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(281) 784-5500
Bakersfield, CA
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(337) 364-2322
Anchorage, AK
(907) 561-2465

Drilling Dynamics MD

COMPANY EXXON MOBIL
WELL PCU 197-34B8
FIELD PICEANCE CREEK
REGION ROCKY MOUNTAINS
COORDINATES 39.915659000
108.261198000
ELEVATION 6,649.1'
COUNTY, STATE RIO BLANCO, CO
API INDEX 05-103-11082-00
SPUD DATE 12/13/2008
CONTRACTOR H_P
CO. REP. S.GUYOTE/W.GARNER
RIG/TYPE # 320/FLEX 4S+
LOGGING UNIT MLU # 032
GEOLOGISTS J.KEEVAN
C.RECORD/C.PIERCE
ADD. PERSONS M.PIPER/B. HICKS
T.WALKER
CO. GEOLOGIST CHRIS ALBA

LOG INTERVAL

CASING DATA

DEPTHS: 4,000' TO 12,645'
DATES: 9/30/2009 TO 12/28/2009
SCALE: 1"=100'

15" AT 150'
10.75" AT 3,976'
7" AT 8,794'
AT

MUD TYPES

HOLE SIZE

LSND TO 12,645'
TO
TO
TO

14.75" TO 4,000'
9.875" TO 8,806'
6.125" TO 12,645'
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	KAOLINITIC	RECRYSTALLIZED CALCITE	VOLCANICS
CHALK	DIATOMITE	LIMESTONE	RHYOLITE	
CRYSTALLINE TUFF	DIORITE	LITHIC TUFF	SALT	
CHERT - ARGILL	DOLOSTONE	MARL - DOLO	SAND	

Lithology

<0 Ttl Gas 500>
units

<325 CO2 10K>
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.

3900

3900

EPOCH WELL SERVICES COMMENCED MUDLOGGING ON THE EXXONMOBIL PCU 197-34B8 WELL ON 09/30/2009 AT 4000' MD. ALL COLORS ARE REFERENCED TO THE GSA ROCK COLOR CHART. ALL TRIP AND CONNECTION GASES ARE REFERENCED ABOVE BACKGROUND; ALL OTHERS ARE ABSOLUTE. 1% METH. EQUIV. = 50 UNIT = 10000 PPM. 10 3/4" CASING @ 3957' PIT 12.0 PPG (E)

4000

4000

SANDSTONE = YELLOWISH GRAY TO WHITE IN COLOR; QUARTZ FRAMEWORK; MEDIUM TO FINE GRAIN SIZE; FAIR TO WELL SORTING; GRAINS ARE ROUNDED TO SUBANGULAR WITH MODERATE TO HIGH SPHERICITY; SAMPLE IS FRIABLE TO MODERATELY HARD; CALCITE CEMENT; NO VISIBLE BEDDING; NO VISIBLE VOIDS; NO GAS SHOWS FROM THIS SANDSTONE.

4100

4100

SILTSTONE = DARK YELLOWISH ORANGE TO DARK YELLOWISH BROWN IN COLOR; BRITTLE TO CRUNCHY TENACITY; IRREGULAR TO PLANAR FRACTURE; CUTTINGS RANGE FROM PLATY TO WEDGELIKE IN APPEARANCE; DULL TO EARTHY LUSTER EXHIBITED; TEXTURE RANGES FROM SILTY TO GRANULAR WITH SOME GRADATION INTO SANDSTONE NOTICEABLE; THICK TO MASSIVE STRUCTURE APPARENT.

4200

4200

LIMESTONE = LIGHT BLUISH GRAY TO MEDIUM BLUISH GRAY WITH POSSIBLE LIMONITE STAINING; MATRIX DOMINATED - MUDSTONE; MATRIX APPEARS TO BE CLASTIC IN ORIGIN; POINT CONTACTS FABRIC WITH NO DISCERNIBLE POROSITY.

4300

4300

SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY IN COLOR; CRUMBLY TO PULVERANT TENACITY; IRREGULAR TO BLOCKY FRACTURE; CUTTINGS ARE PLATY TO TABULAR IN APPEARANCE; DULL TO EARTHY LUSTER EXHIBITED; CLAYEY TO SILTY TEXTURE; THIN TO LAMINAE STRUCTURE INTERBEDDED WITH SILTSTONES APPARENT FROM DRILL BREAKS.

4400

4400

SANDSTONE = LIGHT GREENISH GRAY TO WHITE IN COLOR; QUARTZ FRAMEWORK; COARSE TO FINE GRAIN SIZE; POOR TO FAIR SORTING; ROUNDED TO SUBANGULAR GRAINS WITH LOW TO MODERATE SPHERICITY; FRIABLE TO FIRMLY FRIABLE HARDNESS; CALCITE CEMENT; GRAIN SUPPORTED WITH CEMENT FABRIC; NO VISIBLE POROSITY; CHLORITE GRAINS VISIBLE IN MATRIX; NO GAS SHOWS.

4500

4500

SILTSTONE = GRAYISH ORANGE TO DUSKY YELLOW IN COLOR; DENSE TO CRUMBLY IN TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE NONDULAR TO WEDGELIKE IN COLOR; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE.

4600

4600

SHALE = LIGHT GRAY TO MODERATE GREENISH YELLOW WITH GRAYISH PURPLE HUES; BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURING PLATY TO SCALY CUTTINGS; DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

4700

4700

SANDSTONE = LIGHT GREENISH GRAY TO LIGHT OLIVE TO LIGHT GRAY; FRAMEWORK CONSISTS OF MOSTLY QUARTZ; MEDIUM TO FINE SIZED GRAINS WITH POOR SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; FIRMLY FRIABLE WITH CALCITE CEMENT; MODERATE REACTION WITH HCL.

4800

4800

SILTSTONE = PALE REDDISH BROWN TO MODERATE BROWN; DENSE TO CRUMBLY TENACITY; BLOCKY TO IRREGULAR FRACTURING TABULAR CUTTINGS; EARTHY WITH A SLIGHT FROSTED LUSTER; GRITTY TO SILTY TEXTURE; THICK TO MASSIVE STRUCTURE.

4900

4900

SHALE = MEDIUM BLUISH GRAY TO GREENISH GRAY TO LIGHT GRAY; BRITTLE TO SLIGHTLY CRUNCHY TENACITY; PLANAR FRACTURING; PLATY TO TABULAR TO SLIGHTLY SCALY CUTTINGS; DULL LUSTER; THIN STRUCTURE.

5000

5000

SANDSTONE = BROWNISH GRAY TO MODERATE BROWN TO GRAY COLOR; QUARTZ FRAMEWORK WITH APPROXIMATELY 5% DARK LITHIC CLASTS FINE TO MEDIUM SIZED GRAINS WITH FAIR TO POOR SORTING; SUBANGULAR WITH LOW SPHERICITY; FIRMLY FRIABLE TO MODERATE

5100

5100

SHALE = LIGHT GRAY TO MODERATE GREENISH YELLOW WITH GRAYISH PURPLE HUES; BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURING PLATY TO SCALY CUTTINGS; DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

5200

5200

SANDSTONE = LIGHT GREENISH GRAY TO LIGHT OLIVE TO LIGHT GRAY; FRAMEWORK CONSISTS OF MOSTLY QUARTZ; MEDIUM TO FINE SIZED GRAINS WITH POOR SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; FIRMLY FRIABLE WITH CALCITE CEMENT; MODERATE REACTION WITH HCL.

5300

5300

SILTSTONE = GRAYISH ORANGE TO DUSKY YELLOW IN COLOR; DENSE TO CRUMBLY IN TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE NONDULAR TO WEDGELIKE IN COLOR; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE.

5400

5400

SHALE = LIGHT GRAY TO MODERATE GREENISH YELLOW WITH GRAYISH PURPLE HUES; BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURING PLATY TO SCALY CUTTINGS; DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

5500

5500

SANDSTONE = LIGHT GREENISH GRAY TO LIGHT OLIVE TO LIGHT GRAY; FRAMEWORK CONSISTS OF MOSTLY QUARTZ; MEDIUM TO FINE SIZED GRAINS WITH POOR SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; FIRMLY FRIABLE WITH CALCITE CEMENT; MODERATE REACTION WITH HCL.

5600

5600

SILTSTONE = GRAYISH ORANGE TO DUSKY YELLOW IN COLOR; DENSE TO CRUMBLY IN TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE NONDULAR TO WEDGELIKE IN COLOR; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE.

5700

5700

SHALE = LIGHT GRAY TO MODERATE GREENISH YELLOW WITH GRAYISH PURPLE HUES; BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURING PLATY TO SCALY CUTTINGS; DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

5800

5800

SANDSTONE = LIGHT GREENISH GRAY TO LIGHT OLIVE TO LIGHT GRAY; FRAMEWORK CONSISTS OF MOSTLY QUARTZ; MEDIUM TO FINE SIZED GRAINS WITH POOR SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; FIRMLY FRIABLE WITH CALCITE CEMENT; MODERATE REACTION WITH HCL.

5900

5900

SILTSTONE = GRAYISH ORANGE TO DUSKY YELLOW IN COLOR; DENSE TO CRUMBLY IN TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE NONDULAR TO WEDGELIKE IN COLOR; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE.

6000

6000

SHALE = LIGHT GRAY TO MODERATE GREENISH YELLOW WITH GRAYISH PURPLE HUES; BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURING PLATY TO SCALY CUTTINGS; DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

6100

6100

SANDSTONE = LIGHT GREENISH GRAY TO LIGHT OLIVE TO LIGHT GRAY; FRAMEWORK CONSISTS OF MOSTLY QUARTZ; MEDIUM TO FINE SIZED GRAINS WITH POOR SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; FIRMLY FRIABLE WITH CALCITE CEMENT; MODERATE REACTION WITH HCL.

6200

6200

SILTSTONE = GRAYISH ORANGE TO DUSKY YELLOW IN COLOR; DENSE TO CRUMBLY IN TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE NONDULAR TO WEDGELIKE IN COLOR; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE.

6300

6300

SHALE = LIGHT GRAY TO MODERATE GREENISH YELLOW WITH GRAYISH PURPLE HUES; BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURING PLATY TO SCALY CUTTINGS; DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

6400

6400

SANDSTONE = LIGHT GREENISH GRAY TO LIGHT OLIVE TO LIGHT GRAY; FRAMEWORK CONSISTS OF MOSTLY QUARTZ; MEDIUM TO FINE SIZED GRAINS WITH POOR SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; FIRMLY FRIABLE WITH CALCITE CEMENT; MODERATE REACTION WITH HCL.

6500

6500

SILTSTONE = GRAYISH ORANGE TO DUSKY YELLOW IN COLOR; DENSE TO CRUMBLY IN TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE NONDULAR TO WEDGELIKE IN COLOR; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE.

6600

6600

SHALE = LIGHT GRAY TO MODERATE GREENISH YELLOW WITH GRAYISH PURPLE HUES; BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURING PLATY TO SCALY CUTTINGS; DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

6700

6700

SANDSTONE = LIGHT GREENISH GRAY TO LIGHT OLIVE TO LIGHT GRAY; FRAMEWORK CONSISTS OF MOSTLY QUARTZ; MEDIUM TO FINE SIZED GRAINS WITH POOR SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; FIRMLY FRIABLE WITH CALCITE CEMENT; MODERATE REACTION WITH HCL.

6800

6800

SILTSTONE = GRAYISH ORANGE TO DUSKY YELLOW IN COLOR; DENSE TO CRUMBLY IN TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE NONDULAR TO WEDGELIKE IN COLOR; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE.

6900

6900

SHALE = LIGHT GRAY TO MODERATE GREENISH YELLOW WITH GRAYISH PURPLE HUES; BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURING PLATY TO SCALY CUTTINGS; DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

7000

7000

SANDSTONE = LIGHT GREENISH GRAY TO LIGHT OLIVE TO LIGHT GRAY; FRAMEWORK CONSISTS OF MOSTLY QUARTZ; MEDIUM TO FINE SIZED GRAINS WITH POOR SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; FIRMLY FRIABLE WITH CALCITE CEMENT; MODERATE REACTION WITH HCL.

7100

7100

SILTSTONE = GRAYISH ORANGE TO DUSKY YELLOW IN COLOR; DENSE TO CRUMBLY IN TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE NONDULAR TO WEDGELIKE IN COLOR; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE.

7200

7200

SHALE = LIGHT GRAY TO MODERATE GREENISH YELLOW WITH GRAYISH PURPLE HUES; BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURING PLATY TO SCALY CUTTINGS; DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

7300

7300

SANDSTONE = LIGHT GREENISH GRAY TO LIGHT OLIVE TO LIGHT GRAY; FRAMEWORK CONSISTS OF MOSTLY QUARTZ; MEDIUM TO FINE SIZED GRAINS WITH POOR SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; FIRMLY FRIABLE WITH CALCITE CEMENT; MODERATE REACTION WITH HCL.

7400

7400

SILTSTONE = GRAYISH ORANGE TO DUSKY YELLOW IN COLOR; DENSE TO CRUMBLY IN TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE NONDULAR TO WEDGELIKE IN COLOR; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE.

7500

7500

SHALE = LIGHT GRAY TO MODERATE GREENISH YELLOW WITH GRAYISH PURPLE HUES; BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURING PLATY TO SCALY CUTTINGS; DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

7600

7600

SANDSTONE = LIGHT GREENISH GRAY TO LIGHT OLIVE TO LIGHT GRAY; FRAMEWORK CONSISTS OF MOSTLY QUARTZ; MEDIUM TO FINE SIZED GRAINS WITH POOR SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; FIRMLY FRIABLE WITH CALCITE CEMENT; MODERATE REACTION WITH HCL.

7700

7700

SILTSTONE = GRAYISH ORANGE TO DUSKY YELLOW IN COLOR; DENSE TO CRUMBLY IN TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE NONDULAR TO WEDGELIKE IN COLOR; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE.

7800

7800

SHALE = LIGHT GRAY TO MODERATE GREENISH YELLOW WITH GRAYISH PURPLE HUES; BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURING PLATY TO SCALY CUTTINGS; DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

7900

7900

SANDSTONE = LIGHT GREENISH GRAY TO LIGHT OLIVE TO LIGHT GRAY; FRAMEWORK CONSISTS OF MOSTLY QUARTZ; MEDIUM TO FINE SIZED GRAINS WITH POOR SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; FIRMLY FRIABLE WITH CALCITE CEMENT; MODERATE REACTION WITH HCL.

8000

8000

SILTSTONE = GRAYISH ORANGE TO DUSKY YELLOW IN COLOR; DENSE TO CRUMBLY IN TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE NONDULAR TO WEDGELIKE IN COLOR; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE.

8100

8100

SHALE = LIGHT GRAY TO MODERATE GREENISH YELLOW WITH GRAYISH PURPLE HUES; BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURING PLATY TO SCALY CUTTINGS; DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

8200

8200

SANDSTONE = LIGHT GREENISH GRAY TO LIGHT OLIVE TO LIGHT GRAY; FRAMEWORK CONSISTS OF MOSTLY QUARTZ; MEDIUM TO FINE SIZED GRAINS WITH POOR SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; FIRMLY FRIABLE WITH CALCITE CEMENT; MODERATE REACTION WITH HCL.

8300

8300

SILTSTONE = GRAYISH ORANGE TO DUSKY YELLOW IN COLOR; DENSE TO CRUMBLY IN TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE NONDULAR TO WEDGELIKE IN COLOR; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE.

8400

8400

SHALE = LIGHT GRAY TO MODERATE GREENISH YELLOW WITH GRAYISH PURPLE HUES; BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURING PLATY TO SCALY CUTTINGS; DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

8500

8500

SANDSTONE = LIGHT GREENISH GRAY TO LIGHT OLIVE TO LIGHT GRAY; FRAMEWORK CONSISTS OF MOSTLY QUARTZ; MEDIUM TO FINE SIZED GRAINS WITH POOR SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; FIRMLY FRIABLE WITH CALCITE CEMENT; MODERATE REACTION WITH HCL.

8600

8600

SILTSTONE = GRAYISH ORANGE TO DUSKY YELLOW IN COLOR; DENSE TO CRUMBLY IN TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE NONDULAR TO WEDGELIKE IN COLOR; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE.

8700

8700

SHALE = LIGHT GRAY TO MODERATE GREENISH YELLOW WITH GRAYISH PURPLE HUES; BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURING PLATY TO SCALY CUTTINGS; DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

8800

8800

SANDSTONE = LIGHT GREENISH GRAY TO LIGHT OLIVE TO LIGHT GRAY; FRAMEWORK CONSISTS OF MOSTLY QUARTZ; MEDIUM TO FINE SIZED GRAINS WITH POOR SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; FIRMLY FRIABLE WITH CALCITE CEMENT; MODERATE REACTION WITH HCL.

8900

8900

SILTSTONE = GRAYISH ORANGE TO DUSKY YELLOW IN COLOR; DENSE TO CRUMBLY IN TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE NONDULAR TO WEDGELIKE IN COLOR; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE.

9000

9000

SHALE = LIGHT GRAY TO MODERATE GREENISH YELLOW WITH GRAYISH PURPLE HUES; BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURING PLATY TO SCALY CUTTINGS; DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

9100

9100

SANDSTONE = LIGHT GREENISH GRAY TO LIGHT OLIVE TO LIGHT GRAY; FRAMEWORK CONSISTS OF MOSTLY QUARTZ; MEDIUM TO FINE SIZED GRAINS WITH POOR SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; FIRMLY FRIABLE WITH CALCITE CEMENT; MODERATE REACTION WITH HCL.

9200

9200

SILTSTONE = GRAYISH ORANGE TO DUSKY YELLOW IN COLOR; DENSE TO CRUMBLY IN TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE NONDULAR TO WEDGELIKE IN COLOR; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE.

9300

9300

SHALE = LIGHT GRAY TO MODERATE GREENISH YELLOW WITH GRAYISH PURPLE HUES; BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURING PLATY TO SCALY CUTTINGS; DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

9400

9400

SANDSTONE = LIGHT GREENISH GRAY TO LIGHT OLIVE TO LIGHT GRAY; FRAMEWORK CONSISTS OF MOSTLY QUARTZ; MEDIUM TO FINE SIZED GRAINS WITH POOR SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; FIRMLY FRIABLE WITH CALCITE CEMENT; MODERATE REACTION WITH HCL.

9500

9500

SILTSTONE = GRAYISH ORANGE TO DUSKY YELLOW IN COLOR; DENSE TO CRUMBLY IN TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE NONDULAR TO WEDGELIKE IN COLOR; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE.

9600

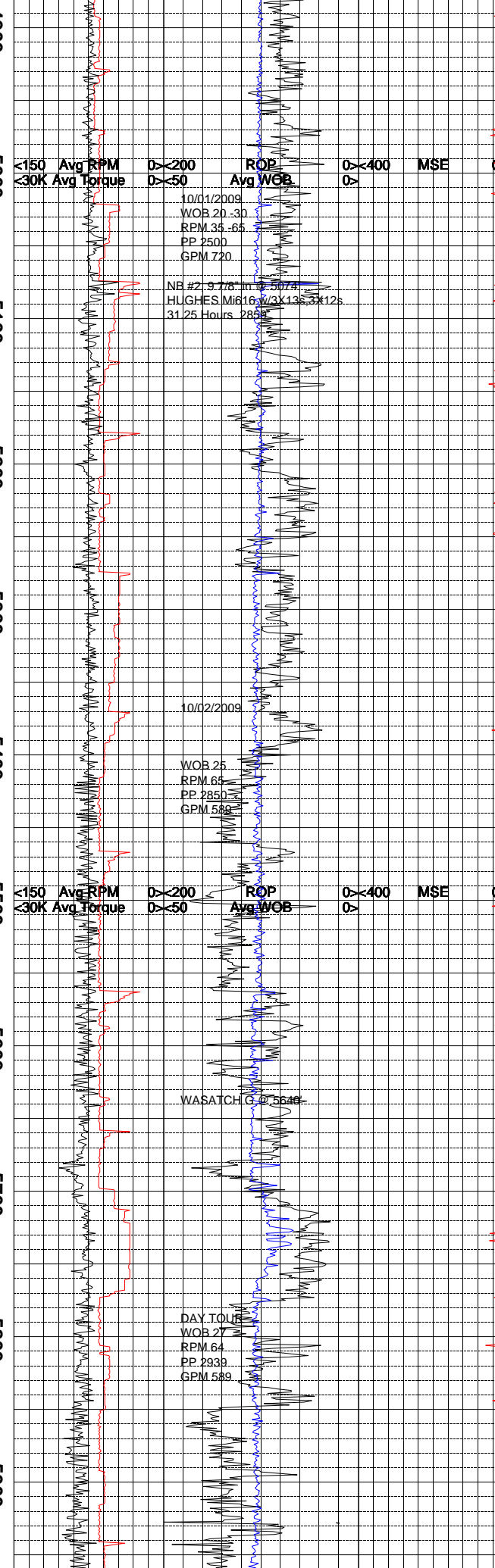
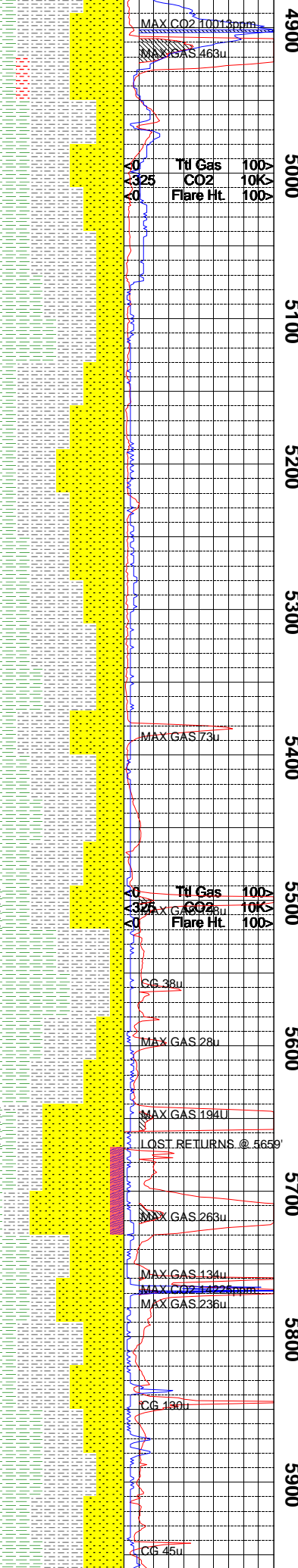
9600

SHALE = LIGHT GRAY TO MODERATE GREENISH YELLOW WITH GRAYISH PURPLE HUES; BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURING PLATY TO SCALY CUTTINGS; DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

9700

9700

SANDSTONE = LIGHT GREENISH GRAY TO LIGHT OLIVE TO LIGHT GRAY; FRAMEWORK CONSISTS OF MOSTLY QUARTZ; MEDIUM TO FINE SIZED GRAINS WITH POOR SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; FIRMLY FRIABLE WITH CALCITE CEMENT; MODERATE REACTION WITH HCL.



HARDNESS; LOW REACTION TO HCL SUGGESTS SILICA CEMENT.

SILTSTONE = REDDISH BROWN TO DARK YELLOWISH BROWN; CRUMBLY TO DENSE TENACITY; FRACTURES FROM IRREGULAR TO BLOCKY; TABULAR TO WEDGELIKE CUTTINGS; EARTHY LUSTER; GRITTY TO SMOOTH TEXTURE; THICK TO MASSIVE STRUCTURE.

SHALE = LIGHT GRAY TO GRAYISH YELLOW GREEN; BRITTLE TO SLIGHTLY CRUNCHY TENACITY; PLANAR FRACTURING; PLATY TO TABULAR CUTTINGS; DULL TO SLIGHTLY EARTHY LUSTER; SMOOTH TO SILTY TEXTURE.

NOTE = TRIPPED OUT AT 5074' TO RIG DOWN MWD TOOLS ON 10/01/2009 AT 1:30 AM.

SILTSTONE = BROWNISH GRAY TO MODERATE REDDISH BROWN; DENSE TO CRUMBLY TENACITY TABULAR TO WEDGELIKE CUTTINGS; EARTHY LUSTER; SILTY TEXTURE WITH A THICK STRUCTURE; FRACTURES FROM IRREGULAR TO TABULAR.

SHALE = LIGHT GRAY TO TO LIGHT OLIVE BROWN WITH OCCASSIONAL PALE PURPLE HUES; TENACITY IS BRITTLE TO SLIGHTLY DENSE; PLANAR FRACTURING; CUTTINGS RANGE FROM MOSTLY PLANAR TO TABULAR; DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE; THIN ST

SANDSTONE = MEDIUM DARK GRAY TO GRAYISH BROWN; FRAMEWORK CONSIST MOSTLY OF QUARTZ WITH APPROXIMATELY 10% BLACK LITHIC CLASTS CREATING A SALT AND PEPPER APPEARANCE; FINE TO MEDIUM SIZED WITH FAIR SORTING; SUB ROUNDED WITH MODERATE SPHERICITY; MODERATE HARD TO HARD; NO REACTION WITH HCL SUGGESTS SILICA CEMENT TRACE AMOUNTS OF PYRITE ARE PRESENT AS AN ACCESSORY MINERAL.

SILTSTONE = MEDIUM DARK GRAY TO MODERATE BROWN TO GRAYISH BROWN; TENACITY IS DENSE TO CRUNCHY; FRACTURES FROM BLOCKY TO IRREGULAR; TABULAR TO SLIGHTLY MASSIVE CUTTINGS; EARTHY LUSTER; TEXTURE IS GRITTY TO SILTY; THICK STRUCTURE.

SHALE = MEDIUM BLUISH GRAY TO MEDIUM GRAY WITH GRAYISH PURPLE HUES; TENACITY IS BRITTLE TO SLIGHTLY CRUNCHY; PLANAR FRACTURING; CUTTINGS ARE PLANAR TO TABULAR; DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE.

SANDSTONE = GRAYISH BROWN TO MEDIUM DARK GRAY; QUARTZ FRAMEWORK WITH ABOUT 15% BLACK LITHIC CLAST; GRAINS RANGE FROM FINE TO COARSE WITH POOR TO FAIR SORTING SUBANGULAR TO SUBROUNDED WITH LOW TO MODERATE SPHERICITY; HARD TO MODERATE HARDNESS; GRAIN SUPPORTED WITH VERY LITTLE REACTION TO HCL SUGGESTING SILICA CEMENT; NO VISIBLE BEDDING.

SILTSTONE = MEDIUM DARK GRAY TO BROWNISH GRAY; BRITTLE TO CRUMBLY TENACITY; FRACTURES FROM BLOCKY TO IRREGULAR; MASSIVE TO TABULAR CUTTINGS; DULL TO EARTHY WITH A SLIGHT FROSTED LUSTER ON SOME AREAS OF THE SAMPLE; SILTY TO GRITT

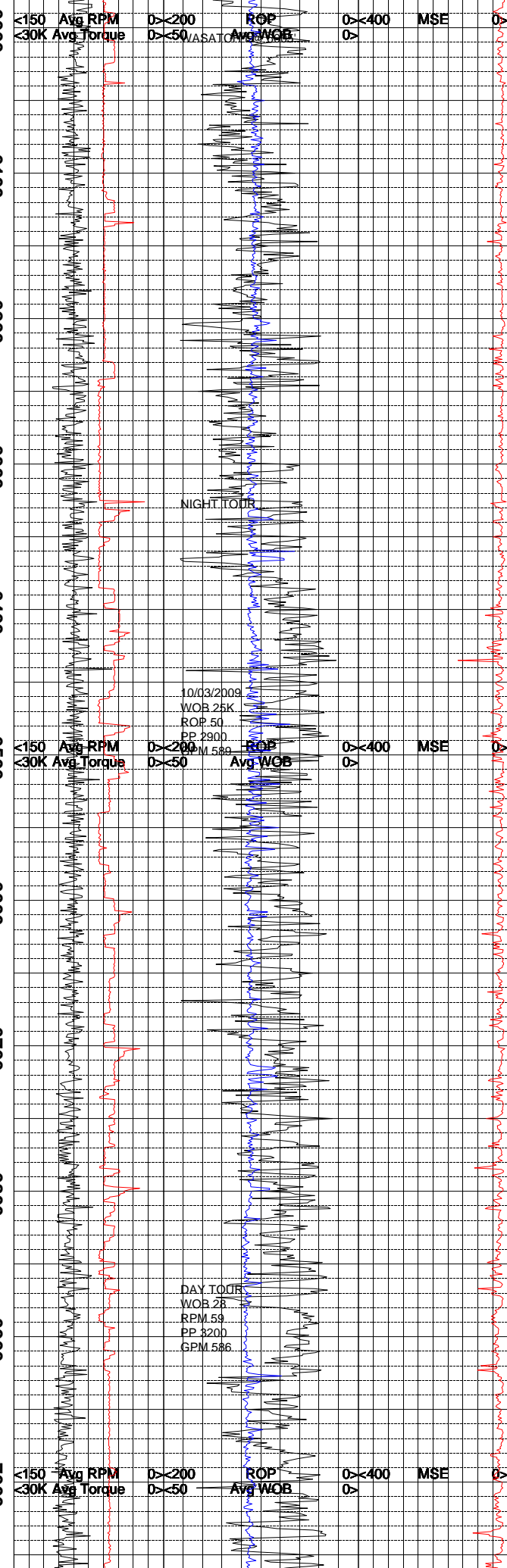
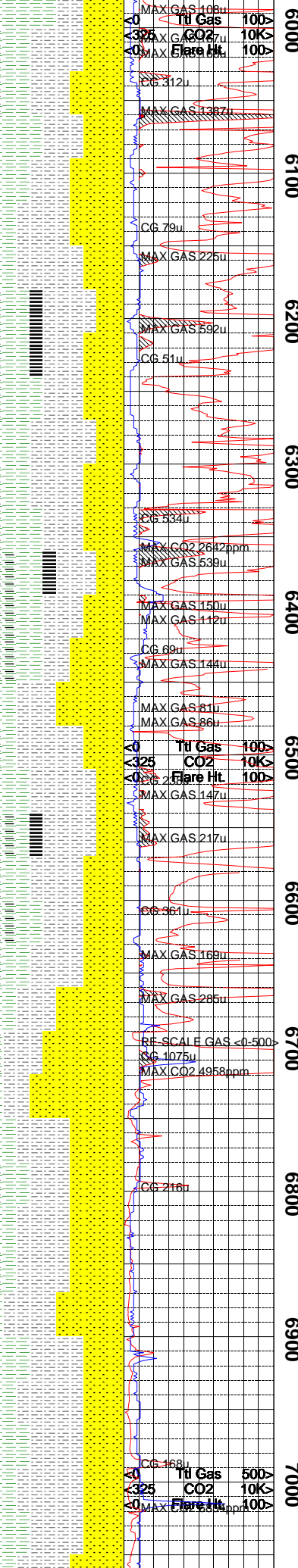
NOTE = LOST RETURNS FROM 5659' MD TO 5671' MD.

SANDSTONE = TRANSLUCENT TO WHITE TO VERY LIGHT GRAY; QUARTZ FRAMEWORK; COARSE TO FINE GRAINED WITH POOR SORTING; SUBANGULAR WITH POOR SPHERICITY; FRIABLE TO FIRMLY FRIABLE WITH MANY LOOSE GRAINS MILD REACTION TO HCL SUGGESTS CALCITE/ SILICA CEMENT; PYRITE PRESENT AS AN ACCESSORY MINERAL.

SHALE = LIGHT TO MEDIUM DARK GRAY; BRITTLE TO CRUNCHY TENACITY; PLANAR FRACTURING; PLATY TO SCALY CUTTINGS; DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE; LAMINAE TO THIN STRUCTURE.

SILTSTONE = PALE RED TO GRAYISH RED IN COLOR; BRITTLE TO NEARLY PULVERANT IN TENACITY; MOTTLED TO IRREGULAR FRACUTRE; CUTTINGS ARE TABULAR TO WEDGELIKE; DULL TO FROSTED LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE APPARENT.

SANDSTONE = WHITE TO YELLOWISH GRAY IN COLOR; QUARTZ FRAMEWORK; MEDIUM TO FINE GRAIN SIZE; FAIR TO WELL SORTED; ROUNDED TO SUBROUNDED GRAINS WIT MODERATE TO HIGH SPHERICITY; FIRMLY FRIABLE TO HARD; SILICA CEMENTATION; NO DISCERNIBLE FABRIC OR BEDDING; CALCITE GRAINS SEEN IN MATRIX; NO VISIBLE POROSITY; LOW GAS SHOWS FROM THIS SANDSTONE.



SHALE = LIGHT BLuish GRAY TO MEDIUM TO MEDIUM LIGHT GRAY IN COLOR; DENSE TO CRUMBLY IN TENACITY; SPLINTERY TO PLANAR FRACTURE; CUTTINGS ARE PLATY TO TABULAR IN APPEARANCE; WAXY TO DULL LUSTER EXHIBITED; CLAYEY TO SLIGHTLY SILTY TEXTURE; THIN STRUCTURE APPARENT.

CARBONACEOUS SHALE = GREENISH BLACK TO GRAYISH BLACK IN COLOR; BRITTLE TO PULVERANT IN TENACITY; PLANAR TO MOTTLED FRACTURE; CUTTINGS ARE WEDGELIKE TO TABULAR IN HABIT; GREASY TO DULL LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN TO LAMINAE STRUCTURE APPARENT.

SILTSTONE = PALE OLIVE TO VERY LIGHT GRAY IN COLOR; DENSE TO BRITTLE IN TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE WEDGELIKE TO NODULAR IN APPEARANCE; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE APPARENT.

COAL = GRAYISH BLACK IN COLOR; BRITTLE TO PULVERANT IN TENACITY; HACKLY TO PLANAR FRACTURE; CUTTINGS ARE TABULAR TO EQUANT IN APPEARANCE; METALLIC LUSTER; SMOOTH TEXTURE; THICK TO THIN STRUCTURE APPARENT.

SANDSTONE = WHITE TO LIGHT GRAY WITH MODERATE YELLOWISH BROWN HUES; MEDIUM TO FINE SIZED GRAINS WITH FAIR SORTING; SUBROUNDED WITH MODERATE TO HIGH SPHERICITY; HARD TO MODERATE HARD; GRAIN SUPPORTED; QUARTZ FRAMEWORK WITH APPROXIMATELY 5%-10% BLACK LITHIC CLASTS SILICA CEMENT; TRACE AMOUNTS OF PYRITE AND CALCITE AS ACCESSORY MINERALS.

CARBONACEOUS SHALE = DARK GRAY TO BLACK; DENSE TO BRITTLE TENACITY; BLOCKY TO SLIGHTLY CONCHOIDAL FRACTURING; NODULAR TO WEDGELIKE CUTTINGS; EARTHY TO RESINOUS LUSTER; SILTY TO SMOOTH TEXTURE THIN TO THICK STRUCTURE.

SHALE = PALE OLIVE TO MEDIUM LIGHT GRAY TO LIGHT BLuish GRAY; DENSE TO BRITTLE TENACITY; FRACTURES FROM PLANAR TO SPLINTERY; PLATY TO SCALY CUTTINGS; DULL TO SLIGHTLY WAXY LUSTER; TEXTURE IS SMOOTH TO SILTY; THIN TO LAMINAE STRUCTURE.

SILTSTONE = DARK YELLOWISH BROWN TO BROWNISH BLACK; DENSE TO CRUMBLY TENACITY; FRACTURES FROM MOSTLY BLOCKY TO OCCASIONALLY IRREGULAR; TABULAR TO SLIGHTLY MASSIVE CUTTINGS; EARTHY WITH A SLIGHT FROSTED LUSTER; TEXTURE IS SILTY TO GRITTY; THICK STRUCTURE.

SANDSTONE = WHITE TO MEDIUM DARK GRAY WITH SOME MODERATE GREENISH YELLOW HUES; QUARTZ FRAME WORK WITH APPROXIMATELY 10% BLACK LITHIC CLASTS; FINE GRAIN SIZE WITH WELL SORTING; SUBROUNDED; HARD TO MODERATE HARD; GRAINS SUPPORTED WITH SILICA CEMENT; VERY SLIGHT REACTION TO HCL SUGGESTS SOME CALCITE GRAINS MAY BE PRESENT.

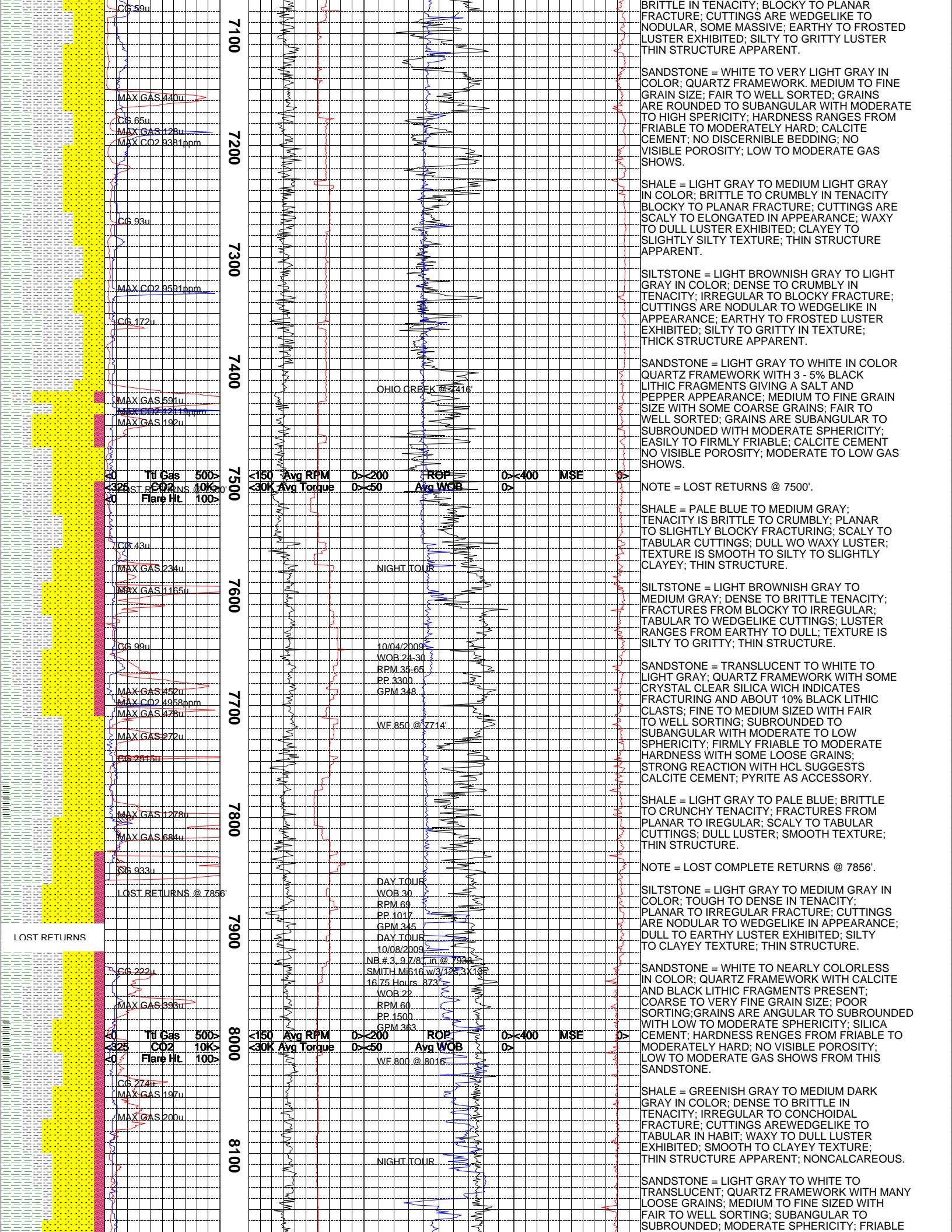
SHALE = LIGHT GRAY TO GREENISH GRAY; TENACITY IS BRITTLE TO CRUNCHY; PLANAR TO SPLINTERY FRACTURING; SCALY TO TABULAR CUTTINGS; LUSTER IS DULL TO WAXY SMOOTH TO SILTY TEXTURE; THIN STRUCTURE.

SILTSTONE = LIGHT OLIVE GRAY TO VERY LIGHT GRAY IN COLOR; DENSE TO BRITTLE IN TENACITY; CONCHOIDAL TO PLANAR FRACTURE; NODULAR TO WEDGELIKE CUTTINGS HABIT; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN STRUCTURE APPARENT.

SANDSTONE = WHITE TO YELLOWISH GRAY IN COLOR; QUARTZ FRAMEWORK WITH ABOUT 3% BLACK LITHIC FRAGMENTS; MEDIUM TO VERY FINE GRAIN SIZE; FAIR SORTING; GRAINS ARE ANGULAR TO SUBROUNDED WITH LOW TO MODERATE SPHERICITY; FRIABLE TO FIRMLY FRIABLE; CALCITE CEMENT; TIGHT SAND WITH NO VISIBLE POROSITY; POINT CONTACT FABRIC WITH NO VISIBLE BEDDING; LOW GAS SHOWS.

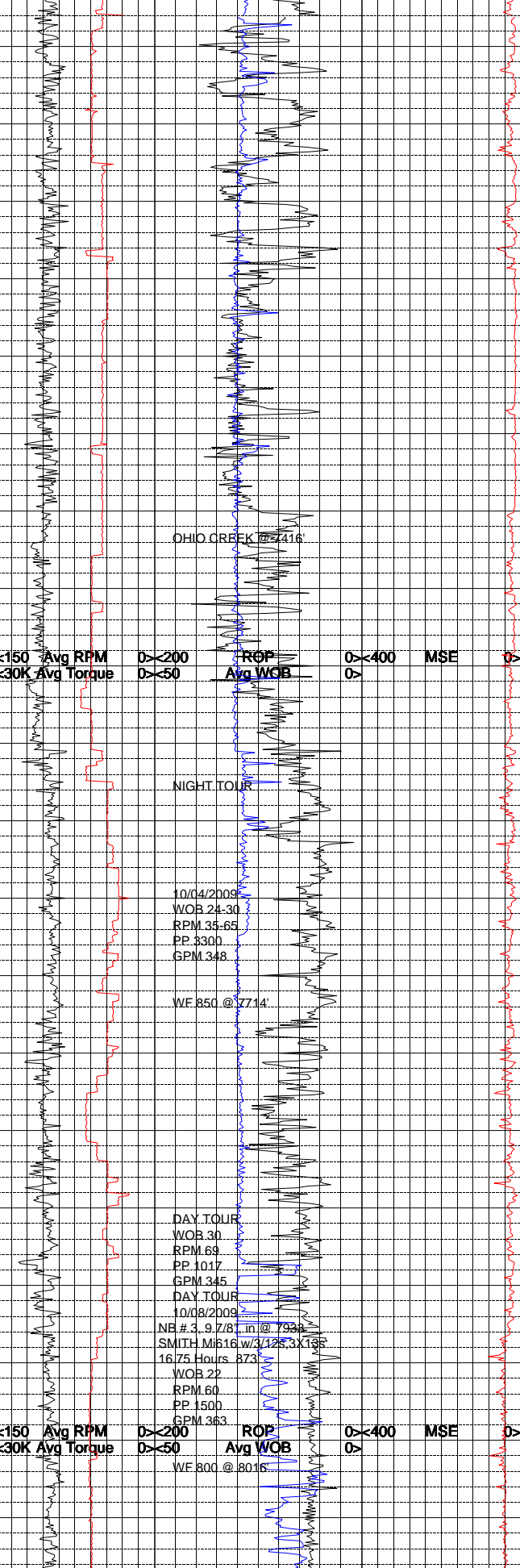
SHALE = GREENISH GRAY TO MEDIUM GRAY IN COLOR; DENSE TO CRUNCHY IN TENACITY; HACKLY TO IRREGULAR FRACTURING; CUTTINGS ARE WEDGELIKE TO NODULAR IN HABIT; WAXY TO DULL LUSTER EXHIBITED; CLAYEY TO SILTY TEXTURE, SOME ABRUPT CONTACTS WITH

SILTSTONE = MODERATE REDDISH BROWN TO GRAYISH ORANGE IN COLOR; DENSE TO



CG 59u
MAX GAS 440u
CG 65u
MAX GAS 128u
MAX CO2 9381ppm
CG 93u
MAX CO2 9591ppm
CG 172u
MAX GAS 591u
MAX CO2 1214ppm
MAX GAS 192u
CG 43u
MAX GAS 234u
MAX GAS 1165u
CG 99u
MAX GAS 452u
MAX CO2 4958ppm
MAX GAS 478u
MAX GAS 272u
CG 2615u
MAX GAS 1778u
MAX GAS 684u
CG 933u
LOST RETURNS @ 7856'
CG 222u
MAX GAS 393u
CG 274u
MAX GAS 197u
MAX GAS 200u

7100
7200
7300
7400
7500
7600
7700
7800
7900
8000
8100



BRITTLE IN TENACITY; BLOCKY TO PLANAR FRACTURE; CUTTINGS ARE WEDGELIKE TO NODULAR, SOME MASSIVE; EARTHY TO FROSTED LUSTER EXHIBITED; SILTY TO GRITTY LUSTER THIN STRUCTURE APPARENT.

SANDSTONE = WHITE TO VERY LIGHT GRAY IN COLOR; QUARTZ FRAMEWORK. MEDIUM TO FINE GRAIN SIZE; FAIR TO WELL SORTED; GRAINS ARE ROUNDED TO SUBANGULAR WITH MODERATE TO HIGH SPERICITY; HARDNESS RANGES FROM FRIABLE TO MODERATELY HARD; CALCITE CEMENT; NO DISCERNIBLE BEDDING; NO VISIBLE POROSITY; LOW TO MODERATE GAS SHOWS.

SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY IN COLOR; BRITTLE TO CRUMBLY IN TENACITY BLOCKY TO PLANAR FRACTURE; CUTTINGS ARE SCALY TO ELONGATED IN APPEARANCE; WAXY TO DULL LUSTER EXHIBITED; CLAYEY TO SLIGHTLY SILTY TEXTURE; THIN STRUCTURE APPARENT.

SILTSTONE = LIGHT BROWNISH GRAY TO LIGHT GRAY IN COLOR; DENSE TO CRUMBLY IN TENACITY; IRREGULAR TO BLOCKY FRACTURE; CUTTINGS ARE NODULAR TO WEDGELIKE IN APPEARANCE; EARTHY TO FROSTED LUSTER EXHIBITED; SILTY TO GRITTY IN TEXTURE; THICK STRUCTURE APPARENT.

SANDSTONE = LIGHT GRAY TO WHITE IN COLOR QUARTZ FRAMEWORK WITH 3 - 5% BLACK LITHIC FRAGMENTS GIVING A SALT AND PEPPER APPEARANCE; MEDIUM TO FINE GRAIN SIZE WITH SOME COARSE GRAINS; FAIR TO WELL SORTED; GRAINS ARE SUBANGULAR TO SUBROUNDED WITH MODERATE SPHERICITY; EASILY TO FIRMLY FRIABLE; CALCITE CEMENT NO VISIBLE POROSITY; MODERATE TO LOW GAS SHOWS.

NOTE = LOST RETURNS @ 7500'.

SHALE = PALE BLUE TO MEDIUM GRAY; TENACITY IS BRITTLE TO CRUMBLY; PLANAR TO SLIGHTLY BLOCKY FRACTURING; SCALY TO TABULAR CUTTINGS; DULL WO WAXY LUSTER; TEXTURE IS SMOOTH TO SILTY TO SLIGHTLY CLAYEY; THIN STRUCTURE.

SILTSTONE = LIGHT BROWNISH GRAY TO MEDIUM GRAY; DENSE TO BRITTLE TENACITY; FRACTURES FROM BLOCKY TO IRREGULAR; TABULAR TO WEDGELIKE CUTTINGS; LUSTER RANGES FROM EARTHY TO DULL; TEXTURE IS SILTY TO GRITTY; THIN STRUCTURE.

SANDSTONE = TRANSLUCENT TO WHITE TO LIGHT GRAY; QUARTZ FRAMEWORK WITH SOME CRYSTAL CLEAR SILICA WICH INDICATES FRACTURING AND ABOUT 10% BLACK LITHIC CLASTS; FINE TO MEDIUM SIZED WITH FAIR TO WELL SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE TO LOW SPHERICITY; FIRMLY FRIABLE TO MODERATE HARDNESS WITH SOME LOOSE GRAINS; STRONG REACTION WITH HCL SUGGESTS CALCITE CEMENT; PYRITE AS ACCESSORY.

SHALE = LIGHT GRAY TO PALE BLUE; BRITTLE TO CRUNCHY TENACITY; FRACTURES FROM PLANAR TO IREGULAR; SCALY TO TABULAR CUTTINGS; DULL LUSTER; SMOOTH TEXTURE; THIN STRUCTURE.

NOTE = LOST COMPLETE RETURNS @ 7856'.

SILTSTONE = LIGHT GRAY TO MEDIUM GRAY IN COLOR; TOUGH TO DENSE IN TENACITY; PLANAR TO IRREGULAR FRACTURE; CUTTINGS ARE NODULAR TO WEDGELIKE IN APPEARANCE; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO CLAYEY TEXTURE; THIN STRUCTURE.

SANDSTONE = WHITE TO NEARLY COLORLESS IN COLOR; QUARTZ FRAMEWORK WITH CALCITE AND BLACK LITHIC FRAGMENTS PRESENT; COARSE TO VERY FINE GRAIN SIZE; POOR SORTING; GRAINS ARE ANGULAR TO SUBROUNDED WITH LOW TO MODERATE SPHERICITY; SILICA CEMENT; HARDNESS RENGES FROM FRIABLE TO MODERATELY HARD; NO VISIBLE POROSITY; LOW TO MODERATE GAS SHOWS FROM THIS SANDSTONE.

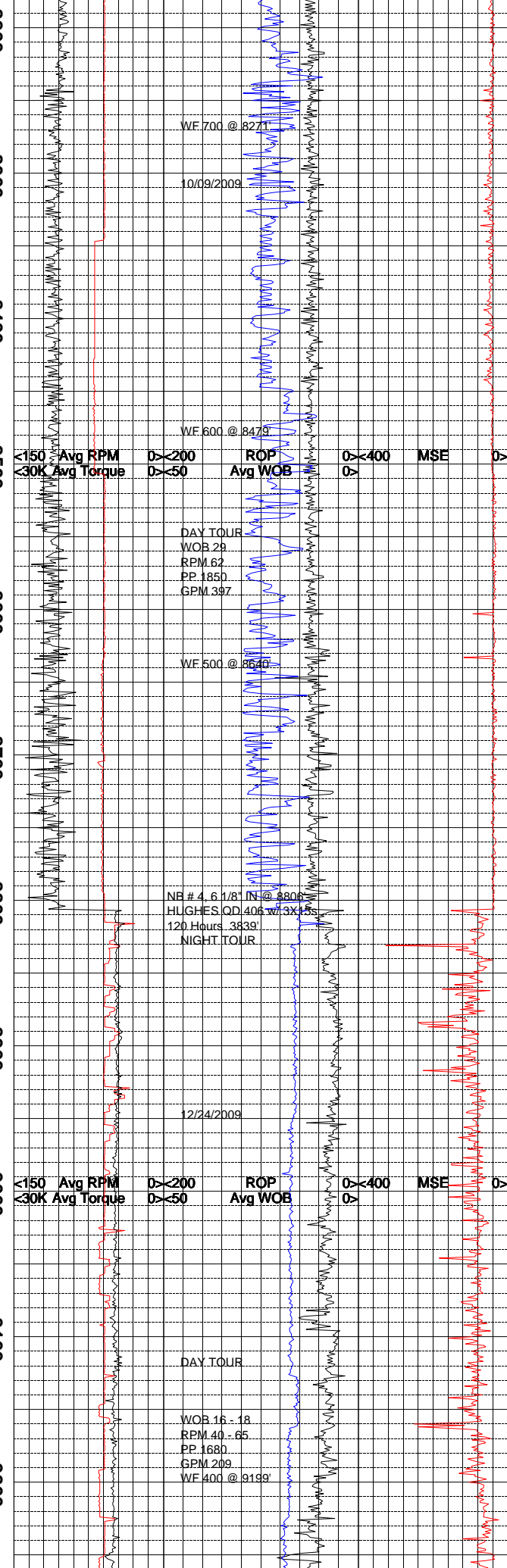
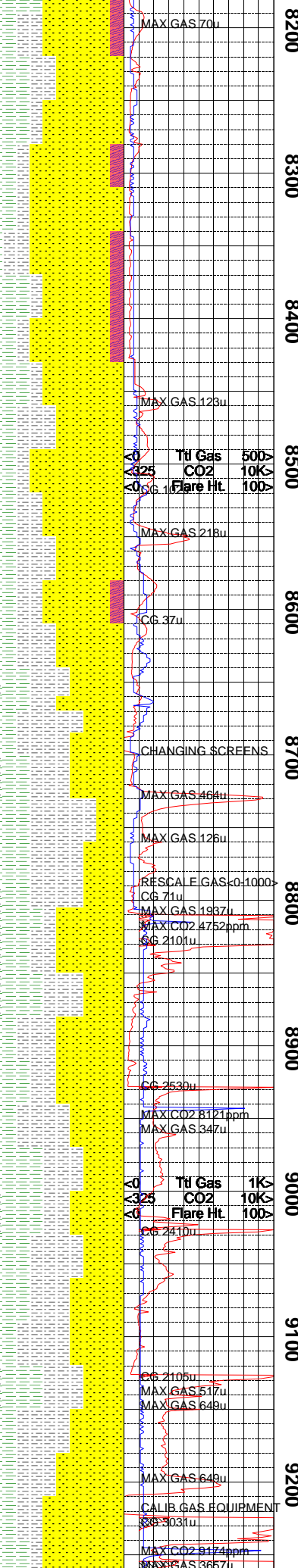
SHALE = GREENISH GRAY TO MEDIUM DARK GRAY IN COLOR; DENSE TO BRITTLE IN TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE WEDGELIKE TO TABULAR IN HABIT; WAXY TO DULL LUSTER EXHIBITED; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE APPARENT; NONCALCAREOUS.

SANDSTONE = LIGHT GRAY TO WHITE TO TRANSLUCENT; QUARTZ FRAMEWORK WITH MANY LOOSE GRAINS; MEDIUM TO FINE SIZED WITH FAIR TO WELL SORTING; SUBANGULAR TO SUBROUNDED; MODERATE SPHERICITY; FRIABLE

LOST RETURNS

0 500y
325 CO2 10K
0 Flare Ht 100y

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



TO MODERATE HARDNESS DEPENDING ON THE SPECIMEN; GRAIN SUPPORTED WITH CALCITE/SILICEOUS CEMENT AS SUGGESTED BY A STRONG REACTION WITH HCL.

SHALE = MEDIUM DARK GRAY TO LIGHT GRAY; TENACITY IS DENSE TO CRUNCHY; FRACTURES FROM PLANAR TO SPLINTERY; TABULAR TO ELONGATED CUTTINGS; DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE; LAMINAE TO THIN STRUCTURE.

SILTSTONE = LIGHT GRAY TO MEDIUM DARK GRAY; TENACITY IS DENSE TO CRUMBLY; FRACTURES FROM IRREGULAR TO BLOCKY; TABULAR TO WEDGELIKE CUTTINGS; EARTHY LUSTER; THIN STRUCTURE.

SANDSTONE = WHITE TO TRANSLUCENT TO LIGHT GRAY; FRAMEWORK CONSISTS OF MOSTLY QUARTZ GRAINS WITH SOME CALCITE IN THE MATRIX; MEDIUM TO FINE SIZED WITH FAIR TO WELL SORTING; ANGULAR TO SUBROUNDED WITH MODERATE SPHERICITY; MODERATE HARDNESS WITH MANY LOOSE GRAINS; GRAIN SUPPORTED WITH SOME CALCITE MATRIX; MODERATE TO STRONG REACTION WITH HCL.

SHALE = LIGHT GRAY TO DARK GRAY COLORING TENACITY IS DENSE TO BRITTLE TO SLIGHTLY CRUNCHY; PLANAR TO SPLINTERY TO SLIGHTLY CONCHOIDAL FRACTURING; PLATY TO ELONGATED CUTTINGS; DULL TO SLIGHTLY WAXY LUSTER; SILTY TO SMOOTH TEXTURE; LAMINAE TO THIN STRUCTURE.

SILTSTONE = MEDIUM DARK GRAY TO DARK GRAY IN COLOR; DENSE TO BRITTLE TENACITY SAMPLE SHOWS BLOCKY TO PLANAR FRACTURE; CUTTINGS ARE NODULAR TO WEDGELIKE IN APPEARANCE; DULL TO EARTHY LUSTER; SOME PYRITE VISIBLE IN MATRIX; SILTY TO SLIGHTLY GRITTY TEXTURE; THIN TO THICK STRUCTURE APPARENT.

SANDSTONE = WHITE TO NEARLY COLORLESS; QUARTZ FRAMEWORK; GRAINS RANGE FROM COARSE TO FINE; POOR TO FAIR SORTING; GRAINS ARE ANGULAR TO SUBROUNDED WITH LOW TO MODERATE SPHERICITY; HARDNESS RANGES FROM FIRMLY FRIABLE TO MODERATELY HARD; CALCITE CEMENT; NO VISIBLE POROSITY LOW GAS SHOWS FROM THIS SAND.

SHALE = GREENISH GRAY TO MEDIUM LIGHT GRAY IN COLOR; DENSE TO BRITTLE TENACITY SPLINTERY TO PLANAR FRACTURE; CUTTINGS ARE NODULAR TO ELONGATED IN HABIT; WAXY TO DULL LUSTER EXHIBITED; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE APPARENT.

NOTE = INTERMEDIATE TD REACHED AT 8806' MD ON 10/9/2009 AT 11:55 AM.

SANDSTONE = WHITE TO TRANSLUCENT TO MEDIUM LIGHT GRAY; QUARTZ FRAMEWORK WITH TRACE AMOUNTS OF CARBONACEOUS SHALE IMBEDDED; FINE TO COARSE GRAINED WITH POOR SORTING; ANGULAR TO SUBANGULAR WITH LOW SPHERICITY; FIRMLY FRAIBLE; CALCITE WITH GRAIN SUPPORT.

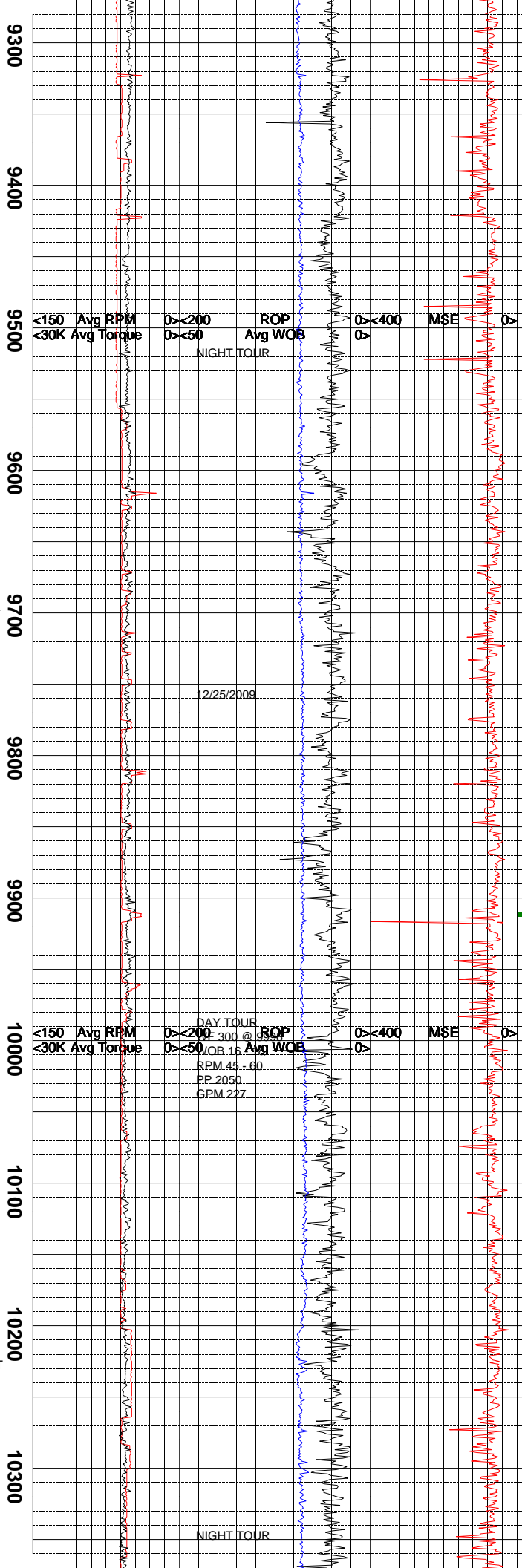
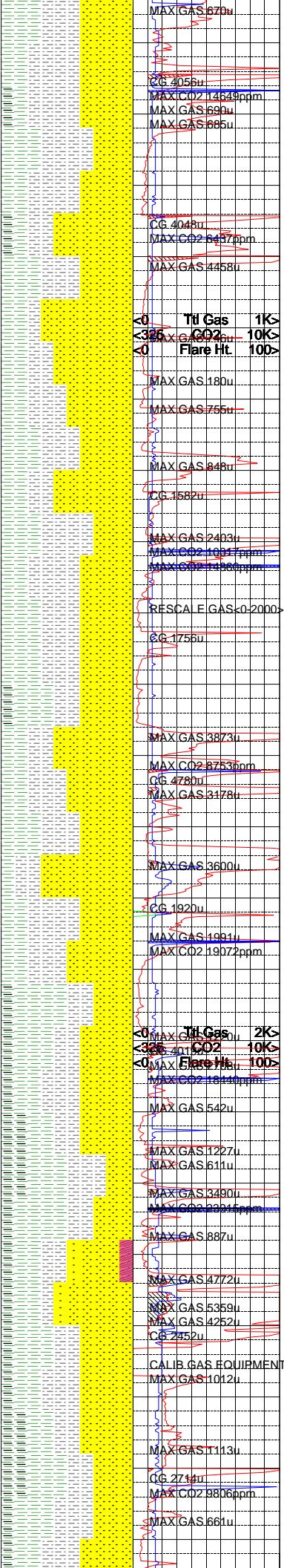
SHALE = MEDIUM DARK GRAY TO LIGHT GRAY; TENACITY IS BRITTLE TO CRUNCHY; PLANAR TO SPLINTERY FRACTURING; PLATY TO SCALY CUTTINGS; LUSTER IS DULL TO EARTHY; SMOOTH TEXTURE; LAMINAE TO THIN STRUCTURE.

SILTSTONE = BROWNISH GRAY TO MEDIUM DARK GRAY; TOUGH TO DENSE TENACITY; FRACTURES FROM IRREGULAR TO BLOCKY; CUTTINGS ARE MASSIVE TO TABULAR; LUSTER IS EARTHY TO WAXY LUSTER; GRITTY TO SILTY TEXTURE; THICK STRUCTURE.

SANDSTONE = WHITE TO TRANSLUCENT TO MEDIUM LIGHT GRAY; QUARTZ FRAMEWORK WITH APPROXIMATELY 10% BLACK LITHIC CLASTS; COARSE TO MEDIUM SIZED WITH POOR SORTING SUBANGULAR WITH LOW SPHERICITY; FRIABLE TO FIRMLY FRIABLE; STRONG REACTION WITH HCL SUGGESTS CALCITE CEMENT; MODERATE GAS ASSOCIATED WITH SAMPLE DEPTH.

SHALE = PALE OLIVE TO MEDIUM LIGHT GRAY IN COLOR; BRITTLE TO CRUMBLY IN TENACITY BLOCKY TO PLANAR FRACTURE; CUTTINGS ARE PLATY TO TABULAR IN APPEARANCE; WAXY TO EARTHY LUSTER EXHIBITED; CLAYEY TO SILTY TEXTURE; THIN STRUCTURE APPARENT.

SILTSTONE = DARK GREENISH GRAY TO MEDIUM GRAY IN COLOR; DENSE TO BRITTLE TENACITY PLANAR TO IRREGULAR FRACTURE; CUTTINGS ARE FLAKY TO WEDGELIKE IN APPEARANCE; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN STRUCTURE APPARENT; NO DISCERNIBLE ACCESSORIES.



SANDSTONE = BLUISH WHITE TO WHITE TO NEARLY TRANSLUCENT IN COLOR; QUARTZ FRAMEWORK WITH APPROXIMATELY 5% BLACK LITHIC FRAGMENTS; GRAINS ARE COARSE TO FINE IN SIZE; FAIR SORTING; GRAINS ARE ROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; HARDNESS RANGES FROM FRIABLE TO MODERATELY HARD; SILICA CEMENT; SOME CALCITE GRAINS VISIBLE IN THE SAMPLE; MODERATE TO HIGH GAS SHOWS IN THIS SAND.

SHALE = MEDIUM LIGHT GRAY TO MEDIUM DARK GRAY IN COLOR; BRITTLE TO CRUMBLY IN TENACITY; IRREGULAR TO PLANAR FRACTURE; CUTTINGS ARE FLAKY TO TABULAR IN HABIT; WAXY TO DULL LUSTER EXHIBITED; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE APPARENT.

CARBONACEOUS SHALE = BROWNISH GRAY TO BROWNISH BLACK IN COLOR; DENSE TO CRUMBLY IN TENACITY; CUTTINGS RANGE FROM MASSIVE TO WEDGELIKE IN HABIT; PLANAR FRACTURE; SILTY TO GRITTY TEXTURE; THIN TO LAMINAE STRUCTURE APPARENT.

SILTSTONE = MEDIUM GRAY TO BROWNISH GRAY TENACITY IS DENSE TO BRITTLE; FRACTURES FROM MOSTLY BLOCKY TO IRREGULAR; CUTTINGS ARE TABULAR; LUSTER IS EARTHY TO OCCASIONALLY SPARKLING; SILTY TO GRITTY TEXTURE; THICK STRUCTURE.

SANDSTONE = WHITE TO MEDIUM LIGHT GRAY TO OCCASIONALLY TRANSLUCENT; QUARTZ FRAMEWORK; FINE TO MEDIUM SIZED GRAINS WITH FAIR SORTING; SUBANGULAR TO SUBROUNDED WITH MODERATE SPHERICITY; GRAIN SUPPORTED; MODERATE HARDNESS; VERY SLIGHT REACTION WITH HCL SUGGESTS SILICA CEMENT; TRACE AMOUNTS OF PYRITE PRESENT AS AN ACCESSORY MINERAL.

SHALE = LIGHT GRAY WITH PALE BLUE HUES; TENACITY IS BRITTLE TO SLIGHTLY CRUNCHY; FRACTURES FROM MOSTLY PLANAR TO OCCASIONALLY SPLINTERY; CUTTINGS ARE PLATY TO SCALY; LUSTER IS DULL TO WAXY; TEXTURE IS SMOOTH; LAMINAE TO THIN STRUCTURE.

CARBONACEOUS SHALE = BROWNISH BLACK TO MEDIUM DARK GRAY; TENACITY IS CRUMBLY TO BRITTLE; FRACTURES FROM BLOCKY TO PLANAR CUTTINGS ARE TABULAR; EARTHY TO SLIGHTLY POLISHED LUSTER; SMOOTH TO SILTY TEXTURE THIN STRUCTURE.

SILTSTONE = BROWNISH GRAY TO MEDIUM DARK GRAY TO BROWNISH BLACK; DENSE TENACITY; FRACTURES FROM PLANAR TO IRREGULAR; CUTTINGS ARE TABULAR TO WEDGELIKE; LUSTER IS EARTHY TO SLIGHTLY SPARKLING; SILTY TO GRITTY TEXTURE; THICK STRUCTURE

SANDSTONE = YELLOWISH GRAY TO WHITE IN COLOR; QUARTZ FRAMEWORK; GRAIN SIZE RANGES FROM MEDIUM TO FINE; FAIR TO WELL SORTED; GRAINS ARE ANGULAR TO SUBROUNDED WITH LOW TO MODERATE SPHERICITY; SAMPLE IS EASILY TO FIRMLY FRIABLE; CALCITE CEMENT; POINT CONTACT FABRIC WITH NO VISIBLE POROSITY; SOME LIMONITE AND CHLORITE GRAINS SEEN IN SAMPLE; NO VISIBLE BEDDING; MODERATELY LOW TO MODERATELY HIGH GAS SHOWS FROM THIS SANDSTONE.

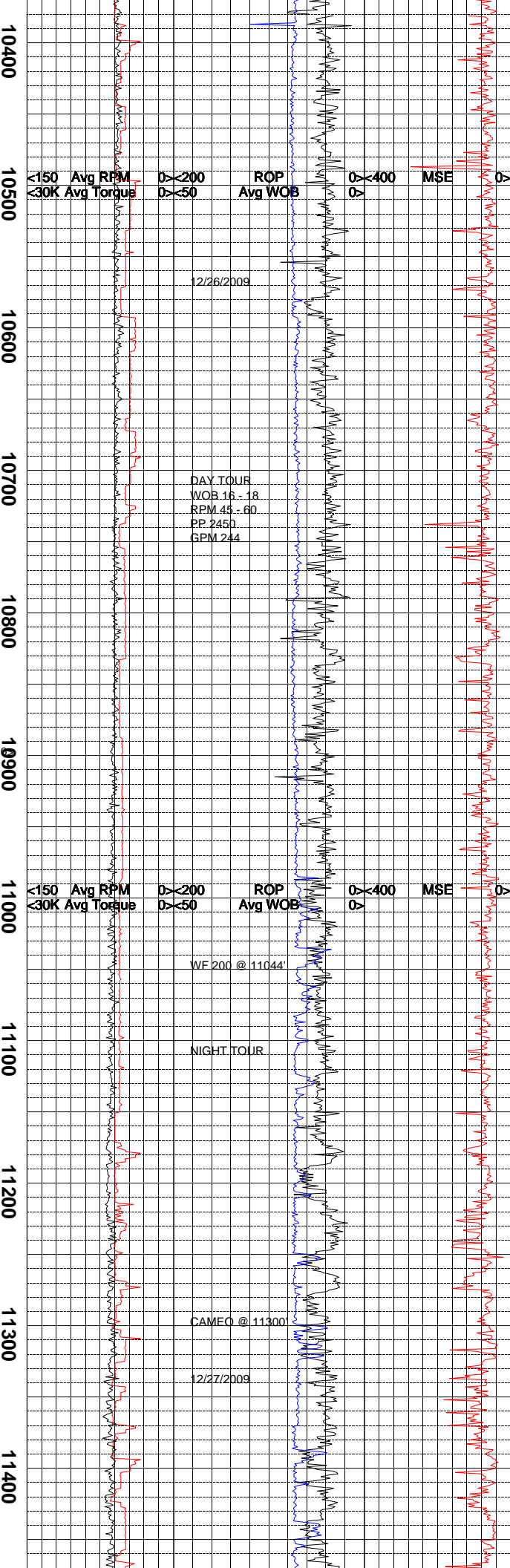
SHALE = DARK GREENISH GRAY TO MEDIUM DARK GRAY IN COLOR; DENSE TO CRUMBLY IN TENACITY; SAMPLE SHOWS IRREGULAR TO BLOCKY FRACTURE; CUTTINGS RANGE FROM MASSIVE TO ELONGATED IN APPEARANCE; WAXY TO DULL LUSTER EXHIBITED; CLAYEY TO SILTY TEXTURE; THIN TO LAMINAE STRUCTURE

CARBONACEOUS SHALE = MEDIUM BLUISH GRAY TO GRAYISH BLACK IN COLOR; BRITTLE TO PULVERANT TENACITY; MOTTLED TO IRREGULAR FRACTURE; CUTTINGS ARE NODULAR TO PLATY IN APPEARANCE; WAXY TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE; THIN TO LAMINAE STRUCTURE APPARENT.

SILTSTONE = BROWNISH BLACK TO MEDIUM DARK GRAY IN COLOR; DENSE TO CRUMBLY TENACITY; PLANAR TO BLOCKY FRACTURE; CUTTINGS ARE NODULAR TO WEDGELIKE IN HABIT; SILTY TO GRITTY, NEARLY GRANULAR TEXTURE; THIN STRUCTURE APPARENT.

SANDSTONE = MEDIUM LIGHT GRAY TO TRANSLUCENT TO WHITE; QUARTZ FRAMEWORK WITH LESS THAN 5% BLACK LITHIC CLASTS; FINE GRAINED WITH WELL SORTING; SUBROUNDED WITH MODERATE SPHERICITY; MODERATE HARD TO FIRMLY FRIABLE WITH SOME LOOSE GRAINS; CERY SLIGHT REACTION WITH HCL INDICATES A SILICA CEMENT; GRAIN SUPPORTED; MODERATE TO HIGH GAS ASSOCIATED WITH SPECIMEN.

ON GAS BUSTER
 CTG 3426u
 CG 3365u
 MAX GAS 779u
 MAX CO2 16124ppm
 MAX GAS 925u
 CG 3365u
 MAX GAS 3484u
 CG 4963u
 MAX CO2 25442ppm
 MAX GAS 5368u
 MAX CO2 8964ppm
 MAX GAS 5090u
 MAX GAS 3652u
 MAX GAS 2308u
 MAX GAS 1839u
 MAX GAS 1864u
 MAX GAS 2070u
 CG 4860u
 MAX GAS 1356u
 MAX GAS 952u
 MAX GAS 830u
 CG 4086u
 RESCAL FIC CO2 325-2000
 MAX GAS 3759u
 MAX GAS 3041u
 CG 4727u
 MAX GAS 1340u
 CG 1622u
 MAX GAS 1434u
 CG 4832u
 MAX GAS 1447u
 MAX GAS 1252u
 CG 3843u
 MAX CO2 2063ppm
 MAX GAS 2345u
 MAX CO2 1149ppm
 MAX GAS 2141u
 MAX CO2 8964ppm
 CG 1312u
 MAX GAS 4620u
 MAX GAS 1382u
 CG 1839u



SHALE = BROWNISH GRAY TO MEDIUM LIGHT GRAY; BRITTLE TENACITY; PLANAR TO SLIGHTLY SPLINTERY FRACTURING; PLATY CUTTINGS; LUSTER IS DULL TO EARTHY; SMOOTH TEXTURE; THIN TO THICK STRUCTURE.

SILTSTONE = MEDIUM DARK GRAY TO BROWNISH BLACK; TENACITY IS DENSE TO BRITTLE; PLANAR TO BLOCKY FRACTURING; TABULAR CUTTINGS; LUSTER IS EARTHY WITH OCCASSIONAL SPARKLING AREAS; TEXTURE IS GRITTY; THICK STRUCTURE.

CARBONACEOUS SHALE = BLACK TO DARK GRAY; TENACITY IS CRUMBLY TO DENSE; FRACTURES FROM BLOCKY TO PLANAR; CUTTINGS ARE TABULAR TO WEDGELIKE; LUSTER IS WAXY TO SLIGHTLY POLISHED; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE.

SANDSTONE = TRANSLUCENT TO LIGHT GRAY; QUARTZ FRAMEWORK WITH MANY LOOSE GRAINS; FINE SIZED WITH WELL SORTING; SUBANGULAR WITH LOW TO MODERATE SPHERICITY; FRIABLE TO MODERATE HARDNESS; GRAIN SUPPORTED; VERY SLIGHT REACTION WITH HCL SUGGESTS SILICA CEMENT; HIGH GAS ASSOCIATED WITH SAMPLE.

SHALE = LIGHT BLUISH GRAY TO DARK GRAY IN COLOR; DENSE TO BRITTLE TENACITY; PLANAR TO CONCHOIDAL FRACTURE; CUTTINGS RANGE FROM PLATY TO TABULAR IN HABIT; WAXY TO EARTHY LUSTER; CLAYEY TO SILTY, ALMOST GRITTY TEXTURE; THIN STRUCTURE APPARENT; NON-CALCAREOUS.

SILTSTONE = OLIVE GRAY TO DARK GRAY IN COLOR; TOUGH TO BRITTLE IN TENACITY; CONCHOIDAL TO BLOCKY FRACTURE; CUTTINGS ARE NODULAR TO WEDGELIKE IN APPEARANCE; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN STRUCTURE.

COAL = GRAYISH BLACK TO BLACK IN COLOR; BRITTLE TO CRUNCHY IN TENACITY; HACKLY TO IRREGULAR FRACTURE; CUTTINGS ARE PLATY TO FLAKY IN APPEARANCE; METALLIC TO GREASY LUSTER EXHIBITED; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE APPARENT.

CARBONACEOUS SHALE = BROWNISH BLACK TO GRAYISH BLACK IN COLOR; BRITTLE TO PULVERANT IN TENACITY; PLANAR TO BLOCKY FRACTURE; CUTTINGS ARE PLATY TO SCALY IN APPEARANCE; WAXY TO EARTHY LUSTER EXHIBITED; CLAYEY TO SILTY TEXTURE; THIN STRUCTURE APPARENT.

SANDSTONE = PALE YELLOWISH BROWN TO WHITE IN COLOR; QUARTZ FRAMEWORK; MEDIUM TO FINE GRAIN SIZE; FAIR SORTING; GRAINS ARE ROUNDED TO SUBANGULAR WITH MODERATE TO HIGH SPHERICITY; FIRMLY FRIABLE TO MODERATELY HARD; PRIMARILY SILICA CEMENT SOME CALCITE; GRAIN SUPPORTED; NO VISIBLE POROSITY; GRADATIONAL BEDDING SEEN IN SAMPLE, WITH GRADATION DOWN TO SILTSTONE MODERATELY HIGH GAS SHOWS.

SILTSTONE = BROWNISH GRAY TO DARK GRAY; TENACITY IS BRITTLE TO CRUMBLY; PLANAR TO IRREGULAR FRACTURING; TABULAR CUTTINGS; EARTHY LUSTER; GRITY TO SILTY TEXTURE; THIN STRUCTURE.

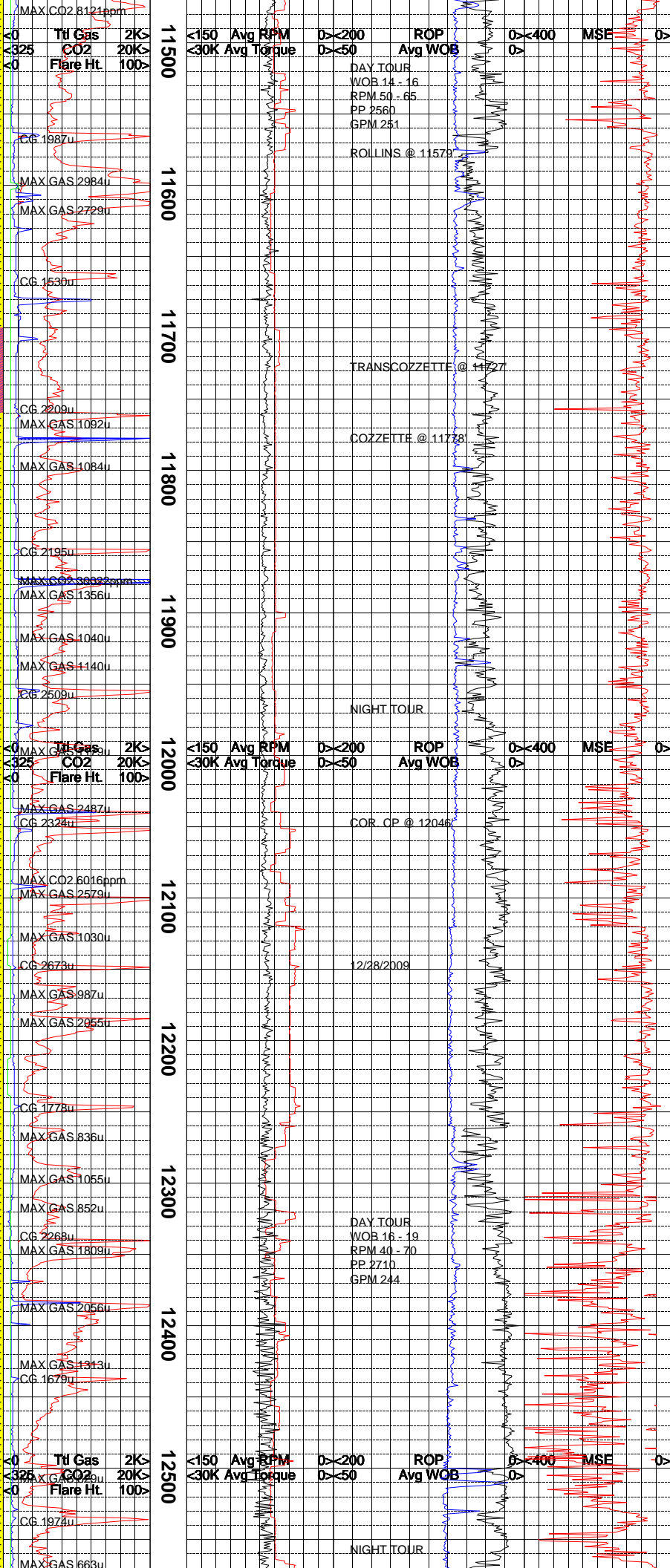
SHALE = MEDIUM BLUISH GRAY TO MEDIUM GRAY; TENACITY IS BRITTLE TO SLIGHTLY CRUNCHY; FRACTURES FROM SPLINERY TO PLANAR; CUTTINGS ARE PLATY TO ELONGATED; DULL LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

CARBONACEOUS SHALE = BLACK TO OLIVE BLACK; BRITTLE TENACITY; SPLINTERY TO BLOCKY FRACTURING; TABULAR TO WEDGELIKE CUTTINGS; POLISHED TO EARTHY LUSTER; CLAYEY TO SMOOTH TEXTURE; THICK STRUCTURE.

COAL = BLACK; CRUMBLY TO PULVERULENT TENACITY; FRACTURES FROM BLOCKY TO CONCHOIDAL TO SPLINTERY; WEDGELIKE TO NODULAR CUTTINGS; RESINOUS TO POLISHED LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE.

SANDSTONE = WHITE TO TRANSLUCENT TO LIGHT GRAY; QUARTZ FRAMEWORK WITH MANY LOOSE GRAINS; FINE SIZED WITH WELL SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; FRIABLE TO EASILY FRIABLE; MILD REACTION WITH HCL SUGGESTS CALCAREOUS/SILICA CEMENT; GRAIN SUPPORTED.

SILTSTONE = BROWNISH GRAY TO OLIVE GRAY TO MEDIUM GRAY; BRITTLE TO CRUNCHY TENACITY; PLANAR FRACTURING; TABULAR TO



SILTSTONE = DARK GREENISH GRAY TO DARK GRAY IN COLOR; TOUGH TO BRITTLE TENACITY SAMPLE SHOWS IRREGULAR TO PLANAR FRACTURE; CUTTINGS ARE SCALY TO TEBULAR IN APPEARANCE; DULL TO FROSTED LUSTER EXHIBITED; SILTY TO SLIGHTLY GRANULAR TEXTURE; THIN STRUCTURE APPARENT.

SHALE = VERY LIGHT GRAY TO MEDIUM LIGHT GRAY IN COLOR; BRITTLE TO CRUNCHY TENACITY; PLANAR FRACTURE; CUTTINGS ARE PLATY TO ELONGATED IN APPEARANCE; WAXY TO DULL LUSTER EXHIBITED; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE APPARENT; MICA PRESENT AS AN ACCESSORY MINERAL.

SANDSTONE = VERY PALE ORANGE TO WHITE IN COLOR; QUARTZ FRAMEWORK; COARSE TO FINE GRAIN SIZE; POOR TO FAIR SORTING; GRAINS ARE ANGULAR TO SUBROUNDED WITH MODERATE SPHERICITY; FIRMLY FRIABLE TO HARD; ABUNDANT LOOSE GRAINS IN SAMPLE TRAY; SILICA CEMENT; NO VISIBLE POROSITY OR BEDDING; PYRITE VISIBLE IN MATRIX; LOW TO MODERATE GAS SHOWS.

CARBONACEOUS SHALE = GRAYISH BLACK TO BLACK IN COLOR; BRITTLE TO CRUMBLY IN TENACITY; HACKLY TO PLANAR FRACTURE; CUTTINGS ARE PLATY TO TABULAR IN HABIT; RESINOUS TO WAXY LUSTER EXHIBITED; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE.

COAL = GRAYISH BLACK IN COLOR; BRITTLE TO PULVERANT IN TENACITY; MOTTLED TO BLOCKY FRACTURE; CUTTINGS ARE ELONGATED TO WEDGELIKE IN APPEARANCE; METALLIC TO VITREOUS LUSTER EXHIBITED; SMOOTH TEXTURE THIN STRUCTURE APPARENT.

SILTSTONE = LIGHT OLIVE GRAY TO DARK GRAY IN COLOR; TOUGH TO CRUMBLY IN TENACITY; CONCHOIDAL TO BLOCKY FRACTURE; CUTTINGS ARE NODULAR TO WEDGELIKE IN APPEARANCE; DULL TO EARTHY LUSTER; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE APPARENT.

SHALE = LIGHT BLuish GRAY TO MEDIUM GRAY TENACITY IS BRITTLE TO CRUNCHY; PLANAR TO SPLINTERY FRACTURING; SCALY TO PLATY CUTTINGS; DULL TO SLIGHTLY WAXY LUSTER; SMOOTH TEXTURE; LAMINAE TO THIN STRUCTURE.

SANDSTONE = TRANSLUCENT TO WHITE TO LIGHT GRAY WITH SOME LIGHT BROWN HUES; QUARTZ FRAMEWORK WITH MANY LOOSE GRAINS; FINE TO MEDIUM SIZED WITH FAIR SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE TO SPHERICITY; EASILY FRIABLE TO FIRMLY FRIABLE; GRAIN SUPPORTED WITH SILICA CEMENT; HIGH GAS ASSOCIATED WITH SAMPLE.

CARBONACEOUS SHALE = OLIVE GRAY TO BROWN TO BLACK; DENSE TO BRITTLE TENACITY; BLOCKY TO CONCHOIDAL TO SLIGHTLY PLANAR FRACTURING; TABULAR CUTTINGS; EARTHY LUSTER; SILTY TO SMOOTH TEXTURE; THIN STRUCTURE.

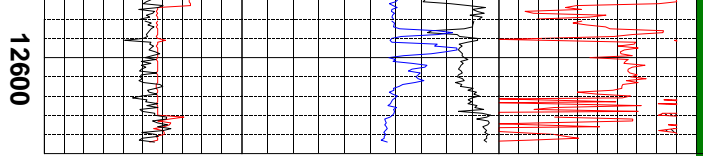
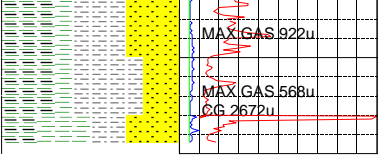
SILTSTONE = DUSKY BROWN TO BROWNISH BLACK; TENACITY IS DENSE TO CRUNCHY; CUTTINGS ARE MASSIVE TO TABULAR; FRACTURES FROM IRREGULAR TO BLOCKY; SPARKLING TO EARTHY LUSTER; TEXTURE IS GRITTY TO SILTY; THICK STRUCTURE.

SHALE = PALE BLUE TO MEDIUM BLuish GRAY TO MEDIUM LIGHT GRAY; BRITTLE TENACITY; SPLINTERY FRACTURING; PLATY TO SCALY CUTTINGS; WAXY TO DULL LUSTER; SMOOTH TEXTURE; LAMINAE STRUCTURE.

SANDSTONE = VERY PALE ORANGE TO WHITE IN COLOR; QUARTZ FRAMEWORK; MEDIUM TO FINE GRAIN SIZE; FAIR TO WELL SORTED; GRAINS ARE SUBANGULAR TO ROUNDED WITH MODERATE TO HIGH SPHERICITY; FIRMLY FRIABLE TO MODERATELY HARD; CALCITE AND SILICA CEMENT; NO VISIBLE POROSITY; MICA AND PYRITE VISIBLE IN SAMPLE; MODERATE TO MODERATELY HIGH GAS SHOWS.

CARBONACEOUS SHALE = GRAYISH BLACK TO BLACK IN COLOR; DENSE TO CRUNCHY IN TENACITY; PLANAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE SCALY TO EQUANT IN HABIT; GREASY TO WAXY LUSTER EXHIBITED; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE APPARENT.

SILTSTONE = DUSKY BROWN TO BROWNISH BLACK; DENSE TO TOUGH TENACITY; FRACTURES FROM IRREGULAR TO BLOCKY; MASSIVE TO TABULAR CUTTINGS; EARTHY TO WAXY LUSTER; GRITTY TO SILTY TEXTURE;



THICK STRUCTURE.
NOTE = REACHED TOTAL DEPTH OF 12645' MD
ON 12/28/2009 AT 11:30 PM.

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