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

Drilling Dynamics MD

COMPANY Exxon Mobil
WELL FRU197-33B9
FIELD Piceance Creek
REGION Rockies
COORDINATES 39.921322000
-108.282561000
ELEVATION GL: 6459.3'
RKB: 30.2'
COUNTY, STATE RIO BLANCO, CO
API INDEX 051031142200
SPUD DATE 04/08/2010
CONTRACTOR HE
CO. REP. C. CURTIS
RIG/TYPE HP321
LOGGING UNIT MLU#31
GEOLOGISTS B.DELANEY; C.RECORD
M.FRANCO
ADD. PERSONS M.PIPER; K.WALLANDER
CO. GEOLOGIST C.ALBA / N. ROOSMAWATI

LOG INTERVAL

CASING DATA

DEPTHS: 3950' TO 12300'
DATES: 07/21/2010 TO 08/02/2010
SCALE: 1"=100'

16.00" AT 150'
10.75" AT 3940'
4.5" AT 12285'
AT

MUD TYPES

HOLE SIZE

WATER-BASED TO 3950'
LSND TO 12300'
TO
TO

14.75" TO 3950'
8.75" TO 12300'
TO
TO

ABBREVIATIONS

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

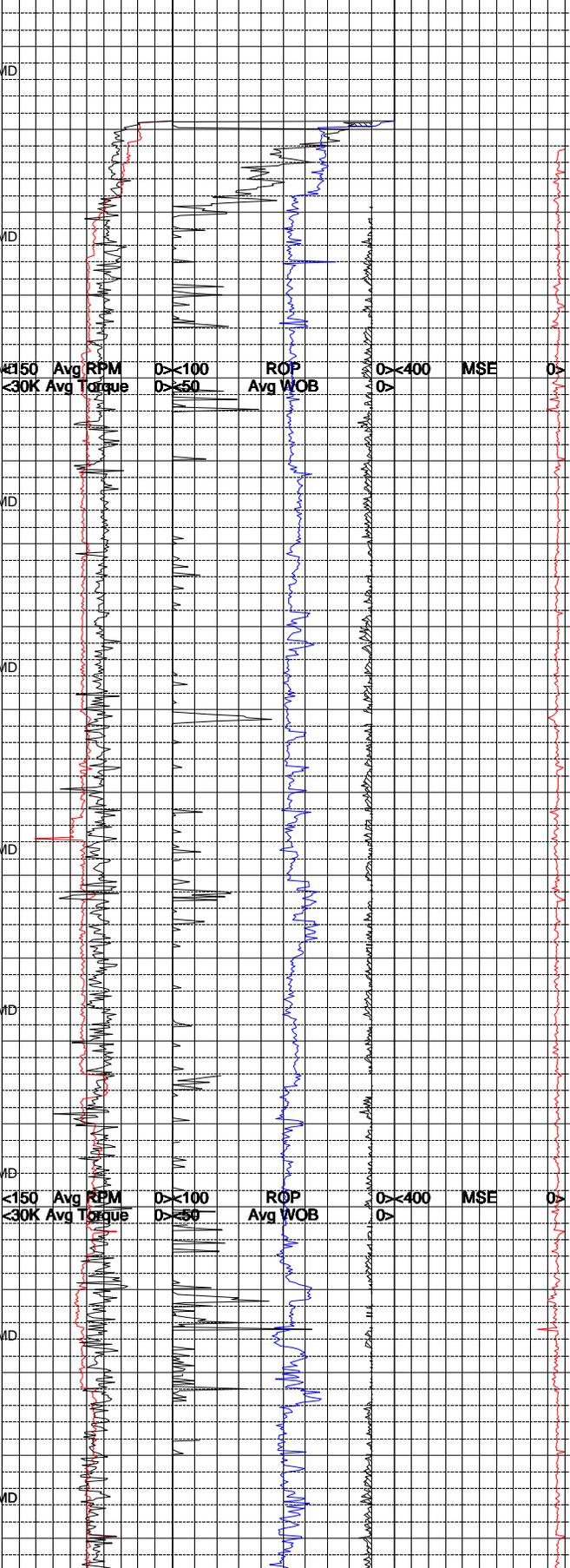
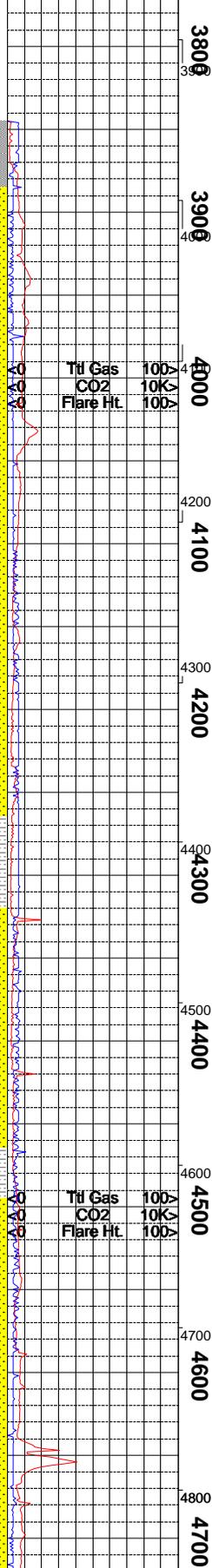
ALTERED ZONE	CHERT - GLASSY	FELSIC SILIC DIKE	MARL - CALC	SANDSTONE
ANDESITE	CHERT - PORCEL	FOSSIL	METAMORPHICS	SANDSTONE-TUFFACEOUS
ANHYDRITE	CHERT - TIGER STRIPE	GABBRO	MUDSTONE	SERICITIZATION
BASALT	CHERT - UNDIFF	GLASSY TUFF	OBSIDIAN	SERPENTINE
BENTONITE	CLAY	GRANITE	PALEOSOL	SHALE
BIOTITIZATION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

Lithology

Ttl Gas units
CO2 10K ppm
Flare Ht. 100 ft

<150 Avg RPM 0 >100 ROP 0 >400 MSE 0 >
ft/hr
<30K Avg Torque 0 >50 Avg WOB 0 >
FTLBS klbs

Remarks
Survey Data, Mud Reports, Other Info.



EPOCH WELL SERVICES COMMENCED LOGGING ON 7/21/2010 @ 3950'.

SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO OCCASIONAL MEDIUM LIGHT GRAY; VERY SLIGHTLY DENSE TO MOSTLY BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR TO EARTHLY HACKLY FRACTURE; OCCASIONAL MASSIVE TO WEDGE LIKE TO OCCASIONAL ELONGATED CUTTINGS HABIT; DULL TO EARTHLY DULL TO OCCASIONAL SEMI-FROSTED TO SEMI-WAXY LUSTER; MODERATELY SMOOTH TO SLIGHTLY CLAYEY TO SLIGHTLY SILTY TEXTURE; NO VISIBLE LAMINAE OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

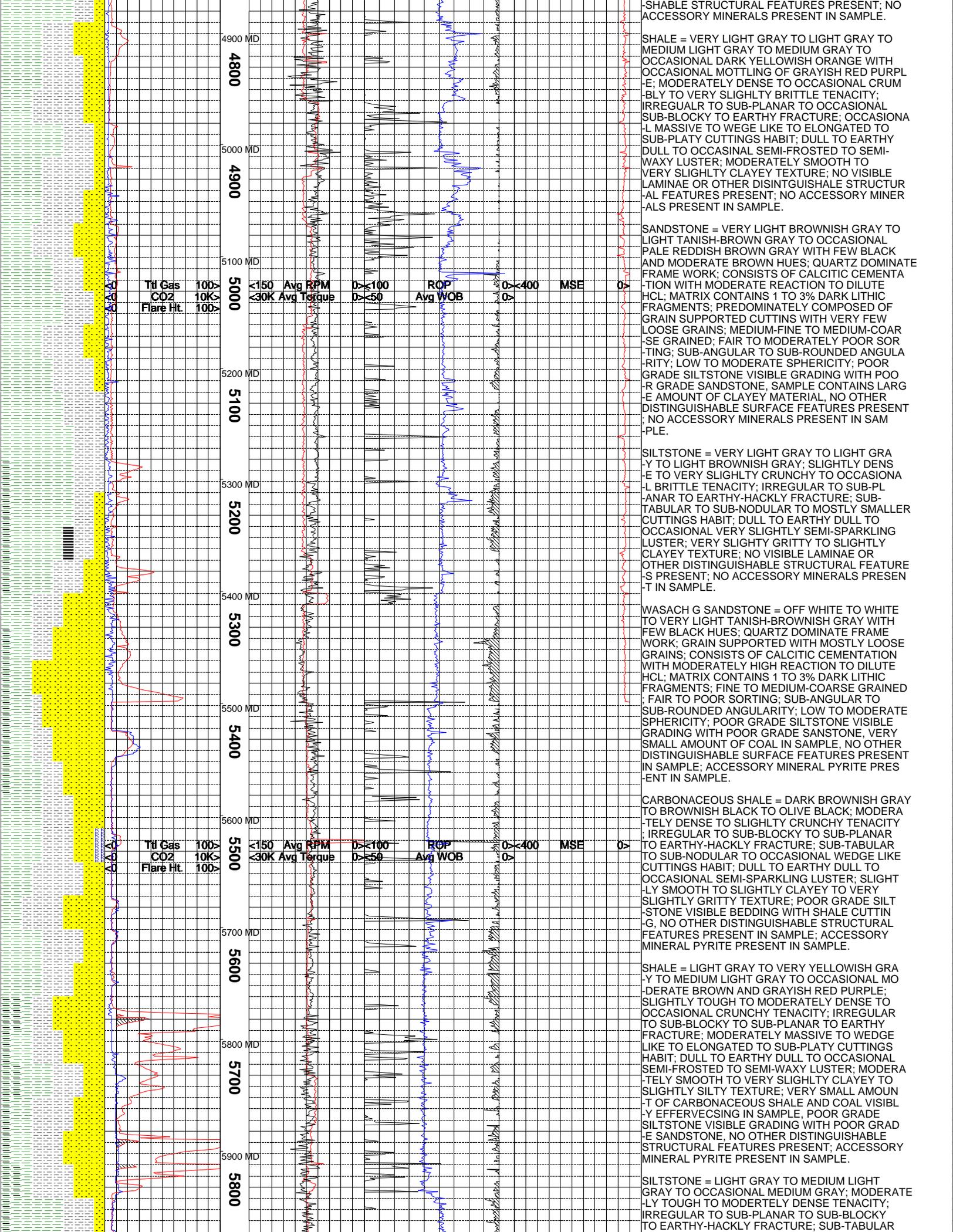
SANDSTONE = OFF WHITE TO VERY LIGHT BROWNISH GRAY TO YELLOWISH GRAY WITH MODERATE BROWN AND BLACK HUES; QUARTZ DOMINANT FRAME WORK; MOSTLY GRAIN SUPPORTED WITH VERY FEW LOOSE GRAINS; CONSISTS OF CALCITIC CEMENTATION WITH MODERATE HIGH REACTION TO DILUTE HCL; MATRIX CONTAINS 3 TO 5% DARK LITHIC FRAGMENTS; MEDIUM FINE TO MEDIUM-COARSE GRAINED; FAIR TO POOR SORTING; SUB-ANGULAR TO SUB-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.

SILTSTONE = VERY LIGHT GRAY TO LIGHT GRAY TO LIGHT BROWNISH GRAY; SLIGHTLY DENSE TO MODERATELY BRITTLE TO SLIGHTLY CRUNCHY TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHLY HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR TO OCCASIONAL PLATY CUTTINGS HABIT; DULL TO EARTHLY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; VERY SLIGHTLY GRITTY TO VERY SLIGHTLY GRANULAR TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE; CUTTINGS IN SAMPLE ARE SLIGHTLY CLAYEY; NO OTHER DISTINGUISHABLE SURFACE FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO MEDIUM LIGHT GRAY; MOSTLY BRITTLE TO CRUMBLY TO VERY SLIGHTLY DENSE TENACITY; IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR TO EARTHLY FRACTURE; OCCASIONAL MASSIVE TO WEDGE LIKE TO ELONGATED TO OCCASIONAL CURVED CUTTINGS HABIT; DULL TO EARTHLY DULL TO OCCASIONAL SEMI-FROSTED TO SEMI-WAXY LUSTER; MODERATELY SMOOTH TO SLIGHTLY CLAYEY TO VERY SLIGHTLY SILTY TEXTURE; NO VISIBLE LAMINAE OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SANDSTONE = OFF WHITE TO VERY LIGHT BROWNISH GRAY WITH BLACK AND MODERATE BROWN HUES; QUARTZ DOMINANT FRAME WORK; PREDOMINANTLY GRAIN SUPPORTED WITH VERY FEW LOOSE GRAINS; CONSISTS OF CALCITIC CEMENTATION WITH MODERATE REACTION TO DILUTE HCL; MATRIX CONTAINS 2 TO 5% DARK LITHIC FRAGMENTS; MEDIUM-FINE TO MEDIUM-COARSE GRAINED; FAIR TO POOR SORTING; SUB-ANGULAR TO SUB-ROUNDED ANGULARITY; LOW TO MODERATE SPHERICITY; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE, NO OTHER DISTINGUISHABLE SURFACE FEATURES PRESENT IN SAMPLE.

SILTSTONE = LIGHT GRAY TO VERY LIGHT BROWNISH GRAY TO OCCASIONAL MODERATE DUSKY RED; VERY SLIGHTLY DENSE TO SLIGHTLY CRUNCHY TO MODERATELY BRITTLE TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHLY-HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR TO OCCASIONAL SEMI-WEDGE LIKE CUTTINGS HABIT; DULL TO EARTHLY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; SLIGHTLY GRITTY TO VERY SLIGHTLY GRANULAR TEXTURE; POOR GRADE SILTSTONE VISIBLE BEDDING WITH POOR GRADE SANDSTONE, NO OTHER DISTINGUISHABLE SURFACE FEATURES PRESENT IN SAMPLE.



SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO MEDIUM LIGHT GRAY TO MEDIUM GRAY TO OCCASIONAL DARK YELLOWISH ORANGE WITH OCCASIONAL MOTTLING OF GRAYISH RED PURPLE; MODERATELY DENSE TO OCCASIONAL CRUMBLY TO VERY SLIGHTLY BRITTLE TENACITY; IRREGULAR TO SUB-PLANAR TO OCCASIONAL SUB-BLOCKY TO EARTHY FRACTURE; OCCASIONALLY MASSIVE TO WEDGE LIKE TO ELONGATED TO SUB-PLATY CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-FROSTED TO SEMI-WAXY LUSTER; MODERATELY SMOOTH TO VERY SLIGHTLY CLAYEY TEXTURE; NO VISIBLE LAMINAE OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SANDSTONE = VERY LIGHT BROWNISH GRAY TO LIGHT TANISH-BROWN GRAY TO OCCASIONAL PALE REDDISH BROWN GRAY WITH FEW BLACK AND MODERATE BROWN HUES; QUARTZ DOMINATE FRAME WORK; CONSISTS OF CALCITIC CEMENTATION WITH MODERATE REACTION TO DILUTE HCL; MATRIX CONTAINS 1 TO 3% DARK LITHIC FRAGMENTS; PREDOMINATELY COMPOSED OF GRAIN SUPPORTED CUTTINGS WITH VERY FEW LOOSE GRAINS; MEDIUM-FINE TO MEDIUM-COARSE GRAINED; FAIR TO MODERATELY POOR SORTING; SUB-ANGULAR TO SUB-ROUNDED ANGULARITY; LOW TO MODERATE SPHERICITY; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE, SAMPLE CONTAINS LARGE AMOUNT OF CLAYEY MATERIAL, NO OTHER DISTINGUISHABLE SURFACE FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SILTSTONE = VERY LIGHT GRAY TO LIGHT GRAY TO LIGHT BROWNISH GRAY; SLIGHTLY DENSE TO VERY SLIGHTLY CRUNCHY TO OCCASIONALLY BRITTLE TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR TO MOSTLY SMALLER CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL VERY SLIGHTLY SEMI-SPARKLING LUSTER; VERY SLIGHTLY GRITTY TO SLIGHTLY CLAYEY TEXTURE; NO VISIBLE LAMINAE OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

WASACH G SANDSTONE = OFF WHITE TO WHITE TO VERY LIGHT TANISH-BROWNISH GRAY WITH FEW BLACK HUES; QUARTZ DOMINATE FRAME WORK; GRAIN SUPPORTED WITH MOSTLY LOOSE GRAINS; CONSISTS OF CALCITIC CEMENTATION WITH MODERATELY HIGH REACTION TO DILUTE HCL; MATRIX CONTAINS 1 TO 3% DARK LITHIC FRAGMENTS; FINE TO MEDIUM-COARSE GRAINED; 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 IN SAMPLE, NO OTHER DISTINGUISHABLE SURFACE FEATURES PRESENT IN SAMPLE; ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.

CARBONACEOUS SHALE = DARK BROWNISH GRAY TO BROWNISH BLACK TO OLIVE BLACK; MODERATELY DENSE TO SLIGHTLY CRUNCHY TENACITY; IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR TO OCCASIONAL WEDGE LIKE CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; SLIGHTLY SMOOTH TO SLIGHTLY CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE; POOR GRADE SILTSTONE VISIBLE BEDDING WITH SHALE CUTTING; NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.

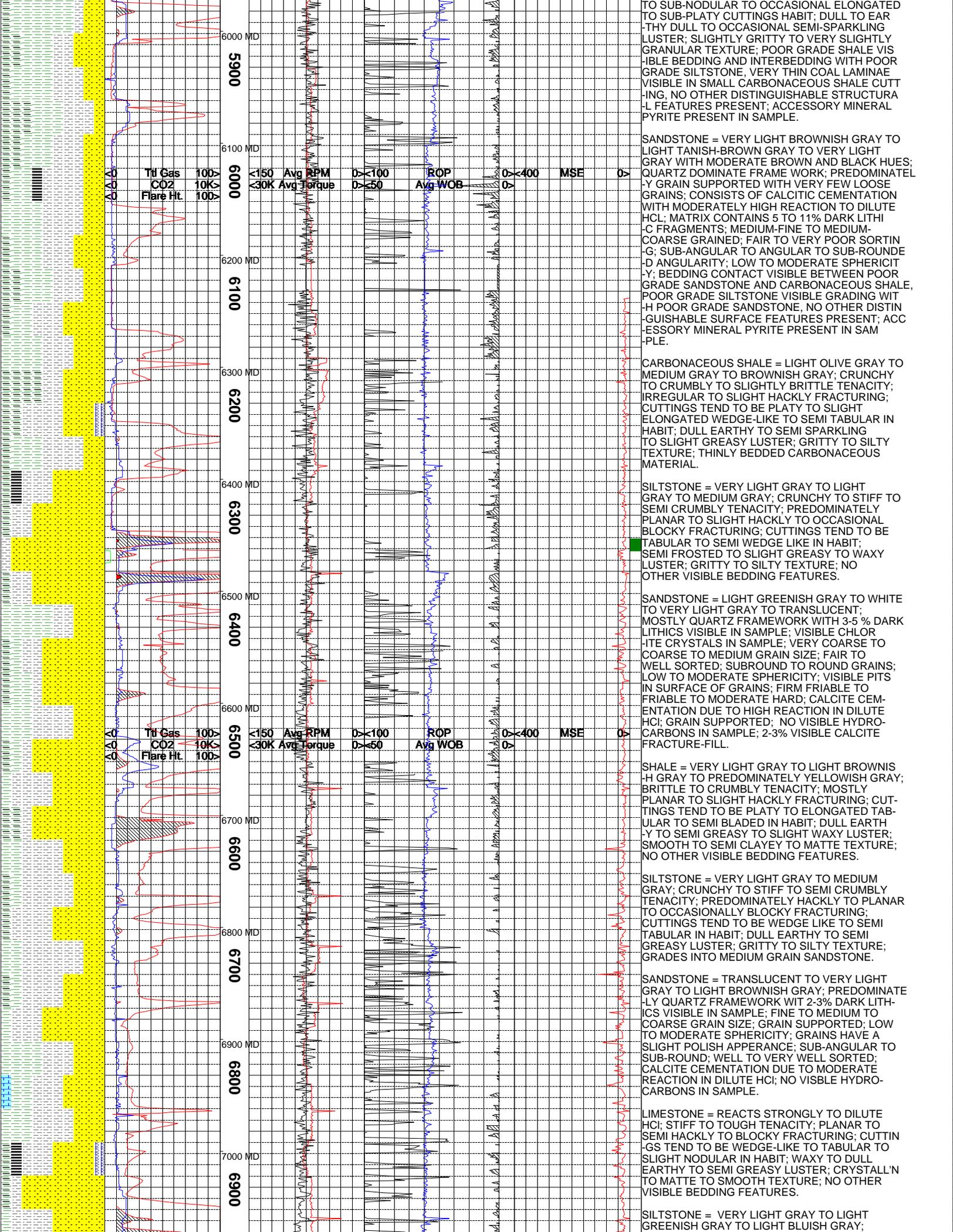
SHALE = LIGHT GRAY TO VERY YELLOWISH GRAY TO MEDIUM LIGHT GRAY TO OCCASIONAL MODERATE BROWN AND GRAYISH RED PURPLE; SLIGHTLY TOUGH TO MODERATELY DENSE TO OCCASIONAL CRUNCHY TENACITY; IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR TO EARTHY FRACTURE; MODERATELY MASSIVE TO WEDGE LIKE TO ELONGATED TO SUB-PLATY CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-FROSTED TO SEMI-WAXY LUSTER; MODERATELY SMOOTH TO VERY SLIGHTLY CLAYEY TO SLIGHTLY SILTY TEXTURE; VERY SMALL AMOUNT OF CARBONACEOUS SHALE AND COAL VISIBLY EFFERVESCENT IN SAMPLE, POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.

SILTSTONE = LIGHT GRAY TO MEDIUM LIGHT GRAY TO OCCASIONAL MEDIUM GRAY; MODERATELY TOUGH TO MODERATELY DENSE TENACITY; IRREGULAR TO SUB-PLANAR TO SUB-BLOCKY TO EARTHY-HACKLY FRACTURE; SUB-TABULAR

5000 MD
 Tq Gas 100K
 CO2 10K
 Flare Ht. 100
 <150 Avg RPM >100 ROP <400 MSE >
 <30K Avg Torque >50 Avg WOB >

5500 MD
 Tq Gas 100K
 CO2 10K
 Flare Ht. 100
 <150 Avg RPM >100 ROP <400 MSE >
 <30K Avg Torque >50 Avg WOB >

Mudlogging by [unreadable]



Tf Gas 100K
CO2 10K
Flare Ht. 100K

Avg RPM
Avg Torque

ROP
Avg WOB

MSE
D

TO SUB-NODULAR TO OCCASIONAL ELONGATED TO SUB-PLATY CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; SLIGHTLY GRITTY TO VERY SLIGHTLY GRANULAR TEXTURE; POOR GRADE SHALE VISIBILE BEDDING AND INTERBEDDING WITH POOR GRADE SILTSTONE, VERY THIN COAL LAMINAE VISIBLE IN SMALL CARBONACEOUS SHALE CUTTING, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.

SANDSTONE = VERY LIGHT BROWNISH GRAY TO LIGHT TANISH-BROWN GRAY TO VERY LIGHT GRAY WITH MODERATE BROWN AND BLACK HUES; QUARTZ DOMINATE FRAME WORK; PREDOMINATELY GRAIN SUPPORTED WITH VERY FEW LOOSE GRAINS; CONSISTS OF CALCITIC CEMENTATION WITH MODERATELY HIGH REACTION TO DILUTE HCL; MATRIX CONTAINS 5 TO 11% DARK LITHIC FRAGMENTS; MEDIUM-FINE TO MEDIUM-COARSE GRAINED; FAIR TO VERY POOR SORTING; SUB-ANGULAR TO ANGULAR TO SUB-ROUND ANGULARITY; LOW TO MODERATE SPHERICITY; BEDDING CONTACT VISIBLE BETWEEN POOR GRADE SANDSTONE AND CARBONACEOUS SHALE, POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE, NO OTHER DISTINGUISHABLE SURFACE FEATURES PRESENT; ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.

CARBONACEOUS SHALE = LIGHT OLIVE GRAY TO MEDIUM GRAY TO BROWNISH GRAY; CRUNCHY TO CRUMBLY TO SLIGHTLY BRITTLE TENACITY; IRREGULAR TO SLIGHT HACKLY FRACTURING; CUTTINGS TEND TO BE PLATY TO SLIGHTLY ELONGATED WEDGE-LIKE TO SEMI TABULAR IN HABIT; DULL EARTHY TO SEMI SPARKLING TO SLIGHT GREASY LUSTER; GRITTY TO SILTY TEXTURE; THINLY BEDDED CARBONACEOUS MATERIAL.

SILTSTONE = VERY LIGHT GRAY TO LIGHT GRAY TO MEDIUM GRAY; CRUNCHY TO STIFF TO SEMI CRUMBLY TENACITY; PREDOMINATELY PLANAR TO SLIGHT HACKLY TO OCCASIONAL BLOCKY FRACTURING; CUTTINGS TEND TO BE TABULAR TO SEMI WEDGE LIKE IN HABIT; SEMI FROSTED TO SLIGHT GREASY TO WAXY LUSTER; GRITTY TO SILTY TEXTURE; NO OTHER VISIBLE BEDDING FEATURES.

SANDSTONE = LIGHT GREENISH GRAY TO WHITE TO VERY LIGHT GRAY TO TRANSLUCENT; MOSTLY QUARTZ FRAMEWORK WITH 3-5 % DARK LITHICS VISIBLE IN SAMPLE; VISIBLE CHLORITE CRYSTALS IN SAMPLE; VERY COARSE TO COARSE TO MEDIUM GRAIN SIZE; FAIR TO WELL SORTED; SUBROUND TO ROUND GRAINS; LOW TO MODERATE SPHERICITY; VISIBLE PITS IN SURFACE OF GRAINS; FIRM FRIABLE TO FRIABLE TO MODERATE HARD; CALCITE CEMENTATION DUE TO HIGH REACTION IN DILUTE HCl; GRAIN SUPPORTED; NO VISIBLE HYDROCARBONS IN SAMPLE; 2-3% VISIBLE CALCITE FRACTURE-FILL.

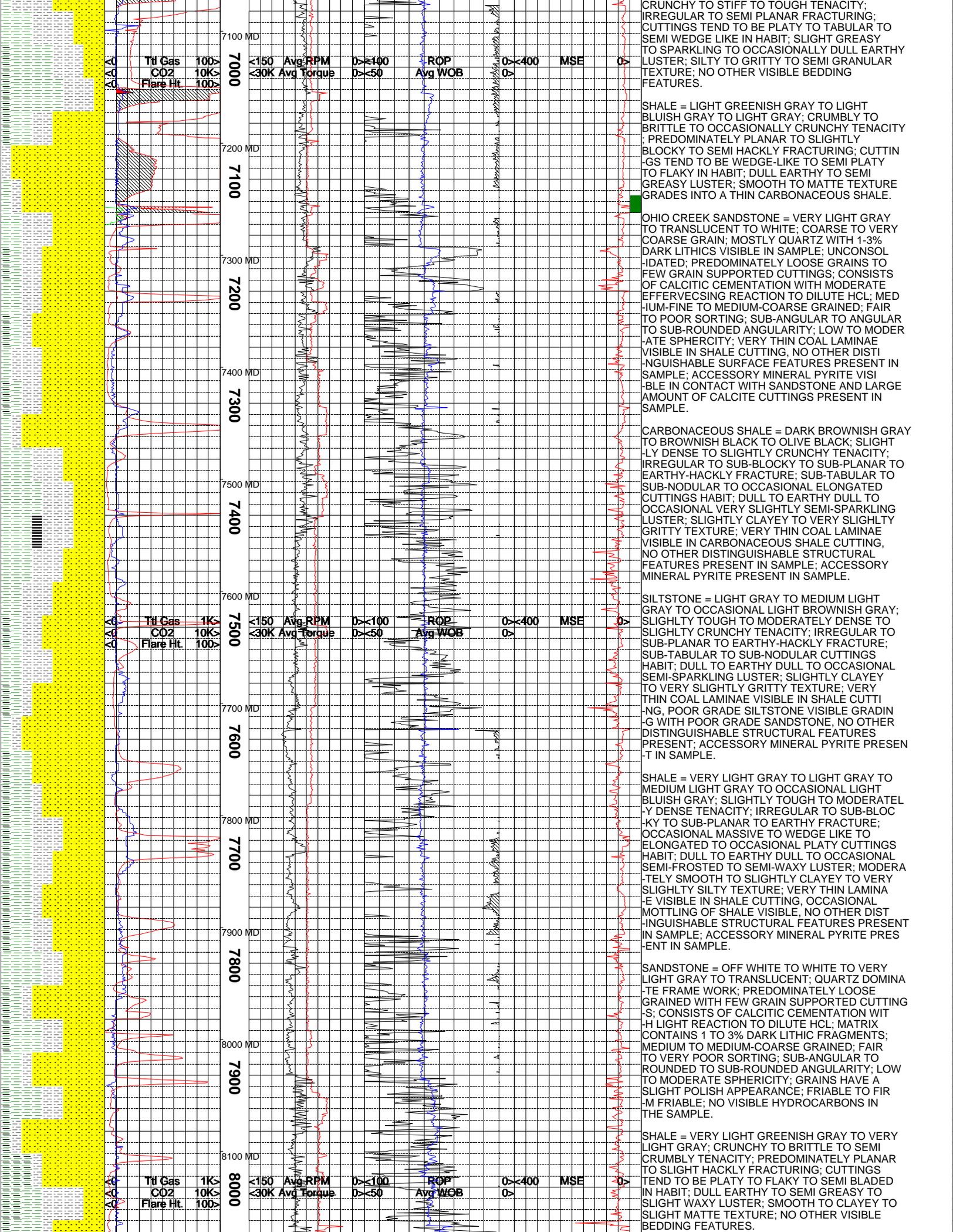
SHALE = VERY LIGHT GRAY TO LIGHT BROWNISH GRAY TO PREDOMINATELY YELLOWISH GRAY; BRITTLE TO CRUMBLY TENACITY; MOSTLY PLANAR TO SLIGHT HACKLY FRACTURING; CUTTINGS TEND TO BE PLATY TO ELONGATED TABULAR TO SEMI BLADED IN HABIT; DULL EARTHY TO SEMI GREASY TO SLIGHT WAXY LUSTER; SMOOTH TO SEMI CLAYEY TO MATTE TEXTURE; NO OTHER VISIBLE BEDDING FEATURES.

SILTSTONE = VERY LIGHT GRAY TO MEDIUM GRAY; CRUNCHY TO STIFF TO SEMI CRUMBLY TENACITY; PREDOMINATELY HACKLY TO PLANAR TO OCCASIONALLY BLOCKY FRACTURING; CUTTINGS TEND TO BE WEDGE LIKE TO SEMI TABULAR IN HABIT; DULL EARTHY TO SEMI GREASY LUSTER; GRITTY TO SILTY TEXTURE; GRADES INTO MEDIUM GRAIN SANDSTONE.

SANDSTONE = TRANSLUCENT TO VERY LIGHT GRAY TO LIGHT BROWNISH GRAY; PREDOMINATELY QUARTZ FRAMEWORK WITH 2-3% DARK LITHICS VISIBLE IN SAMPLE; FINE TO MEDIUM TO COARSE GRAIN SIZE; GRAIN SUPPORTED; LOW TO MODERATE SPHERICITY; GRAINS HAVE A SLIGHT POLISH APPEARANCE; SUB-ANGULAR TO SUB-ROUND; WELL TO VERY WELL SORTED; CALCITE CEMENTATION DUE TO MODERATE REACTION IN DILUTE HCl; NO VISIBLE HYDROCARBONS IN SAMPLE.

LIMESTONE = REACTS STRONGLY TO DILUTE HCl; STIFF TO TOUGH TENACITY; PLANAR TO SEMI HACKLY TO BLOCKY FRACTURING; CUTTINGS TEND TO BE WEDGE-LIKE TO TABULAR TO SLIGHT NODULAR IN HABIT; WAXY TO DULL EARTHY TO SEMI GREASY LUSTER; CRYSTALLINE TO MATTE TO SMOOTH TEXTURE; NO OTHER VISIBLE BEDDING FEATURES.

SILTSTONE = VERY LIGHT GRAY TO LIGHT GREENISH GRAY TO LIGHT BLuish GRAY;



7100 MD
7000

AAG Td Gas 100K
CO2 10K
Flare Ht 100

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

CRUNCHY TO STIFF TO TOUGH TENACITY;
IRREGULAR TO SEMI PLANAR FRACTURING;
CUTTINGS TEND TO BE PLATY TO TABULAR TO
SEMI WEDGE LIKE IN HABIT; SLIGHT GREASY
TO SPARKLING TO OCCASIONALLY DULL EARTHY
LUSTER; SILTY TO GRITTY TO SEMI GRANULAR
TEXTURE; NO OTHER VISIBLE BEDDING
FEATURES.

7200 MD
7100

SHALE = LIGHT GREENISH GRAY TO LIGHT
BLUISH GRAY TO LIGHT GRAY; CRUMBLY TO
BRITTLE TO OCCASIONALLY CRUNCHY TENACITY
; PREDOMINATELY PLANAR TO SLIGHTLY
BLOCKY TO SEMI HACKLY FRACTURING; CUTTIN
-GS TEND TO BE WEDGE-LIKE TO SEMI PLATY
TO FLAKY IN HABIT; DULL EARTHY TO SEMI
GREASY LUSTER; SMOOTH TO MATTE TEXTURE
GRADES INTO A THIN CARBONACEOUS SHALE.

7300 MD
7200

OHIO CREEK SANDSTONE = VERY LIGHT GRAY
TO TRANSLUCENT TO WHITE; COARSE TO VERY
COARSE GRAIN; MOSTLY QUARTZ WITH 1-3%
DARK LITHICS VISIBLE IN SAMPLE; UNCONSOL
-IDATED; PREDOMINATELY LOOSE GRAINS TO
FEW GRAIN SUPPORTED CUTTINGS; CONSISTS
OF CALCITIC CEMENTATION WITH MODERATE
EFFERVECSING REACTION TO DILUTE HCL; MED
-IUM-FINE TO MEDIUM-COARSE GRAINED; FAIR
TO POOR SORTING; SUB-ANGULAR TO ANGULAR
TO SUB-ROUNDED ANGULARITY; LOW TO MODER
-ATE SPHERICITY; VERY THIN COAL LAMINAE
VISIBLE IN SHALE CUTTING, NO OTHER DISTI
-NGUISHABLE SURFACE FEATURES PRESENT IN
SAMPLE; ACCESSORY MINERAL PYRITE VISI
-BLE IN CONTACT WITH SANDSTONE AND LARGE
AMOUNT OF CALCITE CUTTINGS PRESENT IN
SAMPLE.

7400 MD
7300

CARBONACEOUS SHALE = DARK BROWNISH GRAY
TO BROWNISH BLACK TO OLIVE BLACK; SLIGHT
-LY DENSE TO SLIGHTLY CRUNCHY TENACITY;
IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR TO
EARTHY-HACKLY FRACTURE; SUB-TABULAR TO
SUB-NODULAR TO OCCASIONAL ELONGATED
CUTTINGS HABIT; DULL TO EARTHY DULL TO
OCCASIONAL VERY SLIGHTLY SEMI-SPARKLING
LUSTER; SLIGHTLY CLAYEY TO VERY SLIGHTLY
GRITTY TEXTURE; VERY THIN COAL LAMINAE
VISIBLE IN CARBONACEOUS SHALE CUTTING,
NO OTHER DISTINGUISHABLE STRUCTURAL
FEATURES PRESENT IN SAMPLE; ACCESSORY
MINERAL PYRITE PRESENT IN SAMPLE.

7500 MD
7400

AAG Td Gas 1K
CO2 10K
Flare Ht 100

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

SILTSTONE = LIGHT GRAY TO MEDIUM LIGHT
GRAY TO OCCASIONAL LIGHT BROWNISH GRAY;
SLIGHTLY TOUGH TO MODERATELY DENSE TO
SLIGHTLY 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; SLIGHTLY CLAYEY
TO VERY SLIGHTLY GRITTY TEXTURE; VERY
THIN COAL LAMINAE VISIBLE IN SHALE CUTTI
-NG, POOR GRADE SILTSTONE VISIBLE GRADIN
-G WITH POOR GRADE SANDSTONE, NO OTHER
DISTINGUISHABLE STRUCTURAL FEATURES
PRESENT; ACCESSORY MINERAL PYRITE PRESEN
-T IN SAMPLE.

7600 MD
7500

SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO
MEDIUM LIGHT GRAY TO OCCASIONAL LIGHT
BLUISH GRAY; SLIGHTLY TOUGH TO MODERATE
-LY DENSE TENACITY; IRREGULAR TO SUB-BLOC
-KY TO SUB-PLANAR TO EARTHY FRACTURE;
OCCASIONAL MASSIVE TO WEDGE LIKE TO
ELONGATED TO OCCASIONAL PLATY CUTTINGS
HABIT; DULL TO EARTHY DULL TO OCCASIONAL
SEMI-FROSTED TO SEMI-WAXY LUSTER; MODERA
-TELY SMOOTH TO SLIGHTLY CLAYEY TO VERY
SLIGHTLY SILTY TEXTURE; VERY THIN LAMINA
-E VISIBLE IN SHALE CUTTING, OCCASIONAL
MOTTLING OF SHALE VISIBLE, NO OTHER DIST
-INGUISHABLE STRUCTURAL FEATURES PRESENT
IN SAMPLE; ACCESSORY MINERAL PYRITE PRES
-ENT IN SAMPLE.

7700 MD
7600

SANDSTONE = OFF WHITE TO WHITE TO VERY
LIGHT GRAY TO TRANSLUCENT; QUARTZ DOMINA
-TE FRAME WORK; PREDOMINATELY LOOSE
GRAINED WITH FEW GRAIN SUPPORTED CUTTING
-S; CONSISTS OF CALCITIC CEMENTATION WIT
-H LIGHT REACTION TO DILUTE HCL; MATRIX
CONTAINS 1 TO 3% DARK LITHIC FRAGMENTS;
MEDIUM TO MEDIUM-COARSE GRAINED; FAIR
TO VERY POOR SORTING; SUB-ANGULAR TO
ROUNDED TO SUB-ROUNDED ANGULARITY; LOW
TO MODERATE SPHERICITY; GRAINS HAVE A
SLIGHT POLISH APPEARANCE; FRIABLE TO FIR
-M FRIABLE; NO VISIBLE HYDROCARBONS IN
THE SAMPLE.

7800 MD
7700

SHALE = VERY LIGHT GREENISH GRAY TO VERY
LIGHT GRAY; CRUNCHY TO BRITTLE TO SEMI
CRUMBLY TENACITY; PREDOMINATELY PLANAR
TO SLIGHT HACKLY FRACTURING; CUTTINGS
TEND TO BE PLATY TO FLAKY TO SEMI BLADED
IN HABIT; DULL EARTHY TO SEMI GREASY TO
SLIGHT WAXY LUSTER; SMOOTH TO CLAYEY TO
SLIGHT MATTE TEXTURE; NO OTHER VISIBLE
BEDDING FEATURES.

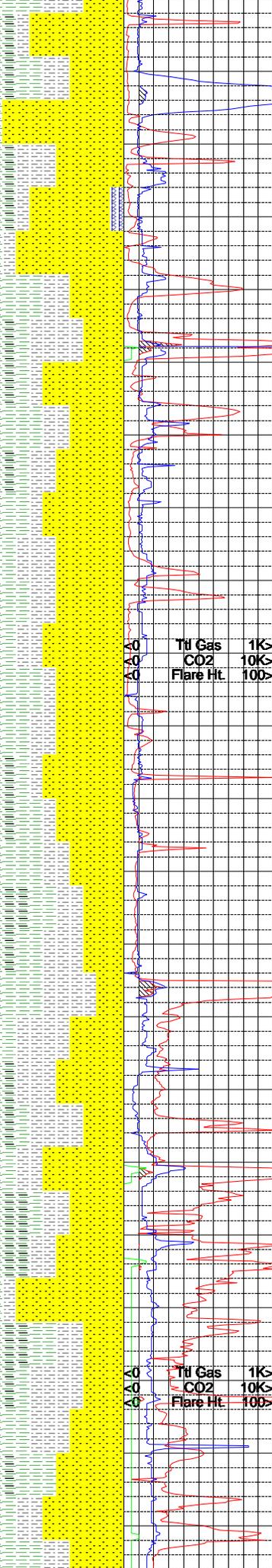
7900 MD
7800

8000 MD
7900

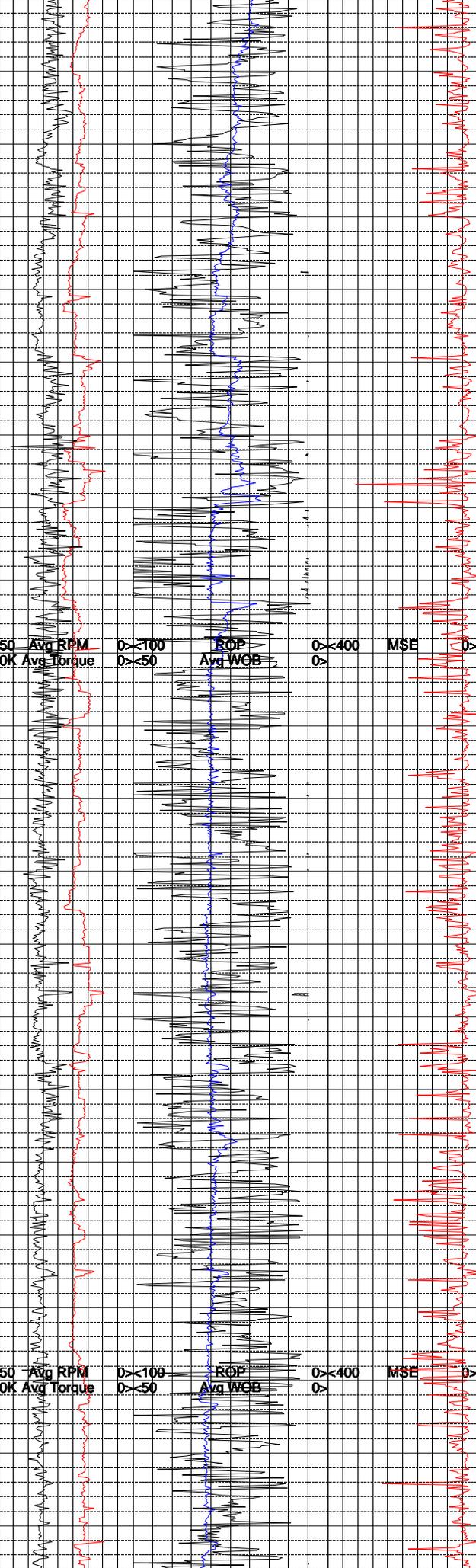
AAG Td Gas 1K
CO2 10K
Flare Ht 100

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

8100 MD
8000



8200 MD
8100
8300 MD
8200
8400 MD
8300
8500 MD
8400
8600 MD
8500
8700 MD
8600
8800 MD
8700
8900 MD
8800
9000 MD
8900
9100 MD
9000
9200 MD
9100



CARBONACEOUS SHALE = GRAYISH BLACK TO MEDIUM DARK GRAY TO LIGHT OLIVE GRAY TO MEDIUM BLUISH GRAY; CRUNCHY TO CRUMBLY TO BRITTLE TENACITY; HACKLY TO SEMI BLOCKY TO PREDOMINATELY PLANAR TO SPLINTERY FRACTURING; CUTTINGS TEND TO BE PLATY TO THINLY TABULAR TO SEMI WEDGE LIKE IN HABIT; DULL EARTHY TO SEMI GREASY TO OCCASIONALLY SPARKLING TO SLIGHT FROSTED LUSTER; PREDOMINATELY GRANULAR TO GRITTY TO OCCASIONALLY SMOOTH TO CLAYEY TEXTURE; VISIBLE DEGASSING ALONG CARBONACEOUS LAMINAE; VISIBLE BANDS OF CARBONACEOUS MATERIAL.

SANDSTONE = WHITE TO TRANSLUCENT TO VERY LIGHT GRAY TO LIGHT BROWNISH GRAY; MOSTLY QUARTZ FRAMEWORK WITH 3-4% DARK LITHICS VISIBLE IN SAMPLE; UNCONSOLIDATED GRAINS DUE TO BIT ACTION; FIRM FRIABLE TO MODERATE HARD TO PREDOMINATELY FRIABLE; SUB-ROUND TO WELL ROUNDED GRAINS; LOW TO MODERATE SPHERICITY; GRAINS HAVE A SLIGHT POLISH APPEARANCE; FAIR TO POORLY SORTED; VERY COARSE TO COARSE TO MEDIUM TO GRANULAR GRAIN SIZE; CALCITE CEMENTATION DUE TO MODERATE REACTION IN DILUTE HCl; NO VISIBLE HYDROCARBONS IN SAMPLE; GRAIN SUPPORTED; GRADES INTO A SILTY CARBONACEOUS SHALE.

SILTSTONE = LIGHT GRAY TO MEDIUM LIGHT GRAY TO MEDIUM GRAY TO LIGHT BROWNISH GRAY TO OCCASIONAL BROWNISH GRAY; SLIGHTLY TOUGH TO MODERATELY DENSE TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; OCCASIONAL MASSIVE TO ELONGATED TO SUB-TABULAR TO SUB-NODULAR CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SLIGHTLY SEMI-SPARKLING LUSTER; SLIGHTLY CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING AND BEDDING WITH POOR GRADE SANDSTONE. VERY SMALL AMOUNT OF COAL VISIBLE EFFERVESCING IN SAMPLE, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; ACCESSORY MINERAL PYRITE AND SEVERAL MEDIUM SIZED RHOMBIC CALCITE CRYSTALS PRESENT IN SAMPLE.

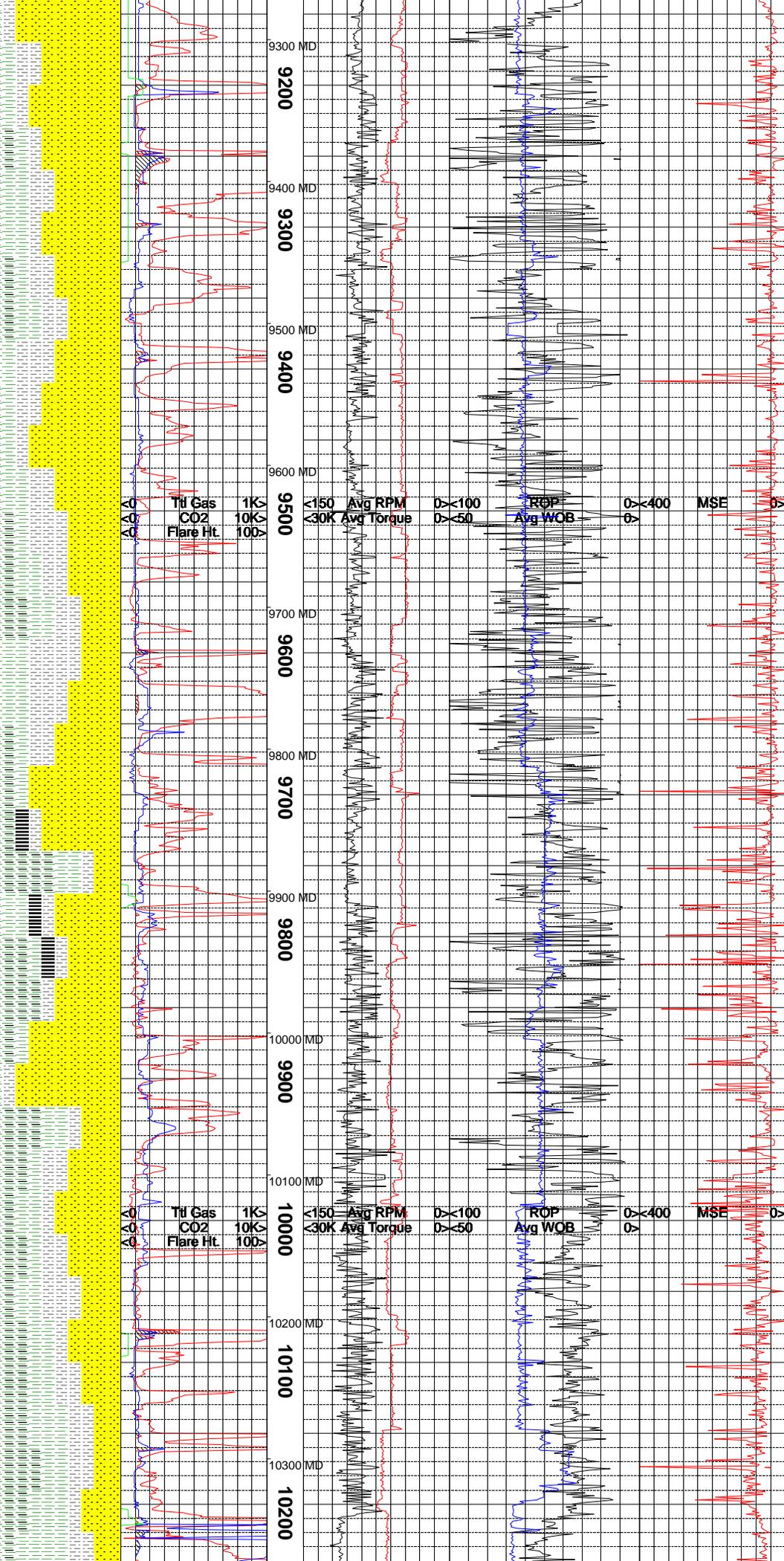
SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO MEDIUM LIGHT GRAY TO OCCASIONAL MEDIUM GRAY AND LIGHT BLUISH GRAY; MODERATELY DENSE TO SLIGHTLY CRUMBLY TO CRUNCHY TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY FRACTURE; MASSIVE TO WEDGE LIKE TO ELONGATED TO OCCASIONAL PLATY CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-FROSTED TO SEMI-WAXY LUSTER; MODERATELY SMOOTH TO SLIGHTLY SILTY TEXTURE; VERY THIN COAL LAMINAE VISIBLE IN SHALE CUTTING. VERY SMALL AMOUNT OF CARBONACEOUS SHALE VISIBLE EFFERVESCING, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.

CARBONACEOUS SHALE = DARK BROWNISH GRAY TO BROWNISH BLACK TO OLIVE BLACK; MODERATELY DENSE TO SLIGHTLY CRUNCHY TENACITY; IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR TO OCCASIONAL SEMI-PLATY CUTTINGS HABIT; DULL TO EARTHY DULL TO SEMI-SPARKLING TO SEMI-GREASY LUSTER; VISIBLE CARBONACEOUS BANDS THROUGHOUT SAMPLE.

SANDSTONE = VERY LIGHT GRAY TO LIGHT BROWNISH GRAY TO VERY LIGHT OLIVE GRAY; MOSTLY QUARTZ FRAMEWORK WITH 4-5% DARK LITHICS VISIBLE IN SAMPLE; COARSE TO MEDIUM TO OCCASIONALLY FINE GRAIN SIZE; POOR TO FAIR SORTED; SUBROUND TO SUB-ANGULAR TO ANGULAR GRAINS; MODERATE TO HIGH SPHERICITY; GRAINS HAVE A SLIGHT FROSTED TO SEMI PITTED APPEARANCE; FIRM FRIABLE TO MODERATE HARD; UNCONSOLIDATED GRAINS DUE TO BIT ACTION; GRAIN SUPPORTED; NO VISIBLE HYDROCARBONS IN SAMPLE;

SILTSTONE = LIGHT GREENISH GRAY TO LIGHT BLUISH GRAY TO OCCASIONALLY LIGHT BROWNISH GRAY; STIFF TO CRUNCHY TENACITY; BLOCKY TO PREDOMINATELY HACKLY TO SEMI PLANAR FRACTURING; CUTTINGS TEND TO BE PLATY TO FLAKY TO SEMI ELONGATED TABULAR IN HABIT; DULL EARTHY TO SLIGHT GREASY TO SEMI FROSTED LUSTER; GRITTY TO SILTY TO SEMI CLAYEY TEXTURE; NO OTHER VISIBLE BEDDING FEATURES.

SHALE = VERY LIGHT GRAY TO VERY LIGHT BROWNISH GRAY TO BLUISH GRAY; CRUMBLY TO BRITTLE TENACITY; PREDOMINATELY PLANAR TO HACKLY TO SLIGHTLY IRREGULAR CUTTINGS HABIT; DULL EARTHY TO SEMI WAXY TO SLIGHT GREASY LUSTER; MATTE TO SLIGHT SILTY TO SMOOTH TO CLAYEY TEXTURE; NO



OTHER VISIBLE ACCESSORY MINERALS IN SAMPLE.

SANDSTONE = WHITE TO TRANSLUCENT TO VERY LIGHT GRAY; MOSTLY QUARTZ FRAMEWORK WITH 4-5% DARK LITHICS VISIBLE IN SAMPLE; PREDOMINATELY GRAIN SUPPORTED WITH FAIR AMOUNT OF LOOSE GRAINS PRESENT; MEDIUM-FINE TO MEDIUM-COARSE GRAINED; FAIR TO MODERATELY WELL SORTING; SUB-ANGULAR TO ANGULAR TO SUB-ROUNDED ANGULARITY; LOW TO MODERATE SPHERICITY; POOR GRADE SILTSTONE VISIBLE GRADING AND BEDDING WITH POOR GRADE SANDSTONE, VERY SMALL AMOUNT OF CARBONACEOUS SHALE VISIBLE EFFERVESCING IN SAMPLE, NO OTHER BEDDING OR OTHER DISTINGUISHABLE SURFACE FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

CARBONACEOUS SHALE = DARK BROWNISH GRAY TO BROWNISH BLACK TO OCCASIONAL OLIVE BLACK; SLIGHTLY TOUGH TO MODERATELY DENSE TENACITY; IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULAR TO OCCASIONAL SUB-NODULAR TO OCCASIONAL ELONGATED CUTTINGS HABIT; DULL TO EARTHY DULL TO SEMI-GREASY TO OCCASIONAL SEMI-SPARKLING LUSTER; SUB-CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE; VERY THIN COAL LAMINAE VISIBLE IN SHALE CUTTING, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; ACCESSORY MINERAL PYRITE PRESENT IN CONTACT WITH CARBONACEOUS SHALE CUTTING, PRESENT IN SAMPLE.

SILTSTONE = LIGHT GRAY TO MEDIUM LIGHT GRAY TO OCCASIONAL MEDIUM GRAY; SLIGHTLY DENSE TO SLIGHTLY TOUGH 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 SEMI-SPARKLING LUSTER; SLIGHTLY GRITTY TO VERY SLIGHTLY GRANULAR TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

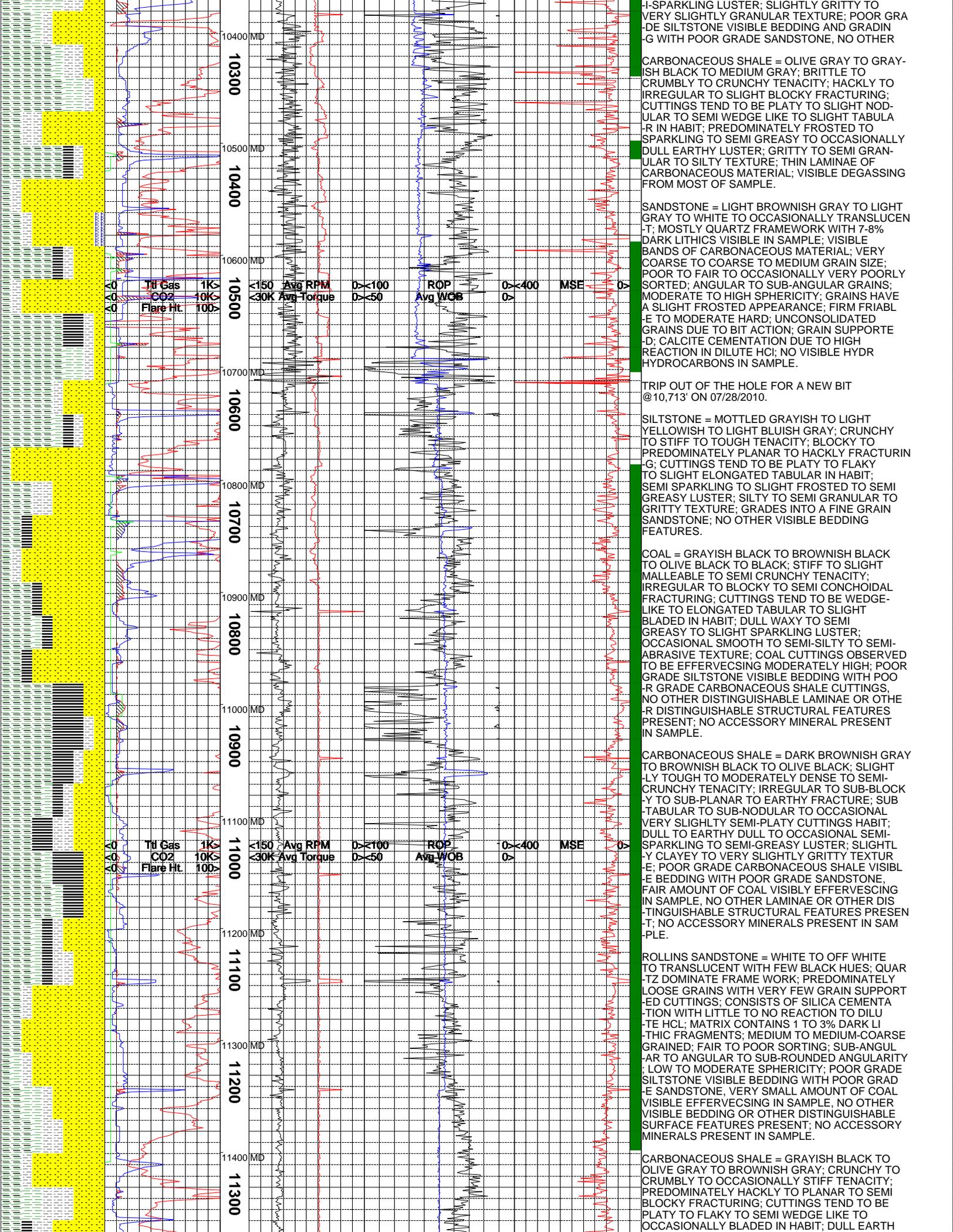
SHALE = VERY LIGHT GREENISH GRAY TO VERY LIGHT BLUISH GRAY TO OLIVE GRAY; IRREGULAR TO PREDOMINATELY PLANAR TO SEMI-HACKLY FRACTURING; CRUMBLY TO CRUNCHY TO BRITTLE TENACITY; CUTTINGS TEND TO BE PLATY TO FLAKY TO SEMI ELONGATED TABULAR IN HABIT; DULL EARTHY TO SEMI GREASY TO SLIGHT WAXY LUSTER; SMOOTH TO CLAYEY TO SEMI MATTE TEXTURE; NO OTHER VISIBLE BEDDING FEATURES; A FEW NACHOLITE CRYSTALS VISIBLE DUE TO CAVINGS.

COAL = BLACK TO MEDIUM GRAYISH BLACK TO OLIVE BLACK TO PREDOMINATELY BROWNISH GRAY TO BROWNISH BLACK; CRUNCHY TO CRUMBLY TO BRITTLE TENACITY; IRREGULAR TO BLOCKY TO PREDOMINATELY CONCHOIDAL FRACTURING; CUTTINGS TEND TO BE NODULAR TO WEDGE LIKE TO SEMI BLADED IN HABIT; DULL TO FROSTED TO SPARKLING TO SEMI GREASY TO WAXY LUSTER; SMOOTH TO MATTE TO SLIGHT GRITTY TO CLAYEY TEXTURE; VISIBLE DEGASSING THROUGH OUT THE SAMPLE; VISIBLE PYRITE BANDS.

CARBONACEOUS SHALE = OLIVE GRAY TO LIGHT BROWNISH GRAY TO BROWNISH GRAY; BRITTLE TO CRUMBLY TO CRUNCHY TENACITY; HACKLY TO PLANAR FRACTURING; CUTTINGS TEND TO BE WEDGE LIKE TO SEMI TABULAR IN HABIT; DULL TO FROSTED TO SEMI SPARKLING LUSTER; GRITTY TO SILTY TEXTURE; VISIBLE BEDS OF CARBONACEOUS MATERIAL IN SAMPLE.

SANDSTONE = LIGHT GRAY TO LIGHT BROWNISH GRAY TO OCCASIONAL BROWNISH GRAY WITH BLACK AND MODERATE BROWN HUES; QUARTZ DOMINATE FRAME WORK; PREDOMINATELY GRAIN SUPPORTED WITH FEW LOOSE GRAINS; CONSISTS OF CALCITIC CEMENTATION WITH MODERATELY HIGH REACTION TO DILUTE HCL; MATRIX CONTAINS 8 TO 11% 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, NO OTHER DISTINGUISHABLE SURFACE FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SILTSTONE = VERY LIGHT GRAY TO LIGHT GRAY TO OCCASIONAL MEDIUM LIGHT GRAY TO YELLOWISH GRAY TO VERY LIGHT BROWNISH GRAY; MODERATELY TOUGH TO MODERATELY DENSE TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR TO OCCASIONAL MASSIVE CUTTINGS HABIT; DULL TO EARTHY DULL TO SEMI



H₂ Gas 1K
 CO₂ 10K
 Flare Ht. 100
 Avg RPM <150
 Avg Torque <30K
 ROP >100
 Avg WOB >50
 MSE >400

H₂ Gas 1K
 CO₂ 10K
 Flare Ht. 100
 Avg RPM <150
 Avg Torque <30K
 ROP >100
 Avg WOB >50
 MSE >400

I-SPARKLING LUSTER; SLIGHTLY GRITTY TO VERY SLIGHTLY GRANULAR TEXTURE; POOR GRADE SILTSTONE VISIBLE BEDDING AND GRADIN-G WITH POOR GRADE SANDSTONE, NO OTHER

CARBONACEOUS SHALE = OLIVE GRAY TO GRAY-ISH BLACK TO MEDIUM GRAY; BRITTLE TO CRUMBLY TO CRUNCHY TENACITY; HACKLY TO IRREGULAR TO SLIGHT BLOCKY FRACTURING; CUTTINGS TEND TO BE PLATY TO SLIGHT NODULAR TO SEMI WEDGE LIKE TO SLIGHT TABULAR IN HABIT; PREDOMINATELY FROSTED TO SPARKLING TO SEMI GREASY TO OCCASIONALLY DULL EARTHY LUSTER; GRITTY TO SEMI GRANULAR TO SILTY TEXTURE; THIN LAMINAE OF CARBONACEOUS MATERIAL; VISIBLE DEGASSING FROM MOST OF SAMPLE.

SANDSTONE = LIGHT BROWNISH GRAY TO GRAY TO WHITE TO OCCASIONALLY TRANSLUCENT; MOSTLY QUARTZ FRAMEWORK WITH 7-8% DARK LITHICS VISIBLE IN SAMPLE; VISIBLE BANDS OF CARBONACEOUS MATERIAL; VERY COARSE TO COARSE TO MEDIUM GRAIN SIZE; POOR TO FAIR TO OCCASIONALLY VERY POORLY SORTED; ANGULAR TO SUB-ANGULAR GRAINS; MODERATE TO HIGH SPHERICITY; GRAINS HAVE A SLIGHT FROSTED APPEARANCE; FIRM FRIABLE TO MODERATE HARD; UNCONSOLIDATED GRAINS DUE TO BIT ACTION; GRAIN SUPPORTED; CALCITE CEMENTATION DUE TO HIGH REACTION IN DILUTE HCl; NO VISIBLE HYDROCARBONS IN SAMPLE.

TRIP OUT OF THE HOLE FOR A NEW BIT @10,713' ON 07/28/2010.

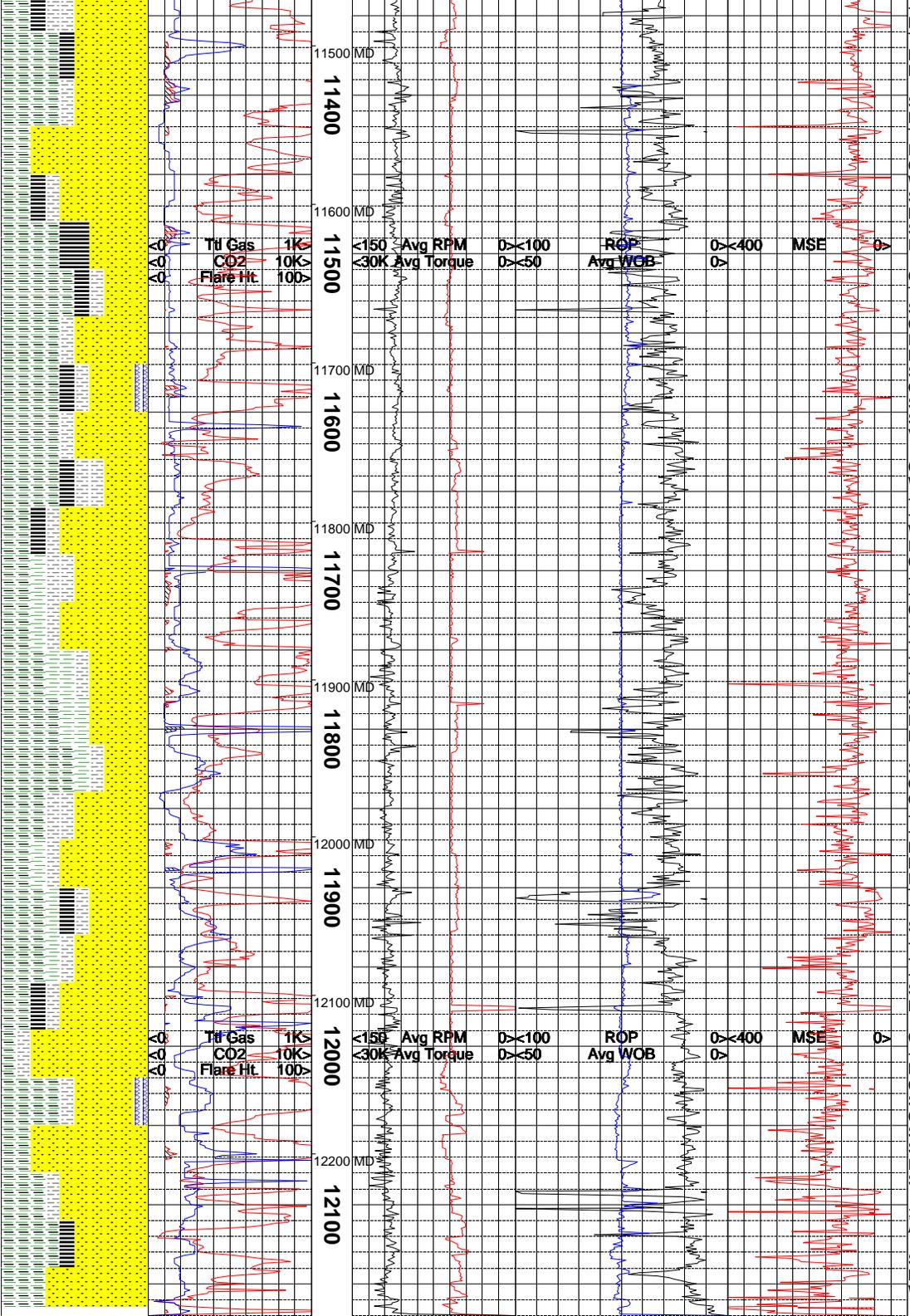
SILTSTONE = MOTTLED GRAYISH TO LIGHT YELLOWISH TO LIGHT BLuish GRAY; CRUNCHY TO STIFF TO TOUGH TENACITY; BLOCKY TO PREDOMINATELY PLANAR TO HACKLY FRACTURING; CUTTINGS TEND TO BE PLATY TO FLAKY TO SLIGHT ELONGATED TABULAR IN HABIT; SEMI SPARKLING TO SLIGHT FROSTED TO SEMI GREASY LUSTER; SILTY TO SEMI GRANULAR TO GRITTY TEXTURE; GRADES INTO A FINE GRAIN SANDSTONE; NO OTHER VISIBLE BEDDING FEATURES.

COAL = GRAYISH BLACK TO BROWNISH BLACK TO OLIVE BLACK TO BLACK; STIFF TO SLIGHT MALLEABLE TO SEMI CRUNCHY TENACITY; IRREGULAR TO BLOCKY TO SEMI CONCHOIDAL FRACTURING; CUTTINGS TEND TO BE WEDGE-LIKE TO ELONGATED TABULAR TO SLIGHT BLADED IN HABIT; DULL WAXY TO SEMI GREASY TO SLIGHT SPARKLING LUSTER; OCCASIONAL SMOOTH TO SEMI-SILTY TO SEMI-ABRASIVE TEXTURE; COAL CUTTINGS OBSERVED TO BE EFFERVESCENT MODERATELY HIGH; POOR GRADE SILTSTONE VISIBLE BEDDING WITH POOR GRADE CARBONACEOUS SHALE CUTTINGS, NO OTHER DISTINGUISHABLE LAMINAE OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; NO ACCESSORY MINERAL PRESENT IN SAMPLE.

CARBONACEOUS SHALE = DARK BROWNISH GRAY TO BROWNISH BLACK TO OLIVE BLACK; SLIGHTLY TOUGH TO MODERATELY DENSE TO SEMI-CRUNCHY TENACITY; IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR TO EARTHY FRACTURE; SUB-TABULAR TO SUB-NODULAR TO OCCASIONAL VERY SLIGHTLY SEMI-PLATY CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKLING TO SEMI-GREASY LUSTER; SLIGHTLY CLAYEY TO SEMI SLIGHTLY GRITTY TEXTURE; POOR GRADE CARBONACEOUS SHALE VISIBLE BEDDING WITH POOR GRADE SANDSTONE, FAIR AMOUNT OF COAL VISIBLE EFFERVESCENT IN SAMPLE, NO OTHER LAMINAE OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

ROLLINS SANDSTONE = WHITE TO OFF WHITE TO TRANSLUCENT WITH FEW BLACK HUES; QUARTZ DOMINATE FRAMEWORK; PREDOMINATELY LOOSE GRAINS WITH VERY FEW GRAIN SUPPORTED CUTTINGS; CONSISTS OF SILICA CEMENTATION WITH LITTLE TO NO REACTION TO DILUTE HCl; MATRIX CONTAINS 1 TO 3% DARK LITHIC FRAGMENTS; MEDIUM TO MEDIUM-COARSE GRAINED; FAIR TO POOR SORTING; SUB-ANGULAR TO ANGULAR TO SUB-ROUNDED ANGULARITY; LOW TO MODERATE SPHERICITY; POOR GRADE SILTSTONE VISIBLE BEDDING WITH POOR GRADE SANDSTONE, VERY SMALL AMOUNT OF COAL VISIBLE EFFERVESCENT IN SAMPLE, NO OTHER VISIBLE BEDDING OR OTHER DISTINGUISHABLE SURFACE FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

CARBONACEOUS SHALE = GRAYISH BLACK TO OLIVE GRAY TO BROWNISH GRAY; CRUNCHY TO CRUMBLY TO OCCASIONALLY STIFF TENACITY; PREDOMINATELY HACKLY TO PLANAR TO SEMI BLOCKY FRACTURING; CUTTINGS TEND TO BE PLATY TO FLAKY TO SEMI WEDGE LIKE TO OCCASIONALLY BLADED IN HABIT; DULL EARTH



Y TO SEMI SPARKLING TO SLIGHT GREASY LUSTER; GRITTY TO SEMI GRANULAR TO SILTY TEXTURE; VISIBLE BANDS OF CARBONACEOUS MATERIAL; VISIBLE DEGASSING ALONG THE BANDS.

SILTSTONE = VERY LIGHT BROWNISH GRAY TO LIGHT YELLOWISH GRAY; CRUNCHY TO STIFF TO TOUGH TENACITY; IRREGULAR TO SLIGHT PLANAR TO SEMI HACKLY FRACTURING; CUTTINGS TEND TO BE ELONGATED TABULAR TO WEDGE LIKE TO SEMI BLADED IN HABIT; SEMI SPARKLING TO SLIGHT FROSTED TO GREASY LUSTER; GRITTY TO SLIGHTLY GRANULAR TO SILTY TEXTURE; NO OTHER VISIBLE BEDDING FEATURES.

COAL = GRAYISH BLACK TO BROWNISH BLACK TO BLACK; STIFF TO SLIGHTLY MALLEABLE TO SEMI CRUNCHY TENACITY; PREDOMINATELY CONCHOIDAL TO BLOCKY TO SLIGHT SPLINTERY FRACTURING; CUTTINGS TEND TO BE WEDGE-LIKE TO TABULAR TO SEMI BLADED IN HABIT; SPARKLING TO WAXY TO SLIGHTLY DULL TO OCCASIONALLY SLIGHTLY METALLIC LUSTER; SMOOTH TO SLIGHT CLAYEY TO OCCASIONALLY SILTY TEXTURE; VISIBLE PYRITE IN SAMPLE; VISIBLE DEGASSING ALONG MOST OF SAMPLE.

CORCORAN COASTAL PLAIN SANDSTONE = OFF WHITE TO WHITE TO VERY LIGHT GRAY TO LIGHT BROWNISH GRAY WITH BLACK AND MODERATE BROWN HUES; QUARTZ DOMINATE FRAMEWORK; PREDOMINATELY GRAIN SUPPORTED WITH FEW LOOSE GRAINS; CONSISTS OF CALCITIC CEMENTATION WITH MODERATELY HIGH REACTIVITY TO DILUTE HCL; MATRIX CONTAINS 2 TO 4% DARK LITHIC FRAGMENTS; MEDIUM-FINE TO COARSE GRAINED; FAIR TO VERY POORLY SORTED; SUB-ANGULAR TO ANGULAR TO SUB-ROUND ANGULARITY; LOW TO MODERATE SPHERICITY; POOR GRADE SILTSTONE VISIBLE GRADINGS WITH POOR GRADE SANDSTONE, VERY 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 OCCASIONAL VERY LIGHT PALE YELLOWISH ORANGE; SLIGHTLY DENSE TO SLIGHTLY BRITTLE TO SLIGHTLY CRUMBLY TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY FRACTURE; MODERATELY WEDGE LIKE TO SUB-PLATY TO MOSTLY SMALLER CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-FROSTED TO SEMI-WAXY LUSTER; MODERATELY SMOOTH TO MODERATELY CLAYEY TO VERY SLIGHTLY SILTY TEXTURE; POOR GRADE SILTSTONE VISIBLE BEDDING WITH POOR GRADE CARBONACEOUS SHALE, VERY SMALL AMOUNT OF COAL VISIBLE EFFERVESCING IN SAMPLE, NO OTHER SURFACE FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

CARBONACEOUS SHALE = OLIVE GRAY TO MEDIUM DARK GRAY TO BROWNISH GRAY; VISIBLE BANDS OF CARBONACEOUS MATERIAL; CRUNCHY TO CRUMBLY TENACITY; PLANAR TO SLIGHT HACKLY TO BLOCKY FRACTURING; CUTTINGS TEND TO BE PLATY TO FLAKY TO SEMI TABULAR IN HABIT; DULL EARTHY TO SEMI SPARKLING TO SLIGHT GREASY LUSTER; PREDOMINATELY GRITTY TO SEMI GRANULAR TO SILTY TO OCCASIONALLY SMOOTH TEXTURE; VISIBLE DEGASSING IN SOME OF THE SAMPLE; VISIBLE HYDROCARBONS UNDER FLUORESCES AT 12180' -12210'.

SANDSTONE = WHITE TO TRANSLUCENT TO VERY LIGHT BROWNISH GRAY; MOSTLY QUARTZ FRAMEWORK WITH 4-5% DARK LITHICS VISIBLE IN

