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Houston, TX  
(281) 784-5500  
Bakersfield, CA  
(661) 328-1595  
New Iberia, LA  
(337) 364-2322  
Anchorage, AK  
(907) 561-2465

## Drilling Dynamics MD

COMPANY	EXXONMOBIL
WELL	PCU_197-34A7
FIELD	PICEANCE CREEK
REGION	ROCKY MOUNTAIN
COORDINATES	LAT: 39.917998000 LONG: 108.277020000
ELEVATION	G.L.:6487.3' RKB: 30.2'
COUNTY, STATE	RIO BLANCO, CO
API INDEX	051031153800
SPUD DATE	01/04/2010
CONTRACTOR	HELMRICH_PAYNE
CO. REP.	JOSH LOVE
RIG/TYPE	325/FLEX 4S
LOGGING UNIT	MLU 48
GEOLOGISTS	MARK GROSS DONNA NEW
ADD. PERSONS	JENN SELL
CO. GEOLOGIST	MELISSA J. SAURBORN

### LOG INTERVAL

DEPTHS: 3815' TO 12652'  
DATES: 05/02/2010 TO 09/25/2010  
SCALE: 1" = 100'

### CASING DATA

10.75" AT 3808'  
7" AT 8585'  
4" AT  
AT

### MUD TYPES

SPUD MUD TO 3815'  
LSND TO 12652'  
TO  
TO

### HOLE SIZE

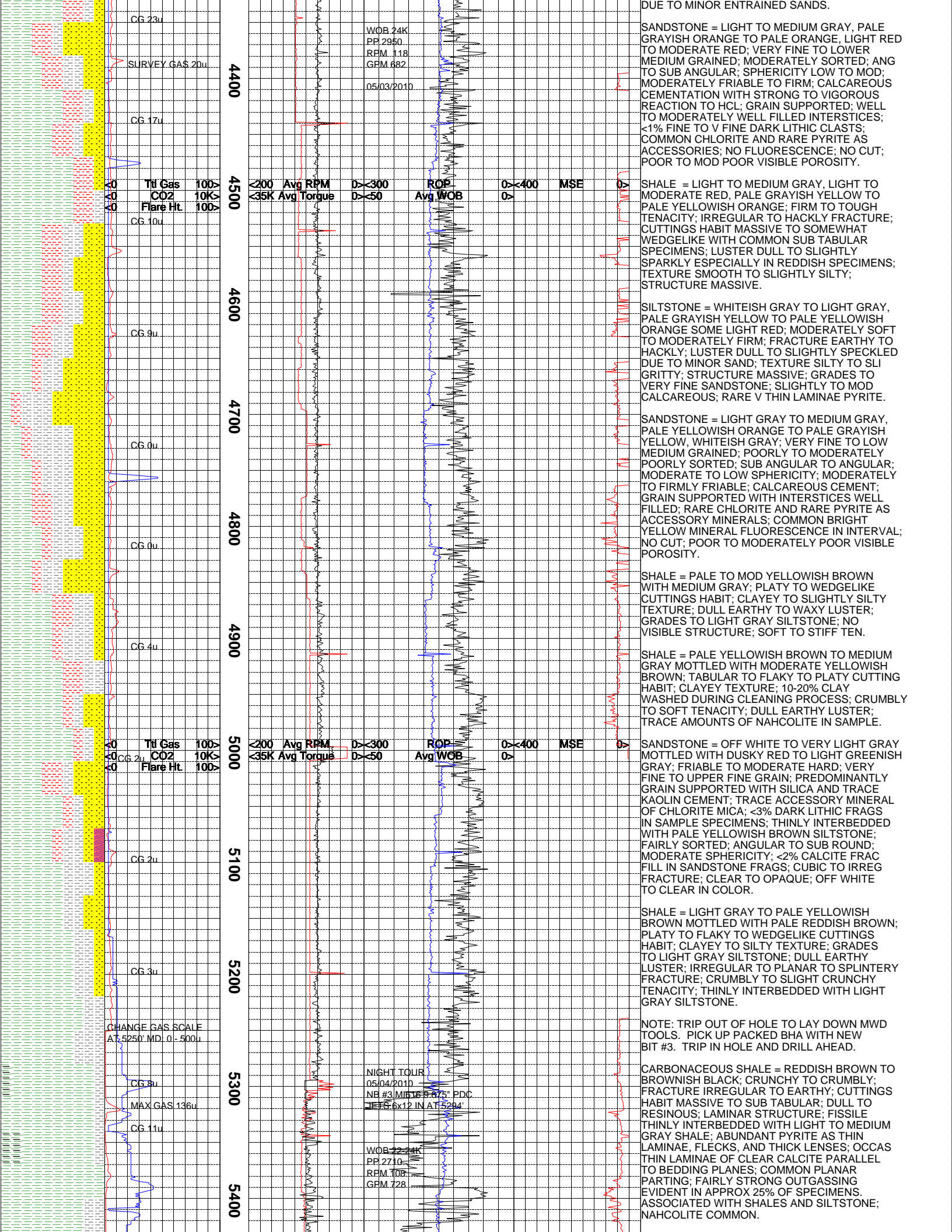
14.75" TO 3815'  
9.875" TO 8600'  
6.125" TO 12652'  
TO

### 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		KAOLINITIC		RECRYSTALLIZED CALCITE		VOLCANICS
	CHALK		DIATOMITE		LIMESTONE		RHYOLITE		
	CRYSTALLINE TUFF		DIORITE		LITHIC TUFF		SALT		
	CHERT - ARGILL		DOLOSTONE		MARL - DOLO		SAND		

EXXONMOBIL		PCU_197-34A7										9/29/2010	
Lithology	<0 Ttl Gas 1K>		Depth	<200 Avg RPM 0>		ROP	<400 MSE 0>		MGS	Remarks Survey Data, Mud Reports, Other Info.			
	<0 CO2 10K>			ft/hr									
	<0 Flare Ht. 100>			psi									
				Avg WOB									
				klbs									
			3400							GSA ROCK COLOR CHART. ROCK CONSTITUENTS 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 BOREHOLE DURING CONNECTIONS.			
			3500							GAS CHROMATOGRAPHY EQUIPMENT IS CALIBRATED TO A TEST GAS COMPOSED OF: METHANE = 10000 PPM ETHANE = 1000 PPM PROPANE = 1000 PPM I-BUTANE = 1000 PPM N-BUTANE = 1000 PPM I-PENTANE = 1000 PPM N-PENTANE = 1000 PPM			
			3600							WHEN THE MUD IS RUN THROUGH THE MGS (MUD GAS SEPARATOR) THE INTERVAL IS MARKED ON THE LOG IN THE SLIDE COLUMN AND NOTED ON THE LOG.			
			3700							ALL SANDSTONE INTERVALS ARE EXAMINED FOR SAMPLE FLUORESCENCE IN THE UV SCOPE AND FOR HYDROCARBON FLUORESCENCE AND MINOR FLUORESCENCE FROM POSSIBLE FRACTURE FILL. ALL FLUORESCENCE IS NOTED ON THE MUD LOG.			
										10.75" SURFACE CASING WAS SET AT 3809'. DRILLED 10' OF NEW FORMATION AND PERFORM F.I.T. - GOOD. DRILL AHEAD.			
			3800							SURVEY @ 3764' MD: INC 19.01 AZI 135.95 TVD 3565.83'			
										EPOCH WELL SERVICES COMMENCED FULL LOGGING ON 05/02/2010 AT 3815'			
			3900							SHALE = PALE TO MOD YELLOWISH BROWN; PLATY TO TABULAR CUTTINGS HABIT; CLAYEY TO SILTY TEXTURE; BLOCKY TO IRREGULAR FRACTURE; NO VISIBLE STRUCTURE; GRADES PALE YELLOWISH BROWN SILTSTONE; DULL EARTHY LUSTER; SOFT TO STIFF TENACITY.			
										SHALE = PALE TO MODERATE YELLOWISH BROWN; BLOCKY TO PLANAR TO IRREGULAR FRACTURE; TABULAR TO PLATY TO FLAKY CUTTINGS HABIT; CLAYEY TO SILTY TEXTURE; DULL EARTHY LUSTER; NO VISIBLE STRUC; 10-20% CLAY IS WASHED OUT DURING CLEANING PROCESS.			
			4000							SILTSTONE = PALE YELLOWISH BROWN TO LIGHT GRAY; HARD TO STIFF TENACITY; PLAT PLATY TO FLAKY TO WEDGELIKE CUTTINGS HABIT; SILTY TO SLIGHTLY GRITTY TEXTURE; SPARKLING TO EARTHY LUSTER; GRADES TO VERY LIGHT GRAY SANDSTONE.			
										SANDSTONE = WHITE TO WHITEISH GRAY, VERY PALE ORANGE TO PALE YELLOWISH ORANGE, VERY PALE GREEN TO LIGHT MOD GREEN; UPPER VERY FINE TO UPPER FINE; MODERATELY SORTED; SUB ANGULAR; MOD SPHERICITY SOME PRISMOIDAL GRAINS; MODERATELY TO FIRMLY FRIABLE; CEMENT CALCAREOUS WITH STRONG REACTION TO HCL; GRAIN SUPPORTED; INTERSTICES WELL FILLED; BEDDING MASSIVE; RARE BRIGHT WHITE MINERAL FLUORESCENCE; NO CUT; MODERATE TO POOR VISIBLE POROSITY.			
			4100							SHALE = PALE YELLOWISH ORANGE, MEDIUM TO PALE GRAY, PALE GRAYISH PINK; FIRM TO MODERATELY CRUNCHY; FRACTURE IRREGULAR TO HACKLY; CUTTINGS HABIT WEDGELIKE TO SUB TABULAR; PEARLY TO SILKY LUSTER WITH SOME WAXY; TEXTURE SMOOTH TO SLIGHTLY SILTY WITH RARE LENSES FINE SAND.			
			4200							SILTSTONE = LIGHT TO MED GRAY, GRAYISH PINK TO LIGHT RED, PALE YELLOWISH ORANGE TO GRAYISH ORANGE, WHITE TO GRAYISH WHITE; TOUGH TO CRUNCHY; FRACTURE HACKLY TO IRREGULAR WITH RARE SUB-CONCHOIDAL; CUTTINGS HABIT MASSIVE TO SEMI WEDGELIKE; LUSTER DULL TO WAXY; TEXTURE PREDOMINANTLY SMOOTH WITH RARE SPECIMENS APPROACHING GRITTY			
			4300										



SANDSTONE = LIGHT TO MEDIUM GRAY, PALE GRAYISH ORANGE TO PALE ORANGE, LIGHT RED TO MODERATE RED; VERY FINE TO LOWER MEDIUM GRAINED; MODERATELY SORTED; ANG TO SUB ANGULAR; SPHERICITY LOW TO MOD; MODERATELY FRIABLE TO FIRM; CALCAREOUS CEMENTATION WITH STRONG TO VIGOROUS REACTION TO HCL; GRAIN SUPPORTED; WELL TO MODERATELY WELL FILLED INTERSTICES; <1% FINE TO V FINE DARK LITHIC CLASTS; COMMON CHLORITE AND RARE PYRITE AS ACCESSORIES; NO FLUORESCENCE; NO CUT; POOR TO MOD POOR VISIBLE POROSITY.

SHALE = LIGHT TO MEDIUM GRAY, LIGHT TO MODERATE RED, PALE GRAYISH YELLOW TO PALE YELLOWISH ORANGE; FIRM TO TOUGH TENACITY; IRREGULAR TO HACKLY FRACTURE; CUTTINGS HABIT MASSIVE TO SOMEWHAT WEDGELIKE WITH COMMON SUB TABULAR SPECIMENS; LUSTER DULL TO SLIGHTLY SPARKLY ESPECIALLY IN REDDISH SPECIMENS; TEXTURE SMOOTH TO SLIGHTLY SILTY; STRUCTURE MASSIVE.

SILTSTONE = WHITEISH GRAY TO LIGHT GRAY, PALE GRAYISH YELLOW TO PALE YELLOWISH ORANGE SOME LIGHT RED; MODERATELY SOFT TO MODERATELY FIRM; FRACTURE EARTHY TO HACKLY; LUSTER DULL TO SLIGHTLY SPECKLED DUE TO MINOR SAND; TEXTURE SILTY TO SLI GRITTY; STRUCTURE MASSIVE; GRADES TO VERY FINE SANDSTONE; SLIGHTLY TO MOD CALCAREOUS; RARE V THIN LAMINAE PYRITE.

SANDSTONE = LIGHT GRAY TO MEDIUM GRAY, PALE YELLOWISH ORANGE TO PALE GRAYISH YELLOW, WHITEISH GRAY; VERY FINE TO LOW MEDIUM GRAINED; POORLY TO MODERATELY POORLY SORTED; SUB ANGULAR TO ANGULAR; MODERATE TO LOW SPHERICITY; MODERATELY TO FIRMLY FRIABLE; CALCAREOUS CEMENT; GRAIN SUPPORTED WITH INTERSTICES WELL FILLED; RARE CHLORITE AND RARE PYRITE AS ACCESSORY MINERALS; COMMON BRIGHT YELLOW MINERAL FLUORESCENCE IN INTERVAL; NO CUT; POOR TO MODERATELY POOR VISIBLE POROSITY.

SHALE = PALE TO MOD YELLOWISH BROWN WITH MEDIUM GRAY; PLATY TO WEDGELIKE CUTTINGS HABIT; CLAYEY TO SLIGHTLY SILTY TEXTURE; DULL EARTHY TO WAXY LUSTER; GRADES TO LIGHT GRAY SILTSTONE; NO VISIBLE STRUCTURE; SOFT TO STIFF TEN.

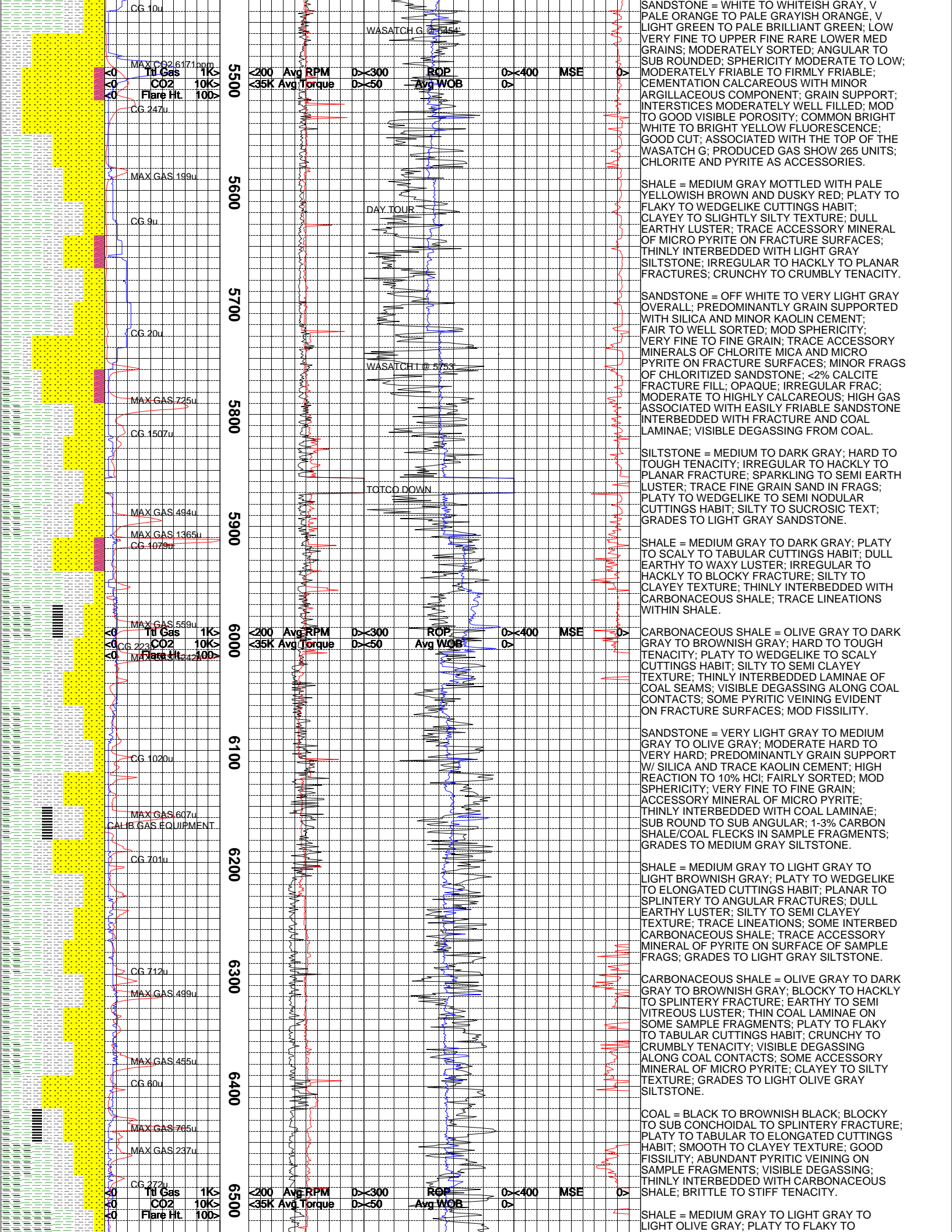
SHALE = PALE YELLOWISH BROWN TO MEDIUM GRAY MOTTLED WITH MODERATE YELLOWISH BROWN; TABULAR TO FLAKY TO PLATY CUTTING HABIT; CLAYEY TEXTURE; 10-20% CLAY WASHED DURING CLEANING PROCESS; CRUMBLY TO SOFT TENACITY; DULL EARTHY LUSTER; TRACE AMOUNTS OF NAHCOLITE IN SAMPLE.

SANDSTONE = OFF WHITE TO VERY LIGHT GRAY MOTTLED WITH DUSKY RED TO LIGHT GREENISH GRAY; FRIABLE TO MODERATE HARD; VERY FINE TO UPPER FINE GRAIN; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND TRACE KAOLIN CEMENT; TRACE ACCESSORY MINERAL OF CHLORITE MICA; <3% DARK LITHIC FRAGS IN SAMPLE SPECIMENS; THINLY INTERBEDDED WITH PALE YELLOWISH BROWN SILTSTONE; FAIRLY SORTED; ANGULAR TO SUB ROUND; MODERATE SPHERICITY; <2% CALCITE FRAC FILL IN SANDSTONE FRAGS; CUBIC TO IRREG FRACTURE; CLEAR TO OPAQUE; OFF WHITE TO CLEAR IN COLOR.

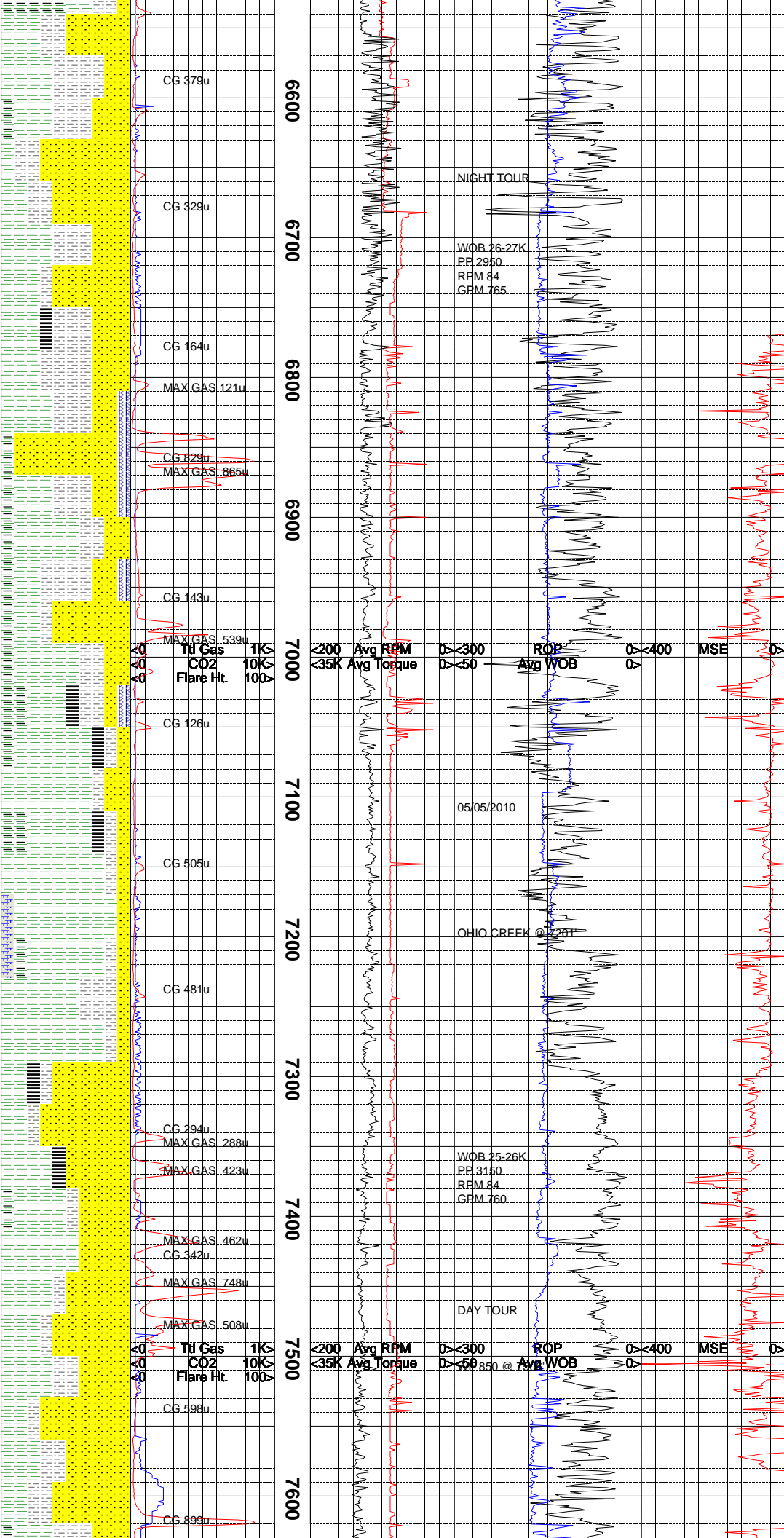
SHALE = LIGHT GRAY TO PALE YELLOWISH BROWN MOTTLED WITH PALE REDDISH BROWN; PLATY TO FLAKY TO WEDGELIKE CUTTINGS HABIT; CLAYEY TO SILTY TEXTURE; GRADES TO LIGHT GRAY SILTSTONE; DULL EARTHY LUSTER; IRREGULAR TO PLANAR TO SPLINTERY FRACTURE; CRUMBLY TO SLIGHT CRUNCHY TENACITY; THINLY INTERBEDDED WITH LIGHT GRAY SILTSTONE.

NOTE: TRIP OUT OF HOLE TO LAY DOWN MWD TOOLS. PICK UP PACKED BHA WITH NEW BIT #3. TRIP IN HOLE AND DRILL AHEAD.

CARBONACEOUS SHALE = REDDISH BROWN TO BROWNISH BLACK; CRUNCHY TO CRUMBLY; FRACTURE IRREGULAR TO EARTHY; CUTTINGS HABIT MASSIVE TO SUB TABULAR; DULL TO RESINOUS; LAMINAR STRUCTURE; FISSILE THINLY INTERBEDDED WITH LIGHT TO MEDIUM GRAY SHALE; ABUNDANT PYRITE AS THIN LAMINAE, FLECKS, AND THICK LENSES; OCCAS THIN LAMINAE OF CLEAR CALCITE PARALLEL TO BEDDING PLANES; COMMON PLANAR PARTING; FAIRLY STRONG OUTGASSING EVIDENT IN APPROX 25% OF SPECIMENS. ASSOCIATED WITH SHALES AND SILTSTONE; NAHCOLITE COMMON.







WEDGE LIKE CUTTINGS HABIT; CLAYEY TO SEMI SILTY TEXTURE; DULL EARTHY TO WAXY LUST; GRADES TO LIGHT GRAY SILTSTONE; CRUNCHY TO CRUMBLY TENACITY; TRACE ACCESSORY MINERAL PYRITE ON FRACTURE SURFACE.

SILTSTONE = MEDIUM GRAY TO LIGHT GRAY; BLOCKY TO IRREGULAR FRACTURE; SILTY TO GRITTY TEXTURE; SPARKLING LUSTER; GRADES TO LIGHT GRAY SANDSTONE; TRACE CARBON SHALE FLECKS IN SAMPLE FRAGMENTS; PLATY TO TABULAR TO WEDGE LIKE CUTTINGS HABIT.

SANDSTONE = MED GRAY TO WHITEISH GRAY GRAYISH PALE GREEN, GRAYISH ORANGE TO PALE YELLOWISH ORANGE; LOWER FINE TO LOWER MEDIUM; SUB ROUNDED TO SUB ANG; MODERATE TO POORLY SORTED; SPHERICITY MODERATE TO LOW W/ SOME PRISMoidal GRAINS; CEMENT STRONGLY CALCAREOUS; GRAIN SUPPORTED; INTERSTICES GENERALLY MODERATE FILLED; RARE THIN DISCONTINUOUS STRINGERS CARBONACEOUS MAT; COMMON PYRITE; COMMON DARK MICACEOUS MINERALS; RARE CHLORITE; NO CUT NO FLUORESCENCE; MODERATE VISIBLE POROSITY; ASSOCIATED W/ INTERBEDDED SHALES AND SILTSTONES AND MINOR THIN, WELL DEVELOPED, COALS.

SHALE = PALE ORANGISH YELLOW, MEDIUM TO LIGHT GRAY, PALE GRAYISH RED, PALE ORANGE TO LIGHT BROWN; TOUGH TO BRITTLE; FRAC HACKLY TO SEMI PLANAR; CUTTINGS HABIT WEDGE LIKE TO MASSIVE; LUSTER WAXY TO SILKY WITH MINOR SPARKLE DUE TO FINELY DISSEMINATED PYRITE; FRAMBOIDAL, LAMINAR AND NODULAR FORMS OF PYRITE COMMON; THIN STRINGER / FLECKS OF CARBONACEOUS MATERIAL; TEXTURE PREDOMINANTLY SMOOTH WITH RARE MINOR SILTINESS; STRUCTURE MASSIVE; RARE DULL RED MINERAL FLUORES.

CARBONACEOUS SHALE = LIGHT BROWNISH GRAY TO BROWNISH BLACK, BLACK; CRUMBLY TO HARD AND BRITTLE TENACITY; FRACTURE EARTHY TO PLANAR; CUTTINGS HABIT MASSIVE TO BLOCKY; LUSTER DULL TO VITREOUS; SMOOTH TO VERY SLIGHTLY SILTY TEXTURE; ABUNDANT PYRITE IN MANY FORMS; INTERBEDDED WITH THIN HEAVILY PYRITIZED COALS.

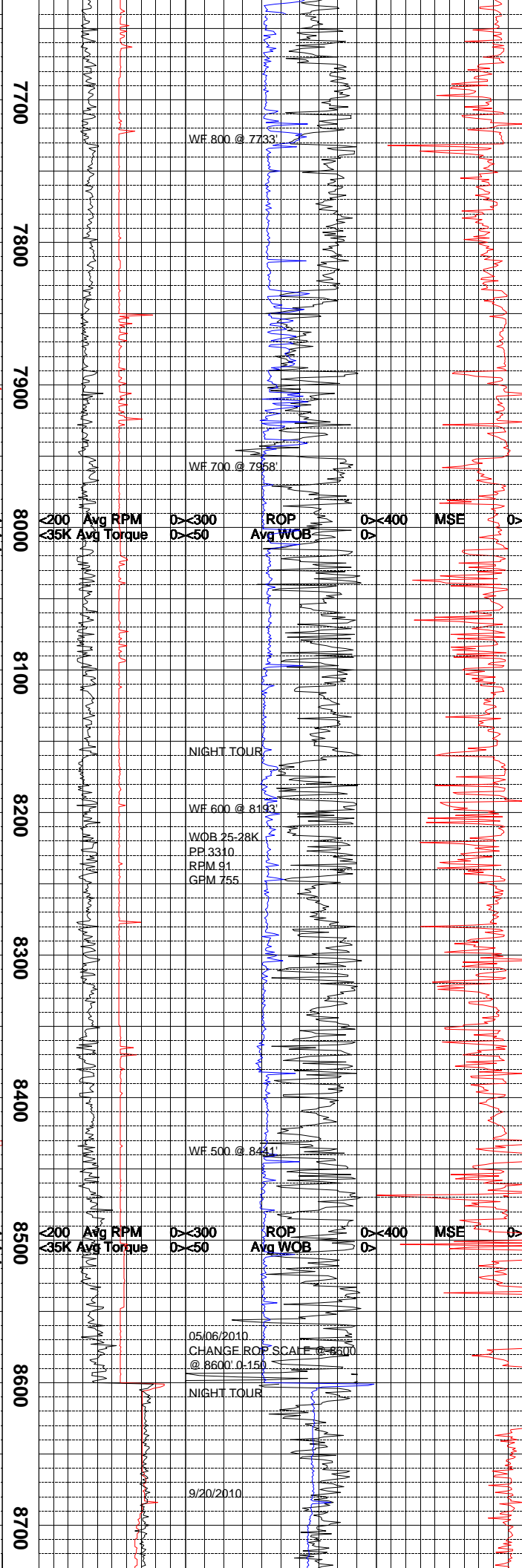
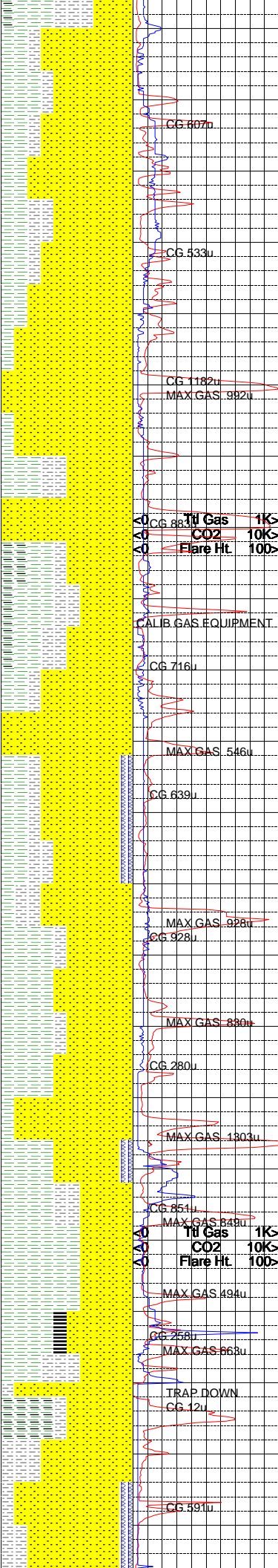
SILTSTONE = WHITEISH GRAY TO LIGHT GRAY, MODERATE RED TO PALE REDDISH PURPLE, VERY PALE ORANGE TO LIGHT YELLOWISH BROWN; MODERATELY FIRM TO CRUMBLY; FRACTURE HACKLY TO SUB CONCHOIDAL; CUTTINGS HABIT MASSIVE TO WEDGE LIKE; LUSTER DULL TO EARTHY WITH SOME MINOR SPARKLE DUE TO FINELY DISSEMINATED PYRITE; SOME PYRITE STRINGERS; TEXTURE SILTY TO SLIGHT GRITTY W/ SOME ENTRAINED FINE GRAIN SAND LENSES; STRUCTURE MASS

SANDSTONE = WHITEISH GRAY TO MEDIUM GRAY, PALE GREEN TO LIGHT BRILLIANT GREEN, VERY PALE ORANGE TO LIGHT TO MODERATE BROWN; FRAME WORK QUARTZ; UPPER VERY FINE TO UPPER FINE; MODERATE SORTING; SUB ANGULAR TO SUB ROUND; SPHERICITY MODERATELY HIGH; MODERATELY FRIABLE TO FIRM FRIABLE; GRAIN SUPPORT; CEMENTATION STRONGLY CALCAREOUS WITH OCCASIONAL ARGILLACEOUS AND RARE PYRITE CEMENT; INTERSTICES MODERATE TO WELL FILL; COMMON CARBONACEOUS V THIN LAMINAE; DARK SUB ROUNDED LITHIC CLASTS <2%; BEDDING MASSIVE; CHLORITE ACCESSORY; NO CUT; NO FLUORESCENCE; MODERATELY POOR VISIBLE POROSITY.

COAL = BLACK; BRITTLE TENACITY; FRACTURE BLOCKY TO PLANAR W/ COMMON CONCHOIDAL; CUTTINGS HABIT BLOCKY; LUSTER VITREOUS TO METALLIC; TEXTURE SMOOTH; ABUNDANT THIN LAMINAE OF PYRITE; MODERATE OUTGASSING EVIDENT IN SOME SPECIMENS.

SHALE = LIGHT TO MEDIUM GRAY, LIGHT TO MOD BROWN, MODERATE RED; FIRM TENACITY; FRACTURE HACKLY; CUTTINGS HABIT WEDGE LIKE TO TABULAR; LUSTER SILKY; SMOOTH; STRUCTURE MASSIVE.

SANDSTONE = OFF WHITE TO V LIGHT GRAY WITH MINOR LIGHT GREENISH GRAY; VERY FINE TO UPPER FINE GRAIN; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND MINOR KAOLIN CEMENT; ABUNDANT LOOSE GRAINS; TRANSPARENT TO TRANSLUCENT; MINOR ETCHING ON SOME GRAINS; TRACE ACCESSORY MINERALS OF CHLORITE MICA AND MICRO PYRITE; MINOR CHLORITIZED SANDSTONE FRAGMENTS; TRACE CARBONACEOUS SHALE/ COAL FLECKS IN PRESERVED SPECIMENS; ROUND TO SUB ANGULAR; MODERATE TO HIGH SPHERICITY; FAIRLY SORTED; MODERATE TO HIGH CALCAREOUS; FRIABLE TO MODERATELY HARD.



SILTSTONE = MEDIUM GRAY TO LIGHT GRAY TO DARK GRAY; HARD TO TOUGH TENACITY; PLATY TO WEDGELIKE CUTTINGS HABIT; SPARKLING TO SEMI EARTHY LUSTER; SILTY TO GRITTY TEXTURE; IRREGULAR TO HACKLY TO BLOCKY FRAC. GRADES TO LIGHT GRAY SANDSTONE; TRACE LOOSE FINE GRAIN SAND IN SAMPLE FRAGMENTS.

SANDSTONE = OFF WHITE TO V LIGHT GRAY W/ TRACE LIGHT GREENISH GRAY; LOWER VERY FINE TO FINE GRAIN W/ MINOR LOWER MEDIUM GRAIN; PREDOMINANT LOOSE GRAIN W/ SOME PRESERVED SPECIMENS; ROUND TO SUB ANGULAR; MOD TO WELL SPHERICITY; WELL SORTED; TRACE ACCESS MINERALS OF PYRITE AND CHLORITE MICA; 2-4% CARBON SHALE/COAL FLECKS IN SAMPLE FRAGMENTS; HIGH GAS AND HIGH ROP DUE TO EASILY FRIABLE TO MODERATE HARD SANDSTONE; PRESERVED SAMPLE FRAGMENTS SHOW SILICA AND SOME KAOLIN CEMENT; THIN SHALE AND SILTSTONE INTERVALS; MINOR ETCHING POSSIBLE DUE TO PDC BIT ACTION.

SHALE = VERY LIGHT GRAY TO MEDIUM GRAY TO GREENISH GRAY; PLATY, ELONGATED TO TABULAR CUTTINGS HABIT; SPLINTERY TO PLANAR TO HACKLY FRACTURE; CLAYEY TO SLIGHT SILTY TEXTURE; EARTHY TO WAXY LUSTER; THIN CARBONACEOUS SHALE FLECKS INTERSPERSED IN SAMPLE FRAGS; GRADES TO LIGHT GRAY SILTSTONE; HARD TENACITY.

SILTSTONE = MEDIUM GRAY TO LIGHT GRAY; CRUNCHY TENACITY; IRREGULAR TO PLANAR FRACTURE; TABULAR TO ELONGATED, PLATY CUTTINGS HABIT; SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; GRADES TO LIGHT GRAY SANDSTONE; TRACE CARBONACEOUS SHALE FLECKS AND LOWER FINE GRAIN SAND IN SAMPLE FRAGMENTS.

CARBONACEOUS SHALE = OLIVE GRAY, DARK GRAY TO BROWNISH GRAY; PLATY TO SEMI ELONGATED CUTTINGS HABIT; SPLINTERY TO HACKLY TO PLANAR FRACTURE; SLI SILTY TO CLAYEY TEXTURE; DULL EARTHY TO SEMI VITREOUS LUSTER; THINLY INTERBEDDED W/ COAL LAMINAE; TRACE PYRITIC VEINING IN SAMPLE SPECIMENS.

SHALE = LIGHT TO MEDIUM GRAY, PALE GREEN TO PALE BLUISH GREEN, V LIGHT GRAYISH BLUE, VERY PALE ORANGE TO LIGHT BROWN; VERY TOUGH TO BRITTLE TENACITY; HACKLY TO SUB PLANAR FRACTURE; CUTTINGS HABIT WEDGE LIKE TO SLIGHTLY TABULAR SOME BLOCKY; LUSTER DULL TO WAXY; TEXTURE SMOOTH TO SLIGHTLY SILTY W/ OCCASIONAL SAND LENSES; STRUCTURE PREDOMINANTLY MASSIVE W OCCAS THINLY LAMINATED RELIC STRUCT SEEN; RARE THIN STRINGERS CARB.

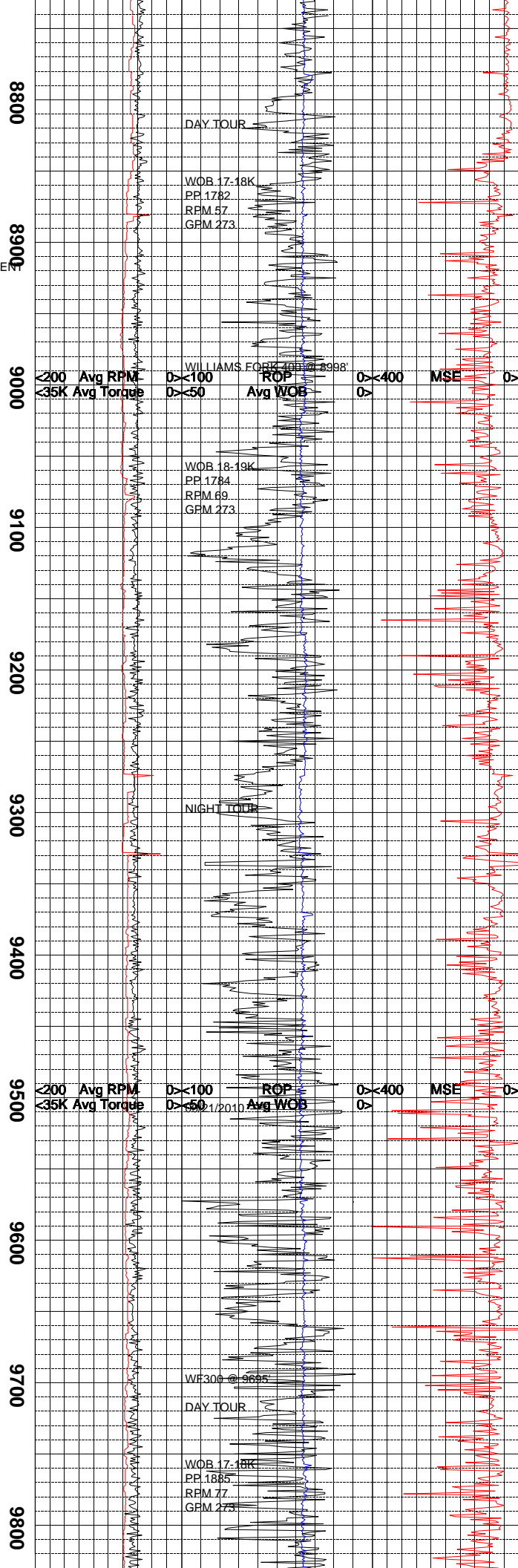
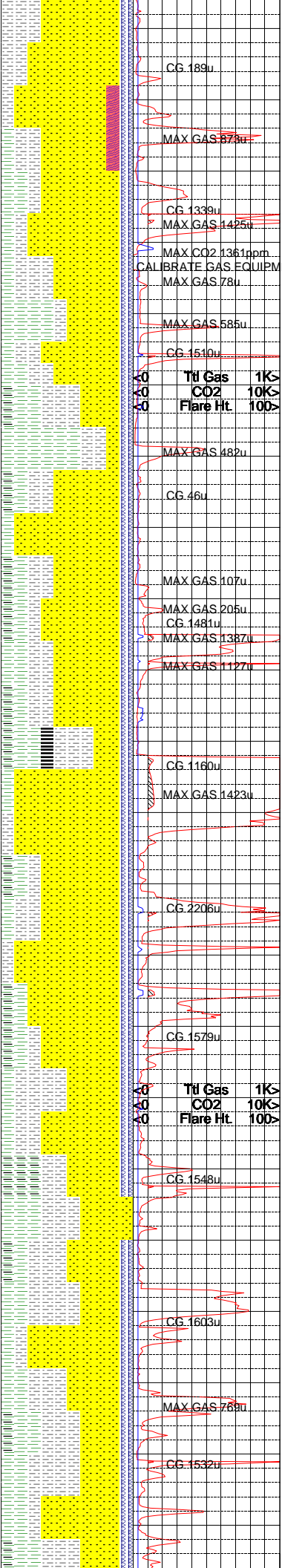
SANDSTONE = WHITISH GRAY TO MEDIUM GRAY, PALE ORANGE TO MODERATE BROWN, RARE DUSKY YELLOWISH BROWN; LOWER FINE TO UPPER MEDIUM; POORLY SORTED; SUB ANGULAR TO ANGULAR; MOD TO POOR SPHERICITY; FIRMLY FRIABLE TO MODERATE FRIABLE COMMON LOOSE GRAINS; CEMENT STRONGLY CALCAREOUS W VIGOROUS REACT TO HCL; INTERSTICES MOD FILLED; RARE DULL YELLOWISH MINERAL FLUORESCENCE; NO CUT POOR TO MODERATE VISIBLE POROSITY.

SANDSTONE = WHITE TO VERY LIGHT GRAY; PREDOMINANTLY CLEAR UNCONSOLIDATED QUARTZ GRAINS; LOWER FINE TO LOWER MEDIUM GRAIN; POORLY SORTED; SUB ANG TO SUB ROUND; MOD HIGH SPHERICITY; VERY SOFT TO EASILY FRIABLE; VERY CALCAREOUS; GRAIN SUPPORTED; COMMON PYRITE AND CHLORITE ACCESS; NO CUT; NO FLUORES.

SANDSTONE = WHITE TO BLUISH WHITE TO BLUISH GRAY, RARE MEDIUM GRAY; FRAME WORK = A CONGLOMERITIC SANDSTONE WITH PREDOMINANTLY QUARTZ AND REWORKED SEDIMENTS; MEDIUM TO VERY COARSE GRAIN; WHITE TO V LIGHT BLUE CHEMICAL CEMENT, SLIGHTLY CALCAREOUS; GRAIN SUPPORTED; INTERSTICES WELL FILLED; ANGULAR TO SUB ROUNDED; EASILY FRIABLE TO MOD FRIABLE; NO FLUOR ; NO CUT; MOD TO POOR POROS

NOTE: TD INTERMEDIATE SECTION AT 8600' ON 5/6/2010. RETURN TO DRILLING PRODUCTION SECTION ON 9/19/2010.

CARBONACEOUS SHALE = BLACK TO MEDIUM DARK GREY, SOME OLIVE GREY; BRITTLE TO CRUNCHY TENACITY; SEMI PLANAR TO BLOCKY TO SPLINTERY FRACTURE; PLATY TO FLAKY TO WEDGELIKE CUTTINGS HABIT; SMOOTH, CLAYEY TEXTURE; LAMINAR TO MASSIVE STRUCTURE; THIN BANDS AND FLECKS OF COAL / CARBONACEOUS MATERIAL PRESENT NO VISIBLE DEGASSING FROM COAL SEAMS; TRACE PYRITE NODULES AND INCLUSIONS.



NOTE: PARTIAL RETURNS WHILE DRILLING  
8798' MD TO 8805' MD.

SANDSTONE = WHITE TO WHITEISH GRAY,  
VERY LIGHT GRAY TO MEDIUM GRAY, RARE  
VERY PALE ORANGE TO PALE ORANGE PINK;  
FRAME WORK PREDOMINANTLY TRANSLUCENT  
TO OPAQUE WHITEISH QUARTZ W/ OCCASION  
TRANSPARENT; LOWER TO UPPER VERY FINE  
WITH RARE LOWER FINE; VERY WELL SORTED;  
SUBROUND TO ROUND; V HIGH SPHERICITY;  
EASILY FRIABLE TO MODERATE FRIABLE W/  
OCCASIONAL V FIRMLY FRIABLE; CEMENT  
PREDOMINANT CALCAREOUS SHOWING MOD  
TO STRONG REACTION TO DILUTE HCL ALSO  
CONSIDERABLE ARGILLACEOUS COMPONENT;  
MOSTLY GRAIN SUPPORTED W/ OCCASIONAL  
MATRIX SUPPORTED SPECIMENS; INTERSTICES  
VERY WELL FILLED; MASSIVE BEDDING; LESS  
THAN 1% V FINE GRAINED BLACK LITHICS;  
RARE THIN LAMINAE CARBONACEOUS MAT;  
RARE CHLORITE ACCESS ; NO FLUORESCENCE;  
NO CUT; POOR TO MODERATE POOR VISIBLE  
POROSITY.

SILTSTONE = WHITEISH GRAY TO VERY LIGHT  
GRAY WITH OCCASIONAL MEDIUM GRAY, LIGHT  
GRAYISH BROWN TO LIGHT MODERATE BROWN,  
MODERATELY TOUGH TO CRUNCHY TENACITY;  
FRACTURE IRREGULAR TO HACKLY; CUTTINGS  
HABIT MOSTLY MASSIVE WITH OCCASIONAL  
WEDGE LIKE; LUSTER DULL TO SUB SUCROSIC;  
TEXTURE SILTY; STRUCTURE MASSIVE WITH  
RARE PALE COLOR BANDING; OCCASIONAL  
THIN LAMINAE CARBONACEOUS MATERIAL.

SANDSTONE = WHITE TO WHITEISH GRAY;  
FRAMEWORK TRANSPARENT TO TRANSLUCENT  
COLORLESS QUARTZ; LOWER FINE TO LOWER  
MEDIUM; MODERATELY SORTED; SUB ANGULAR  
TO SUBROUND; MODERATE HIGH SPHERICITY;  
VERY EASILY FRIABLE TO MODERATE FRIABLE  
PRESENTING AS ABUNDANT LOOSE GRAINS;  
CALCAREOUS CEMENTATION WITH SPARSE  
ARGILLACEOUS COMPONENT SHOWING MOD  
STRONG REACTION TO DILUTE HCL; GRAIN  
SUPPORTED; INTERSTICES SHOW COMMON  
VOIDS; BEDDING MASSIVE; CLEAN SANDSTONE  
WITH FEW TO NO LITHIC FRAGMENTS; RARE  
CHLORITE ACCESSORY; NO FLUORESCENCE;  
NO CUT; MODERATE TO GOOD VISIBLE  
POROSITY.

SHALE = LIGHT GREY TO MEDIUM LIGHT GREY;  
BRITTLE TO CRUMBLY TENACITY; PLANAR TO  
SPLINTERY FRACTURE; PLATY TO FLAKY TO  
SCALY CUTTINGS HABIT; MATTE TO DULL  
LUSTER; SMOOTH TO CLAYEY TEXTURE;  
MASSIVE STRUCTURE WITH FISSILITY.

CARBONACEOUS SHALE = BLACK TO MEDIUM  
DARK GREY, SOME OLIVE GREY; BRITTLE TO  
CRUNCHY TENACITY; SEMI PLANAR TO BLOCKY  
TO SPLINTERY FRACTURE; PLATY TO FLAKY  
TO WEDGELIKE CUTTINGS HABIT; SMOOTH TO  
CLAYEY TEXTURE; LAMINAR TO MASSIVE  
STRUCTURE; THIN BANDS AND FLECKS OF  
COAL AND CARBONACEOUS MATERIAL PRESENT  
NO VISIBLE DEGASSING FROM COAL.

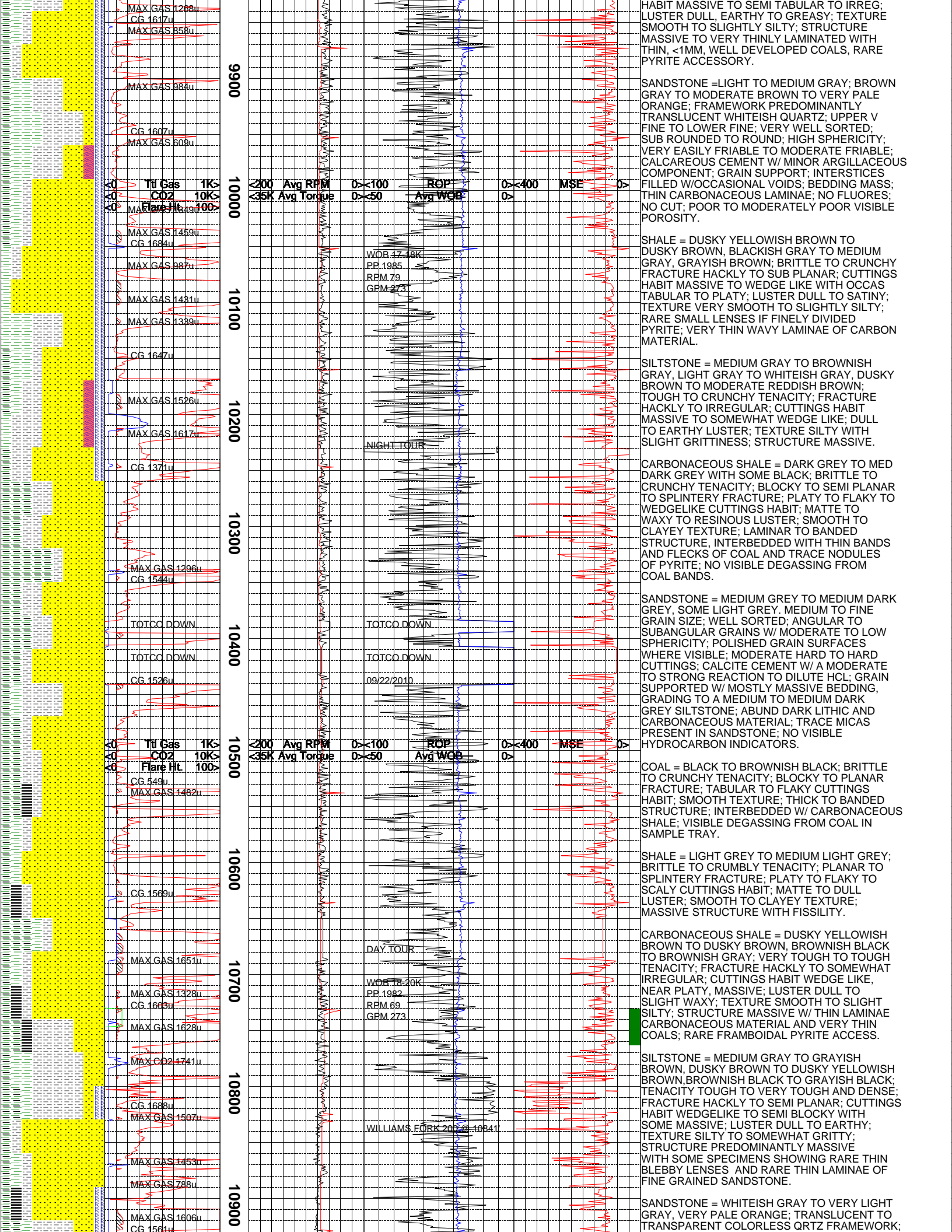
SANDSTONE = WHITE TO VERY LIGHT GREY;  
FINE TO MEDIUM GRAIN SIZE WITH SOME  
COARSE GRAINS; WELL SORTED; SUBROUNDED  
TO SUBANGULAR GRAINS WITH MODERATE TO  
LOW SPHERICITY; POLISHED GRAIN SURFACES  
WHERE VISIBLE; MODERATELY HARD TO FIRM  
FRIABLE CUTTINGS; MAINLY KAOLINITIC  
CEMENT WITH COME CALCITE, A WEAK TO  
MODERATE REACTION TO DILUTE HCL; GRAIN  
SUPPORTED W/ MASSIVE BEDDING; ABUNDANT  
DARK LITHIC INCLUSIONS AND TRACE GREEN  
CHLOROTOID AND MICA INCLUSIONS; NO  
VISIBLE HYDROCARBON INDICATORS.

SILTSTONE = MEDIUM GREY TO MEDIUM LIGHT  
GREY; SEMI TOUGH TO BRITTLE TENACITY;  
IRREGULAR TO BLOCKY TO SPLINTERY  
FRACTURE; PLATY TO FLAKY TO WEDGELIKE  
CUTTINGS HABIT; MATTE TO FROSTED LUSTER;  
SILTY TO GRITTY TEXTURE; MASSIVE  
STRUCTURE.

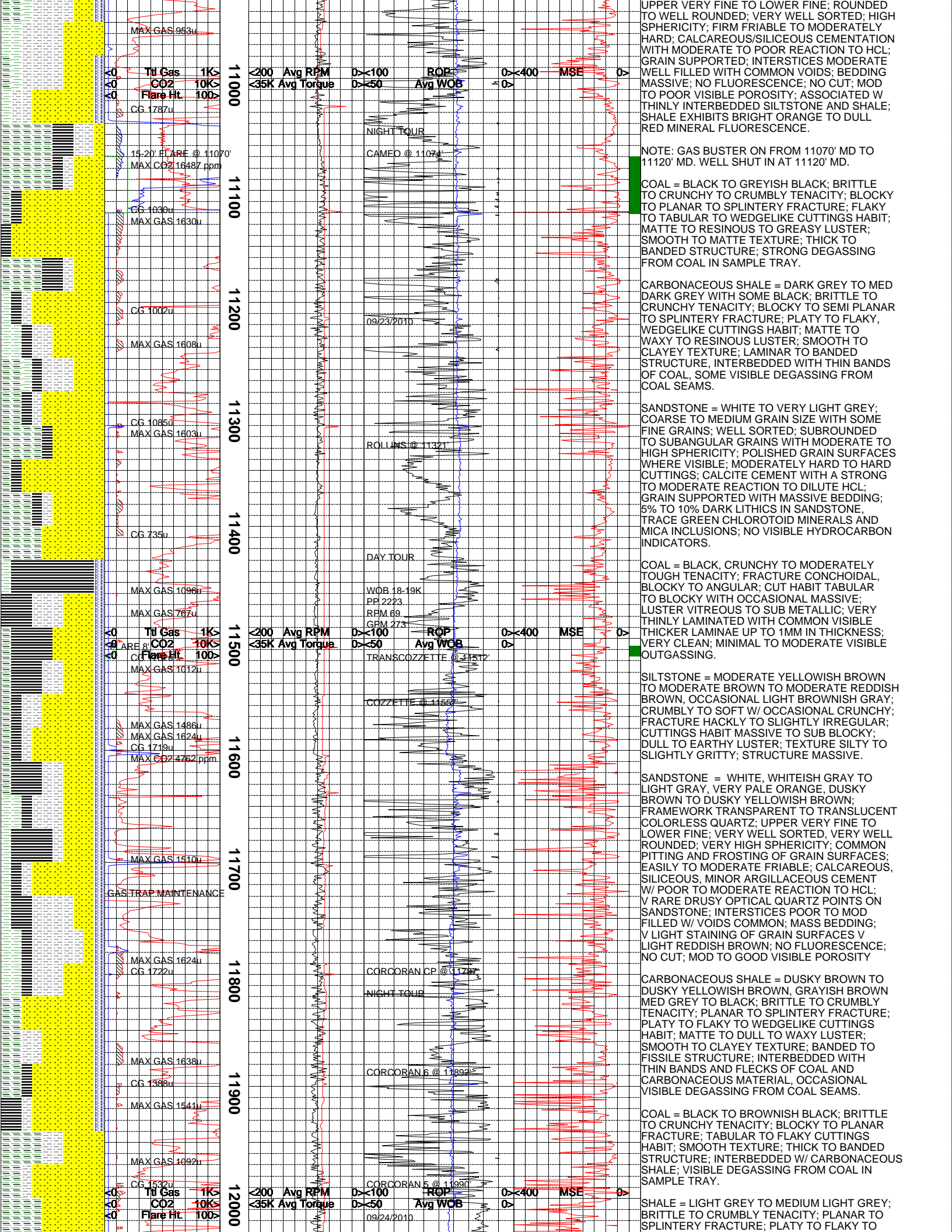
SHALE = LIGHT TO MEDIUM GRAY, LIGHT GRAY  
BROWN TO MODERATE BROWN, DUSKY BROWN  
TO DUSKY YELLOW BROWN, BLACKISH BROWN;  
TOUGH TO MODERATELY TOUGH; CUT HABIT  
MASSIVE TO WEDGELIKE; LUSTER DULL; MASS  
STRUC; SMOOTH TO SLIGHTLY SILTY TEXTURE;  
THIN LAMINAE, DISCONTINUOUS STRINGERS,  
FLECKS OF CARBONACEOUS MATERIAL; RARE  
BETTER DEVELOPED THIN LAMINAE OF COAL;  
RARE VERY THIN AND FINELY DESICCATED  
PYRITE AT SOME BEDDING PLAINS AND AS  
VERY SMALL LENSES OR "SPOTS."

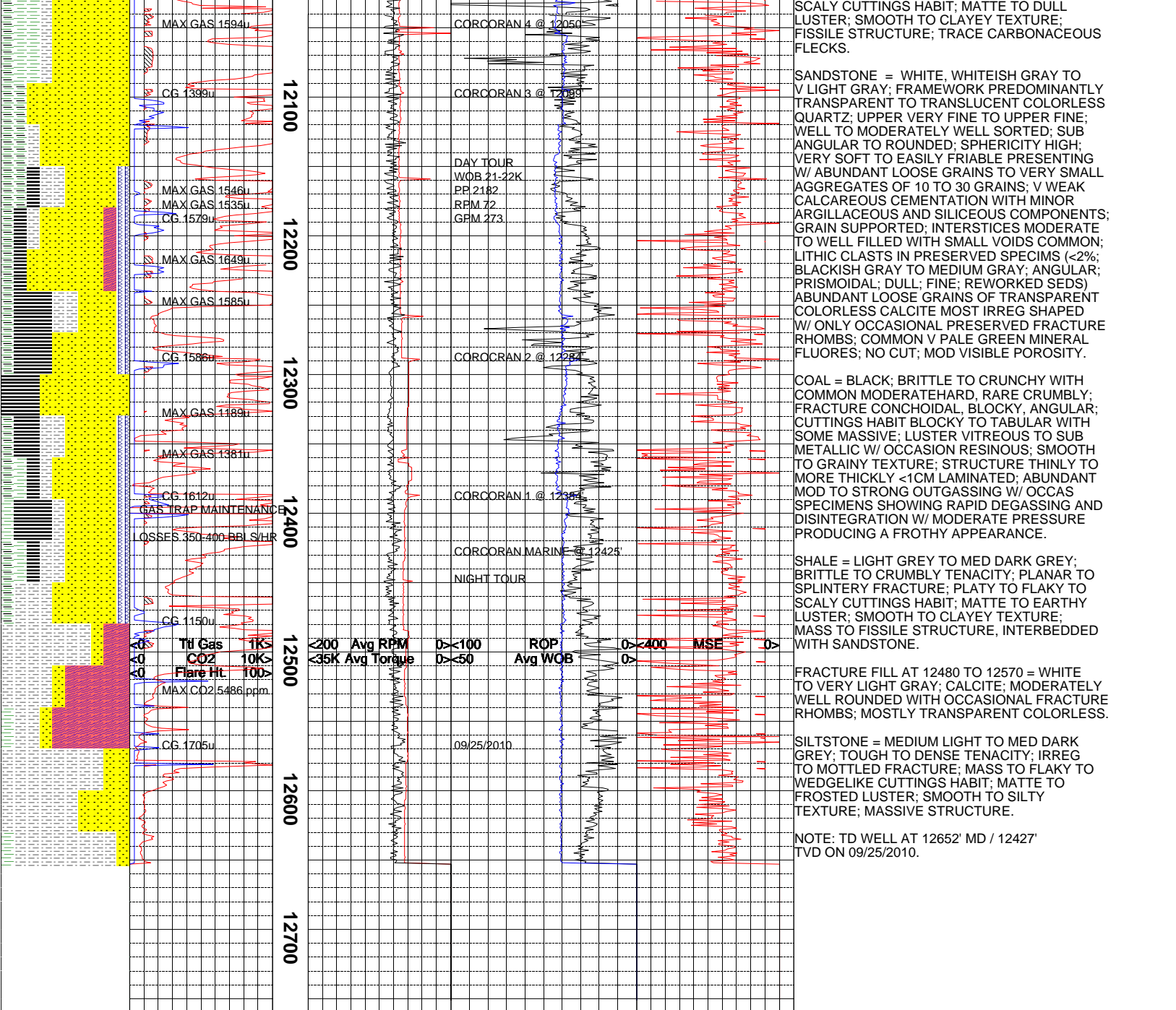
CARBONACEOUS SHALE = DUSKY YELLOWISH  
BROWN TO DUSKY BROWN, BROWNISH BLACK  
TO OLIVE BLK; TENACITY TOUGH TO BRITTLE;  
FRACTURE IRREGULAR TO HACKLY; CUTTINGS











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