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

Drilling Dynamics MD

| | |
|---------------|--------------------------|
| COMPANY | ExxonMobil Production |
| WELL | FRU197-33A6 |
| FIELD | FREEDOM RANCH UNIT |
| REGION | ROCKY MOUNTAINS |
| COORDINATES | 39.915536 108.285764 |
| ELEVATION | GL = 6385' KB = 6412' |
| COUNTY, STATE | RIO BLANCO, CO |
| API INDEX | 051031153500 |
| SPUD DATE | 10/17/2009 |
| CONTRACTOR | HELMRICH AND PAYNE |
| CO. REP. | RICKY OWENS |
| RIG/TYPE | 215/FLEX 3 |
| LOGGING UNIT | MLU 051 |
| GEOLOGISTS | D.CLAAR B.MARSH |
| ADD. PERSONS | B. JOHANNING G.BAKER |
| CO. GEOLOGIST | M. BIGGS |

LOG INTERVAL

DEPTHS: 3,852' TO 12,294'
DATES: 03/02/2010 TO 03/16/2010
SCALE: 1" = 100'

CASING DATA

10.75" AT 3,862'
7.00" AT 8,465'
AT
AT

MUD TYPES

LSND TO 12,294'
TO
TO
TO

HOLE SIZE

9.875" TO 8,465'
6.125" TO 12,294'
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 | | CHERT - GLASSY | | FELSIC SILIC DIKE | | MARL - CALC | | SANDSTONE |
| | ANDESITE | | CHERT - PORCEL | | FOSSIL | | METAMORPHICS | | SANDSTONE-TUFFACEOUS |
| | ANHYDRITE | | CHERT - TIGER STRIPE | | GABBRO | | MUDSTONE | | SERICITIZATION |
| | BASALT | | CHERT - UNDIFF | | GLASSY TUFF | | OBSIDIAN | | SERPENTINE |
| | BENTONITE | | CLAY | | GRANITE | | PALEOSOL | | SHALE |
| | BIOTITIZATION | | CLAY-MUDSTONE | | GRANITE WASH | | PHOSPHATE | | SHALE TUFFACEOUS |
| | BRECCIA | | CLYST-TUFFACEOUS | | GRANODIORITE | | PORCELANITE | | SHELL FRAGMENTS |
| | CALCARENITE | | CHLORITIZATION | | GYPSUM | | PORCELANEOUS CLYST | | SIDERITE |
| | CALCAREOUS TUFF | | COAL | | HALITE | | PYRITE | | SILICIFICATION |
| | CALCILUTITE | | CONGLOMERATE | | HORNBL-QTZ-DIO | | PYROCLASTICS | | SILTSTONE |
| | CARBONATES | | CONGL. SAND | | IGNEOUS (ACIDIC) | | QUARTZ DIORITE | | SILTST-TUFFACEOUS |
| | CARBONACEOUS MAT | | CONGL. SANDSTONE | | IGNEOUS (BASIC) | | QUARTZ LATITE | | TUFF |
| | CARBONACEOUS SH | | COQUINA | | INTRUSIVES | | QUARTZ MONZONITE | | VOLCANICLASTICS SEDS |
| | CEMENT CONTAM. | | DACITE | | KAOLINITIC | | RECRYSTALLIZED CALCITE | | VOLCANICS |
| | CHALK | | DIATOMITE | | LIMESTONE | | RHYOLITE | | |
| | CRYSTALLINE TUFF | | DIORITE | | LITHIC TUFF | | SALT | | |
| | CHERT - ARGILL | | DOLOSTONE | | MARL - DOLO | | SAND | | |

Lithology

Ttl Gas 1K
units
CO2 25K
ppm
Flare Ht. 100
ft

Depth

<150 Avg RPM 0> <100 ROP 0> <400 MSE 0>
ft/hr
<30K Avg Torque 0> <50 Avg WOB 0>
FTLBS klbs

MGS

Remarks
Survey Data, Mud Reports, Other Info.

Ttl Gas 50
CO2 25K
Flare Ht. 100

3500

<150 Avg RPM 0> <100 ROP 0> <400 MSE 0>
<30K Avg Torque 0> <50 Avg WOB 0>

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

CONNECTION GASES AS WELL AS TRIP AND DOWNTIME GASES ARE NOTED ON THE LOG. LARGE CONNECTION GASES WHICH APPEAR ON THE MUD LOG USUALLY REFLECT UPHOLE GAS INTERVALS BLEEDING GAS 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 GAS BUSTER THE INTERVAL IS MARKED ON THE MGS COLUMN AND THE SIZE OF FLARES NOTED.

EVIDENCE OF FRACTURE FILL IS NOTED ON THE MUD LOG. KAOLIN PERCENTAGE IN SS INTERVALS IS ALSO NOTED ON THE MUD LOG.

1 UNIT OF GAS = 200PPM METHANE

10.75" CASING SET @ 3,837'

CANRIG STARTED FULL LOGGING SERVICES @ 3,852' ON 03/02/2010.

DRILL TO 3,862' AND PERFORM F.I.T.

SHALE = LIGHT GRAY TO BLuish GRAY WITH ORANGE-BROWN MUD ENCRUSTED; BRITTLE TO PULVERULENT; IRREGULAR TO PLANAR FRACTURE; MASSIVE TO PLATY TO FLAKY CUTTINGS HABIT; DULL TO EARTHY LUSTER; SMOOTH TO CLAYEY TEXTURE; THICK STRUCTURE; THICKLY BEDDED WITH SANDSTONE AND SOME SILTSTONE; ABUNDANT AMOUNT OF ORANGE-BROWN MUD IN SAMPLE.

SANDSTONE = WHITE TO TRANSLUCENT TO LIGHT GRAY WITH A TRACE AMOUNT OF DARK LITHICS 0-3%; FINE TO UPPER VERY FINE GRAINED; FAIR TO POOR SORTING; VERY FINE LOOSE GRAINS TO FINE GRAINED SMALL CLUSTERS; SLIGHT TO MODERATE REACTION TO DILUTE HCL; SUB ANGULAR TO SUB ROUNDED; MODERATE TO LOW SPHERICITY; VERY THINLY INTERBEDDED WITH SHALE AND SILTSTONE.

SHALE = BROWNISH GRAY TO GRAY TO LIGHT BLuish GRAY; BRITTLE TO PULVERULENT TENACITY; IRREGULAR TO PLANAR FRACTURE; DULL TO EARTHY LUSTER; SMOOTH TO CLAYEY TEXTURE; TRACE AMT OF CLAY IN SAMPLE TRAY; THIN STRUCTURE; THICKLY BEDDED WITH THIN LAYERS OF SANDSTONE OR SILTSTONE IN-BETWEEN.

SILTSTONE = YELLOWISH BROWN TO YELLOW GRAY TO LIGHT BLuish GRAY; VARICOLORED; MOTTLED IN PART; MOD HARD TO CRUNCHY; SLI PLATY CUTTINGS; IRREGULAR FRACTURE; SPARKLING LUSTER WHEN DRIED; MOD CALC; RARE CARBONACEOUS MATERIAL; SILTY TO GRITTY TEXTURE; OCC CONTAINS VF QUARTZ GRAINS; SME F TO VF GRAINED SANDSTONE INTERBEDS; OCC LOOSE MEDIUM BROWN LS/ CALCITE GRAINS; NO VISIBLE STRUCTURE.

NAHCOLITE = TRACE AMOUNTS IN SAMPLE; CLEAR; CRYSTALLINE; SOFT; WITH OUTER REDDISH CLAY COATING.

SHALE = VARICOLORED; MOTTLED IN PART; LIGHT GRAY TO YELLOW BROWN; MOTTLED GRAY/YELLOW; FIRM TO CRUNCHY TO MOD HARD; IRREGULAR TO BLOCKY FRACTURE; DOM PLATY CUTTINGS; SLI CALCAREOUS; VERY FINE MICA VARIABLE AMOUNTS OF SILT; GRADING TO ARGILLACEOUS SILTSTONE; ROUGH TO SILTY TEXTURE; RARE LIGHT GRAY SANDSTONE INTERBEDS; NO VISIBLE STRUCTURE; TRACE AMOUNTS OF NAHCOLITE IN SAMPLES.

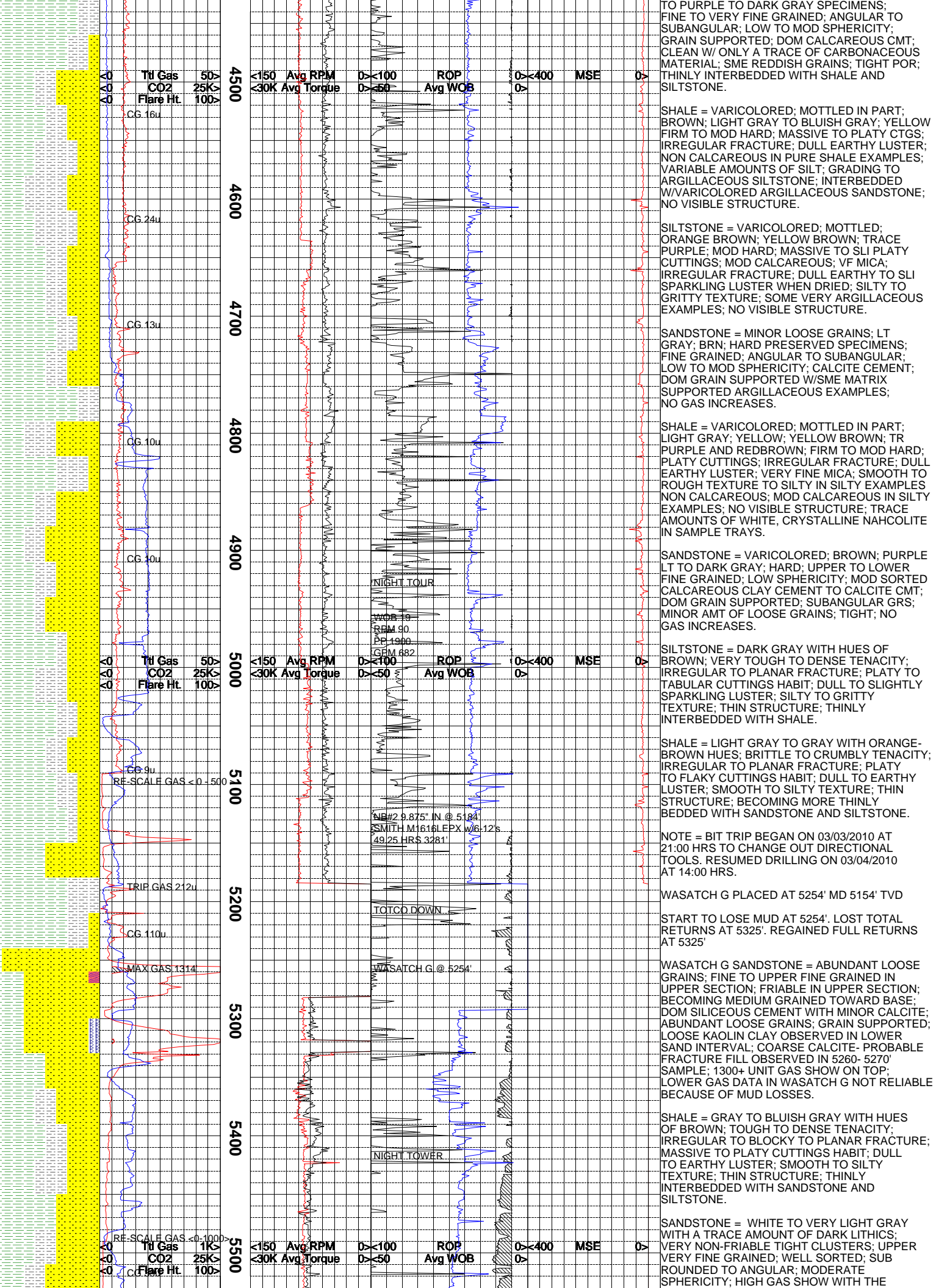
SANDSTONE = LIGHT GRAY; SOME BROWN

NE #1 9.875" IN @ 3852'
HCD 504ZX W/413'S 2" I2'S
25.5 HRS 1332'
NIGHT TOWER

03/03/2010

WOB 17K
RPM 75
PP 4700
GPM 620

DAY TOWER



Tilt Gas 50V
CO2 25K
Flare Hit 100V

<150 Avg RPM
<30K Avg Torque

>100
>50

ROP
Avg WOB

>400 MSE
>

Tilt Gas 50V
CO2 25K
Flare Hit 100V

<150 Avg RPM
<30K Avg Torque

>100
>50

ROP
Avg WOB

>400 MSE
>

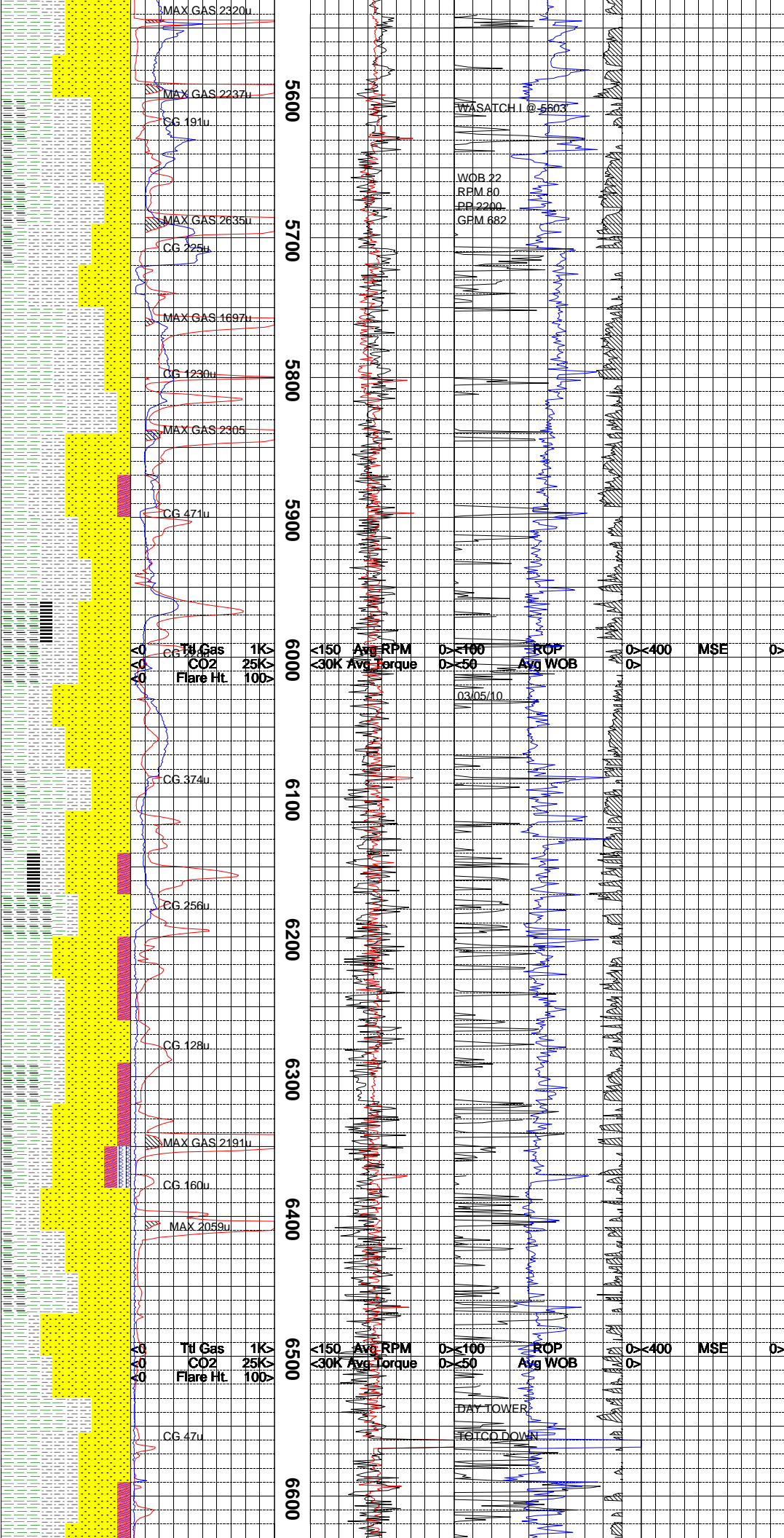
Tilt Gas 1K
CO2 25K
Flare Hit 100V

<150 Avg RPM
<30K Avg Torque

>100
>50

ROP
Avg WOB

>400 MSE
>



SANDSTONE = HIGHLY REACTIVE TO DILUTE HCL; CALCAREOUS CEMENTATION; 1-3% DARK LITHICS THAT GIVE A SLIGHT SALT AND PEPPERED APPEARANCE TO THE SANDSTONE.

SILTSTONE = DARK GRAY TO DARK BROWN WITH HUES OF BLACK-BROWN; VERY TOUGH TO DENSE TENACITY; IRREGULAR TO PLANAR FRACTURE; MASSIVE TO TABULAR CUTTINGS HABIT; DULL TO SPARKLING LUSTER; SILTY TO MILDLY GRITTY TEXTURE; THIN STRUCTURE THINLY INTERBEDDED WITH SANDSTONE AND SHALE.

WASATCH I PLACED AT 5603' MD

SHALE = LIGHT GRAY TO DARK BLUISH GRAY; TOUGH TO BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURE; PLATY TO FLAKY CUTTINGS HABIT; DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE; VERY THINLY INTERBEDDED WITH SANDSTONE AND SILTSTONE.

SANDSTONE = WHITE TO TRANSLUCENT WITH LIGHT GRAY TO BLACK SPECS THROUGHOUT; NON-FRIABLE; VERY HARD TIGHT CLUSTER; HIGHLY REACTIVE TO DILUTE HCL; CALC. CEMENTATION; FINE TO UPPER VERY FINE GRAINED; FAIR TO WELL SORTED; SUB ANGULAR TO SUB ROUNDED; MODERATE TO LOW SPHERICITY; TRACE AMOUNT OF POLISHED SURFACE FEATURES; ELEVATION IN GAS DURING SANDSTONE INTERVALS; THINLY INTERBEDDED WITH SHALE AND SILTSTONE.

SILTSTONE = DARK BROWNISH BLACK TO DARK GRAY WITH BROWN HUES; TOUGH TO DENSE TENACITY; IRREGULAR TO PLANAR FRACTURE; MASSIVE TO TABULAR CUTTINGS HABIT; SILTY TO GRITTY TEXTURE; THIN STRUCTURE; THINLY INTERBEDDED.

CARBONACEOUS SHALE = DARK GRAY TO GRAY WITH BLACK LAMINATIONS; CLEARLY VISIBLE COAL LAMINATION ACROSS THE CARBONACEOUS SHALE; TOUGH TO DENSE TENACITY; IRREGULAR TO PLANAR FRACTURE; PLATY CUTTINGS HABIT; RESINOUS TO DULL LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE; THINLY INTERBEDDED WITH SANDSTONE AND SILTSTONE.

SANDSTONE = WHITE TO LIGHT GRAY WITH A TRACE AMT OF DARK LITHICS GIVING A SALT AND PEPPERED APPEARANCE; ABOUT HALF THE SAMPLE IS TIGHT NON-FRIABLE CLUSTER AND HALF IS UPPER VERY FINE LOOSE GRAINS RANGES FROM FINE TO UPPER VERY FINE GRAINED; FAIR TO WELL SORTED; SUB ANGULAR TO SUB ROUNDED; MODERATE SPHERICITY; HIGHLY REACTIVE TO DILUTE HCL; CALCAREOUS CEMENTATION; 1-3 % DARK LITICS; THINLY INTERBEDDED.

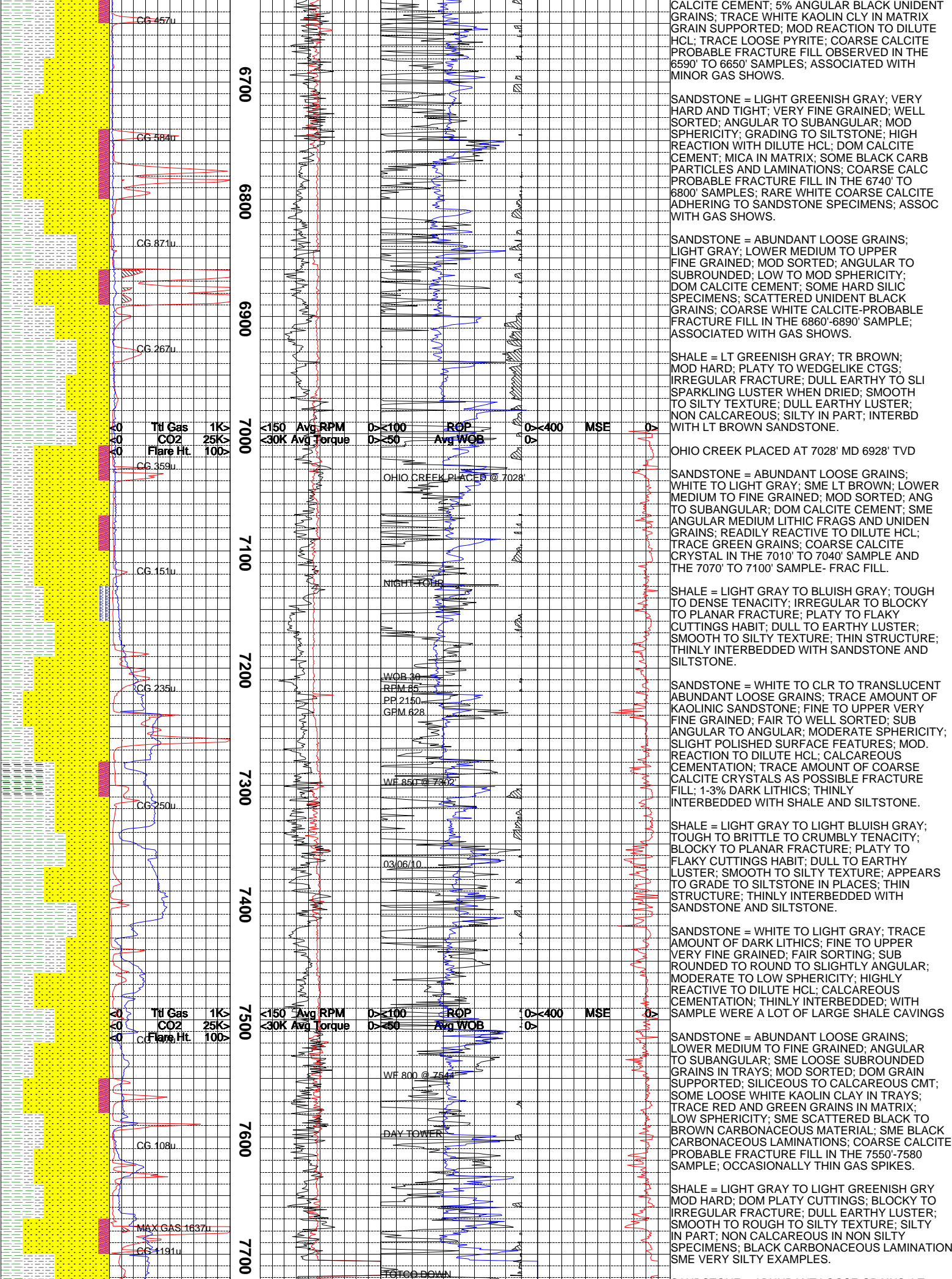
SHALE = LIGHT GRAY TO BLUISH GRAY; TOUGH TO BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO PLATY CUTTINGS HABIT; DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE; THINLY INTERBEDDED WITH SILTSTONE AND SANDSTONE; APPEARS TO GRADE TO CARB. SHALE IN PLACES WHERE THERE IS DARK GRAY BANDING ON SOME INDIVIDUAL SPECIMENS.

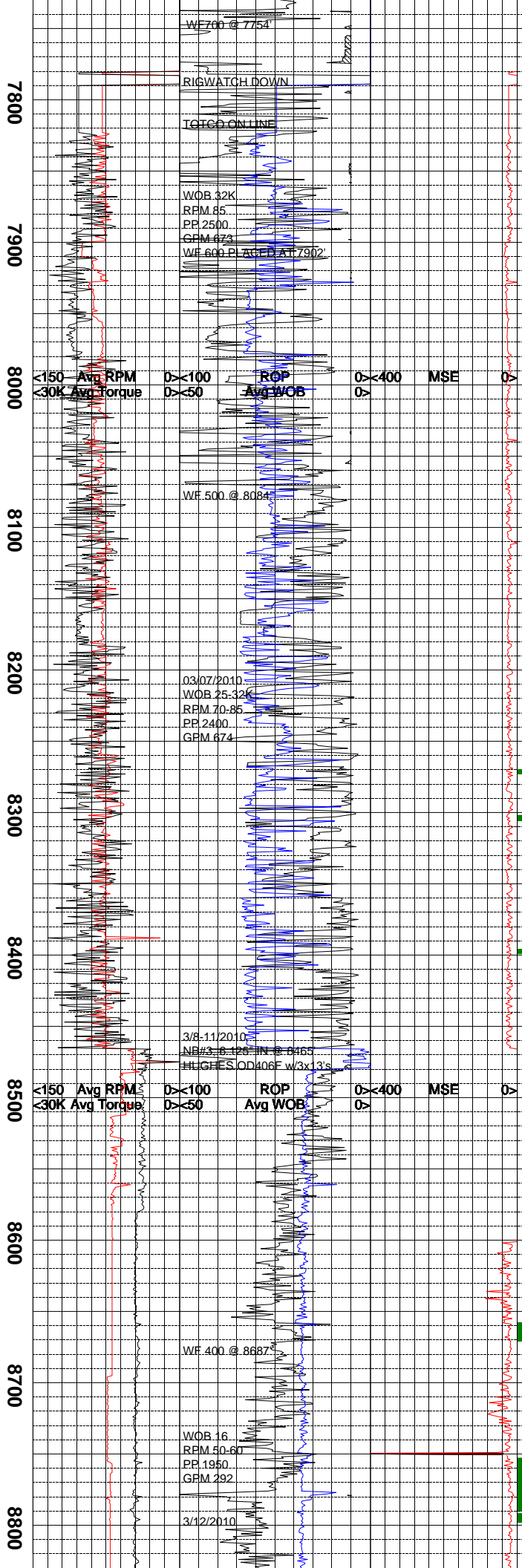
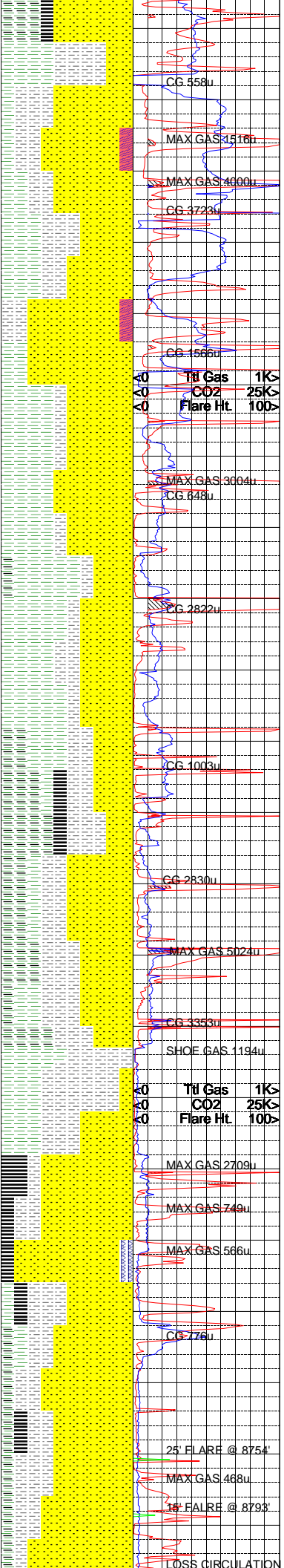
SILTSTONE = DARK GRAYISH BROWN TO DARK BROWN; TOUGH TO DENSE TENACITY; IRREGULAR TO BLOCKY FRACTURE; PLATY TO TABULAR CUTTINGS HABIT; DULL TO SPARKLING LUSTER; THIN STRUCTURE; THINLY INTERBEDDED WITH SANDSTONE AND SHALE.

SANDSTONE = WHITE TO TRANSLUCENT TO OPAQUE WITH A TRACE AMT OF DARK LITHICS THROUGHOUT; UPPER FINE TO FINE GRAINED; FAIR TO WELL SORTED; SUB ANGULAR TO SUB ROUNDED; MIXTURE OF TIGHT NON-FRIABLE CLUSTER TO LOOSE GRAINS; HIGHLY REACTIVE TO DILUTE HCL; CALCAREOUS CEMENTATION; MODERATE SPHERICITY; 1-3% DARK LITHICS; THINLY INTERBEDDED WITH SHALE AND SILTSTONE. MODERATE INCREASE IN GAS WITH THE SANDSTONES.

SHALE = LIGHT GRAY TO LIGHT GREENISH GRAY; LT TO MEDIUM BROWN; SOME MOTTLED GRAYBROWN EXAMPLES; FIRM TO MOD HARD; PLATY CUTTINGS; VARIABLE AMTS OF SILT; GRADING TO ARGILLACEOUS SILTSTONE; OCC SOME ISOLATED QUARTZ GRAINS; NON CALC TO MOD CALCAREOUS IN SILTY SPECIMENS; DULL EARTHY LUSTER; SMOOTH TO ROUGH TEXTURE; SILTY TEXTURE IN SILTY EXAMPLES TRACE MICROPYRITE IN SILTY EXAMPLES; NO VISIBLE STRUCTURE.

SANDSTONE = ABUNDANT LOOSE GRAINS; TRACE LT GRAY PRESERVED SPECIMENS; LOWER MED TO FINE GRAINED; ANGULAR TO SUBANGULAR;





GRAY - OCC LT BROWN; DOM UPPER TO LOWER FINE GRAINED; SME UPPER MEDIUM GRAINED EXAMPLES; ANGULAR TO SUBANGULAR; LOW SPHERICITY; DOM SILICEOUS CEMENT WITH MINOR CALCITE FILL; OCC LOOSE WHITE KAOL MATRIX MATERIAL IN SAMPLES; PRESERVED SPECIMENS USUALLY VERY HARD; SME BLACK CARBONACEOUS LAMINATIONS; TRACE LITHIC AND UNIDENT BLACK GRAINS; ASSOCIATED W/ GAS SPIKES; COARSE CALCITE- PROBABLE FRACTURE FILL OBSERVED IN THE 7550' TO 7580' SAMPLE.

SILTSTONE = LT TO MED GRAY; DARK BROWN; HARD; MASSIVE TO SI PLATY; IRREGULAR TO BLOCKY FRACTURE; DULL TO SLI SPARKLING LUSTER WHEN DRIED; SILTY TEXTURE; DOM SILICEOUS WITH MINOR CALCITE FILL; CARB MATERIAL; SOME BLACK CARBONACEOUS LAM; THINLY BEDDED WITH SANDSTONE AND SHALE.

SANDSTONE = WHITE TO LIGHT GRAY; UPPER TO LOWER FINE GRAINED; HARD; SME PLATY CUTTINGS; ANGULAR TO SUBANGULAR; GRAIN SUPPORTED W/TRACE WHITE KAOLIN CLAY IN SAMPLE TRAYS; DOM CALCITE CEMENT; TR MICA; SCATTERED UNIDENT BLACK GRAINS; COARSE CALCITE-PROBABLE FRACTURE FILL IN THE 7940' TO 7970' SAMPLE.

SHALE = LIGHT GRAY TO DARK GRAY; TOUGH TO DENSE TENACITY; IRREGULAR TO PLANAR FRACTURE; PLATY TO FLAKY TO TABULAR CUTTINGS HABIT; DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE THINLY INTERBEDDED; THERE WAS A LOT OF VERY LARGE SHALE CAVINGS WITH THIS SAMPLE.

SANDSTONE = WHITE TO TRANSLUCENT TO LIGHT BLUISH WHITE WITH DARK LITHICS THROUGHOUT GIVING IT A SALT AND PEPPERED APPEARANCE; FINE TO UPPER VERY FINE GRAINED; SUB ROUNDED TO SUB ANGULAR; MODERATE SPHERICITY; HIGHLY REACTIVE TO DILUTE HCL; CALCAREOUS CEMENTATION; THINLY INTERBEDDED WITH SHALE AND SILTSTONE; REDUCED BIT RATE OCCURRED WHEN DRILLING THIS SANDSTONE.

SHALE/CARBONACEOUS SHALE = DARK GRAY TO BLACK; MOD HARD; PLATY TO FLAKY CTGS; PLANAR TO BLOCKY FRACTURE; SLI RESINOUS LUSTER; SMOOTH TO ROUGH TO SILTY TEXTURE NON CALCAREOUS; ASSOCIATED WITH LOOSE COAL IN SAMPLES.

SILTSTONE = LT TO DARK GRAY; HARD; MASS TO PLATY CUTTINGS; IRREGULAR FRACTURE; DULL LUSTER; VF CARBONACEOUS MATERIAL; GRADING TO CARBONACEOUS SILTSTONE; NON CALCAREOUS; SME THIN BLACK CARBONACEOUS LAMINATIONS; THINLY BEDDED WITH CARB SHALE.

SANDSTONE = MEDIUM GRAY; VERY HARD; VERY FINE GRAINED; ANGULAR TO SUBANGULAR WELL SORTED; GRAIN SUPPORTED; SILICEOUS CEMENT; SPECKLED WITH BLACK CARBONACEOUS MATERIAL; GRADING TO SILTSTONE; OCC THIN GAS SPIKES.

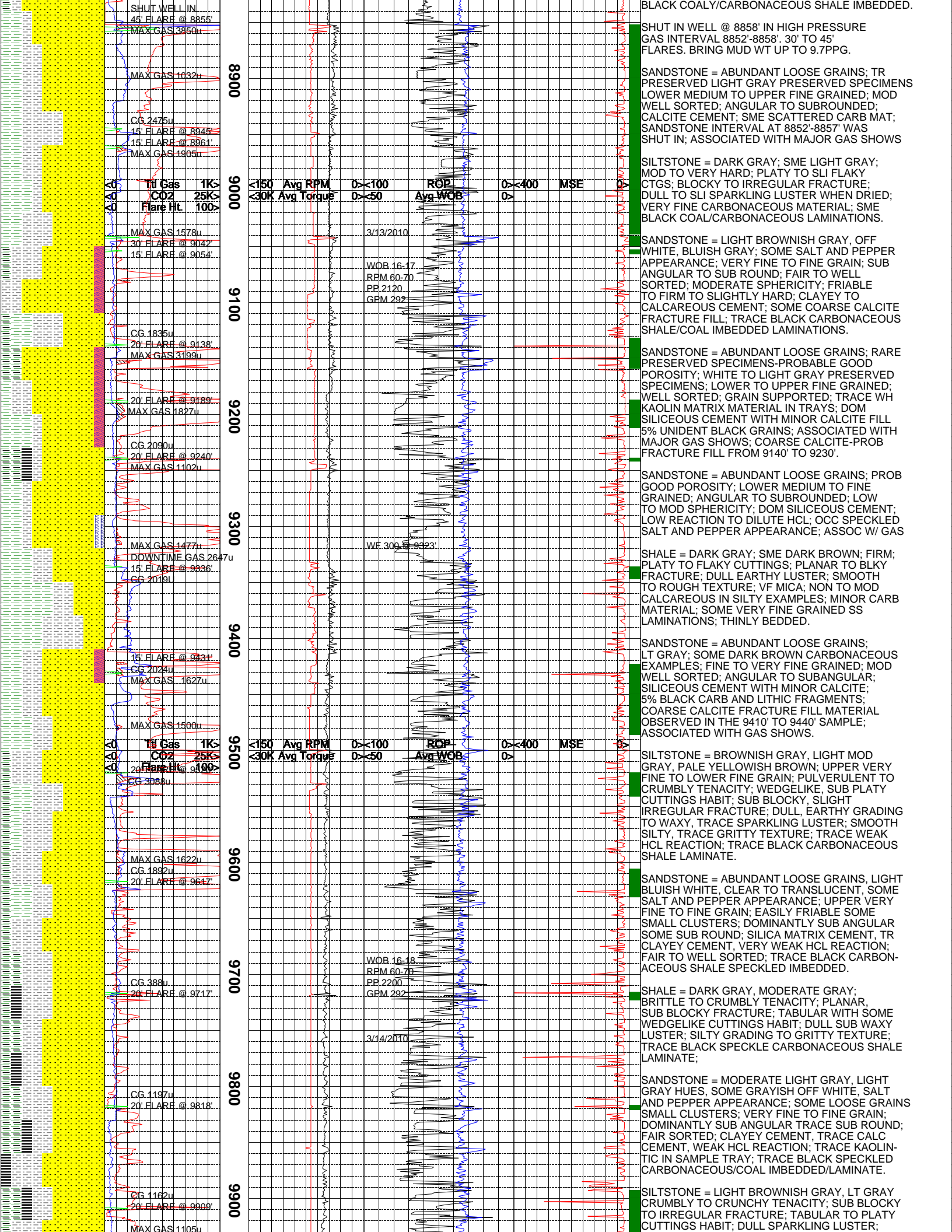
CSG TD = 8465' ON 03/07/2010.
DRILL TO 8475' AND PERFORM F.I.T.

SILTSTONE = DARK TO MEDIUM GRAY; TR DARK BROWN; HARD; SLI PLATY CUTTINGS; IRREGULAR FRACTURE; SLI SPARKLING LUSTER WHEN DRIED; VERY FINE CARBONACEOUS MAT; RAPID REACTION IN DILUTE HCL; DOM CALC CEMENT; SILTY LUSTER; NO STRUCTURE.

SANDSTONE = ABUNDANT LOOSE GRAINS, CLEAR TO TRANSLUCENT, LIGHT BLUISH GRAY, SOME LIGHT OFF WHITE; DOMINANTLY LOWER TO UPPER FINE GRAIN; WELL SORTED; SUB ANGULAR GRADING TO SUB ROUND; MODERATE SPHERICITY; EASILY FRIABLE, WEAK GRAIN SUPPORT; DOMINATLY SILICA MATRIX CEMENT SOME KAOLIN CLAYEY CEMENTATION; GOOD INTERGRANULAR POROSITY; THINLY BEDDED COAL, TRACE BLACK CARBONACEOUS SHALE, A SALT AND PEPPER APPEARANCE.

SILTSTONE = MODERATE LIGHT GRAY, DARK BROWNISH GRAY; CRUNCHY TO CRUMBLY TENACITY; SUB BLOCKY, BLOCKY, SLIGHT IRREGULAR FRACTURE; FLAKY, SUB PLATY CUTTINGS HABIT; DULL, WAXY LUSTER; SILTY GRADING TO GRITTY TEXTURE; TRACE TO SLIGHT CALCITE; TRACE BLACK CARBONACEOUS SHALE SOME COALY LAMINATE.

SANDSTONE = ABUNDANT LOOSE GRAINS, CLEAR TRANSLUCENT, SOME OFF WHITISH GRAY LIGHT BLUISH GRAY; FINE TO MEDIUM GRAIN, WELL SORTED, DOMINANTLY SUB ROUND, MOD SPHERICITY; SILICA MATRIX CEMENT; LOW CALCAREOUS CEMENT; EASILY FRIABLE TO FRIABLE; HIGH GAS SHOW 8857' TRACE



SHUT WELL IN
45' FLARE @ 8855'
MAX GAS 3850u

MAX GAS 1032u

CG 2475u
15' FLARE @ 8945'
15' FLARE @ 8961'
MAX GAS 1905u

1K
CO2 25K
Flare Hit 100

MAX GAS 1578u
30' FLARE @ 9042'
15' FLARE @ 9054'

CG 1835u
20' FLARE @ 9138'
MAX GAS 3199u

20' FLARE @ 9189'
MAX GAS 1827u

CG 2090u
20' FLARE @ 9240'
MAX GAS 1102u

MAX GAS 1477u
DOWNTIME GAS 2647u
15' FLARE @ 9336'
CG 2019u

15' FLARE @ 9331'
CG 2024u
MAX GAS 1627u

MAX GAS 1500u

1K
CO2 25K
Flare Hit 100

CG 3088u

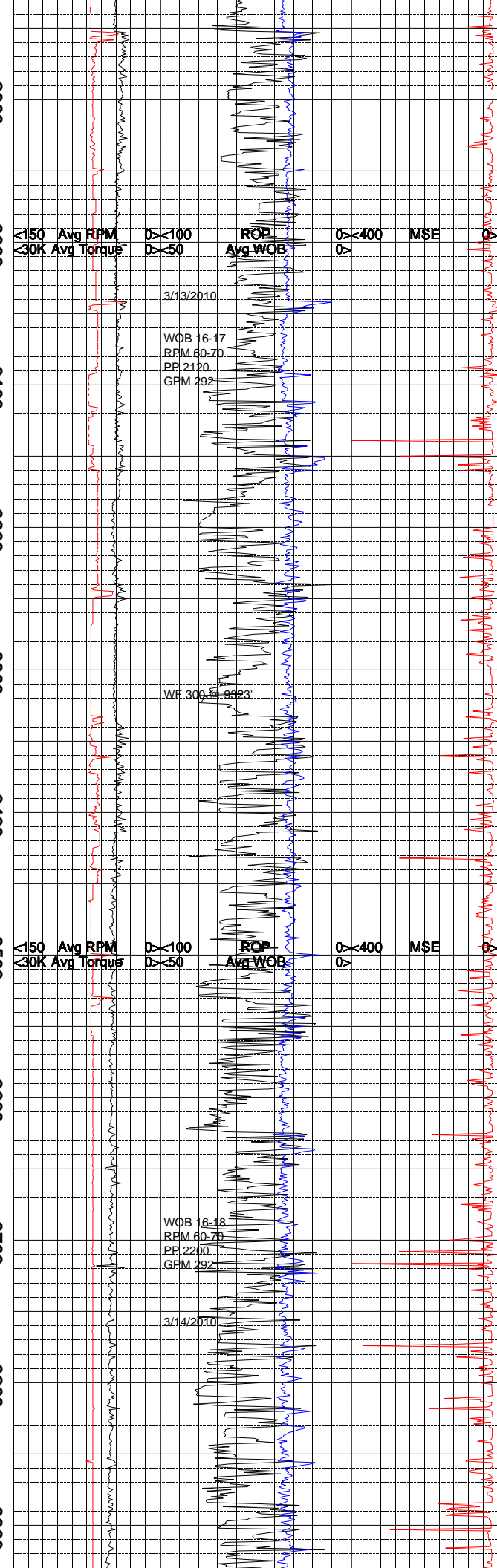
MAX GAS 1622u
CG 1892u
20' FLARE @ 9647'

CG 388u
20' FLARE @ 9717'

CG 1197u
20' FLARE @ 9818'

CG 1162u
20' FLARE @ 9909'

MAX GAS 1105u



SHUT IN WELL @ 8858' IN HIGH PRESSURE
GAS INTERVAL 8852'-8858'. 30' TO 45'
FLARES. BRING MUD WT UP TO 9.7PPG.

SANDSTONE = ABUNDANT LOOSE GRAINS; TR
PRESERVED LIGHT GRAY PRESERVED SPECIMENS
LOWER MEDIUM TO UPPER FINE GRAINED; MOD
WELL SORTED; ANGULAR TO SUBROUNDED;
CALCITE CEMENT; SME SCATTERED CARB MAT;
SANDSTONE INTERVAL AT 8852'-8857' WAS
SHUT IN; ASSOCIATED WITH MAJOR GAS SHOWS

SILTSTONE = DARK GRAY; SME LIGHT GRAY;
MOD TO VERY HARD; PLATY TO SLI FLAKY
CTGS; BLOCKY TO IRREGULAR FRACTURE;
DULL TO SLI SPARKLING LUSTER WHEN DRIED;
VERY FINE CARBONACEOUS MATERIAL; SME
BLACK COAL/CARBONACEOUS LAMINATIONS.

SANDSTONE = LIGHT BROWNISH GRAY, OFF
WHITE, BLUISH GRAY; SOME SALT AND PEPPER
APPEARANCE; VERY FINE TO FINE GRAIN; SUB
ANGULAR TO SUB ROUND; FAIR TO WELL
SORTED; MODERATE SPHERICITY; FRIABLE
TO FIRM TO SLIGHTLY HARD; CLAYEY TO
CALCAREOUS CEMENT; SOME COARSE CALCITE
FRACTURE FILL; TRACE BLACK CARBONACEOUS
SHALE/COAL IMBEDDED LAMINATIONS.

SANDSTONE = ABUNDANT LOOSE GRAINS; RARE
PRESERVED SPECIMENS-PROBABLE GOOD
POROSITY; WHITE TO LIGHT GRAY PRESERVED
SPECIMENS; LOWER TO UPPER FINE GRAINED;
WELL SORTED; GRAIN SUPPORTED; TRACE WH
KAOLIN MATRIX MATERIAL IN TRAYS; DOM
SILICEOUS CEMENT WITH MINOR CALCITE FILL
5% UNIDENT BLACK GRAINS; ASSOCIATED WITH
MAJOR GAS SHOWS; COARSE CALCITE-PROB
FRACTURE FILL FROM 9140' TO 9230'.

SANDSTONE = ABUNDANT LOOSE GRAINS; PROB
GOOD POROSITY; LOWER MEDIUM TO FINE
GRAINED; ANGULAR TO SUBROUNDED; LOW
TO MOD SPHERICITY; DOM SILICEOUS CEMENT;
LOW REACTION TO DILUTE HCL; OCC SPECKLED
SALT AND PEPPER APPEARANCE; ASSOC W/ GAS

SHALE = DARK GRAY; SME DARK BROWN; FIRM;
PLATY TO FLAKY CUTTINGS; PLANAR TO BLKY
FRACTURE; DULL EARTHY LUSTER; SMOOTH
TO ROUGH TEXTURE; VF MICA; NON TO MOD
CALCAREOUS IN SILTY EXAMPLES; MINOR CARB
MATERIAL; SOME VERY FINE GRAINED SS
LAMINATIONS; THINLY BEDDED.

SANDSTONE = ABUNDANT LOOSE GRAINS;
LT GRAY; SOME DARK BROWN CARBONACEOUS
EXAMPLES; FINE TO VERY FINE GRAINED; MOD
WELL SORTED; ANGULAR TO SUBANGULAR;
SILICEOUS CEMENT WITH MINOR CALCITE;
5% BLACK CARB AND LITHIC FRAGMENTS;
COARSE CALCITE FRACTURE FILL MATERIAL
OBSERVED IN THE 9410' TO 9440' SAMPLE;
ASSOCIATED WITH GAS SHOWS.

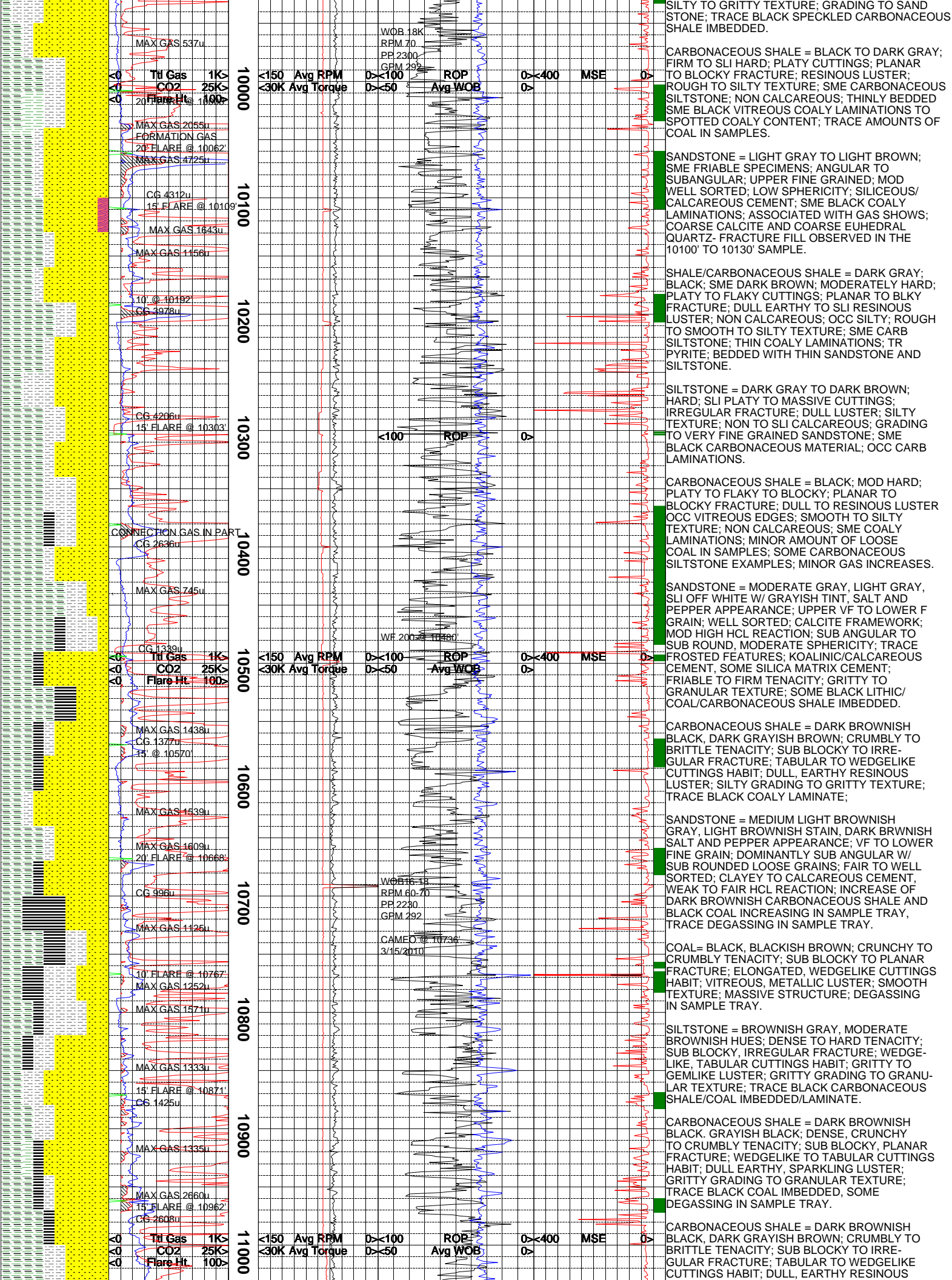
SILTSTONE = BROWNISH GRAY, LIGHT MOD
GRAY, PALE YELLOWISH BROWN; UPPER VERY
FINE TO LOWER FINE GRAIN; PULVERULENT TO
CRUMBLY TENACITY; WEDGELIKE, SUB PLATY
CUTTINGS HABIT; SUB BLOCKY, SLIGHT
IRREGULAR FRACTURE; DULL, EARTHY GRADING
TO WAXY, TRACE SPARKLING LUSTER; SMOOTH
SILTY, TRACE GRITTY TEXTURE; TRACE WEAK
HCL REACTION; TRACE BLACK CARBONACEOUS
SHALE LAMINATE.

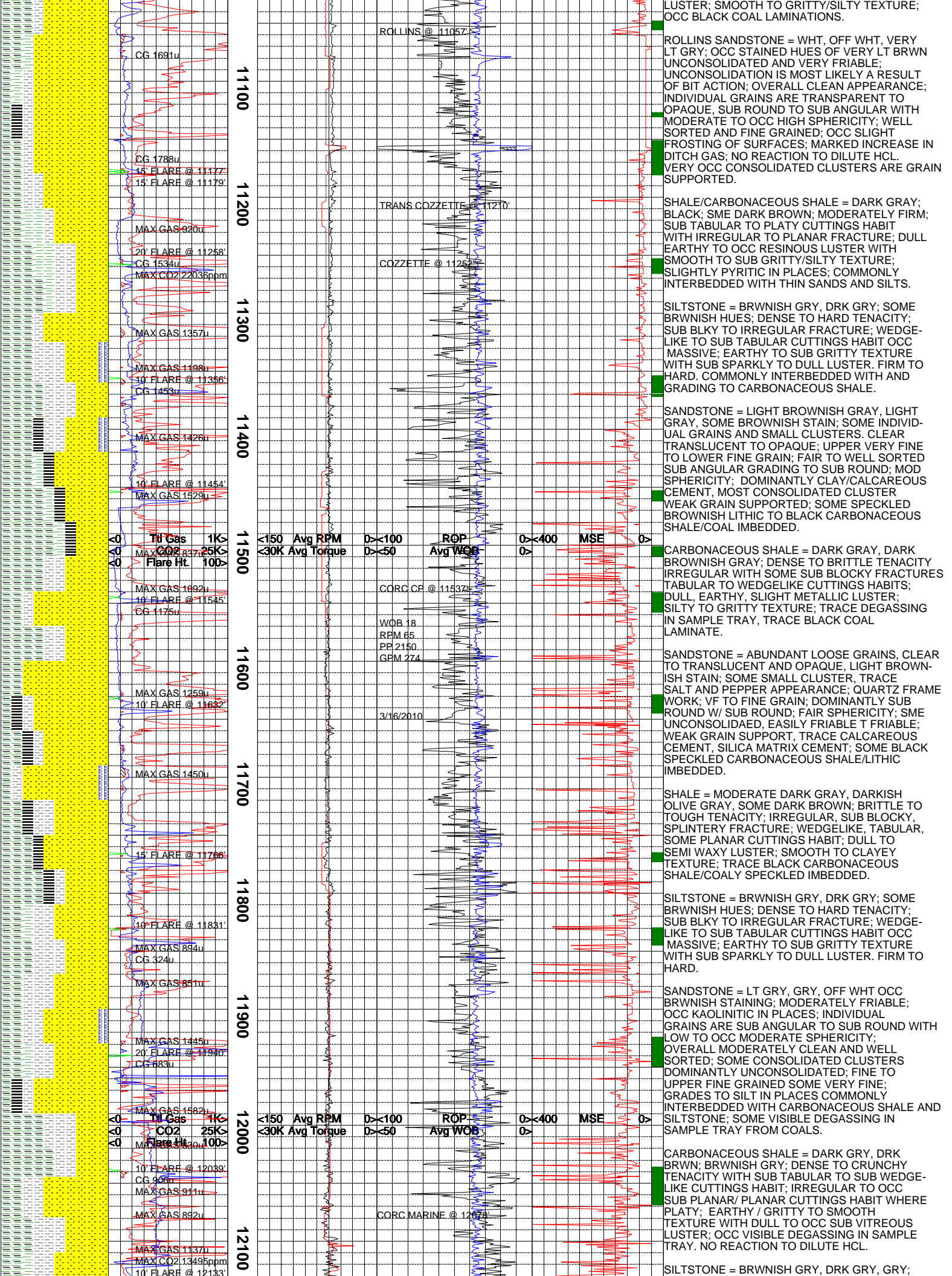
SANDSTONE = ABUNDANT LOOSE GRAINS, LIGHT
BLUISH WHITE, CLEAR TO TRANSLUCENT, SOME
SALT AND PEPPER APPEARANCE; UPPER VERY
FINE TO FINE GRAIN; EASILY FRIABLE SOME
SMALL CLUSTERS; DOMINANTLY SUB ANGULAR
SOME SUB ROUND; SILICA MATRIX CEMENT, TR
CLAYEY CEMENT, VERY WEAK HCL REACTION;
FAIR TO WELL SORTED; TRACE BLACK CARBON-
ACEOUS SHALE SPECKLED IMBEDDED.

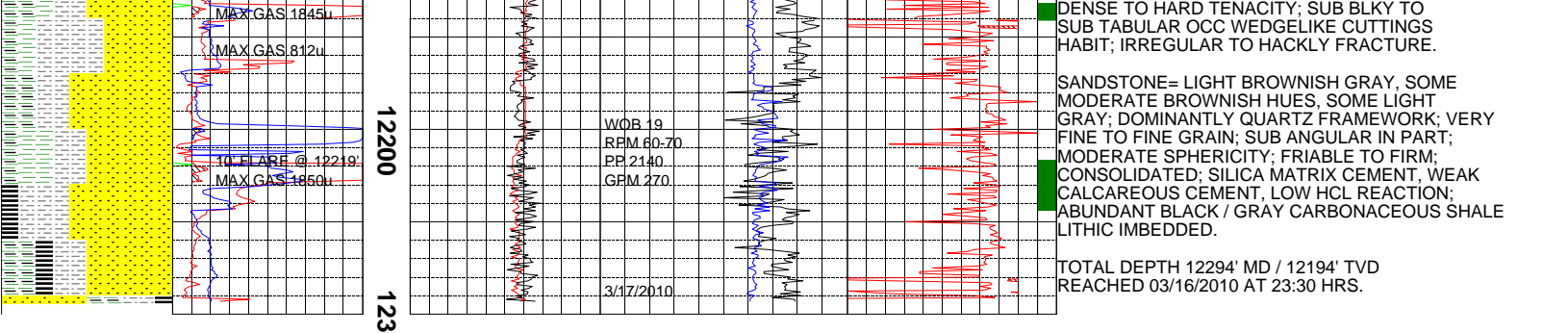
SHALE = DARK GRAY, MODERATE GRAY;
BRITTLE TO CRUMBLY TENACITY; PLANAR,
SUB BLOCKY FRACTURE; TABULAR WITH SOME
WEDGELIKE CUTTINGS HABIT; DULL SUB WAXY
LUSTER; SILTY GRADING TO GRITTY TEXTURE;
TRACE BLACK SPECKLE CARBONACEOUS SHALE
LAMINATE;

SANDSTONE = MODERATE LIGHT GRAY, LIGHT
GRAY HUES, SOME GRAYISH OFF WHITE, SALT
AND PEPPER APPEARANCE; SOME LOOSE GRAINS
SMALL CLUSTERS; VERY FINE TO FINE GRAIN;
DOMINANTLY SUB ANGULAR TRACE SUB ROUND;
FAIR SORTED; CLAYEY CEMENT, TRACE CALC
CEMENT, WEAK HCL REACTION; TRACE KAOLIN-
TIC IN SAMPLE TRAY; TRACE BLACK SPECKLED
CARBONACEOUS/COAL IMBEDDED/LAMINATE.

SILTSTONE = LIGHT BROWNISH GRAY, LT GRAY
CRUMBLY TO CRUNCHY TENACITY; SUB BLOCKY
TO IRREGULAR FRACTURE; TABULAR TO PLATY
CUTTINGS HABIT; DULL SPARKLING LUSTER;







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