous to moderately calcareous.

**Limestone (30 %):** Dirty white, off white, milky white, yellowish white, light brownish, moderately hard to hard, compact, microcrystalline, tight, fossiliferous, occasionally sandy inclusion, occasionally chalky.

**Sand/Sandstone (20 %):** Colourless, transparent to translucent, light brownish to brownish, white, light yellowish to yellowish, in parts dark brownish, in parts friable, medium to coarse grained, in parts very coarse grained, sub angular to sub rounded, sub spherical, moderately to poorly sorted, argillaceous matrix, calcareous cemented, silty.

#### 370 – 380 m

**Sand/Sandstone (50 %):** Dirty white, white, light grayish, grayish white, in parts colourless, dominantly loose to friable, occasionally moderately hard, fine to medium grained, in parts very fine grained, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous cemented, weak cement, dominantly loose and unconsolidated, in parts consolidated, micaceous.

**Clay/Claystone (40 %):** Light brownish, in parts light grayish, dirty white, gray, white, firm, in parts plastic, in parts sticky, amorphous and feebly calcareous to moderately calcareous.

**Limestone (10 %):** Dirty white, off white, milky white, yellowish white, light brownish, moderately hard to hard, compact, microcrystalline, tight, fossiliferous, occasionally sandy inclusion, occasionally chalky.

#### 380 – 400 m

**Sand/Sandstone (60 – 70 %):** Dirty white, white, light grayish, grayish white, in parts colourless, dominantly loose to friable, occasionally moderately hard, fine to medium grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, calcareous cemented, weak cement, dominantly loose and unconsolidated, in parts consolidated, micaceous, in parts silty.

**Clay/Claystone (20 – 30 %):** Light brownish, in parts light grayish, dirty white, gray, white, firm, plastic, in parts soft, amorphous, washable, fairly sticky and feebly calcareous to moderately calcareous.

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**Limestone (10 %):** Dirty white, off white, milky white, yellowish white, light brownish, moderately hard to hard, compact, microcrystalline, tight, fossiliferous, occasionally sandy inclusion, occasionally chalky.

**Siltstone:** In traces.

### 400 – 420 m

**Sandstone (50 – 60 %):** Dirty white, light grayish, grayish white, in parts colourless, dominantly loose to friable, occasionally moderately hard, fine to medium grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, calcareous cemented, weak cement, unconsolidated, in parts consolidated, micaceous, in parts silty, in parts inclusion of dark and green colour mineral.

**Clay/Claystone (20 – 30 %):** Light brownish, in parts light grayish, dirty white, gray, white, firm, plastic to soft, amorphous, in parts washable, fairly sticky and feebly calcareous to moderately calcareous.

**Limestone (20 %):** Dirty white, off white, milky white, yellowish white, light brownish, moderately hard to hard, compact, microcrystalline, tight, fossiliferous, occasionally sandy inclusion, occasionally chalky.

**Siltstone:** In traces.

### 420 – 440m

**Sand/Sandstone (50 – 60 %):** Light grayish, dirty white, grayish white, colourless, clear, transparent to translucent, light yellowish, friable, in parts moderately hard, fine to medium grained, occasionally very fine grained, sub angular to sub rounded, sub spherical, argillaceous matrix, calcareous cemented, weak to moderately cemented, dirty, dominantly loose, in parts consolidated, in parts grading towards siltstone, specks of dark colour and green colour mineral.

**Clay/Claystone (30 %):** Light brownish, dirty white, white, light gray, firm, plastic, in parts soft, amorphous, in parts fairly sticky, feebly to moderately calcareous, in parts washable.

**Limestone (10 – 20 %):** Dirty white, off white, milky white, yellowish white, light brownish, moderately hard to hard, compact, microcrystalline, tight, fossiliferous, occasionally sandy inclusion.

### 440 – 460 m

**Clay/Claystone (70 – 80 %):** Dominantly light brownish, in parts light gray, dirty white, light grayish, dominantly soft, occasionally firm to moderately hard, amorphous, feebly calcareous to moderately calcareous, highly washable, fairly silty.

**Sand/Sandstone (20 %):** Light grayish, dirty white, grayish white, colourless, clear, transparent to translucent, light yellowish, friable, in parts moderately hard, fine to medium grained, occasionally very fine grained, sub angular to sub rounded, sub spherical, argillaceous matrix, calcareous cemented, weak to moderately cemented, dirty, dominantly loose, in parts consolidated, in parts grading towards siltstone, specks of dark colour and green colour mineral.

**Limestone ( Tr. – 10 %):** Dirty white, off white, milky white, yellowish white, light brownish, moderately hard to hard, compact, microcrystalline, tight, fossiliferous, occasionally sandy inclusion.

### 460 – 490

**Sand/Sandstone (60 %):** Colourless, clear, transparent to translucent, light gray, dirty white, grayish white, dominantly loose, in parts friable to moderately hard, dominantly coarse to very coarse grained, in parts fine to medium grained, sub angular to sub rounded, sub spherical to spherical, poorly sorted, well sorted, argillaceous matrix, calcareous cemented, weak cement, inclusion of green and dark colour mineral, in parts silty and micaceous.

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**Clay/Claystone (20 – 30 %):** Medium grey, light greenish grey, light grey, dirty white, grayish white, moderately hard to firm, amorphous to sub blocky, non sticky, feebly to moderately calcareous.

**Limestone (10 – 20 %):** Dirty white, off white, milky white, yellowish white, light brownish, moderately hard to hard, compact, microcrystalline, tight, fossiliferous, occasionally sandy inclusion.

**Coal:** In trace. (Black to brownish black, moderately hard, blocky, fibrous sub bituminous).

### 490 – 510m

**Sand/Sandstone (50 – 60 %):** Colourless, clear, transparent to translucent, light grey, dirty white, grayish, loose, in parts friable to moderately hard, fine to medium grained, in parts coarse grained, sub angular to sub rounded, sub spherical to spherical, poorly sorted, calcareous cement, argillaceous matrix, inclusion green and dark color minerals, in parts silty.

**Clay/Clay stone (30 %):** Light grayish white, light greenish, greenish white, firm, non sticky, washable, sub blocky, in parts silty.

**Limestone (10 – 20 %):** Dull white, milky white, yellowish white, moderately hard, brittle, microcrystalline, tight, occasionally sandy inclusion.

### 510 – 530

**Sand/Sandstone (70 %):** Colourless, clear, transparent to translucent, light grey, dirty white, grayish white, loose, in parts friable, moderately hard, fine to medium grained, in parts coarse grained, sub angular to sub rounded, sub spherical to spherical, poorly sorted, calcareous cement, argillaceous matrix, inclusion green and dark color minerals, in parts silty.

**Clay/Clay stone (20 %):** Light brownish, dirty white, white, light gray, plastic, soft to moderately hard, amorphous, in parts blocky, sticky, feebly to moderately calcareous, in parts silty.

**Limestone (10 %):** Dull white, milky white, yellowish white, moderately hard, brittle, microcrystalline, tight, occasionally sandy inclusion.

### 530 – 560

**Sand/Sandstone (60 – 70 %):** Colourless, clear, transparent to translucent, light grey, dirty white, grayish white, loose, in parts friable, moderately hard to hard, fine to medium grained, in parts coarse grained, compact, rounded to sub rounded, in parts sub angular, sub spherical to spherical, poorly sorted, argillaceous matrix, calcareous cemented, weak cement, inclusion of green and dark colour mineral, in parts silty.

**Clay/Clay stone (30 – 40 %):** Light brownish, dirty white, white, light gray, plastic, soft, in parts moderately hard, amorphous, in parts blocky, sticky, washable, feebly to moderately calcareous, grading towards siltstone.

**Limestone, Siltstone, Pyrite:** In traces.

### 560 – 580 m

**Sand/Sandstone (50 – 60 %):** Colourless, yellowish, grayish, transparent to translucent, light grey, dirty white, grayish white, loose, in parts friable, moderately hard to hard, fine to medium grained, in parts coarse grained, compact, rounded to sub rounded, angular to sub angular, sub spherical to spherical, moderately sorted, argillaceous matrix, calcareous cemented, in parts silty.

**Clay/Claystone (30 – 40 %):** Light brownish, dirty white, white, light gray, plastic, soft, in parts moderately hard, amorphous, in parts blocky, sticky, washable, feebly to moderately calcareous, grading towards siltstone.

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**Limestone (10%):** Dull white, milky white, yellowish white, moderately hard, brittle, microcrystalline.

**Siltstone:** In trace.

580 – 590 m

**Clay/Claystone (50 %):** Dominantly yellowish, dirty white, gray, soft, amorphous, washable.

**Sand/Sandstone (50 %):** Colourless, yellowish, grayish, transparent to translucent, light grey, dirty white, grayish white, loose, in parts friable, moderately hard to hard, fine to medium grained, in parts coarse grained, compact, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, calcareous cemented, in parts silty.

**Limestone:** In trace.

590 – 610 m

**Clay/Claystone (70 – 80 %):** Dominantly yellowish, dirty white, light grayish, grayish, soft, sticky, washable, moderately calcareous.

**Sand/Sandstone (20 – 30 %):** Yellowish, colourless, transparent to translucent, hard, compact, fine to medium grained, in parts coarse to very coarse grained, angular to sub angular, sub rounded, loose, poorly sorted, calcareous cemented.

**Limestone and Siltstone:** In trace.

610 – 620 m

**Sand/Sandstone (80 %):** Dominantly colourless, light brown to brown, light yellowish to yellowish, in parts dark brown, in parts yellowish white, transparent to translucent, moderately hard to hard, in parts friable, coarse to very coarse grained, in parts medium grained, angular to sub angular, sub rounded, sub spherical, argillaceous matrix, calcareous cemented, loose.

**Clay/Claystone (20 %):** Dominantly yellowish, dirty white, light grayish, grayish, soft, in parts moderately hard, amorphous, sticky, washable, moderately calcareous.

**Limestone, Siltstone:** In trace

620 – 640 m

**Sand/Sandstone (90 %):** Colourless, clear, transparent to translucent, light yellowish, light yellowish brown, loose, unconsolidated, very coarse to coarse grained, in parts medium grained, sub angular to sub rounded, in parts rounded, sub spherical to spherical, moderately well sorted, clean, in parts gravelly, argillaceous matrix being washed away, non calcareous.

**Clay/Claystone (10 %):** Grayish to light grayish, light greenish gray, dirty white to white, light brownish to brownish, firm, occasionally soft, and moderately hard, amorphous, moderately calcareous, in parts silty.

**Limestone, Siltstone:** In trace

640 – 650 m

**Sand/Sandstone (90 %):** Colourless, clear, transparent to translucent, light yellowish to yellowish brown, loose to friable, dominantly medium to fine grained, in parts coarse to very coarse grained, sub angular to sub rounded, in parts rounded, sub spherical to spherical, moderately sorted, clean, unconsolidated appear in categories, argillaceous matrix washed away, non calcareous.

**Clay/Claystone (10 %):** Grayish to light grayish, light greenish gray, dirty white to white, light brownish to brownish, firm, occasionally soft, and moderately hard, amorphous, moderately calcareous, in parts silty.

650 – 670 m

**Sand/Sandstone (80 – 90 %):** Colourless, clear, transparent to translucent, light yellowish to yellowish brown, loose, dominantly coarse to very coarse grained, in parts medium grained, sub angular to sub

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rounded, in parts rounded, sub spherical to spherical, moderately to well sorted, clean, unconsolidated appear in categories, argillaceous matrix washed away, non calcareous, matrix soluble in mud.

**Clay/Claystone (10 – 20 %):** Grayish to light grayish, light greenish gray, dirty white to white, light brownish to brownish, firm, occasionally soft, and moderately hard, amorphous, moderately calcareous, in parts silty.

#### 670 – 690 m

**Sand/Sandstone (80 %):** Colorless, clear, transparent to translucent, light yellowish, to light yellowish brown, light brownish yellow, white, loose, coarse to very coarse grained, in parts medium to fine grained, sub angular to sub rounded, in parts rounded, sub spherical to spherical, poorly sorted, dominantly clean, argillaceous matrix soluble in mud system, unconsolidated appearing at categories as whole.

**Clay/Claystone (20 %):** Light brownish to brownish, reddish brown, dirty white to white, yellowish to yellowish white, grayish, soft to firm, in parts moderately hard, amorphous, slightly to moderately calcareous, in parts silty.

#### 690 – 710 m

**Sand/Sandstone (90 – 100 %):** White to milky white, colourless, clear, light yellowish to light yellowish brown, light brownish yellow, transparent to translucent, loose, coarse to very coarse grained, in parts medium to fine grained, sub angular to sub rounded, in parts rounded, sub spherical to spherical, poorly sorted, clean, argillaceous matrix soluble in mud system.

**Clay/Claystone (Tr. – 10 %):** Light brownish to brownish, reddish brown, dirty white to white, yellowish to yellowish white, grayish, soft to firm, in parts moderately hard, amorphous, slightly to moderately calcareous, in parts silty.

#### 710 – 730 m

**Sand/Sandstone (80 – 90 %):** White to milky white, colourless, clear, light yellowish to yellowish brown, transparent to translucent, loose, coarse to very coarse grained, in parts medium grained, in parts rarely fine grained, sub angular to sub rounded, in parts rounded, sub spherical to spherical, poorly to moderately sorted, clean, argillaceous matrix soluble in mud system.

**Clay/Claystone (10 – 20 %):** Light brownish to brownish, dirty white to white, yellowish to yellowish white, in parts reddish brown, in parts grayish white, soft to firm, in parts moderately hard, amorphous, slightly to moderately calcareous, in parts silty.

#### 730 – 740 m

**Sand/Sandstone (50 %):** Colourless, clear, transparent to translucent, light yellowish to light yellowish brown, light brownish yellow, light grayish to grayish, smoky, milky white to white, loose, coarse to very coarse to gravelly grained, in parts medium grained, sub angular to sub rounded, sub spherical to spherical, occasionally sub elongated, poorly sorted, clean, argillaceous matrix soluble in mud.

**Clay/Claystone (50 %):** Light gray to gray, light greenish gray, light grayish white to white, in parts medium gray, light brownish to brownish, light yellowish brown, dirty white, light yellowish, soft to firm, plastic, amorphous, calcareous to highly calcareous, in parts grading towards marl/chalky lime stone, washable, fairly sticky.



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### TERTIARY SEQUENCE:

The Tertiary sequence disconformably underlies the Shumar Formation of Quaternary age. The deposition in this sequence took parts in marine environment, which was later overlain by the continentally deposited formation. The lower boundary of this Tertiary sequence unconformably overlies the Parh Formation of Cretaceous age. Disconformity between the gravelly sandstone of upper Tertiary - Quaternary continental deposits and lower fossiliferous deposits of Bandah formation has been taken as the upper boundary. The Tertiary sequence is further differentiated into three formations. The three formations, Bandah, Khuiala and Sanu are further sub divided into members based on the lithology.

#### **BANDAH FORMATION: (733 m – 919 m)**

On the basis of lithology, the top of Bandah formation has been picked up at 737 m with the presence of argillaceous sediments. The upper clay of Bandah formation (Middle Eocene) is well developed in this well and has been picked up at 733 m. The weathered, very coarse grained to gravelly Sand/Sandstone and Clay/Claystone with some limestone of Middle Eocene at 733 m possibly represent the bottom sediments of Shumar Formations.

This is the upper most formation of Tertiary sequence with thickness increasing towards west as well as towards Shahgarh depression and it lies from depth 733 m to 919 m with total thickness of 186 m. It unconformably underlies the Shumar Formation of Quaternary age. The age of this formation is Middle Eocene age. On the basis of lithological study this formation is divided into four members. These members are discussed in detail, under:

**I – Claystone:** This member is the upper part of Bandah Formation consists of mainly Claystone with thin intercalations of sandstone. It extends from 733 m to 755 m, having a total thickness of 22 m.

Claystone of this member is light gray, gray, greenish gray and dirty white; soft to firm; plastic; amorphous; washable, sticky and calcareous in nature.

**II – A<sub>4</sub> Limestone:** It ranges from the depth of 755 m to 816 m with thickness of 61 m. This member is dominated by limestone with minor Clay/Claystone in the upper and lower part.

Limestone is dirty white to white, off white, smoky white, milky white, occasionally light gray, firm to moderately hard, in parts hard; compact, microcrystalline, in parts chalky; bioclastic with tests of forams and bivalves, NC/NF.

**III – Claystone:** This part of the formation lies from the depth 816m to 841m only consists of 25 m band of claystone intercalated with limestone..

The claystone of this member are dark gray to gray, greenish gray and brown to light brown, light gray, soft to moderately hard, amorphous to sub-blocky, washable, sticky, and calcareous in nature

**IV – B<sub>2</sub> Limestone:** This member is the lower most part of the Bandah Formation. It is 78 m thick band of limestone, from depth 841m to 919 m. At partss thin band of Claystone is observed within this member.

The limestone of this member is dirty white to off white, white, milky white, smoky, occasionally light brownish, moderately hard to hard, compact , micro-crystalline, bio-clastic with tests of foraminifera and bivalves, NC/NF.

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### Lithological Description (Bandah Formation):

- 730 – 740 m**      **Sand/Sandstone (50 %):** Colourless, clear, transparent to translucent, light yellowish to light yellowish brown, light brownish yellow, light grayish to grayish, smoky, milky white to white, loose, coarse to very coarse to gravelly grained, in parts medium grained, sub angular to sub rounded, sub spherical to spherical, occasionally sub elongated, poorly sorted, clean, argillaceous matrix soluble in mud.  
**Clay/Claystone (50 %):** Light gray to gray, light greenish gray, light grayish white to white, in parts medium gray, light brownish to brownish, light yellowish brown, dirty white, light yellowish, soft to firm, plastic, amorphous, calcareous to highly calcareous, in parts grading towards marl/chalky lime stone, washable, fairly sticky.
- 740 – 750 m**      **Clay/Claystone (70 %):** Light gray to gray, light greenish gray, light grayish white to white, in parts medium gray, light brownish to brownish, light yellowish brown, dirty white, light yellowish, soft to plastic, amorphous, silky, occasionally silty, calcareous to highly calcareous, in parts grading towards marl/chalky lime stone, washable, fairly sticky.  
**Sand/Sandstone (30 %):** Colourless, clear, transparent to translucent, light yellowish to light yellowish brown, light brownish yellow, light grayish to grayish, smoky, milky white to white, loose, coarse to very coarse to gravelly grained, in parts medium grained, sub angular to sub rounded, sub spherical to spherical, occasionally sub elongated, poorly sorted, clean, argillaceous matrix soluble in mud.
- 750 – 760 m**      **Limestone (60 %):** White, off white, dirty white, milky white, occasionally light gray to gray, soft to firm, moderately hard, in parts compact, microcrystalline, in parts chalky to marl, bioclastic, foram.  
**Clay/Claystone (30 %):** Light gray to gray, light greenish gray, light grayish white to white, in parts medium gray, light brownish to brownish, light yellowish brown, dirty white, light yellowish, soft to plastic, amorphous, silky, occasionally silty, calcareous to highly calcareous, in parts grading towards marl/chalky lime stone, washable, fairly sticky, in parts glauconitic inclusion.  
**Sand/Sandstone (10 %):** Colourless, clear, transparent to translucent, light yellowish to light yellowish brown, light brownish yellow, light grayish to grayish, smoky, milky white to white, loose, coarse to very coarse to gravelly grained, in parts medium grained, sub angular to sub rounded, sub spherical to spherical, occasionally sub elongated, poorly sorted, clean, argillaceous matrix soluble in mud.  
**Note: After 760 m, sampling interval was 5 m.**
- 760 – 790 m**      **Limestone (100 %):** White, milky white, off white, in parts grayish white to smoky white, firm to moderately hard, in parts compact, in parts chalky, in parts bioclastic, in parts microcrystalline, foram, in parts rarely pyretic.  
**Note: Cement found in sample.**
- 790 – 795 m**      **Limestone (100 %):** White to light grayish white, off white, in parts milky white, occasionally light brownish white to brownish, moderately hard, in parts firm, in parts compact, in parts chalky, in parts bioclastic, foram, in parts microcrystalline, occasionally marly.
- 795 – 800 m**      **Limestone (90 %):** Dirty white to off white, light grayish white to light grayish, white, in parts milky white, in parts light brownish white,

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moderately hard, in parts firm, compact, in parts chalky, in parts bioclastic, forams, microcrystalline, occasionally marly, in parts pyretic.

**Clay/Claystone (10 %):** Light gray to grayish white, light grayish brown, in parts brownish white, soft, in parts firm, blocky to sub blocky, amorphous, calcareous, in parts grading towards marl (highly calcareous).

**Pyrite:** In traces.

#### 800 – 805 m

**Clay/Claystone (60 %):** Light brownish gray to light brownish, medium gray to light gray, light grayish white, in parts occasionally dark gray to blackish gray, soft, in parts firm, sub blocky to blocky, sticky, fairly washable, medium calcareous to calcareous.

**Limestone (40 %):** Dirty white to light grayish white, light yellowish white to light brownish, in parts milky white, in parts off white, moderately hard to hard, in parts firm, compact, bioclastic, microcrystalline, in parts pyretic.

**Pyrite:** In traces

#### 805 – 810 m

**Limestone (70 %):** Dirty white to light grayish white, light yellowish white to light brownish, in parts milky white, in parts off white, firm to moderately hard, compact, bioclastic, microcrystalline, in parts pyretic.

**Clay/Claystone (30 %):** Light brownish gray to light brownish, medium gray to light gray, light grayish white, in parts occasionally dark gray to blackish gray, soft, in parts firm, sub blocky to blocky, sticky, fairly washable, calcareous.

#### 810 – 815 m

**Limestone (100 %):** White to off white, milky white, in parts light grayish white, in parts occasionally light brownish white, firm to moderately hard, in parts hard, in parts compact, in parts chalky, in parts bioclastic, forams, in parts microcrystalline, in parts pyretic.

**Pyrite and Claystone:** In traces

#### 815 – 820 m

**Limestone (70 %):** White to off white, milky white, in parts light grayish white, in parts occasionally light brownish white, firm to moderately hard, in parts hard, in parts compact, in parts chalky, in parts bioclastic, forams, in parts microcrystalline, in parts pyretic.

**Clay/Claystone (30 %):** Light gray to medium gray, light grayish white, light brownish, in parts light yellowish brown to light brownish yellow, soft, sticky, fairly washable, in parts compact, sub blocky to blocky, in parts amorphous, moderately calcareous, in parts highly calcareous.

**Pyrite:** In trace

#### 820 – 825 m

**Clay/Claystone (80 %):** Light brownish to brownish white, light yellowish brown, in parts light gray to light grayish white, in parts occasionally dark brown, in parts occasionally dirty white, soft, sub blocky to blocky, sticky, poorly to fairly washable, non calcareous to feebly calcareous, in parts calcareous, in parts occasionally marly.

**Limestone (20 %):** White to off white, milky white, in parts light grayish white, in parts occasionally light brownish white, firm to moderately hard, in parts hard, in parts compact, in parts chalky, in parts bioclastic, forams, in parts microcrystalline, in parts pyretic.

**Pyrite:** In trace

#### 825 – 840 m

**Clay/Claystone (90 – 100 %):** Light brownish to brownish white, light yellowish brown, greenish gray, light greenish gray, occasionally light yellowish gray to light brownish gray, in parts light gray to light grayish white, in parts occasionally dark brown, in parts occasionally dirty white;

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soft to firm; amorphous; plastic, sub blocky to blocky, fairly sticky to sticky, in parts washable, non calcareous to feebly calcareous, in parts calcareous, in parts occasionally marly.

**Limestone (Tr – 10 %):** White to off white, milky white, in parts light grayish white, in parts occasionally light brownish white, firm to moderately hard, in parts hard, in parts compact, in parts chalky, in parts bioclastic, forams, in parts microcrystalline, in parts pyretic.

**Pyrite:** In traces

840 – 845 m

**Limestone (70 %):** Dirty white, off white, grayish white, light grayish, milky white, soft to moderately hard, in parts chalky to marl, in parts microcrystalline, bioclastic, forams.

**Clay/Claystone (30 %):** Gray to medium gray, greenish gray, in parts dark gray, occasionally light brownish, soft, plastic, in parts firm, amorphous, in parts washable, fairly sticky, calcareous, pyretic.

**Pyrite:** In traces

845 – 850 m

**Limestone (90 %):** Dirty white, off white, grayish white, light grayish, milky white, soft to moderately hard, in parts chalky to marl, in parts microcrystalline, bioclastic, forams.

**Clay/Claystone (10 %):** Gray to medium gray, greenish gray, in parts dark gray, occasionally light brownish, soft, plastic, in parts firm, amorphous, in parts washable, fairly sticky, calcareous, pyretic.

**Pyrite:** rare

850 – 865 m

**Limestone (70 – 80 %):** Dirty white, off white, grayish white, light grayish, milky white, soft to moderately hard, in parts chalky to marl, in parts microcrystalline, bioclastic, forams.

**Shale (10 – 20 %):** Greenish gray, light greenish gray, occasionally medium gray, firm, brittle, fissile, flaky, platy, elongated, splintery, non calcareous to very feebly calcareous.

**Clay/Claystone (10 %):** Gray to medium gray, greenish gray, in parts dark gray, occasionally light brownish, soft, plastic, in parts firm, amorphous, in parts washable, fairly sticky, calcareous, occasionally pyretic.

**Pyrite:** rare

865 – 870 m

**Limestone (90 %):** White to off white, milky white, occasionally light gray white, moderately hard, in parts firm, brittle, compact, microcrystalline, in parts chalky, forams, bioclastic.

**Clay/Claystone (10 %):** Gray to medium gray, greenish gray, in parts dark gray, occasionally light brownish, soft, plastic, in parts firm, amorphous, in parts washable, sticky, calcareous, occasionally pyretic.

**Shale:** In traces

870 – 900 m

**Limestone (100 %):** White to off white, milky white, occasionally light gray white, moderately hard, in parts firm, brittle, compact, microcrystalline, in parts chalky, forams, bioclastic.

**Clay/Claystone, Shale:** In traces.

**Pyrite:** rare

900 – 915 m

**Limestone (100 %):** White, milky white, off white, in parts light yellowish white, occasionally light grayish white, moderately hard, in parts firm, in parts brittle, compact, microcrystalline, in parts chalky, forams, bioclastic.

**Shale, Clay/Claystone:** In traces.

**Pyrite:** Rare

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**915 – 920 m**      **Limestone (70 %):** Dirty white to light grayish white, light brownish white to light brownish, in parts milky white, in parts light yellowish white, moderately hard to hard, in parts firm, brittle, compact, in parts chalky, bioclastic, forams, microcrystalline, in parts pyretic.  
**Clay/Claystone (30 %):** Light grayish white, light gray to medium gray, light greenish gray, in parts dark gray, soft, amorphous, washable, fairly sticky, feebly calcareous to calcareous, in parts marly, in parts micaceous.  
**Pyrite:** In traces.

### **KHUIALA FORMATION: (919 m – 1356 m)**

The Khuiala Formation is overlain by Bandah Formation and underlain by Sanu Formation of the Tertiary sequence. The age of this formation is late Paleocene to Early Eocene. During the Late Paleocene-Early Eocene transgression, the deposition of alternating fine clastics, marl and carbonates characterize oscillating condition. Lithologically it comprises four members, Upper Ghazij Shale, B<sub>4</sub> Limestone, Lower Ghazij Shale and C<sub>2</sub>–C<sub>4</sub> Limestone. The upper half of the Khuiala formation is mainly argillaceous sequence (Ghazij Shales) divided by a marl band with intercalations of fossiliferous microcrystalline limestone designated as the C<sub>2</sub> – C<sub>4</sub> limestone

**Upper Ghazij Shale:** This member is mainly composed of greenish gray to bluish gray, soft, plastic, fossiliferous clay with occasional thin bands of dirty white to bluish gray, soft, fossiliferous marl. It is having the thickness of 166 m, from 919 m to 1085 m.

**B<sub>4</sub> Limestone:** This member comprises mainly interbeds of limestone and Shale/claystone and has a thickness of about 90 m, from 1085 m to 1175 m.

**Lower Ghazij Shale:** This is the third member of Khuiala Formation, which comprises mainly of bluish gray, soft, sticky, plastic, pyritic, fossiliferous clay with dirty white to bluish gray, soft, fossiliferous marl intercalations. It has a thickness of 99 m, from 1175m to 1274 m.

**C<sub>2</sub>-C<sub>4</sub> Limestone:** This is the last member of the Khuiala Formation mainly from the depth 1274 m to 1356 m having thickness of 82 m. It mainly consists of white to dull white, off white, bioclastic, at partss chalky, fossiliferous, moderately hard and pyritic limestone and white, soft, occasionally bluish gray, fossiliferous marl.

### **Lithological Description (Khuiala Formation):**

**920 – 925 m**      **Clay/Claystone (70 %):** Light grayish white to light gray, medium gray, light greenish gray, in parts dark gray, in parts greenish to greenish gray, soft, amorphous, fairly sticky, washable, feebly calcareous to calcareous, in parts micaceous, in parts glauconitic inclusion, in parts marly.  
**Limestone (30 %):** Dirty white to light grayish white, light brownish white to light brownish, in parts milky white, in parts light yellowish white, moderately hard to hard, in parts firm, brittle, compact, in parts chalky, bioclastic, forams, microcrystalline, in parts pyretic.  
**Pyrite and Glauconite:** In traces

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925 – 940 m

**Clay/Claystone (80 – 90 %):** Light gray to medium gray, light grayish white, light greenish gray to light gray, in parts dirty white, whitish gray, soft, in parts firm, amorphous to sub blocky, earthy, in parts sub blocky to blocky, fairly sticky, washable, feebly calcareous to calcareous, in parts occasionally silty, in parts fine glauconitic inclusion.

**Limestone (10 – 20 %):** Dirty white to light grayish white, light brownish white to light brownish, in parts milky white, in parts light yellowish white, moderately hard to hard, in parts firm, brittle, compact, in parts chalky, bioclastic, forams, microcrystalline, in parts pyretic.

**Pyrite, Shale and Glauconite:** In traces

940 – 945 m

**Clay/Claystone (100 %):** Light gray to medium gray, light grayish white, light greenish gray, light greenish gray to light gray, in parts dirty white, whitish gray, soft, in parts firm, amorphous to sub blocky, earthy, in parts sub blocky to blocky, fairly sticky, washable, feebly calcareous to slightly calcareous, in parts occasionally silty, in parts fine grained glauconitic inclusion.

**Limestone and Glauconite:** In traces

945 – 965 m

**Clay/Claystone (90 %):** Light gray to medium gray, light grayish white, light greenish gray to light gray, in parts dirty white, whitish gray, soft, in parts firm, amorphous to sub blocky, earthy, in parts sub blocky to blocky, fairly sticky, washable, feebly calcareous to slightly calcareous, in parts marly, in parts pyretic, in parts fine grained glauconitic dissemination.

**Shale (10 %):** Light gray to medium gray, light greenish gray, firm to moderately hard, in parts hard, sub platy to platy, flaky, in parts elongated, in parts compact, sub fissile to fissile, non calcareous to slightly calcareous, in parts fine grained glauconitic dissemination.

**Limestone, Pyrite and Glauconite:** In traces

965 – 975 m

**Shale (60 – 70 %):** Greenish gray to light greenish gray, occasionally medium gray to gray, firm, occasionally moderately hard, compact, brittle, flaky, splintery, platy, elongated, smooth, non calcareous.

**Clay/Claystone (30 – 40 %):** Greenish gray to gray, grayish white, soft, amorphous, in parts plastic, non calcareous to very feebly calcareous, in parts slightly calcareous to moderately calcareous, occasionally fossiliferous.

**Limestone:** In Trace.

975 – 980 m

**Clay/Claystone (60 %):** Grayish white to light grayish, in parts greenish gray to gray, soft, in parts plastic, amorphous, slightly to moderately calcareous, occasionally feebly calcareous.

**Shale (40 %):** Greenish gray to light greenish gray, occasionally medium gray to gray, firm, occasionally hard, compact, brittle, flaky, splintery, platy, elongated, smooth, non calcareous.

**Limestone:** In Trace.

**Note:** Observed some pressured caving on Shale Shaker.

980 – 985 m

**Clay/Claystone (60 %):** Greenish gray to light greenish gray, occasionally light gray, soft, in parts plastic, amorphous, very feebly calcareous to feebly calcareous, in parts washable.

**Shale (40 %):** Greenish gray to light greenish gray, firm, occasionally moderately hard, brittle, flaky, splintery, platy, elongated, non calcareous.

**Pyrite:** Rare

**Note:** Observed some pressured caving on Shale Shaker.

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- 985 – 995 m**      **Clay/Claystone (50 – 60 %):** Greenish gray to light greenish gray, in parts light gray to grayish white, soft, amorphous, in parts plastic, in parts washable, very feebly calcareous to feebly calcareous.  
**Shale (40 – 50 %):** Greenish gray to light greenish gray, occasionally medium gray to gray, firm, in parts firm to moderately hard, brittle, in parts compact, sub fissile, platy, flaky, splintery, elongated, non calcareous.  
**Limestone and Pyrite:** In traces  
**Note: Observed some pressured caving on Shale Shaker.**
- 995 – 1005 m**      **Clay/Claystone (70 %):** Greenish gray to light greenish gray, in parts light gray to grayish white, soft, amorphous, in parts plastic, in parts washable, very feebly calcareous to feebly calcareous.  
**Shale (30 %):** Greenish gray to light greenish gray, occasionally medium gray to gray, firm, in parts occasionally moderately hard, brittle, in parts compact, sub fissile, platy, flaky, splintery, elongated, non calcareous.  
**Limestone and Pyrite:** In traces  
**Note: Observed some pressured caving on Shale Shaker.**
- 1005 – 1015 m**      **Shale (50 – 60 %):** Greenish gray to light greenish gray, occasionally medium gray to gray, firm, in parts occasionally moderately hard, brittle, in parts compact, sub fissile, platy, flaky, splintery, elongated, non calcareous to feebly calcareous, in parts forams.  
**Clay/Claystone (40 – 50 %):** Greenish gray to light greenish gray, in parts light gray to grayish white, soft, amorphous, in parts plastic, in parts washable, feebly calcareous.  
**Limestone:** In Trace amount.
- 1015 – 1025 m**      **Shale (60 %):** Greenish gray to light greenish gray, occasionally medium gray to gray, firm, in parts moderately hard, brittle, in parts compact, sub fissile, platy, flaky, splintery, elongated, non calcareous to feebly calcareous, in parts forams, in parts fine grained glauconitic inclusion.  
**Clay/Claystone (30 – 40 %):** Greenish gray to light greenish gray, in parts light gray to grayish white, soft, amorphous, in parts plastic, in parts washable, slightly calcareous to feebly calcareous.  
**Limestone (Tr. – 10 %):** Light grayish white to dirty white, light brownish white, in parts occasionally milky white, moderately hard to hard, in parts firm, compact, brittle, microcrystalline, forams, fossiliferous.  
**Glauconite:** Rare.
- 1025 – 1040 m**      **Shale (50 %):** Greenish gray to light greenish gray, firm, brittle, fissile, flaky, platy, occasionally splintery, non calcareous to very feebly calcareous, rarely pyretic dissemination.  
**Clay/Claystone (40 %):** Light greenish gray to greenish gray, light grayish white to light grayish, amorphous, soft, in parts plastic, feebly calcareous to slightly calcareous.  
**Limestone (10 %):** Grayish white to dirty white, white, moderately hard, in parts soft to firm, in parts chalky, in parts microcrystalline, bioclastic, fossiliferous, foram, rarely and pyretized fossil found.
- 1040 – 1055 m**      **Shale (50 – 60 %):** Greenish gray to light greenish gray, occasionally medium gray, firm, in parts occasionally moderately hard, brittle, fissile,

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flaky, platy, occasionally sub blocky to blocky, non calcareous to feebly calcareous, occasionally splintery, occasionally pyretic.

**Clay/Claystone (20 – 30 %):** Light greenish gray to greenish gray, in parts light grayish to grayish white, soft, occasionally firm, amorphous, feebly to slightly calcareous, occasionally moderately calcareous.

**Limestone (20 %):** Dirty white to white, grayish white, light grayish, firm to moderately hard, brittle, microcrystalline to chalky, bioclastic, foram.

#### 1055 – 1065 m

**Clay/Claystone (50 – 60 %):** Light greenish gray to greenish gray, in parts light grayish to grayish white, soft to firm, in parts plastic, amorphous, feebly to slightly calcareous, occasionally moderately calcareous.

**Shale (30 – 40 %):** Greenish gray to light greenish gray, occasionally medium gray, firm, in parts occasionally moderately hard, brittle, fissile, flaky, platy, occasionally sub blocky to blocky, non calcareous to feebly calcareous, occasionally splintery, occasionally pyretic.

**Limestone (10 %):** Dirty white to white, grayish white, light grayish, firm to moderately hard, brittle, microcrystalline to chalky, bioclastic, foram.

#### 1065 – 1085 m

**Shale (50 %):** Greenish gray to light greenish gray, in parts medium gray, firm to moderately hard, brittle, fissile, compact, flaky, platy, occasionally sub blocky to blocky, non calcareous to feebly calcareous, occasionally splintery, occasionally pyretic.

**Limestone (30 – 40 %):** Dirty white to white, grayish white, light grayish, firm to moderately hard, brittle, microcrystalline to chalky, bioclastic, foram.

**Clay/Claystone (10 – 20 %):** Light greenish gray to greenish gray, in parts light grayish to grayish white, soft to firm, in parts plastic, amorphous, feebly to slightly calcareous, in parts moderately calcareous.

#### 1085 – 1090 m

**Limestone (50 %):** Dirty white to white, light grayish white, light grayish, soft to firm, in parts moderately hard, in parts microcrystalline, chalky, bioclastic, foram.

**Shale (30 %):** Greenish gray to light greenish gray, in parts medium gray, firm to moderately hard, brittle, fissile, compact, flaky, platy, occasionally sub blocky to blocky, non calcareous to feebly calcareous, occasionally splintery, occasionally pyretic.

**Clay/Claystone (20 %):** Light greenish gray to greenish gray, in parts light grayish to grayish white, soft to firm, in parts plastic, amorphous, feebly to slightly calcareous, in parts moderately calcareous.

#### 1090 – 1115 m

**Shale (40 – 50 %):** Greenish gray to light greenish gray, in parts medium gray, firm to moderately hard, brittle, fissile, compact, flaky, platy, occasionally sub blocky to blocky, non calcareous to feebly calcareous, occasionally splintery, occasionally pyretic.

**Limestone (30 – 40 %):** Dirty white to white, light grayish white, light grayish, soft to firm, in parts moderately hard, in parts microcrystalline, chalky, bioclastic, foram.

**Clay/Claystone (10 – 20 %):** Light greenish gray to greenish gray, in parts light grayish to grayish white, soft to firm, in parts plastic, amorphous, feebly to slightly calcareous, in parts moderately calcareous.

#### 1115 – 1125 m

**Shale (40 – 50 %):** Greenish gray to light greenish gray, in parts medium gray, firm, in parts moderately hard, brittle, smooth, in parts compact, flaky, fissile, platy, non calcareous to feebly calcareous.



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**Limestone (30 – 40 %):** Dirty white to white, grayish white, light grayish, off white, soft to firm, in parts moderately hard, brittle, microcrystalline to chalky, bioclastic, rarely pyretic, foram.

**Clay/Claystone (20%):** Light greenish gray to greenish gray, light gray to grayish white, soft, in parts firm, plastic, amorphous, in parts washable, slightly to moderately calcareous.

### 1125 – 1140 m

**Shale (50 – 60 %):** Greenish gray to light greenish gray, in parts medium gray, firm, in parts moderately hard, brittle, smooth, in parts compact, flaky, fissile, platy, non calcareous to feebly calcareous.

**Limestone (20 – 30 %):** Dirty white to white, grayish white, light grayish, off white, soft to firm, in parts moderately hard, brittle, microcrystalline to chalky, bioclastic, in parts rarely pyretic, foram.

**Clay/Claystone (10 – 20 %):** Light greenish gray to greenish gray, light gray to grayish white, soft, in parts firm, plastic, amorphous, in parts washable, slightly to moderately calcareous.

### 1140 – 1150 m

**Shale (60 – 70 %):** Greenish gray to light greenish gray, in parts medium gray, generally firm, in parts soft and moderately hard, brittle, smooth, in parts compact, flaky, fissile, platy, non calcareous to feebly calcareous.

**Clay/Claystone (20 – 30 %):** Light greenish gray to greenish gray, light gray to grayish white, soft, in parts firm, plastic, amorphous, in parts washable, slightly to moderately calcareous, in parts fine grained glauconite.

**Limestone (10 %):** Dirty white to white, grayish white, light grayish, off white, soft to firm, in parts moderately hard, brittle, microcrystalline to chalky, bioclastic, in parts rarely pyretic, foram.

### 1150 – 1155 m

**Shale (60 %):** Greenish gray to light greenish gray, in parts medium gray, occasionally dark gray, firm, in parts moderately hard, brittle, in parts compact, fissile to sub fissile, smooth, flaky, platy, in parts elongated, feebly calcareous to slightly calcareous, in parts fine grained glauconite.

**Clay/Claystone (30 %):** Light greenish gray to greenish gray, light greenish white, light gray to grayish white, occasionally brownish gray, soft, in parts firm, amorphous, in parts washable, plastic, slightly calcareous to moderately calcareous.

**Limestone (10 %):** Dirty white to white, light grayish white to grayish, off white, firm to moderately hard, in parts soft, brittle, microcrystalline, in parts chalky, foram.

### 1155 – 1160 m

**Shale (80 %):** Greenish gray to light greenish gray, in parts medium gray, occasionally dark gray, generally firm, in parts moderately hard, brittle, in parts compact, fissile to sub fissile, smooth, flaky, platy, in parts elongated, feebly calcareous to slightly calcareous, in parts fine grained glauconite.

**Clay/Claystone (20 %):** Light greenish gray to greenish gray, light greenish white, light gray to grayish white, occasionally brownish gray, soft, occasionally firm, amorphous, in parts washable, plastic, slightly calcareous to moderately calcareous.

**Limestone:** In Trace.

### 1160 – 1165 m

**Shale (60 %):** Greenish gray to light greenish gray, in parts medium gray, occasionally dark gray, firm, in parts moderately hard, brittle, in parts compact, fissile to sub fissile, smooth, flaky, platy, in parts

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elongated, feebly calcareous to slightly calcareous, in parts fine grained glauconite.

**Limestone (30 %):** Dirty white to white, light grayish white to light grayish, off white, soft to firm, in parts moderately hard, in parts brittle, in parts compact, in parts microcrystalline, chalky, foram.

**Clay/Claystone (10 %):** Light greenish gray to greenish gray, light greenish white, light gray to grayish white, occasionally brownish gray, soft, in parts firm, amorphous, in parts washable, plastic, slightly calcareous to moderately calcareous.

#### 1165 – 1170 m

**Limestone (40 %):** Dirty white to white, light grayish white to light grayish, off white, firm to moderately hard, in parts soft and hard, in parts brittle, in parts compact, in parts microcrystalline, chalky, foram.

**Shale (30 %):** Greenish gray to light greenish gray, in parts medium gray, occasionally dark gray, firm, in parts moderately hard, brittle, in parts compact, fissile to sub fissile, smooth, flaky, platy, in parts elongated, feebly calcareous to slightly calcareous, in parts fine grained glauconite.

**Clay/Claystone (30 %):** Light greenish gray to greenish gray, light greenish white, light gray to grayish white, occasionally brownish gray, soft, in parts firm, amorphous, in parts washable, plastic, slightly calcareous to moderately calcareous.

#### 1170 – 1175 m

**Shale (60 %):** Greenish gray to light greenish gray, in parts medium gray, occasionally dark gray, firm, in parts moderately hard, brittle, in parts compact, fissile to sub fissile, smooth, flaky, platy, in parts elongated, feebly calcareous to slightly calcareous, in parts fine grained glauconite.

**Limestone (20 %):** Dirty white to white, light grayish white to light grayish, off white, soft to firm, in parts moderately hard to hard, in parts brittle, in parts compact, in parts microcrystalline, chalky, foram, in parts pyretic.

**Clay/Claystone (20 %):** Light greenish gray to greenish gray, light greenish white, light gray to grayish white, occasionally brownish gray, soft, in parts firm, amorphous, in parts washable, plastic, slightly calcareous to moderately calcareous.

**Pyrite:** Rare.

#### 1175 – 1180 m

**Shale (70 %):** Greenish gray to light greenish gray, in parts medium gray, occasionally dark gray, firm, in parts moderately hard, brittle, in parts compact, fissile to sub fissile, smooth, flaky, platy, in parts elongated, feebly calcareous to slightly calcareous, in parts pyretic.

**Clay/Claystone (30 %):** Light greenish gray to greenish gray, light greenish white, light gray to grayish white, occasionally brownish gray, soft, in parts firm, amorphous, in parts washable, plastic, slightly calcareous to moderately calcareous.

**Pyrite and Limestone:** In Trace.

#### 1180 – 1195 m

**Shale (70 – 80 %):** Greenish gray to light greenish gray, occasionally medium gray, firm, in parts medium hard, brittle, in parts compact, fissile to sub fissile, flaky, platy, in parts elongated, smooth, non calcareous to feebly calcareous, in parts pyretic.

**Clay/Claystone (20 – 30 %):** Light greenish gray to greenish gray, light greenish white, in parts light grayish white, soft, in parts firm, amorphous, in parts washable, plastic, slightly calcareous to feebly calcareous, in parts moderately calcareous, in parts highly calcareous(marly) .

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*Pyrite and Limestone:* In Trace.

- 1195 – 1210 m** *Shale (70 – 80 %):* Greenish gray to light greenish gray, in parts medium gray, firm to moderately hard, brittle, in parts compact, fissile, smooth, flaky, platy, occasionally splintery, non calcareous to very feebly calcareous.  
*Clay/Claystone (20 – 30 %):* Light greenish gray to greenish gray; in parts occasionally light grayish white to grayish white, occasionally dirty white, soft, occasionally firm, amorphous, slightly to moderately calcareous.  
*Limestone:* In Trace.
- 1210 – 1235 m** *Shale (60 – 70 %):* Greenish gray to light greenish gray, in parts medium gray, firm to moderately hard, brittle, in parts compact, fissile, smooth, flaky, platy, occasionally splintery, non calcareous to very feebly calcareous.  
*Clay/Claystone (30 – 40 %):* Light greenish gray to greenish gray, in parts grayish white to dirty white, occasionally dirty white, light grayish, soft, occasionally firm, amorphous, slightly to moderately calcareous, in parts calcareous, occasionally pyretized fossil found.  
*Limestone:* In Trace.
- 1235 – 1240 m** *Shale (80 %):* Greenish gray to light greenish gray, in parts medium gray, firm to moderately hard, brittle, in parts compact, fissile, smooth, flaky, platy, occasionally splintery, non calcareous to very feebly calcareous.  
*Clay/Claystone (20 %):* Light greenish gray to greenish gray, in parts grayish white to dirty white, occasionally dirty white, light grayish, soft, occasionally firm, amorphous, slightly to moderately calcareous, in parts calcareous, occasionally pyretized fossil found.  
*Limestone:* In Trace.
- 1240 – 1250 m** *Shale (60 – 70 %):* Greenish gray to light greenish gray, in parts medium gray to dark gray, firm to moderately hard, brittle, in parts compact, fissile, smooth, flaky, platy, occasionally splintery, generally feebly, in parts moderately calcareous, occasionally pyretic dissemination.  
*Clay/Claystone (30 – 40 %):* Light greenish gray to greenish gray, in parts dark gray to brownish gray, grayish white to dirty white, soft, amorphous, slightly to feebly calcareous, in parts moderately calcareous to calcareous.  
*Limestone:* In traces.
- 1250 – 1260 m** *Shale (60 %):* Dominantly dark brownish gray to brownish gray, in parts light greenish gray to greenish gray, medium gray to dark gray, firm, occasionally moderately hard, brittle, splintery, elongated, sub fissile to fissile, moderately calcareous to calcareous, in parts feebly calcareous.  
*Clay/Claystone (40 %):* Brownish gray to dark brownish gray, medium gray to dark gray, grayish white to dirty white, generally soft, in parts firm, earthy, amorphous to sub blocky, moderately calcareous to calcareous.  
*Limestone and Pyrite:* In Trace.
- 1260 – 1265 m** *Clay/Claystone (60%):* Brownish gray to dark brownish gray, medium gray to dark gray, grayish white to dirty white, generally soft, in parts firm, earthy, amorphous to sub blocky, moderately calcareous to calcareous.

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**Shale (40 %):** Dominantly dark brownish gray to brownish gray, in parts light greenish gray to greenish gray, medium gray to dark gray, firm, occasionally moderately hard, brittle, splintery, elongated, sub fissile to fissile, moderately calcareous to calcareous, in parts feebly calcareous.

**Limestone:** In trace.

### 1265 – 1270 m

**Shale (70 %):** Greenish gray, medium gray, in parts brownish gray, dark gray, light gray, generally firm, in parts moderately hard, brittle, sub fissile to fissile, flaky, platy to sub platy, occasionally splintery, in parts sub blocky, in parts earthy, in parts smooth, slightly calcareous to moderately calcareous.

**Clay/Claystone (30 %):** Brownish gray to dark brownish gray, medium gray to dark gray, grayish white to dirty white, generally soft, in parts firm, earthy, amorphous to sub blocky, moderately calcareous to calcareous.

### 1270 – 1275 m

**Shale (50 %):** Greenish gray, medium gray, in parts brownish gray, dark gray, light gray, generally firm, in parts moderately hard, brittle, sub fissile to fissile, flaky, platy to sub platy, occasionally splintery, in parts sub blocky, in parts earthy, in parts smooth, slightly calcareous to moderately calcareous.

**Clay/Claystone (30 %):** Brownish gray to dark brownish gray, medium gray to dark gray, grayish white to dirty white, generally soft, in parts firm, earthy, amorphous to sub blocky, moderately calcareous to calcareous.

**Limestone (20 %):** White to dirty white, off white, grayish white, firm to moderately hard, in parts compact and brittle, microcrystalline, in parts chalky, foram, bioclastic.

### 1275 – 1280 m

**Limestone (80 %):** White to off white, milky white, dirty white, in parts grayish white, occasionally light grayish, in parts firm, moderately hard, microcrystalline, in parts chalky, foram, bioclastic.

**Shale (20 %):** Greenish gray, medium gray, in parts brownish gray, dark gray, light gray, generally firm, in parts moderately hard, brittle, sub fissile to fissile, flaky, platy to sub platy, occasionally splintery, in parts sub blocky, in parts earthy, in parts smooth, slightly calcareous to moderately calcareous.

### 1280 – 1300 m

**Limestone (90 – 100 %):** White to off white, milky white, dirty white, in parts light grayish white, in parts firm, moderately hard to hard, compact, brittle, microcrystalline, in parts chalky, foram, fossiliferous, bioclastic, in parts pyretic.

**Shale (Tr. – 10 %):** Greenish gray, medium gray to dark gray, in parts brownish gray, in parts light gray, firm, in parts moderately hard, brittle, in parts compact, sub fissile to fissile, flaky, platy, slightly calcareous to moderately calcareous.

**Pyrite:** In rare amount.

### 1300 – 1310 m

**Limestone (90 – 100 %):** Dirty white to light grayish white, off white to white, in parts light grayish, occasionally milky white, soft to firm, in parts moderately hard to hard, brittle, in parts compact, chalky, in parts microcrystalline, forams in parts pyretic.

**Shale (Tr. – 10 %):** Greenish gray to light greenish gray, medium gray, in parts dark gray, firm to moderately hard, brittle, compact, flaky, platy, in parts splintery, sub fissile to fissile, slightly calcareous to moderately calcareous.

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*Pyrite:* In traces.

**1310 – 1315 m**      *Limestone (100 %):* White to off white, dirty white, milky white, in parts grayish white, occasionally light grayish, firm, in parts moderately hard, brittle, bioclastic, microcrystalline to chalky, foram.

*Shale:* In Trace.

**1315 – 1325 m**      *Limestone (100 %):* White to dirty white, off white, milky white, in parts grayish white, occasionally light grayish, firm, in parts moderately hard, in parts brittle, bioclastic, in parts microcrystalline, chalky, foram.

*Shale:* In Trace.

**1325 – 1345 m**      *Limestone (90 %):* White, dirty white, off white, milky white, occasionally light grayish white to light grayish, firm, in parts moderately hard, in parts bioclastic, dominantly argillaceous, in parts microcrystalline, chalky, foram.

*Shale (10 %):* Greenish gray, medium to dark gray, occasionally brownish gray, firm to moderately hard, brittle, fissile, flaky, platy, in parts elongated, smooth, feebly calcareous to slightly calcareous.

**1345 – 1350 m**      *Limestone (90 %):* Dirty white to white, off white, in parts light grayish white to light grayish, firm to moderately hard, in parts hard, brittle, in parts compact, argillaceous, in parts microcrystalline, marl, chalky, foram.

*Shale (10 %):* Greenish gray, medium to dark gray, occasionally brownish gray, firm to moderately hard, brittle, fissile, flaky, platy, in parts elongated, smooth, feebly calcareous to slightly calcareous.

**1350 – 1355 m**      *Limestone (70 %):* Dirty white to white, off white, in parts light grayish white to light grayish, dirty white to grayish white, firm to moderately hard, in parts hard, brittle, in parts compact, argillaceous, in parts microcrystalline, marl, chalky, foram.

*Clay/Claystone (20 %):* Light gray to medium gray, greenish gray, soft to firm, amorphous, plastic, calcareous.

*Shale (10 %):* Greenish gray, medium to dark gray, occasionally brownish gray, firm to moderately hard, brittle, fissile, flaky, platy, in parts elongated, smooth, feebly calcareous to slightly calcareous.

*Pyrite:* In rare amount.

### SANU FORMATION: (1336 m – 2094 m)

Sanu Formation is the lower most part of the Tertiary sequence. It is overlain by Khuiala Formation and unconformably overlies Parh Formation of Cretaceous. This formation starts from the depth 1356 m and extend upto 2094 m. The thickness of the formation in this well is 738 m. The upper part of the formation consists of Clay (Shaly) and limestone/marl at partss, the lower part consist dominantly of fine to coarse grained sandstone with interbeds of Clay/ Claystone and minor limestone. This formation is further divided into four sub formations on the basis of their lithology type.

**Clay/Shale:** This member is dominated by Clay/Claystone / Shales from depth 1356 m to 1400 m, having a thickness of 44m.

Petrographically the Clay/Claystone of this member is generally gray to dark gray, greenish gray to bluish gray; light brown to brown; firm, plastic; calcareous.

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The shale is medium gray to dark gray, greenish gray, in partss brownish gray; firm to moderately hard, brittle, fissile to sub fissile, feebly to slightly calcareous.

**D<sub>2</sub> Sandstone:** This member consists of interbeds of Clay/Claystone, Sandstone, Siltstones, Shale and coal. The thickness of this member of Sanu Formation is 44 m, which starts from 1400 m and continues up to 1440 m.

Petro-graphically, the sandstone is colorless, clear, transparent to translucent, generally loose to friable, medium to fine, in partss coarse, ccasionally very fine, sub angular to sub rounded, sub spherical, moderately sorted, calcareous to siliceous cement, occasionally pyretic.

**Shale/Clay:** This part of Sanu Formation is having big patch of Shale/Claystone with intercalations of Limestone. It starts from 1440 m extends upto 1699 m.

The shale of this member is generally gray to dark gray, greenish gray, light brown to brown, moderately hard, compact, brittle, sub blocky to blocky, sub platy, sub flaky, sub fissile, non-calcareous to feebly calcareous, occasionally silty, glauconitic, pyritic, fossil of forams.

**D<sub>6</sub> Sandstone:** This member is the lower most part of Sanu Formation. This member unconformably overlies the Parh Formation of Upper Cretaceous age. The thickness is about 395 m and ranges from 1699 m to 2094 m. This member shows dominance of sandstone with interbeds of Clay/Claystone. Minor intercalations of siltstone are also present within this member.

Petrographically the sandstone of this member is white to dirty white, yellowish brown, light brown to brown, light grayish to grayish, color less, clear; friable to moderately hard; fine to very fine, in partss medium grained, occasionally coarse grained, sub angular to sub rounded, poorly to moderately sorted; argillaceous matrix, feebly calcareous , in partss pyretic cement.

### Lithological Description (Sanu Formation):

#### 1355 – 1360 m

**Limestone (50 %):** Dirty white, grayish white to light grayish, off white, firm, in parts moderately hard, brittle, in parts compact, marly, chalky, in parts microcrystalline, forams.

**Clay/Claystone (40 %):** Light gray to medium gray, light greenish gray to greenish gray, in parts dark gray to brownish gray, soft to firm, amorphous, in parts sub blocky to blocky, fairly sticky, in parts washable, plastic, calcareous.

**Shale (10 %):** Medium gray to gray, dark gray, greenish gray, in parts brownish gray to dark brownish, firm to moderately hard, brittle, compact, fissile to sub fissile, flaky, platy, in parts smooth, feebly calcareous to slightly calcareous.

#### 1360 – 1370 m

**Clay/Claystone (70 %):** Light gray to medium gray, light greenish gray to greenish gray, in parts dark gray to brownish gray, soft to firm, amorphous, in parts sub blocky to blocky, fairly sticky, in parts washable, plastic, in parts marly, calcareous.

**Shale (20 – 30 %):** Medium gray to gray, dark gray, greenish gray, in parts brownish gray to dark brownish, firm to moderately hard, brittle, compact, fissile to sub fissile, flaky, platy, in parts smooth, feebly calcareous to slightly calcareous.

**Limestone (Tr. – 10 %):** Dirty white, grayish white to light grayish, off white, firm to moderately hard, brittle, in parts compact, marly, chalky, in parts microcrystalline, forams.

#### 1370 – 1375 m

**Clay/Claystone (70 %):** Light gray to medium gray, light greenish gray to greenish gray, in parts dark gray to brownish gray, soft to firm, amorphous, in parts sub blocky to blocky, fairly sticky, in parts washable, plastic, in parts marly, slightly calcareous to calcareous.

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**Shale (20 %):** Medium gray to gray, dark gray, greenish gray, in parts brownish gray to dark brownish, firm to moderately hard, brittle, compact, fissile to sub fissile, flaky, platy, in parts silty, in parts smooth, feebly calcareous to slightly calcareous, rarely pyretic, in parts forams.

**Limestone (10 %):** Light grayish white to dirty white, off white, in parts light grayish, moderately hard, in parts soft to firm, brittle, compact, microcrystalline, in parts chalky, forams.

**Pyrite:** In rare amount.

#### 1375 – 1380 m

**Clay/Claystone (50 %):** Light gray to medium gray, light greenish gray to greenish gray, in parts dark gray to brownish gray, soft to firm, amorphous, in parts sub blocky to blocky, fairly sticky, in parts washable, plastic, in parts marly, slightly calcareous to calcareous.

**Limestone (30 %):** Light grayish white to dirty white, off white, in parts light grayish, firm to moderately hard, in parts hard, brittle, compact, microcrystalline, in parts chalky, forams.

**Shale (20 %):** Medium gray to gray, dark gray, greenish gray, in parts brownish gray to dark brownish, moderately hard, in parts firm, brittle, compact, fissile to sub fissile, flaky, platy, in parts silty, in parts smooth, feebly calcareous to slightly calcareous, rarely pyretic, in parts forams.

#### 1380 – 1385 m

**Clay/Claystone (50 %):** Dark gray to gray, light gray, dark brownish gray, blackish gray, in parts light grayish white, occasionally greenish gray, soft to firm, in parts moderately hard, in parts compact, blocky to sub blocky, in parts washable, plastic, slightly calcareous to calcareous, in parts glauconitic.

**Shale (40 %):** Dark gray to gray, blackish gray, in parts greenish gray to light greenish, soft to firm, in parts moderately hard, sub fissile to fissile, brittle, in parts compact, flaky to sub flaky, platy to sub platy, slightly calcareous to feebly calcareous, in parts pyretic.

**Limestone (10 %):** Light grayish white to dirty white, off white, in parts light grayish, firm to moderately hard, in parts hard, brittle, compact, microcrystalline, in parts chalky, forams.

**Glauconite and Pyrite:** In traces.

#### 1385 – 1390 m

**Clay/Claystone (60 %):** Dark gray to gray, light gray, dark brownish gray, blackish gray, in parts light grayish white, occasionally greenish gray, soft to firm, in parts moderately hard, in parts compact, blocky to sub blocky, in parts washable, in parts silty, plastic, slightly calcareous to calcareous, in parts glauconitic.

**Shale (40 %):** Dark gray to gray, blackish gray, in parts greenish gray to light greenish, soft to firm, in parts moderately hard, sub fissile to fissile, brittle, in parts compact, flaky to sub flaky, platy to sub platy, slightly calcareous to feebly calcareous, in parts pyretic.

**Glauconite and Limestone:** In Traces.

#### 1390 – 1395 m

**Clay/Claystone (80 %):** Dark gray to gray, light gray, dark brownish gray, blackish gray, in parts light grayish white, occasionally greenish gray, soft, in parts firm to moderately hard, in parts compact, blocky to sub blocky, in parts washable, in parts silty, plastic, non calcareous to feebly calcareous, occasionally calcareous grading towards marly nature .

**Shale (20 %):** Dark gray to gray, blackish gray, in parts greenish gray to light greenish, firm to moderately hard, sub fissile to fissile, brittle, in parts compact, flaky to sub flaky, platy to sub platy, non calcareous to feebly calcareous, in parts pyretic.

**Sandstone and Limestone:** In traces.

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- 1395 – 1400 m**
- Clay/Claystone (70 %):** Light gray to medium gray, light grayish white, in parts dark gray, in parts dark brownish gray, soft to firm, in parts moderately hard, in parts compact, sub blocky to blocky, in parts sticky, fairly washable, plastic, non calcareous to very feebly calcareous, in parts pyretic dissemination, in parts grading towards siltstone.
- Shale (20 %):** Medium gray to dark gray, light greenish gray to greenish gray, in parts brownish gray, firm to moderately hard, brittle, compact, flaky to sub flaky, platy to platy, fissile to sub fissile, non calcareous to very feebly calcareous, in parts silty.
- Coal (10 %):** Brownish black to dark brownish, blackish, moderately hard to hard, compact, brittle, sub vitreous to vitreous, lignitic, conchoidal fracture.
- Sandstone, Siltstone and Pyrite:** In traces.
- 1400 – 1405 m**
- Clay/Claystone (60 %):** Light gray to medium gray, light grayish white, in parts dark brownish gray, soft to firm, in parts moderately hard, in parts compact, sub blocky to blocky, in parts sticky, fairly washable, plastic, non calcareous to very feebly calcareous, in parts pyretic dissemination, in parts grading towards siltstone.
- Siltstone (20 %):** Light yellowish brown to brownish, cream to light cream, light gray to light grayish white, hard, in parts moderately hard, compact, non calcareous.
- Shale (10 %):** Medium gray to dark gray, light greenish gray to greenish gray, in parts brownish gray, firm to moderately hard, brittle, compact, flaky to sub flaky, platy to platy, fissile to sub fissile, non calcareous in parts feebly calcareous, in parts silty.
- Sandstone (10 %):** Clear, colourless, white to milky white, transparent to translucent, fine to medium grained, in parts occasionally coarse grained, loose to friable, rounded to sub rounded, sub angular, sub spherical to spherical, moderately sorted, in parts calcareous cemented, in parts fine grained of glauconite, in parts siltstone/ very fine grain sandstone.
- Coal and Pyrite:** In traces.
- Glauconite:** Rare.
- 1405 – 1410 m**
- Clay/Claystone (60 %):** Medium gray to gray, dark gray, in parts brownish gray, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts washable, non calcareous to very feebly calcareous, occasionally pyretic.
- Siltstone (20 %):** Dark brownish gray to brownish gray, light gray, cream, hard, compact, non calcareous, pyretic.
- Shale (10 %):** Dark gray to blackish gray, medium gray, in parts greenish gray, firm to moderately hard, brittle, compact, flaky to sub flaky, platy to platy, fissile to sub fissile, non calcareous in parts feebly calcareous, in parts silty.
- Sandstone (10 %):** Colourless, clear, transparent to translucent, friable to loose, fine to medium grained, sub angular to sub rounded, sub spherical, moderately sorted, in parts clean, calcareous cemented.
- Pyrite:** In Traces.
- 1410 – 1420 m**
- Clay/Claystone (30 %):** Medium gray to gray, dark gray, in parts brownish gray, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts washable, in parts silty, moderately micaceous, non calcareous to very feebly calcareous, occasionally pyretic.
- Sandstone (30 %):** Colourless, clear, transparent to translucent, friable to loose, fine to medium grained, sub angular to sub rounded, sub



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spherical to spherical, pyretic cemented, moderately sorted, unconsolidated, in parts pyretic, sand embedded in pyrite.

**Siltstone (10 – 20 %):** Dark brownish gray to brownish gray, light gray, cream, hard, compact, non calcareous, pyretic.

**Shale (10 – 20 %):** Dark gray to blackish gray, medium gray, in parts greenish gray, firm to moderately hard, brittle, compact, flaky to sub flaky, platy to platy, in parts moderately micaceous, carbonaceous, dissemination, fissile to sub fissile, non calcareous in parts feebly calcareous, in parts silty.

**Coal (10 %):** Dark brownish black to brownish black, moderately hard, blocky, sub vitreous, sub bituminous, lignitic.

### 1420 – 1425 m

**Clay/Claystone (40 %):** Medium gray to gray, light brownish gray to brownish gray, dark gray, occasionally grayish white, soft to firm, occasionally moderately hard, amorphous, in parts, sub blocky, moderately micaceous, carbonaceous dissemination, non calcareous, occasionally very feebly calcareous, in parts silty.

**Sandstone (20 %):** Colourless, clear, transparent to translucent, in parts friable, loose, medium grained, in parts very fine to fine grained, sub angular to sub rounded, sub spherical, moderately sorted, in parts non calcareous, in parts consolidated, in parts pyretic.

**Shale (20 %):** Dark brownish gray to brownish gray, dark gray, in parts greenish gray, moderately hard, brittle, sub fissile to fissile, flaky, platy, in parts sub blocky to blocky, moderately micaceous, silty, carbonaceous dissemination.

**Siltstone (10 %):** Dark brownish gray to brownish gray, hard, compact, non calcareous.

**Coal (10 %):** Dark brownish black to brownish black, blackish brown, moderately hard, blocky, sub vitreous, conchoidal fracture, sub bituminous to lignitic.

**Pyrite:** In Traces.

### 1425 – 1435 m

**Clay/Claystone (60 %):** Dominantly dark gray to medium gray, medium gray to gray, light brownish gray to brownish gray, dark gray, occasionally grayish white, soft to firm, occasionally moderately hard, amorphous, in parts, sub blocky, in parts washable, moderately micaceous, carbonaceous dissemination, non calcareous, occasionally very feebly calcareous, silty.

**Shale (20 %):** Dark brownish gray to brownish gray, dark gray, in parts greenish gray, moderately hard, brittle, sub fissile to fissile, flaky, platy, in parts sub blocky to blocky, moderately micaceous, silty, carbonaceous.

**Sandstone (10 %):** Colourless, clear, transparent to translucent, in parts friable, loose, medium grained, in parts very fine to fine grained, sub angular to sub rounded, sub spherical, moderately sorted, in parts non calcareous, in parts consolidated, in parts pyretic, sand embedded in pyrite.

**Siltstone (10 %):** Dark brownish gray to brownish gray, hard, compact, non calcareous.

**Pyrite and Coal:** In traces.

### 1435 – 1440 m

**Clay/Claystone (40 %):** Dominantly dark gray to medium gray, medium gray to gray, light brownish gray to brownish gray, dark gray, occasionally grayish white, soft to firm, occasionally moderately hard, amorphous, in parts, sub blocky, in parts washable, moderately micaceous, carbonaceous dissemination, non calcareous, occasionally very feebly calcareous, silty.

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**Sandstone (30 %):** White, light gray, light brownish gray, colourless, clear, transparent to translucent, friable to moderately hard, in parts loose, very fine to fine grained, occasionally medium grained, sub angular to sub rounded, argillaceous matrix, moderately sorted, calcareous cemented, consolidated, in parts pyretic, in parts grading towards siltstone.

**Shale (20 %):** Dark brownish gray to brownish gray, dark gray, in parts greenish gray, moderately hard, brittle, sub fissile to fissile, flaky, platy, in parts sub blocky to blocky, moderately micaceous, silty, carbonaceous.

**Siltstone (10 %):** Dark brownish gray to brownish gray, hard, compact, non calcareous, loose quartz grain.

### 1440 – 1445 m

**Clay/Claystone (40 %):** Dark gray to medium gray, brownish gray, in parts occasionally grayish white, light grayish, soft to firm, in parts moderately hard, amorphous to sub blocky, non calcareous, in parts washable, silty, moderately micaceous.

**Shale (40 %):** Dark gray to blackish gray, medium gray, occasionally greenish gray, moderately hard, compact, in parts brittle, flaky, platy, sub blocky to blocky, sub fissile, in parts fissile, non calcareous, pyretic.

**Sandstone (10 %):** White, light gray, light brownish gray, colourless, clear, transparent to translucent, friable to moderately hard, in parts loose, very fine to fine grained, occasionally medium grained, sub angular to sub rounded, argillaceous matrix, moderately sorted, calcareous cemented, consolidated, pyretic, in parts grading towards siltstone.

**Siltstone (10 %):** Dark brownish gray to brownish gray, hard, compact, non calcareous, loose quartz grain.

**Pyrite:** In traces.

### 1445 – 1455 m

**Clay/Claystone (50 – 60 %):** Dark gray to medium gray, brownish gray, in parts occasionally grayish white, light grayish, soft to firm, in parts moderately hard, amorphous to sub blocky, non calcareous, in parts washable, silty, moderately micaceous.

**Shale (40 – 50 %):** Dark gray to blackish gray, medium gray, occasionally greenish gray, moderately hard, compact, in parts brittle, flaky, platy, sub blocky to blocky, sub fissile, in parts fissile, non calcareous, pyretic.

**Pyrite:** In traces.

### 1455 – 1460 m

**Clay/Claystone (60 %):** Dark gray to gray, brownish gray, dark brownish, in parts light grayish, occasionally grayish white, soft to firm, in parts moderately hard, amorphous, sub blocky, in parts washable, silty, in parts micaceous, feebly calcareous, in parts slightly calcareous to calcareous.

**Shale (40 %):** Dark gray to blackish gray, medium gray, in parts greenish gray, occasionally dark greenish gray, moderately hard, compact, in parts brittle, sub flaky to sub platy, sub blocky, sub fissile to fissile, non calcareous.

**Limestone and Siltstone:** In Traces.

**Pyrite:** In rare amount.

### 1460 – 1465 m

**Clay/Claystone (50 %):** Dark gray to gray, brownish gray, dark brownish, in parts light grayish, occasionally grayish white, soft to firm, in parts moderately hard, amorphous, sub blocky, in parts washable, silty, in parts micaceous, feebly calcareous to slightly calcareous, in parts silty, in parts pyretic dissemination, in parts grading towards siltstone.

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**Shale (30 %):** Dark gray to blackish gray, medium gray, in parts greenish gray, occasionally dark greenish gray, moderately hard, compact, in parts brittle, sub flaky to sub platy, sub blocky, sub fissile to fissile, non calcareous to feebly calcareous.

**Limestone (20 %):** Light grayish white to dirty white, off white, in parts light grayish, firm to moderately hard, in parts soft, brittle, in parts compact, in parts chalky, microcrystalline, forams.

**Pyrite and Siltstone:** In traces.

### 1465 – 1470 m

**Clay/Claystone (60 %):** Dark gray to gray, brownish gray, dark brownish, in parts light grayish, occasionally grayish white, soft to firm, in parts moderately hard, amorphous, sub blocky, in parts washable, silty, in parts micaceous, feebly calcareous to slightly calcareous, in parts silty, in parts pyretic dissemination.

**Shale (30 %):** Dark gray to blackish gray, medium gray, in parts greenish gray, occasionally dark greenish gray, firm to moderately hard, compact, in parts brittle, sub flaky to sub platy, sub blocky, sub fissile to fissile, feebly calcareous.

**Limestone (10 %):** Light grayish white to dirty white, off white, in parts light grayish, firm to moderately hard, in parts soft, brittle, in parts compact, in parts chalky, microcrystalline, forams.

**Pyrite, Sandstone and Siltstone:** In traces.

### 1470 – 1480 m

**Clay/Claystone (60 – 70 %):** Medium gray to light gray, light grayish white, dark gray, in parts brownish gray, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts compact, in parts washable, feebly calcareous to slightly calcareous, in parts silty, in parts micaceous, in parts grading towards siltstone, in parts pyretic dissemination.

**Shale (30 – 40 %):** Dark gray to blackish gray, medium gray, in parts greenish gray, occasionally dark greenish gray, firm to moderately hard, compact, in parts brittle, sub flaky to sub platy, sub blocky, sub fissile to fissile, in parts pyretic, non calcareous to feebly calcareous.

**Pyrite, Sandstone and Limestone:** In traces.

### 1480 – 1490 m

**Clay/Claystone (60 – 70 %):** Dark gray to medium gray, brownish gray, in parts light gray, occasionally light grayish white, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts compact, in parts washable, non calcareous to feebly calcareous, silty, micaceous.

**Shale (30 – 40 %):** Dark gray to blackish gray, medium gray, occasionally greenish gray, moderately hard, in parts firm, compact, brittle, flaky, platy, sub blocky to blocky, sub fissile to fissile, in parts pyretic, non calcareous, in parts feebly calcareous.

**Pyrite and Limestone:** In Traces.

### 1490 – 1500 m

**Clay/Claystone (50 %):** Dark gray to medium gray, brownish gray, in parts light gray, occasionally light grayish white, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts compact, in parts washable, non calcareous to feebly calcareous, silty, micaceous, in parts grading towards siltstone, in parts pyretic dissemination.

**Shale (50 %):** Dark gray to blackish gray, medium gray, occasionally greenish gray, firm to moderately hard, compact, brittle, flaky, platy, sub blocky to blocky, sub fissile to fissile, in parts pyretic, non calcareous, in parts feebly calcareous.

**Pyrite:** In traces.

### 1500 – 1505 m

**Shale (60 %):** Dark gray to blackish gray, medium gray, occasionally greenish gray, firm to moderately hard, compact, brittle, flaky, platy, sub

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blocky to blocky, sub fissile, in parts fissile, in parts pyretic, non calcareous, in parts feebly calcareous.

**Clay/Claystone (40 %):** Dark gray to medium gray, brownish gray, in parts light gray, occasionally light grayish white, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts compact, in parts washable, non calcareous to feebly calcareous, silty, micaceous, in parts grading towards siltstone, in parts pyretic dissemination.

**Pyrite and Limestone:** In traces.

### 1505 – 1520 m

**Clay/Claystone (50 – 60 %):** Dark gray to medium gray, brownish gray, in parts light gray, occasionally light grayish white, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts compact, in parts washable, non calcareous to very feebly calcareous, silty, micaceous.

**Shale (40 – 50 %):** Dark gray to blackish gray, medium gray, occasionally greenish gray, firm to moderately hard, compact, brittle, flaky, platy, sub blocky to blocky, sub fissile, in parts fissile, in parts pyretic, non calcareous.

**Pyrite and Limestone:** In traces.

### 1520 – 1530 m

**Clay/Claystone (70 %):** Dark gray to blackish gray, in parts medium gray, firm to moderately hard, in parts soft, sub blocky to amorphous, non calcareous, in parts washable, earthy, occasionally pyretic, in parts grading towards sub fissile shale.

**Shale (30 %):** Dark gray to blackish gray, occasionally greenish gray, moderately hard, compact, flaky, sub blocky to blocky, sub fissile, non calcareous.

### 1530 – 1540 m

**Clay/Claystone (70 %):** Dark gray to blackish gray, in parts medium gray, soft to firm, in parts moderately hard, sub blocky to amorphous, non calcareous, in parts washable, earthy, occasionally pyretic, in parts grading towards sub fissile shale.

**Shale (30 %):** Dark gray to blackish gray, occasionally greenish gray, moderately hard, compact, flaky, sub blocky to blocky, sub fissile, non calcareous.

### 1540 – 1560 m

**Clay/Claystone (60 %):** Dark gray to blackish gray, in parts medium gray, firm to moderately hard, in parts soft, sub blocky to amorphous, non calcareous, in parts washable, occasionally pyretic.

**Shale (40 %):** Dark gray to blackish gray, in parts occasionally greenish gray, moderately hard, compact, flaky, sub blocky to blocky, sub fissile, non calcareous, in parts pyretic, in parts grading towards claystone.

**Pyrite and Siltstone:** In Traces.

### 1560 – 1570 m

**Clay/Claystone (60 %):** Dark gray to blackish gray, medium gray, in parts light gray to grayish white, firm to moderately hard, in parts soft, sub blocky to amorphous, feebly calcareous to slightly calcareous, in parts washable, occasionally pyretic.

**Shale (30 %):** Dark gray to blackish gray, in parts medium gray, occasionally greenish gray, moderately hard, compact, flaky, sub blocky to blocky, in parts occasionally sub elongated to sub platy, sub fissile, in parts fissile, non calcareous to feebly calcareous, in parts pyretic, in parts grading towards claystone.

**Limestone (10 %):** Light grayish white to grayish, dirty white, in parts light grayish white, firm to moderately hard, in parts hard, compact, brittle, in parts chalky, microcrystalline, in parts marly.

**Pyrite and Glauconite:** In Traces.

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- 1570 – 1575 m**      **Clay/Claystone (50 %):** Dark gray to blackish gray, medium gray, in parts light gray to grayish white, soft to firm, in parts moderately hard, in parts soft, sub blocky to amorphous, feebly calcareous to slightly calcareous, in parts washable, occasionally pyretic.  
**Shale (50 %):** Dark gray to blackish gray, in parts medium gray, occasionally greenish gray, moderately hard, in parts firm, compact, flaky, sub blocky to blocky, in parts occasionally sub elongated to sub platy, sub fissile, in parts fissile, very feebly calcareous to feebly calcareous, in parts pyretic, in parts grading towards claystone.  
**Pyrite, Limestone and Glauconite:** In traces.
- 1575 – 1590 m**      **Clay/Claystone (50 – 60 %):** Light gray to medium gray, light grayish white, light grayish, in parts dark gray, occasionally dirty white, soft to firm, in parts moderately hard, amorphous, sub blocky to blocky, in parts washable, slightly calcareous to calcareous, in parts marly.  
**Shale (40 – 50 %):** Medium gray to dark gray, in parts light gray, in parts occasionally greenish gray, occasionally blackish gray, firm to moderately hard, compact, sub fissile, in parts fissile, flaky, sub platy to platy, sub blocky to blocky, feebly calcareous to slightly calcareous, in parts pyretic, in parts grading towards claystone.  
**Pyrite, Limestone and Siltstone:** In Traces.
- 1590 – 1610 m**      **Clay/Claystone (60 – 70 %):** Light gray to medium gray, light grayish white, light grayish, in parts dark gray, occasionally dirty white, soft to firm, in parts moderately hard, amorphous, sub blocky to blocky, in parts washable, slightly calcareous to calcareous, in parts marly.  
**Shale (30 – 40 %):** Medium gray to dark gray, in parts light gray, in parts occasionally greenish gray, occasionally blackish gray, firm to moderately hard, compact, sub fissile, in parts fissile, flaky, sub platy to platy, sub blocky to blocky, feebly calcareous to slightly calcareous, in parts pyretic, in parts grading towards claystone.  
**Limestone:** In traces.  
**Pyrite:** Rare.
- 1610 – 1615 m**      **Clay/Claystone (50 %):** Medium gray to light gray, in parts light grayish white, in parts grayish, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts blocky, in parts washable, in parts occasionally pyretic, feebly calcareous to slightly calcareous.  
**Shale (50 %):** Dark gray to medium gray, in parts light gray, occasionally light greenish gray, firm to moderately hard, sub flaky to sub platy, in parts sub blocky to blocky, compact, in parts silty, in parts grading towards claystone, feebly calcareous.  
**Limestone:** In Traces.  
**Pyrite:** In rare amount.
- 1615 – 1625 m**      **Clay/Claystone (70 – 80 %):** Light gray to gray, in parts medium gray, occasionally grayish white, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts washable, fairly sticky, moderately calcareous, rarely glauconitic.  
**Shale (20 – 30 %):** Dark gray to medium gray, occasionally greenish gray to light greenish gray, moderately hard, compact, massive to sub fissile, sub flaky to flaky, sub platy to platy, sub blocky to blocky, slightly calcareous to calcareous, occasionally pyretic dissemination.  
**Siltstone:** In traces.
- 1625 – 1630 m**      **Clay/Claystone (80 %):** Light gray to gray, in parts medium gray, occasionally grayish white, soft to firm, in parts moderately hard to hard,

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amorphous to sub blocky, in parts washable, fairly sticky, slightly calcareous to calcareous, in parts marly, in parts pyretic inclusion, occasionally fine grained glauconitic, in parts grading towards siltstone.

**Shale (20 %):** Dark gray to medium gray, occasionally greenish gray to light greenish gray, moderately hard, in parts compact, massive to sub fissile, sub flaky to flaky, sub platy to platy, sub blocky to blocky, feebly calcareous to slightly calcareous, occasionally pyretic dissemination.

**Siltstone and Pyrite:** In traces.

**Glauconite:** Rare.

### 1630 – 1635 m

**Clay/Claystone (80 %):** Light gray to gray, in parts medium gray, in parts light grayish white, in parts occasionally dark gray, soft to firm, in parts moderately hard, occasionally hard, in parts compact, amorphous to sub blocky, in parts washable, in parts pyretic dissemination, feebly calcareous to moderately calcareous.

**Shale (20 %):** Dark gray to medium gray, occasionally greenish gray to light greenish gray, firm to moderately hard, in parts compact, massive to sub fissile, sub flaky to flaky, sub platy to platy, sub blocky to blocky, feebly calcareous to slightly calcareous, occasionally pyretic dissemination.

**Siltstone and Pyrite:** In traces.

### 1635 – 1670 m

**Clay/Claystone (80 – 90 %):** Light gray to gray, in parts grayish white, occasionally white, firm, in parts soft and moderately hard, amorphous, in parts washable, moderately calcareous to calcareous.

**Shale (10 – 20 %):** Dark gray to medium gray, occasionally greenish gray, occasionally brownish gray, moderately hard, compact, sub fissile to massive, occasionally fissile, flaky to sub flaky, sub blocky to blocky, sub platy, slightly calcareous, in parts feebly calcareous.

**Pyrite:** Rare.

### 1670 – 1680 m

**Clay/Claystone (80 – 90 %):** Light gray to gray, medium gray, light grayish white to white, occasionally dirty white, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts washable, in parts fairly sticky, occasionally pyretic, in parts glauconitic, moderately calcareous to calcareous.

**Shale (10 – 20 %):** Dark gray to medium gray, occasionally greenish gray, moderately hard, compact, sub fissile to massive, flaky to sub flaky, sub blocky to blocky, sub platy, slightly calcareous to moderately calcareous, occasionally pyretic dissemination.

**Pyrite:** In traces.

**Glauconite:** Abundant

### 1680 – 1695 m

**Clay/Claystone (90 – 100 %):** Light gray to gray, in parts medium gray, in parts light grayish white to dirty white, occasionally dark gray, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts washable, in parts fairly sticky, occasionally pyretic, in parts glauconitic, moderately calcareous to calcareous.

**Shale (Tr. – 10 %):** Dark gray to medium gray, occasionally greenish gray, moderately hard, compact, sub fissile to massive, flaky to sub flaky, sub blocky to blocky, sub platy, slightly calcareous to moderately calcareous, occasionally pyretic dissemination.

**Pyrite:** In traces.

**Glauconite:** Abundant

### 1695 – 1700 m

**Clay/Claystone (60 %):** Light gray to gray, in parts medium gray, in parts light grayish white to dirty white, occasionally dark gray, soft to

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firm, in parts moderately hard, amorphous to sub blocky, in parts washable, in parts fairly sticky, occasionally pyretic dissemination, in parts glauconitic, feebly calcareous to slightly calcareous.

**Sandstone (30 %):** Light grayish white to light grayish, dirty white, in parts light brownish white to brownish, transparent to translucent, very fine to fine grained, friable to consolidated, sub angular to sub rounded, sub spherical to spherical, moderately sorted, in parts argillaceous matrix, in parts fine grained glauconitic, NF/NC.

**Shale (10 %):** Dark gray to medium gray, occasionally greenish gray, moderately hard, compact, sub fissile to massive, flaky to sub flaky, sub blocky to blocky, non calcareous to feebly calcareous, occasionally pyretic dissemination.

**Pyrite:** In traces.

**Glauconite:** Abundant

### 1700 – 1720 m

**Sandstone (70 – 80 %):** Light grayish white to light grayish, dirty white to white, light brownish white, in parts brownish, in parts smoky white, transparent to translucent, very fine to fine grained, friable, loose, in parts consolidated, sub angular to sub rounded, sub spherical to spherical, moderately sorted, weakly cemented, in parts argillaceous matrix, in parts fine grained glauconitic, NF/NC.

**Clay/Claystone (20 – 30 %):** Light gray to gray, in parts medium gray, in parts light grayish white to dirty white, occasionally dark gray, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts washable, in parts fairly sticky, occasionally pyretic dissemination, in parts glauconitic, non calcareous to feebly calcareous.

**Pyrite and Shale:** In traces.

**Glauconite:** Abundant

### 1720 – 1725 m

**Sandstone (80 %):** Light brownish to brownish, colorless, transparent to translucent, in parts dirty white to brownish white, loose to friable, very fine to fine grained, in parts medium grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, in parts consolidated, dominantly loose quartz grain, in parts pyretic, in parts glauconitic, NF/NC.

**Clay/Claystone (20 %):** Brownish to reddish brown, light brownish, in parts light greenish gray, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts washable, non calcareous to very feebly calcareous.

**Pyrite and Glauconite:** In traces.

### 1725 – 1730 m

**Sandstone (60 %):** Light brownish to brownish, colorless, transparent to translucent, in parts dirty white to brownish white, loose to friable, very fine to fine grained, in parts medium grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, in parts consolidated, dominantly loose quartz grain, in parts pyretic, in parts glauconitic, NF/NC.

**Clay/Claystone (40 %):** Brownish to reddish brown, light brownish, in parts light greenish gray, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts washable, non calcareous, in parts occasionally feebly calcareous.

**Pyrite and Glauconite:** In traces.

### 1730 – 1755 m

**Sandstone (70 – 80 %):** Light brownish to brownish, colorless, transparent to translucent, in parts dirty white to brownish white, loose to friable, very fine to fine grained, in parts medium grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous

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matrix, in parts consolidated, dominantly loose quartz grain, in parts pyretic, in parts glauconitic, NF/NC.

**Clay/Claystone (20 – 30 %):** Brownish to reddish brown, light brownish, in parts light greenish gray, soft, in parts firm to moderately hard, amorphous to sub blocky, in parts washable, non calcareous to feebly calcareous, in parts grading towards very fine sandstone.

**Pyrite and Glauconite:** In traces.

### 1755 – 1760 m

**Sandstone (70 %):** Dominantly light brownish to brownish, in parts light grayish to grayish white, colourless, occasionally transparent to translucent, dominantly friable, in parts moderately hard, very fine to fine grained, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, very feebly calcareous, pyretic, weak to moderately cemented, dirty, in parts glauconitic, NF/NC.

**Clay/Claystone (30 %):** Light gray to grayish white, in parts brownish to light brownish, reddish brown, dirty white, light greenish gray, soft to firm, amorphous, in parts washable, in parts glauconitic, non calcareous to very feebly calcareous.

**Shale and Glauconite:** In traces.

### 1760 – 1765 m

**Sandstone (60 %):** Dominantly brownish to dark brownish, light brownish, occasionally light grayish to grayish white, colourless, friable, to moderately hard, very fine to fine grained, in parts medium grained, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, non calcareous to very feebly calcareous, pyretic dissemination, pyretic cemented, weak to moderately cemented, dirty, argillaceous, in parts glauconitic, NF/NC.

**Clay/Claystone (40 %):** Dominantly brownish to reddish brown, light brown, dark brown, occasionally light gray to grayish white, soft, occasionally firm, in parts washable, amorphous, in parts glauconitic, non calcareous.

**Glauconite:** In Trace.

### 1765 – 1780 m

**Sandstone (70 – 80 %):** Dominantly brownish to dark brownish, light brownish, occasionally light grayish to grayish white, colourless, friable, to moderately hard, very fine to fine grained, in parts medium grained, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, non calcareous to very feebly calcareous, pyretic dissemination, pyretic cemented, weak to moderately cemented, dirty, argillaceous, in parts glauconitic, NF/NC.

**Clay/Claystone (20 – 30 %):** Dominantly brownish to reddish brown, light brown, dark brown, occasionally light gray to grayish white, soft, occasionally firm, in parts washable, amorphous, in parts glauconitic, non calcareous.

**Glauconite:** In traces.

### 1780 – 1790 m

**Sandstone (60 – 70 %):** Dominantly brownish to dark brownish, light brownish, light grayish to light grayish white, in parts white, colourless, friable to moderately hard, very fine to fine grained, in parts medium grained, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, pyretic, non calcareous, rarely very feebly calcareous, weak to moderately cemented, in parts glauconitic, NF/NC.

**Clay/Claystone (30 – 40 %):** Dominantly brownish to reddish brown, light brown to dark brown, in parts grayish to grayish white, dirty white, soft to firm, in parts washable, amorphous, in parts occasionally glauconitic, non calcareous to very feebly calcareous.

**Glauconite:** In Trace.



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- 1790 – 1795 m**      **Clay/Claystone (60 %):** Light yellowish white to light grayish white, dirty white, light yellowish, in parts light grayish, light brownish, grayish, firm to moderately hard, in parts soft, amorphous to sub blocky, in parts silty/sandy, non calcareous, in parts very feebly calcareous, variegated.  
**Sandstone (40 %):** Light gray to light grayish white, dirty white, in parts light yellowish to light yellowish brown, moderately hard, in parts friable to hard, consolidated, very fine to medium grained, sub angular to sub rounded, sub spherical, poorly sorted, argillaceous matrix, dirty, pyretic, non calcareous, weak to moderately cemented, glauconitic, NF/NC.
- 1795 – 1800 m**      **Sandstone (60 %):** Dominantly colorless, light grayish, clear, transparent to translucent, in parts dirty white, grayish white, friable to moderately hard, fine to medium grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, non calcareous, occasionally very feebly calcareous, moderately cemented, dominantly loose in cuttings, in parts consolidated, in parts very fine glauconitic, NF/NC.  
**Clay/Claystone (40 %):** Dirty white to white, grayish white, yellowish white, in parts grayish to light grayish, occasionally dark grayish, soft to firm, occasionally moderately hard, amorphous to sub blocky, in parts washable, non calcareous, occasionally very feebly calcareous.  
**Shale:** In traces.
- 1800 – 1810 m**      **Clay/Claystone (70 %):** Light gray to gray, grayish white to dirty white, in parts medium gray, white, light grayish, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts silty, non calcareous.  
**Sandstone (30 %):** Light gray to grayish white, light grayish to grayish white, colourless, clear, white, light grayish, friable to moderately hard, consolidated, very fine to fine grained, sub angular to sub rounded, sub spherical, moderately sorted, clean, argillaceous matrix, non calcareous, moderately cemented, occasionally fine glauconitic inclusion, in parts grading towards siltstone, rarely blackish carbonaceous matter, micaceous, NF/NC.
- 1810 – 1820 m**      **Sandstone (60 %):** Colourless, clear, white, in parts light grayish white to light grayish, transparent to translucent, friable to moderately hard, in parts consolidated, very fine to fine grained, in parts medium grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, dominantly clean and loose, in parts argillaceous matrix, non calcareous, in parts occasionally feebly calcareous, weak to moderately cemented, occasionally fine grained glauconitic inclusion, in parts grading towards siltstone, NF/NC.  
**Clay/Claystone (40 %):** White to dirty white, light grayish white to light grayish, in parts medium gray to gray, soft, in parts firm to moderately hard, amorphous to sub blocky, in parts silty, non calcareous, in parts occasionally micaceous.
- 1820 – 1825 m**      **Sandstone (50 %):** Colourless, clear, white, in parts light grayish white to light grayish, transparent to translucent, friable to moderately hard, in parts consolidated, very fine to fine grained, in parts medium grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, dominantly clean and loose, in parts argillaceous matrix, non calcareous, in parts occasionally feebly calcareous, weak to moderately cemented, in parts pyretic, occasionally fine grained glauconitic inclusion, in parts grading towards siltstone, NF/NC.

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**Clay/Claystone (40 %):** White to dirty white, light grayish white to light grayish, in parts medium gray to gray, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts silty, non calcareous, in parts occasionally micaceous.

**Shale (10 %):** Blackish to dark brownish, dark gray to medium gray, in parts greenish gray, in parts brownish, firm to moderately hard, compact, sub fissile to fissile, sub flaky to platy, non calcareous, in parts micaceous, in parts pyretic.

**Pyrite:** In Traces.

### 1825 – 1835 m

**Clay/Claystone (70 %):** White to dirty white, light grayish white to light grayish, in parts medium gray, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts washable, in parts silty/sandy, non calcareous, in parts feebly calcareous, in parts micaceous, in parts glauconitic, in parts grading towards siltstone.

**Sandstone (30 %):** Colourless, white, in parts light grayish white, transparent to translucent, friable to moderately hard, very fine to fine grained, in parts medium grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, in parts argillaceous matrix, non calcareous, in parts very feebly calcareous cement, weak to moderately cemented, in parts pyretic, in parts fine grained glauconitic inclusion, NF/NC.

**Pyrite, Siltstone, Glauconite and Shale:** In traces.

### 1835 – 1840 m

**Clay/Claystone (50 %):** Light gray to gray, grayish white to dirty white, white, in parts medium gray, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts silty/sandy, non calcareous to feebly calcareous, in parts micaceous, in parts dark carbonaceous matter, in parts pyretic dissemination, in parts grading towards siltstone.

**Sandstone (50 %):** Colourless, white, in parts light grayish white, transparent to translucent, friable to moderately hard, very fine to fine grained, in parts medium grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, in parts argillaceous matrix, non calcareous, in parts calcareous cement, weak to moderately cemented, in parts pyretic, in parts occasionally dark carbonaceous matter, in parts fine grained glauconitic inclusion, NF/NC.

**Pyrite and Siltstone:** In traces.

### 1840 – 1845 m

**Clay/Claystone (70 %):** White to dirty white, grayish white, occasionally medium gray, blackish gray, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts silty, non calcareous, occasionally very feebly calcareous, occasionally carbonaceous dissemination.

**Sandstone (30 %):** Colourless, clear, transparent to translucent, friable to moderately hard, fine grained, in parts very fine grained, occasionally medium grained, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, non calcareous, occasionally very feebly calcareous, moderately cemented, occasionally grading towards siltstone, glauconitic inclusion, NF/NC.

### 1845 – 1855 m

**Clay/Claystone (70 %):** White to dirty white, grayish white, occasionally medium gray, blackish gray, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts silty, non calcareous, occasionally very feebly calcareous, occasionally pyretic and carbonaceous dissemination.

**Sandstone (30 %):** Colourless, clear, transparent to translucent, friable to moderately hard, fine grained to very fine grained, occasionally medium grained, consolidated, sub angular to sub rounded, sub spherical,

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moderately sorted, argillaceous matrix, non calcareous, occasionally very feebly calcareous, moderately cemented, fine glauconitic inclusion, occasionally pyretic, in parts grading towards siltstone, occasionally sand embedded in pyrite, pyretized carbonaceous matter, NF/NC.

**Pyrite and Carbonaceous matter:** In Traces. (Pyretized woody carbonized matter)

### 1855 – 1860 m

**Clay/Claystone (60 %):** White to dirty white, grayish white, occasionally medium gray, blackish gray, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts silty, non calcareous, occasionally very feebly calcareous, occasionally pyretic and carbonaceous dissemination.

**Sandstone (30 %):** Colourless, clear, transparent to translucent, friable to moderately hard, fine grained to very fine grained, occasionally medium grained, consolidated, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, non calcareous, occasionally very feebly calcareous, moderately cemented, fine glauconitic inclusion, occasionally pyretic, in parts grading towards siltstone, occasionally sand embedded in pyrite, pyretized carbonaceous matter, NF/NC.

**Siltstone (10 %):** Brownish gray to light brownish gray, hard, compact, non calcareous.

**Pyrite and Carbonaceous matter:** In traces. (Pyritized woody matter)

### 1860 – 1865 m

**Clay/Claystone (70 %):** White to dirty white, grayish white, in parts medium gray to gray, blackish gray, soft to firm, in parts moderately hard, amorphous to sub blocky, in parts silty, non calcareous, occasionally very feebly calcareous, pyretic, in parts carbonaceous dissemination.

**Sandstone (30 %):** Colourless, clear, transparent to translucent, friable to moderately hard, fine grained to very fine grained, occasionally medium grained, consolidated, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, non calcareous, occasionally very feebly calcareous, moderately cemented, fine glauconitic inclusion, occasionally pyretic, in parts grading towards siltstone, occasionally sand embedded in pyrite, pyretized carbonaceous matter, NF/NC.

**Pyrite and Siltstone:** In traces.

### 1865 – 1875 m

**Clay/Claystone (90 – 100 %):** Predominantly brownish to reddish brown, brick red, in parts blackish brown, in parts gray to grayish white, soft to firm, amorphous, in parts washable, fairly sticky, non calcareous, in parts carbonaceous matter.

**Sandstone (Tr. – 10 %):** Colourless, clear, transparent to translucent, friable to moderately hard, fine grained to very fine grained, occasionally medium grained, consolidated, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, non calcareous, occasionally very feebly calcareous, moderately cemented, fine glauconitic inclusion, occasionally pyretic, in parts grading towards siltstone, occasionally sand embedded in pyrite, pyretized carbonaceous matter, NF/NC.

**Pyrite:** In trace

### 1875 – 1890 m

**Clay/Claystone (80 – 90 %):** Predominantly brownish to reddish brown, brick red, in parts blackish brown, in parts gray to grayish white, in parts occasionally dirty white to whitish, soft to firm, in parts moderately hard, amorphous, in parts washable, fairly sticky, non calcareous, in parts carbonaceous matter.

**Sandstone (10 – 20 %):** Colourless, clear, transparent to translucent, occasionally brownish, friable to moderately hard, fine grained to

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## SGL # 2

medium grained, in parts very fine grained, occasionally coarse grained, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, weak to moderately cemented, non calcareous, in parts very feebly calcareous, occasionally grading towards siltstone, occasionally fine glauconitic inclusion.

**Siltstone and Glauconite:** In traces.

**Pyrite:** Rare.

### 1890 – 1900 m

**Clay/Claystone (60 – 70 %):** Light yellowish gray to light yellowish white, dirty white to white, light grayish white to light grayish, brownish to reddish brown, in parts brick red, soft in parts firm to moderately hard, amorphous, in parts sub blocky to blocky, non calcareous, in parts occasionally feebly to very feebly calcareous, in parts silt/sandy.

**Sandstone (30 – 40 %):** Colourless, clear, transparent to translucent, in parts white, friable to moderately hard, medium grained, in parts fine grained, occasionally coarse grained, sub angular to sub rounded, sub spherical, moderately sorted, in parts argillaceous matrix, weak to moderately cemented, non calcareous, occasionally very feebly calcareous, in parts rarely pyritic.

**Pyrite, Shale, Carbonaceous matter:** In traces, pyrite rare.

### 1900 – 1905 m

**Clay/Claystone (90 %):** Dominantly brownish to reddish brown, brick red, in parts light grayish white to dirty white, in parts light grayish, soft in parts firm to moderately hard, amorphous, in parts washable, non calcareous, in parts feebly to very feebly calcareous.

**Sandstone (10 %):** Colourless, clear, transparent to translucent, in parts white, friable to moderately hard, medium grained, in parts fine grained, occasionally coarse grained, sub angular to sub rounded, sub spherical, moderately sorted, in parts argillaceous matrix, weak to moderately cemented, non calcareous, occasionally very feebly calcareous, in parts rarely pyritic.

**Pyrite:** Rare

### 1905 – 1915 m

**Clay/Claystone (60 – 70 %):** Dominantly brownish to reddish brown, brick red, in parts light grayish white to dirty white, in parts light grayish, soft in parts firm to moderately hard, amorphous, in parts washable, non calcareous, in parts feebly to very feebly calcareous, occasionally/rarely carbonaceous, in parts silty.

**Sandstone (30 – 40 %):** Colourless, clear, transparent to translucent, brownish to dark brownish, light brownish, in parts grayish white to white, white to dirty white, friable to moderately hard, medium grained, in parts fine grained, occasionally coarse grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, in parts argillaceous matrix, weak to moderately cemented, non calcareous, occasionally very feebly calcareous, in parts rarely pyritic, consolidated, no fluorescence and no cut.

**Pyrite, siltstone:** In traces.

### 1915 – 1920 m

**Clay/Claystone (90 %):** Predominantly reddish brown to brownish red, brick red, in parts light grayish to light grayish white, rarely dirty white, soft to firm, moderately hard, amorphous, in parts sub blocky to blocky, non calcareous, in parts very feebly calcareous, in parts silty.

**Sandstone (10 %):** Colourless, clear, transparent to translucent, white to dirty white, friable to moderately hard, medium grained, in parts fine grained, occasionally coarse grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, in parts argillaceous matrix, weak to moderately cemented, non calcareous, occasionally very feebly

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calcareous, in parts rarely pyritic, consolidated, no fluorescence and no cut.

### 1920 – 1925 m

**Sandstone (70 %):** Colourless, clear, transparent to translucent, light grayish white, white, light brownish, friable to loose, fine to medium grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, weak to moderately cemented, feebly calcareous, predominantly loose, in parts consolidated, fair visible porosity, no fluorescence and no cut.

**Clay/Claystone (30 %):** Dark brownish, reddish brown to brownish, brick red, in parts white to dirty white, grayish white, soft to firm, amorphous, non calcareous very very feebly calcareous, in parts washable.

### 1925 – 1930 m

**Sandstone (50 %):** Colourless, clear, transparent to translucent, light grayish white, white, light brownish, friable to loose, fine to medium grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, weak to moderately cemented, feebly calcareous, predominantly loose, in parts consolidated, fair visible porosity, no fluorescence and no cut.

**Clay/Claystone (50 %):** Dark brownish, reddish brown to brownish, brick red, in parts white to dirty white, grayish white, soft to firm, amorphous, non calcareous very very feebly calcareous, in parts washable.

### 1930 – 1940 m

**Clay/Claystone (50 – 60 %):** Dominantly white to dirty white, in parts brownish, reddish brown, brick red, occasionally gray to medium gray, soft to firm, occasionally moderately hard, amorphous, non calcareous very feebly calcareous, in parts sub blocky, in parts washable.

**Sandstone (40 – 50 %):** Colourless, clear, transparent to translucent, white, loose to friable, occasionally in parts moderately hard, medium to fine grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, weak to moderately cemented, very feebly calcareous, predominantly loose in categories, occasionally in parts consolidated, fair visible porosity, no fluorescence and no cut.

### 1940 – 1950 m

**Clay/Claystone (70 – 80 %):** Dominantly brownish to reddish brown, brick red, in parts white to dirty white, occasionally gray to medium gray, brownish gray, soft to firm, occasionally moderately hard, amorphous, non calcareous very feebly calcareous, in parts sub blocky, in parts washable.

**Sandstone (20 – 30 %):** Colourless, clear, transparent to translucent, white, loose to friable, occasionally in parts moderately hard, medium to fine grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, weak to moderately cemented, very feebly calcareous, predominantly loose in categories, occasionally in parts consolidated, fair visible porosity, no fluorescence and no cut.

### 1950 – 1965 m

**Clay/Claystone (80 – 90 %):** Dominantly brownish to reddish brown, brick red, in parts white to dirty white, occasionally gray to medium gray, brownish gray, occasionally light gray to grayish white soft to firm, occasionally moderately hard, amorphous, non calcareous very feebly calcareous, in parts sub blocky, in parts washable.

**Sandstone (10 – 20 %):** Colourless, clear, transparent to translucent, white, loose to friable, occasionally in parts moderately hard, medium to fine grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, weak to moderately cemented,

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very feebly calcareous, predominantly loose in categories, occasionally in parts consolidated, fair visible porosity, no fluorescence and no cut.

**1965 – 1970 m** *Clay/Claystone (100 %):* Predominantly brownish to reddish brown, brick red, occasionally white to grayish white, brownish gray, soft to firm, in parts moderately hard, amorphous, non calcareous, sub blocky.

**1970 – 1975 m** *Clay/Claystone (70 %):* Dominantly brownish, reddish brown, brick red, in parts dirty white to white, light gray to light greenish gray, light yellowish, lime, firm, in parts soft and moderately hard, amorphous, generally non calcareous, in parts very feebly calcareous, in parts sub blocky, in parts silty.

*Sandstone (30 %):* Colourless, clear, transparent to translucent, white, friable to moderately hard, very fine to fine grained, sub rounded, sub spherical, moderately sorted, argillaceous matrix, weak to moderately cemented, very feebly calcareous, predominantly loose in categories, in parts consolidated, no fluorescence and no cut.

**1975 – 1990 m** *Clay/Claystone (50 – 60 %):* Dominantly brownish, reddish brown, brick red, in parts dirty white to white, light gray to light greenish gray, light yellowish, lime, firm, in parts soft and moderately hard, amorphous, generally non calcareous, in parts very feebly calcareous, in parts sub blocky, in parts silty.

*Sandstone (40 – 50 %):* Colourless, clear, transparent to translucent, white, friable to moderately hard, medium to fine grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, weak to moderately cemented, silica cement, very feebly calcareous, predominantly loose in categories, in parts consolidated, no fluorescence and no cut.

**1990 – 2000 m** *Clay/Claystone (70 – 80 %):* Predominantly brownish, reddish brown, occasionally in parts dirty white to white, light gray, soft to firm, amorphous, non calcareous, in parts slightly washable.

*Sandstone (20 – 30 %):* Colourless, clear, transparent to translucent, white, friable to moderately hard, medium to coarse grained, in parts fine grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, very feebly calcareous, fair visible porosity, no fluorescence and no cut.

**2000 – 2010 m** *Clay/Claystone (90 – 100 %):* Predominantly brownish, reddish brown, brick red, in parts white to dirty white, light gray, occasionally light yellowish to light yellowish white, soft to firm, amorphous, non calcareous, in parts slightly washable, occasionally in parts carbonaceous matter.

*Sandstone (Tr. – 10 %):* Colourless, clear, transparent to translucent, white, friable to moderately hard, medium to coarse grained, in parts fine grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, very feebly calcareous, fair visible porosity, no fluorescence and no cut.

**2010 – 2015 m** *Clay/Claystone (70 %):* Predominantly brownish, reddish brown, brick red, in parts white to dirty white, light gray to light grayish white, in parts light yellowish, soft to firm, amorphous, non calcareous, in parts very feebly calcareous, in parts washable.

*Sandstone (30 %):* Colourless, clear, transparent to translucent, light brownish to brownish, generally loose, in parts consolidated, in parts friable to moderately hard, fine to very fine grain, occasionally medium

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to coarse grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, in parts argillaceous matrix, non calcareous, no fluorescence and no cut.

### 2015 – 2025 m

**Sandstone (50 – 60 %):** Colourless, clear, transparent to translucent, light brownish to brownish, generally loose, in parts consolidated, in parts friable to moderately hard, fine to very fine grain, occasionally medium to coarse grained, in parts very coarse grain, sub angular to sub rounded, sub spherical to spherical, moderately sorted, in parts argillaceous matrix, non calcareous, generally faint dull brownish to light yellowish fluorescence and no cut.

**Clay/Claystone (40 – 50 %):** Predominantly brownish, reddish brown, brick red, in parts white to dirty white, light gray to light grayish white, in parts light yellowish, soft to firm, amorphous, non calcareous, in parts very feebly calcareous, in parts washable.

### 2025 – 2030 m

**Clay/Claystone (90 %):** Predominantly brownish, reddish brown, brick red, in parts white to dirty white, light gray to light grayish white, in parts light yellowish white, occasionally medium gray, soft to firm, moderately hard, amorphous, non calcareous, in parts very feebly calcareous, in parts slightly washable, in parts occasionally carbonaceous matter, occasionally grading toward siltstone.

**Sandstone (10 %):** Colourless, clear, transparent to translucent, light brownish to brownish, generally loose, in parts consolidated, in parts friable to moderately hard, fine to very fine grain, occasionally medium to coarse grained, in parts very coarse grain, sub angular to sub rounded, sub spherical to spherical, moderately sorted, in parts argillaceous matrix, non calcareous, generally faint dull brownish to light yellowish fluorescence and no cut.

### 2030 – 2035 m

**Clay/Claystone (60 %):** Predominantly brownish, reddish brown, brick red, in parts white to dirty white, light gray to light grayish white, in parts light yellowish white, occasionally medium gray, soft to firm, moderately hard, amorphous, non calcareous, in parts very feebly calcareous, in parts slightly washable, in parts occasionally carbonaceous matter, occasionally grading toward siltstone.

**Sandstone (40 %):** Colourless, clear, transparent to translucent, in parts light yellowish white to light brownish white, loose to friable, in parts moderately hard, fine to very fine grain, occasionally medium to coarse grained, in parts very coarse grain, sub angular to sub rounded, sub spherical to spherical, moderately sorted, in parts argillaceous matrix, non calcareous, weak to moderately cemented, fair visible porosity, no fluorescence and no cut.

### 2035 – 2045 m

**Sandstone (60 – 70 %):** Colourless, clear, transparent to translucent, in parts light yellowish white to light brownish white, loose to friable, in parts consolidated, in parts moderately hard, fine to very fine grain, occasionally medium to coarse grained, in parts very coarse grain, sub angular to sub rounded, sub spherical to spherical, moderately sorted, in parts argillaceous matrix, non calcareous, weak to moderately cemented, fair visible porosity, no fluorescence and no cut.

**Clay/Claystone (30 – 40 %):** Light grayish white to light grayish, reddish brown to brownish red, in parts brick red, in parts white to dirty white, in parts light yellowish to light yellowish white, soft to firm, in parts moderately hard, amorphous, non calcareous, in parts very feebly calcareous, in parts washable.

**Pyrite:** In trace.

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- 2045 – 2055 m**      **Clay/Claystone (70 – 80 %):** Light grayish white to light grayish, reddish brown to brownish red, in parts brick red, in parts white to dirty white, in parts light yellowish to light yellowish white, light brownish white, light reddish white, light reddish gray, brownish gray, soft to firm, in parts moderately hard, amorphous, non calcareous, in parts very feebly calcareous, in parts slightly washable, in parts occasionally carbonaceous matter, in parts occasionally micaceous.  
**Sandstone (20 – 30 %):** Colourless, clear, transparent to translucent, in parts light yellowish white to light brownish white, loose to friable, in parts consolidated, in parts moderately hard, fine to very fine grain, occasionally medium to coarse grained, in parts very coarse grain, sub angular to sub rounded, sub spherical to spherical, moderately sorted, in parts argillaceous matrix, non calcareous, weak to moderately cemented, fair visible porosity, no fluorescence and no cut.
- 2055 – 2060 m**      **Clay/Claystone (90 %):** Predominantly reddish brown to brownish red, in parts brick red, light grayish white to light grayish, in parts white to dirty white, in parts light yellowish to light yellowish white, light brownish white, light reddish white, light reddish gray, brownish gray, soft to firm, in parts moderately hard, amorphous, non calcareous, in parts very feebly calcareous, in parts slightly washable, in parts occasionally carbonaceous matter, in parts occasionally micaceous.  
**Sandstone (10 %):** Colourless, clear, transparent to translucent, in parts light yellowish white to light brownish white, loose to friable, in parts consolidated, in parts moderately hard, fine to very fine grain, occasionally medium to coarse grained, in parts very coarse grain, sub angular to sub rounded, sub spherical to spherical, moderately sorted, in parts argillaceous matrix, non calcareous, weak to moderately cemented, fair visible porosity, no fluorescence and no cut.
- 2060 – 2070 m**      **Sandstone (90 – 100 %):** Colourless, clear, transparent to translucent, light grayish white to light greenish white, light yellowish to light brownish, in parts smoky white, loose, in parts friable to moderately hard, medium to coarse grained, in parts fine grain, occasionally very fine grain, sub angular to sub rounded, sub spherical to spherical, moderately sorted, in parts silica cement, argillaceous matrix, non calcareous, weak to moderately cemented, predominantly loose, occasionally consolidated, rarely pyritic, no fluorescence and no cut.  
**Clay/Claystone (Tr. – 10 %):** Light grayish white to light greenish gray, light gray, in parts dirty white to white, in parts reddish brown to brownish red, soft, in parts firm, amorphous, sub blocky, non calcareous, in parts very feebly calcareous, in parts washable.
- 2070 – 2075 m**      **Sandstone (60 %):** Colourless, clear, transparent to translucent, light grayish, light brownish, friable to moderately hard, medium to coarse grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, dominantly clean, argillaceous matrix, predominantly loose and unconsolidated in categories, no fluorescence and no cut.  
**Clay/Claystone (40 %):** Brownish, reddish brown, brick red, in parts white to dirty white, grayish to light grayish, light greenish gray, occasionally lime, soft to firm, in parts moderately hard to hard, amorphous, sub blocky, generally non calcareous, occasionally very feebly calcareous.
- 2075 – 2085m**      **Clay/Claystone (80 – 90 %):** Predominantly brownish, brick red, reddish brown, in parts dirty white grayish, light grayish, brownish gray,



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yellowish gray, soft to firm, in parts moderately hard to hard, amorphous, sub blocky, generally non calcareous, occasionally very feebly calcareous.

**Sandstone (10 – 20 %):** Colourless, clear, transparent to translucent, light greenish gray, light gray, in parts friable, medium to fine grain, occasionally coarse grained, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, silica cement, occasionally feebly calcareous, moderately cemented, consolidated, in parts loose in categories, no fluorescence and no cut.

### 2085 – 2090 m

**Clay/Claystone (70 %):** Brownish, brick red, reddish brown, grayish white, light grayish, light greenish gray, dark gray, soft to firm, occasionally moderately hard to hard, amorphous, sub blocky, non calcareous, silty.

**Sandstone (30 %):** light gray to grayish white, light greenish gray, white, friable, occasionally moderately hard, very fine to fine grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, silica cement, non calcareous, weak cement, no visible porosity, no fluorescence and no cut.

### 2090 – 2095 m

**Clay/Claystone (60 %):** Light grayish to grayish white, light greenish gray, dirty white, in parts medium gray, occasionally brick red to brownish, occasionally milky white, soft to firm, in parts medium hard to hard, amorphous, sub blocky, in parts silty/sandy, non calcareous, in parts feebly to silty calcareous.

**Marl (30 %):** Light brownish, light yellowish brown to light yellowish, light yellowish white to light brownish white, in parts light brownish gray to yellowish gray, firm to moderately hard, sub blocky to blocky, in parts plastic, in parts sticky, in parts poor to slightly washable, highly calcareous.

**Sandstone (10 %):** light gray to grayish white, light greenish gray, white, friable, occasionally moderately hard, very fine to fine grain, in parts coarse grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, silica cement, in parts glauconitic, non calcareous, weak cement, no visible porosity, no fluorescence and no cut.

**Pyrite, Glauconite:** Rare.

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Gas Peaks (Sanu Formation):

Depth (m)	Type	Total Gas (ppm)	C1 (ppm)	C2 (ppm)	C3 (ppm)	iC4 (ppm)	nC4 (ppm)	iC5 (ppm)	nC5 (ppm)
1366	FG	1421	1378	0	6	4	1	1	0
1374	FG	1529	1484	9	6	0	1	1	0
1385	FG	2135	2059	14	10	0	2	2	0
1393	FG	4943	4747	34	28	0	6	4	0
1396	FG	4237	4053	34	27	0	5	3	0
1400	FG	10208	9783	79	61	0	11	7	0
1405	FG	5255	4988	43	38	0	8	6	1
1409	FG	6534	6140	55	54	0	13	12	2
1414	FG	21888	20980	169	134	0	22	14	2
1420	FG	21398	20453	169	137	0	24	18	2
1423	FG	47967	47117	350	0	0	0	24	6
1428	FG	12955	12374	102	84	0	15	12	1
1429	FG	18777	17872	147	127	0	25	22	4
1430	FG	14828	14205	115	89	0	15	12	1
1440	FG	5316	5109	40	33	0	7	0	0
1447	S/ Trip gas	22790	21637	203	175	0	28	19	3
1450	FG	5301	5084	0	44	0	10	8	1
1543	S/ Trip gas	28893	28372	0	111	0	17	23	1
1545	FG	6153	6040	0	23	0	4	2	0
1590	Trip Gas	11200	10985	55	25	0	5	2	0
1705	FG	10707	10574	52	7	1	1	0	0
1708	FG	11307	11127	63	11	2	2	1	0
1718	FG	13169	12976	68	12	2	2	1	0
1730	FG	9589	9471	46	6	1	1	0	0
1732	FG	10900	10765	53	7	1	1	0	0
1737	FG	14186	13990	71	11	2	2	1	0
1741	FG	10317	10188	50	7	1	1	0	0
1752	FG	8024	7936	38	4	0	0	0	0
1756	FG	10147	10014	52	7	1	1	0	0
1759	FG	10229	10085	56	8	1	1	0	0
1767	FG	18412	18170	91	13	2	2	1	0
1775	FG	11080	10934	56	7	1	1	1	0
1778	FG	13078	12918	64	8	1	1	0	0
1783	FG	5692	5586	36	7	1	1	1	0
1792	FG	4147	4090	24	3	0	0	0	0
1792	S/ Trip gas	4608	4510	29	8	2	2	0	0
1805	FG	1597	1572	11	1	0	0	0	0
1812	FG	2183	2140	17	3	0	0	0	0
1837	FG	2124	2084	17	2	0	0	0	0
1850	FG	3551	3451	33	7	1	1	1	0
1853	FG	2634	2590	19	2	0	0	0	0
1860	FG	2999	2912	28	6	1	1	1	0
1864	FG	6153	6013	48	9	1	2	1	0

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1878	FG	2990	2957	15	1	0	0	0	0
1880	FG	1919	1899	10	0	0	0	0	0
1891	FG	5299	5233	27	4	0	0	0	0
1903	FG	2131	2108	10	1	0	0	0	0
1906	FG	2779	2750	13	1	0	0	0	0
1908	FG	3029	2993	15	2	0	0	0	0
1914	FG	3539	3495	19	2	0	0	0	0
1924	FG	7727	7628	39	7	0	0	0	0
1930	FG	5705	5623	32	6	0	0	0	0
1932	FG	5220	5147	29	5	0	0	0	0
1938	FG	3108	3074	17	0	0	0	0	0
1941	FG	4264	4212	26	0	0	0	0	0
1947	FG	8281	8100	78	0	2	3	1	0
1957	FG	3441	3398	19	0	0	0	1	0
1973	FG	5571	5507	32	0	0	0	0	0
1975	FG	6733	6618	49	0	1	2	1	0
2014	FG	5747	5662	31	6	0	0	1	0
2021	FG	11089	10931	73	0	1	2	0	0
2025	FG	13108	12907	88	0	2	3	1	0
2031	FG	6637	6552	38	0	0	1	1	0
2033	FG	7635	7530	48	0	0	1	1	0
2046	FG	17576	17325	113	0	2	3	1	0
2049	FG	18138	17906	108	0	2	2	0	0
2050	FG	6284	6202	39	0	0	1	0	0
2053	FG	7036	6941	41	0	1	1	1	0
2069	FG	57628	56920	349	0	0	0	2	0
2073	FG	16512	16269	105	0	4	3	1	0
2073	S/Trip Gas	1411	1376	11	3	0	1	0	0
2075	Trip Gas	2867	2835	11	2	1	0	0	0
2079	FG	1771	1743	11	2	0	0	0	0
2085	FG	2000	1914	21	8	3	2	0	0
2086	FG	2069	1996	28	0	0	3	1	0
2089	FG	4866	4773	38	0	0	3	1	0

## MESOZOIC SEQUENCE

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The formations penetrated in this well of Mesozoic Sequence consist of Parh and Goru Formation (Upper Cretaceous) and Pariwar Formation (Lower Cretaceous).

#### PARH FORMATION (2094 m – 2444 m)

This formation of Upper Cretaceous age is an argillaceous sequence consisting dominantly of marl with some inter-beds of claystone/shale. This formation is dominantly homogenous and was encountered at the depth of 2094m and extended upto 2444 m.

#### Lithological Description (Parh Formation):

- 2095 – 2100 m**      *Marl/Marlstone (90 %):* Light yellowish white to yellowish white, light brownish white; dirty white to white; light grayish white, firm to moderately hard, amorphous, sub blocky to blocky, highly calcareous, crumbly.  
*Clay/Claystone (10 %):* Reddish brown, brownish, brick red, medium gray to gray, moderately hard to firm, amorphous, sub blocky, non calcareous.  
*Shale:* In traces
- 2100 – 2115 m**      *Marl/Marlstone (100 %):* Dirty white, off white, light yellowish white, light grayish white to white, in parts milky white, firm to moderately hard, amorphous, sub blocky to blocky, highly calcareous.
- 2115 – 2135 m**      *Marl/Marlstone (100 %):* Light grayish to light grayish white, light greenish gray, in parts dirty white; firm to moderately hard, sub blocky to blocky, highly calcareous.  
*Clay/Claystone:* In trace
- 2135 – 2145 m**      *Marl/ Marlstone (100 %):* Light grayish to light grayish white, in parts grayish, occasionally medium gray, firm to moderately hard, occasionally hard; sub blocky to blocky, in parts amorphous; highly calcareous.
- 2140 – 2180 m**      *Marl/Marlstone (100 %):* Gray to light grayish white, in parts grayish white, medium gray; firm to moderately hard, in parts hard; sub blocky to blocky; highly calcareous.
- 2180 – 2195 m**      *Marl/Marlstone (100 %):* Gray to light gray, in parts medium gray; firm to moderately hard, in parts hard; sub blocky to blocky; highly calcareous.
- 2195 – 2215 m**      *Marlstone/Marl (100 %):* Gray to light grayish, light grayish white, in parts medium gray; firm to moderately hard, in parts hard; sub blocky to blocky, in parts amorphous; highly calcareous.
- 2215 – 2220 m**      *Marl/Marlstone (100 %):* Gray to medium gray, in parts dark gray, occasionally light grayish white; moderately hard to hard, in parts firm; sub blocky to blocky, in parts amorphous; highly calcareous, in parts pyritic.  
*Pyrite/Claystone:* In trace
- 2220 – 2225 m**      *Marl/Marlstone (100 %):* Light gray to gray, in parts medium gray, light grayish white; firm to moderately hard, in parts hard; sub blocky to blocky, in parts amorphous; highly calcareous, in parts occasionally pyritic.

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*Pyrite:* Rare.

**2225 – 2240 m** *Marl/Marlstone (100 %):* Light gray to gray, in parts medium gray, in parts light grayish white, firm to moderately hard, in parts hard, sub blocky to blocky, highly calcareous, rare pyritic.

**2240 – 2305 m** *Marl/Marlstone (100 %):* Light grayish to gray, in parts medium gray, light grayish white, occasionally white, rarely yellowish; firm to moderately hard, in parts hard, sub blocky to blocky, highly calcareous, rarely to occasionally pyritic.

**2305 – 2315 m** *Marl/Marlstone (100 %):* Medium gray to gray, light gray, in parts light grayish white; firm to moderately hard, in parts hard, sub blocky to blocky, highly calcareous, in partss occasionally pyritic.

**2315 – 2335 m** *Marl/Marlstone (100 %):* Gray to medium gray, light gray, in parts light grayish white, occasionally white to dirty white; firm to moderately hard, in parts hard, sub blocky to blocky, highly calcareous, rarely to occasionally pyretic, in partss ocasionaly grading to Limestone.

**2335 – 2345 m** *Marl/Marlstone (100%):* Gray to greenish gray, medium gray, light gray to grayish white, firm to moderately hard, in parts hard, sub blocky to blocky, highly calcareous, in parts occasionally pyritic, in parts calcareous and grading toward claystone.  
*Pyrite:* Rare.

**2345 – 2355 m** *Marl/Marlstone (90 %):* Gray to greenish gray, medium gray, light gray to grayish white, in parts occasionally white to dirty white, firm to moderately hard, in parts hard, sub blocky to blocky, highly calcareous, in parts occasionally pyretic.  
*Claystone (10 %):* Gray to medium gray, occasionally dark greenish gray; firm to moderately hard, in parts hard; sub blocky to blocky; calcareous; rarely pyritic, in parts silty/sandy.  
*Sandstone:* In trace

**2355 – 2375 m** *Marl/Marlstone (80 – 90 %):* Gray to light gray, in parts medium gray, occasionally white to milky white; firm to moderately hard, in parts hard; sub blocky to blocky, highly calcareous.  
*Claystone (10 – 20 %):* Gray to medium gray, in parts dark greenish gray; moderately hard to hard, compact; sub blocky to blocky; calcareous; silty, pyretic dissemination.

**2375 – 2440 m** *Marl/Marlstone (100 %):* Light grayish to grayish white, in parts medium gray to gray; firm to moderately hard, in parts hard, sub blocky to blocky, highly calcareous, in partss occasionally pyretic dissemination.  
*Claystone:* In traces, pyritic dissemination, silty.

**2440 – 2445 m** *Marl/Marlstone (70 %):* Light grayish to grayish white, grayish, occasionally medium gray; firm to moderately hard, in parts hard, sub blocky to blocky, highly calcareous.  
*Claystone (30 %):* Gray to medium gray, dark greenish gray, in parts occasionally dark gray, moderately hard to hard, sub blocky to blocky, calcareous, in parts silty/sandy.

### Gas Peaks (Parh Formation):

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Depth (m)	Type	Total Gas (ppm)	C1 (ppm)	C2 (ppm)	C3 (ppm)	iC4 (ppm)	nC4 (ppm)	iC5 (ppm)	nC5 (ppm)
2095	Trip Gas	1934	1894	10	0	0	0	0	0
2098	FG	498	482	4	1	0	0	1	0
2138	FG	1579	1331	29	27	14	7	5	0
2157	FG	1719	1459	39	0	22	11	9	1
2205	FG	1946	1708	57	0	0	16	10	2
2216	FG	2493	2010	65	78	0	16	10	1
2247	FG	1387	1242	42	0	0	9	4	1
2251	S/Trip Gas	878	765	28	0	0	8	4	1
2287	FG	1650	1473	52	0	0	12	4	1
2301	FG	1123	982	36	0	0	11	4	1
2305	FG	1228	1082	41	0	0	11	3	1
2315	FG	1692	1492	55	0	0	15	5	1
2317	FG	1772	1553	58	0	0	17	6	1
2323	FG	2322	2063	81	0	0	23	0	1
2327	FG	2769	2407	95	0	0	28	9	3
2337	FG	3741	3231	135	0	0	40	12	4
2356	FG	4499	3711	176	0	0	69	24	8
2360	FG	3448	2761	140	0	0	63	23	8
2362	FG	3192	2551	125	0	0	60	22	8
2371	FG	1445	1112	52	0	0	31	15	6
2373	FG	885	689	29	0	0	17	10	4
2375	FG	1772	1407	69	0	0	33	14	5
2375	S/Trip Gas	686	516	23	0	0	16	8	4
2377	FG	539	440	22	0	0	10	2	1
2388	FG	683	519	30	0	0	16	6	2
2393	FG	996	732	41	0	0	23	9	3
2399	FG	1336	1018	57	0	0	31	11	5
2409	FG	1057	779	45	0	0	27	11	5
2418	FG	1087	764	45	0	19	23	9	4
2427	FG	1180	890	54	0	0	28	10	4
2430	FG	1380	1108	65	0	28	0	0	6
2434	FG	1297	1013	53	0	0	27	10	4
2441	FG	1662	1366	66	0	0	26	8	4

GORU FORMATION (2444 m – 3017 m)

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Goru Formation conformably underlies the Parh Formaton. The boundary is marked by the Claystone below thick marl sequence. The thickness of Goru Formation is 573 m that encountered at the depth of 2444m and extend upto 3017 m. The Goru Formation has been divided into two sub-formations, Upper Goru and Lower Goru. The lower boundary is marked at the top of highly glauconitic shale of Pariwar Formation. The distinction between Upper Goru and Lower Goru is not clear.

### Lithological Descriptions (Goru Formation)

- 2445 – 2460 m**      *Marl/Marlstone (60 – 70 %):* Light gray to light grayish gray, light greenish gray, occasionally medium gray, light; soft to firm, in parts moderately hard to hard, amorphous, sub blocky to blocky, highly calcareous.  
*Claystone (30 – 40 %):* Gray to medium gray, dark greenish gray, in parts dark gray; moderately hard to hard, sub blocky to blocky, calcareous, in parts silty/sandy, in partss pyretic dissemination.
- 2460 – 2470 m**      *Marl/Marlstone (50 %):* Light gray to light grayish gray, light greenish gray, occasionally medium gray, light; soft to firm, in parts moderately hard to hard, amorphous, sub blocky to blocky, highly calcareous.  
*Claystone (50 %):* Gray to medium gray, dark grayish gray, in parts occasionally dark gray, moderately hard to hard, sub blocky to blocky, calcareous, in parts silty/sandy, occasionally pyritic dissemination.  
*Pyrite:* Rare.
- 2470 – 2475 m**      *Claystone (60 %):* Light greenish gray to greenish gray, gray to medium gray; moderately hard to hard, in parts firm; sub blocky to blocky; calcareous, silty, occasionally sandy; pyritic dissemination.  
*Marl/Marlstone (40 %):* Light grayish to grayish white, grayish; soft to firm; amorphous to sub blocky; highly calcareous.  
*Pyrite:* Rare
- 2475 – 2520 m**      *Claystone (50 – 60 %):* Gray to medium gray, in parts greenish gray; moderately hard to hard, in parts firm, in parts compact; sub blocky to blocky; calcareous; silty, occasionally pyritic dissemination.  
*Marl/Marlstone (40 – 50 %):* Light grayish to grayish white, grayish; soft to firm; amorphous to sub blocky; highly calcareous.  
*Pyrite:* Rare
- 2520 – 2525 m**      *Claystone (50 %):* Gray to medium gray, in parts light gray, occasionally dark gray, grayish white; firm to moderately hard, in parts soft; sub blocky to blocky, in parts amorphous; calcareous; in parts silty, occasionally sandy.  
*Marl/Marlstone (50 %):* Light gray to grayish, light grayish white, in parts dirty white; soft to firm, in parts moderately hard; sub blocky to blocky, in parts amorphous; highly calcareous.
- 2525 – 2545 m**      *Claystone (70 – 80 %):* Gray to medium gray, in parts light gray, occasionally dark gray, grayish white; firm to moderately hard, in parts hard, compact; sub blocky to blocky, in parts amorphous; calcareous; in parts silty, occasionally sandy, rarely pyretic.  
*Marl/Marlstone (20 – 30 %):* Light gray to grayish, light grayish white, in parts dirty white, soft to firm, in parts moderately hard, in parts amorphous, sub blocky to blocky, highly calcareous.  
*Pyrite:* Rare

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- 2545 – 2550 m**      **Claystone (60 %):** Gray to medium gray, in parts light gray, occasionally dark gray, grayish white; moderately hard to hard, in parts firm; compact; sub blocky to blocky; calcareous; in parts silty, occasionally sandy, in partss pyretic dissemination.  
**Marl/Marlstone (40 %):** Light gray to grayish, light grayish white, in parts dirty white; soft to firm; amorphous to sub blocky, in parts blocky; highly calcareous.  
**Pyrite:** Rare.
- 2550 – 2555 m**      **Claystone (90 %):** Gray to medium gray, in parts light gray, occasionally dark gray, grayish white; moderately hard to hard, in parts firm; compact; sub blocky to blocky; calcareous; in parts silty, occasionally sandy.  
**Marl/Marlstone (10 %):** Light gray to grayish, light grayish white, in parts dirty white, soft to firm, in parts moderately hard, in parts amorphous to sub blocky, in parts blocky, highly calcareous.
- 2555 – 2560 m**      **Claystone (70 %):** Gray to medium gray, in parts light gray, occasionally dark gray; moderately hard to hard, in parts firm, occasionally soft; compact; sub blocky to blocky, in parts amorphous; calcareous, in parts sandy, occasionally silty.  
**Marl/Marlstone (30 %):** Light grayish white to light grayish, in parts dirty white; soft to firm, in parts moderately hard; amorphous to sub blocky; highly calcareous.  
**Sandstone:** In trace (very fine to fine grain).
- 2560 – 2600 m**      **Claystone (80 – 90 %):** Gray to medium gray, in parts light gray, occasionally dark gray; moderately hard to hard, in parts firm, occasionally soft; compact; sub blocky to blocky, in parts amorphous; calcareous, in parts silty/sandy, rarely pyritic.  
**Marl/Marlstone (10 – 20 %):** Light grayish white to light grayish, in parts dirty white; soft to firm, in parts moderately hard; amorphous to sub blocky; highly calcareous.
- 2600 – 2605m**      **Claystone (100 %):** Gray to medium gray, in parts light gray, occasionally dark gray; moderately hard to hard, in parts firm to soft; compact; sub blocky to blocky, in parts amorphous; moderately to calcareous; in parts silty/sandy; in partss pyretic dissemination.  
**Marl/Marlstone:** In traces
- 2605 – 2620 m**      **Claystone (100 %):** Dark gray to medium gray, in parts gray to light gray, occasionally grayish white; moderately hard to hard, in parts firm to soft; sub blocky to blocky, in parts amorphous; earthy; calcareous; in parts trace pyritic dissemination; occasionally marly, in parts silty.
- 2620 – 2625 m**      **Claystone (100 %):** Dominantly gray to medium gray, in parts grayish white; soft to firm; amorphous to sub blocky; earthy; calcareous; in parts trace pyritic dissemination; in parts silty.
- 2625 – 2665 m**      **Claystone (100 %):** Dark gray to medium gray, in parts gray to light gray, grayish white; moderately hard to hard, in parts soft to firm; amorphous to sub blocky, in parts blocky, earthy; in parts smooth, calcareous to moderately calcareous, in parts trace pyritic dissemination, in parts silty; occasionally marly, in parts occasionally grading toward massive shale.  
**Pyrite:** In traces



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### SGL # 2

2665 – 2700 m

**Claystone (100 %):** Medium gray to dark gray, gray to light gray, in parts greenish gray, grayish white; moderately hard to hard, in parts soft to firm; amorphous to sub blocky, earthy; in parts smooth; calcareous to moderately calcareous, in parts pyritic dissemination, in parts silty; occasionally grading toward massive shale.

**Sandstone:** In trace (very fine to fine grain).

2700 – 2730 m

**Claystone (100 %):** Dark gray to medium gray, in parts gray to light gray, greenish gray to lt greenish gary, light grayish white; moderately hard to hard, in parts firm to soft; sub blocky to blocky, in parts amorphous; earthy, in parts smooth; calcareous to moderately calcareous, in parts pyritic dissemination, in parts occasionally grading toward massive shale, in parts sandy/silty, in partss marly.

**Sandstone:** In trace (very fine to fine grain).

2730 – 2740 m

**Claystone (70 – 80 %):** Dark gray to medium gray, in parts gray to light gray, greenish gray to lt greenish gary, light grayish white; moderately hard to hard, in parts firm to soft; sub blocky to blocky, in parts amorphous; earthy, in parts smooth; calcareous to moderately calcareous, in parts pyritic dissemination, in parts occasionally grading toward massive shale, in parts sandy/silty.

**Marl/Marlstone (10 – 20 %):** Light grayish white to light grayish, in parts dirty white; firm to moderately hard, sub blocky to blocky, in parts amorphous; highly calcareous, in parts glauconitic.

**Sandstone (10 %):** Light grayish to light grayish white, dirty white, transparent to translucent; friable to moderately hard; very fine to fine grain; sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, siliceous cement, moderately cemented, in parts trace pyrite, in parts fine glauconite inclusion, micaceous.

**Pyrite:** In traces

**Glauconite:** Rare.

2740 – 2745 m

**Claystone (70 %):** Gray to medium gray, in parts dark gray, light gray; moderately hard to hard, in parts firm; compact; sub blocky to blocky; moderately to feebly calcareous; in parts silty; in parts grading toward massive shale.

**Shale (30 %):** Dark gray to blackish gray, in parts medium gray; moderately hard to hard; compact; brittle; sub fissile, sub blocky to sub flaky, sub platy, in parts massive; slightly to feebly calcareous; in parts micaceous, in parts silty, in parts occasionally pyretic.

2745 – 2755 m

**Claystone (70 %):** Gray to medium gray, brownish gray, light gray to grayish, in parts dark gray; firm to moderately hard, in parts soft, occasionally hard; amorphous, sub blocky to blocky; in parts compact, in parts smooth, in parts earthy; slightly to feebly calcareous, in parts moderately calcareous to calcareous, in parts pyritic dissemination, in parts washable.

**Shale (20 – 30 %):** Dark gray to blackish gray, in parts medium gray; moderately hard to hard; compact; brittle; sub fissile to fissile, sub blocky to sub flaky, sub platy, slightly to feebly calcareous; in parts micaceous, in parts silty, in parts occasionally pyretic.

**Marl/Marlstone (Tr. – 10 %):** Light grayish white to light grayish, dirty white; soft to firm, in parts moderately hard to hard; sub blocky to blocky; highly calcareous, in parts glauconitic.

**Sandstone:** In trace.

**Glauconite:** Rare.

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### SGL # 2

2755 – 2760 m

**Claystone (80 %):** Light gray to grayish, light grayish white, in parts medium gray, in parts occasionally light brownish gray; soft to firm, in parts moderately hard; amorphous to sub blocky, feebly to moderately calcareous, in parts calcareous; in parts silty, in parts washable.

**Shale (10 %):** Dark gray to blackish gray, in parts medium gray, moderately hard to hard; compact, brittle; sub fissile to fissile; sub blocky to sub flaky, sub platy; slightly to feebly calcareous; in parts micaceous, in parts silty, in partss occasionally pyretic; in partss massive, grading towards claystone.

**Marl/Marlstone (10 %):** Light grayish white, dirty white, light grayish; soft to firm; sub blocky to blocky; highly calcareous; in partss glauconitic.

**Pyrite, Glauconite:** In trace.

2760 – 2770 m

**Claystone (40 %):** Gray to medium gray, light gray to grayish white, in parts dark gray, dirty white; soft to firm, in parts moderately hard; amorphous to sub blocky; earthy; slightly to feebly calcareous; in parts moderately calcareous.

**Shale (30 %):** Medium gray, greenish gray, in parts dark gray; moderately hard; compact; sub fissile to fissile; flaky to sub flaky, platy; smooth; feebly calcareous; micro micaceous; in parts silty; in partss occasionally pyritic.

**Marl/Marlstone (10 – 20 %):** White to dirty white, grayish white, soft to firm, amorphous to sub blocky, highly calcareous.

**Sandstone (10 – 20 %):** White to dirty white, colourless, clear; friable to moderately hard; very fine to fine grain, sub angular to sub rounded, sub spherical; moderately sorted; argillaceous matrix, calcareous cement; weak to moderate cement, tight, micro micaceous, in parts silty.

**Pyrite:** In traces.

2770 – 2775 m

**Claystone (50 %):** Medium gray to dark gray, gray to light gray, in parts grayish white; soft to firm, occasionally moderately hard; amorphous to sub blocky; earthy; feebly calcareous; in parts slightly to moderately calcareous, occasionally marly.

**Shale (40 %):** Dark gray to blackish gray, medium gray; moderately hard; compact; sub fissile to fissile; flaky to sub flaky, sub platy to platy, smooth, feebly calcareous; micro micaceous; in parts silty, in partss occasionally pyritic.

**Sandstone (10 %):** Grayish white, dirty white, light grayish, occasionally colourless; moderately hard, occasionally friable; very fine to fine grain, moderately sorted; argillaceous matrix, calcareous cement, moderately cemented; tight, micro micaceous; in parts grading toward siltstone, occasionally very fine glauconitic inclusion.

**Pyrite:** In trace.

2775 – 2790 m

**Claystone (30 – 40 %):** Medium gray to dark gray, gray to light gray, grayish white; soft to firm, in parts moderately hard; amorphous to sub blocky; earthy, slightly to feebly calcareous.

**Shale (20 – 30 %):** Dark gray to blackish gray, medium gray; moderately hard; compact; sub fissile to fissile; smooth; flaky to sub flaky, sub platy to platy; feebly calcareous, micro micaceous, in parts silty, in partss occasionally pyritic.

**Marl/Marlstone (20 – 30 %):** Dirty white, grayish white, light grayish, white to off white; generally firm, in parts soft and moderately hard, amorphous to sub blocky; highly calcareous.

**Sandstone (10 %):** White to dirty white, colorless, clear, grayish white to light grayish; moderately hard; very fine to fine grain, sub angular to

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sub rounded, sub spherical, moderately sorted; argillaceous matrix, calcareous cement; moderately cemented, tight, very fine glauconitic inclusion.

### 2790 – 2805 m

**Claystone (50 – 60 %):** Medium gray to dark gray, gray to light gray, in parts grayish white, firm to moderately hard, in parts hard, soft, amorphous to sub blocky, earthy, slightly to feebly calcareous, in parts calcareous, in parts sandy.

**Shale (20 – 30 %):** Dark gray to blackish gray, medium gray, moderately hard to hard, compact, sub fissile to fissile, flaky to sub flaky, sub platy to platy, micro micaceous, in parts silty, slightly to very feebly calcareous, occasionally pyritic.

**Marl/Marlstone (20 %):** Dirty white, grayish white, light grayish, white to off white, firm, in parts soft to moderately hard, amorphous to sub blocky, highly calcareous.

**Sandstone:** In trace.

### 2805 – 2815 m

**Claystone (60 – 70 %):** Medium gray to dark gray, gray to light gray, in parts grayish white, firm to moderately hard, in parts hard, soft, amorphous to sub blocky, earthy, slightly to feebly calcareous, in parts calcareous, in parts sandy.

**Shale (20 – 30 %):** Dark gray to blackish gray, medium gray, moderately hard to hard, compact, sub fissile to fissile, flaky to sub flaky, sub platy to platy, micro micaceous, in parts silty, slightly to very feebly calcareous, occasionally pyritic.

**Marl/Marlstone (10 %):** Dirty white, grayish white, light grayish, white to off white, firm, in parts soft to moderately hard, amorphous to sub blocky, highly calcareous.

### 2815 – 2820 m

**Claystone (60 %):** Medium gray to dark gray, gray to light gray, in parts grayish white, firm to moderately hard, in parts hard, soft, amorphous to sub blocky, earthy, slightly to feebly calcareous, in parts calcareous, in parts sandy.

**Shale (20 %):** Dark gray to blackish gray, medium gray, moderately hard to hard, compact, sub fissile to fissile, flaky to sub flaky, sub platy to platy, micro micaceous, in parts silty, slightly to very feebly calcareous, occasionally pyritic.

**Marl/Marlstone (20 %):** Dirty white, grayish white, light grayish, white to off white, firm, in parts soft to moderately hard, amorphous to sub blocky, highly calcareous.

**Sandstone:** In trace.

### 2820 – 2825 m

**Claystone (50 %):** Medium gray to dark gray, gray to light gray, in parts grayish white, firm to moderately hard, in parts hard, soft, amorphous to sub blocky, earthy, slightly to feebly calcareous, in parts calcareous, in parts sandy.

**Marl/Marlstone (40 %):** Dirty white, grayish white, light grayish, white to off white, firm, in parts soft to moderately hard, amorphous to sub blocky, highly calcareous.

**Shale (10 %):** Dark gray to blackish gray, medium gray, moderately hard to hard, compact, sub fissile to fissile, flaky to sub flaky, sub platy to platy, micro micaceous, in parts silty, slightly to very feebly calcareous, occasionally pyritic.

### 2825 – 2845 m

**Claystone (60 – 70 %):** Medium gray to dark gray, gray to light gray, in parts grayish white, firm to moderately hard, in parts hard, soft, amorphous to sub blocky, earthy, slightly to feebly calcareous, in parts

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calcareous, moderately calcareous, in parts occasionally pyritic dissemination, in parts sandy.

**Shale (20 – 30 %):** Dark gray to blackish gray, medium gray, moderately hard to hard, compact, sub fissile to fissile, flaky to sub flaky, sub platy to platy, in parts smooth, micro micaceous, in parts silty, slightly to very feebly calcareous, occasionally pyritic.

**Marl/Marlstone (Tr. – 10 %):** Dirty white, grayish white, light grayish, white to off white, firm, in parts soft to moderately hard, amorphous to sub blocky, blocky and highly calcareous.

**Siltstone:** In trace.

### 2845 – 2850 m

**Claystone (50 %):** Medium gray to dark gray, gray to light gray, in parts grayish white, firm to moderately hard, in parts hard, soft, amorphous to sub blocky, earthy, moderately calcareous to calcareous, occasionally pyritic, occasionally silty.

**Shale (30 %):** Dark gray to blackish gray, medium gray, moderately hard to hard, compact, sub fissile to fissile, flaky to sub flaky, sub platy to platy, in parts smooth, micro micaceous, occasionally silty, slightly calcareous, occasionally pyritic.

**Marl/Marlstone (20 %):** Grayish white to light grayish white, dirty white, firm to moderately hard, in parts amorphous sub blocky to blocky, highly calcareous.

### 2850 – 2855 m

**Claystone (40 %):** Medium gray to dark gray, gray to light gray, in parts grayish white, firm to moderately hard, in parts hard, soft, amorphous to sub blocky, earthy, moderately calcareous to calcareous, occasionally pyritic, occasionally silty.

**Marl/Marlstone (30 %):** Grayish white to light grayish white, dirty white, firm to moderately hard, in parts amorphous sub blocky to blocky, highly calcareous.

**Shale (10 %):** Dark gray to blackish gray, medium gray, moderately hard to hard, compact, sub fissile to fissile, flaky to sub flaky, sub platy to platy, in parts smooth, micro micaceous, occasionally silty, slightly calcareous, occasionally pyritic.

**Siltstone (10 %):** Light grayish to light grayish white, grayish, colourless, moderately hard to hard, compact, calcareous, fine glauconitic inclusion, occasionally grading toward very fine sandstone.

**Sandstone (10 %):** Colourless, white, grayish white, light grayish, moderately hard to hard, very fine grained, argillaceous matrix, calcareous cement, moderately cemented, fine glauconitic inclusion, tight, in parts grading toward siltstone.

### 2855 – 2865 m

**Claystone (60 – 70 %):** Light grayish to light grayish white, gray to medium gray, dark gray, dirty white, in parts white, occasionally brownish, firm to moderately hard, in parts hard, soft, amorphous to sub blocky, earthy, slightly calcareous to feebly calcareous, in parts smooth, in parts marly, in parts pyritic, in parts sandy, in parts silty, in parts grading toward siltstone.

**Marl/Marlstone (10 – 20 %):** Light grayish white to dirty white, in parts white, firm to moderately hard, soft, sub blocky to blocky, highly calcareous.

**Siltstone (10 %):** Light grayish to gray, light grayish white, in parts dark gray, in parts dark greenish gray, in parts colourless, white, moderately hard to hard, moderately compact to compact, feebly calcareous to slightly calcareous, moderately calcareous, micro micaceous, in parts pyritic, in parts very fine glauconitic inclusion, occasionally grading toward very fine sandstone.

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**Sandstone (10 %):** Colourless, clear, white, light grayish white to light grayish, transparent to translucent, moderately hard to hard, very fine to fine grained, rounded to sub rounded, spherical to sub spherical, argillaceous matrix, calcareous cement, moderately cemented, fine glauconitic inclusion, in parts pyritic, micro micaceous, in parts grading toward siltstone.

**Shale:** In trace.

### 2865 – 2875 m

**Claystone (80 %):** Light gray to grayish white, gray to medium gray, dirty white to white, firm to soft, occasionally moderately hard, amorphous to sub blocky, slightly calcareous to feebly calcareous, in parts marly, in parts pyritic, in parts sandy, in parts silty, in parts micaceous, in parts occasionally carbonaceous, in parts grading toward marlstone.

**Siltstone (10 %):** Light grayish to gray, light grayish white, white to grayish white, in parts medium gray to dark gray, in parts dark greenish gray, in parts colourless, moderately hard to hard, moderately compact to compact, feebly calcareous to slightly calcareous, moderately calcareous, micro micaceous, in parts pyritic, in parts very fine glauconitic inclusion, occasionally grading toward very fine sandstone.

**Sandstone (10 %):** Colourless, clear, white, light grayish white to light grayish, transparent to translucent, moderately hard to hard, very fine to fine grained, rounded to sub rounded, sub angular, spherical to sub spherical, argillaceous matrix, calcareous cement, moderately cemented, fine glauconitic inclusion, in parts pyritic, micro micaceous, in parts grading toward siltstone.

**Shale, Marl/Marlstone:** In trace.

### 2875 – 2880 m

**Claystone (80 %):** Gray to medium gray, light gray, in parts grayish white, white, firm to soft, in parts moderately hard, occasionally hard, amorphous to sub blocky, earthy, slightly calcareous to feebly calcareous, occasionally moderately calcareous to marly, occasionally pyritic, occasionally silty.

**Sandstone (20 %):** Colourless, clear, white, in parts light grayish white, light grayish, occasionally dark gray, moderately hard to hard, consolidated, very fine to fine grained, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous cement, moderately to weak cemented, tight, occasionally very fine glauconitic inclusion, micro micaceous, in parts grading toward silty sandstone.

**Siltstone:** In trace.

### 2880 – 2885 m

**Claystone (60 %):** Gray to medium gray, light gray, in parts grayish white, white, firm to soft, in parts moderately hard, occasionally hard, amorphous to sub blocky, earthy, slightly calcareous to feebly calcareous, occasionally moderately calcareous to marly, occasionally pyritic, occasionally silty.

**Siltstone (20 %):** White, light grayish, light grayish white, grayish, occasionally dark gray, moderately hard to hard, compact, moderately calcareous, micro micaceous, tight, in parts pyritic.

**Sandstone (10 %):** Colourless, clear, white, in parts light grayish white, light grayish, occasionally dark gray, moderately hard to hard, consolidated, very fine to fine grained, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous cement, moderately to weak cemented, tight, occasionally very fine glauconitic inclusion, micro micaceous, in parts grading toward silty sandstone.

**Shale (10 %):** Dark gray, medium gray, occasionally greenish gray, moderately hard to hard, compact, sub fissile to fissile, sub flaky to flaky,

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sub blocky to blocky, micro micaceous, occasionally silty, non calcareous to very feebly calcareous, occasionally pyritic.

### 2885 – 2895 m

**Claystone (80 %):** Gray to medium gray, light gray, in parts grayish white, white, in parts dirty white, firm to soft, in parts moderately hard, occasionally hard, in parts compact, amorphous to sub blocky, slightly calcareous to feebly calcareous, in parts moderately calcareous to calcareous, occasionally pyritic dissemination, in parts silty, in parts sandy, in parts grading toward marl.

**Sandstone (20 %):** Colourless, clear, white, in parts light grayish white to light grayish, occasionally dark gray to blackish gray, moderately hard to hard, occasionally friable, very fine to fine grained, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous cement, moderately cemented, in parts weak cemented, tight, occasionally very fine glauconitic inclusion, in parts grading toward siltstone.

**Shale, Siltstone:** In trace

### 2895 – 2900 m

**Claystone (70 %):** Gray to medium gray, in parts light gray, grayish white, dirty white, firm to soft, in parts moderately hard to hard, amorphous to sub blocky, earthy, generally feebly calcareous, in parts slightly to moderately calcareous, occasionally silty, micro micaceous.

**Siltstone (10 %):** White, light grayish, grayish white, gray to medium gray, moderately hard to hard, compact, feebly to moderately calcareous, micro micaceous, tight.

**Sandstone (10 %):** Colourless, white, light grayish white, grayish white, grayish, moderately hard to hard, very fine to fine grained, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous cement, tight, micro micaceous, silty.

**Shale (10 %):** Medium gray to dark gray, greenish gray, moderately hard to hard, compact, fissile to sub fissile, flaky to sub flaky, platy to sub platy, sub blocky, in parts smooth, micaceous, in parts silty, non calcareous, in parts pyritic.

**Note: After 2900m, sample interval is 2m.**

### 2900 – 2902 m

**Claystone (90 %):** Medium gray to gray, light gray, in parts light grayish white, dirty white, occasionally dark gray, firm to soft, in parts moderately hard to hard, amorphous to sub blocky, earthy, feebly calcareous, in parts moderately calcareous, occasionally calcareous, in parts grading toward marlstone, in parts silty, in parts sandy, micro micaceous, occasionally pyritic.

**Siltstone (10 %):** Light grayish to grayish white, white, in parts medium gray to gray, occasionally dark gray, moderately hard to hard, compact, slightly to feebly calcareous, micaceous, in parts pyritic, in parts grading toward very fine sandstone.

**Sandstone, Marl:** In trace.

### 2902 – 2906 m

**Clay/Claystone (80 – 90 %):** Medium gray to gray, light gray, in parts light grayish white, occasionally dark gray, firm to soft, in parts moderately hard to hard, amorphous to sub blocky, earthy, feebly calcareous, occasionally moderately calcareous, in parts silty, in parts sandy, in parts micaceous, in parts pyritic.

**Siltstone (10 %):** Light gray to grayish in parts dark gray, moderately hard to hard, compact, slightly calcareous, micaceous, in parts pyritic, in parts grading toward very fine sandstone.

**Sandstone (Tr. – 10 %):** White, colourless, light grayish white to grayish, occasionally light brownish white, moderately hard to hard, very

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fine to fine grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous cement, micro micaceous to micaceous, in parts silty, tight, occasionally pyritic, in parts loose coarse to very coarse quartz grain.

**Shale/Pyrite:** In trace.

**Remarks:** Cement contamination.

### 2906 – 2912 m

**Clay/Claystone (70 – 80 %):** Medium gray to gray, light gray, in parts light grayish white, occasionally dark gray, firm to soft, in parts moderately hard to hard, in parts very hard, amorphous to sub blocky, earthy, feebly calcareous, occasionally moderately calcareous, in parts silty, in parts sandy, in parts micaceous, in parts micro micaceous, in parts grading toward siltstone, in parts pyritic.

**Siltstone (10 %):** Light gray to grayish in parts dark gray, moderately hard to hard, compact, slightly calcareous, micaceous, in parts pyritic, in parts grading toward very fine sandstone.

**Sandstone (10 – 20 %):** Gray to light gray, light brownish gray, light grayish white, moderately hard to hard, very fine to fine grain, in parts friable, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous cement, micro micaceous to micaceous, in parts silty, in parts pyritic, in parts toward siltstone.

**Pyrite:** In trace.

### 2912 – 2916 m

**Clay/Claystone (60 – 70 %):** Light gray to gray, grayish white, in parts dirty white, generally firm, soft, in parts moderately hard, amorphous to sub blocky, earthy, feebly calcareous, in parts moderately calcareous, in parts silty, micaceous.

**Sandstone (10 – 20 %):** White, colourless, light grayish white to grayish, moderately hard to hard, very fine to fine grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous cement, moderately to weak cemented, micro micaceous to micaceous, in parts silty, in parts loose quartz grain.

**Siltstone (10 %):** Dark brownish gray, gray to medium gray, dark gray, grayish white, light grayish, hard, compact, feebly calcareous, micaceous, rarely pyritic, in parts micro micaceous.

**Shale (10 %):** Medium gray to dark gray, moderately hard to hard, compact, sub fissile, flaky, platy, smooth, micro micaceous, in parts silty, carbonaceous dissemination, non calcareous.

**Pyrite:** In rare amount.

### 2916 – 2920 m

**Clay/Claystone (50 – 60 %):** Light gray to gray, medium gray, in parts grayish white, light white, dirty white, firm to moderately hard, in parts soft, amorphous to sub blocky, earthy, non calcareous to very feebly calcareous, in parts silty, in parts micro micaceous.

**Shale (20 – 30 %):** Medium gray to dark gray, moderately hard to hard, compact, sub fissile, flaky, platy, smooth, micro micaceous to micaceous, in parts silty, carbonaceous dissemination, non calcareous.

**Siltstone (10 %):** Light grayish white, dirty white, light grayish white, moderately hard to hard, compact, very feebly calcareous to slightly calcareous, micro micaceous to micaceous, in parts grading toward very fine sandstone.

**Sandstone (10 %):** White, light grayish, dirty white, grayish white, moderately hard to hard, very fine to fine grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous cement, tight, weak cemented, consolidated, micro micaceous to micaceous, in parts silty.

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2920 – 2922 m

**Clay/Claystone (60 %):** Gray to medium gray, light gray, in parts grayish white, in parts dirty white, in parts occasionally dark gray, firm to moderately hard, in parts soft, amorphous to sub blocky, earthy, feebly calcareous, in parts non calcareous, in parts silty, in parts micaceous.

**Sandstone (20 %):** White to dirty white, grayish white to light grayish, in parts brownish gray, moderately hard to hard, very fine to fine grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous cement, moderately to weak cemented, in parts micaceous, in parts occasionally pyritic, in parts grading toward siltstone.

**Shale (10 %):** Medium gray to dark gray, moderately hard to hard, compact, sub fissile, sub flaky, sub platy, micro micaceous to micaceous, in parts silty, carbonaceous dissemination, non calcareous.

**Siltstone (10 %):** Light grayish to light grayish white, dirty white, light brownish gray, in parts dirty white, moderately hard to hard, compact, very feebly calcareous to slightly calcareous, micro micaceous to micaceous, in parts grading toward very fine sandstone.

**Pyrite:** In rare amount.

2922 – 2926 m

**Clay/Claystone (70 – 80 %):** Gray to medium gray, light gray, in parts grayish white, in parts dirty white, occasionally light grayish white, in parts occasionally dark gray, firm to moderately hard, in parts soft, amorphous to sub blocky, earthy, feebly calcareous, in parts non calcareous, in parts silty, in parts sandy, in parts micaceous, occasionally pyritic dissemination.

**Shale (10 – 20 %):** Medium gray to dark gray, in parts blackish gray, moderately hard to hard, compact, sub fissile, sub flaky to flaky, sub platy, micro micaceous to micaceous, in parts silty, in parts sandy, carbonaceous dissemination, in parts occasionally pyritic, non calcareous.

**Siltstone (10 %):** Light grayish to light grayish white, dirty white, light brownish gray, in parts dirty white, moderately hard to hard, compact, very feebly calcareous to slightly calcareous, micro micaceous to micaceous, in parts grading toward very fine sandstone.

**Pyrite, Sandstone:** In rare amount.

2926 – 2928 m

**Clay/Claystone (60 %):** Medium gray to dark gray, occasionally grayish white, dirty white, firm to moderately hard, amorphous to sub blocky, earthy, slightly calcareous to feebly calcareous, micro micaceous, in parts silty and micaceous.

**Shale (20 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky, platy, smooth, micro micaceous to micaceous, in parts silty, carbonaceous dissemination, occasionally pyritic.

**Siltstone (10 %):** Light gray to gray, grayish white, in parts dark gray, hard, compact, non calcareous, occasionally pyritic.

**Sandstone (10 %):** White to dirty white, colourless, moderately hard to hard, very fine to fine grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous cement, consolidated, moderately to weak cemented, micaceous to micro micaceous, occasionally loose free quartz medium to coarse grain present.

2928 – 2932 m

**Clay/Claystone (50 – 60 %):** Medium gray to dark gray, occasionally grayish white, dirty white, in parts light gray, firm to moderately hard, in parts soft, amorphous to sub blocky, earthy, slightly calcareous to moderately calcareous, micro micaceous, in parts silty occasionally pyritic.



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**Shale (30 – 40 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, platy to sub platy, smooth, micro micaceous to micaceous, non calcareous to very feebly calcareous, in parts silty, carbonaceous dissemination, occasionally pyritic.

**Siltstone (10 %):** Light gray to gray, grayish white, light grayish white to light grayish, dirty white, in parts dark gray, hard, compact, moderately calcareous, occasionally pyritic.

**Pyrite:** In trace.

### 2932 – 2940 m

**Clay/Claystone (40 – 50 %):** Medium gray to dark gray, light gray, in parts light grayish white to grayish white, dirty white, occasionally white, firm to moderately hard, amorphous to sub blocky, earthy, very feebly to slightly calcareous, micro micaceous to micaceous, in parts silty, in parts sandy.

**Shale (20 – 30 %):** Dark gray to medium gray, moderately hard to hard, compact, sub fissile, flaky, platy to sub platy, smooth, non calcareous to very feebly calcareous, micro micaceous to micaceous, in parts silty, occasionally pyritic.

**Siltstone (10 – 20 %):** Light gray to gray, grayish white, light grayish white to light grayish, light brownish gray, in parts dirty white, in parts dark gray, hard, compact, micro micaceous to micaceous, slightly calcareous, occasionally pyritic.

**Sandstone (10 – 20 %):** light grayish white to light grayish, dirty white, in parts brownish gray, moderately hard to hard, very fine to fine grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous cement, consolidated, moderately to weak cemented, micaceous to micro micaceous, in parts silty, occasionally pyritic.

**Pyrite:** In trace.

### 2940 – 2944 m

**Clay/Claystone (70 - 80 %):** Medium gray to dark gray, light gray, in parts light grayish white to grayish white, dirty white, occasionally white, firm to moderately hard, amorphous to sub blocky, earthy, very feebly to slightly calcareous, micro micaceous to micaceous, in parts silty, in parts sandy.

**Shale (10 %):** Dark gray to medium gray, moderately hard to hard, compact, sub fissile, flaky, platy to sub platy, smooth, non calcareous to very feebly calcareous, micro micaceous to micaceous, in parts silty, occasionally pyritic.

**Siltstone (10 %):** Light gray to gray, grayish white, light grayish white to light grayish, light brownish gray, in parts dirty white, in parts dark gray, hard, compact, micro micaceous to micaceous, slightly calcareous, occasionally pyritic, in parts grading toward very fine sandstone.

**Sandstone (Tr. - 10 %):** light grayish white to light grayish, dirty white, in parts brownish gray, moderately hard to hard, very fine to fine grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous cement, consolidated, moderately to weak cemented, micaceous to micro micaceous, in parts silty, occasionally pyritic, in parts grading toward siltstone.

**Pyrite:** In trace.

### 2944 – 2948 m

**Clay/Claystone (60 %):** Medium gray to dark gray, light gray, in parts light grayish white to grayish white, dirty white, occasionally white, firm to moderately hard, in parts compact, amorphous to sub blocky, earthy, very feebly to slightly calcareous, micro micaceous to micaceous, in parts silty, in parts sandy, occasionally pyritic dissemination.

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**Sandstone (20 – 30 %):** light grayish white to light grayish, gray, dirty white to white, in parts brownish gray, moderately hard to hard, very fine to fine grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous cement, consolidated, tight, moderately to weak cemented, micaceous to micro micaceous, no visible porosity, in parts silty, occasionally pyritic, in parts grading toward siltstone.

**Siltstone (10 %):** Light gray to gray, grayish white, light grayish white to light grayish, light brownish gray, in parts brownish gray to brownish, in parts dirty white, medium gray to dark gray, hard, compact, micro micaceous to micaceous, slightly calcareous to very feebly calcareous, occasionally pyritic, in parts grading toward very fine sandstone.

**Shale (Tr. - 10 %):** Dark gray to medium gray, moderately hard to hard, compact, sub fissile, flaky, platy to sub platy, smooth, non calcareous to very feebly calcareous, micro micaceous to micaceous, in parts silty, in parts sandy, occasionally pyritic.

**Pyrite:** In trace.

### 2948 – 2950 m

**Clay/Claystone (80 %):** Medium gray to dark gray, gray, in parts grayish white, dirty white, firm to moderately hard, in parts hard, amorphous to sub blocky, earthy, very feebly calcareous to feebly calcareous, occasionally slightly calcareous, micro micaceous, in parts silty, occasionally pyritic.

**Siltstone (20 %):** Medium grayish to grayish, dark gray, brownish gray, hard, compact, micro micaceous to micaceous, slightly calcareous, in parts grading toward very fine sandstone.

**Shale, Pyrite:** In trace.

### 2950 – 2952 m

**Clay/Claystone (70 %):** Medium gray to dark gray, gray, in parts grayish white, dirty white, firm to moderately hard, in parts hard, amorphous to sub blocky, earthy, very feebly calcareous to feebly calcareous, occasionally slightly calcareous, micro micaceous, in parts silty, occasionally pyritic.

**Shale (20 %):** Dark gray, blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, non calcareous to very feebly calcareous, micro micaceous, silty, occasionally pyritic.

**Siltstone (10 %):** Medium grayish to grayish, dark gray, brownish gray, hard, compact, micro micaceous to micaceous, slightly calcareous, in parts grading toward very fine sandstone.

**Pyrite:** In trace.

### 2952 – 2958 m

**Clay/Claystone (50 - 60 %):** Medium gray to dark gray, gray, in parts grayish white, dirty white, firm to moderately hard, in parts hard, amorphous to sub blocky, earthy, very feebly calcareous to feebly calcareous, occasionally slightly calcareous, micro micaceous, in parts silty, occasionally pyritic.

**Shale (30 - 40 %):** Dark gray, blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, non calcareous to very feebly calcareous, micro micaceous, silty, occasionally pyritic.

**Siltstone (10 %):** Medium grayish to grayish, dark gray, brownish gray, hard, compact, micro micaceous to micaceous, slightly calcareous, in parts grading toward very fine sandstone, pyritic.

**Pyrite, Sandstone:** In trace (free quartz grain present).

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2958 – 2968 m

**Clay/Claystone (70 – 80 %):** Medium gray to dark gray, gray, in parts light grayish to grayish white, in parts grayish, dirty white, firm to moderately hard, in parts hard, in parts soft, amorphous to sub blocky, earthy, very feebly calcareous to feebly calcareous, occasionally slightly calcareous, occasionally moderately calcareous to calcareous, micro micaceous, in parts silty, occasionally pyritic.

**Shale (Tr. – 10 %):** Dark gray, blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, non calcareous to very feebly calcareous, micro micaceous, silty, occasionally pyritic, rarely very fine glauconite.

**Siltstone (10 %):** Medium gray to gray, dark gray, in parts brownish gray, hard, compact, micro micaceous to micaceous, slightly calcareous, feebly to very feebly calcareous, in parts grading toward very fine sandstone, pyritic.

**Sandstone (10 %):** Light grayish white to light grayish, in parts dirty white, moderately hard to hard, very fine to fine grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous cement, weak to moderately cemented, micro micaceous to micaceous, in parts pyritic, in parts fine grain of glauconite, in parts grading toward siltstone.

**Pyrite:** In trace.

**Glauconite:** In rare amount.

2968 – 2978 m

**Clay/Claystone (60 - 70 %):** Medium gray to dark gray, gray, in parts light grayish to grayish white, in parts grayish, dirty white, firm to moderately hard, in parts hard, in parts soft, amorphous to sub blocky, earthy, very feebly calcareous to feebly calcareous, occasionally slightly calcareous, occasionally moderately calcareous to calcareous, micro micaceous, in parts silty, occasionally pyritic.

**Shale (10 %):** Dark gray, blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, non calcareous to very feebly calcareous, in parts slightly calcareous, micro micaceous, silty, occasionally pyritic, rarely very fine glauconite.

**Siltstone (10 – 20 %):** Medium gray to gray, dark gray, in parts brownish gray, hard, compact, micro micaceous to micaceous, slightly calcareous, feebly to very feebly calcareous, in parts grading toward very fine sandstone, pyritic, occasionally fine glauconitic inclusion.

**Sandstone (10 %):** Light grayish white to light grayish, in parts dirty white, moderately hard to hard, very fine to fine grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous cement, weak to moderately cemented, micro micaceous to micaceous, in parts pyritic, in parts fine grain of glauconite, in parts grading toward siltstone.

**Pyrite:** In trace.

**Glauconite:** In rare amount.

2978 – 2990 m

**Clay/Claystone (70 – 80 %):** Medium gray to dark gray, gray, in parts light grayish to grayish white, in parts grayish, dirty white, firm to moderately hard, in parts hard, in parts soft, amorphous to sub blocky, earthy, very feebly calcareous to feebly calcareous, occasionally slightly calcareous, micro micaceous, in parts silty, occasionally pyritic.

**Shale (10 – 20 %):** Dark gray, blackish gray, in parts medium gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, non calcareous to very feebly calcareous, micro micaceous to micaceous, silty, occasionally pyritic, rarely very fine glauconite.

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**Siltstone (10 %):** Medium gray to grayish, dark gray to blackish gray, in parts brownish gray, hard, compact, micro micaceous to micaceous, slightly calcareous to feebly calcareous, in parts grading toward very fine sandstone, pyritic.

**Sandstone, Pyrite:** In trace.

**Glauconite:** In rare amount.

### 2990 – 2996 m

**Clay/Claystone (60 – 70 %):** Medium gray to dark gray, grayish, in parts light grayish white, in parts grayish, dirty white, firm to moderately hard, in parts hard, in parts soft, amorphous to sub blocky, earthy, very feebly calcareous to feebly calcareous, occasionally slightly calcareous, micro micaceous to micaceous, in parts silty, occasionally pyritic, rarely glauconitic inclusion.

**Shale (20 – 30 %):** Dark gray, blackish gray, in parts gray to medium gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, non calcareous to very feebly calcareous, micro micaceous to micaceous, silty, occasionally pyritic, rarely very fine glauconite.

**Siltstone (10 %):** Medium gray to grayish, dark gray to blackish gray, in parts brownish gray, hard, compact, micro micaceous to micaceous, slightly calcareous to feebly calcareous, in parts grading toward very fine sandstone, pyritic.

**Sandstone, Pyrite:** In trace.

**Glauconite:** In rare amount.

### 2996 – 3000 m

**Clay/Claystone (70 – 80 %):** Medium gray to dark gray, grayish, in parts light grayish white, occasionally dirty white, firm to moderately hard, in parts hard, in parts soft, amorphous to sub blocky, earthy, very feebly calcareous to feebly calcareous, occasionally slightly calcareous, micro micaceous to micaceous, in parts silty, occasionally pyritic, rarely glauconitic inclusion.

**Shale (10 - 20 %):** Dark gray, blackish gray, in parts gray to medium gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, non calcareous to very feebly calcareous, micro micaceous to micaceous, silty, occasionally pyritic, rarely very fine glauconite.

**Siltstone (10 %):** Medium gray to grayish, dark gray to blackish gray, in parts brownish gray, hard, compact, micro micaceous to micaceous, slightly calcareous to feebly calcareous, in parts grading toward very fine sandstone, pyritic.

**Pyrite, Glauconite:** In trace.

### 3000 – 3002 m

**Clay/Claystone (60 %):** Medium gray to dark gray, grayish, in parts light grayish white, occasionally dirty white, firm to moderately hard, in parts hard, in parts soft, amorphous to sub blocky, earthy, very feebly calcareous to feebly calcareous, occasionally slightly calcareous, micro micaceous to micaceous, in parts silty, occasionally pyritic, in parts highly glauconitic inclusion.

**Shale (20 %):** Dark gray, blackish gray, in parts gray to medium gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, non calcareous to very feebly calcareous, micro micaceous to micaceous, silty, occasionally pyritic, in parts highly glauconite.

**Siltstone (20 %):** Medium gray to grayish, dark gray to blackish gray, in parts brownish gray, hard, compact, micro micaceous to micaceous, slightly calcareous to feebly calcareous, in parts grading toward very fine sandstone, pyritic, highly glauconitic.

**Pyrite, Glauconite:** Abundant glauconite, occasionally pyritic.

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- 3002 – 3006 m**      **Clay/Claystone (50 – 60 %):** Medium gray to dark gray, in parts gray, grayish white, dirty white, firm to moderately hard, in parts hard, in parts soft, amorphous to sub blocky, earthy, feebly calcareous to slightly calcareous, in parts highly glauconitic, in parts silty, occasionally pyritic.  
**Shale (20 – 30 %):** Medium gray to dark gray, moderately hard to hard, sub fissile, flaky to sub flaky, sub platy to platy, non calcareous to feebly calcareous, micro micaceous, silty, occasionally pyritic, highly glauconite.  
**Siltstone (20 %):** Medium gray, dark gray, brownish gray, moderately hard to hard, compact, slightly calcareous, pyritic, highly glauconitic.  
**Pyrite:** In trace.  
**Glauconite:** Abundant.
- 3006 – 3008m**      **Clay/Claystone (70 %):** Medium gray to dark gray, in parts gray, grayish white, dirty white, firm to moderately hard, in parts hard, in parts soft, amorphous to sub blocky, earthy, feebly calcareous to slightly calcareous, in parts highly glauconitic, in parts silty, occasionally pyritic.  
**Shale (20 %):** Medium gray to dark gray, moderately hard to hard, sub fissile, flaky to sub flaky, sub platy to platy, non calcareous to feebly calcareous, micro micaceous, silty, occasionally pyritic, highly glauconite.  
**Siltstone (10 %):** Medium gray, dark gray, brownish gray, moderately hard to hard, compact, slightly calcareous, pyritic, highly glauconitic.  
**Pyrite:** In rare amount.  
**Glauconite:** Abundant.
- 3008 – 3016 m**      **Clay/Claystone (50 – 60 %):** Medium gray to dark gray, in parts gray, grayish white, dirty white, firm to moderately hard, in parts hard, amorphous to sub blocky, earthy, in parts highly glauconitic, in parts marly, moderately calcareous to calcareous, in parts silty, occasionally pyritic.  
**Shale (20 – 30 %):** Medium gray to dark gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, non calcareous to very feebly calcareous, smooth, silty, occasionally pyritic, highly glauconite.  
**Siltstone (20 %):** Medium gray to gray, brownish gray, moderately hard to hard, compact, feebly to slightly calcareous, pyritic, highly glauconitic.  
**Pyrite:** In rare amount.  
**Glauconite:** Abundant.
- 3016 – 3018 m**      **Clay/Claystone (40 %):** Medium gray to dark gray, in parts gray, grayish white, dirty white, in parts white, firm to moderately hard, in parts hard, amorphous to sub blocky, earthy, in parts highly glauconitic, in parts marly, moderately calcareous to calcareous, in parts silty, occasionally pyritic.  
**Shale (20 %):** Medium gray to dark gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, non calcareous to very feebly calcareous, smooth, silty, occasionally pyritic, highly glauconite.  
**Siltstone (20 %):** Medium gray to gray, brownish gray, moderately hard to hard, compact, feebly to slightly calcareous, pyritic, highly glauconitic.  
**Sandstone (20 %):** Dirty white, light grayish, grayish, light brownish gray, colorless, transparent to translucent, moderately hard to hard, medium to coarse to very coarse grain, in parts fine grain, sub angular to

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sub rounded, in parts angular, sub spherical, poorly sorted, argillaceous matrix, calcareous cement, occasionally pyritic, consolidated, moderately cemented, glauconitic, dirty.

*Pyrite:* In trace.

*Glauconite:* Abundant.

### Gas Peaks (Goru Formation):

Depth (m)	Type	Total Gas (ppm)	C1 (ppm)	C2 (ppm)	C3 (ppm)	iC4 (ppm)	nC4 (ppm)	iC5 (ppm)	nC5 (ppm)
2445	FG	5535	4416	235	0	0	106	31	14
2448	FG	2342	1851	106	0	0	46	13	6
2451	FG	3406	2246	129	195	0	53	15	6
2465	FG	5363	4087	244	0	0	127	39	17
2468	FG	6722	4437	246	382	0	108	29	14
2480	FG	7704	4327	321	564	0	172	47	24
2500	S/Trip Gas	10446	4914	401	854	0	332	107	61
2506	FG	5126	2606	202	402	0	145	42	24
2516	FG	6625	3101	281	562	0	204	57	35
2528	FG	12459	6232	508	1015	0	359	89	57
2533	FG	15564	7709	621	1266	0	460	117	78
2543	FG	17226	7871	735	1510	0	545	140	95
2575	FG	11840	6677	585	1076	0	0	89	64
2589	FG	20095	10374	982	1989	0	0	208	150
2598	FG	22697	10938	981	1852	0	669	184	129
2620	FG	10453	4849	441	781	164	267	77	54
2624	FG	8637	3920	355	640	144	229	71	48
2643	S/Trip Gas	15423	8751	607	919	205	279	94	59
2682	FG	9501	5783	410	543	111	130	39	22
2690	FG	7386	4243	327	457	98	114	35	19
2710	FG	6623	3573	302	449	95	116	33	18
2711	FG	4768	2465	211	328	75	93	29	16
2715	FG	4008	2018	178	285	65	81	25	14
2717	FG	3585	1754	151	253	65	80	25	13
2718	FG	3752	1935	157	249	62	77	26	14
2720	FG	5161	2625	235	370	83	101	29	15
2720	S/Trip Gas	4007	3098	125	123	23	32	9	5
2725	FG	3129	1781	121	197	45	55	15	8
2736	FG	3203	1740	158	221	43	53	13	7
2739	FG	2905	1638	146	194	34	43	11	6
2747	FG	4013	2240	210	276	47	58	14	7
2755	FG	4804	2931	252	293	45	55	12	6
2759	FG	3221	1869	167	210	35	42	10	6
2764	FG	3428	2119	163	194	34	45	11	6
2768	FG	9002	4729	515	675	96	151	29	17
2775	FG	7834	4082	451	591	83	135	26	15
2778	FG	6084	2942	352	484	68	126	26	16
2781	FG	3859	1844	216	301	45	85	20	12

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2783	FG	4521	2218	249	344	50	97	23	14
2784	FG	4630	2193	260	366	53	103	24	15
2787	FG	4576	2135	254	366	54	106	24	15
2793	FG	7806	3548	459	651	88	180	38	25
2794	FG	8347	3555	484	729	97	211	48	33
2795	FG	6673	2922	385	570	81	163	35	24
2814	FG	10961	4634	670	959	116	284	58	44
2823	FG	9678	4240	590	812	96	242	53	41
2824	FG	9406	4043	557	788	97	248	57	44
2833	FG	9779	5007	586	717	77	194	42	31
2840	FG	9615	4369	601	790	86	225	50	36
2849	FG	8942	4146	556	713	77	208	46	35
2855	S/Trip Gas	955	565	32	40	7	22	10	8
2853	FG	2325	1136	123	164	17	57	17	14
2858	FG	1245	643	66	85	10	30	6	5
2859	FG	1365	680	76	99	11	33	7	5
2862	FG	1143	640	63	68	7	25	5	4
2864	FG	2052	1003	115	159	18	55	10	0
2867	FG	2546	1090	135	206	25	77	18	14
2871	Trip Gas	3407	2623	144	111	9	23	4	3
2892	Trip Gas	2782	2159	118	89	7	18	2	2
2947	Trip Gas	907	726	42	21	1	5	1	1

### PARIWAR FORMATION (3017 m – 3275+m)

The Pariwar Formation belongs to Lower Cretaceous age which conformably overlies Baisakhi-Bedesir Formation of Upper Jurassic. The Pariwar Formation is dominated with Sandstone with interbedded shale and clay/claystone. It has been indicated in the

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previous studies that Pariwar Formation has fair source potential to yield gas with minor oil. Pariwar Formation faced a regressional facies during their sediment accommodation which is known from their micropaleontological studies and indicates a marginal and stable shelf depositional environment.

### Lithological Descriptions (Pariwar Formation)

#### 3018 – 3022m

**Sandstone (50 – 60 %):** Grayish white, white, dirty white, in parts brownish, off white, colorless, moderately hard to hard, medium to coarse to very coarse grain, in parts fine grain, sub angular to sub rounded, in parts angular, sub spherical, tight, poorly sorted, argillaceous matrix, calcareous cement, occasionally pyritic, consolidated, moderately to weak cemented, glauconitic, dirty, calcareous to silica cement, NF and NC.

**Clay/Claystone (20 – 30 %):** Medium gray to dark gray, in parts gray, grayish white, dirty white, in parts white, firm to moderately hard, in parts hard, amorphous to sub blocky, earthy, in parts highly glauconitic, in parts marly, moderately calcareous to calcareous, in parts silty, occasionally pyritic.

**Shale (10 %):** Medium gray to dark gray, in parts blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, non calcareous to very feebly calcareous, smooth, silty, occasionally pyritic, highly glauconite.

**Siltstone (10 %):** Medium gray to gray, brownish gray, grayish to gray, grayish white to dirty white, brownish white, moderately hard to hard, compact, feebly to slightly calcareous, pyritic, highly glauconitic.

**Pyrite:** In trace.

**Glauconite:** Abundant.

#### 3022 – 3032m

**Sandstone (60 – 70 %):** Grayish white, white, dirty white, in parts brownish, off white, colorless, moderately hard to hard, medium to coarse to very coarse grain, in parts fine grain, sub angular to sub rounded, in parts angular, sub spherical, tight, poorly sorted, argillaceous matrix, calcareous cement, occasionally pyritic, consolidated, moderately to weak cemented, glauconitic, dirty, calcareous to silica cement, NF and NC.

**Clay/Claystone (20 – 30 %):** Medium gray to dark gray, in parts gray, grayish white, dirty white, in parts white, firm to moderately hard, in parts hard, amorphous to sub blocky, earthy, in parts highly glauconitic, in parts marly, moderately calcareous to calcareous, in parts silty, occasionally pyritic.

**Shale (Tr. – 10 %):** Medium gray to dark gray, in parts blackish gray, brownish gray to gray, grayish, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, non calcareous to very feebly calcareous, smooth, silty, occasionally pyritic, highly glauconite.

**Siltstone (10 %):** Medium gray to gray, brownish gray, grayish to gray, grayish white to dirty white, brownish white, moderately hard to hard, compact, feebly to slightly calcareous, pyritic, highly glauconitic.

**Pyrite:** In trace.

**Glauconite:** Abundant.

#### 3032 – 3040m

**Sandstone (50 – 60 %):** Grayish white, light gray to grayish, brownish white, white, dirty white, in parts brownish, off white, colorless, moderately hard to hard, medium to coarse to very coarse grain, in parts fine grain, sub angular to sub rounded, in parts angular, sub spherical,



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tight, poorly sorted, argillaceous matrix, calcareous cement, occasionally pyritic, consolidated, moderately to weak cemented, occasionally very fine grain of glauconite, dirty, calcareous to silica cement, poor visible porosity to no visible porosity, micro micaceous, NF and NC.

**Siltstone (20 – 30 %):** Light grayish white to dirty white, gray to grayish, brownish to brownish gray, brownish white, moderately hard to hard, compact, non calcareous to very feebly calcareous, pyritic, in parts very fine grain of glauconite, in parts grading toward very fine sandstone.

**Clay/Claystone (10 – 20 %):** Medium gray to dark gray, in parts gray, grayish white, dirty white, in parts white, firm to moderately hard, in parts hard, amorphous to sub blocky, earthy, in parts highly glauconitic, in parts marly, moderately calcareous to calcareous, in parts silty, occasionally pyritic.

**Shale (10 %):** Medium gray to dark gray, in parts blackish gray, brownish gray to gray, grayish, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, non calcareous to very feebly calcareous, smooth, silty, occasionally pyritic, occasionally very fine grain of glauconite, micro micaceous to micaceous.

**Pyrite, Glauconite:** In trace.

### 3040 – 3044m

**Sandstone (40 – 50 %):** Light grayish to grayish white, dirty white, off white, occasionally brownish gray, moderately hard to hard, very fine to fine grain, occasionally medium to coarse grain, sub angular to sub rounded, sub spherical, poorly sorted, argillaceous matrix, calcareous to silica cement, weak cement, highly glauconite inclusion, dirty, consolidated.

**Siltstone (10 – 20 %):** Light grayish to grayish white, dirty white, off white, in parts brownish gray, dark gray, moderately hard to hard, compact, non calcareous to very feebly calcareous.

**Clay/Claystone (30 %):** White to dirty white, grayish white, in parts grayish, firm to moderately hard, amorphous, feebly calcareous to slightly calcareous, in parts highly glauconitic.

**Shale (10 %):** Medium gray to dark gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, non calcareous.

### 3044 – 3046m

**Sandstone (50 %):** Dirty white, grayish white, white, in parts light grayish to grayish, moderately hard to hard, very fine to fine grain, occasionally medium grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous cement, moderately to weak cement, highly glauconite inclusion, dirty, silty, consolidated, NF and NC.

**Clay/Claystone (40 %):** White to dirty white, grayish white, in parts grayish, firm to moderately hard, amorphous, feebly calcareous to slightly calcareous, in parts highly glauconitic.

**Shale (10 %):** Medium gray to dark gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, non calcareous.

**Pyrite:** In trace.

### 3046 – 3050m

**Sandstone (30 – 40 %):** Dirty white, grayish white, white, in parts light grayish to grayish, moderately hard to hard, very fine to fine grain, occasionally medium grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous cement, moderately to weak cement, highly glauconite inclusion, dirty, silty, consolidated, NF and NC.

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**Clay/Claystone (20 – 30 %):** Medium gray to dark gray, in parts dirty, grayish white, white, light gray, firm to moderately hard, amorphous, earthy, generally non calcareous, in parts feebly calcareous to slightly calcareous, in parts glauconitic, in parts silty.

**Shale (20 – 30 %):** Blackish gray to dark gray, moderately hard to hard, compact, sub fissile to fissile, flaky to sub flaky, sub platy to platy, smooth, non calcareous, in parts silty.

**Siltstone (10 – 20 %):** Light grayish to grayish, dirty white, moderately hard to hard, compact, non calcareous to very feebly calcareous, occasionally glauconitic, in parts pyritic.

**Pyrite:** In trace.

### 3050 – 3056m

**Sandstone (50 %):** Dirty white, grayish white, light grayish white, in parts light grayish to grayish, moderately hard to hard, very fine to fine grain, occasionally medium grain, occasionally coarse grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous to siliceous cement, moderately to weak cement, highly glauconite inclusion, dirty, silty, occasionally pyritic, consolidated, NF and NC.

**Clay/Claystone (20 – 30 %):** Dirty white, grayish white, light gray, in parts medium gray to dark gray, firm to moderately hard, amorphous, earthy, slightly calcareous, in parts non calcareous to feebly calcareous, in parts glauconitic, in parts silty.

**Shale (10 – 20 %):** Blackish gray to dark gray, moderately hard to hard, compact, sub fissile, in parts fissile, flaky to sub flaky, sub platy to platy, smooth, in parts silty, occasionally pyritic dissemination, in parts micro micaceous.

**Siltstone (10 %):** Grayish to grayish white, dark brownish gray to brownish gray, medium gray, hard, compact, non calcareous to feebly calcareous, glauconitic, in parts pyritic, grading toward very fine sandstone.

**Pyrite:** In trace.

### 3056 – 3058m

**Shale (40 %):** Blackish gray to dark gray, moderately hard to hard, compact, sub fissile, in parts fissile, flaky to sub flaky, sub platy to platy, smooth, in parts silty, occasionally pyritic dissemination, in parts micro micaceous.

**Sandstone (30 %):** Dirty white, colorless, grayish white, light grayish white, in parts light grayish to grayish, moderately hard to hard, medium to coarse to very coarse grain, in parts very fine to fine grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, calcareous to siliceous cement, moderately to weak cement, highly glauconite inclusion, dirty, silty, occasionally pyritic, consolidated, occasionally dull brownish fluorescence and NC.

**Clay/Claystone (30 %):** Dirty white, grayish white, light gray, in parts medium gray to dark gray, firm to moderately hard, amorphous, earthy, slightly calcareous, in parts non calcareous to feebly calcareous, in parts glauconitic, in parts silty.

**Pyrite:** In trace.

### 3058 – 3062m

**Sandstone (70 – 80 %):** Dirty white, colorless, in parts clean, grayish white, light grayish, in parts light brownish to brownish white, transparent to translucent, friable to moderately hard, in parts loose, medium to coarse grain, in parts very fine to fine grain and very coarse grain, sub angular to sub rounded, sub spherical, in parts angular, poor to moderately sorted, argillaceous matrix, calcareous to siliceous cement, moderately to weak cement, micro micaceous, in parts dark brownish

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carbonaceous matter, in parts glauconite, dirty, silty, occasionally pyritic, consolidated, occasionally dull brownish fluorescence and NC.

**Shale (10 – 20 %):** Blackish gray, dark gray to brownish gray, in parts brownish black, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, in parts sub blocky, in parts silty, occasionally pyritic dissemination.

**Clay/Claystone (10 %):** Dirty white, grayish to grayish white, light grayish, brownish, in parts light brownish white, firm to moderately hard, amorphous to sub blocky, earthy, non calcareous, in parts feebly calcareous, in parts glauconitic, in parts silty.

**Pyrite, Glauconite:** In trace.

### 3062 – 3064m

**Sandstone (50 %):** Dirty white, colorless, in parts clean, grayish white, light grayish, in parts light brownish to brownish white, transparent to translucent, friable to moderately hard, in parts loose, medium to coarse grain, in parts very fine to fine grain and very coarse grain, sub angular to sub rounded, sub spherical, in parts angular, poor to moderately sorted, argillaceous matrix, calcareous to siliceous cement, moderately to weak cement, micro micaceous, in parts dark brownish carbonaceous matter, in parts glauconite, dirty, silty, occasionally pyritic, consolidated, occasionally dull brownish fluorescence and NC.

**Shale (30 %):** Blackish gray, dark gray to brownish gray, in parts brownish black, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, in parts sub blocky, in parts silty, occasionally pyritic dissemination.

**Clay/Claystone (20 %):** Dirty white, grayish to grayish white, light grayish, brownish, in parts light brownish white, firm to moderately hard, amorphous to sub blocky, earthy, non calcareous, in parts feebly calcareous, in parts glauconitic, in parts silty.

**Pyrite, Glauconite:** In trace.

### 3064 – 3066m

**Sandstone (50 %):** Dirty white, colorless, light grayish, brownish in parts dark brownish, moderately hard to hard, very fine to fine grain occasionally medium to coarse grain and very coarse grain, sub angular to sub rounded, sub spherical, in parts angular, poor to moderately sorted, argillaceous matrix, calcareous to siliceous cement, moderately to weak cement, in parts micaceous to micro micaceous, in parts dark brownish carbonaceous matter, in parts glauconite, dirty, silty, occasionally pyritic, consolidated, occasionally dull brownish fluorescence and NC.

**Shale (20 %):** Blackish gray, dark brownish to brownish gray, in parts blackish brown, in parts dark gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, in parts sub blocky, in parts silty, in parts sandy, micro micaceous to micaceous, in parts carbonaceous matter, occasionally pyritic dissemination.

**Clay/Claystone (20 %):** Dirty white, light grayish to grayish white, in parts light brownish, brownish white, firm to moderately hard, amorphous to sub blocky, earthy, very feebly calcareous to feebly calcareous, in parts sandy, in parts silty.

**Siltstone (10 %):** Grayish white, brownish to brownish white, dirty white, dark brownish gray to brownish gray, hard, compact, non calcareous to feebly calcareous, glauconitic, in parts pyritic, grading toward very fine sandstone.

**Pyrite, Glauconite:** In trace.

### 3066 – 3068m

**Shale (40 %):** Blackish gray, dark brownish to brownish gray, in parts blackish brown, in parts dark gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, in parts sub

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blocky, in parts silty, in parts sandy, micro micaceous to micaceous, in parts carbonaceous matter, occasionally pyritic dissemination.

**Clay/Claystone (30 %):** Dirty white, light grayish to grayish white, in parts light brownish, brownish white, firm to moderately hard, amorphous to sub blocky, earthy, very feebly calcareous to feebly calcareous, in parts sandy, in parts silty.

**Sandstone (30 %):** Dirty white, colorless, light grayish, brownish in parts dark brownish, moderately hard to hard, very fine to fine grain occasionally medium to coarse grain and very coarse grain, sub angular to sub rounded, sub spherical, in parts angular, poor to moderately sorted, argillaceous matrix, calcareous to siliceous cement, moderately to weak cement, in parts micaceous to micro micaceous, in parts dark brownish carbonaceous matter, in parts glauconite, dirty, silty, occasionally pyritic, consolidated, occasionally dull brownish fluorescence and NC.

**Siltstone, Pyrite:** In trace.

**Glauconite:** In rare amount.

### 3068 – 3070m

**Sandstone (50 %):** Grayish white, brownish white, dirty white, in parts brownish, grayish brown, moderately hard to hard, fine grain to medium grain, in parts coarse grain and fine grain, occasionally very coarse grain, sub angular to sub rounded, poorly sorted, argillaceous matrix, siliceous cement, moderately to weak cement, in parts glauconitic, dirty, occasionally pyretic, in parts calcareous, poor visible porosity, occasionally dull brownish fluorescence and NC.

**Shale (20 %):** Blackish gray, dark brownish to brownish gray, in parts blackish brown, in parts dark gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, in parts sub blocky, in parts silty, in parts sandy, micro micaceous to micaceous, in parts carbonaceous matter, occasionally pyretic dissemination.

**Clay/Claystone (20 %):** Dirty white, light grayish to grayish white, in parts light brownish, brownish white, firm to moderately hard, amorphous to sub blocky, earthy, very feebly calcareous to feebly calcareous, in parts sandy, in parts silty.

**Siltstone (10 %)** Grayish white, brownish to brownish white, dirty white, dark brownish gray to brownish gray, hard, compact, non calcareous to feebly calcareous, glauconitic, in parts pyritic, grading toward very fine sandstone.

**Pyrite:** Occasionally.

### 3070 – 3072m

**Sandstone (60 %):** Grayish white, light grayish white, in parts light brownish white, dirty white to white, grayish, moderately hard to hard, fine grain to medium grain, in parts coarse grain and very fine grain, sub angular to sub rounded, sub spherical, poorly sorted, argillaceous matrix, siliceous cement to calcareous cement, consolidated, tight, moderately to weak cement, dirty, occasionally pyretic, in parts micaceous, poor visible porosity, occasionally dull brownish fluorescence and NC.

**Shale (20 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, in parts silty, non calcareous, rarely carbonaceous, occasionally pyretic dissemination.

**Clay/Claystone (20 %):** White to dirty white, medium gray to gray, grayish white, firm to moderately hard, amorphous to sub blocky, in parts earthy, non calcareous to slightly calcareous, in parts silty, occasionally pyritic.

**Pyrite:** In trace.

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3072 – 3078m

**Sandstone (50 %):** Grayish white, light grayish white, in parts light brownish white, dirty white to white, grayish, moderately hard to hard, fine grain to medium grain, in parts coarse grain and very fine grain, sub angular to sub rounded, sub spherical, poorly sorted, argillaceous matrix, siliceous cement to calcareous cement, consolidated, tight, moderately to weak cement, dirty, occasionally pyretic, in parts micaceous, poor visible porosity, occasionally dull brownish fluorescence and NC.

**Clay/Claystone (40 - 50 %):** White to dirty white, medium gray to gray, grayish white, firm to moderately hard, amorphous to sub blocky, in parts earthy, non calcareous to slightly calcareous, in parts silty, occasionally pyritic.

**Shale (Tr. - 10 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, in parts silty, non calcareous, rarely carbonaceous, occasionally pyretic dissemination.

**Pyrite:** In trace.

3078 – 3088m

**Sandstone (60 – 70 %):** Grayish white, light grayish white, dirty white to white, grayish, moderately hard to hard, fine grain to medium grain, in parts coarse grain and very fine grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, silica cement, consolidated, tight, moderately to weak cement, dirty, occasionally pyretic, poor visible porosity, occasionally glauconitic inclusion, very feebly calcareous, NF and NC.

**Clay/Claystone (20 – 30 %):** White to dirty white, medium gray to dark gray, in parts grayish white, off white, firm to moderately hard, amorphous, non calcareous to feebly calcareous, occasionally very feebly calcareous, rarely glauconitic.

**Shale (10 - 20 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, smooth, flaky to sub flaky, sub platy to platy, non calcareous.

**Pyrite:** In trace.

3088 – 3092m

**Sandstone (70 %):** Grayish white, light grayish white, dirty white to white, grayish, moderately hard to hard, fine grain to medium grain, in parts coarse grain and very fine grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, siliceous to pyritic cement, consolidated, tight, moderately to weak cement, dirty, occasionally pyretic, poor visible porosity, occasionally glauconitic inclusion, very feebly calcareous, speckled, light yellowish fluorescence and NC.

**Shale (20 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, smooth, flaky to sub flaky, sub platy to platy, non calcareous.

**Clay/Claystone (10 %):** White to dirty white, medium gray to dark gray, in parts grayish white, off white, firm to moderately hard, amorphous, non calcareous to feebly calcareous, occasionally very feebly calcareous, rarely glauconitic.

**Pyrite:** In trace.

3092 – 3096m

**Sandstone (50 %):** Grayish white, light grayish white, dirty white to white, grayish, moderately hard to hard, fine grain to medium grain, in parts coarse grain and very fine grain, sub angular to sub rounded, sub spherical, poor to moderately sorted, argillaceous matrix, siliceous to pyritic cement, consolidated, tight, moderately to weak cement, dirty, occasionally pyretic, poor visible porosity, occasionally glauconitic inclusion, very feebly calcareous, speckled, light yellowish to dull brownish fluorescence and faint, white, crushed cut..

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**Shale (30 – 40 %):** Dark gray to blackish gray, in parts brownish gray, moderately hard to hard, compact, sub fissile, smooth, flaky to sub flaky, sub platy to platy, non calcareous, in parts silty, in parts micro micaceous to micaceous, occasionally pyritic.

**Clay/Claystone (10 - 20 %):** White to dirty white, medium gray to dark gray, in parts grayish white, off white, light brownish white to brownish, firm to moderately hard, amorphous, earthy, non calcareous to feebly calcareous, occasionally very feebly calcareous, rarely glauconitic.

**Pyrite, Siltstone:** In trace.

### 3096 – 3098m

**Shale (50 %):** Dark gray to blackish gray, in parts brownish gray, moderately hard to hard, compact, sub fissile, smooth, flaky to sub flaky, sub platy to platy, non calcareous, in parts occasionally very feebly calcareous, in parts silty, in parts micro micaceous to micaceous, occasionally pyritic.

**Clay/Claystone (30 %):** Dirty white, light grayish white, off white, light brownish white, in parts gray, firm to moderately hard, amorphous to sub blocky, earthy, feebly calcareous, in parts slightly calcareous, in parts silty.

**Sandstone (20 %):** Grayish white, light grayish white, dirty white, in parts grayish, moderately hard to hard, fine grain to medium grain, in parts coarse grain and very fine grain, occasionally very coarse grain, sub angular to sub rounded, sub spherical, poorly sorted, argillaceous matrix, silica cement, tight, moderately to weak cement, dirty, occasionally pyretic, in parts feebly calcareous, in parts silty, occasionally speckled, light yellowish to light brownish fluorescence and no cut..

**Pyrite, Siltstone:** In trace.

### 3098 – 3102m

**Sandstone (50 %):** Grayish white, light grayish white, dirty white, in parts grayish, moderately hard to hard, fine grain to medium grain, in parts coarse grain and very fine grain, occasionally very coarse grain, sub angular to sub rounded, sub spherical, poorly sorted, argillaceous matrix, silica cement, tight, moderately to weak cement, dirty, occasionally pyretic, in parts feebly calcareous, in parts silty, occasionally speckled, light yellowish to light brownish fluorescence and no cut..

**Shale (40 %):** Dark gray to blackish gray, in parts brownish gray, moderately hard to hard, compact, sub fissile, smooth, flaky to sub flaky, sub platy to platy, non calcareous, in parts occasionally very feebly calcareous, in parts silty, in parts micro micaceous to micaceous, occasionally pyritic.

**Clay/Claystone (10 %):** Dirty white, light grayish white, off white, light brownish white, in parts gray, firm to moderately hard, amorphous to sub blocky, earthy, feebly calcareous, in parts slightly calcareous, in parts silty.

**Pyrite, Siltstone:** In trace.

### 3102 – 3108m

**Shale (50 – 60 %):** Dark gray to blackish gray, in parts dark brownish to brownish gray, moderately hard to hard, compact, sub fissile, smooth, flaky to sub flaky, sub platy to platy, non calcareous, in parts occasionally very feebly calcareous, in parts silty, in parts micro micaceous to micaceous, occasionally pyritic.

**Sandstone (30 – 40 %):** Grayish white, light grayish white, dirty white, in parts grayish, moderately hard to hard, fine grain to medium grain, in parts coarse grain and very fine grain, occasionally very coarse grain, sub angular to sub rounded, sub spherical, poorly sorted, argillaceous matrix, silica cement, tight, moderately to weak cement, dirty, occasionally

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pyretic, in parts feebly calcareous, in parts silty, occasionally speckled, light yellowish to light brownish fluorescence and no cut..

**Clay/Claystone (10 – 20 %):** Dirty white, light grayish white, off white, light brownish white, in parts gray, firm to moderately hard, amorphous to sub blocky, earthy, feebly calcareous, in parts slightly calcareous, in parts silty.

**Pyrite, Siltstone:** In trace.

#### 3108 – 3114m

**Shale (50 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, smooth, flaky to sub flaky, sub platy to platy, non calcareous, in parts silty.

**Sandstone (30 %):** Grayish white to dirty white, light grayish to grayish, light grayish white, occasionally medium to dark grayish, moderately hard to hard, very fine grain to fine grain, in parts occasionally medium grain to coarse grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, siliceous to calcareous cement, tight, weak cement, occasionally pyritic, in parts silty, grading toward siltstone, rarely speckled, light yellowish fluorescence and no cut..

**Clay/Claystone (20 %):** Dirty white to grayish white, light grayish to gray, in parts medium gray to dark gray, firm to moderately hard, amorphous to sub blocky, non calcareous to feebly calcareous, in parts silty.

**Pyrite:** In trace.

#### 3114 – 3116m

**Shale (60 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, smooth, flaky to sub flaky, sub platy to platy, non calcareous, in parts silty.

**Sandstone (20 %):** Grayish white to dirty white, light grayish to grayish, light grayish white, occasionally medium to dark grayish, moderately hard to hard, very fine grain to fine grain, in parts occasionally medium grain to coarse grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, siliceous to calcareous cement, tight, weak cement, occasionally pyritic, in parts silty, grading toward siltstone, rarely speckled, light yellowish fluorescence and no cut..

**Clay/Claystone (20 %):** Dirty white to grayish white, light grayish to gray, in parts medium gray to dark gray, firm to moderately hard, amorphous to sub blocky, non calcareous to feebly calcareous, in parts silty.

**Pyrite:** In trace.

#### 3116 – 3124m

**Shale (50 – 60 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, smooth, flaky to sub flaky, sub platy to platy, non calcareous, in parts silty, occasionally pyritic dissemination, specks of carbonaceous matter.

**Sandstone (10 – 20 %):** Grayish white to dirty white, light grayish to grayish, light grayish white, occasionally medium to dark grayish, in parts brownish gray, occasionally grayish brown, moderately hard to hard, very fine grain to fine grain, in parts occasionally medium grain to coarse grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, siliceous to calcareous cement, tight, weak cement, occasionally pyritic, in parts silty, grading toward siltstone, NF/NC.

**Clay/Claystone (20 %):** Dirty white to grayish white, light grayish to gray, in parts medium gray to dark gray, in parts brownish to brownish white, firm to moderately hard, amorphous to sub blocky, non calcareous to feebly calcareous, in parts silty.

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**Siltstone (10 %):** Grayish white, dirty white to white, light grayish to grayish, hard, compact, non calcareous to very feebly calcareous, occasionally pyritic dissemination, in parts grading toward very fine sandstone.

**Pyrite:** In trace.

### 3124 – 3128m

**Shale (60 - 70 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, smooth, flaky to sub flaky, sub platy to platy, non calcareous, in parts silty, occasionally pyritic dissemination, specks of carbonaceous matter.

**Sandstone (10 %):** Grayish white to dirty white, light grayish to grayish, light grayish white, occasionally medium to dark grayish, in parts brownish gray, occasionally grayish brown, moderately hard to hard, very fine grain to fine grain, in parts occasionally medium grain to coarse grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, siliceous to calcareous cement, tight, weak cement, occasionally pyritic, in parts silty, grading toward siltstone, NF/NC.

**Clay/Claystone (10 – 20 %):** Dirty white to grayish white, light grayish to gray, in parts medium gray to dark gray, in parts brownish to brownish white, firm to moderately hard, amorphous to sub blocky, non calcareous to feebly calcareous, in parts silty.

**Siltstone (10 %):** Grayish white, dirty white to white, light grayish to grayish, hard, compact, non calcareous to very feebly calcareous, occasionally pyritic dissemination, in parts grading toward very fine sandstone.

### 3128 – 3132m

**Sandstone (60 – 70 %):** Light grayish white to grayish white, dirty white, colorless, in parts light yellowish white to light brownish white, in parts white, transparent to translucent, friable to moderately hard, consolidated, fine grain to medium grain, in parts very fine and coarse grain, rarely very coarse grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, silica cement, in parts occasionally calcareous and pyritic cement, weak to moderately cemented, fine grain of glauconitic inclusion, rarely speckled, pin point, light yellowish, occasionally light brownish fluorescence and no cut.

**Shale (10 – 20 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, smooth, flaky to sub flaky, sub platy to platy, non calcareous, in parts silty, occasionally pyritic dissemination, specks of carbonaceous matter.

**Clay/Claystone (10 – 20 %):** Dirty white to grayish white, light grayish, dark gray, in parts brownish gray, white to milky white, firm to moderately hard, amorphous to sub blocky, non calcareous to feebly calcareous, in parts silty.

**Siltstone (Tr. – 10 %):** Grayish white, dirty white to white, light grayish to grayish, hard, compact, non calcareous to very feebly calcareous, occasionally pyritic.

**Pyrite:** In trace.

### 3132 – 3134m

**Sandstone (80 %):** Light grayish white to grayish white, dirty white, colorless, in parts light yellowish white to light brownish white, in parts white, transparent to translucent, friable to moderately hard, consolidated, fine grain to medium grain, in parts very fine and coarse grain, rarely very coarse grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, silica cement, in parts occasionally calcareous and pyritic cement, weak to moderately cemented, fine grain of glauconitic inclusion, rarely speckled, pin point, light yellowish, occasionally light brownish fluorescence and no cut.



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**Shale (10 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, smooth, flaky to sub flaky, sub platy to platy, non calcareous, in parts silty, occasionally pyritic dissemination, specks of carbonaceous matter.

**Clay/Claystone (10 %):** Dirty white to grayish white, light grayish, dark gray, in parts brownish gray, white to milky white, firm to moderately hard, amorphous to sub blocky, non calcareous to feebly calcareous, in parts silty.

**Pyrite:** In trace.

### 3134 – 3136m

**Sandstone (60 %):** Light grayish white to grayish white, dirty white, colorless, in parts light yellowish white to light brownish white, in parts white, transparent to translucent, friable to moderately hard, consolidated, fine grain to medium grain, in parts very fine and coarse grain, rarely very coarse grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, silica cement, in parts occasionally calcareous and pyritic cement, weak to moderately cemented, fine grain of glauconitic inclusion, rarely speckled, pin point, light yellowish, occasionally light brownish fluorescence and no cut.

**Shale (30 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, smooth, flaky to sub flaky, sub platy to platy, non calcareous, in parts silty, occasionally pyritic dissemination, specks of carbonaceous matter.

**Clay/Claystone (10 %):** Dirty white to grayish white, light grayish, dark gray, in parts brownish gray, white to milky white, firm to moderately hard, amorphous to sub blocky, non calcareous to feebly calcareous, in parts silty.

**Siltstone, Pyrite:** In trace.

### 3136 – 3140m

**Sandstone (70 – 80 %):** Light grayish white to grayish white, dirty white, colorless, in parts light yellowish white to light brownish white, transparent to translucent, moderately hard, in parts friable, occasionally loose, consolidated, very fine grain to fine to medium grain, in parts coarse grain, occasionally very coarse grain, sub angular to sub rounded, sub spherical, poorly to moderately sorted, argillaceous matrix, silica cement, in parts occasionally pyritic cement, weak to moderately cemented, tight, dirty, fine grain of glauconitic inclusion, rarely speckled, light yellowish fluorescence and no cut.

**Shale (10 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, smooth, flaky to sub flaky, sub platy to platy, non calcareous, in parts silty, occasionally pyritic dissemination, specks of carbonaceous matter.

**Clay/Claystone (10 – 20 %):** Dirty white to grayish white, light grayish, dark gray, in parts brownish gray, white to milky white, firm to moderately hard, amorphous to sub blocky, non calcareous to feebly calcareous, in parts silty.

**Pyrite:** In trace.

### 3140 – 3142m

**Sandstone (60 %):** Light grayish white to grayish white, dirty white, colorless, in parts light yellowish white to light brownish white, transparent to translucent, moderately hard, in parts friable, occasionally loose, consolidated, very fine grain to fine to medium grain, in parts coarse grain, occasionally very coarse grain, sub angular to sub rounded, sub spherical, poorly to moderately sorted, argillaceous matrix, silica cement, in parts occasionally pyritic cement, weak to moderately cemented, tight, dirty, fine grain of glauconitic inclusion, rarely speckled, light yellowish fluorescence and no cut.

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## SGL # 2

**Clay/Claystone (30 %):** Dirty white to grayish white, light grayish, dark gray, in parts brownish gray, white to milky white, firm to moderately hard, amorphous to sub blocky, non calcareous to feebly calcareous, in parts silty.

**Shale (10 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, smooth, flaky to sub flaky, sub platy to platy, non calcareous, in parts silty, occasionally pyritic dissemination, specks of carbonaceous matter.

**Pyrite:** In trace.

### 3142 – 3146m

**Sandstone (40 – 50 %):** Light grayish white to grayish white, dirty white, colorless, in parts light yellowish white to light brownish white, transparent to translucent, moderately hard, in parts friable, occasionally loose, consolidated, very fine grain to fine to medium grain, in parts coarse grain, occasionally very coarse grain, sub angular to sub rounded, sub spherical, poorly to moderately sorted, argillaceous matrix, silica cement, in parts occasionally pyritic cement, weak to moderately cemented, tight, dirty, fine grain of glauconitic inclusion, rarely speckled, light yellowish fluorescence and no cut.

**Shale (30 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, smooth, flaky to sub flaky, sub platy to platy, non calcareous, in parts silty, occasionally pyritic dissemination, specks of carbonaceous matter.

**Clay/Claystone (20 %):** Dirty white to grayish white, light grayish, dark gray, in parts brownish gray, white to milky white, firm to moderately hard, amorphous to sub blocky, non calcareous to feebly calcareous, in parts silty.

**Siltstone (Tr. – 10 %):** Grayish white, dirty white to white, light grayish to grayish, hard, compact, non calcareous to very feebly calcareous, occasionally pyritic.

**Pyrite:** In trace.

### 3146 – 3148m

**Sandstone (80 %):** Colorless, clear, transparent to translucent, light grayish white, moderately hard to hard, medium grain to coarse grain, in parts fine to medium grain, occasionally very coarse grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, silica cement, in parts occasionally pyritic, weak to moderately cemented, poor visible porosity, in parts occasionally fine grain of glauconitic inclusion, rarely, pin point dull brownish to light yellowish fluorescence and no cut.

**Shale (10 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, non calcareous, in parts silty.

**Clay/Claystone (10 %):** Dirty white to white, gray, medium gray to dark gray, grayish white to light grayish, firm to moderately hard, amorphous.

**Pyrite:** In trace.

### 3148 – 3150m

**Clay/Claystone (40 %):** Dirty white to white, gray, medium gray to dark gray, in parts grayish white, firm to moderately hard, amorphous to sub blocky, non calcareous, occasionally silty.

**Sandstone (30 %):** Colorless, clear, transparent to translucent, light grayish white, moderately hard to hard, medium grain to coarse grain, in parts fine to medium grain, occasionally very coarse grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, silica cement, in parts occasionally pyritic, weak to moderately cemented, poor visible porosity, in parts occasionally fine grain of glauconitic inclusion, NF/NC

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**Shale (30 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, non calcareous, in parts silty.

### 3150 – 3152m

**Sandstone (40 %):** Colorless, clear, transparent to translucent, light grayish white to light grayish, in parts light brownish white, in parts white, moderately hard to hard, in parts friable, medium grain to coarse grain, in parts fine to medium grain, occasionally very coarse grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, silica cement, weak to moderately cemented, in parts occasionally fine grain of glauconitic inclusion, in parts occasionally pyritic, rare, speckled, pin point light yellowish, trace dull brownish, fluorescence and no cut.

**Clay/Claystone (30 %):** Medium gray to gray, dark gray, grayish white, in parts dirty white, light grayish, firm to moderately hard, amorphous to sub blocky, non calcareous, in parts feebly calcareous, occasionally silty.

**Shale (30 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, non calcareous, in parts silty.

### 3152 – 3158m

**Sandstone (70 – 80 %):** Colorless, clear, transparent to translucent, light grayish white to light grayish, in parts light brownish white, in parts white, moderately hard to hard, in parts friable, medium grain to coarse grain, in parts fine to medium grain, occasionally very coarse grain, sub angular to sub rounded, sub spherical, moderately sorted, argillaceous matrix, silica cement, weak to moderately cemented, poor visible porosity, in parts occasionally fine grain of glauconitic inclusion, in parts occasionally pyritic, rare, speckled, pin point light yellowish, trace dull brownish, fluorescence and no cut.

**Clay/Claystone (10 – 20 %):** Medium gray to gray, dark gray, grayish white, in parts dirty white, light grayish, firm to moderately hard, amorphous to sub blocky, non calcareous, in parts feebly calcareous, occasionally silty.

**Shale (10 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, non calcareous, in parts silty.

### 3158 – 3162m

**Sandstone (60 – 70 %):** Colorless, clear, transparent to translucent, light grayish white to light grayish, dirty white, moderately hard to hard, medium grain to coarse grain, in parts fine to medium grain, occasionally very coarse grain, sub angular to sub rounded, sub spherical to spherical, poorly to moderately sorted, argillaceous matrix, silica cement, weak to moderately cemented, in parts occasionally pyritic, dominantly loose in categories, in part consolidated, in parts tight, dirty, NF/NC.

**Clay/Claystone (20 – 30 %):** Medium gray to gray, dark gray, grayish white, in parts dirty white, firm to moderately hard, amorphous to sub blocky, non calcareous, in parts feebly calcareous, occasionally silty.

**Shale (10 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, non calcareous, in parts silty.

### 3162 – 3164m

**Sandstone (50 %):** Colorless, clear, transparent to translucent, light grayish to gray, moderately hard to hard, in parts friable, fine to medium to coarse grain, occasionally very coarse grain, sub angular to sub rounded, sub spherical to spherical, poorly sorted, argillaceous matrix, silica cement, weak to moderately cemented, in parts occasionally

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pyritic, in parts loose in cuttings, consolidated, rarely glauconitic, in parts silty, in parts tight, dirty, NF/NC.

**Clay/Claystone (40 %):** Medium gray to gray, dark gray, grayish white, in parts dirty white, firm to moderately hard, amorphous to sub blocky, earthy, non calcareous, occasionally silty.

**Shale (10 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, non calcareous, in parts silty.

**Pyrite:** In trace. (Sand embedded in pyrite).

### 3164 – 3170m

**Sandstone (70 – 80 %):** Colorless, clear, transparent to translucent, dirty white to white, grayish white, in parts light gray, gray to medium gray, moderately hard to hard, in parts friable, medium to coarse grain, in parts fine and very coarse grain, sub angular to sub rounded, in parts angular, sub spherical to spherical, micaceous to micro micaceous, tight, moderately sorted, argillaceous matrix, silica cement, weak to moderately cemented, in parts occasionally pyritic, consolidated, rarely glauconitic, in parts silty, dirty, no fluorescence to rare speckled dull brownish fluorescence /NC.

**Clay/Claystone (20 %):** Medium gray to gray, dark gray, grayish white, in parts dirty white, firm to moderately hard, amorphous to sub blocky, earthy, non calcareous, occasionally silty.

**Shale (Tr. – 10 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, non calcareous, in parts silty.

**Pyrite:** In trace. (Sand embedded in pyrite).

### 3170 – 3174m

**Sandstone (50 – 60 %):** Colorless, clear, transparent to translucent, grayish white to white, dirty white, medium gray, moderately hard to hard, in parts friable, fine to medium grain, in parts coarse grain, sub angular to sub rounded, sub spherical to spherical, micaceous to micro micaceous, tight, moderately sorted, argillaceous matrix, silica to pyritic cement, weak to moderately cemented, consolidated, compact, in parts silty, NF /NC.

**Clay/Claystone (30 – 40 %):** Medium gray to gray, dark gray, grayish white, in parts dirty white, firm to moderately hard, amorphous to sub blocky, earthy, non calcareous, occasionally silty.

**Shale (10 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, non calcareous, in parts silty, occasionally pyritic dissemination.

**Pyrite:** In trace.

### 3174 – 3176m

**Sandstone (70 %):** Colorless, clear, transparent to translucent, grayish white to white, dirty white, medium gray, moderately hard to hard, in parts friable, fine to medium grain, in parts coarse grain, sub angular to sub rounded, sub spherical to spherical, micaceous to micro micaceous, tight, moderately sorted, argillaceous matrix, silica to pyritic cement, weak to moderately cemented, consolidated, compact, in parts silty, NF /NC.

**Clay/Claystone (20 %):** Medium gray to gray, dark gray, grayish white, in parts dirty white, firm to moderately hard, amorphous to sub blocky, earthy, non calcareous, occasionally silty.

**Shale (10 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, non calcareous, in parts silty, occasionally pyritic dissemination.

**Pyrite:** In trace.

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### SGL # 2

3176 – 3178m

**Shale (40 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, micaceous, non calcareous, in parts silty, occasionally pyritic dissemination.

**Sandstone (30 %):** Colorless, clear, transparent to translucent, grayish white to white, dirty white, medium gray, moderately hard to hard, in parts friable, fine to medium grain, in parts coarse grain, sub angular to sub rounded, sub spherical to spherical, micaceous to micro micaceous, tight, moderately sorted, argillaceous matrix, silica to pyritic cement, weak to moderately cemented, consolidated, compact, in parts silty, NF /NC.

**Clay/Claystone (30 %):** Medium gray to gray, dark gray, grayish white, in parts dirty white, firm to moderately hard, amorphous to sub blocky, earthy, non calcareous, occasionally silty.

**Pyrite:** In trace.

3178 – 3180m

**Sandstone (50 %):** Colorless, clear, transparent to translucent, grayish white to white, dirty white, medium gray, moderately hard to hard, in parts friable, fine to medium grain, in parts coarse grain, sub angular to sub rounded, sub spherical to spherical, micaceous to micro micaceous, tight, moderately sorted, argillaceous matrix, silica to pyritic cement, weak to moderately cemented, consolidated, compact, in parts silty, rare, speckled, light yellowish fluorescence and no cut.

**Shale (30 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, micaceous, non calcareous, in parts silty, occasionally pyritic dissemination.

**Clay/Claystone (20 %):** Medium gray to gray, dark gray, grayish white, in parts dirty white, firm to moderately hard, amorphous to sub blocky, earthy, non calcareous, occasionally silty.

**Pyrite:** In trace.

3180 – 3182m

**Sandstone (70 %):** Colorless, clear, transparent to translucent, light brownish, light grayish white, in parts smoky, moderately hard to hard, in parts friable, medium grain to coarse grain to very coarse grain, in parts very fine to fine grain, sub angular to sub rounded, in parts angular, sub spherical to spherical, moderately sorted, argillaceous matrix, silica cement, weak to moderately cemented, in parts occasionally pyritic cement, in parts loose in cuttings, rare, pin point light yellowish to dull brownish fluorescence and no cut.

**Shale (20 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, micaceous, non calcareous, in parts silty, occasionally pyritic dissemination.

**Clay/Claystone (10 %):** Medium gray to gray, dark gray, grayish white, in parts dirty white, dark gray, firm to moderately hard, amorphous to sub blocky, earthy, non calcareous, occasionally silty.

**Pyrite:** In trace.

3182 – 3184m

**Clay/Claystone (50 %):** Medium gray to gray, dark gray, grayish white, in parts dirty white, dark gray, firm to moderately hard, amorphous to sub blocky, earthy, non calcareous, occasionally silty.

**Shale (30 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, micaceous, non calcareous, in parts silty, occasionally pyritic dissemination.

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**Sandstone (20 %):** Colorless, clear, transparent to translucent, light brownish, light grayish white, in parts smoky, moderately hard to hard, in parts friable, medium grain to coarse grain to very coarse grain, in parts very fine to fine grain, sub angular to sub rounded, in parts angular, sub spherical to spherical, moderately sorted, argillaceous matrix, silica cement, weak to moderately cemented, in parts occasionally pyritic cement, in parts loose in cuttings, rare, pin point light yellowish to dull brownish fluorescence and no cut.

**Pyrite:** In trace.

### 3184 – 3186m

**Sandstone (80 %):** Colorless, clear, transparent to translucent, light brownish, light grayish white, in parts smoky, moderately hard to hard, in parts friable, medium grain to coarse grain to very coarse grain, in parts very fine to fine grain, sub angular to sub rounded, in parts angular, sub spherical to spherical, moderately sorted, argillaceous matrix, silica cement, weak to moderately cemented, in parts occasionally pyritic cement, in parts loose in cuttings, rare, pin point light yellowish to dull brownish fluorescence and no cut.

**Clay/Claystone (10 %):** Medium gray to gray, dark gray, grayish white, in parts dirty white, dark gray, firm to moderately hard, amorphous to sub blocky, earthy, non calcareous, occasionally silty.

**Shale (10 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, micaceous, non calcareous, in parts silty, occasionally pyritic dissemination.

**Pyrite:** In trace.

### 3186 – 3188m

**Clay/Claystone (60 %):** Medium gray to gray, dark gray, grayish white, in parts dirty white, dark gray, firm to moderately hard, amorphous to sub blocky, earthy, non calcareous, occasionally silty.

**Sandstone (30 %):** Colorless, clear, transparent to translucent, light brownish, light grayish white, in parts smoky, moderately hard to hard, in parts friable, medium grain to coarse grain to very coarse grain, in parts very fine to fine grain, sub angular to sub rounded, in parts angular, sub spherical to spherical, moderately sorted, argillaceous matrix, silica cement, weak to moderately cemented, in parts occasionally pyritic cement, in parts loose in cuttings, rare, pin point light yellowish to dull brownish fluorescence and no cut.

**Shale (10 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, micaceous, non calcareous, in parts silty, occasionally pyritic dissemination.

**Pyrite:** In trace.

### 3188 – 3190m

**Sandstone (90 %):** Colorless, clear, transparent to translucent, light brownish white, light grayish white, in parts smoky, moderately hard to hard, consolidated, medium grain to coarse grain to very coarse grain, in parts very fine to fine grain, sub angular to sub rounded, in parts angular, sub spherical to spherical, moderately sorted, argillaceous matrix, silica cement, weak to moderately cemented, in parts occasionally pyritic cement, poor visible porosity, in parts loose in cuttings, trace, pin point light yellowish to dull brownish fluorescence and no cut.

**Clay/Claystone (10 %):** Medium gray to gray, dark gray, grayish white, in parts dirty white, dark gray, firm to moderately hard, amorphous to sub blocky, earthy, non calcareous, occasionally silty.

**Shale, Pyrite:** In trace.

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3190 – 3194m

**Sandstone (50 – 60 %):** Colorless, clear, transparent to translucent, light brownish white, light grayish white, in parts smoky, moderately hard to hard, consolidated, medium grain to coarse grain to very coarse grain, in parts very fine to fine grain, sub angular to sub rounded, in parts angular, sub spherical to spherical, moderately sorted, argillaceous matrix, silica cement, weak to moderately cemented, in parts occasionally pyritic cement, poor visible porosity, in parts loose in cuttings, trace, pin point light yellowish to dull brownish fluorescence and no cut.

**Clay/Claystone (20 – 30 %):** Medium gray to gray, dark gray, grayish white, in parts dirty white, dark gray, firm to moderately hard, amorphous to sub blocky, earthy, non calcareous, occasionally silty.

**Shale (20 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, micaceous, non calcareous, in parts silty, occasionally pyritic dissemination.

**Pyrite:** In trace.

3194 – 3198m

**Clay/Claystone (40 %):** Medium gray to gray, dark gray, grayish white, in parts dirty white, dark gray, firm to moderately hard, amorphous to sub blocky, earthy, non calcareous, occasionally silty.

**Shale (30 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, smooth, micaceous, non calcareous, in parts silty, occasionally pyritic dissemination.

**Sandstone (30 %):** Colorless, clear, transparent to translucent, light brownish white, light grayish white, in parts smoky, moderately hard to hard, consolidated, medium grain to coarse grain to very coarse grain, in parts very fine to fine grain, sub angular to sub rounded, in parts angular, sub spherical to spherical, moderately sorted, argillaceous matrix, silica cement, weak to moderately cemented, in parts occasionally pyritic cement, poor visible porosity, in parts loose in cuttings, trace, pin point light yellowish to dull brownish fluorescence and no cut.

**Pyrite:** In trace.

3198 – 3200m

**Sandstone (70 %):** Colorless, clear, transparent to translucent, grayish, light grayish, smoky, moderately hard to hard, consolidated, medium grain to coarse grain to very coarse grain, in parts fine grain, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, silica to pyritic cement, in parts loose in cuttings, in parts dirty, tight, NF/NC.

**Clay/Claystone (20 %):** Dirty white to grayish white, white, dark gray, in parts gray to medium gray, firm to moderately hard, amorphous to sub blocky, non calcareous, in parts silty.

**Shale (10 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, micro micaceous, non calcareous, in parts silty.

**Pyrite:** In trace (Sand embedded in pyrite).

3200 – 3204m

**Clay/Claystone (40 – 50 %):** Dirty white to grayish white, white, dark gray, in parts gray to medium gray, firm to moderately hard, amorphous to sub blocky, non calcareous, in parts silty.

**Sandstone (40 – 50 %):** Colorless, clear, transparent to translucent, grayish, light grayish, smoky, moderately hard to hard, consolidated, medium grain to coarse grain to very coarse grain, in parts fine grain, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, silica to pyritic cement, in parts loose in cuttings, in parts dirty, tight, NF/NC.

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**Shale (10 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, micro micaceous, non calcareous, in parts silty.

**Pyrite:** In trace.

### 3204 – 3210m

**Sandstone (80 %):** Colorless, clear, transparent to translucent, grayish, light grayish, dirty white, smoky, moderately hard to hard, consolidated, medium grain to coarse grain to very coarse grain, in parts fine grain, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, silica to pyritic cement, poor visible porosity, in parts loose in cuttings, occasionally fine speck of glauconite, in parts dirty, tight, trace, speckled, dull brownish fluorescence, no cut.

**Clay/Claystone (10 %):** Dirty white to grayish white, white, dark gray, in parts gray to medium gray, firm to moderately hard, amorphous to sub blocky, non calcareous, in parts silty.

**Shale (10 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, micro micaceous, non calcareous, in parts silty.

**Pyrite:** In trace. (Sand embedded in pyrite).

### 3210 – 3214m

**Sandstone (70 %):** Colorless, clear, transparent to translucent, light grayish to dirty white, smoky, in parts white, in parts brownish to light brownish, moderately hard to hard, medium grain to coarse grain to very coarse grain, in parts fine grain, sub angular to sub rounded, in parts angular, sub spherical to spherical, poorly sorted, argillaceous matrix, silica to pyritic cement, poor visible porosity, occasionally fine speck of glauconite, in parts loose in cuttings, in parts sand embedded in pyrite, in parts dirty, tight, trace, speckled, dull brownish fluorescence, no cut.

**Clay/Claystone (10 – 20 %):** Dirty white to grayish white, white to milky white, dark gray, in parts gray to medium gray, brownish gray to light brownish, firm to moderately hard, amorphous to sub blocky, in parts earthy, occasionally micro micaceous, non calcareous, in parts silty.

**Shale (10 – 20 %):** Dark gray to blackish gray, in parts occasionally brownish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, in parts sub blocky, sub platy to platy, micro micaceous, non calcareous, in parts silty, pyritic dissemination, in parts fine glauconitic.

**Pyrite, Siltstone:** In trace.

**Glauconite:** In rare amount.

### 3214 – 3216m

**Sandstone (50 %):** Colorless, clear, transparent to translucent, light grayish to grayish, smoky, moderately hard to hard, medium grain to coarse grain to very coarse grain, in parts fine grain, sub angular to sub rounded, sub spherical to spherical, moderately sorted, generally clean, argillaceous matrix, silica cement, in parts pyritic, in parts loose in cuttings, specks of glauconite, occasionally silty, silty sandstone gaining dull brownish fluorescence, no cut.

**Clay/Claystone (40 %):** Predominantly white to milky white, dirty white, occasionally earthy gray, medium gray to gray, firm to moderately hard, amorphous to sub blocky, non calcareous.

**Shale (10 %):** Dark gray to blackish gray, in parts occasionally brownish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, in parts sub blocky, sub platy to platy, micro micaceous, non calcareous, in parts silty, pyritic dissemination, in parts fine glauconitic.

**Pyrite:** In trace. (Sand embedded in pyrite).

### 3216 – 3220m

**Sandstone (60 – 70 %):** Colorless, clear, transparent to translucent, light grayish to grayish, smoky, moderately hard to hard, medium grain to



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coarse grain to very coarse grain, in parts fine grain, sub angular to sub rounded, sub spherical to spherical, moderately sorted, generally clean, argillaceous matrix, silica cement, in parts pyritic, in parts loose in cuttings, specks of glauconite, occasionally silty, silty sandstone gaining dull brownish fluorescence, no cut.

**Clay/Claystone (20 – 30 %):** Predominantly white to milky white, dirty white, occasionally earthy gray, medium gray to gray, firm to moderately hard, amorphous to sub blocky, non calcareous.

**Shale (10 %):** Dark gray to blackish gray, in parts occasionally brownish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, in parts sub blocky, sub platy to platy, micro micaceous, non calcareous, in parts silty, pyritic dissemination, in parts fine glauconitic.

**Pyrite:** In trace.

### 3220 – 3222m

**Sandstone (40 %):** Colorless, clear, transparent to translucent, light grayish to light grayish white, smoky, moderately hard to hard, medium grain to coarse grain to very coarse grain, in parts very fine to fine grain, sub angular to sub rounded, in parts angular, sub spherical to spherical, poor to moderately sorted, generally clean, argillaceous matrix, silica cement, in parts loose in cuttings, occasionally silty, rarely pin point light yellowish silty sandstone gaining dull brownish fluorescence, no cut.

**Clay/Claystone (40 %):** Predominantly white to milky white, light yellowish white, dirty white to light grayish white, firm to moderately hard, amorphous to sub blocky, non calcareous.

**Shale (20 %):** Dark gray to blackish gray, in parts occasionally brownish gray, in parts medium gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, micro micaceous, non calcareous, in parts silty, pyritic dissemination.

**Pyrite:** In rare amount.

### 3222 – 3226m

**Sandstone (60 %):** Colorless, clear, transparent to translucent, light grayish, smoky, moderately hard to hard, coarse grain to very coarse grain, in parts medium grain, sub angular to sub rounded, sub spherical to spherical, moderately sorted, generally clean, argillaceous matrix, silica cement, in parts loose in cuttings, in parts consolidated, rarely glauconitic, rarely pyritic, NF/NC.

**Clay/Claystone (30 %):** Predominantly white to milky white, light yellowish white, dirty white to light grayish white, firm to moderately hard, amorphous to sub blocky, non calcareous.

**Shale (10 %):** Dark gray to blackish gray, in parts occasionally brownish gray, in parts medium gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, micro micaceous, non calcareous, in parts silty, pyritic dissemination.

**Pyrite:** In rare amount.

### 3226 – 3228m

**Sandstone (90 %):** Colorless, clear, transparent to translucent, light grayish, smoky, moderately hard to hard, in parts hard, dominantly medium grain, in parts coarse grain to very coarse grain, sub angular to sub rounded, sub spherical to spherical, moderately to well sorted, clean, argillaceous matrix, silica cement, in parts loose in cuttings, moderately cemented, in parts consolidated, in parts specks of glauconite, trace, speckled dull brownish fluorescence and no cut.

**Clay/Claystone (10 %):** Predominantly white to milky white, light yellowish white, dirty white to light grayish white, firm to moderately hard, amorphous to sub blocky, non calcareous.

**Shale:** In trace.

**Pyrite:** In rare amount.

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- 3228 – 3230m**
- Sandstone (70 %):** Colorless, clear, transparent to translucent, light grayish to grayish white, smoky, dirty white, moderately hard to hard, fine to very fine grain, in parts fine to medium grain to coarse grain, occasionally very coarse grain, sub angular to sub rounded, sub spherical to spherical, poorly sorted, clean, argillaceous matrix, silica cement, in parts consolidated, in parts specks of glauconite, dirty, silty, poor visible porosity, rare, speckled dull brownish fluorescence and no cut.
- Clay/Claystone (20 %):** Predominantly white to milky white, light yellowish white, dirty white to light grayish white, firm to moderately hard, amorphous to sub blocky, non calcareous.
- Shale (10 %):** Dark gray to blackish gray, in parts occasionally brownish gray, in parts medium gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, micro micaceous, non calcareous, in parts silty, pyritic dissemination.
- Pyrite:** Occasionally.
- 3230 – 3234m**
- Sandstone (50 – 60 %):** Colorless, clear, transparent to translucent, light grayish to grayish white, smoky, dirty white, moderately hard to hard, fine to very fine grain, occasionally medium grain to coarse grain, sub angular to sub rounded, sub spherical to spherical, poorly to moderately sorted, argillaceous matrix, silica cement, in parts consolidated, in parts grading toward siltstone, dirty, silty, occasionally pyritic, tight, rare, speckled silty sandstone shows dull brownish fluorescence and no cut.
- Clay/Claystone (30 – 40 %):** Dirty white to light grayish white, in parts medium gray to dark gray, light gray, occasionally milky white, firm to moderately hard, amorphous to sub blocky, in parts earthy, non calcareous.
- Shale (10 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, micro micaceous, non calcareous, in parts silty, pyritic dissemination.
- Pyrite:** Occasionally.
- 3234 – 3244m**
- Sandstone (80 – 90 %):** Colorless, clear, transparent to translucent, light grayish to grayish white, in parts light brownish, smoky, dirty white, moderately hard to hard, medium grain to coarse grain to very coarse grain, in parts fine to very fine grain, sub angular to sub rounded, sub spherical to spherical, poorly to moderately to well sorted, argillaceous matrix, silica cement, in parts consolidated, occasionally loose in cuttings, dirty, silty, moderately to weak cemented, occasionally pyritic, tight, rare, speckled, pin point, silty sandstone shows dull brownish fluorescence and no cut.
- Clay/Claystone (10 – 20 %):** Dirty white to light grayish white, in parts medium gray to dark gray, light gray, occasionally milky white, firm to moderately hard, amorphous to sub blocky, in parts earthy, non calcareous.
- Shale:** In trace.
- Pyrite:** In rare amount.
- 3244 – 3250m**
- Sandstone (60 – 70 %):** Colorless, clear, transparent to translucent, light grayish to grayish white, in parts light brownish, smoky, dirty white, moderately hard to hard, medium grain to coarse grain to very coarse grain, in parts fine to very fine grain, sub angular to sub rounded, sub spherical to spherical, poorly to moderately sorted, argillaceous matrix, silica cement, in parts consolidated, in parts clean, occasionally loose in cuttings, dirty, silty, moderately cemented, occasionally pyritic, tight,

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rare, speckled, pin point, silty sandstone shows dull brownish fluorescence and no cut.

**Clay/Claystone (20 – 30 %):** Gray to medium gray, in parts dark gray, light grayish white, in parts white, firm to moderately hard, amorphous to sub blocky, in parts earthy, non calcareous.

**Shale (10 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, micro micaceous, non calcareous, in parts silty, occasionally pyritic.

**Pyrite:** In trace (Sand embedded in pyrite).

### 3250 – 3254m

**Sandstone (70 – 80 %):** Colorless, clear, transparent to translucent, light grayish to grayish white, in parts light brownish, smoky, dirty white, moderately hard to hard, medium grain to coarse grain to very coarse grain, in parts fine to very fine grain, sub angular to sub rounded, sub spherical to spherical, poorly to moderately sorted, argillaceous matrix, silica cement, in parts consolidated, in parts clean, occasionally loose in cuttings, dirty, silty, moderately cemented, occasionally pyritic, tight, rare, speckled, pin point, silty sandstone shows dull brownish fluorescence and no cut.

**Clay/Claystone (10 – 20 %):** Gray to medium gray, in parts dark gray, light grayish white, in parts white, firm to moderately hard, amorphous to sub blocky, in parts earthy, non calcareous.

**Shale (10 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, micro micaceous, non calcareous, in parts silty, occasionally pyritic.

**Pyrite:** In trace (Sand embedded in pyrite).

### 3254 – 3264m

**Sandstone (80 – 90 %):** Colorless, clear, transparent to translucent, light grayish to grayish white, smoky, dirty white, moderately hard to hard, medium grain to coarse grain to very coarse grain, in parts fine to very fine grain, sub angular to sub rounded, sub spherical to spherical, poorly to moderately sorted, argillaceous matrix, silica cement, in parts consolidated, in parts clean, occasionally loose in cuttings, dirty, silty, moderately cemented, occasionally pyritic, tight, rare, speckled, pin point, silty sandstone shows dull brownish fluorescence and no solvent cut.

**Clay/Claystone (10 %):** Gray to medium gray, in parts dark gray, light grayish white to dirty white, in parts white, firm to moderately hard, amorphous to sub blocky, in parts earthy, non calcareous.

**Shale (Tr. – 10 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, micro micaceous, non calcareous, in parts silty, occasionally pyritic.

**Pyrite:** In trace (Sand embedded in pyrite).

### 3264 – 3268m

**Clay/Claystone (70 – 80 %):** Medium gray to dark gray, light gray to gray, in parts light brownish gray, grayish, occasionally grayish white, firm to moderately hard, in parts soft, amorphous to sub blocky, in parts blocky, in parts earthy, in parts micro micaceous, non calcareous.

**Sandstone (Tr. – 20 %):** Colorless, clear, transparent to translucent, light grayish, smoky, dirty white, moderately hard to hard, medium grain to coarse grain to very coarse grain, in parts fine to very fine grain, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, silica cement, in parts consolidated, in parts clean, occasionally loose in cuttings, dirty, silty, moderately cemented, occasionally pyritic, rare, speckled, pin point, dull brownish fluorescence and no solvent cut.

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**Shale (10 – 20 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, micro micaceous, non calcareous, in parts silty, occasionally pyritic.

**Pyrite:** In trace (Sand embedded in pyrite).

### 3268 – 3270m

**Sandstone (40 %):** Colorless, clear, transparent to translucent, light grayish white to dirty white, smoky, moderately hard to hard, fine to medium grain, in parts very fine and coarse grain to very coarse grain, sub angular to sub rounded, sub spherical to spherical, poor to moderately sorted, argillaceous matrix, silica cement, consolidated, in parts clean, occasionally loose in cuttings, silty, occasionally pyritic cement, rare, pin point, dull brownish fluorescence and no solvent cut.

**Shale (40 %):** Dark gray to blackish gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, micro micaceous, non calcareous, in parts silty, occasionally pyritic.

**Clay/Claystone (20 %):** Medium gray to dark gray, light gray to gray, in parts light brownish gray, grayish, occasionally grayish white, firm to moderately hard, in parts soft, amorphous to sub blocky, in parts blocky, in parts earthy, in parts micro micaceous, non calcareous.

**Pyrite:** In trace (Sand embedded in pyrite).

### 3270 – 3272m

**Sandstone (40 %):** Colorless, clear, transparent to translucent, light gray grayish, dirty white, smoky, moderately hard to hard, coarse to medium grain, occasionally very coarse grain, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, silica cement, in parts clean, occasionally loose in cuttings, silty, in parts pyritic cement, moderately to weak cemented, tight, rare, speckled faint brownish fluorescence and no solvent cut.

**Clay/Claystone (40 %):** Medium gray to dark gray, white, light gray, grayish white to dirty white, firm to moderately hard, occasionally soft, amorphous to sub blocky, earthy, in parts silty, non calcareous.

**Shale (20 %):** Dark gray to blackish gray, earthy gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, micro micaceous, non calcareous, in parts silty.

**Pyrite:** Minor (Sand embedded in pyrite).

### 3272 – 3275m

**Sandstone (60 %):** Colorless, clear, transparent to translucent, light gray grayish, dirty white, smoky, moderately hard to hard, coarse to medium grain, occasionally very coarse grain, sub angular to sub rounded, sub spherical to spherical, moderately sorted, argillaceous matrix, silica cement, in parts clean, occasionally loose in cuttings, silty, in parts pyritic cement, moderately to weak cemented, tight, rare, speckled faint brownish fluorescence and no solvent cut.

**Clay/Claystone (30 %):** Medium gray to dark gray, white, light gray, grayish white to dirty white, firm to moderately hard, occasionally soft, amorphous to sub blocky, earthy, in parts silty, non calcareous.

**Shale (10 %):** Dark gray to blackish gray, earthy gray, moderately hard to hard, compact, sub fissile, flaky to sub flaky, sub platy to platy, micro micaceous, non calcareous, in parts silty.

**Pyrite:** Occasional (Sand embedded in pyrite).

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Gas Peaks (Pariwar Formation):

Depth (m)	Type	Total Gas (ppm)	C1 (ppm)	C2 (ppm)	C3 (ppm)	iC4 (ppm)	nC4 (ppm)	iC5 (ppm)	nC5 (ppm)
3027	FG	2418	2087	106	23	3	7	0	2
3043	FG	1671	1467	69	12	1	4	1	1
3054	FG	2167	1860	115	19	2	3	0	0
3058	FG	8044	6827	419	83	11	14	4	2
3059	FG	6710	5710	352	69	9	12	0	1
3060	FG	49833	41864	2635	560	74	32	101	18
3063	FG	2980	2499	169	31	4	6	1	1
3065	FG	3324	2701	206	45	4	10	2	2
3068	S/Trip Gas	1826	1485	112	24	3	7	1	0
3057- 3068	Pump Out Gas	82765	69444	4333	1019	130	172	50	28
3068	Trip Gas	8113	6763	416	110	11	6	20	4
3072	FG	11090	8634	659	235	32	60	0	13
3077	FG	6457	5193	348	112	14	29	6	6
3082	FG	30102	24587	1605	501	59	114	0	22
3090	FG	18610	15006	1006	328	36	76	16	16
3092	FG	26287	21263	1433	471	52	108	0	21
3094	FG	6062	4803	346	113	13	29	6	6
3098	FG	3233	2585	188	54	6	14	3	3
3117	S/Trip Gas	9565	7749	478	194	16	41	0	10
3119	FG	2544	1977	134	66	5	14	2	3
3129	FG	10110	8614	453	133	18	21	3	4
3134	FG	17672	15020	797	241	33	37	6	5
3136	FG	8004	6841	356	104	14	17	0	3
3139	FG	12885	10939	576	180	25	31	0	6
3142	FG	6261	5293	280	87	12	16	4	3
3146	FG	4325	3641	197	62	9	12	2	2
3150	FG	4543	3861	195	61	7	14	2	3
3151	Trip Gas	53119	48046	1978	277	15	34	11	7
3152	FG	12361	10891	546	86	6	14	4	4
3154	FG	9788	8623	434	65	5	13	2	4
3157	FG	21255	18725	935	141	14	29	6	7
3159	FG	13504	11963	583	83	8	16	2	4
3161	FG	7431	6565	330	45	4	10	1	2
3164	FG	12665	11213	562	76	8	12	2	2
3165	FG	15439	13666	687	93	10	15	2	2
3166	FG	20468	18080	920	127	14	19	4	3
3167	FG	28912	25590	1281	177	20	26	5	4
3171	FG	5545	4927	241	30	3	6	1	1
3172	FG	9286	8285	385	49	6	10	2	2
3178	FG	4702	4027	246	39	5	9	2	0
3180	FG	11761	10348	520	76	9	16	6	3
3181	FG	3980	3448	194	28	3	7	2	2

