

HALLIBURTON

Sperry Drilling Services

DRILLING OPTIMIZATION
END OF WELL REPORT



WELL: 1/2-2

Field: Hummer

Rig: Maersk Giant

17 ½" HOLE SECTION

8 ½" HOLE SECTION

December 2005, January 2006

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1- Drilling Operations

17 1/2" Summary

A 17 1/2" bit, SDBS, EBXT1GSLC, (2x20+ 1x18 +1x22 jets) was made up on a rotary assembly and ran in hole to 660m, washed down to top of cement at 682m, the hole was displaced to 1.40sg mud, the cement and shoe track were drilled to 697m (casing shoe), the rate hole cleaned and then 3m of new formation drilled to 706m, the string pulled back inside the casing, bottom up was circulated and formation integrity test was performed, it yielded 1.61sg EMW. Drilled ahead 17 1/2" hole to 1492m, bottom up was circulated while weighting up mud weight to 1.41sg, the string pulled out of hole to 1435m, had 15 ton over pull, wiped one stand then pumped out to 1412m, bottom up was circulated while increasing mud weight to 1.47sg, the string pulled out of hole to 1470m, had 30 ton over pull, the hole was packed off-no return, ran back to 1432m, attempted to circulate-no success, worked string and increased rotary speed to 160, observed increasing trend in mud return, established circulation while increasing flow rate in stages and also rotary speed, back reamed from 1440m to 1411m, circulated hole clean, pumped out of hole to 1290m, no able to pass 1290m, worked pipe then pumped out to 1251m, stopped pumps and pulled string to 1243m, bottom up was circulated, back reamed to 690m inside 20" casing, bottom up was circulated, swept hole with 8m3 pill around BHA due to possible balling, performed swabbing test 690-533m-no swabbing, ran back and circulated bottom up every 10 stands, tag fill at 1462m, washed down to 1492m, drilled ahead from 1492m to 1507m, bottom up was circulated before the well was checked with carbide and it found to be in gauge, the string pulled to 1467m then ran back in hole, had 5m fill, washed down to bottom, circulated bottom up to conditioning the mud, the string pulled out to surface and it found that the stabilizer was balled and the bit was partly balled. Ran and cemented 13 3/8" casing in place as per Paladin program.

Bit # 04

Bit Information

Bit Type	Security DBS EBXT1GSLC	Ser. No.	10779727
Nozzles	2x20+ 1x18 +1x22	TFA	1.233
Bit size	17 1/2"	Section from	703m
Bit Grading	1-2-WT-A-E-I-NO-TD	Section to	1507m

	Minimum	Maximum	Average
ROP (m/hr)	7.4	42.2	26.7
WOB (ton)	1.5	19.3	9.5
RPM Surface	52	158	142
Torq Max(kN-m)	3.2	12.8	6.9
Torq Ave (kN-m)	1.4	11.5	6.2
Flow (lpm)	3170	4272	3924
SPP (bar)	153	296	244

12 1/4" Summary

A 12 1/4" bit, SDBS, EBXC1S, (2x20+ 1x18 +1x22 jets) was made up on a rotary assembly and ran in hole to top of cement at 1465m, performed choke drill, the cement and shoe track were drilled to 1496m (casing shoe), the rate hole cleaned to 1507m and then 3m of new formation drilled to 1510m, the string pulled back inside the casing, bottom up was circulated and formation integrity test was performed, it yielded 1.81sg EMW, the hole was displaced to 1.55 sg OBM, the pipe was slugged before tripping out of hole to change bottom hole assembly.

Bit # 05

Bit Information

Bit Type	Security DBS EBXC1S	Ser. No.	10702082
Nozzles	2x20+ 1x18 +1x22	TFA	1.233
Bit size	12 1/4"	Section from	1507m
Bit Grading	0-0-NO-A-E-I-NO-BHA	Section to	1510m

8 1/2" Summary

A 8 1/2" bit, SDBS, FM3755Z, (4x20 jets) was made up on a rotary assembly with MWD tool and ran in hole to bottom at 1510m, bottom up was circulated to conditioning the mud, drilled ahead 8 1/2" hole to 1905m, bottom up was circulated, the well was checked for flow and it found to be static, tripped out to 1479m, ran back to 1902m (3m fill), washed down from 1902m to 1905m, resumed drilling 8 1/2" hole from 1905m to 3094m, bottom up was circulated for samples, drilled ahead to 3131m, bottom up was circulated for samples, drilled to 3141m, bottom up was circulated, the string was pulled out of hole to surface to pick up core assembly.

Bit # 06

Bit Information

Bit Type	Security DBS FMF3755Z	Ser. No.	10696608
Nozzles	4x20	TFA	1.227
Bit size	8 1/2"	Section from	1510m
Bit Grading	4-4-BT-A-X-I-NR-CP	Section to	3141m

	Minimum	Maximum	Average
ROP (m/hr)	2.9	65.1	41.3
WOB (ton)	1.2	10.3	2.4
RPM Surface	113	149	133
Torq Max(kN-m)	1.4	12.6	4.7
Torq Ave (kN-m)	0.7	6.6	2.7
Flow (lpm)	1927	3256	2040
SPP (bar)	143	201	176

Core #1 has been cut over the reservoir interval 3141m to 3187m

Core drilling data

	Minimum	Maximum	Average
ROP (m/hr)	5.2	65.0	46.1
WOB (ton)	1.0	9.2	5.9
RPM Surface	69	139	93
Torq Max(kN-m)	8.2	15.8	11.2
Torq Ave (kN-m)	1.8	8.6	6.6
Flow (lpm)	955	2067	1029
SPP (bar)	78	197	85

A 8 ½" bit, SDBS, FM3743Z, (4x18X2X13 jets) was made up on a rotary assembly with MWD tool and ran in hole to 3141m, the cored interval 3141m-3187m was re logged, drilled ahead 8 ½" hole from 3187m to 3434m well-TD, the well circulated clean and the well was checked for flow and was found to be static the string was then pulled out of hole to surface to run wire line logging.

Bit # 07

Bit Information

Bit Type	Security DBS FM3743Z	Ser. No.	
Nozzles	4x18+2x13	TFA	1.253
Bit size	8 ½"	Section from	3187m
Bit Grading	1-1-CT-N-X-I-CT-TD	Section to	3434m

	Minimum	Maximum	Average
ROP (m/hr)	2.7	41.2	18.2
WOB (ton)	0.6	15.4	4.8
RPM Surface	99	156	135
Torq Max(kN-m)	6.5	24.7	12.5
Torq Ave (kN-m)	4.2	11.6	6.7
Flow (lpm)	2045	2115	2065
SPP (bar)	202	212	208

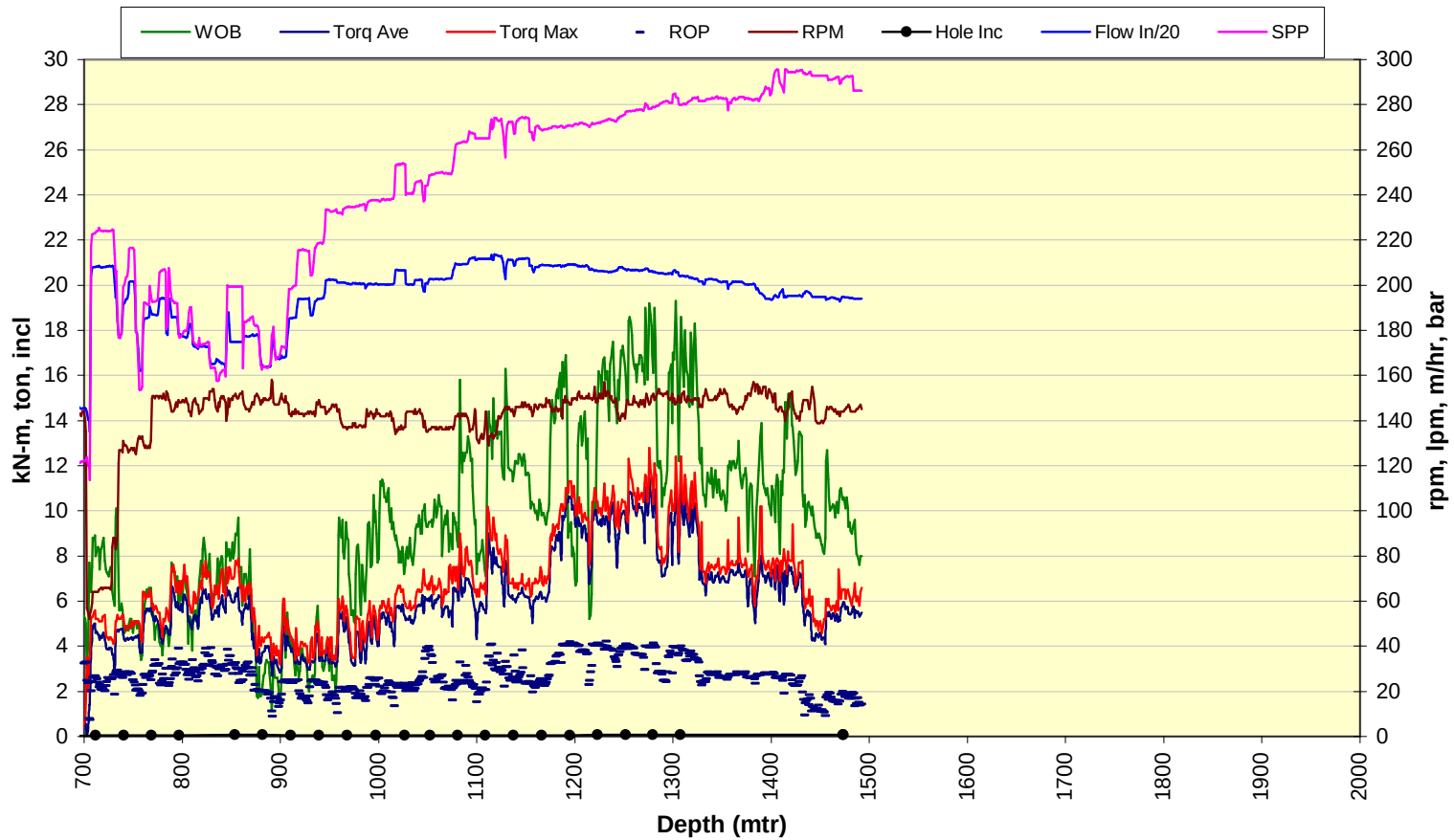
17 1/2" Hole

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Sperry Drilling Services

Company: Paladin
Well Name: 1-2-2

Drilling Parameters Vs Depth

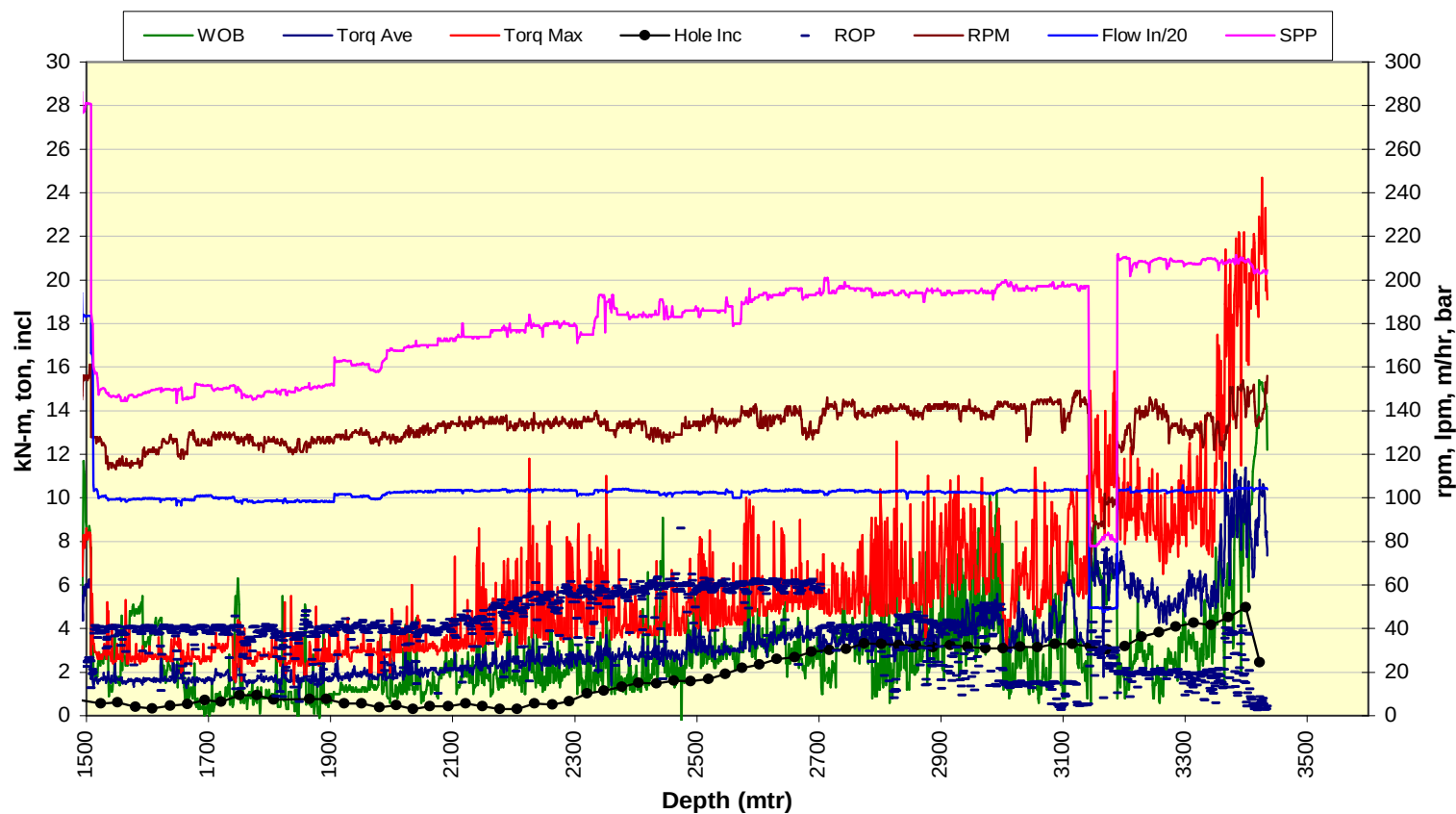


8 1/2" Hole

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Sperry Drilling Services

Company: Paladin
Well Name: 1-2-2

Drilling Parameters Vs Depth



2- Torque and Drag Analysis

Predicted vs. Actual

Prior to drill the 17 ½" and 8 ½" hole sections a torque and drag analysis was performed to give predictive curves for pick up, slack off and rotary off bottom weights and also for the free rotating torque using the friction factor values given in the tables below. Actual weights and torque values from each drilled connection were plotted against the predictive curves.

In 17 ½" section, the String weights and torque values show a close correlation generally following the predicated curve values, no separation between max and average torque and then no indication of drag. The PWD EMW gave no indication of inadequate hole cleaning and no excessive cuttings were seen on circulating bottoms up while drilling.

In 8 ½" section, the String weights and torque values show a close correlation generally following the predicated curve values, no separation between max and average torque and then no indication of drag. The PWD EMW gave no indication of inadequate hole cleaning and no excessive cuttings were seen on circulating bottoms up while drilling.

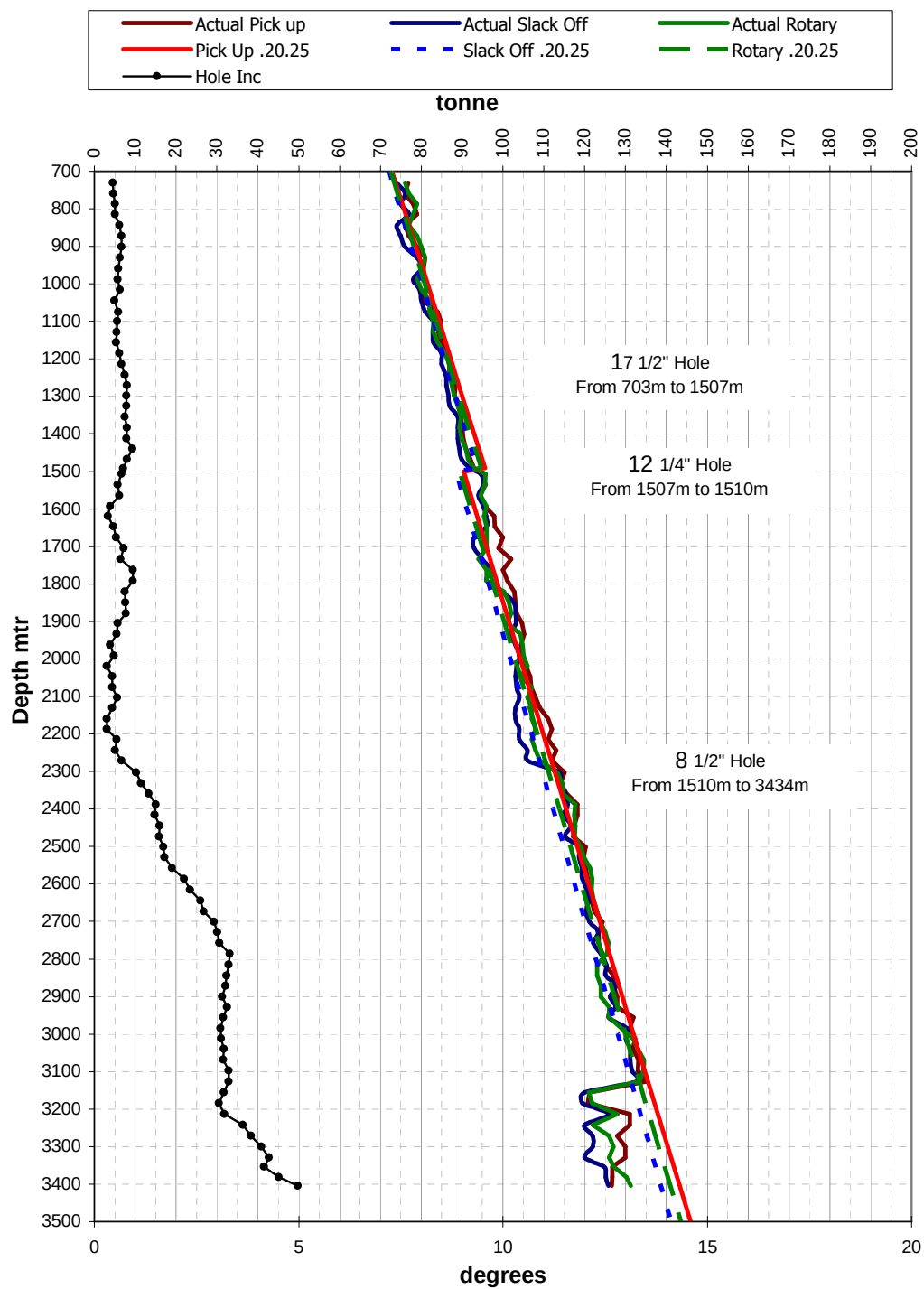
Calculated Friction Factors, String Weights and Torque for 17.5" hole

Predictive Values with block weight				
DEPTH	Pick Up	Slack Off	Rotary	Torque
FF	.20.25	.20.25	.20.25	.30.35
700	73	72	73	0.426
900	79	78	78	0.709
1100	84	83	84	0.829
1300	90	88	89	0.933
1500	96	94	95	1.036

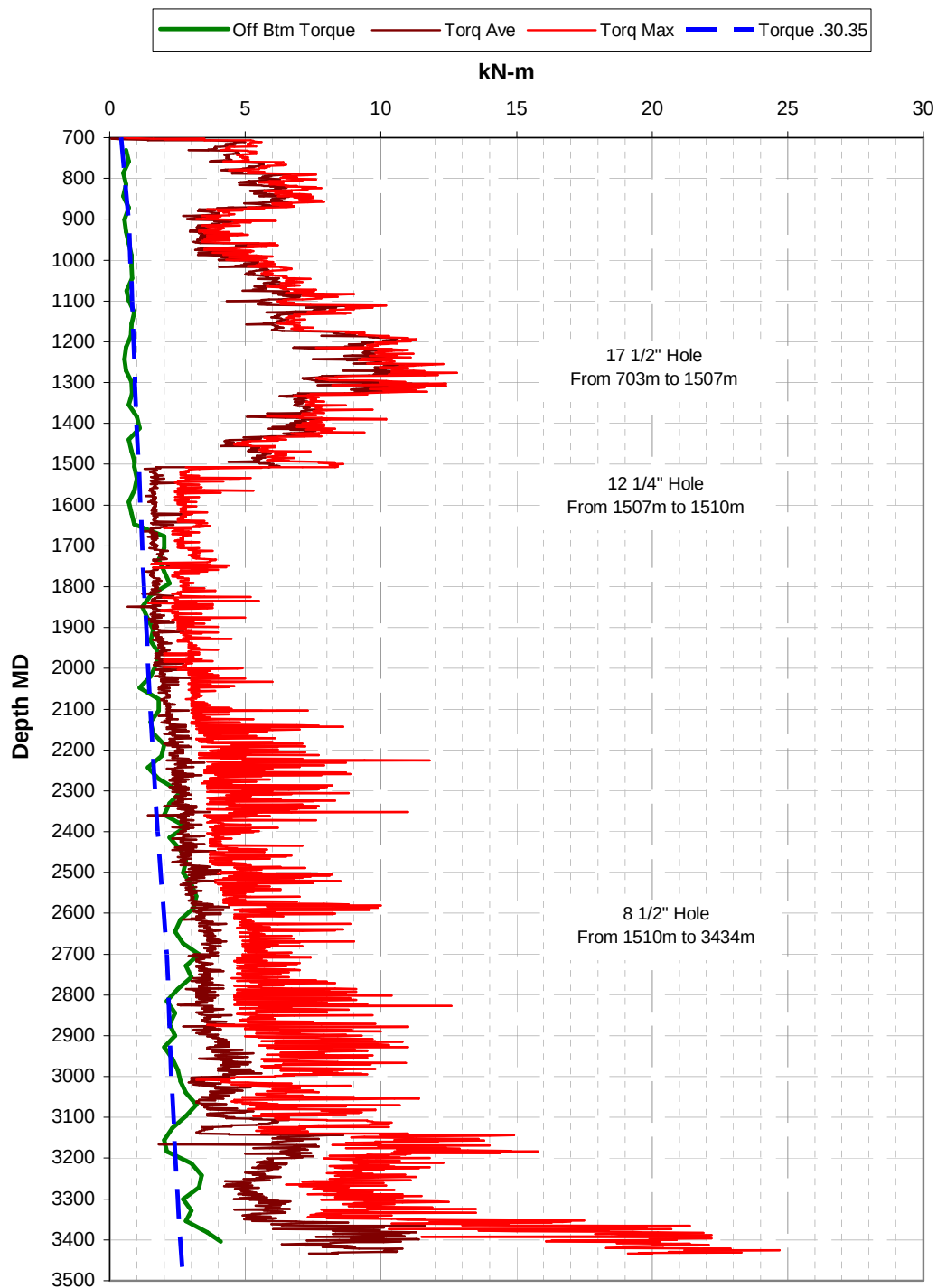
Calculated Friction Factors, String Weights and Torque for 8.5" hole

Predictive Values with block weight				
DEPTH	Pick Up	Slack Off	Rotary	Torque
FF	.20.25	.20.25	.20.25	.30.35
1500	90	89	90	1.060
1800	99	97	98	1.260
2100	107	104	106	1.510
2400	115	112	114	1.760
2700	124	120	122	2.100
3000	132	128	130	2.260
3300	140	136	138	2.510
3500	146	141	144	2.680

Drilling Hookloads Vs Depth



Torque Vs Depth

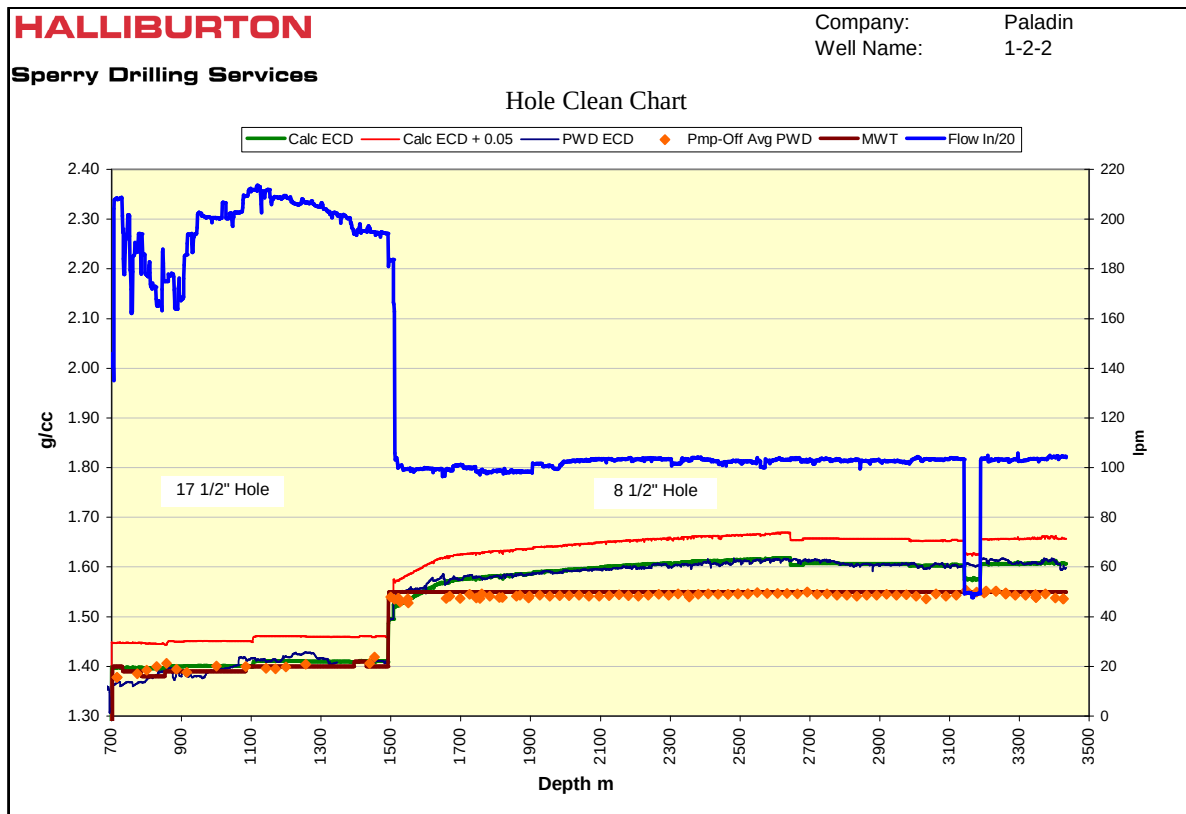


3- Pressure Evaluation – PWD Analysis

17 1/2" and 8 1/2" Hole Sections

A guideline threshold was used to highlight potential situations of poor hole cleaning; the threshold value was set as: - Calculated ECD (HB) + 0.05 sg. This threshold value and the calculated ECD, together with the PWD ECD were plotted real time to allow monitoring of hole cleaning conditions.

The plot shows the PWD ECD at the used mud weight of 1.40sg in 17 1/2" section and 1.55sg in 8 1/2" section fell close to or at the calculated ECD with no apparent trends above the threshold curve indicating poor hole cleaning or any hole problems from ECD.



4- Vibration Evaluation – DDS Analysis

Prior to each Bit BHA analysis was performed to eliminate RPM that coincided with excitation frequencies for the BHA, Bit, and stabilisers in the assembly. This analysis is to predominantly avoid Bit and BHA whirl. It is also useful in choosing an appropriate RPM to eliminate Stick Slip if it should occur.

Real time Data

Run# 800 Real Time DDS Data from 703m to 1492m

Ave Z	Ave X	Ave Y	Ave X-Y	Peak Z	Peak X	Peak Y
0	0 -10.4	0 -30.2	0 – 5.4	0 -46	0-106	0 - 171

The real time data for Run# 800 showed high levels of stick slip vibration with high values on peaks Z, X and Y axes which indicated Coupling and lateral vibrations. These vibrations are recorded over the interval 1094m-1190m and 1441m-1445m.

Run# 900 Real Time DDS Data from 1510m to 3141m

Ave Z	Ave X	Ave Y	Ave X-Y	Peak Z	Peak X	Peak Y
0	0 -10.4	0 -14.2	0 – 2.4	0 -16	0-106	0 - 126

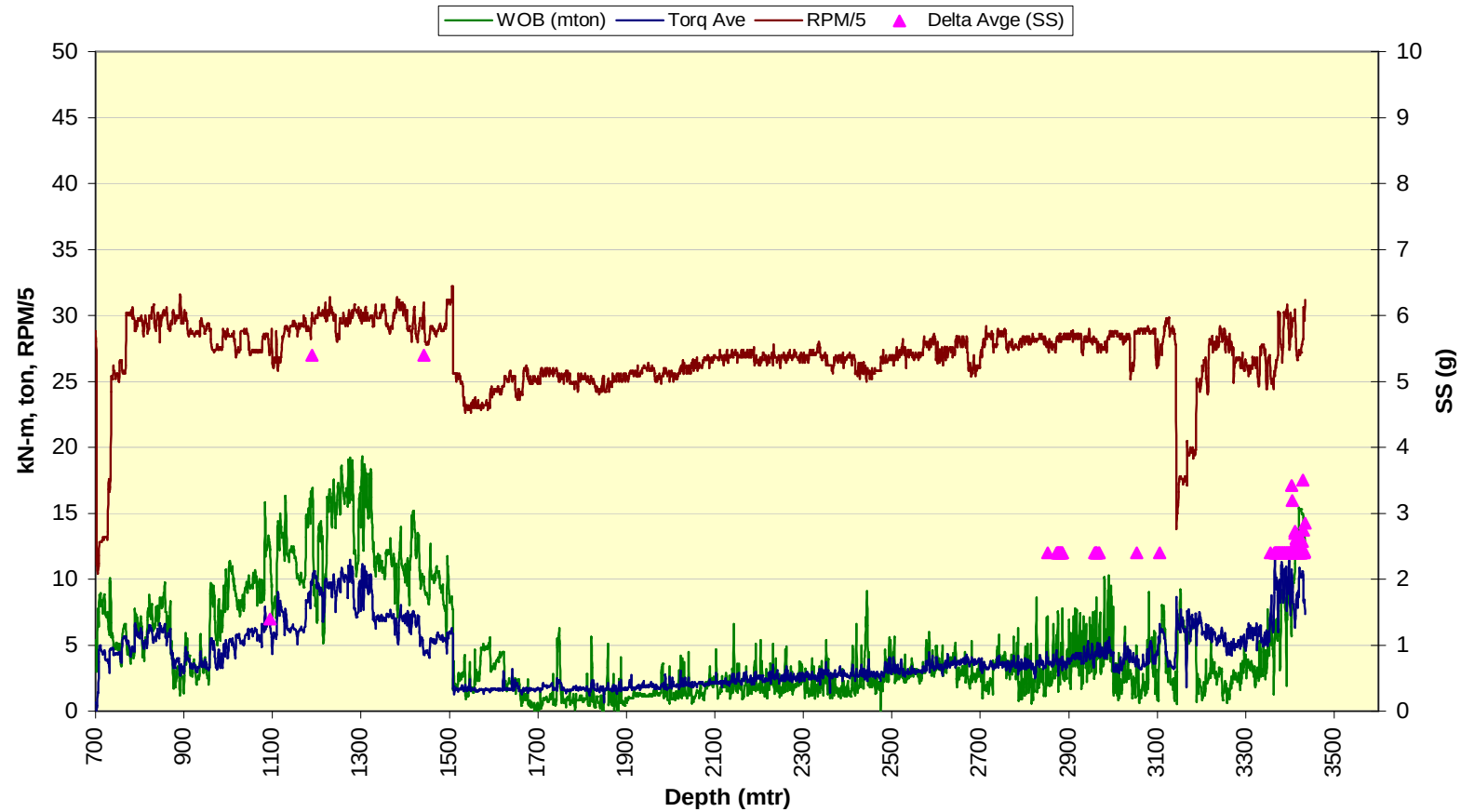
The real time data for Run# 900 showed medium to high levels of stick slip vibration over the interval 2852m to 3104m with 140 RPM with lateral vibrations over the interval 3137m-3140m such vibrations indicate the presence of whirl. The plots below show the extent of these vibrations experienced while drilling with RPM of 146 and 1-2 ton WOB.

Run# 1100 Real Time DDS Data from 3141m to 3434m TD

Ave Z	Ave X	Ave Y	Ave X-Y	Peak Z	Peak X	Peak Y
0	0 -7.4	0	0 – 6.4	0	0-31	0 - 46

The real time data for Run# 1100 showed medium to high levels of stick slip vibration over the interval 2852m to 3104m with 140 RPM with lateral vibrations over the interval 3137m-3140m after entering Sandstone, such vibrations indicated a whirl vibration mode. The plots below show the extent of these vibrations experienced while drilling with RPM of 146 and 1-2 ton WOB. High levels of stick slip vibration were recorded after drilling into the Maureen formation consisting of limestone with high levels apparent between 3396-3404m and occurred with a surface RPM of 138-150

DDS Stick Slip Vs Drilling Parameters

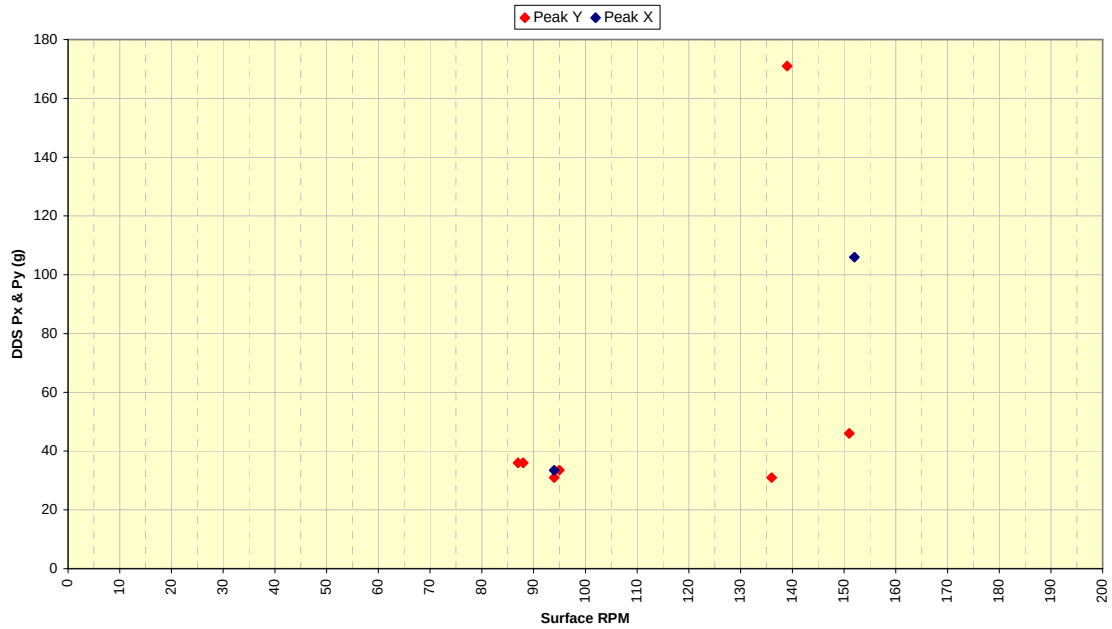


Run 800

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Company: Paladin
Well Name: 1-2-2

DDS Peak Vibration Vs Surface RPM

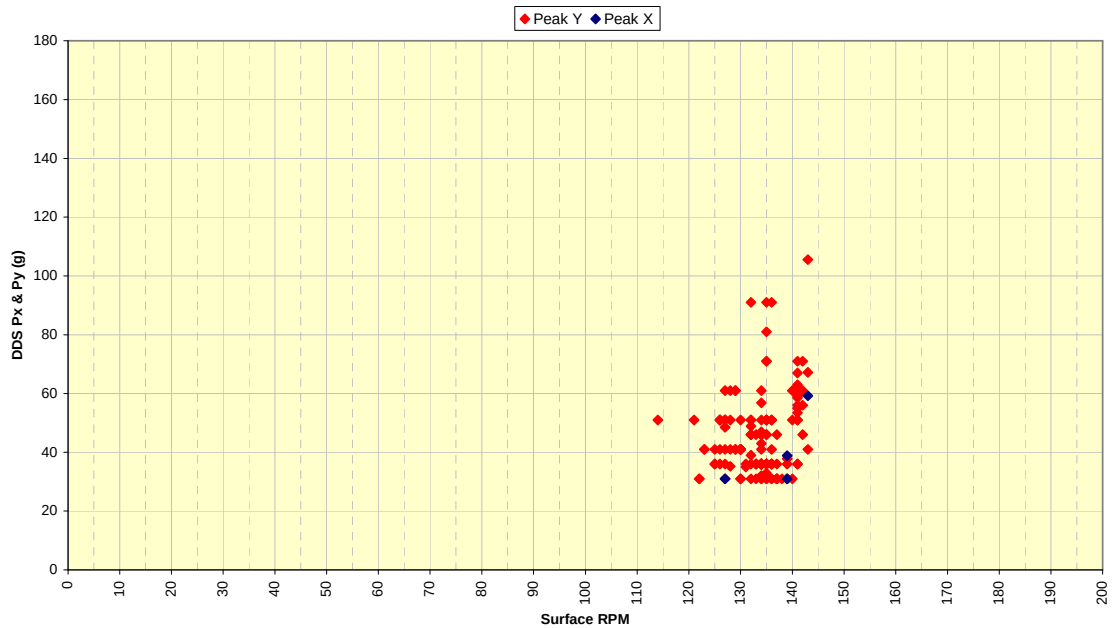


Run 900

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Sperry Drilling Services

Company: Paladin
Well Name: 1-2-2

DDS Peak Vibration Vs Surface RPM

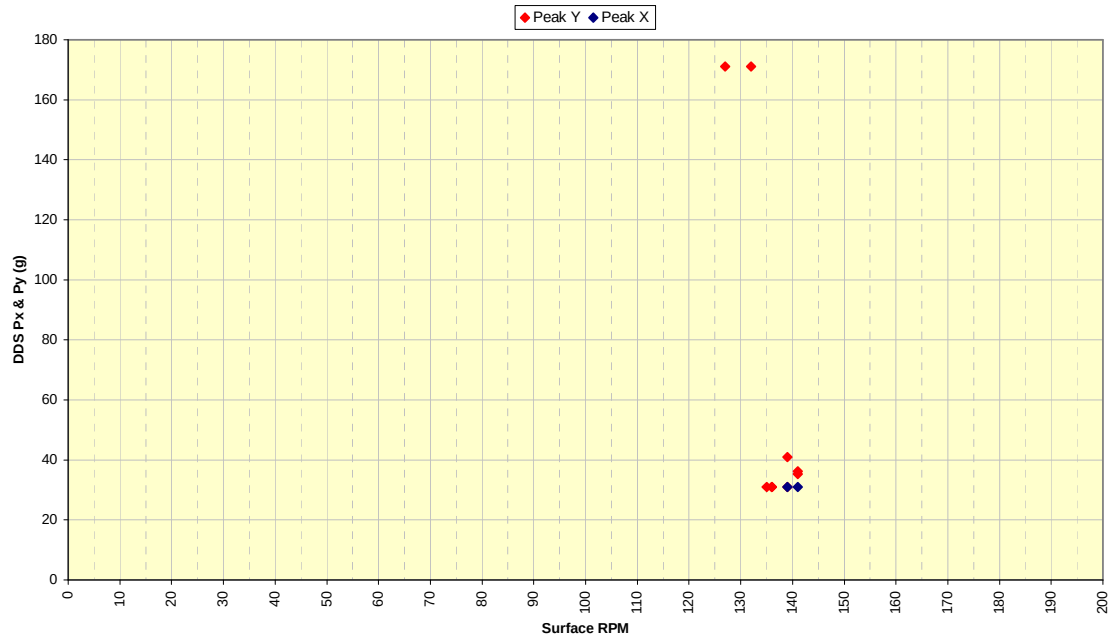


Run 1100

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Sperry Drilling Services

Company: Paladin
Well Name: 1-2-2

DDS Peak Vibration Vs Surface RPM



Memory Data

The Optec Vibration Tool Advisory, 2003 for 8" tools:

Average X greater than 5g for 18 mins (> 18 mins and tool is outwit limits)
Average Y greater than 5g for 18 mins (> 18 mins and tool is outwit limits)
Average Z greater than 4g for 8 mins (> 8 mins and tool is outwit limits)
Peak X greater than 130g for 150 vibration Events
Peak Y greater than 130g for 150 vibration Events
Peak Z greater than 30g for 100 vibration Events

The Optec Vibration Tool Advisory, 2003 for 6 ¾" and smaller tools:

Average X greater than 6g for 18 mins (> 18 mins and tool is outwit limits)
Average Y greater than 6g for 18 mins (> 18 mins and tool is outwit limits)
Average Z greater than 4g for 8 mins (> 8 mins and tool is outwit limits)
Peak X greater than 130g for 150 vibration Events
Peak Y greater than 130g for 150 vibration Events
Peak Z greater than 30g for 100 vibration Events

Insite Tool Read Reports Run# 800

1-2-2 0800 Insite Read DDS.PAR

16-Jan-06 10:33:18

C:\INSITE\Data\Tool Read Reports\1-2-2 0800 Insite Read DDS.PAR

DDS SENSOR PARAMETER REPORT

RUN NUMBER - 800

CUSTOMER: Paladin

RIG NAME: Maersk Giant

WELL NAME: 1-2-2

FIELD: Hummer

JOB NUMBER: NR-MW-000386226

AVERAGE SAMPLE PERIOD...	12 SEC	DDS DELAY...	5 MIN
PEAK SAMPLE PERIOD...	12 SEC	AVG X REAL-TIME THRESHOLD...	4.0 G's
MEM ALLOCATED TO BURST DATA...	192 K	AVG Y REAL-TIME THRESHOLD...	4.0 G's
BURST SAMPLE FREQUENCY...	1000	AVG Z REAL-TIME THRESHOLD...	2.4 G's
BURST BLOCK SIZE...	8 K	PEAK X REAL-TIME THRESHOLD...	30.0 G's
DELAY BETWEEN BURSTS...	28 SEC	PEAK Y REAL-TIME THRESHOLD...	30.0 G's
RECORD BURST X (Y/N)...	Y	PEAK Z REAL-TIME THRESHOLD...	15.0 G's
RECORD BURST Y (Y/N)...	Y	DELTA AVG X-Y REAL-TIME THR...	1.2 G's
RECORD BURST Z (Y/N)...	Y	DELTA PEAK X-Y REAL-TIME THR..	15.0 G's

SENSOR ID NUMBER...	940	NUMBER OF BLOCKS READ...	499
SOFTWARE VERSION NUMBER...	0.50	EXPECTED BLOCKS READ...	NOT SUPP YET
VIBDELAY EXPIRED...	YES	PARTIAL READ...	YES
DATE OF LAST CALIBRATION...	23-Jan-04 16:22:06		
		MAXIMUM TEMPERATURE (C)...	63

NUMBER OF RESETS...	10	LOAD TIME (DDS)...	29-Dec-05 15:52:35
NUMBER OF SOFTWARE RESETS...	0	READ TIME (SURFACE)...	15-Jan-06 18:26:47
NUMBER OF UNEXPECTED RESETS...	0	TIME 1ST SAMPLE...	29-Dec-05 16:00:21
TOTAL BURSTS SAMPLED...	20280	No. OF TIME SYNCs ATTEMPTED...	2170
PERIODIC DATA BLOCKS OPENED...	291	No. OF TIME SYNCs COMPLETED...	2164
PERIODIC STORAGE SLOWED DOWN...	YES	TIME SYNC ERRORS...	6

AVERAGE AND PEAK VIBRATION HISTOGRAMS:

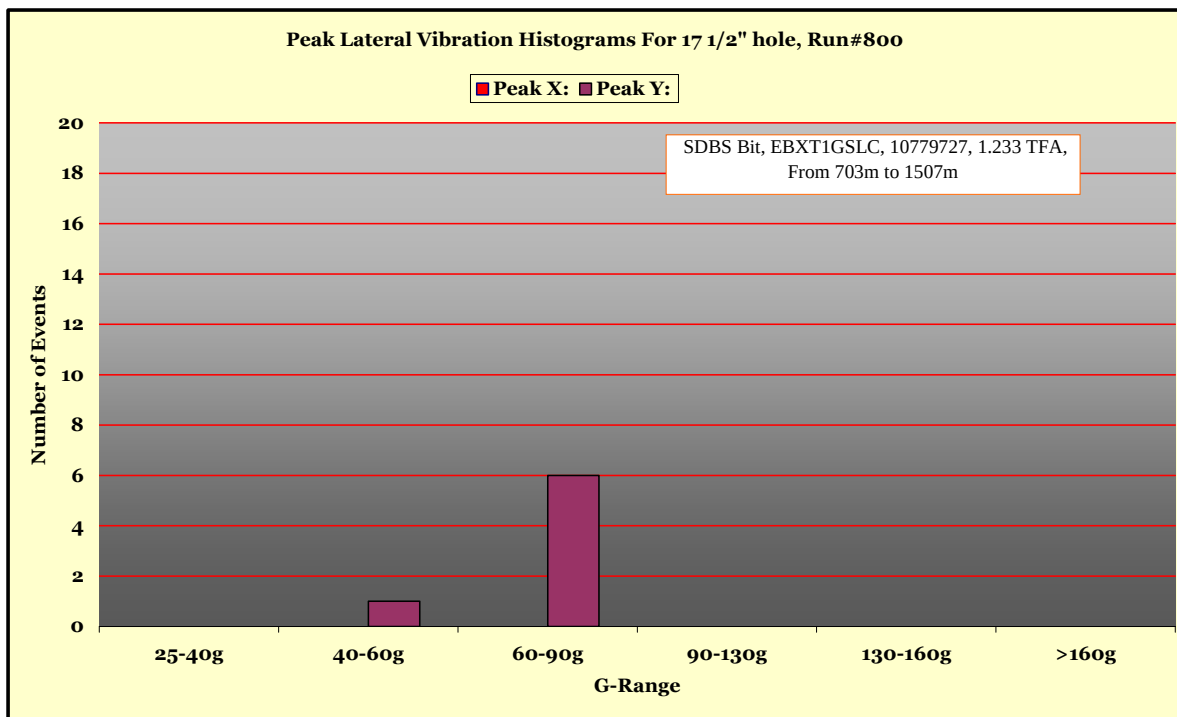
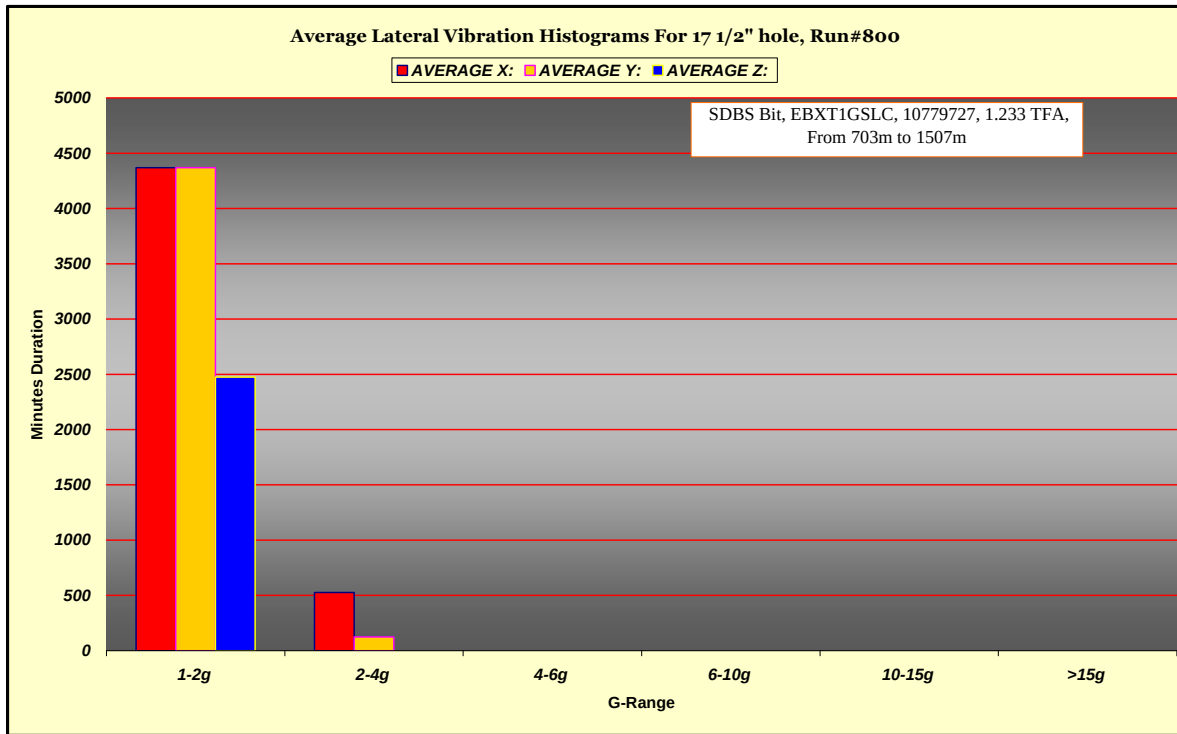
	Total	***** MINUTES *****						
	Maximum	Vib G-min	1-2g	2-4g	4-6g	6-10g	10-15g	>15g
AVERAGE X:3.8	4896	4369	527	0	0	0	0	0
AVERAGE Y:2.4	4493	4369	124	0	0	0	0	0
AVERAGE Z:2.0	2475	2475	0	0	0	0	0	0

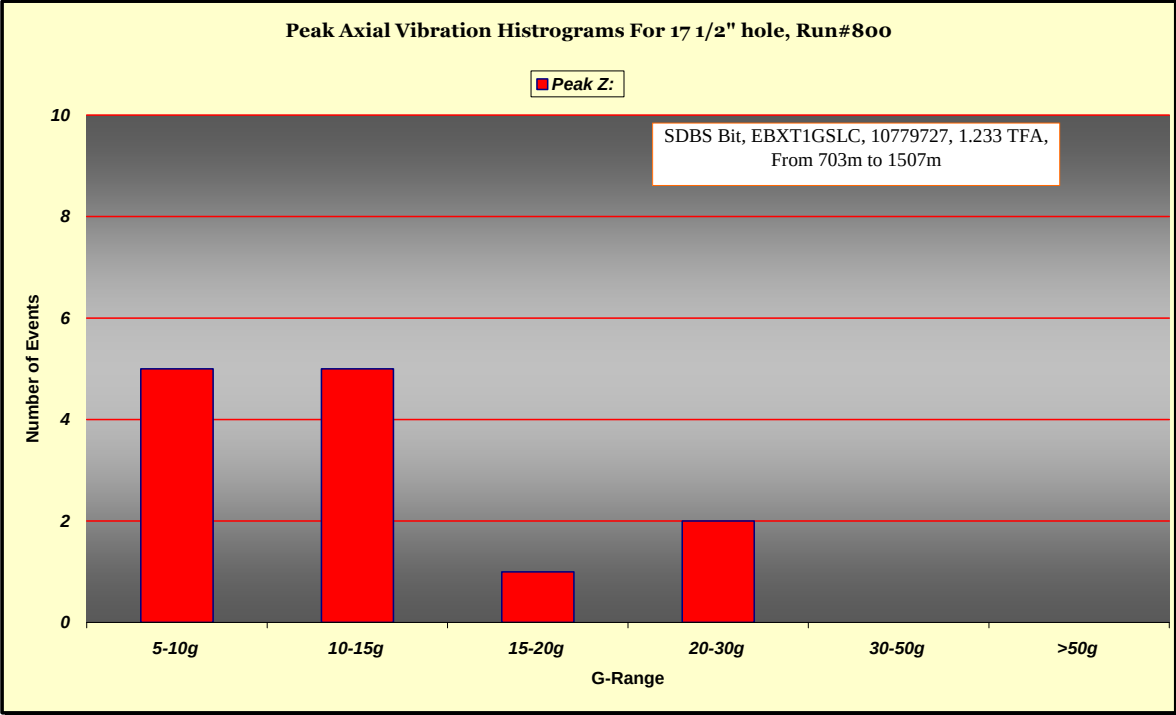
	***** EVENTS *****					
	25-40g	40-60g	60-90g	90-130g	130-160g	>160g
TOTAL PEAKS X: 0	0	0	0	0	0	0
TOTAL PEAKS Y: 0	1	0	0	0	0	0
	5-10g	10-15g	15-20g	20-30g	30-50g	>50g
TOTAL PEAKS Z: 5	5	1	2	0	0	0

Vibration Breakdown for Run 800

From Optec Vibration Tool Advisory 2003, noted that no one of all average and peak axes are exceed tool spec limits

Average and Peak Vibration Events Histograms





Insite Tool Read Reports Run# 900

Paladin_1-2-2 0900 Insite Read.PAR
16-Jan-06 10:37:40
C:\INSITE\Data\Tool Read Reports\1-2-2 0900 Insite Read DDS.PAR

DDS SENSOR PARAMETER REPORT

RUN NUMBER - 900
CUSTOMER: Paladin
RIG NAME: Maersk Giant
WELL NAME: 1-2-2
FIELD: Hummer
JOB NUMBER: NR-MW-000386226

AVERAGE SAMPLE PERIOD...	12 SEC	DDS DELAY...	30 MIN
PEAK SAMPLE PERIOD...	12 SEC	AVG X REAL-TIME THRESHOLD...	4.0 G's
MEM ALLOCATED TO BURST DATA...	192 K	AVG Y REAL-TIME THRESHOLD...	3.0 G's
BURST SAMPLE FREQUENCY...	1000	AVG Z REAL-TIME THRESHOLD...	3.0 G's
BURST BLOCK SIZE...	8 K	PEAK X REAL-TIME THRESHOLD...	30.0 G's
DELAY BETWEEN BURSTS...	28 SEC	PEAK Y REAL-TIME THRESHOLD...	30.0 G's
RECORD BURST X (Y/N)...	Y	PEAK Z REAL-TIME THRESHOLD...	15.0 G's
RECORD BURST Y (Y/N)...	Y	DELTA AVG X-Y REAL-TIME THR...	2.2 G's
RECORD BURST Z (Y/N)...	Y	DELTA PEAK X-Y REAL-TIME THR..	15.0 G's

SENSOR ID NUMBER...	301	NUMBER OF BLOCKS READ...	402
SOFTWARE VERSION NUMBER...	0.50	EXPECTED BLOCKS READ...	NOT SUPP YET
VIBDELAY EXPIRED...	YES	PARTIAL READ...	YES
DATE OF LAST CALIBRATION...	04-Nov-99 14:33:32		
		MAXIMUM TEMPERATURE (C)...	95

NUMBER OF RESETS...	11	LOAD TIME (DDS)...	10-Jan-06 21:55:06
NUMBER OF SOFTWARE RESETS...	0	READ TIME (SURFACE)...	15-Jan-06 09:48:35
NUMBER OF UNEXPECTED RESETS...	0	TIME 1ST SAMPLE...	10-Jan-06 22:29:20
TOTAL BURSTS SAMPLED...	12051	No. OF TIME SYNCs ATTEMPTED...	1297
PERIODIC DATA BLOCKS OPENED...	194	No. OF TIME SYNCs COMPLETED...	1296
PERIODIC STORAGE SLOWED DOWN...	NO	TIME SYNC ERRORS...	1

AVERAGE AND PEAK VIBRATION HISTOGRAMS:

	Total	***** MINUTES *****						
	Maximum	Vib G-min	1-2g	2-4g	4-6g	6-10g	10-15g	>15g
	-----	-----	-----	-----	-----	-----	-----	-----
AVERAGE X:15.2	4407	4369	33	5	0	0	0	0
AVERAGE Y:18.0	521	498	18	5	0	0	0	0
AVERAGE Z:2.8	4448	4369	79	0	0	0	0	0

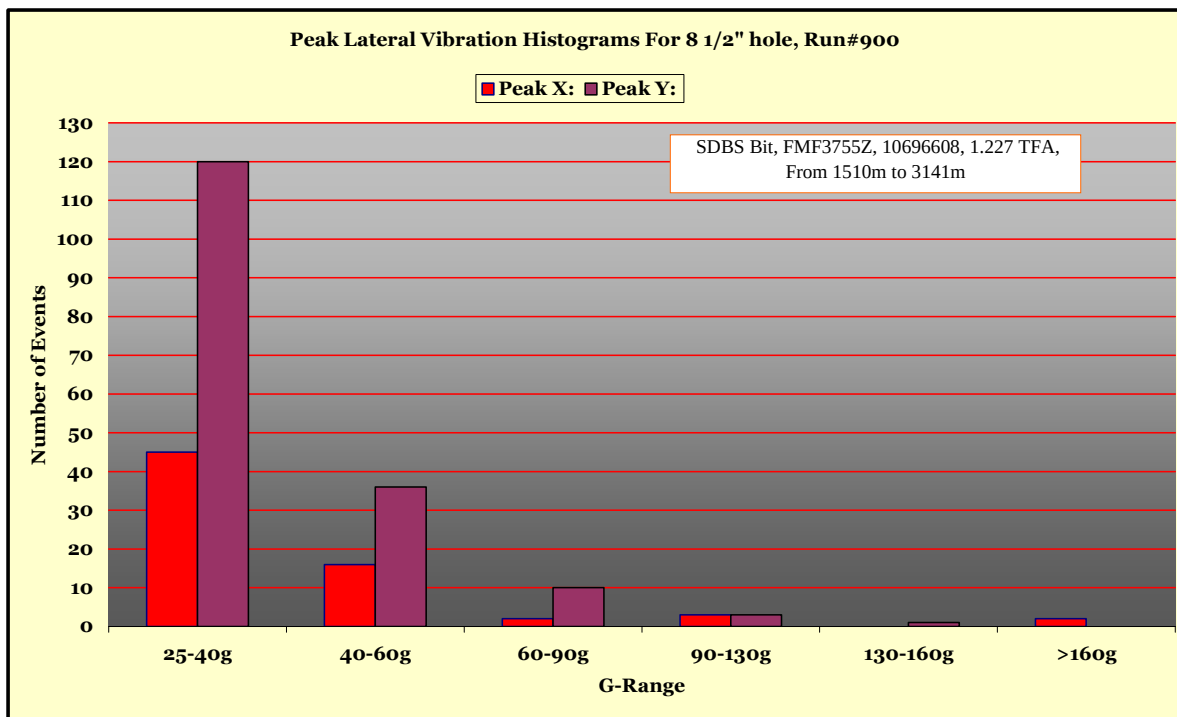
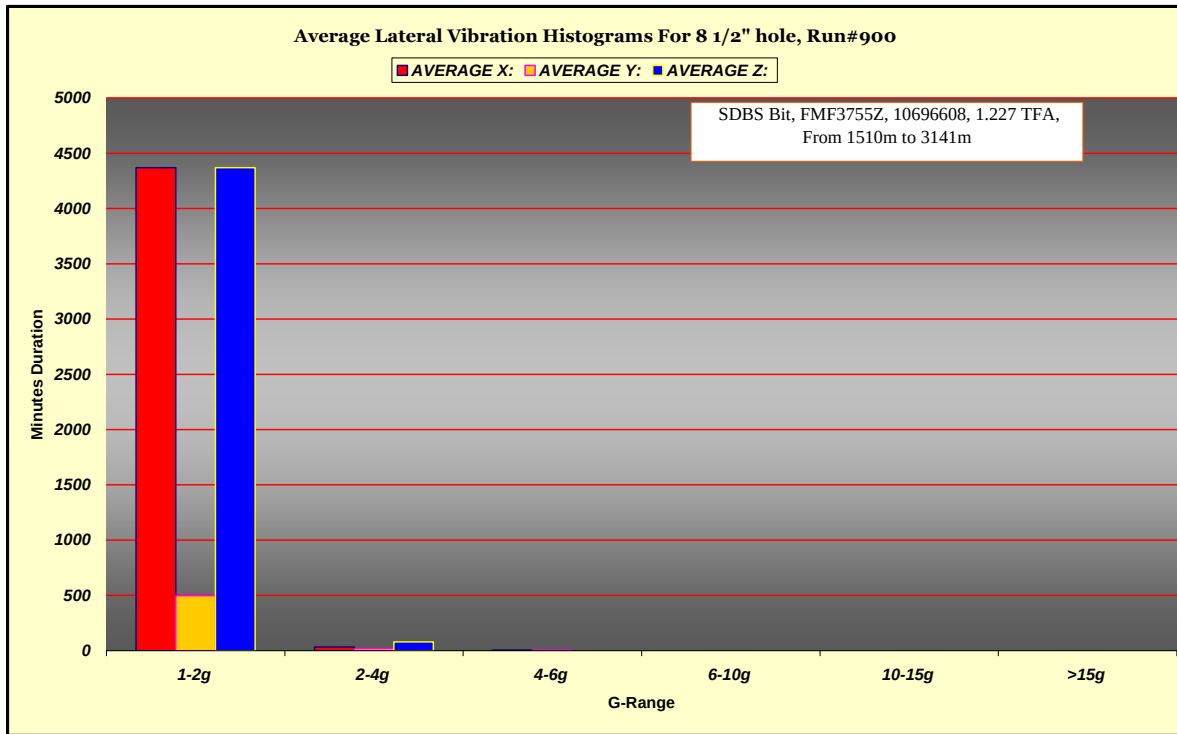
	***** EVENTS *****					
	25-40g	40-60g	60-90g	90-130g	130-160g	>160g
	-----	-----	-----	-----	-----	-----
TOTAL PEAKS X: 45	16	2	3	0	2	
TOTAL PEAKS Y: 120	36	10	3	1	0	

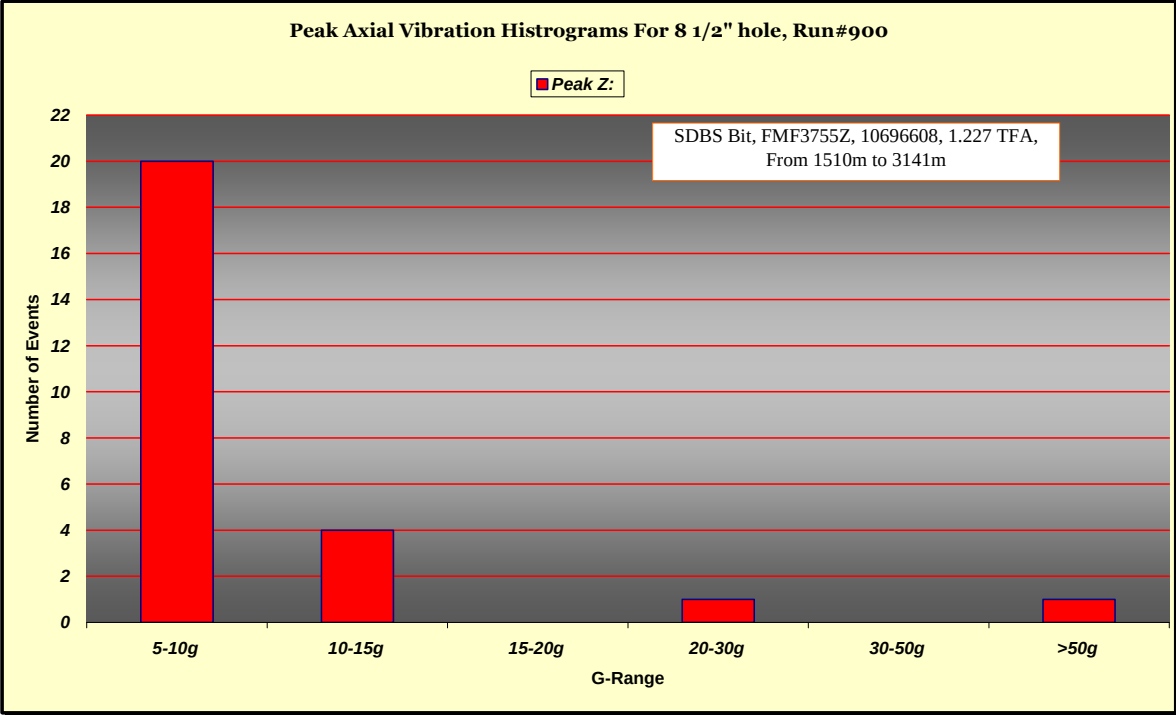
	5-10g	10-15g	15-20g	20-30g	30-50g	>50g
	-----	-----	-----	-----	-----	-----
TOTAL PEAKS Z: 20	4	0	1	0	1	

Vibration Breakdown for Run 900

From Optec Vibration Tool Advisory 2003, none of the average and peak axes exceed tool spec limits

Average and Peak Vibration Events Histograms





DDSLOT Summary Tables**Run 800**

12345	FREQUENCY DOMAIN ANALYSIS TABLE													
	Highest Peak Freq (Hz)			Highest Peak Mag (g ² /Hz)			2nd Peak Freq (Hz)			2nd Peak Mag (g ² /Hz)				
FILE NAME	XFreq	YFreq	ZFreq	XMag	YMag	ZMag	XFreq	YFreq	ZFreq	XMag	YMag	ZMag	Date	Time
Bu114120.04A	10.3	135.3	0.0	0.0	0.1	0.0	22.9	100.1	0.0	0.0	0.0	0.0	04-Jan-06	11:41:20
Bu122120.04A	68.4	134.8	0.0	0.0	0.0	0.0	71.3	143.6	0.0	0.0	0.0	0.0	04-Jan-06	12:21:20
Bu003512.05A	0.0	133.8	0.0	0.0	0.0	0.0	4.4	15.6	0.0	0.0	0.0	0.0	05-Jan-06	00:35:12
Bu041044.06A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	06-Jan-06	04:10:44
Bu202433.29L	49.8	144.5	0.0	0.0	0.0	0.0	27.8	144.0	1.0	0.0	0.0	0.0	29-Dec-05	20:24:33
Bu202505.29L	235.4	93.3	0.0	0.0	0.0	0.0	0.5	136.2	0.0	0.0	0.0	0.0	29-Dec-05	20:25:05
Bu212449.29L	44.9	269.5	0.0	0.1	0.1	0.0	67.4	156.7	0.0	0.1	0.1	0.0	29-Dec-05	21:24:49
Bu212521.29L	198.2	164.6	0.0	0.0	0.0	0.0	68.4	93.3	0.0	0.0	0.0	0.0	29-Dec-05	21:25:21
Bu212553.29L	95.2	124.5	0.0	0.1	0.0	0.0	50.3	160.6	0.0	0.0	0.0	0.0	29-Dec-05	21:25:53
Bu212833.29L	126.5	197.3	0.0	0.0	0.0	0.0	47.9	101.1	0.0	0.0	0.0	0.0	29-Dec-05	21:28:33
Bu225601.29L	111.3	135.7	0.0	0.0	0.0	0.0	114.7	0.0	0.0	0.0	0.0	0.0	29-Dec-05	22:56:01
Bu225705.29L	0.0	0.0	0.0	0.0	0.0	0.0	2.4	44.4	0.0	0.0	0.0	0.0	29-Dec-05	22:57:05
Bu225809.29L	43.9	136.2	0.0	0.0	0.0	0.0	47.9	36.6	0.0	0.0	0.0	0.0	29-Dec-05	22:58:09
Bu225841.29L	46.9	136.7	0.0	0.0	0.0	0.0	49.3	0.0	0.0	0.0	0.0	0.0	29-Dec-05	22:58:41
Bu231129.29L	0.0	99.6	0.0	0.2	0.1	0.0	28.3	100.1	0.0	0.2	0.1	0.0	29-Dec-05	23:11:29
Bu231201.29L	0.0	99.6	0.0	0.2	0.1	0.0	30.3	99.1	0.0	0.1	0.0	0.0	29-Dec-05	23:12:01
Bu231513.29L	0.0	100.6	48.3	0.3	0.2	0.0	28.8	100.1	22.9	0.2	0.2	0.0	29-Dec-05	23:15:13
Bu231753.29L	27.8	100.1	0.0	0.1	0.1	0.0	25.4	101.1	37.6	0.1	0.1	0.0	29-Dec-05	23:17:53
Bu231825.29L	7.3	136.2	15.1	0.0	0.0	0.0	7.8	144.0	9.3	0.0	0.0	0.0	29-Dec-05	23:18:25
Bu234433.29L	0.0	101.6	19.0	0.0	0.1	0.0	10.3	91.8	18.6	0.0	0.0	0.0	29-Dec-05	23:44:33
Bu001601.30L	59.6	18.1	0.0	0.0	0.0	0.0	0.0	18.6	0.0	0.0	0.0	0.0	30-Dec-05	00:16:01
Bu011337.30L	7.8	13.2	15.1	0.0	0.0	0.0	10.3	12.2	15.6	0.0	0.0	0.0	30-Dec-05	01:13:37
Bu012137.30L	0.0	18.1	15.6	0.0	0.0	0.0	8.3	29.3	2.4	0.0	0.0	0.0	30-Dec-05	01:21:37
Bu034953.30L	29.3	0.0	0.0	0.0	0.0	0.0	0.0	135.7	0.0	0.0	0.0	0.0	30-Dec-05	03:49:53

Run900

12345	FREQUENCY DOMAIN ANALYSIS TABLE													
	Highest Peak Freq (Hz)			Highest Peak Mag (g^2/Hz)			2nd Peak Freq (Hz)			2nd Peak Mag (g^2/Hz)				
FILE NAME	XFreq	YFreq	ZFreq	XMag	YMag	ZMag	XFreq	YFreq	ZFreq	XMag	YMag	ZMag	Date	Time
Bu104408.12A	0.0	0.0	17.6	0.0	0.0	0.0	0.0	0.0	18.1	0.0	0.0	0.0	12-Jan-06	10:44:08
Bu220616.14A	129.4	126.5	149.4	3.9	3.8	0.0	170.9	21.5	107.4	2.2	3.7	0.0	14-Jan-06	22:06:16
Bu220648.14A	21.0	21.0	42.0	316.5	306.8	0.1	26.4	26.4	183.1	5.2	4.6	0.1	14-Jan-06	22:06:48
Bu220720.14A	8.3	8.3	0.0	0.7	1.0	0.0	8.8	8.8	0.0	0.6	0.6	0.0	14-Jan-06	22:07:20
Bu220824.14A	10.7	10.7	85.9	1.3	1.1	0.0	11.2	11.2	0.0	0.6	0.9	0.0	14-Jan-06	22:08:24
Bu220856.14A	10.3	10.3	49.8	1.8	1.5	0.0	44.4	91.3	76.7	0.3	0.3	0.0	14-Jan-06	22:08:56
Bu221000.14A	10.3	10.3	0.0	1.2	1.7	0.0	68.8	93.3	31.3	0.4	0.3	0.0	14-Jan-06	22:10:00
Bu221104.14A	10.7	10.7	37.6	0.9	0.5	0.0	11.2	9.8	0.0	0.2	0.3	0.0	14-Jan-06	22:11:04
Bu221136.14A	10.3	10.3	76.7	0.6	0.6	0.0	11.2	9.8	77.6	0.3	0.4	0.0	14-Jan-06	22:11:36
Bu221240.14A	46.9	9.3	0.0	0.0	0.1	0.0	92.8	8.8	1.0	0.0	0.1	0.0	14-Jan-06	22:12:40
Bu221312.14A	12.2	12.2	11.7	1.1	1.8	0.0	9.8	36.1	48.3	0.7	0.9	0.0	14-Jan-06	22:13:12
Bu221344.14A	14.2	14.2	12.2	0.9	0.9	0.0	10.3	12.2	50.3	0.6	0.4	0.0	14-Jan-06	22:13:44
Bu221416.14A	11.7	11.7	0.0	1.0	2.5	0.0	21.0	21.0	11.7	0.6	1.1	0.0	14-Jan-06	22:14:16
Bu221448.14A	12.2	12.2	86.4	1.1	1.7	0.0	11.7	11.7	9.3	0.8	0.7	0.0	14-Jan-06	22:14:48
Bu221520.14A	48.3	11.7	107.9	1.3	1.6	0.0	11.7	11.2	0.5	1.2	1.0	0.0	14-Jan-06	22:15:20
Bu221552.14A	11.7	11.7	108.9	3.3	4.0	0.0	47.4	35.6	59.1	2.3	1.2	0.0	14-Jan-06	22:15:52
Bu221624.14A	11.7	11.7	0.0	2.4	4.4	0.0	35.6	35.6	23.9	1.0	0.9	0.0	14-Jan-06	22:16:24
Bu221728.14A	11.7	11.7	0.0	0.6	3.6	0.0	10.7	10.7	11.7	0.3	0.4	0.0	14-Jan-06	22:17:28
Bu222112.14A	8.8	9.3	71.3	0.9	1.2	0.0	9.3	8.8	0.0	0.9	0.7	0.0	14-Jan-06	22:21:12
Bu222248.14A	10.7	10.7	108.9	1.7	2.1	0.0	15.6	10.3	108.4	0.6	0.5	0.0	14-Jan-06	22:22:48
Bu222320.14A	10.3	10.3	0.0	0.8	0.9	0.0	12.2	12.2	72.3	0.5	0.8	0.0	14-Jan-06	22:23:20
Bu222456.14A	10.3	10.3	37.1	0.9	1.8	0.0	29.3	91.3	71.8	0.2	0.4	0.0	14-Jan-06	22:24:56
Bu222632.14A	9.8	9.8	0.0	0.3	0.3	0.0	10.3	20.5	0.0	0.3	0.3	0.0	14-Jan-06	22:26:32
Bu092709.15A	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15-Jan-06	09:27:09

Run 1100

Run1100	FREQUENCY DOMAIN ANALYSIS TABLE													
	Highest Peak Freq (Hz)			Highest Peak Mag (g ² /Hz)			2nd Peak Freq (Hz)			2nd Peak Mag (g ² /Hz)				
FILE NAME	XFreq	YFreq	ZFreq	XMag	YMag	ZMag	XFreq	YFreq	ZFreq	XMag	YMag	ZMag	Date	Time
Bu111228.18A	0.0	279.8	0.0	0.1	0.1	0.0	123.0	168.5	0.0	0.0	0.0	0.0	18-Jan-06	11:12:28
Bu113316.18A	0.0	279.8	0.0	0.1	0.1	0.0	1.0	279.3	0.0	0.0	0.0	0.0	18-Jan-06	11:33:16
Bu114220.18A	0.0	279.8	0.0	0.9	0.0	0.0	1.0	168.5	0.0	0.3	0.0	0.0	18-Jan-06	11:42:20
Bu114636.18A	0.0	279.8	0.0	2.7	0.2	0.0	1.0	168.5	0.0	0.9	0.1	0.0	18-Jan-06	11:46:36
Bu115156.18A	0.0	279.8	0.0	6.0	0.1	0.0	1.0	258.8	0.0	1.6	0.0	0.0	18-Jan-06	11:51:56
Bu115300.18A	0.0	279.8	0.0	12.8	0.1	0.0	1.0	258.3	0.0	1.3	0.0	0.0	18-Jan-06	11:53:00
Bu122812.18A	0.0	279.8	0.0	0.1	0.1	0.0	1.0	279.3	0.0	0.0	0.0	0.0	18-Jan-06	12:28:12
Bu130916.18A	0.0	76.7	0.0	0.2	0.0	0.0	1.0	259.3	0.0	0.0	0.0	0.0	18-Jan-06	13:09:16
Bu132828.18A	0.0	168.5	0.0	13.4	0.1	0.0	1.0	178.7	0.0	3.0	0.0	0.0	18-Jan-06	13:28:28
Bu135300.18A	0.0	279.8	0.0	0.5	0.1	0.0	1.0	279.3	0.0	0.1	0.1	0.0	18-Jan-06	13:53:00
Bu135852.18A	0.0	279.8	0.0	15.0	0.2	0.0	1.0	259.3	0.0	2.8	0.1	0.0	18-Jan-06	13:58:52
Bu135924.18A	0.0	279.8	0.0	0.2	0.2	0.0	1.0	168.5	0.0	0.0	0.2	0.0	18-Jan-06	13:59:24
Bu140236.18A	0.0	258.8	0.0	1.3	0.1	0.0	1.0	258.3	0.0	0.6	0.0	0.0	18-Jan-06	14:02:36
Bu142220.18A	0.0	168.5	0.0	0.2	0.0	0.0	1.0	279.3	0.0	0.0	0.0	0.0	18-Jan-06	14:22:20
Bu142916.18A	0.0	295.4	1.5	0.2	0.0	0.0	1.0	168.5	0.0	0.0	0.0	0.0	18-Jan-06	14:29:16
Bu145244.18A	0.0	258.3	1.5	23.7	0.1	0.0	1.0	258.8	0.0	7.4	0.1	0.0	18-Jan-06	14:52:44
Bu145628.18A	0.0	0.0	0.0	0.4	0.0	0.0	1.0	1.5	0.0	0.2	0.0	0.0	18-Jan-06	14:56:28
Bu150252.18A	0.0	279.3	0.0	0.7	0.1	0.0	1.0	279.8	0.0	0.2	0.1	0.0	18-Jan-06	15:02:52
Bu150740.18A	0.0	0.0	0.0	1.3	0.0	0.0	1.0	1.0	0.0	0.3	0.0	0.0	18-Jan-06	15:07:40
Bu151540.18A	0.0	279.3	0.0	26.4	0.2	0.0	1.0	168.5	0.0	4.9	0.1	0.0	18-Jan-06	15:15:40
Bu160340.18A	0.0	279.8	0.0	0.2	0.1	0.0	1.0	168.5	0.0	0.0	0.1	0.0	18-Jan-06	16:03:40
Bu160412.18A	0.0	279.3	0.0	0.2	0.1	0.0	1.0	279.8	0.0	0.0	0.1	0.0	18-Jan-06	16:04:12
Bu160444.18A	0.0	279.8	0.0	0.2	0.4	0.0	1.0	279.3	0.0	0.0	0.2	0.0	18-Jan-06	16:04:44
Bu123924.19A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19-Jan-06	12:39:24

The burst files represent the highest magnitude vibration events on the run. They are fast sampled raw data from the accelerometers and are used to define the frequency of the vibration, often allowing its source to be identified. To identify the source of vibration, it is necessary to remove the influence of the rotary speed from the burst file frequency. The dominant and secondary frequencies were ran through a filter calculation to allow for the effect of Rotation. If a peak (or 2nd) burst file frequency has a magnitude greater than 1g²Hz, its dominance is sufficient for it to indicate a whirling condition. These are shaded orange in the table above. In the case of backward whirl (only) in order to calculate the Whirl frequency it is necessary to remove the influence of the rotary speed from the burst file frequency, eg:

$$\text{Burst frequency} = 12.5 \text{ Hz, RPM} = 150 \Rightarrow \text{frequency} = 2.5 \text{ Hz}$$

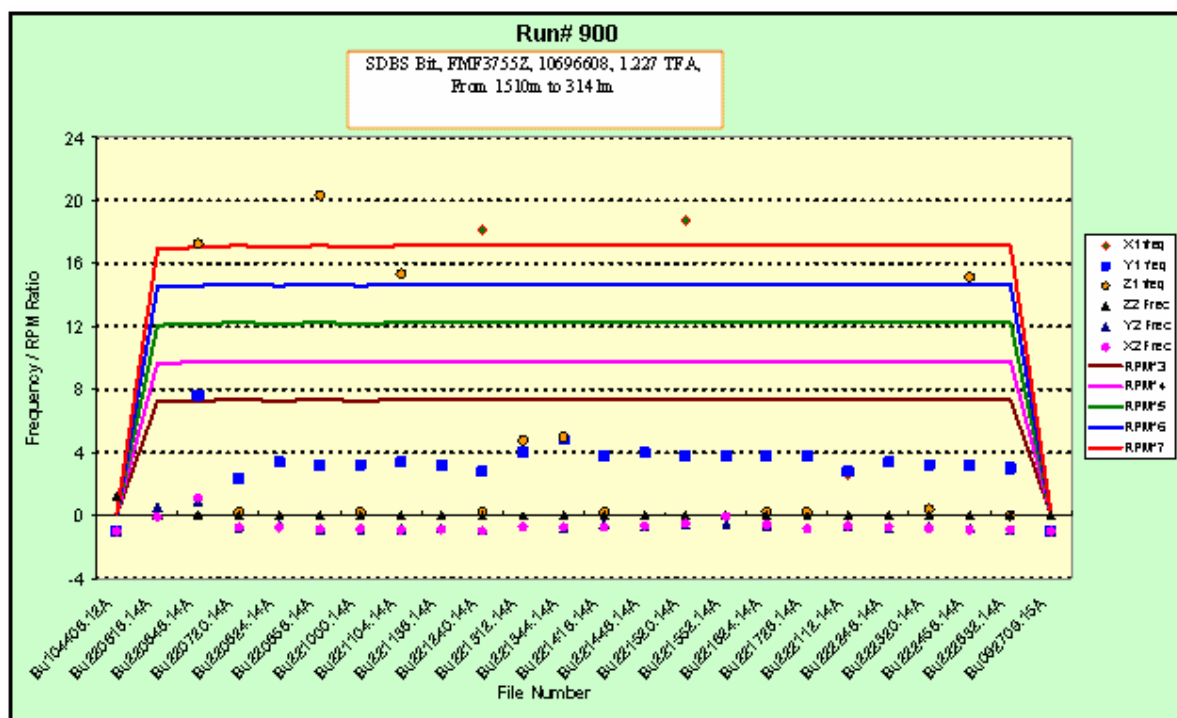
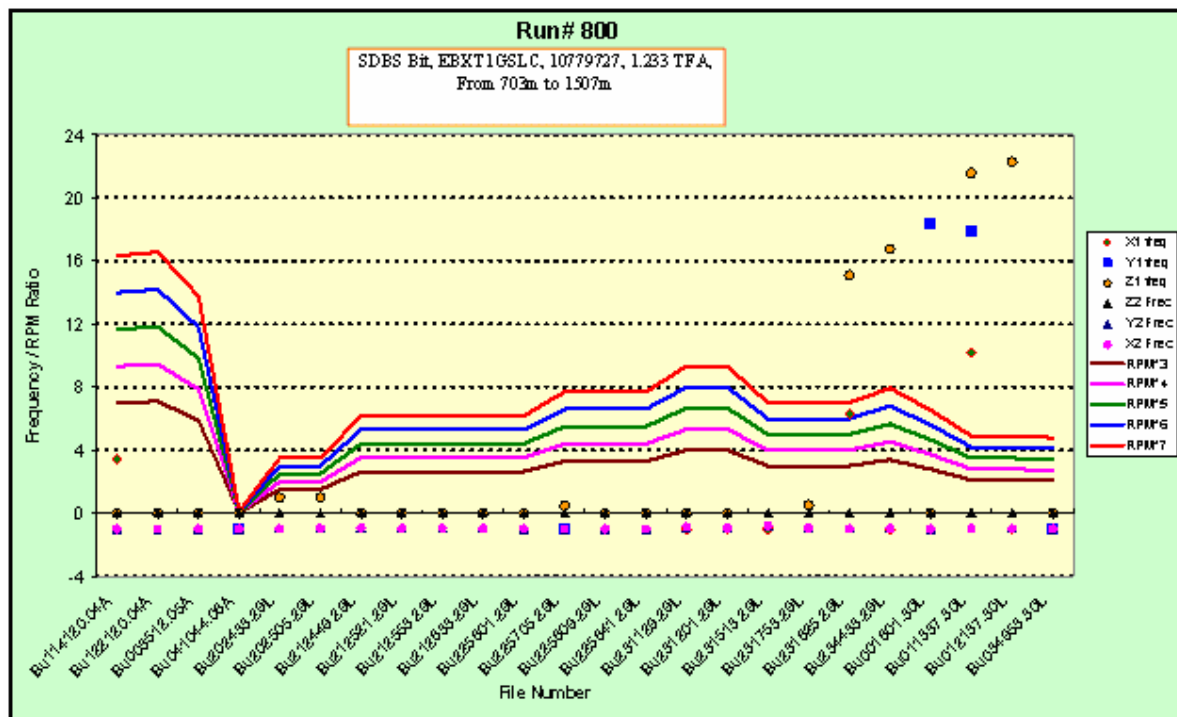
$$\text{Whirl frequency} = 12.5 - 2.5 = 10 \text{ Hz}$$

Run # 900

All the vibrations came from the high vibration interval between 10:44 and 09:27 on the period between 12th to 15th January 2006 for Run 900. In this run, it was noted that the frequency/RPM ratio is around 3*RPM and 7*RPM, there is likelihood it is the result of the impact of a three bladed stabilizer and seven bladed bit with the borehole wall, this indicates bit/BHA whirl, with damage to the bit showing half of bit cutters broken off, and signs of metal damage on top of blades. The bit graded at **4-4-BT-A-X-I-NR-CP**

Run # 1100

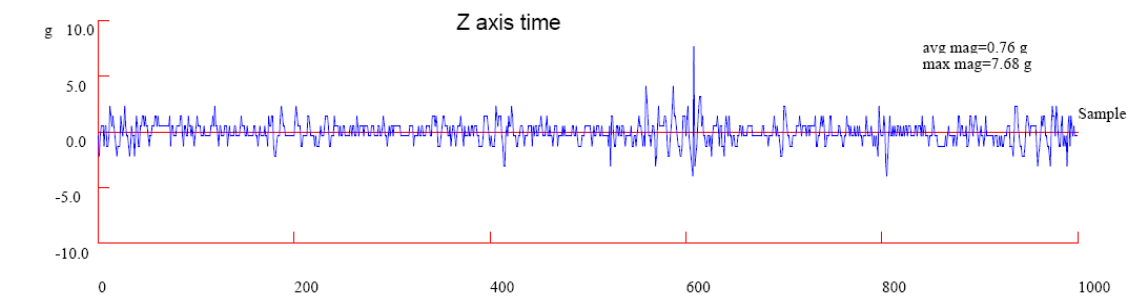
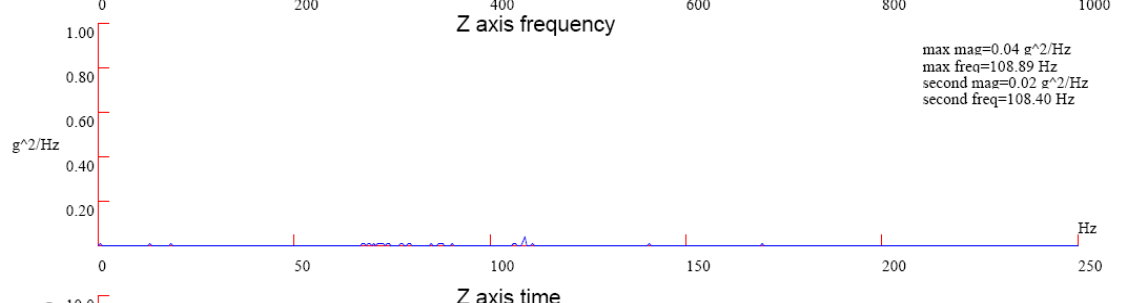
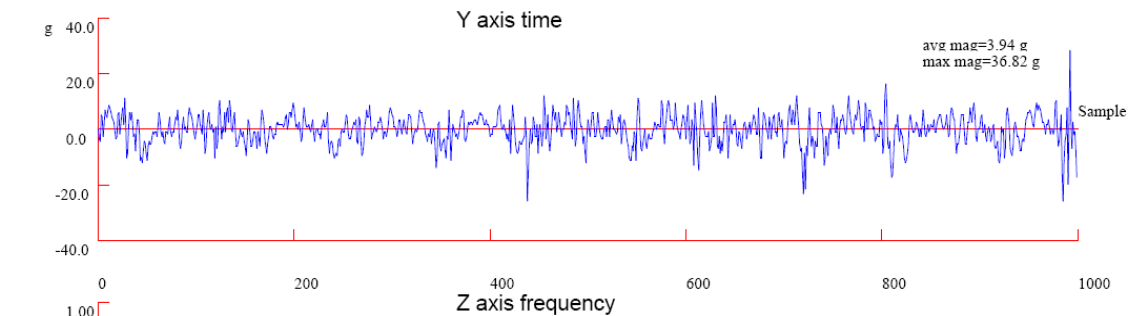
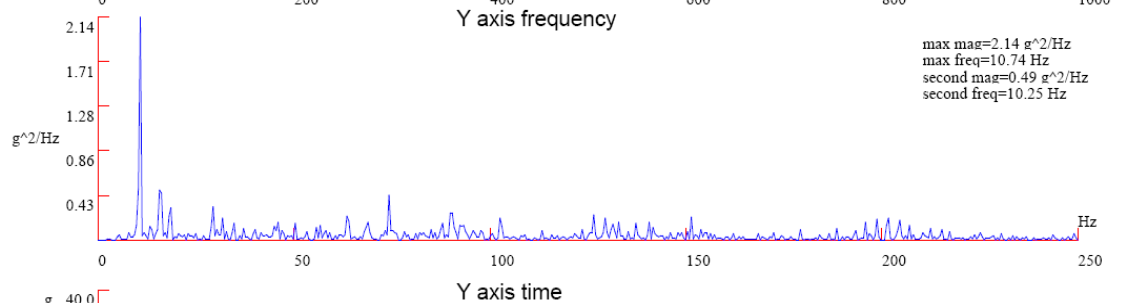
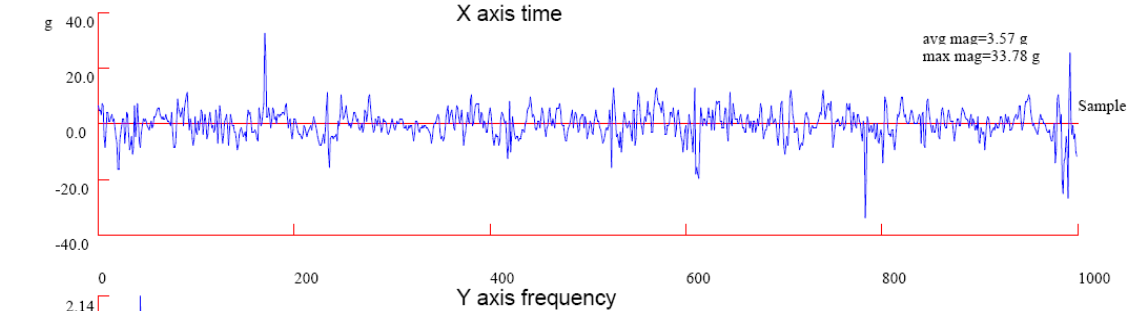
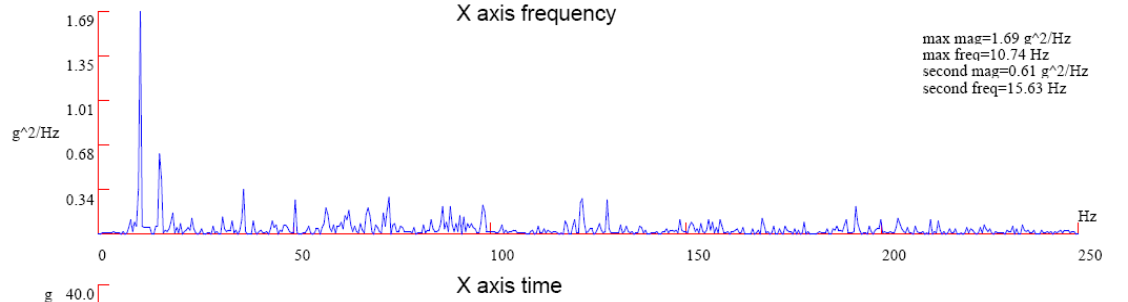
The burst file data came from the interval between 3412 and 3432m. The very low frequency rate on the x axes is synonymous with a torsional vibration mode and is related to the change in formation from 3412m

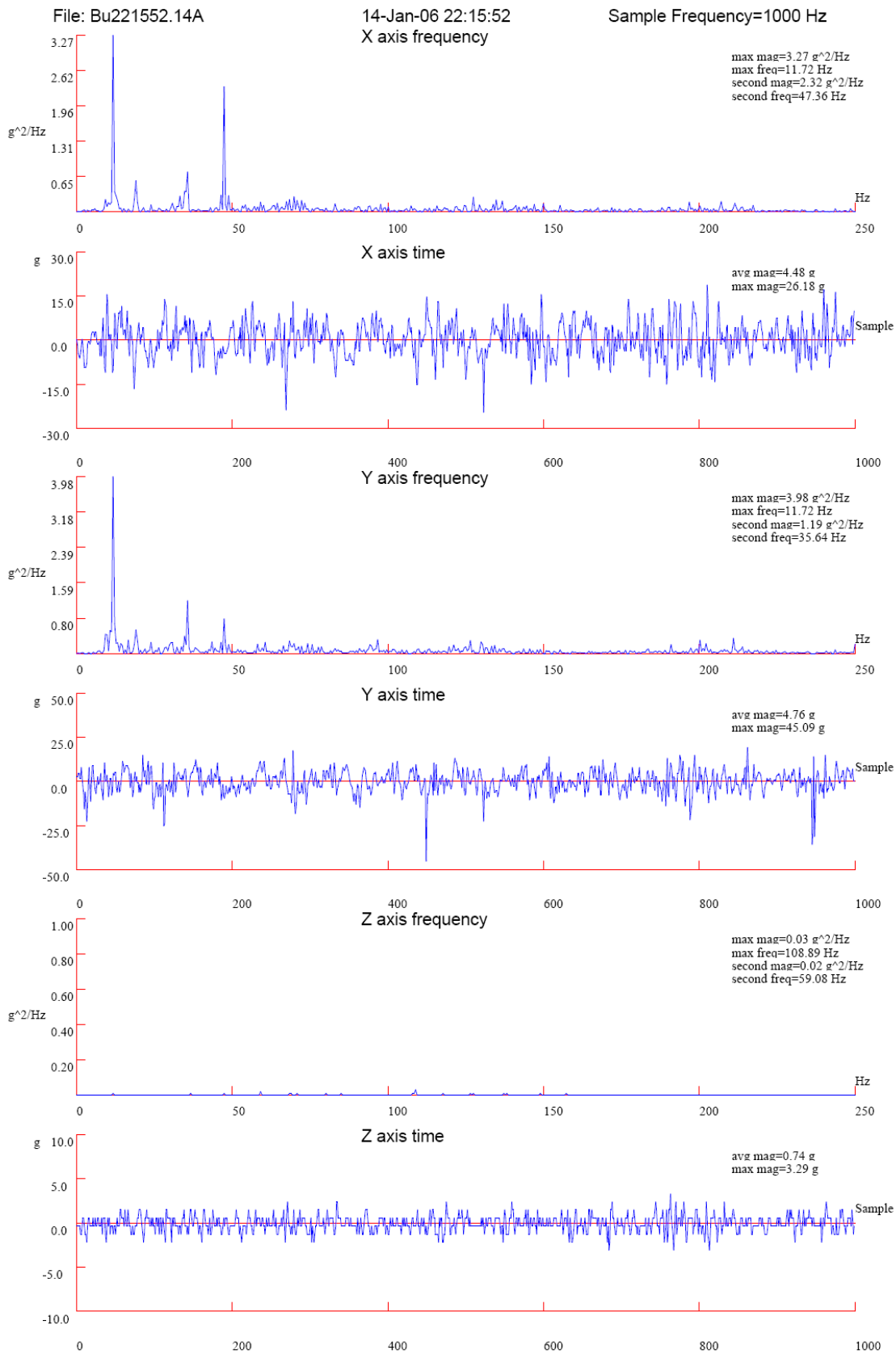


File: Bu222248.14A

14-Jan-06 22:22:48

Sample Frequency=1000 Hz





5- PORE PRESSURE

Pore Pressure Discussion

Formation pressure was mainly predicted whilst drilling by the use of the most reliable drilling models, resistivity and corrected dc exponent (Dxc). The dc exponent models is a function of rate of penetration, weight on bit, rotary speed, bit size and also mud weight for which the original d-exponent is corrected. Thus any change in drill-ability of the formations will be reflected in these models.

The normal trend of the model is to increase with depth, so a decrease in its value due to increasing drill-ability will indicate increasing porosity and so may indicate an increase in formation pressure. However, the long experience with these models showed that they are only reliable indicators of pore pressure when it is taken in non-calcareous shale. This means that values calculated with these models for other lithology have to be viewed with caution.

Resistivity can also be used as an indication of pore pressure. Deep Resistivity is assumed to be a close representation of the true uninvaded formation Resistivity. The normal trend would be for it to increase with depth in line with formation compaction and increasing density. Deviations away from this normal compaction trend may indicate changes in formation pressure although the presence of hydrocarbons makes its use invalid.

In summary, Sperry-Sun personnel in this well using the following criteria performed pore pressure evaluation: -

1. Modified drilling exponent (Dxc) and LWD Resistivity.
2. Gas shows analysis (C.G, T.G trends).
3. Drilling conditions (Torque, Drag and Over-pull)
4. Cutting morphology inspection.

17 ½" Hole summary

Due to lithology and drilling practices some of these evaluation techniques could only be used in a qualitative manner rather than quantitatively. However, the following is an appraisal of the result of the application of these techniques and discussion of the pore pressure development regime encountered while drilling this well.

The initial pore pressure was assumed to be normal pore pressure of the area i.e. 1.03sg EMW. The pore pressure evaluation and the general hole conditions indicated a normal pore pressure regime to approximately 875m. At that depth the drilling models (DXC, SIGMA) and Resistivity start to cut back from the normal compaction trend line but due to hydrocarbons present the Resistivity trend line became inoperative, the drilling models indicated the onset of initial formation pressure with value of 1.08sg at 875m. This increase was confirmed with the appearance of connection gas of 1.31% at 872m. The estimated pore pressure remained constant at that value until about 1030 m; at that depth the Resistivity exhibited a slight increase in pore pressure with value of 1.12sg where the drilling models showed a reverse pore pressure trend, they became highly masked, probably due to bit balling or to the controlled ROP to avoid mud losses on shakers and to hold hole inclination so the drilling models were mainly useless and inoperative in some intervals. The Resistivity model was the only model that we can depend on in addition to hole condition and gas levels.

There is a clear cut back in Resistivity from 1100m-1300m with slight cut back in drilling models Dxc and sigma 1193-1225m, all the models exhibited an increase in estimated pore pressure with value of 1.20sg at 1193m. The Dxc and sigma gave a reverse trend where the Resistivity continued its build up trend; it gave value of 1.3 at 1300 m, the increase in pore pressure is supported by increased back ground gas from about 1.5 to 3.0%.

The Resistivity tool stopped at 1333m, the maximum pore pressure value from the Resistivity 703-1333m was 1.30sg at 1300m, and this value remained constant till 1333m. The sigma not the Dxc showed an increase in pore pressure at 1376m with value of 1.29sg.

The Resistivity worked from 1416m, it continued its cut back trend exhibiting a gradual increase in estimated pore pressure until it reached the value of 1.37sg-1.38sg at 1440 m; this value remained constant till section TD.

The drilling models Dxc and sigma exhibited a slight increase in pore pressure, the sigma exhibited increase in pore pressure of 1.29sg at bottom.

The Conclusion

The maximum estimated pore pressure along this hole 703-1492m was **1.29** sg from drilling models and **1.37-1.38** sg from Resistivity model

The hole condition while attempting to trip out after reaching section TD was in a very bad condition, spent some days working on tight spots and packed off hole, had a lot of large caving on shakers, had to raise mud weight to 1.55sg.

8 ½" Hole summary

A Shift was required for models due to the change in hole size and in order to read the last estimated pore pressure value at the bottom of 17 ½" section, the maximum value was 1.37-1.38sg from Resistivity tool.

The initial pore pressure for this section is assumed to be 1.35sg EMW at the well side geologist request, this value remained constant until 1550m, below that depth, the drilling models and Resistivity showed a reverse trend and cut of pore pressure value, the estimated pore pressure was 1.30sg at 1600m-1627m

At 1627m a clear cut back in drilling models and Resistivity are observed, exhibiting gradual increase in the estimated pore pressure, it reached the value of 1.36 sg

A further cutback in both Dxc and Resistivity was observed with slight increase in background gas, the built up trend was continued and the pore pressure increased until it reached the estimated value of 1.49 sg at 1850m. No connection gas was observed and the PWD Pumps Off min showed a range of 1.52-1.53 sg indicating a the extent of hydrostatic overbalance over this section

The hole condition while wiper tripping at 1905m indicated that the hole was in a very good condition with no indication of poor hole clean or drag,

Decrease in estimated pore pressure below 1900m to 2100m it dropped to 1.45 -1.46 sg. From 2100m to 2260m there is a slight gradual increase in background gas which corresponds with decreases in Resistivity and Dxc suggesting a rise in pore pressure to 1.48 sg. From 2280 m to 2320 m there is a more pronounced increase in background gas and further decreases in Resistivity and Dxc, with an estimated pore pressure of 1.53 sg from 2370m. 0.70% connection gas was observed at 2388m with PWD Pumps off min of 1.529-1.535 sg,

From 2480m increases in Dxc and Sigma are observed suggesting a decrease in pore pressure to 1.50 sg; this value remained constant until 2646m. The Resistivity was showing fixed pore pressure values over the interval 2480m-2626m at 1.53 sg.

From 2646m a clear cutback in both Dxc and sigma was observed with slight increase in background gas suggesting increase in pore pressure to 1.53-1.54sg.

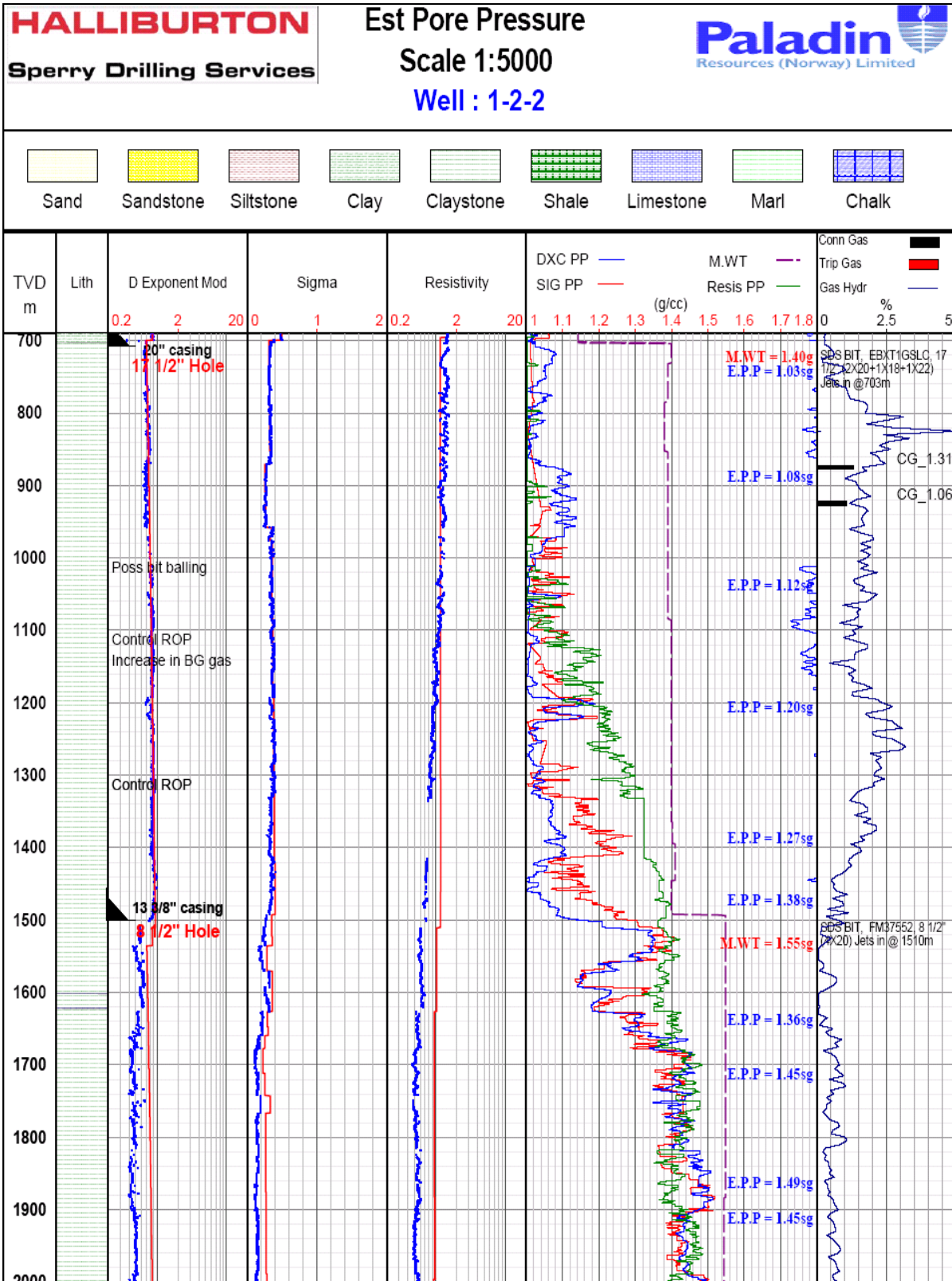
From 2700m, further increase in both background gases from 0.6 to 1.0% and connection gases from 0.3 to 0.7% were observed. From 2800m Both Resistivity and Dxc data became more variable. However Connection Gas was still present to 2928m, suggesting a pore pressure of 1.52 sg. From 2928m Background gas decreased slightly. This coincided with a slight increase in the Dxc and Sigma suggesting the pore pressure had decreased to 1.48 sg at 3000m and it continued its decreasing until it reached to 1.27 sg at 3098m

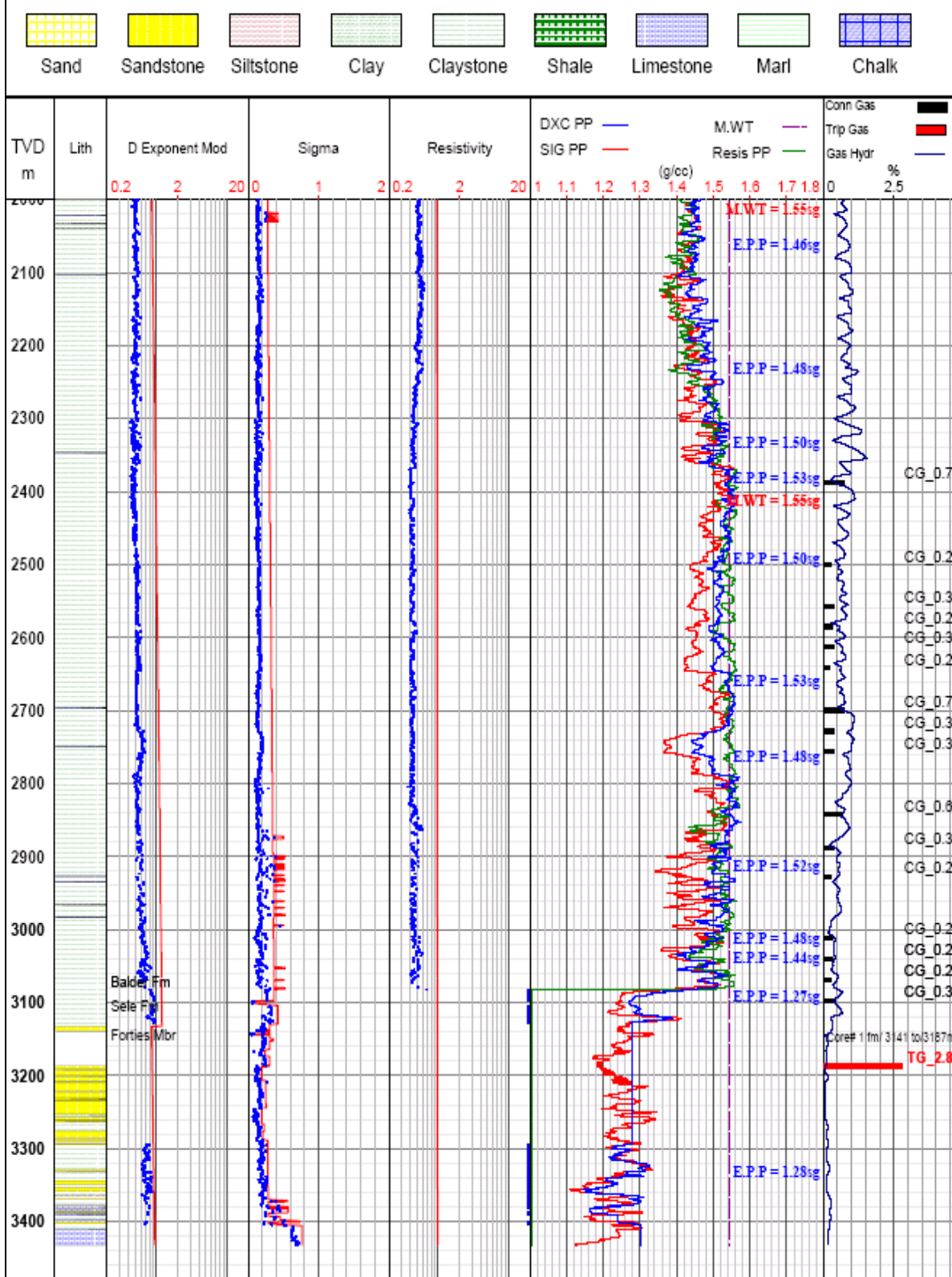
As soon as hitting the reservoir and as this was a hydrocarbon bearing Sandstone, the Dxc and so the Resistivity models are no longer applicable,

The sigma model is the only model to use in addition to gas levels and perhaps hole condition, sigma trend line was shifted to read pore pressure at value of 1.27 sg similar to those was estimated before entering the reservoir.

Values for sigma and Dxc for claystone intervals show the pore pressure to be an estimated 1.28-1.30 sg, low gas levels and no connection gas recorded.

Pore Pressure Logs





Pressure Profile Log

