



Copyright © 2003 by Epoch Well Services, Inc.

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

MUDLOG TVD

COMPANY	ExxonMobil Production
WELL	FRU 197-33A9
FIELD	FREEDOM RANCH UNIT
REGION	ROCKY MOUNTAINS
COORDINATES	N39.915656 W108.285725
ELEVATION	KB 6415' GL 6388'
COUNTY, STATE	RIO BLANCO COUNTY, CO
API INDEX	05-103-11400-00
SPUD DATE	10/02/2009
CONTRACTOR	HELMRICH AND PAYNE
CO. REP.	RICKY T OWENS
RIG/TYPE	215/FLEX 3
LOGGING UNIT	MLU 51
GEOLOGISTS	GEORGE BAKER BRENDA MARSH
ADD. PERSONS	DEVIN CLAAR BILL JOHANNING
CO. GEOLOGIST	MELISSA SAURBORN

LOG INTERVAL

DEPTHS: 3,800' **TO** 12,281'

DATES: 01/05/2010 **TO** 01/24/2010

SCALE: 1"=100'

CASING DATA

16" **AT** 131'

10.75" **AT** 3,833'

7.00" **AT** 8,533'

AT

HOLE SIZE

9.875' **TO** 8,533'

6.125' **TO** 12,281'

TO

TO

MUD TYPES

SPUD **TO** 3,833'

LSND **TO** 12,281'

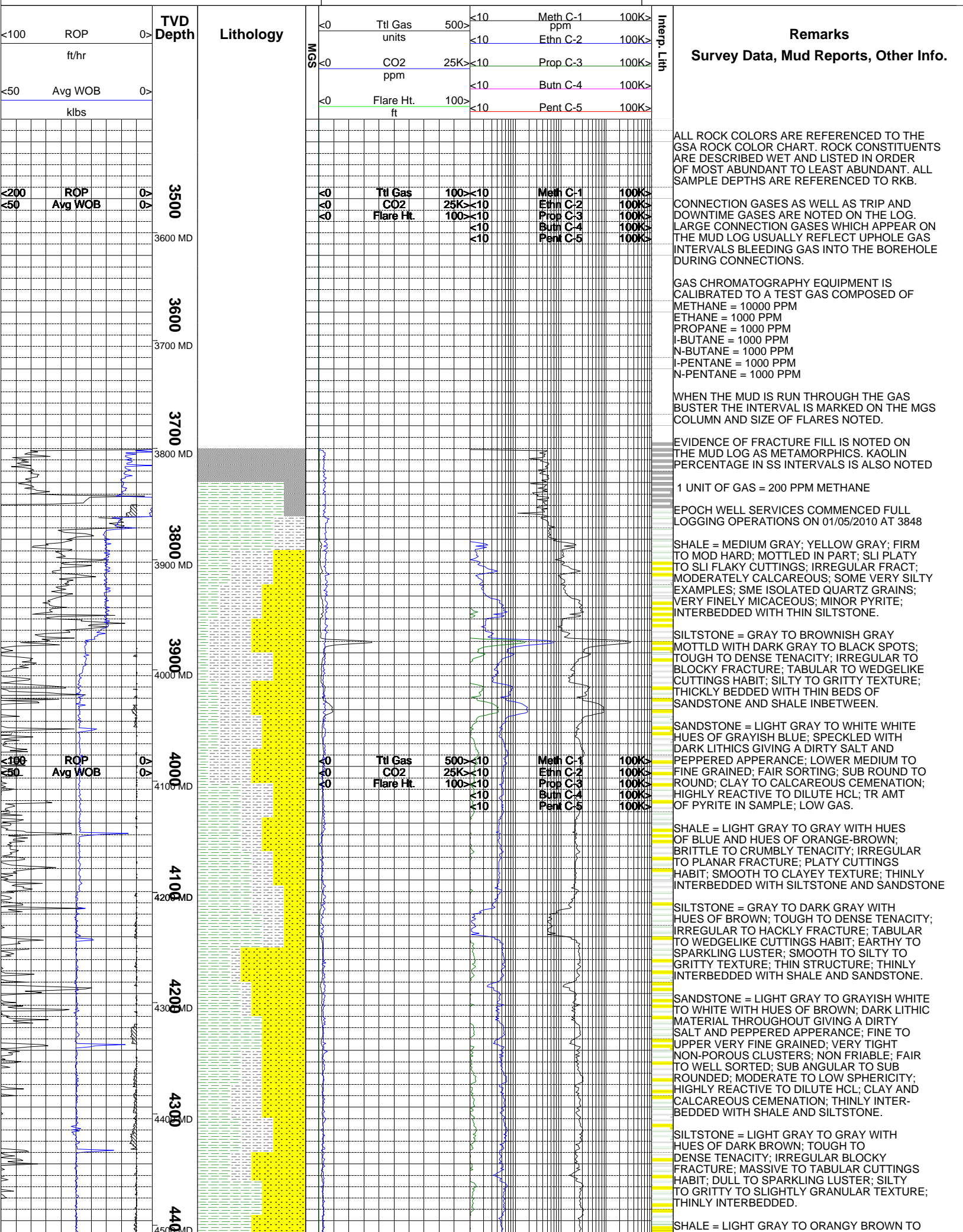
TO

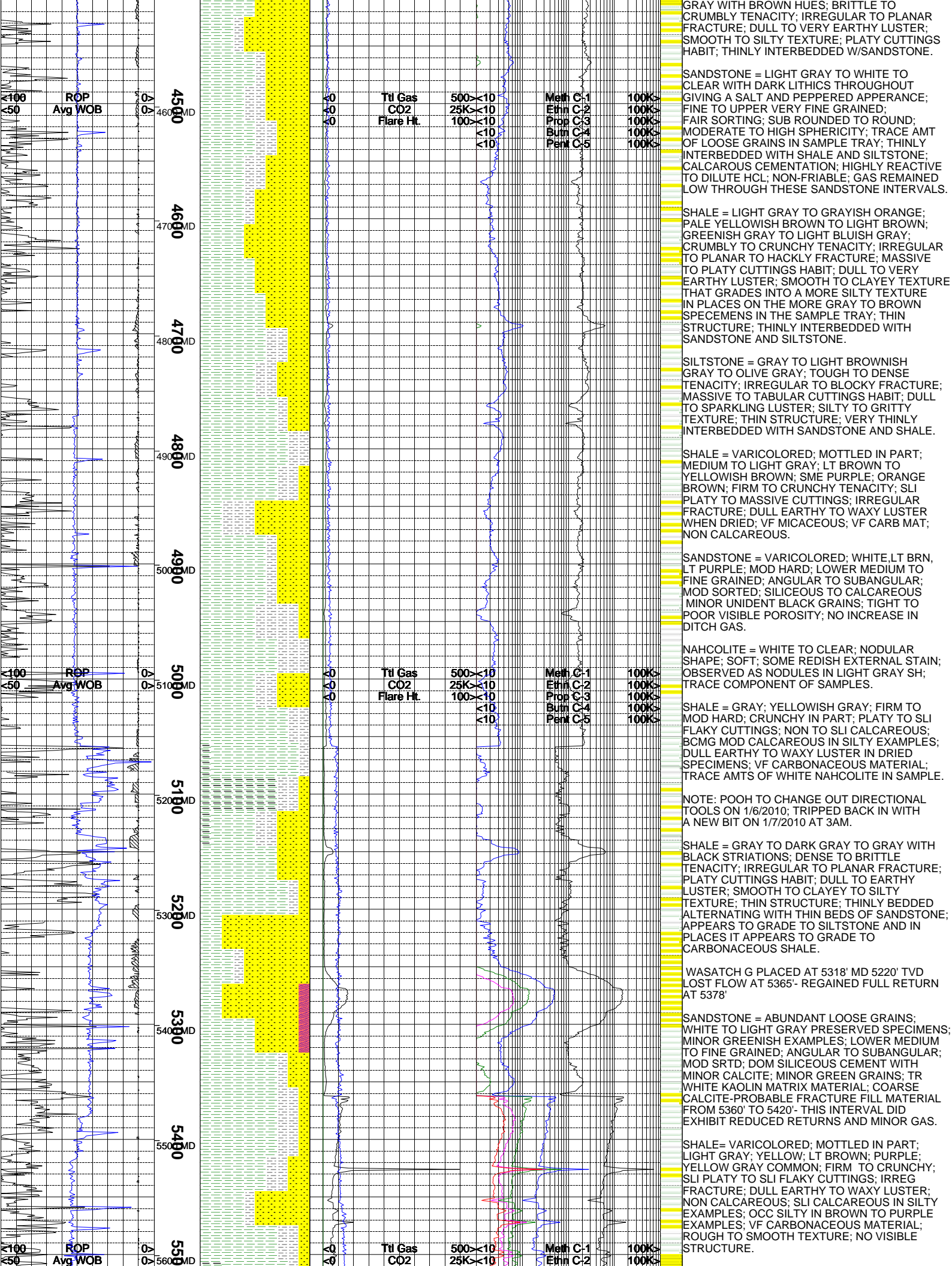
TO

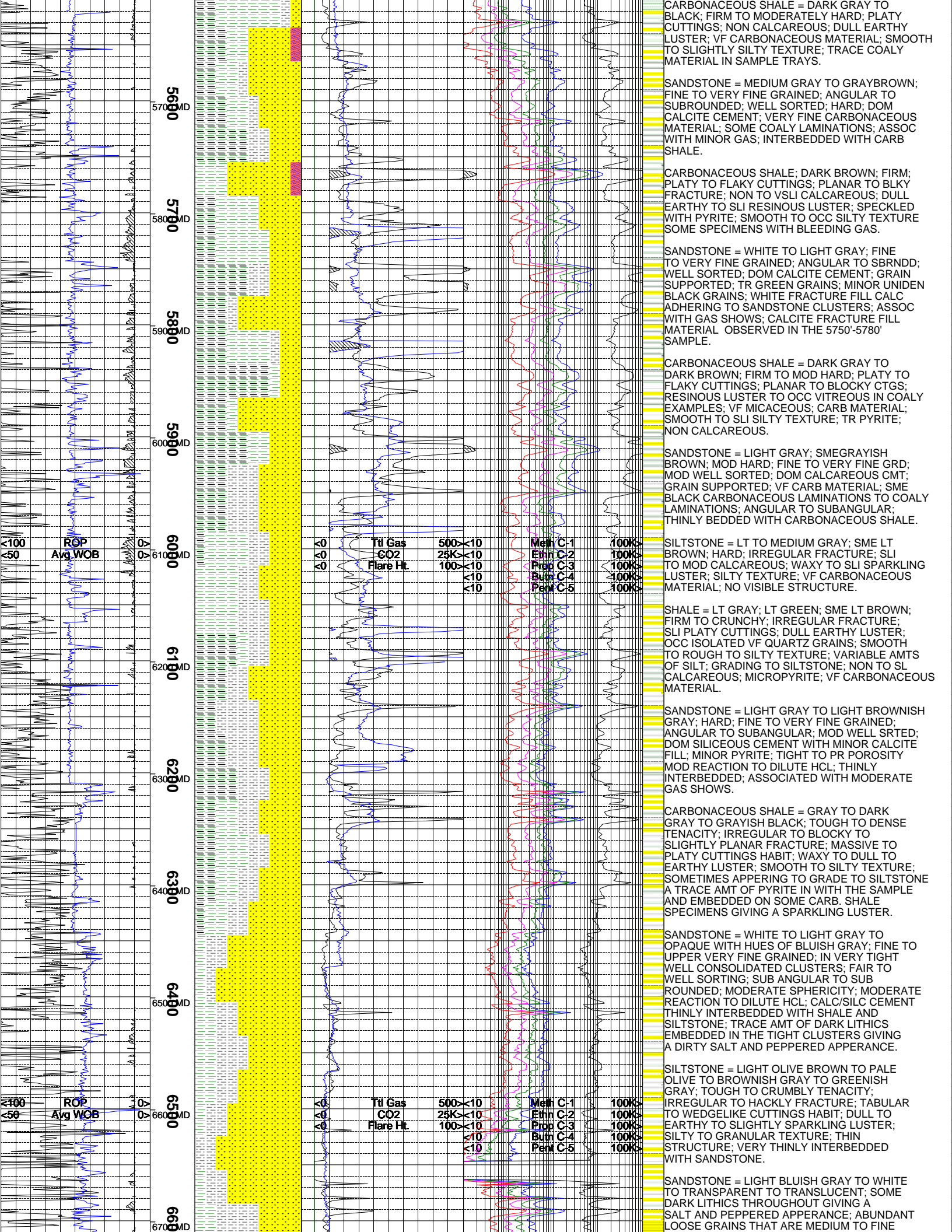
ABBREVIATIONS

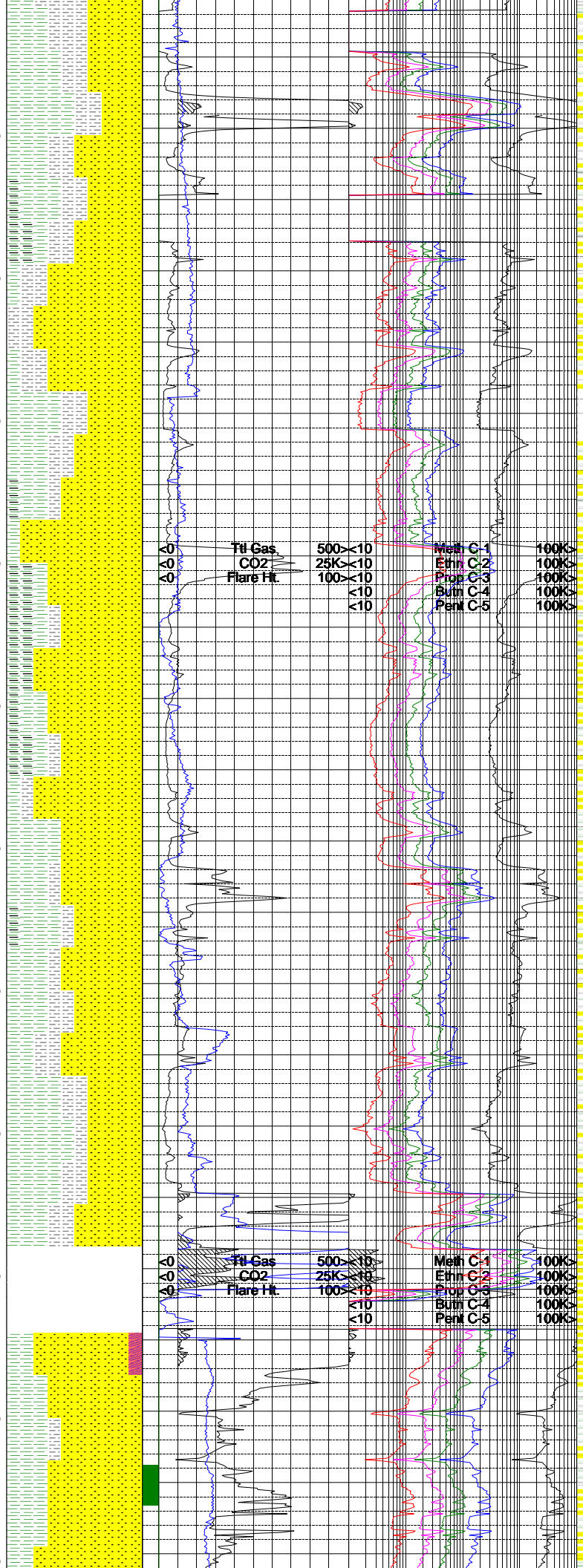
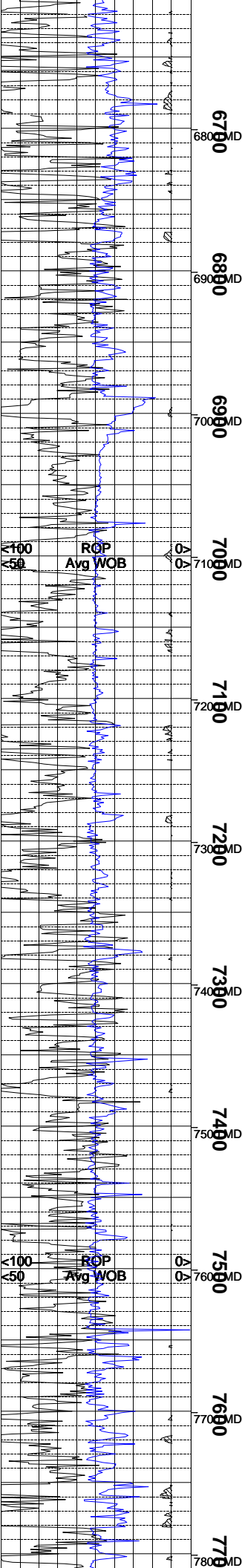
<i>NB</i> NEWBIT	<i>PV</i> PLASTIC VISCOSITY	<i>LC</i> LOST CIRCULATION
<i>RRB</i> RERUN BIT	<i>YP</i> YIELD POINT	<i>CO</i> CIRCULATE OUT
<i>CB</i> CORE BIT	<i>FL</i> FLUID LOSS	<i>NR</i> NO RETURNS
<i>WOB</i> WEIGHT ON BIT	<i>CL</i> PPM CLORIDE ION	<i>TG</i> TRIP GAS
<i>RPM</i> ROTARY REV/MIN	<i>Rm</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	









GRAINED TO A FAIR AMOUNT OF TIGHT CLUSTERS THAT HAVE FINE TO UPPER VERY FINE GRAIN SIZES; FAIR TO POOR SORTING; SUB ANGULAR TO SUB ROUNDED; HIGH SPHERICITY WHEN IN CLUSTERS; LOW REACTION TO DILUTE HCL WHEN INDIVIDUAL GRAINS; HIGH REACTION TO DILUTE HCL WHEN IN CLUSTERS INDICATING A CALCAREOUS CEMENT; THINLY INTERBEDDED WITH SHALE AND SILTSTONE; TRACE AMT OF PYRITE IN SAMPLE TRAY.

SHALE = LIGHT GRAY TO GRAY TO BLUISH GRAY; TOUGH TO CRUMBLY TENACITY; IRREGULAR TO PLANAR FRACTURE; MASSIVE TO PLATY CUTTINGS HABIT; DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE; VISIBLY GRADES TO SILTSTONE WHERE SOME SPECIMENS SHOWED A DEFINITIVE LINE WHERE IT WAS HALF SHALE AND HALF SILTSTONE; THINLY INTERBEDDED.

SILTSTONE = BROWN TO DARK BROWNISH GRAY TO DARK GRAY; TOUGH TENACITY; IRREGULAR TO BLOCKY FRACTURE; TABULAR CUTTINGS HABIT; DULL TO SLIGHTLY SPARKLING LUSTER; THIN STRUCTURE; THINLY INTERBEDDED.

NOTE: SHORT WIPER TRIP AT 6983' MD ON 1/8/2010 6AM; RESUMED DRILLING ON 1/8/2010 AT 6:30PM. FIRST SAMPLE HAD POOR SAMPLE QUALITY DUE TO CAVINGS.

SHALE = BLUISH GRAY TO GRAY WITH DARK LAMINATIONS; TOUGH TO CRUMBLY TENACITY; IRREGULAR TO BLOCKY FRACTURE; PLATY CUTTINGS HABIT; DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE; APPEARS TO GRADE TO SILTSTONE OR CARB. SHALE IN PLACES; THINLY INTERBEDDED.

OHIO CREEK SANDSTONE = WHITE TO WHITE WITH PALE BLUE HUES TO TRANSLUCENT AND CLEAR; ABUNDANT LOOSE GRAINS; TRACE AMT OF MEDIUM SIZED GRAINS; MAINLY FINE TO UPPER VERY FINE GRAINED; WELL TO FAIR SORTING; SUB ANGULAR TO ANGULAR TO SLIGHTLY SUB ROUNDED; MODERATE TO LOW SPHERICITY; MODERATE REACTION TO DILUTE HCL; SLIGHTLY CALCAREOUS CEMENT; TRACE AMT OF DARK LITHICS 1-3% GIVING A SLIGHT SALT AND PEPPERED APPEARANCE WHEN IN CLUSTERS; CLUSTERS WERE FEW COMPARED TO THE LOOSE GRAINS AND VERY HARD AND NON-FRIABLE; THE SANDSTONE LAYERS AT THE OHIO CREEK BECAME THICKER WITH THIN SHALE, CARB. SHALE, OR SILTSTONE LAYERS ALTERNATING.

SHALE = GRAY TO MEDIUM BLUISH GRAY TO GREENISH GRAY; TOUGH TO DENSE TENACITY; PLANAR FRACTURE; PLATY TO WEDGE LIKE CUTTINGS HABIT; WAXY TO DULL TO EARTHY LUSTER; SMOOTH TEXTURE; THIN STRUCTURE; THINLY BEDDED WITH SANDSTONE.

SANDSTONE = WHITE TO GRAYISH WHITE TO GRAY TO VERY LIGHT BLUISH GRAY, SOME TRANSLUCENT TO TRANSPARENT GRAINS AND SOME DARK LITHICS THROUGHOUT; ABUNDANT LOOSE GRAINS; MEDIUM TO FINE GRAIN SIZES FAIR SORTING; SUB ANGULAR TO ANGULAR; LOW SPHERICITY; MODERATE REACTION TO DILUTE HCL WHEN IN CLUSTERS, NO REACTION ON INDIVIDUAL LOOSE GRAINS; WHEN IN CLUSTERS THEY HAVE SLIGHTLY CALCAREOUS CEMENTATION; ALTERNATES WITH BEDS OF SHALE AND SILTSTONE.

SILTSTONE = GRAY WITH BROWN HUES TO LIGHT BROWNISH GRAY TO LIGHT BROWN; TOUGH TO CRUMBLY TENACITY; IRREGULAR TO MOTTLED FRACTURE; TABULAR TO WEDGE LIKE CUTTINGS HABIT; DULL TO SLIGHTLY SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; THINLY INTERBEDDED.

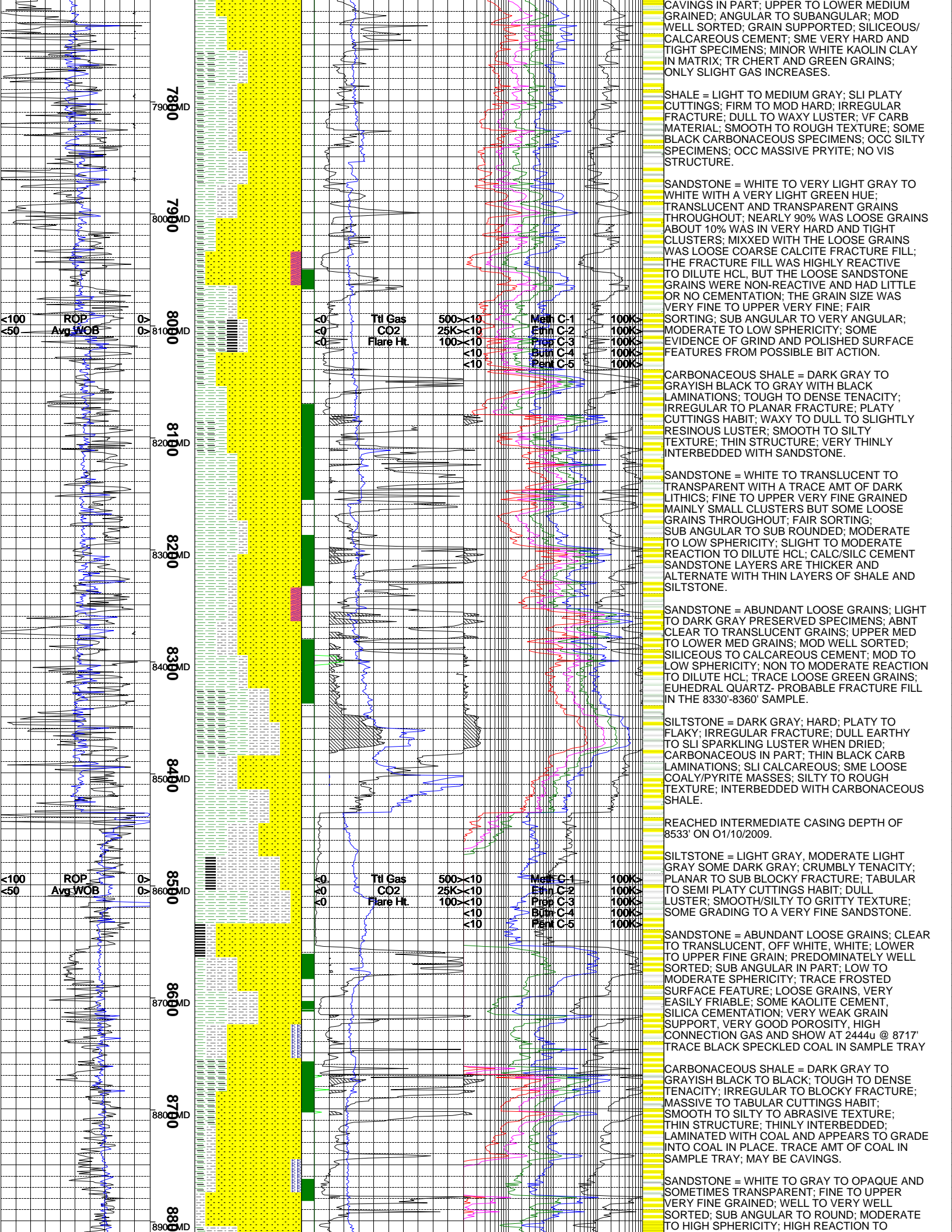
BRIEFLY LOST RETURNS AT 7576' LOST FULL RETURNS AT 7640' IN THE WF800

REPAIR RIG EQUIPMENT

SANDSTONE = ABUNDANT LOOSE GRAINS; UPPER TO LOWER MEDIUM GRAINS; TRACE LIGHT GRAY PRESERVED SPECIMENS; ANGULAR TO SUBRND; TRACE WHITE KAOLIN CLAY IN MATRIX; DOM CALCITE CEMENT; TRACE LOOSE GREEN AND BLACK GRAINS; SOME BLACK CARBONACEOUS LAMINATIONS; ASSOCIATED WITH GAS SHOWS; WHITE CALCITE-FRACTURE FILL MATERIAL ADHERING TO SANDSTONE CLUSTER IN THE 7640'-7670' SAMPLE.

SHALE = LT GREENISH GRAY TO GRAY; MINOR LT BROWN; SLI PLATY CUTTINGS; FIRM TO SL HARD; DULL EARTHY LUSTER; ROUGH TEXTURE; VF PYRITE; VERY MICA; VF CARBONACEOUS.

SANDSTONE = ABUNDANT LOOSE GRAINS;



SAVINGS IN PART; UPPER TO LOWER MEDIUM GRAINED; ANGULAR TO SUBANGULAR; MOD WELL SORTED; GRAIN SUPPORTED; SILICEOUS/ CALCAREOUS CEMENT; SME VERY HARD AND TIGHT SPECIMENS; MINOR WHITE KAOLIN CLAY IN MATRIX; TR CHERT AND GREEN GRAINS; ONLY SLIGHT GAS INCREASES.

SHALE = LIGHT TO MEDIUM GRAY; SLI PLATY CUTTINGS; FIRM TO MOD HARD; IRREGULAR FRACTURE; DULL TO WAXY LUSTER; VF CARB MATERIAL; SMOOTH TO ROUGH TEXTURE; SOME BLACK CARBONACEOUS SPECIMENS; OCC SILTY SPECIMENS; OCC MASSIVE PRYITE; NO VIS STRUCTURE.

SANDSTONE = WHITE TO VERY LIGHT GRAY TO WHITE WITH A VERY LIGHT GREEN HUE; TRANSLUCENT AND TRANSPARENT GRAINS THROUGHOUT; NEARLY 90% WAS LOOSE GRAINS ABOUT 10% WAS IN VERY HARD AND TIGHT CLUSTERS; MIXED WITH THE LOOSE GRAINS WAS LOOSE COARSE CALCITE FRACTURE FILL; THE FRACTURE FILL WAS HIGHLY REACTIVE TO DILUTE HCL, BUT THE LOOSE SANDSTONE GRAINS WERE NON-REACTIVE AND HAD LITTLE OR NO CEMENTATION; THE GRAIN SIZE WAS VERY FINE TO UPPER VERY FINE; FAIR SORTING; SUB ANGULAR TO VERY ANGULAR; MODERATE TO LOW SPHERICITY; SOME EVIDENCE OF GRIND AND POLISHED SURFACE FEATURES FROM POSSIBLE BIT ACTION.

CARBONACEOUS SHALE = DARK GRAY TO GRAYISH BLACK TO GRAY WITH BLACK LAMINATIONS; TOUGH TO DENSE TENACITY; IRREGULAR TO PLANAR FRACTURE; PLATY CUTTINGS HABIT; WAXY TO DULL TO SLIGHTLY RESINOUS LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE; VERY THINLY INTERBEDDED WITH SANDSTONE.

SANDSTONE = WHITE TO TRANSLUCENT TO TRANSPARENT WITH A TRACE AMT OF DARK LITHICS; FINE TO UPPER VERY FINE GRAINED MAINLY SMALL CLUSTERS BUT SOME LOOSE GRAINS THROUGHOUT; FAIR SORTING; SUB ANGULAR TO SUB ROUNDED; MODERATE TO LOW SPHERICITY; SLIGHT TO MODERATE REACTION TO DILUTE HCL; CALC/SILC CEMENT SANDSTONE LAYERS ARE THICKER AND ALTERNATE WITH THIN LAYERS OF SHALE AND SILTSTONE.

SANDSTONE = ABUNDANT LOOSE GRAINS; LIGHT TO DARK GRAY PRESERVED SPECIMENS; ABNT CLEAR TO TRANSLUCENT GRAINS; UPPER MED TO LOWER MED GRAINS; MOD WELL SORTED; SILICEOUS TO CALCAREOUS CEMENT; MOD TO LOW SPHERICITY; NON TO MODERATE REACTION TO DILUTE HCL; TRACE LOOSE GREEN GRAINS; EUHEDRAL QUARTZ- PROBABLE FRACTURE FILL IN THE 8330'-8360' SAMPLE.

SILTSTONE = DARK GRAY; HARD; PLATY TO FLAKY; IRREGULAR FRACTURE; DULL EARTHY TO SLI SPARKLING LUSTER WHEN DRIED; CARBONACEOUS IN PART; THIN BLACK CARB LAMINATIONS; SLI CALCAREOUS; SME LOOSE COALY/PYRITE MASSES; SILTY TO ROUGH TEXTURE; INTERBEDDED WITH CARBONACEOUS SHALE.

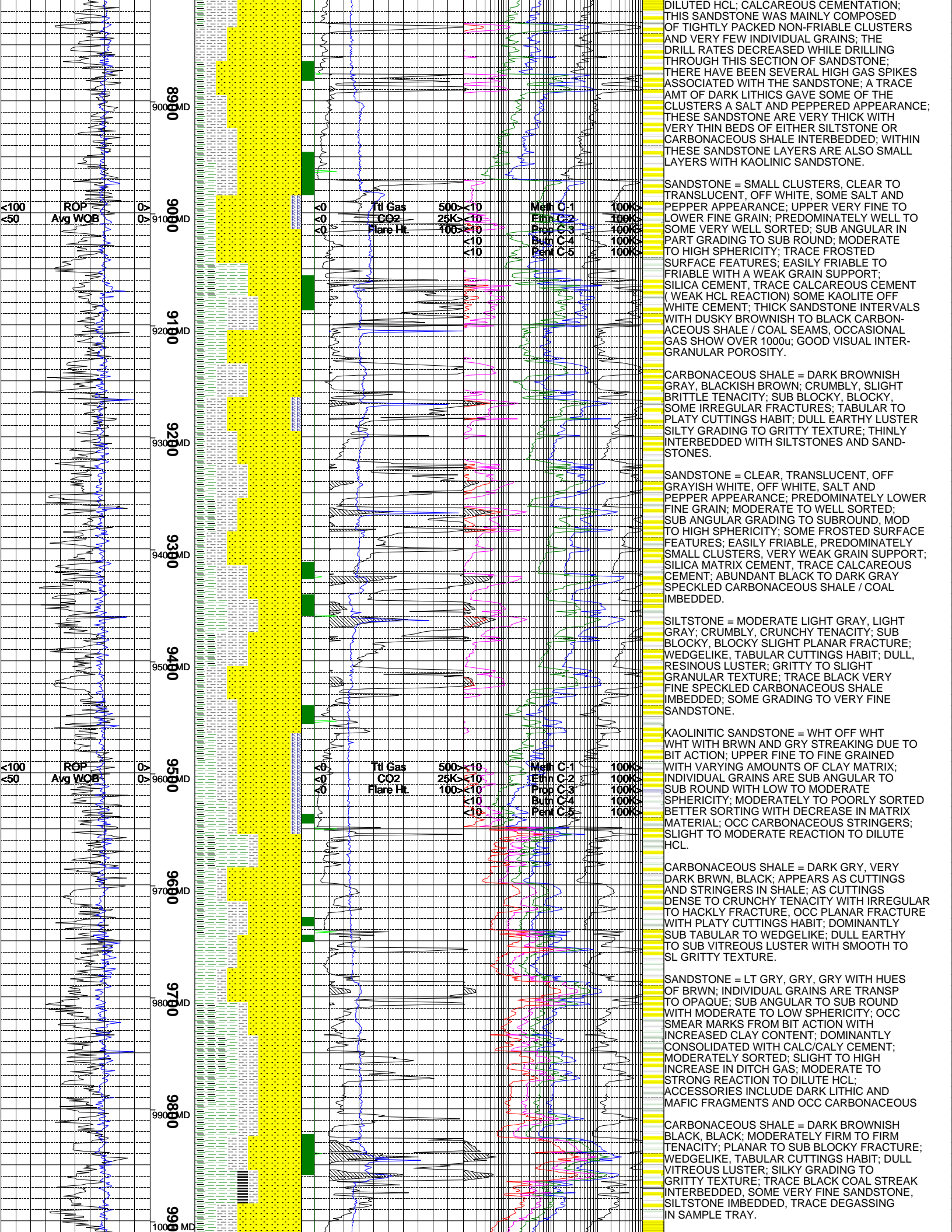
REACHED INTERMEDIATE CASING DEPTH OF 8533' ON 01/10/2009.

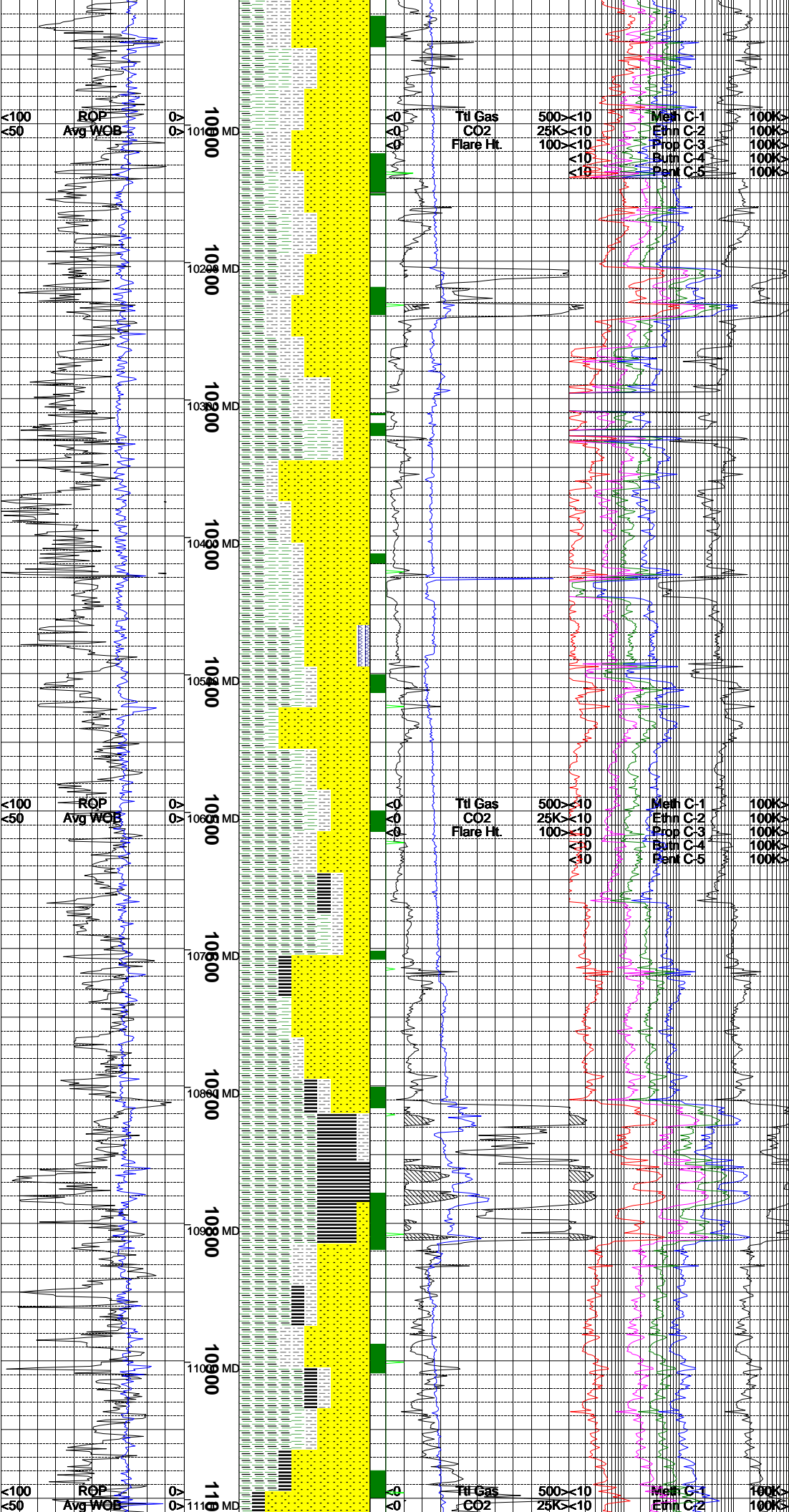
SILTSTONE = LIGHT GRAY, MODERATE LIGHT GRAY SOME DARK GRAY; CRUMBLY TENACITY; PLANAR TO SUB BLOCKY FRACTURE; TABULAR TO SEMI PLATY CUTTINGS HABIT; DULL LUSTER; SMOOTH/SILTY TO GRITTY TEXTURE; SOME GRADING TO A VERY FINE SANDSTONE.

SANDSTONE = ABUNDANT LOOSE GRAINS; CLEAR TO TRANSLUCENT, OFF WHITE, WHITE; LOWER TO UPPER FINE GRAIN; PREDOMINATELY WELL SORTED; SUB ANGULAR IN PART; LOW TO MODERATE SPHERICITY; TRACE FROSTED SURFACE FEATURE; LOOSE GRAINS, VERY EASILY FRIABLE; SOME KAOLITE CEMENT, SILICA CEMENTATION; VERY WEAK GRAIN SUPPORT, VERY GOOD POROSITY, HIGH CONNECTION GAS AND SHOW AT 2444u @ 8717' TRACE BLACK SPECKLED COAL IN SAMPLE TRAY

CARBONACEOUS SHALE = DARK GRAY TO GRAYISH BLACK TO BLACK; TOUGH TO DENSE TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO TABULAR CUTTINGS HABIT; SMOOTH TO SILTY TO ABRASIVE TEXTURE; THIN STRUCTURE; THINLY INTERBEDDED; LAMINATED WITH COAL AND APPEARS TO GRADE INTO COAL IN PLACE. TRACE AMT OF COAL IN SAMPLE TRAY; MAY BE CAVINGS.

SANDSTONE = WHITE TO GRAY TO OPAQUE AND SOMETIMES TRANSPARENT; FINE TO UPPER VERY FINE GRAINED; WELL TO VERY WELL SORTED; SUB ANGULAR TO ROUND; MODERATE TO HIGH SPHERICITY; HIGH REACTION TO





SANDSTONE = BROWNISH GRAY, LIGHT GRAY, CLEAR TO TRANSLUCENT, LT BROWNISH STAIN, SALT AND PEPPER APPEARANCE, HIGH CONTENT OF BROWNISH CARBONEOUS SHALE; UPPER VF TO LOWER FINE GRAIN; MODERATE TO WELL SORTED; SUB ANGULAR IN PART, SOME SUB ROUND, MODERATE SPHERICITY; SOME FROSTED FEATURES, FRIABLE TO FRIABLE FIRM; SILICA/CLAY CEMENT, TRACE CALCAREOUS CEMENT; PREDOMINATELY BLACK/BROWNISH CARBONEOUS SHALE/COAL IMBEDDED.

CARBONEOUS SHALE = DARK BROWNISH BLACK, BLACKISH OLIVE BROWN; CRUMBLY, SLIGHT BRITTLE TENACITY; SUB BLOCKY, EARTHY FRACTURE; WEDGELIKE TO SLIGHT BLOCKY CUTTINGS HABIT; DULL, RESINOUS VITREOUS LUSTER; SILTY GRADING TO GRITTY TEXTURE; TRACE SANDSTONE AND SILTSTONE IMBEDDED.

CARBONEOUS SHALE = DUSKY BROWNISH BLACK, BROWNISH BLACK, DARK BROWN; CRUMBLY, SEMI BRITTLE TENACITY; PLANAR SUB BLOCKY TO BLOCKY FRACTURES; WEDGELIKE SLI PLATY CUTTINGS HABIT; DULL VITREOUS LUSTER; GRITTY, SOME SILTY TEXTURE; TRACE COAL, SILTSTONE AND SANDSTONE IMBEDDED.

SANDSTONE = OFF WHITE, CLEAR TO TRANSLUCENT, LIGHT GRAY; SOME SALT AND PEPPER APPEARANCE, PREDOMINATELY SMALL CLUSTERS UPPER VERY FINE TO LOWER FINE GRAIN; MODERATE WELL TO WELL SORTED; SUB ANGULAR, SUB ROUND; MODERATE SPHERICITY; SOME FROSTED SURFACE FEATURE; EASILY FRIABLE TO FRIABLE; SOME WEAK GRAIN SUPPORT, TRACE INDIVIDUAL GRAINS; SILICA MATRIX CEMENT, TRACE CALCAREOUS CEMENT; SOME SPECKLED CARBONEOUS SHALE/ SILTSTONE IMBEDDED.

CARBONEOUS SHALE = DARK BROWNISH GRAY, BLACKISH BROWN; CRUMBLY, SLIGHT BRITTLE TENACITY; SUB BLOCKY, BLOCKY, SOME IRREGULAR FRACTURES; TABULAR TO PLATY CUTTINGS HABIT; DULL EARTHY LUSTER SILTY GRADING TO GRITTY TEXTURE; THINLY INTERBEDDED WITH SILTSTONES AND SANDSTONES.

SANDSTONE = LT GRY, OFF WHT, LT GRY WITH OCC HUES OF LT BRWN; SME SALT AND PEPPER APPEARANCE; INDIVIDUAL GRAINS ARE TRANSP TO OPAQUE; SUB ROUND TO SUB ANGULAR WITH LOW TO MODERATE SPHERICITY; MODERATELY SORTED; OVERALL FINE GRAINED OCC UPPER MEDIUM GRAINED; DOMINANTLY CONSOLIDATED; CONSOLIDATED CLUSTERS ARE GRAIN SUPPORTED IN A CALC/CLAY MATRIX OCC SILICEOUS CEMENT.

CARBONEOUS SHALE = DARK GRY, VERY DARK BRWN OCC BLACK; CRUNCHY TO DENSE TENACITY; SUB TABULAR TO SUB WEDGELIKE OCC PLATY CUTTINGS HABIT WITH IRREGULAR TO HACKLY FRACTURE; GREASY SUB VIRTEOUS TO DULL LUSTER WITH SMOOTH WAXY TO SL GRITTY TEXTURE; NO VISIBLE DEGASSING IN SAMPLE TRAY.

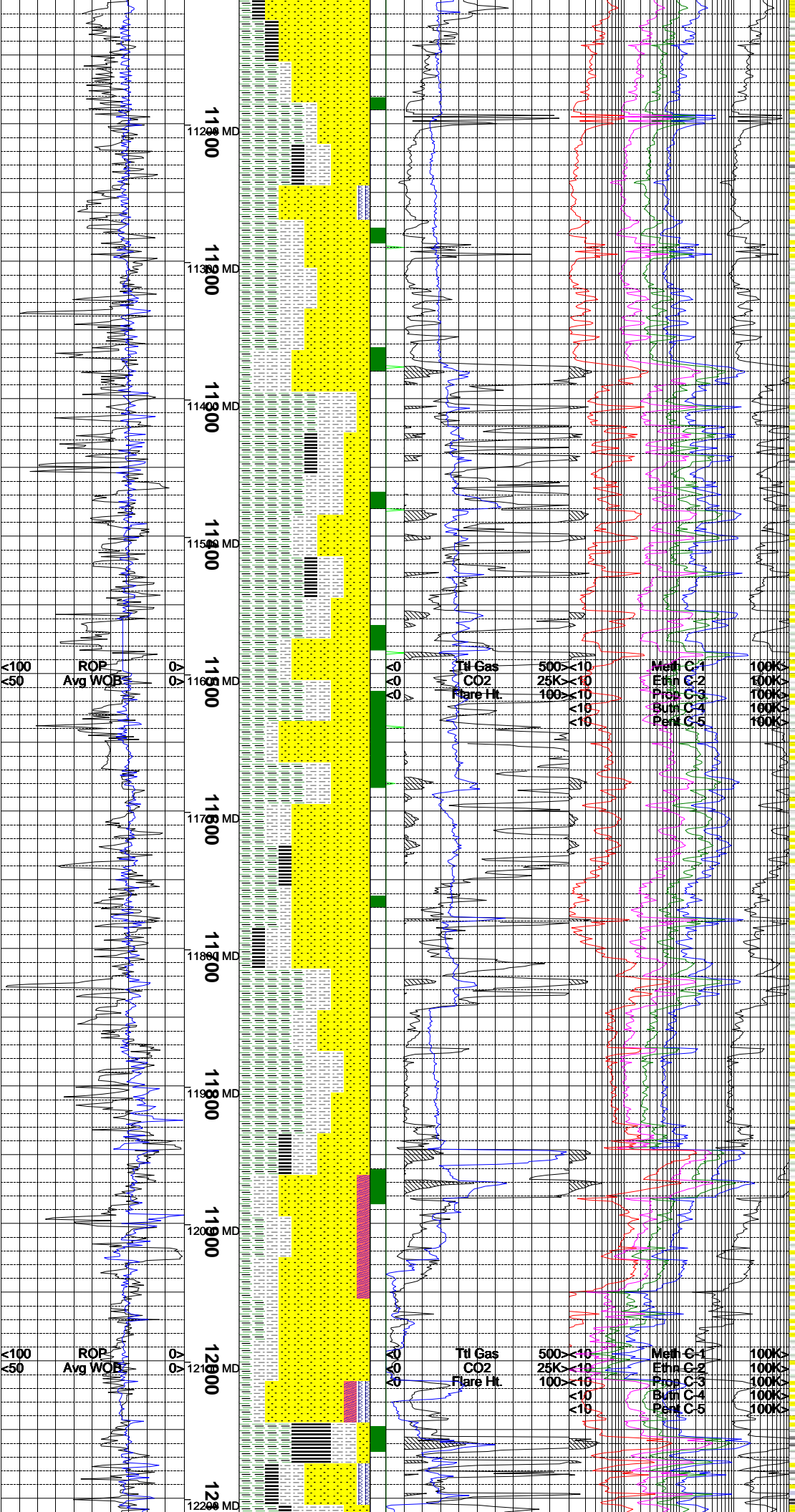
SILTSTONE = GRAY, MODERATE BRWN, DARK GRAY SOME MED GRAY; CRUMBLY TENACITY; PLANAR TO SUB BLOCKY FRACTURE; TABULAR TO SEMI PLATY CUTTINGS HABIT; DULL LUSTER; SMOOTH/SILTY TO GRITTY TEXTURE; SOME GRADING TO A VERY FINE SANDSTONE.

CARBONEOUS SHALE = DARK GRY, VERY DARK BRWN OCC BLACK; CRUNCHY TO DENSE TENACITY; SUB TABULAR TO SUB WEDGELIKE OCC PLATY CUTTINGS HABIT WITH IRREGULAR TO HACKLY FRACTURE; GREASY SUB VIRTEOUS TO DULL LUSTER WITH SMOOTH WAXY TO SL GRITTY TEXTURE.

COAL = BLACK, VERY DARK GRY, OCC HUES OF VERY DARK BRWN; CRUNCHY TO DENSE TENACITY WITH SUB TABULAR TO SUB PLATY CUTTINGS HABIT; IRREGULAR TO OCC PLANAR FLAKY TO PLATY CUTTINGS HABIT; VITREOUS LUSTER; SMOOTH TO SILTY TEXTURE; TRACE DE-GASSING IN SAMPLE TRAY.

SANDSTONE = BROWNISH STAIN, LIGHT BROWN, FROSTED TO TRANSLUCENT; VERY FINE TO SOME FINE GRAIN; PREDOMINATELY WELL SORTED; SUB ANGULAR TO SUB ROUND IN PART MODERATE TO SLIGHT HIGH SPHERICITY; SOME FROSTED SURFACE FEATURES; EASILY FRIABLE OCCASIONAL FIRM FRIABLE; SILICA CEMENT, TRACE CALCAREOUS CEMENT, WEAK GRAIN SUPPORT; GOOD VISUAL INTERGRANULAR POROSITY; TRACE BROWNISH BLACK CARBONEOUS SHALE IMBEDDED; INCREASE AMOUNT OF BLACK COAL FLOATING IN SAMPLE TRAY.

CARBONEOUS SHALE = BLACKISH BROWN, DARK DUSKY BROWN; FIRM TO MODERATELY



HARD TENACITY; PLANAR, SUB BLOCKY FRACTURE; WEDGELIKE, TABULAR TO SOME PLATY CUTTINGS HABIT; DULL RESINOUS GRADING TO VITREOUS LUSTER; GRITTY TRACE GRANULAR TEXTURE; TRACE BLACK STREAKED IMBEDDED COAL.

SANDSTONE = ABUNDANT LOOSE GRAIN, SMALL CLUSTERS, CLEAR TO TRANSLUCENT, LIGHT BROWNISH GRAY; PREDOMINATELY FINE GRAIN; MODERATE TO WELL SORTED; SUB ANGULAR IN PART TO SUB ROUND; MODERATE TO HIGH SPHERICITY; SOME FROSTED SURFACE FEATURES; EASILY FRIABLE TO FRIABLE, WEAK GRAIN SUPPORT, SOME KAOLITE/CLAY CEMENT, TRACE CALCAREOUS CEMENT, VERY WEAK HCL REACTION; TRACE BROWNISH BLACK SPECKLED CARBONACEOUS SHALE IMBEDDED.

CARBONACEOUS SHALE = DARK GRY, VERY DARK BRWN OCC BLACK; CRUNCHY TO DENSE TENACITY; SUB TABULAR TO SUB WEDGELIKE OCC PLATY CUTTINGS HABIT WITH IRREGULAR TO HACKLY FRACTURE; GREASY SUB VITREOUS TO DULL EARTHY LUSTER WITH SMOOTH WAXY TO SL GRITTY TEXTURE; GRADES TO CARBONACEOUS SILTSTONE IN PLACES; OCC SL PYRITIC. COMMON COAL STRINGERS OCC SLIGHT DEGASSING VISIBLE IN SAMPLE TRAY.

SANDSTONE = LT GRYISH BRWN, LT GRY, SME BRWN STAINING; INDIVIDUAL GRAINS ARE TRANSLUCENT TO OPAQUE; UPPER FINE TO LOWER VERY FINE GRAINED; LOW TO MODERATE SPHERICITY; MODERATELY SORTED; DOMINANTLY CONSOLIDATED IN A CALC/CLAY OCC SILICEOUS CEMENT; CONSOLIDATED CLUSTERS ARE GRAIN SUPPORTED; ACCESSORIES INCLUDE DARK LITHIC AND MAFIC FRAGMENTS LESS THAN 2%. MARKED TO SLIGHT INCREASE IN DITCH GAS; SOME OCC CARBONACEOUS MATERIAL.

CARBONACEOUS SHALE = DARK GRY, VERY DARK BRWN OCC BLACK; CRUNCHY TO DENSE TENACITY; SUB TABULAR TO SUB WEDGELIKE OCC PLATY CUTTINGS HABIT WITH IRREGULAR TO HACKLY FRACTURE; GREASY SUB VITREOUS TO DULL LUSTER WITH SMOOTH WAXY TO SL GRITTY TEXTURE. FRACTURE IS MORE PLANAR WITH PLATY CUTTINGS.

SILTSTONE = GRY WITH HUES OF BRWN; TOUGH TO DENSE TENACITY WITH SUB WEDGELIKE TO SUB TABULAR OCC NODULAR CUTTINGS HABIT; DULL EARTHY TO SPARKLY EARTHY LUSTER WITH SILTY TO GRITTY TEXTURE; OVERALL MASSIVE STRUCTURE.

SANDSTONE = CLEAR TO TRANSLUCENT, LIGHT BROWNISH STAIN, VERY LIGHT GRAY; ABUNDANT LOOSE GRAINS, PREDOMINATELY QUARTZ FRAMEWORK; MODERATE FINE GRAIN; SOME SUB ANGULAR TO DOMINANTLY SUB ROUND, MODERATE TO HIGH SPHERICITY; WELL TO VERY WELL SORTED; TRACE FROSTED EASILY FRIABLE, FRIABLE, WEAK GRAIN SUPPORT; SILICA MATRIX CEMENT, TRACE CALCAREOUS/CLAYEY CEMENT; GOOD VISUAL INTERGRANULAR POROSITY; SOME BLACK INTERBEDDED CARBONACEOUS SHALE STRINGERS

CARBONACEOUS SHALE = DARK BROWNISH BLACK, GRAYISH BLACK, DARK BROWN; CRUMBLY TO CRUNCHY TENACITY; PLANAR, SUB BLOCKY, BLOCKY FRACTURE; WEDGELIKE TO PLATY CUTTING HABIT; DULL, VITREOUS SLIGHT RESINOUS LUSTER; GRITTY GRADING TO GRANULAR TEXTURE; TRACE BLACK COAL-SILTSTONE STRINGERS, SOME DEGASSING IN SAMPLE TRAY.

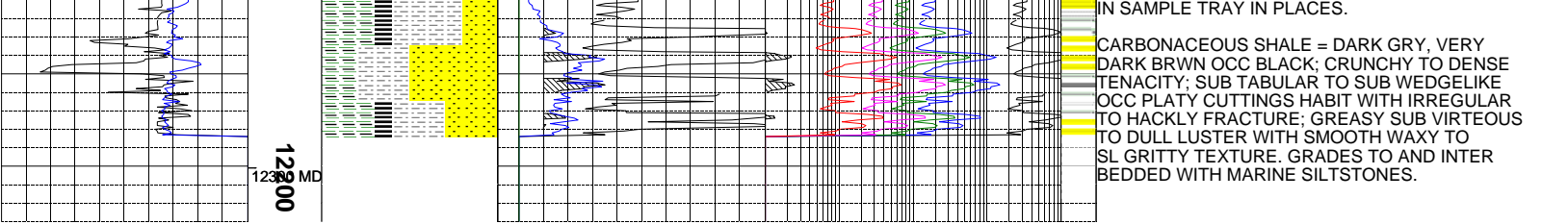
NOTE:TRIP OUT OF HOLE FOR BIT 01/21/2010 @ 9:30. RESUMED DRILLING 01/22/2009 @ 16:25. MAXIMUM TRIP GAS 3305u WITH 15 FT FLARE.

NOTE: TRIP OUT OF THE HOLE FOR NEW BIT 1-23-2010 @ 12024'; RESUMED DRILLING 01/24/2010 @ 2:15AM, TRIP GAS 812u WITH 15 FT FLARE.

SANDSTONE = LIGHT GRAY, GRAY, SOME CLEAR TO TRANSLUCENT, OFF WHITE; PREDOMINATELY VERY FINE GRAIN; WELL SORTED; SUB ANGULAR TO SUBROUND; FRIABLE TO FIRM; TRACE WHITE CLAYEY; TRACE CALCAREOUS CEMENT; WEAK TO FAIR GRAIN SUPPORT; TRACE BLACK SPECKLED CARBONACEOUS SHALE IMBEDDED; LOW BACKGROUND GAS.

SANDSTONE = ABUNDANT CAVINGS

COAL = BLACK, VERY DARK GRY, OCC HUES OF VERY DARK BRWN; CRUNCHY TO DENSE TENACITY WITH SUB TABULAR TO SUB PLATY CUTTINGS HABIT; IRREGULAR TO PLANAR OCC HACKLY CUTTINGS HABIT; VITREOUS TO SUB VITREOUS LUSTER WITH GLASSY TO SL GRITTY/SILTY TEXTURE; VISIBLE DEGASSING



The log data, interpretations and recommendation provided by Epoch are inferences and assumptions based on measurements of drilling fluids. Such inferences and assumptions are not infallible and reasonable professionals may differ. Epoch does not represent or warrant the accuracy, correctness or completeness of any log data, interpretations, recommendations or information provided by Epoch, its officers, agents or employees. Epoch does not and cannot guarantee the accuracy of any such interpretation of the log data, interpretations or recommendations and Company is fully responsible for all decisions and actions it takes based on such log data, interpretations and recommendations.