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## Drilling Dynamics MD

**COMPANY** ExxonMobil Corporation  
**WELL** PCU 296-5A04  
**FIELD** Piceance Creek  
**REGION** Rockies  
**COORDINATES** 39.911931000  
108.198593000  
**ELEVATION** 7295.8'  
**COUNTY, STATE** Rio Blanco, CO  
**API INDEX** 051031124500  
**SPUD DATE** 11/09/2009  
**CONTRACTOR** Helmerich and Payne  
**CO. REP.** Candice Curtis/Mark Hudon  
**RIG/TYPE** Flex 4/Rig 321  
**LOGGING UNIT** 031  
**GEOLOGISTS** Chad Record, Mike Franco,  
Bart Smelser, Mark Gross  
**ADD. PERSONS** Mickey Piper,  
Robert McCane  
**CO. GEOLOGIST** Chris Alba

### LOG INTERVAL

### CASING DATA

**DEPTHS:** 4705' TO 13757'  
**DATES:** 10/31/2010 TO 12/08/2010  
**SCALE:** 1" = 100'

16" AT 150'  
10.75" AT 4616'  
7.00" AT 9992'  
4.50" AT 13735'

### MUD TYPES

### HOLE SIZE

Water Based TO 13757'  
TO  
TO  
TO

14.75" TO 4704'  
9.875" TO 10004'  
6.125" TO 13757'  
TO

### ABBREVIATIONS

<i>NB</i> NEWBIT	<i>PV</i> PLASTIC VISCOSITY	<i>LC</i> LOST CIRCULATION
<i>RRB</i> RERUN BIT	<i>YP</i> YIELD POINT	<i>CO</i> CIRCULATE OUT
<i>CB</i> CORE BIT	<i>FL</i> FLUID LOSS	<i>NR</i> NO RETURNS
<i>WOB</i> WEIGHT ON BIT	<i>CL</i> PPM CLORIDE ION	<i>TG</i> TRIP GAS
<i>RPM</i> ROTARY REV/MIN	<i>Rm</i> MUD RESISTIVITY	<i>SG</i> SURVEY GAS
<i>PP</i> PUMP PRESSURE	<i>Rmf</i> FILTRATE RESISTIVITY	<i>WG</i> WIPER GAS
<i>SPM</i> STROKES/MIN	<i>PR</i> POOR RETURNS	<i>CG</i> CONNECTION GAS
<i>MW</i> MUD WEIGHT	<i>LAT</i> LOGGED AFTER TRIP	
<i>VIS</i> FUNNEL VISCOSITY	<i>LAS</i> 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 2K>  
units

<0 CO2 20K>  
ppm

<0 Flare Ht. 100>  
ft

Depth

<200 Avg RPM 0><300 ROP 0><400 MSE 0>

ft/hr

psi

<20K Avg Torque 0><50 Avg WOB 0>

FTLBS klbs

MGs

Remarks

Survey Data, Mud Reports, Other Info.

100% Ttl Gas  
100% CO2  
100% Flare Ht.

4500 <200 Avg RPM 0><300 ROP 0><400 MSE 0>  
<20K Avg Torque 0><50 Avg WOB 0>

ALL SAMPLE COLOR DESCRIPTIONS REFERENCED TO THE G.S.A. ROCK COLOR CHART.

ROCK CHARACTERISTICS AND CONSTITUENTS ARE LISTED FROM MOST ABUNDANT TO LEAST ABUNDANT PERCENTAGE OF SAMPLE.

GAS CALIBRATED TO S.P.L.W.A. STANDARDS (2% ME = 100 UNITS). GAS CHROMATOGRAPHY EQUIPMENT CALIBRATED TO A TEST GAS COMPOSED OF THE FOLLOWING:

- METHANE = 10,000 PPM
- ETHANE = 1,000 PPM
- PROPANE = 1,000 PPM
- I-BUTANE = 1,000 PPM
- N-BUTANE = 1,000 PPM
- I-PENTANE = 1,000 PPM
- N-PENTANE = 1,000 PPM

EPOCH WELL SERVICES COMMENCED LOGGING THE PCU 296-5A 04 WELL ON 11/01/2010 @ 4704' MD.

MAX GAS 63u

NB #1 9.675' HUGHES  
HCD 504ZX 4x13; 2x12  
IN @ 4704' DRUD 4440  
16:30:00 HRS

NIGHT TOUR

CG 5u  
TOTCO RESE

TOTCO RESE

CG 7u

100% Ttl Gas  
100% CO2  
100% Flare Ht.

5000 <200 Avg RPM 0><300 ROP 0><400 MSE 0>  
<20K Avg Torque 0><50 Avg WOB 0>

SANDSTONE = OFF WHITE TO VERY LIGHT GRAY TO VERY LIGHT BROWNISH GRAY WITH FEW BLACK AND MODERATE BROWN HUES; QUARTZ DOMINATE FRAME WORK; PREDOMINATELY GRAIN SUPPORTED WITH FAIR AMOUNT OF LOOSE GRAINS; QUARTZ CUTTINGS RANGE FROM MOSTLY SMOKEY TO FEW TRANSLUCENT; CONSISTS OF CALCITIC CEMENTATION WITH MODERATELY HIGH REACTION TO DILUTE HCL; MATRIX CONTAINS 3 TO 5% DARK LITHIC FRAGMENT; MEDIUM-FINE TO COARSE GRAINED; FAIR TO POOR SORTING; SUB-ANGULAR TO ANGULAR TO SUB-ROUNDED ANGULARITY; LOW TO MODERATE SPHERICITY; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE; VERY SMALL AMOUNT OF CARBONACEOUS SHALE CUTTINGS IN SAMPLE, NO BEDDING OR OTHER DISTINGUISHABLE SURFACE FEATURES PRESENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

CG 9u

11/02/2010

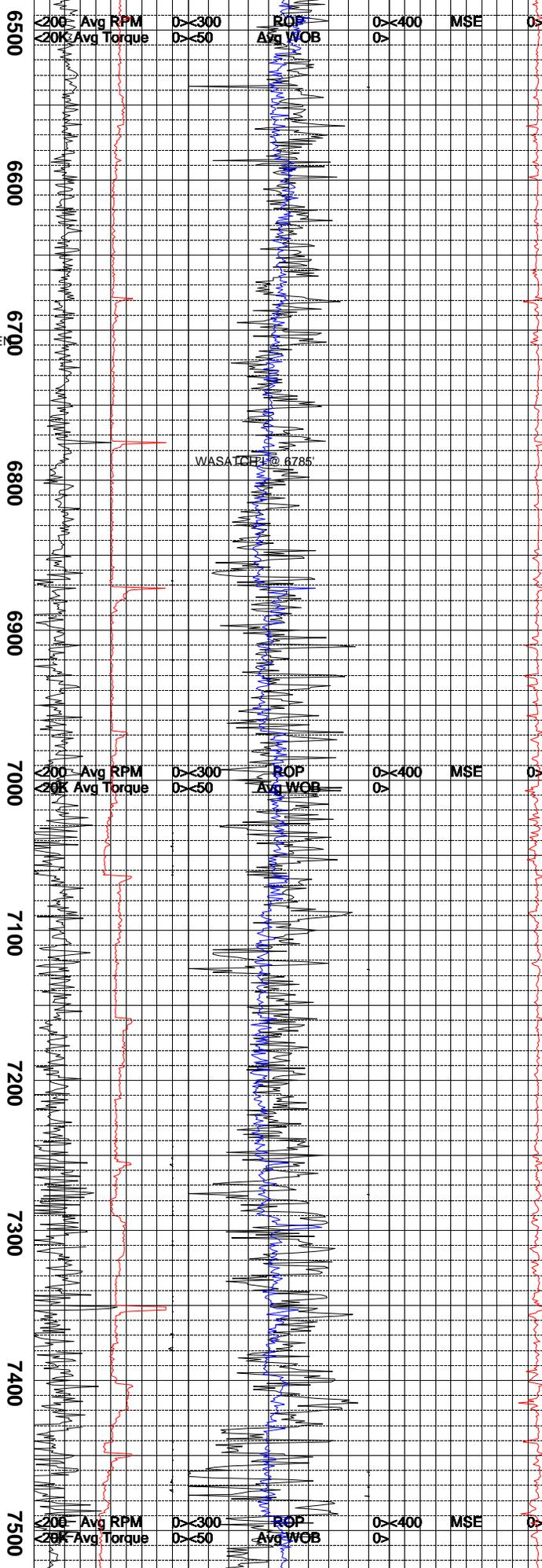
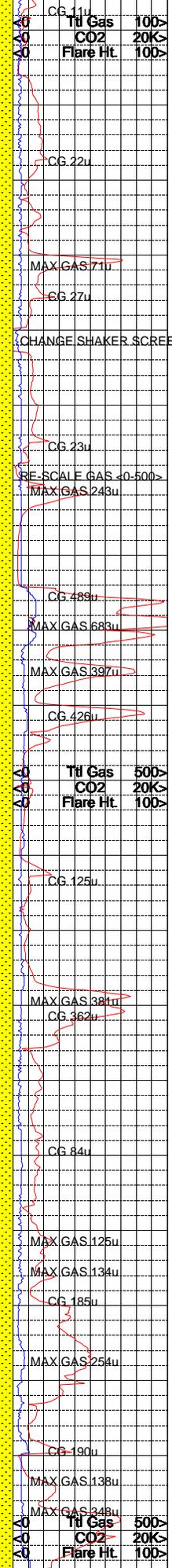
CG 7u

SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO OCCASIONAL LIGHT GRAY AND LIGHT REDDISH BROWN MOTTLING; VERY SLIGHTLY DENSE TO SLIGHTLY CRUNCHY TO MOSTLY BRITTLE TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHLY FRACTURE; SLIGHTLY WEDGE LIKE TO SEMI-PLATY TO MOSTLY SMALL CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-FORSTED LUSTER; MODERATELY SMOOTH TO SLIGHTLY CLAYEY TEXTURE; NO VISIBLE LAMINAE OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

CG 10u

SILTSTONE = VERY LIGHT GRAY TO OCCASIONAL LIGHT GRAY TO OCCASIONAL VERY LIGHT BROWNISH GRAY IN COLOR; MODERATELY DENSE TO SLIGHTLY DENSE TO SLIGHTLY CRUNCHY TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR TO OCCASIONAL SEMI-PLATY CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL VERY SLIGHTLY SEMI-SPARKLING LUSTER; SLIGHTLY CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE, NO LAMINAE OR OTHER





SANDSTONE = WHITE TO LIGHT GRAY TO GREEN ISH GRAY TO TRANSLUCENT; DOMINATE QUARTZ FRAMEWORK WITH LESS THAN 5% BLACK LITHIC CLASTS INTERBEDDED; MEDIUM TO FINE GRAINED WITH FAIR TO POOR SORTING; SUNROUNDED TO SUBANGULAR WITH LOW TO MODERATE SPHERICITY; FIRMLY FRIABLE TO MODERATE HARDNESS; CALCITE CEMENT; MODERATE TO STRONG REACTION WITH DILUTE HCL.

SILTSTONE = MODERATE BROWN TO DARK REDDISH BROWN TO BROWNISH GRAY; TENACITY IS BRITTLE TO CRUMBLY TO OCCASIONALLY SLIGHTLY DENSE; FRACTURES FROM MOSTLY BLOCKY TO IRREGULAR; CUTTINGS ARE TABULAR; SILTY TO GRITTY TEXTURE; GRADING FROM SANDSTONE; THICK STRUCTURE; INTERBEDDED WITH SANDSTONE AND SHALE.

SHALE = PALE BLUE TO GREENISH GRAY TO MEDIUM GRAY; BRITTLE TO SLIGHTLY CRUNCHY TENACITY; FRACTURES FROM PLANAR TO SPLINTERY; CUTTINGS ARE PLATY TO SLIGHTLY ELONGATED; DULL WAXY LUSTER; SMOOTH TO OCCASIONALLY SILTY TEXTURE; SOME SPECIMENS APPEAR TO BE GRADING FROM SILTSTONE; THIN STRUCTURE.

CARBONACEOUS SHALE = BRONISH BLACK TO GRAYISH BLACK TO DARK GRAY; TENACITY IS BRITTLE TO OCCASIONALLY CRUMBLY; IRREGULAR TO PLANAR TO SPLINTERY FRACTURING; CUTTINGS ARE WEDGELIKE TO PLANAR; EARTHY DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN STRUCTURE; INTERBEDDED WITH SHALE AND SILTSTONE AND SANDSTONE; TRACE AMOUNTS OF PYRITE PRESENT AS AN ACCESSORY.

SANDSTONE = TRANSLUCENT TO WHITE TO LIGHT GRAY TO BROWNISH GRAY AND OCCASIONALLY GRAYISH BLUE GRAY; DOMINATE QUARTZ FRAMEWORK WITH LESS THAN 5% BLACK LITHIC CLASTS; TRACE AMOUNTS OF KSPAR; MOSTLY MEDIUM TO FINE WITH OCCASIONAL COARSE GRAINS; FAIR TO POOR SORTING; SUBROUNDED TO SUBANGULAR WITH LOW SPHERICITY; FIRMLY FRIABLE; CALCITE MATRIX SUPPORT; STRONG REACTION WITH HCL; NO VISIBLE BEDDING STRUCTURE; SOME FINE GRAINED SPECIMENS APPEAR TO BE GRADING TOWARDS SILTSTONE.

SILTSTONE = MEDIUM GRAY TO BROWNISH GRAY BRITTLE TO SLIGHTLY DENSE TENACITY; IRREGULAR TO BLOCKY FRACTURING; CUTTINGS ARE TABULAR; EARTHY WITH A SLIGHT SPARKLING LUSTER; SILTY TO GRITTY TEXTURE.

SHALE = MEDIUM DARK GRAY TO OLIVE GRAY; BRITTLE TO SLIGHTLY DENSE TENACITY; PLANAR TO SPLINTERY FRACTURING; CUTTINGS ARE PLATY; WAXY TO DULL LUSTER; SMOOTH TO OCCASIONALLY SILTY TEXTURE; THICK STRUCTURE; INTERBEDDED WITH SILTSTONE AND SANDSTONE.

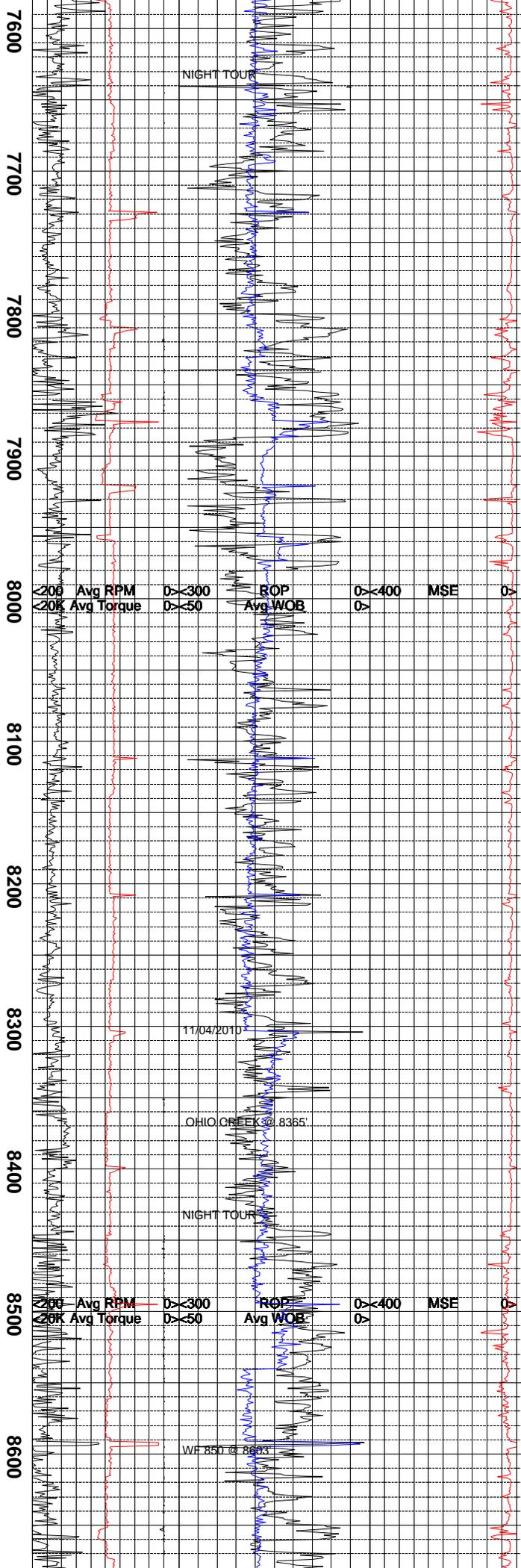
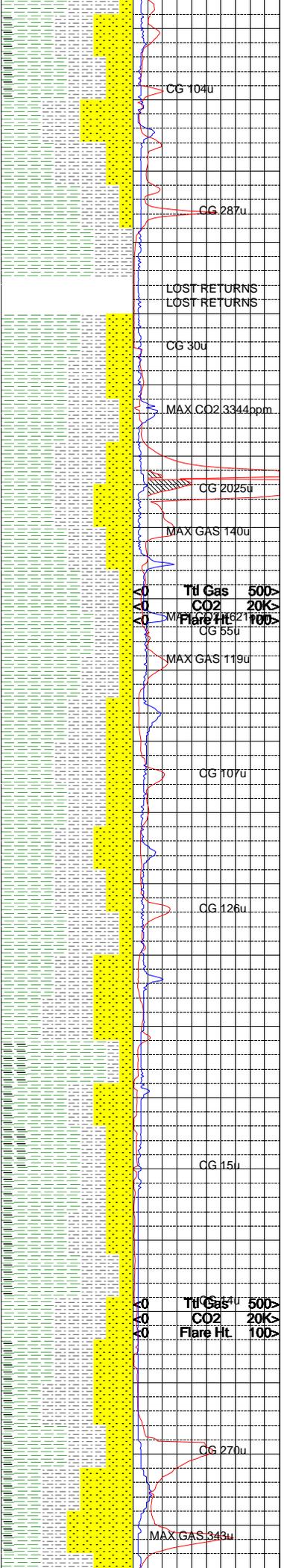
COAL = BLACK; CRUMBLY TO PULVERULENT TENACITY; FRACTURES FROM BLOCKY TO IRREGULAR; CUTTINGS ARE NODULAR TO WEDGELIKE; RESINOUS TO EARTHY LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE INTERBEDDED WITH SILTSTONE AND SHALE AND CARBONACEOUS SHALE AND SANDSTONE.

SANDSTONE = WHITE TO LIGHT GRAY TO MEDIUM GRAY; QUARTZ FRAMEWORK; FINE TO MEDIUM FINE GRAINED; WELL SORTED; SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; MODERATE HARD TO FIRMLY FRIABLE; CALCITE MATRIX SUPPORT; SOME LOOSE GRAINS PRESENT IN SAMPLE; TRACE AMOUNTS OF PYRITE AS ACCESSORY MINERAL.

SHALE = MEDIUM GRAY TO MEDIUM DARK GRAY TO OLIVE GRAY; DENSE TO BRITTLE TENACITY FRACTURES FROM PLANAR TO SPLINTERY; PLATY CUTTINGS HABIT; DULL WAXY LUSTER; SMOOTH TEXTURE THAT OCCASIONALLY GRADES TOWARDS SILTSTONE; THICK STRUCTURE.

SILTSTONE = MEDIUM GRAY TO BROWNISH GRAY TO MODERATE OLIVE BROWN; DENSE TENACITY; FACTURES FROM BLOCKY TO IRREGULAR; CUTTINGS ARE TABULAR; EARTHY TO WAXY WITH A SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; THICK STRUCTURE; INTERBEDDED WITH SHALE, CARBONACEOUS SHALE AND SANDSTONE.

CARBONACEOUS SHALE = GRAYISH BLACK TO BROWNISH BLACK TO DARK GRAY; TENACITY IS BRITTLE TO SLIGHTLY CRUMBLY; PLANAR TO SPLINTERY FRACTURING; CUTTINGS ARE PLATY TO ELONGATED; EARTHY TO RESINOUS LUSTER; SMOOTH TEXTURE; THIN STRUCTURE; INTERBEDDED WITH SILTSTONE AND SHALE.



SANDSTONE = OFF WHITE TO VERY LIGHT YELLOW  
 -OWISH GRAY TO WHITE TO VERY LIGHT GRAY  
 WITH MODERATE BROWN, BLACK, AND OCCASION  
 -AL BRILLIANT GREEN HUES; QUARTZ DOMINAT  
 -E FRAME WORK; PREDOMINATELY GRAIN  
 SUPPORTED WITH FEW LOOSE GRAINS; CONSISTS  
 OF CALCITIC CEMENTATION WITH LIGHT TO  
 MODERATE REACTION TO DILUTE HCL; MATRIX  
 CONTAINS 1 TO 3% DARK LITHIC FRAGMENTS;  
 MEDIUM-FINE TO MEDIUM-COARSE TO COARSE  
 GRAINED; FAIR TO POOR SORTING; SUB-ANGUL  
 -AR TO ANGULAR TO SUB-ROUNDED ANGULARITY  
 ; LOW TO MODERATE SPHERICITY; POOR GRADE  
 SILTSTONE VISIBLE GRADING WITH POOR GRAD  
 -E SANDSTONE, VERY SMALL AMOUNT OF  
 CARBONACEOUS SHALE VISIBLY IN CONTACT  
 WITH POOR GRADE SANDSTONE CUTTING, NO  
 OTHER DISTINGUISHABLE SURFACE FEATURES  
 PRESENT IN SAMPLE; TRACE AMOUNTS OF  
 ACCESSORY MINERAL PYRITE PRESENT AND  
 VISIBLY IN CONTACT WITH POOR GRADE CARBO  
 -NACEOUS SHALE CUTTINGS.

SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY  
 TO OCCASIONAL LIGHT BROWNISH GRAY IN  
 COLOR; MODERATELY DENSE TO VERY SLIGHTLY  
 TOUGH TO SLIGHTLY CRUNCHY TENACITY; IRRE  
 -GULAR TO SUB-PLANAR TO EARTHY FRACTURE;  
 OCCASIONAL MASSIVE TO ELONGATED TO WEDGE  
 LIKE TO SUB-PLATY CUTTINGS HABIT; DULL  
 TO EARTHY DULL TO OCCASIONAL SEMI-WAXY  
 TO SEMI-FROSTED LUSTER; MODERATELY  
 SMOOTH TO VERY SLIGHTLY SILTY TEXTURE;  
 POOR GRADE SILTSTONE VISIBLE GRADING WITH  
 POOR GRADE SANDSTONE, VERY THIN COAL  
 LAMINAE VISIBLY IN SHALE CUTTING, POOR  
 GRADE CARBONACEOUS SHALE CUTTING VISIBLY  
 IN CONTACT WITH SHALE CUTTING, NO OTHER  
 DISTINGUISHABLE STRUCTURAL FEATURES  
 PRESENT IN SAMPLE; TRACE AMOUNTS OF  
 PYRITE PRESENT IN SAMPLE.

SILTSTONE = VERY LIGHT GRAY TO LIGHT GRA  
 -Y IN COLOR; MODERATELY DENSE TO VERY  
 SLIGHTLY TOUGH TENACITY; IRREGULAR TO  
 SUB-PLANAR TO EARTHY-HACKLY FRACTURE;  
 SUB-PLATY TO SUB-TABULAR TO SUB-NODULAR  
 CUTTINGS HABIT; DULL TO EARTHY DULL TO  
 OCCASIONAL VERY SLIGHTLY SEMI-SPARKLING  
 LUSTER; VERY SLIGHTLY CLAYEY TO VERY  
 SLIGHTLY GRITTY TEXTURE; POOR GRADE SILT  
 -STONE VISIBLE GRADING WITH POOR GRADE  
 SANDSTONE, POOR GRADE CARBONACEOUS  
 SHALE CUTTING IN CONTACT WITH SHALE CUTT  
 -ING, NO OTHER DISTINGUISHABLE STRUCTURA  
 -L FEATURES PRESENT IN SAMPLE; TRACE  
 AMOUNTS OF ACCESSORY MINERAL PYRITE  
 VISIBLY IN CONTACT WITH POOR GRADE CARBO  
 -NACEOUS SHALE CUTTING IN SAMPLE.

NOTE = CONDUCT SHORT WIPER TRIP FROM  
 8304' TO WASATCH G TO CLEAN HOLE BEFORE  
 DRILLING INTO OHIO CREEK FORMATION.

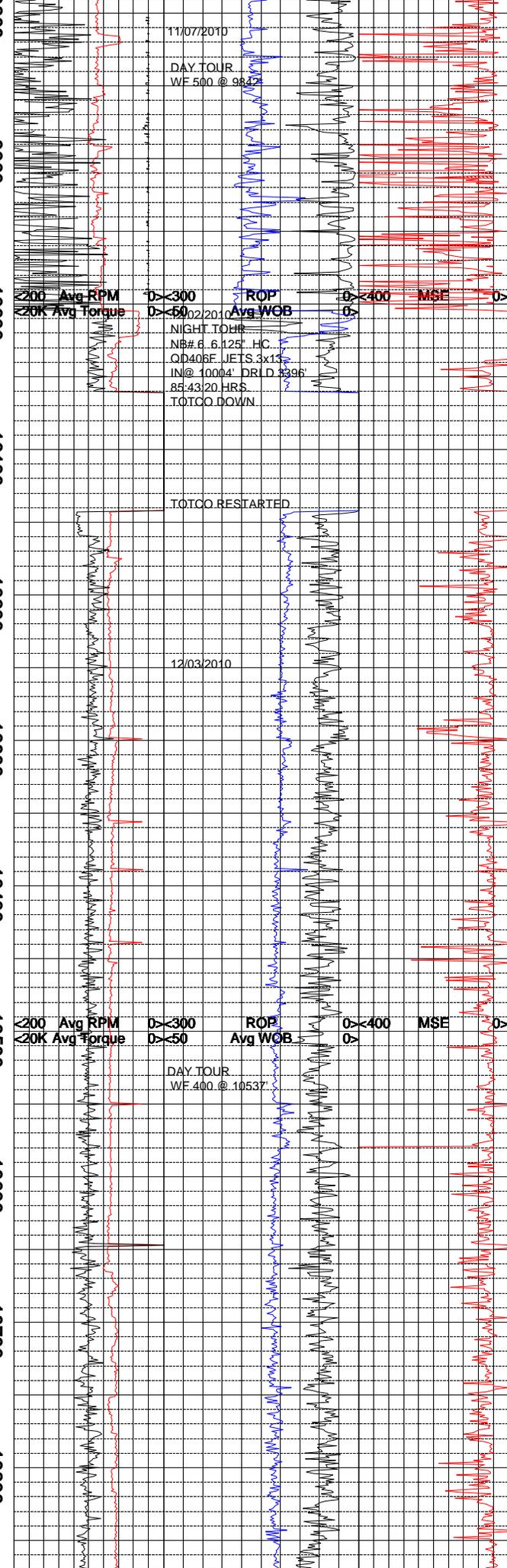
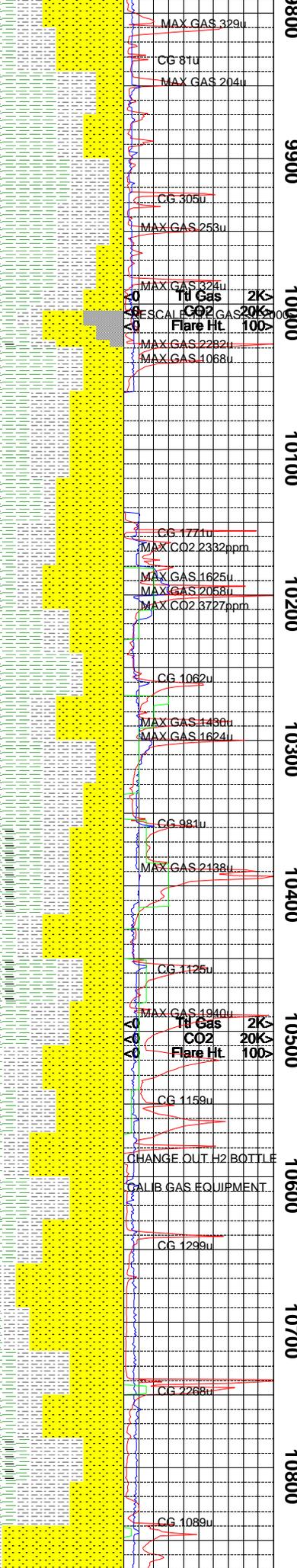
SHALE = MEDIUM BLUISH GRAY TO MEDIUM  
 LIGHT GRAY WITH OCCASIONAL DUSKY YELLOW  
 HUES; BRITTLE TENACITY; PLANAR TO  
 SPLINTERY FRACTURING; CUTINGS ARE PLATY  
 TO ELONGATED; WAXY TO DULL TO SLIGHTLY  
 EARTHY LUSTER; SMOOTH TEXTURE; LAMINAE  
 STRUCTURE.

CARBONACEOUS SHALE = BLACK TO BROWNISH  
 BLACK TO GRAYISH BLACK; VERY BRITTLE  
 TO CRUMBLY TENACITY; FRACTURES FROM  
 PLANAR TO OCCASIONALLY CONCHOIDAL;  
 CUTTINGS ARE TABULAR TO WEDGELIKE;  
 EARTHY TO SLIGHTLY RESINOUS LUSTER;  
 THIN STRUCTURE.

SANDSTONE = WHITE TO VERY LIGHT GRAY;  
 FINE TO MEDIUM GRAINED WITH FAIR SORTING  
 SUBROUNDED WITH SUBANGULAR WITH LOW TO  
 MODERATE SPHERICITY; FIRMLY FRIABLE;  
 QUARTZ DOMINATE; PREDOMINATELY LOOSE  
 UNCONSOLIDATED GRAINS WITH FEW GRAIN  
 SUPPORTED CUTTINGS; CONSISTS OF CALCITIC  
 CEMENTATION WITH LIGHT TO MODERATE  
 REACTION TO DILUTE HCL; MATRIX CONTAINS  
 1 TO 3% DARK LITHIC FRAGMENTS; NO VISIBL  
 -E ACCESSORY MINERALS PRESENT IN SAMPLE.

SILTSTONE = VERY LIGHT GRAY TO LIGHT GRA  
 -Y TO OCCASIONAL MEDIUM LIGHT GRAY IN  
 COLOR; VERY SLIGHTLY DENSE TO MODERATELY  
 BRITTLE TO OCCASIONAL CRUMBLY TENACITY;  
 IRREGULAR TO SUB-PLANAR TO EARTHY  
 HACKLY FRACTURE; SUB-TABULAR TO SUB-  
 NODULAR TO OCCASINAL SEMI-PLATY CUTTINGS  
 HABIT; DULL TO EARTHY DULL TO OCCASIONAL  
 VERY SLIGHTLY SEMI-SPARKLING LUSTER;  
 SLIGHTLY CLAYEY TO VERY SLIGHTLY GRITTY  
 TEXTURE; POOR GRADE SILTSTONE VISIBLE  
 GRADING WITH POOR GRADE SANDSTONE,  
 POOR GRADE SILTSTONE VISIBLE BEDDING WIT  
 -H POOR GRADE SHALE, NO LAMINAE OR OTHER  
 DISTINGUISHABLE STRUCTURAL FEATURES  
 PRESENT; NO ACCESSORY MINERALS PRESENT  
 IN SAMPLE.





11/07/2010  
DAY TOUR  
WF 500 @ 9845

SHALE = MEDIUM GRAY TO MEDIUM DARK GRAY WITH AN OCCASIONAL GRAYISH RED PURPLE HUE; BRITTLE TENACITY; PLANAR TO SPLINTERY FRACTURING; CUTTINGS ARE PLATY TO FLAKY TO ELONGATED; EARTHY TO DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN TO THICK STRUCTURE; INTERBEDDED WITH SILTSTONE AND SANDSTONE AND CARBONACEOUS SHALE.

NOTE: DRILLED INTERMEDIATE TD @ 10004' ON 11/07/2010. DRILL 10' NEW FORMATION. PERFORM FIT TO 860 PSI = 11.0 EMW ON 12/02/2010.

SANDSTONE = TRANSLUCENT TO WHITE TO VERY LIGHT GRAY TO LIGHT GRAY TO MEDIUM LIGHT GRAY TO LIGHT BROWNISH GRAY TO BROWNISH GRAY COLOR; QUARTZ FRAMEWORK WITH 10-30% LITHIC FRAGMENTS; UPPER FINE TO LOWER MEDIUM GRAIN SIZE; VERY WELL TO FAIR SORTING WITH SOME SAMPLES BEING FAIR TO SLIGHTLY POOR SORTING; ROUND TO SUBROUND TO SUBANGULAR ANGULARITY; HIGH TO MODERATE SPHERICITY; SURFACE FEATURES OF FROSTED OR POLISHED GRAINS; EASILY FRIABLE TO FRIABLE TO FIRMLY FRIABLE HARDNESS; GRAIN SUPPORTED; HIGHLY REACTIVE WITH A 10% HCL SOLUTION INDICATING CALCITE CEMENTATION; NO VISIBLE BEDDING STRUCTURES; SAMPLE CONTAINS MANY LOOSE GRAINS; TRACE PYRITE VISIBLE IN THE SAMPLE AS AN ACCESSORY MINERAL; INTERBEDDED WITH SILTSTONE AND SHALE.

12/03/2010  
TOTCO RESTARTED

SHALE = MEDIUM LIGHT GRAY TO MEDIUM DARK GRAY IN COLOR; BRITTLE TO CRUNCHY TENACITY; PLATY TO FLAKY CUTTINGS HABIT; EARTHY TO DULL LUSTER; SMOOTH TO CLAYEY TEXTURE; LAMINAE STRUCTURE VISIBLE ON SOME SAMPLES; INTERBEDDED WITH SANDSTONE AND SILTSTONE; NO VISIBLE ACCESSORY MINERALS PRESENT IN THE SAMPLE.

SILTSTONE = LIGHT GRAY TO MEDIUM LIGHT GRAY TO DARK GRAY TO LIGHT OLIVE GRAY WITH SOME SAMPLES BEING A GREENISH GRAY COLOR; CRUMBLY TO CRUNCHY TO PULVERENT TENACITY; BLOCKY TO PLANAR FRACTURE; MASSIVE TO PLATY TO TABULAR CUTTINGS HABIT; EARTHY TO DULL TO SLIGHTLY WAXY LUSTER; CLAYEY TO SILTY TO GRITTY TEXTURE; LAMINAE TO THIN STRUCTURE; INTERBEDDED WITH SANDSTONE, SHALE AND THIN BEDS OF CARBONACEOUS SHALE; SAMPLE INCLUDED A SHALE SAMPLE WITH A VEIN OF PYRITE; NO OTHER ACCESSORY MINERALS PRESENT IN THE SAMPLE.

SANDSTONE = OFF WHITE TO LIGHT GRAY TO MEDIUM GRAY; MODERATE FRIABLE TO VERY HARD; SUBANGULAR TO SUBROUND; FAIR TO WELL SORTED; 3-5% CARBONACEOUS MATERIAL IN SAMPLE FRAGMENTS; PREDOMINANTLY GRAIN SUPPORTED; MODERATELY TO HIGHLY CALCAREOUS; THINLY INTERBEDDED WITH LOW GRADE COAL/CARBONACEOUS SHALE; VERY FINE TO UPPER FINE GRAIN; LOW TO MODERATE SPHERICITY; NO VISIBLE HYDROCARBON INDICATORS.

SANDSTONE = OFF WHITE TO VERY LIGHT GRAY TO MEDIUM GRAY; GRADES TO LIGHT GRAY SILTSTONE; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND CALCITE MATRIX; VERY FINE TO FINE GRAIN; SOME LOOSE GRAINS IN SAMPLE; FAIR TO WELL SORTED; SUBANGULAR TO ROUND; MODERATE SPHERICITY; FRIABLE TO VERY HARD; HIGHLY CALCAREOUS; THINLY INTERBEDDED WITH CARBONACEOUS SHALE/COAL; TRACE AMOUNTS OF KAOLINITE IN SAMPLE FRAGMENTS.

SANDSTONE = OFF WHITE TO VERY LIGHT GRAY SOME MEDIUM GRAY; GRADES TO LIGHT MEDIUM GRAY SILTSTONE; ANGULAR TO SUBROUND; MODERATE SPHERICITY; FAIRLY SORTED; VERY FINE TO FINE GRAIN; SOME TO ABUNDANT LOOSE GRAINS; PREDOMINANTLY GRAIN SUPPORTED SAMPLE FRAGMENTS WITH SILICA AND CALCITE CEMENT; MODERATELY TO HIGHLY CALCAREOUS; THINLY INTERBEDDED WITH CARBONACEOUS SHALE/COAL AND SILTSTONE; NO VISIBLE HYDROCARBON INDICATORS.

SILTSTONE = LIGHT GRAY TO MEDIUM GRAY SOME DARK GRAY; MODERATE FRIABLE TO HARD; PLATY TO FLAKY CUTTINGS HABIT; GRITTY TO SUCROSIC TEXTURE; SPARKLING TO EARTHY LUSTER; THINLY INTERBEDDED WITH SANDSTONE AND SHALE.

SANDSTONE = OFF WHITE TO VERY LIGHT GRAY

MAX GAS 329u  
CG 81u  
MAX GAS 204u

MAX GAS 253u  
CG 305u

MAX GAS 324u  
MAX GAS 2282u  
MAX GAS 1068u  
MESCAL CO2 GAS 20K  
Flare Hit 100V

CG 1771u  
MAX CO2 2332ppm  
MAX GAS 1625u  
MAX GAS 2058u  
MAX CO2 3727ppm

CG 1062u  
MAX GAS 1490u  
MAX GAS 1624u

CG 984u  
MAX GAS 2138u

CG 1125u  
MAX GAS 1940u  
MAX GAS 2058u  
Flare Hit 100V

CG 1159u  
CHANGE OUT H2 BOTTLE  
CALIB. GAS EQUIPMENT.

CG 1299u  
CG 2268u

CG 1089u

200 Avg RPM  
20K Avg Torque  
D > 300  
D > 50

ROP  
Avg WOB  
D > 400  
MSE  
D >

11/07/2010  
DAY TOUR  
WF 500 @ 9845

12/03/2010  
TOTCO RESTARTED

DAY TOUR  
WF 400 @ 10537

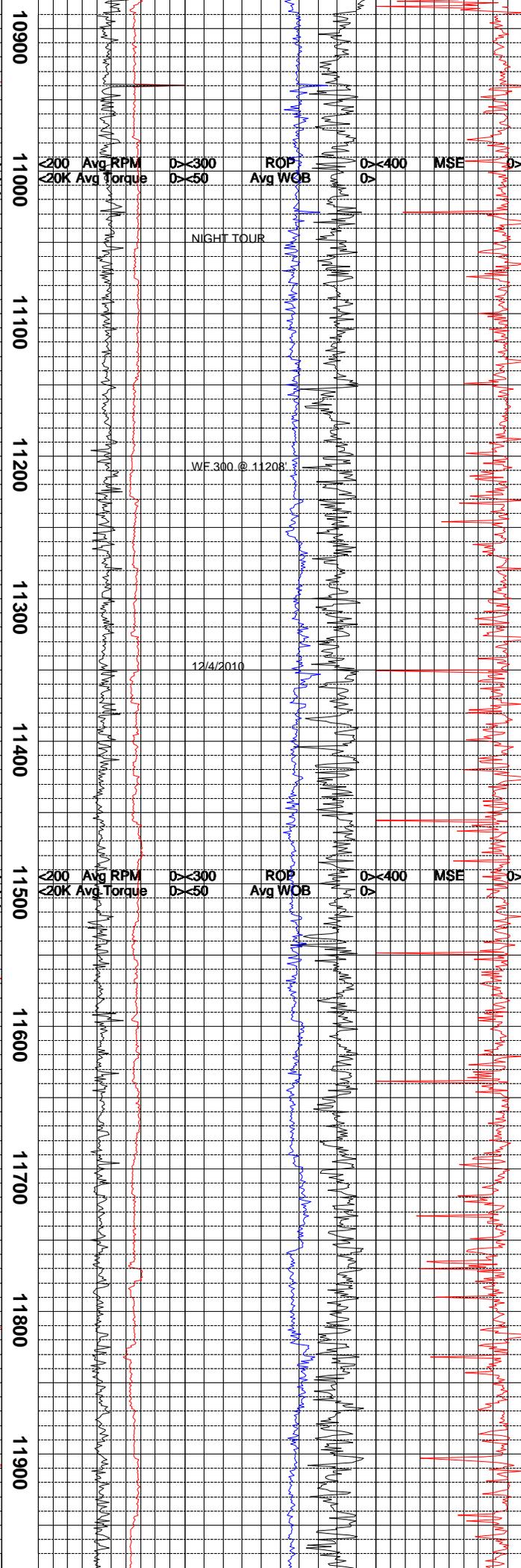
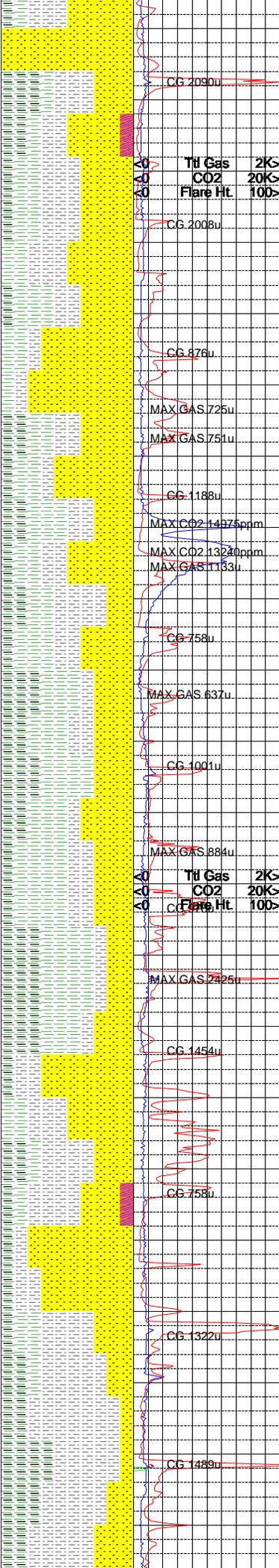
200 Avg RPM  
20K Avg Torque  
D > 300  
D > 50

ROP  
Avg WOB  
D > 400  
MSE  
D >

DAY TOUR  
WF 400 @ 10537

200 Avg RPM  
20K Avg Torque  
D > 300  
D > 50

ROP  
Avg WOB  
D > 400  
MSE  
D >



TO MEDIUM GRAY; GRADES TO LIGHT GRAY SILTSTONE; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA CEMENT; VERY FINE TO UPPER FINE GRAIN; ABUNDANT LOOSE GRAIN; FAIRLY SORTED; LOW TO MODERATE SPHERICITY; ANGULAR TO SUBROUND; FRIABLE TO MODERATE HARD; THINLY INTERBEDDED W/ CARBONACEOUS SHALE/COAL.

NOTE: HIGH GAS IS BLEEDING INTO THE WELL BORE FROM UP HOLE. CONNECTION GASES OBSERVED ON MUD LOG FROM ABOUT 2150 STROKES.

SHALE = VERY LIGHT GRAY TO MEDIUM LIGHT GRAY TO MEDIUM GRAY IN COLOR; BRITTLE TO CRUNCHY TENACITY; PLANAR TO IRREGULAR FRACTURE; MASSIVE TO PLATY TO TABULAR TO WEDGELIKE CUTTINGS HABIT; DULL TO EARTHY LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN TO LAMINAE STRUCTURE VISIBLE IN THE SAMPLE; INTERBEDDED WITH SANDSTONE, SILTSTONE AND VERY THIN BEDS OF CARBONACEOUS SHALE; NO ACCESSORY MINERAL FOUND IN THE SAMPLE.

CARBONACEOUS SHALE = DARK GRAY TO ALMOST BLACK TO BLACK IN COLOR; DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURE; PLATY TO WEDGELIKE TO BLADED CUTTINGS HABIT; EARTHY TO DULL TO WAXY TO ALMOST GREASY LUSTER; SMOOTH TO CLAYEY TO SILTY TEXTURE; NO VISIBLE STRUCTURE PRESENT IN THE SAMPLE.

SILTSTONE = COLOR RANGES FROM VERY LIGHT GRAY TO MEDIUM GRAY TO VERY DARK GRAY; TOUGH TO DENSE TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE CUTTINGS HABIT; EARTHY TO DULL TO GREASY TO SLIGHTLY RESINOUS; SILTY TO GRITTY TO ALMOST GRANULAR TEXTURE; NO VISIBLE STRUCTURE PRESENT IN THE SAMPLE; INTERBEDDED WITH SANDSTONE, SHALE AND CARBONACEOUS SHALE; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE.

SANDSTONE = WHITE TO VERY LIGHT GRAY TO LIGHT GRAY TO MEDIUM GRAY IN COLOR; QUARTZ FRAMEWORK WITH 10-30% LITHIC FRAGMENTS; UPPER FINE TO LOWER MEDIUM GRAIN SIZE WITH LOOSE GRAINS BEING UPPER MEDIUM; WELL TO FAIR SORTING; SUBANGULAR TO SUBROUND ANGULARITY; HIGH TO MODERATE SPHERICITY; SURFACE FEATURE INCLUDE FROSTED AND POLISHED GRAINS POSSIBLY DUE TO MECHANICAL ABRASION; FRIABLE TO FIRMLY FRIABLE TO MODERATELY HARD HARDNESS; HIGHLY REACTIVE WITH A 10% HCL SOLUTION INDICATING CALCITE CEMENTATION; GRAIN SUPPORTED WITH NO VISIBLE BEDDING SURFACES; INTERBEDDED WITH SHALE AND CARBONACEOUS SHALE; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE.

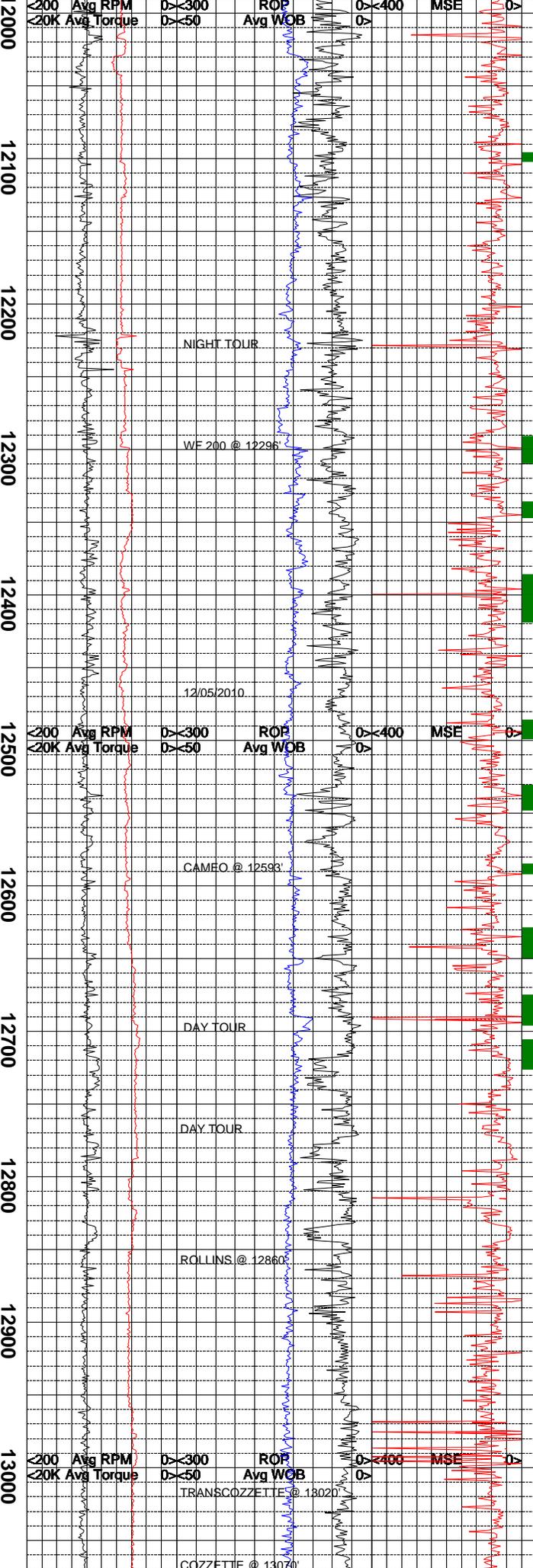
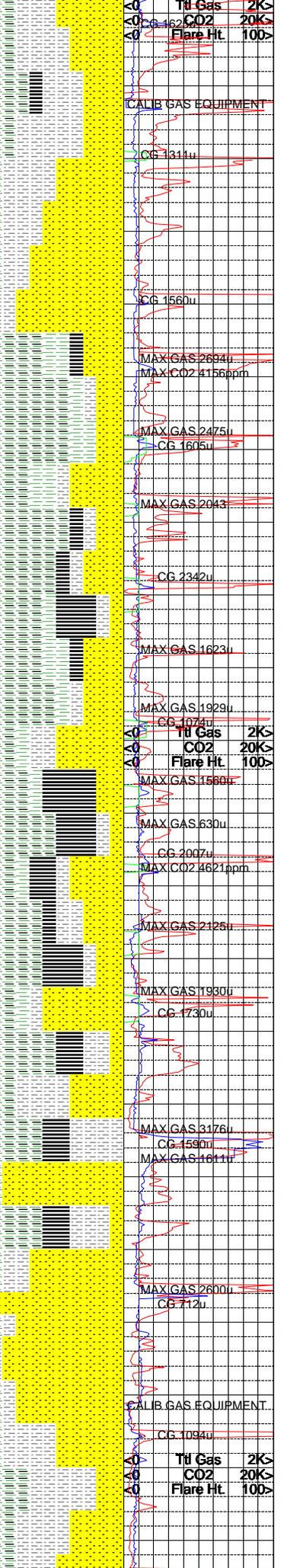
CARBONACEOUS SHALE = DARK GRAY TO ALMOST BLACK TO BLACK IN COLOR; DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURE; PLATY TO WEDGELIKE TO BLADED CUTTINGS HABIT; EARTHY TO DULL TO WAXY TO ALMOST GREASY LUSTER; SMOOTH TO CLAYEY TO SILTY TEXTURE; NO VISIBLE STRUCTURE PRESENT IN THE SAMPLE.

SANDSTONE = OFF WHITE TO LIGHT GRAY TO OLIVE GRAY; FRIABLE TO VERY HARD; FAIR TO WELL SORTED; MODERATE SPHERICITY; VERY FINE TO FINE GRAIN; SUBANGULAR TO ROUND; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA MATRIX; <10% KAOLINITE IN SAMPLE; THINLY INTERBEDDED WITH COAL/ CARBONACEOUS SHALE; SLIGHTLY TO MODERATELY CALCAREOUS.

SILTSTONE = MEDIUM GRAY TO LIGHT GRAY; HARD TO BRITTLE; PLATY TO FLAKY CUTTINGS HABIT; SPARKLING TO EARTHY LUSTER; SILTY TO SUCROSIC TEXTURE; GRADATION AND THIN INTERBEDDING WITH SANDSTONE AND SHALE; TRACE LOOSE SAND GRAINS IN SAMPLE FRAGS;

SANDSTONE = LIGHT OLIVE GRAY TO LIGHT GRAY TO OFF WHITE; FRIABLE TO MODERATE HARD; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND MINOR KAOLINITE CEMENT; ANGULAR TO SUBROUND; FAIR TO WELL SORTED; MODERATE SPHERICITY; VERY FINE TO UPPER FINE GRAIN; GRADATION TO MEDIUM GRAY SILTSTONE; 3-5% CARBONACEOUS SHALE/ COAL FLECKS IN SAMPLE FRAGMENTS; NO VISIBLE HYDROCARBON INDICATORS.

CARBONACEOUS SHALE = BROWNISH GRAY TO OLIVE GRAY TO DARK GRAY; PLATY TO SCALY TO WEDGELIKE CUTTINGS HABIT; BRITTLE TO HARD; SUCROSIC TO MATTE TEXTURE; THINLY INTERBEDDED WITH COAL LAMINAE; GRADATION TO LIGHT OLIVE GRAY SILTSTONE; EARTHY LUSTER.



SILTSTONE = MEDIUM GRAY TO DARK GRAY TO OLIVE GRAY; HARD TO BRITTLE; GRITTY TO SANDY TEXTURE; GRADATION TO OLIVE GRAY SANDSTONE; THINLY INTERBEDDED WITH SANDSTONE AND CARBONACEOUS SHALE.

COAL = BLACK TO BROWNISH BLACK; BLOCKY TO PLATY CUTTINGS HABIT; SHINY TO EARTHY LUSTER; NO VISIBLE DEGASSING; THINLY INTERBEDDED WITH CARBONACEOUS SHALE; EVIDENCE OF SUB DEVELOPED COAL; MATTE TEXTURE.

SANDSTONE = OFF WHITE TO VERY LIGHT GRAY WITH MINOR LIGHT OLIVE GRAY; PREDOMINANT GRAIN SUPPORTED WITH SILICA AND KAOLIN CEMENT; SUBANGULAR TO SUBROUND; FAIRLY SORTED; MODERATE SPHERICITY; VERY FINE TO UPPER FINE GRAIN WITH SOME MEDIUM LOOSE GRAIN; 1-3% CARBONACEOUS SHALE/COAL FLECKS IN SAMPLE FRAGMENTS; NO TRACE ACCESSORY MINERALS OBSERVED; NO VISIBLE HYDROCARBON INDICATORS; SLIGHTLY CALCAREOUS.

CARBONACEOUS SHALE = VERY DARK GRAY TO BLACK IN COLOR; DENSE TO BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO PLANAR FRACTURE; MASSIVE TO PLATY TO TABULAR WITH SOME SAMPLES BEING WEDGELIKE TO BLADED IN CUTTINGS HABIT; EARTHY TO DULL TO GREASY TO RESINOUS LUSTER; SMOOTH TO CLAYEY TEXTURE; LAMINAE TO NO VISIBLE STRUCTURE; INTERBEDDED WITH SANDSTONE AND COAL; NO VISIBLE ACCESSORY MINERALS PRESENT IN THE SAMPLE.

SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY TO MEDIUM GRAY COLOR; BRITTLE TO CRUMBLY TO PULVERULENT TENACITY; PLANAR TO SPLINTERY FRACTURE; PLATY TO FLAKY TO BLADED CUTTINGS HABIT; DULL TO EARTHY LUSTER; SMOOTH TO CLAYEY TEXTURE; NO VISIBLE STRUCTURE PRESENT IN THE SAMPLE; THIN BEDS IN MORE MASSIVE SANDSTONE AND CARBONACEOUS SHALE BEDS; NO ACCESSORY MINERALS PRESENT IN THE SAMPLE.

COAL = BLACK TO BROWNISH BLACK; BLOCKY TO PLATY CUTTINGS HABIT; SHINY TO EARTHY LUSTER; NO VISIBLE DEGASSING; THINLY INTERBEDDED WITH CARBONACEOUS SHALE; EVIDENCE OF SUB DEVELOPED COAL; MATTE TEXTURE.

CARBONACEOUS SHALE = VERY DARK GRAY TO BLACK IN COLOR; BRITTLE TO CRUNCHY TENACITY WITH A FEW SAMPLES BEING DENSE; IRREGULAR TO BLOCKY TO PLANAR FRACTURE; MASSIVE TO PLATY TO WEDGELIKE CUTTINGS HABIT; DULL TO WAXY TO GREASY TO RESINOUS LUSTER; SMOOTH TO CLAYEY TO SILTY TEXTURE; LAMINAE STRUCTURE VISIBLE IN SOME OF THE SAMPLES; INTERBEDDED WITH SANDSTONE AND LARGE AMOUNTS OF COAL; COAL SEEN VISIBLE DEGASSING IN THE SAMPLE; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE.

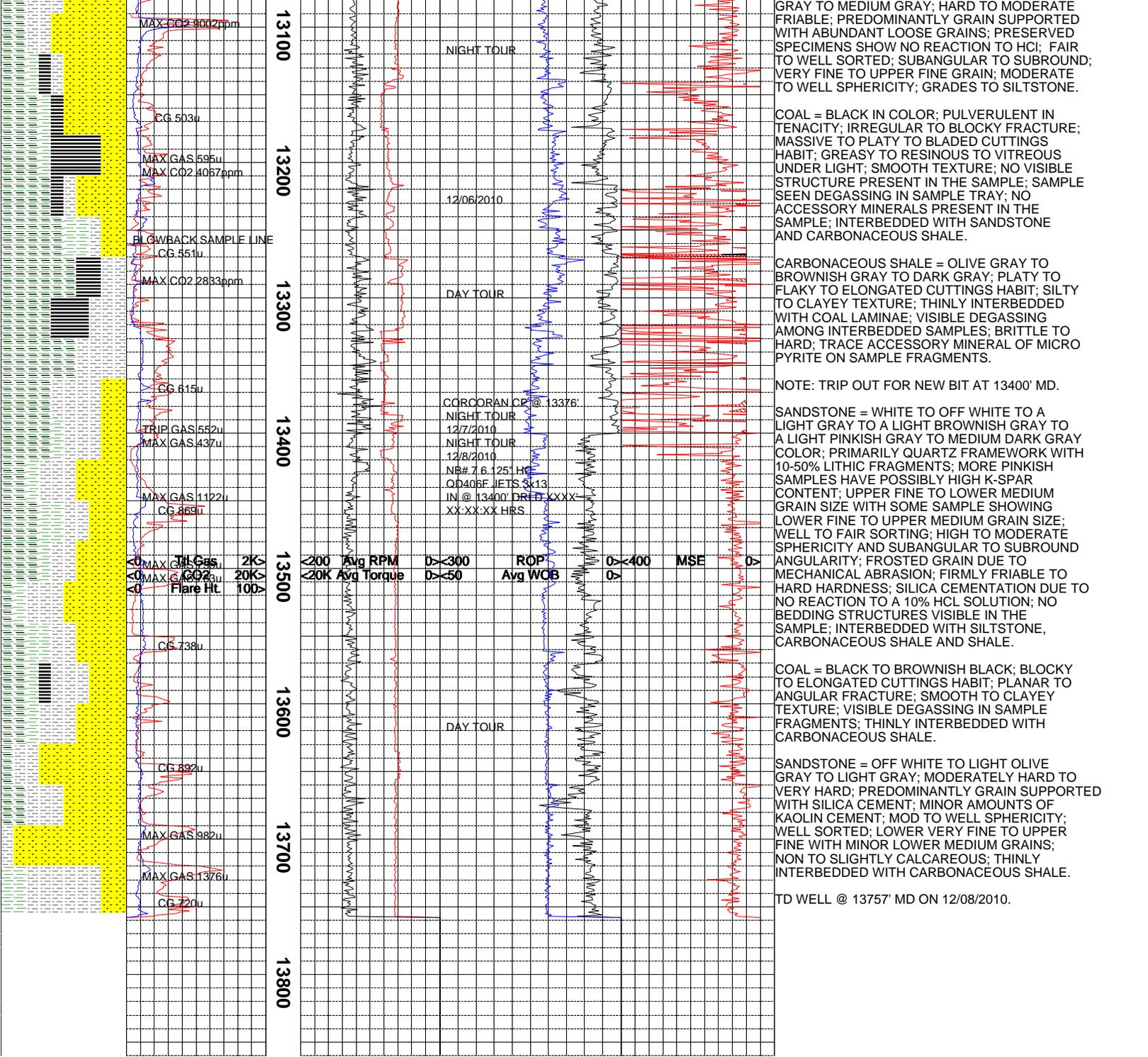
SANDSTONE = OLIVE GRAY TO LIGHT GRAY TO OFF WHITE; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND MINOR KAOLIN CEMENT; MOD WELL SORTED; VERY FINE TO UPPER FINE TO MINOR MEDIUM GRAIN; MODERATE SPHERICITY; SUBROUND TO SUBANGULAR; 2-4% COAL/CARBONACEOUS SHALE FLECKS IN SAMPLE SPECIMENS; SLIGHTLY CALCAREOUS; NO VISIBLE HYDROCARBON INDICATORS; GRADES TO LIGHT OLIVE GRAY SILTSTONE.

COAL = BLACK TO BROWNISH BLACK; BLOCKY TO PLATY CUTTINGS HABIT; VITREOUS TO EARTHY LUSTER; SMOOTH TO CLAYEY TEXTURE; SOME VISIBLE DEGASSING IN SAMPLE FRAGS; THINLY INTERBEDDED WITH CARBONACEOUS SHALE; NO TRACE ACCESSORY MINERALS IN SAMPLE; BLOCKY TO PLANAR FRACTURE.

ROLLINS SANDSTONE = OFF WHITE TO LIGHT OLIVE GRAY; PREDOMINANTLY LOOSE GRAINS; SUBROUND TO SUBANGULAR TO ROUND; WELL SORTED; MOD TO HIGH SPHERICITY; UPPER VERY FINE TO LOWER MEDIUM GRAIN; MINOR PRESERVED SPECIMENS; TRANSPARENT TO OPAQUE; FROSTED; MINOR ABRASION ON GRAINS DUE TO PDC BIT ACTION; PRESERVED SPECIMENS SHOW THINLY INTERBEDDED WITH CARBONACEOUS SHALE; TRACE ACCESSORY MINERAL OF MICROPYRITE; NO VISIBLE HYDROCARBON INDICATORS; NO VISIBLE RXN TO HCl.

SILTSTONE = MEDIUM GRAY TO LIGHT OLIVE GRAY TO LIGHT GRAY; HARD TENACITY; SILTY TO GRITTY TEXTURE; GRADATION TO LIGHT GRAY SANDSTONE; SPARKLING TO SEMI EARTHY LUSTER; THINLY INTERBEDDED WITH SHALE CARBONACEOUS SHALE AND SANDSTONE.

SANDSTONE = OFF WHITE TO LIGHT OLIVE



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