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	PCU 297-11C3
FIELD	Piceance Creek
REGION	Rocky Mountain
COORDINATES	39.896025 N
	108.254523 W
ELEVATION	GL: 6882.8'
	RKB: 6913.0'
COUNTY, STATE	Rio Blanco, Colorado
API INDEX	05-103-11473-00
SPUD DATE	01/26/2010
CONTRACTOR	HP Drilling
CO. REP.	M. Sadler/ M. Wood
RIG/TYPE	#326/ HP Flex-4
LOGGING UNIT	MLU #36
GEOLOGISTS	J. Kokes/J. Keevan
	J. Sell/D. Thibodeaux
ADD. PERSONS	P. Strickland/D. Bedard
	H. Strickland
CO. GEOLOGIST	Chris Alba

LOG INTERVAL

DEPTHS:	3900'	**TO**	12830'
DATES:	04/10/2010	**TO**	05/25/2010
SCALE:	1" = 100'		

MUD TYPES

Water Based Spud Mud	**TO**	3900'
LSND	**TO**	12830'
	TO	
	TO	

CASING DATA

16"	**AT**	150'
10 3/4"	**AT**	3887'
7"	**AT**	8712'
4 1/2"	**AT**	

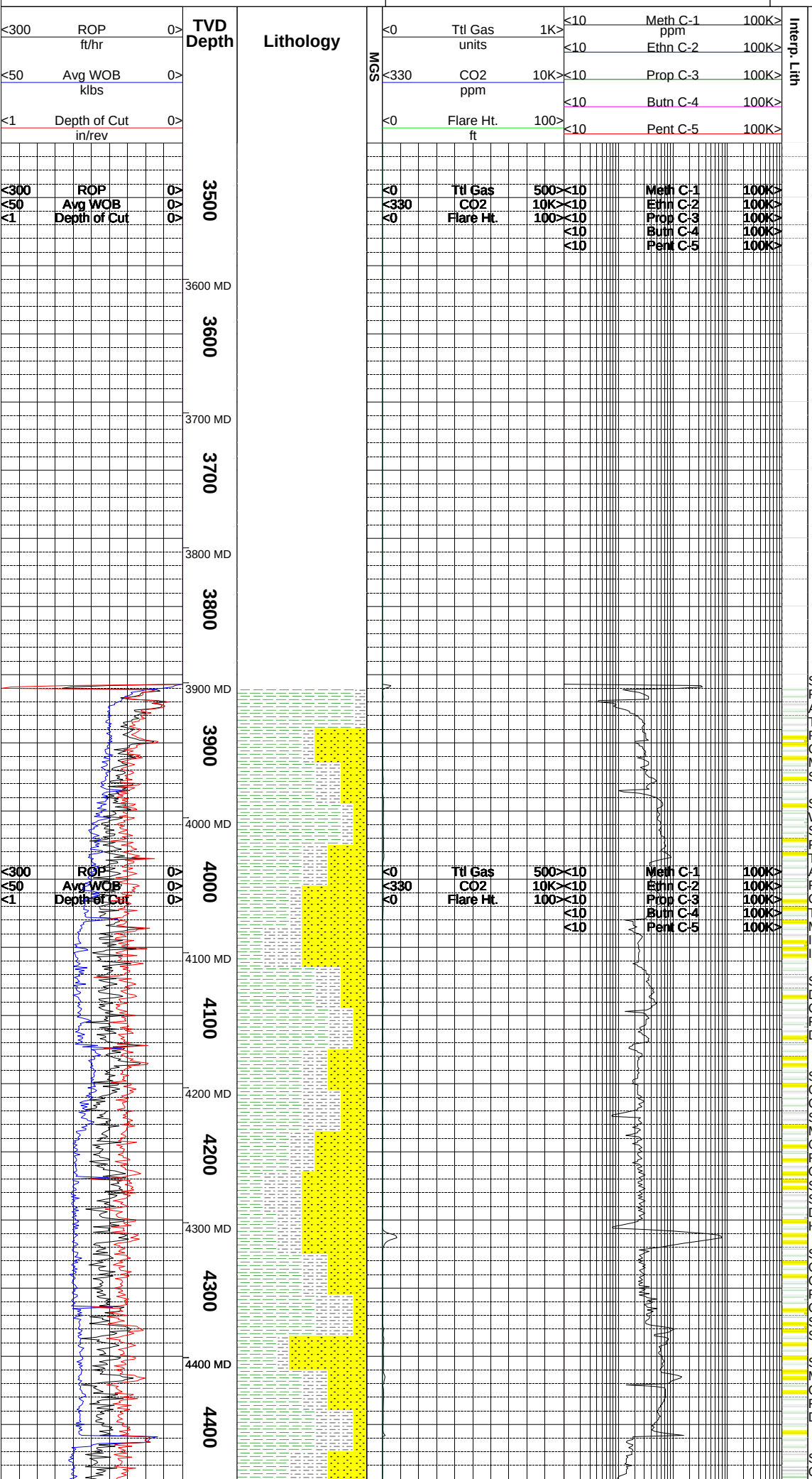
HOLE SIZE

14 1/4"	**TO**	3900'
9 7/8"	**TO**	8733'
6 1/8"	**TO**	12830'
	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
ANDESITE
ANHYDRITE
BASALT
BENTONITE
BIOTITIZATION
BRECCIA
CALCARENITE
CALCAREOUS TUFF
CALCILUTITE
CARBONATES
CARBONACEOUS MAT
CARBONACEOUS SH
CEMENT CONTAM.
CHALK
CRYSTALLINE TUFF
CHERT - ARGILL
CHERT - GLASSY
CHERT - PORCEL
CHERT - TIGER STRIPE
CHERT - UNDIFF
CLAY
CLAY-MUDSTONE
CLYST-TUFFACEOUS
CHLORITIZATION
COAL
CONGLOMERATE
CONGL. SAND
CONGL. SANDSTONE
COQUINA
DACITE
DIATOMITE
DIORITE
DOLOSTONE
FELSIC SILIC DIKE
FOSSIL
GABBRO
GLASSY TUFF
GRANITE
GRANITE WASH
GRANODIORITE
GYPSUM
HALITE
HORNBL-QTZ-DIO
IGNEOUS (ACIDIC)
IGNEOUS (BASIC)
INTRUSIVES
KAOLINITIC
LIMESTONE
LITHIC TUFF
MARL - DOLO
MARL - CALC
METAMORPHICS
MUDSTONE
OBSIDIAN
PALEOSOL
PHOSPHATE
PORCELANITE
PORCELANEOUS CLYST
PYRITE
PYROCLASTICS
QUARTZ DIORITE
QUARTZ LATITE
QUARTZ MONZONITE
RECRYSTALLIZED CALCITE
RHYOLITE
SALT
SAND
SANDSTONE
SANDSTONE-TUFFACEOUS
SERICITIZATION
SERPENTINE
SHALE
SHALE TUFFACEOUS
SHELL FRAGMENTS
SIDERITE
SILICIFICATION
SILTSTONE
SILTST-TUFFACEOUS
TUFF
VOLCANICLASTICS SEDS
VOLCANICS



Remarks

Survey Data, Mud Reports, Other Info.

SHALE = PALE YELLOWISH ORANGE, MODERATE RED, MEDIUM BLUISH GREY, PALE PURPLE IN A MOTTLED PATTERN; BRITTLE TO CRUMBLY TENACITY; PLANAR TO SPLINTERY FRACTURE; PLATY TO FLAKY CUTTINGS HABIT; SMOOTH TO CLAYEY TEXTURE; DULL TO EARTHY TO MATTE LUSTER; FISSILE TO MASSIVE STRUCTURE.

SANDSTONE - WHITE TO LIGHT GREY, CLEAR WITH SOME BLACK SPECKLES CREATING A SALT AND PEPPERED APPEARANCE; MEDIUM TO FINE GRAIN SIZE; WELL SORTED; MODERATE TO LOW SPHERICITY WITH SUBANGULAR TO ANGULAR GRAINS; POLISHED GRAIN SURFACES; FRIABLE TO FIRM FRIABLE CUTTINGS; CALCITE CEMENT WITH A MODERATE REACTION TO DILUTE HCL; GRAIN SUPPORTED WITH MASSIVE BEDDING; ABUNDANT DARK LITHIC INCLUSIONS; NO VISIBLE HYDROCARBON INDICATORS.

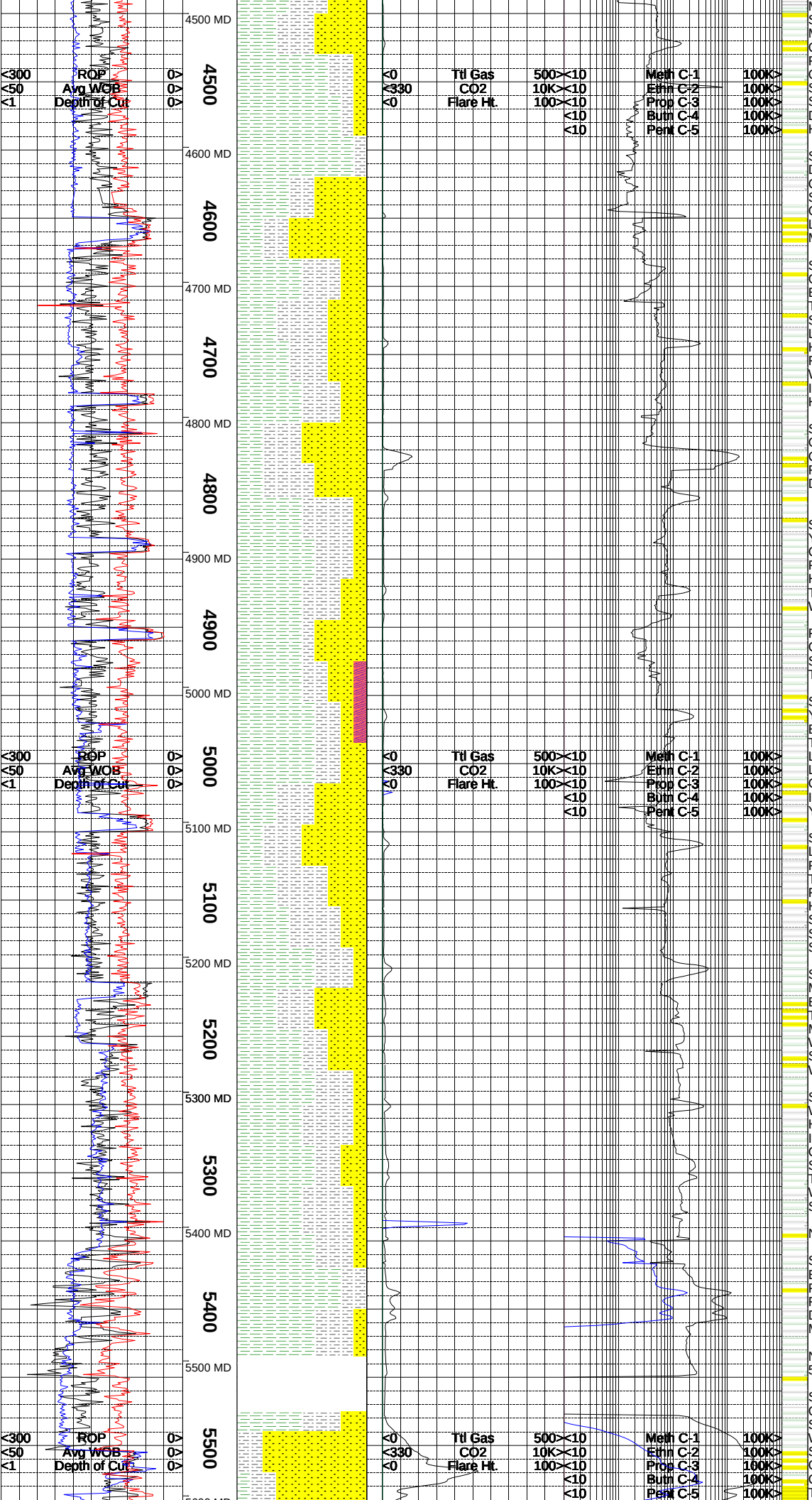
SILTSTONE = PALE YELLOWISH BROWN TO DARK YELLOWISH ORANGE, BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO SPLINTERY FRACTURE; FLAKY TO SCALY CUTTINGS HABIT; DULL TO SPARKLING LUSTER; SMOOTH TO GRITTY TEXTURE; MASSIVE STRUCTURE.

SANDSTONE = CLEAR, WHITE TO VERY LIGHT GREY, SOME VERY PALE ORANGE; MEDIUM TO COARSE GRAIN SIZE; WELL SORTED; SUBANGULAR TO ANGULAR GRAINS WITH MODERATE TO LOW SPHERICITY; POLISHED GRAIN SURFACES; FRIABLE TO EASILY FRIABLE, ABUNDANT UNCONSOLIDATED QUARTZ GRAINS; CALCITE CEMENT WITH A STRONG REACTION TO DILUTE HCL; GRAIN SUPPORTED WITH MASSIVE BEDDING; SOME DARK LITHIC INCLUSIONS; NO VISIBLE HYDROCARBON INDICATORS.

SHALE = DARK YELLOWISH ORANGE TO GRAYISH ORANGE, MEDIUM TO LIGHT GREY; CRUMBLY TENACITY; IRREGULAR TO PLANAR FRACTURE; PLTY TO FLAKY TO SCALY CUTTINGS HABIT; MATTE TO EARTHY LUSTER; SMOOTH TO CLAYEY TEXTURE; MASSIVE STRUCTURE WITH SOME FISSILITY.

SILTSTONE = PALE YELLOWISH BROWN TO MEDIUM LIGHT GREY; BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO SPLINTERY FRACTURE; FLAKY TO SCALY CUTTINGS HABIT; DULL TO SPARKLING LUSTER; SMOOTH TO GRITTY TEXTURE; MASSIVE STRUCTURE.

SANDSTONE = CLEAR, WHITE TO MEDIUM GREY, SALT AND PEPPER APPEARANCE;



MEDIUM GRAIN SIZE; WELL SORTED; SUBANGULAR TO SUBROUND GRAINS WITH MODERATE TO LOW SPHERICITY; POLISHED GRAIN SURFACES; FRIABLE TO EASILY FRIABLE, ABUNDANT UNCONSOLIDATED QUARTZ GRAINS; CALCITE CEMENT WITH A SLIGHT REACTION TO DILUTE HCL; GRAIN SUPPORTED WITH MASSIVE BEDDING; SOME DARK LITHIC INCLUSIONS; NO VISIBLE HYDROCARBON INDICATORS.

SHALE = PALE RED, GRAYISH ORANGE TO DARK YELLOWISH ORANGE; BRITTLE TO CRUMBLY TENACITY; SEMI PLANAR TO SPLINTERY FRACTURE; FLAKY TO SCALY CUTTINGS HABIT; MATTE TO FROSTED LUSTER; SMOOTH TO CLAYEY TEXTURE; MASSIVE TO FISSILE STRUCTURE.

SANDSTONE = LIGHT GREY TO MEDIUM GREY, GRAYISH ORANGE TO MODERATE YELLOWISH BROWN; FINE TO MEDIUM GRAIN SIZE; WELL TO VERY WELL SORTED; SUBROUND TO SUBANGULAR GRAINS WITH MODERATE TO LOW SPHERICITY; FIRM FRIABLE TO MODERATE HARD; CALCITE CEMENT WITH MODERATE REACTION TO DILUTE HCL; GRAIN SUPPORTED WITH MASSIVE BEDDING; TRACE DARK LITHIC INCLUSIONS AND MICAS; NO VISIBLE HYDROCARBON INDICATORS.

SILTSTONE =DARK YELLOWISH ORANGE TO GRAYISH ORANGE, BRITTLE TO CRUNCHY TO CRUMBLY TENACITY; IRREGULAR TO SPLINTERY FRACTURE; FLAKY TO SCALY CUTTINGS HABIT; DULL TO SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; MASSIVE STRUCTURE.

SHALE = MODERATE YELLOWISH BROWN TO DARK YELLOWISH ORANGE, PALE RED; BRITTLE TO CRUMBLY TENACITY; SPLINTERY TO SEMI PLANAR FRACTURE; FLAKY TO PLATY CUTTINGS HABIT; MATTE TO SPARKLING LUSTER; SMOOTH TO CLAYEY TEXTURE; MASSIVE STRUCTURE WITH FISSILITY.

FRACTURE FILL = CLEAR TO SEMI OPAQUE CALCITE GRAINS AND RHOMBS; MEDIUM IN SIZE; EASILY CLEAVED; STRONG REACTION TO DILUTE HCL IN SAMPLE TRAY.

SILTSTONE = YELLOWISH GRAY TO MODERATE YELLOW, PALE RED TO GRAYISH RED PURPLE; BRITTLE TO CRUMBLY TENACITY; SUB-PLANAR TO IRREGULAR FRACTURE; FLAKY TO WEDGE-LIKE CUTTING HABIT; DULL TO EARTHY LUSTER, MINOR SPARKLING DUE TO VITREOUS CLASTS; GRITTY TO GRANULAR TEXTURE; INTERBEDDED PURPLISH SANDSTONE AND YELLOWISH SHALE; LOW BACKGROUND GAS.

SILTSTONE = YELLOWISH GRAY MOTTLED WITH LIGHT GRAY, MINOR PURPLISH GRAY TO REDDISH BROWN BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO SUB-PLANAR FRACTURE; FLAKY TO WEDGELIKE CUTTINGS HABIT; EARTHY TO DULL LUSTER; GRITTY TO SILTY TEXTURE; GRADES INTO SHALE OF SIMILAR COLORATION; MASSIVE TO THICK STRUCTURE; LOW GAS.

SHALE = YELLOWISH GRAY TO GRAYISH ORANGE MOTTLED WITH LIGHT GRAY; CRUMBLY TO BRITTLE TENACITY; WEDGELIKE TO SUB-TABULAR CUTTING HABIT; DULL LUSTER; MASSIVE TO THICK STRUCTURE; INTERBEDDED WITH AND GRADES INTO SIMILARLY COLORED SILTSTONE AND INTERBEDDED WITH SANDSTONE WEAKLY CALCAREOUS; LOW BACKGROUND GAS.

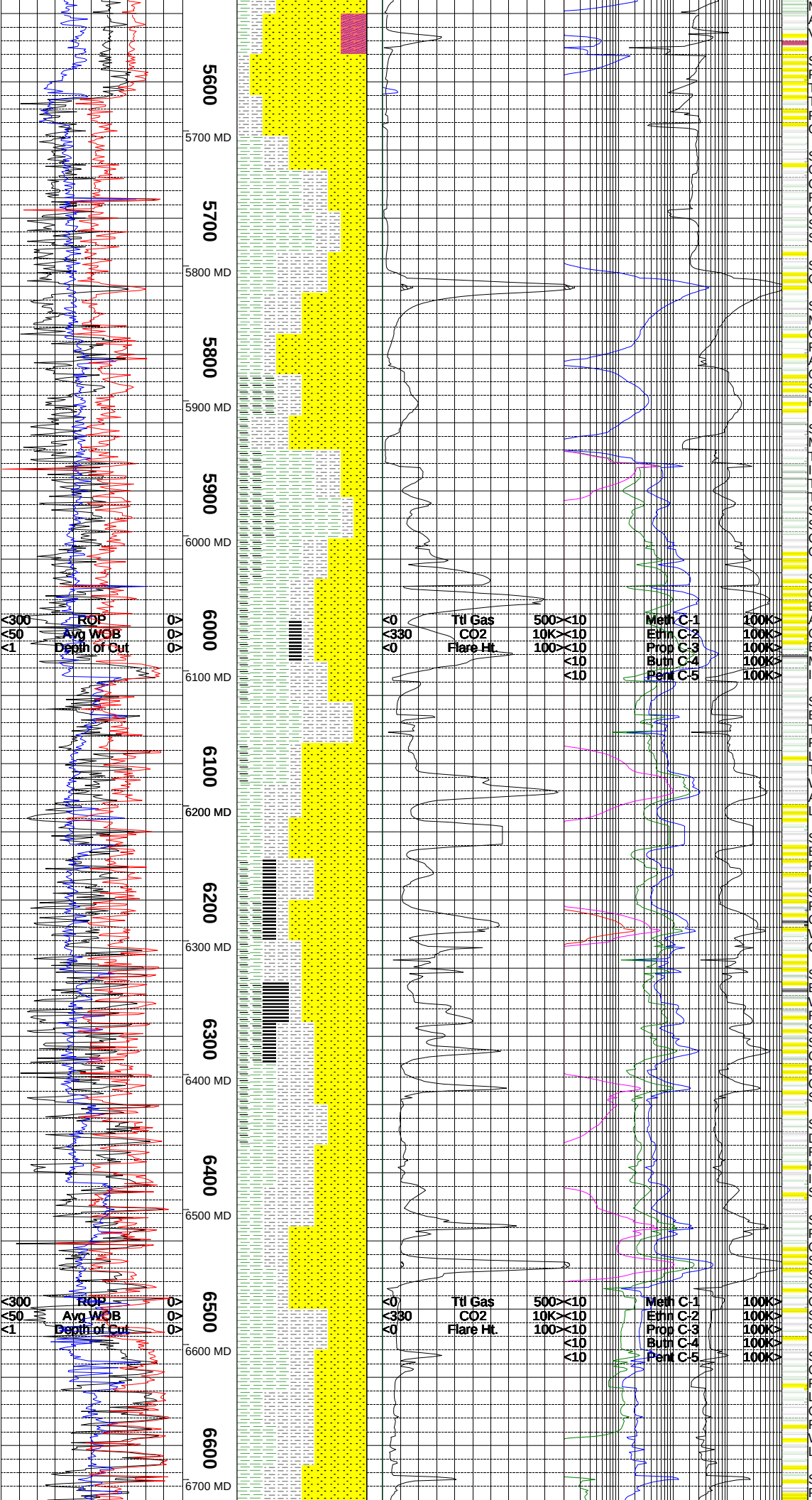
SHALE = YELLOWISH GRAY TO GRAYISH ORANGE WITH MINOR PURPLISH GRAY OR LIGHT GRAY HUES; CRUMBLY TO BRITTLE TENACITY; IRREGULAR FRACTURE; WEDGELIKE TO FLAKY CUTTINGS HABIT; DULL TO EARTHY LUSTER; SILTY TO CLAYEY WITH MINOR GRITTY TEXTURE; GRADES INTO AND INTERBEDDED WITH SILTSTONE AS WELL AS INTERBEDDED SANDSTONE; LOW BACKGROUND GAS.

NOTE: POOH TO L/D DIRECTIONAL TOOL.

SHALE = LIGHT GREY TO MEDIUM GREY, LIGHT BLUISH 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 BEDDING WITH FISSILITY.

NOTE: LOST RETURNS WHILE DRILLING FROM 5563' TO 5577' MD.

SANDSTONE = CLEAR, WHITE TO VERY LIGHT GREY; MEDIUM TO COARSE GRAIN SIZE; WELL SORTED; SUBROUND TO SUBANGULAR GRAINS WITH MODERATE SPHERICITY; FROSTED GRAIN SURFACES; MAINLY UNCONSOLIDATED CLEAR QUARTZ GRAINS WITH SOME EASILY FRIABLE CUTTINGS; SILICA CEMENT WITH NO REACTION TO DILUTE HCL; GRAIN SUPPORTED WITH



MASSIVE BEDDING; TRACE PYRITE INCLUSIONS AND GREEN CHLOROTOID MATERIAL; NO VISIBLE HYDROCARBON INDICATORS.

SILTSTONE = PALE RED, MEDIUM GREY TO PALE GRAYISH BLUE; SEMI TOUGH TO BRITTLE TENACITY;IRREGULAR FRACTURE; MASSIVE TO SCALY CUTTINGS HABIT; MATTE TO FROSTED TO SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; MASSIVE STRUCTURE.

SHALE = MODERATE RED, PALE BLUE, MEDIUM GREY TO LIGHT GREY, SOME MODERATE YELLOW CRUMBLY TENACITY; IRREGULAR TO PLANAR FRACTURE; PLTY TO FLAKY TO SCALY CUTTINGS HABIT; MATTE TO EARTHY LUSTER; SMOOTH TO CLAYEY TEXTURE; MASSIVE STRUCTURE WITH SOME FISSILITY.

SANDSTONE = CLEAR, WHITE TO MEDIUM GREY, SALT AND PEPPER APPEARANCE; FINE TO MEDIUM GRAIN SIZE; WELL SORTED; SUBANGULAR TO SUBROUND GRAINS WITH MODERATE TO LOW SPHERICITY; FROSTED GRAIN SURFACES; FRIABLE TO FIRM FRIABLE CUTTINGS; CALCITE CEMENT WITH A MODERATE REACTION TO DILUTE HCL; GRAIN SUPPORTED WITH MASSIVE BEDDING; SOME DARK LITHIC INCLUSIONS; NO VISIBLE HYDROCARBON INDICATORS.

SHALE = MEDIUM TO MEDIUM DARK GRAY, MINOR LIGHT GRAY; DENSE TO BRITTLE TENACITY; HACKLY TO SUB-BLOCKY OR IRREGULAR FRACTURE; MASSIVE TO SUB-TABULAR CUTTING; EARTHY LUSTER; CLAYEY TO SILTY TEXTURE; THICK TO MASSIVE STRUCTURE; INTERBEDDED SILTSTONES AND SANDSTONES, FREQUENTLY GRADES INTO CARBONACEOUS SHALE; INCREASED BACK-GROUND GAS.

SANDSTONE = LIGHT TO MEDIUM GRAY; 90% QUARTZ CLASTS WITH THE REMAINDER LITHIC ESPECIALLY BLACK; SUBROUNDED TO SUB-ANGULAR; FINE TO UPPER VERY FINE; CALCITE CEMENT; GRAIN SUPPORTED; INTER-BEDDED SHALE AND CARBONACEOUS SHALE, MINOR COAL SEEN DEGASSING IN SAMPLE; INCREASE IN BACKGROUND GAS.

SHALE = MEDIUM DARK GRAY TO MEDIUM GRAY; BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO SUB-BLOCKY FRACTURE; WEDGELIKE TO FLAKY CUTTINGS HABIT; DULL TO EARTHY LUSTER; SILTY TO CLAYEY, SOME GRITTY TEXTURE; GRADES INTO AND INTERBEDDED WITH SILTSTONE OF THE SAME COLORATION AND INTERBEDDED WITH LITHIC SANDSTONE; LOW BACKGROUND GAS.

SANDSTONE = LIGHT TO MEDIUM GRAY, MINOR BROWNISH GRAY TO BROWNISH BLACK; QUARTZ PREDOMINATELY WITH MINOR LITHIC FRAGMENT INCLUDING BLACK LITHIC FRAGMENTS GIVE A SALT AND PEPPER APPEARANCE; FINE GRAINED FAIR SORTING; FRIABLE TO FIRM FRIABLE; CALCITE CEMENT; FREQUENTLY INTERBEDDED WITH SHALE, CARBONACEOUS SHALE, AND OCCASIONALLY COAL; GAS SEEN IN THE SANDS

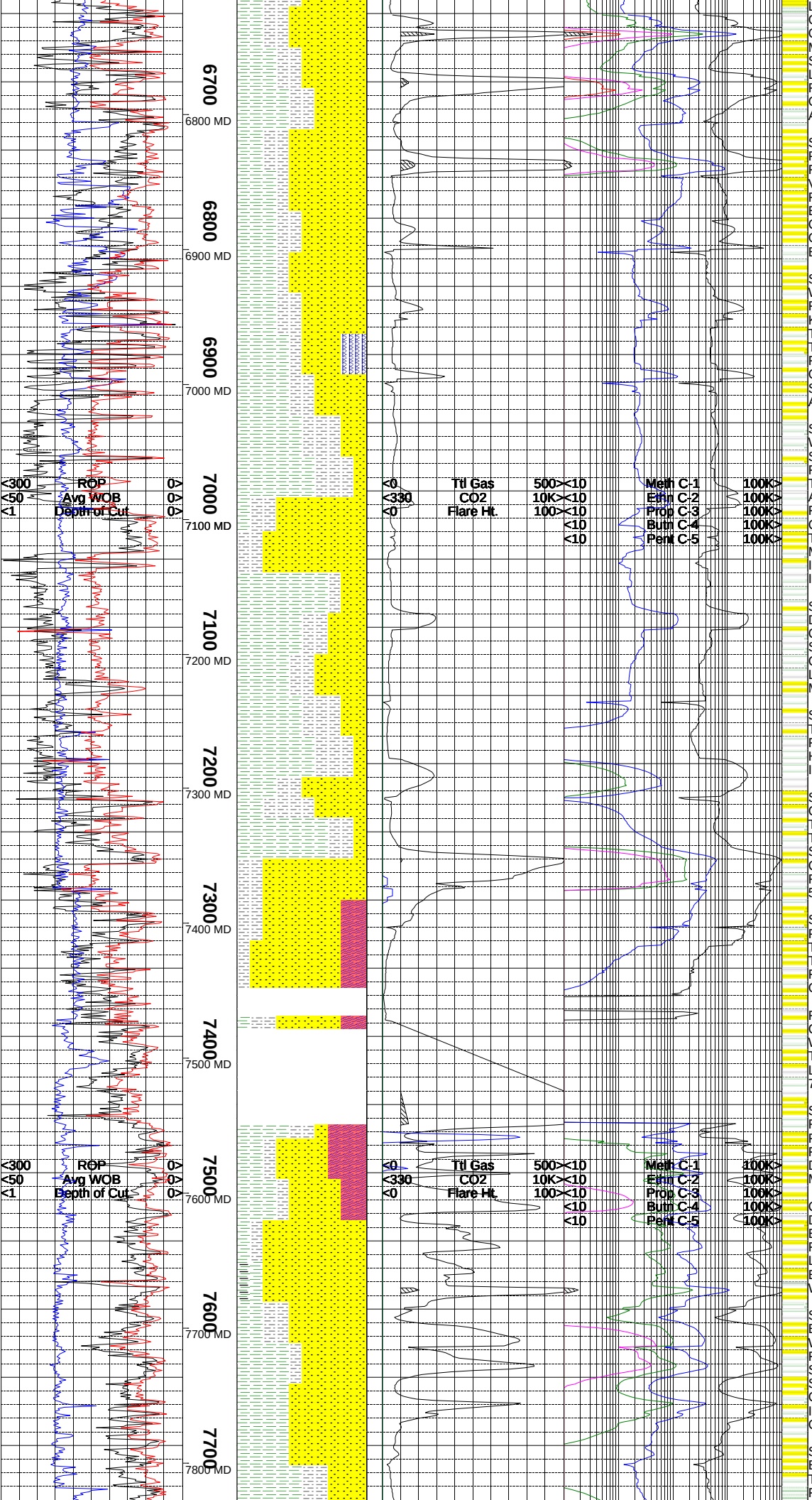
SANDSTONE = LIGHT TO MEDIUM GRAY; MINOR BROWNISH GRAY; PREDOMINATELY QUARTZ WITH 20% LITHICS BY VOLUME; FINE TO VERY FINE, MINOR MEDIUM GRAINED; FAIR SORTING SUBROUNDED TO SUBANGULAR; MODERATE SPHERICITY; EASILY TO FIRM FRIABLE; CALCITE CEMENT; GRAIN SUPPORTED; BEDS OF CARBONACEOUS SHALE AND COAL, GRADES INTO A SILTSTONE; GAS SEEN IN SAND LAYERS.

SILTSTONE = MEDIUM TO MEDIUM DARK GRAY; DENSE TO CRUMBLY TENACITY; IRREGULAR FRACTURE; NODULAR TO WEDGELIKE CUTTINGS HABIT; SILTY TO ABRASIVE TEXTURE; GRADES INTO VERY FINE SANDSTONE AND INTERBEDDED SHALE; LOW BACKGROUND GAS.

SANDSTONE = LIGHT TO LIGHT MEDIUM GRAY; FRIABLE TO EASILY FRIABLE; PREDOMINATELY QUARTZ WITH MINOR LITHIC FRAGMENTS; SUBROUNDED TO SUBANGULAR; MODERATE SPHERICITY; FROSTED GRAINS; GRAIN SUPPORTED; MODERATE AMOUNT OF CALCITE CEMENT; INTERBEDDED AND GRADES INTO SILTSTONE, INTERBEDDED GRAY SHALE; GAS SEEN IN SAND BEDS.

SILTSTONE = LIGHT TO MEDIUM LIGHT GRAY; CRUMBLY TO CRUNCHY TENACITY; IRREGULAR FRACTURE; DULL LUSTER; FLAKY TO WEDGE-LIKE CUTTING WITH MINOR TABULAR; GRANULAR TO GRITTY; GRADES INTO A VERY FINE GRAINED SANDSTONE AND INTERBEDDED WITH GRAY SHALE; SLIGHTLY CALCAREOUS; LOW BACKGROUND GAS.

SANDSTONE = VERY LIGHT TO MEDIUM GRAY; PREDOMINATELY QUARTZ WITH UP TO 20%



LITHIC FRAGMENTS, INCREASING IN LARGER GRAINED SANDSTONE; PREDOMINATELY FINE GRADING INTO MEDIUM LOWER WITH MINOR MEDIUM UPPER OR VERY FINE; FAIR SORTING; SUBROUNDED TO SUBANGULAR; MODERATE TO LOW SPHERICITY; EASILY FRIABLE TO FRIABLE; LOW TO MODERATE CALCITE CEMENT; GRAIN SUPPORTED; INTERBEDDED GRAY SHALE AND SILTSTONE; GAS SEEN IN LOWER PORTION

SANDSTONE = LIGHT TO VERY LIGHT GRAY; PREDOMINATELY QUARTZ WITH BLACK AND REDDISH BROWN LITHIC FRAGMENTS; FINE TO VERY FINE; FAIR TO WELL SORTING; SUB-ROUNDED TO ROUNDED; MODERATE SPHERICITY; EASILY FRIABLE TO FIRM FRIABLE; CALCITE CEMENT; GRAIN SUPPORTED; LOW POROSITY; GRADES INTO A SANDY SILTSTONE, INTER-BEDDED WITH SHALE; LOW BACKGROUND GAS.

SANDSTONE = LIGHT TO VERY LIGHT GRAY, WHITE; PREDOMINATELY QUARTZ WITH LITHIC FRAGMENTS; LOWER SECTION ALSO CONTAINS KAOLINITIC CONTENT; CALCITE CEMENT; FINE TO VERY FINE, MINOR MEDIUM GRAINED; WELL TO FAIRLY SORTED; SUBANGULAR TO SUB-ROUNDED; EASILY FRIABLE TO FRIABLE; GRAIN SUPPORTED WITH MINOR MATRIX SUPPORTED; INTERBEDDED SHALE; LOW GAS AND NO VISIBLE HYDROCARBON INDICATORS.

SANDSTONE - WHITE TO LIGHT GREY, CLEAR WITH SOME BLACK SPECKLES CREATING A SALT AND PEPPERED APPEARANCE; MEDIUM TO FINE GRAIN SIZE; WELL SORTED; MODERATE TO LOW SPHERICITY WITH SUBANGULAR TO ANGULAR GRAINS FROSTED GRAIN SURFACES; FIRM FRIABLE TO MODERATELY HARD CUTTINGS CALCITE CEMENT WITH A STRONG REACTION TO DILUTE HCL; GRAIN SUPPORTED WITH MASSIVE BEDDING; SOME DARK LITHIC INCLUSIONS; NO VISIBLE HYDROCARBON INDICATORS.

SHALE = PALE RED, GRAYISH ORANGE TO DARK YELLOWISH ORANGE; BRITTLE TO CRUMBLY TENACITY; SEMI PLANAR TO SPLINTERY FRACTURE; FLAKY TO SCALY CUTTINGS HABIT; MATTE TO FROSTED LUSTER; SMOOTH TO CLAYEY TEXTURE; MASSIVE TO FISSILE STRUCTURE.

SILTSTONE = MEDIUM TO MEDIUM LIGHT GRAY; TOUGH TO CRUMBLY TENACITY; IRREGULAR FRACTURE; FLAKY TO WEDGELIKE CUTTINGS HABIT; SILTY TO ABRASIVE TEXTURE; GRADES INTO VERY FINE TO FINE SANDSTONE.

SANDSTONE = WHITE TO CLEAR; MEDIUM TO COARSE GRAIN SIZE; WELL SORTED; SUBROUND TO SUBANGULAR GRAINS WITH MODERATE TO LOW SPHERICITY; FROSTED GRAIN SURFACES; UNCONSOLIDATED GRAINS, SOME CALCITE MATRIX COATING ON GRAINS, SOME REACTION TO DILUTE HCL; ASSOCIATED WITH 539 UNIT GAS OCCURRENCE.

SILTSTONE = PALE RED, MEDIUM GREY TO PALE GRAYISH BLUE; SEMI TOUGH TO BRITTLE TENACITY;IRREGULAR FRACTURE; MASSIVE TO SCALY CUTTINGS HABIT; MATTE TO FROSTED TO SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; MASSIVE STRUCTURE.

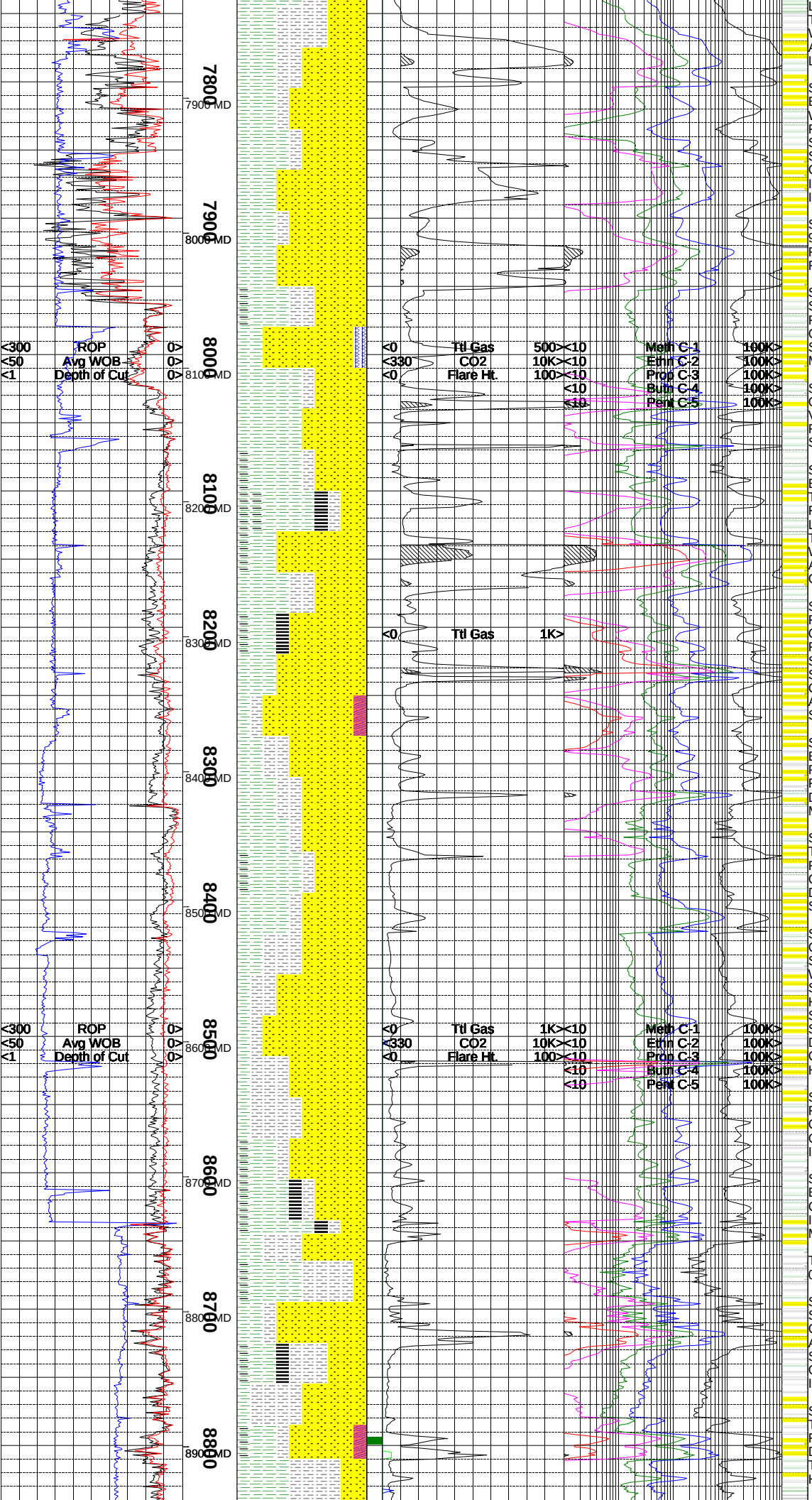
FRACTURE FILL = CLEAR TO MILKY WHITE CALCITE RHOMBS AND GRAINS; INTERBEDDED WITH SANDSTONE; VERY STRONG REACTION TO DILUTE HCL; CORRELATES WITH ZONE OF LOST RETURNS FROM 7494' MD THROUGH 7547' MD.

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

CARBONACEOUS SHALE = BLACK TO MEDIUM DARK GREY; BRITTLE TO CRUNCHY TENACITY; BLOCKY TO PLANAR FRACTURE; PLATY TO FLAKY CUTTINGS HABIT; MATTE TO WAXY LUSTER; SMOOTH TO CLAYEY TEXTURE; BANDED TO LAMINAR STRUCTURE, INTERBEDDED WITH COAL AND PYRITE.

SANDSTONE = LIGHT TO MEDIUM GRAY; MINOR BROWNISH GRAY; PREDOMINATELY QUARTZ WITH 20% LITHICS BY VOLUME; FINE TO VERY FINE, MINOR MEDIUM GRAINED; FAIR SORTING SUBROUNDED TO SUBANGULAR; MODERATE SPHERICITY; EASILY TO FIRM FRIABLE; CALCITE CEMENT; GRAIN SUPPORTED; INTERBEDDED GRAY SHALE; LOW BACKGROUND GAS.

SHALE = MEDIUM DARK GRAY TO MEDIUM GRAY; BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO SUB-BLOCKY FRACTURE; WEDGELIKE TO FLAKY CUTTINGS HABIT; DULL TO EARTHY



LUSTER; SILTY TO CLAYEY, SOME GRITTY TEXTURE; GRADES INTO AND INTERBEDDED WITH SILTSTONE OF THE SAME COLORATION AND INTERBEDDED WITH LITHIC SANDSTONE; LOW BACKGROUND GAS.

SANDSTONE = LIGHT TO MEDIUM GRAY; MINOR BROWNISH GRAY; PREDOMINATELY QUARTZ WITH 20% LITHICS BY VOLUME; FINE TO VERY FINE, MINOR MEDIUM GRAINED; FAIR SORTING SUBROUNDED TO SUBANGULAR; MODERATE SPHERICITY; EASILY TO FIRM FRIABLE; CALCITE CEMENT; GRAIN SUPPORTED; INTERBEDDED LIGHT GRAY SHALE; GAS SEEN IN SAND UNITS.

SANDSTONE = WHITE TO VERY LIGHT GRAY; 90% TO 70% QUARTZ CLASTS WITH THE REMAINDER LITHICS INCLUDING BLACK LITHIC FOR A SALT AND PEPPER APPEARANCE; MEDIUM TO FINE GRAIN; FAIR TO POOR SORTING; SUBANGULAR TO ANGULAR; LOW SPHERICITY; SAND GRAINS CLEAR TO FROSTED; EASILY FRIABLE TO FRIABLE; CALCITE CEMENT; GRAIN SUPPORTED WITH OCCASIONAL CEMENT SUPPORT; INTERBEDDED SHALE AND VERY MINOR COAL SEEN DEGASSING IN TRAY;

SANDSTONE = VERY LIGHT GRAY TO GRAY; QUARTZ AND LITHIC FRAGMENTS; FINE TO VERY FINE; CALCITE CEMENT; FRIABLE TO FIRM FRIABLE; OCCASIONAL INTERBEDDED SHALE LAYERS SEEN; GAS INCREASE IN SAND.

SHALE = MEDIUM DARK GRAY TO MEDIUM GRAY; BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO SUB-BLOCKY FRACTURE; WEDGELIKE TO FLAKY CUTTINGS HABIT; DULL TO EARTHY LUSTER; SILTY TO CLAYEY, SOME GRITTY TEXTURE; GRADES INTO AND INTERBEDDED WITH SILTSTONE OF THE SAME COLORATION AND INTERBEDDED WITH LITHIC SANDSTONE; GAS SEEN IN SANDS.

SANDSTONE = MEDIUM TO VERY LIGHT GRAY; FRIABLE TO FIRMLY FRIABLE; PREDOMINATELY QUARTZ WITH 20% TO 30% BLACK LITHIC FRAGMENTS; FAIR TO WELL SORTED; SUBROUNDED TO SUBANGULAR; MODERATE SPHERICITY; CALCITE CEMENT; GRAIN OR CEMENT SUPPORTED; INTERBEDDED SHALE AND OCCASIONAL COAL OR CARBONACEOUS SHALE; HIGH GAS SEEN IN SAND UNITS.

SHALE = LIGHT GREY TO MEDIUM GREY, LIGHT BLUISH 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 BEDDING WITH SOME FISSILITY.

SILTSTONE = MEDIUM TO MEDIUM LIGHT GRAY; TOUGH TO BRITTLE TENACITY; IRREGULAR FRACTURE; FLAKY TO SCALY TO PLATY CUTTINGS HABIT; SILTY TO GRITTY TEXTURE; DULL TO FROSTED LUSTER; MASSIVE STRUCTURE.

SANDSTONE = CLEAR, WHITE TO VERY LIGHT GREY; MEDIUM TO COARSE GRAIN SIZE; WELL SORTED; SUBROUND TO SUBANGULAR GRAINS WITH MODERATE SPHERICITY; FROSTED GRAIN SURFACES; FIRM FRIABLE TO MODERATELY HARD CUTTINGS; CALCITE CEMENT WITH A STRONG REACTION TO DILUTE HCL; GRAIN SUPPORTED WITH MASSIVE BEDDING; TRACE DARK LITHIC INCLUSIONS AND GREEN CHLOROTOID MATERIAL; NO VISIBLE HYDROCARBON INDICATORS.

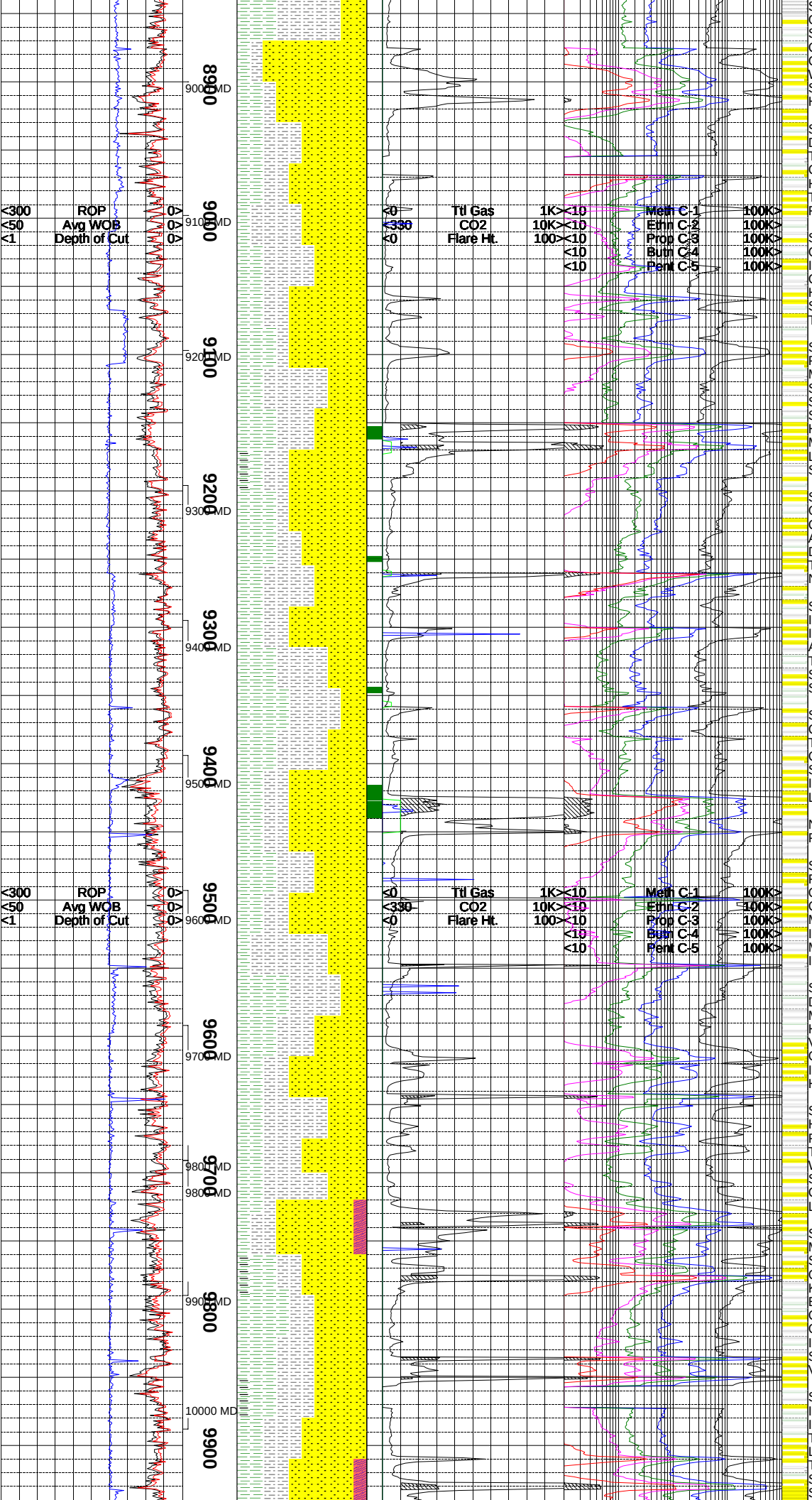
SANDSTONE = WHITE TO LIGHT BROWNISH GRAY FINE TO MEDIUM GRAIN; WELL SORTED; QUARTZ AND LITHIC CLASTS; CALCITE CEMENT GRAIN SUPPORTED; FRIABLE TO FIRM FRIABLE INTERBEDDED SHALE; GAS IN SAND UNITS.

SHALE= DARK TO MEDIUM GRAY; DENSE TO BRITTLE TENACITY; WEDGELIKE TO SUB-BLOCK CUTTINGS HABIT; DULL TO EARTHY LUSTER; INTERBEDDED CARBONACEOUS SHALE AND MINOR COAL SEEN.

TD INTERMEDIATE @ 8733' ON 04/13/2010 AT 06:56. SET INTERMEDIATE CASING @ 8712'.

SANDSTONE=WHITE FINE GRAIN ; MOD WELL SORTED; SUBANGULAR SUBROUNDED;PREDOM GRAIN SUPPORTED; CALCITE CEMENT;TR BLACK ANGULAR LITHICS CLASTS EMBEDED; MOD SPHERICITY; INTERBEDED SILTSTONES SHALES OCC CARBONACEOUS SHALES ; MOD HIGH GAS IN SANDSTONE MOD CONNECTION GASES

SILTSTONE-GRAYISH WHITE; MOD HARD FIRM TOUGH DENSE TENACITY; BLOCKY IRREGULAR FRACTURE; PLANAR MASSIVE CUTTINGS HABIT DULL EARTHY LUSTER; VERY GRITTY SANDY TEXTURRE; GRADING TO VERY FINE GRAIN MOD HARD FRIABLS SANDSTONE; INTERBED SANDS



SANDSTONE=CLEAR WHITE; FINE OCC MEDIUM GRAIN; MOD HARD EASILY FRIABLE; SUBROUND SUBANGULAR; PREDOM GRAIN SUPPORTED; SLI CALCITE CEMENT; BLACK ANGULAR LITHICS CLASTS EMBEDED; MOD SPHERICITY; FAIR MOD WELL SORTED; INTERBEDED SILTSTONES AND SHALES OCC CARBONACEOUS SHALES; NO TRACE HYDROCARBON INDICATORS

SHALE = MEDIUM BLUISH GRAY TO MEDIUM DARK GRAY IN COLOR; DENSE TO BRITTLE IN TENACITY; IRREGULAR TO BLOCKY FRACTURE; CUTTINGS ARE ELONGATED TO TABULAR IN HABIT; SEMI-WAXY TO DULL LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE; WEAK FISSILITY.

SILTSTONE = LIGHT GRAY TO MEDIUM GRAY IN COLOR; DENSE TO CRUNCHY TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE NODULAR TO ELONGATED IN HABIT; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO SLIGHTLY GRITTY TEXTURE; THIN TO THICK STRUCTURE.

SANDSTONE = WHITE TO LIGHT GRAY TO VERY PALE ORANGE IN COLOR; QUARTZ FRAMEWORK; MEDIUM TO FINE GRAIN SIZE; FAIR TO WELL SORTED; GRAINS ARE SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; SAMPLE IS FIRMLY FRIABLE TO MODERATELY HARD; CALCITE CEMENT; CALCITE AND SOME MICA SEEN IN MATRIX; NO VISIBLE POROSITY LOW TO MODERATE GAS ASSOCIATED WITH THIS SANDSTONE.

SHALE = GREENISH GRAY TO MEDIUM DARK GRAY IN COLOR; TOUGH TO BRITTLE TENACITY CONCHOIDAL TO PLANAR FRACTURE; CUTTINGS ARE PLATY TO TABULAR IN HABIT; WAXY TO DULL LUSTER EXHIBITED; SMOOTH TO CLAYEY TEXTURE; THIN TO THICK STRUCTURE; NONCALCAREOUS.

SILTSTONE = DARK GRAY TO GREENISH BLACK IN COLOR; DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURE; CUTTINGS ARE TABULAR TO WEDGELIKE IN HABIT; DULL TO EARTHY LUSTER; SLIGHTLY CLAYEY TO SLIGHTLY GRITTY TEXTURE; THIN TO THICK STRUCTURE.

SHALE = PALE GREEN TO MEDIUM GRAY IN COLOR; DENSE TO CRUNCHY TENACITY; BLOCKY TO IRREGULAR FRACTURE; PLATY TO TABULAR CUTTINGS HABIT; WAXY TO DULL LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE INTERBEDED WTH SILTSTONES AND SANDS; LOW BACKGROUNDGAS HIGH CONNECTION GASES

NOTE=DRILLED TO 9513 LOST PARTIAL RETURN PUMPED 3 10BBL LCM SWEEPS REGAINED CIR

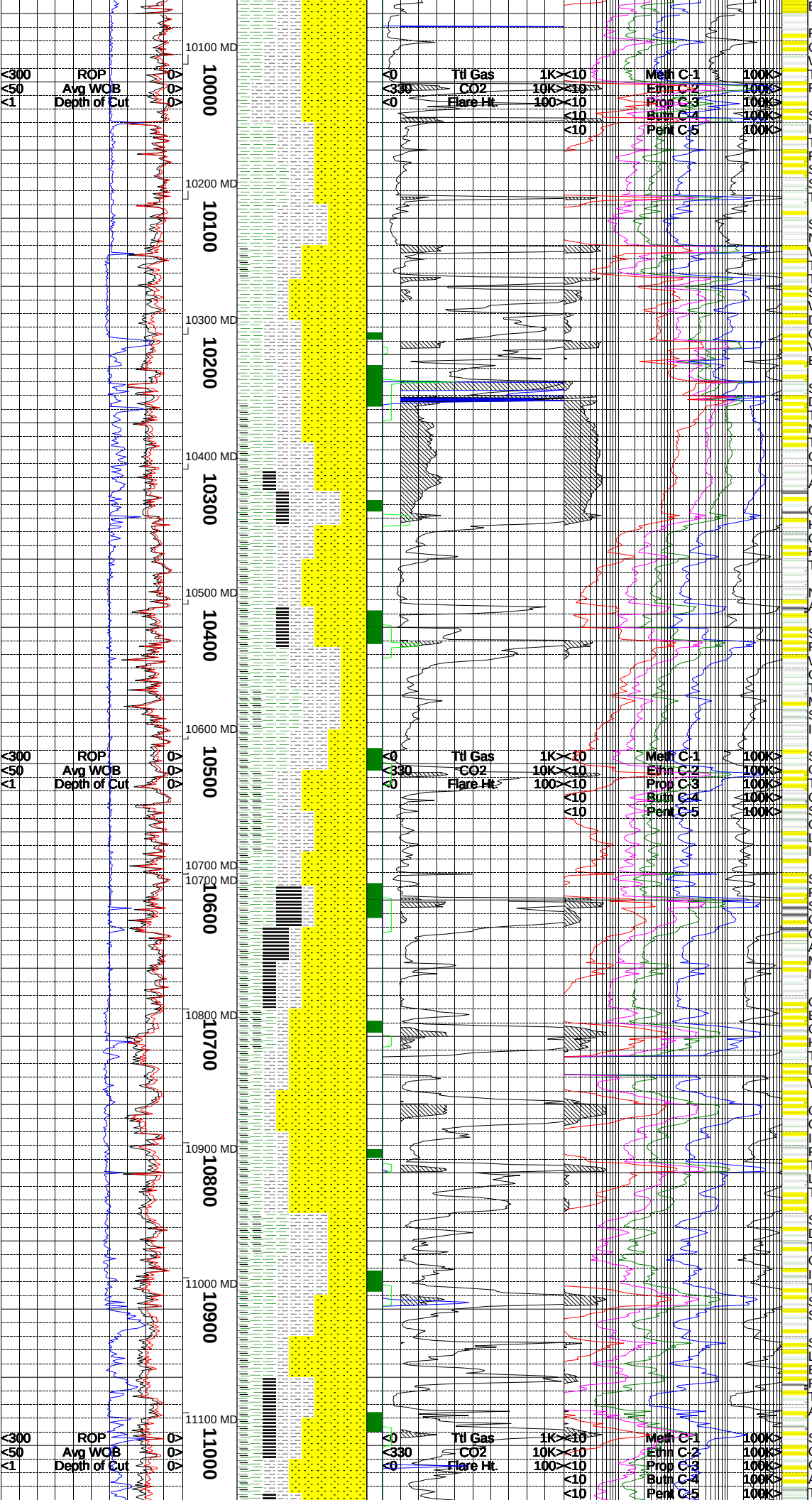
SANDSTONE=WHITE;CLREAR OD HARD EASILY FRIABLE;PREDOM LOOSE CLEAR ANGULAR QUARTZ GRAINS; MOD WELL SORTED; CALCITE CEMENT; TR BLACK LITHICS FRAGS EMBEDED; MOD SPHERICITY; OCC TRACE KAOLINITE; INTERBEDED WITH SHALES AND SILTSTONES; MOD GAS OBERVED, NO TRACE HYDROCARBON INDICATORS

SILTSTONE=GRAYISH WHITE; MOD HARD FIRM; DENSE TENACITY; BLOCKY IRREGULAR FRACTUR MASSIVE PLATY OCC WEDGELIKE CUTTINGS HABIT; DULL EARTHY LUSTER; SMOOTH GRITTY VERY SANDY TEXTURE;THICK STRUCTURE; GRADING TO WHITE VERY FINE GRAIN SANDS INTERBEDED SHALES LOW GAS READINGS NO HYDROCARBON INDICATORS

SHALE=MEDIUM LIGHT TO GRENISH GRAY; MOD HARD FIRM; DENSE SLI BRIITLE TENACITY; PLANAR OCC SPLINTERY FRACTURE; PLATY TABULAR OCC ELONGATED CUTTINGS HABIT; WAXY DULL EARTHY LUSTER; SMOOTH SLI SILTY TEXTURE; INTERBEDED WITH VERY CALCAREOUS SANDY SILTSTONES AND SANDS LOW GAS MOD HIGH CONNECTION GASES

SANDSTONE=GRAYISH WHITE WHITE; FINE MEDIUM GRAIN; MOD SORTED; SUBANGULAR SUBROUNDED MOD WELL SORTED; PREDOM GRAIN SUPPORTED, CALCITE CEMENT WITH TR KAOLINITE; TRACE BLACK ANGULAR LITHICS EMBEDED; MOD HIGH SPHERICITY; TRACE CLEAR XLN CALCITE FILL OBSERVED; HIGH GAS IN SANDSTONE WITH FRACTURE FILL; INTERBEDED SHALES AND CARBONACEOUS SHALES; MOD HIGH GAS READING IN SANDS VERY HIGH CONNECTION GASES

SILTSTONE = GRAYISH OLIVE TO MEDIUM GRAY IN COLOR; DENSE TO BRITTLE IN TENACITY; IRREGULAR TO BLOCKY FRACTURE; NODULAR TO TABULAR CUTTINGS HABIT; DULL TO FROSTED LUSTER EXHIBITED; SAMPLE SHOWS A SILTY TO GRITTY, OCCASIONALLY GRANULAR TEXTURE SEVERAL PIECES SEEN GRADING INTO FINE SANDSTONE; THIN STRUCTURE, APPEARS TO



BE GRADING TO AND FROM A SANDSTONE.

FRACTURE FILL = CLEAR TO MILKY WHITE CALCITE RHOMBS AND GRAINS; INTERBEDDED WITH SANDSTONE; VERY STRONG REACTION TO DILUTE HCL; CORRELATES WITH LOSS ZONE FROM 10020' TO 10050'.

SHALE = LIGHT BLUISH GRAY TO MEDIUM GRAY IN COLOR; SAMPLE SHOWS A BRITTLE TO TOUGH TENACITY; PLANAR TO IRREGULAR FRACTURE; CUTTINGS ARE PLATY TO TABULAR, SOME ELONGATED; WAXY TO DULL LUSTER; SMOOTH TO CLAYEY, OCCASIONALLY SILTY TEXTURE; THIN STRUCTURE.

SANDSTONE = WHITE TO LIGHT GRAY TO NEARLY TRANSLUCENT; QUARTZ FRAMEWORK WITH SOME BLACK LITHIC FRAGEMENTS;COARSE TO FINE GRAIN SIZE; GRAINS ARE ANGULAR TO SUBROUNDED WITH LOW TO MODERATE SPHERICITY; EASILY TO FIRMLY FRIABLE; WEAK CALCITE CEMENT, SLOW TO MODERATE DISSOLUTION IN HCL; NO VISIBLE POROSITY OR BEDDING FEATURES; CALCITE GRAINS VISIBLE IN MATRIX; ASSOCIATED WITH LOW BACKGROUND AND HIGH CONNECTION GAS.

SILTSTONE = DUSKY YELLOWISH BROWN TO DARK GRAY IN COLOR; BRITTLE TO CRUMBLY TENACITY; BLOCKY TO IRREGULAR FRACTURE; NODULAR TO TABULAR CUTTINGS HABIT; DULL TO EARTHY LUSTER; SAMPLE HAS A SILTY TO GRITTY, SOMETIMES GRANULAR TEXTURE; THIN STRUCTURE, INTERBEDDED WITH SANDS AND OCCASIONALLY SHALE.

CARBONACEOUS SHALE=BROWNISH GRAY; MOD HARD FIRM ; BRITTLE TENACITY; BLOCKY OCC PLANAR FRACTURE; FLAKY PLATY CUTTING HABIT; DULL EARTHY LUSTER; SLI GRITTY TEXTURE; INTERBEDED WITH SAHLES AND SAND

NOTE;RAISED MW TO 9.6PPG AT 10433; DRILL AHEAD HIGH BACKGROUND GAS HIGH

SANDSTONE GRAYISH BROWN WHITE; MEDIUM FINE GRAIN; SUBROUNDED SUANGAULAR; MOD WELL SORTED; PREDOM GRAIN SUPPORTED WITH CALCITE CEMENT AND TRACE KAOLINITE; TRACE BLACK LITHICS CLASTS EMBEDED; MOD SPHERICITY; INTERBEDED CARBONACEOUS SHALES OCC THIN COAL BEDS; MOD HIGH GAS IN COAL BEDS; NO HYDROCARBON INDICATORS

SHALE=LIGHT GRAY OCC DARK TO MEDIUM GRAY; MOD HARD FIRM; DENSE SLI CRUMBLY TENACITY; BLOCKY PLANAR OCC TABULAR CUTTINGS HABIT; DULL EARTHY WAXY LUSTER; SMOOTH SLI SILTY TEXTURE; INTERBEDED CARBONACEOUS SHALES AND SILTSTONES; LOW GAS READINGS NO TRACE HYDROCARBON INDICATORS

SANDSTONE=GRAYISH BROWN; WHITE; MOD HARD FINE MEDIUM GRAIN; MOD SORTED SUBANGULAR SUBROUNDED; PREDOM GRAIN SUPPORTED;TR CALCITE CEMENT ;ANGULAR BLACK LITHICS CLASTS EMBEDED; MOD SPHERICITY; SHALE AND CARBONACEOUS SHALES INTERBEDED; MOD GAS IN SANDS; NO TRACE HYDROCARBON INDICATORS

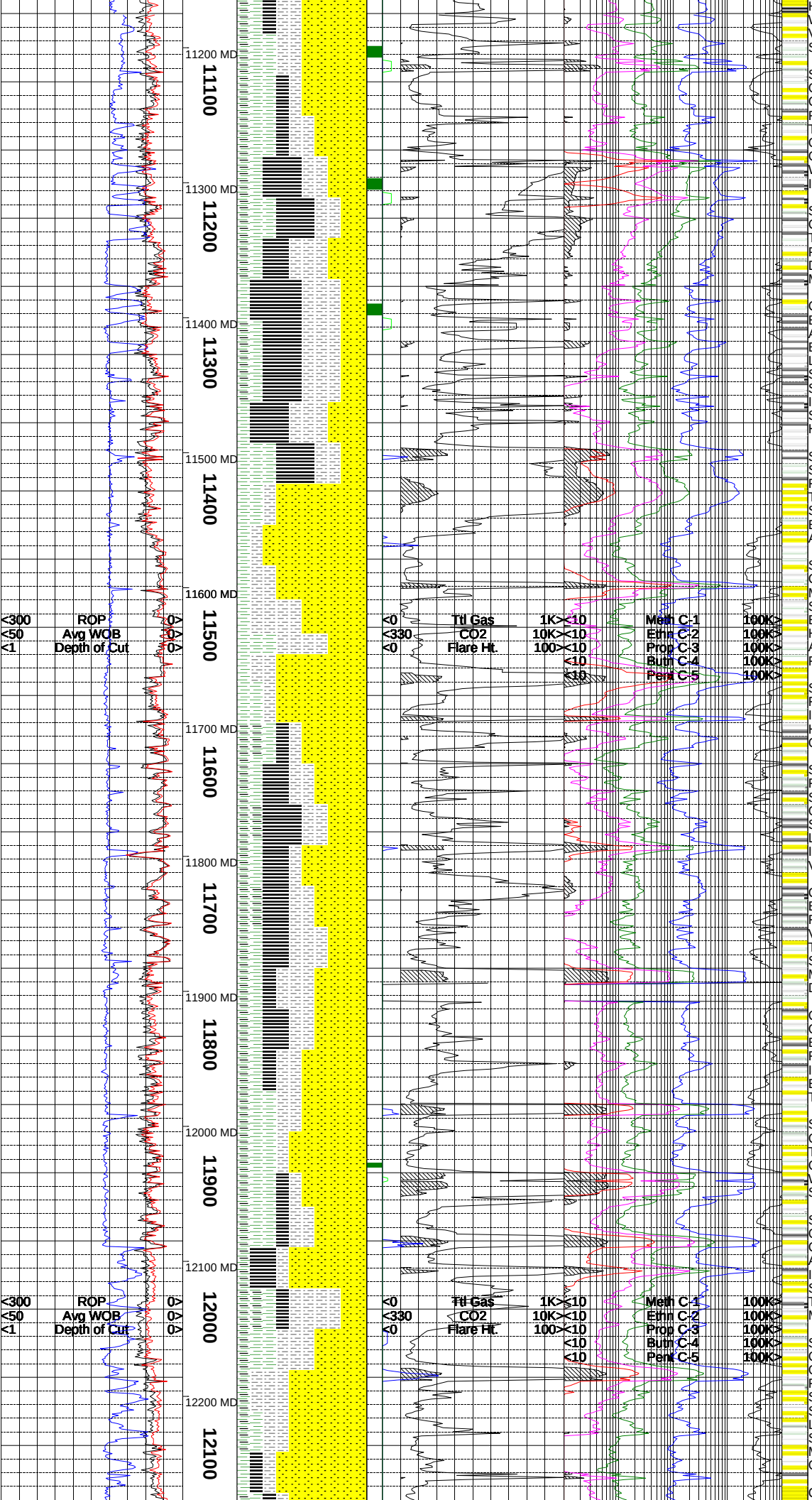
COAL = BLACK GLASSY APPERANCE; MOD HARD; BRITTLE CRUMBLY TENACITY; BLOCKY SLI CONCHOIDAL FRACTURE; WEDGELIKE CUTTINGS HABIT;METALLIC VITREOUS LUSTER; SMOOTH TEXTURE; LAMINAE TO THIN STRUCTURE; SEEN DEGASSING IN SAMPLE TRAY; ASSOCIATED WITH A 1050 UNIT GAS PEAK.

CARBONACEOUS SHALE = GRAYISH BLACK TO OLIVE BLACK IN COLOR; DENSE TO CRUMBLY IN TENACITY; BLOCKY TO IRREGULAR FRACTURE; CUTTINGS ARE NODULAR TO TABULAR IN APPEARANCE; GREASY TO DULL LUSTER; SMOOTH TO OCCASIONALLY SILTY TEXTURE; THIN TO LAMINAE STRUCTURE.

SILTSTONE = BROWNISH BLACK TO MEDIUM DARK GRAY IN COLOR; BRITTLE TO CRUMBLY TENACITY; BLOCKY TO CONCHOIDAL FRACTURE; CUTTINGS ARE MOSTLY NODULAR, SOME PLATY IN HABIT; DULL TO EARTHY LUSTER; SILTY TO GRITTY, OCC GRANULAR TEXTURE; THIN STRUCTURE, GRADES IN AND OUT WITH SANDSTONE.

SHALE = LIGHT BLUISH GRAY TO MEDIUM LIGHT GRAY; DENSE TO BRITTLE TENACITY; BLOCKY TO PLANAR FRACTURE; CUTTINGS ARE PLATY TO WEDGELIKE IN APPEARANCE; WAXY TO DULL LUSTER EXHIBITED; THIN STRUCTURE APPARENT.

SANDSTONE = PALE ORANGE TO WHITE IN COLOR; QUARTZ FRAMEWORK; COARSE TO FINE GRAIN SIZE; POOR TO FAIR SORTING; GRAINS ARE ANGULAR TO SUBROUND WITH MODERATE TO LOW SPHERICITY; FRIABLE TO MODERATELY



HARD; CALCITE CEMENT; GRAIN SUPPORTED, WITH NO VISIBLE POROSITY; CALCITE GRAINS VISIBLE IN MATRIX; MODERATELY HIGH GAS SHOWS FROM THIS SANDSTONE.

SILTSTONE = OLIVE GRAY TO MEDIUM DARK GRAY IN COLOR; SAMPLE HAS A DENSE TO CRUNCHY TENACITY; PLANAR TO BLOCKY FRACTURE; CUTTINGS ARE MOSTLY PLATY TO TABULAR, SOME NODULAR; DULL TO FROSTED, OCCASIONALLY SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; THIN STRUCTURE, INTERBED WITH SHALES AND SANDSTONE; MICA VISIBLE IN MATRIX.

SHALE = GREENISH GRAY TO MEDIUM GRAY IN COLOR; DENSE TO BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURE; CUTTINGS ARE PLATY TO TABULAR IN APPEARANCE; WAXY TO DULL LUSTER; SMOOTH TO OCC SILTY TEXTURE MICA VISIBLE IN MATRIX.

COAL = GRAYISH BLACK TO BLACK IN COLOR; BRITTLE TO CRUMBLY TENACITY; CUTTINGS ARE TABULAR TO WEDGELIKE IN APPEARANCE; BLOCKY FRACTURE; METALLIC TO VITREOUS LUSTER; SMOOTH TEXTURE; LAMINAE TO THICK STRUCTURE APPARENT; ASSOCIATED WITH SEVERAL HIGH GAS PEAKS; DEGASSING SEEN IN SAMPLE; INTERBEDED WITH CARBONACEOUS SHALES AND SOME SANDSTONES; NO TRACE HYDROCARBON INDICATORS.

SHALE= DARK MEDIUM GRAY; MOD HARD FIRM; SLI BRITTLE DENSE TENACITY; BLOCKY IRREG FRACTURE; ELONGATED TO PLANAR OCC SLI TABULAR CUTTINGS HABIT; DULL WAXY LUSTER SLI SILTY TEXTURE; INTERBEDED WITH DARK BLACK BROWNISH CARBONACEOUS SHALES AND THIN BEDED COALS; HIGH GAS IN COAL.

SANDSTONE=CLEAR WHITE; PREDOM LOOSE CLEAR MEDIUM SUBANGUALR QUARTZ GRAINS MOD WELL SORTED; PREEDOM GRAIN SUPPORT SLI CALCITE CEMENT; FINE GRAIN; MOD HARD EASILY FRIABLE; TRACE KAOLONITE; MOD HIGH SPHERICITY; INTERBEDED WITH SHALES AND SILTSTONES; HIGH GAS AT TOP ROLLINS FORMATION; NO HYDROCARBON INDICATOR.

SILTSTONE=LIGHT GRAYISH BROWN; MOD HARD FIRM; SLI CRUBLY DENSE TENACITY; BLOCKY IRREGULAR FRACTURE; MASSIVE PLATY CUTING HABIT; DULL EARTHY OCC SHINY LUSTER; SLI GRITTY OCC SANDY SMOOTH TEXTURE.

SANDSTONE=WHITE REDISH BROWN GRAY;HARD FRIABLE; SUBANGULAR SUBROUNDED; MOD WELL SORTED; ABUD CLEAR ANGULAR MEDIUM QUARTZ GRAINS OBSERVED, PREDOM GRAIN SUPPORTED SILICA CEMENT SLI TR CALCITE; TR BLACK LITHICS CLASTS EMBEDED; MOD SPHERICITY; INTERBEDED WITH CARBONACEOUS SHALES VERY THIN LAMINATED COAL BEDS; HIGH GAS

COAL=BLACK GLASSY APPERANCE; MOD HARD; BRITTLE TENACITY; IRREGULA BLOCKY FRACTUE; WEDGELIKE CUTINGS HABIT; SLI VITREOUS TO METALLIC LUSTER; SMOOTH TEXTURE; INTERBEDED CARBONACEOUS SHALES SILTSTONES AND FINE GRAIN SANDSTONES; MOD HIGH GASES IN BOTH COALS AND SANDS DEGASSING OBSERVED IN SAMPLES

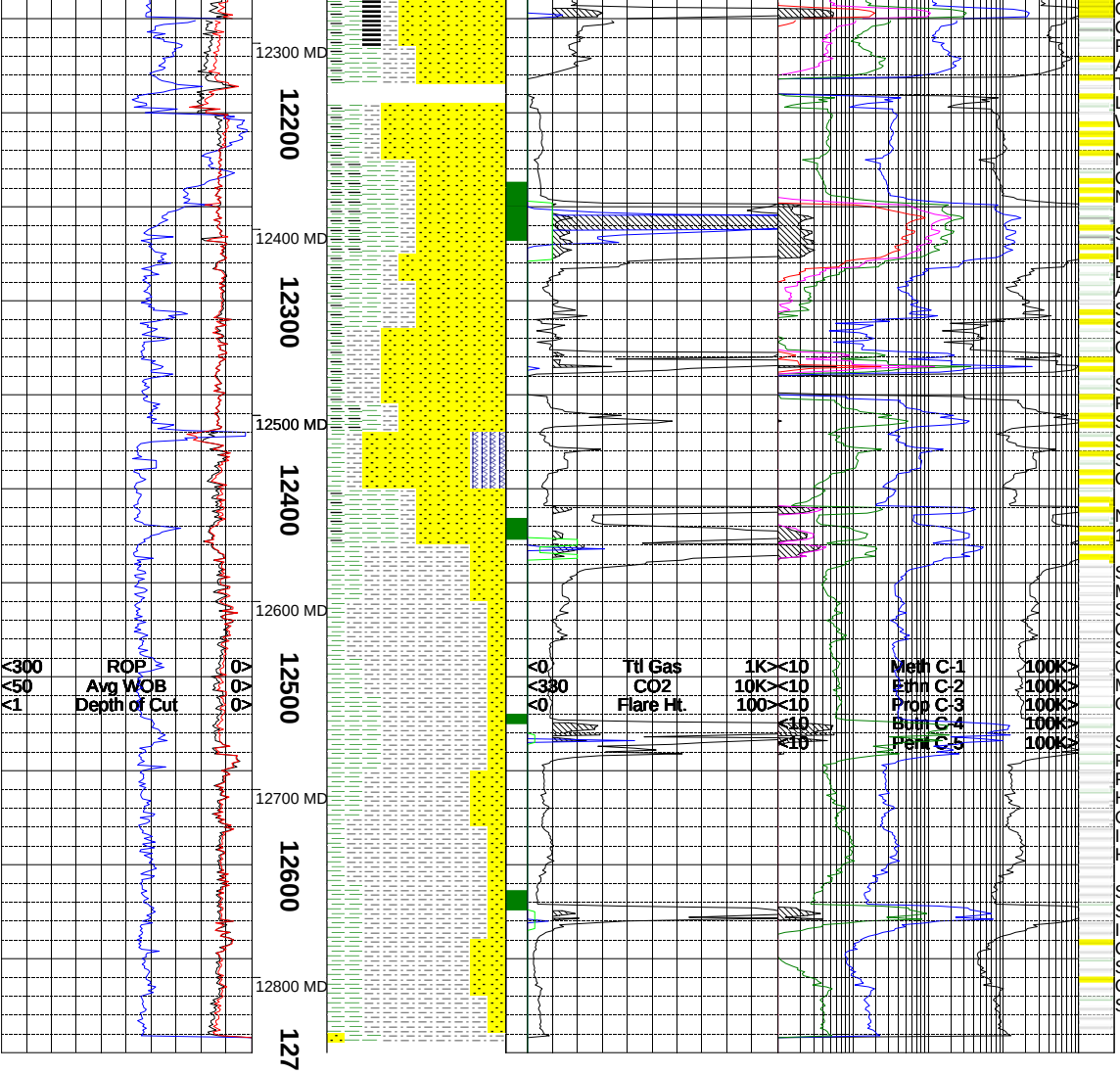
CARBONACEOUS SHALE = GRAYISH BLACK TO OLIVE BLACK IN COLOR; PULVERULENT TO BRITTLE TENACITY; MOTTLED TO PLANAR FRACTURE; CUTTINGS ARE PLATY TO TEBULAR IN APPEARANCE; VITREOUS TO GREASY LUSTER EXHIBITED; SMOOTH TO OCC SILTY TEXTURE; THIN TO THICKS STRUCTURE APPARENT.

SHALE = LIGHT GREENISH GRAY TO MEDIUM GRAY IN COLOR; BRITTLE TO CRUNCHY IN TENACITY; PLANAR TO BLOCKY FRACTURE; CUTTINGS ARE ELONGATED TO FLAKY IN HABIT WAXY TO DULL LUSTER; SMOOTH TO SLIGHTLY SILTY TEXTURE; THIN STRUCTURE.

SILTSTONE = BROWNISH GRAY TO MEDIUM DARK GRAY IN COLOR; DENSE TO BRITTLE TENACITY CUTTINGS ARE NODULAR TO TABULAR IN APPEARANCE; BLOCKY TO IRREGULAR FRACTURE IN THIS SAMPLE; DULL TO EARTHY LUSTER; SILTY TO GRITTY, SOMETIMES GRANULAR TEXTURE; THIN STRUCTURE, INTERBEDDED MOSTLY WITH SANDSTONE.

SANDSTONE = YELLOWISH GRAY TO WHITE IN COLOR; QUARTZ FRAMEWORK; MEDIUM TO FINE GRAIN SIZE; ROUNDED TO SUBANGULAR GRAINS FAIR TO WELL SORTED; MODERATE TO HIGH SPHERICITY; FRIABLE TO MODERATELY HARD; SLOW DISSOLUTION IN HCL INDICATES AT LEAST PARTIAL SILICA CEMENT; GRAIN SUPPORTED WITH NO VISIBLE POROSITY; MODERATE GAS SHOWS FROM SAND; HIGHER GAS SHOWS APPEAR TO BE DERIVED FROM COAL

CARBONACEOUS SHALE = BROWNISH BLACK TO



GRAYISH BLACK IN COLOR; BRITTLE TO CRUMBLY IN TENACITY; CONCHOIDAL TO PLANAR, OCC BLOCKY FRACTURE; CUTTINGS ARE PLATY TO TABULAR IN HABIT; METALLIC TO WAXY LUSTER; SMOOTH TO SILTY TEXTURE; LAMINAE TO THIN STRUCTURE; ASSOCIATED WITH A 649 UNIT GAS PEAK.

NOTE = LOST RETURNS @ 12,318'. REGAINED CIRCULATION @ 12327' AFTER PUMPING NUMEROUS LCM SWEEPS.

SILTSTONE = MEDIUM TO MEDIUM DARK GRAY IN COLOR; TOUGH TO BRITTLE IN TENACITY; BLOCKY TO IRREGULAR FRACTURE; CUTTINGS ARE PLATY TO WEDGELIKE IN APPEARANCE; SEMI-WAXY TO DULL LUSTER EXHIBITED; FINE SILTY TO GRITTY TEXTURE; THIN STRUCUTRE, GRADES FROM SANDSTONES INTO SHALES.

SANDSTONE=CLEAR WHITE OCC GRAYISH BROWN FINE GRAIN; PREDOM GRAIN SUPPORTED; SLI SILICA CEMENT OCC TRACE KAOLINITE IN SAMPLE; MOD HARD FRIABLE; SUBROUNDED SUBANGULAR; ABUD CLEAR LOOSE MEDIUM QUARTZ GRAINS; MOD HIGH SPHERICITY

NOTE; GAS TRAP DOWN NO GAS READING FROM 12478 TO 12487

SANDSTONE;CLEAR WHITE FINE MEDIUM GRAIN MOD HARD EASILY FRIABLE; PREDOM GRAIN SUPPORTED WITH ABUD LOOSE MEDIUM CLEAR QUARTZ GRAINS IN SAMPLE SUBROUNDED TO SUBANGULAR; MOD WELL SORTED; KAOLINITE CEMENT MATRIX; TR BLACK CARBONACEOUS MATERIAL EMBEDED; MOD SPHERICITY; HIGH GAS IN SANDS; INTERBEDED CARBONACEOUS

SILTSTONE GRAYISH BROWN BROWN; MOD HARD FIRM; DENSE TENACITY; IRREGULAR BLOCKY PLANAR FRACTURE; MASSIVE PLATY CUTINGS HABIT; DULL EARTHY LUSTER; SMOOTH SLI GRITTY OCC SANDY TEXTURE; CALCAREOUS INTERBEDED WITH SHALES; NO TRACE HYDROCARBON INDICATORS; LOW GAS

SHALE=DARK MEDIUM GRAY; MOD HARD FIRM; SLI BRITTLE DENSE TENACITY; BLOCKY TO IIREGULAR FRACTURE; TABULAR PLATY CUTTINGS HABIT; DULL EARTH WAXY LUSTER; SMOOTH SLI SILTY TEXTURE; THIN STRUCTURE GRADING TO LIGHT GRAY BROWNISH SANDY SILTSTONE; LOW GAS READINGS IN SHALE