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

MUDLOG MD

COMPANY	EXXONMOBIL
WELL	FRU197-33A4
FIELD	FREEDOM RANCH UNIT
REGION	ROCKY MOUNTAINS
COORDINATES	N39,54,56.038
	W108,17,6.105
ELEVATION	6415'
	6388'
COUNTY, STATE	RIO BLANCO COUNTY, COL
API INDEX	05-103-11100-00
SPUD DATE	05/19/2009
CONTRACTOR	HELMRICH AND PAYNE
CO. REP.	K.GARDNER/G.PERKINS
RIG/TYPE	239/FLEX 3
LOGGING UNIT	MLU 033
GEOLOGISTS	LAYNE GOOD
	NICK BAUER
ADD. PERSONS	JASON REISENBICHLER
	JASON REYNOLDS
CO. GEOLOGIST	MELISSA SAURBORN

LOG INTERVAL

DEPTHS:	3900'	**TO**	12512'
DATES:	05/19/2008	**TO**	06/06/09
SCALE:	1"=100'		

MUD TYPES

SPUD	**TO**	3900'
LSND	**TO**	12512'
	TO	
	TO	

CASING DATA

16"	**AT**	130'
10.75"	**AT**	3877'
7"	**AT**	8717'
4.5"	**AT**	12500'

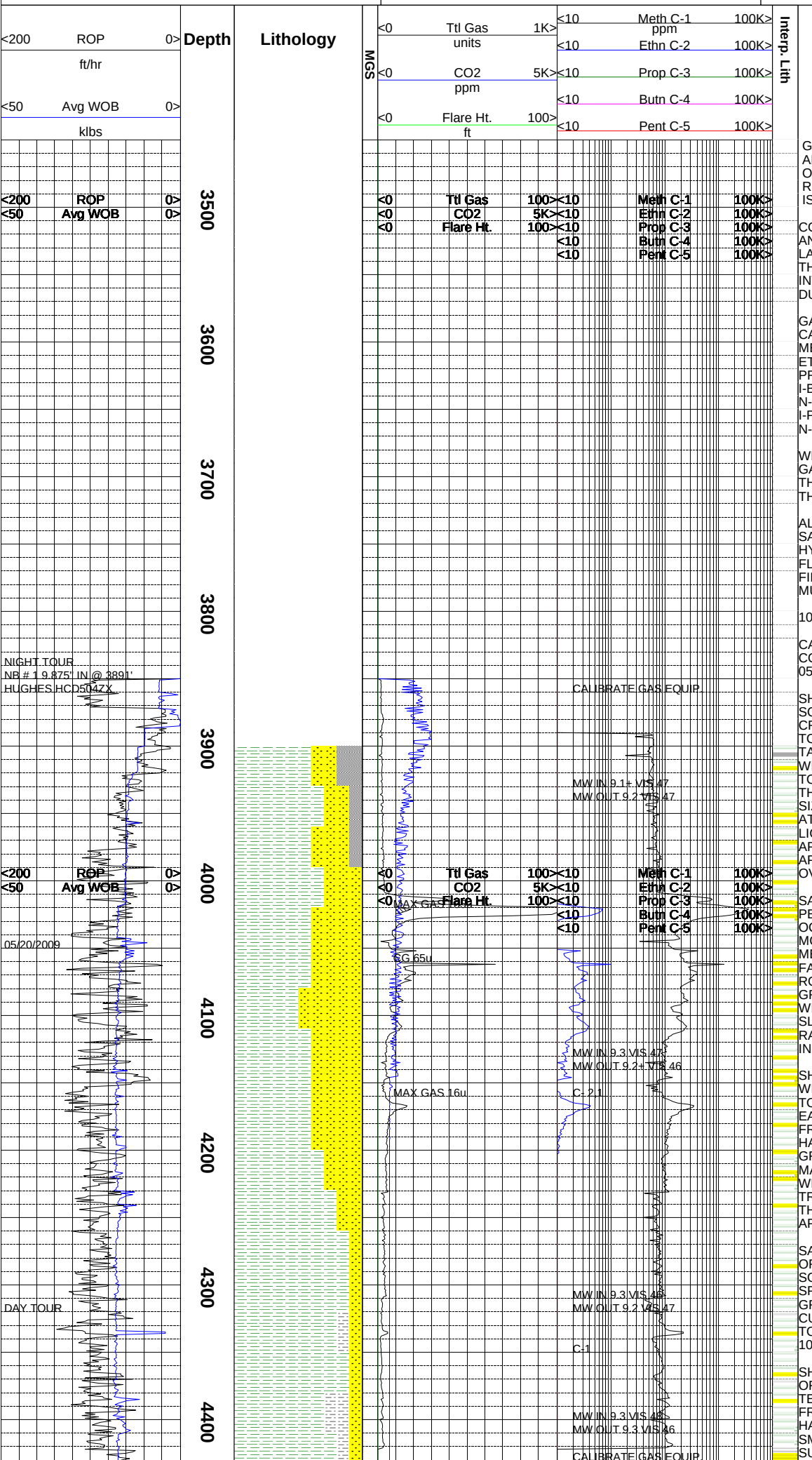
HOLE SIZE

9.875"	**TO**	8723"
6.125"	**TO**	12512'
	TO	
	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 BORE HOLE 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 SEPERATOR) 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 FOR HYDROCARBON FLUORESCENCE AND MINOR FLUORESCENCE FROM POSSIBLE FRACTURE FILL. ALL FLUORESCENCE IS NOTED ON THE MUDLOG.

10.5" SURFACE CASING WAS SET AT 3876'.

CANRIG DRILLING TECHNOLOGY LTD. COMMENCED FULL LOGGING SERVICES ON 05/19/2009 at 3900'.

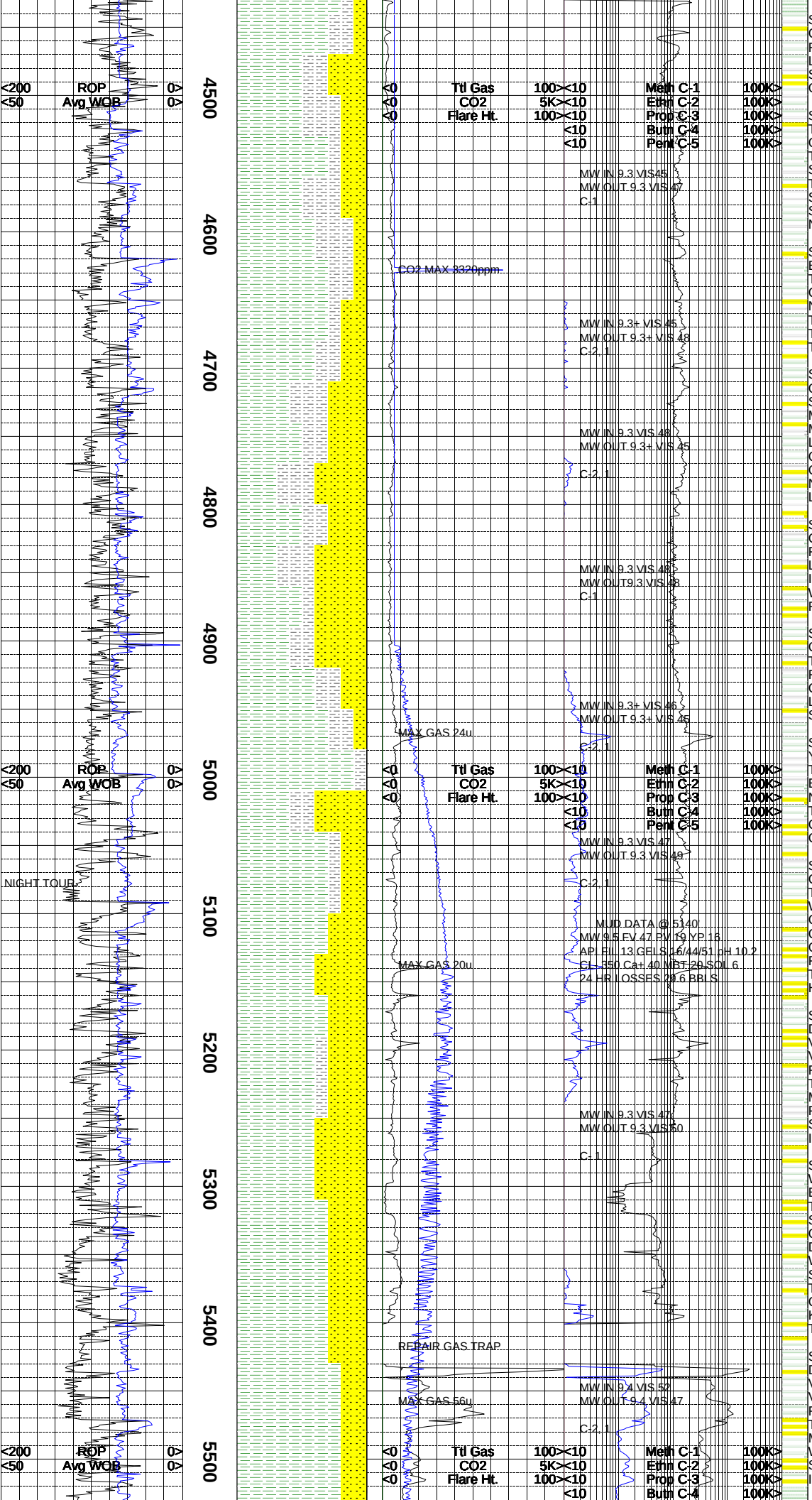
SHALE = DARK YELLOW TO LIGHT BROWN WITH SOME LIGHT BLUE FRAGMENTS; CRUNCHY TO CRUMBLY TO OCC BRITTLE TENACITY; PLANAR TO HACKLY TO EARTHY FRACTURE; SCALY TO TABULAR CUTTINGS HABIT; EARTHY TEXTURE WITH WAXY APPEARANCE WHEN WET; SMOOTH TO GRITTY WITH OCC SILTY GRAINS PRESENT; THIN TO THICK STRUCTURE WITH IRREGULAR SIZING OF CUTTINGS; CEMENT VERY COMMON AT BEGINNING OF HOLE; RARE PIECES OF LIGHT TO DARK PURPLE CLAYSTONE THAT APPEARS VERY SILTY AND GRITTY; NO APPARENT HYDROCARBON INDICATORS PRESENT; OVERALL NON CALCAREOUS.

SANDSTONE = LIGHT GRAY, CLEAR, SALT AND PEPPER GRAINS WITH DARK LITHICS PRESENT, OCC LIGHT BLUE AND LIGHT PINK QUARTZ; MODERATELY HARD TO HARD; FINE LOWER TO MEDIUM AND OCC COARSE GRAINED UPPER; FAIR TO POORLY SORTED; SUBROUNDED TO ROUNDED WITH SOME IRREGULAR QUARTZ GRAINS PRESENT; MAINLY SILICA CEMENT WITH OCC CALCITE CRYSTALS COMMON; SLIGHTLY CALCAREOUS; KAOLINITE SAND VERY RARE BUT PRESENT IN SAMPLES; NO OIL INDICATORS PRESENT.

SHALE = DARK BROWN, TAN, LIGHT BLUE, WITH SOME DARK ORANGISH HUES; CRUMBLY TO CRUNCHY TO OCC BRITTLE TENACITY; EARTHY TO OCC SPLINTERY AND HACKLY FRACTURE; SCALY TO TABULAR CUTTINGS HABIT; OVERALL DULL TO EARTHY LUSTER; GRITTY TO SILTY TO OCC CLAYEY TEXTURE; MASSIVE TO LENTICULAR STRUCTURE; VERY WELL SORTED SHALE NODULES WITH OCC TRACES OF CALCITE AND QUARTZ FINE GRAINS THROUGHOUT SAMPLE; NON CALCAREOUS; NO APPARENT HYDROCARBON INDICATORS.

SANDSTONE = LIGHT GRAY TO DARK YELLOWISH ORANGE COLOR; VERY FINE GRAINED; WELL SORTED; SUBROUNDED GRAINS WITH MODERATE SPHERICITY; LIGHT GRAY CUTTINGS ARE GRAIN SUPPORTED, DARK YELLOWISH ORANGE CUTTINGS ARE MUD MATRIX SUPPORTED; FIRM TO FRIABLE CUTTINGS; FAIR REACTION WITH 10% HCL.

SHALE = PALE BLUE TO DARK YELLOWISH ORANGE COLOR; CRUMBLY TO BRITTLE TENACITY; SPLINTERY TO HACKLY TO EARTHY FRACTURE; WEDGELIKE TO NODULAR CUTTINGS HABIT; EARTHY TO WAXY LUSTER; CLAYEY TO SMOOTH TEXTURE; TRACE OF LAMINE ON SOME SURFACES OF CUTTINGS; FAIR REACTION WITH



SILTSTONE = MODERATE YELLOWISH BROWN COLOR; DENSE TO BRITTLE TENACITY; BLOCKY FRACTURE; NODULAR CUTTINGS HABIT; EARTHY LUSTER; SILTY TO GRITTY TEXTURE; MASSIVE STRUCTURE; SLIGHT REACTION WITH 10% HCL; GRADING INTO SAND STONE;

SANDSTONE = MODERATE YELLOWISH BROWN TO MODERATE BROWN TO OLIVE GRAY TO GRAYISH RED PURPLE COLOR; VERY FINE TO FINE GRAINED; FAIR TO POOR SORTING; SUBANGULAR TO SUBROUND GRAINS; MODERATE TO LOW SPHERICITY; FRIABLE; MATRIX SUPPORTED WITH SALT AND PEPPER GRAINS; SLIGHT REACTION WITH HCL; UNDER UV LIGHT NO FLUORESCENCE.

SHALE = DARK YELLOWISH ORANGE TO MEDIUM BLUISH COLOR; BRITTLE TO DENSE TO TOUGH TENACITY; EARTHY TO SPLINTERY TO CONCHOIDAL FRACTURE; WEDGELIKE TO NODULAR TO BLADED CUTTINGS HABIT; EARTHY TO WAXY LUSTER; CLAYEY TO SMOOTH TEXTURE; TRACE OF SILT ON SURFACE OF THE CUTTINGS.

SANDSTONE = GRAYISH RED TO GRAYISH ORANGE COLOR; FINE TO VERY FINE GRAIN SIZE; FAIR SORTING; SUBANGULAR GRAINS; MODERATE SPHERICITY; FIRMLY FRIABLE; MATRIX SUPPORTED; LESS THEN 2% DARK LITHICS; PREDOMNIANTLY QUARTS GRAINS, CLEAR TO GRAYISH RED TO MILKY WHITE COLOR; FAIR REACTION WITH 10% HCL; NO HYDROCARBON FLUORESCENCE UNDER UV LIGHT.

SILTSTONE = MODERATE YELLOWISH BROWN COLOR; BRITTLE TO DENSE TENACITY; BLOCKY FRACTURE; NODULAR CUTTINGS HABIT; EARTHY LUSTER; SILTY TO GRITY TEXTURE, GRADING INTO SANDSTONE; PREDOMINANTLY MASSIVE WITH TRACE OF LAMINAE VISIBLE; SLIGHT REACTION IN HCL.

SHALE = GRAYISH ORANGE TO MEDIUM BLUE COLOR; DENSE TO TOUGH TO BRITTLE TENACITY; BLOCKY TO CONCHOIDAL TO HACKLY FRACTURE; NODUAL TO WEDGELIKE TO BLADED CUTTINGS HABIT; EARTHY TO DULL TO WAXY LUSTER; CLAYEY TO SILTY TEXTURE; MASSIVE STRUCTURE; SLIGHT REACTION WITH HCL.

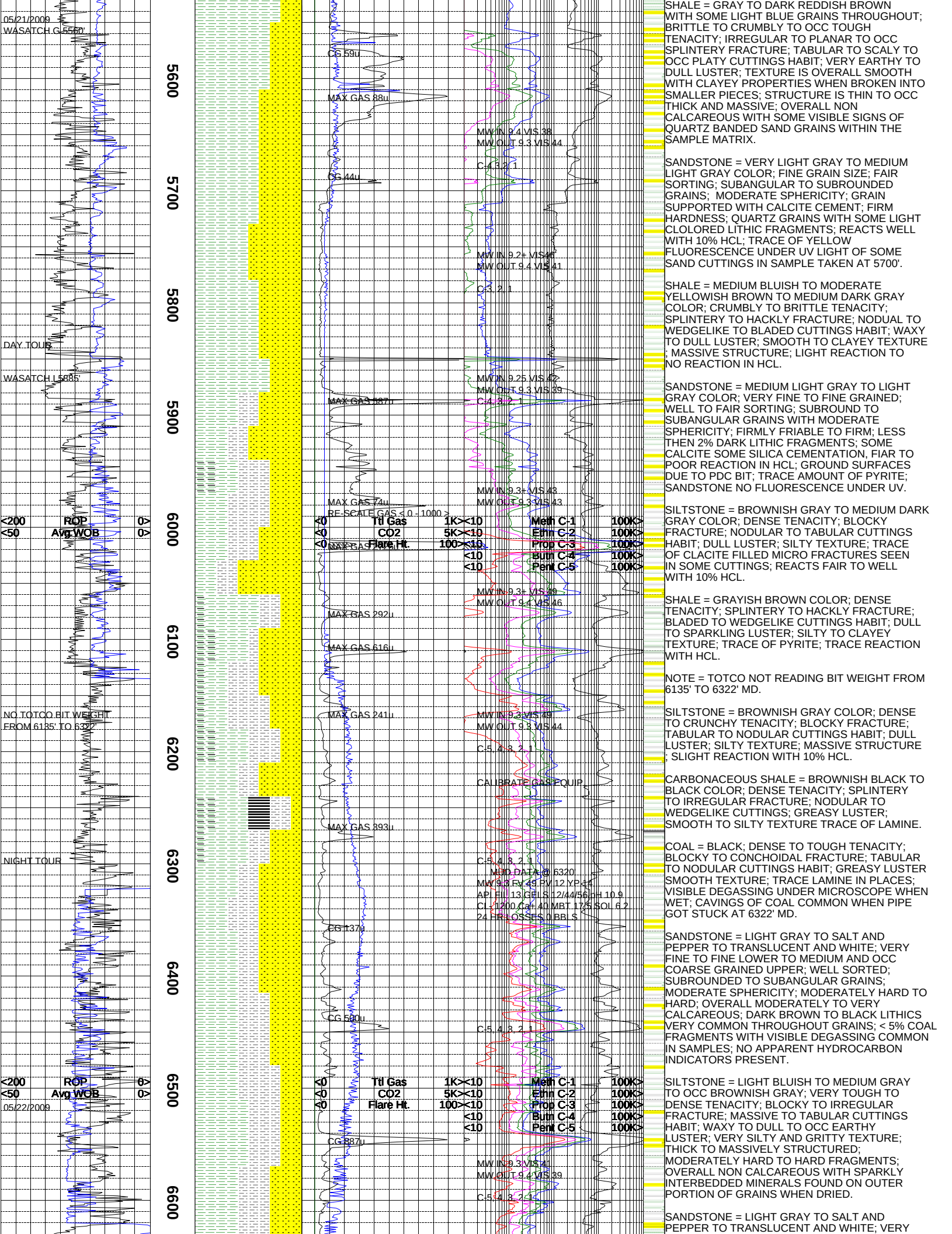
SHALE = MEDIUM BLUE TO MODERATE YELLOWISH BROWN COLOR; DENSE TO BRITTLE TENACITY; CHONCHOIDAL TO HACKLY TO EARTHY FRACTURE; WEDGELIKE TO BLADED TO NODUAL CUTTINGS HABIT; SMOOTH TO CLAYEY TEXTURE; WAXY TO EARTHY LUSTER; COATING OF SILT ON SOME OF THE SHALE CUTTINGS; NO REACTION WITH HCL.

SHALE = GRAYISH ORANGE TO LIGHT BLUEISH COLOR; TOUGH TO BRITTLE TO CRUNCHY TENACITY; HACKLY TO IRREGULAR FRACTURE; WEDGELIKE TO NODULAR TO OCC BLADED CUTTINGS HABIT; SMOOTH TO SILTY TO OCC CLAYEY TEXTURE; EARTHY TO DULL TO OCC GREASY LUSTER; SANDY CEMENT CLUSTERS FOUND SCATTERED THROUGHOUT SAMPLES; NON TO SLIGHTLY CALCAREOUS; NO APPARENT HYDROCARBON INDICATORS PRESENT.

SANDSTONE = LIGHT GRAY TO DARK GRAY WITH DARK GREENISH HUES AND DARK LITHICS; VERY FINE TO FINE TO OCC MEDIUM GRAINED; VERY WELL TO WELL SORTED; SUBROUNDED TO ROUNDED WITH SUBANGULAR QUARTZ GRAINS THROUGHOUT SAMPLE; MODERATE SPHERICITY; MAINLY SILICA CEMENTATION WITH CLEAR TO PINKISH CRYSTALS COMMON; OVERALL NON TO SLIGHTLY CALCAREOUS; NO APPARENT OIL INDICATORS PRESENT.

SHALE = DARK GRAY TO YELLOWISH BROWN WITH LIGHT BLUE GRAINS THROUGHOUT; BRITTLE TO CRUMBLY TO OCC TOUGH TENACITY; IRREGULAR TO PLANAR TO OCC SPLINTERY FRACTURE; TABULAR TO SCALY TO OCC PLATY CUTTINGS HABIT; VERY EARTHY TO DULL LUSTER; TEXTURE IS OVERALL SMOOTH WITH CLAYEY PROPERTIES WHEN BROKEN INTO SMALLER PIECES; STRUCTURE IS THIN TO OCC THICK AND MASSIVE; OVERALL NON CALCAREOUS WITH SOME VISIBLE SIGNS OF KAOLINITE BANDED SAND PARTICLES WITHIN THE SAMPLE MATRIX.

SANDSTONE = LIGHT GRAY TO OFF WHITE WITH DARK GREENISH HUES AND DARK LITHICS; VERY FINE TO FINE TO OCC COARSE GRAINED; VERY WELL TO WELL SORTED; SUBROUNDED TO ROUNDED WITH SUBANGULAR QUARTZ GRAINS THROUGHOUT SAMPLE; MODERATE SPHERICITY; MAINLY SILICA CEMENTATION WITH CLEAR TO WHITE CRYSTALS COMMON; OVERALL NON TO SLIGHTLY CALCAREOUS; NO APPARENT OIL INDICATORS PRESENT.



SHALE = GRAY TO DARK REDDISH BROWN WITH SOME LIGHT BLUE GRAINS THROUGHOUT; BRITTLE TO CRUMBLY TO OCC TOUGH TENACITY; IRREGULAR TO PLANAR TO OCC SPLINTERY FRACTURE; TABULAR TO SCALY TO OCC PLATY CUTTINGS HABIT; VERY EARTHY TO DULL LUSTER; TEXTURE IS OVERALL SMOOTH WITH CLAYEY PROPERTIES WHEN BROKEN INTO SMALLER PIECES; STRUCTURE IS THIN TO OCC THICK AND MASSIVE; OVERALL NON CALCAREOUS WITH SOME VISIBLE SIGNS OF QUARTZ BANDED SAND GRAINS WITHIN THE SAMPLE MATRIX.

SANDSTONE = VERY LIGHT GRAY TO MEDIUM LIGHT GRAY COLOR; FINE GRAIN SIZE; FAIR SORTING; SUBANGULAR TO SUBROUNDED GRAINS; MODERATE SPHERICITY; GRAIN SUPPORTED WITH CALCITE CEMENT; FIRM HARDNESS; QUARTZ GRAINS WITH SOME LIGHT CLOLORED LITHIC FRAGMENTS; REACTS WELL WITH 10% HCL; TRACE OF YELLOW FLUORESCENCE UNDER UV LIGHT OF SOME SAND CUTTINGS IN SAMPLE TAKEN AT 5700'.

SHALE = MEDIUM BLUISH TO MODERATE YELLOWISH BROWN TO MEDIUM DARK GRAY COLOR; CRUMBLY TO BRITTLE TENACITY; SPLINTERY TO HACKLY FRACTURE; NODUAL TO WEDGELIKE TO BLADED CUTTINGS HABIT; WAXY TO DULL LUSTER; SMOOTH TO CLAYEY TEXTURE ; MASSIVE STRUCTURE; LIGHT REACTION TO NO REACTION IN HCL.

SANDSTONE = MEDIUM LIGHT GRAY TO LIGHT GRAY COLOR; VERY FINE TO FINE GRAINED; WELL TO FAIR SORTING; SUBROUND TO SUBANGULAR GRAINS WITH MODERATE SPHERICITY; FIRMLY FRIABLE TO FIRM; LESS THEN 2% DARK LITHIC FRAGMENTS; SOME CALCITE SOME SILICA CEMENTATION, FIAR TO POOR REACTION IN HCL; GROUND SURFACES DUE TO PDC BIT; TRACE AMOUNT OF PYRITE; SANDSTONE NO FLUORESCENCE UNDER UV.

SILTSTONE = BROWNISH GRAY TO MEDIUM DARK GRAY COLOR; DENSE TENACITY; BLOCKY FRACTURE; NODULAR TO TABULAR CUTTINGS HABIT; DULL LUSTER; SILTY TEXTURE; TRACE OF CLACITE FILLED MICRO FRACTURES SEEN IN SOME CUTTINGS; REACTS FAIR TO WELL WITH 10% HCL.

SHALE = GRAYISH BROWN COLOR; DENSE TENACITY; SPLINTERY TO HACKLY FRACTURE; BLADED TO WEDGELIKE CUTTINGS HABIT; DULL TO SPARKLING LUSTER; SILTY TO CLAYEY TEXTURE; TRACE OF PYRITE; TRACE REACTION WITH HCL.

NOTE = TOTCO NOT READING BIT WEIGHT FROM 6135' TO 6322' MD.

SILTSTONE = BROWNISH GRAY COLOR; DENSE TO CRUNCHY TENACITY; BLOCKY FRACTURE; TABULAR TO NODULAR CUTTINGS HABIT; DULL LUSTER; SILTY TEXTURE; MASSIVE STRUCTURE ; SLIGHT REACTION WITH 10% HCL.

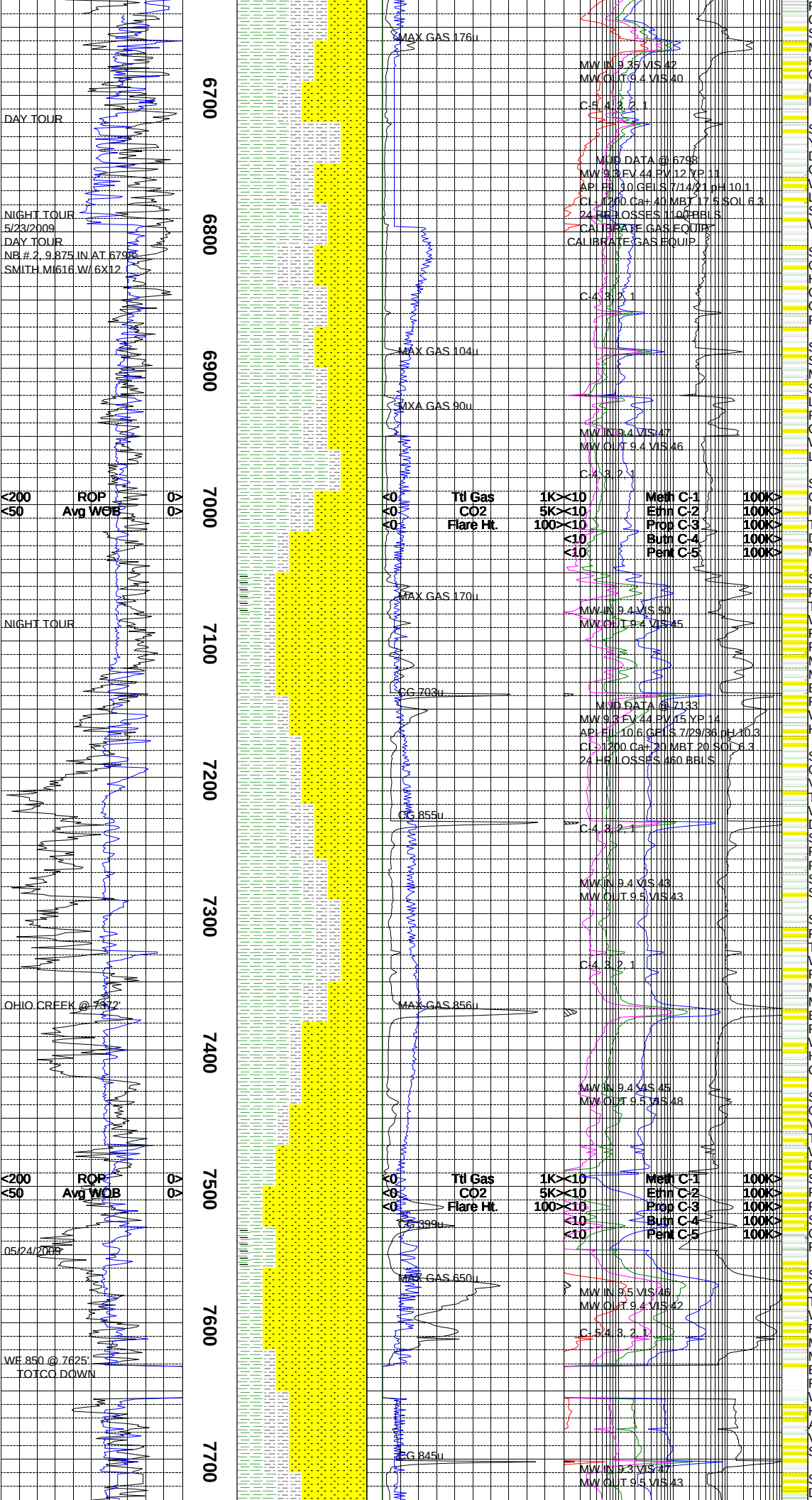
CARBONACEOUS SHALE = BROWNISH BLACK TO BLACK COLOR; DENSE TENACITY; SPLINTERY TO IRREGULAR FRACTURE; NODULAR TO WEDGELIKE CUTTINGS; GREASY LUSTER; SMOOTH TO SILTY TEXTURE TRACE OF LAMINE.

COAL = BLACK; DENSE TO TOUGH TENACITY; BLOCKY TO CONCHOIDAL FRACTURE; TABULAR TO NODULAR CUTTINGS HABIT; GREASY LUSTER SMOOTH TEXTURE; TRACE LAMINE IN PLACES; VISIBLE DEGASSING UNDER MICROSCOPE WHEN WET; CAVINGS OF COAL COMMON WHEN PIPE GOT STUCK AT 6322' MD.

SANDSTONE = LIGHT GRAY TO SALT AND PEPPER TO TRANSLUCENT AND WHITE; VERY FINE TO FINE LOWER TO MEDIUM AND OCC COARSE GRAINED UPPER; WELL SORTED; SUBROUNDED TO SUBANGULAR GRAINS; MODERATE SPHERICITY; MODERATELY HARD TO HARD; OVERALL MODERATELY TO VERY CALCAREOUS; DARK BROWN TO BLACK LITHICS VERY COMMON THROUGHOUT GRAINS; < 5% COAL FRAGMENTS WITH VISIBLE DEGASSING COMMON IN SAMPLES; NO APPARENT HYDROCARBON INDICATORS PRESENT.

SILTSTONE = LIGHT BLUISH TO MEDIUM GRAY TO OCC BROWNISH GRAY; VERY TOUGH TO DENSE TENACITY; BLOCKY TO IRREGULAR FRACTURE; MASSIVE TO TABULAR CUTTINGS HABIT; WAXY TO DULL TO OCC EARTHY LUSTER; VERY SILTY AND GRITTY TEXTURE; THICK TO MASSIVELY STRUCTURED; MODERATELY HARD TO HARD FRAGMENTS; OVERALL NON CALCAREOUS WITH SPARKLY INTERBEDDED MINERALS FOUND ON OUTER PORTION OF GRAINS WHEN DRIED.

SANDSTONE = LIGHT GRAY TO SALT AND PEPPER TO TRANSLUCENT AND WHITE; VERY



FINE TO FINE LOWER TO MEDIUM AND OCC COARSE GRAINED UPPER; WELL SORTED; SUBROUNDED TO WELL ROUNDED GRAINS; MODERATE SPHERICITY; MODERATELY HARD TO HARD; OVERALL MODERATELY TO VERY CALCAREOUS; DARK BROWN TO BLACK LITHICS IN SAMPLES; NO APPARENT HYDROCARBON INDICATORS PRESENT.

SHALE = DARK YELLOWISH ORANGE TO PALE YELLOWISH ORANGE TO LIGHT OLIVE GRAY TO DARK YELLOWISH BROWN COLOR; BRITTLE TO CRUMBLY TO TOUGH TENACITY; NODULAR TO WEDGELIKE CUTTINGS HABIT; EARTHY TO DULL LUSTER; CLAYEY TO SILTY TEXTURE; MASSIVE STRUCTURE; NO REACTION TO FAIR REACTION WITH 10% HCL.

SILTSTONE = LIGHT GRAY TO LIGHT BROWNISH GRAY COLOR; DENSE TENACITY; IRREGULAR TO HACKLY FRACTURE; NODULAR TO WEDGELIKE CUTTINGS HABIT; DULL LUSTER; SILTY TO GRITTY TEXTURE; MASSIVE STRUCTURE; FAIR REACTION WITH HCL.

SANDSTONE = LIGHT GRAY COLOR; FINE GRAIN SIZE; WELL SORTED; SUBROUNDED GRAINS; MODERATESPHERICITY; FIRM HARDNESS; GRAIN SUPPORTED WITH CALCITE CEMENTATION; LESS THAN 2% DARK COLORED LITHICS; PREDOMINANTLY FOGGY AND SOME CLEAR QUARTZ GRAINS; REACTION FAIR TO WIELL WITH HCL; NO FLUORESCENCE UNDER UV LIGHT.

SHALE = MEDIUM BLUISH TO MEDIUM GRAY COLOR; DENSE TO BRITTLE TENACITY; IRREGULAR TO SPLINTERY FRACTURE; NODULAR TO WEDGELIKE CUTTINGS HABIT; WAXY TO DULL LUSTER; SILTY TO SMOOTH TEXTURE; MASSIVE STRUCTURE; NO REACTION IN HCL.

SANDSTONE = OFF WHITE TO OPAQUE WITH PALE BLUE HUES; VERY FINE TO FINE LOWER TO MEDIUM AND OCC COARSE GRAINED UPPER; WELL TO FAIRLY SORTED; SUBROUNDED TO ROUNDED WITH SOME ANGULAR GRAINS DUE TO PDC BIT ACTION; MODERATE SPHERICITY; MODERATELY HARD TO OCC HARD; SLIGHTLY TO MODERATELY CALCAREOUS; DARK BROWN TO BLACK LITHICS COMMON WITHIN QUARTZ FRAMEWORK; SLIGHT MECHANICAL ABRASION WITH IMPACTION DUE TO BIT; NO APPARENT HYDROCARBON INDICATORS.

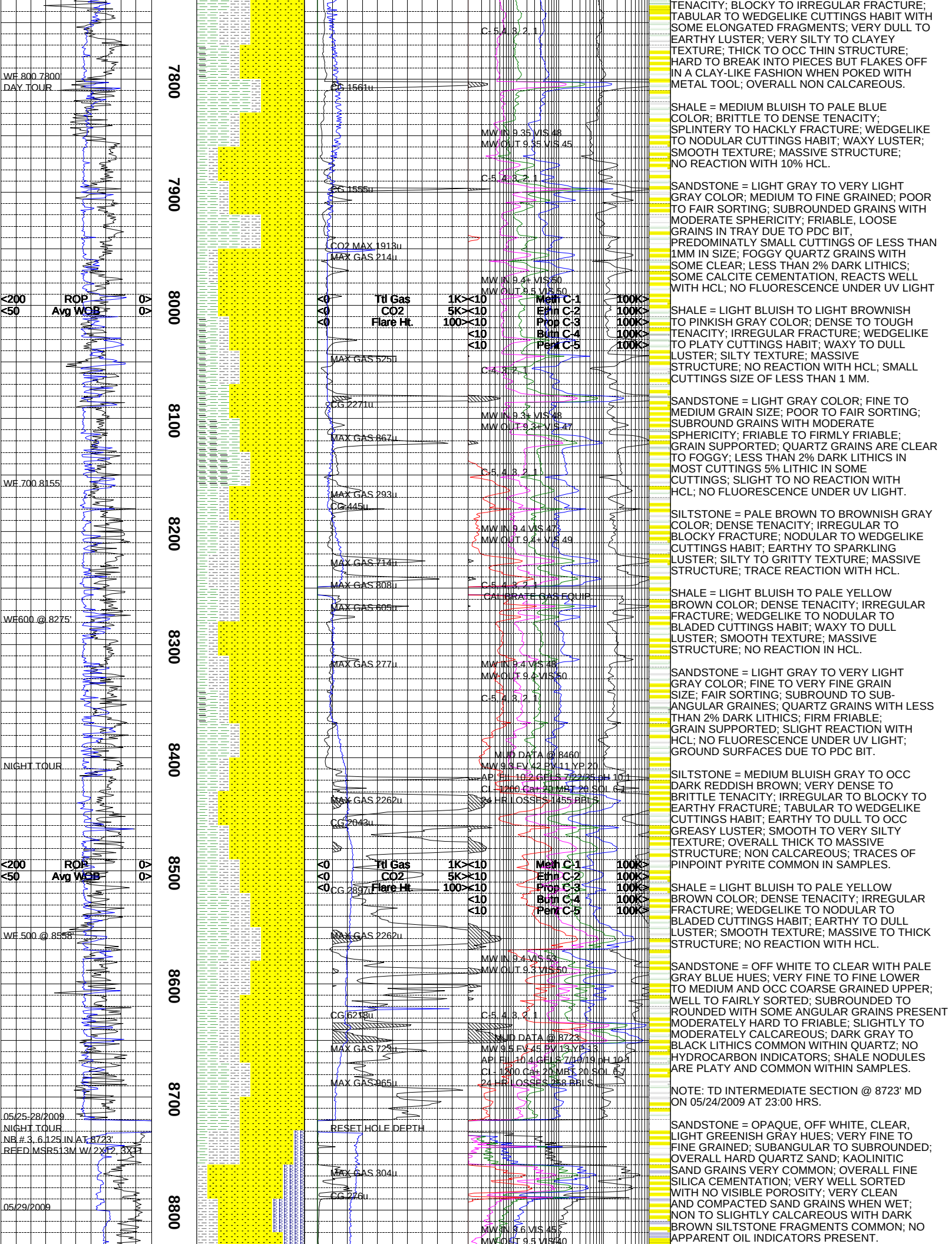
SHALE = MEDIUM BLUISH GRAY TO MEDIUM GRAY WITH OCC DARK REDDISH BROWN HUES; VERY BRITTLE TO DENSE TENACITY; BLOCKY TO IRREGULAR FRACTURE; TABULAR TO WEDGELIKE TO OCC NODULAR CUTTINGS HABIT; DULL TO EARTHY TO RARELY WAXY LUSTER; SMOOTH TO SILTY TEXTURE WITH CLAYEY PROPERTIES WHEN BROKEN INTO SMALLER PIECES; OVERALL THICK TO MASSIVE STRUCTURE; NON CALCAREOUS; TRACES OF SMALL PYRITE FRAGMENTS IN SAMPLES.

SANDSTONE = OFF WHITE TO CLEAR WITH PALE BLUE HUES; VERY FINE TO FINE LOWER TO MEDIUM AND OCC COARSE GRAINED UPPER; WELL TO FAIRLY SORTED; SUBROUNDED TO ROUNDED WITH SOME ANGULAR GRAINS PRESENT MODERATELY HARD TO OCC HARD; SLIGHTLY TO MODERATELY CALCAREOUS; DARK BROWN TO BLACK LITHICS COMMON WITHIN QUARTZ FRAMEWORK; SLIGHT MECHANICAL ABRASION WITH IMPACTION DUE TO BIT; NO APPARENT HYDROCARBON INDICATORS; PYRITE NODULES COMMON AT OHIO CREEK FM CONTACT.

SHALE = MEDIUM BLUISH GRAY TO MEDIUM GRAY WITH OCC DARK REDDISH BROWN HUES; VERY BRITTLE TO DENSE TENACITY; BLOCKY TO IRREGULAR FRACTURE; TABULAR TO WEDGELIKE TO OCC NODULAR CUTTINGS HABIT; DULL TO EARTHY TO RARELY WAXY LUSTER; SMOOTH TO SILTY TEXTURE WITH CRUNCHY PROPERTIES WHEN BROKEN INTO SMALLER PIECES; OVERALL THICK TO MASSIVE STRUCTURE; NON CALCAREOUS; TRACES OF CARBONACEOUS SHALE AND CALCITE CRYSTALS FOUND THROUGHOUT SAMPLES.

SANDSTONE = OFF WHITE TO CLEAR WITH PALE GRAY BLUE HUES; VERY FINE TO FINE LOWER TO MEDIUM AND OCC COARSE GRAINED UPPER; WELL TO FAIRLY SORTED; SUBROUNDED TO ROUNDED WITH SOME ANGULAR GRAINS PRESENT MODERATELY HARD TO OCC HARD; SLIGHTLY TO MODERATELY CALCAREOUS; DARK GRAY TO BLACK LITHICS COMMON WITHIN QUARTZ FRAMEWORK; SOME MECHANICAL ABRASION WITH IMPACTION DUE TO BIT; NO APPARENT HYDROCARBON INDICATORS; SHALE NODULES ARE PLATY AND COMMON WITHIN SAMPLES; VERY CLEAN WELL CONSOLIDATED QUARTZ SAND WITH NO VISIBLE POROSITY.

SILTSTONE = MEDIUM TO DARK GRAY WITH OCC DUSKY BROWN HUES; VERY TOUGH TO DENSE



TENACITY; BLOCKY TO IRREGULAR FRACTURE; TABULAR TO WEDGELIKE CUTTINGS HABIT WITH SOME ELONGATED FRAGMENTS; VERY DULL TO EARTHY LUSTER; VERY SILTY TO CLAYEY TEXTURE; THICK TO OCC THIN STRUCTURE; HARD TO BREAK INTO PIECES BUT FLAKES OFF IN A CLAY-LIKE FASHION WHEN POKED WITH METAL TOOL; OVERALL NON CALCAREOUS.

SHALE = MEDIUM BLUISH TO PALE BLUE COLOR; BRITTLE TO DENSE TENACITY; SPLINTERY TO HACKLY FRACTURE; WEDGELIKE TO NODULAR CUTTINGS HABIT; WAXY LUSTER; SMOOTH TEXTURE; MASSIVE STRUCTURE; NO REACTION WITH 10% HCL.

SANDSTONE = LIGHT GRAY TO VERY LIGHT GRAY COLOR; MEDIUM TO FINE GRAINED; POOR TO FAIR SORTING; SUBROUNDED GRAINS WITH MODERATE SPHERICITY; FRIABLE, LOOSE GRAINS IN TRAY DUE TO PDC BIT, PREDOMINATLY SMALL CUTTINGS OF LESS THAN 1MM IN SIZE; FOGGY QUARTZ GRAINS WITH SOME CLEAR; LESS THAN 2% DARK LITHICS; SOME CALCITE CEMENTATION, REACTS WELL WITH HCL; NO FLUORESCENCE UNDER UV LIGHT

SHALE = LIGHT BLUISH TO LIGHT BROWNISH TO PINKISH GRAY COLOR; DENSE TO TOUGH TENACITY; IRREGULAR FRACTURE; WEDGELIKE TO PLATY CUTTINGS HABIT; WAXY TO DULL LUSTER; SILTY TEXTURE; MASSIVE STRUCTURE; NO REACTION WITH HCL; SMALL CUTTINGS SIZE OF LESS THAN 1 MM.

SANDSTONE = LIGHT GRAY COLOR; FINE TO MEDIUM GRAIN SIZE; POOR TO FAIR SORTING; SUBROUND GRAINS WITH MODERATE SPHERICITY; FRIABLE TO FIRMLY FRIABLE; GRAIN SUPPORTED; QUARTZ GRAINS ARE CLEAR TO FOGGY; LESS THAN 2% DARK LITHICS IN MOST CUTTINGS 5% LITHIC IN SOME CUTTINGS; SLIGHT TO NO REACTION WITH HCL; NO FLUORESCENCE UNDER UV LIGHT.

SILTSTONE = PALE BROWN TO BROWNISH GRAY COLOR; DENSE TENACITY; IRREGULAR TO BLOCKY FRACTURE; NODULAR TO WEDGELIKE CUTTINGS HABIT; EARTHY TO SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; MASSIVE STRUCTURE; TRACE REACTION WITH HCL.

SHALE = LIGHT BLUISH TO PALE YELLOW BROWN COLOR; DENSE TENACITY; IRREGULAR FRACTURE; WEDGELIKE TO NODULAR TO BLADED CUTTINGS HABIT; WAXY TO DULL LUSTER; SMOOTH TEXTURE; MASSIVE STRUCTURE; NO REACTION IN HCL.

SANDSTONE = LIGHT GRAY TO VERY LIGHT GRAY COLOR; FINE TO VERY FINE GRAIN SIZE; FAIR SORTING; SUBROUND TO SUB-ANGULAR GRAINES; QUARTZ GRAINS WITH LESS THAN 2% DARK LITHICS; FIRM FRIABLE; GRAIN SUPPORTED; SLIGHT REACTION WITH HCL; NO FLUORESCENCE UNDER UV LIGHT; GROUND SURFACES DUE TO PDC BIT.

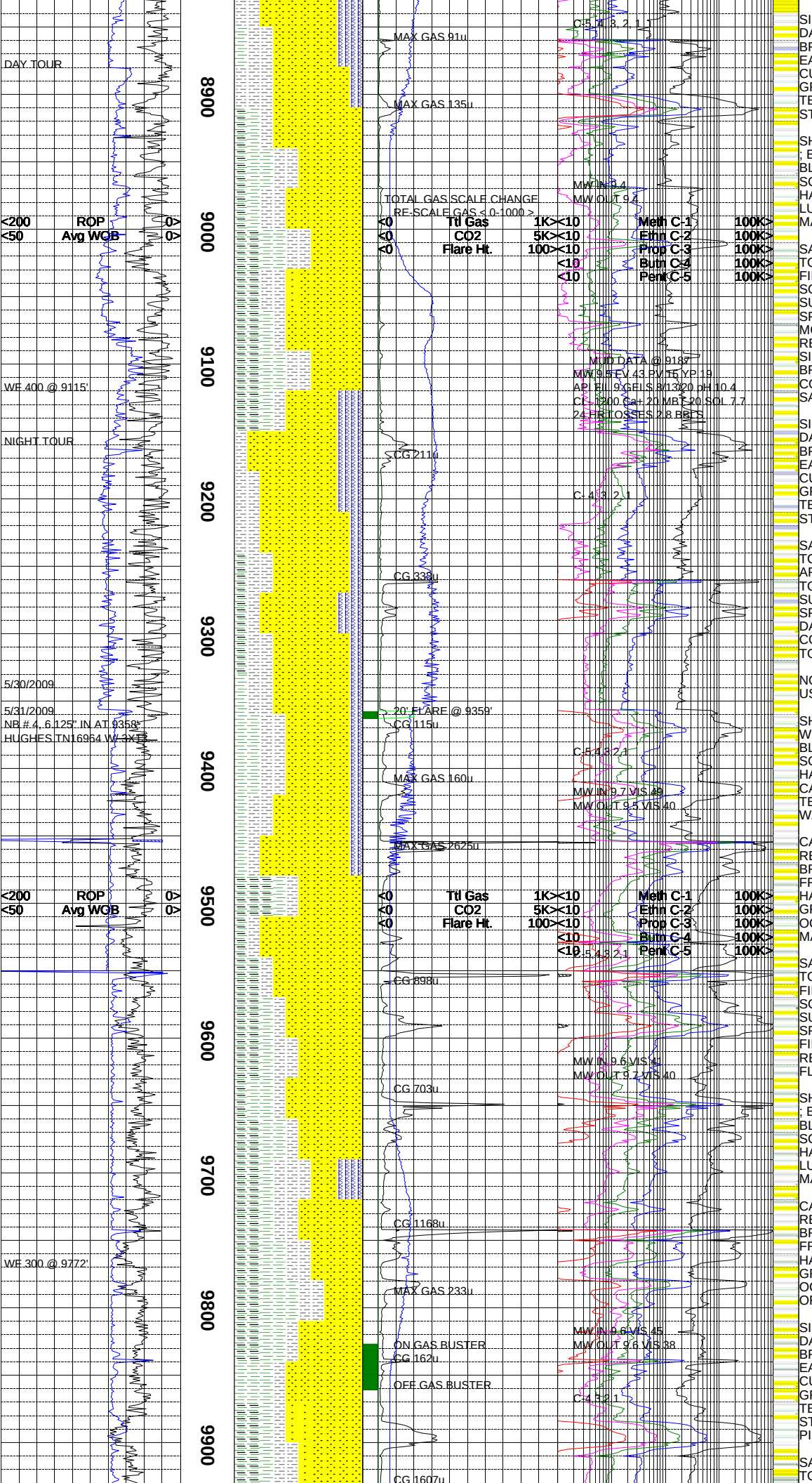
SILTSTONE = MEDIUM BLUISH GRAY TO OCC DARK REDDISH BROWN; VERY DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY TO EARTHY FRACTURE; TABULAR TO WEDGELIKE CUTTINGS HABIT; EARTHY TO DULL TO OCC GREASY LUSTER; SMOOTH TO VERY SILTY TEXTURE; OVERALL THICK TO MASSIVE STRUCTURE; NON CALCAREOUS; TRACES OF PINPOINT PYRITE COMMON IN SAMPLES.

SHALE = LIGHT BLUISH TO PALE YELLOW BROWN COLOR; DENSE TENACITY; IRREGULAR FRACTURE; WEDGELIKE TO NODULAR TO BLADED CUTTINGS HABIT; EARTHY TO DULL LUSTER; SMOOTH TEXTURE; MASSIVE TO THICK STRUCTURE; NO REACTION WITH HCL.

SANDSTONE = OFF WHITE TO CLEAR WITH PALE GRAY BLUE HUES; VERY FINE TO FINE LOWER TO MEDIUM AND OCC COARSE GRAINED UPPER; WELL TO FAIRLY SORTED; SUBROUNDED TO ROUNDED WITH SOME ANGULAR GRAINS PRESENT MODERATELY HARD TO FRIABLE; SLIGHTLY TO MODERATELY CALCAREOUS; DARK GRAY TO BLACK LITHICS COMMON WITHIN QUARTZ; NO HYDROCARBON INDICATORS; SHALE NODULES ARE PLATY AND COMMON WITHIN SAMPLES.

NOTE: TD INTERMEDIATE SECTION @ 8723' MD ON 05/24/2009 AT 23:00 HRS.

SANDSTONE = OPAQUE, OFF WHITE, CLEAR, LIGHT GREENISH GRAY HUES; VERY FINE TO FINE GRAINED; SUBANGULAR TO SUBROUNDED; OVERALL HARD QUARTZ SAND; KAOLINITIC SAND GRAINS VERY COMMON; OVERALL FINE SILICA CEMENTATION; VERY WELL SORTED WITH NO VISIBLE POROSITY; VERY CLEAN AND COMPACTED SAND GRAINS WHEN WET; NON TO SLIGHTLY CALCAREOUS WITH DARK BROWN SILTSTONE FRAGMENTS COMMON; NO APPARENT OIL INDICATORS PRESENT.



SILTSTONE = BLUISH GRAY TO SLIGHTLY DARK REDDISH BROWN; VERY DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY TO EARTHY FRACTURE; TABULAR TO WEDGELIKE CUTTINGS HABIT; EARTHY TO DULL TO OCC GREASY LUSTER; SMOOTH TO VERY SILTY TEXTURE; OVERALL THICK TO MASSIVE STRUCTURE; NON CALCAREOUS.

SHALE = LIGHT GRAY TO DARK GRAY TO BLACK ; BRITTLE TO CRUMBLY TENACITY; PLANAR TO BLOCKY TO IRREGULAR FRACTURE; PLATY TO SCALY TO WEDGE-LIKE TO BLADED CUTTINGS HABIT; EARTHY TO DULL TO SLIGHTLY WAXY LUSTER; GENERALLY SMOOTH TEXTURE; MASSIVE STRUCTURE.

SANDSTONE = COLOR VARIES FROM GRAY TO WHITE TO OCCASIONALLY TRANSLUCENT; FINE TO MEDIUM GRAIN SIZE; FAIR TO WELL SORTED GRAINS; ROUND TO SUB-ROUND TO SUB-ANGULAR GRAINS WITH LOW TO MODERATE SPHERICITY; SAMPLE IS FRIABLE TO MODERATELY HARD; ALTHOUGH SLIGHTLY REACTIVE TO HCL SOLUTION; PREDOMINANTLY SILICA CEMENT; SAMPLE ALSO CONTAINS BROWN AND BLACK LITHIC FRAGMENTS WHICH COMPRISE TWO TO THREE PERCENT OF SAMPLE.

SILTSTONE = BLUISH GRAY TO SLIGHTLY DARK REDDISH BROWN; VERY DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY TO EARTHY FRACTURE; TABULAR TO WEDGELIKE CUTTINGS HABIT; EARTHY TO DULL TO OCC GREASY LUSTER; SMOOTH TO VERY SILTY TEXTURE; OVERALL THICK TO MASSIVE STRUCTURE; NON CALCAREOUS.

SANDSTONE = OFF WHITE TO VERY LIGHT GRAY TO OCC TRANSLUCENT WITH A SALT/PEPPER APPEARANCE; FINE TO OCC VERY FINE LOWER TO MEDIUM AND OCC COARSE UPPER GRAINED; SUBANGULAR TO SUBROUNDED; MODERATE SPHERICITY; MODERATELY FRIABLE TO HARD; DARK BROWN TO BLACK LITHICS COMMON; WELL CONSOLIDATED CLEAN QUARTZ SAND; SLIGHTLY TO MOD CALCAREOUS; NO FLUORESCENCE.

NOTE: TOOH AT 9358' MD FOR BIT AND RUN USIT LOGS.

SHALE = LIGHT GRAY TO DARK GRAY TO BLACK WITH LIGHT BLUISH GRAY HUES; WEDGED TO BLOCKY TO IRREGULAR FRACTURE; PLATY TO SCALY TO TABULAR TO BLADED CUTTINGS HABIT; VERY EARTHY TO DULL LUSTER; NON CALCAREOUS WITH A SMOOTH TO SILTY TEXTURE; CAVINGS COMMON FROM UP HOLE WASHING DOWN DURING TRIP.

CARBONACEOUS SHALE = DARK BROWN TO REDDISH BROWN TO BLACK; DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURE; GENERALLY MASSIVE CUTTINGS HABIT; EARTHY TO DULL TO OCCASIONALLY GREASY LUSTER; MASSIVE STRUCTURE WITH OCCASIONAL STRINGERS OF CARBONACEOUS MATERIAL.

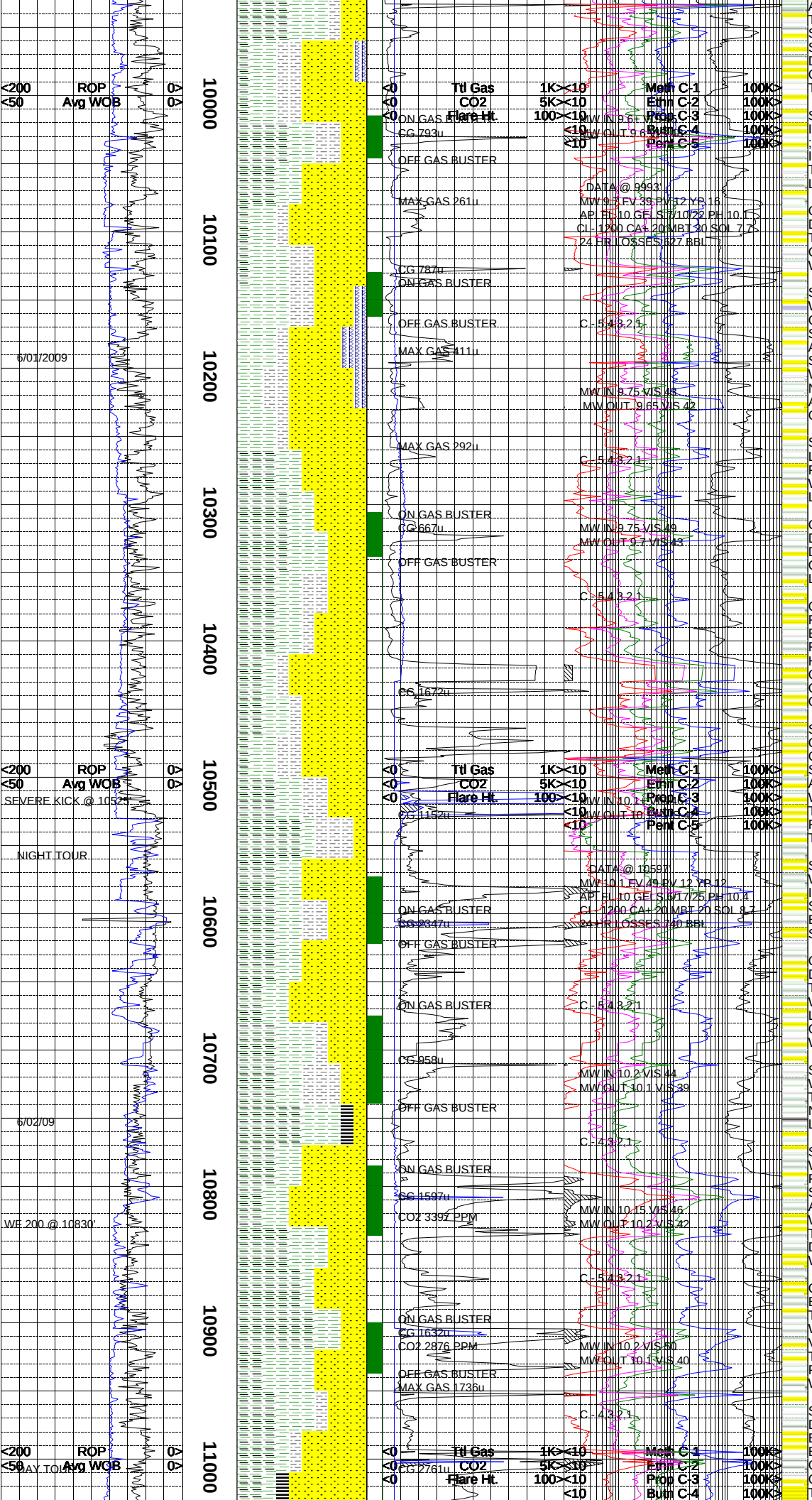
SANDSTONE = COLOR VARIES FROM GRAY TO WHITE TO OCCASIONALLY TRANSLUCENT; FINE TO MEDIUM GRAIN SIZE; FAIR TO WELL SORTED GRAINS; ROUND TO SUB-ROUND TO SUB-ANGULAR GRAINS WITH LOW TO MODERATE SPHERICITY; SAMPLE IS FRIABLE TO FIRM FRIABLE; CALCITE CEMENT; SAMPLE IS REACTIVE TO HCL SOLUTION; NO VISIBLE FLOURESCENTS UNDER UV LIGHT.

SHALE = LIGHT GRAY TO DARK GRAY TO BLACK ; BRITTLE TO CRUMBLY TENACITY; PLANAR TO BLOCKY TO IRREGULAR FRACTURE; PLATY TO SCALY TO WEDGE-LIKE TO BLADED CUTTINGS HABIT; EARTHY TO DULL TO SLIGHTLY WAXY LUSTER; GENERALLY SMOOTH TEXTURE; MASSIVE STRUCTURE.

CARBONACEOUS SHALE = DARK BROWN TO REDDISH BROWN TO BLACK; DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURE; GENERALLY MASSIVE CUTTINGS HABIT; EARTHY TO DULL TO OCCASIONALLY GREASY LUSTER; MASSIVE STRUCTURE WITH OCCASIONAL BLACK STRINGERS; DEGASSING OF SAMPLE IS ALSO VISIBLE.

SILTSTONE = MEDIUM BLUISH GRAY TO OCC DARK REDDISH BROWN; VERY DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY TO EARTHY FRACTURE; TABULAR TO WEDGELIKE CUTTINGS HABIT; EARTHY TO DULL TO OCC GREASY LUSTER; SMOOTH TO VERY SILTY TEXTURE; OVERALL THICK TO MASSIVE STRUCTURE; NON CALCAREOUS; TRACES OF PINPOINT PYRITE COMMON IN SAMPLES.

SANDSTONE = OFF WHITE TO VERY LIGHT GRAY TO OCC TRANSLUCENT WITH A SALT/PEPPER



APPEARANCE; FINE TO OCC VERY FINE LOWER TO MEDIUM AND OCC COARSE UPPER GRAINED; SUBANGULAR TO SUBROUNDED; MODERATE SPHERICITY; MODERATELY FRIABLE TO HARD; DARK BROWN TO BLACK LITHICS COMMON; WELL CONSOLIDATED CLEAN QUARTZ SAND; SLIGHTLY TO MOD CALCAREOUS; NO FLUORESCENCE.

SHALE = GRAY TO LIGHT GRAY TO DARK GRAY IN COLOR WITH LOW TO VERY LOW SPEHRICITY ; CRUMBLY TO CRUNCHY TENACITY WITH IRREGULAR TO PLANAR FRACTURES; SCALY TO TABULAR CTGS HABIT WITH A DULL TO EARTHY LUSTER ; SMOOTH TO SILTY TEXTURE.

CARBONACEOUS SHALE = DARK GRAY TO DARK BROWN IN COLOR BRITTLE TO CRUMBLY TENACITY WITH TABULAR TO WEDGELIKE CTGS HABIT; VITREOUS TO RESINOUS LUSTER WITH A SILTY TO ABRASIVE TEXTURE.

SANDSTONE = OFFWHITE TO GRAY IN COLOR WITH A CALTIC FRAMEWORK; MEDIUM TO COARSE FRAMEWORK WITH FAIR TO WELL SORTING; SUBROUND TO SUBANGULAR ANGULARITY WITH MODERATE TO HIGH SPHERICITY; BRITTLE TO CRUMBLY TENACITY WITH HACKLY TO MOTTLED FRACTURES; NIODULAR TO EQUANT CTGS HABIT WITH A FROSTED TO DULL LUSTER; GRITTY TO GRANULAR TEXTURE.

SILTSTONE = GRAY TO BROWN IN COLOR WITH LOW TO VERY LOW SPHERICITY; CRUNCHY TO PULVERANT TENACITY WITH SCALY TO WEDGELIKE CTGS HABIT; DULL TO EARTHY LUSTER WITH A SMOOTH TO SILTY TEXTURE.

CARBONACEOUS SHALE = DARK GRAY TO DARK BROWN IN COLOR WITH BRITTLE TO DENSE TENACITY; ELONGATED TO TABULAR CTGS HABIT WITH A RESINOUS TO DULL LUSTER; SILTY TO ABRASIVE TEXTURE,

CARBONACEOUS SHALE = DARK BROWN TO REDDISH BROWN TO BLACK; DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURE; GENERALLY MASSIVE CUTTINGS HABIT; EARTHY TO DULL TO OCCASIONALLY GREASY LUSTER; MASSIVE STRUCTURE WITH OCCASIONAL BLACK STRINGERS; DEGASSING OF SAMPLE IS ALSO VISIBLE.

SANDSTONE = OFFWHITE TO LIGHT GRAY IN COLOR WITH MEDIUM TO COARSE GRAIN SIZE; CALCITIC FRAME WORK WITH FAIR TO WELL SORTING; SUBROUND TO SUBANGULAR ANGULARITY; MODERATE TO HIGH SPHERICITY WITH DENSE TO BRITTLE TENACITY; EQUANT TO NODULAR CTGS HABIT WITH A WAXY TO FROSTED LUSTER; GRITTY TO GRANULAR TEXTURE WITH 20% BLACK LITHICS.

SHALE = DARK GRAY TO BROWN IN COLOR WITH BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO PLANAR FRACTURES WITH SCALY TO TABULAR CTGS HABIT; DULL TO EARTHY LUSTER WITH A SMOOTH TO SILTY TEXTURE.

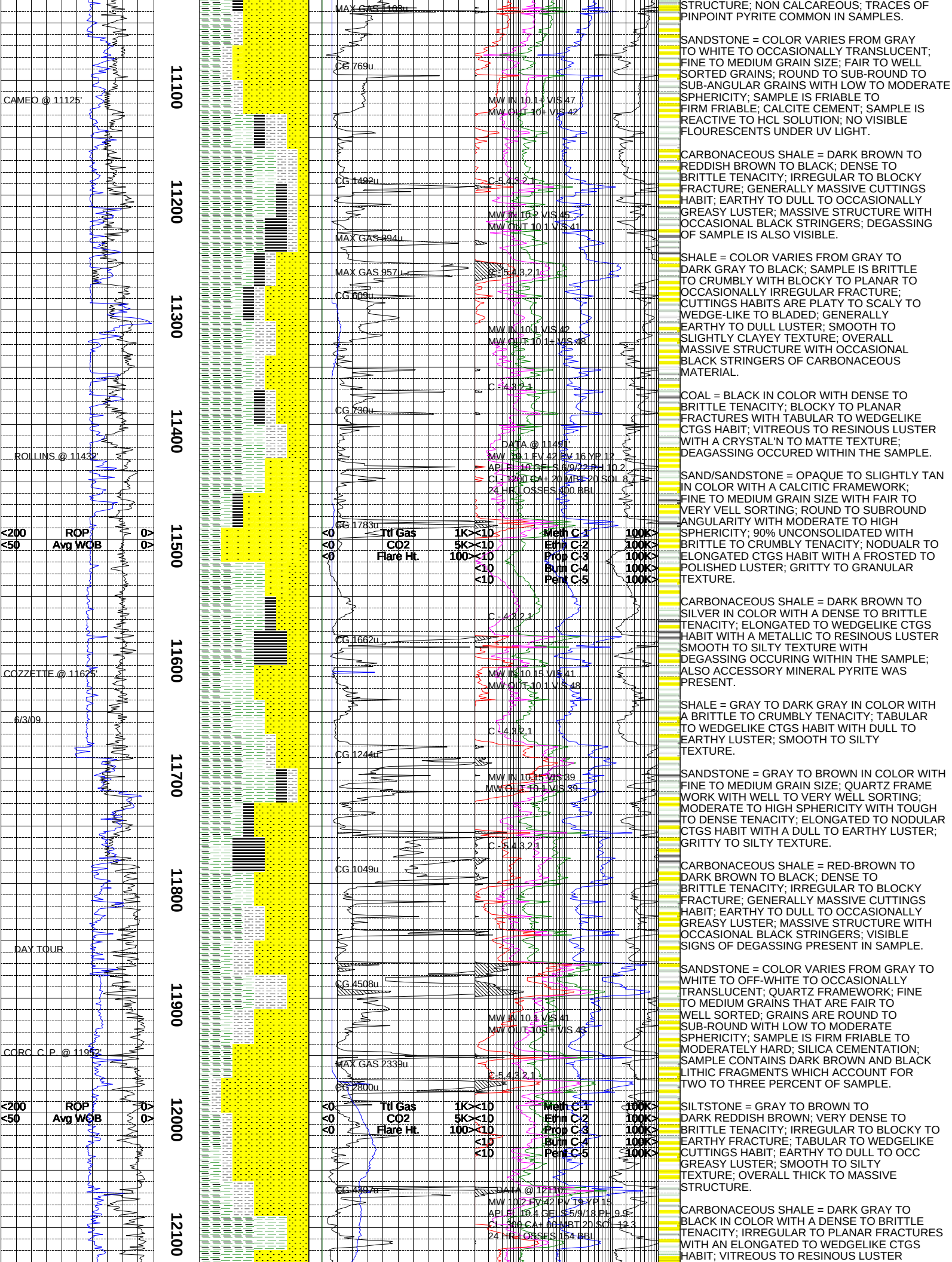
CARBONACEOUS SHALE = DARK BROWN TO DARK GRAY IN COLOR WITH DENSE TO BRITTLE TENACITY; SCALY TO WEDGELIKE CTGS HABIT WITH A RESINOUS TO SLIGHTLY VITREOUS LUISTER; SILTY TO SLIGHTLY GRITTY TEXTURE WITH DEGASSING OCCURING WITHIN THE SAMPLE.

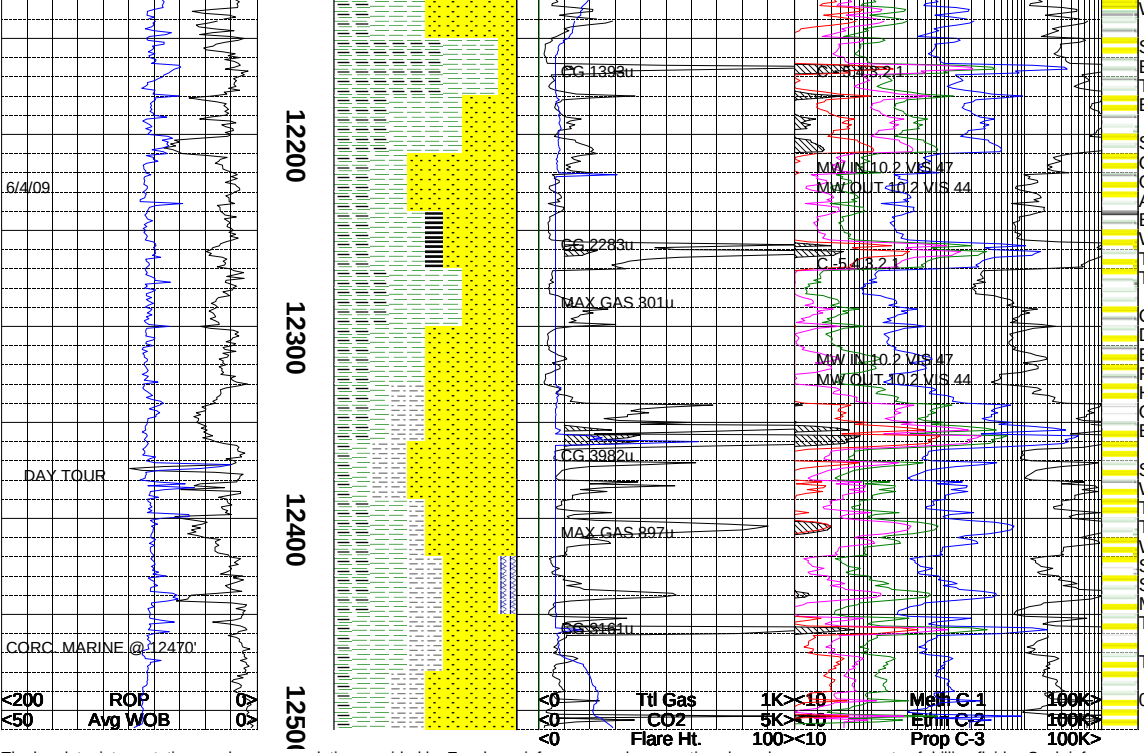
SILTSTONE = LIGHT GRAY TO TAN IN COLOR WITH MODERATE TO LOW SPHERICITY; CRUMBLY TO CRUNCHY TENACITY WITH ELONGATED TO NODULAR CTGS HABIT; DULL TO EARTHY LUSTER WITH A SMOOTH TO SILTY TEXTURE.

SANDSTONE = GRAY TO OFFWHITE IN COLOR WITH A CALCITIC FRAMEWORK; MEDIUM TO FINE GRAIN SIZE WITH WELL TO VERY WELL SORTING; SUBROUND TO SUBANGULAR ANGULARITY; MODERATE TO HIGH SPHERICITY WITH DENSE TO BRITTLE TENACITY; NODULAR TO ELONGATED CTGS HABIT WITH A WAXY TO DULL LUSTER; GRITTY TO GRANULAR TEXTURE WITH 30% BLACK LITHICS.

CARBONACEOUS SHALE = BLACK TO DARK BROWN IN COLOR WITH DENSE TO BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURES WITH A TABULAR TO WEDGELIKE CTGS HABIT; VITREOUS TO DULL LUSTER WITH A SILTY TO ABRASIVE TEXTURE; ACCESSORY MINERAL PYRITE WAS PRESENT WITHIN SAMPLE; SAMPLE WAS ALSO DEGASSING.

SILTSTONE = MEDIUM BLUISH GRAY TO OCC DARK REDDISH BROWN; VERY DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY TO EARTHY FRACTURE; TABULAR TO WEDGELIKE CUTTINGS HABIT; EARTHY TO DULL TO OCC GREASY LUSTER; SMOOTH TO VERY SILTY TEXTURE; OVERALL THICK TO MASSIVE


11100
11200
11300
11400
11500
11600
11700
11800
11900
12000
12100
CAMEO @ 11125'
ROLLINS @ 11432'
COZZETTE @ 11625'
6/3/09
DAY TOUR
CORC. C. P. @ 11952'
MAX GAS 1103u
CG 769u
MW IN 10.1+ VIS 47
MW OUT 10+ VIS 42
CG 1492u
C-5,4,3,2,1
MW IN 10.2 VIS 45
MW OUT 10.1 VIS 41
MAX GAS 894u
MAX GAS 957u
C-5,4,3,2,1
CG 609u
MW IN 10.1 VIS 42
MW OUT 10.1+ VIS 48
C-5,4,3,2,1
CG 730u
DATA @ 11495'
MW 10.1 FV 42 PV 16 YP 12
API FL 10 GEL-S 6/9/22 PH 10.2
CL- 1200 CA+ 20 MBT 20 SOL 8.7
24 HR LOSSES 200 BBL
CG 1783u
<0 Ttl Gas 1K><10 Meth C-1 100K>
<0 CO2 5K><10 Ethn C-2 100K>
<0 Flare Ht. 100><10 Prop C-3 100K>
<10 Butn C-4 100K>
<10 Pent C-5 100K>
<200 ROP 0>
<50 Avg WOB 0>
C-5,4,3,2,1
CG 1662u
MW IN 10.15 VIS 41
MW OUT 10.1 VIS 48
C-5,4,3,2,1
CG 1244u
MW IN 10.15 VIS 39
MW OUT 10.1 VIS 39
C-5,4,3,2,1
CG 1049u
CG 4508u
MW IN 10.1 VIS 41
MW OUT 10.1+ VIS 43
MAX GAS 2339u
C-5,4,3,2,1
CG 2800u
<0 Ttl Gas 1K><10 Meth C-1 100K>
<0 CO2 5K><10 Ethn C-2 100K>
<0 Flare Ht. 100><10 Prop C-3 100K>
<10 Butn C-4 100K>
<10 Pent C-5 100K>
<200 ROP 0>
<50 Avg WOB 0>
CG 4300u
DATA @ 12110'
MW 10.2 FV 42 PV 19 YP 15
API FL 10.4 GEL-S 5/9/18 PH 9.9
CL- 300 CA+ 60 MBT 20 SOL 12.3
24 HR LOSSES 154 BBL
STRUCTURE; NON CALCAREOUS; TRACES OF PINPOINT PYRITE COMMON IN SAMPLES.
SANDSTONE = COLOR VARIES FROM GRAY TO WHITE TO OCCASIONALLY TRANSLUCENT; FINE TO MEDIUM GRAIN SIZE; FAIR TO WELL SORTED GRAINS; ROUND TO SUB-ROUND TO SUB-ANGULAR GRAINS WITH LOW TO MODERATE SPHERICITY; SAMPLE IS FRIABLE TO FIRM FRIABLE; CALCITE CEMENT; SAMPLE IS REACTIVE TO HCL SOLUTION; NO VISIBLE FLOURESCENTS UNDER UV LIGHT.
CARBONACEOUS SHALE = DARK BROWN TO REDDISH BROWN TO BLACK; DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURE; GENERALLY MASSIVE CUTTINGS HABIT; EARTHY TO DULL TO OCCASIONALLY GREASY LUSTER; MASSIVE STRUCTURE WITH OCCASIONAL BLACK STRINGERS; DEGASSING OF SAMPLE IS ALSO VISIBLE.
SHALE = COLOR VARIES FROM GRAY TO DARK GRAY TO BLACK; SAMPLE IS BRITTLE TO CRUMBLY WITH BLOCKY TO PLANAR TO OCCASIONALLY IRREGULAR FRACTURE; CUTTINGS HABITS ARE PLATY TO SCALY TO WEDGE-LIKE TO BLADED; GENERALLY EARTHY TO DULL LUSTER; SMOOTH TO SLIGHTLY CLAYEY TEXTURE; OVERALL MASSIVE STRUCTURE WITH OCCASIONAL BLACK STRINGERS OF CARBONACEOUS MATERIAL.
COAL = BLACK IN COLOR WITH DENSE TO BRITTLE TENACITY; BLOCKY TO PLANAR FRACTURES WITH TABULAR TO WEDGELIKE CTGS HABIT; VITREOUS TO RESINOUS LUSTER WITH A CRYSTAL'N TO MATTE TEXTURE; DEAGASSING OCCURED WITHIN THE SAMPLE.
SAND/SANDSTONE = OPAQUE TO SLIGHTLY TAN IN COLOR WITH A CALCITIC FRAMEWORK; FINE TO MEDIUM GRAIN SIZE WITH FAIR TO VERY VELL SORTING; ROUND TO SUBROUND ANGULARITY WITH MODERATE TO HIGH SPHERICITY; 90% UNCONSOLIDATED WITH BRITTLE TO CRUMBLY TENACITY; NODUALR TO ELONGATED CTGS HABIT WITH A FROSTED TO POLISHED LUSTER; GRITTY TO GRANULAR TEXTURE.
CARBONACEOUS SHALE = DARK BROWN TO SILVER IN COLOR WITH A DENSE TO BRITTLE TENACITY; ELONGATED TO WEDGELIKE CTGS HABIT WITH A METALLIC TO RESINOUS LUSTER SMOOTH TO SILTY TEXTURE WITH DEGASSING OCCURING WITHIN THE SAMPLE; ALSO ACCESSORY MINERAL PYRITE WAS PRESENT.
SHALE = GRAY TO DARK GRAY IN COLOR WITH A BRITTLE TO CRUMBLY TENACITY; TABULAR TO WEDGELIKE CTGS HABIT WITH DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE.
SANDSTONE = GRAY TO BROWN IN COLOR WITH FINE TO MEDIUM GRAIN SIZE; QUARTZ FRAME WORK WITH WELL TO VERY WELL SORTING; MODERATE TO HIGH SPHERICITY WITH TOUGH TO DENSE TENACITY; ELONGATED TO NODULAR CTGS HABIT WITH A DULL TO EARTHY LUSTER; GRITTY TO SILTY TEXTURE.
CARBONACEOUS SHALE = RED-BROWN TO DARK BROWN TO BLACK; DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURE; GENERALLY MASSIVE CUTTINGS HABIT; EARTHY TO DULL TO OCCASIONALLY GREASY LUSTER; MASSIVE STRUCTURE WITH OCCASIONAL BLACK STRINGERS; VISIBLE SIGNS OF DEGASSING PRESENT IN SAMPLE.
SANDSTONE = COLOR VARIES FROM GRAY TO WHITE TO OFF-WHITE TO OCCASIONALLY TRANSLUCENT; QUARTZ FRAMEWORK; FINE TO MEDIUM GRAINS THAT ARE FAIR TO WELL SORTED; GRAINS ARE ROUND TO SUB-ROUND WITH LOW TO MODERATE SPHERICITY; SAMPLE IS FIRM FRIABLE TO MODERATELY HARD; SILICA CEMENTATION; SAMPLE CONTAINS DARK BROWN AND BLACK LITHIC FRAGMENTS WHICH ACCOUNT FOR TWO TO THREE PERCENT OF SAMPLE.
SILTSTONE = GRAY TO BROWN TO DARK REDDISH BROWN; VERY DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY TO EARTHY FRACTURE; TABULAR TO WEDGELIKE CUTTINGS HABIT; EARTHY TO DULL TO OCC GREASY LUSTER; SMOOTH TO SILTY TEXTURE; OVERALL THICK TO MASSIVE STRUCTURE.
CARBONACEOUS SHALE = DARK GRAY TO BLACK IN COLOR WITH A DENSE TO BRITTLE TENACITY; IRREGULAR TO PLANAR FRACTURES WITH AN ELONGATED TO WEDGELIKE CTGS HABIT; VITREOUS TO RESINOUS LUSTER



WITH A SILTY TO ABRASIVE TEXTURE.

SHALE = GRAY TO DARK GRAY IN COLOR WITH BRITTLE TO CRUMBLY TENACITY; TABULAR TO WEDGLEIKE CTGS HABIT WITH A DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE.

SANDSTONE = OFFWHITE IN COLOR WITH A CALCITIC FRAME WORK; MEDIUM TO FINE GRAINSIZE WITH SUBROUND TO SUBANGULAR ANGULARITY; MODERATE TO LOW SPHERICITY; BRITTLE TO CRUMBLY TENACITY WITH WEDGELIKE TO ELONGATED CTGS HABIT; WAXY TO DULL LUSTER WITH A GRITTY TO SILTY TEXTURE.

CARBONACEOUS SHALE = RED-BROWN TO DARK BROWN TO BLACK; DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURE; GENERALLY MASSIVE CUTTINGS HABIT; EARTHY TO DULL TO OCCASIONALLY GREASY LUSTER; MASSIVE STRUCTURE WITH BANDS OF CARBONACEOUS MATERIAL.

SANDSTONE = COLOR VARIES FROM GRAY TO WHITE TO OFF-WHITE TO OCCASIONALLY TRANSLUCENT; QUARTZ FRAMEWORK; FINE TO MEDIUM GRAINS THAT ARE FAIR TO WELL SORTED; GRAINS ARE ROUND TO SUB-ROUND WITH LOW TO MODERATE SPHERICITY; SAMPLE IS FIRM FRIABLE TO MODERATELY HARD; SLIGHTLY REACTIVE TO HCL SOLUTION; CALCITE CEMENTATION.

T.D. 12512'

06/04/09