COAL ASSESSMENT REPORT TITLE PAGE AND SUMMARY

TITLE OF REPORT: **Fording River Operations Assessment Report**
2017 Turnbull Exploration Project

TOTAL COST: $ 842,777.90

AUTHOR: **Barry F. Musil**
SIGNATURE: **Originals Signed and Sealed by Author**

NOTICE OF WORK PERMIT NUMBER/DATE: **CX-5-012 / May 15 2014 – May 14 2019**

YEAR OF WORK: **2017**

PROPERTY NAME: **Turnbull Mountain Exploration (FRO)**

COAL LICENSE(S) AND/OR LEASES ON WHICH PHYSICAL WORK WAS DONE:
COAL LEASES: 389275, 389290, 389311

MINERAL INVENTORY MINFILE NUMBER**:**
File: 14675-20/1630586

MINING DIVISION: **Fort Steele**
NTS / BCGS: **082J0262**
LATITUDE: **50° 13' 01"**
LONGITUDE: -**114° 50' 28"** (at centre of work)
UTM Zone: **11** EASTING: **654000** NORTHING: **5565000**

OWNER: **Teck Coal Limited**

MAILING ADDRESS: **PO BOX 100, Elkford, BC, V0B 1H0**

OPERATOR: **Teck Coal Limited**

MAILING ADDRESS: **PO BOX 100, Elkford, BC, V0B 1H0**

REPORT KEYWORDS:

Interbedded sequence of sandstones, siltstones, silty shales, mudstones, and medium to high volatile bituminous coal from the Jurassic–Cretaceous Mist Mountain Formation. The region is structurally complex, containing extensive thrust faulting and folding.

REFERENCES TO PREVIOUS ASSESSMENT WORK AND ASSESSMENT REPORT NUMBERS:

Annual Assessment Reports Since 1970

SUMMARY OF TYPES OF WORK IN THIS REPORT		EXTENT OF WORK (in metric units)	ON WHICH TENURES
GEOLOGICAL (scale, area)			
	Ground, mapping		
	Photo interpretation		
GEOPHYSICAL (line-kilometres)			
	Ground (Specify types)		
	Airborne (Specify types)		
	Borehole		
	Gamma, Neutron	**2717.4m**	**Coal Lease: 389275, 389290, 389311**
	Density	**2717.4m**	**Coal Lease: 389275, 389290, 389311**
	Caliper	**2717.4m**	**Coal Lease: 389275, 389290, 389311**
	Deviation	**2717.4m**	**Coal Lease: 389275, 389290, 389311**
	Dip		
	Others (specify):		
	Core		
	Non-core		
SAMPLING AND ANALYSES			
Total # of Samples			
52	**Proximate**		**Coal Lease: 389275, 389290, 389311**
	Ultimate		
52	**Petrographic**		**Coal Lease: 389275, 389290, 389311**
	Vitrinite reflectance		
	Coking		
52	**Wash tests**		**Coal Lease: 389275, 389290, 389311**
PROSPECTING (scale/area)			
PREPARATORY/PHYSICAL			
Line/grid (km)			
Trench (number, metres)			
Bulk sample(s)			

Table 6 remains confidential under the terms of the Coal Act Regulation, and has been removed from the public version.

http://www.bclaws.ca/civix/document/id/complete/statreg/251_2004

Fording River Operations

Assessment Report

2017 Turnbull Exploration Project

Teck

Fording River Operations Assessment Report

2017 Turnbull Exploration Project

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1. INTRODUCTION

This report presents results of coal exploration activities conducted during the summer of 2017 on the Turnbull Mountain Exploration project, located in the Elk Valley Coalfield, Teck Coal Limited, Fording River Operation, in southeastern British Columbia. The exploration work was completed by Fording River site personnel.

i. Property Description and Access

The Turnbull Mountain Exploration project is located in the Fording River property and Upper Fording River Valley, approximately 26 kilometers north, and east of Elkford, BC. Access to the Fording River property is by paved road northeast from Elkford along the Fording River Valley, or north along the Elk River Valley via the Forestry Service gravel road or the Kan-Elk Powerline road.

ii. Property History

The Elk River portion of the property was actively explored by the Canadian Pacific Railway Company in the period between 1902 and 1908. Until 1947, the property was comprised of 10,276 hectares in 40 Crown Granted Lots. In that year, the holdings were reduced to 2,979 hectares in 15 Crown Granted Lots. In 1967 and 1968, Canadian Pacific Oil and Gas reacquired part of the coal lands which had been abandoned in 1947. An additional nine Coal Licenses located at the south end of the property were acquired in 2001. At the present time, the Fording River Property consists of 22,635 hectares, held on seven Coal Leases, nine Coal Licenses, and 15 Crown Granted Lots.

Mining operations, which commenced in 1971, have produced more than 270 million tonnes of clean metallurgical and thermal coal for markets in North and South America, Africa, Europe, and Asia.

iii. Coal Licenses and Tenure

Currently, 28 coal licenses for Fording River Operations are held by Teck Coal Limited. The tenure number, name, owner, grant and expiry dates, and area are summarized in Table 1. All licenses are located in British Columbia in the Fort Steel Mining Division. The location and distribution of coal licenses are shown in Table 1.

Table 1
FRO Coal Licenses

Code	Name	Parties	Status	Grant Date	Area (Ha)	Project
389275	COAL LEASE No. 01	TECK COAL LIMITED (100%)	Active	1/1/1974	1,009.00	Fording River Operations, BC
389282	COAL LEASE No. 02	TECK COAL LIMITED (100%)	Active	5/19/1977	2,250.00	Fording River Operations, BC
389285	COAL LEASE No. 05	TECK COAL LIMITED (100%)	Active	3/17/1982	644	Fording River Operations, BC
389290	COAL LEASE No. 09	TECK COAL LIMITED (100%)	Active	10/1/1991	1,096.00	Fording River Operations, BC
389310	COAL LEASE No. 16	TECK COAL LIMITED (100%)	Active	5/9/1998	2,859.00	Fording River Operations, BC
389311	COAL LEASE No. 17	TECK COAL LIMITED (100%)	Active	5/9/1999	8,180.00	Fording River Operations, BC
389312	COAL LEASE No. 18	TECK COAL LIMITED (100%)	Active	1/30/2000	1,298.00	Fording River Operations, BC
402047	CLIC-402047	TECK COAL LIMITED (100%)	Active	5/8/2003	259	Fording River Operations, BC
402048	CLIC-402048	TECK COAL LIMITED (100%)	Active	5/8/2003	129	Fording River Operations, BC
402049	CLIC-402049	TECK COAL LIMITED (100%)	Active	5/8/2003	258	Fording River Operations, BC
402050	CLIC-402050	TECK COAL LIMITED (100%)	Active	5/8/2003	259	Fording River Operations, BC
402051	CLIC-402051	TECK COAL LIMITED (100%)	Active	5/8/2003	261	Fording River Operations, BC
402052	CLIC-402052	TECK COAL LIMITED (100%)	Active	5/8/2003	258	Fording River Operations, BC
402053	CLIC-402053	TECK COAL LIMITED (100%)	Active	5/8/2003	129	Fording River Operations, BC
402054	CLIC-402054	TECK COAL LIMITED (100%)	Active	5/8/2003	129	Fording River Operations, BC
402055	CLIC-402055	TECK COAL LIMITED (100%)	Active	5/8/2003	259	Fording River Operations, BC
402056	CLIC-402056	TECK COAL LIMITED (100%)	Active	5/8/2003	259	Fording River Operations, BC
402057	CLIC-402057	TECK COAL LIMITED (100%)	Active	5/8/2003	130	Fording River Operations, BC
402058	CLIC-402058	TECK COAL LIMITED (100%)	Active	5/8/2003	240	Fording River Operations, BC
402105	CLIC-402105	TECK COAL LIMITED (100%)	Active	5/8/2003	259	Fording River Operations, BC
402106	CLIC-402106	TECK COAL LIMITED (100%)	Active	5/8/2003	325	Fording River Operations, BC
402110	CLIC-402110	TECK COAL LIMITED (100%)	Active	5/8/2003	258	Fording River Operations, BC
402111	CLIC-402111	TECK COAL LIMITED (100%)	Active	5/8/2003	255	Fording River Operations, BC
402112	CLIC-402112	TECK COAL LIMITED (100%)	Active	5/8/2003	228	Fording River Operations, BC
402113	CLIC-402113	TECK COAL LIMITED (100%)	Active	5/8/2003	95	Fording River Operations, BC

402115	CLIC-402115	TECK COAL LIMITED (100%)	Active	5/8/2003	284	Fording River Operations, BC
417067	CLIC-417067	TECK COAL LIMITED (100%)	Active	10/14/2005	259	Fording River Operations, BC
417068	CLIC-417068	TECK COAL LIMITED (100%)	Active	10/14/2005	259	Fording River Operations, BC

2. GEOLOGY

i. Stratigraphy

The general stratigraphic succession on the Fording River Property is summarized in the Table 2:

Table 2
Fording River Stratigraphy

Period	Litho-Stratigraphic Units			Principle Rock Types
Recent				Colluvium
Quaternary				Clay, silt, sand, gravel, cobbles
Lower Cretaceous	Blairmore Group			Massive bedded sandstones and conglomerates
Lower Cretaceous to Upper Jurassic	KOOTENAY GROUP	Elk Formation		Sandstone, siltstone, shale, mudstones, chert pebble conglomerate, minor coal
		Mist Mountain Formation		Sandstone, siltstone, shale, mudstones, thick coal seams
		MORRISSEY FORMATION	Moose Mountain Member	Medium to coarse-grained quartz- chert sandstone
			Weary Ridge Member	Fine to coarse-grained, slight ferruginous quartz-chert sandstone
Jurassic	Fernie Formation			Shale, siltstone, fine-grained sandstone
Triassic	Spray River Formation			Sandy shale, shale quartzite
	Rocky Mountain			Quartzite
Mississippian	Rundle Group			Limestone

The oldest rocks present on the Fording River property are the Rundle Group limestone, located on the west bank of the Fording River, near the southern property boundary.

These rocks are in faulted contact with the Kootenay Group to the west, and unconformable contact with Rocky Mountain Formation quartzites to the north. The latter are best exposed on the eastern slope of the Brownie Creek valley.

The Fernie Formation shales occur throughout the area, generally along the sides of the valleys on the lower flanks of the mountains. The shales are recessive and, generally poorly exposed. However there are some good exposures of Fernie Formation strata on the lower western slopes of Eagle Mountain in some creek drainages. The Fernie Formation is in conformable contact with the Morrissey through the "Passage Beds," which are a transitional zone from marine to non-marine sedimentation.

The Morrissey Formation, which is the "basal sandstone" of the Kootenay Group, is a prominent cliff-forming marker horizon in many locations. On the Fording River property, the top of the Moose Mountain member (Morrissey Formation) is in sharp contact with 010 seam, the lowermost bed of the Mist Mountain Formation.

The Mist Mountain Formation contains all of the economic coal seams, and is the most widely occurring formation on the Fording River property. This economically important formation is an interbedded sequence of sandstones, siltstones, silty shales, mudstones, and medium to high volatile bituminous coal seams. The volatile content of the coal increases up section, with decreasing rank. Lenticular sandstones comprise about 1/3 of the Mist Mountain sediments at Fording River, but very few laterally extensive sandstone beds exist.

The sandstone immediately above and below seam 040 and above 090, are the most persistent units, and are often cliff-forming marker horizons.

The Mist Mountain Formation is generally overlain conformably by strata of the Elk Formation. On the Fording property, this formation is commonly a succession of sandstones, siltstones, shales, mudstones, chert pebble conglomerates, and sporadic, thin, high volatile bituminous coal seams. The coal seams are characterized by high alginate content and referred to as "Needle" coal. The Elk Formation is observed near the tops of the mountains, mainly on the east side of the Elk Valley on the Greenhills Range, and northward to the Mount Tuxford areas.

The top of the Elk Formation marks the upper boundary of the Kootenay Group, which is unconformably overlain by the basal member of the Blairmore Group. This thick bedded, cliff-forming sandstone and conglomerate unit is observed on the upper slopes of Mount Tuxford.

ii. Structure

Subsequent to deposition, the sediments were involved in the mountain building movements of the late Cretaceous to early Tertiary Laramide orogeny. The major structural features of the Fording River property are the North-South trending synclines with near horizontal to steep westerly dipping thrust faults, and a few high angle normal faults. Some of the thrust faults were probably folded late in the tectonic cycle.

The formation of the major fold structures began early in the tectonic cycle. In the current mining area, two asymmetric synclines are evident: the Greenhills Syncline to the west, and the Alexander Creek Syncline to the east of the Fording River.

The thrust faulting (i.e.: the Ewin Pass and Brownie Ridge Thrusts), was probably contemporaneous with the later stages of folding. The intervening anticline was subsequently faulted (Erickson Fault), then eroded.

The Alexander Creek Syncline can be traced from the southern property boundary on Castle Mountain to the northern end of the property on Weary Ridge. The strata of the west limb, on the west face of Eagle Mountain, dip easterly at 20 to 25^{o}, decreasing gradually to zero as the axis is approached. The east limb, however, attains a 20^{o} westerly dip within a much shorter (500m) distance of the axis.

This asymmetry is possibly due, at least in part, to the influence of the Ewin Pass Thrust which subcrops 600 to 800 meters east of the synclinal axis.

Further to the east, on Brownie Ridge, the strata dip westerly at a mean dip of 42^{o}. The Brownie Ridge Thrust, which subcrops near the crest of the ridge, probably contributes to this steepening.

Within the mining area, the axis of the Alexander Creek Syncline plunges to the north at an average of 4^{o}. Turnbull Mountain exhibits a localized series of en echelon fold structure, plunging both to the north and to the south. These subsidiary folds may be related to thrust faulting. From the south end of Mount Tuxford, the synclinal axis continues north- northwest along the base of Mount Veits and into the Elk River Valley near Aldridge Creek.

On Mount Tuxford, the beds exposed are those of the Elk Formation and the overlying (non-coal bearing) Cadomin Formation. The area has not been extensively explored. The stratigraphic sequence of the east limb, in the more extensively explored Mist Mountain strata near Aldridge Creek (Elco property), closely resembles the east limb strata found on Henretta Ridge, ten kilometers to the south.

On the northwest corner of Eagle Mountain, the lower Kootenay-upper Fernie section is the locus for a zone of near horizontal thrust faulting. The effect is to cause a double repetition of the lower coal seams and basal sandstone on the west synclinal limb. This fault zone is synclinal in form and continuous with the Ewin Pass Thrust zone found in the east limb.

The Greenhills Syncline in the mining area is essentially a “mirror-image” of the Alexander Creek structure. The east limb of the asymmetric syncline dips westerly at 15 to 25^{o}, except in areas near the Erickson Fault, where 45 to 55^{o} dips are common. The west limb exhibits much steeper dips, commonly in the 35 to 45^{o} range. The Greenhills Syncline plunges northward (340 to 350^{o}), at less than 5^{o}, and then appears to die out to the north in the area of the Osborne Creek Depression.

The Erickson Fault, which locally runs along the base of the Greenhills Range, west of the Fording River, is one of the major regional faults. From south to north, this westerly dipping (40 to 70^{o}) normal fault, brings Mist Mountain strata progressively into contact with Rundle, Rocky Mountain, Spray River, Fernie, and Morrissey strata. The downthrown block is to the west. Near the south end of Lake Mountain, the Erickson Fault begins to “splay” into two zones.

The main fault runs along the eastern margin of Lake Mountain, and the subsidiary fault runs to the west and appears to “die out” northward. The steep northward dip exhibited in the Lake Mountain strata

could be due to influence from these flanking “splays” of the fault. The flat lying region to the north of Lake Mountain (Osborne Creek Depression area) is completely void of outcrop, and the Erickson Fault has not been traced either through or to the north of this area.

3. 2017 SUMMARY OF EXPLORATION WORK

i. 2017 Turnbull Exploration Project Objectives

In 2017 Fording River conducted an exploration drilling and coal sampling program on Turnbull Mountain. Some geotechnical work and geochemical sampling was completed as well.

Six Reverse Circulation (RC) drill holes were drilled for structure and coal quality purposes. Two bulk samples were completed with a 0.23m Large Diameter Coring (LDC) rig at one drillsite. Two RC geochemical holes were drilled and sampled only for geochemical purposes. One diamond drill hole with HQ drillrod was also drilled at exploration drillsite 3407 for the geotechnical purposes and was not sampled. Three level loggers were installed in previously drilled holes for the purpose of studying groundwater. In total nine drillholes and two bulk samples were completed. There was 2,717.4m RC, 160.8m LDC, and 317m of diamond drilling. In total there was 3,195m drilled. Geophysical logs were completed for the six exploration and two geochemical holes. 17 test pits were completed for geochemical purposes.

The overall objective for the 2017 Turnbull Exploration drilling program was to improve resource confidence and increase coal location and quality knowledge using tighter spaced drilling, sampling and additional coal quality analyses.

These objectives were accomplished by:

- Developing and implementing an exploration program that included drilling and logging of six new RC coal exploration holes, collecting two bulk samples, as well as one geotechnical hole, and two geochemical holes and 17 geotechincal test pits;
- Revising geological interpretation that was based on historic mapping and drilling in the Turnbull Mountain area;
- Integrating the new exploration and geotechnical drilling results with previous historic programs;
- Updating the geological interpretation based on new drilling;
- Determine the coal quality of the represented coal seams from cuttings samples and bulk samples;
- Updating the coal resources in the exploration area using a computer geologic model; and
- Improve resource model and support an economic assessment of Turnbull Mountain.

Prior to drilling, deteriorated pre-existing exploration roads and trails were improved to allow drilling equipment access. Timber harvesting, new excavated trail, and drill pad construction was completed by local contractors to provide access to new drill holes and test pits.

Each drilling location and test pit was surveyed to obtain exact coordinates and elevations. The

exploration project was completed under the direction and supervision of Fording River Operations' site geology team.

The following table shows the drillhole locations with respect to Coal Leases.

Table 3
Turnbull Drillhole Locations Relative to Coal License

Coal License	Drillholes
389290	3410,3411
389275	3407,3409,3412,3413,GT17-07
389311	3402,3403

ii Summary of Completed Work

The total cost for the 2017 Turnbull Exploration Project was $842,777.90
See Appendix 1 for the cost statement.

The exploration project planning, execution, and geological interpretation and modeling were completed by the Fording River geology team.

Prior to drill site preparation, the excavated trails and exploration drill sites were located by the Fording River geology team. Trail and drill site construction for the 2017 program began in June. The new roads and drill pads were completed by the Down to Earth Excavating and Transendent Mining and Mobilization both of, Sparwood, BC.

RC and LDC drilling services were performed by Foraco Canada Ltd., Calgary, AB using a Foremost DR-24. The reverse circulation drilling method was chosen as the preferred method for collecting uncontaminated, representative and accurately located coal samples. LDC is the preferred method for collecting bulk samples for the purpose of carbonization.

As sampling accuracy is critical to develop an accurate understanding of coal seam thickness and quality, Fording River utilized a rigorous Quality Assurance/Quality Control procedure to assure accurate collection of coal samples.

A total of eight RC drillholes were completed by Foraco for a cumulative drilling length of 2,717.4m. Drillhole depths ranged between 178 and 671 m, averaging 340 m. One HQ geotechnical hole was drilled for a total of 317m by GeoTech Drilling of Vernon, BC. Core was logged for geology and rock mass rating (RMR), review appendix 5. Acoustical and optical televiewers were run down this hole as well. Geotechnical analysis was completed by TetraTech consultants. Drillhole information is given in Table 4, and the exploration area with drillhole locations are shown in Figure 4.

Table 4
2017 Drill Hole Collar Locations

Drillhole Name	Purpose	UTM COORDINATES		Elevation	Azimuth	Dip	Hole Depth (m)
		Easting	Northing				
3402	geological	654175.90	5564828.00	2418.25	0	-90	652.3
3403	geological	654011.80	5565042.00	2427.50	0	-90	671
3407	geological	652412.85	5564810.76	2042.27	0	-90	299
3409	geological	652492.93	5564627.14	2044.46	0	-90	262.6
3410	geological	653673.10	5566127.33	1929.35	0	-90	177.5
3411	geological	653911.38	5565637.71	2103.61	0	-90	202
3412	Geochemical	652589.60	5564787.00	2133.08	0	-90	251
3413	Geochemical	652596.20	5565014.00	2106.93	0	-90	202
GT17-07	Geotechnical	652409.57	5565818.33	2042.21	108	-83	316.9

Downhole geophysical logs were completed by Cordax, Calgary, AB. Each hole was logged through the drill pipe for gamma-neutron. Open holes were logged for downhole deviation and gamma density. The geophysical logs are in Appendix 2. Acoustical and optical televeiwers were run on four exploration, two geochemical, and the one geotechnical holes for geotechnical analysis. Groundwater data loggers were inserted in one geotechnical and three previously drilled exploration drillholes for groundwater monitoring.

Coal seams intersected by reverse circulation drilling were sampled in 0.5 meter intervals. Representative composite samples for each coal seam were prepared at Fording River Operation's on-site process plant laboratory. Raw composite samples received in-house raw proximate, sulphur, and FSI analysis.

Composites were forwarded to GWIL Industries, Calgary, AB, for single gravity wash and fluorine analysis. Clean coal samples were returned to the Fording River laboratory where Fording River Operation's staff completed in-house clean proximate analysis: ash, volatile matter, raw moisture, fixed carbon, sulfur, P_2O_5, and FSI. Pearson Coal Petrography, Victoria BC, completed Petrographic analysis.

LDC is a specialized method of drilling using a conventional reverse circulation rig to drill a 0.23m diameter hole to recover representative core of coal seams. The seams targeted at site BK-0029 were 120220 and 110220. A total of five coring holes were drilled three metres apart on the same drill pad to extract sufficient coal from each seam for pilot plant and carbonization testing. 681.5 kgs was collected for seam 120220 and 648 kgs was collected for seam 110220. RC hole 3410 was drilled initially as a pilot hole to determine suitability of the site and coals seams for bulk sampling. Refer to Appendix 2 for seam intervals.

Bulk samples from seams 120220, 110220 were sent to GWIL Laboratories (Calgary, AB) for homogenization and washability analysis, then to Hazen Research Inc (Golden, CO) for pilot plant washability, and then to Canmet Energy (Ottawa, ON) for carbonization and testing.

17 test pits were completed by Transcendent Mining and Mobilization of Sparwood, BC and consulting expertise was completed by Thurber Engineering Ltd. Pits had a surface area of 1x2m and ranged in

depth from 2-10m. They were taken on the edge of existing roads and filled back in. Pits were logged and sampled for geotechnical water management. Locations are shown in Table 5.

Table 5

2017 Test Pit Locations

Test Pit ID	UTM COORDINATES		Elevation
	Easting	Northing	
TP17-01	652726.6	5565159	2053.53
TP17-02	652684.3	5565268	2052.52
TP17-02-OS4M	652679.4	5565269	2049.74
TP17-03	652662.4	5565376	2047.23
TP17-04	652679.4	5565450	2049.76
TP17-05A	652716.9	5565550	2045.12
TP17-05B	652727.6	5565646	2012.26
TP17-06A	652776.1	5565626	2044.62
TP17-06B-OS4M	652792.9	5565694	2010.32
TP17-07A	652847.9	5565639	2044.44
TP17-08A	652937.6	5565641	2043.96
TP17-08B	652941	5565685	2014.18
TP17-09A	653027.2	5565664	2042.27
TP17-09B	653028.9	5565705	2013.48
TP17-10A	653118.8	5565631	2040.53
TP17-10B	653097.4	5565683	2011.27
TP17-13	653289.5	5566170	1845.79

Geochemical samples were taken on exploration drillhole 3407 and geochemical drillholes 3412 and 3413. Samples were taken in two meter sample intervals and tested for the geochemical signatures of the rock. Samples were shipped to Bureau Veritas Commodities Canada Ltd. of Vancouver, BC for

analysis. To-date testing is ongoing and analysis is to be completed by in-house Teck staff and SRK consultants of Vancouver, BC.

4. RESULTS

The primary goal of the 2017 drilling program on Turnbull Mountain was to improve resource confidence through tighter spaced drilling, and increase coal seam location and quality knowledge. Holes were drilled to infill to an approximate 400 meter density between the 2015, and prior Turnbull exploration holes with favorable results. The project consisted of six exploration RC drillholes, two RC geochemical holes, two bulk samples using the LDC drilling method, and one HQ diamond drillhole for geotechnical purposes. There was 2,717.4m RC, 160.8m LDC, and 316.9m diamond drilling. In total there was 3195.1m drilled. Geophysical logs were completed for the six exploration and two geochemical holes.

The Mist Mountain Formation in the Turnbull mountain area is structurally dominated by the Ewin Pass (TB_Major thrust 210-220) and Brownie Ridge (220-230 Fault) thrust faults, with displacement of over 250 and 100 meters respectively. The three major fault blocks in Turnbull mountain are known as the 210 (west of Ewin Pass fault), the 220 (east of Ewin Pass and west of Brownie Ridge fault), and the 230 (east of Brownie Ridge fault) The Turnbull mountain area contains five dominant coal seams (40, 50, 70, 110 and 130 packages) which are consistently greater than four meters in thickness, and often significantly thicker. The 2017 exploration drilling showed continuation of significant seams in both the 210 and 220 fault blocks.

In house raw coal assay results from composites have been completed and are included in Appendix 3. In house clean coal assay results from the composite samples have yet to be completed. Once done, they will be added to the seam's qualities in the geological data base and interpolated in the geological model. Carbonization from seam 120220 and 110220 have also yet to be completed. Also, to-date, coal petrography reports have not been processed. Previous seam qualities support the coal's marketability and assist the long term mine plan for the region.

The 2017 drilling program results were incorporated into the Fording River East 3D Block Model. The geological model will be used for detailed mine planning and economic analysis. For modeling methods and parameters please refer to Appendix 4.

There are no reserves published for Turnbull Mountain as detailed engineering work has not been completed. Turnbull Mountain resources are incorporated with Eagle and Henretta resources, and are collectively called FRO East. [redacted]

[redacted]

[redacted]

5. CONCLUSION

The 2017 exploration drilling program has successfully increased drillhole density and resource confidence in Turnbull Mountain. The program confirmed the location and continuity of all coal seams in the Turnbull Mountain area allowing improved geological and structural interpretation. The assay results are ongoing and coal quality data will be incorporated into the geological model. Fording River Operations has now updated its current model, and a mine engineering economic assessment of Turnbull Mountain is under evaluation.

Further RC drilling to improve resource confidence and to increase the amount and density of coal quality data including ash, volatile matter, P_2O_5, FSI, fluorine, and fluidity is recommended prior to detailed planning for Turnbull mining. In addition, bulk sampling of all economic seams using the LDC drilling method is recommended for pilot plant washability analysis and carbonization testing.

6. AUTHOR'S QUALIFICATIONS

Statements of Author's Academic and Professional Qualifications

CERTIFICATE OF QUALIFIED PERSON

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I, Barry F. Musil, P.Geo, am employed as a Senior Geologist, Supervisor at Fording River Operations. This certificate applies to the report titled "Fording River Operations, Assessment Report, 2017 Turnbull Exploration Program". I graduated from the University of British Columbia with a Bachelor of Science Degree in Geology, 1984. I am a member of the Association of Professional Engineers and Geoscientists of British Columbia (# 19361). Since 1986 I have been involved with coal mining projects at Fording River, and other Teck Coal

Operations. As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43-101 Standards of Disclosure for Mineral Projects (NI 43-101).

"Signed and Stamped"

Barry F. Musil, P.Geo.

620,000 630,000 640,000 650,000 660,000 670,000

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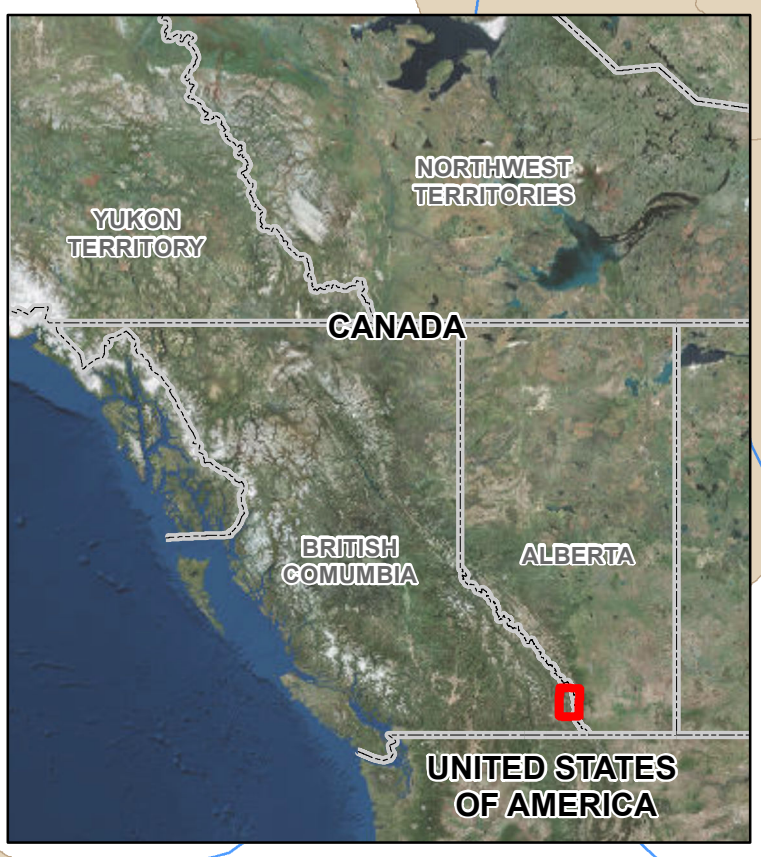

Fording River Operations

Greenhills Operations

Line Creek Operations

Elkview Operations

Elkford

Sparwood

Hosmer

FORDING RIVER

BULL RIVER

BRITISH COLUMBIA

ALBERTA

43

3

620,000 630,000 640,000 650,000 660,000 670,000

Figure 1 - Location Map

- Communities
- Canadian Pacific Railway
- Primary Highway
- Secondary Highway
- Watercourse
- British Columbia - Alberta Border
- Mine Permit Boundaries
- FRO Mine Permit Boundary
- First Nations Reserve
- Provincial Park/Protected Area
- Waterbody

N

0 2.5 5 Kilometers

DATE:	MINE OPERATION:
4/13/2016	Elk Valley
SCALE:	COORDINATE SYSTEM:
1:250,000	NAD 1983 UTM Zone 11N

Teck

Document Path: \\teckcominco\CGO\Groups\TCGIS\Data\Operations\FRO\Projects\2016\General Maps\MXD\ElkValley_Overview_Inset_11x17.mxd

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5572000 5568000 5564000 5560000 5556000 5552000

328050
389312
389311
389312
389290
389285
389275
417068
417067
389275
389312
389282
389285
389312
389310
327991
327990
327978
327992
327993
328674
327997
327996
327995
327998
327999
328000
328001
327806
327805

649000 652000 655000 658000 661000

Figure 2 - Coal License Map

Roads
Railway
Major Streams
Provincial Boundaries
Mineral Coal Tenure
Coal Licenses
Teck Fee Simple Land

Elkford

N

0 0.5 1 2 Kilometers

DATE:	MINE OPERATION:
4/13/2016	Coal Mountain
SCALE:	COORDINATE SYSTEM:
1:65,000	NAD 1983 UTM Zone 11N

Teck

Document Path: \\teckcominco\CGO\Groups\TCGIS\Data\Operations\FRO\Projects\2016\Geology\MXD\Turnbull_20160412\TBL_Claim2015.mxd

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5,567,000 5,566,000 5,565,000 5,564,000 5,563,000

JF JMo JKMM KE CPRM TS

3395 3393 3394 3391 3397 3388 3389 3390 3392 3387 3408 3396 3405 2831B BH15-02 BH15-01

Mount Turnbull

Document Path: \\teckcominco.loc\CGO\Groups\TCGIS\Data\Operations\FRO\Projects\2016\Geology\MXD\TBL_GLGY2016_04.mxd

Teck

Figure 3
Property Geology Map

Legend

- 2015 Turnbull Geotech Holes on pre-exisiting drill sites
- 2015 Turnbull Geotech Holes
- 2015 Turnbull Drill Holes
- MYAB Boundary
- Anticline and syncline
- Bedding, tops known (inclined, vertical, overturned)

LOWER CRETACEOUS

- KC — *CROWSNEST FORMATION*
- KBl — *BLAIRMORE GROUP*
- KE — *KOOTENAY GROUP ELK FORMATION*

UPPER JURASSIC AND LOWER CRETACEOUS

- JKMM — *MIST MOUNTAIN FORMATION*
- JMo — *MORRISEY FORMATION*
- JF — *FERNIE FORMATION*

TRIASSIC

- TWh — *SPRAY RIVER GROUP WHITEHORSE FORMATION*
- TSM — *SULPHUR MOUNTAIN FORMATION*

UPPER CARBONIFEROUS AND PERMIAN

- CPRM — *ROCKY MOUNTAIN SUPERGROUP*

LOWER CARBONIFEROUS

- TS — *SPRAY RIVER GROUP*

N

0 100 200 400 600 Meters

DATE:	MINE OPERATION:
4/14/2016	Fording River
SCALE: 1:20,000	COORDINATE SYSTEM: NAD 1983 UTM Zone 11N

652,000 653,000 654,000 655,000 656,000 657,000

5,567,000 5,566,000 5,565,000 5,564,000

Henretta Lake Access
Henretta Crossover
Henretta Lake Access
Henretta Lake Access
Henretta Coal Haul
Saddle Rd.

TP17-13
3410
3411
3403
3402
TP17-06B-OS4M
TP17-09B
TP17-08B
TP17-10B
TP17-05B
TP17-10A
TP17-09A
TP17-08A
TP17-07A
TP17-05A
TP17-06A
TP17-04
TP17-03
TP17-02-OS4M
TP17-02
TP17-01
3413
3407
3412
3409

652,000 653,000 654,000 655,000 656,000 657,000

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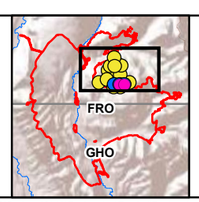

2017 Turnbull Exploration - Drill Holes and Excavated Trail

- 2017 Drillholes
- 2017 Test Pits
- 2017 Drilled on Historical Site
- Historical Drillholes
- 2017 Excavated MYAB Trail: 1.39km
- Pre-Existing Road: 40.12km
- MYAB Boundary

N

0 85 170 340 510 Meters

DATE:	MINE OPERATION:
1/15/2018	Fording River
SCALE:	COORDINATE SYSTEM:
1:15,000	NAD 1983 UTM Zone 11N

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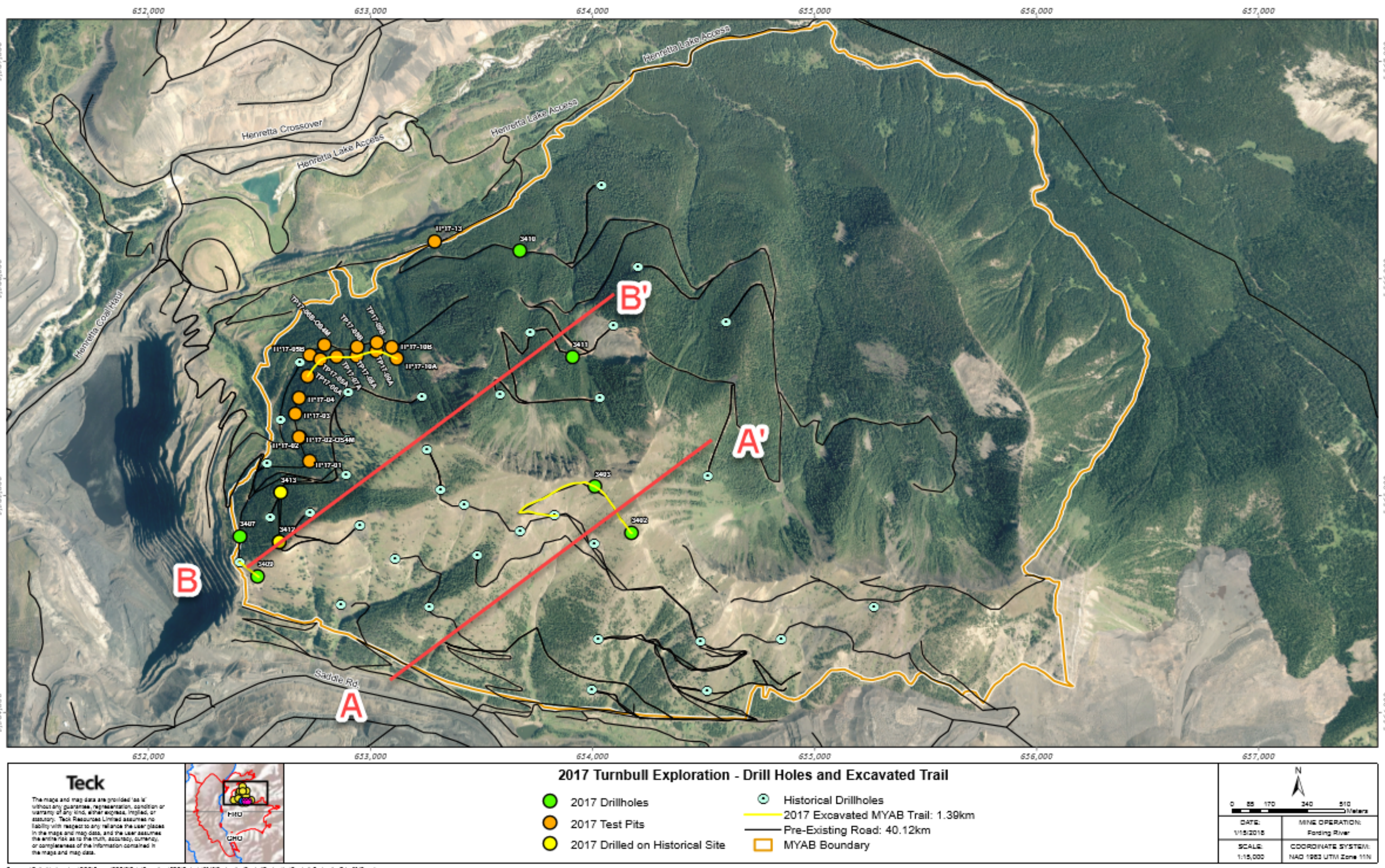
652,000
653,000
654,000
655,000
656,000
657,000
5,567,000
5,566,000
5,565,000
5,564,000
Henretta Crossover
Henretta Lake Access
Henretta Coal Haul
Saddle Rd.
A
A'
B
B'
2017 Turnbull Exploration - Drill Holes and Excavated Trail
2017 Drillholes
2017 Test Pits
2017 Drilled on Historical Site
Historical Drillholes
2017 Excavated MYAB Trail: 1.39km
Pre-Existing Road: 40.12km
MYAB Boundary
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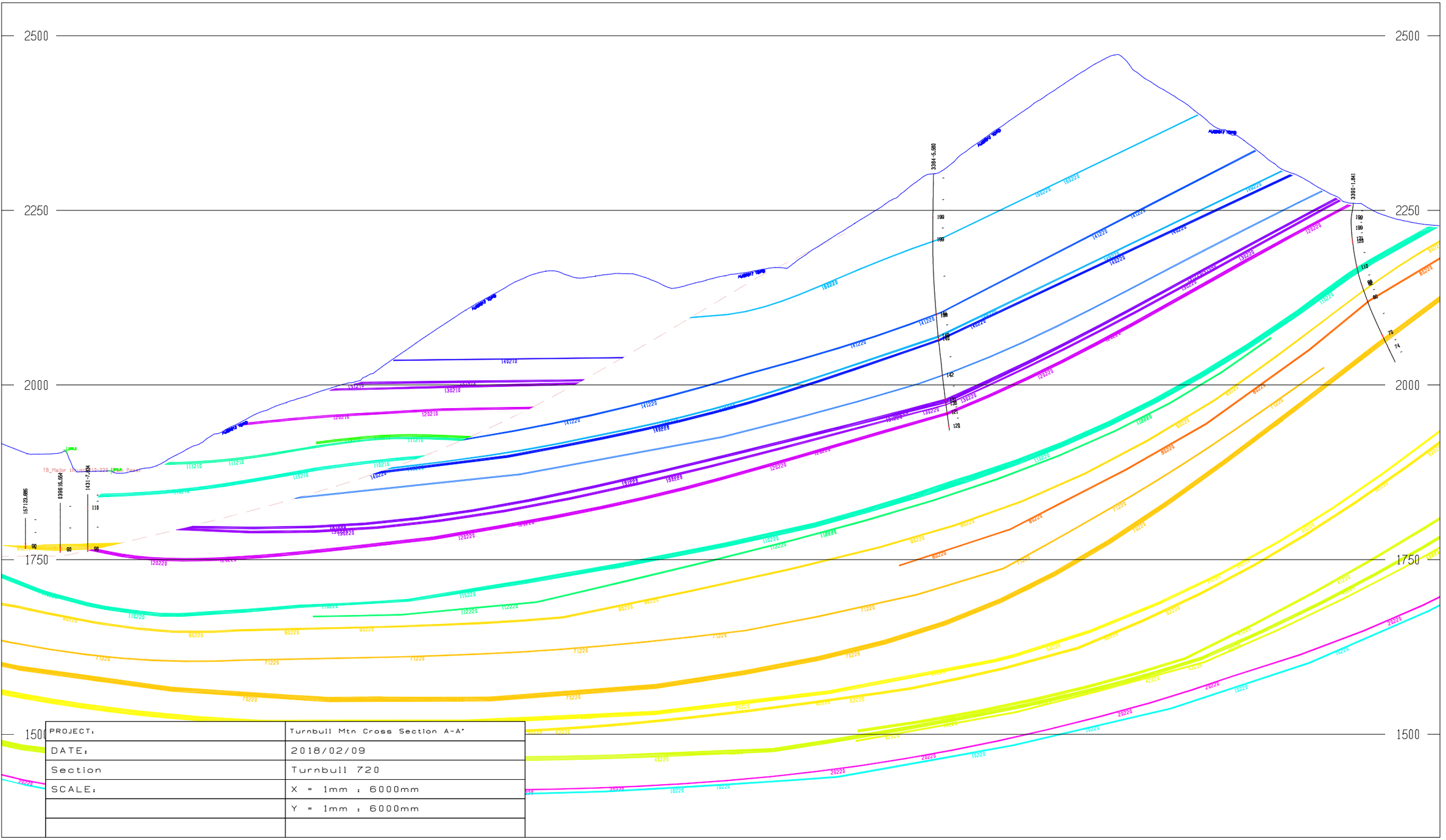
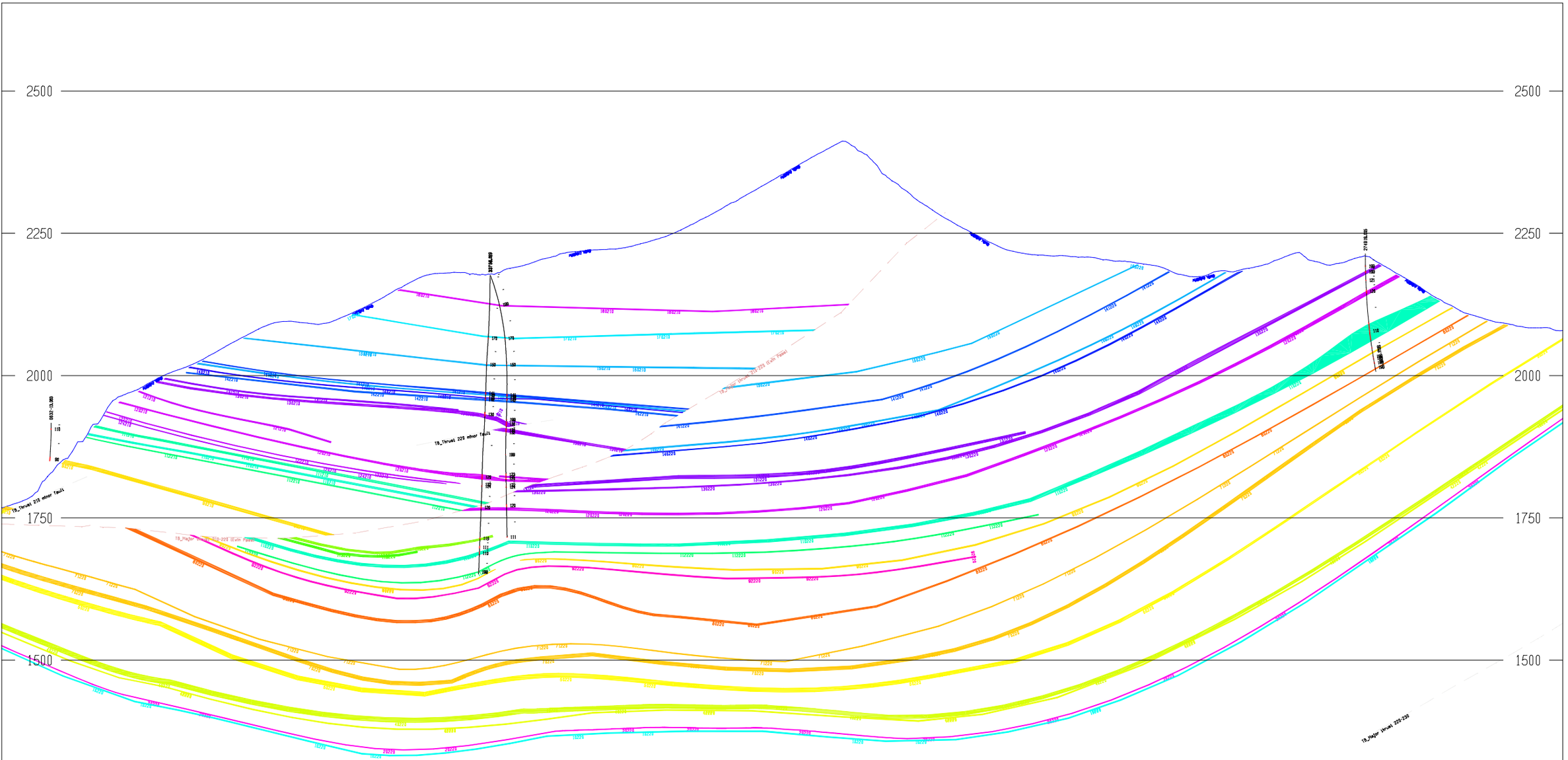
FRO
GHO
N
Meters
DATE:
1/15/2018
MINE OPERATION:
Fording River
SCALE:
1:15,000
COORDINATE SYSTEM:
NAD 1983 UTM Zone 11N



PROJECT:	Turnbull Mtn Cross Section A-A'
DATE:	2018/02/09
Section	Turnbull 720
SCALE:	X = 1mm : 6000mm
	Y = 1mm : 6000mm



PROJECT:	Turnbull Mtn Cross Section B-B'
DATE:	2018/02/09
Section	Turnbull 752
SCALE:	X = 1mm : 8000mm
	Y = 1mm : 8000mm

Exploration Work type	Comment	Days			Totals
Personnel (Name)* / Position	**Field Days (list actual days)**	**Days**	**Rate**	**Subtotal***	
			$0.00	$0.00	
				$0.00	**$0.00**
Office Studies	**List Personnel (note - Office only, do not include field days**				
Literature search			$0.00	$0.00	
Database compilation			$0.00	$0.00	
Computer modelling			$0.00	$0.00	
Reprocessing of data			$0.00	$0.00	
General research			$0.00	$0.00	
Report preparation			$0.00	$0.00	
Other (specify)	Consultant GeoTech and Groundwater Analysis			$225,700.00	
				$225,700.00	**$225,700.00**
Airborne Exploration Surveys	**Line Kilometres / Enter total invoiced amount**				
Aeromagnetics			$0.00	$0.00	
Radiometrics			$0.00	$0.00	
Electromagnetics			$0.00	$0.00	
Gravity			$0.00	$0.00	
Digital terrain modelling			$0.00	$0.00	
Other (specify)			$0.00	$0.00	
				$0.00	**$0.00**
Remote Sensing	**Area in Hectares / Enter total invoiced amount or list personnel**				
Aerial photography			$0.00	$0.00	
LANDSAT			$0.00	$0.00	
Other (specify)			$0.00	$0.00	
				$0.00	**$0.00**
Ground Exploration Surveys	**Area in Hectares/List Personnel**				
Geological mapping					
Regional		*note: expenditures here*			
Reconnaissance		*should be captured in Personnel*			
Prospect		*field expenditures above*			
Underground	Define by length and width				
Trenches	Define by length and width			$0.00	**$0.00**
Ground geophysics	**Line Kilometres / Enter total amount invoiced list personnel**				
Radiometrics					
Magnetics					
Gravity					
Digital terrain modelling					
Electromagnetics	*note: expenditures for your crew in the field*				
SP/AP/EP	*should be captured above in Personnel*				
IP	*field expenditures above*				
AMT/CSAMT					
Resistivity					
Complex resistivity					
Seismic reflection					
Seismic refraction					
Well logging	2717m			$28,892.00	
Geophysical interpretation					
Petrophysics					
Other (specify)					
				$28,892.00	**$28,892.00**
Geochemical Surveying	**Number of Samples**	**No.**	**Rate**	**Subtotal**	
	note: This is for assays or laboratory costs				
Drill (cuttings, core, etc.)	52		$178.00	$9,256.00	
Stream sediment			$0.00	$0.00	
Soil			$0.00	$0.00	
Rock	305		$0.00	$15,250.00	
Water			$0.00	$0.00	
Biogeochemistry			$0.00	$0.00	
Whole rock			$0.00	$0.00	
Petrology	52		$150.00	$7,800.00	
Other (specify)			$0.00	$0.00	

				$32,306.00	**$32,306.00**
Drilling	**No. of Holes, Size of Core and Metres**	**No.**	**Rate**	**Subtotal**	
Diamond	1 hole, HQ, 316m			$112,500.00	
Reverse circulation (RC)	8 holes, 2717m			$140,565.90	
Rotary air blast (RAB)			$0.00	$0.00	
Other (specify)	Bulk Sample, 9" Coring, 161m		$0.00	$172,389.00	
				$425,454.90	**$425,454.90**
Other Operations	**Clarify**	**No.**	**Rate**	**Subtotal**	
Trenching			$0.00	$0.00	
Bulk sampling			$0.00	$0.00	
Underground development			$0.00	$0.00	
Other (specify)	Road and Pad Construction, Test Pits			$124,425.00	
				$124,425.00	**$124,425.00**
Reclamation	**Clarify**	**No.**	**Rate**	**Subtotal**	
After drilling			$0.00	$0.00	
Monitoring			$0.00	$0.00	
Other (specify)			$0.00	$0.00	
Transportation		**No.**	**Rate**	**Subtotal**	
Airfare			$0.00	$0.00	
Taxi			$0.00	$0.00	
truck rental			$0.00	$0.00	
kilometers			$0.00	$0.00	
ATV			$0.00	$0.00	
fuel			$0.00	$0.00	
Helicopter (hours)			$0.00	$0.00	
Fuel (litres/hour)			$0.00	$0.00	
Other					
				$0.00	**$0.00**
Accommodation & Food	**Rates per day**				
Hotel			$0.00	$0.00	
Camp			$0.00	$0.00	
Meals	day rate or actual costs-specify		$0.00	$0.00	
				$0.00	**$0.00**
Miscellaneous					
Telephone			$0.00	$0.00	
Other (Specify)	Supplies - drill casing, sample bags, sample tags			$6,000.00	
				$6,000.00	**$6,000.00**
Equipment Rentals					
Field Gear (Specify)			$0.00	$0.00	
Other (Specify)					
				$0.00	**$0.00**
Freight, rock samples					
			$0.00	$0.00	
			$0.00	$0.00	
				$0.00	**$0.00**
TOTAL Expenditures					**$842,777.90**

COMPENSATED DENSITY
DEEP RESISTIVITY
GAMMA RAY, CALIPER
3402

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3402
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3402
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION:
SEC TWP RGE

Other Services
NNTS
GYRO

Permanent Datum
Log Measured From
Drilling Measured From

Elevation (m)

Elevation
K.B. (m)
D.F. (m)
G.L. (m)

Date	21 AUG 2017		
Run Number	ONE		
Depth Driller (m)	652.30		
Depth Logger (m)	652.16		
Bottom Logged Interval (m)	648.26		
Top Log Interval (m)	0.00		
Casing Driller (m)	6.00		
Casing Logger (m)	5.39		
Bit Size (mm)	139.70		
Type Fluid in Hole	POLYMER		
Reported Density (kg/m3)	1020		
Reported Viscosity (cp)	40		
Source of Sample	N/A		
pH	N/A		
Fluid Loss (cc)	N/A		
Rm @ Meas. Temp (Ohmm @ °C)	N/A		
Rm @ BHT (Ohmm @ °C)	N/A		
Magnetic Declination (°)	N/A		
Time Circulation Stopped	21 AUG 2017 14h00		
Time Logger on Bottom	22 AUG 2017 03h14		
Maximum Temperature (°C)	N/A		
Equipment Number	C05		
Location	FORDING RIVER		
Recorded By	S.BEECRAFT		
Witnessed By	K. FRASER		

<<< Fold Here >>>

Comments

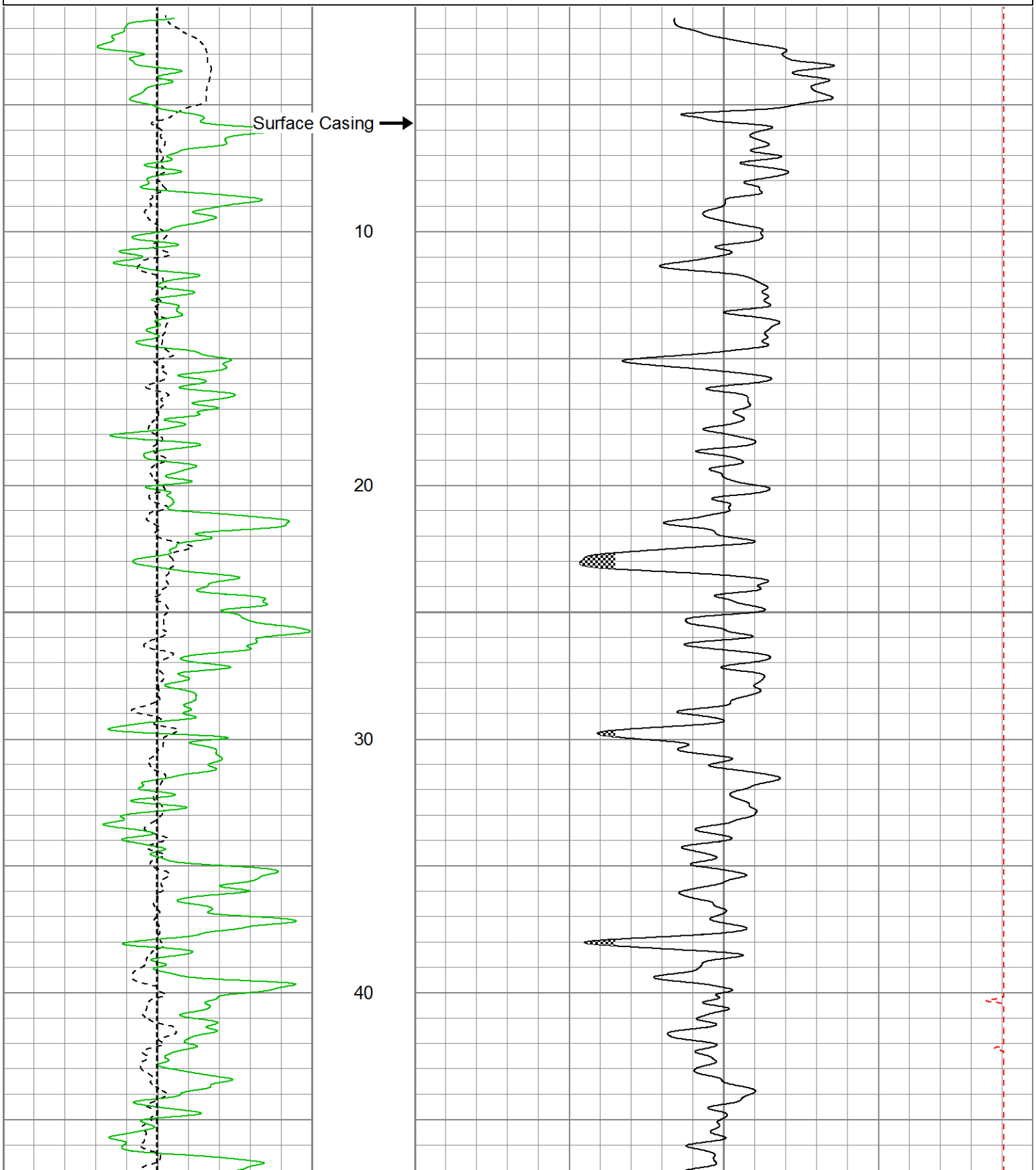
FLUID FOUND AT 156 m
TOOLS: NNTS1, GYRO, DIP12, GL5, DNDS3

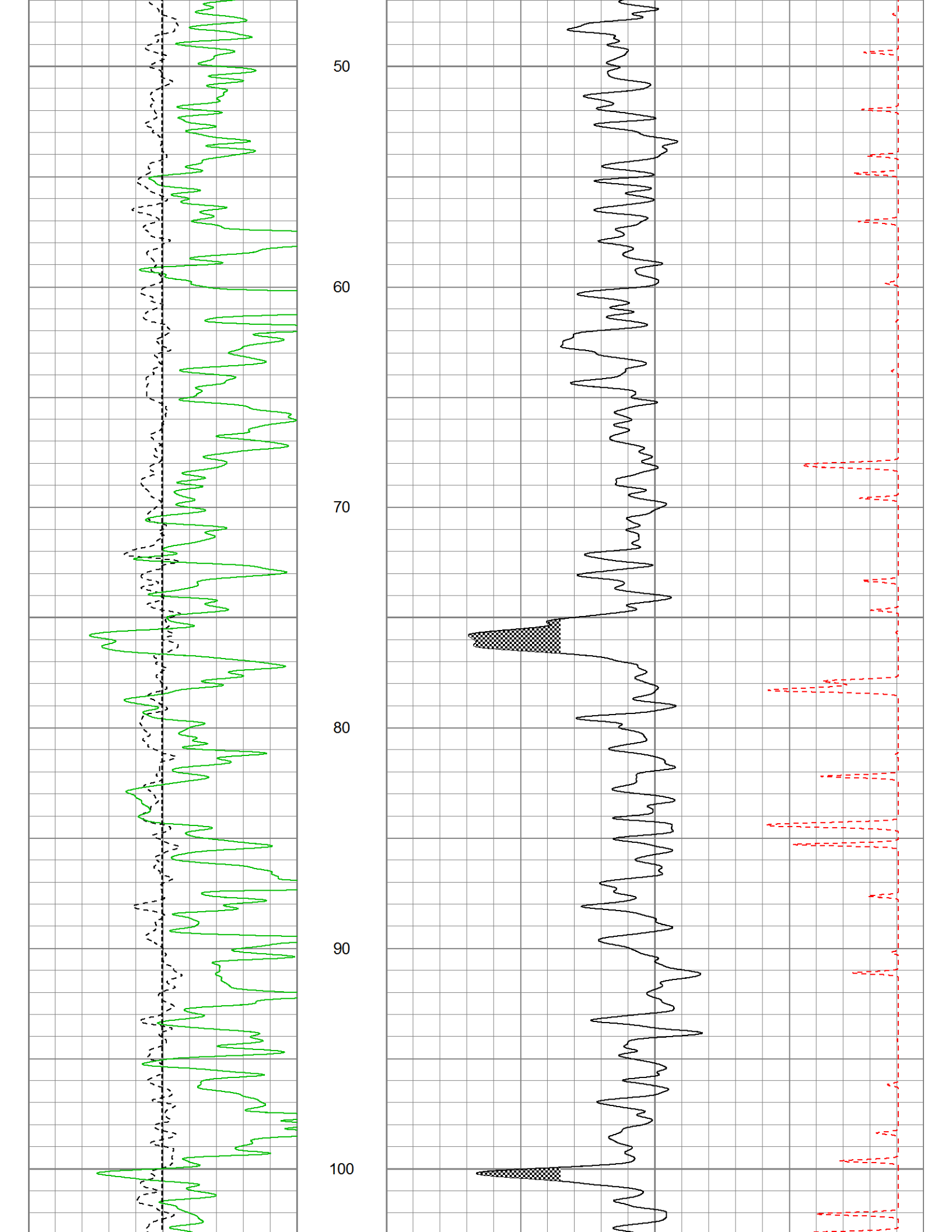
MAIN PASS

Database File:	c:\warrior\data\fro\3402\3402cdx\3402 fro.db
Dataset Pathname:	./../denres
Presentation Format:	denresdn
Dataset Creation:	Tue Aug 22 11:55:01 2017
Charted by:	Depth in Meters scaled 1:200

90	Density Caliper (DCAL) (mm)	190
0	Gamma Ray (GRFE) (API)	200
90	Bit Size (BIT1) (mm)	190

1	Bulk Density (DEN) (g/cc)	3
2	Deep Resistivity (DRFE) (Ohm-m)	20000

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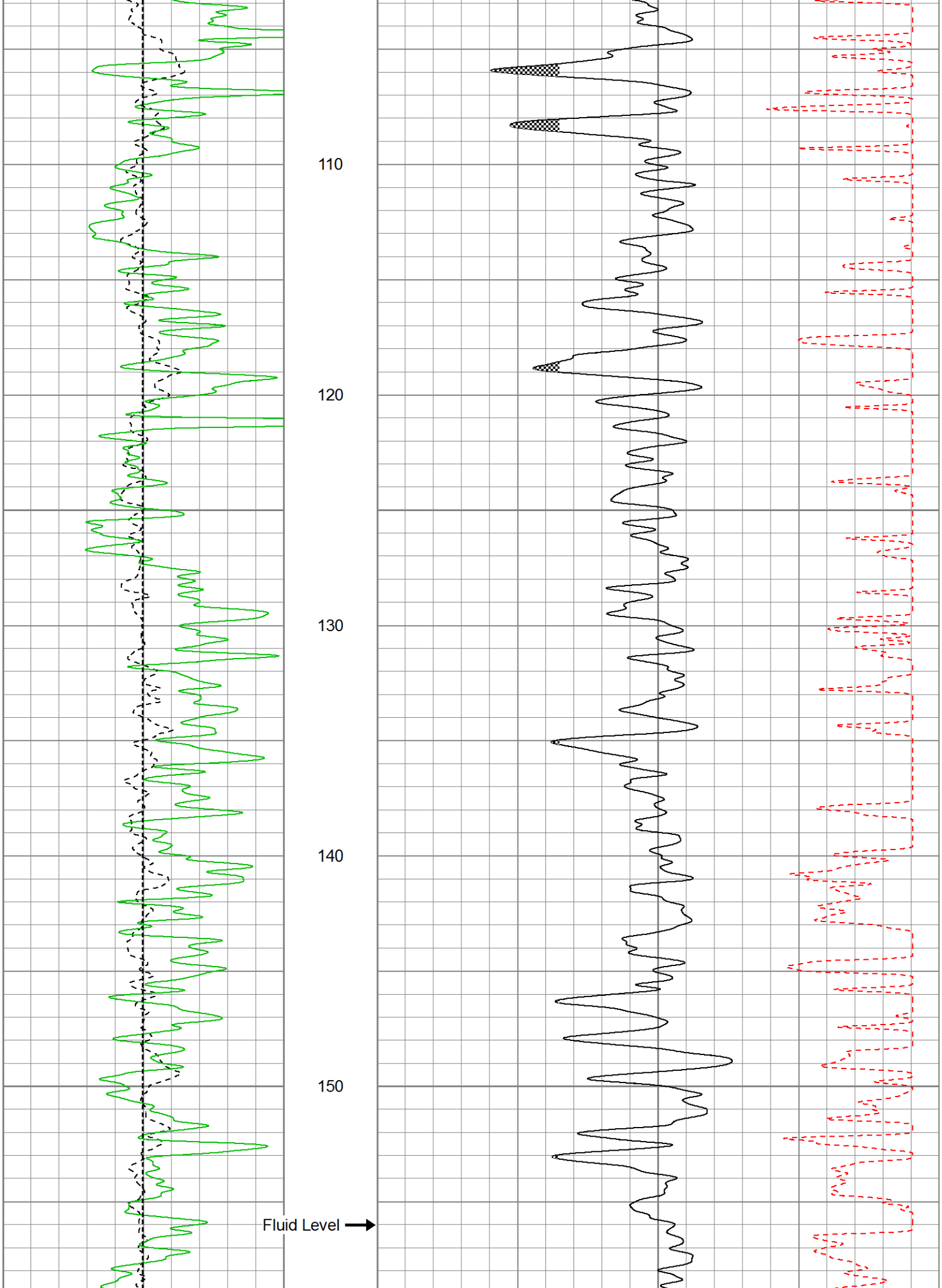
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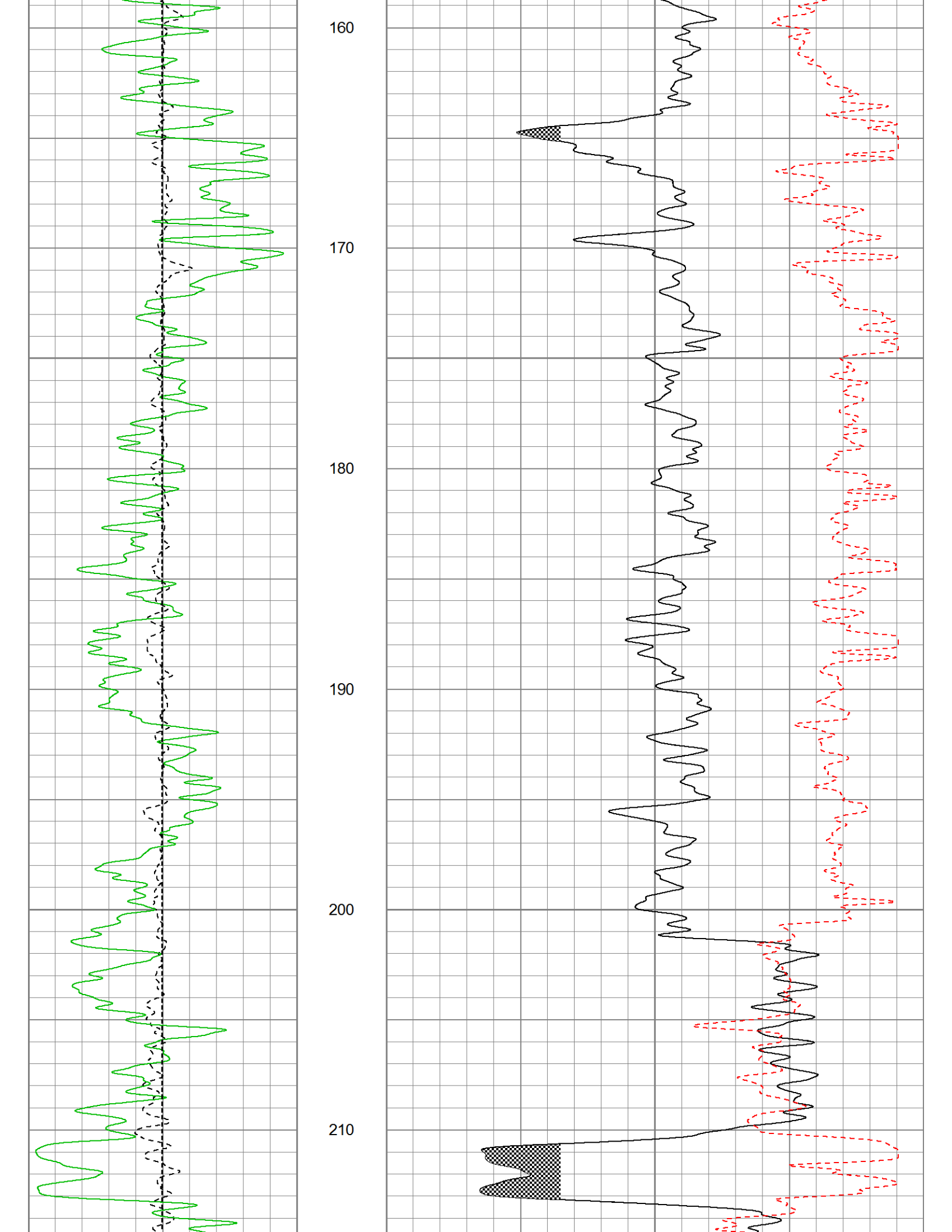
Fluid Level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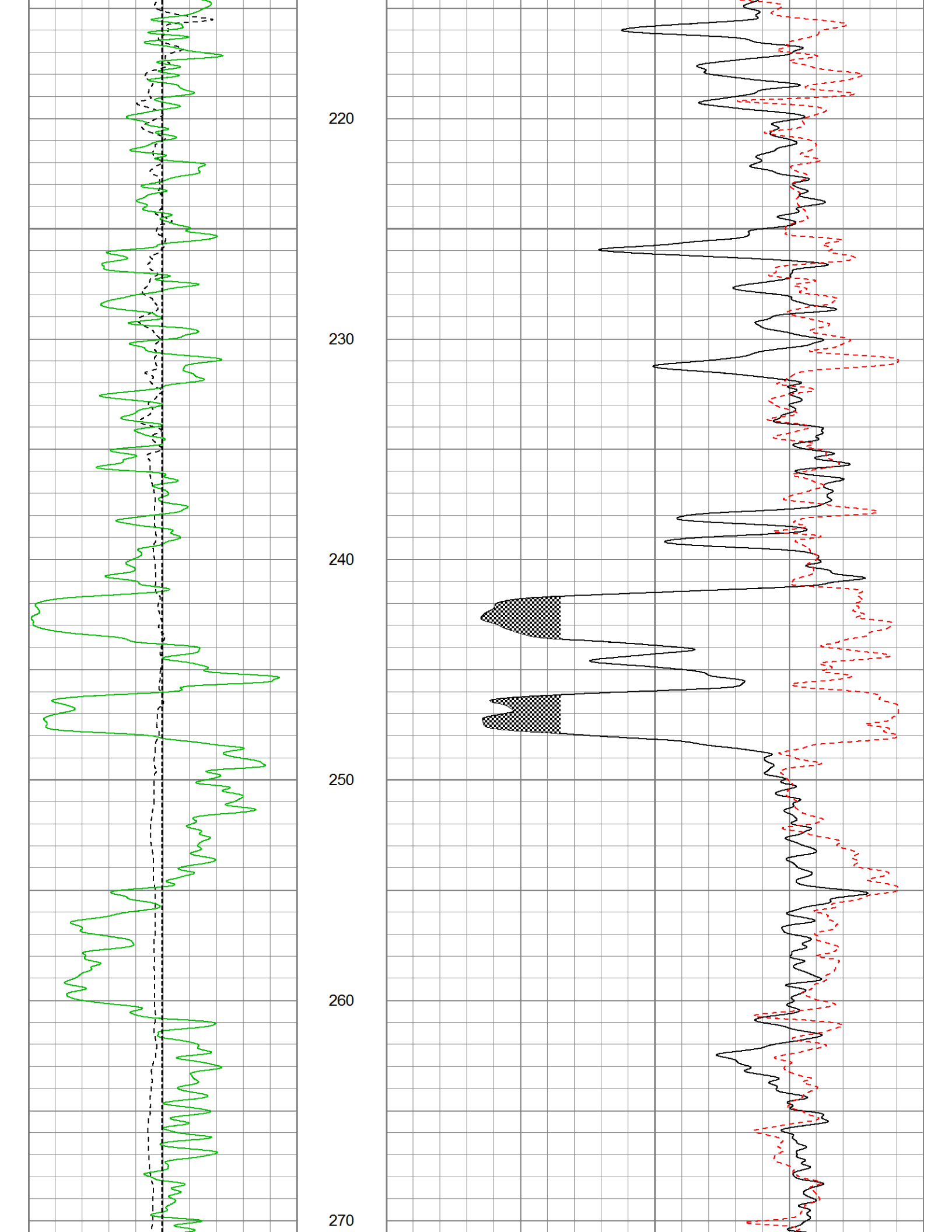
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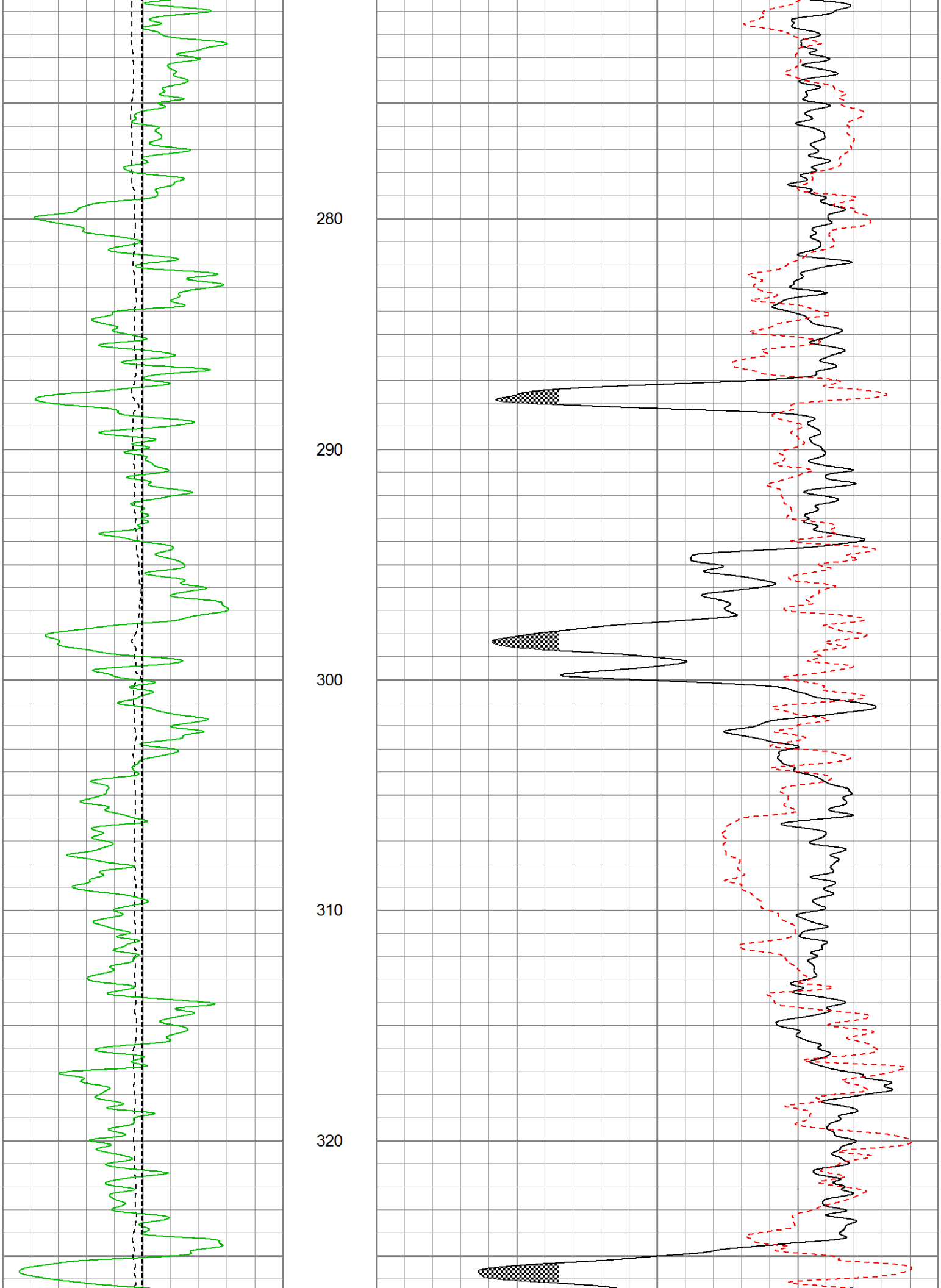
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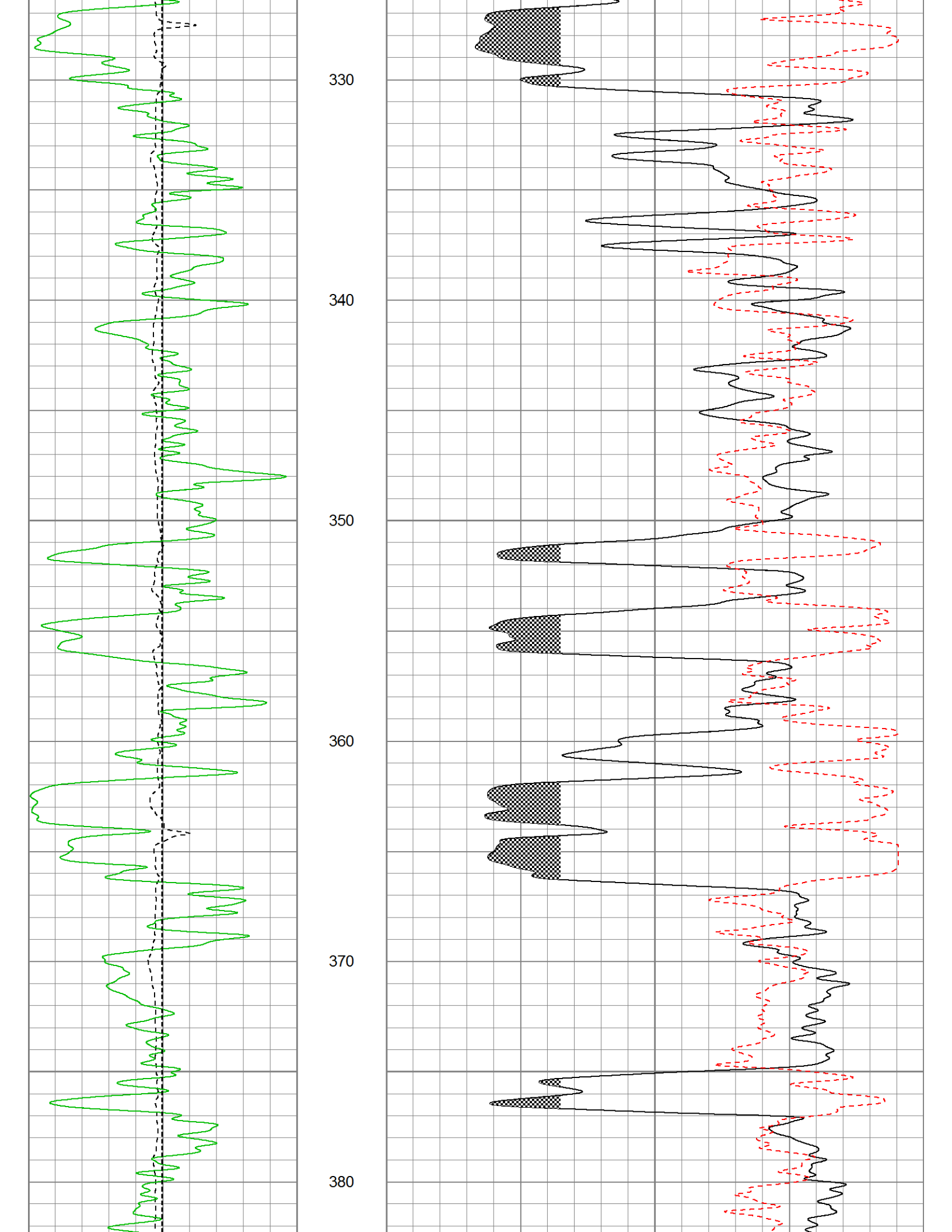
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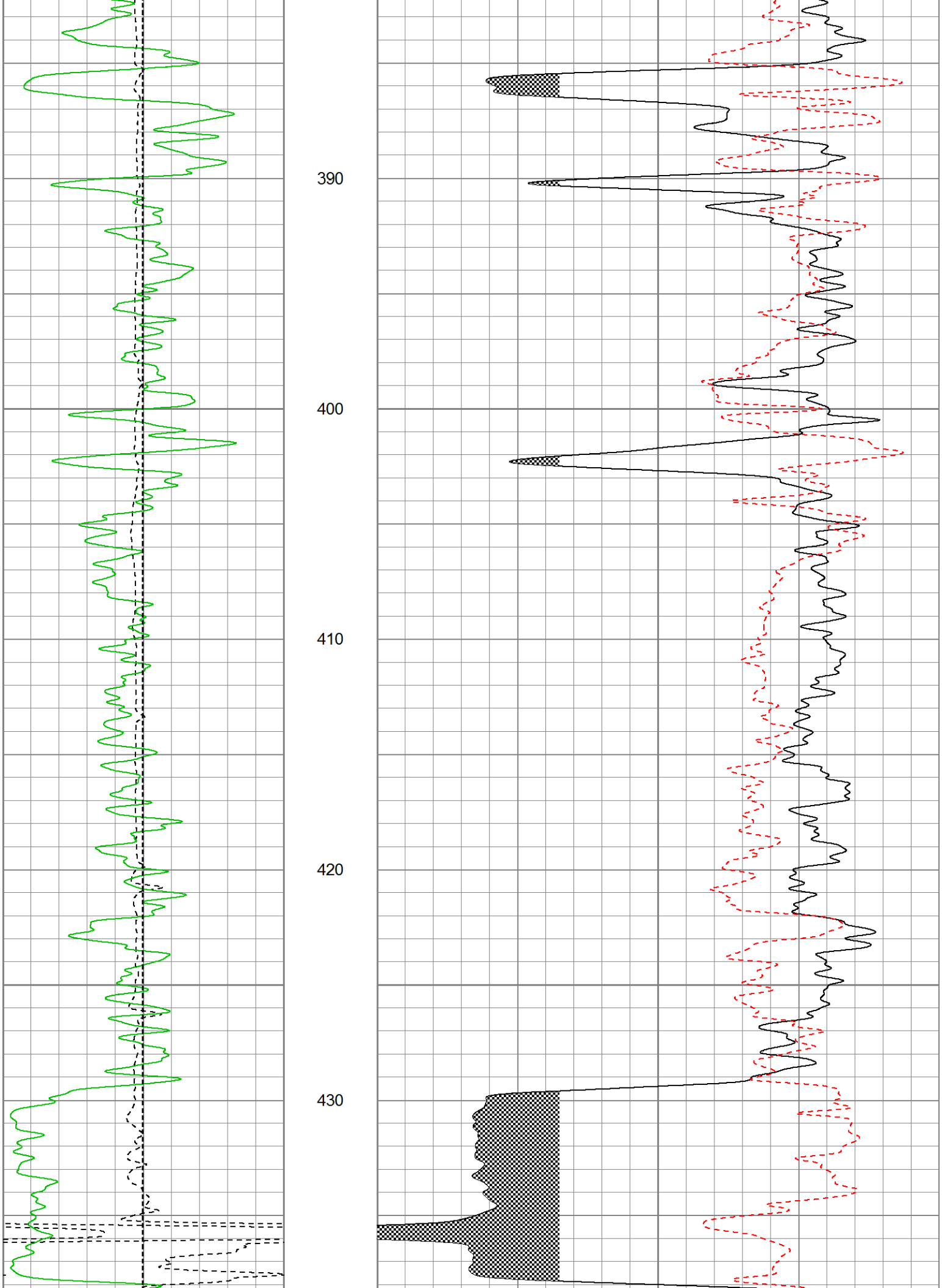
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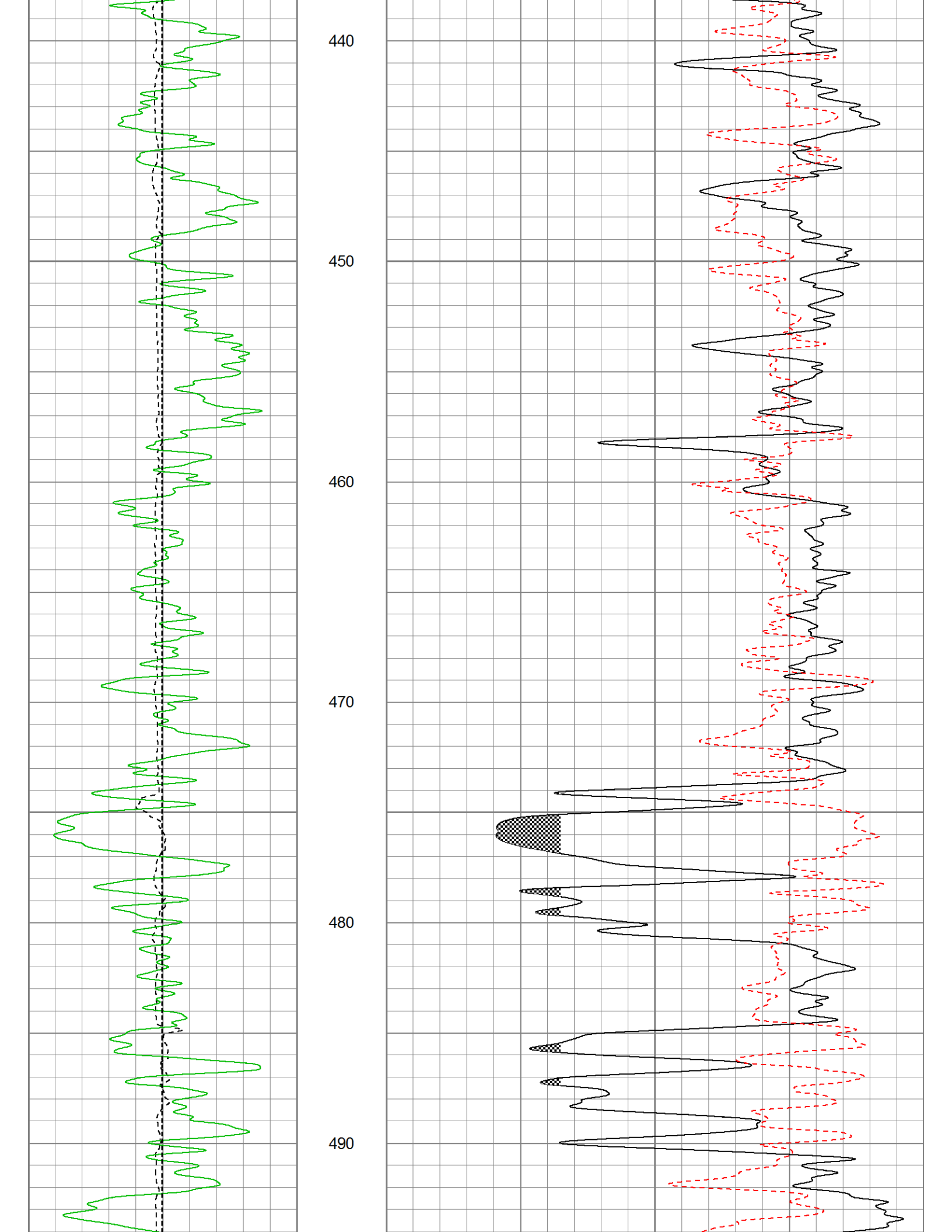
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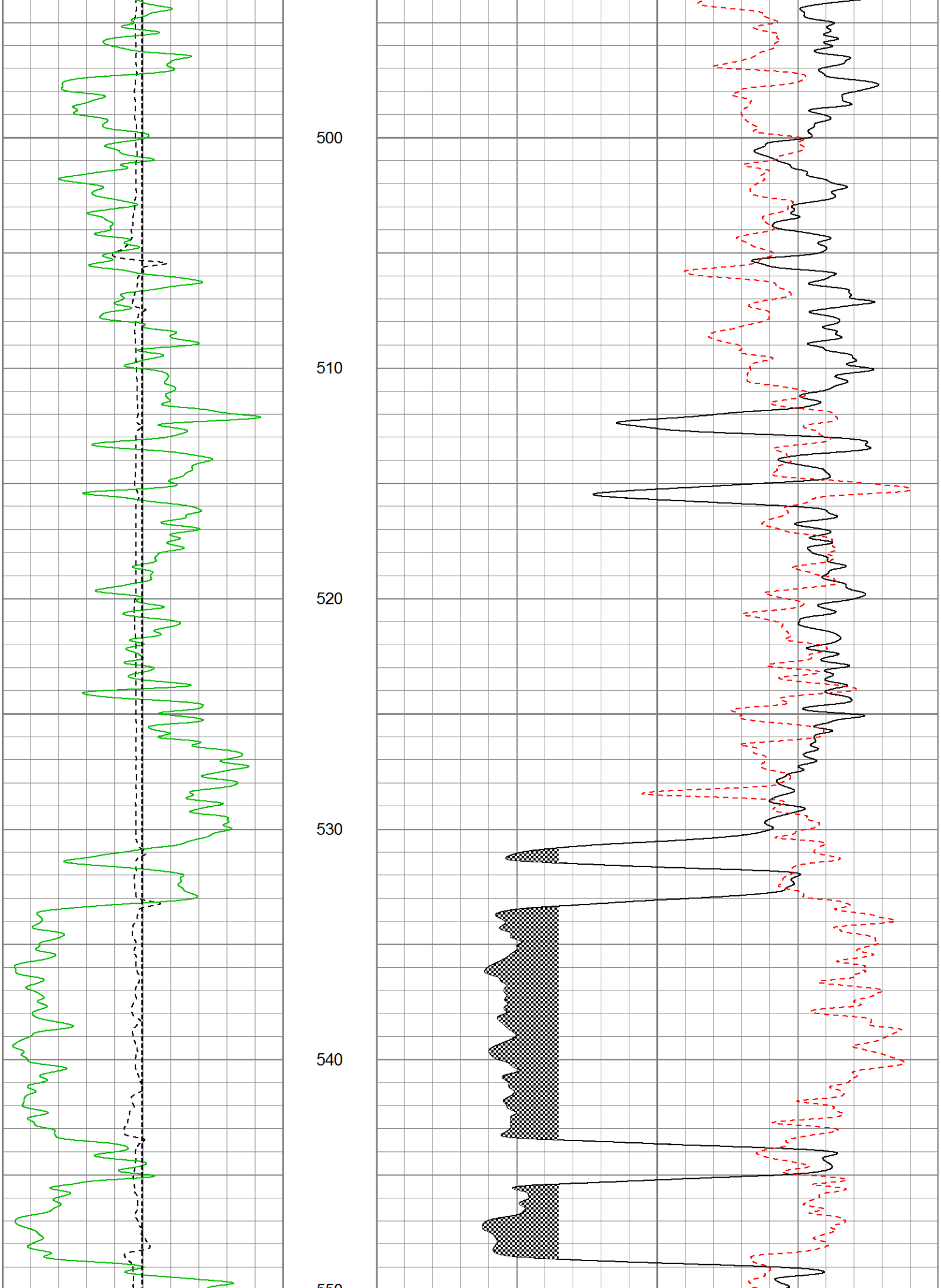
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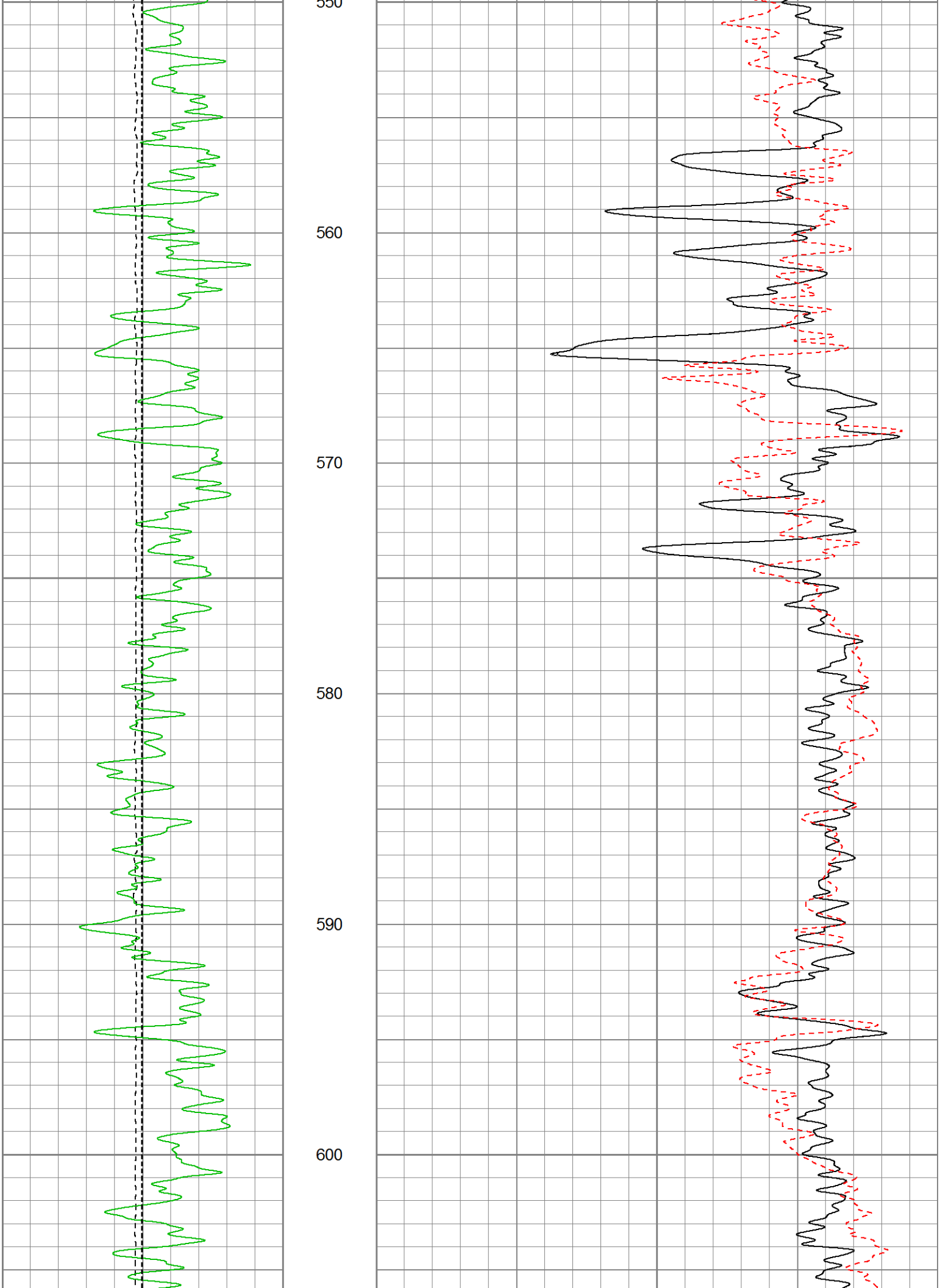
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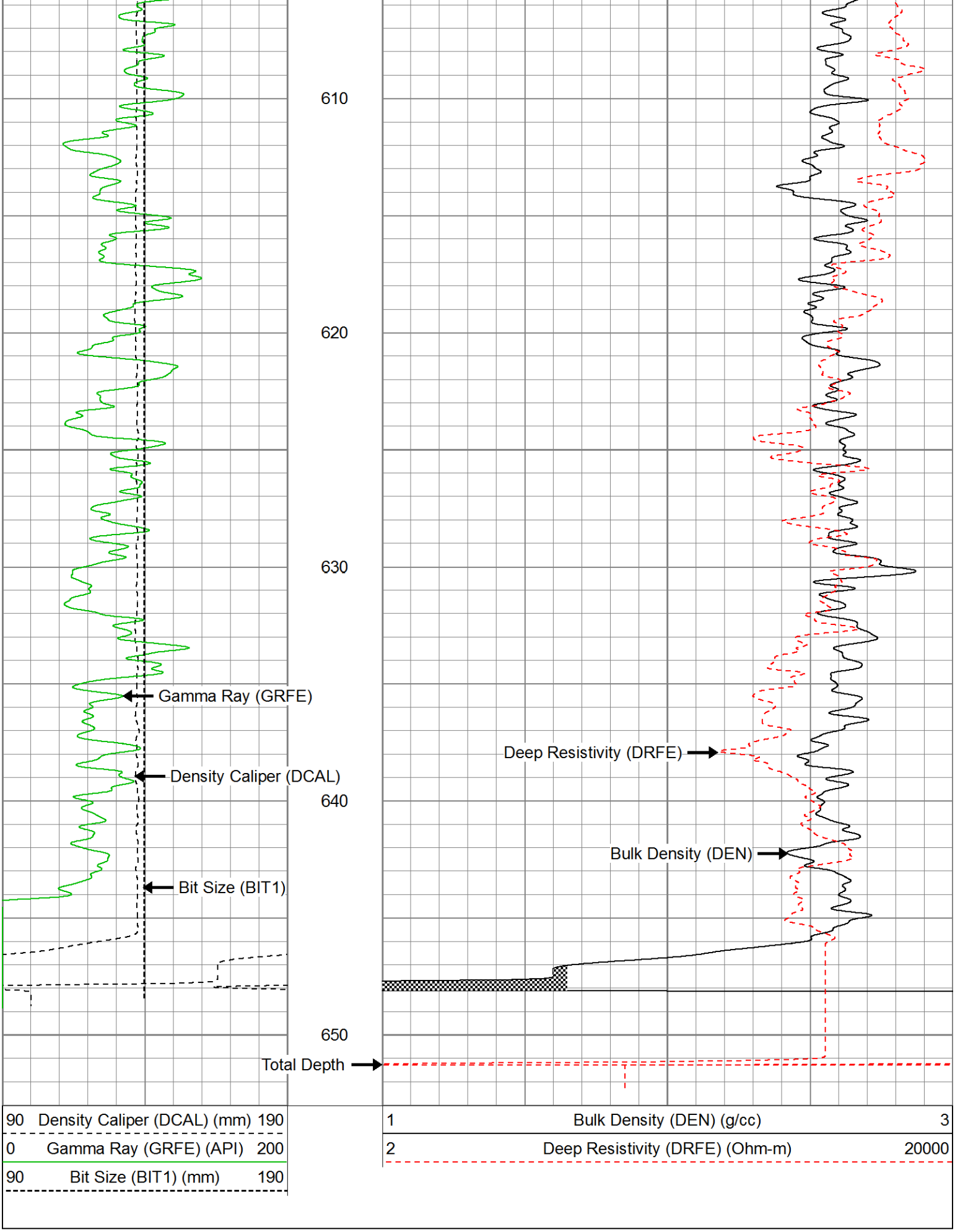


	Company TECK COAL FORDING RIVER OPERATIONS

Well	3402
Field	TURNBULL
Country	CANADA
Province	B.C.

GYRO VERTICALITY ANALYSIS 3402

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3402
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3402
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION: SEC TWP RGE

Other Services
NNTS
DENRES

Permanent Datum
Log Measured From
Drilling Measured From

Elevation (m)

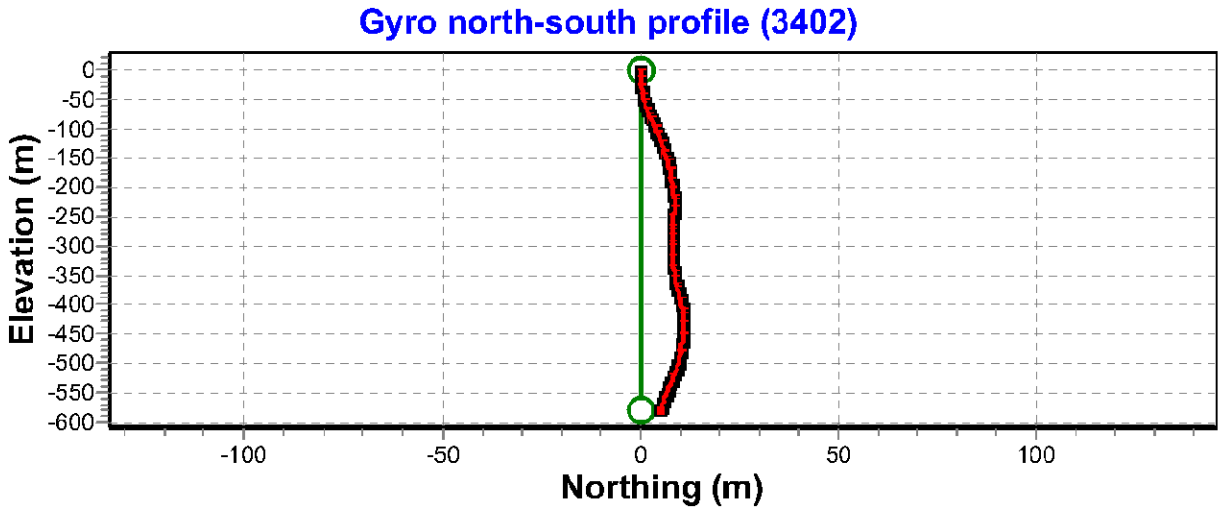
Elevation
K.B. (m)
D.F. (m)
G.L. (m)

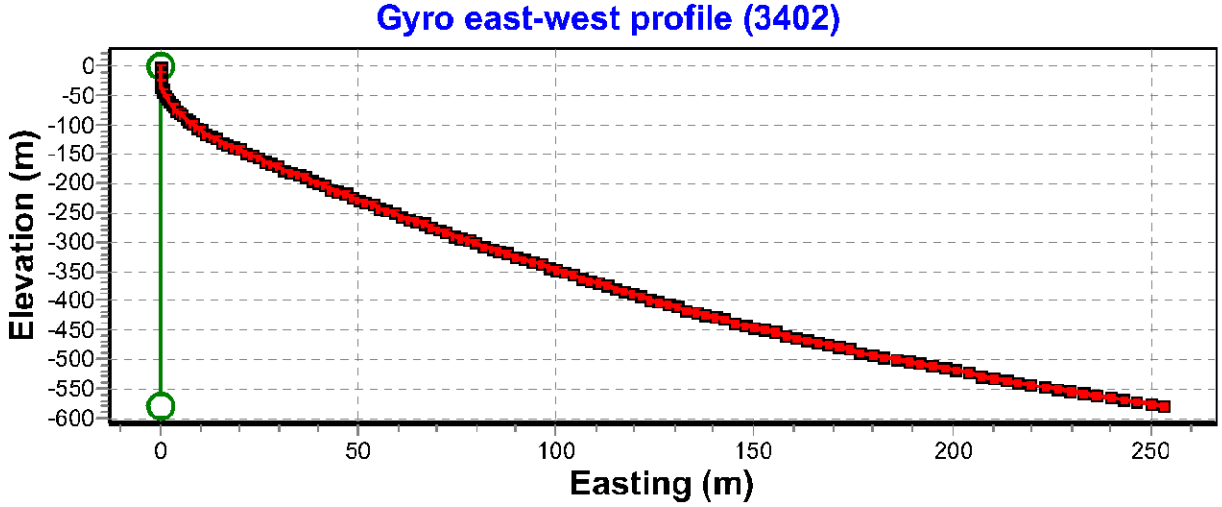
Date	21 AUG 2017		
Run Number	ONE		
Depth Driller (m)	652.3		
Depth Logger (m)	645.32		
Bottom Logged Interval (m)	645.32		
Top Log Interval (m)	0.00		
Casing Driller (m)	6.00		
Casing Logger (m)	N/A		
Bit Size (mm)	139.70		
Type Fluid in Hole	POLYMER		
Reported Density (kg/m3)	1020		
Reported Viscosity (cp)	40		
Source of Sample	N/A		
pH	N/A		
Fluid Loss (cc)	N/A		
Rm @ Meas. Temp (Ohmm @ °C)	N/A		
Rm @ BHT (Ohmm @ °C)	N/A		
Magnetic Declination (°)	N/A		
Time Circulation Stopped	21 AUG 2017 14h00		
Time Logger on Bottom	21 AUG 2017 18h58		
Maximum Temperature (°C)	N/A		
Equipment Number	C05		
Location	FORDING RIVER		
Recorded By	S.BEECRAFT		
Witnessed By	K. FRASER		

<<< Fold Here >>>

Comments

TOOLS: NNTS1, GYRO, DIP12, GL5, DNDS3


Gyro north-south profile (3402)
Elevation (m)
0
-50
-100
-150
-200
-250
-300
-350
-400
-450
-500
-550
-600
-100
-50
0
50
100
Northing (m)


Gyro east-west profile (3402)
Elevation (m)
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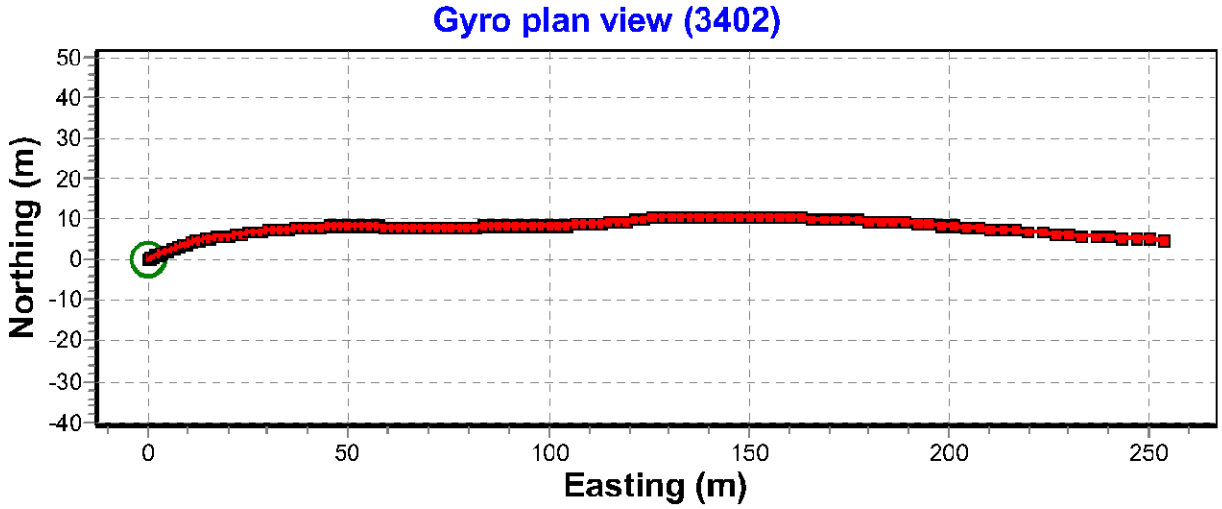
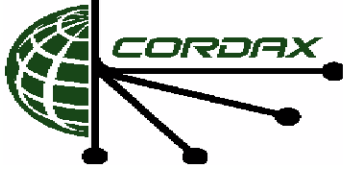
-100
-150
-200
-250
-300
-350
-400
-450
-500
-550
-600
0
50
100
150
200
250
Easting (m)



	Company	TECK COAL FORDING RIVER OPERATIONS



Well	3402
Field	TURNBULL
Country	CANADA
Province	B.C.

UNCOMPENSATED NEUTRON GAMMA RAY 3402

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3402
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3402
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION: SEC TWP RGE

Other Services
DENRES
GYRO

Elevation
K.B. (m)
D.F. (m)
G.L. (m)

Permanent Datum
Log Measured From
Drilling Measured From
Elevation (m)

Date	21 AUG 2017		
Run Number	ONE		
Depth Driller (m)	652.30		
Depth Logger (m)	645.73		
Bottom Logged Interval (m)	645.73		
Top Log Interval (m)	0.00		
Casing Driller (m)	6.00		
Casing Logger (m)	N/A		
Bit Size (mm)	139.70		
Type Fluid in Hole	POLYMER		
Reported Density (kg/m3)	1020		
Reported Viscosity (cp)	40		
Source of Sample	N/A		
pH	N/A		
Fluid Loss (cc)	N/A		
Rm @ Meas. Temp (Ohmm @ °C)	N/A		
Rm @ BHT (Ohmm @ °C)	N/A		
Magnetic Declination (°)	N/A		
Time Circulation Stopped	21 AUG 2017 14h00		
Time Logger on Bottom	21 AUG 2017 17h23		
Maximum Temperature (°C)	N/A		
Equipment Number	C05		
Location	FORDING RIVER		
Recorded By	S.BEECRAFT		
Witnessed By	K. FRASER		

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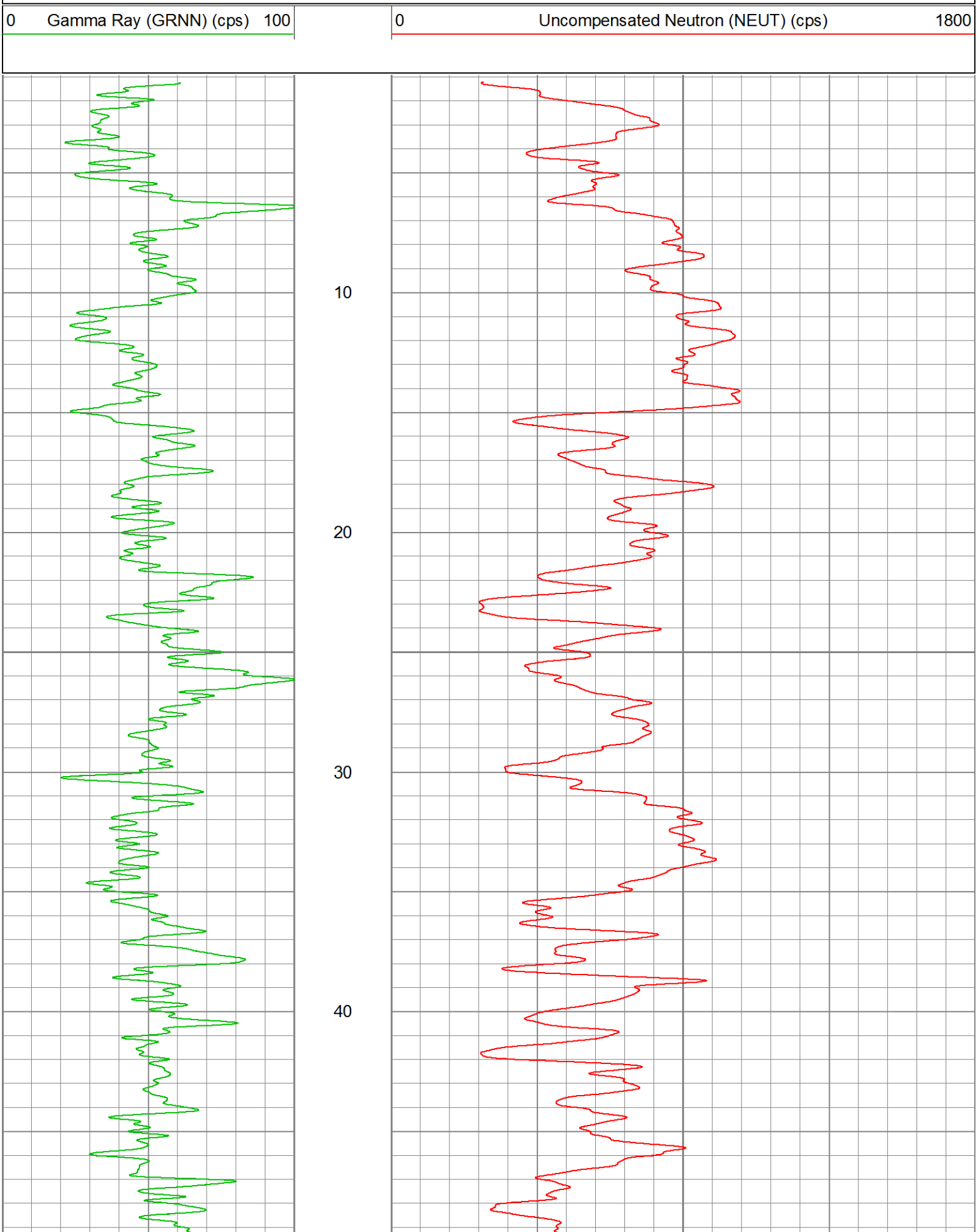
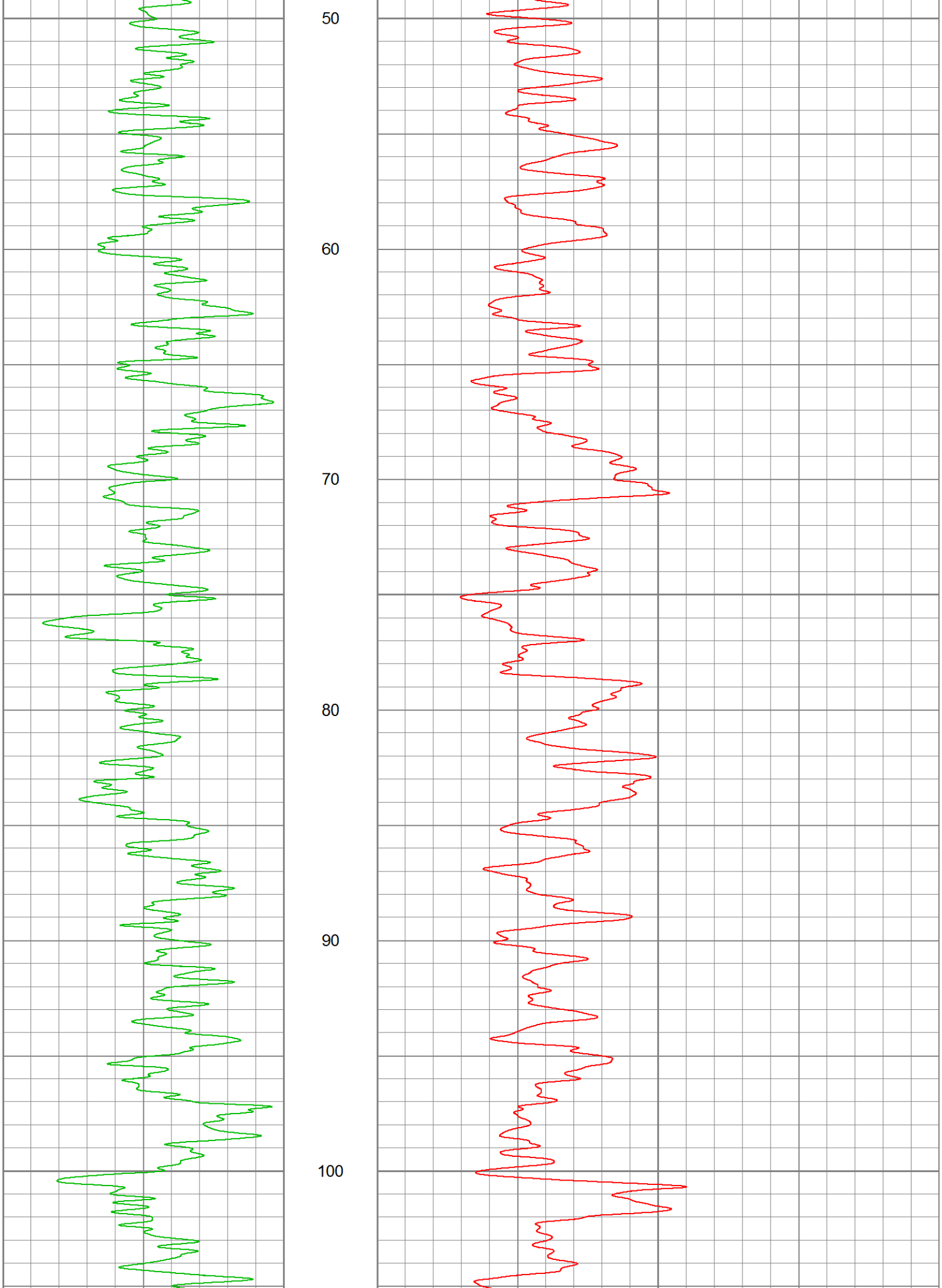
Comments

NNTS LOGGED THROUGH THE DRILL PIPE
TOOLS: NNTS1, GYRO, DIP12, GL5, DNDS3

MAIN PASS

Database File:	c:\warrior\data\fro\3402\3402cdx\3402 fro.db
Dataset Pathname:	nnts1
Presentation Format:	nnts
Dataset Creation:	Mon Aug 21 20:54:49 2017
Charted by:	Depth in Meters scaled 1:200

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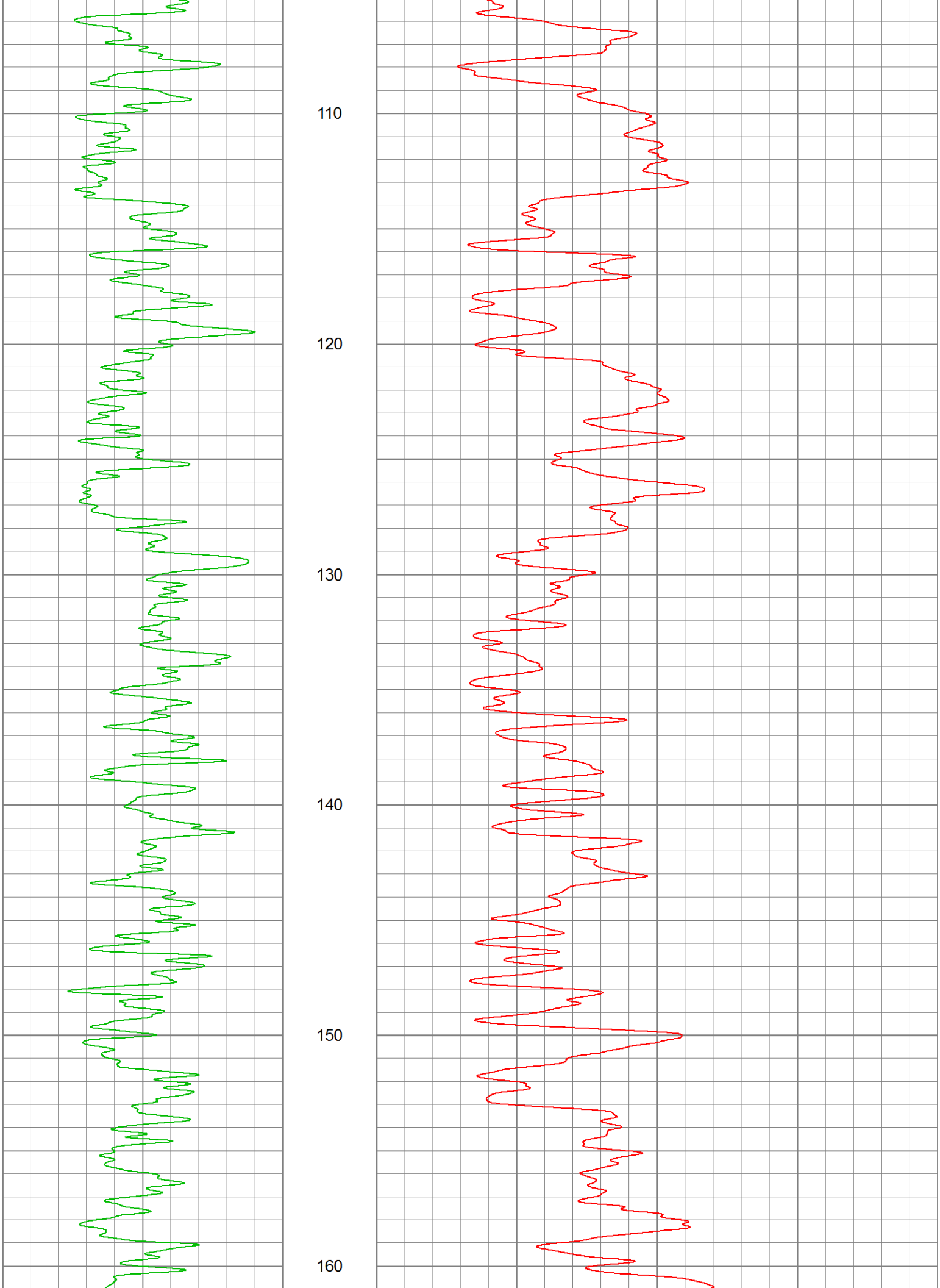
60
70
80
90
100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120
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140
150
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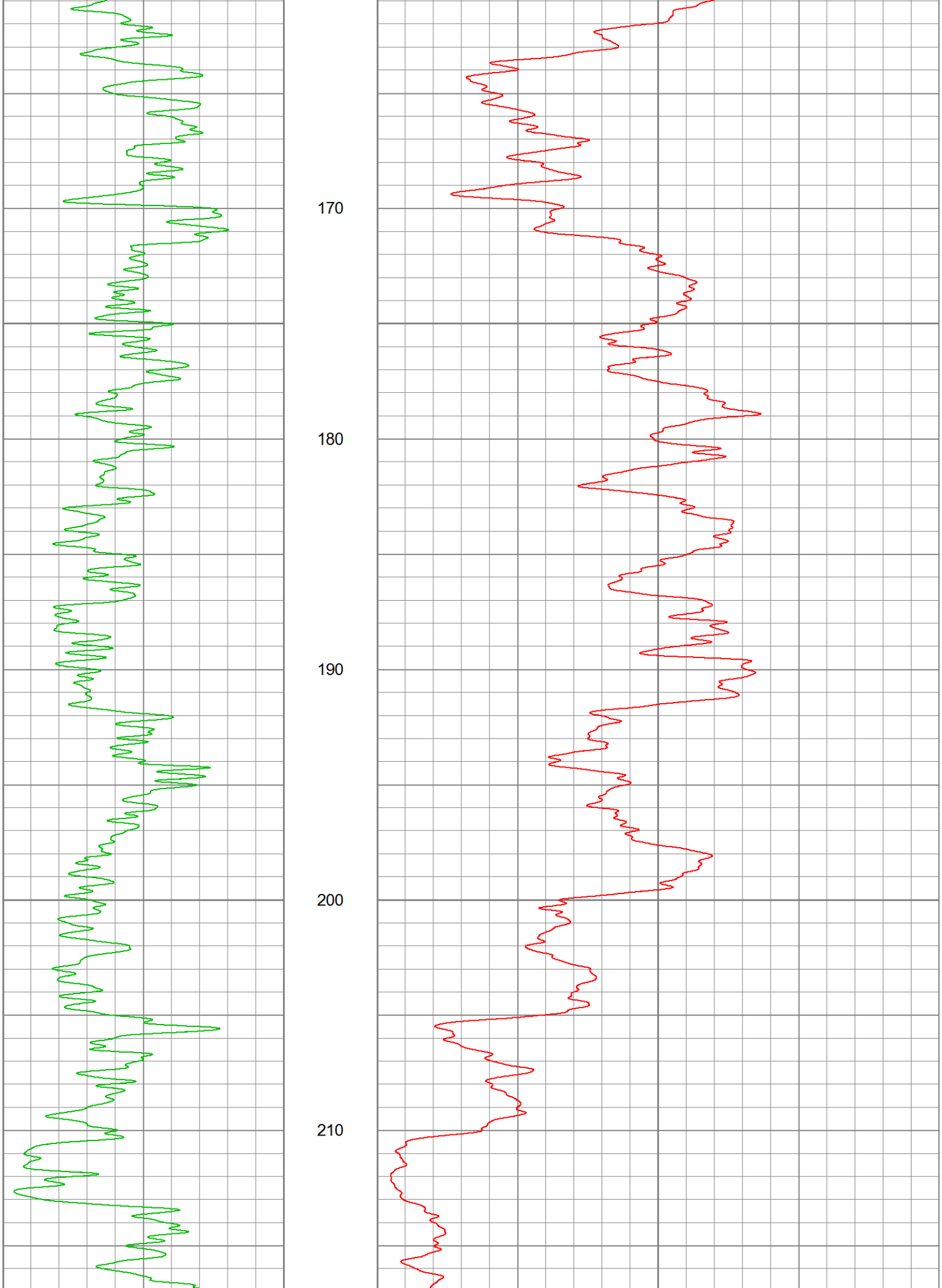
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200
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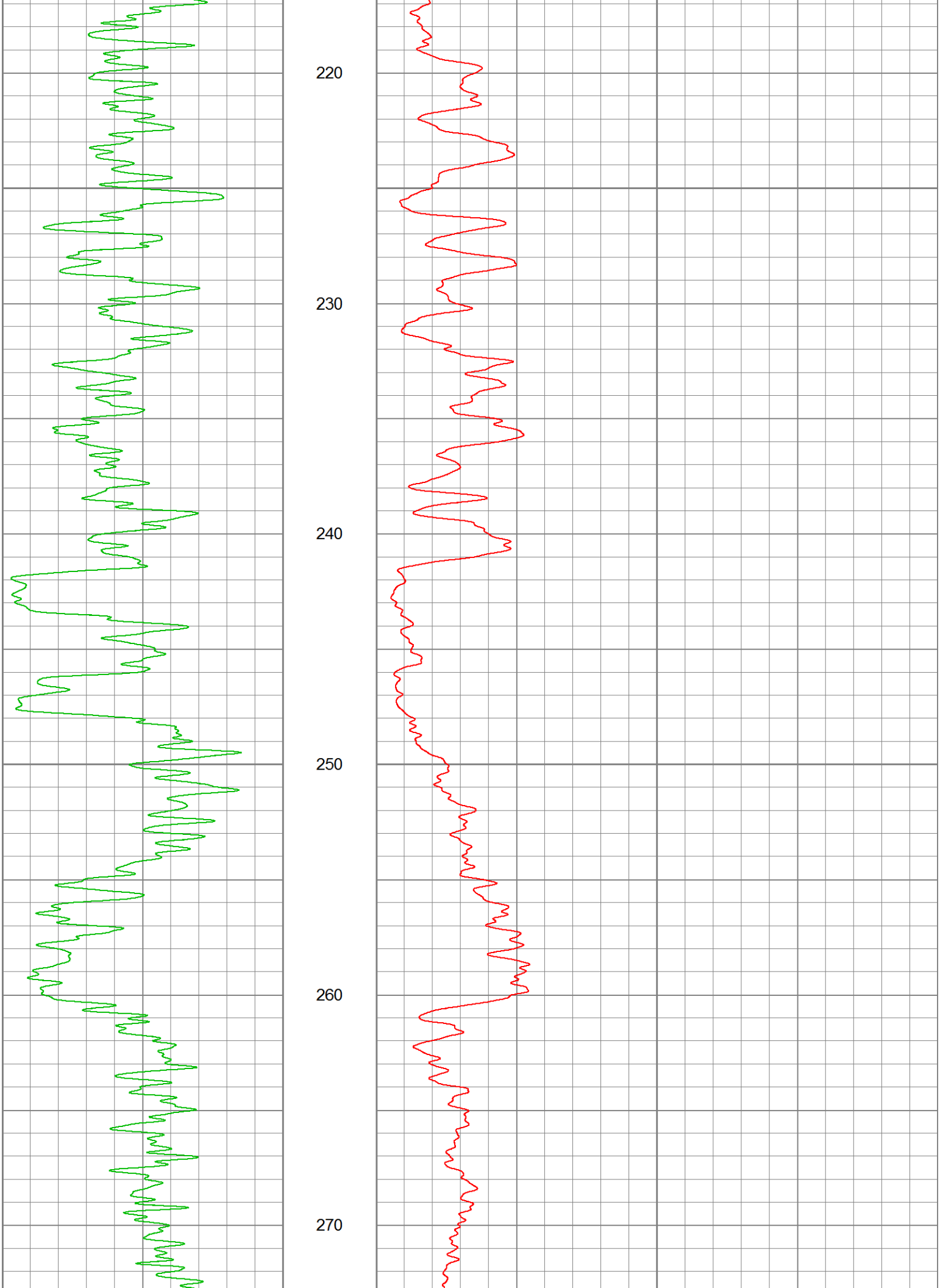
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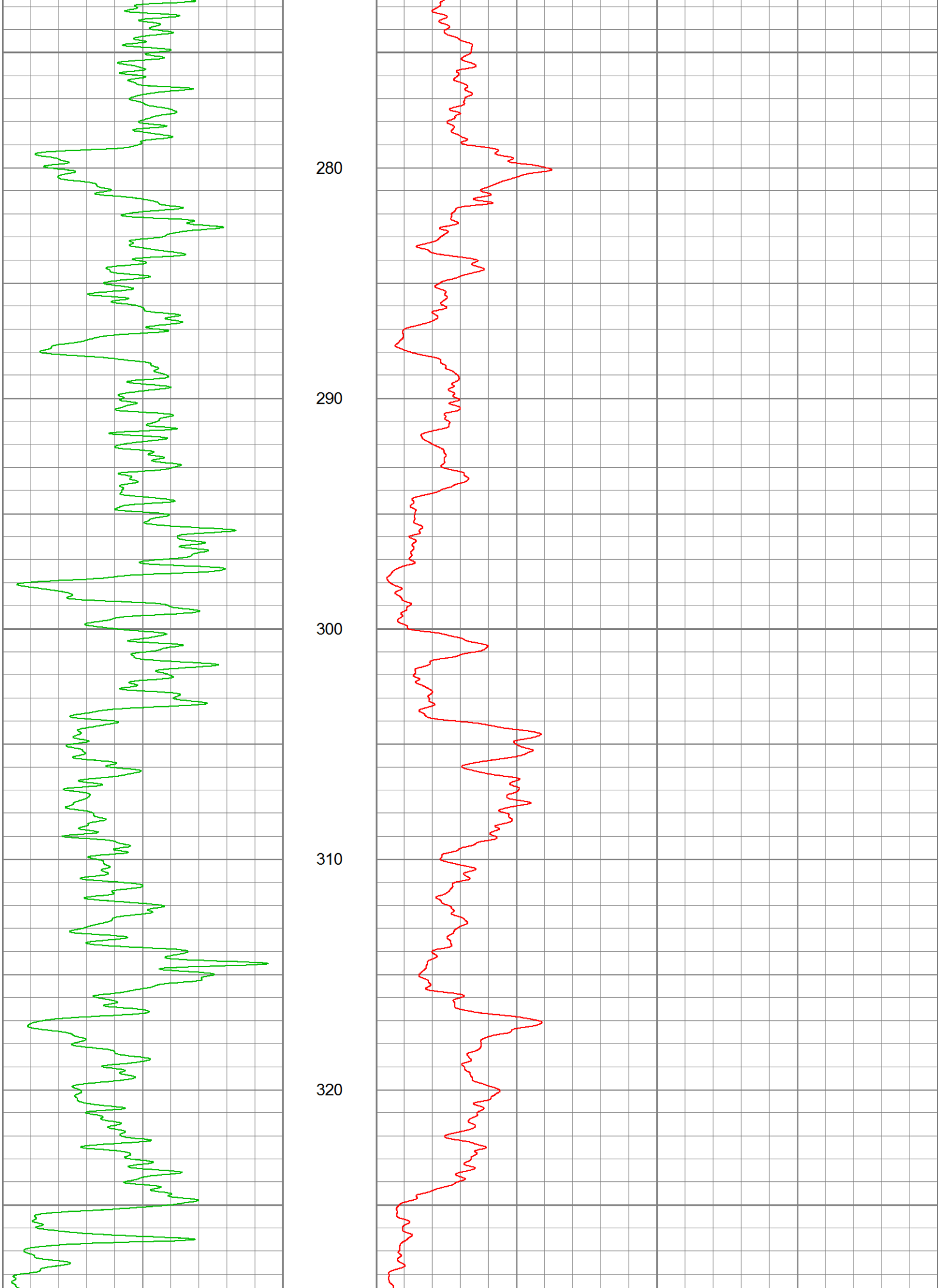
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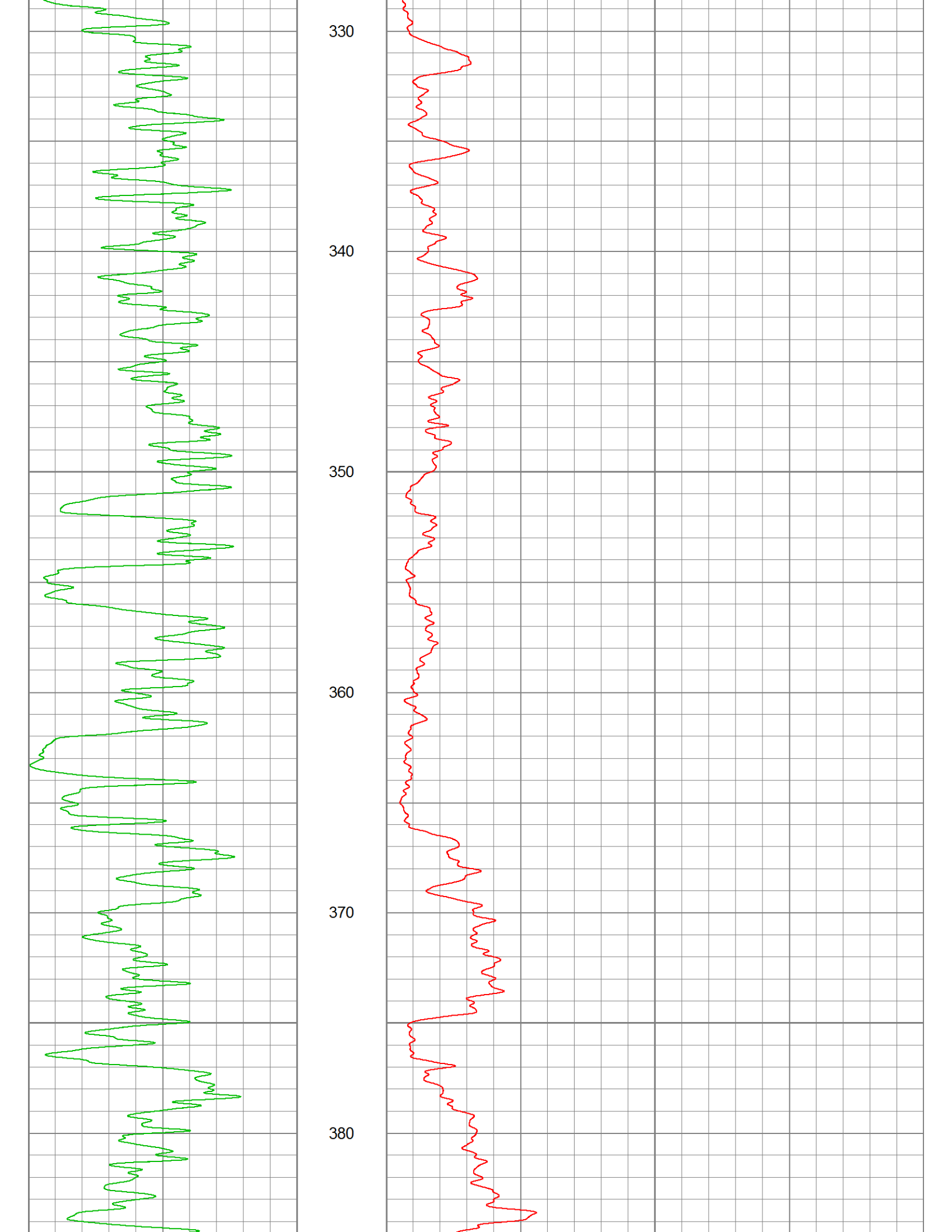
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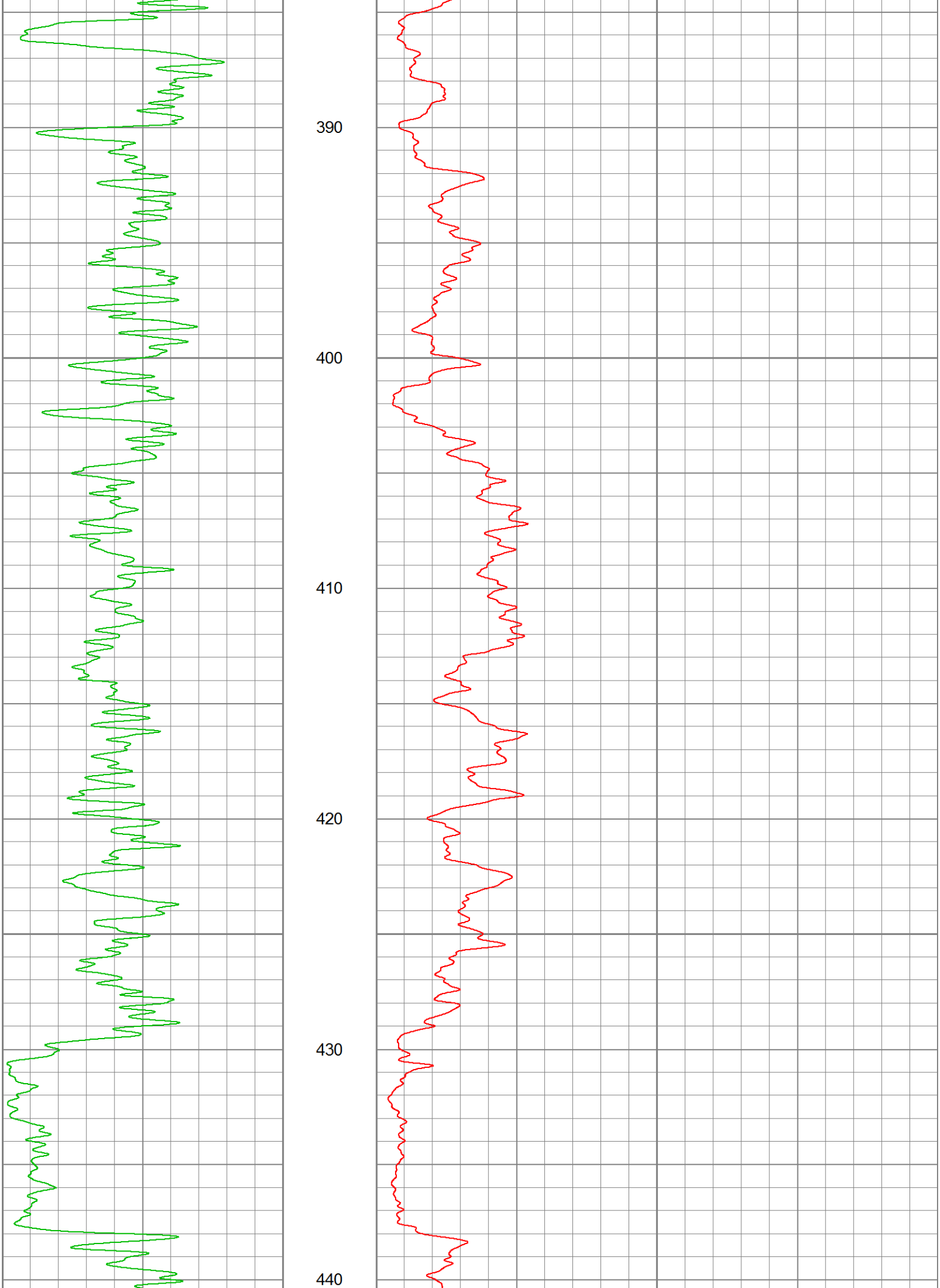
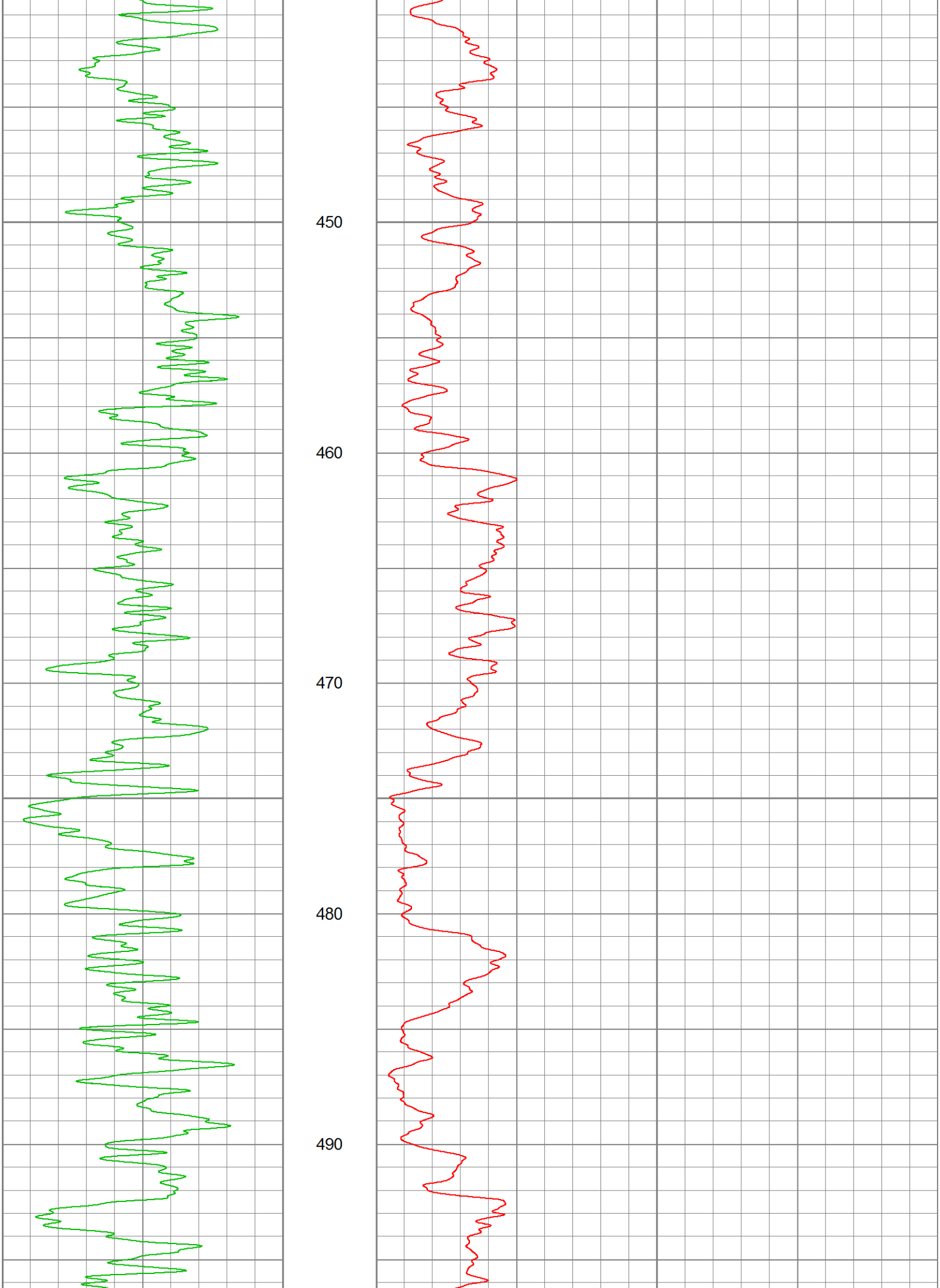
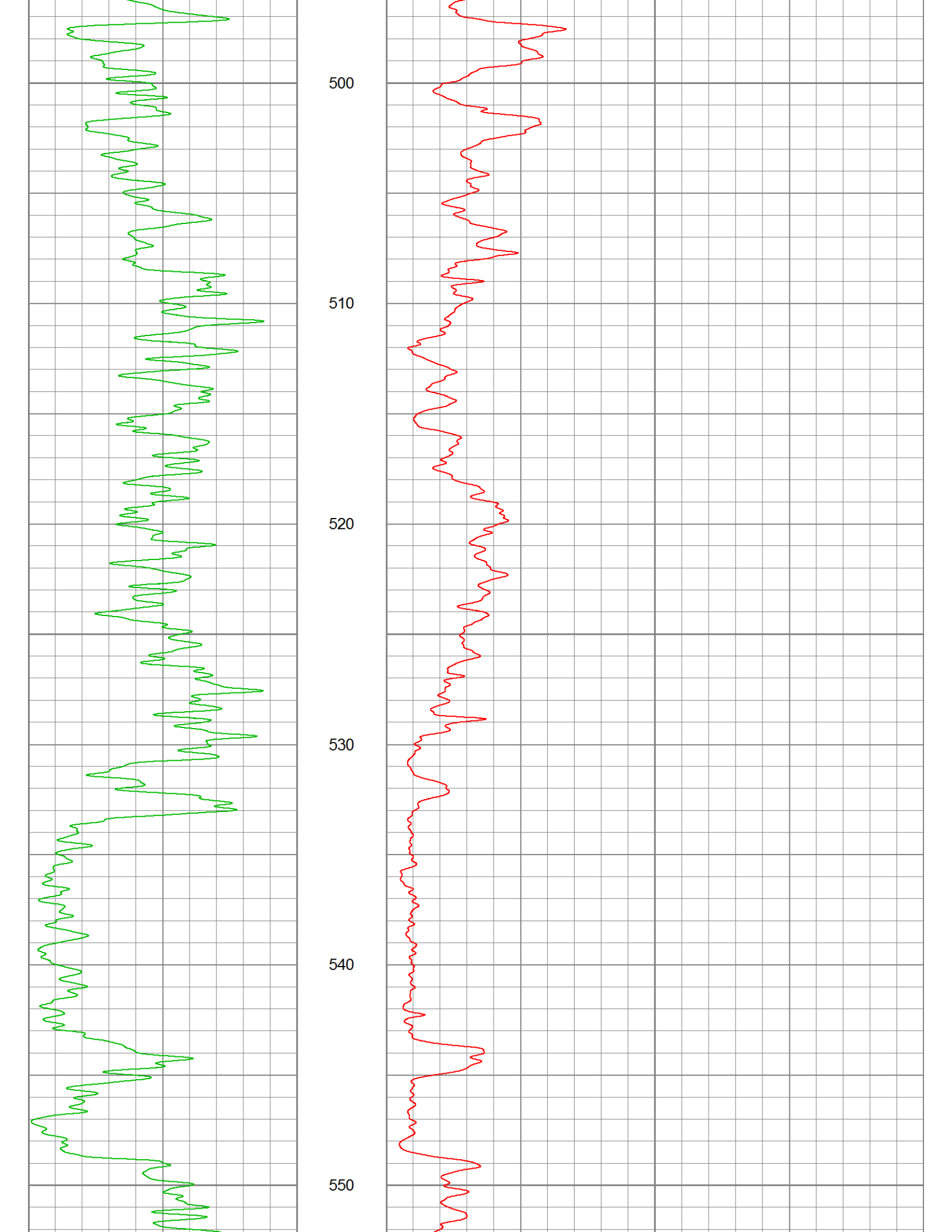
340
350
360
370
380


390
400
410
420
430
440


450
460
470
480
490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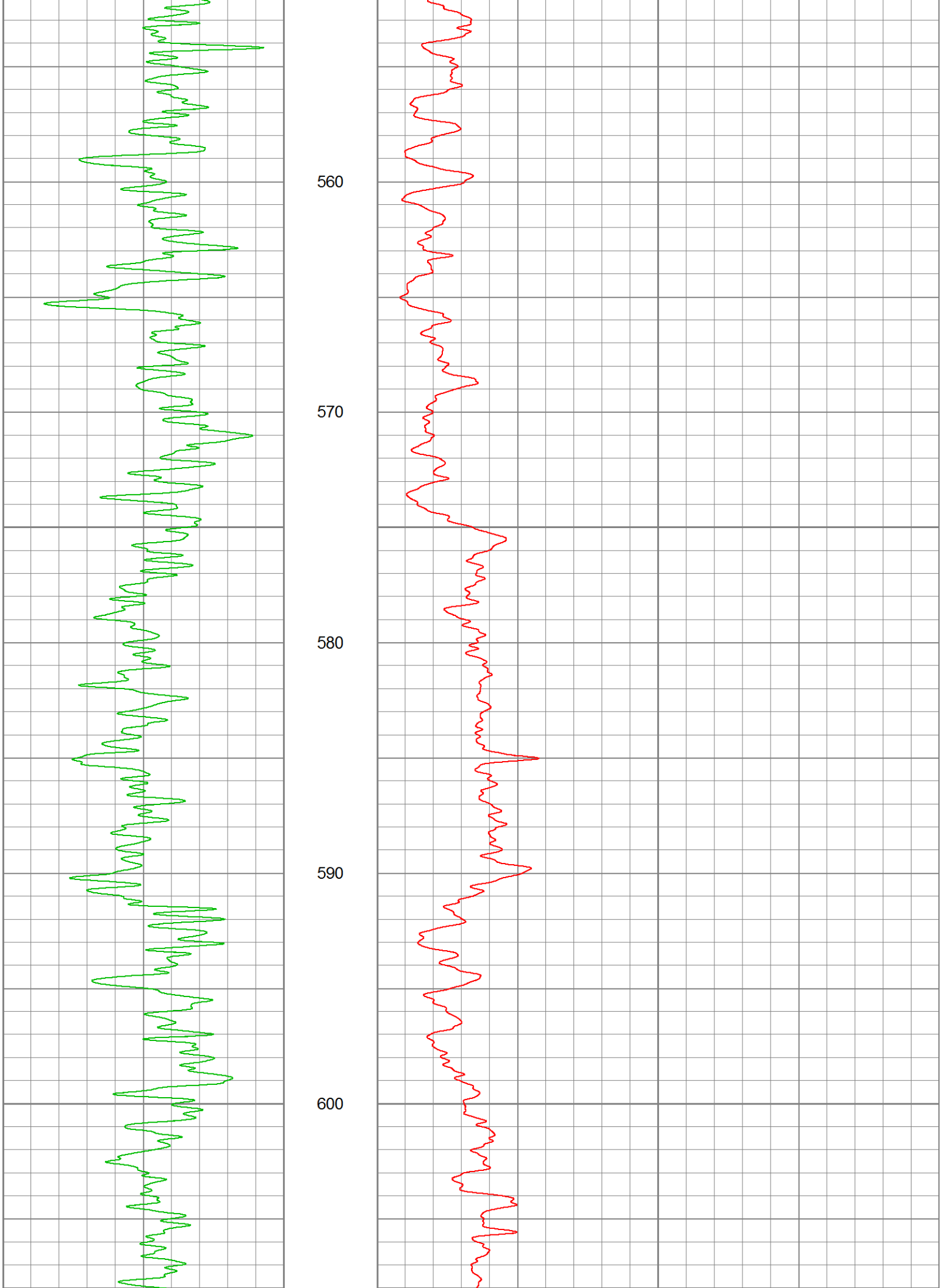
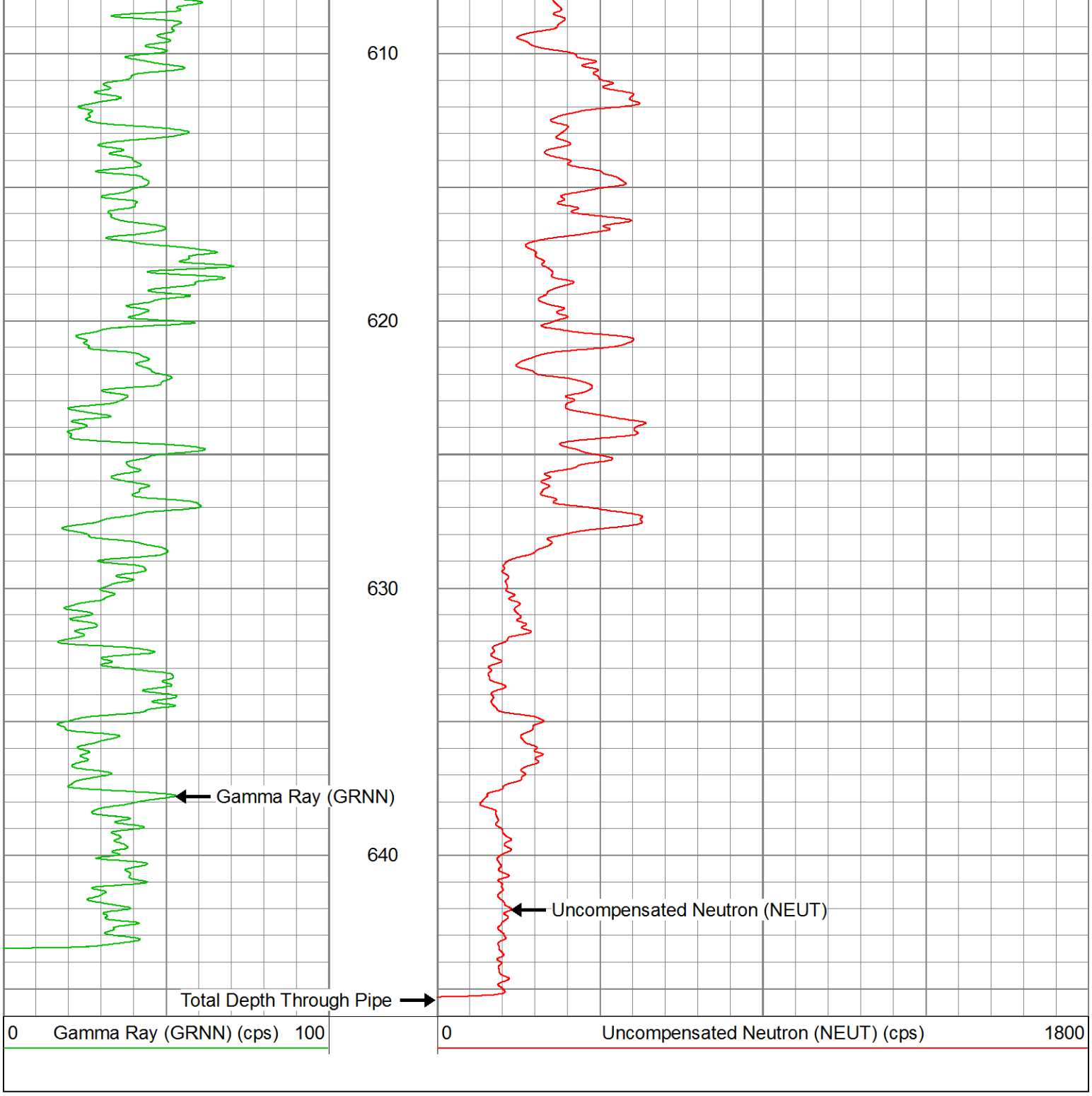
510
520
530
540
550


560
570
580
590
600



Company	TECK COAL FORDING RIVER OPERATIONS
Well	3402
Field	TURNBULL
Country	CANADA
Province	B.C.

COMPENSATED DENSITY
DEEP RESISTIVITY
GAMMA RAY, CALIPER
3403

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3403
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3403
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION: SEC TWP RGE

Other Services
NNTS
GYRO

Elevation
K.B. (m)
D.F. (m)
G.L. (m)

Permanent Datum
Log Measured From
Drilling Measured From
Elevation (m)

Date	26 AUG 2017			
Run Number	ONE			
Depth Driller (m)	671.00			
Depth Logger (m)	671.00			
Bottom Logged Interval (m)	671.00			
Top Log Interval (m)	0.00			
Casing Driller (m)	6.00			
Casing Logger (m)	5.01			
Bit Size (mm)	139.70			
Type Fluid in Hole	POLYMER			
Reported Density (kg/m3)	1020			
Reported Viscosity (cp)	40			
Source of Sample	N/A			
pH	N/A			
Fluid Loss (cc)	N/A			
Rm @ Meas. Temp (Ohmm @ °C)	N/A			
Rm @ BHT (Ohmm @ °C)	N/A			
Magnetic Declination (°)	N/A			
Time Circulation Stopped	25 AUG 2017 23h00			
Time Logger on Bottom	26 AUG 2017 22h53			
Maximum Temperature (°C)	N/A			
Equipment Number	C05			
Location	FORDING RIVER			
Recorded By	S.BEECRAFT			
Witnessed By	K. FRASER			

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Comments

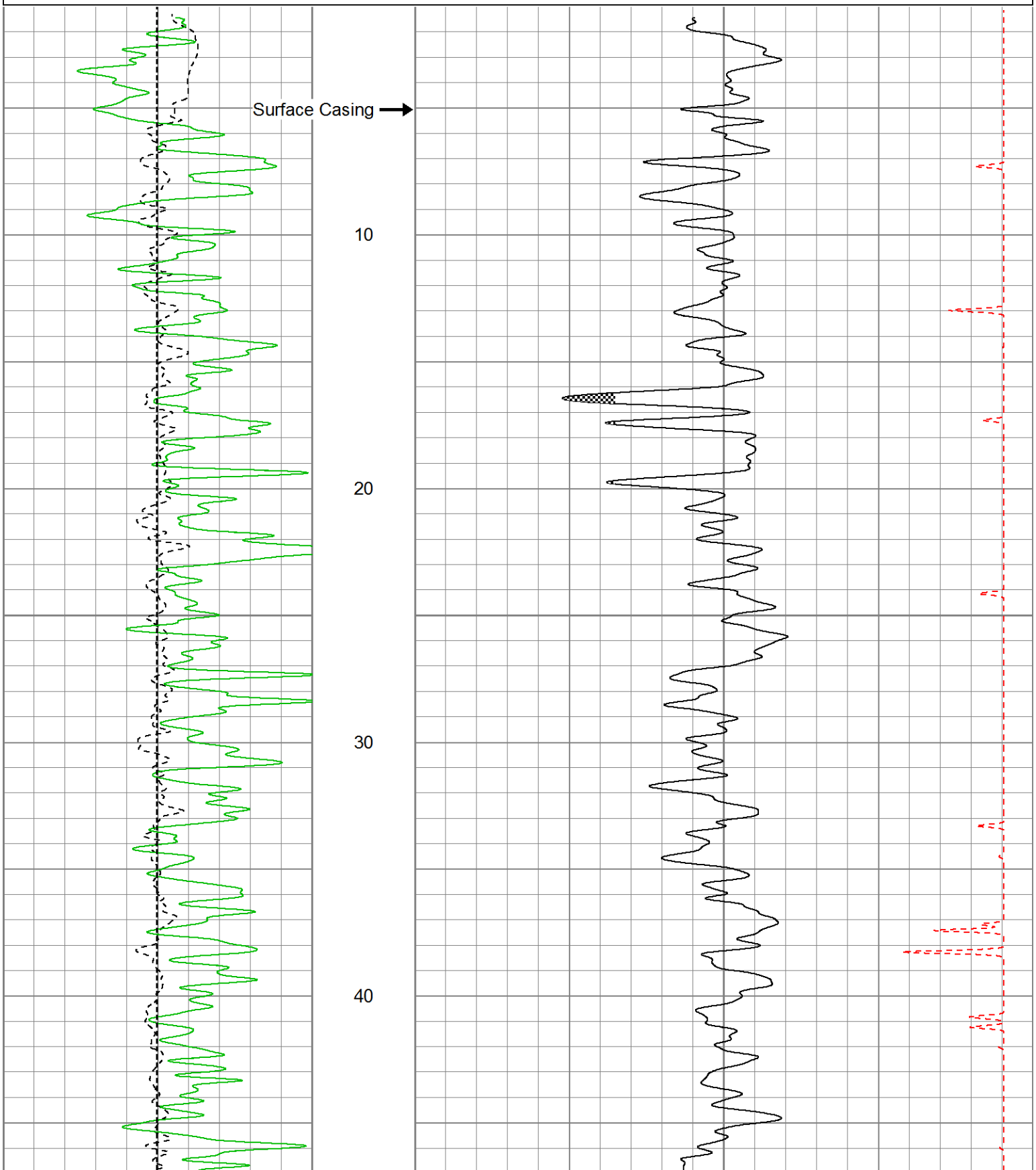
BIT SIZE 139.7 mm FROM 0 TO 275 M
BITE SIZE 135.26 mm FROM 275 TO 671 M
FLUID FOUND AT 118.82 M
TOOLS: NNTS1, GYRO, DIP12, GL5, DNDS3

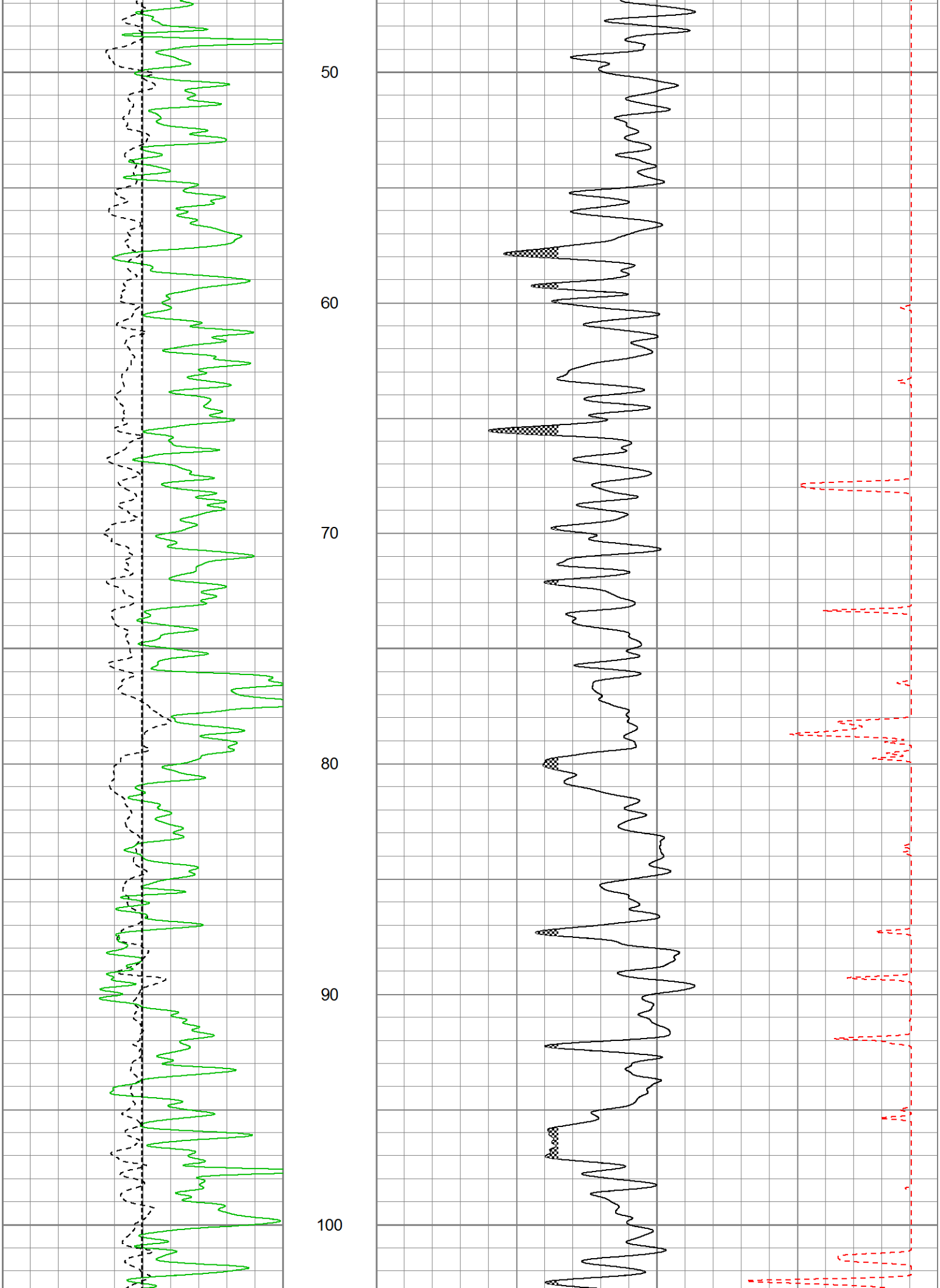
MAIN PASS

Database File:	c:\warrior\data\fro\3403\3403cdx\3403 fro.db
Dataset Pathname:	./../denres
Presentation Format:	denresdn
Dataset Creation:	Sun Aug 27 08:45:41 2017
Charted by:	Depth in Meters scaled 1:200

90	Density Caliper (DCAL) (mm)	190
0	Gamma Ray (GRFE) (API)	200
90	Bit Size (BIT1) (mm)	190

1	Bulk Density (DEN) (g/cc)	3
2	Deep Resistivity (DRFE) (Ohm-m)	20000

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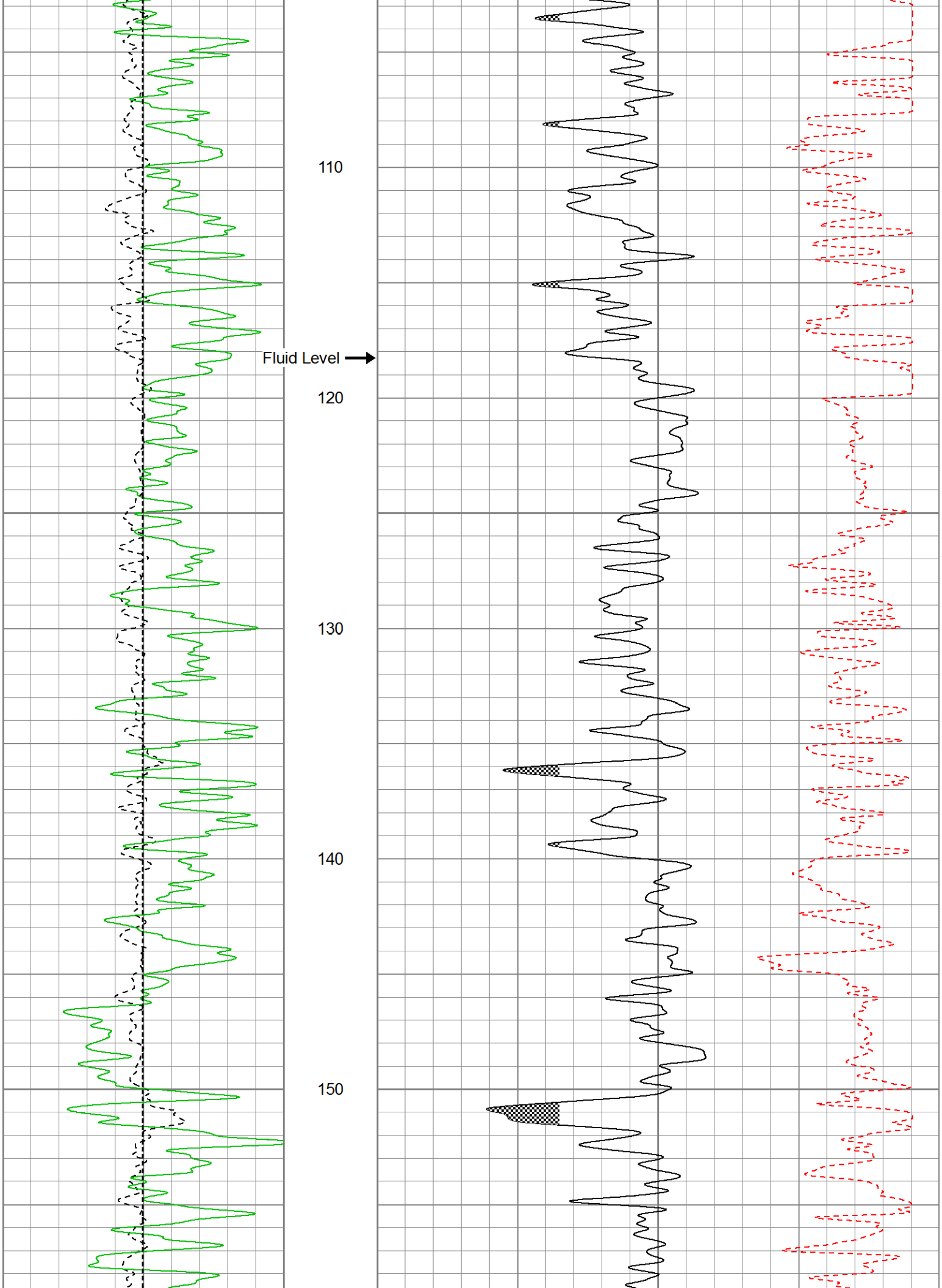
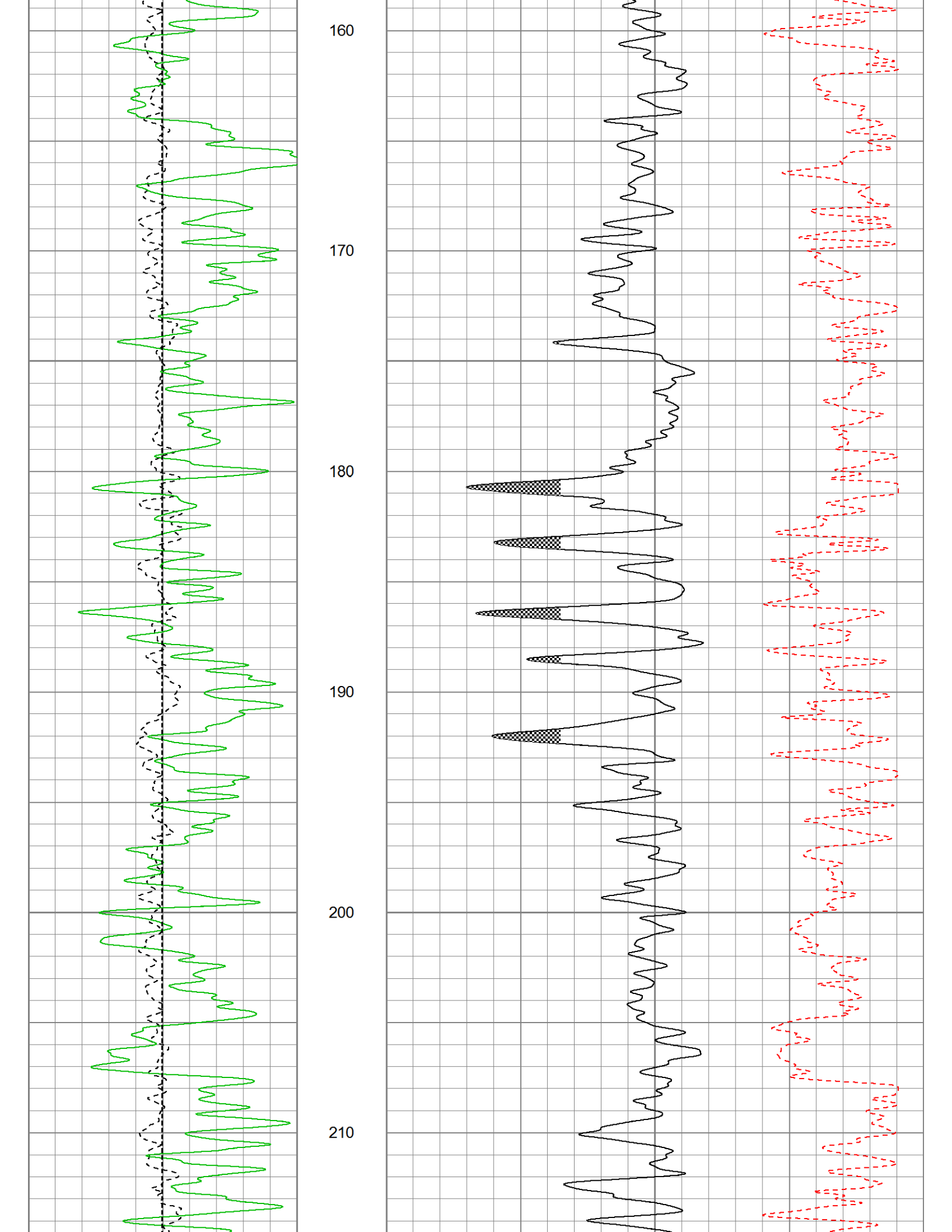
60
70
80
90
100


110
Fluid Level
120
130
140
150


160
170
180
190
200
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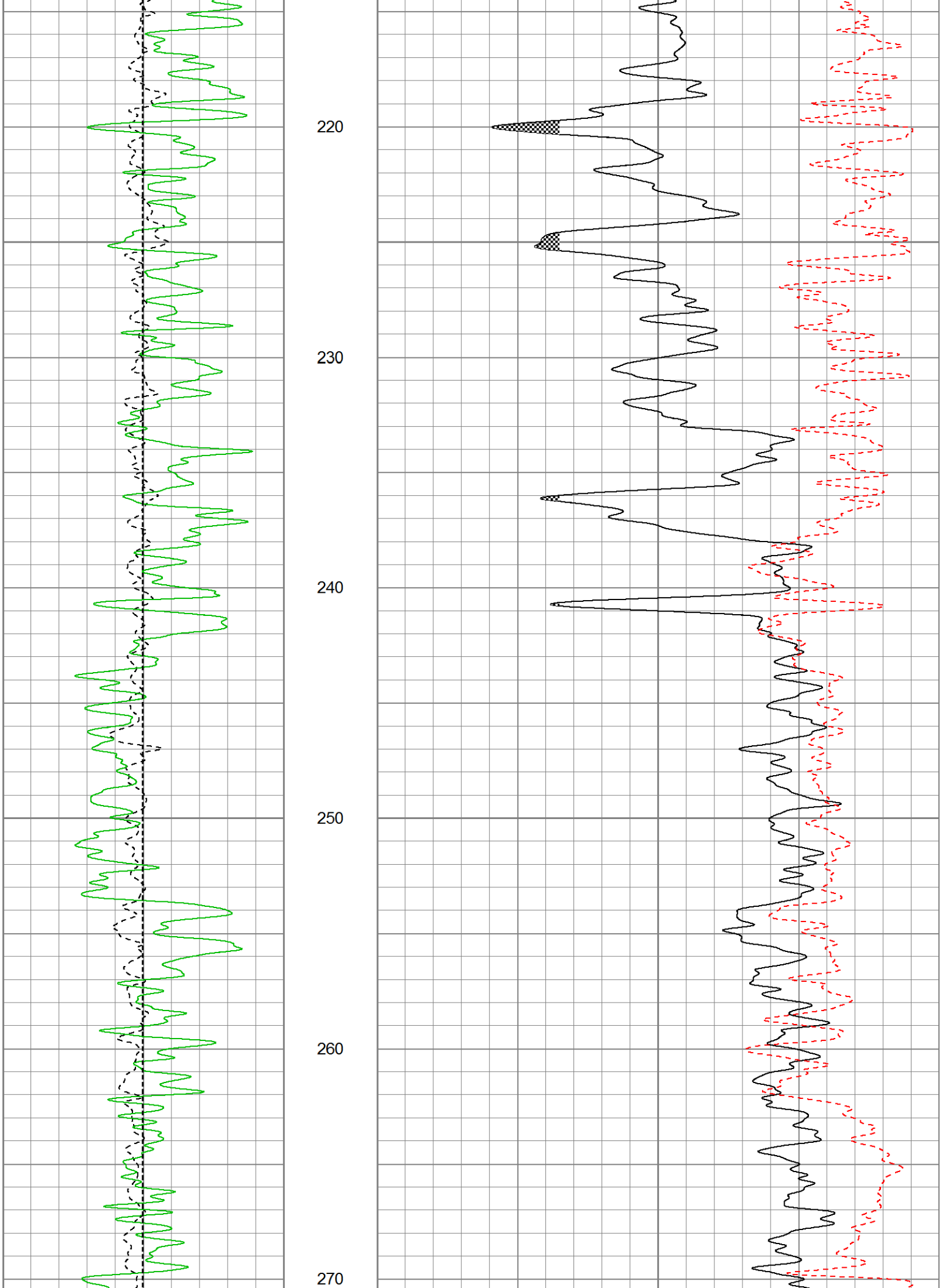
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250
260
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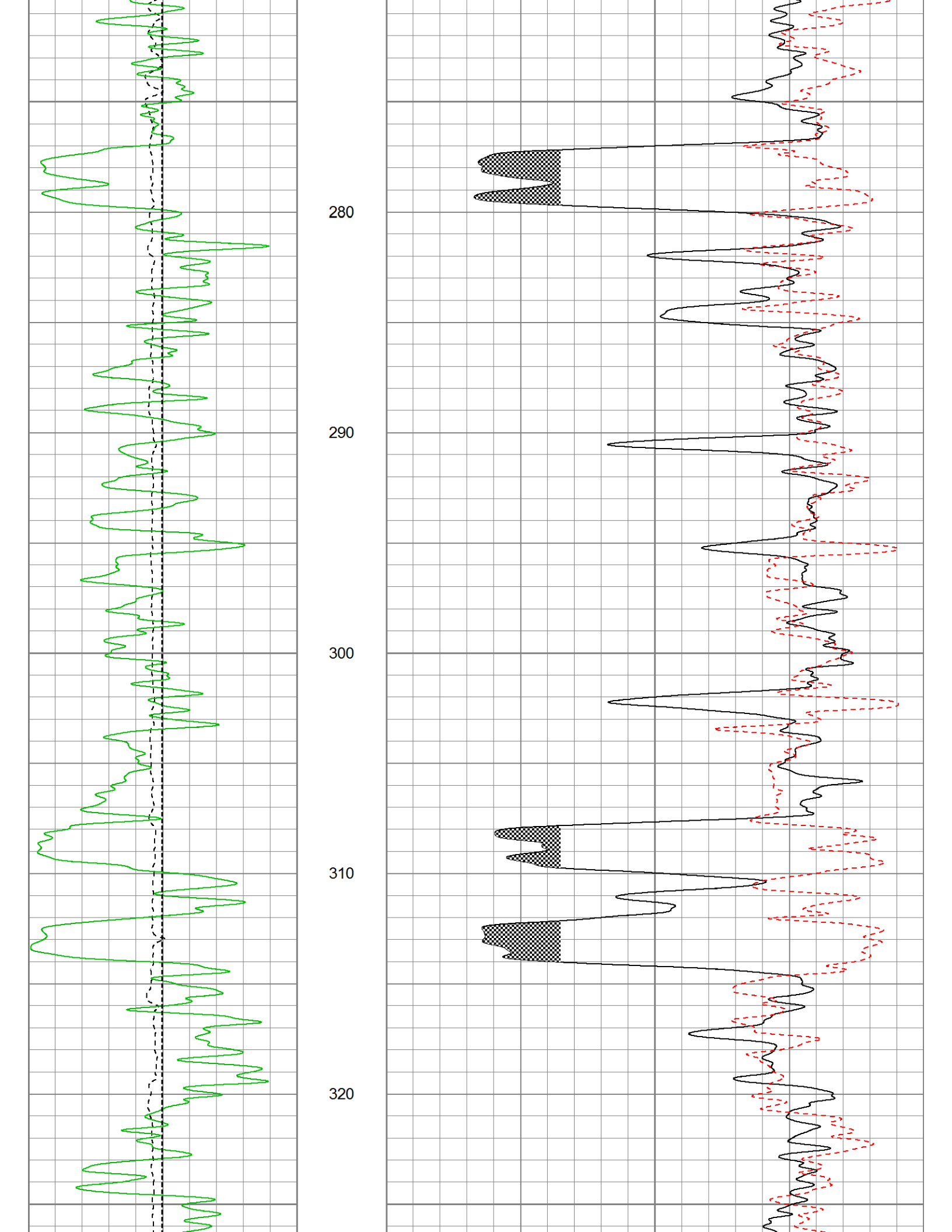
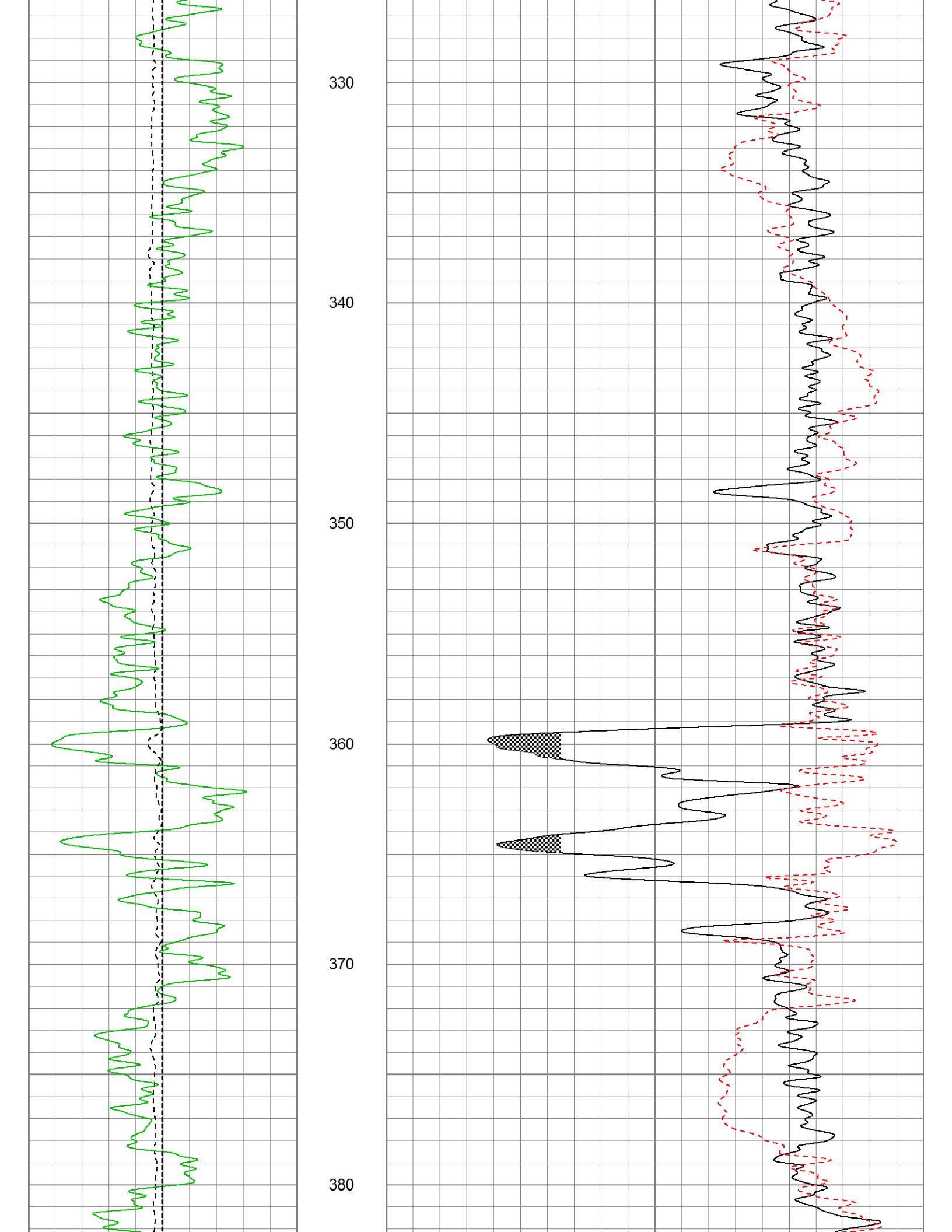
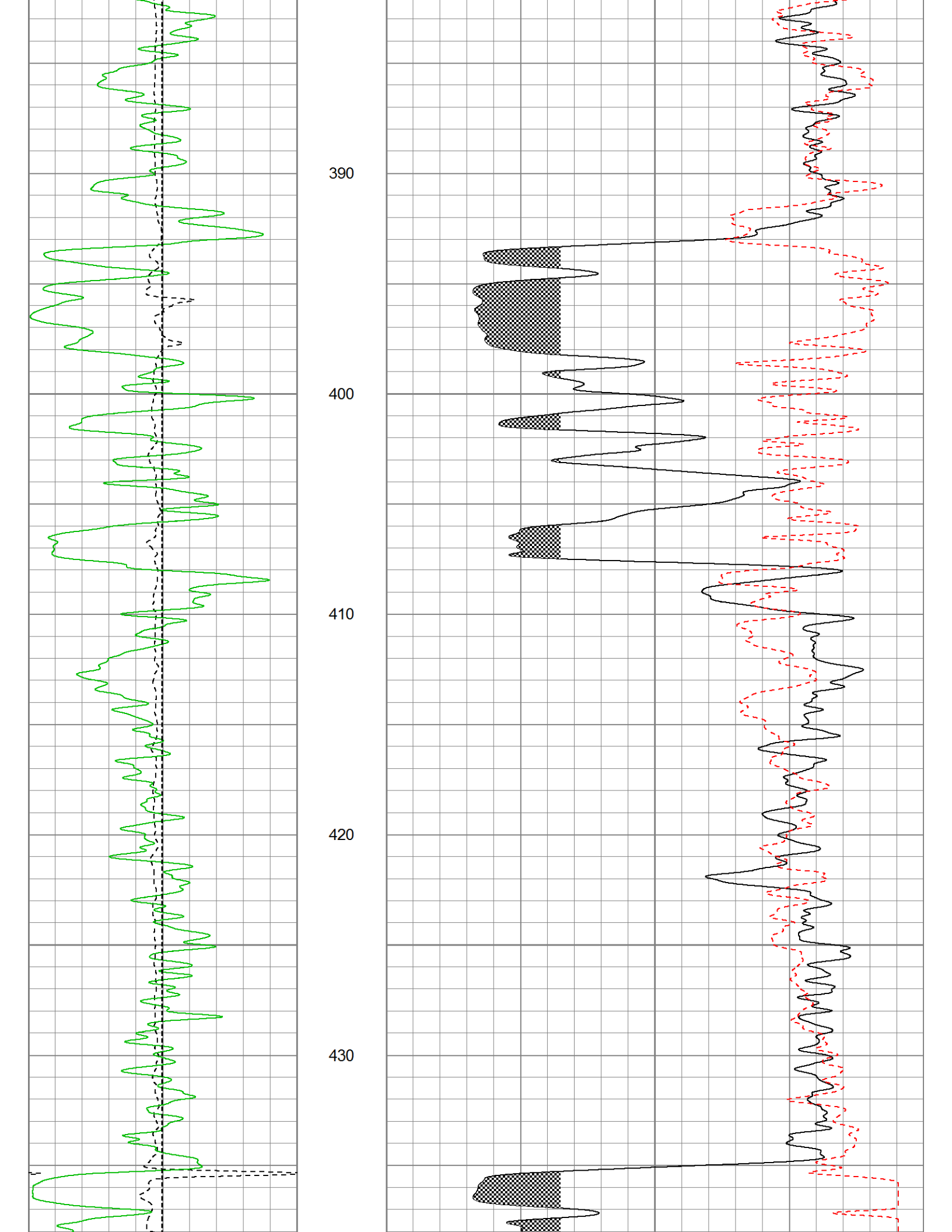
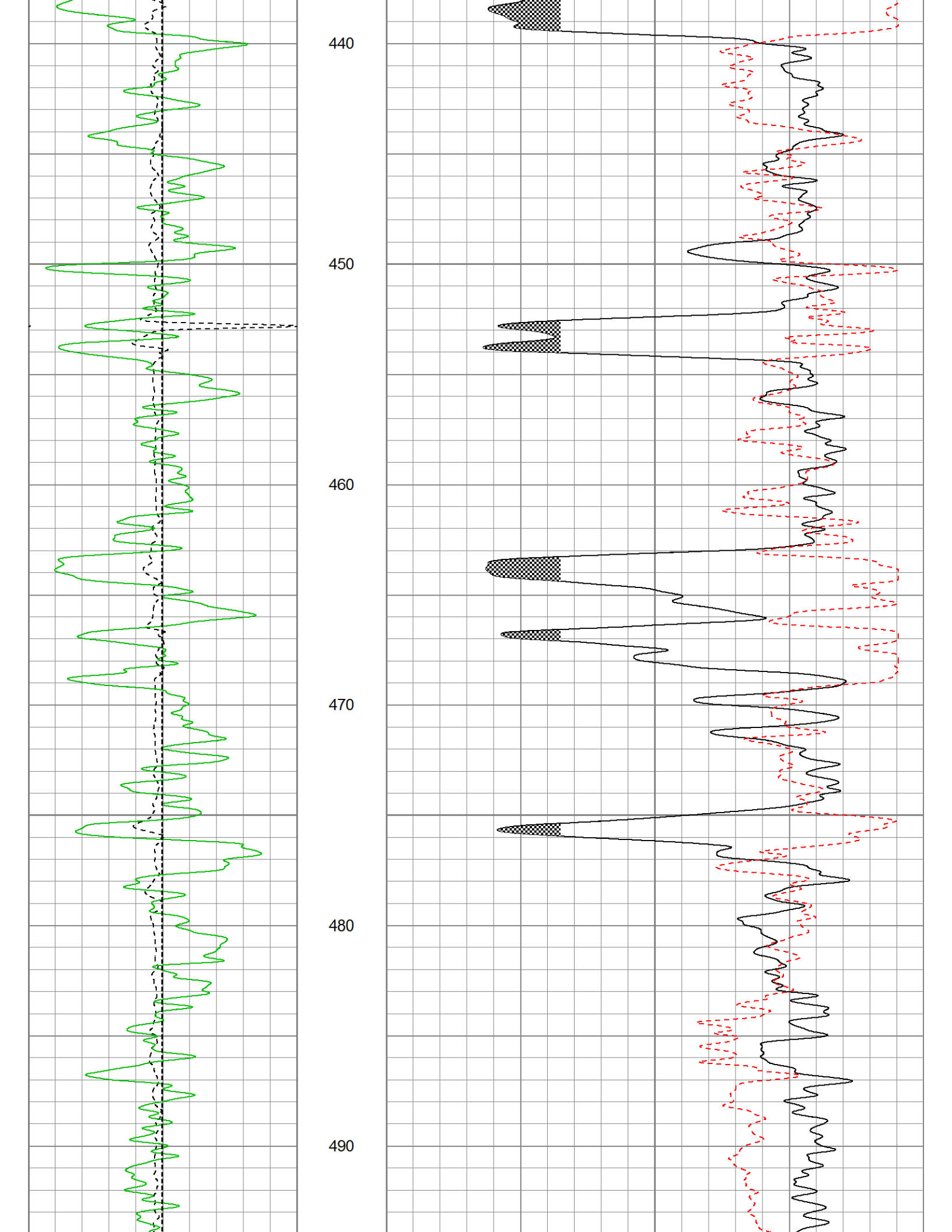
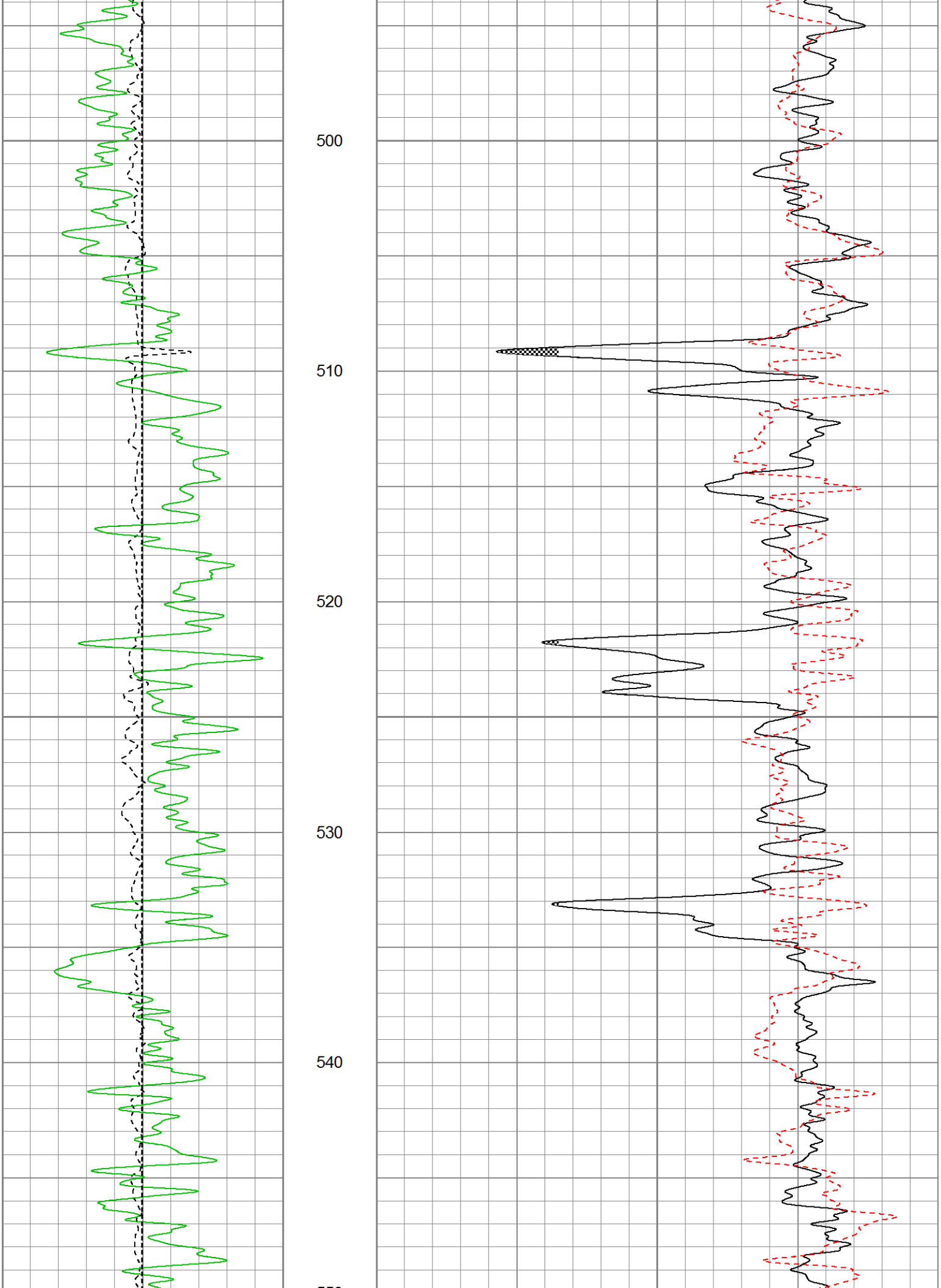
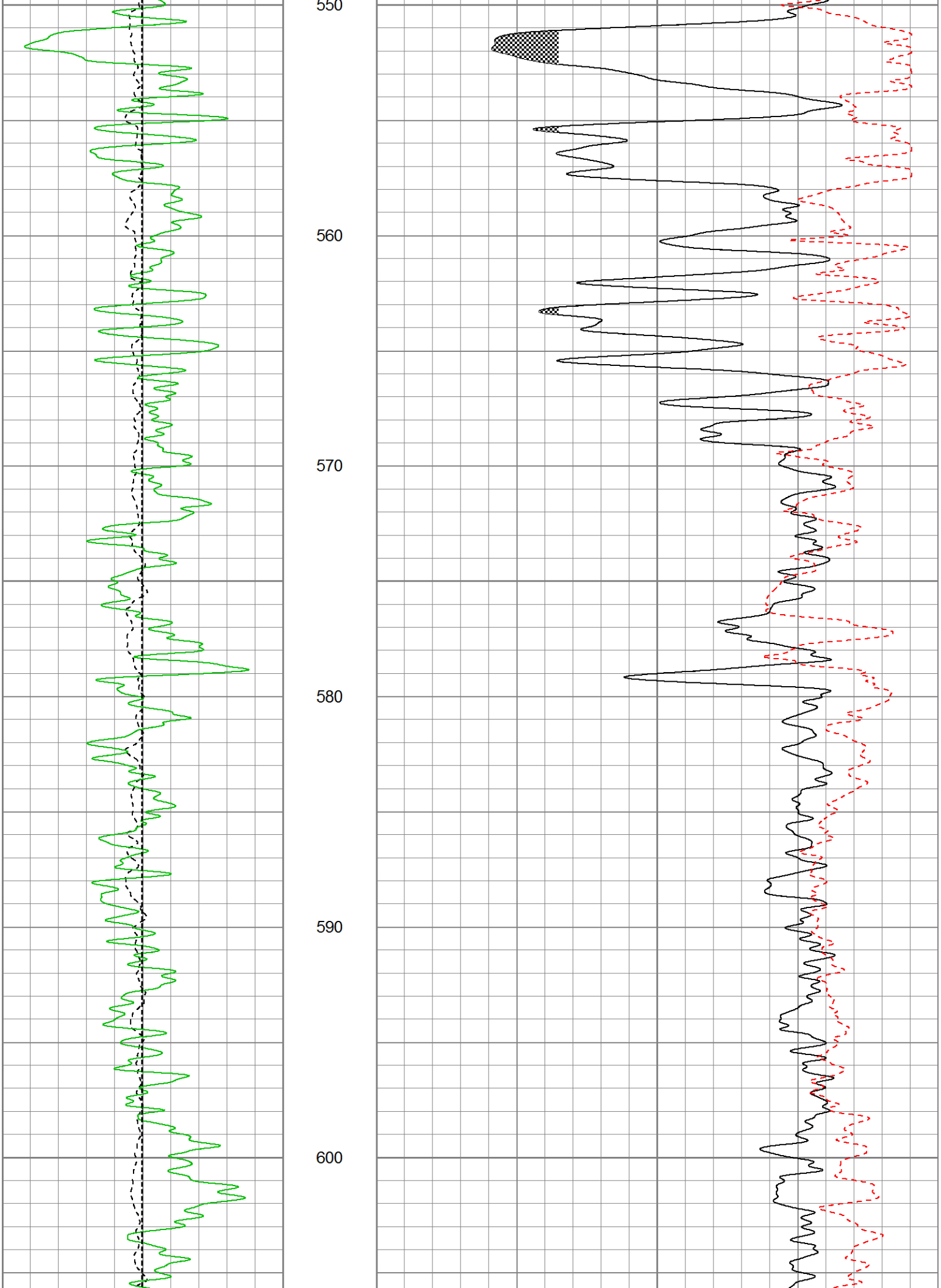

280
290
300
310
320

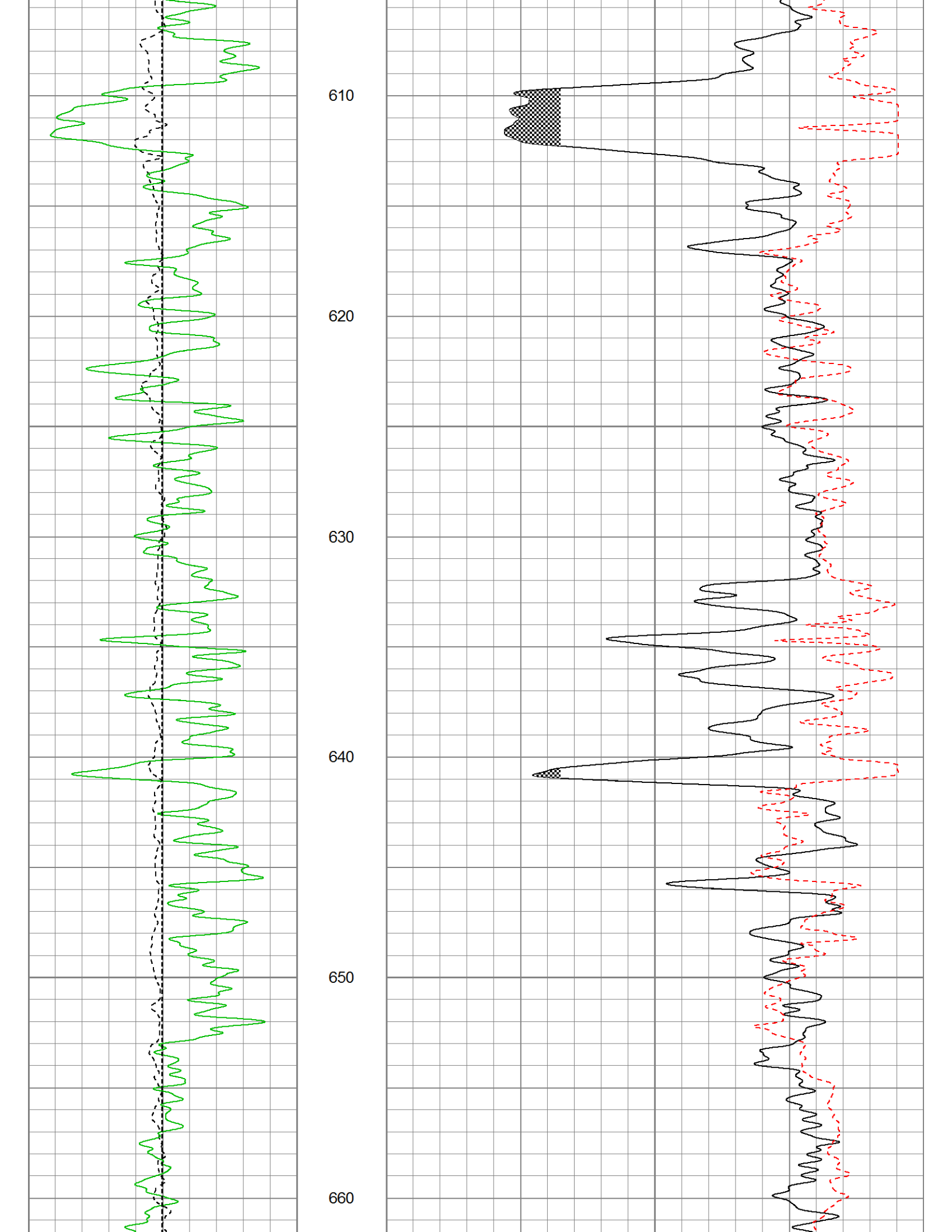

330
340
350
360
370
380

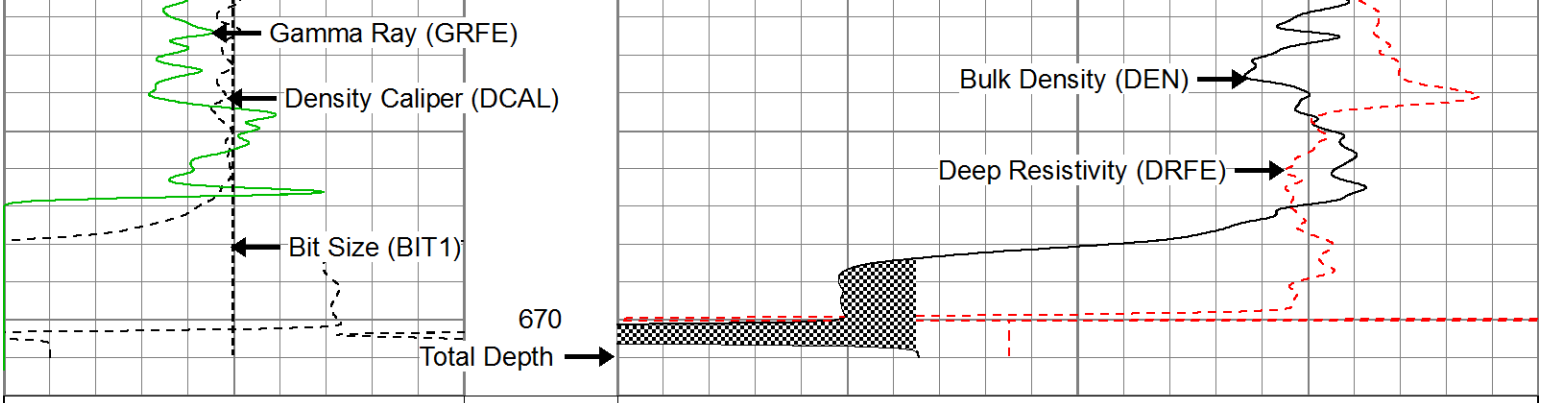

390
400
410
420
430


440
450
460
470
480
490


500
510
520
530
540


550
560
570
580
590
600


610
620
630
640
650
660



90	Density Caliper (DCAL) (mm)	190
0	Gamma Ray (GRFE) (API)	200
90	Bit Size (BIT1) (mm)	190

1	Bulk Density (DEN) (g/cc)	3
2	Deep Resistivity (DRFE) (Ohm-m)	20000

CORDAX

Company	TECK COAL FORDING RIVER OPERATIONS
Well	3403
Field	TURNBULL
Country	CANADA
Province	B.C.

GYRO VERTICALITY ANALYSIS 3403

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3403
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3403
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION:
SEC TWP RGE

Permanent Datum
Log Measured From
Drilling Measured From
Elevation (m)

Other Services
NNTS
DENRES

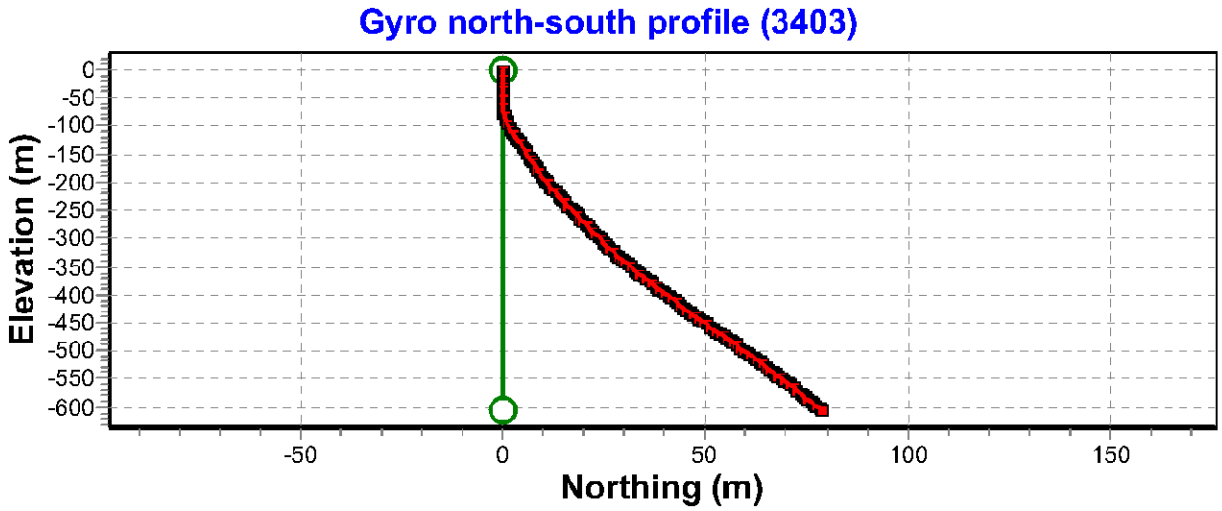
Elevation
K.B. (m)
D.F. (m)
G.L. (m)

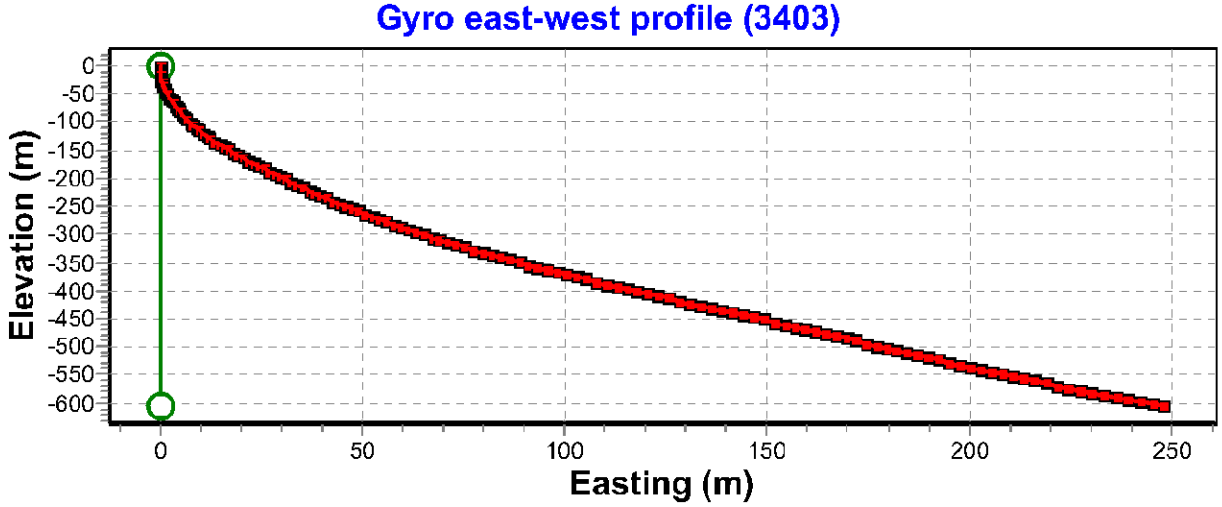
Date	26 AUG 2017		
Run Number	ONE		
Depth Driller (m)	671.00		
Depth Logger (m)	670.93		
Bottom Logged Interval (m)	670.93		
Top Log Interval (m)	0.00		
Casing Driller (m)	6.00		
Casing Logger (m)	N/A		
Bit Size (mm)	139.70		
Type Fluid in Hole	POLYMER		
Reported Density (kg/m3)	1020		
Reported Viscosity (cp)	40		
Source of Sample	N/A		
pH	N/A		
Fluid Loss (cc)	N/A		
Rm @ Meas. Temp (Ohmm @ °C)	N/A		
Rm @ BHT (Ohmm @ °C)	N/A		
Magnetic Declination (°)	N/A		
Time Circulation Stopped	25 AUG 2017 23h00		
Time Logger on Bottom	26 AUG 2017 01h56		
Maximum Temperature (°C)	N/A		
Equipment Number	C05		
Location	FORDING RIVER		
Recorded By	S.BEECRAFT		
Witnessed By	K. FRASER		

<<< Fold Here >>>

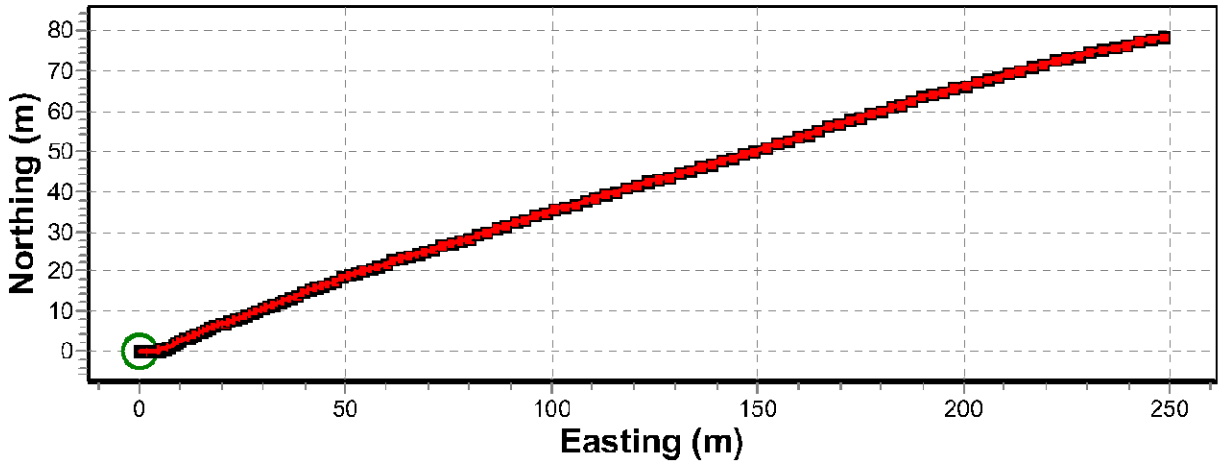
Comments

TOOLS: NNTS1, GYRO, DIP12, GL5, DNDS3

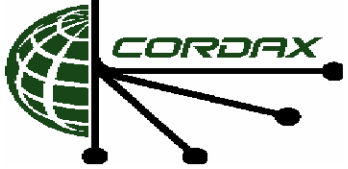

Gyro north-south profile (3403)
Elevation (m)
0
-50
-100
-150
-200
-250
-300
-350
-400
-450
-500
-550
-600
-50
0
50
100
150
Northing (m)


Gyro east-west profile (3403)
Elevation (m)
0
-50
-100
-150
-200
-250
-300
-350
-400
-450
-500
-550
-600
0
50
100
150
200
250
Easting (m)

Gyro plan view (3403)



	Company	TECK COAL FORDING RIVER OPERATIONS



Well	3403
Field	TURNBULL
Country	CANADA
Province	B.C.

UNCOMPENSATED NEUTRON GAMMA RAY
3403

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3403
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3403
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI#:
LOCATION:
SEC TWP RGE

Other Services
DENRES
GYRO

Permanent Datum — Elevation (m)
Log Measured From
Drilling Measured From

Elevation
K.B. (m)
D.F. (m)
G.L. (m)

Date	26 AUG 2017		
Run Number	ONE		
Depth Driller (m)	671.00		
Depth Logger (m)	670.99		
Bottom Logged Interval (m)	670.99		
Top Log Interval (m)	0.00		
Casing Driller (m)	6.00		
Casing Logger (m)	N/A		
Bit Size (mm)	139.70		
Type Fluid in Hole	POLYMER		
Reported Density (kg/m3)	1020		
Reported Viscosity (cp)	40		
Source of Sample	N/A		
pH	N/A		
Fluid Loss (cc)	N/A		
Rm @ Meas. Temp (Ohmm @ °C)	N/A		
Rm @ BHT (Ohmm @ °C)	N/A		
Magnetic Declination (°)	N/A		
Time Circulation Stopped	25 AUG 2017 23h00		
Time Logger on Bottom	26 AUG 2017 00h26		
Maximum Temperature (°C)	N/A		
Equipment Number	C05		
Location	FORDING RIVER		
Recorded By	S.BEECRAFT		
Witnessed By	K. FRASER		

<<< Fold Here >>>

Comments

NNTS LOGGED THROUGH THE DRILL PIPE
TOOLS: NNTS1, GYRO, DIP12, GL5, DNDS3

MAIN PASS

Database File:	c:\warrior\data\fro\3403\3403cdx\3403 fro.db
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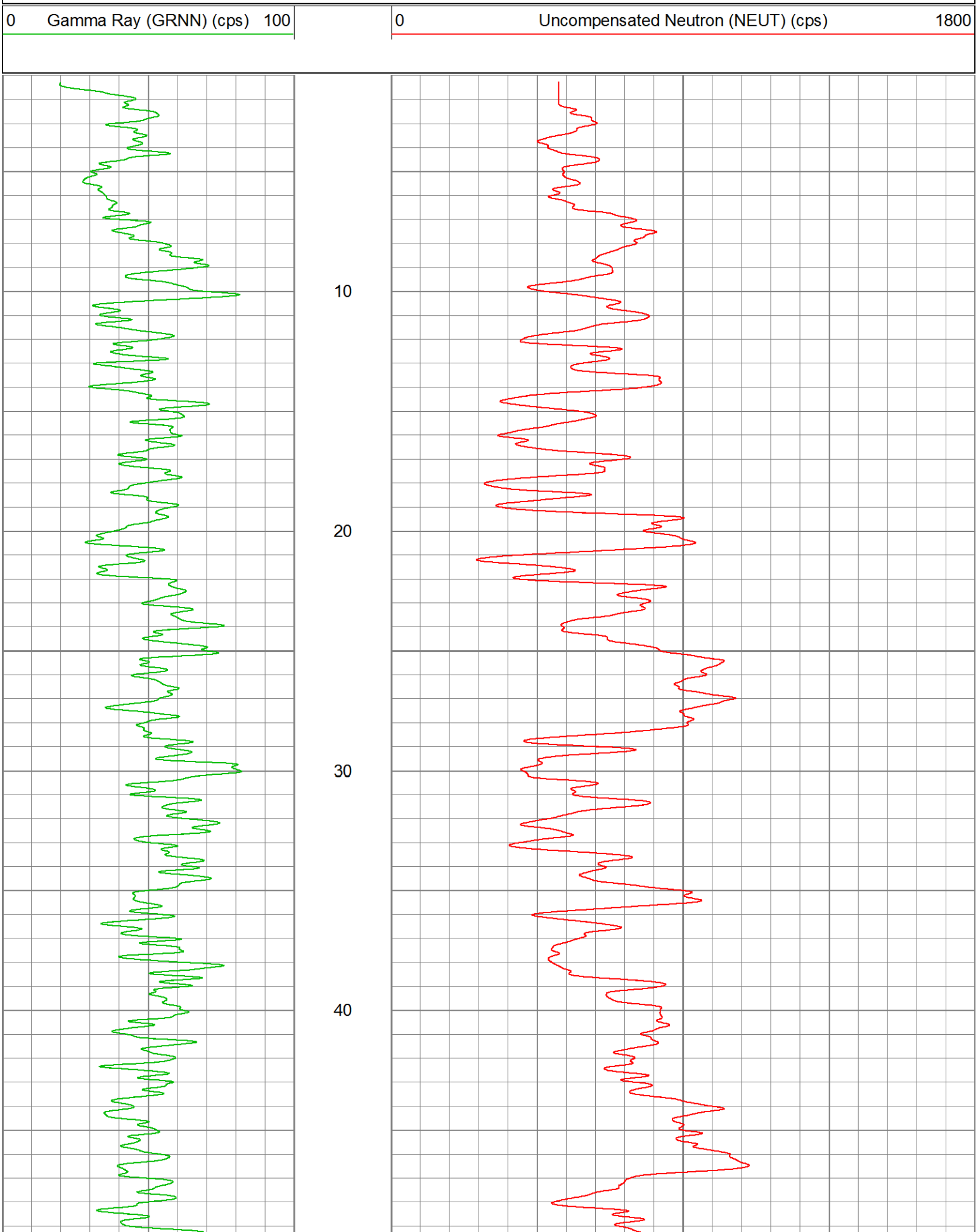
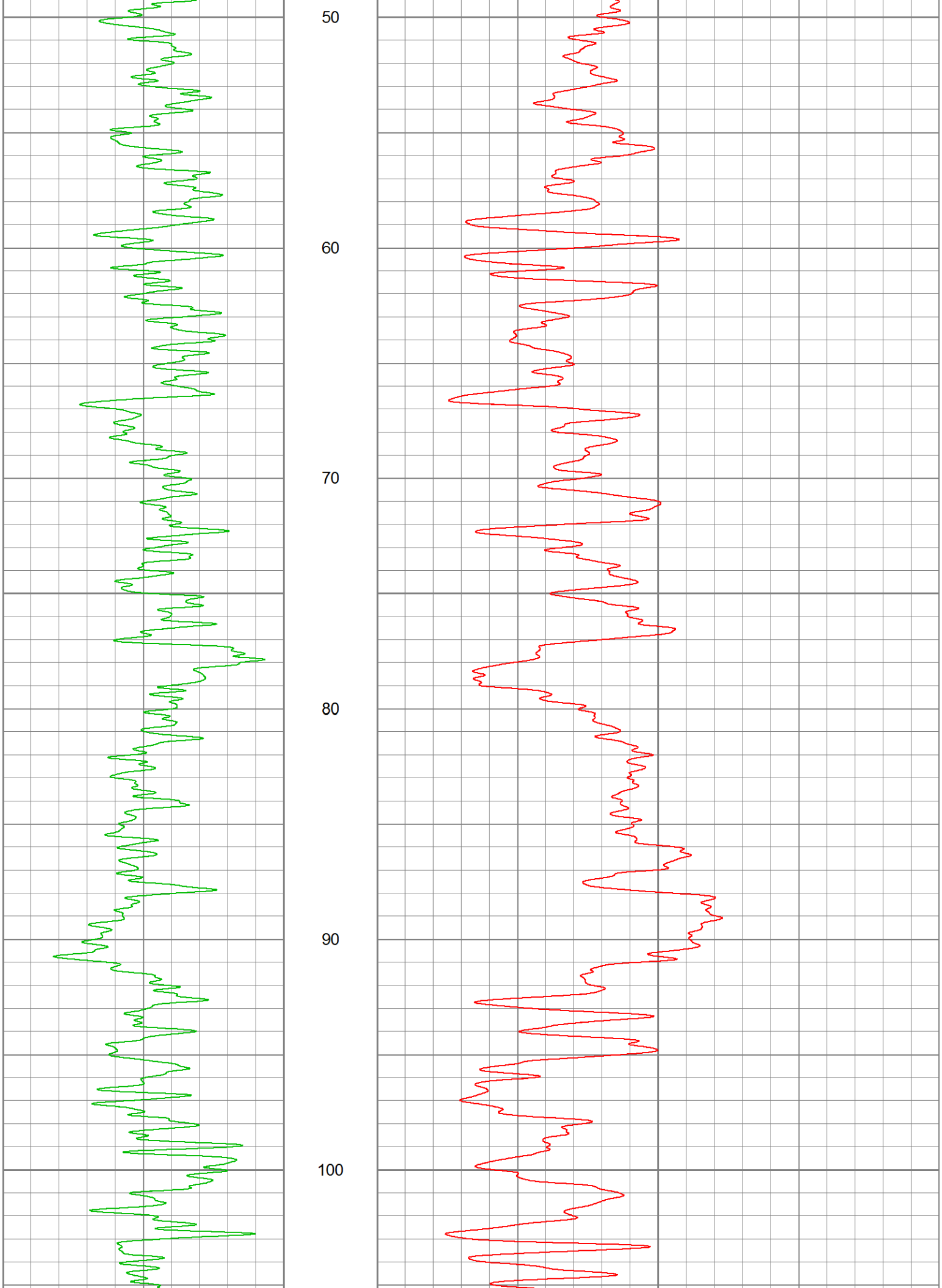
Presentation Format:	nnts
Dataset Creation:	Sat Aug 26 03:49:39 2017
Charted by:	Depth in Meters scaled 1:200

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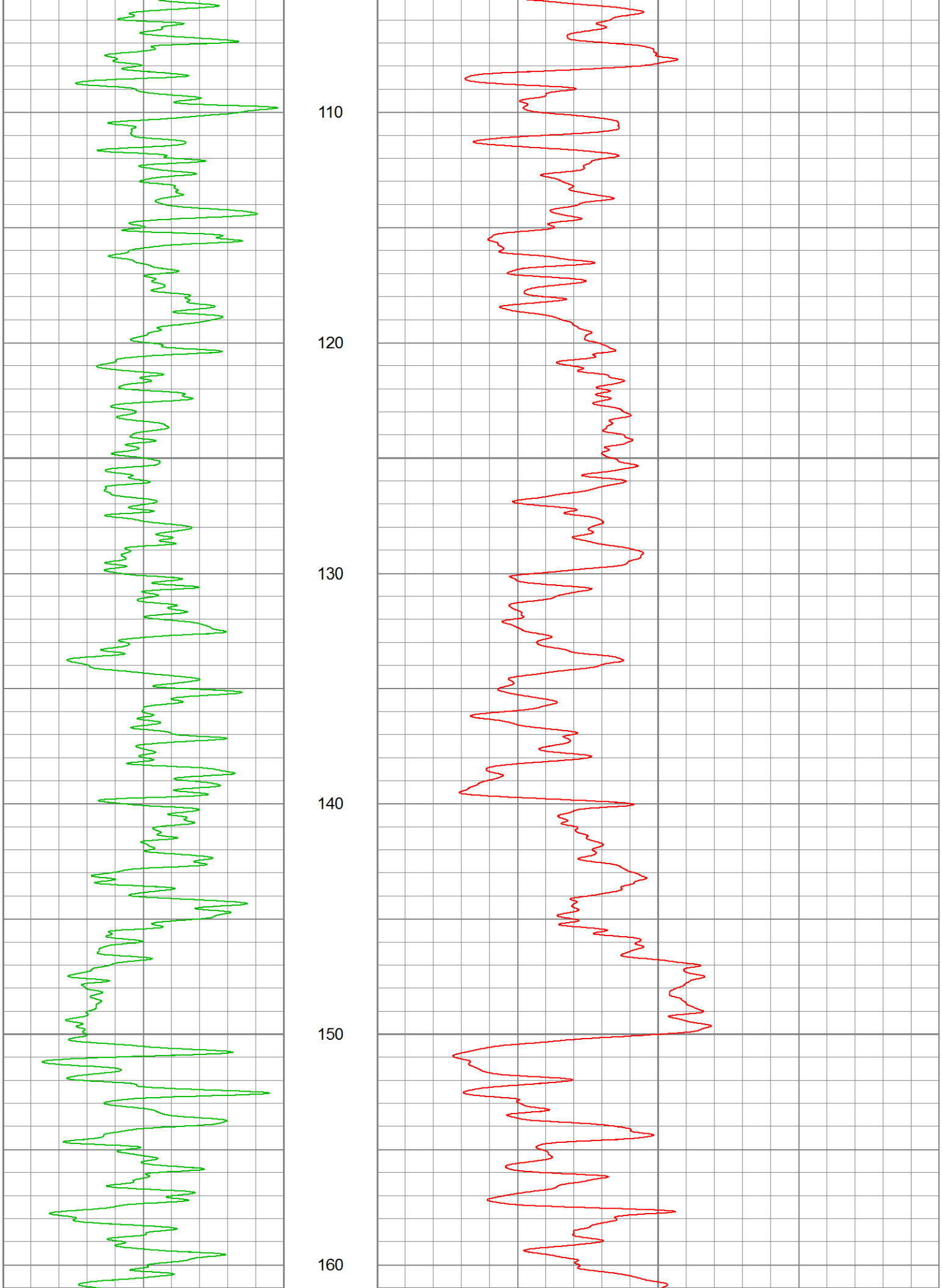
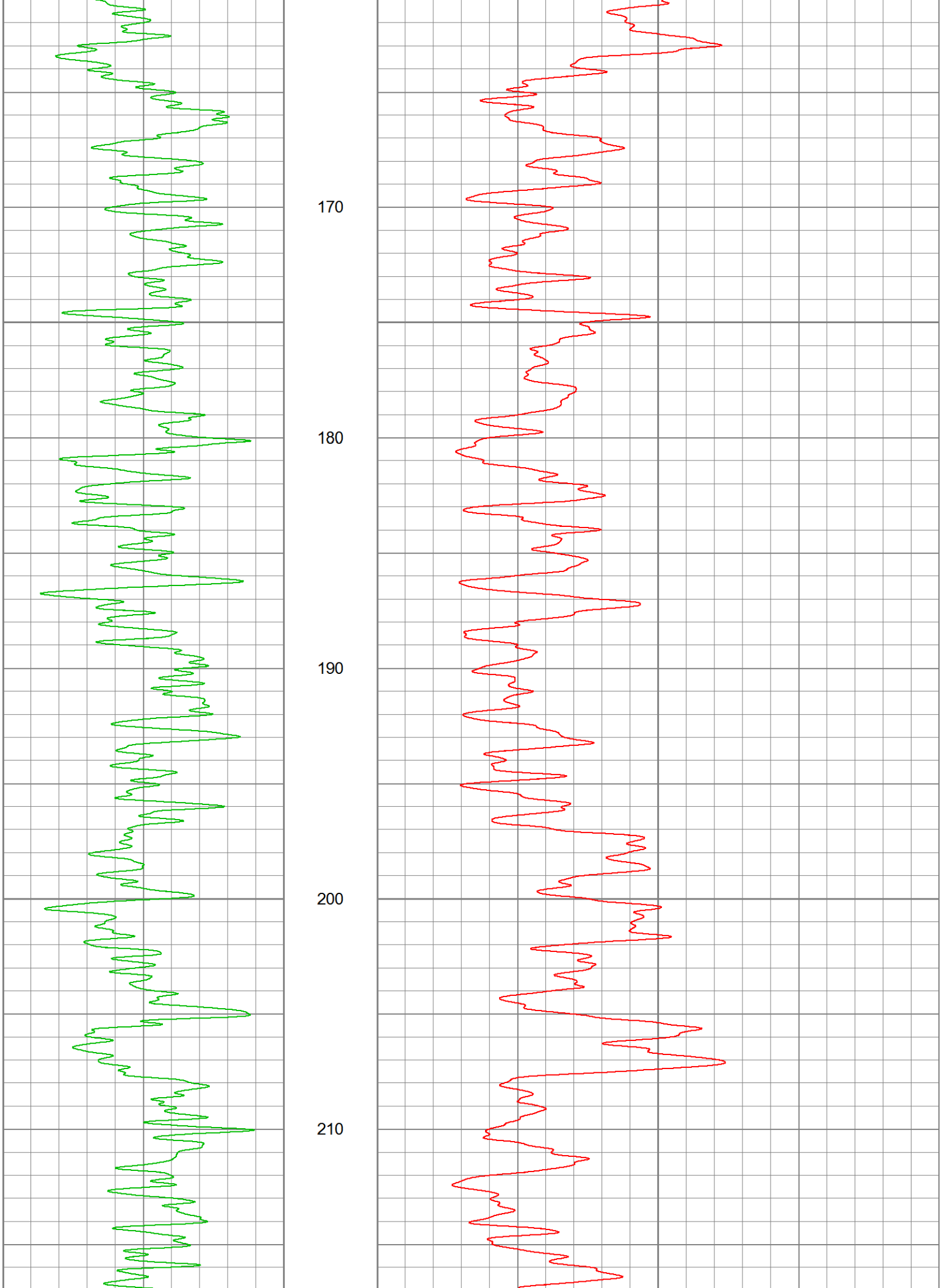
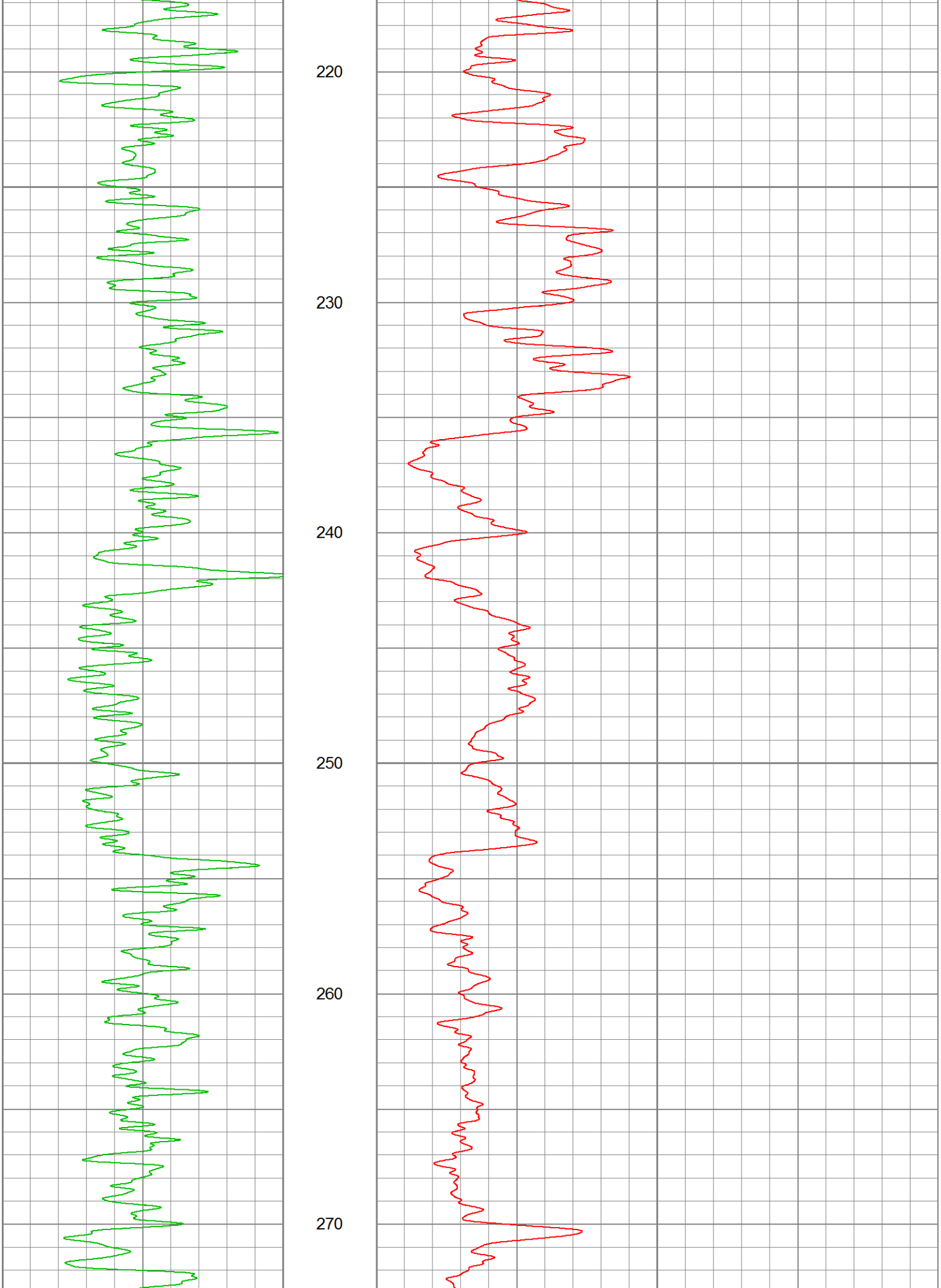
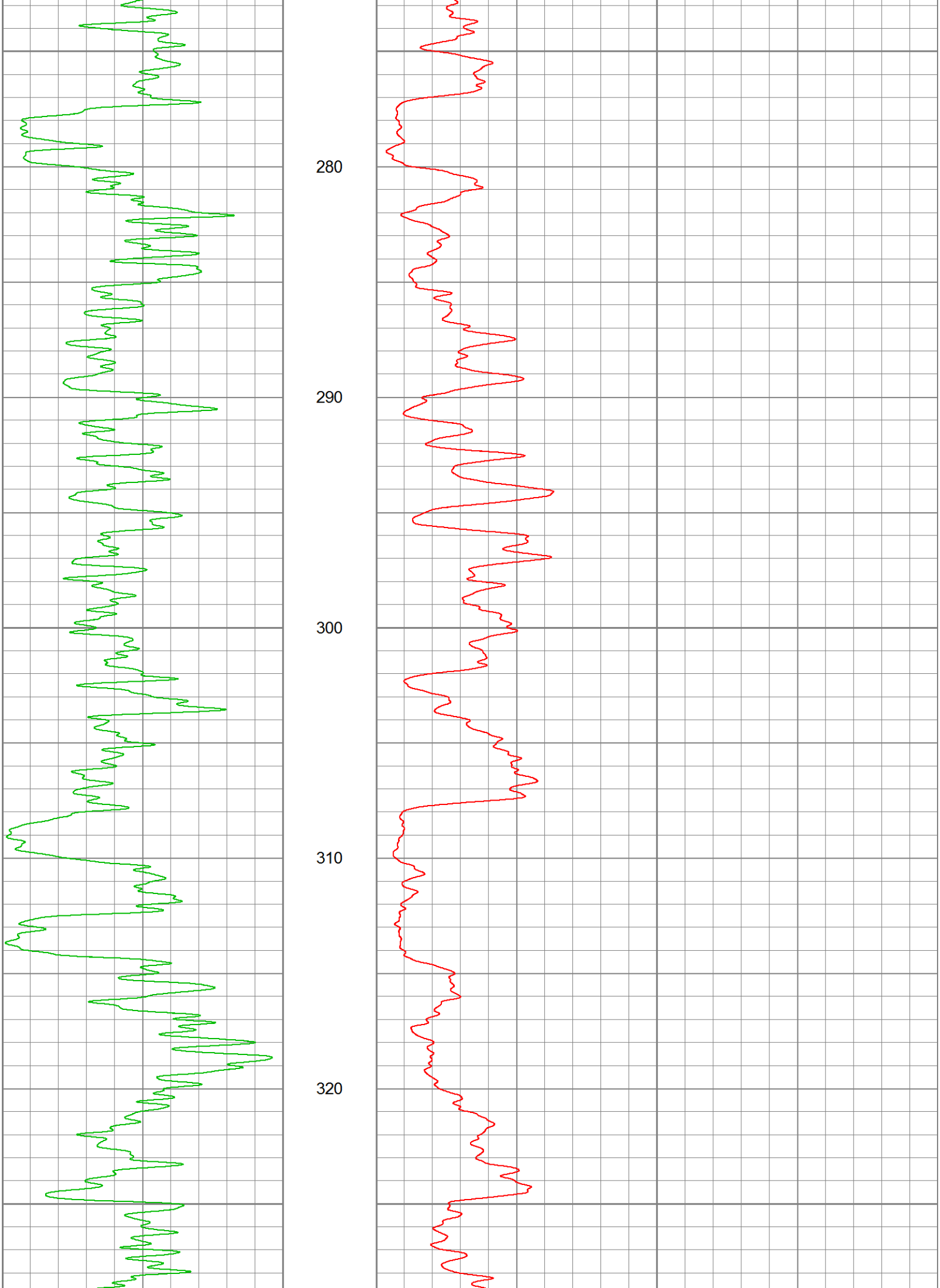
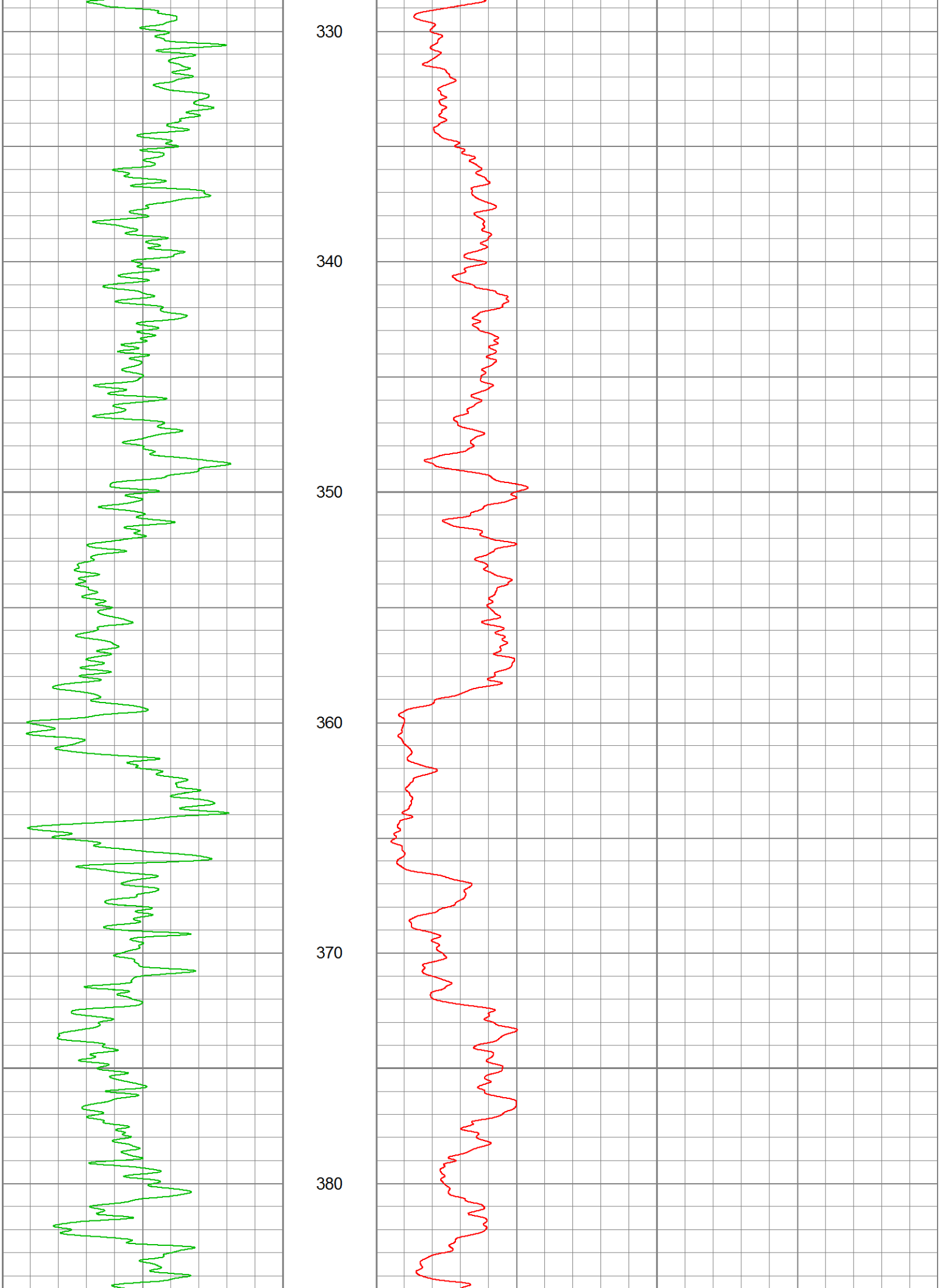
60
70
80
90
100

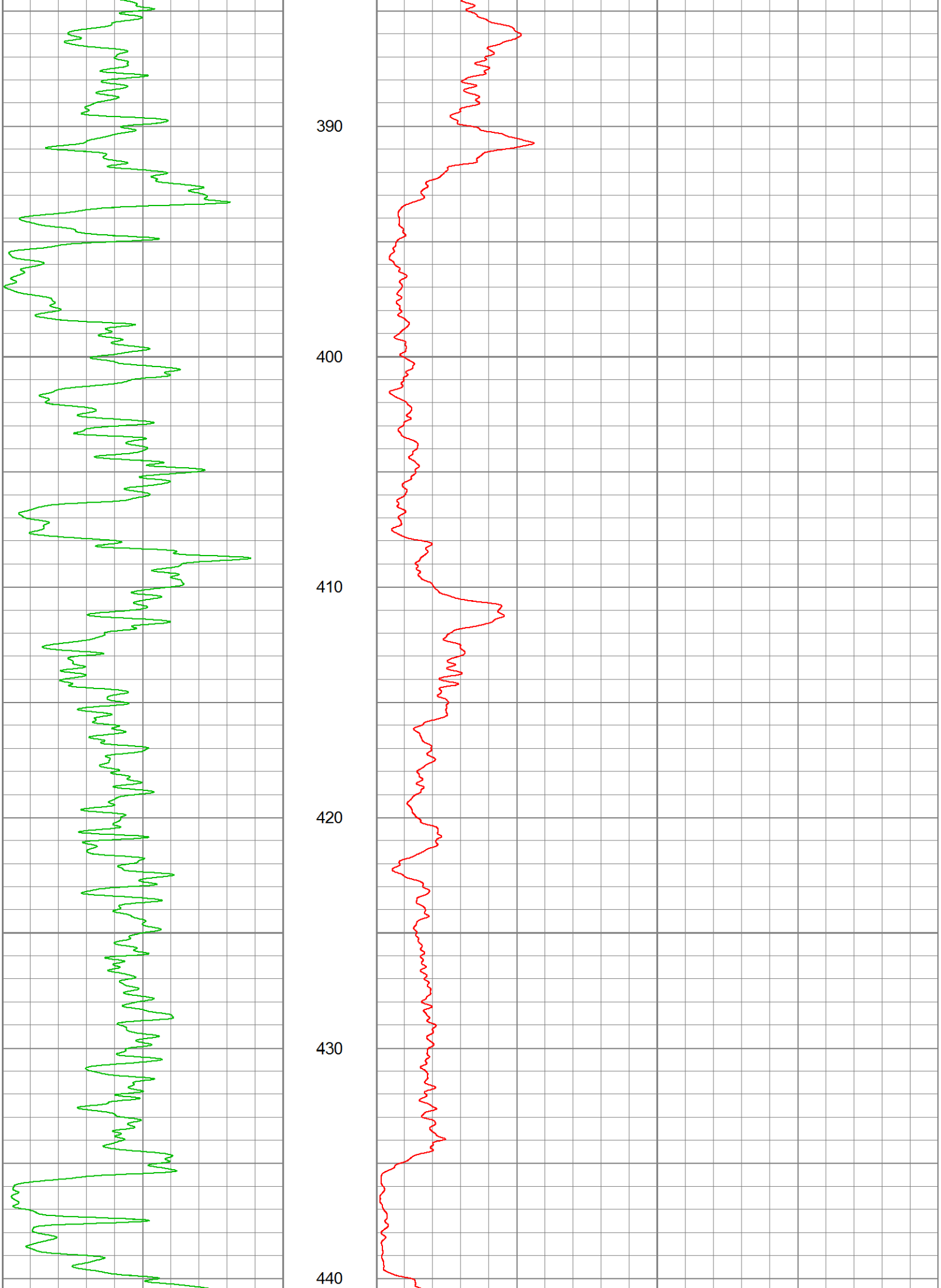

110
120
130
140
150
160

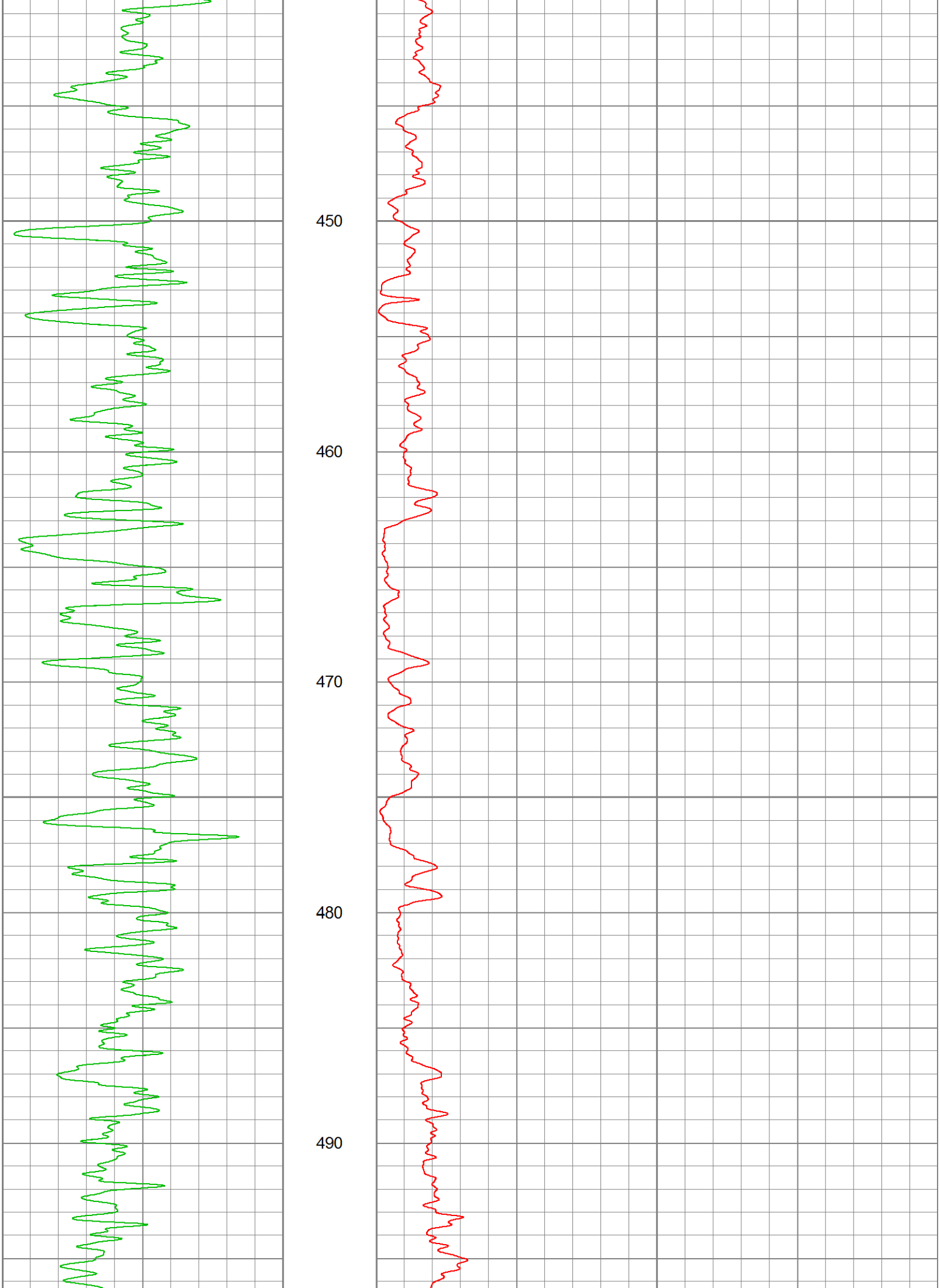

170
180
190
200
210

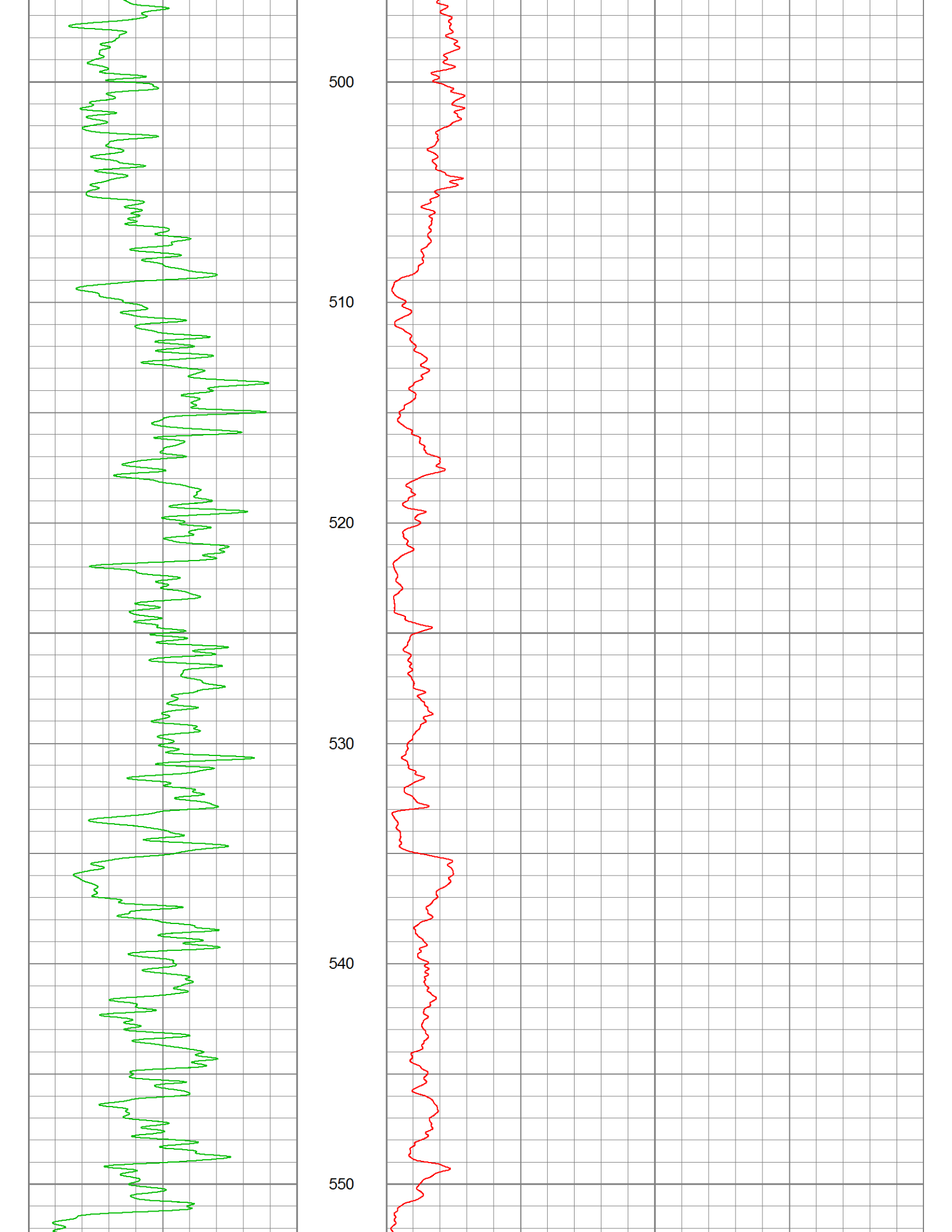

220
230
240
250
260
270

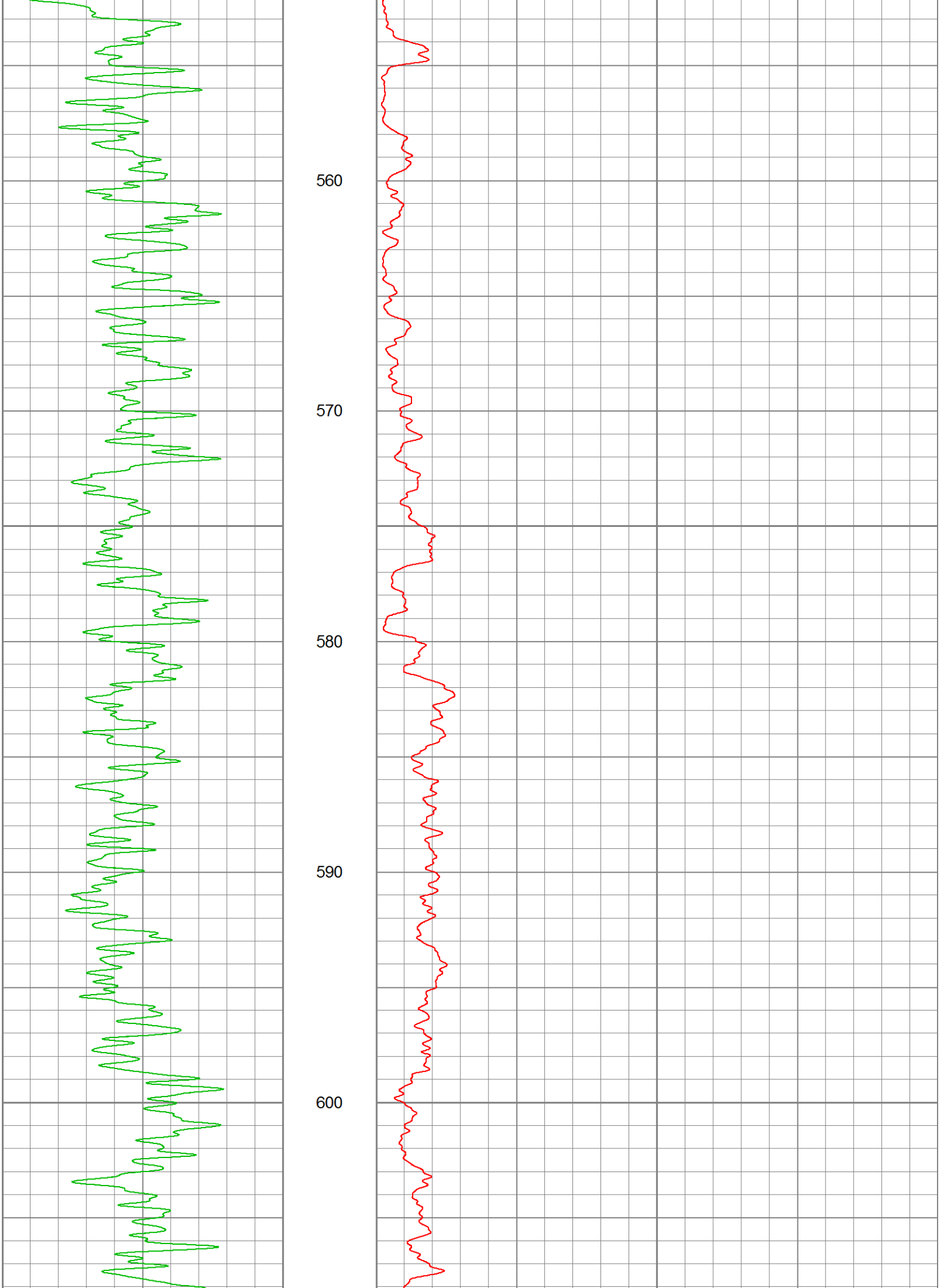

280
290
300
310
320

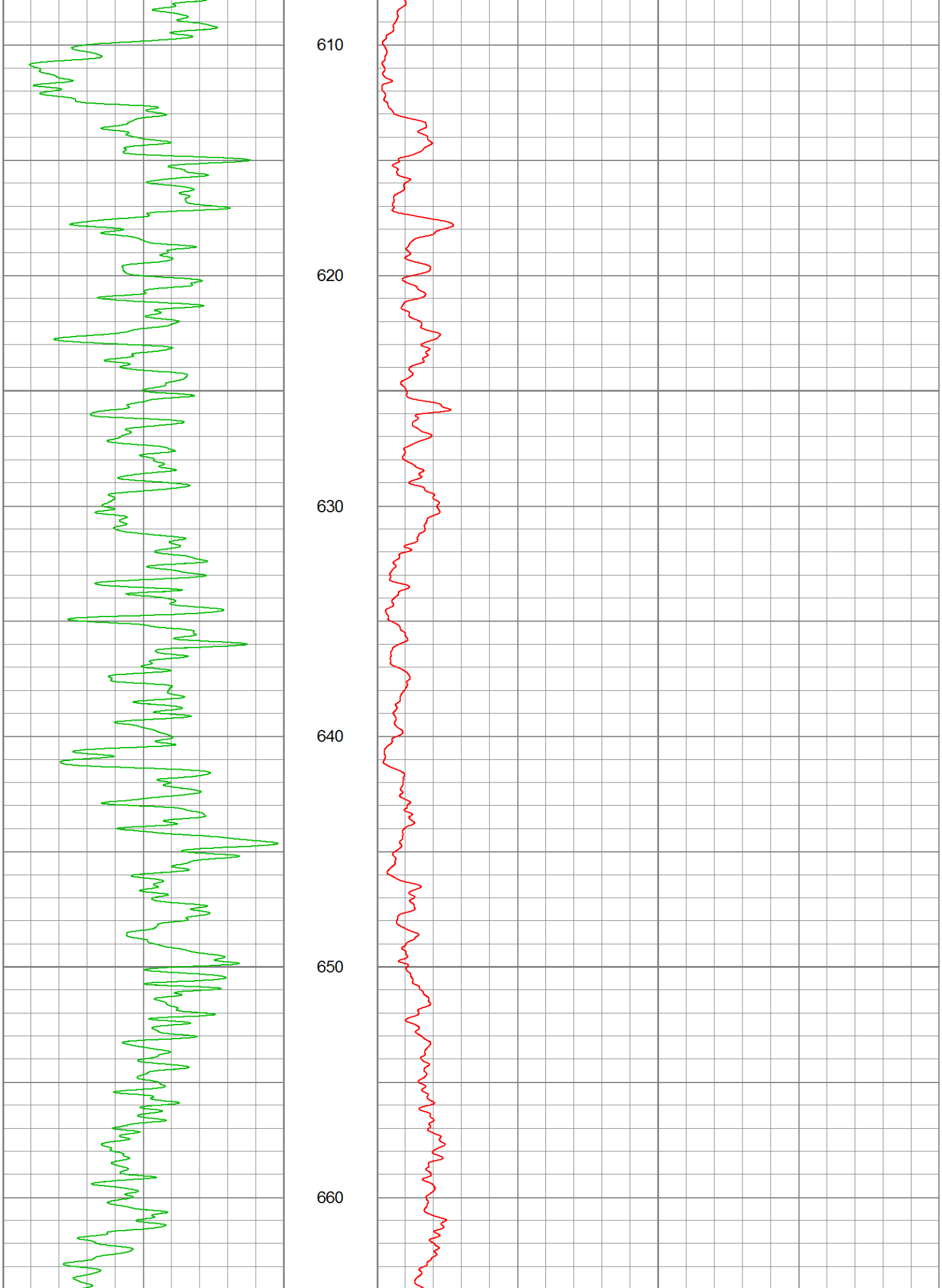

330
340
350
360
370
380

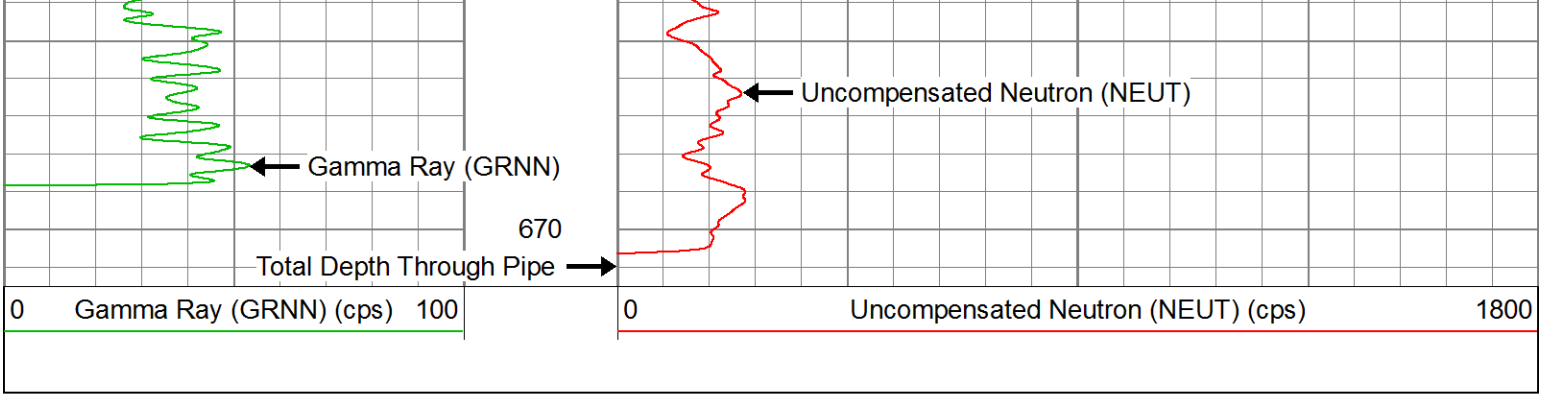

390
400
410
420
430
440


450
460
470
480
490


500
510
520
530
540
550


560
570
580
590
600


610
620
630
640
650
660



Company	TECK COAL FORDING RIVER OPERATIONS
Well	3403
Field	TURNBULL
Country	CANADA
Province	B.C.

COMPENSATED DENSITY
DEEP RESISTIVITY
GAMMA RAY, CALIPER
3407

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3407
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3407
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION: SEC TWP RGE

Other Services
NNTS
GYRO
ATV

Elevation (m)
Permanent Datum
Log Measured From
Drilling Measured From

Elevation
K.B. (m)
D.F. (m)
G.L. (m)

Date	09 JULY 2017		
Run Number	ONE		
Depth Driller (m)	299.00		
Depth Logger (m)	299.05		
Bottom Logged Interval (m)	299.05		
Top Log Interval (m)	0.00		
Casing Driller (m)	6.00		
Casing Logger (m)	5.30		
Bit Size (mm)	139.70		
Type Fluid in Hole	WATER		
Reported Density (kg/m3)	N/A		
Reported Viscosity (cp)	N/A		
Source of Sample	N/A		
pH	N/A		
Fluid Loss (cc)	N/A		
Rm @ Meas. Temp (Ohmm @ °C)	N/A		
Rm @ BHT (Ohmm @ °C)	N/A		
Magnetic Declination (°)	N/A		
Time Circulation Stopped	09 JUL 2017 14h55		
Time Logger on Bottom	09 JUL 2017 23h35		
Maximum Temperature (°C)	N/A		
Equipment Number	C05		
Location	FORDING RIVER		
Recorded By	A. ADEAGA		
Witnessed By	K. FRASER		

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Comments

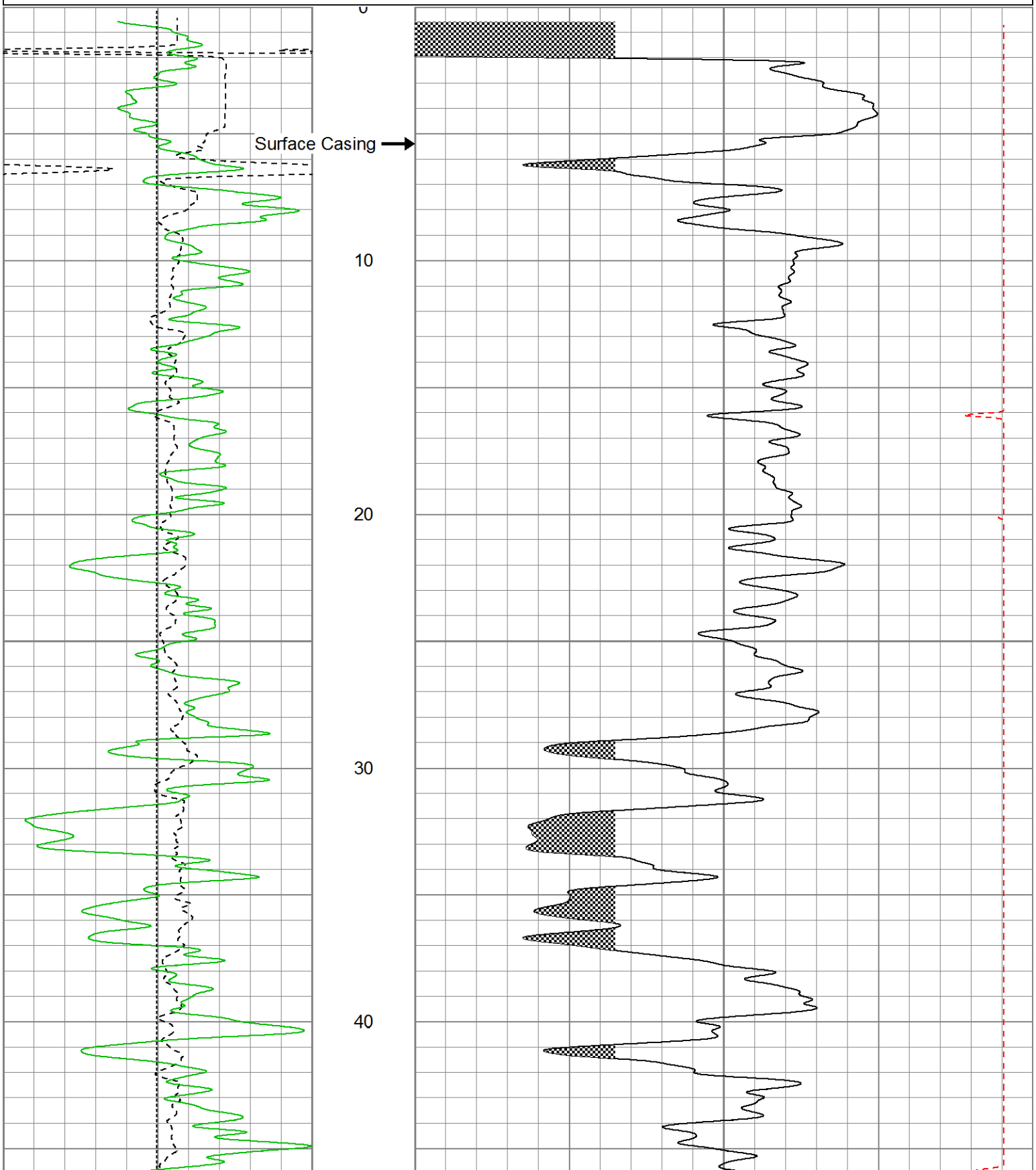
FLUID LEVEL DETECTED AT 206.20 m
TOOLS: NNTS1, DIP12, GL5, DNDS10, ATV

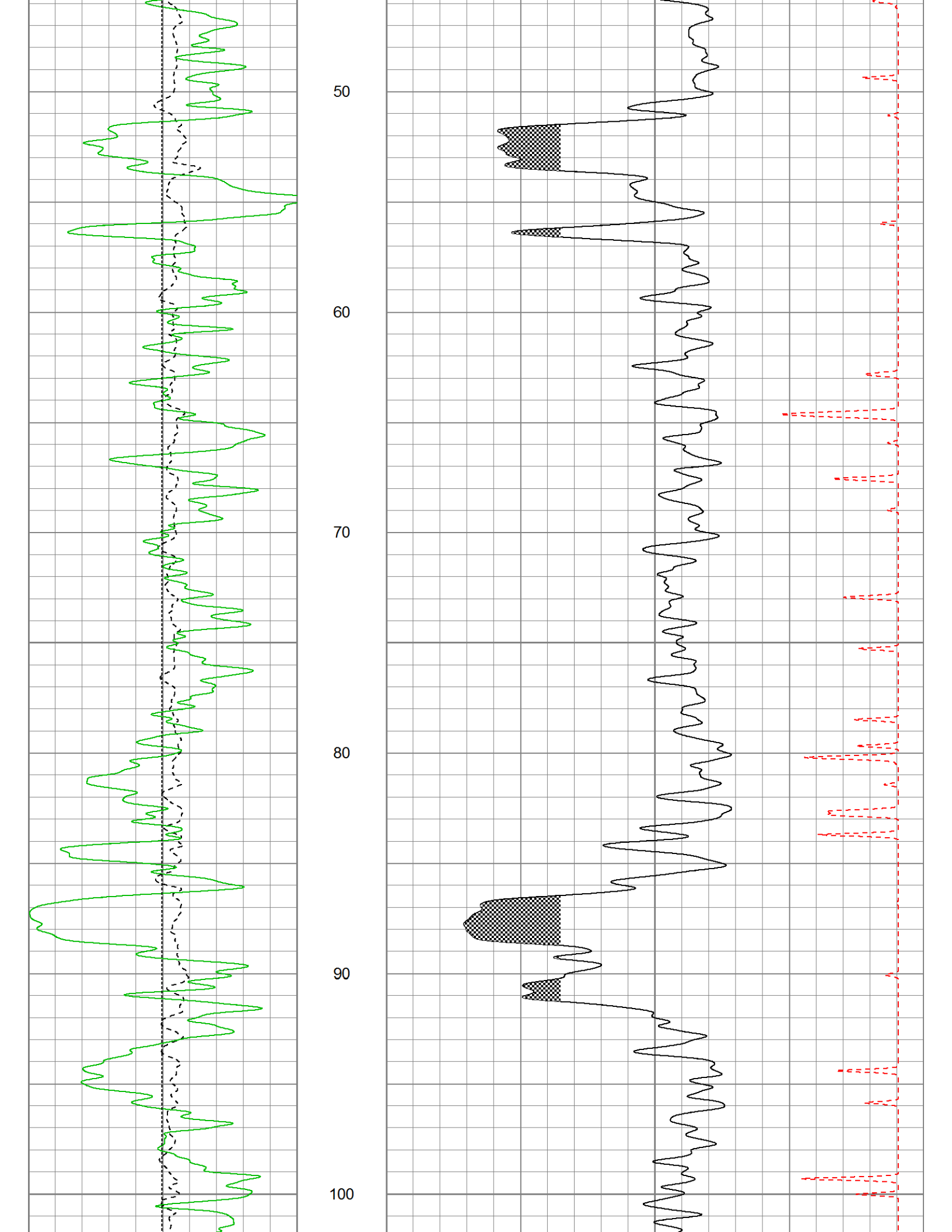
MAIN PASS

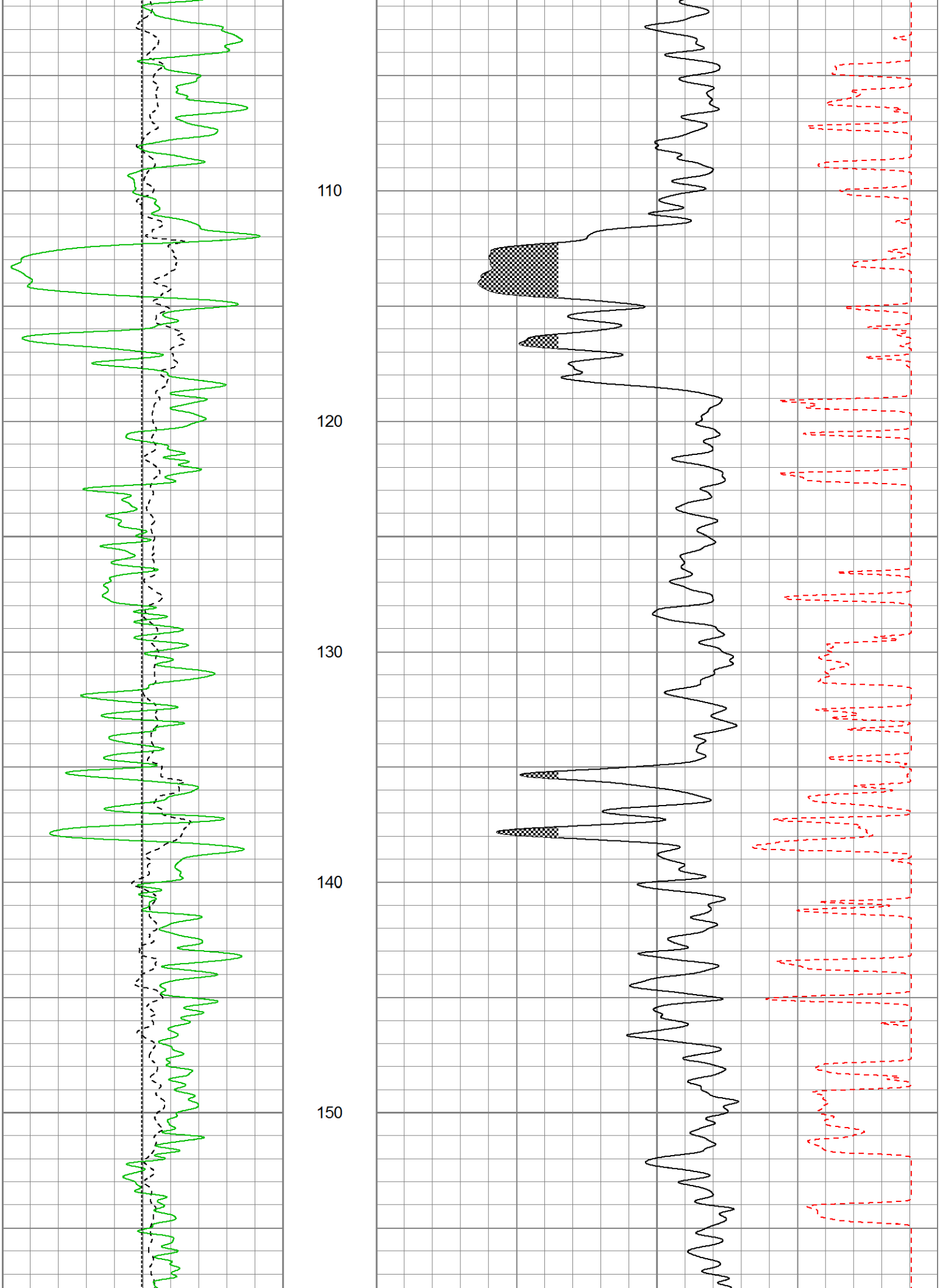
Database File:	c:\warrior\data\fro\3407\3407cdx\3407-fro.db
Dataset Pathname:	./../DENRES
Presentation Format:	denresdn
Dataset Creation:	Mon Jul 10 12:37:13 2017
Charted by:	Depth in Meters scaled 1:200

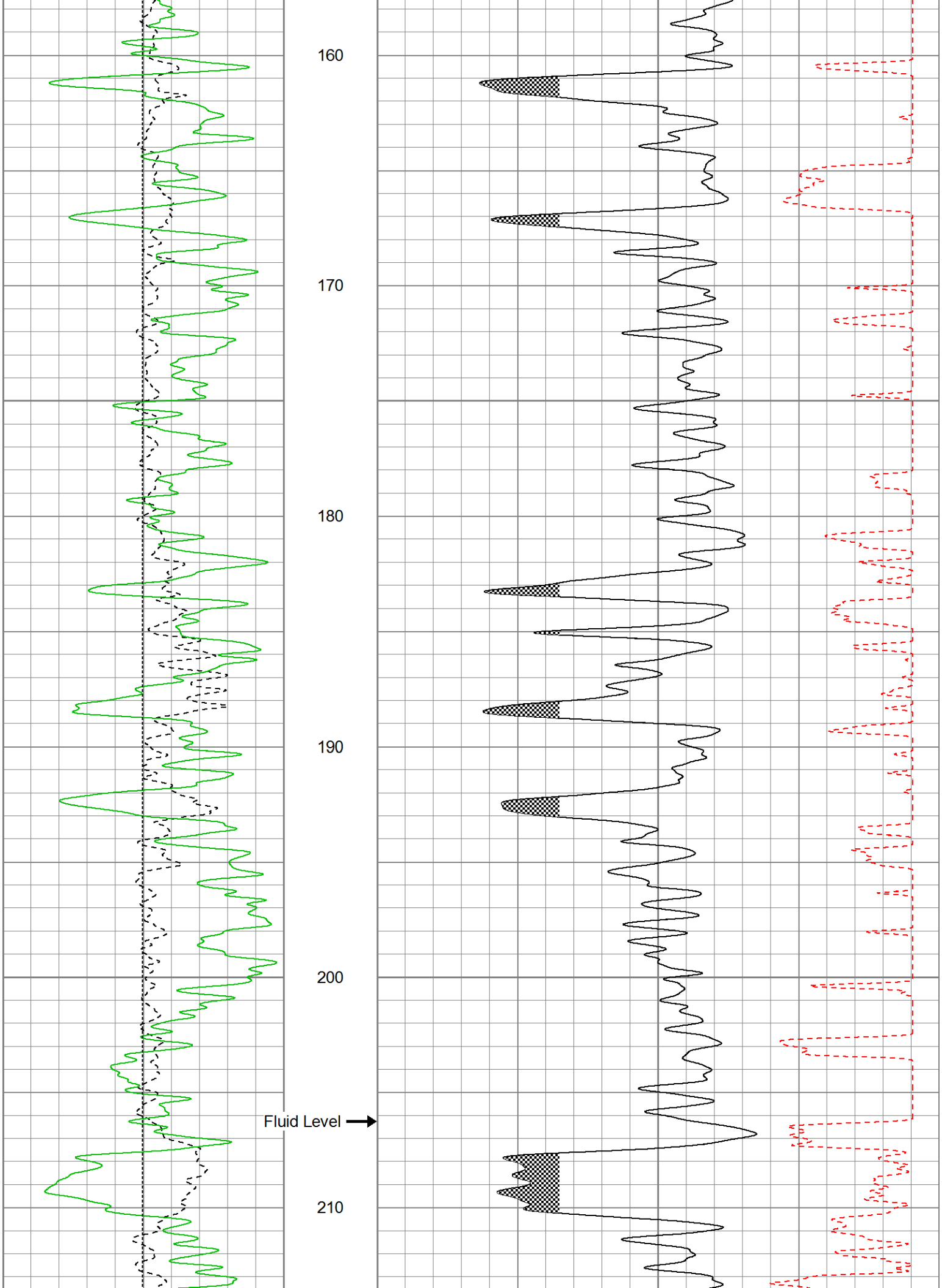
90	Density Caliper (DCAL) (mm)	190
0	Gamma Ray (GRFE) (API)	200
90	Bit Size (BIT1) (mm)	190

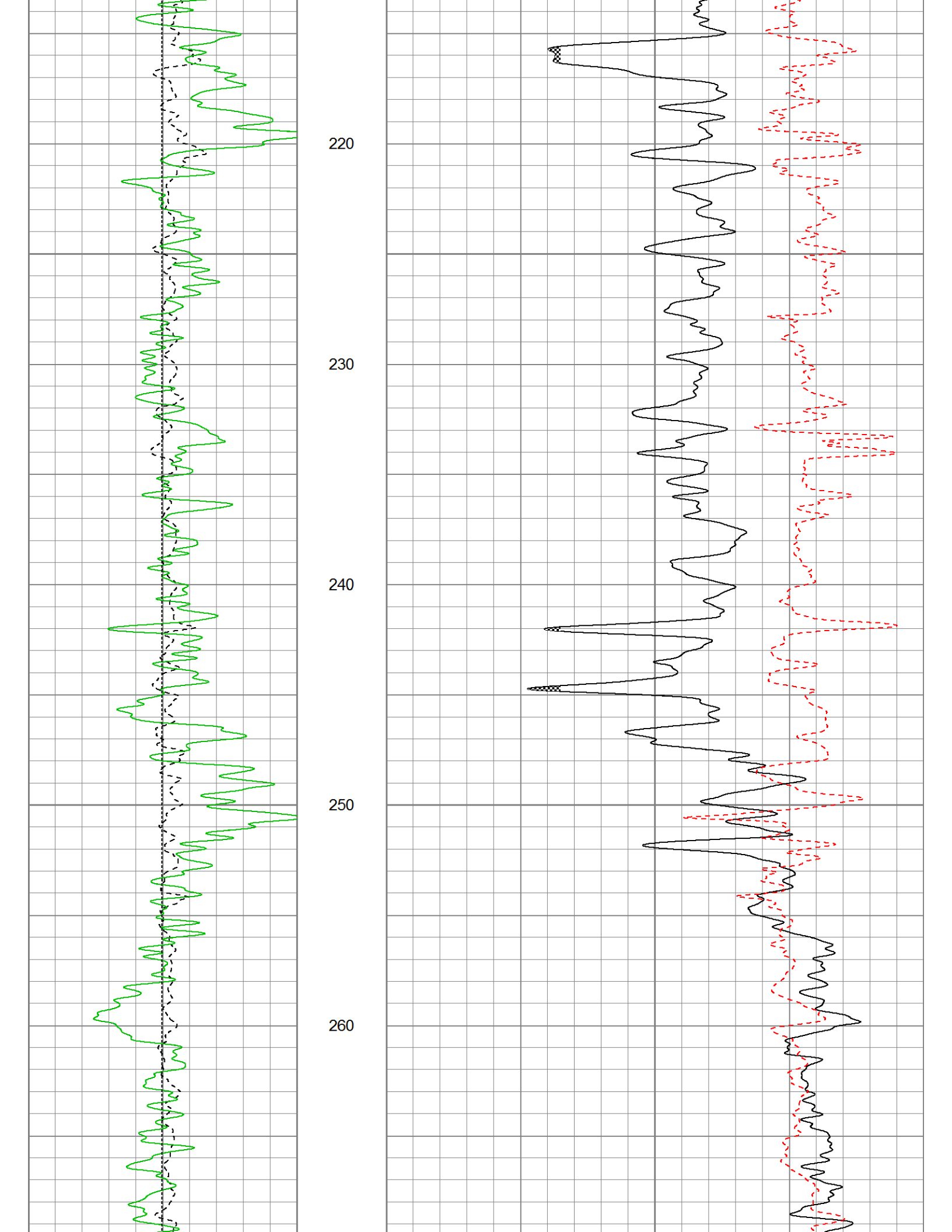
1	Bulk Density (DEN) (g/cc)	3
2	Deep Resistivity (DRFE) (Ohm-m)	20000

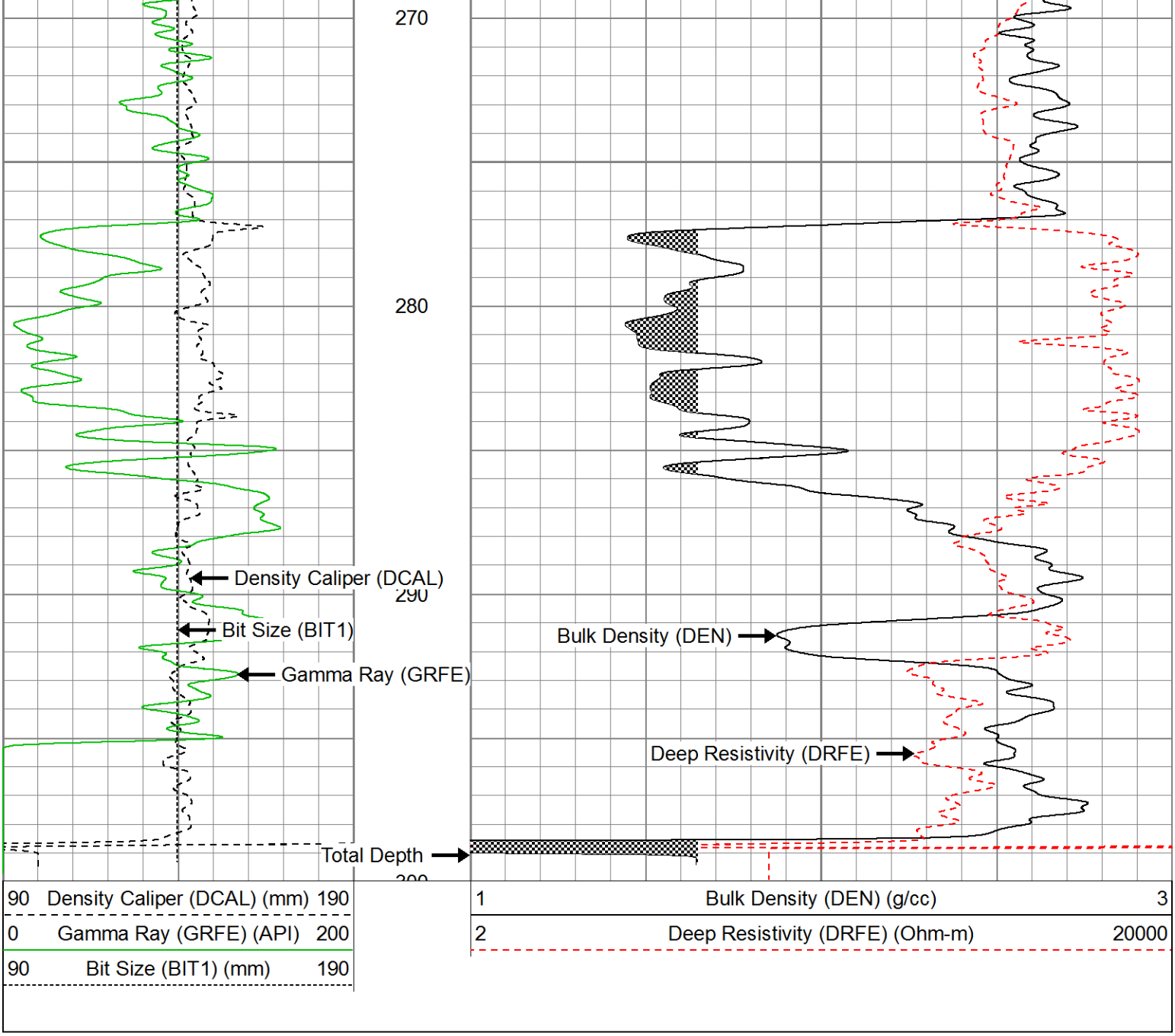



50
60
70
80
90
100


110
120
130
140
150


160
170
180
190
200
Fluid Level
210


220
230
240
250
260



Company	TECK COAL FORDING RIVER OPERATIONS
Well	3407
Field	TURNBULL
Country	CANADA
Province	B.C.

GYRO VERTICALITY ANALYSIS 3407

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3407
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3407
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION: SEC TWP RGE

Other Services
DENRES
NNTS
ATV

Permanent Datum
Log Measured From
Drilling Measured From

Elevation (m)

Elevation
K.B. (m)
D.F. (m)
G.L. (m)

Date	09 JULY 2017			
Run Number	ONE			
Depth Driller (m)	299.00			
Depth Logger (m)	298.05			
Bottom Logged Interval (m)	298.05			
Top Log Interval (m)	0.00			
Casing Driller (m)	6.00			
Casing Logger (m)	N/A			
Bit Size (mm)	139.70			
Type Fluid in Hole	WATER			
Reported Density (kg/m3)	N/A			
Reported Viscosity (cp)	N/A			
Source of Sample	N/A			
pH	N/A			
Fluid Loss (cc)	N/A			
Rm @ Meas. Temp (Ohmm @ °C)	N/A			
Rm @ BHT (Ohmm @ °C)	N/A			
Magnetic Declination (°)	14.32			
Time Circulation Stopped	09 JUL 2017 14h55			
Time Logger on Bottom	09 JUL 2017 16h20			
Maximum Temperature (°C)	N/A			
Equipment Number	C05			
Location	FORDING RIVER			
Recorded By	A. ADEAGA			
Witnessed By	K. FRASER			

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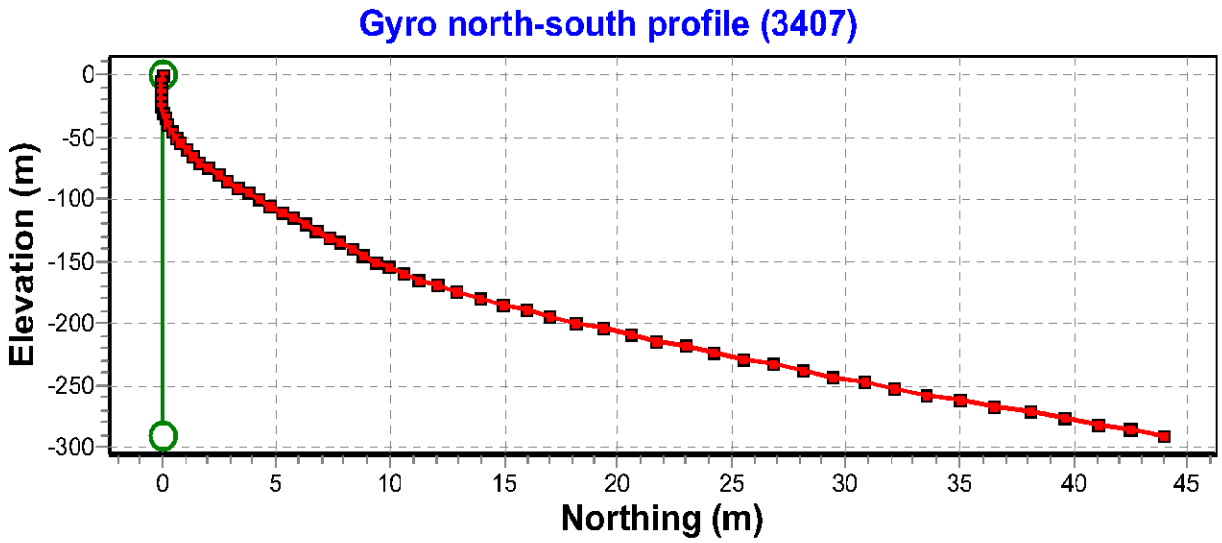
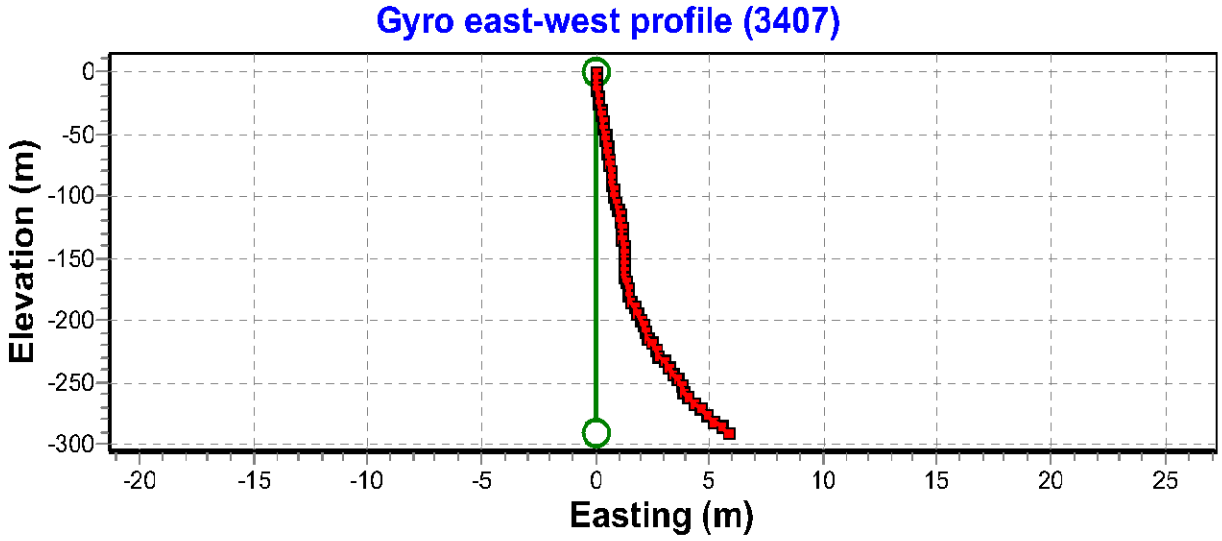
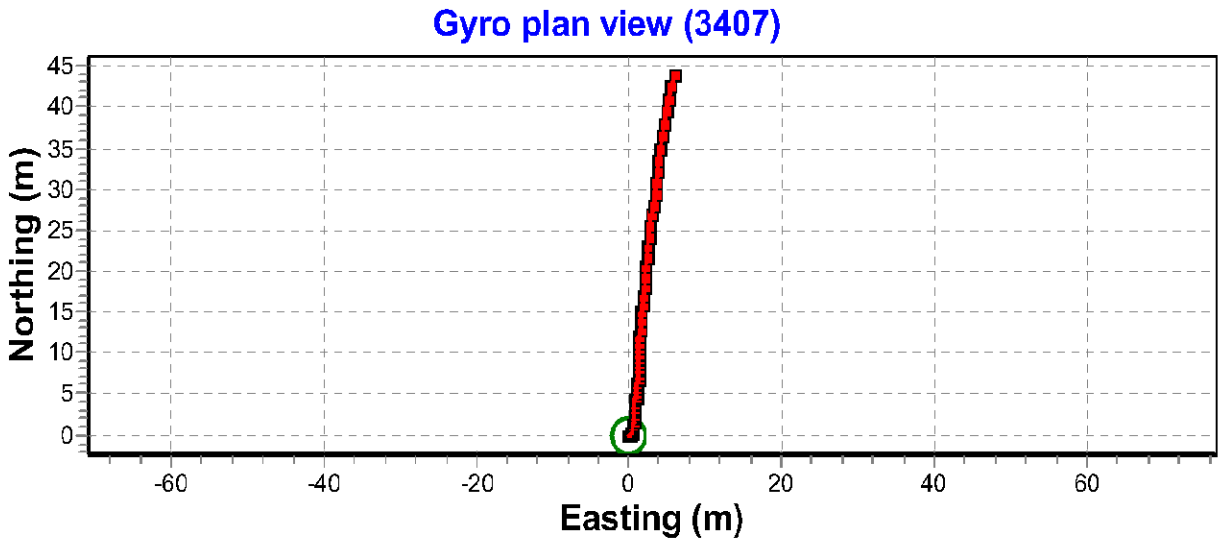
Comments

GYRO LOGGED THROUGH THE DRILL PIPE
TOOLS: NNTS1, DIP12, GL5, DNDS10, ATV


Gyro north-south profile (3407)
Elevation (m)
0
-50
-100
-150
-200
-250
-300
0
5
10
15
20
25
30
35
40
45
Northing (m)


Gyro east-west profile (3407)
Elevation (m)
0
-50
-100
-150
-200
-250
-300
-20
-15
-10
-5
0
5
10
15
20
25
Easting (m)


Gyro plan view (3407)
Northing (m)
45
40
35
30
25
20
15
10
5
0
-60
-40
-20
0
20
40
60
Easting (m)

Company	TECK COAL FORDING RIVER OPERATIONS
Well	3407
Field	TURNBULL
Country	CANADA
Province	B.C.

UNCOMPENSATED NEUTRON GAMMA RAY 3407

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3407
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3407
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION:
SEC TWP RGE

Other Services
DENRES
GYRO
ATV

Permanent Datum Elevation (m)
Log Measured From
Drilling Measured From

Elevation
K.B. (m)
D.F. (m)
G.L. (m)

Date	09 JULY 2017		
Run Number	ONE		
Depth Driller (m)	299.00		
Depth Logger (m)	298.05		
Bottom Logged Interval (m)	298.05		
Top Log Interval (m)	0.00		
Casing Driller (m)	6.00		
Casing Logger (m)	N/A		
Bit Size (mm)	139.70		
Type Fluid in Hole	WATER		
Reported Density (kg/m3)	N/A		
Reported Viscosity (cp)	N/A		
Source of Sample	N/A		
pH	N/A		
Fluid Loss (cc)	N/A		
Rm @ Meas. Temp (Ohmm @ °C)	N/A		
Rm @ BHT (Ohmm @ °C)	N/A		
Magnetic Declination (°)	N/A		
Time Circulation Stopped	09 JUL 2017 14h55		
Time Logger on Bottom	09 JUL 2017 15h30		
Maximum Temperature (°C)	N/A		
Equipment Number	C05		
Location	FORDING RIVER		
Recorded By	A. ADEAGA		
Witnessed By	K. FRASER		

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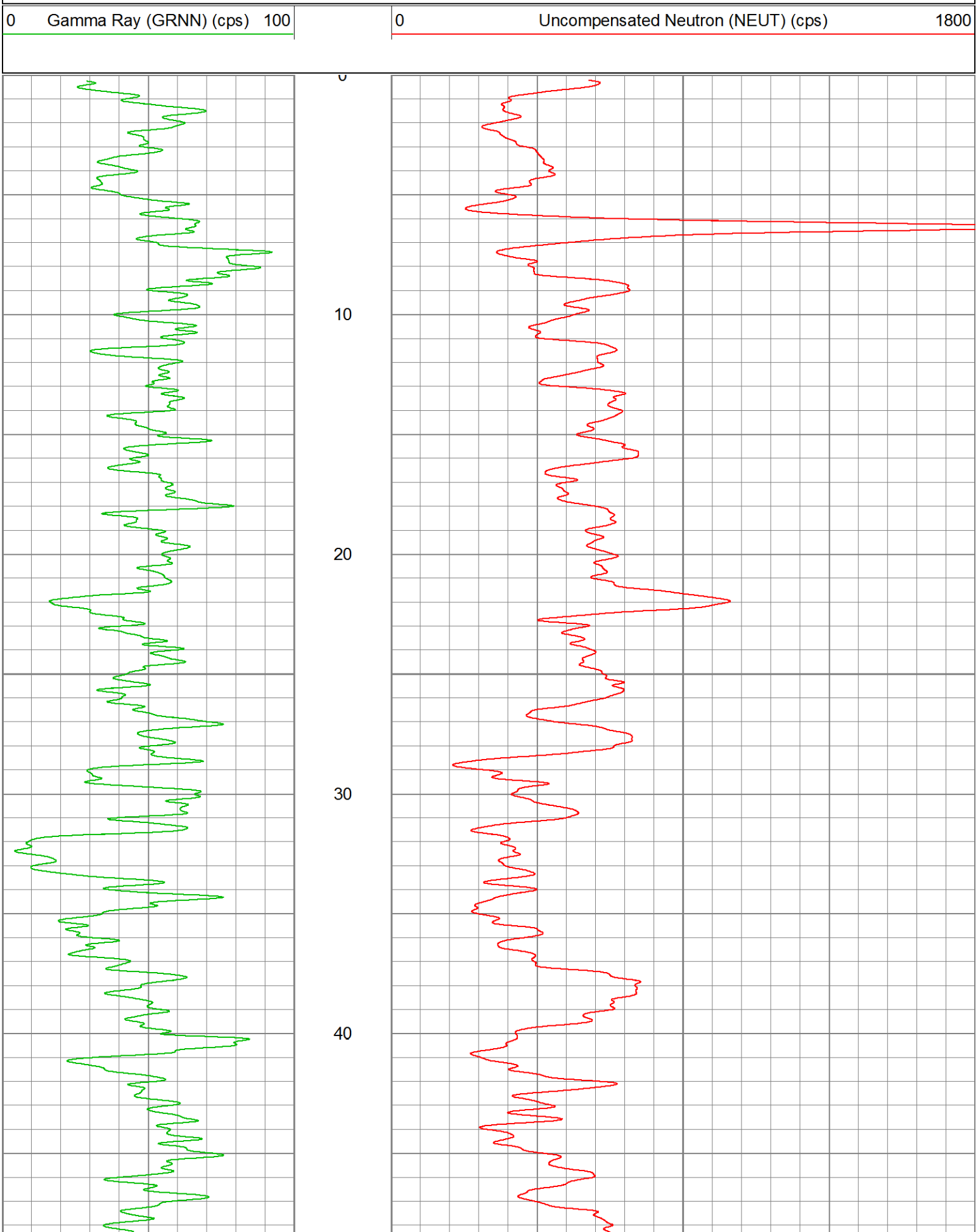
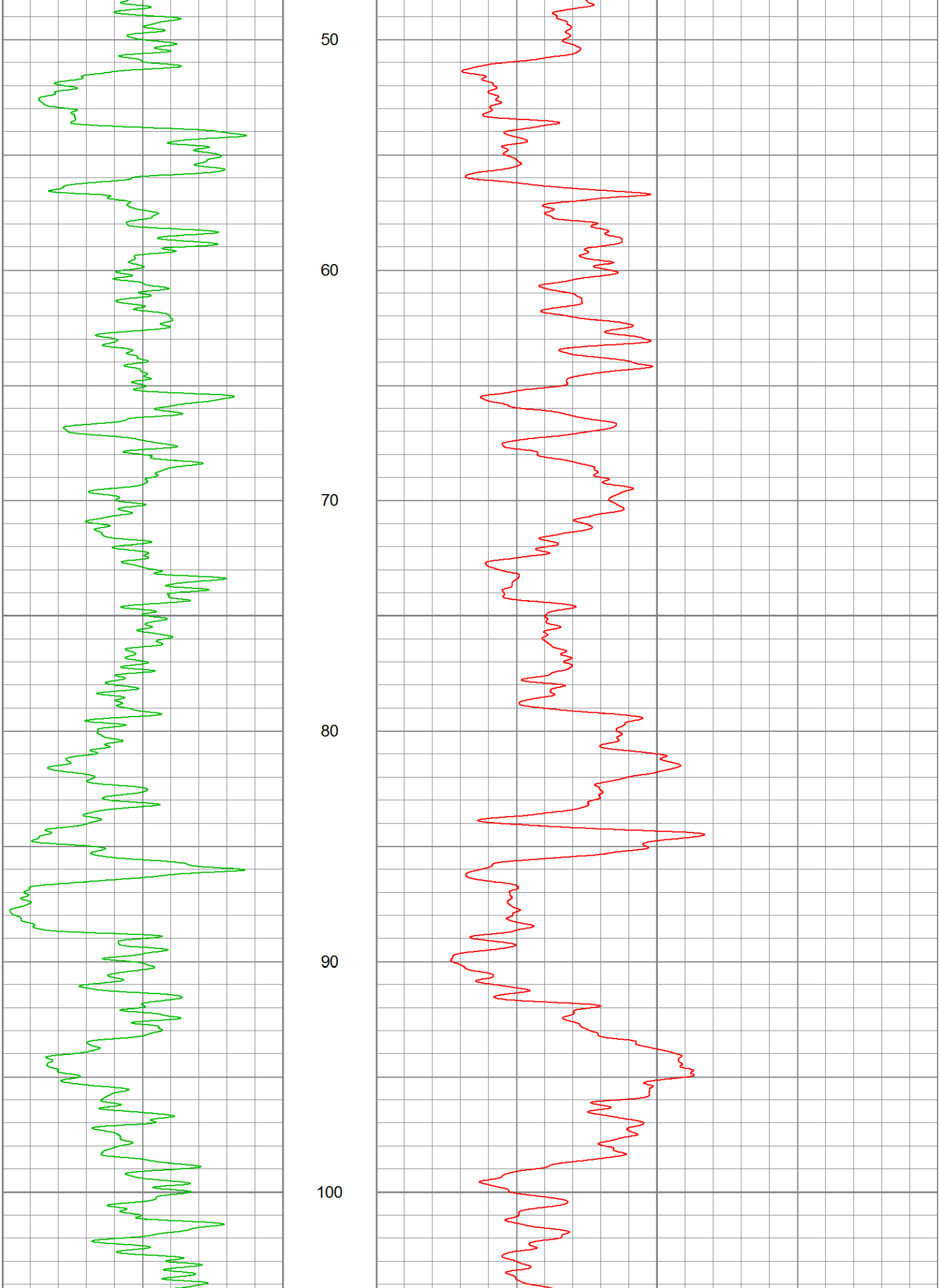
Comments

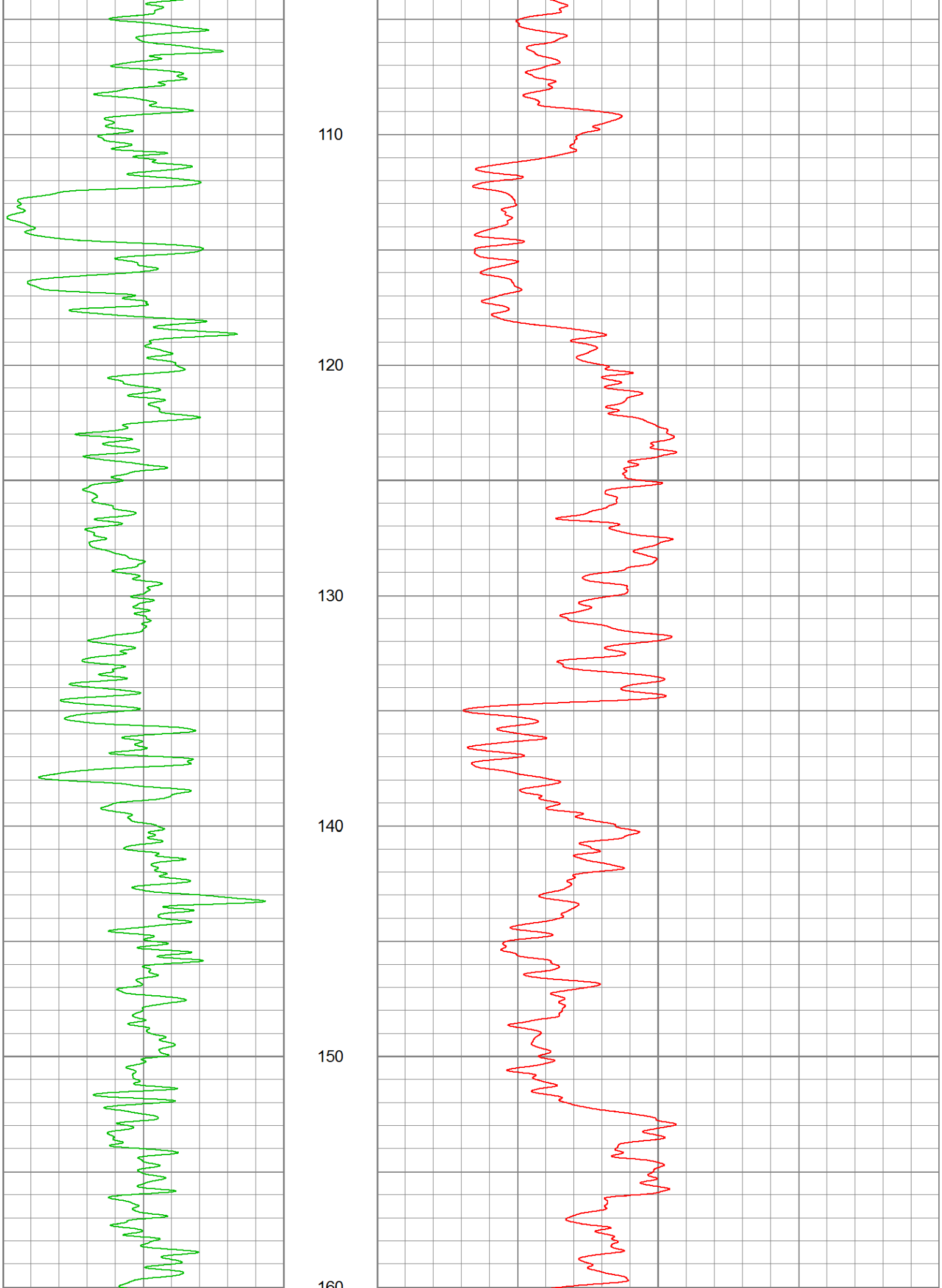
NNTS LOGGED THROUGH THE DRILL PIPE
TOOLS: NNTS1, DIP12, GL5, DNDS10, ATV

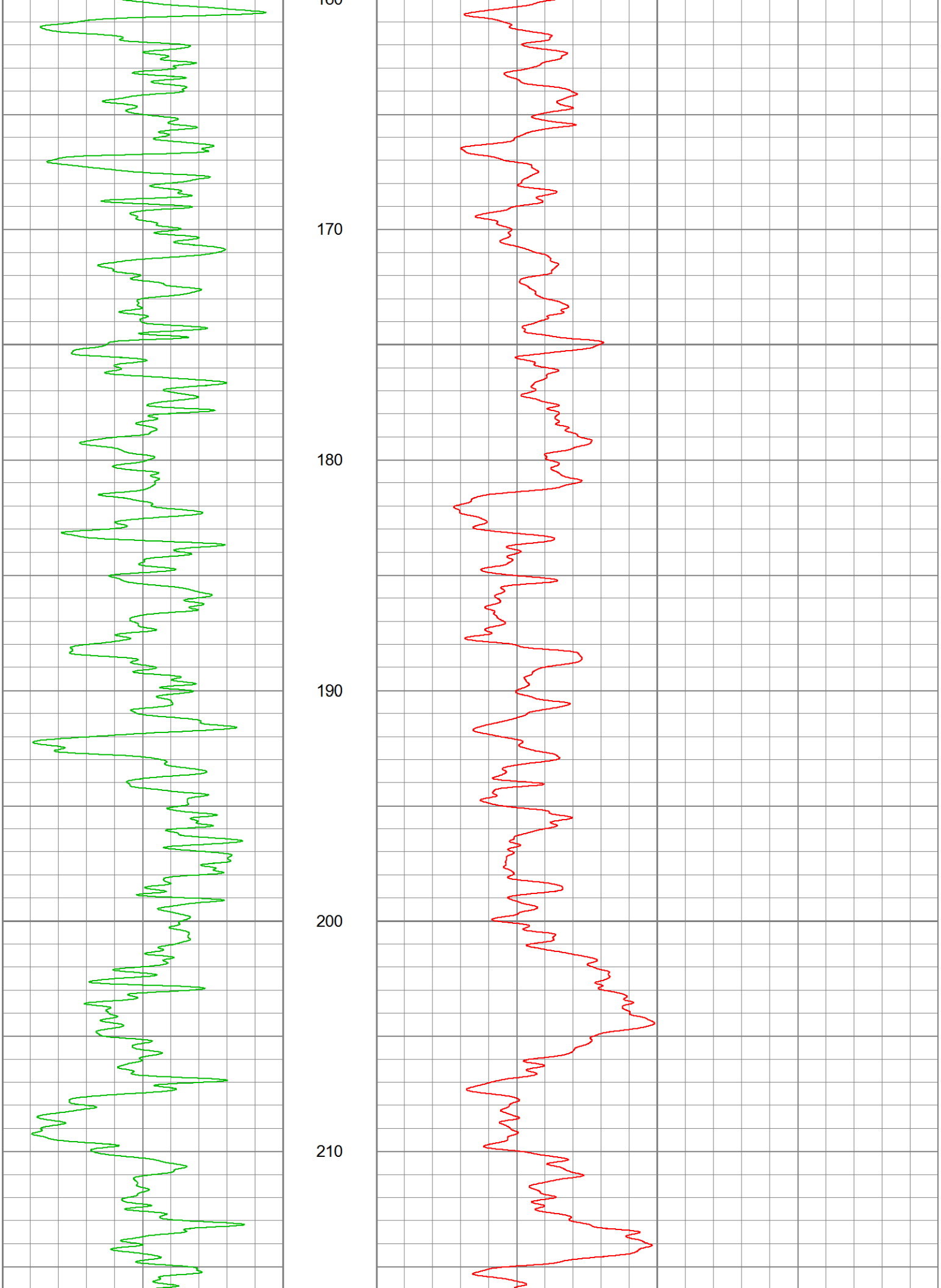
MAIN PASS

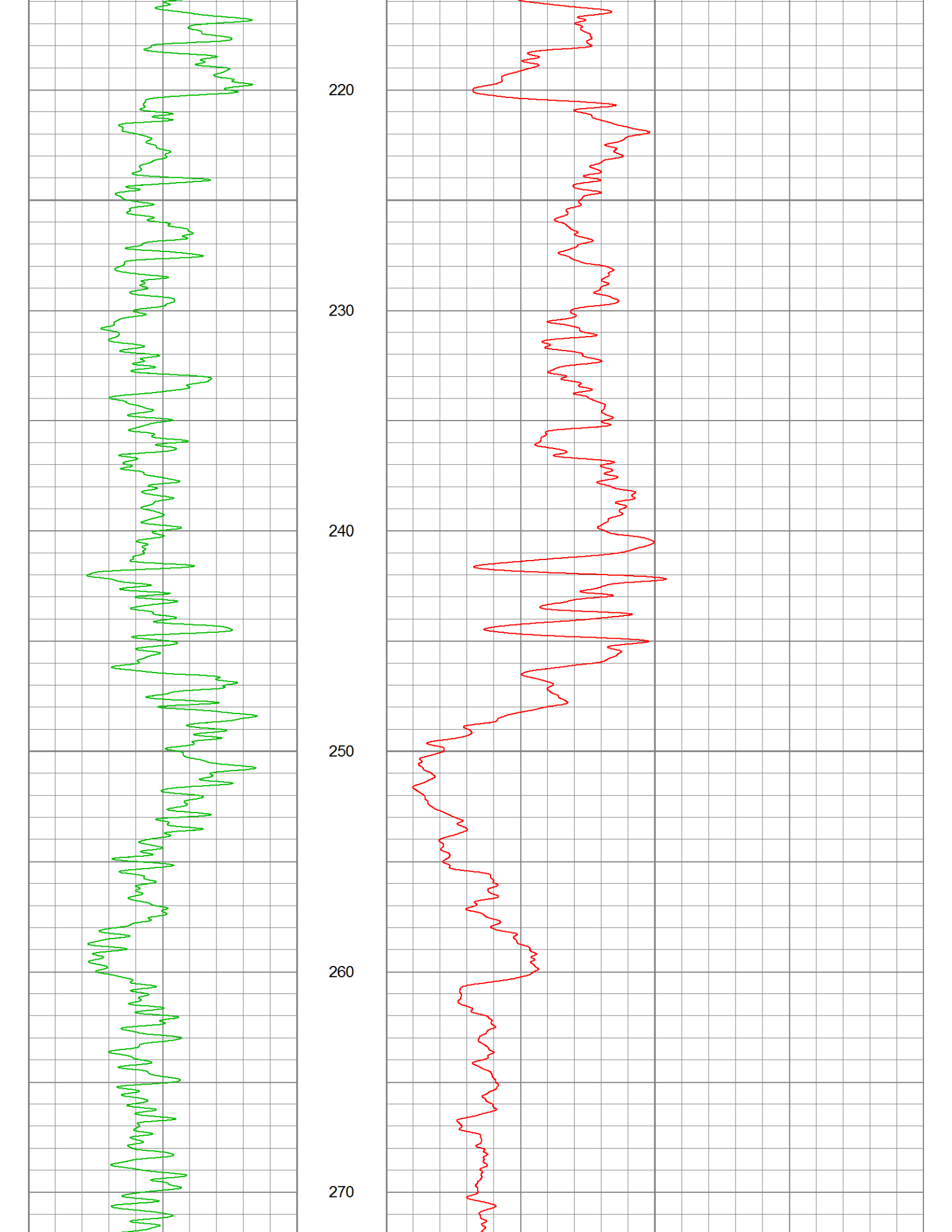
Database File:	c:\warrior\data\fro\3407\3407cdx\3407-fro.db
Dataset Pathname:	nnts1
Presentation Format:	nnts
Dataset Creation:	Sun Jul 09 17:15:34 2017
Charted by:	Depth in Meters scaled 1:200

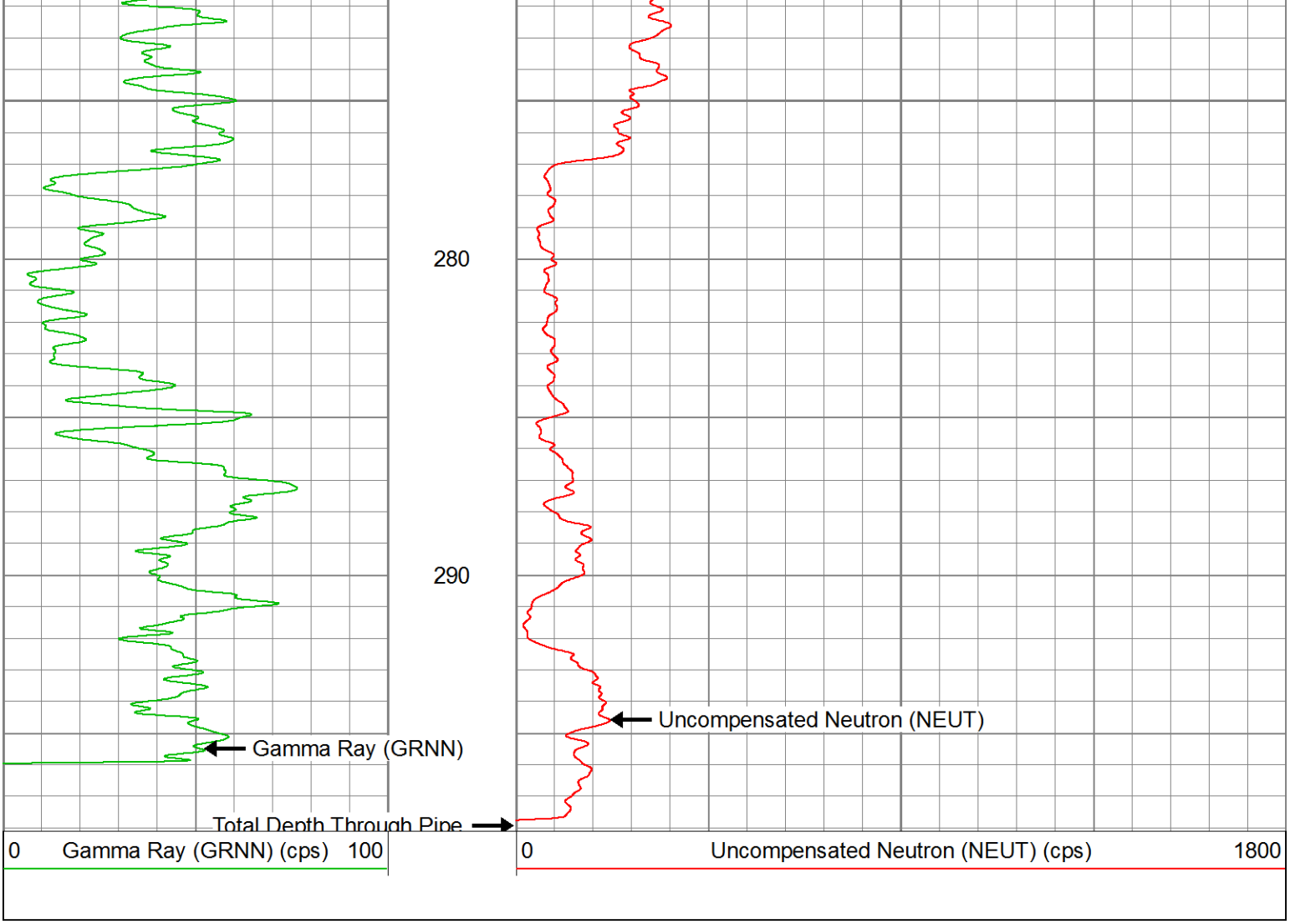



50
60
70
80
90
100


110
120
130
140
150
160


170
180
190
200
210


220
230
240
250
260
270



Company	TECK COAL FORDING RIVER OPERATIONS
Well	3407
Field	TURNBULL
Country	CANADA
Province	B.C.

COMPENSATED DENSITY
DEEP RESISTIVITY
GAMMA RAY, CALIPER
3409

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3409
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3409
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION:
SEC TWP RGE

Other Services
GYRO
NNTS
ATV

Permanent Datum
Log Measured From
Drilling Measured From
Elevation (m)

Elevation
K.B. (m)
D.F. (m)
G.L. (m)

Date	08 JULY 2017		
Run Number	ONE		
Depth Driller (m)	262.60		
Depth Logger (m)	262.90		
Bottom Logged Interval (m)	262.90		
Top Log Interval (m)	0.00		
Casing Driller (m)	6.00		
Casing Logger (m)	5.80		
Bit Size (mm)	139.70		
Type Fluid in Hole	WATER		
Reported Density (kg/m3)	N/A		
Reported Viscosity (cp)	N/A		
Source of Sample	N/A		
pH	N/A		
Fluid Loss (cc)	N/A		
Rm @ Meas. Temp (Ohmm @ °C)	N/A		
Rm @ BHT (Ohmm @ °C)	N/A		
Magnetic Declination (°)	N/A		
Time Circulation Stopped	08 JUL 2017 00h10		
Time Logger on Bottom	08 JUL 2017 06h50		
Maximum Temperature (°C)	N/A		
Equipment Number	C05		
Location	FORDING RIVER		
Recorded By	A. ADEAGA		
Witnessed By	K. FRASER		

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Comments

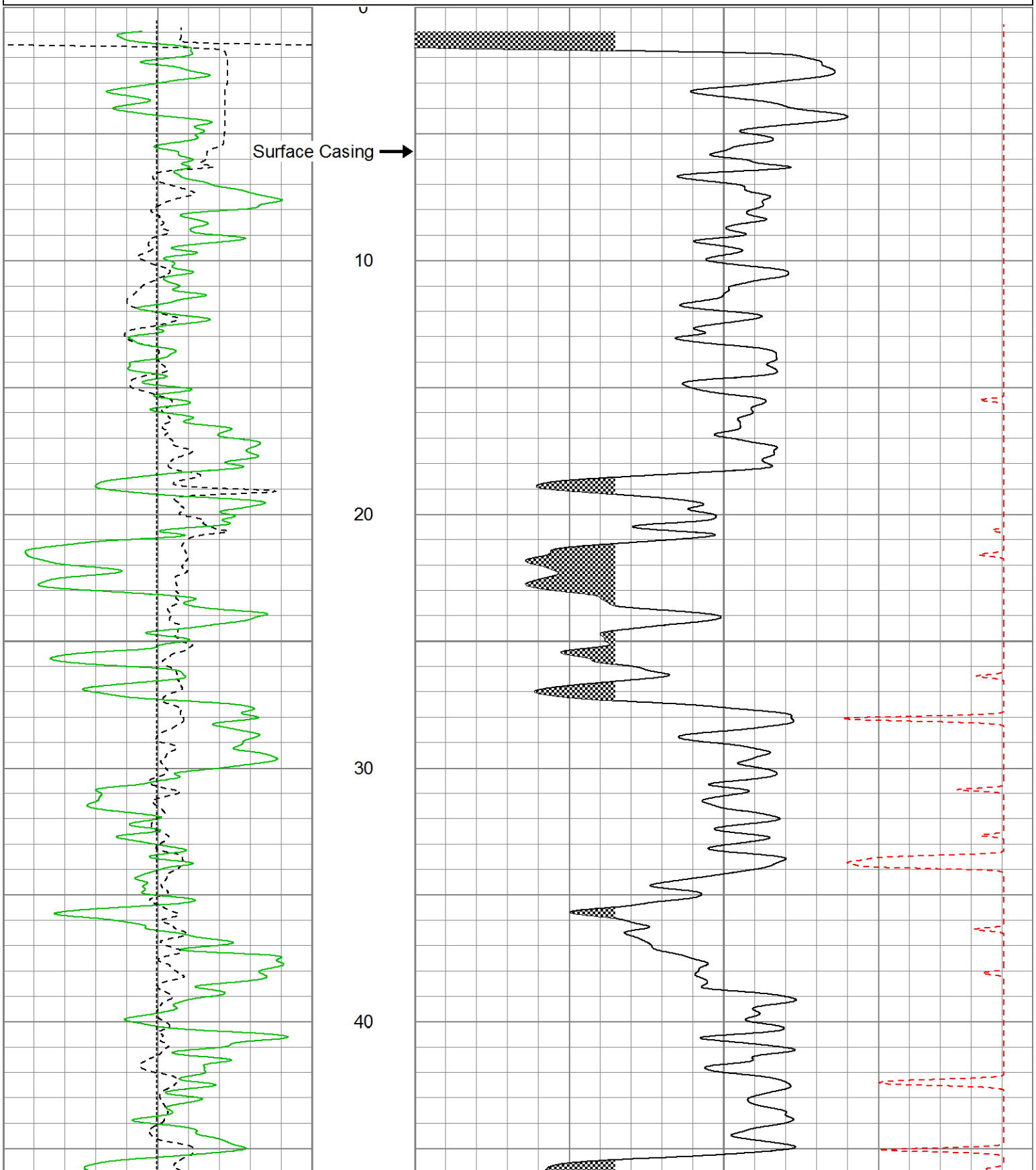
FLUID LEVEL DETECTED AT 97.70 m
TOOLS: NNTS1, DIP12, GL5, DNDS10, ATV

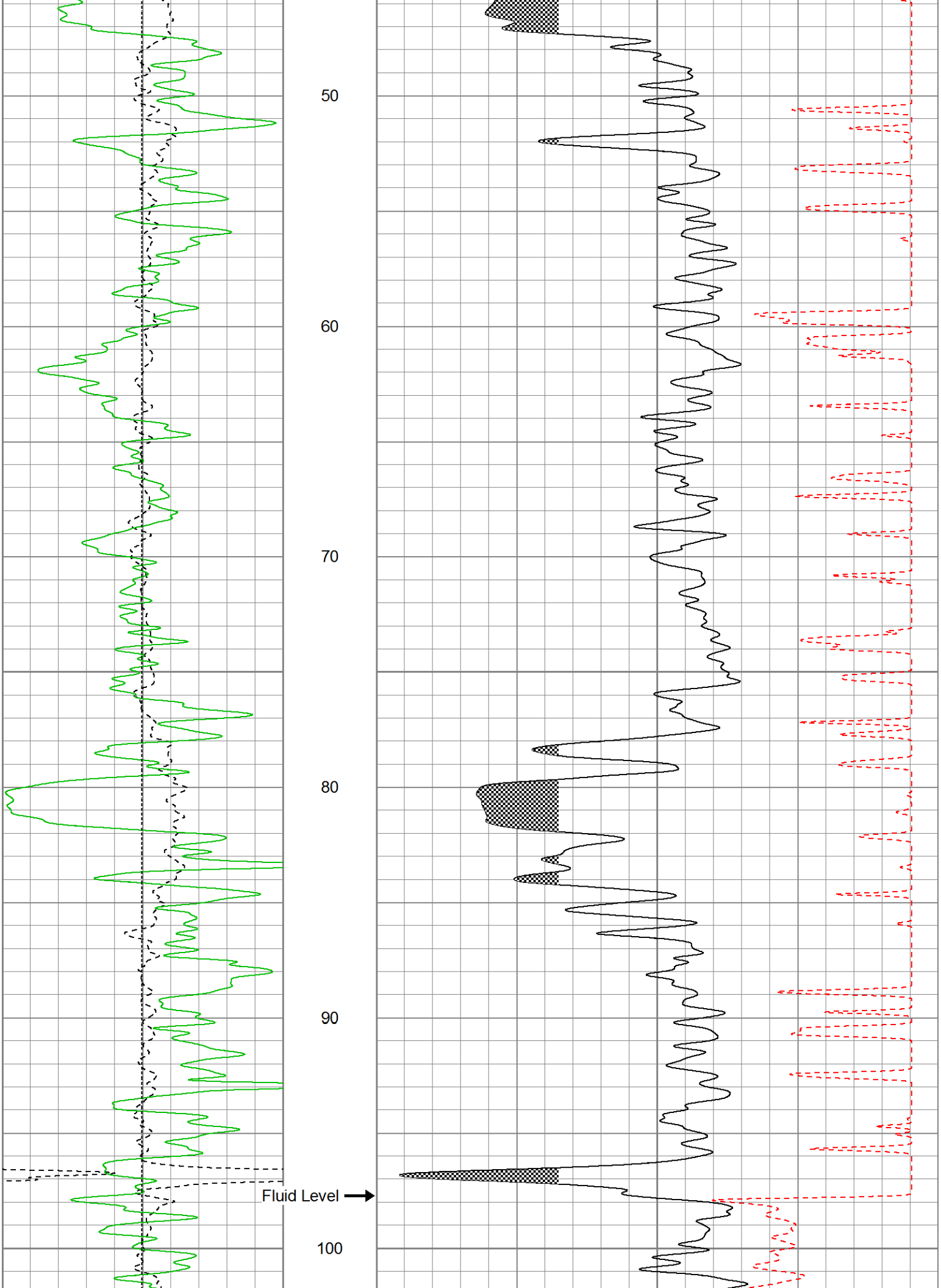
MAIN PASS

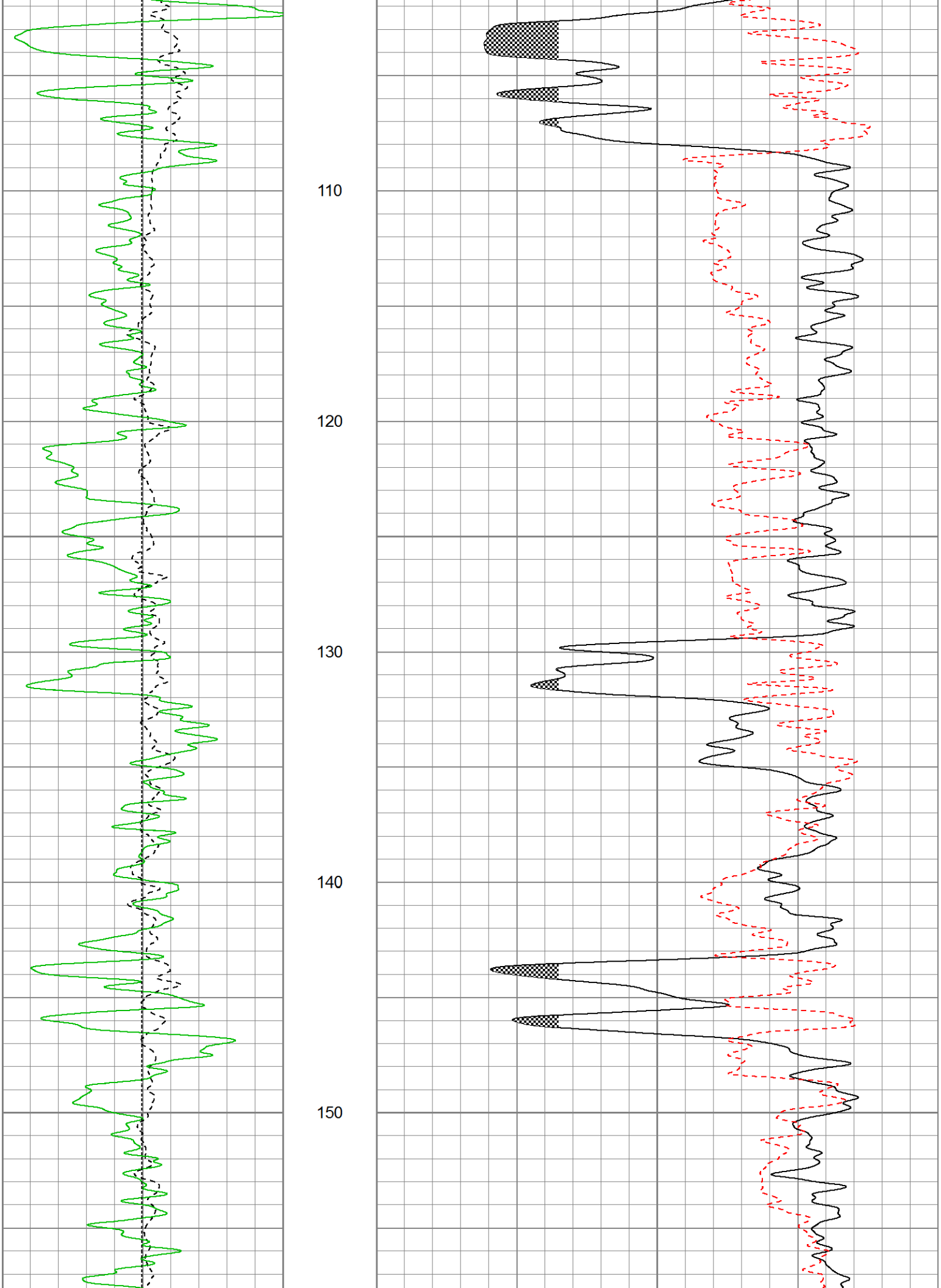
Database File:	c:\warrior\data\fro\3409\3409cdx\3409-fro.db
Dataset Pathname:	./../merge1
Presentation Format:	denresdn
Dataset Creation:	Sat Jul 08 17:37:30 2017
Charted by:	Depth in Meters scaled 1:200

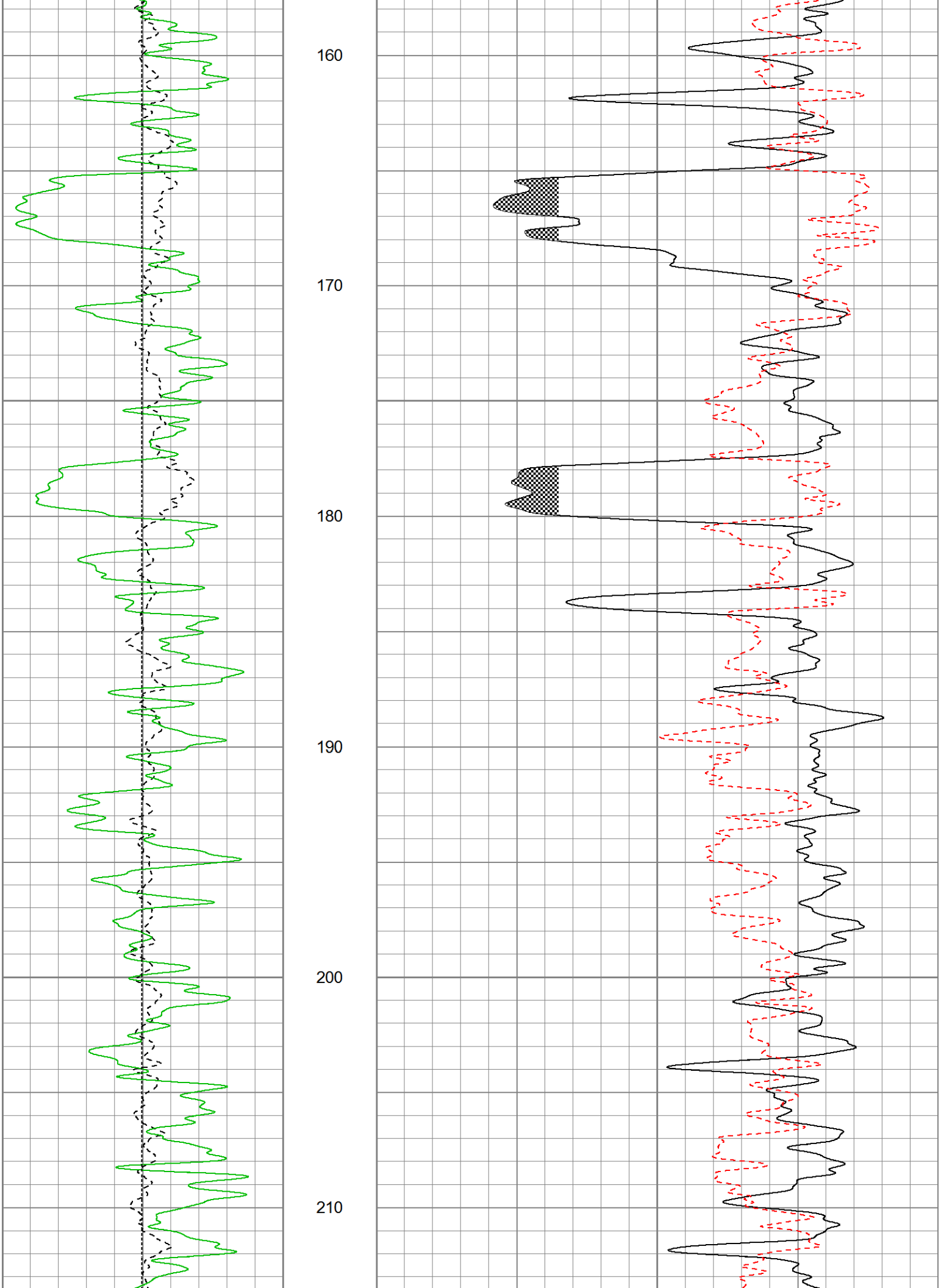
90	Density Caliper (DCAL) (mm)	190
0	Gamma Ray (GRFE) (API)	200
90	Bit Size (BIT1) (mm)	190

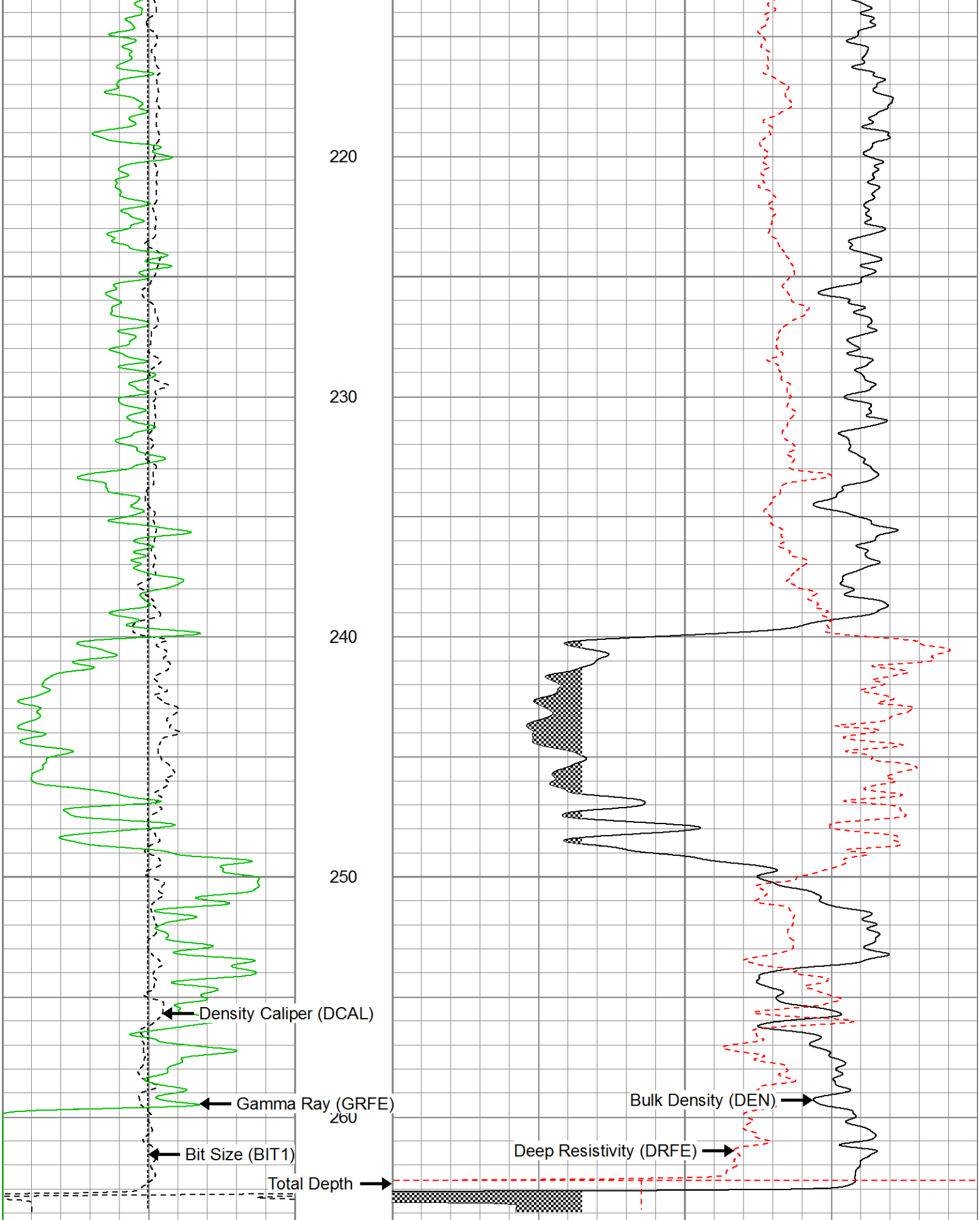
1	Bulk Density (DEN) (g/cc)	3
2	Deep Resistivity (DRFE) (Ohm-m)	20000




50
60
70
80
90
Fluid Level
100


110
120
130
140
150


160
170
180
190
200
210



90	Density Caliper (DCAL) (mm)	190
0	Gamma Ray (GRFE) (API)	200
90	Bit Size (BIT1) (mm)	190
1	Bulk Density (DEN) (g/cc)	3
2	Deep Resistivity (DRFE) (Ohm-m)	20000

Company	TECK COAL FORDING RIVER OPERATIONS
Well	3409
Field	TURNBULL
Country	CANADA
Province	B.C.

GYRO VERTICALITY ANALYSIS 3409

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3409
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3409
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION: SEC TWP RGE

Other Services
DENRES
NNTS
ATV

Permanent Datum
Log Measured From
Drilling Measured From

Elevation (m)

Elevation
K.B. (m)
D.F. (m)
G.L. (m)

Date	08 JULY 2017			
Run Number	ONE			
Depth Driller (m)	262.60			
Depth Logger (m)	255.35			
Bottom Logged Interval (m)	255.35			
Top Log Interval (m)	0.00			
Casing Driller (m)	6.00			
Casing Logger (m)	N/A			
Bit Size (mm)	139.70			
Type Fluid in Hole	WATER			
Reported Density (kg/m3)	N/A			
Reported Viscosity (cp)	N/A			
Source of Sample	N/A			
pH	N/A			
Fluid Loss (cc)	N/A			
Rm @ Meas. Temp (Ohmm @ °C)	N/A			
Rm @ BHT (Ohmm @ °C)	N/A			
Magnetic Declination (°)	14.32			
Time Circulation Stopped	08 JUL 2017 00h10			
Time Logger on Bottom	08 JUL 2017 02h35			
Maximum Temperature (°C)	N/A			
Equipment Number	C05			
Location	FORDING RIVER			
Recorded By	A. ADEAGA			
Witnessed By	K. FRASER			

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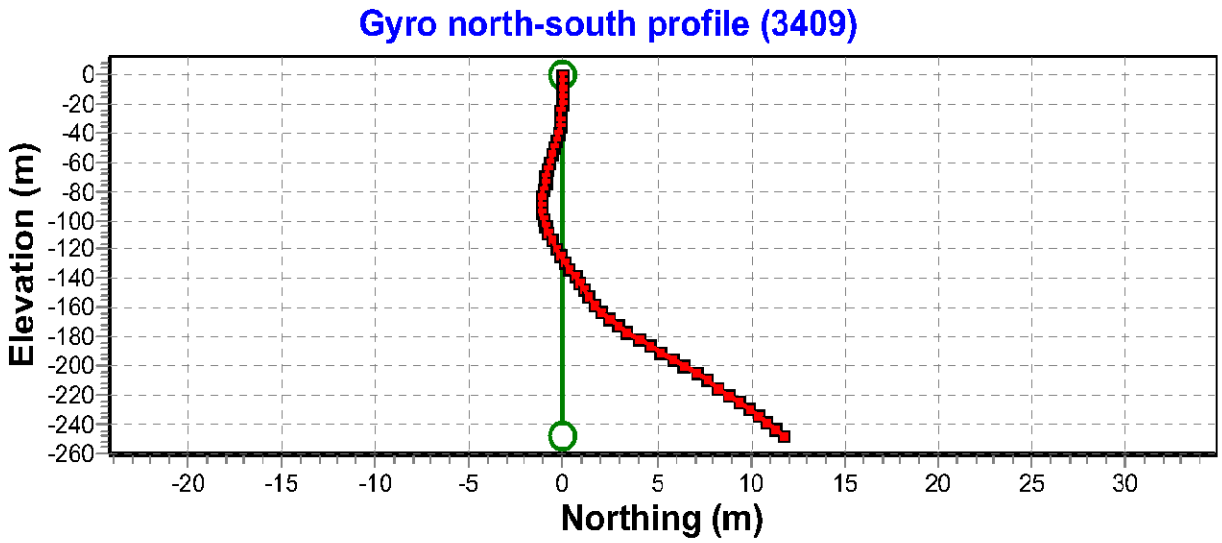
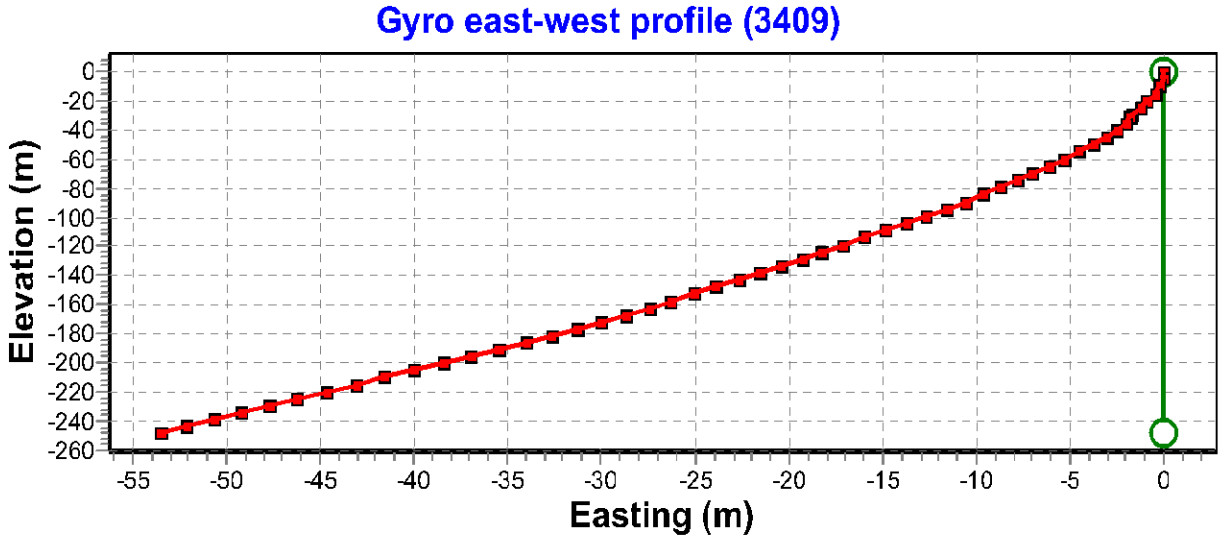
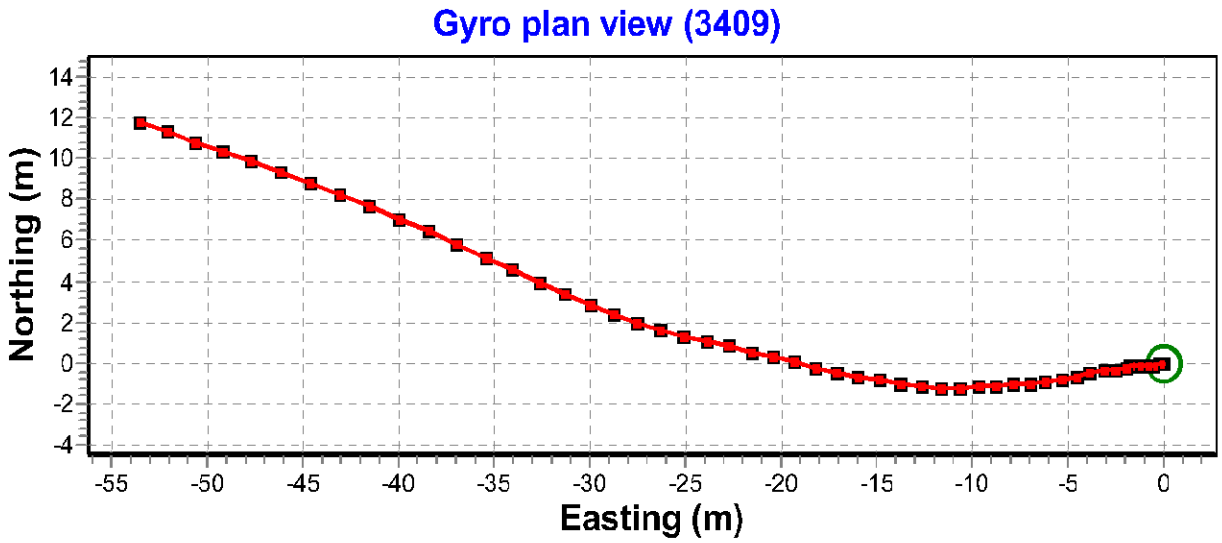
Comments

GYRO LOGGED THROUGH THE DRILL PIPE
TOOLS: NNTS1, DIP12, GL5, DNDS10


Gyro north-south profile (3409)
Elevation (m)
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
-220
-240
-260
-20
-15
-10
-5
0
5
10
15
20
25
30
Northing (m)


Gyro east-west profile (3409)
Elevation (m)
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
-220
-240
-260
-55
-50
-45
-40
-35
-30
-25
-20
-15
-10
-5
0
Easting (m)


Gyro plan view (3409)
Northing (m)
14
12
10
8
6
4
2
0
-2
-4
-55
-50
-45
-40
-35
-30
-25
-20
-15
-10
-5
0
Easting (m)

Company	TECK COAL FORDING RIVER OPERATIONS
Well	3409
Field	TURNBULL
Country	CANADA
Province	B.C.

UNCOMPENSATED NEUTRON GAMMA RAY
3409

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3409
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3409
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION:
SEC TWP RGE

Permanent Datum Elevation (m)
Log Measured From
Drilling Measured From

Other Services
DENRES
GYRO
ATV

Elevation
K.B. (m)
D.F. (m)
G.L. (m)

Date	08 JULY 2017		
Run Number	ONE		
Depth Driller (m)	262.60		
Depth Logger (m)	255.32		
Bottom Logged Interval (m)	255.32		
Top Log Interval (m)	1.00		
Casing Driller (m)	6.00		
Casing Logger (m)	N/A		
Bit Size (mm)	139.70		
Type Fluid in Hole	WATER		
Reported Density (kg/m3)	N/A		
Reported Viscosity (cp)	N/A		
Source of Sample	N/A		
pH	N/A		
Fluid Loss (cc)	N/A		
Rm @ Meas. Temp (Ohmm @ °C)	N/A		
Rm @ BHT (Ohmm @ °C)	N/A		
Magnetic Declination (°)	N/A		
Time Circulation Stopped	08 JUL 2017 00h10		
Time Logger on Bottom	08 JUL 2017 01h50		
Maximum Temperature (°C)	N/A		
Equipment Number	C05		
Location	FORDING RIVER		
Recorded By	A. ADEAGA		
Witnessed By	K. FRASER		

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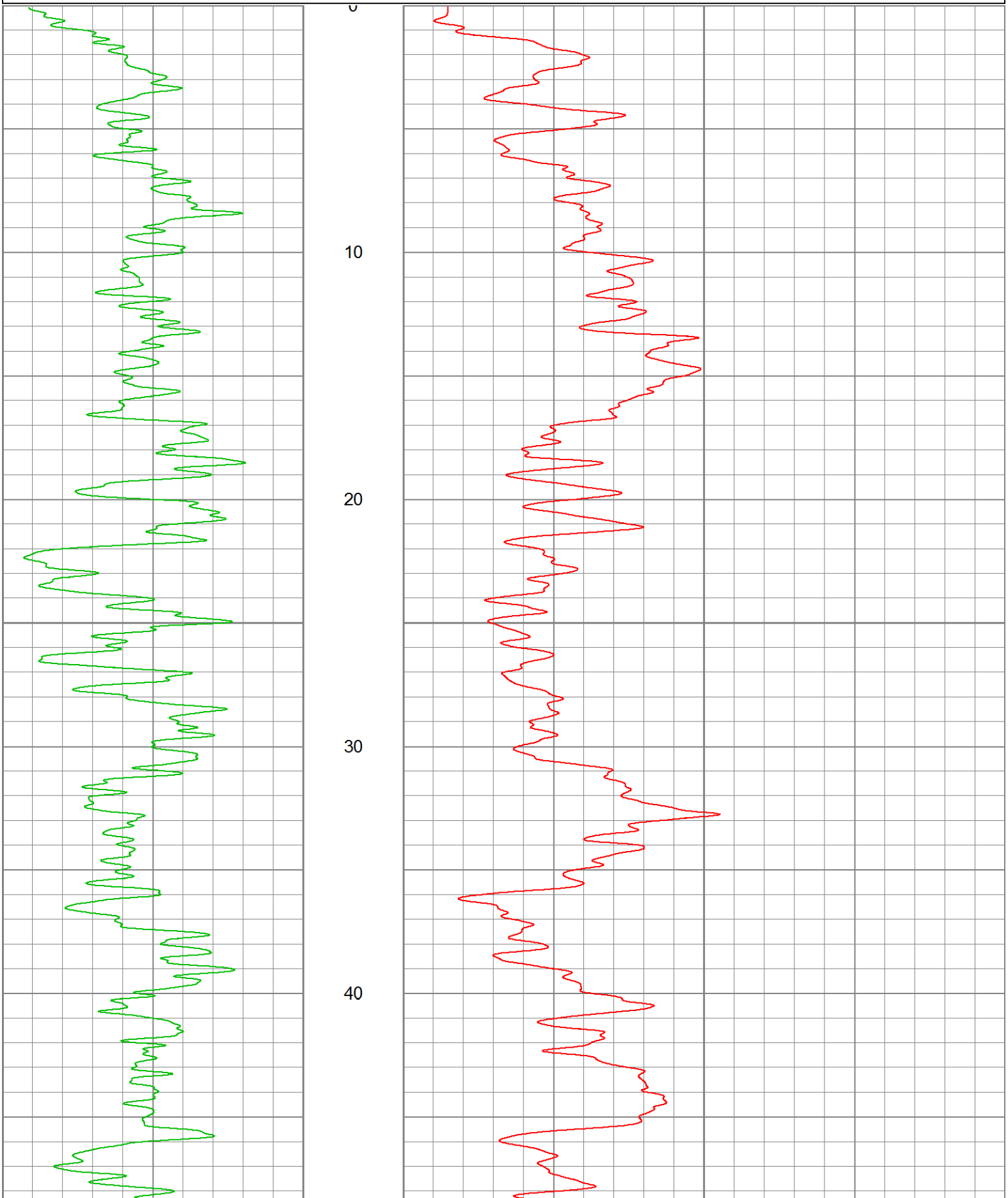
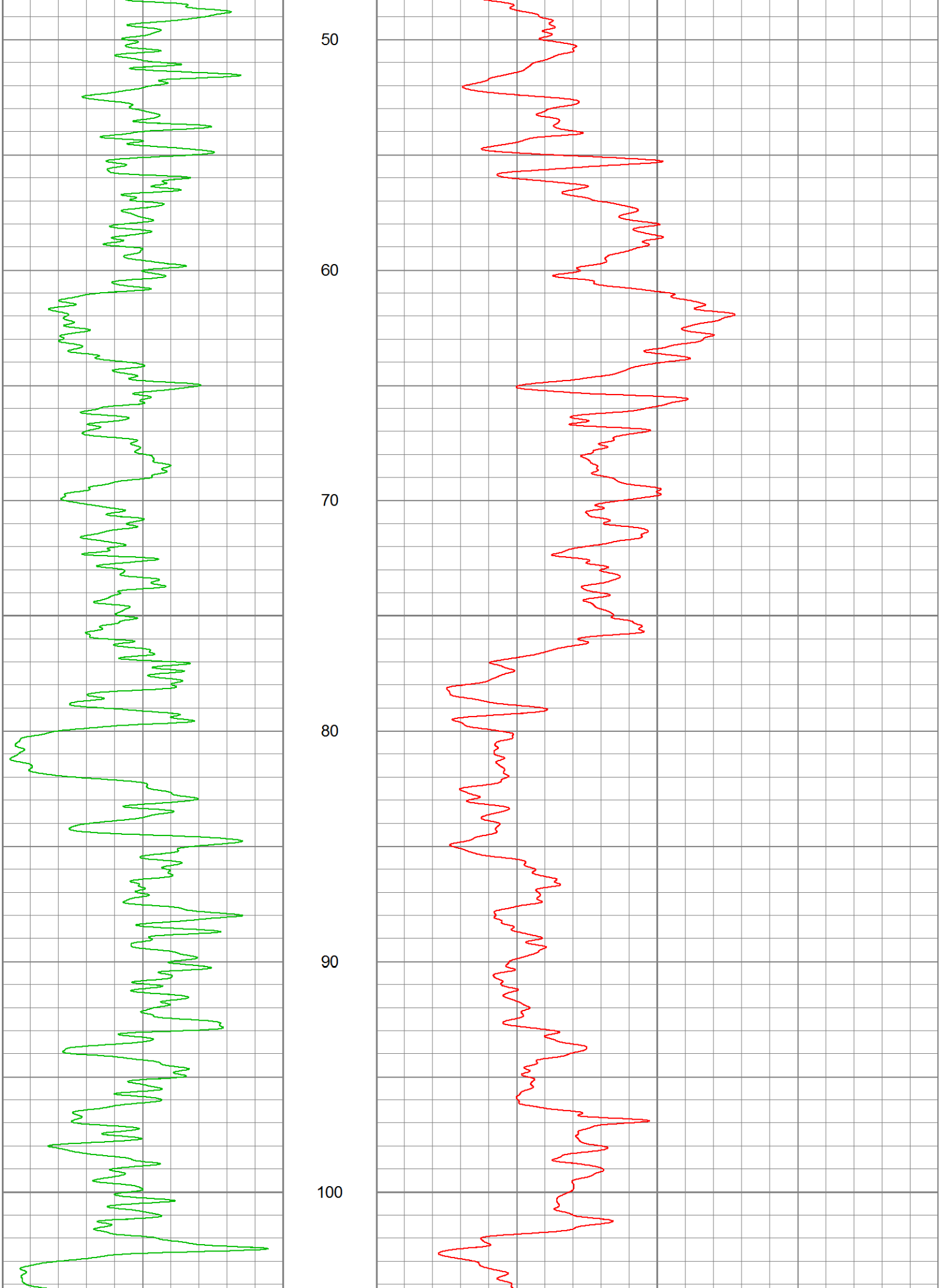
Comments

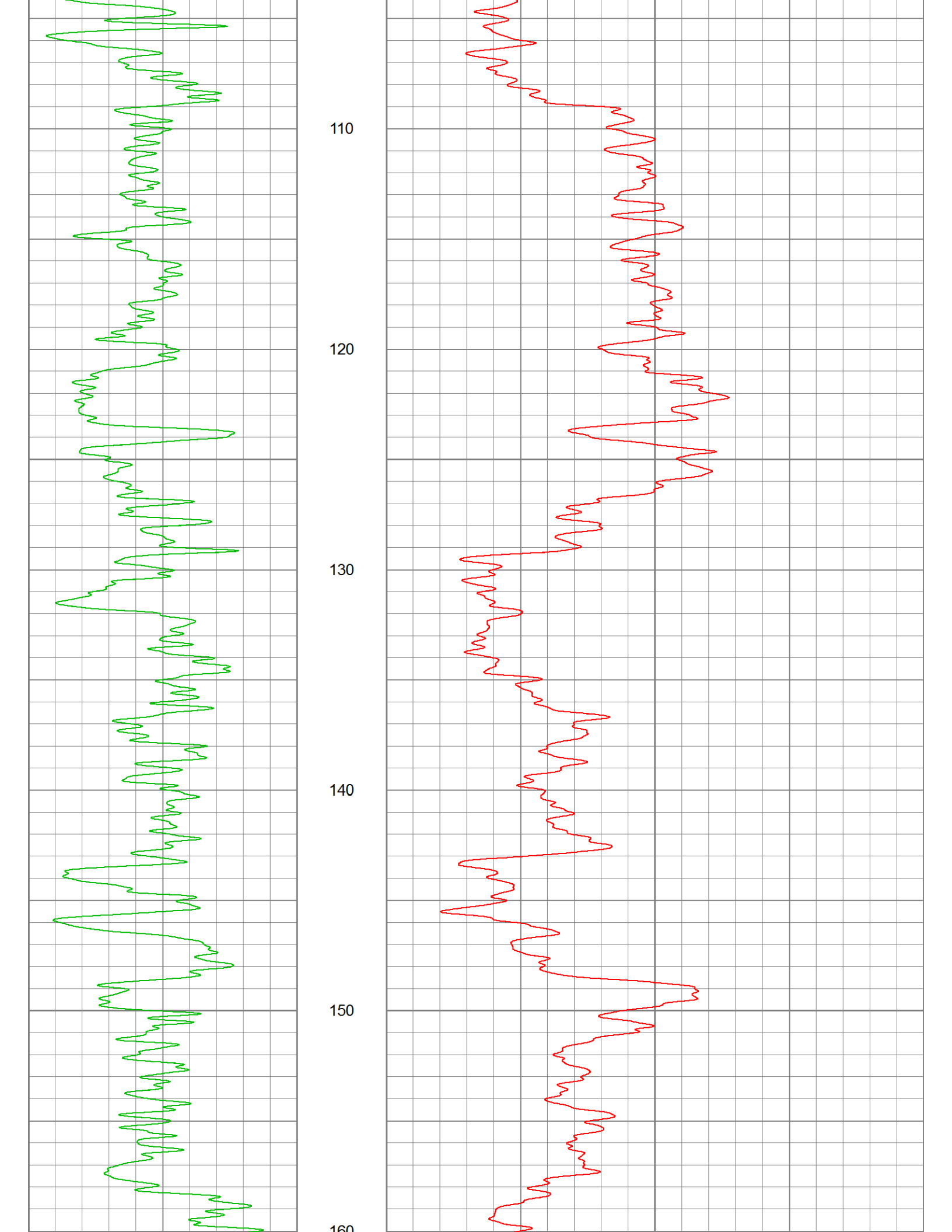
NNTS LOGGED THROUGH THE DRILL PIPE
TOOLS: NNTS1, DIP12, GL5, DNDS10

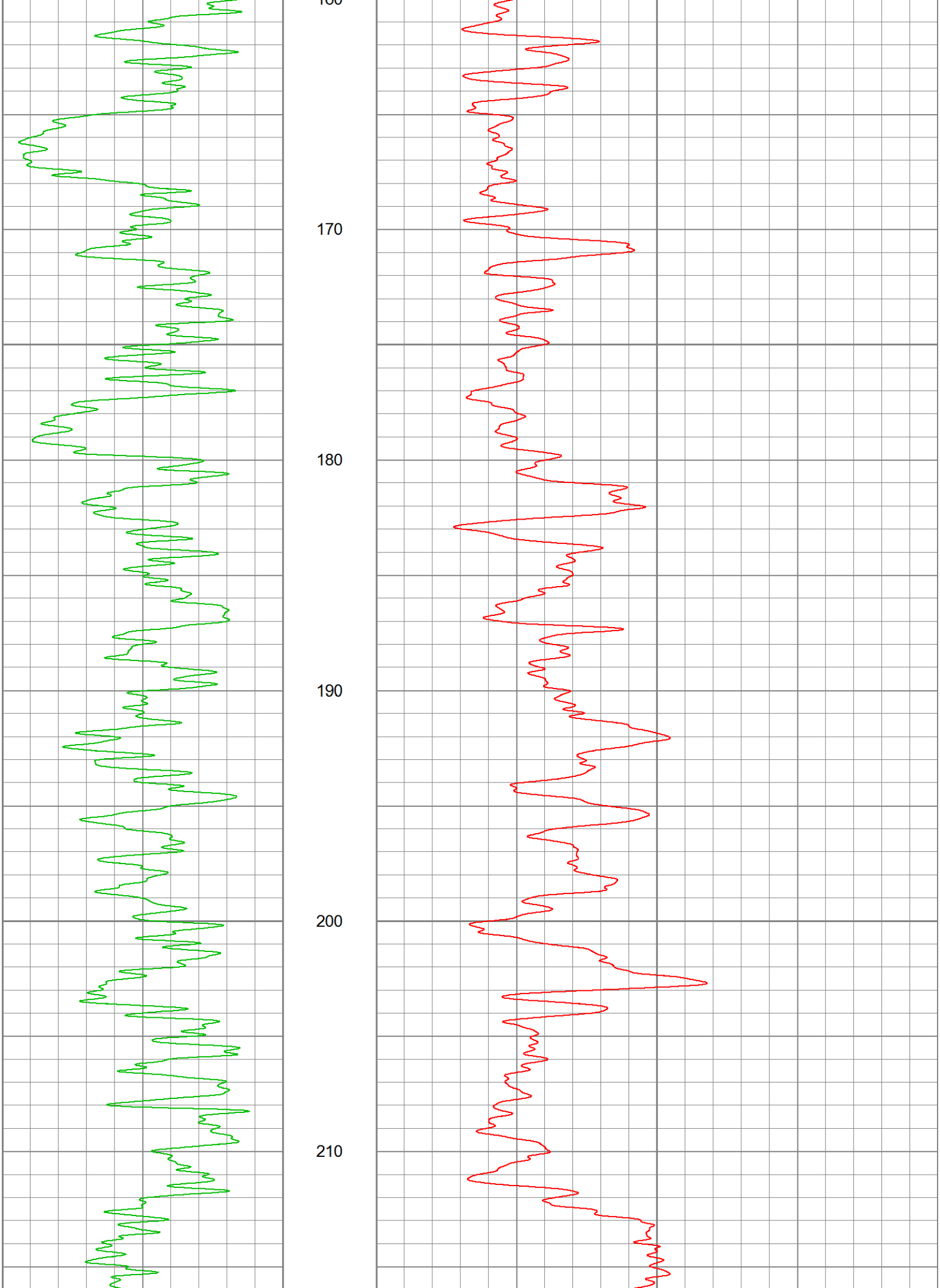
MAIN PASS

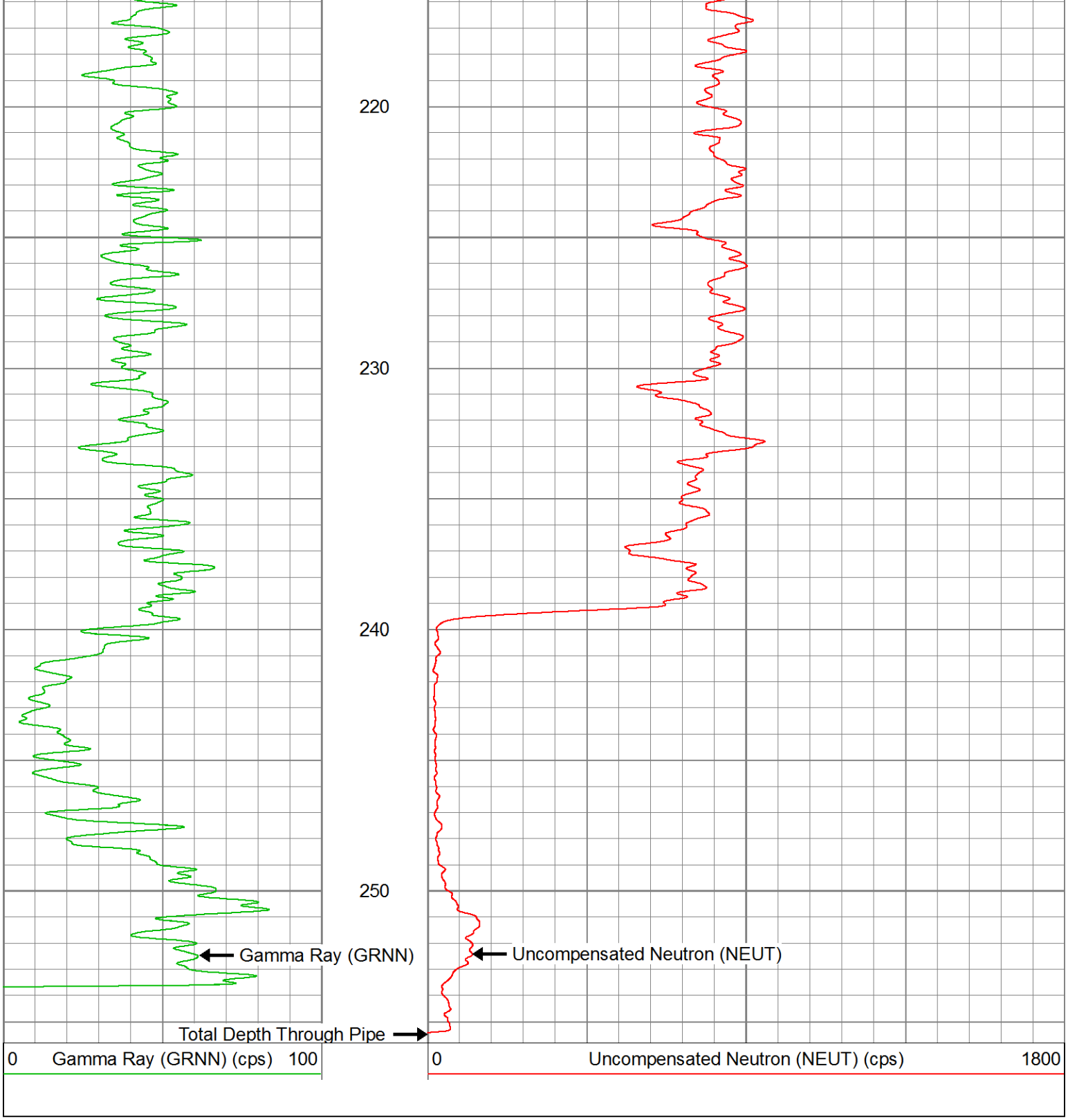
Database File:	c:\warrior\data\fro\3409\3409cdx\3409-fro.db
Dataset Pathname:	nnts1
Presentation Format:	nnts
Dataset Creation:	Sat Jul 08 03:40:03 2017
Charted by:	Depth in Meters scaled 1:200




50
60
70
80
90
100


110
120
130
140
150
160


170
180
190
200
210



Company	TECK COAL FORDING RIVER OPERATIONS
Well	3409
Field	TURNBULL
Country	CANADA
Province	B.C.

COMPENSATED DENSITY
DEEP RESISTIVITY
GAMMA RAY, CALIPER
3410

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3410
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3410
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION: SEC TWP RGE

Other Services
NNTS
GYRO

Elevation (m)
Permanent Datum
Log Measured From
Drilling Measured From

Elevation
K.B. (m)
D.F. (m)
G.L. (m)

Date	15 JULY 2017		
Run Number	ONE		
Depth Driller (m)	177.50		
Depth Logger (m)	177.50		
Bottom Logged Interval (m)	177.50		
Top Log Interval (m)	0.00		
Casing Driller (m)	9.00		
Casing Logger (m)	9.00		
Bit Size (mm)	139.70		
Type Fluid in Hole	WATER		
Reported Density (kg/m3)	N/A		
Reported Viscosity (cp)	N/A		
Source of Sample	N/A		
pH	N/A		
Fluid Loss (cc)	N/A		
Rm @ Meas. Temp (Ohmm @ °C)	N/A		
Rm @ BHT (Ohmm @ °C)	N/A		
Magnetic Declination (°)	N/A		
Time Circulation Stopped	15 JUL 2017 10h30		
Time Logger on Bottom	15 JUL 2017 15h25		
Maximum Temperature (°C)	N/A		
Equipment Number	C05		
Location	FORDING RIVER		
Recorded By	A. ADEAGA		
Witnessed By	K. FRASER		

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Comments

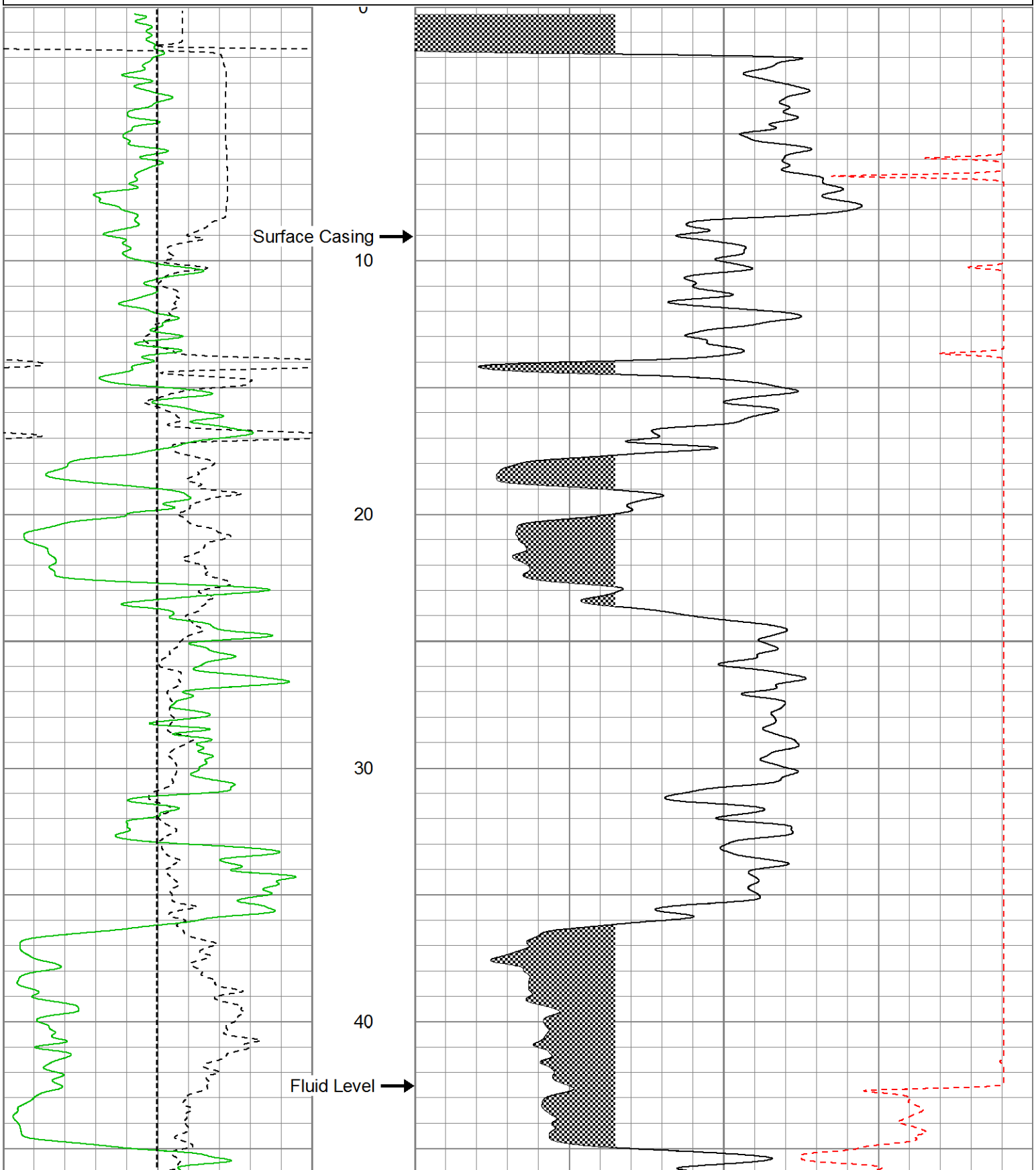
FLUID LEVEL DETECTED AT 42.50 m
TOOLS: NNTS1, DIP12, GL5, DNDS10.

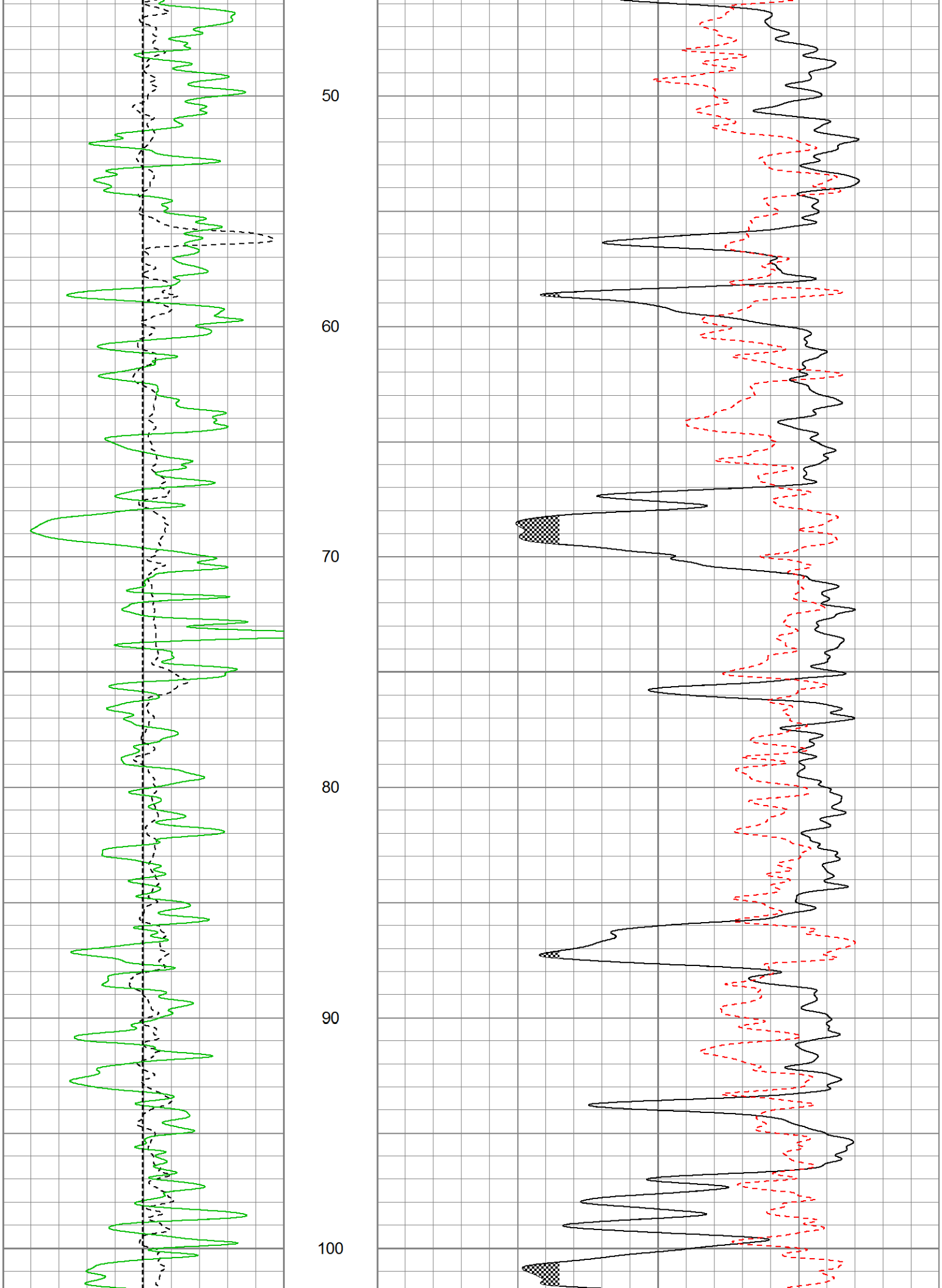
MAIN PASS

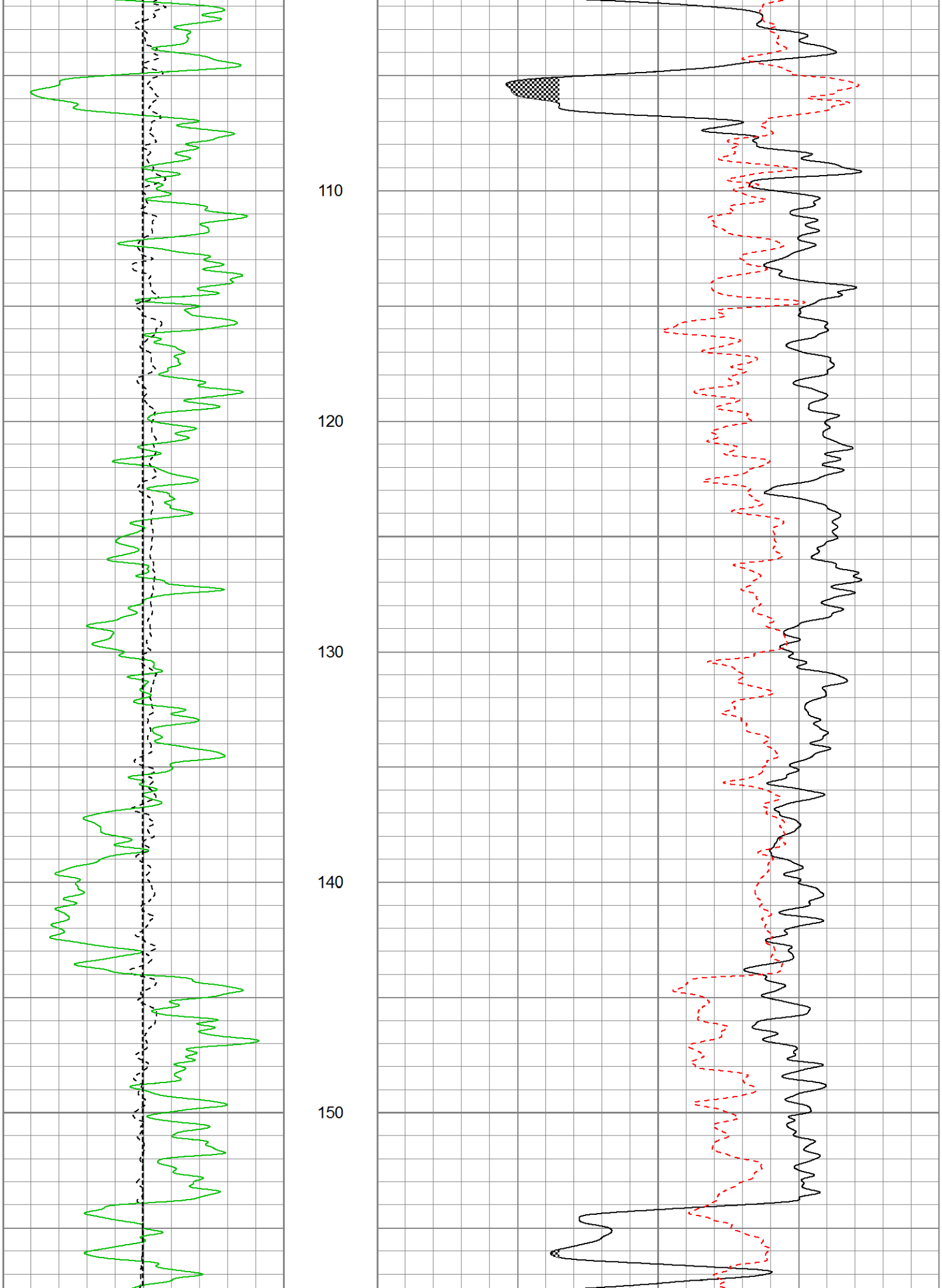
Database File:	c:\warrior\data\fro\3410\3410cdx\3410-fro.db
Dataset Pathname:	./../DENRES
Presentation Format:	denresdn
Dataset Creation:	Sat Jul 15 22:13:23 2017
Charted by:	Depth in Meters scaled 1:200

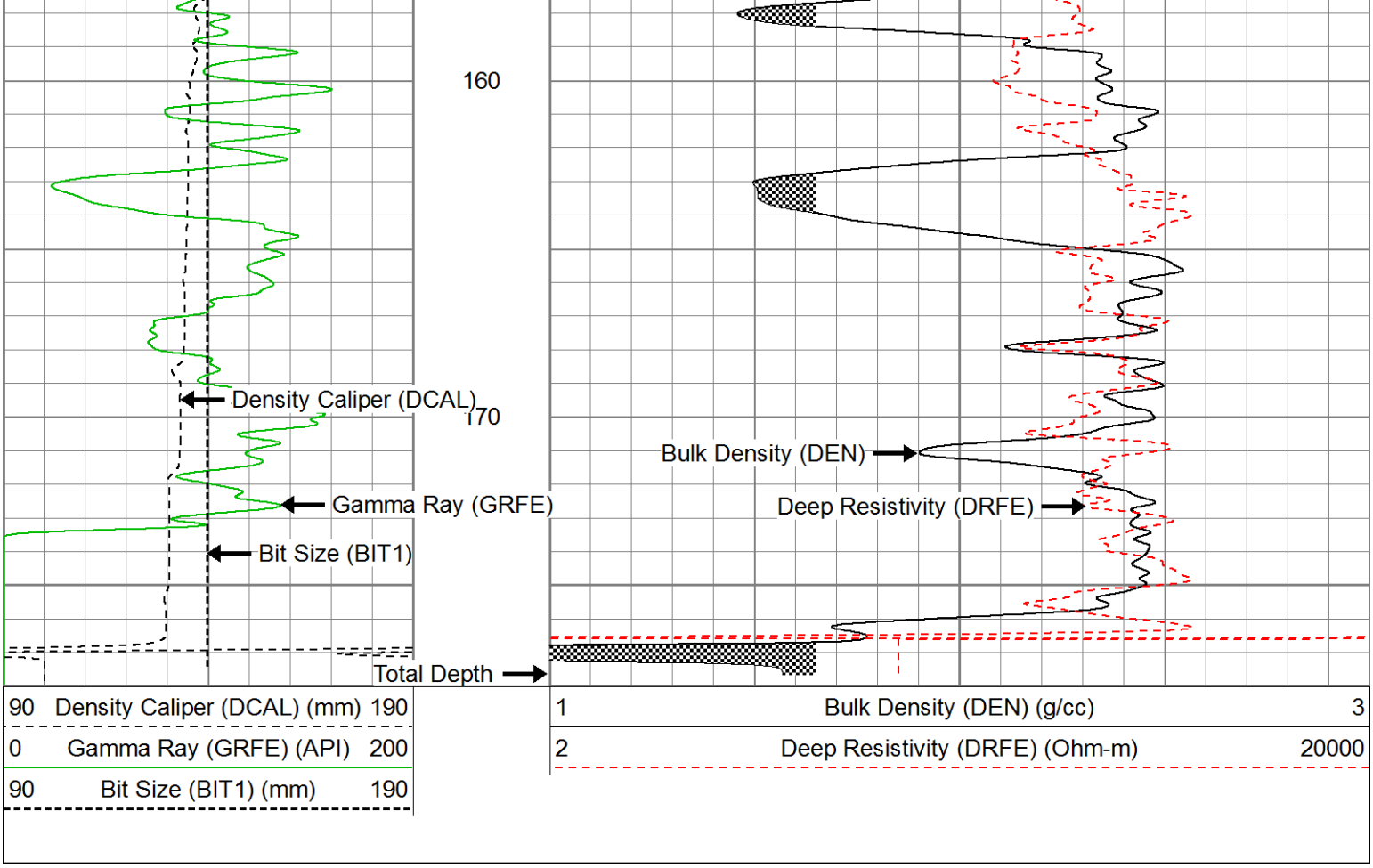
90	Density Caliper (DCAL) (mm)	190
0	Gamma Ray (GRFE) (API)	200
90	Bit Size (BIT1) (mm)	190

1	Bulk Density (DEN) (g/cc)	3
2	Deep Resistivity (DRFE) (Ohm-m)	20000




50
60
70
80
90
100


110
120
130
140
150



90	Density Caliper (DCAL) (mm)	190
0	Gamma Ray (GRFE) (API)	200
90	Bit Size (BIT1) (mm)	190

1	Bulk Density (DEN) (g/cc)	3
2	Deep Resistivity (DRFE) (Ohm-m)	20000

CORDAX

Company	TECK COAL FORDING RIVER OPERATIONS
Well	3410
Field	TURNBULL
Country	CANADA
Province	B.C.

GYRO VERTICALITY ANALYSIS 3410

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3410
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name3410
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION: SEC TWP RGE

Other Services
DENRES
NNTS

Permanent Datum
Log Measured From
Drilling Measured From

Elevation (m)

Elevation
K.B. (m)
D.F. (m)
G.L. (m)

Date	15 JULY 2017			
Run Number	ONE			
Depth Driller (m)	177.50			
Depth Logger (m)	175.91			
Bottom Logged Interval (m)	175.91			
Top Log Interval (m)	0.00			
Casing Driller (m)	9.00			
Casing Logger (m)	N/A			
Bit Size (mm)	139.70			
Type Fluid in Hole	WATER			
Reported Density (kg/m3)	N/A			
Reported Viscosity (cp)	N/A			
Source of Sample	N/A			
pH	N/A			
Fluid Loss (cc)	N/A			
Rm @ Meas. Temp (Ohmm @ °C)	N/A			
Rm @ BHT (Ohmm @ °C)	N/A			
Magnetic Declination (°)	14.32			
Time Circulation Stopped	15 JUL 2017 10h30			
Time Logger on Bottom	15 JUL 2017 12h30			
Maximum Temperature (°C)	N/A			
Equipment Number	C05			
Location	FORDING RIVER			
Recorded By	A. ADEAGA			
Witnessed By	K. FRASER			

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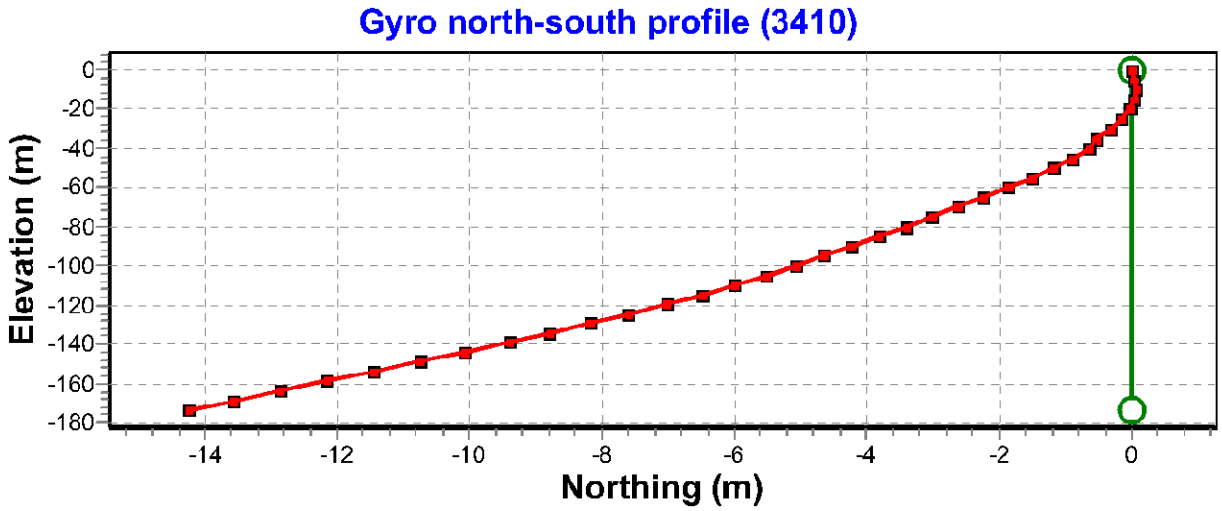
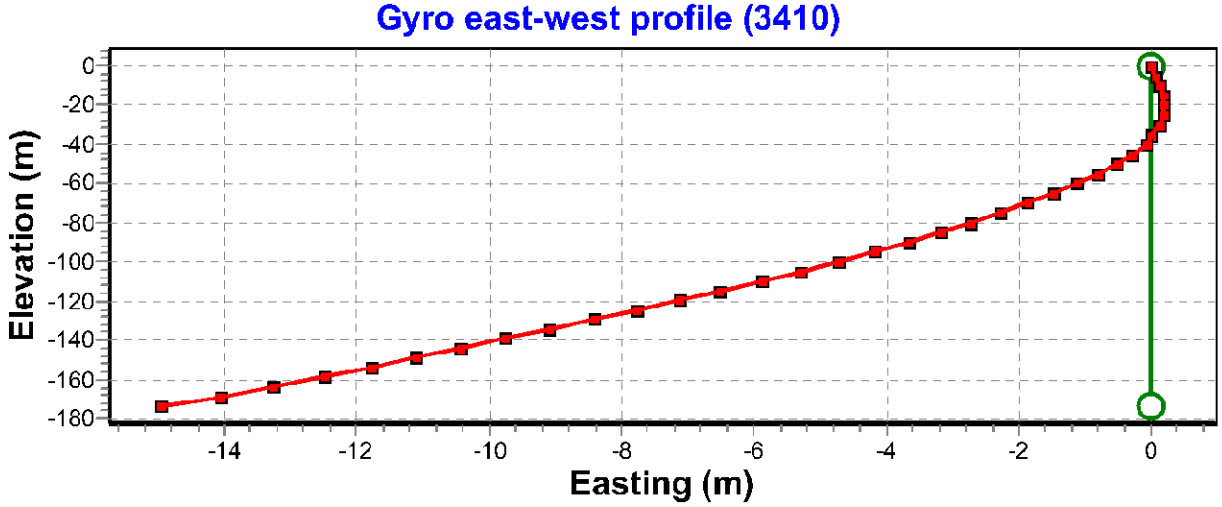
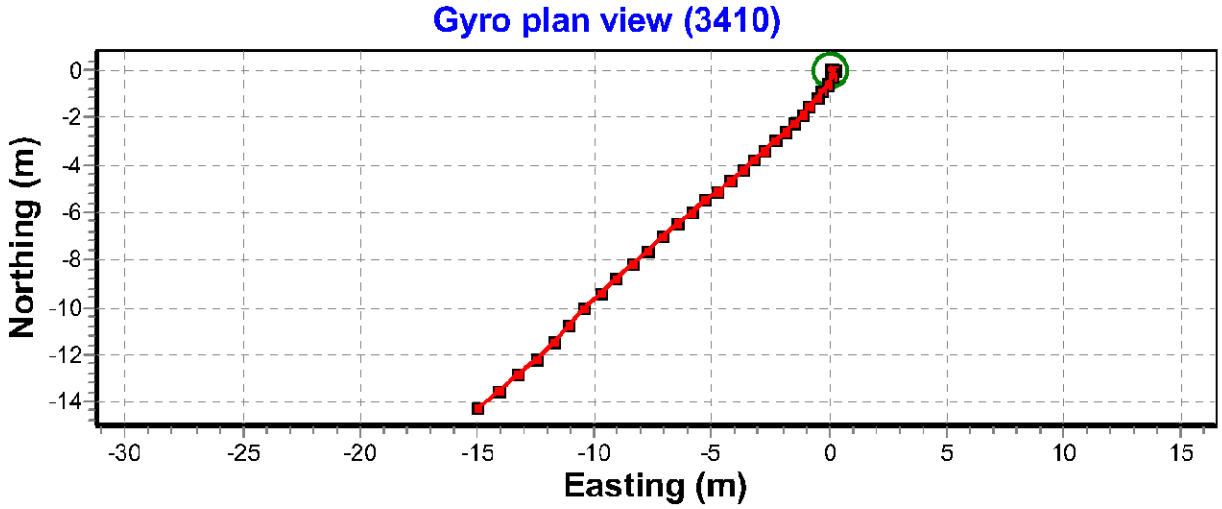
Comments

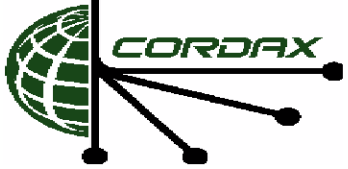
GYRO LOGGED THROUGH THE DRILL PIPE
TOOLS: NNTS1, DIP12, GL5, DNDS10.


Gyro north-south profile (3410)
Elevation (m)
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-14
-12
-10
-8
-6
-4
-2
0
Northing (m)


Gyro east-west profile (3410)
Elevation (m)
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-14
-12
-10
-8
-6
-4
-2
0
Easting (m)



	Company TECK COAL FORDING RIVER OPERATIONS



Well	3410
Field	TURNBULL
Country	CANADA
Province	B.C.

UNCOMPENSATED NEUTRON GAMMA RAY 3410

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3410
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name3410
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION:
SEC TWP RGE

Other Services
DENRES
GYRO

Permanent Datum Elevation (m)
Log Measured From
Drilling Measured From

Elevation
K.B. (m)
D.F. (m)
G.L. (m)

Date	15 JULY 2017		
Run Number	ONE		
Depth Driller (m)	177.50		
Depth Logger (m)	175.91		
Bottom Logged Interval (m)	175.91		
Top Log Interval (m)	0.00		
Casing Driller (m)	9.00		
Casing Logger (m)	N/A		
Bit Size (mm)	139.70		
Type Fluid in Hole	WATER		
Reported Density (kg/m3)	N/A		
Reported Viscosity (cp)	N/A		
Source of Sample	N/A		
pH	N/A		
Fluid Loss (cc)	N/A		
Rm @ Meas. Temp (Ohmm @ °C)	N/A		
Rm @ BHT (Ohmm @ °C)	N/A		
Magnetic Declination (°)	N/A		
Time Circulation Stopped	15 JUL 2017 10h30		
Time Logger on Bottom	15 JUL 2017 12h00		
Maximum Temperature (°C)	N/A		
Equipment Number	C05		
Location	FORDING RIVER		
Recorded By	A. ADEAGA		
Witnessed By	K. FRASER		

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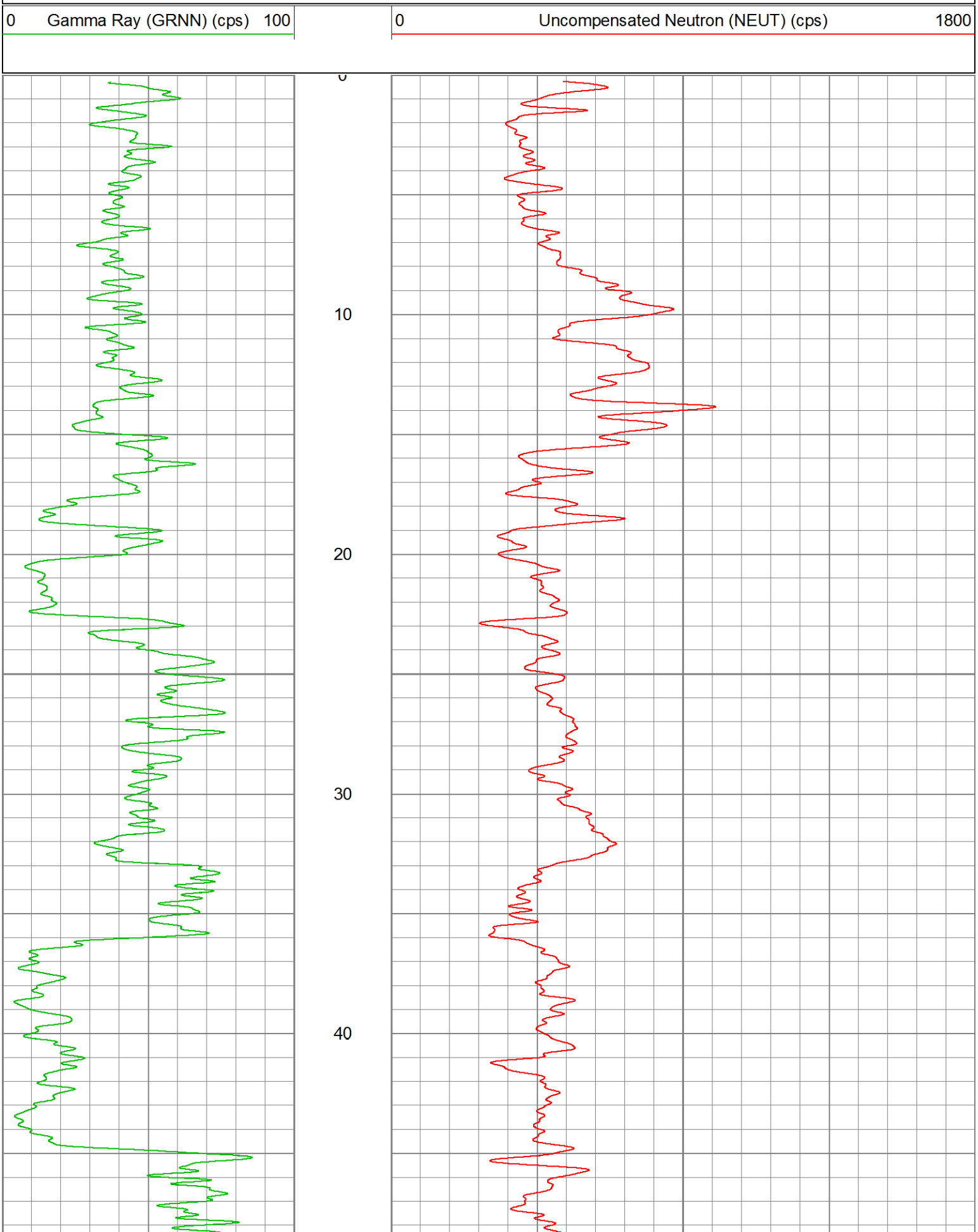
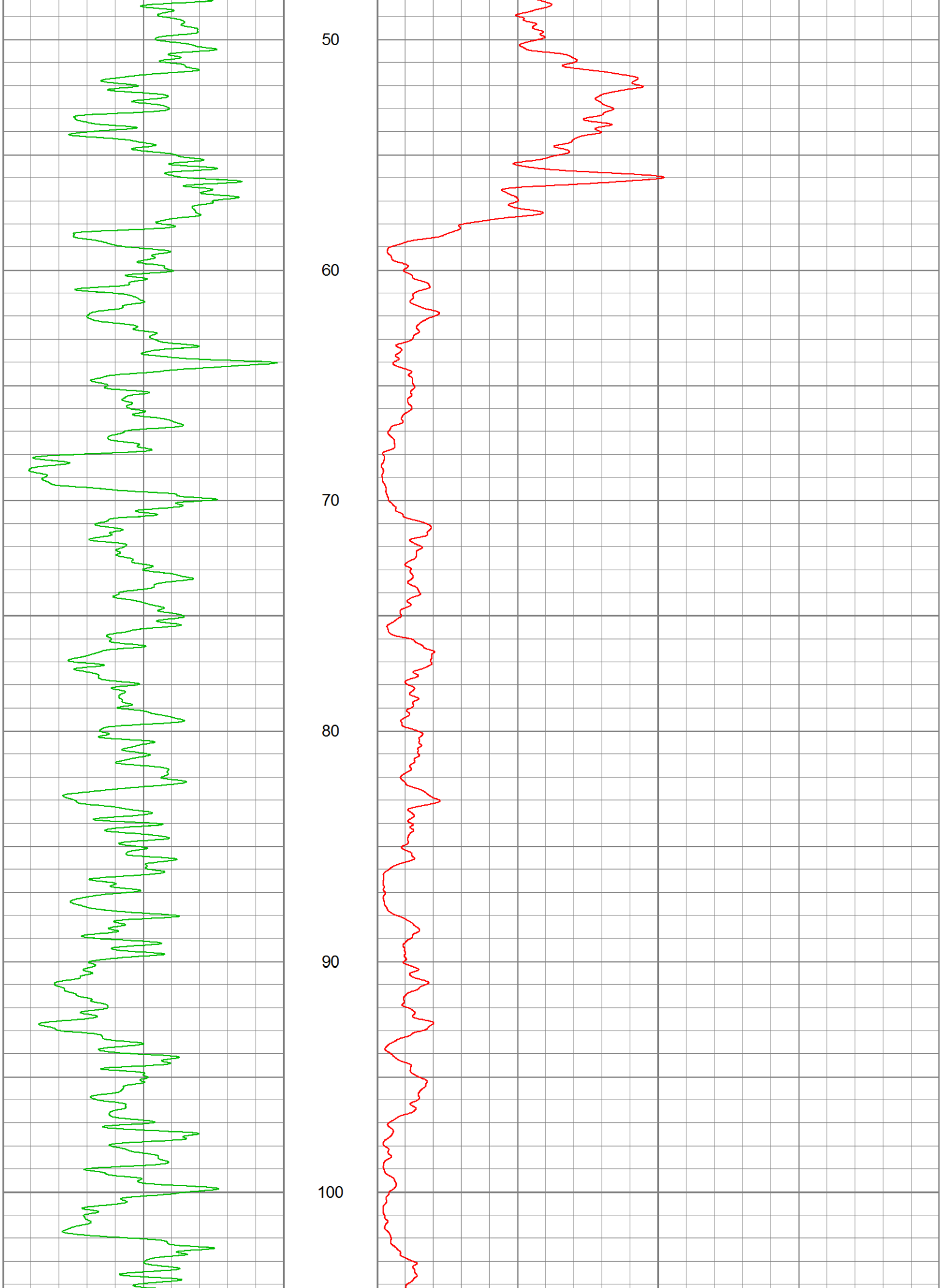
Comments

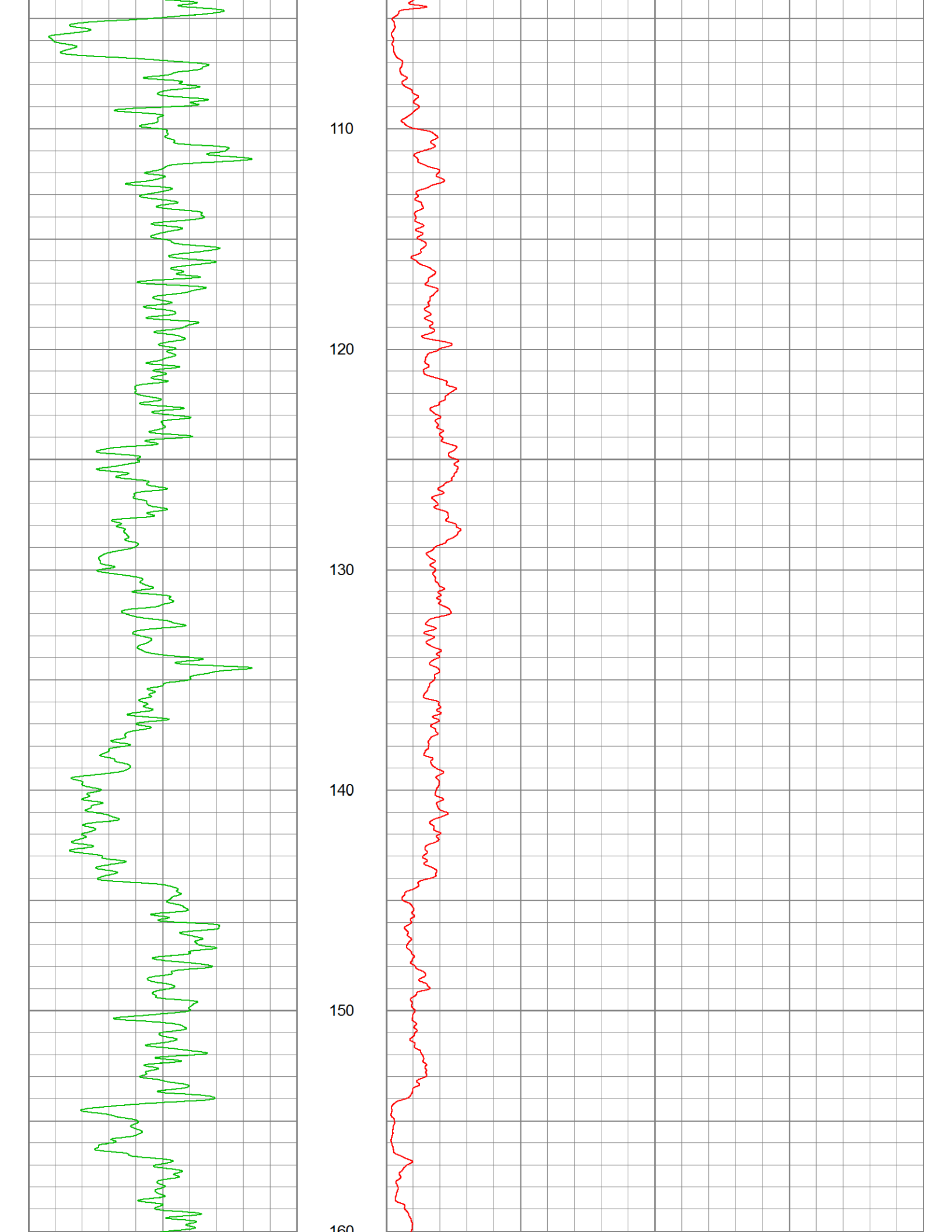
NNTS LOGGED THROUGH THE DRILL PIPE
TOOLS: NNTS1, DIP12, GL5, DNDS10.

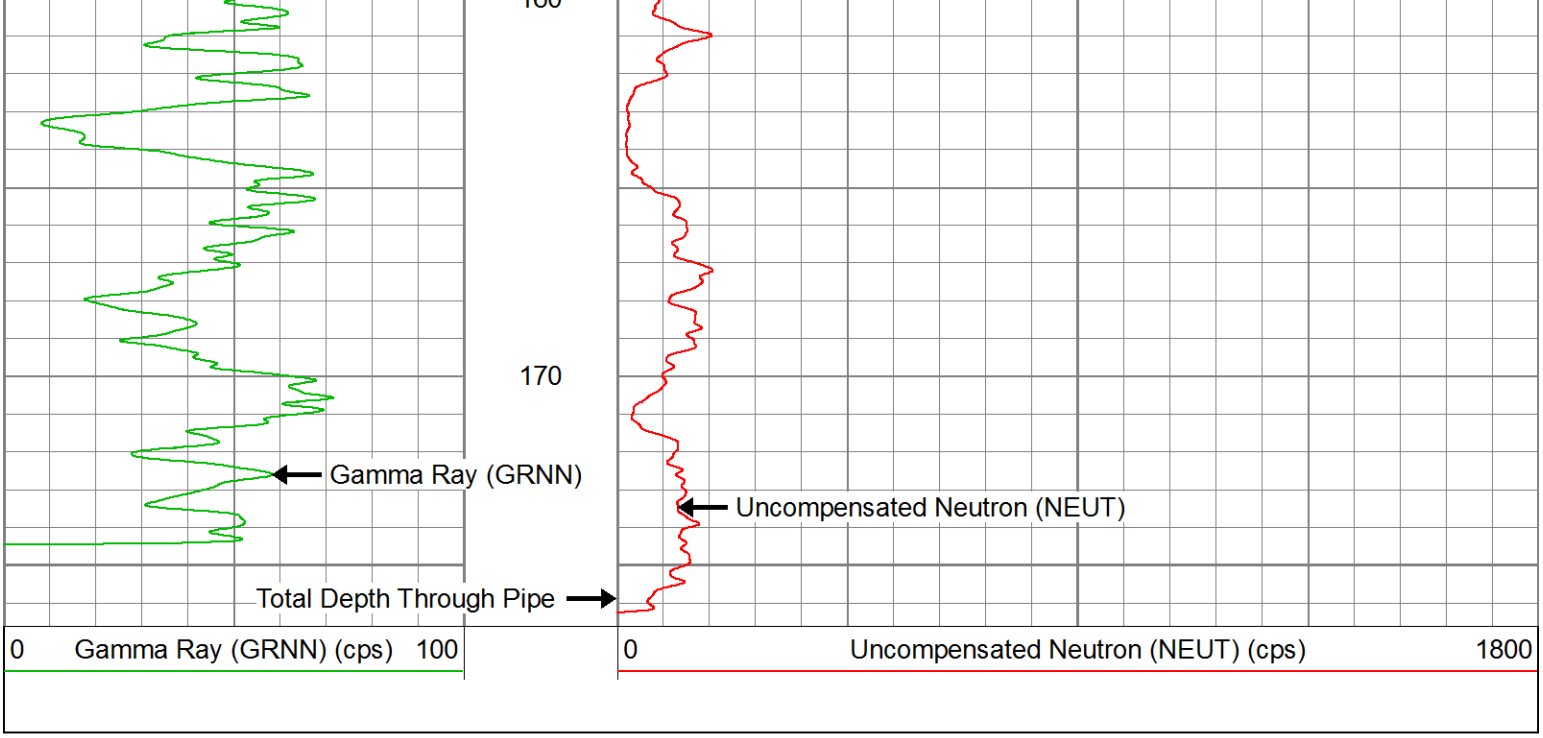
MAIN PASS

Database File:	c:\warrior\data\fro\3410\3410cdx\3410-fro.db
Dataset Pathname:	nnts1
Presentation Format:	nnts
Dataset Creation:	Sat Jul 15 13:30:50 2017
Charted by:	Depth in Meters scaled 1:200




50
60
70
80
90
100


110
120
130
140
150
160



Company	TECK COAL FORDING RIVER OPERATIONS
Well	3410
Field	TURNBULL
Country	CANADA
Province	B.C.

COMPENSATED DENSITY
DEEP RESISTIVITY
GAMMA RAY, CALIPER
3411

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3411
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name3411
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION: SEC TWP RGE

Other Services
GYRO
NNTS

Elevation
K.B. (m)
D.F. (m)
G.L. (m)

Permanent Datum
Log Measured From
Drilling Measured From
Elevation (m)

Date	16 JULY 2017		
Run Number	ONE		
Depth Driller (m)	202.00		
Depth Logger (m)	201.80		
Bottom Logged Interval (m)	201.80		
Top Log Interval (m)	0.00		
Casing Driller (m)	9.00		
Casing Logger (m)	8.69		
Bit Size (mm)	139.70		
Type Fluid in Hole	WATER		
Reported Density (kg/m3)	N/A		
Reported Viscosity (cp)	N/A		
Source of Sample	N/A		
pH	N/A		
Fluid Loss (cc)	N/A		
Rm @ Meas. Temp (Ohmm @ °C)	N/A		
Rm @ BHT (Ohmm @ °C)	N/A		
Magnetic Declination (°)	N/A		
Time Circulation Stopped	16 JUL 2017 18h10		
Time Logger on Bottom	16 JUL 2017 23h30		
Maximum Temperature (°C)	N/A		
Equipment Number	C05		
Location	FORDING RIVER		
Recorded By	S.BEECRAFT		
Witnessed By	K. FRASER		

<<< Fold Here >>>

Comments

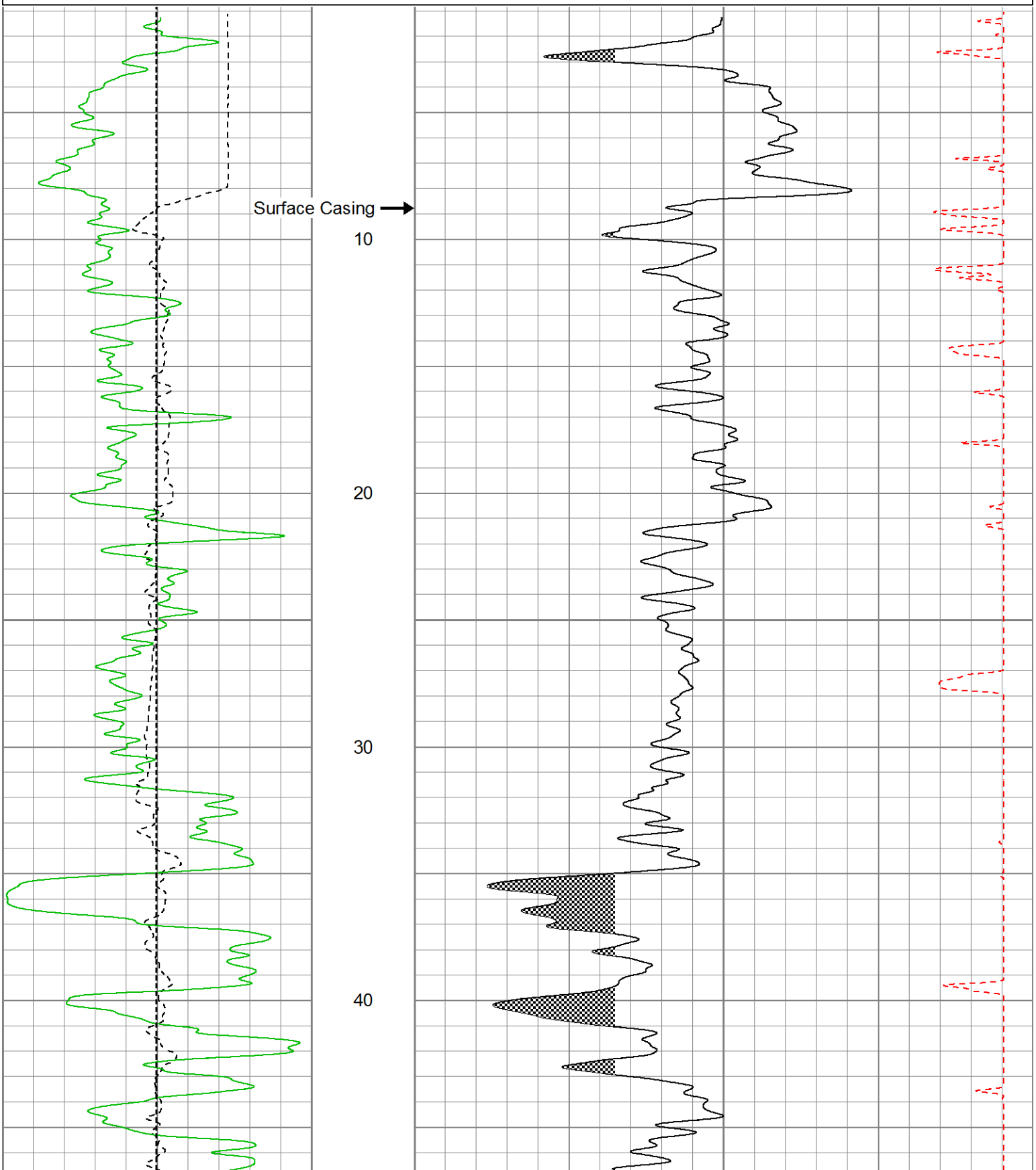
FLUID FOUND AT 47.3 m
TOOLS: NNTS1, DIP12, GL5, DNDS10.

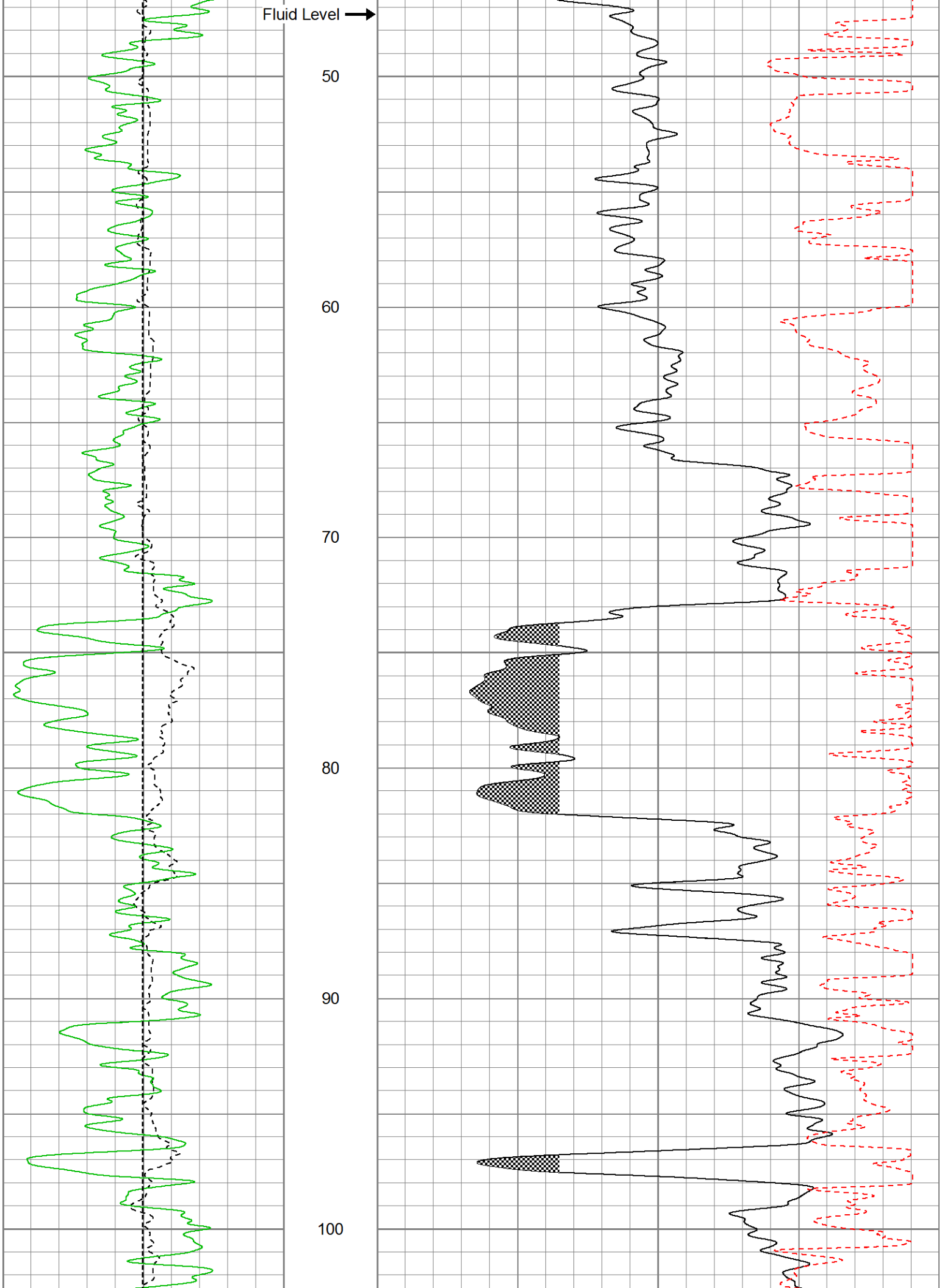
MAIN PASS

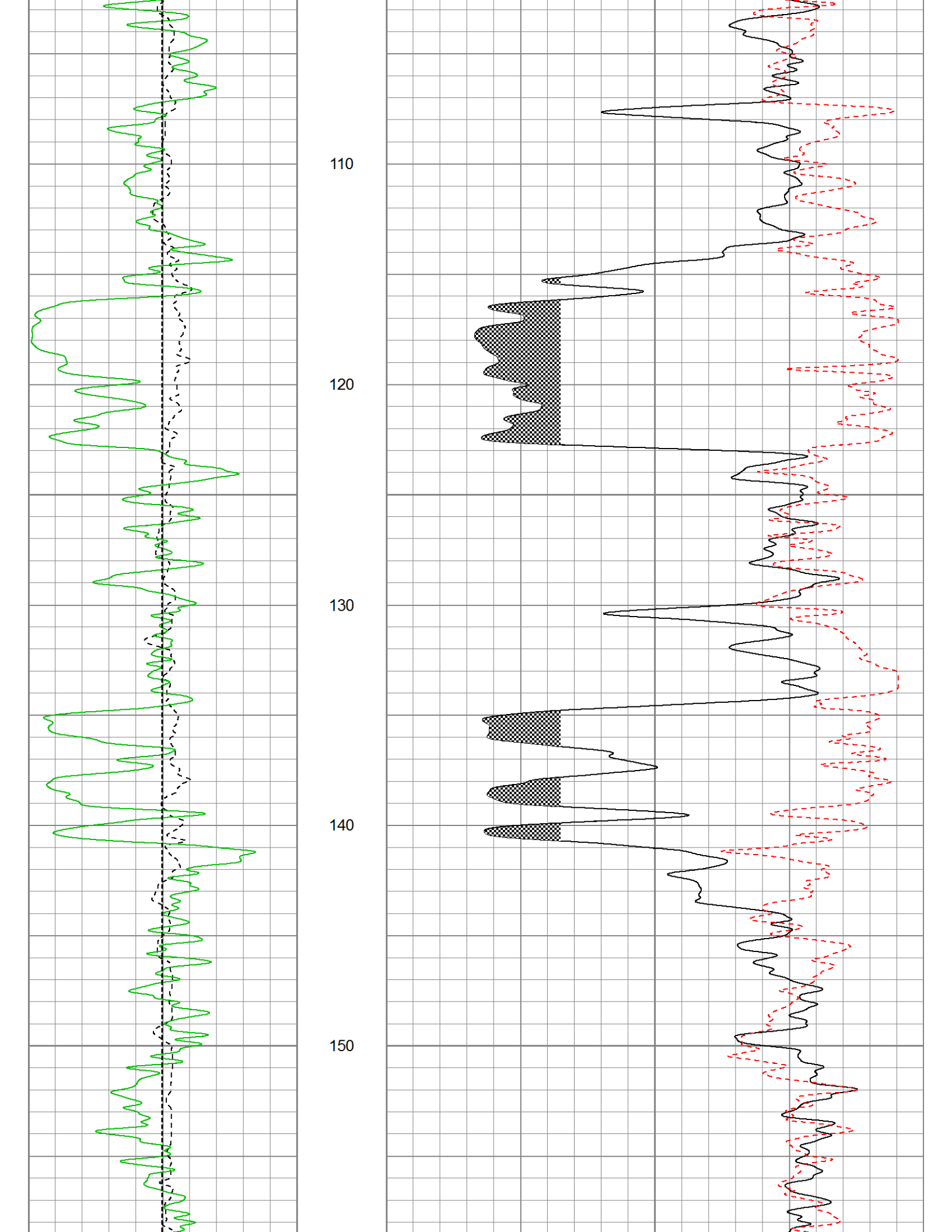
Database File:	c:\warrior\data\fro\3411\3411cdx\3411-fro.db
Dataset Pathname:	./../DENRES
Presentation Format:	denresdn
Dataset Creation:	Mon Jul 17 10:20:35 2017
Charted by:	Depth in Meters scaled 1:200

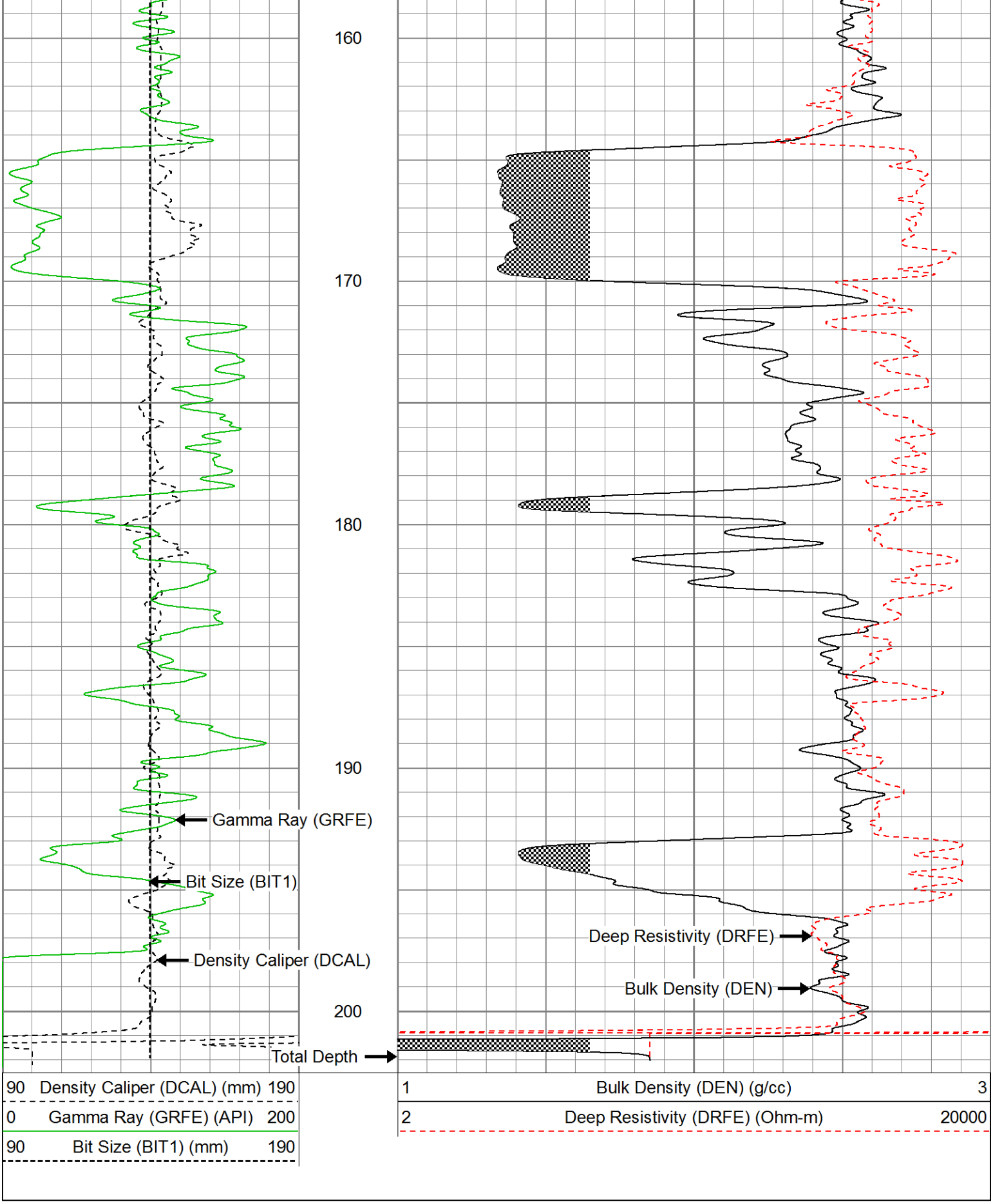
90	Density Caliper (DCAL) (mm)	190
0	Gamma Ray (GRFE) (API)	200
90	Bit Size (BIT1) (mm)	190

1	Bulk Density (DEN) (g/cc)	3
2	Deep Resistivity (DRFE) (Ohm-m)	20000




Fluid Level
50
60
70
80
90
100


110
120
130
140
150



CORDAX

Company	TECK COAL FORDING RIVER OPERATIONS
Well	3411
Field	TURNBULL
Country	CANADA

Country	CANADA
Province	B.C.

GYRO VERTICALITY ANALYSIS 3411

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3411
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name3411
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION: SEC TWP RGE

Other Services
DENRES
NNTS

Permanent Datum
Log Measured From
Drilling Measured From

Elevation (m)

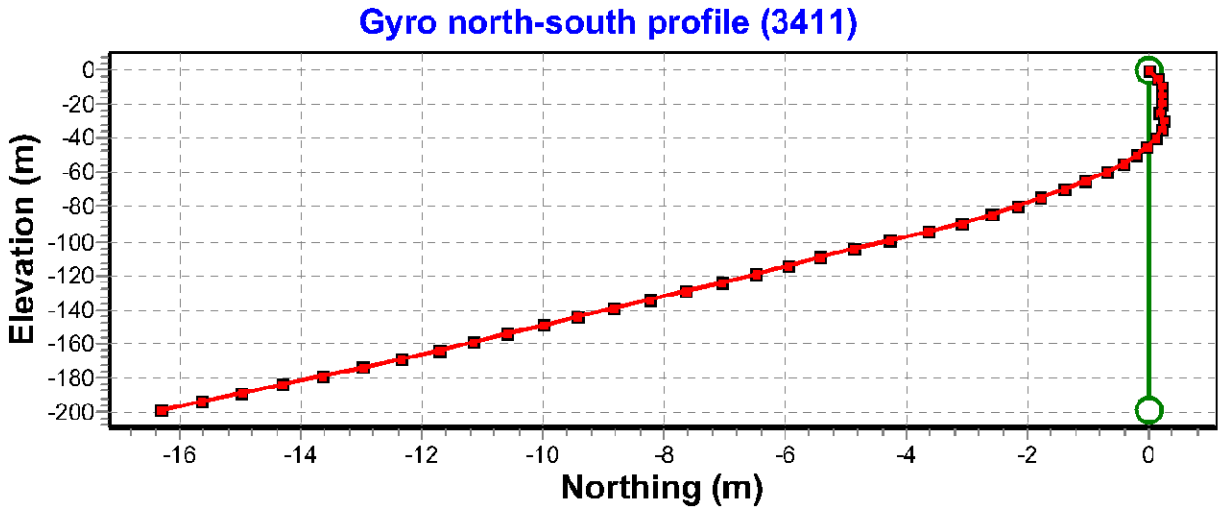
Elevation
K.B. (m)
D.F. (m)
G.L. (m)

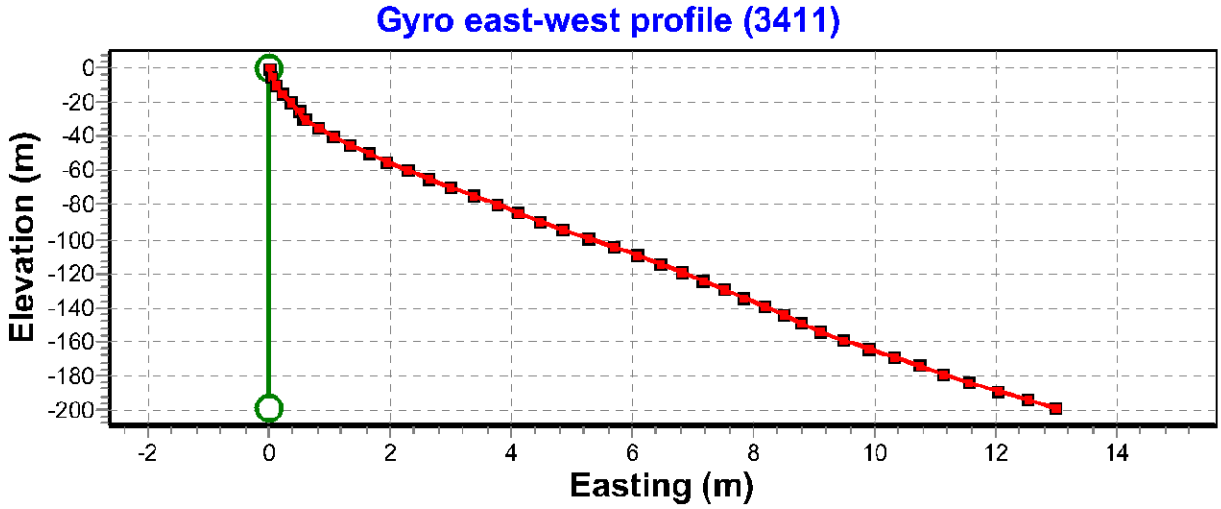
Date	16 JULY 2017		
Run Number	ONE		
Depth Driller (m)	202.00		
Depth Logger (m)	200.13		
Bottom Logged Interval (m)	200.13		
Top Log Interval (m)	0.00		
Casing Driller (m)	9.00		
Casing Logger (m)	N/A		
Bit Size (mm)	139.70		
Type Fluid in Hole	WATER		
Reported Density (kg/m3)	N/A		
Reported Viscosity (cp)	N/A		
Source of Sample	N/A		
pH	N/A		
Fluid Loss (cc)	N/A		
Rm @ Meas. Temp (Ohmm @ °C)	N/A		
Rm @ BHT (Ohmm @ °C)	N/A		
Magnetic Declination (°)	N/A		
Time Circulation Stopped	16 JUL 2017 18h10		
Time Logger on Bottom	16 JUL 2017 19h23		
Maximum Temperature (°C)	N/A		
Equipment Number	C05		
Location	FORDING RIVER		
Recorded By	S.BEECRAFT		
Witnessed By	K. FRASER		

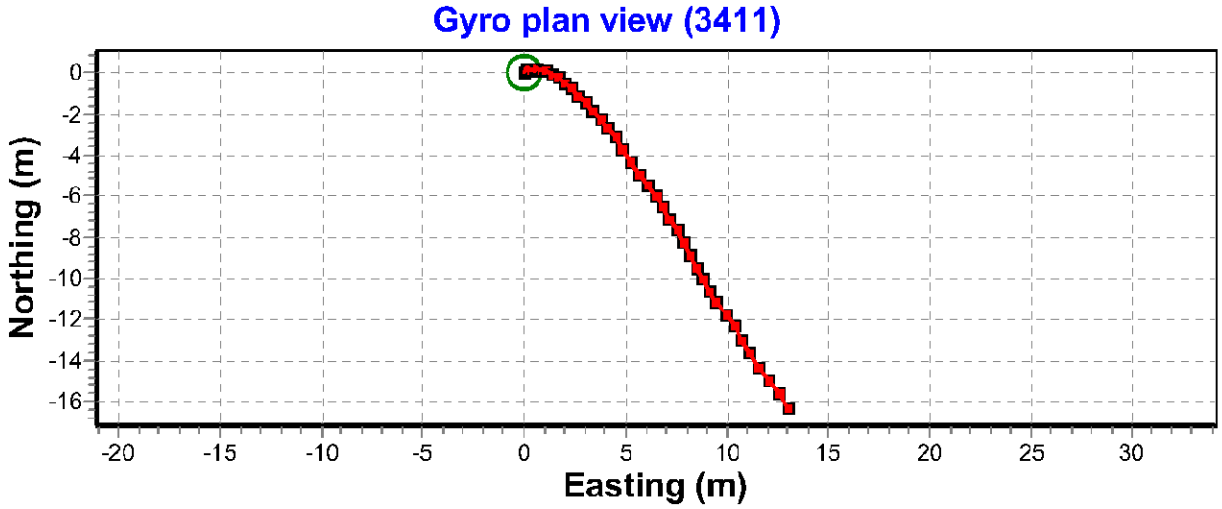
<<< Fold Here >>>

Comments

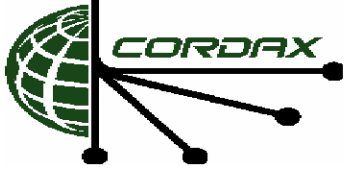
GYRO LOGGED THROUGH THE DRILL PIPE
TOOLS: NNTS1, DIP12, GL5, DNDS10.


Gyro north-south profile (3411)
Elevation (m)
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
-16
-14
-12
-10
-8
-6
-4
-2
0
Northing (m)


Gyro east-west profile (3411)
Elevation (m)
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
-2
0
2
4
6
8
10
12
14
Easting (m)



	Company TECK COAL FORDING RIVER OPERATIONS



Well	3411
Field	TURNBULL
Country	CANADA
Province	B.C.

UNCOMPENSATED NEUTRON GAMMA RAY 3411

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3411
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name3411
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION:
SEC TWP RGE

Other Services
DENRES
GYRO

Permanent Datum Elevation (m)
Log Measured From
Drilling Measured From

Elevation
K.B. (m)
D.F. (m)
G.L. (m)

Date	16 JULY 2017		
Run Number	ONE		
Depth Driller (m)	202.00		
Depth Logger (m)	200.13		
Bottom Logged Interval (m)	200.13		
Top Log Interval (m)	0.00		
Casing Driller (m)	9.00		
Casing Logger (m)	N/A		
Bit Size (mm)	139.70		
Type Fluid in Hole	WATER		
Reported Density (kg/m3)	N/A		
Reported Viscosity (cp)	N/A		
Source of Sample	N/A		
pH	N/A		
Fluid Loss (cc)	N/A		
Rm @ Meas. Temp (Ohmm @ °C)	N/A		
Rm @ BHT (Ohmm @ °C)	N/A		
Magnetic Declination (°)	N/A		
Time Circulation Stopped	16 JUL 2017 18h10		
Time Logger on Bottom	16 JUL 2017 18h34		
Maximum Temperature (°C)	N/A		
Equipment Number	C05		
Location	FORDING RIVER		
Recorded By	S.BEECRAFT		
Witnessed By	K. FRASER		

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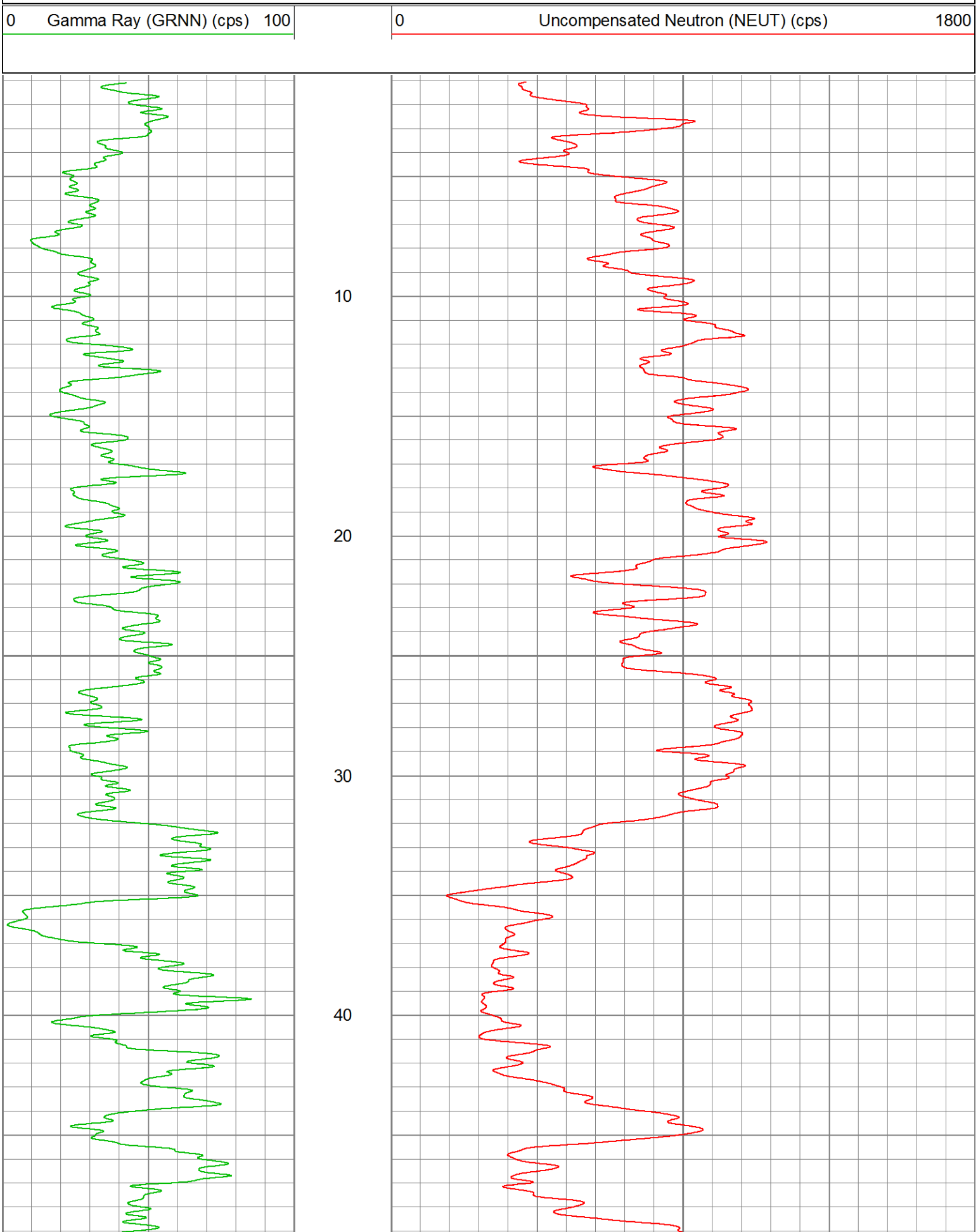
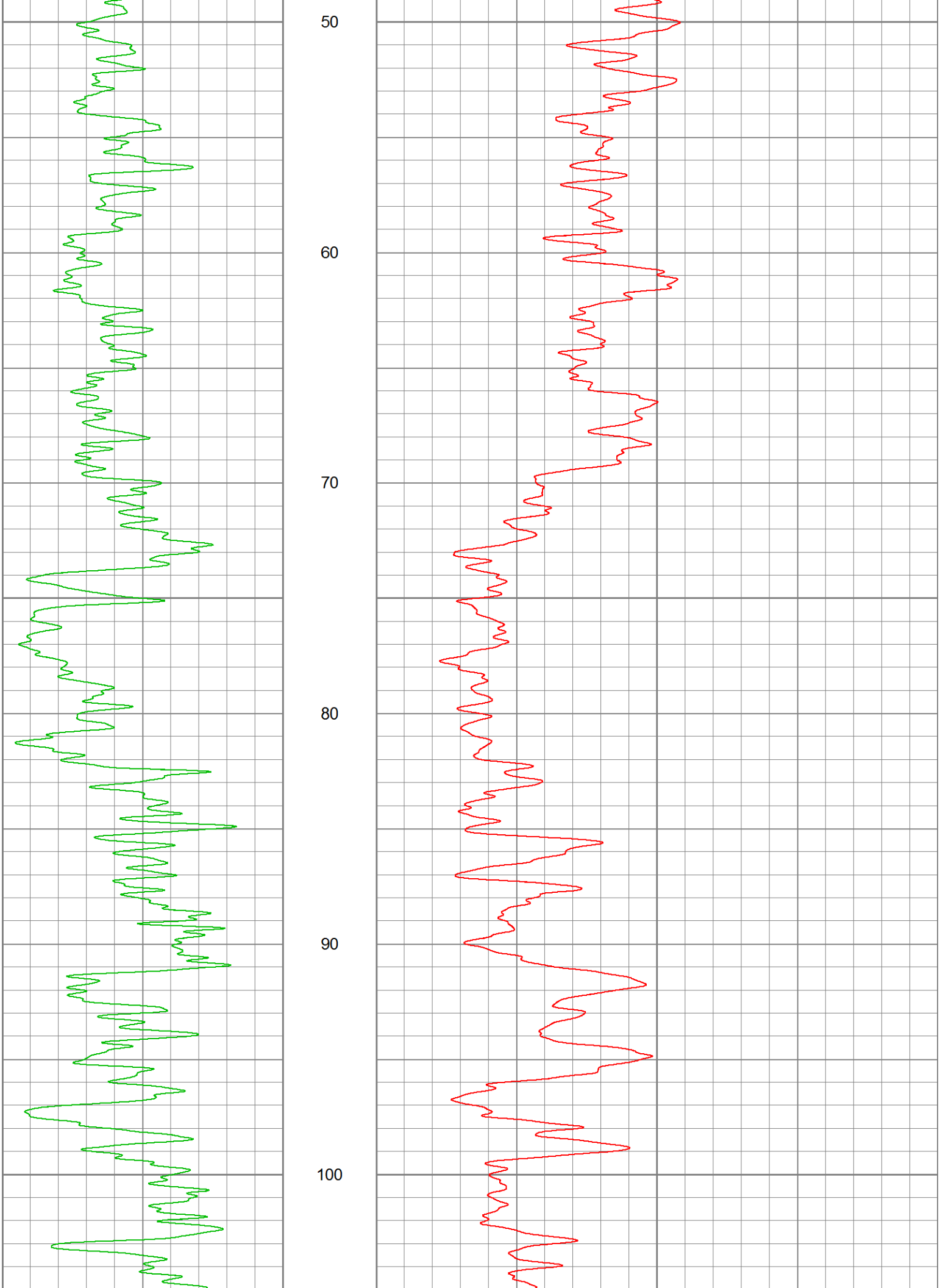
Comments

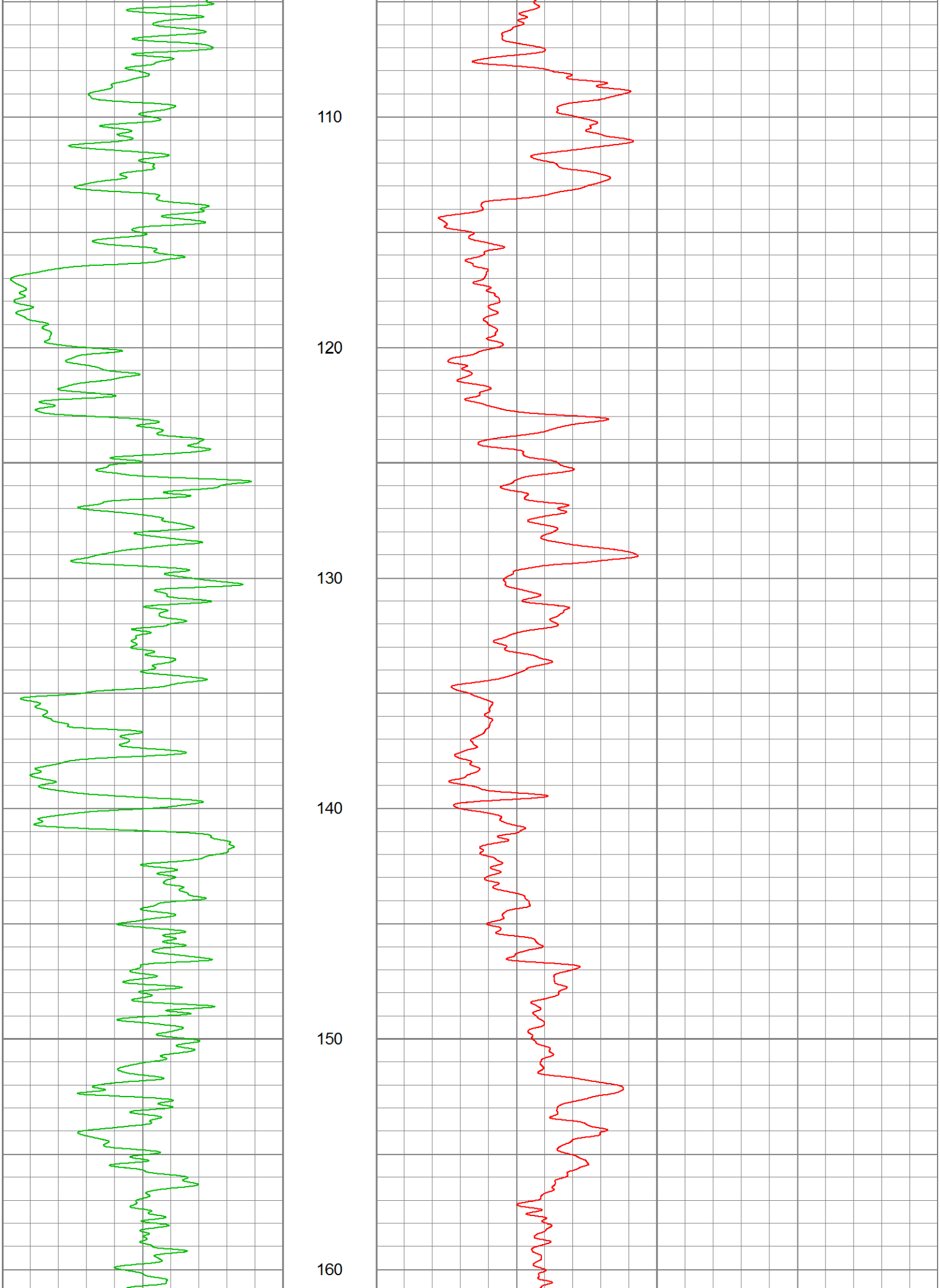
NNTS LOGGED THROUGH THE DRILL PIPE
TOOLS: NNTS1, DIP12, GL5, DNDS10.

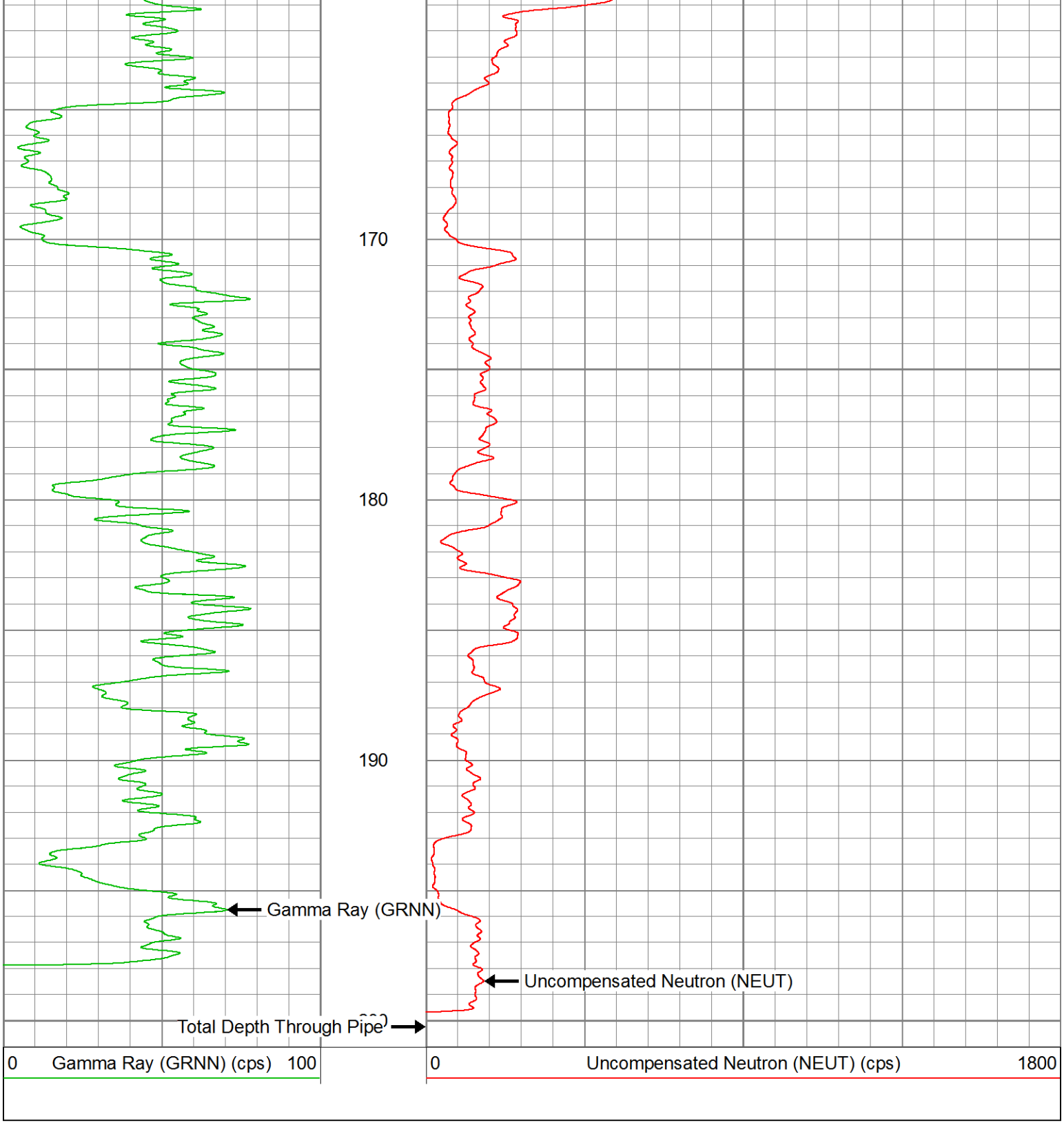
MAIN PASS

Database File:	c:\warrior\data\fro\3411\3411cdx\3411-fro.db
Dataset Pathname:	nnts1
Presentation Format:	nnts
Dataset Creation:	Sun Jul 16 20:37:54 2017
Charted by:	Depth in Meters scaled 1:200




50
60
70
80
90
100


110
120
130
140
150
160



Company	TECK COAL FORDING RIVER OPERATIONS
Well	3411
Field	TURNBULL
Country	CANADA
Province	B.C.

COMPENSATED DENSITY
DEEP RESISTIVITY
GAMMA RAY, CALIPER
3412

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3412
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3412
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION:
SEC TWP RGE

Other Services
GYRO
NNTS

Permanent Datum
Log Measured From
Drilling Measured From

Elevation (m)

Elevation
K.B. (m)
D.F. (m)
G.L. (m)

Date	30 AUG 2017		
Run Number	ONE		
Depth Driller (m)	251.00		
Depth Logger (m)	250.62		
Bottom Logged Interval (m)	250.62		
Top Log Interval (m)	0.00		
Casing Driller (m)	21.00		
Casing Logger (m)	20.47		
Bit Size (mm)	139.70		
Type Fluid in Hole	WATER		
Reported Density (kg/m3)	N/A		
Reported Viscosity (cp)	N/A		
Source of Sample	N/A		
pH	N/A		
Fluid Loss (cc)	N/A		
Rm @ Meas. Temp (Ohmm @ °C)	N/A		
Rm @ BHT (Ohmm @ °C)	N/A		
Magnetic Declination (°)	N/A		
Time Circulation Stopped	30 AUG 2017 06h30		
Time Logger on Bottom	30 AUG 2017 11h46		
Maximum Temperature (°C)	N/A		
Equipment Number	C05		
Location	FORDING RIVER		
Recorded By	S.BEECRAFT		
Witnessed By	K. FRASER		

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Comments

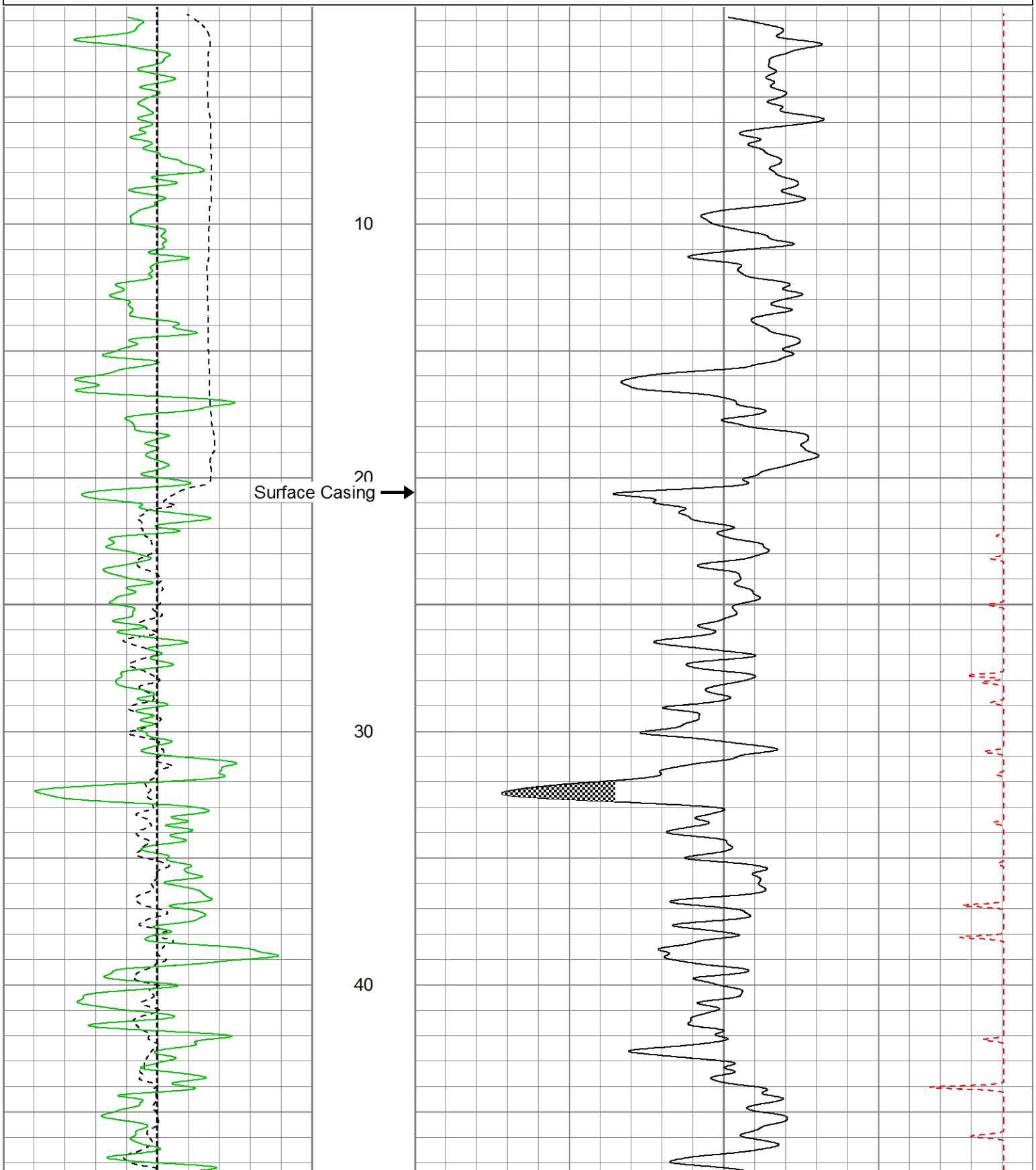
FLUID FOUND AT191 m
TOOLS: NNTS1, DIP12, GL5, DNDS3.

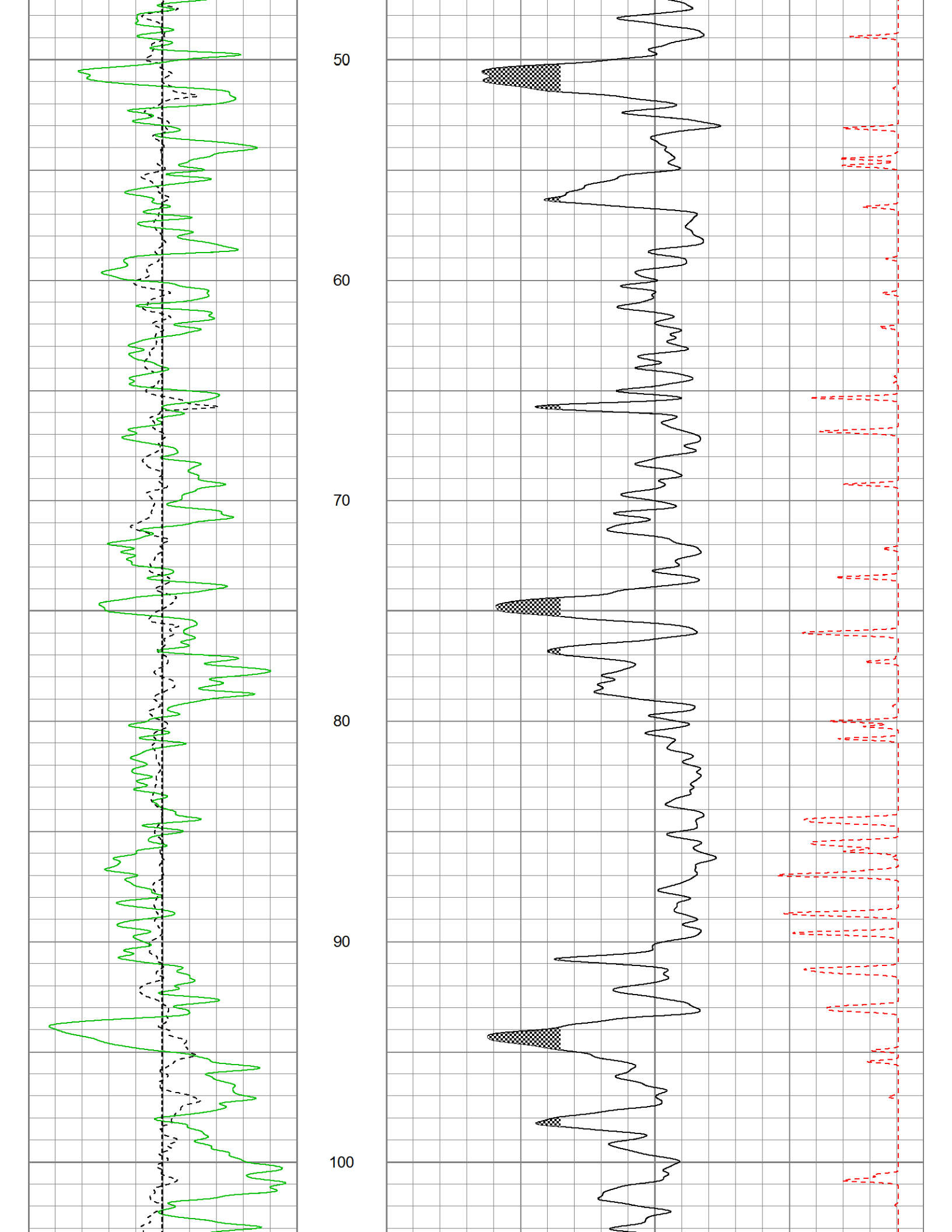
MAIN PASS

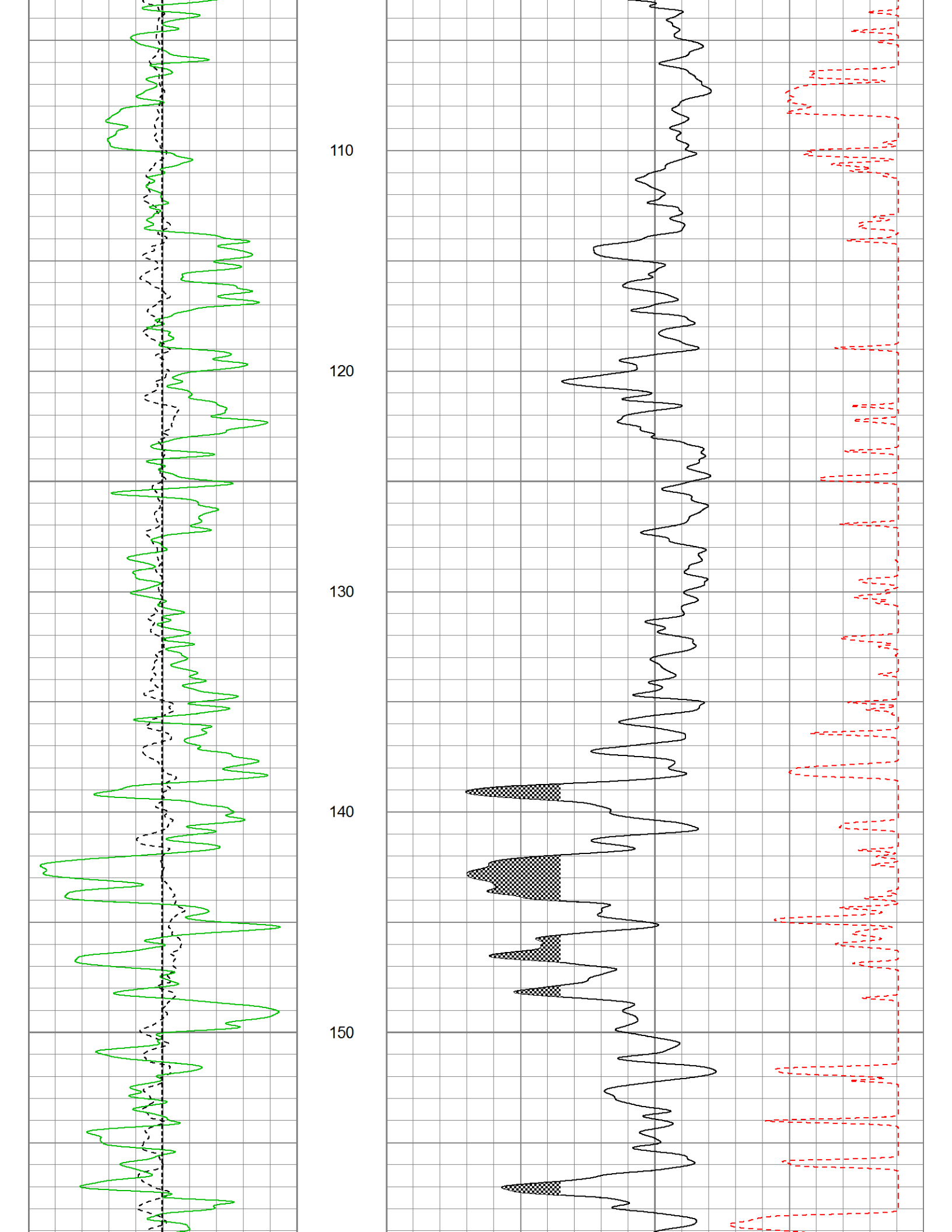
Database File:	c:\warrior\data\fro\3412\3412cdx\3412-fro.db
Dataset Pathname:	./../DENRES
Presentation Format:	denresdn
Dataset Creation:	Wed Aug 30 12:23:18 2017
Charted by:	Depth in Meters scaled 1:200

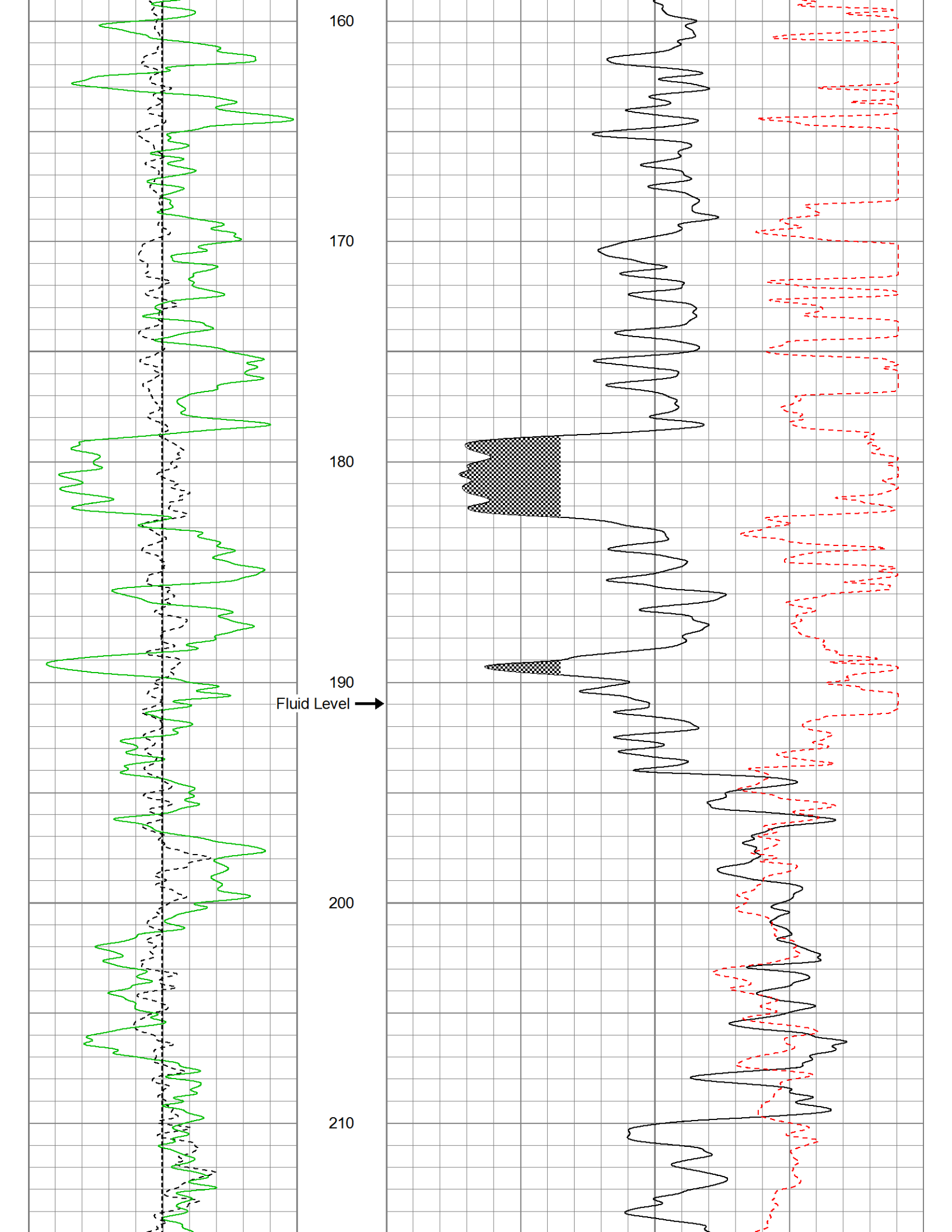
90	Density Caliper (DCAL) (mm)	190
0	Gamma Ray (GRFE) (API)	200
90	Bit Size (BIT1) (mm)	190

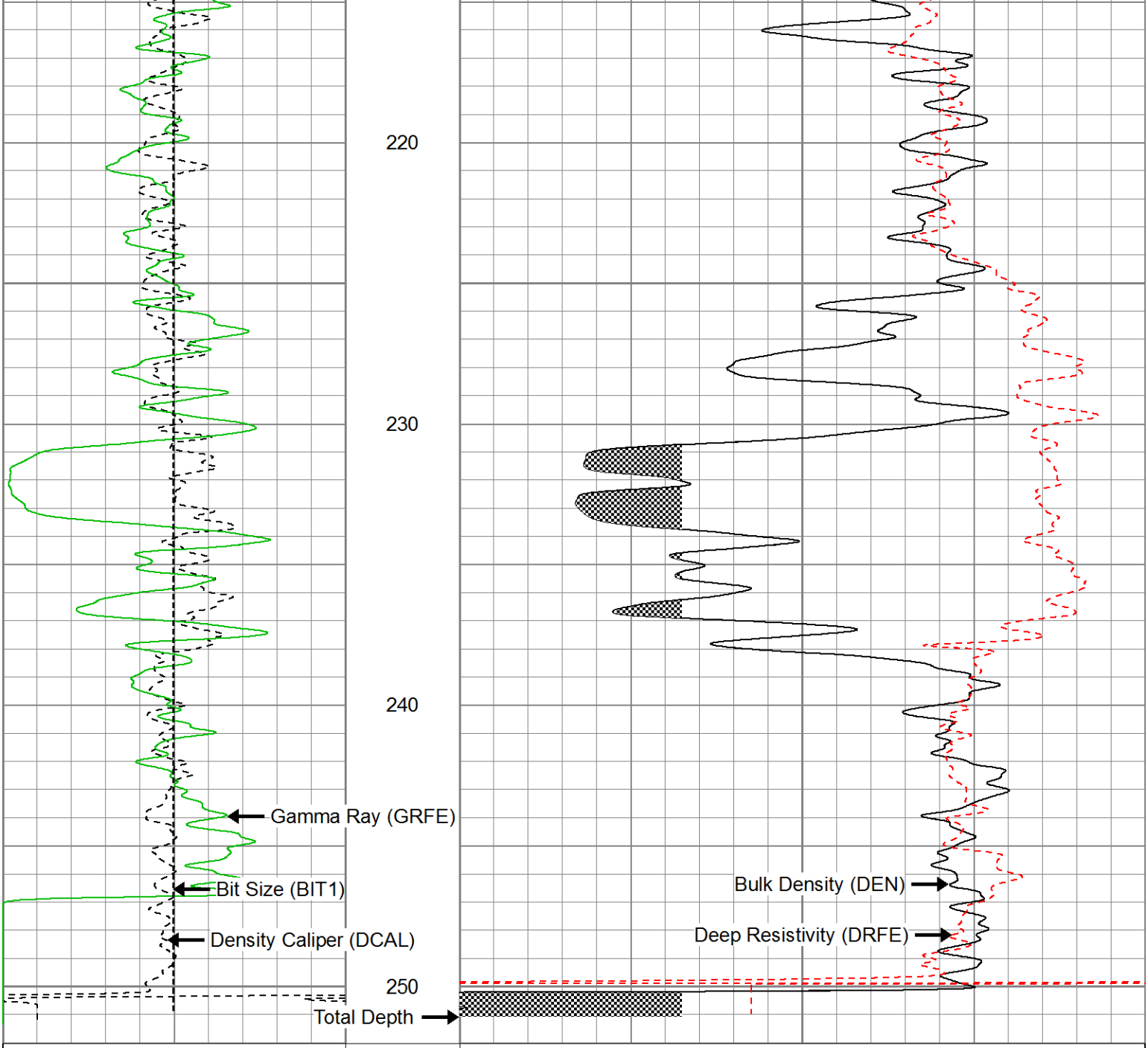
1	Bulk Density (DEN) (g/cc)	3
2	Deep Resistivity (DRFE) (Ohm-m)	20000




50
60
70
80
90
100


110
120
130
140
150


160
170
180
190
Fluid Level
200
210



90	Density Caliper (DCAL) (mm)	190
0	Gamma Ray (GRFE) (API)	200
90	Bit Size (BIT1) (mm)	190

1	Bulk Density (DEN) (g/cc)	3
2	Deep Resistivity (DRFE) (Ohm-m)	20000

Company	TECK COAL FORDING RIVER OPERATIONS
Well	3412
Field	TURNBULL
Country	CANADA
Province	B.C.

GYRO VERTICALITY ANALYSIS 3412

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3412
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3412
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION:
SEC TWP RGE

Other Services
DENRES
NNTS

Permanent Datum
Log Measured From
Drilling Measured From
Elevation (m)

Elevation
K.B. (m)
D.F. (m)
G.L. (m)

Date	30 AUG 2017		
Run Number	ONE		
Depth Driller (m)	251.00		
Depth Logger (m)	250.40		
Bottom Logged Interval (m)	250.40		
Top Log Interval (m)	0.00		
Casing Driller (m)	21.00		
Casing Logger (m)	N/A		
Bit Size (mm)	139.70		
Type Fluid in Hole	WATER		
Reported Density (kg/m3)	N/A		
Reported Viscosity (cp)	N/A		
Source of Sample	N/A		
pH	N/A		
Fluid Loss (cc)	N/A		
Rm @ Meas. Temp (Ohmm @ °C)	N/A		
Rm @ BHT (Ohmm @ °C)	N/A		
Magnetic Declination (°)	N/A		
Time Circulation Stopped	30 AUG 2017 06h30		
Time Logger on Bottom	30 AUG 2017 08h11		
Maximum Temperature (°C)	N/A		
Equipment Number	C05		
Location	FORDING RIVER		
Recorded By	S.BEECRAFT		
Witnessed By	K. FRASER		

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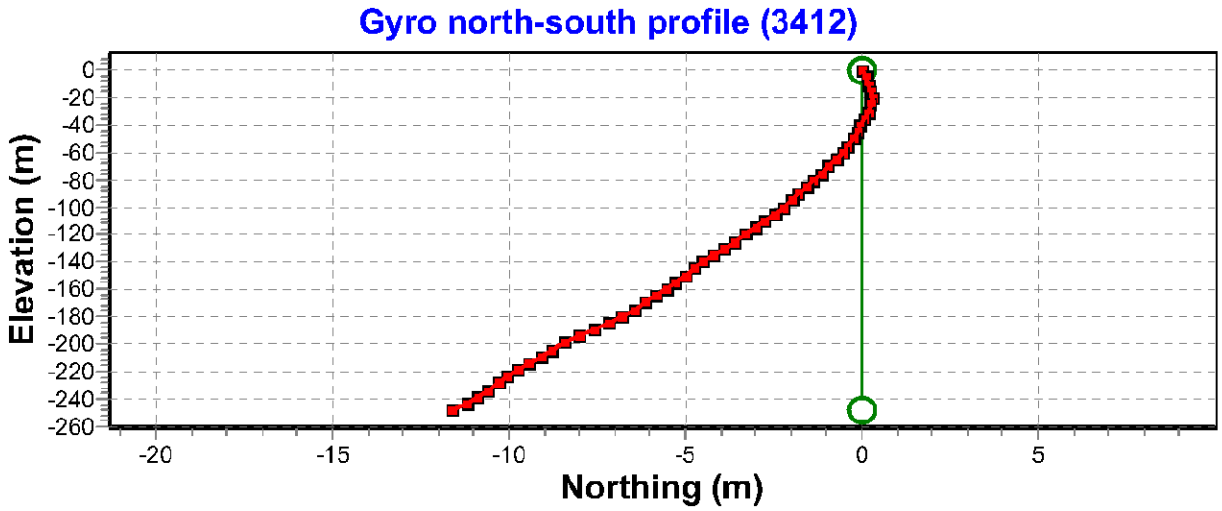
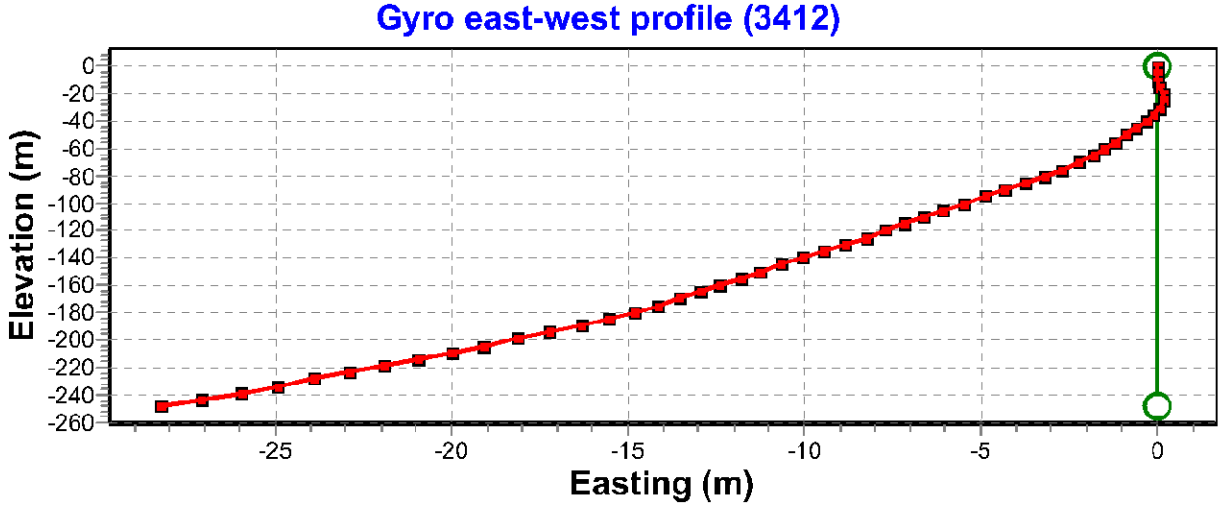
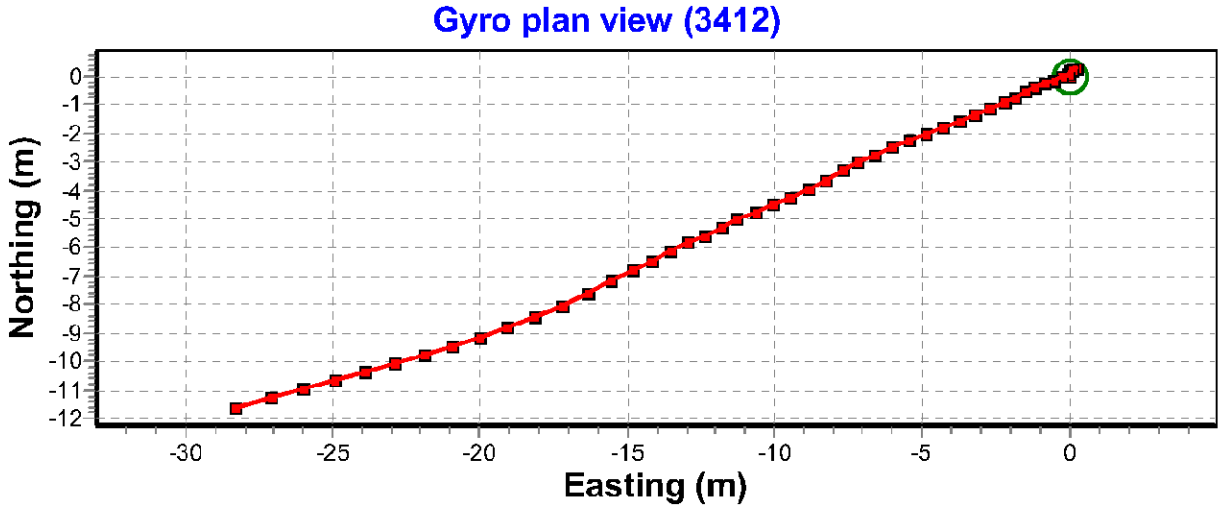
Comments

TOOLS: NNTS1, DIP12, GL5, DNDS3.


Gyro north-south profile (3412)
Elevation (m)
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
-220
-240
-260
-20
-15
-10
-5
0
5
Northing (m)


Gyro east-west profile (3412)
Elevation (m)
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
-220
-240
-260
-25
-20
-15
-10
-5
0
Easting (m)



	Company	TECK COAL FORDING RIVER OPERATIONS

Well	3412
Field	TURNBULL
Country	CANADA
Province	B.C.

UNCOMPENSATED NEUTRON GAMMA RAY
3412

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3412
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION:
SEC TWP RGE

Other Services
DENRES
GYRO

Permanent Datum
Log Measured From
Drilling Measured From
Elevation (m)

Elevation
K.B. (m)
D.F. (m)
G.L. (m)

Date	30 AUG 2017		
Run Number	ONE		
Depth Driller (m)	251.00		
Depth Logger (m)	250.40		
Bottom Logged Interval (m)	250.40		
Top Log Interval (m)	0.00		
Casing Driller (m)	21.00		
Casing Logger (m)	N/A		
Bit Size (mm)	139.70		
Type Fluid in Hole	WATER		
Reported Density (kg/m3)	N/A		
Reported Viscosity (cp)	N/A		
Source of Sample	N/A		
pH	N/A		
Fluid Loss (cc)	N/A		
Rm @ Meas. Temp (Ohmm @ °C)	N/A		
Rm @ BHT (Ohmm @ °C)	N/A		
Magnetic Declination (°)	N/A		
Time Circulation Stopped	30 AUG 2017 06h30		
Time Logger on Bottom	30 AUG 2017 07h31		
Maximum Temperature (°C)	N/A		
Equipment Number	C05		
Location	FORDING RIVER		
Recorded By	S.BEECRAFT		
Witnessed By	K. FRASER		

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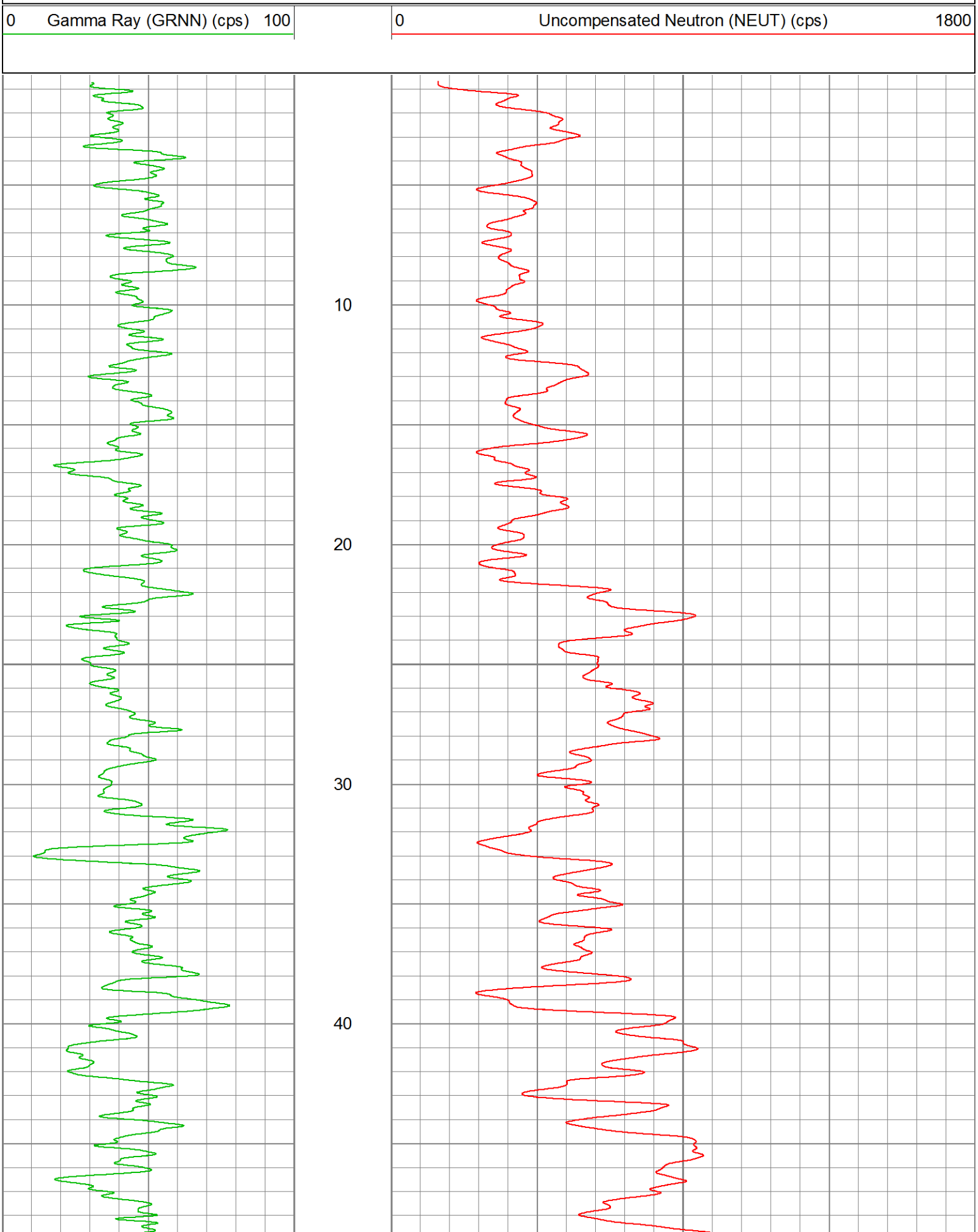
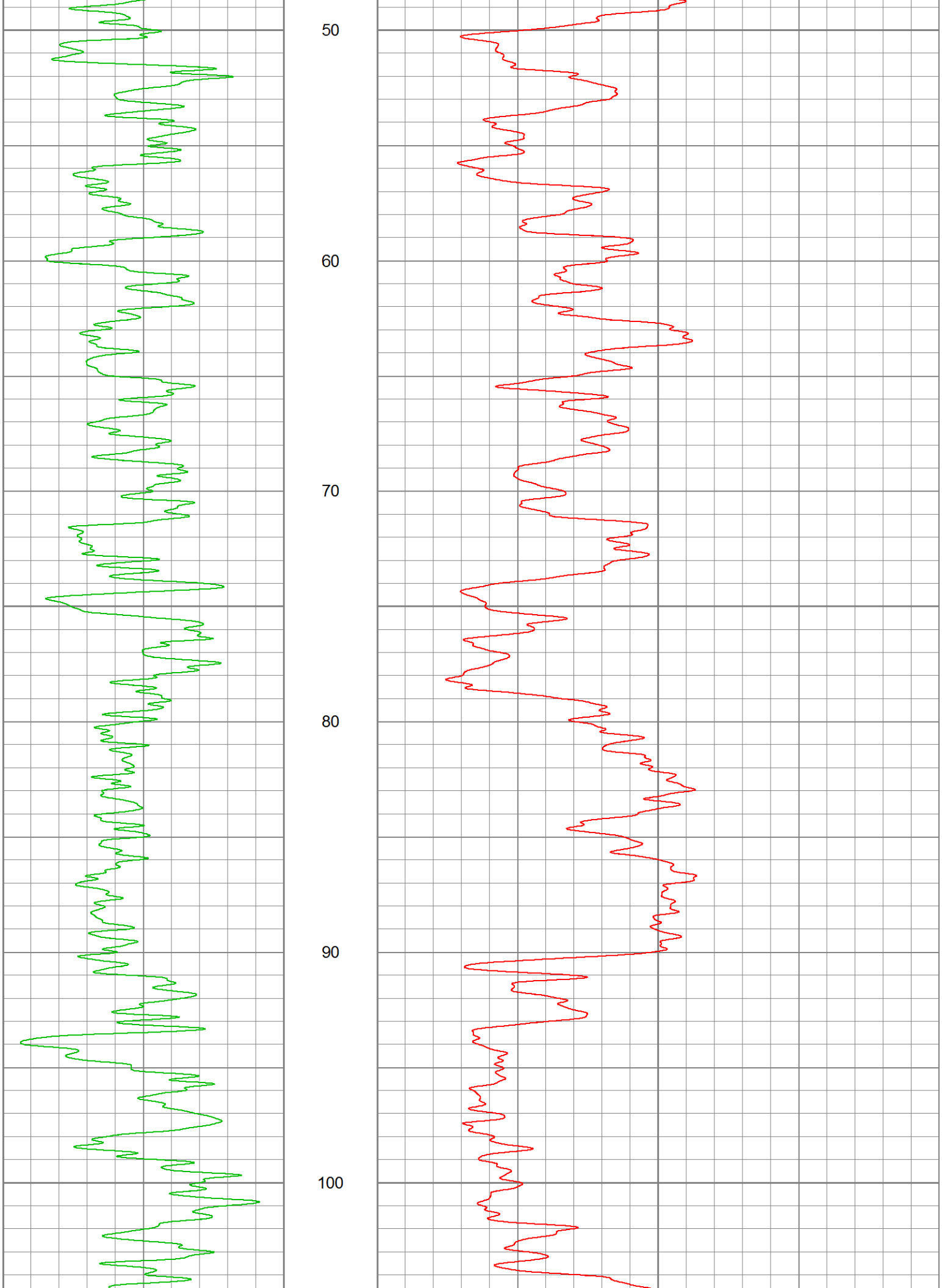
Comments

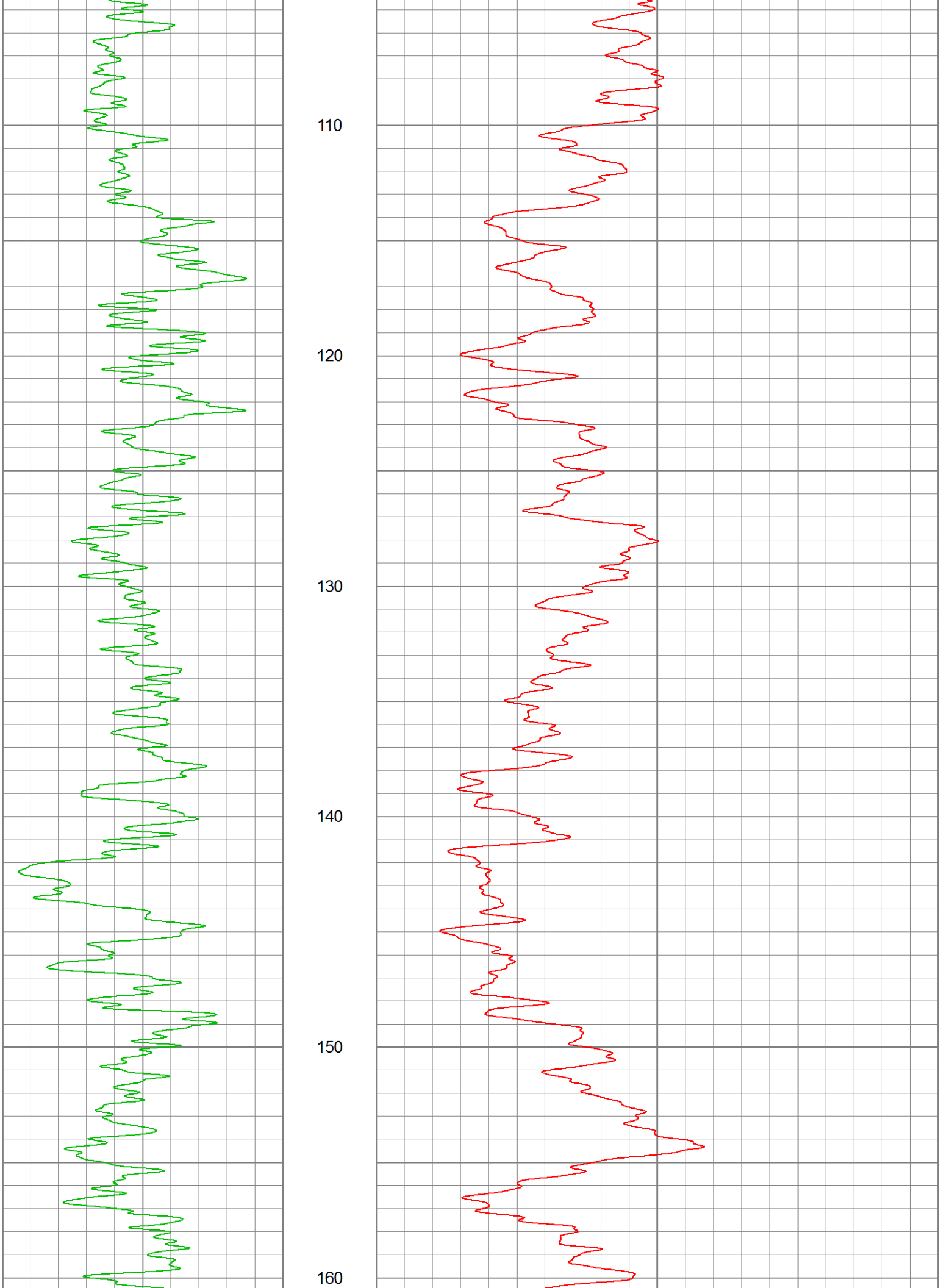
NNTS LOGGED THROUGH THE DRILL PIPE
TOOLS: NNTS1, DIP12, GL5, DNDS3.

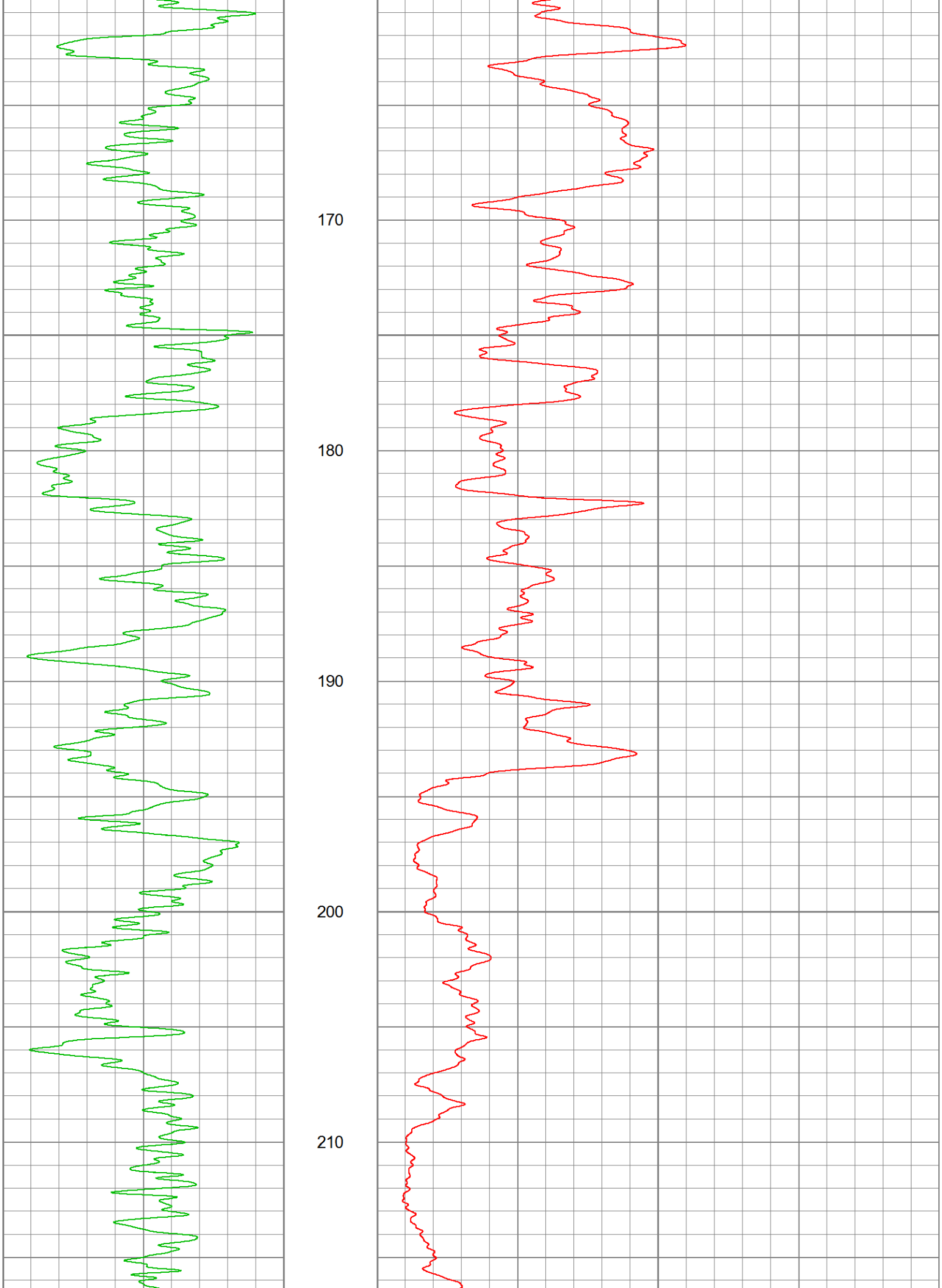
MAIN PASS

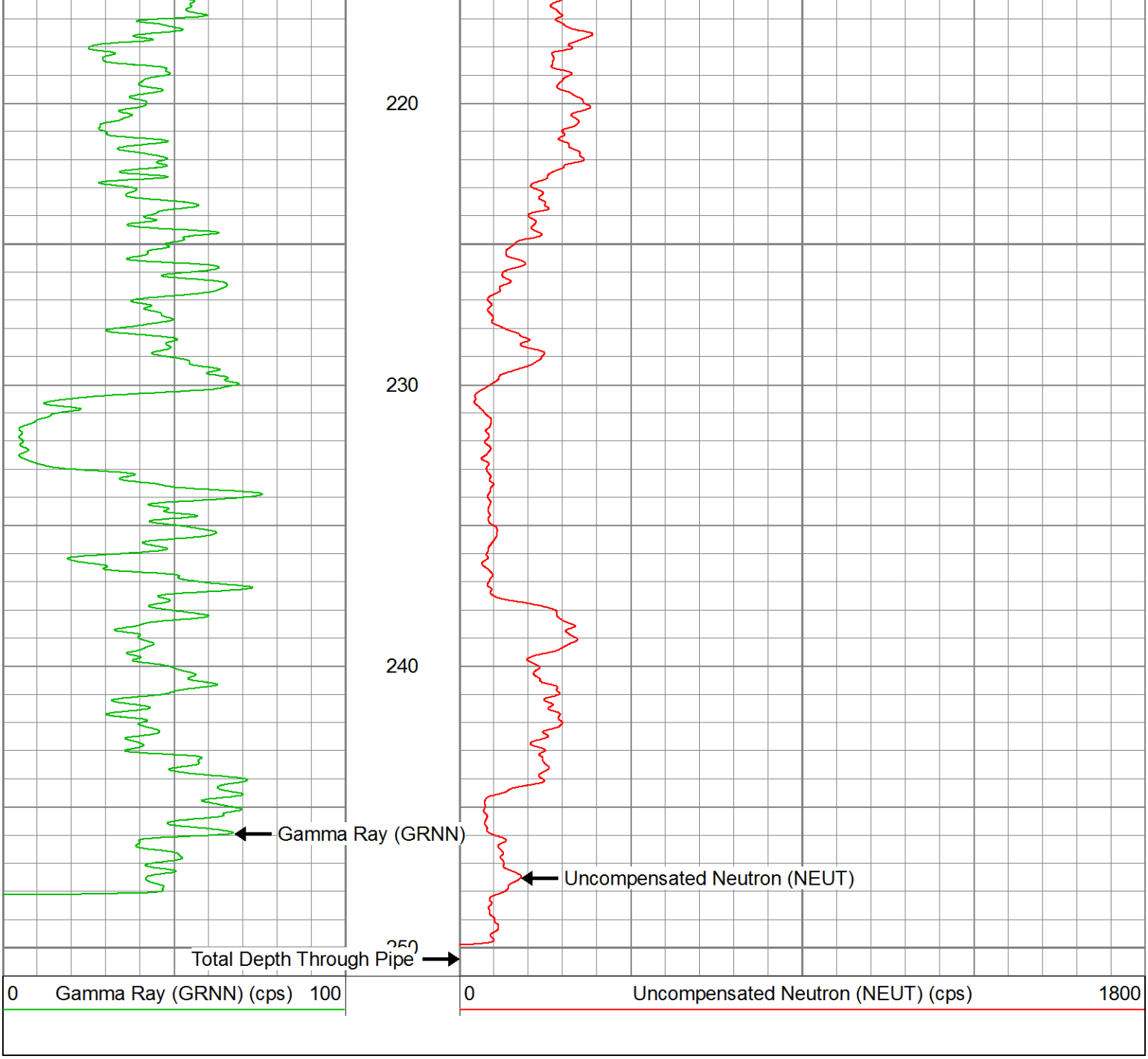
Database File:	c:\warrior\data\fro\3412\3412cdx\3412-fro.db
Dataset Pathname:	nnts1
Presentation Format:	nnts
Dataset Creation:	Wed Aug 30 08:52:21 2017
Charted by:	Depth in Meters scaled 1:200




50
60
70
80
90
100


110
120
130
140
150
160


170
180
190
200
210



Company	TECK COAL FORDING RIVER OPERATIONS
Well	3412
Field	TURNBULL
Country	CANADA
Province	B.C.

COMPENSATED DENSITY
DEEP RESISTIVITY
GAMMA RAY, CALIPER
3413

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3413
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3413
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION:
SEC TWP RGE

Other Services
GYRO
NNTS

Permanent Datum
Log Measured From
Drilling Measured From

Elevation (m)

Elevation
K.B. (m)
D.F. (m)
G.L. (m)

Date	28 AUG 2017		
Run Number	ONE		
Depth Driller (m)	202.00		
Depth Logger (m)	201.83		
Bottom Logged Interval (m)	201.39		
Top Log Interval (m)	1.00		
Casing Driller (m)	18.00		
Casing Logger (m)	17.33		
Bit Size (mm)	139.70		
Type Fluid in Hole	WATER		
Reported Density (kg/m3)	N/A		
Reported Viscosity (cp)	N/A		
Source of Sample	N/A		
pH	N/A		
Fluid Loss (cc)	N/A		
Rm @ Meas. Temp (Ohmm @ °C)	N/A		
Rm @ BHT (Ohmm @ °C)	N/A		
Magnetic Declination (°)	N/A		
Time Circulation Stopped	28 AUG 2017 17h30		
Time Logger on Bottom	28 AUG 2017 9h08		
Maximum Temperature (°C)	N/A		
Equipment Number	C05		
Location	FORDING RIVER		
Recorded By	S.BEECRAFT		
Witnessed By	K. FRASER		

<<< Fold Here >>>

Comments

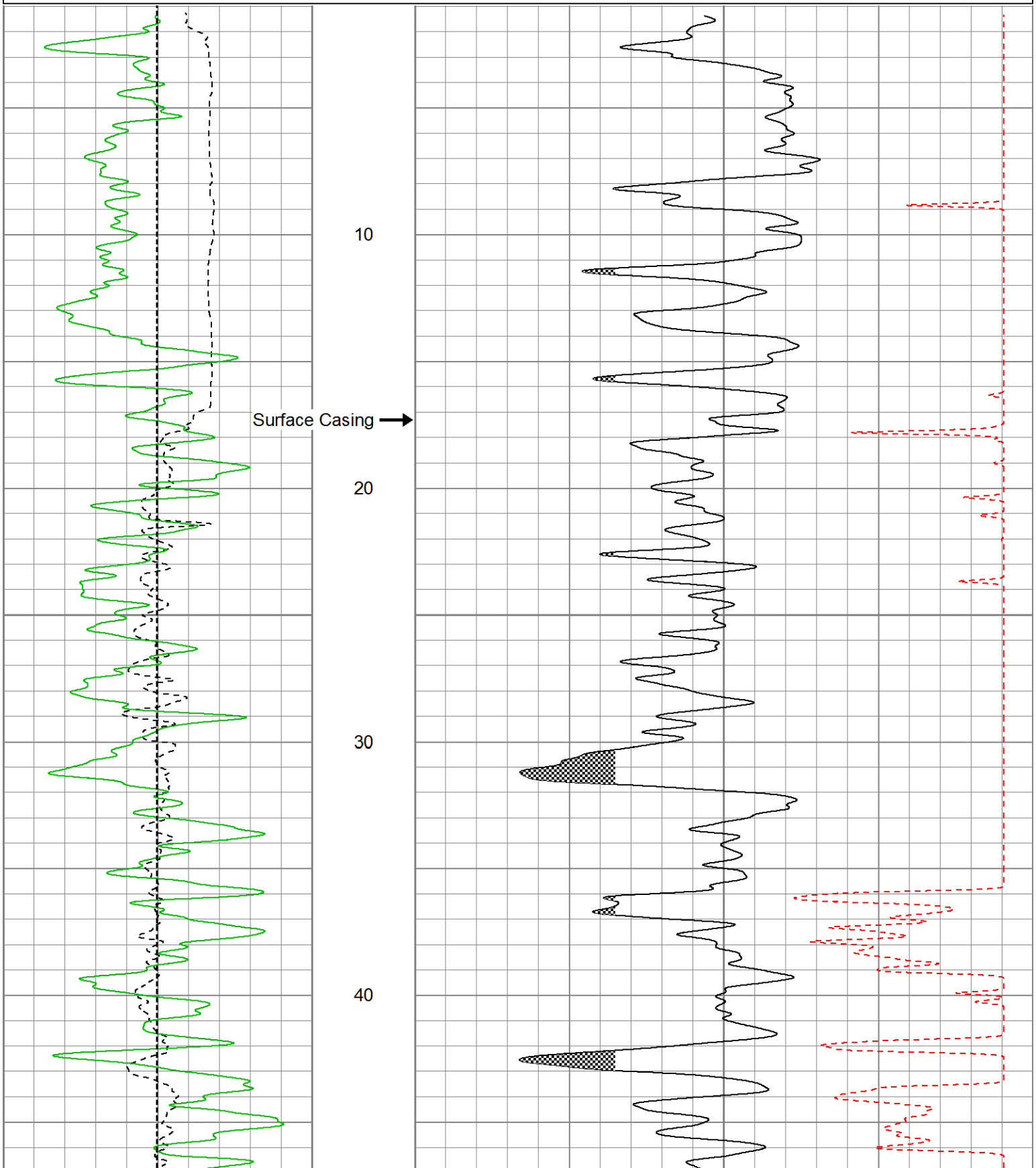
FLUID FOUND AT 135 m
TOOLS: NNTS1, DIP12, GL5, DNDS3.

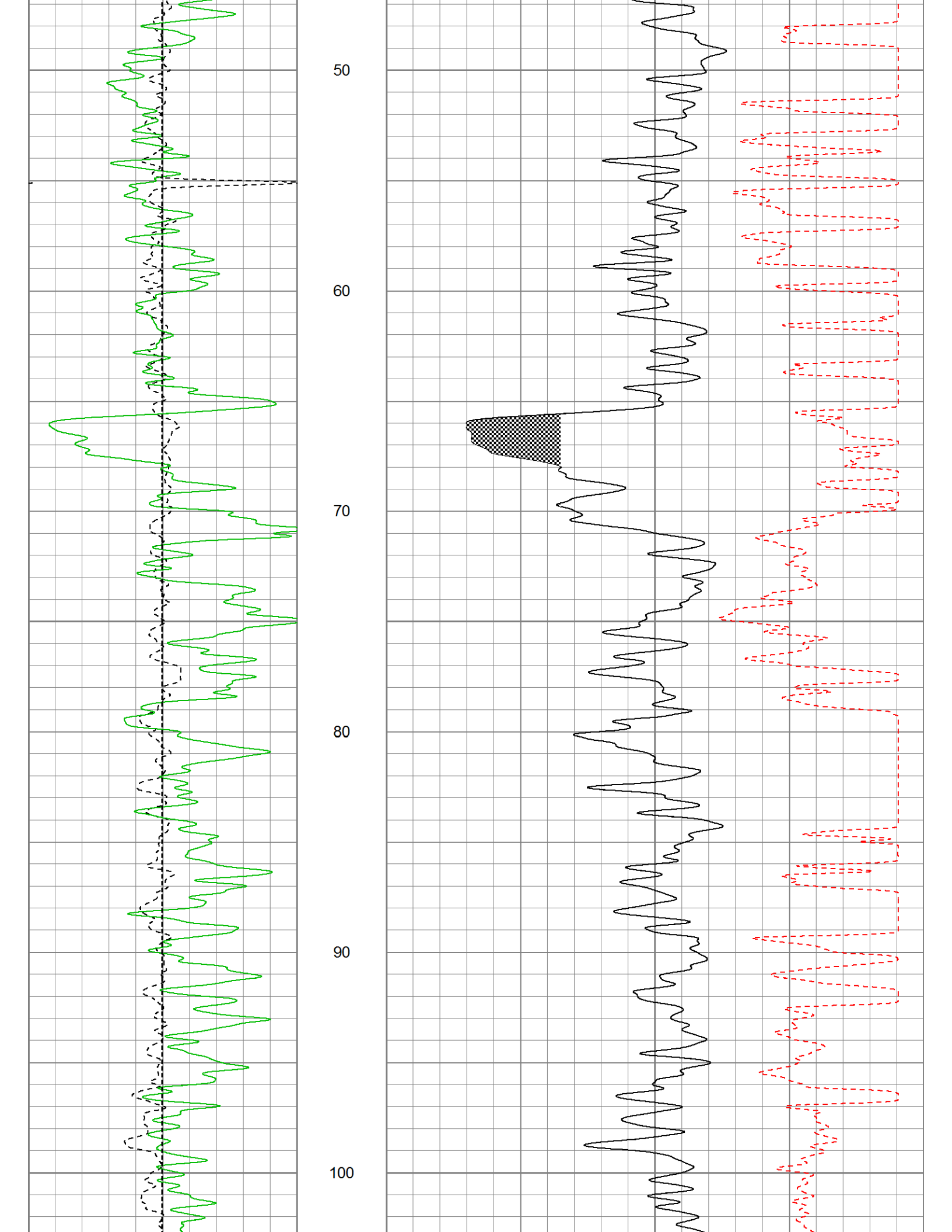
MAIN PASS

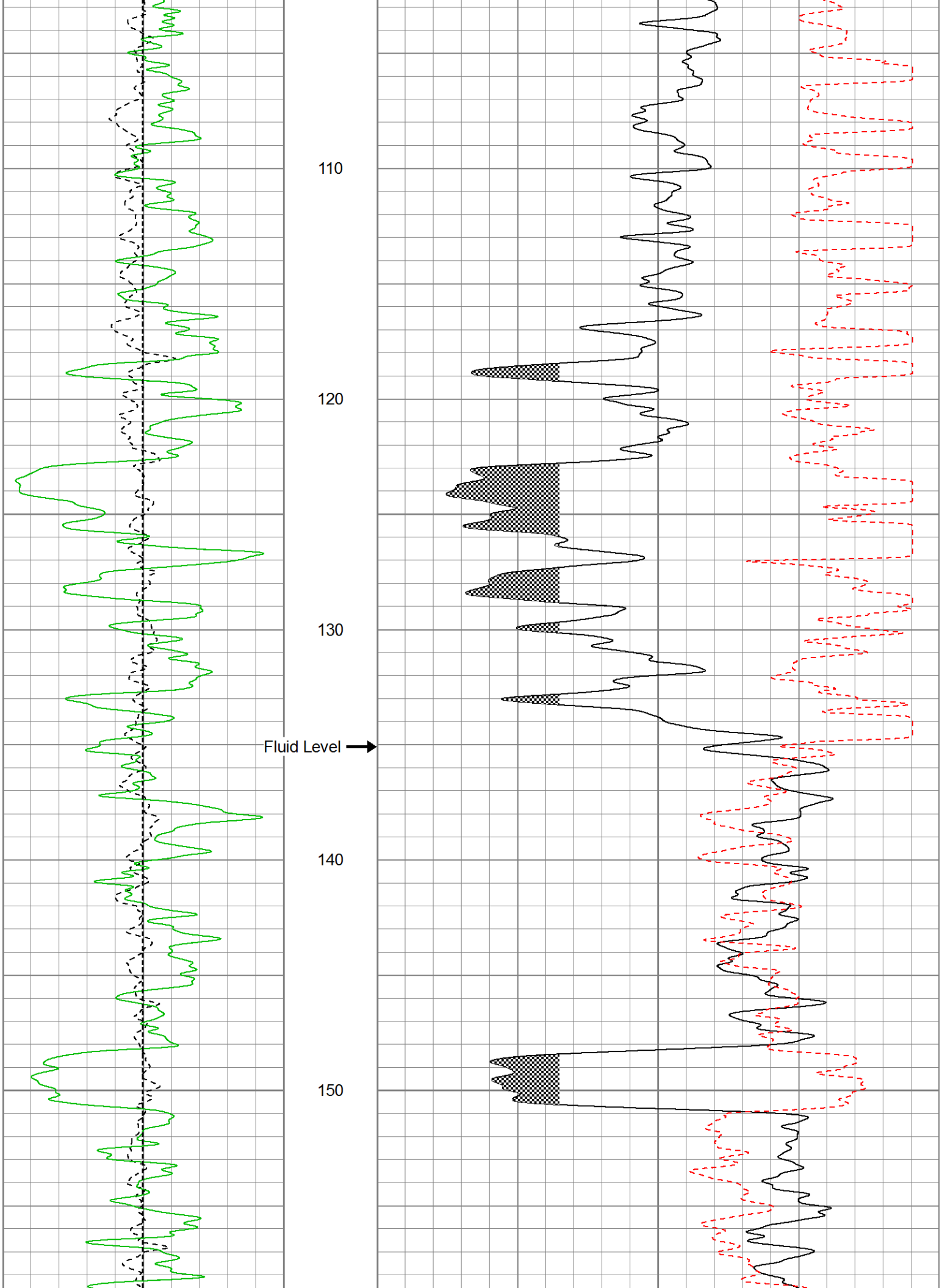
Database File:	c:\warrior\data\fro\3413\3413cdx\3413-fro.db
Dataset Pathname:	./../denres
Presentation Format:	denresdn
Dataset Creation:	Tue Aug 29 09:35:39 2017
Charted by:	Depth in Meters scaled 1:200

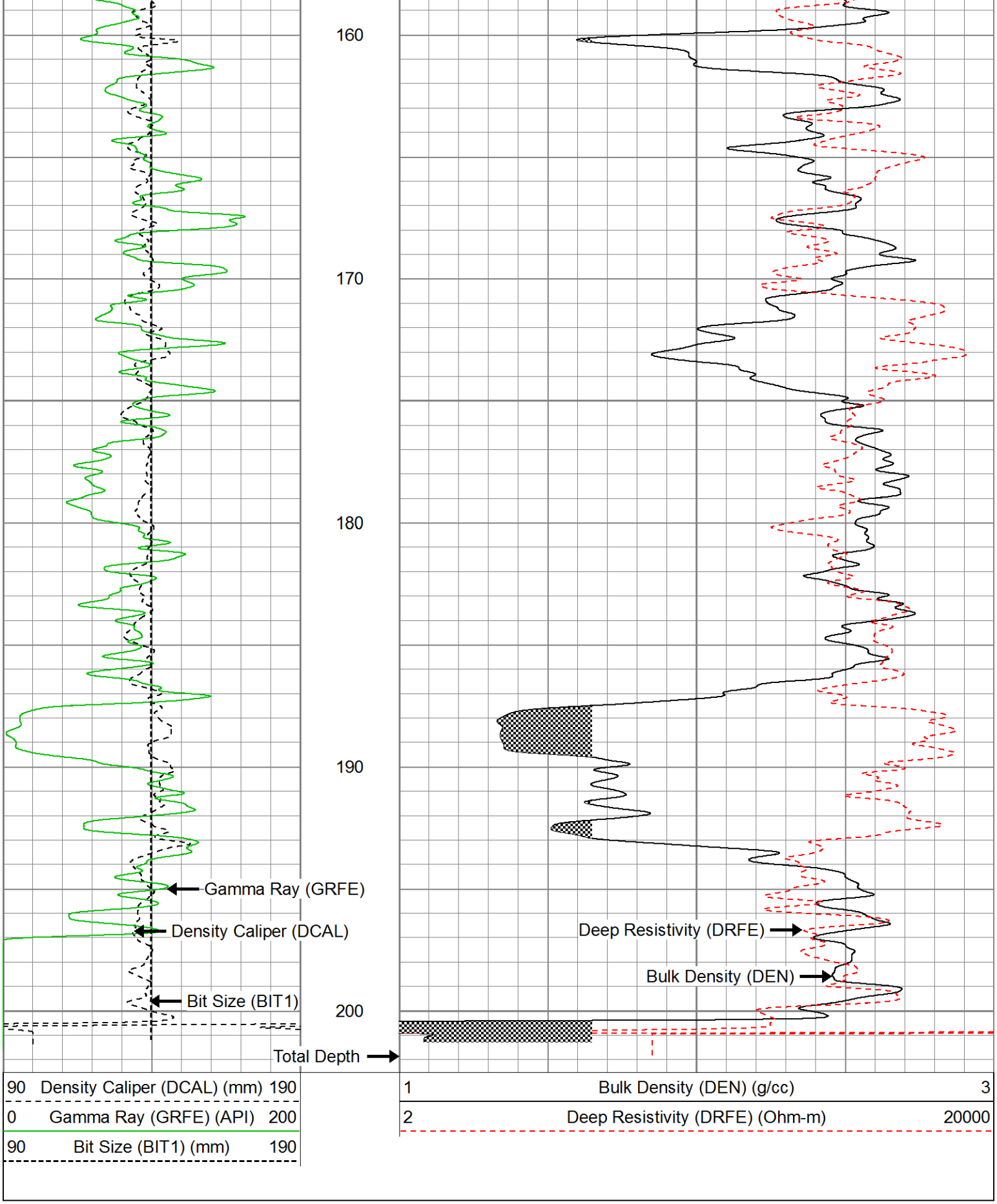
90	Density Caliper (DCAL) (mm)	190
0	Gamma Ray (GRFE) (API)	200
90	Bit Size (BIT1) (mm)	190

1	Bulk Density (DEN) (g/cc)	3
2	Deep Resistivity (DRFE) (Ohm-m)	20000




50
60
70
80
90
100


110
120
130
Fluid Level
140
150



CORDAX

Company	TECK COAL FORDING RIVER OPERATIONS
Well	3413
Field	TURNBULL
Country	CANADA

Country	CANADA
Province	B.C.

GYRO VERTICALITY ANALYSIS 3413

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3413
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name3413
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION: SEC TWP RGE

Other Services
DENRES
NNTS

Permanent Datum
Log Measured From
Drilling Measured From

Elevation (m)

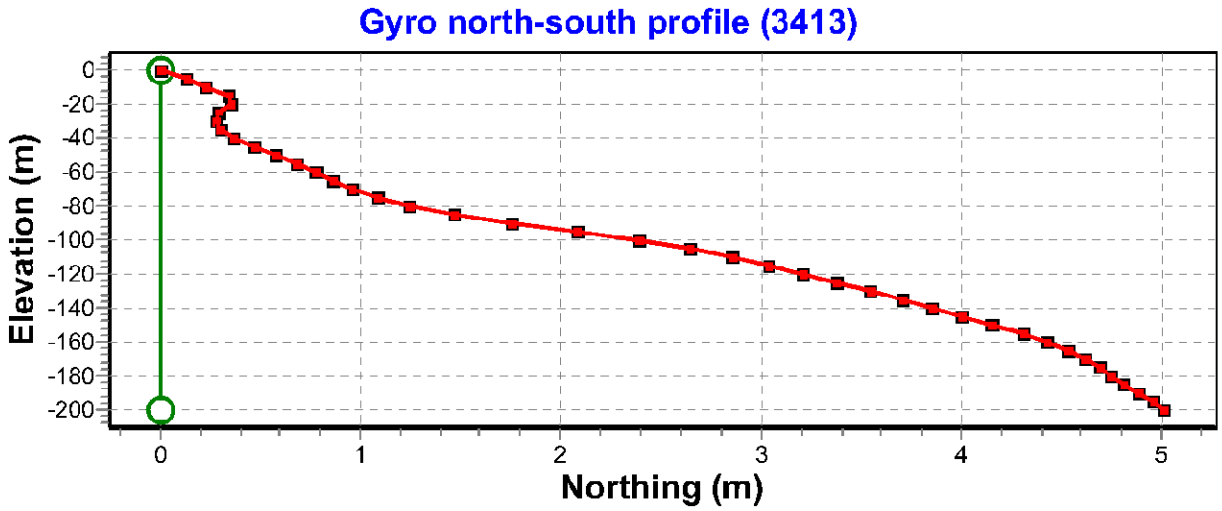
Elevation
K.B. (m)
D.F. (m)
G.L. (m)

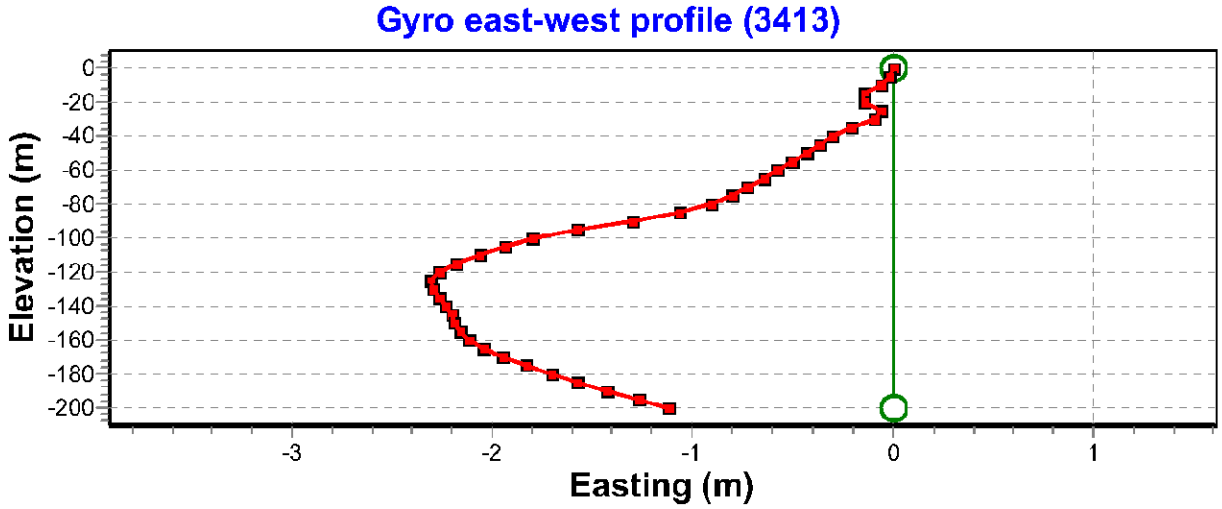
Date	28 AUG 2017			
Run Number	ONE			
Depth Driller (m)	202.00			
Depth Logger (m)	200.54			
Bottom Logged Interval (m)	200.54			
Top Log Interval (m)	0.00			
Casing Driller (m)	18.00			
Casing Logger (m)	N/A			
Bit Size (mm)	139.70			
Type Fluid in Hole	WATER			
Reported Density (kg/m3)	N/A			
Reported Viscosity (cp)	N/A			
Source of Sample	N/A			
pH	N/A			
Fluid Loss (cc)	N/A			
Rm @ Meas. Temp (Ohmm @ °C)	N/A			
Rm @ BHT (Ohmm @ °C)	N/A			
Magnetic Declination (°)	N/A			
Time Circulation Stopped	28 AUG 2017 17h30			
Time Logger on Bottom	28 AUG 2017 18h51			
Maximum Temperature (°C)	N/A			
Equipment Number	C05			
Location	FORDING RIVER			
Recorded By	S.BEECRAFT			
Witnessed By	K. FRASER			

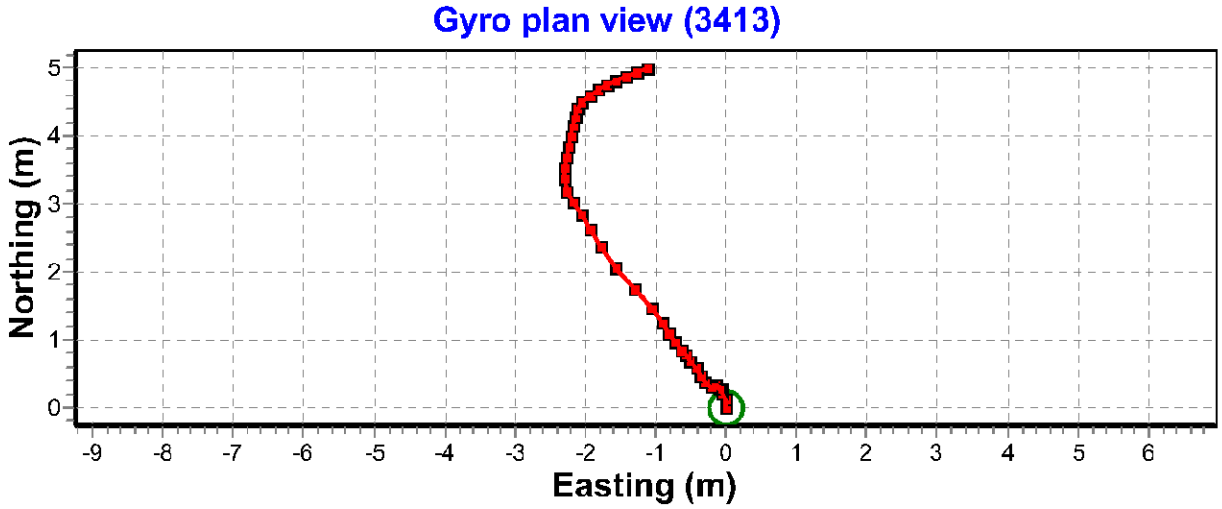
<<< Fold Here >>>

Comments

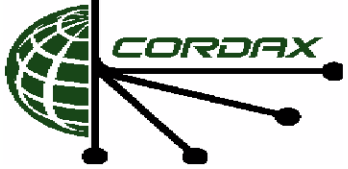
NNTS LOGGED THROUGH THE DRILL PIPE
TOOLS: NNTS1, DIP12, GL5, DNDS3.


Gyro north-south profile (3413)
Elevation (m)
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
0
1
2
3
4
5
Northing (m)


Gyro east-west profile (3413)
Elevation (m)
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
-3
-2
-1
0
1
Easting (m)



	Company TECK COAL FORDING RIVER OPERATIONS



Well	3413
Field	TURNBULL
Country	CANADA
Province	B.C.

UNCOMPENSATED NEUTRON GAMMA RAY
3413

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3413
Field TURNBULL
Province B.C.
Country CANADA

Company TECK COAL FORDING RIVER OPERATIONS
Well Name 3413
Field TURNBULL
Province B.C.
Country CANADA

LICENSE:
UWI# :
LOCATION:
SEC TWP RGE

Other Services
DENRES
GYRO

Permanent Datum Elevation (m)
Log Measured From
Drilling Measured From

Elevation
K.B. (m)
D.F. (m)
G.L. (m)

Date	28 AUG 2017		
Run Number	ONE		
Depth Driller (m)	202.00		
Depth Logger (m)	200.54		
Bottom Logged Interval (m)	200.54		
Top Log Interval (m)	0.00		
Casing Driller (m)	18.00		
Casing Logger (m)	N/A		
Bit Size (mm)	139.70		
Type Fluid in Hole	WATER		
Reported Density (kg/m3)	N/A		
Reported Viscosity (cp)	N/A		
Source of Sample	N/A		
pH	N/A		
Fluid Loss (cc)	N/A		
Rm @ Meas. Temp (Ohmm @ °C)	N/A		
Rm @ BHT (Ohmm @ °C)	N/A		
Magnetic Declination (°)	N/A		
Time Circulation Stopped	28 AUG 2017 17h30		
Time Logger on Bottom	28 AUG 2017 18h14		
Maximum Temperature (°C)	N/A		
Equipment Number	C05		
Location	FORDING RIVER		
Recorded By	S.BEECRAFT		
Witnessed By	K. FRASER		

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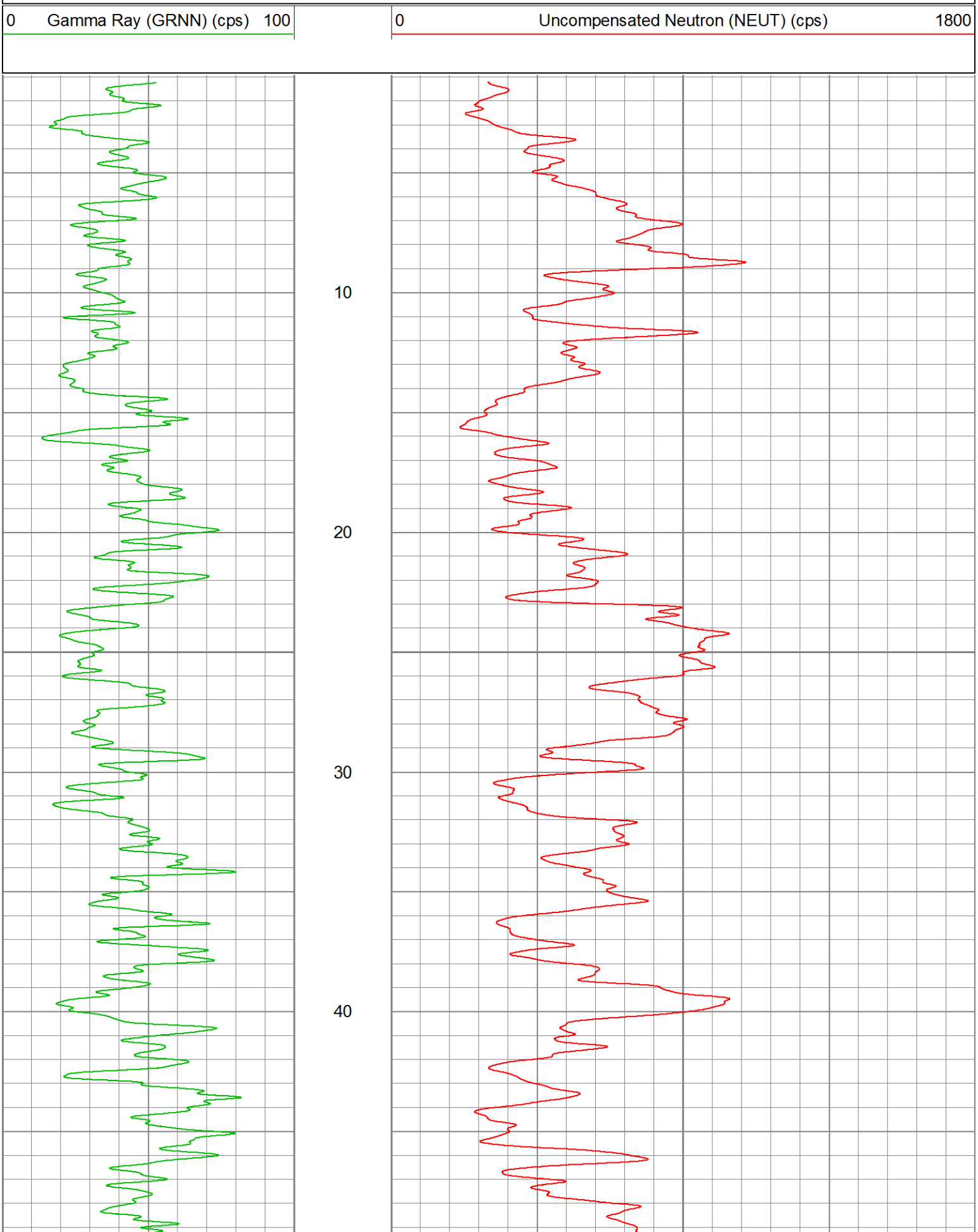
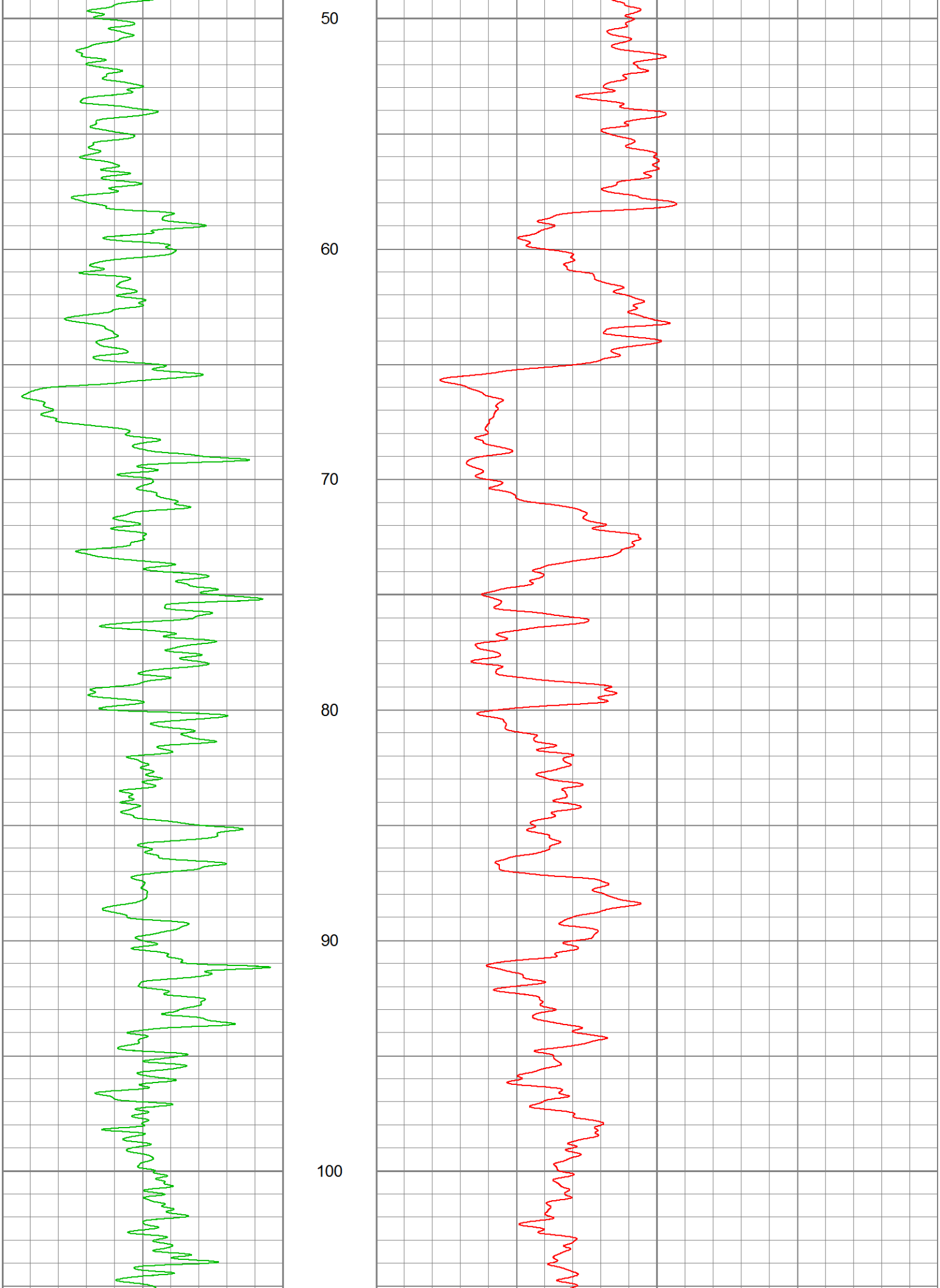
Comments

NNTS LOGGED THROUGH THE DRILL PIPE
TOOLS: NNTS1, DIP12, GL5, DNDS3.

MAIN PASS

Database File:	c:\warrior\data\fro\3413\3413cdx\3413-fro.db
Dataset Pathname:	nnts1
Presentation Format:	nnts
Dataset Creation:	Mon Aug 28 19:36:02 2017
Charted by:	Depth in Meters scaled 1:200

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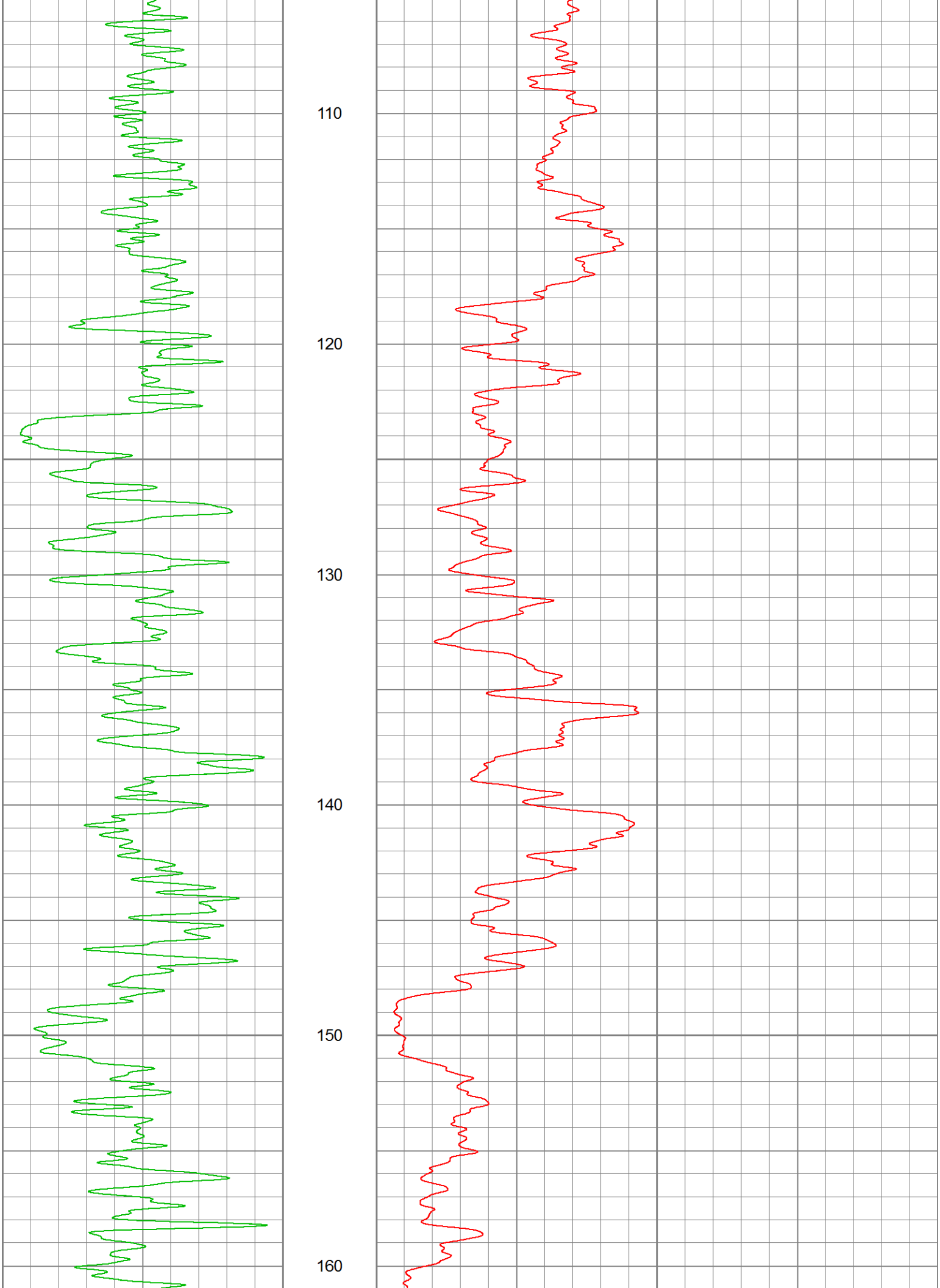
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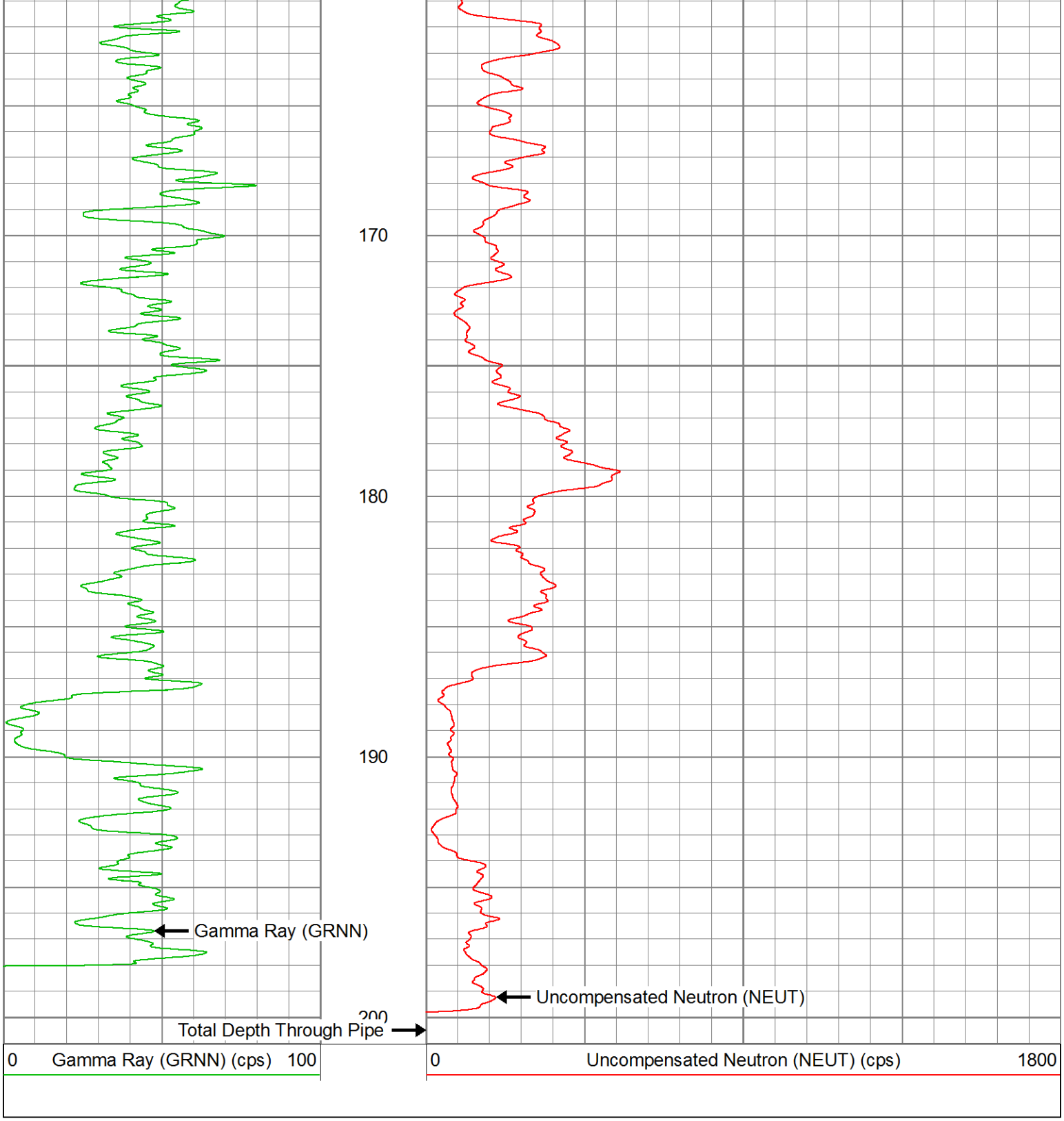

Company	TECK COAL FORDING RIVER OPERATIONS
Well	3413
Field	TURNBULL
Country	CANADA
Province	B.C.

Hole #	Composite #	Ash (%)	R.M. (%)	Vol (%)	F.C. (%)	FSI	Sul (%)
3409	FRO17-0187	34.90	0.76	22.62	41.72	4.5	0.65
3409	FRO17-0188	39.80	0.60	21.87	37.73	4.5	0.81
3409	FRO17-0189	23.40	0.85	25.15	50.60	7.5	0.71
3409	FRO17-0190	19.60	0.72	24.10	55.58	7.0	0.65
3409	FRO17-0191	26.10	0.55	22.70	50.65	6.0	0.56
3409	FRO17-0192	33.10	0.60	19.99	46.31	4.5	0.61
3409	FRO17-0193	30.10	0.62	20.22	49.06	2.5	0.40
3402	FRO17-0194	36.00	0.64	25.63	37.73	6.0	0.42
3402	FRO17-0195	21.80	0.66	28.23	49.31	5.5	0.54
3402	FRO17-0196	29.20	0.67	23.44	46.69	7.5	0.66
3402	FRO17-0197	28.50	0.61	24.77	46.12	7.0	0.70
3402	FRO17-0198	26.60	0.60	23.88	48.92	7.5	0.59
3402	FRO17-0199	39.85	0.56	19.61	39.98	7.0	0.58
3402	FRO17-0200	13.76	0.53	23.73	61.98	7.5	0.48
3402	FRO17-0201	36.43	0.86	17.99	44.72	2.0	0.57
3402	FRO17-0202	17.49	0.93	21.11	60.47	4.5	0.46
3402	FRO17-0203	23.30	0.40	19.08	57.22	2.5	0.37
3411	FRO17-0215	43.53	0.29	27.84	28.34	3.0	0.39
3411	FRO17-0216	30.49	0.42	25.86	43.23	7.0	0.70
3411	FRO17-0217	27.04	0.49	24.03	48.44	7.5	0.66
3411	FRO17-0218	16.07	0.41	26.52	57.00	8.0	0.57
3411	FRO17-0219	21.34	0.39	23.84	54.43	8.0	0.57
3411	FRO17-0220	26.44	0.33	24.72	48.51	8.0	0.53
3411	FRO17-0221	25.81	0.25	23.38	50.56	7.5	0.70
3411	FRO17-0222	10.19	0.33	24.03	65.45	7.5	0.52
3411	FRO17-0223	25.04	0.27	19.44	55.25	2.0	0.75
3403	FRO17-0233	18.10	0.51	29.44	51.95	7.5	0.57
3403	FRO17-0234	33.10	0.35	17.80	48.75	1.5	0.60
3403	FRO17-0235	25.70	0.35	21.47	52.48	4.0	0.62
3403	FRO17-0236	26.10	0.38	32.22	41.30	6.5	0.62
3403	FRO17-0237	25.30	0.48	27.84	46.38	6.5	0.41
3403	FRO17-0238	34.70	0.43	26.13	38.74	6.5	0.82
3403	FRO17-0239	18.60	0.45	25.78	55.17	8.0	0.74
3403	FRO17-0240	37.30	0.54	21.58	40.58	6.0	1.61
3403	FRO17-0241	22.60	0.50	24.11	52.79	6.5	0.66
3403	FRO17-0242	38.90	0.54	20.59	39.97	5.0	1.12
3403	FRO17-0243	23.20	0.50	23.66	52.64	8.0	0.59
3407	FRO17-0254	10.60	0.49	28.54	60.37	8.5	0.77
3407	FRO17-0255	42.40	0.47	20.39	36.74	5.5	0.81
3407	FRO17-0256	26.50	0.39	22.25	50.86	5.5	0.51
3407	FRO17-0257	43.66	0.54	19.91	35.89	5.0	0.58
3407	FRO17-0258	37.08	0.62	22.33	39.97	7.0	0.97
3407	FRO17-0259	29.64	0.52	21.29	48.55	6.5	0.65
3407	FRO17-0260	27.36	0.54	21.03	51.07	2.5	0.42
3410	FRO17-0261	27.10	0.87	21.81	50.22	3.5	0.61
3410	FRO17-0262	19.70	0.53	23.49	56.28	8.0	0.88
3410	FRO17-0263	19.60	0.56	22.58	57.26	5.0	0.64
3410	FRO17-0264	23.10	0.44	19.15	57.31	2.0	0.89
3410	FRO17-0265	35.10	0.50	18.38	46.02	2.5	0.61
3410	FRO17-0266	20.00	0.37	22.22	57.41	5.0	0.64
3410	FRO17-0267	35.90	0.44	17.73	45.93	1.5	0.80

Appendix 4: Modeling Method and Parameters

Fording River uses 3D block models for all geology modeling.

The 3D block models are volumetric based: a TOPO model item stores the proportion of the model block existing below topography. Separate model items list up to three waste types and two coal seams per block (as either met or oxide). These items are stored as volumetric proportions: the sum of the waste and coal items equals the TOPO item. Additional model items (for each coal item) are: seam name, raw ash, raw SG, raw VM, delivered ash, delivered SG, plant yield, clean sulphur and clean phosphorous.

Table 1 lists the block model dimensions used for the various block models (units of measure are in meters).

Table 1 - Model Block Dimensions

Pit	X-direction	Y-direction	Z-direction
Fording River East	20	20	15
Fording River West	25	25	15
Castle	25	25	15

The 3D model is built from the valid (i.e. with clear hanging wall and footwall definition) drill intervals from the AcQuire database. The seam dips and true thicknesses are calculated based on drilling data, and then seam polygons are generated. The true thicknesses of the seams are interpolated using an inverse distance weighting.

The search and weighting parameters are listed in Table 2.

Table 2 - Interpolation and Search Parameters

MINING AREA	SEAM THICKNESS			QUALITY PARAMETERS (DASH, DSG)				QUALITY PARAMETERS (VM, S, PHOS)			
	Max. Number of Samples	Inverse Dist. Weighting	Search Dist. (m)	Inverse Dist. Weighting	X Search Dist. (m)	Y Search Dist. (m)	Z Search Dist. (m)	Inverse Dist. Weighting	X Search Dist. (m)	Y Search Dist. (m)	Z Search Dist. (m)
Fording River East	1	2	1,800	1.2	800	600	800	1.5	800	600	800
Fording River West	4	2	2,500	1.2	800	600	800	1.5	800	600	800
Castle	1	2.2	2,000	1.2	2,800	2,800	1,000	1.5	2,800	2,800	1,000

Due to the low coal recoveries experienced in areas immediately adjacent to major fault zones and when mining thin seams, the following recovery factors were determined from reconciliation data and added to the 2015 Turnbull R&R block models:

- 45% volume discount to coal within 25m of the two major regional thrust faults in FROE
- 20% volume discount to all seams between 0.90m and 1.10m true thickness
- 10% volume discount to all seams between 1.11m and 1.50m true thickness

The next modeling step is the classification of modeled coal volumes as Measured, Indicated, Inferred, or Speculative resource. Each modeled block is assigned one of the categories, based on an assessment of the drill hole spacing between and along sections, as per suggested in GSC paper 88-21 guidelines for complex geology.

The criterion used to assign coal blocks to the appropriate category is listed in the following table.

Category	Model Block Distance to nearest 3 data points along strike direction(meters)	Model Block Distance to nearest 3 data points along dip direction(meters)
Measured	< 150	< 200
Indicated	150 to 300	200 to 400
Inferred	300 to 600	400 to 800
Speculative	> 600	> 800

Table 3 - Resource Category Criteria

Geomechanical Drill Core Log

Teck FRO - Turnbull West Project

ISSUED FOR REVIEW

Hole # GT17-07

Client:	Teck Coal	Northing:	5564818.33	Date Hole Started:	24-Aug-17
Project:	Turnbull West PFS - Fording River Operations (FRO)	Easting:	652409.57	Date Hole Finished:	3-Sep-17
Project Number:	ENG.ROCK03055-01	Elevation (m):	2042.21	Total Hole Depth (m):	316.88
Logged By:	Robyn Barnett, Aaron Nickoli	Azimuth:	90	Depth of Casing (m):	22.9
		Plunge:	85	Core Size:	HQ3

INTERVAL DATA																ISRM Weathering and Strength		DISCONTINUITY DATA													
												Recovery		RQD		Fracture Count															
Time	ACTIII Inclin.	Interval From (m)	Interval To (m)	Interval Length (m)	Elev. (m)	Run No.	Ref. Line Conf.	Gamma	Logged Lithology	Simplified Lithology	Structure (Bed Thickness)	Length (m)	%	Length (m)	%	Natural	Mechanical	Weathering	Strength	Depth (m)	Disc. Type	JRC	Alpha	Beta	Shape	Rough	Infill (PC, CC, F)	Type (CL, PY, CO, CA, GR)	Aperture (Closed, Gapped, Open)	Weather	JCON (RMR'76)	Comments	Average RMR Per Run
2:40:00 PM	-	0.00	2.83	2.83	2042.2	0	-	-	Casing	Casing	-	0.00	0%	0.00	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Casing	N/A
2:40:00 PM	83.20	2.83	4.00	1.17	2039.4	1	-	-	SST	SST	V.Thin	0.34	29%	0.12	10%	1	50	W2	R3	2.83	JN	5	75	-	PL	SM	PC	Ca	G	W2	12	Last 200 mm broken core; 0.83 m core loss assigned to end of run	49
3:45:00 PM	83.90	4.00	5.10	1.10	2038.2	2	-	-	Calcareous SST	SST	V.Thin	0.29	26%	0.00	0%	10	10	W2	R3	-	-	-	-	-	-	-	-	-	-	-	0	Rubble zone - unable to determine natural fractures; 0.81 m core loss assigned to start of run	22
		5.10	6.23	1.13	2037.1	2	-	-	Calcareous SLT/MDST	SLT/MDST	V.Thin	1.13	100%	0.51	45%	6	25	W2	R3	5.49	BD	3	72	-	PL	SM	CC	Ca, Fe	G	W2	12	Reacts with acid	
																				5.61	BD	3	71	-	PL	SM	-	-	C	W2	25		
																				5.62	BD	3	72	-	PL	SM	PC	Fe, Ca	G	W2	12		
																				5.68	BD	3	70	-	PL	SM	PC	Fe, Ca	G	W2	12	Iron staining either side of bed 20 mm	
																				5.76	BC	3	78	-	PL	SM	F	BR, Fe	O	W2	0	280 mm angular broken rock 5 to 50 mm long and 5 to 20 mm wide	41
																				6.11	BC	9	76	-	PL	Ro	F	BR	O	W1	0	80 mm angular broken rock 10 to 50 mm long and 5 to 25 mm wide	
																				6.23	FLT	7	70	-	PL	Ro	F	BR, Clay, Coal	O	W3	0	110 mm angular broken rock 5 to 10 mm long and 5 to 10 mm wide	
		6.23	7.00	0.77	2036.0	2	1	-	Calcareous SST	SST	V.Thin	0.77	100%	0.67	87%	0	0	W1	R4	6.82	BD	5	80	84	PL	SM	-	-	C	W1	25	Reacts with acid	79
5:25:00 PM	-	7.00	7.26	0.26	2035.2	3	-	-	Calcareous SLT/SST	SST/SLT	V.Thin	0.26	100%	0.18	69%	3	4	W2	R3	7.00	JN	3	63	-	PL	SM	CC	Fe	G	W2	20	Minor Fe staining on joint surface	57
																				7.08	BD	3	74	-	PL	SM	CC	Fe	G	W2	20	Reacts with acid; minor Fe staining on joint surface	
																				7.26	JN	13	37	-	PL	VR	CC	Fe	G	W2	20		
		7.26	7.83	0.57	2034.9	3	-	-	MDST with coal stringers	MDST	V.Thin	0.57	100%	0.47	82%	2	20	W1	R3	7.68	JN	13	45	-	PL	VR	CC	Fe	G	W2	20	Irregular oriented coal stringers in MDST - no reaction to acid	61
																				7.75	JN	11	2	-	UN	VR	CC	Fe	G	W2	20		
		7.83	10.00	2.17	2034.4	3	1	-	Calcareous Interbedded SLT/SST	SST/SLT	V.Thin	1.68	77%	1.58	73%	2	13	W1	R3	7.98	JN	7	27	348	PL	Ro	PC	Fe	G	W2	20	0.41 m core loss assigned to end of run	
																				8.48	BD	5	71	161	PL	SM	-	-	C	W1	25	Reacts with acid	
																				8.55	VN	5	4	-	PL	SM	F	Ca	C	W1	12		
																				8.95	VN	7	12	262	PL	Ro	CC	Fe	C	W2	20		65
																				8.95	JN	3	32	258	PL	SM	-	-	C	W1	25		
																				9.05	VN	5	75	178	PL	SM	F	Coal, Ca	C	W1	12	Coal stringer with calcite	
																				9.11	JN	7	4	-	UN	Ro	PC	Fe	C	W1	20	Undulating along core axis	
																				9.17	JN	5	56	63	PL	K	PC	Fe	G	W1	6		
6:25:00 PM	-	10.00	13.00	3.00	2032.2	4	-	-	Silty SST with bands of MDST	SST	V.Thin	2.98	99%	2.48	83%	8	25	W1	R3	10.79	CO	7	73	-	PL	Ro	-	-	G	W1	25	Silty SST reacts with acid, MDST does not react; SST/MDST contact	
																				10.98	CO	9	77	-	PL	Ro	-	-	G	W1	20	MDST/SST contact	
																				11.45	JN	17	7	-	UN	VR	PC	Fe	C	W2	20	JN undulates along core axis 4-12°	
																				11.51	BD	11	75	-	PL	Ro	CC	Coal	C	W1	12		
																				11.77	JN	19	14	-	UN	VR	PC	Fe	C	W2	20	Undulating through core axis	
																				12.05	BD	1	70	-	PL	SM	PC	Fe	G	W2	20	Contact SST/MDST	68
																				12.29	BD	5	75	-	PL	SM	F	Coal	G	W1	12		
																				12.33	BD	7	77	-	PL	Ro	F	Coal	G	W2	12	Fe staining on MDST joint surface	
																				12.37	BC	9	70	-	PL	Ro	F	BR, Coal	O	W1	0	30 mm broken rock 5-10 mm long, 5-10 mm wide	
																				12.42	VN	5	65	-	PL	SM	F	Ca	C	W1	20	Calcite vein	
																				12.60	JN	5	12	-	PL	SM	CC	Fe	G	W2	20		
																				12.80	JN	5	14	-	PL	SM	CC	Fe	G	W2	20		
6:30:00 PM	84.00	13.00	16.00	3.00	2029.2	5	1	-	Calcareous SLT/SST with MDST bands	SST/SLT	L	3.00	100%	2.66	89%	7	8	W1	R3	13.12	JN	11	22	353	PL	Ro	CC	Fe	G	W2	20	Core reacts with acid (entire run)	
																				13.18	JN	7	6	268	PL	SM	CC	Fe, Ca	G	W1	20	Near parallel to core axis for 230 mm	
																				13.24	JN	13	30	340	ST	Ro	CC	Fe	G	W2	20		
																				13.28	JN	5	49	351	CU	SM	CC	Fe	G	W2	20		70
																				13.40	JN	7	29	338	PL	SM	CC	Fe	G	W2	20		
																				14.92	BD	1	70	140	PL	SM	PC	Ca, Carb Coal	G	W1	12	Bedding is folded and irregular around 13.6 to 13.87 m; lineations on bedding surface	
																				15.70	JN	7	7	50	PL	SM	PC	Ca	G	W1	20		
8:10:00 PM	84.10	16.00	19.00	3.00	2026.2	6	1	-	Calcareous SLT/SST	SST/SLT	MED	3.00	100%	3.00	100%	4	5	W1	R4	17.32	JN	9	43	298	PL	Ro	-	-	C	W1	25	Entire length of core reacts with acid; fracture may be mechanical	
																				17.73	BD	3	65	99	PL	SM	PC	Ca	G	W1	20	Appears to be bedding but difficult to tell	76
																				18.25	JN	5	33	302	PL	SM	CC	Fe, BR	G	W2	12	2 closely spaced parallel joints forming a small zone of broken rock	
																				18.97	JN	5	21	324	PL	SM	PC	Ca	G	W1	20		
9:00:00 PM	83.50	19.00	22.00	3.00	2023.2	7	1	-	Calcareous SLT/MDST	SLT/MDST	MED	2.95	98%	2.95	98%	1	5	W1	R4	21.73	JN	5	33	346	PL	SM	CC	Fe	G	W2	20	Orientation line could be traced to 20.54 m where drill spin occurred; orientation line above 20.54 m traced fro previous run; bedding appears to be approximately perpendicular to core axis; entire length of core reacts with acid	82
9:50:00 PM	83.60	22.00	25.00	3.00	2020.2	8	1	7	Calcareous SLT	SLT	L	3.01	100%	3.01	100%	2	4	W1	R4	22.17	JN	7	48	351	PL	SM	CC	Fe	G	W2	20	Entire length of run reacts with acid; bedding appears approximately perpendicular to core axis	84
																				22.27	JN	7	41	352	PL	SM	CC	Fe, Ca	G	W2	20	Calcite (?) crystals on joint surface	
																				24.85	JN	9	11	29	IR	Ro	PC	Ca	C	W1	25		
10:40:00 PM	84.00	25.00	28.00	3.00	2017.2	9	1	-	Calcareous interbedded SST/SLT/MDST	SST/SLT	L	3.00	100%	2.80	93%	11	6	W1	R4	25.25	JN	7	15	89	PL	SM	PC	Ca	G	W1	25	Entire run reacts with acid; orientation line could be traced to 27.33 m, remaining line traced from previous run	
																				25.33	JN	7	44	55	PL	SM	-	-	C	W1	25		
																				25.60	JN	3	16	353	PL	SM	PC	Ca	G	W1	20		
																				26.32	BD	1	79	162	PL	SM	-	-	C	W1	25		
																				26.47	JN	5	12	14	PL	SM	PC	Ca	G	W1	20		66
																				26.90	BD	1	70	164	PL	SM	-	-	C	W1	25		
																				26.98	JN	11	18	354	IR	Ro	PC	Fe	G	W2	20		
																				27.35	JN	7	65	173	PL	Po	F	Coal	O	W2	6	3 mm coal parting; conchoidal fracture; possible bedding	
																				27.72	JN	9	19	335	PL	Ro	CC	Fe	G	W3	20		
																				27.85	JN	3	64	123	PL	SM	F	Coal	O	W2	6	4 mm coal parting	
																				27.90	JN	7	8	233	PL	SM	PC	Fe	G	W2	20		
11:20:00 PM	83.70	28.00	29.84	1.84	2014.2	10	1	-	Calcareous interbedded SLT/SST	SST/SLT	L	1.84	100%	1.77	96%	1	4	W1	R4	29.61	JN	3	19	353	PL	SM	CC	Fe	G	W2	20	Orientation line from previous run traced to 29.65 m; core reacts with acid	82
		29.84	31.00	1.16	2012.4	10	0	-	COAL/MDST	COAL	Thin	0.91	78%	0.00	0%	100	50	W3	R1	30.42	FLT	5	70	-	IR	Po	F	Coal, BR	O	W3	0	Final 300 mm of run is MDST; minimum 300 mm FLT with friable coal/crushed rock infill; strength ranges from R0 to R2	
																				30.70	FLT	7	72	-	PL	SM	F	Coal, BR	O	W3	0	40 mm friable/broken coal; shiny surface	29
																				30.80	BD	1	74	-	PL	Po	-	-	C	W1	20	Planar, polished BD in MDST	
																				30.84	JN	1	82	-	UN	Po	PC	Ca	G	W1	20		
12:20:00 AM	83.70	31.00	32.54	1.54	2011.2	11	-	-	Interbedded MDST/SLT	SLT/MDST	L	1.54	100%	1.07	69%	6	25	W1	R4	31.37	JN	3	73	-	PL	SM	F	Coal	O	W3	6	400 mm mechanically broken core at beginning of run; 5 mm coal seam; lineations on surface	
																				31.59	JN	5	19	-	PL	SM	CC	Fe	G	W2	20	2 shallow, intersecting joints at 31.59 m and 31.67 m	
																				31.67	JN	5	14	-	ST	SM	CC	Fe	G	W2	20		
																				32.12	JN	9	9	-	PL	Ro	CC	Fe	G	W2	20		56
																				32.31	JN	7	76	-	PL	SM	PC	Fe	G	W2	20		
																				32.45	JN/BC	3	65	-	ST	SM	PC	Carb Coal	G	W1	12	100 mm of broken core at end of run; likely mechanical	
		32.54	34.00	1.46	2009.7	11	-	-	COAL	COAL	V.Thick	0.86	59%	0.10	7%	50	50	W3	R0	32.64	FLT	7	74	-	PL	SM	F	Coal, BR	O	W3	0	80 mm zone of friable/broken coal; 0.6 m core loss assumed at end of run; driller indicated that significant water loss began occurring during drilling	22

Geomechanical Drill Core Log

Teck FRO - Turnbull West Project

ISSUED FOR REVIEW

Hole # GT17-07

Client:	Teck Coal	Northing:	5564818.33	Date Hole Started:	24-Aug-17
Project:	Turnbull West PFS - Fording River Operations (FRO)	Easting:	652409.57	Date Hole Finished:	3-Sep-17
Project Number:	ENG.ROCK03055-01	Elevation (m):	2042.21	Total Hole Depth (m):	316.88
Logged By:	Robyn Barnett, Aaron Nickoli	Azimuth:	90	Depth of Casing (m):	22.9
		Plunge:	85	Core Size:	HQ3

INTERVAL DATA																ISRM Weathering and Strength		DISCONTINUITY DATA														
											Recovery		RQD		Fracture Count																		
Time	ACTIII Inclin.	Interval From (m)	Interval To (m)	Interval Length (m)	Elev. (m)	Run No.	Ref. Line Conf.	Gamma	Logged Lithology	Simplified Lithology	Structure (Bed Thickness)	Length (m)	%	Length (m)	%	Natural	Mechanical	Weathering	Strength	Depth (m)	Disc. Type	JRC	Alpha	Beta	Shape	Rough	Infill (PC, CC, F)	Type (CL, PY, CO, CA, GR)	Aperture (Closed, Gapped, Open)	Weather	JCON (RMR'76)	Comments	Average RMR Per Run
																				33.08	BD	5	77	-	PL	SM	CC	Coal	G	W2	12		
																				33.17	FLT	3	57	-	PL	SM	F	Coal, BR	O	W3	0	60 mm broken/friable coal	
1:00:00 AM	84.10	34.00	34.62	0.62	2008.2	12	-	-	COAL	COAL	Thin	0.62	100%	0.12	19%	100	50	W3	R0	34.47	FLT	5	69	-	PL	SM	F	Coal, BR	O	W3	0	50 mm friable coal infill; strength ranges from S5 to R0	28
																				34.62	CO	1	69	-	PL	SM	-	-	C	W3	20		
		34.62	35.84	1.22	2007.6	12	0	-	Interbedded COAL/MDST	COAL	Thin	1.22	100%	0.68	56%	3	50	W3	R1	34.84	CO	5	75	-	IR	SM	CC	Coal	G	W3	12	Micro-fractures in core; 450 mm coal seam contact (upper); strength ranges from R1 to R2	57
																				35.30	CO/BC	7	55	-	PL	Po	PC	Ca, Coal	G	W2	20	Lower contact coal seam; 30 mm zone of broken core	
																				35.63	BD	5	65	-	PL	SM	CC	Carb Coal	G	W2	6	3 mm carb coal infill	
		35.84	37.00	1.16	2006.4	12	0	-	COAL	COAL	V.Thin	0.94	81%	0.12	10%	100	10	W3	R0	35.84	CO	3	73	-	PL	SM	PC	Carb Coal	G	W2	6	Coal/MDST contact; run consists of relatively intact core with a zone of S4 soil like coal from 36.31-36.56 m; 0.22 m core loss assumed at end of run	31
																				36.24	JN	3	48	-	PL	SM	CC	Coal	G	W3	20		
3:25:00 AM	84.10	37.00	38.64	1.64	2005.2	13	0	-	COAL/Coaly MDST	COAL	-	1.32	80%	0.24	15%	10	100	W2	R1	38.06	BD	3	73	-	PL	SM	CC	Carb Coal	G	W3	12	Consists of mechanically broken/pulverized rock fragments; 0.32 m core loss assumed at start of run; strength ranges from R1 to R2	39
																				38.20	JN	1	81	-	PL	SM	F	Coal	O	W3	6	2 mm coal parting	
																				38.27	JN	5	41	-	PL	SM	PC	Carb Coal	G	W2	20		
																				38.35	JN	3	79	-	CU	Po	PC	Carb Coal	G	W2	20	Conchoidal/glassy surface	
		38.64	40.00	1.36	2003.6	13	1	-	Interbedded SST/SLT/MDST	SST/SLT	L	1.36	100%	1.36	100%	0	2	W1	R4	-	-	-	-	-	-	-	-	-	-	-	25	No natural fractures	87
10:20:00 AM	84.20	40.00	41.48	1.48	2002.2	14	-	-	Interbedded calcareous SST/SLT	SST/SLT	V.Thin	1.48	100%	1.48	100%	0	4	W1	R4	41.17	BD	3	74	-	PL	SM	-	-	C	W1	25	Reacts with acid	87
																				41.48	CO/BD	7	60	-	PL	Ro	-	-	C	W1	25		
		41.48	43.00	1.52	2000.7	14	1	-	Interbedded MDST/COAL	COAL	V.Thin	1.46	96%	1.11	73%	8	20	W1	R2	41.52	BD	1	74	-	PL	SM	-	-	C	W1	20	MDST R3, Coal R2	
																				41.76	BD	5	64	-	PL	SM	CC	Coal, Carb Coal	G	W1	0	10 mm crushed coal infill, 5-20 mm long, 5-10 mm wide	
																				41.88	BD	3	77	345	PL	SM	F	Coal	O	W1	0	15 mm crushed coal infill, 5-10 mm long, 5 mm wide	
																				42.13	JN	3	12	300	PL	SM	-	-	G	W1	20		47
																				42.19	CO	3	77	310	PL	SM	-	-	G	W1	20	MDST-Coal contact	
																				42.37	JN	7	9	310	PL	Ro	-	-	G	W1	12		
																				42.44	JN	3	23	176	PL	SM	-	-	G	W1	12		
																				42.49	JN	7	31	174	PL	Ro	-	-	G	W1	12		
																				42.82	BD	9	74	-	PL	Ro	-	-	G	W1	12		
10:25:00 AM	84.10	43.00	46.00	3.00	1999.2	15	-	-	Interbedded SLT/SST/MDST	SLT/MDST	L	2.77	92%	2.75	92%	8	25	W1	R3	43.00	BD	3	73	-	PL	K	-	-	G	W1	6	Lineations on bedding surface; 0.23 m core loss assigned to end of run	
																				43.21	JN	7	55	-	PL	Po	CC	Carb Coal	G	W1	6		
																				43.91	BD	3	77	-	PL	SM	CC	Coal	G	W1	12	<1 mm coal on bedding surface	
																				44.11	JN	7	59	-	PL	Po	CC	Carb Coal	G	W1	6		66
																				44.58	JN	9	23	-	PL	Ro	-	-	G	W1	25		
																				45.21	JN	9	22	-	PL	Ro	-	-	G	W1	25		
																				45.37	JN	5	64	-	PL	SM	F	BR	O	W1	0	15 mm, 5-10 mm long, 5-10 mm wide crushed rock	
																				45.64	BD	5	73	-	PL	SM	CC	Coal	G	W1	12		
11:10:00 AM	84.20	46.00	49.00	3.00	1996.2	16	1	-	Calcareous Silty SST with MDST Bands	SST	V.Thin	2.87	96%	2.85	95%	3	25	W1	R3	46.37	BD	3	65	-	PL	SM	-	-	G	W1	20	First 200 mm of run MDST with coal stringers	
																				46.70	BD	3	58	-	PL	SM	F	Coal	C	W1	6	0.13 m core loss assigned to start of run	
																				46.95	JN	9	47	-	PL	Ro	CC	Fe	G	W2	25	Fe staining; 5 mm either side of joint	69
																				47.57	BD	3	54	-	PL	SM	-	-	C	W1	25	Silty SST reacts with acid; MDST does not react	
																				48.61	FLT	5	73	-	PL	K	F	BR, Coal	O	W1	0	20 mm broken rock coal crush	
11:50:00 AM	83.60	49.00	52.00	3.00	1993.2	17	2	0	Calcareous interbedded SLT/SST	SST/SLT	V.Thin	3.00	100%	2.92	97%	6	3	W1	R3	49.09	BD	7	70	148	PL	Ro	-	-	G	W1	25	Drillers lost circulation during this run	
																				49.65	JN	5	27	337	PL	SM	CC	Fe	G	W2	12		
																				51.17	JN	9	31	344	PL	Ro	PC	Fe	G	W2	20		
																				51.17	BD	5	74	141	PL	SM	-	-	C	W1	25		71
																				51.19	JN	7	34	343	PL	Ro	PC	Fe	G	W2	12		
																				51.60	JN	3	35	346	PL	SM	CC	Fe	G	W2	12		
																				51.62	JN	3	40	246	PL	SM	PC	Fe	G	W2	20		
																				51.92	JN	5	40	329	PL	SM	CC	Fe	G	W2	12		
12:35:00 PM	83.00	52.00	53.06	1.06	1990.2	18	-	-	Interbedded SLT/SST	SST/SLT	V.Thin	1.06	100%	1.06	100%	1	2	W1	R3	52.48	BD	3	49	-	PL	SM	-	-	C	W1	25		78
																				52.75	JN	9	70	-	PL	Ro	CC	Fe	G	W2	12		
		53.06	55.00	1.94	1989.1	18	-	-	COAL	COAL	V.Thin	1.05	54%	0.85	44%	6	25	W1	R2	53.06	BD	5	73	-	PL	SM	F	BR	O	W1	0	Contact SST-Coal; 35 mm angular broken rock; 5-50 mm long, 5-20 mm wide	
																				53.26	BD	3	67	-	PL	SM	-	-	G	W1	20		
																				53.55	BC	9	84	-	PL	Ro	F	BR, Coal	O	W1	0	50 mm crushed coal 5 mm and smaller	41
																				53.70	JN	7	46	-	PL	Ro	-	-	G	W1	20		
																				53.75	JN	7	61	-	CU	Po	CC	Carb Coal	G	W1	6		
																				53.80	JN	7	50	-	PL	Ro	-	-	G	W1	20	0.89 m core loss assigned to end of run	
1:20:00 PM	83.80	55.00	55.52	0.52	1987.2	19	-	-	COAL	COAL	V.Thin	0.52	100%	0.10	19%	50	50	W1	R2	55.10	BC	17	-	-	IR	VR	F	BR	O	W1	0	110 mm angular broken coal; some carbonaceous coal surfaces; fragments 5-15 mm wide and long	20
		55.52	58.00	2.48	1986.7	19	1	-	Interbedded MDST/SLT	SLT/MDST	V.Thin	2.48	100%	2.48	100%	2	16	W1	R3	55.32	CO	9	82	-	PL	Ro	CC	Carb Coal	G	W1	6		65
																				56.37	BD	5	51	-	PL	Po	-	-	G	W1	6		
2:07:00 PM	83.60	58.00	58.15	0.15	1984.2	20	-	-	Interbedded MDST/SLT	SLT/MDST	V.Thin	0.15	100%	0.15	100%	0	0	W1	R3	58.10	VN	5	55	-	PL	SM	CC	Ca	C	W1	25		69
		58.15	58.79	0.64	1984.1	20	-	-	COAL	COAL	V.Thin	0.64	100%	0.64	100%	0	25	W1	R2	58.52	JN	5	30	-	PL	SM	-	-	C	W1	20		72
		58.79	61.00	2.21	1983.4	20	-	-	Silty SST with Coal beds	SST	V.Thin	2.21	100%	2.17	98%	3	10	W1	R3	59.61	BD	3	50	-	PL	SM	F	Coal	G	W1	12		
																				59.84	JN	3	29	-	PL	SM	-	-	G	W1	20		67
																				60.00	BD	7	46	-	UN	Po	CC	Carb Coal	G	W1	6		
3:05:00 PM	-	61.00	64.00	3.00	1981.2	21	-	-	SST	SST	L	2.97	99%	2.94	98%	3	12	W1	R3	62.50	BD	3	60	-	PL	SM	-	-	C	W1	25	Bands of fine to medium SST, some coal stringers towards end of run	
																				62.62	CO	3	84	-	PL	SM	F	Coal	C	W1	12	Coal bed not parallel to bedding	
																				62.65	CO	3	88	208	PL	SM	CC	Carb Coal	G	W1	6	Coal bed not parallel to bedding	
																				62.97	JN	7	37	78	PL	Ro	-	-	C	W1	25		67
																				63.30	BD	7	54	122	PL	Po	CC	Carb Coal	G	W1	6		
																				63.42	BD	5	68	174	PL	Po	CC	Carb Coal	C	W1	6		
																				63.69	BD	5	64	92	PL	SM	PC	Py?	G	W1	12	Pyrite (?) on bedding surface	
5:30:00 PM	-	64.00	64.90	0.90	1978.2	22	1	-	Coal Rich Black Silty SST	SST	V.Thin	0.90	100%	0.89	99%	2	10	W1	R3	64.42	JN	11	27	317	PL	Ro	-	-	G	W1	25	Coal stringers up to 5 mm thick	
																				64.47	BD	5	65	124	PL	Po	CC	Carb Coal	O	W1	0	Friable coal bed 10 mm thick	66
																				64.85	CO	7	84	72	PL	Ro	CC	Coal	C	W1	12	Coal parting	
		64.90	66.58	1.68	1977.3	22	1	-	Calcareous SLT/SST	SST/SLT	V.Thin	1.68	100%	1.59	95%	2	9	W1	R4	65.26	JN	9	30	328	PL	Ro	-	-	G	W1	20		70
																				65.54	JN	3	63	130	PL	Po	CC	Carb Coal	G	W1	6		
		66.58	67.00	0.42	1975.6	22	1	-	SLT/MDST	SLT/MDST	V.Thin	0.42	100%	0.42	100%	0	4	W1	R3	66.58	CO/BD	3	84	103	PL	Po	CC	Carb Coal	C	W1	6		60
6:00:00 PM	83.60	67.00	67.68	0.68	1975.2	23	1	-	MDST with coal partings	MDST	V.Thin	0.68	100%	0.68	100%	3	3	W1	R3	67.14	JN	5	62	-	PL	Po	CC	Carb Coal	G	W1	6	1 mm coal parting; orientation line could be drawn to 67.2 m	55
																				67.49	JN	3	46	227	CU	Po	-	-	C	W1	20		
																				67.65	JN	1	75	162	PL	Po	F	Carb Coal	O	W3	6	4 mm coal parting	
		67.68	69.40	1.72	1974.5	23	1	-	Calcareous MDST/SLT	SLT/MDST	MED	1.72	100%	1.59	92%	3	6	W1	R5	67.92	JN	5	28	18	PL	SM	PC	Ca	G	W1	20		
																				68.13	JN	13	44	328	PL	Ro	PC	Ca	G	W1	20	Cluster of calcite veins around 68.73 m	82
																				69.35	JN	3	20	154	PL	SM	PC	Ca	C	W1	20		
		69.40	70.00	0.60	1972.8	23	1	-	Interbedded MDST/SLT	SLT/MDST	MED	0.60	100%	0.38	63%	3	3	W1	R5	69.44	JN	5	70	139	PL	SM	PC	Ca	G	W1	20		
																				69.68	JN	3	59	332	PL	SM	-	-	C	W1	25		67
																				69.81	JN	9	16	164	IR	Ro	PC	Fe	G	W1	20	Jointing is irregular and changes direction; alpha is generally consistent but beta varies from 164° to 315°	
6:30:00 PM	84.00	70.00	73.00	3.00	1972.2	24	2	11	Interbedded MDST/SLT/SST	SLT/MDST	V.Thin	3.01	100%	3.01	100%	5	3	W1	R5	70.60	JN	7	40	283	PL	SM	CC	Fe, Ca	G	W2	12	Sugary crystal coating on Fe, possibly Ca but not reactive	
																				71.55	JN	9	37	318	PL	Ro	PC	Fe	G	W2	20		80

Geomechanical Drill Core Log

Teck FRO - Turnbull West Project

ISSUED FOR REVIEW

Hole # GT17-07

Client:	Teck Coal	Northing:	5564818.33	Date Hole Started:	24-Aug-17
Project:	Turnbull West PFS - Fording River Operations (FRO)	Easting:	652409.57	Date Hole Finished:	3-Sep-17
Project Number:	ENG.ROCK03055-01	Elevation (m):	2042.21	Total Hole Depth (m):	316.88
Logged By:	Robyn Barnett, Aaron Nickoli	Azimuth:	90	Depth of Casing (m):	22.9
		Plunge:	85	Core Size:	HQ3

INTERVAL DATA																	ISRM Weathering and Strength		DISCONTINUITY DATA															
											Recovery		RQD		Fracture Count																		
Time	ACTIII Inclin.	Interval From (m)	Interval To (m)	Interval Length (m)	Elev. (m)	Run No.	Ref. Line Conf.	Gamma	Logged Lithology	Simplified Lithology	Structure (Bed Thickness)	Length (m)	%	Length (m)	%	Natural	Mechanical	Weathering	Strength	Depth (m)	Disc. Type	JRC	Alpha	Beta	Shape	Rough	Infill (PC, CC, F)	Type (CL, PY, CO, CA, GR)	Aperture (Closed, Gapped, Open)	Weather	JCON (RMR'76)	Comments	Average RMR Per Run
																				71.83	JN	9	52	77	UN	Po	PC	Fe	G	W2	20		
																				72.14	BD	3	63	109	PL	Po	PC	Carb Coal	G	W2	20		
																				72.71	BD	1	69	119	PL	Po	PC	Ca	G	W1	20		
9:05:00 PM	83.70	73.00	74.38	1.38	1969.2	25	0	-	MDST/SLT	SLT/MDST	MED	1.38	100%	1.17	85%	5	6	W1	R4	73.02	JN	3	71	-	PL	SM	F	Coal	O	W3	0	Unable to trace reference line due to irregularly broken rock near end of coal seam at start of run; 18 mm friable coal seam at beginning of run parallel to BD	55
																				73.22	BD	1	67	-	PL	Po	F	Carb Coal	O	W3	6	3 mm carb coal infill	
																				73.28	BD	1	70	-	PL	SM	-	-	C	W1	20		
																				73.32	JN	5	36	-	PL	SM	CC	Fe	G	W2	20		
																				73.67	BD	5	74	-	CU	Po	CC	Carb Coal	G	W2	6	1mm carb coal parting	
																				73.73	JN	7	29	-	PL	SM	CC	Fe	G	W2	12	Conchoidal fracturing in the core around this joint	
		74.38	76.00	1.62	1967.8	25	0	-	Interbedded MDST/SLT/SST	SLT/MDST	V.Thin	1.62	100%	1.53	94%	3	3	W1	R5	74.61	BD	7	69	-	PL	SM	CC	Carb Coal	G	W2	20	Healed contact parallel to bedding between units	
																				74.87	BD	3	73	-	PL	Po	F	Carb Coal	O	W2	12	5 mm coal infill (hard coal)	77
																				74.95	BD	5	73	-	PL	SM	CC	Carb Coal	G	W2	12	2 mm coal infill (hard coal)	
9:10:00 PM	84.00	76.00	79.00	3.00	1966.2	26	1	-	MDST/SLT	SLT/MDST	MED	2.97	99%	2.90	97%	5	9	W1	R4	76.04	JN	9	20	353	PL	Ro	PC	Ca	G	W1	20	Orientation line could be traced from end of run to 77.05 m where there was broken core	
																				76.56	JN	3	55	-	CU	Po	PC	Ca	C	W1	20		
																				76.70	BC	-	-	-	-	-	-	-	-	-	25	20 mm zone of mechanically broken rubble with drill spin on contacts	76
																				77.01	JN	13	50	23	IR	Ro	PC	Fe	G	W2	20	Irregular break in core where Fe coating is present - may be where 2 joint intersect; mechanical breaking near the joint	
																				77.97	BD	5	71	112	PL	Po	CC	Carb Coal	G	W2	6	20 mm coal infill	
																				78.02	JN	5	30	356	PL	SM	PC	Fe	G	W2	20		
9:45:00 PM	83.50	79.00	80.78	1.78	1963.2	27	2	0	Interbedded MDST/SLT/SST	SLT/MDST	V.Thin	1.78	100%	1.74	98%	5	3	W1	R5	79.26	JN	5	34	7	PL	SM	CC	Fe	G	W2	20		
																				79.92	JN	9	18	349	PL	Ro	CC	Fe	G	W2	20		
																				80.55	BD	1	63	155	PL	Po	F	Coal	O	W3	0	20 mm coal seam	76
																				80.57	BD	3	61	135	PL	Po	CC	Fe	G	W2	12	Lower contact of above coal seam; Fe on bedding surface and lineations	
																				80.68	JN	7	29	339	PL	SM	PC	Fe	G	W2	20		
		80.78	82.00	1.22	1961.4	27	2	0	SST/SLT with Coal stringers	SST/SLT	V.Thin	1.22	100%	1.22	100%	3	3	W1	R5	81.06	BD	1	72	129	PL	Po	F	Carb Coal	O	W3	6	Closed contact parallel to bedding; 3 mm coal parting; lineations on surface	70
																				81.32	BD	5	69	171	PL	Po	PC	Carb Coal	G	W2	12		
																				81.60	BD	3	68	150	PL	Po	F	Carb Coal	O	W3	6	5 mm coal parting	
10:15:00 PM	83.60	82.00	85.00	3.00	1960.2	28	2	0	Interbedded SST/SLT/MDST	SST/SLT	V.Thin	3.00	100%	3.00	100%	1	4	W1	R5	84.25	JN	7	5	97	CU	SM	PC	Fe	G	W2	20	Joint is forming a divot in the core	87
11:00:00 PM	83.50	85.00	88.00	3.00	1957.2	29	1	-	Interbedded SST/SLT/MDST	SST/SLT	V.Thin	3.01	100%	2.61	87%	8	7	W1	R5	85.46	BD	7	64	173	PL	Po	-	-	C	W1	20	Unable to trace orientation line due to drill spin near bottom of run; could orient from previous run to 86.98 m	
																				85.50	BD	7	69	145	PL	Po	-	-	C	W1	20	Part of bedding surface is polished	
																				86.73	BD	3	71	131	PL	Po	-	-	C	W1	20		79
																				87.11	JN	5	4	-	PL	SM	CC	Fe	G	W2	20		
																				87.64	BD	3	66	-	PL	Po	PC	Carb Coal	G	W1	20	Shiny reflective surface	
																				87.76	BD	1	77	-	PL	Po	PC	Carb Coal, Fe	G	W1	20		
																				87.83	JN	1	58	-	CU	Po	-	-	C	W1	20	Conchoidal surface	
																				87.92	JN	11	7	-	PL	Ro	PC	Ca?	G	W1	20		
12:00:00 AM	83.40	88.00	89.86	1.86	1954.2	30	1	-	Interbedded SST/SLT/MDST	SST/SLT	V.Thin	1.86	100%	1.63	88%	2	10	W1	R5	88.42	JN	9	47	149	PL	Ro	-	-	C	W1	25	Orientation line traced from previous run to 89.75 m; unable to trace from this run due to coal at bottom; bedding appears to locally steepen and then become irregular from 89.06 m to end of run	74
																				88.47	JN	5	8	0	PL	SM	PC	Ca	G	W1	20		
																				89.73	BC	-	-	-	-	-	-	-	-	-	0	130 mm zone of mechanically broken core between units	
		89.86	91.00	1.14	1952.3	30	0	-	COAL	COAL	V.Thin	1.03	90%	0.93	82%	3	12	W4	R1	90.05	JN	9	43	-	CU	Ro	CC	Carb Coal	G	W3	12	Coal breaks apart on weakness planes when handled	
																				90.22	BD	3	66	-	PL	Po	CC	Carb Coal	G	W3	12	Lineations on joint surface that run perpendicular to the core axis	60
																				90.64	JN	5	16	-	PL	SM	CC	Carb Coal	G	W3	12	Run is highly mechanically broken and core breaks when handled; difficult to distinguish mechanical and natural features	
12:45:00 AM	83.90	91.00	92.21	1.21	1951.2	31	0	-	COAL	COAL	L	1.21	100%	0.57	47%	5	50	W3	R1	91.68	JN	3	54	-	PL	SM	CC	Carb Coal	G	W3	12	Core is naturally disking along this joint set	
																				91.80	JN	1	72	-	PL	Po	CC	Carb Coal	G	W3	12	Possibly bedding	
																				92.06	JN	5	65	-	PL	Po	CC	Carb Coal	G	W3	12		36
																				92.13	FLT	1	73	-	PL	Po	F	Coal, BR	O	W3	0	80 mm friable broken coal	
																				92.20	CO	3	69	-	PL	Po	F	Coal, BR	O	W3	0	Lower contact of fault and unit contact	
		92.21	94.00	1.79	1950.0	31	0	-	Interbedded MDST/COAL	COAL	Thin	1.66	93%	0.49	27%	6	20	W3	R2	92.50	FLT	15	69	-	IR	VR	F	Coal, BR	O	W3	0	Strength ranges from R1 to R3; 0.13 m core loss assumed at end of run; run is highly mechanically broken; 190 mm of friable polished coal; the surface logged may not represent the true fault contact due to mechanical damage in the core	
																				92.76	JN	5	54	-	CU	Po	PC	Carb Coal	G	W2	12		
																				93.10	JN	7	38	-	PL	SM	-	-	C	W1	20		38
																				93.30	JN	5	33	-	PL	SM	F	Coal, BR	O	W3	0	93.3-93.46 m zone of weak S4 coal	
																				93.53	BC	-	-	-	-	-	-	-	-	-	0	120 mm zone of mechanically broken, disked mudstone	
																				93.74	JN	9	46	-	CU	Ro	CC	Coal	G	W2	12		
																				93.84	JN	5	38	-	PL	SM	CC	Coal	G	W2	12		
1:15:00 AM	84.10	94.00	95.44	1.44	1948.2	32	0	-	Interbedded MDST/COAL	COAL	Thin?	0.92	64%	0.00	0%	20	100	W3	R2	94.61	JN	5	65	-	PL	SM	PC	Carb Coal	G	W2	12	Run is highly mechanically pulverized; micro-fracturing visible in available intact core; strength ranges from R1 to R3	
																				94.65	JN	7	44	-	IR	SM	-	-	C	W1	20		33
																				94.87	JN	7	56	-	PL	SM	PC	Carb Coal	G	W2	12	Zone of mechanically broken pulverized rock from 94.89-95.12 m	
																				95.33	JN	3	70	-	PL	Po	F	Carb Coal	G	W3	6	Zone of broken coal from 95.33-95.44 m	
		95.44	97.00	1.56	1946.8	32	0	-	Interbedded MDST/SLT	SLT/MDST	Thin	1.56	100%	1.53	98%	2	5	W1	R4	95.85	JN	1	69	-	ST	Po	F	Coal	O	W3	0	20 mm coal seam; lineations on joint surface	67
																				96.70	JN	7	61	-	PL	SM	PC	Ca?	G	W1	20	Looks like calcite coating but doesn't react with acid	
2:10:00 AM	-	97.00	98.92	1.92	1945.2	33	1	-	Interbedded SLT/SST	SST/SLT	Thin?	1.92	100%	1.54	80%	5	7	W1	R5	97.15	BD	5	55	-	PL	SM	PC	Ca	C	W1	20	Orientation line could be drawn to 98.26 m	
																				97.18	JN	5	7	-	PL	SM	PC	Ca	G	W1	20		
																				97.89	JN	7	17	-	PL	Ro	PC	Ca	G	W1	20		79
																				98.26	JN	7	16	-	PL	SM	PC	Ca	G	W1	20	Core is disking into thin pieces along this joint; calcite veins near 98.26 m	
																				98.86	JN	9	13	2	PL	Ro	CC	Ca	G	W1	20	Joint runs ~ 200 mm along core	
2:40:00 AM	83.80	98.92	100.00	1.08	1943.3	34	1	-	SLT/SST	SST/SLT	V.Thin	1.08	100%	0.90	83%	2	2	W1	R5	98.98	JN	7	16	8	PL	SM	PC	Ca	G	W1	20		82
																				99.09	BD	-	63	114	-	-	F	Coal	C	W1	25	Healed 4 m coal seam parallel to bedding	
3:30:00 AM	80.40	100.00	102.58	2.58	1942.2	35	1	-	Interbedded SLT/SST	SST/SLT	V.Thin	2.58	100%	2.04	79%	2	5	W1	R5	100.97	JN	7	13	356	ST	SM	PC	Ca	G	W1	20	Orientation line traced to 102.12 m from previous run; joint runs ~230 mm along core	84
																				102.03	JN	7	4	-	PL	SM	PC	Ca	G	W1	20	Joint runs ~740 mm near parallel to core axis	
																				102.30	JN	9	29	-	UN	Ro	PC	Ca	G	W1	20	Bisects joint above	

Geomechanical Drill Core Log

Teck FRO - Turnbull West Project

ISSUED FOR REVIEW

Hole # GT17-07

Client:	Teck Coal	Northing:	5564818.33	Date Hole Started:	24-Aug-17
Project:	Turnbull West PFS - Fording River Operations (FRO)	Easting:	652409.57	Date Hole Finished:	3-Sep-17
Project Number:	ENG.ROCK03055-01	Elevation (m):	2042.21	Total Hole Depth (m):	316.88
Logged By:	Robyn Barnett, Aaron Nickoli	Azimuth:	90	Depth of Casing (m):	22.9
		Plunge:	85	Core Size:	HQ3

INTERVAL DATA																ISRM Weathering and Strength		DISCONTINUITY DATA												
											Recovery		RQD		Fracture Count															
Time	ACTIII Inclin.	Interval From (m)	Interval To (m)	Interval Length (m)	Elev. (m)	Run No.	Ref. Line Conf.	Gamma	Logged Lithology	Simplified Lithology	Structure (Bed Thickness)	Length (m)	%	Length (m)	%	Natural	Mechanical	Weathering	Strength	Depth (m)	Disc. Type	JRC	Alpha	Beta	Shape	Rough	Infill (PC, CC, F)	Type (CL., PY, CO, CA, GR)	Aperture (Closed, Gapped, Open)	Weather	JCON (RMR'76)	Comments	Average RMR Per Run
		102.58	103.00	0.42	1939.6	35	0	-	MDST/FLT	FLT	-	0.16	38%	0.00	0%	50	20	W2	R1	102.58	FLT	3	61	-	PL	Po	F	BR, Coal	O	W3	0	0.60 m core loss assumed; micro-fractures visible in intact core; 40 mm crushed rock infill in fault; run consists of pulverized/broken rock	19
10:20:00 AM	83.60	103.00	106.00	3.00	1939.2	36	1	-	Interbedded SLT/MDST	SLT/MDST	L	3.00	100%	3.00	100%	0	25	W1	R4	103.65	BD	5	70	-	PL	SM	-	-	C	W1	25	Recovered an additional 0.13 m in run	87
																				105.04	JN	7	23	-	PL	Ro	-	-	C	W1	25	Variable bedding	
12:00:00 AM	83.50	106.00	109.00	3.00	1936.2	37	1	-	Silty MDST	MDST	L	2.97	99%	2.97	99%	0	8	W1	R4	106.51	BD	1	73	356	PL	SM	-	-	C	W1	20		85
																				107.74	JN	5	26	192	PL	SM	-	-	C	W1	25		
12:35:00 PM	83.40	109.00	112.00	3.00	1933.2	38	2	8	Interbedded SLT/SST/MDST	SLT/MDST	L	3.00	100%	3.00	100%	0	9	W1	R4	110.45	BD	3	77	142	PL	SM	-	-	C	W1	25		87
																				110.68	VN	5	69	155	PL	SM	F	Ca	C	W1	25	Calcite vein parallel to bedding	
1:20:00 PM	83.70	112.00	115.00	3.00	1930.2	39	3	0	Interbedded SLT/SST/MDST	SLT/MDST	L	3.00	100%	3.00	100%	0	15	W1	R4	112.75	VN	7	11	123	PL	Ro	F	Ca	C	W1	6		74
																				113.02	BD	1	51	183	PL	Po	CC	Carb Coal	C	W1	12		
																				113.50	JN	9	15	358	PL	Ro	PC	Ca	C	W1	25		
																				114.91	JN	7	15	103	PL	Ro	-	-	C	W1	12	Last 70 mm of run is coal; crushed (mechanical?) fragments at contact	
																				114.93	CO	5	70	-	PL	SM	-	-	C	W1	6		
2:00:00 PM	83.90	115.00	115.27	0.27	1927.2	40	0	-	MDST	MDST	L	0.27	100%	0.14	52%	2	0	W1	R4	115.18	JN	3	49	-	PL	Po	CC	Carb Coal	G	W1	0	Carb coal on joint surface; 35 mm clayey coal powder	
																				115.23	FLT	3	73	-	PL	Po	F	Coal, Clay	O	W2	12	Coal heavily fractured, difficult to determine natural fracture from mechanical	46
		115.27	117.77	2.50	1926.9	40	0	-	COAL	COAL	V.Thin	1.78	71%	1.20	48%	8	25	W1	R2	115.42	BD	7	55	-	PL	Ro	-	-	G	W1	12		
																				115.84	BD	5	72	-	PL	SM	-	-	G	W1	12		
																				115.86	JN	9	19	-	PL	Ro	-	-	G	W1	12		
																				115.95	BD	5	73	-	PL	SM	-	-	G	W1	12		
																				116.05	BD	5	61	-	PL	SM	-	-	G	W1	12		41
																				116.46	JN	5	32	-	PL	SM	-	-	G	W1	12		
																				116.60	BD	5	52	-	PL	SM	-	-	G	W1	12		
																				116.77	BD	5	48	-	PL	SM	-	-	G	W1	12		
																				117.05	SHZ	-	-	-	-	-	F	Coal	O	W1	0	Sheared friable coal fragments < 1mm; 0.72 m of lost recovery assigned to end of coal unit	
2:00:00 PM	83.90	117.77	118.00	0.23	1924.4	40	1	-	MDST	MDST	L	0.23	100%	0.23	100%	1	0	W1	R3	118.00	BD	3	70	180	PL	Po	CC	Carb Coal	G	W1	6		50
	83.40	118.00	119.46	1.46	1924.2	41	1	-	Interbedded COAL/MDST	COAL	L	1.46	100%	1.23	84%	3	25	W1	R2	118.47	BD	3	71	-	PL	SM	CC	-	G	W1	6	Run heavily fractured, difficult to distinguish natural and mechanical fractures	
																				118.90	BD	3	64	-	PL	SM	-	-	G	W1	12		
																				119.05	JN	3	24	-	PL	SM	-	-	G	W1	12		
																				119.10	JN	3	36	-	PL	SM	-	-	G	W1	12		60
																				119.12	BD	7	66	-	PL	VR	-	-	G	W1	12		
																				119.28	JN	11	7	-	PL	SM	-	-	G	W1	12		
																				119.30	BD	3	70	-	PL	SM	-	-	G	W1	12		
2:45:00 PM	84.00	119.46	121.00	1.54	1922.7	42			Interbedded COAL/MDST	COAL	L	0.96	62%	0.67	44%	4	25	W1	R2	119.50	BC	5	68	-	PL	SM	F	BR	O	W1	0	Heavy fracturing, difficult to determine natural features; 0.58 m core loss assigned to end of run; 100 mm, 10 - 50 mm long, 5-20 mm angular fragments	
																				119.96	JN	3	28	175	PL	SM	-	-	C	W1	12		41
																				120.04	JN	5	58	28	PL	SM	-	-	C	W1	12		
																				120.25	BD	5	87	174	PL	SM	-	-	C	W1	20		
3:15:00 PM	84.00	121.00	121.56	0.56	1921.2	43	1	-	Interbedded COAL/MDST	COAL	L	0.41	73%	0.15	27%	25	25	W1	R2	121.15	BD	3	71	-	PL	SM	-	-	G	W1	12	0.15 m core loss assigned to start of run	
																				121.20	BC	3	73	-	PL	SM	F	BR, Coal	O	W1	0	190 mm angular coal fragments; 5-60 mm long 5-10 mm wide	31
																				121.56	BD	7	59	-	PL	Po	CC	Carb Coal	G	W1	6		
		121.56	122.50	0.94	1920.6	43	1	-	SST with SLT bands	SST/SLT	L	0.94	100%	0.94	100%	1	0	W1	R5	122.02	BD	3	68	-	PL	Po	CC	Carb Coal	G	W1	6		68
3:55:00 PM	84.00	122.50	124.00	1.50	1919.7	44	1	-	SST	SST	V.Thin	1.50	100%	1.50	100%	1	4	W1	R4	122.72	FLT	3	78	311	PL	K	CC	Carb Coal	G	W1	6		68
6:30:00 PM	83.80	124.00	127.00	3.00	1918.2	45	1	35	SST with SLT bands	SST/SLT	V.Thin	3.01	100%	2.89	96%	4	3	W1	R5	124.52	JN	5	39	316	PL	SM	-	-	C	W1	20	High gamma value therefore ACT III data should be used with caution; ACT-III mark done by dayshift helper	
																				125.36	JN	11	54	324	PL	Ro	PC	Ca	G	W1	20		
																				125.40	JN	3	2	-	PL	SM	PC	Ca	C	W1	20	Joints at 125.4 and 125.45 m intersect to form a stepped like pattern in the core	83
																				125.45	JN	7	49	279	PL	SM	PC	Ca	G	W1	20	Near parallel to core axis; mostly healed in core	
																				126.46	JN	5	11	34	PL	SM	-	-	C	W1	25	Small piece of a mostly healed joint	
																				126.62	JN	7	6	35	ST	SM	CC	Ca	G	W1	20	Joints runs approximately 400 mm near parallel to core axis; highly reactive coating	
2:20:00 AM	83.80	127.00	130.00	3.00	1915.2	50	1	-	Interbedded SST/SLT with occasional MDST interbeds	SST/SLT	L	3.00	100%	3.00	100%	8	5	W1	R5	127.30	JN	5	64	64	PL	SM	-	-	C	W1	20	orientation line can't be drawn for the whole run except the top 120 mm; bedding is locally changing a bit within the run; it gets locally steeper then goes back to ~ 70	
																				128.20	BD	3	75	108	PL	SM	F	Coal	O	W2	6	3 mm coal parting	
																				128.22	JN	5	38	277	PL	SM	-	-	C	W1	20	Potential cross bedding around 127.45-127.7 m and 128.6-128.7 m	
																				128.41	JN	5	84	157	PL	Po	PC	Ca	G	W1	12	Lineations on surface; possible bedding but inconsistent with remaining run; calcite on surface; beta estimated as joint is near perpendicular to core axis	77
																				128.89	BD	3	73	104	PL	SM	-	-	C	W1	20		
																				129.28	BD	7	71	99	UN	Po	PC	Carb Coal	G	W2	12	Conchoidal breakiglassy surface	
																				129.49	BD	3	72	-	CU	Po	PC	Carb Coal	G	W2	12	< 1 mm coal seam	
																				129.91	JN	15	54	82	CU	Ro	-	-	G	W1	20	Glassy surface on part of joint	
10:10:00 AM	84.00	130.00	133.00	3.00	1912.2	51	2	0	SST with SLT bands	SST/SLT	L	3.00	100%	3.00	100%	0	15	W1	R4	130.32	BD	5	65	55	PL	SM	-	-	C	W1	25	All recorded features healed	
																				130.86	JN	5	26	314	PL	SM	-	-	C	W1	25		
																				130.90	JN	5	19	312	PL	SM	-	-	C	W1	25		
																				130.97	JN	5	35	338	PL	SM	-	-	C	W1	25	Healed calcite veins parallel to joint	84
																				132.10	VN	9	8	334	UN	Ro	F	Ca	C	W1	25		
																				132.16	BD	3	51	115	PL	SM	-	-	C	W1	25		
																				132.19	BD	1	76	154	PL	Po	CC	Carb Coal	C	W1	6		
10:45:00 AM	84.10	133.00	136.00	3.00	1909.2	52	1	-	Interbedded SST/MDST	SST	L	3.00	100%	3.00	100%	0	17	W1	R4	134.68	BD	3	71	132	PL	SM	CC	Coal	C	W1	20		85
																				135.22	JN	11	15	345	UN	Ro	-	-	C	W1	25	In MDST band	
11:30:00 AM	84.00	136.00	139.00	3.00	1906.2	53	1	78	Interbedded SST/SLT/MDST	SST/SLT	L	2.98	99%	2.98	99%	0	10	W1	R3	136.47	BD	3	70	198	PL	Po	CC	Carb Coal	C	W1	6	All logged features open from drilling/mechanical fracture	
																				137.27	BD	1	72	157	PL	Po	CC	Carb Coal	C	W1	6		
																				137.31	JN	3	24	312	PL	SM	-	-	C	W1	20		
																				137.41	JN	3	32	310	PL	SM	-	-	C	W1	20		
																				137.62	VN	3	10	332	PL	SM	F	Ca	C	W1	20		71
																				138.05	BD	3	78	178	PL	SM	PC	Ca	C	W1	12	Calcite vein along bedding	
																				138.66	JN	7	13	342	IR	Ro	PC	Ca	C	W1	12	Vuggy quartz at 138.66 m	
																				138.78	BD	3	76	190	PL	Po	CC	Carb Coal	C	W1	6		
																				138.82	BD	3	74	196	PL	Po	CC	Carb Coal	C	W1	6		
																				138.88	BD	3	65	192	PL	Po	CC	Carb Coal	C	W1	6		
																				138.96	BD	3	71	-	PL	SM	F	Coal	C	W1	20	20 mm coal at end of run	
12:40:00 PM	83.30	139.00	140.10	1.10	1903.2	54	-	-	COAL	COAL	L	0.23	21%	0.00	0%	25	25	W1	R2	-	-	-	-	-	-	-	-	-	-	-	0	0.77 m core loss assigned to start of run; run is too damaged to determine if any features are natural	20
		140.10	142.00	1.90	1902.1	54	-	-	Coaly MDST/SLT and FLT	FLT	L	1.90	100%	1.52	80%	0	25	W1	R3	140.12	BD	1	66	-	PL	Po	CC	Carb Coal	G	W1	6	Coaly mudstone transitioning to SLT and back to coaly MDST	

Geomechanical Drill Core Log

Teck FRO - Turnbull West Project

ISSUED FOR REVIEW

Hole # GT17-07

Client:	Teck Coal	Northing:	5564818.33	Date Hole Started:	24-Aug-17
Project:	Turnbull West PFS - Fording River Operations (FRO)	Easting:	652409.57	Date Hole Finished:	3-Sep-17
Project Number:	ENG.ROCK03055-01	Elevation (m):	2042.21	Total Hole Depth (m):	316.88
Logged By:	Robyn Barnett, Aaron Nickoli	Azimuth:	90	Depth of Casing (m):	22.9
		Plunge:	85	Core Size:	HQ3

INTERVAL DATA																ISRM Weathering and Strength		DISCONTINUITY DATA															
											Recovery		RQD		Fracture Count																			
Time	ACTIII Inclin.	Interval From (m)	Interval To (m)	Interval Length (m)	Elev. (m)	Run No.	Ref. Line Conf.	Gamma	Logged Lithology	Simplified Lithology	Structure (Bed Thickness)	Length (m)	%	Length (m)	%	Natural	Mechanical	Weathering	Strength	Depth (m)	Disc. Type	JRC	Alpha	Beta	Shape	Rough	Infill (PC, CC, F)	Type (CL, PY, CO, CA, GR)	Aperture (Closed, Gapped, Open)	Weather	JCON (RMR'76)	Comments	Average RMR Per Run
																				140.38	JN	3	65	-	PL	Po	CC	Carb Coal	C	W1	6		60
																				140.48	JN	3	69	-	PL	Po	CC	Carb Coal	C	W1	6		
																				141.52	CO	3	54	-	PL	Po	CC	Carb Coal	C	W1	6	MDST/coal coated 85mm coal	
																				141.60	FLT	5	63	-	PL	Po	CC	Carb Coal	G	W1	0	60mm angular fragment, either slickensided or MDST lineations on surface (confirm in televiewer log)	
																				141.91	FLT	5	69	-	PL	SM	F	Coal	O	W1	0	50 mm sheared friable coal	
1:20:00 PM	83.60	142.00	142.56	0.56	1900.2	55	-	-	COAL/MDST	COAL	-	0.53	95%	0.16	29%	25	25	W1	R2	142.30	JN	1	-	-	PL	Po	CC	Carb Coal	G	W1	6	Coal transition to MDST; Coal R2, MDST R3; 142-142.5 m drillers had a difficult time keeping water in the hole which lead to bad drill string vibration; highly mechanically damaged, possibly due to excess rod vibration; MDST and fragments have carb coal/polished surfaces; run too broken to determine natural/mechanical features	31
2:05:00 PM	83.60	142.56	145.00	2.44	1899.6	56	1	-	MDST/SLT TRANSITIONS TO SLT/SST	SLT/MDST	L	2.44	100%	2.44	100%	0	8	W1	R4	142.87	BD	7	53	153	PL	Ro	F	Coal	C	W1	12	MDST R3	
																				143.05	VN	5	40	322	PL	SM	PC	Ca	C	W1	20		
																				143.57	JN	5	28	312	PL	SM	PC	Ca	C	W1	20		81
																				143.66	JN	5	35	318	PL	SM	CC	Ca	C	W1	12		
																				144.34	JN	5	33	348	PL	SM	-	-	C	W1	25		
																				144.51	BD	9	68	118	PL	Ro	-	-	C	W1	25		
3:20:00 PM	84.00	145.00	148.00	3.00	1897.2	57	1	-	Interbedded SLT/SST	SST/SLT	L	3.01	100%	3.01	100%	0	8	W1	R4	145.40	JN	5	29	340	PL	SM	-	-	C	W1	25	Healed features mechanically broken	
																				145.50	JN	7	19	348	PL	Ro	-	-	C	W1	25	Healed features mechanically broken	
																				145.60	JN	7	30	345	PL	SM	-	-	C	W1	25	Healed features mechanically broken	91
																				145.98	JN	7	32	344	PL	Ro	-	-	C	W1	25	Healed features mechanically broken	
																				147.31	VN	5	75	150	PL	SM	CC	Ca	C	W1	20		
4:00:00 PM	83.00	148.00	151.00	3.00	1894.2	58	-	-	Interbedded SLT/SST/MDST	SLT/MDST	L	3.00	100%	2.96	99%	2	8	W1	R4	148.75	JN	3	21	-	PL	SM	PC	Ca	C	W1	20		
																				150.08	SHZ	5	83	-	PL	Po	CC	Carb Coal	G	W1	6	20 mm crystalline coal, reconsolidated sheared material?	
																				150.71	BD	5	67	-	PL	Po	CC	Carb Coal	C	W1	6		72
																				150.91	BD	3	69	-	PL	Po	CC	Carb Coal	C	W1	6	20 mm crystalline coal, reconsolidated sheared material?	
5:00:00 PM	83.70	151.00	154.00	3.00	1891.2	59	2	-	Interbedded SLT/SST/MDST	SLT/MDST	L	3.00	100%	3.00	100%	3	20	W1	R3	151.84	BD	3	52	175	PL	Po	CC	Carb Coal	C	W1	6	Frequent mechanical breaks, some with polished surfaced; MDST R3, SST R4	
																				152.06	JN	3	44	347	PL	SM	-	-	C	W1	25		
																				152.17	FLT	3	62	335	PL	K	CC	Carb Coal	C	W1	6		
																				152.37	VN	3	57	76	PL	Po	CC	Carb Coal	C	W1	6		66
																				152.81	BX	7	64	150	PL	Ro	CC	Ca	C	W1	12	Healed breccia zone, calcite infill, 120 mm zone of healed breccia	
																				152.93	JN	1	69	176	PL	SM	-	-	C	W1	6		
																				153.53	JN	9	27	24	PL	Ro	-	-	C	W1	25		
																				154.00	BD	1	63	78	PL	Po	CC	Carb Coal	G	W1	6		
5:50:00 PM	84.00	154.00	157.00	3.00	1888.2	60	2	0	Interbedded SLT/SST/MDST	SLT/MDST	L	3.00	100%	3.00	100%	3	20	W1	R3	155.80	BX	3	68	180	PL	SM	F	Ca	C	W1	12	15 mm healed breccia zone with calcite infill	
																				156.02	JN	1	14	341	PL	SM	-	-	C	W1	20		
																				156.13	BD	3	61	170	PL	SM	PC	Ca	C	W1	12		68
																				156.77	JN	7	6	-	PL	Ro	PC	Ca	G	W1	12		
																				156.90	JN	7	10	-	PL	Ro	PC	Ca	G	W1	12		
6:30:00 PM	83.80	157.00	160.00	3.00	1885.2	61	1	-	Interbedded SLT/SST/MDST	SLT/MDST	L	3.01	100%	3.01	100%	5	3	W1	R4	157.60	BD	7	57	-	PL	SM	-	-	C	W1	20	Orientation line could only be traced confidently to 159.27 m due to broken rock; could not be traced from previous run	
																				157.71	BD	5	65	-	PL	SM	-	-	C	W1	20		
																				158.57	BD	3	66	-	PL	Po	CC	Carb Coal	G	W2	6	2 mm coal parting; lineations on surface	73
																				159.27	JN	7	55	326	PL	SM	PC	Ca	G	W1	20	Broken rock parallel to joint, possibly mechanical	
																				159.62	BD	1	64	119	PL	Po	-	-	C	W1	12	Three healed, shallow joints in core with calcite infill	
9:40:00 PM	84.00	160.00	163.00	3.00	1882.2	62	1	-	Interbedded SLT/SST/MDST	SLT/MDST	L	2.95	98%	2.75	92%	9	12	W1	R5	160.21	JN	5	51	-	CU	SM	-	-	C	W1	20	Driller using thick bentonite mud to try and gain circulation; orientation line could only be traced to a zone of rubble/mechanically broken rock at 161.40 m; bedding appears to become shallower relative to core axis in run	
																				160.68	JN	15	47	-	IR	Ro	-	-	C	W1	20	Surface is partly broken along joint and partly mechanical through rock	
																				160.89	BD	1	53	-	PL	SM	PC	Carb Coal	G	W2	12		
																				161.26	JN	7	19	-	PL	SM	-	-	C	W1	20	Zone of broken rubble from 161.26-161.40 m due to a combination of closely spaced joints and mechanical fracturing	
																				161.38	JN	7	29	-	PL	SM	PC	Ca	G	W1	20		
																				161.40	JN	9	46	294	CU	Ro	PC	Ca	G	W1	20		
																				161.75	JN	13	33	278	ST	Ro	-	-	C	W1	25		
																				162.15	VN	5	63	133	PL	SM	CC	Ca	G	W1	20		
																				162.20	JN	7	30	346	PL	SM	PC	Ca	G	W1	20		
																				162.43	VN	-	40	128	-	-	CC	Ca	C	W1	25	2 mm healed calcite vein parallel to bedding	
																				162.85	VN	-	45	125	-	-	CC	Ca	C	W1	25	1-3 mm healed calcite vein parallel to bedding	
9:00:00 AM	83.80	163.00	164.50	1.50	1879.2	63	1	-	Interbedded SLT/SST	SST/SLT	L	1.50	100%	1.50	100%	0	4	W1	R4	163.43	BD	3	43	108	PL	SM	-	-	C	W1	25		87
																				163.57	VN	5	42	117	PL	SM	CC	Ca	C	W1	25		
10:40:00 AM	83.90	164.50	166.00	1.50	1877.7	64	1		Interbedded SLT/SST/MDST	SLT/MDST	L	1.50	100%	1.50	100%	2	16	W1	R4	164.54	JN	1	42	-	PL	Po	CC	Carb Coal	G	W1	6		
																				164.84	JN	3	53	-	PL	SM	PC	Ca	C	W1	25		
																				164.86	JN	3	48	-	PL	SM	PC	Ca	C	W1	25		74
																				164.97	BD	3	40	-	PL	Po	CC	Carb Coal	G	W1	6		
																				165.57	VN	7	47	108	PL	Ro	F	Ca	C	W1	25		
2:20:00 PM	83.30	166.00	169.00	3.00	1876.2	65	1	-	Interbedded SLT/SST/MDST	SLT/MDST	L	2.96	99%	2.96	99%	0	19	W1	R4	166.45	JN	3	32	304	PL	SM	-	-	C	W1	25		
																				166.70	JN	3	37	27	PL	SM	PC	Ca	C	W1	25		
																				167.21	BD	3	40	131	PL	Po	CC	Carb Coal	C	W1	25	Striations on bedding surface	87
																				167.43	JN	3	34	338	PL	SM	PC	Ca	C	W1	25		
																				168.04	BD	3	47	127	PL	SM	-	-	C	W1	25	168.14-168.39 m bedding is deformed/folded	
																				168.39	FLT	3	26	124	PL	Po	CC	Carb Coal	C	W1	25		
3:30:00 PM		169.00	170.20	1.20	1873.2	66	-	-	Interbedded SLT/SST/MDST	SLT/MDST	L	1.20	100%	1.17	98%	2	3	W1	R4	169.05	JN	5	85	-	PL	SM	F	Clay	O	W1	0	30 mm high plastic light brown clay	
																				169.76	BX	7	34	-	PL	Ro	F	Ca, BR	C	W1	25	Healed calcite infilled breccia	73
																				169.86	BD	1	52	-	PL	SM	-	-	C	W1	25		
																				170.01	VN	3	46	-	PL	SM	PC	Ca	G	W1	12	Orthogonal to bedding	
		170.20	170.92	0.72	1872.0	66	-	-	MDST	MDST	L	0.67	93%	0.62	86%	2	11	W1	R3	170.30	BD	1	53	-	PL	Po	CC	Carb Coal	G	W1	6		
																				170.37	FLT	1	51	-	PL	SM	F	Clay, BR	G	W1	0	50 mm angular broken rock and plastic clay	
																				170.74	JN	3	46	-	PL	SM	-	-	C	W1	25		65
																				170.78	JN	3	35	-	PL	SM	-	-	C	W1	25	First 90 mm RC coal, followed by sheared coal; extremely friable and weak.	
		170.92	172.00	1.08	1871.3	66	-	-	COAL/Shear Zone	COAL	L	0.35	32%	0.00	0%	25	25	W5	S4	170.97	CO	3	46	-	PL	Po	CC	Carb Coal	G	W5	0		18
																				171.08	SHZ	7	43	-	PL	Ro	F	Coal	O	W1	0	0.68 m core loss assigned to end of run	
5:10:00 PM	84.30	172.00	173.50	1.50	1870.2	67	-	-	COAL	COAL	L	0.21	14%	0.00	0%	50	50	W5	S4	-	-	-	-	-	-	-	-	-	-	0	Assumed strength of friable coal recovered from previous run; coal recovered R2; assigned 1.29 m core loss to end of run	18
5:40:00 PM	84.30	173.50	174.30	0.80	1868.7	68	-		COAL	COAL	-	0.05	6%	0.00	0%	100	100	W5	S4	-	-	-	-	-	-	-	-	-	-	0	Only rubble in tube; 0.75 m core loss assigned to start of run	18

Geomechanical Drill Core Log

Teck FRO - Turnbull West Project

ISSUED FOR REVIEW

Hole # GT17-07

Client:	Teck Coal	Northing:	5564818.33	Date Hole Started:	24-Aug-17
Project:	Turnbull West PFS - Fording River Operations (FRO)	Easting:	652409.57	Date Hole Finished:	3-Sep-17
Project Number:	ENG.ROCK03055-01	Elevation (m):	2042.21	Total Hole Depth (m):	316.88
Logged By:	Robyn Barnett, Aaron Nickoli	Azimuth:	90	Depth of Casing (m):	22.9
		Plunge:	85	Core Size:	HQ3

INTERVAL DATA																ISRM Weathering and Strength		DISCONTINUITY DATA													
											Recovery		RQD		Fracture Count																
Time	ACTIII Inclin.	Interval From (m)	Interval To (m)	Interval Length (m)	Elev. (m)	Run No.	Ref. Line Conf.	Gamma	Logged Lithology	Simplified Lithology	Structure (Bed Thickness)	Length (m)	%	Length (m)	%	Natural	Mechanical	Weathering	Strength	Depth (m)	Disc. Type	JRC	Alpha	Beta	Shape	Rough	Infill (PC, CC, F)	Type (CL, PY, CO, CA, GR)	Aperture (Closed, Gapped, Open)	Weather	JCON (RMR'76)	Comments	Average RMR Per Run
		174.30	175.00	0.70	1867.9	68	-		MDST/SLT/SST	SLT/MDST	L	0.70	100%	0.38	54%	3	2	W1	R4	174.80	BD	3	55	140	PL	Po	CC	Carb Coal	G	W1	6		
																				174.88	JN	3	74	226	ST	SM	CC	Carb Coal	G	W1	6		46
																				175.00	BD	3	67	138	PL	Po	CC	Carb Coal	G	W1	6		
6:15:00 PM		175.00	176.50	1.50	1867.2	69	1	-	MDST/SLT/SST with coal partings	SLT/MDST	L	0.44	29%	0.44	29%	3	0	W1	R4	176.06	FLT	3	75	104	PL	K	CC	Carb Coal	G	W1	6	Carb coal on joint surface at both ends of run; no rubble in run to explain lost core; no coal residue on split; core loss assigned to start of run; potential friable coal seam to start run	41
																				176.34	BD	3	35	165	PL	Po	CC	Carb Coal	G	W1	6		
																				176.50	BD	7	58	156	PL	Po	CC	Carb Coal	G	W1	6		
10:15:00 PM	83.30	176.50	178.00	1.50	1865.7	70	0	-	MDST/SLT/SST	SLT/MDST	L	0.86	57%	0.45	30%	1	50	W1	R4	177.83	JN	5	22	-	PL	SM	PC	Ca	G	W1	20	Run was partially drilled by dayshift and then finished by nightshift; dayshift pulled rods before leaving; recovered run consists of a few pieces of mechanically ground down/highly spun core; can only distinguish one natural fracture because recovery is so poor and the run is so mechanically damaged; bottom 480 mm of run has multiple calcite veins running near parallel to core axis cross cutting bedding.	65
11:05:00 PM	83.30	178.00	181.00	3.00	1864.2	71	1	-	Interbedded SLT/MDST	SLT/MDST	L	3.00	100%	2.86	95%	8	13	W1	R4	178.00	BX	-	22	-	-	-	CC	Ca	C	-	25	Healed breccia from 178.0-178.36 m	
																				178.36	VN	-	62	-	-	-	F	Ca	C	W1	25	Possible brecciation / alteration from beginning of run to 178.36 m; orientation line could be drawn to 178.94 m; some micro-fracturing in core leading to broken zones around joints; 2-3 mm wide healed calcite vein cross cutting bedding	
																				178.49	BD	5	54	-	PL	Po	PC	Carb Coal	G	W1	12		
																				178.69	BD	7	46	-	PL	Po	PC	Carb Coal	G	W1	12		
																				178.86	JN	17	43	-	ST	Ro	PC	Ca	G	W1	20	60 mm zone of mechanically broken rock around this joint; alpha is only approximate	77
																				178.99	JN	11	51	271	PL	Ro	PC	Ca	G	W1	20		
																				179.20	JN	9	43	243	CU	Ro	PC	Ca	G	W1	20		
																				179.28	JN	13	45	282	CU	Ro	PC	Ca	G	W1	20		
																				179.89	BD	3	39	129	PL	Po	PC	Ca, Carb Coal	G	W1	20		
																				180.11	JN	1	17	128	PL	Po	CC	Ca	C	W1	25	Broke along joint when handling the core; shiny/mirrored surface; veins run parallel to feature	
																				180.61	JN	7	39	45	PL	SM	PC	Ca	G	W1	20		
12:10:00 AM	83.90	181.00	184.00	3.00	1861.2	72	0	-	SLT with SST banding	SLT	L	3.00	100%	2.78	93%	5	8	W1	R4	181.71	JN	3	45	-	PL	SM	-	-	C	W1	25	Unable to confidently orient run due to a combination of natural and mechanical fractures at beginning of run; appears to be folding and possible brecciation from 182.83-183.5 m	
																				182.13	JN	3	49	-	PL	SM	PC	Ca	G	W1	20	Bedding is wavy/deformed from 182.07-182.27 m; possible folding	75
																				182.95	JN	3	46	-	PL	SM	-	-	C	W1	25		
																				183.53	JN	1	75	-	PL	Po	PC	Carb Coal	G	W1	12		
																				183.76	BD	1	39	-	PL	Po	-	-	C	W1	20		
																				183.80	JN	5	59	-	PL	SM	PC	Ca	G	W1	20		
																				183.90	BD	1	32	-	PL	Po	PC	Ca	G	W1	12	Glassy/mirrored surface	
																				184.00	BD	3	32	-	PL	Po	PC	Ca	G	W1	12	Glassy/mirrored surface with lineations	
1:10:00 AM	83.20	184.00	184.42	0.42	1858.2	73	0	-	MDST/SLT	SLT/MDST	L	0.42	100%	0.30	71%	3	8	W1	R4	184.20	BD	3	37	-	PL	Po	PC	Carb Coal	G	W1	12	Very mechanically broken at end of interval before coal; unable to draw orientation line	
																				184.24	JN	7	6	-	PL	Po	PC	Ca	G	W1	20	Joint running near parallel to core axis for 70 mm; lineations on surface	55
																				184.29	BD	3	48	-	PL	Po	PC	Ca, Carb Coal	G	W1	12	Zone of mechanically broken core from 184.29-184.42 m	
		184.42	185.61	1.19	1857.8	73	0	-	COAL	COAL	L	0.61	51%	0.36	30%	50	20	W3	R0	184.42	FLT	3	55	-	PL	Po	F	Coal, BR	O	W3	0	Assumed 40 mm friable/broken coal; strength in run ranges from R0 to R1	
																				184.59	JN	3	61	-	PL	Po	CC	Carb Coal	G	W3	12		29
																				184.84	FLT	1	83	-	PL	Po	F	Coal, BR	O	W3	0	40 mm friable/broken coal	
																				184.90	JN	9	36	-	CU	Ro	F	Coal, BR	G	W3	20		
																				184.95	FLT	17	-	-	IR	Ro	F	Coal, BR	O	W3	0	40 mm friable/broken coal; broken coal contact	
		185.61	187.00	1.39	1856.6	73	0	-	MDST	MDST	MASS?	1.39	100%	0.83	60%	9	6	W1	R3	185.87	JN	5	66	-	PL	Po	CC	Coal, BR	G	W2	12	Difficult to distinguish bedding, unit appears massive; mechanically broken rock and coal in joint	
																				186.00	JN	5	71	-	PL	Po	PC	Carb Coal	G	W1	12		
																				186.10	JN	19	10	-	IR	VR	PC	Ca, Fe	G	W1	20	Joint runs ~140mm near parallel to core axis; reddish Fe (?) staining; concholdal breaks along joint	
																				186.21	JN	9	82	-	UN	Po	PC	Carb Coal	G	W1	20	Core is disking parallel to this feature when handled; alpha approximate as surface undulates	50
																				186.52	SHZ	9	68	-	UN	Po	F	Coal, BR	O	W1	0	5 mm broken rock/coal infill; alpha approximate as surface undulates	
																				186.71	JN	5	64	-	PL	Po	PC	Ca	G	W1	20	Core is disking/flaking around this joint when handled	
																				186.75	FLT	7	56	-	UN	Po/SM	F	Coal, BR	O	W3	0	30 mm friable coal / broken rock; surface is part polished part smooth; alpha approximate	
																				186.88	JN	9	43	-	CU	Ro	PC	Carb Coal	G	W1	20		
3:20:00 AM	83.30	187.00	189.15	2.15	1855.2	74	0	-	MDST with coal seams	MDST	V.Thin	2.15	100%	1.65	77%	8	15	W1	R3	187.03	FLT	1	68	-	PL	Po	F	Coal, BR, Fe, Ca	O	W3	0	Could not draw orientation line due to broken core at beginning of run; 70mm friable/broken coal; red staining and calcite on contact surface	
																				187.17	JN	3	56	-	PL	Po	PC	Carb Coal	G	W1	12	Possibly bedding	
																				187.29	BD	7	67	-	UN	Po	CC	Coal, BR	G	W1	6	Zone of broken/flaking rock	
																				187.31	BD	1	65	-	PL	Po	PC	Carb Coal	G	W1	12	Glassy surface	
																				187.39	JN	5	62	-	UN	Po	PC	Carb Coal, BR	G	W1	12	Pink/red staining on calcite coating	
																				187.42	BD	3	67	-	PL	Po	PC	Carb Coal	G	W1	12	Lineations on surface	55
																				187.55	BD	3	69	-	UN	Po	PC	Carb Coal, Ca	G	W1	12	Conchoidal glassy surface; 3 mm coal seam (healed) parallel to bedding at 187.58 m	
																				187.99	BD	5	64	-	PL	Po	PC	Carb Coal	G	W1	12		
																				188.53	VN	-	44	-	-	-	CC	Ca	C	W1	25	1 mm healed calcite vein parallel to bedding	
																				188.94	VN	-	24	-	-	-	CC	Ca	C	W1	25	1 mm healed calcite vein	
																				189.06	JN	11	32	-	PL	Ro	-	-	C	W1	25	70 mm zone of pulverized/broken rock just before the end of run, likely mechanical	
9:05:00 AM	83.40	189.15	190.00	0.85	1853.1	75	1	-	MDST	MDST	V.Thin	0.85	100%	0.85	100%	2	7	W1	R3	189.45	BD	3	56	-	PL	Po	-	-	C	W1	20	Unable to trace orientation line past a zone of mechanical rubble at 189.45 m	
																				189.93	JN	5	31	297	PL	SM	-	-	G	W1	20		71
																				189.95	BD	3	61	128	PL	Po	PC	Carb Coal	G	W1	12	Likely bedding	
5:10:00 AM	83.30	190.00	193.00	3.00	1852.2	76	1	-	MDST with SLT/SST	MDST	V.Thin	3.00	100%	2.91	97%	3	3	W1	R4	190.60	VN	3	54	-	CU	Po	F	Ca	G	W1	20	Orientation line could be traced to 191.42 m; appears to be folding/possible brecciation or alteration from 191.13-191.28 m; unusual cross hatching in bedding (see photos); 4 mm thick calcite vein parallel to bedding	
																				191.33	JN	9	29	-	PL	Ro	-	-	C	W1	25	2 parallel joints intersecting core; possibly mechanical breaks along weakness planes	78
																				191.42	JN	11	26	274	PL	Ro	-	-	C	W1	25		

Geomechanical Drill Core Log

Teck FRO - Turnbull West Project

ISSUED FOR REVIEW

Hole # GT17-07

Client:	Teck Coal	Northing:	5564818.33	Date Hole Started:	24-Aug-17
Project:	Turnbull West PFS - Fording River Operations (FRO)	Easting:	652409.57	Date Hole Finished:	3-Sep-17
Project Number:	ENG.ROCK03055-01	Elevation (m):	2042.21	Total Hole Depth (m):	316.88
Logged By:	Robyn Barnett, Aaron Nickoli	Azimuth:	90	Depth of Casing (m):	22.9
		Plunge:	85	Core Size:	HQ3

INTERVAL DATA																	ISRM Weathering and Strength		DISCONTINUITY DATA											
											Recovery		RQD		Fracture Count															
Time	ACTIII Inclin.	Interval From (m)	Interval To (m)	Interval Length (m)	Elev. (m)	Run No.	Ref. Line Conf.	Gamma	Logged Lithology	Simplified Lithology	Structure (Bed Thickness)	Length (m)	%	Length (m)	%	Natural	Mechanical	Weathering	Strength	Depth (m)	Disc. Type	JRC	Alpha	Beta	Shape	Rough	Infill (PC, CC, F)	Type (CL, PY, CO, CA, GR)	Aperture (Closed, Gapped, Open)	Weather	JCON (RMR'76)	Comments	Average RMR Per Run
																				191.87	BD	5	64	124	PL	Po/SM	PC	Ca	G	W1	20	Partially polished surface; 1mm calcite vein	
																				192.49	JN	7	35	334	PL	SM	-	-	C	W1	25		
																				192.71	VN	1	63	123	PL	Po	CC	Ca	G	W1	12	5 mm wide calcite vein approximately parallel to bedding	
6:10:00 AM	83.30	193.00	196.00	3.00	1849.2	77	2	0	SLT with SST bands	SLT	L	3.00	100%	2.98	99%	4	8	W1	R4	193.54	JN	3	32	334	PL	SM	PC	Ca	G	W1	20		
																				194.32	JN	3	39	304	PL	SM	-	-	C	W1	25	2 parallel closely spaced joints at 194.32 and 194.36 m	
																				194.36	JN	5	40	313	PL	SM	-	-	C	W1	25		79
																				194.90	BD	1	64	116	PL	Po	PC	Ca	G	W1	20	4 mm wide calcite vein parallel to bedding at 194.91 m	
																				195.35	JN	11	32	352	PL	Ro	-	-	C	W1	25	Mostly rough surface with some smooth sections	
																				195.49	JN	5	44	338	PL	SM	PC	Ca	G	W1	20		
																				195.79	JN	5	44	336	PL	SM	PC	Ca	G	W1	20		
9:05:00 AM	83.80	196.00	197.36	1.36	1846.2	78	1	-	SST/SLT/MDST (calcareous interbedded)	SST/SLT	L	1.36	100%	1.36	100%	0	4	W1	R4	196.91	BD	5	71	-	PL	SM	-	-	C	W1	25	Calcite veins running parallel to core axis; minor reaction to acid SST/SLT	87
																				197.16	VN	3	67	-	PL	SM	CC	Ca	C	W1	25		
		197.36	198.55	1.19	1844.8	78	-	-	MDST	MDST	L	1.19	100%	1.19	100%	0	6	W1	R4	197.36	CO	3	66	-	PL	SM	-	-	C	W1	25		
																				197.83	VN	3	4	-	PL	SM	CC	Ca	C	W1	25	Calcite vein near parallel to core axis	87
																				198.48	VN	3	12	-	PL	SM	CC	Ca	C	W1	25	No reaction to acid	
																				198.55	CO	9	67	-	UN	Ro	-	-	C	W1	25		
		198.55	199.00	0.45	1843.7	78	1	-	SLT/SST calcareous	SST/SLT	L	0.45	100%	0.45	100%	1	3	W1	R4	198.67	BD	3	60	110	PL	SM	F	Coal	G	W1	12	Minor reaction to acid SST/SLT	76
																				198.77	BD	3	66	117	PL	SM	-	-	C	W1	25		
10:00:00 AM	83.80	199.00	202.00	3.00	1843.2	79	2	0	Calcareous SST/SLT/MDST interbedded	SST/SLT	L	3.00	100%	3.00	100%	0	14	W1	R4	199.70	BD	3	59	119	PL	SM	CC	Coal	C	W1	25		
																				199.80	BD	3	65	112	PL	SM	CC	Carb Coal	C	W1	25		
																				200.04	JN	5	33	318	PL	SM	-	-	C	W1	25		
																				200.43	JN	3	23	352	PL	SM	-	-	C	W1	25		87
																				200.76	JN	5	35	334	PL	SM	-	-	C	W1	25		
																				201.30	VN	9	14	260	PL	Ro	CC	Ca	C	W1	25		
																				201.41	BD	3	62	132	PL	SM	CC	Carb Coal	C	W1	25		
10:50:00 AM		202.00	202.41	0.41	1840.2	80	1	-	SST/SLT/MDST calcareous interbedded	SST/SLT	L	0.41	100%	0.41	100%	0	1	W1	R4	202.10	BD	3	63	134	PL	SM	-	-	C	W1	25		82
		202.41	203.36	0.95	1839.8	80	-	-	MDST	MDST	L	0.95	100%	0.95	100%	0	50	W1	R3	202.56	BD	1	63	118	PL	Po	CC	Carb Coal	C	W1	25		
																				202.76	JN	1	35	352	PL	SM	-	-	C	W1	25		
																				202.80	JN	1	20	-	PL	SM	-	-	C	W1	25		79
																				202.81	BD	1	62	292	PL	SM	-	-	C	W1	25	Mechanically broken zone 202.8-203.4 m	
																				203.04	BD	1	63	-	PL	SM	-	-	C	W1	25		
																				203.34	BD	1	74	-	PL	SM	-	-	C	W1	25		
		203.36	205.00	1.64	1838.8	80			COAL/Coaly MDST	COAL	L	1.39	85%	0.92	56%	2	50	W1	R2	203.87	FLT	9	40	-	PL	Ro	F	Coal	O	W1	0	0.25 m core loss assigned to end of run; footwall of fault; 410 mm sheared coal infill, S4 strength.	45
11:40:00 AM	82.60	205.00	205.82	0.82	1837.2	81	1	-	MDST/SST/SLT interbedded	SLT/MDST	L	0.82	100%	0.82	100%	0	3	W1	R3	204.13	FLT	1	60	-	PL	SM	F	Coal	O	W1	0	Footwall 50 mm sheared coal infill	
																				205.20	JN	3	25	288	PL	SM	-	-	C	W1	25		
																				205.31	JN	3	42	294	PL	SM	-	-	C	W1	25		79
																				205.47	BD	5	58	94	PL	SM	-	-	C	W1	25		
		205.82	206.00	0.18	1836.4	82	-	-	COAL	COAL	-	0.04	22%	0.00	0%	10	10	W1	R2	-	-	-	-	-	-	-	-	-	-	-	0	Rubble at start of liner; 0.14m lost core assigned to start of run	20
		206.00	206.77	0.77	1836.2	82	-	-	MDST/SST/SLT interbedded	SLT/MDST	L	0.77	100%	0.77	100%	1	20	W1	R3	206.13	JN	3	72	-	PL	Po	CC	Carb Coal	C	W1	25		
																				206.24	BD	7	43	-	PL	Po	CC	Carb Coal	C	W1	25		
																				206.72	JN	5	45	-	PL	SM	-	-	C	W1	25		74
																				206.77	JN	3	60	-	PL	Po	CC	Carb Coal	G	W1	6		
		206.77	208.00	1.23	1835.4	82	-	-	COAL	COAL	-	1.23	100%	1.20	98%	2	5	W1	R2	-	-	-	-	-	-	-	-	-	-	-	0	Recovered in liner	52
2:20:00 PM		208.00	211.00	3.00	1834.2	83	-	-	COAL	COAL	-	1.55	52%	0.00	0%	3	25	W1	R1	-	-	-	-	-	-	-	-	-	-	-	0	Recovered in liner; 1.45 m core loss as liner folded over not allowing coal to enter liner; core loss assigned to start of run	34
3:10:00 PM		211.00	212.60	1.60	1831.2	84	-	-	Interbedded COAL/MDST	COAL	L	1.60	100%	1.60	100%	2	32	W1	R2	211.76	BD	3	74	-	PL	Po	CC	Carb Coal	C	W1	25		
																				212.04	BD	3	63	-	PL	Po	CC	Carb Coal	C	W1	25		
																				212.16	FLT	3	85	-	PL	K	CC	Carb Coal	G	W1	6		69
																				212.45	BD	3	71	-	PL	Po	CC	Carb Coal	C	W1	25		
																				212.60	BD	3	70	-	PL	Po	CC	Carb Coal	G	W1	6		
4:00:00 PM	83.70	212.60	214.00	1.40	1829.6	85	1	-	MDST with coal partings	MDST	L	1.40	100%	1.40	100%	1	10	W1	R3	212.76	BD	1	80	140	PL	Po	CC	Carb Coal	G	W1	6		
																				212.94	BD	3	60	140	PL	SM	CC	Coal	C	W1	25		
																				213.30	BX	3	32	130	PL	SM	-	-	C	W1	25	Healed breccia zone 10 mm thick	
																				213.58	BD	3	60	86	PL	Po	CC	Carb coal	C	W1	25		81
																				213.73	BD	1	60	120	PL	Po	CC	Carb Coal	C	W1	25		
																				213.76	CO	3	56	108	PL	SM	-	-	C	W1	25	Contact between MDST and SST/SLT	
5:10:00 PM	83.30	214.00	217.00	3.00	1828.2	86	1	-	SLT/MDST with occasional SST bands	SLT/MDST	L	2.96	99%	2.91	97%	0	50	W1	R3	214.75	BD	3	63	120	PL	Po	CC	Carb Coal	C	W1	25		
																				214.85	BD	3	42	132	PL	Po	CC	Carb Coal	C	W1	25		
																				214.93	JN	3	24	34	PL	Po	CC	Carb Coal	C	W1	25		
																				215.41	JN	11	36	19	PL	Ro	PC	CA	C	W1	25		84
																				215.68	BD	1	64	122	PL	Po	CC	Carb Coal	C	W1	25		
																				216.45	JN	1	38	345	PL	SM	-	-	C	W1	25		
																				216.83	JN	1	28	349	PL	SM	-	-	C	W1	25		
6:15:00 PM	83.40	217.00	218.63	1.63	1825.2	87	1	20	SLT/MDST	SLT/MDST	L	1.63	100%	1.63	100%	0	8	W1	R3	217.30	BD	3	86	66	PL	SM	-	-	C	W1	25		
																				217.60	VN	5	13	182	PL	SM	F	Ca	C	W1	25		84
																				217.74	JN	5	14	202	PL	SM	F	Ca	C	W1	25	Breccia in the calcite vein	
																				218.63	CO	3	70	46	PL	SM	-	-	C	W1	25	MDST/SLT contact with SST	
		218.63	220.00	1.37	1823.6	87	1	20	SST	SST	L	1.37	100%	1.37	100%	1	19	W1	R4	218.87	BD	3	65	102	PL	SM	-	-	C	W1	25		
																				219.20	JN	5	30	252	PL	SM	-	-	C	W1	25		84
																				219.60	JN	3	43	250	PL	SM	-	-	C	W1	25		
																				220.00	JN	5	48	178	PL	SM	F	Ca	G	W1	12		
6:40:00 PM	83.30	220.00	221.59	1.59	1822.2	88			SST	SST	L	1.59	100%	1.30	82%	11	5	W1	R3	220.28	JN	7	41	259	PL	SM	PC	Ca	G	W1	20	Unable to draw orientation line due to multiple joints running near parallel to core axis at end of run; orientation line from previous run could be traced to 221.37 m; significant calcite veining and micro-fracturing within the run; occasional coal seams	
																				220.46	JN	7	38	247	PL	SM	PC	Ca	G	W1	20		
																				220.71	VN	-	46	274	-	-	F	Ca	C	W1	12	Healed vein cluster, 7-9 mm thick	
																				220.92	BD	1	47	60	PL	Po	F	Carb Coal	O	W3	0	Glassy surface; 3 mm coal seam; beta value seems inconsistent with previous run but bedding appears to have changed	
																				220.96	JN	7	33	275	PL	SM	PC	Ca	G	W1	20	Joint only intersects a small amount of core taking a chip out	52
																				221.15	BD	5	59	59	PL	Po	PC	Carb Coal	G	W1	12		
																				221.22	BD	5	43	65	CU	Po	PC	Carb Coal	G	W1	12		
																				221.27	JN	9	36	282	PL	Ro	CC	Ca	G	W1	12	Joint only intersects a small amount of core taking a chip out	
																				221.39	JN	1	35	-	PL	Po	F	Carb Coal	O	W3	0	4 mm coal seam	
																				221.42	JN	7	21	287	PL	SM	F	Ca	G	W1	12	2 mm coal seam	
																				221.51	BD	1	54	-	PL	Po	F	Carb Coal	O	W3	0	Bedding is irregular from 220.71-221.51 m and the core is altered due to many calcite veins and coal seams; 5 mm coal seam parallel to bedding	
																				221.53	JN	13	40	-	PL	Ro	CC	Ca	G	W1	12	1 mm calcite coating	
		221.59	223.00	1.41	1820.6	88	0	-	SLT with SST bands	SLT	V.Thin	1.41	100%	1.10	78%	6	2	W1	R3	221.59	CO	-	52	-	-	-	-	-	-	-	25	Healed contact parallel to bedding	

Geomechanical Drill Core Log

Teck FRO - Turnbull West Project

ISSUED FOR REVIEW

Hole # GT17-07

Client:	Teck Coal	Northing:	5564818.33	Date Hole Started:	24-Aug-17
Project:	Turnbull West PFS - Fording River Operations (FRO)	Easting:	652409.57	Date Hole Finished:	3-Sep-17
Project Number:	ENG.ROCK03055-01	Elevation (m):	2042.21	Total Hole Depth (m):	316.88
Logged By:	Robyn Barnett, Aaron Nickoli	Azimuth:	90	Depth of Casing (m):	22.9
		Plunge:	85	Core Size:	HQ3

INTERVAL DATA																	ISRM Weathering and Strength		DISCONTINUITY DATA													
												Recovery		RQD		Fracture Count																	
Time	ACTIII Inclin.	Interval From (m)	Interval To (m)	Interval Length (m)	Elev. (m)	Run No.	Ref. Line Conf.	Gamma	Logged Lithology	Simplified Lithology	Structure (Bed Thickness)	Length (m)	%	Length (m)	%	Natural	Mechanical	Weathering	Strength	Depth (m)	Disc. Type	JRC	Alpha	Beta	Shape	Rough	Infill (PC, CC, F)	Type (CL, PY, CO, CA, GR)	Aperture (Closed, Gapped, Open)	Weather	JCON (RMR'76)	Comments	Average RMR Per Run
																				221.89	JN	7	36	-	PL	SM	PC	Ca	G	W1	12		
																				221.96	JN	7	60	-	PL	SM	CC	Ca	G	W1	12	1 mm thick calcite coating; starts at 221.96 m and becomes reactive (calcareous)	
																				222.28	BD	3	61	-	PL	SM	PC	Carb Coal	G	W1	12		55
																				222.39	VN	9	28	-	PL	Ro	F	Ca	G	W1	12	3 mm calcite vein	
																				222.52	JN	11	2	-	UN	Ro	F	Ca	G	W1	12	Joint runs near parallel to core axis from 222.28-223.0 m (± 20 mm); up to 2 mm thick calcite infill	
																				222.85	JN	7	7	-	PL	SM	PC	Ca	G	W1	12	Joint runs near parallel to core axis for ~270 mm from 222.7-222.97 m	
8:40:00 PM	83.30	223.00	223.68	0.68	1819.2	89	0	-	MDST	MDST	V.Thin	0.68	100%	0.31	46%	5	15	W1	R3	223.13	JN	5	16	-	PL	SM	PC	Ca	G	W1	20	High mechanical fracturing in first 120 mm of run	
																				223.19	JN	11	52	-	CU	Ro	PC	Ca	G	W1	20	Alpha approximate as surface is curved	
																				223.33	JN	5	2	-	PL	SM	PC	Ca	G	W1	20	Joint runs near parallel to core axis for ~110 mm	50
																				223.35	JN	7	42	-	PL	SM	PC	Ca	G	W1	20		
																				223.37	JN	3	64	-	PL	Po	PC	Ca, Carb Coal	G	W1	12	30 mm mechanically broken zone	
		223.68	225.20	1.52	1818.5	89	0	-	COAL	COAL	L?	1.31	86%	0.22	14%	50	50	W3	R1	223.68	CO	1	70	-	PL	Po	F	Coal	O	W1	0	Coal/MDST contact; 0.21 m core loss assumed at end of run; run consists of 280 mm intact/mechanically broken coal; 250 mm highly friable/broken coal to end (some breaking appears mechanical)	22
																				223.99	FLT	3	70	-	PL	Po	F	Coal, BR	O	W1	0	250 mm friable/broken coal	
																				224.36	JN	3	50	-	PL	Po	CC	Carb Coal	G	W1	12	Coal is breaking along this plane when handled	
																				224.61	FLT	3	69	-	PL	Po	F	Coal, BR	O	W3	0	50 mm broken friable coal	
9:20:00 PM	83.30	225.20	226.00	0.80	1817.0	90	0	-	COAL	COAL	L	0.74	92%	0.29	36%	50	50	W3	R1	225.43	BD	7	55	-	CU	Po	CC	Coal	G	W1	12	150 mm mechanically pulverized core at start of run	
																				225.75	JN	7	63	-	PL	Po	CC	Coal	G	W1	12	Coal is flaking off of this surface	32
																				225.84	BC	5	85	-	PL	SM	F	BC	O	W3	0	90 mm pulverized/broken coal zone; core is disking and broken into coarse sand to fine gravel size pieces	
10:00:00 PM		226.00	227.50	1.50	1816.2	91	0	-	COAL	COAL	L?	1.45	97%	1.24	83%	9	5?	W3	R1	-	-	-	-	-	-	-	-	-	-	-	0	Drilled run using acrylic liner tube to preserve coal; TT suggested drilling a 1.5 m run; material at beginning of liner is coal, at the bottom of the liner appears to be transitioning to coaly MDST	38
10:40:00 PM	83.20	227.50	229.00	1.50	1814.7	92	0	-	MDST	MDST	V.Thin	1.50	100%	1.36	91%	5	3	W1	R3	228.06	BD	3	46	-	PL	Po	PC	Ca	G	W1	20	Material retrieved in acrylic liner but then extracted since it was intact; glassy surface	
																				228.13	JN	11	43	-	IR	Po	CC	Coal	G	W2	6	Difficult to distinguish bedding in run	
																				228.30	JN	7	41	-	ST	Po	CC	Coal	G	W2	6	2 mm coal seam	57
																				228.53	JN	7	27	-	PL	Po	PC	Coal	G	W1	20	3 mm coal seam	
																				228.56	JN	15	63	-	IR	Ro	CC	Coal	G	W2	20	1 mm coal parting; irregularly broken coal surface	
																				228.70	JN	7	56	129	PL	SM	F	Coal	G	W2	6	5-7 mm coal seam	
11:40:00 PM	83.60	229.00	231.11	2.11	1813.2	93	1	9	SST with SLT bands	SST/SLT	L	2.11	100%	2.11	100%	1	3	W1	R4	229.28	BD	3	64	117	PL	Po	PC	Ca, Py?	G	W1	20	Possible pyrite on surface; shiny non-reactive mineral	82
		231.11	232.00	0.89	1811.1	93	1	9	SST with SLT bands	SST/SLT	L	0.84	94%	0.84	94%	1	1	W1	R4	231.11	CO	-	59	112	-	-	-	-	C	W1	25	Healed contact parallel to bedding	80
																				231.26	JN	7	42	337	PL	SM	PC	Ca	G	W1	20		
12:35:00 AM	83.30	232.00	232.32	0.32	1810.2	94	0	-	MDST	MDST	V.Thin?	0.32	100%	0.26	81%	1	10	W1	R3	232.17	JN	3	61	-	PL	Po	-	-	G	W1	20	Drill spin and mechanical fracturing in run; 20 mm zone of mechanical gravel size rubble at 232.25 m; last 0.79 m of run got stuck in core barrel and was heavily mechanically broken trying to extract	71
		232.32	233.35	1.03	1809.9	95	0	-	COAL	COAL	L	0.83	81%	0.00	0%	50	100	W3	R0	232.72	JN	1	60	-	PL	Po	CC	Coal	C	W2	12	Strength ranges from R0 to R1	
																				232.81	FLT	3	54	-	CU	Po	F	Coal	O	W3	0	70 mm zone of friable, pulverized coal at 232.6 m	
																				233.18	JN	1	61	-	PL	Po	CC	Carb Coal	G	W1	12	190 mm zone of friable, pulverized coal from 232.93-233.12 m, possibly mechanical; 50 mm soft friable coal at contact with next unit	26
		233.35	235.00	1.65	1808.9	94	1	-	MDST with SLT bands	MDST	L	1.65	100%	1.65	100%	0	2	W1	R4	233.35	CO	1	59	126	PL	Po	CC	Coal	G	W1	12		
																				234.52	BD	-	68	103	-	-	-	-	C	W1	25	Healed bedding	81
1:20:00 AM	83.80	235.00	237.20	2.20	1807.2	95	1	-	MDST/SLT interbedded	SLT/MDST	L	2.20	100%	2.05	93%	3	2	W1	R4	237.03	BD	5	42	-	PL	Po	CC	Carb Coal	G	W2	6	Orientation line could only be traced to 237.2 m; unable to confidently trace line from previous run; no apparent reason for 0.18 m of core loss, confirmed with driller helper that no core was dropped	65
																				237.12	BD	1	47	-	PL	Po	PC	Carb Coal	G	W2	12		
																				237.20	JN	9	56	94	IR	Po	CC	Carb Coal	G	W2	6	2-3 mm coal seam	
		237.20	238.00	0.80	1805.0	95	1	-	SST/SLT	SST/SLT	L	0.62	77%	0.62	77%	1	2	W1	R4	237.25	JN	7	63	77	PL	SM	PC	Carb Coal	G	W2	12	Unusual clasts of material not aligned with bedding, possibly healed breccia(?); lineations on joint surface; conchoidal fracturing	66
2:30:00 AM	83.60	238.00	241.00	3.00	1804.2	96	1	-	SLT/MDST with sandstone bands	SLT/MDST	V.Thin	3.00	100%	3.00	100%	1	4	W1	R5	238.75	VN	-	71	130	-	-	F	Ca	C	W1	25	Orientation line traced across entire run; 1 mm wide healed vein parallel to bedding	
																				239.05	BD	-	69	134	-	-	-	-	C	W1	25		89
																				239.18	BD	7	60	129	PL	SM	PC	Carb Coal	G	W1	12		
																				240.76	VN	-	64	119	-	-	F	Ca	C	W1	25	1 mm healed calcite vein parallel to bedding	
																				240.93	VN	-	66	146	-	-	F	Ca	C	W1	25	0.5 mm wide healed calcite vein	
3:00:00 AM	83.80	241.00	244.00	3.00	1801.2	97	2	0	SST/SLT interbedded	SST/SLT	L	3.00	100%	3.00	100%	1	4	W1	R5	242.16	BD	-	61	99	-	-	-	-	C	W1	25	Healed bedding	
																				243.01	BD	-	62	116	-	-	-	-	C	W1	25	Healed bedding	91
																				243.33	JN	7	21	330	PL	SM	-	-	C	W1	20		
																				243.95	VN	-	56	112	-	-	F	Ca	C	W1	25	Healed 1-8 mm wide calcite vein	
3:50:00 AM	83.80	244.00	247.00	3.00	1798.2	98	2	8	SST/SLT interbedded with occasional MDST bands	SST/SLT	L	3.00	100%	3.00	100%	3	4	W1	R5	244.86	JN	3	72	94	PL	Po	F	Carb Coal	G	W2	6	3 mm coal seam	
																				245.06	BD	9	59	124	PL	Ro	PC	Carb Coal	G	W2	12	Irregular coal surface on bedding	
																				245.10	BD	-	53	143	-	-	F	Carb Coal	C	W2	25	Heal 3 mm coal seam parallel to BD	81
																				245.46	BD	-	58	159	-	-	-	-	C	W1	25	Healed bedding	
																				246.03	BD	5	53	165	PL	Po	-	-	G	W1	20	Glassy surface; irregular beta values for bedding	
																				246.63	JN	9	46	336	CU	Ro	-	-	C	W1	25		
4:40:00 AM	83.80	247.00	248.29	1.29	1795.2	99	2	3	Interbedded SST/SLT	SST/SLT	L	1.29	100%	1.21	94%	2	2	W1	R5	247.18	BD	5	55	124	PL	Po	PC	Carb Coal	G	W1	12	Bedding is wavy and irregular through much of this interval; bedding changes directions in the run at ~248.29 m; glassy surface	
																				247.47	BD	-	54	109	-	-	-	-	C	W1	25	Healed bedding	83
																				247.66	JN	9	28	334	PL	Ro	PC	Ca	G	W1	20		
																				247.91	JN	11	31	345	PL	Ro	-	-	C	W1	25		
		248.29	250.00	1.71	1793.9	99	2	3	MDST with SLT bands	MDST	V.Thin	1.71	100%	1.71	100%	2	2	W1	R4	248.29	BD/CO	7	72	276	PL	Po/SM	PC	Carb Coal	G	W1	12	Unit contact; bedding changes direction to align with previous interval; surface is partly polished	
																				248.53	BD	7	64	319	PL	SM	-	-	G	W1	20	Bedding changes direction within interval	76
																				248.60	VN	-	72	49	-	-	F	Ca	C	W1	25	Healed calcite vein 1-8 mm wide	
5:40:00 AM	83.30	250.00	250.87	0.87	1792.2	100	1	-	MDST/SLT	SLT/MDST	L	0.83	95%	0.83	95%	0	4	W1	R3	250.17	JN	3	40	-	PL	SM	-	-	C	W1	25		
																				250.55	BD	3	70	92	PL	SM	F	Coal	C	W1	25	Coal parting 3 mm thick	
																				250.87	CO	3	67	85	PL	SM	-	-	C	W1	25	0.3 m transition zone instead of a sharp contact; contact parallel to bedding	79
		250.87	253.00	2.13	1791.3	100	1	-	SST	SST	L	2.13	100%	2.13	100%	0	16	W1	R4	251.06	JN	7	30	267	PL	Ro	-	-	C	W1	25		
																				251.56	JN	5	27	320	PL	SM	-	-	C	W1	25		87
																				251.98	JN	3	20	325	PL	SM	PC	Ca	C	W1	25	251.63-252.13 m irregular vuggy calcite veins	
8:50:00 AM	83.80	253.00	256.00	3.00	1789.2	101	1	36	Interbedded SLT/SST	SST/SLT	L	3.00	100%	3.00	100%	1	7	W1	R4	253.82	BX	1	60	125	PL	Po	CC	Carb Coal	G	W1	6	Healed breccia with calcite infill	
																				254.13	JN	3	50	28	PL	SM	-	-	C	W1	25		81
																				254.77	BD	3	57	152	PL	SM	-	-	C	W1	25		
9:30:00 AM	83.30	256.00	259.00	3.00	1786.2	102	1	-	interbedded SLT/SST/MDST	SLT/MDST	L	3.00	100%	3.00	100%	0	9	W1	R5	256.61	BD	3	58	80	PL	SM	-	-	C	W1	25		
																				256.94	JN	7	42	303	PL	Ro	PC	Ca	C	W1	25		92
																				258.61	BD	1	48	103	PL	Po	CC	Carb Coal	C	W1	25		
																				258.68	JN	3	46	234	PL	SM	-	-	C	W1	25		

Geomechanical Drill Core Log

Teck FRO - Turnbull West Project

ISSUED FOR REVIEW

Hole # GT17-07

Client:	Teck Coal	Northing:	5564818.33	Date Hole Started:	24-Aug-17
Project:	Turnbull West PFS - Fording River Operations (FRO)	Easting:	652409.57	Date Hole Finished:	3-Sep-17
Project Number:	ENG.ROCK03055-01	Elevation (m):	2042.21	Total Hole Depth (m):	316.88
Logged By:	Robyn Barnett, Aaron Nickoli	Azimuth:	90	Depth of Casing (m):	22.9
		Plunge:	85	Core Size:	HQ3

INTERVAL DATA																ISRM Weathering and Strength		DISCONTINUITY DATA															
											Recovery		RQD		Fracture Count																			
Time	ACTIII Inclin.	Interval From (m)	Interval To (m)	Interval Length (m)	Elev. (m)	Run No.	Ref. Line Conf.	Gamma	Logged Lithology	Simplified Lithology	Structure (Bed Thickness)	Length (m)	%	Length (m)	%	Natural	Mechanical	Weathering	Strength	Depth (m)	Disc. Type	JRC	Alpha	Beta	Shape	Rough	Infill (PC, CC, F)	Type (CL, PY, CO, CA, GR)	Aperture (Closed, Gapped, Open)	Weather	JCON (RMR'76)	Comments	Average RMR Per Run
11:30:00 AM	83.50	259.00	259.42	0.42	1783.2	103	1		SLT/SST/MDST	SST/SLT	L	0.42	100%	0.42	100%	0	0	W1	R4	259.29	BD	3	68	-	PL	SM	-	-	C	W1	25		82
		259.42	259.77	0.35	1782.8	103	1	-	Coaly MDST	MDST	L	0.35	100%	0.35	100%	0	40	W1	R4	259.48	BD	3	72	-	PL	Po	CC	Carb Coal	C	W1	25	Mechanically fractured zone	82
																				259.60	BD	3	58	324	PL	Po	CC	Carb Coal	C	W1	25		
		259.77	262.00	2.23	1782.4	103	1	-	SLT with SST bands	SLT	L	2.23	100%	2.23	100%	0	7	W1	R4	259.82	JN	3	65	192	PL	Po	CC	Carb Coal	C	W1	25		
																				261.42	BD	1	68	170	PL	Po	CC	Carb Coal	C	W1	25		87
																				261.64	BD	3	75	165	PL	SM	F	Coal	C	W1	25		
12:35:00 PM	83.20	262.00	265.00	3.00	1780.2	104	1	31	MDST/SLT/SST interbedded	SLT/MDST	L	3.01	100%	3.01	100%	0	16	W1	R4	262.33	JN	7	38	3	PL	Ro	-	-	C	W1	25		
																				263.25	JN	11	8	258	PL	Ro	PC	Ca	C	W1	25		
																				263.43	BD	7	50	176	PL	Po	CC	Carb Coal	C	W1	25	First 0.1 m of run is rubble therefore unable to determine natural vs mechanical fractures	92
																				263.95	JN	11	9	328	PL	Ro	-	-	C	W1	25		
																				264.22	BD	1	57	200	PL	Po	CC	Carb Coal	C	W1	25		
																				264.89	BD	1	59	180	PL	Po	CC	Carb Coal	C	W1	25		
1:25:00 PM	84.00	265.00	266.02	1.02	1777.2	105	-	-	Interbedded MDST/COAL	COAL	L	1.02	100%	0.80	78%	2	25	W1	R3	265.38	BD	3	57	-	PL	Po	CC	Carb Coal	C	W1	25		
																				265.47	JN	3	63	-	PL	Po	CC	Carb Coal	C	W1	25	Red garnet coloured mineral on carb coal surfaces	
																				265.61	BD	5	68	-	PL	SM	-	-	C	W1	25	MDST/coal contact	67
																				265.78	BC	1	70	-	PL	Po	F	Coal	O	W1	0	Footwall surface polished carb coal	
																				265.85	BD	1	52	-	PL	Po	CC	Carb Coal	G	W1	6	Fracture infilled with crushed coal 20 mm	
		266.02	268.00	1.98	1776.2	106	-	-	Interbedded SLT/SST	SST/SLT	L	1.95	98%	1.92	97%	1	17	W1	R4	266.02	CO	3	60	-	PL	-	-	-	C	W1	25		
																				266.14	JN	3	55	-	PL	Po	CC	Carb Coal	C	W1	25		82
																				267.31	BD	3	58	-	PL	Po	CC	Carb Coal	C	W1	25		
																				267.52	JN	3	52	-	PL	SM	-	-	C	W1	25		
																				267.60	FLT	3	70	-	PL	Po	CC/F	Carb Coal	O	W1	0	50 mm crushed coal infill	
2:36:00 PM	83.40	268.00	271.00	3.00	1774.2	107	-	-	Interbedded SLT/MDST/COAL	SLT/MDST	L	3.00	100%	3.00	100%	0	35	W1	R3	268.33	BD	3	67	-	PL	SM	F	Coal	C	W1	25		
																				268.34	CO	15	63	-	IR	VR	-	-	C	W1	25	40 mm band of sulfide; coal/sulfide contact	
																				269.16	BD	3	57	-	PL	SM	F	Coal	C	W1	25		
																				269.25	BD	3	62	-	PL	SM	F	Coal	C	W1	25		84
																				269.72	BD	1	60	-	PL	Po	CC	Carb Coal	C	W1	25		
																				269.78	JN	5	27	-	PL	SM	-	-	C	W1	25		
																				270.44	BD	1	68	-	PL	Po	CC	Carb Coal	C	W1	25		
																				270.46	JN	3	48	-	PL	SM	-	-	C	W1	25		
3:40:00 PM	83.90	271.00	272.50	1.50	1771.2	108	1	-	Interbedded SLT/MDST/COAL	SLT/MDST	-	1.50	100%	1.50	100%	1	35	W1	R3	271.09	BD	7	63	-	PL	Ro	F	Sulfide	C	W1	25	20 mm thick sulfide band	
																				271.20	BD	1	75	-	PL	Po	CC	Carb Coal	G	W1	6		
																				271.56	BD	1	65	355	PL	Po	CC	Carb Coal	C	W1	25		81
																				271.61	BD	1	54	318	PL	Po	CC	Carb Coal	C	W1	25	30 mm thick sulfide band	
																				271.73	BD	3	54	5	PL	SM	F	Sulfide	C	W1	25		
																				271.97	BD	5	52	293	PL	SM	-	-	C	W1	25		
		272.50	274.00	1.50	1769.7	108	1	-	SLT/MDST	SLT/MDST	L	1.50	100%	1.50	100%	0	26	W1	R4	272.50	CO/BD	5	53	303	PL	Po	CC	Carb Coal	C	W1	25		
																				272.88	JN	11	6	-	CU	Po	CC	Carb Coal	C	W1	25	Undulating in core	87
																				273.02	JN	5	35	205	PL	SM	-	-	C	W1	25	-	
																				273.23	JN	5	10	110	PL	Po	CC	Carb Coal	C	W1	25		
4:37:00 PM	84.20	274.00	277.00	3.00	1768.2	109	-	-	Interbedded SST/SLT	SST/SLT	L	3.00	100%	3.00	100%	0	37	W1	R4	274.24	BD	3	40	-	PL	Po	CC	Carb Coal	C	W1	25		
																				274.37	BD	3	28	-	PL	Po	CC	Carb Coal	C	W1	25		
																				274.43	JN	3	45	-	PL	SM	-	-	C	W1	25		
																				274.66	SHZ	3	38	-	PL	Po	CC	Carb Coal	C	W1	25	Healed shear zone/breccia with calcite infill	87
																				274.91	BX	1	64	-	PL	Po	CC	Carb Coal	C	W1	25	Healed breccia zone, 70 mm long, infilled with calcite	
																				276.01	BX	3	75	-	PL	SM	F	BX, Ca	C	W1	25		
																				276.34	BD	3	46	-	PL	Po	CC	Carb Coal	C	W1	25		
																				276.53	BD	3	50	-	PL	Po	CC	Carb Coal	C	W1	25		
5:40:00 PM	84.00	277.00	280.00	3.00	1765.2	110	1	-	Interbedded SST/SLT	SST/SLT	L	3.00	100%	3.00	100%	0	19	W1	R4	277.54	JN	3	67	338	PL	SM	-	-	C	W1	25		
																				277.59	BX	9	70	130	PL	SM	F	Ca, BX	C	W1	25	Healed breccia with vuggy calcite	87
																				278.24	JN	5	48	33	PL	SM	-	-	C	W1	25		
																				278.40	JN	3	43	323	PL	SM	-	-	C	W1	25		
																				278.93	BD	3	60	110	PL	SM	CC	Coal	C	W1	25		
6:50:00 PM	83.90	280.00	283.00	3.00	1762.2	111	1	-	Interbedded SST/SLT	SST/SLT	L	3.01	100%	2.94	98%	1	4	W1	R4	280.46	BX?	-	41	81	-	-	F	BX	C	W1	25	Orientation line could be traced to 281.42 m; remaining orientation line was drawn from previous run; possible healed breccia from 280.40-280.59 m where bedding is deformed	
																				281.16	JN	7	43	302	PL	SM	-	-	C	W1	25		
																				281.33	JN	9	38	316	PL	Ro	-	-	C	W1	25		
																				281.42	JN	9	31	276	PL	Ro	-	-	C	W1	25	Parallel features dissecting the core causing a zone of broken rock at 281.42 and 281.49 m	91
																				281.49	JN	11	31	289	PL	Ro	-	-	C	W1	25		
																				282.08	VN	-	49	113	PL	-	F	Ca	C	W1	25	Healed 1-3 mm wide calcite vein; parallel to bedding	
																				282.14	VN	-	54	112	PL	-	F	Ca	C	W1	25	Healed 0.5-5 mm wide calcite vein; parallel to bedding	
																				282.20	VN	-	55	116	PL	-	F	Ca	C	W1	25	Healed 0.5-3 mm wide calcite vein; parallel to bedding	
																				282.42	JN	7	22	315	PL	SM	PC	Ca	G	W1	20	3-25 mm thick vuggy calcite vein with crystalline calcite crystals; healed	
																				282.56	VN	-	49	109	-	-	F	Ca	C	W1	20		
1:50:00 AM	83.50	283.00	286.00	3.00	1759.2	112	0	-	Interbedded SLT/MDST with occasional SST bands	SLT/MDST	V.Thin	3.00	100%	3.00	100%	5	4	W1	R4	283.36	JN	7	38	-	PL	SM	-	-	C	W1	25	Unable to draw orientation line due to coal seams near end of run; cannot trace from previous run	
																				283.66	BD	-	52	-	-	-	-	-	C	W1	25	Healed bedding	
																				284.40	BD	5	53	-	PL	SM	-	-	C	W1	25		
																				284.44	VN	-	49	-	-	-	F	Ca	C	W1	25	1 mm thick healed calcite vein parallel to bedding	
																				285.10	JN	9	23	-	ST	Ro	PC	Ca	G	W1	20		
																				285.11	BD	5	55	-	PL	SM	-	-	C	W1	25		77
																				285.25	JN	7	26	-	PL	SM	PC	Ca	G	W1	20		
																				285.59	JN	15	71	-	IR	Ro	F	Carb Coal	G	W1	12	5 mm coal seam parallel to bedding; appears to be some mechanical spinning; coal is broken creating an irregular surface	
																				285.70	BD	5	52	-	PL	Po	CC	Carb Coal	G	W1	12		
																				285.76	BD	5	54	111	PL	Po	F	Carb Coal	O	W3	6	10 mm coal seam (broken mechanically parallel to bedding)	
3:00:00 AM	84	286	289	3.00	1756.2	113	2	0	Interbedded SST/SLT/MDST	SST/SLT	L	3.01	100%	3.01	100%	2	4	W1	R4	286.83	VN	-	28	131	UN	-	F	Ca	C	W1	25	Closely spaced beds to 0.69 m followed by more banding; healed calcite vein 1-3 mm thick; some pitting in vein; cuts bedding; becomes a vein cluster at one point within core	
																				286.88	BD	5	59	105	PL	Po	-	-	C	W1	25		
																				287.30	BX?	-	56	112	-	-	F	BX	C	W1	25	80 mm zone of highly deformed bedding, possible healed breccia/alteration; final 1.96 m of run is completely intact core with no natural or mechanical fractures; healed features used to get alpha/beta of bedding	85
																				287.73	BD	5	61	101	PL	SM	PC	Carb Coal	G	W1	12		
																				288.14	BD	1	64	109	PL	Po	-	-	C	W1	25		
																				288.14	BX	-	64	116	-	-	F	BX, Ca	C	W1	25	55 mm healed breccia zone with calcite	
																				288.34	BX?	-	59	108	-	-	F	BX	C	W1	25	240 mm highly deformed bedding; possible brecciation or alteration/folding	
																				288.59	BD	5	56	103	PL	Po/SM	-	-	C	W1	25		

Geomechanical Drill Core Log

Teck FRO - Turnbull West Project

ISSUED FOR REVIEW

Hole # GT17-07

Client:	Teck Coal	Northing:	5564818.33	Date Hole Started:	24-Aug-17
Project:	Turnbull West PFS - Fording River Operations (FRO)	Easting:	652409.57	Date Hole Finished:	3-Sep-17
Project Number:	ENG.ROCK03055-01	Elevation (m):	2042.21	Total Hole Depth (m):	316.88
Logged By:	Robyn Barnett, Aaron Nickoli	Azimuth:	90	Depth of Casing (m):	22.9
		Plunge:	85	Core Size:	HQ3

INTERVAL DATA																ISRM Weathering and Strength		DISCONTINUITY DATA												
											Recovery		RQD		Fracture Count																
Time	ACTIII Inclin.	Interval From (m)	Interval To (m)	Interval Length (m)	Elev. (m)	Run No.	Ref. Line Conf.	Gamma	Logged Lithology	Simplified Lithology	Structure (Bed Thickness)	Length (m)	%	Length (m)	%	Natural	Mechanical	Weathering	Strength	Depth (m)	Disc. Type	JRC	Alpha	Beta	Shape	Rough	Infill (PC, CC, F)	Type (CL, PY, CO, CA, GR)	Aperture (Closed, Gapped, Open)	Weather	JCON (RMR'76)	Comments	Average RMR Per Run
4:20:00 AM	83.9	289	292	3.00	1753.2	114	1	-	Banded SLT/MDST with occasional SLT bands	SLT/MDST	L	2.99	100%	2.99	100%	2	4	W1	R5	289.05	JN	7	29	-	PL	SM	CC	Ca, Py?	G	W1	20	Shiny gold sulfide on surface in addition to ~1 mm thick calcite; orientation line could be traced to mechanically broken zone at 289.35 m	
																				289.36	BD	7	59	-	PL	SM	-	-	G	W1	20	Zone of mechanically broken gravel size rubble	90
																				290.08	BD	-	57	130	PL	-	-	-	C	W1	25	Healed bedding	
																				290.72	BD	-	55	135	PL	-	-	-	C	W1	25	Healed bedding	
																				291.11	BD	-	66	150	PL	-	-	-	C	W1	25	Healed bedding	
																				291.77	BD	-	59	148	PL	-	-	-	C	W1	25	Healed bedding	
5:20:00 AM	88.9	292	293.3	1.30	1750.2	115	1	50	Interbedded SLT/SST/MDST	SLT/MDST	L	1.3	100%	1.3	100%	1	0	W1	R5	292.61	JN	1	44	288	PL	SM	-	-	C	W1	25	Very poor gamma value; do not rely on ACTIII information; confirmed with driller helper that nothing unusual occurred with the markings	92
																				292.80	BD	-	51	103	PL	-	-	-	C	W1	25	Healed bedding	
																				293.30	CO	-	52	115	PL	-	-	-	C	W1	25	Healed contact parallel to bedding	
		293.3	295	1.70	1748.9	115	1	50	Banded MDST/SLT	SLT/MDST	V.Thin	1.65	97%	1.65	97%	2	3	W1	R5	293.81	BD	-	69	146	PL	-	-	-	C	W1	25	Healed BD	
																				294.24	BD	5	53	115	PL	SM	PC	Carb Coal	G	W1	20	Bedding changes direction within the core	85
																				295.35	BD	5	60	106	PL	SM	PC	Carb Coal	G	W1	20		
																				2945.87	JN	9	55	49	CU	Ro	-	-	C	W1	25		
6:15:00 AM	84	295	297.68	2.68	1747.2	120	0	-	COAL	COAL	L	0.6	22%	0	0%	100	100	W3	R0	-	-	-	-	-	-	-	-	-	-	-	0	Run consists entirely of fine to coarse gravel sized pulverized rubble (coal and some MDST)	18
		297.68	298	0.32	1744.5	120	0	-	Coaly MDST	MDST	V.Thin?	0.32	100%	0.14	44%	2	20	W1	R3	297.97	JN	11	48	-	CU	Ro	PC	Ca	G	W1	20	Run consists of a small piece of intact MDST with pulverized/mechanically fractured MDST/coal; calcite veins running through MDST	48
																				297.99	JN	9	50	-	PL	Ro	PC	Carb Coal	G	W1	12	Small piece of coal at end of run suggests it may be transitioning back to coal; 2.08 m core loss assigned to start of run	
9:30:00 AM	83.9	298	301	3.00	1744.2	121	-	-	COAL	COAL	-	2.35	78%	1.98	66%	0	50	W1	R2	300.00	BD	5	73	-	PL	SM	-	-	C	W1	25	Recovered in liner; 0.55 m core loss assigned to start of run; liner folded over during drilling	75
11:10:00 AM	84.1	301	301.97	0.97	1741.2	122	-	-	COAL	COAL	-	0.61	63%	0.28	29%	50	50	W1	R2	301.32	JN	3	24	-	PL	SM	-	-	G	W1	12	0.36 m core loss assigned to end of run; core recovered in liner	37
12:00:00 PM	84.1	301.97	304	2.03	1740.2	123	1	-	COAL/FLT	FLT	-	1.43	70%	1.07	53%	2	100	W1	R2	303.46	FLT	7	48	306	PL	Ro	F	BR, Coal	O	W1	0	90 mm friable sheared coal	
																				303.87	BD	7	43	335	PL	Ro	-	-	C	W1	12	Heavy mechanical fracturing, difficult to determine natural features	51
12:50:00 PM	83.9	304	306.4	2.40	1738.2	124	-	-	COAL	COAL	-	2.4	100%	2.37	99%	1	20	W1	R2	306.05	BD	3	57	-	PL	SM	-	-	C	W1	25		82
		306.4	307	0.60	1735.8	124	-	-	Coaly MDST	MDST	-	0.53	88%	0.53	88%	0	7	W1	R3	306.76	BD	3	42	114	PL	SM	CC	Coal	C	W1	25		76
1:45:00 PM	83.7	307	307.93	0.93	1735.2	125			Coaly MDST	MDST	-	0.93	100%	0.71	76%	25	25	W1	R3	307.09	BD	5	23	-	PL	SM	-	-	C	W1	25		61
		307.93	309.38	1.45	1734.3	125			COAL	COAL	-	0.72	50%	0.6	41%	1	15	W1	R2	308.39	BD	3	25	-	PL	SM	-	-	C	W1	25	0.73 m core loss assigned to end of run; heavy mechanical fracturing; unable to distinguish natural from mechanical features	65
3:10:00 PM	83.9	309.38	310.67	1.29	1732.8	126			COAL/Coaly MDST	COAL	-	0.88	68%	0.38	29%	25	25	W1	R2	310.48	BD	3	45	-	PL	Po	CC	Carb Coal	C	W1	25	Run is very broken; drilled in liner and removed; can't distinguish natural from mechanical	50
																				310.67	CO	9	28	-	PL	Ro	F	Coal	C	W1	25		
		310.67	312.38	1.71	1731.5	126			MDST/SLT interbedded	SLT/MDST	L	1.71	100%	1.43	84%	3	25	W1	R3	311.35	BD	1	62	-	PL	SM	F	Coal	C	W1	25		
																				311.62	BC	5	65	-	PL	SM	F	Coal, BR	O	W1	0	Footwall of broken zone, 50 mm broken coal	64
																				311.85	BC	7	40	-	PL	Ro	F	Coal, BR	O	W1	0	Footwall of broken zone, 50 mm broken coal	
																				312.28	BD	3	70	-	PL	SM	-	-	C	W1	25		
5:10:00 PM	83.8	312.38	315.38	3.00	1729.8	127			Interbedded MDST/SLT/SST	SLT/MDST	L	3	100%	2.98	99%	1	25	W1	R3	312.60	BC	5	85	-	PL	SM	F	BR, Coal	O	W1	0	MDST R3, SLT/SST R4	
																				313.47	JN	7	12	336	PL	Ro	PC	Ca	C	W1	25		
																				314.16	VN	3	67	210	PL	SM	F	Ca	C	W1	25		79
																				314.82	VN	3	55	228	PL	Po	CC	Carb Coal	C	W1	25		
																				315.06	BD	3	78	180	PL	SM	-	-	C	W1	25		
5:50:00 PM	-	315.38	316.88	1.50	1726.8	128			Interbedded MDST/SLT/SST	SLT/MDST	L	1.2	80%	1.2	80%	0	15	W1	R3	315.54	BD	9	70	-	PL	Ro	CC	Carb Coal	C	W1	25	Lost core 0.3 m assigned to end of run	81
																				316.33	VN	7	55	-	PL	Po	CC	Carb Coal	C	W1	25	End of Hole (EOH)	
		EOH at 316.88 m																														