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-297-11B1ST1
FIELD	PICEANCE CREEK
REGION	ROCKY MT
COORDINATES	LAT.39.879628000
	LON.108.240365000
ELEVATION	GL = 7126'
	KB = 7143'
COUNTY, STATE	RIO BLANCO CO. CO
API INDEX	051031137801
SPUD DATE	04/10/2009
CONTRACTOR	HELMERICH PAYNE
CO. REP.	RICKY T. OWENS
RIG/TYPE	FLEX 3
LOGGING UNIT	MLU038
GEOLOGISTS	GEORGE BAKER
	BRENDA MARSH
ADD. PERSONS	BILL JOHANNING
	DEVIN CLAAR
CO. GEOLOGIST	MICHAEL HOWELL

LOG INTERVAL

DEPTHS:	3,960'	TO	13,000'
DATES:	09/21/2009	TO	10/10/2009
SCALE:	1" = 100'		

MUD TYPES

LSND	TO	13,000'
	TO	
	TO	
	TO	

CASING DATA

16"	AT	130'
10.75"	AT	3,953'
7.00"	AT	9,006'
	AT	

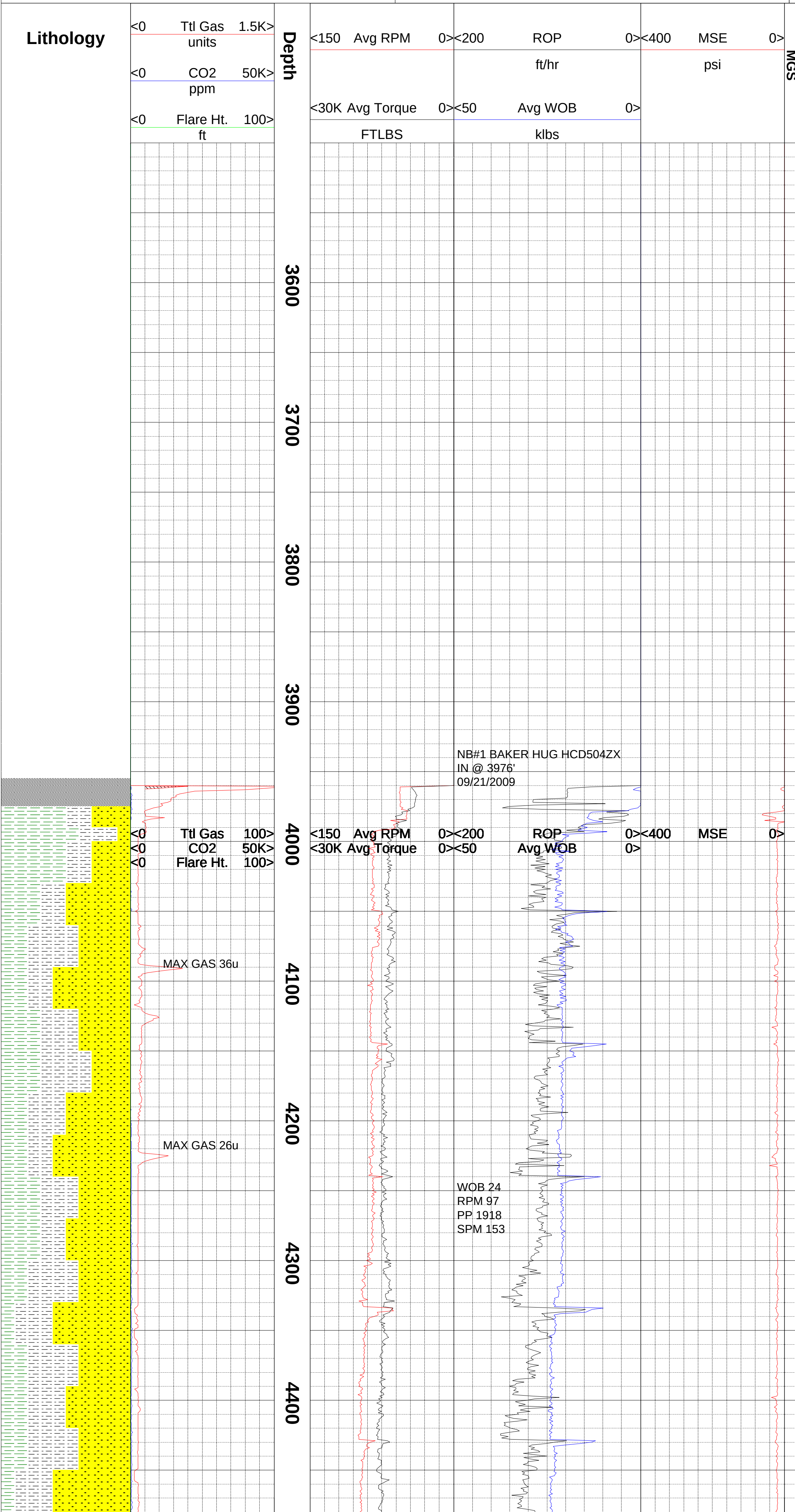
HOLE SIZE

9.875"	TO	8,976'
6.125"	TO	9,006'
6.125"	TO	13,000'
	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	



Remarks

Survey Data, Mud Reports, Other Info.

ALL ROCK COLORS ARE REFERENCED TO THE GSA ROCK COLOR CHART. ROCK CONSTITUENTS ARE DESCRIBED WET AND LISTED IN ORDER OF MOST ABUNDANT TO LEAST ABUNDANT. ALL SAMPLE DEPTHS ARE REFERENCED TO RKB.

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

CO2 IS CALIBRATED TO A TEST GAS COMPOSED OF 100000 PPM.

1 UNIT OF GAS = 200 PPM C-1 ME

CONNECTION GAS, TRIP GAS AND WIPER GAS ARE NOTED ON THE MUD LOG. FLARE HEIGHTS AND DEPTHS OF GAS BUSTER USEAGE ARE ALSO NOTED.

EARLY CONNECTION GASES REPRESENTING UP HOLE GAS INTERVALS BLEEDING INTO THE BOREHOLE ARE COMMON IN THE PRODUCTION INTERVAL.

EVIDENCE OF FRACTURE FILL IS NOTED ON THE LOG USING THE LITHOLOGY SYMBOL FOR METAMORPHICS. THE 10% DOES NOT REPRESENT 10% FRACTURE FILL IN SAMPLE. IT ONLY INDICATES THAT FRACTURE FILL HAS BEEN OBSERVED OVER THE INTERVAL.

SURVEY DATA @ 3968'
INC. 25.05
AZIMUTH: 187.66
TVD: 3704.15

EPOCH WELL SERVICES COMMENCED LOGGING OPERATIONS 09/21/2009 AT 14:00 @ 3960'.

DRILL TO 3986' AND PERFORM F.I.T.

SHALE = YELLOW; LIGHT GRAY; MOTTLED IN PART; FIRM; PLATY TO SLI FLAKY CUTTINGS; IRREGULAR FRACTURE; DULL EARTHY LUSTER; SMOOTH TO SILTY TEXTURE; MOD CALCAREOUS IN SILTY EXAMPLES; VARIABLE AMOUNTS OF SILT; NO VISIBLE STRUCTURE.

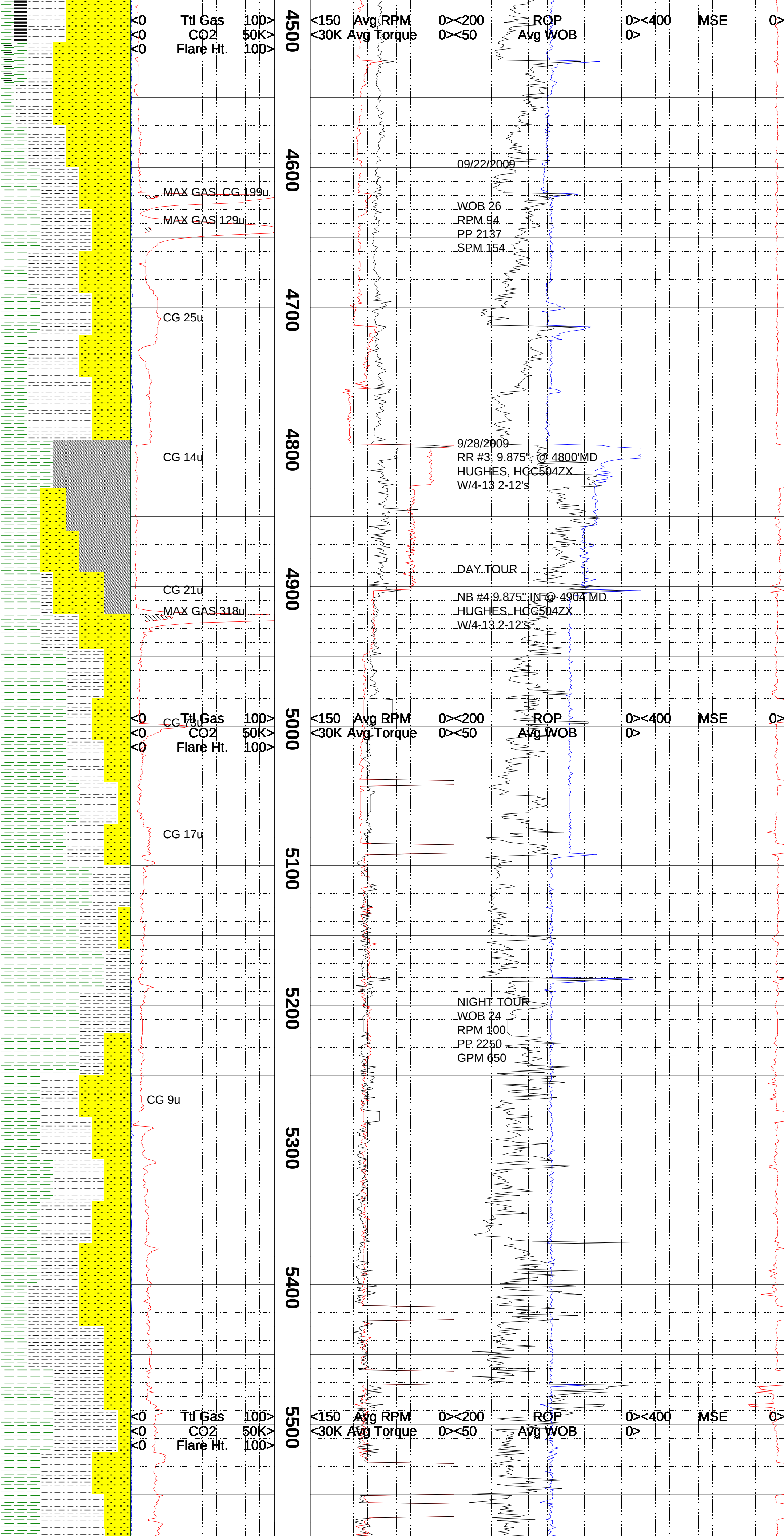
SANDSTONE = LIGHT YELLOWISH BROWN, LIGHT BLUISH GRAY, TRACES TRANSLUCENT QUARTZ GRAINS; UPPER VERY FINE TO UPPER FINE GRAIN; POOR TO FAIR SORTING; PREDOMINATELY SUB ANGULAR TO SUB ROUND ANGULARITY; LOW SHERICITY; TRACE FROSTED SURFACE FEATURES; EASILY FRIABLE TO SLIGHT FIRM; SILICIA MATRIX CEMENT, TRACE CLAY CEMENT; WEAK GRAIN SUPPORT; POOR VISUAL INTER GRANULAR POROSITY; SOME DARK LITHIC AND CARBON-ACEOUS SHALE IMBEDDED.

SILTSTONE = BROWN TO DARK BROWN, LIGHT BROWNISH GRAY; PULVERULENT TO CRUMBLY TENACITY; SUB BLOCKY TO BLOCKY FRACTURE; WEDGELIKE, SUB MASSIVE CUTTINGS HABIT; DULL EARTHY SLIGHT WAXY LUSTER; GRITTY TO SMOOTH TEXTURE; SEMI THICK STRUCTURE, GRADING TO SANDSTONE; TRACES BLACK LITHIC IMBEDDED.

SHALE = LIGHT GRAYISH RED, BROWNISH GRAY, LIGHT GRAY; CRUNCHY TO BRITTLE TENACITY; SUB BLOCKY, BLOCKY, IRREGULAR IN PART FRACTURE; TABULAR, SUB MASSIVE CUTTINGS HABIT; DULL, WAXY LUSTER; GRITTY, CLAYEY TEXTURE; SEMI MASSIVE THICK STRUCTURE; GRADING TO SILTSTONE.

SANDSTONE = TRANSLUCENT, LIGHT YELLOWISH BROWN, PALE GRAYISH ORANGE; LOWER TO UPPER FINE GRAIN; POOR TO FAIR SORTING; PREDOMINATELY SUB ROUNDED TRACE SUB ANGULAR; LOW TO MODERATE SPHERICIAL; POLISH TO FROSTED SURFACE FEATURES; EASILY FRIABLE TO FRIABLE; SILICA CEMENT; VERY WEAK GRAIN SUPPORTED; TRACES BLACK COAL IMBEDDED.

SILTSTONE = LIGHT GRAYISH BROWN, PALE YELLOWISH BROWN, LIGHT GRAYISH ORANGE;



PULVERULENT, CRUNCHY TENACITY, SUB BLOCKY, BLOCKY FRACTURE; ELONGATED, WEDGELIKE, SUB MASSIVE CUTTINGS HABIT; DULL, EARTHY, SLIGHT WAXY LUSTER; GRITTY, SILTY TEXTURE; SEMI MASSIVE, THICK STURCTURE; GRADING TO SANDSTONE; TRACES BLACK SPECKLED LITHIC IMBEDDED.

SANDSTONE = CLEAR TO TRANSLUCENT, LIGHT GRAYISH BLUE, OFF WHITE; QUARTZ FRAME-WORK; LOWER TO UPPER FINE GRAIN; FAIR TO WELL SORTED; PREDOMINATELY SUB ROUND TO ROUND ANGULARITY; MODERATE SPHERICITY; FROSTED TO POLISH SURFACE FEATURE; VERY FRIABLE TO FRIABLE; SOME SILICA MATRIX CEMENT, VERY WEAK GRAIN SUPPORT, GOOD VISUAL INTER GRANULAR POROSITY; BLACK SPECKLED COAL IMBEDDED.

SILTSTONE = DUSKY YELLOWISH, PALE YELLOWISH BROWN; PULVERULENT, CRUMBLY, SLIGHT BRITTLE TENACITY; EARTHY, SUB BLOCKY, IRREGULAR IN PART FRACTURE; WEDGELIKE, TABULAR CUTTINGS HABIT; DULL, RESINOUS LUSTER; GRITTY TO GRANULAR TEXTURE; SEMI MASSIVE THICK STRUCTURE; TRACES BLACK LITHIC IMBEDDED.

CEMENT = TIME DRILLING TO KICK OFF THE PCU 297-11B1ST1 FROM 4800' TO 4902' MD, KICK OFF INTO SHALE AND SANDSTONE FORMATIONS, VERY LOW GAS 2-4u.

SHALE = YLWISH GRY TO YLWISH BRWN; DENSE TO CRUNCHY TENACITY WITH SUB MASSIVE TO MASSIVE TO SUB TABULAR CUTTINGS HABIT; IRREGULAR TO HACKLY FRACTURE; DULL EARTHY TO SUB WAXY TEXTURE; BECOMING GRITTY AS GRADING TO DIRTY SILTSTONE; EARTHY TO WAXY LUSTER; COMMONLY INTERBEDDED WITH SILTS AND SANDS.

SILTSTONE = DUSKY YELLOWISH, PALE YELLOWISH BROWN; OCC UPPER FINE GRAINED CRUMBLY, OCC SLIGHTLY BRITTLE TENACITY; BECOMES EARTHY WHERE GRADING TO SHALE WEDGELIKE TO TABULAR SUB TABULAR CTTNGS HABIT; DULL RESINOUS LUSTER; OCC GRANULAR TEXTURE; TRACE BLACK LITHIC/ MAFIC FRAGMENTS.

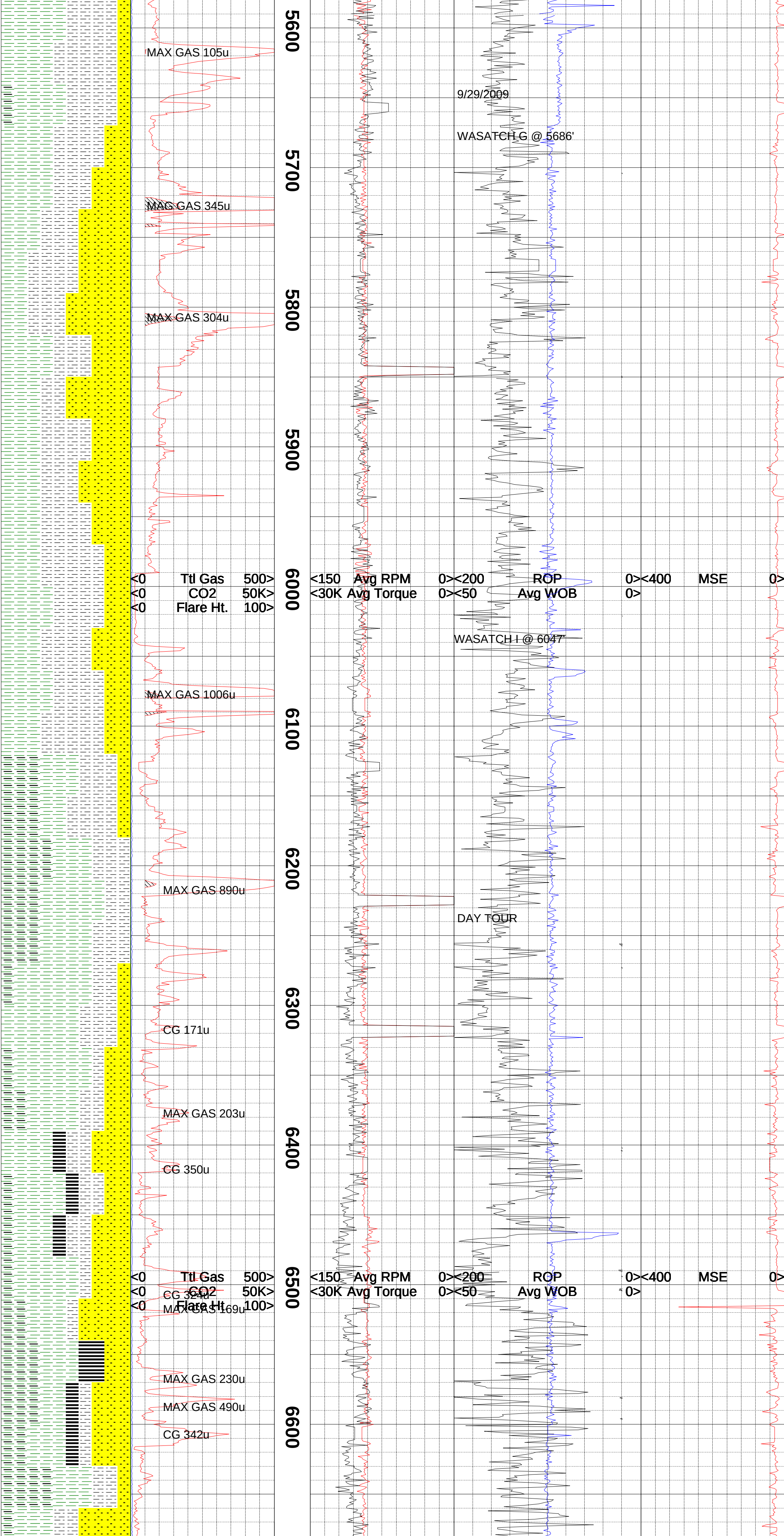
SANDSTONE = HUES OF YLWISH BRN, OFF WHT VERY LT GRY WITH SL YLW HUE; INDIVIDUAL GRAINS ARE TRANSPARENT TO OPAQUE; SUB ANGULAR TO SUB ROUND SME ROUND, WITH LOW TO MODERATE SPHERICITY; DOMINANTLY LOOSE IN SAMPLE TRAY; CONSOLIDATED CLUSTERS GRAIN SUPPORTED IN A CALC/CLAY CEMENT; MODERATE TO STRONG REACTION TO DILUTE HCL, SOME OCC FROSTING; EASILY FRIABLE; LOOSE GRAINS ARE MOST LIKELY A RESULT OF BIT ACTION; VERY SLIGHT INCREASE IN DITCH GAS; ACCESSORIES INCLUDE DARK LITHIC AND MAFIC FRAGMENTS LESS THEN 5%.

SHALE = DULL YELLOWISH BROWN, LIGHT GRAYISH BROWN, LIGHT GRAY; CRUMBLY IN PART, TRACE SLIGHT BRITTLE TENACITY; EARTHY, SUB BLOCKY, IRREGULAR IN PART FRACTURE; SOME WEDGELIKE, SUB TABULAR TO TABULAR CUTTINGS HABIT; DULL, RESINOUS LUSTER, SILTY GRADING TO GRITTY TEXTURE; SUB THIN STRUCTURE; TRACES IN SAMPLE GRADING TO VERY FINE SILTSTONE.

SANDSTONE = CLEAR TO TRANSLUCENT LOOSE GRAINS, OFF WHITE TO LIGHT BLUISH GRAY CLUSTERS; UPPER VERY FINE TO LOWER FINE GRAIN; FAIR TO WELL SORTED; PREDOMINATELY SUB ROUNDED LOOSE GRAINS, SUB ANGULAR GRAINS IN CLUSTERS; MODERATELY SPHERICITY; FROSTED IN PART; SLIGHTLY MODERATELY FIRM TO FIRM; CALCITE CEMENT, WEAK HCL REACTION; TRACES SILTSTONE AND SHALE INTERBEDDED; FAIR TO GOOD VISUAL INTER GRANULAR POROSITY.

SILTSTONE = LIGHT YELLOWISH BROWN, MODERATED PALE BROWN; CRUNCHY, SOME BRITTLE TENACITY; SUB BLOCKY, BLOCKY IN PART; FRACTURE; WEDGELIKE, SUB TBULAR CUTTINGS HABIT; SLIGHT RESINOUS LUSTER; GRITTY TO SILTY TEXTURE; TRACE SILTSTONE WITH SHALE INTERBEDDED.

SHALE = PALE YELLOWISH BROWN, LIGHT YELLOWISH GRAY, SOME LIGHT GREENISH GRAY; PULVRULENT, SOME CURMBLY TO BRITLE TENACITY; SUB BLOCKY, BLOCKY FRACTURE; TABULAR, SUB MASSIVE TO MASSIVE CUTTINGS HABIT; DULL EARTHY SLIGHT WAXY LUSTER; CLAYEY TO SMOOTH TEXTURE; SUB MASSIVE STRUCTURE; TRACE SILTSTONE IMBEDDED.



SHALE = DARK DUSKY BROWN, VERY DUSKY RED OCCASIONALLY BRWN WITH GRYISH HUES. PREDOMINATELY FIRM TO MODERATELY HARD; SUB BLOCKY, BLOCKY WITH SLIGHT IRREGULAR FRACTURE; PLATY WEDGELIKE CUTTINGS HABIT; DULL EARTHY TO RESINOUS LUSTER; GRITTY TO SLIGHTLY SMOOTH TEXTURE; NON CALCAROUS, TRACE BLACK LITHIC / COAL IMBEDDED.

WASATCHA G 5710' MD 5320' TVD

SANDSTONE = ABUNDANT LOOSE GRAINS, CLEAR TO TRANSLUCENT, OFF WHITE, LIGHT BLUISH GRAY CLUSTERS; UPPER VERY FINE TO FINE GRAIN; FAIR TO WELL SORTED; ANGULAR TO SUBANGULAR, SILICA MATRIX CEMENT, TRACE CALCAREOUS CEMENT, TRACE BLACK GRAINS, GOOD VISUAL INTERGRANULAR POROSITY, TRACE CALCITE CRYSTALS.

SILTSTONE = LIGHT REDDISH BROWN, LIGHT BROWN, DUSKY BROWN IN PART; CRUNCHY, TO BRITTLE TENACITY; PREDOMINATELY SUB BLOCKY, SOME BLOCKY FRACTURE; WEDGELIKE TO SUB MASSIVE CUTTINGS HABIT; DULL, RESINOUS LUSTER; GRITTY, SLIGHTLY SMOOTH TEXTURE, TRACE PRYITIC IMBEDDED, SLIGHT GRADING TO SANDSTONE.

SANDSTONE = TRACES LOOSE GRAINS ON BOTTOM OF TRAY, CLEAR TO TRANSLUCENT, SUB ROUNDED; BLUISH OFF WHITE TO OFF WHITE CLUSTERS, UPPER VERY FINE TO FINE GRAIN, PREDOMINATELY SUB ANGULAR, CALCAREOUS CEMENT; TRACE FROSTED SURFACE FEATURES; FIRM FRIABLE TO MODERATELY HARD; SOME FIRM GRAIN SUPPORT; POOR TO FAIR VISUAL INTER GRANULAR POROSITY; TRACE BLACK LITHIC / CARBONACEOUS SHALE IMBEDDED; SOME INCREASED GAS LEVEL.

WASATCH I @ 6060' MD

CARBONACEOUS SHALE = DARK BROWN, DARK BROWNISH BLACK, MODERATELY FIRM TO FIRM, CRUMBLY IN PART; SUB BLOCKY, BLOCKY FRACTURE; DULL EARTHY LUSTER; ROUGH TEXTURE; TRACE GAS BUBBLES IN SAMPLE TRAY; TRACE BLACK SPECKLED LITHIC IMBEDDED.

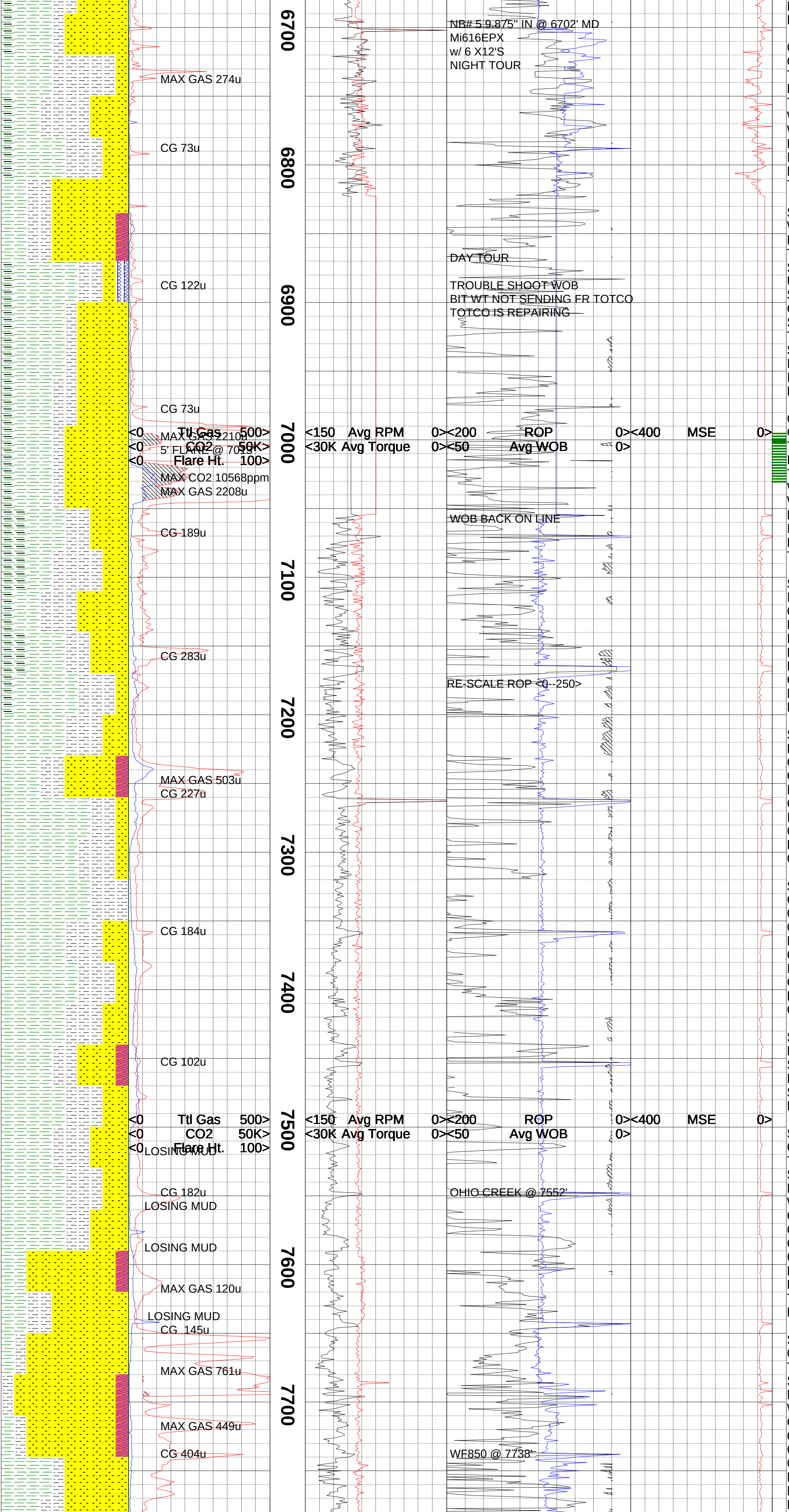
SILTSTONE = MEDIUM LIGHT REDISH BROWN, LIGHT GRAYISH BROWN; CRUNCHY, CRUMBLY TENACITY; PREDOMINATELY SUB BLOCKY, BLOCKY FRACTURE; WEDGELIKE, SUB TABULAR CUTTINGS HABIT; EARTHY, DULL, RESINOUS LUSTER; GRITTY SMOOTH TEXTURE; SUB THICK STRUCTURE; TRACES BLACK LITHIC / CARBONACEOUS SHALE IMBEDDED.

CARBONACEOUS SHALE = DARK GRY, BLACK, OCC DARK BRWN; CRUNCHY TO BRITTLE TENACITY; SUB TAB TO SUB WEDGELIKE / ELONGATED CUTTINGS HABIT WITH IRREGULAR TO HACKLY FRACTURE; PLANAR FRACTURE WITH PLATY CUTTINGS; DULL EARTHY TO SUB WAXY OCC SUB VITREOUS LUSTER WITH EARTHY TO SMOOTH TEXTURE; SL INCREASE IN DITCH GAS ON OCCASION.

COAL = DARK BLACK, BLACK, VERY DARK BRWN WHERE GRADING FROM CARBONACEOUS SHALE TO COAL; DENSE TO BRITTLE TENACITY WITH IRREGULAR TO HACKLY FRACTURE; SUB TABULAR TO SUB WEDGELIKE CUTTINGS HABIT; SLIGHTLY PYRITIC IN PLACES; DULL EARTHY TO SUB VITREOUS LUSTER WITH SMOOTH TO SUB GLASSY TEXTURE; OCC EARTHY IN PLACES; VISIBLE DEGASSING IN SAMPLE TRAY; OCC INCREASE IN DITCH GAS.

SANDSTONE = LT GRY, OFF WHT, GRY; INDIVIDUAL GRAINS ARE TRANSPARENT TO OPAQUE; SUB ANGULAR TO SUB ROUND; LOW TO OCC MODERATE SPHERICITY; OVERALL MODERATELY TO WELL SORTED; UPPER FINE TO FINE GRAINED OCC UPPER MEDIUM GRAINED; DMINANTLY CONSOLIDATED; CLUSTERS ARE GRAIN SUPPORTED IN A CALC/CLAY CEMENT MODERATE TO STRONG REACTION TO DILUTE HCL; SLIGHT TO MODERATE INCREASE IN DITCH GAS; ACCESSORIES INCLUDE DARK LITHIC AND MAFIC FRAGMENTS 3% - 5%.

COAL = DARK BLACK, BLACK, VERY DARK BRWN WHERE GRADING FROM CARBONACEOUS SHALE TO COAL; DENSE TO BRITTLE TENACITY WITH IRREGULAR TO HACKLY FRACTURE; SUB TABULAR TO SUB WEDGELIKE CUTTINGS HABIT; SLIGHTLY PYRITIC IN PLACES; DULL EARTHY TO SUB VITREOUS LUSTER WITH SMOOTH TO SUB GLASSY TEXTURE; OCC EARTHY IN PLACES; VISIBLE DEGASSING IN IN SAMPLE TRAY.



NOTE: TOH @ 6702' TO CHANGE OUT BHA AND LAY DOWN SHLUMBERGER'S TOOLS. 09-29-09.

CARBONACEOUS SHALE = DARK BRWN, BLACK, OCC DARK GRY; CRUNCHY TO BRITTLE TENACITY; SUB TAB TO SUB WEDGELIKE / ELONGATED CUTTINGS HABIT WITH IRREGULAR TO HACKLY FRACTURE; PLANAR FRACTURE WITH PLATY CUTTINGS; DULL EARTHY TO SUB WAXY OCC SUB VITREOUS LUSTER WITH EARTHY TO SMOOTH TEXTURE; SL PYRITIC IN PLACES; OCC COAL LAMINAE AND LENSES; VISIBLE DEGASSING IN SAMPLE TRAY IN PLACES.

SANDSTONE = WHT, OFF WHT, LT GRY, GRY WITH OCC HUES OF LT BRWN, GRY; DOMINANTLY LOOSE TRANSPARENT TO TRANSLUCENT GRAINS IN TRAY; ROUND TO SUB ROUND; HIGH SPHERICITY; WELL SORTED; UPPER MEDIUM TO LOWER FINE GRAINED IN SIZE; APPEARS BI-MODAL AS CONSOLIDATED CLUSTER ARE FINER GRAINED; MODERATELY SORTED; FINE TO UPPER FINE GRAINED; LOW TO MODERATE SPHERICITY; SUB ANGULAR TO SUB ROUND; CLUSTERS ARE GRAIN SUPPORTED IN A CALC/CLAY MATRIX; ACCESSORIES INCLUDE DARK LITHIC AND MAFIC FRAGMENTS; LOOSE CALCITE GRAINS IN SAMPLE TRAP.

CARBONACEOUS SHALE = DARK BRWN, BLACK, OCC DARK GRY; CRUNCHY TO BRITTLE TENACITY; SUB TAB TO SUB WEDGELIKE / ELONGATED CUTTINGS HABIT WITH IRREGULAR TO HACKLY FRACTURE; PLANAR FRACTURE WITH PLATY CUTTINGS; DULL EARTHY TO SUB WAXY OCC SUB VITREOUS LUSTER WITH EARTHY TO SMOOTH TEXTURE; SL PYRITIC IN PLACES; OCC COAL LAMINAE AND LENSES; VISIBLE DEGASSING IN SAMPLE TRAY IN PLACES.

SANDSTONE = LT GRY, OFF WHT, GRY; INDIVIDUAL GRAINS ARE TRANSPARENT TO OPAQUE; SUB ANGULAR TO SUB ROUND; LOW TO OCC MODERATE SPHERICITY; OVERALL MODERATELY TO WELL SORTED; UPPER FINE TO FINE GRAINED OCC UPPER MEDIUM GRAINED; DOMINANTLY CONSOLIDATED; CLUSTERS ARE GRAIN SUPPORTED IN A CALC/CLAY CEMENT MODERATE TO STRONG REACTION TO DILUTE HCL; SLIGHT TO MODERATE INCREASE IN GAS.

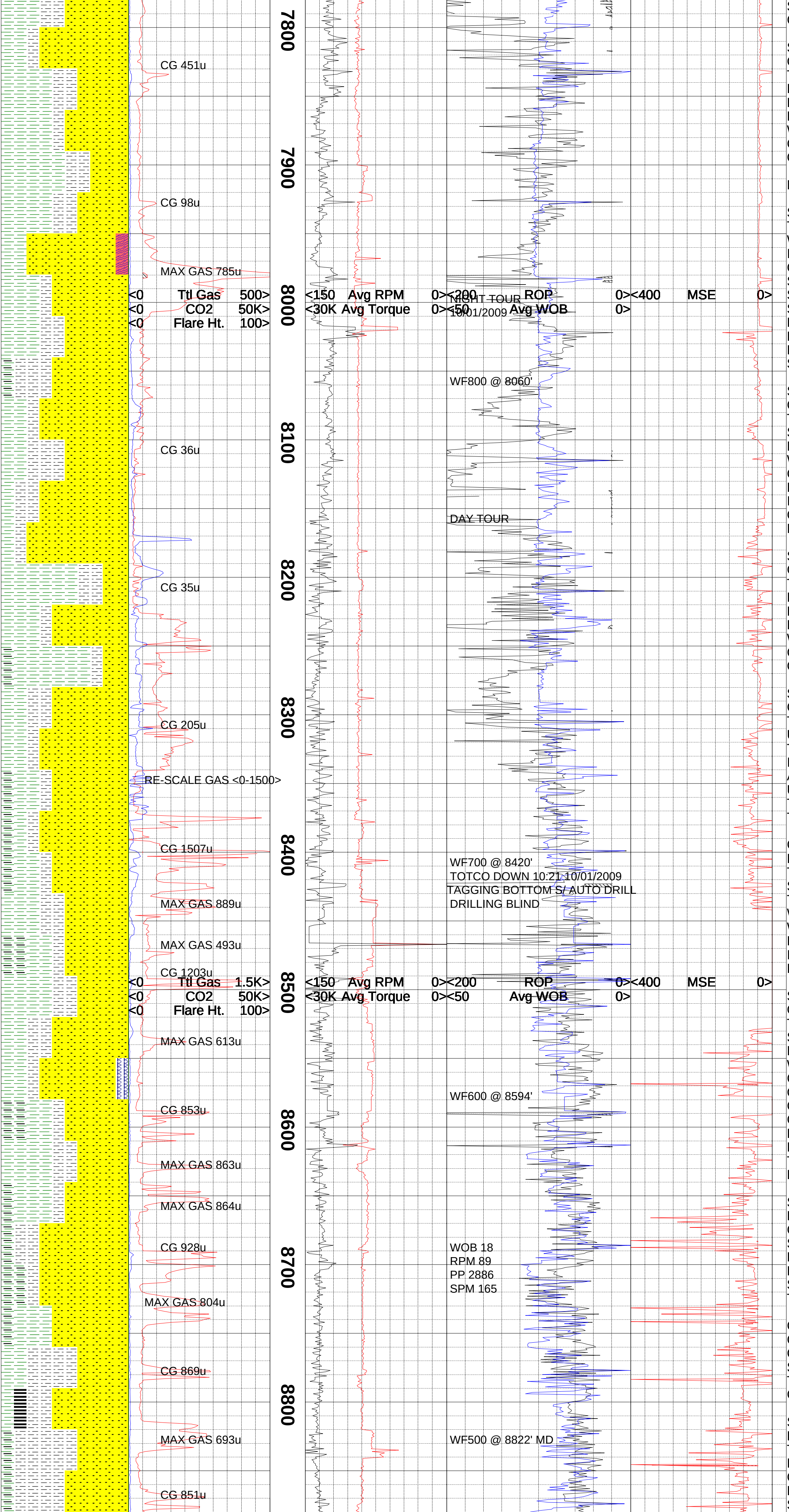
SHALE = GRY, DARK GRY, GRY WITH HUES OF BRWN, BRWNISH YLW IN PLACES; FIRM TO CRUNCHY TENACITY; SUB TABULAR TO TABULAR OCC WEDGELIKE CUTTINGS HABIT; DULL EARTHY TO WAXY LUSTER WITH SMOOTH TO CLAYEY/EARTHY TEXTURE; GRADES TO AND INTERBEDDED WITH SILTSTONE; TRACE CARBONACEOUS SHALE LESS THEN 5% OFTEN PYRITIC AND DEGASSING IN SAMPLE TRAY. OCC LAMINATIONS.

SHALE = GRY, DARK GRY, GRY WITH HUES OF GRN, BRWNISH YLW IN PLACES; FIRM TO CRUNCHY TENACITY; SUB TABULAR TO TABULAR OCC WEDGELIKE CUTTINGS HABIT; DULL EARTHY TO WAXY LUSTER WITH SMOOTH TO CLAYEY/EARTHY TEXTURE; GRADES TO AND INTERBEDDED WITH SILTSTONE; TRACE CARBONACEOUS SHALE LESS THEN 5% OFTEN PYRITIC AND DEGASSING IN SAMPLE TRAY; OCC LAMINATIONS.

SILTSTONE = LT GRY, MED GRY OCC REDDISH BRWN; FIRM TO CRUMBLY TENACITY WITH SL PLATY TO SUB TABULAR OCC FLAKY CTTNGS HABIT; SL SPARKLING LUSTER WITH SILTY TO SUB GRITTY TEXTURE; SL TO MODERATELY MICACEOUS; OCC GRADES TO SANDSTONE.

SANDSTONE = VERY LT GRY, OFF WHT, SME GRNISH GRY; INDIVID GRAINS ARE TRANSP TO OPAQUE; LOWER FINE TO FINE GRAINED; SUB ANGULAR TO SUB ROUND WITH LOW TO MODERATE SPHERICITY; OVERALL MODERATELY WELL TO WELL SORTED; OCCASSIONAL GREEN GRAINS INDICATING POSS CHLORITIZATION; OVERALL DOMINANTLY CONSOLIDATED; CLUSTERS ARE GRAIN SUPPORTED IN A CALC/ CLAY MATRIX OCC SL SILICEOUS; STRONG REACTION TO DILUTE HCL; ACCESSORIES INCL DARK LITHIC AND MAFIC FRAGMENTS LESS THAN 5%. SLIGHT TO HIGH INCREASE IN DITCH GAS.

SANDSTONE = VERY LT GRY, OFF WHT, SME GRNISH GRY; INDIVID GRAINS ARE TRANSP TO OPAQUE; FINE TO UPPER FINE GRAINED; SUB ANGULAR TO SUB ROUND WITH LOW TO MODERATE SPHERICITY; OVERALL MODERATELY WELL TO WELL SORTED; OCCASIONAL GREEN GRAINS INDICATING POSS CHLORITIZATION; OVERALL DOMINANTLY CONSOLIDATED; CLUSTERS ARE GRAIN SUPPORTED IN A CALC/ CLAY MATRIX OCC SL SILICEOUS; STRONG REACTION TO DILUTE HCL; ACCESSORIES INCL DARK LITHIC AND MAFIC FRAGMENTS 5-10% MODERATE TO HIGH INCREASE IN DITCH GAS



SOME LOOSE CALCITE CRYSTALS; TRACE CHERT.

SHALE = GRNISH GRY, GRY, BRWN WITH HUES OF PURP, BRWN; LT BRWN; STIFF TO CRUNCHY TENACITY WITH SUB WEDGELIKE TO SUB ELONGATED CUTTINGS HABIT; IRREGULAR TO HACKLY FRACTURE SL SPLINTERY IN PLACES; EARTHY TO SMOOTH WAXY TEXTURE WITH WAXY/GREASY TO DULL LUSTER; OCC CARBONACEOUS IN PLACES; SOME LAMINAE AND OCC LENSES; DOMINANTLY NON FISSILE.

NOTE: WIPER TRIP @ 8020' MD

SANDSTONE = ABUDUNT LOOSE CLEAR TO TRANSLUCENT GRAINS, SMALL WHITE, OFF WHITE CLUSTERS WITH BLACK LITHIC IMBEDDED; VERY FINE TO LOWER FINE GRAIN; FAIR SORTED; SUB ANGULAR TO SUB ROUND ANGULARITY; SOME FROSTED SURFACE FEATURES; FRIABLE, FIRM TO SLIGHTLY HARD; CALCITIC CEMENT, MODERATE HCL REACTION; TRACE WHITE KAOLIN MATRIX; FAIR TO GOOD VISUAL INTER GRANULAR POROSITY, TRACE OF COARSE CALCITE IN SAMPLE TRAY.

SANDSTONE = VERY LT GRY, OFF WHT, SME GRNISH HUES; INDIVID GRAINS ARE TRANSP TO OPAQUE; UPPER MEDIUM TO FINE GRAIN; SUB ANGULAR TO SUB ROUND WITH LOW TO MODERATE SPHERICITY; OVERALL MODERATELY WELL TO WELL SORTED; OCCASIONAL GREEN GRAINS INDICATING POSS CHLORITIZATION; DOMINANTLY UNCONSOLIDATED AND LOOSE IN SAMPLE TRAY; OCCASIONAL CLUSTERS ARE GRAIN SUPPORTED IN A CALC/CLAY MATRIX; MODERATELY TO EASILY FRIABLE.

SHALE = GRNISH GRY, GRY, BRWN WITH HUES GRY, DRK BRWN; LT BRWN; STIFF TO CRUNCHY TENACITY WITH SUB WEDGELIKE TO SUB ELONGATED CUTTINGS HABIT; IRREGULAR TO HACKLY FRACTURE SL SPLINTERY IN PLACES; EARTHY TO SMOOTH WAXY TEXTURE WITH WAXY/GREASY TO DULL LUSTER; OCC CARBONACEOUS IN PLACES; SOME LAMINAE AND OCC LENSES; OVERALL LOW FISSILITY.

SANDSTONE = WHT TO TRANSPARENT OCC LT GRY; ABUNDANT LOOSE GRAINS IN SAMPLE TRAY; OCCASIONAL CLUSTERS BUT DOMINANTLY UNCONSOLIDATED; INDIVIDUAL GRAINS ARE TRANSPARENT OR TRANSLUCENT, OPAQUE IN PLACES, BUT RARE; SUB ROUND TO SUB ANGULAR WITH MODERATE SPHERICITY; UPPER MEDIUM TO FINE GRAINED; MODERATELY TO WELL SORTED; SOME FROSTING; MODERATE TO HIGH INCREASE IN DITCH GAS.

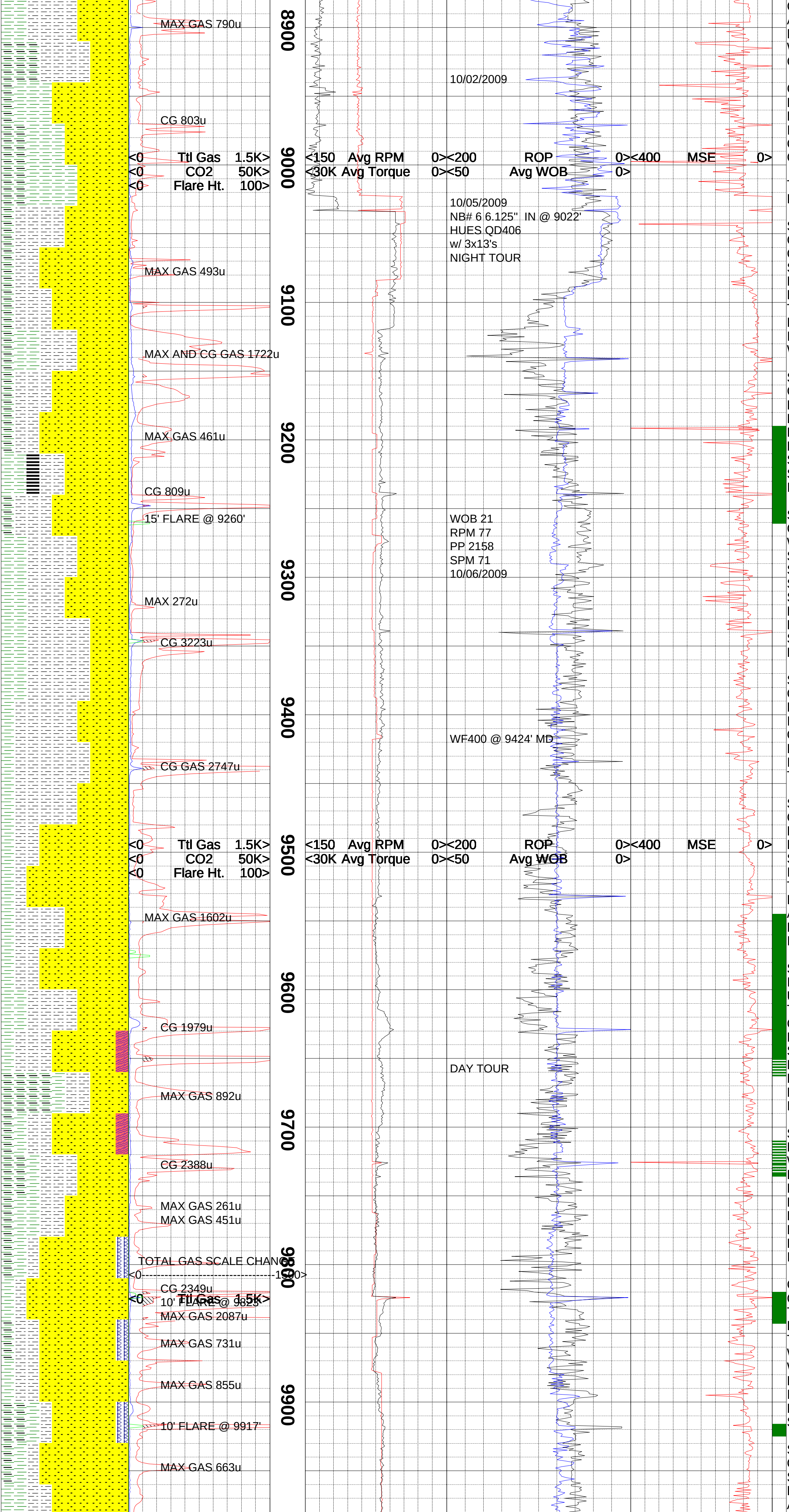
CARBONACEOUS SHALE = DARK BRWN, BLACK, BRWN WITH BLACK HUES; CRUNCHY TO BRITTLE TENACITY; SUB WEDGELIKE/ WEDGELIKE TO SUB TABULAR CTTNGS HABIT WITH IRREGULAR TO HACKLY FRACTURE; PLANAR FRACTURE WITH PLATY CUTTINGS; DULL EARTHY TO SUB WAXY OCC SUB VITREOUS LUSTER WITH EARTHY TO SMOOTH TEXTURE; SL PYRITIC IN PLACES; OCC COAL LAMINAE AND LENSES.

SANDSTONE = WHT, OFF WHT, VERY LT GRY OCC GRY; INDIVID GRAINS ARE TRANSP TO OPAQUE; FINE TO UPPER FINE GRAINED; SUB ANGULAR TO SUB ROUND WITH LOW TO MODERATE SPHERICITY; OVERALL MODERATELY WELL TO WELL SORTED; OCCASIONAL BLACK CARBONACEOUS MATERIAL LENSES / LAMINAE; OVERALL DOMINANTLY CONSOLIDATED; CLUSTERS ARE GRAIN SUPPORTED IN A CALC/ CLAY MATRIX OCC SL SILICEOUS; STRONG REACTION TO DILUTE HCL; ACCESSORIES INCL DARK LITHIC AND MAFIC FRAGMENTS LESS THAN 5%; MODERATE TO HIGH INCREASE IN DITCH GAS.

SILTSTONE = LIGHT GREENISH BLUE GRAY, LIGHT BLUISH GRAY, LIGHT GRAY; CRUMBLY, CRUNCHY TRACE BRITTLE TENACITY; SPLINTERY, SUB BLOCKY, BLOCKY FRACTURE; ELONGATED, WEDGELIKE TO PLAYT CUTTINGS HABIT; DULL, RESINOUS LUSTER; GRITTY TO SILTY TEXTURE; THIN STRUCTURE, GRADING TO VERY FINE SANDSTONE.

COAL = BLACK, DARK BROWNISH BLACK; CRUMBLY TENACITY; SUB BLOCKY; PLATY CUTTING HABIT; VITREOUS LUSTER; FISSILE STRUCTURE, DEGASSING IN SAMPLE TRAY, TRACE COAL IMBEDDED IN SANDSTONE CLUSTERS.

SANDSTONE = WHITE, OFF WHITE, BLUISH LIGHT GRAY, SOME LOOSE GRAINS CLEAR TRANSLUCENT TO OPAQUE; UPPER VERY FINE TO FINE GRAIN; FAIR TO WELL SORTED; CLUSTERS ARE SUB ANGULAR TO SUB ROUNDED; LOOSE GRAINS MODERATELY SPHERICITY; SOME FROSTED SURFACE FEATURES;



CONSOLIDATED IN PART, FRIABLE TO MODERATE FIRM; PREDOMINATELY SILICEOUS MATRIX CEMENT, TRACE CALCAREOUS CEMENT; WEAK HCL REACTION; DISSEMINATED BLACK CARBONACEOUS SHALE IMBEDDED.

CARBONACEOUS SHALE = DARK GRAYISH BROWN, DUSKY BROWN; CRUMBLY TO BRITTLE TENACITY; SUB BLOCKY, SLIGHTLY IRREGULAR FRACTURES; SUB TABULAR CUTTINGS HABIT; DULL, EARTHY LUSTER; GRITTY TEXTURE; SUB MASSIVE STRUCTURE.

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SANDSTONE = LIGHT GRAY, OFF WHITE, GRAYISH WHITE; LOWER FINE TO MEDIUM GRAIN; PREDOMINATELY FAIR SORTING; SUBANGULAR TO SUBROUND ANGULARITY; LOW SPHERICITY; EASILY FRIABLE TO FRIABLE; PREDOMIATELY CALCITE CEMENT; TRACES CALCITE CRYSTALS IN FRACTURES; BLACK LITHIC AND CARBONACEOUS SHALE IMBEDDED; HIGHER GASES ASSOCIATED WITH SANDSTONE.

SILTSTONE = MODERATE LIGHT GRAY, LIGHT GRAY, TRACE DARK GREENISH GRAY; FIRM, HARD TO OCCASIONAL VERY HARD; SUB BLOCKY, BLOCKY IN PART, SOME IRREGULAR FRACTURE; TABULAR, PLATY CUTTINGS HABIT; DULL WAXY LUSTER; GRITTY, TO SLIGHTLY SMOOTH TEXTURE; TRACE SANDSTONE AND SHALE IMBEDDED; LOWER GASES OBSERVED IN SILTSTONE.

SANDSTONE = OFF WHITE, LIGHT BLUISH GRAY, LIGHT GRAYISH WHITE; SPECKLED WITH BLACK LITHIC AND CARBONACEOUS SHALE; LOWER TO MEDIUM FINE GRAIN; SOME POOR TO PREDOMINATE FAIR SORTING; SUB ANGULAR TO SUBROUND, LOW SPHERICITY; TRACE FOSTED SURFACE FEATURE FIRM FRIABLE TO MODERATELY HARD; PREDOMINATELY CALCAREOUS CEMENT, SOME SILICA MATRIX CEMENT; TRACE BLACK COAL LAMINATION; HIGH LEVELS OF GAS SHOWS.

SILTSTONE = MODERATE DARK GRAY, LIGHT GRAY, MEDIUM BLUISH GRAY; BRITTLE TO DENSE; SUB BLOCKY, BLOCKY SLIGHT IRREGULAR FRACTURES; TRACE CALCAREOUS CEMENT; PLATY TO WEDGELIKE CUTTINGS HABIT; DULL, RESINOUS LUSTER, TRACE MICA IMBEDDED; GRITTY TO SILTY TEXTURE; TRACES VERY FINE SANDSTONE IMBEDDED.

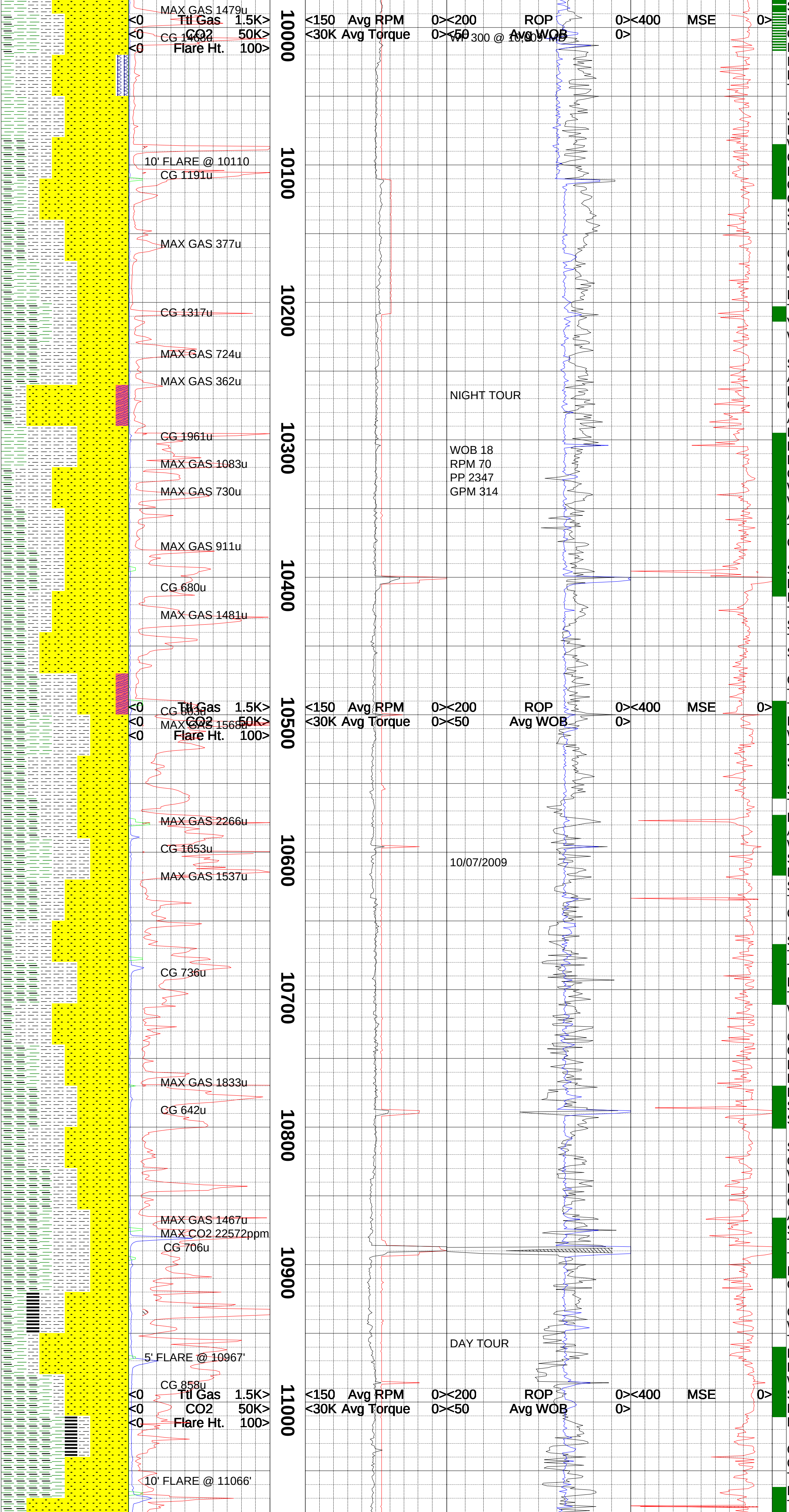
SANDSTONE = ABUDENT LOOSE GRAINS, OFF GRAYISH WHITE, UPPER VERY FINE TO LOWER FINE GRAIN; POOR TO FAIR SORTING; PREDOMINATELY SUBANGULAR, SOME SUB ROUND, VERY LOW SPHERICITY; FROSTED IN PART SURFACE FEATURES; EASILY FRIABLE TO FRIABLE POSSIBLE DUE TO PDC BIT; PREDOMINATELY SILICA CEMENT, TRACE KAOLIN AND CALCAREOUS CEMENT; DISSEMINATED BLACK LITHIC AND CARBONACEOUS SHALE IMBEDDED.

SANDSTONE = VERY LT GRY TO OFF WHT; INDIVIDUAL GRAINS ARE TRANSL TO OPAQUE; UPPER FINE TO VERY FINE GRAINED WITH LOW TO OCC MODERATE SPHERICITY; DOMINANTLY CONSOLIDATED CLUSTERS; FIRM AND MODERATELY FRIABLE; OVERALL GRAIN SUPPORTED IN A CALC/CLAY MATRIX; MODERATE TO STRONG REACTION TO DILUTE HCL; ACCESSORIES INCLUDE DARK LITHIC AND MAFIC FRAGMENTS 3-5%; SLIGHT TO HIGH INCREASE IN DITCH GAS.

SHALE = GRY, BRWNISH GRY, OCC DARK GRY; DENSE TO STIFF TENACITY WITH SUB WEDGELIKE TO SUB TABULAR CUTTINGS HABIT; DARK CARBONACEOUS FOSSILIZED IMPRINTS OF PLANT MATERIAL; IRREGULAR TO SUB PLANAR FRACTURE; DULL TO SUB WAXY LUSTER WITH EARTHY TO SMOOTH TEXTURE; CARBONACEOUS LAMINATIONS AND LENSES; SL PYRITIC IN PLACES; GRADES TO CARBONACEOUS SHALE IN PLACES; NO REACTION TO DILUTE HCL.

CARBONACEOUS SHALE = DARK BRWN, BLACK, OCC DARK GRY; CRUNCHY TO BRITTLE TENACITY; SUB TAB TO SUB WEDGELIKE / ELONGATED CUTTINGS HABIT WITH IRREGULAR TO HACKLY FRACTURE; PLANAR FRACTURE WITH PLATY CUTTINGS; DULL EARTHY TO SUB WAXY OCC SUB VITREOUS LUSTER WITH EARTHY TO SMOOTH TEXTURE; SL PYRITIC IN PLACES; OCC COAL LAMINAE AND LENSES; GRADES TO AND INTERBEDDED WITH SHALE AND SILTSTONE.

SANDSTONE = TRANSLUCENT TO TRANSPARENT OFF WHT; DOMINANTLY LOOSE GRAINS IN SAMPLE TRAY; MOST LIKELY A RESULT OF BIT ACTION; INDIVIDUAL GRAINS ARE SUB ANGULAR TO SUB ROUND WITH MODERATE



SPHERICITY; MODERATELY TO WELL SORTED FINE TO UPPER FINE GRAINED; OCC CONSOLIDATED CLUSTER ARE GRAIN SUPPORTED IN A CALC/CLAY CEMENT. SLIGHT TO HIGH INCREASE IN DITCH GAS; SL TO STRONG REACTION TO DILUTE HCL; VERY CLEAN; LESS THEN 1% ACCESSORY MINERALS.

SILTSTONE = DARK GRY; GRY; GRY WITH HUES OF BRWN; HARD TO DENSE TENACITY WITH MASSIVE TO TABULAR/SUB TABULAR CUTTINGS HABIT; IRREGULAR TO HACKLY FRACTURE; SPARKLY TO DULL LUSTER WITH GRITTY TO SILTY TEXTURE; COMMON CARBONACEOUS LAMINAE OCC APPEARS SLICKENSIDAL; COMMONLY INTERBEDDED WITH SANDSTONE.

CARBONACEOUS SHALE = DARK BRWN, BLACK, OCC DARK GRY; CRUNCHY TO BRITTLE TENACITY; SUB TAB TO SUB WEDGELIKE / ELONGATED CUTTINGS HABIT WITH IRREGULAR TO HACKLY FRACTURE; DULL EARTHY TO SUB VITREOUS LUSTER OCC GREASY; EARTHY TO WAXY SMOOTH TEXTURE.

SANDSTONE = CLEAR TO WHITE WITH A TRACE AMOUNT OF DARK LITHICS GIVING A SALT AND PEPPERED APPERANCE; MIXTURE OF SMALL CLUSTERS AND LOOSE INDIVIDUAL GRAINS; ALSO PRESENT WERE LOOSE CALCITE AND HEXAHEDRON QUARTZ CRYSTALS AS POSSIBLE FRACTURE FILL; CLUSTERS WERE HIGHLY REACTIVE TO DILUTE HCL AND HAD A CALCITE CEMENTATION; FINE TO UPPER FINE GRAINED WHEN IN CLUSTERS; MEDIUM TO FINE GRAINED WHEN LOOSE; FAIR TO WELL SORTING; SUB-ANGULAR TO ANGULAR; MODERATE SPHERICITY; TRACE AMT OF COAL IN SAMPLE TRAY MAY BE CAVINGS.

SILSTONE = DARK GRAY TO BROWNISH GRAY TO BROWNISH BLACK; TOUGH TO DENSE TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO TABULAR CUTTINGS HABIT; DULL TO SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; THINLY INTERBEDDED WITH SANDSTONE AND CARBONACEOUS SHALE.

CARBONACEOUS SHALE = GRAY TO DARK GRAY TO GRAYISH BLACK; DENSE TO BRITTLE TENACITY; IRREGULAR TO PLANAR FRACTURE; PLATY TO FLAKY CUTTINGS HABIT; DULL TO WAXY LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE; INTERBEDDED WITH SANDSTONE AND SILTSTONE.

SANDSTONE = WHITE TO VERY LIGHT GRAY TO TRANSLUCENT TO CLEAR; SOME DARK LITHICS WHEN IN CLUSTERS GIVING A SALT AND PEPPERED APPEARANCE; FINE GRAINED; WELL TO FAIR SORTING; SUB ANGULAR TO SUB ROUNDED; MODERATE SPHERICITY; MODERATE REACTION TO DILUTE HCL; CALC/ SILICA CEMENTATION; ABUNDANT LOOSE GRNS; THICKER SANDSTONE BEDS WITH THIN LAYERS OF CARB. SHALE AND SILTSTONE IN-BETWEEN.

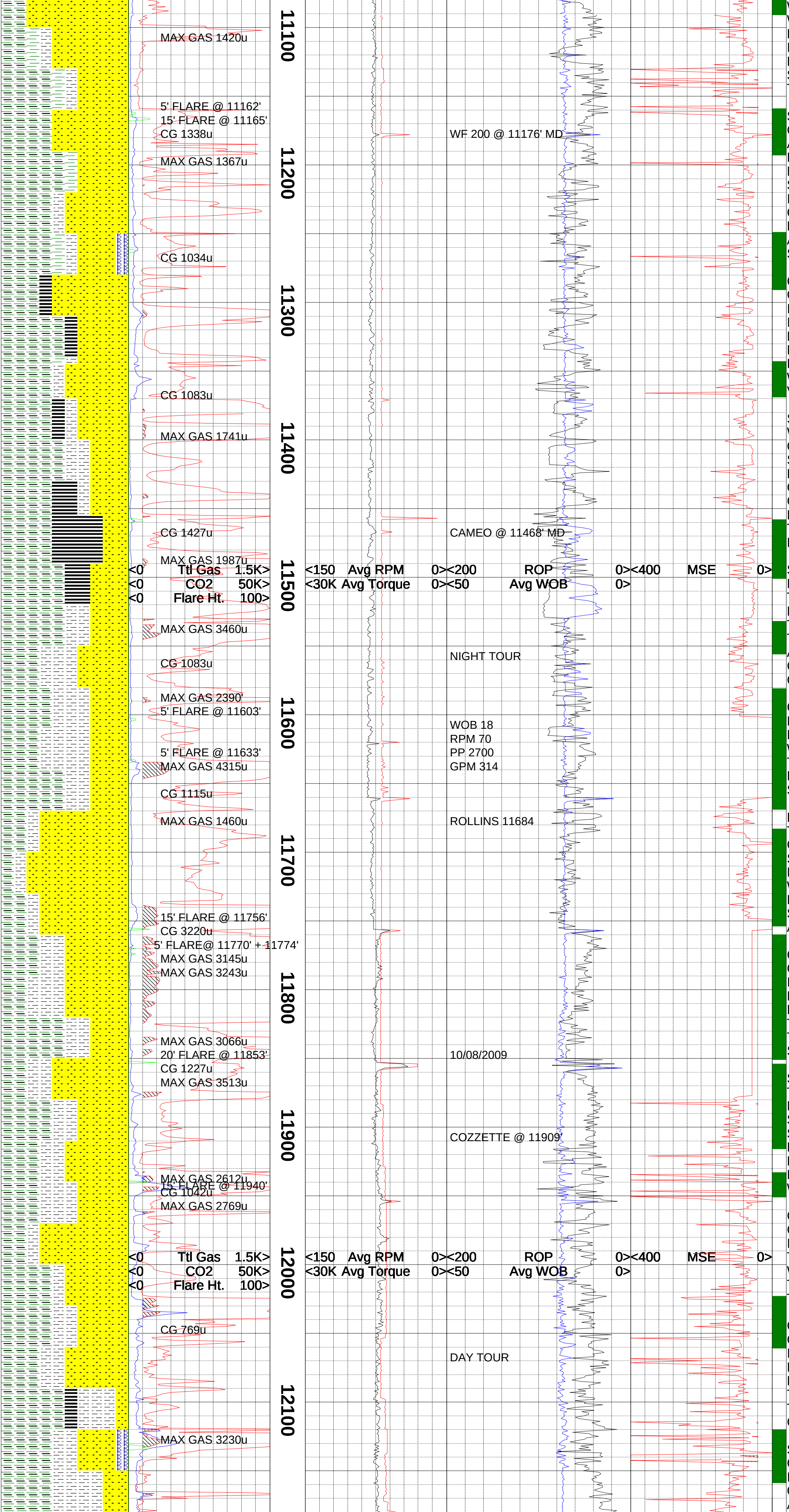
SILTSTONE = BROWN TO GRAYISH BROWN TO BROWNISH BLACK; TOUGH TO DENSE TENACITY; IRREGULAR TO TABULAR CUTTINGS HABIT; DULL TO SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; THINLY INTERBEDDED WITH SANDSTONE AND SILTSTONE.

CARBONACEOUS SHALE = DARK GRAY TO GRAYISH BLACK; TOUGH TO FIRM TO BRITTLE TENACITY; IRREGULAR TO PLANAR FRACTURE; MASSIVE TO PLATY CUTTINGS HABIT; DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE; THINLY INTERBEDDED WITH SANDSTONE AND SILTSTONE.

SANDSTONE = CLEAR TO TRANSLUCENT TO OPAQUE WITH SOME WHITE TO YELLOWISH WHITE GRAINS; TRACE AMOUNT OF DARK LITHICS THROUGHOUT; FINE TO VERY FINE GRAINED; FAIR TO WELL SORTED; SUB-ANGULAR TO SUB ROUND; MODERATE SPHERICITY; SLIGHT TO MODERATE REACTION TO DILUTE HCL; CALC/SILC CEMENTATION; TRACE AMT OF COAL IN SAMPLE; THINLY INTERBEDDED. ASSOCIATIATED WITH ELEV. GAS.

COAL = BLACK, VERY DARK GRY; DARK GRY WITH HUES OF BROWN; CRUNCHY TO BRITTLE TENACITY WITH IRREGULAR TO HACKLY FRACTURE IS PLANAR WITH PLATY CUTTINGS; EARTHY/GREASY TO SUB VITREOUS LUSTER WITH EARTHY TO SMOOTH/GREASY TEXTURE; SUB TABULAR TO SUB WEDGELIKE CUTTINGS HABIT OCC PLATY; OCC SLIGHTLY PYRITIC IN PLACES; VISIBLE DEGASSING IN SAMPLE TRAY

CARBONACEOUS SHALE = DARK GRY, BLACK, GRY WITH BWN HUES; CRUNCHY TO BRITTLE TENACITY; SUB TAB TO SUB WEDGELIKE / ELONGATED CUTTINGS HABIT WITH IRREGULAR TO HACKLY FRACTURE; PLANAR FRACTURE



WITH PLATY CUTTINGS; DULL EARTHY TO SUB WAXY OCC SUB VITREOUS LUSTER WITH EARTHY/GRITTY TO SMOOTH TEXT SL PYRITIC IN PLACES; OCC COAL LAMINAE AND LENSES; GRADES TO AND INTERBEDDED WITH SHALE AND SILTSTONE; TRACE COAL IN SMPL TRAY VISIBLE DEGASSING.

SANDSTONE = GRY WITH HUES OF BRWN; MED GRY SM LT BRWNISH GRY; INDIVIDUAL GRAINS ARE SUB ANGULAR TO ANGULAR OCC SUB ROUND; FINE TO VERY FINE; MODERATELY TO MODERATELY WELL SORTED, WITH LOW SPHERICITY; DOMINANTLY GRAIN SUPPORTED IN A SILICEOUS/SL CALC MATRIX; OCC CARBONACEOUS LAMINATIONS AND LENSES; LOW PENETRATION RATES AS GRADING TO AND INTERBEDDED WITH SILTSTONES; TIGHT. SL TO MODERATELY KAOLINITIC IN PLACES.

COAL = BLACK, VERY DARK GRY; CRUNCHY TO BRITTLE TENACITY WITH IRREGULAR TO HACKLY FRACTURE; FRACTURE IS PLANAR WITH PLATY CUTTINGS HABIT; DOMINANTLY SUB TABULAR TO TABULAR OCC PLATY SUB PLATY CUTTINGS HABIT; EARTHY/GREASY TO SUB VITREOUS LUSTER WITH EARTHY TO SMOOTH/GREASY TEXTURE; VISIBLE DEGASSING IN SAMPLE TRAY.

SANDSTONE = LT GRYISH BRWN; LT BRWN WITH GRY HUES MED GRY; TRANSPARENT TO OPAQUE; FINE TO LOWER VERY FINE GRAINED; SUB ANGULAR TO ANGULAR OCC SUB ROUND; DOMINANTLY CONSOLIDATED; CLUSTERS ARE GRAIN SUPPORTED IN A SILICEOUS SL CALCAREOUS CEMENT OCC KAOLINITIC IN PLACES; MODERATELY TO WELL SORTED; LOW TO MODERATE SPHERICITY; SL REACTION TO DILUTE HCL.

SILTSTONE = GRAYISH BROWN TO DARK GRAY MOTTLED WITH A DARK GRAY TO BLACK SPECKS TOUGH TO CRUNCHY; IRREGULAR TO HACKLY FRACTURE; TABULAR CUTTINGS HABIT; SILTY TO GRAINULAR TEXTURE; THIN STRUCTURE; THINLY INTERBEDDED WITH CARB; SHALE AND SANDSTONE; A TRACE AMOUNT OF COAL WAS IN SAMPLE TRAY WHICH MAY BE CAVINGS.

CARBONACEOUS SHALE = GRAY TO DARK GRAY MOTTLED WITH BLACK SPECS; TOUGH TO BRITTLE; IRREGULAR TO PLANAR FRACTURE; WAXY TO DULL LUSTER; SMOOTH TO SILTY TEXTURE; APPEARS TO GRADE INTO COAL IN PLACES; THINLY INTERBEDDED WITH SILTSTON SILTSTONE AND SANDSTONE.

ROLLINS SANDSTONE = WHITE TO OPAQUE TO TRANSLUCENT; ABUNDANT LOOSE GRAINS; COARSE TO MEDIUM TO FINE GRAINED; WELL SORTED; SUB ANGULAR TO SUB ROUNDED; MODERATE SPHERICITY; GRAIN SUPPORTED WITH SILICEOUS CEMENTATION; LITTLE TO NO REACTION TO DILUTE HCL; THICKLY BEDDED SANDS WITH A SMALL AMOUNT OF CARB SHALE AND SILTSTONE IN SAMPLE 10-20%.

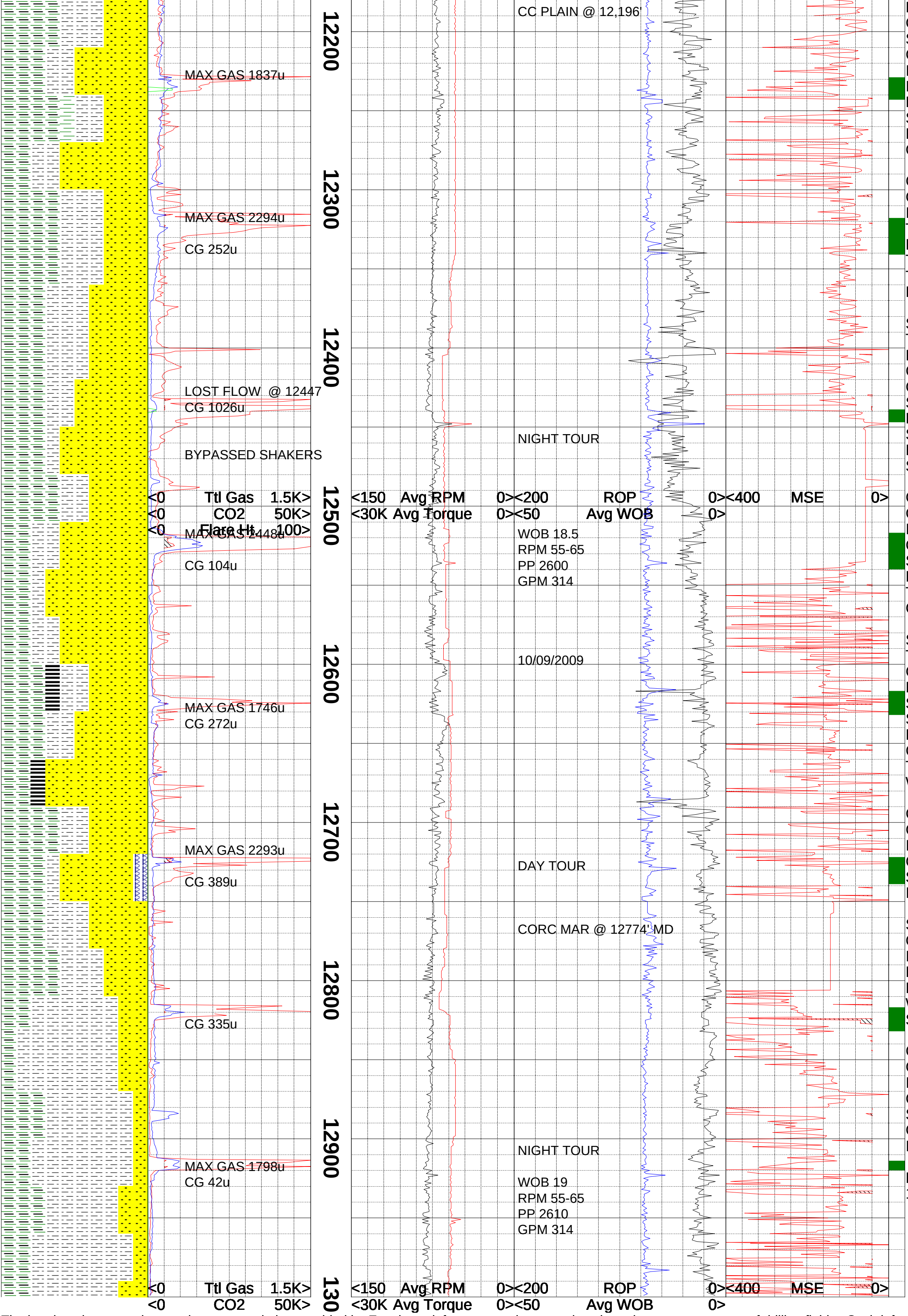
CARBONACEOUS SHALE = DARK GRAY TO GRAYISH BLACK; TOUGH TO DENSE TENACITY; IRREGULAR TO BLOCKY TO PLANAR FRACTURE; MASSIVE TO PLATY CUTTINGS HABIT; WAXY TO DULL TO SLIGHTLY VITREOUS LUSTER; SILTY TO GRITTY TEXTURE; THICK STRUCTURE; THINLY INTERBEDDED WITH SANDSTONE AND SILTSTONE.

SANDSTONE = WHITE TO OPAQUE TO TRANSLUCENT; TRACE AMT OF DARK LITHICS; MEDIUM TO FINE GRAINED; FAIR SORTING; SUB ANGULAR TO ANGULAR; MODERATELY SPHERICAL; SOME POLISHED SURFACE FEATURES; MODERATE REACTION TO DILUTE HCL; CALC/SILIC AND GRAIN SUPPORTED MATRIX; THINLY INTERBEDDED. ASSOCIATED WITH ELEVATED GAS.

CARBONACEOUS SHALE = DARK GRAY TO GRAYISH BLACK; HARD TO DENSE TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO PLATY TO SLIGHTLY TABULAR IN PLACES; WAXY TO DULL LUSTER; SMOOTH TO SILTY TEXTURE; THINLY INTERBEDDED; APPEARS TO GRADE INTO SILTSTONE IN PLACES.

CARBONACEOUS SHALE = DARK GRAY TO GRAYISH BLACK; TOUGH TO DENSE TENACITY; IRREGULAR TO BLOCKY TO PLANAR FRACTURE; MASSIVE TO PLATY CUTTINGS HABIT; WAXY TO DULL TO SLIGHTLY VITREOUS LUSTER; SILTY TO GRITTY TEXTURE; THICK STRUCTURE; THINLY INTERBEDDED WITH SANDSTONE GRADES TO CARBONACEOUS SILTSTONE.

SANDSTONE = LT GRY WITH BRWNISH HUES; GRY; MEDIUM FINE TO UPPER FINE GRAINED; INDIVIDUAL GRAINS ARE TRANSPARENT TO OPAQUE OCC HUES OF BRWNISH YLW; SUB ANGULAR TO ANGULAR SOME SUB ROUND;



LOW TO MODERATE SPHERICITY; DOMINANTLY CONSOLIDATED; MODERATELY TO WELL SORTED; APPEARS DIRTY IN PLACES; CONSOLIDATED CLUSTER ARE GRAIN SUPPORTED IN A SILICEOUS/SL CALC CEMENT; OCC INCREASES IN CLAY CONTENT RESULTING IN A BIT SMEAR PATTERN ON SOME CUTTINGS; SLIGHT TO MODERATE REACTION TO DILUTE HCL; TRACE TO 3% ACCESSORY MINERALS; OCC CARBONACEOUS MATERIAL.

CARBONACEOUS SHALE = DARK GRAY TO GRAYISH BLACK; HARD TO DENSE TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO PLATY TO SLIGHTLY TABULAR IN PLACES; EARTHY TO DULL LUSTER; SMOOTH TO SILTY TEXTURE; THINLY INTERBEDDED; APPEARS TO GRADE INTO SILTSTONE IN PLACES. SL PYRITIC IN PLACES.

SANDSTONE = WHITE TO TRANSLUCENT TO TRANSPARENT; TRACE AMT OF DARK LITHICS; FINE GRAINED; A MIXTURE OF CONSOLIDATED CLUSTERS AND LOOSE INDIVIDUAL GRAINS; CLUSTERS ARE GRAIN SUPPORTED WITH CALC/ SILC CEMENTATION; MODERATE REACTION TO DILUTE HCL; SUB ANGULAR TO ANGULAR; MOD. SPHERICITY; IS INTERBEDDED WITH THIN BEDS OF CARBONACEOUS SHALE AND SILTSTONE.

CARBONACEOUS SHALE = DARK GRAY TO GRAYISH BLACK; TOUGH TO DENSE TENACITY; IRREGULAR FRACTURE; PLATY TO TABULAR CUTTINGS HABIT; WAXY TO DULL LUSTER; SMOOTH TO SILTY TEXTURE; THINLY INTER-BEDDED WITH SANDSTONE AND SILTSTONE. TRACE AMT OF COAL IN SAMPLE. APPEARS TO GRADE TO COAL AND SILTSTONE.

SANDSTONE = WHITE TO TRANSLUCENT TO TRANSPARENT; TRACE AMT OF DARK LITHICS GIVING A SALT AND PEPPERED APPEAREANCE; FINE TO VERY FINE GRAINED; WELL SORTED; SUB ANGULAR TO SUB ROUNDED; MOD. SPHERICITY; MODERATE TO HIGH REACTION TO DILUTE HCL; CALCAREOUS TO SILICEOUS CEMENTATION; TRACE AMT OF KAOLINIC SAND; TRACE AMT OF COAL; THINLY INTERBEDDED WITH CARB. SHALE AND SILTSTONE.

CARBONACEOUS SHALE = BLACK DARK GRAY TO GRAYISH BLACK; TOUGH TO DENSE TENACITY; IRREGULAR FRACTURE; PLATY TO TABULAR CUTTINGS HABIT; EARTHY TO DULL LUSTER; SMOOTH TO SILTY/GRITTY TEXTURE; THINLY INTERBEDDED WITH SANDSTONE AND SILTSTONE

SILTSTONE = GRAY TO DARK GRAY WITH HUES OF BROWN; TOUGH, HARD, AND DENSE; IRREGULAR TO TABULAR TO SLIGHTLY PLATY CUTTINGS HABIT; DULL TO SPARKLING LUSTER; THIN STRUCTURE; INTERBEDDED WITH CARB. SHALE AND SMALL BEDS OF SANDSTONE.

CARBONACEOUS SHALE = DARK GRAY TO GRAYISH BLACK; TOUGH TO DENSE TENACITY; IRREGULAR TO BLOCKY FRACTURE; PLATY CUTTINGS HABIT; WAXY TO DULL LUSTER; SMOOTH TO SILTY TEXTURE; APPEARS TO GRADE TO SILTSTONE; INTERBEDDED THINLY IN THICKER BEDS OF SILTSTONE.

REACHED FINAL TD OF 13000' MD ON 10/09/2009 AT 23:45 HRS.