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 Production
WELL	FRU 197-33B6
FIELD	Piceance Creek
REGION	Rockies
COORDINATES	39.921441
	108.282516
ELEVATION	6459'
COUNTY, STATE	Rio Blanco, CO
API INDEX	051031142400
SPUD DATE	03/30/2010
CONTRACTOR	HP
CO. REP.	W.GARNER/ C.CURTIS
RIG/TYPE	HP321
LOGGING UNIT	MLU#31
GEOLOGISTS	M.FRANCO/C.RECORD
	B.DELANEY
ADD. PERSONS	M.PIPER/ R.MCCANE
CO. GEOLOGIST	CHRIS ALBA

LOG INTERVAL

DEPTHS:	4045'	**TO**	12776'
DATES:	07/05/2010	**TO**	07/17/2010
SCALE:	5" = 100'		

MUD TYPES

WATER-BASED	**TO**	4055'
LSND	**TO**	12776'
	TO	
	TO	

CASING DATA

16"	**AT**	149'
10.75"	**AT**	4045'
4"	**AT**	12776'
	AT	

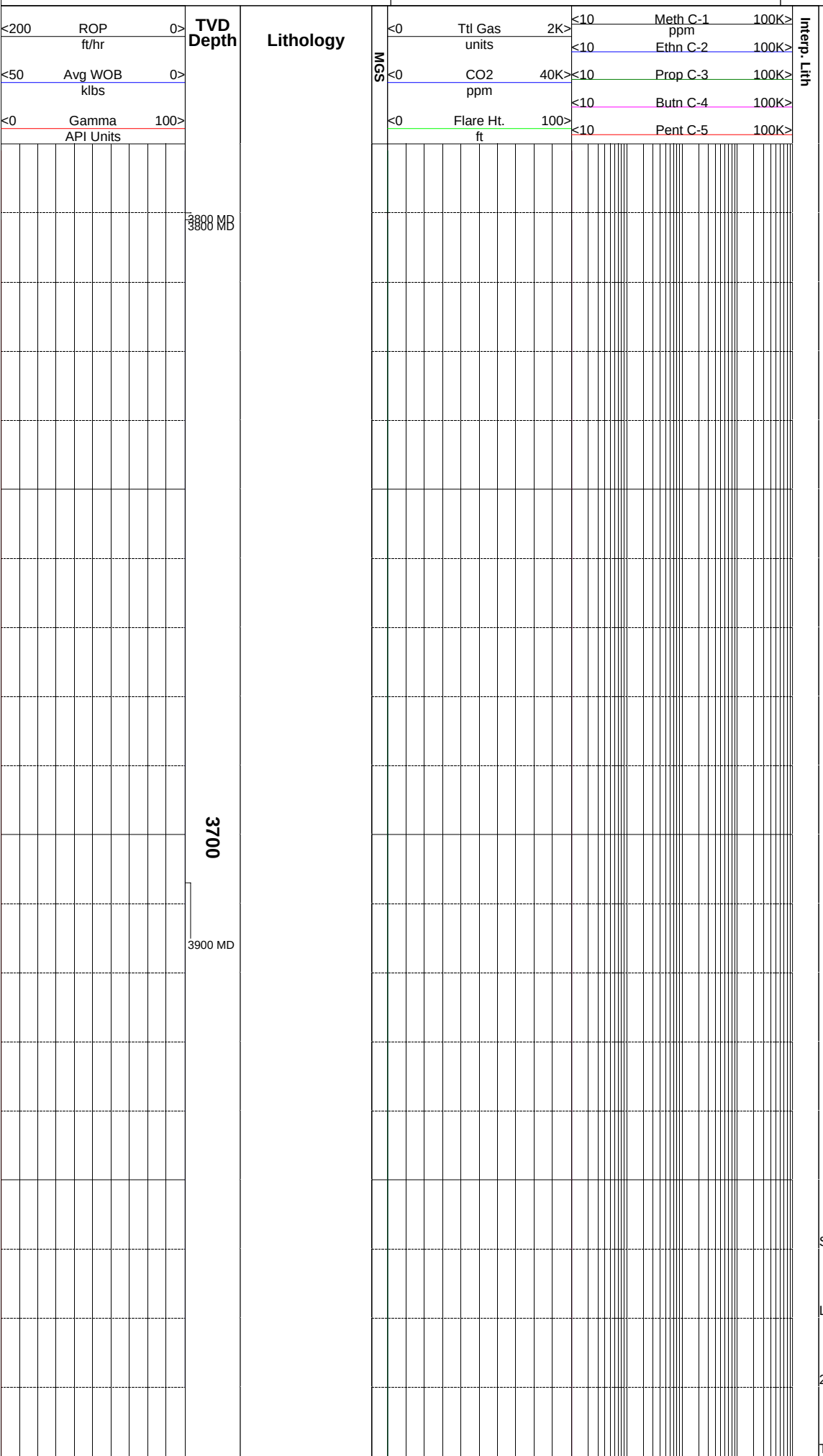
HOLE SIZE

14.00"	**TO**	4055'
10.00"	**TO**	10343'
8.15"	**TO**	12776'
	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		

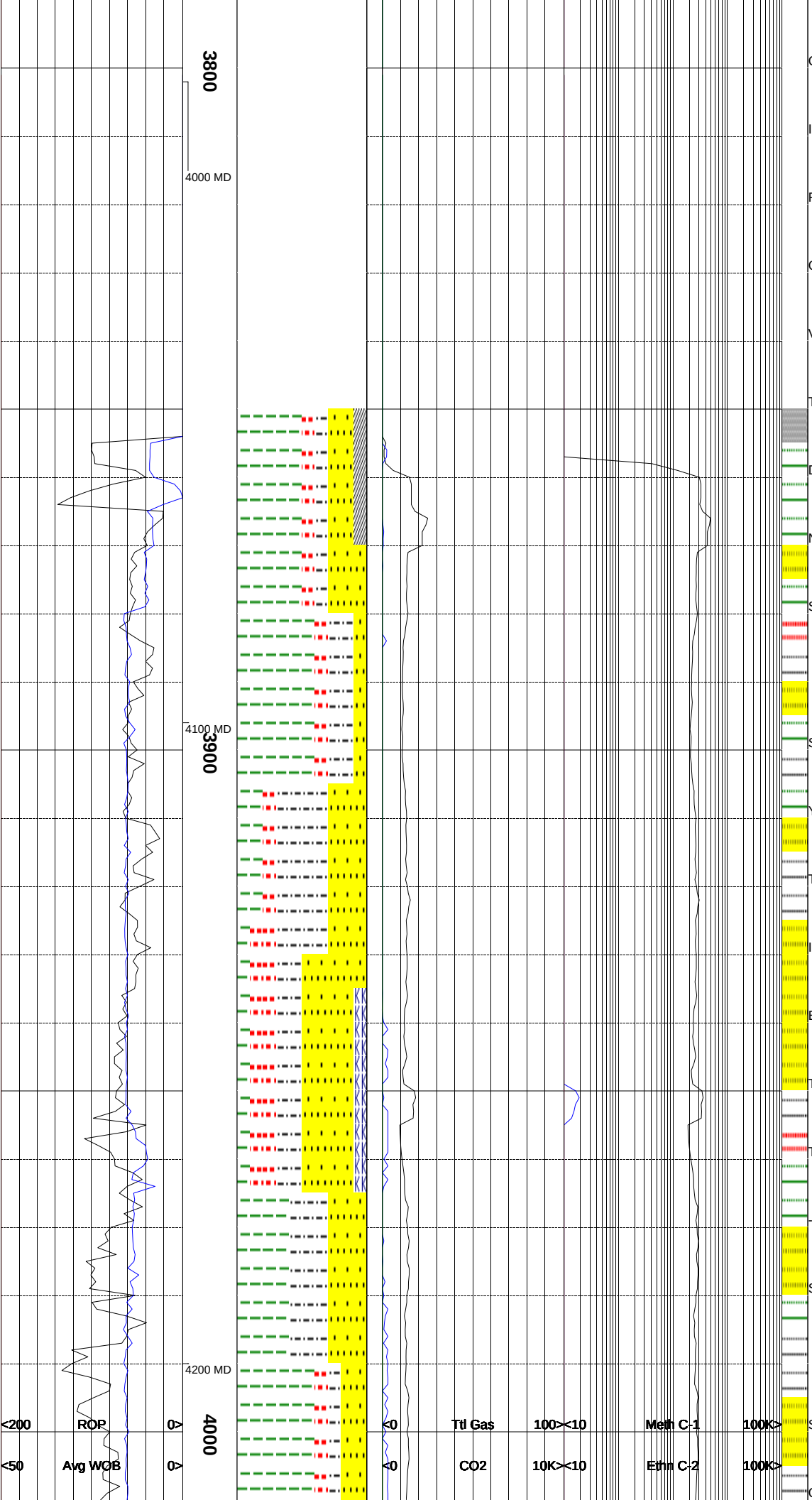
ALTERED ZONE
ANDESITE
ANHYDRITE
BASALT
BENTONITE
BIOTITIZATION
BRECCIA
CALCARENITE
CALCAREOUS TUFF
CALCILUTITE
CARBONATES
CARBONACEOUS MAT
CARBONACEOUS SH
CEMENT CONTAM.
CHALK
CRYSTALLINE TUFF
CHERT - ARGILL
CHERT - GLASSY
CHERT - PORCEL
CHERT - TIGER STRIPE
CHERT - UNDIFF
CLAY
CLAY-MUDSTONE
CLYST-TUFFACEOUS
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.

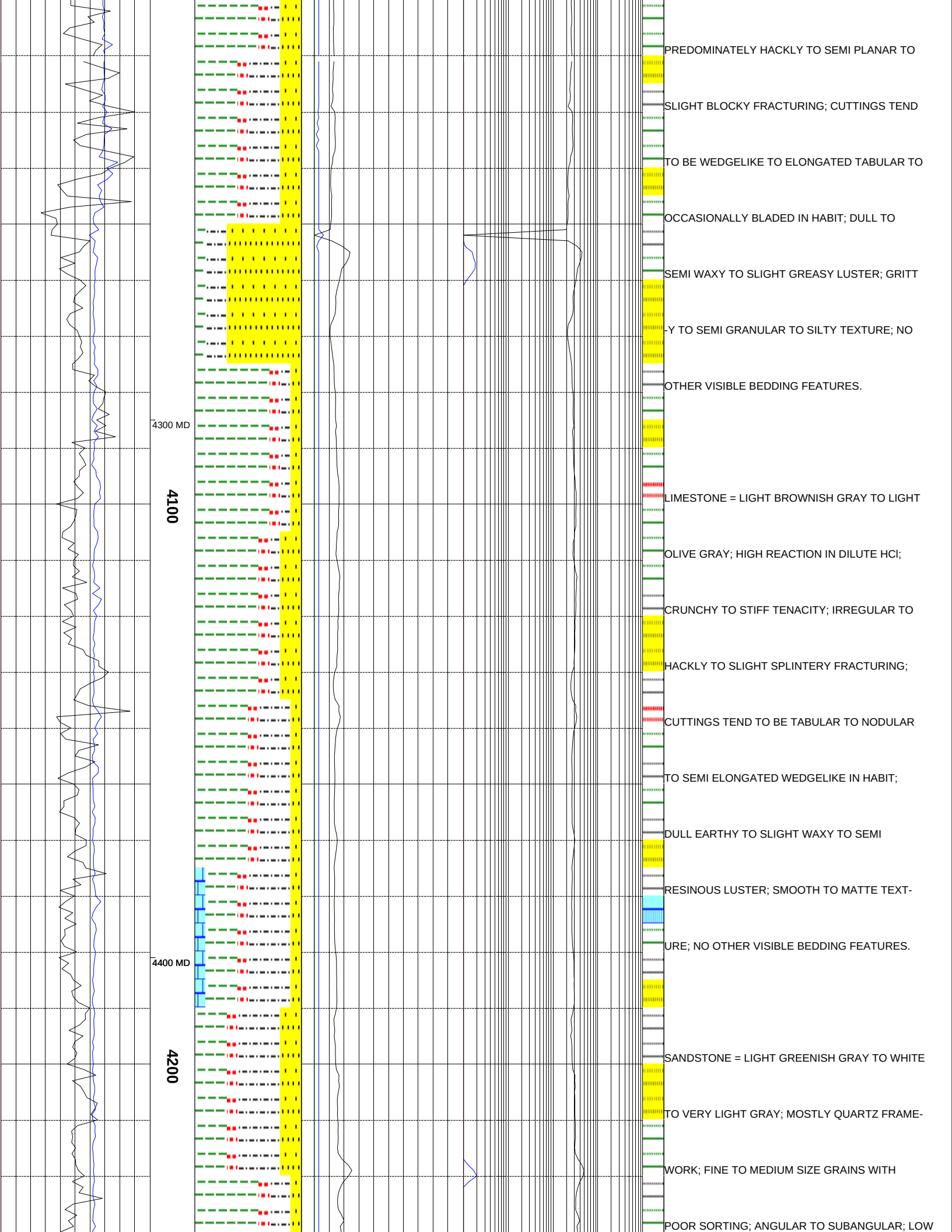
SANDSTONE = WHITE TO TRANSLUCENT TO VERY LIGHT GRAY; MOSTLY QUARTZ FRAMEWORK WITH 2-3% DARK LITHICS VISIBLE IN SAMPLE; 15% TO 20% PALESOLS VISIBLE IN SAMPLE; VERY

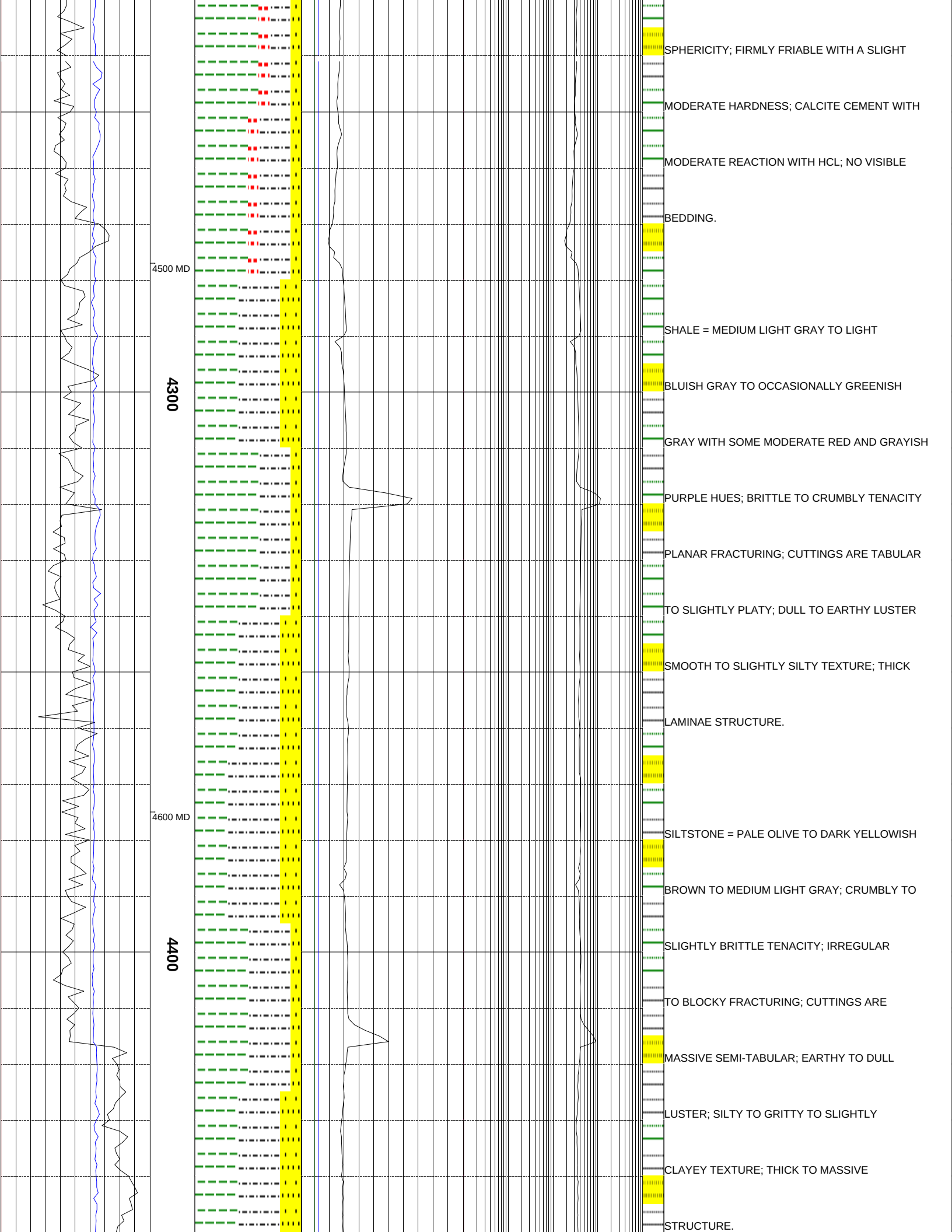


COARSE TO MEDIUM TO FINE GRAIN; GRADES INTO A FINE GRAIN SILTSTONE; FAIR TO POORLY SORTED; SUBROUND TO SUBANGULAR GRAINS; MODERATE TO LOW SPHERICITY; NO VISIBLE SURFACE FEATURES; MODERATE HARD TO FIRM FRIABLE; CALCITIC CEMENTATION DUE TO MODERATE REACTION IN DILUTE HCl; NO VISIBLE HYDROCARBONS IN SAMPLE; GRAIN SUPPORTED.

SHALE = VERY LIGHT GRAY TO SLIGHT MOTTLE YELLOWISH BROWN; BRITTLE TO CRUMBLY TENACITY; PLANAR TO SLIGHT SPLINTERY TO IRREGULAR FRACTURING; CUTTINGS TEND TO BE PLATY TO FLAKY IN HABIT; DULL EARTHY TO SEMI GREASY LUSTER; SMOOTH TO CLAYEY TEXTURE; NO OTHER VISIBLE BEDDING FEATUR -ES; VISIBLE NACHOLITE CRYSTALS IN THE SAMPLE.

SILTSTONE = MEDIUM LIGHT GRAY TO LIGHT OLIVE GRAY; CRUNCHY TO STIFF TENACITY;


PREDOMINATELY HACKLY TO SEMI PLANAR TO
SLIGHT BLOCKY FRACTURING; CUTTINGS TEND
TO BE WEDGELIKE TO ELONGATED TABULAR TO
OCCASIONALLY BLADED IN HABIT; DULL TO
SEMI WAXY TO SLIGHT GREASY LUSTER; GRITT
-Y TO SEMI GRANULAR TO SILTY TEXTURE; NO
OTHER VISIBLE BEDDING FEATURES.
4300 MD
4100
LIMESTONE = LIGHT BROWNISH GRAY TO LIGHT
OLIVE GRAY; HIGH REACTION IN DILUTE HCl;
CRUNCHY TO STIFF TENACITY; IRREGULAR TO
HACKLY TO SLIGHT SPLINTERY FRACTURING;
CUTTINGS TEND TO BE TABULAR TO NODULAR
TO SEMI ELONGATED WEDGELIKE IN HABIT;
DULL EARTHY TO SLIGHT WAXY TO SEMI
RESINOUS LUSTER; SMOOTH TO MATTE TEXT-
URE; NO OTHER VISIBLE BEDDING FEATURES.
4400 MD
4200
SANDSTONE = LIGHT GREENISH GRAY TO WHITE
TO VERY LIGHT GRAY; MOSTLY QUARTZ FRAME-
WORK; FINE TO MEDIUM SIZE GRAINS WITH
POOR SORTING; ANGULAR TO SUBANGULAR; LOW



SPHERICITY; FIRMLY FRIABLE WITH A SLIGHT

MODERATE HARDNESS; CALCITE CEMENT WITH

MODERATE REACTION WITH HCL; NO VISIBLE

BEDDING.

SHALE = MEDIUM LIGHT GRAY TO LIGHT

BLUISH GRAY TO OCCASIONALLY GREENISH

GRAY WITH SOME MODERATE RED AND GRAYISH

PURPLE HUES; BRITTLE TO CRUMBLY TENACITY

PLANAR FRACTURING; CUTTINGS ARE TABULAR

TO SLIGHTLY PLATY; DULL TO EARTHY LUSTER

SMOOTH TO SLIGHTLY SILTY TEXTURE; THICK

LAMINAE STRUCTURE.

SILTSTONE = PALE OLIVE TO DARK YELLOWISH

BROWN TO MEDIUM LIGHT GRAY; CRUMBLY TO

SLIGHTLY BRITTLE TENACITY; IRREGULAR

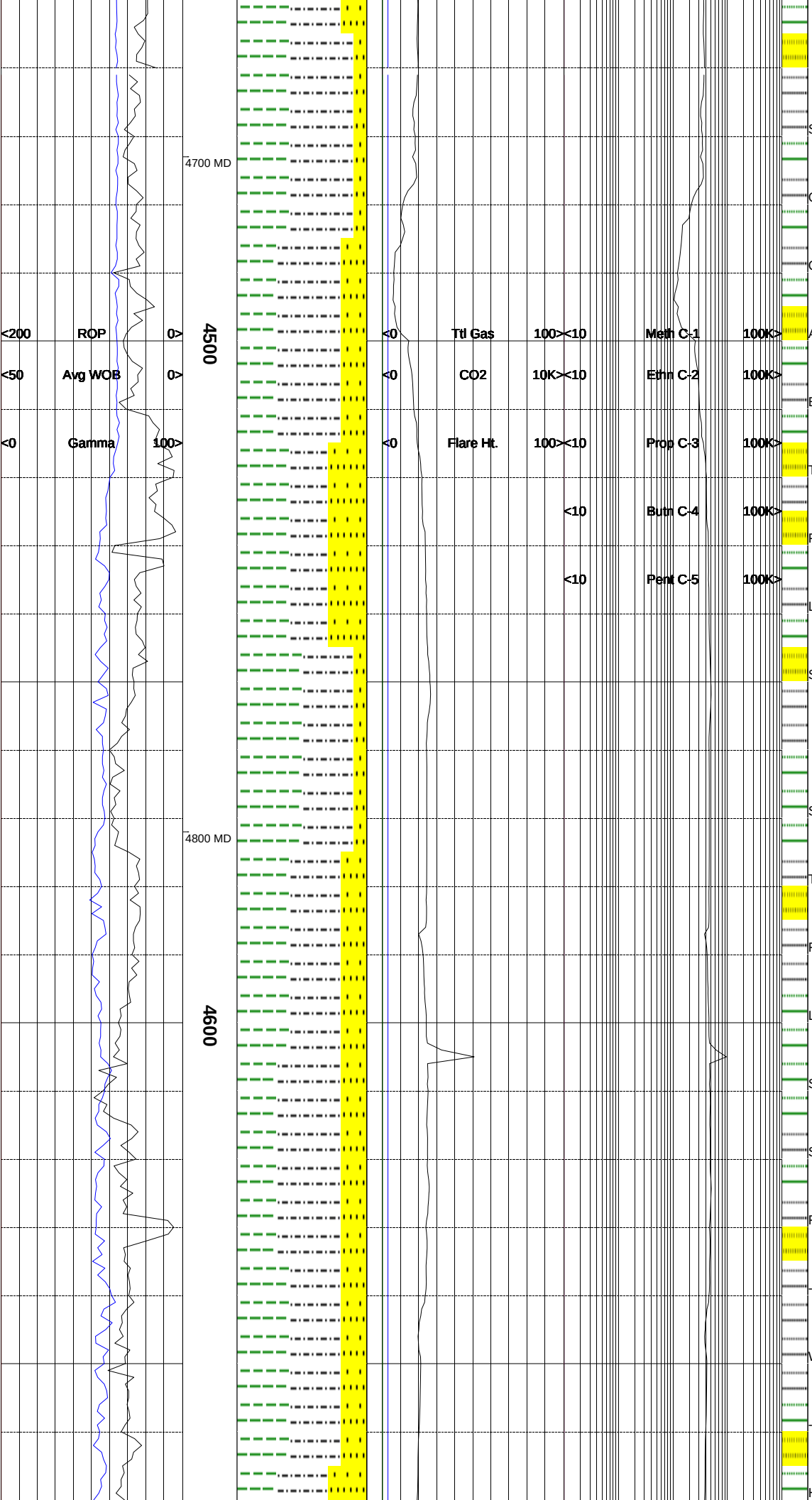
TO BLOCKY FRACTURING; CUTTINGS ARE

MASSIVE SEMI-TABULAR; EARTHY TO DULL

LUSTER; SILTY TO GRITTY TO SLIGHTLY

CLAYEY TEXTURE; THICK TO MASSIVE

STRUCTURE.



SHALE = MEDIUM LIGHT GRAY TO GRAYISH

GREEN TO LIGHT BLUISH GRAY WITH STREAKS

OF GRAYISH PURPLE AND LIGHT OLIVE BROWN

AND DUSKY RED; CRUMBLY TO SLIGHTLY

BRITTLE TENACITY; IRREGULAR TO BLOCKY

TO SEMI-PLANAR FRACTURING; TABULAR TO

PLATY CUTTINGS; DULL TO EARTHY TO WAXY

LUSTER; SMOOTH TO CLAYEY TEXTURE; THICK

STRUCTURE.

SANDSTONE = VERY LIGHT GRAY TO WHITE TO

TRANSLUCENT; COMPOSED OF MOSTLY QUARTZ

FRAMEWORK WITH APPROXIMATELY 5-10% BLACK

LITHIC CLASTS; FINE GRAINED AND WELL

SORTED; SUBANGULAR; LOW TO MODERATE

SPHERICITY; MODERATE HARD TO FIRMLY

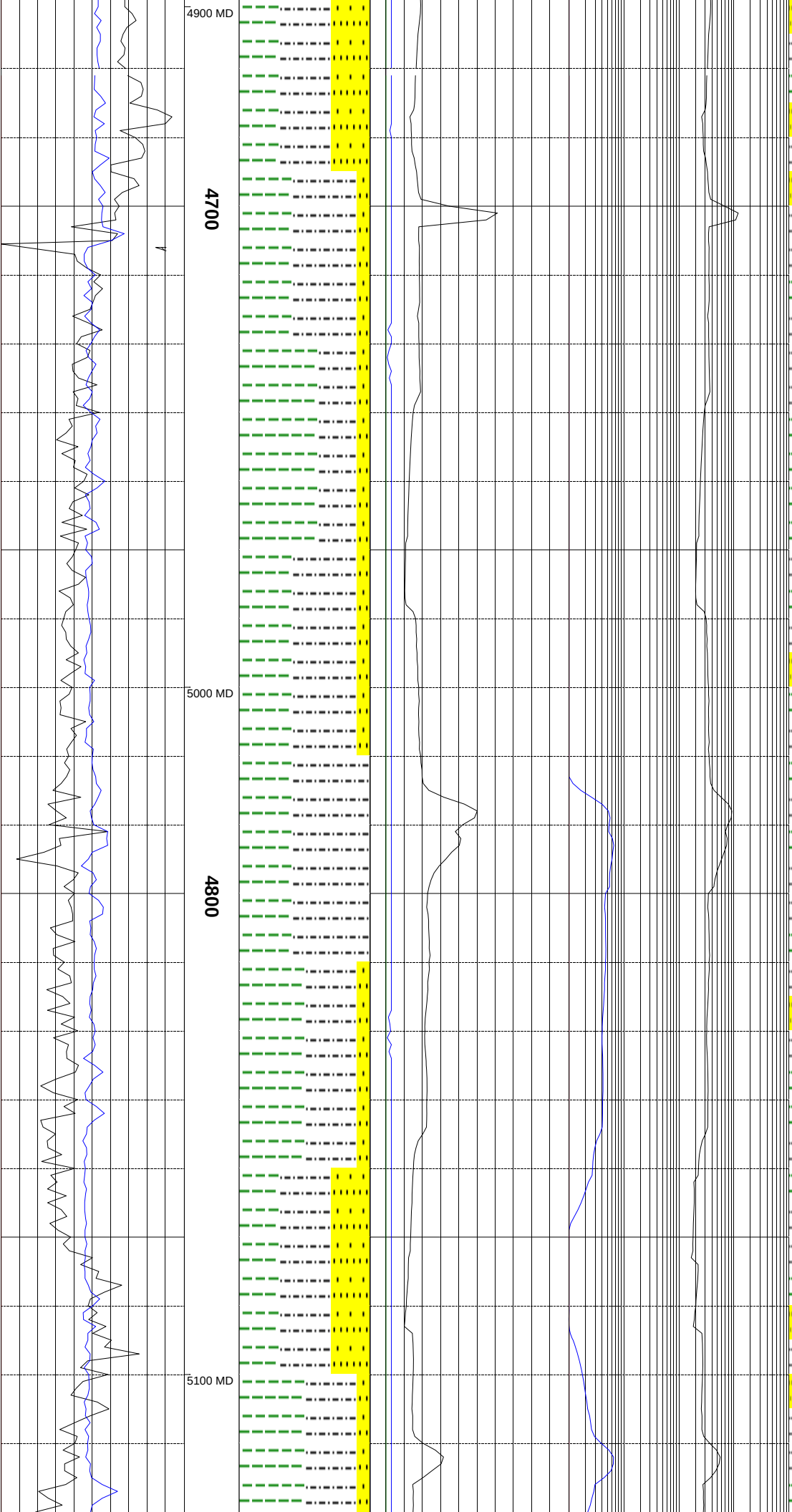
FRIABLE; MODERATE TO WEAK REACTION SUGGE

-STS CALCITE CEMENT; SMALL AMOUNTS OF

WHITE KAOLINITIC MATRIX; NO VISIBLE BEDD

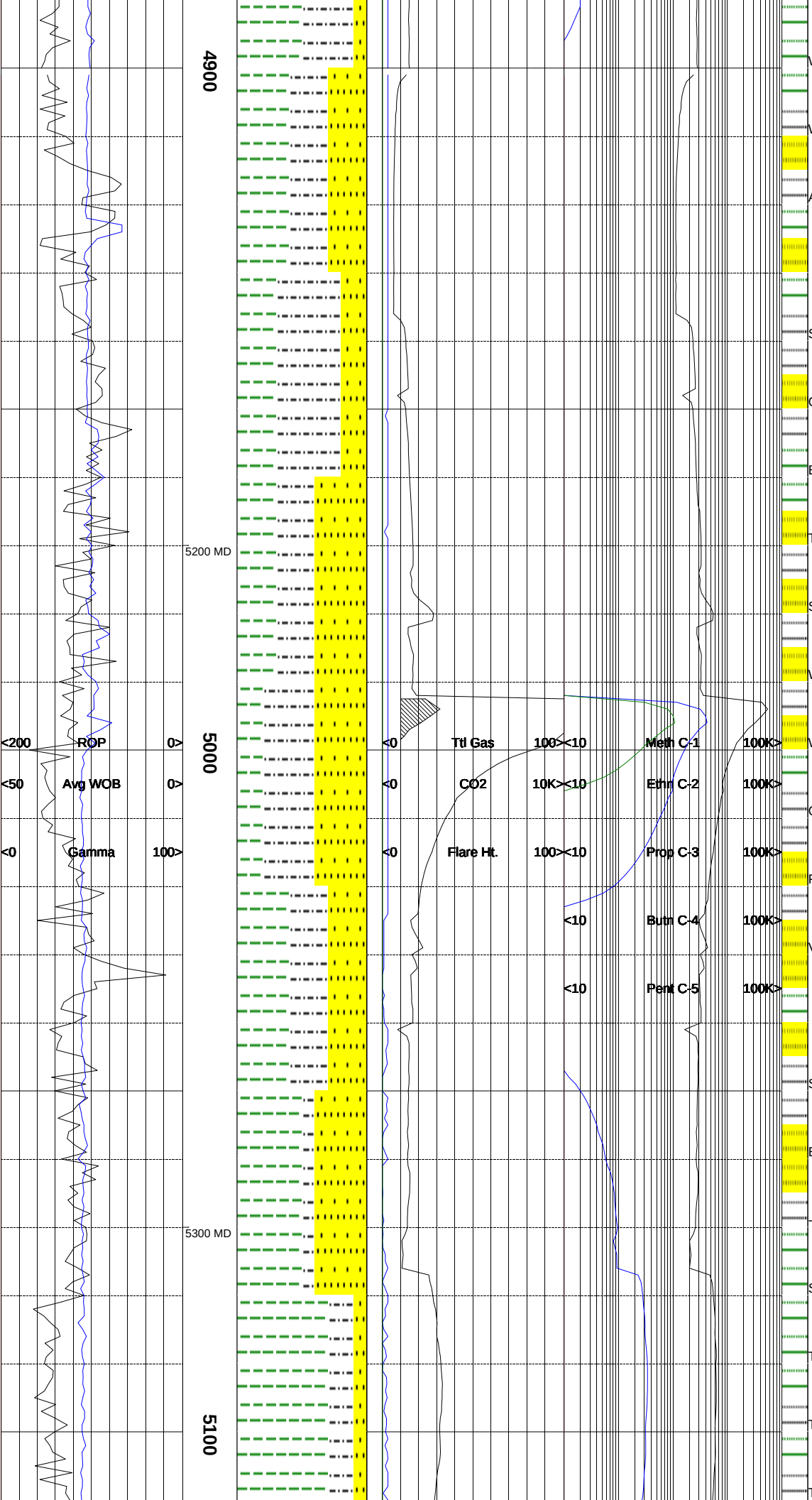
-ING; OCCASIONAL DARK YELLOWISH ORANGE

HUES.



SILTSTONE = MEDIUM GRAY TO LIGHT BROWNISH GRAY TO MODERATE OLIVE BROWN TO MODERATE BROWN; TENACITY IS MOSTLY BRITTLE TO OFTEN CRUMBLY; IRREGULAR TO BLOCKY FRACTURING; CUTTINGS ARE SLIGHTLY MASSIVE TO TABULAR; EARTHY TO SLIGHTLY FROSTED LUSTER; GRITTY TO SILTY TEXTURE; GRADING FROM SANDSTONE; MASSIVE TO THICK STRUCTURE; LOW GAS ASSOCIATED WITH SAMPLE.

SANDSTONE = TRANSLUCENT TO GRAYISH ORANGE PINK TO LIGHT OLIVE GRAY; DOMINATE QUARTZ FRAMEWORK WITH TRACE AMOUNTS OF VERY FINE BLACK CLASTS; MOSTLY FINE GRAINED WITH OCCASIONAL MEDIUM GRAINS; WELL TO FAIR SORTED; SUBROUNDED TO SUBANGULAR WITH MODERATE TO LOW SPHERICITY; MODERATE HARD; SLIGHT TO MODERATE REACTION WITH HCL SUGGESTS SOME CALCITE CEMENT; GRAIN SUPPORTED



WITH OCCASIONAL FRAGMENTS DISPLAYING A

WHITE KAOLINITIC MATRIX; INCREASING

AMOUNT OF LOOSE GRAINS IN SAMPLE.

SHALE = MEDIUM BLUSH GRAY TO GRAYISH

GREEN TO MEDIUM GRAY WITH LIGHT OLIVE

BROWN TO MEDIUM YELLOW STREAKS; BRITTLE

TO SLIGHTLY CRUMBLY TENACITY; PLANAR TO

SUB BLOCKY; TABULAR TO PLATY TO SLIGHTLY

WEDGELIKE IN HABIT; DULL EARTHY TO SEMI

WAXY LUSTER; PREDOMINATELY SMOOTH TO

CLAYEY TO SLIGHT MATTE IN TEXTURE; 2-5%

PALEOSOLS VISIBLE IN SAMPLE; NO OTHER

VISIBLE BEDDING FEATURES.

SILTSTONE = VERY LIGHT GRAY TO LIGHT

BLUISH GRAY TO MEDIUM BLUISH GRAY; CRUNC

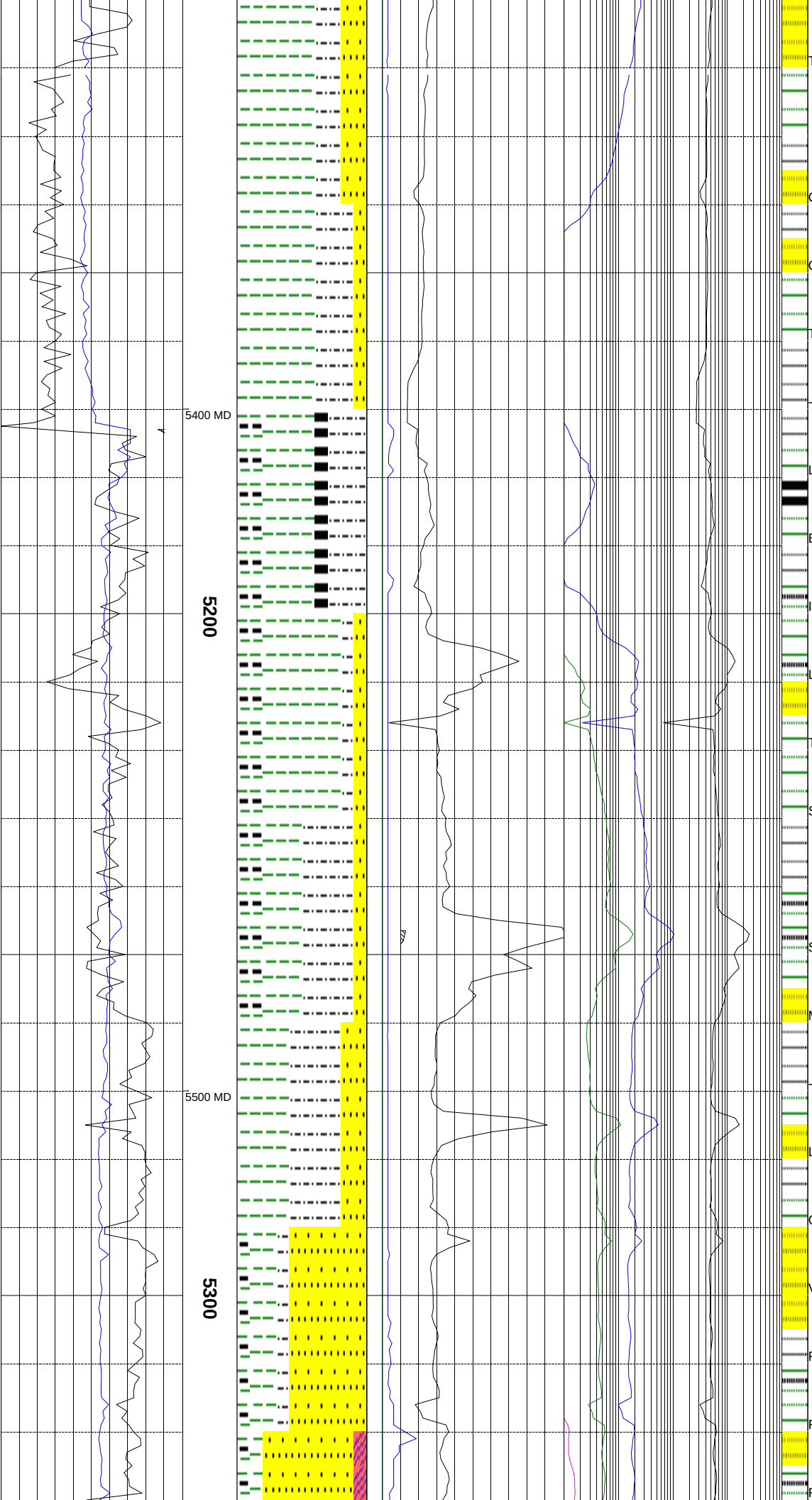
-HY TO CRUMBLY TENACITY; PLANAR TO

SLIGHT HACKLY FRACTURING; CUTTINGS TEND

TO BE PLATY TO SLIGHT WEDGELIKE TO SEMI

TABULAR IN HABIT; SLIGHT FROSTED TO SEMI

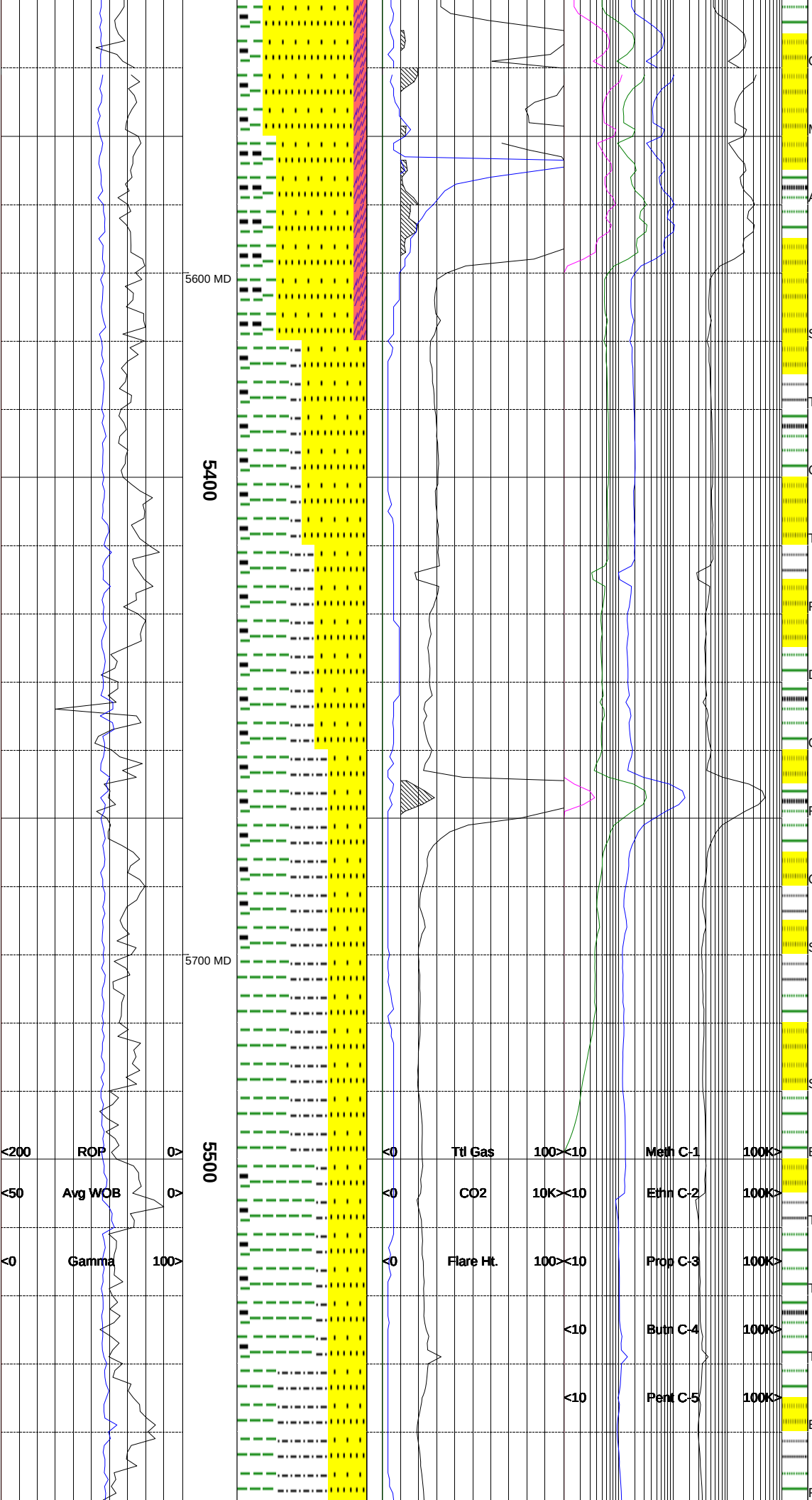
TO SLIGHT GREASY LUSTER; GRITTY TO SILTY



TEXTURE.

CARBONACEOUS SHALE = BROWNISH GRAY TO
OLIVE GRAY TO DARK OLIVE GRAY; CRUNCHY
TO CRUMBLY TO OCCASIONALLY STIFF TENACIT
-Y; PREDOMINATELY PLANAR TO SLIGHT HACK-
LY FRACTURING; VISIBLE BEDS OF CARBONAC-
EOUS MATERIAL; VISIBLE VEINS OF PYRITE
IN SAMPLE; CUTTINGS TEND TO BE WEDGE-
LIKE TO SEMI TABULAR IN HABIT; FROSTED
TO EARTHY LUSTER; TEXTURE RANGES FROM
SMOOTH TO SILTY; THICK STRUCTURE.

SANDSTONE = WHITE TO TRANSLUCENT TO
MEDIUM LIGHT GRAY; DOMINANT QUARTZ FRAME
-WORK WITH APPROXIMATELY 10% FINE BLACK
LITHIC CLASTS EMBEDDED; COARSE TO FINE
GRAINED WITH POOR SORTING; ANGULAR TO
VERY ANGULAR WITH LOW SPHERICITY; EASILY
FRIABLE TO FRIABLE TO OCCASIONALLY FIRML
FRAIBLE; STRONG TO MODERATE STRONG
REACTION WITH HCL SUGGESTS CALCITE



CEMENT; MATRIX SUPPORTED WITH CALCITE

MATRIX; ABUNDENT PYRITE IN SAMPLE AS AN

ACCESSORY MINERAL; NO VISIBLE BEDDING.

SHALE = PALE BLUE TO MEDIUM BLUISH GRAY

TO MEDIUM GRAY; BRITTLE TO SLIGHTLY

CRUNCHY TENACITY; FRACTURES FROM PLANAR

TO SLIGHTLY SPLINTERY; CUTTINGS ARE

PLATY TO FLAKY TO SEMI TABULAR; WAXY TO

DULL LUSTER; SILTY TO SMOOTH TEXTURE;

GRADING FROM SILTSTONE; OCCASIONAL DUSKY

RED AND DARK GREENISH YELLOW HUES

OBSERVED ON SOME OF THE SAMPLE; THICK

STRUCTURE.

SILTSTONE = MEDIUM DARK GRAY TO MODERATE

BROWN TO MODERATE OLIVE BROWN; CRUMBLY

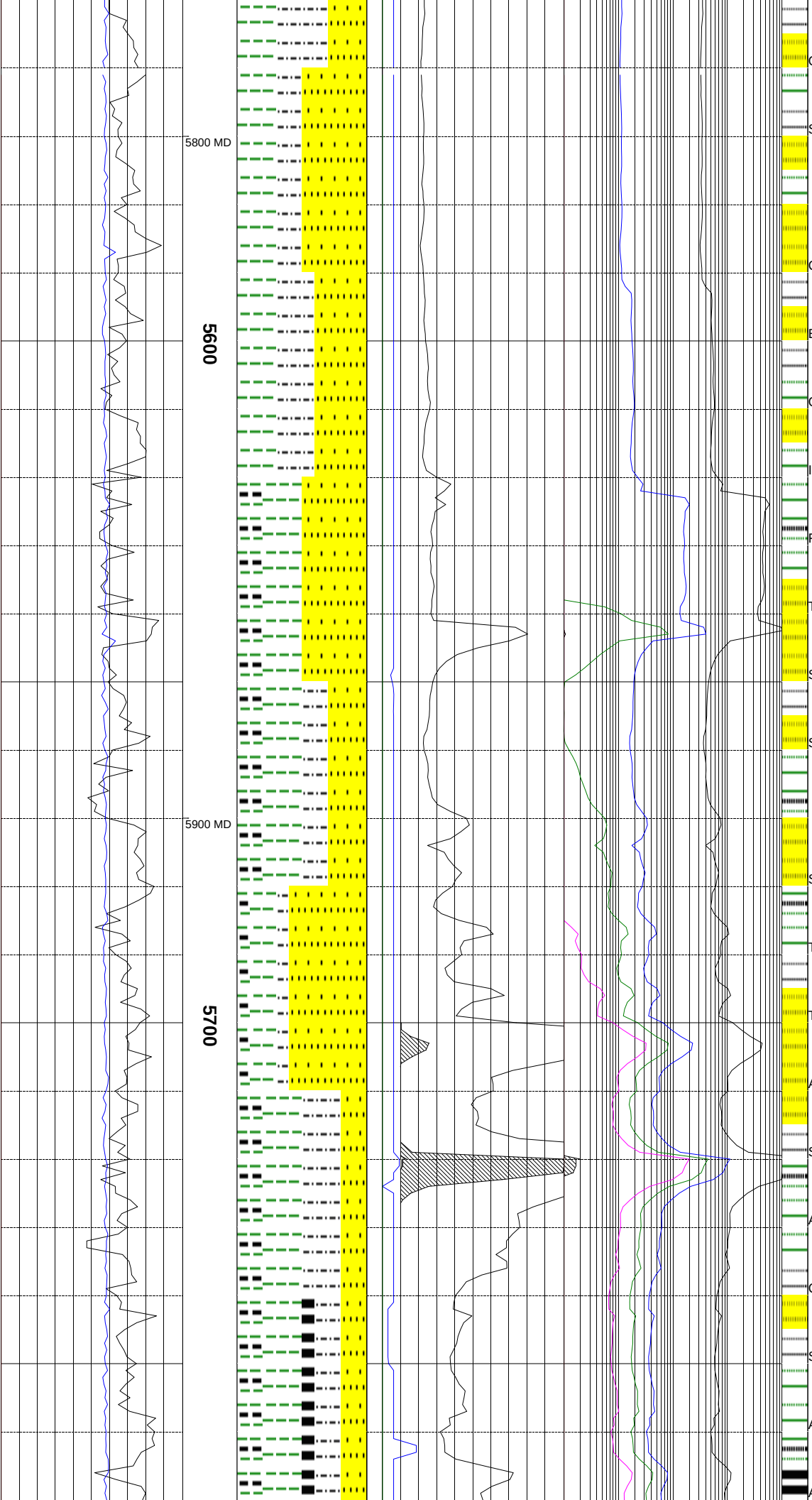
TO SLIGHTLY BRITTLE TENACITY; IRREGULAR

TO BLOCKY FRACTURING; CUTTINGS ARE

TABULAR TO SLIGHTLY MASSIVE HABIT;

EARTHY TO WAXY LUSTER; TEXTURE MOSTLY

RANGES FROM GRITTY TO SILTY AND



OCCASIONALLY SLIGHTLY CLAYEY; THICK

STRUCTURE.

CARBONACEOUS SHALE = GRAYISH BLACK TO

BROWNISH BLACK; DENSE TO BRITTLE WITH

OCCASIONALLY A SLIGHTLY CRUMBLY TENACITY

IRREGULAR TO PLANAR TO SUB BLOCKY

FRACTURING; WEDGELIKE CUTTINGS; POLISHED

TO EARTHY LUSTER; TEXTURE IS SMOOTH TO

SILTY; THIN STRUCTURE; INTERBEDDED WITH

SANDSTONE; SHALE AND SILTSTONE.

SANDSTONE = WHITE TO MEDIUM LIGHT GRAY

TO TRANSLUCENT; QUARTZ FRAMEWORK; COARSE

TO FINE GRAINED WITH POOR SORTING;

ANGULAR TO SUBANGULAR WITH LOW

SPHERICITY; EASILY FRIABLE TO FRIABLE;

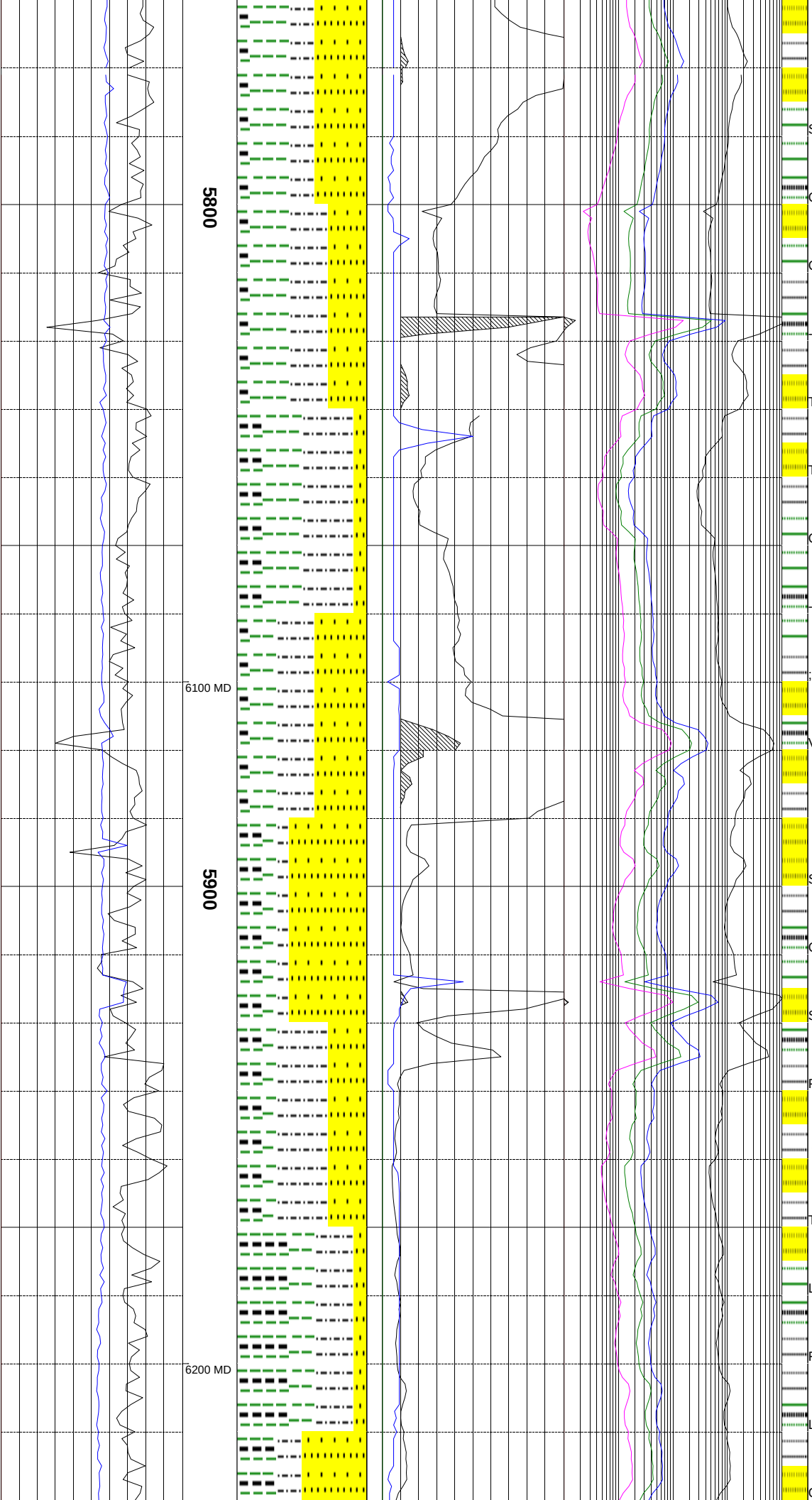
ABUNDENT LOOSE GRAINS IN SAMPLE; CALCITE

CEMENT; MATRIX SUPPORTED WITH CALCITE;

STRONG REACTION WITH DILUTE HCL; TRACE

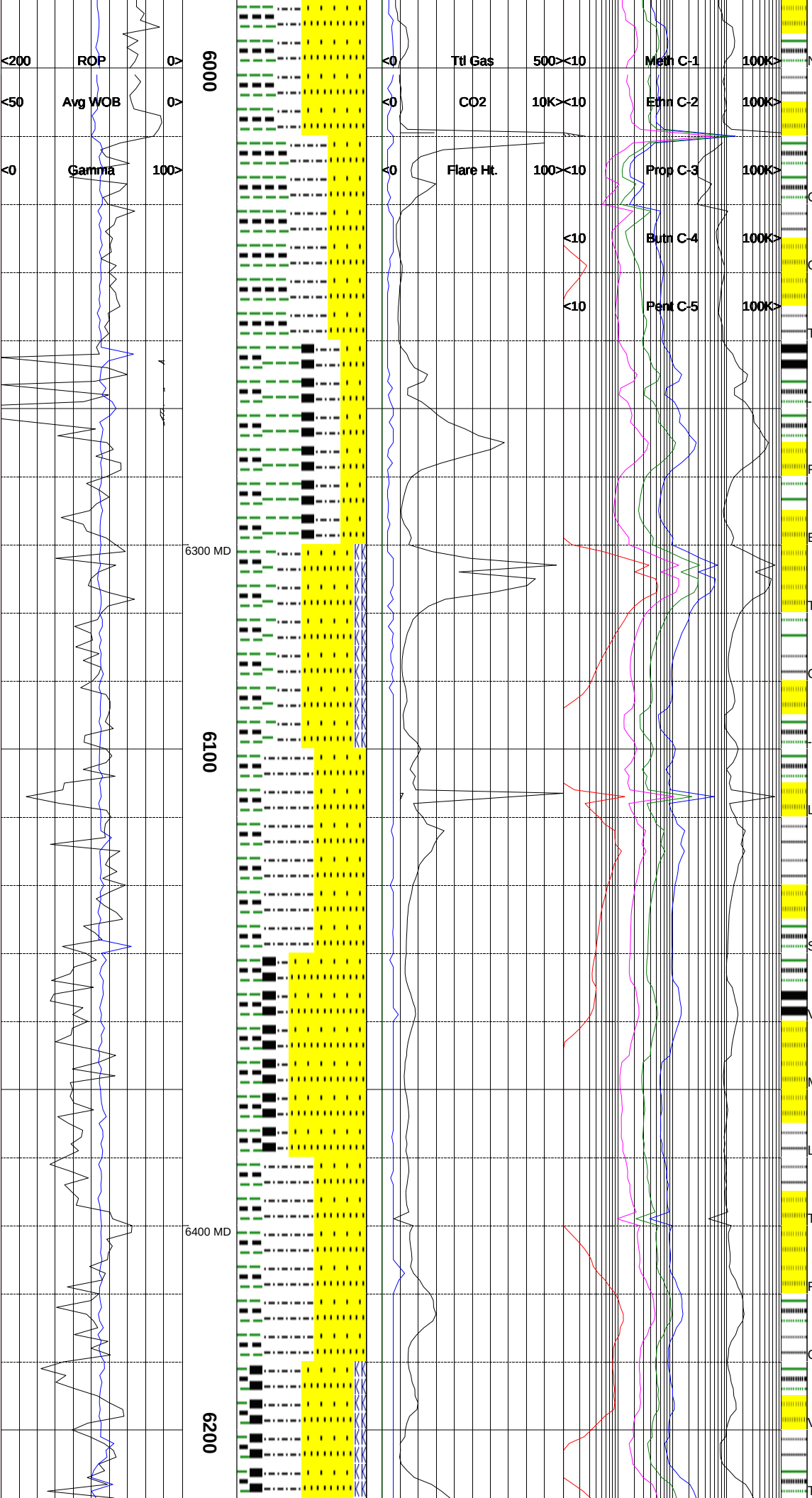
AMOUNTS OF PYRITE PRESENT IN SAMPLE AS

AN ACCESSORY.



SHALE = MEDIUM LIGHT GRAY TO MEDIUM DARK GRAY WITH OCCASIONAL DUSKY RED AND DARK GREENISH YELLOW HUES; CRUMBLY TO SLIGHTLY CRUNCHY TO PREDOMINATELY BRITTLE TENACITY; PLANAR TO SLIGHT HACKLY FRACTURING; CUTTINGS TO BE PLATY TO FLAKY TO OCCASIONALLY TABULAR IN HABIT; DULL EARTHY TO SEMI WAXY TO SLIGHT GREASY LUSTER; SMOOTH TO CLAYEY TEXTURE; NO OTHER VISIBLE BEDDING FEATURES.

SILTSTONE = MEDIUM GRAY TO LIGHT OLIVE GRAY TO LIGHT GREENISH GRAY; CRUNCHY TO STIFF TO OCCASIONALLY CRUMBLY TENACITY; PREDOMINATELY HACKLY TO SLIGHT BLOCKY TO SLIGHTLY PLANAR FRACTURING; CUTTINGS TEND TO BE PLATY TO NODULAR TO WEDGE-LIKE TO SEMI TABULAR IN HABIT; SLIGHT FROSTED TO SEMI SPARKLING TO SLIGHT WAXY LUSTER; OCCASIONALLY GRANULAR TO SEMI GRITTY TO PREDOMINATELY SILTY TEXTURE;



NO OTHER VISIBLE BEDDING FEATURES.

COAL = BROWNISH BLACK TO OLIVE BLACK TO

OCCASIONALLY OLIVE GRAY; TOUGH TO STIFF

TO SLIGHT CRUNCHY TENACITY; PREDOMINATEL

-Y PLANAR TO BLOCKY TO SPLINTERY FRACTU-

RING; CUTTINGS TEND TO BE WEDGE-LIKE TO

ELONGATED TABULAR IN HABIT; DULL EARTHY

TO SLIGHT GREASY TO SPARKLING LUSTER;

GRITTY TO SMOOTH TO SILTY TEXTURE; VISIB

-LE BEDS OF CARBONACEOUS MATERIAL; VISIB

LE DEGASSING ALONG CARBONACEOUS BEDS.

SANDSTONE = TRANSLUCENT TO WHITE TO

VERY LIGHT GRAY TO LIGHT BROWNISH GRAY;

MOSTLY QUARTZ FRAMEWORK WITH 2-3% DARK

LITHICS VISIBLE IN SAMPLE; COARSE TO MED

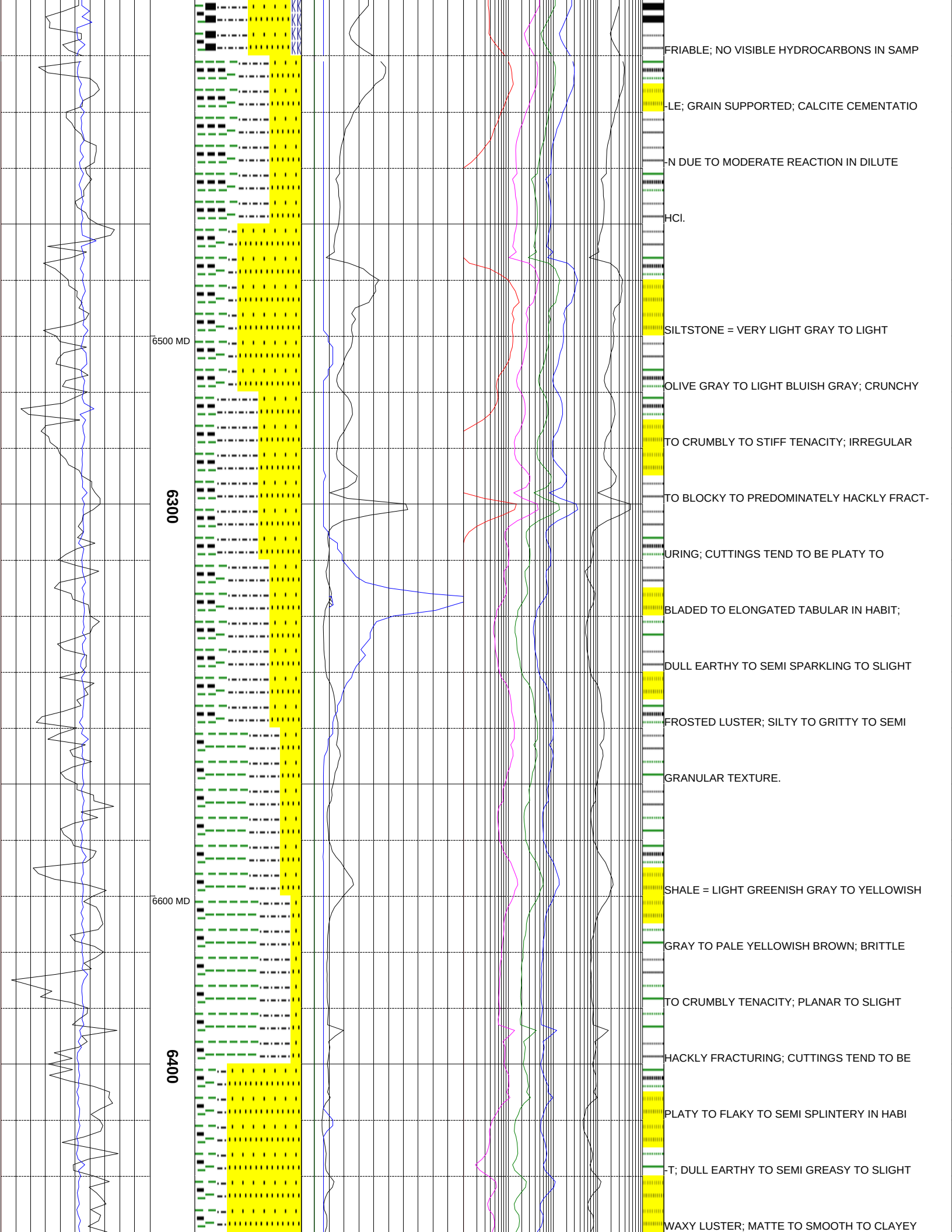
TO PREDOMINATELY FINE GRAIN; POOR TO

FAIR SORTED; SUB-ROUND TO SUB-ANGULAR

GRAINS; MODERATE TO LOW SPHERICITY; NO

VISIBLE BEDDING FEATURES ON GRAINS; HARD

TO MODERATE HARD TO OCCASIONALLY FIRM



FRIABLE; NO VISIBLE HYDROCARBONS IN SAMP

-LE; GRAIN SUPPORTED; CALCITE CEMENTATIO

-N DUE TO MODERATE REACTION IN DILUTE

HCl.

SILTSTONE = VERY LIGHT GRAY TO LIGHT

OLIVE GRAY TO LIGHT BLUISH GRAY; CRUNCHY

TO CRUMBLY TO STIFF TENACITY; IRREGULAR

TO BLOCKY TO PREDOMINATELY HACKLY FRACT-

URING; CUTTINGS TEND TO BE PLATY TO

BLADED TO ELONGATED TABULAR IN HABIT;

DULL EARTHY TO SEMI SPARKLING TO SLIGHT

FROSTED LUSTER; SILTY TO GRITTY TO SEMI

GRANULAR TEXTURE.

SHALE = LIGHT GREENISH GRAY TO YELLOWISH

GRAY TO PALE YELLOWISH BROWN; BRITTLE

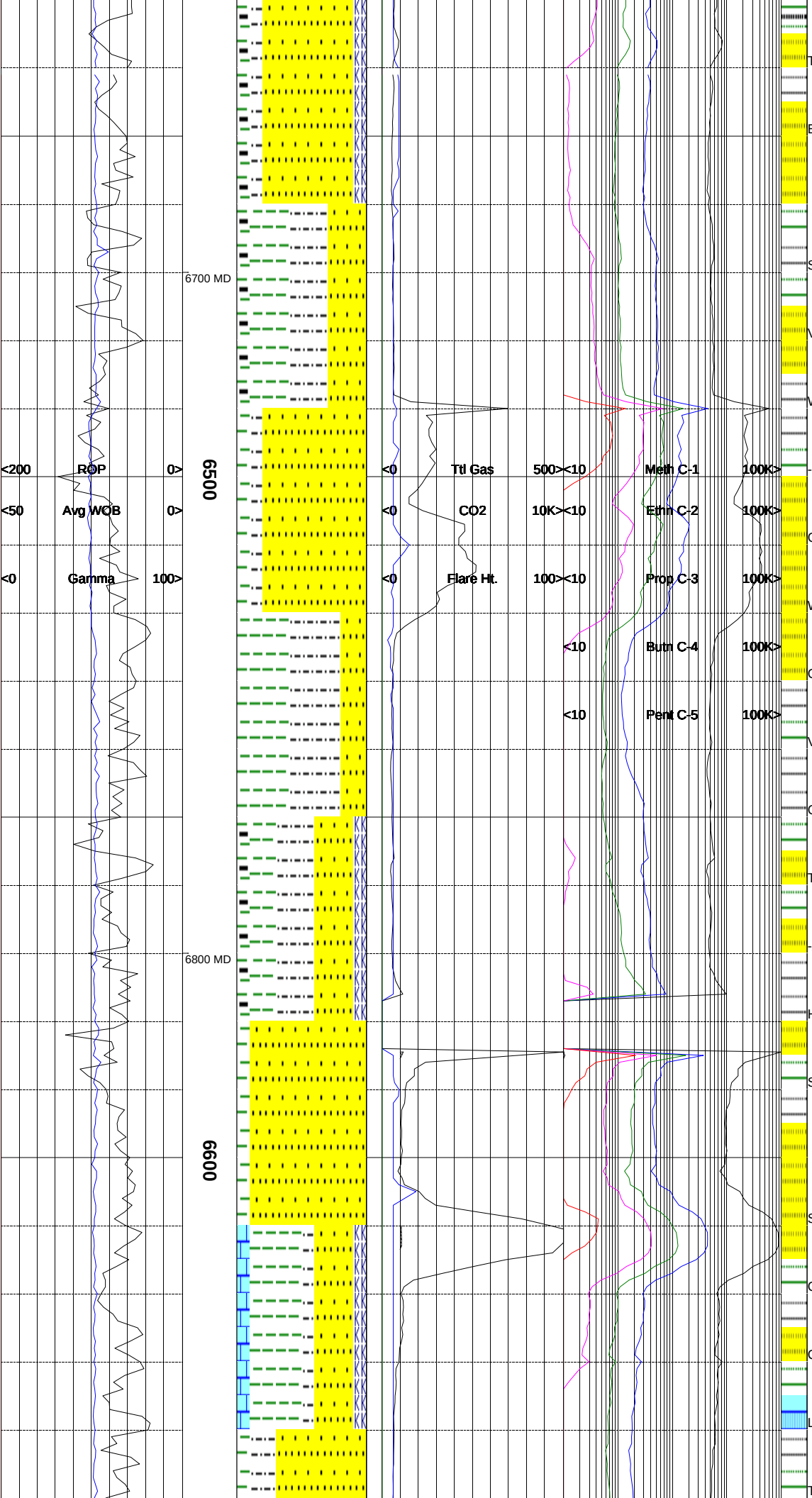
TO CRUMBLY TENACITY; PLANAR TO SLIGHT

HACKLY FRACTURING; CUTTINGS TEND TO BE

PLATY TO FLAKY TO SEMI SPLINTERY IN HABI

-T; DULL EARTHY TO SEMI GREASY TO SLIGHT

WAXY LUSTER; MATTE TO SMOOTH TO CLAYEY



TEXTURE; NO OTHER VISIBLE BEDDING FEATUR

ES.

SANDSTONE = WHITE TO TRANSLUCENT TO

VERY LIGHT GRAY; MOSTLY QUARTZ FRAME-

WORK WITH 1-2% CHLORITE VISIBLE IN SAMPL

-E; COARSE TO VERY COARSE TO MEDIUM;

GRADES INTO A GRITTY SILTSTONE; FAIR TO

WELL SORTED; SUB-ANGULAR TO SUB-ROUND

GRAINS; LOW TO MODERATE SPHERICITY; NO

VISIBLE SURFACE FEATURES; UNCONSOLIDATED

GRAINS DUE TO BIT ACTION; FIRM FRIABLE

TO MODERATE HARD TO HARD; CALCITE CEMENT

-ATION DUE TO HIGH REACTION IN DILUTE

HCl; NO VISIBLE HYDROCARBONS; GRAIN

SUPPORTED.

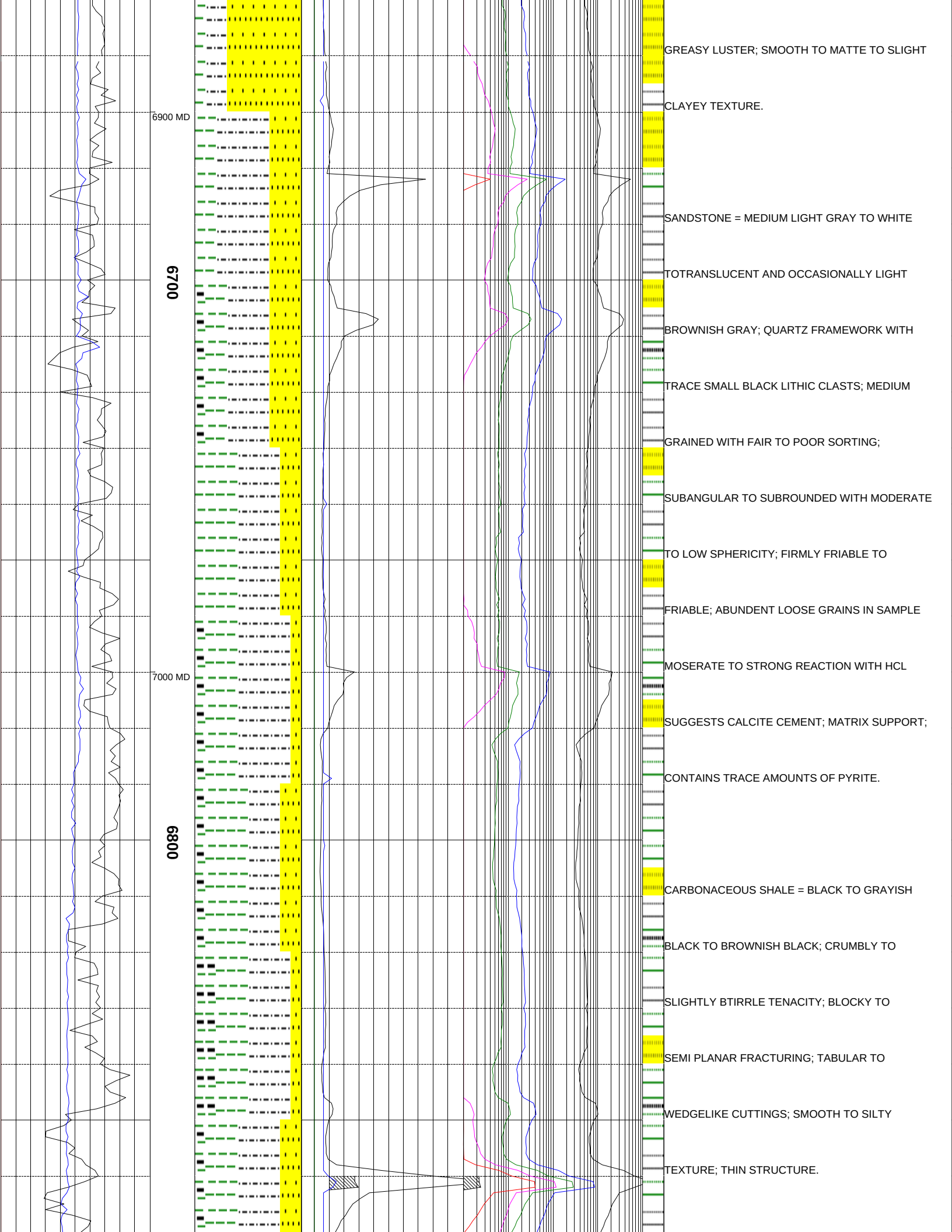
SHALE = YELLOWISH GRAY TO LIGHT GREENISH

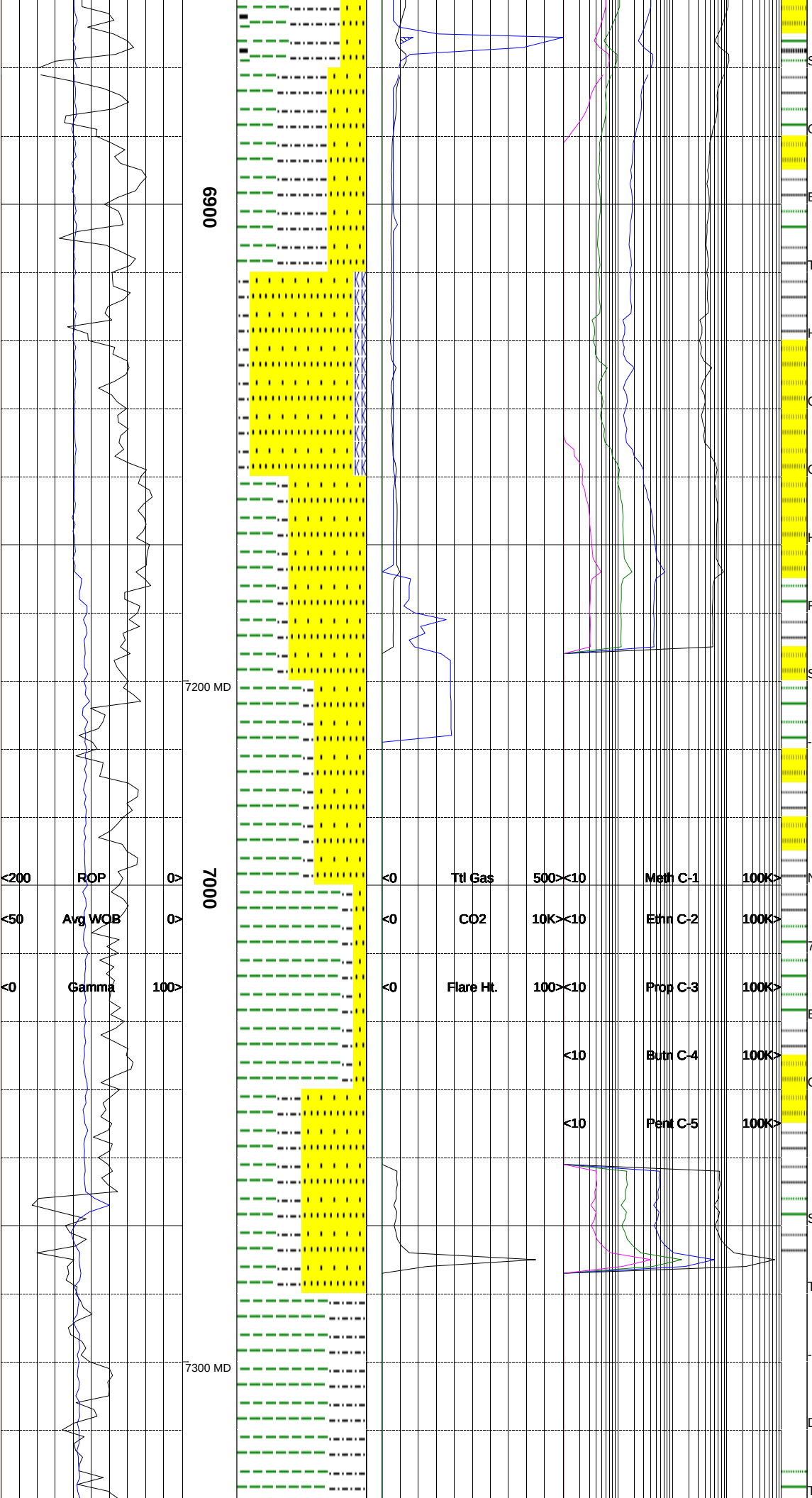
GRAY TO LIGHT YELLOWISH GRAY; CRUNCHY TO

CRUMBLY TENACITY; PLANAR TO SLIGHT HACK-

LY FRACTURING; CUTTINGS TEND TO BE PLATY

TO FLAKY IN HABIT; DULL EARTHY TO SLIGHT

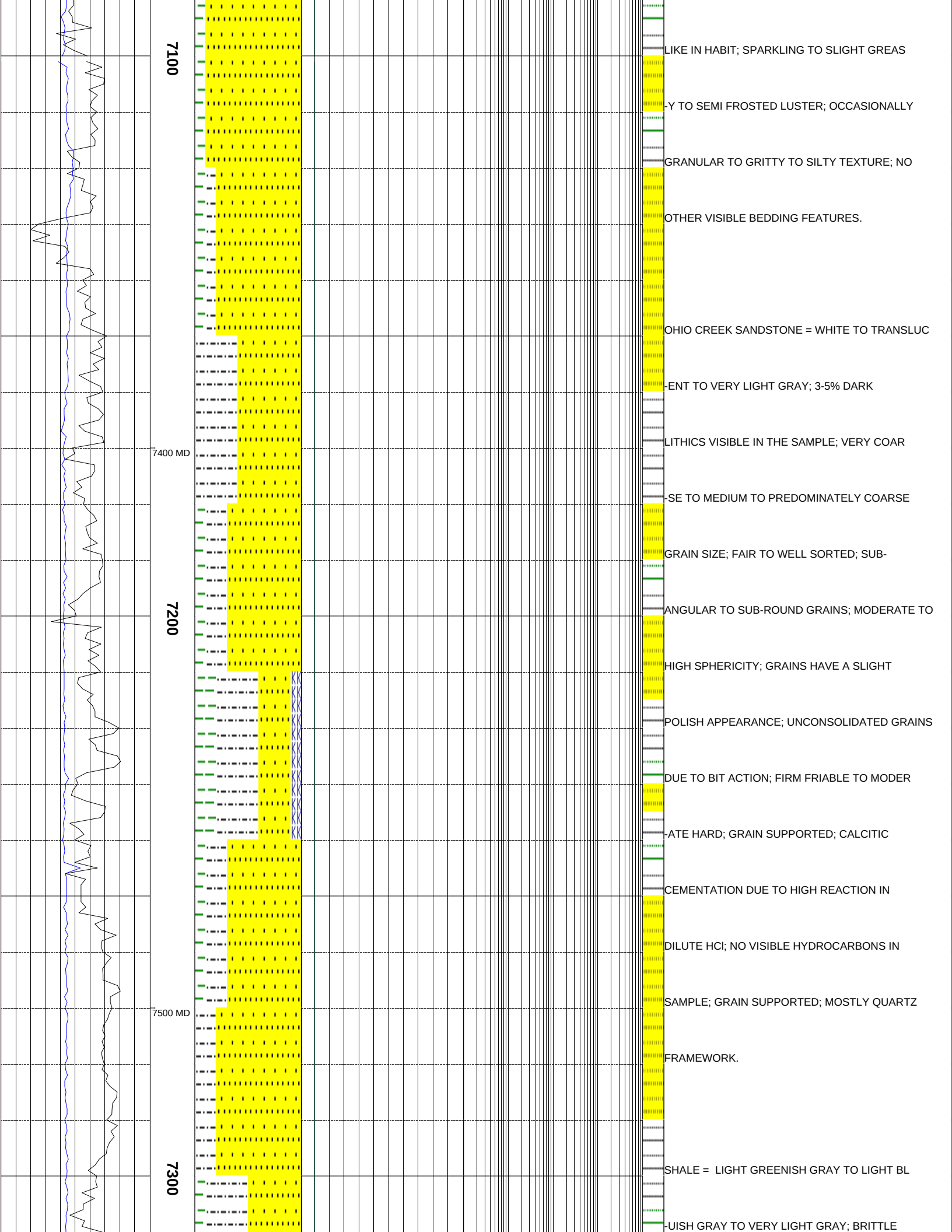

6900 MD
6700
7000 MD
6800
GREASY LUSTER; SMOOTH TO MATTE TO SLIGHT
CLAYEY TEXTURE.
SANDSTONE = MEDIUM LIGHT GRAY TO WHITE
TOTRANSLUCENT AND OCCASIONALLY LIGHT
BROWNISH GRAY; QUARTZ FRAMEWORK WITH
TRACE SMALL BLACK LITHIC CLASTS; MEDIUM
GRAINED WITH FAIR TO POOR SORTING;
SUBANGULAR TO SUBROUNDED WITH MODERATE
TO LOW SPHERICITY; FIRMLY FRIABLE TO
FRIABLE; ABUNDENT LOOSE GRAINS IN SAMPLE
MOSERATE TO STRONG REACTION WITH HCL
SUGGESTS CALCITE CEMENT; MATRIX SUPPORT;
CONTAINS TRACE AMOUNTS OF PYRITE.
CARBONACEOUS SHALE = BLACK TO GRAYISH
BLACK TO BROWNISH BLACK; CRUMBLY TO
SLIGHTLY BTIRRLE TENACITY; BLOCKY TO
SEMI PLANAR FRACTURING; TABULAR TO
WEDGELIKE CUTTINGS; SMOOTH TO SILTY
TEXTURE; THIN STRUCTURE.



SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO OCCASIONALLY MEDIUM GRAY; PREDOMINATELY BRITTLE TO CRUMBLY TO SLIGHTLY CRUNCHY TENACITY; PREDOMINATELY PLANAR TO SLIGHT HACKLY TO SEMI SPLINTERY FRACTURING; CUTTINGS TEND TO BE PLATY TO FLAKY TO OCCASIONALLY TABULAR TO WEDGE-LIKE IN HABIT; DULL EARTHY TO GREASY TO SEMI-RESINOUS LUSTER; MATTE TO PREDOMINATELY SMOOTH TO CLAYEY TEXTURE; NO OTHER VISIB-LE BEDDING FEATURES.

NOTE = RIGWATCH DOWN FROM 7195' MD TO 7658' MD. CAUGHT SAMPLE BASED OFF BOTTOMS UP STROKES; UNABLE TO CORRALATE GAS.

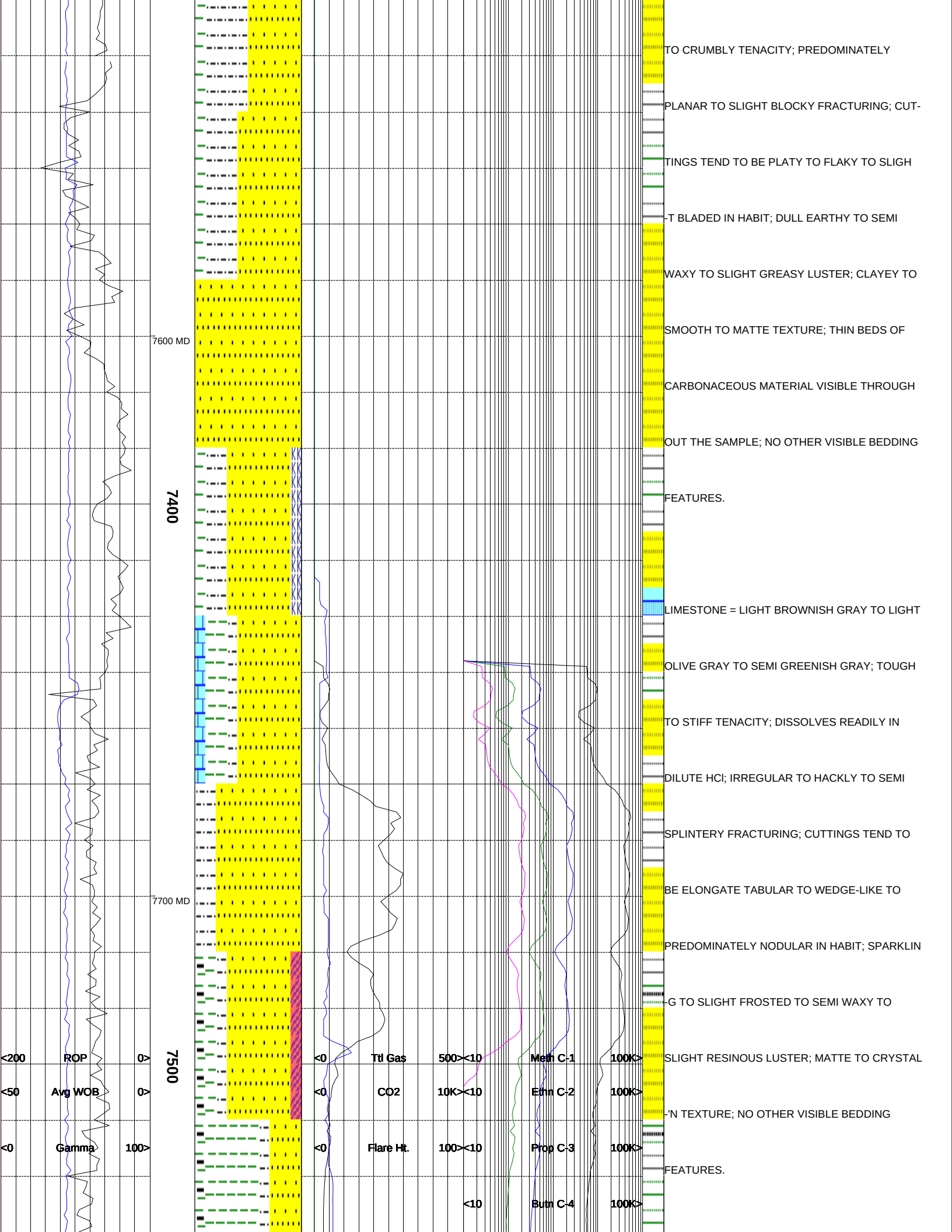
SILSTONE = LIGHT OLIVE GRAY TO BROWNISH TO MEDIUM GRAY; CRUNCHY TO STIFF TO TOUG-H TENACITY; IRREGULAR TO PLANAR TO PRE-DOMINATELY HACKLY FRACTURING; CUTTINGS TEND TO BE TABULAR TO ELONGATED WEDGE-

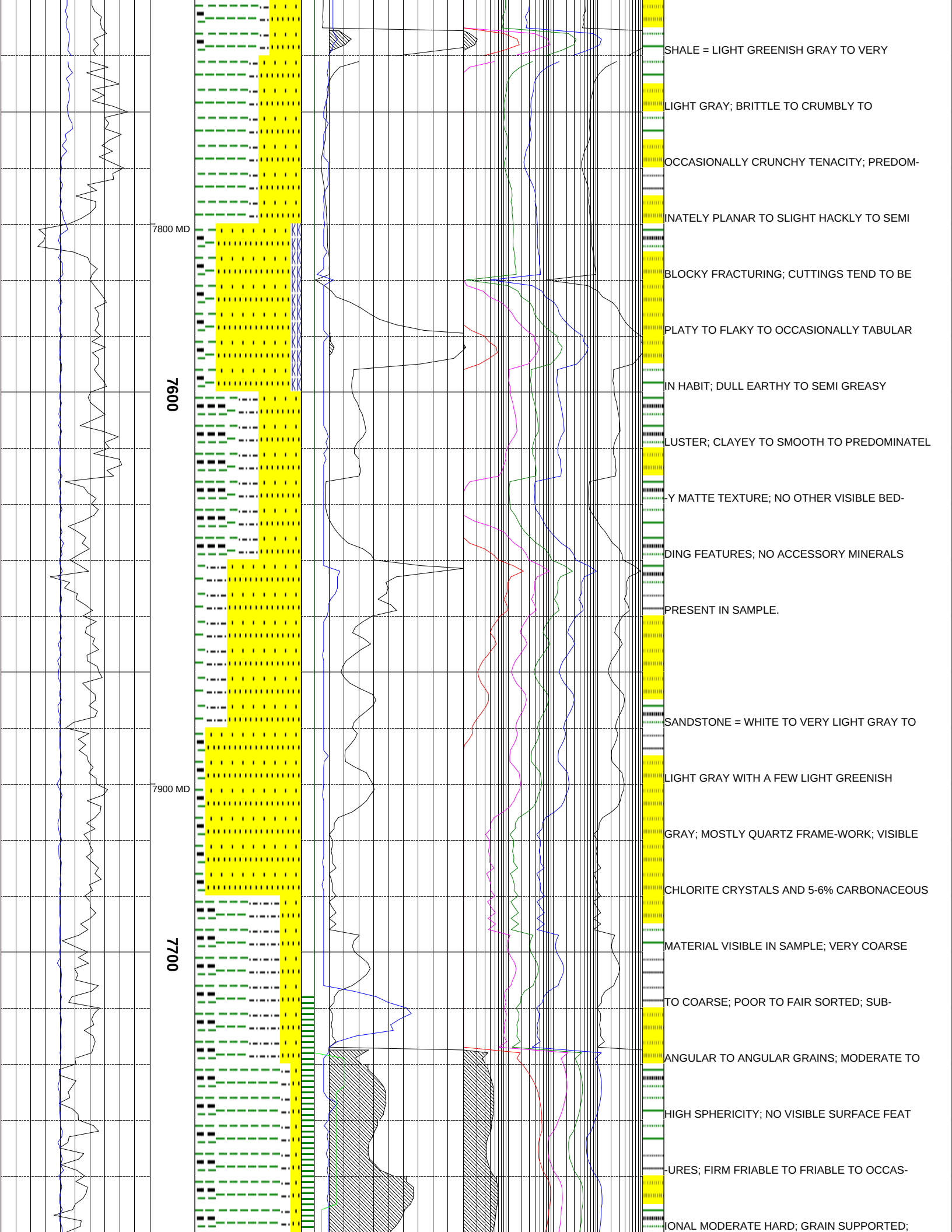


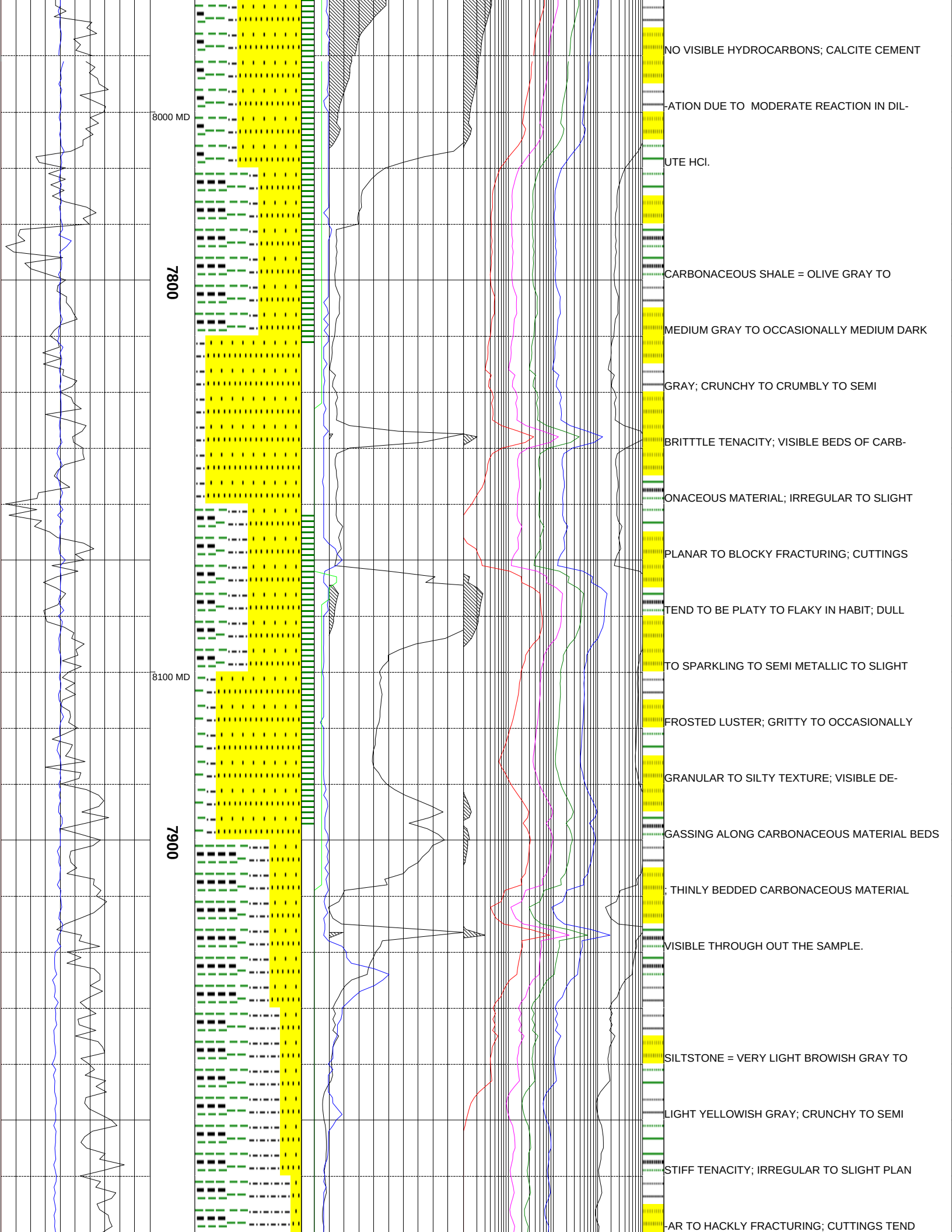
-LIKE IN HABIT; SPARKLING TO SLIGHT GREAS
-Y TO SEMI FROSTED LUSTER; OCCASIONALLY
-GRANULAR TO GRITTY TO SILTY TEXTURE; NO
OTHER VISIBLE BEDDING FEATURES.

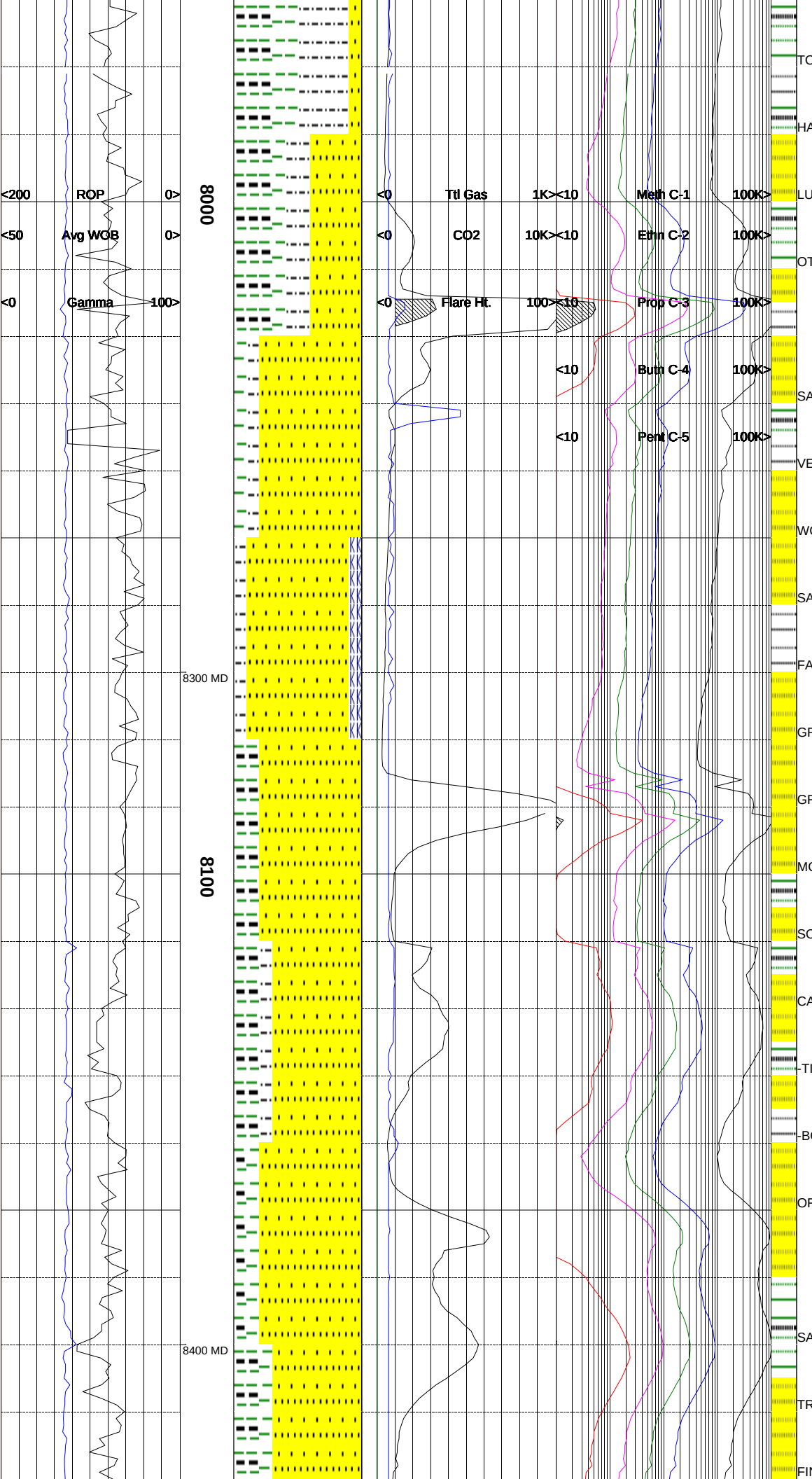
OHIO CREEK SANDSTONE = WHITE TO TRANSLUC
-ENT TO VERY LIGHT GRAY; 3-5% DARK
-LITHICS VISIBLE IN THE SAMPLE; VERY COAR
-SE TO MEDIUM TO PREDOMINATELY COARSE
GRAIN SIZE; FAIR TO WELL SORTED; SUB-
ANGULAR TO SUB-ROUND GRAINS; MODERATE TO
HIGH SPHERICITY; GRAINS HAVE A SLIGHT
-POLISH APPEARANCE; UNCONSOLIDATED GRAINS
DUE TO BIT ACTION; FIRM FRIABLE TO MODER
-ATE HARD; GRAIN SUPPORTED; CALCITIC
-CEMENTATION DUE TO HIGH REACTION IN
DILUTE HCl; NO VISIBLE HYDROCARBONS IN
SAMPLE; GRAIN SUPPORTED; MOSTLY QUARTZ
-FRAMEWORK.

SHALE = LIGHT GREENISH GRAY TO LIGHT BL
-UISH GRAY TO VERY LIGHT GRAY; BRITTLE


7600 MD
7400
7700 MD
7500
<200 ROP 0>
<50 Avg WOB 0>
<0 Gamma 100>
<0 Ttl Gas 500><10 Meth C-1 100K>
<0 CO2 10K><10 Ethn C-2 100K>
<0 Flare Ht. 100><10 Prop C-3 100K>
<10 Buth C-4 100K>
TO CRUMBLY TENACITY; PREDOMINATELY
PLANAR TO SLIGHT BLOCKY FRACTURING; CUT-
TINGS TEND TO BE PLATY TO FLAKY TO SLIGH
-T BLADED IN HABIT; DULL EARTHY TO SEMI
WAXY TO SLIGHT GREASY LUSTER; CLAYEY TO
SMOOTH TO MATTE TEXTURE; THIN BEDS OF
CARBONACEOUS MATERIAL VISIBLE THROUGH
OUT THE SAMPLE; NO OTHER VISIBLE BEDDING
FEATURES.
LIMESTONE = LIGHT BROWNISH GRAY TO LIGHT
OLIVE GRAY TO SEMI GREENISH GRAY; TOUGH
TO STIFF TENACITY; DISSOLVES READILY IN
DILUTE HCl; IRREGULAR TO HACKLY TO SEMI
SPLINTERY FRACTURING; CUTTINGS TEND TO
BE ELONGATE TABULAR TO WEDGE-LIKE TO
PREDOMINATELY NODULAR IN HABIT; SPARKLIN
-G TO SLIGHT FROSTED TO SEMI WAXY TO
SLIGHT RESINOUS LUSTER; MATTE TO CRYSTAL
-'N TEXTURE; NO OTHER VISIBLE BEDDING
FEATURES.


7800 MD
7600
7900 MD
7700
SHALE = LIGHT GREENISH GRAY TO VERY
LIGHT GRAY; BRITTLE TO CRUMBLY TO
OCCASIONALLY CRUNCHY TENACITY; PREDOM-
INATELY PLANAR TO SLIGHT HACKLY TO SEMI
BLOCKY FRACTURING; CUTTINGS TEND TO BE
PLATY TO FLAKY TO OCCASIONALLY TABULAR
IN HABIT; DULL EARTHY TO SEMI GREASY
LUSTER; CLAYEY TO SMOOTH TO PREDOMINATEL
-Y MATTE TEXTURE; NO OTHER VISIBLE BED-
DING FEATURES; NO ACCESSORY MINERALS
PRESENT IN SAMPLE.
SANDSTONE = WHITE TO VERY LIGHT GRAY TO
LIGHT GRAY WITH A FEW LIGHT GREENISH
GRAY; MOSTLY QUARTZ FRAME-WORK; VISIBLE
CHLORITE CRYSTALS AND 5-6% CARBONACEOUS
MATERIAL VISIBLE IN SAMPLE; VERY COARSE
TO COARSE; POOR TO FAIR SORTED; SUB-
ANGULAR TO ANGULAR GRAINS; MODERATE TO
HIGH SPHERICITY; NO VISIBLE SURFACE FEAT
-URES; FIRM FRIABLE TO FRIABLE TO OCCAS-
IONAL MODERATE HARD; GRAIN SUPPORTED;


8000 MD
7800
8100 MD
7900
NO VISIBLE HYDROCARBONS; CALCITE CEMENT
-ATION DUE TO MODERATE REACTION IN DIL-
UTE HCl.
CARBONACEOUS SHALE = OLIVE GRAY TO
MEDIUM GRAY TO OCCASIONALLY MEDIUM DARK
GRAY; CRUNCHY TO CRUMBLY TO SEMI
BRITTTLE TENACITY; VISIBLE BEDS OF CARB-
ONACEOUS MATERIAL; IRREGULAR TO SLIGHT
PLANAR TO BLOCKY FRACTURING; CUTTINGS
TEND TO BE PLATY TO FLAKY IN HABIT; DULL
TO SPARKLING TO SEMI METALLIC TO SLIGHT
FROSTED LUSTER; GRITTY TO OCCASIONALLY
GRANULAR TO SILTY TEXTURE; VISIBLE DE-
GASSING ALONG CARBONACEOUS MATERIAL BEDS
; THINLY BEDDED CARBONACEOUS MATERIAL
VISIBLE THROUGH OUT THE SAMPLE.
SILTSTONE = VERY LIGHT BROWISH GRAY TO
LIGHT YELLOWISH GRAY; CRUNCHY TO SEMI
STIFF TENACITY; IRREGULAR TO SLIGHT PLAN
-AR TO HACKLY FRACTURING; CUTTINGS TEND



TO BE WEDGE-LIKE TO SEMI TABULAR IN

HABIT; SLIGHT FROSTED TO SEMI SPARKLING

LUSTER; GRITTY TO GRANULAR TEXTURE; NO

OTHER VISIBLE BEDDING FEATURES.

SANDSTONE = WHITE TO TRANSLUCENT TO

VERY LIGHT GRAY MOSTLY QUARTZ FRAME-

WORK WITH 1-2% DARK LITHICS VISIBLE IN

SAMPLE; VERY COARSE TO COARSE; POOR TO

FAIR SORTED; SUBANGULAR TO ANGULAR

GRAINS; MODERATE TO LOW SPHERICITY;

GRAINS HAVE A SLIGHT FROSTED APPEARANCE;

MODERATE HARD TO FIRM FRIABLE; UNCON-

SOLIDATED GRAINS DUE TO BIT ACTION;

CALCITE CEMENTATION DUE TO MODERATE REAC

-TION IN DILUTE HCl; NO VISIBLE HYDROCAR

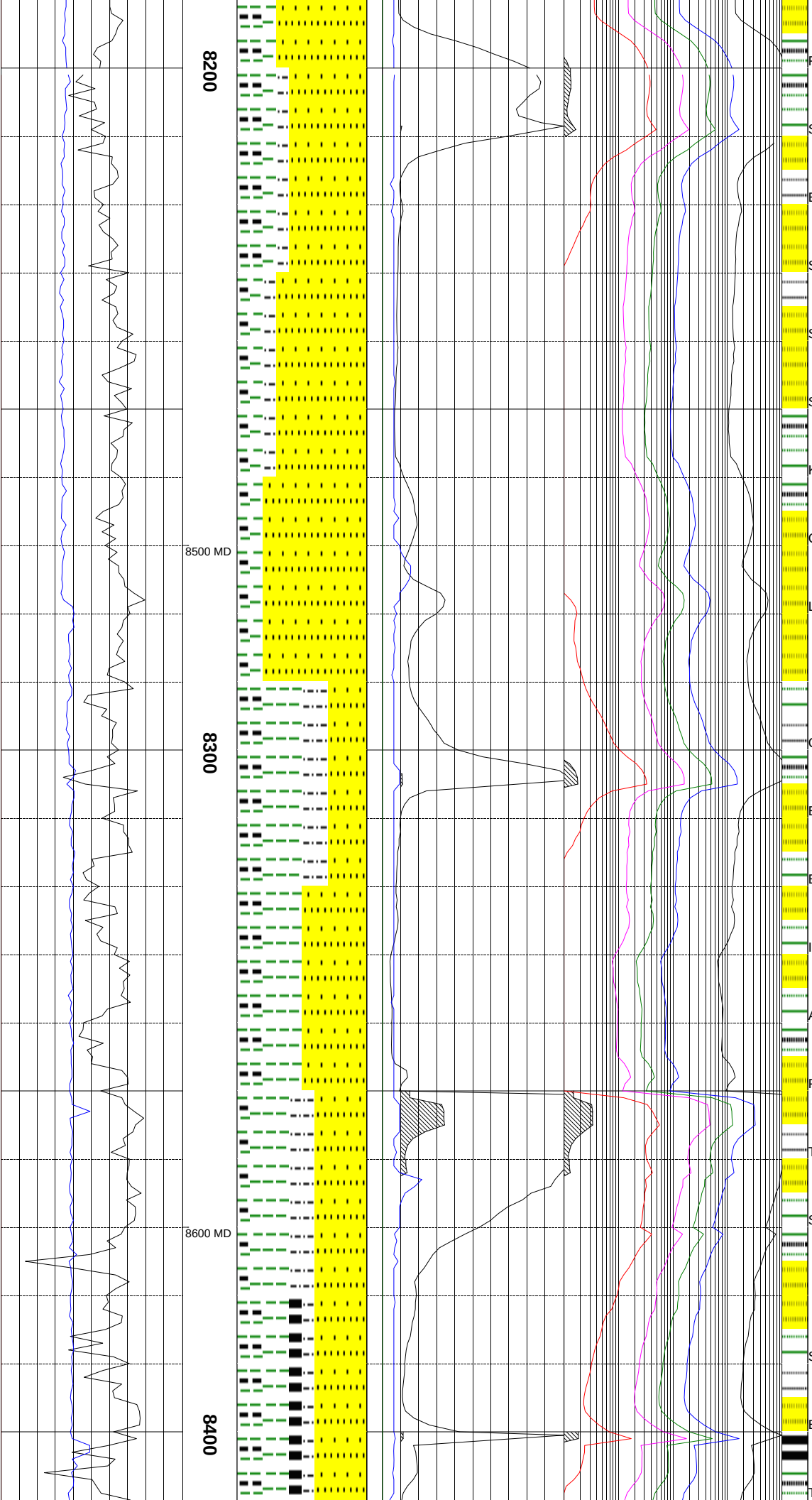
-BONS IN SAMPLE; GRAIN SUPPORTED; LAYERS

OF CARBONACEOUS MATERIALS OBSERVED.

SANDSTONE = WHITE TO VERY LIGHT GRAY TO

TRANSLUCENT; DOMINATE QUARTZ FRAMEWORK;

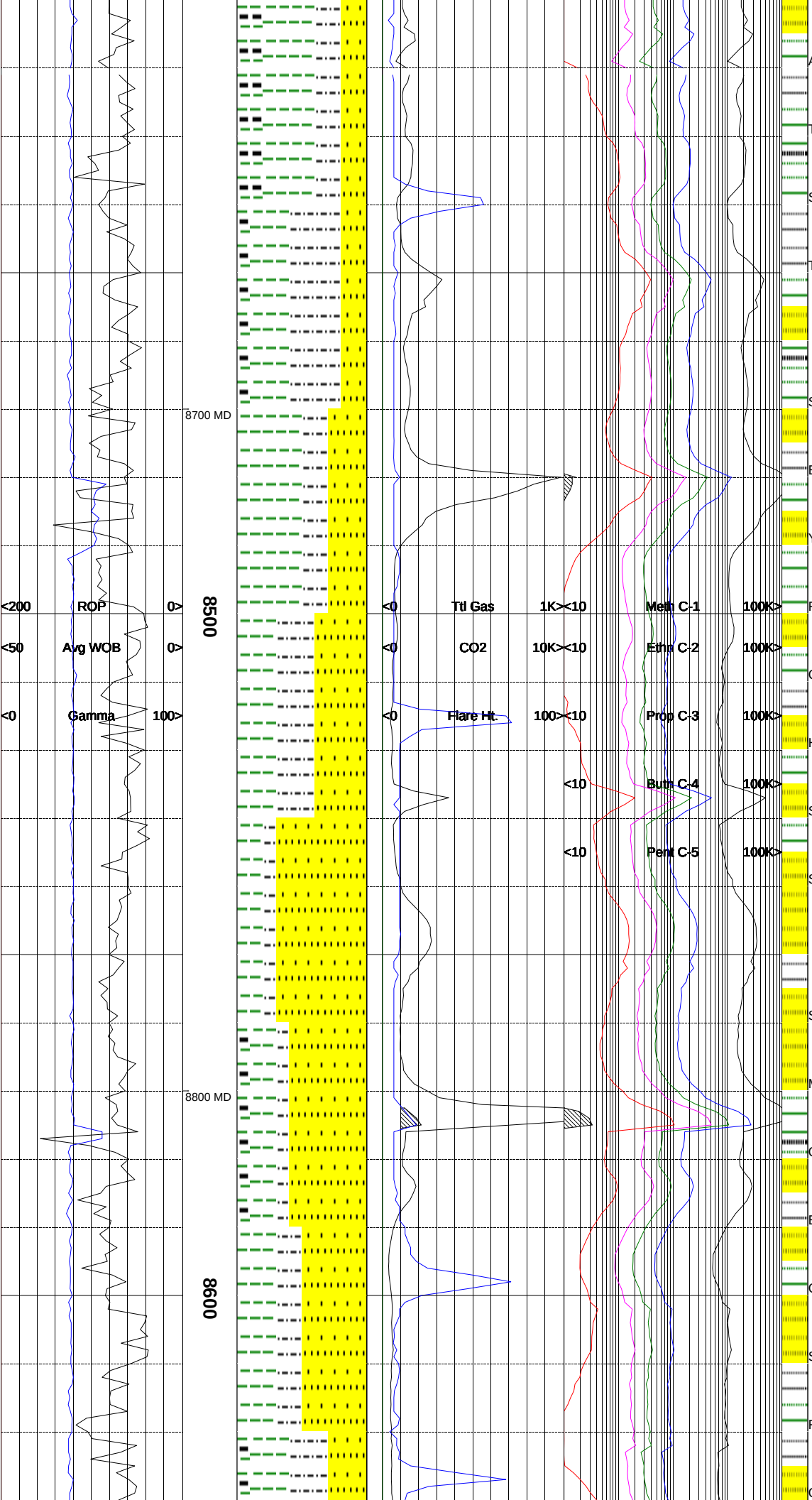
FINE TO OCCASIONALLY MEDIUM GRAINED WITH



FAIR TO SEMI WELL SORTING; SUBANGULAR TO SUBROUNDED WITH MODERATE SPHERICITY; EASILY FRIABLE TO FRIABLE WITH MAJORITY SAMPLE IN LOOSE GRAINS FROM BIT ACTION; STRONG TO MODERATE REACTION WITH HCL SUGGESTS CALCITE CEMENT; WHITE KAOLINITIC ALONG WITH SOME POSSIBLE CALCITE CEMENT; LESS THAN 5% FINE BLACK LITHICS IN SAMPLE; NO VISIBLE BEDDING.

CARBONACEOUS SHALE = GRAYISH BLACK TO BROWNISH BLACK; CRUMBLY TO SLIGHTLY BRITTLE TENACITY; FRACTURES FROM IRREGULAR TO BLOCKY; CUTTINGS PRODUCE A WEDGELIKE TO TABULAR HABIT; EARTHY TO POLISHED LUSTER; SMOOTH TO SILTY TEXTURE THIN STRUCTURE; INTERBEDDED WITH SANDSTONE.

SILTSTONE = MEDIUM LIGHT GRAY TO BROWNISH GRAY; BRITTLE TO SLIGHTLY DENSE TENACITY; IRREGULAR FRACTURING; CUTTINGS



ARE TABULAR TO SLIGHTLY MASSIVE; EARTHY

TO WAXY WITH A SLIGHT SPARKLING LUSTER;

SILTY TO OCCASIONALLY GRITTY TEXTURE;

THICK TO SLIGHTLY MASSIVE STRUCTURE.

SHALE = MEDIUM LIGHT GRAY TO MEDIUM

BLUISH GRAY WITH OCCASIONAL MODERATE

YELLOW HUES; BRITTLE TO CRUNCHY TENACITY

FRACTURES FROM PLANAR TO BLOCKY;

CUTTINGS DISPLAY A TABULAR TO PLATY

HABIT; DULL TO EARTHY LUSTER; TEXTURE IS

SMOOTH TO SILTY; THIN TO LAMINAE

STRUCTURE.

SANDSTONE = WHITE TO VERY LIGHT GRAY TO

MEDIUM GRAY WITH SOME TRANLUCENCE;

QUARTZ FRAMEWORK WITH APPROXIMATELY 3-5%

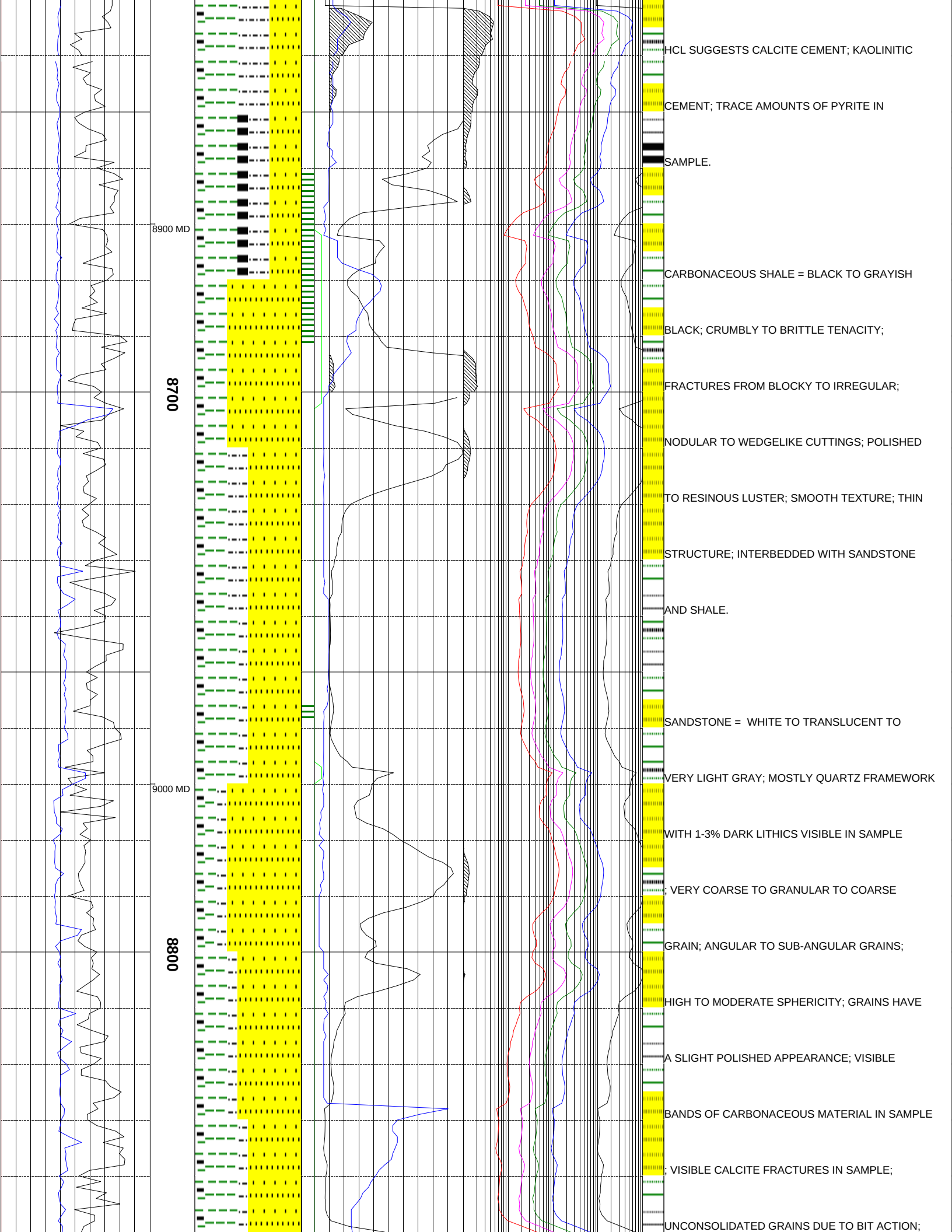
BLACK LITHIC CLASTS; MEDIUM TO FINE

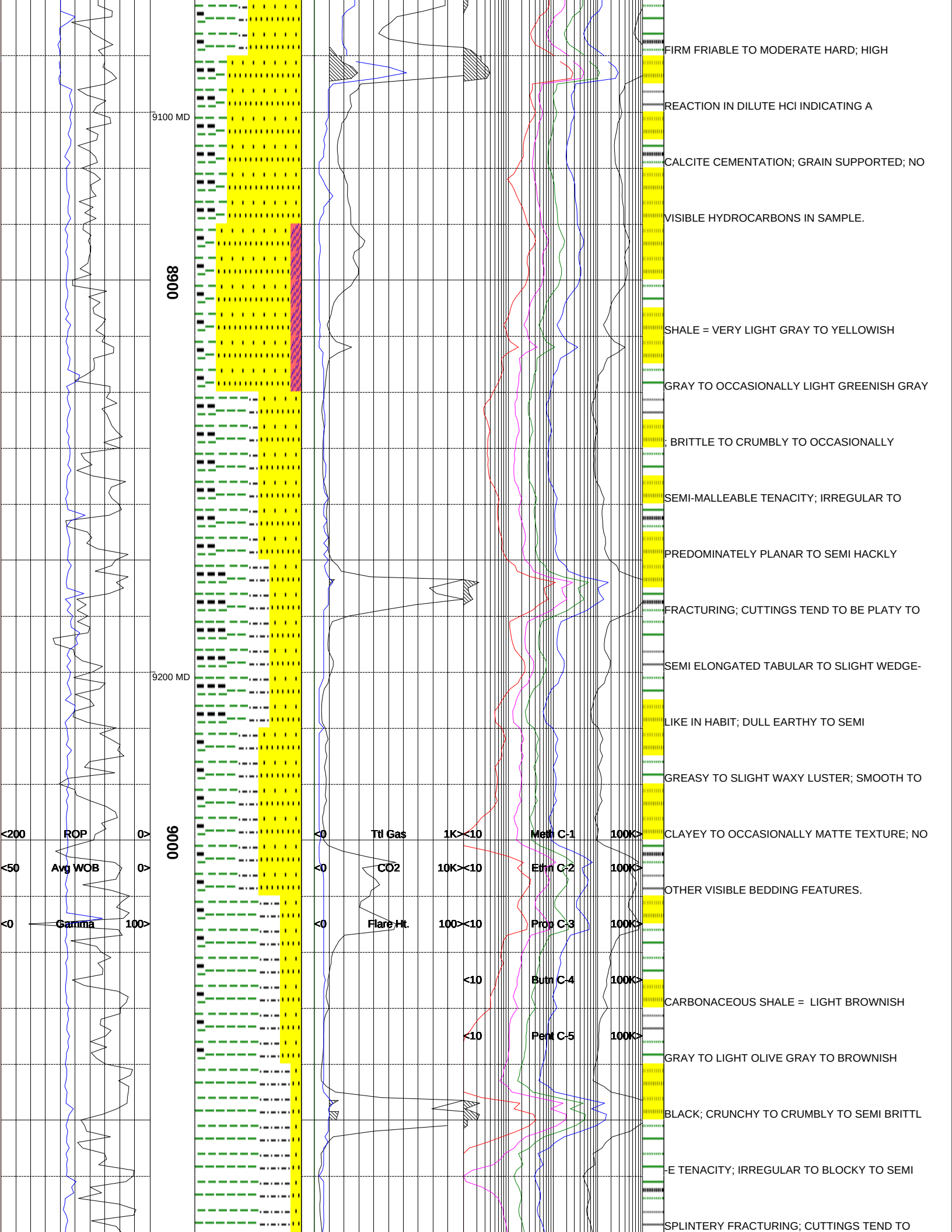
GRAINED WITH POOR SORTING; ANGULAR TO

SUBANGULAR; WITH LOW SPHERICITY; FIRMLY

FRIABLE TO FRIABLE WITH ABUNDENT LOOSE

GRAINS IN SAMPLE' STRONG REACTION WITH


8900 MD
8700
9000 MD
8800
HCL SUGGESTS CALCITE CEMENT; KAOLINITIC
CEMENT; TRACE AMOUNTS OF PYRITE IN
SAMPLE.
CARBONACEOUS SHALE = BLACK TO GRAYISH
BLACK; CRUMBLY TO BRITTLE TENACITY;
FRACTURES FROM BLOCKY TO IRREGULAR;
NODULAR TO WEDGELIKE CUTTINGS; POLISHED
TO RESINOUS LUSTER; SMOOTH TEXTURE; THIN
STRUCTURE; INTERBEDDED WITH SANDSTONE
AND SHALE.
SANDSTONE = WHITE TO TRANSLUCENT TO
VERY LIGHT GRAY; MOSTLY QUARTZ FRAMEWORK
WITH 1-3% DARK LITHICS VISIBLE IN SAMPLE
; VERY COARSE TO GRANULAR TO COARSE
GRAIN; ANGULAR TO SUB-ANGULAR GRAINS;
HIGH TO MODERATE SPHERICITY; GRAINS HAVE
A SLIGHT POLISHED APPEARANCE; VISIBLE
BANDS OF CARBONACEOUS MATERIAL IN SAMPLE
; VISIBLE CALCITE FRACTURES IN SAMPLE;
UNCONSOLIDATED GRAINS DUE TO BIT ACTION;


9100 MD
8900
9200 MD
9000
<200 ROP 0>
<50 Avg WOB 0>
<0 Gamma 100>
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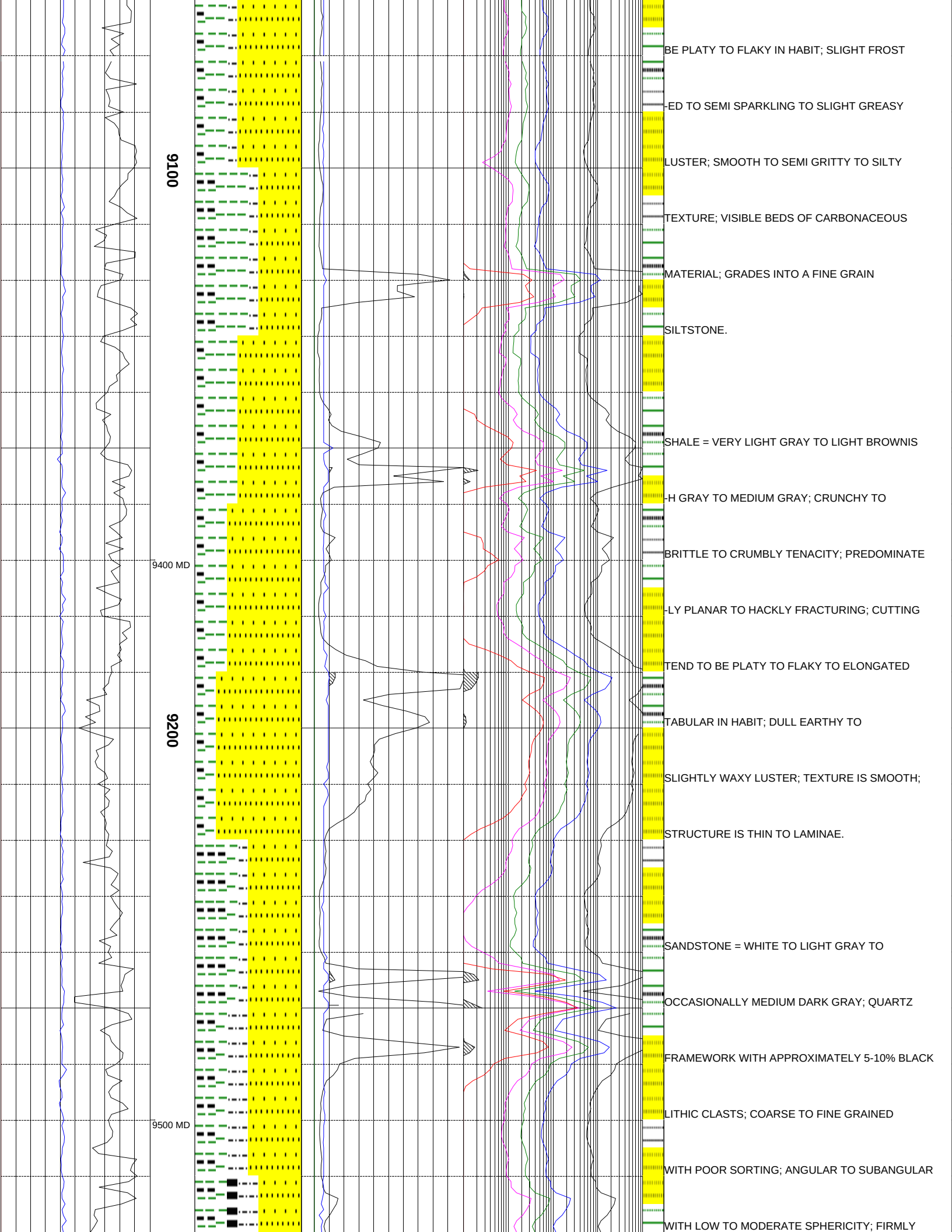
<0 CO2 10K><10 Etha C-2 100K>
<0 Flare Ht. 100><10 Prop C-3 100K>
<10 Butn C-4 100K>
<10 Pent C-5 100K>
FIRM FRIABLE TO MODERATE HARD; HIGH
REACTION IN DILUTE HCl INDICATING A
CALCITE CEMENTATION; GRAIN SUPPORTED; NO
VISIBLE HYDROCARBONS IN SAMPLE.
SHALE = VERY LIGHT GRAY TO YELLOWISH
GRAY TO OCCASIONALLY LIGHT GREENISH GRAY
; BRITTLE TO CRUMBLY TO OCCASIONALLY
SEMI-MALLEABLE TENACITY; IRREGULAR TO
PREDOMINATELY PLANAR TO SEMI HACKLY
FRACTURING; CUTTINGS TEND TO BE PLATY TO
SEMI ELONGATED TABULAR TO SLIGHT WEDGE-
LIKE IN HABIT; DULL EARTHY TO SEMI
GREASY TO SLIGHT WAXY LUSTER; SMOOTH TO
CLAYEY TO OCCASIONALLY MATTE TEXTURE; NO
OTHER VISIBLE BEDDING FEATURES.
CARBONACEOUS SHALE = LIGHT BROWNISH
GRAY TO LIGHT OLIVE GRAY TO BROWNISH
BLACK; CRUNCHY TO CRUMBLY TO SEMI BRITTL
-E TENACITY; IRREGULAR TO BLOCKY TO SEMI
SPLINTERY FRACTURING; CUTTINGS TEND TO



BE PLATY TO FLAKY IN HABIT; SLIGHT FROST

-ED TO SEMI SPARKLING TO SLIGHT GREASY

LUSTER; SMOOTH TO SEMI GRITTY TO SILTY

TEXTURE; VISIBLE BEDS OF CARBONACEOUS

MATERIAL; GRADES INTO A FINE GRAIN

SILTSTONE.

SHALE = VERY LIGHT GRAY TO LIGHT BROWNIS

-H GRAY TO MEDIUM GRAY; CRUNCHY TO

BRITTLE TO CRUMBLY TENACITY; PREDOMINATE

-LY PLANAR TO HACKLY FRACTURING; CUTTING

TEND TO BE PLATY TO FLAKY TO ELONGATED

TABULAR IN HABIT; DULL EARTHY TO

SLIGHTLY WAXY LUSTER; TEXTURE IS SMOOTH;

STRUCTURE IS THIN TO LAMINAE.

SANDSTONE = WHITE TO LIGHT GRAY TO

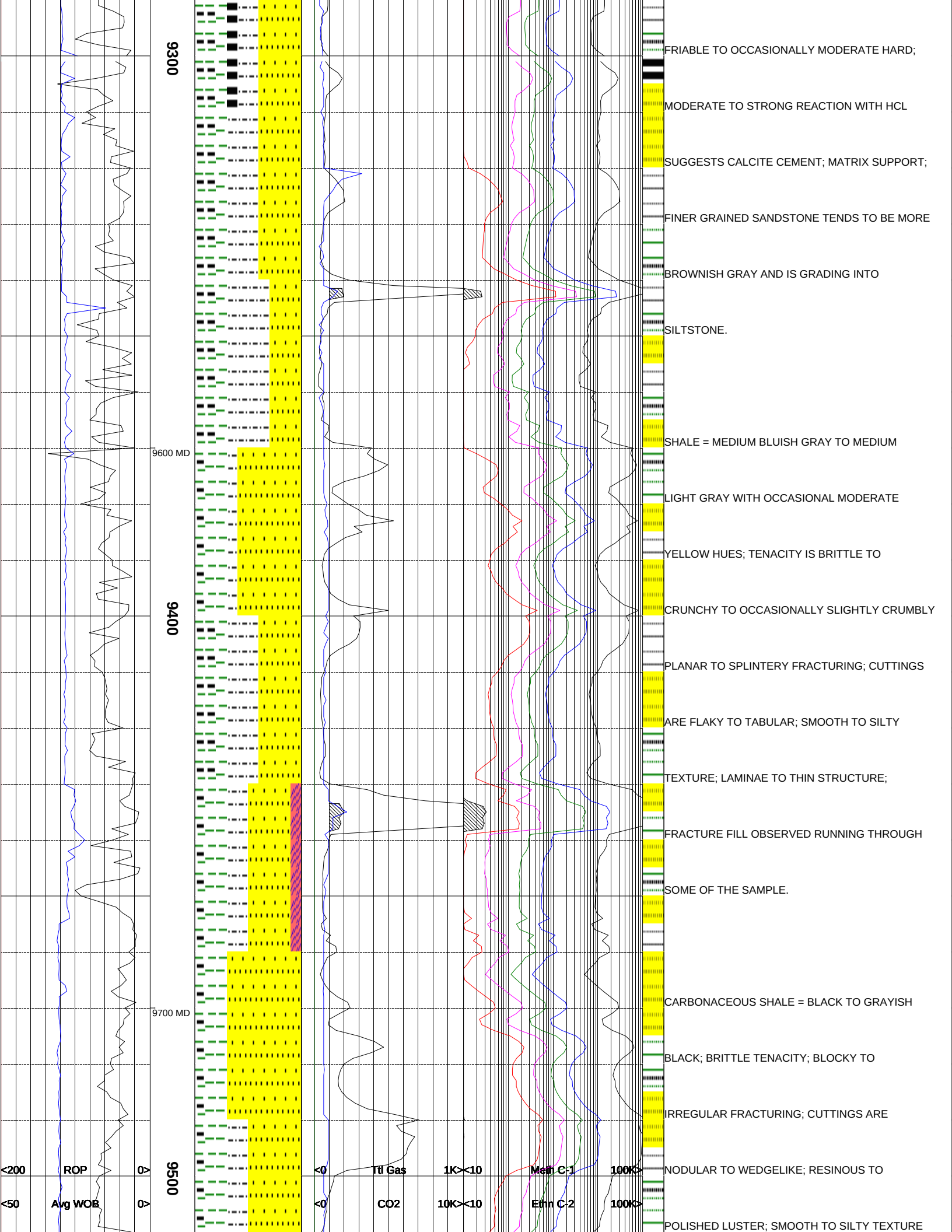
OCCASIONALLY MEDIUM DARK GRAY; QUARTZ

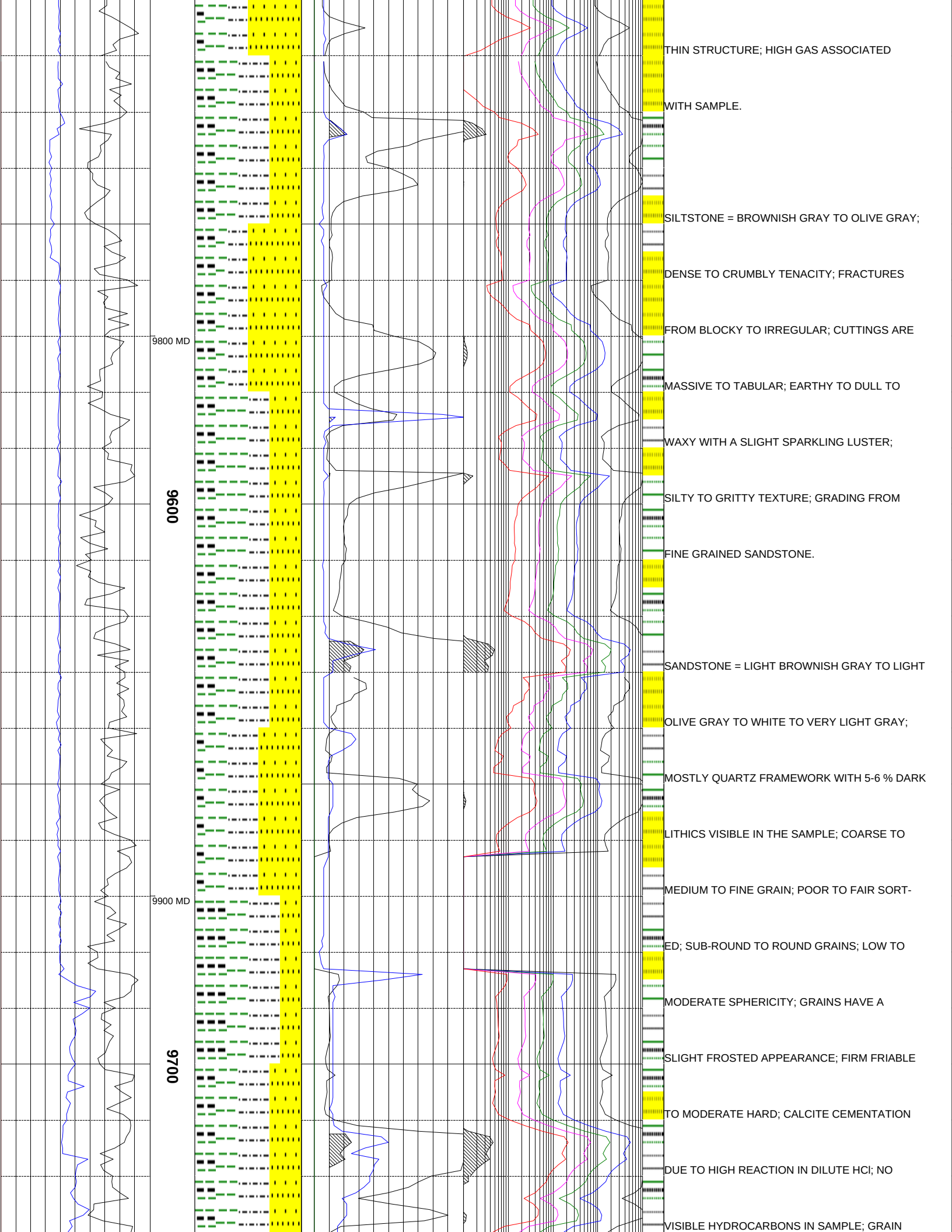
FRAMEWORK WITH APPROXIMATELY 5-10% BLACK

LITHIC CLASTS; COARSE TO FINE GRAINED

WITH POOR SORTING; ANGULAR TO SUBANGULAR

WITH LOW TO MODERATE SPHERICITY; FIRMLY


9300
9400
9500
9600 MD
9700 MD
<200
ROP
0>
<50
Avg WOB
0>
<0
Ttl Gas
1K><10
Meth C-1
100K>
<0
CO2
10K><10
Ethn C-2
100K>
FRIABLE TO OCCASIONALLY MODERATE HARD;
MODERATE TO STRONG REACTION WITH HCL
SUGGESTS CALCITE CEMENT; MATRIX SUPPORT;
FINER GRAINED SANDSTONE TENDS TO BE MORE
BROWNISH GRAY AND IS GRADING INTO
SILTSTONE.
SHALE = MEDIUM BLUISH GRAY TO MEDIUM
LIGHT GRAY WITH OCCASIONAL MODERATE
YELLOW HUES; TENACITY IS BRITTLE TO
CRUNCHY TO OCCASIONALLY SLIGHTLY CRUMBLY
PLANAR TO SPLINTERY FRACTURING; CUTTINGS
ARE FLAKY TO TABULAR; SMOOTH TO SILTY
TEXTURE; LAMINAE TO THIN STRUCTURE;
FRACTURE FILL OBSERVED RUNNING THROUGH
SOME OF THE SAMPLE.
CARBONACEOUS SHALE = BLACK TO GRAYISH
BLACK; BRITTLE TENACITY; BLOCKY TO
IRREGULAR FRACTURING; CUTTINGS ARE
NODULAR TO WEDGELIKE; RESINOUS TO
POLISHED LUSTER; SMOOTH TO SILTY TEXTURE



THIN STRUCTURE; HIGH GAS ASSOCIATED

WITH SAMPLE.

SILTSTONE = BROWNISH GRAY TO OLIVE GRAY;

DENSE TO CRUMBLY TENACITY; FRACTURES

FROM BLOCKY TO IRREGULAR; CUTTINGS ARE

MASSIVE TO TABULAR; EARTHY TO DULL TO

WAXY WITH A SLIGHT SPARKLING LUSTER;

SILTY TO GRITTY TEXTURE; GRADING FROM

FINE GRAINED SANDSTONE.

SANDSTONE = LIGHT BROWNISH GRAY TO LIGHT

OLIVE GRAY TO WHITE TO VERY LIGHT GRAY;

MOSTLY QUARTZ FRAMEWORK WITH 5-6 % DARK

LITHICS VISIBLE IN THE SAMPLE; COARSE TO

MEDIUM TO FINE GRAIN; POOR TO FAIR SORT-

ED; SUB-ROUND TO ROUND GRAINS; LOW TO

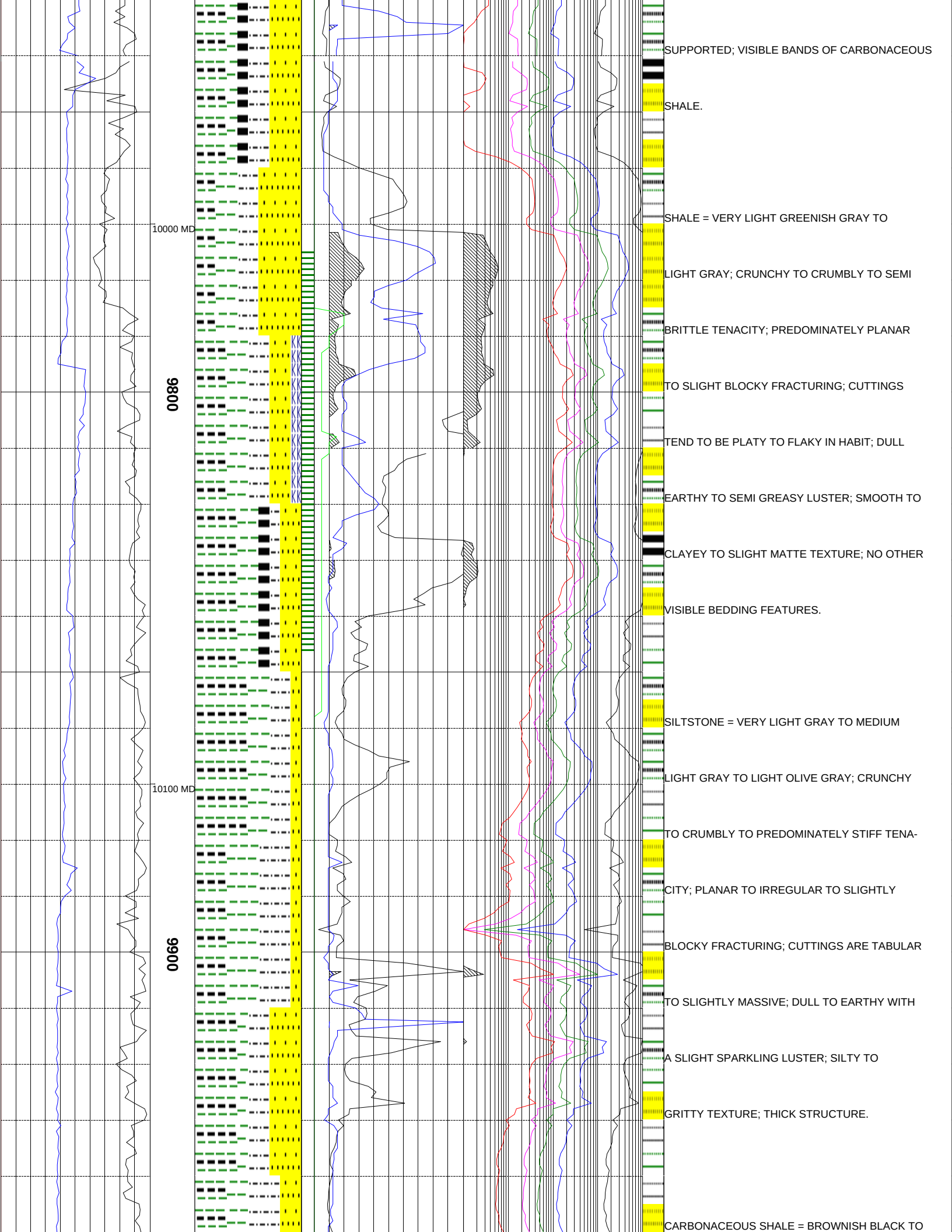
MODERATE SPHERICITY; GRAINS HAVE A

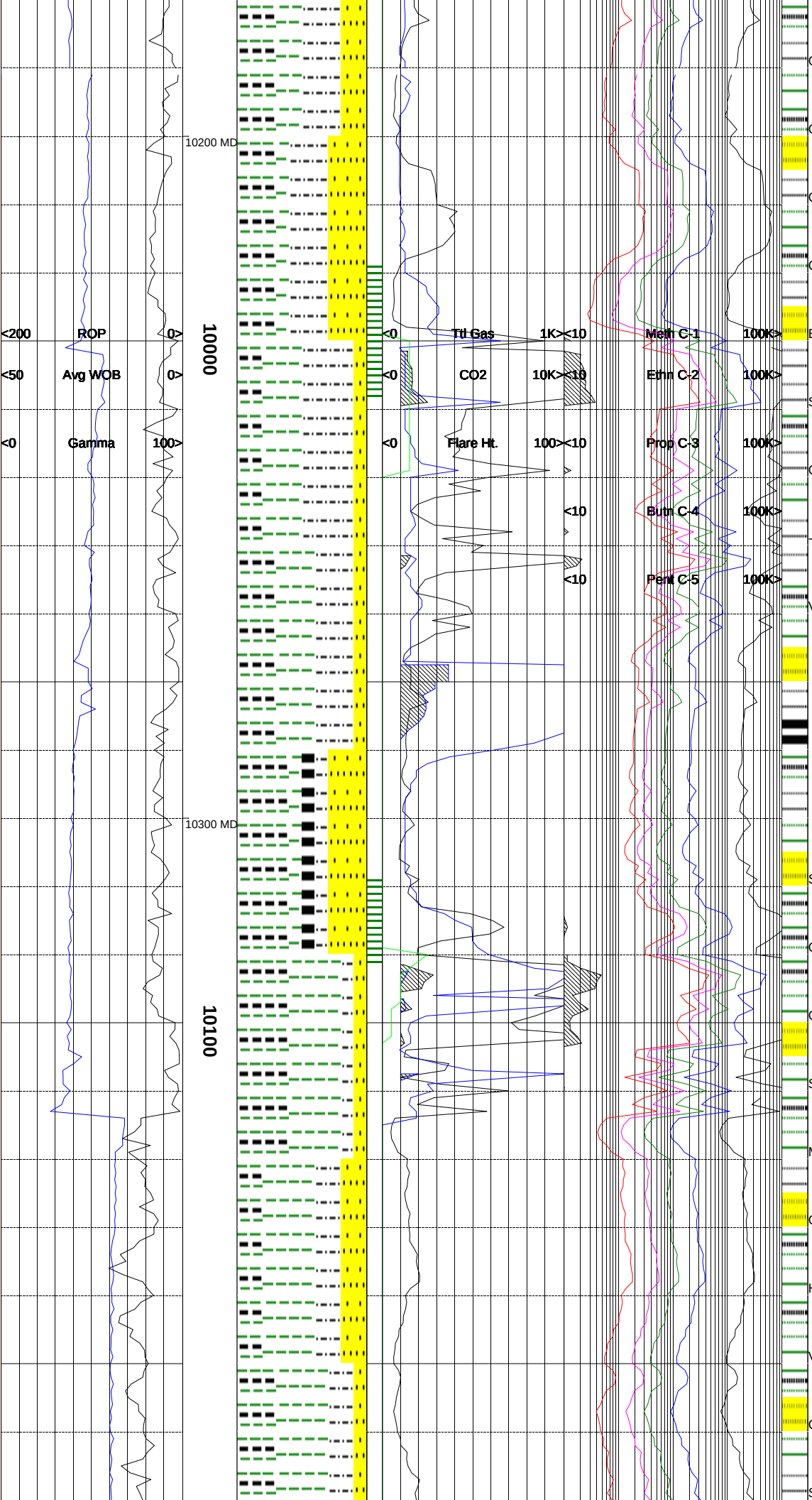
SLIGHT FROSTED APPEARANCE; FIRM FRIABLE

TO MODERATE HARD; CALCITE CEMENTATION

DUE TO HIGH REACTION IN DILUTE HCl; NO

VISIBLE HYDROCARBONS IN SAMPLE; GRAIN


SUPPORTED; VISIBLE BANDS OF CARBONACEOUS
SHALE.
10000 MD
SHALE = VERY LIGHT GREENISH GRAY TO
LIGHT GRAY; CRUNCHY TO CRUMBLY TO SEMI
BRITTLE TENACITY; PREDOMINATELY PLANAR
0086
TO SLIGHT BLOCKY FRACTURING; CUTTINGS
TEND TO BE PLATY TO FLAKY IN HABIT; DULL
EARTHY TO SEMI GREASY LUSTER; SMOOTH TO
CLAYEY TO SLIGHT MATTE TEXTURE; NO OTHER
VISIBLE BEDDING FEATURES.
SILTSTONE = VERY LIGHT GRAY TO MEDIUM
10100 MD
LIGHT GRAY TO LIGHT OLIVE GRAY; CRUNCHY
TO CRUMBLY TO PREDOMINATELY STIFF TENA-
CITY; PLANAR TO IRREGULAR TO SLIGHTLY
0066
BLOCKY FRACTURING; CUTTINGS ARE TABULAR
TO SLIGHTLY MASSIVE; DULL TO EARTHY WITH
A SLIGHT SPARKLING LUSTER; SILTY TO
GRITTY TEXTURE; THICK STRUCTURE.
CARBONACEOUS SHALE = BROWNISH BLACK TO



GRAYISH BLACK TO BLACK; BRITTLE TO

CRUMBLY TENACITY; IRREGULAR TO PLANAR TO

OCCASIONALLY SLIGHTLY BLOCKY FRACTURING;

CUTTINGS ARE TABULAR TO WEDGELIKE;

EARTHY TO POLISHED LUSTER; SMOOTH TO

SILTY TEXTURE; THIN STRUCTURE; PYRITE

CRYSTALS VISIBLE IN SAMPLE; VISIBLE BAND

-S OF CARBONACEOUS MATERIAL IN SAMPLE;

VISIBLE DEGASSING IN SAMPLE.

NOTE: TOOH TO CHANGE THE BIT TO 7.875".

SANDSTONE = MEDIUM GRAY TO BROWNISH GRAY

QUARTZ FRAMEWORK WITH FINE TO VERY FRINE

GRAINS; WELL SORTED; SUBROUBDED TO

SUBANGULAR WITH MODERATE SPHERICITY;

MODERATE HARD TO SLIGHTLY FIRMLY FRIABLE

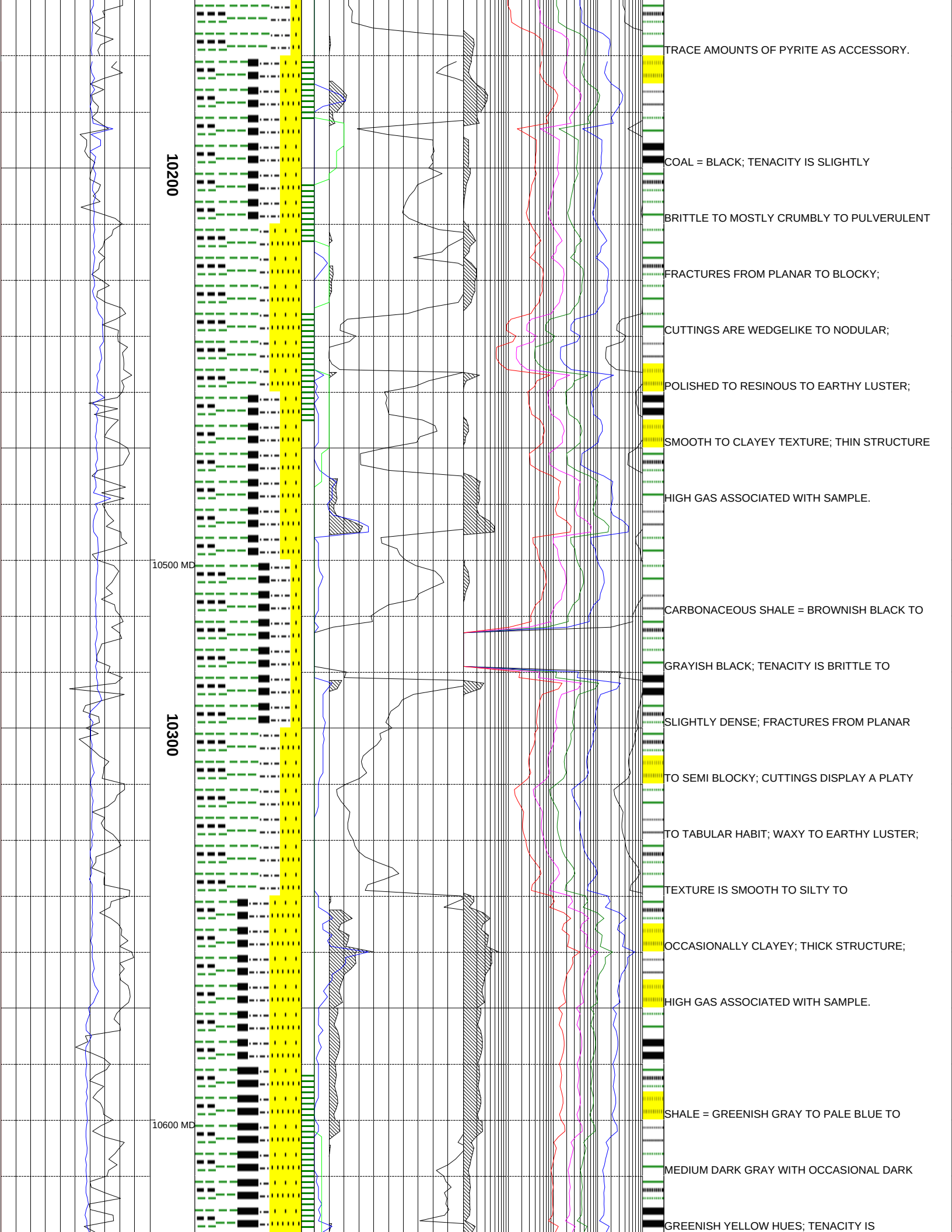
GRAIN SUPPORTED; SLIGHT REACTION WITH

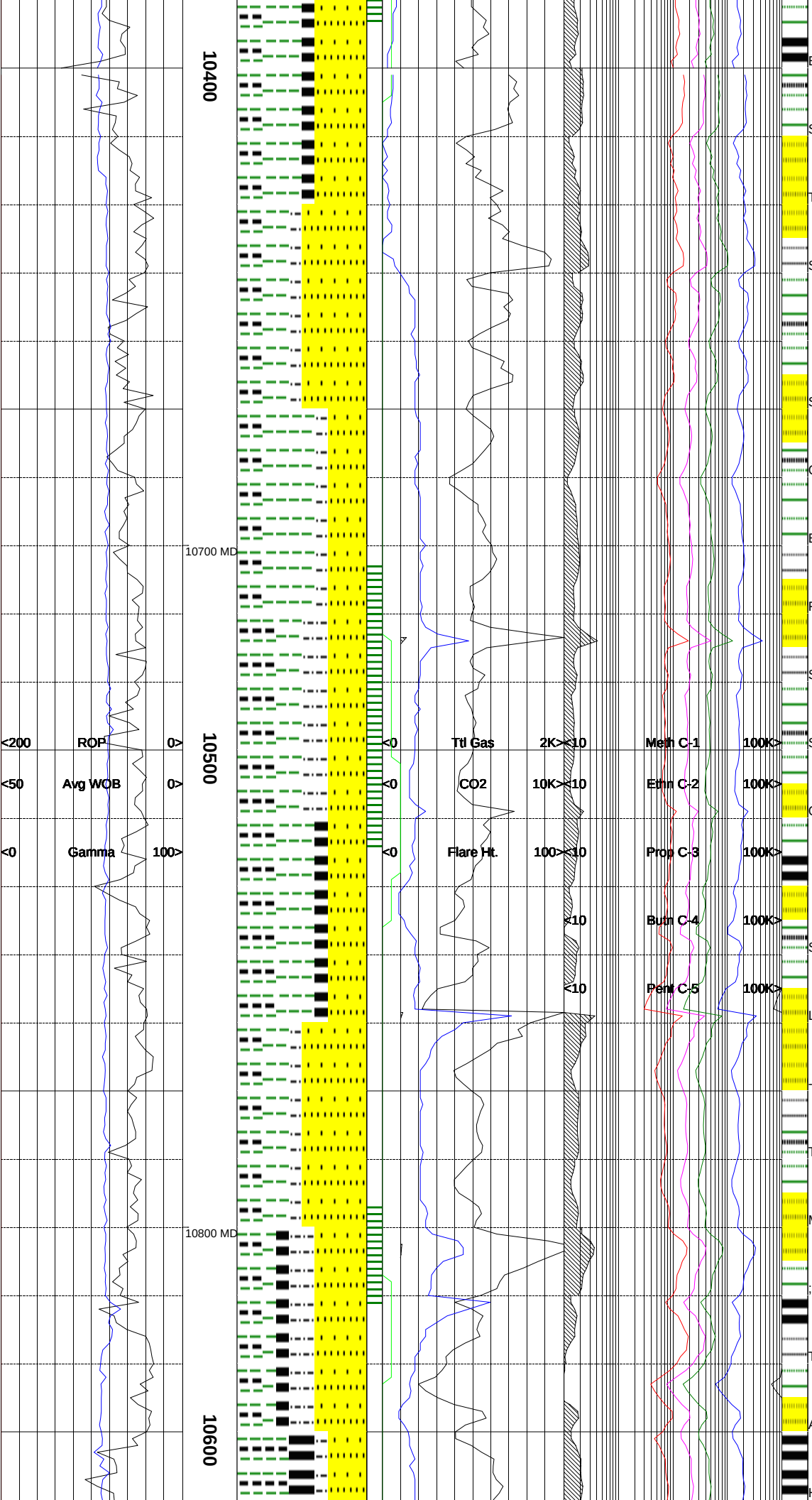
HCL SUGGESTS COME CALCITE CEMENT; NO

VISIBLE BEDDING; THIN LAYERS OF

CARBONACEOUS SHALE CAN OCCASIONALLY BE

SEEN IN SOME OF THE SAMPLE; CONTAINS


10200
10500 MD
10300
10600 MD
TRACE AMOUNTS OF PYRITE AS ACCESSORY.
COAL = BLACK; TENACITY IS SLIGHTLY
BRITTLE TO MOSTLY CRUMBLY TO PULVERULENT
FRACTURES FROM PLANAR TO BLOCKY;
CUTTINGS ARE WEDGELIKE TO NODULAR;
POLISHED TO RESINOUS TO EARTHY LUSTER;
SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE
HIGH GAS ASSOCIATED WITH SAMPLE.
CARBONACEOUS SHALE = BROWNISH BLACK TO
GRAYISH BLACK; TENACITY IS BRITTLE TO
SLIGHTLY DENSE; FRACTURES FROM PLANAR
TO SEMI BLOCKY; CUTTINGS DISPLAY A PLATY
TO TABULAR HABIT; WAXY TO EARTHY LUSTER;
TEXTURE IS SMOOTH TO SILTY TO
OCCASIONALLY CLAYEY; THICK STRUCTURE;
HIGH GAS ASSOCIATED WITH SAMPLE.
SHALE = GREENISH GRAY TO PALE BLUE TO
MEDIUM DARK GRAY WITH OCCASIONAL DARK
GREENISH YELLOW HUES; TENACITY IS



BRITTLE TO CRUMBLY; FRACTURES FROM

SPLINTERY TO PLANAR; CUTTINGS ARE PLATY

TO FLAKY; DULL WAXY LUSTER; SMOOTH TO

SILTY TEXTURE; THICK STRUCTURE.

SILTSTONE = MEDIUM DARK GRAY TO BROWNISH

GRAY TO MODERATE OLIVE BROWN; DENSE TO

BRITTLE TENACITY; BLOCKY TO PLANAR

FRACTURING; CUTTINGS ARE TABULAR TO

SLIGHTLY PLATY; EARTHY TO DULL TO

SLIGHTLY SPARKLING LUSTER; SILTY TO

GRITTY TEXTURE; STHIN STRUCTURE.

SANDSTONE = WHITE TO TRANSLUCENT TO VERY

LIGHT BROWNISH GRAY; MOSTLY QUARTZ FRAME

-WORK WITH 1-3% DARK LITHICS VISIBLE IN

THE SAMPLE; VERY COARSE TO COARSE TO

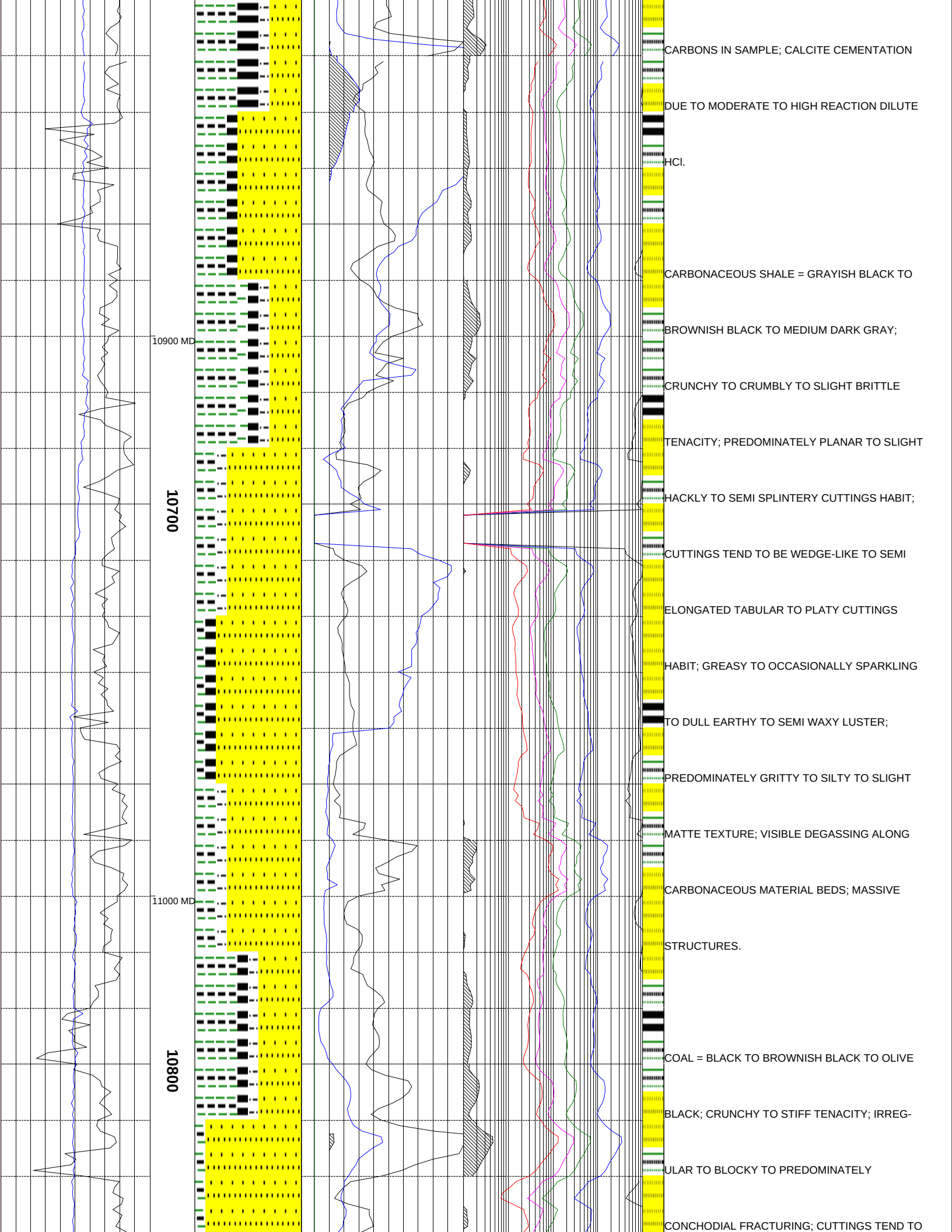
MEDIUM GRAIN SIZE; FAIR TO POORLY SORTED

; SUB-ANGULAR TO SUB-ROUND GRAINS; HIGH

TO MODERATE SPHERICITY; NO VISIBLE SURF-

ACE FEATURES; FIRM FRIABLE TO MODERATE

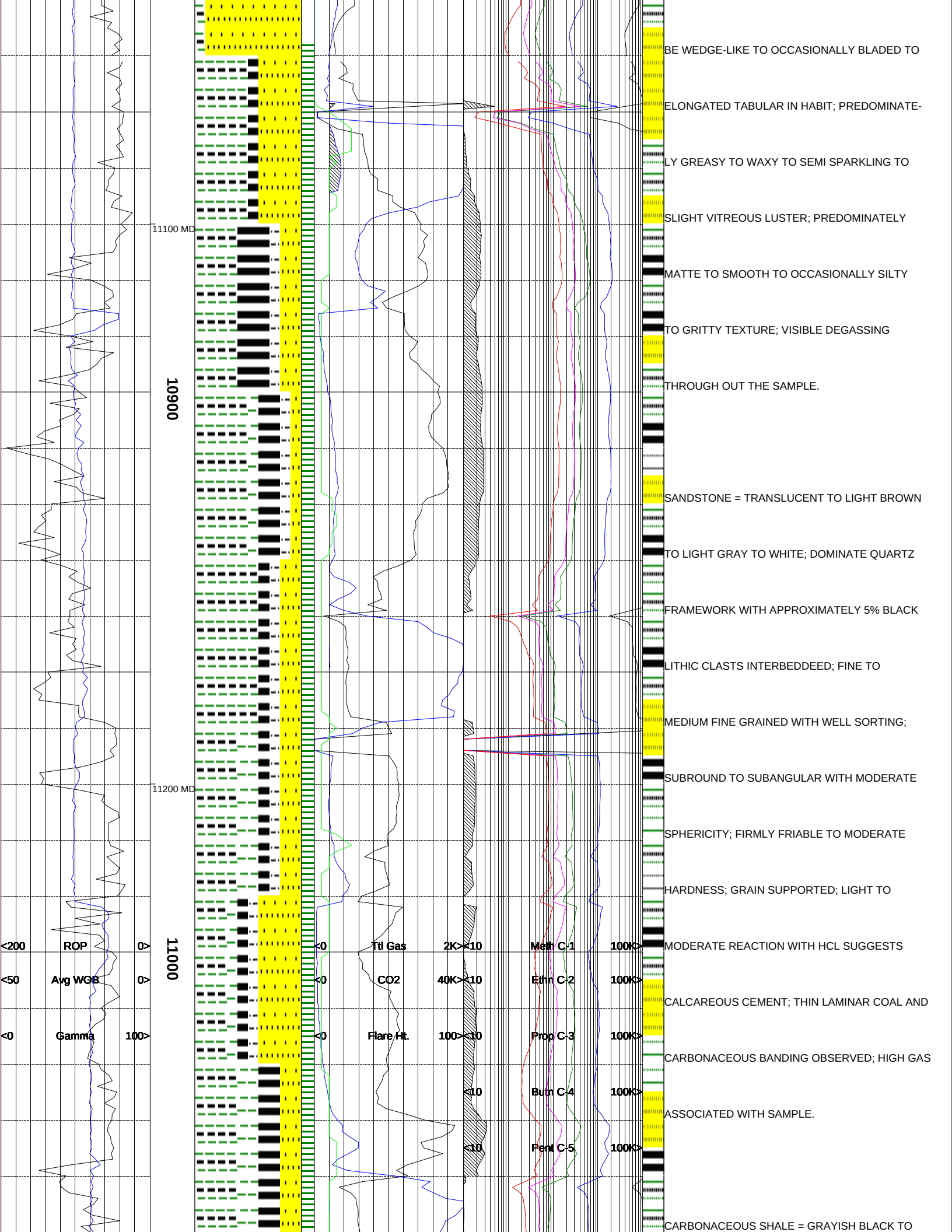
HARD; GRAIN SUPPORTED; NO VISIBLE HYDRO-



CARBONS IN SAMPLE; CALCITE CEMENTATION DUE TO MODERATE TO HIGH REACTION DILUTE HCl.

CARBONACEOUS SHALE = GRAYISH BLACK TO BROWNISH BLACK TO MEDIUM DARK GRAY; CRUNCHY TO CRUMBLY TO SLIGHT BRITTLE TENACITY; PREDOMINATELY PLANAR TO SLIGHT HACKLY TO SEMI SPLINTERY CUTTINGS HABIT; CUTTINGS TEND TO BE WEDGE-LIKE TO SEMI ELONGATED TABULAR TO PLATY CUTTINGS HABIT; GREASY TO OCCASIONALLY SPARKLING TO DULL EARTHY TO SEMI WAXY LUSTER; PREDOMINATELY GRITTY TO SILTY TO SLIGHT MATTE TEXTURE; VISIBLE DEGASSING ALONG CARBONACEOUS MATERIAL BEDS; MASSIVE STRUCTURES.

COAL = BLACK TO BROWNISH BLACK TO OLIVE BLACK; CRUNCHY TO STIFF TENACITY; IRREG-ULAR TO BLOCKY TO PREDOMINATELY CONCHODIAL FRACTURING; CUTTINGS TEND TO



BE WEDGE-LIKE TO OCCASIONALLY BLADED TO

ELONGATED TABULAR IN HABIT; PREDOMINATE-

LY GREASY TO WAXY TO SEMI SPARKLING TO

SLIGHT VITREOUS LUSTER; PREDOMINATELY

MATTE TO SMOOTH TO OCCASIONALLY SILTY

TO GRITTY TEXTURE; VISIBLE DEGASSING

THROUGH OUT THE SAMPLE.

SANDSTONE = TRANSLUCENT TO LIGHT BROWN

TO LIGHT GRAY TO WHITE; DOMINATE QUARTZ

FRAMEWORK WITH APPROXIMATELY 5% BLACK

LITHIC CLASTS INTERBEDDEED; FINE TO

MEDIUM FINE GRAINED WITH WELL SORTING;

SUBROUND TO SUBANGULAR WITH MODERATE

SPHERICITY; FIRMLY FRIABLE TO MODERATE

HARDNESS; GRAIN SUPPORTED; LIGHT TO

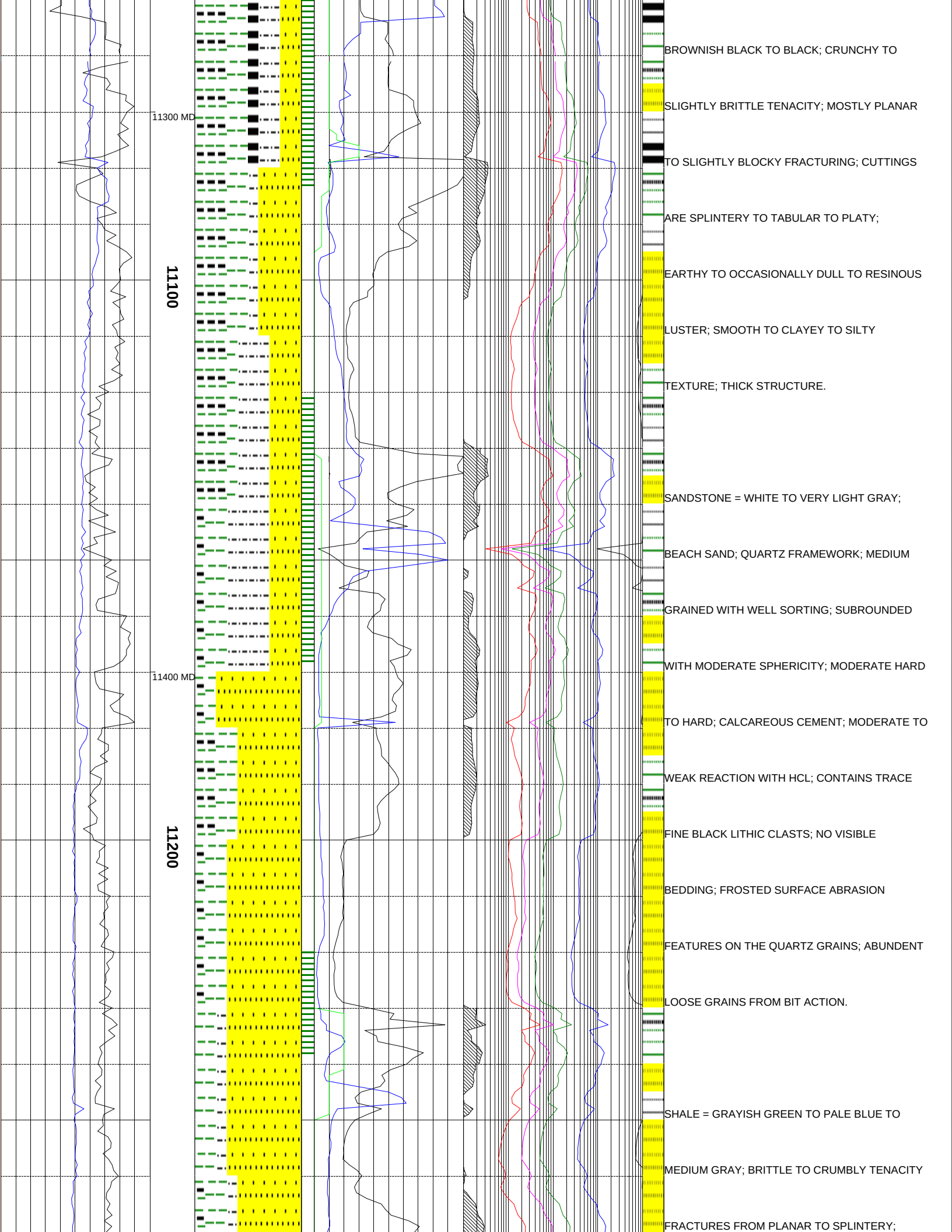
MODERATE REACTION WITH HCL SUGGESTS

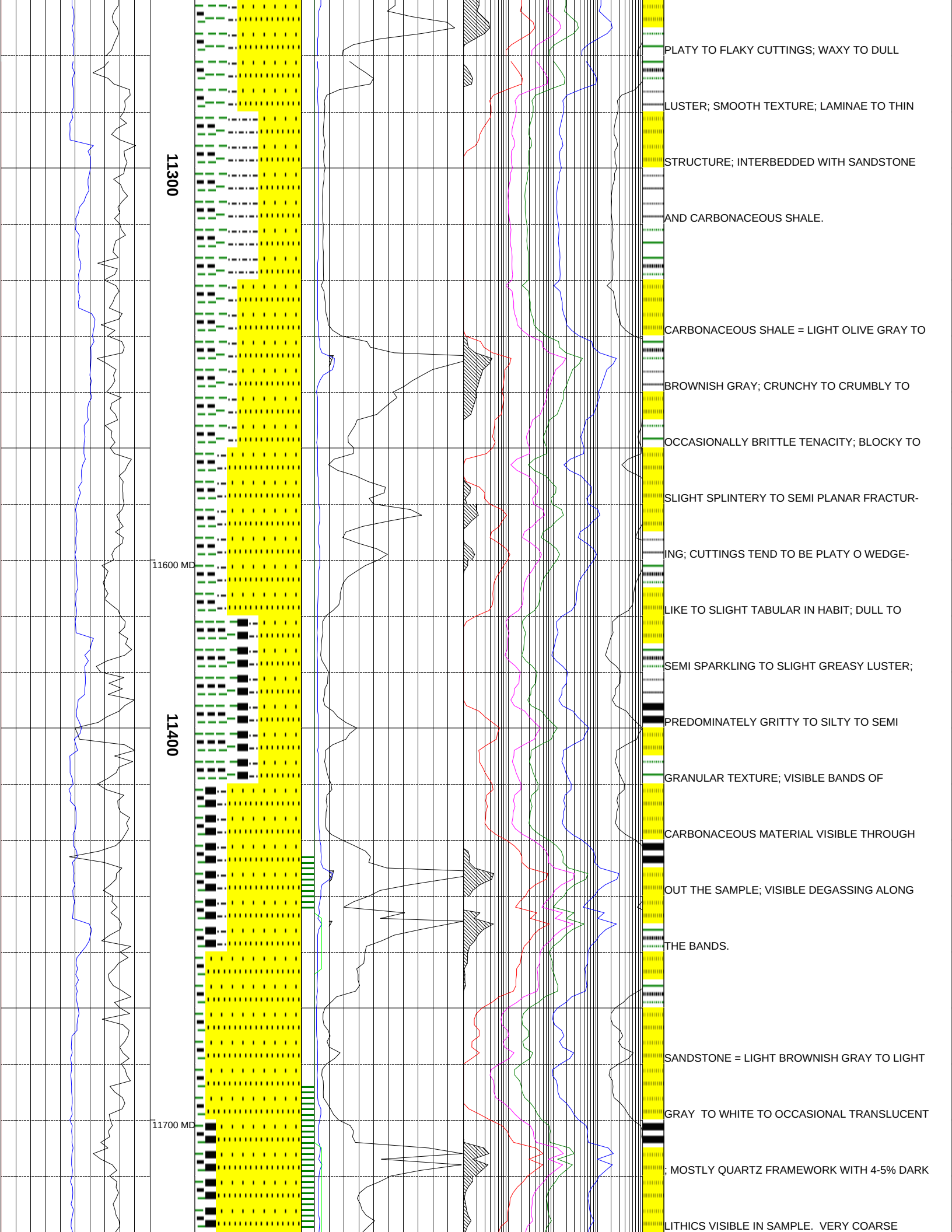
CALCAREOUS CEMENT; THIN LAMINAR COAL AND

CARBONACEOUS BANDING OBSERVED; HIGH GAS

ASSOCIATED WITH SAMPLE.

CARBONACEOUS SHALE = GRAYISH BLACK TO

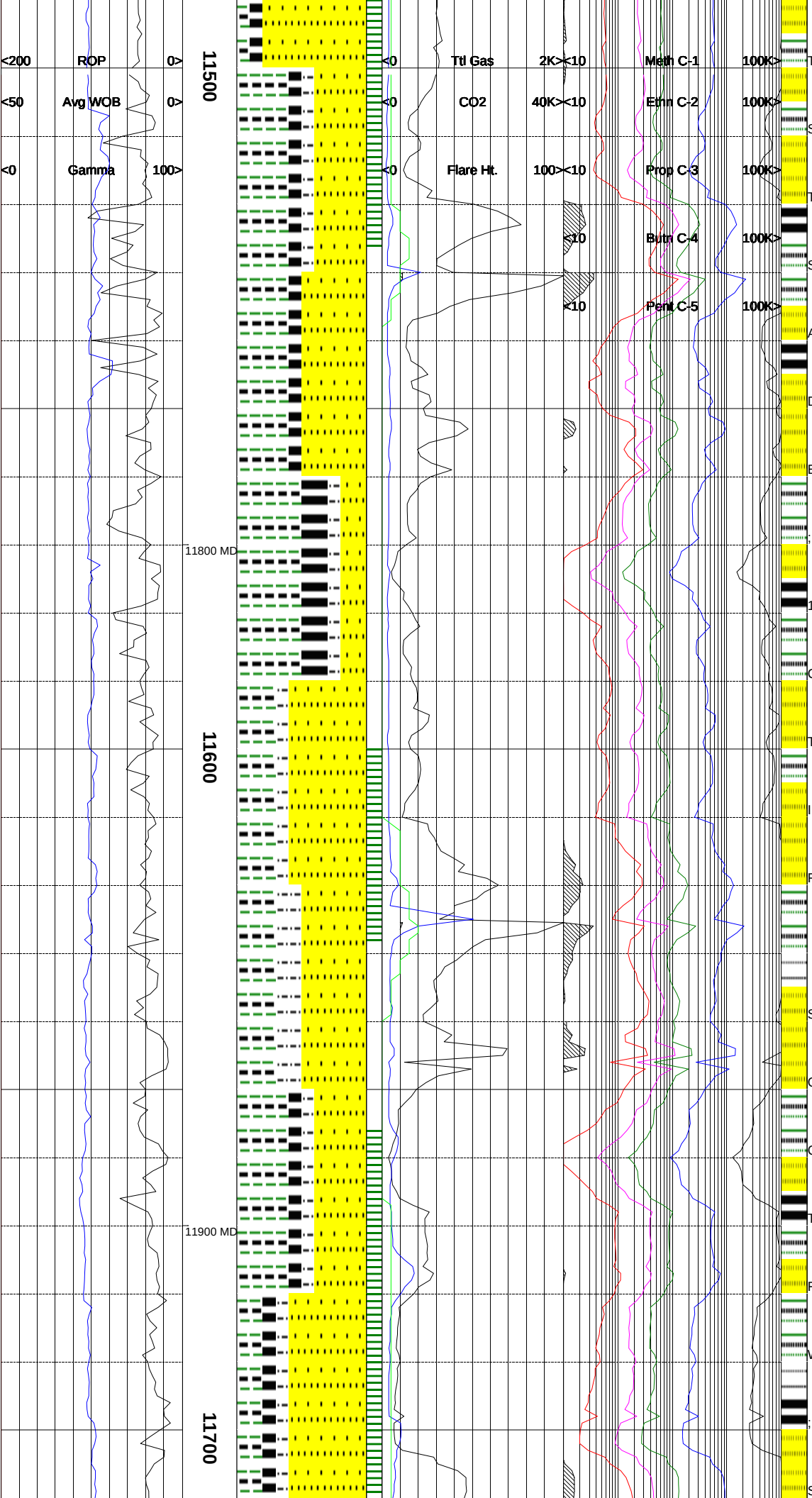

11300 MD
11100
11400 MD
11200
BROWNISH BLACK TO BLACK; CRUNCHY TO
SLIGHTLY BRITTLE TENACITY; MOSTLY PLANAR
TO SLIGHTLY BLOCKY FRACTURING; CUTTINGS
ARE SPLINTERY TO TABULAR TO PLATY;
EARTHY TO OCCASIONALLY DULL TO RESINOUS
LUSTER; SMOOTH TO CLAYEY TO SILTY
TEXTURE; THICK STRUCTURE.
SANDSTONE = WHITE TO VERY LIGHT GRAY;
BEACH SAND; QUARTZ FRAMEWORK; MEDIUM
GRAINED WITH WELL SORTING; SUBROUNDED
WITH MODERATE SPHERICITY; MODERATE HARD
TO HARD; CALCAREOUS CEMENT; MODERATE TO
WEAK REACTION WITH HCL; CONTAINS TRACE
FINE BLACK LITHIC CLASTS; NO VISIBLE
BEDDING; FROSTED SURFACE ABRASION
FEATURES ON THE QUARTZ GRAINS; ABUNDENT
LOOSE GRAINS FROM BIT ACTION.
SHALE = GRAYISH GREEN TO PALE BLUE TO
MEDIUM GRAY; BRITTLE TO CRUMBLY TENACITY
FRACTURES FROM PLANAR TO SPLINTERY;



PLATY TO FLAKY CUTTINGS; WAXY TO DULL LUSTER; SMOOTH TEXTURE; LAMINAE TO THIN STRUCTURE; INTERBEDDED WITH SANDSTONE AND CARBONACEOUS SHALE.

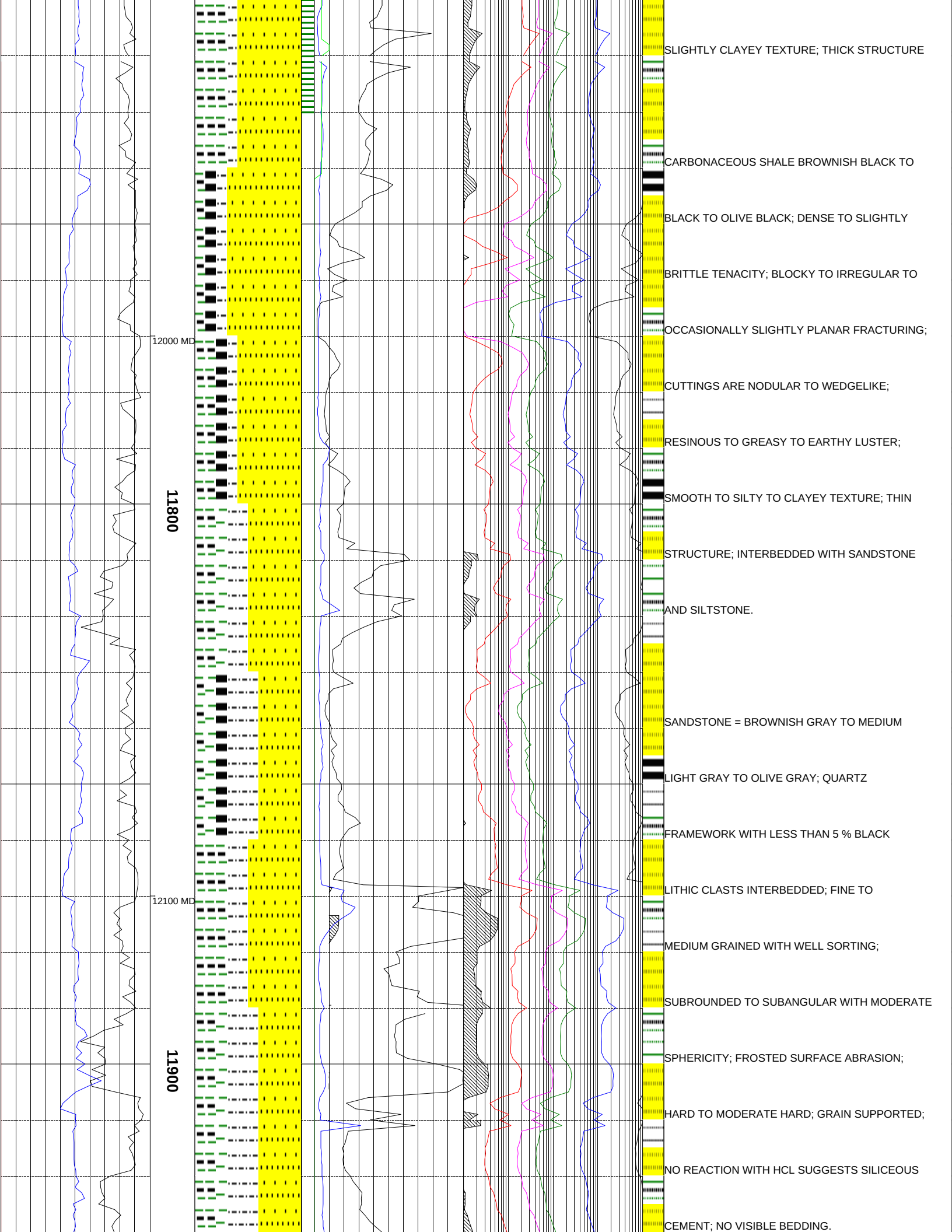
CARBONACEOUS SHALE = LIGHT OLIVE GRAY TO BROWNISH GRAY; CRUNCHY TO CRUMBLY TO OCCASIONALLY BRITTLE TENACITY; BLOCKY TO SLIGHT SPLINTERY TO SEMI PLANAR FRACTURING; CUTTINGS TEND TO BE PLATY O WEDGE-LIKE TO SLIGHT TABULAR IN HABIT; DULL TO SEMI SPARKLING TO SLIGHT GREASY LUSTER; PREDOMINATELY GRITTY TO SILTY TO SEMI GRANULAR TEXTURE; VISIBLE BANDS OF CARBONACEOUS MATERIAL VISIBLE THROUGH OUT THE SAMPLE; VISIBLE DEGASSING ALONG THE BANDS.

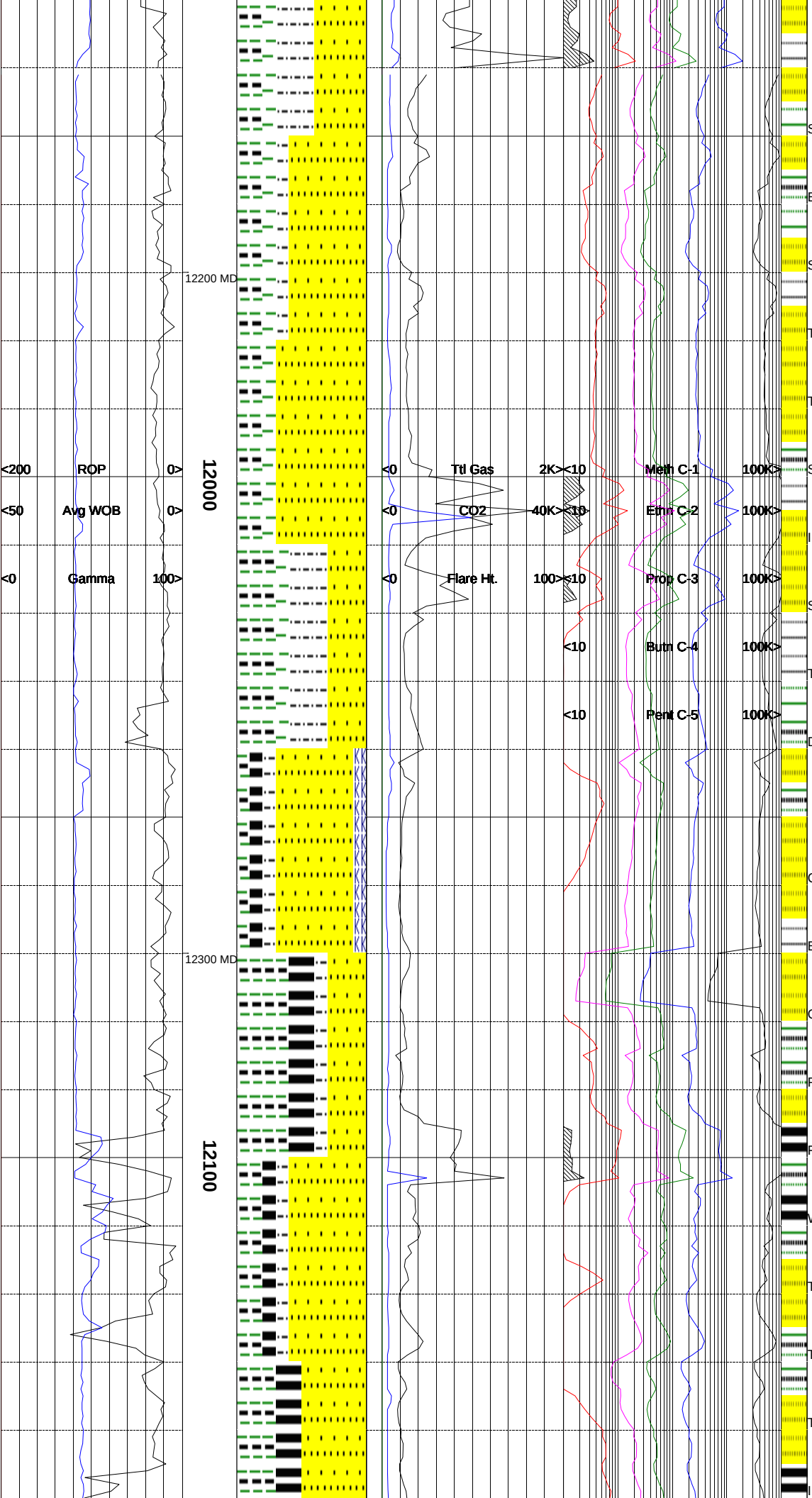
SANDSTONE = LIGHT BROWNISH GRAY TO LIGHT GRAY TO WHITE TO OCCASIONAL TRANSLUCENT ; MOSTLY QUARTZ FRAMEWORK WITH 4-5% DARK LITHICS VISIBLE IN SAMPLE. VERY COARSE



TO COARSE TO OCCASIONALLY MEDIUM GRAIN SIZE; FAIR TO POORLY SORTED; SUB-ROUND TO ROUND GRAINS; MODERATE TO HIGH SPHERICITY; GRAINS HAVE A SLIGHT PITTED APPEARANCE; A FEW UNCONSOLIDATED GRAINS DUE TO BIT ACTION; FIRM FRIABLE TO MOD-ERATE HARD TO VERY HARD; GRAIN SUPPORTED ; A FEW VISIBLE HYDROCARBONS IN SAMPLE @ 11880' IN A FIRM COARSE GRAIN SANDSTONE; CEMENTATION IS PROBABLY MORE SILICIOUS THAN CALCITIC DUE TO VERY LOW REACTION IN DILUTE HCl; NO OTHER VISIBLE BEDDING FEATURES.

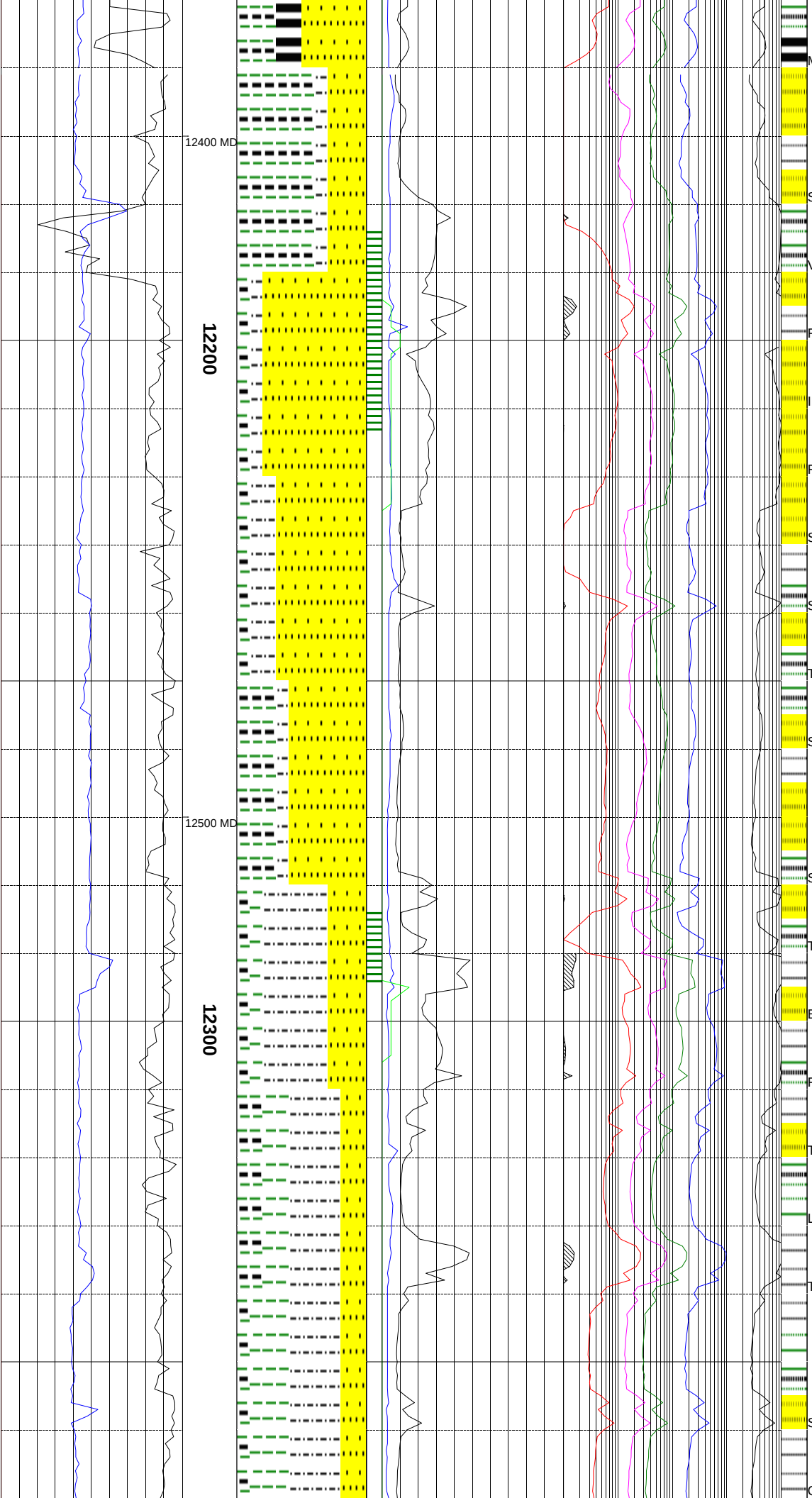
SILTSTONE = LIGHT BROWNISH GRAY TO LIGHT GRAY TO LIGHT BLUISH GRAY; CRUNCHY TO CRUMBLY TO SEMI STIFF TENACITY; BLOCKY TO SLIGHT PLANAR TO PREDOMINATELY HACKLY FRACTURING; CUTTINGS TEND TO BE SEMI WEDGE-LIKE TO ELONGATED TABULAR IN HABIT ; SLIGHT FROSTED TO SEMI SPARKLING TO SLIGHT GREASY LUSTER; GRITTY TO SILTY TO


12000 MD
11800
12100 MD
11900
SLIGHTLY CLAYEY TEXTURE; THICK STRUCTURE
CARBONACEOUS SHALE BROWNISH BLACK TO
BLACK TO OLIVE BLACK; DENSE TO SLIGHTLY
BRITTLE TENACITY; BLOCKY TO IRREGULAR TO
OCCASIONALLY SLIGHTLY PLANAR FRACTURING;
CUTTINGS ARE NODULAR TO WEDGELIKE;
RESINOUS TO GREASY TO EARTHY LUSTER;
SMOOTH TO SILTY TO CLAYEY TEXTURE; THIN
STRUCTURE; INTERBEDDED WITH SANDSTONE
AND SILTSTONE.
SANDSTONE = BROWNISH GRAY TO MEDIUM
LIGHT GRAY TO OLIVE GRAY; QUARTZ
FRAMEWORK WITH LESS THAN 5 % BLACK
LITHIC CLASTS INTERBEDDED; FINE TO
MEDIUM GRAINED WITH WELL SORTING;
SUBROUNDED TO SUBANGULAR WITH MODERATE
SPHERICITY; FROSTED SURFACE ABRASION;
HARD TO MODERATE HARD; GRAIN SUPPORTED;
NO REACTION WITH HCL SUGGESTS SILICEOUS
CEMENT; NO VISIBLE BEDDING.



SILTSTONE = LIGHT BLUISH GRAY TO LIGHT BROWNISH GRAY; CRUNCHY TO PREDOMINATELY STIFF TO SEMI BRITTLE TENACITY; HACKLY TO PLANAR TO OCCASIONALLY BLOCKY FRACTURING; CUTTINGS TEND TO BE PLATY TO SEMI TABULAR TO OCCASIONALLY WEDGE-LIKE IN HABIT; FROSTED TO SLIGHT SPARKLING TO SEMI GREASY LUSTER; GRITTY TO GRANULAR TO SILTY TEXTURE; NO OTHER VISIBLE BEDDING FEATURES.

COAL = OLIVE BLACK TO GRAYISH BLACK TO BROWNISH BLACK; STIFF TO CRUNCHY TO OCCASIONALLY CRUMBLY TENACITY; BLOCKY TO PREDOMINATELY CONCHOIDAL TO SEMI PLANAR FRACTURING; CUTTINGS TEND TO BE MOSTLY WEDGE-LIKE TO SLIGHT ELONGATED TABULAR TO SLIGHT BLADED IN HABIT; DULL EARTHY TO WAXY TO SEMI SPARKLING LUSTER; MATTE TO SMOOTH TO SLIGHT GRITTY TEXTURE; VISIBLE DEGASSING ALONG THE CARBONACEOUS

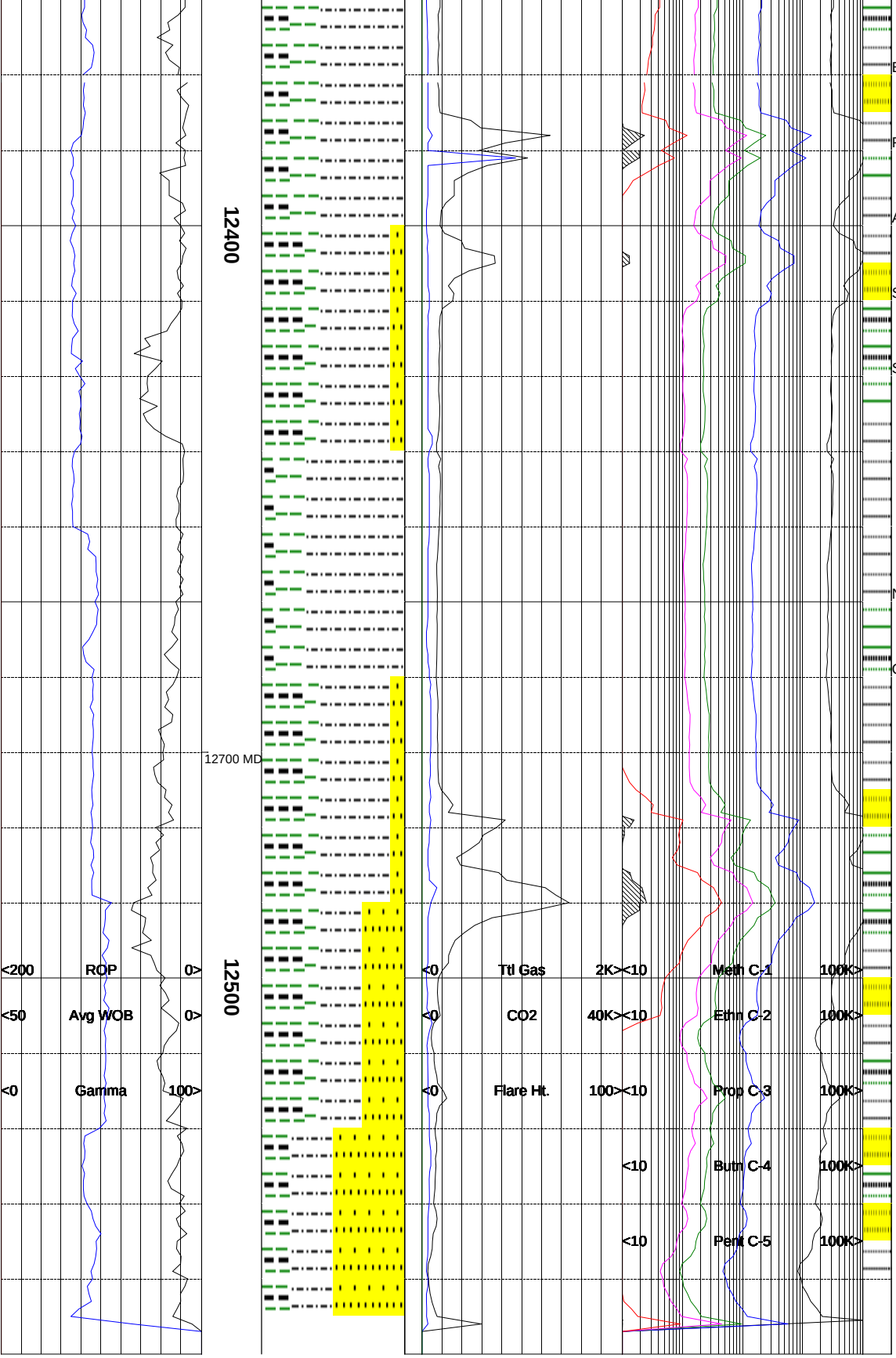


MATERIAL.

SANDSTONE = VERY LIGHT GRAY TO WHITE TO VERY LIGHT BROWNISH GRAY; MOSTLY QUARTZ FRAMEWORK WITH 7-8% DARK LITHICS VISIBLE IN SAMPLE; COARSE TO MEDIUM TO MOSTLY FINE TO VERY FINE GRAIN; FAIR TO WELL SORTED; ROUND TO SUB-ROUND GRAINS; LOW SPHERICITY; HARD TO VERY HARD; VERY LOW TO NO REACTION WITH HCL SUGGESTS SILICEOUS CEMENT; NO VISIBLE BEDDING.

SILTSTONE = BROWNISH GRAY TO OLIVE GRAY TO BROWNISH BLACK; TOUGH TO SLIGHTLY BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURING; CUTTINGS ARE MASSIVE TO TABULAR; EARTHY TO DULL WITH A SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; MASSIVE TO THICK STRUCTURE.

SHALE = MEDIUM GRAY TO MEDIUM BLUISH GRAY WITH LIGHT OLIVE BROWN HUES;



BRITTLE TO SLIGHTLY CRUNCHY TENACITY;

PLANAR TO SPLINTERY FRACTURING; CUTTINGS

ARE PLATY TO FLAKY; DULL WAXY LUSTER;

SILTY TO SMOOTH TEXTURE; LAMINAE TO THIN

STRUCTURE.

NOTE = REACHED TOTAL DEPTH OF 12776' MD

ON 7/17/2010 AT APPROXIMATELY 3:50 AM.