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
Measured Depth Log

Well Name:	HOWARD 1C-28HZ (Vertical Hole Section)
Location:	Section 28, T1N, R67W, WELD County, CO.
License Number:	API: 05-123-36933 — Region: DJ Basin - Wattenberg
Spud Date:	October 8, 2013 — Drilling Completed: October 16, 2013
Surface Coordinates:	NENE Sec 28 T1N R67W; 280' FNL 1094' FEL Lat N 40.028556 Long W -104.89003
Bottom Hole Coordinates:	NENE Sec 33 T1N R67W; 4518' N, 495' E
Ground Elevation (ft):	4983' — K.B. Elevation (ft): 4999'
Logged Interval (ft):	6940' To: 12,330' — Total Depth (ft): 12,330' DMTD
Formation:	Pierre Sands/Shales, Niobrara, Niobrara B, Codell Target
Type of Drilling Fluid:	Water & Poly to 7120', LSND 7120' -12,330'

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 7100' - 12,278'

Contractors

1) Drilling Contractor: XTREME, Rig #20
Tool pusher Siji Chaparro
2) Company Man: Marvin Hackworth & Tom Kibbe
3) Mud Comapny : AES Drilling Fluids
4) Directional Drilling: Baker Huges
Pulse Tool
Drillers: Barry Combs, Scott Stanford
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

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

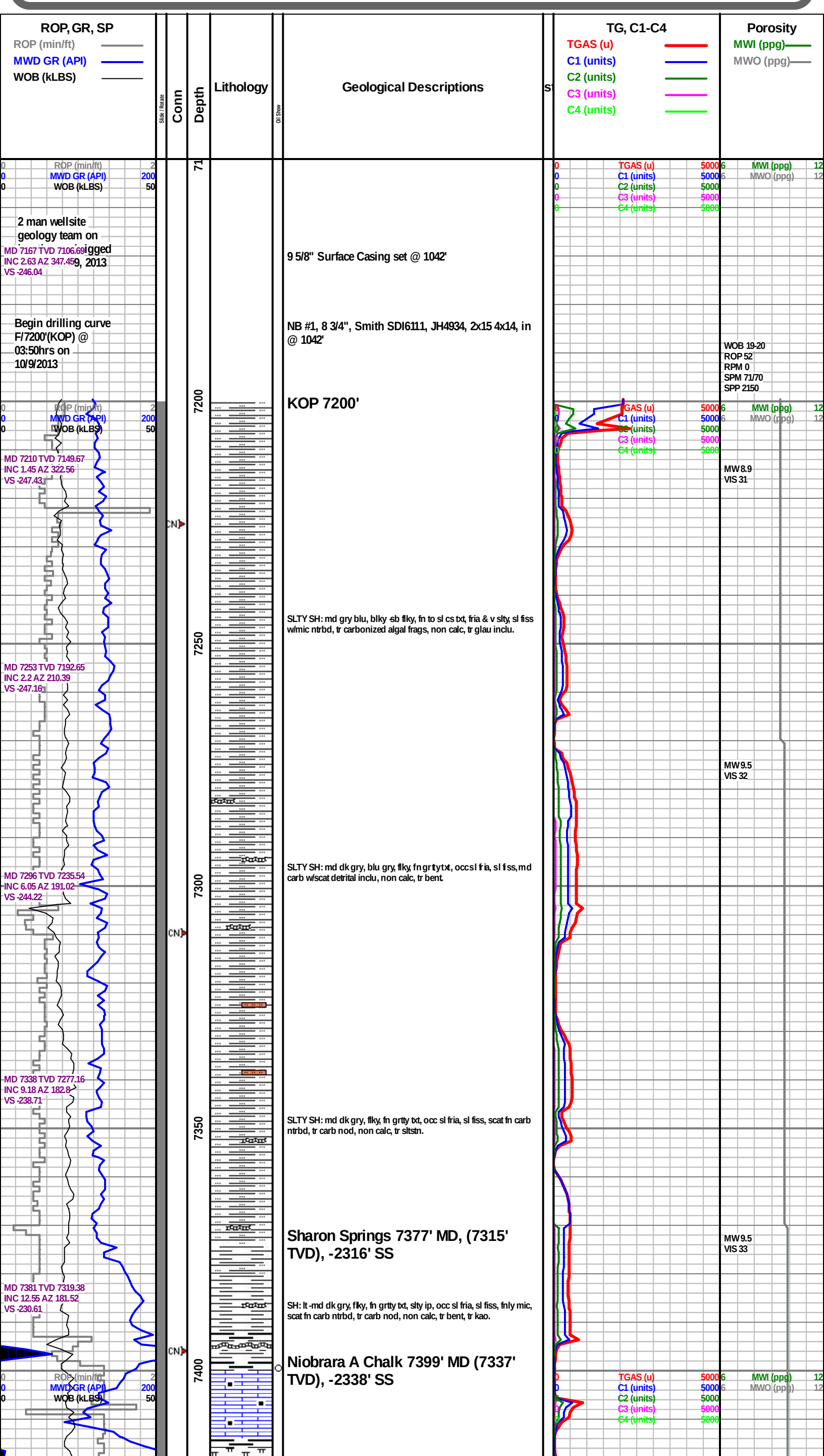
SORTING: Well, Moderate, Poor

ROUNDING: Rounded, Subrnd, Subang, Angular

OIL SHOW: Even, Spotted, Ques, Dead

INTERVAL: Core, Dst

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



MD 7423 TVD 7360.15
INC 15.27 AZ 181.47
VS -220.52

7450

SHLYCARB CHALK (40%): md gry mott, mic xtln, md cons, v slty w/abndt blk carb nods & occ lt gry, clayey ntrbd grading nto MARL(50%): md gry, rthy txt, md frm, sli fiss, v shly ip grading nto SHALE (10%): md dk gry, rthy -slty txt, v calc; abndt tr pyr, micaceous pyr, tr bent.

MW 9.7
VIS 35

MD 7466 TVD 7401.18
INC 19.47 AZ 180.62
VS -207.69

MW 9.9
VIS 38

CN

10/10/2013

Trip for MM @ 7481'

NB #2, 8 3/4", SEC MMD55M, 12198372, 2x16 3x18, in @ 7481'. OB#1 drilled 6439' in 19hrs at 338ft/hr avg ROP.

7500

CARB MRLY SH: drk gry, v f rthy/sbchlky txt, plty-sbblky, frm, v calc, dissem pyr ip, sbcarb, 40% cly rch mtx, strng petro odor, NFS, fst hzy cldy grnish yel cuts, brt yel res rng, tr o odor. Abdt Mrlstn, tr Chlk, tr pyr.

MW 10.2
VIS 42

MD 7508 TVD 7440.21
INC 23.81 AZ 179.43
VS -192.2

7550

MRLY SH: md to dk gry mott, blky, rthy txt, sb fiss, md cons -fri w/clystn ntrbd, md carb w/scat blk nods, tr pyr nuggets, occ wht, sb xtln chalk.

MD 7551 TVD 7478.7
INC 29.03 AZ 179.74
VS -173.08

MW 10.2
VIS 42

CN

SHLYCHLK MARL: md to dk gry mott, blu gry, blky, rthy txt, md frm -fria, sb fiss w/clayey ntrbd & occ carb stria, v slty, v dayey ip, tr microfos inclu w/abndt carbonized algal detritus.

MD 7593 TVD 7514.54
INC 33.78 AZ 180.25
VS -151.2

7600

Niobrara B Shale 7597' MD (7518' TVD), -2519' SS

ROP (min/ft) 0 2
MWD GR (API) 0 200
WOB (kLBS) 0 50

TGAS (u) 0 5000 6
C1 (units) 0 5000 6
C2 (units) 0 5000
C3 (units) 0 5000
C4 (units) 0 5000

MWI (ppg) 12
MWO (ppg) 12

MW 10.3
VIS 43

MD 7636 TVD 7549.08
INC 39.28 AZ 180.08
VS -125.61

CN

7650

SHALE (70%): md dk gry, blky, rthy txt, h2o sens ip, md frm -v fria, scat carb ntrbd, tr pyr; MARL (20%): md -dk gry, blky, v shly -slty w/shale ntrbd & occ carb stria; CHALK (10%/stringers): wht -lt gry gry, sb xtln -amorph, sft, slty-shly ip, sl fiss, tr bent.

MW 10.3
VIS 43

MD 7679 TVD 7581.04
INC 44.65 AZ 180.05
VS -96.87

WOB 22.5-24.3
ROP 72
RPM 0-10
SPM 70/70
SPP 2805-2825

Crossed fault at 7717' md, w/71' throw, faulted down section into C Shoulder

7700

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; MARL (10%): md -dk gry, blky, v shly, sl chalky ip, md frm, sb fiss; tr chalk, pyr.

MW 10.2
VIS 41

C Shoulder 7717' MD (7604.74' TVD), -2605.74' SS

MD 7722 TVD 7609.91
INC 50.95 AZ 180.47
VS -65.03

CN

7750

SHALE (50%): md -dk gry, mott ip, blky, sl splnty, md frm -fiss w/carbonate ntrbd, sb cs, gritty txt, v carbonaceous ip w/carbonized plant frags; LS (50%): lt -md gry, blky, sb xtln -rthy txt, v shly ip grading nto shale, abndt fos detritus grading nto wackestone, scat carb nod inclu.

MW 10.2
VIS 41

MD 7764 TVD 7634.76
INC 56.49 AZ 179.69
VS -31.19

7800

SHALE (40%): 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; LS (60%): lt -md gry, blky, rthy -sb xtln, v shly, clayey -sl marly, abndt fos w/carb ntrbd.

ROP (min/ft) 0 2
MWD GR (API) 0 200
WOB (kLBS) 0 50

TGAS (u) 0 5000 6
C1 (units) 0 5000 6
C2 (units) 0 5000
C3 (units) 0 5000
C4 (units) 0 5000

MWI (ppg) 12
MWO (ppg) 12

MW 10.2
VIS 41

MD 7807 TVD 7656.4
INC 63.03 AZ 180.83
VS 5.93

CN

7850

SHALE (70%): lt-md gry, blky, sb plty, md frm -fri, cs -gritty txt, fiss w/carbonate ntrb, md carb w/nod inclu & occ plnt frags, calc; LS (30%): wht -lt gry, blky, sb xtln to amorph, v shly ip w/sme sh ntrbd, scat carb inclu, locally abndt fos detritus.

MW 10.2
VIS 41

MD 7849 TVD 7673.56
INC 68.73 AZ 181.44
VS 44.24

MW 10.1
VIS 49

Ft. Hays 7884' MD (7685' TVD), -2686' SS

MD 7892 TVD 7686.67
INC 75.73 AZ 181.82
VS 85.14

MW 10.15
VIS 50

CN

7900

LS (90%): 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; SH (10%): dk gry, blky, cs -gritty txt, md frm, carbonaceous.

10/11/2013

MD 7934 TVD 7694.96
INC 81.51 AZ 181.57
VS 126.27

7950

LS: lt -md gry, gry brn mott, micxtln w/occ calcite inclu, md wl cons, abndt fos grading nto boundstone w/v slty micrite matrix, clayey, occ shly fiss partings w/traces shale.

MW 10.15
VIS 50

MD 7977 TVD 7699.87
INC 85.37 AZ 182.61
VS 168.95

CN

8000

LS (95%): lt -md gry, gry brn mott, micxtln w/occ calcite inclu, md wl cons, abndt fos grading nto boundstone w/v slty micrite matrix, clayey, occ shly fiss partings; SH (5%): v dk gry -blk, blky, fn -sb gritty txt, md frm, v carb.

MW 10.10
VIS 49

ROP (min/ft) 0 2
MWD GR (API) 0 200
WOB (kLBS) 0 50

TGAS (u) 0 5000 6
C1 (units) 0 5000 6
C2 (units) 0 5000
C3 (units) 0 5000
C4 (units) 0 5000

MWI (ppg) 12
MWO (ppg) 12

MD 8020 TVD 7702.76
INC 86.92 AZ 181.3
VS 211.81

MW 10.15
VIS 50

8050

LS (90%): lt -md gry, gry brn mott, micxtln w/occ calcite inclu, md wl cons, abndt fos grading nto boundstone w/v slty micrite matrix, clayey, occ shly fiss partings; SH (10%)

Reached ICLP of 8,074' @ 03:48 hrs on 10/11/2013

MD 8075 TVD 7704

INC 90.5 AZ 181.3
VS 266.77

Proj. To Bit

8100

END Vertical Hole Log Section,
Begin Horizontal Log Section

Formation Top Picks by John Morgan, Anadarko

Sharon Springs 7,556' (-2,353')
Niobrara A 7,591' (-2,373')
Nobrara B Shale 7,518' (-2,519')
Niobrara C Shoulder 7,605' (-2,606') Ft.
Hays 7,685' (-2,686) Codell
7,701 (-2,702) DMTD
12,330 Production csg
12,315'