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# MUDLOG MD

**COMPANY** ExxonMobil Production  
**WELL** PCU 197-34B8 ST1  
**FIELD** PICEANCE CREEK  
**REGION** ROCKY MOUNTAINS  
**COORDINATES** 39.915659000  
108.261198000  
**ELEVATION** 6649.1'  
**COUNTY, STATE** RIO BLANCO, CO  
**API INDEX** 05-103-11082-01  
**SPUD DATE** 12/13/2008  
**CONTRACTOR** H\_P  
**CO. REP.** M. MARTINEZ/W. GARNER  
**RIG/TYPE** # 320/FLEX 4S+  
**LOGGING UNIT** MLU # 032  
**GEOLOGISTS** J. KEEVAN, C. RECORD  
C. PIERCE  
**ADD. PERSONS** M. PIPER, B.HICKS  
T. WALKER  
**CO. GEOLOGIST** CHRIS ALBA

## LOG INTERVAL

## CASING DATA

**DEPTHS:** 4,000' TO 8,889'  
**DATES:** 9/30/2009 TO 3/4/2010  
**SCALE:** 5" = 100'

16" AT 132'  
10.75" AT 3,976'  
7" AT 8,675'

## MUD TYPES

AT

## HOLE SIZE

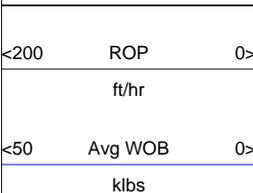
LSND TO 8,889'  
TO  
TO  
TO  
TO

14.75" TO 4,000'  
9.875" TO 8,675'  
6.125" TO 8,889'  
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	KAOLINIC	RECRYSTALLIZED CALCITE	VOLCANICS
CHALK	DIATOMITE	LIMESTONE	RHYOLITE	
CRYSTALLINE TUFF	DIORITE	LITHIC TUFF	SALT	
CHERT - ARGILL	DOLOSTONE	MARL - DOLO	SAND	



Depth

Lithology

MGS	<0 Ttl Gas units 500>	<10 Meth C-1 ppm 100K>
	<325 CO2 ppm 10K>	<10 Ethn C-2 100K>
	<0 Flare Ht. ft 100>	<10 Butn C-4 100K>
		<10 Pent C-5 100K>

Interp. Lith

Remarks  
Survey Data, Mud Reports, Other Info.

3900

EPOCH WELL SERVICES COMMENCED

MUDLOGGING ON THE EXXONMOBIL PCU

197-34B8 WELL ON 09/30/2009 AT 4000' MD.

ALL COLORS ARE REFERENCED TO THE GSA

ROCK COLOR CHART.

ALL TRIP AND CONNECTION GASES ARE

REFERENCED ABOVE BACKGROUND; ALL OTHERS

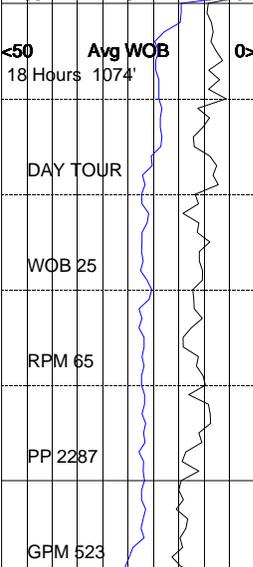
ARE ABSOLUTE.

1% METH. EQUIV. = 50 UNIT = 10000 PPM.

10 3/4" CASING @ 3957' PIT 12.0 PPG (E)

NB # 1, 9 7/8" in @ 4000'

HUGHES 5047X w/3X13s,3X12s



4000

MGS	<0 Ttl Gas units 500>	MW IN 9.4" VIS 47	<10 Meth C-1 ppm 100K>
	<325 CO2 ppm 10K>	MW OUT 9.4" VIS 40	<10 Ethn C-2 100K>
	<0 Flare Ht. ft 100>		<10 Prop C-3 100K>
			<10 Butn C-4 100K>
			<10 Pent C-5 100K>

SANDSTONE = YELLOWISH GRAY TO WHITE IN

COLOR; QUARTZ FRAMEWORK; MEDIUM TO FINE

GRAIN SIZE; FAIR TO WELL SORTING; GRAINS

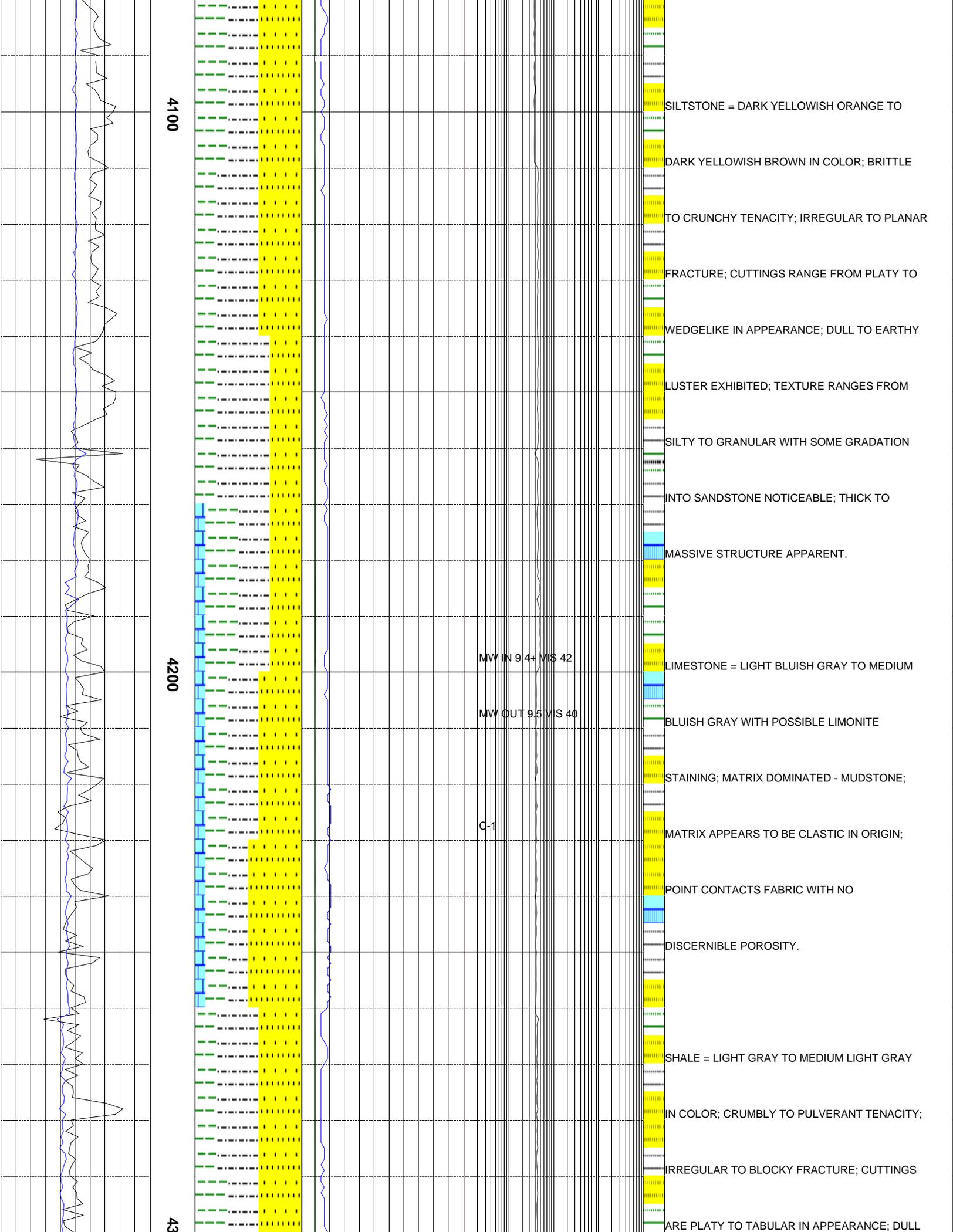
ARE ROUNDED TO SUBANGULAR WITH MODERATE

TO HIGH SPHERICITY; SAMPLE IS FRIABLE TO

MODERATELY HARD; CALCITE CEMENT; NO

VISIBLE BEDDING; NO VISIBLE VOIDS; NO

GAS SHOWS FROM THIS SANDSTONE.



4100

4200

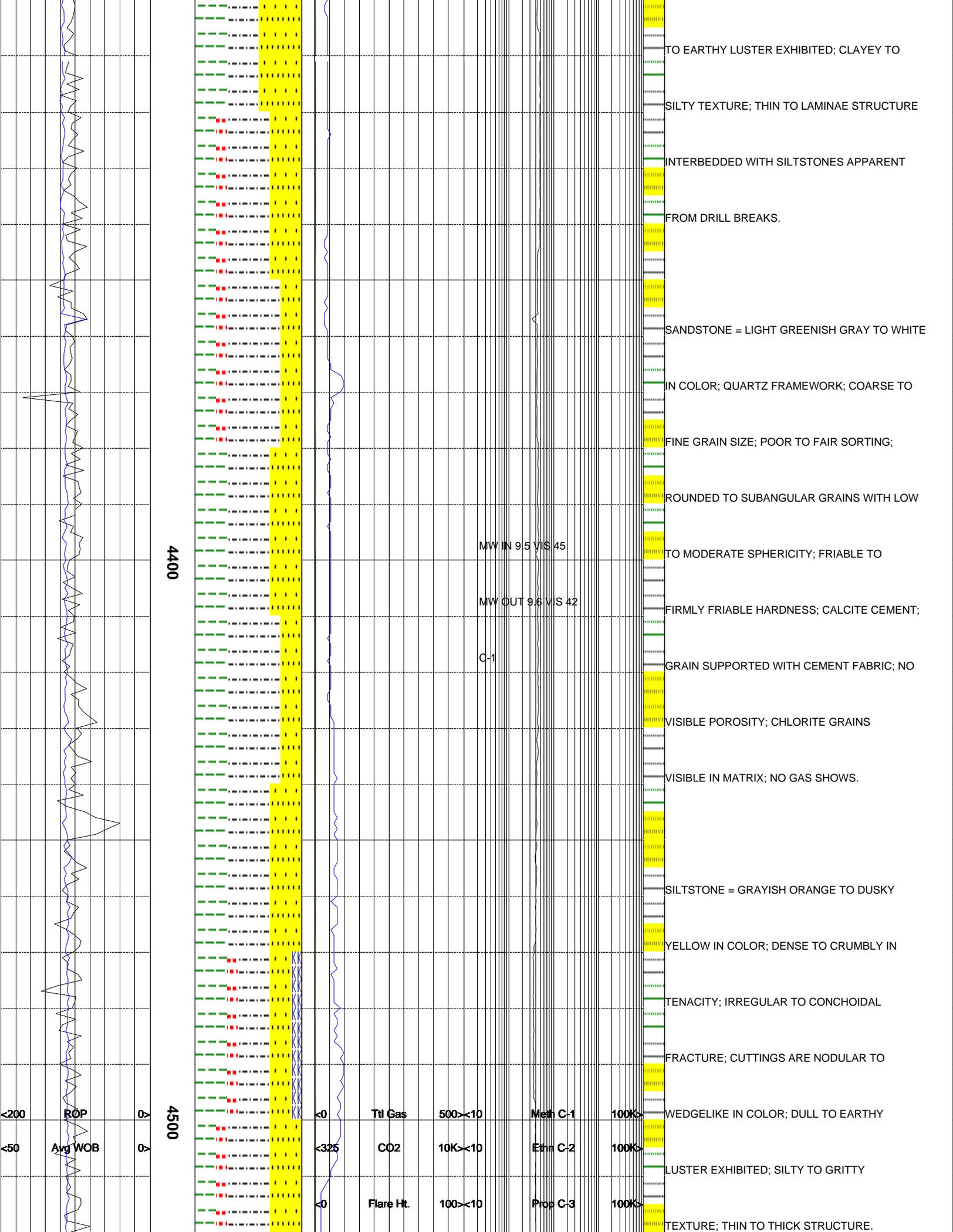
43

SILTSTONE = DARK YELLOWISH ORANGE TO  
 DARK YELLOWISH BROWN IN COLOR; BRITTLE  
 TO CRUNCHY TENACITY; IRREGULAR TO PLANAR  
 FRACTURE; CUTTINGS RANGE FROM PLATY TO  
 WEDGELIKE IN APPEARANCE; DULL TO EARTHY  
 LUSTER EXHIBITED; TEXTURE RANGES FROM  
 SILTY TO GRANULAR WITH SOME GRADATION  
 INTO SANDSTONE NOTICEABLE; THICK TO  
 MASSIVE STRUCTURE APPARENT.  
 LIMESTONE = LIGHT BLUISH GRAY TO MEDIUM  
 BLUISH GRAY WITH POSSIBLE LIMONITE  
 STAINING; MATRIX DOMINATED - MUDSTONE;  
 MATRIX APPEARS TO BE CLASTIC IN ORIGIN;  
 POINT CONTACTS FABRIC WITH NO  
 DISCERNIBLE POROSITY.  
 SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY  
 IN COLOR; CRUMBLY TO PULVERANT TENACITY;  
 IRREGULAR TO BLOCKY FRACTURE; CUTTINGS  
 ARE PLATY TO TABULAR IN APPEARANCE; DULL

MW IN 914+ VIS 42

MW OUT 95 VIS 40

C-1



NIGHT TOUR

4600

4700

MAX CO2 5169ppm

MW IN 9.5 VIS 56

MW OUT 9.6 VIS 47

C-1

SHALE = LIGHT GRAY TO MODERATE GREENISH

YELLOW WITH GRAYISH PURPLE HUES; BRITTLE

TENACITY; PLANAR TO IRREGULAR FRACTURING

PLATY TO SCALY CUTTINGS; DULL TO WAXY

LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE

STRUCTURE.

SANDSTONE = LIGHT GREENISH GRAY TO LIGHT

OLIVE GRAY TO LIGHT GRAY; FRAMEWORK

CONSISTS OF MOSTLY QUARTZ; MEDIUM TO

FINE SIZED GRAINS WITH POOR SORTING;

SUBROUNDED TO SUBANGULAR WITH MODERATE

SPHERICITY; FIRMLY FRIABLE WITH CALCITE

CEMENT; MODERATE REACTION WITH HCL.

SILTSTONE = PALE REDDISH BROWN TO

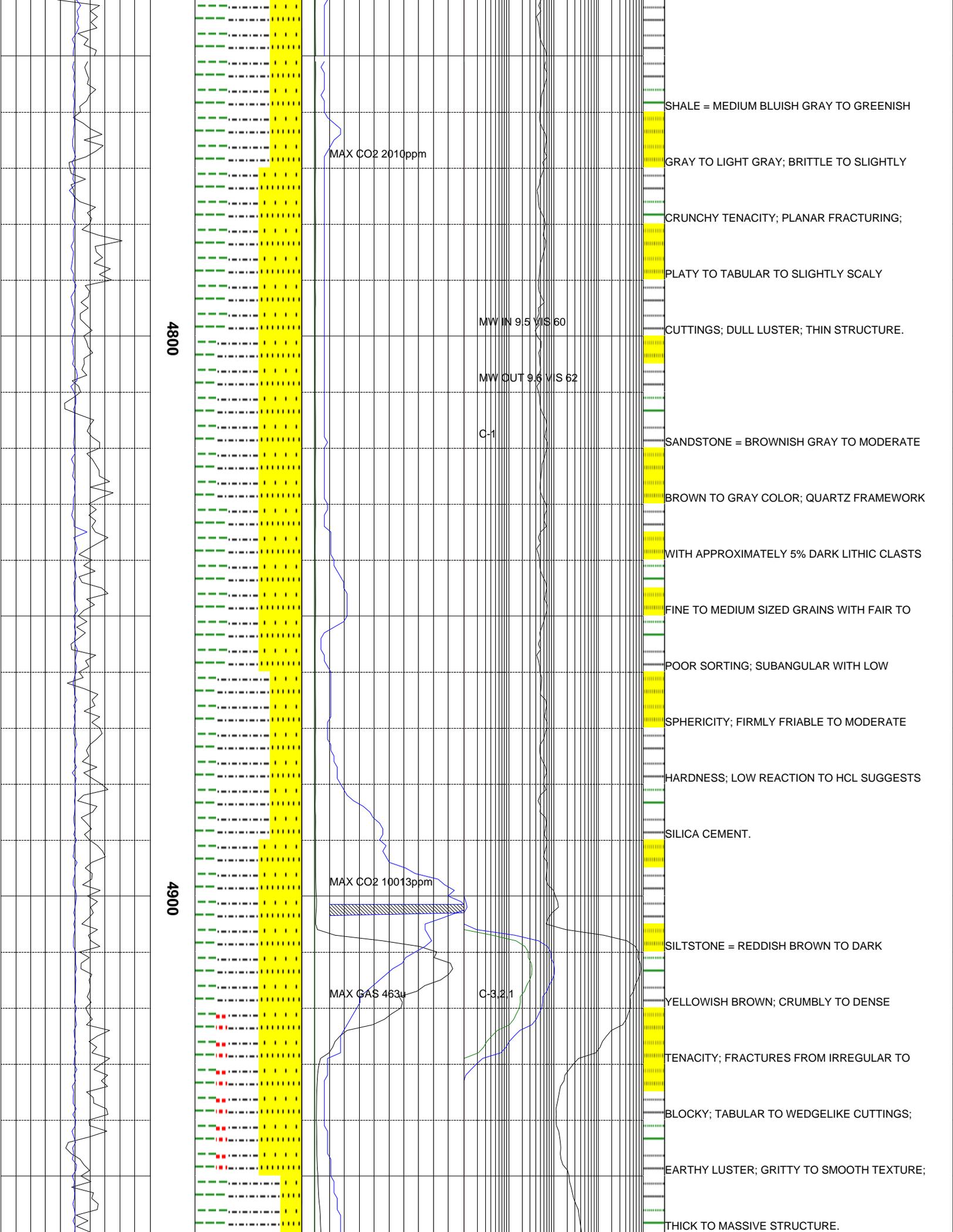
MODERATE BROWN; DENSE TO CRUMBLY

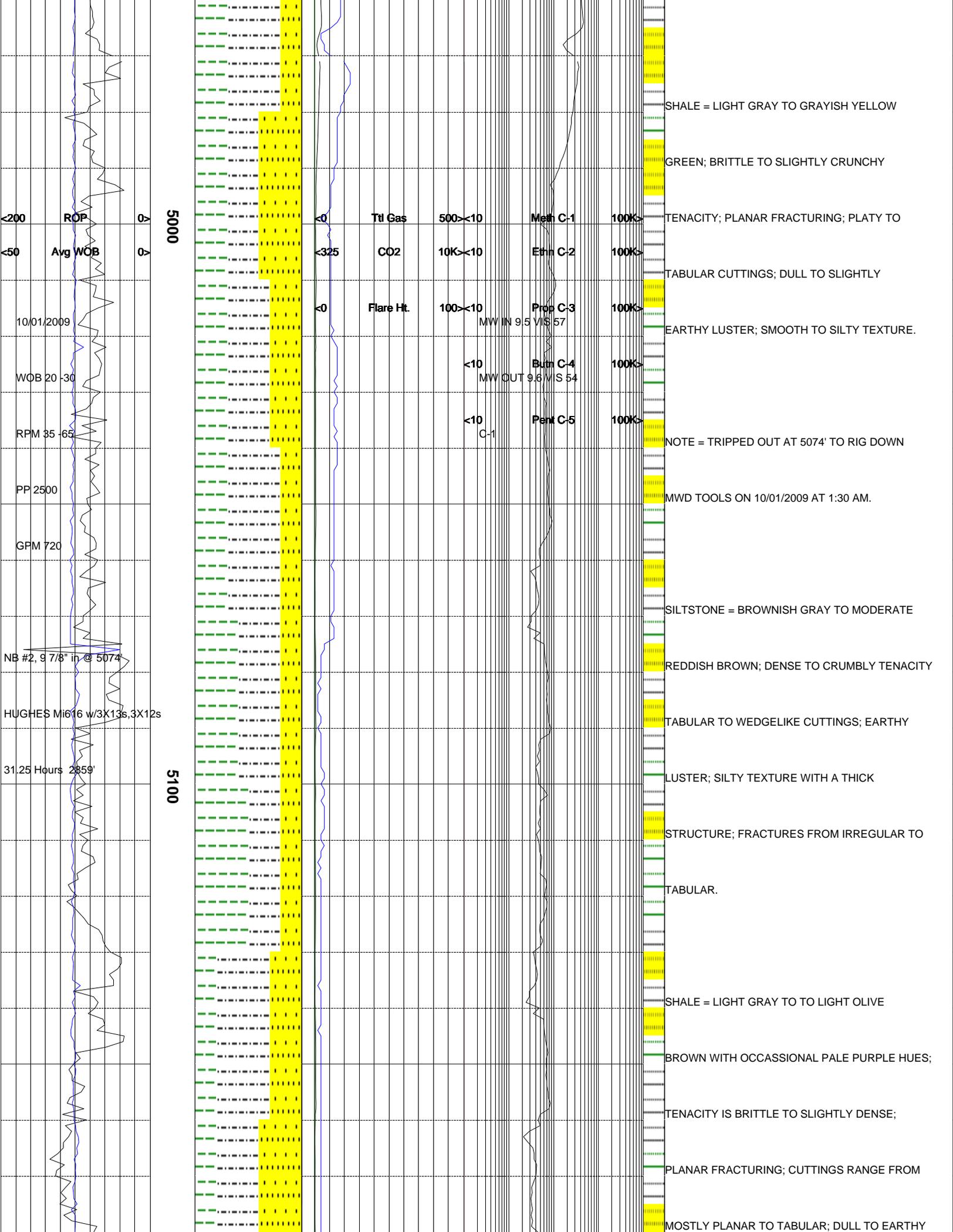
TENACITY; BLOCKY TO IRREGULAR FRACTURING

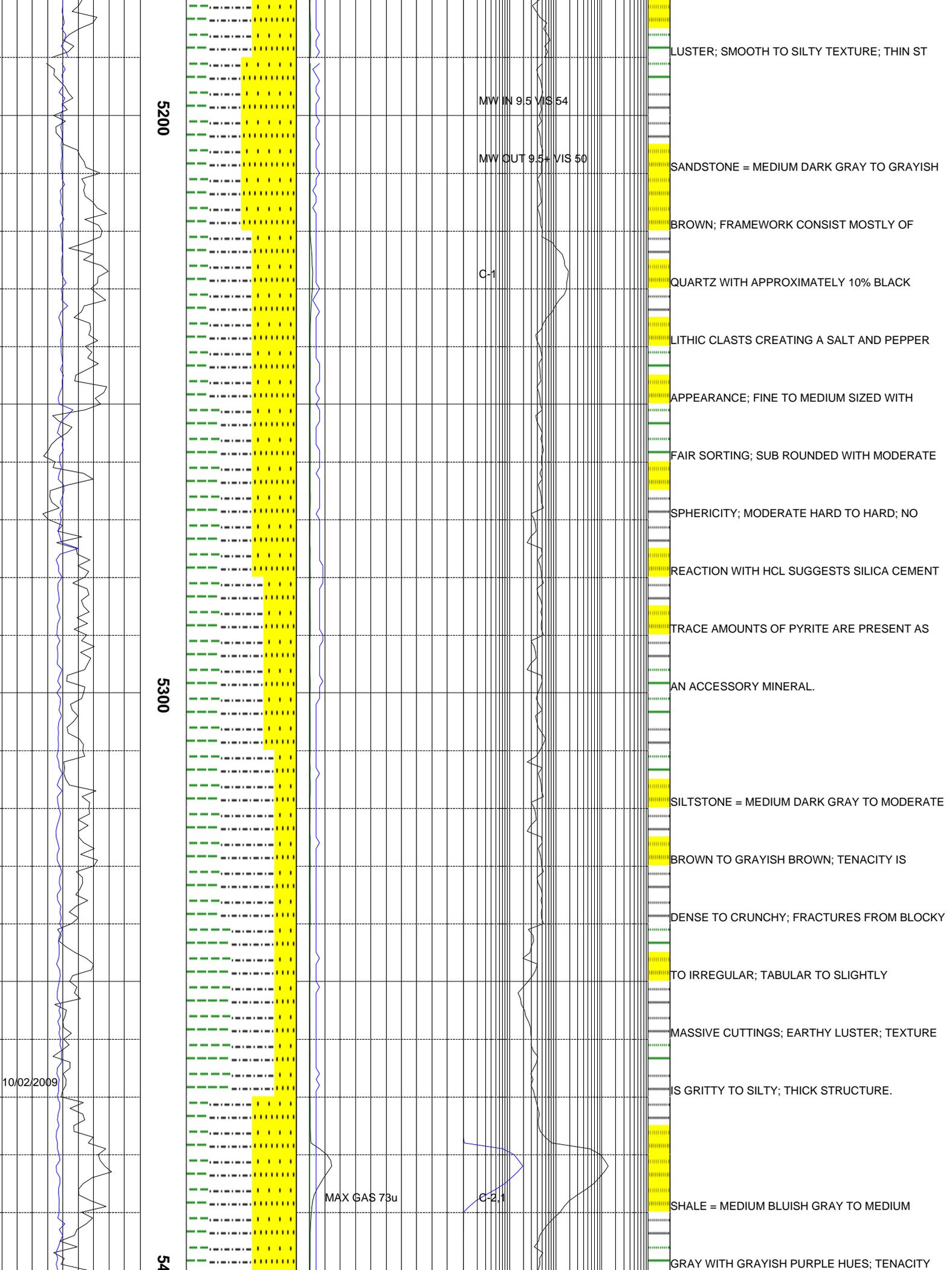
TABULAR CUTTINGS; EARTHY WITH A SLIGHT

FROSTED LUSTER; GRITTY TO SILTY TEXTURE;

THICK TO MASSIVE STRUCTURE.







5200

5300

54

MW IN 9.5 VIS 54

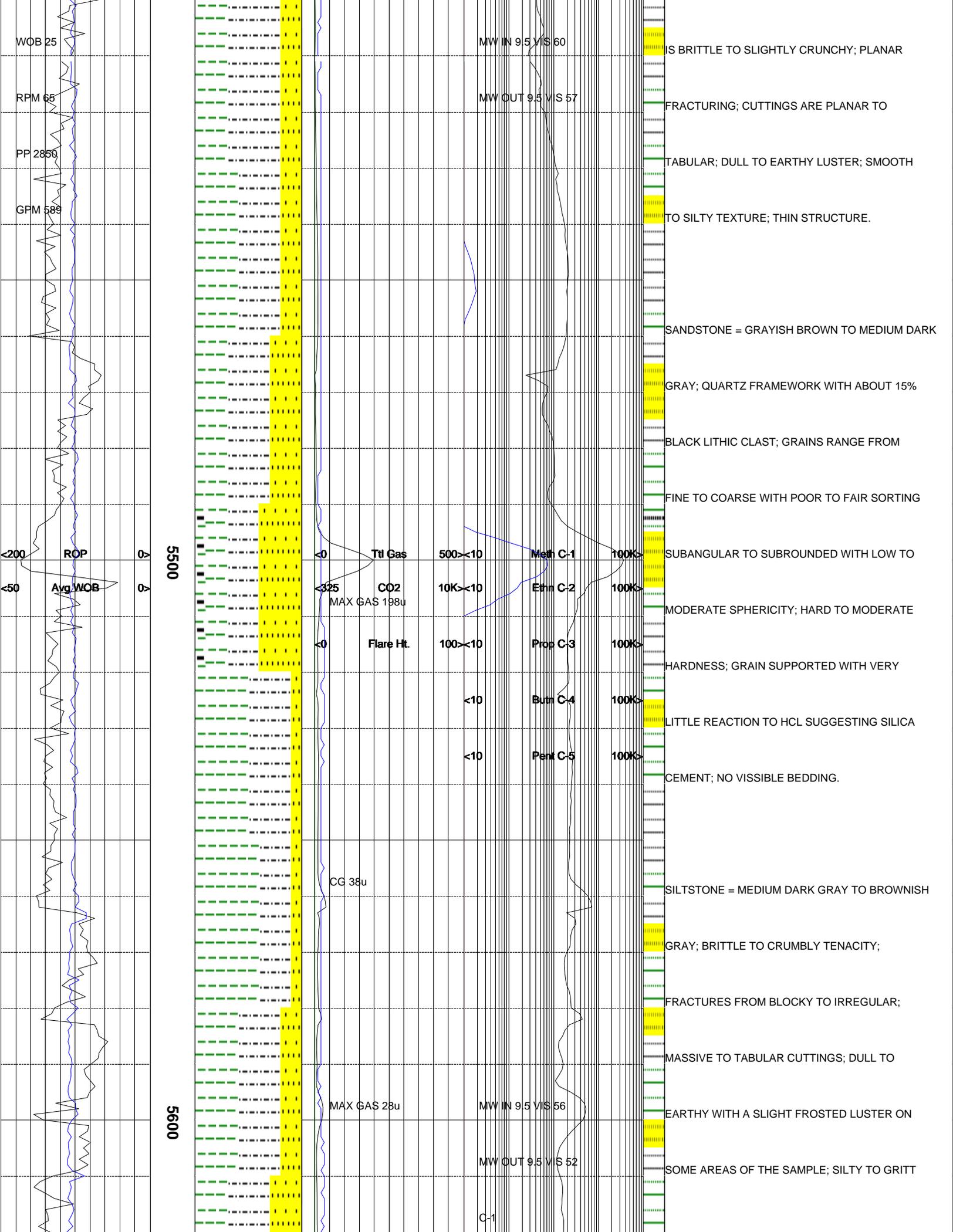
MW OUT 9.5+ VIS 50

C-1

MAX GAS 73u

C-2.1

10/02/2009



WASATCH G @ 5640'

NOTE = LOST RETURNS FROM 5659' MD TO

5671' MD.

MAX GAS 194u

SANDSTONE = TRANSLUCENT TO WHITE TO VERY

LOST RETURNS @ 5659'

LIGHT GRAY; QUARTZ FRAMEWORK; COARSE TO

FINE GRAINED WITH POOR SORTING;

SUBANGULAR WITH POOR SPHERICITY; FRIABLE

TO FIRMLY FRIABLE WITH MANY LOOSE GRAINS

MILD REACTION TO HCL SUGGESTS CALCITE/

MAX GAS 263u

SILICA CEMENT; PYRITE PRESENT AS AN

ACCESSORY MINERAL.

5700

MAX GAS 134u

SHALE = LIGHT TO MEDIUM DARK GRAY;

BRITTLE TO CRUNCHY TENACITY; PLANAR

MAX CO2 14225ppm

FRACTURING; PLATY TO SCALY CUTTINGS;

MAX GAS 236u

DULL TO EARTHY LUSTER; SMOOTH TO SILTY

TEXTURE; LAMINAE TO THIN STRUCTURE.

DAY TOUR

WQB 27

5800

RPM 64

MW IN 9.4 VIS 59

SILTSTONE = PALE RED TO GRAYISH RED IN

PP 2939

MW OUT 9.4+ VIS 55

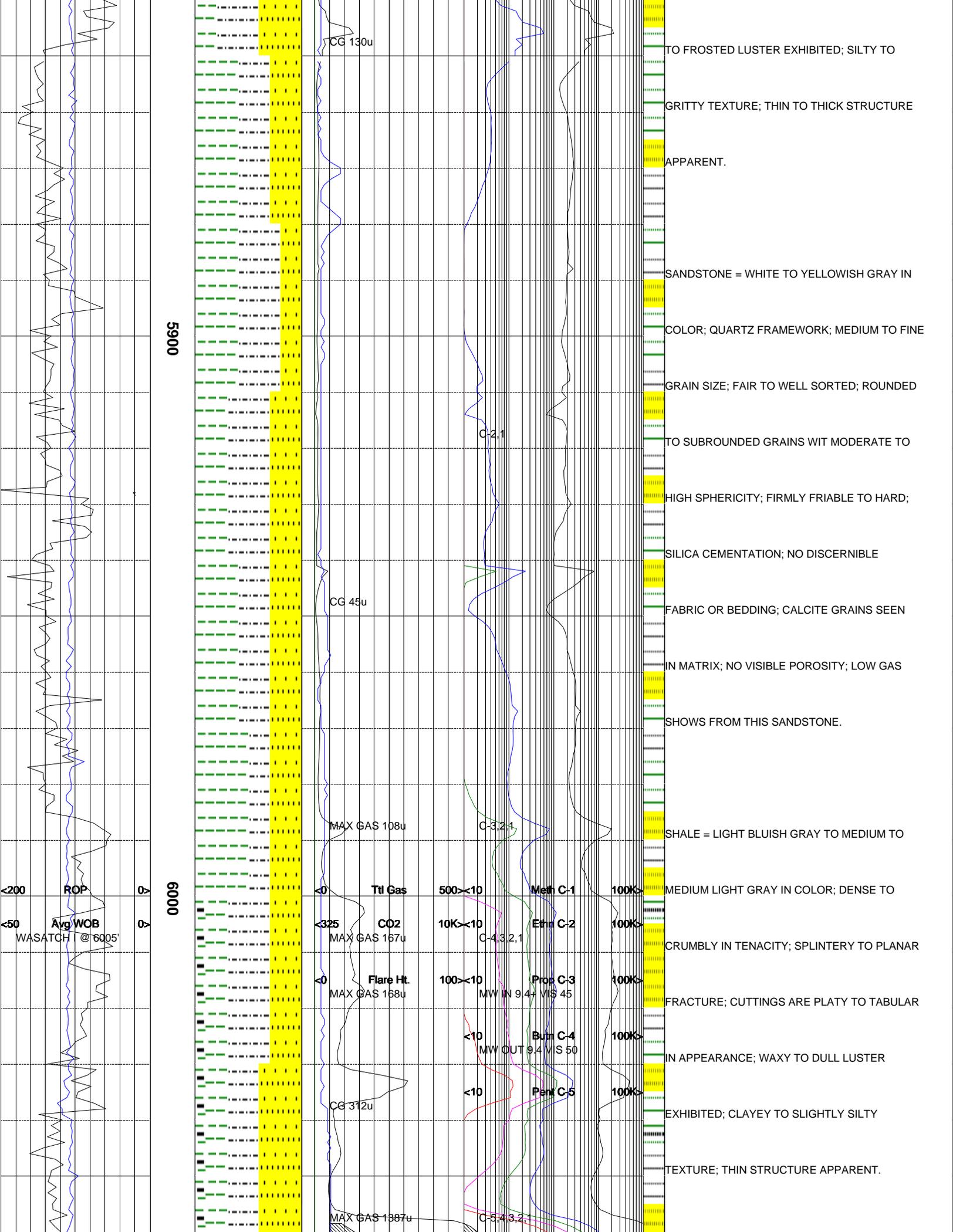
COLOR; BRITTLE TO NEARLY PULVERANT IN

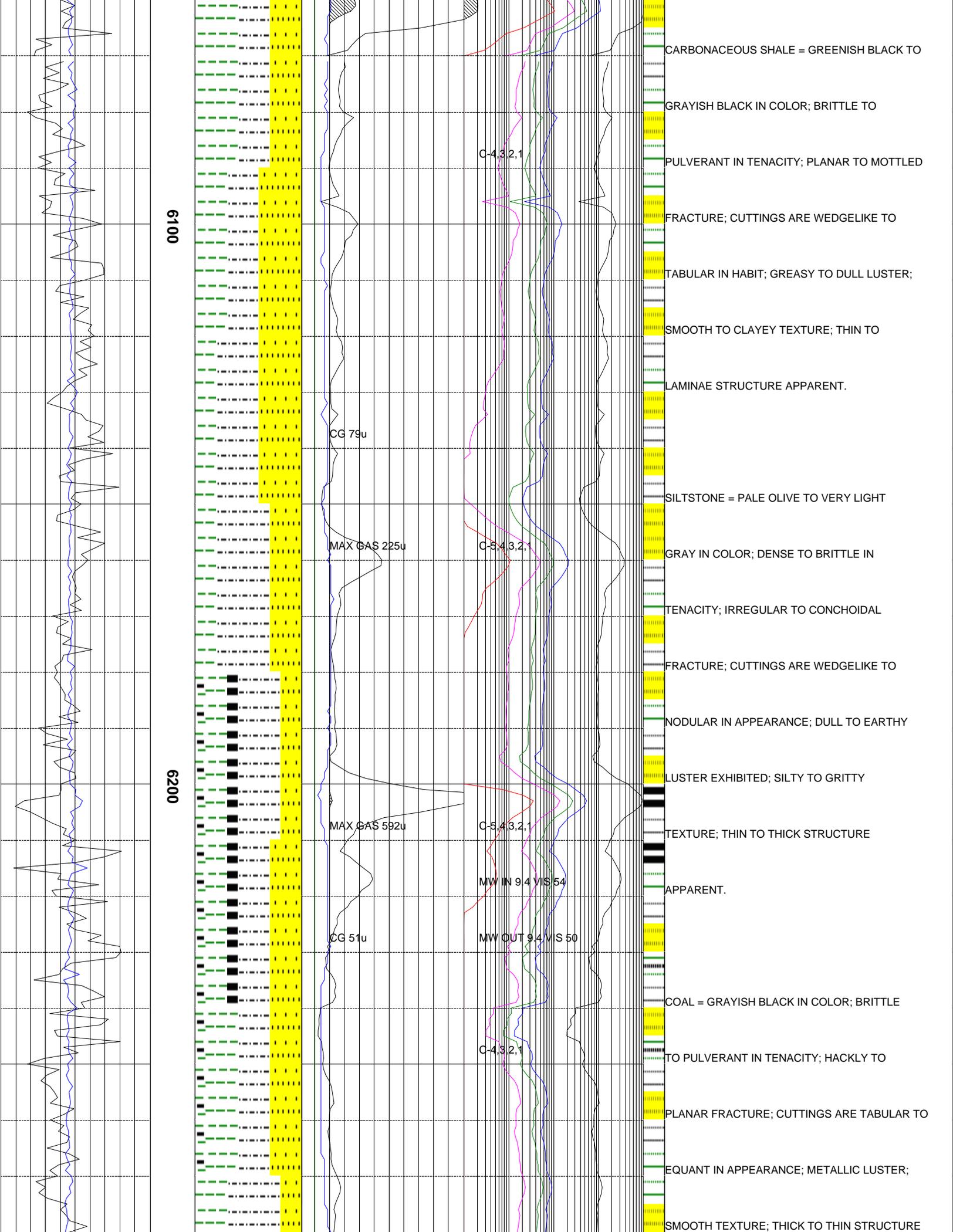
GPM 589

TENACITY; MOTTLED TO IRREGULAR FRACUTRE;

C-2.1

CUTTINGS ARE TABULAR TO WEDGELIKE; DULL





6100

6200

CARBONACEOUS SHALE = GREENISH BLACK TO  
 GRAYISH BLACK IN COLOR; BRITTLE TO  
 PULVERANT IN TENACITY; PLANAR TO MOTTLED  
 FRACTURE; CUTTINGS ARE WEDGELIKE TO  
 TABULAR IN HABIT; GREASY TO DULL LUSTER;  
 SMOOTH TO CLAYEY TEXTURE; THIN TO  
 LAMINAE STRUCTURE APPARENT.  
 SILTSTONE = PALE OLIVE TO VERY LIGHT  
 GRAY IN COLOR; DENSE TO BRITTLE IN  
 TENACITY; IRREGULAR TO CONCHOIDAL  
 FRACTURE; CUTTINGS ARE WEDGELIKE TO  
 NODULAR IN APPEARANCE; DULL TO EARTHY  
 LUSTER EXHIBITED; SILTY TO GRITTY  
 TEXTURE; THIN TO THICK STRUCTURE  
 APPARENT.  
 COAL = GRAYISH BLACK IN COLOR; BRITTLE  
 TO PULVERANT IN TENACITY; HACKLY TO  
 PLANAR FRACTURE; CUTTINGS ARE TABULAR TO  
 EQUANT IN APPEARANCE; METALLIC LUSTER;  
 SMOOTH TEXTURE; THICK TO THIN STRUCTURE

CG 79u

MAX GAS 225u

MAX GAS 592u

CG 51u

C-4.3.2.1

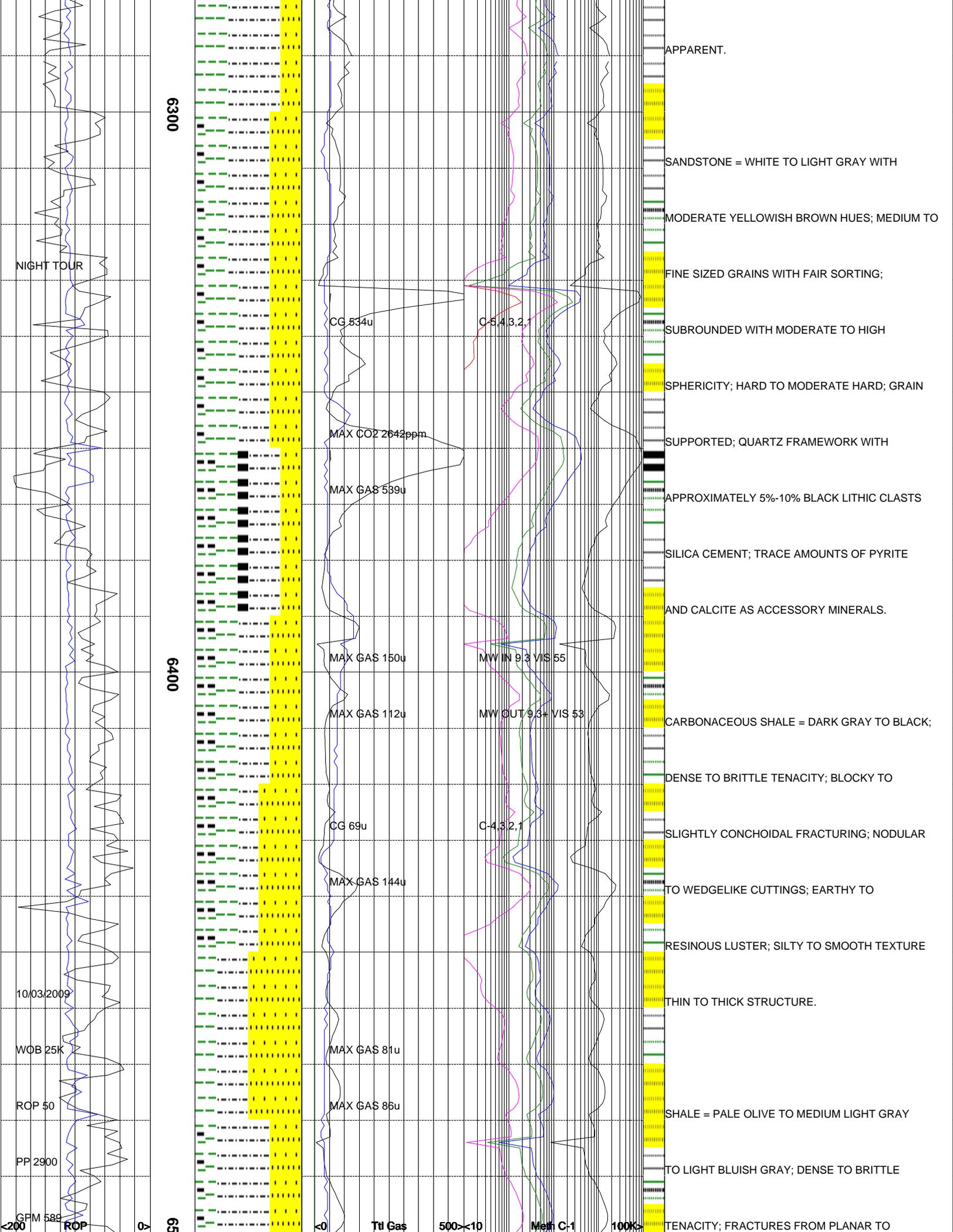
C-5.4.3.2.1

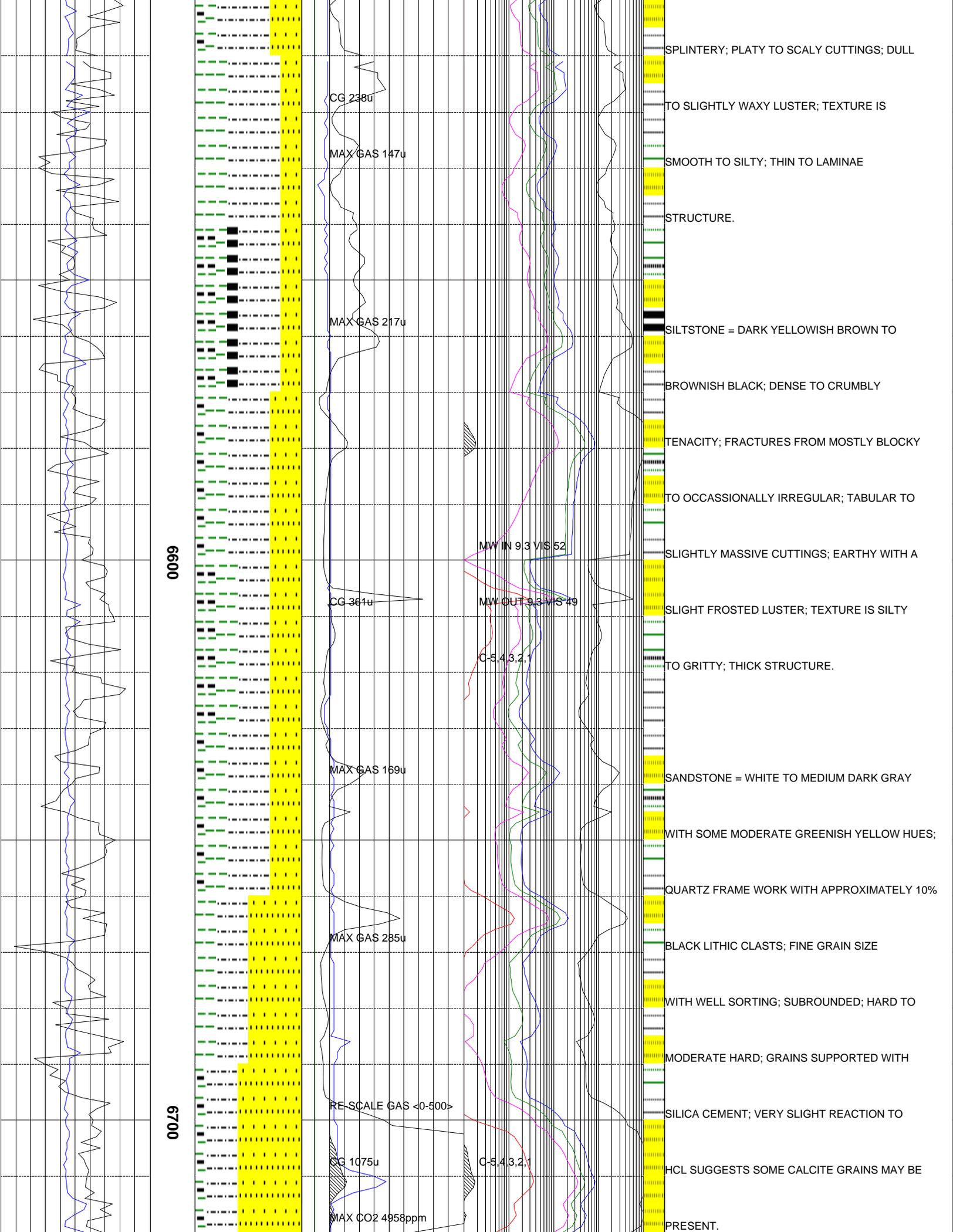
C-5.4.3.2.1

C-4.3.2.1

MW IN 9.4 VIS 54

MW OUT 9.4 VIS 50





00600

06700

CG 238u

MAX GAS 147u

MAX GAS 217u

CG 361u

MAX GAS 169u

MAX GAS 285u

RE-SCALE GAS <0-500>

CG 1075u

MAX CO2 4958ppm

MW IN 9.3 VIS 52

MW OUT 9.3 VIS 49

C-5.4.3.2.1

C-5.4.3.2

SPLINTERY; PLATY TO SCALY CUTTINGS; DULL

TO SLIGHTLY WAXY LUSTER; TEXTURE IS

SMOOTH TO SILTY; THIN TO LAMINAE

STRUCTURE.

SILTSTONE = DARK YELLOWISH BROWN TO

BROWNISH BLACK; DENSE TO CRUMBLY

TENACITY; FRACTURES FROM MOSTLY BLOCKY

TO OCCASSIONALLY IRREGULAR; TABULAR TO

SLIGHTLY MASSIVE CUTTINGS; EARTHY WITH A

SLIGHT FROSTED LUSTER; TEXTURE IS SILTY

TO GRITTY; THICK STRUCTURE.

SANDSTONE = WHITE TO MEDIUM DARK GRAY

WITH SOME MODERATE GREENISH YELLOW HUES;

QUARTZ FRAME WORK WITH APPROXIMATELY 10%

BLACK LITHIC CLASTS; FINE GRAIN SIZE

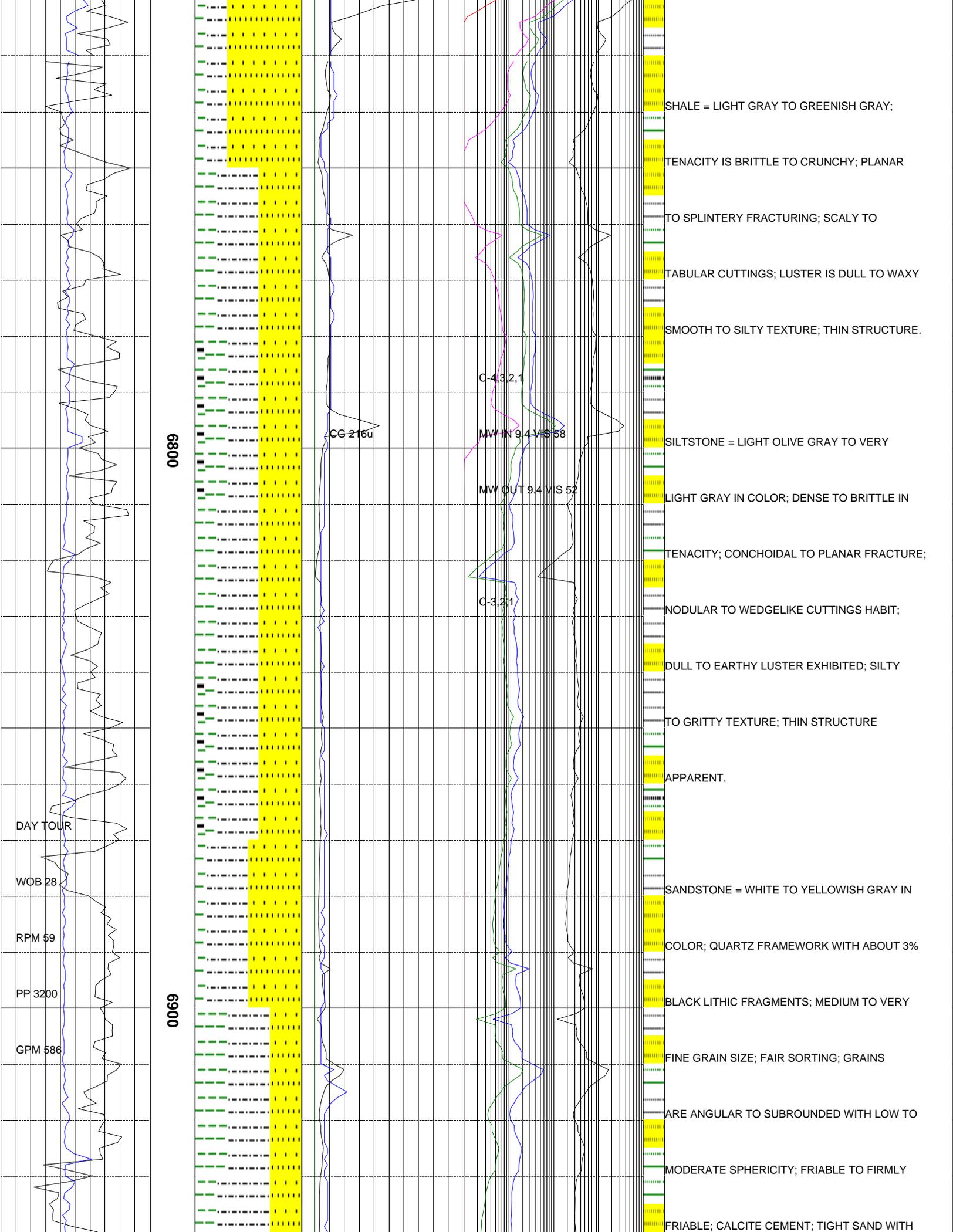
WITH WELL SORTING; SUBROUNDED; HARD TO

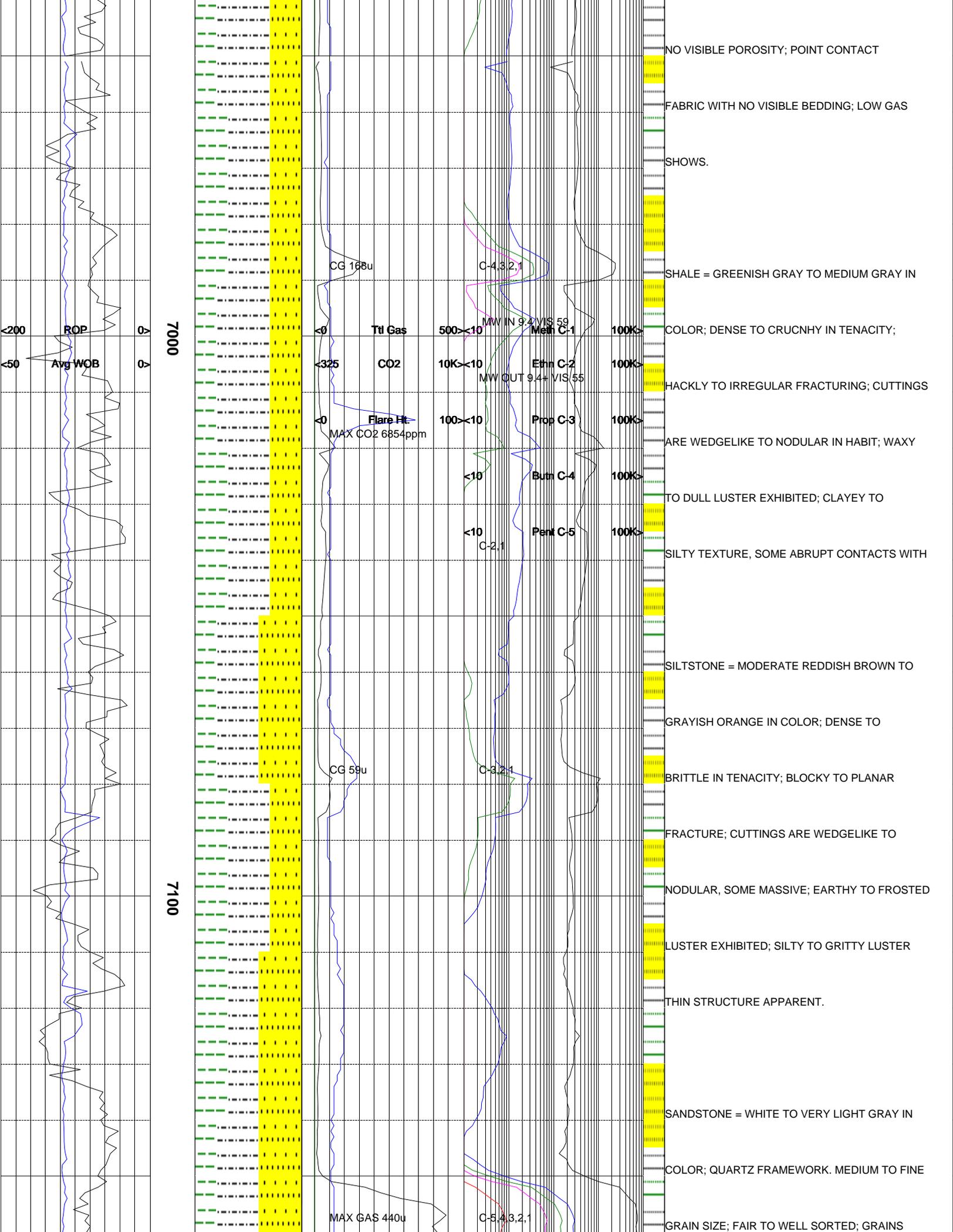
MODERATE HARD; GRAINS SUPPORTED WITH

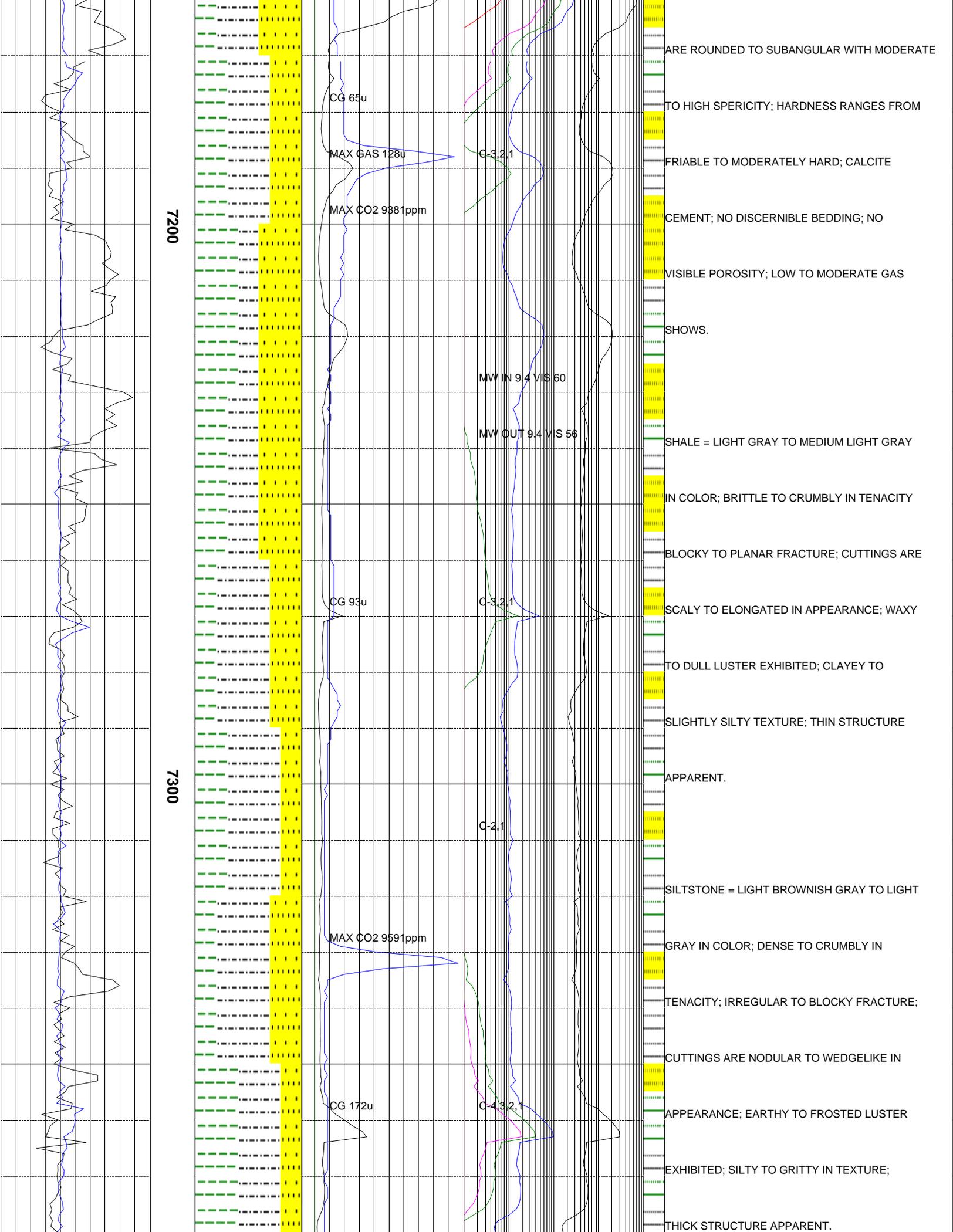
SILICA CEMENT; VERY SLIGHT REACTION TO

HCL SUGGESTS SOME CALCITE GRAINS MAY BE

PRESENT.







7200

7300

CG 65u

MAX GAS 128u

MAX CO2 9381ppm

CG 93u

MAX CO2 9591ppm

CG 172u

C-3.2.1

C-3.2.1

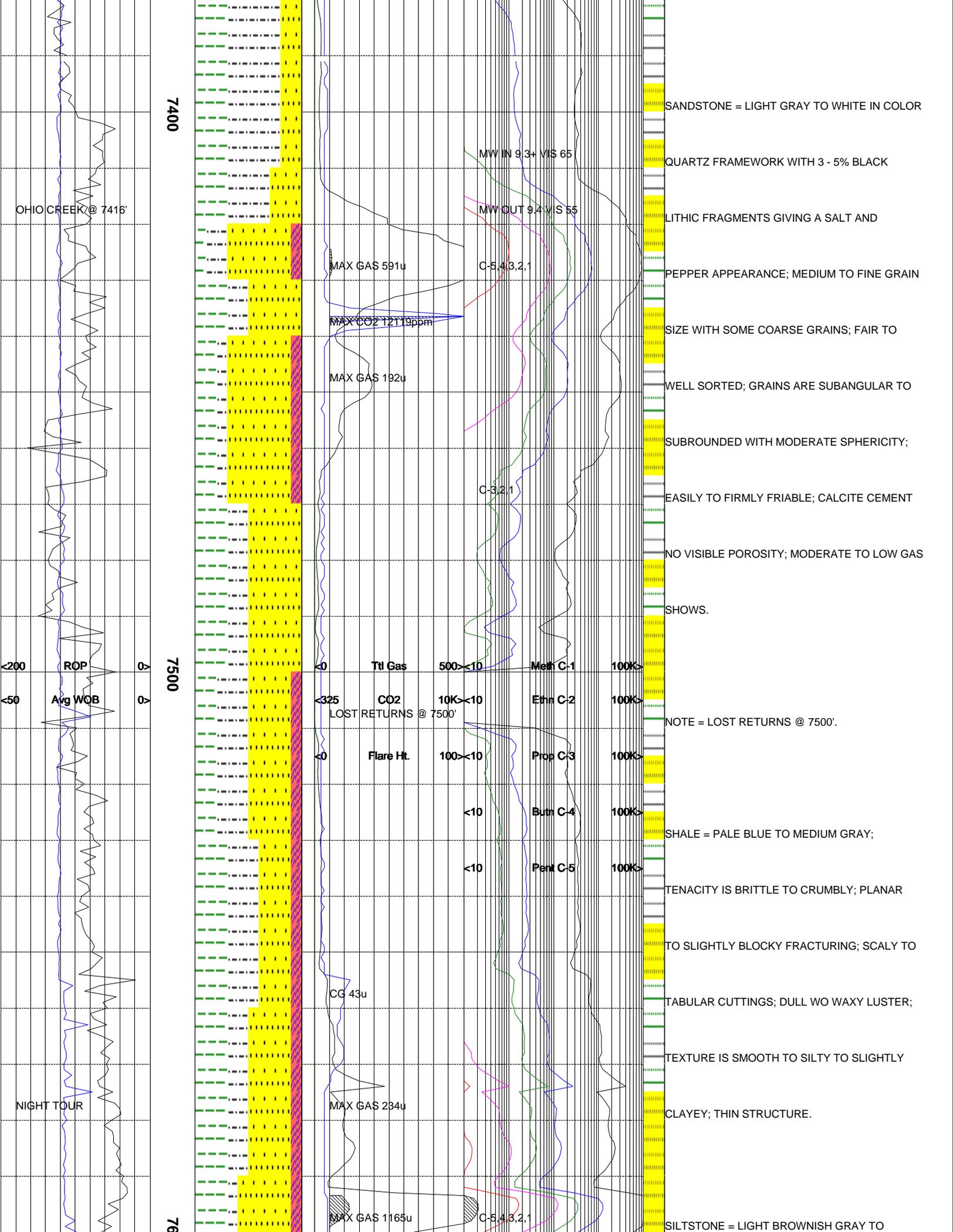
C-2.1

C-4.3.2.1

MW IN 9.4 VIS 60

MW OUT 9.4 VIS 56

ARE ROUNDED TO SUBANGULAR WITH MODERATE  
 TO HIGH SPERICITY; HARDNESS RANGES FROM  
 FRIABLE TO MODERATELY HARD; CALCITE  
 CEMENT; NO DISCERNIBLE BEDDING; NO  
 VISIBLE POROSITY; LOW TO MODERATE GAS  
 SHOWS.  
 SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY  
 IN COLOR; BRITTLE TO CRUMBLY IN TENACITY  
 BLOCKY TO PLANAR FRACTURE; CUTTINGS ARE  
 SCALY TO ELONGATED IN APPEARANCE; WAXY  
 TO DULL LUSTER EXHIBITED; CLAYEY TO  
 SLIGHTLY SILTY TEXTURE; THIN STRUCTURE  
 APPARENT.  
 SILTSTONE = LIGHT BROWNISH GRAY TO LIGHT  
 GRAY IN COLOR; DENSE TO CRUMBLY IN  
 TENACITY; IRREGULAR TO BLOCKY FRACTURE;  
 CUTTINGS ARE NODULAR TO WEDGELIKE IN  
 APPEARANCE; EARTHY TO FROSTED LUSTER  
 EXHIBITED; SILTY TO GRITTY IN TEXTURE;  
 THICK STRUCTURE APPARENT.



7400

7500

7600

OHIO CREEK @ 7416'

NIGHT TOUR

SANDSTONE = LIGHT GRAY TO WHITE IN COLOR

QUARTZ FRAMEWORK WITH 3 - 5% BLACK

LITHIC FRAGMENTS GIVING A SALT AND

PEPPER APPEARANCE; MEDIUM TO FINE GRAIN

SIZE WITH SOME COARSE GRAINS; FAIR TO

WELL SORTED; GRAINS ARE SUBANGULAR TO

SUBROUNDED WITH MODERATE SPHERICITY;

EASILY TO FIRMLY FRIABLE; CALCITE CEMENT

NO VISIBLE POROSITY; MODERATE TO LOW GAS

SHOWS.

NOTE = LOST RETURNS @ 7500'.

SHALE = PALE BLUE TO MEDIUM GRAY;

TENACITY IS BRITTLE TO CRUMBLY; PLANAR

TO SLIGHTLY BLOCKY FRACTURING; SCALY TO

TABULAR CUTTINGS; DULL WO WAXY LUSTER;

TEXTURE IS SMOOTH TO SILTY TO SLIGHTLY

CLAYEY; THIN STRUCTURE.

SILTSTONE = LIGHT BROWNISH GRAY TO

MAX GAS 591u

MAX CO2 12119ppm

MAX GAS 192u

Ttl Gas

CO2

Flare Ht.

CG 43u

MAX GAS 234u

MAX GAS 1165u

MW IN 9.3+ VIS 65

MW OUT 9.4 VIS 55

C-5.4.3.2.1

C-3.2.1

Meth C-1

Ethn C-2

Prop C-3

Butn C-4

Pent C-5

C-5.4.3.2.1

ROP

Avg WOB

NIGHT TOUR

<0 500 >10

<325 10K >10

<0 100 >10

<10

<10

<0 500 >10

100K >

100K >

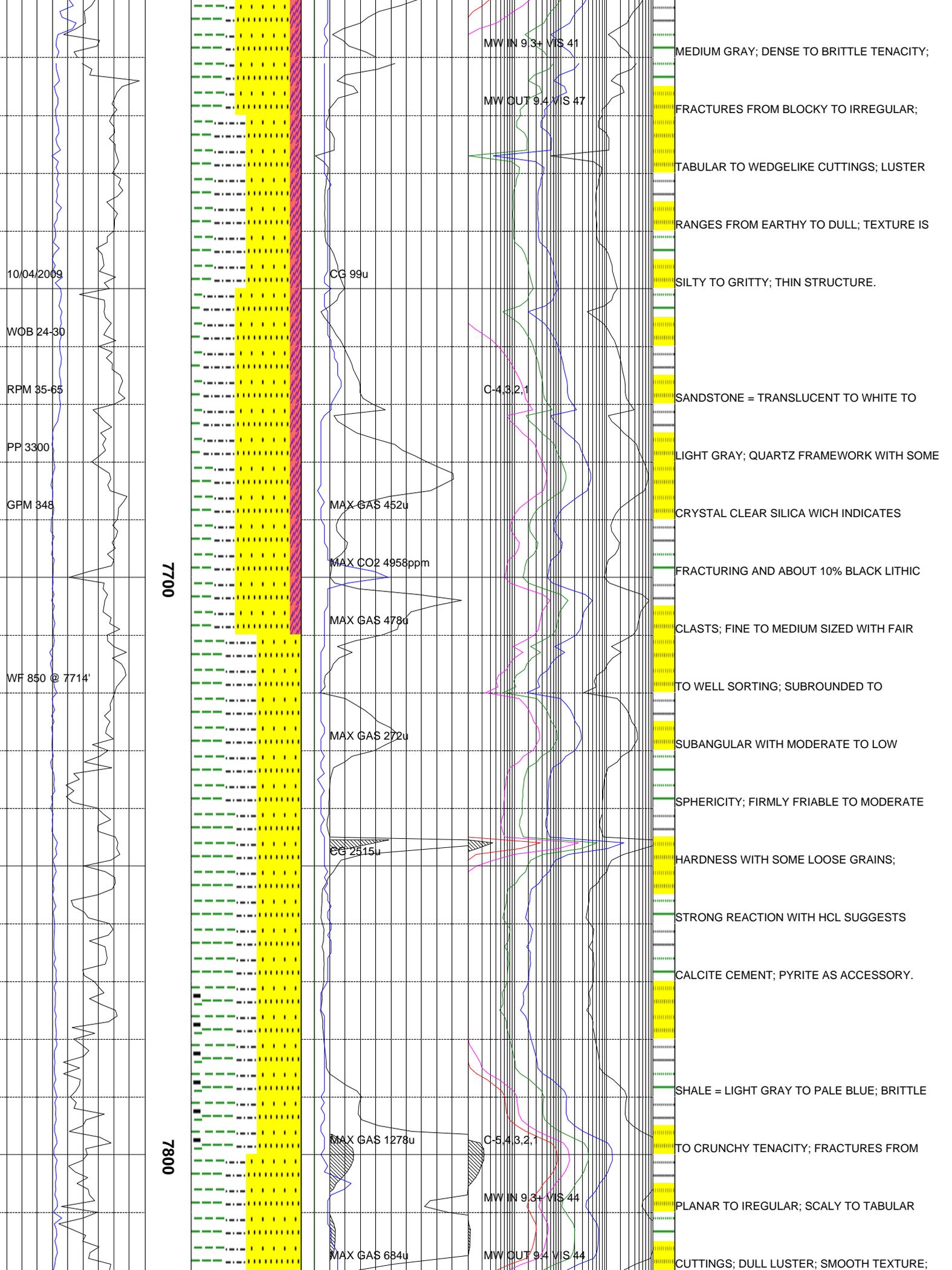
100K >

100K >

100K >

100K >

LOST RETURNS @ 7500'



7700

7800

MEDIUM GRAY; DENSE TO BRITTLE TENACITY;

FRACTURES FROM BLOCKY TO IRREGULAR;

TABULAR TO WEDGELIKE CUTTINGS; LUSTER

RANGES FROM EARTHY TO DULL; TEXTURE IS

SILTY TO GRITTY; THIN STRUCTURE.

SANDSTONE = TRANSLUCENT TO WHITE TO

LIGHT GRAY; QUARTZ FRAMEWORK WITH SOME

CRYSTAL CLEAR SILICA WICH INDICATES

FRACTURING AND ABOUT 10% BLACK LITHIC

CLASTS; FINE TO MEDIUM SIZED WITH FAIR

TO WELL SORTING; SUBROUNDED TO

SUBANGULAR WITH MODERATE TO LOW

SPHERICITY; FIRMLY FRIABLE TO MODERATE

HARDNESS WITH SOME LOOSE GRAINS;

STRONG REACTION WITH HCL SUGGESTS

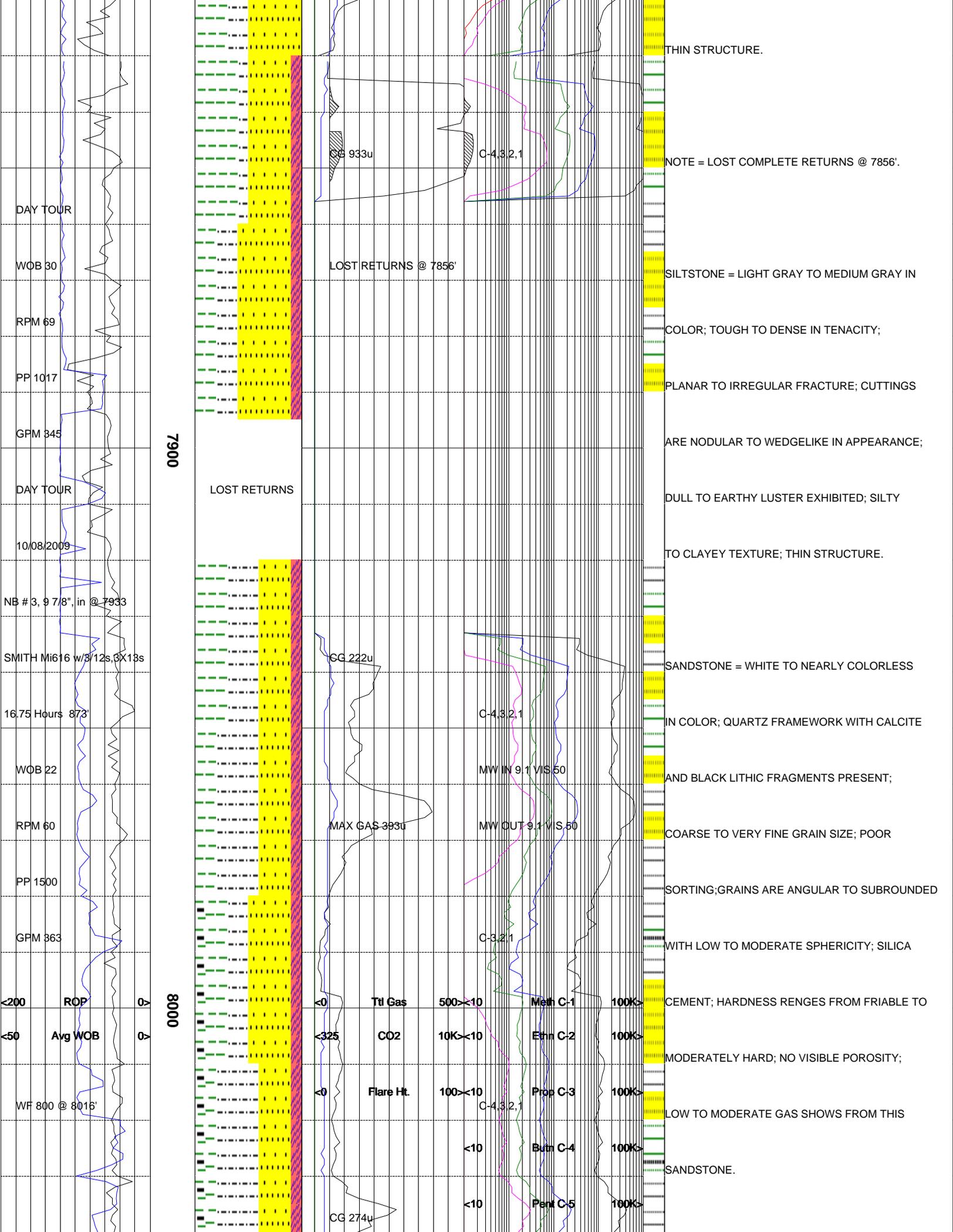
CALCITE CEMENT; PYRITE AS ACCESSORY.

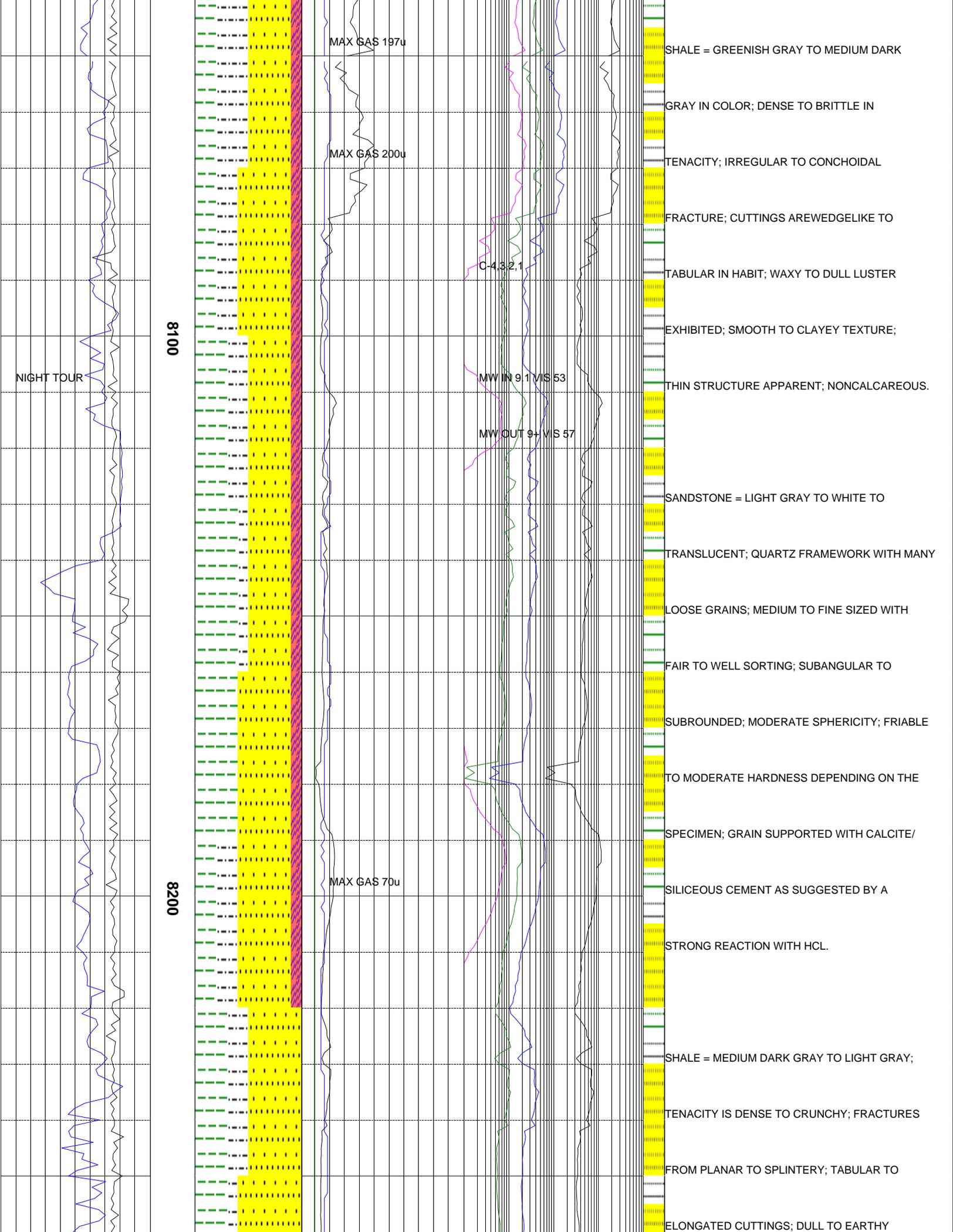
SHALE = LIGHT GRAY TO PALE BLUE; BRITTLE

TO CRUNCHY TENACITY; FRACTURES FROM

PLANAR TO IREGULAR; SCALY TO TABULAR

CUTTINGS; DULL LUSTER; SMOOTH TEXTURE;





MAX GAS 197u

SHALE = GREENISH GRAY TO MEDIUM DARK

GRAY IN COLOR; DENSE TO BRITTLE IN

MAX GAS 200u

TENACITY; IRREGULAR TO CONCHOIDAL

FRACTURE; CUTTINGS ARE WEDGE LIKE TO

C-432.1

TABULAR IN HABIT; WAXY TO DULL LUSTER

8100

EXHIBITED; SMOOTH TO CLAYEY TEXTURE;

NIGHT TOUR

MW IN 9-1 VIS 53

THIN STRUCTURE APPARENT; NONCALCAREOUS.

MW OUT 9-1 VIS 57

SANDSTONE = LIGHT GRAY TO WHITE TO

TRANSLUCENT; QUARTZ FRAMEWORK WITH MANY

LOOSE GRAINS; MEDIUM TO FINE SIZED WITH

FAIR TO WELL SORTING; SUBANGULAR TO

SUBROUNDED; MODERATE SPHERICITY; FRIABLE

TO MODERATE HARDNESS DEPENDING ON THE

SPECIMEN; GRAIN SUPPORTED WITH CALCITE/

8200

MAX GAS 70u

SILICEOUS CEMENT AS SUGGESTED BY A

STRONG REACTION WITH HCL.

SHALE = MEDIUM DARK GRAY TO LIGHT GRAY;

TENACITY IS DENSE TO CRUNCHY; FRACTURES

FROM PLANAR TO SPLINTERY; TABULAR TO

ELONGATED CUTTINGS; DULL TO EARTHY

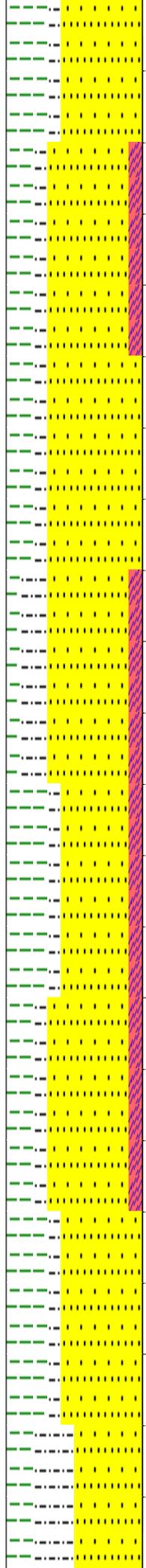
WF 700 @ 8271

10/09/2009

WF 600 @ 8479

8300

8400



MAX GAS 123u

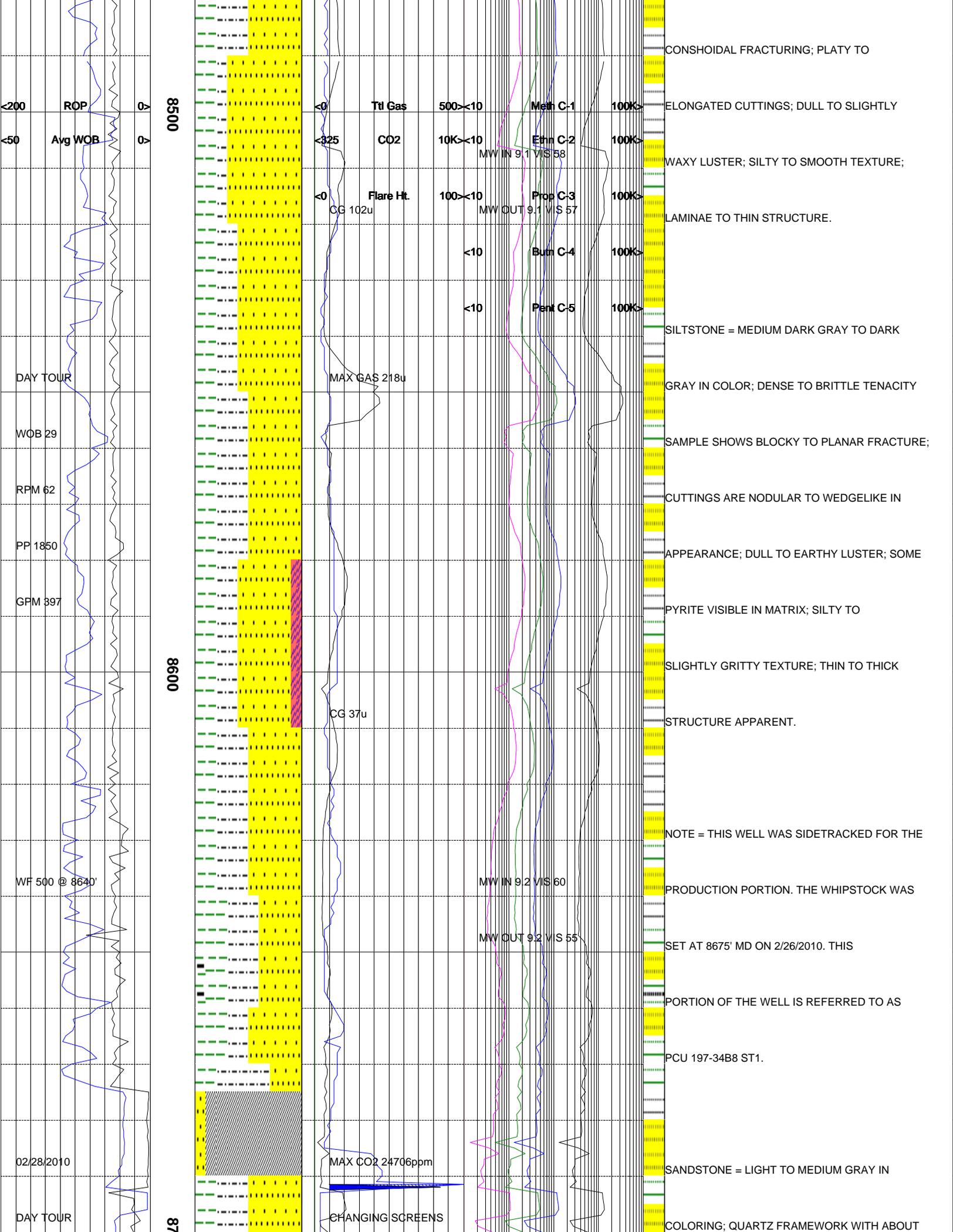
MW IN 9.1 VIS 68

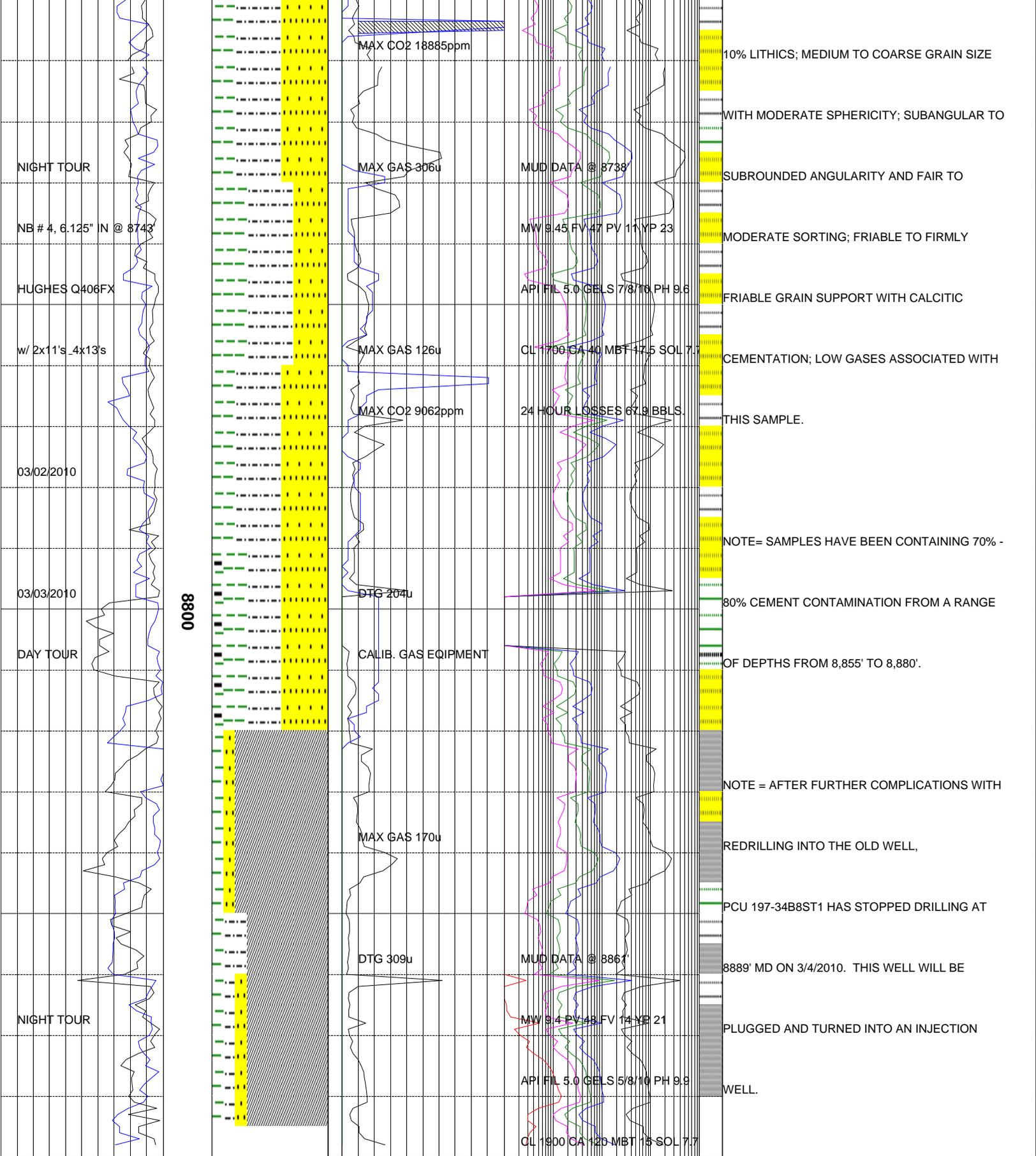
MW OUT 9.1 VIS 55

C-3.2.1

C-4.3.2.1

LUSTER; SMOOTH TO SILTY TEXTURE; LAMINAE  
 TO THIN STRUCTURE.  
 SILTSTONE = LIGHT GRAY TO MEDIUM DARK  
 GRAY; TENACITY IS DENSE TO CRUMBLY;  
 FRACTURES FROM IRREGULAR TO BLOCKY;  
 TABULAR TO WEDGELIKE CUTTINGS; EARTHY  
 LUSTER; THIN STRUCTURE.  
 SANDSTONE = WHITE TO TRANSLUCENT TO  
 LIGHT GRAY; FRAMEWORK CONSISTS OF MOSTLY  
 QUARTZ GRAINS WITH SOME CALCITE IN THE  
 MATRIX; MEDIUM TO FINE SIZED WITH FAIR  
 TO WELL SORTING; ANGULAR TO SUBROUNDED  
 WITH MODERATE SOHERICITY; MODERATE  
 HARDNESS WITH MANY LOOSE GRAINS; GRAIN  
 SUPPORTED WITH SOME CALCITE MATRIX;  
 MODERATE TO STRONG REACTION WITH HCL.  
 SHALE = LIGHT GRAY TO DARK GRAY COLORING  
 TENACITY IS DENSE TO BRITTLE TO SLIGHTY  
 CRUNCHY; PLANAR TO SPLINTERY TO SLIGHTLY





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