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
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'		

MUD TYPES

SPUD MUD	**TO**	3815'
LSND	**TO**	12652'
	TO	
	TO	

CASING DATA

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

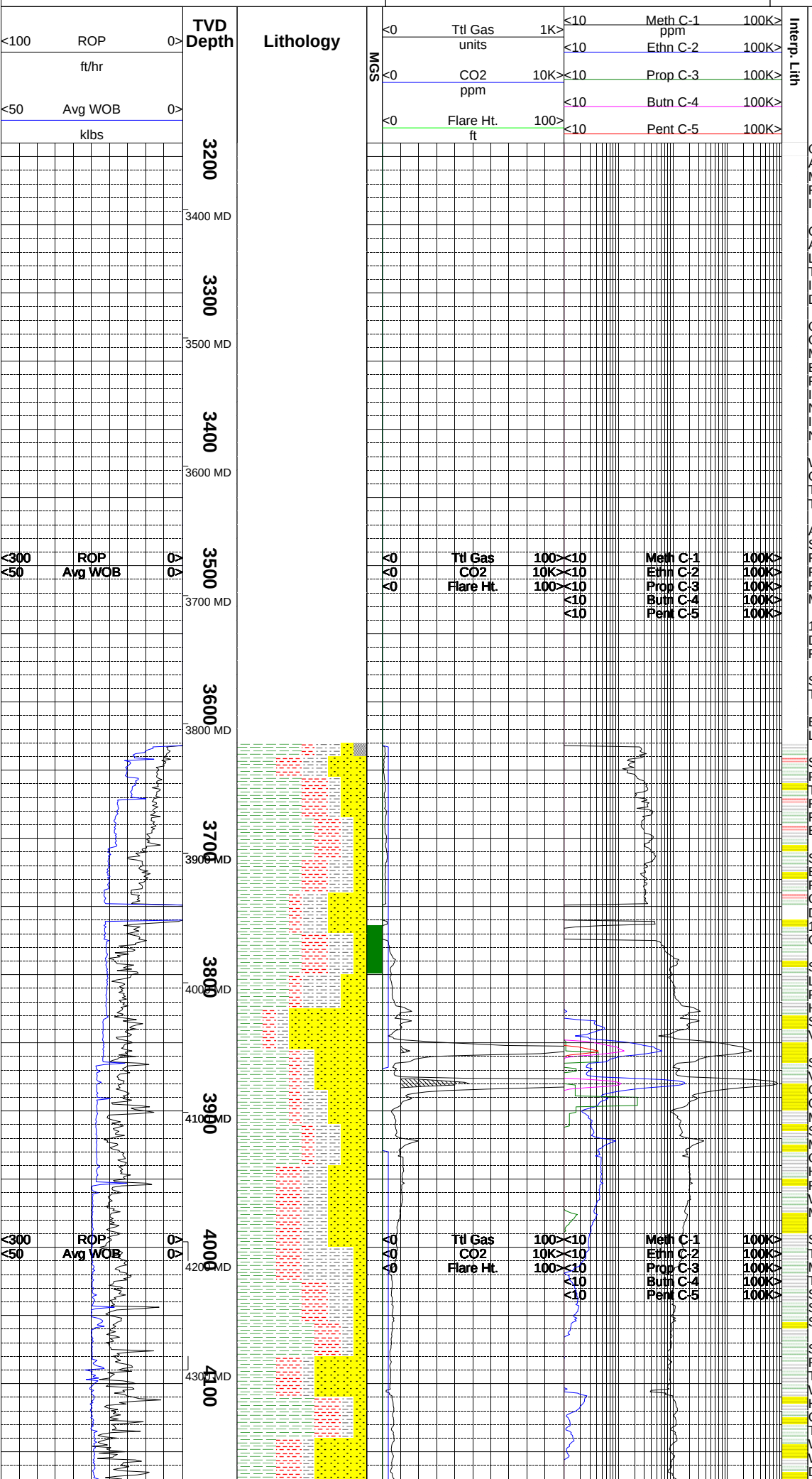
HOLE SIZE

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
- 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.

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.

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

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.

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.

SURVEY @ 3764' MD: INC 19.01 AZI 135.95
TVD 3565.83'

EPOCH WELL SERVICES COMMENCED FULL LOGGING ON 05/02/2010 AT 3815'

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.

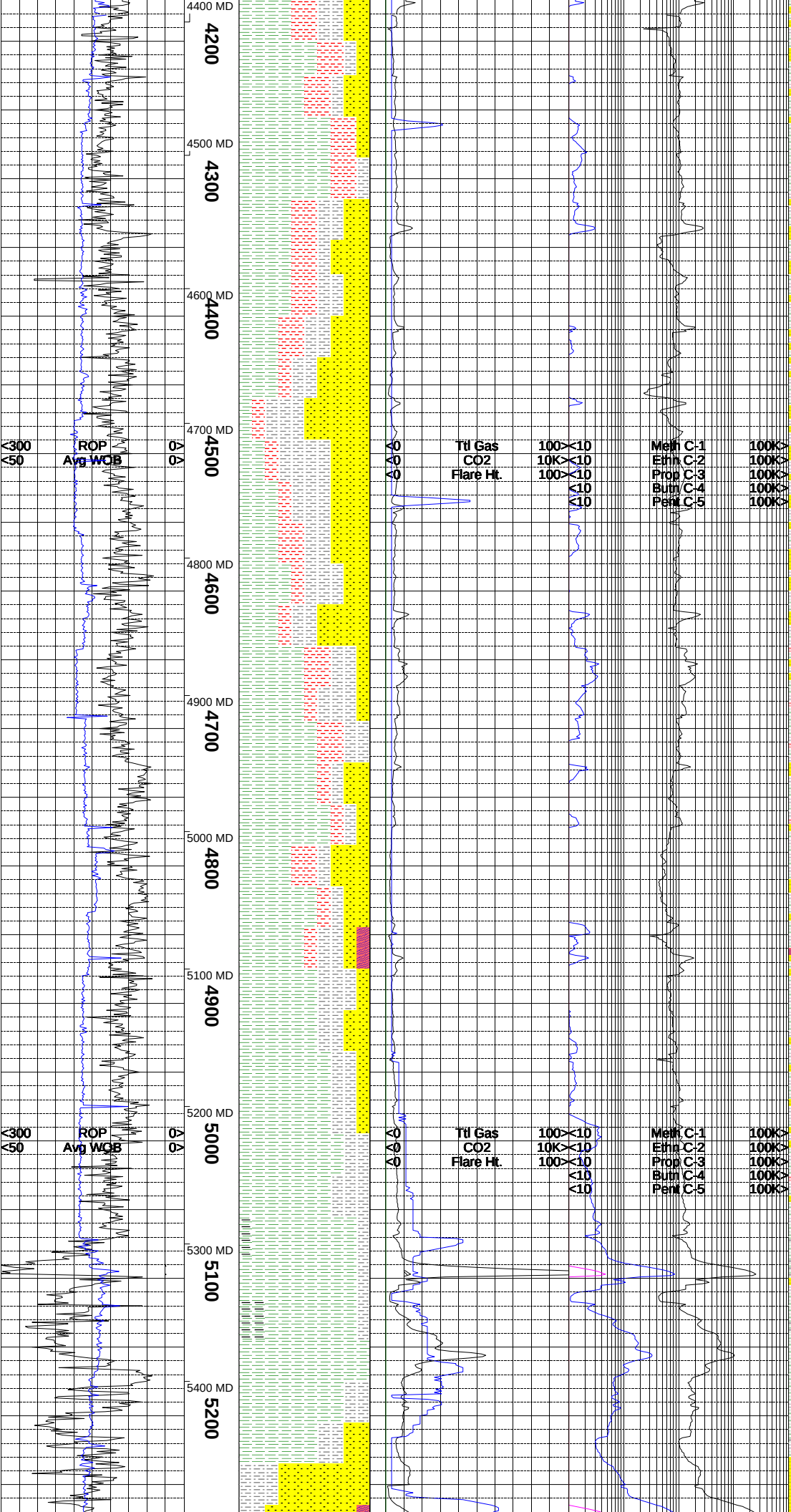
SHALE = PALE TO MODERATE YELLOWISH BROWN; BLOCKY TO PLANAR TO IRREGULAR FRACTURE; TABULAR TO PLATY TO FLAKY CUTTINGS HABIT; CLAYEY TO SILTY TEXTURE; DULL EARTHY LUSTER; NO VISIBLE STRUC; 10-20% CLAY IS WASHED OUT DURING CLEANING PROCESS.

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.

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.

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 DUE TO MINOR ENTRAINED SANDS.



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.

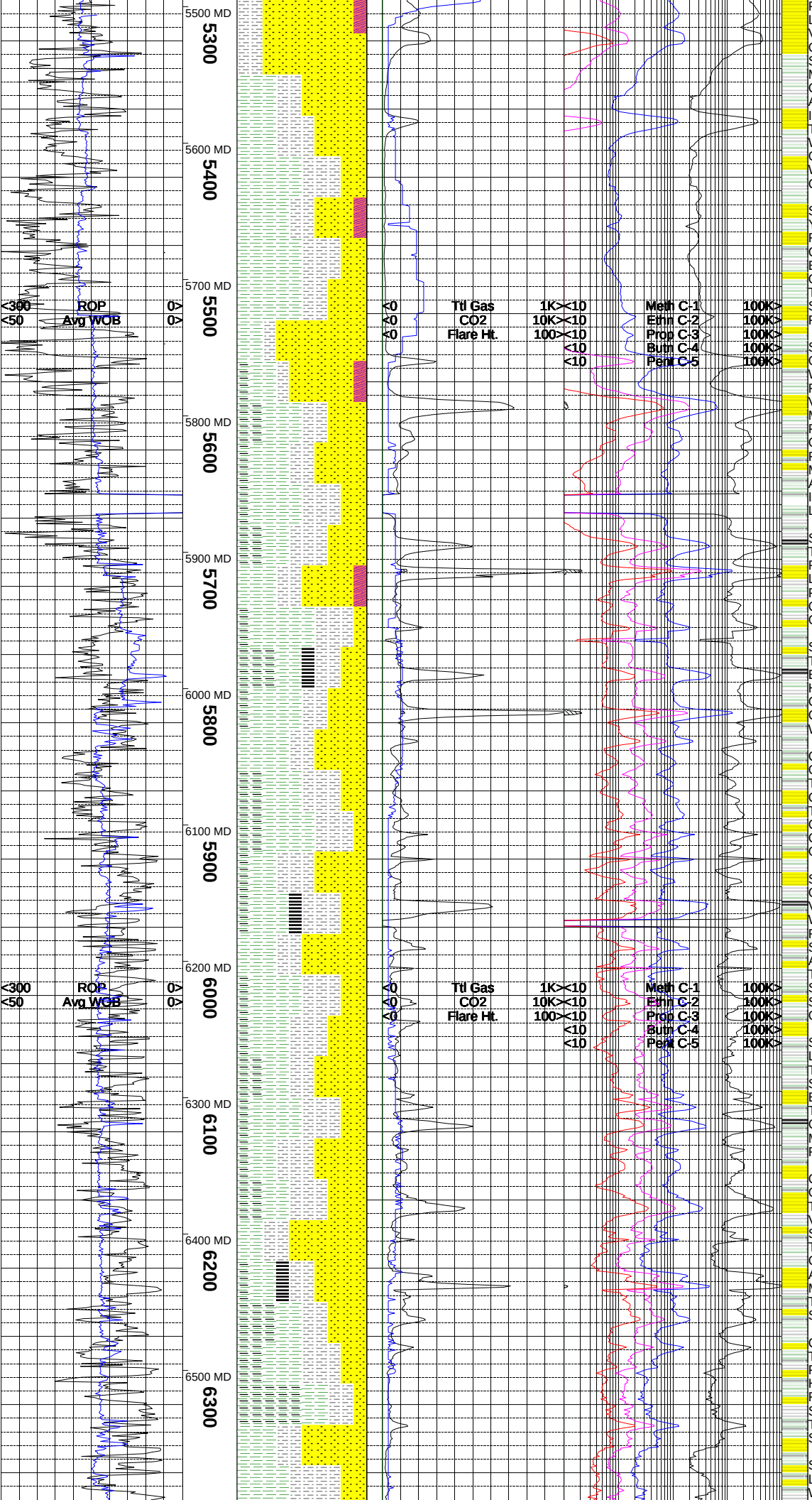
SANDSTONE = OFF WHITE TO VERY LIGHT GRAY MOTTLED WITH DUSKY RED TO LIGHT GREENISH GRAY; FRIABLE TO MODERATE HARD; VERY FINE TO UPPER FINE GRAIN; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND TRACE KAOLIN CEMENT; TRACE ACCESSORY MINERAL OF CHLORITE MICA; <3% DARK LITHIC FRAGS IN SAMPLE SPECIMENS; THINLY 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.

SANDSTONE = WHITE TO WHITEISH GRAY, V



PALE ORANGE TO PALE GRAYISH ORANGE, V LIGHT GREEN TO PALE BRILLIANT GREEN; LOW VERY FINE TO UPPER FINE RARE LOWER MED GRAINS; MODERATELY SORTED; ANGULAR TO SUB ROUNDED; SPHERICITY MODERATE TO LOW; MODERATELY FRIABLE TO FIRMLY FRIABLE; CEMENTATION CALCAREOUS WITH MINOR ARGILLACEOUS COMPONENT; GRAIN SUPPORT; INTERSTICES MODERATELY WELL FILLED; MOD TO GOOD VISIBLE POROSITY; COMMON BRIGHT WHITE TO BRIGHT YELLOW FLUORESCENCE; GOOD CUT; ASSOCIATED WITH THE TOP OF THE WASATCH G; PRODUCED GAS SHOW 265 UNITS; CHLORITE AND PYRITE AS ACCESSORIES.

SHALE = MEDIUM GRAY MOTTLED WITH PALE YELLOWISH BROWN AND DUSKY RED; PLATY TO FLAKY TO WEDGELIKE CUTTINGS HABIT; CLAYEY TO SLIGHTLY SILTY TEXTURE; DULL EARTHY LUSTER; TRACE ACCESSORY MINERAL OF MICRO PYRITE ON FRACTURE SURFACES; THINLY INTERBEDDED WITH LIGHT GRAY SILTSTONE; IRREGULAR TO HACKLY TO PLANAR FRACTURES; CRUNCHY TO CRUMBLY TENACITY.

SANDSTONE = OFF WHITE TO VERY LIGHT GRAY OVERALL; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND MINOR KAOLIN CEMENT; FAIR TO WELL SORTED; MOD SPHERICITY; VERY FINE TO FINE GRAIN; TRACE ACCESSORY MINERALS OF CHLORITE MICA AND MICRO PYRITE ON FRACTURE SURFACES; MINOR FRAGS OF CHLORITIZED SANDSTONE; <2% CALCITE FRACTURE FILL; OPAQUE; IRREGULAR FRAC; MODERATE TO HIGHLY CALCAREOUS; HIGH GAS ASSOCIATED WITH EASILY FRIABLE SANDSTONE INTERBEDDED WITH FRACTURE AND COAL LAMINAE; VISIBLE DEGASSING FROM COAL.

SILTSTONE = MEDIUM TO DARK GRAY; HARD TO TOUGH TENACITY; IRREGULAR TO HACKLY TO PLANAR FRACTURE; SPARKLING TO SEMI EARTH LUSTER; TRACE FINE GRAIN SAND IN FRAGS; PLATY TO WEDGELIKE TO SEMI NODULAR CUTTINGS HABIT; SILTY TO SUCROSIC TEXT; GRADES TO LIGHT GRAY SANDSTONE.

SHALE = MEDIUM GRAY TO DARK GRAY; PLATY TO SCALY TO TABULAR CUTTINGS HABIT; DULL EARTHY TO WAXY LUSTER; IRREGULAR TO HACKLY TO BLOCKY FRACTURE; SILTY TO CLAYEY TEXTURE; THINLY INTERBEDDED WITH CARBONACEOUS SHALE; TRACE LINEATIONS WITHIN SHALE.

CARBONACEOUS SHALE = OLIVE GRAY TO DARK GRAY TO BROWNISH GRAY; HARD TO TOUGH TENACITY; PLATY TO WEDGELIKE TO SCALY CUTTINGS HABIT; SILTY TO SEMI CLAYEY TEXTURE; THINLY INTERBEDDED LAMINAE OF COAL SEAMS; VISIBLE DEGASSING ALONG COAL CONTACTS; SOME PYRITIC VEINING EVIDENT ON FRACTURE SURFACES; MOD FISSILITY.

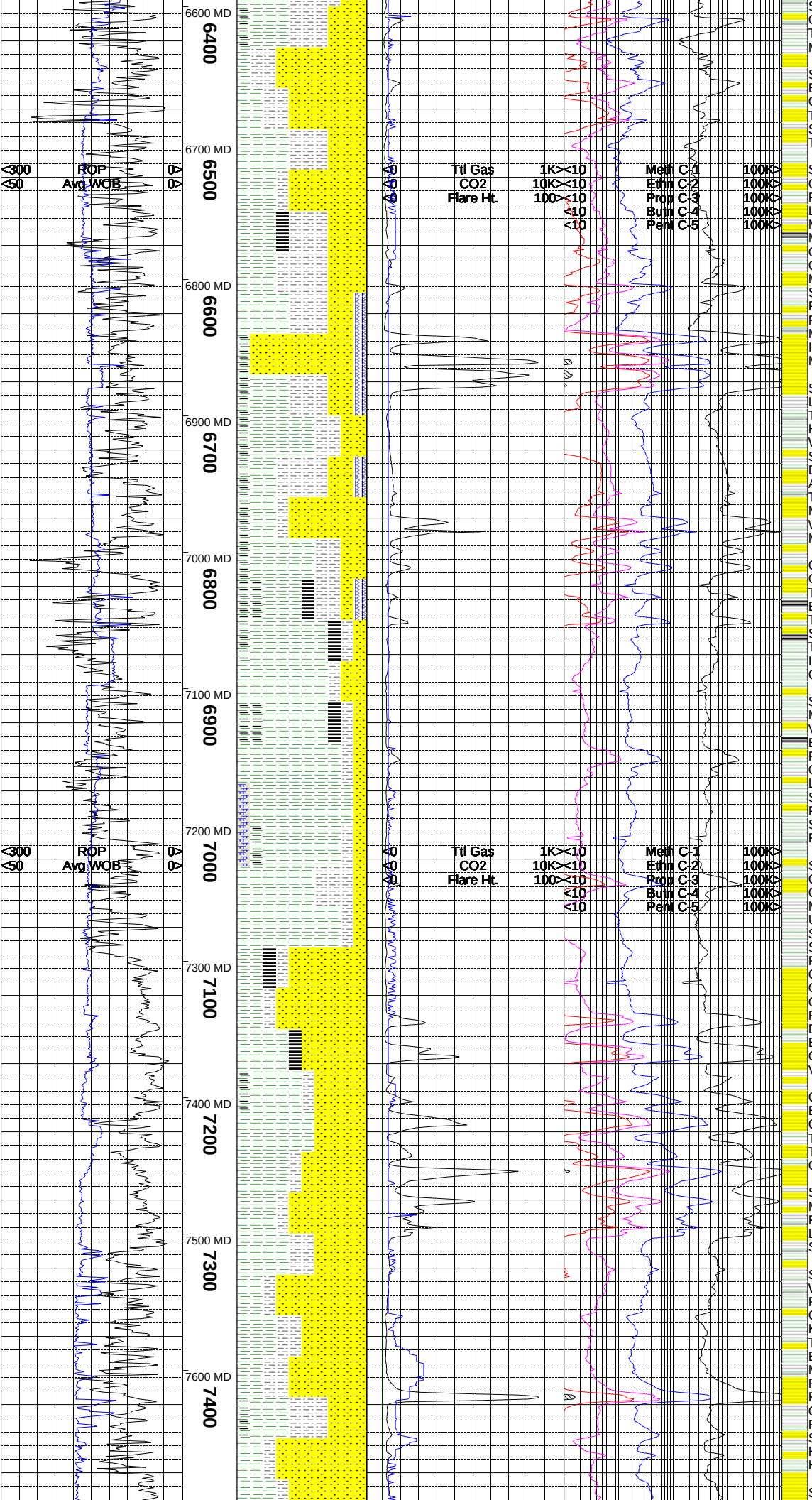
SANDSTONE = VERY LIGHT GRAY TO MEDIUM GRAY TO OLIVE GRAY; MODERATE HARD TO VERY HARD; PREDOMINANTLY GRAIN SUPPORT W/ SILICA AND TRACE KAOLIN CEMENT; HIGH REACTION TO 10% HCl; FAIRLY SORTED; MOD SPHERICITY; VERY FINE TO FINE GRAIN; ACCESSORY MINERAL OF MICRO PYRITE; THINLY INTERBEDDED WITH COAL LAMINAE; SUB ROUND TO SUB ANGULAR; 1-3% CARBON SHALE/COAL FLECKS IN SAMPLE FRAGMENTS; GRADES TO MEDIUM GRAY SILTSTONE.

SHALE = MEDIUM GRAY TO LIGHT GRAY TO LIGHT BROWNISH GRAY; PLATY TO WEDGELIKE TO ELONGATED CUTTINGS HABIT; PLANAR TO SPLINTERY TO ANGULAR FRACTURES; DULL EARTHY LUSTER; SILTY TO SEMI CLAYEY TEXTURE; TRACE LINEATIONS; SOME INTERBED CARBONACEOUS SHALE; TRACE ACCESSORY MINERAL OF PYRITE ON SURFACE OF SAMPLE FRAGS; GRADES TO LIGHT GRAY SILTSTONE.

CARBONACEOUS SHALE = OLIVE GRAY TO DARK GRAY TO BROWNISH GRAY; BLOCKY TO HACKLY TO SPLINTERY FRACTURE; EARTHY TO SEMI VITREOUS LUSTER; THIN COAL LAMINAE ON SOME SAMPLE FRAGMENTS; PLATY TO FLAKY TO TABULAR CUTTINGS HABIT; CRUNCHY TO CRUMBLY TENACITY; VISIBLE DEGASSING ALONG COAL CONTACTS; SOME ACCESSORY MINERAL OF MICRO PYRITE; CLAYEY TO SILTY TEXTURE; GRADES TO LIGHT OLIVE GRAY SILTSTONE.

COAL = BLACK TO BROWNISH BLACK; BLOCKY TO SUB CONCHOIDAL TO SPLINTERY FRACTURE; PLATY TO TABULAR TO ELONGATED CUTTINGS HABIT; SMOOTH TO CLAYEY TEXTURE; GOOD FISSILITY; ABUNDANT PYRITIC VEINING ON SAMPLE FRAGMENTS; VISIBLE DEGASSING; THINLY INTERBEDDED WITH CARBONACEOUS SHALE; BRITTLE TO STIFF TENACITY.

SHALE = MEDIUM GRAY TO LIGHT GRAY TO LIGHT OLIVE GRAY; PLATY TO FLAKY TO WEDGELIKE 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 WEDGELIKE 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 WEDGELIKE; 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

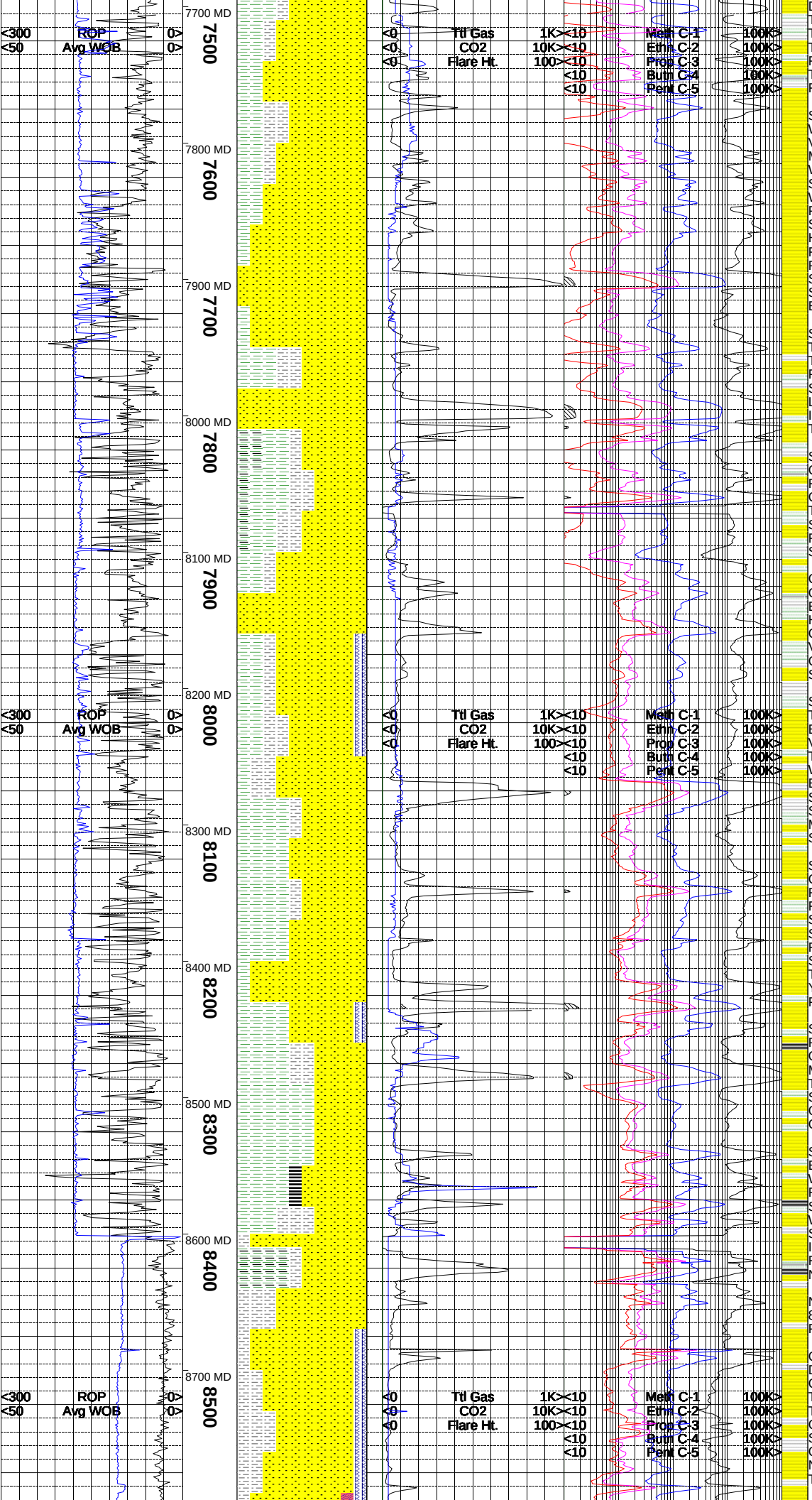
SANDSTONE = WHITEISH GRAY TO MEDIUM GRAY, PALE GREEN TO LIGHT BRILLIANT GREEN, VERY PALE ORANGE TO LIGHT TO MODERATE BROWN; FRAME WORK QUARTZ; UPPER VERY FINE TO UPPER FINE; MODERATE SORTING; SUB ANGULAR TO SUB ROUND; SPHERICITY MODERATELY HIGH; MODERATELY FRIABLE TO FIRM FRIABLE; GRAIN SUPPORT; CEMENTATION 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 IS 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.

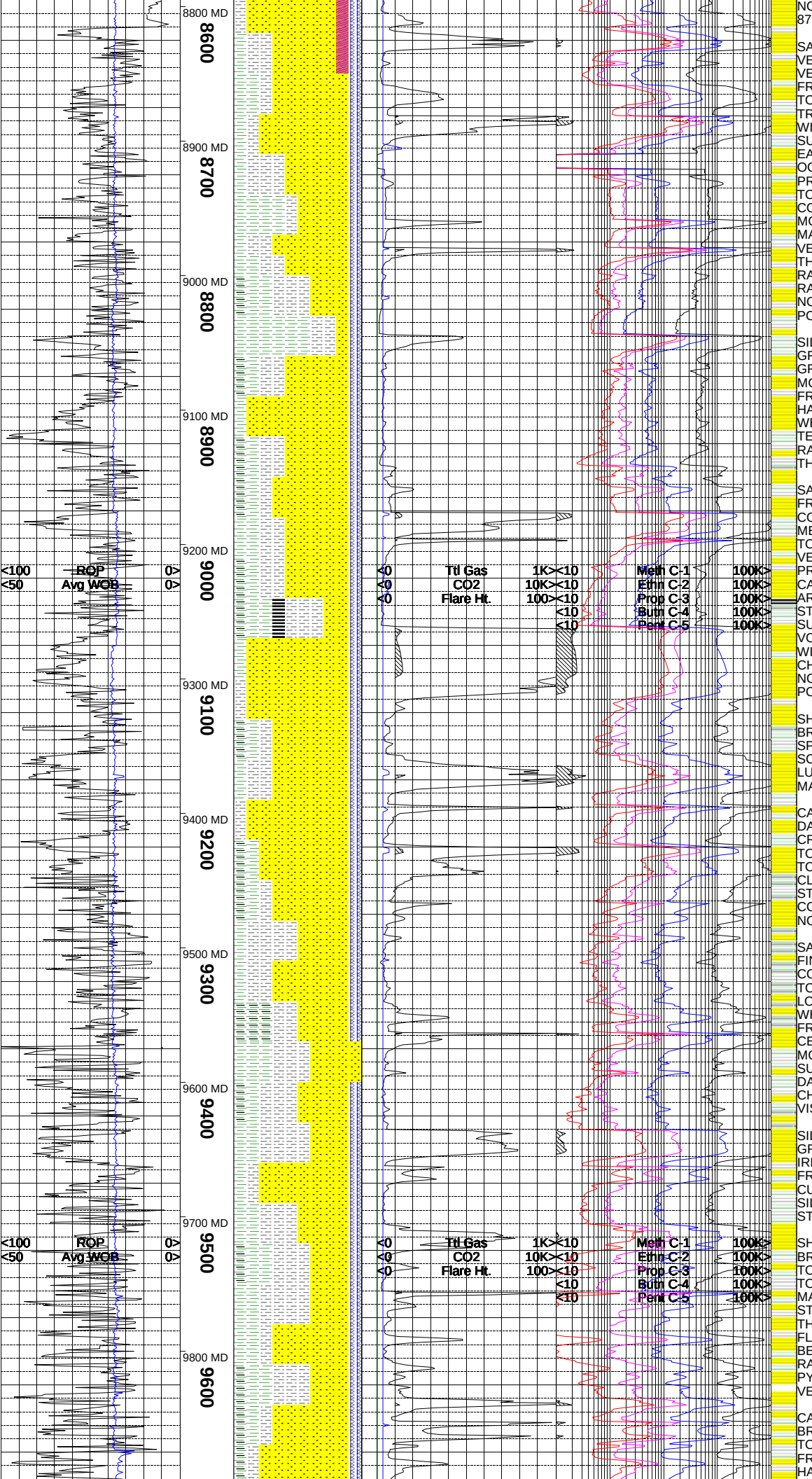
SANDSTONE = WHITISH GRAY TO MEDIUM GRAY, PALE ORANGE TO MODERATE BROWN, RARE DUSKY YELLOWISH BROWN; LOWER FINE TO UPPER MEDIUM; POORLY SORTED; SUB ANGULAR TO ANGULAR; MOD TO POOR SPHERICITY; FIRMLY FRIABLE TO MODERATE FRIABLE COMMON LOOSE GRAINS; CEMENT STRONGLY CALCAREOUS W VIGOROUS REACT TO HCL;INTERSTICES 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.

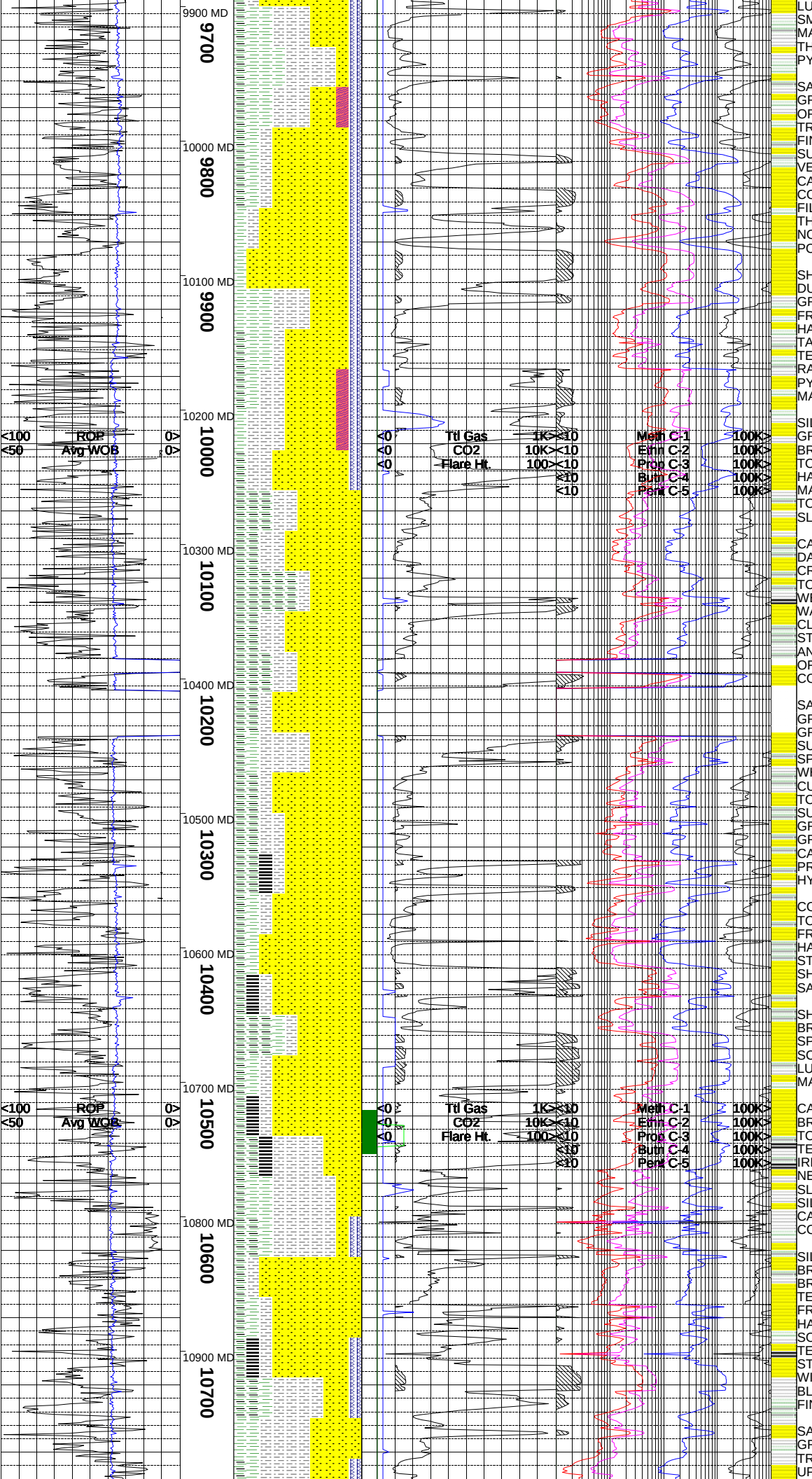
CARBONACEOUS SHALE = BLACK TO MEDIUM DARK GREY, SOME OLIVE GREY; BRITTLE TO CRUNCHY TENACITY; SEMI PLANAR TO BLOCKY TO SPLINTERY FRACTURE; PLATY TO FLAKY TO WEDGELIKE CUTTINGS HABIT; SMOOTH TO CLAYEY TEXTURE; LAMINAR TO MASSIVE STRUCTURE; THIN BANDS AND FLECKS OF COAL AND CARBONACEOUS MATERIAL PRESENT 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 BLCK;TENACITY TOUGH TO BRITTLE; FRACTURE IRREGULAR TO HACKLY; CUTTINGS HABIT MASSIVE TO SEMI TABULAR TO IRREG;



LUSTER DULL, EARTHY TO GREASY; TEXTURE SMOOTH TO SLIGHTLY SILTY; STRUCTURE MASSIVE TO VERY THINLY LAMINATED WITH THIN, <1MM, WELL DEVELOPED COALS, RARE PYRITE ACCESSORY.

SANDSTONE =LIGHT TO MEDIUM GRAY; BROWN GRAY TO MODERATE BROWN TO VERY PALE ORANGE; FRAMEWORK PREDOMINANTLY TRANSLUCENT WHITEISH QUARTZ; UPPER V FINE TO LOWER FINE; VERY WELL SORTED; SUB ROUNDED TO ROUND; HIGH SPHERICITY; VERY EASILY FRIABLE TO MODERATE FRIABLE; CALCAREOUS CEMENT W/ MINOR ARGILLACEOUS COMPONENT; GRAIN SUPPORT; INTERSTICES FILLED W/OCCASIONAL VOIDS; BEDDING MASS; THIN CARBONACEOUS LAMINAE; NO FLUORES; NO CUT; POOR TO MODERATELY POOR VISIBLE POROSITY.

SHALE = DUSKY YELLOWISH BROWN TO DUSKY BROWN, BLACKISH GRAY TO MEDIUM GRAY, GRAYISH BROWN; BRITTLE TO CRUNCHY FRACTURE HACKLY TO SUB PLANAR; CUTTINGS HABIT MASSIVE TO WEDGE LIKE WITH OCCAS TABULAR TO PLATY; LUSTER DULL TO SATINY; TEXTURE VERY SMOOTH TO SLIGHTLY SILTY; RARE SMALL LENSES IF FINELY DIVIDED PYRITE; VERY THIN WAVY LAMINAE OF CARBON MATERIAL.

SILTSTONE = MEDIUM GRAY TO BROWNISH GRAY, LIGHT GRAY TO WHITEISH GRAY, DUSKY BROWN TO MODERATE REDDISH BROWN; TOUGH TO CRUNCHY TENACITY; FRACTURE HACKLY TO IRREGULAR; CUTTINGS HABIT MASSIVE TO SOMEWHAT WEDGE LIKE; DULL TO EARTHY LUSTER; TEXTURE SILTY WITH SLIGHT GRITTINESS; STRUCTURE MASSIVE.

CARBONACEOUS SHALE = DARK GREY TO MED DARK GREY WITH SOME BLACK; BRITTLE TO CRUNCHY TENACITY; BLOCKY TO SEMI PLANAR TO SPLINTERY FRACTURE; PLATY TO FLAKY TO WEDGELIKE CUTTINGS HABIT; MATTE TO WAXY TO RESINOUS LUSTER; SMOOTH TO CLAYEY TEXTURE; LAMINAR TO BANDED STRUCTURE, INTERBEDDED WITH THIN BANDS AND FLECKS OF COAL AND TRACE NODULES OF PYRITE; NO VISIBLE DEGASSING FROM COAL BANDS.

SANDSTONE = MEDIUM GREY TO MEDIUM DARK GREY, SOME LIGHT GREY. MEDIUM TO FINE GRAIN SIZE; WELL SORTED; ANGULAR TO SUBANGULAR GRAINS W/ MODERATE TO LOW SPHERICITY; POLISHED GRAIN SURFACES WHERE VISIBLE; MODERATE HARD TO HARD CUTTINGS; CALCITE CEMENT W/ A MODERATE TO STRONG REACTION TO DILUTE HCL; GRAIN SUPPORTED W/ MOSTLY MASSIVE BEDDING, GRADING TO A MEDIUM TO MEDIUM DARK GREY SILTSTONE; ABUND DARK LITHIC AND CARBONACEOUS MATERIAL; TRACE MICAS PRESENT IN SANDSTONE; NO VISIBLE HYDROCARBON INDICATORS.

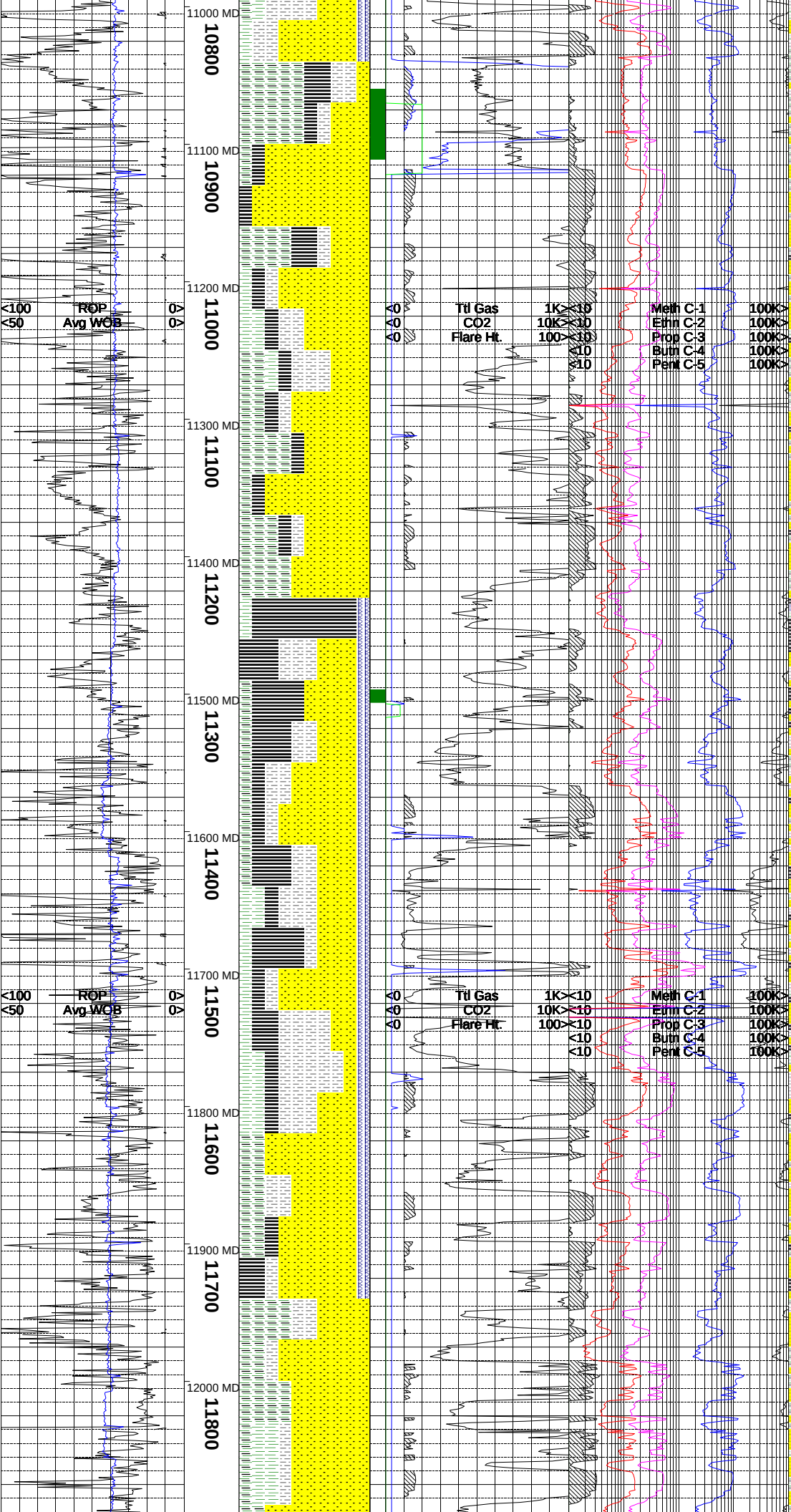
COAL = BLACK TO BROWNISH BLACK; BRITTLE TO CRUNCHY TENACITY; BLOCKY TO PLANAR FRACTURE; TABULAR TO FLAKY CUTTINGS HABIT; SMOOTH TEXTURE; THICK TO BANDED STRUCTURE; INTERBEDDED W/ CARBONACEOUS SHALE; VISIBLE DEGASSING FROM COAL IN SAMPLE TRAY.

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 = DUSKY YELLOWISH BROWN TO DUSKY BROWN, BROWNISH BLACK TO BROWNISH GRAY; VERY TOUGH TO TOUGH TENACITY; FRACTURE HACKLY TO SOMEWHAT IRREGULAR; CUTTINGS HABIT WEDGE LIKE, NEAR PLATY, MASSIVE; LUSTER DULL TO SLIGHT WAXY; TEXTURE SMOOTH TO SLIGHT SILTY; STRUCTURE MASSIVE W/ THIN LAMINAE CARBONACEOUS MATERIAL AND VERY THIN COALS; RARE FRAMBOIDAL PYRITE ACCESS.

SILTSTONE = MEDIUM GRAY TO GRAYISH BROWN, DUSKY BROWN TO DUSKY YELLOWISH BROWN,BROWNISH BLACK TO GRAYISH BLACK; TENACITY TOUGH TO VERY TOUGH AND DENSE; FRACTURE HACKLY TO SEMI PLANAR; CUTTINGS HABIT WEDGELIKE TO SEMI BLOCKY WITH SOME MASSIVE; LUSTER DULL TO EARTHY; TEXTURE SILTY TO SOMEWHAT GRITTY; STRUCTURE PREDOMINANTLY MASSIVE WITH SOME SPECIMENS SHOWING RARE THIN BLEBBY LENSES AND RARE THIN LAMINAE OF FINE GRAINED SANDSTONE.

SANDSTONE = WHITEISH GRAY TO VERY LIGHT GRAY, VERY PALE ORANGE; TRANSLUCENT TO TRANSPARENT COLORLESS QRTZ FRAMEWORK; UPPER VERY FINE TO LOWER FINE; ROUNDED



TO WELL ROUNDED; VERY WELL SORTED; HIGH SPHERICITY; FIRM FRIABLE TO MODERATELY HARD; CALCAREOUS/SILICEOUS CEMENTATION WITH MODERATE TO POOR REACTION TO HCL; GRAIN SUPPORTED; INTERSTICES MODERATE WELL FILLED WITH COMMON VOIDS; BEDDING MASSIVE; NO FLUORESCENCE; NO CUT; MOD TO POOR VISIBLE POROSITY; ASSOCIATED W THINLY INTERBEDDED SILTSTONE AND SHALE; SHALE EXHIBITS BRIGHT ORANGE TO DULL RED MINERAL FLUORESCENCE.

COAL = BLACK TO GREYISH BLACK; BRITTLE TO CRUNCHY TO CRUMBLY TENACITY; BLOCKY TO PLANAR TO SPLINTERY FRACTURE; FLAKY TO TABULAR TO WEDGELIKE CUTTINGS HABIT; MATTE TO RESINOUS TO GREASY LUSTER; SMOOTH TO MATTE TEXTURE; THICK TO BANDED STRUCTURE; STRONG DEGASSING FROM COAL IN SAMPLE TRAY.

CARBONACEOUS SHALE = DARK GREY TO MED DARK GREY WITH SOME BLACK; BRITTLE TO CRUNCHY TENACITY; BLOCKY TO SEMI PLANAR TO SPLINTERY FRACTURE; PLATY TO FLAKY, WEDGELIKE CUTTINGS HABIT; MATTE TO WAXY TO RESINOUS LUSTER; SMOOTH TO CLAYEY TEXTURE; LAMINAR TO BANDED STRUCTURE, INTERBEDDED WITH THIN BANDS OF COAL SHOWING VISIBLE DEGASSING

SANDSTONE = WHITE TO VERY LIGHT GREY; COARSE TO MEDIUM GRAIN SIZE WITH SOME FINE GRAINS; WELL SORTED; SUBROUNDED TO SUBANGULAR GRAINS WITH MODERATE TO HIGH SPHERICITY; POLISHED GRAIN SURFACES WHERE VISIBLE; MODERATELY HARD TO HARD CUTTINGS; CALCITE CEMENT WITH A STRONG TO MODERATE REACTION TO DILUTE HCL; GRAIN SUPPORTED WITH MASSIVE BEDDING; 5% TO 10% DARK LITHICS IN SANDSTONE, TRACE GREEN CHLOROTOID MINERALS AND MICA INCLUSIONS; NO VISIBLE HYDROCARBON INDICATORS.

COAL = BLACK, CRUNCHY TO MODERATELY TOUGH TENACITY; FRACTURE CONCHOIDAL, BLOCKY TO ANGULAR; CUT HABIT TABULAR TO BLOCKY WITH OCCASIONAL MASSIVE; LUSTER VITREOUS TO SUB METALLIC; VERY THINLY LAMINATED WITH COMMON VISIBLE THICKER LAMINAE UP TO 1MM IN THICKNESS; VERY CLEAN; MINIMAL TO MODERATE VISIBLE OUTGASSING.

SILTSTONE = MODERATE YELLOWISH BROWN TO MODERATE BROWN TO MODERATE REDDISH BROWN, OCCASIONAL LIGHT BROWNISH GRAY; CRUMBLY TO SOFT W/ OCCASIONAL CRUNCHY; FRACTURE HACKLY TO SLIGHTLY IRREGULAR; CUTTINGS HABIT MASSIVE TO SUB BLOCKY; DULL TO EARTHY LUSTER; TEXTURE SILTY TO SLIGHTLY GRITTY; STRUCTURE MASSIVE.

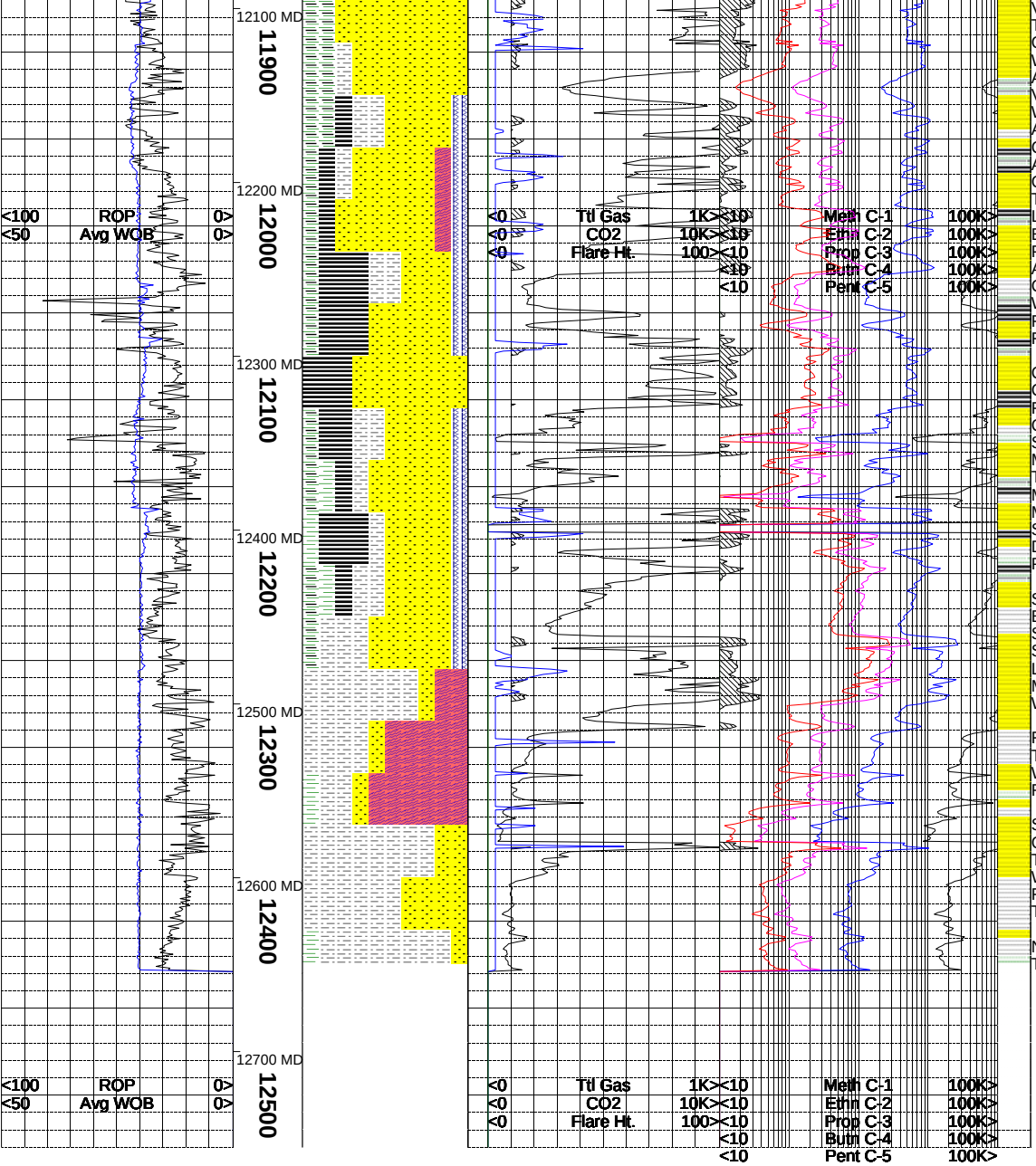
SANDSTONE = WHITE, WHITEISH GRAY TO LIGHT GRAY, VERY PALE ORANGE, DUSKY BROWN TO DUSKY YELLOWISH BROWN; FRAMEWORK TRANSPARENT TO TRANSLUCENT COLORLESS QUARTZ; UPPER VERY FINE TO LOWER FINE; VERY WELL SORTED, VERY WELL ROUNDED; VERY HIGH SPHERICITY; COMMON PITTING AND FROSTING OF GRAIN SURFACES; EASILY TO MODERATE FRIABLE; CALCAREOUS, SILICEOUS, MINOR ARGILLACEOUS CEMENT W/ POOR TO MODERATE REACTION TO HCL; V RARE DRUSY OPTICAL QUARTZ POINTS ON SANDSTONE; INTERSTICES POOR TO MOD FILLED W/ VOIDS COMMON; MASS BEDDING; V LIGHT STAINING OF GRAIN SURFACES V LIGHT REDDISH BROWN; NO FLUORESCENCE; NO CUT; MOD TO GOOD VISIBLE POROSITY

CARBONACEOUS SHALE = DUSKY BROWN TO DUSKY YELLOWISH BROWN, GRAYISH BROWN MED GREY TO BLACK; BRITTLE TO CRUMBLY TENACITY; PLANAR TO SPLINTERY FRACTURE; PLATY TO FLAKY TO WEDGELIKE CUTTINGS HABIT; MATTE TO DULL TO WAXY LUSTER; SMOOTH TO CLAYEY TEXTURE; BANDED TO FISSILE STRUCTURE; INTERBEDDED WITH THIN BANDS AND FLECKS OF COAL AND CARBONACEOUS MATERIAL, OCCASIONAL VISIBLE DEGASSING FROM COAL SEAMS.

COAL = BLACK TO BROWNISH BLACK; BRITTLE TO CRUNCHY TENACITY; BLOCKY TO PLANAR FRACTURE; TABULAR TO FLAKY CUTTINGS HABIT; SMOOTH TEXTURE; THICK TO BANDED STRUCTURE; INTERBEDDED W/ CARBONACEOUS SHALE; VISIBLE DEGASSING FROM COAL

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; FISSILE STRUCTURE; TRACE CARBONACEOUS FLECKS.

SANDSTONE = WHITE, WHITEISH GRAY TO



V LIGHT GRAY; FRAMEWORK PREDOMINANTLY TRANSPARENT TO TRANSLUCENT COLORLESS QUARTZ; UPPER VERY FINE TO UPPER FINE; WELL TO MODERATELY WELL SORTED; SUB ANGULAR TO ROUNDED; SPHERICITY HIGH; VERY SOFT TO EASILY FRIABLE PRESENTING W/ ABUNDANT LOOSE GRAINS TO VERY SMALL AGGREGATES OF 10 TO 30 GRAINS; V WEAK CALCAREOUS CEMENTATION WITH MINOR ARGILLACEOUS AND SILICEOUS COMPONENTS; GRAIN SUPPORTED; INTERSTICES MODERATE TO WELL FILLED WITH SMALL VOIDS COMMON; LITHIC CLASTS IN PRESERVED SPECIMS (<2%; BLACKISH GRAY TO MEDIUM GRAY; ANGULAR; PRISMOIDAL; DULL; FINE; REWORKED SEDS) ABUNDANT LOOSE GRAINS OF TRANSPARENT COLORLESS CALCITE MOST IRREG SHAPED W/ ONLY OCCASIONAL PRESERVED FRACTURE RHOMBS; COMMON V PALE GREEN MINERAL FLUORES; NO CUT; MOD VISIBLE POROSITY.

COAL = BLACK; BRITTLE TO CRUNCHY WITH COMMON MODERATEHARD, RARE CRUMBLY; FRACTURE CONCHOIDAL, BLOCKY, ANGULAR; CUTTINGS HABIT BLOCKY TO TABULAR WITH SOME MASSIVE; LUSTER VITREOUS TO SUB METALLIC W/ OCCASION RESINOUS; SMOOTH TO GRAINY TEXTURE; STRUCTURE THINLY TO MORE THICKLY <1CM LAMINATED; ABUNDANT MOD TO STRONG OUTGASSING W/ OCCAS SPECIMENS SHOWING RAPID DEGASSING AND DISINTEGRATION W/ MODERATE PRESSURE PRODUCING A FROTHY APPEARANCE.

SHALE = LIGHT GREY TO MED DARK GREY; BRITTLE TO CRUMBLY TENACITY; PLANAR TO SPLINTERY FRACTURE; PLATY TO FLAKY TO SCALY CUTTINGS HABIT; MATTE TO EARTHY LUSTER; SMOOTH TO CLAYEY TEXTURE; MASS TO FISSILE STRUCTURE, INTERBEDDED WITH SANDSTONE.

FRACTURE FILL AT 12480 TO 12570 = WHITE TO VERY LIGHT GRAY; CALCITE; MODERATELY WELL ROUNDED WITH OCCASIONAL FRACTURE RHOMBS; MOSTLY TRANSPARENT COLORLESS.

SILTSTONE = MEDIUM LIGHT TO MED DARK GREY; TOUGH TO DENSE TENACITY; IRREG TO MOTTLED FRACTURE; MASS TO FLAKY TO WEDGELIKE CUTTINGS HABIT; MATTE TO FROSTED LUSTER; SMOOTH TO SILTY TEXTURE; MASSIVE STRUCTURE.

NOTE: TD WELL AT 12652' MD / 12427' TVD ON 09/25/2010.