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## Drilling Dynamics MD

**COMPANY** ExxonMobil Production  
**WELL** PCU296-5A05  
**FIELD** PICEANCE CREEK  
**REGION** ROCKYS  
**COORDINATES** 39.911890000 Deg N  
108.198602000 Deg W  
**ELEVATION** 7295.9'  
**COUNTY, STATE** RIO BLANCO, CO  
**API INDEX** 051031124400  
**SPUD DATE** 11/14/2009  
**CONTRACTOR** HE  
**CO. REP.** CANDICE CURTIS  
**RIG/TYPE** 321, FLEX 4  
**LOGGING UNIT** 31  
**GEOLOGISTS** C. RECORD / B. SMELSER  
M. FRANCO  
**ADD. PERSONS** M. PIPER  
R. McCANE  
**CO. GEOLOGIST** CHRIS ALBA

### LOG INTERVAL

### CASING DATA

**DEPTHS:** 4400' TO 13721'  
**DATES:** 11/11/2010 TO 11/28/2010  
**SCALE:** 1"=100'

16.00" AT 150'  
10.75" AT 4662'  
7.00" AT 9954'  
4.5" AT 13700'

### MUD TYPES

### HOLE SIZE

WATER BASED TO 13721'  
TO  
TO  
TO

14.75" TO 4677'  
9.875" TO 9967'  
6.125" TO 13721'  
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	SERICIZATION
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	KAOLINITIC	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 <150 Avg RPM 0><200 ROP 0><400 MSE 0>  
ft/hr  
psi  
<30K Avg Torque 0><50 Avg WOB 0>  
FTLBS klbs

Remarks  
Survey Data, Mud Reports, Other Info.

100V Ttl Gas  
100V CO2  
100V Flare Hit

4500 <150 Avg RPM 0><200 ROP 0><400 MSE 0>  
<30K 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 296-5A05 WELL ON 11/11/2010 @ 4677' MD.

NB #2 9.875" BHI  
HDC504ZX 2X12.4X14  
IN @ 4677' DRL D-1455  
21:15:42 HRS  
11/11/2010  
DAY TOUR  
WOB 19K  
RPM 50  
PP 2200  
GPM 678

SILTSTONE = MODERATE BROWN TO MODERATE YELLOWISH BROWN TO MODERATE REDDISH BROWN; SLIGHTLY DENSE TO BRITTLE TO SLIGHTLY CRUMBLY TENACITY; IRREGULAR TO BLOCKY FRACTURING; MASSIVE TO TABULAR CUTTINGS; EARTHY TO DULL LUSTER; SILTY TO GRITTY TEXTURE; THICK TO MASSIVE STRUCTURE.

MAX GAS 100u  
MAX GAS 82u  
CG 7u

4800

SHALE = MEDIUM GRAY TO MEDIUM BLuish GRAY TO LIGHT OLIVE GRAY WITH OCCASIONAL GRAYISH BLUE HUE; BRITTLE TENACITY; PLANAR TO SUB BLOCKY FRACTURING; CUTTINGS ARE PLATY TO TABULAR; EARTHY TO DULL LUSTER; SMOOTH TO SLIGHTLY SILTY TEXTURE; GRADING FROM SILTSTONE; THIN STRUCTURE; INTERBEDDED WITH SILTSTONE AND SANDSTONE.

GAS LINE FROZE  
MAX GAS 10u

4900

SANDSTONE = BROWNISH GRAY TO MODERATE BROWN TO TRANSLUCENT TO OLIVE GRAY TO LIGHT GRAY TO WHITE; DOMINATE QUARTZ FRAMEWORK WITH APPROXIMATELY 5% BROWNISH GRAY LITHIC CLASTS; FINE TO MEDIUM FINE GRAINED WITH FAIR SORTING; SOME SPECIMEN APPEARS TO BE GRADING TOWARDS SILTSTONE; QUARTZ FRAMEWORK WITH APPROXIMATELY 5% FRIABLE; MATRIX SUPPORT WITH CALCITE CEMENT; MILD REACTION WITH DILUTE HCL; NO VISIBLE BEDDING STRUCTURE.

100V Ttl Gas  
10K CO2  
100V Flare Hit

5000 <150 Avg RPM 0><200 ROP 0><400 MSE 0>  
<30K Avg Torque 0><50 Avg WOB 0>

SILTSTONE = MODERATE BROWN TO MODERATE YELLOWISH BROWN TO LIGHT GRAY; BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO BLOCKY FRACTURING; MASSIVE TO TABULAR CUTTINGS; EARTHY WITH AN OCCASIONAL SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; INTERBEDDED WITH SHALE AND SANDSTONE; THICK TO MASSIVE STRUCTURE.

MAX GAS 114u

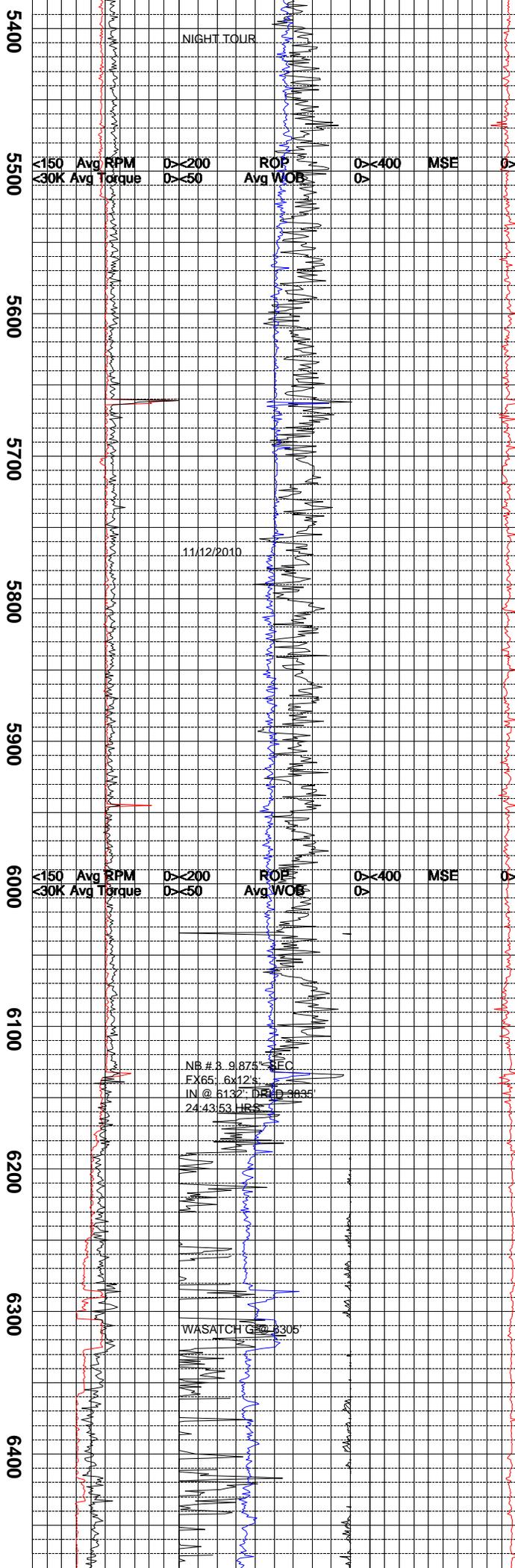
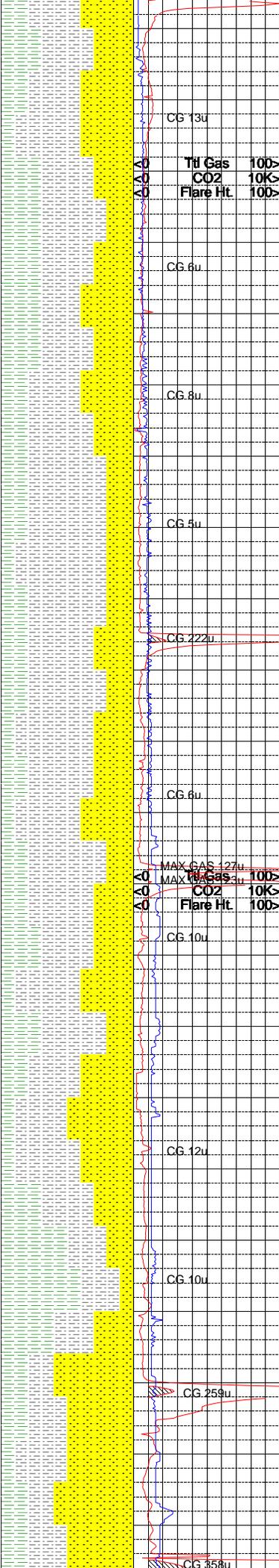
5200

SANDSTONE = TRANSLUCENT TO LIGHT GRAY TO MODERATE BROWN; DOMINATE QUARTZ FRAMEWORK; FINE TO MEDIUM GRAINED WITH FAIR SORTING; ANGULAR TO SUB ANGULAR WITH LOW SPHERICITY; FIRMLY FRIABLE TO FRIABLE WITH ABUNDENT LOOSE GRAINS IN SAMPLE; MODERATE TO STRONG REACTION WITH DILUTE HCL; CALCITE CEMENT WITH MATRIX SUPPORT WITH OCCASIONAL SPECIMENS DISPLAYING GRAIN SUPPORT; INTERBEDDED WITH SILTSTONE AND SHALE; NO OTHER VISIBLE BEDDING STRUCTURE.

MAX GAS 173u  
CG 181u

5300

SHALE = MEDIUM LIGHT GRAY TO MEDIUM BLuish GRAY TO LIGHT OLIVE GRAY WITH OCCASIONAL MODERATE OLIVE BROWN HUES; BRITTLE TENACITY; PLANAR TO SPLINTERY FRACTURING; CUTTINGS ARE PLATY TO FLAKY TO SLIGHTLY TABULAR; DULL TO WAXY LUSTER SMOOTH TO SILTY TEXTURE; SOME GRADING FROM SILTSTONE; THIN STRUCTURE.  
SILTSTONE = BROWNISH GRAY TO MODERATE BROWN TO MODERATE OLIVE BROWN TO MODERATE YELLOWISH BROWN; SLIGHTLY DENSE TO BRITTLE TENACITY; BLOCKY TO IRREGULAR FRACTURING; CUTTINGS ARE MASSIVE TO TABULAR; DULL TO EARTHY TO WAXY WITH A SLIGHT SPARKLING LUSTER; GRITTY TO SILTY TEXTURE; MASSIVE TO THICK STRUCTURE, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; NO ACCESSORY MINERALS



PRESENT IN SAMPLE.

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

SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY TO OCCASIONAL MEDIUM GRAY IN COLOR; VERY SLIGHTLY DENSE TO SLIGHTLY CRUMBLY TO SLIGHTLY BRITTLE TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY FRACTURE; OCCASIONA -L MASSIVE TO WEDGE LIKE TO SUB-PLATY CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-FROSTED TO SEMI-WAXY LUSTER; MODERATELY SMOOTH TO SLIGHTLY CLAYEY TO VERY SLIGHTLY SILTY TEXTURE; POOR GRADE SILTSTONE VISIBE BEDDING WITH POOR GRADE SALE, POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTON -E, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES VISIBLY PRESENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SILTSTONE = VERY LIGHT GRAY TO VERY LIGH -T BROWNISH GRAY TO OCCASIONAL PALE YELL -OWISH ORANGE TO LIGHT BROWN IN COLOR; MODERATELY CRUMBLY TO VERY SLIGHTLY BRITTLE TO OCCASIONAL VERY SLIGHTLY DENS -E TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR TO MOSTLY SMALL 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 DISTINGUISHABLE STRUCT -URAL FEATURES PRESENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SANDSTONE = LIGHT BROWNISH GRAY TO LIGHT PALE REDDISH BROWN TO OCCASIONAL VERY LIGHT GRAY WITH FEW BLACK AND MODERATE BROWN HUES; QUARTZ DOMINATE FRAME WORK; PREDOMINATELY GRAIN SUPPORTED WITH FEW LOOSE GRAINS; CONSISTS OF CALCITIC CEMEN -TATION WITH MODERATE TO HIGH REACTION TO DILUTE HCL; MATRIX CONTAINS 3 TO 5% DARK LITHIC FRAGMENTS; FINE TO MEDIUM-COARSE GRAINED; FAIR TO MODERATELY POOR SORTING; SUB-ANGULAR TO ANGULAR TO SUB-ROUNDED ANGULARITY; LOW TO MODERATE SPHERICITY; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE, POOR GRADE SILTSTONE VISIBLE BEDDING WITH POOR GRADE SHALE, NO OTHER DISTINGUISHAB -LE SURFACE FEATURES PRESENT; NO ACCESSO -RY MINERALS PRESENT IN SAMPLE.

NOTE: DRILLED TO 6132', POOH TO REMOVE DIRECTIONAL TOOLS ON 11/12/2010.

SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY TO OCCASIONAL MEDIUM GRAY IN COLOR; MODERATELY DENSE TO SLIGHTLY CRUNCHY TENACITY; IRREGULAR TO SUB-BLOCKY TO EARTHY FRACTURE; OCCASIONAL MASSIVE TO WEDGE LIKE TO OCCASIONAL ELONGATED CUTTI -NGS HABIT; DULL TO EARTHY DULL TO OCCAS -IONAL SEMI-WAXY TO SEMI-FROSTED LUSTER; MODERATELY SMOOTH TO VERY SLIGHTLY CLAYEY TO VERY SLIGHTLY SILTY TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE, NO LAMINAE OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

WASATCH G SANDSTONE = OFF WHITE TO WHITE TO VERY LIGHT GRAY WITH OCCASIONAL BLACK MODERATE BROWN, AND OCCASIONAL BRILLIANT GREEN HUES; QUARTZ DOMINATE FRAME WORK; QUARTZ CUTTINGS RANGE FROM SMOKY TO TRANSLUCENT; PREDOMINATELY GRAIN SUPPORT -ED WITH FAIR AMOUNT OF LOOSE GRAINS; CONSISTS OF CALCITIC CEMENTATION WITH MODERATE TO MODERATELY HIGH REACTION TO DILUTE HCL; MATRIX CONTAINS 1 TO 3% DARK LITHIC FRAGMENTS; FINE TO MEDIUM-FINE TO MEDIUM-COARSE GRAINED; MODERATELY FAIR TO POOR SORTING; SUB-ANGULAR TO SUB-ROUNDED ANGULARITY; LOW TO MODERATE SPHERICITY; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE, VERY SMALL AMOUNT OF COAL VISIBLY EFFERVESCIN -G IN SAMPLE, NO OTHER DISTINGUISHABLE

NIGHT TOUR

CG 13u  
 Ttl Gas 100Y  
 CO2 10K  
 Flare Hit 100Y

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

CG 6u

5600

CG 8u

5700

CG 5u

11/12/2010

5800

CG 222u

5900

CG 6u

MAX GAS 127u  
 MAX CO2 31u  
 Flare Hit 100Y

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

CG 10u

6100

NB # 3 9875  
 FX65 6x12's  
 IN @ 6132' DRD 8835  
 24:43:53 HR 5

CG 12u

6200

CG 10u

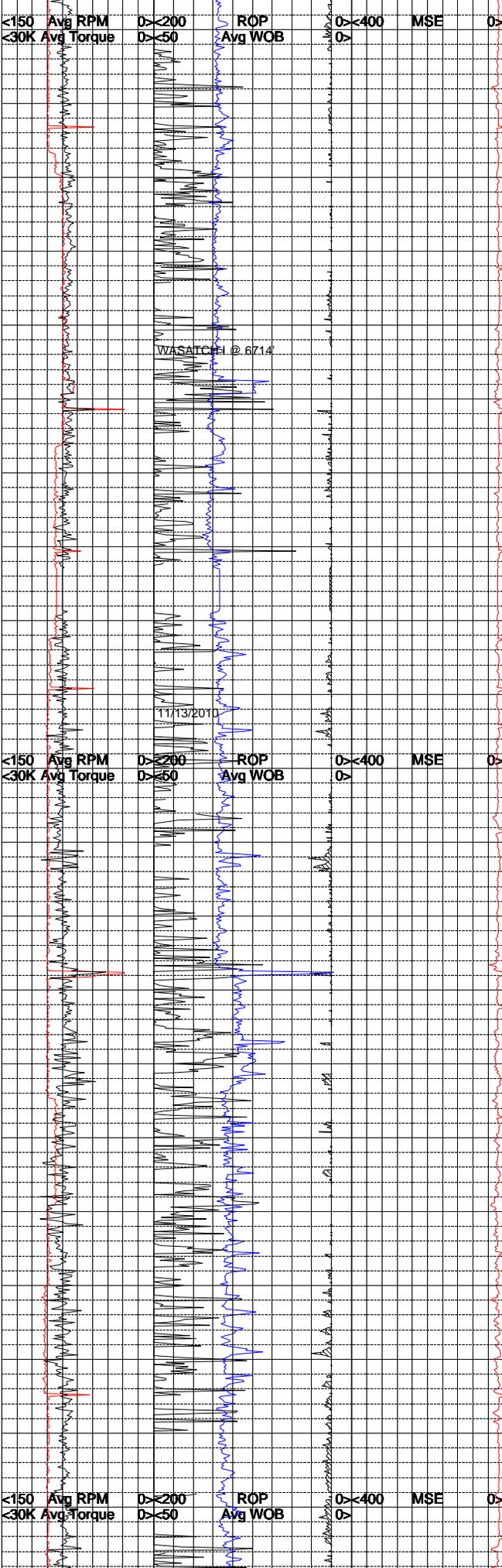
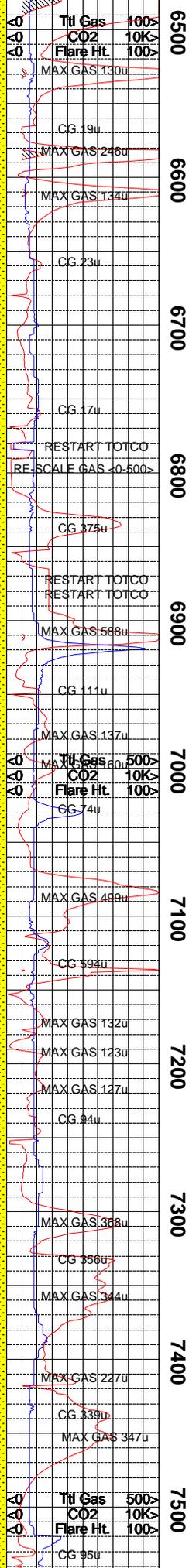
6300

WASATCH G 8305

CG 259u

6400

CG 358u



SURFACE FEATURES PRESENT IN SAMPLE; TRACE AMOUNTS OF ACCESSORY MINERAL PYRITE VISIBLY PRESENT IN SAMPLE.

SILTSTONE = VERY LIGHT GRAY TO LIGHT GRAY TO OCCASIONAL MODERATE REDDISH BROWN IN COLOR; MODERATELY DENSE TO SLIGHTLY CRUMBLY TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR TO OCCASIONAL PLATY TO MOSTLY SMALL CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL VERY SLIGHTLY SEMI-SPARKLING LUSTER; SLIGHTLY CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE; POOR GRADE SANDSTONE VISIBLE BEDDING AND GRADING WITH POOR GRADE SILTSTONE, NO OTHER BEDDING OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY TO MEDIUM GRAY WITH OCCASIONAL DARK YELLOWISH ORANGE IN COLOR; MODERATELY DENSE TO SLIGHTLY CRUMBLY TO OCCASIONAL CRUNCHY TENACITY; IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR TO EARTHY FRACTURE; WEDGE LIKE TO OCCASIONAL ELONGATED TO OCCASIONAL MASSIVE CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL VERY SLIGHTLY SEMI-FROSTED TO SEMI-WAXY LUSTER; MODERATELY SMOOTH TO SEMI-CLAYEY TO VERY SLIGHTLY SILTY TEXTURE; VERY THIN COAL LAMINAE VISIBLE IN SHALE CUTTING, SHALE VISIBLE INTERBEDDING WITH POOR GRADE SILTSTONE CUTTING, POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; TRACE AMOUNTS OF ACCESSORY MINERAL PYRITE VISIBLY PRESENT IN SAMPLE.

CARBONACEOUS SHALE = DARK BROWNISH GRAY TO BROWNISH BLACK TO OCCASIONAL OLIVE BLACK IN COLOR; SLIGHTLY DENSE TO MODERATELY CRUNCHY TO CRUMBLY TENACITY; IRREGULAR TO SEMI-PLANAR TO OCCASIONAL SUB-BLOCKY TO EARTHY-HACKLY FRACTURE; OCCASIONAL WEDGE LIKE TO MASSIVE TO VERY SLIGHTLY ELONGATED CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL VERY SLIGHTLY SEMI-SPARKLING LUSTER; OCCASIONAL CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE; VERY THIN COAL LAMINAE VISIBLE IN POOR GRADE CARBONACEOUS SHALE CUTTING, POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE, VERY SMALL AMOUNT OF CARBONACEOUS SHALE VISIBLY EFFERVESCING IN SAMPLE, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; TRACE AMOUNTS OF ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.

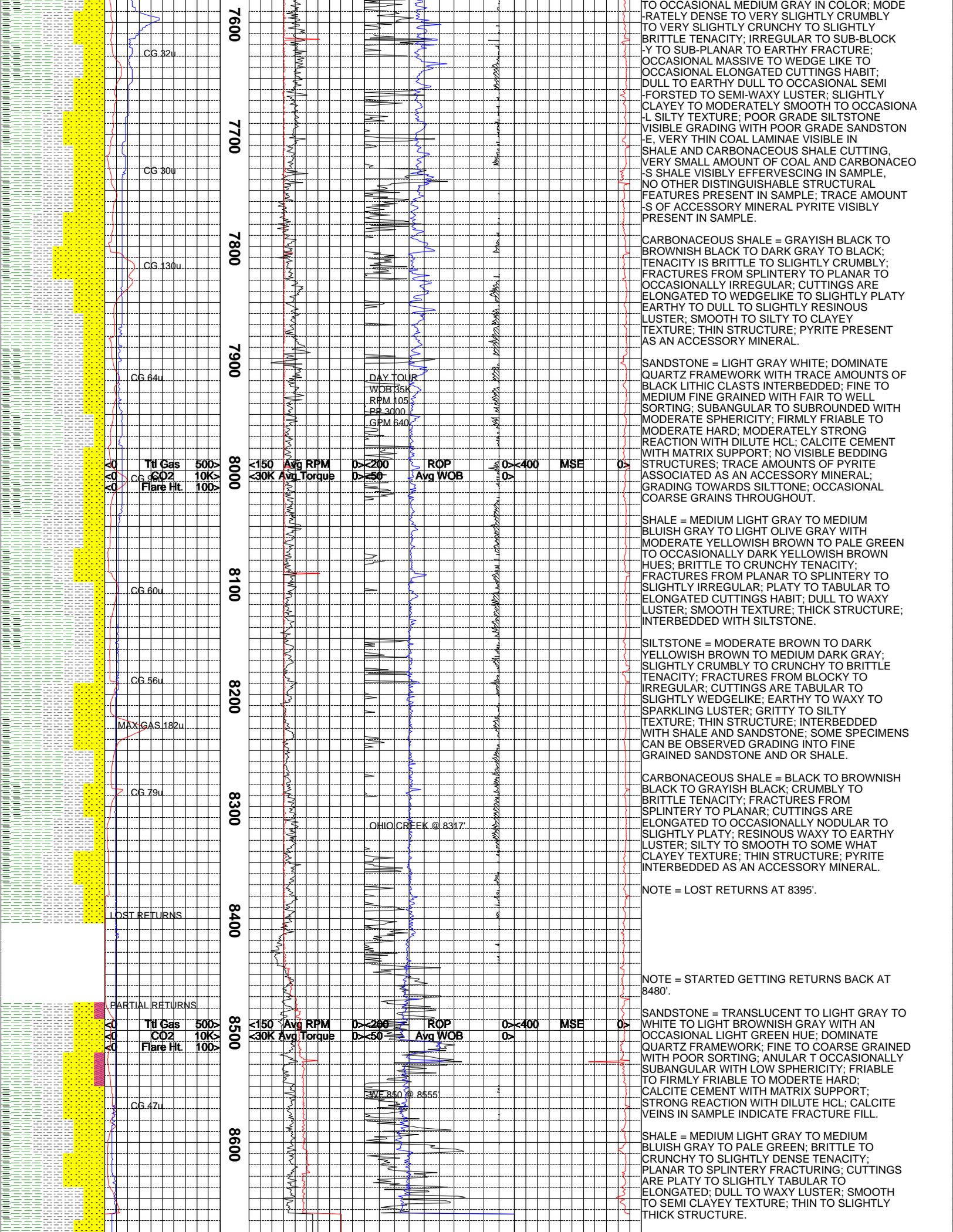
SANDSTONE = OFF WHITE TO WHITE TO LIGHT BROWNISH GRAY TO YELLOWISH GRAY WITH FEW BLACK AND MODERATE BROWN HUES; QUARTZ DOMINATE FRAME WORK; QUARTZ CUTTINGS RANGE FROM SMOKY TO TRANSLUCENT IN APPEARANCE; PREDOMINATELY GRAIN SUPPORTED WITH FAIR AMOUNT OF LOOSE GRAINS; CONSISTS OF CALCITIC CEMENTATION WITH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

SILTSTONE = VERY LIGHT GRAY TO LIGHT GRAY TO LIGHT BROWNISH GRAY WITH OCCASIONAL BLACK HUES IN COLOR; MODERATELY DENSE TO VERY SLIGHTLY CRUMBLY TO CRUNCHY TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR TO OCCASIONAL SUB-PLATY CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL VERY SLIGHTLY SEMI-SPARKLING LUSTER; VERY SLIGHTLY CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING AND BEDDING WITH POOR GRADE SANDSTONE, VERY SMALL AMOUNT OF COAL AND CARBONACEOUS SHALE CUTTINGS VISIBLE EFFERVESCING IN SAMPLE, POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE CARBONACEOUS SHALE, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; TRACE AMOUNTS OF ACCESSORY MINERALS PYRITE VISIBLY IN CONTACT WITH POOR GRADE SANDSTONE IN SAMPLE.

SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY

WASATCH @ 6714

11/13/2010



CG.32u  
CG.30u  
CG.130u  
CG.64u  
CG.60u  
CG.56u  
CG.79u  
CG.47u

H<sub>2</sub> Gas 500Y  
 CO<sub>2</sub> 10K  
 Flare Hit 100Y

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

DAY FOUR  
 WOB 35k  
 RPM 105  
 BP 3000  
 GPM 640

OHIO CREEK @ 8317

WAVE 850 @ 8555

LOST RETURNS

PARTIAL RETURNS

TO OCCASIONAL MEDIUM GRAY IN COLOR; MODE -RATELY DENSE TO VERY SLIGHTLY CRUMBLY TO VERY SLIGHTLY CRUNCHY TO SLIGHTLY BRITTLE TENACITY; IRREGULAR TO SUB-BLOCK -Y TO SUB-PLANAR TO EARTHY FRACTURE; OCCASIONAL MASSIVE TO WEDGE LIKE TO OCCASIONAL ELONGATED CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI -FORSTED TO SEMI-WAXY LUSTER; SLIGHTLY CLAYEY TO MODERATELY SMOOTH TO OCCASIONA -L SILTY TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTON -E, VERY THIN COAL LAMINAE VISIBLE IN SHALE AND CARBONACEOUS SHALE CUTTING, VERY SMALL AMOUNT OF COAL AND CARBONACEO -S SHALE VISIBLY EFFERVESCING IN SAMPLE, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; TRACE AMOUNT -S OF ACCESSORY MINERAL PYRITE VISIBLY PRESENT IN SAMPLE.

CARBONACEOUS SHALE = GRAYISH BLACK TO BROWNISH BLACK TO DARK GRAY TO BLACK; TENACITY IS BRITTLE TO SLIGHTLY CRUMBLY; FRACTURES FROM SPLINTERY TO PLANAR TO OCCASIONALLY IRREGULAR; CUTTINGS ARE ELONGATED TO WEDGELIKE TO SLIGHTLY PLATY EARTHY TO DULL TO SLIGHTLY RESINOUS LUSTER; SMOOTH TO SILTY TO CLAYEY TEXTURE; THIN STRUCTURE; PYRITE PRESENT AS AN ACCESSORY MINERAL.

SANDSTONE = LIGHT GRAY WHITE; DOMINATE QUARTZ FRAMEWORK WITH TRACE AMOUNTS OF BLACK LITHIC CLASTS INTERBEDDED; FINE TO MEDIUM FINE GRAINED WITH FAIR TO WELL SORTING; SUBANGULAR TO SUBROUNDED WITH MODERATE SPHERICITY; FIRMLY FRIABLE TO MODERATE HARD; MODERATELY STRONG REACTION WITH DILUTE HCL; CALCITE CEMENT WITH MATRIX SUPPORT; NO VISIBLE BEDDING STRUCTURES; TRACE AMOUNTS OF PYRITE ASSOCIATED AS AN ACCESSORY MINERAL; GRADING TOWARDS SILTSTONE; OCCASIONAL COARSE GRAINS THROUGHOUT.

SHALE = MEDIUM LIGHT GRAY TO MEDIUM BLUISH GRAY TO LIGHT OLIVE GRAY WITH MODERATE YELLOWISH BROWN TO PALE GREEN TO OCCASIONALLY DARK YELLOWISH BROWN HUES; BRITTLE TO CRUNCHY TENACITY; FRACTURES FROM PLANAR TO SPLINTERY TO SLIGHTLY IRREGULAR; PLATY TO TABULAR TO ELONGATED CUTTINGS HABIT; DULL TO WAXY LUSTER; SMOOTH TEXTURE; THICK STRUCTURE; INTERBEDDED WITH SILTSTONE.

SILTSTONE = MODERATE BROWN TO DARK YELLOWISH BROWN TO MEDIUM DARK GRAY; SLIGHTLY CRUMBLY TO CRUNCHY TO BRITTLE TENACITY; FRACTURES FROM BLOCKY TO IRREGULAR; CUTTINGS ARE TABULAR TO SLIGHTLY WEDGELIKE; EARTHY TO WAXY TO SPARKLING LUSTER; GRITTY TO SILTY TEXTURE; THIN STRUCTURE; INTERBEDDED WITH SHALE AND SANDSTONE; SOME SPECIMENS CAN BE OBSERVED GRADING INTO FINE GRAINED SANDSTONE AND OR SHALE.

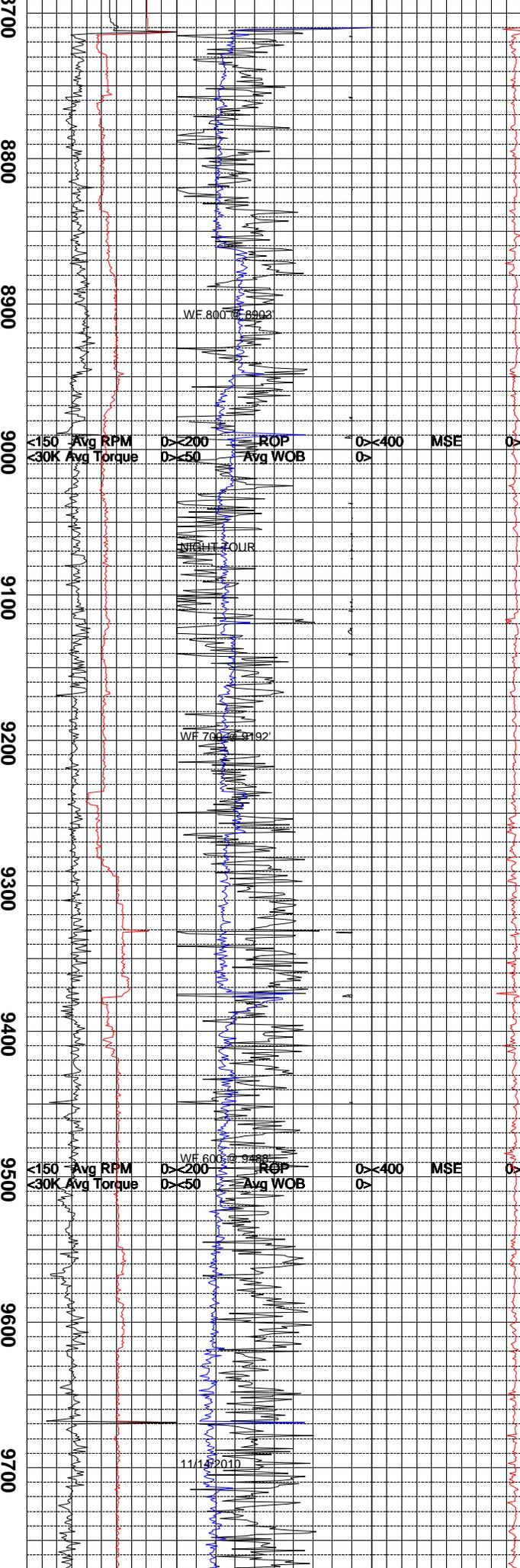
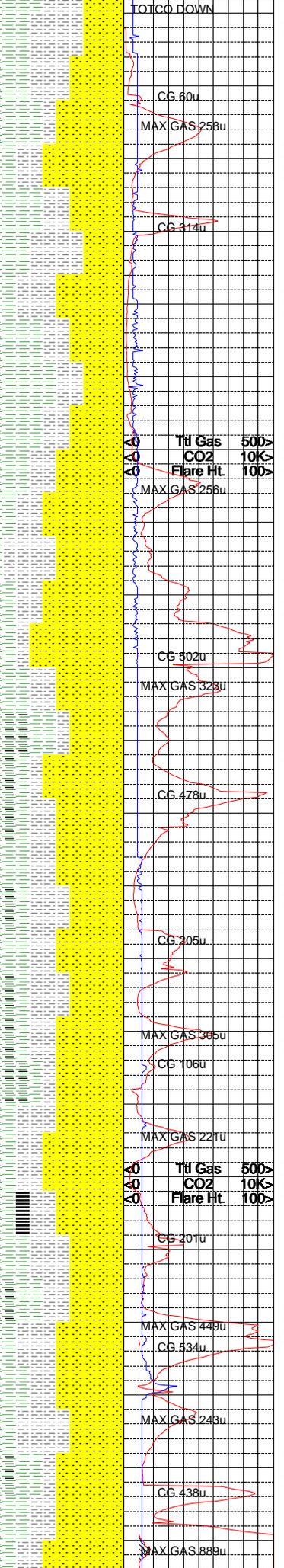
CARBONACEOUS SHALE = BLACK TO BROWNISH BLACK TO GRAYISH BLACK; CRUMBLY TO BRITTLE TENACITY; FRACTURES FROM SPLINTERY TO PLANAR; CUTTINGS ARE ELONGATED TO OCCASIONALLY NODULAR TO SLIGHTLY PLATY; RESINOUS WAXY TO EARTHY LUSTER; SILTY TO SMOOTH TO SOME WHAT CLAYEY TEXTURE; THIN STRUCTURE; PYRITE INTERBEDDED AS AN ACCESSORY MINERAL.

NOTE = LOST RETURNS AT 8395'.

NOTE = STARTED GETTING RETURNS BACK AT 8480'.

SANDSTONE = TRANSLUCENT TO LIGHT GRAY TO WHITE TO LIGHT BROWNISH GRAY WITH AN OCCASIONAL LIGHT GREEN HUE; DOMINATE QUARTZ FRAMEWORK; FINE TO COARSE GRAINED WITH POOR SORTING; ANULAR T OCCASIONALLY SUBANGULAR WITH LOW SPHERICITY; FRIABLE TO FIRMLY FRIABLE TO MODERTE HARD; CALCITE CEMENT WITH MATRIX SUPPORT; STRONG REACTION WITH DILUTE HCL; CALCITE VEINS IN SAMPLE INDICATE FRACTURE FILL.

SHALE = MEDIUM LIGHT GRAY TO MEDIUM BLUISH GRAY TO PALE GREEN; BRITTLE TO CRUNCHY TO SLIGHTLY DENSE TENACITY; PLANAR TO SPLINTERY FRACTURING; CUTTINGS ARE PLATY TO SLIGHTLY TABULAR TO ELONGATED; DULL TO WAXY LUSTER; SMOOTH TO SEMI CLAYEY TEXTURE; THIN TO SLIGHTLY THICK STRUCTURE.



SILTSTONE = DARK REDDISH BROWN TO MODERATE OLIVE BROWN TO MEDIUM GRAY; CRUMBLY TO SLIGHTLY BRITTLE TENACITY; FRACTURES FROM IRREGULAR TO BLOCKY; TABULAR TO WEDGE LIKE TO OCCASIONALLY SLIGHTLY NODULAR; CUTTINGS HABIT; EARTHY TO DULL TO OCCASIONALLY SPARKLING LUSTER SILTY TO GRITTY TO SLIGHTLY CLAYEY TEXTURE; THIN STRUCTURE; INTERBEDDED WITH SANDSTONE AND SHALE.

SANDSTONE = MEDIUM DARK GRAY TO LIGHT GRAY TO TRANSLUCENT TO WHITE; DOMINATE QUARTZ FRAMEWORK APPROXIMATELY 2% BLACK LITHIC CLASTS INTERBEDDED; MEDIUM TO COARSE TO OCCASIONALLY MEDIUM FINE GRAINED WITH POOR SORTING; ANGULAR TO SUBANGULAR WITH LOW SPHERICITY; MODERATE HARD TO OCCASIONALLY FIRMLY FRIABLE; STRONG REACTION WITH HCL SUGGEST CALCITE CEMENT; LIGHTER GRAY AND WHITE SPECIMENS DISPLAY MATRIX SUPPORT; WITH THE DARKER GRAY SPECIMENS DISPLAYING GRAIN SUPPORT; NO VISIBLE BEDDING STRUCTURE.

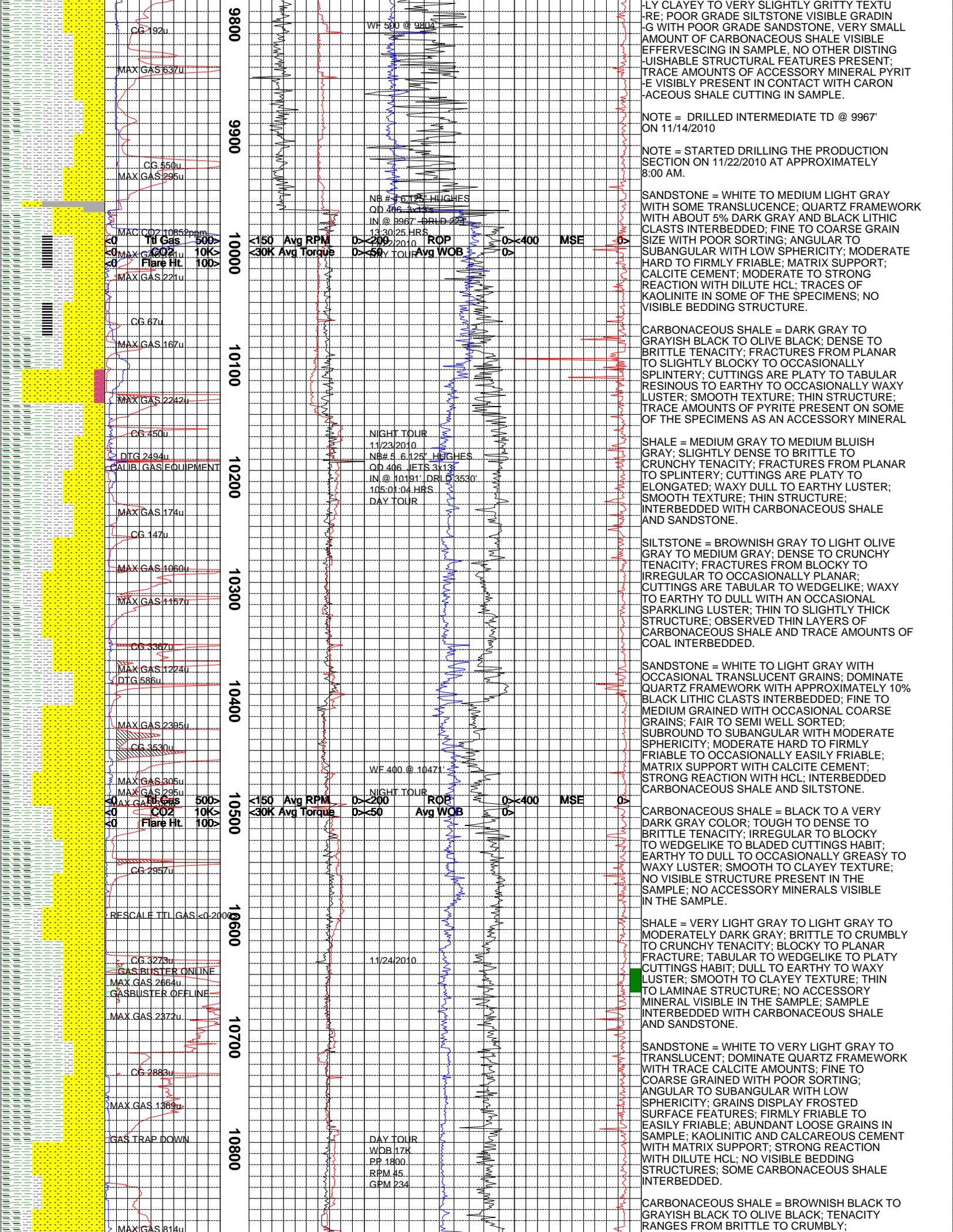
CARBONACEOUS SHALE = BLACK TO BROWNISH BLACK TO GRAYISH BLACK; SLIGHTLY DENSE TO BRITTLE TO SLIGHTLY CRUNCHY TENACITY; IRREGULAR TO SPLINTERY TO SUB BLOCKY FRACTURING; CUTTINGS ARE NODULAR TO WEDGE LIKE; RESINOUS TO SLIGHTLY WAXY LUSTER; SMOOTH TO CLAYEY TO SILTY TEXTURE; INTERBEDDED WITH SHALE, SILTSTONE AND SANDSTONE.

SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY TO OCCASIONAL MEDIUM GRAY TO LIGHT BLUIS -H GRAY IN COLOR; MODERATELY DENSE TO VERY SLIGHTLY TOUGH TO SLIGHTLY CRUNCHY TENACITY; IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR TO EARTHY FRACTURE; OCCASIONAL MASSIVE TO WEDGE LIKE TO FEW ELONGATED CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-FROSTED TO SEMI-WAXY LUSTER; VERY SLIGHTLY CLAYEY TO MODERATE -LY SMOOTH TO SLIGHTLY SILTY TEXTURE; POOR GRADE SANDSTONE VISIBLE BEDDING AND GRADING WITH POOR GRADE SILTSTONE, VERY THIN COAL LAMINAE VISIBLE IN POOR GRADE SANDSTONE AND CARBONACEOUS SHALE CUTTING. VERY SMALL AMOUNT OF COAL VISIB -LE EFFERVESCING IN SAMPLE, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRES -ENT; TRACE AMOUNTS OF ACCESSORY MINERAL PYRITE VISIBLE PRESENT IN SAMPLE.

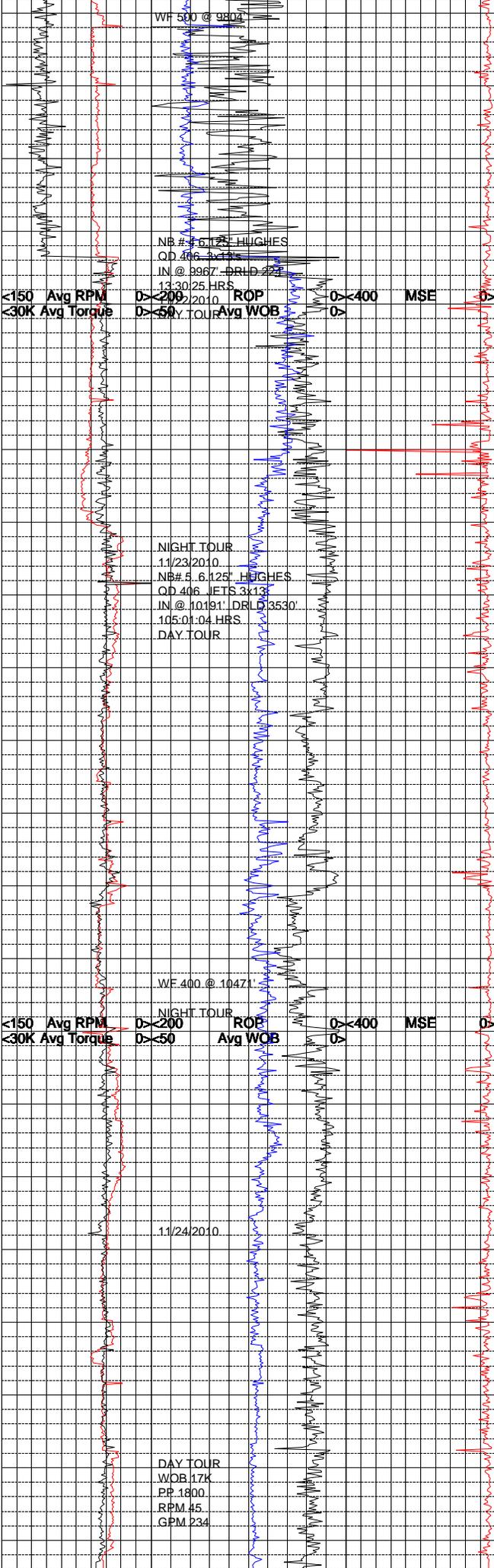
SILTSTONE = VERY LIGHT GRAY TO LIGHT GRA -Y TO OCCASIONAL MEDIUM LIGHT GRAY TO LIGHT BROWNISH GRAY IN COLOR; MODERATELY TOUGH TO MODERATELY DENSE TO OCCASIONAL CRUNCHY TENACITY; IRREGULAR TO SUB-PLANA -R TO EARTHY-HACKLY FRACTURE; SUB-TABULA -R TO SUB-NODULAR TO OCCASIONAL SUB-PLATY CUTTINGS HABIT; DULL TO EARTHY DUL -L TO OCCASIONAL VERY SLIGHTLY SEMI-SPARKLING LUSTER; SLIGHTLY CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRAD -E SANDSTONE, VERY SMALL AMOUNT OF CARBO -NACEOUS SHALE CUTTINGS VISIBLE LIGHTLY EFFERVESCING IN SAMPLE. POOR GRADE SILTS -TONE VISIBLE GRADING WITH POOR GRADE CA -RBONACEOUS SHALE CUTTINGS, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRES -ENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SANDSTONE = OFF WHITE TO VERY LIGHT YELL -OWISH GRAY TO VERY LIGHT BROWNISH GRAY WITH FEW BLACK AND MODERATE BROWN HUES; QUARTZ DOMINATE FRAME WORK; QUARTZ CUTTINGS RANGE FROM SMOKY TO TRANSLUCENT ; PREDOMINATELY GRAIN SUPPORTED WITH MODERATE AMOUNT OF LOOSE GRAINS; CONSIST -S OF CALCITIC CEMENTATION WITH MODERATE TO VERY HIGH REACTION TO DILUTE HCL; MAT -RIX CONTAINS 3 TO 5% DARK LITHIC FRAGME -NTS; MEDIUM-FINE TO MEDIUM-COARSE TO COARSE GRAINED; FAIR TO MODERATELY POOR SORTING; SUB-ANGULAR TO ANGULAR TO SUB-ROUNDED ANGULARITY; LOW TO MODERA -TE SPHERICITY; POOR GRADE SILTSTONE VIS -BLE GRADING WITH POOR GRADE SANDSTONE, NO BEDDING OR OTHER DISTINGUISHABLE SURFACE FEATURES PRESENT; TRACE AMOUNTS OF ACCESSORY MINERAL PYRITE VISIBLY PRESENT IN SAMPLE.

CARBONACEOUS SHALE = BROWNISH GRAY TO DARK BROWNISH GRAY TO BROWNISH BLACK TO OCCASIONAL OLIVE BLACK IN COLOR; MODE -RATELY DENSE TO SLIGHTLY TOUGH TO SLIGH -TLY CRUNCHY TENACITY; IRREGULAR TO SUB-BLOCKY TO EARTHY-HACKLY FRACTURE; OCCASI -ONAL MASSIVE TO WEDGE LIKE TO SUB-TABUL -AR TO SUB-NODULAR CUTTINGS HABIT; DULL TO EARTHY DULL TO SLIGHTLY GREASY TO OCCASIONAL SEMI-SPARKLING LUSTER; SLIGHT



CG 192u  
MAX GAS 637u  
CG 550u  
MAX GAS 295u  
MAC CO2 1085 ppm  
MAX GAS 1085u  
MAX GAS 221u  
MAX GAS 221u  
CG 67u  
MAX GAS 167u  
MAX GAS 2242u  
CG 450u  
DTG 2494u  
CALIB. GAS EQUIPMENT  
MAX GAS 174u  
CG 147u  
MAX GAS 4060u  
MAX GAS 1157u  
CG 3367u  
MAX GAS 1224u  
DTG 586u  
MAX GAS 2395u  
CG 3530u  
MAX GAS 305u  
MAX GAS 295u  
MAX GAS 88 Gas  
MAX GAS 88 Gas  
CG 2957u  
RESCALE TTL GAS <0-200  
CG 3273u  
GAS BUSTER ONLINE  
MAX GAS 2664u  
GAS BUSTER OFFLINE  
MAX GAS 2372u  
CG 2883u  
MAX GAS 1369u  
GAS TRAP DOWN  
MAX GAS 814u



LY CLAYE TO VERY SLIGHTLY GRITTY TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADIN -G WITH POOR GRADE SANDSTONE, VERY SMALL AMOUNT OF CARBONACEOUS SHALE VISIBLE EFFERVESCING IN SAMPLE, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; TRACE AMOUNTS OF ACCESSORY MINERAL PYRITE VISIBLY PRESENT IN CONTACT WITH CARBONACEOUS SHALE CUTTING IN SAMPLE.

NOTE = DRILLED INTERMEDIATE TD @ 9967' ON 11/14/2010

NOTE = STARTED DRILLING THE PRODUCTION SECTION ON 11/22/2010 AT APPROXIMATELY 8:00 AM.

SANDSTONE = WHITE TO MEDIUM LIGHT GRAY WITH SOME TRANSLUCENCY; QUARTZ FRAMEWORK WITH ABOUT 5% DARK GRAY AND BLACK LITHIC CLASTS INTERBEDDED; FINE TO COARSE GRAIN SIZE WITH POOR SORTING; ANGULAR TO SUBANGULAR WITH LOW SPHERICITY; MODERATE HARD TO FIRMLY FRIABLE; MATRIX SUPPORT; CALCITE CEMENT; MODERATE TO STRONG REACTION WITH DILUTE HCL; TRACES OF KAOLINITE IN SOME OF THE SPECIMENS; NO VISIBLE BEDDING STRUCTURE.

CARBONACEOUS SHALE = DARK GRAY TO GRAYISH BLACK TO OLIVE BLACK; DENSE TO BRITTLE TENACITY; FRACTURES FROM PLANAR TO SLIGHTLY BLOCKY TO OCCASIONALLY SPLINTERY; CUTTINGS ARE PLATY TO TABULAR RESINOUS TO EARTHY TO OCCASIONALLY WAXY LUSTER; SMOOTH TEXTURE; THIN STRUCTURE; TRACE AMOUNTS OF PYRITE PRESENT ON SOME OF THE SPECIMENS AS AN ACCESSORY MINERAL

SHALE = MEDIUM GRAY TO MEDIUM BLuish GRAY; SLIGHTLY DENSE TO BRITTLE TO CRUNCHY TENACITY; FRACTURES FROM PLANAR TO SPLINTERY; CUTTINGS ARE PLATY TO ELONGATED; WAXY DULL TO EARTHY LUSTER; SMOOTH TEXTURE; THIN STRUCTURE; INTERBEDDED WITH CARBONACEOUS SHALE AND SANDSTONE.

SILTSTONE = BROWNISH GRAY TO LIGHT OLIVE GRAY TO MEDIUM GRAY; DENSE TO CRUNCHY TENACITY; FRACTURES FROM BLOCKY TO IRREGULAR TO OCCASIONALLY PLANAR; CUTTINGS ARE TABULAR TO WEDGELIKE; WAXY TO EARTHY TO DULL WITH AN OCCASIONAL SPARKLING LUSTER; THIN TO SLIGHTLY THICK STRUCTURE; OBSERVED THIN LAYERS OF CARBONACEOUS SHALE AND TRACE AMOUNTS OF COAL INTERBEDDED.

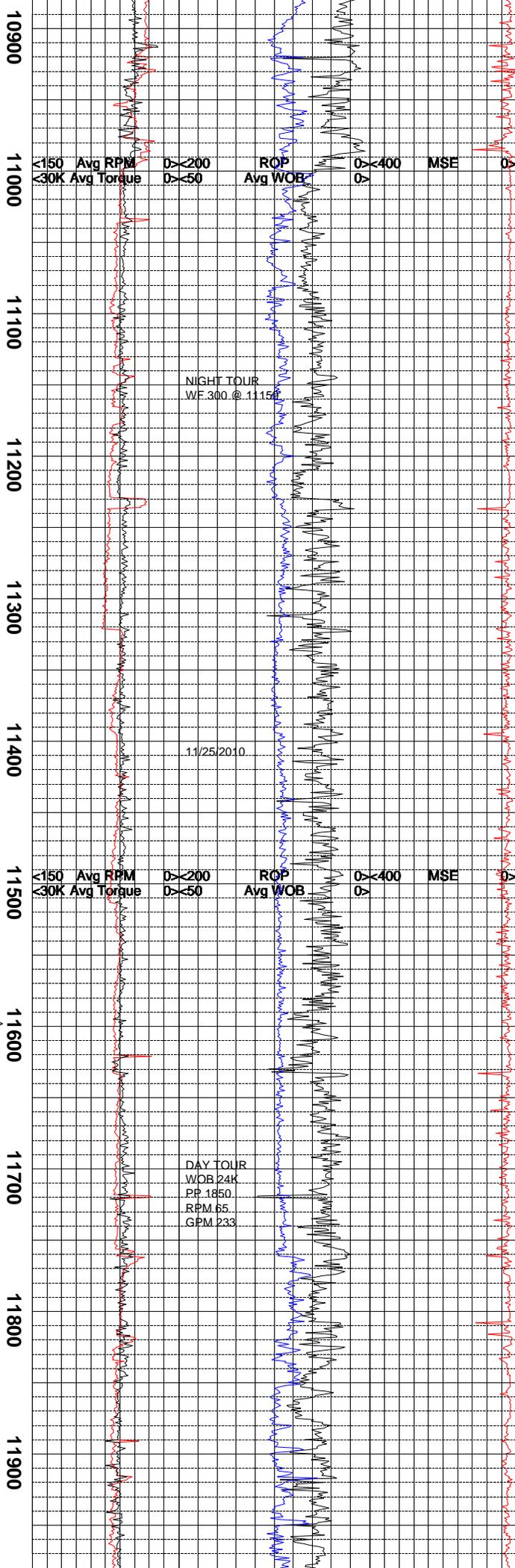
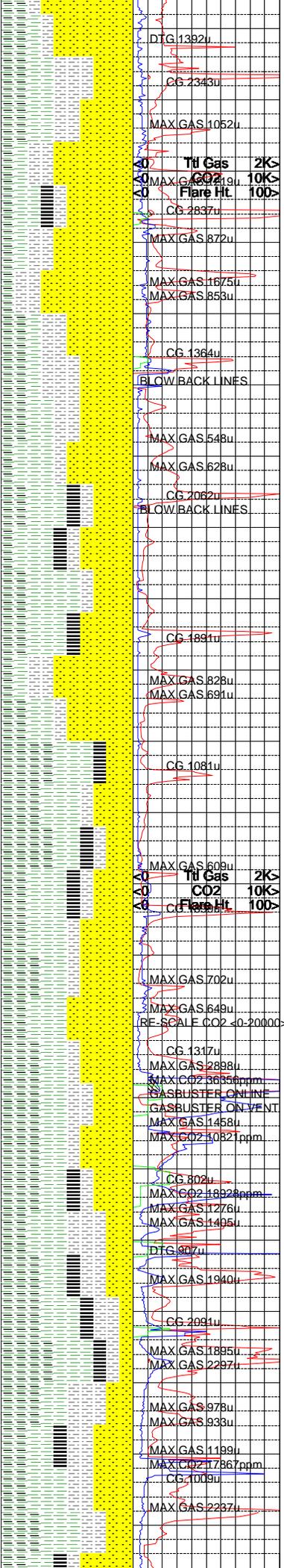
SANDSTONE = WHITE TO LIGHT GRAY WITH OCCASIONAL TRANSLUCENT GRAINS; DOMINATE QUARTZ FRAMEWORK WITH APPROXIMATELY 10% BLACK LITHIC CLASTS INTERBEDDED; FINE TO MEDIUM GRAINED WITH OCCASIONAL COARSE GRAINS; FAIR TO SEMI WELL SORTED; SUBROUND TO SUBANGULAR WITH MODERATE SPHERICITY; MODERATE HARD TO FIRMLY FRIABLE TO OCCASIONALLY EASILY FRIABLE; MATRIX SUPPORT WITH CALCITE CEMENT; STRONG REACTION WITH HCL; INTERBEDDED CARBONACEOUS SHALE AND SILTSTONE.

CARBONACEOUS SHALE = BLACK TO A VERY DARK GRAY COLOR; TOUGH TO DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY TO WEDGELIKE TO BLADED CUTTINGS HABIT; EARTHY TO DULL TO OCCASIONALLY GREASY TO WAXY LUSTER; SMOOTH TO CLAYEY TEXTURE; NO VISIBLE STRUCTURE PRESENT IN THE SAMPLE; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE.

SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO MODERATELY DARK GRAY; BRITTLE TO CRUMBLY TO CRUNCHY TENACITY; BLOCKY TO PLANAR FRACTURE; TABULAR TO WEDGELIKE TO PLATY CUTTINGS HABIT; DULL TO EARTHY TO WAXY LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN TO LAMINAE STRUCTURE; NO ACCESSORY MINERAL VISIBLE IN THE SAMPLE; SAMPLE INTERBEDDED WITH CARBONACEOUS SHALE AND SANDSTONE.

SANDSTONE = WHITE TO VERY LIGHT GRAY TO TRANSLUCENT; DOMINATE QUARTZ FRAMEWORK WITH TRACE CALCITE AMOUNTS; FINE TO COARSE GRAINED WITH POOR SORTING; ANGULAR TO SUBANGULAR WITH LOW SPHERICITY; GRAINS DISPLAY FROSTED SURFACE FEATURES; FIRMLY FRIABLE TO EASILY FRIABLE; ABUNDANT LOOSE GRAINS IN SAMPLE; KAOLINITE AND CALCAREOUS CEMENT WITH MATRIX SUPPORT; STRONG REACTION WITH DILUTE HCL; NO VISIBLE BEDDING STRUCTURES; SOME CARBONACEOUS SHALE INTERBEDDED.

CARBONACEOUS SHALE = BROWNISH BLACK TO GRAYISH BLACK TO OLIVE BLACK; TENACITY RANGES FROM BRITTLE TO CRUMBLY;



FRACTURES FROM IRREGULAR TO PLANAR TO SPLINTERY TO OCCASIONALLY BLOCKY; CUTTINGS ARE TABULAR TO WEDGELIKE; EARTHY TO WAXY TO SLIGHTLY RESINOUS LUSTER; SMOOTH TEXTURE; THIN STRUCTURE; INTERBEDDED WITH SANDSTONE, SILTSTONE AND SHALE.

SHALE = MEDIUM LIGHT GRAY TO LIGHT OLIVE GRAY TO LIGHT GRAYISH GRAY; BRITTLE TO SLIGHTLY CRUNCHY TENACITY; FRACTURES FROM PLANAR TO SPLINTERY; CUTTINGS ARE PLATY TO FLAKY; WAXY TO DULL LUSTER; SMOOTH TEXTURE; LAMINAE TO THIN STRUCTURE; INTERBEDDED WITH CARBONACEOUS SHALE, SILTSTONE AND SANDSTONE.

SILTSTONE = BROWNISH GRAY TO LIGHT BROWNISH GRAY TO LIGHT GRAY TO OCCASIONALLY GRAYISH RED PURPLE; DENSE TO SLIGHTLY BRITTLE TENACITY; BLOCKY TO IRREGULAR FRACTURING; CUTTINGS ARE TABULAR TO WEDGELIKE; EARTHY TO DULL LUSTER; SILTY TO GRITTY TEXTURE; THIN STRUCTURE; TRACE AMOUNTS OF COAL INTERBEDDED; INTERBEDDED WITH SANDSTONE SHALE AND CARBONACEOUS SHALE.

SANDSTONE = WHITE TO LIGHT GRAY TO A MEDIUM LIGHT GRAY TO MEDIUM DARK GRAY LIGHT OLIVE GRAY TO BROWNISH GRAY COLOR; QUARTZ FRAMEWORK WITH A FEW SAMPLES SHOWING HIGHER % OF K-SPAR AN OTHERS; UPPER FINE TO LOWER MEDIUM GRAIN SIZE; WELL TO FAIR SORTING WITH SOME SAMPLES SHOWING FAIR TO SLIGHTLY POOR SORTING; SUBANGULAR TO SUBROUND ANGULARITY; HIGH TO MODERATE SPHERICITY; SURFACE FEATURES OF GRAINS INCLUDE POLISHING AND FROSTING OF GRAINS POSSIBLY DUE TO MECHANICAL ABRASION; EASILY FRIABLE TO FRIABLE TO FIRMLY FRIABLE WITH SOME SAMPLES BEING MODERATELY HARD; SAMPLE IS REACTIVE WITH A 10% SOLUTION OF HCL INDICATING CALCITE CEMENTATION; SAMPLES ARE GRAIN SUPPORTED AND INCLUDE 10% TO 20% LITHIC FRAGMENTS; SOME BEDDING SURFACES VISIBLE IN A VERY FEW SAMPLES; MANY LOOSE GRAINS IN THE SAMPLE AND NO VISIBLE ACCESSORY MINERAL PRESENT; INTERBEDDED WITH CARBONACEOUS SHALE, SHALE AND SOME SILTSTONE.

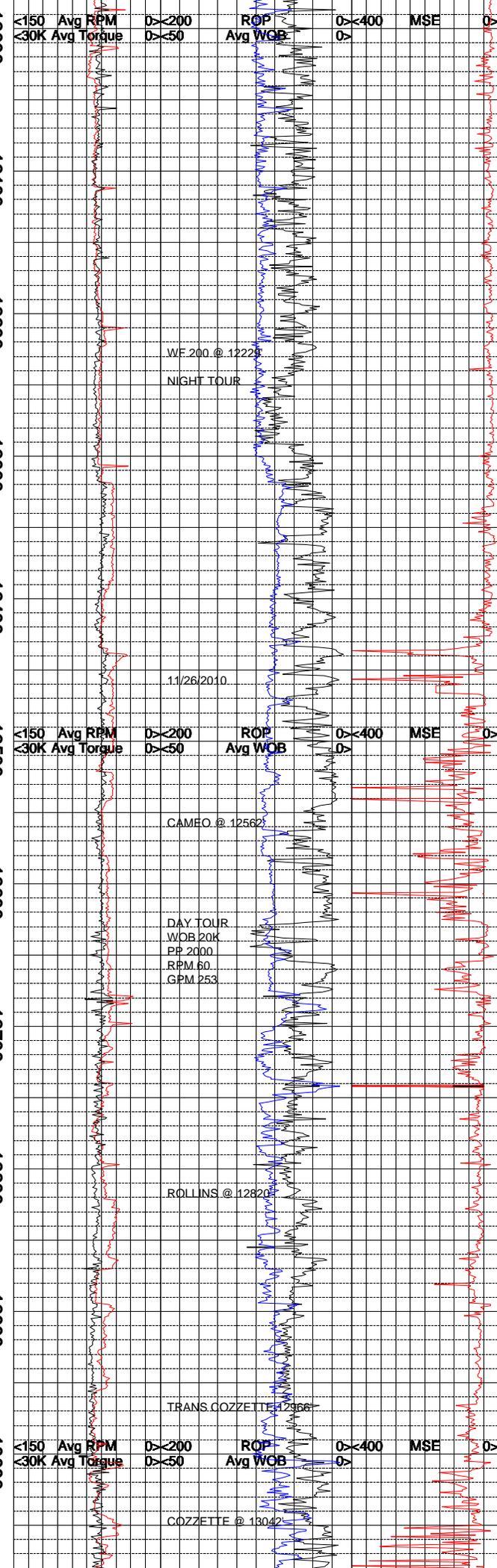
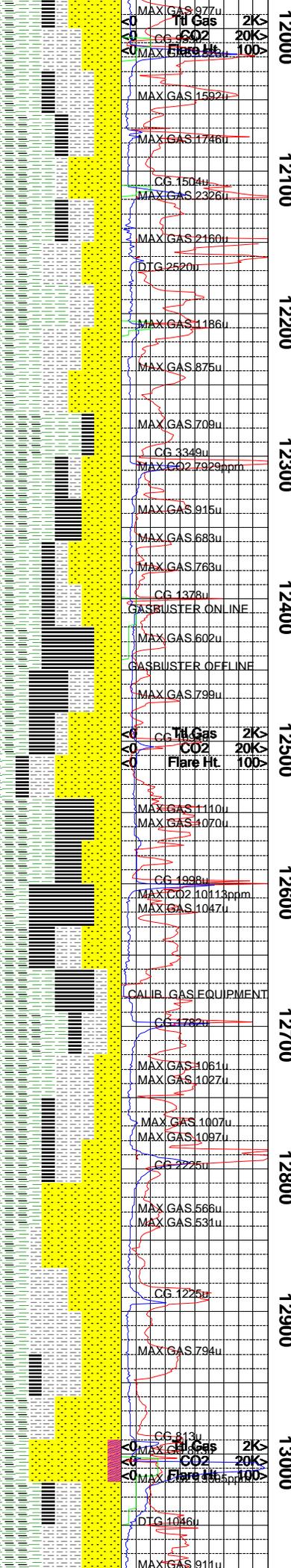
COAL = BLACK IN COLOR; VERY BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO BLOCKY TO SPLINTERY FRACTURE; MASSIVE TO FLAKY TO BLADED CUTTINGS HABIT; GREASY TO RESINOUS LUSTER; SMOOTH TO CLAYEY TEXTURE; VISIBLE EFFERVESCENT IN THE SAMPLE; THIN TO LAMINAE STRUCTURE; THIN BEDS VISIBLE IN SANDSTONE SAMPLES; INTERBEDDED WITH SANDSTONE, SILTSTONE, SHALE, AND CARBONACEOUS SHALE.

SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO MODERATELY DARK GRAY; BRITTLE TO CRUMBLY TO CRUNCHY TENACITY; BLOCKY TO PLANAR FRACTURE; TABULAR TO WEDGELIKE TO PLATY CUTTINGS HABIT; DULL TO EARTHY TO WAXY LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN TO LAMINAE STRUCTURE; NO ACCESSORY MINERAL VISIBLE IN THE SAMPLE; SAMPLE INTERBEDDED WITH CARBONACEOUS SHALE, SILTSTONE AND SANDSTONE.

CARBONACEOUS SHALE = GRAYISH BLACK TO BLACK; BRITTLE TO SLIGHTLY DENSE TENACITY; FRACTURES FROM IRREGULAR TO SLIGHTLY BLOCKY TO PLANAR; CUTTINGS ARE NODULAR TO WEDGELIKE TO SLIGHTLY ELONGATED; RESINOUS TO EARTHY TO OCCASIONALLY WAXY LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN TO SOME WHAT THICK STRUCTURE; INTERBEDDED WITH SILTSTONE, SHALE AND SANDSTONE; OCCASIONAL COAL INTERBEDDED WITHIN SAMPLE; HIGH GAS ASSOCIATED WITH SAMPLE.

SILTSTONE = BROWNISH GRAY TO LIGHT OLIVE GRAY TO MEDIUM GRAY; BRITTLE TO SLIGHTLY CRUMBLY TENACITY; FRACTURES FROM BLOCKY TO IRREGULAR; CUTTINGS ARE TABULAR TO SLIGHTLY WEDGELIKE; WAXY TO EARTHY TO DULL LUSTER; GRITTY TO SILTY TO SLIGHTLY CLAYEY TEXTURE; THIN STRUCTURE; INTERBEDDED WITH CARBONACEOUS SHALE, SHALE, SANDSTONE AND COAL.

SANDSTONE = MEDIUM LIGHT GRAY TO LIGHT BROWNISH GRAY WITH OCCASIONAL PALE YELLOWISH BROWN HUES; DOMINATE QUARTZ FRAMEWORK WITH APPROXIMATELY 10% BLACK LITHIC CLASTS INTERBEDDED; FINE TO MEDIUM COARSE GRAINED WITH POOR TO SLIGHTLY FAIR SORTING; ANGULAR TO SUBANGULAR WITH LOW SPHERICITY; FIRMLY FRIABLE TO FRIABLE WITH FREQUENT LOOSE GRAINS IN SAMPLE; MATRIX SUPPORT; MODERATE TO LOW REACTION WITH HCL SUGGESTS CALCAREOUS / SILICEOUS CEMENT;



INTERBEDDED WITH SILTSTONE; OCCASIONAL THIN SEAMS OF CARBONACEOUS SHALE AND COAL CAN BE OBSERVED IN A FEW OF THE SPECIMENS.

SHALE = MEDIUM LIGHT GRAY TO MEDIUM GRAY TO LIGHT BLuish GRAY; DENSE TO BRITTLE TENACITY; FRACTURES FROM PLANAR TO SPLINTERY; CUTTINGS ARE ELONGATED TO PLATY TO SLIGHTLY FLAKY; WAXY TO DULL LUSTER; SMOOTH TEXTURE; LAMINAE TO THIN STRUCTURE.

COAL = BLACK; BRITTLy TO CRUMBLY TO SLIGHTLY PULVERULENT TENACITY; CUTTINGS ARE FLAKY TO NODULAR; FRACTURES FROM BLOCKY TO IRREGULAR; EARTHY TO GREASY LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE; INTERBEDDED WITH CARBONACEOUS SHALE, SILTSTONE, SANDSTONE AND SHALE; HIGH GAS ASSOCIATED WITH SAMPLE.

CARBONACEOUS SHALE = BLACK TO GRAYISH BLACK TO DARK GRAY TO BROWNISH BLACK COLOR; DENSE TO BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO BLOCKY TO PLANAR FRACTURE; MASSIVE TO PLATY TO WEDGELIKE TO BLADED CUTTING HABIT; EARTHY TO DULL TO WAXY TO GREASY LUSTER; SMOOTH TO CLAYEY TEXTURE; STRUCTURES VISIBLE IN THE SAMPLE ARE LAMINAE TO THIN; NO VISIBLE ACCESSORY MINERALS PRESENT IN THE SAMPLE; INTERBEDDED WITH SANDSTONE AND COAL.

SANDSTONE = PALE YELLOWISH BROWN TO PALE BROWN TO A DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN COLOR; UPPER FINE TO LOWER MEDIUM GRAIN SIZE; WELL TO FAIR TO SLIGHTLY POOR SORTING; SUBROUND TO SUBANGULAR ANGULARITY; HIGH TO MODERATE SPHERICITY; SOME POLISHED TO FROSTED GRAINS; HARDNESS RANGES FROM FRIABLE TO HARD; MATRIX SUPPORTED WITH 10 TO 20% LITHICS; NO BEDDING STRUCTURES VISIBLE IN THE SAMPLES; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE; HIGHLY REACTIVE WITH A 10% HCL SOLUTION; INTERBEDDED WITH CARBONACEOUS SHALE AND COAL.

SHALE = LIGHT GRAY TO MEDIUM GRAY TO MEDIUM DARK GRAY COLOR; DENSE TO BRITTLE TO CRUNCHY TENACITY; IRREGULAR TO PLANAR FRACTURE; MASSIVE TO PLATY TO TABULAR CUTTINGS HABIT WITH SOME SAMPLES BEING WEDGELIKE TO BLADED; EARTHY TO DULL TO OCCASIONALLY WAXY LUSTER; SMOOTH TO CLAYEY TEXTURE; LAMINAE STRUCTURE VISIBLE IN SOME OF THE SAMPLES; NO ACCESSORY MINERALS PRESENT IN THE SAMPLE; INTERBEDDED WITH SANDSTONE, SHALE AND COAL.

COAL = BLACK; CRUMBLY TO PULVERULENT TO BRITTLE TENACITY; FRACTURES FROM IRREGULAR TO BLOCKY TO OCCASIONALLY CONCHOIDAL; CUTTINGS ARE FLAKY TO ELONGATED TO SLIGHTLY NODULAR; SLIGHTLY GREASY TO RESINOUS TO EARTHY LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE INTERBEDDED WITH CARBONACEOUS SHALE SILTSTONE AND SANDSTONE; HIGH GAS ASSOCIATED WITH SAMPLE.

CARBONACEOUS SHALE = BLACK TO GRAYISH BLACK TO BROWNISH BLACK; DENSE TO BRITTLE TENACITY; FRACTURES FROM SUB BLOCKY TO IRREGULAR TO SLIGHTLY PLANAR; CUTTINGS ARE ELONGATED TO PLATY TO SLIGHTLY FLAKY; RESINOUS TO POLISHED TO SLIGHTLY EARTHY LUSTER; THICK STRUCTURE; INTERBEDDED WITH CARBONACEOUS SHALE; SMOOTH TEXTURE.

SANDSTONE = WHITE TO VERY LIGHT GRAY TO MEDIUM LIGHT GRAY; DOMINATE QUARTZ FRAMEWORK; FINE TO COARSE GRAINED WITH POOR SORTING; SUBANGULAR TO SUBROUND WITH MODERATE TO LOW SPHERICITY; EASILY FRIABLE TO FRIABLE WITH ABUNDANT LOOSE GRAINS IN SAMPLE; MATRIX SUPPORT; MODERATE REACTION WITH HCL SUGGESTS SOME CALCAREOUS CEMENT; NO VISIBLE BEDDING STRUCTURE; INTERBEDDED WITH CARBONACEOUS SHALE, SILTSTONE AND SHALE.

SILTSTONE = LIGHT BROWNISH GRAY TO MEDIUM LIGHT GRAY TO BROWNISH GRAY; TENACITY RANGES FROM DENSE TO BRITTLE TO OCCASIONALLY CRUNCHY; FRACTURES FROM IRREGULAR TO BLOCKY; CUTTINGS ARE TABULAR TO SLIGHTLY WEDGELIKE; WAXY TO DULL TO EARTHY TO OCCASIONALLY SLIGHTLY SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; GRADING FROM SANDSTONE; THIN STRUCTURE.

SHALE = LIGHT GRAY TO MEDIUM GRAY TO MEDIUM DARK GRAY COLOR; DENSE TO BRITTLE

WF 200 @ 12225  
NIGHT TOUR

11/26/2010

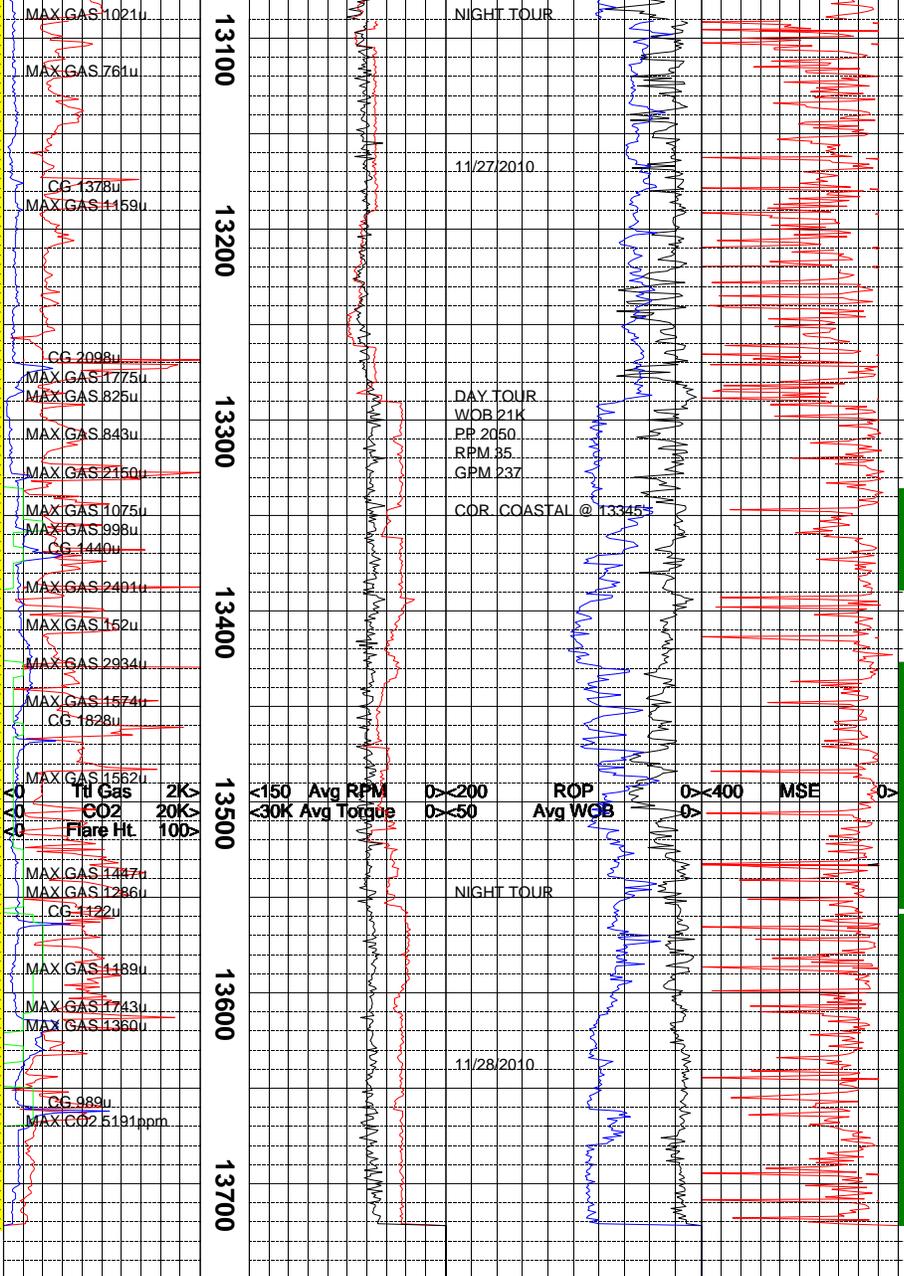
CAMEO @ 12562

DAY TOUR  
WOB 20K  
PP 2000  
RPM 60  
GPM 253

ROLLINS @ 12820

TRANS.COZZETTE @ 12966

COZZETTE @ 13042



TO CRUNCHY TENACITY; IRREGULAR TO PLANAR FRACTURE; MASSIVE TO PLATY TO TABULAR CUTTINGS HABIT WITH SOME SAMPLES BEING WEDGELIKE TO BLADED; EARTHY TO DULL TO OCCASIONALLY WAXY LUSTER; SMOOTH TO CLAYEY TEXTURE; LAMINAE STRUCTURE VISIBLE IN SOME OF THE SAMPLES; NO ACCESSORY MINERALS PRESENT IN THE SAMPLE; INTERBEDDED WITH SANDSTONE; SHALE AND COAL.

COAL = BLACK IN COLOR; TENACITY IS BRITTLE TO CRUMBLY TO CRUNCHY; BLOCKY TO IRREGULAR FRACTURE; CUTTINGS HABIT IS MASSIVE TO TABULAR TO NODULAR; WAXY TO GREASY TO RESINOUS LUSTER; SMOOTH TO CLAYEY TEXTURE; SOME LAMINAE STRUCTURE IN SOME OF THE SAMPLES; INTERBEDDED WITH SANDSTONE AND CARBONACEOUS SHALE, AND SILTSTONE; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE.

SANDSTONE = LIGHT GRAY TO WHITE TO TRANSLUCENT; DOMINATE QUARTZ FRAMEWORK WITH APPROXIMATELY 10% BLACK LITHIC CLASTS INTERBEDDED; MEDIUM FINE TO MEDIUM TO OCCASIONALLY COARSE GRAINED WITH FAIR TO POOR SORTING; SUBANGULAR TO SUBROUND WITH LOW TO MODERATE SPHERICITY; HARD TO MODERATE HARD; GRAIN SUPPORT; SILICA CEMENT SUGGESTS BY NO TO VERY LITTLE REACTION WITH DILUTE HCL; NO VISIBLE BEDDING STRUCTURE.

CARBONACEOUS SHALE = GRAYISH BLACK TO BROWNISH BLACK TO BLACK; SLIGHTLY DENSE TO BRITTLE TO CRUNCHY TENACITY; FRACTURES FROM PLANAR TO SPLINTER TO OCCASIONALLY BLOCKY; CUTTINGS ARE TABULAR TO ELONGATED TO SLIGHTLY NODULAR RESINOUS TO POLISHED TO SOMETIMES EARTHY WAXY LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE; INTERBEDDED WITH SHALE, SILTSTONE AND SANDSTONE; TRACE AMOUNTS OF PYRITE PRESENT AS AN ACCESSORY MINERAL; HIGH GAS ASSOCIATED WITH SAMPLE

SANDSTONE = WHITE TO LIGHT GRAY TO MEDIUM LIGHT GRAY TO A PINKISH GRAY TO A LIGHT BROWNISH GRAY COLOR; QUARTZ FRAMEWORK; UPPER FINE TO LOWER MEDIUM GRAIN SIZE; WELL TO FAIR SORTING; HIGH TO MODERATE SPHERICITY; SUBANGULAR TO SUBROUND ANGULARITY; SURFACE FEATURES FROM POLISHED TO FROSTED GRAINS; FRIABLE TO MODERATELY HARD HARDNESS; 10-20% LITHIC CLASTS; NO REACTION WITH A 10% HCL SOLUTION INDICATING SILICA CEMENT; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE; INTERBEDDED WITH CARBONACEOUS SHALE AND SILTSTONE.

NOTE = REACHED TOTAL DEPTH OF 13721' FOR PCU 296-5A 05 ON 11/28/2010 @ 03:30:00

The log data, interpretations and recommendation provided by Epoch are inferences and assumptions based on measurements of drilling fluids. Such inferences and assumptions are not infallible and reasonable professionals may differ. Epoch does not represent or warrant the accuracy, correctness or completeness of any log data, interpretations, recommendations or information provided by Epoch, its officers, agents or employees. Epoch does not and cannot guarantee the accuracy of any such interpretation of the log data, interpretations or recommendations and Company is fully responsible for all decisions and actions it takes based on such log data, interpretations and recommendations.

