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# MUDLOG TVD

**COMPANY** ExxonMobil Production  
**WELL** PCU 197-34A3  
**FIELD** PICEANCE CREEK UNIT  
**REGION** ROCKY MOUNTAINS  
**COORDINATES** LAT: 39.918037  
LONG: -108.276941  
**ELEVATION** G.L.: 6490.8'  
RKB: 30.2'  
**COUNTY, STATE** RIO BLANCO, CO  
**API INDEX** 051031154200  
**SPUD DATE** 02/27/2010  
**CONTRACTOR** HELMERICH AND PAYNE  
**CO. REP.** J. THOMAS  
**RIG/TYPE** HP 325 / FLEX 4S  
**LOGGING UNIT** MLU 48  
**GEOLOGISTS** M. GROSS  
D. NEW  
**ADD. PERSONS**  
**CO. GEOLOGIST** MELISSA SAURBORN

## LOG INTERVAL

## CASING DATA

**DEPTHS:** 3858' TO 12800'  
**DATES:** 06/15/2010 TO 07/31/2010  
**SCALE:** 1" = 100'

10.75" AT 3853'  
7.00" AT 8731'  
AT  
AT

## MUD TYPES

## HOLE SIZE

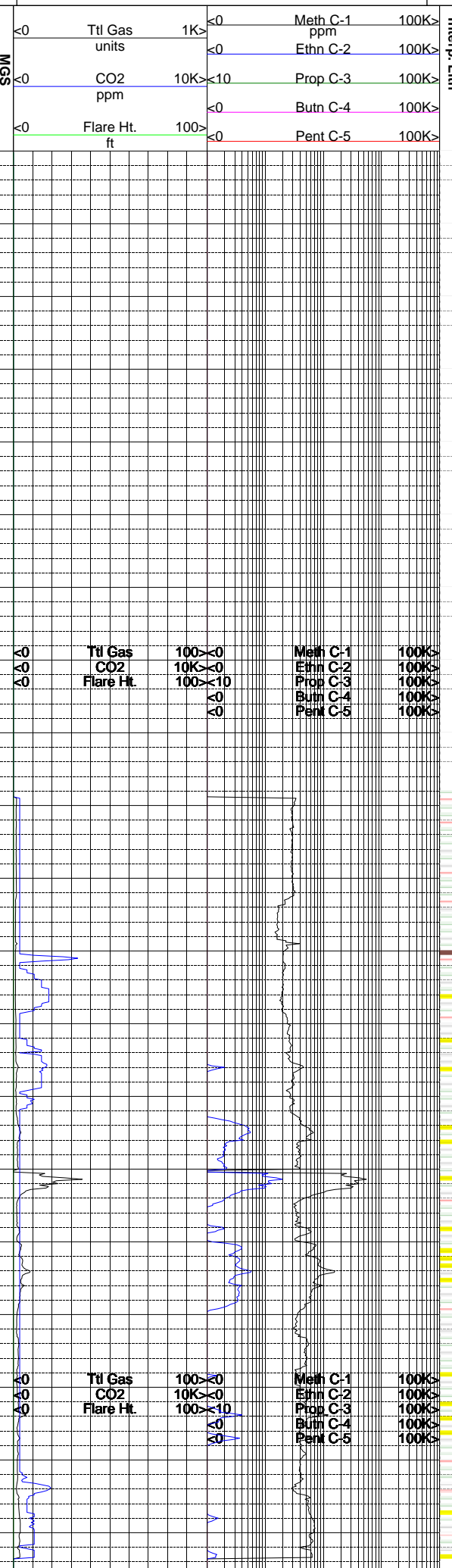
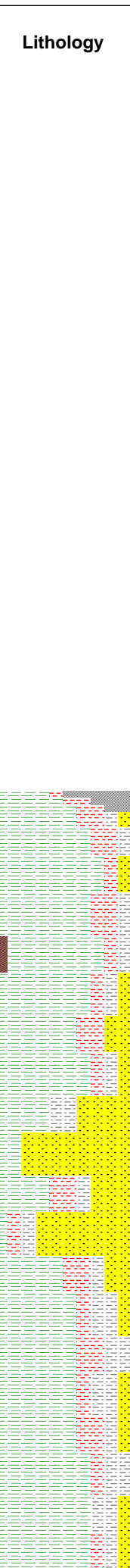
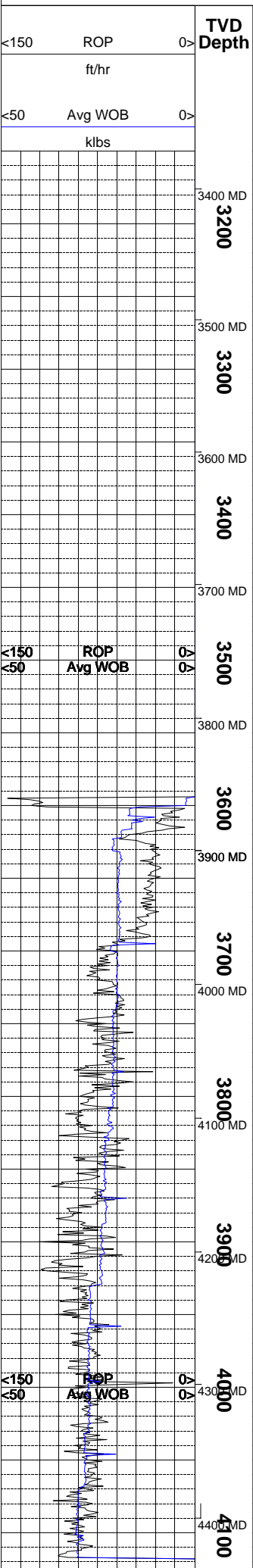
SPUD MUD TO 3858'  
LSND TO 12800'  
TO  
TO

14.75" TO 3858'  
9.875" TO 8750'  
6.125" TO 12800'  
TO

## ABBREVIATIONS

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

ALTERED ZONE	CHERT - GLASSY	FELSIC SILIC DIKE	MARL - CALC	SANDSTONE
ANDESITE	CHERT - PORCEL	FOSSIL	METAMORPHICS	SANDSTONE-TUFFACEOUS
ANHYDRITE	CHERT - TIGER STRIPE	GABBRO	MUDSTONE	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	



**Remarks**  
**Survey Data, Mud Reports, Other Info.**

ALL ROCK COLORS ARE REFERENCED TO THE GSA ROCK COLOR CHART. ROCK CONSTITUENTS ARE DESCRIBED WET AND LISTED IN ORDER OF MOST ABUNDANT TO LEAST ABUNDANT WITH RESPECT TO PERCENTAGE IN SAMPLE. DEPTH IS REFERENCED TO RKB.

CONNECTION GASES AS WELL AS TRIP GASES AND DOWNTIME GASES ARE NOTED ON THE LOG. LARGE CONNECTION GASES WHICH APPEAR ON THE MUDLOG USUALLY REFLECT UPHOLE GAS INTERVALS BLEEDING INTO THE BOREHOLE DURING CONNECTIONS.

GAS CHROMATOGRAPHY EQUIPMENT IS CALIBRATED TO A TEST GAS COMPOSED OF:  
 METHANE = 10000 PPM  
 ETHANE = 1000 PPM  
 PROPANE = 1000 PPM  
 I-BUTANE = 1000 PPM  
 N-BUTANE = 1000 PPM  
 I-PENTANE = 1000 PPM  
 N-PENTANE = 1000 PPM

WHEN THE MUD IS RUN THROUGH THE MGS (MUD GAS SEPERATOR) THE INTERVAL IS MARKED ON THE LOG IN THE SLIDE COLUMN AND NOTED ON THE LOG.

ALL SANDSTONE INTERVALS ARE EXAMINED FOR SAMPLE FLUORESCENCE IN THE UV SCOPE AND FOR HYDROCARBON FLUORESCENCE AND MINOR FLUORESCENCE FROM POSSIBLE FRACTURE FILL. ALL FLUORESCENCE IS NOTED ON THE MUDLOG.

10.75" SURFACE CASING WAS SET AT 3853'. DRILLED 10' OF NEW FORMATION AND PERFORM F.I.T. - GOOD. DRILL AHEAD.

SURVEY @ 3728' MD: INC 24.16 AZI 108.32 TVD 3474.44'

EPOCH WELL SERVICES COMMENCED FULL LOGGING ON 06/16/2010 AT 3858'

SHALE = VERY PALE GRAY, YELLOWISH GRAY; SOFT TO MODERATELY FIRM TENACITY; PLANAR TO IRREGULAR FRACTURE; WEDGELIKE TO PLATY CUTTINGS HABIT; DULL EARTHY TO SEMI WAXY LUSTER; GRADES TO PALE YELLOWISH GRAY SILTSTONE; SOME CLAY WASHES OUT DURING CLEANING PROCESS.

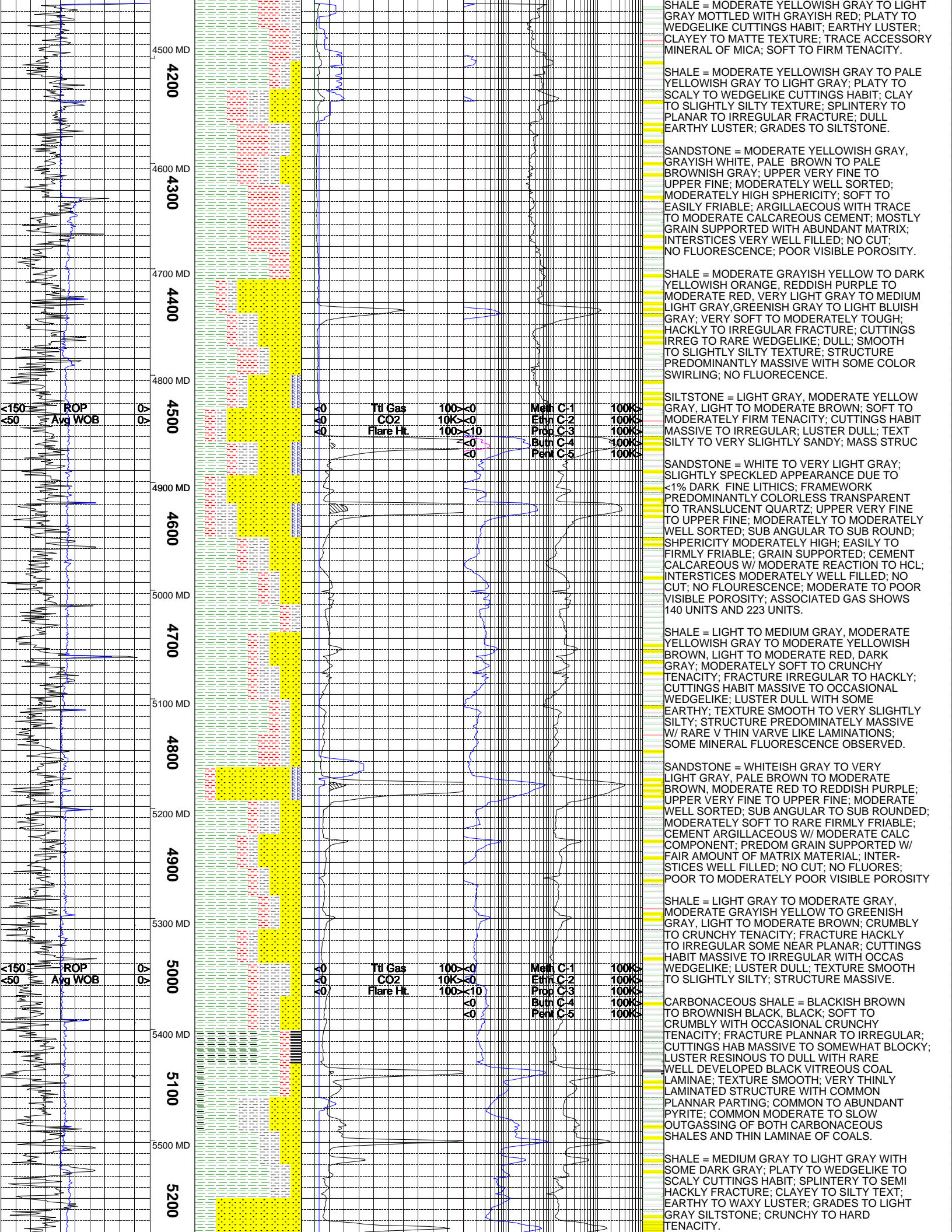
SHALE = PALE TO MODERATE YELLOWISH GRAY MOTTLED WITH LIGHT GRAY; PLATY TO SCALY TO TABULAR CUTTINGS HABIT; PLANAR TO HACKLY FRACTURE; DULL EARTHY LUSTER; MASSIVE STRUCTURE; CRUNCHY TO CRUMBLY TENACITY; TRACE AMOUNTS OF NAHCOLITE IN SAMPLE.

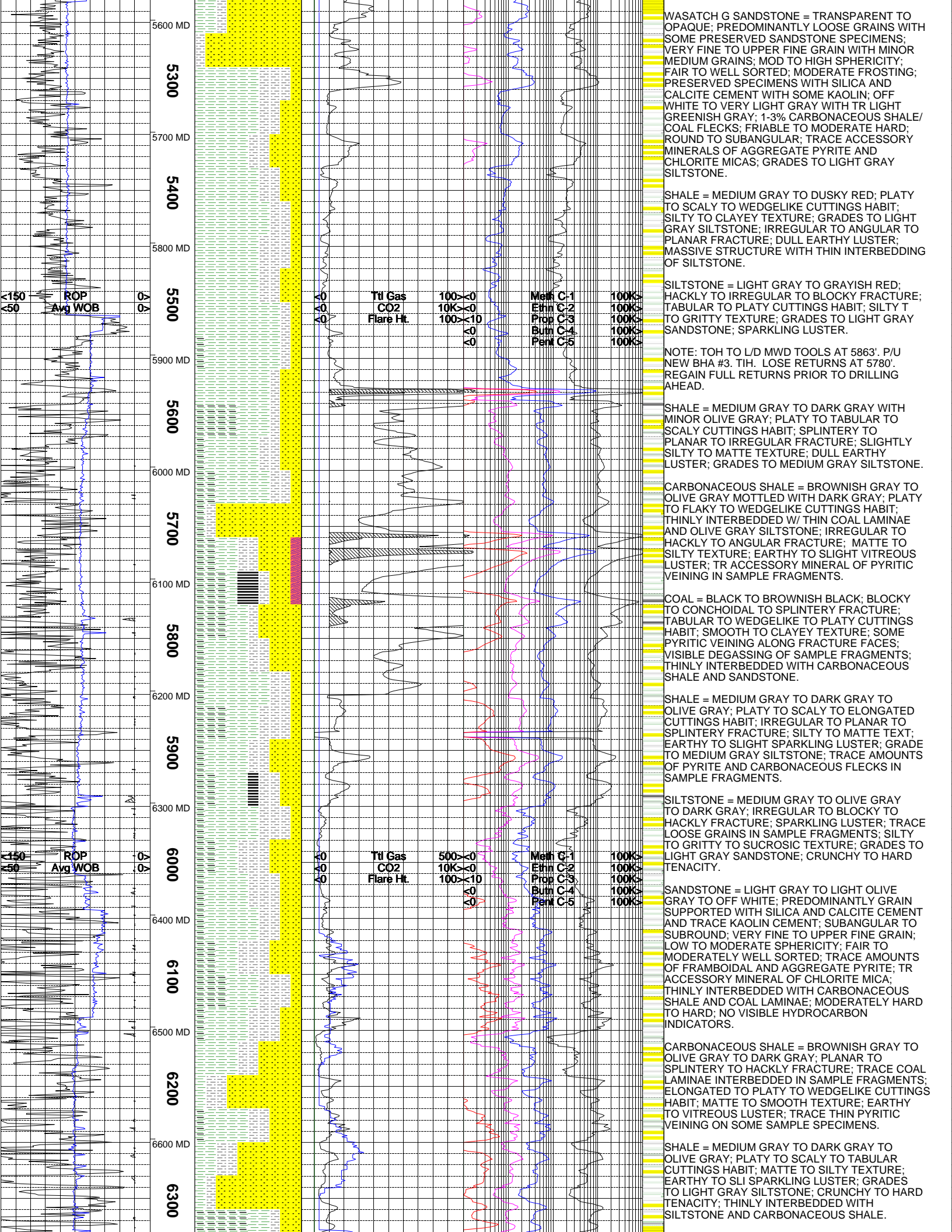
SILTSTONE = LIGHT GRAY TO PALE YELLOWISH GRAY; BLOCKY TO IRREGULAR FRACTURE; PLATY TO WEDGELIKE TO SCALY CUTTINGS HABIT; SILTY TO SUCROSIC TEXTURE; GRADES TO LIGHT GRAY SANDSTONE; SPARKLING TO SEMI EARTHY LUSTER; THINLY INTERBEDDED WITH SHALE.

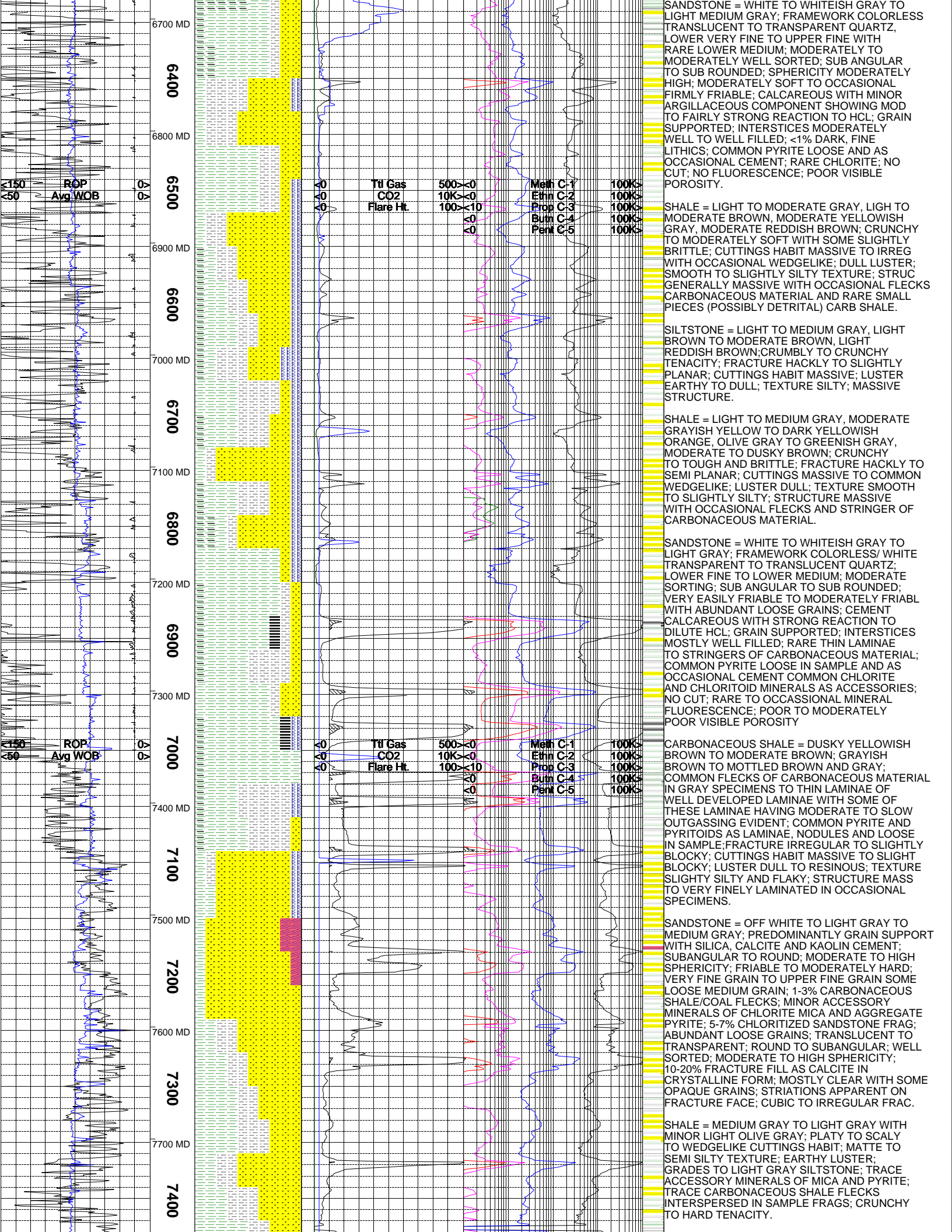
SANDSTONE = OFF WHITE TO LIGHT GRAY TO MEDIUM GRAY; FRIABLE TO MODERATE HARD; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND CALCITE CEMENT AND MINOR AMT OF KAOLIN; 2-4% DARK LITHIC MATERIAL; TR AMOUNT OF NAHCOLITE IN SAMPLE; ANGULAR TO SUBROUND; LOW TO MODERATE SPHERICITY; FAIRLY SORTED; VERY FINE TO UPPER FINE GRAIN; TRACE ACCESSORY MINERAL OF MICRO PYRITE.

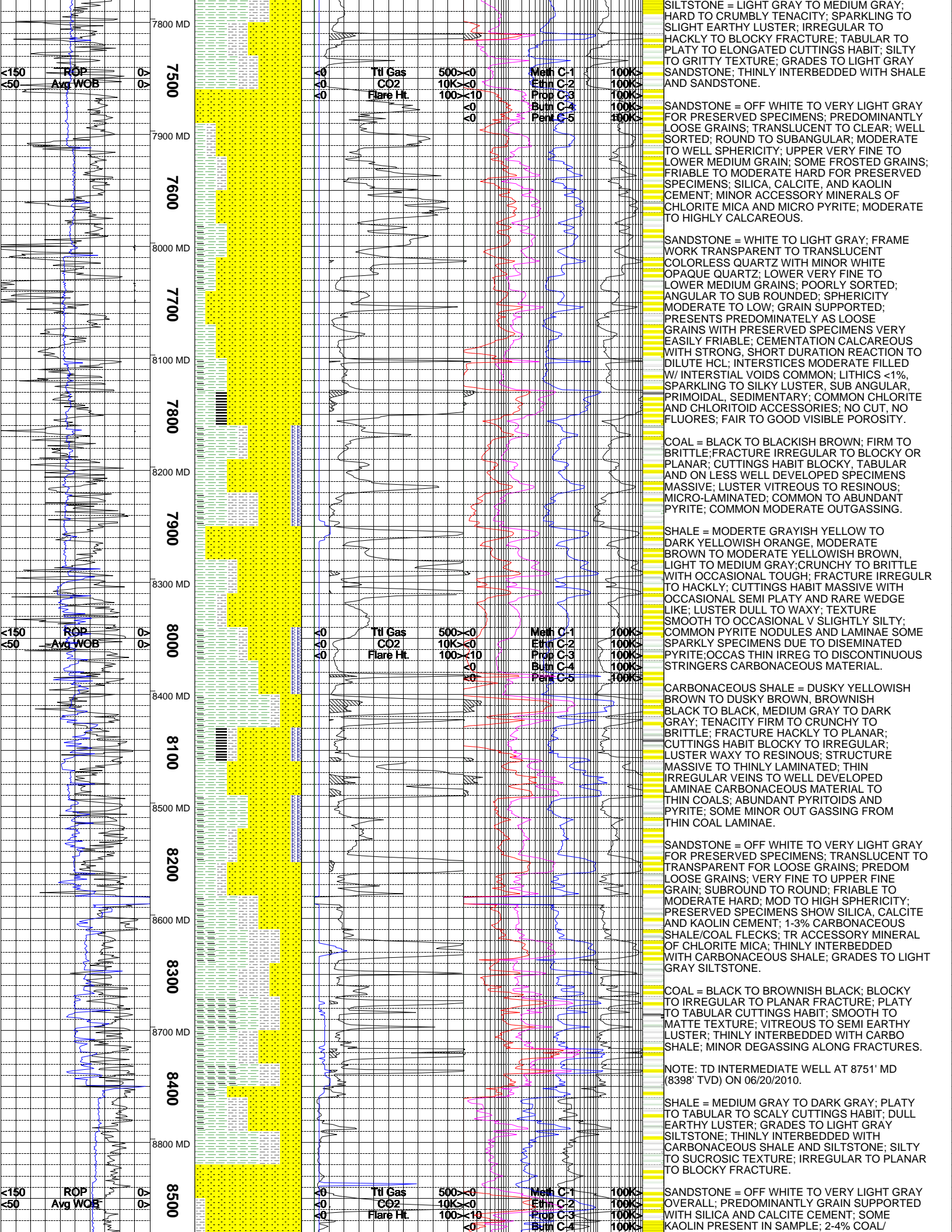
SHALE = PALE TO MODERATE YELLOWISH GRAY MOTTLED WITH LIGHT GRAY; PLATY TO SCALY TO WEDGELIKE CUTTINGS HABIT; CLAYEY TO MATTE TEXTURE; IRREGULAR TO SPLINTRY FRACTURE; EARTHY LUSTER; MASSIVE STRUC; FIRM TO CRUNCHY TENACITY.

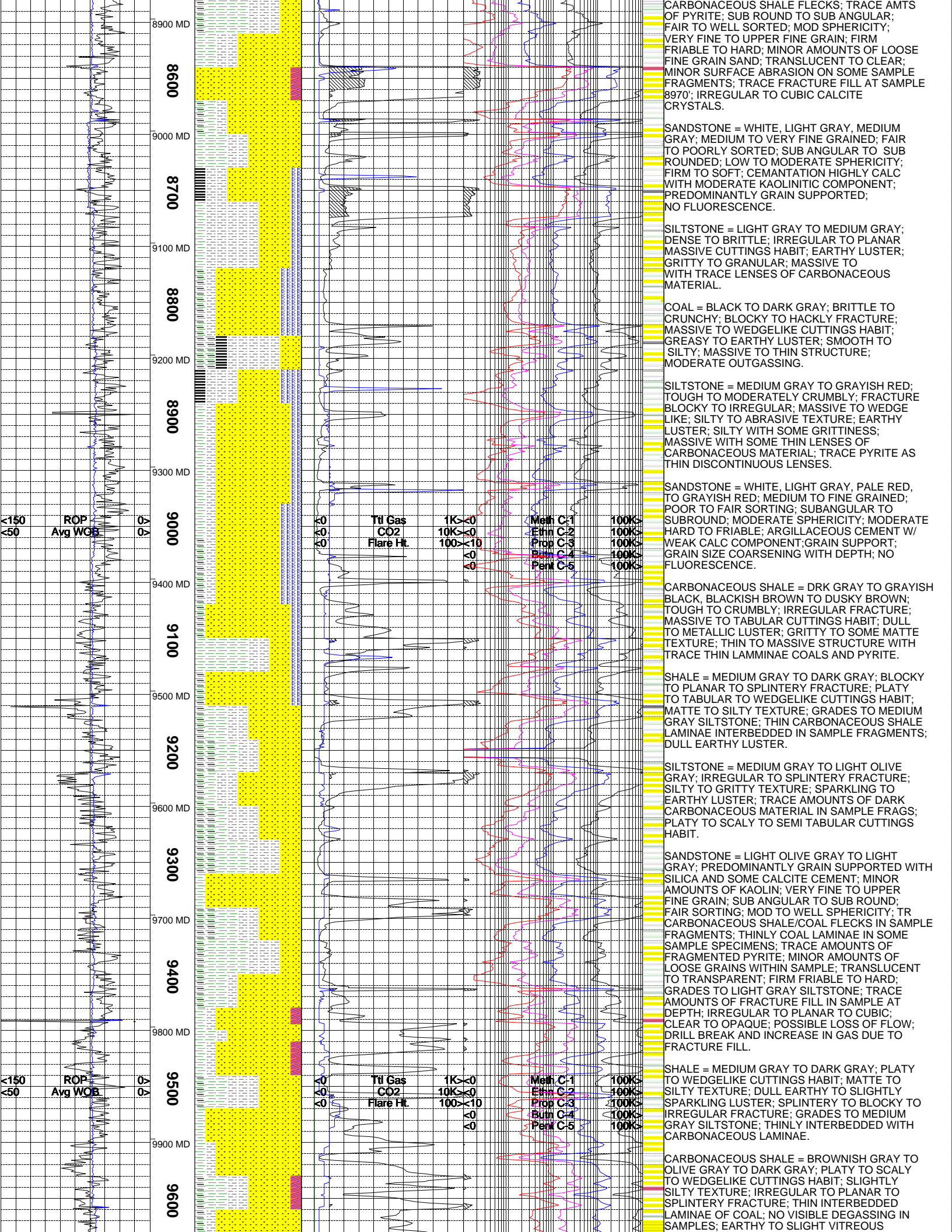
SHALE = PALE TO MODERATE YELLOWISH GRAY TO LIGHT GRAY MOTTLED WITH DUSKY RED; BLOCKY TO PLANAR TO HACKLY FRACTURE; PLATY TO WEDGELIKE TO SEMI ELONGATED CUTTINGS HABIT; CLAYEY TO SEMI SILTY TEXTURE; DULL EARTHY LUSTER; GRADES TO PALE YELLOWISH GRAY SILTSTONE.

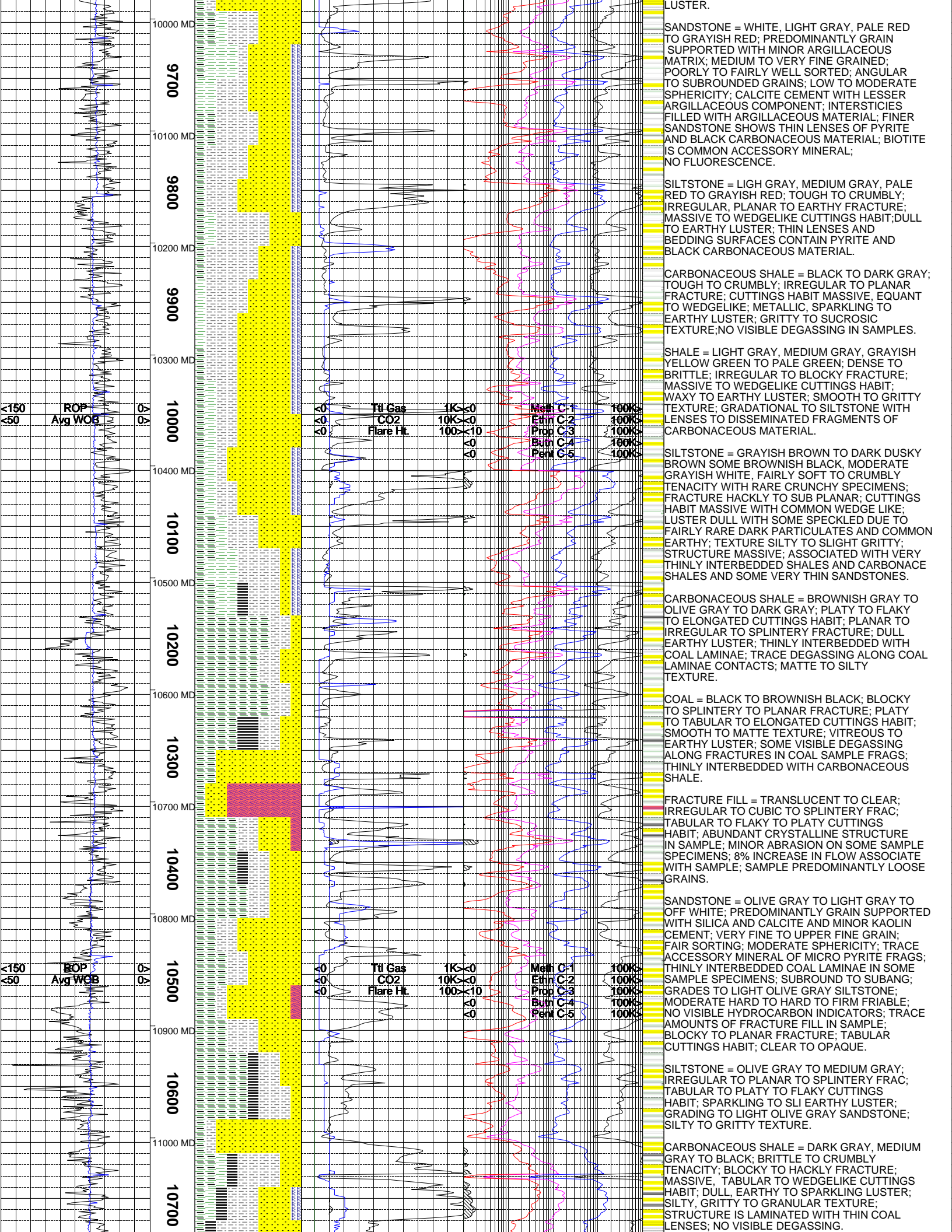












SANDSTONE = WHITE, LIGHT GRAY, PALE RED TO GRAYISH RED; PREDOMINANTLY GRAIN SUPPORTED WITH MINOR ARGILLACEOUS MATRIX; MEDIUM TO VERY FINE GRAINED; POORLY TO FAIRLY WELL SORTED; ANGULAR TO SUBROUNDED GRAINS; LOW TO MODERATE SPHERICITY; CALCITE CEMENT WITH LESSER ARGILLACEOUS COMPONENT; INTERSTICES FILLED WITH ARGILLACEOUS MATERIAL; FINER SANDSTONE SHOWS THIN LENSES OF PYRITE AND BLACK CARBONACEOUS MATERIAL; BIOTITE IS COMMON ACCESSORY MINERAL; NO FLUORESCENCE.

SILTSTONE = LIGH GRAY, MEDIUM GRAY, PALE RED TO GRAYISH RED; TOUGH TO CRUMBLY; IRREGULAR, PLANAR TO EARTHY FRACTURE; MASSIVE TO WEDGELIKE CUTTINGS HABIT; DULL TO EARTHY LUSTER; THIN LENSES AND BEDDING SURFACES CONTAIN PYRITE AND BLACK CARBONACEOUS MATERIAL.

CARBONACEOUS SHALE = BLACK TO DARK GRAY; TOUGH TO CRUMBLY; IRREGULAR TO PLANAR FRACTURE; CUTTINGS HABIT MASSIVE, EQUANT TO WEDGELIKE; METALLIC, SPARKLING TO EARTHY LUSTER; GRITTY TO SUCROSIC TEXTURE; NO VISIBLE DEGASSING IN SAMPLES.

SHALE = LIGHT GRAY, MEDIUM GRAY, GRAYISH YELLOW GREEN TO PALE GREEN; DENSE TO BRITTLE; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO WEDGELIKE CUTTINGS HABIT; WAXY TO EARTHY LUSTER; SMOOTH TO GRITTY TEXTURE; GRADATIONAL TO SILTSTONE WITH LENSES TO DISSEMINATED FRAGMENTS OF CARBONACEOUS MATERIAL.

SILTSTONE = GRAYISH BROWN TO DARK DUSKY BROWN SOME BROWNISH BLACK, MODERATE GRAYISH WHITE, FAIRLY SOFT TO CRUMBLY TENACITY WITH RARE CRUNCHY SPECIMENS; FRACTURE HACKLY TO SUB PLANAR; CUTTINGS HABIT MASSIVE WITH COMMON WEDGE LIKE; LUSTER DULL WITH SOME SPECKLED DUE TO FAIRLY RARE DARK PARTICULATES AND COMMON EARTHY; TEXTURE SILTY TO SLIGHT GRITTY; STRUCTURE MASSIVE; ASSOCIATED WITH VERY THINLY INTERBEDDED SHALES AND CARBONACE SHALES AND SOME VERY THIN SANDSTONES.

CARBONACEOUS SHALE = BROWNISH GRAY TO OLIVE GRAY TO DARK GRAY; PLATY TO FLAKY TO ELONGATED CUTTINGS HABIT; PLANAR TO IRREGULAR TO SPLINTERY FRACTURE; DULL EARTHY LUSTER; THINLY INTERBEDDED WITH COAL LAMINAE; TRACE DEGASSING ALONG COAL LAMINAE CONTACTS; MATTE TO SILTY TEXTURE.

COAL = BLACK TO BROWNISH BLACK; BLOCKY TO SPLINTERY TO PLANAR FRACTURE; PLATY TO TABULAR TO ELONGATED CUTTINGS HABIT; SMOOTH TO MATTE TEXTURE; VITREOUS TO EARTHY LUSTER; SOME VISIBLE DEGASSING ALONG FRACTURES IN COAL SAMPLE FRAGS; THINLY INTERBEDDED WITH CARBONACEOUS SHALE.

FRACTURE FILL = TRANSLUCENT TO CLEAR; IRREGULAR TO CUBIC TO SPLINTERY FRAC; TABULAR TO FLAKY TO PLATY CUTTINGS HABIT; ABUNDANT CRYSTALLINE STRUCTURE IN SAMPLE; MINOR ABRASION ON SOME SAMPLE SPECIMENS; 8% INCREASE IN FLOW ASSOCIATE WITH SAMPLE; SAMPLE PREDOMINANTLY LOOSE GRAINS.

SANDSTONE = OLIVE GRAY TO LIGHT GRAY TO OFF WHITE; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND CALCITE AND MINOR KAOLIN CEMENT; VERY FINE TO UPPER FINE GRAIN; FAIR SORTING; MODERATE SPHERICITY; TRACE ACCESSORY MINERAL OF MICRO PYRITE FRAGS; THINLY INTERBEDDED COAL LAMINAE IN SOME SAMPLE SPECIMENS; SUBROUND TO SUBANG; GRADES TO LIGHT OLIVE GRAY SILTSTONE; MODERATE HARD TO HARD TO FIRM FRIABLE; NO VISIBLE HYDROCARBON INDICATORS; TRACE AMOUNTS OF FRACTURE FILL IN SAMPLE; BLOCKY TO PLANAR FRACTURE; TABULAR CUTTINGS HABIT; CLEAR TO OPAQUE.

SILTSTONE = OLIVE GRAY TO MEDIUM GRAY; IRREGULAR TO PLANAR TO SPLINTERY FRAC; TABULAR TO PLATY TO FLAKY CUTTINGS HABIT; SPARKLING TO SLI EARTHY LUSTER; GRADING TO LIGHT OLIVE GRAY SANDSTONE; SILTY TO GRITTY TEXTURE.

CARBONACEOUS SHALE = DARK GRAY, MEDIUM GRAY TO BLACK; BRITTLE TO CRUMBLY TENACITY; BLOCKY TO HACKLY FRACTURE; MASSIVE, TABULAR TO WEDGELIKE CUTTINGS HABIT; DULL, EARTHY TO SPARKLING LUSTER; SILTY, GRITTY TO GRANULAR TEXTURE; STRUCTURE IS LAMINATED WITH THIN COAL LENSES; NO VISIBLE DEGASSING.

