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(281) 784-5500
Bakersfield, CA
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(907) 561-2465

Drilling Dynamics MD

COMPANY	EXXONMOBIL
WELL	FRU197-33A2
FIELD	FREEDOM RANCH UNIT
REGION	ROCKIES
COORDINATES	39.915658 108.285631
ELEVATION	6390'
COUNTY, STATE	RIO BLANCO, CO
API INDEX	05-103-11098-00
SPUD DATE	2/1/2009
CONTRACTOR	HELMRICH AND PAYNE
CO. REP.	KEVIN GARDNER
RIG/TYPE	239 / Flex 3
LOGGING UNIT	MLU 033
GEOLOGISTS	LAYNE GOOD NICK BAUER
ADD. PERSONS	JASON REISENBICHLER
CO. GEOLOGIST	MELISSA SAURBORN

LOG INTERVAL

DEPTHS: 4000' **TO** 12297'
DATES: 6/26/2009 **TO** 7/10/2009
SCALE: 1" = 100'

CASING DATA

16" **AT** 130'
10.75" **AT** 3956'
7" **AT** 8536'

AT

HOLE SIZE

14.75" **TO** 3983'
9.875" **TO** 8555'
6.125" **TO** 12297'
TO

MUD TYPES

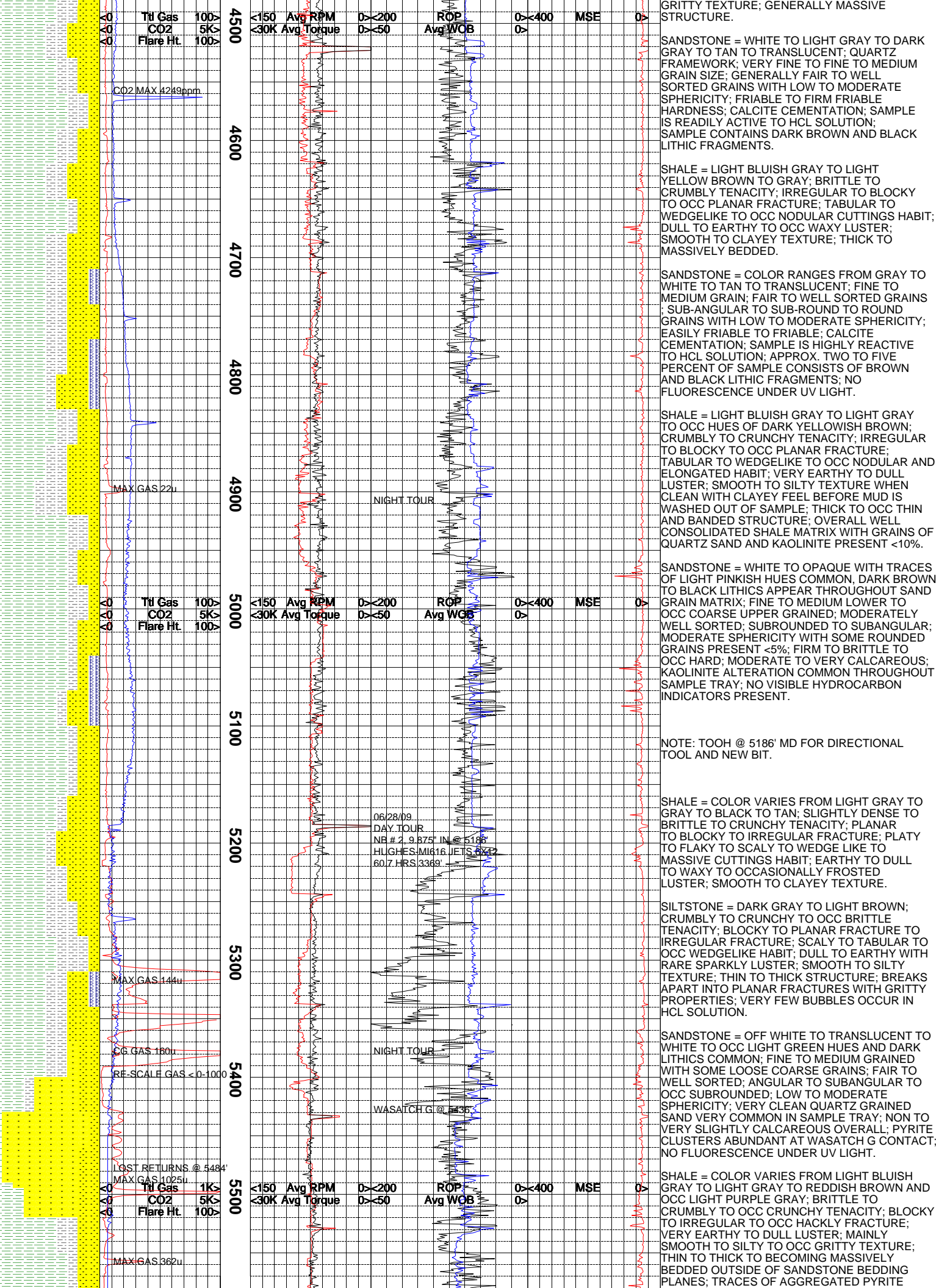
SPUD MUD **TO** 3983'
LSND **TO** 12297'
TO
TO

ABBREVIATIONS

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

ALTERED ZONE	CHERT - GLASSY	FELSIC SILIC DIKE	MARL - CALC	SANDSTONE
ANDESITE	CHERT - PORCEL	FOSSIL	METAMORPHICS	SANDSTONE-TUFFACEOUS
ANHYDRITE	CHERT - TIGER STRIPE	GABBRO	MUDSTONE	SERICITIZATION
BASALT	CHERT - UNDIFF	GLASSY TUFF	OBSIDIAN	SERPENTINE
BENTONITE	CLAY	GRANITE	PALEOSOL	SHALE
BIOTITIZATION	CLAY-MUDSTONE	GRANITE WASH	PHOSPHATE	SHALE TUFFACEOUS
BRECCIA	CLYST-TUFFACEOUS	GRANODIORITE	PORCELANITE	SHELL FRAGMENTS
CALCARENITE	CHLORITIZATION	GYPSUM	PORCELANEOUS CLYST	SIDERITE
CALCAREOUS TUFF	COAL	HALITE	PYRITE	SILICIFICATION
CALCILUTITE	CONGLOMERATE	HORNBL-QTZ-DIO	PYROCLASTICS	SILTSTONE
CARBONATES	CONGL. SAND	IGNEOUS (ACIDIC)	QUARTZ DIORITE	SILTST-TUFFACEOUS
CARBONACEOUS MAT	CONGL. SANDSTONE	IGNEOUS (BASIC)	QUARTZ LATITE	TUFF
CARBONACEOUS SH	COQUINA	INTRUSIVES	QUARTZ MONZONITE	VOLCANICLASTICS SEDS
CEMENT CONTAM.	DACITE	KAOLINITIC	RECRYSTALLIZED CALCITE	VOLCANICS
CHALK	DIATOMITE	LIMESTONE	RHYOLITE	
CRYSTALLINE TUFF	DIORITE	LITHIC TUFF	SALT	
CHERT - ARGILL	DOLOSTONE	MARL - DOLO	SAND	

Lithology	Ttl Gas 4K<			Depth	Avg RPM 0<200			ROP			MSE 0>			MGS	Remarks Survey Data, Mud Reports, Other Info.
	CO2 8K<							ft/hr			psi				
	Flare Ht. 100>				30K Avg Torque 0>50			Avg WOB 0>							
	ft				FTLBS			klbs							
															ARE DESCRIBED WET AND LISTED IN ORDER OF MOST ABUNDANT TO LEAST ABUNDANT WITH RESPECT TO PERCENTAGE IN SAMPLE. DEPTH IS REFERENCED TO RKB.
															CONNECTION GASES AS WELL AS TRIP GASES AND DOWNTIME GASES ARE NOTED ON THE LOG LARGE CONNECTION GASES WHICH APPEAR ON THE MUDLOG USUALLY REFLECT UPHOLE GAS INTERVALS BLEEDING INTO THE BORE HOLE DURING CONNECTIONS.
															GAS CHROMATOGRAPHY EQUIPMENT IS CALIBRATED TO A TEST GAS COMPOSED OF: METHANE = 10000PPM ETHANE = 1000PPM PROPANE = 1000PPM I-BUTANE = 1000PPM N-BUTANE = 1000PPM I-PENTANE = 1000PPM N-PENTANE = 1000PPM
															WHEN THE MUD IS RUN THROUGH THE MGS (MUD GAS SEPERATOR) THE INTERVAL IS MARKED ON THE LOG IN THE SLIDE COLUMN AND NOTED ON THE LOG.
															ALL SANDSTONE INTERVALS ARE EXAMINED FOR SAMPLE FLUORESCENCE IN THE UV SCOPE FOR HYDROCARBON FLUOREESCENCE AND MINOR FLUORESCENCE FROM POSSIBLE FRACTURE FILL. ALL FLUORESCENCE IS NOTED ON THE MUDLOG.
															10.75" SURFACE CASING WAS SET AT 3956'
															CANRIG DRILLING TECHNOLOGY LTD. COMMENCED FULL LOGGING SERVICES ON 06/26/2009.
															SHALE = LIGHT BLUISH GRAY TO LIGHT YELLOW BROWN TO GRAY; BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO BLOCKY TO OCC PLANAR FRACTURE; TABULAR TO WEDGELIKE TO OCC NODULAR CUTTINGS HABIT; DULL TO EARTHY TO OCC WAXY LUSTER; SMOOTH TO CLAYEY TEXTURE; THICK TO MASSIVELY BEDDED; TRACES OF PYRITE NODULES FOUND IN SAMPLE TRAY; COMMON CLAYLIKE MUD PROPERTIES; OVERALL NON CALCAREOUS.
															SHALE = COLOR VARIES FROM GRAY TO YELLOWISH BROWN TO BROWN; CRUMBLY TO CRUNCHY TO BRITTLE TENACITY; IRREGULAR TO PLANAR FRACTURE; MASSIVE TO FLAKY TO WEDGE LIKE CUTTINGS HABIT; DULL TO EARTHY TO WAXY LUSTER; SMOOTH TO SLIGHTLY CLAYEY TEXTURE; MASSIVE STRUCTURE.
															SANDSTONE = COLOR RANGES FROM GRAY TO WHITE TO TAN TO TRANSLUCENT; FINE TO MEDIUM GRAIN; FAIR TO WELL SORTED GRAINS ; SUB-ANGULAR TO SUB-ROUND TO ROUND GRAINS WITH LOW TO MODERATE SPHERICITY; EASILY FRIABLE TO FRIABLE; CALCITE CEMENTATION; SAMPLE IS HIGHLY REACTIVE TO HCL SOLUTION; APPROX. TWO TO FIVE PERCENT OF SAMPLE CONSISTS OF DARK BROWN AND BLACK LITHIC FRAGMENTS; NO FLUORESCENCE UNDER UV LIGHT.
															SILTSTONE = LIGHT GRAY TO GRAY TO BLUISH GRAY; BRITTLE TO CRUMBLY TO CRUNCHY TENACITY; GENERALLY IRREGULAR FRACTURE; MASSIVE CUTTINGS HABIT; WAXY TO DULL TO EARTHY LUSTER; SILTY TO GRITTY TEXTURE; MASSIVE STRUCTURE.
															SHALE = YELLOWISH BROWN TO BROWN TO LIGHT GRAY; SAMPLE HAS BRITTLE TO CRUNCHY TO CRUMBLY TENACITY; PLANAR TO IRREGULAR FRACTURE; CUTTINGS ARE GENERALLY MASSIVE TO PLATY TO FLAKY TO WEDGE LIKE; OVERALL DULL TO EARTHY LUSTER; SMOOTH TO CLAYEY TEXTURE; MASSIVE STRUCTURE.
															SHALE = COLOR VARIES FROM LIGHT GRAY TO GRAY TO BLACK TO TAN; SLIGHTLY DENSE TO BRITTLE TO CRUNCHY TENACITY; PLANAR TO BLOCKY TO IRREGULAR FRACTURE; PLATY TO FLAKY TO SCALY TO WEDGE LIKE TO MASSIVE CUTTINGS HABIT; EARTHY TO DULL TO WAXY TO OCCASIONALLY FROSTED LUSTER; SMOOTH TO CLAYEY TO SLIGHTLY



GRITTY TEXTURE; GENERALLY MASSIVE STRUCTURE.

SANDSTONE = WHITE TO LIGHT GRAY TO DARK GRAY TO TAN TO TRANSLUCENT; QUARTZ FRAMEWORK; VERY FINE TO FINE TO MEDIUM GRAIN SIZE; GENERALLY FAIR TO WELL SORTED GRAINS WITH LOW TO MODERATE SPHERICITY; FRIABLE TO FIRM FRIABLE HARDNESS; CALCITE CEMENTATION; SAMPLE IS READILY ACTIVE TO HCL SOLUTION; SAMPLE CONTAINS DARK BROWN AND BLACK LITHIC FRAGMENTS.

SHALE = LIGHT BLuish GRAY TO LIGHT YELLOW BROWN TO GRAY; BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO BLOCKY TO OCC PLANAR FRACTURE; TABULAR TO WEDGELIKE TO OCC NODULAR CUTTINGS HABIT; DULL TO EARTHY TO OCC WAXY LUSTER; SMOOTH TO CLAYEY TEXTURE; THICK TO MASSIVELY BEDDED.

SANDSTONE = COLOR RANGES FROM GRAY TO WHITE TO TAN TO TRANSLUCENT; FINE TO MEDIUM GRAIN; FAIR TO WELL SORTED GRAINS; SUB-ANGULAR TO SUB-ROUND TO ROUND GRAINS WITH LOW TO MODERATE SPHERICITY; EASILY FRIABLE TO FRIABLE; CALCITE CEMENTATION; SAMPLE IS HIGHLY REACTIVE TO HCL SOLUTION; APPROX. TWO TO FIVE PERCENT OF SAMPLE CONSISTS OF BROWN AND BLACK LITHIC FRAGMENTS; NO FLUORESCENCE UNDER UV LIGHT.

SHALE = LIGHT BLuish GRAY TO LIGHT GRAY TO OCC HUES OF DARK YELLOWISH BROWN; CRUMBLY TO CRUNCHY TENACITY; IRREGULAR TO BLOCKY TO OCC PLANAR FRACTURE; TABULAR TO WEDGELIKE TO OCC NODULAR AND ELONGATED HABIT; VERY EARTHY TO DULL LUSTER; SMOOTH TO SILTY TEXTURE WHEN CLEAN WITH CLAYEY FEEL BEFORE MUD IS WASHED OUT OF SAMPLE; THICK TO OCC THIN AND BANDED STRUCTURE; OVERALL WELL CONSOLIDATED SHALE MATRIX WITH GRAINS OF QUARTZ SAND AND KAOLINITE PRESENT <10%.

SANDSTONE = WHITE TO OPAQUE WITH TRACES OF LIGHT PINKISH HUES COMMON, DARK BROWN TO BLACK LITHICS APPEAR THROUGHOUT SAND GRAIN MATRIX; FINE TO MEDIUM LOWER TO OCC COARSE UPPER GRAINED; MODERATELY WELL SORTED; SUBROUNDED TO SUBANGULAR; MODERATE SPHERICITY WITH SOME ROUNDED GRAINS PRESENT <5%; FIRM TO BRITTLE TO OCC HARD; MODERATE TO VERY CALCAREOUS; KAOLINITE ALTERATION COMMON THROUGHOUT SAMPLE TRAY; NO VISIBLE HYDROCARBON INDICATORS PRESENT.

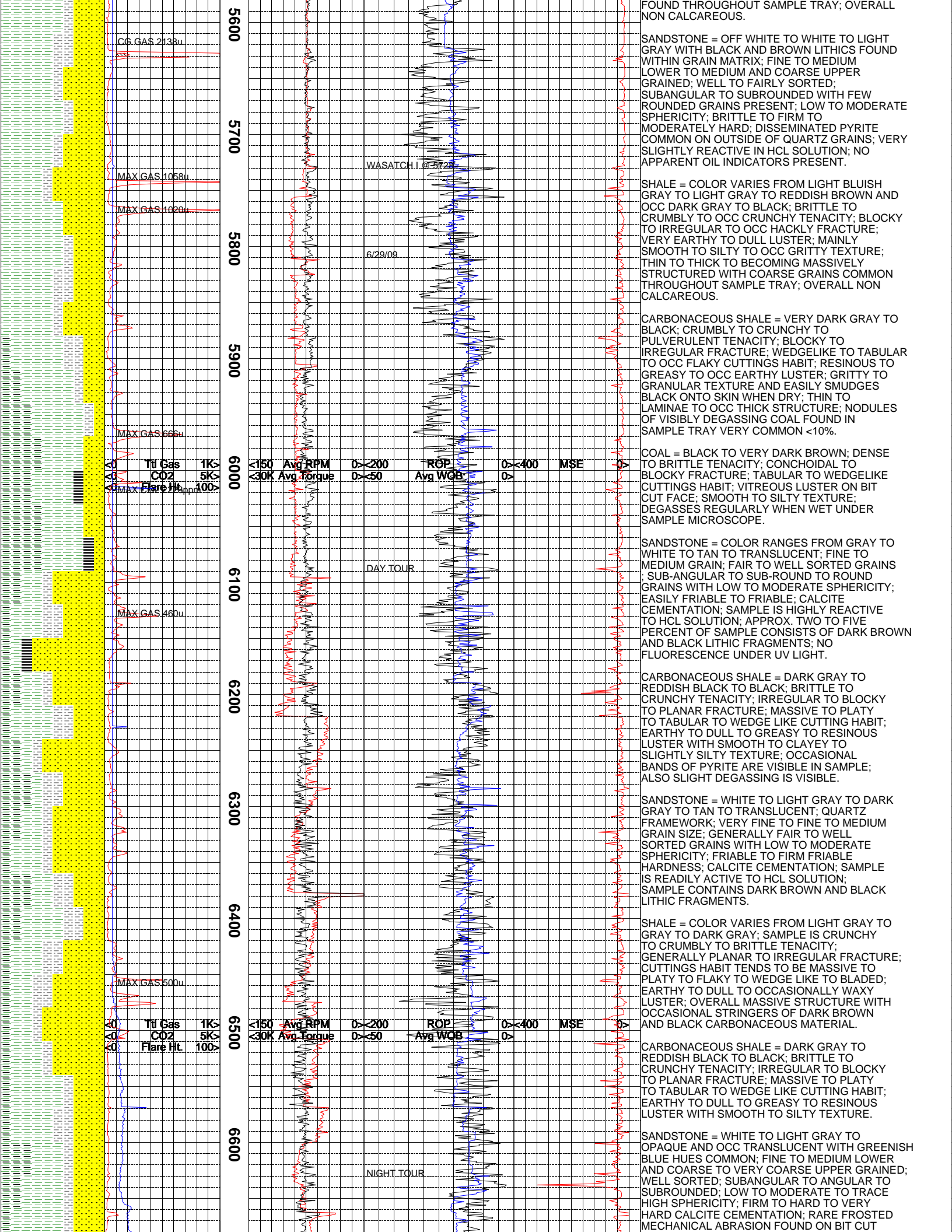
NOTE: TOOH @ 5186' MD FOR DIRECTIONAL TOOL AND NEW BIT.

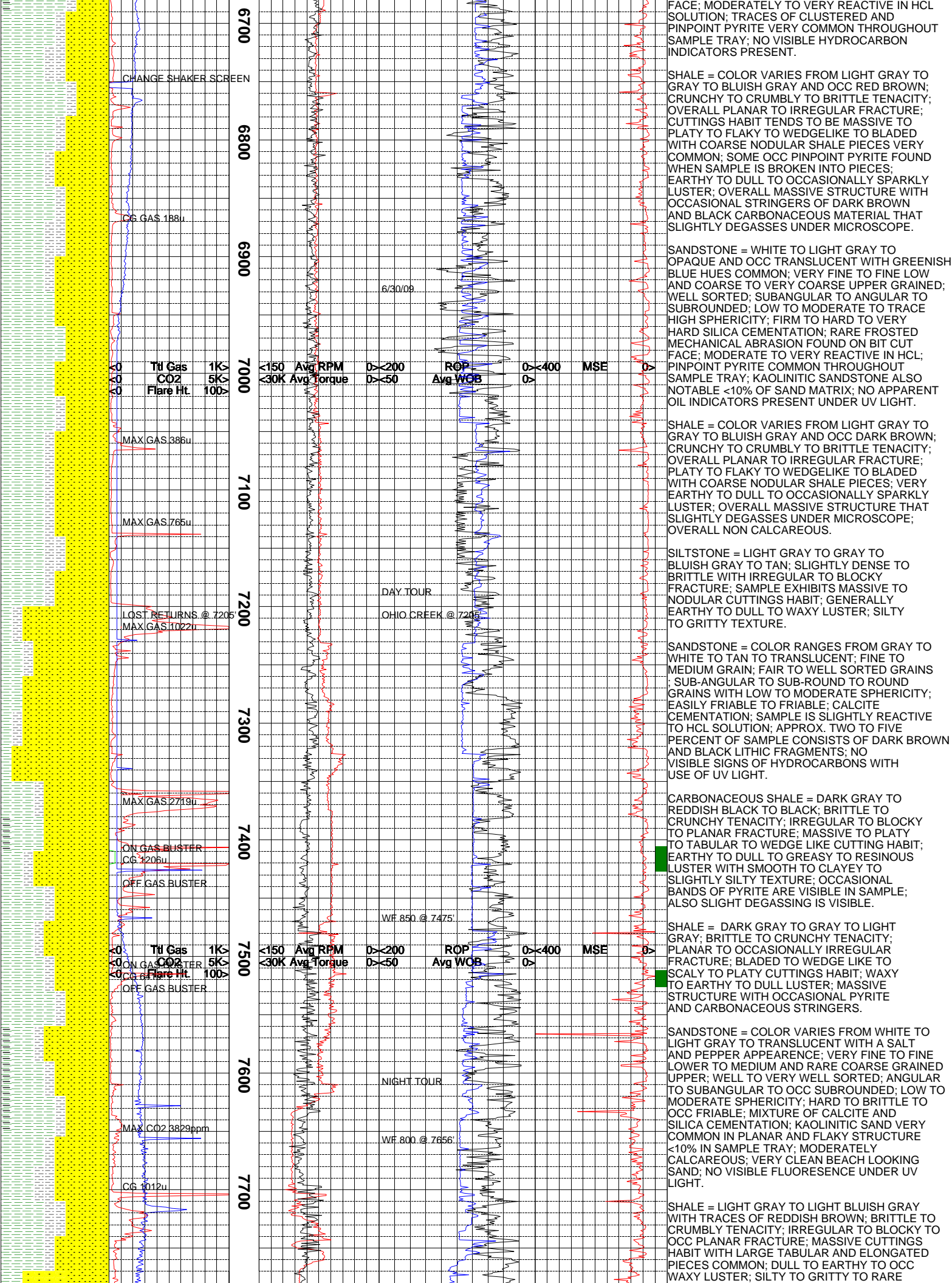
SHALE = COLOR VARIES FROM LIGHT GRAY TO GRAY TO BLACK TO TAN; SLIGHTLY DENSE TO BRITTLE TO CRUNCHY TENACITY; PLANAR TO BLOCKY TO IRREGULAR FRACTURE; PLATY TO FLAKY TO SCALY TO WEDGE LIKE TO MASSIVE CUTTINGS HABIT; EARTHY TO DULL TO WAXY TO OCCASIONALLY FROSTED LUSTER; SMOOTH TO CLAYEY TEXTURE.

SILTSTONE = DARK GRAY TO LIGHT BROWN; CRUMBLY TO CRUNCHY TO OCC BRITTLE TENACITY; BLOCKY TO PLANAR FRACTURE TO IRREGULAR FRACTURE; SCALY TO TABULAR TO OCC WEDGELIKE HABIT; DULL TO EARTHY WITH RARE SPARKLY LUSTER; SMOOTH TO SILTY TEXTURE; THIN TO THICK STRUCTURE; BREAKS APART INTO PLANAR FRACTURES WITH GRITTY PROPERTIES; VERY FEW BUBBLES OCCUR IN HCL SOLUTION.

SANDSTONE = OFF WHITE TO TRANSLUCENT TO WHITE TO OCC LIGHT GREEN HUES AND DARK LITHICS COMMON; FINE TO MEDIUM GRAINED WITH SOME LOOSE COARSE GRAINS; FAIR TO WELL SORTED; ANGULAR TO SUBANGULAR TO OCC SUBROUNDED; LOW TO MODERATE SPHERICITY; VERY CLEAN QUARTZ GRAINED SAND VERY COMMON IN SAMPLE TRAY; NON TO VERY SLIGHTLY CALCAREOUS OVERALL; PYRITE CLUSTERS ABUNDANT AT WASATCH G CONTACT; NO FLUORESCENCE UNDER UV LIGHT.

SHALE = COLOR VARIES FROM LIGHT BLuish GRAY TO LIGHT GRAY TO REDDISH BROWN AND OCC LIGHT PURPLE GRAY; BRITTLE TO CRUMBLY TO OCC CRUNCHY TENACITY; BLOCKY TO IRREGULAR TO OCC HACKLY FRACTURE; VERY EARTHY TO DULL LUSTER; MAINLY SMOOTH TO SILTY TO OCC GRITTY TEXTURE; THIN TO THICK TO BECOMING MASSIVELY BEDDED OUTSIDE OF SANDSTONE BEDDING PLANES; TRACES OF AGGREGATED PYRITE





CHANGE SHAKER SCREEN

CG GAS 188u

MAX GAS 386u

MAX GAS 765u

LOST RETURNS @ 7205
MAX GAS 1022u

MAX GAS 2719u

ION GAS BUSTER
CG 1206u

OFF GAS BUSTER

ION GAS BUSTER
CG 1206u
OFF GAS BUSTER

MAX CO2 3829ppm

CG 1012u

6700
6800
6900
7000
7100
7200
7300
7400
7500
7600
7700

≤ 150	Avg RPM	$0 \leq 200$	ROP	$0 \leq 400$	MSE	$0 \leq$
$\leq 30K$	Avg Torque	$0 \leq 50$	Avg WOB	$0 \leq$		

6/30/09

DAY TOUR
OHIO CREEK @ 7205

WF 850 @ 7475

NIGHT TOUR

WF 800 @ 7656

FACE; MODERATELY TO VERY REACTIVE IN HCL SOLUTION; TRACES OF CLUSTERED AND PINPOINT PYRITE VERY COMMON THROUGHOUT SAMPLE TRAY; NO VISIBLE HYDROCARBON INDICATORS PRESENT.

SHALE = COLOR VARIES FROM LIGHT GRAY TO GRAY TO BLuish GRAY AND OCC RED BROWN; CRUNCHY TO CRUMBLY TO BRITTLE TENACITY; OVERALL PLANAR TO IRREGULAR FRACTURE; CUTTINGS HABIT TENDS TO BE MASSIVE TO PLATY TO FLAKY TO WEDGELIKE TO BLADED WITH COARSE NODULAR SHALE PIECES VERY COMMON; SOME OCC PINPOINT PYRITE FOUND WHEN SAMPLE IS BROKEN INTO PIECES; EARTHY TO DULL TO OCCASIONALLY SPARKLY LUSTER; OVERALL MASSIVE STRUCTURE WITH OCCASIONAL STRINGERS OF DARK BROWN AND BLACK CARBONACEOUS MATERIAL THAT SLIGHTLY DEGASSES UNDER MICROSCOPE.

SANDSTONE = WHITE TO LIGHT GRAY TO OPAQUE AND OCC TRANSLUCENT WITH GREENISH BLUE HUES COMMON; VERY FINE TO FINE LOW AND COARSE TO VERY COARSE UPPER GRAINED; WELL SORTED; SUBANGULAR TO ANGULAR TO SUBROUNDED; LOW TO MODERATE TO TRACE HIGH SPHERICITY; FIRM TO HARD TO VERY HARD SILICA CEMENTATION; RARE FROSTED MECHANICAL ABRASION FOUND ON BIT CUT FACE; MODERATE TO VERY REACTIVE IN HCL; PINPOINT PYRITE COMMON THROUGHOUT SAMPLE TRAY; KAOLINITIC SANDSTONE ALSO NOTABLE <10% OF SAND MATRIX; NO APPARENT OIL INDICATORS PRESENT UNDER UV LIGHT.

SHALE = COLOR VARIES FROM LIGHT GRAY TO GRAY TO BLuish GRAY AND OCC DARK BROWN; CRUNCHY TO CRUMBLY TO BRITTLE TENACITY; OVERALL PLANAR TO IRREGULAR FRACTURE; PLATY TO FLAKY TO WEDGELIKE TO BLADED WITH COARSE NODULAR SHALE PIECES; VERY EARTHY TO DULL TO OCCASIONALLY SPARKLY LUSTER; OVERALL MASSIVE STRUCTURE THAT SLIGHTLY DEGASSES UNDER MICROSCOPE; OVERALL NON CALCAREOUS.

SILTSTONE = LIGHT GRAY TO GRAY TO BLuish GRAY TO TAN; SLIGHTLY DENSE TO BRITTLE WITH IRREGULAR TO BLOCKY FRACTURE; SAMPLE EXHIBITS MASSIVE TO NODULAR CUTTINGS HABIT; GENERALLY EARTHY TO DULL TO WAXY LUSTER; SILTY TO GRITTY TEXTURE.

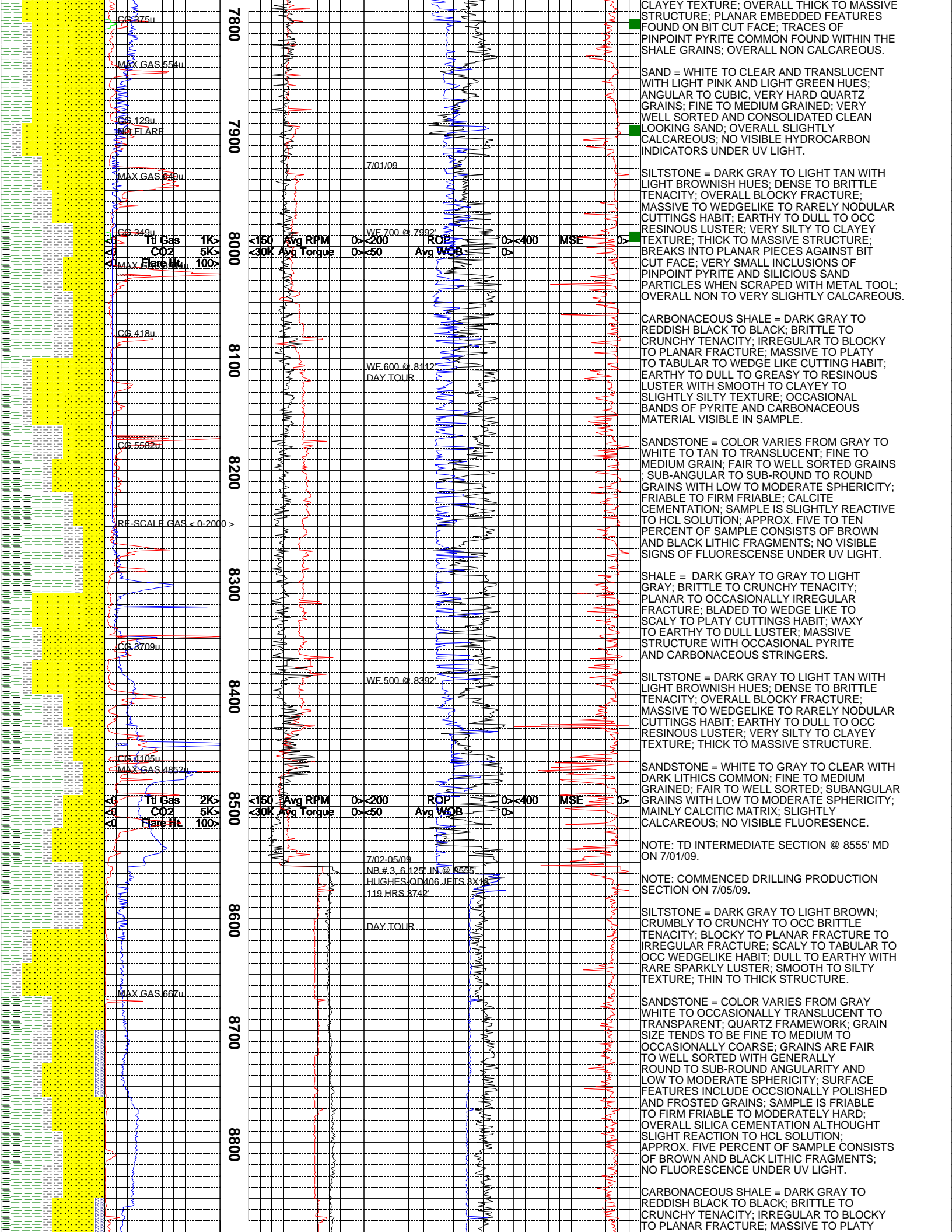
SANDSTONE = COLOR RANGES FROM GRAY TO WHITE TO TAN TO TRANSLUCENT; FINE TO MEDIUM GRAIN; FAIR TO WELL SORTED GRAINS ; SUB-ANGULAR TO SUB-ROUND TO ROUND GRAINS WITH LOW TO MODERATE SPHERICITY; EASILY FRIABLE TO FRIABLE; CALCITE CEMENTATION; SAMPLE IS SLIGHTLY REACTIVE TO HCL SOLUTION; APPROX. TWO TO FIVE PERCENT OF SAMPLE CONSISTS OF DARK BROWN AND BLACK LITHIC FRAGMENTS; NO VISIBLE SIGNS OF HYDROCARBONS WITH USE OF UV LIGHT.

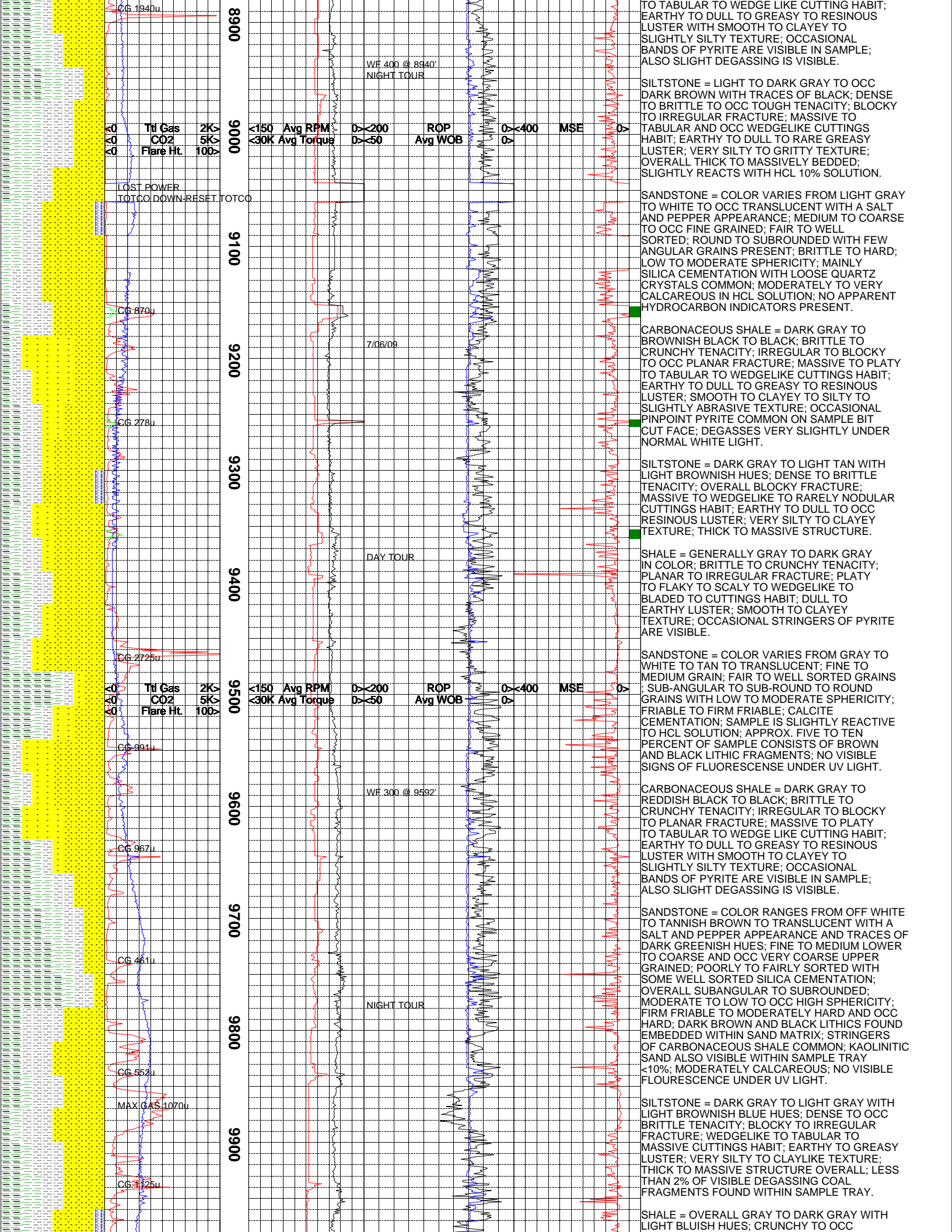
CARBONACEOUS SHALE = DARK GRAY TO REDDISH BLACK TO BLACK; BRITTLE TO CRUNCHY TENACITY; IRREGULAR TO BLOCKY TO PLANAR FRACTURE; MASSIVE TO PLATY TO TABULAR TO WEDGE LIKE CUTTING HABIT; EARTHY TO DULL TO GREASY TO RESINOUS LUSTER WITH SMOOTH TO CLAYEY TO SLIGHTLY SILTY TEXTURE; OCCASIONAL BANDS OF PYRITE ARE VISIBLE IN SAMPLE; ALSO SLIGHT DEGASSING IS VISIBLE.

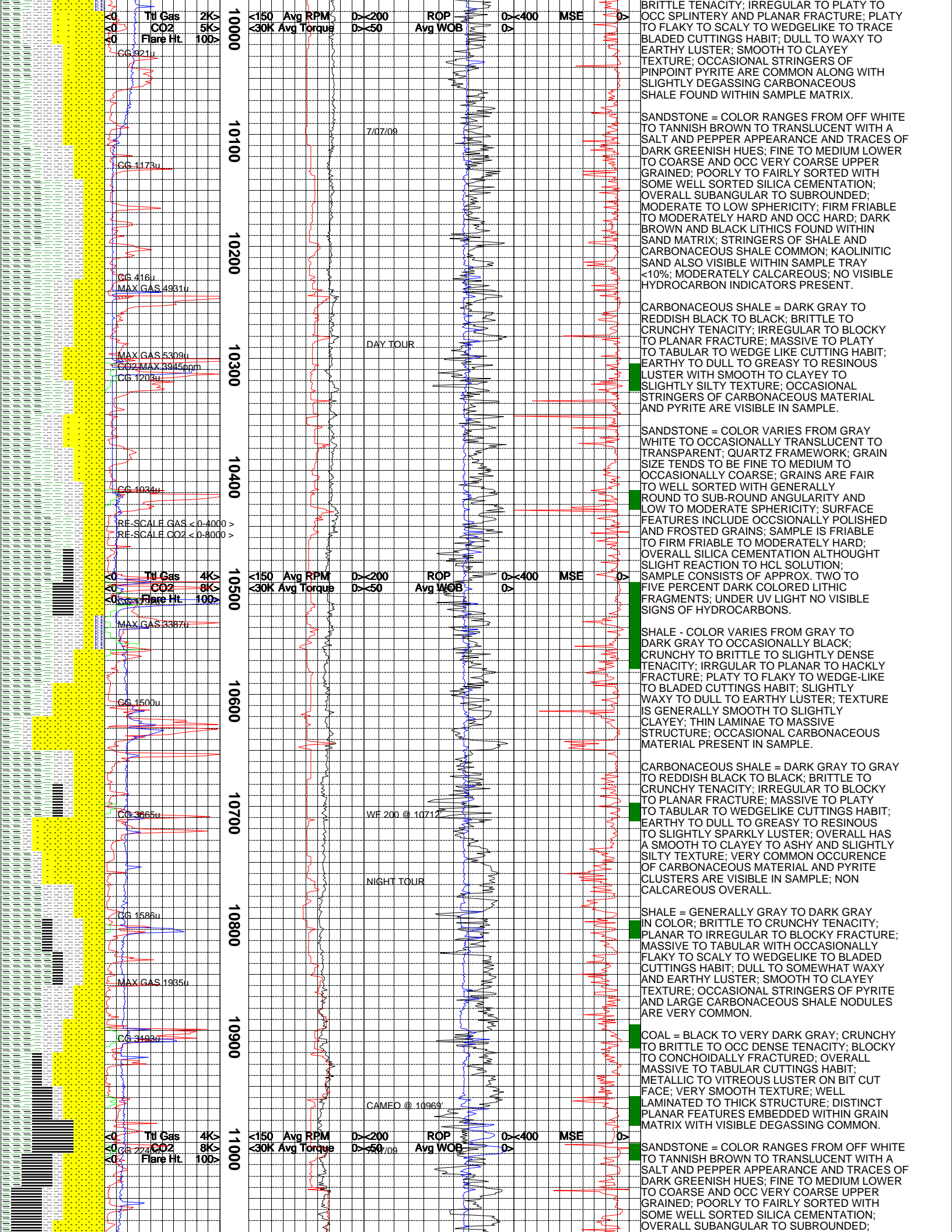
SHALE = DARK GRAY TO GRAY TO LIGHT GRAY; BRITTLE TO CRUNCHY TENACITY; PLANAR TO OCCASIONALLY IRREGULAR FRACTURE; BLADED TO WEDGE LIKE TO SCALY TO PLATY CUTTINGS HABIT; WAXY TO EARTHY TO DULL LUSTER; MASSIVE STRUCTURE WITH OCCASIONAL PYRITE AND CARBONACEOUS STRINGERS.

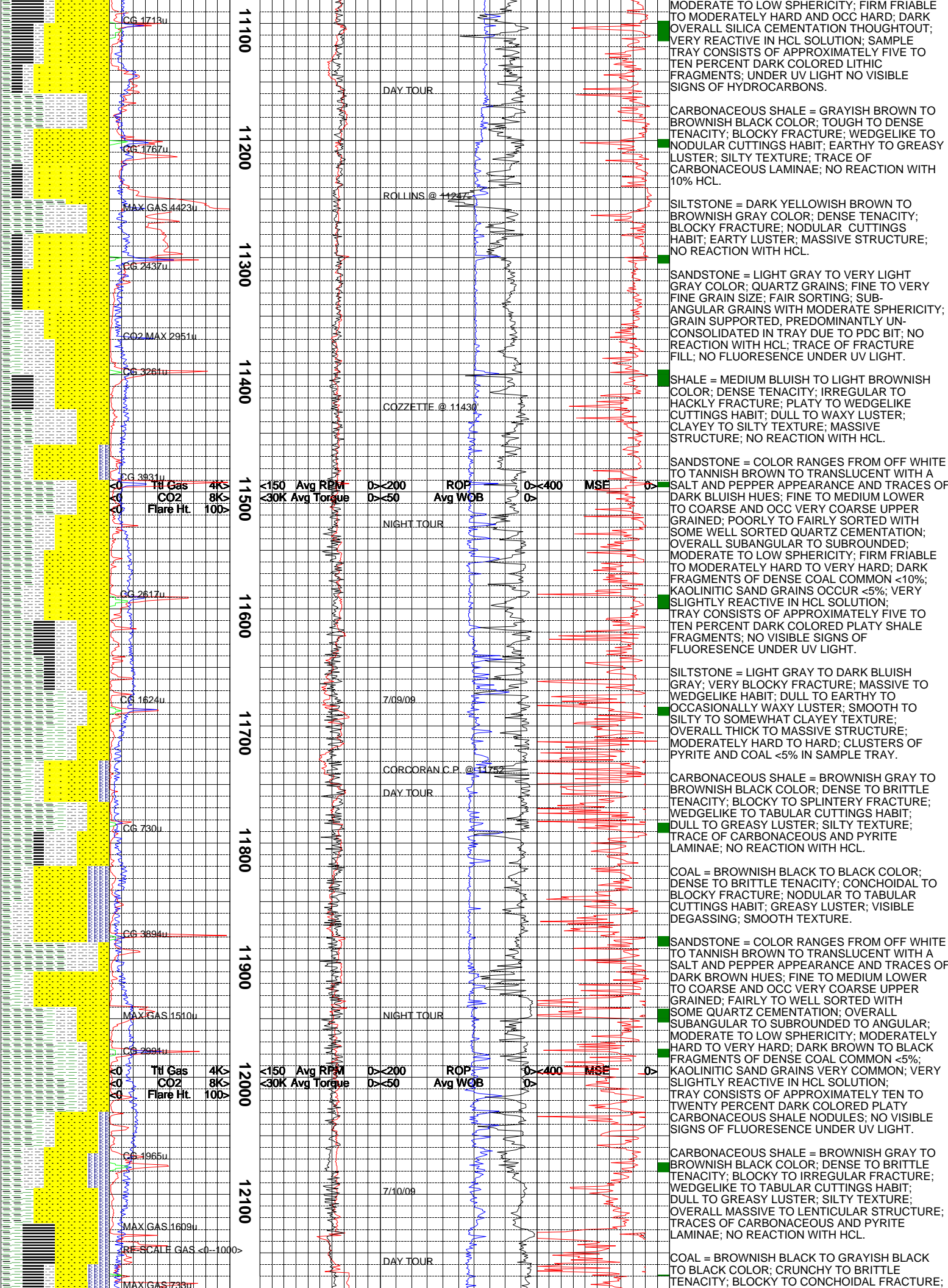
SANDSTONE = COLOR VARIES FROM WHITE TO LIGHT GRAY TO TRANSLUCENT WITH A SALT AND PEPPER APPEARANCE; VERY FINE TO FINE LOWER TO MEDIUM AND RARE COARSE GRAINED UPPER; WELL TO VERY WELL SORTED; ANGULAR TO SUBANGULAR TO OCC SUBROUNDED; LOW TO MODERATE SPHERICITY; HARD TO BRITTLE TO OCC FRIABLE; MIXTURE OF CALCITE AND SILICA CEMENTATION; KAOLINITIC SAND VERY COMMON IN PLANAR AND FLAKY STRUCTURE <10% IN SAMPLE TRAY; MODERATELY CALCAREOUS; VERY CLEAN BEACH LOOKING SAND; NO VISIBLE FLUORESENCE UNDER UV LIGHT.

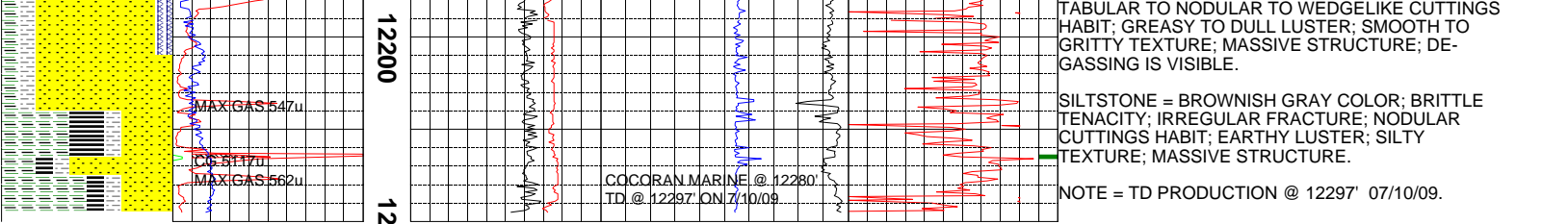
SHALE = LIGHT GRAY TO LIGHT BLuish GRAY WITH TRACES OF REDDISH BROWN; BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO BLOCKY TO OCC PLANAR FRACTURE; MASSIVE CUTTINGS HABIT WITH LARGE TABULAR AND ELONGATED PIECES COMMON; DULL TO EARTHY TO OCC WAXY LUSTER; SILTY TO GRITTY TO RARE











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