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MUDLOG MD

COMPANY ExxonMobil Oil Corporation
WELL PCU 297-12A1
FIELD Piceance Creek
REGION Rocky Mountains
COORDINATES Lat: 39.8890710
Long: 108.2372410
ELEVATION GL: 7183.6'
RKB: 7197'
COUNTY, STATE Rio Blanco, Colorado
API INDEX 051031115700
SPUD DATE 09/22/2009
CONTRACTOR HP DRILLING
CO. REP. M. SADLER / J. WOODS
RIG/TYPE 326 FLEX FOUR
LOGGING UNIT CANRIG UNIT ML036
GEOLOGISTS John Morris
Bill Johanning
ADD. PERSONS
CO. GEOLOGIST CHRIS ALBA

LOG INTERVAL

CASING DATA

DEPTHS: 4111' TO 6282'
DATES: 6/16/2009 TO 6/18/2009
SCALE: 5" = 100'

16.000" AT 150'
10.750" AT 4111'
AT
AT

MUD TYPES

HOLE SIZE

WATER BASE TO 5730'
DSF TO 6200'
LSND TO 6282'
TO

14.250" TO 4111'
9.875" TO 6282'
TO
TO

ABBREVIATIONS

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

Legend of geological symbols and patterns including: 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.

<200	ROP	0>
ft/hr		
<50	Avg WOB	0>
klbs		

Depth
3800
3900

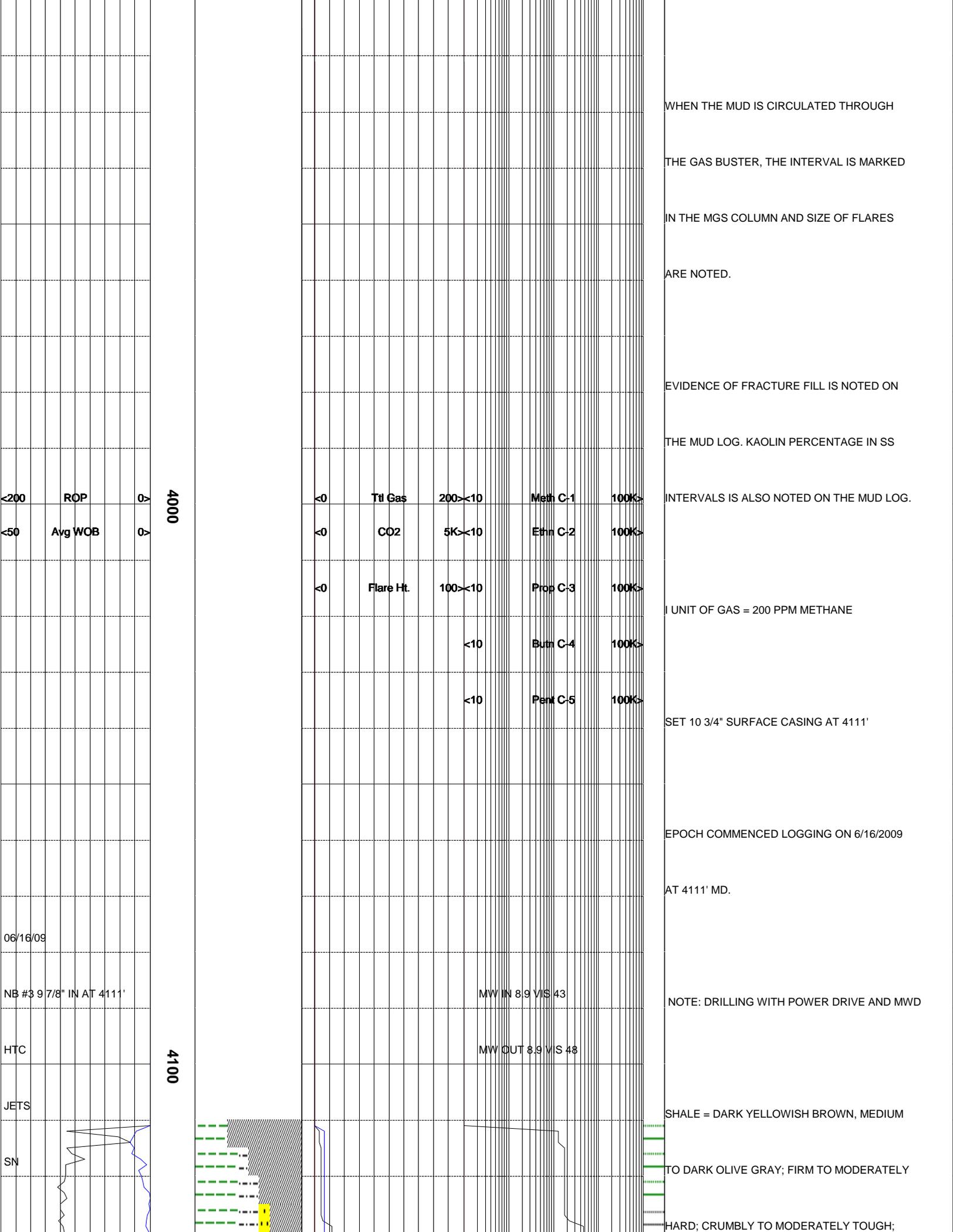
Lithology

MGS	<0	Ttl Gas units	200>	<10	Meth C-1 ppm	100K>
	<0	CO2 ppm	25K>	<10	Ethn C-2	100K>
	<0	Flare Ht. ft	100>	<10	Prop C-3	100K>
	<0			<10	Butn C-4	100K>
				<10	Pent C-5	100K>

Interp. Lith

Remarks
Survey Data, Mud Reports, Other Info.

ALL ROCK COLORS ARE REFERENCED TO THE CONNECTION GASES AS WELL AS TRIP AND DOWNTIME GASES ARE NOTED ON THE LOG. LARGE CONNECTION GASES WHICH APPEAR ON THE MUD LOG USUALLY REFLECT UPHOLE GAS INTERVALS BLEEDING GAS INTO THE BOREHOLE DURING CONNECTIONS. GAS CHROMATOGRAPHY EQUIPMENT IS CALIBRATED TO A TEST GAS COMPOSED OF METHANE = 10040 PPM ETHANE = 990 PPM PROPANE = 1000 PPM I-BUTANE = 1010 PPM N-BUTANE = 1000 PPM I-PENTANE = 1000 PPM N-PENTANE = 1000 PPM



WHEN THE MUD IS CIRCULATED THROUGH THE GAS BUSTER, THE INTERVAL IS MARKED IN THE MGS COLUMN AND SIZE OF FLARES ARE NOTED.

EVIDENCE OF FRACTURE FILL IS NOTED ON THE MUD LOG. KAOLIN PERCENTAGE IN SS INTERVALS IS ALSO NOTED ON THE MUD LOG.

1 UNIT OF GAS = 200 PPM METHANE

SET 10 3/4" SURFACE CASING AT 4111'

EPOCH COMMENCED LOGGING ON 6/16/2009

AT 4111' MD.

NOTE: DRILLING WITH POWER DRIVE AND MWD

SHALE = DARK YELLOWISH BROWN, MEDIUM

TO DARK OLIVE GRAY; FIRM TO MODERATELY

HARD; CRUMBLY TO MODERATELY TOUGH;

<200 ROP
<50 Avg WOB

4000

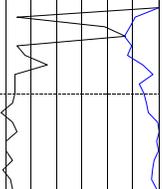
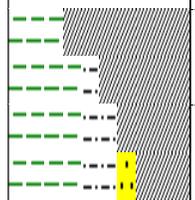
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<0	CO2	5K><10	Ethn C-2	100K>
<0	Flare Ht.	100><10	Prop C-3	100K>
		<10	Butn C-4	100K>
		<10	Pent C-5	100K>

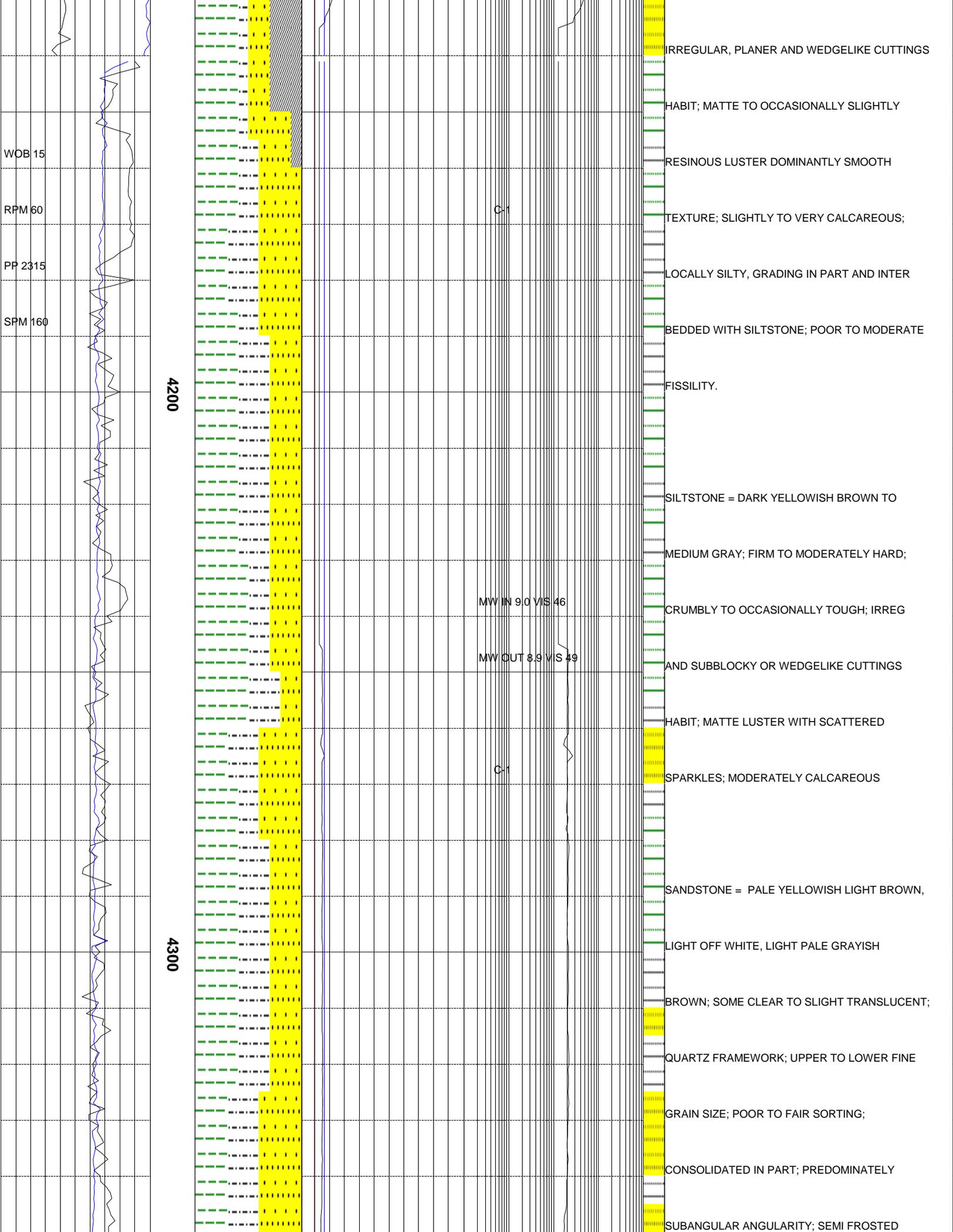
06/16/09
NB #3 9 7/8" IN AT 4111'

MW IN 8.9 VIS 43
MW OUT 8.9 VIS 48

HTC
JETS
SN

4100





WOB 15

RPM 60

PP 2315

SPM 160

4200

4300

C-1

MW IN 9.0 VIS 46

MW OUT 8.9 VIS 49

C-1

IRREGULAR, PLANER AND WEDGELIKE CUTTINGS

HABIT; MATTE TO OCCASIONALLY SLIGHTLY

RESINOUS LUSTER DOMINANTLY SMOOTH

TEXTURE; SLIGHTLY TO VERY CALCAREOUS;

LOCALLY SILTY, GRADING IN PART AND INTER

BEDDED WITH SILTSTONE; POOR TO MODERATE

FISSILITY.

SILTSTONE = DARK YELLOWISH BROWN TO

MEDIUM GRAY; FIRM TO MODERATELY HARD;

CRUMBLY TO OCCASIONALLY TOUGH; IRREG

AND SUBBLOCKY OR WEDGELIKE CUTTINGS

HABIT; MATTE LUSTER WITH SCATTERED

SPARKLES; MODERATELY CALCAREOUS

SANDSTONE = PALE YELLOWISH LIGHT BROWN,

LIGHT OFF WHITE, LIGHT PALE GRAYISH

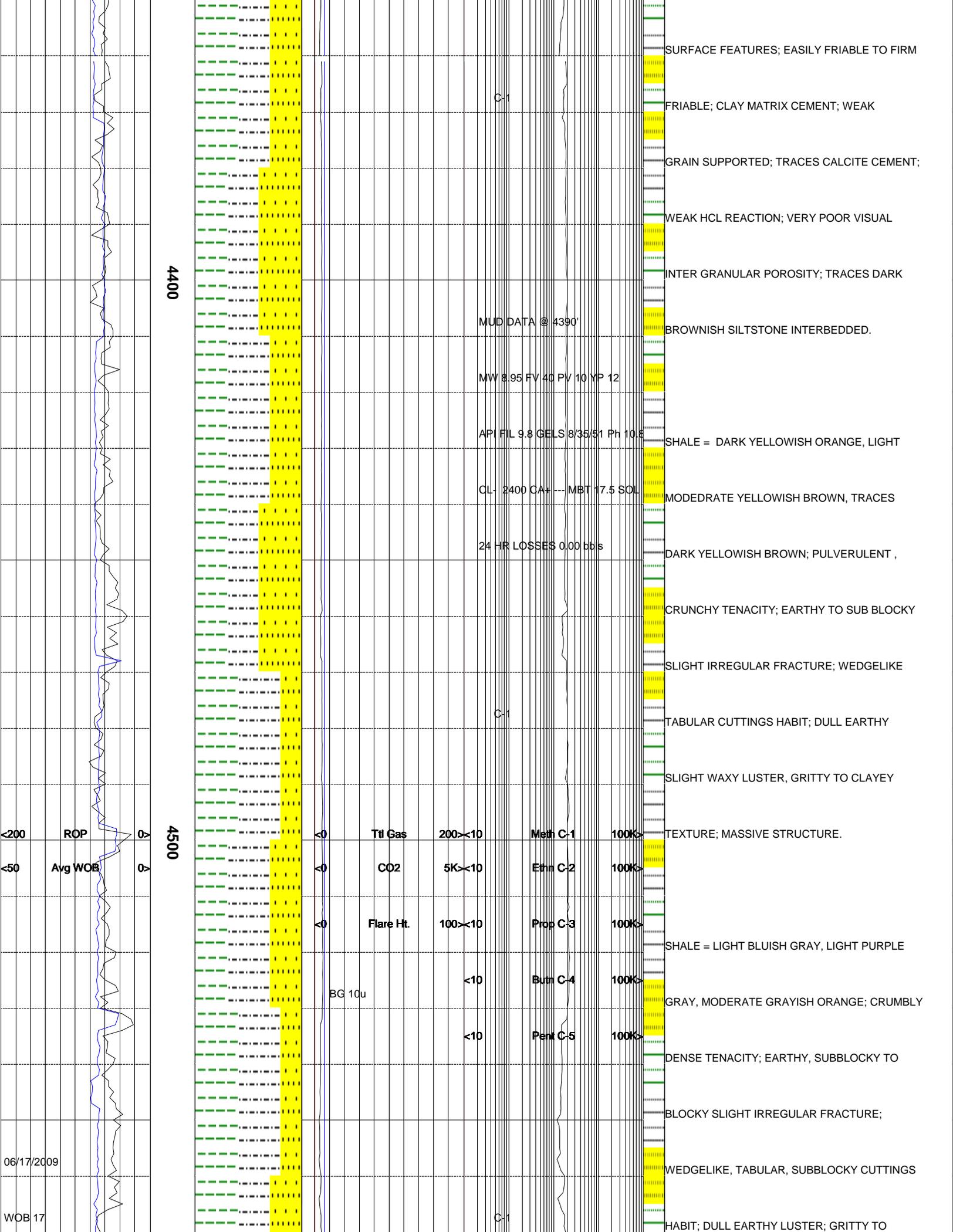
BROWN; SOME CLEAR TO SLIGHT TRANSLUCENT;

QUARTZ FRAMEWORK; UPPER TO LOWER FINE

GRAIN SIZE; POOR TO FAIR SORTING;

CONSOLIDATED IN PART; PREDOMINATELY

SUBANGULAR ANGULARITY; SEMI FROSTED



4400

4500

SURFACE FEATURES; EASILY FRIABLE TO FIRM

FRIABLE; CLAY MATRIX CEMENT; WEAK

GRAIN SUPPORTED; TRACES CALCITE CEMENT;

WEAK HCL REACTION; VERY POOR VISUAL

INTER GRANULAR POROSITY; TRACES DARK

MUD DATA @ 4390'

BROWNISH SILTSTONE INTERBEDDED.

MW 8.95 FV 40 PV 10 YP 12

API FIL 9.8 GELS 8/35/51 Ph 10.8

SHALE = DARK YELLOWISH ORANGE, LIGHT

CL- 2400 CA+ --- MBT 17.5 SOL

MODEDRATE YELLOWISH BROWN, TRACES

24 HR LOSSES 0.00 bbs

DARK YELLOWISH BROWN; PULVERULENT ,

CRUNCHY TENACITY; EARTHY TO SUB BLOCKY

SLIGHT IRREGULAR FRACTURE; WEDGELIKE

C-1

TABULAR CUTTINGS HABIT; DULL EARTHY

SLIGHT WAXY LUSTER, GRITTY TO CLAYEY

<200 ROP

<0 Tft Gas 200x<10 Meth C-1 100K>

TEXTURE; MASSIVE STRUCTURE.

<50 Avg WOB

<0 CO2 5K<10 Ethn C-2 100K>

SHALE = LIGHT BLUISH GRAY, LIGHT PURPLE

<0 Flare Ht. 100x<10 Prop C-3 100K>

GRAY, MODERATE GRAYISH ORANGE; CRUMBLY

BG 10u <10 Butn C-4 100K>

DENSE TENACITY; EARTHY, SUBBLOCKY TO

<10 Pent C-5 100K>

BLOCKY SLIGHT IRREGULAR FRACTURE;

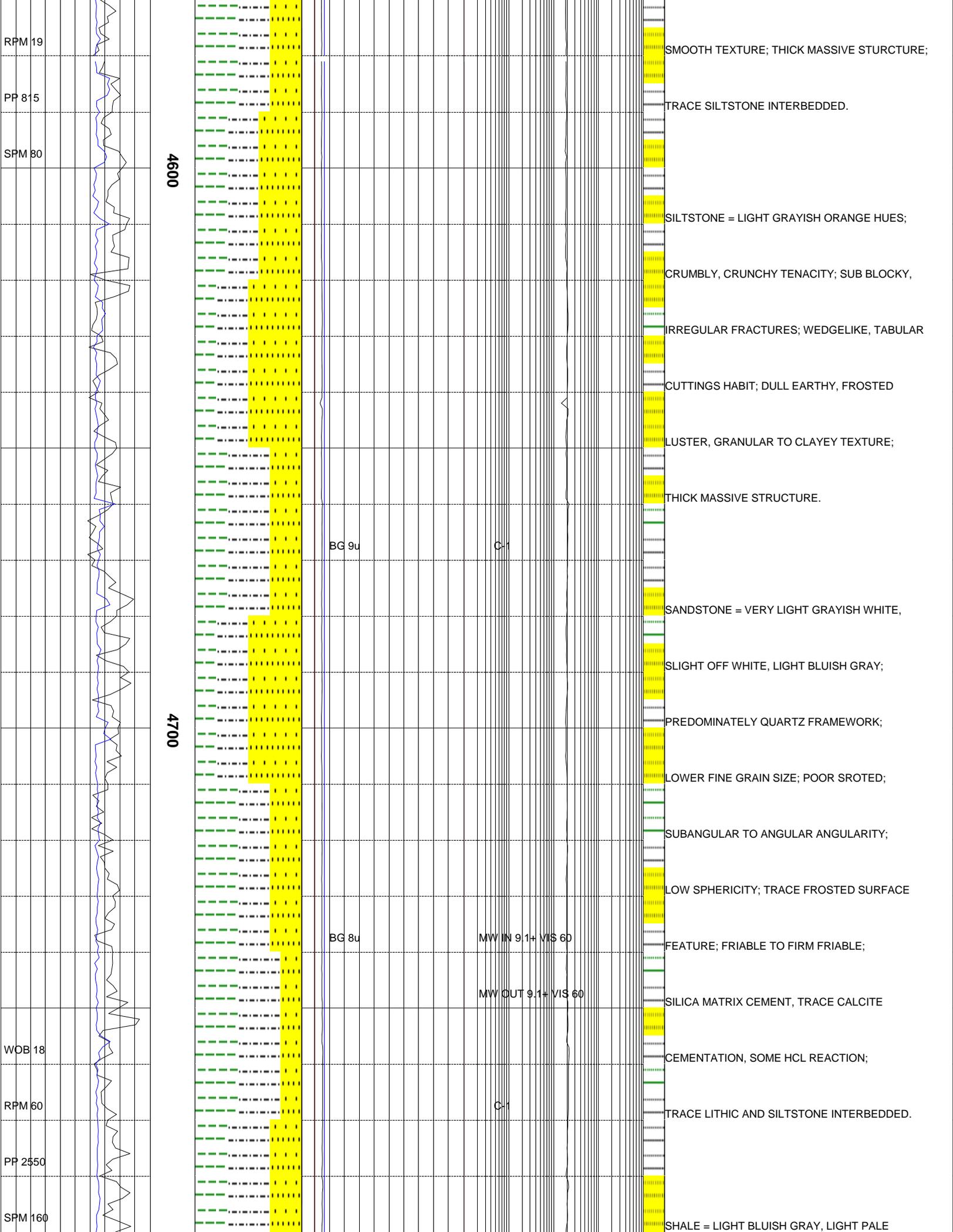
06/17/2009

WEDGELIKE, TABULAR, SUBBLOCKY CUTTINGS

WOB 17

C-1

HABIT; DULL EARTHY LUSTER; GRITTY TO



RPM 19

PP 815

SPM 80

4600

SMOOTH TEXTURE; THICK MASSIVE STRUCTURE;

TRACE SILTSTONE INTERBEDDED.

SILTSTONE = LIGHT GRAYISH ORANGE HUES;

CRUMBLY, CRUNCHY TENACITY; SUB BLOCKY,

IRREGULAR FRACTURES; WEDGELIKE, TABULAR

CUTTINGS HABIT; DULL EARTHY, FROSTED

LUSTER, GRANULAR TO CLAYEY TEXTURE;

THICK MASSIVE STRUCTURE.

BG 9u

C-1

SANDSTONE = VERY LIGHT GRAYISH WHITE,

SLIGHT OFF WHITE, LIGHT BLUISH GRAY;

4700

PREDOMINATELY QUARTZ FRAMEWORK;

LOWER FINE GRAIN SIZE; POOR SORTED;

SUBANGULAR TO ANGULAR ANGULARITY;

LOW SPHERICITY; TRACE FROSTED SURFACE

BG 8u

MW IN 9.1+ VIS 60

FEATURE; FRIABLE TO FIRM FRIABLE;

MW OUT 9.1+ VIS 60

SILICA MATRIX CEMENT, TRACE CALCITE

WOB 18

CEMENTATION, SOME HCL REACTION;

RPM 60

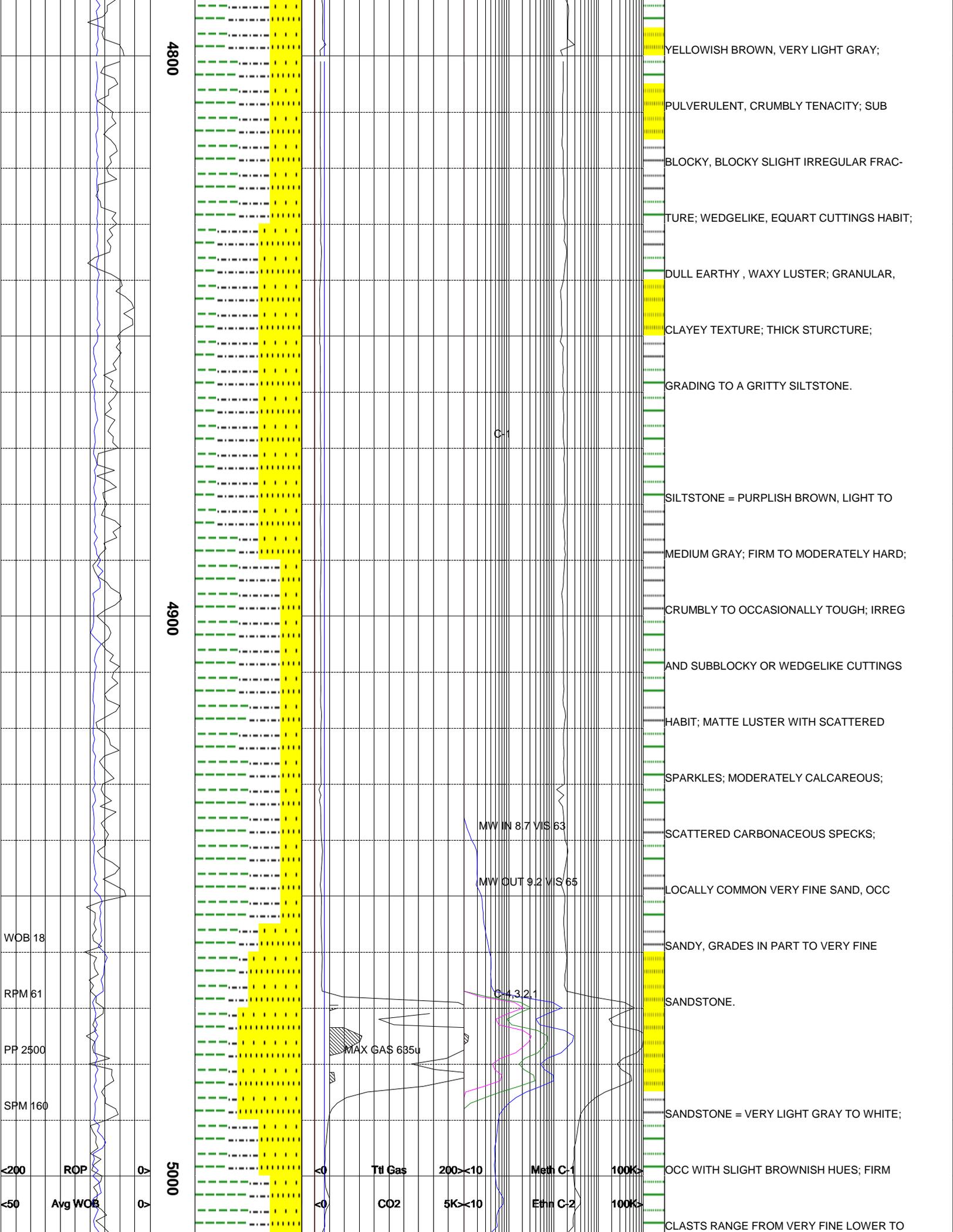
C-1

TRACE LITHIC AND SILTSTONE INTERBEDDED.

PP 2550

SPM 160

SHALE = LIGHT BLUISH GRAY, LIGHT PALE



4800

4900

5000

YELLOWISH BROWN, VERY LIGHT GRAY;
 PULVERULENT, CRUMBLY TENACITY; SUB
 BLOCKY, BLOCKY SLIGHT IRREGULAR FRAC-
 TURE; WEDGELIKE, EQUART CUTTINGS HABIT;
 DULL EARTHY, WAXY LUSTER; GRANULAR,
 CLAYEY TEXTURE; THICK STURCTURE;
 GRADING TO A GRITTY SILTSTONE.
 SILTSTONE = PURPLISH BROWN, LIGHT TO
 MEDIUM GRAY; FIRM TO MODERATELY HARD;
 CRUMBLY TO OCCASIONALLY TOUGH; IRREG
 AND SUBBLOCKY OR WEDGELIKE CUTTINGS
 HABIT; MATTE LUSTER WITH SCATTERED
 SPARKLES; MODERATELY CALCAREOUS;
 SCATTERED CARBONACEOUS SPECKS;
 LOCALLY COMMON VERY FINE SAND, OCC
 SANDY, GRADES IN PART TO VERY FINE
 SANDSTONE.
 SANDSTONE = VERY LIGHT GRAY TO WHITE;
 OCC WITH SLIGHT BROWNISH HUES; FIRM
 CLASTS RANGE FROM VERY FINE LOWER TO

C-1

MW IN 8.7 VIS 63

MW OUT 9.2 VIS 65

C-1.321

MAX GAS 635u

WOB 18

RPM 61

PP 2500

SPM 160

<200 ROP

<50 Avg WOB

Ttl Gas

CO2

200<10

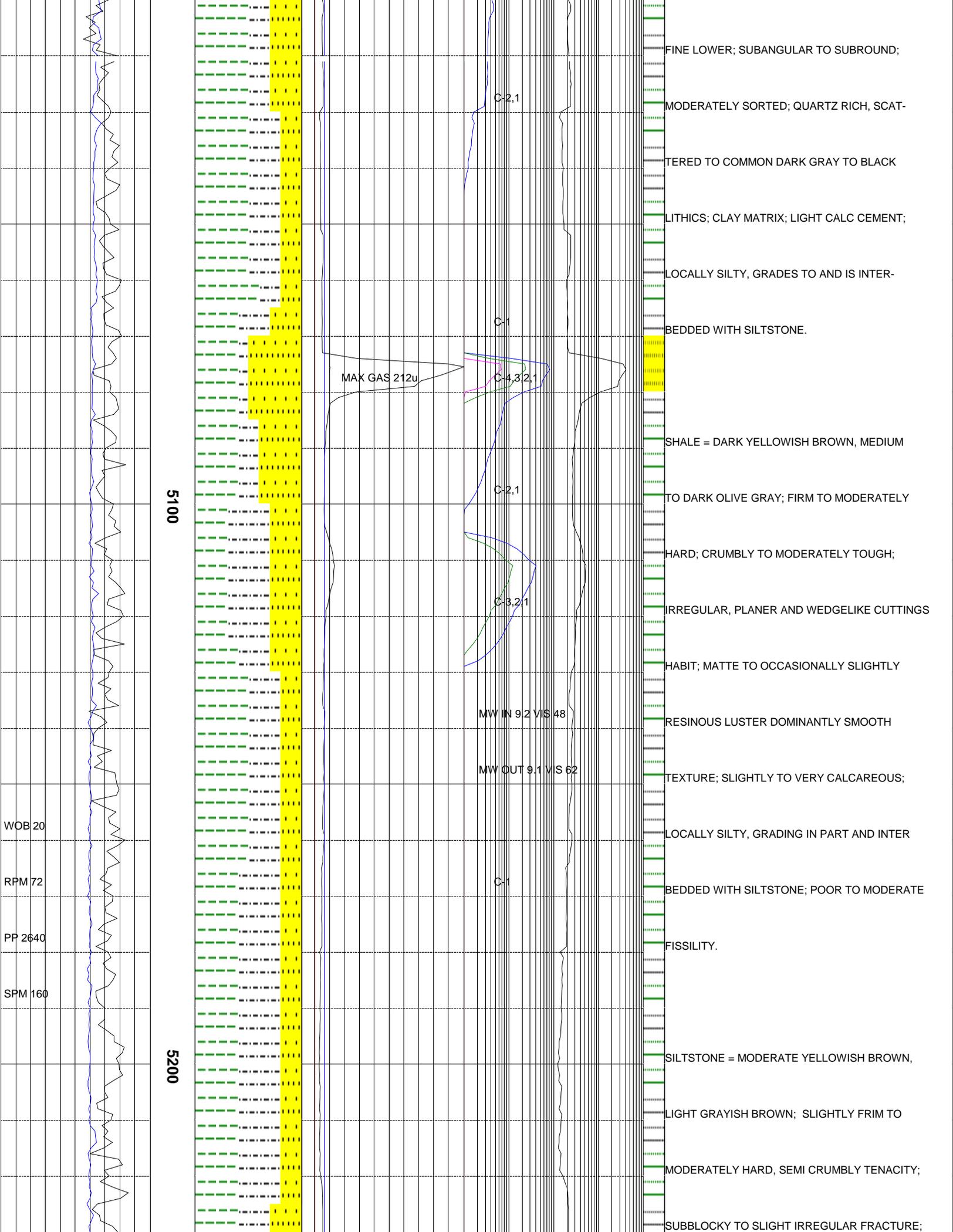
5K<10

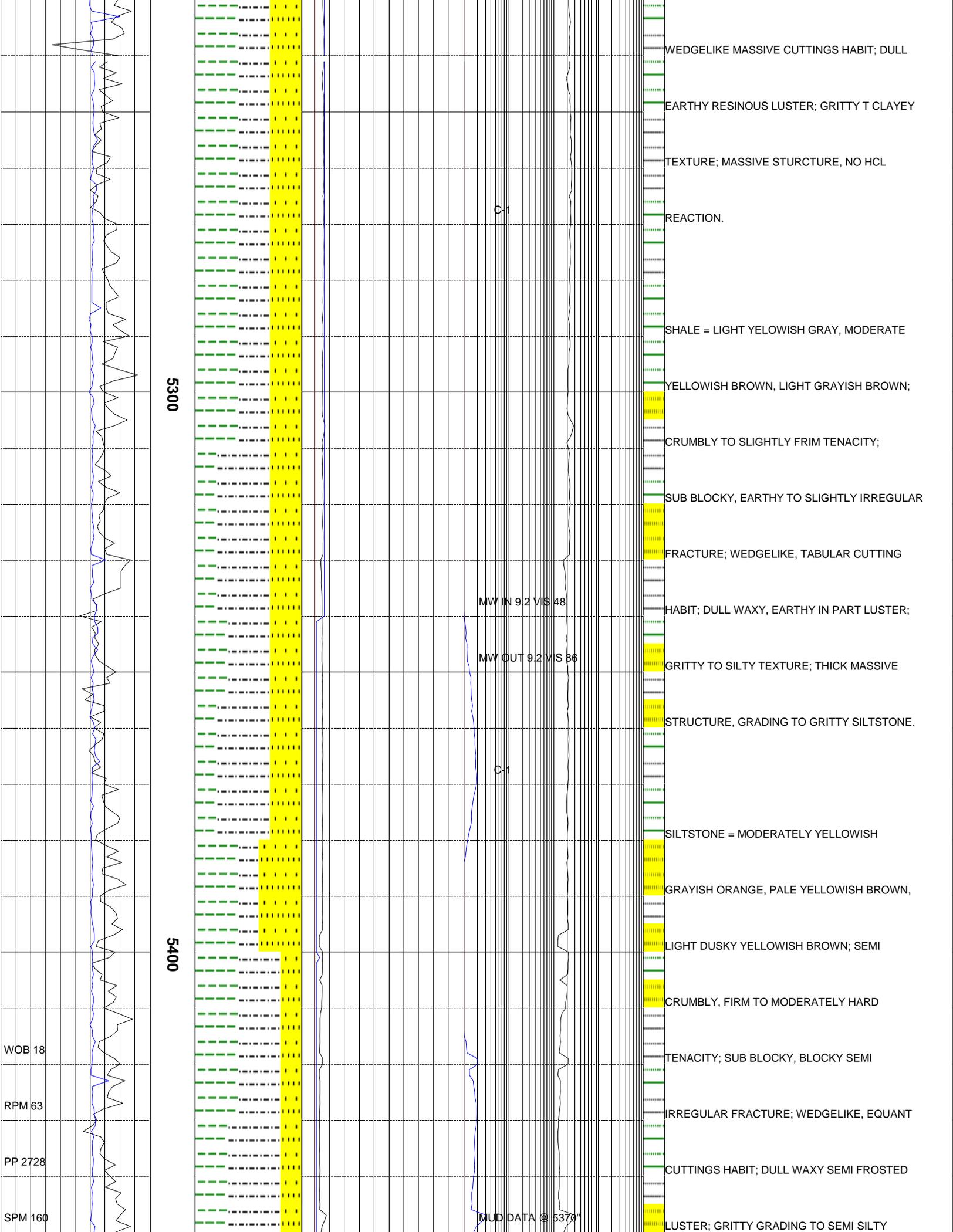
Meth C-1

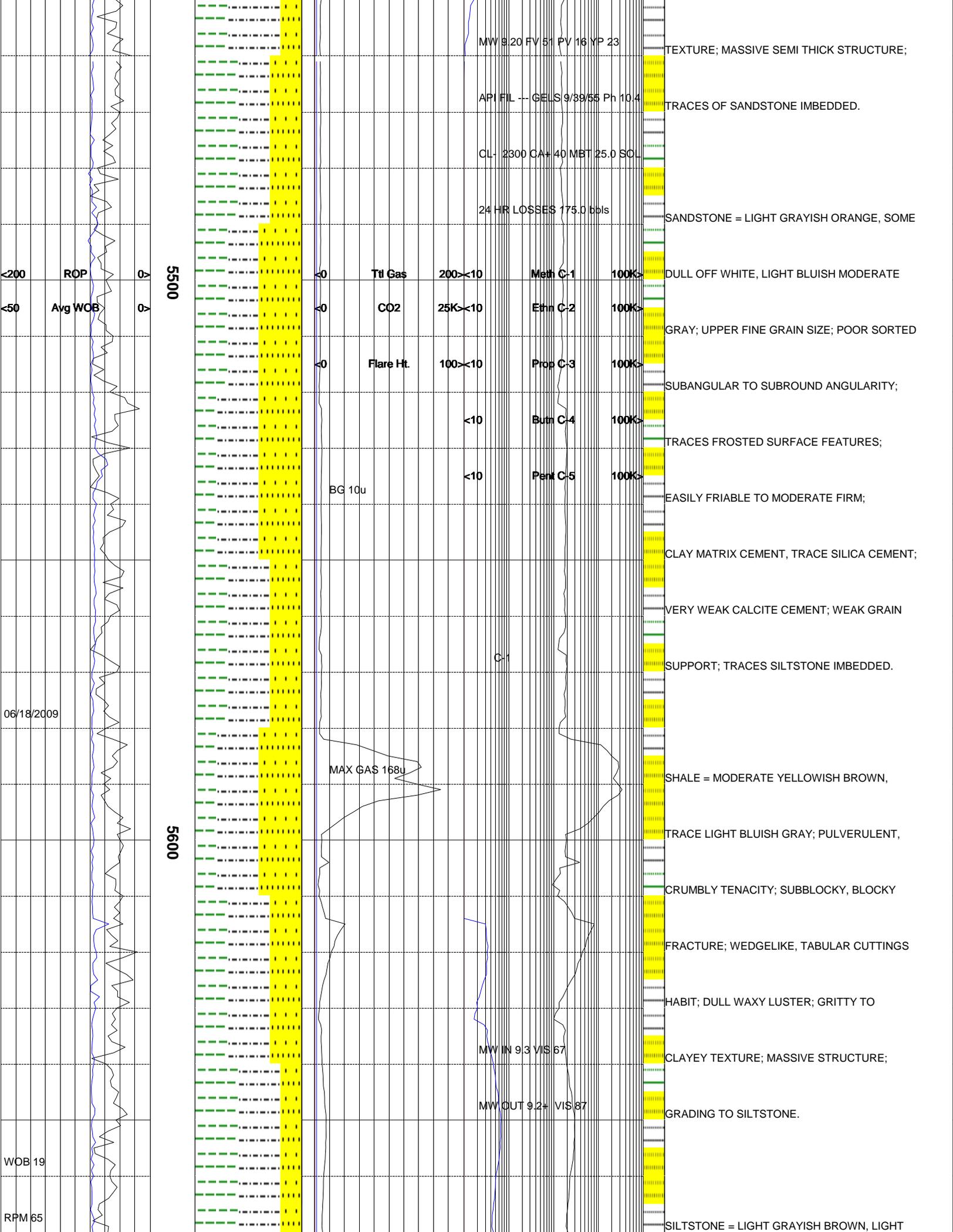
Ethn C-2

100K>

100K>







5500

5600

<200 ROP

<50 Avg WOB

06/18/2009

WOB 19

RPM 65

<0 Ttl Gas 200 > <10 Meth C-1 100K >

<0 CO2 25K > <10 Ethn C-2 100K >

<0 Flare Ht. 100 > <10 Prop C-3 100K >

<10 Burn C-4 100K >

BG 10u <10 Pent C-5 100K >

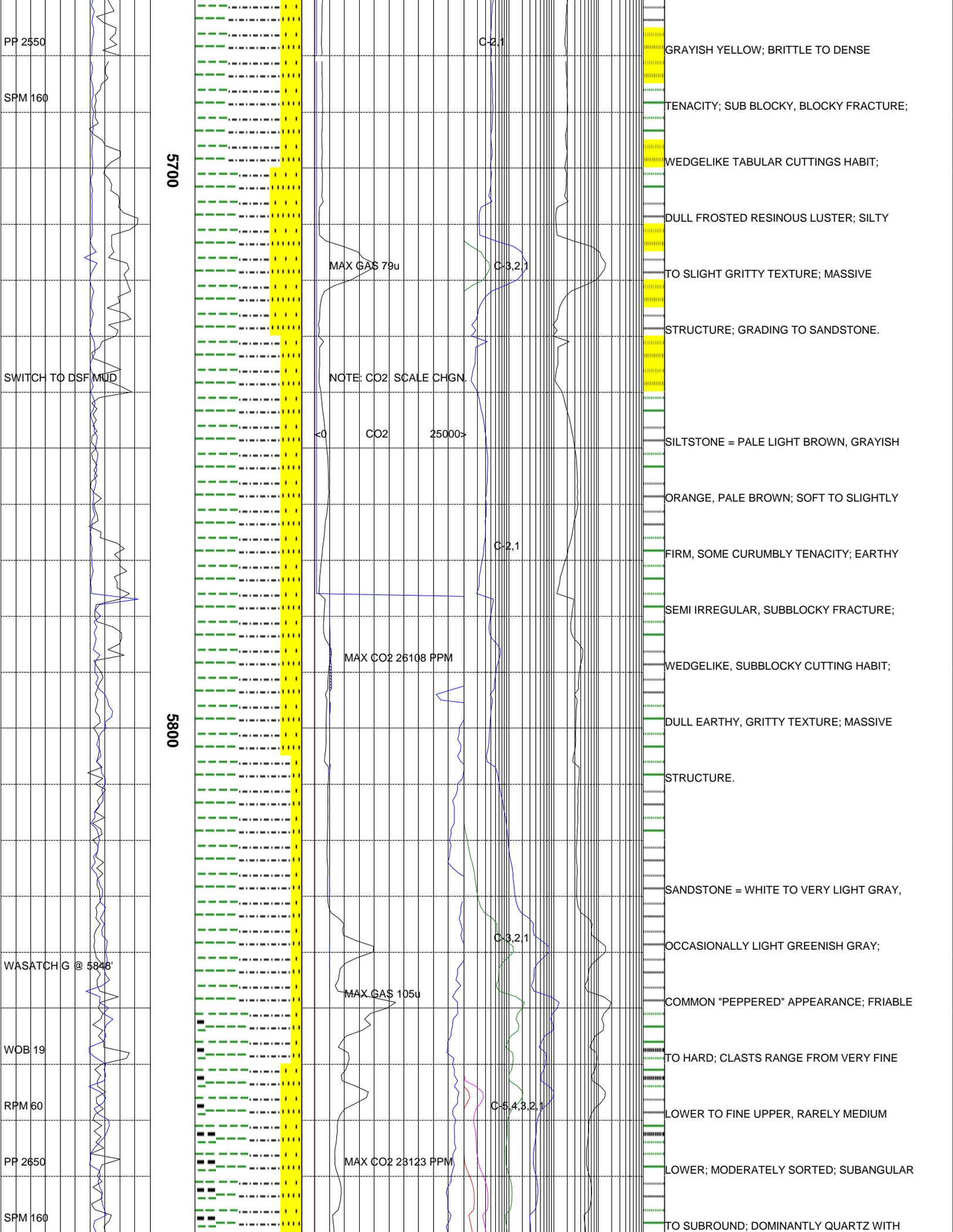
C-1

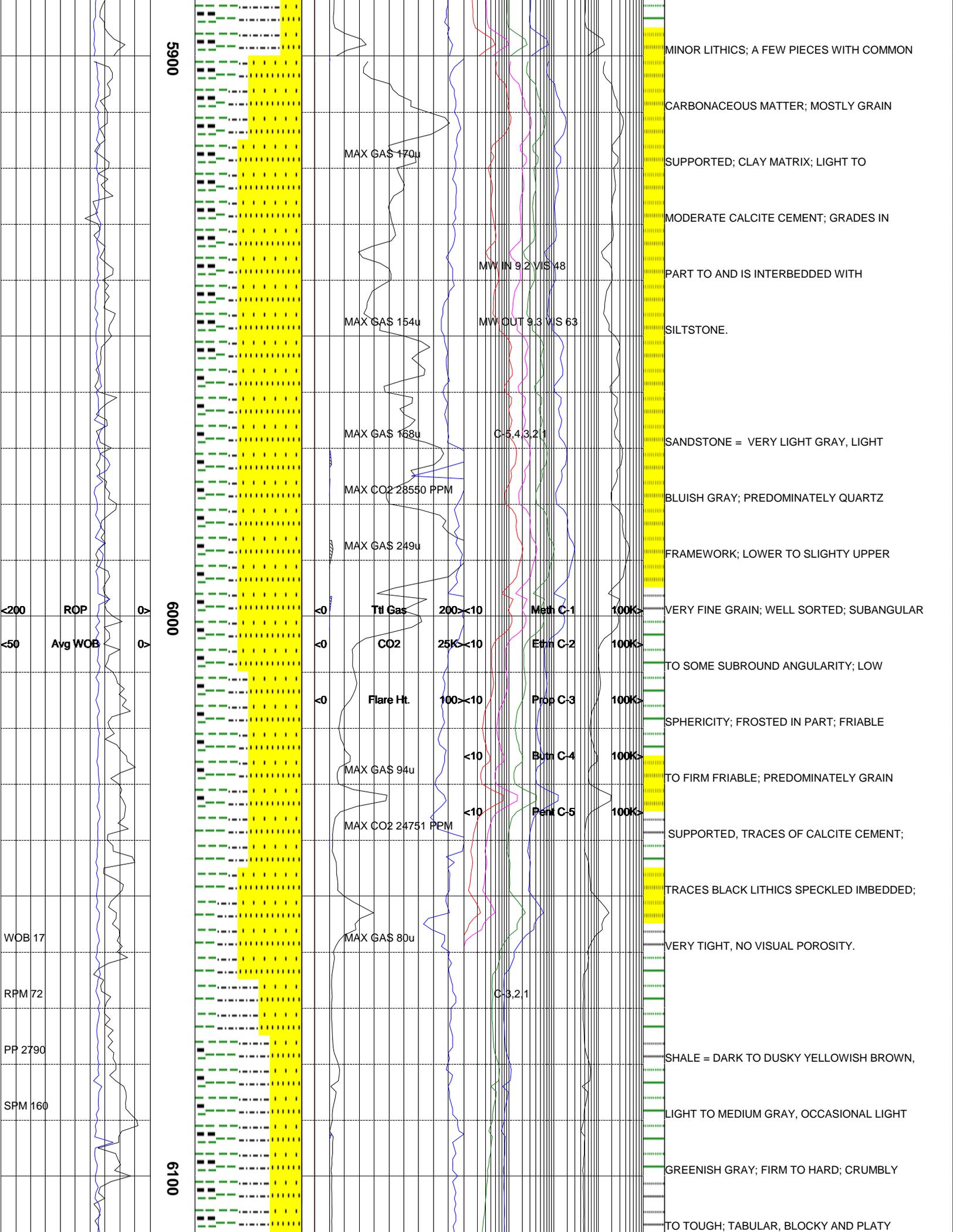
MAX GAS 168u

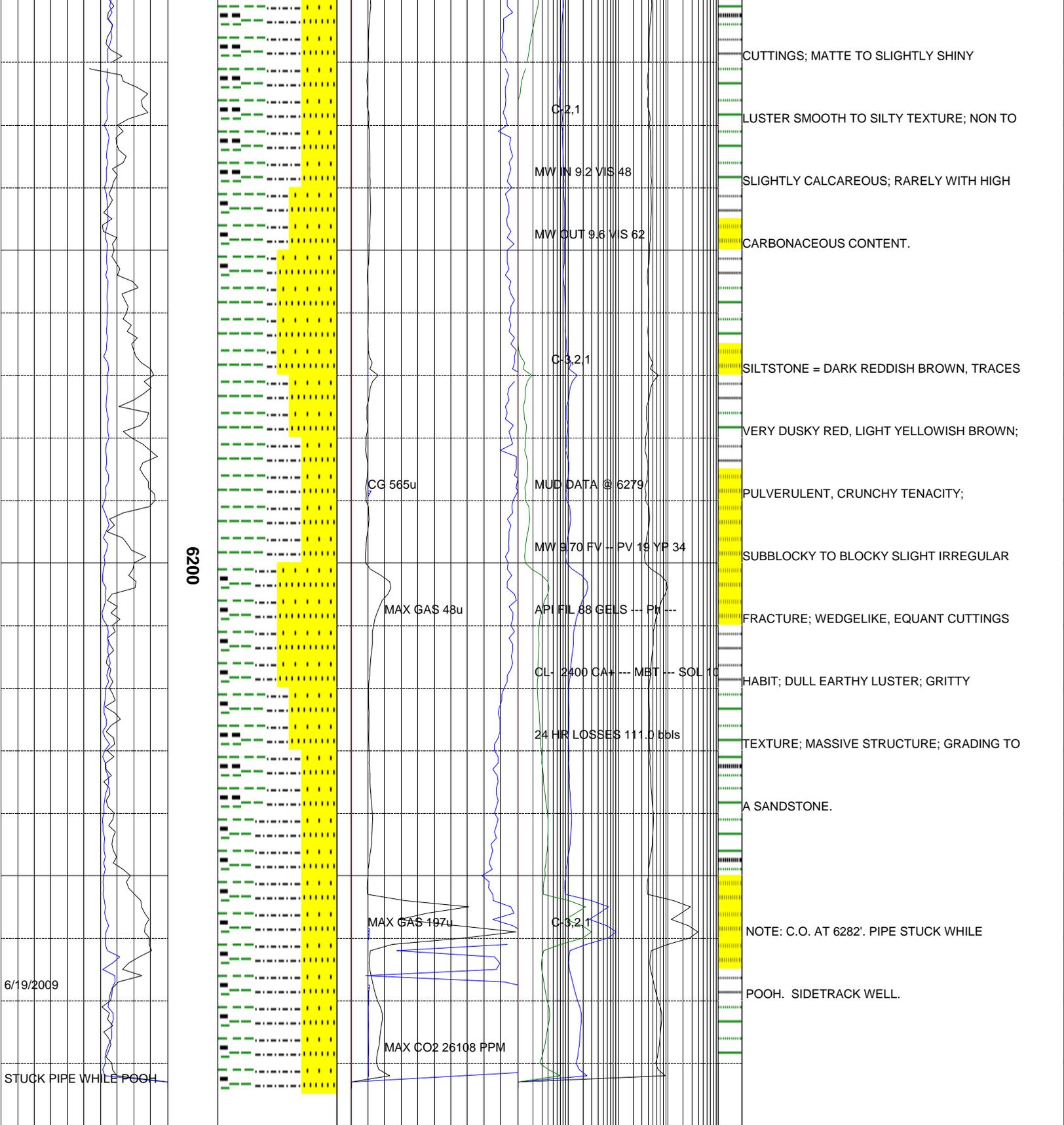
MW IN 9.3 VIS 67

MW OUT 9.2+ VIS 87

TEXTURE; MASSIVE SEMI THICK STRUCTURE;
 TRACES OF SANDSTONE IMBEDDED.
 CL- 2300 CA+ 40 MBT 25.0 SOL
 24 HR LOSSES 175.0 bbls
 SANDSTONE = LIGHT GRAYISH ORANGE, SOME
 DULL OFF WHITE, LIGHT BLUISH MODERATE
 GRAY; UPPER FINE GRAIN SIZE; POOR SORTED
 SUBANGULAR TO SUBROUND ANGULARITY;
 TRACES FROSTED SURFACE FEATURES;
 EASILY FRIABLE TO MODERATE FIRM;
 CLAY MATRIX CEMENT, TRACE SILICA CEMENT;
 VERY WEAK CALCITE CEMENT; WEAK GRAIN
 SUPPORT; TRACES SILTSTONE IMBEDDED.
 SHALE = MODERATE YELLOWISH BROWN,
 TRACE LIGHT BLUISH GRAY; PULVERULENT,
 CRUMBLY TENACITY; SUBBLOCKY, BLOCKY
 FRACTURE; WEDGELIKE, TABULAR CUTTINGS
 HABIT; DULL WAXY LUSTER; GRITTY TO
 CLAYEY TEXTURE; MASSIVE STRUCTURE;
 GRADING TO SILTSTONE.
 SILTSTONE = LIGHT GRAYISH BROWN, LIGHT







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