GOOLSBY BROTHERS
and associates, inc.
575 Union Blvd, Suite 208
Lakewood, CO 80228
303-945-2860 Office
Geological Wellsite
Supervision
www.goolsbybrothers.com

PETCOM

Scale 1:240 (5"=100') Imperial
True Vertical Depth Log

Well Name:	HOWARD 28C-33HZ (Vertical Hole Section)
Location:	Section 28, T1N, R67W, WELD County, CO.
License Number:	API: 05-123-36932
Region:	DJ Basin - Wattenberg
Spud Date:	October 28, 2013
Drilling Completed:	November 5, 2013
Surface Coordinates:	NENE Sec 28 T1N R67W; 340' FNL 1094' FEL Lat N 40.0142211 Long W -104.5324104
Bottom Hole Coordinates:	NENE Sec 33 T1N R67W; 5118.58' N, 1337.32' E
Ground Elevation (ft):	4983'
K.B. Elevation (ft):	4999'
Logged Interval (ft):	7284' To: 13,042'
Total Depth (ft):	13,042' DMTD
Formation:	Pierre Sands/Shales, Niobrara, Codell Target
Type of Drilling Fluid:	Water & Poly to 7284', LSND 7284' - 13,042'

Printed by STRIP.LOG from WellSight Systems 1-800-447-1534 www.WellSight.com

OPERATOR

Company: Kerr-McGee Oil & Gas Onshore LP
Address: Granite Tower - 1099 18th St. Ste 1800
Denver, CO 80202
CO Geologist, John Morgan

E-Logs

MWD GR 1029' - 12,989'

Contractors

1) Drilling Contractor: XTREME, Rig #20
Tool pusher Siji Chaparro
2) Company Man: Charlie Daigle & Tom Kibbe
3) Mud Comapny : AES Drilling Fluids
4) Directional Drilling: Baker Huges
Pulse Tool
Drillers: Barry Combs, Travis
MWD: Greg Dore & David Campbell
5) Gas Equipment: Mudlogging Systems Inc.
by Terra Services
Redbox # ML-462 & Ratcliff Agitator
6) Well Site Geology: Goolsby Brothers & Associates
Geologists: Hank McCroskey & Ian Harris

ROCK TYPES

Anhy, Bent, Brec, Cht, Clyst, Coal, Congl, Dol, Gyp, Igne, Lmst, Meta, Mrlst, Salt, Shale, Shcol, Shgy, Sltst, Ss, Till, Slty sh, Arg ss, Fracture, Chalk, Carb sh, Arg lmy ss, Cmt, Fault

ACCESSORIES

MINERAL: Anhy, Arggrn, Arg, Bent, Bit, Brecfrag, Calc, Carb, Chtdk, Chtlt, Dol, Feldspar, Ferrpel, Ferr, Glau, Gyp, Hvymin, Kaol, Marl, Minxl, Nodule, Phos, Pyr, Salt, Sandy, Silt, Sil, Sulphur, Tuff

FOSSIL: Algae, Amph, Belm, Bioclst, Brach, Bryozoa, Cephal, Coral, Crin, Echin, Fish, Foram, Fossil, Gastro, Oolite, Ostra, Pelec, Pellet, Pisolite, Plant, Strom

STRINGER: Anhy, Arg, Bent, Coal, Dol, Gyp, Ls, Mrst, Sltstrg, Ssstrg

TEXTURE: Boundst, Chalky, Cryxln, Earthy, Finexln, Grainst, Lithogr, Microxln, Mudst, Packst, Wackest

OTHER SYMBOLS

POROSITY: Earthy, Fenest, Fracture, Inter, Moldic, Organic, Pinpoint, Vuggy

SORTING: Well, Moderate, Poor

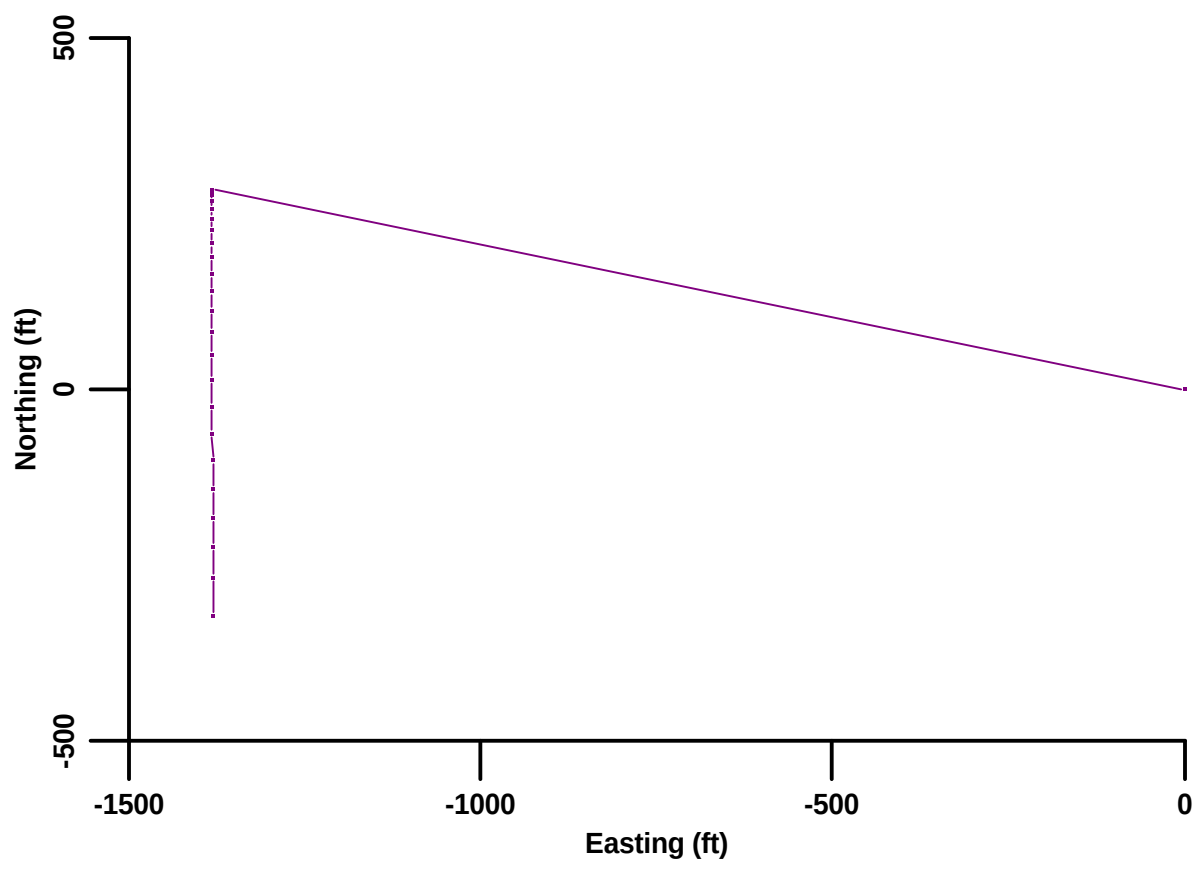
ROUNDING: Rounded, Subrnd, Subang, Angular

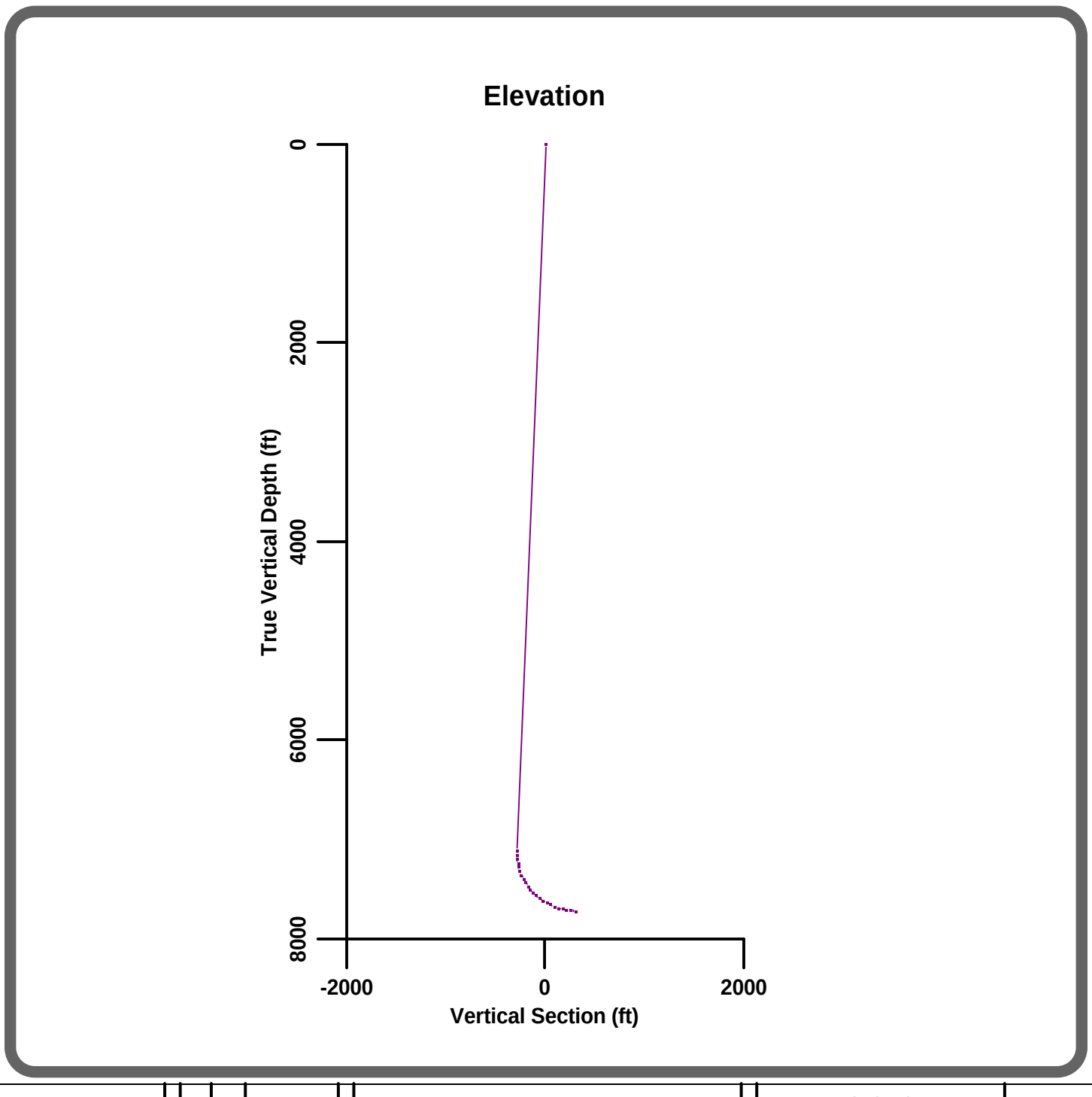
OIL SHOW: Even, Spotted, Ques, Dead

INTERVAL: Core, Dst

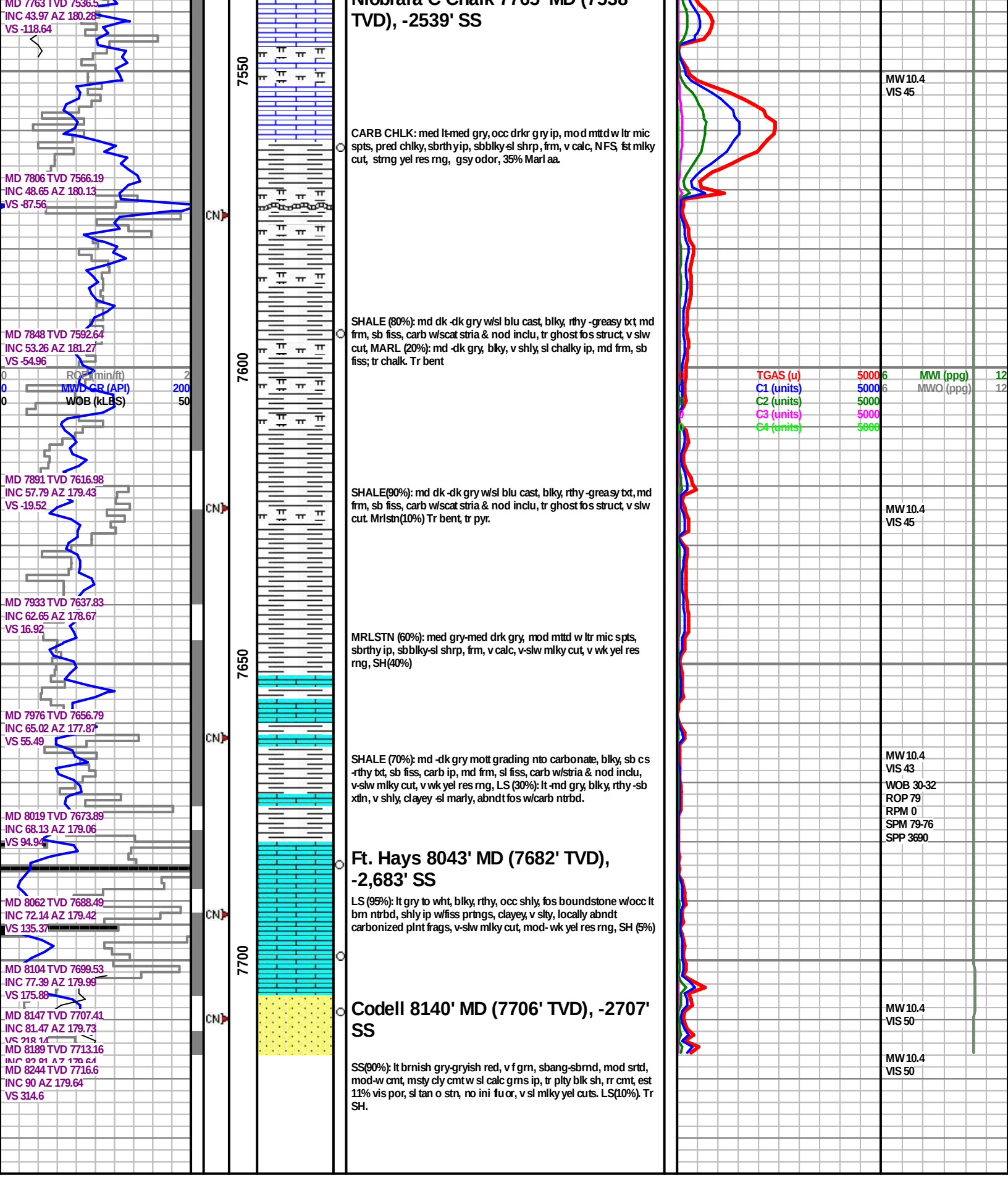
EVENT: New bit, Rft, Off btm, Conn, Casing, Casing_right

Plan





ROP (min/ft) / MWD GR (API) / WOB (kLBS)	Slide / Rotate	Conn	Depth	Lithology	Oil Show	Geological Descriptions	TG, C1-C4 (TGAS (u), C1 (units), C2 (units), C3 (units), C4 (units))	Porosity (MWI (ppg), MWO (ppg))
						9 5/8" Surface Casing set @ 1029'		
2 man wellsite geology team on location and rigged up October 30, 2013								
Begin drilling curve F/7284'(KOP) @ 20:20hrs on 10/30/2013						NB #2, 8 3/4", Smith MDI611, JH468, 3x14 3x15, in @ 3639'		WOB 25-26 ROP 28 RPM 0 SPM 71/72 SPP 2780
MD 7295 TVD 7111.52 INC 2.27 AZ 167.9 VS -290	CN		7100			KOP 7284'		MW 10.0 VIS 32
						SLTY SH: md dk gry, dull- sl sprkln g lstr, slty-matte txt, sub blky-wdglk, irreg-sb plnr, brttl tncty, mod fsslty, no n calc, no oil indicators.		
MD 7337 TVD 7153.44 INC 4.72 AZ 181.21 VS -287.46			7150					MW 9.9 VIS 32 MW 9.9 VIS 34 MW 9.9 VIS 40
						SLTY SH: md dk gry, dull- sl sprkln g occ sub wxy lstr, slty-matte txt,sub blky-wdglk, irreg-sb plnr, brttl tncty, sl fsslty, non calc, no oil indicators.		
MD 7380 TVD 7196.14 INC 8.66 AZ 182.18 VS -282.46	CN		7200			SLTY SH: md dk gry, dull- sl sprkln g occ sub wxy lstr, slty-matte txt,sub blky-wdglk, irreg-sb plnr, brttl tncty, sl fsslty, non calc, no oil indicators.		
MD 7422 TVD 7237.42 INC 12.43 AZ 181.64 VS -274.78			7250			SLTY SH: md dk gry, dull- sl sprkln g occ sub wxy lstr, slty-matte txt,sub blky-wdglk, irreg-sb plnr, brttl tncty, sl fsslty, non calc, no oil indicators, tr sltstn		
MD 7465 TVD 7279.01 INC 16.93 AZ 179.61 VS -263.89	CN		7300			SLTY SH: md dk gry, dull- sl sprkln g occ sub wxy lstr, slty-matte txt,sub blky-wdglk, irreg-sb plnr, brttl tncty, sl fsslty, non calc, no oil indicators, tr sltstn, tr bnt		
MD 7507 TVD 7318.75 INC 20.77 AZ 178.63 VS -250.32						Sharon Springs 7508' MD, (7320' TVD), -2321' SS		WOB 24-25 ROP 103 RPM 0 SPM 83-80 SPP 3530 MW 10.01 VIS 39
						Niobrara A Chalk 7529' MD (7339' TVD), -2340' SS		
MD 7550 TVD 7358.43 INC 24.51 AZ 179.49 VS -233.77	CN		7350			CARB CHALK (60%): lt med-med gry, occ drkr gry ip, abndt mttld w v smll lent tan spcks, pred sbchlky, s brthy-sm th ru, sbplty-p lty, abndt shrp/jggd thru, v frm-hd, micrite w 15% arg mtx, no vis perm or por, no ini fluor, wk hzy/dif mlky yel cuts, drk yel o res rng, strng o odor, MARLSTN(30%), SH(10%)		MW 10.05 VIS 40
						Fault		
MD 7593 TVD 7397.04 INC 27.69 AZ 179.99 VS -214.86			7400			MRLSTN (80%): med gry-med drk gry, mod mttd w ltr mic spts, sbrthy ip, sbblky-sl shrp, frm, v calc, v-slw mlky cut, wk yel res rng, SH(20%)		
MD 7633 TVD 7431.94 INC 30.76 AZ 181.49 VS -195.34						Niobrara B Upper Marl 7633' MD (7432' TVD), -2433' SS		MW 10.15 VIS 40
11/1/2013	CN		7450			MRLSTN (80%): med gry-med drk gry, mod mttd w ltr mic spts, sbrthy ip, sbblky-sl shrp, frm, v calc, v-slw mlky cut, wk yel res rng, CHLK (20%). Tr off wt foss frags. Tr SH		
						TOOH @ 7660' For new bit and mudmotor. NB#3 8 7'8", SEC, MMD55M, 12198372, 2x16 / 3x18. OB#2 drld 4021' in 20.7hrs @ 194'/hr avg.		MW 10.4 VIS 41
MD 7678 TVD 7470.12 INC 33.15 AZ 180.15 VS -171.53						MRLSTN (80%): med gry-med drk gry, mod mttd w ltr mic spts, sbrthy ip, sbblky-sl shrp, frm, v calc, v-slw mlky cut, wk yel res rng, CHLK (20%). Tr off wt foss frags. Tr SH		
MD 7721 TVD 7504.95 INC 38.6 AZ 181.24 VS -146.34	CN		7500					
						SH(60%): md dk gry, dull-sl sprkln g occ sub wxy lstr, slty-matte txt,sub blky-wdglk, irreg-sb plnr, brttl tncty, sl fsslty, vry calc, no smpl fl, mod- fst ylwsh wht cut fl, mod ylw resid rng. CHLK(30%), MRLSTN(10%)		
						Niobrara C Chalk 7765' MD (7538'		


MD 7763 TVD 7536.5
INC 43.97 AZ 180.28
VS -118.64
MD 7806 TVD 7566.19
INC 48.65 AZ 180.13
VS -87.56
MD 7848 TVD 7592.64
INC 53.26 AZ 181.27
VS -54.96
ROP (min/ft)
MWD GR (API)
WOB (kLBS)
MD 7891 TVD 7616.98
INC 57.79 AZ 179.43
VS -19.52
MD 7933 TVD 7637.83
INC 62.65 AZ 178.67
VS 16.92
MD 7976 TVD 7656.79
INC 65.02 AZ 177.87
VS 55.49
MD 8019 TVD 7673.89
INC 68.13 AZ 179.06
VS 94.94
MD 8062 TVD 7688.49
INC 72.14 AZ 179.42
VS 135.37
MD 8104 TVD 7699.53
INC 77.39 AZ 179.99
VS 175.88
MD 8147 TVD 7707.41
INC 81.47 AZ 179.73
MD 8189 TVD 7713.16
MD 8244 TVD 7716.6
INC 90 AZ 179.64
VS 314.6
CN
7550
7600
7650
7700
Niobrara C Chalk 7765' MD (7538 TVD), -2539' SS
CARB CHLK: med lt-med gry, occ drkr gry ip, mod mttd w ltr mic spts, pred chlky, sbrthy ip, sbblky-sl shrp, frm, v calc, NFS, fst mlky cut, strng yel res rng, gsy odor, 35% Marl aa.
SHALE (80%): md dk -dk gry w/sl blu cast, blky, rthy -greasy txt, md frm, sb fiss, carb w/scat stria & nod inclu, tr ghost fos struct, v slw cut, MARL (20%): md -dk gry, blky, v shly, sl chalky ip, md frm, sb fiss; tr chalk. Tr bent
SHALE(90%): md dk -dk gry w/sl blu cast, blky, rthy -greasy txt, md frm, sb fiss, carb w/scat stria & nod inclu, tr ghost fos struct, v slw cut. Mrlstn(10%) Tr bent, tr pyr.
MRLSTN (60%): med gry-med drk gry, mod mttd w ltr mic spts, sbrthy ip, sbblky-sl shrp, frm, v calc, v-slw mlky cut, v wk yel res rng, SH(40%)
SHALE (70%): md -dk gry mott grading nto carbonate, blky, sb cs -rthy txt, sb fiss, carb ip, md frm, sl fiss, carb w/stria & nod inclu, v-slw mlky cut, v wk yel res rng, LS (30%): lt -md gry, blky, rthy -sb xtln, v shly, clayey -sl marly, abndt fos w/carb ntrbd.
Ft. Hays 8043' MD (7682' TVD), -2,683' SS
LS (95%): lt gry to wht, blky, rthy, occ shly, fos boundstone w/occ lt brn ntrbd, shly ip w/fiss prtngs, clayey, v slty, locally abndt carbonized plnt frags, v-slw mlky cut, mod- wk yel res rng, SH (5%)
Codell 8140' MD (7706' TVD), -2707' SS
SS(90%): lt brnish gry-gryish red, v f grn, sbang-sbrnd, mod srtd, mod-w cmt, msty cly cmt w sl calc grns ip, tr plty blk sh, rr cmt, est 11% vis por, sl tan o stn, no ini fluor, v sl mlky yel cuts. LS(10%). Tr SH.
TGAS (u)
C1 (units)
C2 (units)
C3 (units)
C4 (units)
MWI (ppg)
MWO (ppg)
MW 10.4
VIS 45
MW 10.4
VIS 45
MW 10.4
VIS 43
WOB 30-32
ROP 79
RPM 0
SPM 79-76
SPP 3690
MW 10.4
VIS 50
MW 10.4
VIS 50