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

MUDLOG TVD

COMPANY ExxonMobil Corporation
WELL PCU 296-5A08
FIELD Piceance Creek
REGION Rockies
COORDINATES Lat: 39.911963000
Long: -108.198677000
ELEVATION G.L.:7294.1'
COUNTY, STATE Rio Blanco, CO
API INDEX 051031124200
SPUD DATE 11/29/2009
CONTRACTOR Helmerich_Payne
CO. REP. C. Curtis / M. Hudon
RIG/TYPE 321 / Flex 4
LOGGING UNIT MLU 31
GEOLOGISTS C. Record, M. Gross
B. Smelser
ADD. PERSONS M. Piper
CO. GEOLOGIST C. Alba

LOG INTERVAL

CASING DATA

DEPTHS: 4875' TO 13885'
DATES: 2/03/2011 TO 5/7/2011
SCALE: 1" = 100'

16.00" AT 115'
10.75" AT 4876'
7" AT 10004'
4.50" AT 13880'

MUD TYPES

HOLE SIZE

Spud Mud TO 4874'
LSND TO 13885'
TO
TO

14.75" TO 4891'
9.875" TO 10007'
6.125" TO 13885'
TO

ABBREVIATIONS

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

- 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, SAND, SANDSTONE, SANDSTONE-TUFFACEOUS, SERICITIZATION, SERPENTINE, SHALE, SHALE TUFFACEOUS, SHELL FRAGMENTS, SIDERITE, SILICIFICATION, SILTSTONE, SILTST-TUFFACEOUS, TUFF, VOLCANICLASTICS SEDS, VOLCANICS

<250	ROP	0
<50	Avg WOB	0

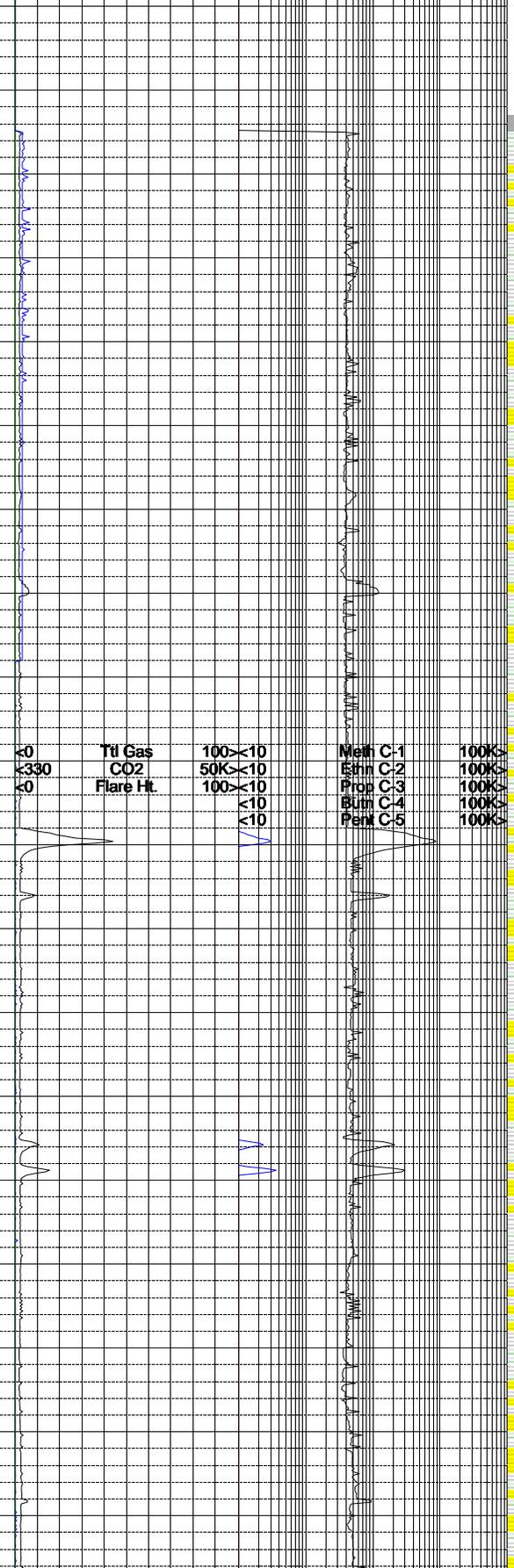
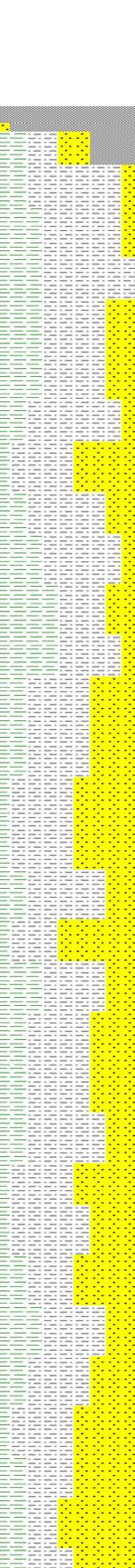
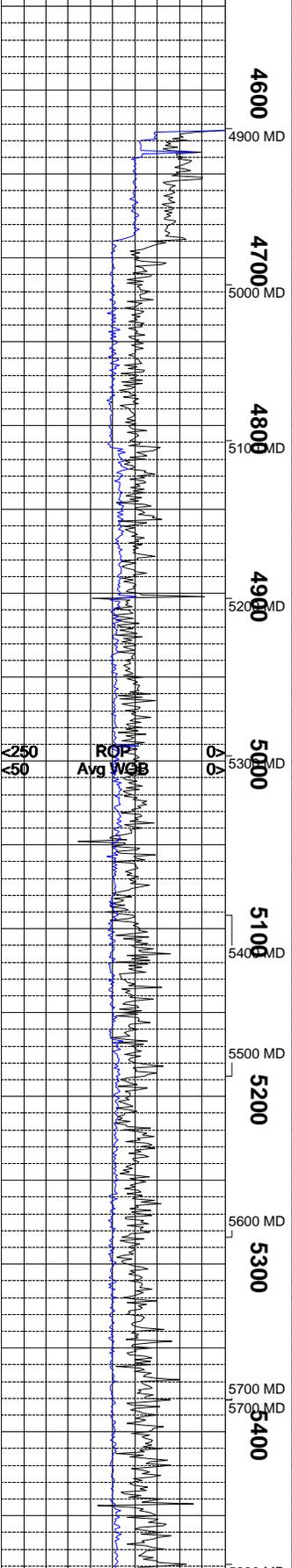
TVD Depth

Lithology

<0	Ttl Gas	100	<10	Meth C-1	100K
<0	CO2	50K	<10	Ethn C-2	100K
<0	Flare Ht.	100	<10	Prop C-3	100K
			<10	Butn C-4	100K
			<10	Pent C-5	100K

Interp. Lith

Remarks
Survey Data, Mud Reports, Other Info.



Interp. Lith

EPOCH WELL SERVICES COMMENCED LOGGING THE PCU 296-5A 08 WELL ON 2/03/2010 @ 4891' MD.

SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO YELLOWISH GRAY TO SLIGHTLY DUSKY YELLOW IN COLOR; CRUMBLY TO CRUNCHY TENACITY; IRREGULAR TO PLANAR FRACTURE; PLATY TO FLAKY TO SCALY CUTTINGS HABIT; EARTHY TO DULL LUSTER; SMOOTH TO CLAYEY TO SOMEWHAT SILTY TEXTURE; NO VISIBLE BEDDING STRUCTURES IN THE SAMPLE; SMALL AMOUNT OF KAOLINITE CLAY PRESENT IN THE SAMPLE; THINLY INTERBEDDED WITH SILTSTONE; MINOR SANDSTONE IN THE SAMPLE.

SILTSTONE = DUSKY YELLOW TO GRAYISH YELLOW TO YELLOWISH GRAY TO LIGHT OLIVE GRAY IN COLOR; BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO TABULAR CUTTINGS HABIT; DULL TO EARTHY LUSTER; SILTY TO GRITTY TO GRANULAR TEXTURE; NO VISIBLE BEDDING STRUCTURES IN THE SAMPLE; NO VISIBLE ACCESSORY MINERALS IN THE SAMPLE; INTERBEDDED WITH SHALE AND SOME SANDSTONE.

SANDSTONE = WHITE TO OFF WHITE TO VERY LIGHT GRAY TO GRAY TO LIGHT BROWNISH GRAY TO A LIGHT OLIVE GRAY COLOR; QUARTZ FRAMEWORK; VERY FINE TO LOWER MEDIUM GRAIN SIZE; WELL TO FAIR TO SLIGHTLY POOR SORTING; SUBROUND TO SUBANGULAR; HIGH TO MOD SPHERICITY; SOME FROSTED GRAINS VISIBLE IN THE SAMPLE; EASILY FRIABLE TO FRIABLE HARDNESS; MODERATE REACTION TO A 10% HCL SOLUTION; SOME CALCITE CEMENTATION; MANY LOOSE GRAINS IN SAMPLE; NO BEDDING STRUCTURES VISIBLE IN THE SAMPLE; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE.

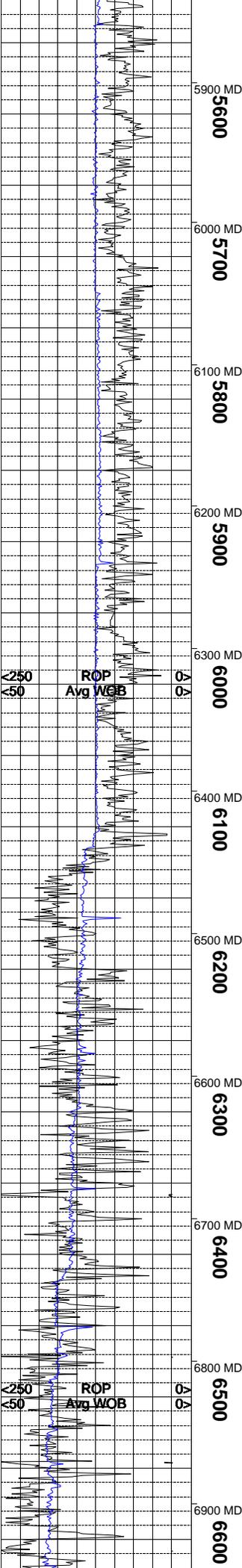
SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO YELLOWISH GRAY TO SLIGHTLY DUSKY YELLOW IN COLOR; CRUMBLY TO CRUNCHY TENACITY; IRREGULAR TO PLANAR FRACTURE; PLATY TO FLAKY TO SCALY CUTTINGS HABIT; EARTHY TO DULL LUSTER; SMOOTH TO CLAYEY TO SOMEWHAT SILTY TEXTURE; LAMINAE TO THIN BEDDING STRUCTURE VISIBLE IN THE SAMPLE; SOME SAMPLES SHOW A GRADING BETWEEN SHALE AND SILTSTONE; MANY LOOSE SAND GRAINS VISIBLE IN THE SAMPLE; NO ACCESSORY MINERALS IN THE SAMPLE.

SILTSTONE = DUSKY YELLOW TO GRAYISH YELLOW TO YELLOWISH GRAY TO LIGHT OLIVE GRAY IN COLOR; BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO TABULAR CUTTINGS HABIT; DULL TO EARTHY LUSTER; SILTY TO GRITTY TO GRANULAR TEXTURE; NO VISIBLE BEDDING STRUCTURES IN THE SAMPLE; NO VISIBLE ACCESSORY MINERALS IN THE SAMPLE; INTERBEDDED WITH SHALE AND SOME SANDSTONE.

SANDSTONE = MEDIUM TO LIGHT GRAY TO PALE BROWN TO LIGHT BROWNISH GRAY TO OCCASIONALLY TRANSLUCENT; QUARTZ DOMINATE FRAMEWORK WITH A MODERATE REACTION WITH HCL; FINE TO COARSE GRAINS WITH POOR SORTING; ROUND TO SUBANGULAR LOW TO MODERATE SPHERICITY; FIRMLY FRIABLE TO OCCASIONALLY MODERATE HARD; CALCAREOUS CEMENT WITH PSEUDOMATRIX; NO VISIBLE BEDDING STRUCTURE; INTERBEDDED WITH SILTSTONE AND SHALE.

SHALE = MEDIUM LIGHT GRAY TO MEDIUM BLuish GRAY WITH LIGHT OLIVE BROWN AND OCCASIONAL GRAYISH PURPLE HUES; BRITTLE TO SLIGHTLY CRUNCHY TENACITY; FRACTURES FROM BLOCKY TO PLANAR; CUTTINGS ARE PLATY TO SLIGHTLY TABULAR; DULL TO EARTH LUSTER; SILTY TO SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

SILTSTONE = MODERATE BROWN TO LIGHT BROWNISH GRAY; BRITTLE TO SLIGHTLY CRUMBLY TENACITY; FRACTURES FROM BLOCKY TO IRREGULAR; CUTTINGS ARE TABULAR TO SLIGHTLY MASSIVE; DULL TO OCCASIONALLY



SPARKLING LUSTER; GRITTY TEXTURE; THICK STRUCTURE; INTERBEDDED WITH SANDSTONE AND SHALE.

SANDSTONE = LIGHT GRAY TO WHITE TO LIGHT BROWNISH GRAY TO GRAYISH ORANGE PINK; QUARTZ FRAMEWORK WITH OCCASIONAL TRANSLUCENT QUARTZ GRAINS; MEDIUM TO FINE GRAINED WITH POOR SORTING; ANGULAR TO SUBANGULAR; FIRMLY FRIABLE TO OCCASIONALLY FRIABLE AND MODERATE HARDNESS; NO VISIBLE BEDDING STRUCTURE; GRADING INTO SILTSTONE; MODERATE TO SLIGHT REACTION WITH HCL SUGGESTS CALCAREOUS CEMENT; MATRIX SUPPORT WITH OCCASIONAL SPECIMENS DISPLAYING GRAIN SUPPORT HABITS.

SILTSTONE = MODERATE BROWN TO DARK YELLOWISH ORANGE TO LIGHT BROWNISH GRAY; TENACITY IS BRITTLE TO SLIGHTLY CRUMBLY; FRACTURES FROM IRREGULAR TO BLOCKY TO OCCASIONALLY PLANAR; CUTTINGS ARE TABULAR TO PLATY; DULL TO EARTHY TO SLIGHTLY SPARKLING LUSTER; GRITTY TO SILTY TEXTURE; THICK STRUCTURE; SOME SPECIMENS ARE GRADING INTO SHALE.

SHALE = MEDIUM LIGHT GRAY TO MEDIUM BLuish GRAY WITH OCCASIONAL GRAYISH PURPLE AND PALE GREEN HUES; BRITTLE TO SOME WHAT CRUNCHY TENACITY; PLANAR TO SPLINTERY TO SLIGHTLY BLOCKY FRACTURING; CUTTINGS ARE PLATY TO TABULAR; DULL TO WAXY LUSTER; SMOOTH TO SILTY TEXTURE; THIN TO SEMI THICK STRUCTURE; INTERBEDDED WITH SILTSTONE AND SANDSTONE SOME SPECIMENS ARE OBSERVED GRADING FROM SILTSTONE.

SANDSTONE = TRANSLUCENT TO LIGHT BROWNISH GRAY TO PALE YELLOWISH BROWN TO OCCASIONALLY WHITE; QUARTZ FRAMEWORK WITH SOME KSPAR ; FINE TO MEDIUM GRAINED WITH FAIR TO POOR SORTING; SUBANGULAR WITH MODERATE TO LOW SPHERICITY; FRIABLE TO FIRMLY FRIABLE WITH THE TRANSLUCENT TO WHITE SPECIMENS TENDING TO HAVE MODERATE HARDNESS; NO VISIBLE BEDDING STRUCTURE; MATRIX SUPPORT WITH SOME CALCAREOUS CEMENT; MODERATE REACTION WITH HCL.

SILTSTONE = MODERATE BROWN TO DARK YELLOWISH ORANGE TO LIGHT BROWNISH GRAY; TENACITY IS BRITTLE TO SLIGHTLY CRUMBLY; FRACTURES FROM IRREGULAR TO BLOCKY TO OCCASIONALLY PLANAR; CUTTINGS ARE TABULAR TO PLATY; DULL TO EARTHY TO SLIGHTLY SPARKLING LUSTER; GRITTY TO SILTY TEXTURE.

SHALE = LIGHT GRAY TO YELLOWISH BROWN COLOR; BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO PLANAR FRACTURE; PLATY TO FLAKY TO WEDGELIKE TO BLADED CUTTINGS HABIT; EARTHY TO DULL LUSTER; LAMINAE BEDDING STRUCTURE VISIBLE IN THE SAMPLE; SOME SAMPLES SHOW GRADING WITH SILTSTONE; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE.

SANDSTONE = TRANSLUCENT TO LIGHT GRAY TO WHITE; DOMINATE QUARTZ FRAMEWORK; FINE TO MEDIUM TO OCCASIONALLY COARSE GRAINED WITH POOR TO SLIGHTLY FAIR SORTING; ANGULAR TO SUBANGULAR WITH OCCASIONAL SUBROUNDED SPECIMENS; LOW SPHERICITY; EASILY FRIABLE TO FIRMLY FRIABLE; STRONG REACTION WITH HCL SUGGESTS CALCITE CEMENT; MATRIX SUPPORTED; NO VISIBLE BEDDING STRUCTURE; ABUNDANT LOOSE GRAINS IN SAMPLE.

SILTSTONE = MODERATE BROWN TO LIGHT BROWNISH GRAY TO MODERATE YELLOWISH BROWN; BRITTLE TO SLIGHTLY CRUMBLY TENACITY; FRACTURES FROM BLOCKY TO IRREGULAR TO SLIGHTLY PLANAR; CUTTINGS ARE TABULAR TO SLIGHTLY PLATY; EARTHY TO DULL LUSTER; GRITTY TO SILTY TEXTURE; THIN TO SLIGHTLY THICK STRUCTURE.

SHALE = MEDIUM LIGHT GRAY TO LIGHT BLuish GRAY WITH GRAYISH BLUE TO GRAYISH PURPLE AND GRAYISH ORANGE HUES; BRITTLE TENACITY; PLANAR TO SLIGHTLY BLOCKY FRACTURING; CUTTINGS ARE PLATY TO TABULAR TO FLAKY; DULL TO WAXY LUSTER; SMOOTH TO SILTY TEXTURE; SOME SPECIMENS GRADE INTO SILTSTONE; THIN STRUCTURE TRACE AMOUNTS OF PYRITE PRESENT AS AN ACCESSORY MINERAL; TRACE AMOUNTS OF CARBONACEOUS SHALE IN SAMPLE.

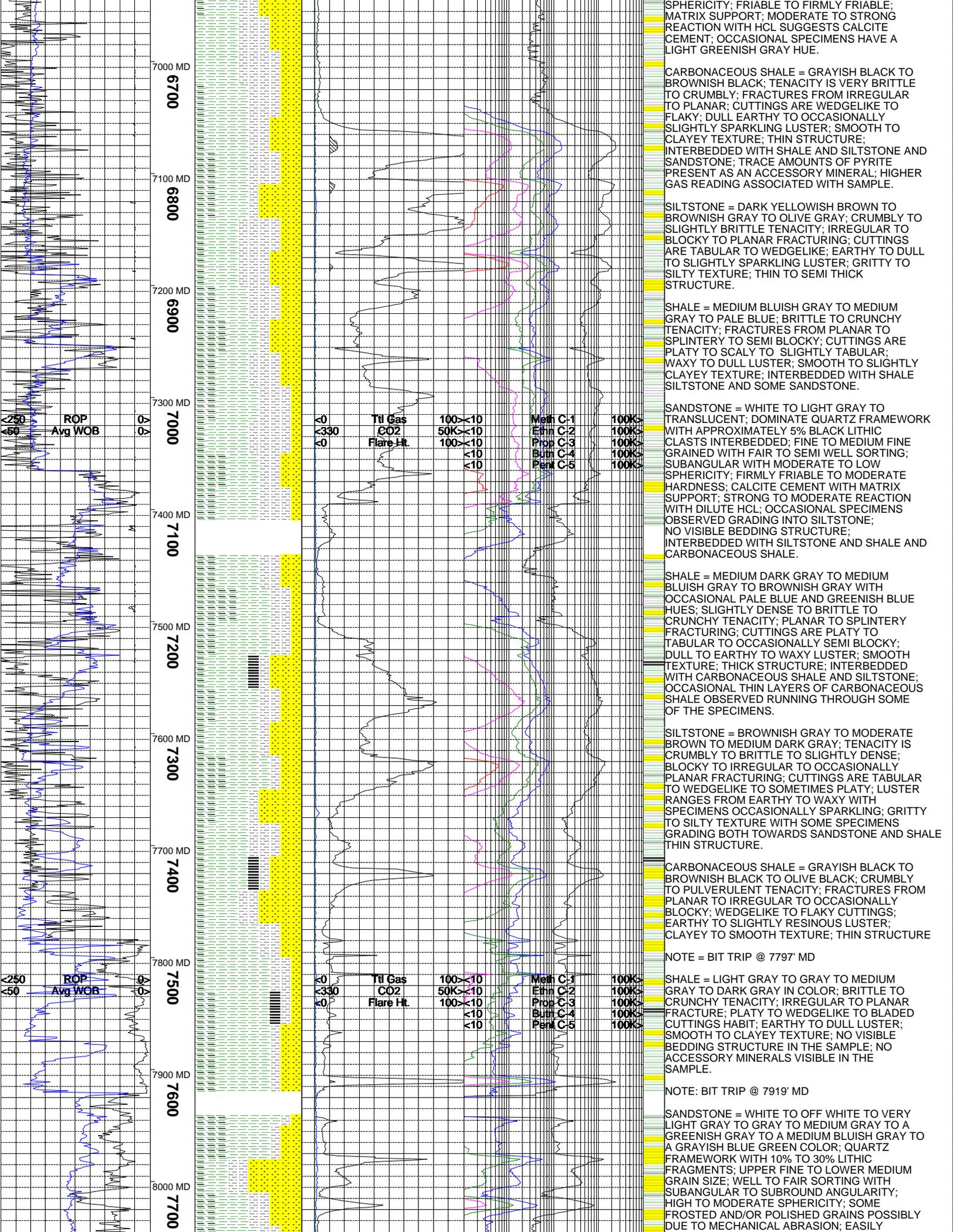
SANDSTONE = WHITE TO MEDIUM LIGHT GRAY TO TRANSLUCENT; DOMINATE QUARTZ FRAMEWORK; FINE TO MEDIUM SIZE GRAINS WITH FAIR SORTING; SUBANGULAR TO SUBROUNDED WITH MODERATE TO LOW

<250 ROP
<50 Avg WOB

Til Gas	100 > 10	Meth C-1	100K >
CO2	50K > 10	Ethn C-2	100K >
Flare Ht	100 > 10	Prop C-3	100K >
	< 10	Burn C-4	100K >
	< 10	Perf C-5	100K >

<250 ROP
<50 Avg WOB

Til Gas	100 > 10	Meth C-1	100K >
CO2	50K > 10	Ethn C-2	100K >
Flare Ht	100 > 10	Prop C-3	100K >
	< 10	Burn C-4	100K >
	< 10	Perf C-5	100K >



6700 MD
6800 MD
6900 MD
7000 MD
7100 MD
7200 MD
7300 MD
7400 MD
7500 MD
7600 MD
7700 MD
7800 MD
7900 MD
8000 MD

ROP
Avg WOB

Ti Gas
CO2
Flare Ht

100x<10
50Kx<10
100x<10
<10
<10

Meth C-1
Ethn C-2
Prop C-3
Bum C-4
Perm C-5

100Ks
100Ks
100Ks
100Ks
100Ks

SPHERICITY; FRIABLE TO FIRMLY FRIABLE; MATRIX SUPPORT; MODERATE TO STRONG REACTION WITH HCL SUGGESTS CALCITE CEMENT; OCCASIONAL SPECIMENS HAVE A LIGHT GREENISH GRAY HUE.

CARBONACEOUS SHALE = GRAYISH BLACK TO BROWNISH BLACK; TENACITY IS VERY BRITTLE TO CRUMBLY; FRACTURES FROM IRREGULAR TO PLANAR; CUTTINGS ARE WEDGELIKE TO FLAKY; DULL EARTHY TO OCCASIONALLY SLIGHTLY SPARKLING LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE; INTERBEDDED WITH SHALE AND SILTSTONE AND SANDSTONE; TRACE AMOUNTS OF PYRITE PRESENT AS AN ACCESSORY MINERAL; HIGHER GAS READING ASSOCIATED WITH SAMPLE.

SILTSTONE = DARK YELLOWISH BROWN TO BROWNISH GRAY TO OLIVE GRAY; CRUMBLY TO SLIGHTLY BRITTLE TENACITY; IRREGULAR TO BLOCKY TO PLANAR FRACTURING; CUTTINGS ARE TABULAR TO WEDGELIKE; EARTHY TO DULL TO SLIGHTLY SPARKLING LUSTER; GRITTY TO SILTY TEXTURE; THIN TO SEMI THICK STRUCTURE.

SHALE = MEDIUM BLuish GRAY TO MEDIUM GRAY TO PALE BLUE; BRITTLE TO CRUNCHY TENACITY; FRACTURES FROM PLANAR TO SPLINTERY TO SEMI BLOCKY; CUTTINGS ARE PLATY TO SCALY TO SLIGHTLY TABULAR; WAXY TO DULL LUSTER; SMOOTH TO SLIGHTLY CLAYEY TEXTURE; INTERBEDDED WITH SHALE SILTSTONE AND SOME SANDSTONE.

SANDSTONE = WHITE TO LIGHT GRAY TO TRANSLUCENT; DOMINATE QUARTZ FRAMEWORK WITH APPROXIMATELY 5% BLACK LITHIC CLASTS INTERBEDDED; FINE TO MEDIUM FINE GRAINED WITH FAIR TO SEMI WELL SORTING; SUBANGULAR WITH MODERATE TO LOW SPHERICITY; FIRMLY FRIABLE TO MODERATE HARDNESS; CALCITE CEMENT WITH MATRIX SUPPORT; STRONG TO MODERATE REACTION WITH DILUTE HCL; OCCASIONAL SPECIMENS OBSERVED GRADING INTO SILTSTONE; NO VISIBLE BEDDING STRUCTURE; INTERBEDDED WITH SILTSTONE AND SHALE AND CARBONACEOUS SHALE.

SHALE = MEDIUM DARK GRAY TO MEDIUM BLuish GRAY TO BROWNISH GRAY WITH OCCASIONAL PALE BLUE AND GREENISH BLUE HUES; SLIGHTLY DENSE TO BRITTLE TO CRUNCHY TENACITY; PLANAR TO SPLINTERY FRACTURING; CUTTINGS ARE PLATY TO TABULAR TO OCCASIONALLY SEMI BLOCKY; DULL TO EARTHY TO WAXY LUSTER; SMOOTH TEXTURE; THICK STRUCTURE; INTERBEDDED WITH CARBONACEOUS SHALE AND SILTSTONE; OCCASIONAL THIN LAYERS OF CARBONACEOUS SHALE OBSERVED RUNNING THROUGH SOME OF THE SPECIMENS.

SILTSTONE = BROWNISH GRAY TO MODERATE BROWN TO MEDIUM DARK GRAY; TENACITY IS CRUMBLY TO BRITTLE TO SLIGHTLY DENSE; BLOCKY TO IRREGULAR TO OCCASIONALLY PLANAR FRACTURING; CUTTINGS ARE TABULAR TO WEDGELIKE TO SOMETIMES PLATY; LUSTER RANGES FROM EARTHY TO WAXY WITH SPECIMENS OCCASIONALLY SPARKLING; GRITTY TO SILTY TEXTURE WITH SOME SPECIMENS GRADING BOTH TOWARDS SANDSTONE AND SHALE THIN STRUCTURE.

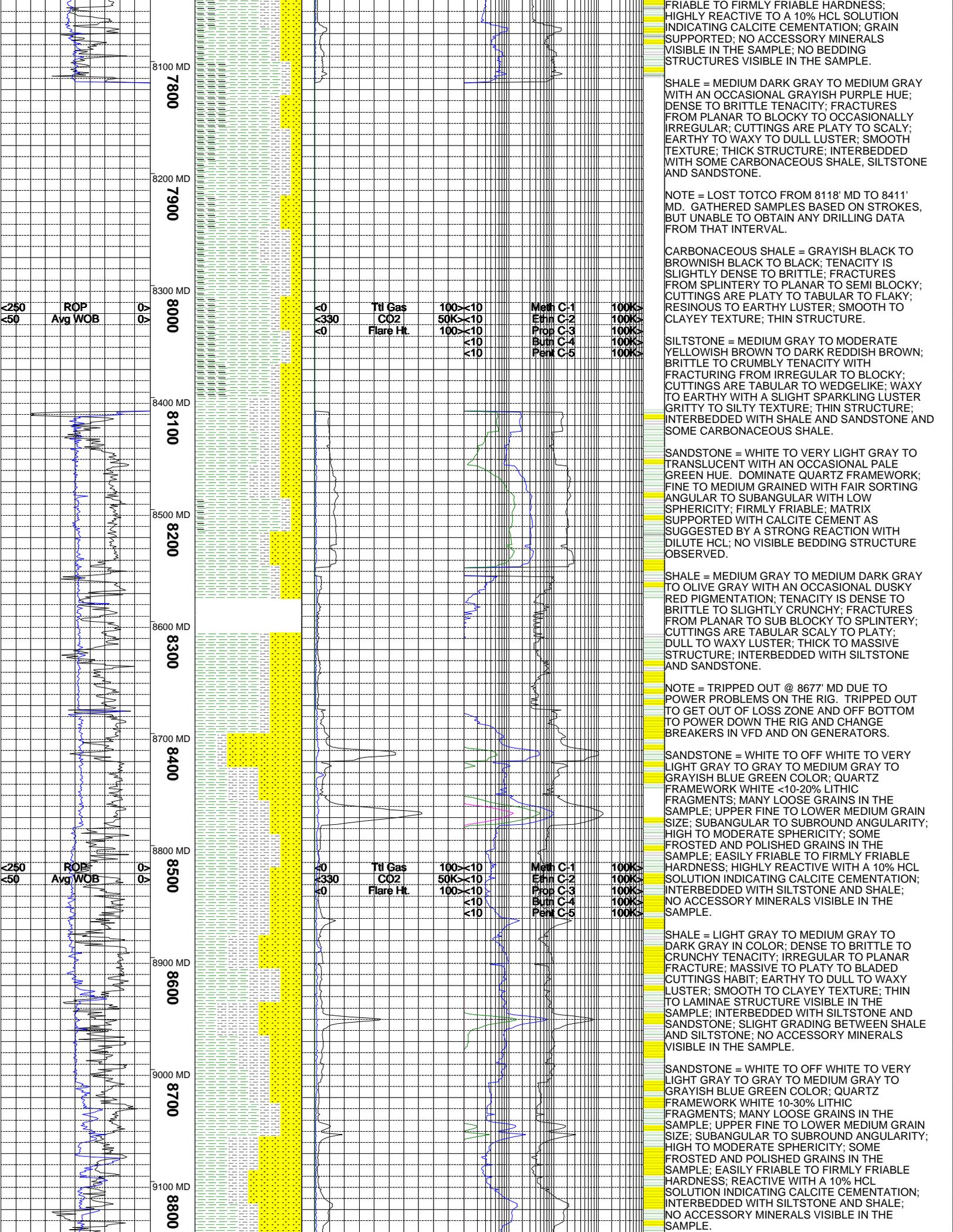
CARBONACEOUS SHALE = GRAYISH BLACK TO BROWNISH BLACK TO OLIVE BLACK; CRUMBLY TO PULVERULENT TENACITY; FRACTURES FROM PLANAR TO IRREGULAR TO OCCASIONALLY BLOCKY; WEDGELIKE TO FLAKY CUTTINGS; EARTHY TO SLIGHTLY RESINOUS LUSTER; CLAYEY TO SMOOTH TEXTURE; THIN STRUCTURE

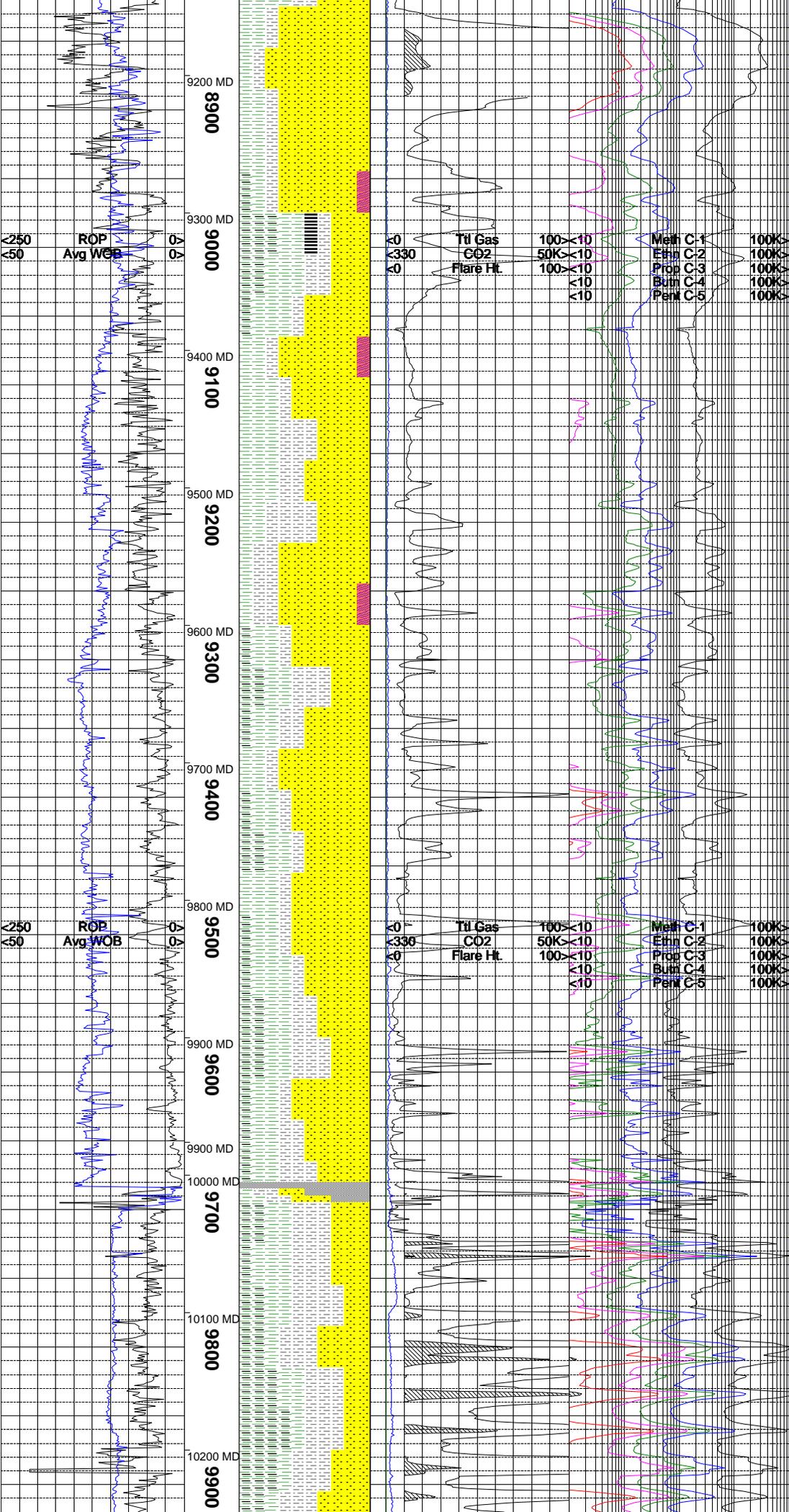
NOTE = BIT TRIP @ 7797' MD

SHALE = LIGHT GRAY TO GRAY TO MEDIUM GRAY TO DARK GRAY IN COLOR; BRITTLE TO CRUNCHY TENACITY; IRREGULAR TO PLANAR FRACTURE; PLATY TO WEDGELIKE TO BLADED CUTTINGS HABIT; EARTHY TO DULL LUSTER; SMOOTH TO CLAYEY TEXTURE; NO VISIBLE BEDDING STRUCTURE IN THE SAMPLE; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE.

NOTE = BIT TRIP @ 7919' MD

SANDSTONE = WHITE TO OFF WHITE TO VERY LIGHT GRAY TO GRAY TO MEDIUM GRAY TO A GREENISH GRAY TO A MEDIUM BLuish GRAY TO A GRAYISH BLUE GREEN COLOR; QUARTZ FRAMEWORK WITH 10% TO 30% LITHIC FRAGMENTS; UPPER FINE TO LOWER MEDIUM GRAIN SIZE; WELL TO FAIR SORTING WITH SUBANGULAR TO SUBROUND ANGULARITY; HIGH TO MODERATE SPHERICITY; SOME FROSTED AND/OR POLISHED GRAINS POSSIBLY DUE TO MECHANICAL ABRASION; EASILY





SILTSTONE = DARK GRAY TO VERY DARK GRAY TO A GRAYISH BROWN TO MODERATE BROWN COLOR; TOUGH TO BRITTLE TENACITY; BLOCKY TO IRREGULAR FRACTURE; MASSIVE TO PLATY TO TABULAR CUTTINGS HABIT; EARTHY TO DULL LUSTER; SILTY TO GRITTY TO SLIGHTLY GRANULAR TEXTURE; NO VISIBLE BEDDING STRUCTURES IN THE SAMPLE; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE.

CARBONACEOUS SHALE = BLACK TO GRAYISH BLACK TO BROWNISH BLACK; BRITTLE TO CRUMBLY TENACITY; FRACTURES FROM PLANAR TO SPLINTERY; CUTTINGS ARE NODULAR TO FLAKY; RESINOUS TO EARTHY LUSTER; SMOOTH TO SILTY TO CLAYEY TEXTURE; THIN STRUCTURE; INTERBEDDED WITH SHALE, SILTSTONE AND SANDSTONE.

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

SANDSTONE = WHITE TO LIGHT GRAY TO TRANSLUCENT; DOMINATE QUARTZ FRAMEWORK WITH TRACE AMOUNTS OF BLACK LITHIC CLASTS INTERBEDDED; FINE TO MEDIUM COARSE GRAINED WITH POOR SORTING; ANGULAR TO SUBANGULAR WITH LOW SPHERICITY; EASILY FRIABLE TO FRIABLE; STRONG REACTION WITH HCL SUGGESTS CALCITE CEMENT; MATRIX SUPPORT; NO VISIBLE BEDDING STRUCTURE; TRACE AMOUNTS OF PYRITE PRESENT AS AN ACCESSORY MINERAL; TRACE AMOUNTS OF CARBONACEOUS MATERIAL INTERBEDDED.

SHALE = MEDIUM GRAY TO MEDIUM DARK GRAY; TENACITY IS BRITTLE TO SLIGHTLY DENSE; FRACTURES FROM PLANAR TO SPLINTERY TO IRREGULAR; CUTTINGS ARE SCALY TO TABULAR TO PLATY; DULL WAXY LUSTER; SMOOTH TO SILTY TEXTURE; WITH OCCASIONAL SPECIMENS GRADING TOWARDS SILTSTONE; THIN TO SEMI THICK STRUCTURE.

SILTSTONE = MEDIUM DARK GRAY TO BROWNISH GRAY TO OLIVE GRAY; BRITTLE TENACITY; IRREGULAR TO PLANAR FRACTURING; CUTTINGS ARE TABULAR TO WEDGELIKE; EARTHY TO SLIGHTLY SPARKLING LUSTER; GRITTY TO SILTY TEXTURE; SOME SPECIMENS OBSERVED GRADING TOWARDS SANDSTONE; NO VISIBLE ACCESSORY MINERALS IN THE SAMPLE.

SANDSTONE = WHITE TO OFF WHITE TO VERY LIGHT GRAY TO GRAY TO DARK GRAY TO LIGHT BLUISH GRAY TO A GRAYISH BLUE GREEN COLOR; QUARTZ FRAMEWORK; UPPER FINE TO LOWER MEDIUM GRAIN SIZE; WELL TO FAIR SORTING; SUBROUND TO SUBANGULAR; HIGH TO MODERATE SPHERICITY; SOME BEDDING CONTACTS VISIBLE IN THE SAMPLE; HIGHLY REACTIVE WITH A 10% HCL SOLUTION; FRIABLE TO MODERATELY HARD HARDNESS; GRAIN SUPPORTED WITH <10% TO 30% LITHIC FRAGMENTS INCLUDED; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE; SAMPLE INTERBEDDED WITH SILTSTONE, SHALE AND SOME CARBONACEOUS SHALE; CALCITE CEMENTATION DUE TO HIGH REACTION WITH THE DILUTE HCL SOLUTION.

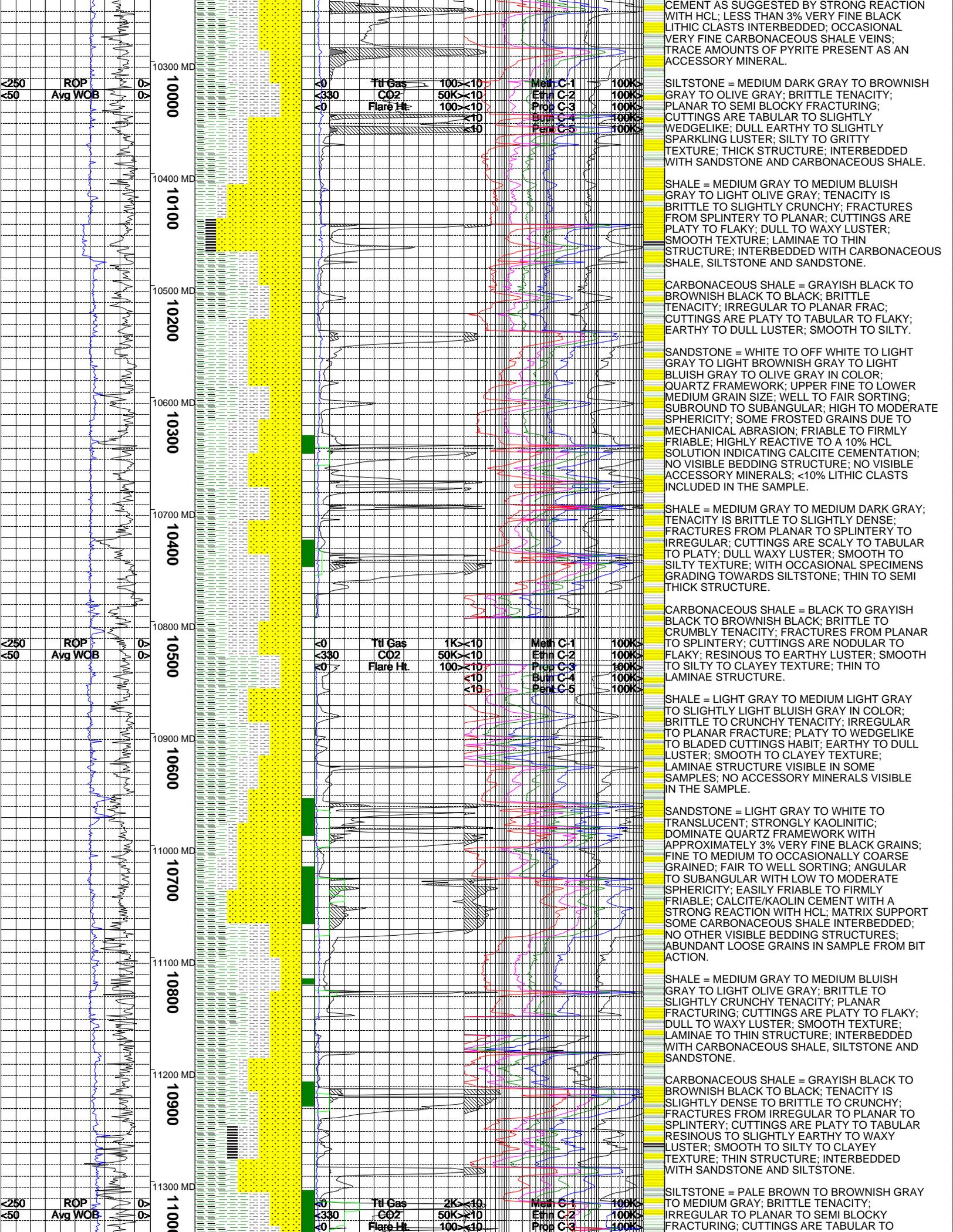
NOTE = DRILLED TO INTERMEDIATE TOTAL DEPTH OF 10007' MD (9682' TVD) ON 02/01/2011 @ APPROXIMATELY 10:00:00.

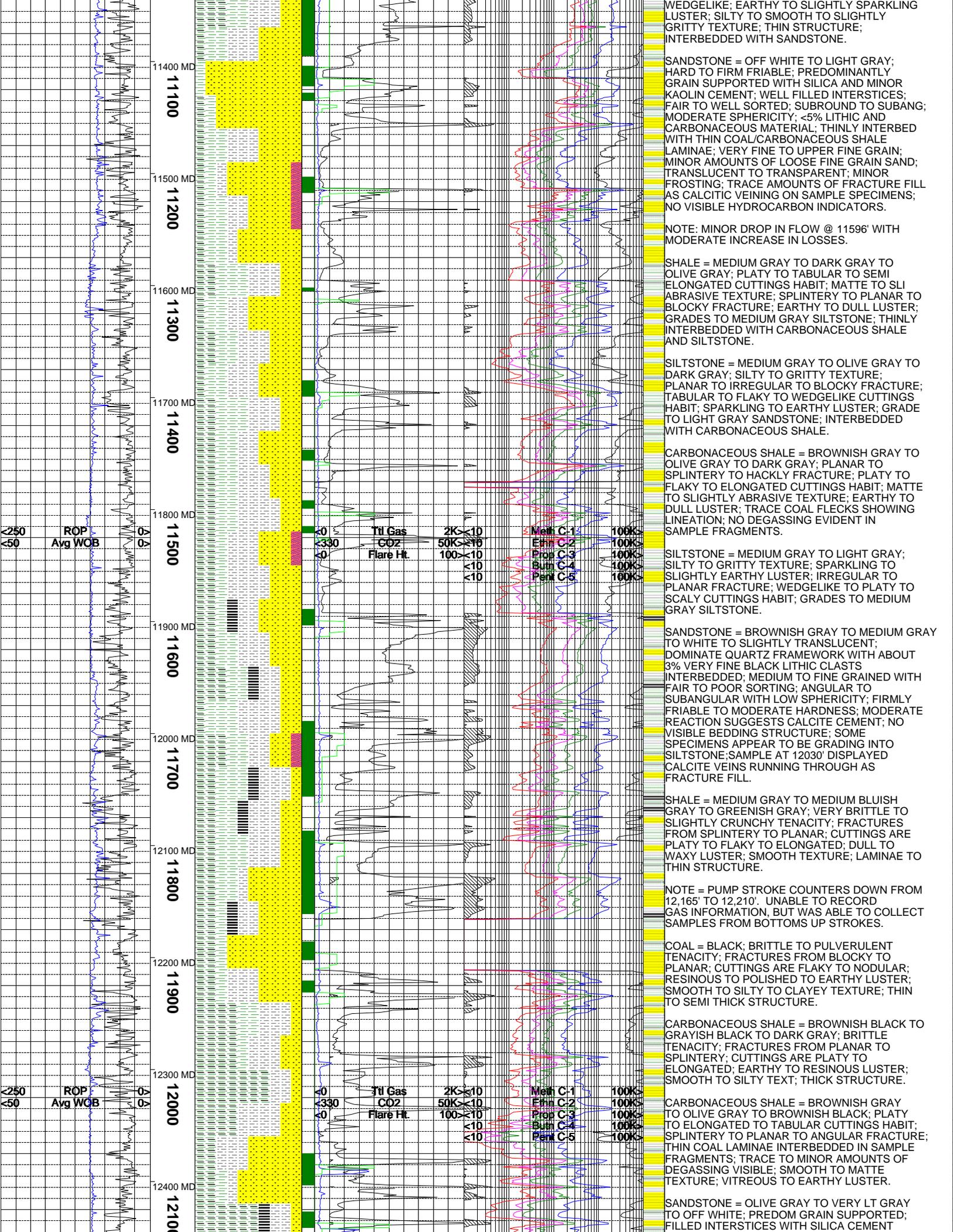
NOTE = RESUME DRILLING OF PRODUCTION SECTION ON 04/30/2011.

SILTSTONE = LIGHT GRAY TO MEDIUM GRAY TO LIGHT OLIVE GRAY; SLIGHTLY DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURING; CUTTINGS ARE TABULAR TO MASSIVE; WAXY TO SPARKLING TO SLIGHTLY EARTHY LUSTER; SILTY TO GRITTY TEXTURE; THICK STRUCTURE; GRADING FROM FINE GRAIN SANDSTONE.

CARBONACEOUS SHALE = BROWNISH BLACK TO OLIVE BLACK TO DARK GRAY TO BLACK; VERY BRITTLE TO SLIGHTLY PULVERULENT TENACITY FRACTURES FROM PLANAR TO SPLINTERY; CUTTINGS ARE PLATY TO ELONGATED TO BLADED; EARTHY TO DULL TO WAXY LUSTER; SMOOTH TO SLIGHTLY SILTY TEXTURE; THIN TO LAMINAE STRUCTURE.

SANDSTONE = WHITE TO LIGHT GRAY TO TRANSLUCENT; FINE TO MEDIUM FINE GRAINED WITH WELL SORTING; SUBROUND TO SUBANGULAR WITH LOW SPHERICITY; FIRMLY FRIABLE TO FRIABLE; CALCITE AND KAOLIN





11400 MD
11100
11500 MD
11200
11600 MD
11300
11700 MD
11400
11800 MD
11500
11900 MD
11600
12000 MD
11700
12100 MD
11800
12200 MD
11900
12300 MD
12000
12400 MD
12100

<250
<50
ROP
Avg WOB

Til Gas	2K < 10	Mark C-1	100K <
CO ₂	50K < 10	Ethn C-2	100K <
Flare Ht	100 < 10	Prop C-3	100K <
	< 10	Burn C-4	100K <
	< 10	Perf C-5	100K <

WEDGELIKE; EARTHY TO SLIGHTLY SPARKLING LUSTER; SILTY TO SMOOTH TO SLIGHTLY GRITTY TEXTURE; THIN STRUCTURE; INTERBEDDED WITH SANDSTONE.

SANDSTONE = OFF WHITE TO LIGHT GRAY; HARD TO FIRM FRIABLE; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND MINOR KAOLIN CEMENT; WELL FILLED INTERSTICES; FAIR TO WELL SORTED; SUBROUND TO SUBANG; MODERATE SPHERICITY; <5% LITHIC AND CARBONACEOUS MATERIAL; THINLY INTERBED WITH THIN COAL/CARBONACEOUS SHALE LAMINAE; VERY FINE TO UPPER FINE GRAIN; MINOR AMOUNTS OF LOOSE FINE GRAIN SAND; TRANSLUCENT TO TRANSPARENT; MINOR FROSTING; TRACE AMOUNTS OF FRACTURE FILL AS CALCITIC VEINING ON SAMPLE SPECIMENS; NO VISIBLE HYDROCARBON INDICATORS.

NOTE: MINOR DROP IN FLOW @ 11596' WITH MODERATE INCREASE IN LOSSES.

SHALE = MEDIUM GRAY TO DARK GRAY TO OLIVE GRAY; PLATY TO TABULAR TO SEMI ELONGATED CUTTINGS HABIT; MATTE TO SLI ABRASIVE TEXTURE; SPLINTERY TO PLANAR TO BLOCKY FRACTURE; EARTHY TO DULL LUSTER; GRADES TO MEDIUM GRAY SILTSTONE; THINLY INTERBEDDED WITH CARBONACEOUS SHALE AND SILTSTONE.

SILTSTONE = MEDIUM GRAY TO OLIVE GRAY TO DARK GRAY; SILTY TO GRITTY TEXTURE; PLANAR TO IRREGULAR TO BLOCKY FRACTURE; TABULAR TO FLAKY TO WEDGELIKE CUTTINGS HABIT; SPARKLING TO EARTHY LUSTER; GRADE TO LIGHT GRAY SANDSTONE; INTERBEDDED WITH CARBONACEOUS SHALE.

CARBONACEOUS SHALE = BROWNISH GRAY TO OLIVE GRAY TO DARK GRAY; PLANAR TO SPLINTERY TO HACKLY FRACTURE; PLATY TO FLAKY TO ELONGATED CUTTINGS HABIT; MATTE TO SLIGHTLY ABRASIVE TEXTURE; EARTHY TO DULL LUSTER; TRACE COAL FLECKS SHOWING LINEATION; NO DEGASSING EVIDENT IN SAMPLE FRAGMENTS.

SILTSTONE = MEDIUM GRAY TO LIGHT GRAY; SILTY TO GRITTY TEXTURE; SPARKLING TO SLIGHTLY EARTHY LUSTER; IRREGULAR TO PLANAR FRACTURE; WEDGELIKE TO PLATY TO SCALY CUTTINGS HABIT; GRADES TO MEDIUM GRAY SILTSTONE.

SANDSTONE = BROWNISH GRAY TO MEDIUM GRAY TO WHITE TO SLIGHTLY TRANSLUCENT; DOMINATE QUARTZ FRAMEWORK WITH ABOUT 3% VERY FINE BLACK LITHIC CLASTS INTERBEDDED; MEDIUM TO FINE GRAINED WITH FAIR TO POOR SORTING; ANGULAR TO SUBANGULAR WITH LOW SPHERICITY; FIRMLY FRIABLE TO MODERATE HARDNESS; MODERATE REACTION SUGGESTS CALCITE CEMENT; NO VISIBLE BEDDING STRUCTURE; SOME SPECIMENS APPEAR TO BE GRADING INTO SILTSTONE; SAMPLE AT 12030' DISPLAYED CALCITE VEINS RUNNING THROUGH AS FRACTURE FILL.

SHALE = MEDIUM GRAY TO MEDIUM BLUISH GRAY TO GREENISH GRAY; VERY BRITTLE TO SLIGHTLY CRUNCHY TENACITY; FRACTURES FROM SPLINTERY TO PLANAR; CUTTINGS ARE PLATY TO FLAKY TO ELONGATED; DULL TO WAXY LUSTER; SMOOTH TEXTURE; LAMINAE TO THIN STRUCTURE.

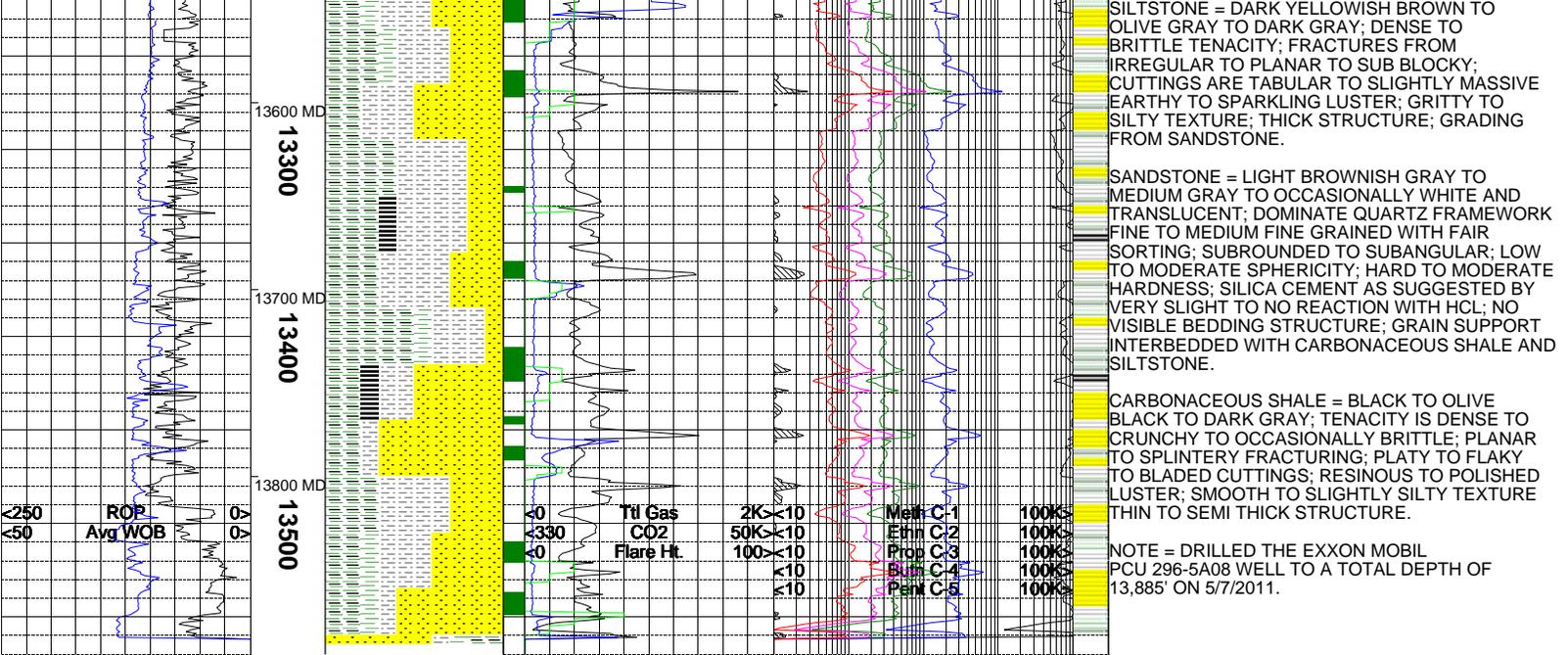
NOTE = PUMP STROKE COUNTERS DOWN FROM 12,165' TO 12,210'. UNABLE TO RECORD GAS INFORMATION, BUT WAS ABLE TO COLLECT SAMPLES FROM BOTTOMS UP STROKES.

COAL = BLACK; BRITTLE TO PULVERULENT TENACITY; FRACTURES FROM BLOCKY TO PLANAR; CUTTINGS ARE FLAKY TO NODULAR; RESINOUS TO POLISHED TO EARTHY LUSTER; SMOOTH TO SILTY TO CLAYEY TEXTURE; THIN TO SEMI THICK STRUCTURE.

CARBONACEOUS SHALE = BROWNISH BLACK TO GRAYISH BLACK TO DARK GRAY; BRITTLE TENACITY; FRACTURES FROM PLANAR TO SPLINTERY; CUTTINGS ARE PLATY TO ELONGATED; EARTHY TO RESINOUS LUSTER; SMOOTH TO SILTY TEXT; THICK STRUCTURE.

CARBONACEOUS SHALE = BROWNISH GRAY TO OLIVE GRAY TO BROWNISH BLACK; PLATY TO ELONGATED TO TABULAR CUTTINGS HABIT; SPLINTERY TO PLANAR TO ANGULAR FRACTURE; THIN COAL LAMINAE INTERBEDDED IN SAMPLE FRAGMENTS; TRACE TO MINOR AMOUNTS OF DEGASSING VISIBLE; SMOOTH TO MATTE TEXTURE; VITREOUS TO EARTHY LUSTER.

SANDSTONE = OLIVE GRAY TO VERY LT GRAY TO OFF WHITE; PREDOM GRAIN SUPPORTED; FILLED INTERSTICES WITH SILICA CEMENT



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