# COMPACT TRIPLE COMBO
# QUICKLOOK LOG

Weatherford®

| | |
|---|---|
| COMPANY | EAST CHEYENNE GAS STORAGE LLC |
| WELL | ECGS No 31-7 WP-D005-1 SIDETRACK |
| FIELD | WEST PEETZ |
| PROVINCE/COUNTY | LOGAN |
| COUNTRY/STATE | U.S.A. / COLORADO |
| LOCATION | SHL: SESW; 1062' FSL & 2175' FWL |

| | | | |
|---|---|---|---|
| SEC 31 | TWP 12N | RGE 52W | Other Services |
| Latitude | 40.96661 | | |
| Longitude | -103.22107 | | |
| API Number | 05075094100001 | | |

| | |
|---|---|
| Permanent Datum GL, Elevation 4543 feet | Elevations: feet |
| Log Measured From KB | KB 4557 |
| Drilling Measured From KB | DF 4557 |
| | GL 4543 |

| | | | | |
|---|---|---|---|---|
| Date | 27-SEP-2017 | | | |
| Run Number | 1 | | | |
| Service Order | 8367-193562243 | | | |
| Depth Driller | 5250.00 | feet | | |
| Depth Logger | 4658.00 | feet | | |
| First Reading | 4655.00 | feet | | |
| Last Reading | 3821.00 | feet | | |
| Casing Driller | 3834.00 | feet | | |
| Casing Logger | 3831.00 | feet | | |
| Bit Size | 6.125 | inches | | |
| Hole Fluid Type | FWM | | | |
| Density / Viscosity | 8.30 lb/USg | 42.00 sec/Qt | | |
| PH / Fluid Loss | --- | --- | | |
| Sample Source | FLOWLINE | | | |
| Rm @ Measured Temp | 1.04 @ 83.0 | ohm-m | | |
| Rmf @ Measured Temp | 0.78 @ 83.0 | ohm-m | | |
| Rmc @ Measured Temp | 1.25 @ 83.0 | ohm-m | | |
| Source Rmf / Rmc | CALC | CALC | | |
| Rm @ BHT | 0.546 @162.0 | ohm-m | | |
| Time Since Circulation | 12 HOURS | | | |
| Max Recorded Temp | 162.00 | deg F | | |
| Equipment / Base | 13174 | CASPER | | |
| Recorded By | ANDREW EASTAUGHFFE | | | |
| Witnessed By | GARY OHLMAN | | | |
| DRILLING RIG | BRIGADE 14 | | | |

## BOREHOLE RECORD

Last Edited: 27-SEP-2017 13:53

| Bit Size inches | Depth From feet | Depth To feet |
|---|---|---|
| 13.500 | 0.00 | 1218.00 |
| 8.750 | 1218.00 | 3834.00 |
| 6.125 | 3834.00 | 5250.00 |

## CASING RECORD

| Type | Size inches | Depth From feet | Shoe Depth feet | Weight pounds/ft |
|---|---|---|---|---|
| SURFACE | 9.625 | 0.00 | 1218.00 | 36.00 |
| OLD PROD | 7.000 | 0.00 | 3834.00 | 26.00 |

## REMARKS

SOFTWARE: LOGGED WITH WLS 17.03.9609

TOOLS: MAI, MFE, SKJ, MPD, MVC, MDN, MCG, SHA, MTAK, CBH RAN IN COMBINATION

HARDWARE: MPD: 8 INCH PROFILE PLATE
MDN: DUAL BOWSPRING ECCENTRALIZER
MFE: 1 X 0.5" STANDOFF
MAI: 1 X 0.5" STANDOFF AT TOP AND 1 X 0.5" " PINEAPPLE" STANDOFF AT BOTTOM

MATRIX FOR POROSITY CALCULATION : 2.65g/cc

TOTAL HOLE VOLUME FROM 4635FT TO CASING AT 3831FT = 220 CUBIC FEET
ANNULAR VOLUME WITH 4.5 INCH PRODUCTION CASING FROM 4635FT TO CASING AT 3831FT = 130 CUBIC FEET

ALL INTERVALS LOGGED AND SCALED PER CUSTOMERS REQUEST

ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.

RUGOSITY AND WASHOUTS WILL AFFECT REPEATABILITY AND DATA QUALITY.

BOREHOLE BLOCKED. LOGGED OUT FROM BLOCK AT CLIENT REQUEST.

NO REPEAT SECTION LOGGED AT CLIENT REQUEST.

LOG DEPTH CORRECTED TO OPEN HOLE LOG OF WELL PRIOR TO 7" CASING AND SIDETRACK. ORIGINAL LOG BY WEATHERFORD DATED 16-OCT-2012.

SIDETRACK TARGET DETAILS AS PROVIDED BY LONQUIST FIELD SERVICE:
- BHL: 45.95 FT S; 213.82 FT E
- BHL LAT: 40 DEG 57' 59.34"N
- BHL LONG: 103 DEG 13' 13.06" W

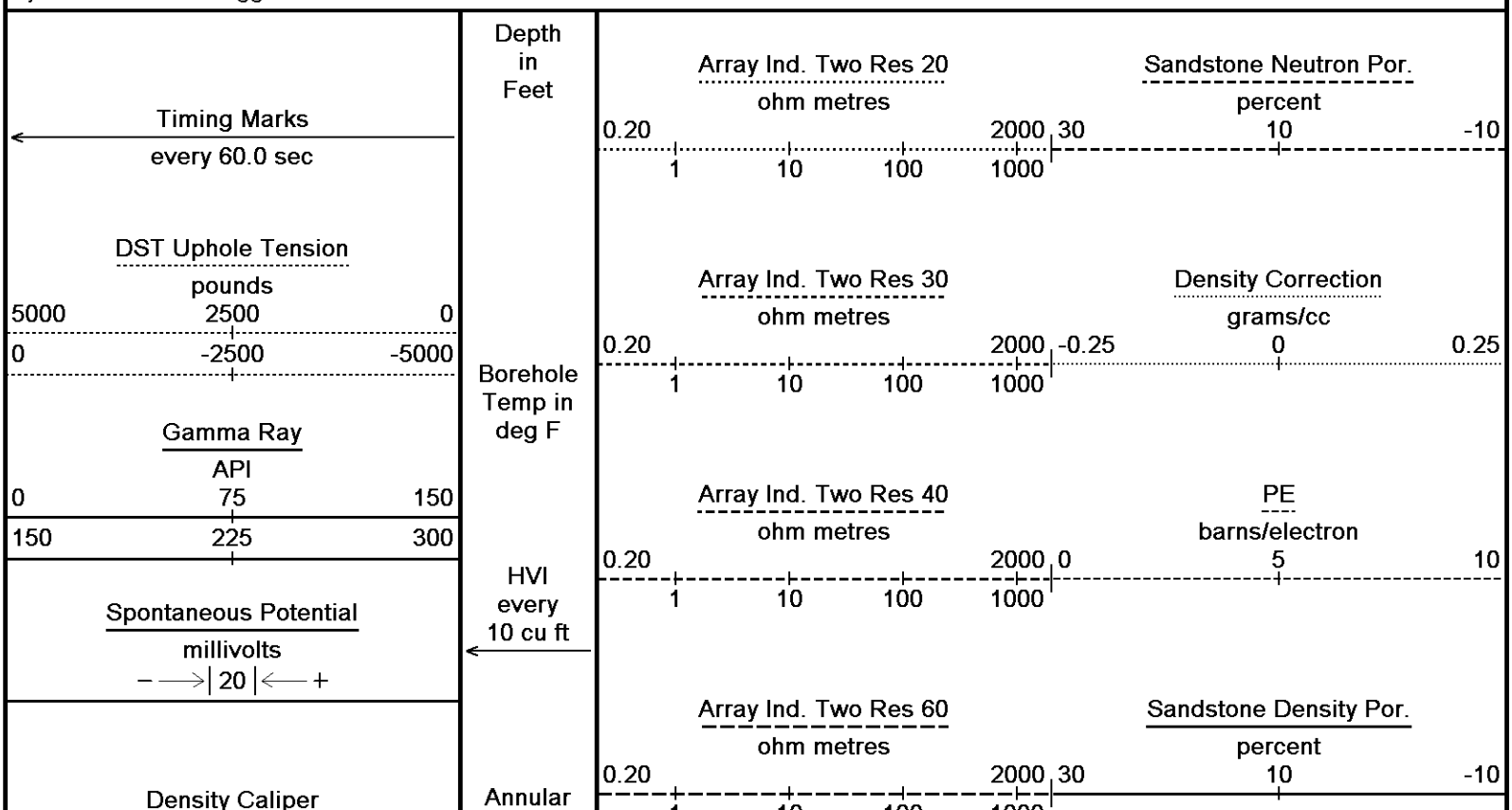
CREW:
ANDREW.A.EASTAUGHFFE, PETER B. MEYER

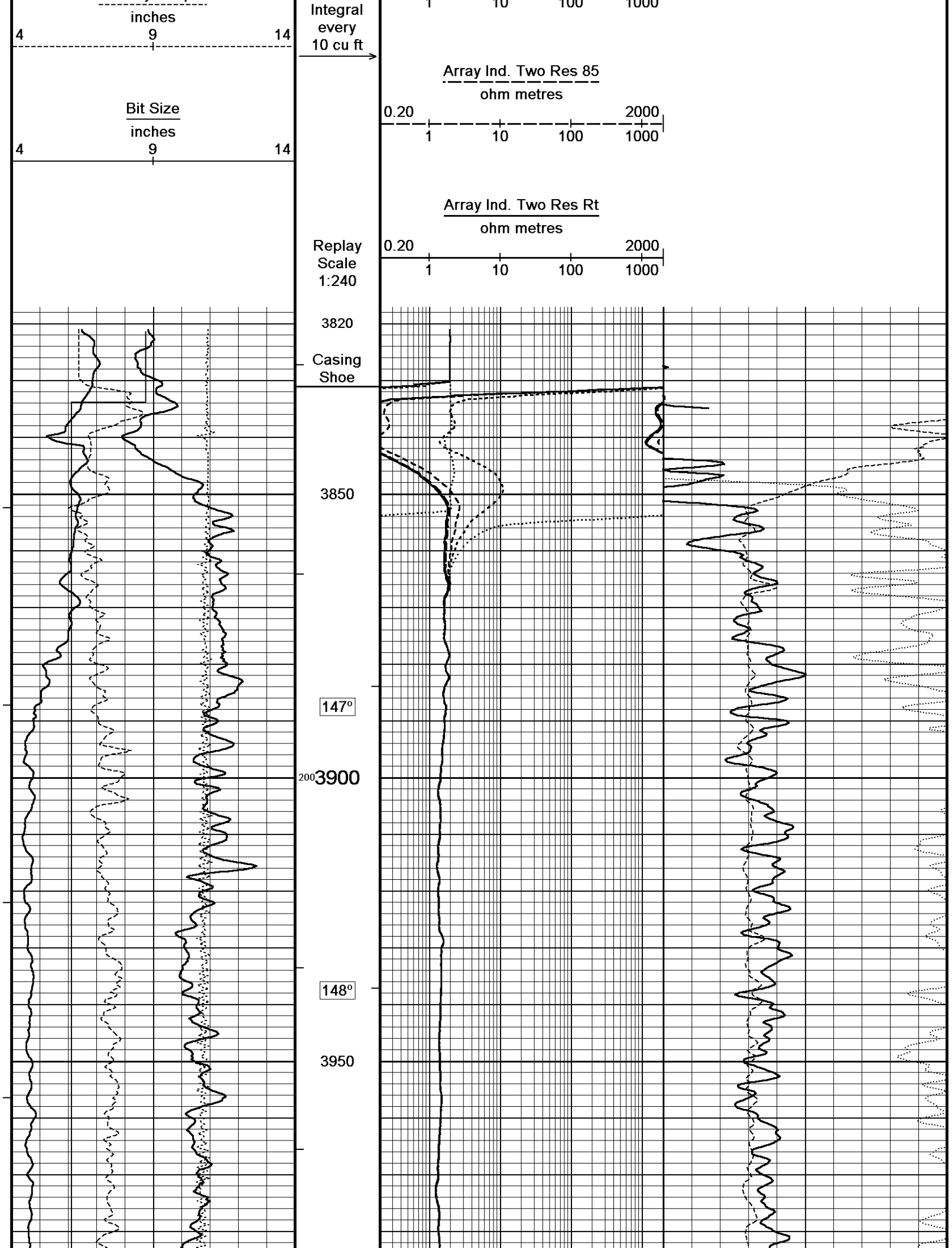
RIG: BRIGADE 14

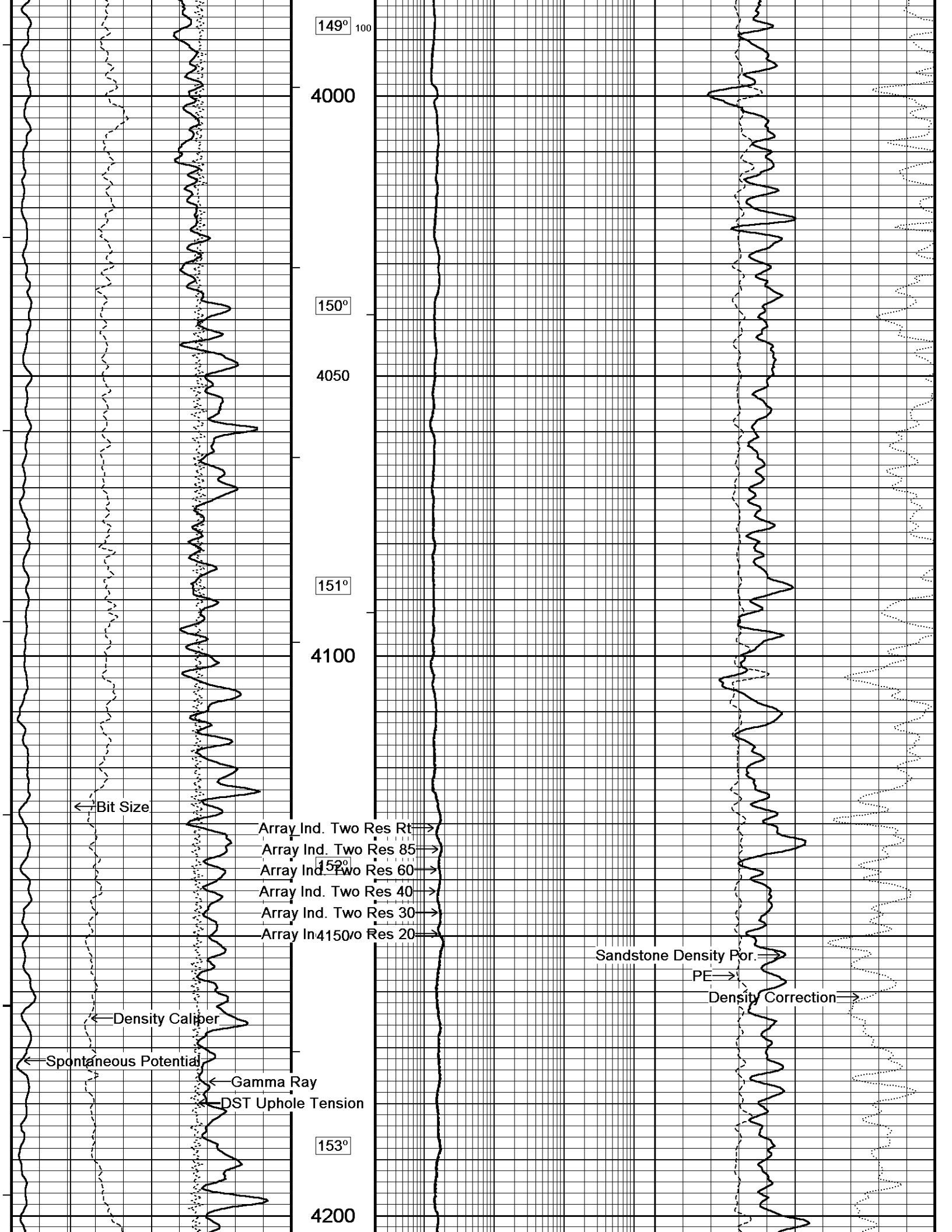


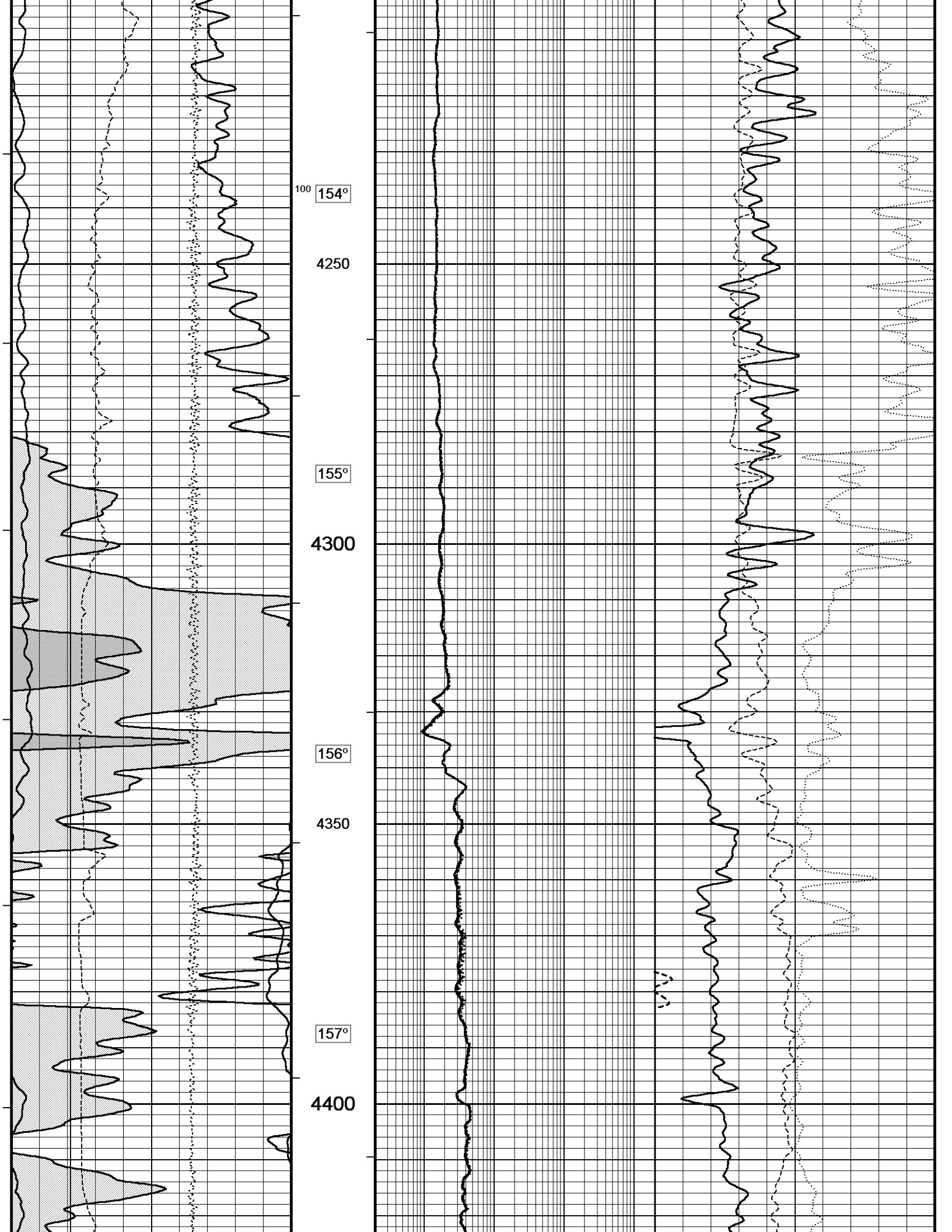
## 5 INCH MAIN LOG

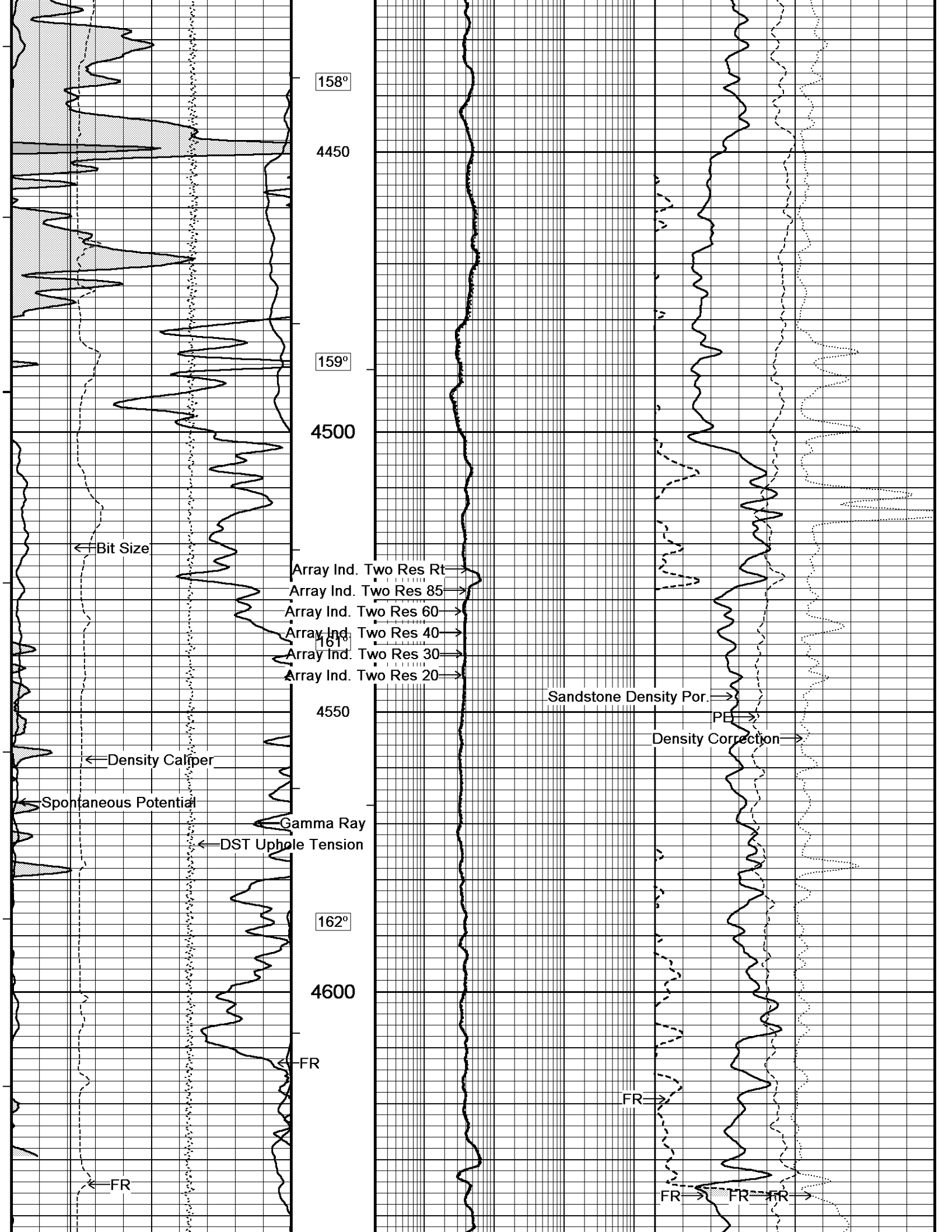
Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 28-SEP-2017 12:25
Filename: C:\Users\E143235...\ECGS No 31-7 WP-D005-1 SIDETRACK_LOGOUT FROM BRIDGE.dta
System Versions: Logged with 17.03.9609 Processed with 17.03.9609 Plotted with 15.04.5108

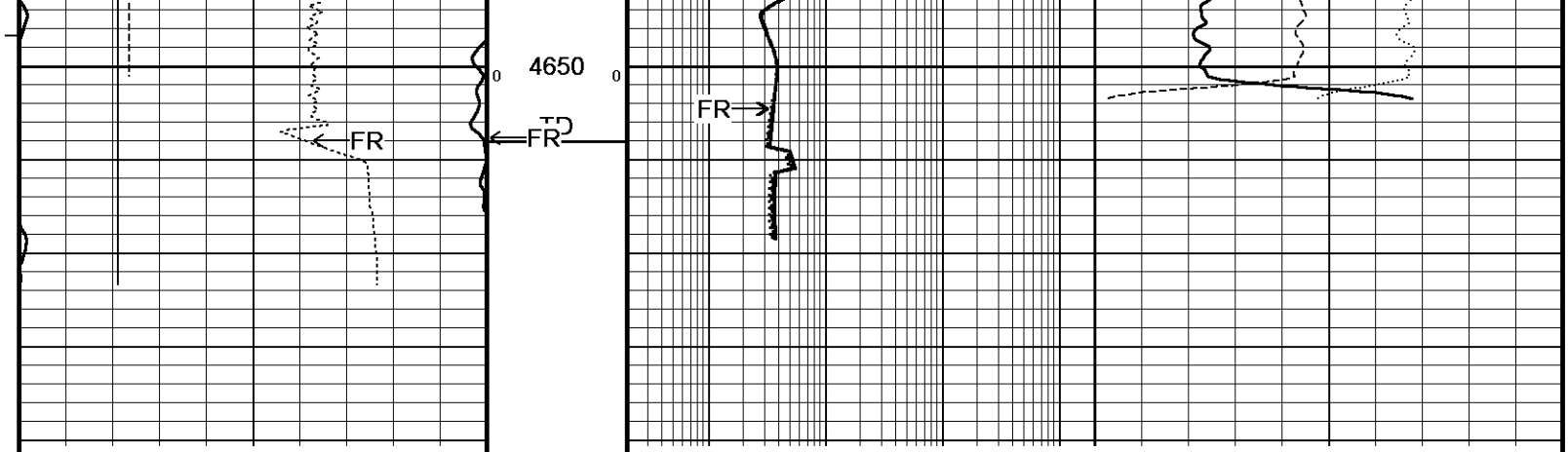



inches
4
9
14
Integral
every
10 cu ft
Array Ind. Two Res 85
ohm metres
0.20
2000
1
10
100
1000
Bit Size
inches
4
9
14
Array Ind. Two Res Rt
ohm metres
0.20
2000
1
10
100
1000
Replay
Scale
1:240
3820
Casing
Shoe
3850
147°
200
3900
148°
3950


149°
100
4000
150°
4050
151°
4100
152°
4150
153°
4200
Bit Size
Array Ind. Two Res Rt
Array Ind. Two Res 85
Array Ind. Two Res 60
Array Ind. Two Res 40
Array Ind. Two Res 30
Array In
o Res 20
Sandstone Density Por.
PE
Density Correction
Density Caliper
Spontaneous Potential
Gamma Ray
DST Uphole Tension


100
154°
4250
155°
4300
156°
4350
157°
4400


158°
4450
159°
4500
Bit Size
Array Ind. Two Res Rt
Array Ind. Two Res 85
Array Ind. Two Res 60
Array Ind. Two Res 40
161°
Array Ind. Two Res 30
Array Ind. Two Res 20
Sandstone Density Por.
4550
PE
Density Correction
Density Caliper
Spontaneous Potential
Gamma Ray
DST Uphole Tension
162°
4600
FR
FR
FR
FR
FR
FR




Timing Marks
every 60.0 sec

DST Uphole Tension
pounds
5000 2500 0
0 -2500 -5000

Gamma Ray
API
0 75 150
150 225 300

Spontaneous Potential
millivolts
– → | 20 | ← +

Density Caliper
inches
4 9 14

Bit Size
inches
4 9 14

Depth in Feet

Borehole Temp in deg F

HVI every 10 cu ft

Annular Integral every 10 cu ft

Replay Scale 1:240

Array Ind. Two Res 20
ohm metres
0.20 2000
1 10 100 1000

Sandstone Neutron Por.
percent
30 10 -10

Array Ind. Two Res 30
ohm metres
0.20 2000
1 10 100 1000

Density Correction
grams/cc
-0.25 0 0.25

Array Ind. Two Res 40
ohm metres
0.20 2000
1 10 100 1000

PE
barns/electron
0 5 10

Array Ind. Two Res 60
ohm metres
0.20 2000
1 10 100 1000

Sandstone Density Por.
percent
30 10 -10

Array Ind. Two Res 85
ohm metres
0.20 2000
1 10 100 1000

Array Ind. Two Res Rt
ohm metres
0.20 2000
1 10 100 1000

Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 28-SEP-2017 12:25
Filename: C:\Users\E143235...\ECGS No 31-7 WP-D005-1 SIDETRACK_LOGOUT FROM BRIDGE.dta
System Versions: Logged with 17.03.9609 Processed with 17.03.9609 Plotted with 15.04.5108

5 INCH MAIN LOG

BEFORE SURVEY CALIBRATION
C:\Users\E143235\AppData\Local\Temp\Weatherford PreV...\ECGS No 31-7 WP-D005-1 SIDETRACK_LOGOUT FROM BRIDGE.dta

## General Constants All 000

Last Edited on 27-SEP-2017,13:54

| | | |
|---|---|---|
| **General Parameters** | | |
| Mud Resistivity | 1.040 | ohm-metres |
| Mud Resistivity Temperature | 83.000 | degrees F |
| Water Level | 0.000 | feet |
| Borehole Fluid Processing | Wet Hole | |
| **Hole/Annular Volume and Differential Caliper Parameters** | | |
| HVOL Method | Single Caliper | |
| HVOL Caliper 1 | Density Caliper | |
| HVOL Caliper 2 | N/A | |
| Annular Volume Diameter | 4.500 | inches |
| Caliper for Differential Caliper | Density Caliper | |
| **Rwa Parameters** | | |
| Porosity used | Crossplot Porosity | |
| Resistivity used | Array Ind. Two Res Rt | |
| RWA Constant A | 0.620 | |
| RWA Constant M | 2.150 | |
| SW/APOR Tool Source | 0.000 | |

## High Resolution Temperature Calibration MCG-E.A 514

Field Calibration on 19-JUL-2017 12:39

| | Measured | Calibrated(Deg F) |
|---|---|---|
| Lower | 33.00 | 33.00 |
| Upper | 210.00 | 210.00 |

## High Resolution Temperature Constants MCG-E.A 514

Last Edited on 19-JUL-2017 12:38

| | |
|---|---|
| Pre-filter Length | 11 |

## Gamma Calibration MCG-E.A 514

Field Calibration on 27-SEP-2017 04:52

| | Measured | Calibrated (API) |
|---|---|---|
| Background | 66 | 45 |
| Calibrator (Gross) | 1412 | 957 |
| Calibrator (Net) | 1347 | 912 |

## Gamma Calibration Tolerances MCG-E.A 514

Ratio 1.476 (1.40 – 1.475 – 1.55) Counts/API

## Gamma Constants MCG-E.A 514

Last Edited on 27-SEP-2017,13:56

| | | |
|---|---|---|
| Gamma Calibrator Number | GRC.C.072 | |
| GRC-M Calibrator Jig in Use? | NO | |
| Inactive Background Jig in Use? | NO | |
| Mud Density | 1.00 | gm/cc |
| Caliper Source for Processing | Density Caliper | |
| Tool Position | Eccentred | |
| Potassium Equivalence | Chloride | |
| K Mud Concentration | 0.00 | % |

## Neutron Calibration MDN-B.J 426

Base Calibration on 26-SEP-2017 12:18
Field Check on 26-SEP-2017 12:33

**Base Calibration**

| | Measured | | Calibrated (cps) | |
|---|---|---|---|---|
| | Near | Far | Near | Far |
| | 3129 | 95 | 3714 | 110 |
| Ratio | 32.816 | | 33.764 | |

**Field Calibrator at Base**

| | Calibrated (cps) | |
|---|---|---|
| | 1369 | 2003 |
| Ratio | 0.684 | |

**Field Check**

| | Calibrated (cps) | |
|---|---|---|
| | 1372 | 2016 |
| Ratio | 0.680 | |

## Neutron Calibration Tolerances MDN-B.J 426

| | | |
|---|---|---|
| Ratio | 32.816 | -5% 33 +5% |
| Base Check | 0.684 | 0.65 0.7 0.75 |
| Field Check | 0.680 | 0.664 0.684 0.704 |

## Neutron Constants MDN-B.J 426

Last Edited on 27-SEP-2017,11:00

| | | |
|---|---|---|
| Neutron Source Id | N-1057 | |
| Neutron Jig Number | 5922NE | |
| Air Hole Processing | Modified Ratio | |
| Caliper Source for Processing | Density Caliper | |
| Stand-off | 0.00 | inches |
| Mud Density | 1.00 | gm/cc |
| Limestone Sigma | 7.10 | cu |
| Sandstone Sigma | 7.00 | cu |
| Dolomite Sigma | 4.70 | cu |
| Formation Pressure Source | Constant Value | |
| Formation Pressure | 0.00 | kpsi |
| Temperature Source | Constant Value | |
| Temperature | 68.00 | degrees F |
| Mud Salinity | 0.00 | kppm |
| Salinity Correction | Not Applied | |
| Formation Fluid Salinity Source | Constant Value | |
| Formation Fluid Salinity | 0.00 | kppm |
| Barite Mud Correction | Not Applied | |

## Induction Calibration MAI-B.J 363

Base Calibration on 07-SEP-2017 12:41
Field Check on 27-SEP-2017 04:38

Base Calibration

Test Loop Calibration

| Channel | Measured Low | Measured High | Calibrated (mmho/m) Low | Calibrated (mmho/m) High |
|---|---|---|---|---|
| 1 | 17.8 | 467.2 | 9.3 | 966.2 |
| 2 | 6.3 | 374.8 | 7.6 | 821.4 |
| 3 | 3.8 | 260.7 | 5.2 | 566.0 |
| 4 | 2.0 | 132.4 | 2.6 | 279.2 |
| Array Temperature | | 69.4 | Deg F | |

Test Loop Calibration Verified

| Channel | Base Check (mmho/m) Low | Base Check (mmho/m) High | Field Check (mmho/m) Low | Field Check (mmho/m) High | |
|---|---|---|---|---|---|
| 1 | 11.1 | 3889.7 | 11.2 | 3888.4 | |
| 2 | 30.2 | 3597.4 | 30.2 | 3597.4 | |
| 3 | 27.8 | 3036.9 | 27.9 | 3037.1 | |
| 4 | 19.4 | 2089.4 | 19.5 | 2089.6 | |
| Deep | 16.2 | 1942.5 | 16.3 | 1942.6 | |
| Medium | 41.0 | 4004.1 | 41.1 | 4004.5 | |
| Shallow | 46.1 | 5383.3 | 46.2 | 5383.3 | |
| Array Temperature | | 112.3 | | 47.9 | Deg F |

## Induction Constants MAI-B.J 363

Last Edited on 27-SEP-2017,13:56

| | | |
|---|---|---|
| Induction Model | RtAP-WBM | |
| Borehole Correction Constants | | |
| Tool Centred | No | |
| Hole Size Source | Density Caliper | |
| Hole Size Constant Value | N/A | inches |
| Stand-off Type | Pineapple | |
| Stand-off | 0.49 | inches |
| Number of Fins on Stand-off | 5.0000 | |
| Stand-off Fin Angle | 72.00 | degrees |
| Stand-off Fin Width | 1.3878 | inches |
| Rm Source | Global Value: Temperature Corrected | |
| Temp. for Rm Corr. | MCG External Temperature | |
| Squasher Start | 0.0020 | mhos/metre |
| Squasher Offset | N/A | mhos/metre |

| | | |
|---|---|---|
| Squasher Offset | N/A | mmhos/metre |

Borehole Normalisation

| | | | |
|---|---|---|---|
| DRM1 | 0.0000 | DRC1 | 0.0000 |
| DRM2 | 0.0000 | DRC2 | 0.0000 |
| MRM1 | 0.0000 | MRC1 | 0.0000 |
| MRM2 | 0.0000 | MRC2 | 0.0000 |
| SRM1 | 0.0000 | SRC1 | 0.0000 |
| SRM2 | 0.0000 | SRC2 | 0.0000 |

Calibration Site Corrections

| | | |
|---|---|---|
| Channel 1 | 0.00 | mmhos/metre |
| Channel 2 | 0.00 | mmhos/metre |
| Channel 3 | 0.00 | mmhos/metre |
| Channel 4 | 0.00 | mmhos/metre |

Symmetrised Receiver Gains

| | |
|---|---|
| Receiver 1 | 1.00 |
| Receiver 2 | 1.00 |
| Receiver 3 | 1.00 |
| Receiver 4 | 1.00 |

Apparent Porosity and Water Saturation Constants

| | | |
|---|---|---|
| Archie Constant (A) | 1.00 | |
| Cementation Exponent (M) | 2.00 | |
| Saturation Exponent (N) | 2.00 | |
| Saturation of Water for Apor | 100.00 | percent |
| Resistivity of Water for Apor and Sw | 0.05 | ohm-m |
| Resistivity of Mud Filtrate for Sw | 0.00 | ohm-m |
| Source for Rt | 0.00 | |
| Source for Rxo | 0.00 | |

## Photo Density Calibration MPD-C.A 310

Base Calibration on 26-SEP-2017 11:20
Field Check on 26-SEP-2017 11:31

Density Calibration

| Base Calibration | Measured Near | Measured Far | Calibrated (sdu) Near | Calibrated (sdu) Far |
|---|---|---|---|---|
| Background | 1083 | 1373 | | |
| Reference 1 | 51905 | 25170 | 59443 | 30683 |
| Reference 2 | 20980 | 2502 | 25116 | 2544 |

Field Check at Base

| Near | Far |
|---|---|
| 1082.8 | 1373.5 |

Field Check

| Near | Far |
|---|---|
| 1082.0 | 1370.5 |

PE Calibration

| Base Calibration | Measured WS | Measured WH | Ratio | Calibrated Ratio |
|---|---|---|---|---|
| Background | 203 | 973 | | |
| Reference 1 | 21396 | 51733 | 0.418 | 0.372 |
| Reference 2 | 6056 | 20865 | 0.294 | 0.273 |

Field Check at Base

| WS | WH |
|---|---|
| 202.8 | 973.3 |

Field Check

| WS | WH |
|---|---|
| 200.5 | 975.0 |

## Photo Density Calibration Tolerances MPD-C.A 310

| | | | | | |
|---|---|---|---|---|---|
| Near Density Ratio | 2.55 | -5% 2.52 +5% | Far Density Ratio | 21.08 | -5% 21.00 +5% |
| PE Calibration | 0.115 | 0.089 0.110 0.131 | | | |
| Near Den. Field Check | 1082.0 | -3% 1082.8 +3% | Far Den. Field Check | 1370.5 | -3% 1373.5 +3% |
| PE WS Field Check | 200.5 | -6% 202.8 +6% | PE WH Field Check | 975.0 | -6% 973.3 +6% |

## Density Constants MPD-C.A 310

Last Edited on 27-SEP-2017,11:00

| | | |
|---|---|---|
| Density Source Id | P50562B | |
| Nylon Calibrator Number | DNC.E.652 | |
| Aluminium Calibrator Number | DAC-D-535 | |
| Density Shoe Profile | 8 inch | |
| Caliper Source for Processing | Density Caliper | |
| PE Correction to Density | Not Applied | |
| Mud Density | 1.00 | gm/cc |
| Mud Density Z/A Multiplier | | |
| Mud Filtrate Density | 1.00 | gm/cc |
| Dry Hole Mud Filtrate Density | 1.00 | gm/cc |
| DNCT | 0.00 | gm/cc |
| CRCT | 0.00 | gm/cc |
| Density Z/A Correction | Hybrid | |

| Matrix Density (gm/cc) | Depth (ft) |
|---|---|
| 2.65 | 0.00 |
| 0.00 | 0.00 |
| 0.00 | 0.00 |
| 0.00 | 0.00 |
| 0.00 | 0.00 |
| 0.00 | 0.00 |
| 0.00 | 0.00 |
| 0.00 | 0.00 |

## Caliper Calibration MPD-C.A 310

Base Calibration on 26-SEP-2017 09:32
Field Calibration on 26-SEP-2017 09:34

Base Calibration

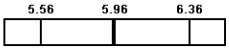
| Reading No | Measured | Calibrator Size (in) |
|---|---|---|
| 1 | 14960 | 3.99 |
| 2 | 23555 | 5.96 |
| 3 | 32200 | 7.96 |
| 4 | 40394 | 9.85 |
| 5 | 49647 | 11.88 |
| 6 | N/A | N/A |

Field Calibration

| Measured Caliper (in) | Actual Caliper (in) |
|---|---|
| 5.94 | 5.96 |

## Caliper Calibration Tolerances MPD-C.A 310

Long Arm Field Cal. 5.94 in




## DOWNHOLE EQUIPMENT

C:\Users\E143235\AppData\Local\Temp\Weatherford PreV...\ECGS No 31-7 WP-D005-1 SIDETRACK_LOGOUT FROM BRIDGE.dta

Cablehead, 11 pin
CBH-CA 121 LG: 2.40 ft WT: 24.3 lb OD: 2.240 in

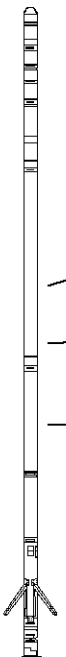
11C-11B Compact Tool Adaptor
MTA-K.A 164 LG: 1.53 ft WT: 13.2 lb OD: 2.240 in

Compact Swivel Head Adaptor
SHA-J.B 723 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

Compact Comms Gamma
MCG-E.A 514 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

Compact Neutron
MDN-B.J 426 LG: 5.04 ft WT: 50.7 lb OD: 2.240 in

Compact Vee Arm Caliper
MVC-A.A 141 LG: 8.06 ft WT: 61.7 lb OD: 2.244 in



45.13 ft GRGC - MCG Gamma Ray

42.22 ft CGXT - MCG External Temperature

38.67 ft NPRS - Sandstone Neutron Por.

23.37 ft AVOL - Annular Volume

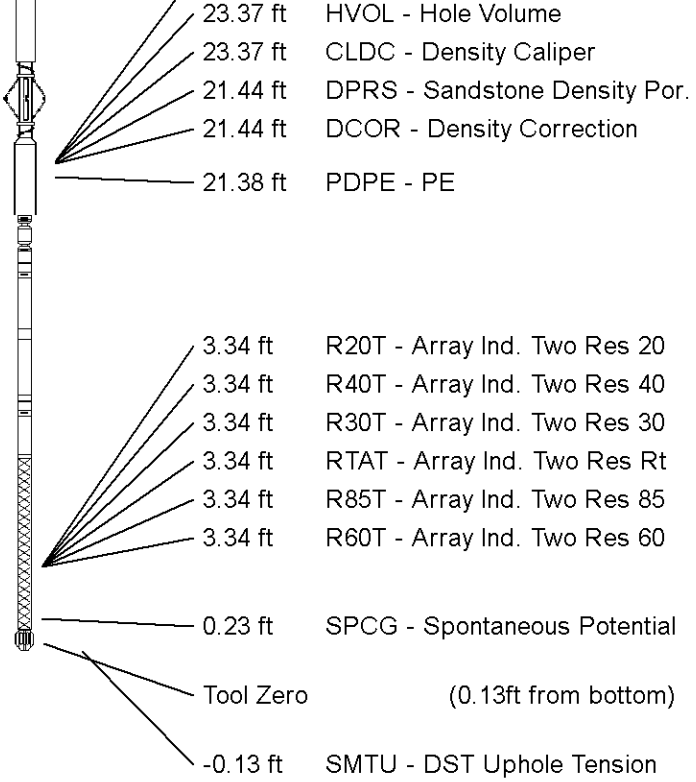
Compact Density/Caliper
MPD-C.A 310 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in

Compact Knuckle Joint
SKJ-E.B 730 LG: 2.17 ft WT: 24.3 lb OD: 2.240 in

Compact Focussed Electric
MFE-C.A 417 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

Compact Induction
MAI-B.J 363 LG: 10.81 ft WT: 48.5 lb OD: 2.244 in

Total Length: 56.64 ft Weight: 447.5 lb




All measurements relative to tool zero.

| | |
|---|---|
| COMPANY | EAST CHEYENNE GAS STORAGE LLC |
| WELL | ECGS No 31-7 WP-D005-1 SIDETRACK |
| FIELD | WEST PEETZ |
| PROVINCE/COUNTY | LOGAN |
| COUNTRY/STATE | U.S.A. / COLORADO |

| | | | | | |
|---|---|---|---|---|---|
| Elevation Kelly Bushing | 4557 | feet | First Reading | 4655.00 | feet |
| Elevation Drill Floor | 4557 | feet | Depth Driller | 5250.00 | feet |
| Elevation Ground Level | 4543 | feet | Depth Logger | 4658.00 | feet |

Weatherford®

# COMPACT TRIPLE COMBO
# QUICKLOOK LOG