Houston, TX
(281) 784-5500
Bakersfield, CA
(661) 328-1595
New Iberia, LA
(337) 364-2322
Anchorage, AK
(907) 561-2465

Drilling Dynamics MD

COMPANY	ExxonMobil Production
WELL	FRU197-33B1
FIELD	PICEANCE CREEK
REGION	ROCKIES
COORDINATES	39.921453000
	-108.282474000
ELEVATION	GL: 6459.5'
	RKB: 30.2'
COUNTY, STATE	RIO BLANCO, CO
API INDEX	051031142800
SPUD DATE	06/19/2010
CONTRACTOR	HP
CO. REP.	CANDANCE CURTIS
RIG/TYPE	HP321
LOGGING UNIT	MLU#31
GEOLOGISTS	B.DELANEY
	C.RECORD
ADD. PERSONS	M.FRANCO
CO. GEOLOGIST	CHRIS ALBA

LOG INTERVAL

DEPTHS:	4083'	**TO**	12912'
DATES:	06/19/2010	**TO**	07/01/2010
SCALE:	1" = 100'		

MUD TYPES

WATER-BASED	**TO**	4083'
LSND	**TO**	12912'
	TO	
	TO	

CASING DATA

16"	**AT**	150'
10.75"	**AT**	4077'
5"	**AT**	12890'
	AT	

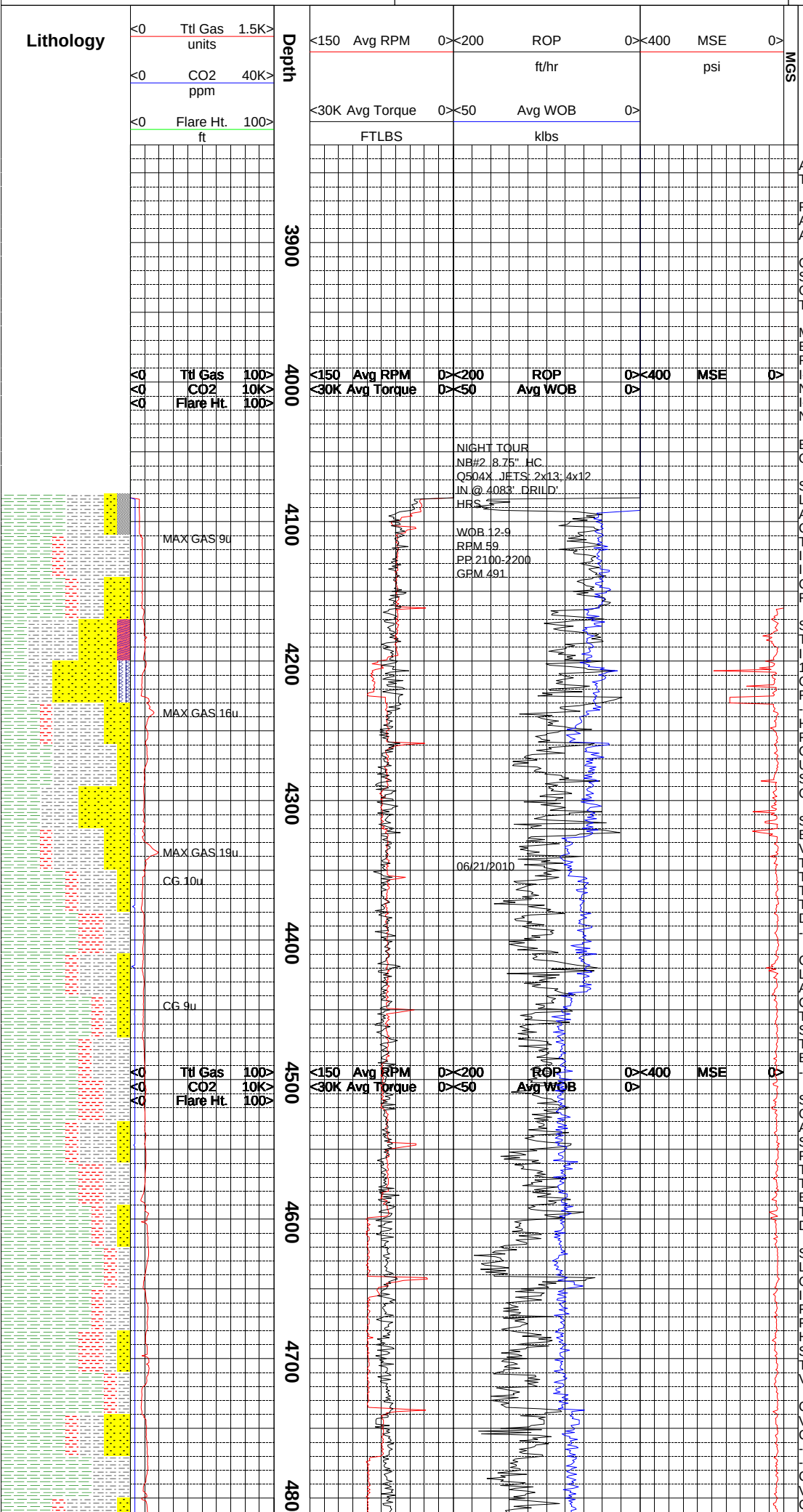
HOLE SIZE

14.75"	**TO**	3934'
8.75"	**TO**	11147'
7.875"	**TO**	12912'
	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
ANDESITE
ANHYDRITE
BASALT
BENTONITE
BIOTITIZATION
BRECCIA
CALCARENITE
CALCAREOUS TUFF
CALCILUTITE
CARBONATES
CARBONACEOUS MAT
CARBONACEOUS SH
CEMENT CONTAM.
CHALK
CRYSTALLINE TUFF
CHERT - ARGILL
CHERT - GLASSY
CHERT - PORCEL
CHERT - TIGER STRIPE
CHERT - UNDIFF
CLAY
CLAY-MUDSTONE
CLYST-TUFFACEOUS
CHLORITIZATION
COAL
CONGLOMERATE
CONGL. SAND
CONGL. SANDSTONE
COQUINA
DACITE
DIATOMITE
DIORITE
DOLOSTONE
FELSIC SILIC DIKE
FOSSIL
GABBRO
GLASSY TUFF
GRANITE
GRANITE WASH
GRANODIORITE
GYPSUM
HALITE
HORNBL-QTZ-DIO
IGNEOUS (ACIDIC)
IGNEOUS (BASIC)
INTRUSIVES
KAOLINITIC
LIMESTONE
LITHIC TUFF
MARL - DOLO
MARL - CALC
METAMORPHICS
MUDSTONE
OBSIDIAN
PALEOSOL
PHOSPHATE
PORCELANITE
PORCELANEOUS CLYST
PYRITE
PYROCLASTICS
QUARTZ DIORITE
QUARTZ LATITE
QUARTZ MONZONITE
RECRYSTALLIZED CALCITE
RHYOLITE
SALT
SAND
SANDSTONE
SANDSTONE-TUFFACEOUS
SERICITIZATION
SERPENTINE
SHALE
SHALE TUFFACEOUS
SHELL FRAGMENTS
SIDERITE
SILICIFICATION
SILTSTONE
SILTST-TUFFACEOUS
TUFF
VOLCANICLASTICS SEDS
VOLCANICS



Remarks

Survey Data, Mud Reports, Other Info.

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.

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

METHANE = 9,990 PPM
ETHANE = 1,010 PPM
PROPANE = 980 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 ON 06/20/2010 @ 4083'.

SHALE = VERY LIGHT GREENISH GRAY TO LIGHT BLUISH GRAY TO YELLOWISH MOTTLED APPEARANCE ON MOST OF SAMPLE; BRITTLE TO CRUMBLY TENACITY; PREDOMINATELY PLANAR TO SLIGHT HACKLY TO SEMI BLOCKY FRACTUR-ING; CUTTINGS TEND TO BE PLATY TO FLAKY IN HABIT; DULL EARTHY LUSTER; SMOOTH TO CLAYEY TEXTURE; NO OTHER VISIBLE BEDDING FEATURES.

SANDSTONE = LIGHT GREENISH GRAY TO WHITE TO TRANSLUCENT; CHLORITE CRSTALS VISIBLE IN SAMPLE; MOSTLY QUARTZ FRAMEWORK WITH 1-2% DARK LITHICS VISIBLE IN SAMPLE; COARSE TO MEDIUM TO FINE GRAIN; POOR TO FAIR SORTED; SUBANGULAR TO ANGULAR GRAIN -S; MODERATE TO HIGH SPHERICITY; GRAINS HAVE SLIGHT POLISH APPEARANCE; FIRM FRIABLE TO MODERATE HARD; CALCITE CEMENTATION DUE TO HIGH REACTION IN DIL-UTE HCl; NO VISIBLE HYDROCARBONS IN THE SAMPLE; VISIBLE CALCITE FRACTURE-FILL; GRAIN SUPPORTED.

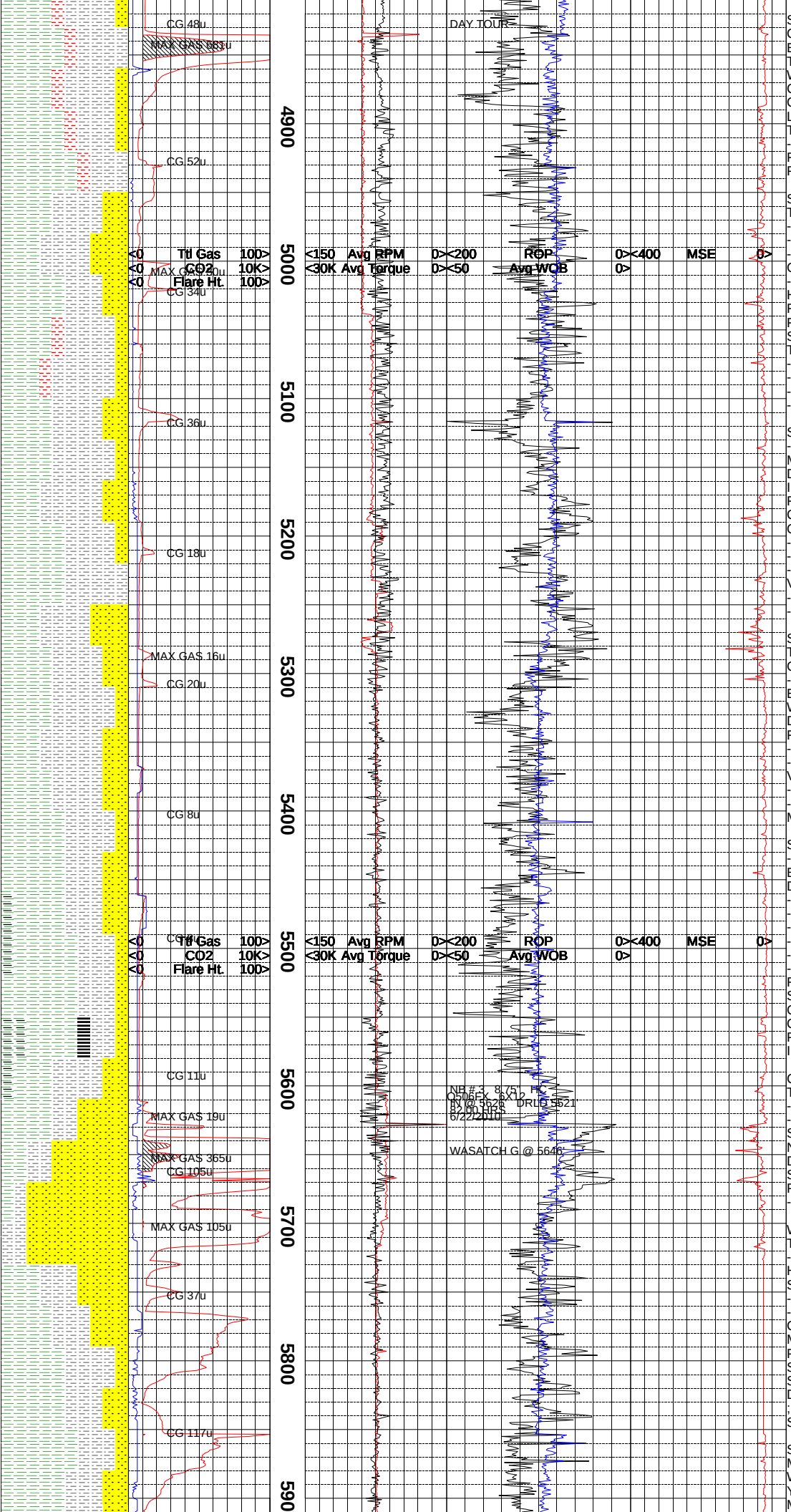
SILTSTONE = VERY LIGHT GRAY TO LIGHT BLUISH GRAY; NACHOLITE CRYSTALS ARE VISIBLE IN THE SAMPLE; CRUNCHY TO STIFF TENACITY; IRREGULAR TO SLIGHT HACKLY TO SEMI PLANAR FRACTURING; CUTTINGS TEND TO BE WEDGE LIKE TO SEMI ELONGATED TABULAR IN HABIT; SLIGHT FROSTED TO SEMI DULL EARTHY LUSTER; GRITTY TO SILTY TEXT -URE; VISIBLE 10% PALEOSOLS IN SAMPLE.

CLAYSTONE = VERY LIGHT BROWNISH GRAY TO LIGHT YELLOWISH GRAY; BRITTLE TO MALLE-ABLE TENACITY; NO VISIBLE FRACTURES; CUTTINGS TEND TO BE NODULAR TO MASSIVE TO SEMI PLATY IN HABIT; DULL EARTHY TO SEMI GREASY LUSTER; CLAYEY TO SMOOTH TO SEMI MATTE TEXTURE; NO OTHER VISIBLE BEDDING FEATURES; 5-10% PALEOSOLS VISIBL -E IN SAMPLE.

SHALE = PALE YELLOWISH BROWN TO LIGHT OLIVE GRAY TO YELLOWISH GRAY; MOTTLED APPEARANCE IS PRESENT THROUGH OUT THE SAMPLE; BRITTLE TO CRUMBLY TENACITY; PREDOMINATELY PLANAR TO SLIGHT HACKLY TO SEMI BLOCKY FRACTURING; CUTTINGS TEND TO BE PLATY TO FLAKY IN HABIT; DULL EARTHY TO SLIGHT GREASY LUSTER; CLAYEY TO SMOOTH TEXTURE; NO OTHER VISIBLE BED-DING FEATURES.

SILTSTONE = PALE YELLOWISH BROWN TO LIGHT GRAY TO OCCASIONALLY LIGHT BLUISH GRAY; CRUNCHY TO CRUMBLY TENACITY; IRREGULAR TO PLANAR TO SEMI HACKLY FRACTURING; CUTTINGS TEND TO BE PLATY TO FLAKY TO PREDOMINATELY WEDGE-LIKE IN HABIT; DULL EARTHY TO SLIGHTLY WAXY TO SEMI FROSTED LUSTER; GRITTY TO GRANULAR TO PREDOMINATELY SILTY TEXTURE; NO OTHER VISIBLE BEDDING FEATURES.

CLAYSTONE = VERY LIGHT YELLOWISH GRAY TO VERY LIGHT BROWNISH GRAY; BRITTLE TO CRUMBLY TO MALLEABLE TENACITY; NO VISIBL -E FRACTURES; CUTTINGS TEND TO BE MASSIV -E TO NODULAR IN HABIT; GREASY LUSTER; CLAYEY TO SMOOTH TEXTURE; NO OTHER VISIBLE BEDDING FEATURES; 4-5% VISIBLE CRYSTALS OF NACHOLITE IN SAMPLE.



SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO OCCASIONAL MEDIUM LIGHT GRAY; MODERATELY BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; WEDGE LIKE TO SUB-PLATY TO VERY SMALL CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-WAXY TO SEMI-FROSTED LUSTER; MODERATELY SMOOTH TO SEMI-CLAYEY TO SEMI-SILTY TEXTURE; NO VISIBLE LAMINA -E OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SANDSTONE = OFF WHITE TO VERY LIGHT GRAY TO VERY LIGHT YELLOWISH GRAY TO VERY LIG -HT BROWNISH GRAY WITH BLACK AND MODERAT -E BROWN HUES; QUARTZ DOMINATE FRAME WOR -K; GRAIN SUPPORTED WITH MOSTLY LOOSE GRAINS; CONTAINS CALCITIC CEMENTATION WI -TH MODERATELY HIGH REACTION TO DILUTE HCL; MATRIX CONTAINS 7 TO 9% DARK LITHIC FRAGMENTS; MEDIUM-FINE TO FINE GRAINED; FAIR TO WELL SORTING; SUB-ANGULAR TO SUB-ROUNDED TO ROUNDED ANGULARITY; LOW TO MODERATE SPHERICITY; POOR GRADE SILTS -TONE VISIBLE GRADING WITH POOR GRADE SA -NDSTONE, NO OTHER DISTINGUISHABLE SURFA -CE FEATURES PRESENT; NO ACCESSORY MINER -ALS PRESENT IN SAMPLE.

SILTSTONE = VERY LIGHT GRAY TO LIGHT GRA -Y TO LIGHT BROWNISH GRAY TO OCCASIONAL MODERATE REDDISH BROWN GRAY; SLIGHTLY DENSE TO MODERATELY CRUNCHY TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; SLIGHT -LY CLAYEY TO VERY SLIGHLTY GRITTY TEXTU -RE; POOR GRADE SILTSTONE VISIBLE BEDDIN -G AND GRADING WITH POOR GRADE SANDSTONE VISIBLE, NO OTHER DISTINGUISHABLE STRUCT -URAL FEATURES PRESENT; NO ACCESSORY MIN -ERALS VISIBLY PRESENT IN SAMPLE.

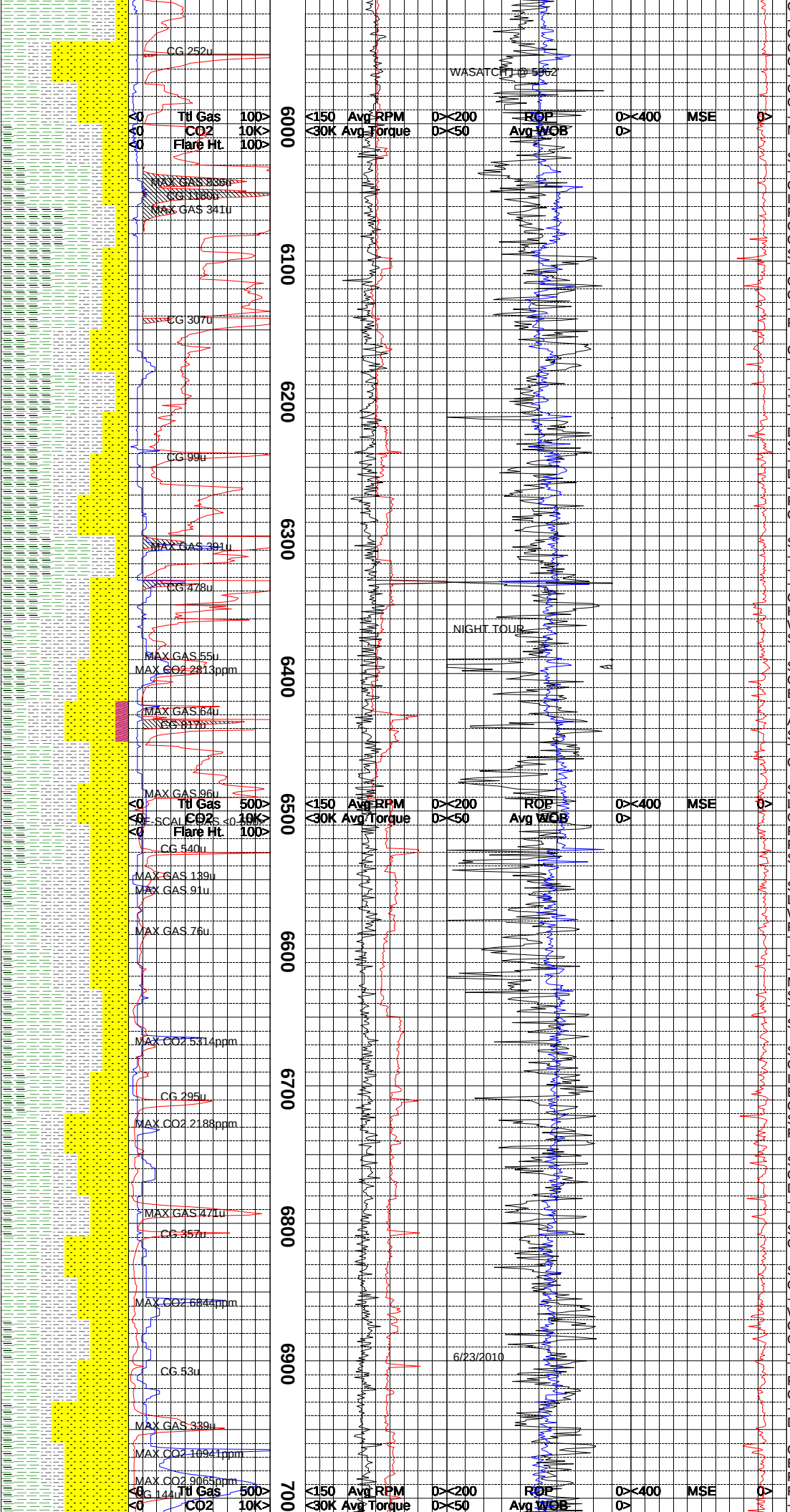
SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY TO MEDIUM GRAY TO OCCASIONAL MEDIUM DARK GRAY; MODERATELY DENSE TO SLIGHTLY CRUNC -HY TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY FRACTURE; OCCASIONAL MASSIVE TO WEDGE LIKE TO ELONGATED CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASINAL SEMI-FROSTED TO SEMI-WAXY LUSTER; VERY SLIGHT -LY CLAYEY TO SLIGHTLY SILTY TO MODERATE -LY SMOOTH TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTON -E VISIBLE, NO OTHER DISTINGUISHABLE STR -UCTURAL FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SANDSTONE = OFF WHITE TO VERY LIGHT BROW -NISH GRAY TO VERY LIGHT GRAY WITH FEW BLACK AND MODERATE BROWN HUES; QUARTZ DOMINATE FRAME WORK; MOSTLY GRAIN SUPPOR -TED WITH FEW LOOSE GRAINS; CONTAINS CAL -CITIC CEMENTATION WITH LIGHT TO MODERAT -E REACTION TO DILUTE HCL; MATRIX CONTAI -NS 2 TO 4% DARK LITHIC FRAGMENTS; MEDIU -M-FINE TO FINE GRAINED; FAIR TO WELL SO -RTING; SUB-ANGULAR TO SUB-ROUNDED TO ROUNDED ANGULARITY; LOW TO MODERATE SPHERICITY; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE, NO OTHER DISTINGUISHABLE SURFACE FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

CARBONACEOUS SHALE = DARK BROWNISH GRAY TO BROWNISH BLACK TO OCCASIONAL OLIVE BL -ACK; SLIGHTLY DENSE TO BRITTLE TO CRUMB -LY TENACITY; IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR FRACTURE; SUB-TABULAR TO SUB-NODULAR CUTTINGS HABIT; DULL TO EARTHY DULL LUSTER; SLIGHTLY CLAYEY TO SLIGHTLY SMOOTH TEXTURE; NO STRUCTURAL FEATURES PRESENT; ACCESSORY MINERAL PYRITE PRESEN -T IN SAMPLE.

WASATCH G SANDSTONE = OFF WHITE TO WHITE TO VERY LIGHT GRAY WITH FEW BLACK, MODER -ATE BROWN AND OCCASIONAL MODERATE GREEN HUES; QUARTZ DOMINATE FRAME WORK; GRAIN SUPPORTED WITH MOSTLY LOOSE GRAINS; CONT -AINS CALCITIC CEMETATION WITH MODERATEL -Y HIGH REACTION TO DILUTE HCL; MATRIX CONTAINS 8 TO 11% DARK LITHIC FRAGMENTS; MEDIUM-FINE TO COARSE GRAINED; FAIR TO POOR SORTING; SUB-ANGULAR ANGULAR TO SUB-ROUNDED ANGULARITY; LOW TO MODERATE SPHERICITY; NO VISIBLE BEDDING OR OTHER DISTINGUISHABLE SURFACE FEATURES PRESENT ; ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.

SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO MEDIUM LIGHT GRAY TO LIGHT BLUISH GRAY WITH OCCASIONAL GRAYISH RED AND MODERATE YELLOW MOTTLING; MODERATELY BRITTLE TO MODERATELY CRUMBLY TO VERY SLIGHTLY



CRUNCHY TENACITY; IRREGULAR TO SUB-PLANA -R TO EARTHY FRACTURE; WEDGE LIKE TO OCCASIONAL PLATY TO MODERATELY SMALL CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-FROSTED TO SEMI-WAXY LUS -TER; MODERATELY SMOOTH TO SLIGHLTY CLAYEY TO SLIGHTLY SILTY TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING WITH POO -R GRADE SANDSTONE IN SAMPLE; ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.

SILTSTONE = VERY LIGHT GRAY TO LIGHT GRA -Y WITH VERY FEW BLACK HUES; MODERATELY CRUNCHY TO VERY SLIGHTLY DENSE TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASINAL SEMI-SPARKLING LUSTER; VERY SLIGHTLY CLAYEY TO VERY SLIGHLTY GRITTY TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURE -S PRESENT IN SAMPLE; ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.

CARBONACEOUS SHALE = DARK BROWNISH GRAY TO BROWNISH BLACK TO OLIVE BLACK; MODERA -TELY DENSE TO SLIGHLTY CRUNCHY TENACITY ; IRREGULAR TO SUB-BLOCKY TO EARTHY-HACK -LY FRACTURE; SUB-TABULAR TO SUB-NODULAR TO OCCASIONAL WEDGE LIKE CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; SLIGHTLY CLAYEY TO VER -Y SLIGHTLY GRITTY TEXTURE; NO VISIBLE LAMINAE OR OTHER DISTINGUISHABLE STRUCTU -RAL FEATURES PRESENT; ACCESSORY MINERAL PYRITE AND LARGE RHOMBIC CUTTINGS OF CALCITE PRESENT IN SAMPLE.

SANDSTONE = VERY LIGHT GRAY TO VERY LIGH -T TAN-BROWNISH GRAY WITH BLACK AND MODE -RATE BROWN HUES; QUARTZ FRAME WORK; MOS -TLY GRAIN SUPPORTED; CONTAINS CALCITIC CEMENT WITH MODERATE REACTION TO DILUTE HCL; FINE TO MEDIUM-FINE GRAINED; FAIR WELL SORTING; SUBANGULAR WITH MODERATE SPHERICITY; MODERATE HARDNESS.

SILTSTONE = BROWNISH GRAY TO OLIVE GRAY OCCASIONALLY MEDIUM LIGHT GRAY; DENSE TO BRITTLE TENACITY; MOSTLY BLOCKY TO OCCAS -IONALLY IRREGULAR FRACTURING; CUTTINGS ARE TABULAR TO WEDGELIKE; EARTHY DULL TO SLIGHTLY WAXY LUSTER; GRITTY TO SILTY TEXTURE; THICK STRUCTURE; TRACE AMOUNTS OF PYRITE WITH SAMPLE.

SHALE = MEDIUM BLUISH GRAY TO MEDIUM LIGHT GRAY WITH OCCASIONAL LIGHT OLIVE GRAY HUES; BRITTLE TENACITY; FRACTURES FROM PLANAR TO IRREGULAR; TABULAR TO PLATY CUTTINGS; SMOOTH TEXTURE; LAMINAE STRUCTURE.

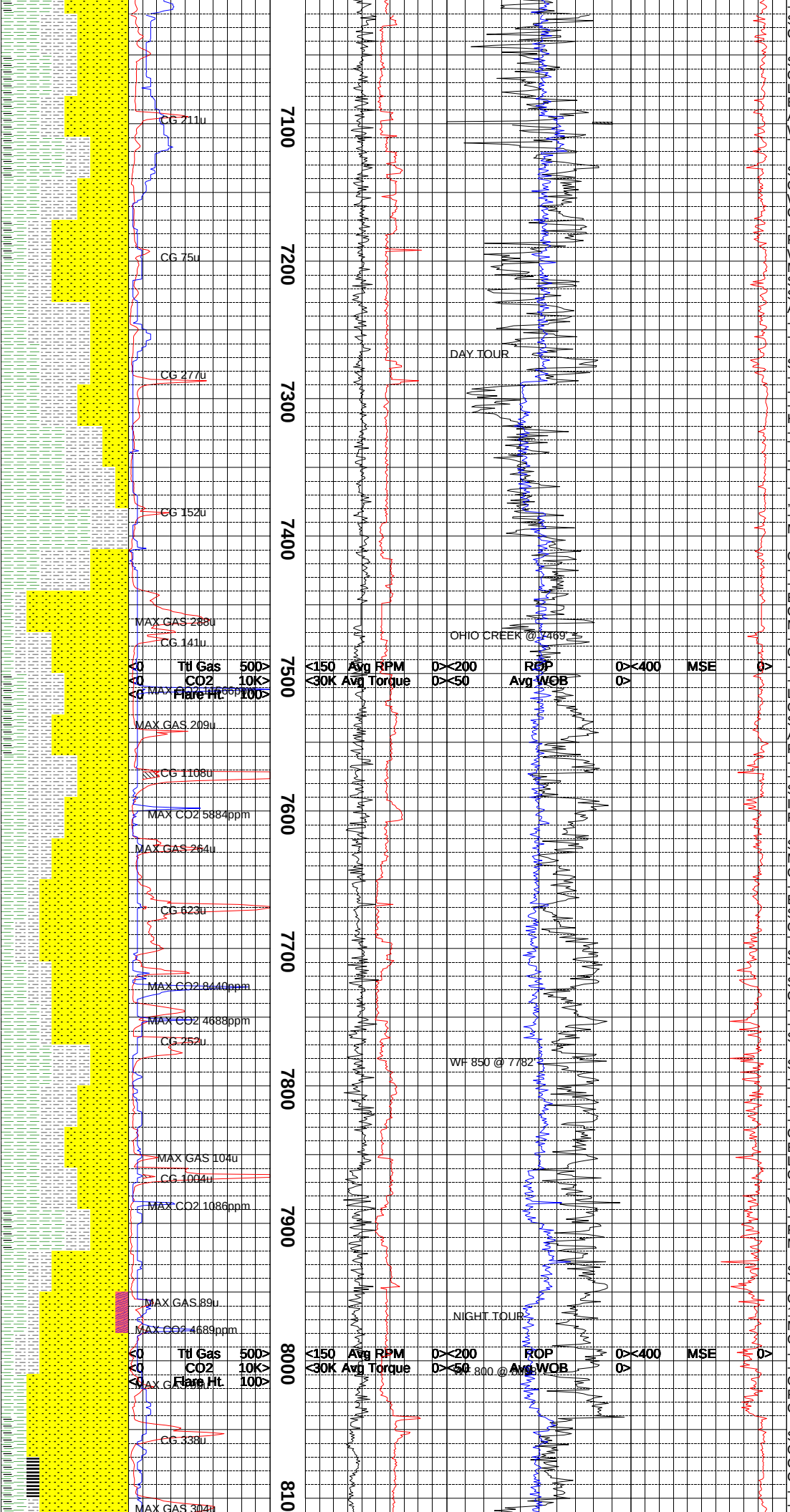
SANDSTONE = BROWNISH GRAY TO OCCASIONAL LIGHT GRAY; DOMINANT QUARTZ FRAMEWORK WITH LESS THAN 5% BLACK LITHIC CLASTS; FINE TO MEDIUM FINED GRAINED WITH FAIR TO WELL SORTING; SUBANGULAR TO SUB -ROUNDED GRAINS; MODERATE TO LOW SPHERIC -ITY; MODERATE HARDNESS; SLIGHT TO MODERATE STRONG REACTION WITH DILUTE HCL SUGGESTS CALCITE CEMENT; GRAIN SUPPORTED TRACE AMOUNTS OF PYRITE INCLUDED WITHIN SAMPLE.

SHALE = MEDIUM GRAY TO MEDIUM BLUISH GRAY; BRITTLE TO CRUNCHY TENACITY; IRREGULAR TO PLANAR WITH OCCASIONAL BLOCKY FRACTURING; PLATY TO TABULAR CUTTINGS; DULL TO WAXY LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE; GRADING FROM SILTSTONE.

SILTSTONE = BROWNISH GRAY TO LIGHT OLIVE GRAY TO MEDIUM LIGHT GRAY; SLIGHTLY DENSE TO SOMEWHAT CRUMBLY TENACITY; FRAC -TURES FROM BLOCKY TO SEMI-IRREGULAR; TABULAR TO WEDGELIKE CUTTINGS; EARTHY TO SLIGHTLY WAXY LUSTER; SILTY TO SLIGHTLY GRITTY TEXTURE; GRADING INTO SHALE.

SANDSTONE = LIGHT GRAY TO MEDIUM DARK GRAY TO LIGHT BROWNISH GRAY WITH OCCA -SIONAL WHITE; DOMINANT QUARTZ FRAMEWORK WITH APPROXIMATELY 10-15% BLACK LITHIC CLASTS; FINE TO MEDIUM WITH SOME COARSE GRAINS; POOR SORTING; ANGULAR TO SUBANG -ULAR WITH LOW SPHERICITY; MODERATE HARD TO FIRMLY FRIABLE; MODERATE TO STRONG REACTION WITH HCL SUGGESTS CALCITE CEMENT; NO VISIBLE BEDDING; TRACE AMO -UNTS OF WHITE CLAY MATRIX, WITH MOST DISPLAYING GRAIN SUPPORT.

CARBONACEOUS SHALE = BLACK TO GRAYISH BLACK TO BROWNISH BLACK; TENACITY RANGES FROM BRITTLE TO SLIGHTLY CRUMBLY; FRACTURES FROM MOSTLY IRREGULAR TO BLO -CKY; CUTTINGS ARE NODULAR TO OCCASION



-ALLY ELONGATED; LUSTER IS SLIGHTLY POLI SHED TO SEMI-EARTHY; TEXTURE RANGES FROM CLAYEY TO SILTY; THIN STRUCTURE.

SHALE = LIGHT GRAY TO MEDIUM GRAY WITH OCCASIONAL HUES OF MEDIUM BLUISH GRAY TO LIGHT BLUISH GRAY; TENACITY RANGES FROM BRITTLE TO SLIGHTLY CRUNCHY; CUTTINGS ARE PLATY TO SLIGHTLY TABULAR; LUSTER IS WAXY TO DULL; TEXTURE IS MOSTLY SMOOTH TO OCCASIONALLY SILTY; THIN STRUCTURE.

SANDSTONE = WHITE TO MEDIUM GRAY TO OLIVE GRAY; DOMINANT QUARTZ FRAMEWORK WITH APPROXIMATELY 5-10% BLACK LITHIC CLASTS; FINE TO MEDIUM SIZED WITH OCCASI -ONAL COARSE GRAINS; POOR TO SLIGHTLY FAIR SORTING; ANGULAR TO SUBANGULARITY WITH LOW SPHERICITY; FIRMLY FRABLE TO MODERATE HARDNESS; CALCITE CEMENT AS SUGGESTED WITH A MODERATE TO FAIRLY STRONG REACTION WITH HCL; TRACE AMOUNT OF PYRITE PRESENT; GRAIN SUPPORTE -D WITH LOOSE GRAINS; NO OTHER DISTINGUI -SHALBLE SURFACES FEATURES PRESENT.

SILTSTONE = VERY LIGHT GRAY TO LIGHT GRA -Y TO OCCASIONAL MEDIUM LIGHT GRAY; MODE -RATELY DENSE TO SLIGHTLY CRUNCHY TENAIC -ITY; IRREGULAR TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULAR TO SUB-NODU -LAR CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; SLI -GHTLY CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE; POOR GRADE SILTSTONE VISIBLE GR -ADING WITH POOR GRADE SANDSTONE PRESENT , NO OTHER DISTINGISHABLE STRUCTURAL FEA -TURES PRESENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

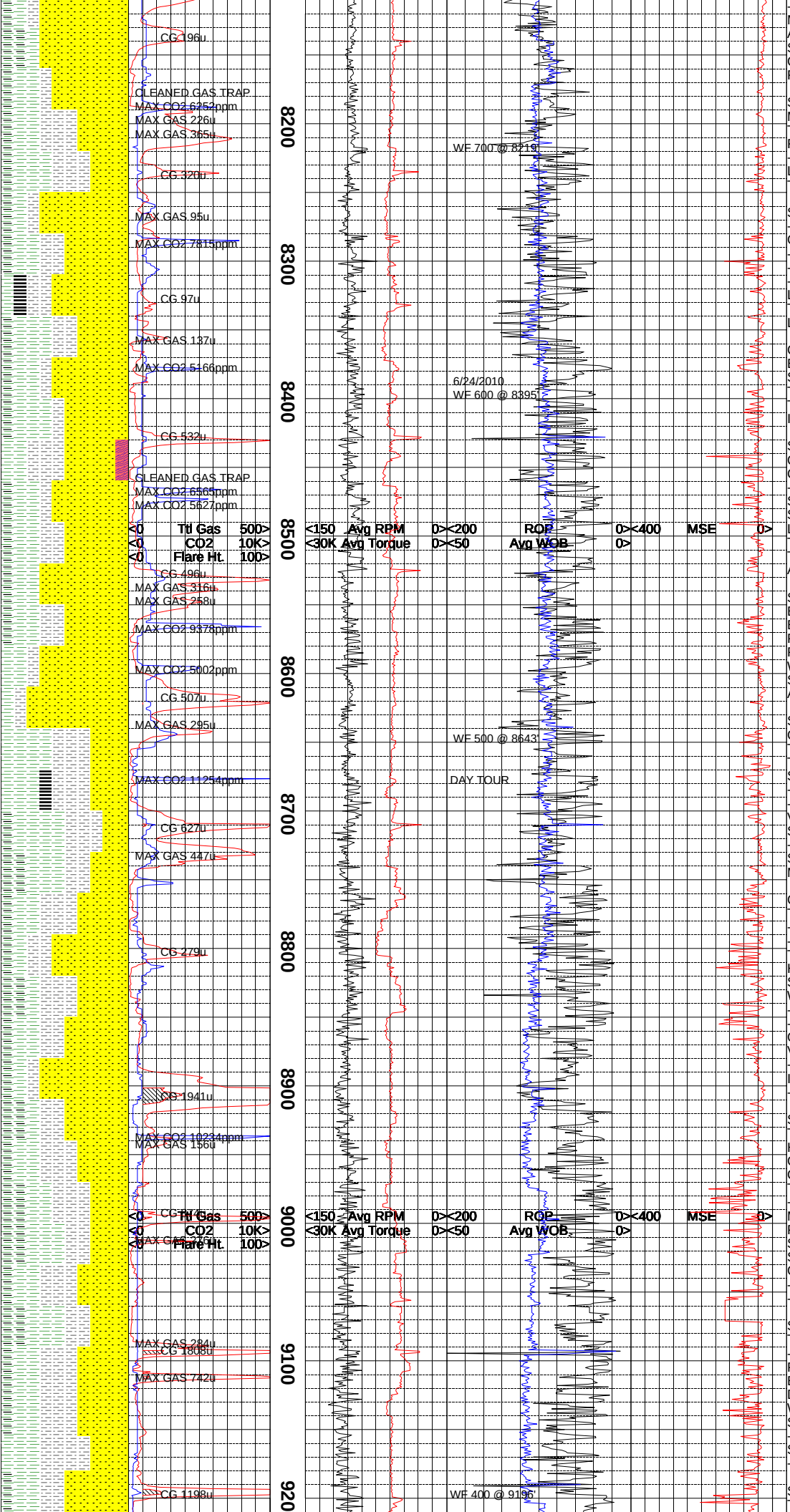
OHIO CREEK SANDSTONE = OFF WHITE TO WHIT -E TO VERY LIGHT GRAY TO VERY LIGHT BROW -NISH-TAN GRAY WITH BLACK AND MODERATE BROWN HUES; QUARTZ DOMINATE FRAME WORK; QUARTZ CUTTINGS RANGE FROM SMOKY TO MODERATELY TRANSLUCENT IN CLEARITY; GRAI -N SUPPORTED WITH MOSTLY LOOSE GRAINS; COMPOSED PRIMARELY OF CALCITIC CEMENTATI -ON WITH MODERATELY HIGH REACTION TO DIL -UTE HCL; MATRIX CONTAINS 3 TO 5% DARK LITHIC FRAGMENTS; MEDIUM-FINE TO MEDIUM-COARSE GRAINED; FAIR TO POOR SORTING; SUB-ANGULAR TO ANGULAR TO SUB-ROUNDED ANGULARITY; LOW TO MODERATE SPHERICITY; POOR GRADE SILTSTONE VISIBLE GRADING WIT -H POOR GRADE SANDSTONE, NO OTHER DISTIN -GUISHABLE SURFACE FEATURES PRESENT IN SAMPLE; ACCESSORY MINERAL PYRITE VISIBLY IN CONTACT WITH SANDSTONE CUTTING IN SAM PLE.

SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO MEDIUM LIGHT GRAY TO OCCASIONAL MEDIUM GRAY; MODERATELY DENSE TO SLIGHTLY CRUNC -HY TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY FRACTURE; OCCASIONAL MASSIVE TO SUB-PLATY TO WEDGE LIKE TO ELONGATED TO OCCASIONAL BLADED CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASINAL SEMI-WAXY TO SEMI-FROSTED LUSTER; MODERATELY SMOOTH TO SLIGHTLY SILTY TEXTURE; POOR GRADE SANDSTONE VISIBLE BEDDING WITH SHALE CUTTING, NO OTHER DISTINGUISHABLE STRUCT -URAL FEATURES PRESENT; ACCESSORY MINERA -L PYRITE AND CALCITE VISIBLY PRESENT IN SAMPLE.

SILTSTONE = VERY LIGHT GRAY TO LIGHT GRA -Y; MODERATELY DENSE TO SLIGHTLY TOUGH TO VERY SLIGHTLY CRUNCHY TENACITY; IRREG -ULAR TO SUB-PLANAR TO EARTHY-HACKLY FRA -CTURE; SUB-TABULAR TO SUB-NODULAR TO OCCASINAL PLATY CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; SLIGHTLY CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE; POOR GRADE SILTSTONE VIS -IBLE GRADING WITH POOR GRADE SANDSTONE, VERY THIN LAMINAE VISIBLE IN SHALE CUTTI -NG, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SANDSTONE = MEDIUM LIGHT GRAY TO WHITE TO OCCASIONALLY TRANSLUCENENT; DOMINANT QUARTZ FRAMEWORK WITH APPROXIMATELY 10% BLACK LITHIC CLASTS INTERBEDDED; MEDIUM TO COARSE WITH OCCASIONAL FINE GRAINS; POOR SORTING; ANGULAR TO SUBANGU -LARITY WITH LOW SPHERICITY; FIRMLY FRIA -BLE TO MODERATE HARD WITH SOME LOOSE GRAINS FROM BIT ACTION; MODERATE REACTION WITH HCL SUGGESTS CALCITE CEMENT; WHITE CALCITE MATRIX.

SANDSTONE = WHITE TO MEDIUM LIGHT GRAY; QUARTZ FRAMEWORK WITH SOME BLACK CARBONACEOUS MATERIAL INTERBEDDED; COARSE TO MEDIUM GRAINED WITH POOR SORT -ING; ANGULAR WITH LOW TO VERY LOW SPHER -ICITY; HARDNESS VARIES FROM EASILY FRIA



-BLE TO FIRMLY FRIABLE WITH OCCASIONAL MODERATE HARD FRAGMENTS; CALCITE CEMENT ALONG WITH CALCITE MATRIX; MODERATE TO STRONG REACTION WITH HCL; ABUNDENT LOOSE GRAINS IN SAMPLE DUE TO BIT ACTION AND FRIABLE HARDNESS.

SILTSTONE = LIGHT BROWNISH GRAY TO MEDIUM GRAY; BRITTLE TO SLIGHTLY CRUMBLY TENACITY; MOSTLY IRREGULAR TO BLOCKY FRACTURING; CUTTINGS ARE TABULAR TO WEDG -ELIKE; EARTHY TO DULL TO SLIGHTY WAXY LUSTER; THIN STRUCTURE; GRITTY TO SILTY TEXTURE; GRADING FROM SANDSTONE.

SHALE = MEDIUM LIGHT GRAY TO MEDIUM BLUI -SH GRAY WITH OCCASIONAL LIGHT OLIVE GRAY AND MODERATE OLIVE BROWN HUES; TENA -CITY IS BRITTLE TO SLIGHTLY CRUNCHY; FR -ACTURES FROM PLANAR TO OCCASIONALLY IRR -EGULAR; TABULAR TO PLATY CUTTINGS; LUSTER RANGES FROM WAXY TO DULL; SMOOTH TO SILTY TEXTURE GRADING FROM SILTSTONE; LAMINAE TO THIN STRUCTURE.

CARBONACEOUS SHALE = GRAYISH BLACK TO BROWNISH BLACK; TENACITY IS CRUMBLY TO SLIGHTLY BRITTLE; FRACTURES FROM BLOCKY TO IRREGULAR; CUTTINGS ARE WEDGELIKE TO TABULAR; EARTHY TO DULL LUSTER; TEXTURE IS SILTY TO SMOOTH; THIN STRUCTURE.

SANDSTONE = MEDIUM LIGHT GRAY TO WHITE; QUARTZ FRAMEWORK WITH TRACE BLACK LITHIC CLASTS; MOSTLY FINE TO MEDIUM WITH OCCAS -IONAL COARSE GRAINS; POOR TO SEMI-FAIR SORTING; SUBANGULAR WITH LOW TO MODERATE SPHERICITY; FIRMLY FRIABLE WITH SOME LOOSE GRAINS; CALCITE CEMENT; MODERATE TO STRONG REACTION WITH DILUTE HCL; TRACE AMOUNTS OF PYRITE PRESENT AS AN ACCESSORY MINERAL.

SHALE = MEDIUM LIGHT GRAY WITH LIGHT BROWNISH GRAY AND LIGHT OLIVE GRAY HUES; BRITTLE TENACITY; FRACTURES FROM MOSTLY PLANAR TO SLIGHTLY BLOCKY; CUTTINGS ARE PLATY TO TABULAR TO SOMEWHAT SCALY; DULL WAXY LUSTER; TEXTURE IS SMOOTH; THIN STRUCTURE; INTERBEDDED WITH SANDSTONE AND SILTSTONE.

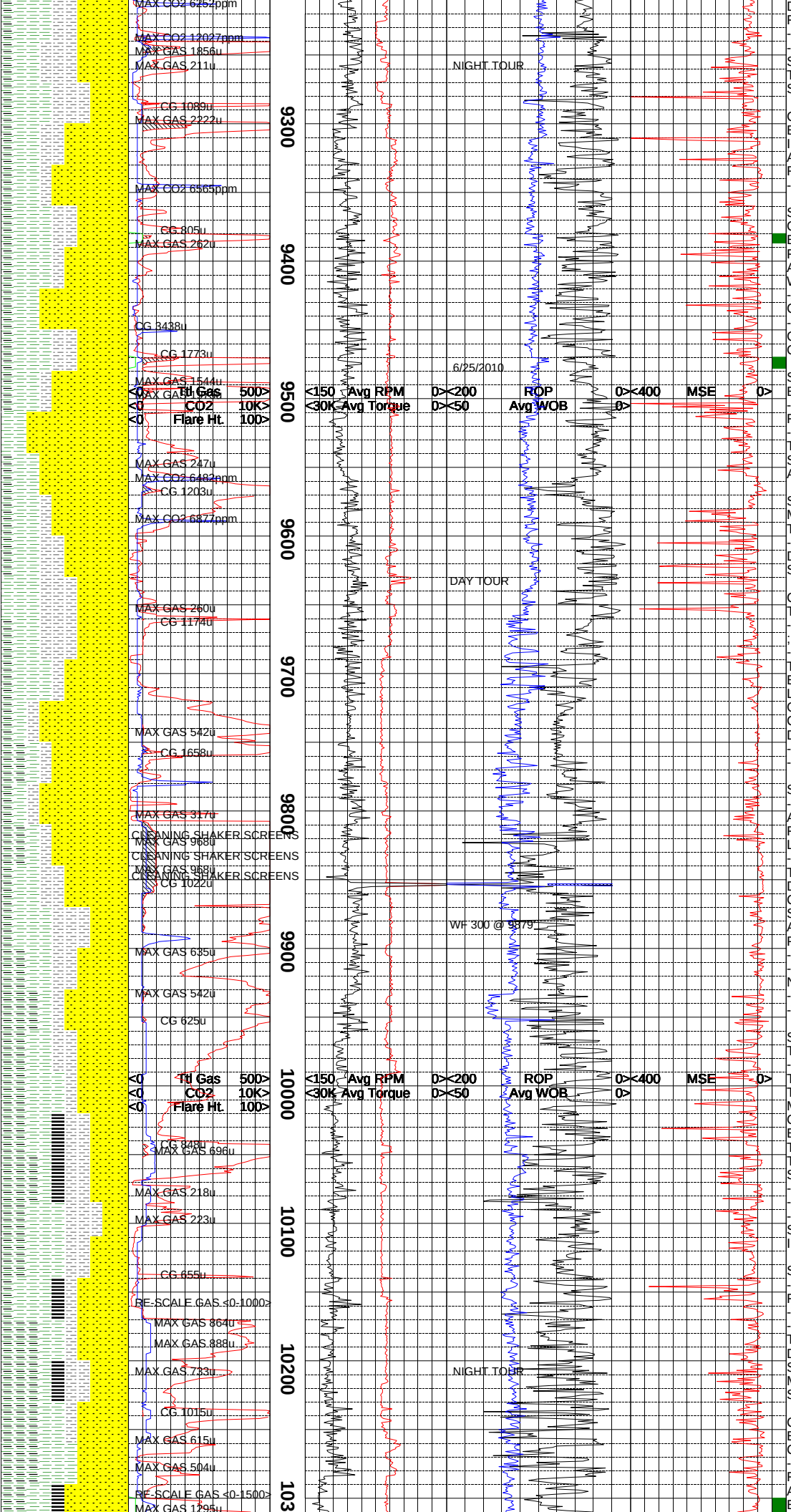
SILTSTONE = LIGHT GRAY TO MEDIUM LIGHT GRAY WITH FEW BLACK HUES; SLIGHTLY DENSE TO MODERATELY TOUGH TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR CUTTINGS HABI -T; DULL TO EARTHY DULL TO OCCASINAL SEM -I-SPARKLING LUSTER; SLIGHTLY CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRAD -E SANDSTONE, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.

CARBONACEOUS SHALE = DARK BROWNISH GRAY TO BROWNISH BLACK TO OLIVE BLACK; MODERA -TELY TOUGH TO MODERATELY DENSE TO OCCAS -IONAL SEMI-CRUNCHY TENACITY; IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; OCCASIONAL MASSIVE TO SUB-TABULAR TO SUB-NODULAR TO OCCASINAL WEDGE LIKE CUTTINGS HABIT; DULL TO EARTH -Y DULL TO OCCASIONAL SEMI-SPARKLING LUS -TER; SLIGHTLY CLAYEY TO VERY SLIGHLTY GRITTY TEXTURE; VERY THIN COAL LAMINAE VISIBLE IN SHALE CUTTING, NO OTHER DISTI -NGUISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; ACCESSORY MINERAL PYRITE PRES -ENT IN SAMPLE.

SANDSTONE = OFF WHITE TO VERY LIGHT GRAY TO WHITE WITH BLACK AND MODERATE BROWN HUES; QUARTZ DOMINATE FRAME WORK; MOSTLY GRAIN SUPPORTED WITH FEW LOOSE GRAINS; CONTAINS SILICIC CEMENTATION WITH LITTLE TO NO REACTION TO DILUTE HCL; MATRIX CON -TAINS 9 TO 12% DARK LITHIC FRAGMENTS; MEDIUM-COARSE 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, FRACT -URE EVIDENCE VISIBLE IN SAMPLE; NO ACCE -SSORY MINERALS PRESENT IN SAMPLE.

SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY TO MEDIUM GRAY; MODERATELY DENSE TO SLI -GHLTY CRUMBLY TO CRUNCHY TENACITY; SUB-PLANAR TO IRREGULAR FRACTURE; MASSIVE TO ELONGATED TO WEDGE LIKE CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-WAXY TO SEMI-FROSTED LUSTER; MODERATELY SMOOTH TO SLIGHTLY SILTY TEXTURE; NO VIS -IBLE LAMINAE OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; NO ACCESSOR -Y MINERALS PRESENT IN SAMPLE.

SILTSTONE = MEDIUM GRAY TO BROWNISH GRAY TO OCCASIONALLY DUSKY BROWN; TENACITY IS



DENSE TO BRITTLE TO SLIGHTLY CRUMBLY; FRACTURES MOSTLY FROM BLOCKY TO IRREG -ULAR; CUTTINGS ARE WEDGELIKE TO SEMI-TA -BULAR; DULL TO WAXY WITH OCCASIONALLY A SLIGHT SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; THICK STRUCTURE; GRADING FROM SANDSTONE.

CARBONACEOUS SHALE = BLACK TO BROWNISH BLACK TO GRAYISH BLACK; BRITTLE TENACITY IRREGULAR TO BLOCKY FRACTURING; CUTTINGS ARE NODULAR TO WEDGELIKE; POILISHED TO RESINOUS LUSTER; THIN STRUCTURE; INTERBE -DED WITH SANDSTONE SILTSTONE AND SHALE.

SANDSTONE = MEDIUM LIGHT GRAY TO WHITE; QUARTZ FRAMEWORK WITH APPROXIMATELY 5% BLACK LITHIC CLASTS; MEDIUM TO MEDIUM FINE WITH OCCASIONAL COARSE GRAINS; OVER ALL FAIR SORTING; SUBROUND TO SUBANGULAR WITH MODERATE TO LOW SPHERICITY; MODER -ATE HARD TO FIRMLY FRIABLE; CALCITE CEMENT; MODERATE TO FAIRLY STRONG REACT -ION WITH DILUTE HCL; ABUNDENT LOOSE GRAINS; SOME FINER GRAINED FRAGMENTS CAN OBSERVED GRADING INTO SILTSTONE.

SHALE = MEDIUM LIGHT GRAY TO MEDIUM BLUISH GRAY WITH OLIVE GRAY HUES; TENA -CITY IS CRUNCHY TO BRITTLE; FRACTURES FROM PLANAR TO SLIGHTLY ELONGATED; CUTT -INGS ARE PLATY TO SCALY; LUSTER IS WAXY TO DULL; SMOOTH TEXTURE; LAMINAE TO THIN STRUCTURE; INTERBEDDED WITH SANDSTONE AND CARBONACEOUS SHALE.

SILTSTONE = MODERATE YELLOWISH BROWN TO MODERATE OLIVE BROWN TO MEDIUM GRAY; TENACITY IS VRUMBLY TO BRITTLE; IRREGU -LAR TO BLOCKY FRACTURING; EARTHY TO DULL LUSTER; THIN STRUCTURE; GRITTY TO SILTY TEXTURE; GRADING FROM SANDSTONE.

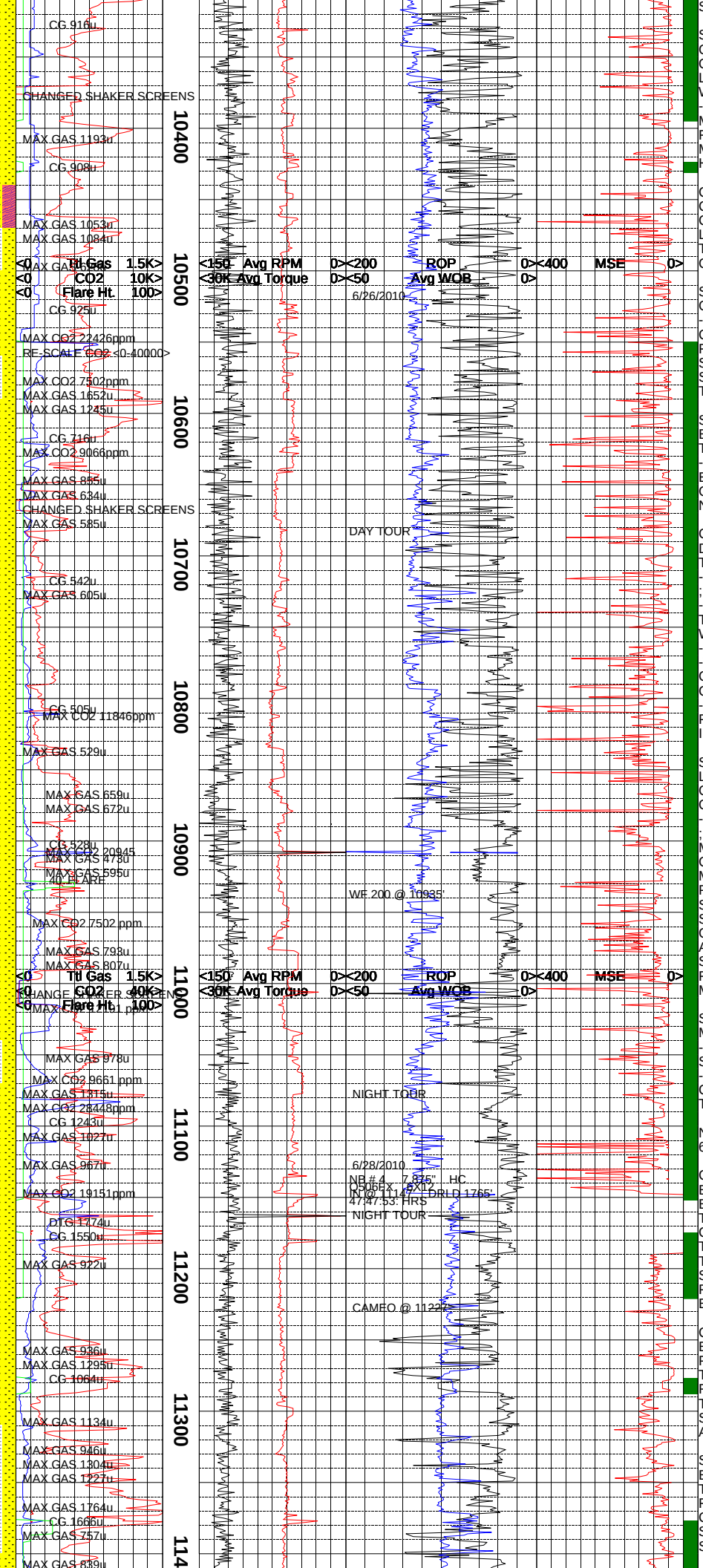
CARBONACEOUS SHALE = DARK BROWNISH GRAY TO BROWNISH BLACK TO OLIVE BLACK; MODERA -TELY DENSE TO SLIGHLTY CRUNCHY TENACITY ; IRREGULAR TO SUB-PLANAR TO EARTHY-HACK -LY FRACTURE; SUB-TABULAR TO SUB-NODULAR TO MOSTLY SMALL CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; SLIGHTLY CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE; VERY SMALL AMOUNT OF CARBONACEOUS SHALE CUTTINGS VISIBLY DEGASSING, NO OTHER DISTINGUISHABLE STRU -CTURAL FEATURES PRESENT; ACCESSORY MINE -RAL PYRITE PRESENT IN SAMPLE.

SANDSTONE = OFF WHITE TO WHITE TO YELLOW -ISH GRAY TO VERY LIGHT GRAY WITH BLACK AND MODERATE BROWN HUES; QUARTZ DOMINATE FRAME WORK; GRAIN SUPPORTED WITH MOSTLY LOOSE GRAINS; COMPOSED OF CALCITIC CEMEN -TATION WITH LIGHT TO MODERATE REACTION TO DILUTE HCL; MATRIX CONTAINS 8 TO 10% DARK LITHIC FRAGMENTS; 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 WIT -H POOR GRADE SANDSTONE, VERY SMALL AMOU -NT OF COAL VISIBLY DEGASSING IN SAMPLE, NO OTHER DISTINGUISHABLE SURFACE FEATURE -S PRESENT; NO ACCESSORY MINERALS PRESEN -T IN SAMPLE.

SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY TO MEDIUM GRAY TO OCCASIONAL LIGHT BLUIS -H GRAY; SLIGHTLY DENSE TO MODERATELY TOUGH TENACITY; IRREGULAR TO SUB-PLANAR TO MOTTLED TO EARTHY-HACKLY FRACTURE; MASSIVE TO ELONGATED TO WEDGE LIKE TO OCCASIONAL PLATY CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-FROSTED TO SEMI-WAXY LUSTER; MODERATELY SMOOTH TO SLIGHTLY SILTY TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRAD -E SANDSTONE, VERY THIN COAL LAMINAE VIS -IBLE IN SHALE CUTTING, NO OTHER DISTING -UISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SILTSTONE = VERY LIGHT GRAY TO LIGHT GRA -Y TO VERY LIGHT BROWNISH GRAY WITH FEW BLACK HUES; SLIGHTLY TOUGH TO MODERA -TELY DENSE TENACITY; IRREGULAR TO SUB-P -LANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; MOSTLY SILTY TO MODERATELY GRITTY TEXTURE; NO VISIBLE STRUCTURE; GRADING FROM SANDSTONE.

CARBONACEOUS SHALE = BLACK TO GRAYISH BLACK TO OCCASIONALLY BROWNISH GRAY; CRUMBLY TO SLIGHTLY CRUNCHY TO OCCASIONA -LLY PULVERULENT TENACITY; FRACTURES FROM BLOCK TO SEMI-IRREGULAR; CUTTINGS ARE WEDGELIKE TO NODULAR TO SOMETIMES ELONGATED; RESINOUS TO POLISHED LUSTER;



SMOOTH TO SILTY TEXTURE.

SANDSTONE = LIGHT OLIVE GRAY TO BROWNISH GRAY TO MEDIUM LIGHT GRAY; DOMINENT QUARTZ FRAMEWORK WITH LESS THAN 5% BLACK LITHIC CLASTS; MEDIUM TO MEDIUM FINE WITH OCCASIONAL COARSE GRAINS; FAIR SORT -ING; SUBROUNDED TO SUBANGULAR WITH MODERATE TO LOW SPHERICITY; FIRMLY FRIABLE; CALCITE CEMENT WITH CALCITE MATRIX; MODERATE TO STRONG REACTION WITH HCL; ABUNDENT LOOSE GRAINS IN SAMPLE.

COAL = BLACK; TENACITY IS PULVERULENT TO CRUMBLY; FRACTURES FROM PLANAR TO BLOCKY CUTTINGS ARE NODULAR TO WEDGELIKE; LUSTER IS POLISHED TO RESINOUS; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE; HIGH GAS ASSOCIATED WITH SAMPLE.

SHALE = MEDIUM LIGHT GRAY TO GREENISH GRAY TO LIGHT BLUISH GRAY WITH AN OCCASI -ONAL LIGHT OLIVE BROWN HUE; BRITTLE TO CRUNCHY TENACITY; PLANAR TO SPLINTERY FRACTURING; CUTTINGS ARE PLATY TO SLIGHTLY ELONGATED; EARTHY TO DULL TO SLIGHTLY WAXY LUSTER; SMOOTH TEXTURE; THIN TO SOMEWHAT THICK STRUCTURE.

SILTSTONE = MODERATE OLIVE BROWN TO BROWNISH GRAY TO MEDIUM GRAY; BRITTLE TO CRUMBLY TENACITY; IRREGULAR FRACTUR -ING; CUTTINGS ARE TABULAR TO WEDGELIKE; EARTHY WITH A SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; GRADING FROM SANDSTONE; NO VISIBLE STRUCTURE.

CARBONACEOUS SHALE = BROWNISH GRAY TO DARK BROWNISH GRAY TO BROWNISH BLACK TO OLIVE BLACK; SLIGHTLY TOUGH TO MODERA -TELY DENSE TO SLIGHTLY CRUNCHY TENACITY ; IRREGULAR TO SUB-PLANAR TO EARTHY-HACK -LY FRACTURE; OCCASIONAL MASSIVE TO SUB-TABULAR TO SUB-NODULAR TO OCCASIONAL WEDGE LIKE CUTTINGS HABIT; DULL TO EARTH -Y DULL TO OCCASIONAL SEMI-SPARKLING LUS -TER; SLIGHTLY CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE; VERY SMALL AMOUNT OF COAL VISIBLY DEGASSING IN SAMPLE, NO OTH -ER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SANDSTONE = PALE YELLOWISH GRAY TO VERY LIGHT BROWNISH-TAN GRAY TO VERY LIGHT GRAY WITH BLACK AND MODERATE BROWN HUES; QUARTZ DOMINANT FRAME WORK; PREDOMINATEL -Y GRAIN SUPPORTED WITH FEW LOOSE GRAINS ; COMPOSED OF CALCITIC CEMENTATION WITH MODERATE REACTION TO DILUTE HCL; MATRIX CONTAINS 5 TO 8% DARK LITHIC FRAGMENTS; 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, SMALL AMOUNT OF COAL VISIBLY EFFERVESCING IN SAMPLE, NO OTHER DISTINGUISHABLE SURFACE FEATURES PRESENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

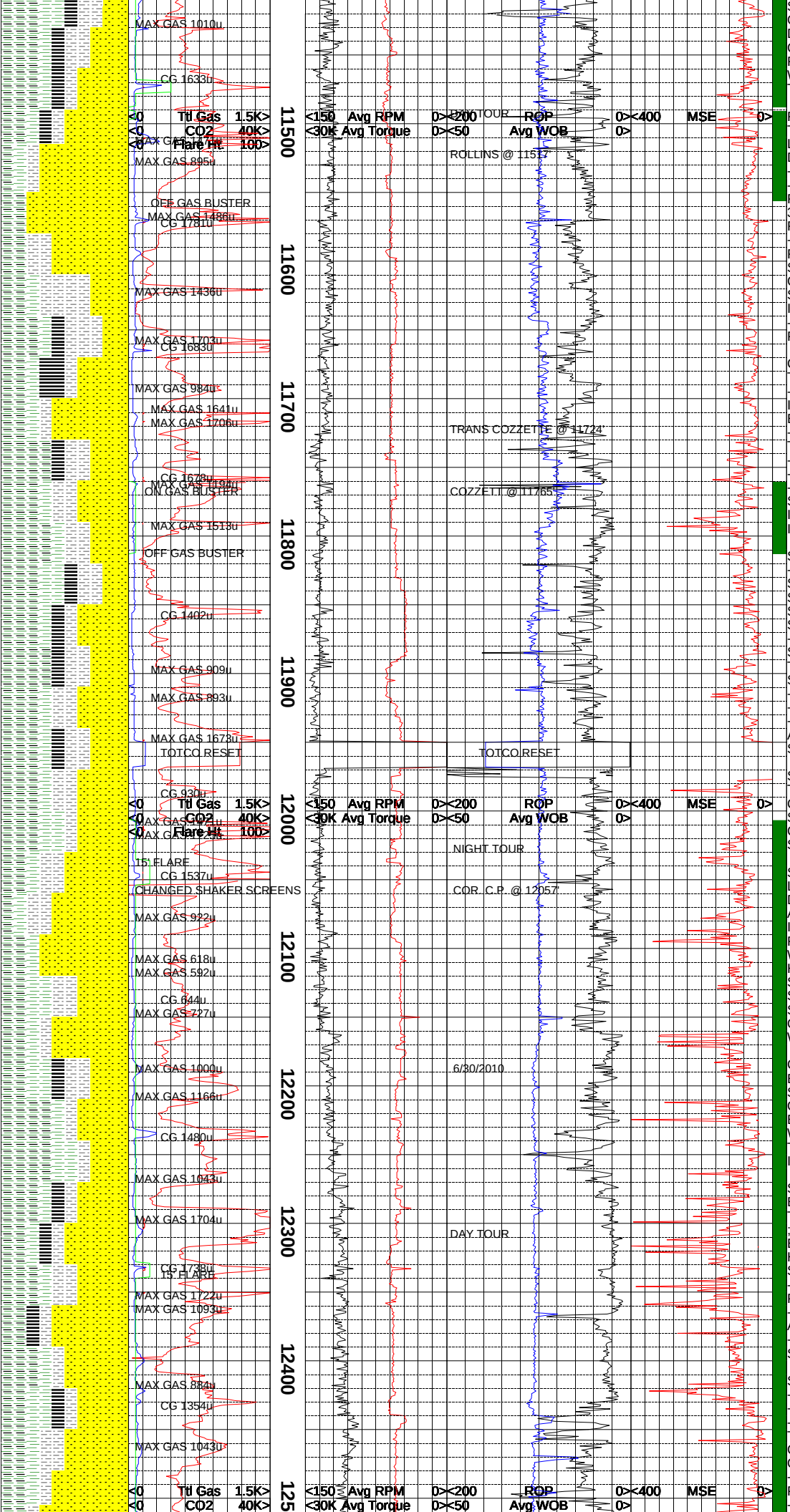
SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO MEDIUM LIGHT GRAY; SLIGHTLY TOUGH TO MOD -ERATELY DENSE TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY FRACTURE; OCCASIONA -L MASSIVE TO ELONGATED TO WEDGE LIKE CUTTINGS; DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

NOTE = MADE BIT TRIP @ 11147' MD ON 6/26/2010.

CARBONACEOUS SHALE = BLACK TO GRAYISH BLACK TO BROWNISH BLACK; DENSE TO BRITTLE TO OCCASSIONALLY CRUMBLY TENACITY; BLOCKY TO PLANAR FRACTURING; CUTTINGS ARE NODULAR TO TABULAR; EARTHY TO RESINOUS LUSTER; SMOOTH TO SILTY TEXTURE; THICK TO SLIGHTLY MASSIVE STRUCTURE; CONTAINS TRACE AMOUNTS OF PYRITE AS ACCESSORY; SOME SPECIMENS CAN BE SEEN TRANSITIONING INTO IMATURE COAL.

COAL = BLACK; CRUMBLY TO SLIGHTLY BRITTLE TENACITY; FRACTURES FROM MOSTLY PLANAR TO OCCASIONALLY BLOCKY; TABULAR TO NODULAR CUTTINGS; POLISHED TO RESINOUS TO SLIGHTLY EARTHY LUSTER; TEXTURE IS SMOOTH TO CLAYEY; THIN TO SEMI-THICK STRUCTURE; HIGH GAS ASSOCIATED WITH SAMPLE.

SILTSTONE = BROWNISH GRAY TO BROWNISH BLACK TO OLIVE GRAY; DENSE TO CRUNCHY TENACITY; IRREGULAR FRACTURING; VERY FINE GRAINS; NODULAR TO WEDGELIKE CUTTINGS; EARTHY TO WAXY WITH A SLIGHT SPARKLING LUSTER; SILTY TEXTURE; THIN STRUCTURE.



SHALE = LIGHT BLUSH GRAY TO MEDIUM LIGHT GRAY TO GRAYISH GREEN WITH OCCASIONAL DUSKY YELLOW HUES; BRITTLE TO SLIGHTLY CRUMBLY TENACITY; PLANAR TO SPLINTERY FRACTURING; CUTTINGS ARE PLATY TO SCALY; WAXY TO DULL LUSTER; SMOOTH TO SILTY TEXTURE; THIN TO LAMINAE STRUCTURE.

ROLLINS SANDSTONE = OFF WHITE TO WHITE TO VERY LIGHT YELLOWISH GRAY TO VERY LIGHT GRAY WITH FEW BLACK HUES; QUARTZ DOMINANT FRAME WORK; GRAIN SUPPORTED WIT -H MOSTLY LOOSE GRAINS; COMPOSED OF SILI -CA CEMENTATION WITH VERY LITTLE TO NO REACTION TO DILUTE HCL; MATRIX CONTAINS 3 TO 5% DARK LITHIC FRAGMENTS; MEDIUM-FINE TO COARSE GRAINED; FAIR TO POOR SOR -TING; 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 COAL VISIBLY DEGASSING IN SAMPLE, NO OTHER DISTINGUISHABLE SURF -ACE FEATURES PRESENT; ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.

CARBONACEOUS SHALE = DARK BROWNISH GRAY TO BROWNISH BLACK TO OLIVE BLACK; SLIGHT -LY TOUGH TO MODERATELY DENSE TENACITY; IRREGULAR TO SUB-PLANAR TO SUB-BLOCKY TO EARTHY FRACTURE; SUB-TABULAR TO SUB-NODU -LAR CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; SLI -GHTLY CLAYEY TO VERY SLIGHTLY GRITTY TE -XTURE; POOR GRADE SILTSTONE VISIBLE GRA -DING WITH POOR GRADE SANDSTONE, VERY SMALL AMOUNT OF COAL VISIBLE DEGASSING IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SILTSTONE = VERY LIGHT GRAY TO VERY LIGH -T BROWNISH GRAY TO LIGHT BROWNISH GRAY; SLIGHTLY DENSE TO SLIGHTLY TOUGH TO VERY SLIGHTLY CRUNCHY TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR CUTTINGS HABI -T; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; SLIGHTLY CLAYEY TO SLIGHLTY GRITTY TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRAD -E SANDSTONE, SMALL AMOUNT OF COAL VISIB -LY DEGASSING IN SAMPLE, NO OTHER DISTIN -GUISHABLE STRUCTURAL FEATURES PRESENT; ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.

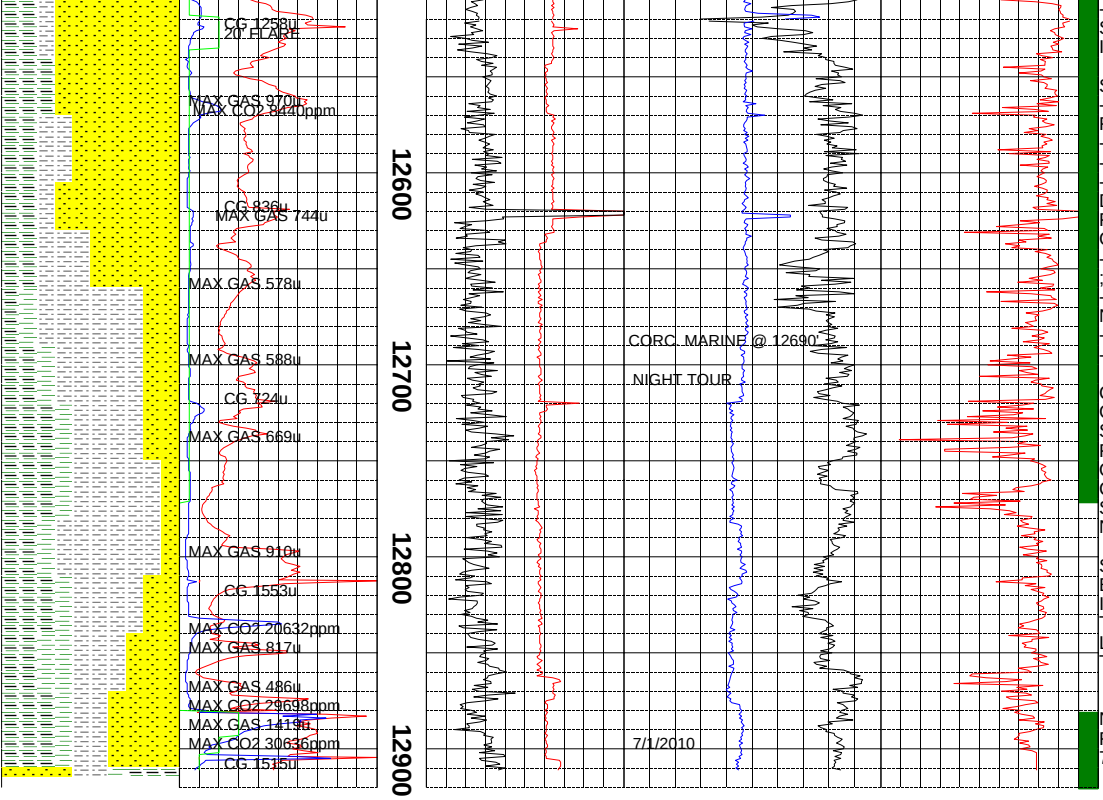
SHALE = PALE GREEN TO MEDIUM BLUISH GRAY TO GREENISH GRAY; BRITTLE TO SLIGHTLY CRUMBLY TENACITY; PLANAR TO SOMEWHAT SPLINTERY FRACTURING; PLATY TO TABULAR CUTTINGS; DULL TO SLIGHTLY WAXY LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE.

SANDSTONE = BROWNISH GRAY TO MEDIUM LIGHT GRAY; TO WHITE TO TRANSLUCENT; DOMINANT QUARTZ FRAMEWORK WITH TRACE AMOUNTS OF BLACK LITIC CLASTS INTERBEDDED; FINE TO MEDIUM GRAINED WITH FAIR TO SEMI-WELL SORTING; SUBROUNDED WITH MODERATE SPHERICITY; HARD TO VERY HARD; ABUNDENT LOOSE QUARTZ GRAINS IN SAMPLE; QUARTZ GRAINS DISPLAY FROSTED SURFACE FEATURES; GRAIN SUPPORTED WITH SILICA CEMENT WITH POSSIBLE TRACE AMOUNT OF CALCITE; NO TO VERY SLIGHT REACTION WITH DILUTE HCL.

CARBONACEOUS SHALE = GRAYISH BLACK TO BROWNISH BLACK TO BROWNISH GRAY; SLIGHTLY DENSE TO BRITTLE TO OCCASIONALLY CRUMBLY; IRREGULAR TO BLOCKY FRACTURING; EARTHY TO DULL LUSTER WITH A SLIGHT SPARKLING LUSTER; CLAYEY TO SILTY TEXTURE; THICK STRUCTURE; INTERBEDDED WITH SANDSTONE AND SILTSTONE

SHALE = MEDIUM LIGHT GRAY TO MEDIUM BLUISH GRAY; BRITTLE TO SLIGHTLY CRUMBLY TENACITY; IRREGULAR TO PLANAR FRACTURING ; OCCASIONAL MASSIVE TO WEDGE LIKE TO ELONGATED TO OCCASIONAL PLATY CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-WAXY TO SEMI-FROSTED LUSTER; MODERA -TELY SMOOTH TO SLIGHTLY SILTY TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING WIT -H POOR GRADE CARBONACEOUS SHALE, SMALL AMOUNT OF COAL VISIBLY DEGASSING IN SAMP -LE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SILTSTONE = VERY LIGHT GRAY TO VERY LIGH -T BROWNISH GRAY; SLIGHTLY DENSE TO SLIG -HTLY CRUNCHY TENACITY; IRREGULAR TO SUB -PLANAR TO EARTHY HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR TO MOSTLY SMALL CUTTINS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; SLIGHT -LY CLAYEY TO SLIGHTLY GRITTY TEXTURE; POOR GRADE SILTSTONE VISIBLE BEDDING WIT -H CARBONACEOUS SHALE, NO OTHER DISTINGU



-ISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SANDSTONE = LIGHT GRAY TO VERY LIGHT BRO -WNISH GRAY TO LIGHT BROWNISH GRAY WITH FEW BLACK AND MODERATE BROWN HUES; QUART -Z DOMINANT FRAME WORK; MOSTLY GRAIN SUP -PORTED WITH LOOSE GRAINS; CONTAINS CALC -ITIC CEMENTATION WITH LIGHT REACTION TO DILUTE HCL; CONTAINS 3 TO 5% DARK LITHIC FRAGMENTS; MEDIUM TO MEDIUM-COARSE GRAINED; FAIR TO POOR SORTING; SUB-ANGUL -AR TO ANGULAR TO SUB-ROUNDED ANGULARITY ; LOW TO MODERATE SPHERICITY; SMALL AMOU -NT OF COAL VISIBLY DEGASSING IN SAMPLE, NO OTHER DISTINGUISHABLE SURFACE FEATURE -S PRESENT; ACCESSORY MINERAL PYRITE PRE -SENT IN SAMPLE.

CARBONACEOUS SHALE = BROWNISH BLACK TO GRAYISH BLACK TO BLACK; BRITTLE TO SLIGHTLY CRUNCHY TENACITY; FRACTURES FROM PLANAR TO SUB BLOCKY TO OCCASIONALLY IRREGULAR; PLATY TO TABULAR CUTTINGS; RESINOUS WITH A SLIGHT SPARKLING LUSTER; SMOOTH TEXTURE; NO VISIBLE STRUCTURE.

SILTSTONE = BROWNISH GRAY TO BROWNISH BLACK TO DARK GRAY; DENSE TENACITY; IRREGULAR TO BLOCKY FRACTURING; MASSIVE TO TABULAR CUTTINGS; EARTHY TO SPARKLING LUSTER; SILTY TO SLIGHTLY GRITTY TEXTURE THICK TO MASSIVE STRUCTURE.

NOTE = REACHED TOTAL DEPTH OF 12912' MD REACHED AT APPROXIMATELY 1:30 AM ON 7/1/2010.