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# MUDLOG MD

**COMPANY** ExxonMobil Production

**WELL** PCU 297-12A7

**FIELD** Piceance Creek Unit

**REGION** Rocky Mountain

**COORDINATES** Lat. 39.889005 N  
Lon. 108.23726 W

**ELEVATION** GL: 7183.9'  
KB: 7214'

**COUNTY, STATE** RIO BLANCO, CO

**API INDEX** 05-103-11161-00

**SPUD DATE** 10/12/2008

**CONTRACTOR** HE Drilling

**CO. REP.** J. Woods, M. Sadler

**RIG/TYPE** 326 / Flex Four

**LOGGING UNIT** Canrig Unit 36

**GEOLOGISTS** J.Kokes  
B.Laiche

**ADD. PERSONS** H.Strickland  
P.Strickland

**CO. GEOLOGIST** Chris Alba

## LOG INTERVAL

## CASING DATA

**DEPTHS:** 3995' TO 12866'

**DATES:** 5/22/2009 TO 11/22/2009

**SCALE:** 1" = 100'

10 3/4" AT 3980'

7" AT 8881'

4.5" AT 12866'

AT

## MUD TYPES

## HOLE SIZE

WATER BASED TO 3995'

LSND TO 5500'

DSF TO 5882'

LSND TO 12866'

14 1/4" TO 3995'

9 7/8" TO 8896'

6.125" TO 12866'

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	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	

<200	ROP	>0
<50	Avg WOB	>0
<1	Depth of Cut	>0

Depth

Lithology

MGS	Ttl Gas	500	<10	Meth C-1	100K
	units		<10	Ethn C-2	100K
	CO2	50K	<10	Prop C-3	100K
	ppm		<10	Butn C-4	100K
	Flare Ht.	100	<10	Pent C-5	100K
	ft				

Interp. Lith

Remarks  
Survey Data, Mud Reports, Other Info.

<200	ROP	>0
<50	Avg WOB	>0
<1	Depth of Cut	>0

3700  
3800  
3900  
4000

Lithology

MGS	Ttl Gas	500	<10	Meth C-1	100K
	units		<10	Ethn C-2	100K
	CO2	50K	<10	Prop C-3	100K
	ppm		<10	Butn C-4	100K
	Flare Ht.	100	<10	Pent C-5	100K
	ft				

Interp. Lith

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 3980'

EPOCH COMMENCED LOGGING ON 5/22/2009 AT 3995' MD.

<200	ROP	>0
<50	Avg WOB	>0
<1	Depth of Cut	>0

4100

Lithology

MGS	Ttl Gas	500	<10	Meth C-1	100K
	units		<10	Ethn C-2	100K
	CO2	50K	<10	Prop C-3	100K
	ppm		<10	Butn C-4	100K
	Flare Ht.	100	<10	Pent C-5	100K
	ft				

Interp. Lith

SANDSTONE = LIGHT PALE BROWNISH YELLOW, LIGHT MODERATE BROWN, SOME CLEAR TO TRANSLUCENT; UPPER VERY FINE TO FINE GRAIN SIZE; POOR TO FAIR SORTED; SUB-ANGULAR, SUBROUND IN PART; CLEAR TO FROSTED SURFACE FEATURES; EASILY FRIABLE TO FRIABLE; CLAY MATRIX CEMENT TRACE CALCAREOUS CEMENT; LITHE AND SILTSTONE INTERBEDDED.

SHALE = MODERATED YELLOWISH BROWN; CRUMBLY, TENACITY; SUBBLOCKY FRACTURE; WEDGELIKE, TABULAR CUTTINGS HABIT; DULL EARTHY LUSTER, SILTY, CLAYEY TEXTURE; MASSIVE TO THICK STRUCTURE.

<200	ROP	>0
<50	Avg WOB	>0
<1	Depth of Cut	>0

4200

Lithology

MGS	Ttl Gas	500	<10	Meth C-1	100K
	units		<10	Ethn C-2	100K
	CO2	50K	<10	Prop C-3	100K
	ppm		<10	Butn C-4	100K
	Flare Ht.	100	<10	Pent C-5	100K
	ft				

Interp. Lith

SANDSTONE = LIGHT PALE BROWN, VERY LIGHT GRAY, OFF WHITE WITH SLIGHT TRANSLUCENT GRAINS; PREDOMINATELY QUARTZ FRAMEWORK; LOWER FINE TO SOME UPPER FINE GRAIN; POOR SORTING; SUBANGULAR TO SUBROUND; TRACES FROSTED SURFACE FEATURES; EASILY FRIABLE TO SOME FRIABLE; CLAY MATRIX CEMENT, TRACE CALCAREOUS CEMENT; SOME GRAIN SUPPORTED; TRACE SILTSTONE INTERBEDDED.

<200	ROP	>0
<50	Avg WOB	>0
<1	Depth of Cut	>0

4300

Lithology

MGS	Ttl Gas	500	<10	Meth C-1	100K
	units		<10	Ethn C-2	100K
	CO2	50K	<10	Prop C-3	100K
	ppm		<10	Butn C-4	100K
	Flare Ht.	100	<10	Pent C-5	100K
	ft				

Interp. Lith

SILTSTONE = LIGHT YELLOWISH BROWN, MODERATE PALE YELLOWISH BROWN; PULVERULENT, CRUNCHY TENACITY; EARTHY SUBBLOCKY FRACTURE; WEDGELIKE CUTTINGS HABIT; DULL SEMI EARTHY LUSTER; GRITTY TO GRANULAR TEXTURE; THIN STRUCTURE; GRADING TO SANDSTONE.

<200	ROP	>0
<50	Avg WOB	>0
<1	Depth of Cut	>0

4400

Lithology

MGS	Ttl Gas	500	<10	Meth C-1	100K
	units		<10	Ethn C-2	100K
	CO2	50K	<10	Prop C-3	100K
	ppm		<10	Butn C-4	100K
	Flare Ht.	100	<10	Pent C-5	100K
	ft				

Interp. Lith

SHALE = BROWNISH YELLOW ORANGE, PALE TO MODERATE YELLOWISH BROWN, OCCASIONALLY MEDIUM GRAY WITH SLIGHT GREENISH HUES; FIRM; CRUMBLY TO OCCASIONALLY MODERATELY TOUGH; IRREGULAR, SUBBLOCKY, RARELY WEDGE-LIKE CUTTINGS HABIT; MATTE TO RARELY SLIGHTLY RESINOUS LUSTER; DOMINANTLY SMOOTH TEXTURE; MODERATELY CALCAREOUS; LOCALLY SILTY, GRADING IN PART TO AND INTERBEDDED WITH SILTSTONE; POOR TO MODERATE FISSILITY.

<200	ROP	>0
<50	Avg WOB	>0
<1	Depth of Cut	>0

4500

Lithology

MGS	Ttl Gas	500	<10	Meth C-1	100K
	units		<10	Ethn C-2	100K
	CO2	50K	<10	Prop C-3	100K
	ppm		<10	Butn C-4	100K
	Flare Ht.	100	<10	Pent C-5	100K
	ft				

Interp. Lith

SANDSTONE = VERY LIGHT GRAY TO WHITE; OCC WITH SLIGHT BROWNISH HUES; FIRM CLASTS RANGE FROM VERY FINE LOWER TO FINE LOWER; SUBANGULAR TO SUBROUND; MODERATELY SORTED; QUARTZ RICH, SCATTERED TO COMMON DARK GRAY TO BLACK LITHICS; CLAY MATRIX; LIGHT CALC CEMENT; LOCALLY SILTY, GRADES TO AND IS INTERBEDDED WITH SILTSTONE.

<200	ROP	>0
<50	Avg WOB	>0
<1	Depth of Cut	>0

4600

Lithology

MGS	Ttl Gas	500	<10	Meth C-1	100K
	units		<10	Ethn C-2	100K
	CO2	50K	<10	Prop C-3	100K
	ppm		<10	Butn C-4	100K
	Flare Ht.	100	<10	Pent C-5	100K
	ft				

Interp. Lith

SILTSTONE = MODERATE TO DARK YELLOWISH BROWN, LIGHT GRAY, OCCASIONAL SLIGHTLY OLIVE HUES; FIRM TO MODERATELY HARD; CRUMBLY TO OCCASIONALLY MODERATELY TOUGH; EARTHY LUSTER WITH SCATTERED SPARKLES; ABRASIVE, GRITTY TEXTURE; MODERATELY CALCAREOUS;

NB #3, 9.7/8" AT 3995'  
HC HCM5042X  
JETS: 4X13, 2X12  
SN: 7014935  
W/POWERDRIVE + MWD  
ETG: 1321' HRS 31

5-23-2009  
WOB 18  
RPM 82  
PP 2273  
SPM 154

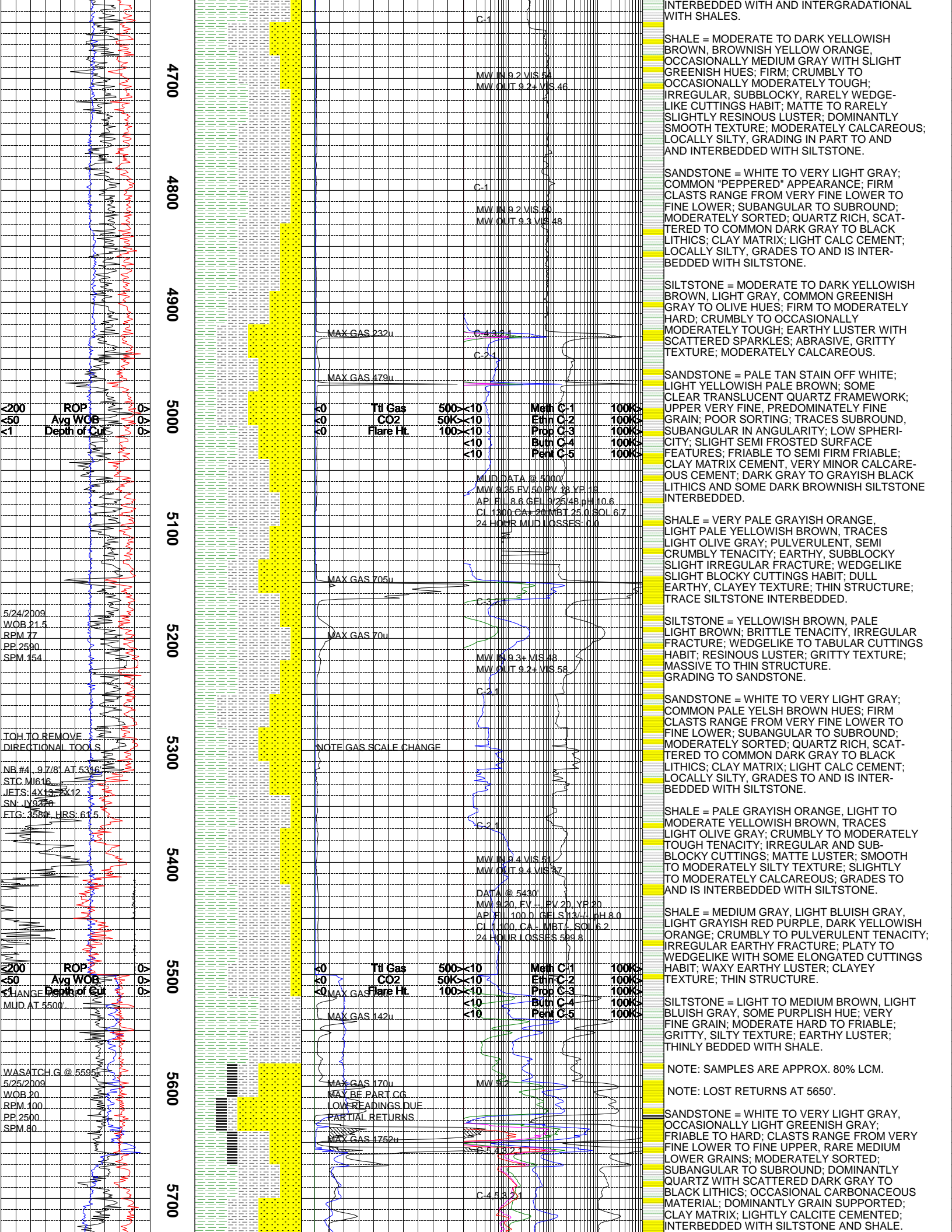
MUD DATA @ 4007  
MW IN 8.90 FV 35 PV 7 YP 8  
API FL 13.5 GE 13.7/12 pH 10.4  
CL 1100 CA+ 80 LMBT 15.0 SOL 3.7  
24 HR LOSSES 0.00

C-1  
MW IN 8.9+ VIS 54  
MW OUT 8.9+ VIS 45

C-1  
MW IN 9.0+ VIS 43  
MW OUT 9.0+ VIS 48

C-1  
MW IN 9.2 VIS 64  
MW OUT 9.2 VIS 56

MAX GAS 400



4700  
4800  
4900  
5000  
5100  
5200  
5300  
5400  
5500  
5600  
5700

ROP  
Avg WOB  
Depth of Cut

5/24/2009  
WOB 21.5  
RPM 77  
PP 2590  
SPM 154

TOH TO REMOVE  
DIRECTIONAL TOOLS

NB #4 .97/8" AT 5316  
STC M616  
JETS: 4X12 3X12  
SN: J9270  
FTG: 358# HRS: 61.5

CHANGE  
MUD AT 5500'

WATCH G @ 5595'  
5/25/2009  
WOB 20  
RPM 100  
PP 2500  
SPM 80

Til Gas	500x<10	Meth C-1	100K>
CO2	50Kx<10	Ethn C-2	100K>
Flare Ht	100x<10	Prop C-3	100K>
	<10	Butn C-4	100K>
	<10	Perw C-5	100K>

MUD DATA @ 5000'  
MW IN 9.25 FV 50 PV 28 Y2 18  
AP FL 8.6 GEL 9.25 48 pH 10.6  
CL 1300 CA 70 MBT 25.0 SOL 6.7  
24 HOUR MUD LOSSES 0.0

NOTE GAS SCALE CHANGE

Til Gas	500x<10	Meth C-1	100K>
CO2	50Kx<10	Ethn C-2	100K>
Flare Ht	100x<10	Prop C-3	100K>
	<10	Butn C-4	100K>
	<10	Perw C-5	100K>

DATA @ 5430'  
MW IN 9.20 FV - FV 20 Y2 20  
AP FL 100.0 GELS 13.4 pH 8.0  
CL 1100 CA - MBT - SOL 6.2  
24 HOUR LOSSES 599.8

MAX GAS 170u  
MAY BE PART CG  
LOW READINGS DUE  
PARTIAL RETURNS  
MAX GAS 175u

SHALE = MODERATE TO DARK YELLOWISH BROWN, BROWNISH YELLOW ORANGE, OCCASIONALLY MEDIUM GRAY WITH SLIGHT GREENISH HUES; FIRM; CRUMBLY TO OCCASIONALLY MODERATELY TOUGH; IRREGULAR, SUBBLOCKY, RARELY WEDGE-LIKE CUTTINGS HABIT; MATTE TO RARELY SLIGHTLY RESINOUS LUSTER; DOMINANTLY SMOOTH TEXTURE; MODERATELY CALCAREOUS; LOCALLY SILTY, GRADING IN PART TO AND INTERBEDDED WITH SILTSTONE.

SANDSTONE = WHITE TO VERY LIGHT GRAY; COMMON "PEPPERED" APPEARANCE; FIRM CLASTS RANGE FROM VERY FINE LOWER TO FINE LOWER; SUBANGULAR TO SUBROUND; MODERATELY SORTED; QUARTZ RICH, SCATTERED TO COMMON DARK GRAY TO BLACK LITHICS; CLAY MATRIX; LIGHT CALC CEMENT; LOCALLY SILTY, GRADES TO AND IS INTERBEDDED WITH SILTSTONE.

SILTSTONE = MODERATE TO DARK YELLOWISH BROWN, LIGHT GRAY, COMMON GREENISH GRAY TO OLIVE HUES; FIRM TO MODERATELY HARD; CRUMBLY TO OCCASIONALLY MODERATELY TOUGH; EARTHY LUSTER WITH SCATTERED SPARKLES; ABRASIVE, GRITTY TEXTURE; MODERATELY CALCAREOUS.

SANDSTONE = PALE TAN STAIN OFF WHITE; LIGHT YELLOWISH PALE BROWN; SOME CLEAR TRANSLUCENT QUARTZ FRAMEWORK; UPPER VERY FINE, PREDOMINATELY FINE GRAIN; POOR SORTING; TRACES SUBROUND, SUBANGULAR IN ANGULARITY; LOW SPHERICITY; SLIGHT SEMI FROSTED SURFACE FEATURES; FRIABLE TO SEMI FIRM FRIABLE; CLAY MATRIX CEMENT, VERY MINOR CALCAREOUS CEMENT; DARK GRAY TO GRAYISH BLACK LITHICS AND SOME DARK BROWNISH SILTSTONE INTERBEDDED.

SHALE = VERY PALE GRAYISH ORANGE, LIGHT PALE YELLOWISH BROWN, TRACES LIGHT OLIVE GRAY; PULVERULENT, SEMI CRUMBLY TENACITY; EARTHY, SUBBLOCKY SLIGHT IRREGULAR FRACTURE; WEDGELIKE SLIGHT BLOCKY CUTTINGS HABIT; DULL EARTHY, CLAYEY TEXTURE; THIN STRUCTURE; TRACE SILTSTONE INTERBEDDED.

SILTSTONE = YELLOWISH BROWN, PALE LIGHT BROWN; BRITTLE TENACITY, IRREGULAR FRACTURE; WEDGELIKE TO TABULAR CUTTINGS HABIT; RESINOUS LUSTER; GRITTY TEXTURE; MASSIVE TO THIN STRUCTURE. GRADING TO SANDSTONE.

SANDSTONE = WHITE TO VERY LIGHT GRAY; COMMON PALE YELSH BROWN HUES; FIRM CLASTS RANGE FROM VERY FINE LOWER TO FINE LOWER; SUBANGULAR TO SUBROUND; MODERATELY SORTED; QUARTZ RICH, SCATTERED TO COMMON DARK GRAY TO BLACK LITHICS; CLAY MATRIX; LIGHT CALC CEMENT; LOCALLY SILTY, GRADES TO AND IS INTERBEDDED WITH SILTSTONE.

SHALE = PALE GRAYISH ORANGE, LIGHT TO MODERATE YELLOWISH BROWN, TRACES LIGHT OLIVE GRAY; CRUMBLY TO MODERATELY TOUGH TENACITY; IRREGULAR AND SUB-BLOCKY CUTTINGS; MATTE LUSTER; SMOOTH TO MODERATELY SILTY TEXTURE; SLIGHTLY TO MODERATELY CALCAREOUS; GRADES TO AND IS INTERBEDDED WITH SILTSTONE.

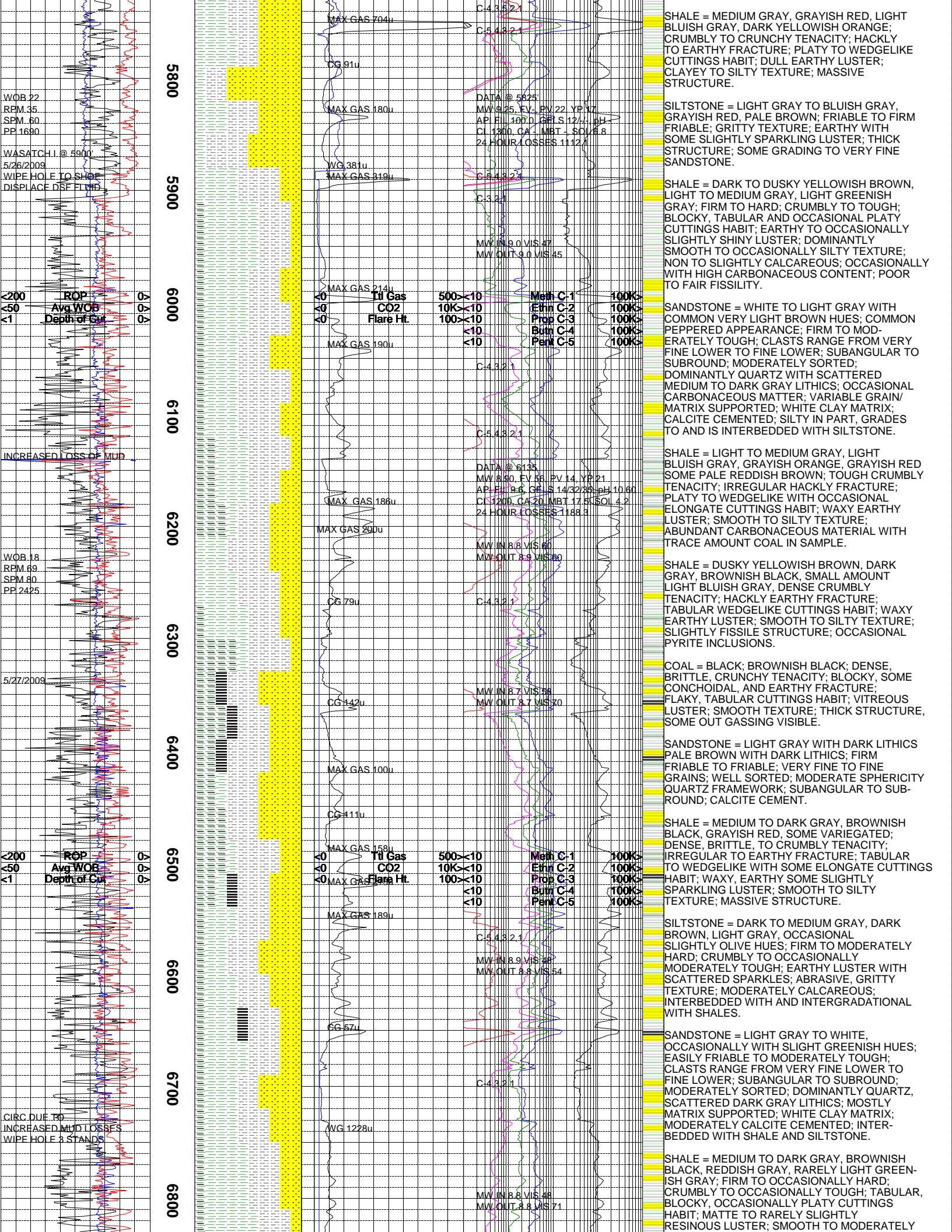
SHALE = MEDIUM GRAY, LIGHT BLUISH GRAY, LIGHT GRAYISH RED PURPLE, DARK YELLOWISH ORANGE; CRUMBLY TO PULVERULENT TENACITY; IRREGULAR EARTHY FRACTURE; PLATY TO WEDGELIKE WITH SOME ELONGATED CUTTINGS HABIT; WAXY EARTHY LUSTER; CLAYEY TEXTURE; THIN STRUCTURE.

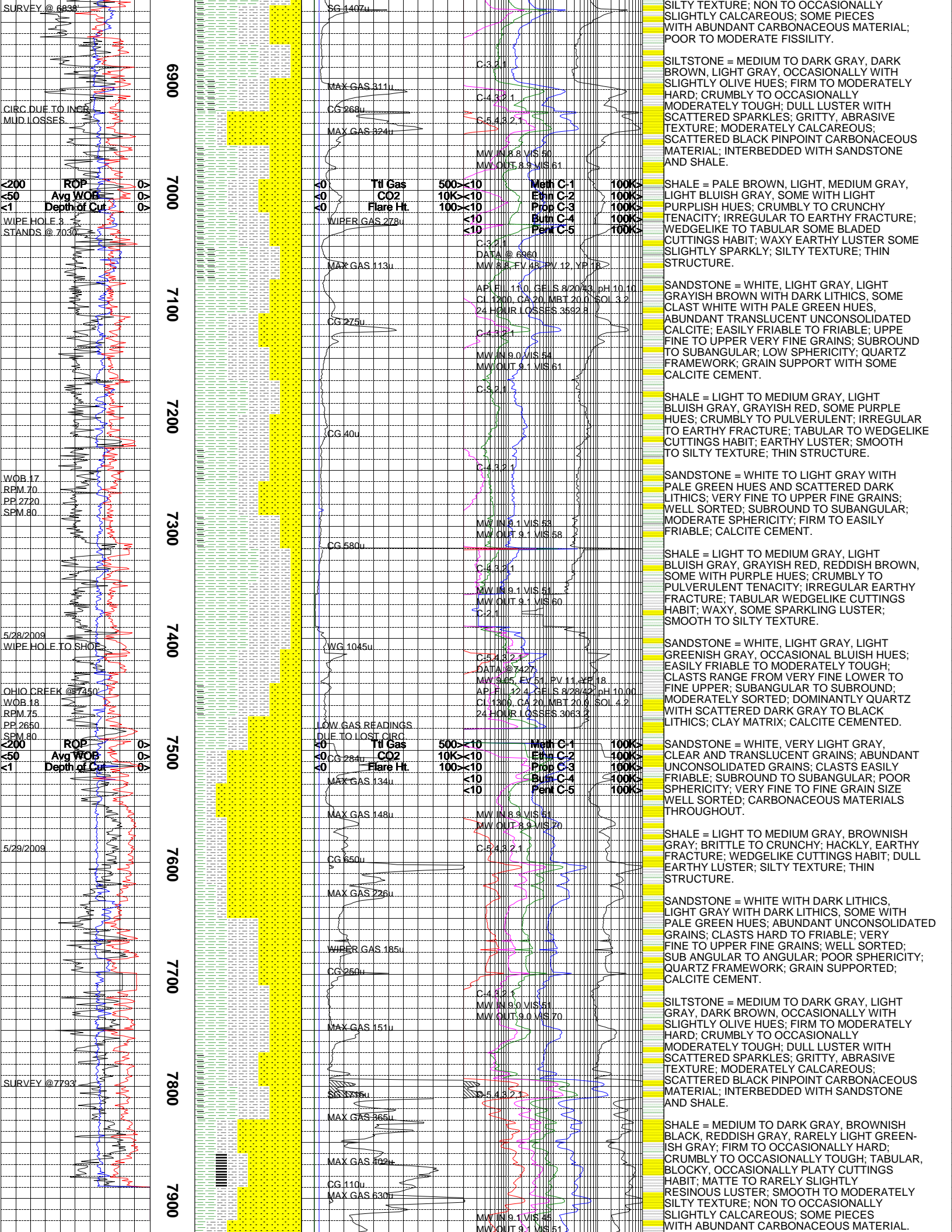
SILTSTONE = LIGHT TO MEDIUM BROWN, LIGHT BLUISH GRAY, SOME PURPLISH HUE; VERY FINE GRAIN; MODERATE HARD TO FRIABLE; GRITTY, SILTY TEXTURE; EARTHY LUSTER; THINLY BEDDED WITH SHALE.

NOTE: SAMPLES ARE APPROX. 80% LCM.

NOTE: LOST RETURNS AT 5650'.

SANDSTONE = WHITE TO VERY LIGHT GRAY, OCCASIONALLY LIGHT GREENISH GRAY; FRIABLE TO HARD; CLASTS RANGE FROM VERY FINE LOWER TO FINE UPPER, RARE MEDIUM LOWER GRAINS; MODERATELY SORTED; SUBANGULAR TO SUBROUND; DOMINANTLY QUARTZ WITH SCATTERED DARK GRAY TO BLACK LITHICS; OCCASIONAL CARBONACEOUS MATERIAL; DOMINANTLY GRAIN SUPPORTED; CLAY MATRIX; LIGHTLY CALCITE CEMENTED; INTERBEDDED WITH SILTSTONE AND SHALE.





6900  
7000  
7100  
7200  
7300  
7400  
7500  
7600  
7700  
7800  
7900

<200 ROP  
<50 Avg WOB  
<1 Depth of Cut  
WIPE HOLE 3  
STANDS @ 7030

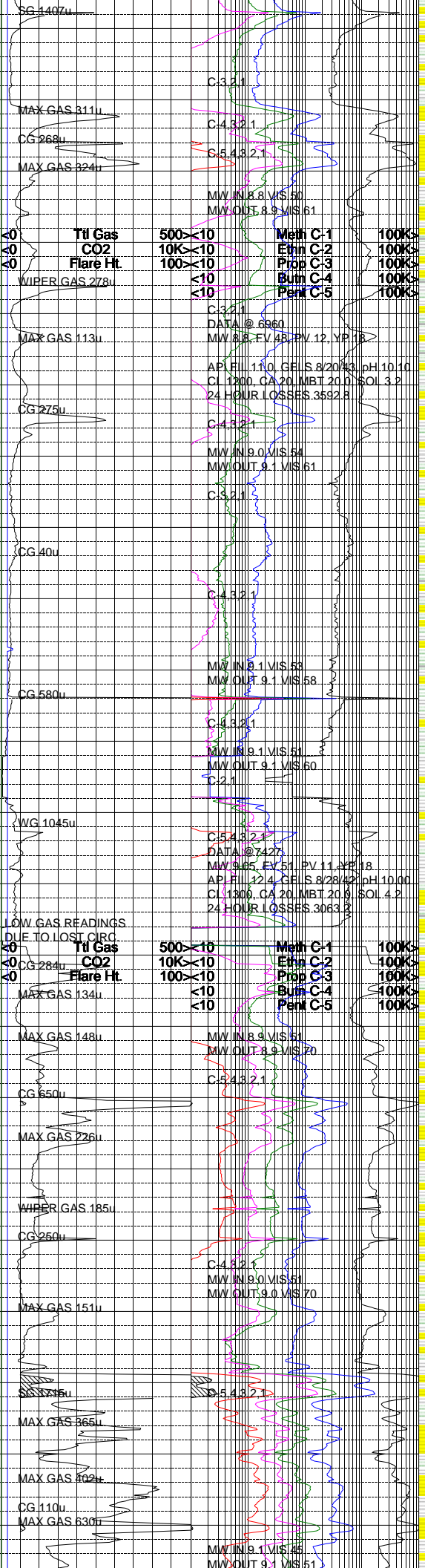
WOB 17  
RPM 70  
PP 2720  
SPM 80

5/28/2009  
WIPE HOLE TO SHOT

OHIO CREEK @ 7450  
WOB 18  
RPM 75  
PP 2650  
SPM 80

5/29/2009

SURVEY @ 7793



SILTSTONE; NON TO OCCASIONALLY SLIGHTLY CALCAREOUS; SOME PIECES WITH ABUNDANT CARBONACEOUS MATERIAL; POOR TO MODERATE FISSILITY.

SILTSTONE = MEDIUM TO DARK GRAY, DARK BROWN, LIGHT GRAY, OCCASIONALLY WITH SLIGHTLY OLIVE HUES; FIRM TO MODERATELY HARD; CRUMBLY TO OCCASIONALLY MODERATELY TOUGH; DULL LUSTER WITH SCATTERED SPARKLES; GRITTY, ABRASIVE TEXTURE; MODERATELY CALCAREOUS; SCATTERED BLACK PINPOINT CARBONACEOUS MATERIAL; INTERBEDDED WITH SANDSTONE AND SHALE.

SHALE = PALE BROWN, LIGHT, MEDIUM GRAY, LIGHT BLuish GRAY, SOME WITH LIGHT PURPLISH HUES; CRUMBLY TO CRUNCHY TENACITY; IRREGULAR TO EARTHY FRACTURE; WEDGELIKE TO TABULAR SOME BLADED CUTTINGS HABIT; WAXY EARTHY LUSTER SOME SLIGHTLY SPARKLY; SILTY TEXTURE; THIN STRUCTURE.

SANDSTONE = WHITE, LIGHT GRAY, LIGHT GRAYISH BROWN WITH DARK LITHICS, SOME CLAST WHITE WITH PALE GREEN HUES, ABUNDANT TRANSLUCENT UNCONSOLIDATED CALCITE; EASILY FRIABLE TO FRIABLE; UPPE FINE TO UPPER VERY FINE GRAINS; SUBROUND TO SUBANGULAR; LOW SPHERICITY; QUARTZ FRAMEWORK; GRAIN SUPPORT WITH SOME CALCITE CEMENT.

SHALE = LIGHT TO MEDIUM GRAY, LIGHT BLuish GRAY, GRAYISH RED, SOME PURPLE HUES; CRUMBLY TO PULVERULENT; IRREGULAR TO EARTHY FRACTURE; TABULAR TO WEDGELIKE CUTTINGS HABIT; EARTHY LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE.

SANDSTONE = WHITE TO LIGHT GRAY WITH PALE GREEN HUES AND SCATTERED DARK LITHICS; VERY FINE TO UPPER FINE GRAINS; WELL SORTED; SUBROUND TO SUBANGULAR; MODERATE SPHERICITY; FIRM TO EASILY FRIABLE; CALCITE CEMENT.

SHALE = LIGHT TO MEDIUM GRAY, LIGHT BLuish GRAY, GRAYISH RED, REDDISH BROWN, SOME WITH PURPLE HUES; CRUMBLY TO PULVERULENT TENACITY; IRREGULAR EARTHY FRACTURE; TABULAR WEDGELIKE CUTTINGS HABIT; WAXY, SOME SPARKLING LUSTER; SMOOTH TO SILTY TEXTURE.

SANDSTONE = WHITE, LIGHT GRAY, LIGHT GREENISH GRAY, OCCASIONAL BLuish HUES; EASILY FRIABLE TO MODERATELY TOUGH; CLASTS RANGE FROM VERY FINE LOWER TO FINE UPPER; SUBANGULAR TO SUBROUND; MODERATELY SORTED; DOMINANTLY QUARTZ WITH SCATTERED DARK GRAY TO BLACK LITHICS; CLAY MATRIX; CALCITE CEMENTED.

SANDSTONE = WHITE, VERY LIGHT GRAY, CLEAR AND TRANSLUCENT GRAINS; ABUNDANT UNCONSOLIDATED GRAINS; CLASTS EASILY FRIABLE; SUBROUND TO SUBANGULAR; POOR SPHERICITY; VERY FINE TO FINE GRAIN SIZE WELL SORTED; CARBONACEOUS MATERIALS THROUGHOUT.

SHALE = LIGHT TO MEDIUM GRAY, BROWNISH GRAY; BRITTLE TO CRUNCHY; HACKLY, EARTHY FRACTURE; WEDGELIKE CUTTINGS HABIT; DULL EARTHY LUSTER; SILTY TEXTURE; THIN STRUCTURE.

SANDSTONE = WHITE WITH DARK LITHICS, LIGHT GRAY WITH DARK LITHICS, SOME WITH PALE GREEN HUES; ABUNDANT UNCONSOLIDATED GRAINS; CLASTS HARD TO FRIABLE; VERY FINE TO UPPER FINE GRAINS; WELL SORTED; SUB ANGULAR TO ANGULAR; POOR SPHERICITY; QUARTZ FRAMEWORK; GRAIN SUPPORTED; CALCITE CEMENT.

SILTSTONE = MEDIUM TO DARK GRAY, LIGHT GRAY, DARK BROWN, OCCASIONALLY WITH SLIGHTLY OLIVE HUES; FIRM TO MODERATELY HARD; CRUMBLY TO OCCASIONALLY MODERATELY TOUGH; DULL LUSTER WITH SCATTERED SPARKLES; GRITTY, ABRASIVE TEXTURE; MODERATELY CALCAREOUS; SCATTERED BLACK PINPOINT CARBONACEOUS MATERIAL; INTERBEDDED WITH SANDSTONE AND SHALE.

SHALE = MEDIUM TO DARK GRAY, BROWNISH BLACK, REDDISH GRAY, RARELY LIGHT GREENISH GRAY; FIRM TO OCCASIONALLY HARD; CRUMBLY TO OCCASIONALLY TOUGH; TABULAR, BLOCKY, OCCASIONALLY PLATY CUTTINGS HABIT; MATTE TO RARELY SLIGHTLY RESINOUS LUSTER; SMOOTH TO MODERATELY SILTY TEXTURE; NON TO OCCASIONALLY SLIGHTLY CALCAREOUS; SOME PIECES WITH ABUNDANT CARBONACEOUS MATERIAL.

WIPE HOLE @ 7983  
WF 800 @ 8000

ROP  
Avg WOB  
Depth of Cut

WF 700 @ 8260

WIPE HOLE 3  
STANDS @ 8273

SURVEY @ 8367  
WOB 18  
PB2560  
SPM 60  
RPM 62  
5/30/2009

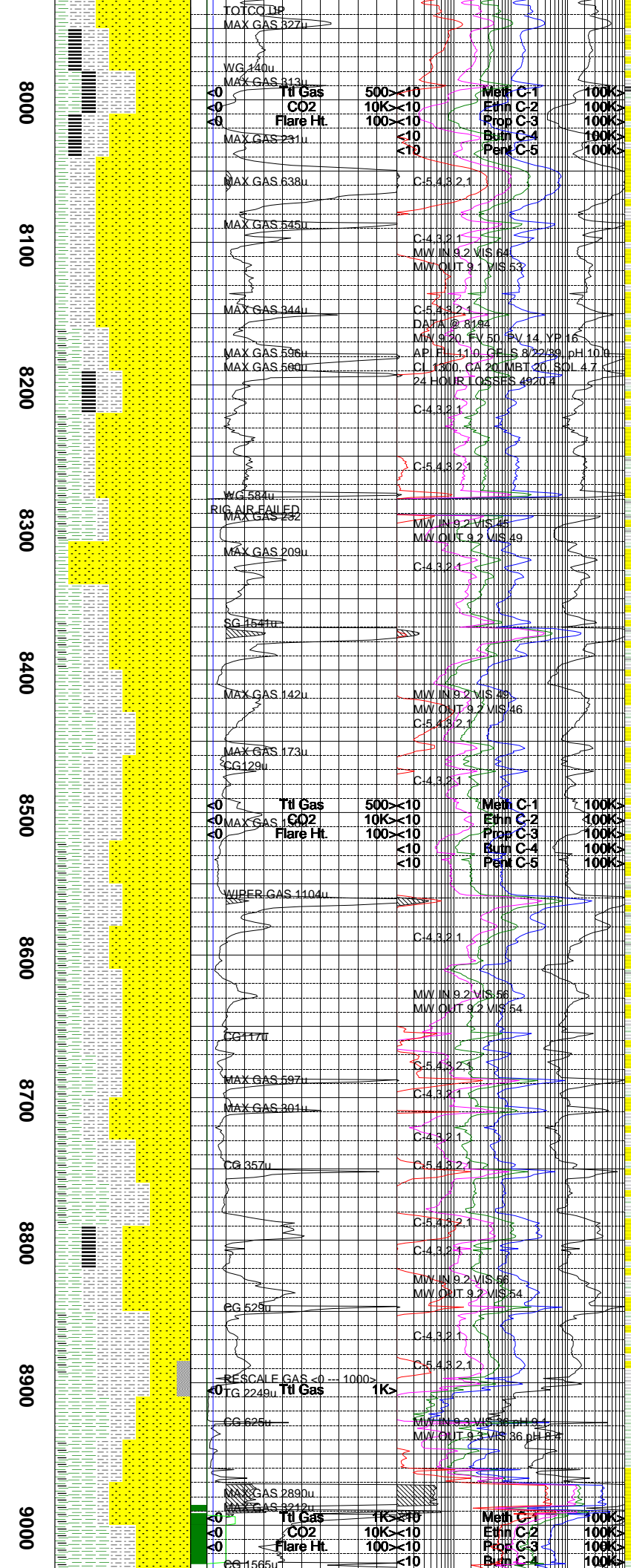
ROP  
Avg WOB  
Depth of Cut

SURVEY @ 8530

WF 500 @ 8690

NB #5 6.125" IN @ 8896  
HUGHES ITR 125BR  
JETS: 3X13  
S/N: 7123474  
FTG: 10' HRS: 2 25  
11/18/2009  
NB #6 6.125" IN @ 8908  
HUGHES QD406  
JETS: 3X13  
S/N: 7125167  
FTG: XXXX HRS: XXX X

ROP  
Avg WOB  
Depth of Cut



SANDSTONE = LIGHT GRAY, LIGHT GREENISH GRAY; COMMON "PEPPERED" APPEARANCE; EASILY FRIABLE TO OCCASIONALLY HARD; CLASTS RANGE FROM VERY FINE LOWER TO FINE LOWER, RARE MEDIUM LOWER GRAINS; ANGULAR TO SUBROUND; MODERATELY SORTED; DOMINANTLY QUARTZ; SCATTERED DARK GRAY LITHICS AND CARBONACEOUS MATTER; WHITE CLAY MATRIX; VARIABLE GRAIN/MATRIX SUPPORTED; LIGHTLY CALCITE CEMENTED; INTERBEDDED WITH SILTSTONE AND SHALE.

SHALE = LIGHT - MEDIUM GRAY, DARK BROWN, LIGHT BLuish GRAY, OCCASIONAL LIGHT GREENISH HUES; CRUMBLY TO BRITTLE TENACITY; IRREGULAR TO EARTHY FRACTURE; WEDGELIKE TO TABULAR, OCCASIONAL PLATY CUTTINGS HABIT; WAXY EARTHY LUSTER SOME SLIGHTLY SPARKLY; SILTY TEXTURE; THINLY INTERBEDDED WITH SILTSTONE AND SANDSTONE

SANDSTONE = LIGHT GRAY TO LIGHT GREENISH GRAY; COMMON "PEPPERED" APPEARANCE; EASILY FRIABLE TO OCCASIONALLY HARD; CLASTS RANGE FROM VERY FINE LOWER TO FINE LOWER; ANGULAR TO SUBROUND; MODERATELY SORTED; DOMINANTLY QUARTZ; SCATTERED LITHICS AND CARBONACEOUS MATTER; MOSTLY LOOSE GRAINS IN SAMPLE; WHITE CLAY MATRIX; LIGHT CALCITE CEMENT.

SHALE = LIGHT TO MEDIUM GRAY, BROWNISH BLACK, LIGHT BLuish GRAY, SOME WITH PURPLE; CRUMBLY TO CRUNCHY TENACITY; IRREGULAR TO HACKLY FRACTURE; PLATY TO WEDGELIKE CUTTINGS HABIT; EARTHY, SOME SLIGHTLY SPARKLY LUSTER; SMOOTH TO SILTY TEXTURE; TRACE COAL IN SAMPLE.

SANDSTONE = WHITE, SOME WITH PALE GREEN HUE, TRANSPARENT AND TRANSLUCENT; PREDOMINATELY UNCONSOLIDATED GRAINS; CLASTS EASILY FRIABLE; LOWER FINE TO LOWER MEDIUM GRAIN SIZE; WELL SORTED; SUBANGULAR TO ANGULAR; POOR SPHERICITY; CARBONACEOUS MATERIAL THROUGHOUT; SLIGHT CALCITE CEMENT; QUARTZ FRAMEWORK.

SANDSTONE = WHITE WITH DARK LITHICS, SOME WITH PALE GREEN HUE; ABUNDANT UNCONSOLIDATED GRAINS; CLASTS FIRM TO FRIABLE; SUBROUND TO SUBANGULAR; VERY FINE TO UPPER FINE GRAINS; WELL SORTED; QUARTZ FRAMEWORK, CALCITE CEMENT.

SHALE = LIGHT TO MEDIUM GRAY, DARK GRAY, LIGHT BLuish GRAY; BRITTLE TO CRUNCHY TENACITY; EARTHY TO HACKLY FRACTURE; TABULAR TO WEDGELIKE CUTTINGS HABIT; WAXY EARTHY LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE.

SILTSTONE = MEDIUM TO DARK GRAY, LIGHT GRAY, DARK BROWN, FIRM TO MODERATELY HARD; CRUMBLY TO COMMONLY MODERATELY TOUGH; DULL LUSTER WITH SCATTERED SPARKLES; GRITTY, ABRASIVE TEXTURE; MODERATELY CALCAREOUS; SCATTERED BLACK PINPOINT CARBONACEOUS MATERIAL; INTERBEDDED WITH SANDSTONE AND SHALE.

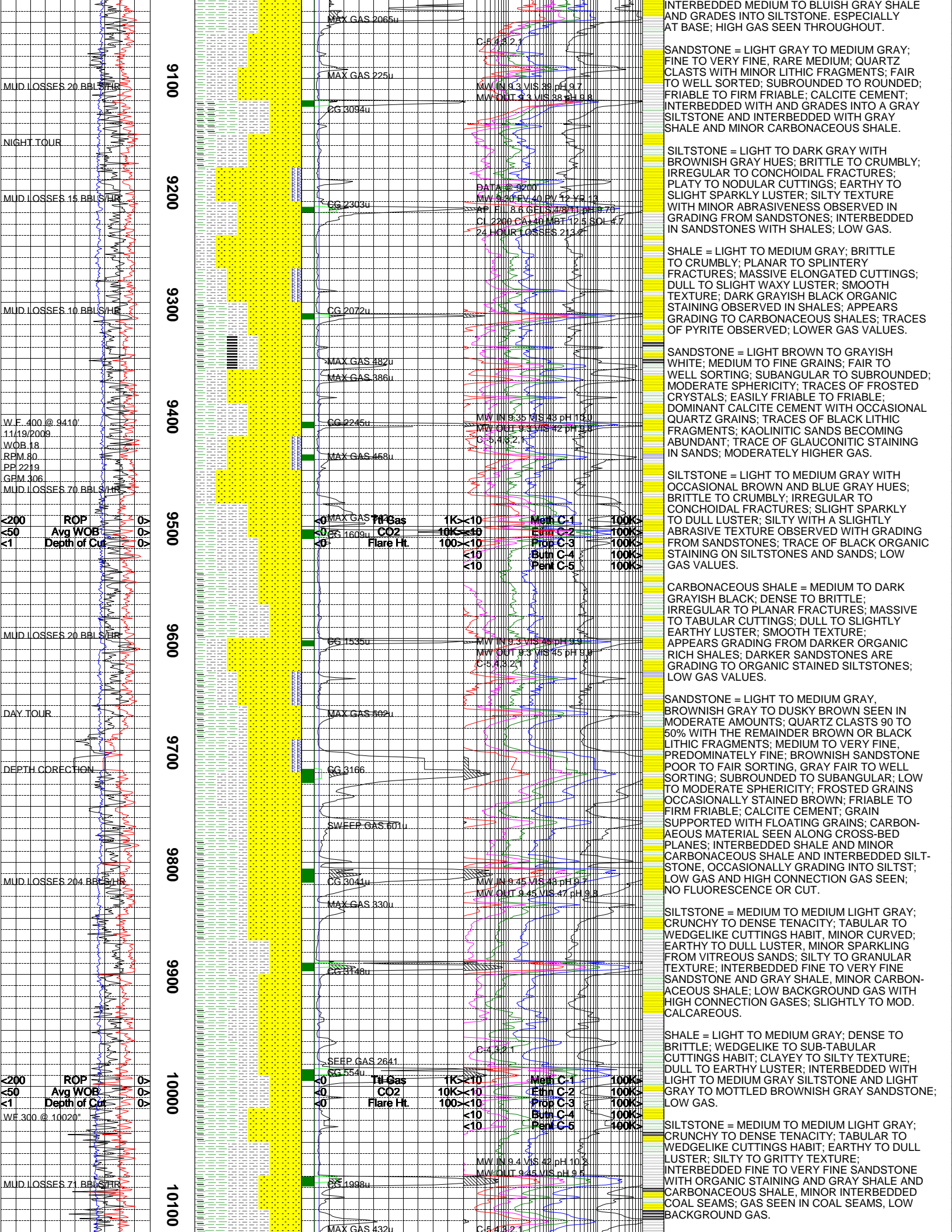
SANDSTONE = LIGHT GRAY WITH OCCASIONAL VERY LIGHT GREENISH GRAY HUES, COMMON PEPPERED APPEARANCE; EASILY FRIABLE TO FIRM; CLASTS RANGE FROM VERY FINE LOWER TO FINE LOWER; ANGULAR TO SUBROUND; MODERATELY SORTED; QUARTZ RICH WITH SCATTERED LITHICS; WHITE CLAY MATRIX; VARIABLE MATRIX/GRAIN SUPPORTED; LIGHT CALCITE CEMENT; INTERBEDDED WITH SILTSTONE AND SHALE.

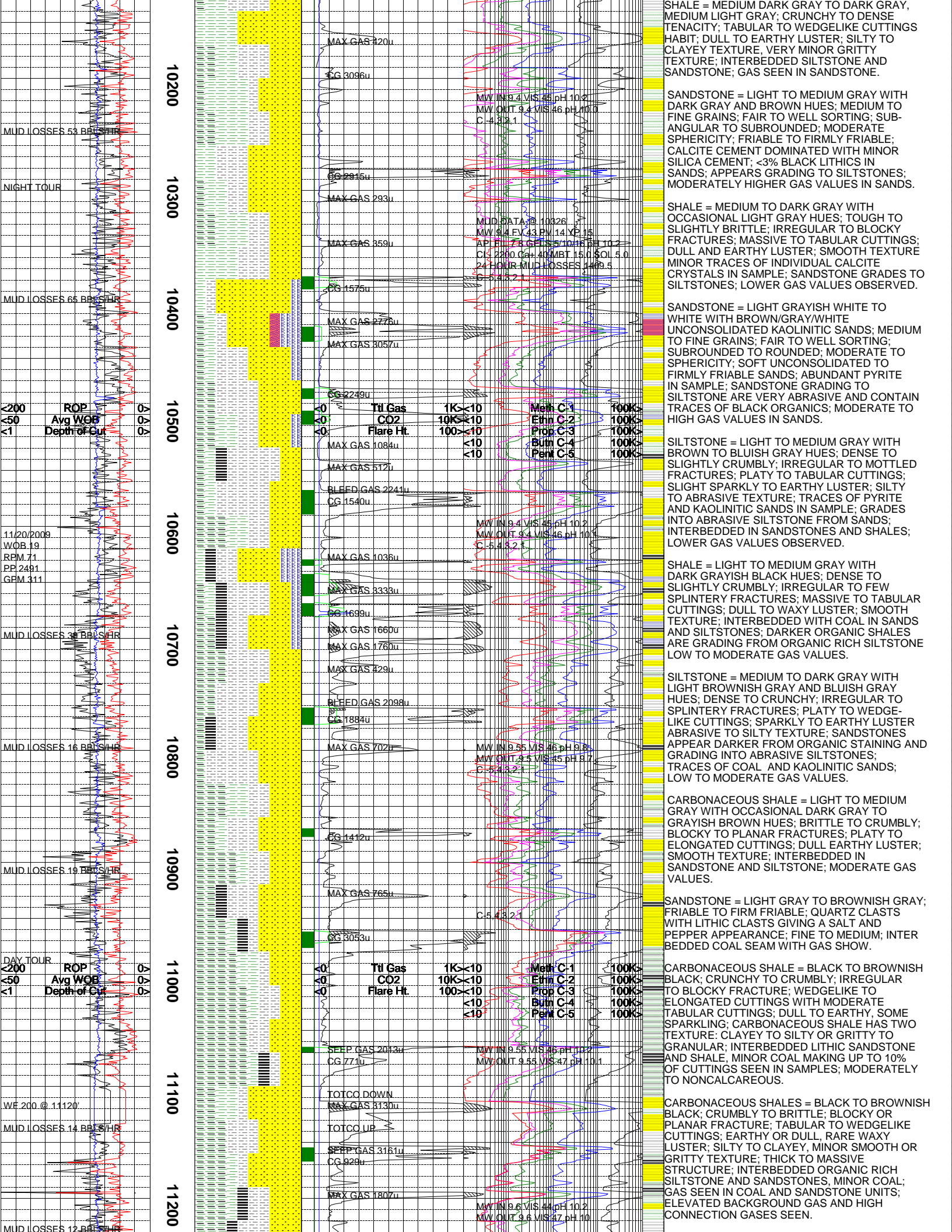
SHALE = LIGHT TO DARK GRAY, MODERATE TO DARK BROWNISH GRAY, LIGHT GREENISH GRAY; FIRM TO OCCASIONALLY MODERATELY HARD; CRUMBLY TO OCCASIONALLY MODERATELY TOUGH; BLOCKY, TABULAR AND PLATY CUTTINGS HABIT; MATTE LUSTER; SMOOTH TO LOCALLY SILTY TEXTURE; SLIGHTLY TO MODERATELY CALCAREOUS.

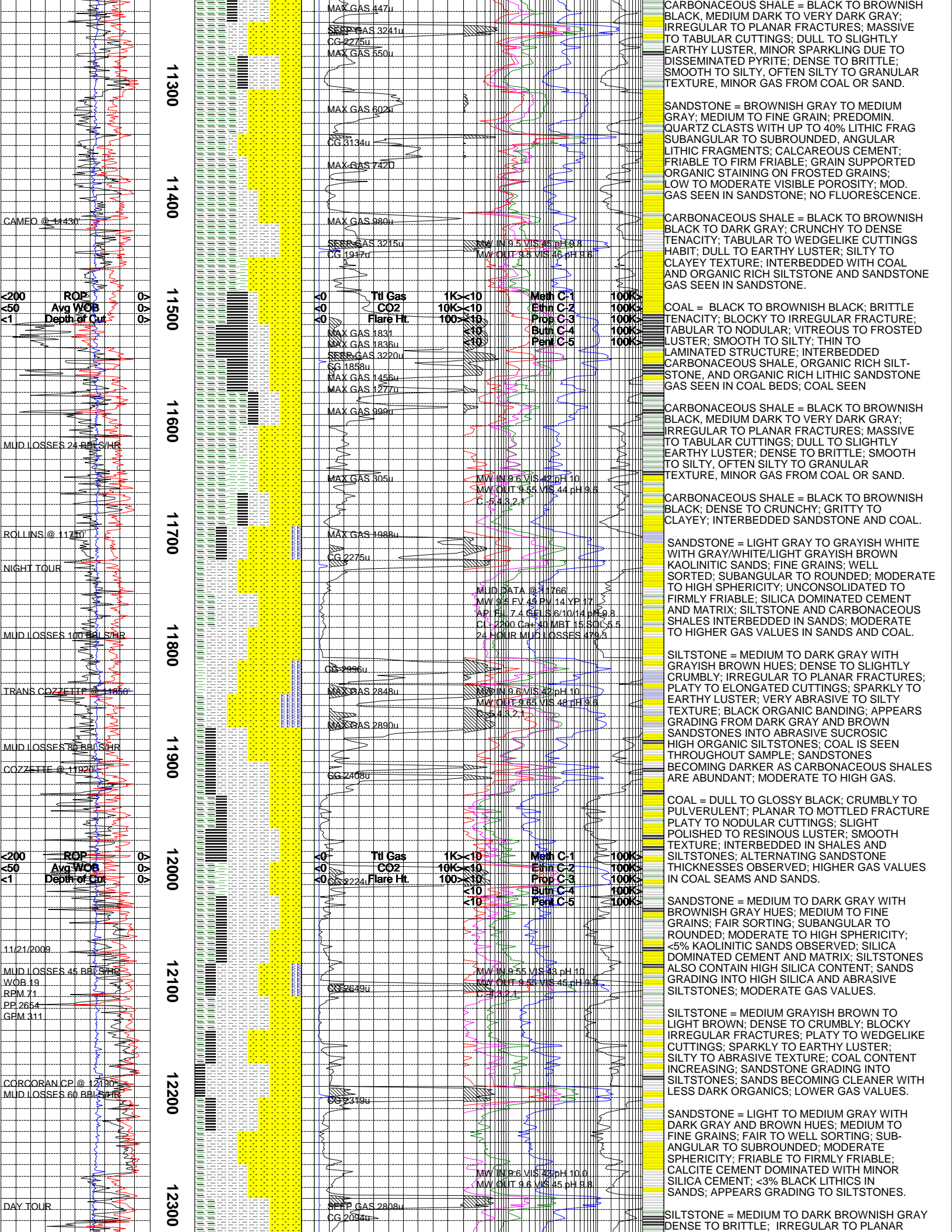
TD INTERMEDIATE AT 8896'. CASING @ 8881'

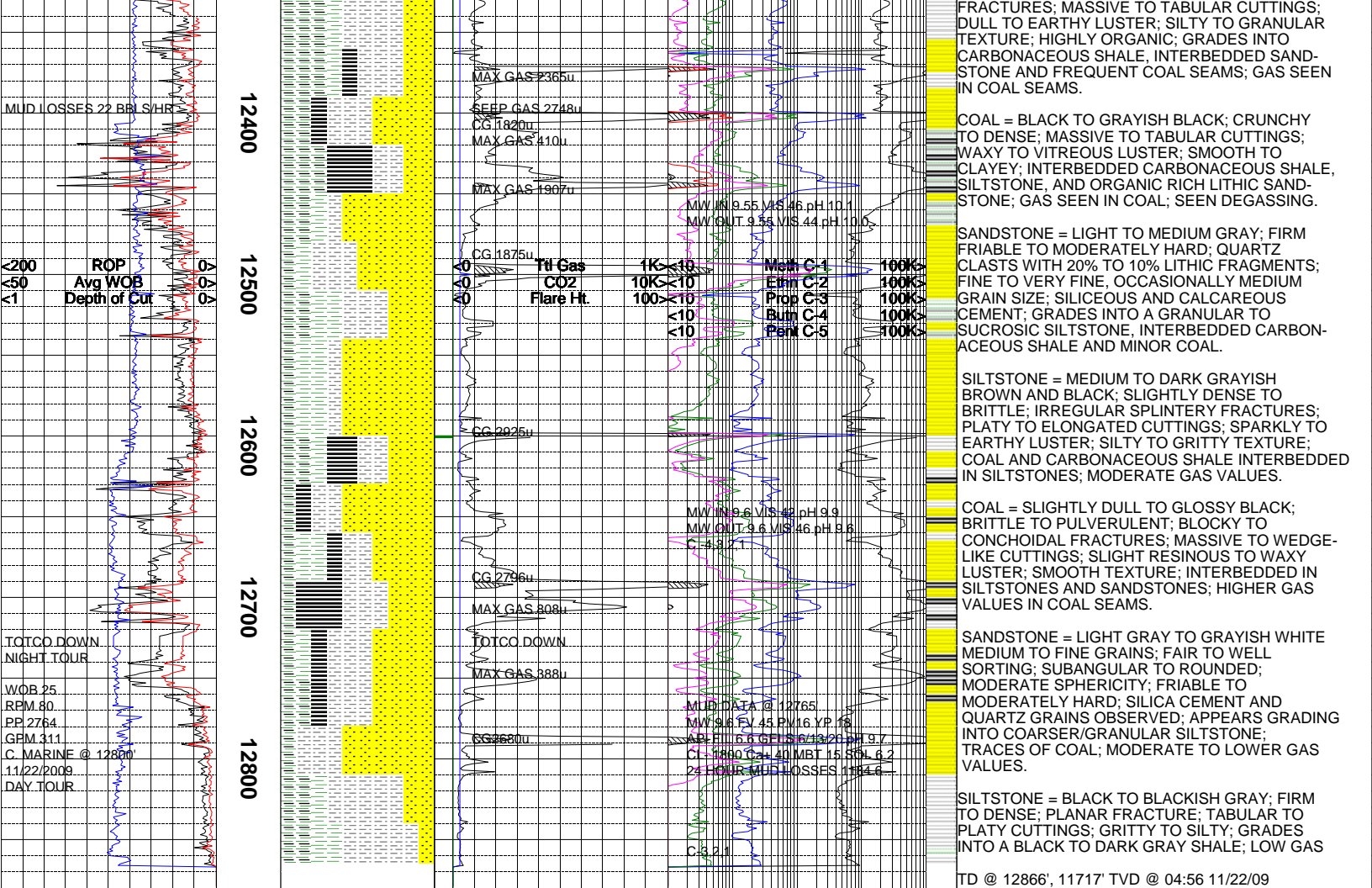
SHALE = LIGHT TO MEDIUM GRAY; DENSE TO BRITTLE; WEDGELIKE TO SUB-TABULAR CUTTINGS HABIT; CLAYEY TO SILTY TEXTURE; DULL TO EARTHY LUSTER; INTERBEDDED WITH LIGHT TO MEDIUM GRAY SILTSTONE THAT GRADES INTO A LIGHT GRAY TO MOTTLED BROWNISH GRAY SANDSTONE; LOW GAS.

SANDSTONE = LIGHT TO MEDIUM GRAY, WITH SALT AND PEPPER APPEARANCE WITH BLACK AND REDDISH BROWN LITHIC FRAGMENTS; 90 TO 60% QUARTZ CLASTS WITH THE REMAINDER LITHIC FRAGMENTS; FINE TO MEDIUM GRAINED FAIR TO POOR SORTING; MODERATE SPHERICIT









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