CHECKLIST FOR FILING A UIC PERMIT APPLICATION

Please utilize this checklist to ensure you have prepared, completed, and enclosed all required documentation and payment to ensure a timely review of your submittal.

Operator	Ritchie Hunter Water Disposal, LLC		
Existing UIC Permit ID Number		UIC Well API Number	47-085-10142

Office of Oil and Gas Office Use Only	
Permit Reviewer	
Date Received	
Administratively Complete Date	
Approved Date	
Permit Issued	

Please check the fees and payment included.

Fees		Payment Type	
UIC Permit Fee: $500	✓	Check	✓
Groundwater Protection Plan (GPP) Fee: $50.00	✓	Electronic	
		Other	

Please check the items completed and enclosed.

- ✓ Checklist
- ✓ UIC-1
  - ✓ Section 1 – Facility Information
  - ✓ Section 2 – Operator Information
  - ✓ Section 3 – Application Information
  - ✓ Section 4 – Applicant/Activity Request and Type
  - ✓ Section 5 – Brief description of the Nature of the Business
  - ✓ CERTIFICATION
- ✓ Section 6 – Construction
  - ✓ Appendix A Injection Well Form
  - ✓ Appendix B Storage Tank Inventory
- ✓ Section 7 – Area of Review
  - ✓ Appendix C Wells Within the Area of Review

- [ ] Appendix D Public Service District Affidavit
- [ ] Appendix E Water Sources
- [x] Appendix F Area Permit Wells
- [x] Section 8 – Geological Data on Injection and Confining Zones
- [x] Section 9 – Operating Requirements / Data
  - [x] Appendix G Wells Serviced by Injection Well
- [x] Section 10 – Monitoring
- [x] Section 11 – Groundwater Protection Plan (GPP)
  - [x] Appendix H Groundwater Protection Plan (GPP)
- [x] Section 12 – Plugging and Abandonment
- [x] Section 13 – Additional Bonding
- [x] Section 14 – Financial Responsibility
  - [x] Appendix I Financial Responsibility
- [x] Section 15 – Site Security Plan
  - [x] Appendix J Site Security for Commercial Wells
- [x] Section 16 – Additional Information
  - [ ] Appendix K Other Permit Approvals

NOTE: For all 2D wells an additional bond in the amount of $5,000 is required.

Reviewed by (Print Name): _____

Reviewed by (Sign): _____

Date Reviewed: _____

UIC-1
(4/25)

WEST VIRGINIA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS
601 57th Street, SE
Charleston, WV 25304
(304) 926-0450
www.dep.wv.gov/oil-and-gas

UNDERGROUND INJECTION CONTROL
(UIC)
PERMIT APPLICATION

UIC PERMIT ID # _____ API # 47-085-10142 WELL # W-1652

Section I. Facility Information

Facility Name: Ritchie Hunter SWD #2

Address: 28407 State Route 7

City: Ellenboro State: WV Zip: 26346

County: Ritchie

Location description:

From Parkersburg, WV, travel East on US-50 for 27 miles. Turn right onto Co. Rd 8/Bonds Creek. Drive three miles and turn right onto Co Rd 8, the facility will be on the right

Location of well(s) or approximate center of field/project in UTM NAD 83 (meters):

Northing: 4345233.4 Easting: 491755

Environmental Contact Information:

Name: Environmental Safety and Health Title:

Phone: (985)851-2055 Email: Consulting@esandh.com

Section 2. Operator Information

Operator Name: Ritchie Hunter Water Disposal, LLC

Operator ID: 494506251

Address: 28407 State Route 7

City: Marietta State: OH Zip: 45750

County: Washington

Contact Name: Robert W. Sloan Contact Title: Senior Vice President - Operations

Contact Phone: (469)444-1291 Contact Email: rsloan@greenhunterwater.com

Section 3. Applicant Information

Ownership Status: ■ PRIVATE ☐ PUBLIC ☐ FEDERAL ☐ STATE
☐ OTHER (explain):

SIC code: ■ 1311 (2D, 2H, 2R) ☐ 1479 (3S) ☐ OTHER (explain):

Section 4. Applicant / Activity Request and Type:

A. Apply for a new UIC Permit: ■ 2D ☐ 2H ☐ 2R ☐ 3S
B. Reissue existing UIC Permit: ☐ 2D ☐ 2H ☐ 2R ☐ 3S
C. Modify existing UIC Permit: ☐ 2D ☐ 2H ☐ 2R ☐ 3S
(Submit only documentation pertaining to the modification request)

2D COMMERCIAL FACILITY: ■ YES ☐ NO

Section 5. Briefly describe the nature of business and the activities to be conducted:

Treat, Handle, and Dispose of Oil & Gas Produced and Flowback Brine Water

CERTIFICATION

All permit applications must be signed by a responsible corporate officer for a corporation, by a general partner for a partnership, by the proprietor of a sole proprietorship, or by a principal executive or ranking elected official for a public agency, or a [1]duly authorized representative in accordance with 47CSR13-13.11.b.

A. Name and title of person applying for permit:

Print Name: Robert W. Sloan

Print Title: Senior Vice President - Operations

B. Signature and Date.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Signature: 

Date: August 5, 2015

[1] A person is a duly authorized representative if:

The authorization is made in writing by a person described in subdivision 47CSR13-13.11.a.

The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of the plant manager, operator of a well or a well field, superintendent, or position of equivalent responsibility.

The written authorization is submitted to the Director.

(4/25)

APPENDIX A
Injection Well Form

1) GEOLOGIC TARGET FORMATION: Oriskany

Depth: 6270 Feet (top) 6360 Feet (bottom)

2) Estimated Depth of Completed Well, (or actual depth of existing well): 6450 Feet

3) Approximate water strata depths: Fresh 175 Feet Salt 1000 Feet

4) Approximate coal seam depths: None Noted

5) Is coal being mined in the area? Yes ☐ No ☑

6) Virgin reservoir pressure in target formation 1400 psig Source

7) Estimated reservoir fracture pressure 2940 psig (BHFP)

8) MAXIMUM PROPOSED INJECTION OPERATIONS:

Injection rate (bbl/hour): 210 bbl/hour

Injection volume (bbl/day): 5000 bbl/day

Injection pressure (psig): 1965 PSI

Bottom hole pressure (psig): 5035 PSI

9) DETAILED IDENTIFICATION OF MATERIALS TO BE INJECTED, INCLUDING ADDITIVES:

Production Brine; Flowback, Pit, and Runoff Water; Corrosion Inhibitor, Biocide

Temperature of injected fluid: (°F): 60

10) FILTERS (IF ANY)

Bag and Cartridge Filters are used at the Pumps

11) SPECIFICATIONS FOR CATHODIC PROTECTION AND OTHER CORROSION CONTROL

Pipelines are supported, wrapped, and coated to reduce corrosion

dep

APPENDIX A (cont.)

12. Casing and Tubing Program

TYPE	Size	New or Used	Grade	Weight per ft. (lb/ft)	FOOTAGE: For Drilling	INTERVALS: Left in Well	CEMENT: Fill-up (Cu. Ft.)
Conductor	13-3/8"	New	R-3	48#	35'	35'	7 sks(Cement to Surface)
Fresh Water	9-5/8"	New	R-3	26#	330'	330'	90 sks(C.T.S.)
Coal							
Intermediate 1	7"	New	R-3	17#	2130'	2130'	300 sks(C.T.S.)
Intermediate 2							
Production	4-1/2"	New	R-3	11.6#	6447'	6447'	115 sks
Tubing	2-7/8"	New	J55	6.5#	6260'	6260'	
Liners							

TYPE	Wellbore Diameter	Casing Size	Wall Thickness	Burst Pressure	Cement Type	Cement Yield (cu. ft./sk)	Cement to Surface ? (Y or N)
Conductor	15"	13-3/8"	.330	1,640	Type 1/Class A	1.4	Y
Fresh Water	12-1/4"	9-5/8"	.312	2,270	Type 1/Class A	1.38	Y
Coal							
Intermediate 1	8-7/8"	7"	.231	2,310	Type 1/Class A	1.4	Y
Intermediate 2							
Production	6-3/8"	4-1/2"	.250	7,780	Strong Lite 150	1.94	N, 4450'
Tubing							
Liners							

PACKERS	Packer #1	Packer #2	Packer #3	Packer #4
Kind:	Baker Hughes - Double LokSet A-2			
Sizes:	4-1/2" x 2-3/8"			
Depths Set:	6260'			

WR-35
Rev. 8/23/13

State of West Virginia
Department of Environmental Protection - Office of Oil and Gas
Well Operator's Report of Well Work

API 47- 085 - 10142 County Ritchie District Grant
Quad Elienboro Pad Name Mason Field/Pool Name N/A
Farm name Nathanael Mason & Pearl Everett Mason Well Number W-1652
Operator (as registered with the OOG) Haught Energy Corporation
Address 12864 Staunton TPKE City Smithville State WV Zip 26178

As Drilled location NAD 83/UTM Attach an as-drilled plat, profile view, and deviation survey
Top hole Northing 39.256625 Easting 81.096325
Landing Point of Curve Northing NA Easting NA
Bottom Hole Northing NA Easting NA

Elevation (ft) 1021' GL Type of Well ■New □ Existing Type of Report □Interim ■Final

Permit Type □ Deviated □ Horizontal □ Horizontal 6A ■ Vertical Depth Type ■ Deep □ Shallow

Type of Operation □ Convert □ Deepen ■ Drill □ Plug Back □ Redrilling □ Rework □ Stimulate

Well Type □ Brine Disposal □ CBM ■ Gas □ Oil □ Secondary Recovery □ Solution Mining □ Storage □ Other _____

Type of Completion ■ Single □ Multiple Fluids Produced □ Brine ■Gas □ NGL □ Oil □ Other _____
Drilled with □ Cable ■ Rotary

Drilling Media Surface hole ■ Air □ Mud □Fresh Water Intermediate hole ■ Air □ Mud □ Fresh Water □ Brine
Production hole ■ Air □ Mud □ Fresh Water □ Brine
Mud Type(s) and Additive(s)
NA

Date permit issued 09/26/2014 Date drilling commenced 01/19/2015 Date drilling ceased 01/26/2015
Date completion activities began 2/4/2015 Date completion activities ceased 3/24/2015
Verbal plugging (Y/N) NA Date permission granted NA Granted by NA

Please note: Operator is required to submit a plugging application within 5 days of verbal permission to plug

Freshwater depth(s) ft 175 Open mine(s) (Y/N) depths N
Salt water depth(s) ft None Void(s) encountered (Y/N) depths N
Coal depth(s) ft None Cavern(s) encountered (Y/N) depths N
Is coal being mined in area (Y/N) N

Reviewed by:

API 47- 085 - 10142 Farm name Nathanael Mason & Pearl Everett Mason Well number W-1652

CASING STRINGS	Hole Size	Casing Size	Depth	New or Used	Grade wt/ft	Basket Depth(s)	Did cement circulate (Y/ N) * Provide details below*
Conductor	15"	13 3/8"	35'	New	48#	NA	Yes
Surface	12 -1/4"	9 5/8"	330'	New	26#	NA	Yes
Coal							
Intermediate 1	8 -7/8"	7"	2130	New	17#	1600	Yes
Intermediate 2							
Intermediate 3							
Production	6 -3/8"	4 1/2"	6447.3	New	11.6#	6000, 5000	No
Tubing							
Packer type and depth set							

Comment Details 115 Sacks of cement used on production string (as below) providing approximately 2,000 + feet fill up.

CEMENT DATA	Class/Type of Cement	Number of Sacks	Slurry wt (ppg)	Yield (ft^3/sks)	Volume (ft^3)	Cement Top (MD)	WOC (hrs)
Conductor	Type 1/Class A	7	14.8	1.4	8.8	Surface	8
Surface	Type 1/Class A	90	14.8	1.38	124.2	Surface	8
Coal							
Intermediate 1	Type 1/Class A	300	14.8	1.4	420	Surface	8
Intermediate 2							
Intermediate 3							
Production	Strong Lite 150	115	13.1	1.94	223.1	4,450'	24
Tubing							

Drillers TD (ft) 6,480' Loggers TD (ft) 6,490'

Deepest formation penetrated Oriskany Plug back to (ft) NA

Plug back procedure NA

Kick off depth (ft) NA

Check all wireline logs run ■ caliper ■ density □ deviated/directional ■ induction
■ neutron □ resistivity ■ gamma ray ■ temperature □sonic

Well cored □ Yes ■ No Conventional Sidewall Were cuttings collected □ Yes ■ No

DESCRIBE THE CENTRALIZER PLACEMENT USED FOR EACH CASING STRING

Centralizers were used on Fresh water, Intermediate and Production strings as necessary to ensure a centered up casing string for optimal cement circulation and setting.

WAS WELL COMPLETED AS SHOT HOLE □ Yes ■ No DETAILS

WAS WELL COMPLETED OPEN HOLE? □ Yes ■ No DETAILS

WERE TRACERS USED □ Yes ■ No TYPE OF TRACER(S) USED

API 47- 085 - 10142 Farm name Nathanael Mason & Pearl Everett Mason Well number W-1652

PERFORATION RECORD

Stage No.	Perforation date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formation(s)
1	2-4-2015	6294	6360	104	Oriskany

Please insert additional pages as applicable.

STIMULATION INFORMATION PER STAGE

Complete a separate record for each stimulation stage.

Stage No.	Stimulations Date	Ave Pump Rate (BPM)	Ave Treatment Pressure (PSI)	Max Breakdown Pressure (PSI)	ISIP (PSI)	Amount of Proppant (lbs)	Amount of Water (bbls)	Amount of Nitrogen/other (units)
1	2/5/15	4.0	1900	2940	1650	NA	425	NA

Please insert additional pages as applicable.

API 47- 085 - 10142 Farm name Nathanael Mason & Pearl Everett Mason Well number W-1652

PRODUCING FORMATION(S)	DEPTHS		
Oriskany	6294-6360 TVD	6294-6360 MD	

Please insert additional pages as applicable.

GAS TEST ☐ Build up ☐ Drawdown ■ Open Flow OIL TEST ☐ Flow ☐ Pump

SHUT-IN PRESSURE Surface 200 psi Bottom Hole 1400 psi DURATION OF TEST 24 hrs

OPEN FLOW Gas 200 mcfpd Oil NA bpd NGL NA bpd Water NA bpd GAS MEASURED BY ■ Estimated ☐ Orifice ☐ Pilot

LITHOLOGY/ FORMATION	TOP DEPTH IN FT NAME TVD	BOTTOM DEPTH IN FT TVD	TOP DEPTH IN FT MD	BOTTOM DEPTH IN FT MD	DESCRIBE ROCK TYPE AND RECORD QUANTITY AND TYPE OF FLUID (FRESHWATER, BRINE, OIL, GAS, H_2S, ETC)
See Attached	0		0		

Please insert additional pages as applicable.

Drilling Contractor Top Drilling Corporation
Address 107 Lancaster Street City Marietta State OH Zip 45750

Logging Company Nabors Completion & Production Services Co.
Address P.O. Box 975682 City Dallas State TX Zip 75397

Cementing Company Universal Well Services, Inc.
Address P.O. Box 200969 City Dallas State TX Zip 75320

Stimulating Company Universal Well Services, Inc.
Address P.O. Box 200969 City Dallas State TX Zip 75320

Please insert additional pages as applicable.

Completed by Haught Energy Corporation Telephone 304-477-3333
Signature Title Development Director Date 3/25/15

Submittal of Hydraulic Fracturing Chemical Disclosure Information Attach copy of FRACFOCUS Registry

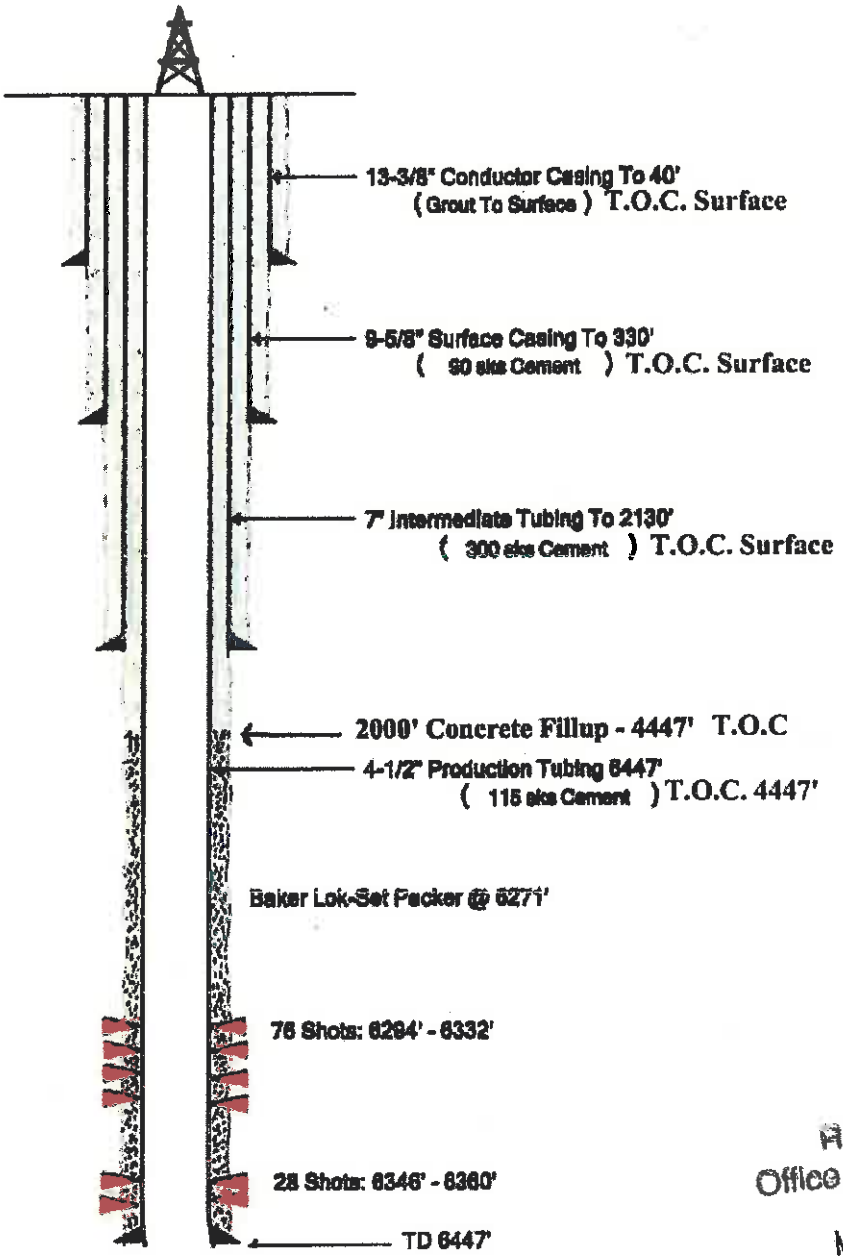
Mason W-1652

API # 47-085-10142

Formation	Top	Bottom	Remarks
Red Rock & Shale	0	604	
Sand	604	639	
Red Rock	639	719	
Sand	719	739	
Red Rock	739	794	
Slate	794	874	
Dunkard Sand	874	884	
Slate & Shells	884	1264	
Gas Sand	1264	1374	
Slate	1374	1442	
1st Salt Sand	1442	1502	
Shale	1502	1538	
2nd Salt Sand	1538	1556	
Shale	1556	1584	
3rd Salt Sand	1584	1694	
Slate	1694	1780	
Maxon Sand	1780	1819	
Shale	1819	1889	
Little lime	1889	1914	
Pencil Cave	1914	1918	
Big Lime	1918	2016	
Big Injun Sand	2016	2076	
Slate Break	2076	2080	
Squaw Sand	2080	2094	
Slate & Shells	2094	2358	
Coffee Shale	2358	2392	
Berea Sand	2392	2396	
Slate & Shells	2396	2512	
Sand	2512	2524	
Slate & Shells	2524	2784	
Sand	2784	2796	
Slate & Shells	2796	4428	
Benson Sand	4428	4454	
Slate & Shells	4454	4949	
Alexander Sand	4949	4960	
Slate & Shells	4960	5358	
Sand	5358	5378	
Slate & Shells	5378	6008	
Hamilton Shale	6008	6032	
Tully Lime	6032	6036	
Marcellus Shale	6036	6074	
Onondaga Lime	6074	6300	
Oriskany Sand	6300	6360	
Lime	6360	6480	
TD	6480		

GreenHunter Water

RITCHIE HUNTER WATER DISPOSAL
WELLBORE SCHEMATIC * & COMPLETION DATA



* Schematic Not To Scale

<<< Fold Here >>>

All interpretations are opinions based on inferences from electrical or other measurements and we cannot and do not guarantee the accuracy or correctness of any interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions set out in our current Price Schedule.

Comments

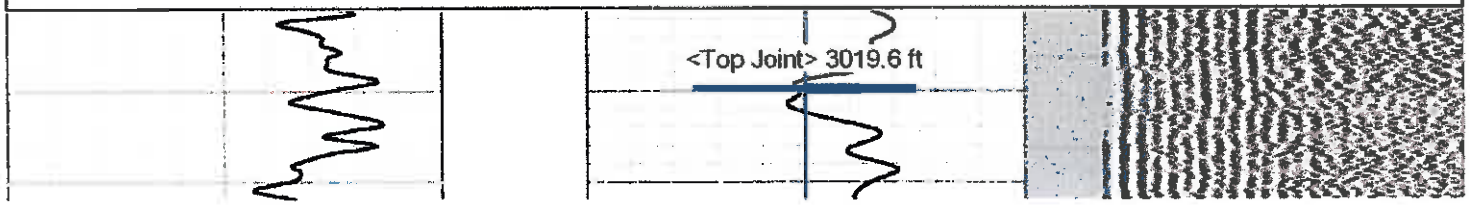
Crew
Jerry Blake
Roger Butcher

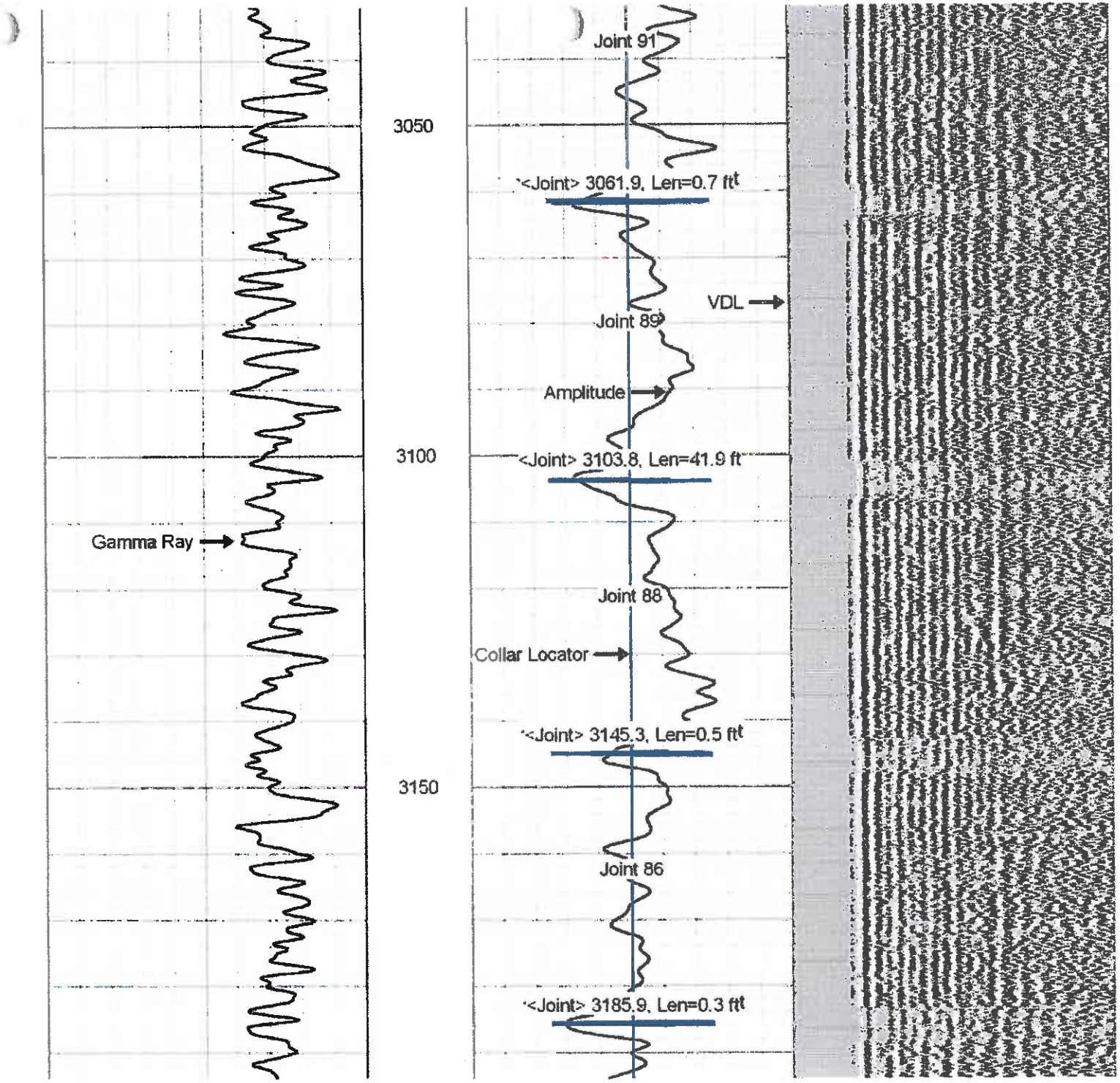
NABORS COMPLETION & PRODUCTION SERVICES CO.

CEMENT BOND LOG

Database File:	whittle_masonw1652_feb42015.db
Dataset Pathname:	pass5
Presentation Format:	scbl_dr
Dataset Creation:	Wed Feb 04 09:05:44 2015 by Log 0
Charted by:	Depth in Feet scaled 1:240

0	Gamma Ray	200	0	Amplitude (mV)	100	200	VDL	1200
200	GR	400	10	Collar Locator	-10			

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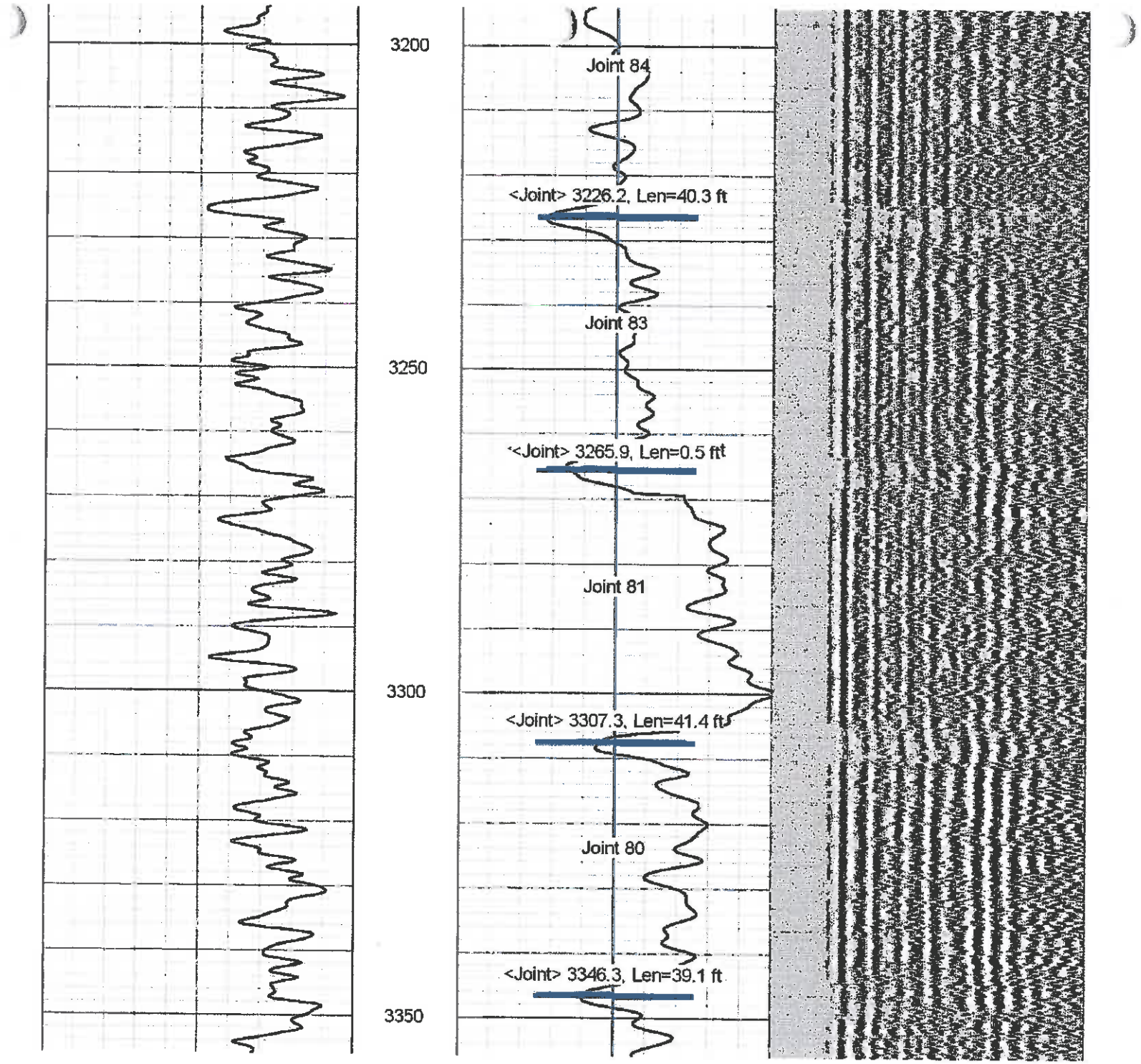
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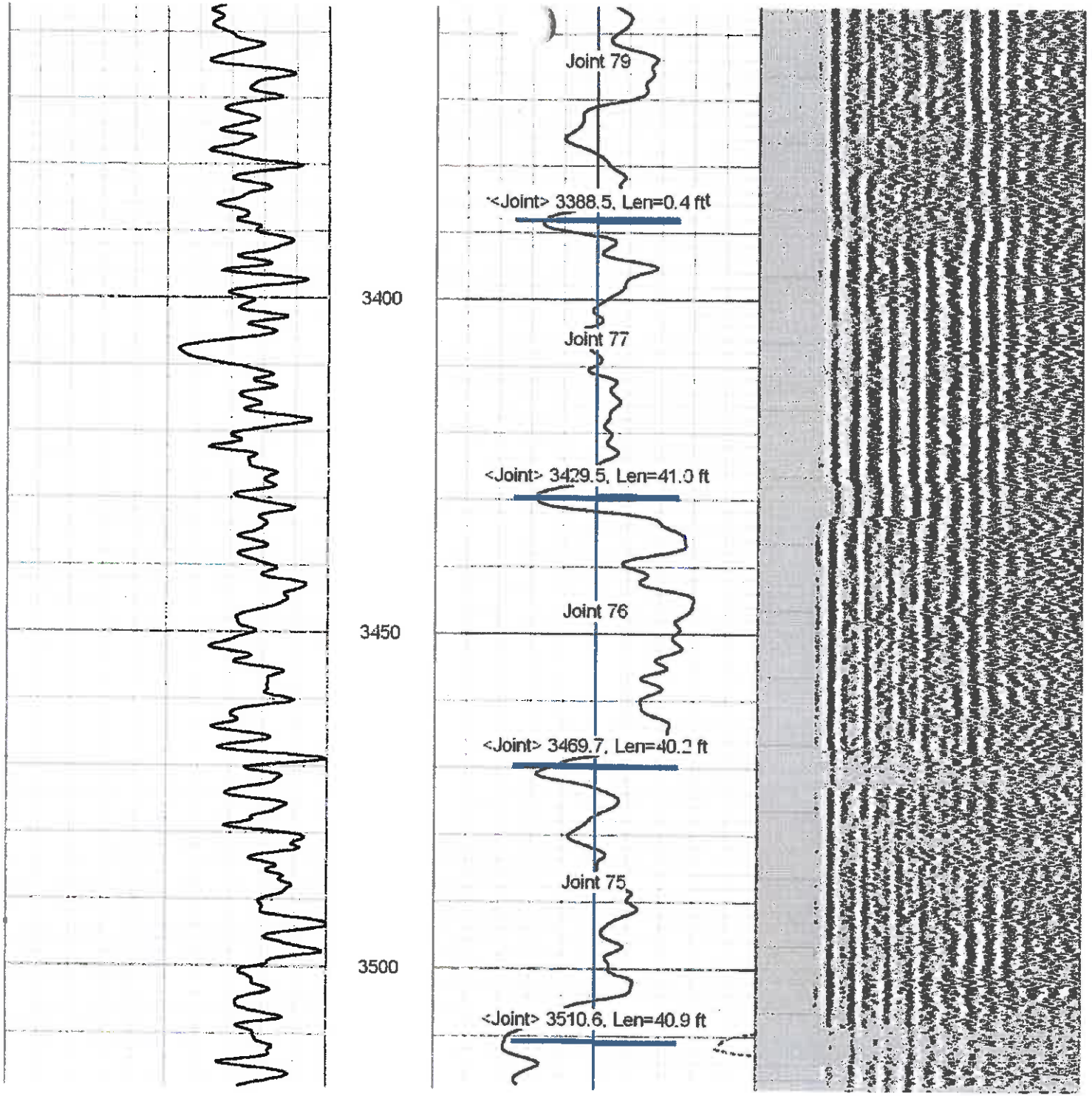
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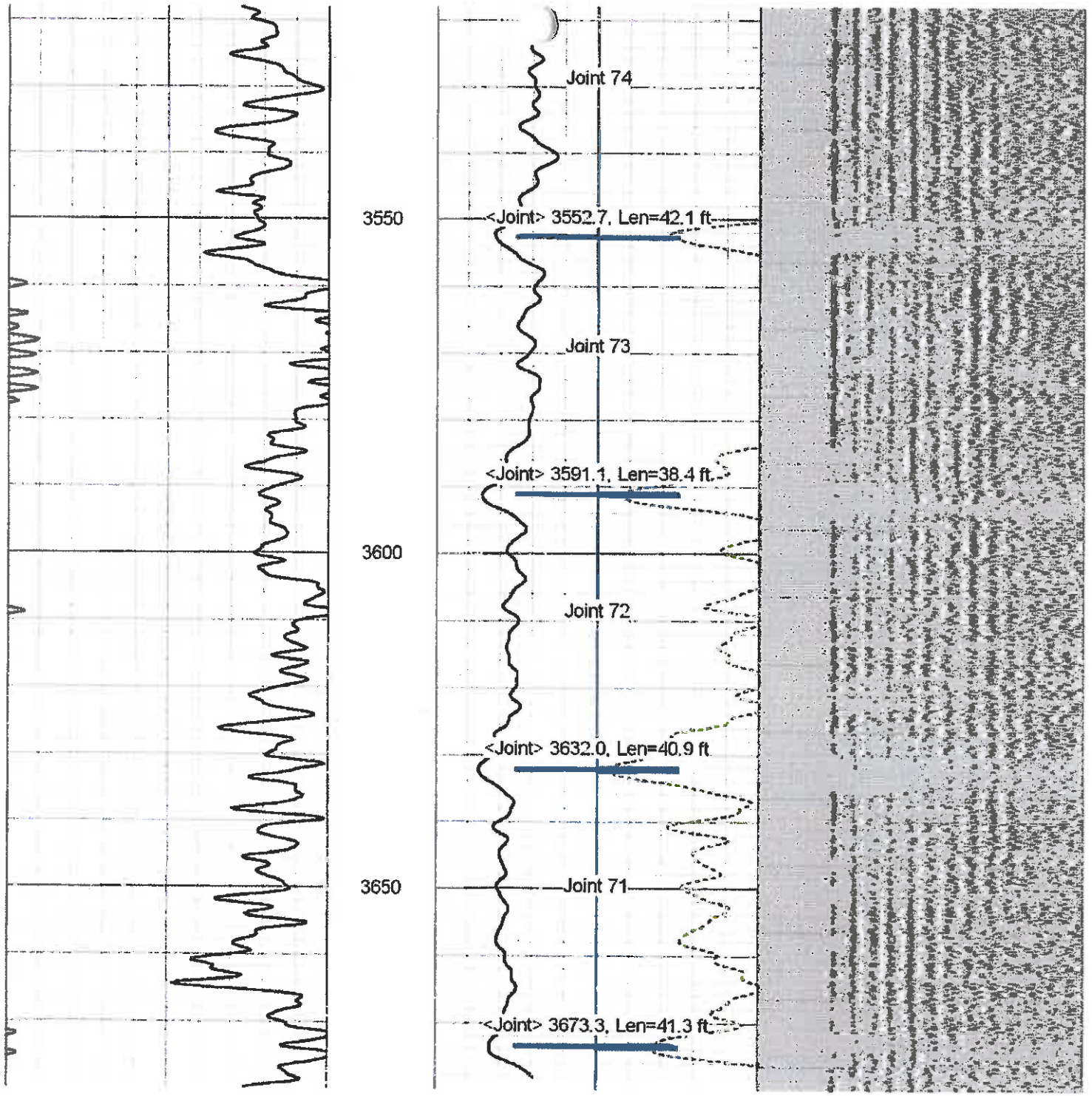
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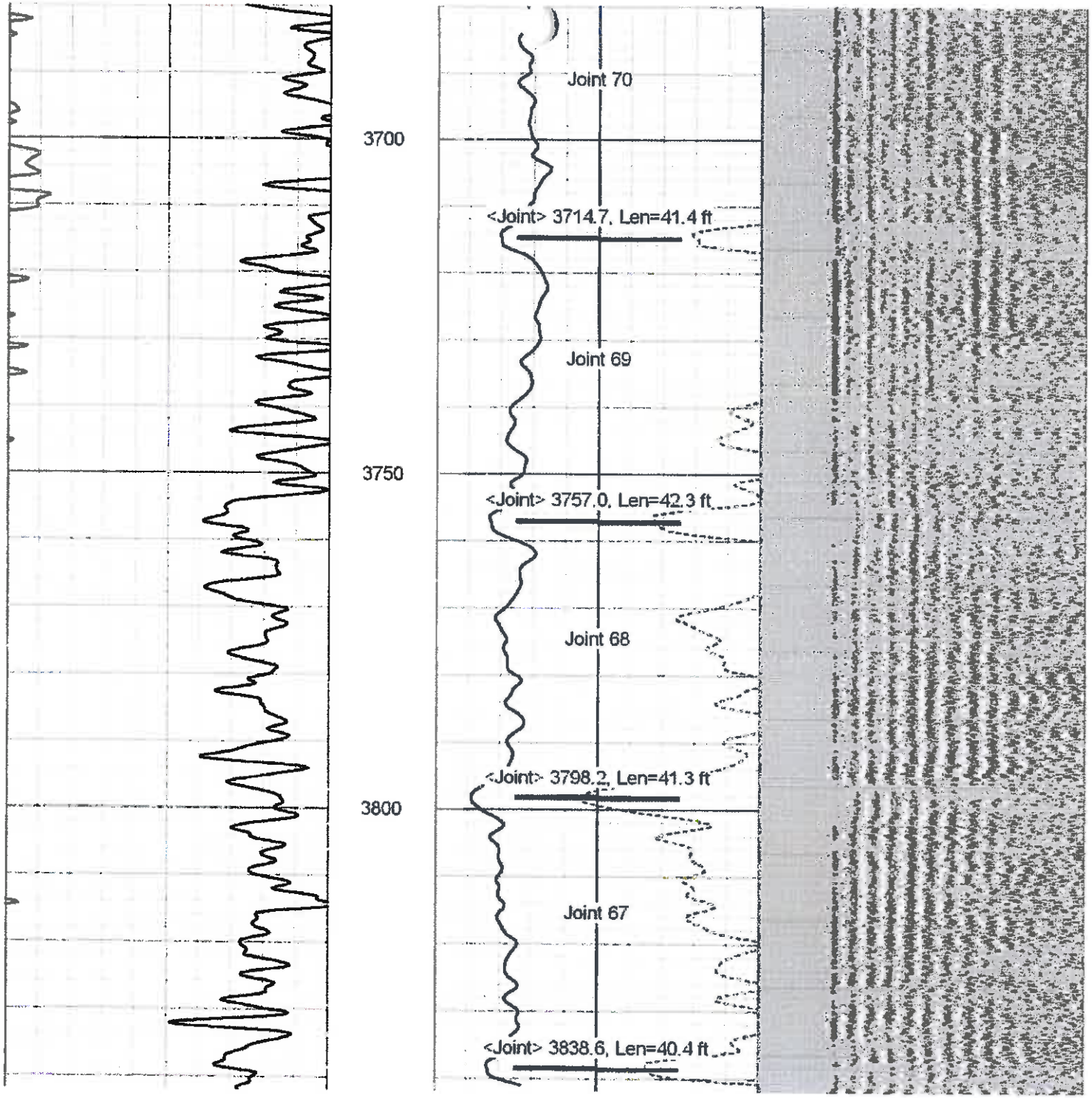
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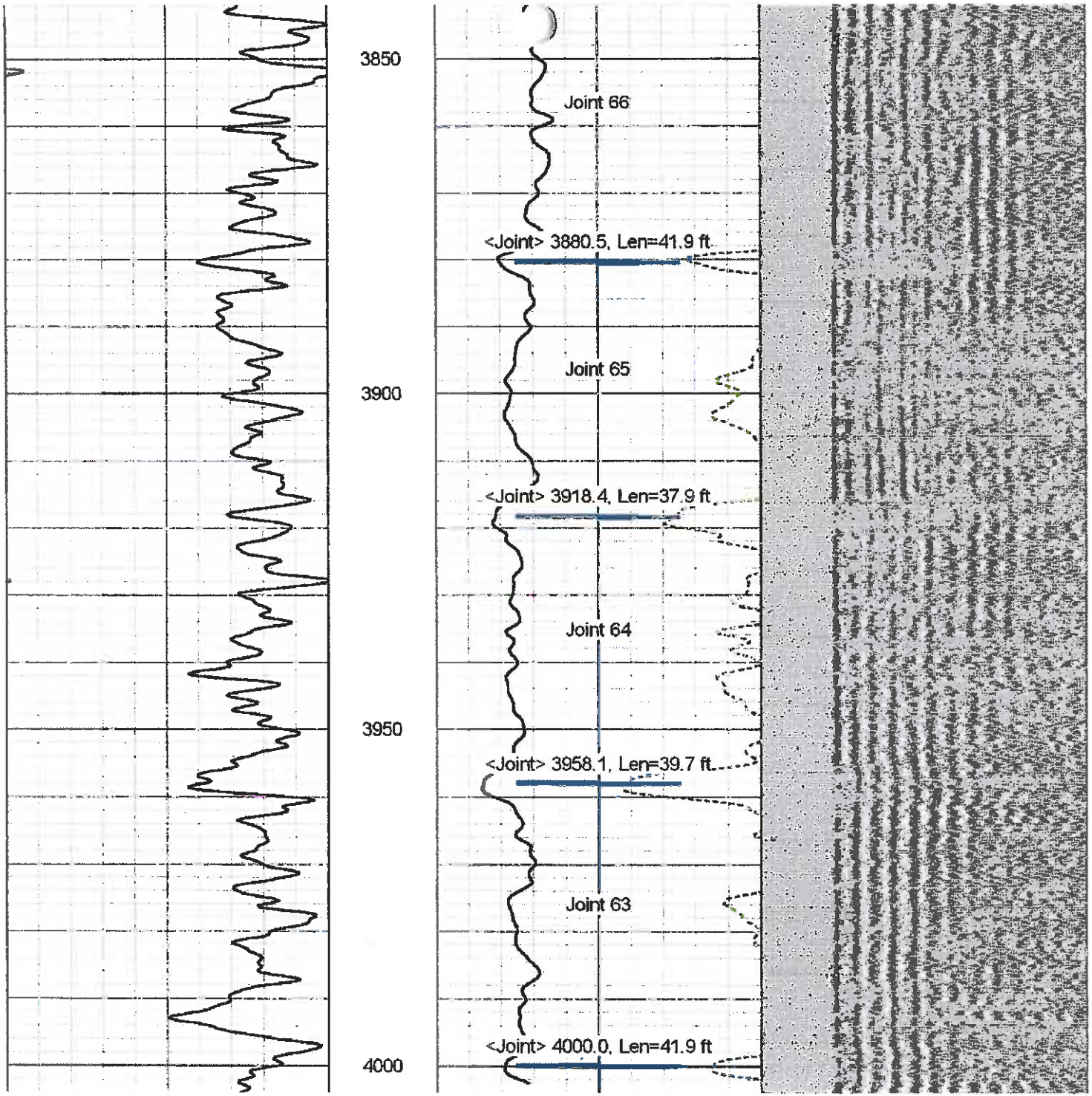
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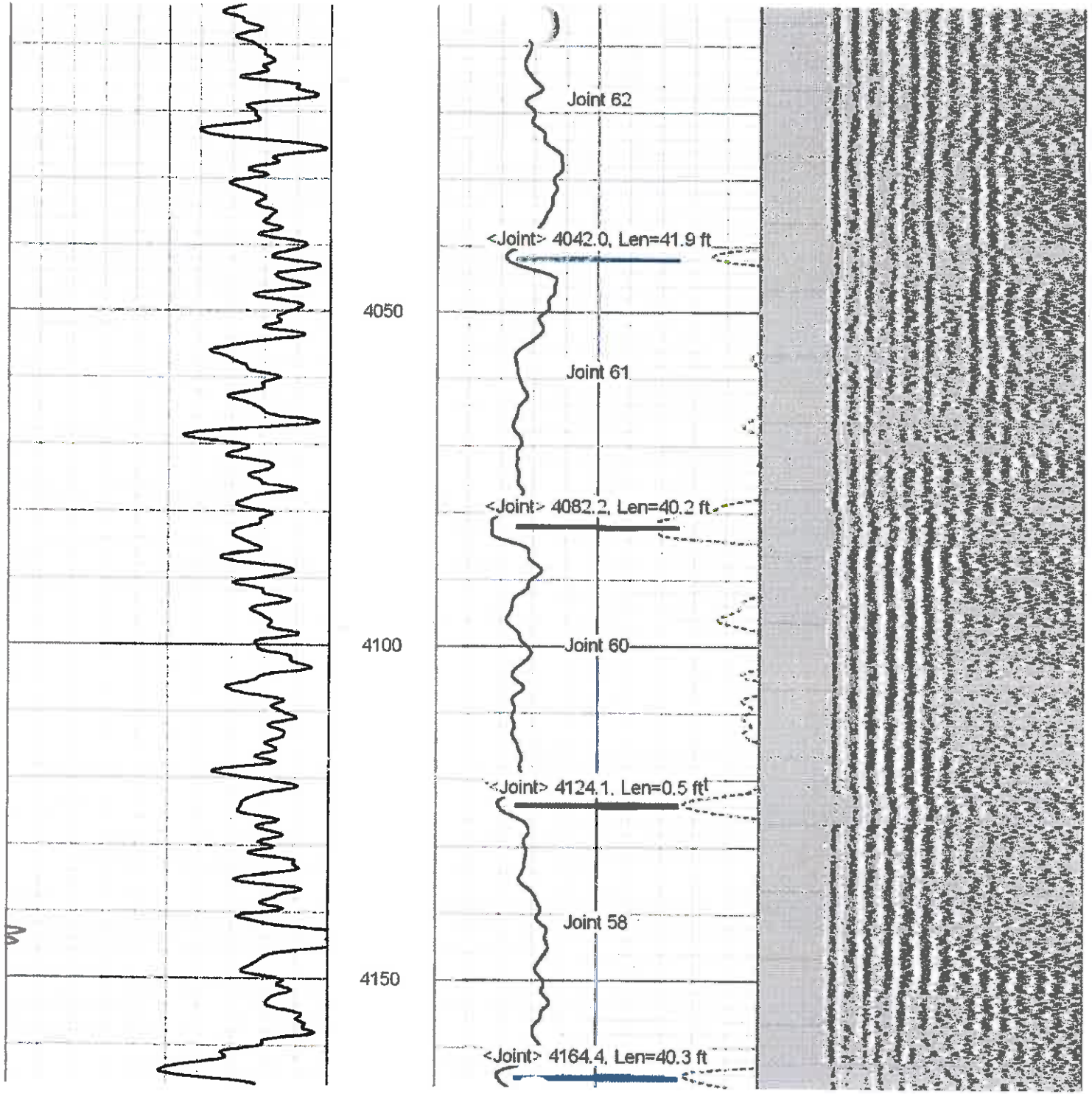
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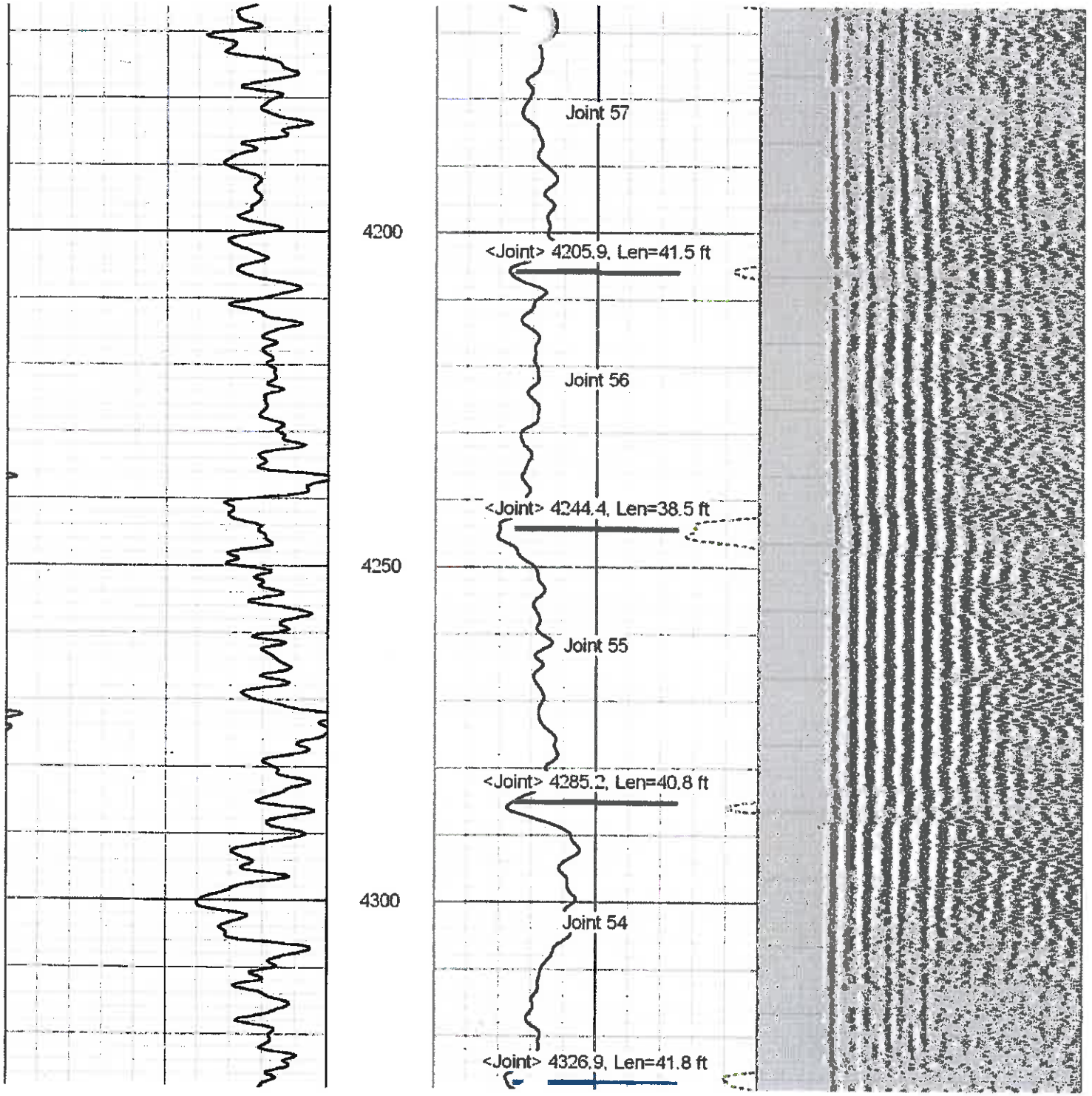
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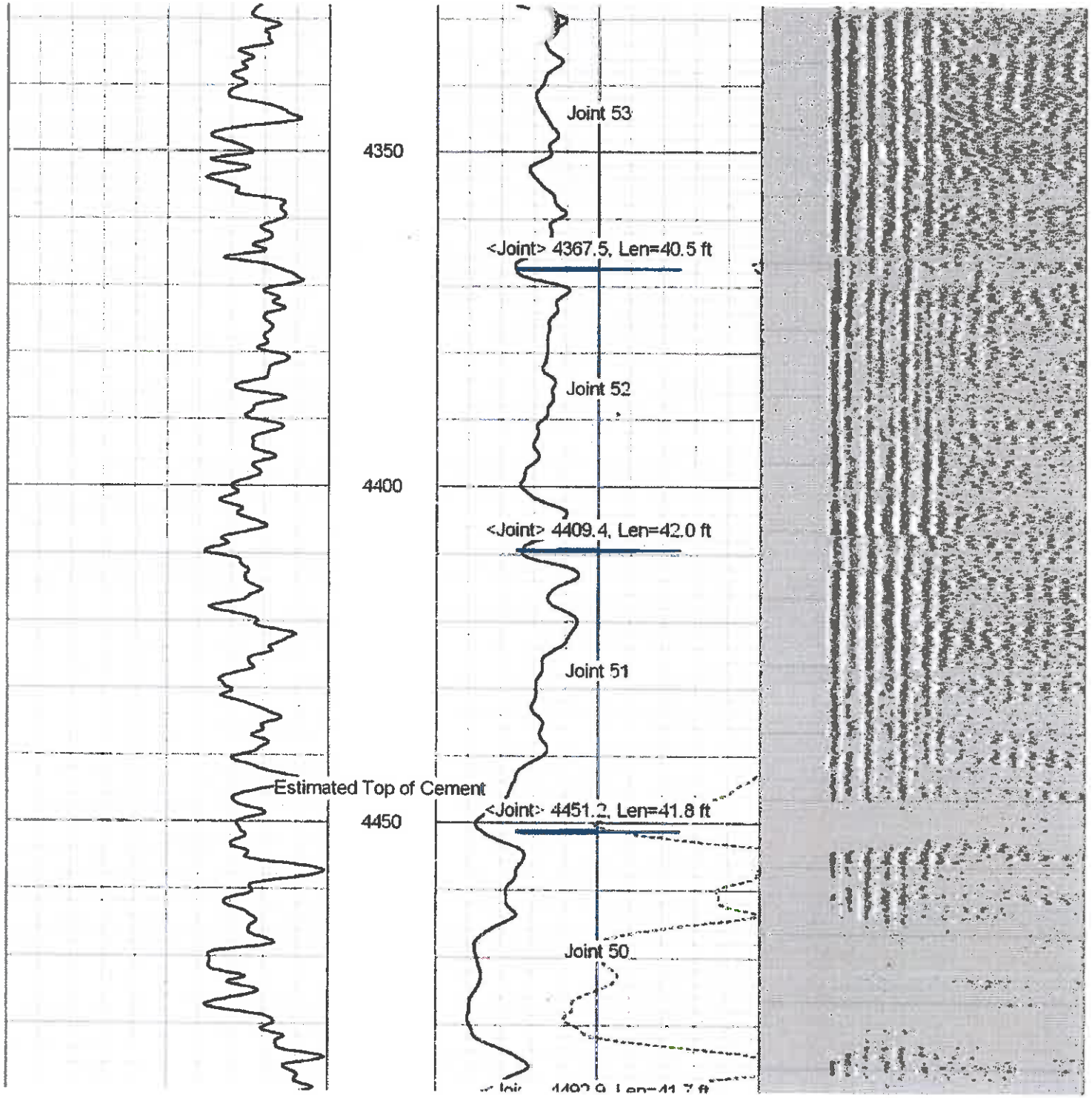
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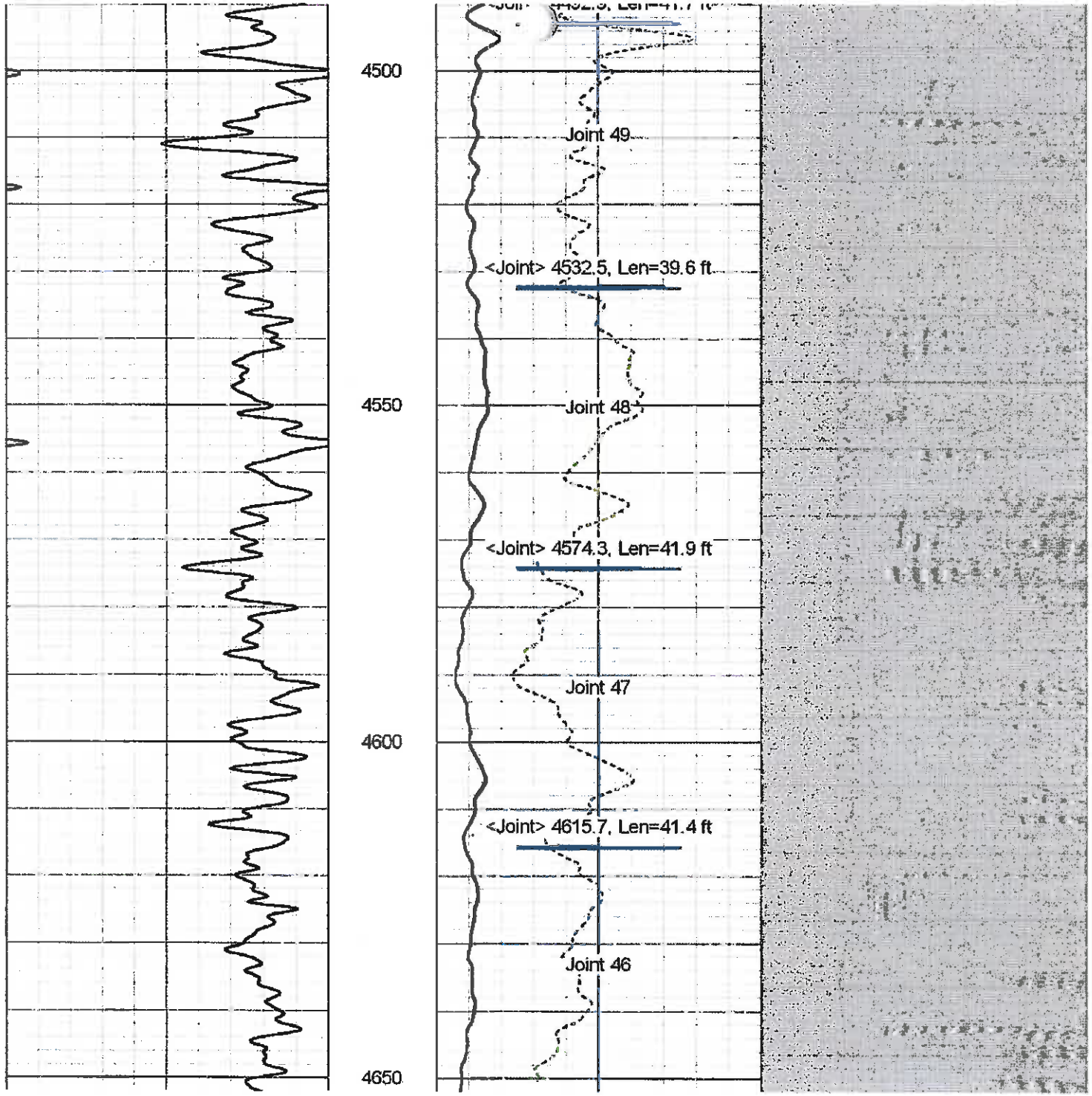
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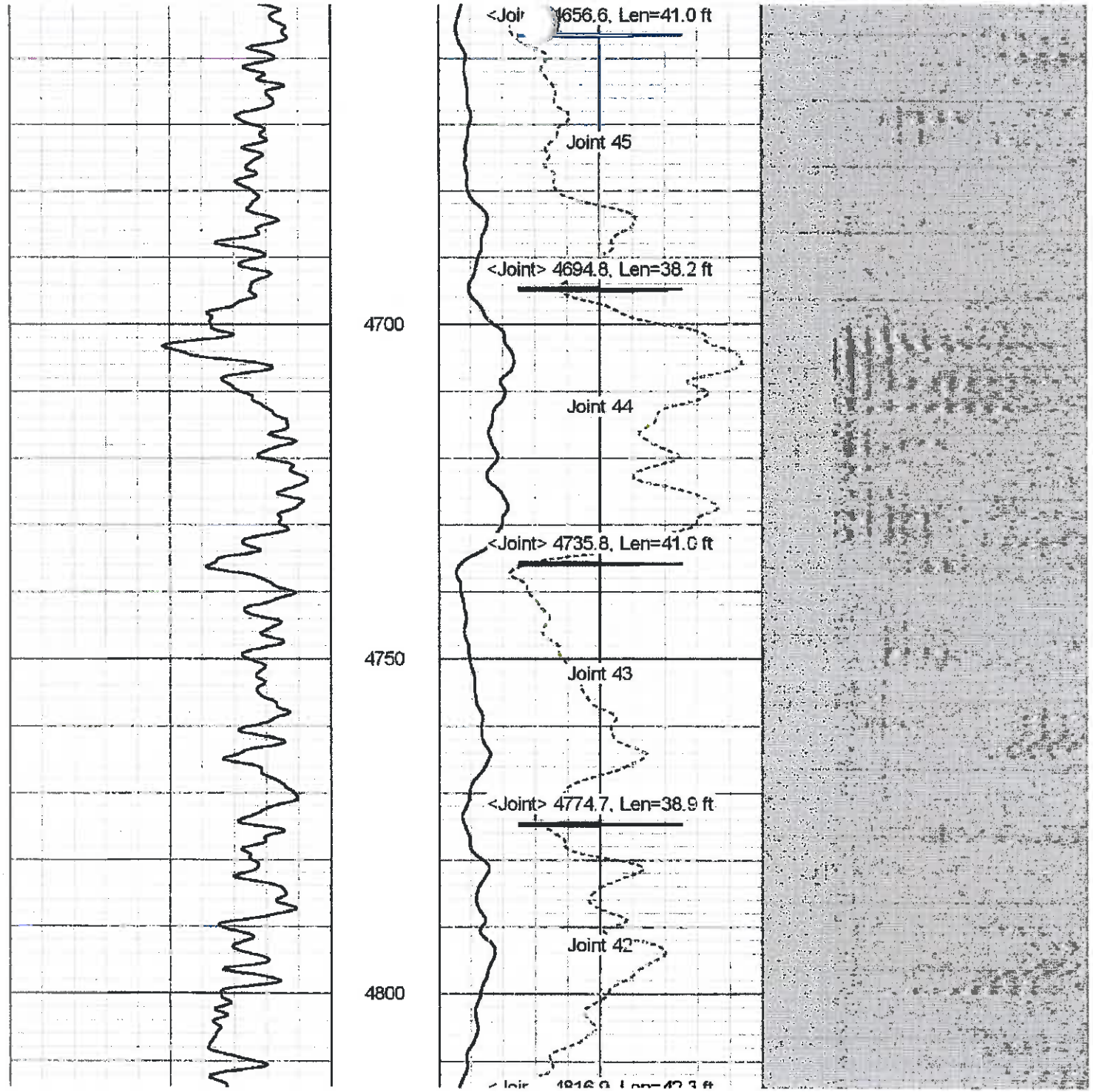
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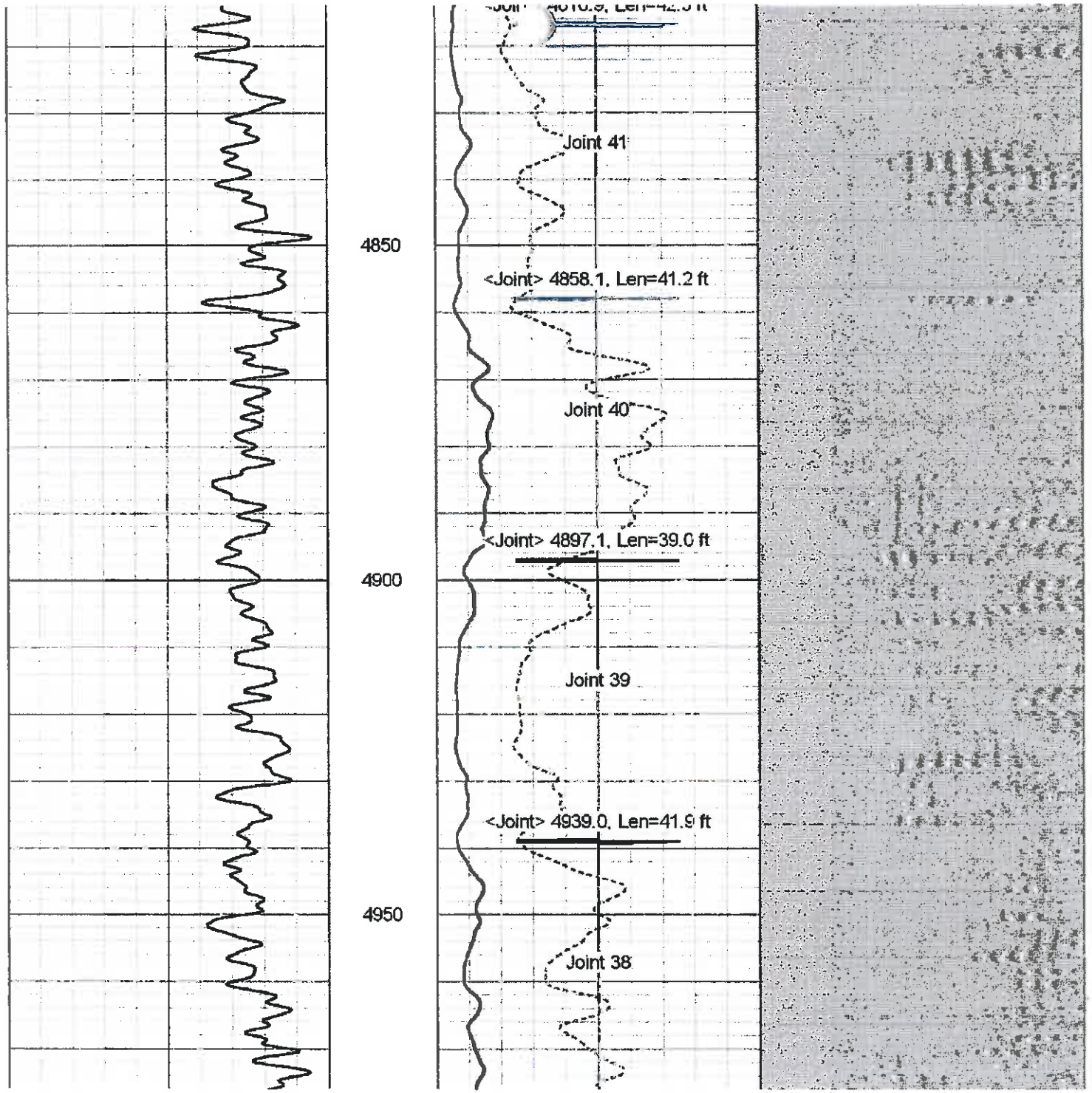
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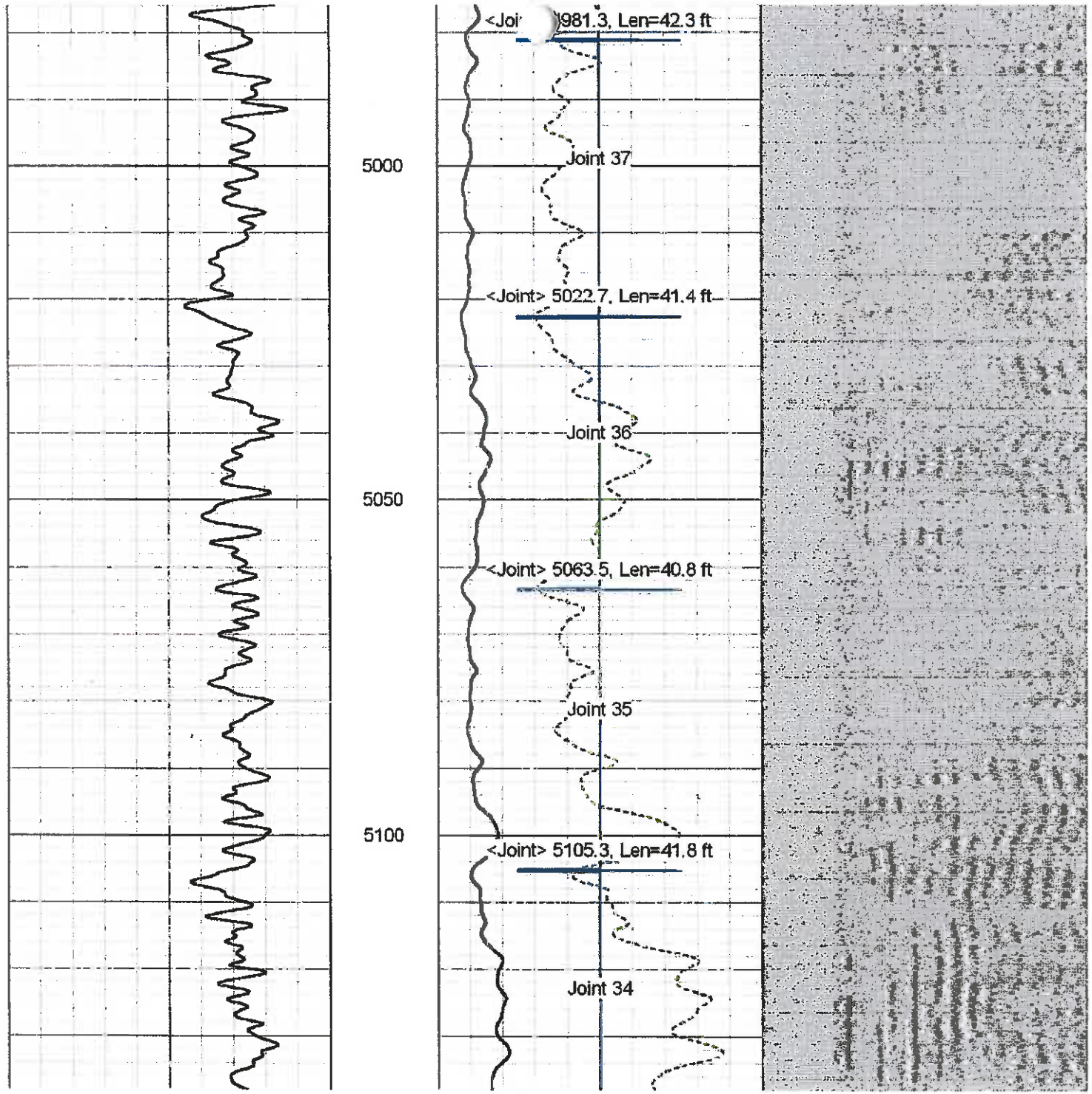
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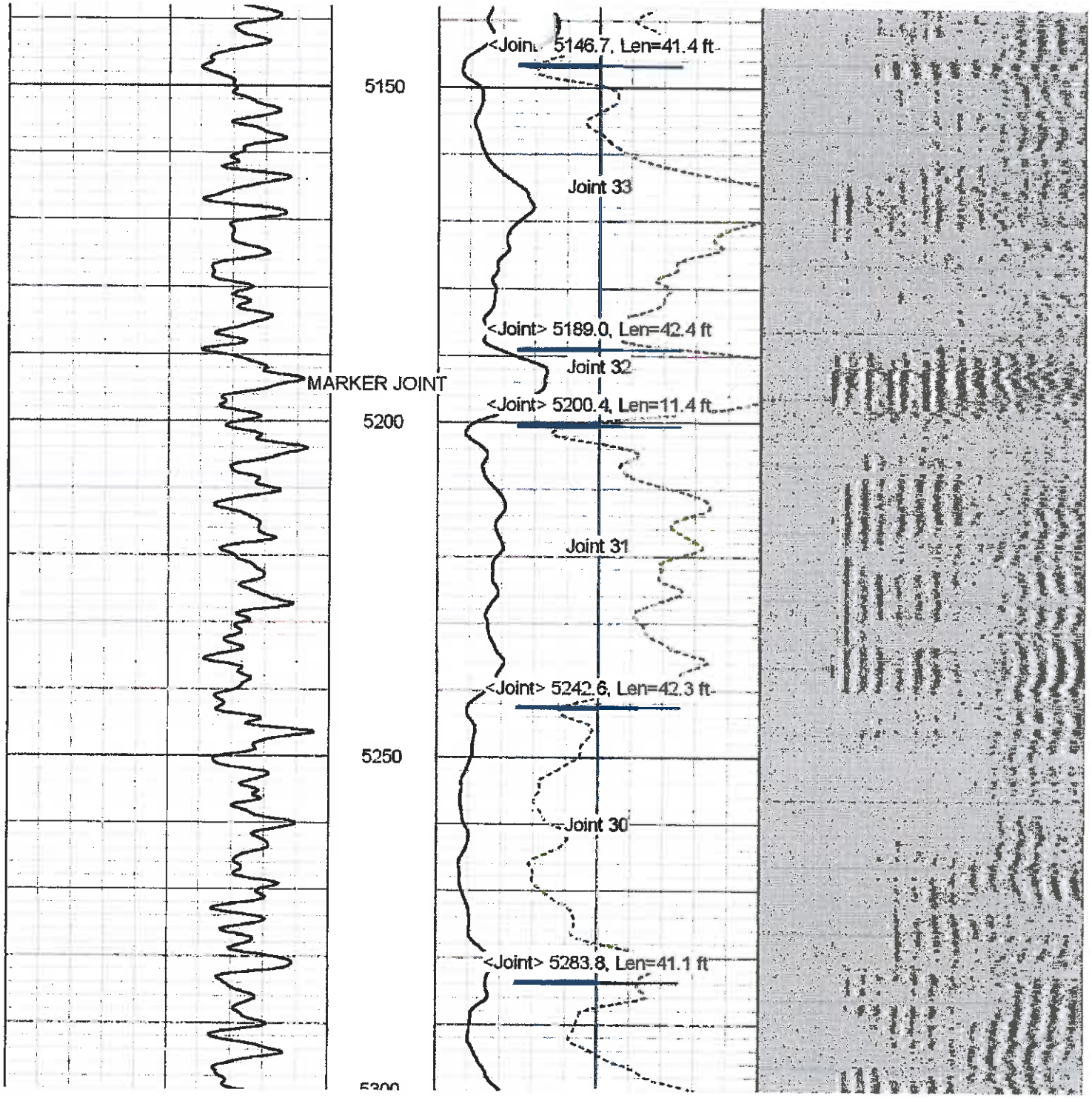
Joint 34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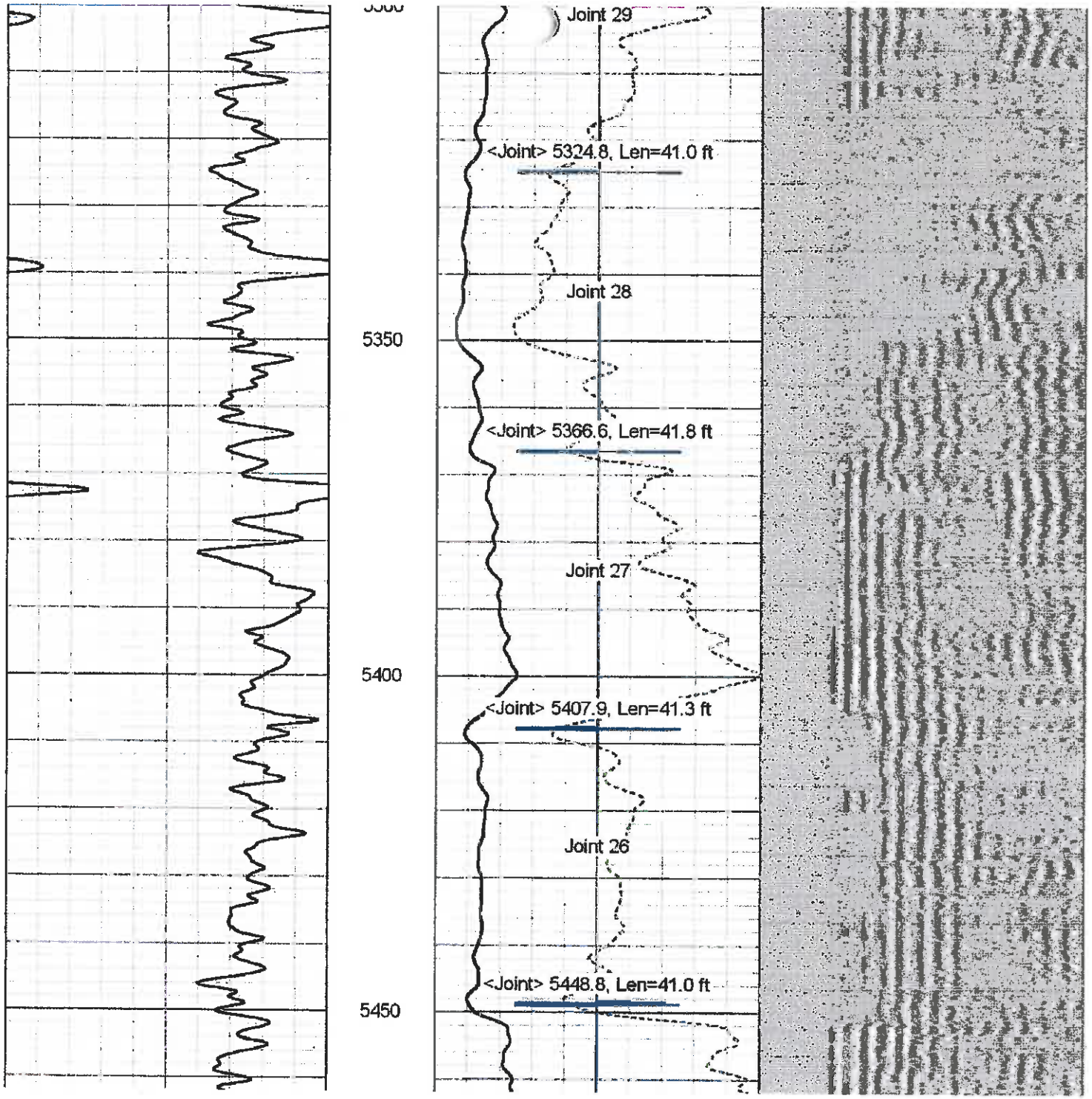
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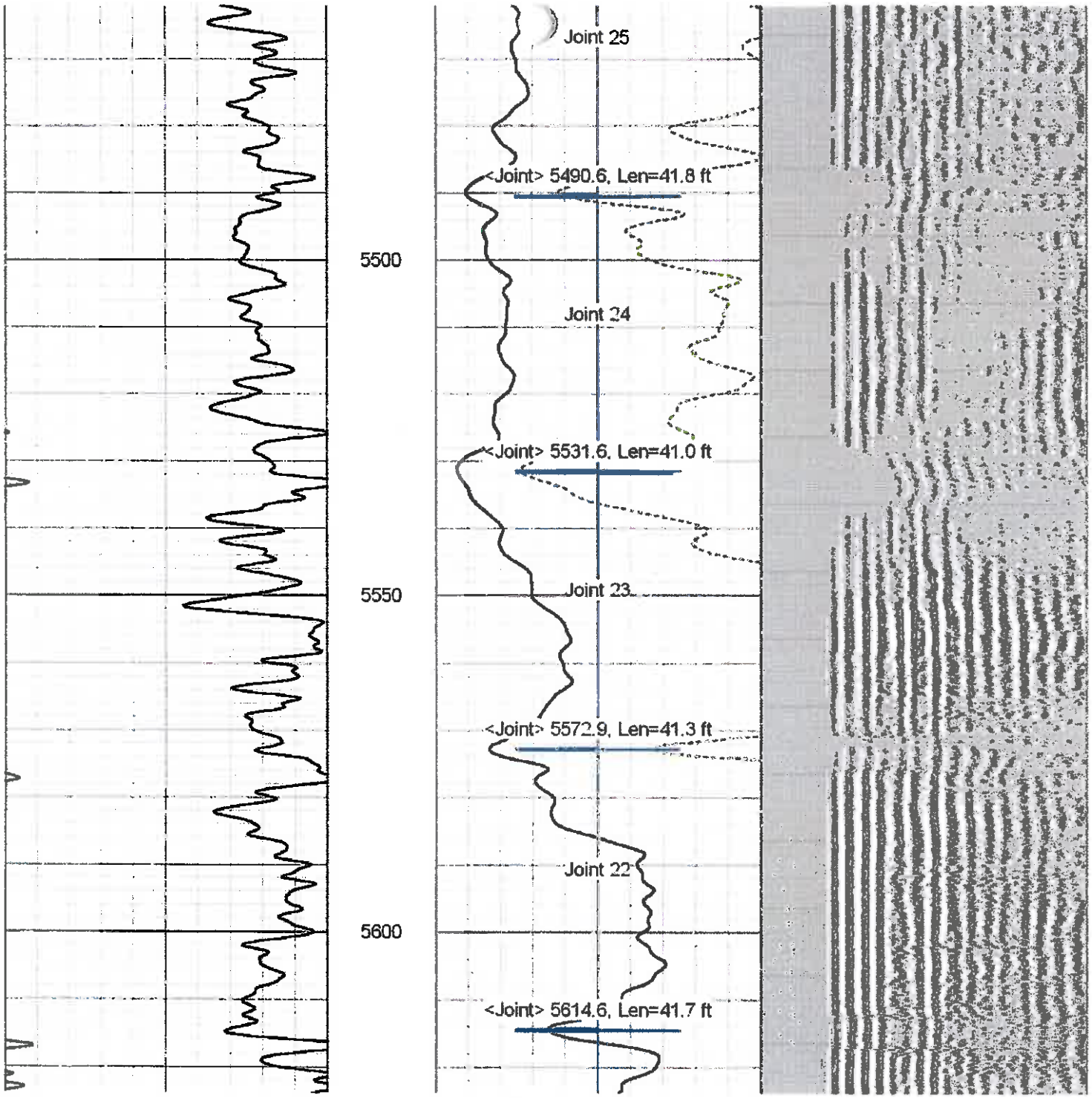
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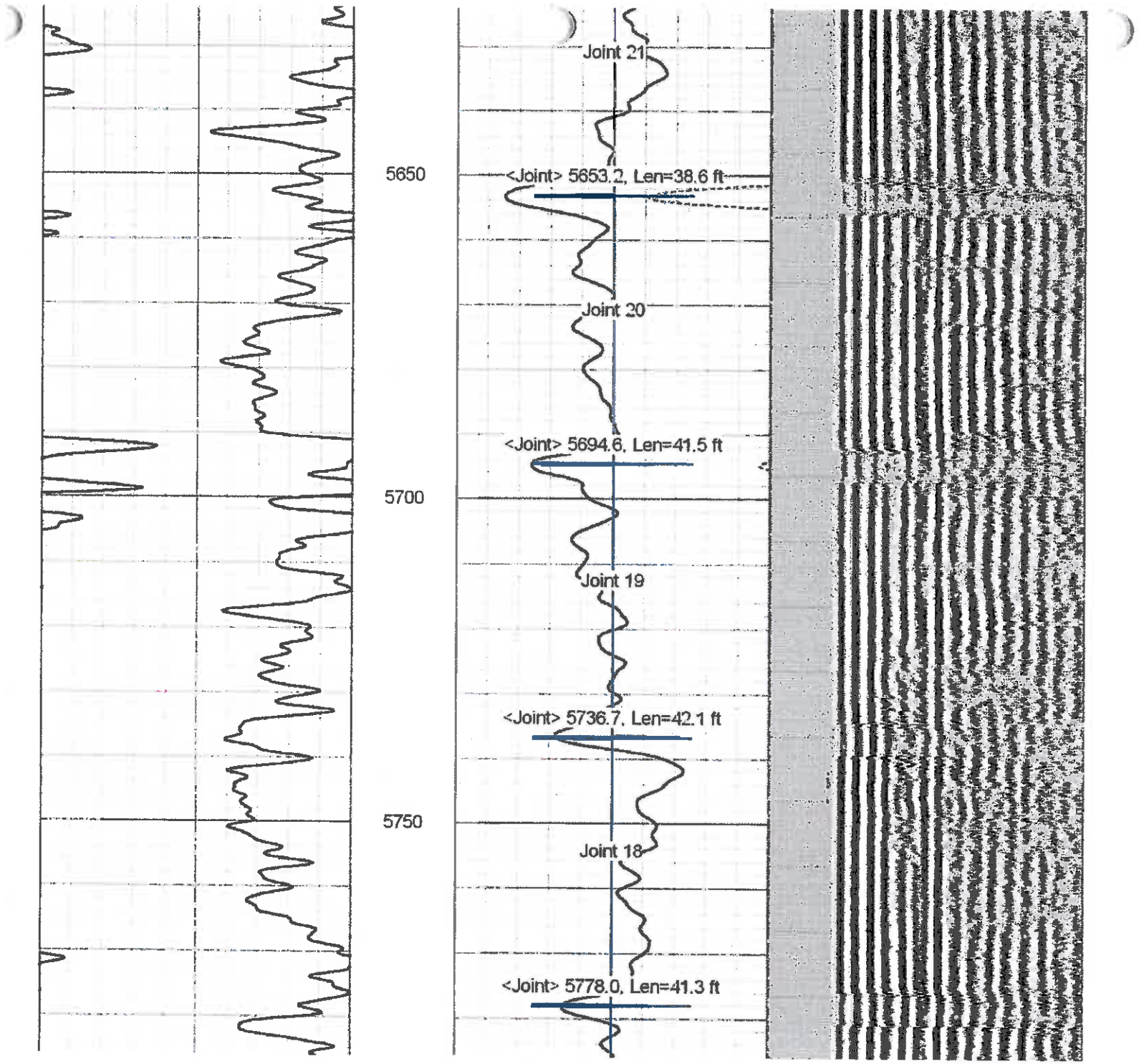
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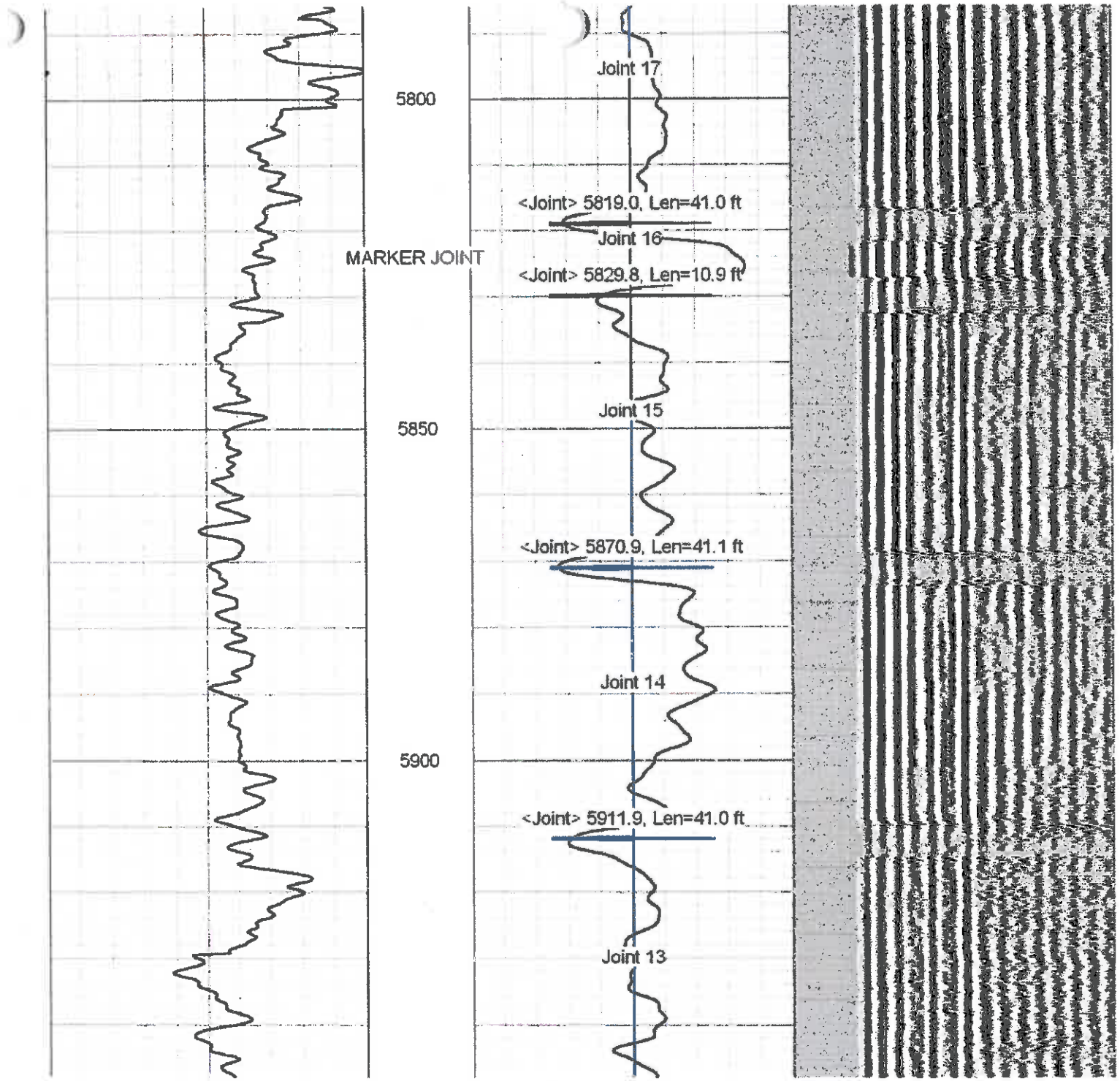
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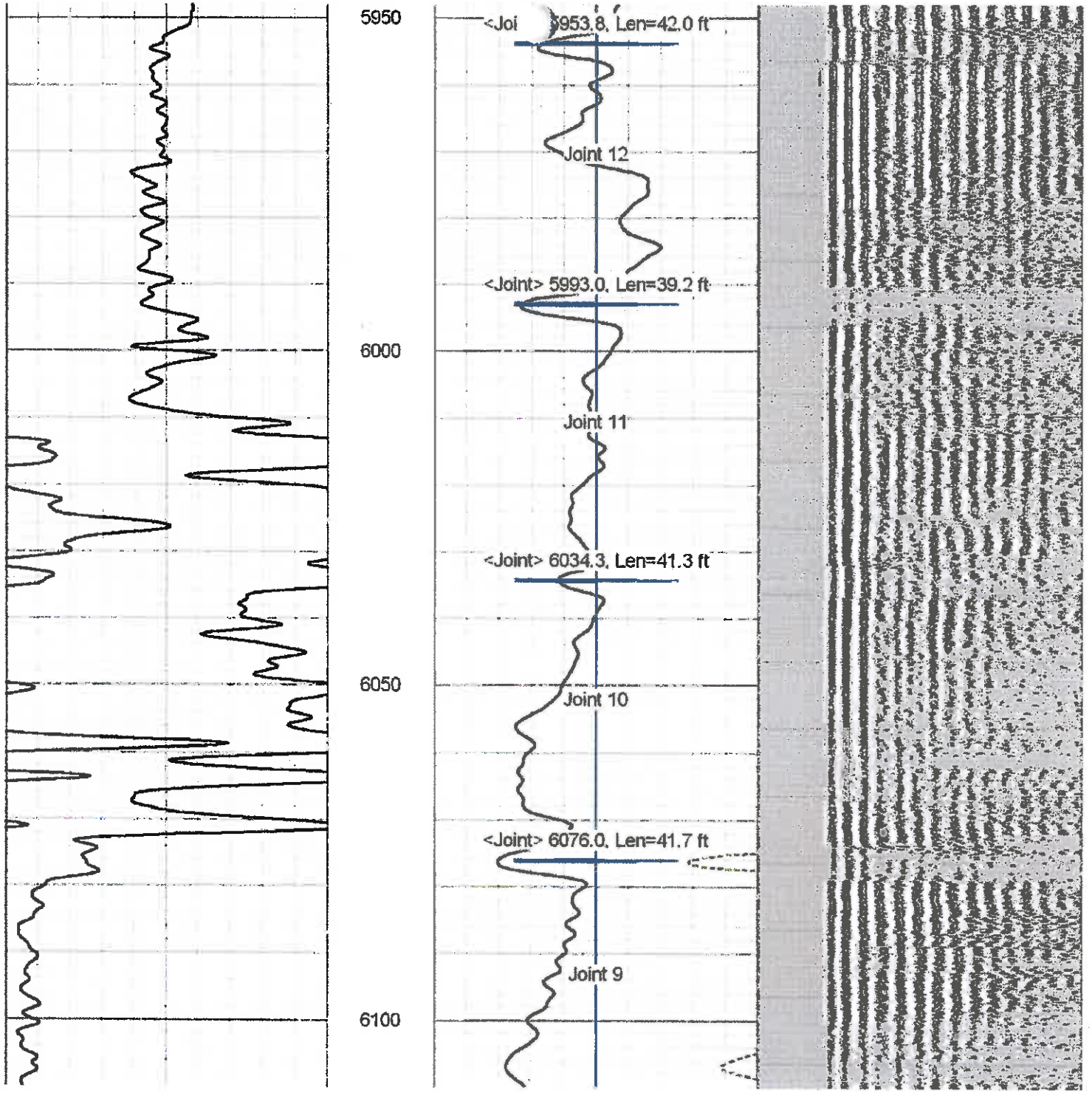
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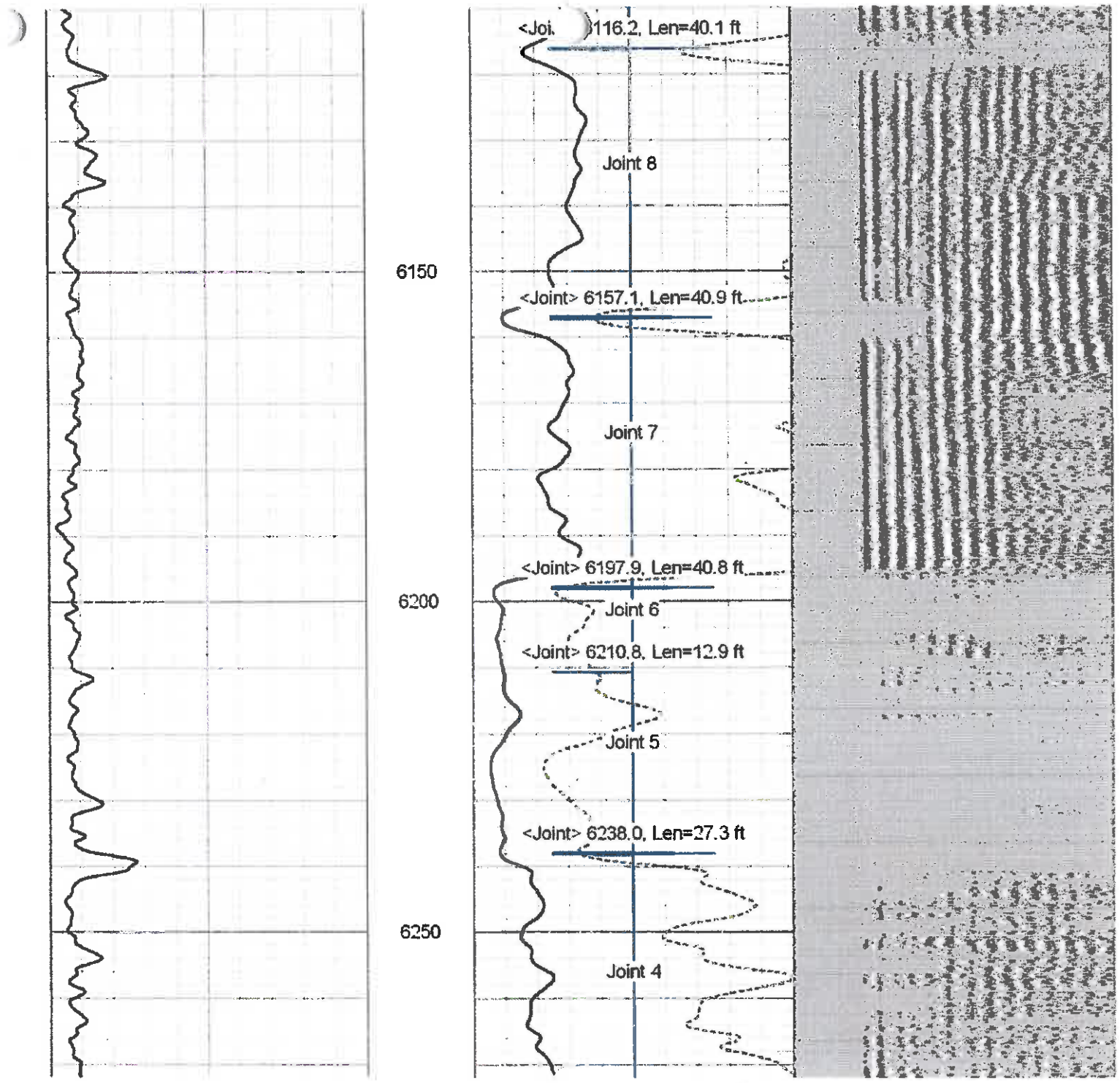
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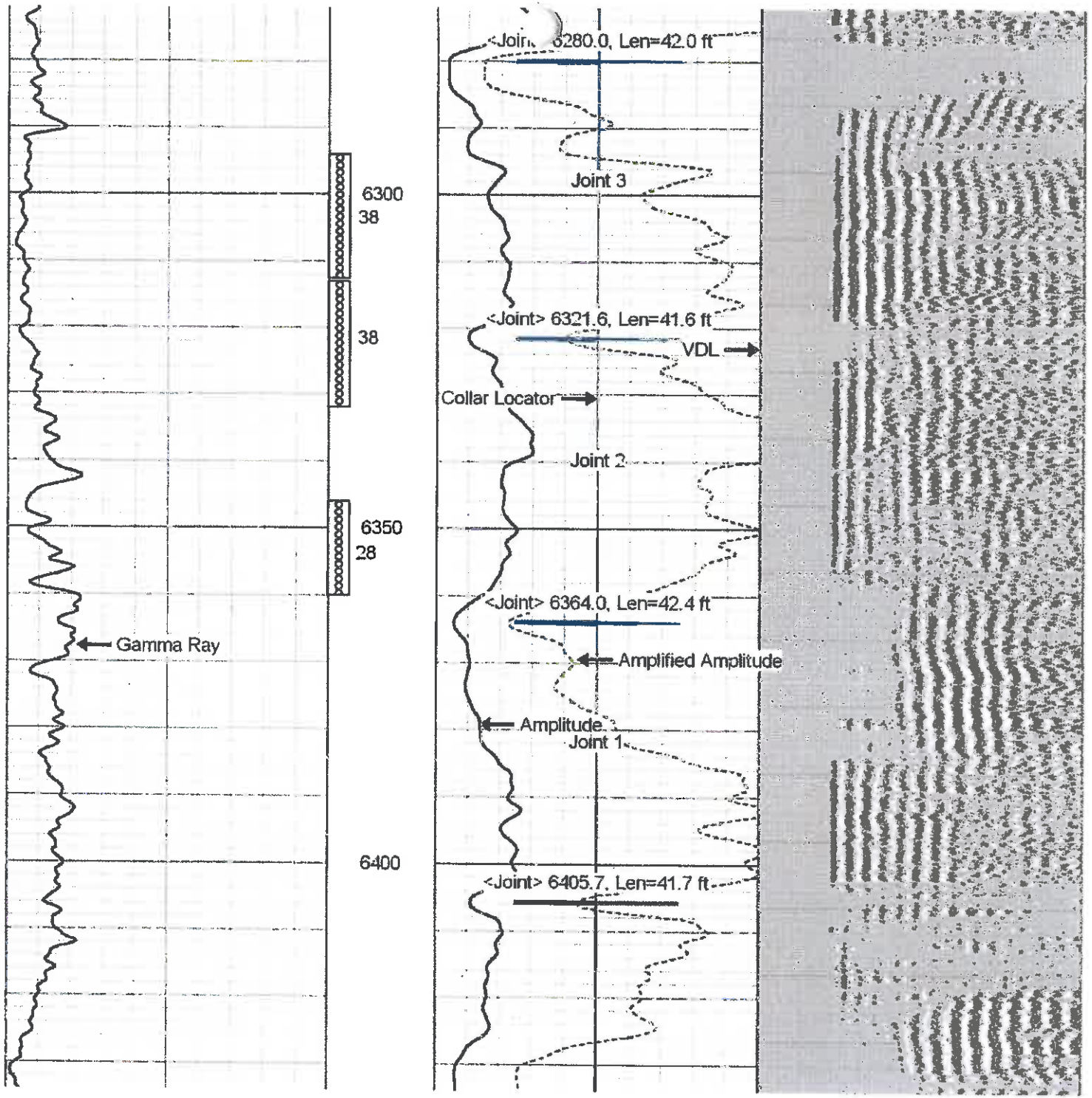
Joint 4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6350
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VDL
Collar Locator
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Amplified Amplitude
Amplitude
Joint 1
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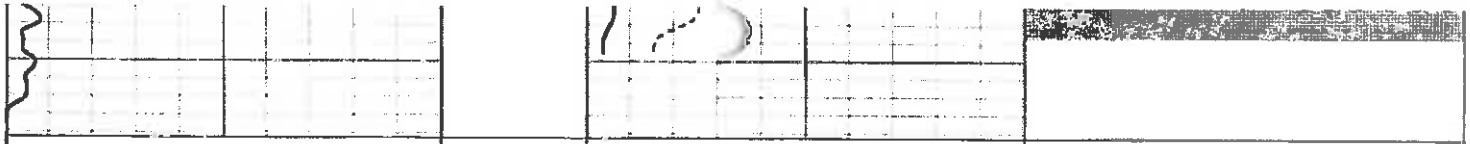
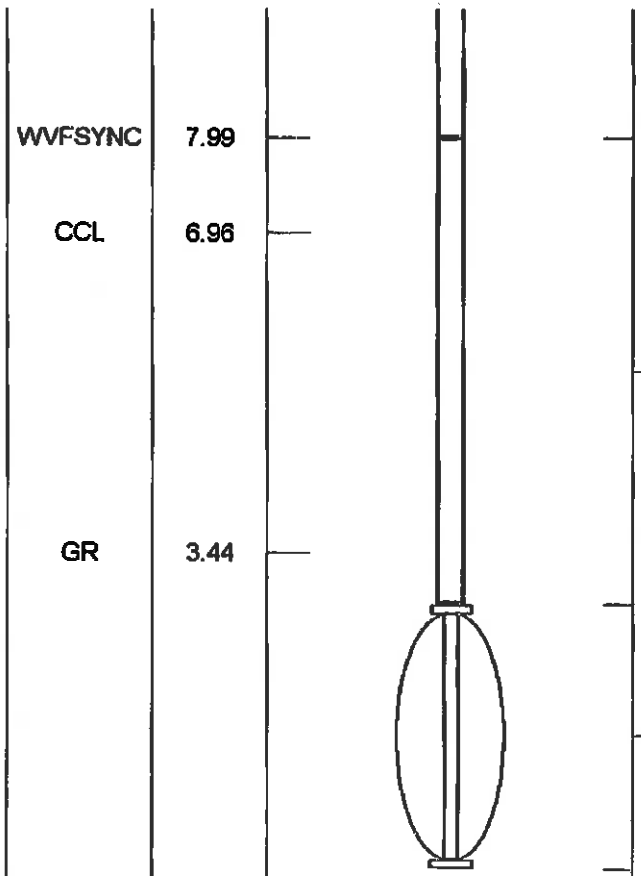


0	Gamma Ray	200	0	Amplitude (mV)	100	200	VDL	1200
200	GR	400	10	Collar Locator	-10			

NABORS
COMPLETION & PRODUCTION SERVICES CO.

TD @ 6446 FT.

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			SDSCENT Centralizer for testing	2.88	2.75	20.00
WVF3FT	12.24		CBLSIEN1x2-Probe169 (PRB169_001) Probe 1 11/16" Dual Receiver Bont	8.60	1.69	41.00
WVF5FT	11.24					

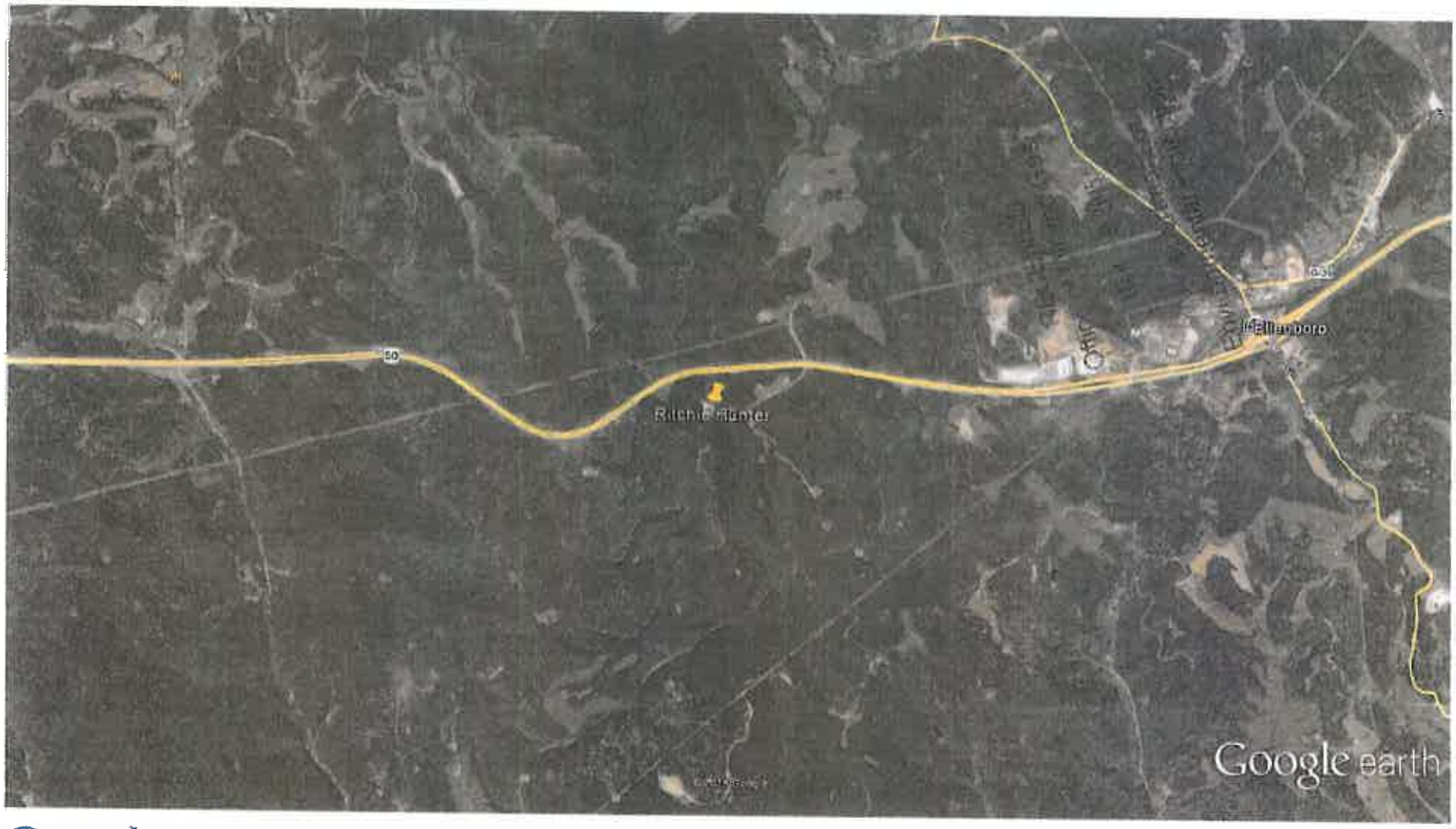


WVFSYNC	7.99				
CCL	6.96				
		GR_CCL-Probe169 (Prb169_001) Probe 1 11/16" Gamma Ray - CCL	5.12	1.69	30.00
GR	3.44				
		SDSCENT Centralizer for testing	2.88	2.75	20.00

Dataset:	whittle_masonw1652_feb42015.db: field/well/run1/pass5
Total Length:	19.47 ft
Total Weight:	111.00 lb
O.D.	2.75 in

APPENDIX B
Storage Tank Inventory

API #	Tank ID	Tank Location (UTM NAD 83 Meters)		Installation Date	Tank Age (Months)	Construction Material (Steel, plastic, etc.)	Capacity (gallons)	Type of Fluid Stored	Volume of Fluid Stored (gallons)	Tank Type Single/Double Wall
		Northing	Easting							
47-085-10142	1	4345465.21	491393.75	Aug 2012	29	Steel	16800	Brine(Dirty)		Single
47-085-10142	2	4345468.3	491390.15	Aug 2012	29	Steel	16800	Brine(Dirty)		Single
47-085-10142	3	4345470.77	491386.32	Aug 2012	29	Steel	16800	Brine(Dirty)		Single
47-085-10142	4	4345473.55	491382.49	Aug 2012	29	Steel	16800	Brine(Dirty)		Single
47-085-10142	5	4345476.02	491379.14	Aug 2012	29	Steel	16800	Brine(Dirty)		Single
47-085-10142	6	4345478.49	491375.55	Aug 2012	29	Steel	16800	Brine(Dirty)		Single
47-085-10142	7	4345469.21	491396.63	Aug 2012	29	Steel	16800	Brine(Clean)		Single
47-085-10142	8	4345471.66	491392.79	Aug 2012	29	Steel	16800	Brine(Dirty)		Single
47-085-10142	9	4345474.46	491388.96	Aug 2012	29	Steel	16800	Brine(Dirty)		Single
47-085-10142	10	4345477.24	491385.13	Aug 2012	29	Steel	16800	Brine(Dirty)		Single
47-085-10142	11	4345479.71	491381.54	Aug 2012	29	Steel	16800	Brine(Dirty)		Single
47-085-10142	12	4345482.18	491378.19	Aug 2012	29	Steel	16800	Brine(Dirty)		Single
47-085-10142	13	4345472.91	491399.75	Aug 2012	29	Steel	16800	Brine(Clean)		Single
47-085-10142	14	4345475.69	491396.15	Aug 2012	29	Steel	16800	Brine(Dirty)		Single
47-085-10142	15	4345477.85	491392.08	Aug 2012	29	Steel	16800	Brine(Dirty)		Single
47-085-10142	16	4345481.25	491387.77	Aug 2012	29	Steel	16800	Brine(Dirty)		Single
47-085-10142	17	4345483.72	491384.18	Aug 2012	29	Steel	16800	Brine(Dirty)		Single
47-085-10142	18	4345486.19	491380.11	Aug 2012	29	Steel	8820	Crude Oil		Single
47-085-10142	19	4345484.32	491392.09	Aug 2012	29	Steel	1000	Runoff Water		Single



Google earth

miles 3
km 5

Google earth

feet 500
meters 100

EL: 1056'

Google earth

feet 1000

meters 500

FIBERSPAR

FS LPJ 3" 2,500 (E)

3 Inch Nominal, 2,500 Series Fiberspar LinePipe-J w/HDPE Pressure Barrier & HDPE External Wear Layer

Product Data Sheet (Imperial Units)

ASTM 2996 Designation: RTRP-11HZ1-4112

Fiberspar s/n: JEGN030025

Physical Properties:*

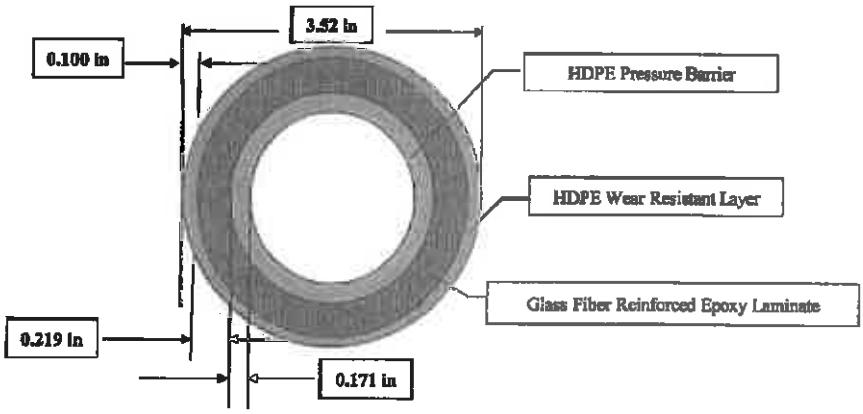
Geometry		**Tensile Modulus**	
Outside Diameter (in)	3.52	Axial (psi)	9.79E+05
Inside Diameter (in)	2.54	Hoop (psi)	1.27E+06
Inside Flow Area (in^2)	5.06	**Poisson's Ratio**	
Total Wall Thickness (in)	0.49	Major	0.49
C/S Area (in^2)	4.66	Minor	0.63
Linear Weight		**Thermal Exp. Coeff.**	
Linear Weight - Air (lb/ft)	2.88	Axial (in/in -°F)	1.15E-05
Linear Weight - Water (lb/ft)	0.87	Hoop (in/in -°F)	6.67E-06
Net Density (lb/in^2)	0.052	**Thermal Conductivity**	
Flow Coefficients		(BTU/hour/ft^2 - in/°F)	1.92
Hazen - William's	150	**Resin T_g**	
Darcy-Weisbach	0.0004	(°C)	125°
Manning	0.009	(°F)	257°

* properties listed are valid for entire temperature range of the product unless otherwise specified

Mechanical Performance:

Maximum Operating Temperature	140 °F
Minimum Operating Temperature	-29 °F

	73 °F	140 °F
Max. Recommended Operating Pressure (psi)	2,500	2,500
Nominal Ultimate Burst Pressure (psi)	9,700	8,200
Maximum Recommended Tensile Load (lbs)	13,200	10,500
Nominal Ultimate Tensile Load (lbs)	33,000	26,200
Nominal Ultimate Compressive Load (lbs)	-41,800	-27,700
Nominal Ultimate Collapse Pressure (psi)	650	650
Minimum Operating Bend Radius (in)	83	83
Minimum Spooling Diameter (in)	94	94



FS LPJ 3" 2,500 (E)

3 Inch Nominal, 2,500 Series Fiberspar LinePipe-J w/HDPE Pressure Barrier & HDPE External Wear Layer

Product Data Sheet (Metric Units)

ASTM 2996 Designation: RTRP-11HZ1-4112

Fiberspar s/n: JEGN030025

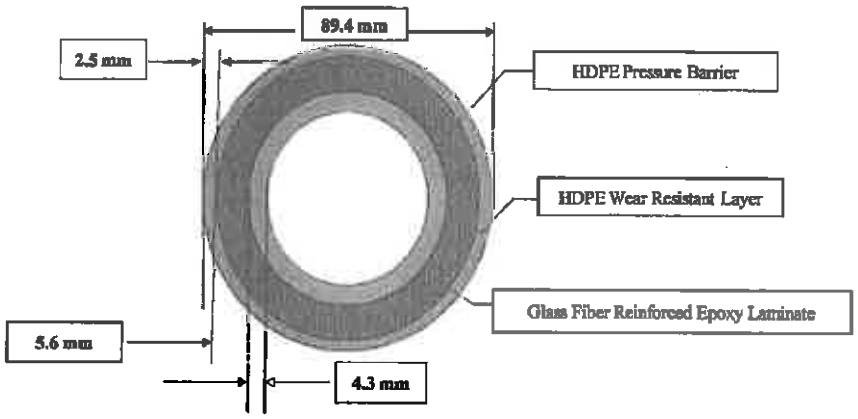
Physical Properties:*

Geometry		**Tensile Modulus**	
Outside Diameter (mm)	89	Axial (MPa)	6,748
Inside Diameter (mm)	64	Hoop (MPa)	8,732
Inside Flow Area (mm^2)	3,264	**Poisson's Ratio**	
Total Wall Thickness (mm)	12.4	Major	0.49
C/S Area (mm^2)	3,007	Minor	0.63
Linear Weight		**Thermal Exp. Coeff.**	
Linear Weight - Air (kg/m)	4.29	Axial (mm/mm-°C)	2.08E-05
Linear Weight - Water (kg/m)	1.29	Hoop (mm/mm-°C)	1.20E-05
Specific Gravity (g/cm^3)	1.43	**Thermal Conductivity**	
Flow Coefficients		(W/(m-°K))	0.273
Hazen - William's	150	**Resin T_g**	
Darcy-Weisbach	0.0004	(°C)	125°
Manning	0.009	(°F)	257°

* properties listed are valid for entire temperature range of the product unless otherwise specified

Mechanical Performance:

Maximum Operating Temperature	60 °C		
Minimum Operating Temperature	**-34 °C**	**26 °C**	**60 °C**
Max. Recommended Operating Pressure (MPa)		17.24	17.24
Nominal Ultimate Burst Pressure (MPa)		66.9	56.5
Maximum Recommended Tensile Load (kg)		5,980	4,760
Nominal Ultimate Tensile Load (kg)		14,960	11,880
Nominal Ultimate Compressive Load (kg)		-18,970	-12,570
Nominal Ultimate Collapse Pressure (kPa)		4,400	4,400
Minimum Operating Bend Radius (cm)		211	211
Minimum Spooling Diameter (cm)		239	239



SECTION 1 GENERAL INFORMATION	
Name of facility:	Ritchie Hunter SWD Facility
Type of facility:	Support Activities for Oil & Gas Operations
NAICS Number:	213112
Facility Start-up Date:	August 2012
Route and Distance to Nearest Waterway:	Approximately 3,170 feet southeast of Bonds Creek
Location of facility:	39° 15' 30.9" N 81° 05' 58.3" W Ritchie County, West Virginia
Name and address of owner/operator:	**Owner:** GreenHunter Water, LLC 1048 Texan Trail Grapevine, TX 76051 Office #: 972-410-1044 Fax #: 972-410-1066 **Operator:** GreenHunter Water, LLC 28407 State Route 7 Marietta, Ohio 45750 Office #: 740-373-4599
Designated person accountable for oil spill prevention at facility:	Dave Casto, Facility Manager
Has the facility experienced a reportable oil spill event during the twelve months prior to January 10, 1974 (effective date of 40 CFR, Part 112) (if yes, complete attachment #1)?	No

MANAGEMENT APPROVAL	
This SPCC Plan will be implemented as herein described.	
Signature:	Rick Zickefoose
Name:	Rick Zickefoose
Title:	Vice President of Operations, Appalachian Basin
Date:	11-18-14

RECEIVED
Office of Oil and Gas
MAR 9 2015
WV Department of
Environmental Protection

POTENTIAL SPILLS – PREDICTION AND CONTROL RITCHIE HUNTER SWD FACILITY					
SOURCE	MAJOR TYPE OF FAILURE	TOTAL QUANTITY (Gallons)	RATE (Gallons/ HR)	DIRECTION OF FLOW	SECONDARY CONTAINMENT
Flow Line	Leak or Rupture	-	-	North, South, East, and West	No
Storage Tanks	Leak or Rupture	294,420	16,800	North, South, and East	Yes (See Attachment # 2)

DISCUSSION

Location:

This facility is located in Ritchie County, West Virginia in the town of Ellenboro. From Parkersburg, West Virginia, travel east on US-50 for 27.0 miles. Turn right onto Co Rd 8/Bonds Creek. Drive 0.3 miles and turn right onto Co Rd 8. The facility will be on the right. The coordinates of this facility are 39° 15' 30.9" N and 81° 05' 58.3" W.

Facility Description:

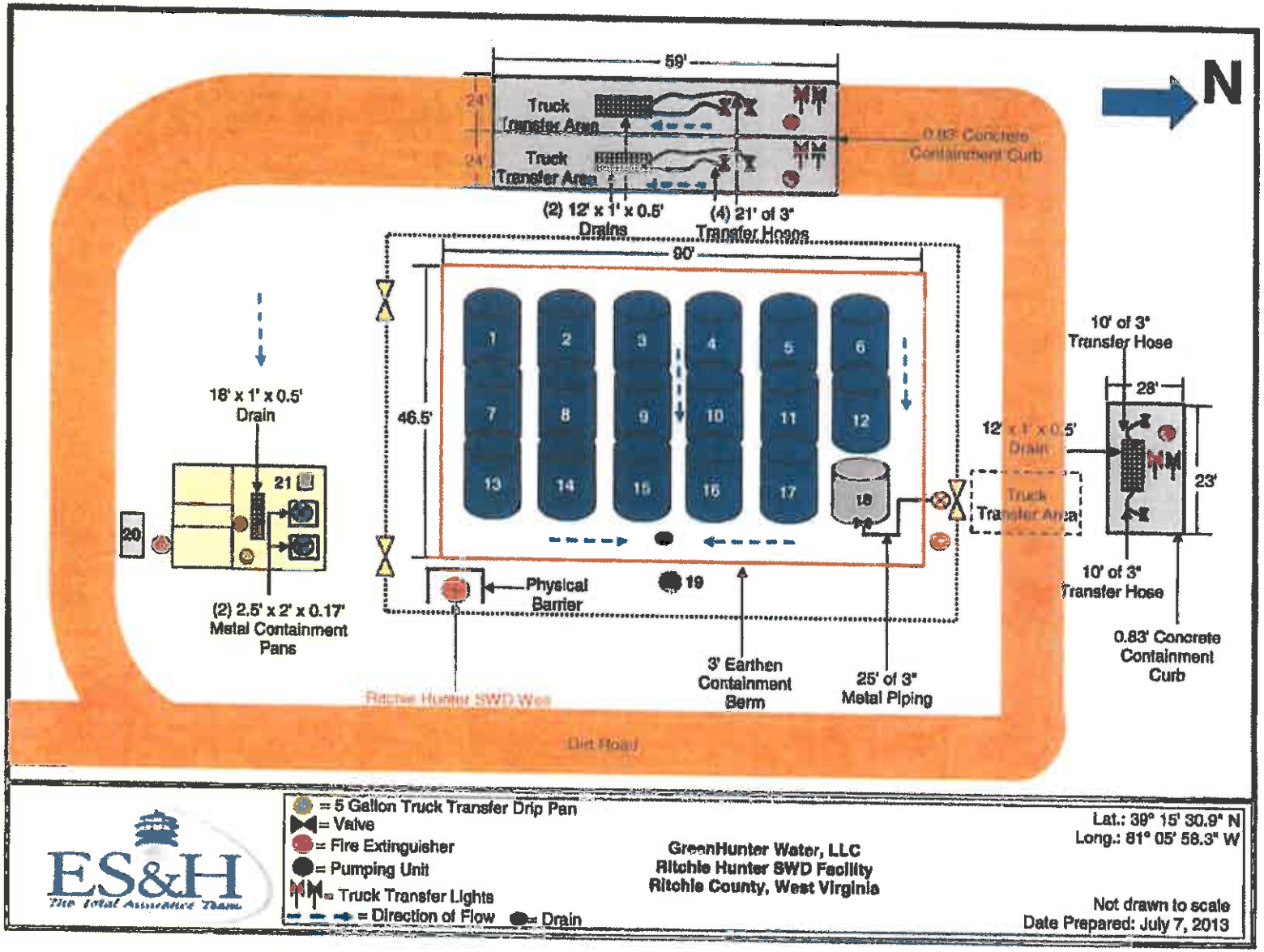
This facility is a saltwater disposal facility. This facility contains (15) 400 barrel saltwater storage tanks (dirty), (2) 400 barrel saltwater storage tanks (clean), and (1) 210 barrel oil storage tank. Presently, there is (1) saltwater injection well associated with this facility.

Saltwater is transported to this facility via truck, where it is offloaded to the saltwater storage tanks. Storm water and all fluids at the transfer area will flow into the drain and then to the underground sump. Once the underground sump reaches its maximum capacity, the product will flow to the 210 barrel crude oil/saltwater storage tank. Once the crude oil/saltwater storage tank reaches capacity, the product will be transported from this facility via truck.

(PLEASE SEE THE SITE DIAGRAM AND EVACUATION MAP(S) ON THE FOLLOWING PAGES)

WELL NAME	API #	TOWNSHIP
Ritchie Hunter Disposal Well	47-085-0-9721	Ellenboro

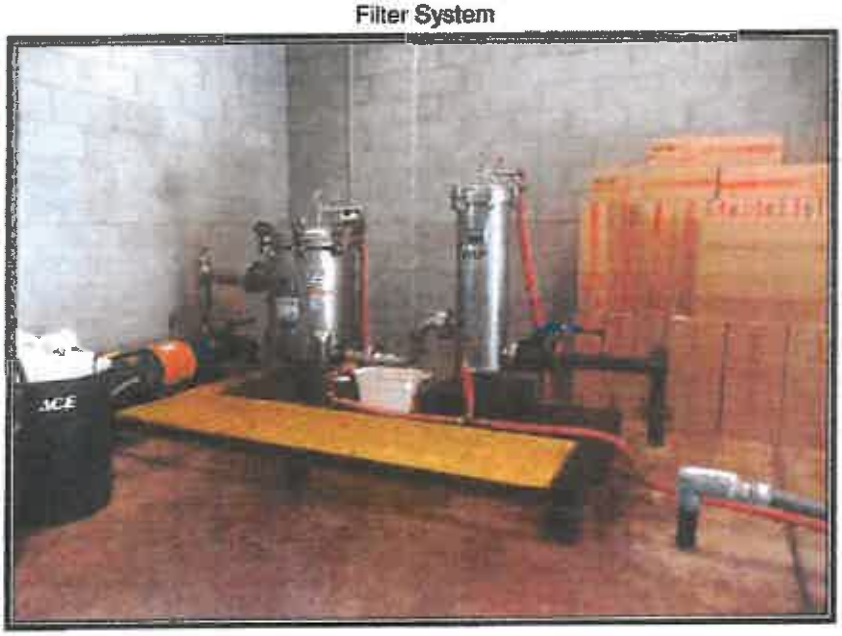
RITCHIE HUNTER SWD FACILITY EQUIPMENT LIST			
IDENTIFICATION	EQUIPMENT TYPE	CAPACITY (BARRELS)	DIMENSIONS
1	Saltwater Storage Tank (Dirty)	400	-
2	Saltwater Storage Tank (Dirty)	400	-
3	Saltwater Storage Tank (Dirty)	400	-
4	Saltwater Storage Tank (Dirty)	400	-
5	Saltwater Storage Tank (Dirty)	400	-
6	Saltwater Storage Tank (Dirty)	400	-
7	Saltwater Storage Tank (Clean)	400	-
8	Saltwater Storage Tank (Dirty)	400	-
9	Saltwater Storage Tank (Dirty)	400	-
10	Saltwater Storage Tank (Dirty)	400	-
11	Saltwater Storage Tank (Dirty)	400	-
12	Saltwater Storage Tank (Dirty)	400	-
13	Saltwater Storage Tank (Clean)	400	-
14	Saltwater Storage Tank (Dirty)	400	-
15	Saltwater Storage Tank (Dirty)	400	-
16	Saltwater Storage Tank (Dirty)	400	-
17	Saltwater Storage Tank (Dirty)	400	-
18	Oil Storage Tank	210	-
19	Underground Sump	1,000 gallons	-
20	Generator	-	-
21	Filter System	-	-


N
59'
24'
Truck Transfer Area
24'
Truck Transfer Area
0.83' Concrete Containment Curb
(2) 12' x 1' x 0.5' Drains
(4) 21' of 3" Transfer Hoses
90'
46.5'
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
21
20
18' x 1' x 0.5' Drain
(2) 2.5' x 2' x 0.17' Metal Containment Pans
Physical Barrier
3' Earthen Containment Berm
25' of 3" Metal Piping
10' of 3" Transfer Hose
28'
12' x 1' x 0.5' Drain
Truck Transfer Area
23'
10' of 3" Transfer Hose
0.83' Concrete Containment Curb
Ritchie Hunter SWD Well
Dirt Road
= 5 Gallon Truck Transfer Drip Pan
= Valve
= Fire Extinguisher
= Pumping Unit
= Truck Transfer Lights
= Direction of Flow
= Drain
ES&H
The Total Assurance Team
GreenHunter Water, LLC
Ritchie Hunter SWD Facility
Ritchie County, West Virginia
Lat.: 39° 15' 30.9" N
Long.: 81° 05' 58.3" W
Not drawn to scale
Date Prepared: July 7, 2013

GreenHunter Water, LLC
Ritchie Hunter SWD Facility
Ritchie County, West Virginia

(2) Pumping Units

Filter System



GreenHunter Water, LLC
Ritchie Hunter SWD Facility
Ritchie County, West Virginia

Overview of Saltwater Storage Tanks

Ritchie Hunter SWD Well

GreenHunter Water, LLC
Ritchie Hunter SWD Facility
Ritchie County, West Virginia

1,000 Gallon Underground Storage Tank

Overview of Transfer Area

ATTACHMENT #2
OIL SPILL CONTINGENCY AND COUNTERMEASURES PLAN
WRITTEN COMMITMENT OF MANPOWER AND MATERIALS

Secondary containment or diversionary structures are practical for all tanks and vessels at this facility.

RITCHIE HUNTER SWD FACILITY
SECONDARY CONTAINMENT CALCULATIONS

Secondary Containment Location	Secondary Containment Capacity (Gallons)	Secondary Containment Dimensions
Storage Tanks Earthen Containment Berm	93,911.40	90' x 46.5' x 3'
Storage Tanks Earthen Containment Berm with Tanks Displacement Considered	51,826.92	-
TOTAL POTENTIAL SECONDARY CONTAINMENT:	**51,826.92**	-
ADDITIONAL SECONDARY CONTAINMENT CALCULATIONS		
Underground Sump (19)	1,000.00	-
Truck Transfer Area	3,998.21	28' x 23' x 0.83'
Truck Transfer Area	8,791.09	59' x 24' x 0.83'
Truck Transfer Area	8,791.09	59' x 24' x 0.83'
Pumping Unit Metal Containment Pan	6.36	2.5' x 2' x 0.17'
Pumping Unit Metal Containment Pan	6.36	2.5' x 2' x 0.17'
Drain	67.32	18' x 1' x 0.5'
Drain	44.88	12' x 1' x 0.5'
Drain	44.88	12' x 1' x 0.5'
Drain	44.88	12' x 1' x 0.5'
Truck Transfer Drip Pan	5.00	-
TOTAL POTENTIAL SECONDARY CONTAINMENT:	**22,800.07**	-

V = Volume	A = Area
pi = 3.14	r = Radius
2r = Diameter	h = Height

For Tank Displacement (With Rupture of Largest Storage Tank):

$$V = pi \times r^2 \times h$$
$$A = pi \times r^2$$

For 16,800 Gallons (400 Barrel) Storage Tanks,

$$\text{Volume} = pi \times r^2 \times 20'$$
$$16{,}800 \text{ gallons} = pi \times r^2 \times 20'$$
$$16{,}800/62.80 = r^2$$
$$267.52 = r^2$$

$$\text{Area} = pi \times r^2$$
$$A = pi \times 267.52$$

A = 840.01 gals/ft x (16) tanks = 13,440.16 gallons/ft

Total Displacement Volume of Tanks: 13,440.16 gallons/ft x 3 ft = 40,320.48 gallons

For 8,820 Gallons (210 Barrel) Storage Tanks,

$$\text{Volume} = pi \times r^2 \times 15'$$
$$8{,}820 \text{ gallons} = pi \times r^2 \times 15'$$
$$8{,}820/47.10 = r^2$$
$$187.26 = r^2$$

$$\text{Area} = pi \times r^2$$
$$A = pi \times 187.26$$

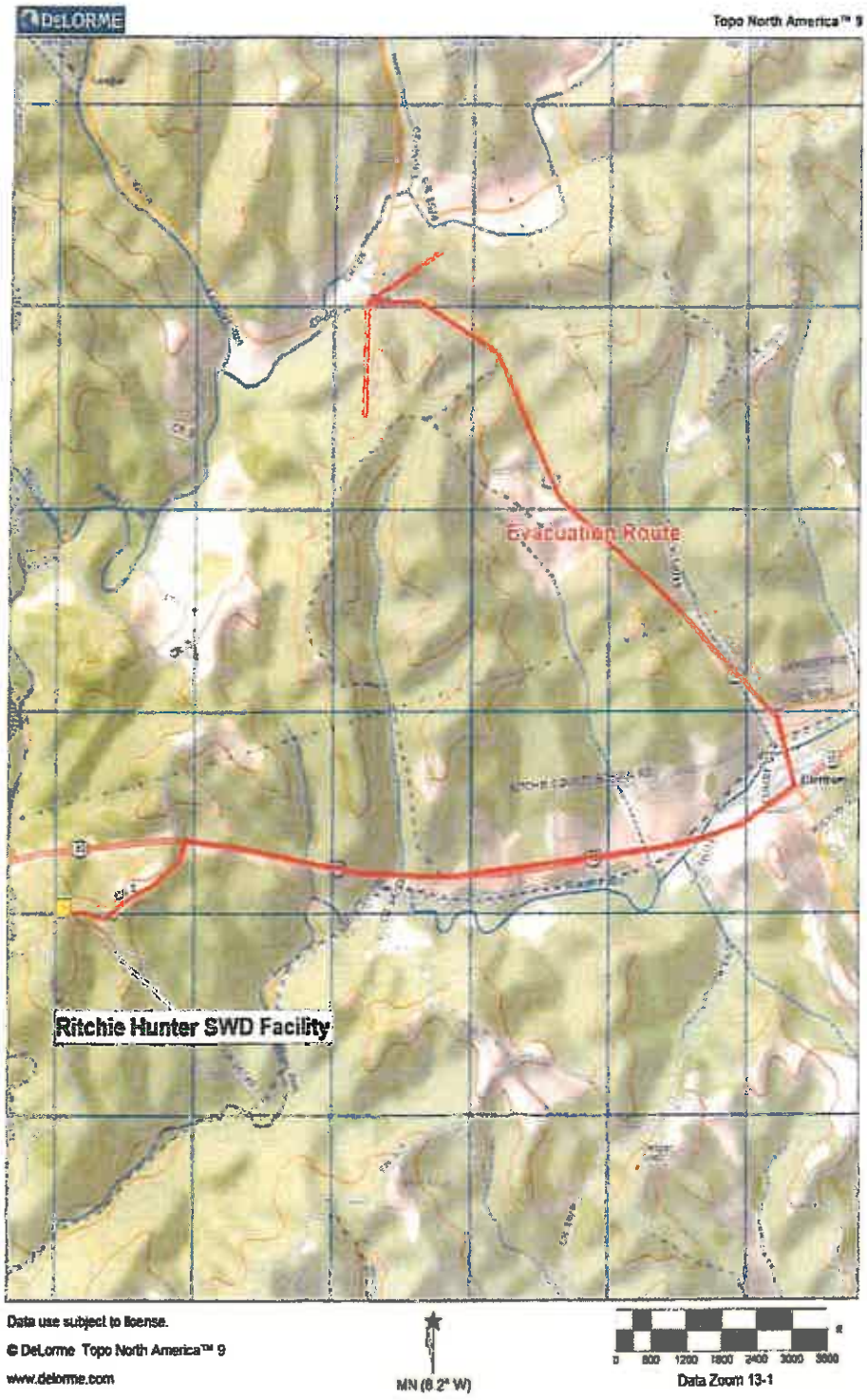
A = 588.00 gals/ft x (1) tank = 588.00 gallons/ft

Total Displacement Volume of Tanks: 588.00 gallons/ft x 3 ft = 1,764.00 gallons

Total Earthen Containment Berm Capacity with Tank Displacement Considered:
93,911.40 gallons – 40,320.48 gallons – 1,764.00 gallons = 51,826.92 gallons

Any resources needed to handle an incident in which this secondary containment is breeched will come from the contracted OSRO.

COMPANY	TYPE	CONTACT NUMBER
Summit Environmental Services	Additional Resource	1-866-737-4822
Weavertown Environmental Group	Additional Resource	800-746-4850
BBU Services, Inc.	Additional Resource	800-837-8064
ES&H Consulting Services, Inc.	Additional Resource	877-437-2634



ES&H
The Title Insurance Team

GreenHunter Water, LLC
Ritchie Hunter SWD Facility
Ritchie County, West Virginia
Topographical Evacuation Route Map
39° 15' 30.9" N/ 81° 05' 58.3" W

ES&H
The Total Assurance Team

GreenHunter Water, LLC
Ritchie Hunter SWD Facility
Ritchie County, West Virginia
Aerial Evacuation Route Map
39° 15' 30.9" N/ 81° 05' 58.3" W

SECTION 1 GENERAL INFORMATION (CONTINUED)	
Containment or diversionary structures or equipment to prevent oil from reaching navigable waters are practical. (If NO, Complete Attachment #2)	YES
Inspections and Records The required inspections follow written procedures. The written procedures and a record of inspections, signed by the appropriate supervisor or inspector, are attached. Discussion: The site manager makes visual inspections of the facility equipment on a daily basis. All facility safety devices and facility equipment are thoroughly inspected, tested, and results documented on a weekly basis. All inspection documentation is kept at the Ritchie Hunter Facility office and the Marietta office. Records of inspections or tests, signed by supervisor or inspector, are kept in plan for at least three years.	YES YES
Personnel Training and Spill Prevention Procedures Personnel are properly instructed in the following: 1. Operations and maintenance of equipment to prevent oil discharges 2. Applicable pollution control laws, rules, and regulations 3. Discharge procedure protocols (discovery and notification) 4. Discharge prevention measures, which include procedures for routine handling of products Description of procedures employed for instruction: In house instruction is provided to personnel regarding operation and maintenance of equipment and applicable pollution control laws, rules, and regulations. On the job instructions are utilized as needed to keep oil spill prevention training up to date. The general program includes the protocols of HAZWOPER outlined in 29 CFR 1910.120. Scheduled prevention briefings for the operating personnel are conducted frequently enough to assure adequate understanding of the SPCC Plan: Description of Briefing Program: Annual spill prevention briefings and other personnel meetings are conducted at the facility to discuss safety, pollution control, and the requirements of the SPCC Plan. The site manager also uses this time to discuss pollution prevention regulations and any incidents that may have occurred prior to the meeting. The Discharge Prevention Meeting Log will be kept in Section 12 of this plan.	YES YES YES YES YES

SECTION 1
GENERAL INFORMATION (CONTINUED)

Applicable Regulations:

This plan was prepared in accordance with 40 CFR Part 112, 40 CFR Part 109.5, and 35 CSR 1-7. This plan follows the 40 CFR regulations, along with incorporating the 35 CSR 1-7 requirements.

GREEN HUNTER, LLC.

Permitted Oil & Gas Wells & domest well

1/4 Mile AOR around proposed SWIW

Topographic map c.i. = 20 FEET

Ritchie Co., W. Va.

POSTED WELL DATA

UWI

WELL SYMBOLS
- Abandoned Oil Well
- Cancelled Permit
- Dry Hole
- Gas Well
- Location Only
- Oil & Gas Well
- Oil Well
- Plugged and Abandoned
- SALT WATER DISPOSAL
- Unknown Status
- WATER INTAKE

REMARKS

Red Arrow indicates proposed disposal site
Black Circle: 1-mile radius around proposed site
PURPLE ARROW = Domestic Water Well

By: R. Brown 3/4/2015

0 — 2,500 FEET

APPENDIX C

Wells within the Area of Review

API #	Well Type	Well Status (Active, Abandoned, Shut-in, Plugged)	Northing (UTM NAD 83 Meters)	Easting (UTM NAD 83 Meters)	Penetrate Injection Zone (Y or N)	Penetrate Confining Zone (Y or N)	Total Vertical Depth	Surface Elevation
47-085-05555	Gas	Active	4345234.80	491296.24	N	N	5160	1060
47-085-09767	Cancelled	Abandoned	4344972.28	491661.26	N	N	6300	1002
47-085-91226	O&G	Plugged	4344945.77	491650.20	N	N	1400	1000
47-085-09721	SWD	Active	4345452.91	491378.19	Y	Y	6146	1057

Make as many copies as necessary and include page numbers as appropriate.

GREEN HUNTER, LLC.

Permitted Oil & Gas Wells & domest well

1-Mile Radius around proposed SWIW

Topographic map c.i. = 20 FEET

Ritchie Co., W. Va.

POSTED WELL DATA

UWI

WELL SYMBOLS

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- Location Only
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- Unknown Status
- WATER INTAKE

REMARKS

Red Arrow indicates proposed disposal site
Black Circle: 1-mile radius around proposed site
PURPLE ARROW = Domestic Water Well

By: R. Brown 3/4/2015

0 — 2,500
FEET

GREEN HUNTER, LLC.

Permitted Oil & Gas Wells

1-Mile Radius around proposed SWIW

Ritchie Co., W. Va.

POSTED WELL DATA

UWI

WELL SYMBOLS

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- Cancelled Permit
- Dry Hole
- Gas Well
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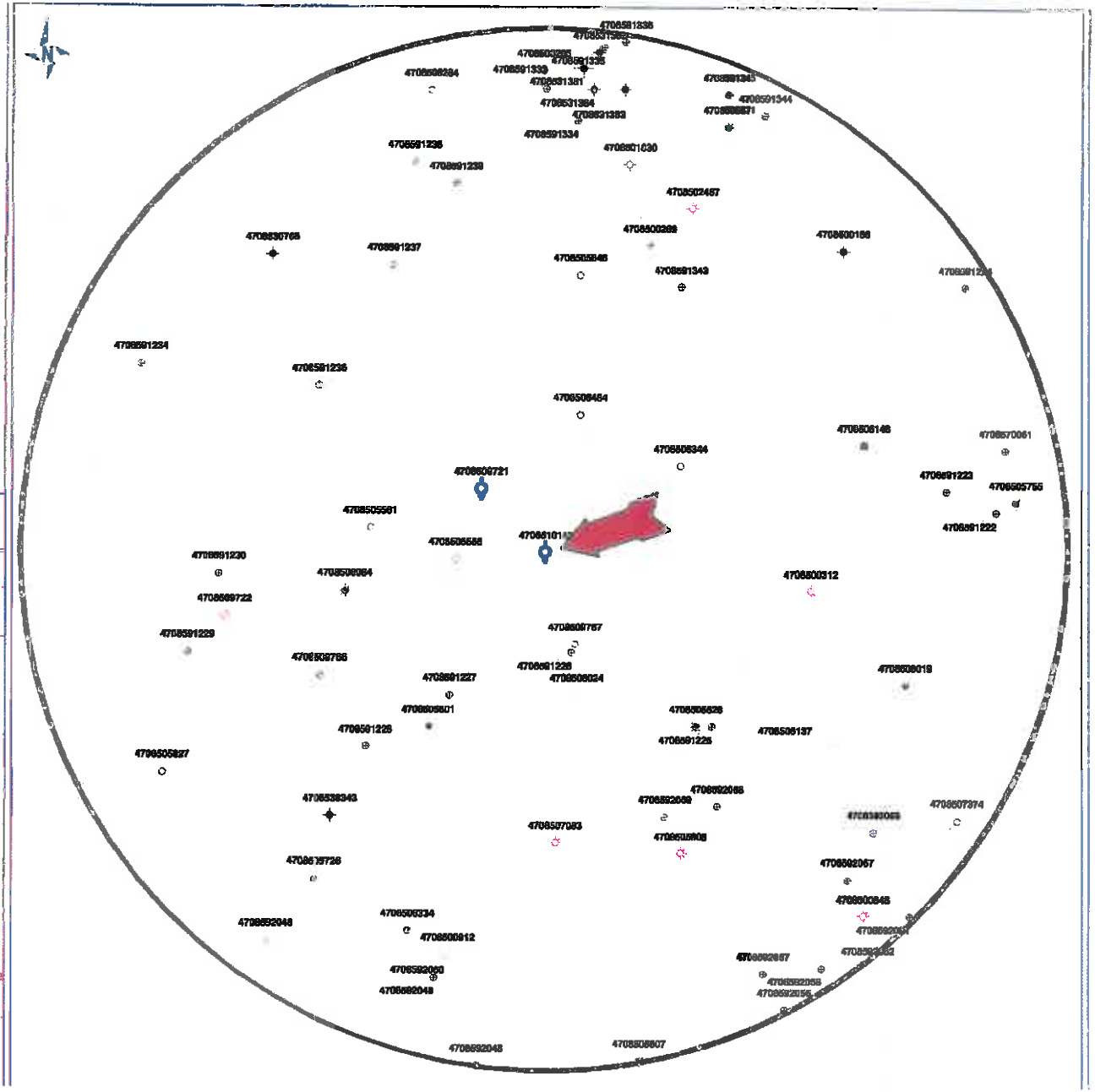
- Oil Well
- Plugged and Abandoned
- SALT WATER DISPOSAL
- Unknown Status

REMARKS

Red Arrow indicates proposed disposal site
Black Circle: 1-mile radius around proposed site

By: R. Brown 3/4/2015

0 2,500
FEET



	UWI/API	WELLNAME	WELLNO	OPER	SYM	FIELD	SURFLAT	SURFLON	COUNTY	FM@TD	LAUEL	HISTOPER	WELL COMP_DATE	WELL SPUD_DATE	WELL PERMIT_DATE	WELL ELEV_GR	WELL TD
	4708500912	THOMAS W MURRAY 1		BUCKEYE OIL PRODUCING CO.	GAS	GRANT	39.255527	-81.086187	RITCHIE	KEENER	4708500912	Orphan well proj	1/1/1936	1/1/1936		760	1650
	4708500848	FRANK FINLEY 3	3	TRIAD HUNTER VIRCO	GAS	GRANT	39.248817	-81.088915	RITCHIE	SQUAW	BIG INJUN	MOOM GAS CO	1/1/1940		7/4/2005	968	2107
	4708500911	DAN LOY 2	2	RENO OIL CO.	GAS	GRANT	39.245415	-81.1011	RITCHIE	SQUAW	SQUAW	Reno Oil Co.	1/1/1941			765	1690
	4708501830	PAUL GOODWIN 1	1	MID-EAST OIL	DRY	GRANT	39.267581	-81.094711	RITCHIE	BIG INJUN	BIG INJUN	Mid-East Oil	9/8/1951			822	1978
	4708502467	GOODWIN	2	Mid-East Oil	GAS	GRANT	39.265155	-81.092461	RITCHIE	Big INJUN	BIG INJUN	Mid-East Oil	1/1/1961			962	2099
X	4708505855	VARNER	1	XTO ENERGY, INC.	GAS	GRANT	39.256988	-81.10088	RITCHIE		4708505855	Haught, Inc.	11/1/1982	10/25/1982		1080	5160
	4708505561	E & M Mason	1	B & L Oil Co.	CANC	GRANT	39.25727	-81.10391	RITCHIE		CANCELLED						0
	4708505571	MASON	2B	DUNN, J. L.	O&G	GRANT	39.266444	-81.091178	RITCHIE	LO HURON	LO HURON	G & S Drilling Co.	8/11/1982	8/7/1982		1050	4296
	4708505607	HENRY & ESTHER SIERS 1	1	PETRO-MARK, INC.	O&G	GRANT	39.242459	-81.094527	RITCHIE	HURON	HURON	Petro-Mark, Inc.	6/10/1982	6/14/1982		1080	4592
	4708505608	SIERS	2	PETRO-MARK, INC.	GAS	GRANT	39.248256	-81.092897	RITCHIE	HURON	HURON	Petro-Mark, Inc.	7/19/1982	7/15/1982		908	4527
	4708505628	SMITH	1	PETROLEUM DEVELOPMENT CORP.	O&G	GRANT	39.251753	-81.092258	RITCHIE		4708505628	Petroleum Developmen	7/11/1982	6/28/1982		860	3926
	4708505646	GOODWIN, PAUL K.	1	KOBER OIL, INC.	CANC	GRANT	39.28427	-81.09647	RITCHIE	DEV SHALE	CANCELLED					990	0
	4708505726	DILLY	1	HUGHES RIVER OIL & GAS COMPAN	O&G	GRANT	39.247533	-81.10588	RITCHIE		4708505726	Buchanan, Wayman W.	8/4/1982	7/28/1982		780	4806
	4708505755	HISSEM	1	HUGHES RIVER OIL & GAS COMPAN	O&G	GRANT	39.257994	-81.090867	RITCHIE		4708505755	Panther Fuel Co.	10/6/1982	9/23/1982		805	5580
	4708505801	DILLY	2	HUGHES RIVER OIL & GAS COMPAN	O&G	GRANT	39.251733	-81.101814	RITCHIE		4708505801	Buchanan, Wayman W.	11/18/1982	11/18/1982		725	4894
	4708505827	Wm O Hewitt	1	Petroleum Development Corp.	CANC	GRANT	39.25046	-81.11128	RITCHIE		CANCELLED	Petroleum Developmen				975	0
	4708506019	RAY CROSS 1	CROSS 1	HUGHES RIVER OIL & GAS COMPAN	O&G	GRANT	39.252915	-81.094827	RITCHIE	ANGOLA	ANGOLA	Buchanan, Wayman W.	12/31/1982	11/26/1982		895	4980
	4708506024	SMITH	2	XTO ENERGY, INC.	GAS	GRANT	39.252624	-81.096587	RITCHIE	ANGOLA	ANGOLA	Petroleum Developmen	12/3/1982	11/28/1982		930	5059
	4708506084	MASON	1	UNIVERSAL PETROLEUM, INC.	O&G	GRANT	39.255527	-81.1049	RITCHIE		4708506064	Uranus Geo Co., Inc.	1/8/1983	12/30/1982		900	5144
	4708506137	JO-IN REROAD 1-A	1-A	SLAUSER WELL SERVICES, INC.	GAS	GRANT	39.251175	-81.08912	RITCHIE		4708506157	Energex Oil & Gas Co	1/25/1983	1/1/1983		850	5722
	4708506148	GRIMES	1	HUGHES RIVER OIL & GAS COMPAN	O&G	GRANT	39.259591	-81.08832	RITCHIE		4708506148	Panther Fuel Co.	5/30/1983	5/23/1983		940	5784
	4708506284	Everett & Mary M Wilson	H-1343	Haught, Inc.	CANC	GRANT	39.26948	-81.10176	RITCHIE		CANCELLED	Haught, Inc.				780	0
	4708506285	UNKNOWN	H-1344	HAUGHT, INC	CANC	GRANT	39.26998	-81.09779	RITCHIE		4708506285						0
	4708506334	GRIFFORD BASHAM	H-1390	MOUNTAIN V OIL AND GAS, INC.	OIL	GRANT	39.245081	-81.102525	RITCHIE	ANGOLA	ANGOLA	Bore, Inc. / Hufco,	6/10/1994	6/9/1994		659	5007
	4708506344	Philip Nuhfer	1	Uranus Geo Co., Inc.	CANC	GRANT	39.259	-81.09287	RITCHIE		CANCELLED						0
	4708506484	Everett Mason	H-1411	HAUGHT, INC.	CANC	GRANT	39.2604	-81.09647	RITCHIE		CANCELLED						0
	4708507088	MOORE	522	ZICKEFOOSE, W. F. AND R. L.	GAS	GRANT	39.248549	-81.097809	RITCHIE		4708507088	CNG Development Co.	8/20/1984	8/14/1984		922	5100
	4708507974	Francis & Barbara Seese	H-1579	Haught, Inc	CANC	GRANT	39.24918	-81.08295	RITCHIE		CANCELLED						0
X	4708508731	HAUGHT	W-1590	Haught Energy Corp	SWD	GRANT	39.258384	-81.099934	RITCHIE	GENESEO	GENESEO, INJECTION	Trans-Capital Invest	9/30/2008	7/2/2008	4/16/2008	1057	6145
	4708509722	Heartwood Forestland Fund	W-1591	TRANS-CAPITAL INVEST	GAS	GRANT	39.254891	-81.109094	RITCHIE	LO HURON	LO HURON	Trans-Capital Invest	8/30/2008		5/7/2008	854	3068
	4708531381	J N DELANCY 1	1	HANLON OIL & GAS CO.	ABOIL	GRANT	39.270059	-81.0964	RITCHIE	KEENER	KEENER	Hanlon Oil & Gas Co.				920	1969
	4708500269	Charles O Delancey	1	Orphan well proj	UNKN	GRANT	39.265106	-81.099975	RITCHIE			Orphan well proj				900	
	4708500186	James E Aikire 1	1	Orphan well proj	P&A	GRANT	39.264961	-81.087067	RITCHIE	BIG INJUN	BIG INJUN	Orphan well proj				1085	2080
	4708509766	HEARTWOOD FORESTLAND	W1602	TRANS-CAPITAL INVEST	CANC	GRANT	39.253159	-81.10569	RITCHIE	MARCELLUS	4708509766				10/31/2008	928	6400
X	4708509767	HAUGHT	W1603	TRANS-CAPITAL INVEST	CANC	GRANT	39.254036	-81.096646	RITCHIE	MARCELLUS	CANCELLED				10/31/2008	1002	6300
	4708531384	UNKNOWN		UNKNOWN	P&A	GRANT	39.269472	-81.096027	RITCHIE		4708531384	Hanlon Oil & Gas Co.					
	4708531383	UNKNOWN		UNKNOWN	P&A	GRANT	39.269472	-81.094907	RITCHIE		4708531383	Hanlon Oil & Gas Co.					
	4708531382	UNKNOWN		UNKNOWN	P&A	GRANT	39.270486	-81.09584	RITCHIE		4708531382	Hanlon Oil & Gas Co.					
	4708530343	UNKNOWN		UNKNOWN	P&A	GRANT	39.249174	-81.105921	RITCHIE		4708530343	Henaghan & Hanlon					
	4708530765	M E Fox	1	Hanlon Oil & Gas Co.	P&A	GRANT	39.264828	-81.107414	RITCHIE		4708530765	Hanlon Oil & Gas Co.					
	4708570061	Fox Biddie 1	1	Findley, Frank	UNKN	GRANT	39.259446	-81.081241	RITCHIE		4708570061	Findley, Frank	1/1/1922				
	4708591227	UNKNOWN		UNKNOWN	UNKN	GRANT	39.252836	-81.101067	RITCHIE		4708591227						
	4708591234	UNKNOWN		UNKNOWN	UNKN	GRANT	39.26178	-81.11208	RITCHIE		4708591234						
	4708591230	UNKNOWN		UNKNOWN	UNKN	GRANT	39.255974	-81.10928	RITCHIE		4708591230						
	4708591228	UNKNOWN		UNKNOWN	UNKN	GRANT	39.251185	-81.104054	RITCHIE		4708591228						
	4708591238	UNKNOWN		UNKNOWN	UNKN	GRANT	39.26744	-81.102374	RITCHIE		4708591238						
X	4708591226	UNKNOWN		UNKNOWN	UNKN	GRANT	39.253797	-81.096774	RITCHIE		4708591226						
	4708591225	UNKNOWN		UNKNOWN	UNKN	GRANT	39.251785	-81.091738	RITCHIE		4708591225						
	4708591224	UNKNOWN		UNKNOWN	UNKN	GRANT	39.263957	-81.082684	RITCHIE		4708591224						
	4708591223	UNKNOWN		UNKNOWN	UNKN	GRANT	39.258287	-81.085333	RITCHIE		4708591223						
	4708591222	UNKNOWN		UNKNOWN	UNKN	GRANT	39.257716	-81.081574	RITCHIE		4708591222						
	4708591229	UNKNOWN		UNKNOWN	UNKN	GRANT	39.259797	-81.1104	RITCHIE		4708591229						
	4708591236	UNKNOWN		UNKNOWN	UNKN	GRANT	39.261199	-81.105734	RITCHIE		4708591236						
	4708591237	UNKNOWN		UNKNOWN	UNKN	GRANT	39.264537	-81.10312	RITCHIE		4708591237						
	4708591239	UNKNOWN		UNKNOWN	UNKN	GRANT	39.26686	-81.10088	RITCHIE		4708591239						
	4708591233	UNKNOWN		UNKNOWN	UNKN	GRANT	39.269472	-81.097707	RITCHIE		4708591233						
	4708591236	UNKNOWN		UNKNOWN	UNKN	GRANT	39.270778	-81.094907	RITCHIE		4708591236						
	4708591234	UNKNOWN		UNKNOWN	UNKN	GRANT	39.268601	-81.096587	RITCHIE		4708591234						
	4708591244	UNKNOWN		UNKNOWN	UNKN	GRANT	39.268747	-81.089887	RITCHIE		4708591244						
	4708591235	UNKNOWN		UNKNOWN	UNKN	GRANT	39.270633	-81.095653	RITCHIE		4708591235						
	4708591243	UNKNOWN		UNKNOWN	UNKN	GRANT	39.263957	-81.092859	RITCHIE		4708591243						
	4708591245	UNKNOWN		UNKNOWN	UNKN	GRANT	39.260327	-81.091178	RITCHIE		4708591245						
	4708592061	UNKNOWN		UNKNOWN	UNKN	GRANT	39.248517	-81.084638	RITCHIE		4708592061						
	4708592069	UNKNOWN		UNKNOWN	UNKN	GRANT	39.249274	-81.098898	RITCHIE		4708592069						
	4708592062	UNKNOWN		UNKNOWN	UNKN	GRANT	39.245936	-81.085187	RITCHIE		4708592062						
	4708592066	UNKNOWN		UNKNOWN	UNKN	GRANT	39.248899	-81.085942	RITCHIE		4708592066						
	4708592068	UNKNOWN		UNKNOWN	UNKN	GRANT	39.249565	-81.091582	RITCHIE		4708592068						
	4708592067	UNKNOWN		UNKNOWN	UNKN	GRANT	39.247533	-81.086874	RITCHIE		4708592067						
	4708592056	UNKNOWN		UNKNOWN	UNKN	GRANT	39.243904	-81.08911	RITCHIE		4708592056						
	4708592057	UNKNOWN		UNKNOWN	UNKN	GRANT	39.24492	-81.089855	RITCHIE		4708592057						
	4708592050	UNKNOWN		UNKNOWN	UNKN	GRANT	39.245356	-81.101223	RITCHIE		4708592050						
	4708592048	UNKNOWN		UNKNOWN	UNKN	GRANT	39.242508	-81.100104	RITCHIE		4708592048						
	4708592046	UNKNOWN		UNKNOWN	UNKN	GRANT	39.245791	-81.107557	RITCHIE								
	4708592049	UNKNOWN		UNKNOWN	UNKN	GRANT	39.244775	-81.101594	RITCHIE		4708592049						
	4708592058	UNKNOWN		UNKNOWN	UNKN	GRANT	39.245065	-81.087805	RITCHIE		4708592058						
X	4708510421	PEARL EVERETT MASON & NATHAN	2 (W 1652)	GREENHUNTER	SWD	GRANT	39.256586	-81.097677	RITCHIE	ORISKANY	PROPOSED ORISKANY, INJECTION	HAUGHT ENERGY CORPOR	1/15/2015	1/5/2015	10/3/2014	1021	6480
X	4708SWATERWELL11	POTABLE WATER	11	GREENHUNTER	WATER	GRANT	39.258811	-81.099721	RITCHIE	MANNINGTON AC	GREENHUNTER POTABLE WATERWELL						

UWI/API	1/4 MILE AOR	PENETRATE INJECT ZONE?	PENETRATE CONFINE ZONE?	WELLNAME	WELLNO	OPER	SYMBOL	FIELD	SURFLAT	SURFLON	COUNTY	FM@TD	LABEL	HISTOPER	WELL COMP_DATE	WELL SPUD_DATE	WELL PERMIT_DATE	WELL ELEV_GR	WELL TD
4708505555	Y	N	N	WARNER	1	XTO ENERGY, INC.	GAS	GRANT	39.256288	-81.10008	RITCHIE	ANGOLA	4708505555	Haught, Inc.	11/1/1982	10/25/1982		1080	3180
4708509767	Y	N	N	HAUGHT	W1803	TRANS-CAPITAL INVEST	CANC	GRANT	39.254036	-81.096846	RITCHIE	CANCELLED	CANCELLED		CANCELLED	CANCELLED	10/31/2008	1002	(6300)
4708501228	Y	N	N	UNKNOWN		UNKNOWN	UNKN	GRANT	39.258797	-81.096774	RITCHIE	KEENER	4708501228						1400
4708510142	Y	Y	Y	PEARL EVERETT MASON & NATHAN	2 (W 1852)	GREEN HUNTER	SWD	GRANT	39.256586	-81.097877	RITCHIE	HELDERBERG	PROPOSED ORISKANY, INJECTION	HAUGHT ENERGY CORFOR	1/15/2015	1/5/2015	10/3/2014	1021	6480
4708509721	N	Y	Y	HAUGHT	W-1590	HAUGHT ENERGY CORP.	SWD	GRANT	39.256364	-81.099934	RITCHIE	ORISKANY	GENESEO, INJECTION	Trans-Capital Invest	9/30/2009	7/2/2006	4/16/2008	1057	6146

Geological Investigation: Oriskany Sand Injection Well, API 4708510142

Background

The PEARL MASON & NATHANAEL L. MASON #2 (W 1652) well is located in Grant District, Ritchie County, West Virginia (Ellenboro quadrangle) and was originally drilled in January, 2015 to a depth of approximately 6,480' kb. It is presently owned by GreenHunter, LLC of Reno, Ohio.

Completed using 4 ½" production casing cemented to ~ 4,460' KB, the well was equipped with a 4 ½" production string, set at 6,446' kb. The production casing was perforated across the Oriskany Sandstone interval from 6,294' to 6,359' kb 104 perforations, then acidized with hydrochloric acid.

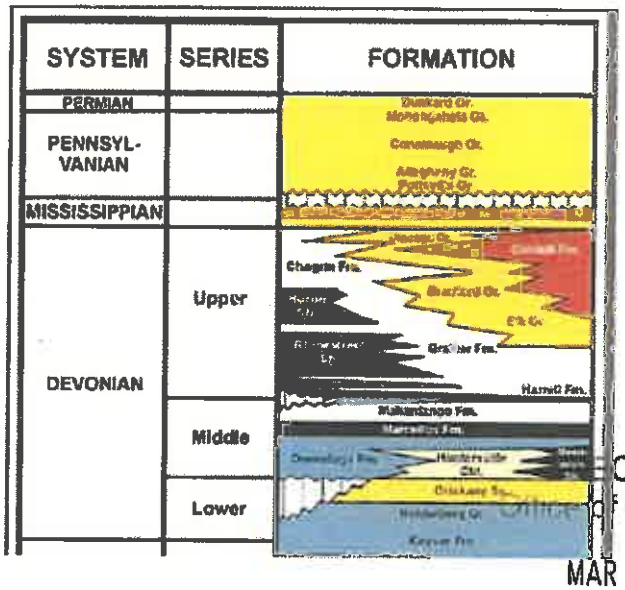
The objective of this effort is to obtain UIC authorization.

Geologic Setting

The Injection Zone is the Oriskany Sandstone, a Lower-Devonian-age fine to medium grain, calcareous arenite, with angular to sub-angular grains and silica and carbonate as the bonding material. In the study area, primary porosity is typically intergranular, and varies from two to ten percent. Secondary porosity occurs from dissolution of carbonate constituents, with production occurring from a combination of stratigraphic and structural traps, especially in updip-Oriskany Sandstone pinch-outs.

In Ritchie County, the source for the Oriskany is the eastern Appalachian Front, which contributed the sand into a foreland basin that covered central West Virginia.

Bound above by the Devonian-age Onondaga Limestone and below by the Helderberg Limestone, the Oriskany Injection zone is effectively sealed by these two very low-permeability carbonates.



The lower Confining Stratum, the Helderberg Limestone, is a very low-permeability, microcrystalline, marine carbonate with occasional chert. The Oriskany sand is hydraulically isolated below by the Helderberg Limestone.

The upper Confining Stratum is the Middle-Devonian Onondaga Limestone, as shown on the stratigraphic column, above. This unit, sometimes referred to as the "Corniferous" represents the top of the drillers "Big Lime". It is a very light grey to buff color, microcrystalline, marine carbonate with very low permeability.

Significant near-by structural features include the Burning Springs Anticline (eight miles, westward) and the Rome Trough, within which the subject well lays.

The nearest faulting to the subject well is shown in Figure 2. The north-south , high-angle fault lays about six miles to the west. No faults are indicated within the AOR.

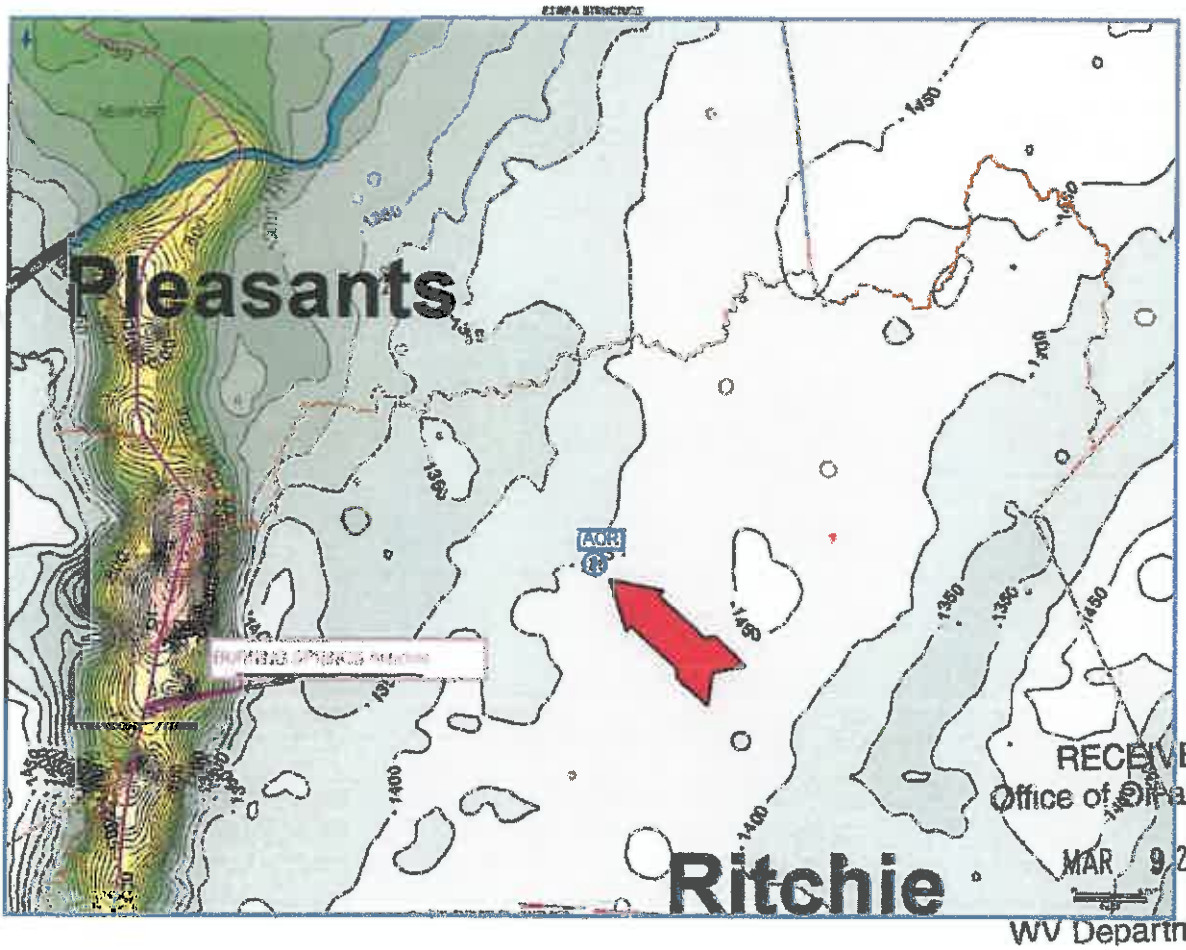


Figure 1.. Red arrow shows location of the Subject well (-81.0976770°, 39.2565860°), AOR (circle) and Burning Springs Anticline. Structure surface is the top of the Berea Sandstone.

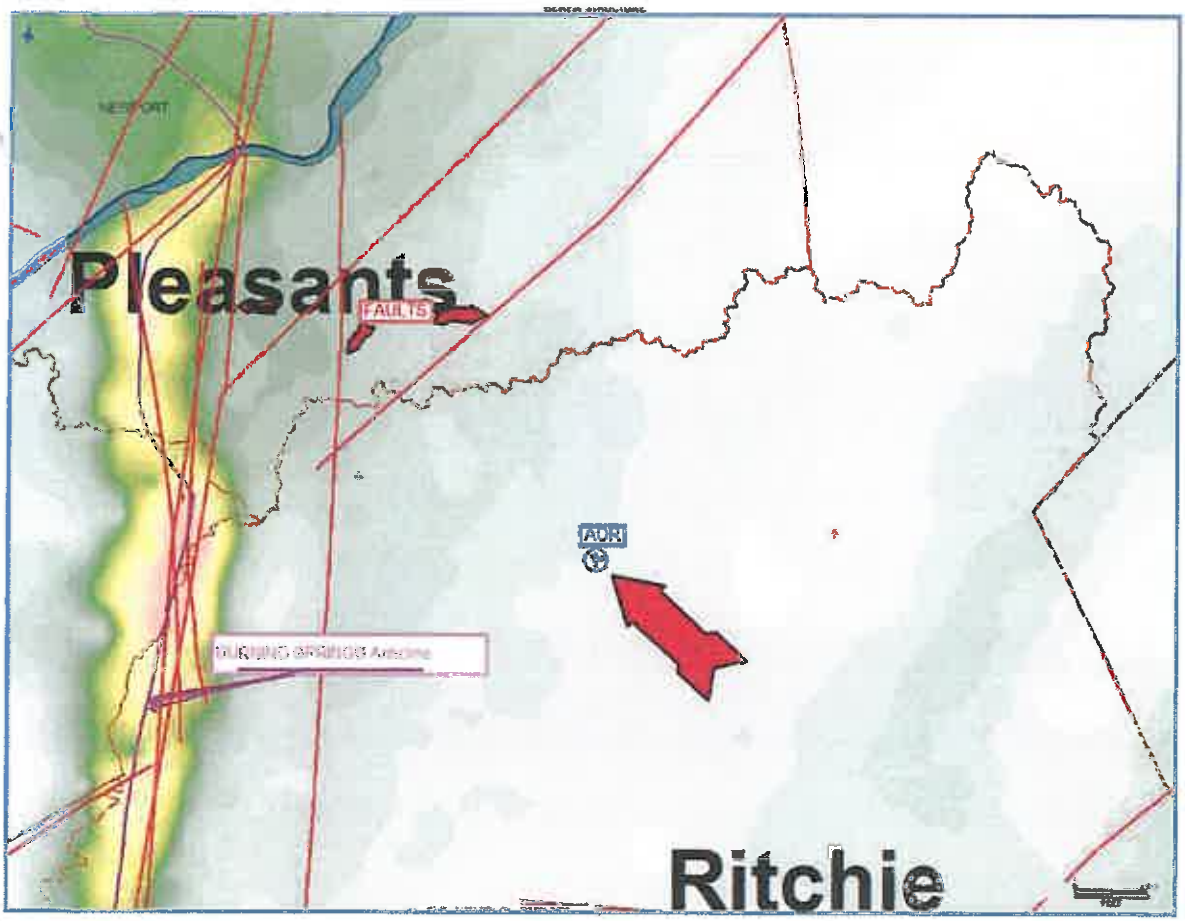
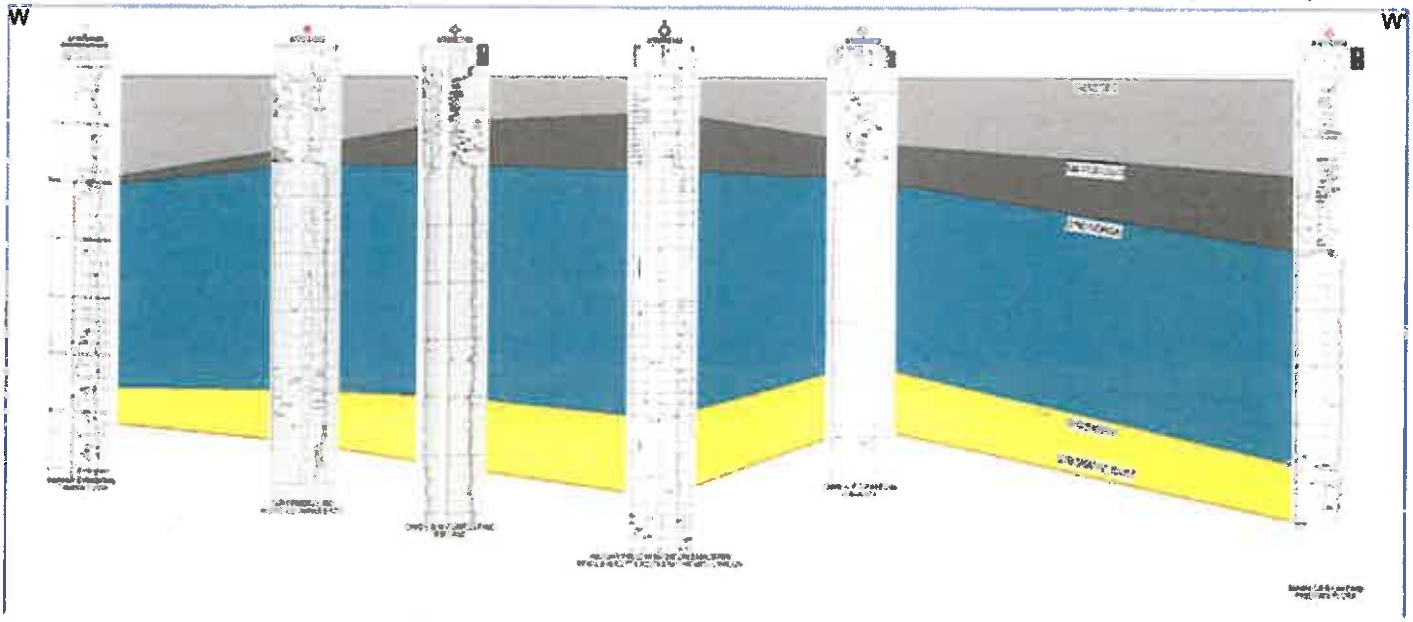
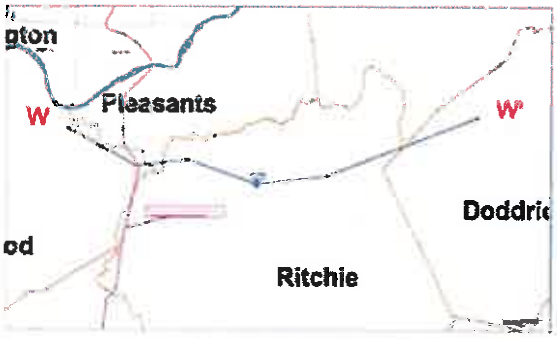


Figure 2.. Faulting indicated in red lines. Subject well AOR is indicated by red arrow.

West – East Cross section across PEARL E. MASON & N. L. MASON #2 (W 1652)





PEARL E. MASON & N. L. MASON #2 (W 1652), API # 4708510142, CONFINING STRATA

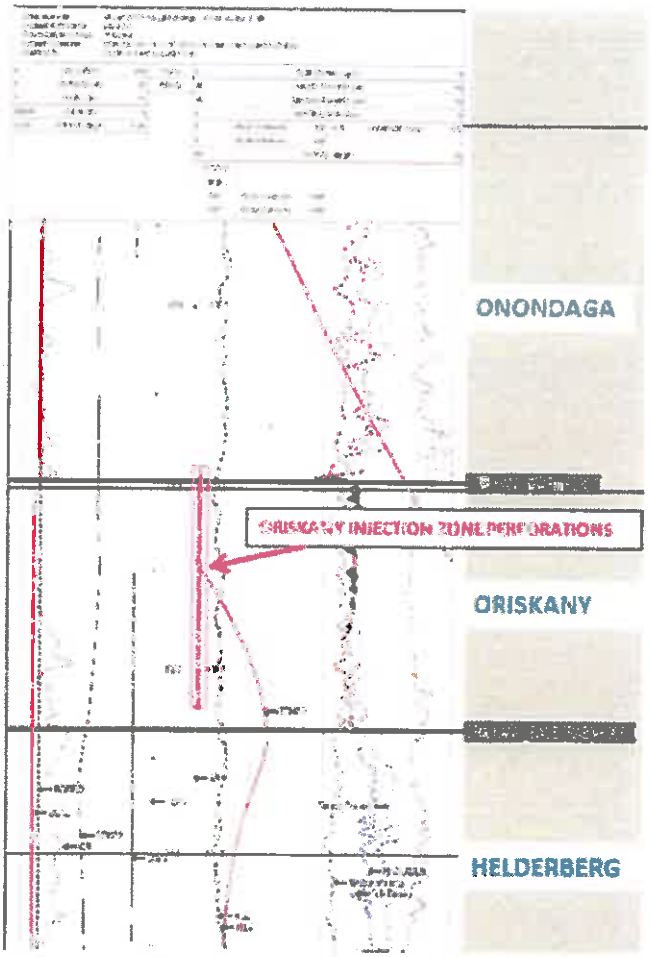
NABORS

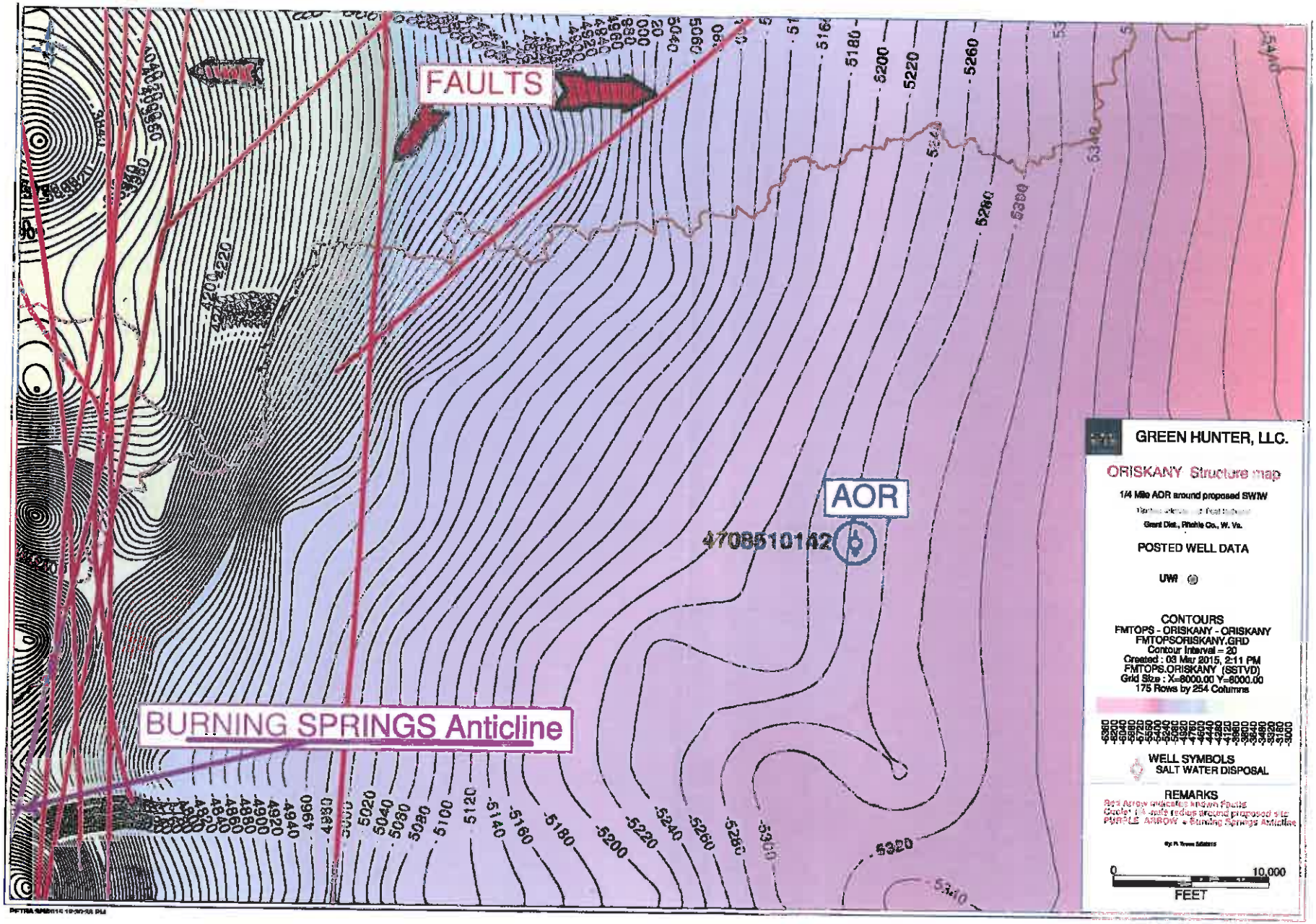
GAMMA RAY / NEUTRON
LITHO DENSITY
INDUCTION
TEMPERATURE

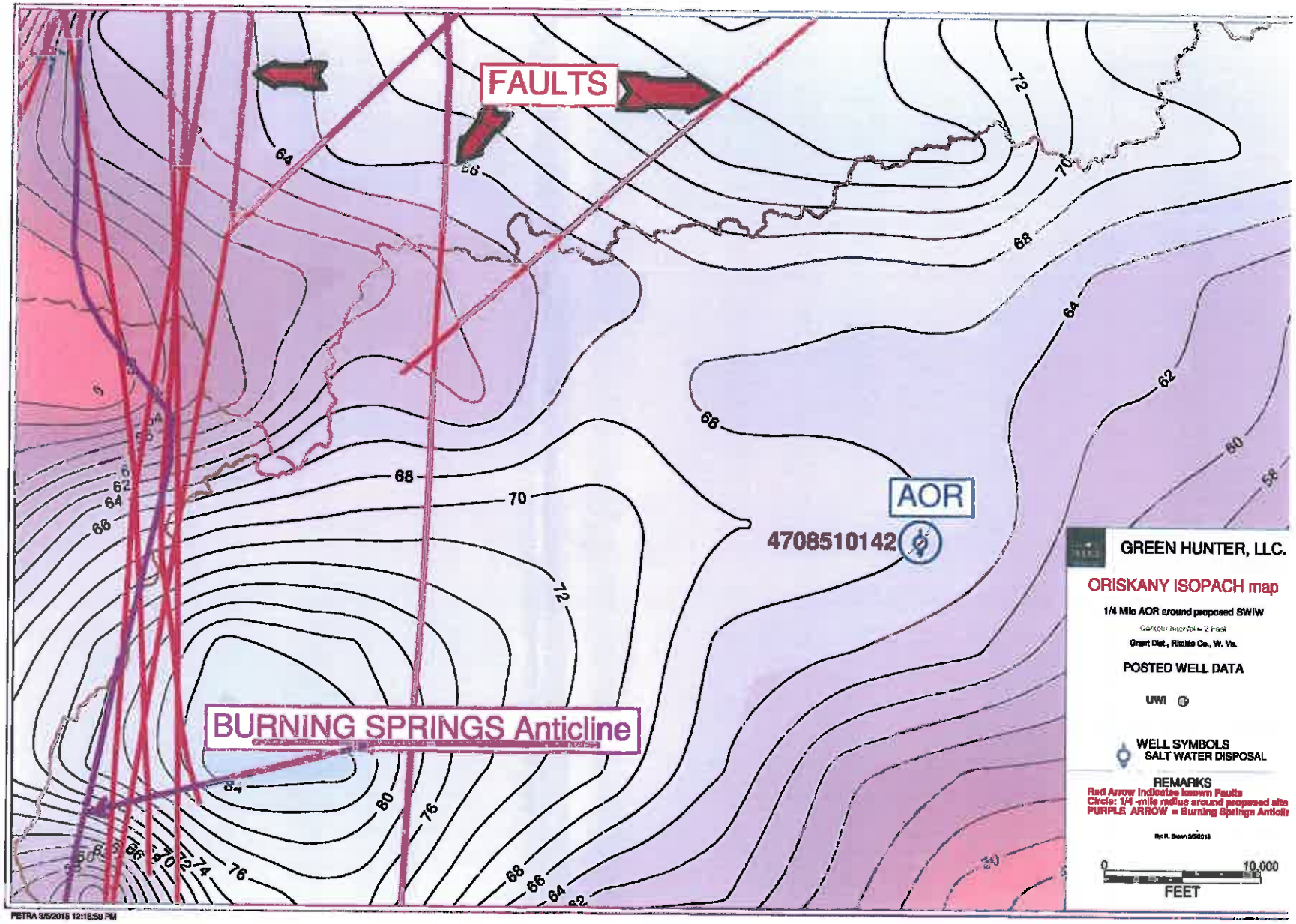
Company WHITTLE CORPORATION
Well RITCHIE HUNTER 2 (W-1652)
Field GRANT
County RITCHIE State WV
Location: API # : 47-085-10142
SEC TWP RGE
Other Services
LAS
TEMP
Permanent Datum Elevation 1021'
Log Measured From TOP OF 7 INCH
Drilling Measured From
Elevations
K.B. 1039'
D.F. 1038'
G.L. 1021'

WHITTLE CORPORATION | RITCHIE HUNTER 2 (W-1652) | GRANT | RITCHIE | WV

Date	26-JAN-15
Run Number	ONE
Depth Driller	6480'
Depth Logger	6485'
Bottom Logged Interval	6482'
Top Log Interval	45'
Casing Driller	7" @ 2103
Casing Logger	7" @ 2114'
Bit Size	6 3/4
Type Fluid in Hole	AIR/GAS
Density / Viscosity	N/A
pH / Fluid Loss	N/A
Source of Sample	N/A
Rm @ Meas. Temp	N/A
Rmf @ Meas. Temp	N/A
Rmc @ Meas. Temp	N/A
Source of Rmf / Rmc	N/A
Rm @ BHT	N/A
Time Circulation Stopped	N/A
Time Logger on Bottom	4 HRS
Maximum Recorded Temperature	109°
Equipment Number	3463
Location	SHELDETA PA
Recorded By	ALAN GILGORA
Witnessed By	DOUG MALCOLM




FAULTS
AOR
4708510142
BURNING SPRINGS Anticline
GREEN HUNTER, LLC.
ORISKANY Structure map
1/4 Mile AOR around proposed SWIW
Grant Dist., Ritchie Co., W. Va.
POSTED WELL DATA
UWI
CONTOURS
FMTOPS - ORISKANY - ORISKANY
FMTOPSORISKANY.GRD
Contour Interval = 20
Created : 03 Mar 2015, 2:11 PM
FMTOPS.ORISKANY (SSTVD)
Grid Size : X=8000.00 Y=8000.00
175 Rows by 254 Columns
WELL SYMBOLS
SALT WATER DISPOSAL
REMARKS
Red Arrow indicates known Faults
Circle (1/4 mile radius around proposed SWIW
PURPLE ARROW = Burning Springs Anticline
0
10,000
FEET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AOR
4708510142
BURNING SPRINGS Anticline
GREEN HUNTER, LLC.
ORISKANY ISOPACH map
1/4 Mile AOR around proposed SWIW
Grant Dist., Ritchie Co., W. Va.
POSTED WELL DATA
UWI
WELL SYMBOLS
SALT WATER DISPOSAL
REMARKS
Red Arrow Indicates known Faults
Circle: 1/4 -mile radius around proposed site
PURPLE ARROW = Burning Springs Anticlir
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10,000
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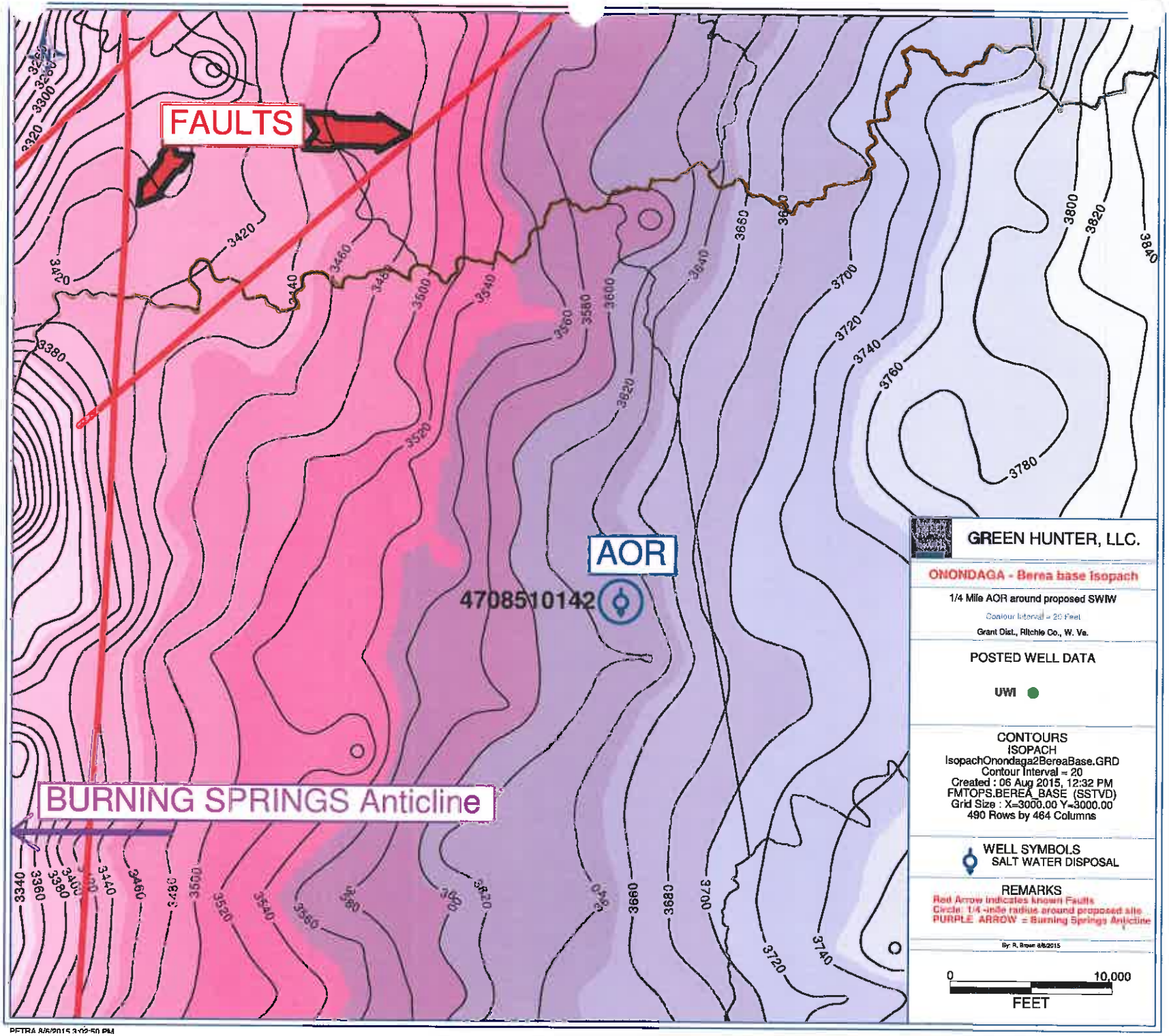
PETRA 3/5/2015 12:16:58 PM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AOR
4708510142
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GREEN HUNTER, LLC.
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1/4 Mile AOR around proposed SWIW
Contour Interval = 20 Feet
Grant Dist., Ritchie Co., W. Va.
POSTED WELL DATA
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CONTOURS
ISOPACH
IsopachOnondaga2BereaBase.GRD
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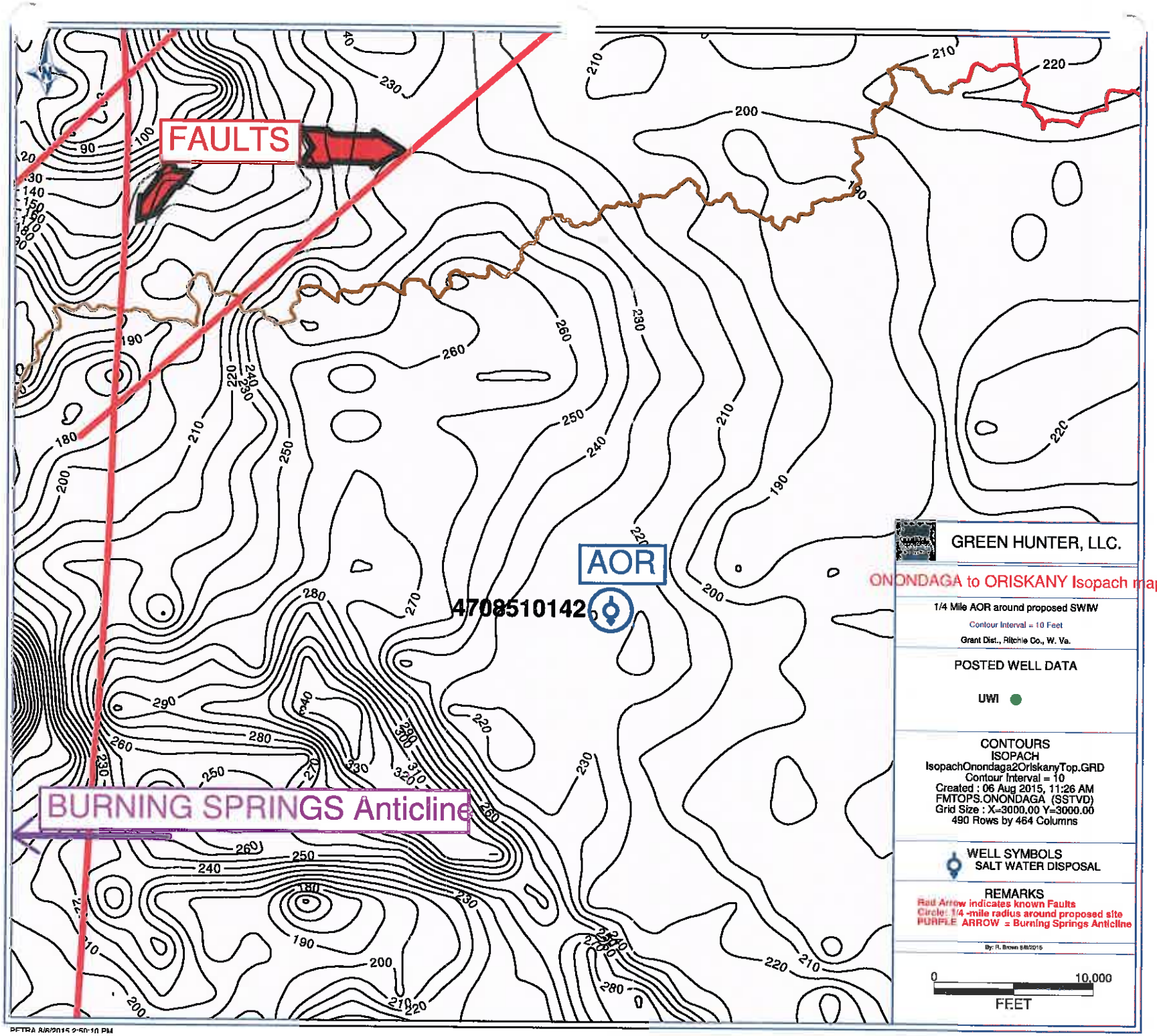
SALT WATER DISPOSAL
REMARKS
Red Arrow indicates known Faults
Circle: 1/4 -mile radius around proposed site
PURPLE ARROW = Burning Springs Anticline
By: R. Brown 8/6/2015
0
10,000
FEET


FAULTS
AOR
4708510142
BURNING SPRINGS Anticline
GREEN HUNTER, LLC.
ONONDAGA to ORISKANY Isopach map
1/4 Mile AOR around proposed SWIW
Contour Interval = 10 Feet
Grant Dist., Ritchie Co., W. Va.
POSTED WELL DATA
UWI
CONTOURS
ISOPACH
IsopachOnondaga2OriskanyTop.GRD
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WELL SYMBOLS
SALT WATER DISPOSAL
REMARKS
Red Arrow indicates known Faults
Circle: 1/4 -mile radius around proposed site
PURPLE ARROW = Burning Springs Anticline
By: R. Brown 8/6/2015
0
10,000
FEET
PETRA 8/6/2015 2:50:10 PM

Bryn Mueller

From: Rocky Roberts <rocky32joe@gmail.com>
Sent: Tuesday, August 04, 2015 2:25 PM
To: Bryn Mueller
Subject: Re: FW: Certified Mail - Ritchie #2
Attachments: Half Mile AOR Well Data.xlsx

Bryn,

I have attached a spreadsheet with the eleven wells that the WVDEP required additional half mile area of review in their Notice of Deficiency Letter dated July 30, 2015. The spreadsheet indicates the ground elevation, total depth of the well, depth of the fresh water and salt water encountered, the formation of the salt water horizon, surface, intermediate and production casing setting depths, cementing information for each casing string and the producing formation. This data was compiled using in house completion report/WR35 data and the WVGES website. There were three wells in which no completion/WR35 reports could be located (085-06137, 085-06148 and 085-06334). In these cases the WVGES website was utilized for all of the necessary information.

In my review there were only three wells that did not have the intermediate casing covering the reported salt water depths; 085-05608, 085-05801 and 085-06137. It should be noted that one well, 085-05801, reported salt water at a depth of 2050'. This depth place the salt water below the Big Injun sand and above the Berea sand possibly in the Weir sand, although the open hole log indicated no formation fluids in the wellbore. It can be reasonably assumed that the reported salt water depth is in error.

In my opinion other than the well 085-05801, the depth of the salt water encountered from each of the wells were typical for the area and can be attributed to the hydrocarbon bearing nature of these formations in the shallow Pennsylvanian and Mississippian aged sandstones.

Respectfully,
Rocky Roberts
Consulting Geologist

On Tue, Aug 4, 2015 at 8:52 AM, Bryn Mueller <bmueller@greenhunterwater.com> wrote:

Bryn Mueller

Engineering Technician

bmueller@greenhunterwater.com

GreenHunter Resources, Inc. (NYSE Amex:GRH)

1048 Texan Trail

Formation Fluid Compatibility Assessment

Ritchie Hunter Water Disposal

Ritchie Hunter Disposal Well #2

API: 47-085-10142

Sample	Barium MG/L	Iron MG/L	Magnesium MG/L	Sodium MG/L	PH Unit	Chloride MG/L	TDS MG/L
L14061672	467	101	1500	33600	5.84	5150	71100
L14071617	934	164	2000	46100	5.84	108000	166000
L14051014	994	104	1180	27700	5.59	46000	167000
L14031355	113	64	935	21900	6.31	68200	82100
L13101751	186	133	2400	57100	5.57	156000	250000
L14010244	1080	106	1490	38400	6.15	91900	96400
Average:	629	112	1584	37466	5.88	79208	138766

NABORS

GAMMA RAY / NEUTRON
LITHO DENSITY
INDUCTION
TEMPERATURE

Company WHITTLE CORPORATION
Well RITCHIE HUNTER 2 (W-1652)
Field GRANT
County RITCHIE State WV

Location: API # : 47-085-10142

SEC TWP RGE

Other Services
TIF
LAS
TEMP

Elevation
K.B. 1029'
D.F. 1029'
G.L. 1021'

Permanent Datum Elevation 1021'
Log Measured From TOP OF 7 INCH
Drilling Measured From

Company WHITTLE CORPORATION
Well RITCHIE HUNTER 2 (W-1652)
Field GRANT
County RITCHIE
State WV

Date	26-JAN-15
Run Number	ONE
Depth Driller	6480'
Depth Logger	6490'
Bottom Logged Interval	6490'
Top Log Interval	45'
Casing Driller	7" @ 2130'
Casing Logger	7" @' 2114'
Bit Size	6.375
Type Fluid in Hole	AIR/GAS
Density / Viscosity	N/A
pH / Fluid Loss	N/A
Source of Sample	N/A
Rm @ Meas. Temp	N/A
Rmf @ Meas. Temp	N/A
Rmc @ Meas. Temp	N/A
Source of Rmf / Rmc	N/A
Rm @ BHT	N/A
Time Circulation Stopped	N/A
Time Logger on Bottom	4 HRS
Maximum Recorded Temperature	106°
Equipment Number	2453
Location	SHELOCTA PA
Recorded By	ALAN KILGORE
Witnessed By	DOUG HAUGHT

<<< Fold Here >>>

Comments

Matrix Density : 2.68 g/cc
Fluid Density : 0.7 g/cc

* All Presentations And Logging Speeds At Customer Request *
* Presented Downhole Temperature On Final Logs *
Crew : GORDON CLARK , TYLER GODFREY
TOP DRILLING RIG # 5

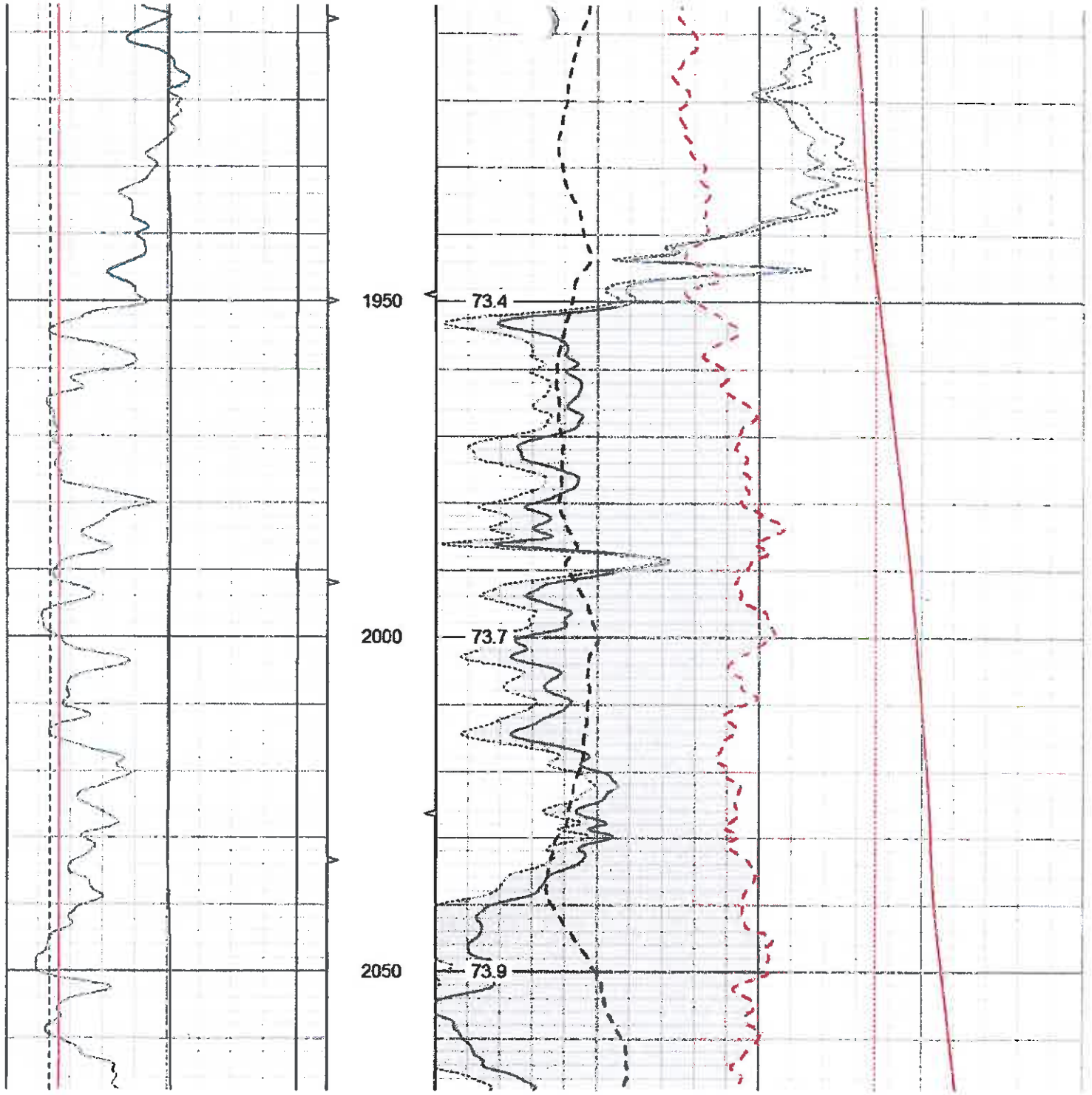
* All Logs Measured From Top Of 7 IN *
* THANK YOU FOR USING NABORS COMPLETION AND PRODUCTION SERVICES CO. *

NABORS

MAIN LOG

Database File:	26-jan-2015 haught energy ritchie hunter 2 .db
Dataset Pathname:	pass3.2
Presentation Format:	dntstack
Dataset Creation:	Mon Jan 26 14:10:47 2015 by Calc Open-Cased 090629
Charted by:	Depth in Feet scaled 1:240

0	GR (GAPI)	200	TBHV	2	Bulk Density (g/cc)	3		
5	BOREID (in)	15	ABHV	30	Density Porosity (pu)	-10		
5	DCAL (in)	15		30	Neutron Porosity (pu)	-10		
20000	LTEN (lb)	0		2	MATRXDEN (g/cc)	3		
-0.25	DTMP2 (degF)	0.25		0	RILD (Ohm-m)	100	-0.3	Correction (g/cc) 0.2
				0	RILM (Ohm-m)	100		
				65	TEMP2 (degF)	70		
				TEMP2 (degF)				
				100	RILD (Ohm-m)	1000		
				100	RILM (Ohm-m)	1000		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2000
2050
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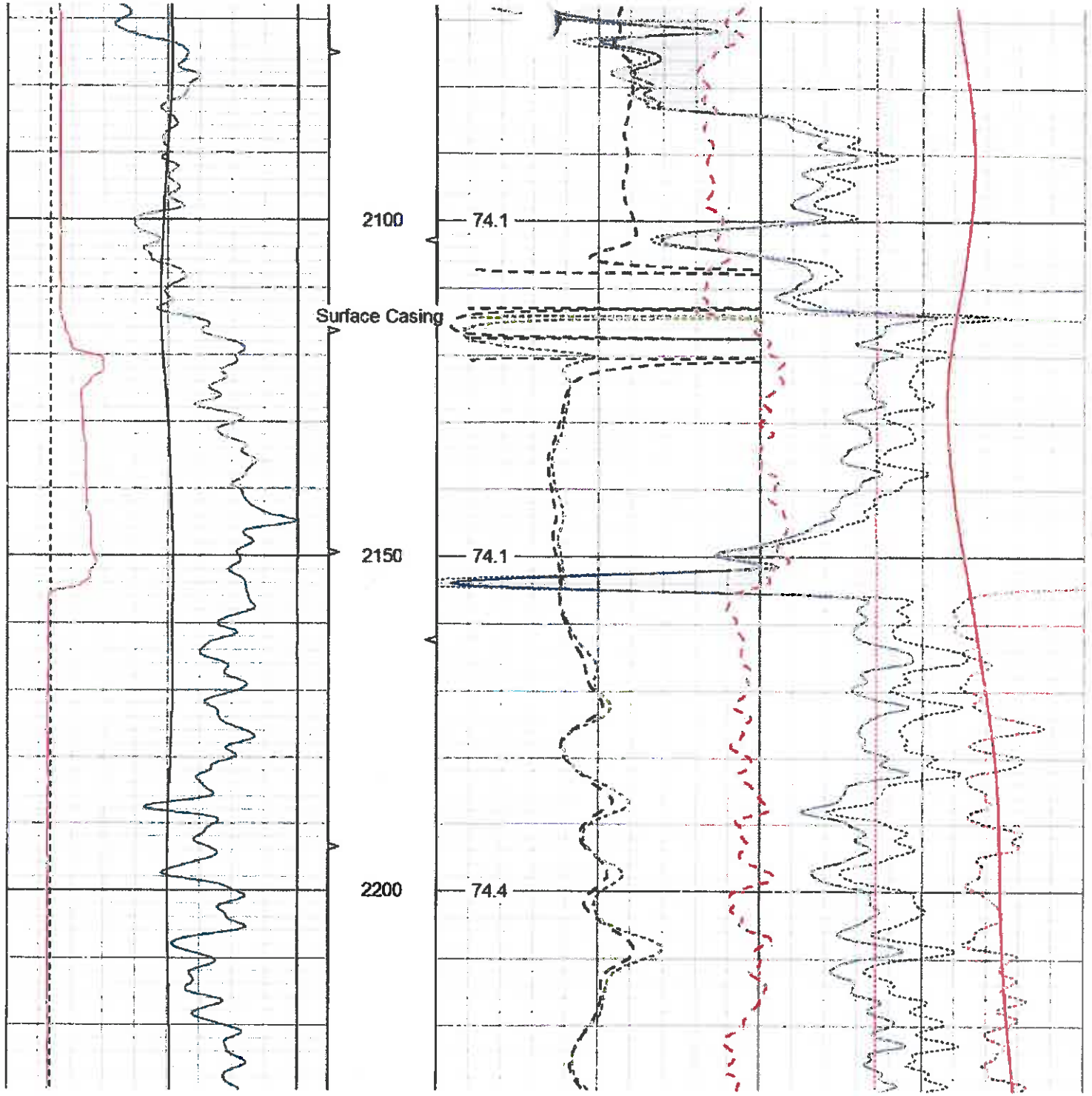
73.7
73.9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Surface Casing
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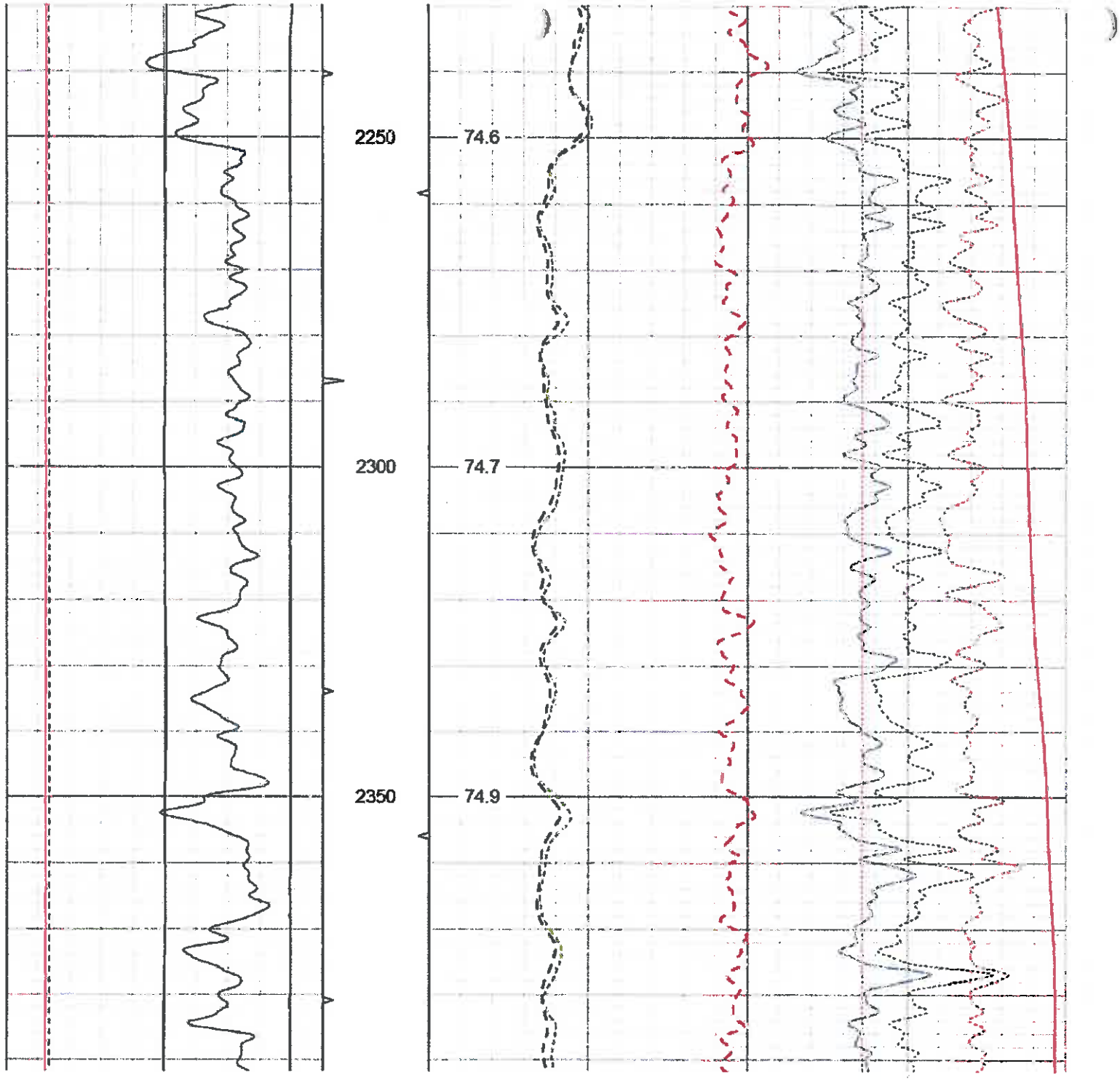
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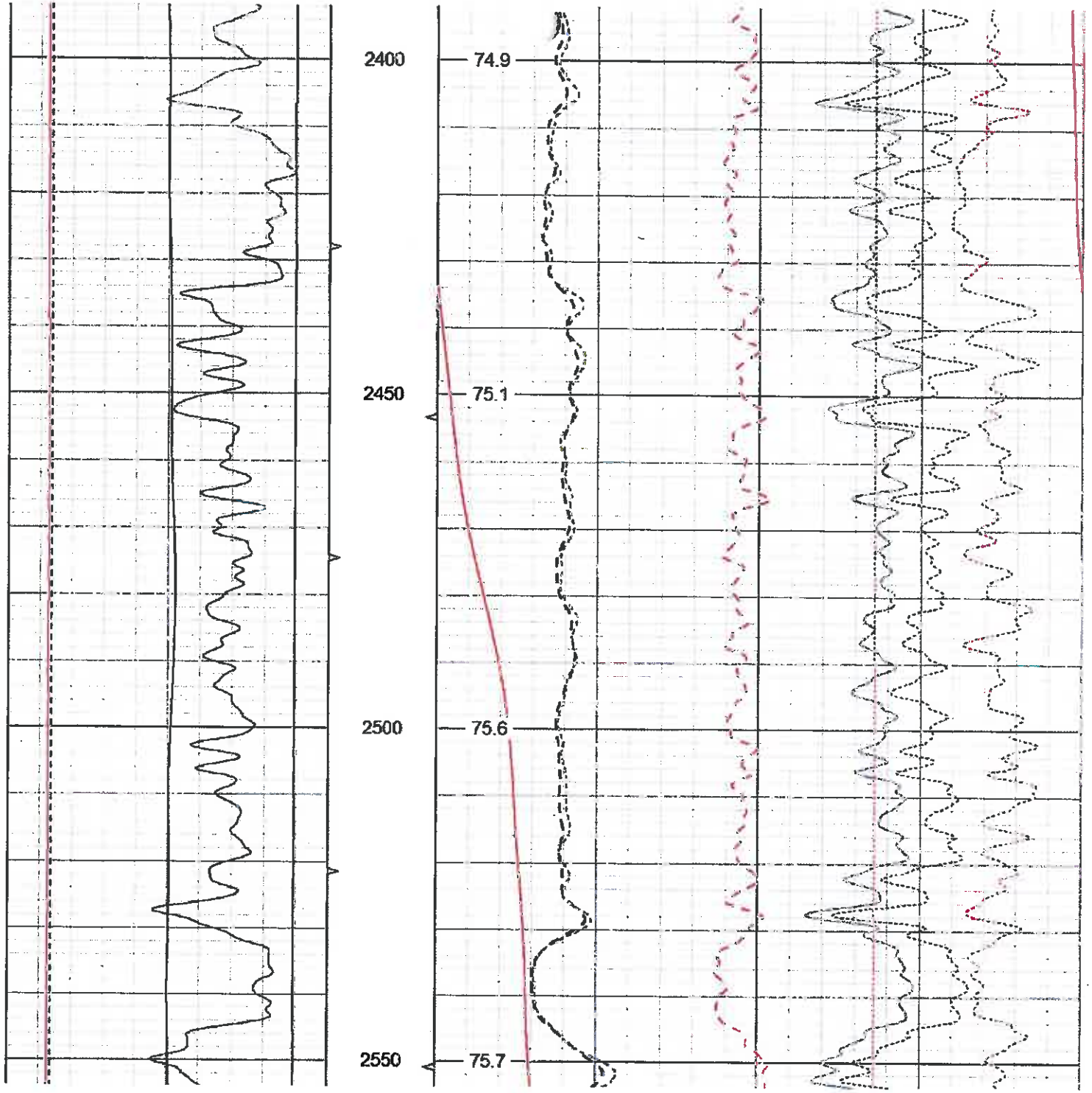
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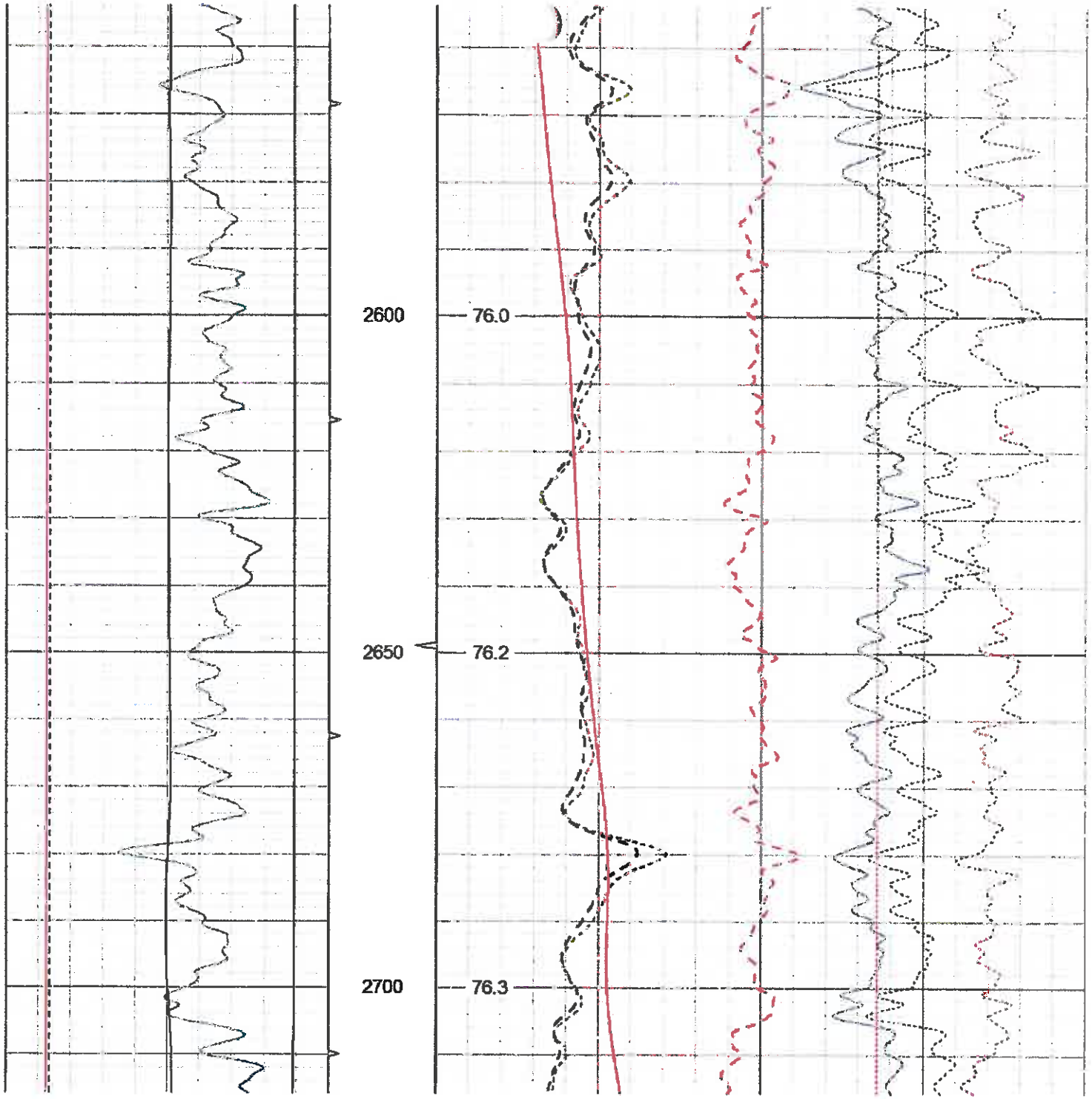
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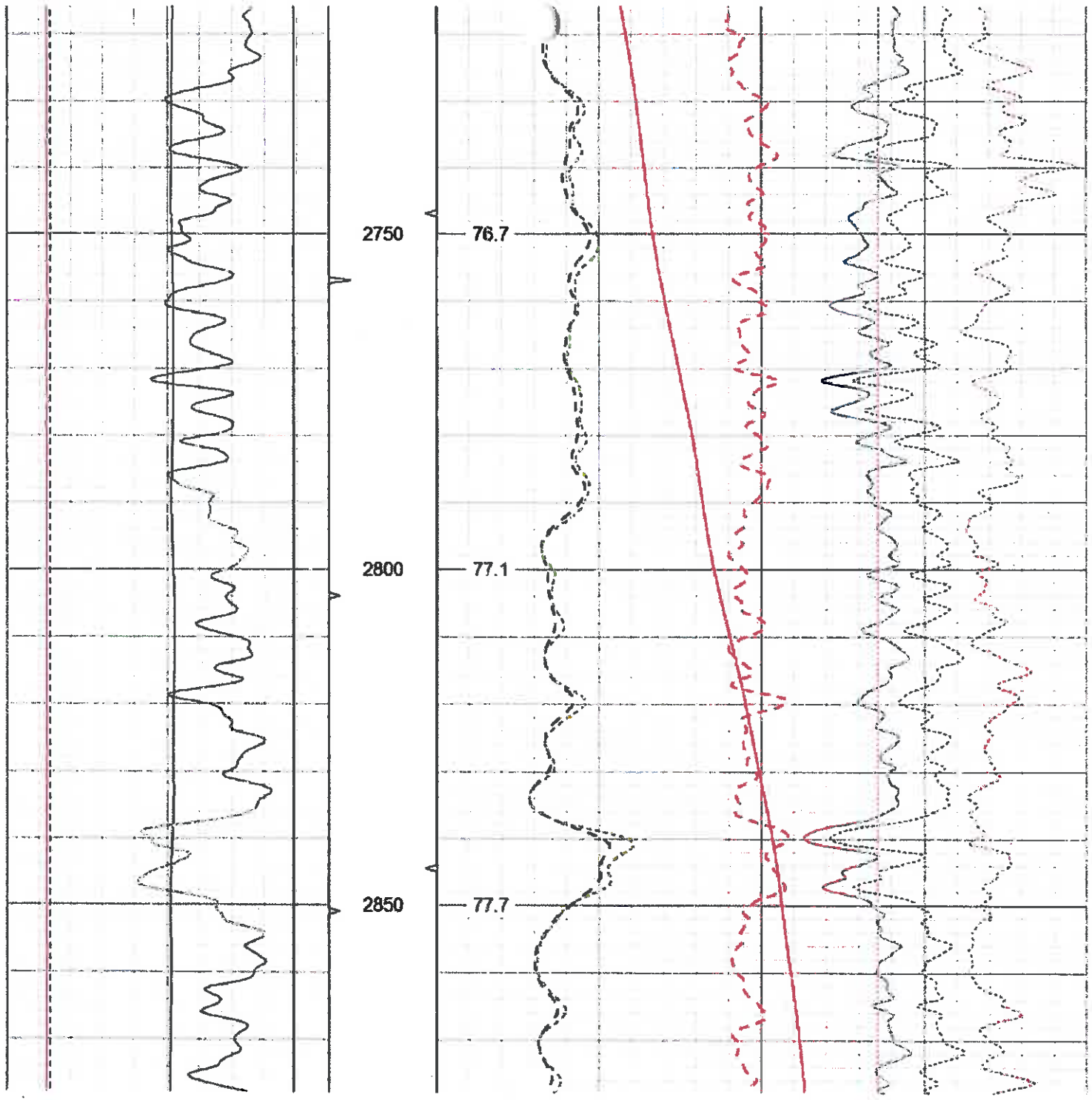
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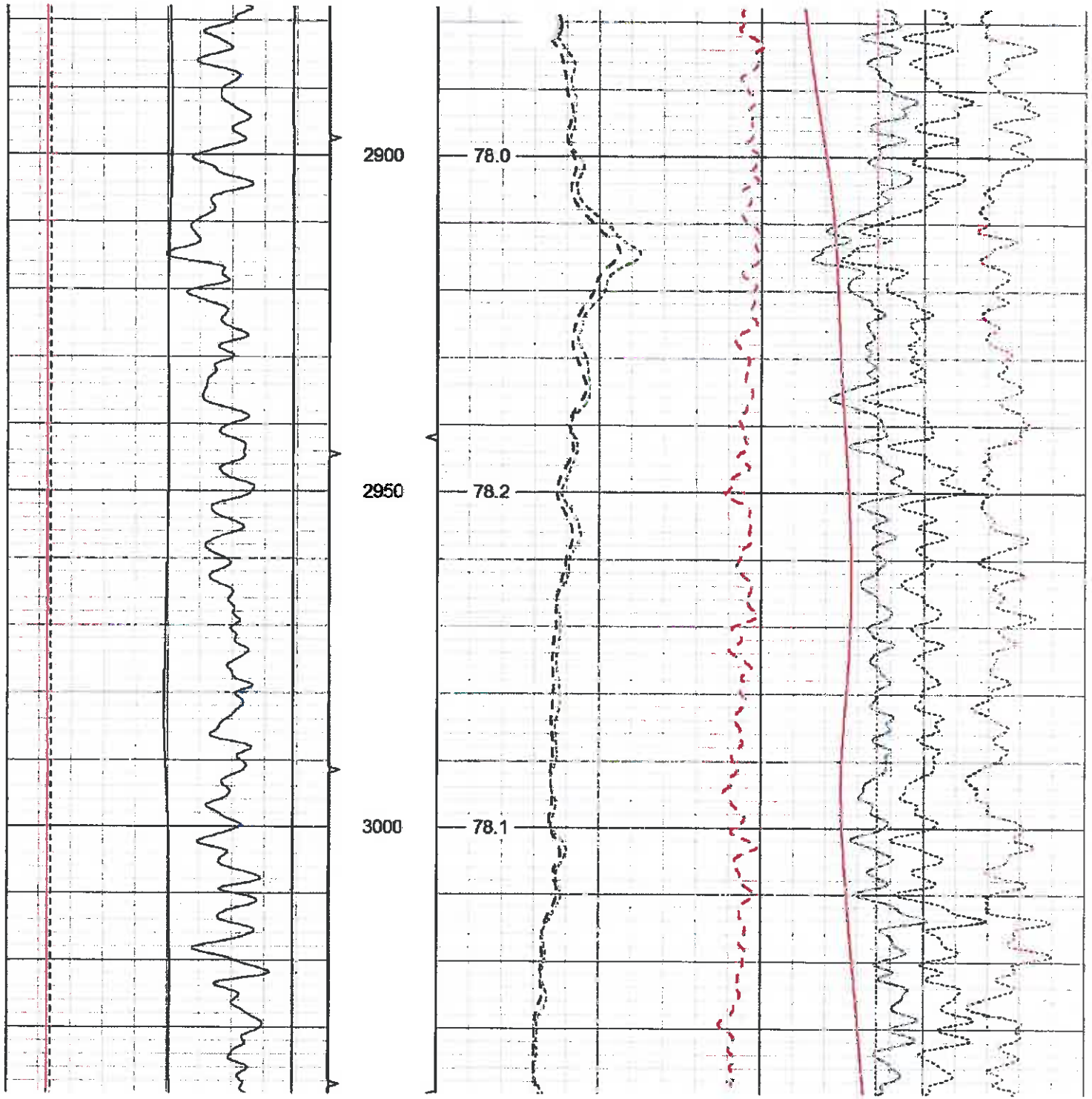
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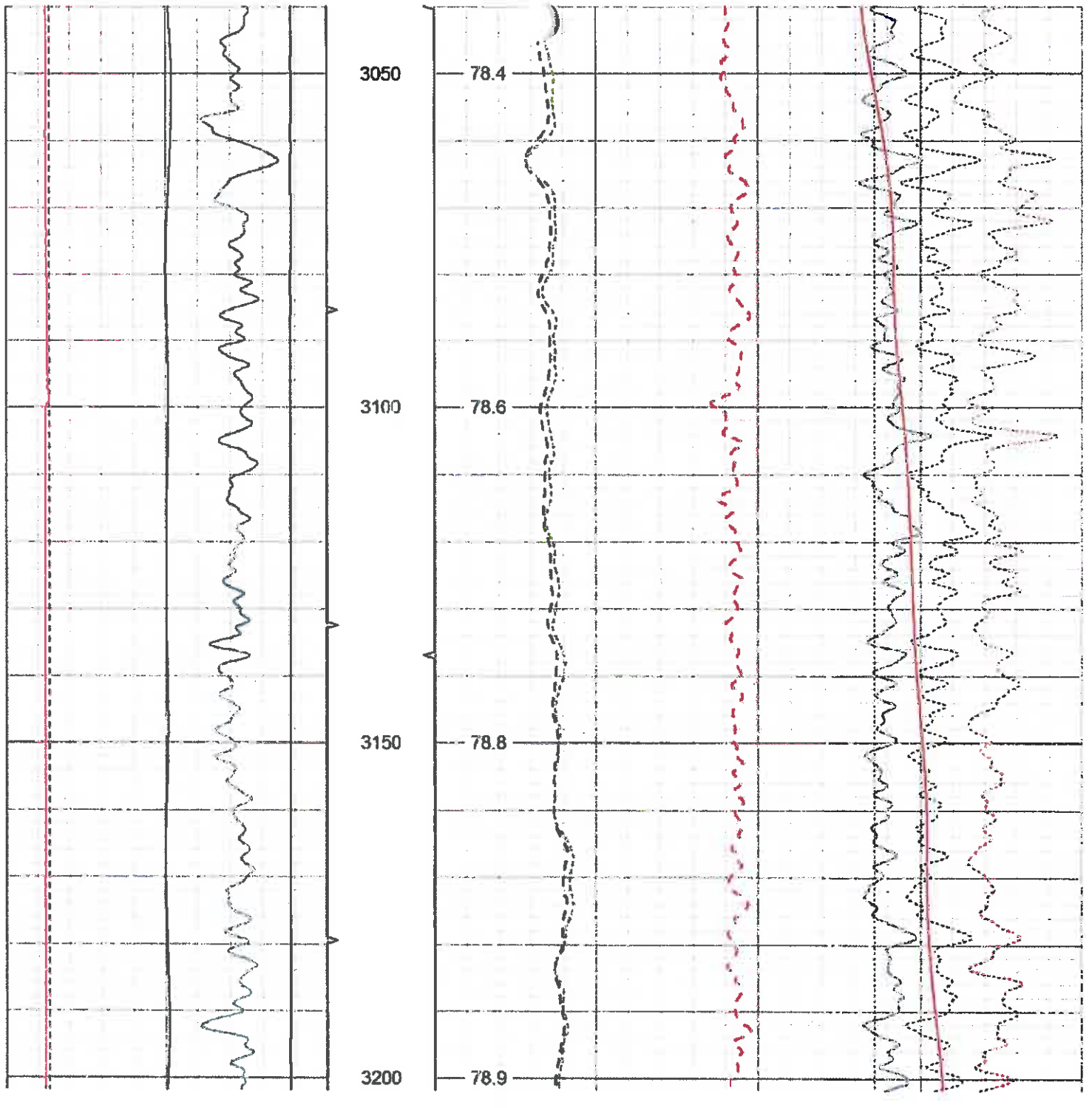
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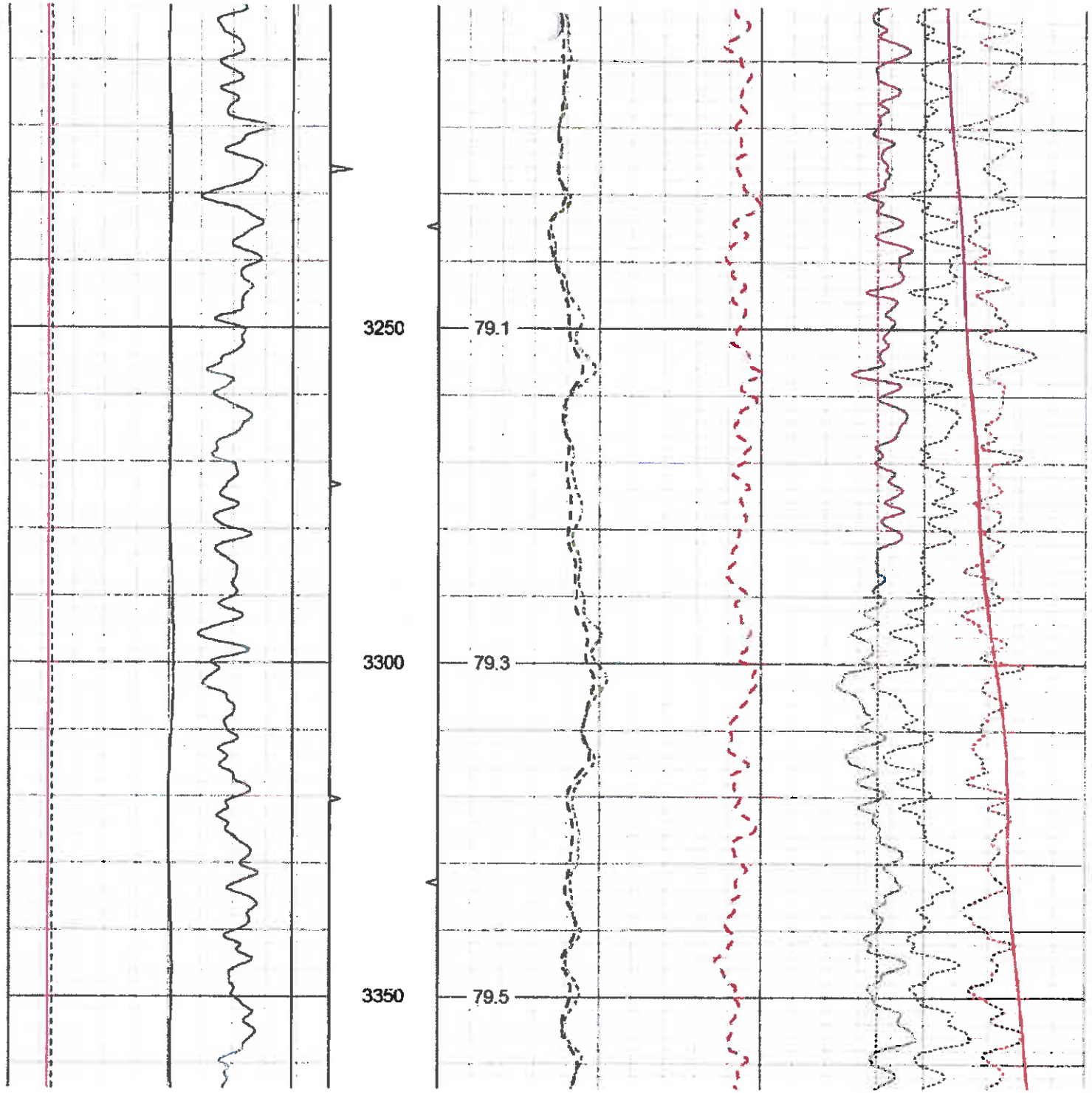
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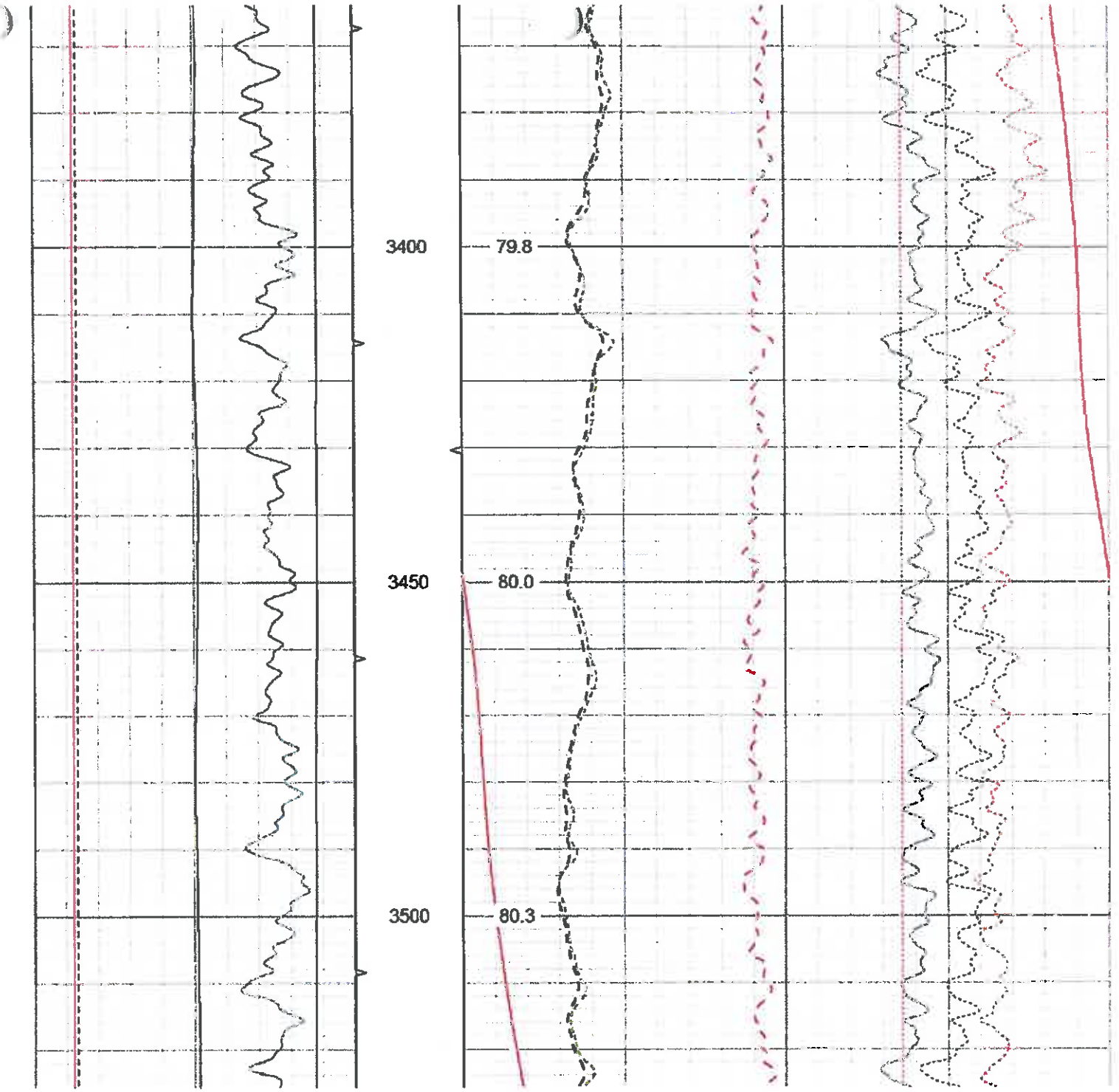
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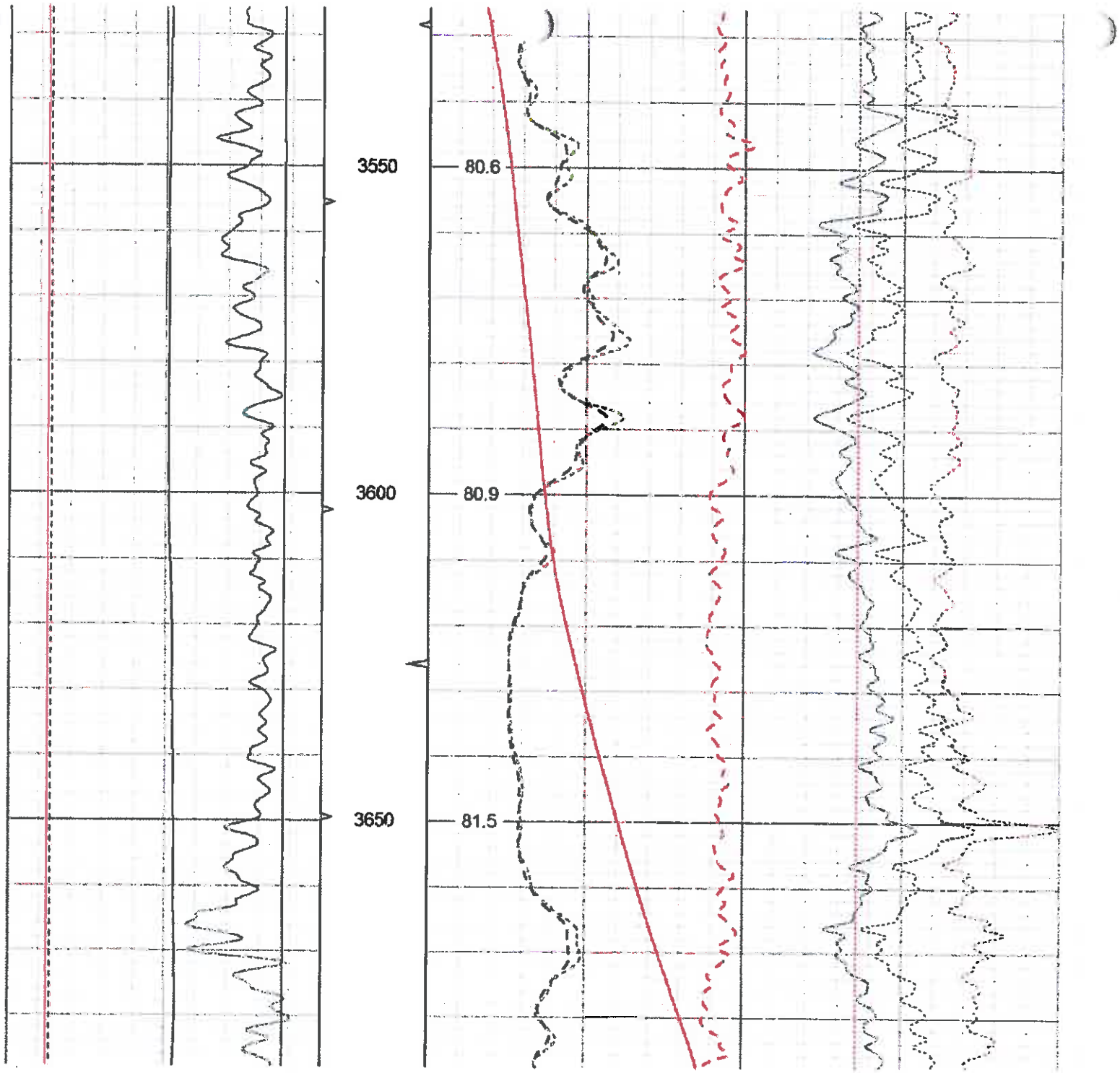
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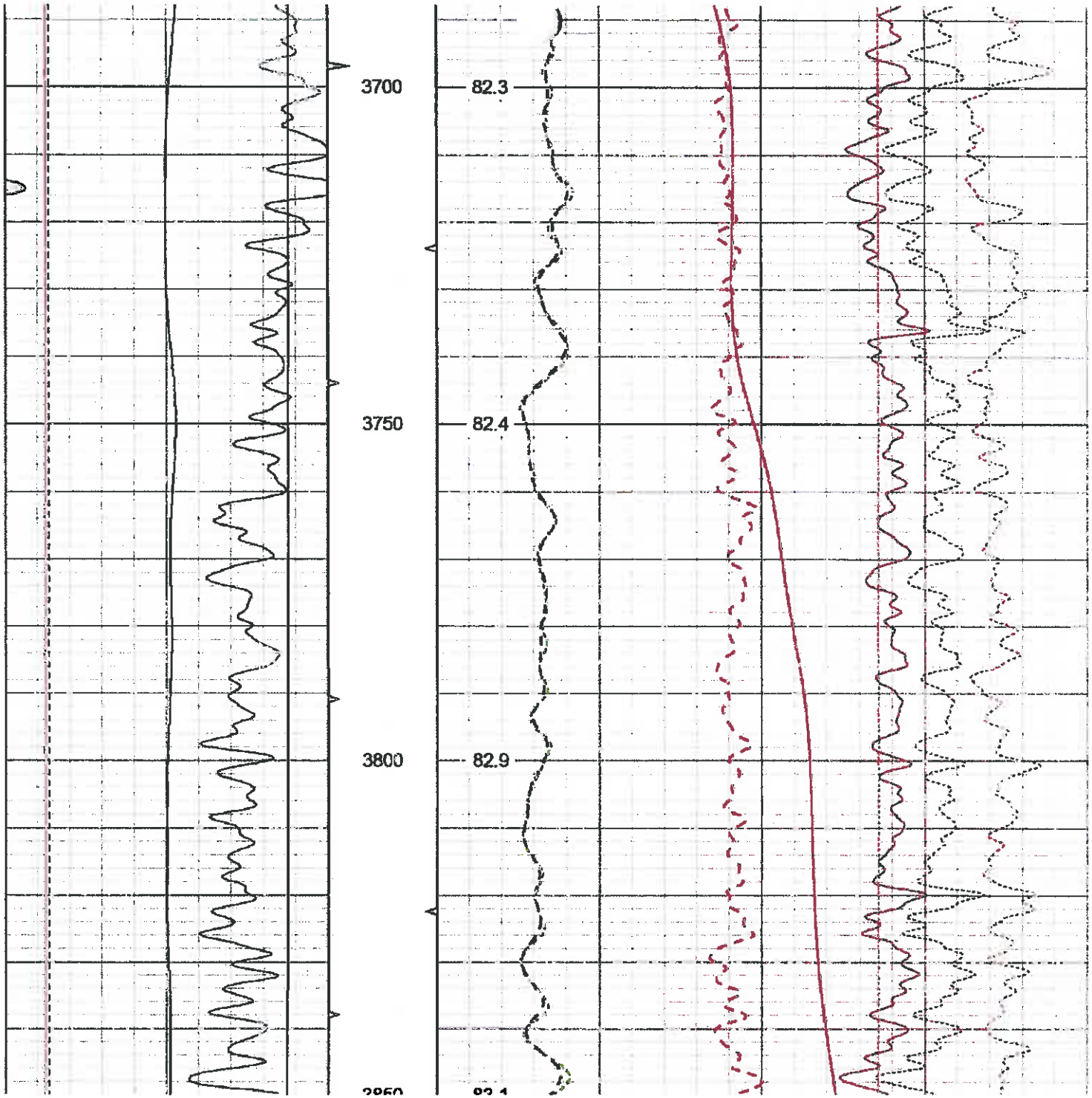
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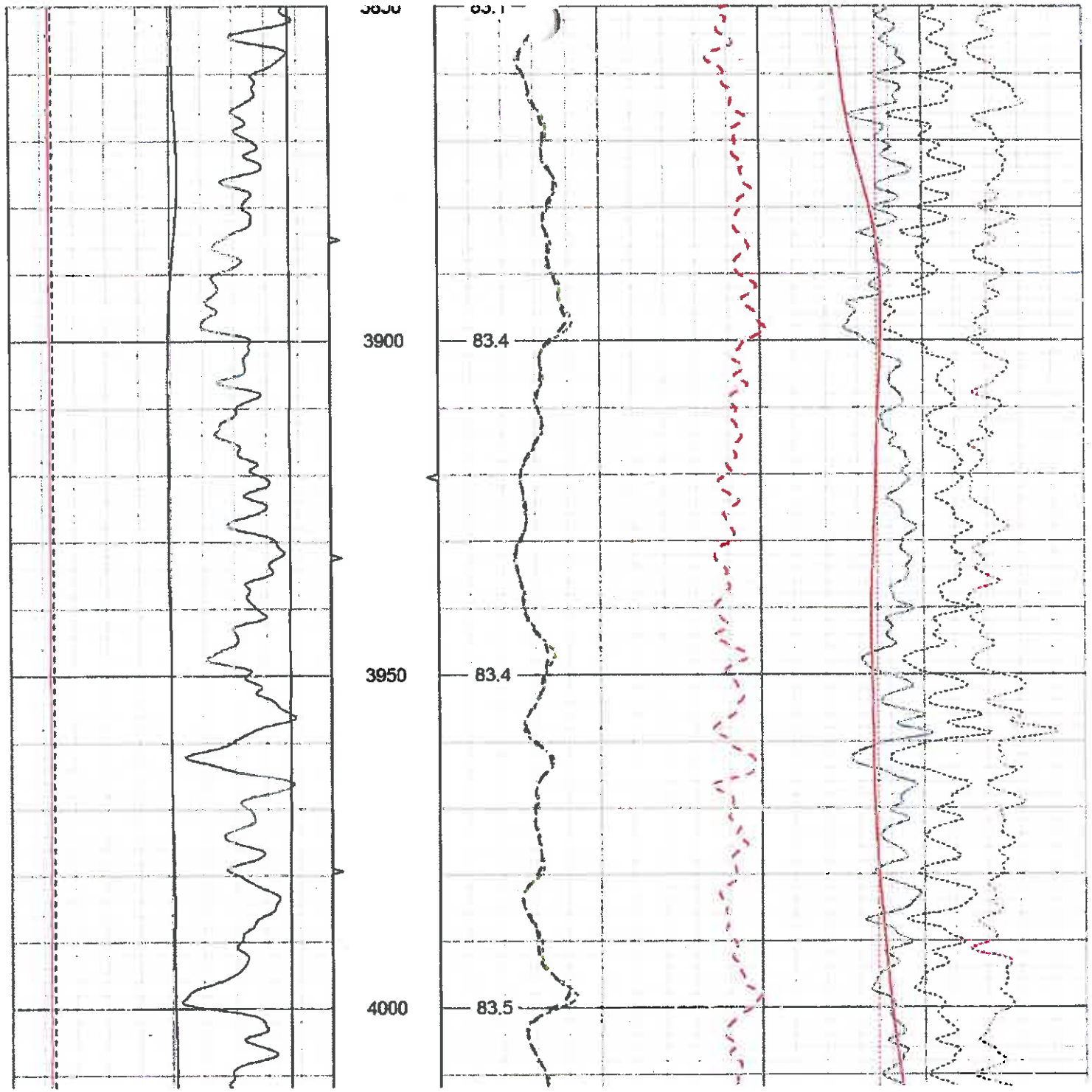
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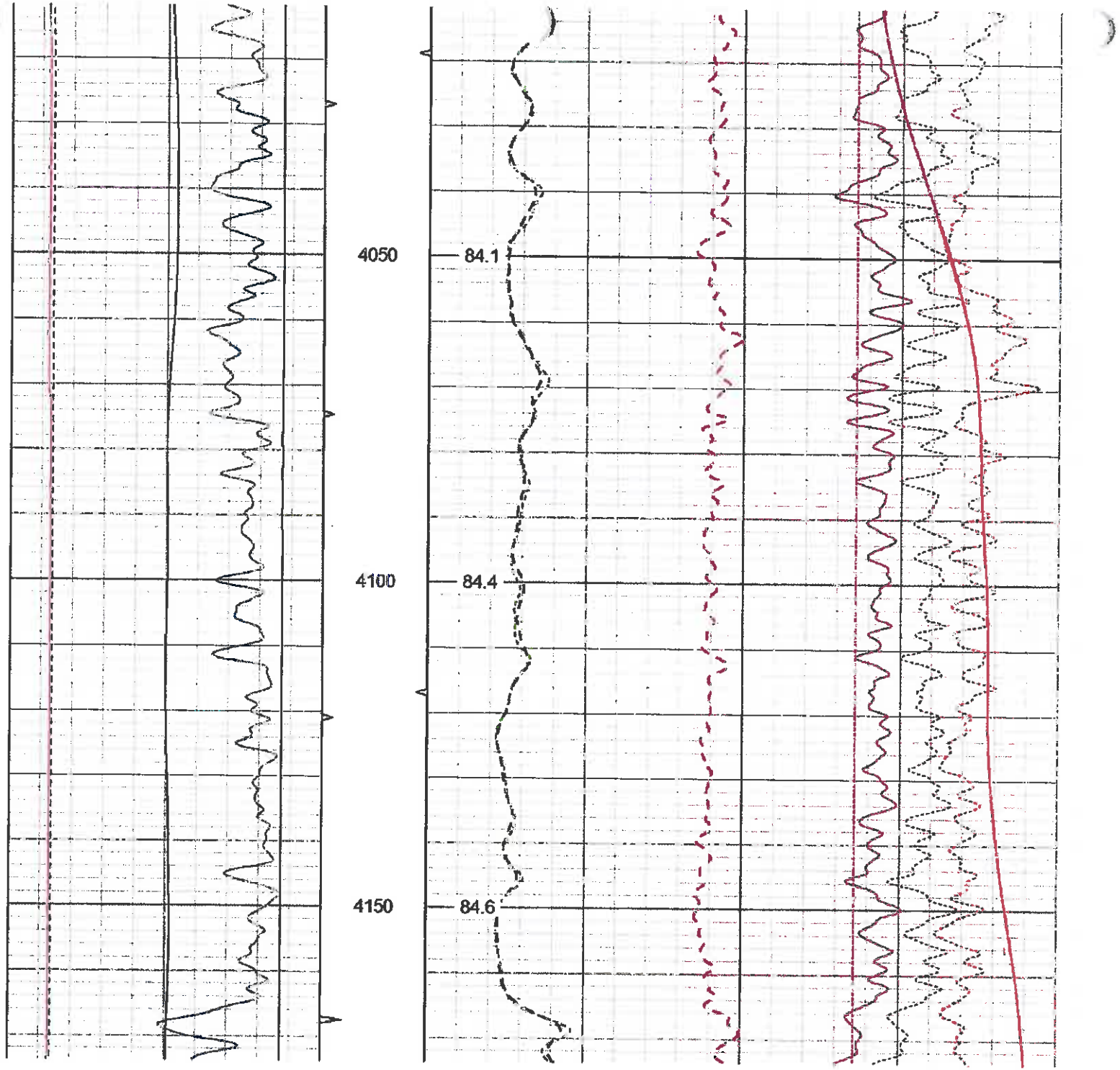
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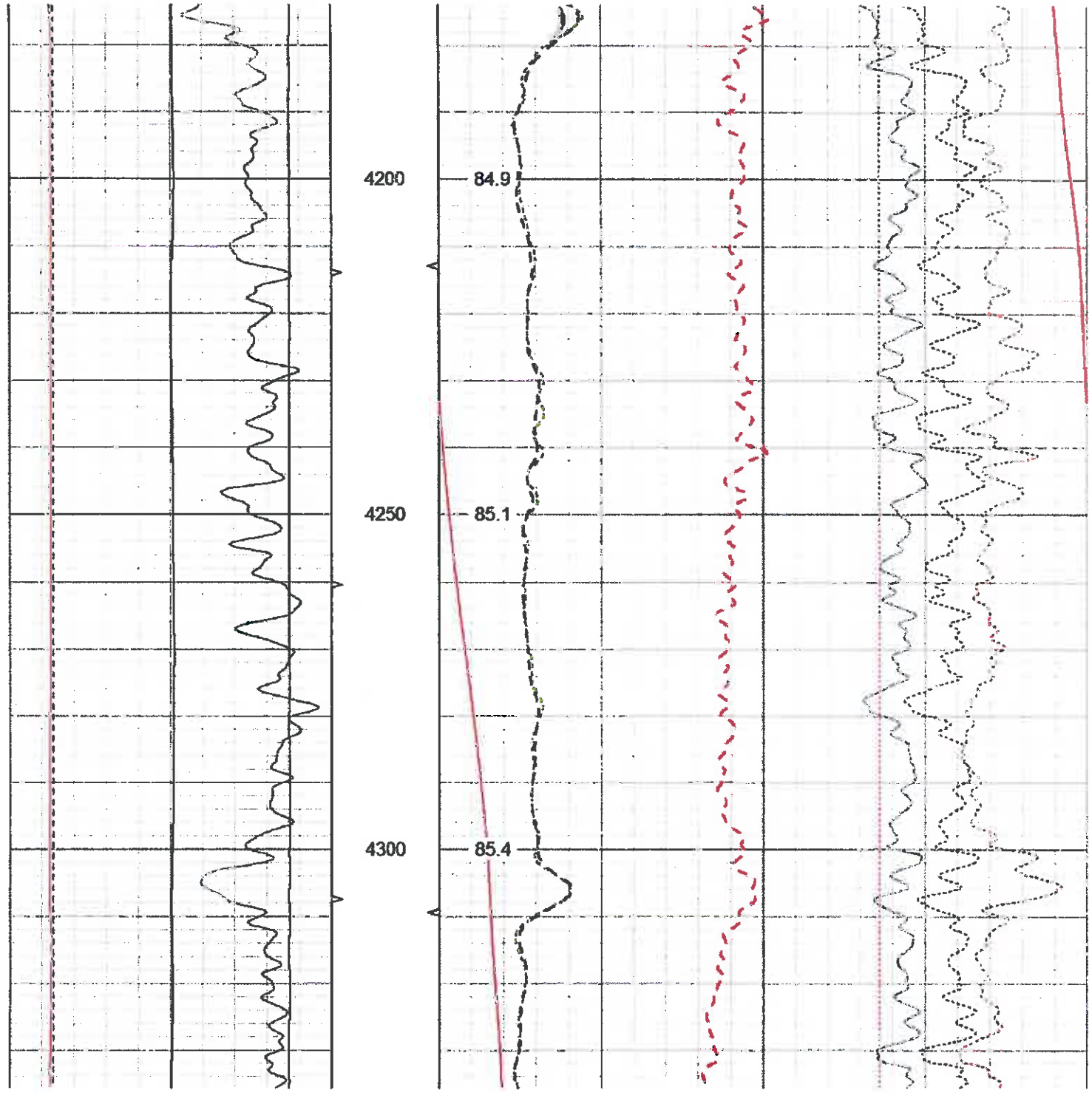
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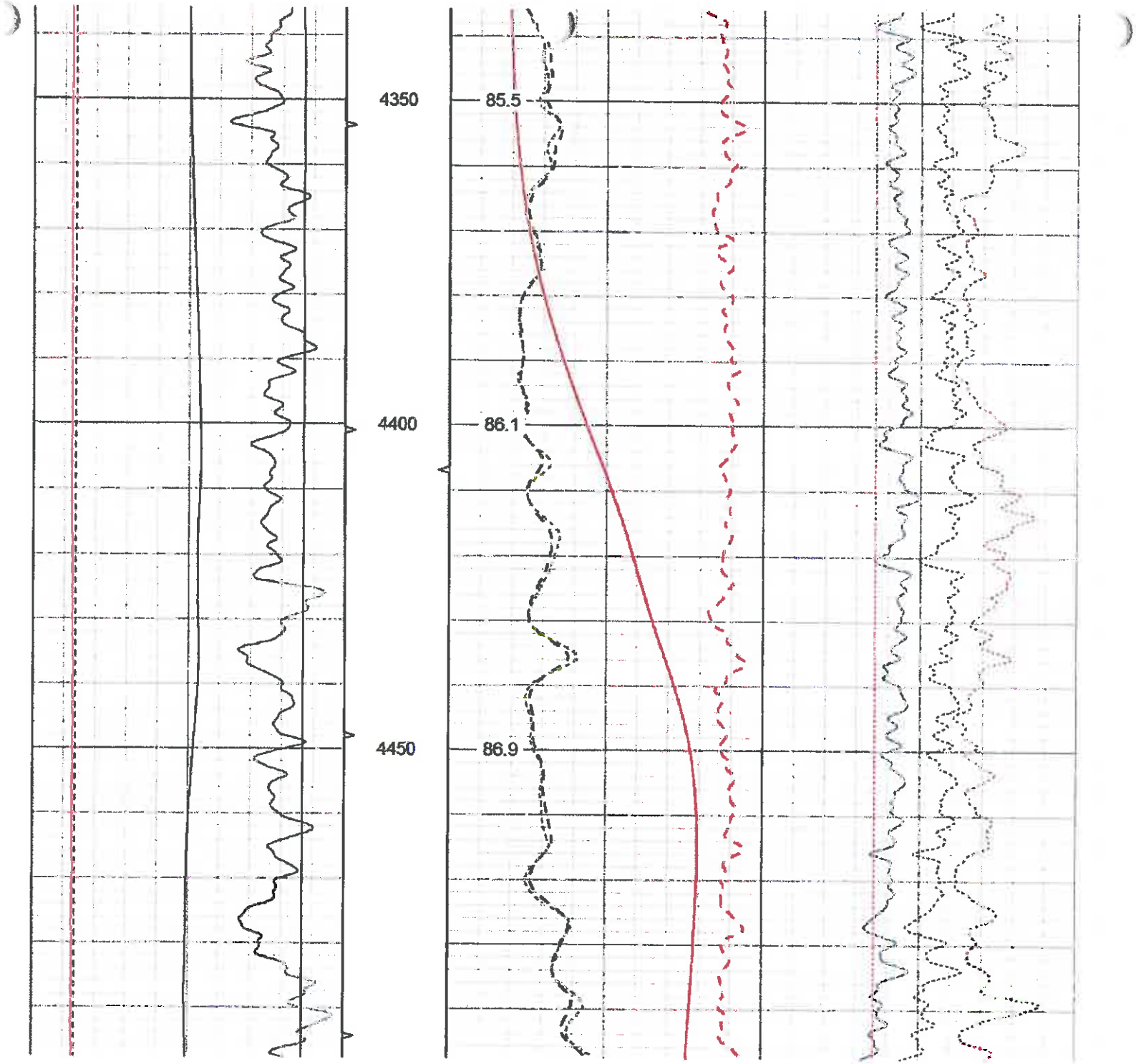
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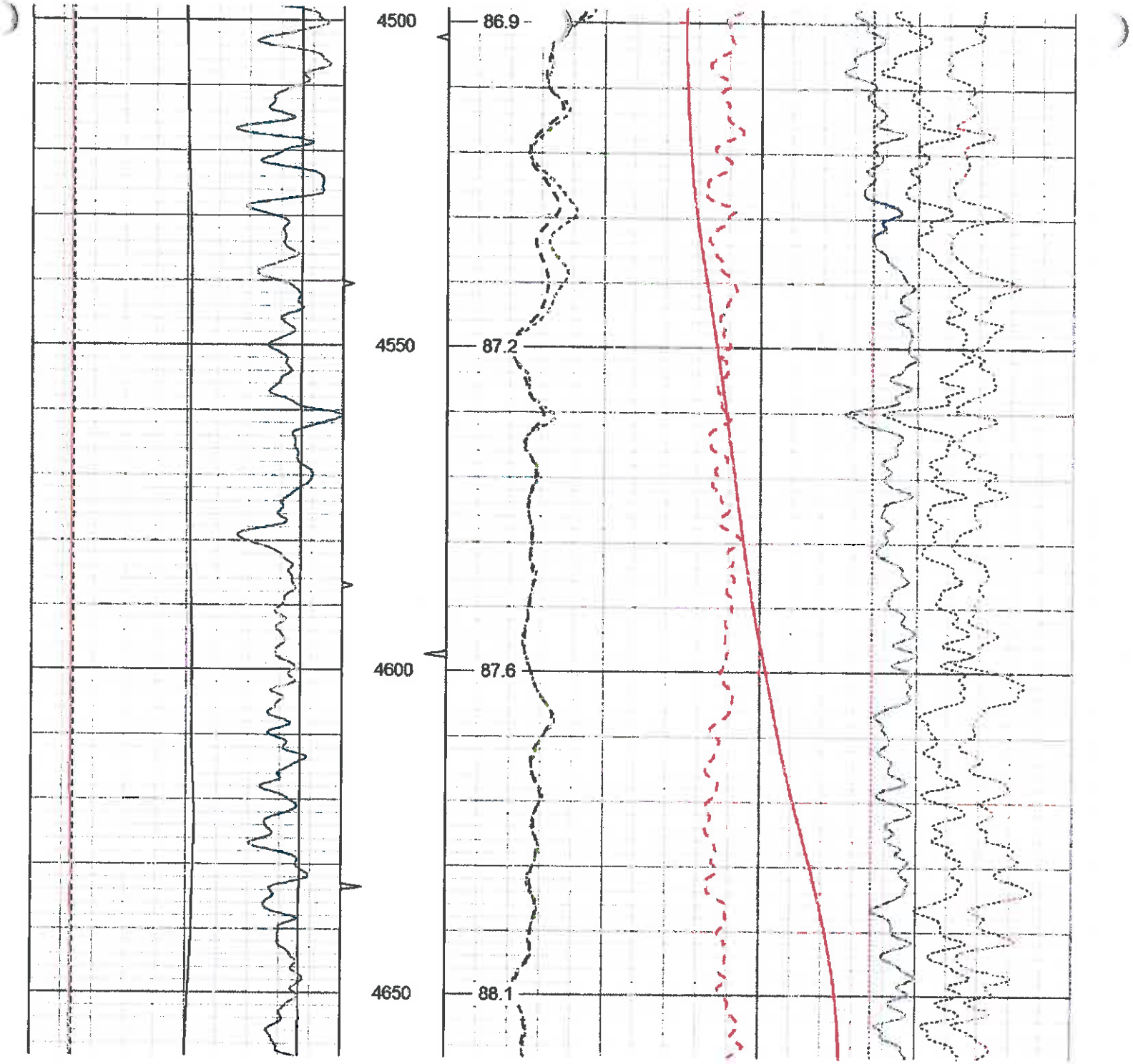
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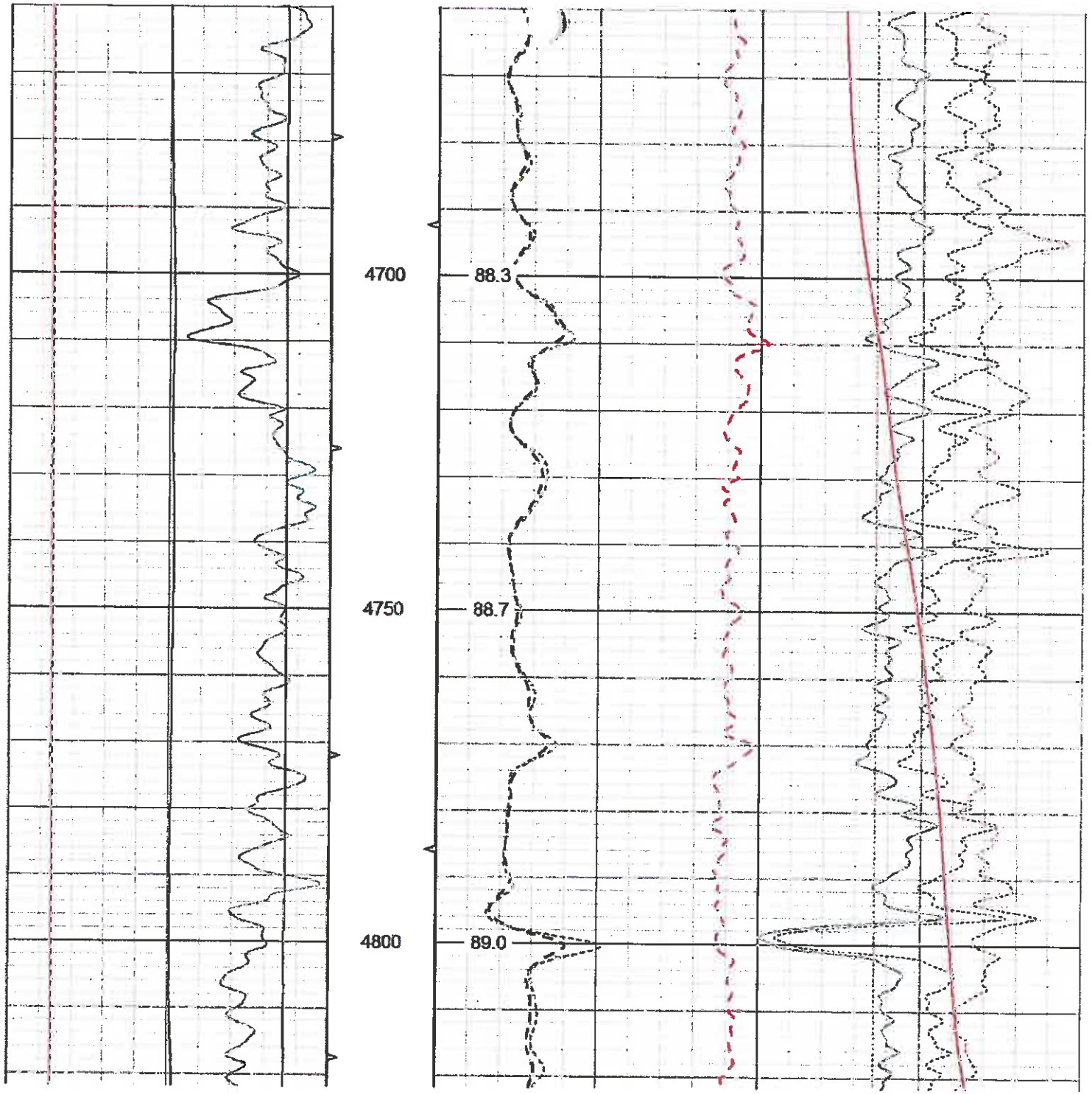
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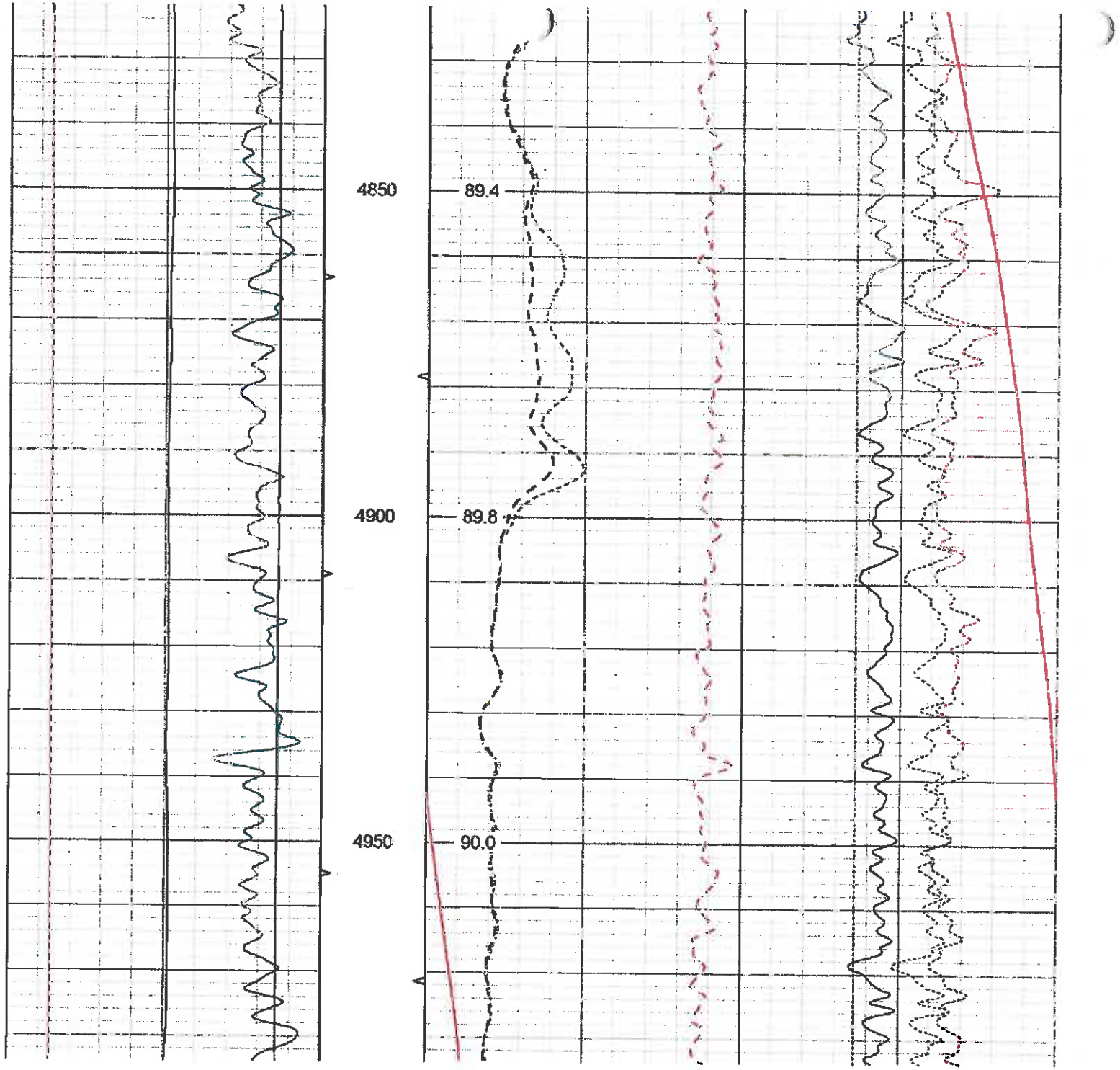
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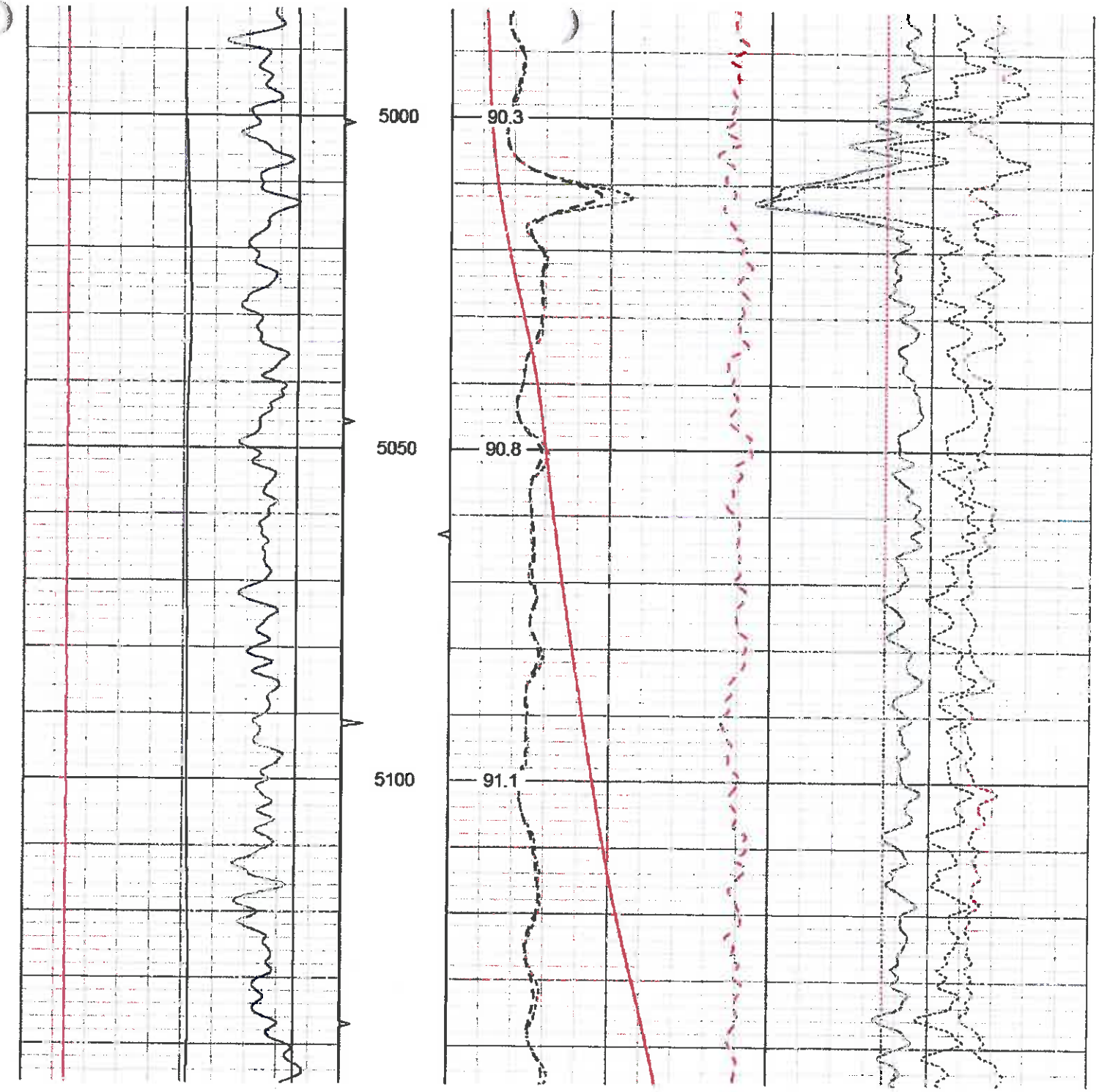
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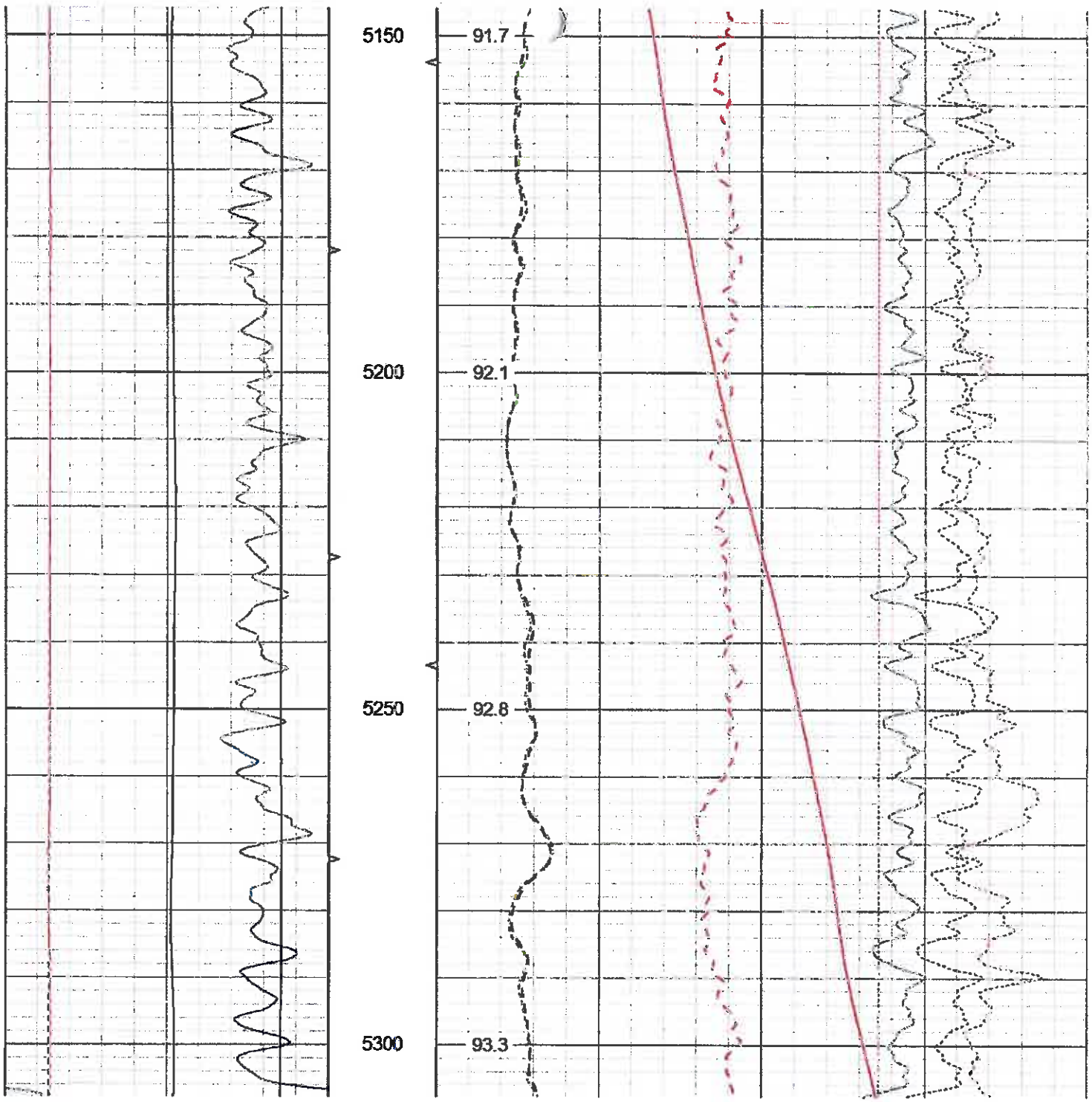
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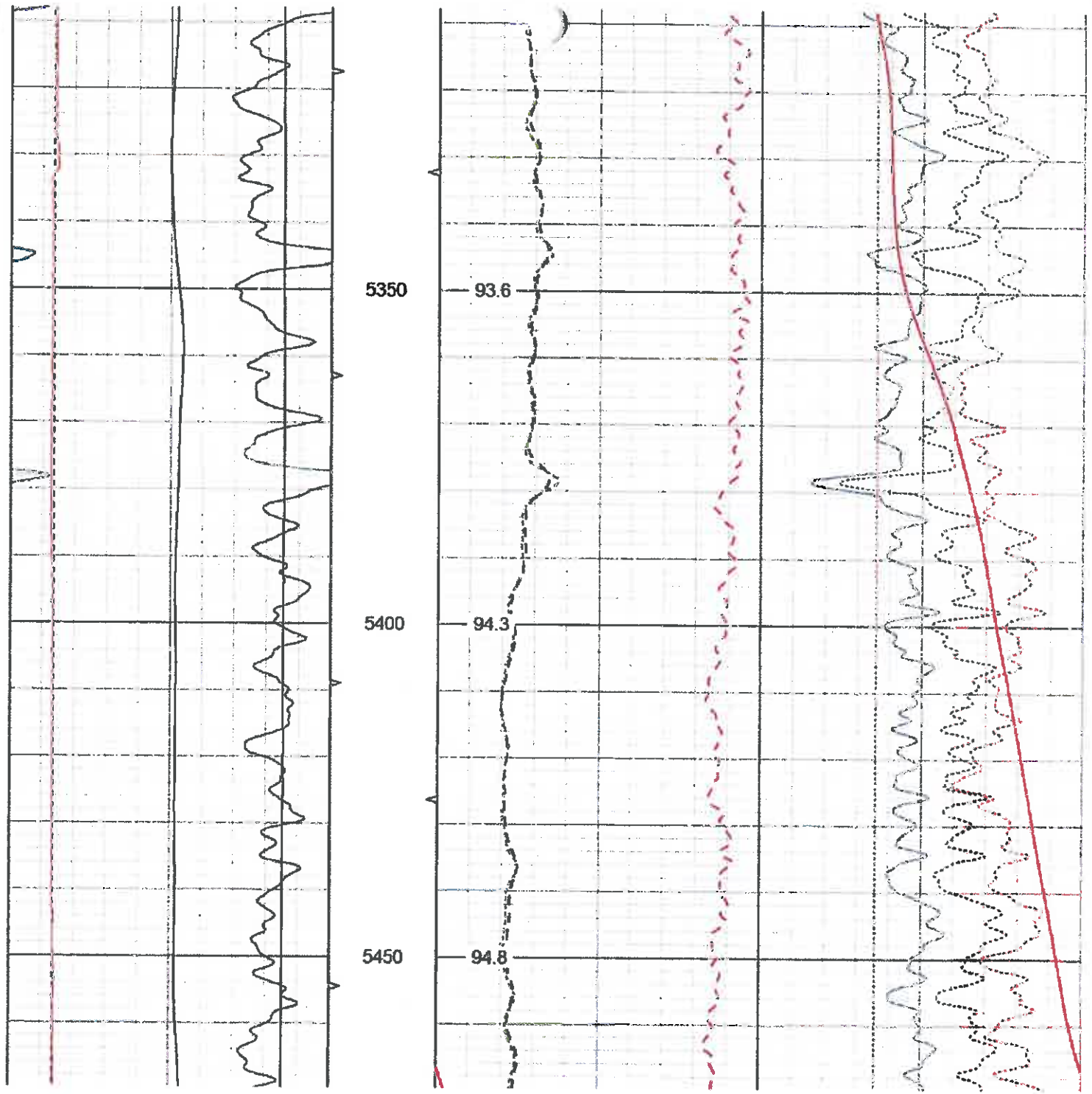
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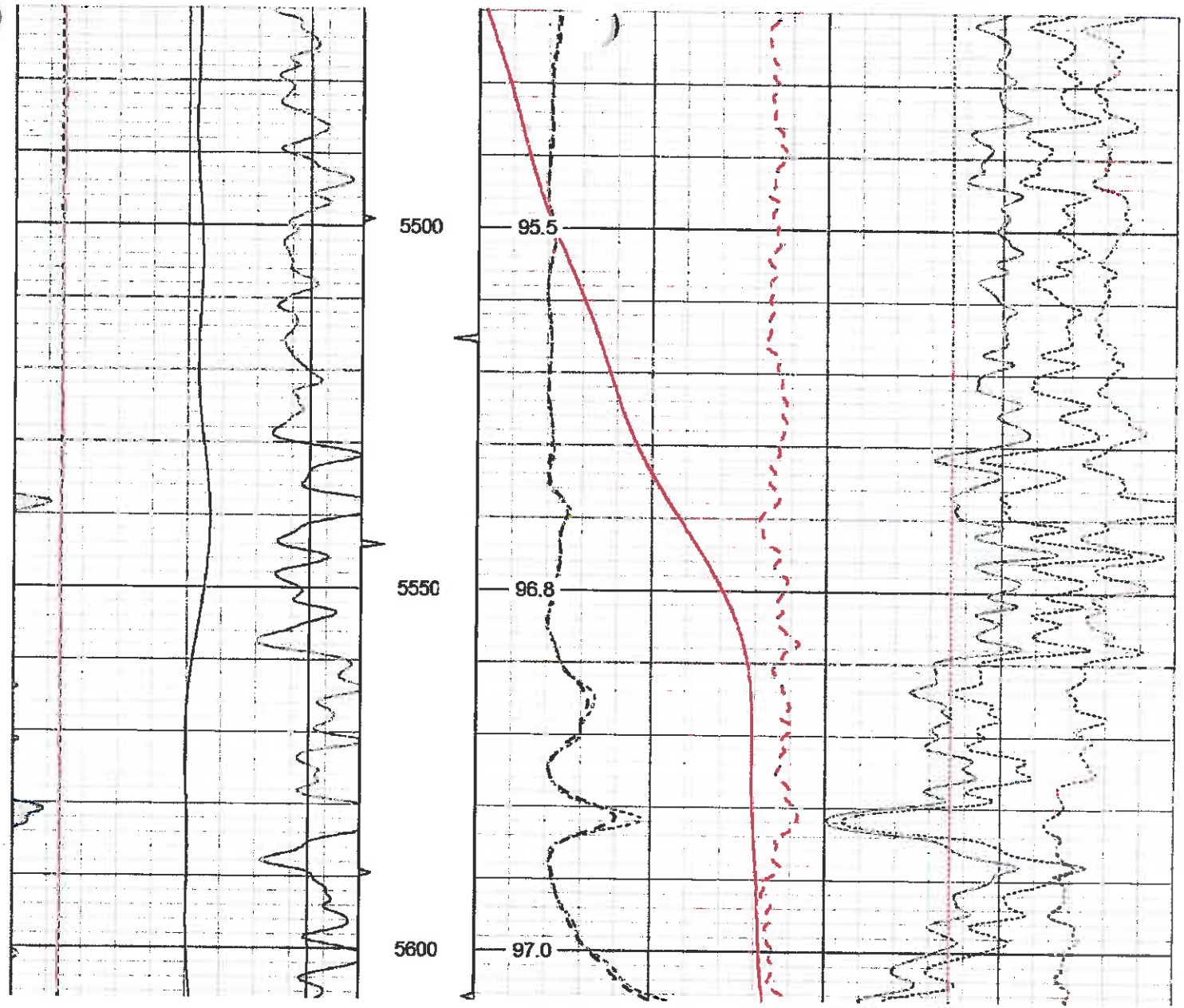
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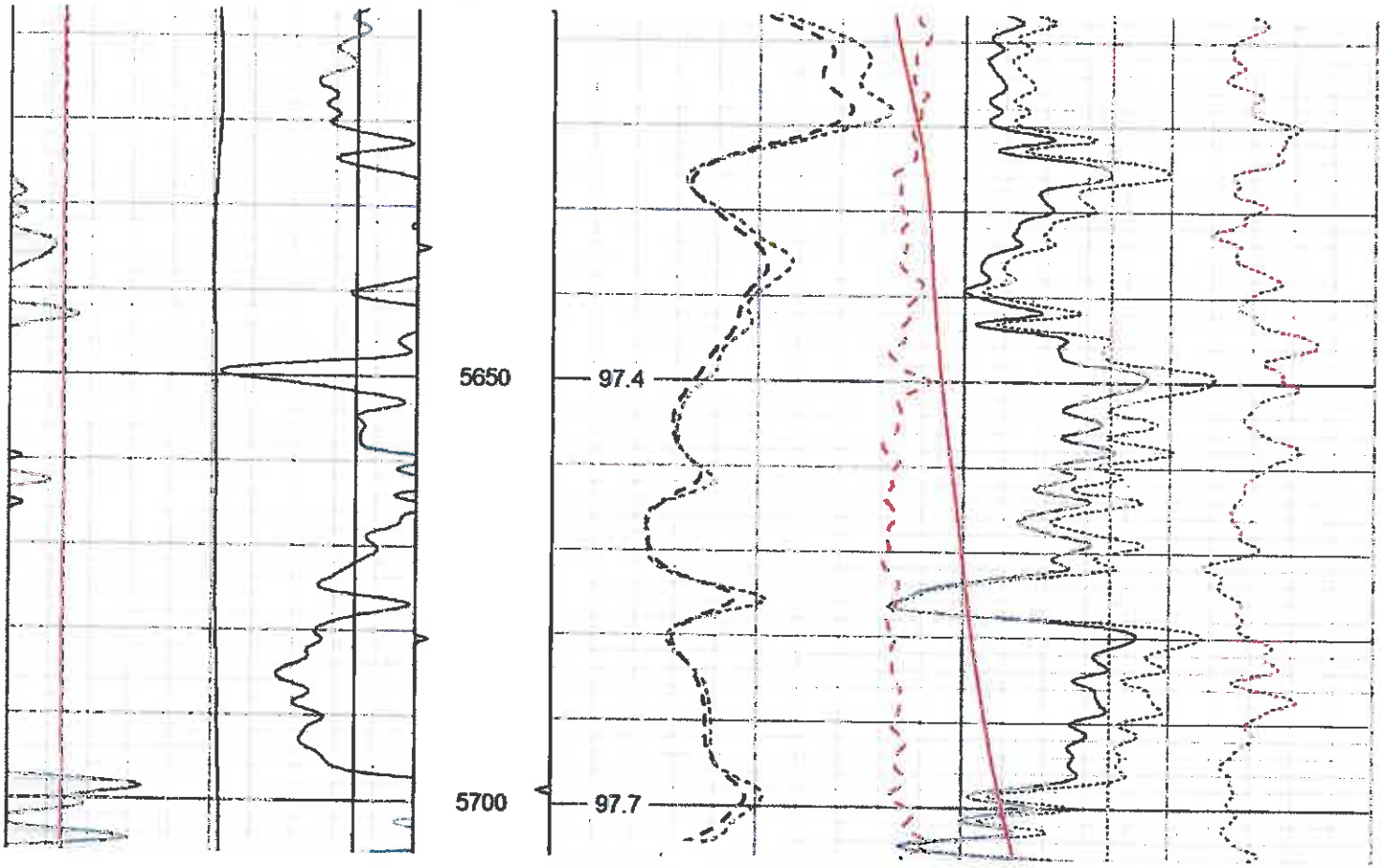
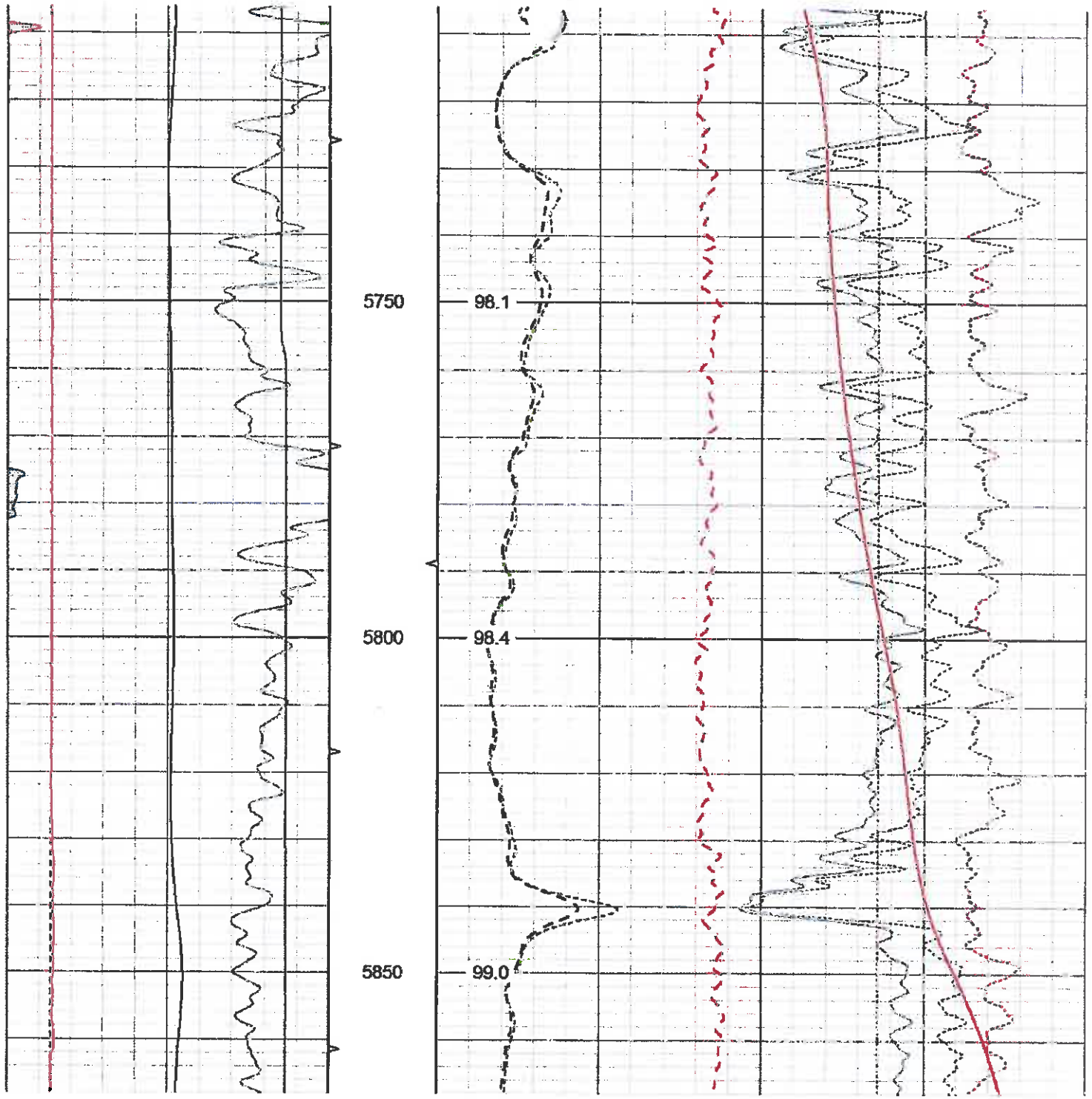
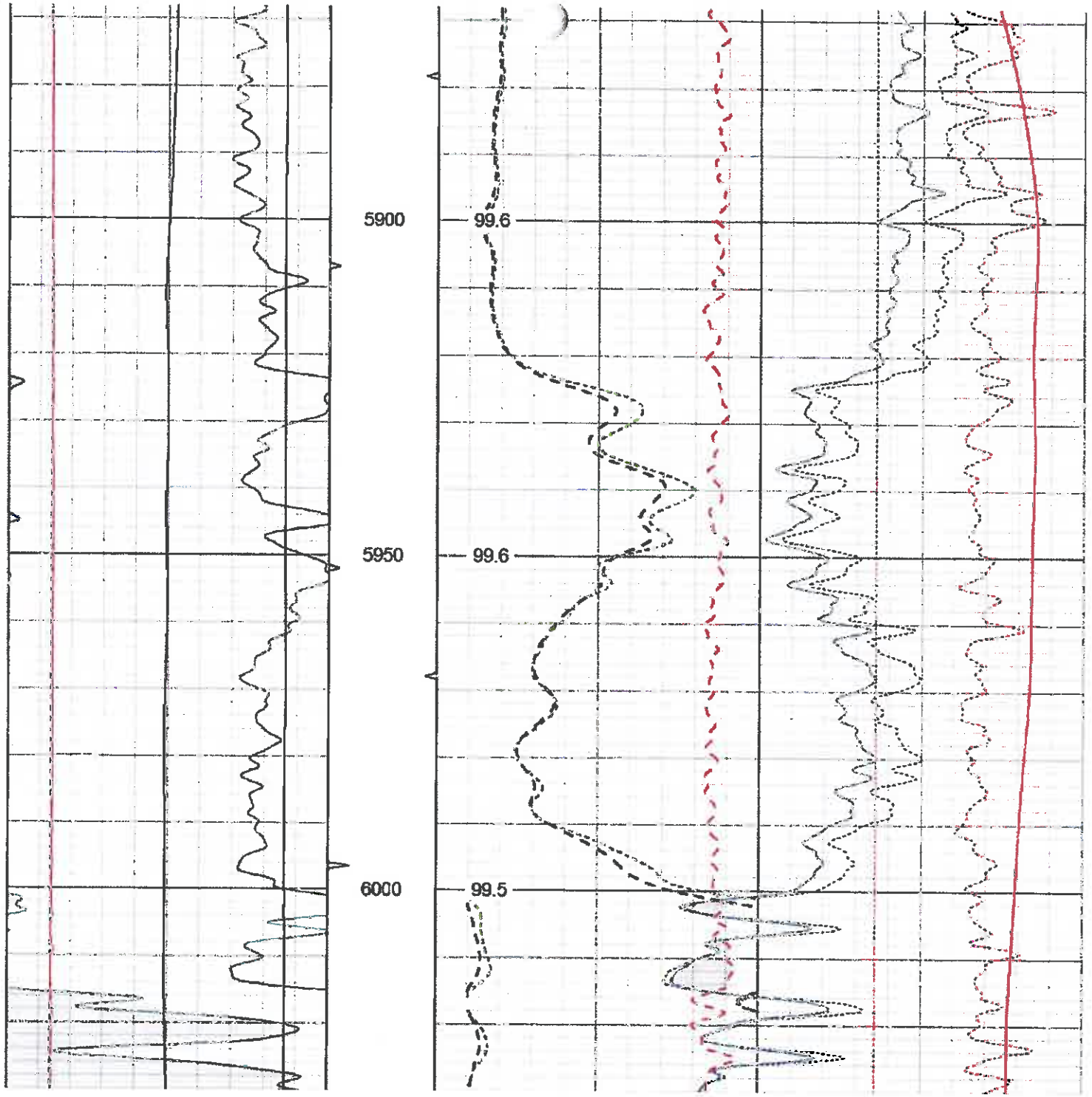
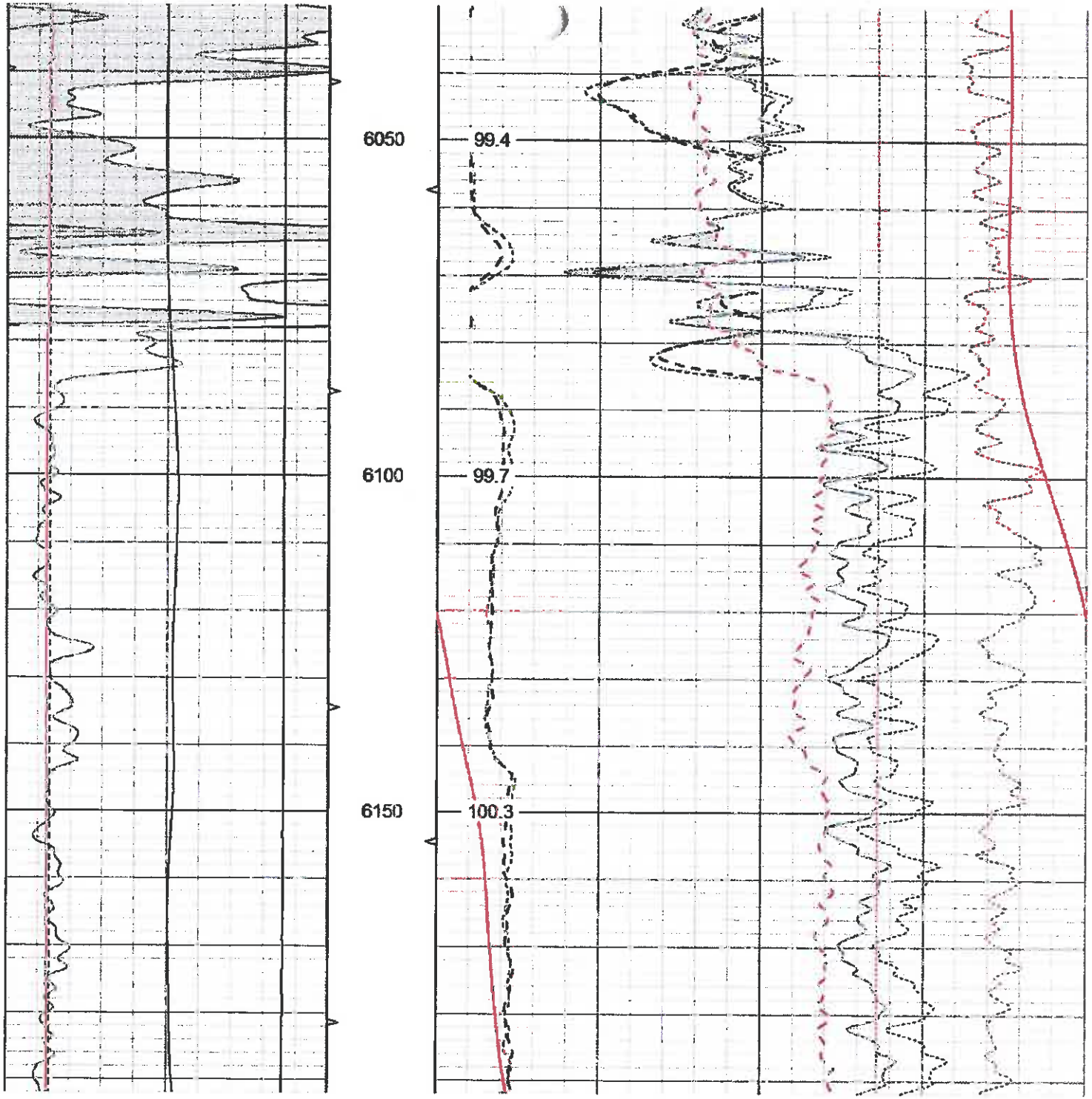
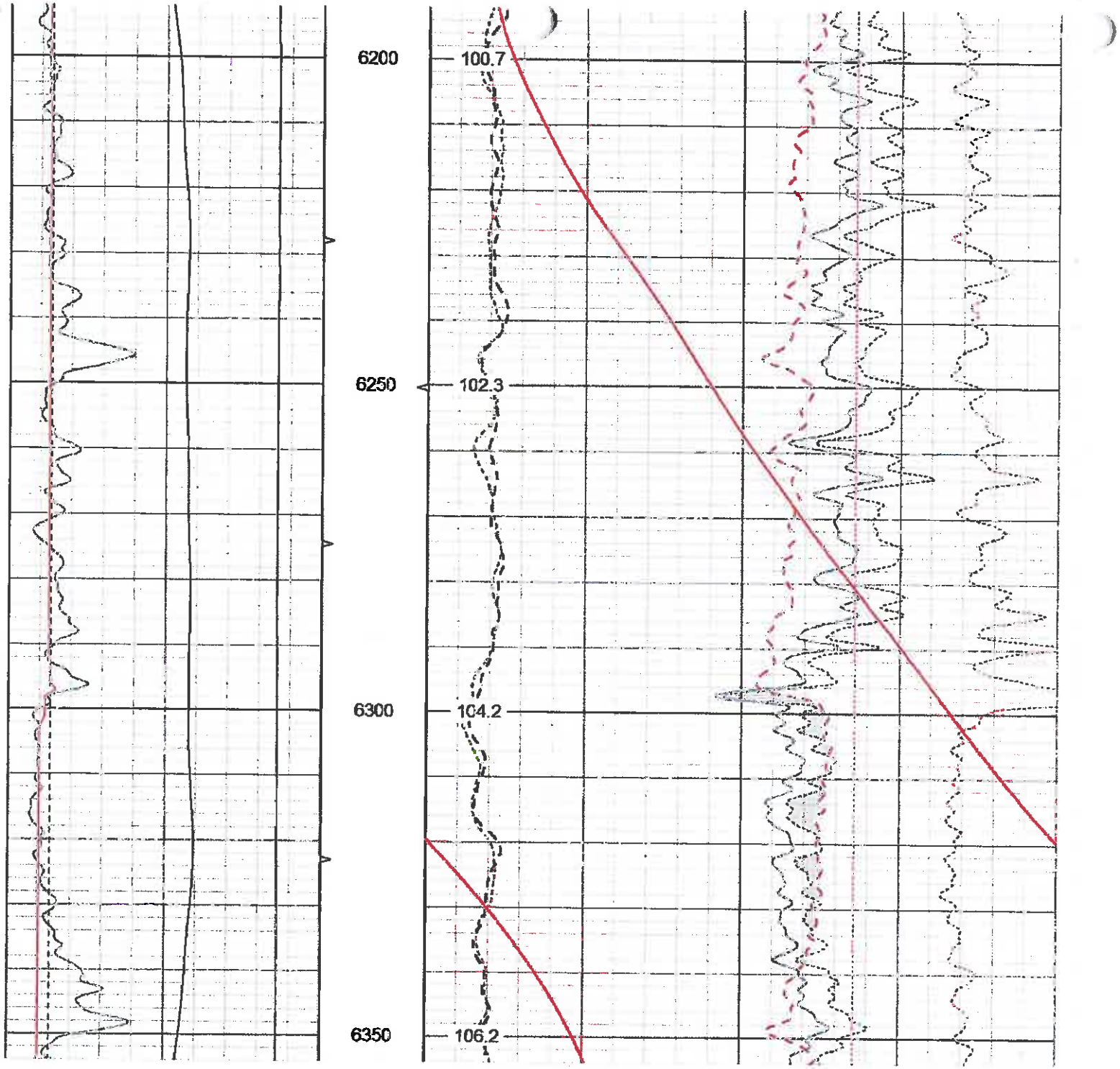
96.8
97.0

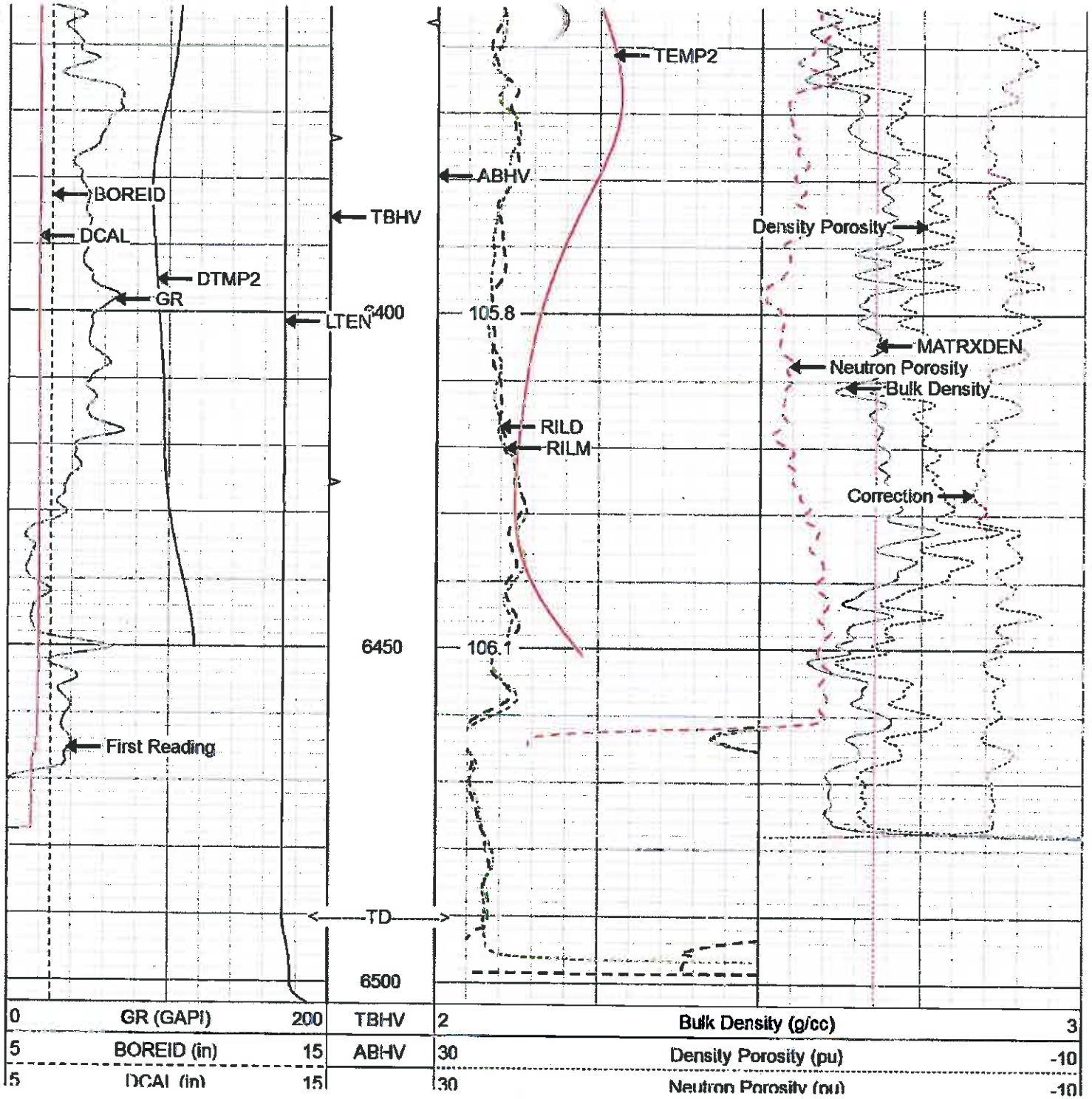

5650
97.4
5700
97.7


5750
5800
5850
98.1
98.4
99.0


5900
5950
6000
99.6
99.6
99.5


6050
99.4
6100
99.7
6150
100.3


6200
100.7
6250
102.3
6300
104.2
6350
106.2


TEMP2
ABHV
BOREID
TBHV
Density Porosity
DCAL
DTMP2
GR
6400
LTEN
105.8
MATRXDEN
Neutron Porosity
Bulk Density
RILD
RILM
Correction
6450
106.1
First Reading
TD
6500
0
GR (GAPI)
200
TBHV
2
Bulk Density (g/cc)
3
5
BOREID (in)
15
ABHV
30
Density Porosity (pu)
-10
5
DCAL (in)
15
30
Neutron Porosity (pu)
-10

20000	LTEN (lb)	0
-0.25	DTMP2 (degF)	0.25

2	MATRXDEN (g/cc)			3
0	RILD (Ohm-m)	100	-0.3 Correction (g/cc)	0.2
0	RILM (Ohm-m)	100		
65	TEMP2 (degF)			70

TEMP2 (degF)		
100	RILD (Ohm-m)	1000
100	RILM (Ohm-m)	1000

NABORS

MAIN LOG

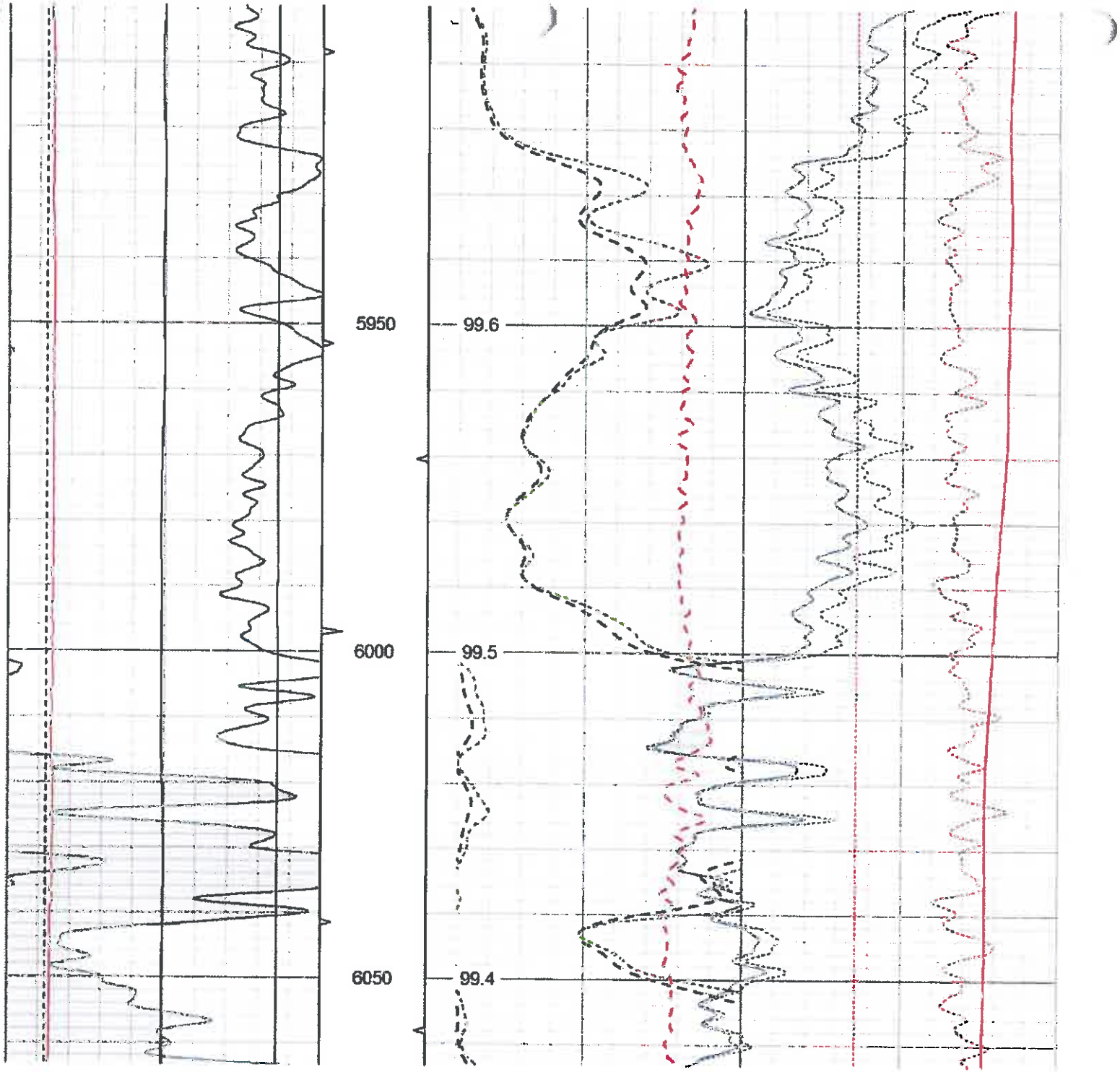
NABORS

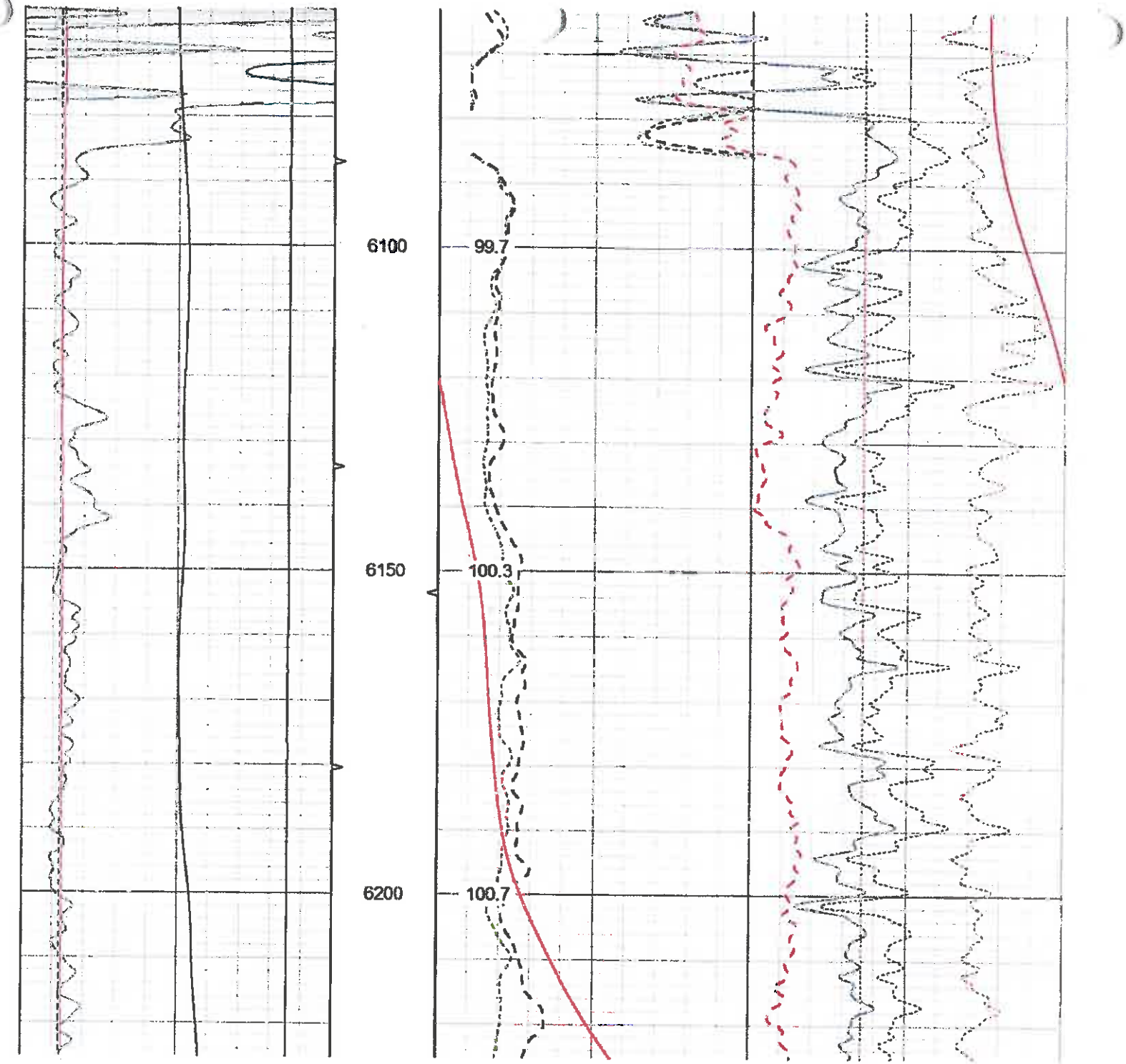
REPEAT SECTION

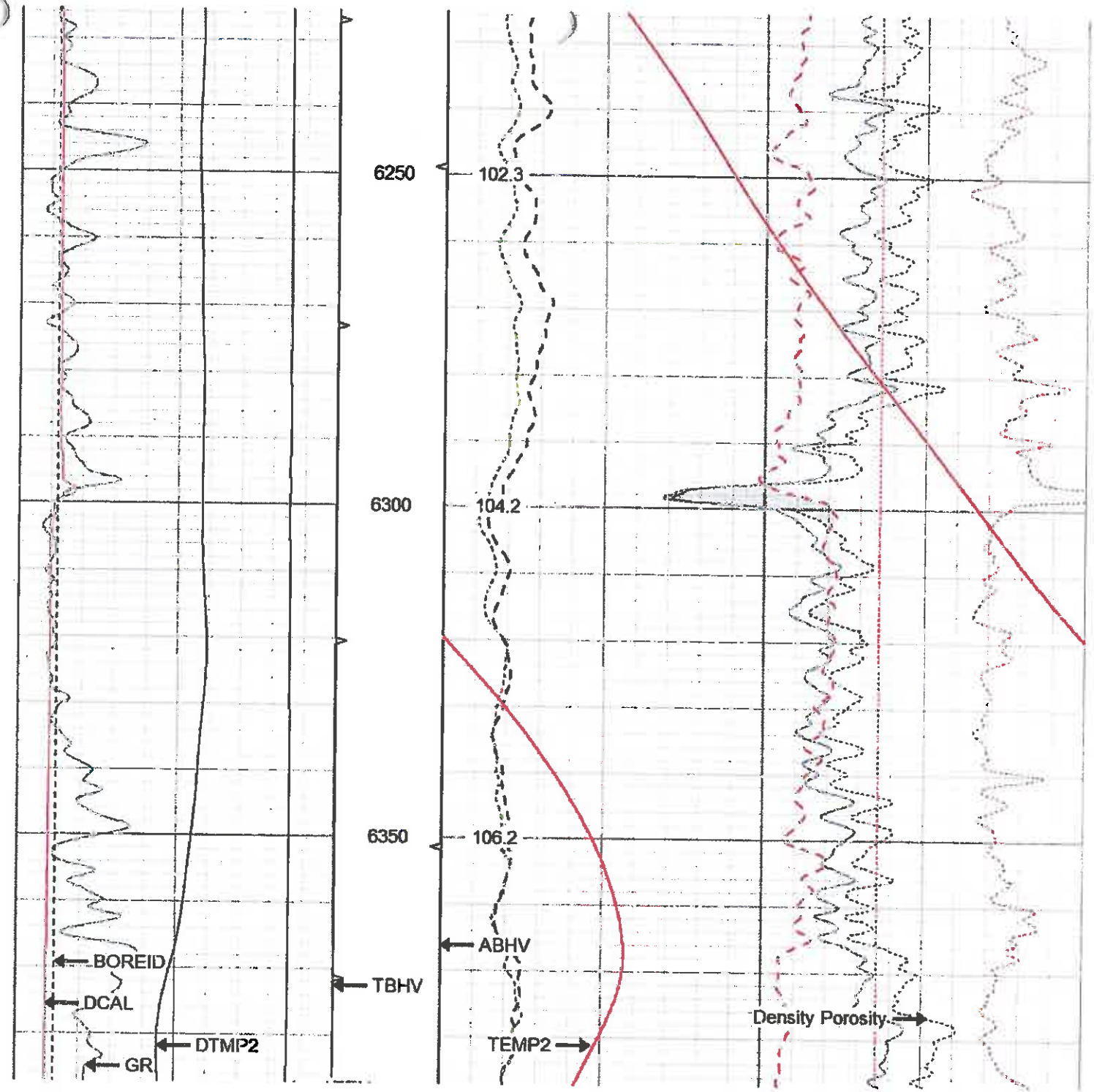
Database File:	26-jan-2015 haught energy ritchie hunter 2 .db
Dataset Pathname:	pass2.1
Presentation Format:	dntstack
Dataset Creation:	Mon Jan 26 14:13:15 2015 by Calc Open-Cased 090629
Charted by:	Depth in Feet scaled 1:240

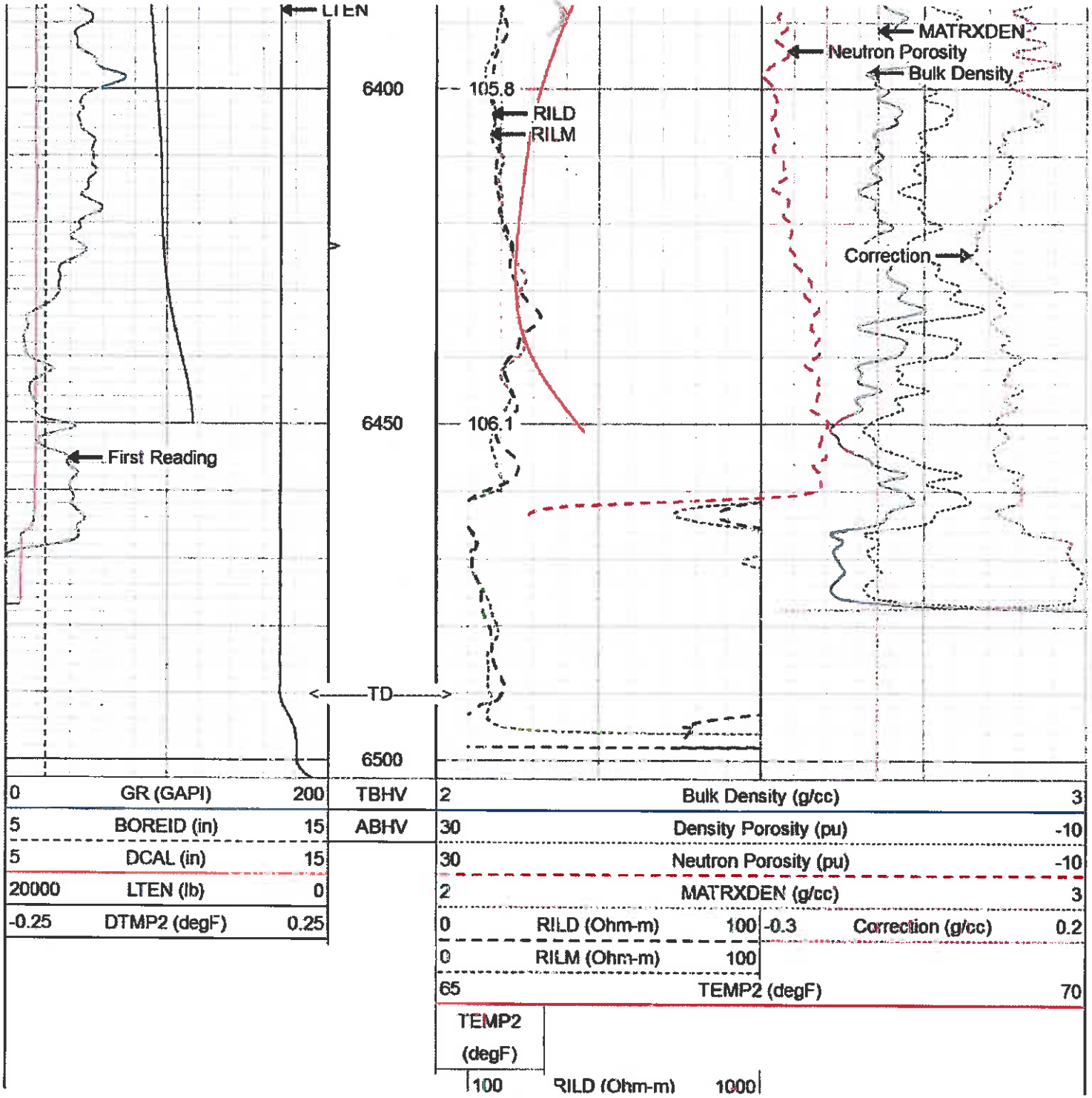
0	GR (GAPI)	200	TBHV	2	Bulk Density (g/cc)	3
5	BOREID (in)	15	ABHV	30	Density Porosity (pu)	-10
5	DCAL (in)	15		30	Neutron Porosity (pu)	-10
20000	LTEN (lb)	0		2	MATRXDEN (g/cc)	3
-0.25	DTMP2 (degF)	0.25		0	RILD (Ohm-m) 100	-0.3 Correction (g/cc) 0.2
				0	RILM (Ohm-m) 100	
				65	TEMP2 (degF)	70

TEMP2 (degF)		
100	RILD (Ohm-m)	1000
100	RILM (Ohm-m)	1000


5950
6000
6050
99.6
99.5
99.4


6100
99.7
6150
100.3
6200
100.7


6250
6300
6350
102.3
104.2
106.2
BOREID
DCAL
GR
DTMP2
TBHV
ABHV
TEMP2
Density Porosity


LTEN
6400
6450
6500
105.8
106.1
RILD
RILM
MATRXDEN
Neutron Porosity
Bulk Density
Correction
First Reading
TD
0 GR (GAPI) 200
5 BOREID (in) 15
5 DCAL (in) 15
20000 LTEN (lb) 0
-0.25 DTMP2 (degF) 0.25
TBHV
ABHV
2 Bulk Density (g/cc) 3
30 Density Porosity (pu) -10
30 Neutron Porosity (pu) -10
2 MATRXDEN (g/cc) 3
0 RILD (Ohm-m) 100
-0.3 Correction (g/cc) 0.2
0 RILM (Ohm-m) 100
65 TEMP2 (degF) 70
TEMP2 (degF)
100 RILD (Ohm-m) 1000

100	RILM (Ohm-m)	1000

NABORS

REPEAT SECTION

Calibration Report

Database File: 26-jan-2015 haught energy ritchie hunter 2 .db
Dataset Pathname: pass2.1
Dataset Creation: Mon Jan 26 14:13:15 2015 by Calc Open-Cased 090629

Dual Induction Calibration Report

Serial-Model:	GOI-5401-GEAR
Surface Cal Performed:	Wed Apr 16 13:52:05 2014
Downhole Cal Performed:	Wed Apr 16 13:52:06 2014
After Survey Verification Performed:	Wed Apr 16 13:52:06 2014

Surface Calibration

	Readings			References			Results	
Loop:	Air	Loop		Air	Loop		m	b
Deep	-0.011	0.635	V	0.000	400.000	mmho/m	619.439	6.783
Medium	0.029	0.783	V	0.000	464.000	mmho/m	615.661	-17.909
Internal:	Zero	Cal		Zero	Cal		m	b
Deep	-0.008	0.637	V	0.000	400.000	mmho/m	619.673	5.155
Medium	0.004	0.743	V	0.000	464.000	mmho/m	627.646	-2.429

Downhole Calibration

	Readings			References			Results	
	Zero	Cal		Zero	Cal		m'	b'
Deep	0.000	0.000	mmho/m	1.630	401.478	mmho/m	1.000	0.000
Medium	0.000	0.000	mmho/m	-15.527	439.613	mmho/m	1.000	0.000
LL3		0.017	V		2.000	Ohm-m		
		2.519	V		500.000	Ohm-m		
		1.000	V		1.000	mmho-m		

After Survey Verification

	Readings		Targets		Results	
	Zero	Cal	Zero	Cal	m'	b'

Deep	0.000	0.000	mmho/m	0.000	0.000	mmho/m	0.000	0.000
Medium	0.000	0.000	mmho/m	0.000	0.000	mmho/m	0.000	0.000
LL3		0.000	Ohm-m		1.000	Ohm-m		
		0.000	Ohm-m		0.000	Ohm-m		
		1.000	mmho-m		1.000	mmho-m		

Temperature Calibration Report

Serial Number:	070210			
Tool Model:	PROBE			
Performed:	Fri Feb 28 14:25:08 2014			
	Reference		Reading	
Low Reference:	0.00	degF	0.00	cps
High Reference:	0.00	degF	10.00	cps
Gain:	0.12			
Offset:	0.00			
Delta Spacing	2			

Litho Density Calibration Report
Serial: 081232 Model: PRB

Master Calibration

Performed Fri Jan 23 12:53:20 2015

	Background	Magnesium	Aluminum	Aluminum+Fe	
Window 1	1196.0	56825.6	13565.6	11221.2	cps
Window 2	1100.3	49150.2	11942.4	10048.5	cps
Window 3	728.3	16307.4	4273.2	3807.2	cps
Window 4	244.6	265.4	247.1	247.6	cps
Long Space	0.0	48049.9	10842.1	8948.2	cps
Short Space	0.9	5773.1	4145.9	3428.4	cps
Rho		1.7100	2.5900	0.0000	g/cc
Pe		2.0000	2.7500	5.7900	

Rib Angle	: 47.5	Rib Slope	: 1.090	Density/Spine Ratio	: 0.577
Spine Angle	: 77.5	Spine Slope	: 4.497	Spine Intercept	: -28.2

Before Survey Verification

Performed Fri Jan 23 13:12:14 2015

	Background	Magnesium	Aluminum	Aluminum+Fe	
Window 1	1225.3	58404.3	13541.3	11116.6	cps
Window 2	1126.8	50538.9	11913.6	9957.6	cps
Window 3	740.2	16834.8	4240.1	3789.0	cps
Window 4	247.1	272.0	246.0	247.4	cps

Long Space	0.0	49412.1	10786.8	8830.8	cps
Short Space	1.8	5907.2	4105.4	3377.6	cps
Measured Rho		1.7077	2.5856	2.5758	g/cc
Measured Correction		0.0142	-0.0074	-0.1355	g/cc
Measured Pe			3775.2936	3093.9563	

After Survey Verification — Performed Fri Jan 23 13:29:42 2015

	Background	Magnesium	Aluminum	Aluminum+Fe	
Window 1	1197.5	58433.1	11205.1	0.0	cps
Window 2	1100.8	50561.5	10036.0	0.0	cps
Window 3	730.1	16841.5	3806.3	0.0	cps
Window 4	244.6	271.3	247.5	0.0	cps
Long Space	0.0	49460.7	8935.2	0.0	cps
Short Space	0.9	5920.0	3410.9	0.0	cps
Measured Rho		1.7088	2.5750	0.0000	g/cc
Measured Correction		0.0159	-0.1294	0.0000	g/cc
Measured Pe			3130.4210	0.0000	

Gamma Ray Calibration Report

Serial Number:	040203	
Tool Model:	ADDON	
Performed:	Fri Jan 23 15:14:42 2015	
Calibrator Value:	5485.0	GAPI
Background Reading:	129.9	cps
Calibrator Reading:	5585.4	cps
Sensitivity:	0.2500	GAPI/cps

Neutron Calibration Report

Serial Number:	211		
Tool Model:	PROBEOP		
Performed:	Mon Jan 26 12:39:54 2015		
Calibrator Values:	6.9	13	NAPI
Calibrator Readings:	2850	1850	cps
Sensitivity:	-0.0087	NAPI/cps	

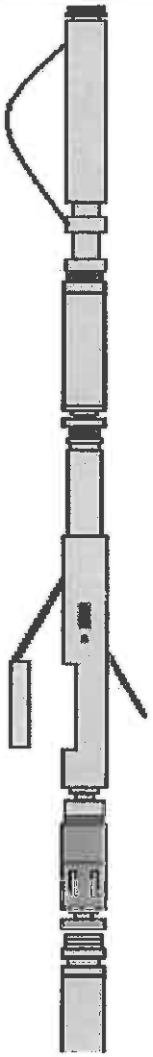
Log Variables

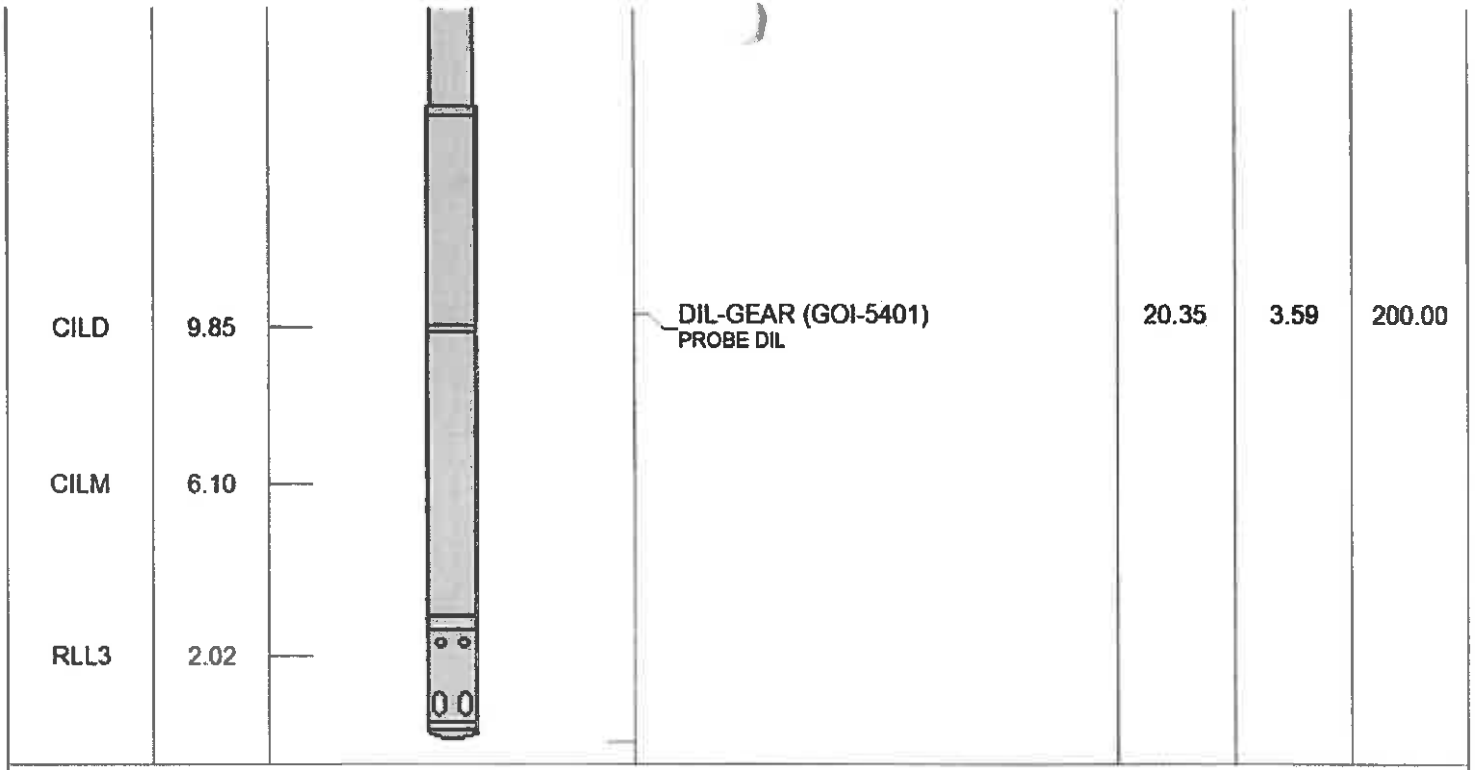
Database:C:\Warrior\Data\26-jan-2015 haught energy ritchie hunter 2 .db
Dataset: field/well/run1/pass2.1

Top Bottom

NPORSHIFT	NPORSEL	FLUIDDEN g/cc	MATRXDEN g/cc	SNDERRM mmho/m	SNDERR mmho/m	CASEOD in	PERFS
0	Limestone	0.7	2.68	4.5	5.5	4.5	0

TDEPTH ft	BOTTEMP degF	BOREID in
0	100	6.25

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
NEU	41.10		OHNEU-PROBEOP (211)	6.36	3.37	70.00
GR	34.24		OHGR-ADDON (040203)	3.70	3.36	30.00
			LDT-PRB (081232)	9.30	3.59	275.00
DCAL	25.43					
W1	25.27					
W2	25.27					
W3	25.27					
W4	25.27		OHTEMP-PROBE (070210)	2.75	3.24	40.00
Q	25.27					
SSD	25.06					
TEMP	21.48					



Dataset:	26-jan-2015 haught energy ritchie hunter 2 .db: field/well/run1/pass2.1
Total Length:	42.47 ft
Total Weight:	615.00 lb
O.D.	3.59 in

(4/25)

APPENDIX E
Water Sources

Operator: Green Hunter Water, LLC Year 2015 UIC Permit # 47-085-09721

		Source #	Source #	Source #	Source #
Water Source Name		Ritchie Hunter	[redacted]		
Northing		4345427.21	[redacted]		
Easting		491413.17			
Parameter	Units				
TPH - GRO	mg/L	113000			
TPH - DRO	mg/L	21900			
TPH - ORO	mg/L				
BTEX	mg/L	2190			
Chloride	mg/L	95200			
Sodium	mg/L	43100			
Total Dissolved Solids (TDS)	mg/L	152000			
Aluminum	mg/L	N/A			
Arsenic	mg/L	N/A			
Barium	mg/L	604			
Iron	mg/L	135			
Manganese	mg/L	13.5			
pH	SU	6.02			
Calcium	mg/L	17600			
Sulfate	mg/L	N/A			
MBAS	mg/L				
Dissolved Methane	mg/L	138			
Dissolved Ethane	mg/L	234			
Dissolved Butane	mg/L	838			
Dissolved Propane	mg/L	590			
Bacteria (Total Coliform)	c/100mL	N/A			

Microbac

Laboratory Report Number: L15021062

Steve Riffe
Green Hunter Water
28407 State Route 7
Marietta, OH 45750

Please find enclosed the analytical results for the samples you submitted to Microbac Laboratories. Review and compilation of your report was completed by Microbac's Ohio Valley Division (OVD). If you have any questions, comments, or require further assistance regarding this report, please contact your service representative listed below.

Laboratory Contact:
Michelle Taylor – Client Services Specialist
(740) 373-4071
Michelle.Taylor@microbac.com

I certify that all test results meet all of the requirements of the accrediting authority listed below. All results for soil samples are reported on a 'dry-weight' basis unless specified otherwise. Analytical results for water and wastes are reported on a 'as received' basis unless specified otherwise. A statement of uncertainty for each analysis is available upon request. This laboratory report shall not be reproduced, except in full, without the written approval of Microbac Laboratories. The reported results are related only to the samples analyzed as received.

This report was certified on March 13 2015

David E. Vandenberg

David Vandenberg – Managing Director

State of Origin: OH
Accrediting Authority: N/A ID:OH00218
QAPP: Microbac OVD

Microbac

Lab Report #: L15021062
Lab Project #: 3072.002
Project Name: Hunter Disposal #2
Lab Contact: Michelle Taylor

Record of Sample Receipt and Inspection

Comments/Discrepancies

This is the record of the shipment conditions and the inspection records for the samples received and reported as a sample delivery group (SDG). All of the samples were inspected and observed to conform to our receipt policies, except as noted below.

The following discrepancies were noted:

Discrepancy	Resolution
All voa vials/RSK's received with considerable headspace. BRG	Please proceed. MRT

Coolers

Cooler #	Temperature Gun	Temperature	COC #	Airbill #	Temp Required?
0010135	1	0.0			X
001-9293	1	3.0			X

Inspection Checklist

#	Question	Result
1	Were shipping coolers sealed?	NA
1	Were shipping coolers sealed?	NA
2	Were custody seals intact?	NA
2	Were custody seals intact?	NA
3	Were cooler temperatures in range of 0-6?	Yes
3	Were cooler temperatures in range of 0-6?	Yes
4	Was ice present?	Yes
4	Was ice present?	Yes
5	Were COC's received/information complete/signed and dated?	Yes
5	Were COC's received/information complete/signed and dated?	Yes
6	Were sample containers intact and match COC?	Yes
6	Were sample containers intact and match COC?	Yes
7	Were sample labels intact and match COC?	Yes
7	Were sample labels intact and match COC?	Yes
8	Were the correct containers and volumes received?	Yes
8	Were the correct containers and volumes received?	Yes
9	Were samples received within EPA hold times?	Yes
9	Were samples received within EPA hold times?	Yes
10	Were correct preservatives used? (water only)	Yes
10	Were correct preservatives used? (water only)	Yes
11	Were pH ranges acceptable? (voa's excluded)	Yes
11	Were pH ranges acceptable? (voa's excluded)	NA

12	Were VOA samples free of headspace (less than 6mm)?	No
12	Were VOA samples free of headspace (less than 6mm)?	NA

Microbac

Lab Report #: L15021062
Lab Project #: 3072.002
Project Name: Hunter Disposal #2
Lab Contact: Michelle Taylor

Samples Received

Client ID	Laboratory ID	Date Collected	Date Received
RITCHIE #2	L15021062-01	02/20/2015 09:30	02/20/2015 13:39
RITCHIE #2	L15021062-02	02/25/2015 09:30	02/25/2015 09:53

Login Number: L15021062
Department: Volatiles - GC
Analyst: Jared Smith

Analysis RSK-175

HOLDING TIMES

Sample Preparation: All holding times were met.

Sample Analysis: All holding times were met.

PREPARATION

During preparation it was noted that samples were received with headspace.

CALIBRATION

Initial Calibration: For all compounds that yielded a %RSD greater than 15%, linear or higher order equations were applied. All acceptance criteria were met.

Alternate Source Standards: All acceptance criteria were met.

Continuing Calibration and Tune: All acceptance criteria were met.

BATCH QA/QC

Method Blank: All acceptance criteria were met.

Laboratory Control Sample: All acceptance criteria were met.

Matrix Spikes/Sample Duplicates: The MS/MSD results were not associated with this sample delivery group (SDG), due to insufficient volume of sample. Microbac Laboratories recommends site specific MS/MSD samples to avoid possible data qualifications.

SAMPLES

Samples: Samples 01 required dilution analyses. Analyzed two dilutions of sample 01 which do not confirm original run. Quantity not sufficient for further analysis.

Manual Integration Reason Codes

Reason #1: Data System Fails to Select Correct Peak In some cases the chromatography system selects and integrates the 'wrong peak'. In this case the analyst must correct the selection and force the system to integrate the proper peak. Other times the system may miss the peak completely.

Reason #2: Data System Splits the Peak Incorrectly or Integrates a False Peak as a Rider Peak This phenomena is common at low concentrations where the signal:noise ratio is low. A single compound (peak) is incorrectly split into multiple peaks or integrated as a main peak with one or more rider peaks resulting in low area counts for the target compound.

Reason #3: Improperly Integrated Isomers and/or coeluting compounds. This system often fails to distinguish coeluting compounds and or isomers. The integration areas and concentrations are wrong, and they must be corrected by manual integration. Prime examples are benzo(k)fluoranthene and benzo(b)fluoranthene which are often unresolved and integrated improperly when both are present at low concentrations in standards or samples.

Reason #4: System Establishes Incorrect Baseline There are numerous situations in chromatography where the system establishes the baseline incorrectly. Some baseline errors will be obvious to the analyst and should be corrected via manual procedures.

Reason #5: Miscellaneous Other situations involving integration errors may require in-depth review and technical judgment. These cases should be brought to the attention of the laboratory management. If the form of manual integration is not clearly covered by these four cases, then review and approval by the Laboratory Director or the QA/QC Supervisor will be required.

Narrative ID: 95876
Approved By: Franci Bolden

Microbac

Lab Report #: L15021062
Lab Project #: 3072.002
Project Name: Hunter Disposal #2
Lab Contact: Michelle Taylor

Certificate of Analysis

Sample #	L15021062-01	**PrePrep Method**	N/A	**Instrument**	HPMS8
Client ID	RITCHIE #2	**Prep Method**	5030B/5030C/5035A	**Prep Date**	N/A
Matrix	Water	**Analytical Method**	8260B	**Cal Date**	02/06/2015 20 20
Workgroup #	WG513149	**Analyst**	TMB	**Run Date**	02/23/2015 16 55
Collect Date	02/20/2015 09 30	**Dilution**	25	**File ID**	8M403172
Sample Tag	DL01	**Units**	ug/L		

Analyte	CAS #	Result	Qual	RL	MDL
Benzene	71-43-2	1000		125	3.13
Ethyl benzene	100-41-4	152		125	6.25
Toluene	108-88-3	2640		125	6.25
Xylenes, Total	1330-20-7	2190		125	12.5

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	86.9	86	118	
1,2-Dichloroethane-d4	95.6	80	120	
Toluene-d8	112	88	110	*
4-Bromofluorobenzene	103	86	115	

* Surrogate or spike compound out of range

Sample #	L15021062-01	**PrePrep Method**	N/A	**Instrument**	HP5
Client ID	RITCHIE #2	**Prep Method**	5030B/5030C/5035A	**Prep Date**	N/A
Matrix	Water	**Analytical Method**	8015C	**Cal Date**	02/19/2015 16 22
Workgroup #	WG513420	**Analyst**	JDS	**Run Date**	02/25/2015 15 40
Collect Date	02/20/2015 09 30	**Dilution**	1	**File ID**	5G327328
Sample Tag	01	**Units**	ug/L		

Analyte	CAS #	Result	Qual	RL	MDL
Gasoline Range Organics	8006-61-9	118000	I	100	45.0

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Chlorobenzene(s)	1240	74	138	*

* Surrogate or spike compound out of range

I Semiquantitative result (out of instrument calibration range)

Sample #	L15021062-01	**PrePrep Method**	N/A	**Instrument**	HP5
Client ID	RITCHIE #2	**Prep Method**	5030B/5030C/5035A	**Prep Date**	N/A
Matrix	Water	**Analytical Method**	8015C	**Cal Date**	02/19/2015 16 22
Workgroup #	WG513420	**Analyst**	JDS	**Run Date**	02/25/2015 16 45
Collect Date	02/20/2015 09 30	**Dilution**	100	**File ID**	5G327330
Sample Tag	DL01	**Units**	ug/L		

Certificate of Analysis

Analyte	CAS #	Result	Qual	RL	MDL
Gasoline Range Organics	8006-61-9	113000		10000	4500

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Chlorobenzene(s)	122	74	138	

Sample #	L15021062-01	PrePrep Method	N/A	Instrument	HP16
Client ID	RITCHIE #2	Prep Method	5021	Prep Date	N/A
Matrix	Water	Analytical Method	RSK175	Cal Date	02/19/2015 16:08
Workgroup #	WG513247	Analyst	JDS	Run Date	02/24/2015 17:07
Collect Date	02/20/2015 09:30	Dilution	1	File ID	16G46808
Sample Tag	01	Units	ug/L		

Analyte	CAS #	Result	Qual	RL	MDL
n-Butane	106-97-8	10600	I	5.00	1.00
methane	74-82-8	1820	I	5.00	1.00
ethane	74-84-0	2310	I	5.00	1.00
Propane	74-98-6	4740	I	5.00	2.50

I Semiquantitative result (out of instrument calibration range)

Sample #	L15021062-01	PrePrep Method	N/A	Instrument	HP16
Client ID	RITCHIE #2	Prep Method	5021	Prep Date	N/A
Matrix	Water	Analytical Method	RSK175	Cal Date	02/19/2015 16:08
Workgroup #	WG513421	Analyst	JDS	Run Date	02/25/2015 17:05
Collect Date	02/20/2015 09:30	Dilution	5	File ID	16G46833
Sample Tag	DL02	Units	ug/L		

Analyte	CAS #	Result	Qual	RL	MDL
n-Butane	106-97-8	358		25.0	5.00
methane	74-82-8	47.4		25.0	5.00
ethane	74-84-0	89.4		25.0	5.00
Propane	74-98-6	142		25.0	12.5

Sample #	L15021062-01	PrePrep Method	N/A	Instrument	HP16
Client ID	RITCHIE #2	Prep Method	5021	Prep Date	N/A
Matrix	Water	Analytical Method	RSK175	Cal Date	02/19/2015 16:08
Workgroup #	WG513421	Analyst	JDS	Run Date	02/25/2015 14:08
Collect Date	02/20/2015 09:30	Dilution	10	File ID	16G46819
Sample Tag	DL01	Units	ug/L		

Analyte	CAS #	Result	Qual	RL	MDL
n-Butane	106-97-8	838		50.0	10.0

Certificate of Analysis

Analyte	CAS #	Result	Qual	RL	MDL
methane	74-82-8	138		50.0	10.0
ethane	74-84-0	234		50.0	10.0
Propane	74-98-6	390		50.0	25.0

Sample #	L15021062-01	PrePrep Method	N/A	Instrument:	HP14
Client ID	RITCHIE #2	Prep Method	3510C	Prep Date	02/24/2015 09 45
Matrix	Water	Analytical Method	8015C	Cal Date	03/02/2015 15 27
Workgroup #	WG513326	Analyst	AED	Run Date	03/04/2015 02 29
Collect Date	02/20/2015 09 30	Dilution	1	File ID	14G56218
Sample Tag	01	Units	ug/L		

Analyte	CAS #	Result	Qual	RL	MDL
Carbon Range (C28-C40)		558		500	250

Surrogate	Recovery	Lower Limit	Upper Limit	Q
O-Terphenyl	19.4	49	174	*
Octacosane	31.9	26	152	

* Surrogate or spike compound out of range

Sample #	L15021062-01	PrePrep Method	N/A	Instrument:	HP14
Client ID	RITCHIE #2	Prep Method	3510C	Prep Date	02/24/2015 09 45
Matrix	Water	Analytical Method	8015C	Cal Date	03/11/2015 20 49
Workgroup #	WG513326	Analyst	AED/MES	Run Date	03/12/2015 09 38
Collect Date	02/20/2015 09 30	Dilution	5	File ID	14G56468
Sample Tag	DL01	Units	ug/L		

Analyte	CAS #	Result	Qual	RL	MDL
Diesel Range (C10-C28)	68334-30-5	21000		2500	1250
Carbon Range (C28-C40)			ND	2500	1250

Surrogate	Recovery	Lower Limit	Upper Limit	Q
O-Terphenyl	DL	49	174	*
Octacosane	88.7	26	152	

DL Surrogate or spike compound was diluted out

ND Not detected at or above the reporting limit (RL/MDL).

Microbac

Lab Report #: L15021062
Lab Project #: 3072.002
Project Name: Hunter Disposal #2
Lab Contact: Michelle Taylor

Certificate of Analysis

Sample #:	L15021062-01	PrePrep Method:	N/A	Instrument:	ICP-THERMO2
Client ID:	RITCHIE #2	Prep Method:	3015	Prep Date:	02/23/2015 11 11
Matrix:	Water	Analytical Method:	6010B	Cal Date:	02/25/2015 08 00
Workgroup #:	WG513301	Analyst:	KHR	Run Date:	02/25/2015 10 25
Collect Date:	02/20/2015 09 30	Dilution:	200	File ID:	T2 022515 102540
Sample Tag:	DL01	Units:	mg/L		

Analyte	CAS #	Result	Qual	RL	MDL
Aluminum, Total	7429-90-5		ND	40.0	20.0
Arsenic, Total	7440-38-2		ND	20.0	10.0
Barium, Total	7440-39-3	804		2.00	1.00
Calcium, Total	7440-70-2	17600		100	50.0
Iron, Total	7439-89-6	135		20.0	10.0
Manganese, Total	7439-96-5	13.5		2.00	1.00
Sodium, Total	7440-23-5	43100		100	50.0

ND Not detected at or above the reporting limit (RL/MDL).

Sample #:	L15021062-01	PrePrep Method:	N/A	Instrument:	TIAMO2
Client ID:	RITCHIE #2	Prep Method:	9040C	Prep Date:	N/A
Matrix:	Water	Analytical Method:	9040C	Cal Date:	
Workgroup #:	WG513131	Analyst:	TMM	Run Date:	02/23/2015 16 50
Collect Date:	02/20/2015 09 30	Dilution:	1	File ID:	TO 022315 1650PH
Sample Tag:	01	Units:	UNITS		

Analyte	CAS #	Result	Qual	RL	MDL
pH	10-29-7	6.02		0.000	0.000

Sample #:	L15021062-01	PrePrep Method:	N/A	Instrument:	SMARTCHEM2
Client ID:	RITCHIE #2	Prep Method:	SM4500-Cl(-)-E-1997	Prep Date:	N/A
Matrix:	Water	Analytical Method:	SM4500-Cl(-)-E-1997	Cal Date:	02/25/2015 08 32
Workgroup #:	WG513348	Analyst:	DCM	Run Date:	02/25/2015 09 04
Collect Date:	02/20/2015 09 30	Dilution:	2500	File ID:	S2150225001 039
Sample Tag:	DL01	Units:	mg/L		

Analyte	CAS #	Result	Qual	RL	MDL
Chloride	16887-00-6	95200		5000	2500

Microbac

Lab Report #: L15021062
Lab Project #: 3072.002
Project Name: Hunter Disposal #2
Lab Contact: Michelle Taylor

Certificate of Analysis

Sample #: L15021062-01
Client ID: RITCHIE #2
Matrix: Water
Workgroup #: WG513038
Collect Date: 02/20/2015 09 30
Sample Tag:

PrePrep Method: N/A
Prep Method: SM5540-C-2000
Analytical Method: SM5540-C-2000
Analyst: TB
Dilution: 1
Units: mg/L

Instrument: V-1200
Prep Date: N/A
Cal Date: 01/07/2015 14 00
Run Date: 02/20/2015 16 15
File ID: 00 1502201615-06

Analyte	CAS #	Result	Qual	RL	MDL
Surfactants		1.19		0.100	0.0500

Sample #: L15021062-01
Client ID: RITCHIE #2
Matrix: Water
Workgroup #: WG513193
Collect Date: 02/20/2015 09 30
Sample Tag: 01

PrePrep Method: N/A
Prep Method: SM4500-SO4E-1997
Analytical Method: SM4500-SO4E-1997
Analyst: TB
Dilution: 1
Units: mg/L

Instrument: SMARTCHEM
Prep Date: N/A
Cal Date: 02/23/2015 16 47
Run Date: 02/23/2015 17 26
File ID: SC150223003.063

Analyte	CAS #	Result	Qual	RL	MDL
Sulfate	14808-79-8	ND	ND	5.00	2.50

ND Not detected at or above the reporting limit (RL/MDL).

Sample #: L15021062-01
Client ID: RITCHIE #2
Matrix: Water
Workgroup #: WG513150
Collect Date: 02/20/2015 09 30
Sample Tag:

PrePrep Method: N/A
Prep Method: 180 1/SM2540C
Analytical Method: SM2540-C-1997
Analyst: ADG
Dilution: 1
Units: mg/L

Instrument: OVEN
Prep Date: N/A
Cal Date:
Run Date: 02/23/2015 12 44
File ID: EN 1502231244-06

Analyte	CAS #	Result	Qual	RL	MDL
Total Dissolved Solids		152000		1000	500

Sample #: L15021062-02
Client ID: RITCHIE #2
Matrix: Water
Workgroup #: WG513376
Collect Date: 02/25/2015 09 30
Sample Tag:

PrePrep Method: N/A
Prep Method: SM9222B-1997
Analytical Method: SM9222B-1997
Analyst: EPT
Dilution: 10
Units: col/100 ml

Instrument: INCUBATOR
Prep Date: N/A
Cal Date:
Run Date: 02/26/2015 11 35
File ID: IN1502271328150I

Analyte	CAS #	Result	Qual	RL	MDL
Total Coliform		ND	ND	10.0	10.0

ND Not detected at or above the reporting limit (RL/MDL).

Microbac Laboratories Inc.
Ohio Valley Division Analyst List
March 13, 2015

001 - BIO-CHEM TESTING WVDEP 220
002 - REIC Consultants, Inc. WVDEP 060
003 - Sturm Environmental
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WTD - WADE T. DELONG
XXX - UNAVAILABLE OR SUBCONTRACT

Microbac Laboratories Inc.
List of Valid Qualifiers
March 13, 2015

Qualkey: STD

Qualifier	Description
*	Surrogate or spike compound out of range
+	Correlation coefficient for the MSA is less than 0.995
<	Result is less than the associated numerical value.
>	Result is greater than the associated numerical value.
A	See the report narrative
B	Analyte present in method blank
B,H1	Analyte present in method blank. Sample analysis performed past holding time.
B1	Target analyte detected in method blank at or above the method reporting limit
B3	Target analyte detected in calibration blank at or above the method reporting limit
B4	The BOD unseeded dilution water blank exceeded 0.2 mg/L
C	Confirmed by GC/MS
CG	Confluent growth
CT1	The cooler temperature at receipt exceeded regulatory guidelines for requested testing.
DL	Surrogate or spike compound was diluted out
E	Estimated concentration due to sample matrix interference
EDL	Elevated sample reporting limits, presence of non-target analytes
EMPC	Estimated Maximum Possible Concentration
F, S	Estimated result below quantitation limit; method of standard additions(MSA)
F,CT1	Estimated value; the analyte concentration was less than the RL/LOQ. The cooler temperature at receipt exceeded regula
FL	Free Liquid
H1	Sample analysis performed past holding time.
H1,CT1	Sample analysis performed past holding time. The cooler temperature at receipt exceeded regulatory guidelines for reque
I	Semiquantitative result (out of instrument calibration range)
J	Estimated value; the analyte concentration was less than the RL/LOQ.
J,B	Analyte detected in both the method blank and sample above the MDL.
J,CT1	Estimated value; the analyte concentration was less than the RL/LOQ.
J,CT1	Estimated value; the analyte concentration was less than the RL/LOQ. The cooler temperature at receipt exceeded regula
J,P	Estimate; columns don't agree to within 40%
J,S	Estimated concentration; analyzed by method of standard addition (MSA)
L	Sample reporting limits elevated due to matrix interference
L1	The associated blank spike (LCS) recovery was above the laboratory acceptance limits.
L2	The associated blank spike (LCS) recovery was below the laboratory acceptance limits.
M	Matrix effect; the concentration is an estimate due to matrix effect.
N	Tentatively identified compound(TIC)
NA	Not applicable
ND	Not detected at or above the reporting limit (RL/MDL).
ND, B	Not detected at or above the reporting limit (RL). Analyte present in method blank.
ND, CT1	Analyte was not detected. The concentration is below the reported LOD. The cooler temperature at receipt exceeded reg
ND, L	Not detected; sample reporting limit (RL) elevated due to interference
ND, S	Not detected; analyzed by method of standard addition (MSA)
ND,H1	Not detected; Sample analysis performed past holding time.
ND,H1,CT1	Not detected; Sample analysis performed past holding time. The cooler temperature at receipt exceeded regulatory guide
NF	Not found by library search
NFL	No free liquid
NI	Non-ignitable
NR	Analyte is not required to be analyzed
NS	Not spiked
P	Concentrations >40% difference between the two GC columns
Q	One or more quality control criteria failed. See narrative.
QNS	Quantity of sample not sufficient to perform analysis
RA	Reanalysis confirms reported results
RE	Reanalysis confirms sample matrix interference
S	Analyzed by method of standard addition (MSA)
SMI	Sample matrix interference on surrogate
SP	Reported results are for spike compounds only
TIC	Library Search Compound
TNTC	Too numerous to count
TNTC, B	Too numerous to count. Analyte present in method blank.
TNTC,CT1	Too numerous to count. The cooler temperature at receipt exceeded regulatory guidelines for requested testing.
TNTC,H1	Too numerous to count. Sample analysis performed past holding time.
U	Analyte was not detected. The concentration is below the reported MDL.
UJ	Undetected; the MDL and RL are estimated due to quality control discrepancies.
UQ	Undetected; the analyte was analyzed for, but not detected.
W	Post-digestion spike for furnace AA out of control limits
X	Exceeds regulatory limit
X, S	Exceeds regulatory limit; method of standard additions (MSA)
Z	Cannot be resolved from isomer - see below

L15021062 / Revision: 0 / 16 total pages

COC No. A 45241

158 Starlite Drive
Marietta, OH 45750

MICROBAC®

CHAIN-OF-CUSTODY RECORD

Phone: 740-373-4071
Toll Free: 800-373-4071

Company Name: GreenHunter Water — PO# 290855

Project Contact: Brian Mueller — Contact Phone #: (817) 991-7465

Turn Around Requirements: STD — Location: 47-085-10142

Project ID: Ritchie Hunter Composite Sample

Sampler (print): Michael Umstead — Signature:

Program: ☐ CWA ☐ RCRA ☐ DOD ☐ AFCEE ☐ Other

Sample I.D. No.	Comp	Grab	Date	Time	Matrix*	NUMBER OF CONTAINERS	Hold	F cap	TOTAL # (LAB USE)	ADDITIONAL REQUIREMENTS
Ritchie #2			2/25/15	9:30 am		1				

Microbac OVD
Received: 02/25/2015 09:53
By: CARA STRICKLER
2210000056827

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
			Cara Strickler		
Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time
	2/25/15	9:43	Brenda Brewer	2-25-15	943

Remarks:

*Water (W), Soil (S), Solid Waste (SD), Unknown (X)

Page _____ of _____

Page 15

Generated: 03/13/2015 11:14

Microbac

Laboratory Report Number: L15071525

Steve Riffe
Green Hunter Water
28407 State Route 7
Marietta, OH 45750

Please find enclosed the analytical results for the samples you submitted to Microbac Laboratories. Review and compilation of your report was completed by Microbac's Ohio Valley Division (OVD). If you have any questions, comments, or require further assistance regarding this report, please contact your service representative listed below.

Laboratory Contact:
Michelle Taylor – Client Services Specialist
(740) 373-4071
Michelle.Taylor@microbac.com

I certify that all test results meet all of the requirements of the accrediting authority listed below. All results for soil samples are reported on a 'dry-weight' basis unless specified otherwise. Analytical results for water and wastes are reported on a 'as received' basis unless specified otherwise. A statement of uncertainty for each analysis is available upon request. This laboratory report shall not be reproduced, except in full, without the written approval of Microbac Laboratories. The reported results are related only to the samples analyzed as received.

This report was certified on July 30 2015

David E. Vandenberg

David Vandenberg – Managing Director

State of Origin: OH
Accrediting Authority: N/A ID:OH00218
QAPP: Microbac OVD

Microbac

Lab Report #: L15071525
Lab Project #: 3072.003
Project Name: Ritchie Hunter & Cairo Hunter
Lab Contact: Michelle Taylor

Record of Sample Receipt and Inspection

Comments/Discrepancies

This is the record of the shipment conditions and the inspection records for the samples received and reported as a sample delivery group (SDG). All of the samples were inspected and observed to conform to our receipt policies, except as noted below.

There were no discrepancies.

Discrepancy	Resolution

Coolers

Cooler #	Temperature Gun	Temperature	COC #	Airbill #	Temp Required?
001-9293	H	0.0			X

Inspection Checklist

#	Question	Result
1	Were shipping coolers sealed?	Yes
2	Were custody seals intact?	NA
3	Were cooler temperatures in range of 0-6?	Yes
4	Was ice present?	Yes
5	Were COC's received/information complete/signed and dated?	Yes
6	Were sample containers intact and match COC?	Yes
7	Were sample labels intact and match COC?	Yes
8	Were the correct containers and volumes received?	Yes
9	Were samples received within EPA hold times?	Yes
10	Were correct preservatives used? (water only)	Yes
11	Were pH ranges acceptable? (voa's excluded)	NA
12	Were VOA samples free of headspace (less than 6mm)?	NA

Microbac

Lab Report #: L15071525
Lab Project #: 3072.003
Project Name: Ritchie Hunter & Cairo Hunter
Lab Contact: Michelle Taylor

Samples Received

Client ID	Laboratory ID	Date Collected	Date Received
RITCHIE HUNTER #1	L15071525-01	07/28/2015 11:30	07/28/2015 14:22

Microbac Laboratories • Ohio Valley Division
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Microbac

Lab Report #: L15071525
Lab Project #: 3072.003
Project Name: Ritchie Hunter & Cairo Hunter
Lab Contact: Michelle Taylor

Certificate of Analysis

Sample #:	L15071525-01	**PrePrep Method:**	N/A	**Instrument:**	BAL018
Client ID:	RITCHIE HUNTER #1	**Prep Method:**	SM2710F	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	SM2710F	**Cal Date:**	
Workgroup #:	WG533072	**Analyst:**	DLP	**Run Date:**	07/29/2015 14:45
Collect Date:	07/28/2015 11:30	**Dilution:**	1	**File ID:**	18.1507291445-01
Sample Tag:		**Units:**	Water=1.00		

Analyte	CAS #	Result	Qual	RL	MDL
Specific Gravity		1.13		0.000	0.000

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July 30, 2015

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Microbac Laboratories Inc.
List of Valid Qualifiers
July 30, 2015

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B3	Target analyte detected in calibration blank at or above the method reporting limit
B4	The BOD unseeded dilution water blank exceeded 0.2 mg/L
C	Confirmed by GC/MS
CG	Confluent growth
CT1	The cooler temperature at receipt exceeded regulatory guidelines for requested testing.
DL	Surrogate or spike compound was diluted out
E	Estimated concentration due to sample matrix interference
E,CT1	Estimated results. The cooler temperature at receipt exceeded regulatory guidelines for requested testing.
EDL	Elevated sample reporting limits, presence of non-target analytes
EMPC	Estimated Maximum Possible Concentration
F, S	Estimated result below quantitation limit; method of standard additions(MSA)
F,CT1	Estimated value; the analyte concentration was less than the RL/LOQ. The cooler temperature at receipt exceeded regula
FL	Free Liquid
H1	Sample analysis performed past holding time.
H1,CT1	Sample analysis performed past holding time. The cooler temperature at receipt exceeded regulatory guidelines for reque
I	Semiquantitative result (out of instrument calibration range)
J	Estimated value; the analyte concentration was less than the RL/LOQ.
J,B	Analyte detected in both the method blank and sample above the MDL.
J,CT1	Estimated value; the anaiyte concentration was less than the RL/LOQ.
J,CT1	Estimated value; the analyte concentration was less than the RL/LOQ. The cooler temperature at receipt exceeded regula
J,P	Estimate; columns don't agree to within 40%
J,S	Estimated concentration; analyzed by method of standard addition (MSA)
L	Sample reporting limits elevated due to matrix interference
L1	The associated blank spike (LCS) recovery was above the laboratory acceptance limits.
L2	The associated blank spike (LCS) recovery was below the laboratory acceptance limits.
M	Matrix effect; the concentration is an estimate due to matrix effect.
N	Tentatively identified compound(TIC)
NA	Not applicable
ND	Not detected at or above the reporting limit (RL/MDL).
ND, B	Not detected at or above the reporting limit (RL). Analyte present in method blank.
ND, CT1	Analyte was not detected. The concentration is below the reported LOD. The cooler temperature at receipt exceeded reg
ND, L	Not detected; sample reporting limit (RL) elevated due to interference
ND, S	Not detected; analyzed by method of standard addition (MSA)
ND,H1	Not detected; Sample analysis performed past holding time.
ND,H1,CT1	Not detected; Sample analysis performed past holding time. The cooler temperature at receipt exceeded regulatory guide
NF	Not found by library search
NFL	No free liquid
NI	Non-ignitable
NR	Analyte is not required to be analyzed
NS	Not spiked
P	Concentrations >40% difference between the two GC columns
Q	One or more quality control criteria failed. See narrative.
QNS	Quantity of sample not sufficient to perform analysis
RA	Reanalysis confirms reported results
RE	Reanalysis confirms sample matrix interference
S	Analyzed by method of standard addition (MSA)
SMI	Sample matrix interference on surrogate
SP	Reported results are for spike compounds only
TIC	Library Search Compound
TNTC	Too numerous to count
TNTC, B	Too numerous to count. Analyte present in method blank.
TNTC,CT1	Too numerous to count. The cooler temperature at receipt exceeded regulatory guidelines for requested testing.
TNTC,H1	Too numerous to count. Sample analysis performed past holding time.
U	Analyte was not detected. The concentration is below the reported MDL.
UJ	Undetected; the MDL and RL are estimated due to quality control discrepancies.
UQ	Undetected; the analyte was analyzed for, but not detected.
W	Post-digestion spike for furnace AA out of control limits
X	Exceeds regulatory limit
X, S	Exceeds regulatory limit; method of standard additions (MSA)

Qualkey: STD

Z	Cannot be resolved from isomer - see below

L15071525 / Revision: 0 / 8 total pages

COC No. A 45242

158 Starlite Drive
Marietta, OH 45750

MICROBAC®

CHAIN-OF-CUSTODY RECORD

Phone: 740-373-4071
Toll Free: 800-373-4071

Company Name: GreenHunter Water	
Project Contact: Steve Riffe	Contact Phone #: (740) 373-4599
Turn Around Requirements: STD	Location: 47-085-09721
Project ID: Ritchie Hunter Composite	
Sampler (print): Michael Umstot	Signature:

Program: ☐ CWA ☐ RCRA ☐ DOD ☐ AFCEE ☐ Other

Sample I.D. No.	Comp	Grab	Date	Time	Matrix*	NUMBER OF CONTAINERS	Hold	Spec. - Gran.	TOTAL # (LAB USE)	ADDITIONAL REQUIREMENTS
Ritchie Hunter #1			7/28/15	11:30am		1				

Microbac OVD
Received: 07/28/2015 14:22
By: BRENDA GREGORY
221000073172

Relinquished by: (Signature)	Date	Time	Received by: (Signature)
			Brenda Gregory

Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks:
	7/28/15	2:20p	Brenda Gregory	7/28/15	1420	

*Water (W), Soil (S), Solid Waste (SD), Unknown (X)

Page _____ of _____

Page 8

Generated: 07/30/2015 11:03

Operational Data

Static Reservoir Pressure	225
Avg daily rate:	3000 BBL/Day
Maximum daily rate:	4000 BBL/Day
Average inj pressure:	1500
Max inj pressure	2000
Injection Fluid Additives	Production and Flowback Brine Water Corrosion inhibitor Biocide
Nature of annulus and fluid	There is no fluid in the annulus -the annulus is an open space in which the only liquid present is the condensate that forms as as a result of the inj fluid down-hole. -The annuli has a constant pressure of 0 PSI. The annuli will become pressurized only in the event of a well integrity failure, at which time the facility personnel will shut off the well and notfiy the State.

Please refer to the plugging and abandonment prorcedure for permanent well closure

-In the event of a well failure, the state will be notified immediately and the well will be shut off and any fluid in the holding tanks will be transported via truck to another disposal location

Groundwater Use	The surrounding landowners are not dependent on groundwater. The only water source is a cistrern at the church roughly a quarter mile away that brings in water from the city. No groundwater is used in the area
Corrective Action	The only well within the AOR that pentrates the Gordon Formation is the Ritchie Hunter #1, also operated by GreenHunter Water -UIC2D0859721. That well will be plugged upon the permitting of the Ritchie #2
Chemical Analysis	Have attached the Microbac results with the permit attachments

Monitoring Data

WR-40 & Monthly SG Test
The incoming disposal fluid is first dispatched by the Company at the main Marietta Office location.
The dispatchers keep a manifest on record
The fluid that comes into the facility is first micron tested by the facility operator
-Once deemed disposable fluid, the facility operator will document:
- Fluid source - Operator, pad, API #, etc..
- Injection Pressure
- Annulus Pressure
- Flow Rate
- Cumulutive Volume
- Type
- Transport Company (GRH or Third Party)
- Quantity
- Date
- Ticket Number

-The facility operator brings the disposal information to the main Marietta office weekly

Ritchie Hunter #2 - Deficiencies

Section 1

A. Northing: 4345233.4 Easting: 491755

Section 6

A. Joints/Couplings (2)-Service End Connectors (1)- Pipe to Pipe Connector

Length	1408'
Valves	(2)-One at the Facility & One at the Wellhead
Buried	The lines have been buried, the ends are above ground
Pressure in Line	1700 PSI
Wellhead Elevation	1021'
Facility Elevation	1060'

We will pressure test the line upon burying the ends next week(8/9 - 8/15)

B. No Tanks at the Wellhead, the fluid is piped in from an existing facility - Ritchie Hunter#1

C. Bottom Hole Fracture Pressure 2940 PSI

MAX PROPOSED INJ OPERATIONS

Virgin Reservoir Pressure	1400 PSI
Inj Rate(bbl/hr)	210 bbl/hr
Injection Volume(bbl/day)	5000 bbl/day
Injection Pressure(psig)	2000 PSI
Bottom Hole Pressure	2900 PSI

Section 7

A. Depth of Lowest USDW 208'

Formation Fluid Compatibility Assessment

Ritchie Hunter Water Disposal

Ritchie Hunter Disposal Well #2

API: 47-085-10142

Sample	Barium MG/L	Iron MG/L	Magnesium MG/L	Sodium MG/L	PH Unit	Chloride MG/L	TDS MG/L
L14061672	467	101	1500	33600	5.84	5150	71100
L14071617	934	164	2000	46100	5.84	108000	166000
L14051014	994	104	1180	27700	5.59	46000	167000
L14031355	113	64	935	21900	6.31	68200	82100
L13101751	186	133	2400	57100	5.57	156000	250000
L14010244	1080	106	1490	38400	6.15	91900	96400
Average:	629	112	1584	37466	5.88	79208	138766

Wells Serviced by Ritchie SWD #2

Operator	Well Name	API #
Energy Plus	Tanner	47-770-0582
Energy Plus	Waters	47-770-0577
EQT	CPT 11	47-017-06348
Northeast Natural Resources	Statler 6H	47-610-1656
HG Energy	H. Lynch	47-033-1778
JayBee Oil & Gas	Ash	47-017-05969
JayBee Oil & Gas	Broome	47-103-02580
JayBee Oil & Gas	Broome	47-103-02581
JayBee Oil & Gas	Broome	47-103-30502
JayBee Oil & Gas	Coffman	47-017-06022
JayBee Oil & Gas	Horner	47-017-05925
JayBee Oil & Gas	Horner	47-017-05929
JayBee Oil & Gas	Horner	47-017-06030
JayBee Oil & Gas	Kincaid	47-085-09293
JayBee Oil & Gas	Kincaid	47-085-09294
JayBee Oil & Gas	L Davis	47-085-09297
JayBee Oil & Gas	L Davis	47-085-09298
JayBee Oil & Gas	L Davis	47-085-09299
JayBee Oil & Gas	L Davis	47-085-09300
JayBee Oil & Gas	L Davis	47-085-09301
JayBee Oil & Gas	McIntyre	47-095-02020
JayBee Oil & Gas	McIntyre	47-095-02024
JayBee Oil & Gas	McIntyre	47-095-02025
JayBee Oil & Gas	McIntyre	47-095-02026
JayBee Oil & Gas	Schulburg	47-017-05952
JayBee Oil & Gas	Schulburg	47-017-05969
JayBee Oil & Gas	Schulburg	47-017-05970
JayBee Oil & Gas	Schulburg	47-017-05971
JayBee Oil & Gas	Sharp/Hurley	47-017-05712
JayBee Oil & Gas	Sharp/Hurley	47-017-05713
JayBee Oil & Gas	Sharp/Hurley	47-017-05870
JayBee Oil & Gas	Sharp/Hurley	47-017-05996
JayBee Oil & Gas	Sharp/Hurley	47017-05997
JayBee Oil & Gas	T-103	47-095-02100
JayBee Oil & Gas	T-1213	47-095-020052
JayBee Oil & Gas	T-1214	47-095-02053
JayBee Oil & Gas	W-701	47-095-02050
JayBee Oil & Gas	W-702	47-095-02051
JayBee Oil & Gas	W-703	47-095-02081
JayBee Oil & Gas	W-704	47-095-02082
Stainaker Energy	Haymond 541	47-097-03811
Stainaker Energy	McClain 525	47-097-03745
Stainaker Energy	Skidmore 538	47-097-03796
Top Drilling	Barker 1585	47-085-09611
Top Drilling	P. Barker 1606	47-035-05777
Triad	Collins 1116	
Triad	E. Weese 1107	47-095-02021
Triad	E. Weese 1108	47-095-02022
Triad	E. Weese 1109	47-095-02023
Triad	R. Weese 1110	47-095-02027
Triad	Wetzel PR #26	47-103-02263
Waco Oil & Gas	Donna 1	47-049-02179
Waco Oil & Gas	Donna 2	47-049-02070
Waco Oil & Gas	Donna 3	47-049-02180
Waco Oil & Gas	Donna 4	47-049-02181
Waco Oil & Gas	Donna 6	47-049-02183
Waco Oil & Gas	Radtke 1907	47-033-05136
XTO	Brennon 1H	47-033-05407
XTO	Brennon 2H	47-049-02162
XTO	Brennon 5H	47-049-02210
XTO	Brennon 7H	47-049-02209
XTO	Crimm 2247H	47-049-02114
XTO	Crimm 2248H	47-049-02115
XTO	Fenn 1H	47-049-02128
XTO	Fenn 9H	47-049-02130
XTO	Fenn 10H	47-049-02138
XTO	Gould 2162V	47-097-03587
XTO	Gould 2240H	47-097-03738
XTO	Martin 2210H	47-033-05407
XTO	McClelland 2172H	47-049-01984
XTO	McClelland 2246H	47-049-02102
XTO	Ward 2241H	47-001-03104

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT & COMPANY IDENTIFICATION

GreenHunter Water, LLC and its affiliates — Information: (972) 410 1044
1048 Texan Trail
Grapevine, TX 76051

Product Name: Produced Water Last Revision: 11/7/2011
MSDS Number: A0133.msd Date Prepared: 03/07/06

Synonyms: Formation Water, Salt Water, H2O, Oily Water

Description: Water extracted from natural gas well production with residual mineral contents and residual hydrocarbons.

2. COMPOSITION & INFORMATION ON INGREDIENTS

			Occupational Exposure Limits*			
			OSHA	ACGIH		
Product	**CAS No**	**Wt%**	**PEL**	**TLV**	**Other**	**Units**
Produced Water	Mixture	N/A	N/A	N/A		
Components						
Water		>68**	N/A			
Mineral Variety		<32	N/A			
Gas Condensate	8002-05-9	<1	N/A	N/A		ppm
Benzene	71-43-2	<1	1.0	0.5	5 $_{STEL}$	ppm
Hydrogen Sulfide	7783-06-4	<1	10#	10	15 $_{STEL}$	ppm

Key: * = 8-Hr. TWA unless otherwise specified
** = Normal composition ranges are shown. Exceptions may occur depending upon the source of the produced water.
N/A = Not Available
STEL = Short Term Exposure Limit; 15 minutes.
# = Vacated 1989 PEL. The manufacturer has included this data for informational purposes since these values were vacated in 1992.

3. HAZARDS IDENTIFICATION

Note: This product has not been tested by GreenHunter Water, LLC to determine its specific health hazards. Therefore, the information provided in this section includes health hazard information on the product components.

Carcinogenicity:	**NTP**	**IARC Monographs**	**OSHA Regulated**
Benzene	Yes	Yes	Yes

Potential Health Effects from Overexposure:
Acute Effects:

Eyes:	May cause eye irritation. Eye contact with H_2S gas may cause painful irritation and may be indicative of exposure above applicable H_2S standards.
Skin:	Contact may cause skin irritation.
Inhalation:	Breathing the mist and vapors may be irritating to the respiratory tract. H2S is irritating and highly toxic if inhaled.
Ingestion:	Ingestion may cause irritation of the digestive tract that may result in nausea, vomiting and diarrhea. In addition, signs and symptoms of H_2S toxicity may be present.

Chronic Effects:
Not determined.

Additional Medical and Toxicological Information:
Natural gas condensate and some of its fractions, which can contaminate produced water, have been shown to cause skin irritation damage and even cancers when applied directly and repeatedly to the skin. When laboratory animals inhale oil vapors at high concentration or ingest in repeated doses, various tumors have developed.
Benzene is recognized as a human carcinogen by OSHA, NTP, ACGIH and IARC. Benzene affects the blood system and can develop a form of leukemia (see 29 CFR 1910.1028 for standard).

4. FIRST AID MEASURES

Eye Contact: Flush eyes with clean, low-pressure water for at least 15 minutes, occasionally lifting the eyelids. If pain or redness persists after flushing, obtain medical attention. If eye is exposed to hot liquid, cover eyes with cloth and seek medical attention immediately by calling 911.

Skin Contact: In case of hot liquid exposure, do not remove clothing or treat – wash only unburned area and seek medical attention immediately by calling 911.

Inhalation: Immediately remove person to area of fresh air. For respiratory distress, give oxygen, rescue breathing, or administer CPR if necessary. Obtain prompt medical attention by calling 911.

Ingestion: Do not induce vomiting. Seek medical attention.

Medical Providers: Medical providers are urged to contact a Regional Poison Center at 800-222-1222.

5. FIRE FIGHTING MEASURES

Flash Point: N/A
Flammable Limits in Air, % by Volume:
Lower: 4.0
Upper: 46.0
Autoignition Temperature: N/A

Extinguishing Media: Dry chemical, foam, carbon dioxide, or water spray.
NFPA Ratings: Health: 1 Flammability: 4 Reactivity: 0

General Hazard:
May react with strong oxidizing materials and a wide variety of chemicals. Forms explosive mixtures with air.

Fire Fighting Instructions:
Any fire would be associated with any natural gas condensate floating on the surface of he produced water. Water may be ineffective on flames but should be used to keep fire exposed containers cool. Keep the surrounding areas cool by using water mists. Firefighters should wear self-contained breathing apparatus and full protective clothing.

6. ACCIDENTAL RELEASE MEASURES

Stop the source of the leak or release. Clean up the releases as soon as possible, observing precautions in Personal Protection Equipment section. Contain liquid to prevent further contamination of soil and surface water. Cleanup small spills using appropriate techniques. Where feasible and appropriate, remove contaminated soil or flush with fresh water. Follow prescribed procedures for reporting and responding to larger releases. Advise authorities and the National Response Center (800-424-8802) if the release is to a watercourse.

7. HANDLING & STORAGE

Store and transfer away from sources of ignition. Use only explosion proof or intrinsically safe electrical equipment where product is stored or handled. Store containers in a well ventilated area. Do not handle near food or drinking water. Wash after handling and shower at end of work period.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Eye Protection:	Chemical goggles or face shield should be worn when handling product if the possibility of spray exists.
Skin Protection:	Normal working clothes should be worn. Wash contaminated clothing prior to reuse.
Inhalation:	Respiratory protection is not required for normal use. At excessive concentrations, wear a NIOSH approved air purifying respirator with organic vapor cartridges.
Ventilation:	Work in well ventilated areas. Use non-sparking tools where liquids or vapors from the condensate contamination may be generated at flammable concentrations.

9. PHYSICAL & CHEMICAL PROPERTIES

Boiling Point @760 mmHg: 212 °F
Freezing Point: <32 °F
Vapor Pressure mmHg @100 °F: N/A
Vapor Density (Air=1): 1.2
% Solubility in H_2O: Soluble in water
pH: N/A
Specific Gravity 60/60F: >1@0 °C
Evaporation Rate: N/A
% Volatile by Volume: Negligible
Odor: Slight hydrocarbon and/or rotten egg

Viscosity (method, temp.): N/A Appearance: Clear or opaque liquid

10. STABILITY & REACTIVITY
Stability: Stable.
Hazardous Polymerization: Will not occur.
Conditions to Avoid/Incompatibilities: Keep material away from heat, sparks, open flames, and oxiders such as chlorine.
Hazardous Decomposition Products: Normal combustion of H_2S creates sulfur oxides.

11. TOXICOLOGICAL INFORMATION
Refer to Section 3.

12. ECOLOGICAL INFORMATION
No data available.

13. DISPOSAL CONSIDERATIONS
This product is not a "listed" hazardous waste. But when disposed of in containers may meet the criteria of being an "ignitable" waste. It is the responsibility of the user to determine if the material disposed of meets federal, state, or local criteria to be defined as a hazardous waste.

14. TRANSPORT INFORMATION
Water, liquid, DOT Number N/A

15. REGULATORY INFORMATION
EPA SARA TITLE III

Section 302 EPCRA Extremely Hazardous Substances (EHS)
Product Component CAS No. Wt% RQ, lb TPQ, lb
None

Section 304 CERCLA Hazardous Substances

Product Component	CAS No.	Wt%	RQ, lb
Benzene	71-43-2	<1	10
Hydrogen Sulfide	7783-06-4	<1	100

Section 311/312 Hazard Categorization

Acute:	Chronic:	Fire:	Pressure:	Reactive:
X	X	X		

Section 313 EPCRA Toxic Substances

Ingredient	CAS No.	Wt.%
Benzene	71-43-2	<1
Hydrogen Sulfide	7783-06-4	<1

Key RQ = Reportable Quantity
TPQ = Threshold Planning Quantity of EHS

CALIFORNIA PROPOSITION 65 WARNING
Chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm may be found in crude oil and petroleum products. Although it is possible to sufficiently

refine a crude oil or its end products to remove the potential for cancer, we are advising that one or more of the listed chemicals may be present in some detectable quantities. Read and follow directions and use care when handling crude oil and petroleum products.

16. OTHER INFORMATION

THIS INFORMATION RELATES ONLY TO THE SPECIFIC MATERIAL DESIGNATED AND MAY NOT BE VALID FOR SUCH MATERIAL USED IN COMBINATION WITH ANY OTHER MATERIALS OR IN ANY PROCESS. SUCH INFORMATION IS TO THE BEST OF THIS COMPANY'S KNOWLEDGE AND BELIEVED ACCURATE AND RELIABLE AS OF THE DATE INDICATED. HOWEVER, NO REPRESENTATION, WARRANTY OR GUARANTEE IS MADE AS TO THE ACCURACY, RELIABILITY OR COMPLETENESS. IT IS THE USER'S RESPONSIBILITY TO SATISFY THEMSELVES AS TO THE SUITABILITY AND COMPLETENESS OF SUCH INFORMATION FOR HIS OWN PARTICULAR USE.

This is the end of MSDS A0133.msd

APPENDIX H

GROUNDWATER PROTECTION PLAN

Facility Name: Ritchie Hunter #2

County: Ritchie

Facility Location:

Postal Service Address:	122 Lonesome Pine Rd		
Ellenboro, WV 26346			
Latitude :	39°15'30.41"	Longitude:	8°5'58.54"

Contact Information:

Person:	Bryn Mueller
Phone Number:	(469)444-9816
E-mail Address:	bmueller@greenhunterwater.com

Date: 3/6/2015

1. A list of all operations that may contaminate the groundwater.

Handling and Disposing of Oilfield Produced Brine Water

2. A description of procedures and facilities used to protect groundwater quality from the list of potential contaminant sources above.

Any accumulated stormwater inside of the containment berm will flow to the 1000 gallon sump. The sump is equipped with a float valve. Once the sump reaches a certain amount, the product will flow to the 210 barrel crude oil/brine water storage tank. No stormwater will be discharged from the secondary containment structures.

3. List procedures to be used when designing and adding new equipment or operations.

Any new equipemtn will be installed and maintained with the same integrity as the current equipment. Any possible spills will be confined to the secondary containment and will flow to the underground sump. No groundwater will be affected.

4. Summarize all activities at your facility that are already regulated for groundwater protection.

Handling and Disposing of Oil and Gas Produced Brine Water

5. Discuss any existing groundwater quality data for your facility or an adjacent property.

There is no groundwater use at this facility or on any adjacent property. The Ritchie facility has fresh water brought in and the only other water usage is via a cistern at a nearby church roughly .25 mile from the facility.

6. Provide a statement that no waste material will be used for deicing or fill material on the property unless allowed by another rule.

GreenHunter Water will not allow any waste material to be used for deicing or fill material; only state approved and environmentally-friendly fill will be used, unless otherwise directed.

7. Describe the groundwater protection instruction and training to be provided to the employees. Job procedures shall provide direction on how to prevent groundwater contamination.

Facility personnel receive training for protecting the groundwater by routinely inspecting the external tank sidewalls, tops, attached valves, and piping. The personnel conducting the inspections are required to record the findings, any deficiencies noted during the routine inspections are recorded and immediately brought to the attention of the on-site facility manager. The daily integrity checks will be recorded in the main Marietta office for a period of at least 3 years.

8. Include provisions for inspections of all GPP elements and equipment. Inspections must be made quarterly at a minimum.

External tanks sidewalls, tops, and attached valves and piping are inspected routinely during daily operations. Facility personnel conducting the inspections are required to record the findings, any deficiencies noted during the routine inspections are recorded and immediately brought to the attention of the on-site facility manager.

Signature: _____

Date: March 6, 2015

GreenHunter Water
Future Plugging Procedure
API: 47-085-10142

1) Pull Tubing and remove packer
2) Run tubing back in well and set 200' cement plug from 6180'-6380'
3) Run tubing tag cement top with tubing to guarantee cement placement
4) Load 7" casing with 6% gel as pulling tubing out of casing
5) Use 7" casing to set 100' cement plug from 2000'-1900'
6) Use 7" casing to set cement plug from 300'-400' over bottom of 9 5/8" casing
7) Use 7" casing to set cement plug from 200' to surface.
8) Erect monument

APPENDIX I

Requirement for Financial Responsibility to Plug/Abandon an Injection Well

To: WV Department of Environmental Protection
Office of Oil and Gas
601 57th Street, SE
Charleston, West Virginia 25304-2345
ATTN: Underground Injection Control Program

From: GreenHunter Water, LLC
28407 State Route 7
Marietta, OH 45750

Date: March 6, 2015

Subject: Underground Injection Control (UIC) Permit Application
#_____
Requirement for Financial Responsibility

I, Robert W. Sloan, verify in accordance with 47CSR13-13.7.g., that I will maintain financial responsibility and resources to close, plug, and abandon underground injection wells(s) in a manner prescribed by the Chief of the Office of Oil and Gas.

Name: Robert W Sloan

Signature: 

Date: March 6, 2015

APPENDIX J

Site Security for Commercial Facilities

Provide a detailed description of the method(s) utilized at the facility to restrict or prohibit illegal dumping of unauthorized waste or vandalism at the facility.

1. Complete enclosure of all wells, holding tank/pits and manifold assemblies within a chain link or other suitable fencing; and

2. Require that all gates and other entry points be locked when the facility is unattended; or

3. Providing tamper-proof seals for the master valve on each well (a "lock-out" or chain & padlock system would be more secure; however, these devices could create a potential safety hazard if the well needed to be quickly shut in due to an emergency); and

4. Installing locking caps on all valves and connections on holding tanks, unloading racks, and headers.

The tank battery is surrounded by a locked fence with lighting and cameras for additional security. The facility is manned around the clock by designated employees to guarantee no illegal dumping or vandalism occurs.

APPENDIX K

Identify permit or construction approvals received or applied for under the following programs:

Permit/approvals	ID Number
Hazardous Waste Management Program under RCRA	
NPDES Program	
Prevention of Significant Deterioration (PSD)	
Nonattainment Program	
Dredge or Fill	
NPDES/NPDES – Stormwater	
WVDEP – Office of Waste Management (OWM) – Solid Waste Facility	
WVDEP – OWM – RCRA (Hazardous Waste TSD or Transporter)	
WVDEP – OWM – UST	
CERCLA – Superfund	
WV Voluntary Remediation – Brownfields	
FIFRA – Federal Insecticide, Fungicide and Rodenticide Act	
Well Head Protection Program (WHPP)	
Underground Injection Control (UIC)	
Toxic Substances Control Act (TSCA)	
Best Management Plans	
Management of Used Oil	
Other Relevant Permits (Specify):	