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Drilling Dynamics MD

COMPANY ExxonMobil Production
WELL PCU-297-11B8
FIELD PICEANCE CREEK
REGION ROCKY MT
COORDINATES LAT 39.885354000
LON 108.239363000
ELEVATION GL = 7127'
KB = 7154'
COUNTY, STATE RIO BLANCO CO. CO
API INDEX 051031137100
SPUD DATE 4/21/2009
CONTRACTOR HELMERICH_PAYNE
CO. REP. RICKY T. OWENS
RIG/TYPE FLEX 3
LOGGING UNIT MLU051
GEOLOGISTS GEORGE BAKER
BRENDA MARSH
ADD. PERSONS DEVIN CLAAR
BILL JOHANNING
CO. GEOLOGIST MICHAEL HOWELL

LOG INTERVAL

CASING DATA

DEPTHS: 3,717' TO 12,715'
DATES: 11/23/2009 TO 12/04/2009
SCALE: 1" = 100'

16.00" AT 130'
10.75" AT 3,717'
7.00" AT 8,622'
AT

MUD TYPES

HOLE SIZE

SPUD MUD TO 3,717'
LSND TO 12,175'
TO
TO

9.875" TO 8,641'
6.125" TO 12,715'
TO
TO

ABBREVIATIONS

NB NEWBIT	PV PLASTIC VISCOSITY	LC LOST CIRCULATION
RRB RERUN BIT	YP YIELD POINT	CO CIRCULATE OUT
CB CORE BIT	FL FLUID LOSS	NR NO RETURNS
WOB WEIGHT ON BIT	CL PPM CLORIDE ION	TG TRIP GAS
RPM ROTARY REV/MIN	Rm MUD RESISTIVITY	SG SURVEY GAS
PP PUMP PRESSURE	Rmf FILTRATE RESISTIVITY	WG WIPER GAS
SPM STROKES/MIN	PR POOR RETURNS	CG CONNECTION GAS
MW MUD WEIGHT	LAT LOGGED AFTER TRIP	
VIS FUNNEL VISCOSITY	LAS LOGGED AFTER SURVEY	

ALTERED ZONE	CHERT - GLASSY	FELSIC SILIC DIKE	MARL - CALC	SANDSTONE
ANDESITE	CHERT - PORCEL	FOSSIL	METAMORPHICS	SANDSTONE-TUFFACEOUS
ANHYDRITE	CHERT - TIGER STRIPE	GABBRO	MUDSTONE	SERICITIZATION
BASALT	CHERT - UNDIFF	GLASSY TUFF	OBSIDIAN	SERPENTINE
BENTONITE	CLAY	GRANITE	PALEOSOL	SHALE
BIOTITIZATION	CLAY-MUDSTONE	GRANITE WASH	PHOSPHATE	SHALE TUFFACEOUS
BRECCIA	CLYST-TUFFACEOUS	GRANODIORITE	PORCELANITE	SHELL FRAGMENTS
CALCARENITE	CHLORITIZATION	GYPSUM	PORCELANEOUS CLYST	SIDERITE
CALCAREOUS TUFF	COAL	HALITE	PYRITE	SILICIFICATION
CALCILUTITE	CONGLOMERATE	HORNBL-QTZ-DIO	PYROCLASTICS	SILTSTONE
CARBONATES	CONGL. SAND	IGNEOUS (ACIDIC)	QUARTZ DIORITE	SILTST-TUFFACEOUS
CARBONACEOUS MAT	CONGL. SANDSTONE	IGNEOUS (BASIC)	QUARTZ LATITE	TUFF
CARBONACEOUS SH	COQUINA	INTRUSIVES	QUARTZ MONZONITE	VOLCANICLASTICS SEDS
CEMENT CONTAM.	DACITE	KAOLINIC	RECRYSTALLIZED CALCITE	VOLCANICS
CHALK	DIATOMITE	LIMESTONE	RHYOLITE	
CRYSTALLINE TUFF	DIORITE	LITHIC TUFF	SALT	
CHERT - ARGILL	DOLOSTONE	MARL - DOLO	SAND	

Lithology

<0 Ttl Gas 1.5K>
units

<0 CO2 100K>
ppm

<0 Flare Ht. 100>
ft

Depth

<150 Avg RPM 0><200 ROP 0><400 MSE 0>

ft/hr

<30K Avg Torque 0><50 Avg WOB 0>

FTLBS klbs

MGS

Remarks
Survey Data, Mud Reports, Other Info.

<0 Ttl Gas 200Y>
CO2 20K>
Flare Ht. 100Y>

3500

<150 Avg RPM 0><200 ROP 0><400 MSE 0>

<30K Avg Torque 0><50 Avg WOB 0>

ALL ROCK COLORS ARE REFERENCED TO THE GSA ROCK COLOR CHART, ROCK CONSTITUENTS ARE DESCRIBED WET AND LISTED IN ORDER OF MOST ABUNDANT TO LEAST ABUNDANT, ALL SAMPLE DEPTHS ARE REFERENCED TO RKB.

GAS CHROMATOGRAPHY EQUIPMENT IS CALIBRATED TO A TEST GAS COMPOSED OF METHANE = 10000 PPM
ETHANE = 1000 PPM
PROPANE = 1000 PPM
I-BUTANE = 1000 PPM
N-BUTANE = 1000 PPM
I-PENTANE = 1000 PPM
N-PENTANE = 1000 PPM

CO2 IS CALIBRATED TO A TEST GAS COMPOSED OF 100000 PPM

CONNECTION GAS, TRIP GAS, AND WIPER GAS ARE NOTED ON THE MUDLOG, FLARE HEIGHTS AND DEPTHS OF GAS BUSTER USAGE ARE ALSO NOTED.

EARLY CONNECTION GASES REPRESENTING UP HOLE GAS INTERVALS BLEEDING INTO THE BOREHOLE ARE COMMON IN THE PRODUCTION INTERVAL.

EVIDENCE OF FRACTURE FILL IS NOTED ON THE LOG USING THE LITHOLOGY SYMBOL FOR METAMORPHICS. THE 10% DOES NOT REPRESENT 10% FRACTURE FILL IN SAMPLE. IT ONLY INDICATES THAT FRACTURE FILL HAS BEEN OBSERVED OVER THE INTERVAL.

CANRIG WELL SERVICE COMMENCED LOGGING OPERATION ON 11/23/2009 @ 15:45 HRS AT A DEPTH OF 3,317' MD.

SURVEY DATA AT 3647' MD
INCL: 0.43
AZIM: 93.74
TVD: 3606.87

SANDSTONE = BROWNISH GRAY, LIGHT BROWN STAIN, SOME CLEAR/TRANSLUCENT, OFF WHITE WITH BLACK LITHIC SALT AND PEPPER APPEARANCE; PREDOMINATELY QUARTZ; UPPER VERY FINE TO LOWER FINE; SUB ANGULAR IN PART, TRACE SUB ROUND, VERY LOW SPHERICITY; FRIABLE TO SLIGHTLY FIRM TO HARD; GRAIN SUPPORT IN PART; SILICA MATRIX CEMENT, WHITE CLAY/KAOLITE CEMENT, SOME CALCAREOUS CEMENT WITH WEAK HCL REACTION; POOR TO FAIR VISUAL INTER GRANULAR POROSITY; TRACE BLACK CARBONACEOUS SHALE/LITHIC SPECKLED IMBEDDED; TRACE INDIVIDUAL GRAINS IN BOTTOM OF SAMPLE TRAY.

<0 Ttl Gas 200Y>
CO2 20K>
Flare Ht. 100Y>

4000

<150 Avg RPM 0><200 ROP 0><400 MSE 0>

<30K Avg Torque 0><50 Avg WOB 0>

SILTSTONE = MODERATE YELLOWISH BROWN, LIGHT PALE BROWN, PALE GRAYISH ORANGE; CRUNCHY, SEMI BRITTLE TENACITY; PLANAR, SUB BLOCKY TO BLOCKY FRACTURE; WEDGELIKE, TABULAR SUB MASSIVE CUTTINGS HABIT; DULL, RESINOUS, SEMI SPARKLING LUSTER; SILTY GRADING TO GRAINY TEXTURE; TRACE VERY FINE BROWNISH STAIN SANDSTONE IMBEDDED.

SHALE = LIGHT BLuish GRAY, BROWNISH GRAY; FIRM TO SLIGHTLY HARD TENACITY; SUB BLOCKY, BLOCKY FRACTURE; TABULAR, SUB MASSIVE CUTTINGS HABIT; DULL, EARTHY WAXY IN PART LUSTER; SMOOTH TEXTURE; TRACE SILTSTONE IMBEDDED.

SANDSTONE = MODERATE BROWNISH GRAY, LIGHT YELLOWISH BROWN, TRACE BROWNISH STAIN; PREDOMINATELY QUARTZ; LOWER VERY FINE TO UPPER FINE GRAIN; FAIR SORTING; SUB ANGULAR IN PART, SOME SUB ROUND, TRACE VERY LOW SPHERICITY; TRACE INDIVIDUAL FROSTED GRAINS IN BOTTOM OF SAMPLE TRAY; FRIABLE TO FIRM, TRACE HARD; SILICA MATRIX CEMENT, OCC BROWNISH CLAY CEMENT, TRACE CALCAREOUS CEMENT; POOR TO FAIR VISUAL INTER GRANULAR POROSITY; TRACE BLACK CARBONACEOUS SHALE/SHALE-COAL SPECKLED IMBEDDED; GAS SHOWS COMING FROM THIN COAL/CARBONACEOUS SHALE SEAMS WITHIN SANDSTONE FORMATIONS.

SILTSTONE = PALE YELLOWISH BROWN, LIGHT BROWNISH GRAYISH YELLOW; CRUNCHY, CRUMBLY, SOME DENSE TENACITY; EARTHY

BG 12u

MAX GAS 218u

MAX GAS 176u

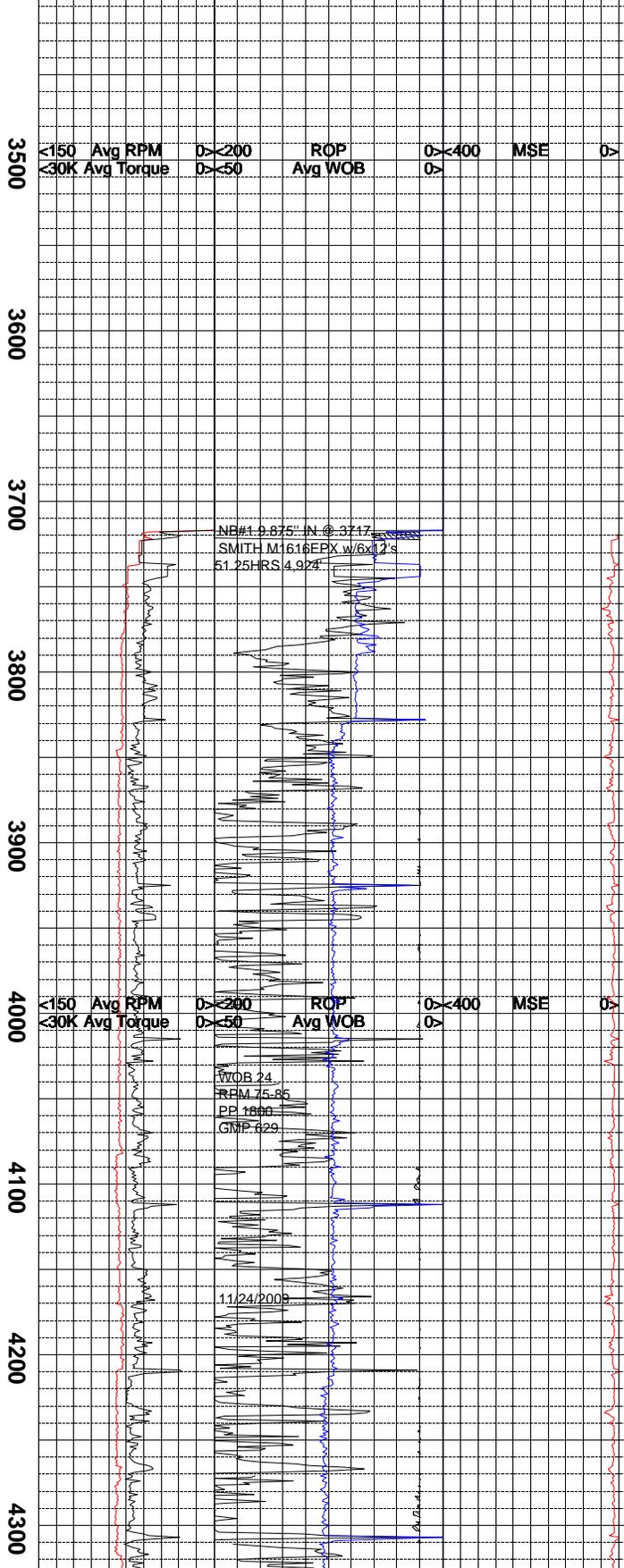
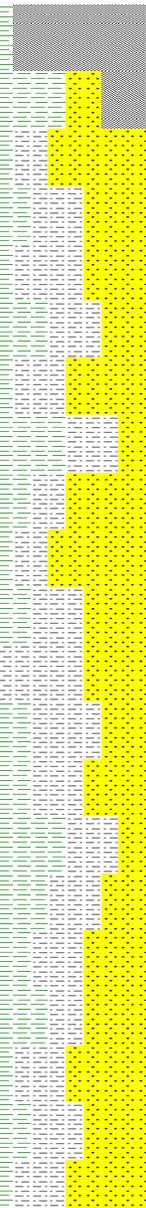
MAX GAS 35u

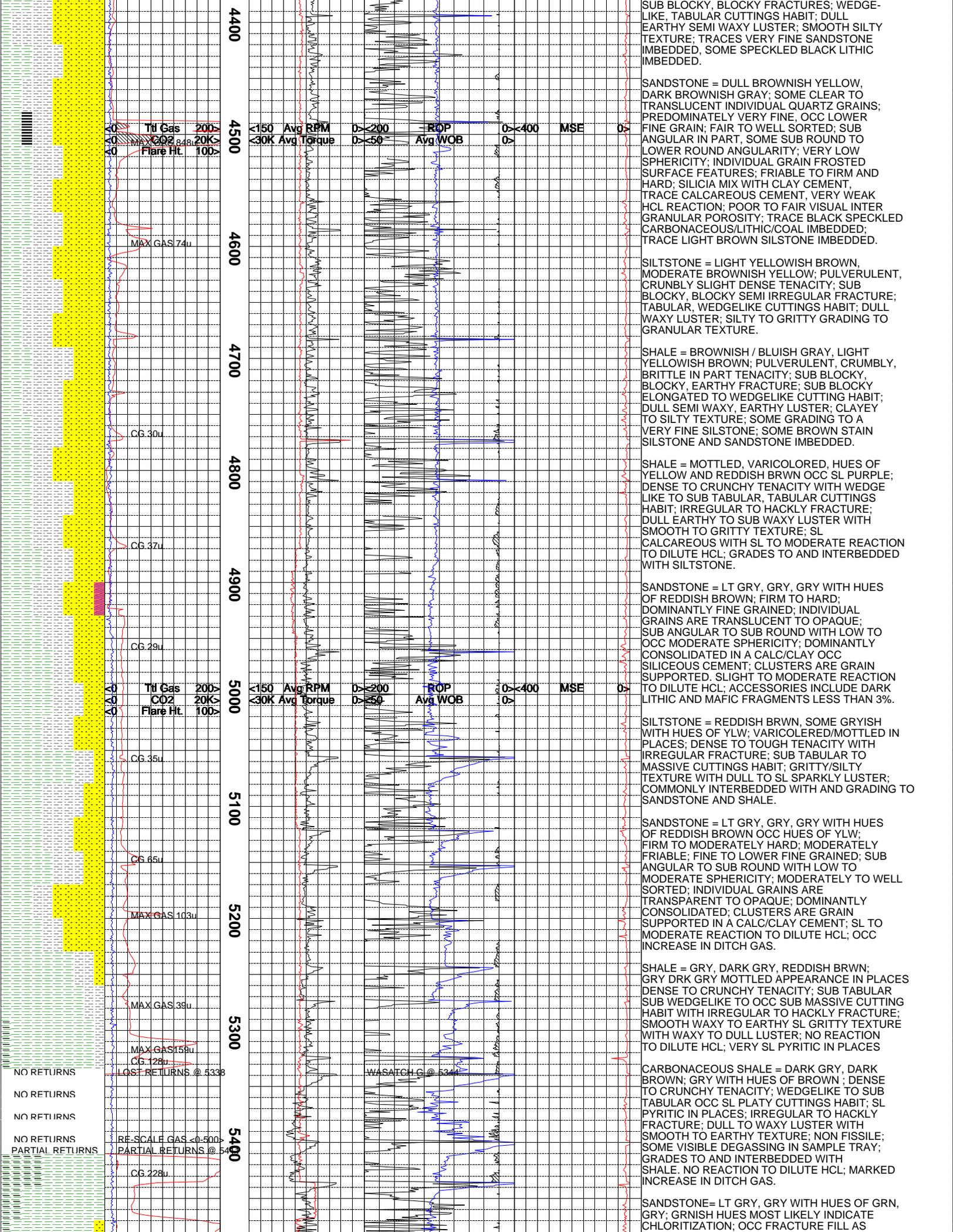
MAX GAS 165u

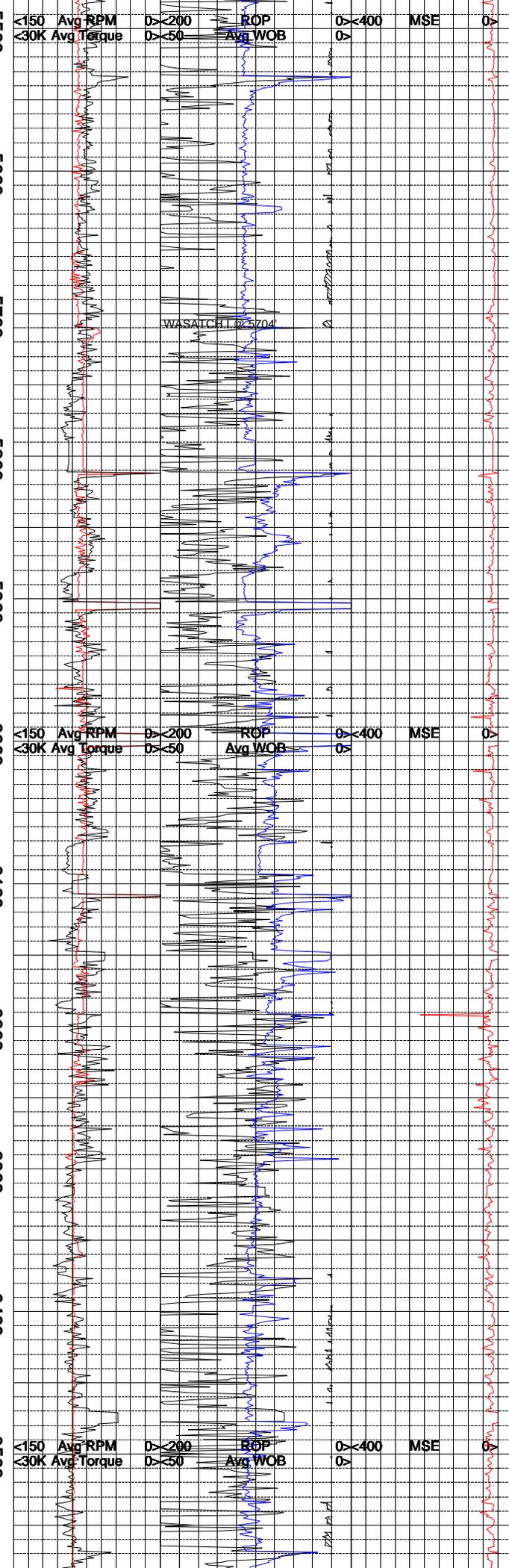
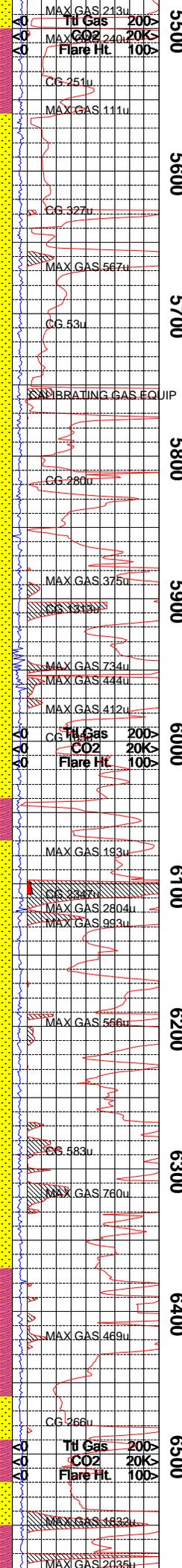
NB#1 9.875" IN @ 3717'
SMITH M1616EPX w/6x12's
51.25 HRS 4.924'

WOB 24
RPM 75-85
PP 1800
GMP 829

11/24/2009







EVIDENCED BY LOOSE CALCITE CRYSTALS; INDIVIDUAL GRAINS ARE SUB ANGULAR TO SUB ROUND WITH LOW SPHERICITY; FINE TO UPPER FINE GRAINED OCC FROSTING; MODERATELY TO WELL SORTED; TRANSPARENT TO OPAQUE; DOMINANTLY GRAIN SUPPORTED IN A CALC/SILICEOUS CEMENT; SL REACTION TO DILUTE HCL; SLIGHT TO MARKED INCREASE IN DITCH GAS.

NOTE: POOR SAMPLE QUALITY DUE TO LCM AMOUNTS IN SYSTEM.

SHALE = GRY, GREENISH GRY, MOTTLED YELLOWISH GRY; GRAYISH BRWN; FIRM CRUNCHY TO DENSE TENACITY; SUB WEDGE LIKE TO SUB TABULAR OCC ELONGATED CUTTINGS HABIT WITH IRREGULAR TO HACKLY FRACTURE; NON FISSILE; SMOOTH TO EARTHY TEXTURE WITH WAXY TO DULL LUSTER; OCC CARBONACEOUS LAMINAE; OCC SL PYRITIC.

SANDSTONE = VERY LT GRY, LT GRY; FINE TO VERY FINE GRAINED; DOMINANTLY CONSOLIDATED WITH LOW TO MODERATE SPHERICITY; MODERATELY WELL SORTED; SUB ANGULAR TO SUB ROUND; ACCESSORIES INCLUDE DARK LITHIC AND MAFIC FRAGMENTS LESS THAN 2%; INCREASE IN DITCH GAS; STRONG REACTION TO DILUTE HCL; CLUSTERS ARE GRAIN SUPPORTED IN A CALC/ SL CLAYEY CEMENT.

CARBONACEOUS SHALE = DARK GRY, DARK BROWN; GRY WITH HUES OF BROWN ; DENSE TO CRUNCHY TENACITY; WEDGELIKE TO SUB TABULAR OCC SL PLATY CUTTINGS HABIT; PYRITIC IN PLACES; IRREGULAR TO HACKLY FRACTURE; DULL TO WAXY LUSTER WITH SMOOTH TO EARTHY TEXTURE; NON FISSILE; SOME VISIBLE DEGASSING IN SAMPLE TRAY; GRADES TO AND INTERBEDDED WITH SHALE. NO REACTION TO DILUTE HCL; MARKED INCREASE IN DITCH GAS. APPEARS TO BE A CARBONACEOUS SILT IN PLACES.

COAL = BLACK, BLACK WITH HUES OF DARK BRWN; SUB TABULAR TO TABULAR SOME SUB WEDGELIKE CUTTINGS HABIT WITH IRREGULAR FRACTURE OCC APPEARS SL CONCHOIDAL; OCC PYRITIC LAMINATIONS/ BANDING; GLASSY TO EARTHY TEXTURE WITH SUB VITREOUS TO WAXY/DULL LUSTER; GRADES TO AND INTERBEDDED WITH CARBONACEOUS SHALE/CARBONACEOUS SILTSTONE; VISIBLE DEGASSING IN SAMPLE TRAY.

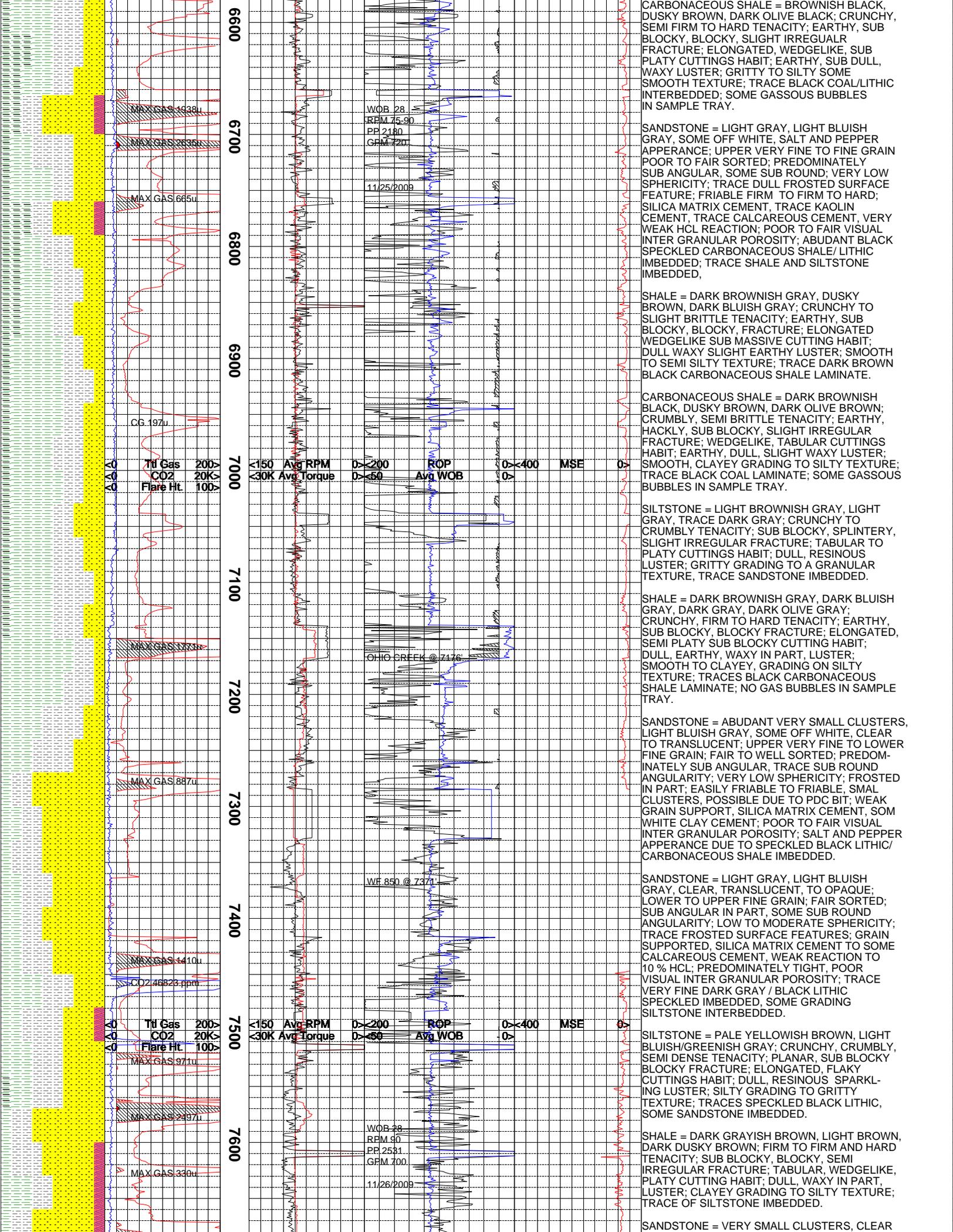
SANDSTONE = LIGHT BLUISH GRAY, LIGHT GRAY, SALT AND PEPPER APPEARANCE; LOWER FINE TO MEDIUM AND TRACE COARSE IMBEDDED; VERY POOR TO POOR SORTED; PREDOMINATELY SUB ANGULAR, TRACE SUB ROUND ANGULARITY; VERY LOW SPHERICITY; TRACE FROSTED SURFACE FEATURES; FRIABLE TO FIRM AND HARD; SOME CLUSTERS SILICIA MATRIX CEMENT, OCCASIONAL WHITE CLAY CEMENT, TRACE CALCAREOUS CEMENT; POOR TO FAIR VISUAL INTER GRANULAR POROSITY; BLACK SPECKLED DISSEMINATED CARBON ACEOUS SHALE/LITHIC/COAL IMBEDDED; TRACE SILTSTONE IMBEDDED.

CARBONACEOUS SHALE = DARK DUSKY BROWN, BROWNISH BLACK, DARK OLIVE GRAY; CRUNCHY, CRUMBLY TENACITY; SUB BLOCKY, BLOCKY SLIGHT IRREGULAR FRACTURE; TABULAR TO SUB PLATY CUTTING HABIT; DULL, EARTHY, SEMI WAXY LUSTER; GRITTY TO SILTY TEXTURE; TRACES COAL IMBEDDED, SOME GASSOUS BUBBLES IN SAMPLE TRAY.

SILTSTONE = MODERATE GRAYISH BROWN, LIGHT YELLOWISH BROWN; PULVERULENT, CRUNCHY TO HARD TENACITY; PLANAR, SUB BLOCKY, BLOCKY FRACTURE; TABULAR, WEDGE-LIKE, SEMI MASSIVE CUTTINGS HABIT; DULL, WAXY, SLIGHTLY RESINOUS LUSTER; GRITTY GRADING TO SILTY TEXTURE; TRACES SILTSTONE GRADING TO SANDTON.

SHALE = MODERATE BLUISH GRAY, LIGHT BROWNISH TO GREENISH GRAY; CRUMBLY TO BRITTLE TENACITY; EARTHY, SUB BLOCKY, BLOCKY SLIGHT IRREGULAR FRACTURE; BLOCKY TO PLATY CUTTINGS HABIT; DULL EARTHY, WAXY IN PART, LUSTER; TRACES DARK CARBONACEOUS SHALE LAMINATE.

SANDSTONE = LIGHT BLUISH GRAY, LIGHT MODERATE GRAY; SALT AND PEPPER APPEARANCE; VERY FINE GRAIN; POOR TO FAIR SORTED; SUB ANGULAR IN PART, TRACE ANGULAR ANGULARITY; VERY LOW SPHERICITY; TRACE FROSTED SURFACE FEATURE; FIRM FRIABLE, HARD, VERY TIGHT; SILICIA MATRIX CEMENT, FAIR VISUAL INTERGRANULAR POROSITY; TRACE BLACK CARBONACEOUS SHALE/LITHIC SPECKLED IMBEDDED.



CARBONACEOUS SHALE = BROWNISH BLACK, DUSKY BROWN, DARK OLIVE BLACK; CRUNCHY, SEMI FIRM TO HARD TENACITY; EARTHY, SUB BLOCKY, BLOCKY, SLIGHT IRREGULAR FRACTURE; ELONGATED, WEDGELIKE, SUB PLATY CUTTINGS HABIT; EARTHY, SUB DULL, WAXY LUSTER; GRITTY TO SILTY SOME SMOOTH TEXTURE; TRACE BLACK COAL/LITHIC INTERBEDDED; SOME GASSOUS BUBBLES IN SAMPLE TRAY.

SANDSTONE = LIGHT GRAY, LIGHT BLUISH GRAY, SOME OFF WHITE, SALT AND PEPPER APPEARANCE; UPPER VERY FINE TO FINE GRAIN POOR TO FAIR SORTED; PREDOMINATELY SUB ANGULAR, SOME SUB ROUND; VERY LOW SPHERICITY; TRACE DULL FROSTED SURFACE FEATURE; FRIABLE FIRM TO FIRM TO HARD; SILICA MATRIX CEMENT, TRACE KAOLIN CEMENT, TRACE CALCAREOUS CEMENT, VERY WEAK HCL REACTION; POOR TO FAIR VISUAL INTER GRANULAR POROSITY; ABUDANT BLACK SPECKLED CARBONACEOUS SHALE/ LITHIC IMBEDDED; TRACE SHALE AND SILTSTONE IMBEDDED,

SHALE = DARK BROWNISH GRAY, DUSKY BROWN, DARK BLUISH GRAY; CRUNCHY TO SLIGHT BRITTLE TENACITY; EARTHY, SUB BLOCKY, BLOCKY, FRACTURE; ELONGATED WEDGELIKE SUB MASSIVE CUTTING HABIT; DULL WAXY SLIGHT EARTHY LUSTER; SMOOTH TO SEMI SILTY TEXTURE; TRACE DARK BROWN BLACK CARBONACEOUS SHALE LAMINATE.

CARBONACEOUS SHALE = DARK BROWNISH BLACK, DUSKY BROWN, DARK OLIVE BROWN; CRUMBLY, SEMI BRITTLE TENACITY; EARTHY, HACKLY, SUB BLOCKY, SLIGHT IRREGULAR FRACTURE; WEDGELIKE, TABULAR CUTTINGS HABIT; EARTHY, DULL, SLIGHT WAXY LUSTER; SMOOTH, CLAYEY GRADING TO SILTY TEXTURE; TRACE BLACK COAL LAMINATE; SOME GASSOUS BUBBLES IN SAMPLE TRAY.

SILTSTONE = LIGHT BROWNISH GRAY, LIGHT GRAY, TRACE DARK GRAY; CRUNCHY TO CRUMBLY TENACITY; SUB BLOCKY, SPLINTERY, SLIGHT IRREGULAR FRACTURE; TABULAR TO PLATY CUTTINGS HABIT; DULL, RESINOUS LUSTER; GRITTY GRADING TO A GRANULAR TEXTURE, TRACE SANDSTONE IMBEDDED.

SHALE = DARK BROWNISH GRAY, DARK BLUISH GRAY, DARK GRAY, DARK OLIVE GRAY; CRUNCHY, FIRM TO HARD TENACITY; EARTHY, SUB BLOCKY, BLOCKY FRACTURE; ELONGATED, SEMI PLATY SUB BLOCKY CUTTING HABIT; DULL, EARTHY, WAXY IN PART, LUSTER; SMOOTH TO CLAYEY, GRADING ON SILTY TEXTURE; TRACES BLACK CARBONACEOUS SHALE LAMINATE; NO GAS BUBBLES IN SAMPLE TRAY.

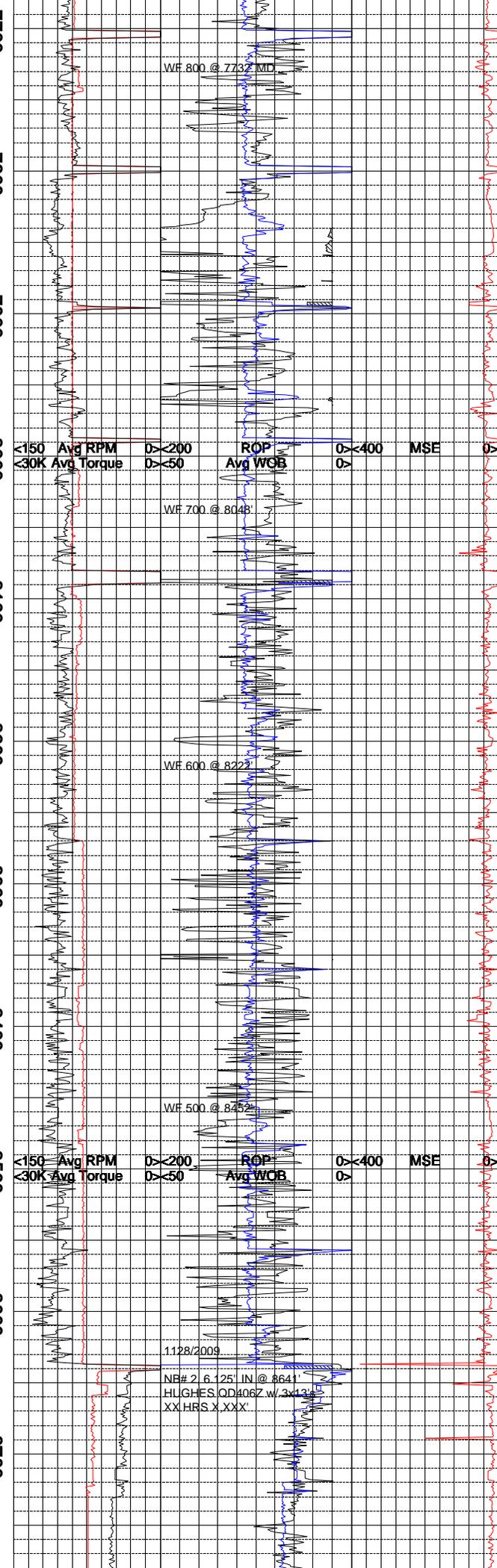
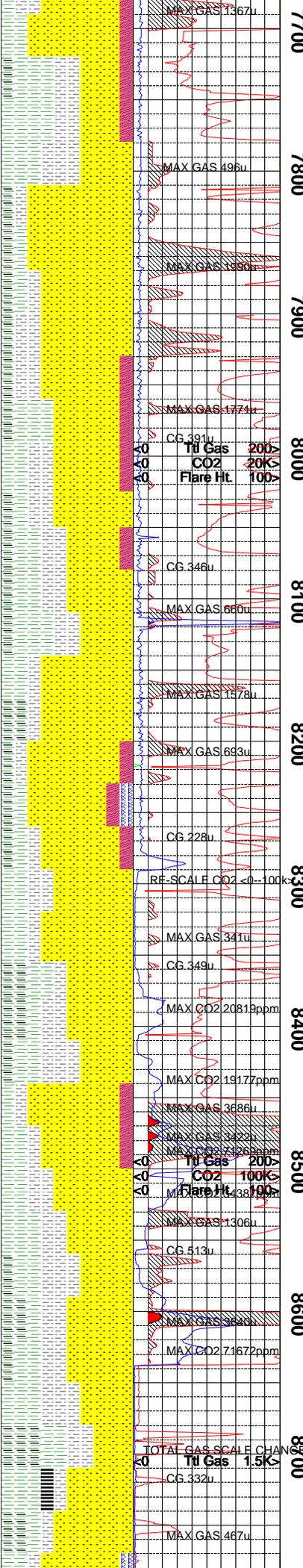
SANDSTONE = ABUDANT VERY SMALL CLUSTERS, LIGHT BLUISH GRAY, SOME OFF WHITE, CLEAR TO TRANSLUCENT; UPPER VERY FINE TO LOWER FINE GRAIN; FAIR TO WELL SORTED; PREDOMINATELY SUB ANGULAR, TRACE SUB ROUND ANGULARITY; VERY LOW SPHERICITY; FROSTED IN PART; EASILY FRIABLE TO FRIABLE, SMALL CLUSTERS, POSSIBLE DUE TO PDC BIT; WEAK GRAIN SUPPORT, SILICA MATRIX CEMENT, SOM WHITE CLAY CEMENT; POOR TO FAIR VISUAL INTER GRANULAR POROSITY; SALT AND PEPPER APPEARANCE DUE TO SPECKLED BLACK LITHIC/ CARBONACEOUS SHALE IMBEDDED.

SANDSTONE = LIGHT GRAY, LIGHT BLUISH GRAY, CLEAR, TRANSLUCENT, TO OPAQUE; LOWER TO UPPER FINE GRAIN; FAIR SORTED; SUB ANGULAR IN PART, SOME SUB ROUND ANGULARITY; LOW TO MODERATE SPHERICITY; TRACE FROSTED SURFACE FEATURES; GRAIN SUPPORTED, SILICA MATRIX CEMENT TO SOME CALCAREOUS CEMENT, WEAK REACTION TO 10 % HCL; PREDOMINATELY TIGHT, POOR VISUAL INTER GRANULAR POROSITY; TRACE VERY FINE DARK GRAY / BLACK LITHIC SPECKLED IMBEDDED, SOME GRADING SILTSTONE INTERBEDDED.

SILTSTONE = PALE YELLOWISH BROWN, LIGHT BLUISH/GREENISH GRAY; CRUNCHY, CRUMBLY, SEMI DENSE TENACITY; PLANAR, SUB BLOCKY BLOCKY FRACTURE; ELONGATED, FLAKY CUTTINGS HABIT; DULL, RESINOUS SPARKLING LUSTER; SILTY GRADING TO GRITTY TEXTURE; TRACES SPECKLED BLACK LITHIC, SOME SANDSTONE IMBEDDED.

SHALE = DARK GRAYISH BROWN, LIGHT BROWN, DARK DUSKY BROWN; FIRM TO FIRM AND HARD TENACITY; SUB BLOCKY, BLOCKY, SEMI IRREGULAR FRACTURE; TABULAR, WEDGELIKE, PLATY CUTTING HABIT; DULL, WAXY IN PART, LUSTER; CLAYEY GRADING TO SILTY TEXTURE; TRACE OF SILTSTONE IMBEDDED.

SANDSTONE = VERY SMALL CLUSTERS, CLEAR



TRANSLUCENT TO OPAQUE, LIGHT BLUISH GRAY SOME OFF WHITE; VERY FINE TO FINE GRAIN; FAIR SORTING; PREDOMINATELY SUB ANGULAR, SOME SUB ROUND; LOW SPHERICITY; EASILY FRIABLE TO FRIABLE; WEAK GRAIN SUPPORT, SILICIA CEMENT, SOME WEAK CALCAREOUS CEMENT; SMALL CLUSTER WITH SPECKLED BLACK LITHIC/CARBONACEOUS SHALE; FAIR TO GOOD INTER GRANULAR POROSITY, COARSE CALCITE CRYSTALS IN SAMPLE TRAY.

SANDSTONE = ABUNDANT LOOSE GRAINS, VERY SMALL CLUSTERS, SALT AND PEPPER APPEAR; LIGHT BLUISH GRAY; LOWER VERY FINE TO UPPER FINE GRAIN; WELL SORTED; PREDOMINATELY SUB ANGULAR, GRADING TO SUB ROUND; LOW TO MODERATELY LOW SPHERICITY; CLEAR TO FROSTED SURFACE FEATURES; VERY WEAK GRAIN SUPPORT, EASILY FRIABLE, TO FRIABLE; SILICIA MATRIX CEMENT, TRACE CALCAREOUS CEMENT, ABUNDANT BLACK LITHIC/CARBONACEOUS SHALE SPECKLED IMBEDDED.

SANDSTONE = ABUNDANT SMALL CLUSTER AND INDIVIDUAL GRAINS, CLEAR TO TRANSLUCENT, SALT AND PEPPER APPEARANCE, LIGHT GRAYISH BLUE; VERY FINE TO FINE GRAIN, WELL SORTED; SUB ANGULAR IN PART, SOME SEMI SUB ROUND, MODERATE LOW SPHERICITY; FROSTED IN PART SURFACE FEATURES; EASILY FRIABLE TO FRIABLE; WEAK GRAIN SUPPORT, SILICIA MATRIX CEMENT, TRACE CALCAREOUS CEMENT, ABUNDANT BLACK SPECKLED LITHIC/CARBONACEOUS SHALE IMBEDDED, SILTSTONE GRADING TO SANDSTONE

CARBONACEOUS SHALE / LITHIC = BLACK, DARK BROWNISH BLACK, DARK OLIVE BLACK; CRUNCHY, BRITTLE TENACITY; SUB BLOCKY TO BLOCKY FRACTURES; FLAKY TO PLATY CUTTINGS HABIT; DULL EARTHY, WAXY IN PART LUSTER; SILTY GRADING TO GRITTY TEXTURE; TRACE BLACK LITHIC IMBEDDED IN SANDSTONE SMALL CLUSTERS.

SANDSTONE = LT GRY, GRY, GRY WITH GRNISH HUES; DOMINANTLY CONSOLIDATED; LOOSE GRAINS IN SMPL TRAY ASSOCIATED WITH BIT ACTION; CLUSTERS ARE GRAIN SUPPORTED IN A CALC/CLAY/ OCC SILICEOUS CEMENT; CLAY CONTENT OF MATRIX INCREASES IN PLACES; INDIVIDUAL GRAINS ARE TRANSPARENT TO OPAQUE; FINE TO UPPER FINE GRAINED; WELL SORTED WITH LOW TO MODERATE SPHERICITY; ACCESSORIES INCLUDE DARK LITHIC AND MAFIC FRAGMENTS 3-5%; SL TO NO REACTION TO DILUTE HCL WITH SLIGHT TO MARKED INCREASE IN DITCH GAS.

SILTSTONE = LIGHT GRY, GRY, GRY WITH SL GRN HUES, TRACE DARK GRAY; CRUNCHY TO DENSE TENACITY; SUB BLOCKY TO SUB TAB, IRREGULAR TO HACKLY FRACTURE, HARD; DULL TO SL RESINOUS LUSTER WITH GRITTY SILTY TEXTURE GRADES TO UPPER VERY FINE GRAINED SANDSTONE. OCC CARBONACEOUS MATERIAL WITHIN.

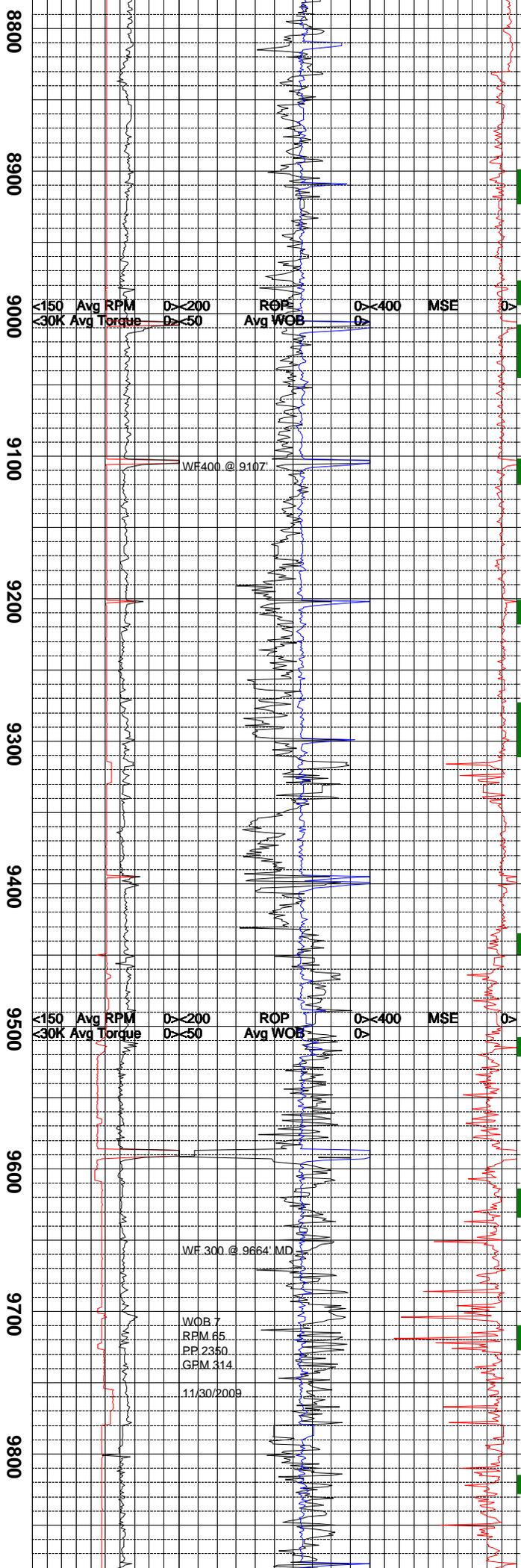
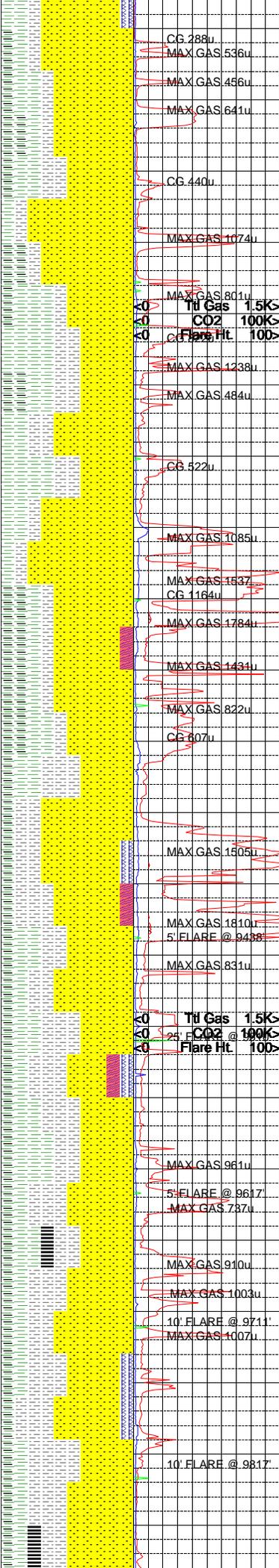
SANDSTONE = LT GRY, GRY, DRK GRY; GRY W/ GRNISH HUES; DOM CONSOLIDATED; LOOSE GRAINS IN SMPL TRAY ASSOCIATED WITH BIT ACTION; CLUSTERS ARE GRAIN SUPPORTED IN A CALC/CLAY/ OCC SILICEOUS CEMENT; CLAY CONTENT OF MATRIX INCREASES IN PLACES; INDIVIDUAL GRAINS ARE TRANSPARENT TO OPAQUE; FINE TO UPPER FINE GRAINED; WELL SORTED WITH LOW TO MODERATE SPHERICITY; ACCESSORIES INCLUDE DARK LITHIC AND MAFIC FRAGMENTS 3-5%; SL TO NO REACTION TO DILUTE HCL WITH SLIGHT TO MARKED INCREASE IN DITCH GAS. OCC CARBONACEOUS MATERIAL AND LAMINAE.

SANDSTONE = LT GRY, OFF WHT; DOMINANTLY UNCONSOLIDATED; INDIVIDUAL GRAINS ARE SUB ANGULAR TO SUB ROUND OCC ROUNDED; MODERATE SPHERICITY, WELL SORTED; CLEAN. LARGE QUANTITIES OF CALCITE CRYSTALS IN SAMPLE SOME MUD ADDITIVE SOME MOST LIKELY FRACTURE FILL. MARKED INCREASE IN DITCH GAS.

NOTE = TD FOR INTERMEDIATE CASING AT 8641' MD ON 11/26/2009 AT 11:25HRS.

NOTE = RESUMED DRILLING PRODUCTION HOLE ON 11/29/2009 AT 06:14HRS.

SANDSTONE = LT GRY, GRY, GRY WITH HUES WHITE BIT SMEARS WHERE KAOLINITIC; FIRM TO SLIGHTLY HARD; MODERATELY FRIABLE; FINE TO UPPER FINE GRAINED; SUB ANGULAR TO SUB ROUND WITH LOW TO MODERATE SPHERICITY; MODERATELY TO WELL SORTED; INDIVIDUAL GRAINS ARE TRANSPARENT TO OPAQUE; DOMINANTLY CONSOLIDATED; CLUSTERS ARE GRAIN SUPPORTED IN A CALC/CLAY CEMENT; STRONG TO MODERATE REACTION TO DILUTE HCL; MARKED INCREASE IN DITCH GAS;



ACCESSORIES INCLUDE DARK LITHIC AND MAFIC FRAGMENTS LESS THAN 5%.

CARBONACEOUS SHALE = DARK BRWN, DARK GRY; GRY WITH HUES OF BRWN; DENSE TO CRUNCHY TENACITY WITH SUB WEDGELIKE TO SUB TABULAR CUTTINGS HABIT; IRREGULAR TO HACKLY FRACTURE SL PLATY WHERE CUTTING IS MORE PLANAR; EARTHY TO GRITTY TEXTURE WITH DULL TO SUB WAXY LUSTER; GRADES TO SHALE IN PLACES.

SILTSTONE = LIGHT GRY, GRAY, OCC DRK GRY, SUB BLCKY TO SUB TABULAR CUTTINGS HABIT WITH IRREGULAR TO HACKLY FRACTURE; HARD; DULL TO SL SPARKLY LUSTER WITH GRITTY TO EARTHY TEXTURE, UPPER FIRM TO HARD. OCC GRADES TO VERY FINE SANDSTONE.

CARBONACEOUS SHALE = DARK BROWN, BROWNISH BLACK, DARK OLIVE GRAY; CRUNCHY TO DENSE TENACITY; IRREGULAR TO HACKLY FRACTURE, OCC PLANAR IN PLACES TABULAR TO SUB PLATY CUTTING HABIT; DULL EARTHY TO SUB WAXY LUSTER; SMOOTH TO SILTY TEXTURE; GRADES TO AND INTERBEDDED WITH SHALES AND SILTS.

SANDSTONE = VERY LT GRY, LT GRY, GRY WITH HUES OF WHT; INDIVIDUAL GRAINS ARE TRANSPARENT TO OPAQUE; SUB ANGULAR TO SUB ROUND WITH MODERATE SPHERICITY; FINE TO UPPER FINE GRAINED; WELL SORTED; CONSOLIDATED CLUSTERS ARE GRAIN SUPPORTED IN CALC /CLAY OCC SILICEOUS CEMENT; SALT AND PEPPER APPEARANCE WITH BIT SMEAR MARKS WHERE CLAY MATRIX INCREASES; ACCESSORIES INCLUDE DARK LITHIC AND MAFIC FRAGMENTS LESS THAN 5%; MARKED INCREASE IN DITCH GAS; MODERATE TO STRONG REACTION TO DILUTE HCL.

CARBONACEOUS SHALE - DARK BROWN, BROWNISH BLACK, DULL BLACK, DARK DUSKY BROWN; CRUMBLY, BRITTLE TO HARD TENACITY; PLANAR, SPLINTERY, SUB BLOCKY FRACTURE; ELONGATED, FLAKY CUTTINGS HABIT; DULL EARTHY, SEMI VITREOUS LUSTER; SILTY, CLAYEY TO SMOOTH TEXTURE; TRACE GASEOUS BUBBLES IN SAMPLE TRAY, TRACE COAL INTERBEDDED WITH CARBONACEOUS SHALE; MOST CARBONACEOUS SHALE/COAL IS THINLY BEDDED STREAMERS IN SANDSTONE FORMATION.

SILTSTONE = LIGHT GRAY, LIGHT BLUISH GRAY; PULVERULENT, CRUMBLY TENACITY; PLANAR, SUB BLOCKY, BLOCKY SEMI IRREGULAR FRACTURE; WEDGELIKE, PLATY CUTTINGS HABIT; DULL, GEMLIKE LUSTER; SILTY GRADING TO GRITTY TEXTURE; TRACE BLACK CARBONACEOUS SHALE AND SANDSTONE IMBEDDED.

SANDSTONE = ABUNDANT INDIVIDUAL GRAINS AND SMALL CLUSTERS, LIGHT GRAY, LIGHT BLUISH GRAY, CLEAR TO TRANSLUCENT, SALT AND PEPPER APPEARANCE; UPPER VERY FINE TO LOWER FINE GRAIN, WELL SORTED; SUB ANGULAR IN PART, SOME SUB ROUND, VERY LOW SPHERICITY; OCCASIONAL FROSTED SURFACE FEATURES; CLAY/SILICEOUS CEMENT, TRACE CALCAREOUS CEMENT, WEAK HCL REACTION; PREDOMINATELY SMALL CLUSTERS WITH BLACK SPECKLED CARBONACEOUS SHALE IMBEDDED; TRACE CALCITE CRYSTALS; TRACE SANDSTONE AND SILTSTONE LAMINATE.

COAL = BLACK, DARK BLACKISH BROWN; PULVERULENT, CRUNCHY, TENACITY; SUB BLOCKY, BLOCKY, SPLINTERY, FRACTURE; ELONGATED, FLAKY TO PLATY CUTTINGS HABIT VITREOUS, LUSTER; SOME HIGH SPIKES IN GAS ASSOCIATED WITH THIN COAL SEAMS IN SANDSTONE FORMATION.

SANDSTONE = CLEAR, TRANSLUCENT, OPAQUE, ABUNDANT INDIVIDUAL GRAINS, SMALL CLUSTERS, SALT AND PEPPER APPEARANCE; UPPER VERY FINE TO LOWER FINE GRAIN; PREDOMINATELY FAIR SORTED; SUB ANGULAR IN PART, SOME SUB ROUND, VERY LOW SPHERICITY; TRACE FROSTED SURFACE FEATURE; EASILY FRIABLE TO FRIABLE, ABUNDANT SMALL CLUSTERS POSSIBLE DUE TO PDC BIT; KAOLIN/CLAY/SILICEOUS CEMENT TRACE CALCAREOUS CEMENT; GOOD VISUAL INTERGRANULAR POROSITY; ABUNDANT BLACK SPECKLED CARBONACEOUS SHALE/LITHIC IMBEDDED; TRACE LIGHT GRAY SILTSTONE LAMINATE.

CARBONACEOUS SHALE = BLACK, BLACKISH BROWN, DUSKY GRAYISH BROWN; CRUNCHY, CRUMBLY, SOME BRITTLE TENACITY; SUB BLOCKY, BLOCKY, SOME SPLINTERY FRACTURE; FLAKY TO PLATY CUTTINGS HABIT; DULL SEMI WAXY TO RESINOUS LUSTER; SMOOTH TO GRITTY TEXTURE; TRACE BLACK COAL LAMINATE, TRACE SILTSTONE IMBEDDED.

<150 Avg RPM D>200 ROP D>400 MSE D>
 <30K Avg Torque D>50 Avg WOB D>

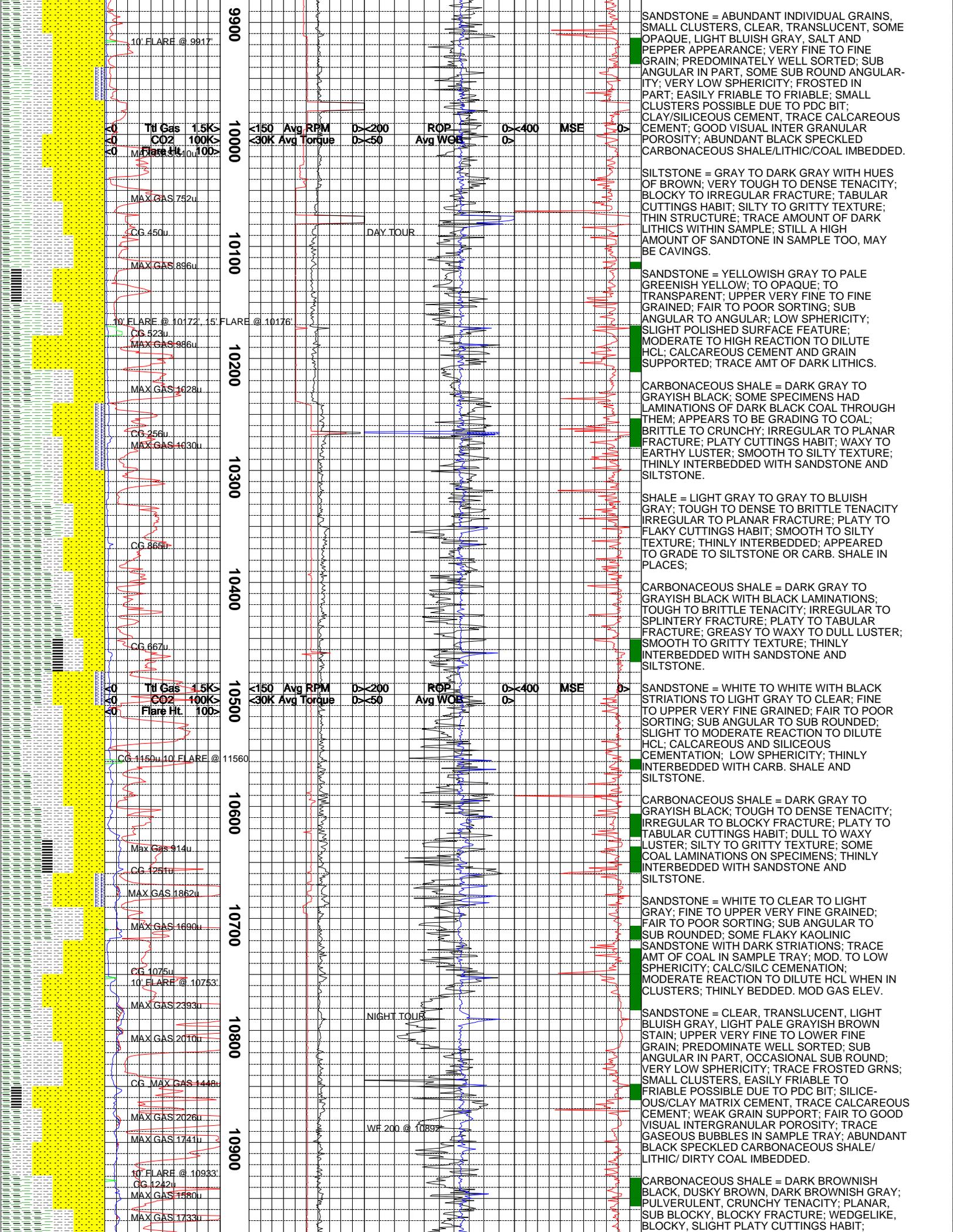
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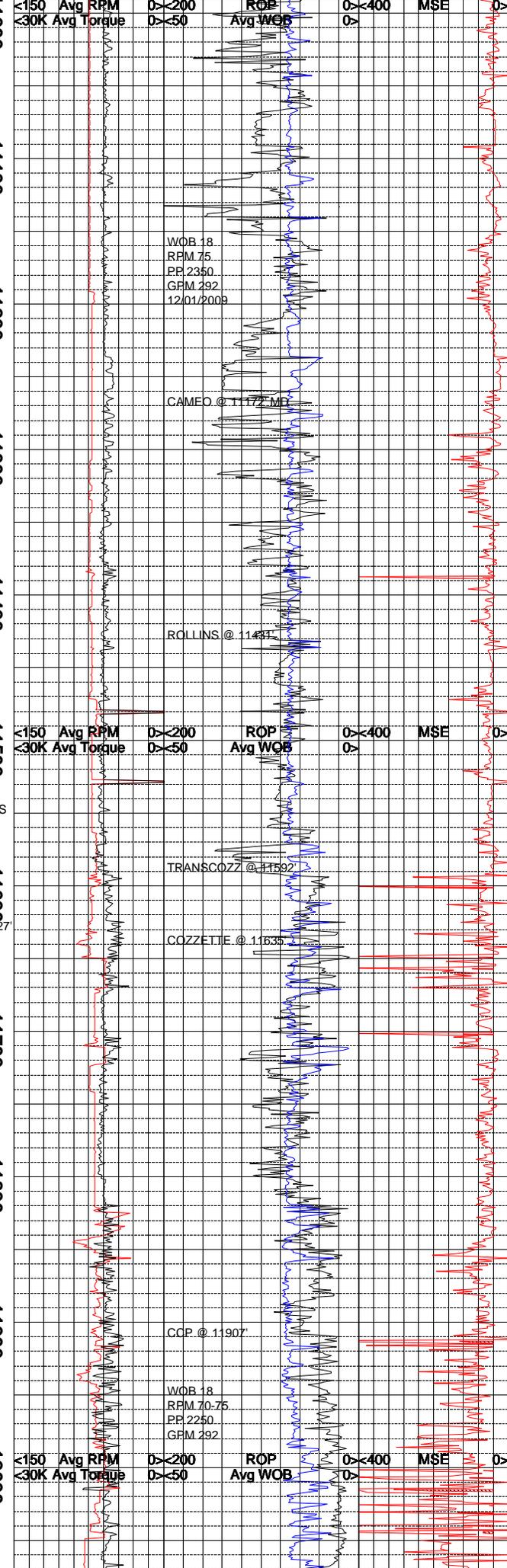
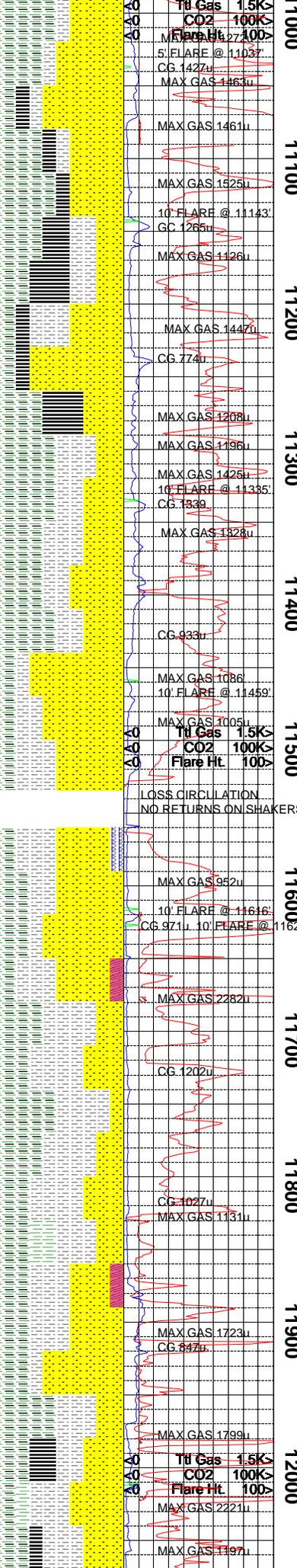
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WF 300 @ 9664' MD

WOB 7
 RPM 65
 PP 2350
 GFM 314
 11/30/2009

CG 288u
 MAX GAS 536u
 MAX GAS 456u
 MAX GAS 641u
 CG 440u
 MAX GAS 1074u
 MAX GAS 801u
 Ti Gas 1.5K
 CO2 100K
 Flare Hit 100
 MAX GAS 1238u
 MAX GAS 484u
 CG 522u
 MAX GAS 1085u
 MAX GAS 1537
 CG 1164u
 MAX GAS 1784u
 MAX GAS 1434u
 MAX GAS 822u
 CG 607u
 MAX GAS 1505u
 MAX GAS 1810u
 5 FLARE @ 9438
 MAX GAS 831u
 Ti Gas 1.5K
 CO2 100K
 Flare Hit 100
 MAX GAS 961u
 5 FLARE @ 9617
 MAX GAS 737u
 MAX GAS 910u
 MAX GAS 1003u
 10 FLARE @ 9711
 MAX GAS 1007u
 10 FLARE @ 9817





DULL, EARTHY, SEMI WAXY LUSTER; GRITTY TO SILTY TEXTURE; TRACE SANDSTONE IMBEDDED, TRACE GASEOUS BUBBLES IN SAMPLE TRAY.

SANDSTONE = LIGHT BROWNISH GRAY STAIN, MODERATE GRAYISH BROWN, SOME CLEAR, TRANSLUCENT, DULL SALT AND PEPPER APPEARANCE; VERY FINE TO FINE GRAIN; PREDOMINATELY FAIR SORTED; SUB ANGULAR IN PART; EASILY FRIABLE, FRIABLE; CLAY/SILICEOUS CEMENT; POOR TO FAIR VISUAL INTER GRANULAR POROSITY; ABUNDANT BLACK SPECKLED CARBONACEOUS SHALE/COAL.

COAL = DARK BLACKISH BROWN, BLACK, PULVERULENT, SUB BLOCKY TO IRREGULAR FRACTURE; FLAKY, PLATY CUTTINGS HABIT; VITREOUS LUSTER, SMOOTH TEXTURE; GASEOUS BUBBLES IN SAMPLE TRAY, HIGH GAS SHOWS.

CARBONACEOUS SHALE = BLACKISH BROWN, BLACK, DARK OLIVE BLACK; PULVERULENT, CRUNCHY TEXTURE; PLANAR, SUB BLOCKY, BLOCKY FRACTURE; WEDGELIKE, PLATY CUTTINGS HABIT; DULL WAXY, SEMI EARTHLY LUSTER; GRITTY TO SILTY TEXTURE; SOME BLACK COAL LAMINATE/IMBEDDED; GASEOUS BUBBLES IN SAMPLE TRAY.

SILTSTONE = LIGHT GRAY, DARK GRAY; PULVERULENT, SLIGHT CRUNCHY; SUB BLOCKY TO BLOCKY FRACTURE; WEDGELIKE, FLAKY IN PART CUTTINGS HABIT; DULL GEMLIKE LUSTER; GRITTY GRADING TO GRANULAR TEXTURE; TRACE SANDSTONE AND CARBONACEOUS SHALE IMBEDDED.

ROLLINS SANDSTONE = CLEAR, TRANSLUCENT, LIGHT BROWNISH GRAY STAIN, SOME LIGHT GRAY, TRACE LIGHT BROWN LITHIC W/ SALT AND PEPPER APPEARANCE; PREDOMINATELY QUARTZ FRAMEWORK; LOWER TO UPPER FINE GRAIN; WELL SORTED; SUB ANGULAR IN PART; VERY LOW SPHERICITY; TRACE FROSTED FEATURES; VERY WEAK GRAIN SUPPORT; EASILY FRIABLE, FRIABLE, SILICA MATRIX CEMENT, TRACE CALCAREOUS CEMENT; LIGHT BROWNISH LITHIC IMBEDDED, FAIR TO GOOD VISUAL INTERGRANULAR POROSITY.

LOSS CIRCULATION FROM 11527' TO 11561'

CARBONACEOUS SHALE = DARK DUSKY BROWN, BLACKISH BROWN; PULVERULENT, CRUNCHY TENACITY; PLANAR, SUB BLOCKY FRACTURES; TABULAR TO PLATY CUTTINGS HABIT; DULL EARTHLY, SEMI WAXY, LUSTER; GRITTY GRADING TO GRANULAR TEXTURE; TRACE BLACK COAL LAMINATE, SOME GASEOUS BUBBLES IN SAMPLE TRAY.

SANDSTONE = WHITE TO TRANSLUCENT TO SOMETIME TRANSPARENT; ABUNDANT LOOSE GRAINS; WHEN IN CLUSTERS IS GRAIN SUPPORTED; FINE TO MEDIUM GRAINED; FAIR TO WELL SORTING; SUB ANGULAR TO ANGULAR; LOW SPHERICITY; SLIGHT TO NO REACTION TO DIUTUTE HCL; TRACE AMT OF COURSE CALCITE CRYSTALS AS POSSIBLE FRACTURE FILL IN SAMPLE TRAY; TRACE AMT OF COAL, POSSIBLE CAVINGS;

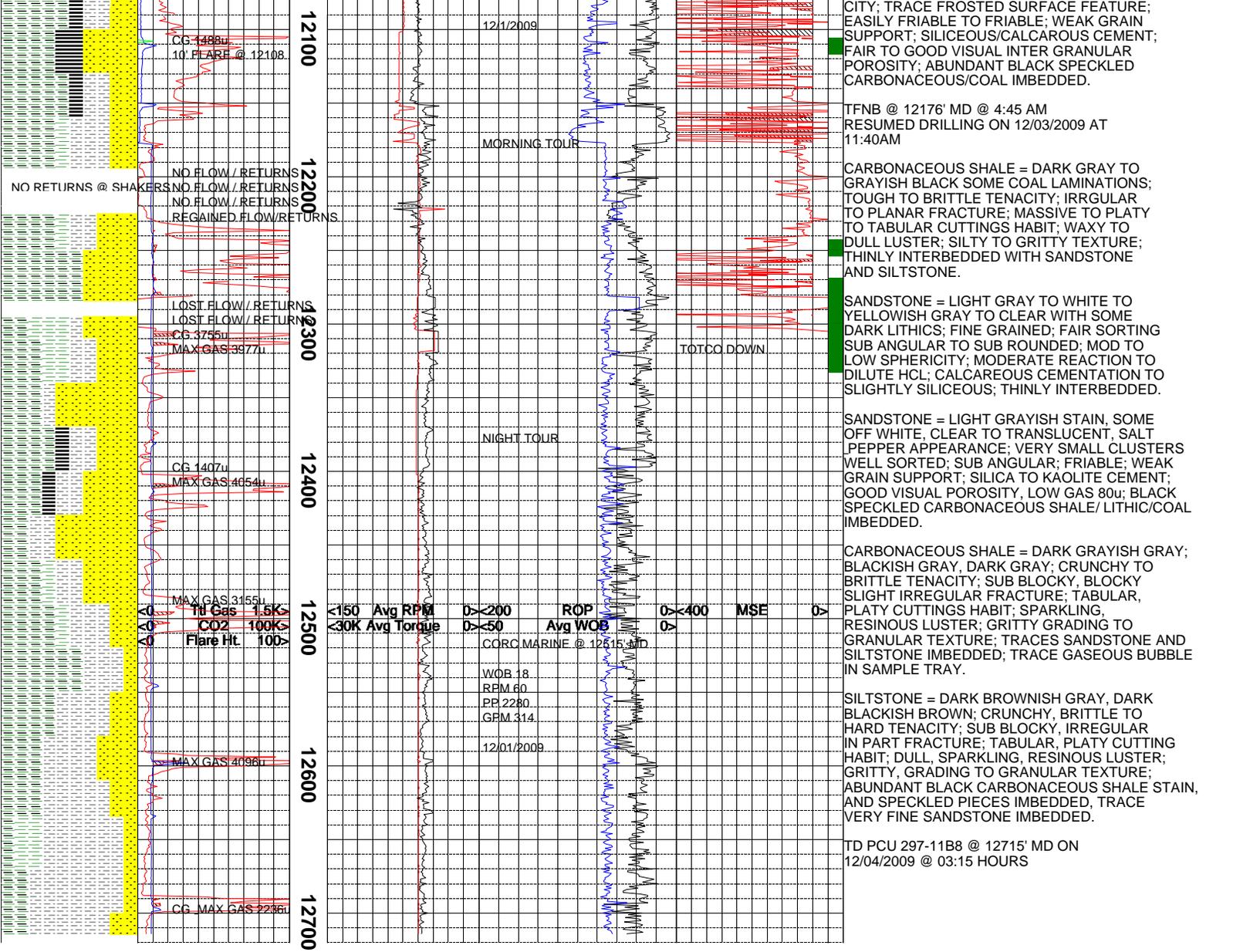
SILTSTONE = DUSKY BROWN TO GRAYISH BLACK TO BROWNISH BLACK; VERY TOUGH TO DENSE TENACITY; IRREGULAR TO BLOCKY FRACTURE; TABULAR TO NODULAR CUTTINGS HABIT; WAXY TO DULL TO SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; THINLY INTERBEDDED WITH CARB. SHALE AND SANDSTONE; TRACE AMT OF COAL AND PYRITE IN WITH THE SAMPLE.

CARBONACEOUS SHALE = DARK GRAY TO GRAYISH BLACK WITH BLACK COAL LAMINATIONS THROUGHOUT; TOUGH TO DENSE TO SOME TIMES BRITTLE; PLATY TO TABULAR CUTTINGS HABIT; WAXY TO DULL LUSTER; SMOOTH TO SILTY TEXTURE; THINLY INTERBEDDED WITH SILTSTONE AND SANDSTONE.

SILTSTONE = DARK GRAY TO DUSKY BROWN; TOUGH TO DENSE TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO TABULAR CUTTINGS HABIT; SILTY TO GRANULAR TEXTURE; THINLY INTERBEDDED WITH SANDSTONE AND SILTSTONE; TRACE AMT OF PYRITE IN SAMPLE TRAY 1-3%.

COAL = BLACK; CRUMBLY TO CRUNCHY TENACITY; SUB BLOCKY, SPLINTERY FRACTURE; FLAKY TO PLATY CUTTINGS HABIT; VITREOUS LUSTER; SMOOTH TEXTURE; THIN SEAMS IN SANDSTONE FORMATIONS.

SANDSTONE = CLEAR, TRANSLUCENT, SMALL CLUSTERS, LIGHT BLuish GRAY, SALT AND PEPPER APPEARANCE; VERY FINE TO FINE GRAIN; SUB ANGULAR IN PART, LOW SPHERI-



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