

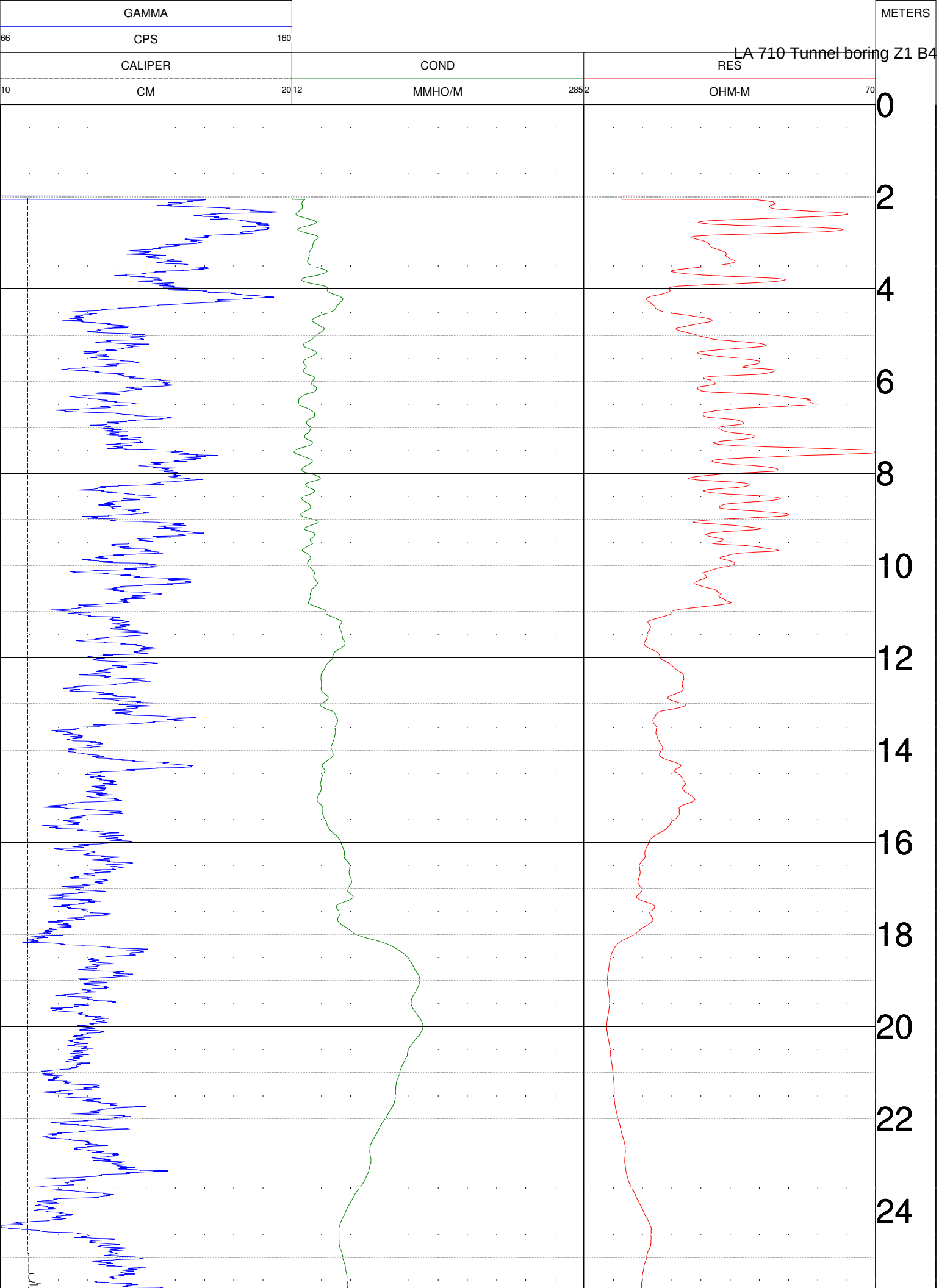
LA 710 Tunnel boring Z1 B4

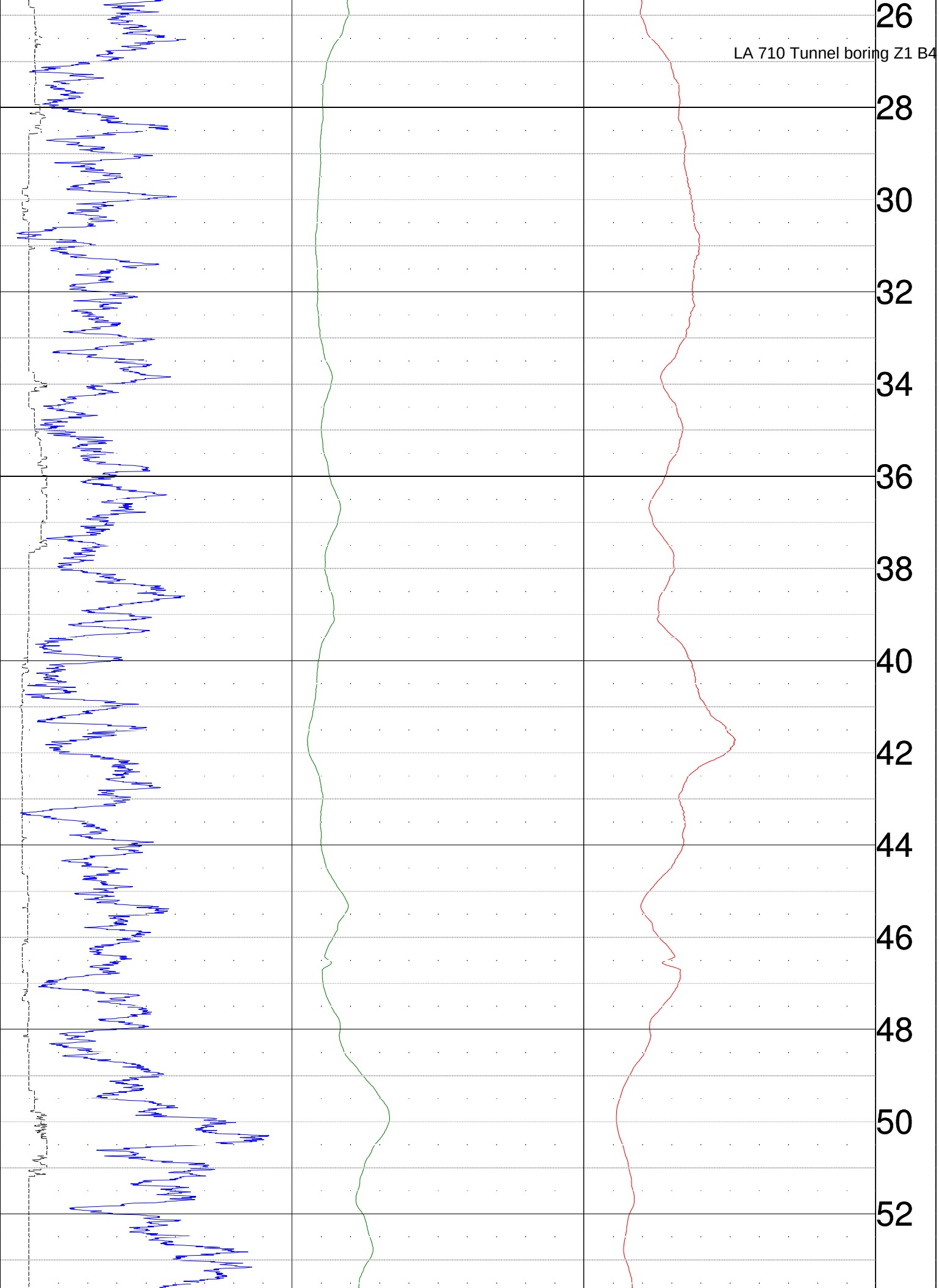
COMPANY	: CALTRANS				
WELL	: Z1 B4				
LOCATION/FIELD	: LA 710 TUNNEL				
COUNTY	: LA				
LOCATION	: CA				
SECTION	: None	TOWNSHIP	: None	RANGE	: None
DATE	: 2/25/09	PERMANENT DATUM	: None		
DEPTH DRILLER	: 99.06M			KB	: NA
LOG BOTTOM	: 99.0	LOG MEASURED FROM:	GL	DF	: NA
LOG TOP	: 1.9	DRL MEASURED FROM:	GL	GL	: NA
CASING DIAMETER	: N/A	LOGGING UNIT	: 7311.		
CASING TYPE	: N/A	FIELD OFFICE	: 7311.		
CASING THICKNESS:	0	RECORDED BY	: DH/DG		
BIT SIZE	: 10.00CM	BOREHOLE FLUID	: 0	FILE	: PROCESSE
MAGNETIC DECL.	: 12.85	RM	: 0	TYPE	: 9065A
MATRIX DENSITY	: 2.71	RM TEMPERATURE	: 0	LGDATE	: 2/25/09.
NEUTRON MATRIX	: DOLOMITE	MATRIX DELTA T	: 140		
				THRESH:	2500

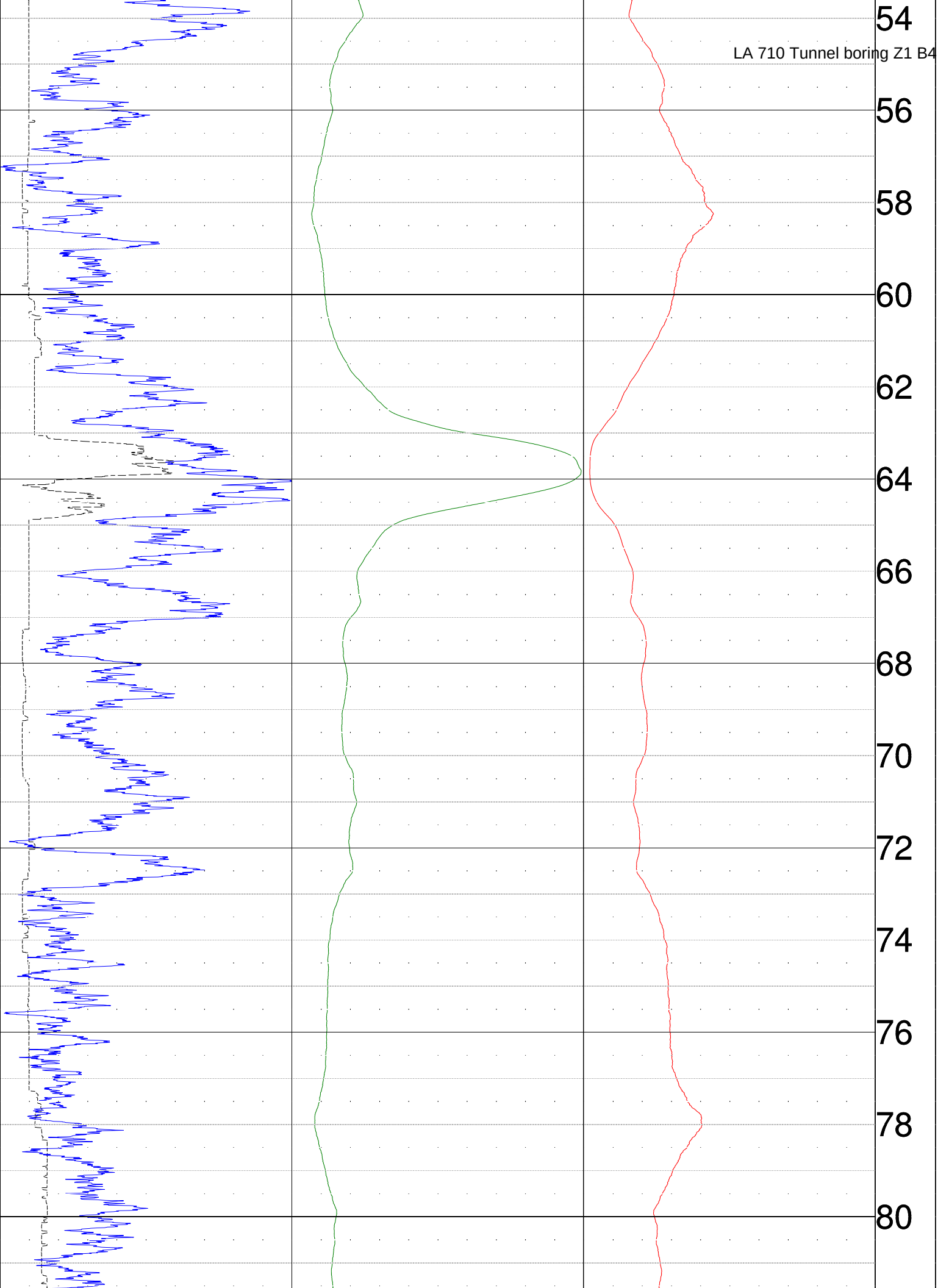
OTHER SERVICES:
IND-CAL
AC TEL
PSLOG

LOG DEPTH IN METERS, CALIPER DIAMETER IN CM
EA: 07-187900. GL ELEVATION ESTIMATED FROM HANDHELD GPS 123.8M

ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS


GAMMA
66
CPS
160
CALIPER
10
CM
20
COND
12
MMHO/M
285
RES
2
OHM-M
70
METERS
LA 710 Tunnel boring Z1 B4
0
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LA 710 Tunnel boring Z1 B4
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LA 710 Tunnel boring Z1 B4
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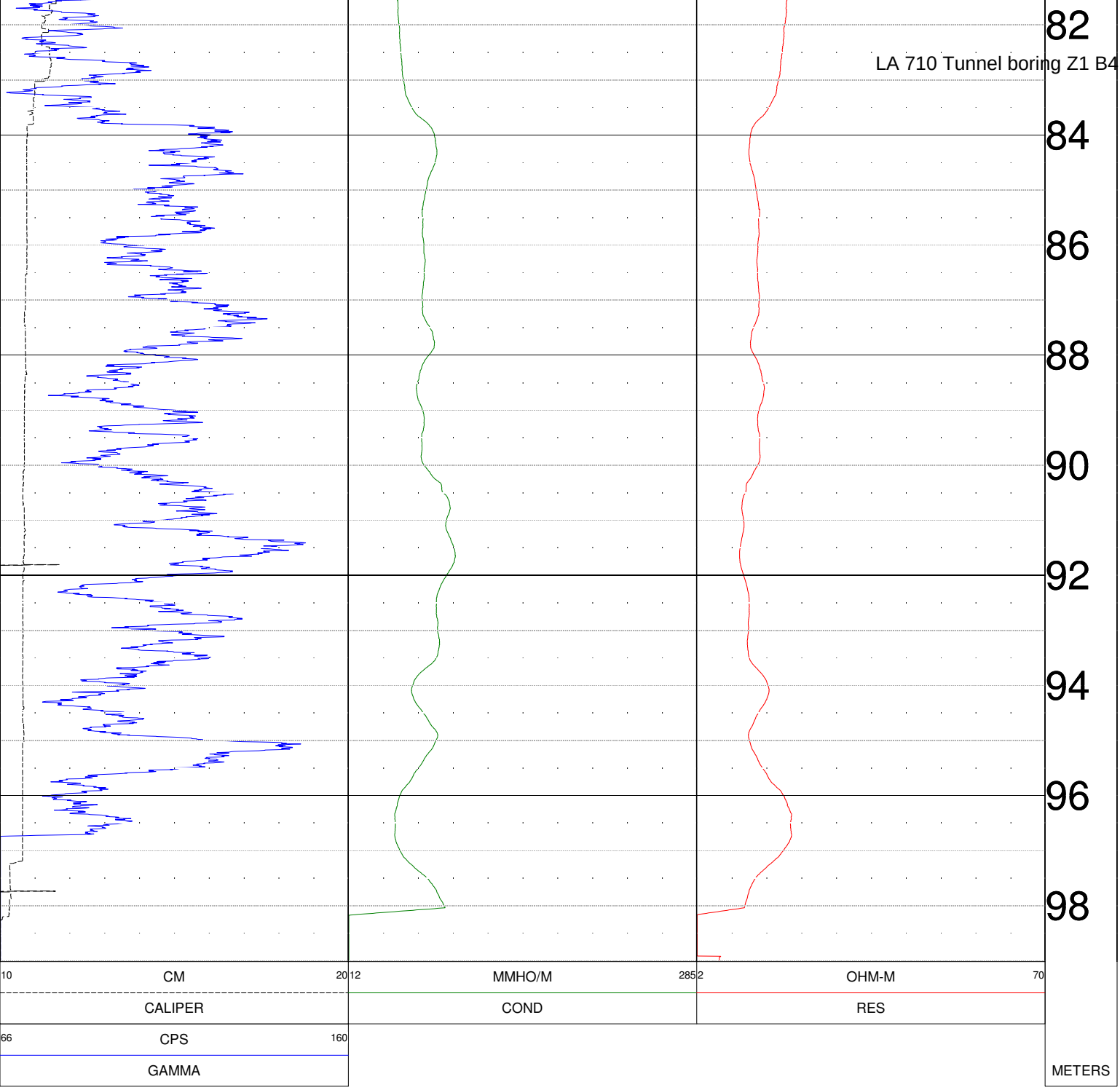

LA 710 Tunnel boring Z1 B4
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CM
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MMHO/M
285
2
OHM-M
70
CALIPER
COND
RES
66
CPS
160
GAMMA
METERS

Table 2. LA 710 Tunnel
Boring Z1 B4
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
Not Provided	7.9	25.9	313	1025		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8.4	27.6	318	1045		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8.9	29.2	424	1390		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9.4	30.8	424	1390		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9.9	32.5	413	1356		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10.5	34.4	388	1272		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10.9	35.8	382	1252		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11.4	37.4	373	1224		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11.9	39.0	382	1252	1282	4206	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12.4	40.7	417	1367	1429	4687	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12.9	42.3	435	1426	1852	6076	0.47	2.10	131.15	0.397	1.168	6.675	8294	24398	139407
	13.4	44.0	394	1292	1786	5859	0.47	2.06	128.62	0.319	0.942	6.144	6669	19668	128315
	14	45.9	368	1206	1852	6076	0.48	2.10	131.15	0.284	0.840	6.826	5930	17548	142559
	14.4	47.2	400	1312	1923	6309	0.48	2.14	133.69	0.343	1.012	7.463	7156	21145	155869
	14.9	48.9	442	1452	2083	6835	0.48	2.22	138.82	0.435	1.286	9.071	9093	26848	189446
	15.4	50.5	485	1593	2083	6835	0.47	2.22	138.82	0.524	1.542	8.953	10944	32203	186977
	15.9	52.2	427	1402	1852	6076	0.47	2.10	131.15	0.384	1.129	6.693	8013	23588	139782
	16.5	54.1	368	1206	1786	5859	0.48	2.06	128.62	0.278	0.823	6.198	5816	17190	129453
	17.5	57.4	373	1224	1724	5657	0.48	2.02	126.09	0.281	0.830	5.629	5873	17331	117570
	17.5	57.4	439	1439	1667	5468	0.46	1.98	123.58	0.381	1.114	4.991	7953	23269	104244
	18	59.1	476	1562	1786	5859	0.46	2.06	128.62	0.467	1.366	5.947	9757	28524	124199
	18.5	60.7	340	1116	1667	5468	0.48	1.98	123.58	0.229	0.677	5.194	4783	14142	108470
	18.8	61.7	256	841	1667	5468	0.49	1.98	123.58	0.130	0.387	5.325	2718	8089	111224
	19.4	63.6	250	820	1563	5126	NA	NA	NA	NA	NA	NA	NA	NA	NA
	20	65.6	260	854	1667	5468	0.49	1.98	123.58	0.134	0.399	5.320	2804	8342	111110
	20.5	67.3	269	882	1667	5468	0.49	1.98	123.58	0.143	0.425	5.308	2988	8883	110864
	20.9	68.6	281	922	1563	5126	NA	NA	NA	NA	NA	NA	NA	NA	NA
	21.4	70.2	294	965	1724	5657	0.49	2.02	126.09	0.175	0.519	5.771	3649	10838	120535
	21.9	71.9	301	988	1724	5657	0.48	2.02	126.09	0.183	0.544	5.760	3827	11361	120298
	22.4	73.5	345	1131	1724	5657	0.48	2.02	126.09	0.240	0.711	5.684	5016	14839	118713
	22.9	75.1	336	1101	1724	5657	0.48	2.02	126.09	0.227	0.673	5.701	4750	14064	119067
	23.4	76.8	215	704	1613	5292	0.49	1.94	121.09	0.089	0.266	4.927	1865	5563	102897
	23.9	78.4	195	641	1667	5468	0.49	1.98	123.58	0.076	0.226	5.398	1577	4710	112745
	24.4	80.1	278	911	1852	6076	0.49	2.10	131.15	0.162	0.483	6.988	3385	10079	145951
	24.9	81.7	435	1426	1923	6309	0.47	2.14	133.69	0.405	1.193	7.380	8455	24910	154138
	25.9	85.0	532	1745	1923	6309	0.46	2.14	133.69	0.606	1.768	7.112	12655	36916	148538
	26.4	86.6	575	1886	2000	6562	0.45	2.18	136.25	0.721	2.098	7.769	15056	43812	162255

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z1 B4
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	26.4	86.6	538	1764	2000	6562	0.46	2.18	136.25	0.631	1.843	7.889	13176	38501	164762
	26.9	88.3	714	2343	2000	6562	0.43	2.18	136.25	1.114	3.178	7.245	23256	66369	151321
	27.4	89.9	781	2563	1923	6309	0.40	2.14	133.69	1.307	3.663	6.177	27299	76502	129012
	27.9	91.5	735	2412	2174	7132	0.44	2.26	141.40	1.225	3.516	9.071	25576	73423	189456
	28.5	93.5	746	2448	2083	6835	0.43	2.22	138.82	1.238	3.533	8.000	25864	73785	167084
	29	95.1	794	2604	2083	6835	0.42	2.22	138.82	1.401	3.964	7.784	29253	82792	162566
	29.5	96.8	704	2310	1923	6309	0.42	2.14	133.69	1.062	3.022	6.504	22182	63110	135835
	30	98.4	658	2158	2174	7132	0.45	2.26	141.40	0.980	2.842	9.397	20475	59360	196258
	30.5	100.1	575	1886	2083	6835	0.46	2.22	138.82	0.734	2.143	8.672	15339	44755	181117
	31	101.7	625	2051	1923	6309	0.44	2.14	133.69	0.837	2.411	6.805	17472	50351	142116
	31.5	103.3	625	2051	2000	6562	0.45	2.18	136.25	0.853	2.465	7.593	17806	51490	158589
	32	105.0	526	1727	1786	5859	0.45	2.06	128.62	0.571	1.658	5.809	11919	34624	121316
	32.5	106.6	602	1976	2083	6835	0.45	2.22	138.82	0.807	2.347	8.575	16854	49023	179098
	32.5	106.6	595	1953	2083	6835	0.46	2.22	138.82	0.788	2.294	8.601	16455	47901	179630
	33	108.3	704	2310	2174	7132	0.44	2.26	141.40	1.123	3.238	9.206	23460	67629	192277
	33.5	109.9	746	2448	2174	7132	0.43	2.26	141.40	1.261	3.616	9.022	26345	75515	188431
	34	111.5	694	2278	2083	6835	0.44	2.22	138.82	1.072	3.083	8.221	22397	64390	171707
	34.5	113.2	694	2278	2083	6835	0.44	2.22	138.82	1.072	3.083	8.221	22397	64390	171707
	35	114.8	735	2412	2174	7132	0.44	2.26	141.40	1.225	3.516	9.071	25576	73423	189456
	35.5	116.5	725	2377	2083	6835	0.43	2.22	138.82	1.168	3.342	8.094	24386	69803	169054
	36	118.1	704	2310	2083	6835	0.44	2.22	138.82	1.103	3.166	8.181	23032	66124	170860
	36.6	120.1	685	2247	2174	7132	0.44	2.26	141.40	1.063	3.071	9.287	22192	64130	193968
	37	121.4	658	2158	2083	6835	0.44	2.22	138.82	0.962	2.781	8.368	20101	58077	174768
	37.5	123.0	676	2217	2174	7132	0.45	2.26	141.40	1.034	2.992	9.325	21596	62480	194762
	38	124.7	676	2217	2083	6835	0.44	2.22	138.82	1.015	2.926	8.298	21202	61115	173299
	38.4	126.0	676	2217	2083	6835	0.44	2.22	138.82	1.015	2.926	8.298	21202	61114	173299
	39	128.0	649	2130	2000	6562	0.44	2.18	136.25	0.920	2.652	7.503	19220	55396	156703
	39.5	129.6	694	2278	2174	7132	0.44	2.26	141.40	1.092	3.153	9.248	22813	65846	193140
	40	131.2	667	2187	2273	7456	0.45	2.31	143.99	1.025	2.979	10.547	21410	62214	220275
	40.5	132.9	769	2524	2174	7132	0.43	2.26	141.40	1.340	3.829	8.917	27991	79967	186236
	41	134.5	725	2377	2273	7456	0.44	2.31	143.99	1.211	3.496	10.299	25295	73023	215095
	41.5	136.2	581	1907	1923	6309	0.45	2.14	133.69	0.724	2.099	6.955	15119	43835	145253
	42	137.8	532	1745	1786	5859	0.45	2.06	128.62	0.583	1.692	5.792	12174	35337	120976
	42.5	139.4	667	2187	1852	6076	0.43	2.10	131.15	0.934	2.662	5.959	19500	55598	124465
	43	141.1	505	1657	1923	6309	0.46	2.14	133.69	0.546	1.598	7.192	11409	33381	150199
	43.5	142.7	485	1593	1923	6309	0.47	2.14	133.69	0.505	1.480	7.247	10540	30902	151358
	44	144.4	549	1803	2000	6562	0.46	2.18	136.25	0.659	1.923	7.852	13761	40160	163981

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z1 B4
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	44.5	146.0	581	1907	2000	6562	0.45	2.18	136.25	0.738	2.145	7.746	15408	44801	161786
	45	147.6	543	1783	2000	6562	0.46	2.18	136.25	0.645	1.883	7.871	13464	39317	164378
	45.5	149.3	568	1864	2000	6562	0.46	2.18	136.25	0.705	2.052	7.791	14715	42854	162709
	46	150.9	746	2448	2174	7132	0.43	2.26	141.40	1.261	3.616	9.022	26345	75515	188431
	46.5	152.6	794	2604	2174	7132	0.42	2.26	141.40	1.427	4.061	8.802	29796	84807	183829
	47	154.2	735	2412	2174	7132	0.44	2.26	141.40	1.225	3.516	9.071	25576	73423	189456
	47.5	155.8	806	2646	2273	7456	0.43	2.31	143.99	1.500	4.284	9.914	31329	89475	207049
	48	157.5	794	2604	2174	7132	0.42	2.26	141.40	1.427	4.061	8.802	29796	84807	183829
	48.5	159.1	769	2524	2174	7132	0.43	2.26	141.40	1.340	3.829	8.917	27991	79967	186236
	49	160.8	794	2604	2273	7456	0.43	2.31	143.99	1.453	4.157	9.977	30343	86814	208365
	49.5	162.4	746	2448	2381	7812	0.45	2.35	146.59	1.308	3.781	11.568	27313	78963	241604
	49.9	163.7	714	2343	2000	6562	0.43	2.18	136.25	1.114	3.178	7.245	23256	66369	151321
	50.4	165.4	725	2377	1923	6309	0.42	2.14	133.69	1.125	3.188	6.421	23486	66572	134096
	50.9	167.0	769	2524	2083	6835	0.42	2.22	138.82	1.316	3.740	7.897	27480	78103	164929
	51.5	169.0	746	2448	2381	7812	0.45	2.35	146.59	1.308	3.781	11.568	27313	78963	241605
	52	170.6	847	2780	2381	7812	0.43	2.35	146.59	1.686	4.815	11.063	35222	100556	231059
	52.5	172.2	794	2604	2174	7132	0.42	2.26	141.40	1.427	4.061	8.802	29796	84807	183829
	52.6	172.6	893	2929	2174	7132	0.40	2.26	141.40	1.806	5.050	8.297	37711	105481	173276
	53.1	174.2	806	2646	2083	6835	0.41	2.22	138.82	1.446	4.084	7.723	30204	85288	161297
	53.1	174.2	794	2604	2083	6835	0.42	2.22	138.82	1.401	3.964	7.784	29253	82792	162566
	53.5	175.5	926	3038	2273	7456	0.40	2.31	143.99	1.977	5.539	9.277	41300	115680	193755
	53.7	176.2	909	2983	2174	7132	0.39	2.26	141.40	1.872	5.219	8.208	39095	108999	171431
	53.9	176.8	909	2983	2273	7456	0.40	2.31	143.99	1.906	5.355	9.372	39811	111851	195740
	54.5	178.8	893	2929	2273	7456	0.41	2.31	143.99	1.839	5.181	9.462	38402	108198	197618
	54.6	179.1	909	2983	2273	7456	0.40	2.31	143.99	1.906	5.355	9.372	39811	111851	195740
	54.6	179.1	962	3155	2381	7812	0.40	2.35	146.59	2.171	6.090	10.417	45343	127193	217564
	55	180.4	980	3217	2381	7812	0.40	2.35	146.59	2.257	6.310	10.302	47139	131792	215170
	55.1	180.8	1000	3281	2381	7812	0.39	2.35	146.59	2.348	6.542	10.181	49043	136625	212631
	55.5	182.1	943	3095	2381	7812	0.41	2.35	146.59	2.090	5.880	10.525	43648	122815	219824
	55.6	182.4	943	3095	2381	7812	0.41	2.35	146.59	2.090	5.880	10.525	43648	122815	219824
	56	183.7	962	3155	2273	7456	0.39	2.31	143.99	2.132	5.933	9.070	44538	123903	189438
	56.1	184.1	962	3155	2381	7812	0.40	2.35	146.59	2.171	6.090	10.417	45343	127193	217564
	56.5	185.4	1000	3281	2381	7812	0.39	2.35	146.59	2.348	6.542	10.181	49043	136625	212631
	56.6	185.7	926	3038	2500	8202	0.42	2.39	149.21	2.049	5.822	12.206	42797	121586	254926
	57	187.0	820	2689	2500	8202	0.44	2.39	149.21	1.606	4.624	12.797	33538	96575	267271
	57.1	187.3	943	3095	2500	8202	0.42	2.39	149.21	2.127	6.028	12.102	44427	125904	252753
	57.5	188.6	926	3038	2500	8202	0.42	2.39	149.21	2.049	5.822	12.206	42797	121586	254926

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z1 B4
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	57.6	189.0	893	2929	2500	8202	0.43	2.39	149.21	1.905	5.438	12.398	39794	113565	258929
	58	190.3	833	2734	2273	7456	0.42	2.31	143.99	1.602	4.556	9.778	33453	95162	204218
	58.5	191.9	909	2983	2273	7456	0.40	2.31	143.99	1.906	5.355	9.372	39811	111851	195740
	59	193.6	1042	3418	2632	8634	0.41	2.43	151.84	2.639	7.427	13.325	55119	155115	278290
	59	193.6	862	2828	2381	7812	0.42	2.35	146.59	1.745	4.972	10.985	36447	103842	229425
	59.5	195.2	893	2929	2381	7812	0.42	2.35	146.59	1.872	5.310	10.816	39097	110893	225892
	59.5	195.2	877	2878	2273	7456	0.41	2.31	143.99	1.775	5.014	9.547	37067	104712	199399
	60	196.9	926	3038	2381	7812	0.41	2.35	146.59	2.013	5.681	10.628	42046	118647	221959
	60	196.9	943	3095	2381	7812	0.41	2.35	146.59	2.090	5.880	10.525	43648	122815	219824
	60.5	198.5	909	2983	2381	7812	0.41	2.35	146.59	1.941	5.491	10.724	40531	114677	223979
	60.5	198.5	943	3095	2381	7812	0.41	2.35	146.59	2.090	5.880	10.525	43648	122815	219824
	61	200.1	962	3155	2500	8202	0.41	2.39	149.21	2.210	6.246	11.992	46152	130444	250452
	61	200.1	980	3217	2500	8202	0.41	2.39	149.21	2.297	6.474	11.875	47980	135220	248015
	61.5	201.8	1087	3566	2500	8202	0.38	2.39	149.21	2.824	7.813	11.173	58977	163183	233352
	61.5	201.8	1111	3645	2632	8634	0.39	2.43	151.84	3.003	8.357	12.840	62713	174533	268165
	62	203.4	1190	3906	2500	8202	0.35	2.39	149.21	3.387	9.169	10.422	70746	191491	217661
	62	203.4	1190	3906	2632	8634	0.37	2.43	151.84	3.447	9.454	12.248	71992	197451	255794
	62.5	205.1	1429	4687	2381	7812	0.22	2.35	146.59	4.792	11.681	6.922	100088	243964	144572
	62.5	205.1	1389	4557	2273	7456	0.20	2.31	143.99	4.449	10.696	5.981	92924	223384	124923
	62.5	205.1	1429	4687	2381	7812	0.22	2.35	146.59	4.792	11.681	6.922	100088	243964	144572
	62.5	205.1	1563	5126	2778	9113	0.27	2.47	154.48	6.041	15.328	11.038	126173	320120	230538
	63	206.7	909	2983	2500	8202	0.42	2.39	149.21	1.975	5.625	12.304	41255	117478	256982
	63	206.7	980	3217	2273	7456	0.39	2.31	143.99	2.217	6.144	8.958	46301	128318	187086
	63.5	208.3	676	2217	1724	5657	0.41	2.02	126.09	0.922	2.599	4.775	19259	54283	99722
	63.5	208.3	495	1624	1923	6309	0.46	2.14	133.69	0.525	1.537	7.220	10961	32106	150796
	63.9	209.6	459	1505	1786	5859	0.46	2.06	128.62	0.434	1.270	5.992	9054	26523	125136
	64.1	210.3	424	1390	1852	6076	0.47	2.10	131.15	0.377	1.111	6.701	7878	23198	139962
	64.5	211.6	704	2310	2273	7456	0.45	2.31	143.99	1.144	3.310	10.389	23890	69133	216969
	64.5	211.6	658	2158	2083	6835	0.44	2.22	138.82	0.962	2.781	8.368	20101	58077	174768
	65	213.3	909	2983	2174	7132	0.39	2.26	141.40	1.872	5.219	8.208	39095	108999	171431
	65	213.3	820	2689	2381	7812	0.43	2.35	146.59	1.578	4.521	11.208	32950	94420	234088
	65.5	214.9	909	2983	2273	7456	0.40	2.31	143.99	1.906	5.355	9.372	39811	111851	195740
	65.5	214.9	909	2983	2273	7456	0.40	2.31	143.99	1.906	5.355	9.372	39811	111851	195740
	66	216.5	893	2929	2174	7132	0.40	2.26	141.40	1.806	5.050	8.297	37711	105481	173276
	66	216.5	847	2780	2273	7456	0.42	2.31	143.99	1.656	4.702	9.705	34596	98202	202693
	66.5	218.2	1111	3645	2500	8202	0.38	2.39	149.21	2.951	8.126	11.004	61627	169712	229818
	66.5	218.2	862	2828	2273	7456	0.42	2.31	143.99	1.714	4.854	9.628	35800	101382	201089

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z1 B4
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	66.9	219.5	926	3038	2381	7812	0.41	2.35	146.59	2.013	5.681	10.628	42046	118647	221959
	67	219.8	962	3155	2273	7456	0.39	2.31	143.99	2.132	5.933	9.070	44538	123903	189438
	67.5	221.5	1087	3566	2273	7456	0.35	2.31	143.99	2.725	7.367	8.280	56914	153863	172936
	67.5	221.5	909	2983	2174	7132	0.39	2.26	141.40	1.872	5.219	8.208	39095	108999	171431
	67.5	221.5	893	2929	2083	6835	0.39	2.22	138.82	1.773	4.919	7.288	37023	102739	152205
	67.9	222.8	926	3038	2174	7132	0.39	2.26	141.40	1.942	5.395	8.115	40556	112681	169482
	68	223.1	847	2780	2174	7132	0.41	2.26	141.40	1.627	4.589	8.535	33973	95832	178259
	68.4	224.4	909	2983	2174	7132	0.39	2.26	141.40	1.872	5.219	8.208	39095	108999	171431
	68.5	224.7	893	2929	2273	7456	0.41	2.31	143.99	1.839	5.181	9.462	38402	108198	197618
	68.9	226.0	943	3095	2273	7456	0.40	2.31	143.99	2.053	5.731	9.177	42873	119693	191658
	69	226.4	833	2734	2273	7456	0.42	2.31	143.99	1.602	4.556	9.778	33453	95162	204218
	69.4	227.7	806	2646	2174	7132	0.42	2.26	141.40	1.473	4.184	8.740	30765	87386	182537
	69.6	228.3	847	2780	2174	7132	0.41	2.26	141.40	1.627	4.589	8.535	33973	95832	178259
	69.9	229.3	781	2563	2083	6835	0.42	2.22	138.82	1.357	3.850	7.842	28346	80399	163775
	69.9	229.3	794	2604	2083	6835	0.42	2.22	138.82	1.401	3.964	7.784	29253	82792	162566
	70	229.7	781	2563	2174	7132	0.43	2.26	141.40	1.382	3.942	8.861	28873	82336	185061
	70.5	231.3	781	2563	2174	7132	0.43	2.26	141.40	1.382	3.942	8.861	28873	82336	185061
	71	232.9	806	2646	2174	7132	0.42	2.26	141.40	1.473	4.184	8.740	30765	87386	182537
	71.5	234.6	794	2604	2174	7132	0.42	2.26	141.40	1.427	4.061	8.802	29796	84807	183829
	72.1	236.5	714	2343	2083	6835	0.43	2.22	138.82	1.135	3.252	8.139	23695	67928	169976
	72.6	238.2	685	2247	2174	7132	0.44	2.26	141.40	1.063	3.071	9.287	22192	64131	193968
	73.1	239.8	725	2377	2083	6835	0.43	2.22	138.82	1.168	3.342	8.094	24386	69803	169054
	73.5	241.1	746	2448	2174	7132	0.43	2.26	141.40	1.261	3.616	9.022	26345	75515	188431
	74.1	243.1	794	2604	2083	6835	0.42	2.22	138.82	1.401	3.964	7.784	29253	82792	162566
	74.6	244.8	820	2689	2174	7132	0.42	2.26	141.40	1.522	4.313	8.675	31782	90080	181181
	75	246.1	781	2563	2174	7132	0.43	2.26	141.40	1.382	3.942	8.861	28873	82336	185061
	75.5	247.7	781	2563	2000	6562	0.41	2.18	136.25	1.332	3.756	6.954	27821	78454	145234
	76	249.3	746	2448	2174	7132	0.43	2.26	141.40	1.261	3.616	9.022	26345	75515	188431
	76.5	251.0	806	2646	2273	7456	0.43	2.31	143.99	1.500	4.284	9.914	31329	89475	207049
	77	252.6	962	3155	2500	8202	0.41	2.39	149.21	2.210	6.246	11.992	46152	130444	250452
	77.5	254.3	943	3095	2500	8202	0.42	2.39	149.21	2.127	6.028	12.102	44427	125904	252752
	78	255.9	909	2983	2500	8202	0.42	2.39	149.21	1.975	5.625	12.304	41255	117478	256982
	78.5	257.5	794	2604	2273	7456	0.43	2.31	143.99	1.453	4.157	9.977	30343	86814	208365
	79	259.2	735	2412	2174	7132	0.44	2.26	141.40	1.225	3.516	9.071	25576	73423	189456
	79.5	260.8	704	2310	2083	6835	0.44	2.22	138.82	1.103	3.166	8.181	23032	66124	170860
	80	262.5	820	2689	2083	6835	0.41	2.22	138.82	1.494	4.208	7.659	31202	87892	159966
	80.5	264.1	820	2689	2083	6835	0.41	2.22	138.82	1.494	4.208	7.659	31202	87892	159967

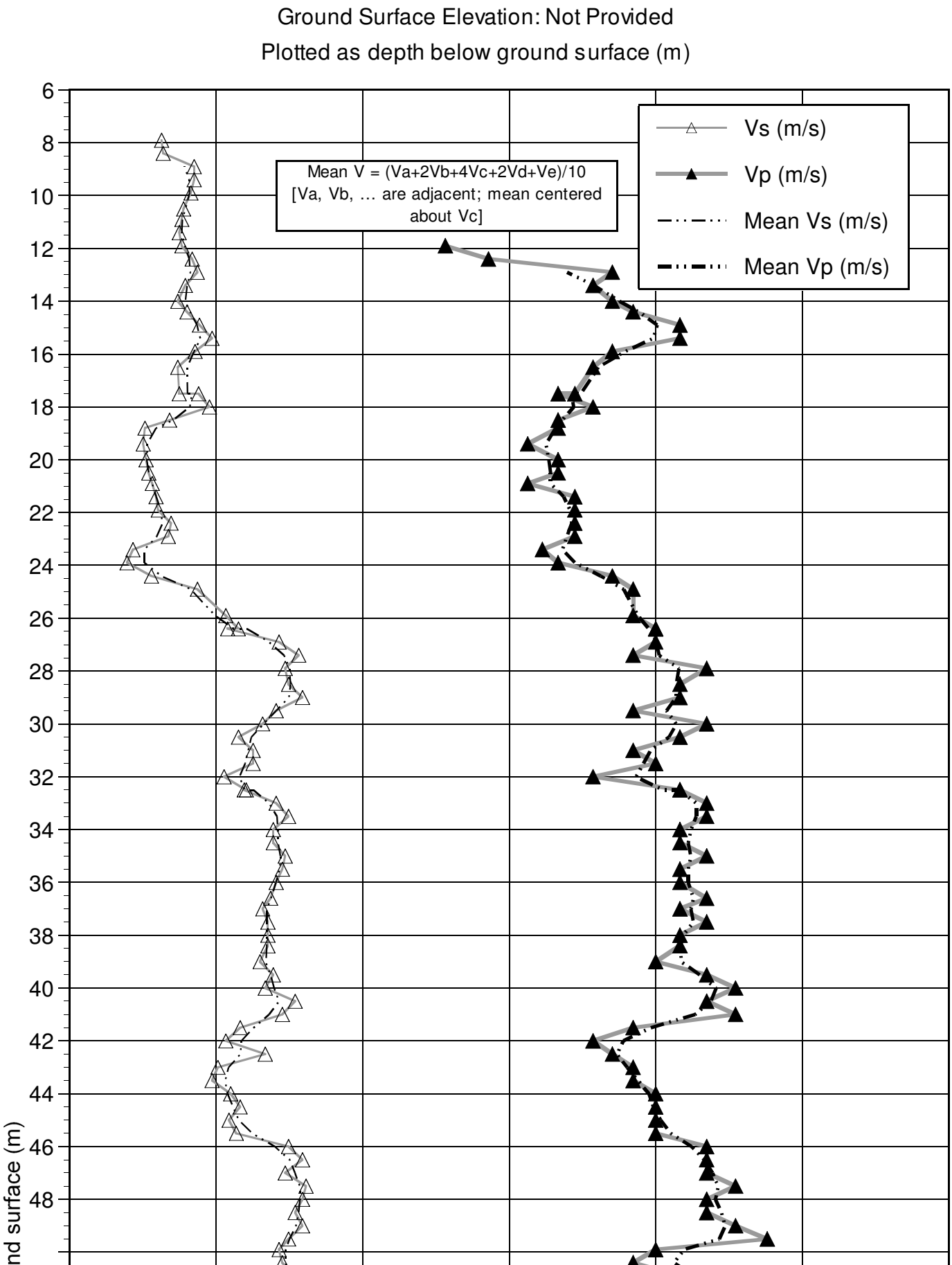
γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

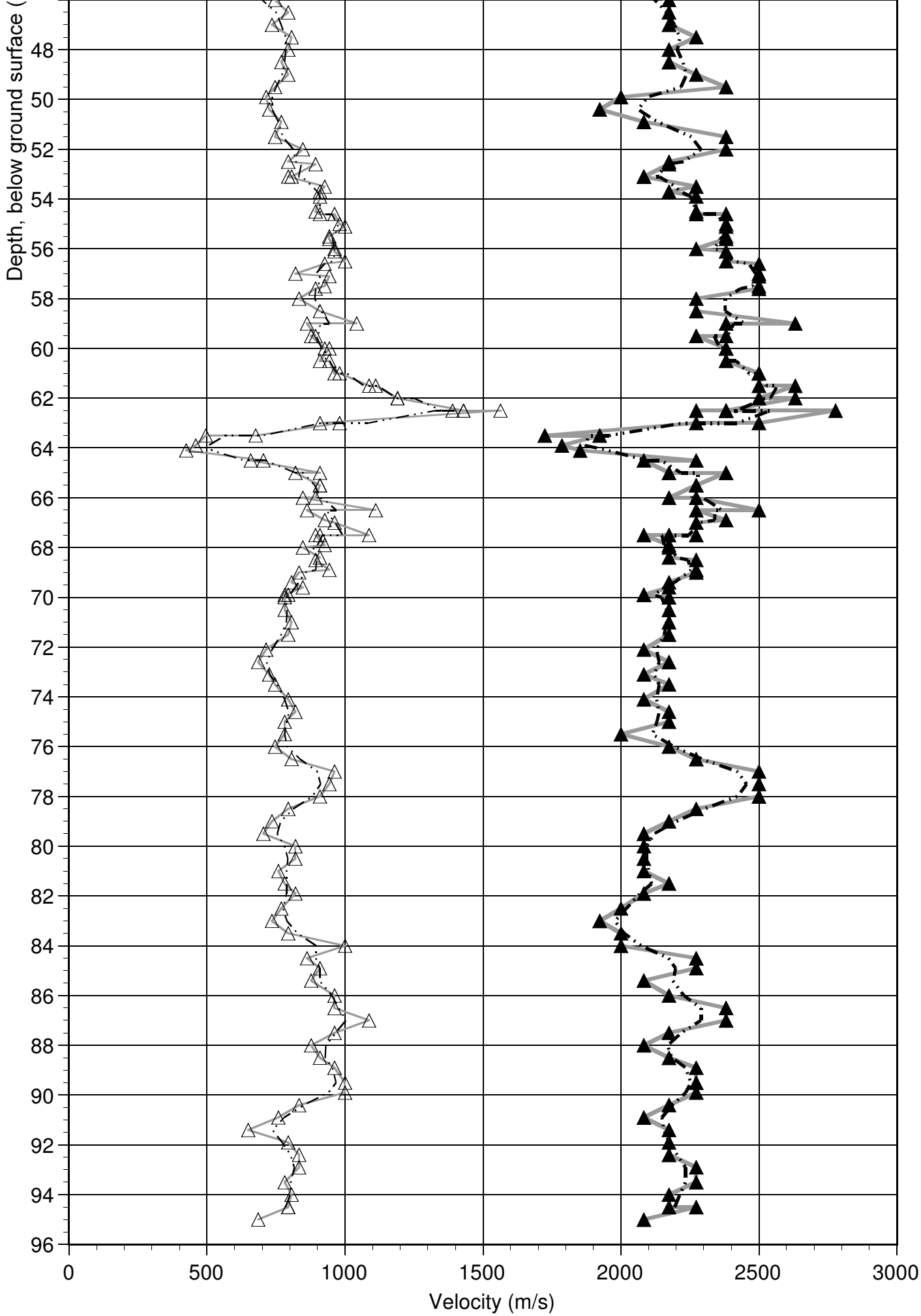
Table 2. LA 710 Tunnel
Boring Z1 B4
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	81	265.7	758	2485	2083	6835	0.42	2.22	138.82	1.276	3.634	7.950	26654	75900	166031
	81.5	267.4	781	2563	2174	7132	0.43	2.26	141.40	1.382	3.942	8.861	28873	82336	185061
	81.9	268.7	820	2689	2083	6835	0.41	2.22	138.82	1.494	4.208	7.659	31202	87892	159966
	82.5	270.7	769	2524	2000	6562	0.41	2.18	136.25	1.291	3.650	7.008	26972	76233	146367
	83	272.3	735	2412	1923	6309	0.41	2.14	133.69	1.158	3.275	6.376	24182	68406	133168
	83.5	274.0	794	2604	2000	6562	0.41	2.18	136.25	1.375	3.867	6.897	28712	80768	144047
	84	275.6	1000	3281	2000	6562	0.33	2.18	136.25	2.183	5.820	5.820	45582	121553	121553
	84.5	277.2	862	2828	2273	7456	0.42	2.31	143.99	1.714	4.854	9.628	35800	101382	201089
	84.9	278.5	909	2983	2273	7456	0.40	2.31	143.99	1.906	5.355	9.372	39811	111851	195740
	85.4	280.2	877	2878	2083	6835	0.39	2.22	138.82	1.711	4.764	7.370	35735	99505	153922
	86	282.2	962	3155	2174	7132	0.38	2.26	141.40	2.094	5.773	7.912	43736	120570	165243
	86.5	283.8	962	3155	2381	7812	0.40	2.35	146.59	2.171	6.090	10.417	45343	127193	217564
	87	285.4	1087	3566	2381	7812	0.37	2.35	146.59	2.774	7.593	9.613	57943	158574	200764
	87.5	287.1	962	3155	2174	7132	0.38	2.26	141.40	2.094	5.773	7.912	43736	120570	165243
	88	288.7	877	2878	2083	6835	0.39	2.22	138.82	1.711	4.764	7.370	35735	99505	153922
	88.5	290.4	909	2983	2174	7132	0.39	2.26	141.40	1.872	5.219	8.208	39095	108999	171431
	88.9	291.7	962	3155	2273	7456	0.39	2.31	143.99	2.132	5.933	9.070	44538	123903	189438
	89.5	293.6	1000	3281	2273	7456	0.38	2.31	143.99	2.306	6.366	8.838	48172	132950	184592
	89.9	294.9	1000	3281	2273	7456	0.38	2.31	143.99	2.306	6.366	8.838	48172	132950	184592
	90.4	296.6	833	2734	2174	7132	0.41	2.26	141.40	1.573	4.448	8.607	32850	92893	179757
	90.9	298.2	758	2485	2083	6835	0.42	2.22	138.82	1.276	3.634	7.950	26654	75900	166031
	91.4	299.9	649	2130	2174	7132	0.45	2.26	141.40	0.955	2.772	9.431	19946	57885	196962
	91.9	301.5	794	2604	2174	7132	0.42	2.26	141.40	1.427	4.061	8.802	29796	84807	183829
	92.4	303.1	833	2734	2174	7132	0.41	2.26	141.40	1.573	4.448	8.607	32850	92893	179757
	92.9	304.8	833	2734	2273	7456	0.42	2.31	143.99	1.602	4.556	9.778	33453	95162	204218
	93.5	306.8	781	2563	2273	7456	0.43	2.31	143.99	1.408	4.035	10.037	29402	84266	209619
	94	308.4	806	2646	2174	7132	0.42	2.26	141.40	1.473	4.184	8.740	30765	87386	182537
	94.5	310.0	794	2604	2174	7132	0.42	2.26	141.40	1.427	4.061	8.802	29796	84807	183829
	94.5	310.0	794	2604	2273	7456	0.43	2.31	143.99	1.453	4.157	9.977	30343	86814	208365
	95	311.7	685	2247	2083	6835	0.44	2.22	138.82	1.043	3.003	8.260	21787	62721	172520

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Figure 1. LA 710 Tunnel
Boring Z1 B4
Downhole Interval Velocities




Depth, below ground surface (
48
50
52
54
56
58
60
62
64
66
68
70
72
74
76
78
80
82
84
86
88
90
92
94
96
0
500
1000
1500
2000
2500
3000
Velocity (m/s)



Z1 B4

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WELL	:	Z1 B4
FIELD	:	LA 710 TUNNEL
COUNTY	:	LA
STATE	:	CA

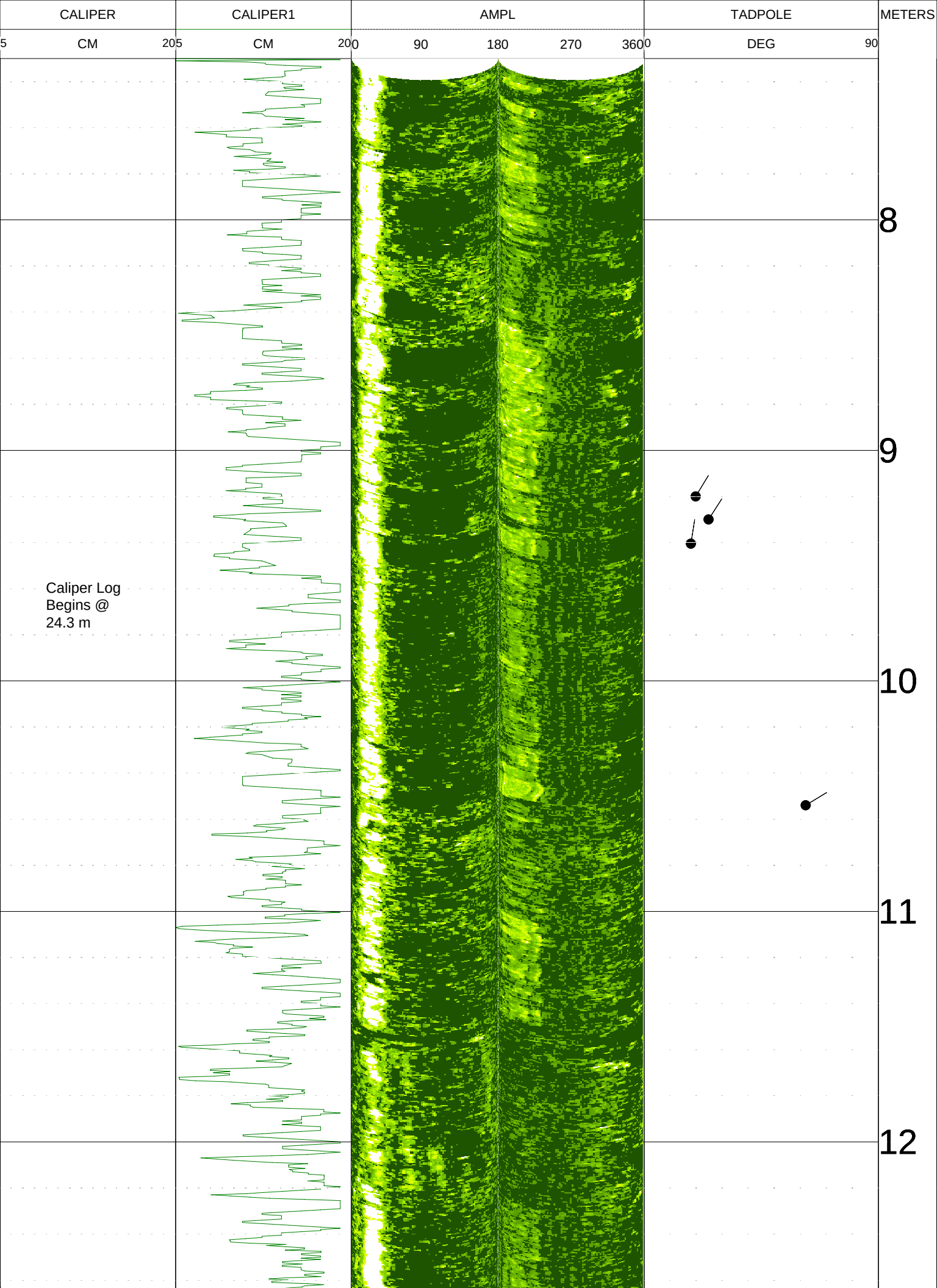
OTHER SERVICES:
IND-CAL.
AC TEL.
PSLOG.

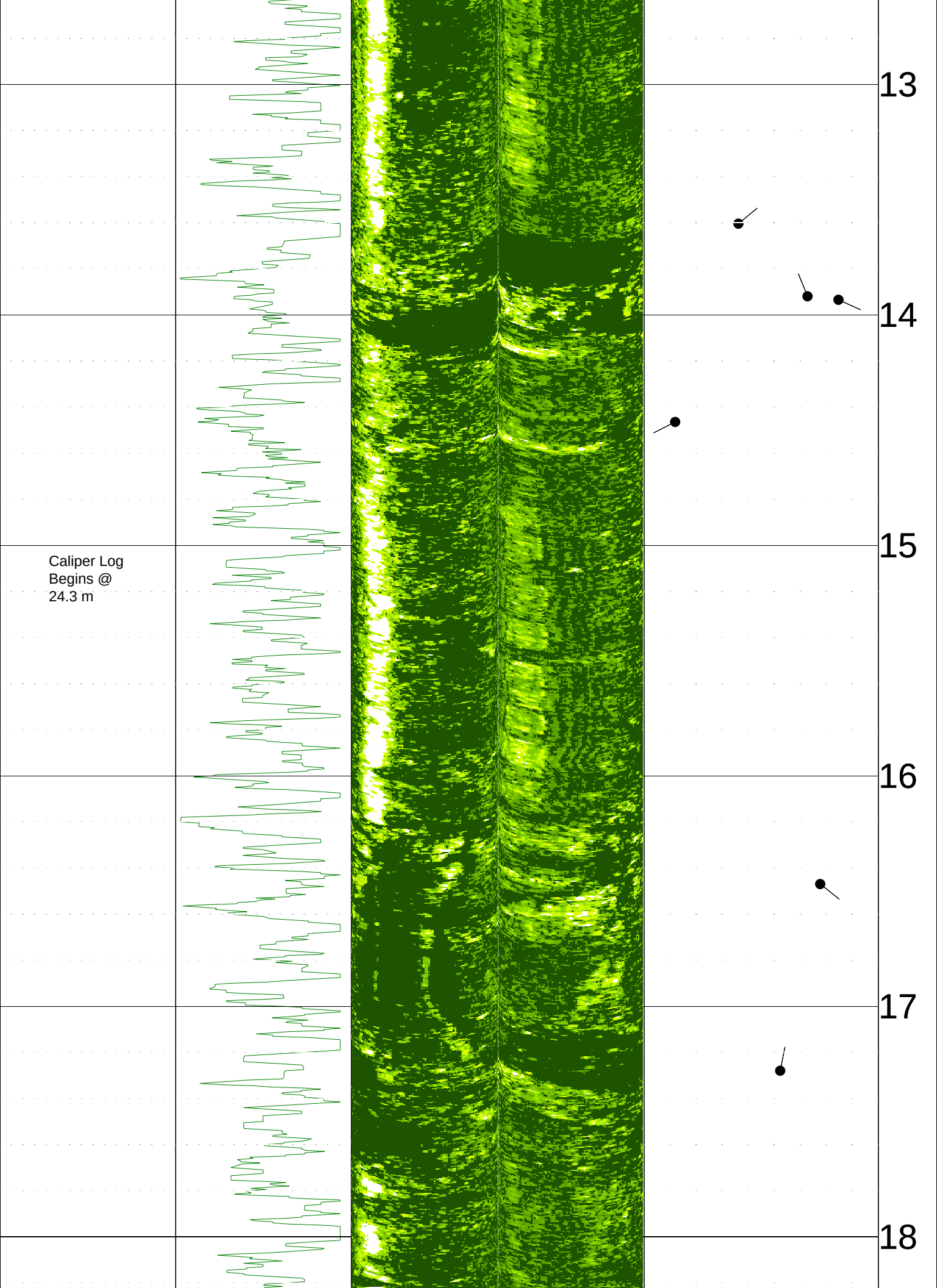
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API NO.	:	
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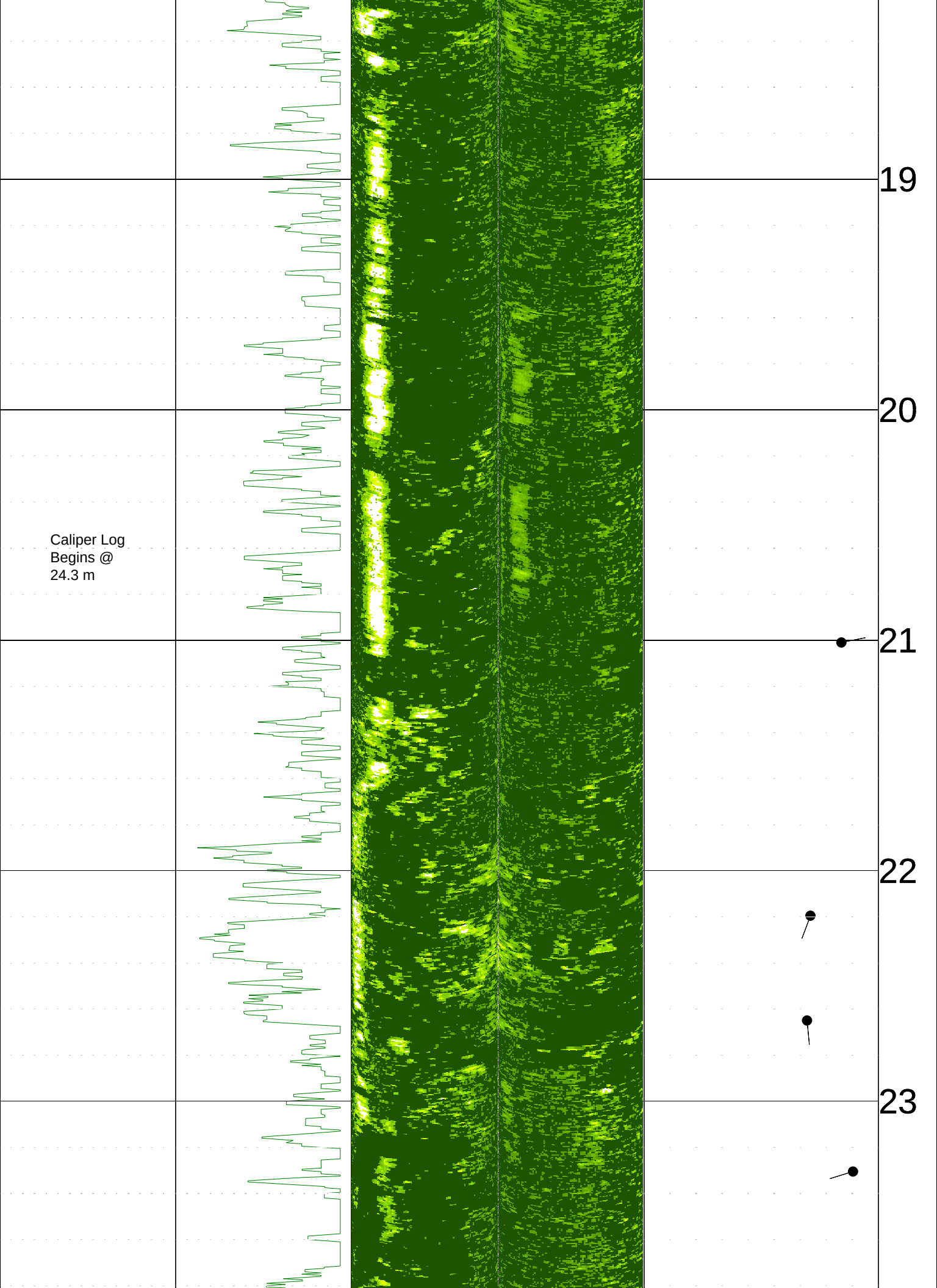
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LOG MEASURED FROM	:	GL	ELEVATION DF	: NA
DRL MEASURED FROM	:	GL	ELEVATION GL	: 123.75.

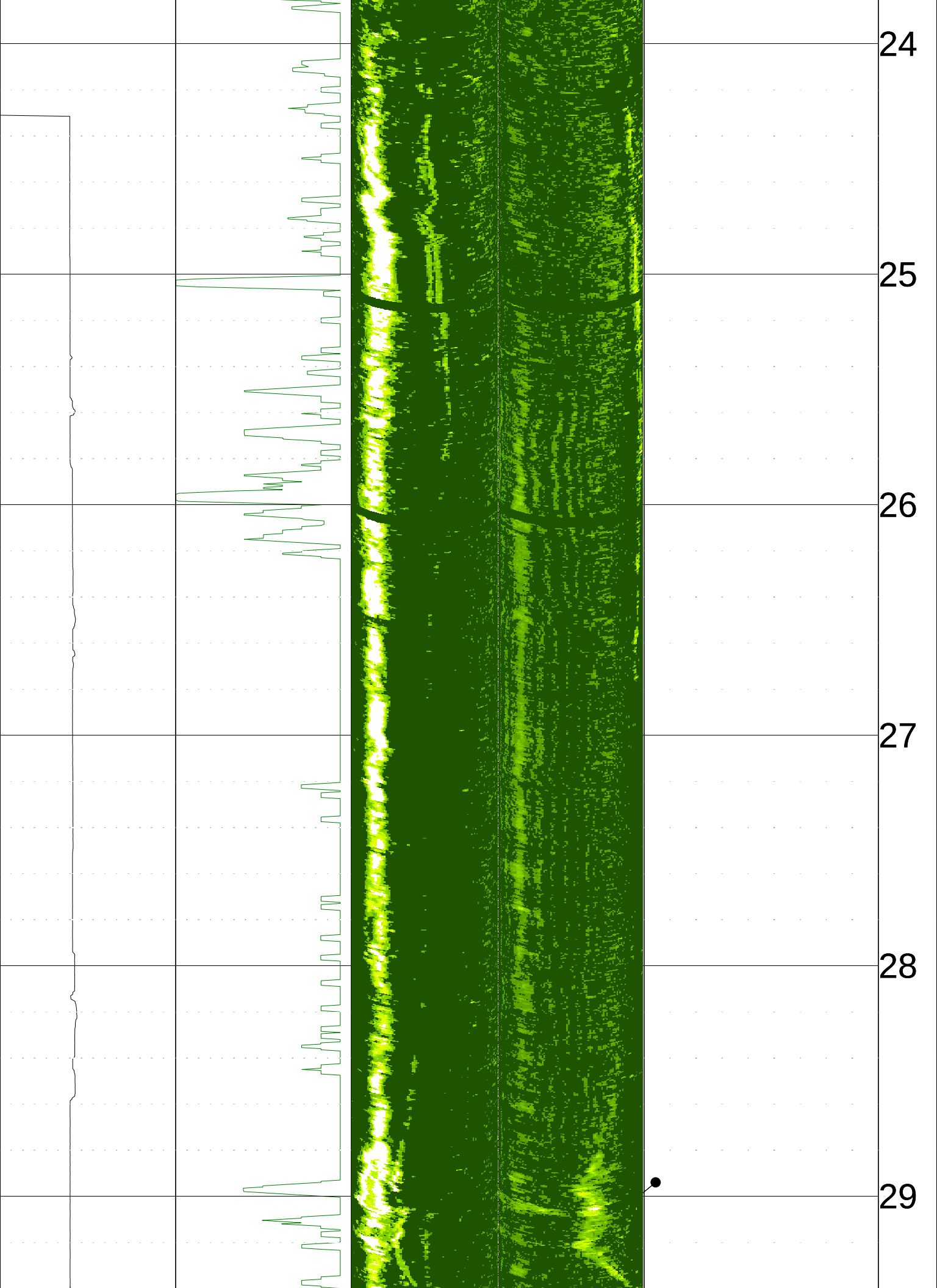
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DEPTH DRILLER	:	99.06.	LOGGER TD	:
BIT SIZE	:	10.00cm	ARRIVAL TIME	:
LOG TOP	:	3.50	DEPARTURE TIME	:
LOG BOTTOM	:	99.00	CIRC STOPPED	: 2/24 AM
CASING OD	:			
CASING BOTTOM	:	N/A		
CASING TYPE	:	N/A		
BOREHOLE FLUID	:	0		
RM TEMPERATURE	:	0		
MUD RES	:	0		
MUD WEIGHT	:			
WITNESSED BY	:			
RECORDED BY	:	DH/DG		
REMARKS 1	:			
REMARKS 2	:	EA: 07-187900		

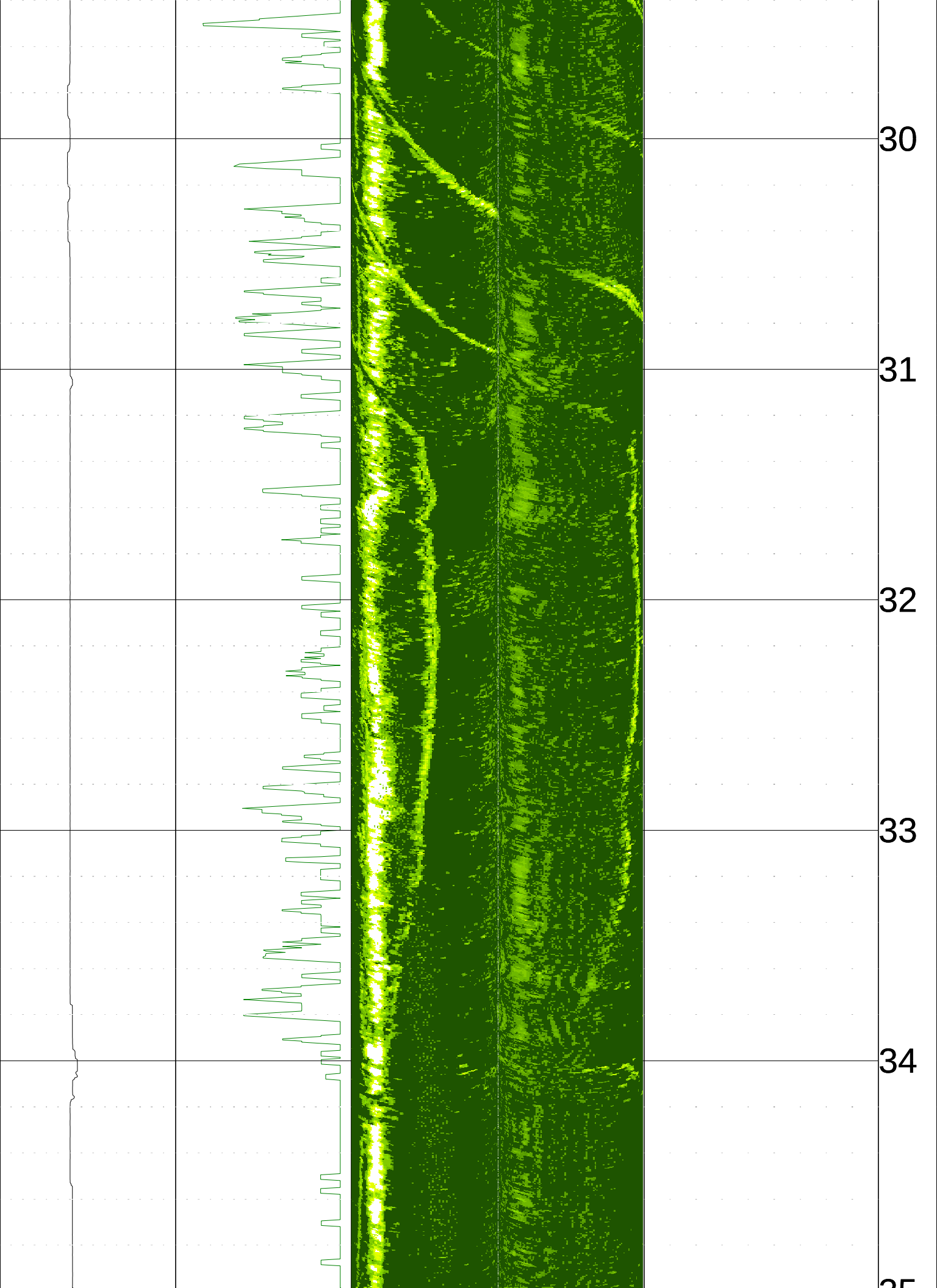
ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS

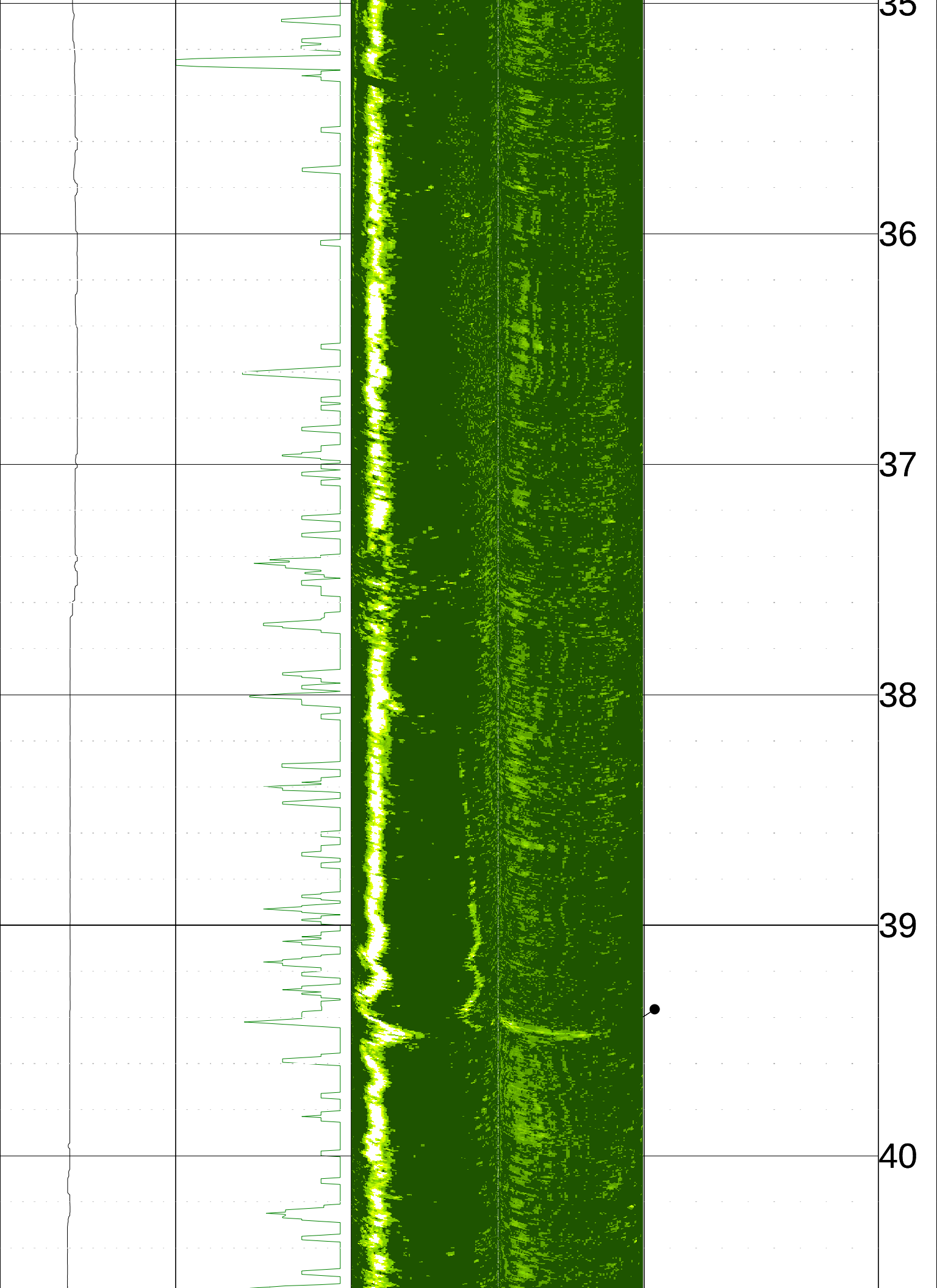

CALIPER
CALIPER1
AMPL
TADPOLE
METERS
5
CM
20
5
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20
0
90
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270
360
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Caliper Log
Begins @
24.3 m

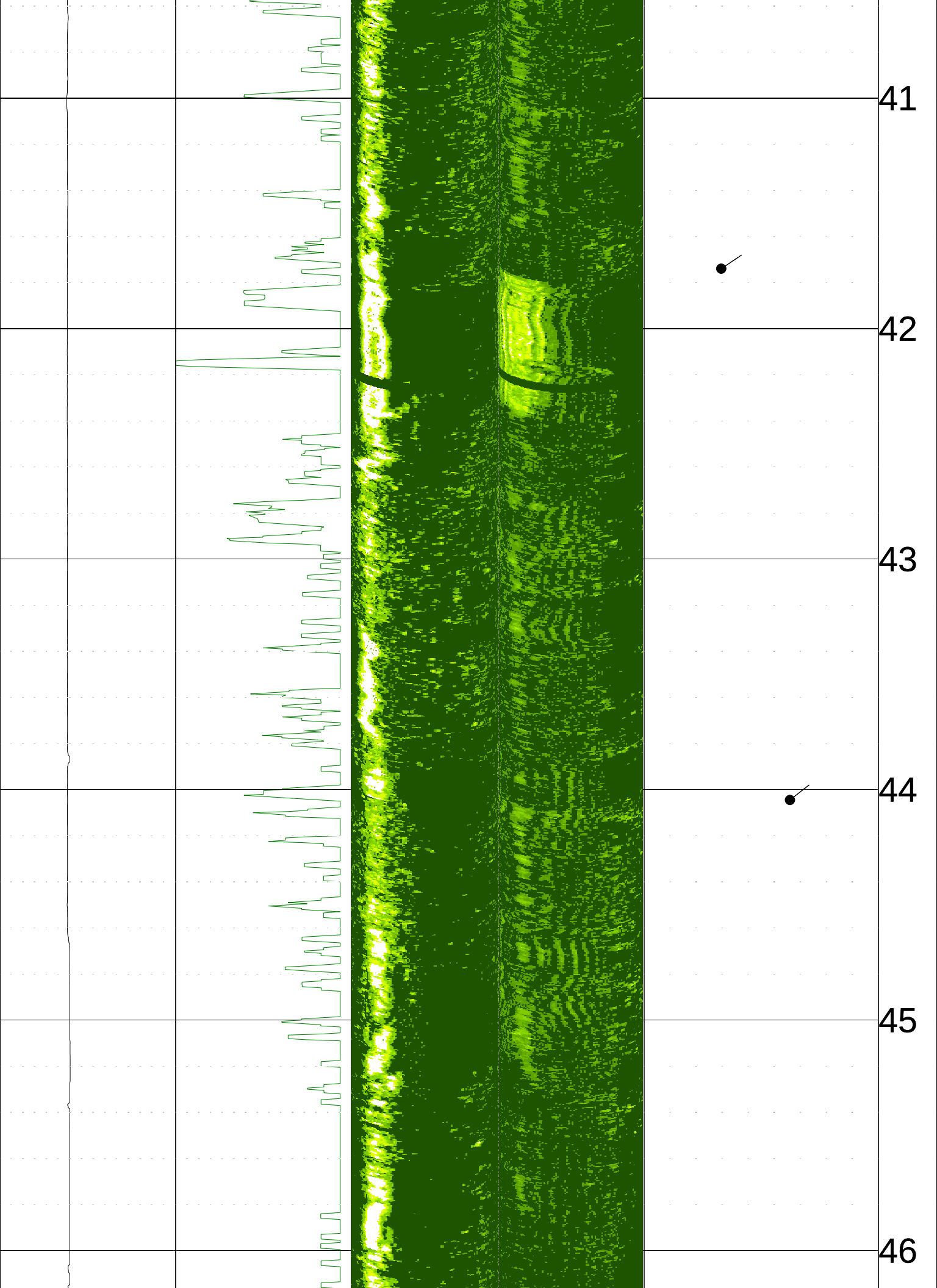

13
14
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18
Caliper Log
Begins @
24.3 m

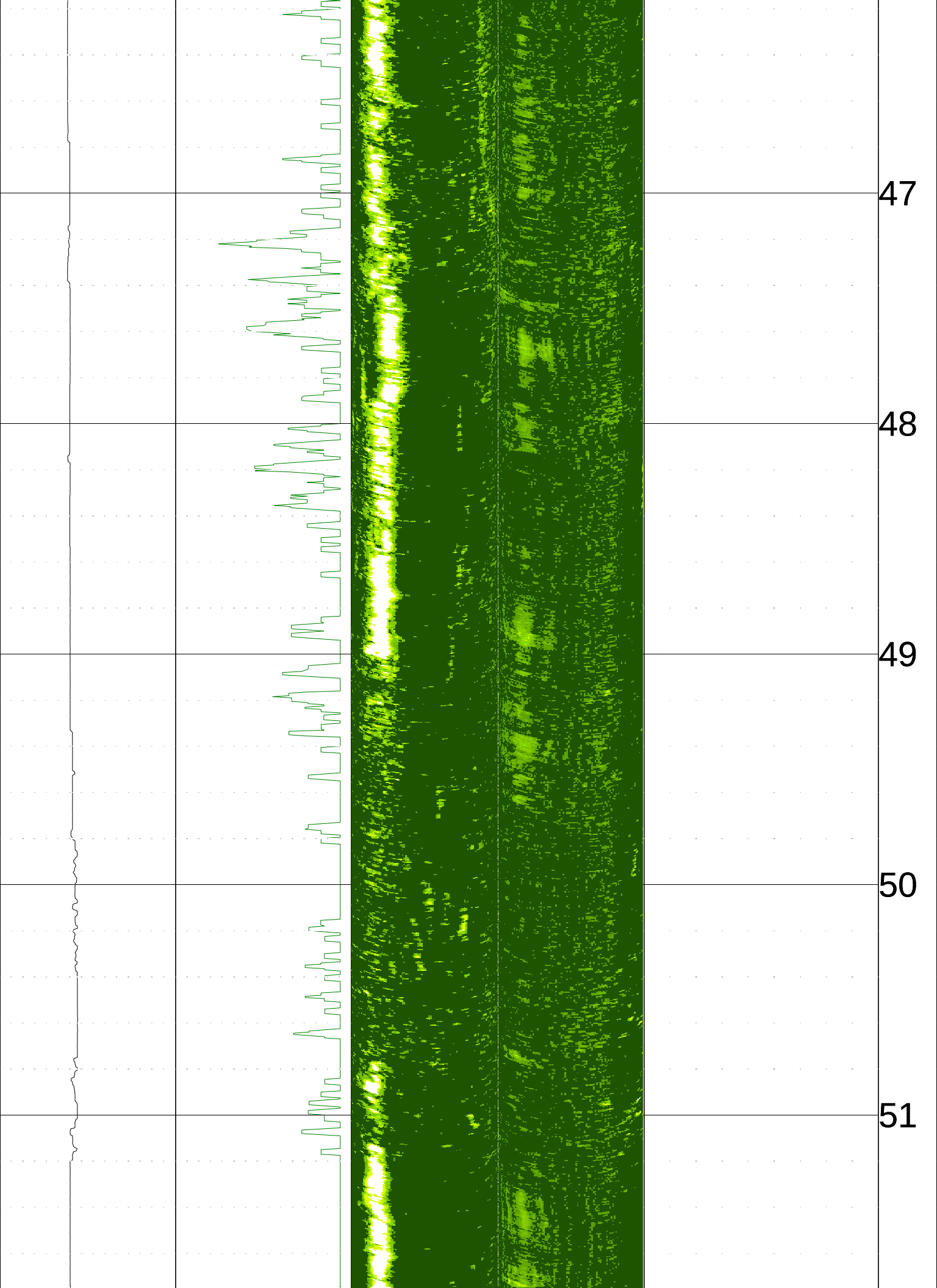

19
20
Caliper Log
Begins @
24.3 m
21
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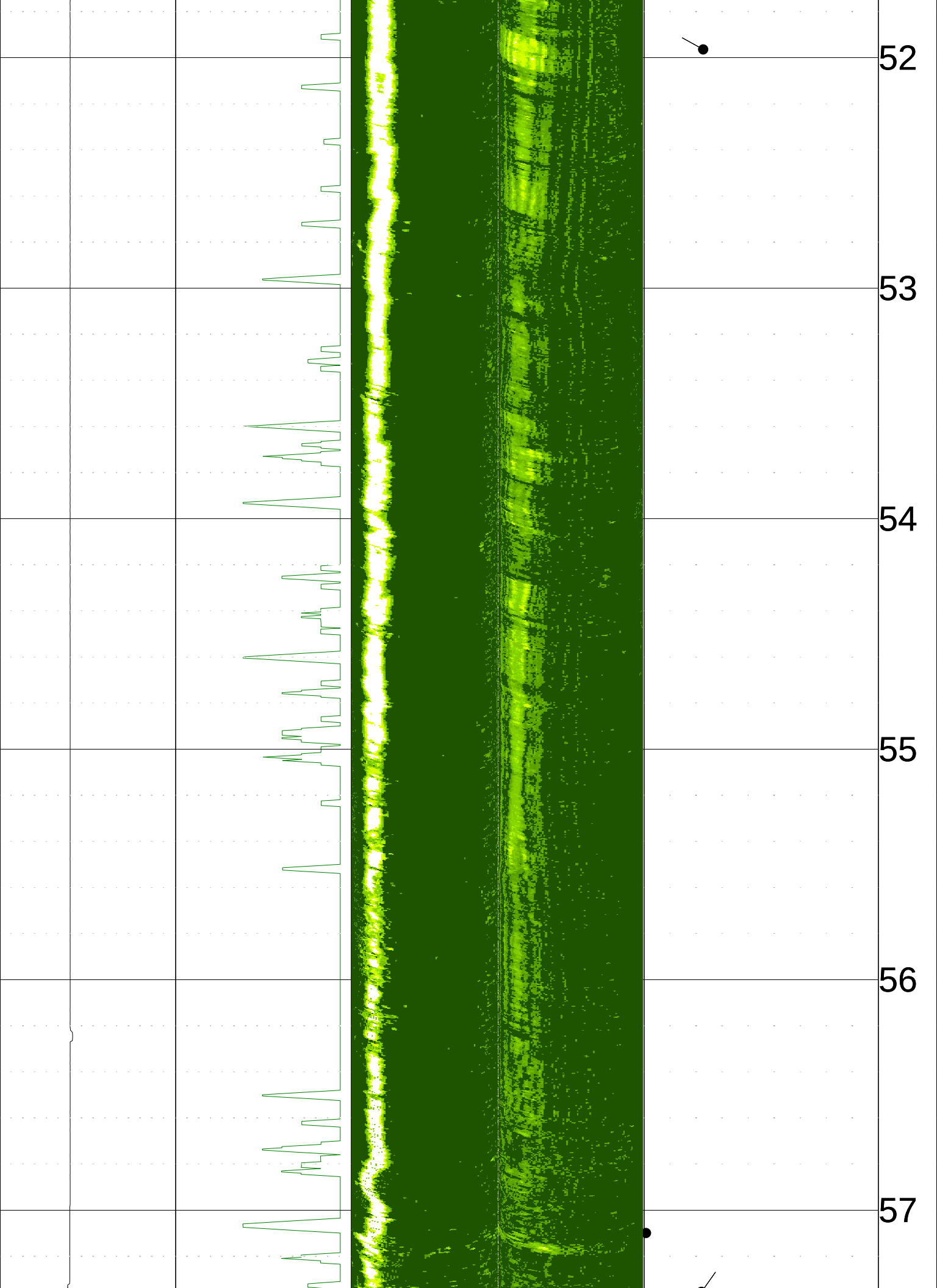

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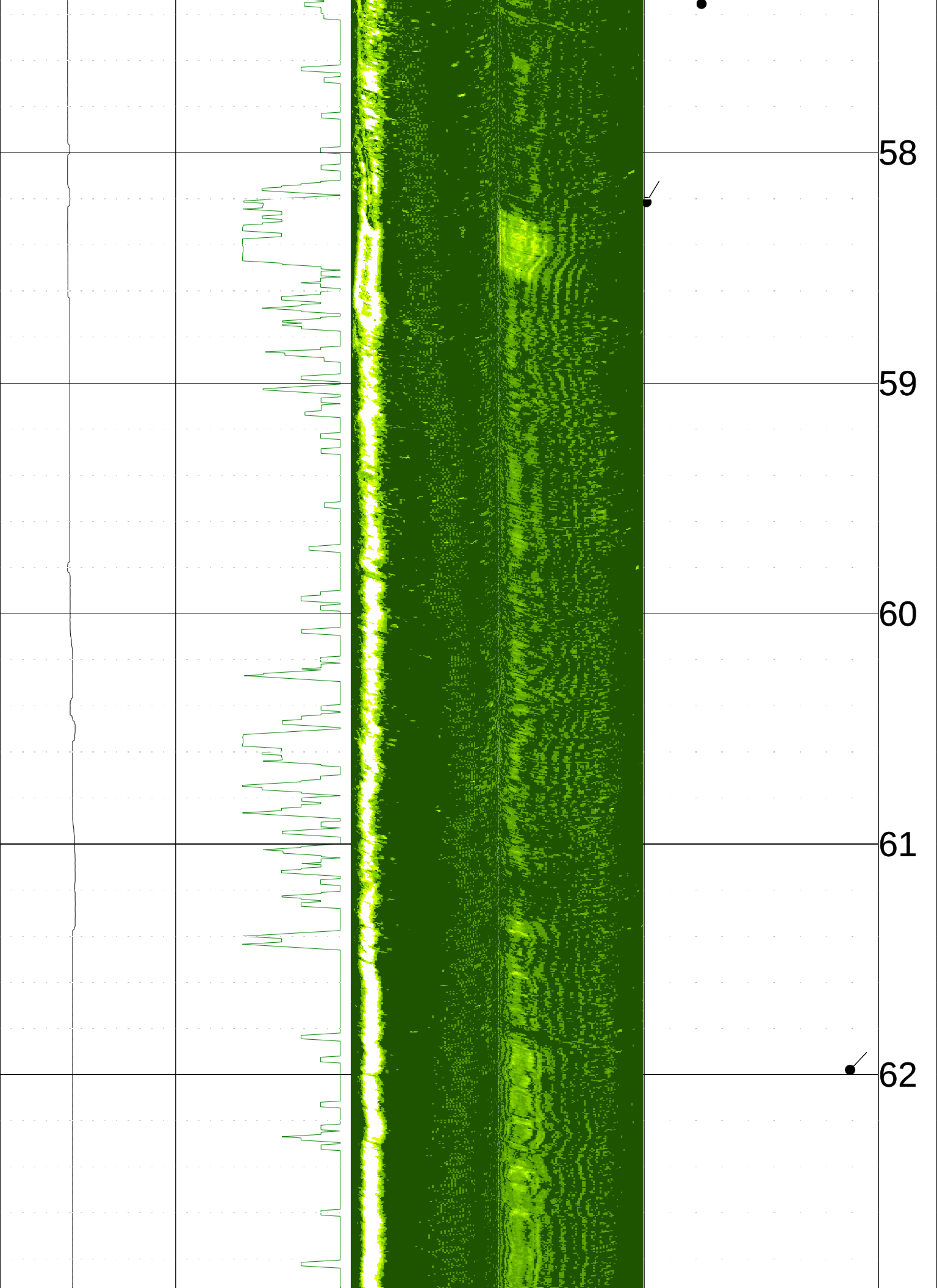

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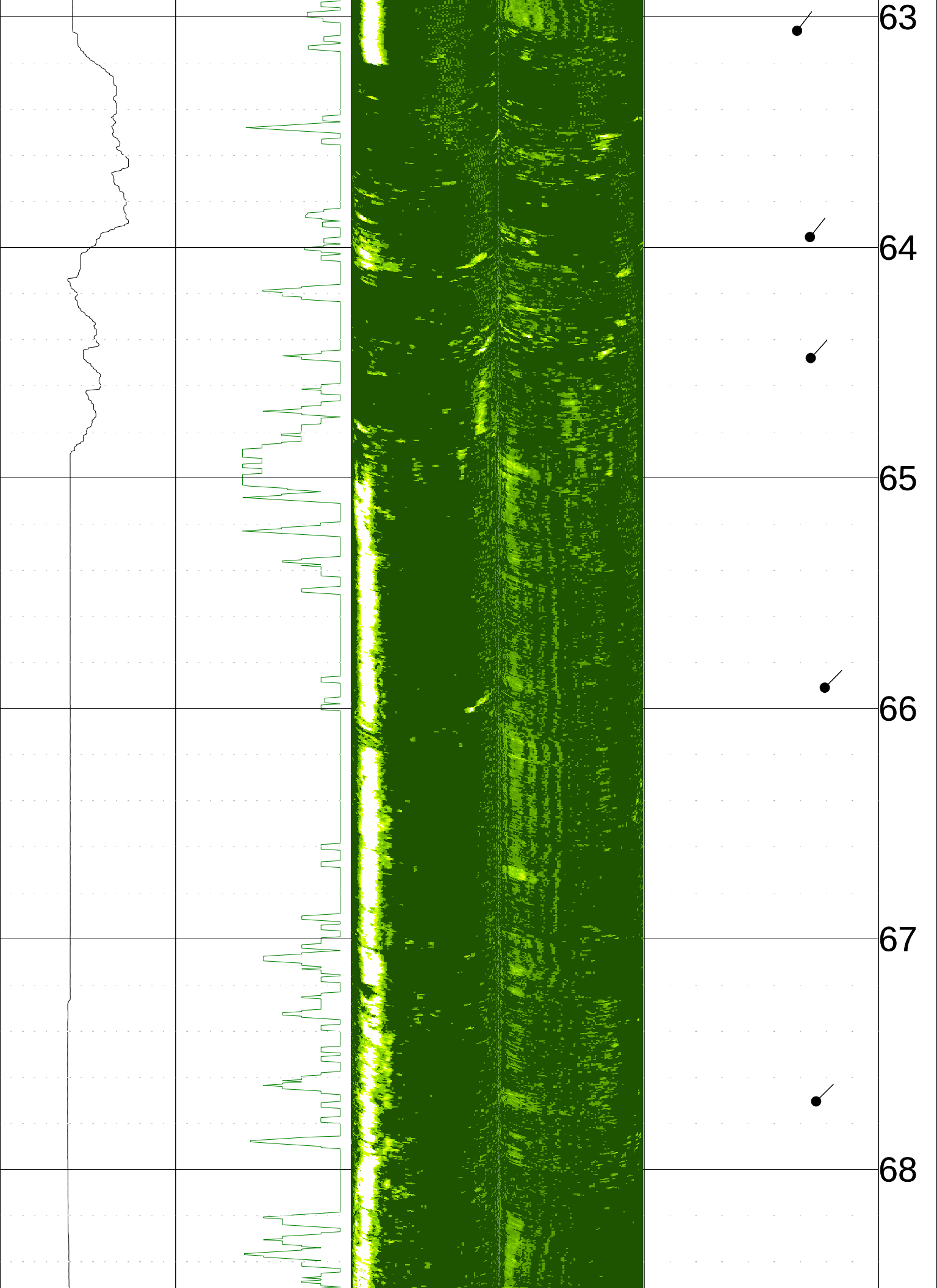

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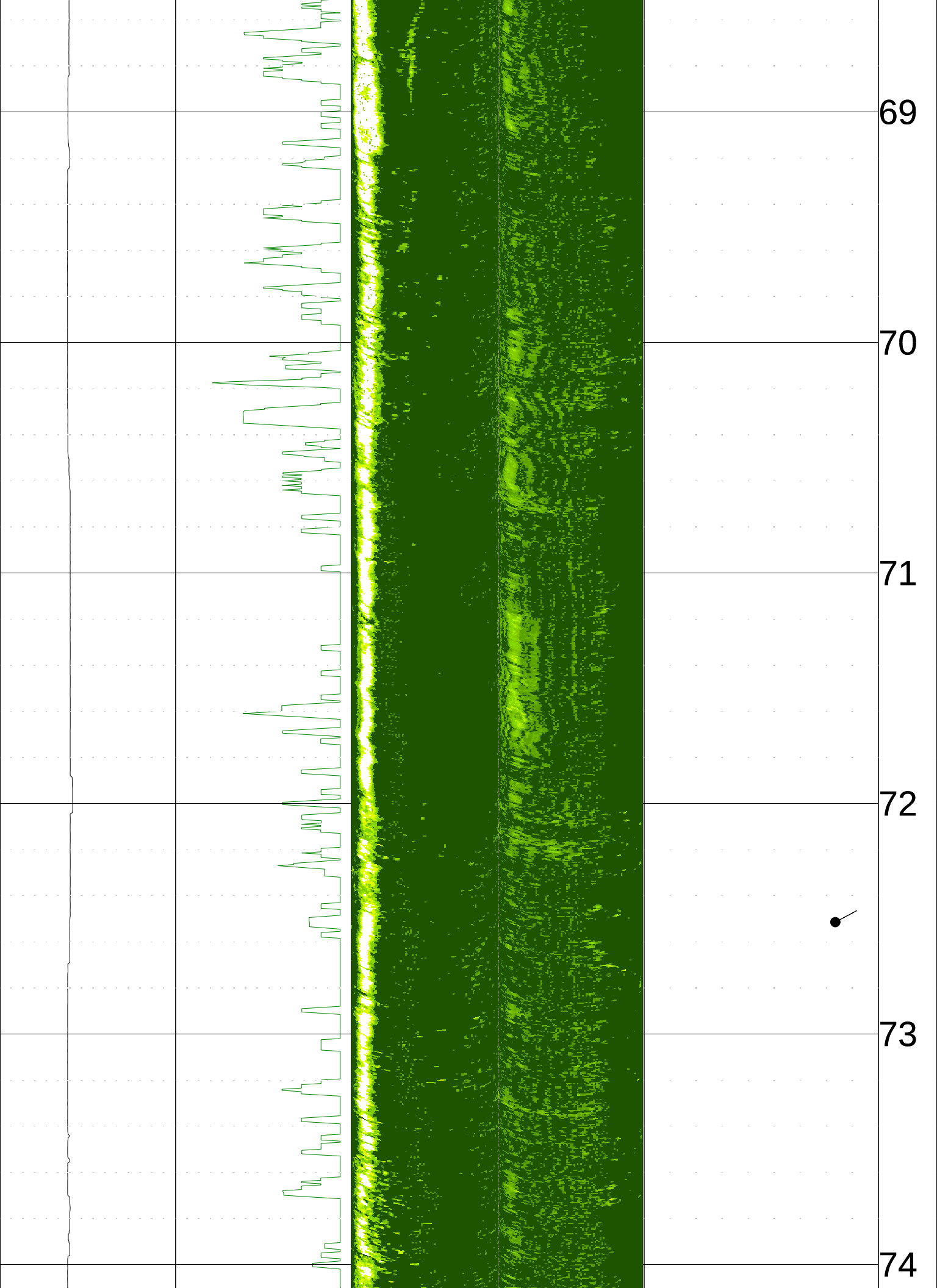

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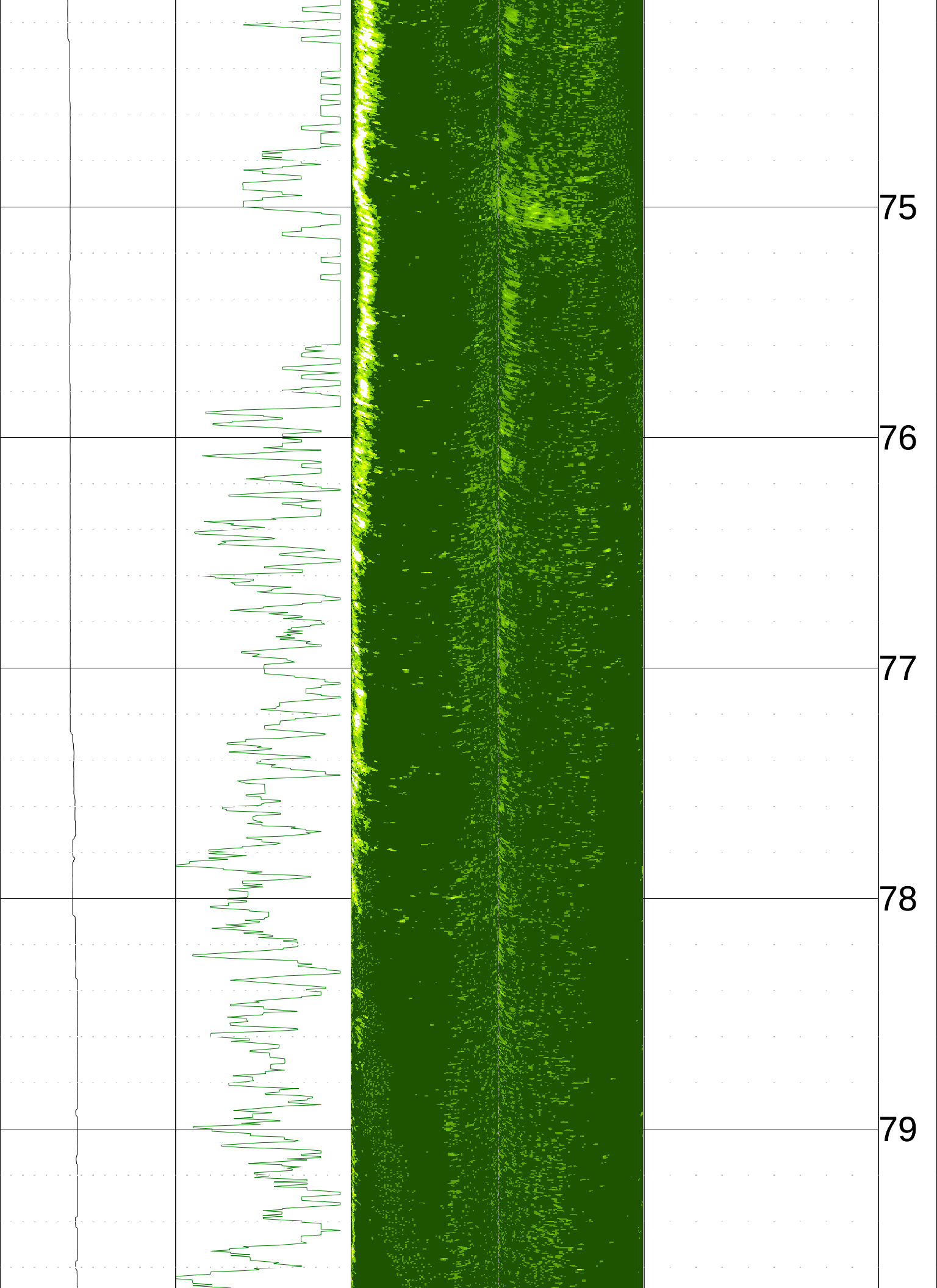

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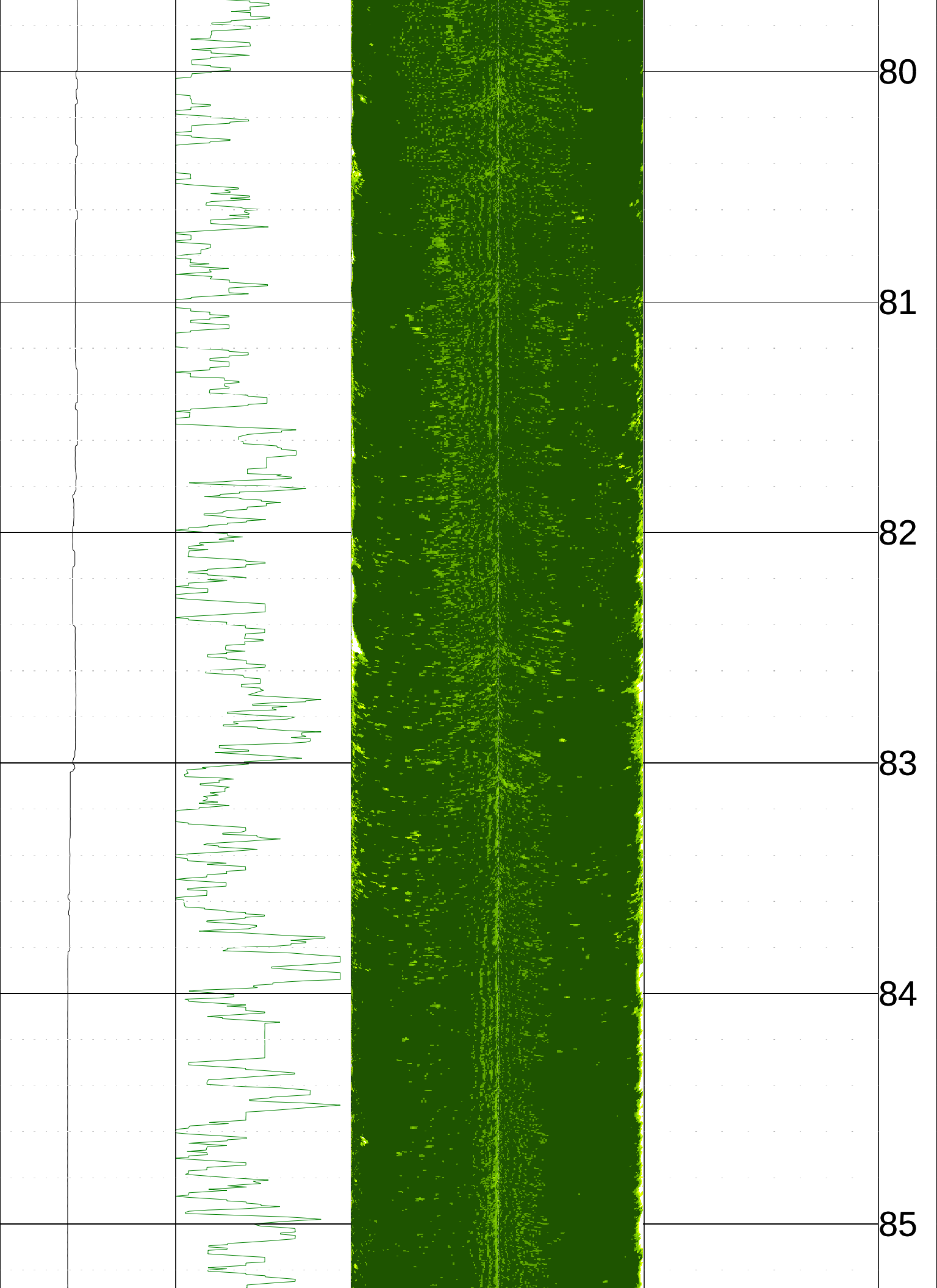

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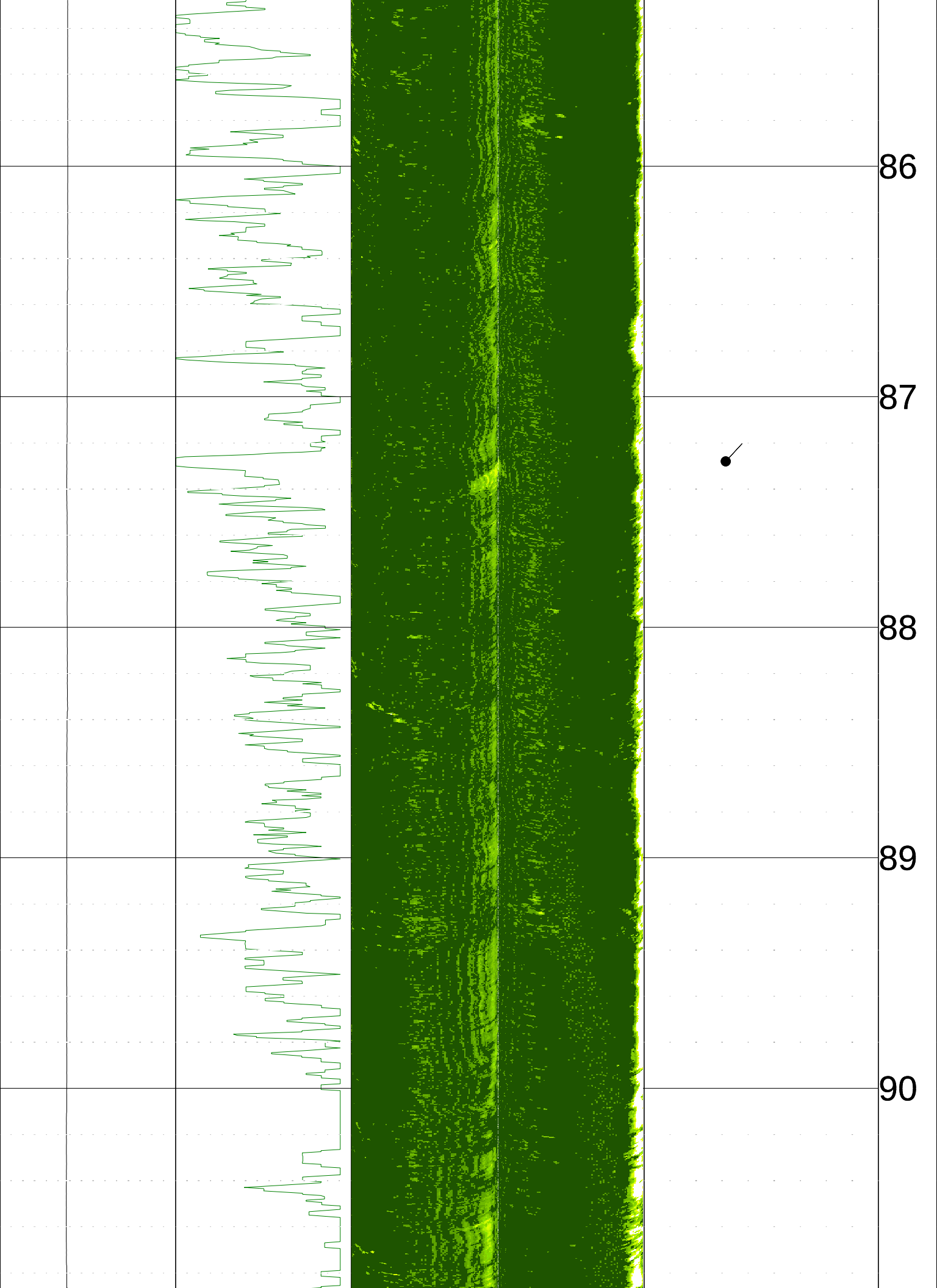

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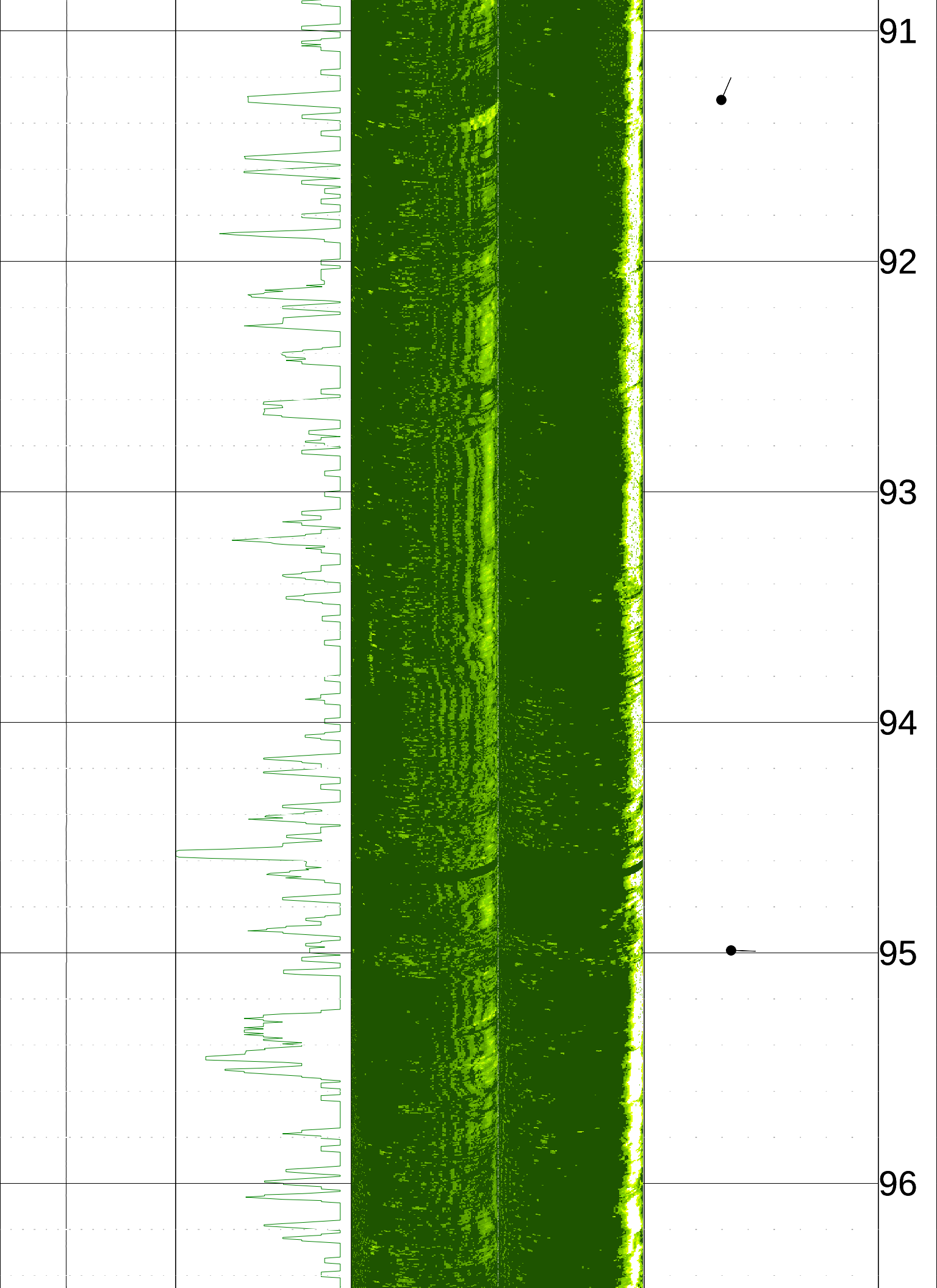

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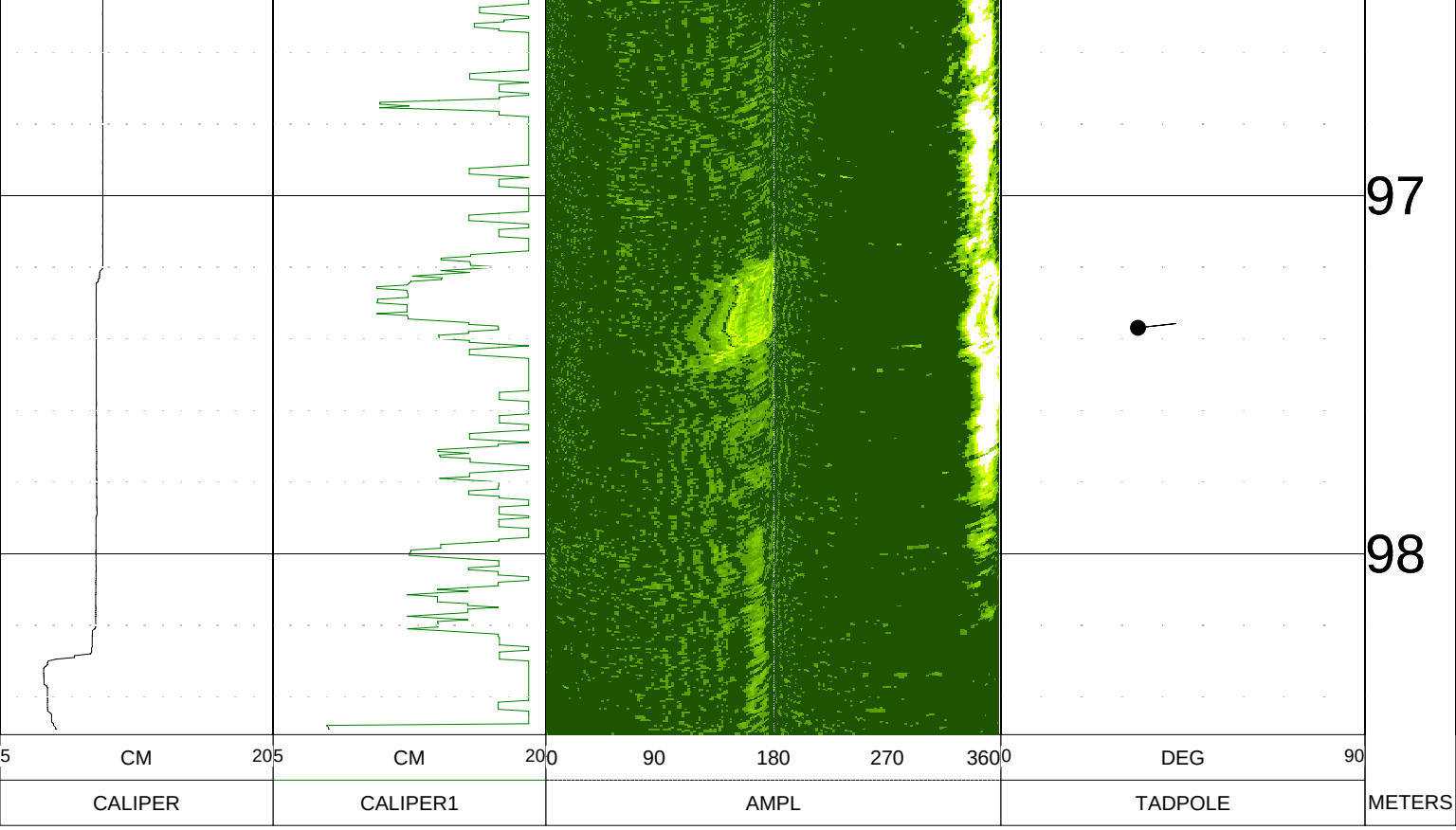

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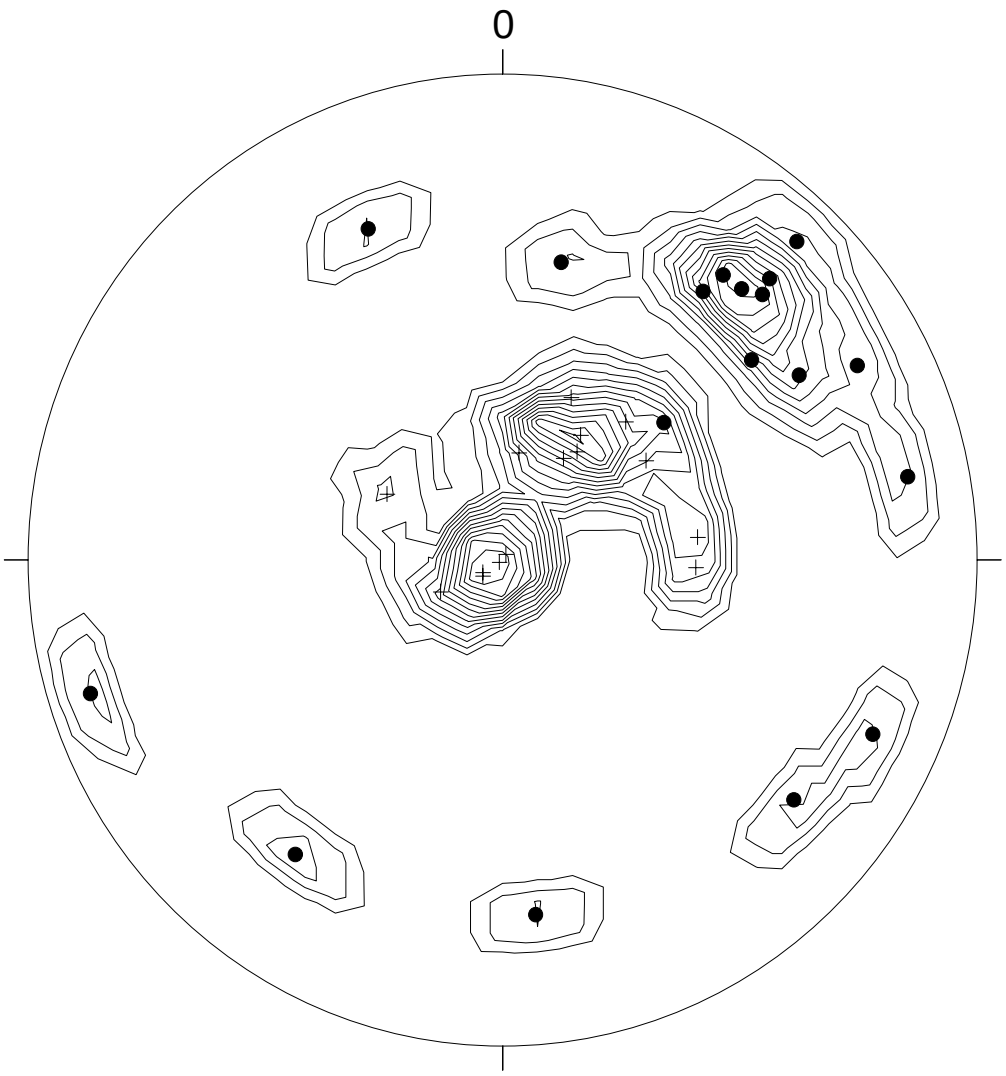

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89
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91
92
93
94
95
96


97
98
5
CM
20
5
CM
20
0
90
180
270
360
0
DEG
90
CALIPER
CALIPER1
AMPL
TADPOLE
METERS



LA 710 Tunnel, boring Z1 B4

Stereonet contour plot of poles to planes
bedding and fractures

+ n=15 (P)
● n=18 (P)

n=33
max. dens.=14.24 (at 30/ 66)
min. dens.=0.00
Contours at every interval between
1 and 14, inclusive
(Multiples of random distribution)

Apparent bedding denoted as cross
Apparent fractures denoted as solid circles
Plotted on upper hemisphere



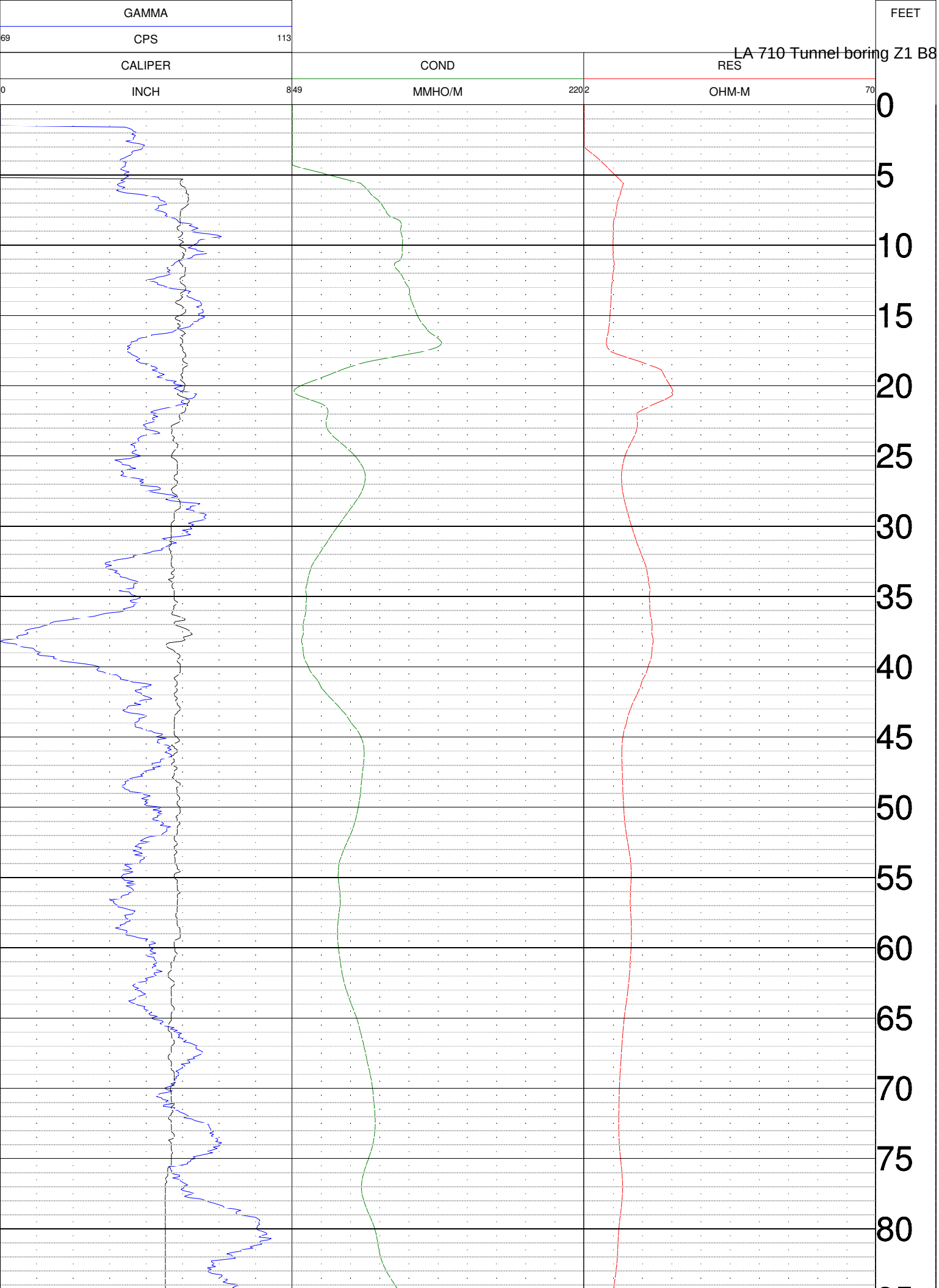
LA 710 Tunnel boring Z1 B8

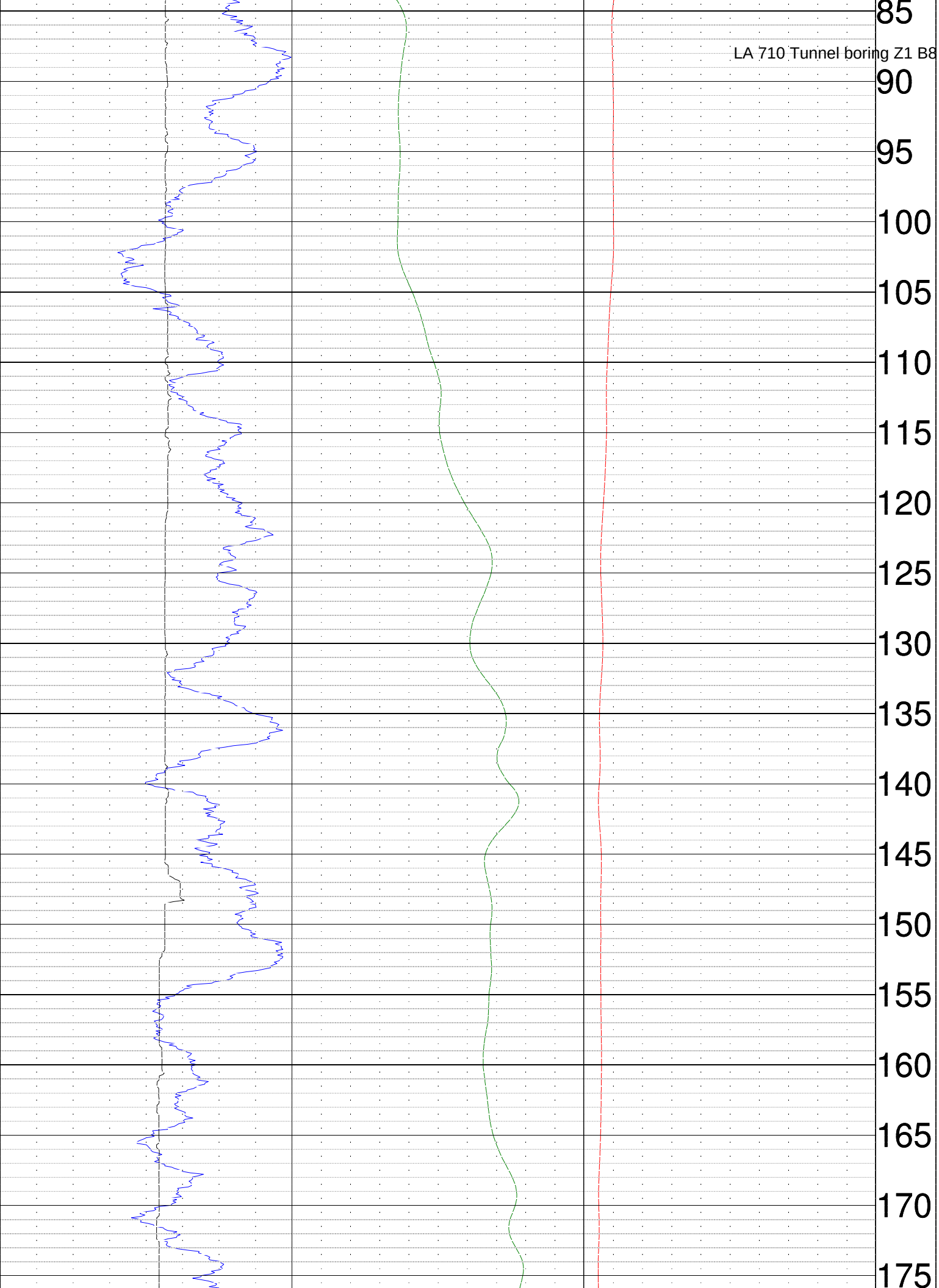
COMPANY	: CALTRANS				
WELL	: Z1 B8				
LOCATION/FIELD	: LA 710 TUNNEL				
COUNTY	: LA				
LOCATION	: CA				
SECTION	: None	TOWNSHIP	: None	RANGE	: None
DATE	: 1/08/09	PERMANENT DATUM	: None		
DEPTH DRILLER	: 200 FT			KB	: NA
LOG BOTTOM	: 201.5	LOG MEASURED FROM:	GL	DF	: NA
LOG TOP	: -0.2	DRL MEASURED FROM:	GL	GL	: NA
CASING DIAMETER	: 3.9	LOGGING UNIT	: 7311		
CASING TYPE	: none	FIELD OFFICE	: 7311		
CASING THICKNESS:	0	RECORDED BY	: DH/DL		
BIT SIZE	: 3.95 IN	BOREHOLE FLUID	: 0	FILE	: PROCESSE
MAGNETIC DECL.	: 12.85	RM	: 0	TYPE	: 9065A
MATRIX DENSITY	: 2.71	RM TEMPERATURE	: 0	LGDATE	: 1/08/09.
NEUTRON MATRIX	: DOLOMITE	MATRIX DELTA T	: 140		
				THRESH:	2500

OTHER SERVICES:
IND-CAL
AC TEL
PSLOG

THIS LOG MEASURED IN FEET, CALIPER MEASURED IN INCHES
EA: 07-187900. GL ELEVATION ESTIMATED FROM HANDHELD GPS 377 FT

ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS


GAMMA
69
CPS
113
CALIPER
0
INCH
8
COND
49
MMHO/M
220
RES
2
OHM-M
70
FEET
LA 710 Tunnel boring Z1 B8
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80


LA 710 Tunnel boring Z1 B8
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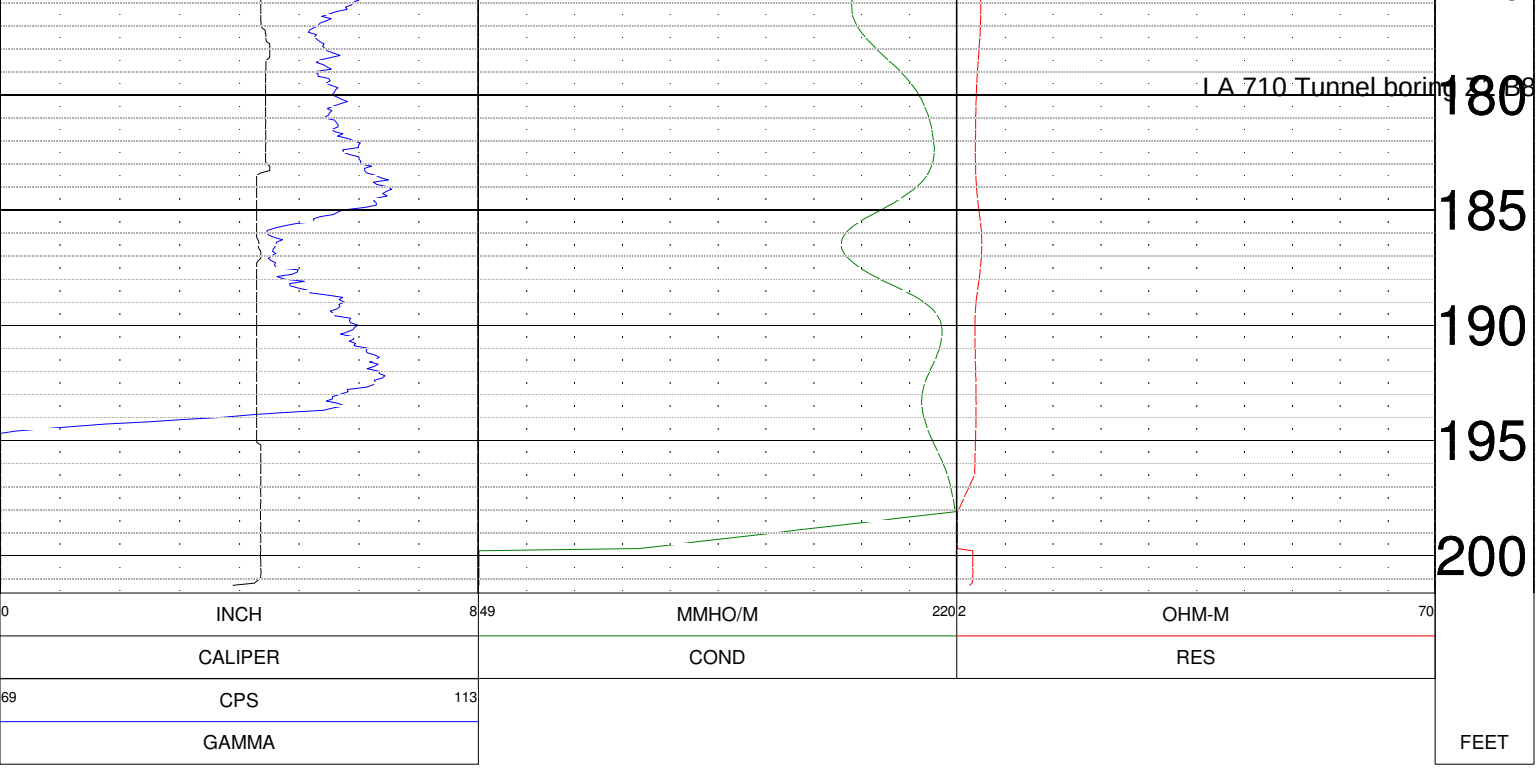

I A 710 Tunnel boring 2 of 8
180
185
190
195
200
0
INCH
8
49
MMHO/M
220
2
OHM-M
70
CALIPER
COND
RES
69
CPS
113
GAMMA
FEET

Table 2. LA 710 Tunnel
Boring Z1 B8
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
Not Provided	1	3.3	214	702		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	1.5	4.9	203	666		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2	6.6	215	706		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2.5	8.2	242	795		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3	9.8	255	836		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3.5	11.5	258	847		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4	13.1	233	763		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4.5	14.8	198	650		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5	16.4	196	643		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5.5	18.0	242	795		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6	19.7	299	979		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6.5	21.3	241	791	515	1691	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7	23.0	194	637	382	1252	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7.5	24.6	187	613	495	1624	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8	26.2	198	650	833	2734	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8.5	27.9	219	717	1163	3815	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9	29.5	237	777	1613	5292	0.49	1.94	121.09	0.109	0.324	4.901	2269	6758	102358
	9.5	31.2	242	795	1786	5859	0.49	2.06	128.62	0.121	0.361	6.408	2529	7539	133836
	10	32.8	261	858	2000	6562	0.49	2.18	136.25	0.149	0.445	8.531	3116	9292	178175
	10.5	34.4	253	831	1613	5292	0.49	1.94	121.09	0.124	0.370	4.880	2596	7723	101922
	11	36.1	267	875	1471	4825	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11.5	37.7	290	951	1563	5126	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12	39.4	328	1076	1667	5468	0.48	1.98	123.58	0.213	0.630	5.215	4445	13155	108922
	12.5	41.0	286	937	1613	5292	0.48	1.94	121.09	0.158	0.470	4.835	3307	9814	100975
	13	42.7	274	899	1613	5292	0.49	1.94	121.09	0.146	0.432	4.852	3041	9032	101330
	13.5	44.3	317	1042	1613	5292	0.48	1.94	121.09	0.195	0.579	4.785	4083	12083	99940
	14	45.9	339	1112	1667	5468	0.48	1.98	123.58	0.227	0.673	5.196	4751	14048	108513
	14.5	47.6	333	1094	1667	5468	0.48	1.98	123.58	0.220	0.651	5.206	4594	13590	108723
	14.9	48.9	342	1122	1667	5468	0.48	1.98	123.58	0.231	0.684	5.190	4833	14285	108405
	14.9	48.9	308	1009	1724	5657	0.48	2.02	126.09	0.191	0.567	5.749	3994	11850	120076
	15.4	50.5	348	1141	1667	5468	0.48	1.98	123.58	0.240	0.708	5.180	5002	14778	108179
	15.5	50.9	360	1182	1724	5657	0.48	2.02	126.09	0.262	0.775	5.655	5478	16184	118097
	15.9	52.2	354	1161	1667	5468	0.48	1.98	123.58	0.248	0.732	5.168	5181	15297	107940
	16	52.5	370	1215	1724	5657	0.48	2.02	126.09	0.277	0.818	5.635	5787	17080	117685
	16.4	53.8	345	1131	1613	5292	0.48	1.94	121.09	0.231	0.681	4.738	4817	14220	98961
	16.5	54.1	400	1312	1667	5468	0.47	1.98	123.58	0.317	0.931	5.077	6615	19441	106028
	16.9	55.4	412	1353	1667	5468	0.47	1.98	123.58	0.337	0.988	5.050	7031	20634	105474

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z1 B8
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	17	55.8	354	1161	1563	5126	NA	NA	NA	NA	NA	NA	NA	NA	NA
	17.4	57.1	333	1094	1613	5292	0.48	1.94	121.09	0.216	0.637	4.758	4501	13302	99383
	17.5	57.4	348	1141	1667	5468	0.48	1.98	123.58	0.240	0.708	5.180	5002	14778	108179
	17.9	58.7	348	1141	1724	5657	0.48	2.02	126.09	0.244	0.723	5.678	5104	15094	118596
	18	59.1	377	1238	1724	5657	0.47	2.02	126.09	0.288	0.848	5.621	6007	17719	117392
	18.5	60.7	357	1172	1724	5657	0.48	2.02	126.09	0.258	0.761	5.661	5381	15901	118227
	18.5	60.7	374	1226	1724	5657	0.48	2.02	126.09	0.282	0.833	5.628	5895	17395	117540
	19	62.3	400	1312	1786	5859	0.47	2.06	128.62	0.330	0.971	6.130	6885	20290	128029
	19	62.3	364	1193	1786	5859	0.48	2.06	128.62	0.272	0.805	6.206	5690	16823	129621
	19.5	64.0	364	1193	1667	5468	0.48	1.98	123.58	0.262	0.772	5.150	5467	16128	107558
	19.5	64.0	348	1141	1724	5657	0.48	2.02	126.09	0.244	0.723	5.678	5104	15094	118596
	20	65.6	354	1161	1667	5468	0.48	1.98	123.58	0.248	0.732	5.168	5181	15297	107940
	20	65.6	364	1193	1724	5657	0.48	2.02	126.09	0.267	0.789	5.648	5578	16475	117964
	20.5	67.3	339	1112	1667	5468	0.48	1.98	123.58	0.227	0.673	5.196	4751	14048	108513
	21	68.9	315	1033	1667	5468	0.48	1.98	123.58	0.196	0.582	5.237	4101	12153	109379
	21.5	70.5	331	1085	1667	5468	0.48	1.98	123.58	0.216	0.640	5.211	4518	13370	108824
	22	72.2	357	1172	1667	5468	0.48	1.98	123.58	0.253	0.745	5.162	5274	15567	107816
	22.5	73.8	345	1131	1667	5468	0.48	1.98	123.58	0.235	0.696	5.185	4916	14529	108293
	23	75.5	364	1193	1667	5468	0.48	1.98	123.58	0.262	0.772	5.150	5467	16128	107558
	23.5	77.1	385	1262	1724	5657	0.47	2.02	126.09	0.299	0.881	5.606	6240	18394	117081
	24	78.7	385	1262	1563	5126	NA	NA	NA	NA	NA	NA	NA	NA	NA
	24	78.7	377	1238	1667	5468	0.47	1.98	123.58	0.282	0.830	5.123	5888	17344	106998
	24.5	80.4	388	1274	1724	5657	0.47	2.02	126.09	0.305	0.898	5.598	6362	18746	116918
	25	82.0	400	1312	1724	5657	0.47	2.02	126.09	0.323	0.951	5.573	6750	19865	116402
	25.5	83.7	392	1287	1724	5657	0.47	2.02	126.09	0.311	0.915	5.590	6487	19109	116751
	26	85.3	370	1215	1667	5468	0.47	1.98	123.58	0.272	0.801	5.137	5671	16720	107286
	26.5	86.9	392	1287	1667	5468	0.47	1.98	123.58	0.304	0.895	5.093	6358	18702	106370
	27	88.6	440	1442	1724	5657	0.47	2.02	126.09	0.390	1.144	5.484	8151	23885	114534
	27.5	90.2	455	1491	1724	5657	0.46	2.02	126.09	0.417	1.221	5.448	8716	25497	113780
	28	91.9	460	1508	1724	5657	0.46	2.02	126.09	0.427	1.248	5.435	8917	26070	113511
	28.5	93.5	440	1442	1724	5657	0.47	2.02	126.09	0.390	1.144	5.484	8151	23885	114534
	29	95.1	455	1491	1724	5657	0.46	2.02	126.09	0.417	1.221	5.448	8716	25497	113780
	29.5	96.8	471	1544	1724	5657	0.46	2.02	126.09	0.447	1.306	5.408	9342	27274	112945
	30	98.4	488	1600	1786	5859	0.46	2.06	128.62	0.490	1.431	5.916	10239	29891	123556
	30.5	100.1	506	1661	1786	5859	0.46	2.06	128.62	0.528	1.538	5.865	11031	32129	122500
	31	101.7	513	1682	1852	6076	0.46	2.10	131.15	0.552	1.612	6.468	11539	33658	135081
	31.5	103.3	533	1750	1786	5859	0.45	2.06	128.62	0.586	1.701	5.788	12239	35519	120889

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z1 B8
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	32	105.0	526	1727	1786	5859	0.45	2.06	128.62	0.571	1.658	5.809	11919	34624	121316
	32.5	106.6	656	2151	1786	5859	0.42	2.06	128.62	0.886	2.520	5.388	18502	52622	112539
	33	108.3	588	1930	1667	5468	0.43	1.98	123.58	0.685	1.958	4.586	14306	40883	95773
	33.5	109.9	465	1526	1667	5468	0.46	1.98	123.58	0.428	1.249	4.928	8944	26078	102922
	34	111.5	367	1204	1613	5292	0.47	1.94	121.09	0.261	0.769	4.698	5455	16068	98110
	34.5	113.2	317	1042	1667	5468	0.48	1.98	123.58	0.200	0.591	5.233	4167	12344	109292
	35	114.8	276	905	1724	5657	0.49	2.02	126.09	0.154	0.457	5.799	3210	9546	121121
	35.5	116.5	345	1131	1786	5859	0.48	2.06	128.62	0.245	0.725	6.243	5116	15151	130386
	36	118.1	460	1508	1852	6076	0.47	2.10	131.15	0.444	1.303	6.612	9275	27215	138099
	36.5	119.8	449	1475	1852	6076	0.47	2.10	131.15	0.424	1.246	6.639	8863	26033	138649
	37	121.4	430	1411	1724	5657	0.47	2.02	126.09	0.374	1.096	5.506	7804	22894	114996
	37.5	123.0	417	1367	1667	5468	0.47	1.98	123.58	0.344	1.008	5.041	7178	21056	105277
	38.5	126.3	465	1526	1724	5657	0.46	2.02	126.09	0.437	1.277	5.422	9126	26662	113233
	39	128.0	460	1508	1667	5468	0.46	1.98	123.58	0.418	1.221	4.941	8740	25500	103195
	39.5	129.6	455	1491	1724	5657	0.46	2.02	126.09	0.417	1.221	5.448	8716	25497	113780
	40	131.2	460	1508	1724	5657	0.46	2.02	126.09	0.427	1.248	5.435	8917	26070	113511
	40.5	132.9	426	1396	1667	5468	0.47	1.98	123.58	0.358	1.050	5.021	7487	21938	104866
	41	134.5	421	1381	1613	5292	0.46	1.94	121.09	0.344	1.006	4.587	7182	21020	95808
	41.5	136.2	488	1600	1724	5657	0.46	2.02	126.09	0.481	1.400	5.363	10038	29241	112017
	42	137.8	635	2083	1786	5859	0.43	2.06	128.62	0.831	2.371	5.462	17346	49527	114080
	42.5	139.4	667	2187	1667	5468	0.40	1.98	123.58	0.880	2.472	4.326	18376	51627	90347
	43	141.1	513	1682	1724	5657	0.45	2.02	126.09	0.531	1.542	5.296	11094	32205	110609
	43.5	142.7	494	1620	1724	5657	0.46	2.02	126.09	0.493	1.434	5.348	10287	29943	111685
	44	144.4	513	1682	1724	5657	0.45	2.02	126.09	0.531	1.542	5.296	11094	32205	110609
	44.5	146.0	526	1727	1786	5859	0.45	2.06	128.62	0.571	1.658	5.809	11919	34624	121316
	45	147.6	541	1773	1786	5859	0.45	2.06	128.62	0.602	1.745	5.767	12572	36449	120445
	45.5	149.3	541	1773	1786	5859	0.45	2.06	128.62	0.602	1.745	5.767	12572	36449	120445
	46	150.9	533	1750	1786	5859	0.45	2.06	128.62	0.586	1.701	5.788	12239	35519	120889
	46.5	152.6	541	1773	1786	5859	0.45	2.06	128.62	0.602	1.745	5.767	12572	36449	120445
	47	154.2	548	1798	1786	5859	0.45	2.06	128.62	0.619	1.791	5.745	12919	37414	119983
	47	154.2	541	1773	1786	5859	0.45	2.06	128.62	0.602	1.745	5.767	12572	36449	120445
	47.5	155.8	556	1823	1786	5859	0.45	2.06	128.62	0.636	1.839	5.722	13280	38418	119501
	48	157.5	506	1661	1786	5859	0.46	2.06	128.62	0.528	1.538	5.865	11031	32129	122500
	48.5	159.1	513	1682	1786	5859	0.46	2.06	128.62	0.542	1.577	5.847	11316	32930	122120
	49	160.8	548	1798	1786	5859	0.45	2.06	128.62	0.619	1.791	5.745	12919	37414	119982
	49.5	162.4	635	2083	1786	5859	0.43	2.06	128.62	0.831	2.371	5.462	17346	49527	114080
	50	164.0	851	2792	1786	5859	0.35	2.06	128.62	1.492	4.038	4.580	31166	84338	95653

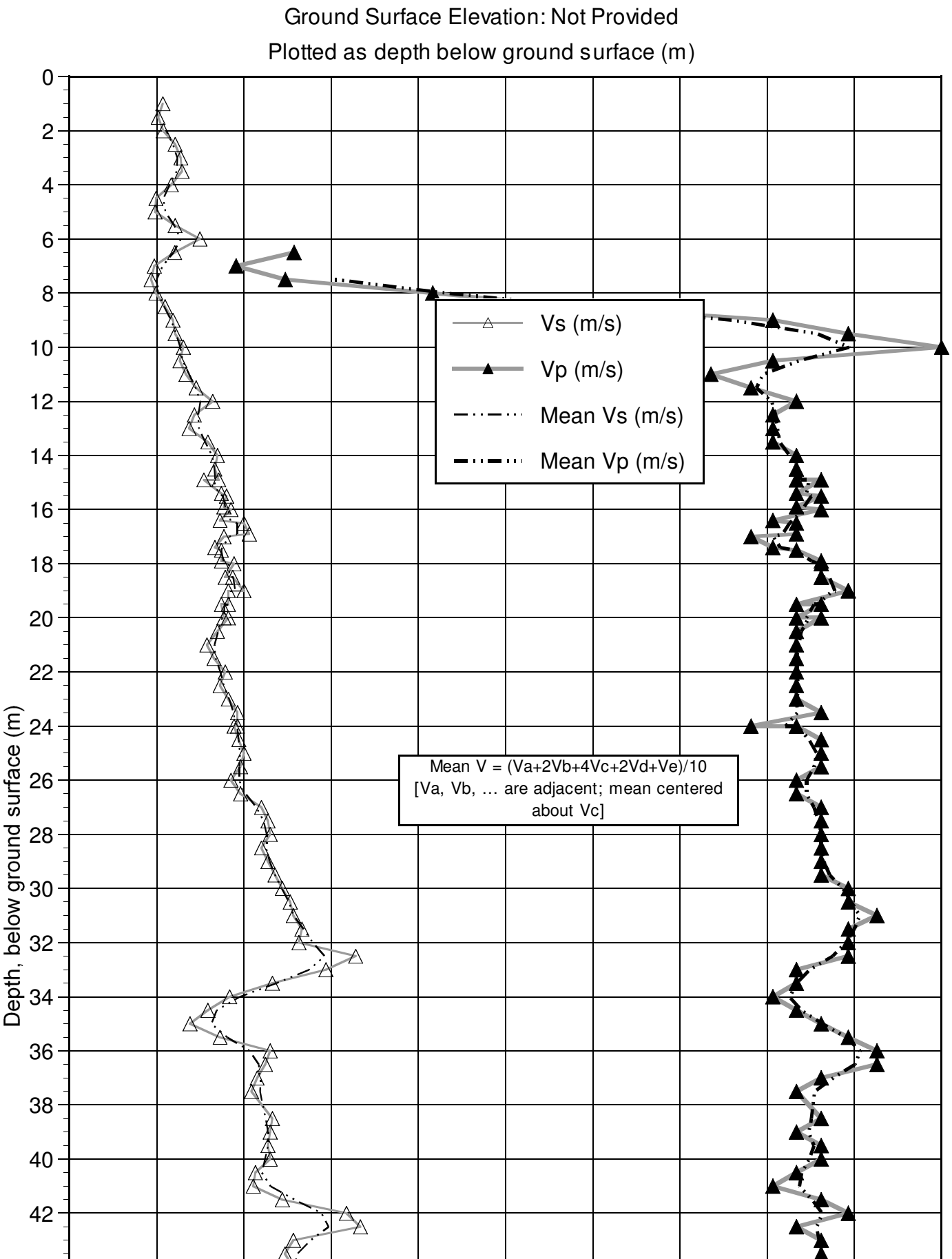
γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

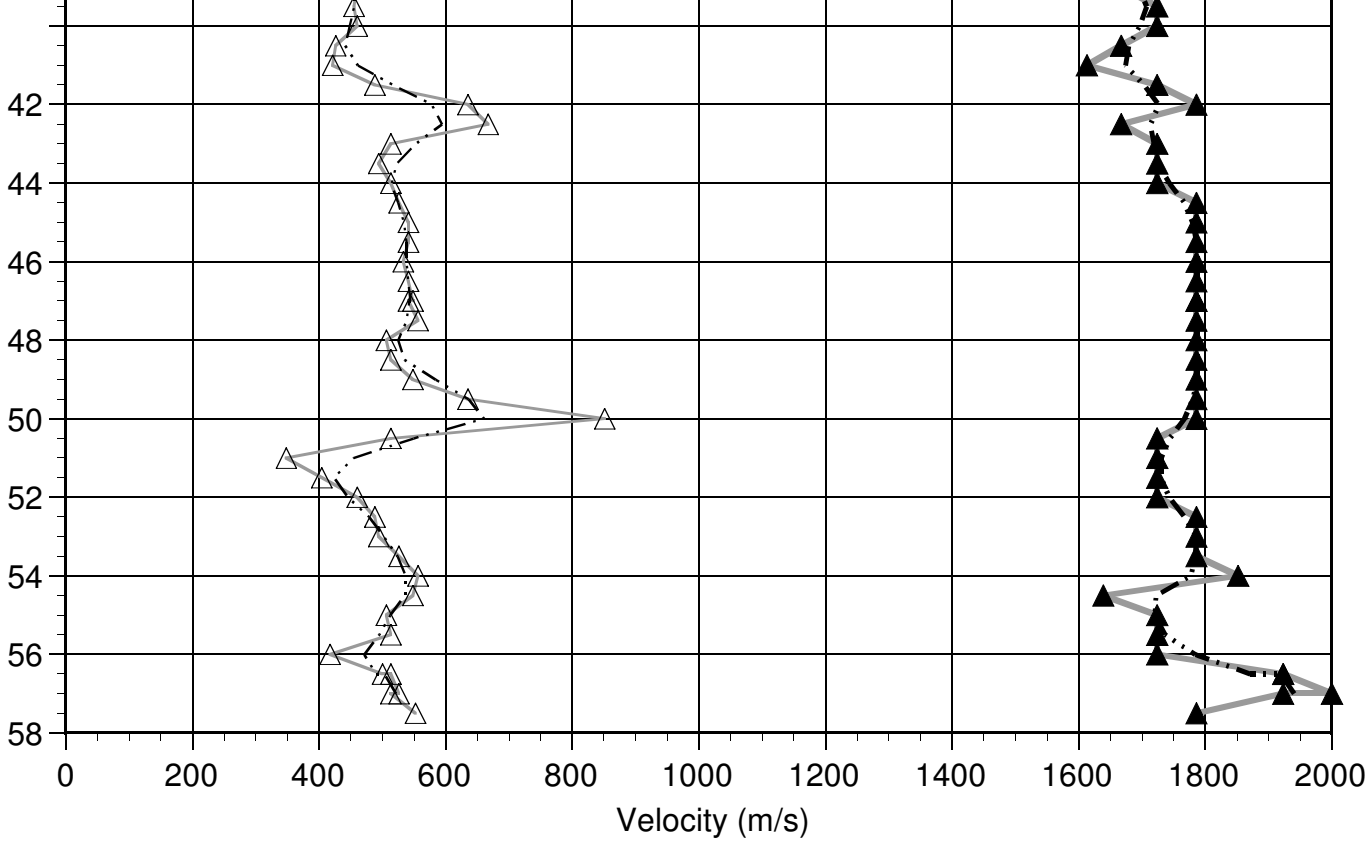
Table 2. LA 710 Tunnel
Boring Z1 B8
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	50.5	165.7	513	1682	1724	5657	0.45	2.02	126.09	0.531	1.542	5.296	11094	32205	110609
	51	167.3	348	1141	1724	5657	0.48	2.02	126.09	0.244	0.723	5.678	5104	15094	118596
	51.5	169.0	404	1326	1724	5657	0.47	2.02	126.09	0.330	0.970	5.565	6887	20260	116219
	52	170.6	460	1508	1724	5657	0.46	2.02	126.09	0.427	1.248	5.435	8917	26070	113511
	52.5	172.2	488	1600	1786	5859	0.46	2.06	128.62	0.490	1.431	5.916	10239	29891	123556
	53	173.9	494	1620	1786	5859	0.46	2.06	128.62	0.502	1.466	5.900	10493	30610	123217
	53.5	175.5	526	1727	1786	5859	0.45	2.06	128.62	0.571	1.658	5.809	11919	34624	121315
	54	177.2	556	1823	1852	6076	0.45	2.10	131.15	0.648	1.881	6.340	13542	39286	132410
	54.5	178.8	548	1798	1639	5378	0.44	1.96	122.33	0.588	1.691	4.482	12288	35319	93605
	55	180.4	506	1661	1724	5657	0.45	2.02	126.09	0.518	1.505	5.314	10815	31424	110981
	55.5	182.1	513	1682	1724	5657	0.45	2.02	126.09	0.531	1.542	5.296	11094	32205	110609
	56	183.7	417	1367	1724	5657	0.47	2.02	126.09	0.351	1.030	5.537	7324	21517	115636
	56.5	185.4	500	1640	1923	6309	0.46	2.14	133.69	0.535	1.567	7.206	11182	32735	150502
	56.5	185.4	513	1682	1923	6309	0.46	2.14	133.69	0.563	1.646	7.169	11763	34387	149728
	57	187.0	526	1727	2000	6562	0.46	2.18	136.25	0.605	1.769	7.924	12627	36941	165494
	57	187.0	513	1682	1923	6309	0.46	2.14	133.69	0.563	1.646	7.169	11763	34387	149728
	57.5	188.6	552	1813	1786	5859	0.45	2.06	128.62	0.629	1.820	5.731	13134	38012	119696

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Figure 1. LA 710 Tunnel
Boring Z1 B8
Downhole Interval Velocities




42
44
46
48
50
52
54
56
58
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Velocity (m/s)

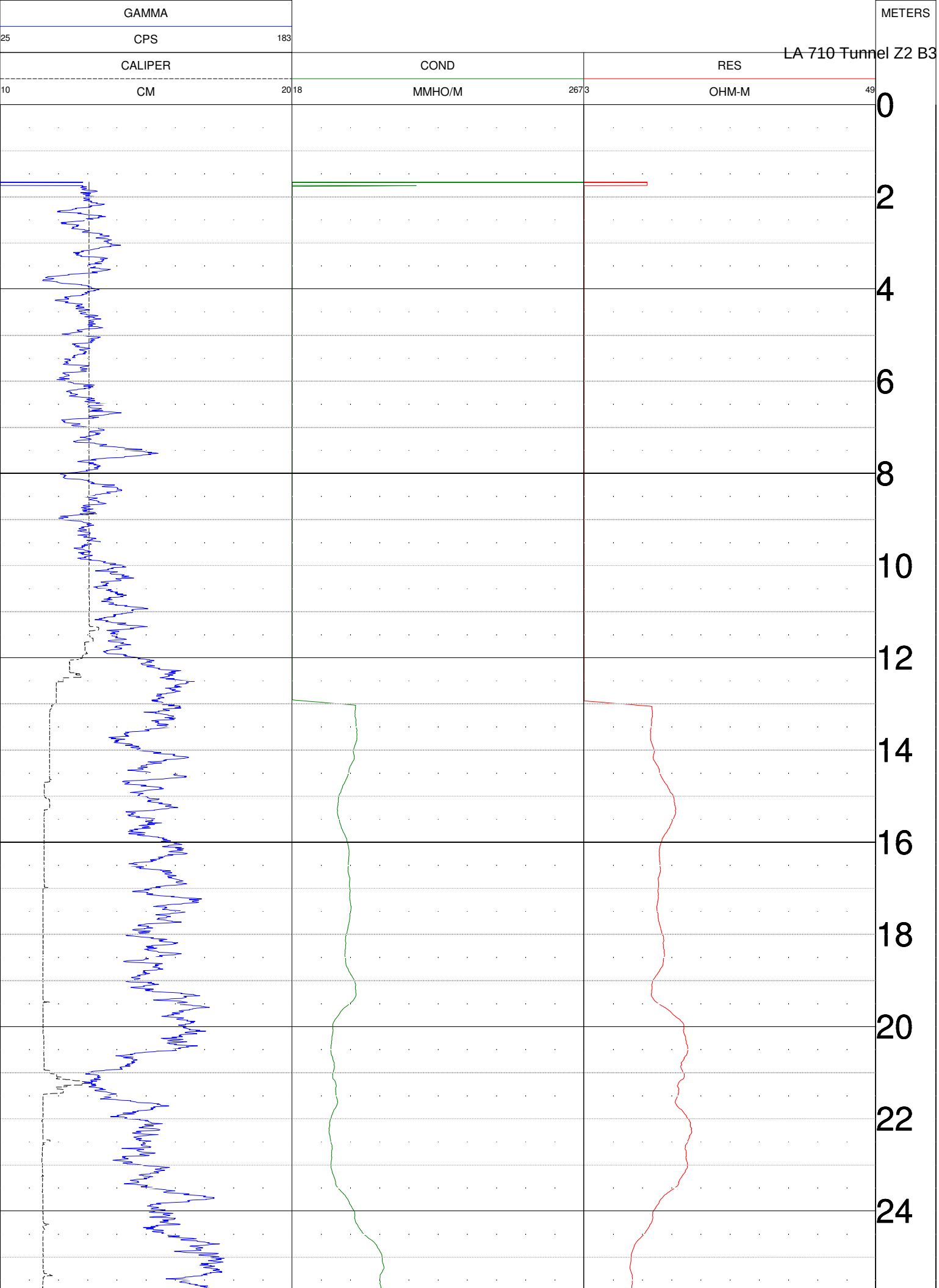
California Department of Transportation
Geophysical Services

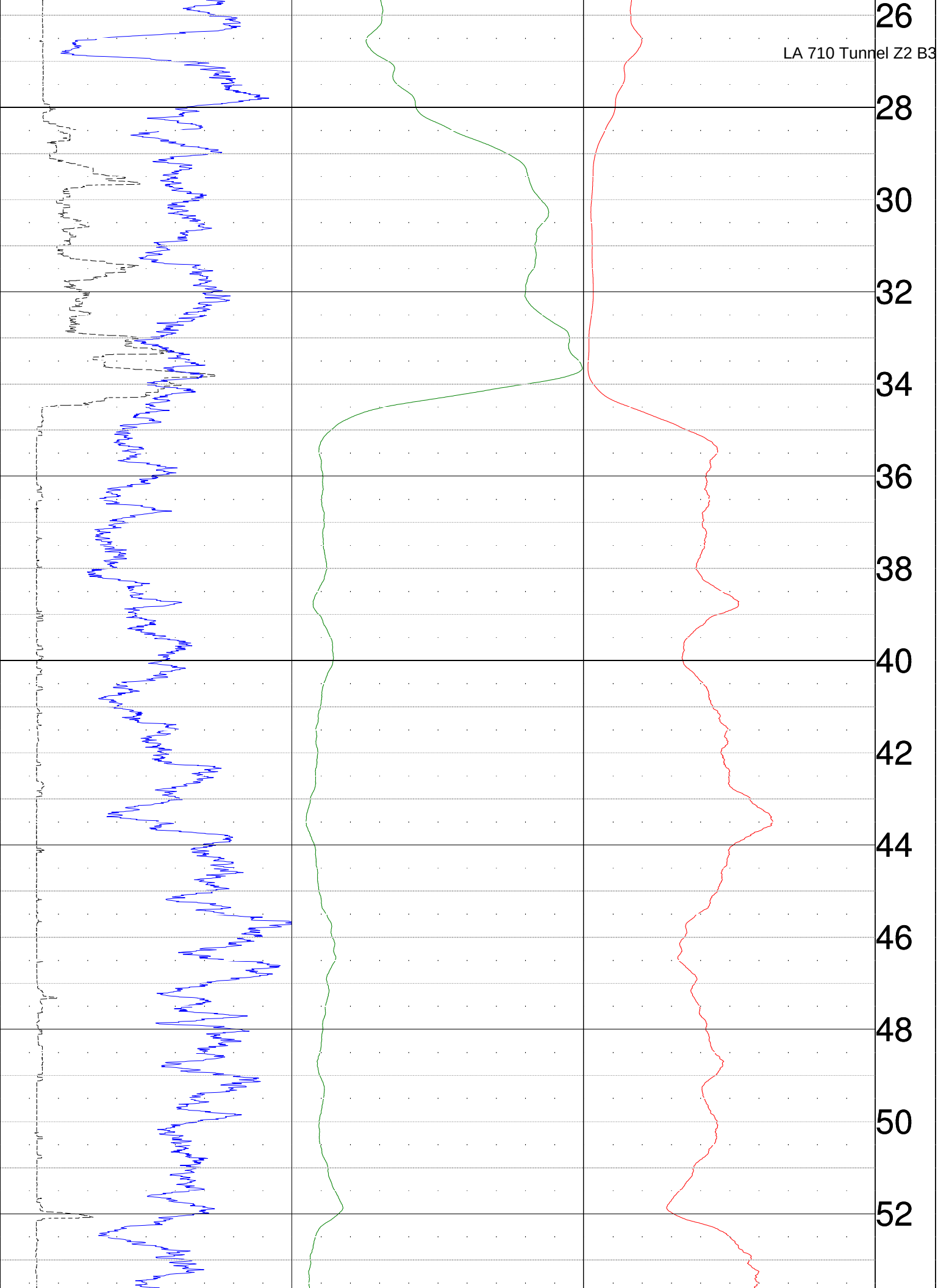
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WELL	: Z2 B3.				
LOCATION/FIELD	: LA 710 TUNNEL				
COUNTY	: LA				
LOCATION	: CA				
SECTION	: None	TOWNSHIP	: None	RANGE	: None
DATE	: 3/17/09	PERMANENT DATUM	: None		
DEPTH DRILLER	: 106.68M			KB	: NA
LOG BOTTOM	: 106.7	LOG MEASURED FROM:	GL	DF	: NA
LOG TOP	: 1.6	DRL MEASURED FROM:	GL	GL	: NA
CASING DIAMETER	: 12.	LOGGING UNIT	: 7311		
CASING TYPE	: steel	FIELD OFFICE	: 7311		
CASING THICKNESS:	.47	RECORDED BY	: DH/DG		
BIT SIZE	: 10.8CM.	BOREHOLE FLUID	: 0	FILE	: PROCESSE
MAGNETIC DECL.	: 12.85	RM	: 0	TYPE	: 9065A
MATRIX DENSITY	: 2.71	RM TEMPERATURE	: 0	LGDATE	: 3/17/09.
NEUTRON MATRIX	: DOLOMITE	MATRIX DELTA T	: 140		
				THRESH:	2500

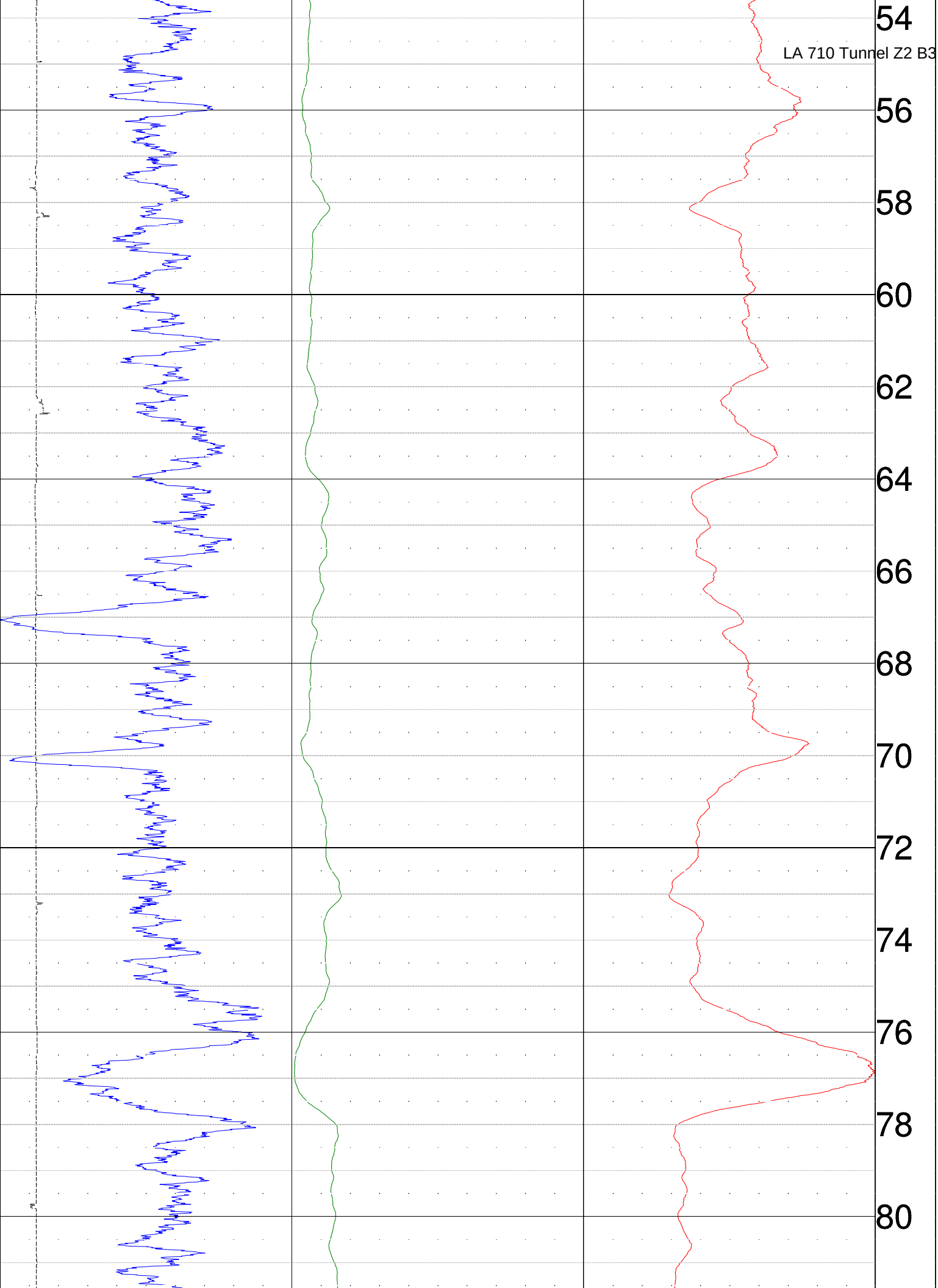
OTHER SERVICES:
IND-CAL
AC TEL.
PSLOG.

LOG DEPTH IN METERS, CALIPER DIAMETER IN CM
EA: 07-187900. GL ELEVATION ESTIMATED FROM HANDHELD GPS 170.4M

ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS


GAMMA
25
CPS
183
CALIPER
10
CM
20
COND
18
MMHO/M
267
RES
3
OHM-M
49
METERS
LA 710 Tunnel Z2 B3
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LA 710 Tunnel Z2 B3
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LA 710 Tunnel Z2 B3
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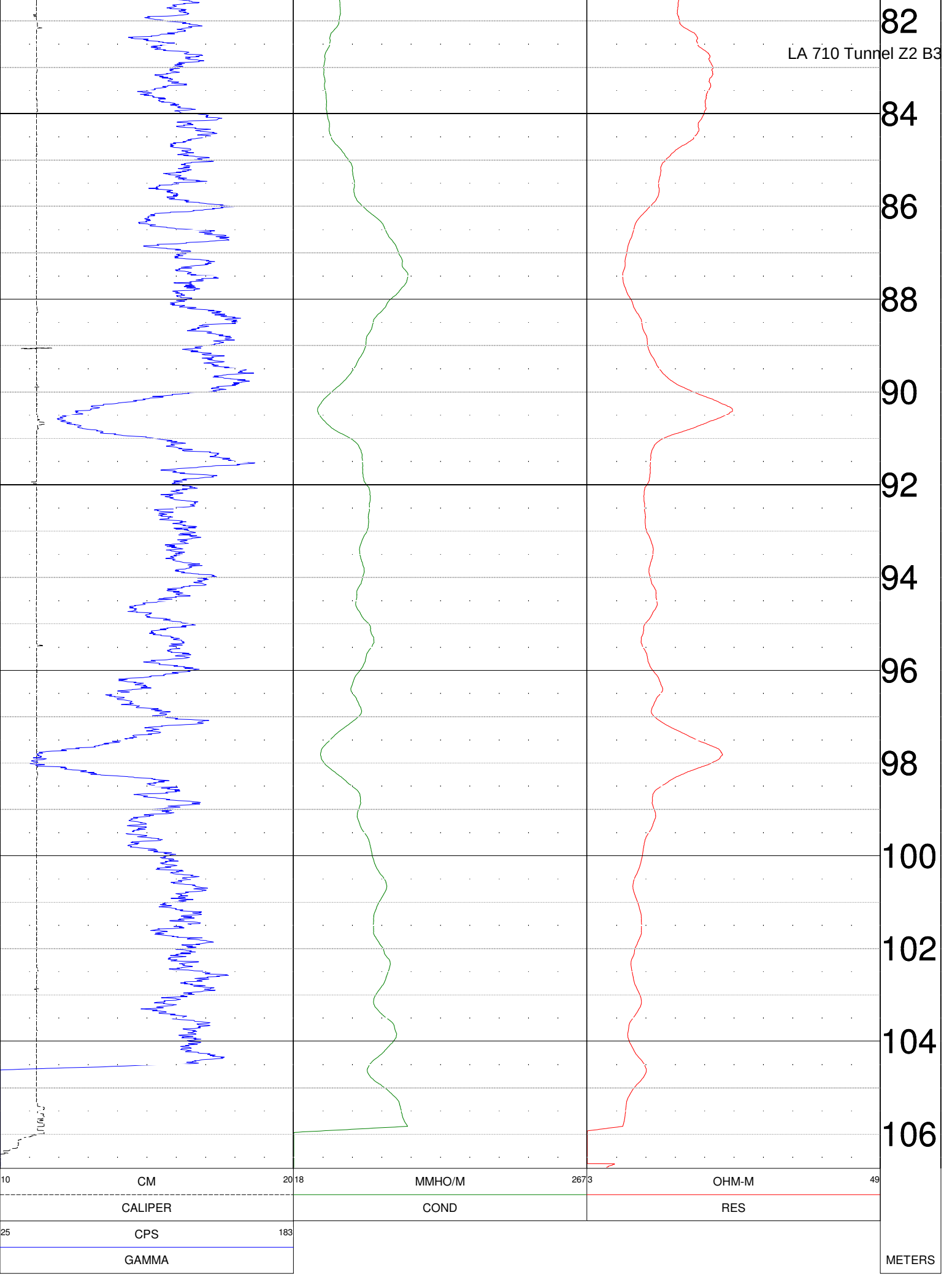

LA 710 Tunnel Z2 B3
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100
102
104
106
10
CM
20
18
MMHO/M
2673
OHM-M
49
CALIPER
COND
RES
25
CPS
183
GAMMA
METERS

Table 2. LA 710 Tunnel
Boring Z2 B3
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
Not Provided	11.3	37.1	633	2076		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11.8	38.7	463	1519		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12.5	41.0	538	1764		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	13	42.7	450	1478	1163	3815	NA	NA	NA	NA	NA	NA	NA	NA	NA
	13.5	44.3	431	1414	1042	3418	NA	NA	NA	NA	NA	NA	NA	NA	NA
	14	45.9	407	1334	1042	3418	NA	NA	NA	NA	NA	NA	NA	NA	NA
	14.6	47.9	417	1367	1389	4557	NA	NA	NA	NA	NA	NA	NA	NA	NA
	15	49.2	446	1465	1190	3906	NA	NA	NA	NA	NA	NA	NA	NA	NA
	15.5	50.9	452	1485	1163	3815	NA	NA	NA	NA	NA	NA	NA	NA	NA
	16	52.5	448	1471	1429	4687	NA	NA	NA	NA	NA	NA	NA	NA	NA
	16.6	54.5	362	1189	1786	5859	0.48	2.06	128.62	0.270	0.800	6.209	5649	16703	129677
	17	55.8	408	1339	1613	5292	0.47	1.94	121.09	0.323	0.947	4.615	6749	19785	96386
	17.5	57.4	775	2543	2000	6562	0.41	2.18	136.25	1.312	3.703	6.981	27392	77332	145807
	18	59.1	303	994	2083	6835	0.49	2.22	138.82	0.204	0.608	9.379	4265	12702	195883
	18.6	61.0	510	1674	1613	5292	0.44	1.94	121.09	0.505	1.459	4.373	10545	30462	91324
	19	62.3	391	1282	1064	3490	NA	NA	NA	NA	NA	NA	NA	NA	NA
	19.3	63.3	441	1445	1515	4971	NA	NA	NA	NA	NA	NA	NA	NA	NA
	20	65.6	327	1072	1786	5859	0.48	2.06	128.62	0.220	0.652	6.276	4595	13627	131081
	20.6	67.6	370	1215	1923	6309	0.48	2.14	133.69	0.294	0.870	7.528	6135	18170	157230
	21	68.9	578	1896	1389	4557	NA	NA	NA	NA	NA	NA	NA	NA	NA
	21.1	69.2	549	1803	1667	5468	0.44	1.98	123.58	0.598	1.720	4.702	12482	35924	98205
	21.1	69.2	781	2563	2500	8202	0.45	2.39	149.21	1.459	4.219	12.993	30468	88105	271365
	21.5	70.5		NA	2174	7132	NA	NA	NA	NA	NA	NA	NA	NA	NA
	21.6	70.9	667	2187	2273	7456	0.45	2.31	143.99	1.025	2.979	10.547	21410	62214	220276
	22	72.2	413	1356	1613	5292	0.46	1.94	121.09	0.331	0.970	4.604	6917	20265	96161
	22	72.2	543	1783	1923	6309	0.46	2.14	133.69	0.633	1.843	7.077	13211	38486	147796
	22.5	73.8	398	1307	1923	6309	0.48	2.14	133.69	0.340	1.005	7.467	7099	20980	155945
	22.5	73.8	442	1452	1923	6309	0.47	2.14	133.69	0.419	1.234	7.361	8757	25781	153735
	22.9	75.1	581	1907	2174	7132	0.46	2.26	141.40	0.766	2.238	9.683	15990	46738	202238
	22.9	75.1	578	1896	1852	6076	0.45	2.10	131.15	0.702	2.030	6.268	14660	42397	130919
	23.4	76.8	602	1976	2174	7132	0.46	2.26	141.40	0.822	2.397	9.608	17167	50072	200669
	23.6	77.4	581	1907	2174	7132	0.46	2.26	141.40	0.766	2.238	9.683	15990	46738	202237
	23.9	78.4	521	1709	2083	6835	0.47	2.22	138.82	0.603	1.769	8.847	12598	36954	184772
	24	78.7	526	1727	2273	7456	0.47	2.31	143.99	0.639	1.881	11.062	13344	39276	231029
	24.5	80.4	435	1426	2000	6562	0.48	2.18	136.25	0.413	1.217	8.180	8617	25423	170841
	24.5	80.4	431	1414	2083	6835	0.48	2.22	138.82	0.413	1.221	9.100	8628	25499	190065
	24.9	81.7		NA	1852	6076	NA	NA	NA	NA	NA	NA	NA	NA	NA

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z2 B3
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	24.9	81.7	368	1206	1852	6076	0.48	2.10	131.15	0.284	0.840	6.826	5930	17548	142559
	24.9	81.7	379	1243	1923	6309	0.48	2.14	133.69	0.307	0.909	7.510	6417	18993	156854
	25	82.0	439	1439	1923	6309	0.47	2.14	133.69	0.412	1.213	7.371	8604	25340	153939
	25	82.0	472	1548	1852	6076	0.47	2.10	131.15	0.467	1.370	6.581	9762	28610	137449
	25.4	83.3	510	1674	2000	6562	0.47	2.18	136.25	0.568	1.665	7.973	11865	34770	166509
	25.6	84.0	562	1843	2000	6562	0.46	2.18	136.25	0.689	2.008	7.812	14387	41927	163147
	25.9	85.0	806	2646	2174	7132	0.42	2.26	141.40	1.473	4.184	8.740	30765	87386	182537
	26	85.3	685	2247	2174	7132	0.44	2.26	141.40	1.063	3.071	9.287	22192	64131	193968
	26.5	86.9	833	2734	2500	8202	0.44	2.39	149.21	1.660	4.772	12.725	34665	99663	265768
	26.6	87.3	909	2983	2000	6562	0.37	2.18	136.25	1.804	4.941	6.325	37671	103204	132101
	26.9	88.3	877	2878	2000	6562	0.38	2.18	136.25	1.679	4.638	6.491	35074	96868	135564
	27.1	88.9	746	2448	2500	8202	0.45	2.39	149.21	1.331	3.863	13.163	27800	80681	274921
	27.5	90.2	735	2412	2381	7812	0.45	2.35	146.59	1.270	3.675	11.619	26515	76751	242667
	27.5	90.2	781	2563	2500	8202	0.45	2.39	149.21	1.459	4.219	12.993	30468	88106	271365
	28	91.9	725	2377	2273	7456	0.44	2.31	143.99	1.211	3.496	10.299	25295	73023	215095
	28	91.9	714	2343	2273	7456	0.45	2.31	143.99	1.177	3.401	10.345	24577	71039	216051
	28.5	93.5	641	2103	2000	6562	0.44	2.18	136.25	0.897	2.588	7.534	18730	54047	157356
	28.5	93.5	617	2025	2174	7132	0.46	2.26	141.40	0.863	2.513	9.553	18025	52494	199524
	28.9	94.8	549	1803	1923	6309	0.46	2.14	133.69	0.647	1.882	7.058	13503	39309	147407
	29	95.1	568	1864	2000	6562	0.46	2.18	136.25	0.705	2.052	7.791	14715	42854	162709
	29.5	96.8	515	1691	1923	6309	0.46	2.14	133.69	0.569	1.663	7.161	11884	34732	149566
	29.6	97.1	490	1608	1923	6309	0.47	2.14	133.69	0.515	1.508	7.234	10748	31496	151081
	30	98.4	481	1577	1923	6309	0.47	2.14	133.69	0.495	1.452	7.260	10338	30325	151627
	30	98.4	505	1657	1923	6309	0.46	2.14	133.69	0.546	1.598	7.192	11409	33381	150199
	30	98.4	485	1593	1923	6309	0.47	2.14	133.69	0.505	1.480	7.247	10540	30902	151358
	30.9	101.4	490	1608	1852	6076	0.46	2.10	131.15	0.505	1.476	6.531	10543	30835	136408
	31.4	103.0	481	1577	2000	6562	0.47	2.18	136.25	0.504	1.482	8.057	10536	30961	168282
	32	105.0	556	1823	2083	6835	0.46	2.22	138.82	0.686	2.006	8.736	14334	41904	182458
	32.5	106.6	538	1764	2000	6562	0.46	2.18	136.25	0.631	1.843	7.889	13176	38501	164762
	33.5	109.9	467	1533	2083	6835	0.47	2.22	138.82	0.486	1.431	9.004	10141	29886	188048
	34	111.5	417	1367	1852	6076	0.47	2.10	131.15	0.365	1.075	6.718	7617	22446	140309
	34	111.5	575	1886	1786	5859	0.44	2.06	128.62	0.680	1.963	5.662	14212	40994	118259
	34.5	113.2	806	2646	1852	6076	0.38	2.10	131.15	1.366	3.779	5.383	28535	78928	112419
	34.9	114.5	806	2646	2083	6835	0.41	2.22	138.82	1.446	4.084	7.723	30204	85288	161297
	35.5	116.5	1220	4001	2381	7812	0.32	2.35	146.59	3.492	9.235	8.655	72937	192872	180773
	36	118.1	847	2780	2174	7132	0.41	2.26	141.40	1.627	4.589	8.535	33974	95833	178259
	36.6	120.1	909	2983	2083	6835	0.38	2.22	138.82	1.838	5.081	7.201	38381	106117	150394

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z2 B3
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	37	121.4	820	2689	2174	7132	0.42	2.26	141.40	1.522	4.313	8.675	31782	90080	181181
	37.5	123.0	1000	3281	2083	6835	0.35	2.22	138.82	2.224	6.005	6.686	46442	125421	139647
	38	124.7	769	2524	2083	6835	0.42	2.22	138.82	1.316	3.740	7.897	27480	78103	164929
	38.5	126.3	909	2983	2273	7456	0.40	2.31	143.99	1.906	5.356	9.372	39811	111851	195740
	39	128.0	1064	3490	2500	8202	0.39	2.39	149.21	2.705	7.517	11.332	56494	156991	236664
	39.5	129.6	543	1783	2500	8202	0.48	2.39	149.21	0.706	2.083	13.997	14744	43501	292330
	40.1	131.6	508	1665	1852	6076	0.46	2.10	131.15	0.541	1.580	6.483	11306	32998	135392
	40.6	133.2	625	2051	2273	7456	0.46	2.31	143.99	0.901	2.629	10.712	18817	54912	223732
	41.1	134.8	926	3038	2273	7456	0.40	2.31	143.99	1.977	5.539	9.277	41300	115680	193755
	41.6	136.5	1220	4001	2381	7812	0.32	2.35	146.59	3.492	9.235	8.655	72937	192872	180772
	42	137.8	1136	3728	2632	8634	0.39	2.43	151.84	3.141	8.702	12.656	65596	181752	264322
	42.6	139.8	781	2563	2273	7456	0.43	2.31	143.99	1.408	4.035	10.037	29402	84266	209619
	43	141.1	862	2828	2381	7812	0.42	2.35	146.59	1.745	4.972	10.985	36447	103842	229425
	43.6	143.0	633	2076	2500	8202	0.47	2.39	149.21	0.957	2.807	13.662	19996	58619	285328
	44.1	144.7	602	1976	2381	7812	0.47	2.35	146.59	0.852	2.498	12.176	17798	52176	254291
	44.6	146.3	543	1783	2083	6835	0.46	2.22	138.82	0.657	1.922	8.776	13717	40150	183279
	45	147.6	625	2051	2500	8202	0.47	2.39	149.21	0.934	2.739	13.693	19499	57198	285989
	45.6	149.6	595	1953	2381	7812	0.47	2.35	146.59	0.832	2.440	12.202	17376	50971	254853
	46.1	151.2	758	2485	2500	8202	0.45	2.39	149.21	1.372	3.977	13.109	28649	83051	273790
	46.7	153.2	649	2130	2632	8634	0.47	2.43	151.84	1.026	3.010	15.476	21419	62868	323223
	47.2	154.9	847	2780	2500	8202	0.44	2.39	149.21	1.717	4.927	12.649	35850	102897	264188
	47.7	156.5	962	3155	2500	8202	0.41	2.39	149.21	2.210	6.246	11.992	46152	130444	250453
	48.7	159.8	820	2689	2778	9113	0.45	2.47	154.48	1.663	4.829	16.877	34722	100855	352475
	48.7	159.8	833	2734	2381	7812	0.43	2.35	146.59	1.631	4.664	11.138	34058	97418	232611
	49.1	161.1	725	2377	2500	8202	0.45	2.39	149.21	1.255	3.650	13.265	26212	76232	277040
	49.7	163.1	730	2395	2632	8634	0.46	2.43	151.84	1.296	3.780	15.116	27064	78938	315696
	50.1	164.4	1042	3418	2632	8634	0.41	2.43	151.84	2.639	7.427	13.325	55119	155115	278290
	50.1	164.4	775	2543	2632	8634	0.45	2.43	151.84	1.462	4.246	14.895	30525	88676	311081
	50.6	166.0	858	2816	2381	7812	0.43	2.35	146.59	1.730	4.932	11.005	36135	103006	229842
	51.1	167.7	690	2263	2222	7291	0.45	2.29	142.69	1.087	3.146	9.838	22705	65696	205469
	51.6	169.3	806	2646	2174	7132	0.42	2.26	141.40	1.473	4.184	8.740	30765	87386	182537
	52.1	170.9	1136	3728	2439	8002	0.36	2.37	147.90	3.059	8.330	10.014	63895	173969	209155
	52.6	172.6	1351	4434	2703	8867	0.33	2.45	153.16	4.480	11.947	11.947	93569	249519	249524
	53	173.9	1136	3728	2778	9113	0.40	2.47	154.48	3.195	8.944	14.833	66736	186796	309788
	53.6	175.9	1163	3815	2326	7630	0.33	2.33	145.29	3.147	8.391	8.391	65721	175255	175254
	54.1	177.5	1042	3418	2632	8634	0.41	2.43	151.84	2.639	7.427	13.325	55119	155115	278290
	54.6	179.1	952	3125	2632	8634	0.42	2.43	151.84	2.206	6.286	13.902	46075	131280	290349

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z2 B3
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	55	180.4	893	2929	2439	8002	0.42	2.37	147.90	1.889	5.374	11.575	39445	112232	241756
	55.6	182.4	578	1896	2632	8634	0.47	2.43	151.84	0.813	2.397	15.760	16973	50057	329152
	56.1	184.1	971	3185	2941	9650	0.44	2.52	157.13	2.372	6.827	18.610	49550	142592	388672
	56.6	185.7	990	3248	2632	8634	0.42	2.43	151.84	2.384	6.760	13.664	49796	141178	285387
	57.1	187.3	1333	4374	2778	9113	0.35	2.47	154.48	4.399	11.880	13.228	91877	248124	276268
	57.6	189.0	1538	5047	3125	10253	0.34	2.56	159.79	6.058	16.237	16.919	126531	339116	353357
	58.7	192.6	952	3125	2564	8412	0.42	2.41	150.52	2.187	6.211	12.936	45676	129717	270180
	59.1	193.9	714	2343	2174	7132	0.44	2.26	141.40	1.156	3.327	9.163	24135	69484	191377
	59.1	193.9	1053	3454	2439	8002	0.39	2.37	147.90	2.625	7.274	10.593	54826	151928	221248
	59.6	195.5	1538	5047	2778	9113	0.28	2.47	154.48	5.857	14.979	11.284	122321	312839	235677
	60.1	197.2	1408	4621	2941	9650	0.35	2.52	157.13	4.993	13.493	15.116	104281	281813	315700
	60.6	198.8	1000	3281	2778	9113	0.43	2.47	154.48	2.474	7.055	15.794	51681	147347	329862
	61.1	200.5	870	2853	2564	8412	0.44	2.41	150.52	1.823	5.233	13.421	38077	109283	280309
	61.6	202.1	763	2504	3125	10253	0.47	2.56	159.79	1.492	4.380	23.008	31152	91478	480530
	62.1	203.7	820	2689	3030	9943	0.46	2.54	158.46	1.705	4.982	21.038	35618	104043	439378
	62.5	205.1	1064	3490	2941	9650	0.42	2.52	157.13	2.849	8.117	17.976	59493	169524	375424
	63	206.7	952	3125	3030	9942	0.45	2.54	158.46	2.302	6.655	20.239	48085	138984	422698
	63.6	208.7	800	2625	3333	10936	0.47	2.60	162.47	1.666	4.895	26.696	34787	102235	557562
	64.1	210.3	1087	3566	2778	9113	0.41	2.47	154.48	2.924	8.242	15.195	61059	172138	317359
	64.5	211.6	769	2524	2500	8202	0.45	2.39	149.21	1.414	4.095	13.053	29537	85523	272606
	65	213.3		NA	2632	8634	NA	NA	NA	NA	NA	NA	NA	NA	NA
	65.5	214.9	1000	3281	2632	8634	0.42	2.43	151.84	2.432	6.886	13.601	50797	143819	284052
	66	216.5	1031	3382	2778	9113	0.42	2.47	154.48	2.630	7.470	15.587	54927	156006	325534
	66.5	218.2	1010	3314	2500	8202	0.40	2.39	149.21	2.439	6.840	11.687	50932	142858	244079
	67	219.8	1111	3645	3125	10253	0.43	2.56	159.79	3.160	9.023	20.783	65999	188447	434064
	67.5	221.5	1587	5208	3448	11313	0.37	2.62	163.81	6.611	18.057	22.386	138081	377118	467548
	68	223.1	1639	5378	2703	8867	0.21	2.45	153.16	6.593	15.942	9.130	137701	332952	190675
	68.5	224.7	1316	4317	2778	9113	0.36	2.47	154.48	4.284	11.613	13.381	89475	242541	279471
	69	226.4	1124	3686	2941	9650	0.41	2.52	157.13	3.178	8.990	17.536	66365	187755	366252
	69.5	228.0	885	2903	3030	9942	0.45	2.54	158.46	1.988	5.778	20.658	41517	120680	431450
	69.9	229.3	885	2903	2941	9650	0.45	2.52	157.13	1.971	5.717	19.145	41168	119407	399848
	69.9	229.3	820	2689	2941	9650	0.46	2.52	157.13	1.691	4.931	19.518	35318	102981	407648
	69.9	229.3	943	3095	2941	9650	0.44	2.52	157.13	2.240	6.463	18.786	46785	134990	392360
	69.9	229.3	862	2828	2941	9650	0.45	2.52	157.13	1.871	5.436	19.279	39067	113528	402651
	70.3	230.6	1149	3771	2564	8412	0.37	2.41	150.52	3.186	8.755	11.605	66531	182861	242372
	71	232.9	990	3248	2632	8634	0.42	2.43	151.84	2.384	6.760	13.664	49796	141178	285387
	71.5	234.6	847	2780	2778	9113	0.45	2.47	154.48	1.777	5.149	16.724	37116	107539	349281

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z2 B3
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	72	236.2	1136	3728	2778	9113	0.40	2.47	154.48	3.195	8.944	14.833	66736	186796	309789
	72.4	237.5	1515	4971	2941	9650	0.32	2.52	157.13	5.778	15.247	14.069	120679	318443	293835
	72.9	239.2	1176	3860	2500	8202	0.36	2.39	149.21	3.308	8.983	10.527	69091	187620	219867
	73.4	240.8		NA	2500	8202	NA	NA	NA	NA	NA	NA	NA	NA	NA
	73.9	242.5	1020	3348	2703	8867	0.42	2.45	153.16	2.554	7.239	14.515	53351	151184	303141
	74.4	244.1	1087	3566	3030	9942	0.43	2.54	158.46	2.999	8.554	19.310	62634	178652	403295
	74.9	245.7	1064	3490	3030	9942	0.43	2.54	158.46	2.873	8.214	19.478	59997	171557	406810
	75.3	247.0	1266	4153	3030	9942	0.39	2.54	158.46	4.067	11.342	17.886	84943	236875	373548
	75.9	249.0	1250	4101	3448	11313	0.42	2.62	163.81	4.100	11.680	25.735	85632	243940	537480
	76.4	250.7	1370	4494	3571	11717	0.41	2.65	165.16	4.965	14.037	27.126	103687	293174	566531
	76.9	252.3	1449	4755	3448	11313	0.39	2.62	163.81	5.512	15.352	23.853	115111	320636	498175
	77.4	253.9	1235	4050	3226	10583	0.41	2.58	161.13	3.934	11.127	21.613	82162	232387	451394
	77.9	255.6	1299	4261	2703	8867	0.35	2.45	153.16	4.138	11.171	12.403	86420	233315	259050
	78.4	257.2	1031	3382	2703	8867	0.41	2.45	153.16	2.607	7.378	14.444	54457	154098	301668
	78.9	258.9	1124	3686	2632	8634	0.39	2.43	151.84	3.071	8.527	12.749	64130	178092	266275
	79.4	260.5	1075	3528	2632	8634	0.40	2.43	151.84	2.812	7.873	13.094	58732	164425	273473
	79.9	262.1	1031	3382	2857	9374	0.43	2.50	155.80	2.652	7.560	16.837	55398	157901	351637
	80.4	263.8	1176	3860	2941	9650	0.40	2.52	157.13	3.484	9.788	17.128	72758	204416	357728
	80.9	265.4	1176	3860	2564	8412	0.37	2.41	150.52	3.337	9.122	11.403	69699	190510	238149
	81.4	267.1	1075	3528	2632	8634	0.40	2.43	151.84	2.812	7.873	13.094	58732	164425	273473
	81.9	268.7	1163	3815	2857	9374	0.40	2.50	155.80	3.374	9.453	15.874	70476	197437	331533
	82.4	270.3	1136	3728	3030	9942	0.42	2.54	158.46	3.278	9.297	18.938	68457	194169	395530
	82.9	272.0	1042	3418	3030	9942	0.43	2.54	158.46	2.754	7.894	19.636	57523	164861	410109
	83.4	273.6	1316	4317	2857	9374	0.37	2.50	155.80	4.321	11.799	14.612	90242	246435	305178
	83.9	275.3	1429	4687	2857	9374	0.33	2.50	155.80	5.093	13.582	13.582	106375	283667	283667
	84.4	276.9	1235	4050	2703	8867	0.37	2.45	153.16	3.739	10.232	12.935	78095	213694	270149
	84.9	278.5	1351	4434	2703	8867	0.33	2.45	153.16	4.480	11.947	11.947	93569	249518	249518
	85.4	280.2	1429	4687	2941	9650	0.35	2.52	157.13	5.137	13.824	14.924	107281	288720	311697
	85.9	281.8	1176	3860	2941	9650	0.40	2.52	157.13	3.484	9.788	17.128	72758	204416	357728
	86.4	283.5	1250	4101	2703	8867	0.36	2.45	153.16	3.833	10.457	12.809	80060	218395	267529
	86.9	285.1	1316	4317	2778	9113	0.36	2.47	154.48	4.284	11.613	13.381	89475	242541	279470
	87.4	286.7	1316	4317	2778	9113	0.36	2.47	154.48	4.284	11.613	13.381	89475	242541	279471
	87.9	288.4	1149	3771	2564	8412	0.37	2.41	150.52	3.186	8.755	11.605	66531	182861	242372
	88.9	291.7	1370	4494	2857	9374	0.35	2.50	155.80	4.683	12.652	14.129	97812	264239	295085
	88.9	291.7	1250	4101	2778	9113	0.37	2.47	154.48	3.866	10.617	13.938	80751	221749	291102
	89.4	293.3	1235	4050	2703	8867	0.37	2.45	153.16	3.739	10.232	12.935	78096	213695	270150
	89.9	294.9	1250	4101	3571	11717	0.43	2.65	165.16	4.134	11.824	28.234	86335	246953	589666

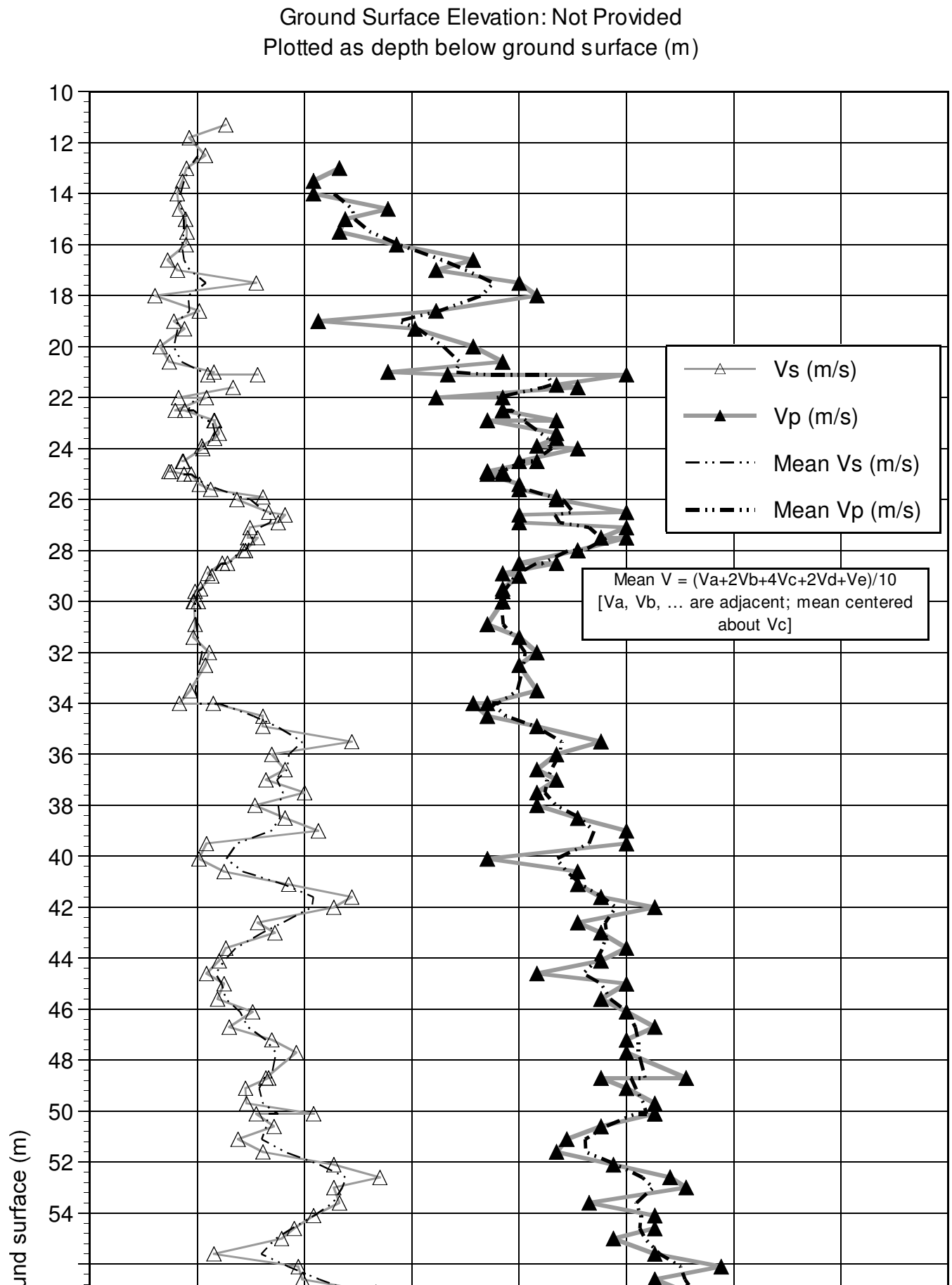
γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

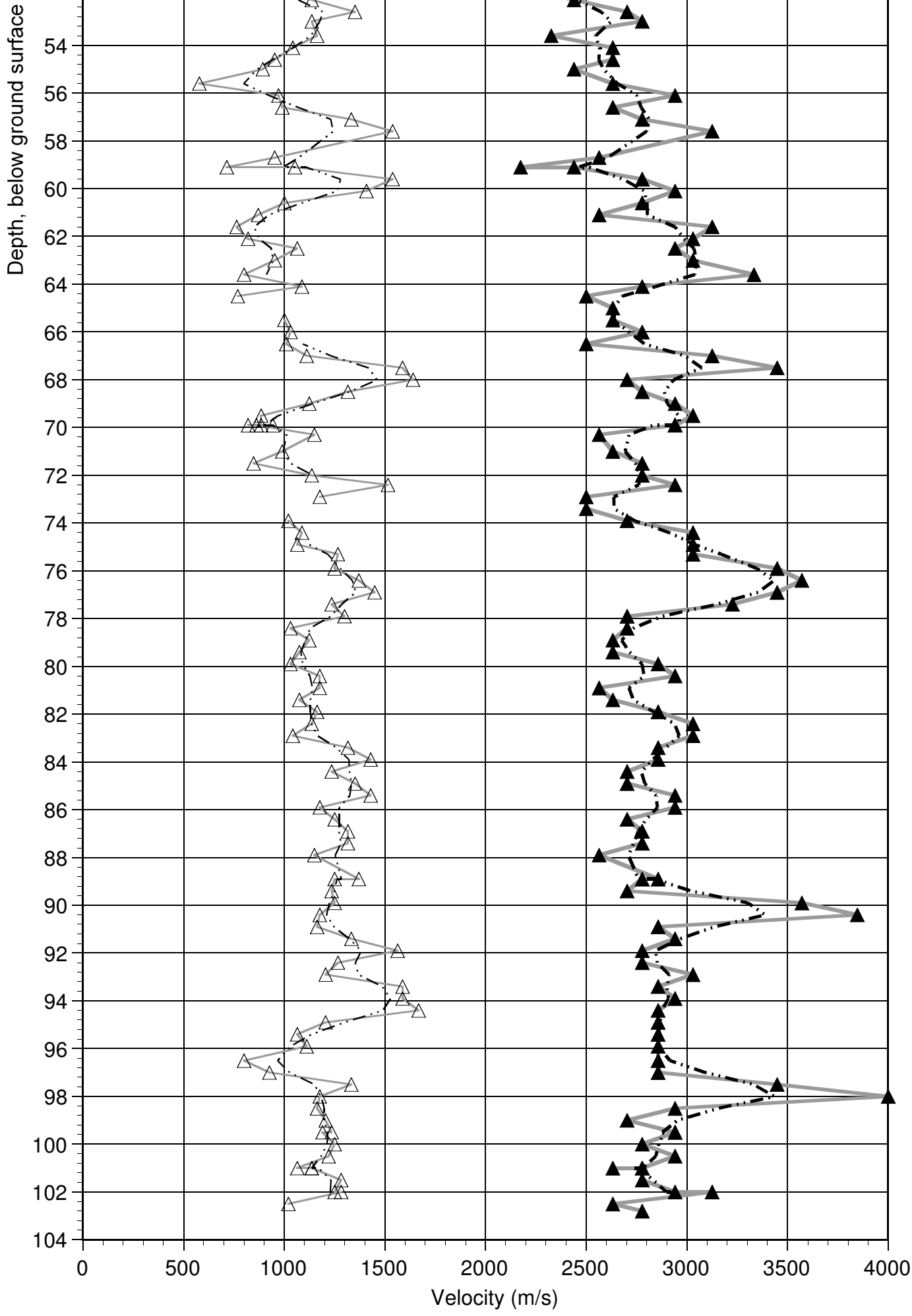
Table 2. LA 710 Tunnel
Boring Z2 B3
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	90.4	296.6	1176	3860	3846	12619	0.45	2.69	167.86	3.722	10.781	34.814	77728	225161	727107
	90.9	298.2	1163	3815	2857	9374	0.40	2.50	155.80	3.374	9.453	15.874	70476	197437	331533
	91.4	299.9	1333	4374	2941	9650	0.37	2.52	157.13	4.475	12.266	15.807	93454	256188	330134
	91.9	301.5	1563	5126	2778	9113	0.27	2.47	154.48	6.041	15.328	11.038	126173	320120	230539
	92.4	303.1	1266	4153	2778	9113	0.37	2.47	154.48	3.965	10.856	13.807	82808	226722	288359
	92.9	304.8	1205	3953	3030	9942	0.41	2.54	158.46	3.685	10.362	18.396	76953	216411	384202
	93.4	306.4	1587	5208	2857	9374	0.28	2.50	155.80	6.288	16.057	11.988	131326	335348	250379
	93.9	308.1	1587	5208	2941	9650	0.29	2.52	157.13	6.342	16.419	13.318	132446	342910	278144
	94.4	309.7	1667	5468	2857	9374	0.24	2.50	155.80	6.933	17.222	11.130	144788	359685	232449
	94.9	311.4	1205	3953	2857	9374	0.39	2.50	155.80	3.623	10.085	15.543	75662	210623	324617
	95.4	313.0	1064	3490	2857	9374	0.42	2.50	155.80	2.824	8.019	16.607	58990	167476	346847
	95.9	314.6	1111	3645	2857	9374	0.41	2.50	155.80	3.081	8.694	16.265	64350	181585	339700
	96.5	316.6	800	2625	2857	9374	0.46	2.50	155.80	1.597	4.656	18.244	33359	97240	381021
	97	318.2	926	3038	2857	9374	0.44	2.50	155.80	2.140	6.168	17.519	44687	128818	365894
	97.5	319.9	1333	4374	3448	11313	0.41	2.62	163.81	4.665	13.175	24.982	97430	275161	521747
	98	321.5	1176	3860	4000	13123	0.45	2.71	169.22	3.752	10.900	38.367	78356	227647	801316
	98.5	323.2	1163	3815	2941	9650	0.41	2.52	157.13	3.403	9.579	17.236	71076	200061	359971
	99	324.8	1205	3953	2703	8867	0.38	2.45	153.16	3.561	9.800	13.172	74377	204686	275107
	99.5	326.4	1235	4050	2941	9650	0.39	2.52	157.13	3.836	10.688	16.658	80122	223229	347912
	99.5	326.4	1190	3906	2941	9650	0.40	2.52	157.13	3.567	10.003	17.017	74501	208906	355405
	100	328.1	1250	4101	2778	9113	0.37	2.47	154.48	3.866	10.617	13.938	80751	221749	291102
	100.5	329.7	1220	4001	2941	9650	0.40	2.52	157.13	3.743	10.453	16.782	78180	218307	350500
	101	331.4	1064	3490	2778	9113	0.41	2.47	154.48	2.800	7.920	15.359	58489	165413	320785
	101	331.4	1136	3728	2632	8634	0.39	2.43	151.84	3.141	8.702	12.656	65596	181752	264321
	101	331.4	1136	3728	2778	9113	0.40	2.47	154.48	3.195	8.944	14.833	66736	186796	309788
	101.5	333.0	1282	4206	2778	9113	0.36	2.47	154.48	4.067	11.101	13.670	84945	231843	285510
	102	334.6	1250	4101	2941	9650	0.39	2.52	157.13	3.933	10.931	16.529	82137	228306	345223
	102	334.6	1282	4206	3125	10253	0.40	2.56	159.79	4.207	11.770	19.387	87869	245824	404905
	102.5	336.3	1020	3348	2632	8634	0.41	2.43	151.84	2.532	7.149	13.467	52892	149316	281259
	102.8	337.3		NA	2778	9113	NA	NA	NA	NA	NA	NA	NA	NA	NA

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Figure 1. LA 710 Tunnel
Boring Z2 B3
Downhole Interval Velocities




Depth, below ground surface
54
56
58
60
62
64
66
68
70
72
74
76
78
80
82
84
86
88
90
92
94
96
98
100
102
104
0
500
1000
1500
2000
2500
3000
3500
4000
Velocity (m/s)



Z2 B3

COMPANY	:	CALTRANS.
WELL	:	Z2 B3
FIELD	:	LA 710 TUNNEL.
COUNTY	:	LA
STATE	:	CA

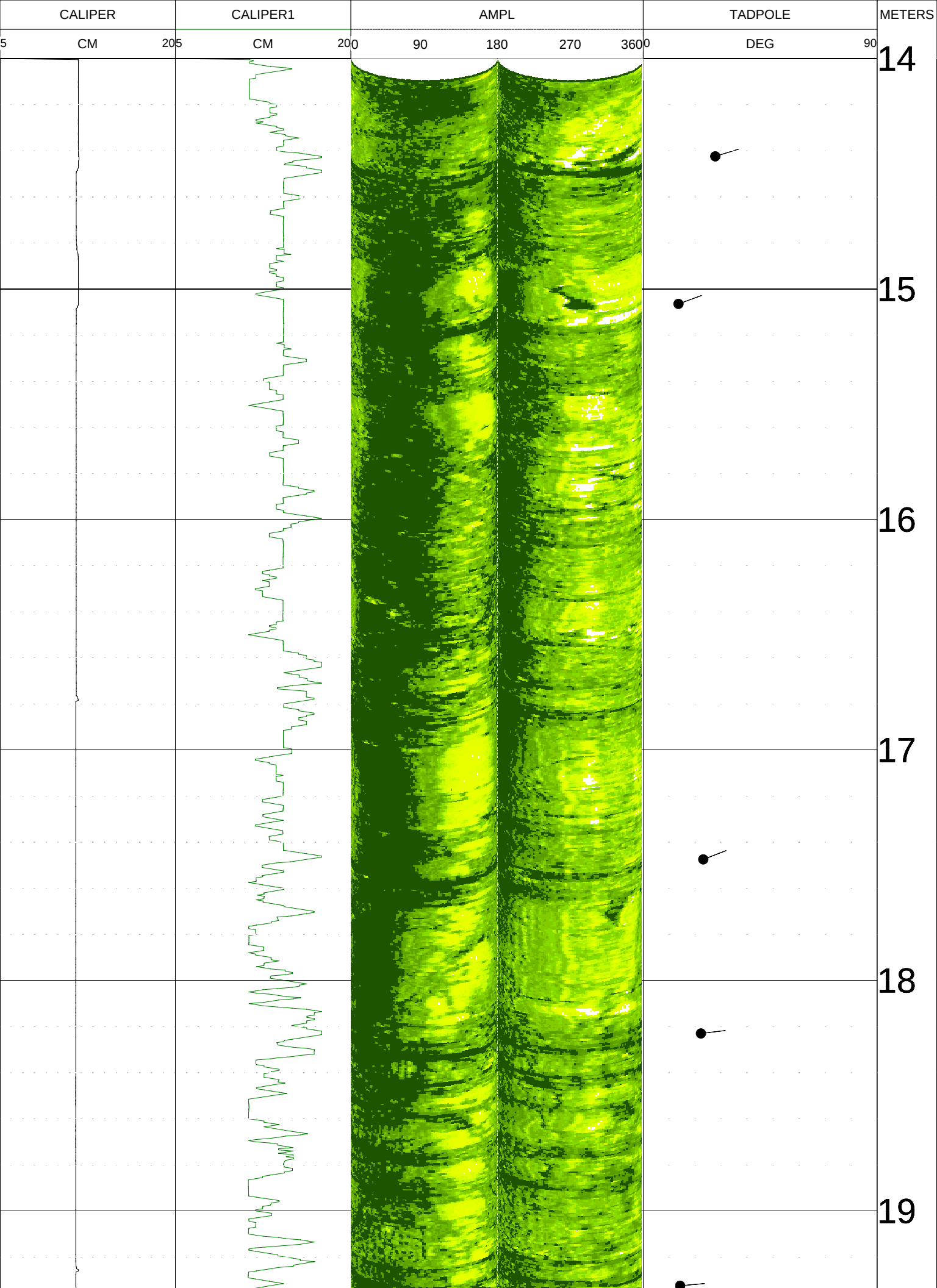
OTHER SERVICES:
IND-CAL.
AC TEL.
PSLOG.

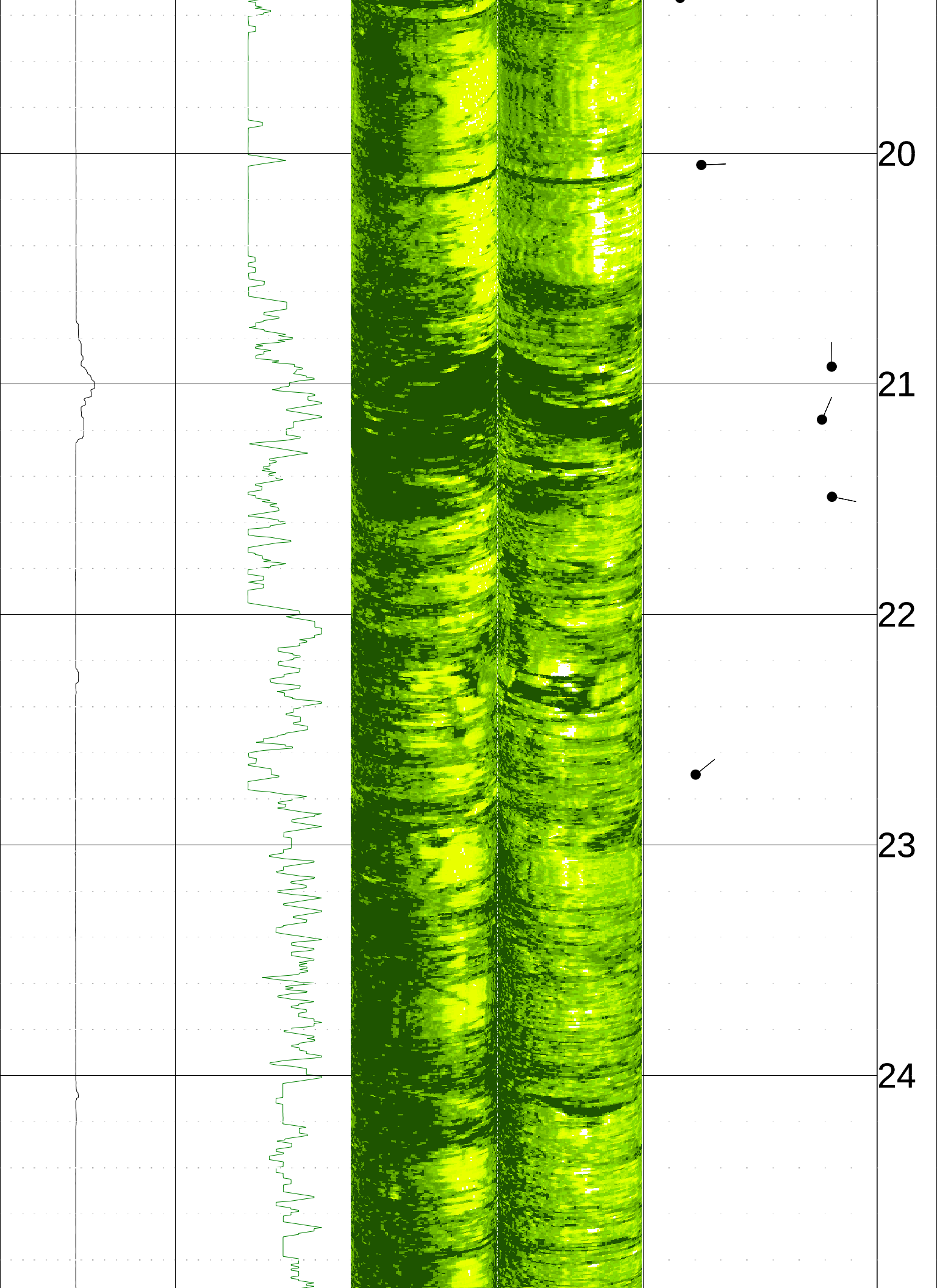
LOCATION	:	
SECTION	:	None
TOWNSHIP	:	NONE
RANGE	:	None
API NO.	:	
UNIQUE WELL ID.	:	

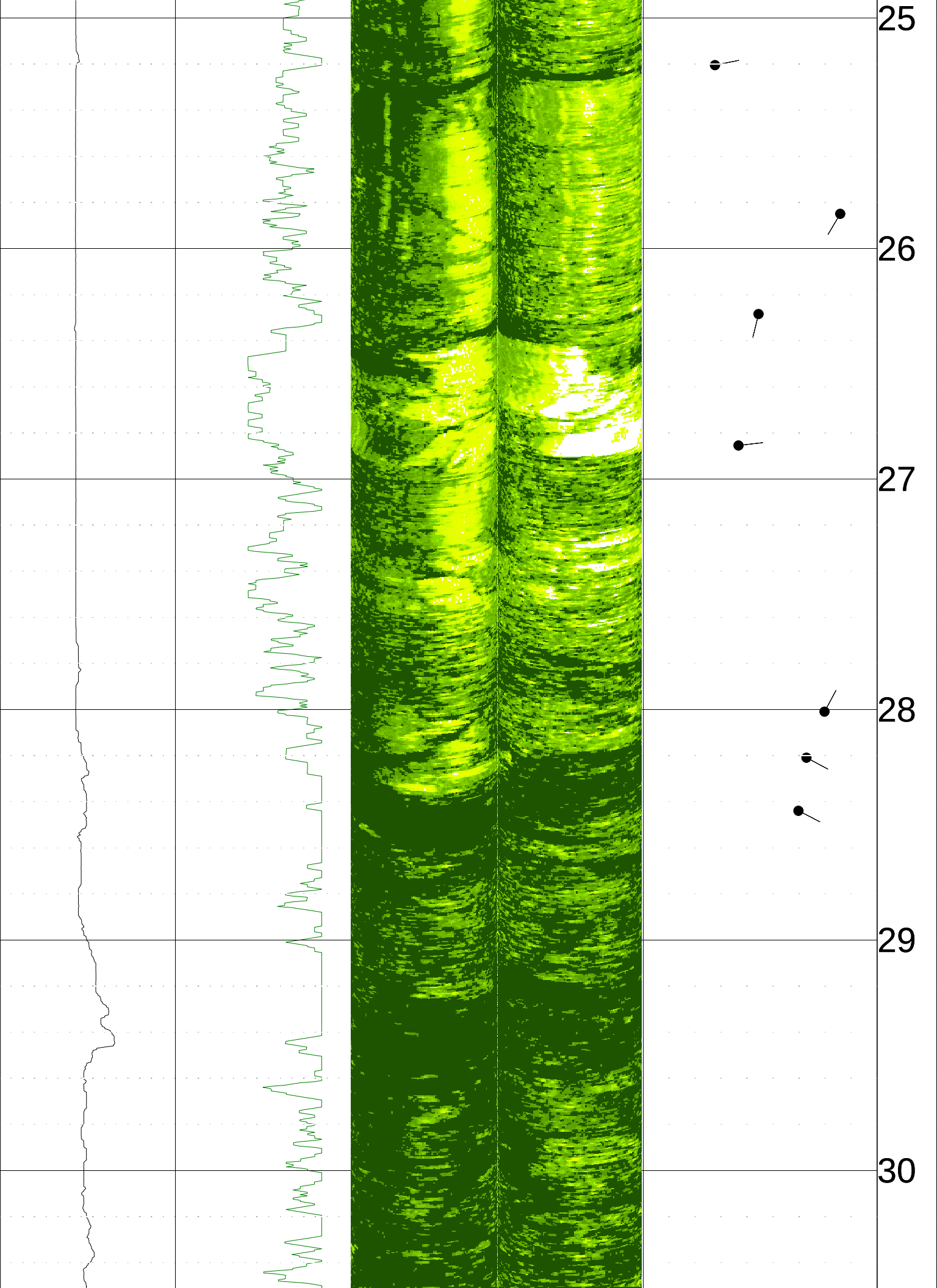
PERMANENT DATUM	:	None	ELEVATION KB	: NA
LOG MEASURED FROM:		GL	ELEVATION DF	: NA
DRL MEASURED FROM	:	GL	ELEVATION GL	: 170.38m

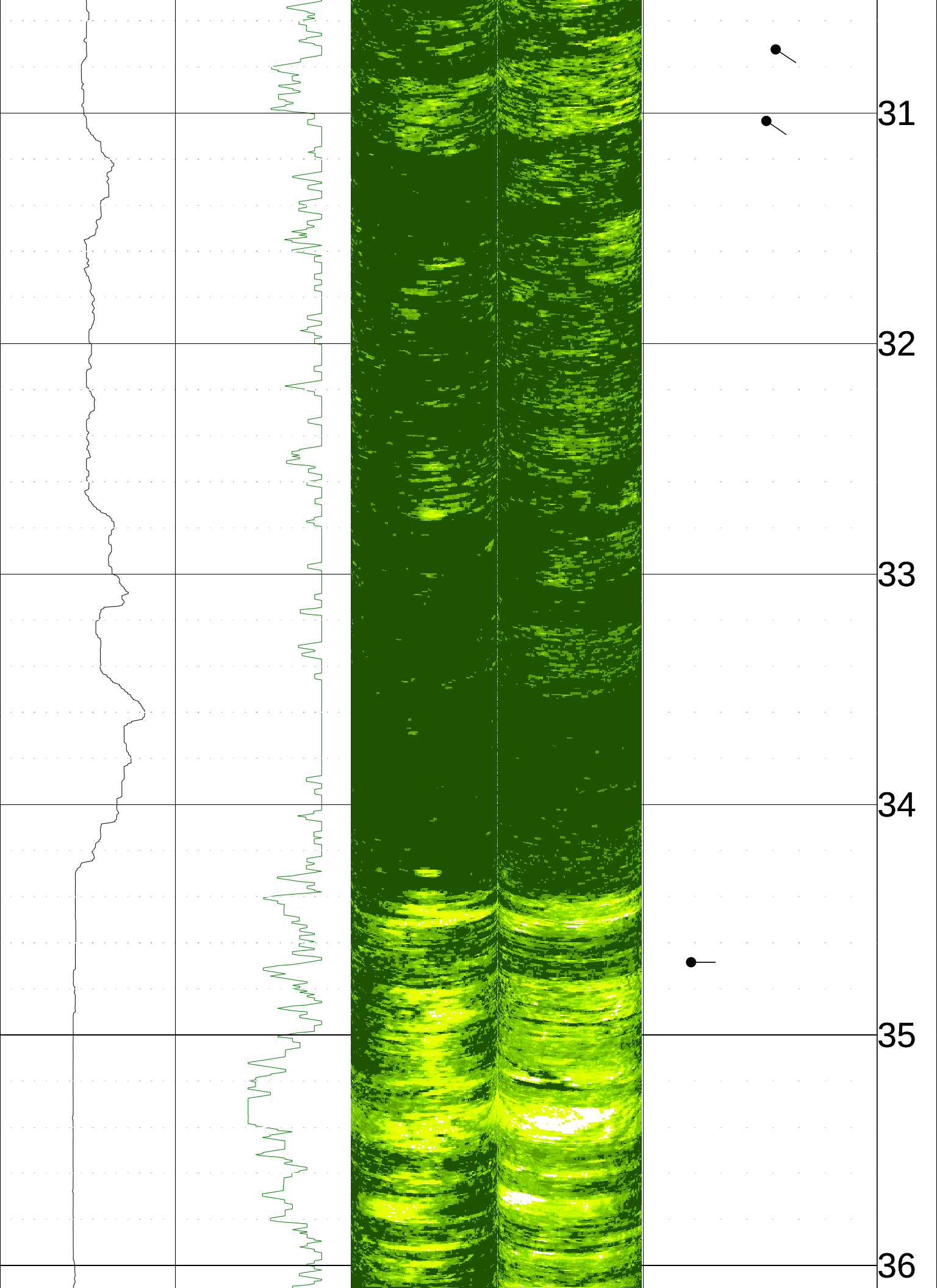
DATE	:	03/17/09	RIG NUMBER	:
DEPTH DRILLER	:	106.68.	LOGGER TD	:
BIT SIZE	:	10.8cm.	ARRIVAL TIME	:
LOG TOP	:	14.00	DEPARTURE TIME:	
LOG BOTTOM	:	105.75	CIRC STOPPED	: 3/17 AM
CASING OD	:			
CASING BOTTOM	:	11.73m		
CASING TYPE	:	steel		
BOREHOLE FLUID	:	0		
RM TEMPERATURE	:	0		
MUD RES	:	0		
MUD WEIGHT	:			
WITNESSED BY	:			
RECORDED BY	:	DH/DG		
REMARKS 1	:			
REMARKS 2	:	EA: 07-187900		

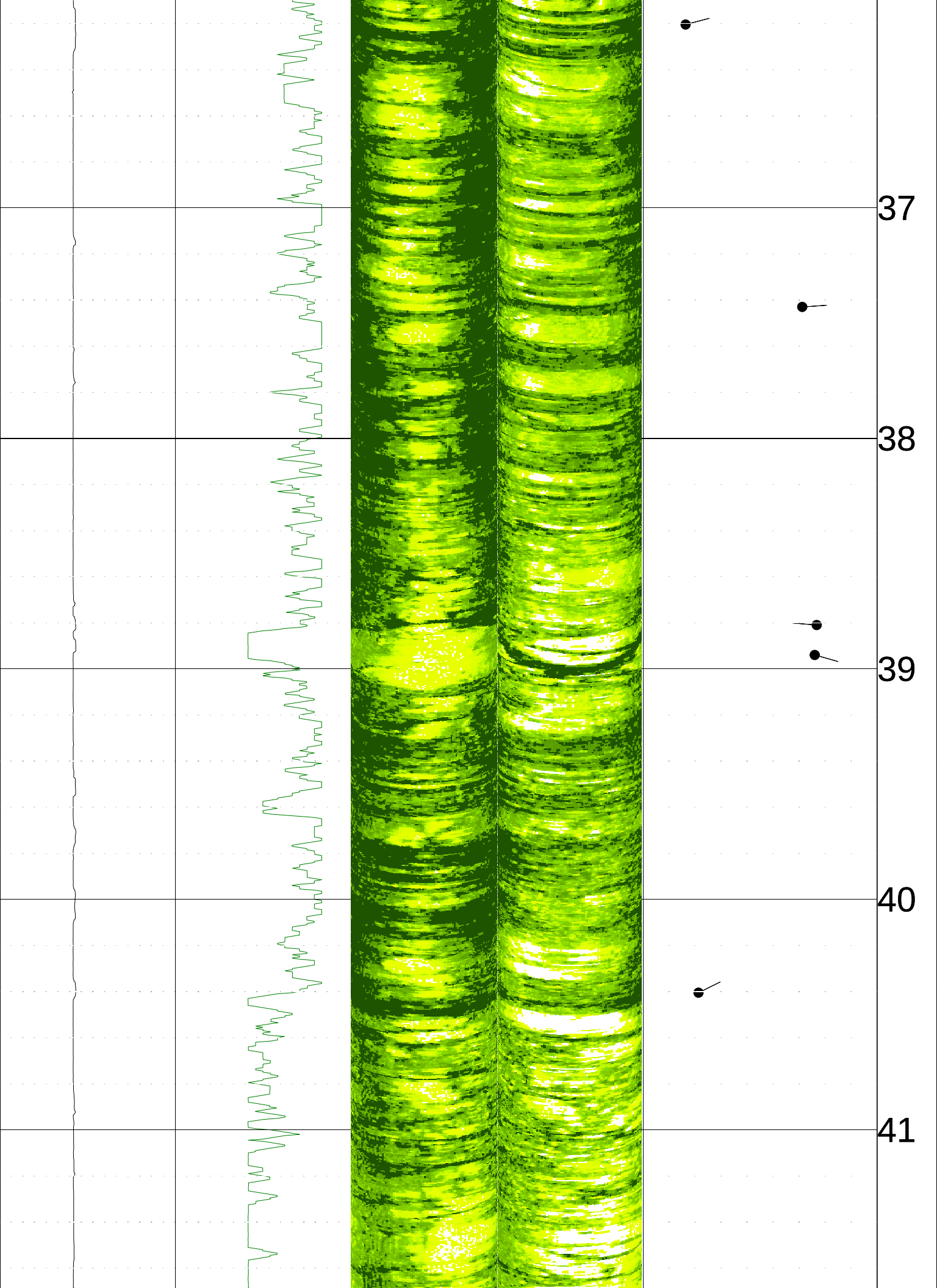
ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS

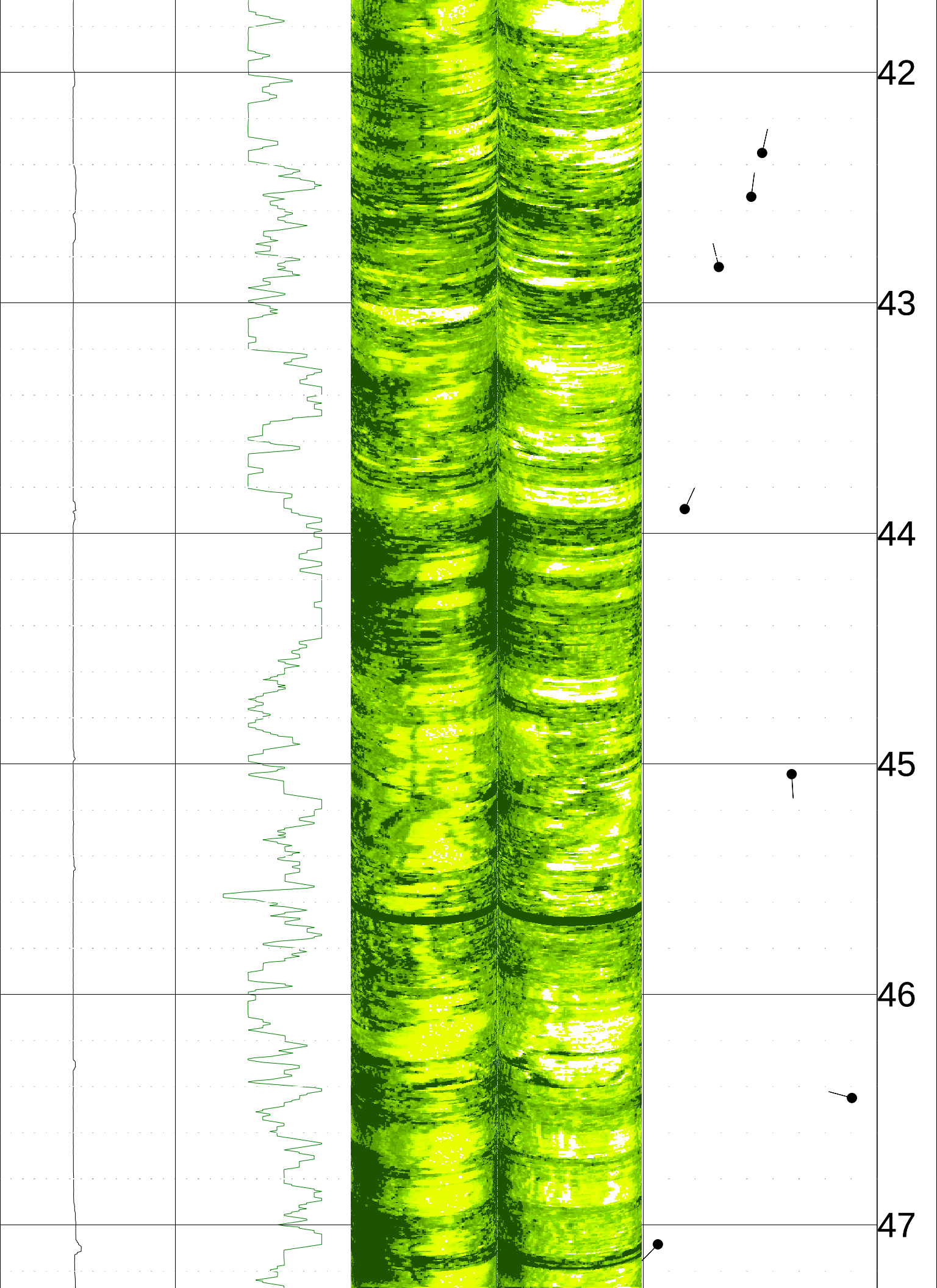

CALIPER
CALIPER1
AMPL
TADPOLE
METERS
5
CM
20
5
CM
20
0
90
180
270
360
0
DEG
90
14
15
16
17
18
19

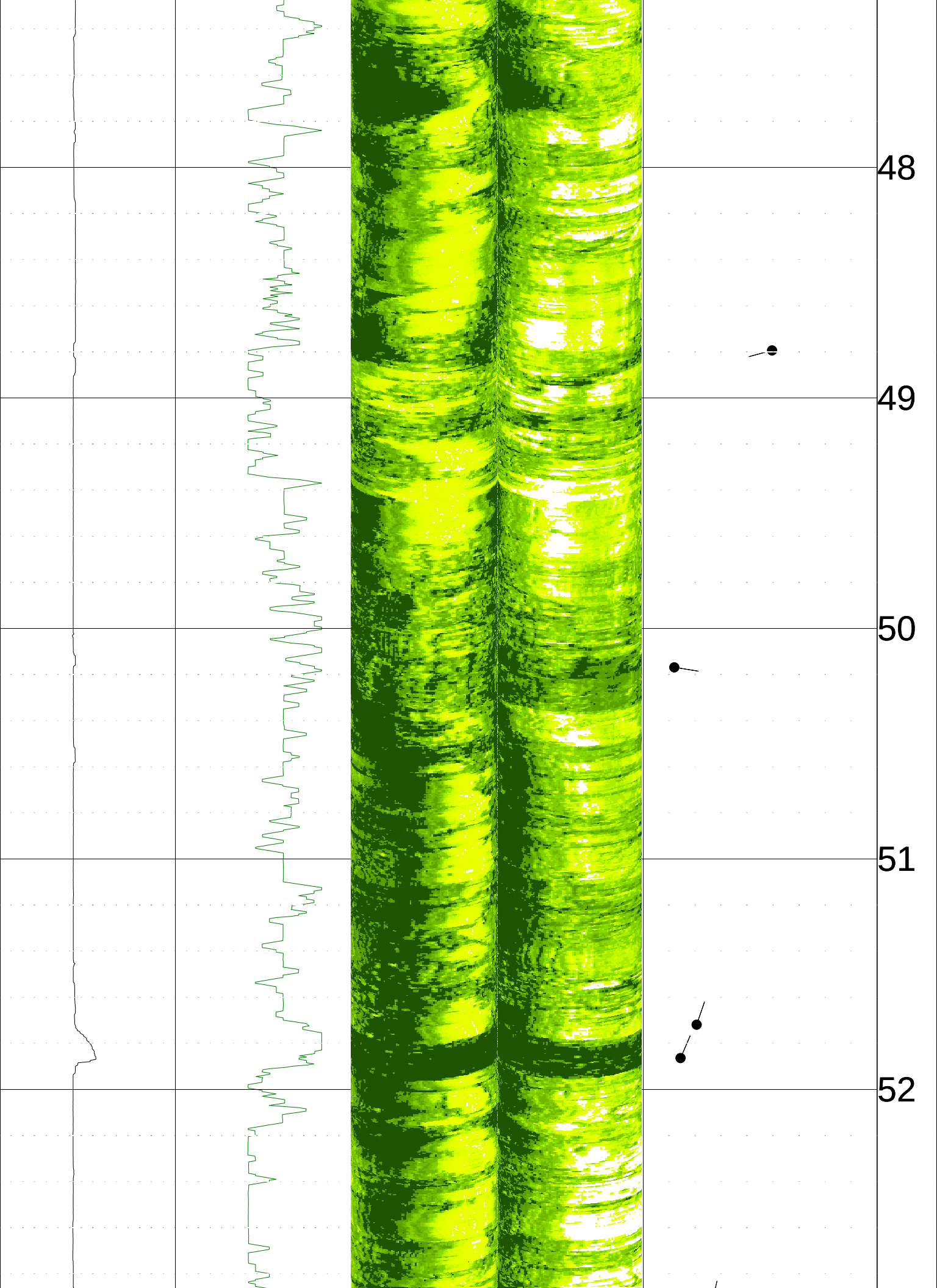

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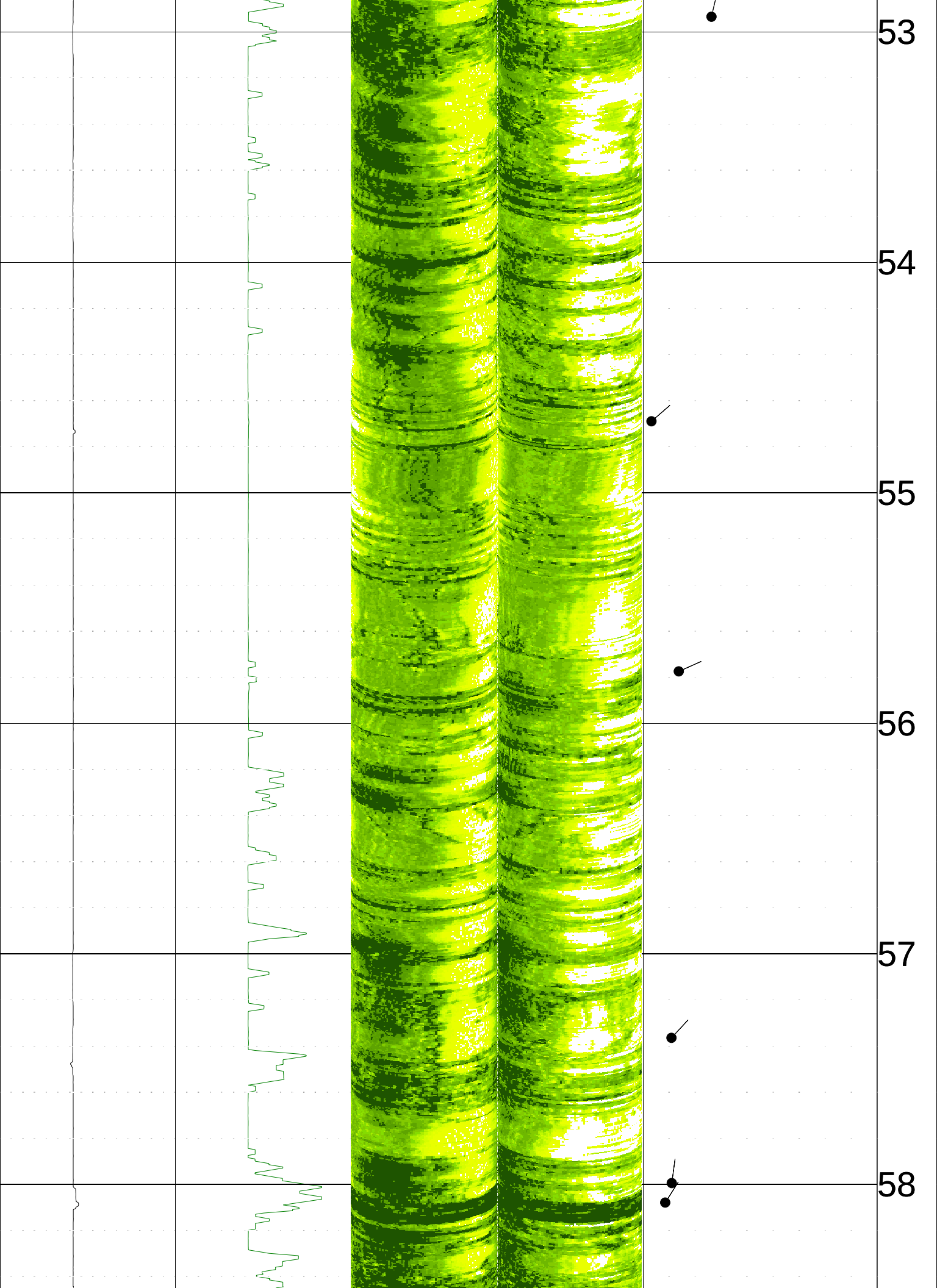

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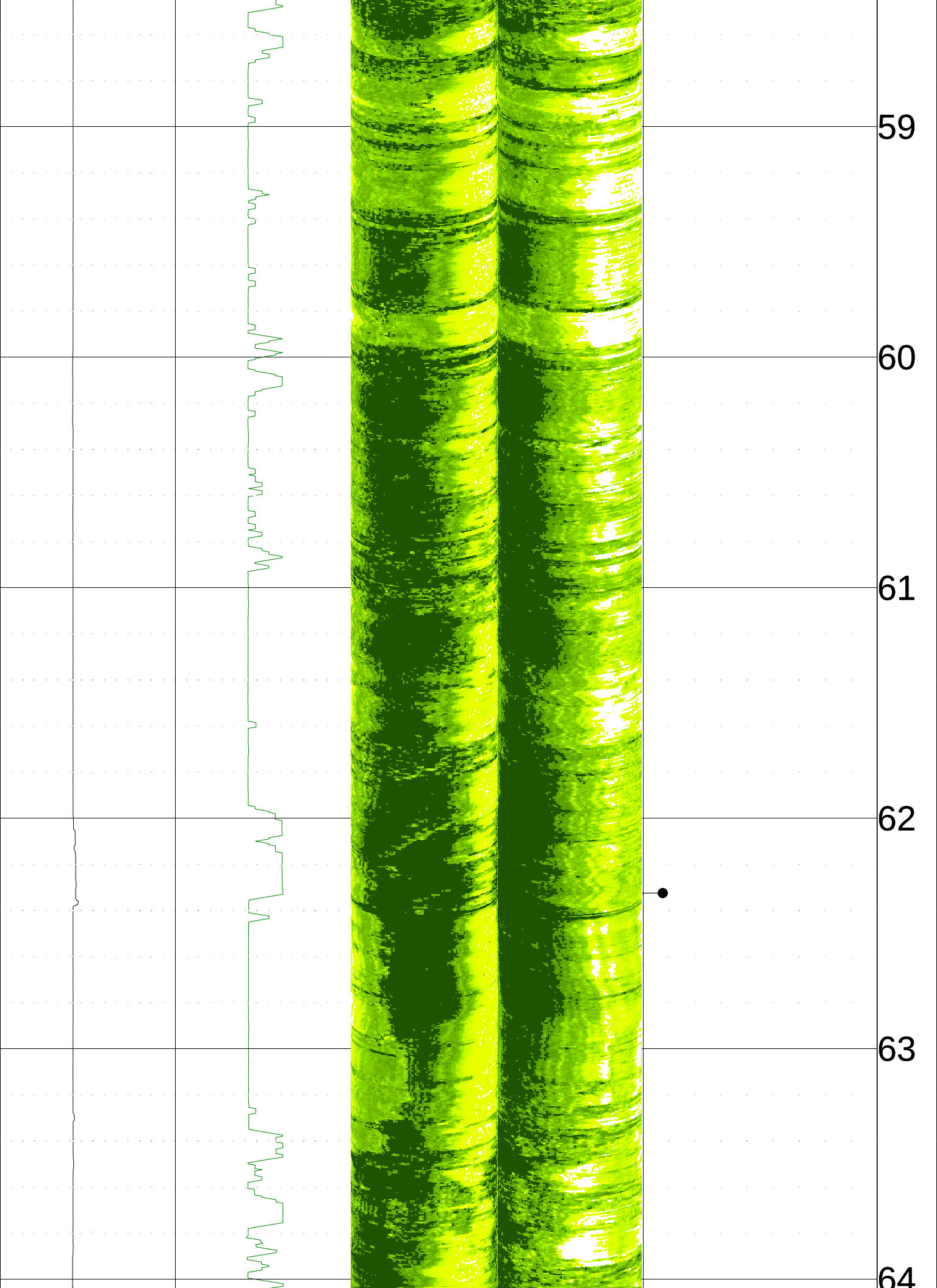

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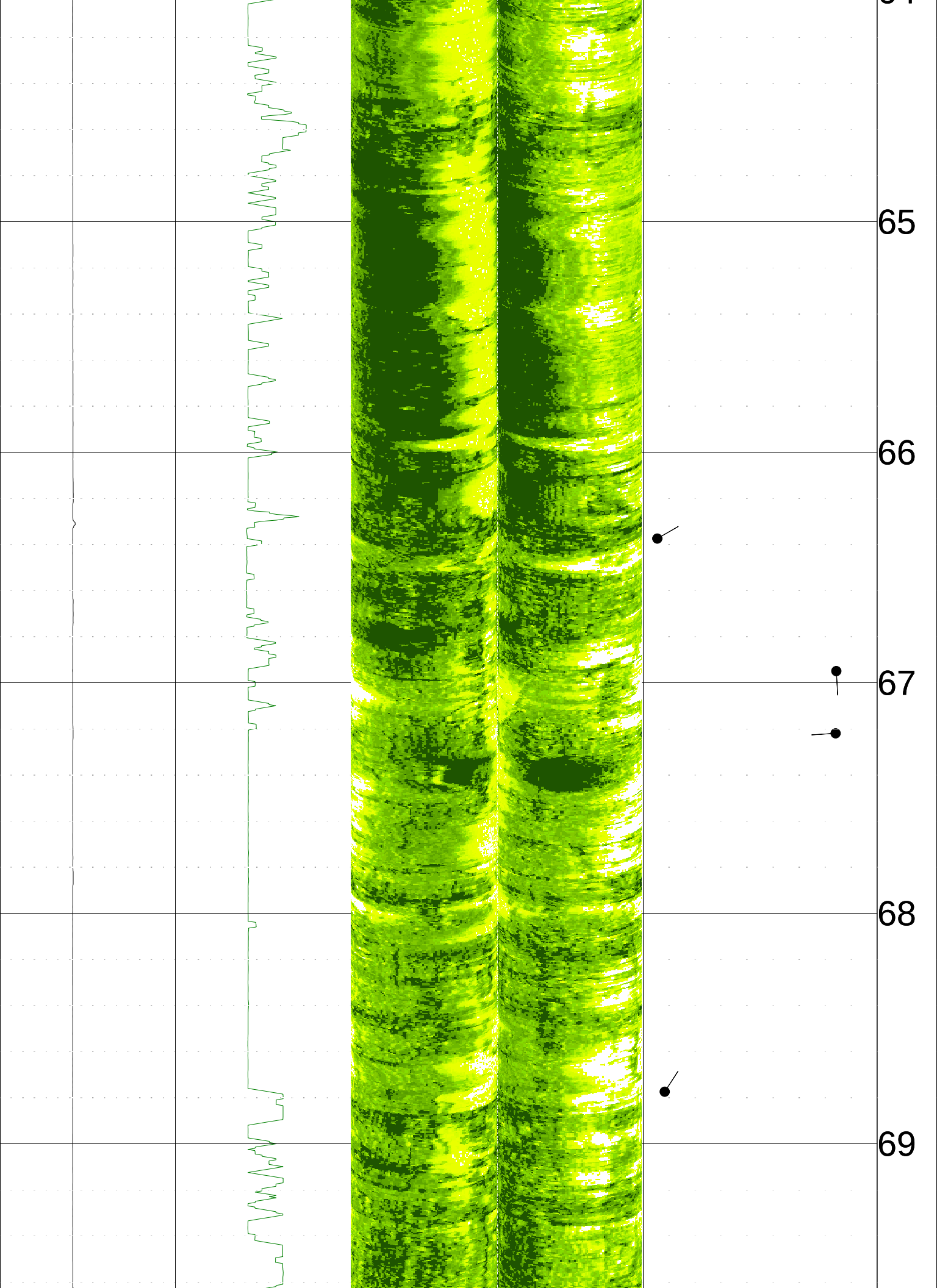

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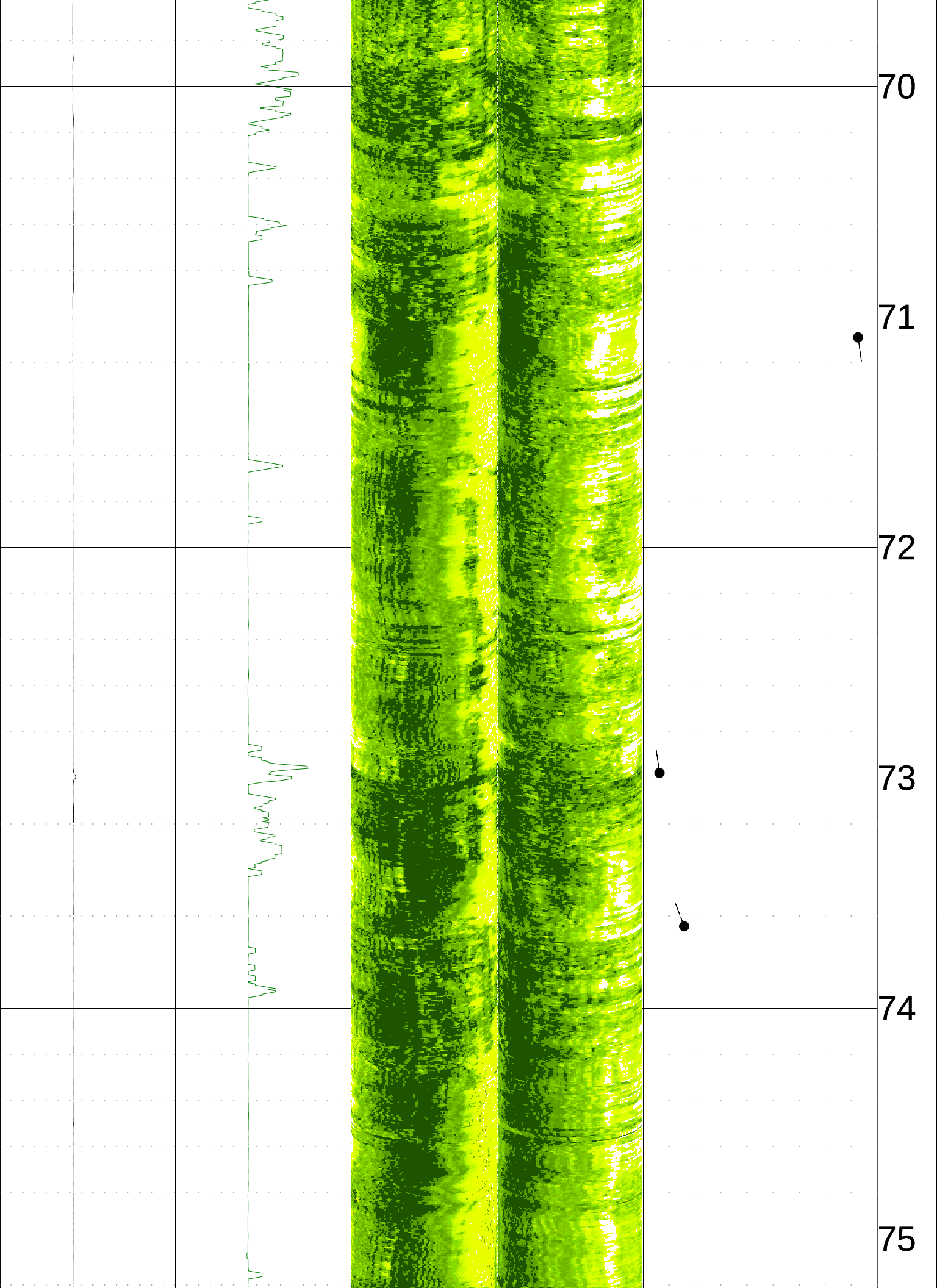

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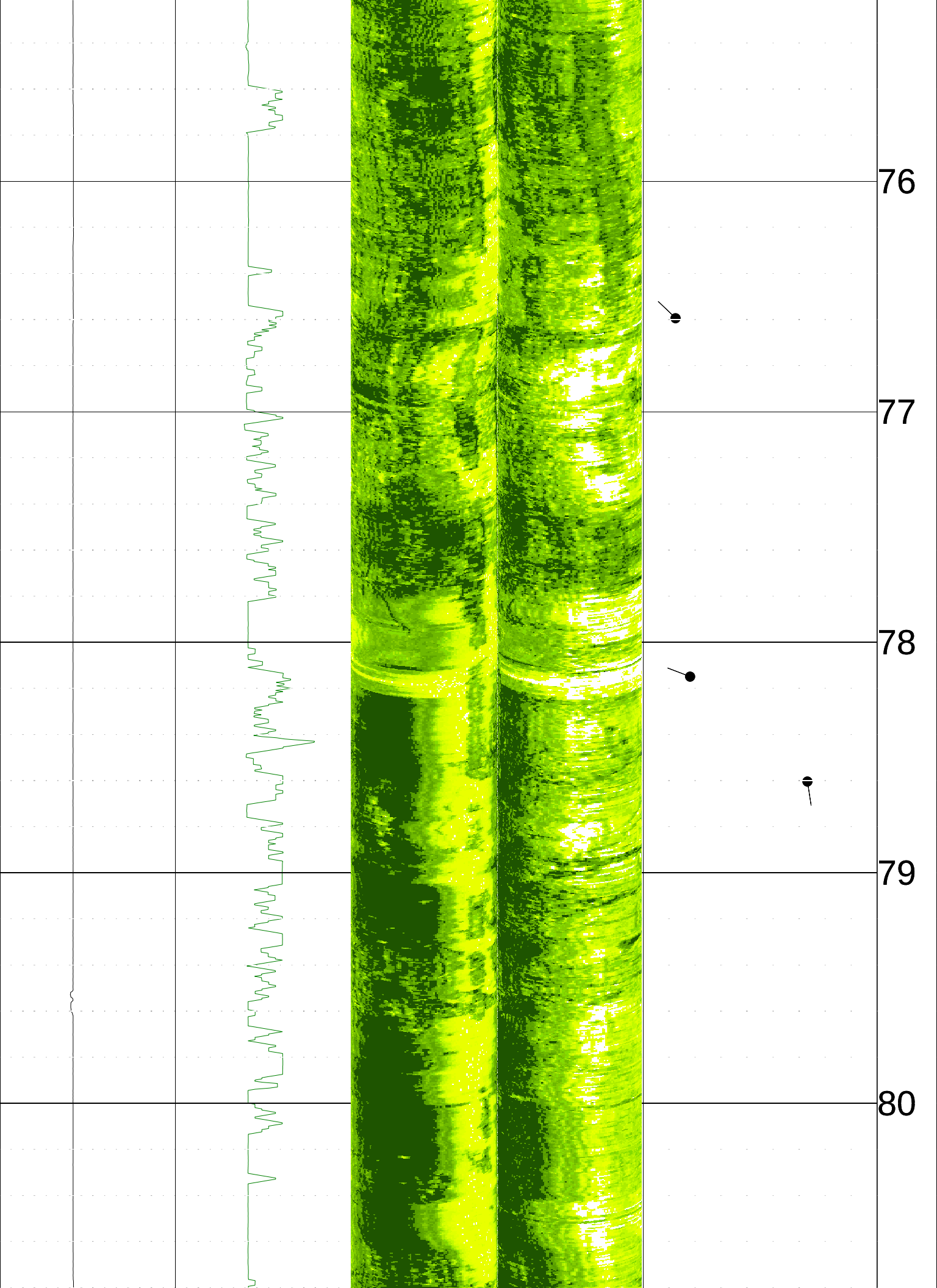

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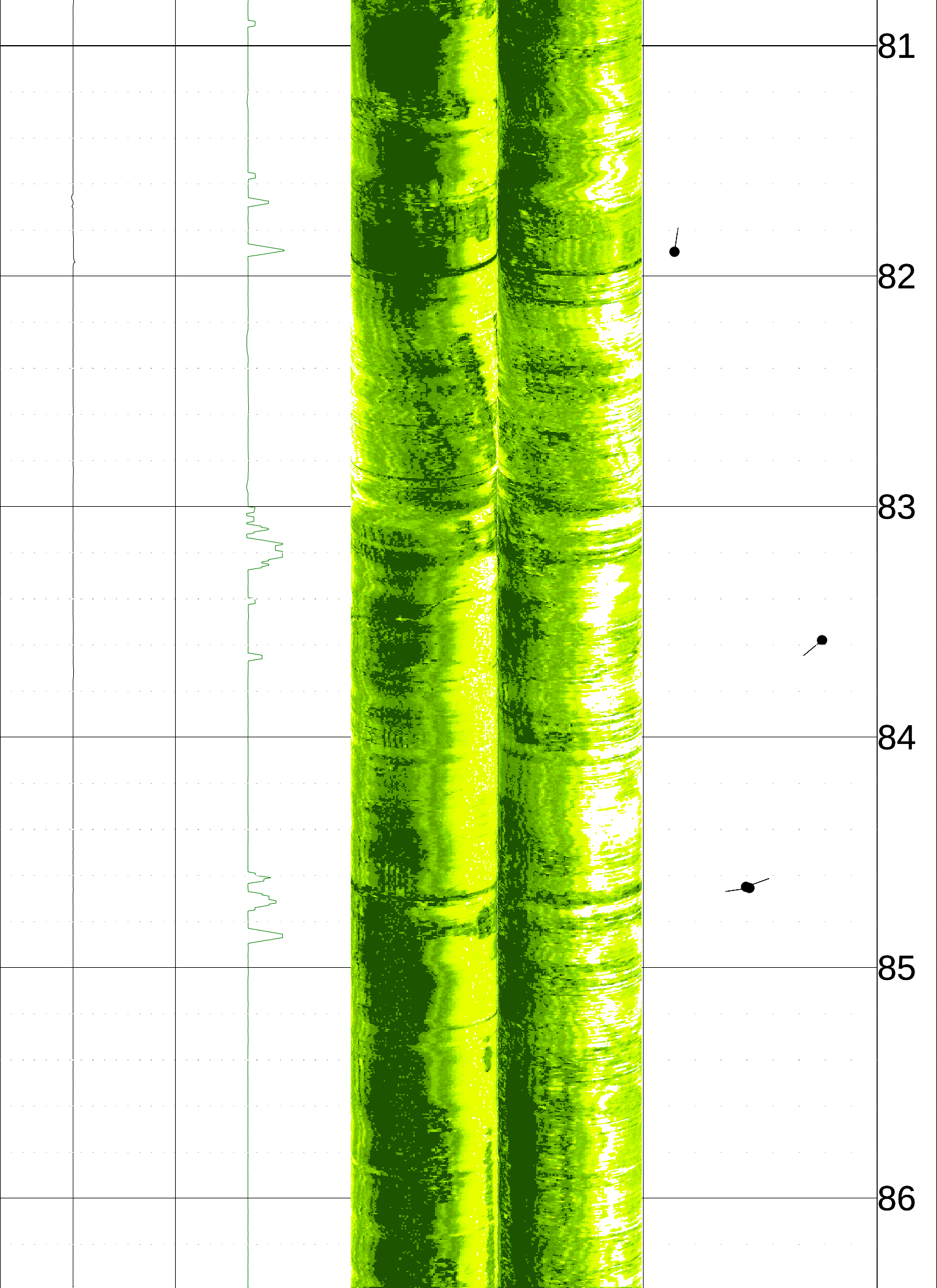

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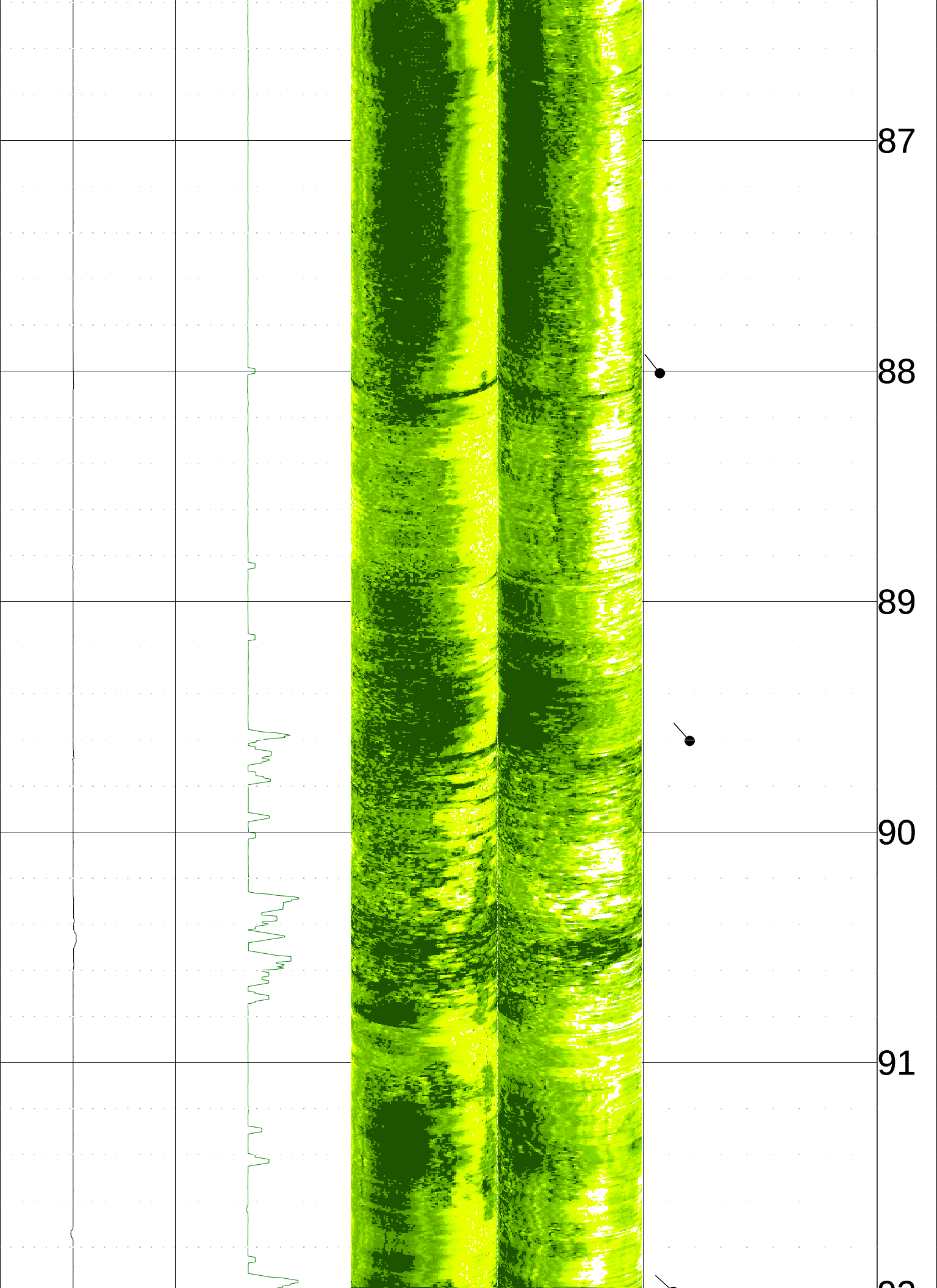

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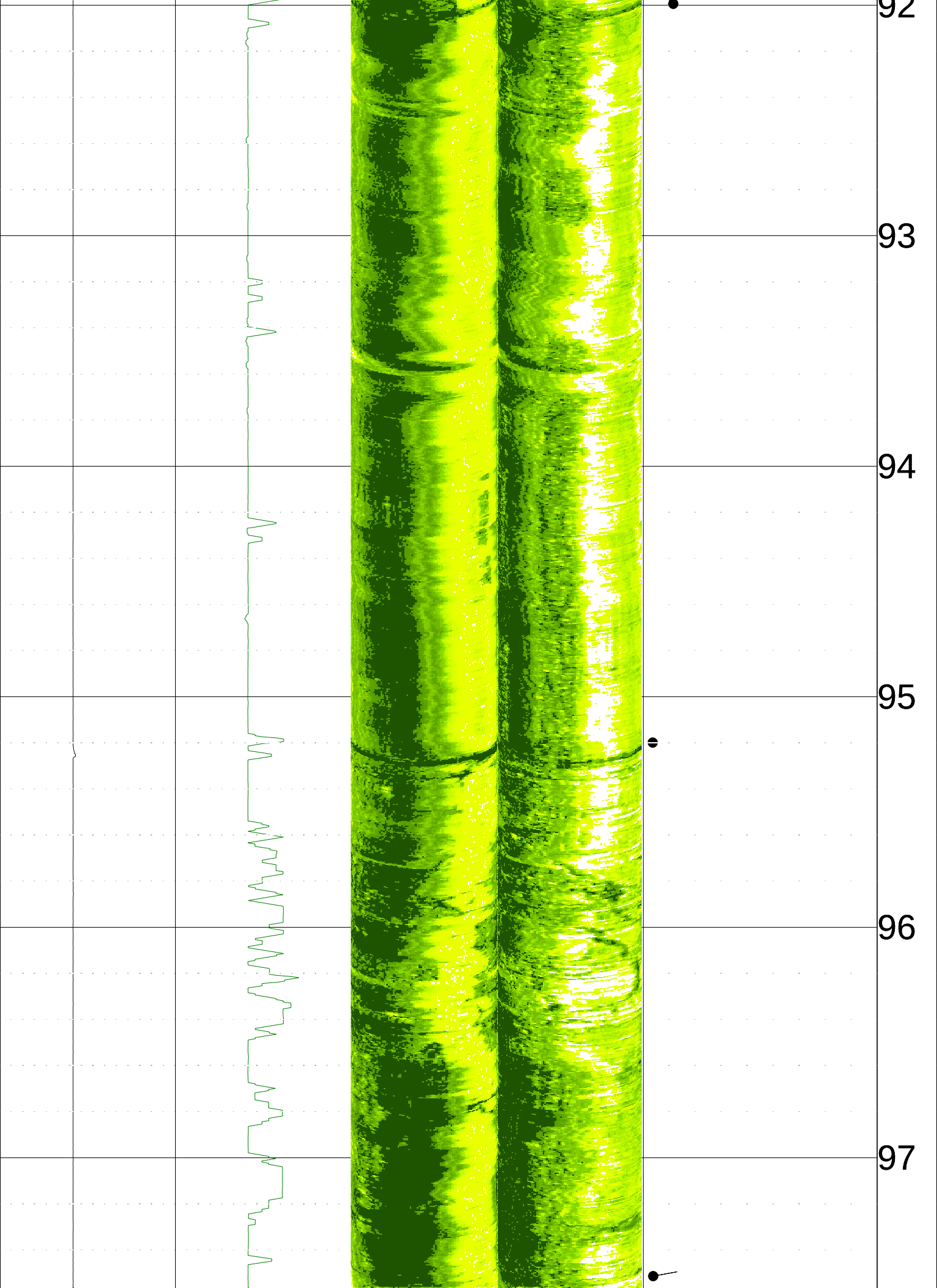

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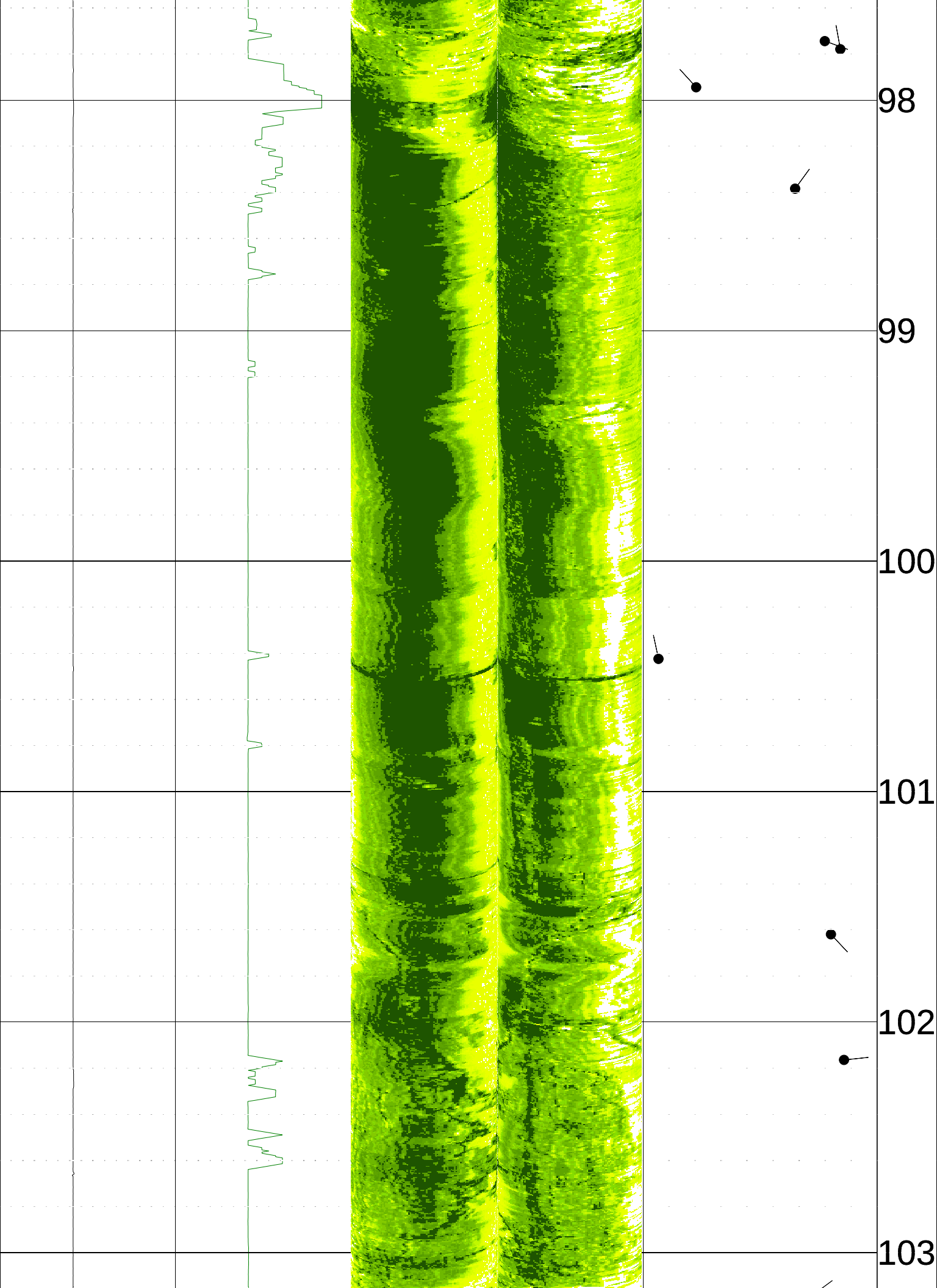

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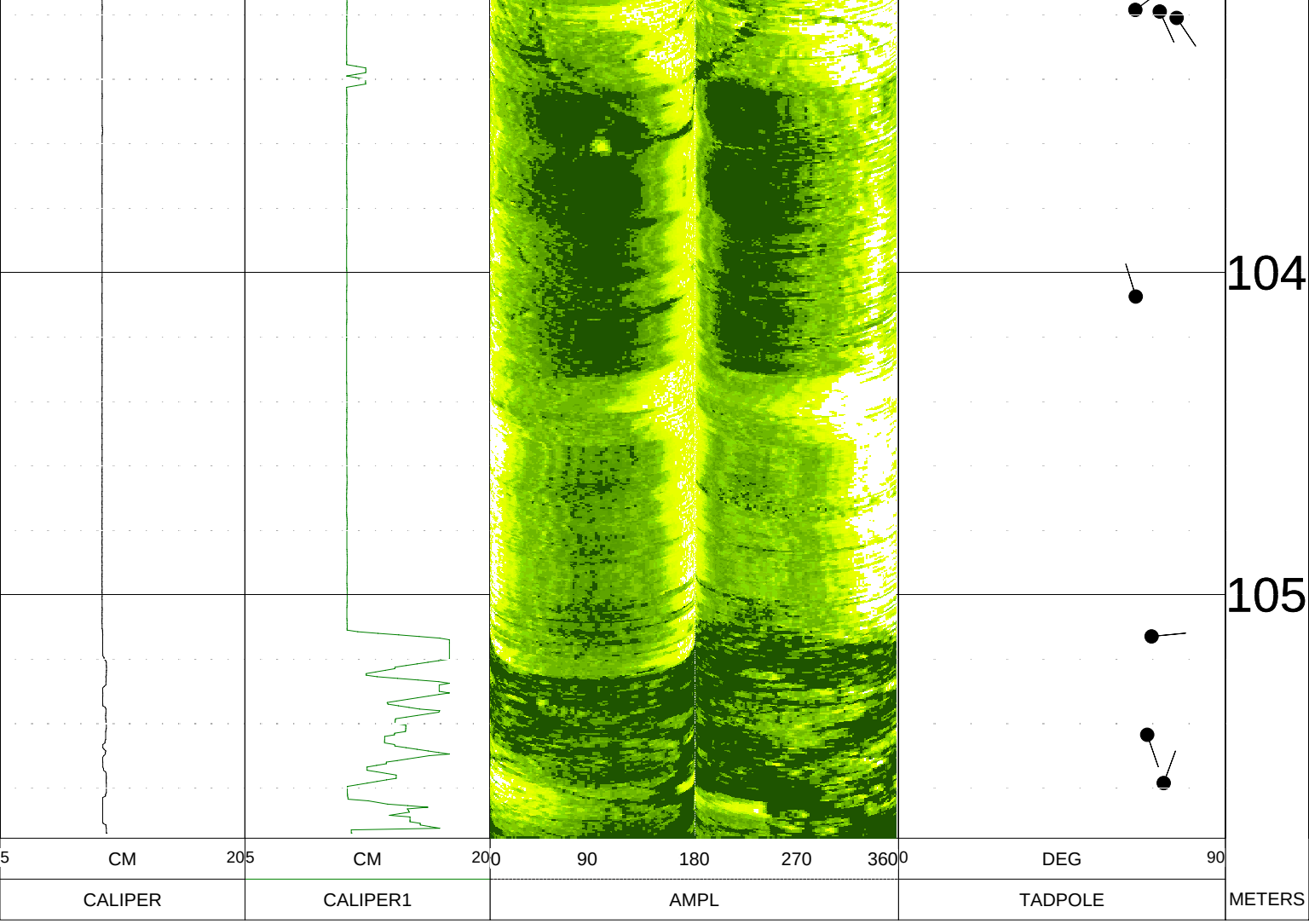

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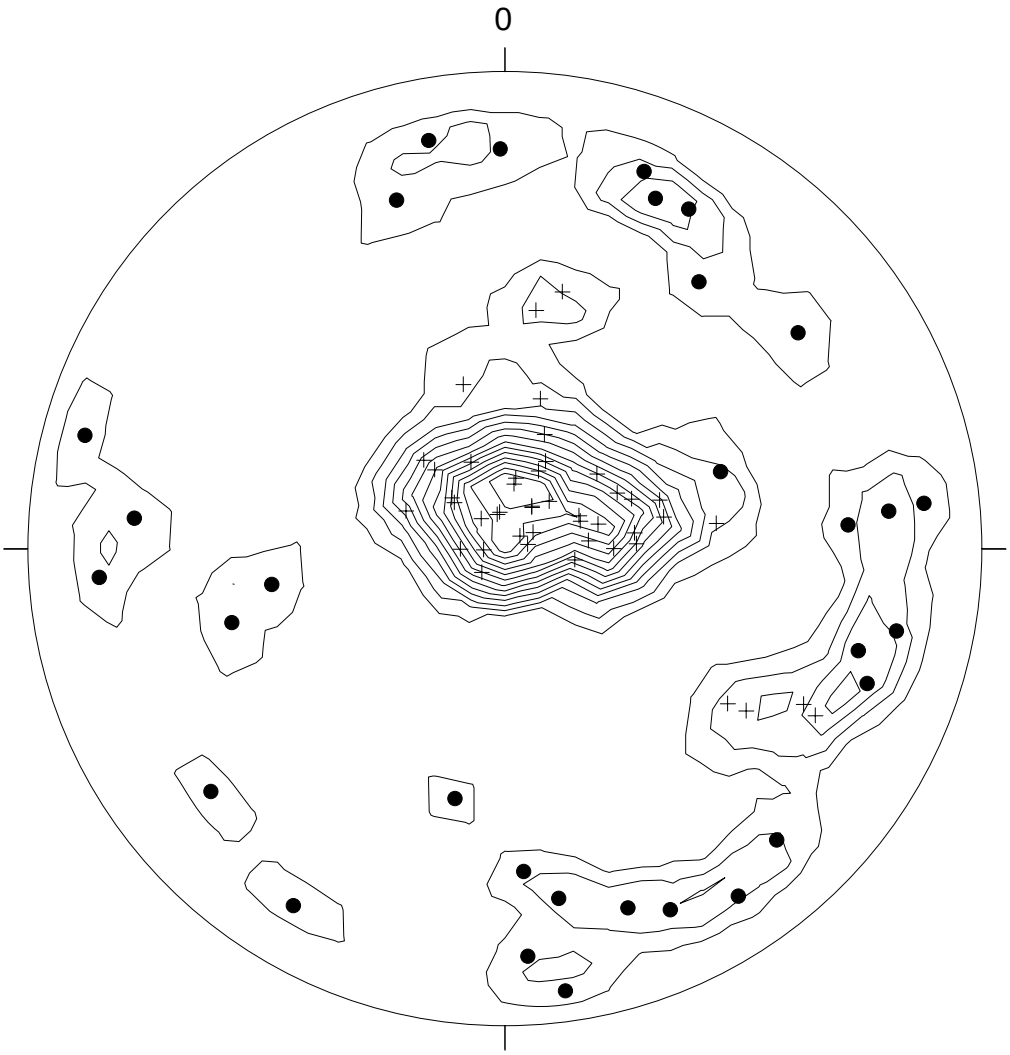

81
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97


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99
100
101
102
103


104
105
5
CM
20
5
CM
20
0
90
180
270
360
0
DEG
90
CALIPER
CALIPER1
AMPL
TADPOLE
METERS



LA 710 Tunnel, boring Z2 B3

Stereonet contour plot of poles to planes,
bedding and fractures

+ n=45 (P)
• n=31 (P)

n=76
max. dens.=14.89 (at 30/ 78)
min. dens.=0.00
Contours at every integer between
1 and 14, inclusive:
(Multiples of random distribution)

Apparent bedding denoted as cross
Apparent fractures denoted as solid circle
Plotted on upper hemisphere



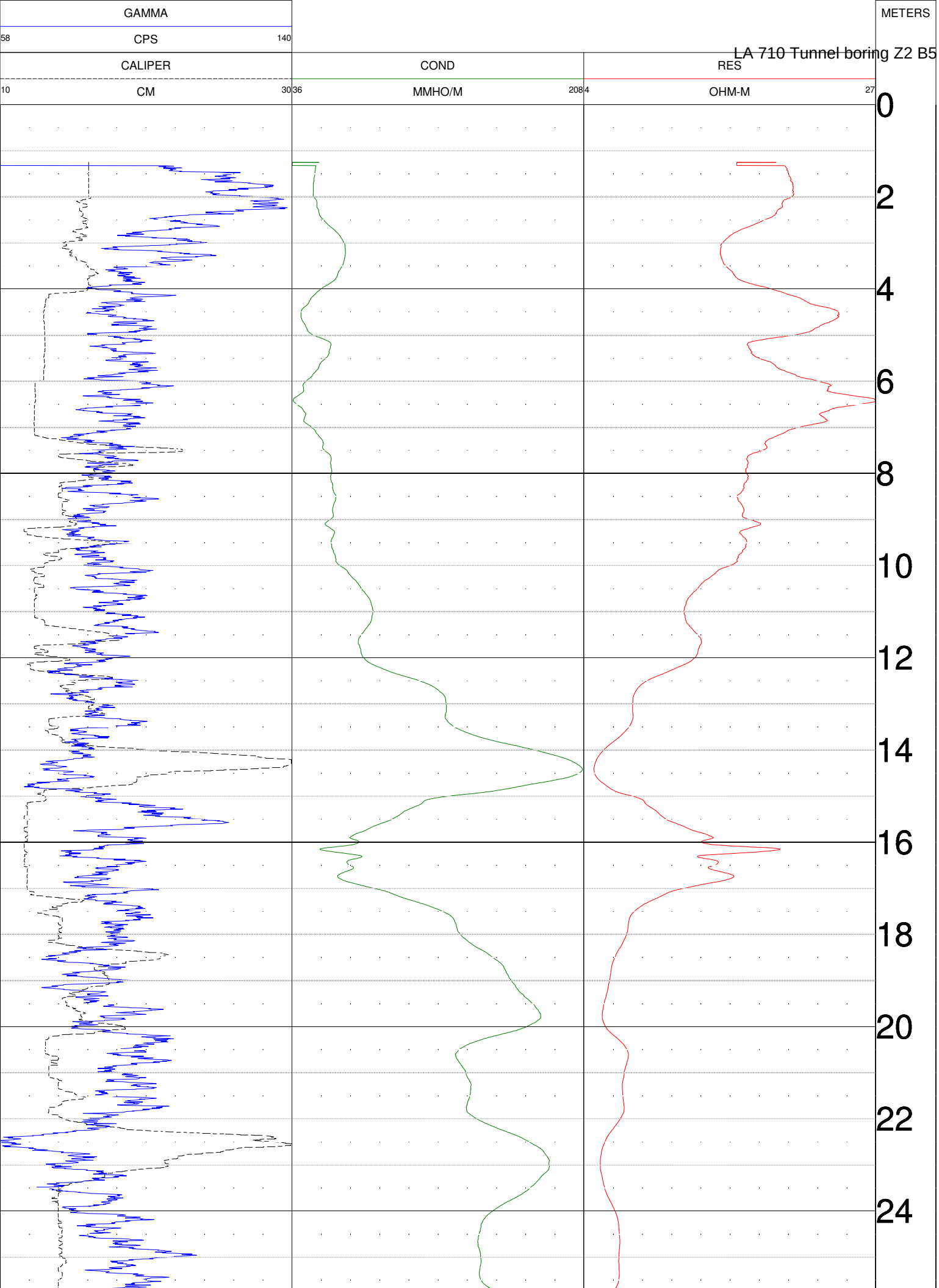
LA 710 Tunnel boring Z2 B5

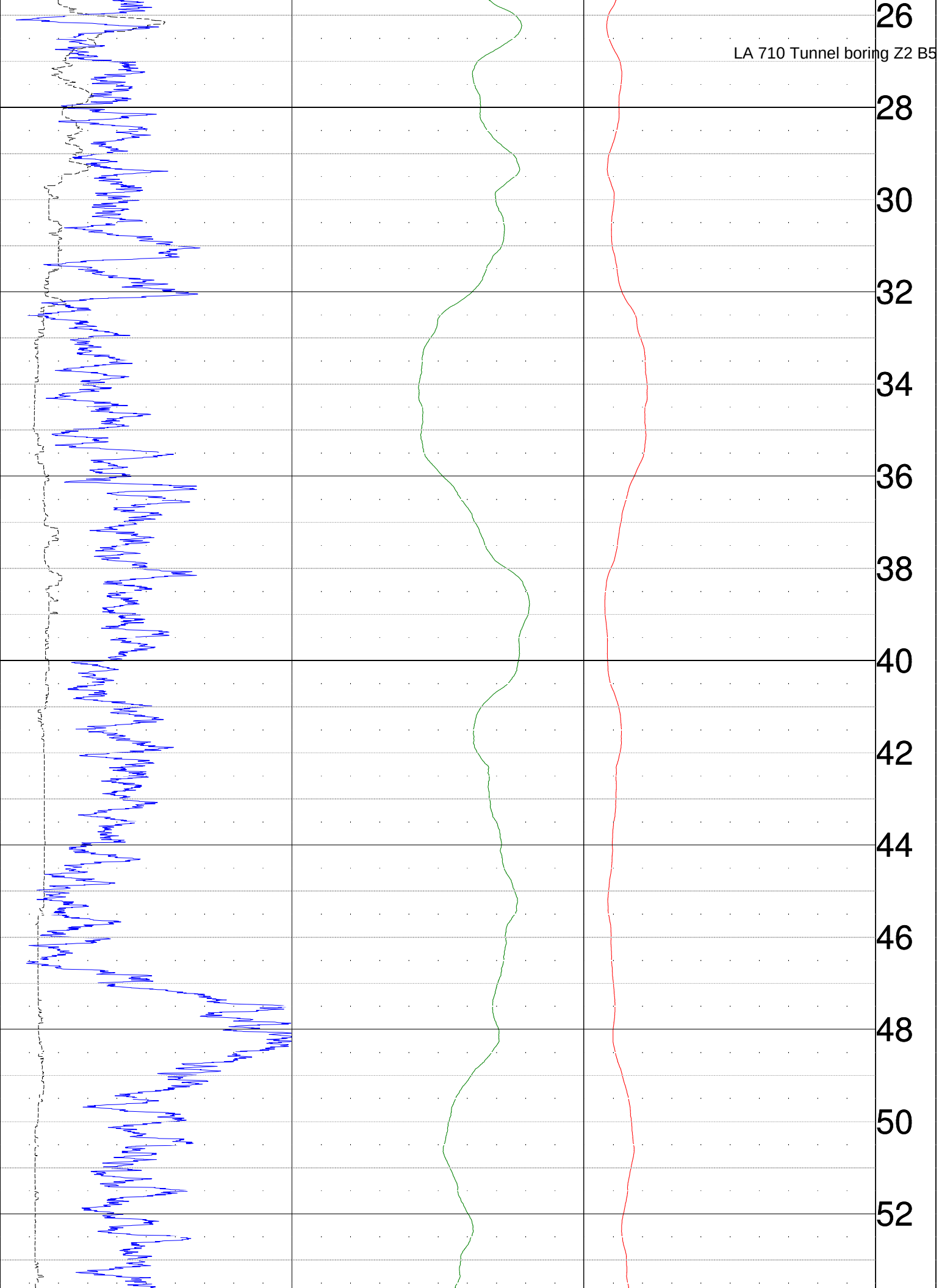
COMPANY	: CALTRANS				
WELL	: Z2 B5				
LOCATION/FIELD	: LA 710 TUNNEL				
COUNTY	: LA				
LOCATION	: CA				
SECTION	: None	TOWNSHIP	: NONE	RANGE	: None
DATE	: 4/14/09	PERMANENT DATUM	: None		
DEPTH DRILLER	: 91.44			KB	: NA
LOG BOTTOM	: 90.6	LOG MEASURED FROM:	GL	DF	: NA
LOG TOP	: 1.2	DRL MEASURED FROM:	GL	GL	: NA
CASING DIAMETER	: n/a	LOGGING UNIT	: 7311		
CASING TYPE	: N/A	FIELD OFFICE	: 7311		
CASING THICKNESS:	N/A	RECORDED BY	: DH/DL		
BIT SIZE	: 10.8CM	BOREHOLE FLUID	: 0	FILE	: PROCESSE
MAGNETIC DECL.	: 12.85	RM	: 0	TYPE	: 9065A
MATRIX DENSITY	: 2.71	RM TEMPERATURE	: 0	LGDATE	: 4/14/09.
NEUTRON MATRIX	: DOLOMITE	MATRIX DELTA T	: 140		
				THRESH:	2500

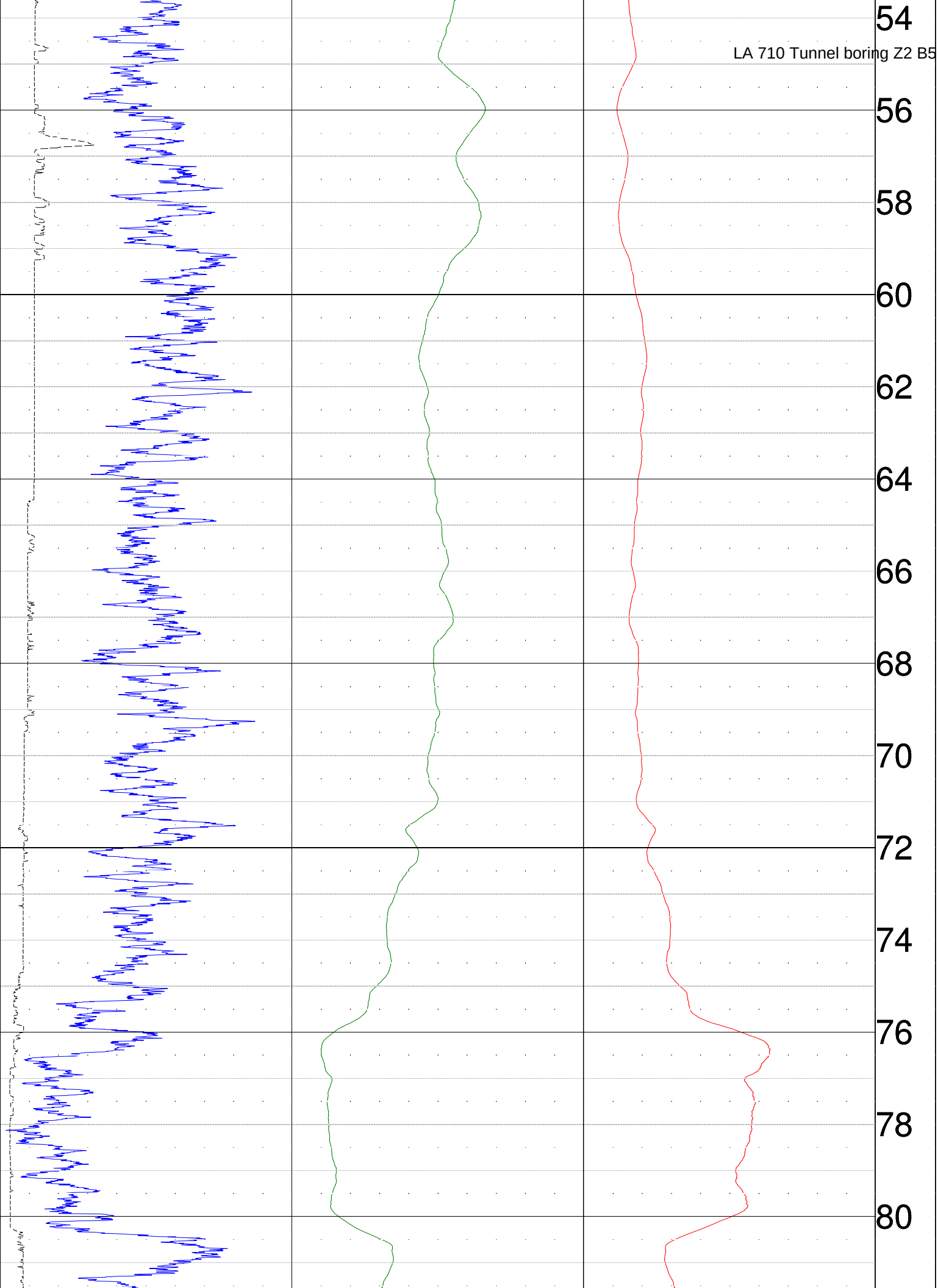
OTHER SERVICES:
IND-CAL
AC TEL
PS LOG

CALIPER LOG IS APPROXIMATE, AND STARTS AT ~82M DEPTH
EA: 07-187900. GL ELEVATION ESTIMATED FROM HANDHELD GPS 143.9M

ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS


GAMMA
58
CPS
140
CALIPER
10
CM
30
COND
36
MMHO/M
208
RES
4
OHM-M
27
METERS
LA 710 Tunnel boring Z2 B5
0
2
4
6
8
10
12
14
16
18
20
22
24


LA 710 Tunnel boring Z2 B5
26
28
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32
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44
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52


LA 710 Tunnel boring Z2 B5
54
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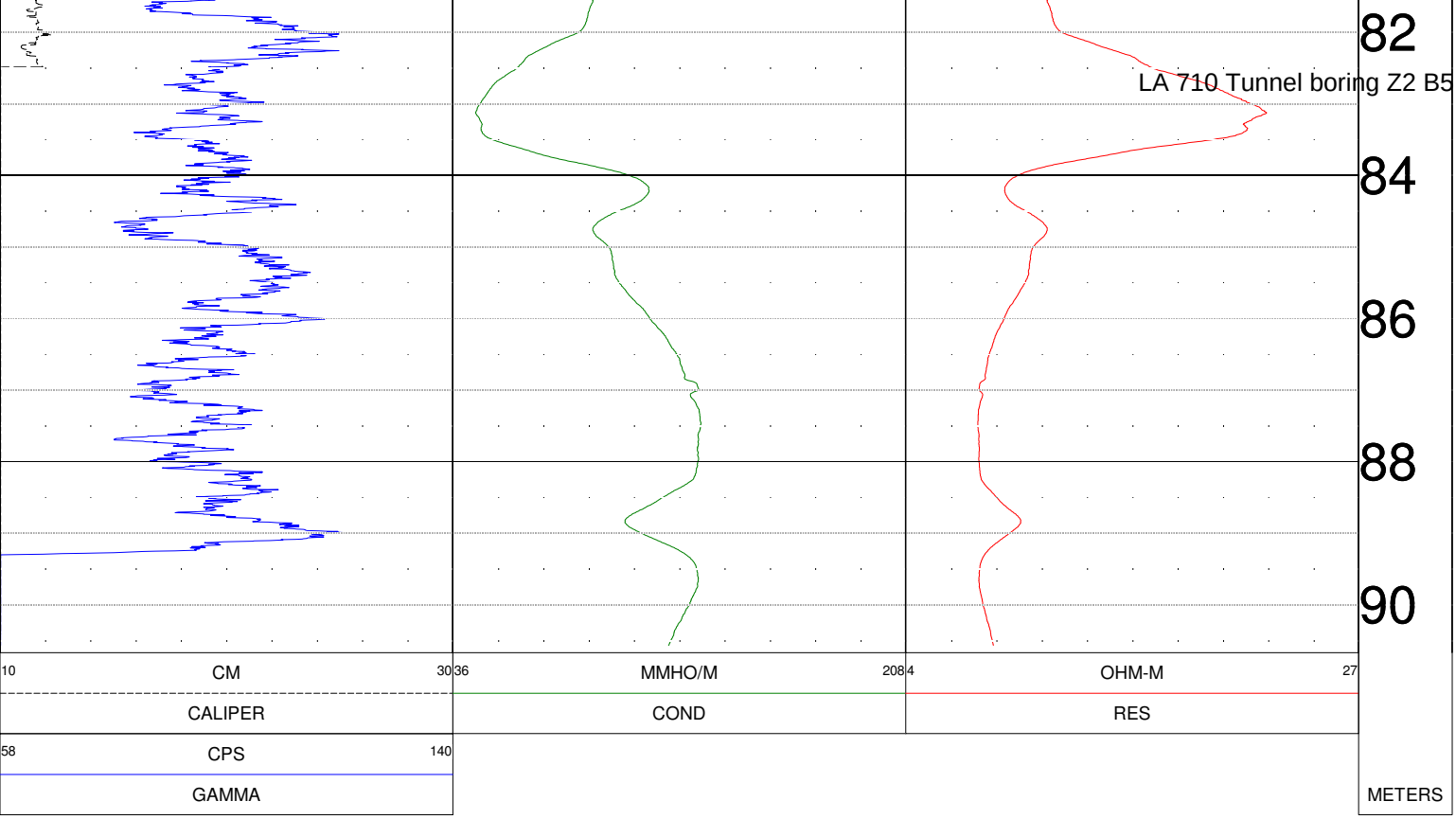

LA 710 Tunnel boring Z2 B5
82
84
86
88
90
10
CM
30
CALIPER
36
MMHO/M
208
COND
4
OHM-M
27
RES
58
CPS
140
GAMMA
METERS

Table 2. LA 710 tunnel
Boring Z2 B5
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
Not Provided	2	6.6	323	1058		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2.5	8.2	336	1101		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3	9.8	279	916		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3.5	11.5	239	785		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4	13.1	336	1101		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4.5	14.8	357	1172	625	2051	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5	16.4	321	1052	641	2103	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5.5	18.0	314	1032	806	2646	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6	19.7	365	1197	735	2412	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6.5	21.3	357	1172	714	2343	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7	23.0	342	1124	685	2247	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7.5	24.6	279	916	943	3095	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8	26.2	282	927	1515	4971	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8.5	27.9	282	924	1724	5657	0.49	2.02	126.09	0.160	0.476	5.791	3347	9950	120938
	9	29.5	313	1025	1613	5292	0.48	1.94	121.09	0.189	0.561	4.793	3956	11714	100109
	9.5	31.2	281	922	1613	5292	0.48	1.94	121.09	0.153	0.454	4.842	3196	9489	101122
	10	32.8	248	812	1493	4897	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10.5	34.4	331	1086	1449	4755	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11	36.1	379	1243	1563	5126	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11.5	37.7	360	1180	1563	5126	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12	39.4	347	1139	1613	5292	0.48	1.94	121.09	0.234	0.690	4.734	4884	14415	98872
	12.5	41.0	287	943	1613	5292	0.48	1.94	121.09	0.160	0.475	4.832	3345	9925	100924
	13	42.7	230	756	1695	5561	0.49	2.00	124.84	0.106	0.317	5.603	2217	6610	117023
	13.5	44.3	286	937	1818	5965	0.49	2.08	129.88	0.170	0.505	6.651	3547	10551	138913
	14	45.9	301	988	1724	5657	0.48	2.02	126.09	0.183	0.544	5.760	3827	11361	120298
	14.5	47.6	227	746	1613	5292	0.49	1.94	121.09	0.100	0.299	4.912	2092	6235	102594
	15	49.2	244	800	1695	5561	0.49	2.00	124.84	0.119	0.354	5.586	2485	7401	116666
	15.5	50.9	394	1292	1818	5965	0.48	2.08	129.88	0.322	0.952	6.448	6735	19874	134662
	16	52.5	424	1390	1818	5965	0.47	2.08	129.88	0.374	1.099	6.380	7802	22957	133240
	16.5	54.1	417	1367	1786	5859	0.47	2.06	128.62	0.358	1.052	6.093	7470	21981	127248
	17	55.8	345	1131	1667	5468	0.48	1.98	123.58	0.235	0.696	5.185	4916	14529	108293
	17.5	57.4	266	873	1613	5292	0.49	1.94	121.09	0.137	0.408	4.863	2865	8516	101563
	18	59.1	262	859	1724	5657	0.49	2.02	126.09	0.138	0.412	5.820	2891	8604	121547
	18.5	60.7	292	959	1818	5965	0.49	2.08	129.88	0.178	0.529	6.640	3715	11046	138688
	19	62.3	314	1032	1754	5756	0.48	2.04	127.35	0.202	0.599	6.010	4213	12500	125518
	19	62.3	292	959	1754	5756	0.49	2.04	127.35	0.174	0.518	6.046	3643	10824	126279
	19.5	64.0	294	965	1754	5756	0.49	2.04	127.35	0.176	0.524	6.044	3686	10950	126222

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 tunnel
Boring Z2 B5
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	19.5	64.0	291	954	1724	5657	0.49	2.02	126.09	0.171	0.507	5.777	3565	10590	120648
	19.5	64.0	289	948	1754	5756	0.49	2.04	127.35	0.170	0.506	6.052	3559	10578	126391
	20	65.6	287	943	1724	5657	0.49	2.02	126.09	0.167	0.496	5.782	3483	10351	120757
	20	65.6	289	948	1695	5561	0.49	2.00	124.84	0.167	0.496	5.522	3489	10361	115327
	20	65.6	282	924	1695	5561	0.49	2.00	124.84	0.159	0.472	5.533	3314	9848	115560
	20.5	67.3	313	1025	1754	5756	0.48	2.04	127.35	0.199	0.591	6.013	4161	12346	125588
	21	68.9	340	1116	1818	5965	0.48	2.08	129.88	0.241	0.713	6.557	5027	14899	136939
	21.5	70.5	345	1131	1818	5965	0.48	2.08	129.88	0.247	0.733	6.548	5167	15307	136753
	22	72.2	355	1163	1852	6076	0.48	2.10	131.15	0.264	0.782	6.852	5517	16342	143109
	22.5	73.8	336	1101	1754	5756	0.48	2.04	127.35	0.230	0.680	5.973	4798	14211	124739
	23	75.5	282	927	1695	5561	0.49	2.00	124.84	0.160	0.474	5.532	3333	9903	115535
	23.5	77.1	254	833	1724	5657	0.49	2.02	126.09	0.130	0.387	5.831	2717	8092	121778
	24	78.7	265	868	1695	5561	0.49	2.00	124.84	0.140	0.416	5.558	2923	8696	116082
	24.5	80.4	262	859	1724	5657	0.49	2.02	126.09	0.138	0.412	5.820	2891	8604	121546
	25	82.0	278	911	1724	5657	0.49	2.02	126.09	0.156	0.463	5.796	3255	9678	121061
	25.5	83.7	317	1042	1818	5965	0.48	2.08	129.88	0.210	0.622	6.598	4379	13000	137803
	26	85.3	316	1038	1786	5859	0.48	2.06	128.62	0.206	0.612	6.294	4309	12787	131463
	26.5	86.9	292	959	1724	5657	0.49	2.02	126.09	0.173	0.513	5.774	3607	10713	120592
	27	88.6	294	965	1724	5657	0.49	2.02	126.09	0.175	0.519	5.771	3649	10838	120535
	27.6	90.6	292	959	1695	5561	0.48	2.00	124.84	0.171	0.508	5.517	3571	10603	115218
	28	91.9	286	937	1695	5561	0.49	2.00	124.84	0.163	0.485	5.527	3409	10128	115433
	28.6	93.8	289	948	1695	5561	0.49	2.00	124.84	0.167	0.496	5.522	3489	10361	115327
	29.1	95.5	275	901	1724	5657	0.49	2.02	126.09	0.152	0.453	5.801	3184	9469	121156
	29.6	97.1	267	877	1667	5468	0.49	1.98	123.58	0.142	0.421	5.310	2956	8789	110907
	30.1	98.8	279	916	1724	5657	0.49	2.02	126.09	0.158	0.469	5.794	3291	9786	121012
	30.6	100.4	296	971	1724	5657	0.48	2.02	126.09	0.177	0.525	5.769	3693	10966	120478
	31.1	102.0	321	1052	1724	5657	0.48	2.02	126.09	0.207	0.615	5.728	4334	12846	119623
	31.6	103.7	345	1131	1754	5756	0.48	2.04	127.35	0.243	0.718	5.955	5066	14995	124381
	32.1	105.3	342	1124	1754	5756	0.48	2.04	127.35	0.239	0.708	5.960	4997	14793	124474
	33.1	108.6	331	1086	1724	5657	0.48	2.02	126.09	0.221	0.656	5.709	4625	13699	119234
	33.1	108.6	338	1108	1724	5657	0.48	2.02	126.09	0.231	0.682	5.697	4815	14252	118981
	33.6	110.2	331	1086	1724	5657	0.48	2.02	126.09	0.221	0.656	5.709	4625	13699	119234
	34.1	111.9	325	1065	1695	5561	0.48	2.00	124.84	0.211	0.624	5.464	4403	13040	114109
	34.6	113.5	321	1052	1724	5657	0.48	2.02	126.09	0.207	0.615	5.728	4334	12846	119623
	35	114.8	311	1019	1724	5657	0.48	2.02	126.09	0.195	0.578	5.745	4069	12069	119976
	35.6	116.8	316	1038	1754	5756	0.48	2.04	127.35	0.204	0.606	6.006	4267	12657	125447
	36.1	118.4	311	1019	1754	5756	0.48	2.04	127.35	0.197	0.584	6.017	4109	12195	125658

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 tunnel
Boring Z2 B5
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	36.6	120.1	303	994	1754	5756	0.48	2.04	127.35	0.187	0.556	6.029	3912	11617	125920
	37.1	121.7	299	982	1754	5756	0.49	2.04	127.35	0.183	0.543	6.035	3819	11343	126044
	37.6	123.4	294	965	1724	5657	0.49	2.02	126.09	0.175	0.519	5.771	3649	10838	120535
	38.1	125.0	291	954	1724	5657	0.49	2.02	126.09	0.171	0.507	5.777	3565	10590	120648
	38.6	126.6	299	982	1667	5468	0.48	1.98	123.58	0.177	0.526	5.262	3706	10995	109906
	39.6	129.9	379	1243	1667	5468	0.47	1.98	123.58	0.284	0.837	5.120	5932	17474	106938
	40.1	131.6	373	1224	1639	5378	0.47	1.96	122.33	0.273	0.804	4.903	5698	16783	102391
	40.6	133.2	397	1302	1667	5468	0.47	1.98	123.58	0.312	0.916	5.083	6511	19141	106167
	41.1	134.8	424	1390	1695	5561	0.47	2.00	124.84	0.359	1.053	5.266	7499	21996	109981
	41.6	136.5	424	1390	1695	5561	0.47	2.00	124.84	0.359	1.053	5.266	7499	21996	109981
	42.1	138.1	424	1390	1695	5561	0.47	2.00	124.84	0.359	1.053	5.266	7499	21996	109981
	43.1	141.4	417	1367	1695	5561	0.47	2.00	124.84	0.347	1.019	5.282	7251	21286	110311
	43.1	141.4	424	1390	1667	5468	0.47	1.98	123.58	0.355	1.042	5.025	7423	21757	104950
	43.6	143.0	410	1345	1639	5378	0.47	1.96	122.33	0.329	0.965	4.827	6874	20165	100823
	44.1	144.7	385	1262	1613	5292	0.47	1.94	121.09	0.287	0.843	4.663	5993	17616	97394
	44.6	146.3	376	1233	1587	5208	0.47	1.92	119.84	0.271	0.798	4.475	5666	16662	93460
	45	147.6	382	1252	1613	5292	0.47	1.94	121.09	0.283	0.831	4.669	5901	17354	97515
	45.1	148.0	391	1282	1587	5208	0.47	1.92	119.84	0.293	0.860	4.446	6118	17959	92859
	45.5	149.3	395	1297	1639	5378	0.47	1.96	122.33	0.306	0.900	4.858	6394	18787	101464
	45.6	149.6	413	1356	1613	5292	0.46	1.94	121.09	0.331	0.970	4.604	6917	20265	96161
	46	150.9	400	1312	1639	5378	0.47	1.96	122.33	0.314	0.921	4.848	6548	19230	101258
	46.1	151.2	435	1426	1639	5378	0.46	1.96	122.33	0.370	1.083	4.772	7737	22625	99673
	46.5	152.6	424	1390	1639	5378	0.46	1.96	122.33	0.352	1.030	4.797	7348	21519	100191
	47	154.2	495	1624	1695	5561	0.45	2.00	124.84	0.490	1.425	5.091	10235	29752	106332
	47.1	154.5	467	1533	1667	5468	0.46	1.98	123.58	0.432	1.260	4.923	9028	26314	102811
	47.1	154.5	526	1727	1695	5561	0.45	2.00	124.84	0.554	1.603	5.006	11569	33473	104553
	47.5	155.8	500	1640	1695	5561	0.45	2.00	124.84	0.500	1.452	5.078	10441	30328	106057
	47.6	156.2	575	1886	1695	5561	0.44	2.00	124.84	0.660	1.896	4.864	13795	39592	101586
	48	157.5	490	1608	1639	5378	0.45	1.96	122.33	0.471	1.366	4.638	9834	28538	96876
	48	157.5	521	1709	1695	5561	0.45	2.00	124.84	0.542	1.571	5.021	11329	32807	104873
	48.5	159.1	633	2076	1667	5468	0.42	1.98	123.58	0.793	2.245	4.442	16562	46895	92766
	48.5	159.1	459	1505	1667	5468	0.46	1.98	123.58	0.417	1.216	4.944	8700	25387	103248
	49	160.8	510	1674	1695	5561	0.45	2.00	124.84	0.521	1.510	5.051	10872	31532	105483
	49	160.8	433	1420	1613	5292	0.46	1.94	121.09	0.363	1.062	4.561	7592	22185	95261
	49.5	162.4	402	1318	1754	5756	0.47	2.04	127.35	0.329	0.969	5.840	6872	20236	121974
	49.5	162.4	435	1426	1667	5468	0.46	1.98	123.58	0.374	1.095	5.000	7816	22877	104427
	50	164.0	481	1577	1695	5561	0.46	2.00	124.84	0.462	1.346	5.128	9653	28116	107108

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Table 2. LA 710 tunnel
Boring Z2 B5
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	50.5	165.7	472	1548	1961	6433	0.47	2.16	134.97	0.481	1.414	7.671	10047	29523	160208
	50.5	165.7	398	1307	1786	5859	0.47	2.06	128.62	0.327	0.964	6.134	6830	20132	128102
	50.5	165.7	543	1783	1754	5756	0.45	2.04	127.35	0.603	1.744	5.475	12585	36418	114357
	51	167.3	521	1709	1786	5859	0.45	2.06	128.62	0.559	1.625	5.824	11672	33931	121645
	51	167.3	476	1562	1786	5859	0.46	2.06	128.62	0.467	1.366	5.947	9757	28524	124199
	51.5	169.0	521	1709	1754	5756	0.45	2.04	127.35	0.553	1.607	5.541	11558	33556	115726
	51.5	169.0	476	1562	1613	5292	0.45	1.94	121.09	0.440	1.277	4.459	9186	26680	93136
	52	170.6	476	1562	1724	5657	0.46	2.02	126.09	0.458	1.336	5.394	9566	27907	112647
	52	170.6	481	1577	1754	5756	0.46	2.04	127.35	0.472	1.376	5.650	9848	28744	118006
	52.5	172.2	472	1548	1754	5756	0.46	2.04	127.35	0.454	1.326	5.674	9480	27701	118497
	53	173.9	467	1533	1786	5859	0.46	2.06	128.62	0.450	1.317	5.970	9396	27496	124680
	53	173.9	467	1533	1754	5756	0.46	2.04	127.35	0.445	1.302	5.685	9303	27200	118732
	53	173.9	472	1548	1754	5756	0.46	2.04	127.35	0.454	1.326	5.674	9480	27701	118496
	53.5	175.5	476	1562	1563	5126	NA	NA	NA	NA	NA	NA	NA	NA	NA
	53.5	175.5	505	1657	1786	5859	0.46	2.06	128.62	0.526	1.531	5.869	10976	31972	122574
	54	177.2	455	1491	1724	5657	0.46	2.02	126.09	0.417	1.221	5.448	8716	25497	113780
	54	177.2	510	1674	1786	5859	0.46	2.06	128.62	0.536	1.561	5.855	11201	32606	122274
	54.5	178.8	532	1745	1754	5756	0.45	2.04	127.35	0.577	1.673	5.509	12055	34944	115064
	54.5	178.8	500	1640	1818	5965	0.46	2.08	129.88	0.520	1.518	6.184	10863	31700	129158
	55	180.4	541	1773	1786	5859	0.45	2.06	128.62	0.602	1.745	5.767	12572	36449	120445
	55	180.4	532	1745	1887	6190	0.46	2.12	132.42	0.600	1.749	6.751	12534	36521	140998
	55.5	182.1	575	1886	1786	5859	0.44	2.06	128.62	0.680	1.963	5.662	14212	40994	118258
	55.5	182.1	556	1823	1818	5965	0.45	2.08	129.88	0.642	1.860	6.021	13411	38852	125761
	56	183.7	515	1691	1852	6076	0.46	2.10	131.15	0.558	1.628	6.460	11658	33995	134922
	56	183.7	556	1823	1818	5965	0.45	2.08	129.88	0.642	1.860	6.021	13411	38852	125760
	56.5	185.4	510	1674	1852	6076	0.46	2.10	131.15	0.547	1.596	6.475	11421	33326	135237
	56.5	185.4	495	1624	1887	6190	0.46	2.12	132.42	0.520	1.521	6.858	10857	31768	143235
	57	187.0	474	1555	1887	6190	0.47	2.12	132.42	0.476	1.397	6.916	9951	29182	144444
	57	187.0	526	1727	2174	7132	0.47	2.26	141.40	0.627	1.843	9.867	13104	38496	206085
	57.5	188.6	556	1823	1786	5859	0.45	2.06	128.62	0.636	1.839	5.722	13280	38418	119501
	57.5	188.6	578	1896	1923	6309	0.45	2.14	133.69	0.716	2.076	6.966	14944	43349	145485
	58	190.3	562	1843	1852	6076	0.45	2.10	131.15	0.663	1.922	6.320	13848	40140	132002
	58	190.3	532	1745	1724	5657	0.45	2.02	126.09	0.571	1.654	5.242	11936	34551	109487
	58.5	191.9	524	1718	1818	5965	0.45	2.08	129.88	0.570	1.659	6.117	11911	34655	127761
	58.5	191.9	503	1649	1786	5859	0.46	2.06	128.62	0.520	1.516	5.876	10866	31662	122721
	59	193.6	500	1640	1852	6076	0.46	2.10	131.15	0.525	1.534	6.504	10969	32044	135841
	59	193.6	508	1665	1818	5965	0.46	2.08	129.88	0.536	1.563	6.163	11196	32642	128713

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Boring Z2 B5
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	59.5	195.2	602	1976	1852	6076	0.44	2.10	131.15	0.762	2.197	6.188	15922	45883	129236
	59.5	195.2	571	1875	1852	6076	0.45	2.10	131.15	0.686	1.986	6.290	14327	41473	131363
	60	196.9	532	1745	1852	6076	0.46	2.10	131.15	0.594	1.730	6.412	12414	36126	133914
	60	196.9	521	1709	1786	5859	0.45	2.06	128.62	0.559	1.625	5.824	11672	33931	121645
	60	196.9	500	1640	1818	5965	0.46	2.08	129.88	0.520	1.518	6.184	10863	31700	129158
	60.5	198.5	549	1803	1818	5965	0.45	2.08	129.88	0.628	1.821	6.040	13118	38035	126151
	60.5	198.5	538	1764	1786	5859	0.45	2.06	128.62	0.596	1.727	5.776	12437	36072	120625
	61	200.1	521	1709	1852	6076	0.46	2.10	131.15	0.570	1.661	6.445	11902	34684	134596
	61	200.1	515	1691	1852	6076	0.46	2.10	131.15	0.558	1.628	6.460	11658	33995	134922
	61	200.1	521	1709	1852	6076	0.46	2.10	131.15	0.570	1.661	6.445	11902	34684	134596
	61.5	201.8	495	1624	1818	5965	0.46	2.08	129.88	0.510	1.489	6.198	10649	31094	129443
	61.5	201.8	549	1803	1852	6076	0.45	2.10	131.15	0.634	1.841	6.359	13246	38459	132805
	62	203.4	667	2187	1786	5859	0.42	2.06	128.62	0.916	2.599	5.349	19124	54274	111710
	62	203.4	532	1745	1818	5965	0.45	2.08	129.88	0.589	1.711	6.093	12294	35731	127250
	62.5	205.1	556	1823	1852	6076	0.45	2.10	131.15	0.648	1.881	6.340	13542	39286	132410
	62.5	205.1	588	1930	1786	5859	0.44	2.06	128.62	0.713	2.052	5.619	14889	42854	117356
	63	206.7	602	1976	1852	6076	0.44	2.10	131.15	0.762	2.197	6.188	15922	45883	129236
	63	206.7	641	2103	1818	5965	0.43	2.08	129.88	0.855	2.443	5.738	17855	51030	119835
	63.5	208.3	610	2001	1786	5859	0.43	2.06	128.62	0.766	2.197	5.548	15998	45883	115877
	63.5	208.3	587	1924	1818	5965	0.44	2.08	129.88	0.716	2.064	5.923	14947	43105	123712
	64	210.0	602	1976	1667	5468	0.42	1.98	123.58	0.718	2.047	4.541	15004	42758	94843
	64.5	211.6	585	1919	1818	5965	0.44	2.08	129.88	0.711	2.052	5.929	14860	42865	123829
	64.5	211.6	602	1976	1786	5859	0.44	2.06	128.62	0.748	2.147	5.573	15615	44840	116388
	65	213.3	543	1783	1667	5468	0.44	1.98	123.58	0.585	1.685	4.719	12212	35183	98565
	65	213.3	541	1773	1667	5468	0.44	1.98	123.58	0.578	1.667	4.728	12080	34821	98741
	65	213.3	575	1886	1818	5965	0.44	2.08	129.88	0.687	1.985	5.961	14352	41462	124506
	65.5	214.9	543	1783	1818	5965	0.45	2.08	129.88	0.615	1.783	6.058	12834	37244	126529
	66	216.5	513	1682	1754	5756	0.45	2.04	127.35	0.536	1.559	5.564	11205	32568	116196
	66.5	218.2	493	1616	1818	5965	0.46	2.08	129.88	0.505	1.475	6.204	10544	30797	129583
	67	219.8	518	1700	1786	5859	0.45	2.06	128.62	0.553	1.608	5.832	11552	33593	121806
	67.5	221.5	571	1875	1754	5756	0.44	2.04	127.35	0.666	1.919	5.391	13912	40086	112586
	68	223.1	625	2051	1786	5859	0.43	2.06	128.62	0.805	2.302	5.497	16808	48078	114797
	68.5	224.7	625	2051	1818	5965	0.43	2.08	129.88	0.813	2.329	5.794	16973	48645	121011
	68.5	224.7	641	2103	1852	6076	0.43	2.10	131.15	0.863	2.472	6.053	18029	51633	126427
	69.5	228.0	617	2025	1818	5965	0.43	2.08	129.88	0.793	2.275	5.821	16557	47513	121566
	70	229.7	637	2090	1887	6190	0.44	2.12	132.42	0.861	2.471	6.404	17973	51607	133747
	70.5	231.3	667	2187	1852	6076	0.43	2.10	131.15	0.934	2.662	5.959	19500	55598	124465

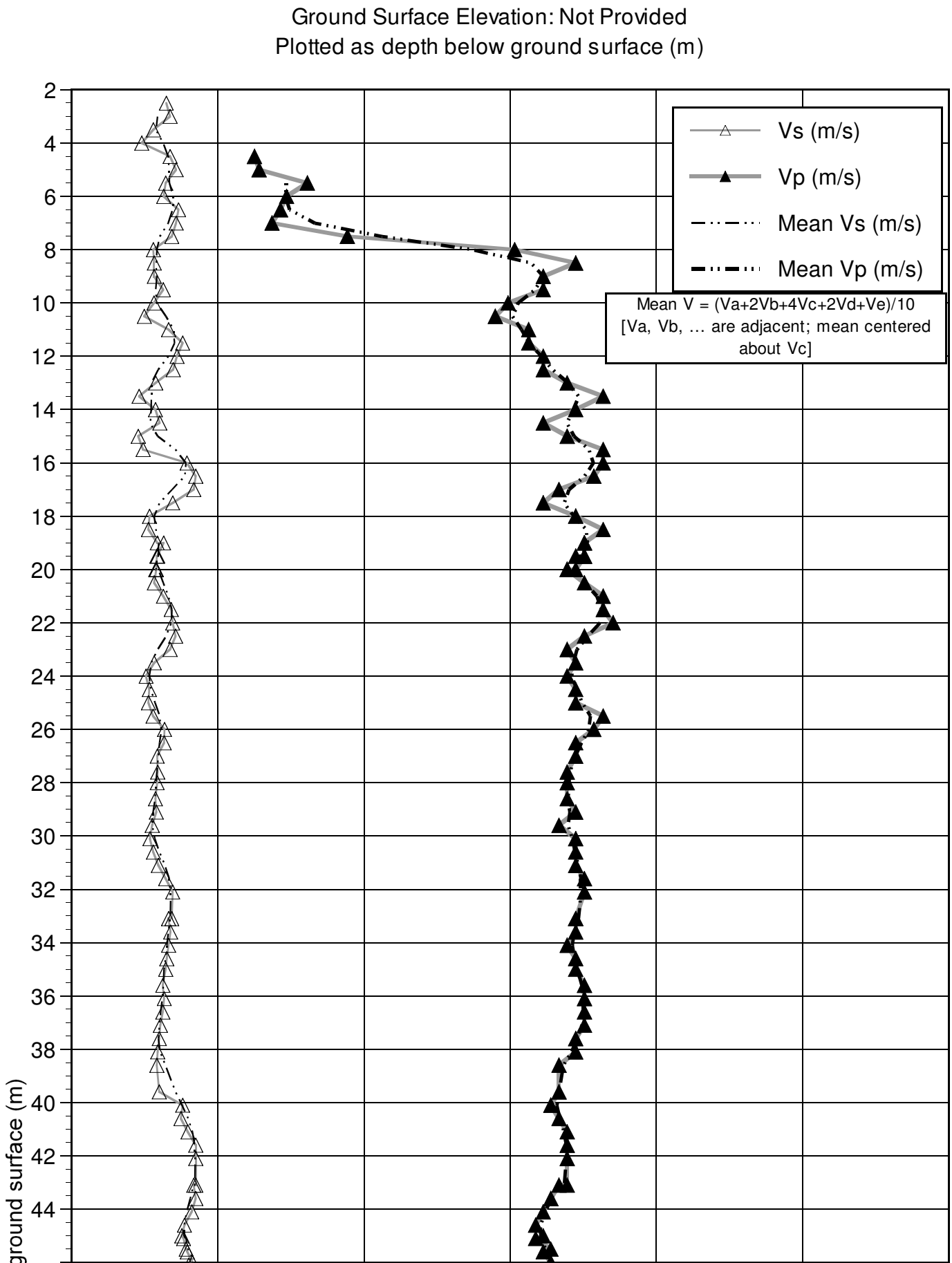
γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

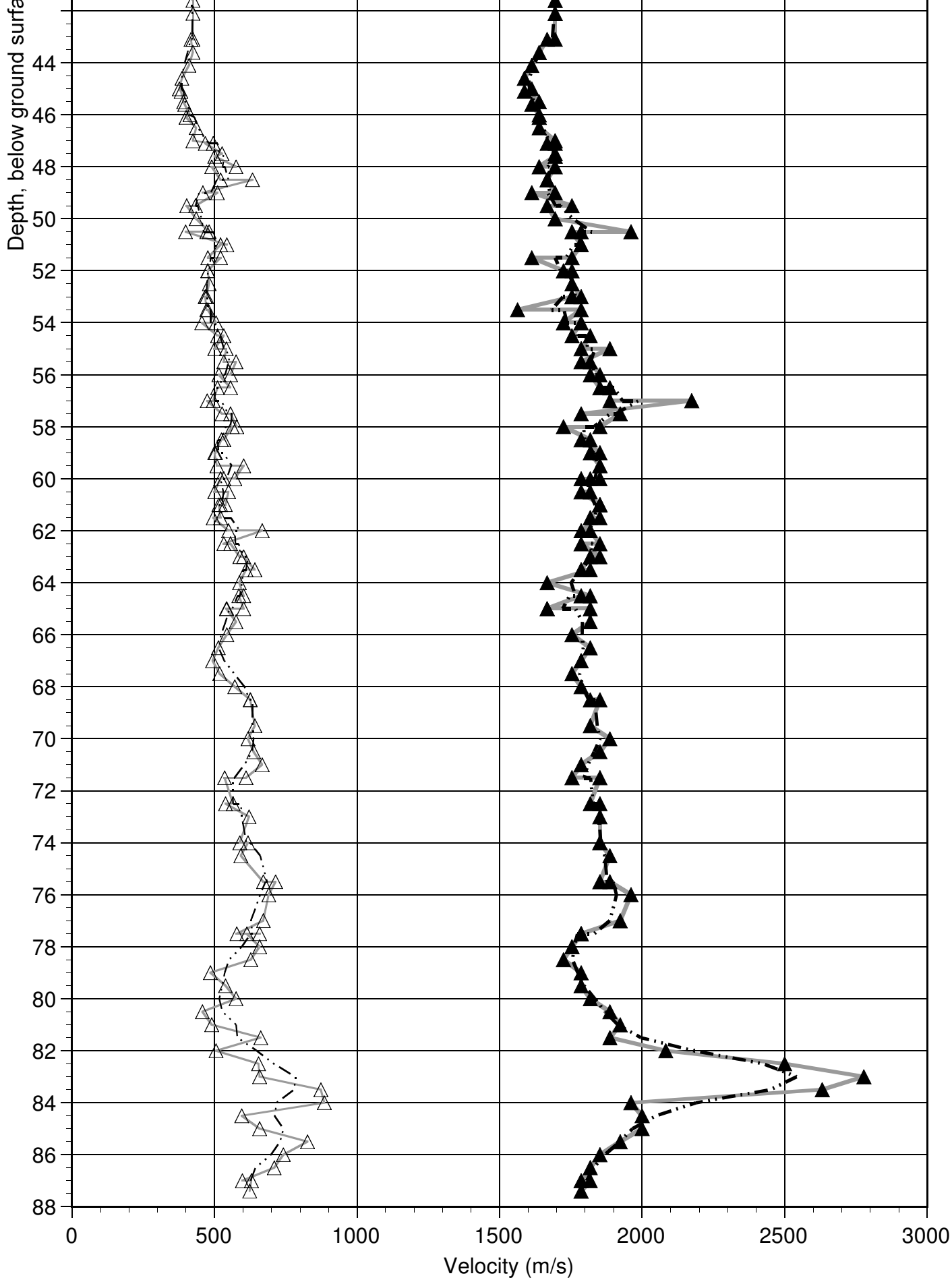
Table 2. LA 710 tunnel
Boring Z2 B5
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	71	232.9	610	2001	1786	5859	0.43	2.06	128.62	0.766	2.197	5.548	15998	45883	115877
	71.5	234.6	535	1754	1754	5756	0.45	2.04	127.35	0.583	1.690	5.501	12184	35304	114891
	71.5	234.6	565	1854	1852	6076	0.45	2.10	131.15	0.671	1.943	6.310	14005	40577	131793
	72.5	237.9	538	1764	1818	5965	0.45	2.08	129.88	0.601	1.746	6.076	12560	36476	126895
	72.5	237.9	621	2038	1852	6076	0.44	2.10	131.15	0.810	2.329	6.124	16927	48635	127896
	73	239.5	588	1930	1852	6076	0.44	2.10	131.15	0.727	2.099	6.235	15182	43842	130223
	74	242.8	617	2025	1852	6076	0.44	2.10	131.15	0.800	2.301	6.137	16718	48065	128175
	74	242.8	592	1941	1852	6076	0.44	2.10	131.15	0.736	2.123	6.224	15362	44340	129983
	74.5	244.4	671	2202	1887	6190	0.43	2.12	132.42	0.955	2.728	6.277	19955	56973	131105
	75.5	247.7	714	2343	1852	6076	0.41	2.10	131.15	1.072	3.028	5.775	22386	63244	120618
	75.5	247.7	690	2263	1887	6190	0.42	2.12	132.42	1.009	2.871	6.206	21071	59963	129617
	76	249.3	671	2202	1961	6433	0.43	2.16	134.97	0.974	2.792	7.014	20339	58317	146485
	77	252.6	578	1896	1923	6309	0.45	2.14	133.69	0.716	2.076	6.966	14944	43349	145485
	77.5	254.3	658	2158	1786	5859	0.42	2.06	128.62	0.892	2.535	5.381	18624	52947	112376
	77.5	254.3	613	2013	1786	5859	0.43	2.06	128.62	0.775	2.222	5.536	16195	46418	115615
	77.5	254.3	658	2158	1786	5859	0.42	2.06	128.62	0.892	2.535	5.381	18624	52947	112376
	78	255.9	627	2057	1754	5756	0.43	2.04	127.35	0.802	2.288	5.210	16748	47791	108806
	78.5	257.5	485	1593	1724	5657	0.46	2.02	126.09	0.476	1.387	5.370	9941	28967	112147
	79	259.2	538	1764	1786	5859	0.45	2.06	128.62	0.596	1.727	5.776	12437	36072	120625
	79.5	260.8	575	1886	1786	5859	0.44	2.06	128.62	0.680	1.963	5.662	14212	40994	118259
	80	262.5	457	1498	1818	5965	0.47	2.08	129.88	0.434	1.272	6.299	9060	26569	131562
	80.5	264.1	490	1608	1887	6190	0.46	2.12	132.42	0.510	1.492	6.872	10645	31165	143517
	81	265.7	662	2173	1923	6309	0.43	2.14	133.69	0.939	2.691	6.668	19616	56210	139256
	81.5	267.4	505	1657	1887	6190	0.46	2.12	132.42	0.541	1.581	6.830	11300	33028	142644
	82	269.0	654	2144	2083	6835	0.45	2.22	138.82	0.950	2.746	8.385	19839	57352	175117
	82.5	270.7	658	2158	2500	8202	0.46	2.39	149.21	1.035	3.027	13.559	21606	63210	283181
	83	272.3	873	2865	2778	9113	0.45	2.47	154.48	1.887	5.455	16.577	39420	113936	346210
	83.5	274.0	885	2903	2632	8634	0.44	2.43	151.84	1.905	5.471	14.304	39782	114273	298739
	84	275.6	595	1953	1961	6433	0.45	2.16	134.97	0.766	2.220	7.291	15999	46372	152272
	84.5	277.2	658	2158	2000	6562	0.44	2.18	136.25	0.945	2.719	7.471	19729	56794	156024
	85	278.9	826	2711	2000	6562	0.40	2.18	136.25	1.491	4.165	6.742	31133	86989	140818
	85.5	280.5	741	2430	1923	6309	0.41	2.14	133.69	1.175	3.320	6.353	24542	69349	132689
	86	282.2	709	2327	1852	6076	0.41	2.10	131.15	1.057	2.988	5.795	22069	62414	121040
	86.5	283.8	597	1959	1818	5965	0.44	2.08	129.88	0.742	2.135	5.889	15487	44590	122992
	87	285.4	629	2063	1786	5859	0.43	2.06	128.62	0.815	2.329	5.483	17020	48650	114515
	87	285.4	623	2044	1818	5965	0.43	2.08	129.88	0.808	2.315	5.801	16868	48359	121152
	87.4	286.7	592	1941	1786	5859	0.44	2.06	128.62	0.721	2.075	5.608	15065	43338	117121

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Figure 1. LA 710 Tunnel
Boring Z2 B5
Downhole Interval Velocities



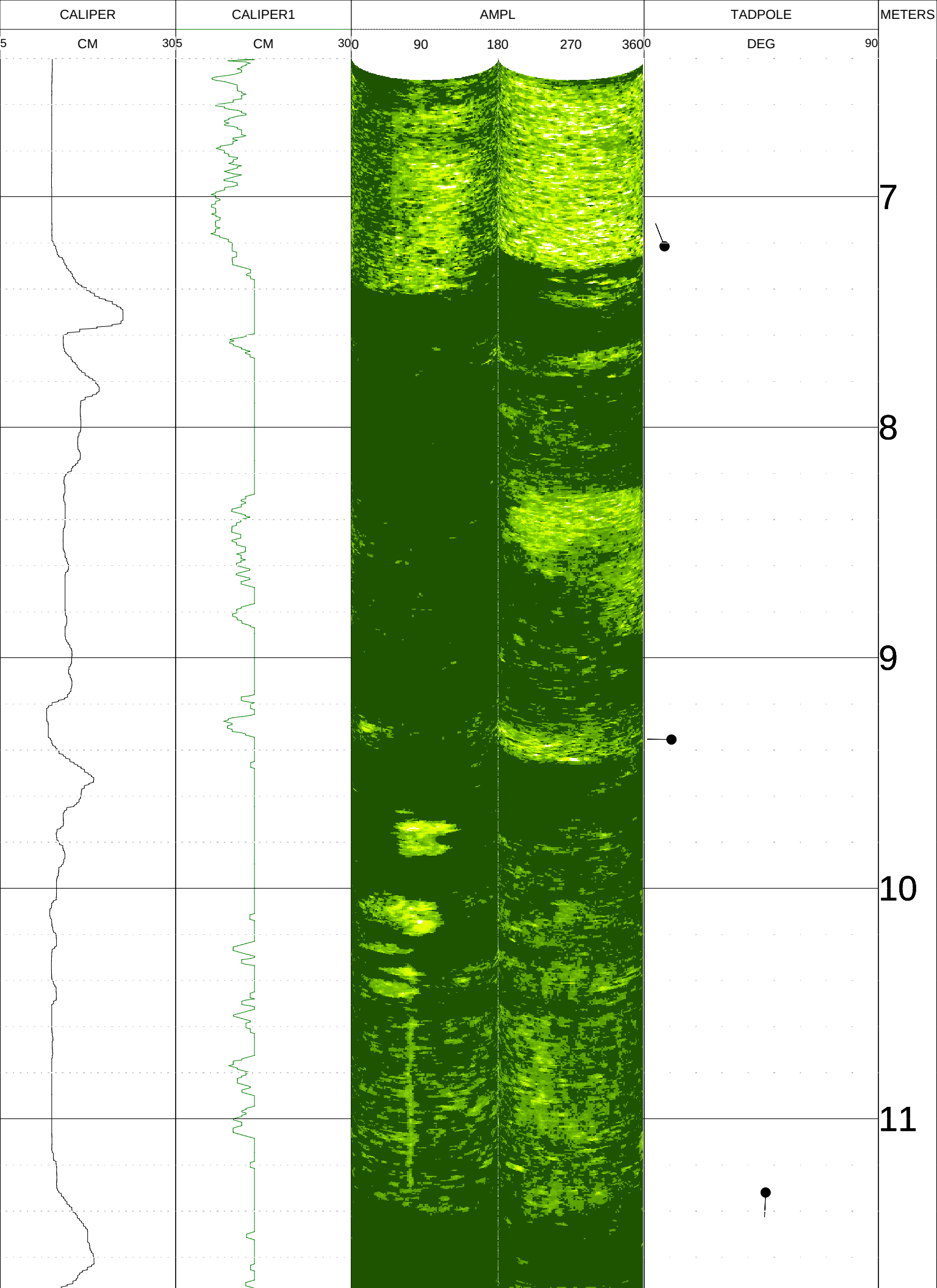

Depth, below ground surfa
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78
80
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86
88
0
500
1000
1500
2000
2500
3000
Velocity (m/s)

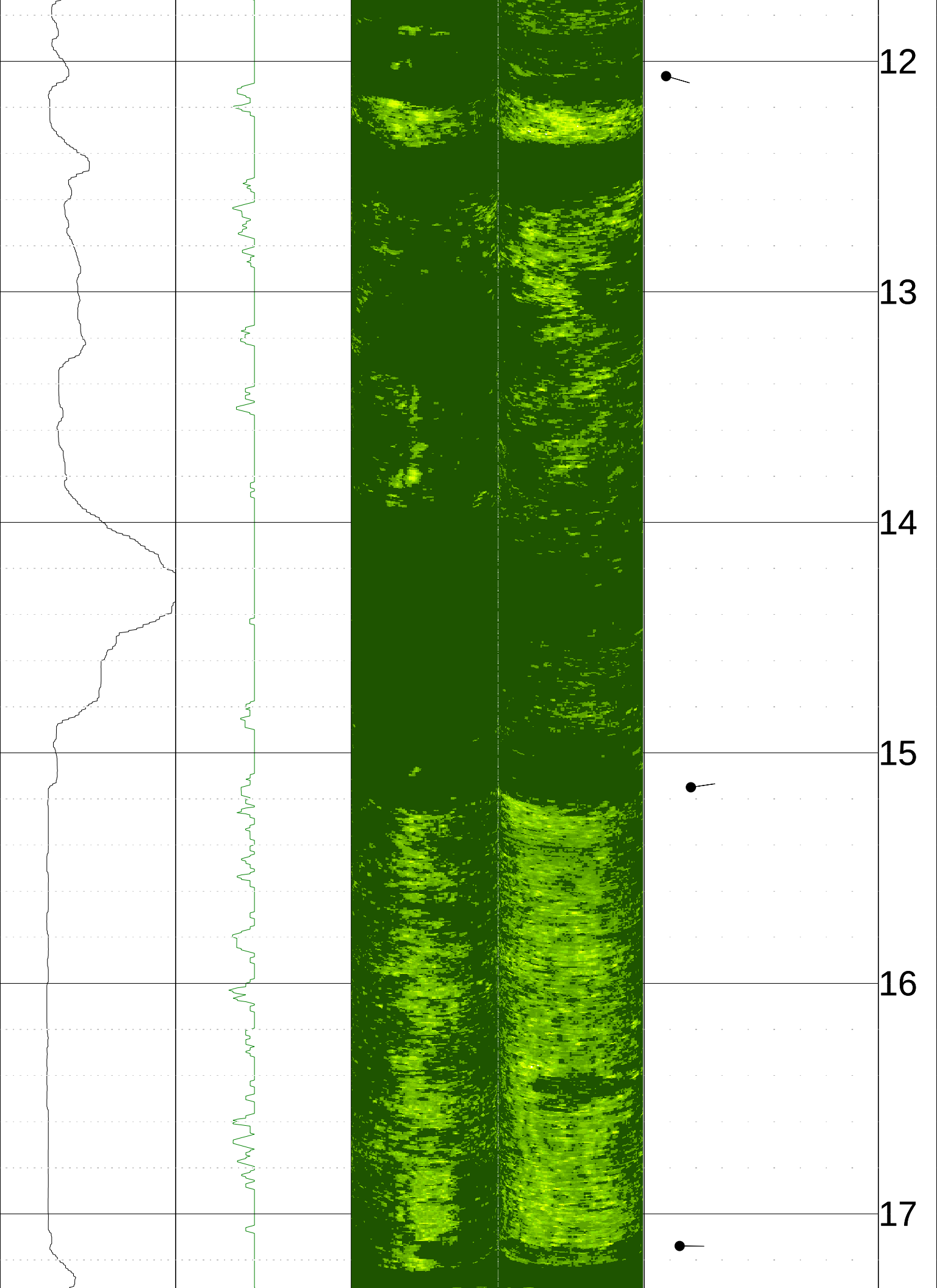
California Department of Transportation
Geophysical Services

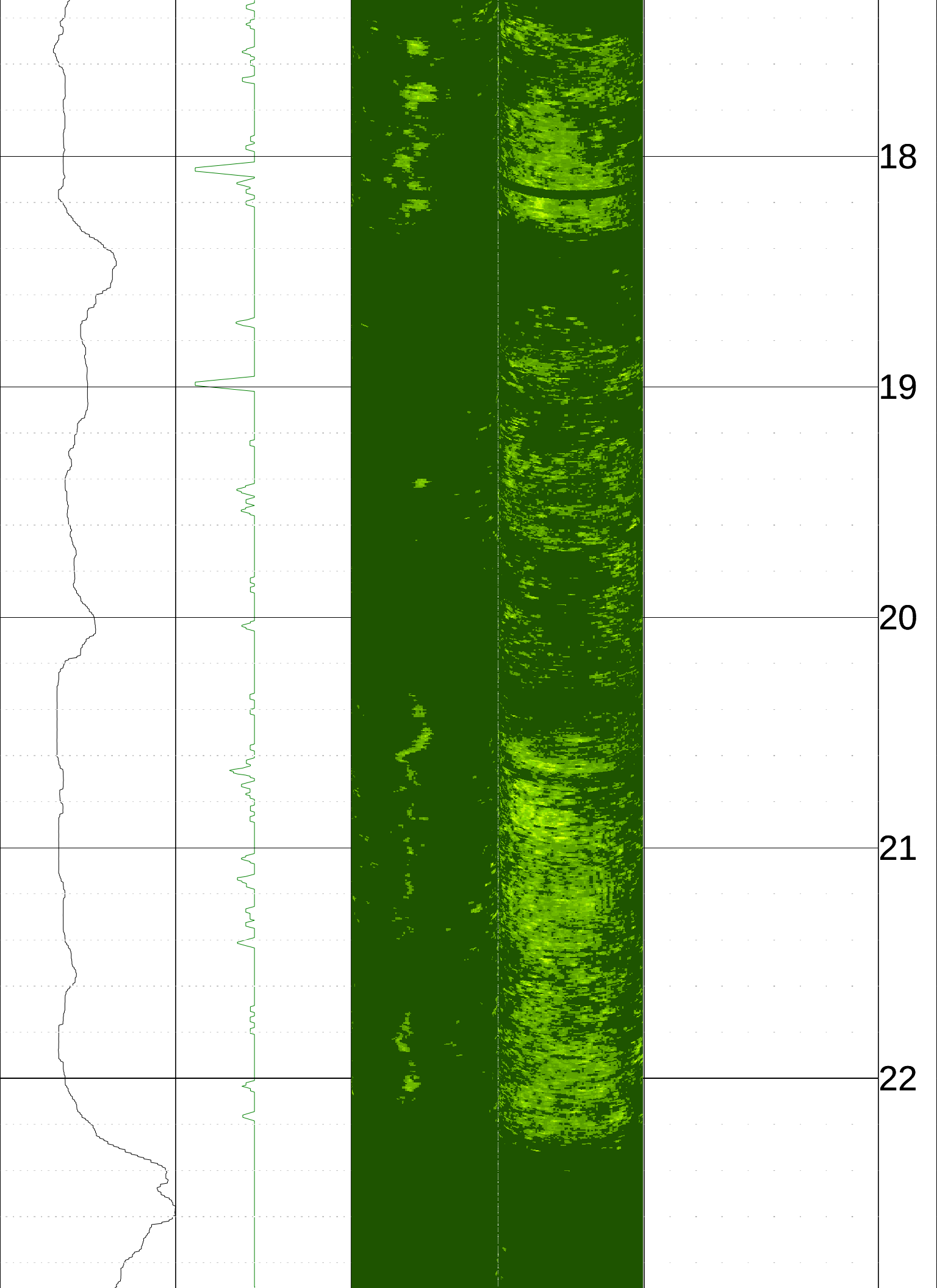
Z2 B5

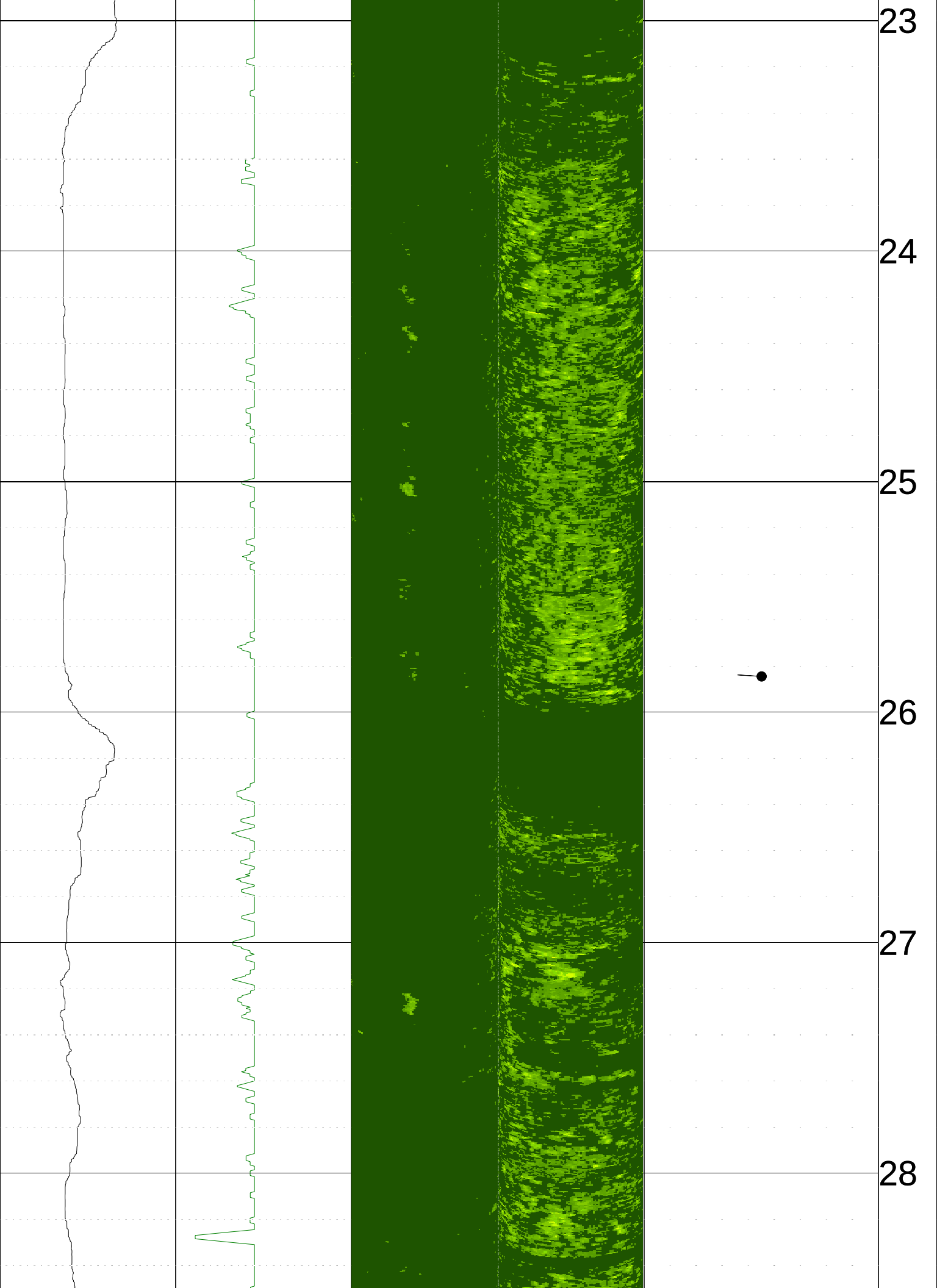
COMPANY	: CALTRANS	OTHER SERVICES:	
WELL	: Z2 B5		IND-CAL.
FIELD	: LA-710 Tunnel.		AC TEL.
COUNTY	: LA		PSLOG.
STATE	: CA		
LOCATION	:		
SECTION	: None		
TOWNSHIP	: NONE		
RANGE	: None		
API NO.	:		
UNIQUE WELL ID.	:		
PERMANENT DATUM	: None	ELEVATION KB	: NA
LOG MEASURED FROM	: GL	ELEVATION DF	: NA
DRL MEASURED FROM	: GL	ELEVATION GL	: 143.86
DATE	: 04/14/09	RIG NUMBER	:
DEPTH DRILLER	: 91.44m	LOGGER TD	:
BIT SIZE	: 10.8cm.	ARRIVAL TIME	:
LOG TOP	: 5.00	DEPARTURE TIME	:
LOG BOTTOM	: 90.00	CIRC STOPPED	: 4/14 AM
CASING OD	:		
CASING BOTTOM	: n/a		
CASING TYPE	: n/a		
BOREHOLE FLUID	: 0		
RM TEMPERATURE	: 0		
MUD RES	: 0		
MUD WEIGHT	:		
WITNESSED BY	:		
RECORDED BY	: DH/DL		
REMARKS 1	: POORLY INDUR., SOIL-LIKE MATERIAL, POOR QUAL. ATV LOG.		
REMARKS 2	: BH COLLAPSE NEAR BOTTOM, NO MECH. CAL. AVAIL BELOW -82.6 M		

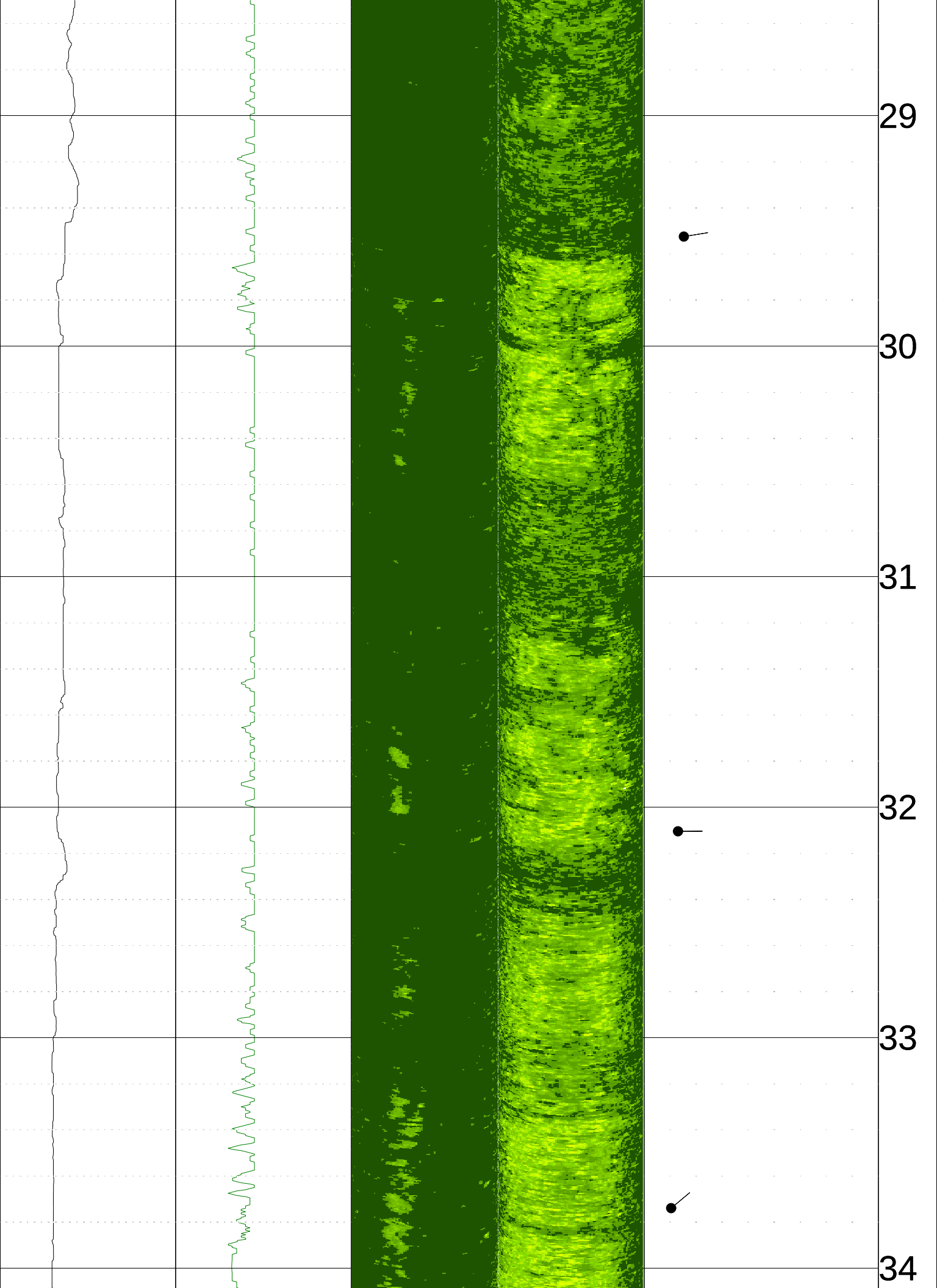
ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS

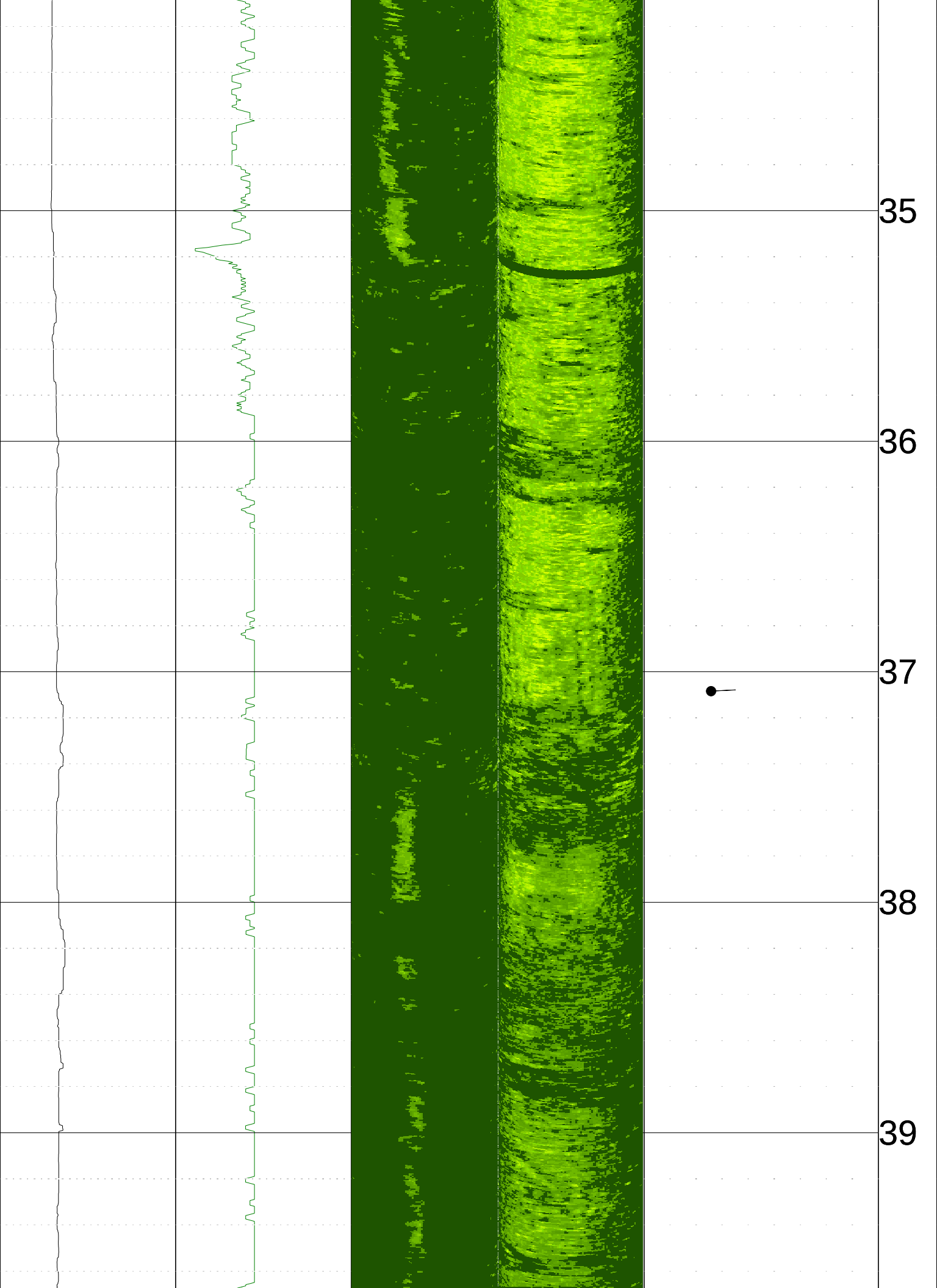

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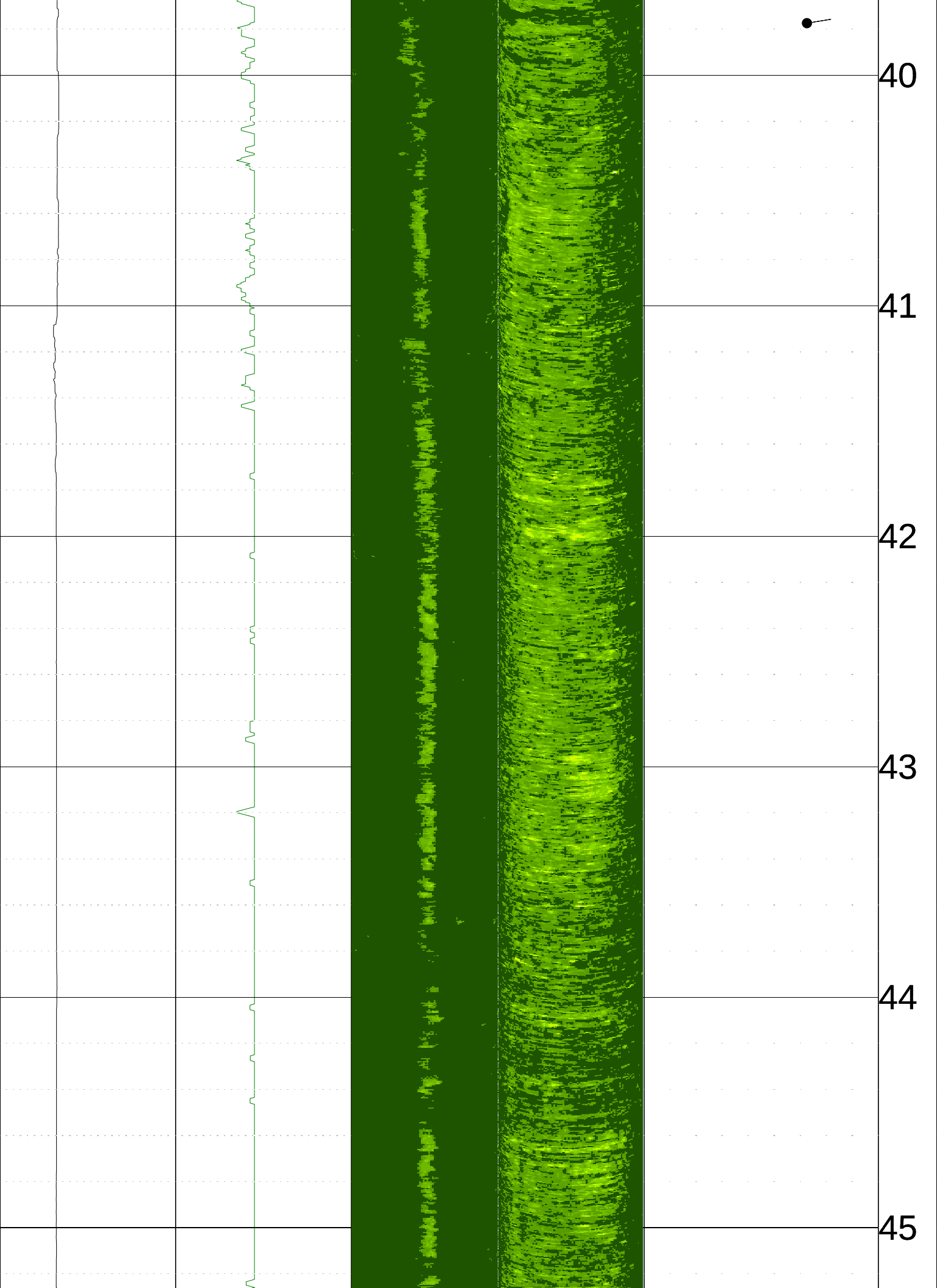

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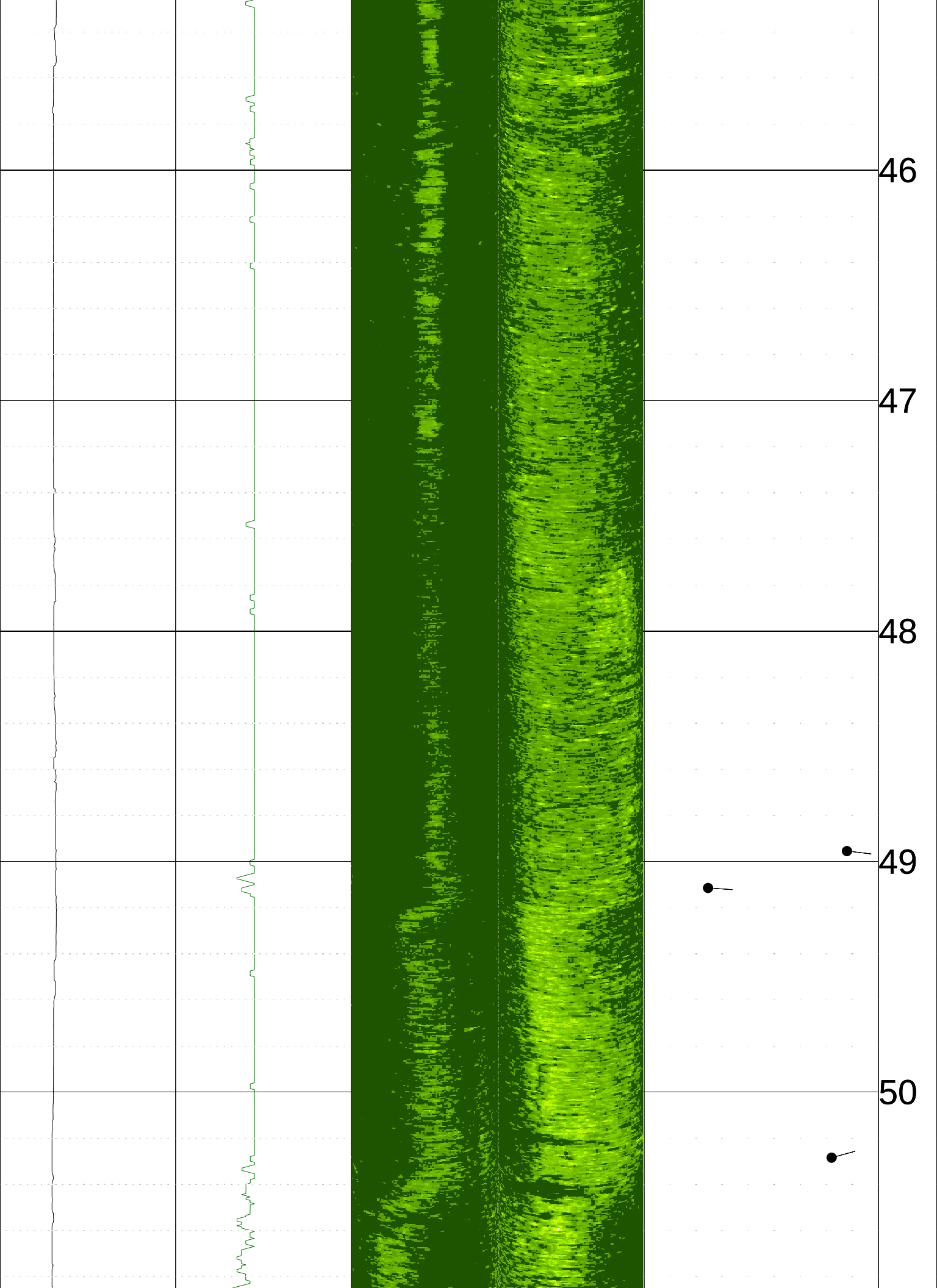

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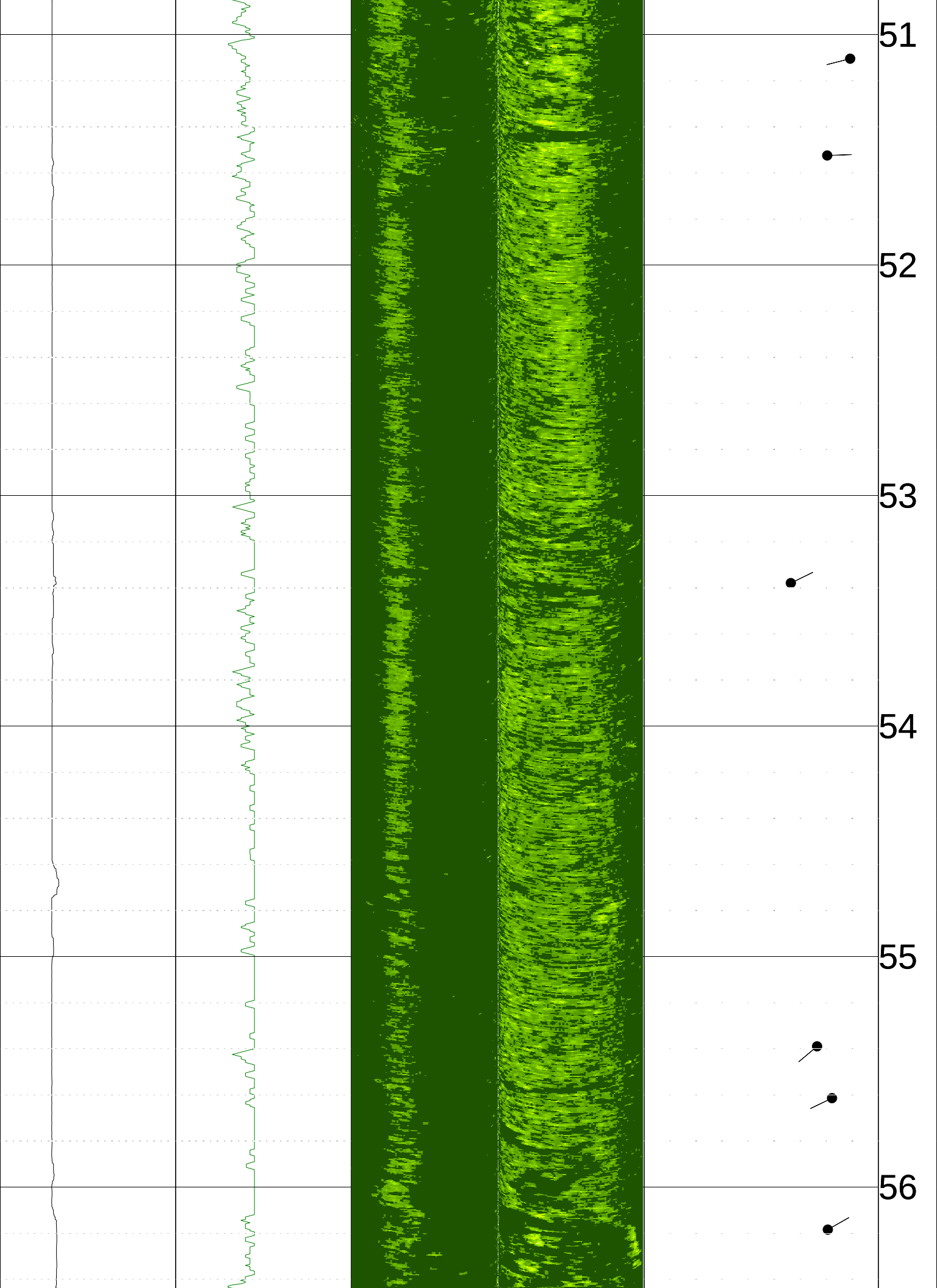

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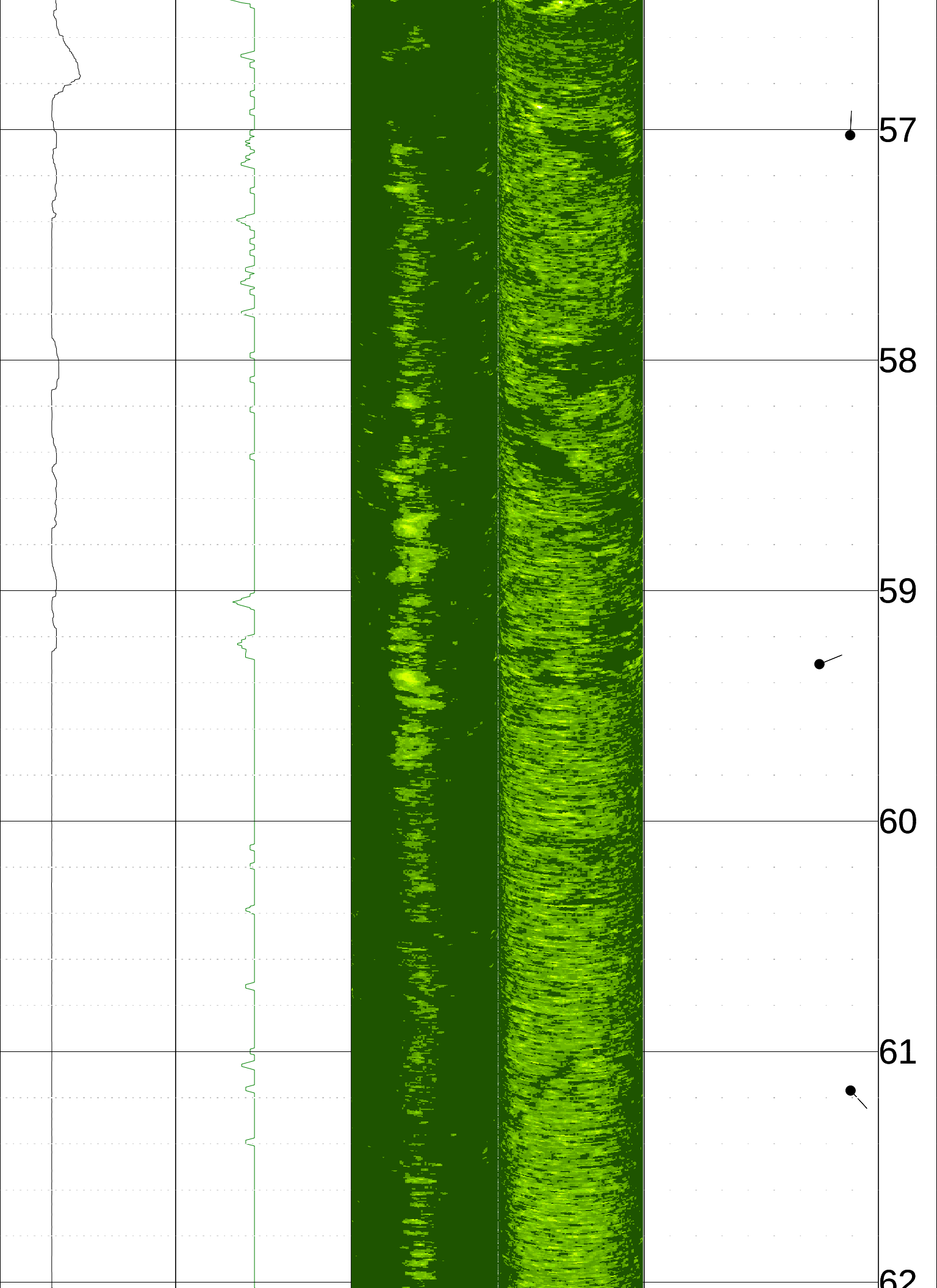

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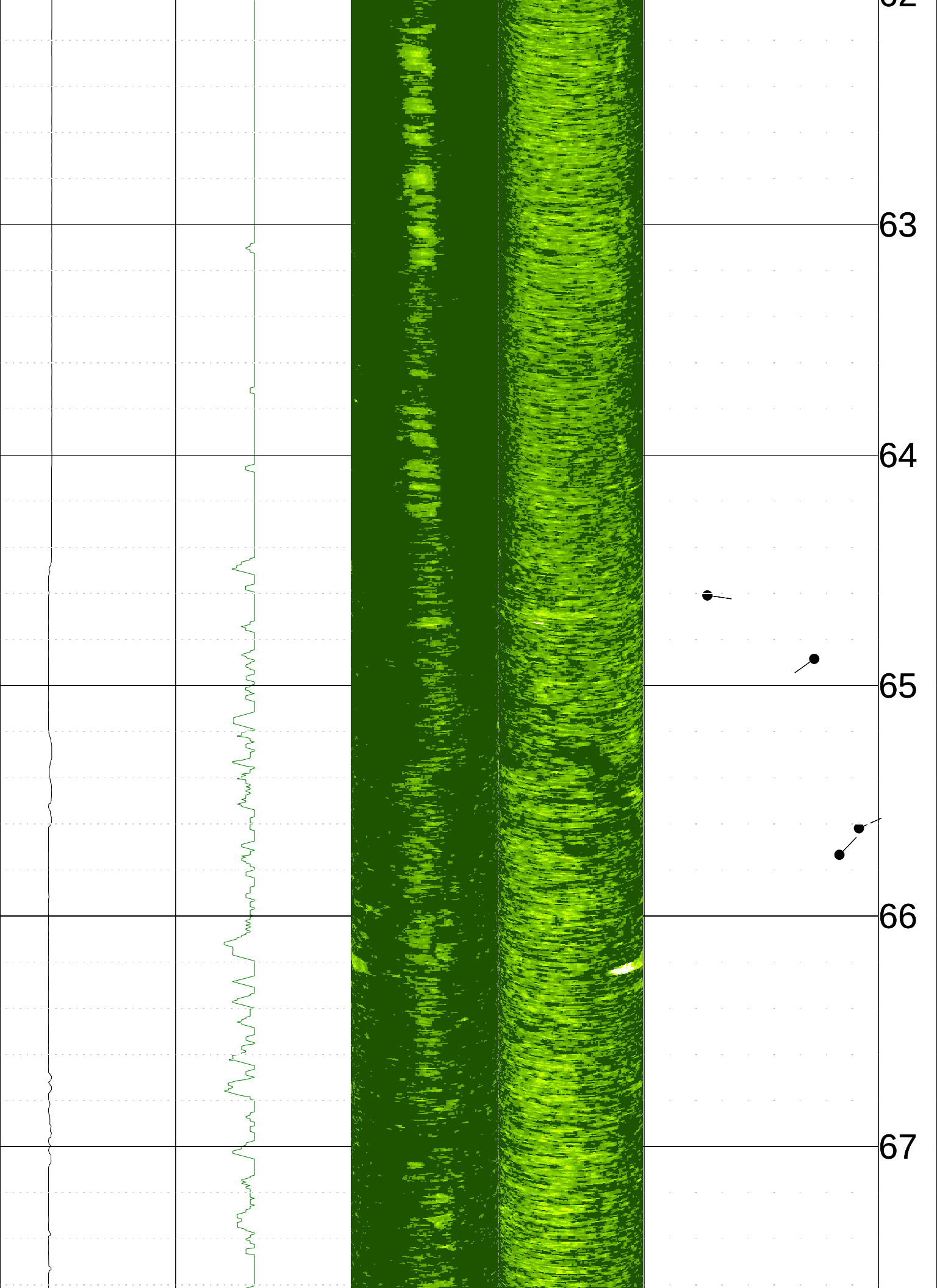

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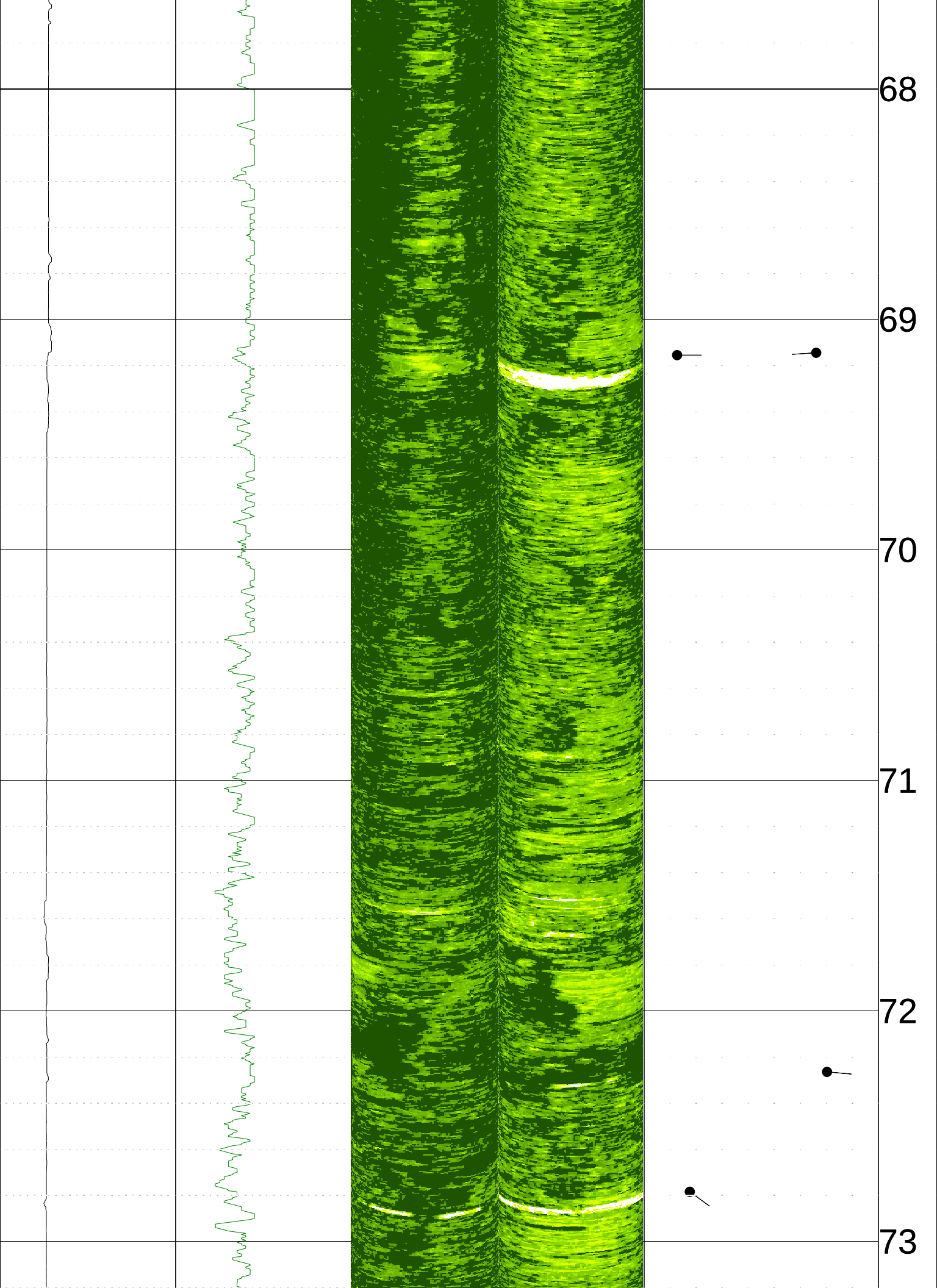

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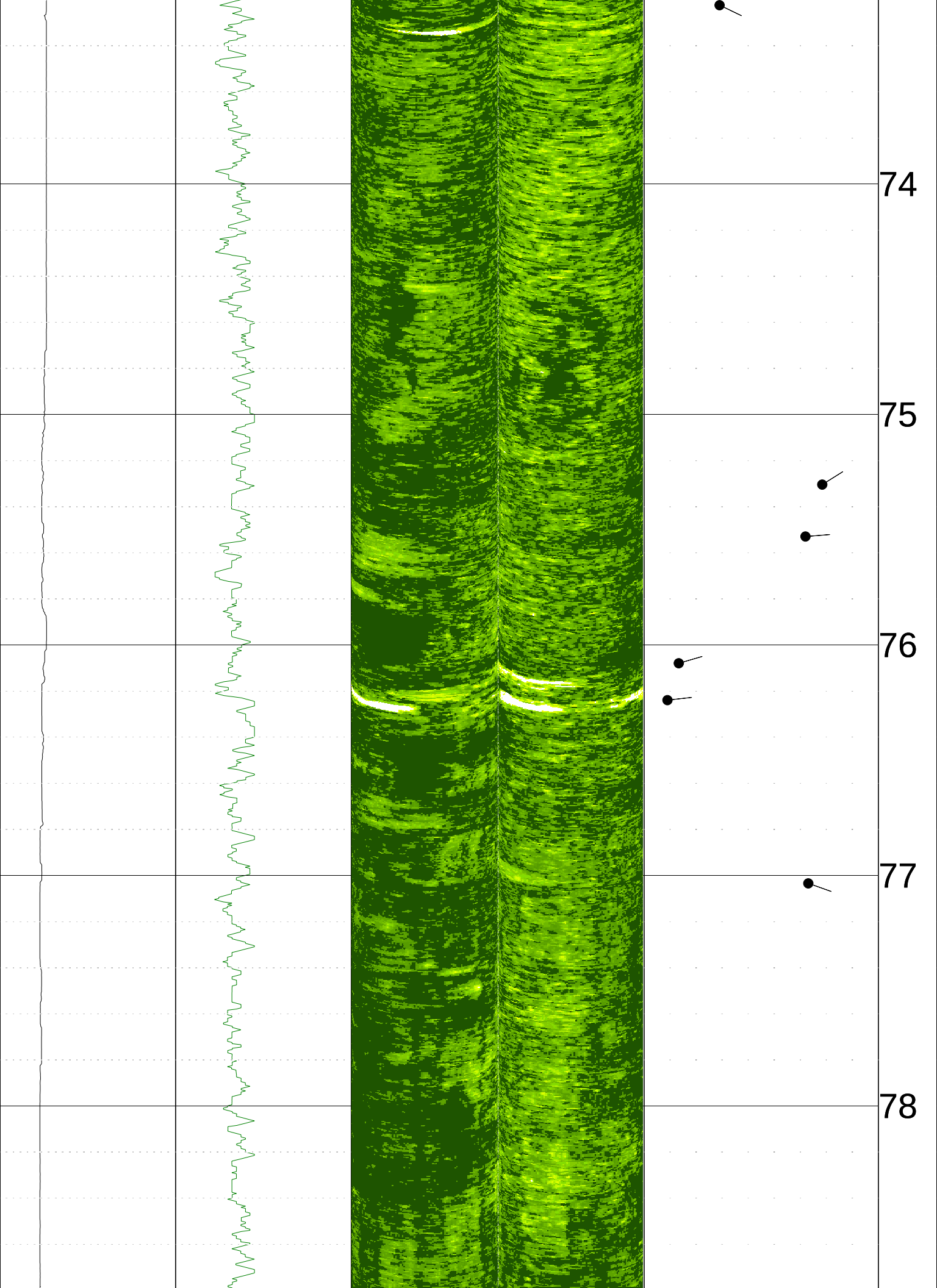

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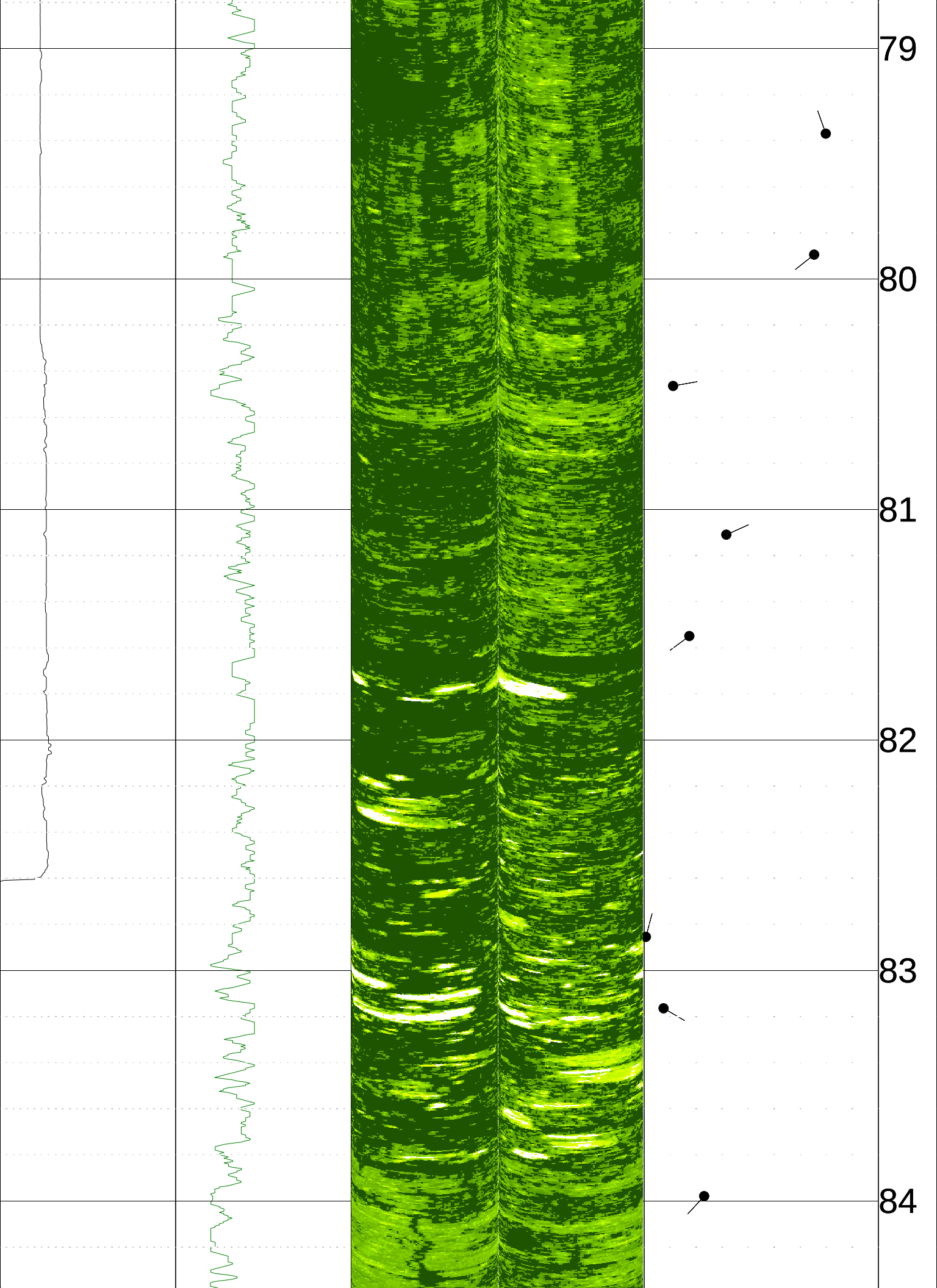

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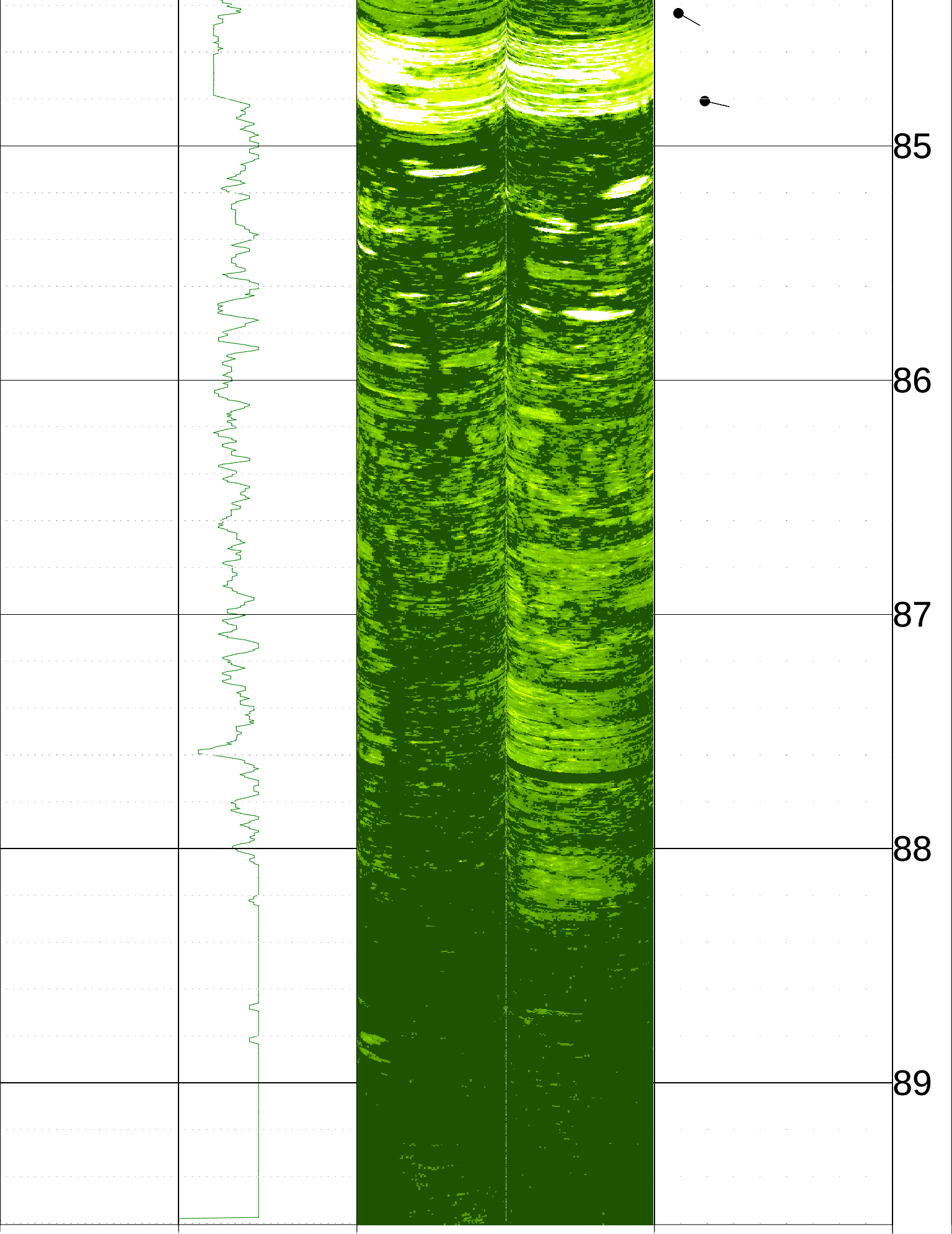

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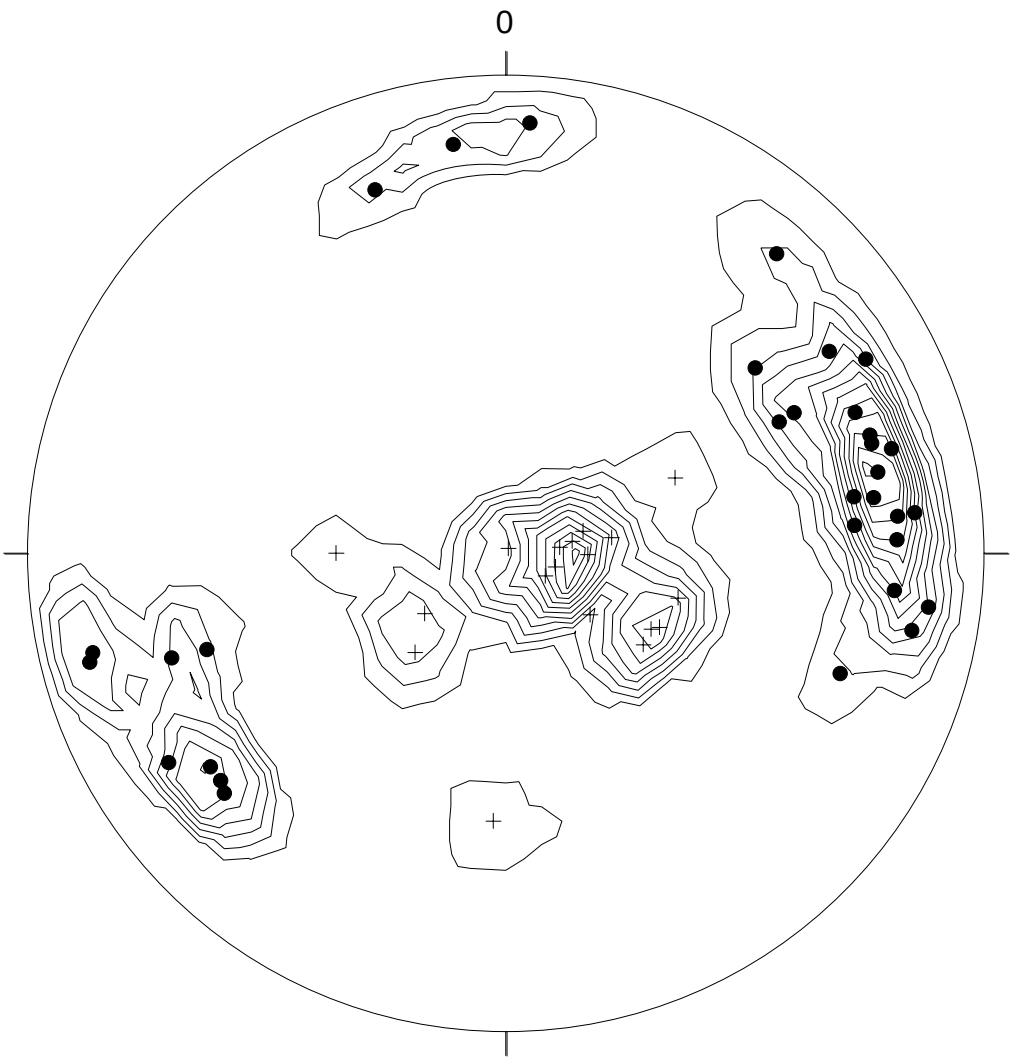

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DEG
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CALIPER
CALIPER1
AMPL
TADPOLE
METERS



LA 710 Tunnel, boring Z2 B5

+ n=18 (P)
• n=32 (P)

Stereonet contour plot of poles to planes,
Both bedding and fractures

n=50
max. dens.=13.26 (at 76/ 24)
min. dens.=0.00
Contours at every integer between
1 and 13, inclusive:
(Multiples of random distribution)

Apparent bedding denoted as cross
Apparent fractures denoted as solid circle
Plotted on upper hemisphere



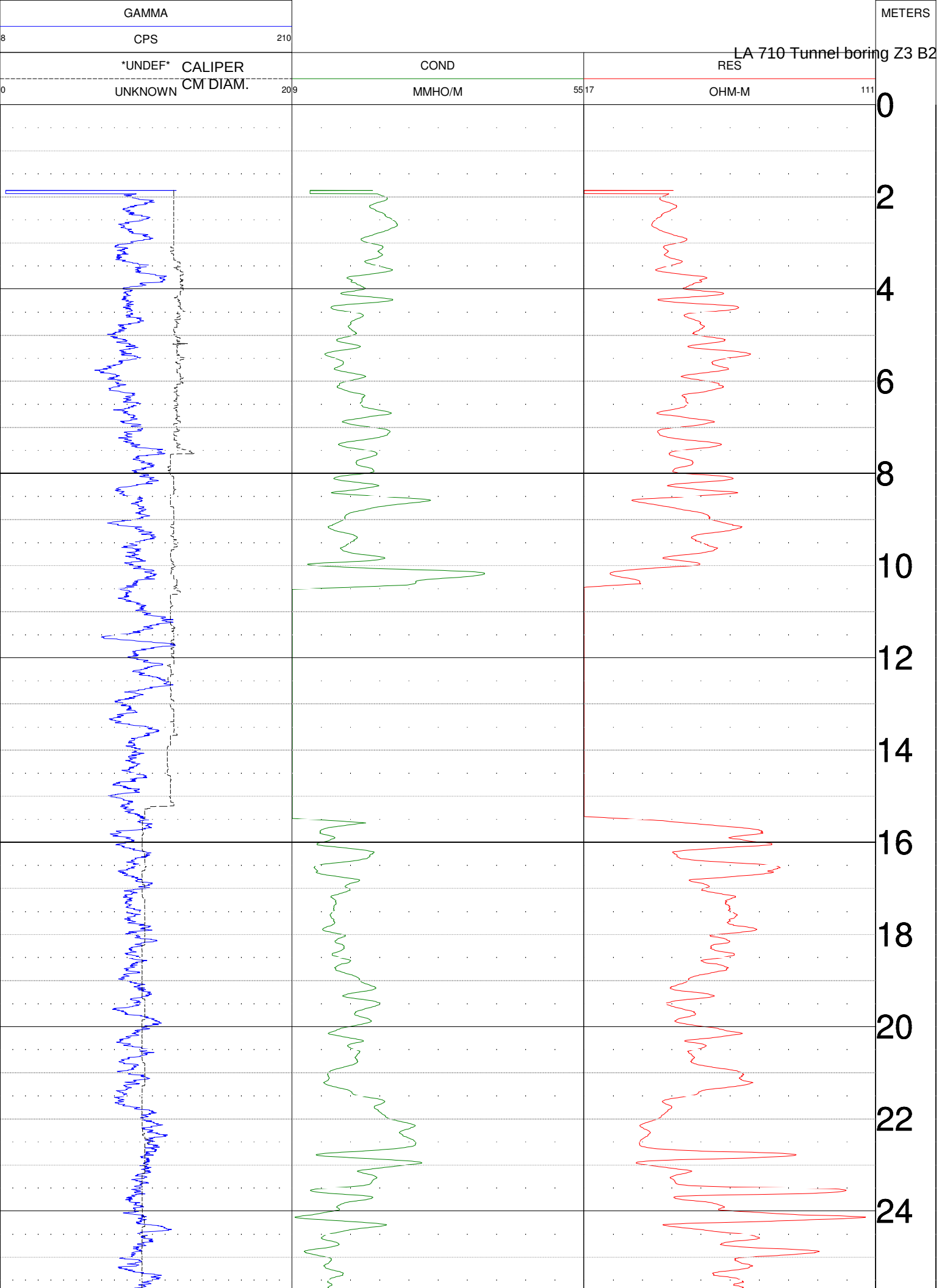
LA 710 Tunnel boring Z3 B2

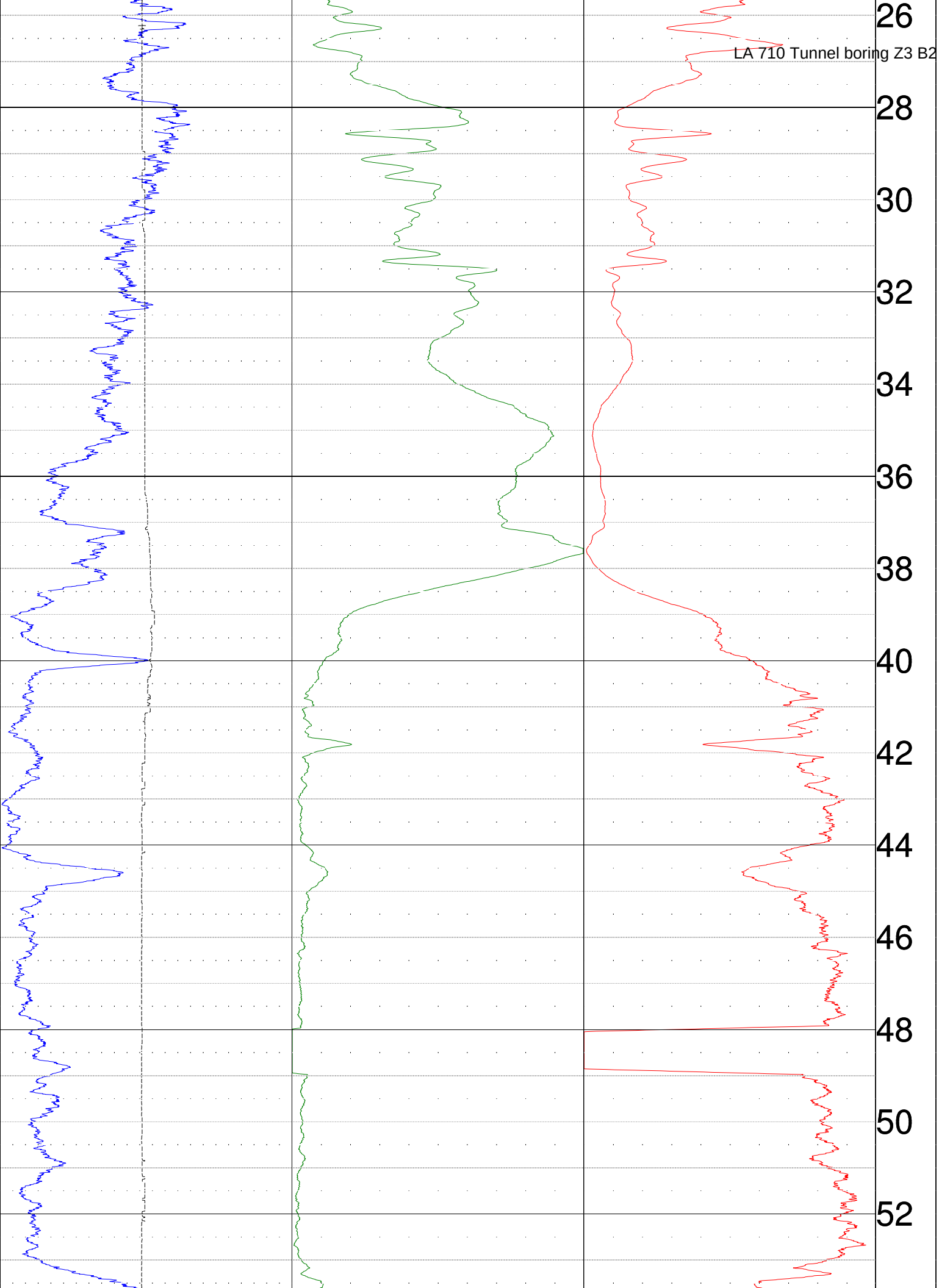
COMPANY	: CALTRANS				
WELL	: Z3 B2				
LOCATION/FIELD	: LA 710 TUNNEL				
COUNTY	: LA				
LOCATION	: CA				
SECTION	: None	TOWNSHIP	: None	RANGE	: None
DATE	: 1/20/09	PERMANENT DATUM	: None		
DEPTH DRILLER	: 83.8M			KB	: NA
LOG BOTTOM	: 83.8	LOG MEASURED FROM:	GL	DF	: NA
LOG TOP	: 1.8	DRL MEASURED FROM:	GL	GL	: NA
CASING DIAMETER	: N/A	LOGGING UNIT	: 7311		
CASING TYPE	: none	FIELD OFFICE	: 7311		
CASING THICKNESS:	0	RECORDED BY	: DH/DL		
BIT SIZE	: 9.4CM	BOREHOLE FLUID	: 0	FILE	: PROCESSE
MAGNETIC DECL.	: 12.85	RM	: 0	TYPE	: 9065A
MATRIX DENSITY	: 2.71	RM TEMPERATURE	: 0	LGDATE	: 1/20/09.
NEUTRON MATRIX	: DOLOMITE	MATRIX DELTA T	: 140		
				THRESH:	2500

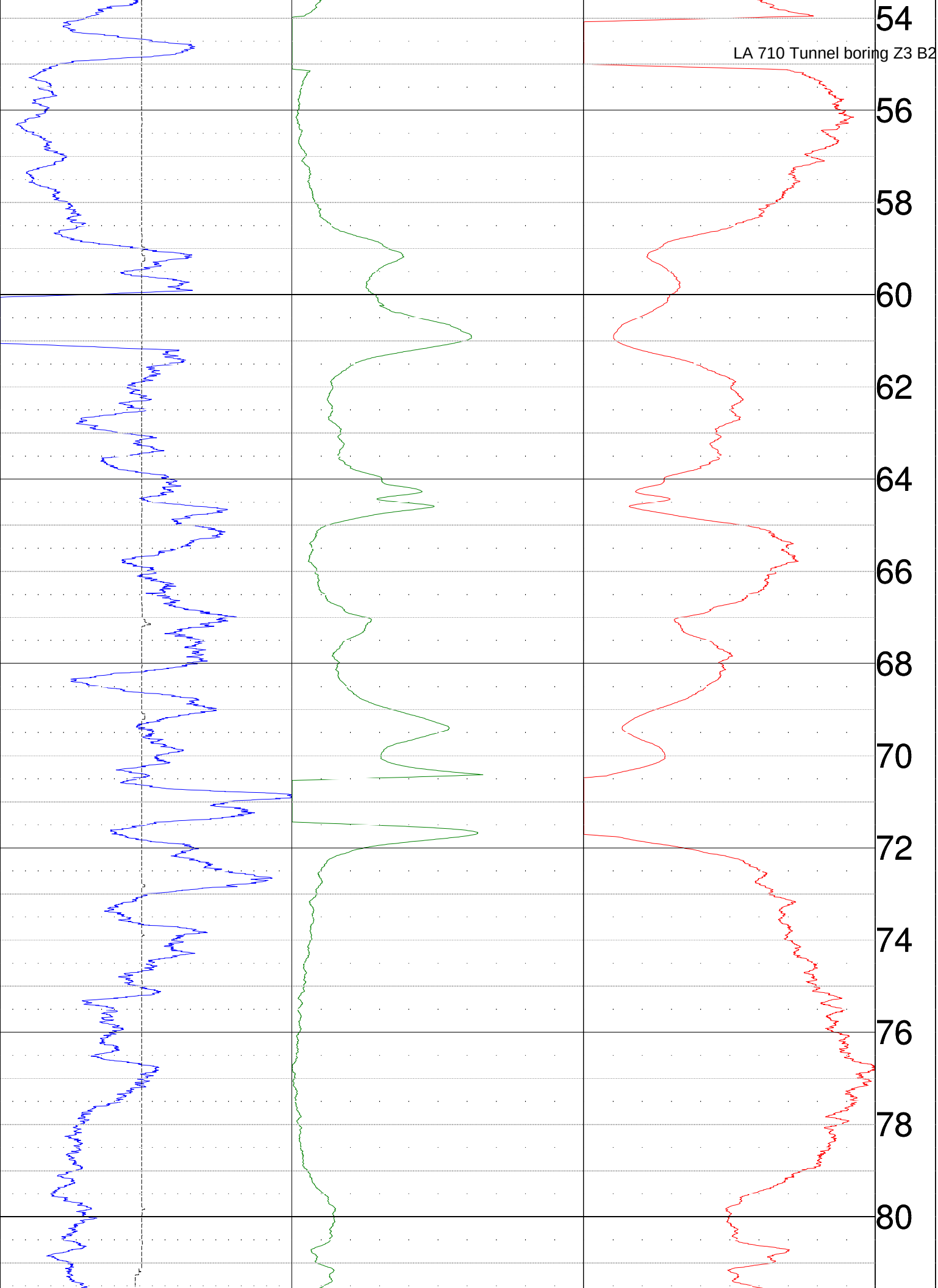
OTHER SERVICES:
CAL-IND
AC TEL
PSLOG

CALIPER MEASUREMENT UNITS ARE CM DIAMETER
CALIPER MEASUREMENTS REPORTED AS "UNKNOWN", "UNDER" UNITS ARE CM DIA
GL ELEVATION NOT REPORTED, MEASURED AS 24.2M BY HANDHELD GPS

ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS


GAMMA
8
CPS
210
UNDEF
CALIPER
CM DIAM.
0
UNKNOWN
20
9
COND
MMHO/M
55
17
RES
OHM-M
111
METERS
LA 710 Tunnel boring Z3 B2
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LA 710 Tunnel boring Z3 B2
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LA 710 Tunnel boring Z3 B2
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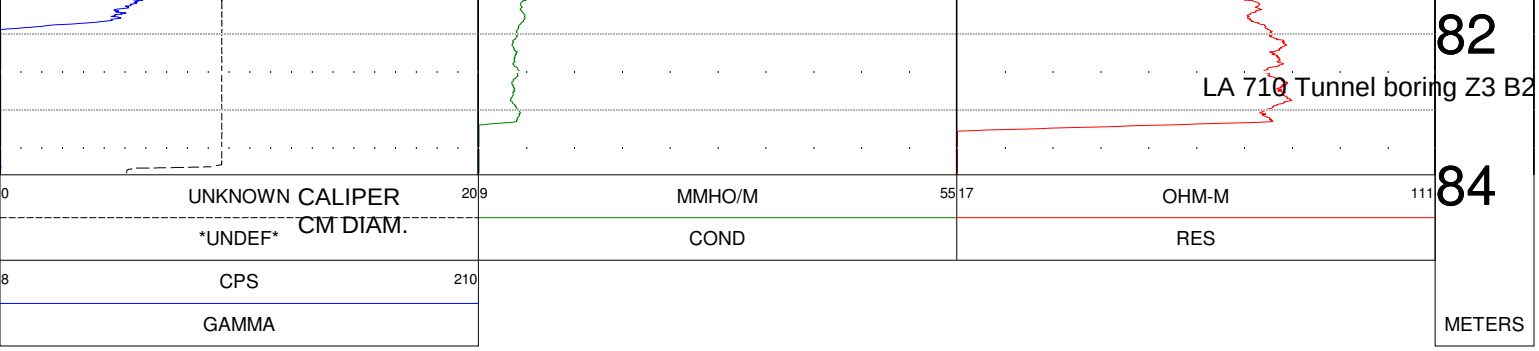

82
LA 710 Tunnel boring Z3 B2
84
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UNKNOWN
CALIPER
CM DIAM.
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MMHO/M
55
17
OHM-M
111
UNDEF
COND
RES
8
CPS
210
GAMMA
METERS

Table 2. LA 710 Tunnel
Boring Z3 B2
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
Not Provided	1.5	4.9	353	1159		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2	6.6	402	1318		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2.5	8.2	350	1147		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3	9.8	372	1220		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3.5	11.5	369	1211		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4	13.1	356	1168		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4.5	14.8	385	1262		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5	16.4	433	1420		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5.5	18.0	426	1396		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6	19.7	556	1823		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6.5	21.3	375	1229	699	2294	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7	23.0	350	1147	610	2001	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7.5	24.6	353	1159	769	2524	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8	26.2	379	1243		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8.5	27.9	412	1350	709	2327	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9	29.5	433	1420	758	2485	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9.5	31.2	439	1439		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10	32.8	418	1373	699	2294	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10.5	34.4	397	1302	775	2543	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11	36.1	429	1408		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11.5	37.7	418	1373	877	2878	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12	39.4	386	1267	699	2294	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12.5	41.0	495	1624	775	2543	NA	NA	NA	NA	NA	NA	NA	NA	NA
	13	42.7	513	1682	775	2543	NA	NA	NA	NA	NA	NA	NA	NA	NA
	13.5	44.3	505	1657	746	2448	NA	NA	NA	NA	NA	NA	NA	NA	NA
	14	45.9	495	1624	746	2448	NA	NA	NA	NA	NA	NA	NA	NA	NA
	14.5	47.6	532	1745	781	2563	NA	NA	NA	NA	NA	NA	NA	NA	NA
	15	49.2	541	1773	787	2583	NA	NA	NA	NA	NA	NA	NA	NA	NA
	15.5	50.9	518	1700	746	2448	NA	NA	NA	NA	NA	NA	NA	NA	NA
	16.5	54.1	521	1709	752	2467	NA	NA	NA	NA	NA	NA	NA	NA	NA
	17	55.8	532	1745	820	2689	NA	NA	NA	NA	NA	NA	NA	NA	NA
	17.5	57.4	552	1813	806	2646	NA	NA	NA	NA	NA	NA	NA	NA	NA
	18	59.1	562	1843	813	2667	NA	NA	NA	NA	NA	NA	NA	NA	NA
	18.5	60.7	599	1965	971	3185	NA	NA	NA	NA	NA	NA	NA	NA	NA
	19	62.3	595	1953	1000	3281	NA	NA	NA	NA	NA	NA	NA	NA	NA
	19.5	64.0	538	1764	952	3125	NA	NA	NA	NA	NA	NA	NA	NA	NA
	20	65.6	552	1813	952	3125	NA	NA	NA	NA	NA	NA	NA	NA	NA

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B2
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	20.5	67.3	538	1764	971	3185	NA	NA	NA	NA	NA	NA	NA	NA	NA
	21	68.9	483	1585	926	3038	NA	NA	NA	NA	NA	NA	NA	NA	NA
	21.5	70.5	513	1682	1235	4050	NA	NA	NA	NA	NA	NA	NA	NA	NA
	22	72.2	610	2001	2083	6835	0.45	2.22	138.82	0.827	2.403	8.549	17267	50184	178546
	22.5	73.8	559	1833	1020	3348	NA	NA	NA	NA	NA	NA	NA	NA	NA
	23	75.5	488	1600	909	2983	NA	NA	NA	NA	NA	NA	NA	NA	NA
	23.5	77.1	505	1657	926	3038	NA	NA	NA	NA	NA	NA	NA	NA	NA
	24	78.7	495	1624	893	2929	NA	NA	NA	NA	NA	NA	NA	NA	NA
	24.5	80.4	476	1562	806	2646	NA	NA	NA	NA	NA	NA	NA	NA	NA
	25	82.0	490	1608	909	2983	NA	NA	NA	NA	NA	NA	NA	NA	NA
	25.5	83.7	500	1640	909	2983	NA	NA	NA	NA	NA	NA	NA	NA	NA
	26	85.3	488	1600	855	2804	NA	NA	NA	NA	NA	NA	NA	NA	NA
	26.4	86.6	457	1498	840	2757	NA	NA	NA	NA	NA	NA	NA	NA	NA
	26.8	87.9	513	1682	885	2903	NA	NA	NA	NA	NA	NA	NA	NA	NA
	27.5	90.2	515	1691	926	3038	NA	NA	NA	NA	NA	NA	NA	NA	NA
	28	91.9	498	1632	885	2903	NA	NA	NA	NA	NA	NA	NA	NA	NA
	28.5	93.5	510	1674	901	2956	NA	NA	NA	NA	NA	NA	NA	NA	NA
	29	95.1	578	1896	1053	3454	NA	NA	NA	NA	NA	NA	NA	NA	NA
	29.5	96.8	606	1988	1449	4755	NA	NA	NA	NA	NA	NA	NA	NA	NA
	30	98.4	568	1864	1010	3314	NA	NA	NA	NA	NA	NA	NA	NA	NA
	30	98.4	562	1843	1053	3454	NA	NA	NA	NA	NA	NA	NA	NA	NA
	30.5	100.1	541	1773	917	3010	NA	NA	NA	NA	NA	NA	NA	NA	NA
	31	101.7	588	1930	719	2360	NA	NA	NA	NA	NA	NA	NA	NA	NA
	31.5	103.3	595	1953	769	2524	NA	NA	NA	NA	NA	NA	NA	NA	NA
	32	105.0	513	1682	1124	3686	NA	NA	NA	NA	NA	NA	NA	NA	NA
	32.4	106.3	500	1640	1031	3382	NA	NA	NA	NA	NA	NA	NA	NA	NA
	32.9	107.9	546	1793	1449	4755	NA	NA	NA	NA	NA	NA	NA	NA	NA
	33.4	109.6	613	2013	1852	6076	0.44	2.10	131.15	0.791	2.275	6.150	16514	47506	128447
	33.9	111.2	602	1976	1961	6433	0.45	2.16	134.97	0.785	2.272	7.266	16386	47451	151755
	34.4	112.9	562	1843	2041	6696	0.46	2.20	137.53	0.695	2.029	8.248	14522	42375	172272
	34.9	114.5	508	1665	2083	6835	0.47	2.22	138.82	0.573	1.683	8.887	11967	35145	185614
	35.5	116.5	461	1512	2041	6696	0.47	2.20	137.53	0.468	1.378	8.552	9771	28788	178607
	36	118.1	481	1577	1852	6076	0.46	2.10	131.15	0.486	1.422	6.557	10141	29691	136944
	36.5	119.8	510	1674	1818	5965	0.46	2.08	129.88	0.542	1.578	6.156	11311	32966	128561
	36.9	121.1	599	1965	1724	5657	0.43	2.02	126.09	0.724	2.073	5.039	15126	43303	105233
	37.5	123.0	592	1941	2041	6696	0.45	2.20	137.53	0.771	2.243	8.147	16110	46851	170154
	38	124.7	662	2173	2222	7291	0.45	2.29	142.69	1.002	2.910	9.951	20937	60770	207827

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B2
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	38.5	126.3	641	2103	1923	6309	0.44	2.14	133.69	0.880	2.530	6.747	18379	52840	140906
	39	128.0	595	1953	1563	5126	NA	NA	NA	NA	NA	NA	NA	NA	NA
	39.5	129.6	629	2063	1408	4621	NA	NA	NA	NA	NA	NA	NA	NA	NA
	39.9	130.9	658	2158	1429	4687	NA	NA	NA	NA	NA	NA	NA	NA	NA
	40.4	132.5	662	2173	1111	3645	NA	NA	NA	NA	NA	NA	NA	NA	NA
	40.9	134.2	671	2202	1163	3815	NA	NA	NA	NA	NA	NA	NA	NA	NA
	41.5	136.2	746	2448	1429	4687	NA	NA	NA	NA	NA	NA	NA	NA	NA
	42	137.8	862	2828	1695	5561	0.33	2.00	124.84	1.486	3.940	3.763	31038	82282	78595
	42.5	139.4	893	2929	1471	4825	NA	NA	NA	NA	NA	NA	NA	NA	NA
	43	141.1	952	3125	1389	4557	NA	NA	NA	NA	NA	NA	NA	NA	NA
	43.5	142.7	962	3155	1429	4687	NA	NA	NA	NA	NA	NA	NA	NA	NA
	44	144.4	935	3066	1818	5965	0.32	2.08	129.88	1.817	4.799	4.455	37952	100228	93039
	44.6	146.3	1000	3281	2000	6562	0.33	2.18	136.25	2.183	5.820	5.820	45582	121553	121553
	45	147.6	847	2780	2381	7812	0.43	2.35	146.59	1.686	4.815	11.063	35222	100556	231059
	45.6	149.6	1010	3314	2703	8867	0.42	2.45	153.16	2.503	7.103	14.583	52279	148349	304572
	46.1	151.2	1087	3566	2857	9374	0.42	2.50	155.80	2.949	8.347	16.442	61583	174327	343390
	46.6	152.9	885	2903	2778	9113	0.44	2.47	154.48	1.938	5.595	16.509	40474	116849	344805
	46.6	152.9	893	2929	2857	9374	0.45	2.50	155.80	1.990	5.753	17.720	41553	120161	370097
	46.6	152.9	943	3095	2778	9113	0.43	2.47	154.48	2.202	6.320	16.157	45996	131990	337444
	47.1	154.5	980	3217	3030	9942	0.44	2.54	158.46	2.440	7.034	20.056	50955	146907	418867
	47.6	156.2	1010	3314	2941	9650	0.43	2.52	157.13	2.568	7.361	18.349	53635	153734	383227
	48.1	157.8	917	3010	2778	9113	0.44	2.47	154.48	2.083	5.993	16.316	43499	125170	340773
	48.1	157.8	930	3052	2778	9113	0.44	2.47	154.48	2.141	6.153	16.238	44721	128514	339142
	48.1	157.8	909	2983	2778	9113	0.44	2.47	154.48	2.045	5.890	16.367	42711	123010	341821
	48.6	159.4	833	2734	2941	9650	0.46	2.52	157.13	1.748	5.091	19.443	36505	106330	406065
	49.1	161.1	714	2343	2778	9113	0.46	2.47	154.48	1.262	3.698	17.410	26368	77236	363613
	50.1	164.4	488	1600	2632	8634	0.48	2.43	151.84	0.579	1.716	16.072	12087	35832	335665
	50.6	166.0	571	1875	2778	9113	0.48	2.47	154.48	0.808	2.388	18.016	16875	49880	376269
	51.1	167.7	645	2117	2778	9113	0.47	2.47	154.48	1.030	3.031	17.720	21511	63307	370088
	51.6	169.3	870	2853	2778	9113	0.45	2.47	154.48	1.871	5.410	16.599	39078	112988	346666
	52.1	170.9	909	2983	2778	9113	0.44	2.47	154.48	2.045	5.890	16.367	42711	123010	341821
	52.5	172.2	870	2853	2778	9113	0.45	2.47	154.48	1.871	5.410	16.599	39078	112988	346666
	53.1	174.2	1250	4101	3125	10253	0.40	2.56	159.79	3.999	11.237	19.664	83530	234680	410690
	53.6	175.9	1333	4374	3571	11717	0.42	2.65	165.16	4.703	13.348	27.474	98230	278782	573803
	54.1	177.5	1600	5249	3333	10936	0.35	2.60	162.47	6.663	17.993	20.034	139149	375788	418411
	54.6	179.1	1290	4233	2941	9650	0.38	2.52	157.13	4.191	11.573	16.186	87522	241706	338043
	55.1	180.8	1176	3860	2381	7812	0.34	2.35	146.59	3.250	8.700	8.978	67880	181712	187515

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Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B2
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	55.6	182.4	870	2853	2941	9650	0.45	2.52	157.13	1.903	5.527	19.236	39749	115439	401741
	56.1	184.1	952	3125	2941	9650	0.44	2.52	157.13	2.283	6.582	18.729	47681	137457	391165
	56.6	185.7	1176	3860	3333	10936	0.43	2.60	162.47	3.602	10.294	24.114	75232	214990	503634
	57.1	187.3	1333	4374	3125	10253	0.39	2.56	159.79	4.551	12.639	18.929	95039	263965	395345
	57.6	189.0	1333	4374	3333	10936	0.40	2.60	162.47	4.627	12.999	22.748	96631	271487	475101
	58.1	190.6	1333	4374	3333	10936	0.40	2.60	162.47	4.627	12.999	22.748	96631	271487	475103
	58.6	192.3	1333	4374	3333	10936	0.40	2.60	162.47	4.627	12.999	22.748	96631	271487	475101
	59.1	193.9	1111	3645	2941	9650	0.42	2.52	157.13	3.107	8.805	17.630	64899	183892	368208
	59.6	195.5	667	2187	2632	8634	0.47	2.43	151.84	1.081	3.169	15.402	22577	66182	321680
	60	196.9	769	2524	2564	8412	0.45	2.41	150.52	1.427	4.139	13.950	29797	86445	291351
	60.5	198.5	893	2929	2778	9113	0.44	2.47	154.48	1.973	5.691	16.463	41199	118851	343838
	60.6	198.8	769	2524	2500	8202	0.45	2.39	149.21	1.414	4.095	13.052	29537	85523	272605
	60.6	198.8	606	1988	2500	8202	0.47	2.39	149.21	0.878	2.579	13.768	18335	53861	287541
	61	200.1	1163	3815	3030	9942	0.41	2.54	158.46	3.432	9.703	18.733	71678	202658	391235
	61.1	200.5	588	1930	2632	8634	0.47	2.43	151.84	0.842	2.481	15.721	17577	51806	328346
	61.5	201.8	1250	4101	2941	9650	0.39	2.52	157.13	3.933	10.931	16.529	82137	228306	345223
	61.6	202.1	1176	3860	2778	9113	0.39	2.47	154.48	3.425	9.526	14.527	71530	198955	303396
	62	203.4	1250	4101	3125	10253	0.40	2.56	159.79	3.999	11.237	19.664	83530	234680	410690
	62	203.4	1282	4206	3125	10253	0.40	2.56	159.79	4.207	11.770	19.387	87869	245825	404907
	62.5	205.1	1282	4206	3226	10583	0.41	2.58	161.13	4.242	11.931	21.202	88604	249191	442805
	62.5	205.1	1299	4261	3030	9942	0.39	2.54	158.46	4.281	11.880	17.600	89413	248122	367588
	62.5	205.1	1250	4101	3333	10936	0.42	2.60	162.47	4.066	11.534	23.495	84930	240891	490703
	63	206.7	1250	4101	3030	9942	0.40	2.54	158.46	3.966	11.085	18.020	82833	231515	376362
	63	206.7	1250	4101	3125	10253	0.40	2.56	159.79	3.999	11.237	19.664	83530	234680	410692
	63.5	208.3	1190	3906	2941	9650	0.40	2.52	157.13	3.567	10.003	17.017	74501	208906	355405
	63.5	208.3	833	2734	2857	9374	0.45	2.50	155.80	1.733	5.038	18.062	36197	105226	377238
	64	210.0	1075	3528	2857	9374	0.42	2.50	155.80	2.886	8.181	16.526	60266	170853	345146
	64	210.0	1087	3566	3030	9942	0.43	2.54	158.46	2.999	8.554	19.310	62634	178652	403295
	64.5	211.6	926	3038	2857	9374	0.44	2.50	155.80	2.140	6.168	17.520	44688	128819	365915
	64.5	211.6	1351	4434	3333	10936	0.40	2.60	162.47	4.753	13.323	22.580	99260	278259	471595
	65	213.3	1471	4825	3704	12151	0.41	2.67	166.51	5.768	16.225	28.897	120471	338866	603514
	65.1	213.6	1613	5292	2941	9650	0.28	2.52	157.13	6.548	16.827	13.043	136753	351447	272402
	65.5	214.9	1282	4206	3571	11717	0.43	2.65	165.16	4.348	12.402	27.947	90820	259024	583684
	65.6	215.2	1389	4557	3333	10936	0.39	2.60	162.47	5.020	14.006	22.223	104851	292526	464143
	66	216.5	1389	4557	3704	12151	0.42	2.67	166.51	5.145	14.593	29.727	107457	304788	620866
	66	216.5	1190	3906	3226	10583	0.42	2.58	161.13	3.658	10.397	21.981	76398	217149	459077
	66.5	218.2	1389	4557	4000	13123	0.43	2.71	169.22	5.229	14.970	36.398	109205	312644	760184

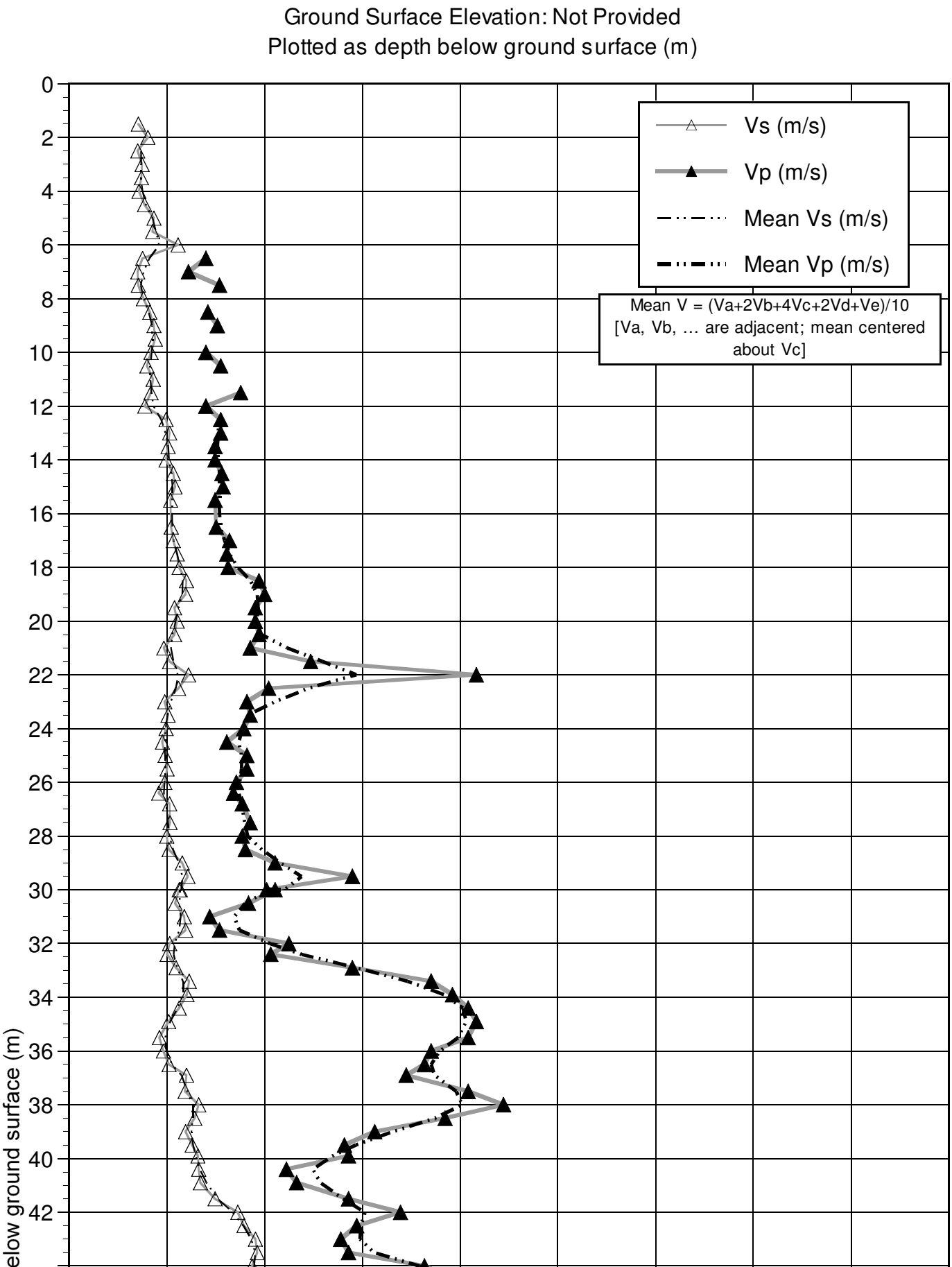
γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

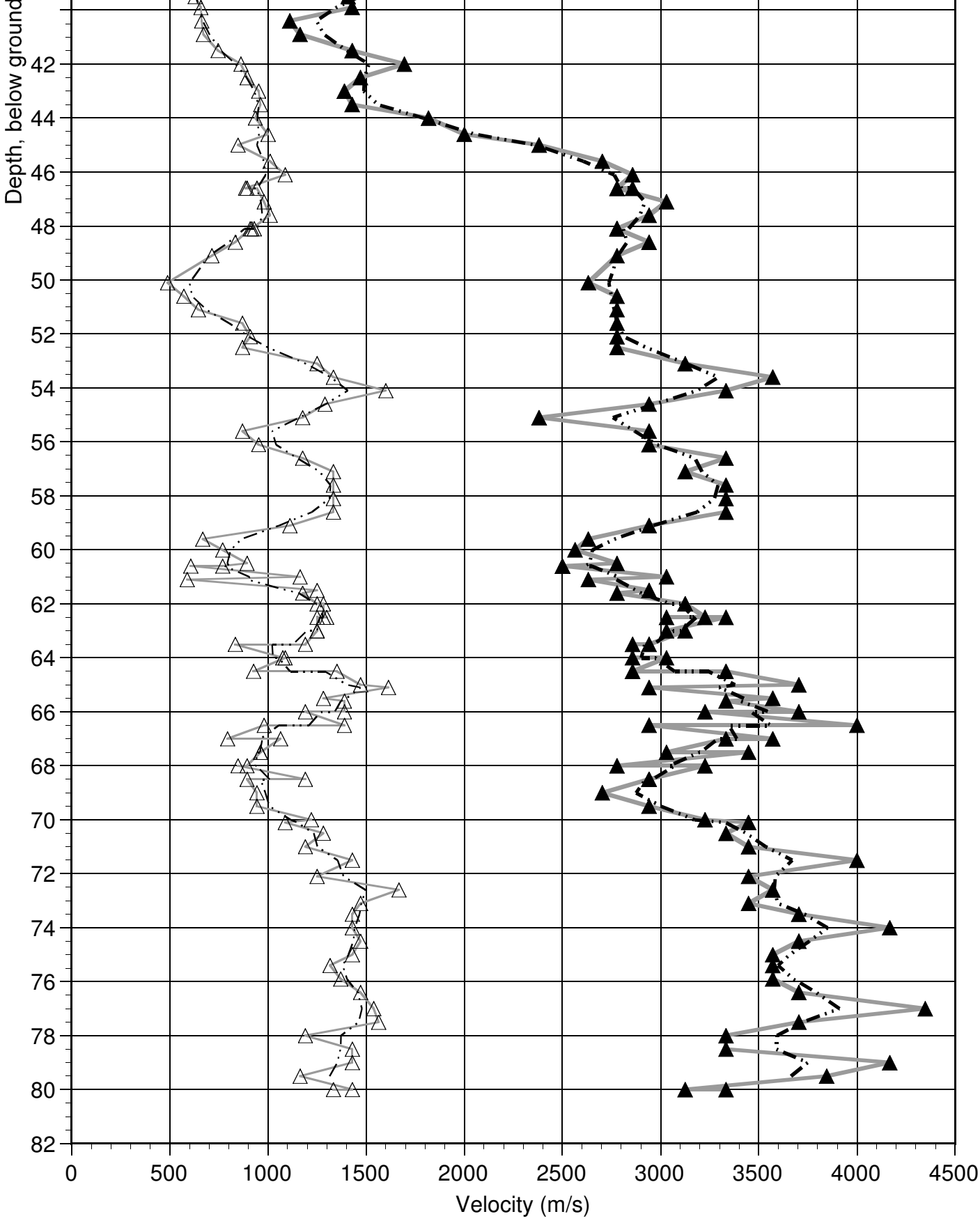
Table 2. LA 710 Tunnel
Boring Z3 B2
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	66.5	218.2	980	3217	2941	9650	0.44	2.52	157.13	2.419	6.955	18.548	50527	145264	387372
	67	219.8	794	2604	3571	11717	0.47	2.65	165.16	1.666	4.913	31.523	34804	102604	658372
	67	219.8	1064	3490	3333	10936	0.44	2.60	162.47	2.945	8.502	24.990	61515	177570	521922
	67.5	221.5	962	3155	3030	9942	0.44	2.54	158.46	2.347	6.778	20.179	49014	141554	421453
	67.5	221.5	962	3155	3448	11313	0.46	2.62	163.81	2.426	7.074	27.967	50670	147737	584096
	68	223.1	893	2929	2778	9113	0.44	2.47	154.48	1.973	5.691	16.463	41199	118851	343837
	68	223.1	847	2780	3226	10583	0.46	2.58	161.13	1.854	5.424	24.387	38715	113275	509323
	68.5	224.7	1190	3906	2941	9650	0.40	2.52	157.13	3.567	10.003	17.017	74501	208906	355406
	68.5	224.7	893	2929	2941	9650	0.45	2.52	157.13	2.007	5.816	19.098	41907	121466	398864
	69	226.4	943	3095	2703	8867	0.43	2.45	153.16	2.183	6.247	15.009	45602	130479	313474
	69.5	228.0	943	3095	2941	9650	0.44	2.52	157.13	2.240	6.463	18.786	46785	134990	392360
	70	229.7	1220	4001	3226	10583	0.42	2.58	161.13	3.839	10.876	21.740	80170	227143	454049
	70.1	230.0	1087	3566	3448	11313	0.44	2.62	163.81	3.100	8.959	27.068	64750	187106	565323
	70.5	231.3	1282	4206	3333	10936	0.41	2.60	162.47	4.278	12.090	23.214	89341	252512	484824
	71	232.9	1190	3906	3448	11313	0.43	2.62	163.81	3.719	10.653	26.243	77670	222501	548095
	71.5	234.6	1429	4687	4000	13123	0.43	2.71	169.22	5.532	15.787	35.994	115534	329712	751744
	72.1	236.5	1250	4101	3448	11313	0.42	2.62	163.81	4.100	11.680	25.735	85632	243940	537480
	72.6	238.2	1667	5468	3571	11717	0.36	2.65	165.16	7.349	20.001	23.947	153485	417723	500130
	73.1	239.8	1471	4825	3448	11313	0.39	2.62	163.81	5.675	15.763	23.635	118521	329215	493627
	73.5	241.1	1429	4687	3704	12151	0.41	2.67	166.51	5.443	15.379	29.330	113686	321187	612562
	74	242.8	1429	4687	4167	13670	0.43	2.73	170.58	5.576	15.986	40.002	116462	333873	835455
	74.5	244.4	1471	4825	3704	12151	0.41	2.67	166.51	5.768	16.225	28.897	120471	338866	603514
	75	246.1	1429	4687	3571	11717	0.40	2.65	165.16	5.399	15.169	26.546	112765	316815	554427
	75.4	247.4	1316	4317	3571	11717	0.42	2.65	165.16	4.580	13.022	27.638	95662	271963	577229
	75.9	249.0	1370	4494	3571	11717	0.41	2.65	165.16	4.965	14.037	27.126	103687	293174	566531
	76.4	250.7	1471	4825	3704	12151	0.41	2.67	166.51	5.768	16.225	28.897	120472	338867	603514
	77	252.6	1538	5047	4348	14265	0.43	2.75	171.94	6.519	18.623	43.372	136147	388954	905843
	77.5	254.3	1563	5126	3704	12151	0.39	2.67	166.51	6.512	18.126	27.905	136001	378557	582808
	78	255.9	1190	3906	3333	10936	0.43	2.60	162.47	3.688	10.526	23.999	77034	219838	501231
	78.5	257.5	1429	4687	3333	10936	0.39	2.60	162.47	5.311	14.739	21.835	110928	307826	456038
	79	259.2	1429	4687	4167	13670	0.43	2.73	170.58	5.576	15.986	40.002	116462	333872	835452
	79.5	260.8	1163	3815	3846	12619	0.45	2.69	167.86	3.636	10.541	34.929	75931	220154	729503
	80	262.5	1429	4687	3125	10253	0.37	2.56	159.79	5.224	14.291	18.032	109101	298479	376596
	80	262.5	1333	4374	3333	10936	0.40	2.60	162.47	4.627	12.999	22.748	96631	271487	475101

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Figure 1. LA 710 Tunnel
Boring Z3 B2
Downhole Interval Velocities



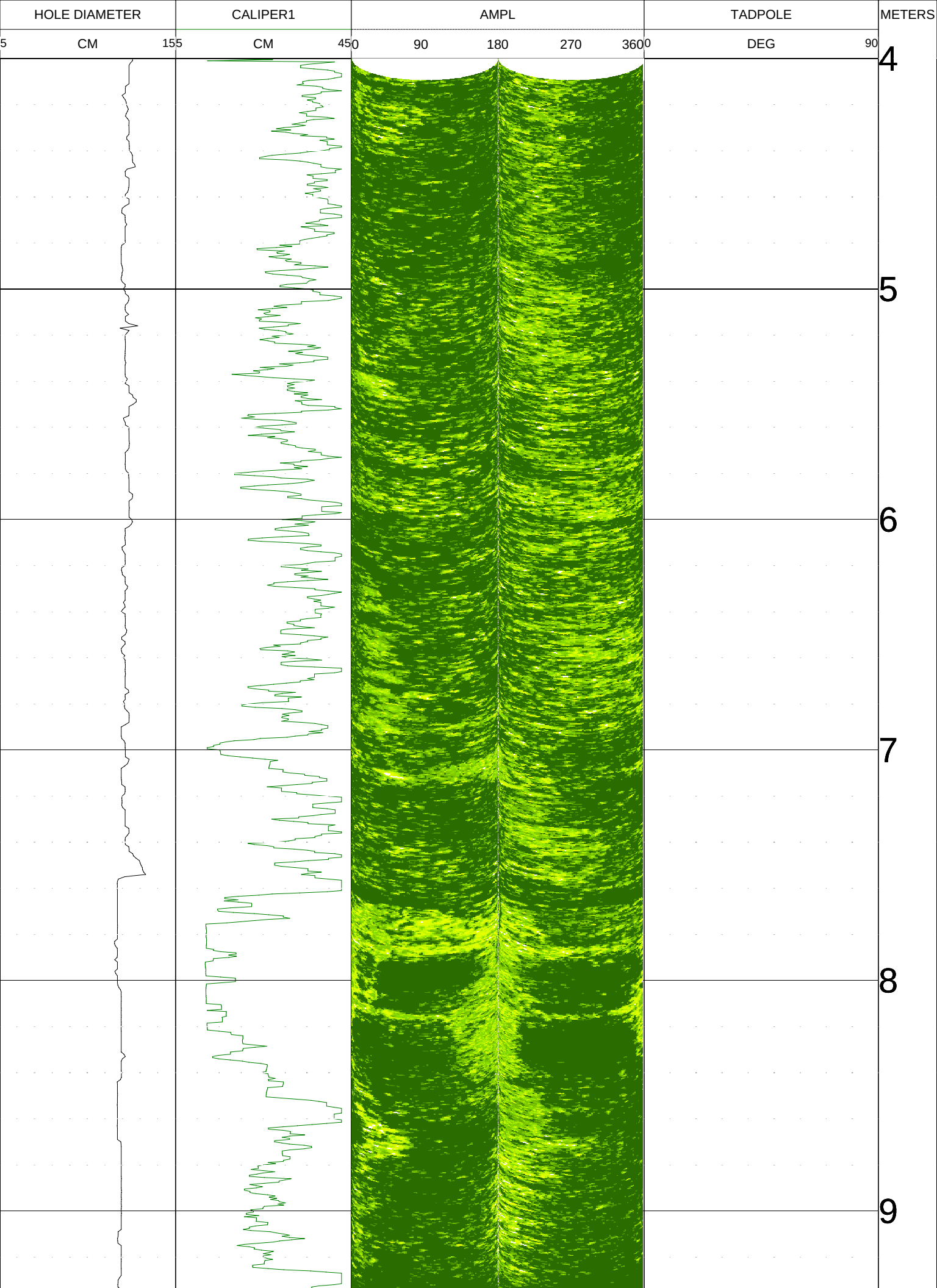

Depth, below ground
42
44
46
48
50
52
54
56
58
60
62
64
66
68
70
72
74
76
78
80
82
0
500
1000
1500
2000
2500
3000
3500
4000
4500
Velocity (m/s)

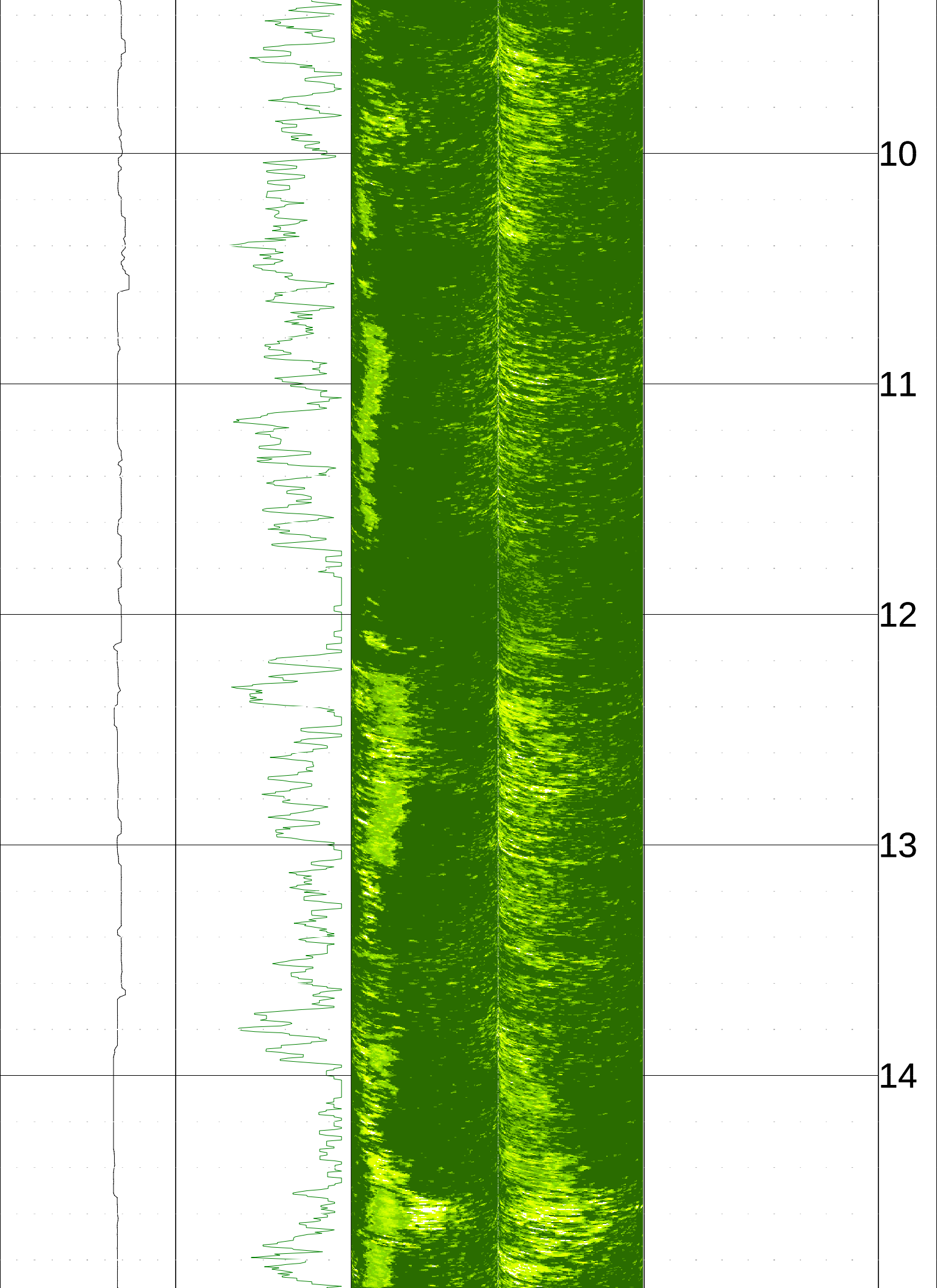


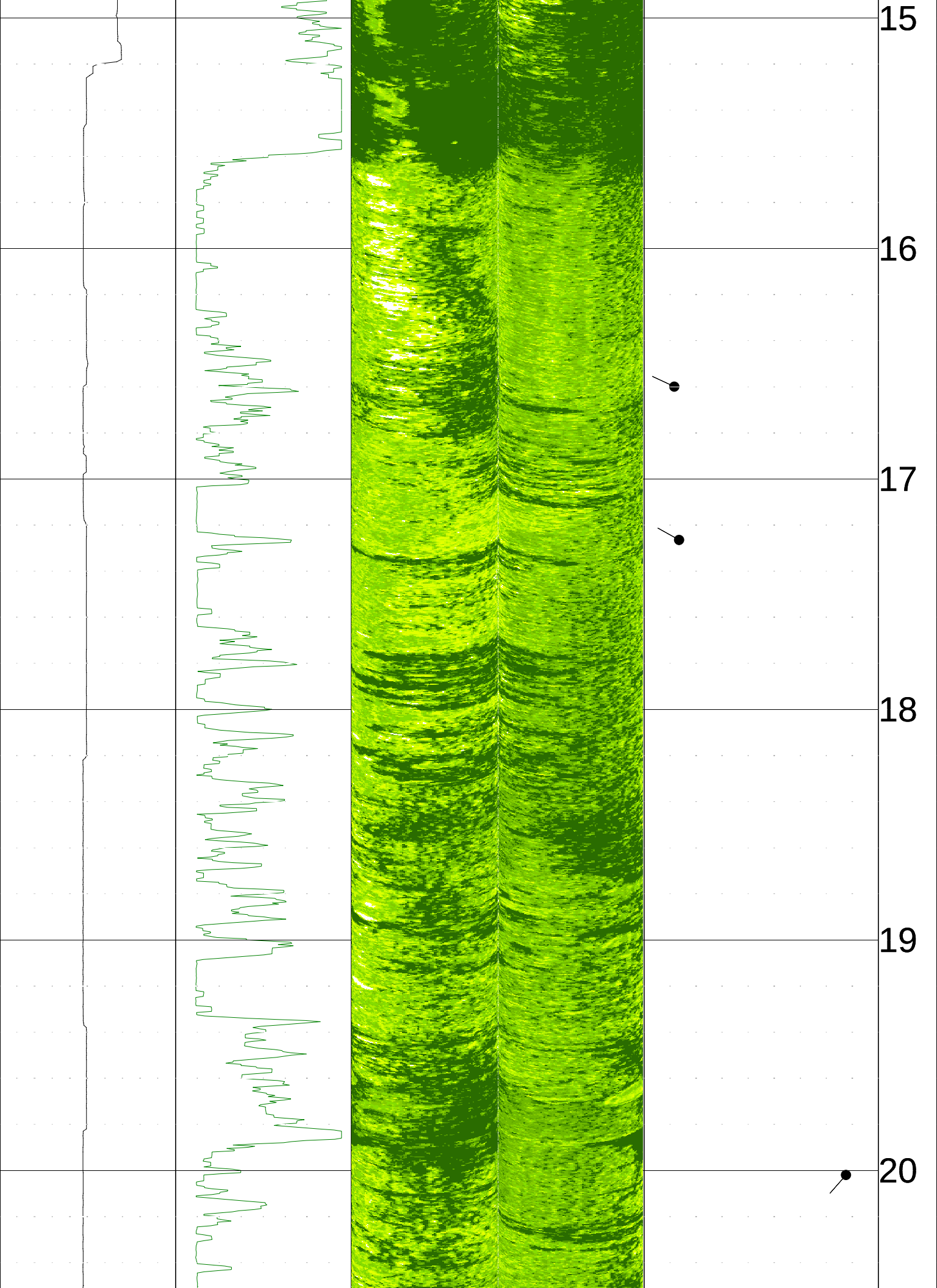
Z3 B2.

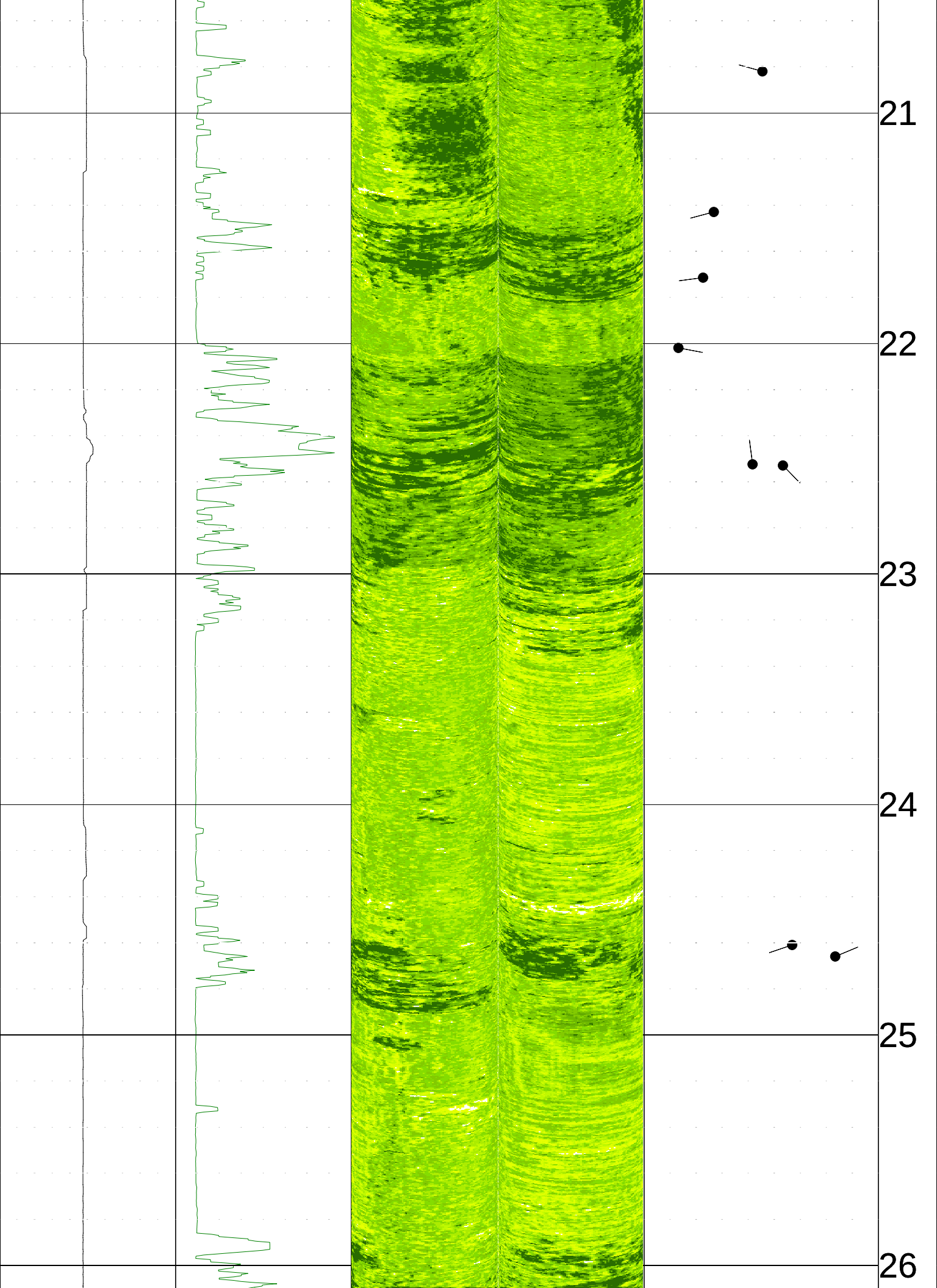
COMPANY	: CALTRANS.	OTHER SERVICES:	
WELL	: Z3 B2.		
FIELD	: LA 710 TUNNEL.		
COUNTY	: LA		
STATE	: CA		
LOCATION	:		
SECTION	: None		
TOWNSHIP	: None		
RANGE	: None		
API NO.	:		
UNIQUE WELL ID.	:		
PERMANENT DATUM	: None	ELEVATION KB	: NA
LOG MEASURED FROM	: GL	ELEVATION DF	: NA
DRL MEASURED FROM	: GL	ELEVATION GL	: 795ft.
DATE	: 1/20/09.	RIG NUMBER	:
DEPTH DRILLER	: 275	LOGGER TD	:
BIT SIZE	: 9.4	ARRIVAL TIME	:
LOG TOP	: 3.05	DEPARTURE TIME	:
LOG BOTTOM	: 83.85	CIRC STOPPED	: 0930
CASING OD	:		
CASING BOTTOM	: NA		
CASING TYPE	: none		
BOREHOLE FLUID	: 0		
RM TEMPERATURE	: 0		
MUD RES	: 0		
MUD WEIGHT	:		
WITNESSED BY	:		
RECORDED BY	: DH/DL		
REMARKS 1	: IND, Acoustic Tel, PSLog, CAL		
REMARKS 2	: EA: 07-187900		

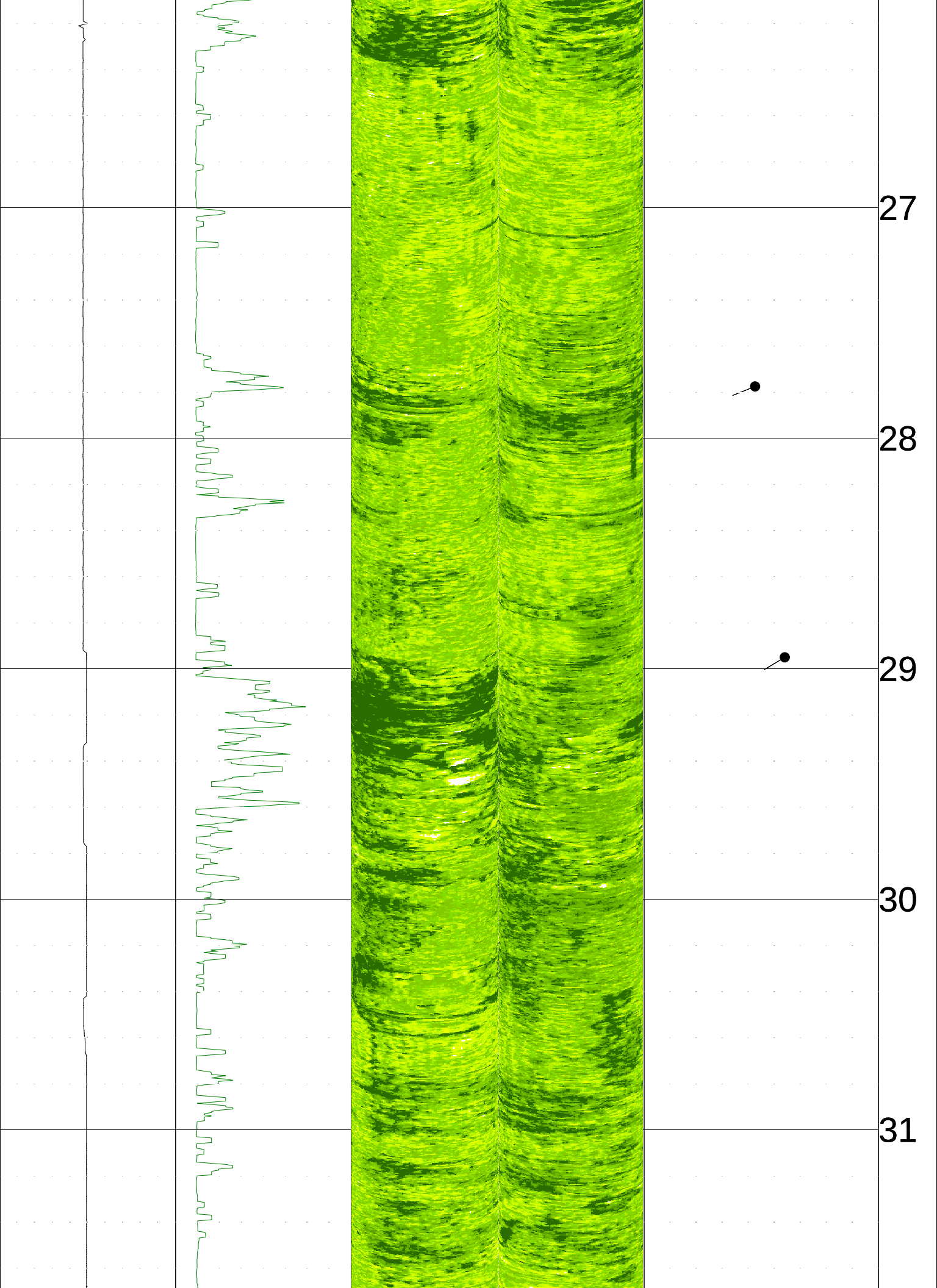
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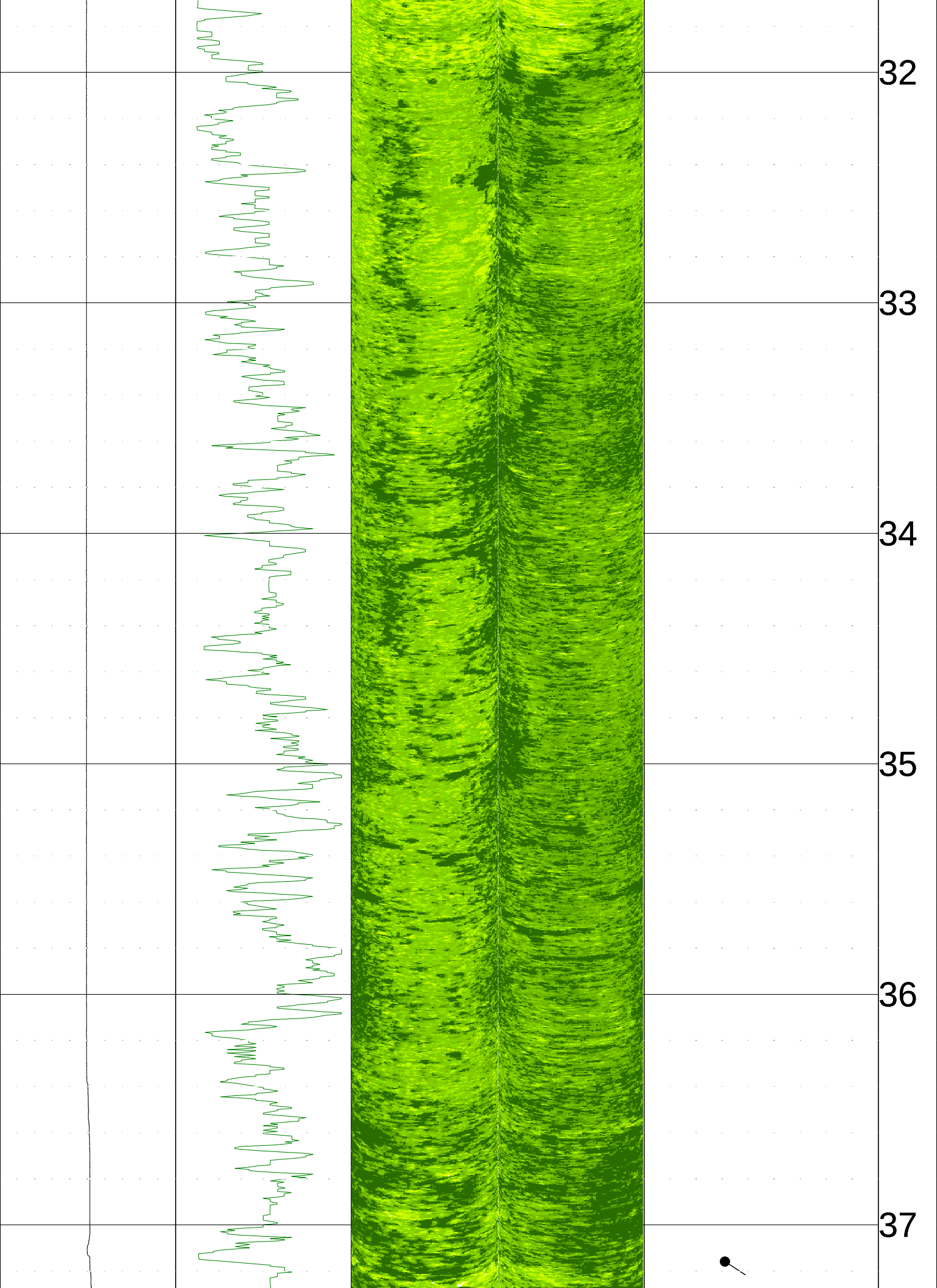

HOLE DIAMETER
5
CM
15
CALIPER1
5
CM
45
AMPL
0
90
180
270
360
TADPOLE
0
DEG
90
METERS
4
5
6
7
8
9

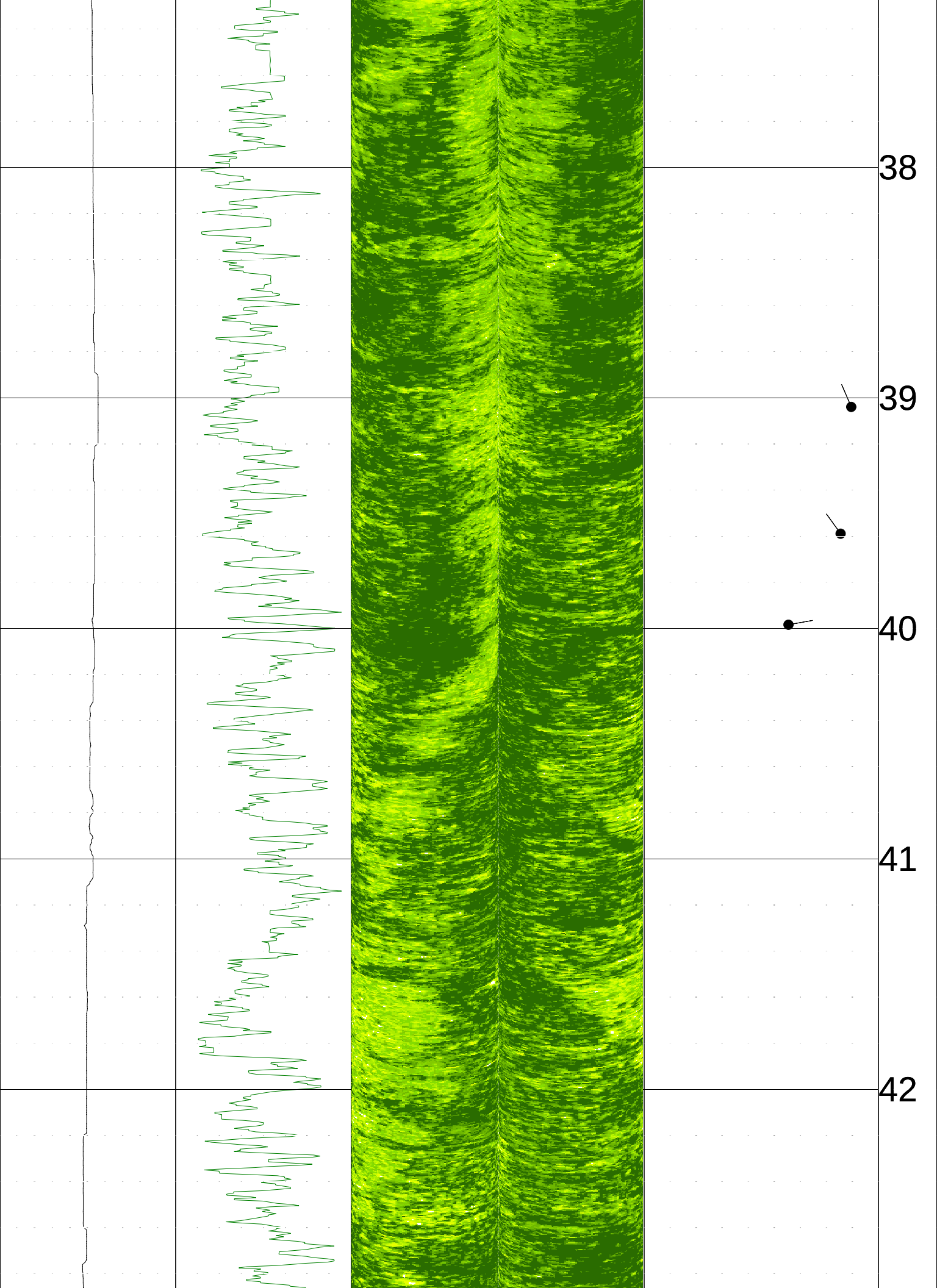

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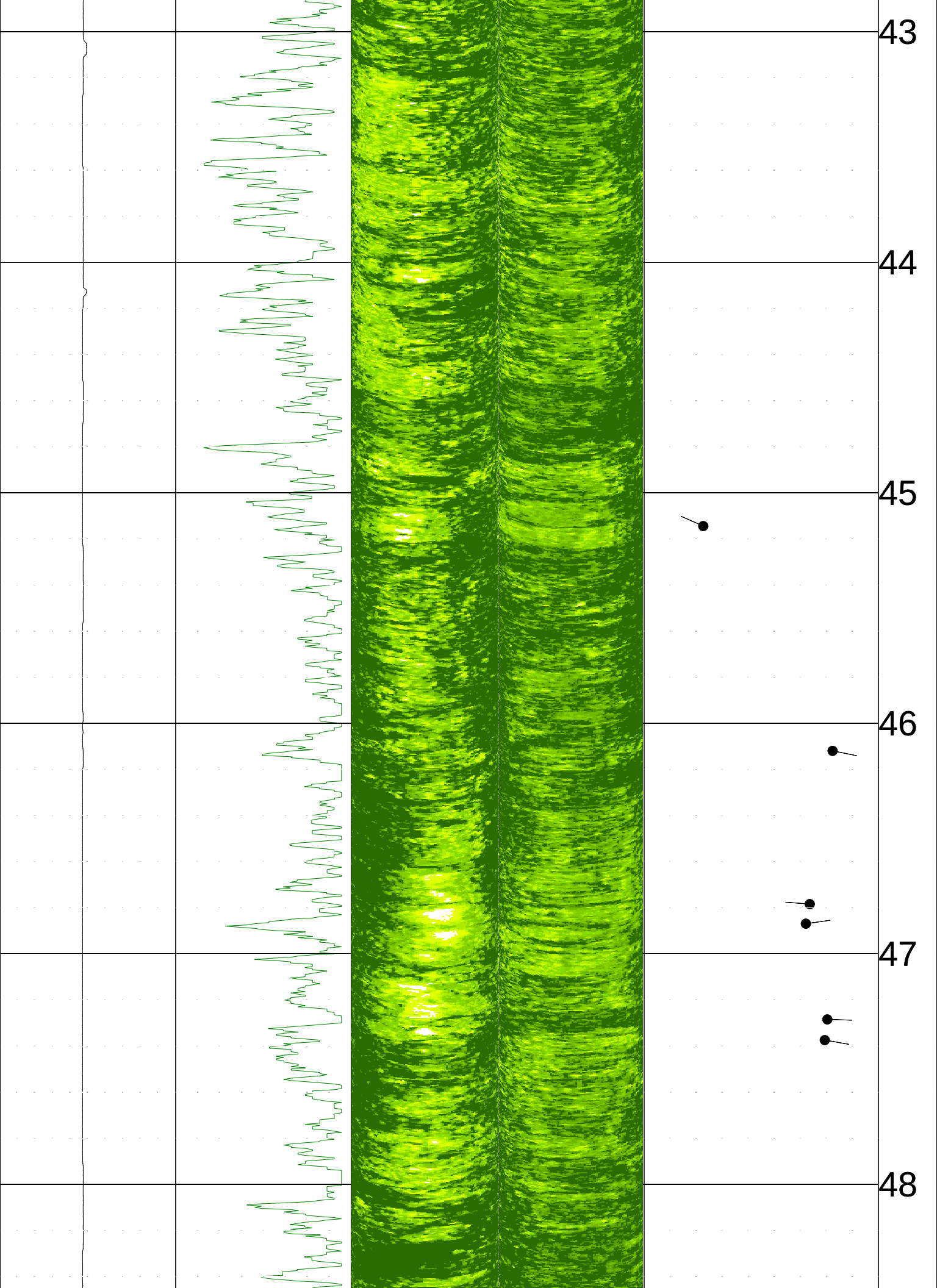

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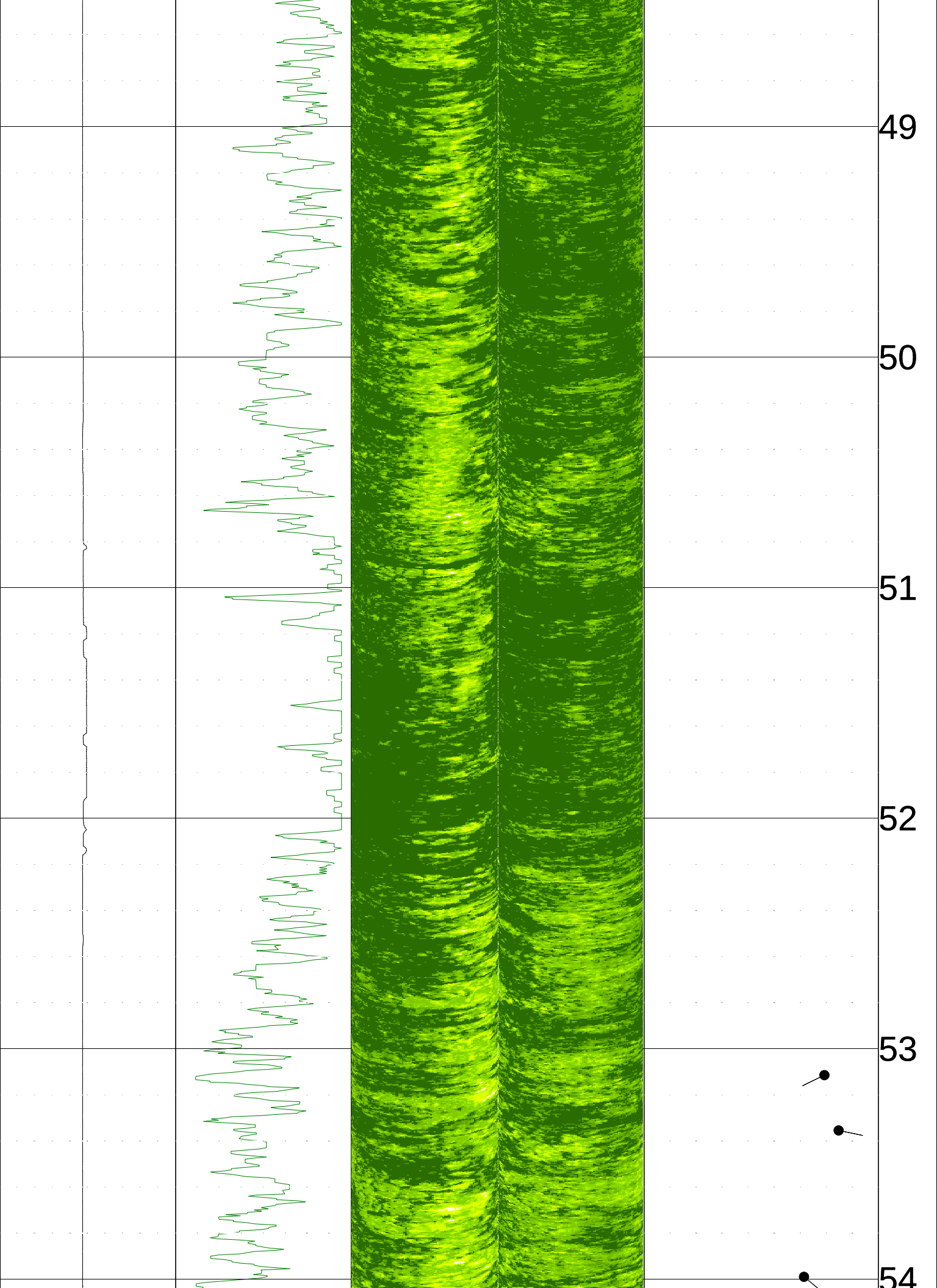

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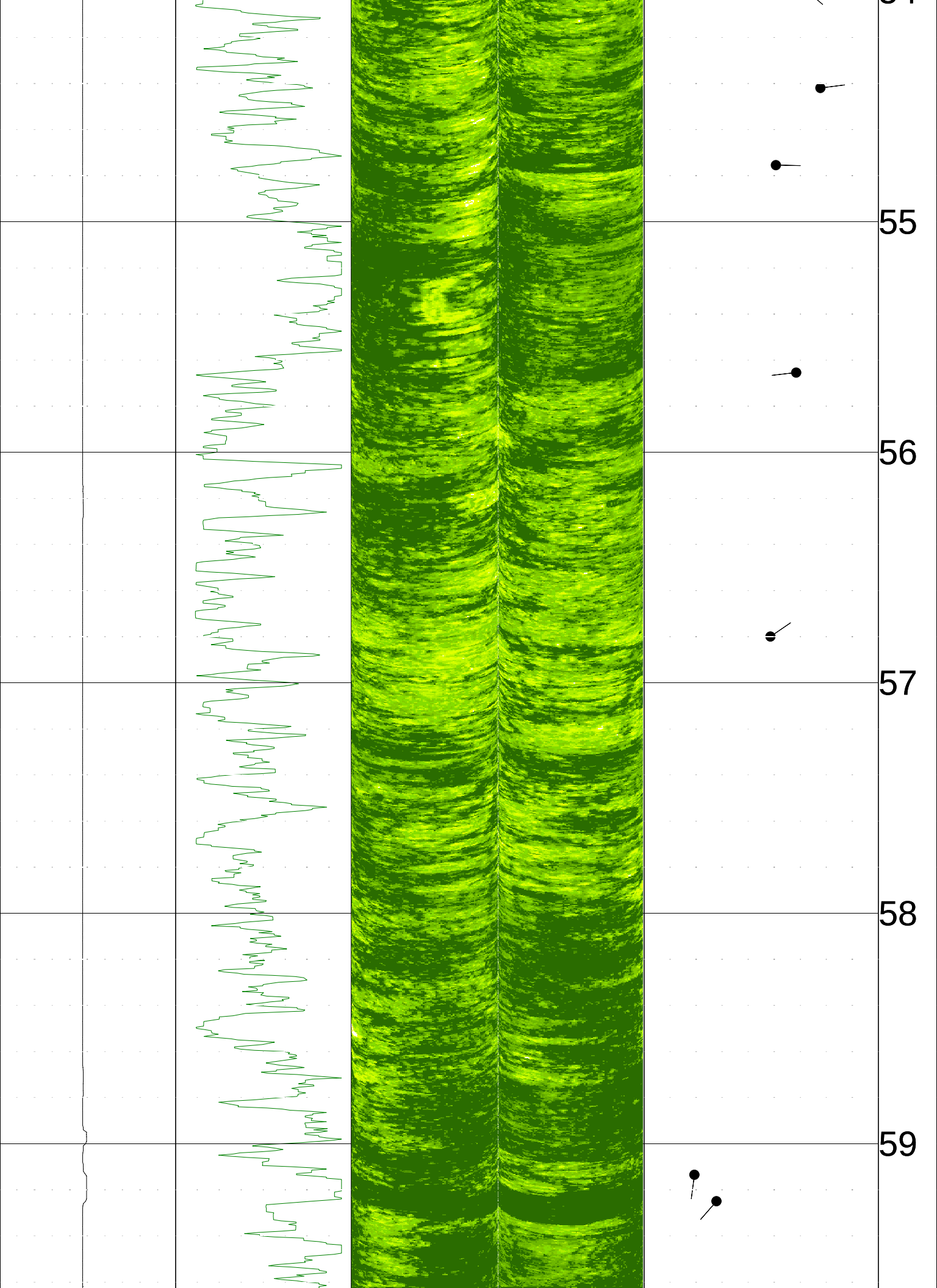

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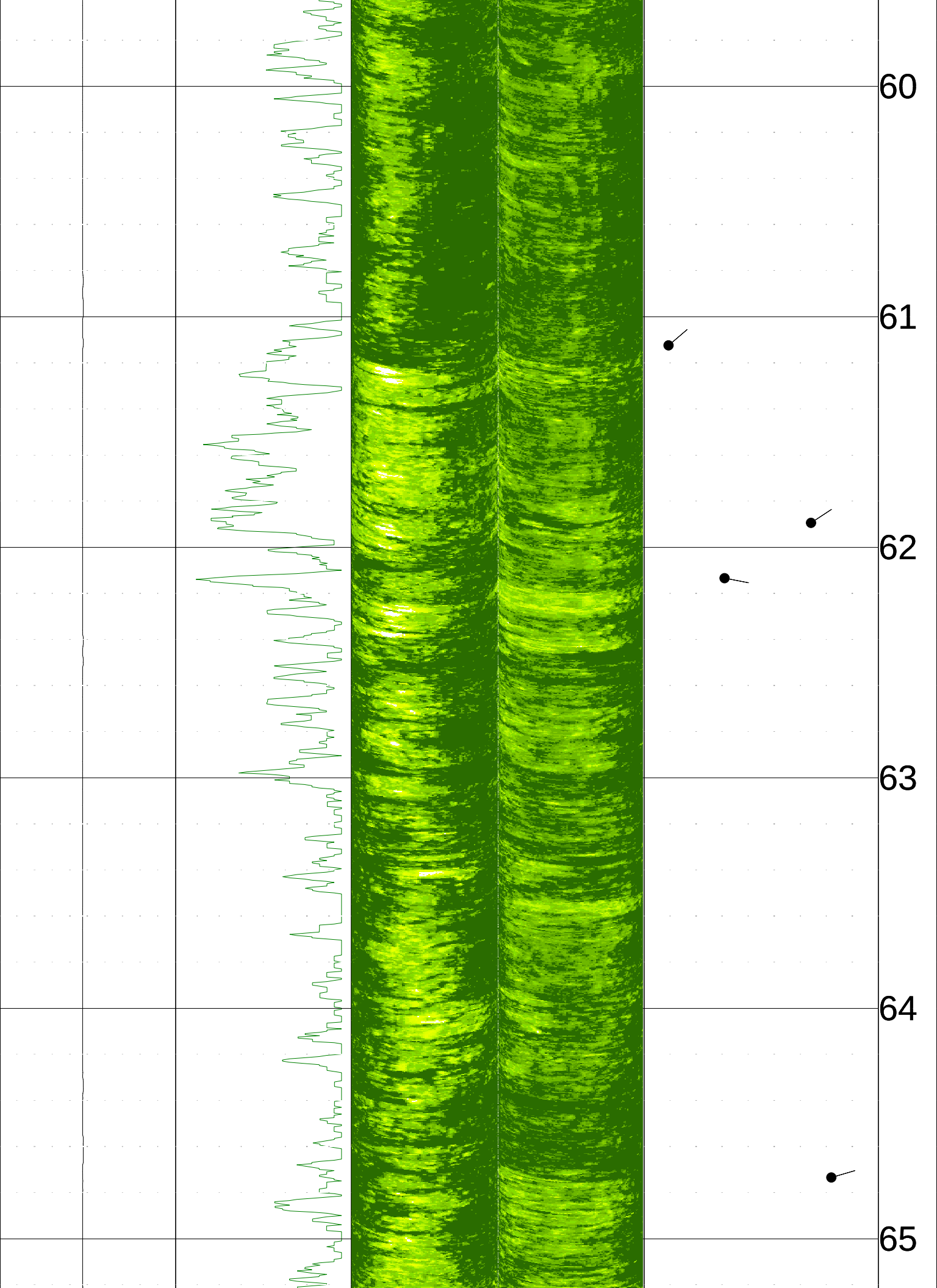

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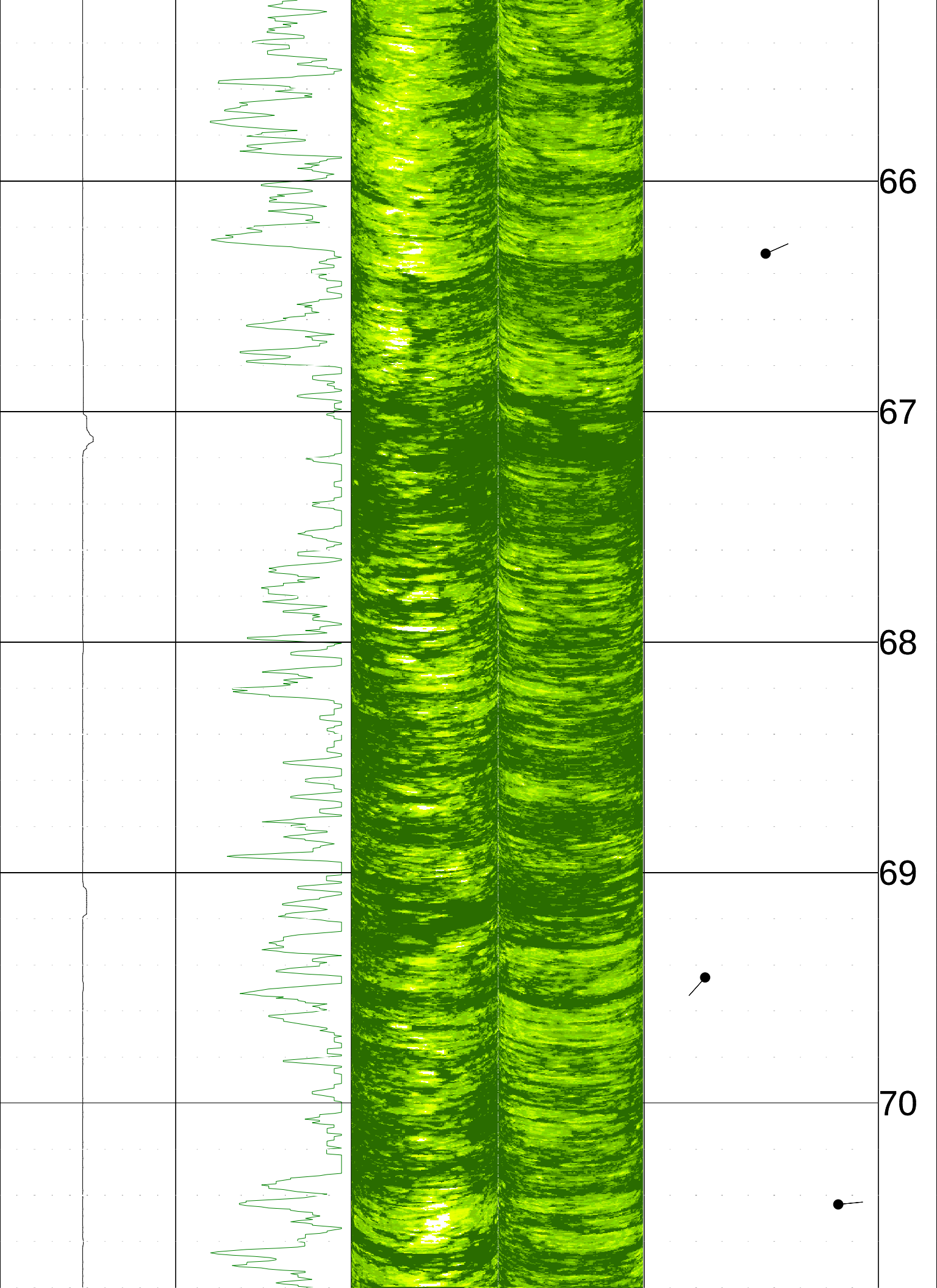

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42

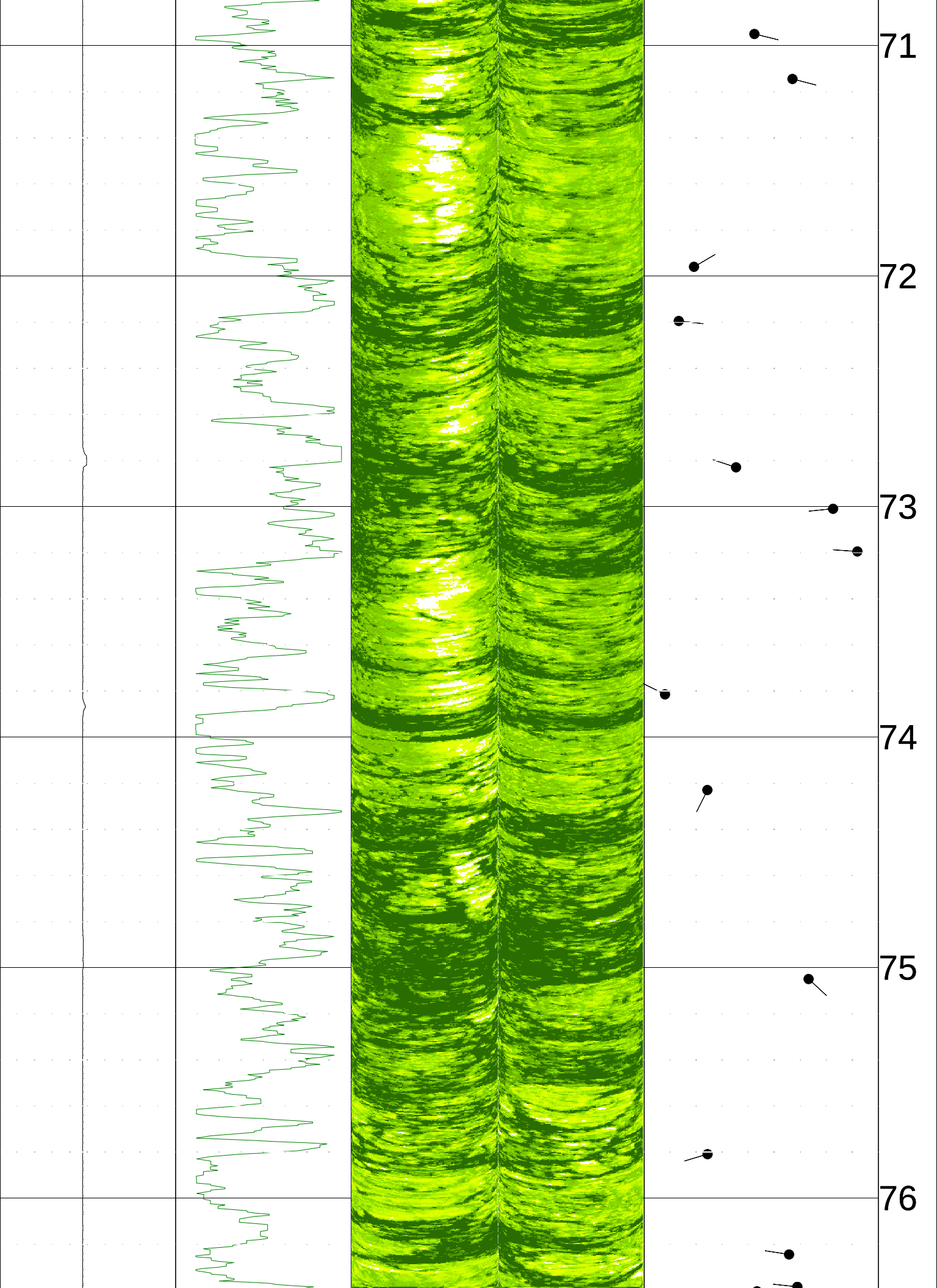

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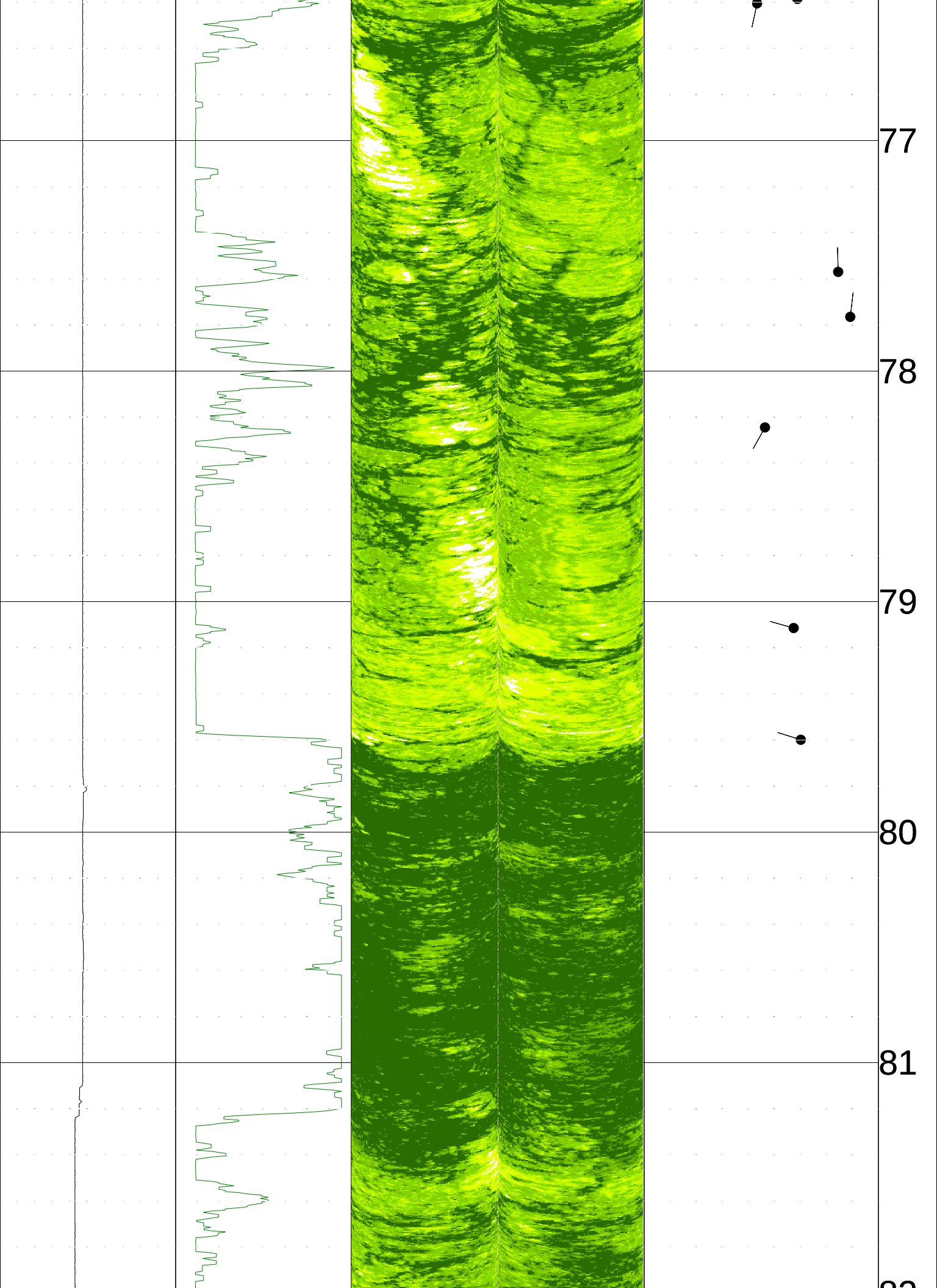

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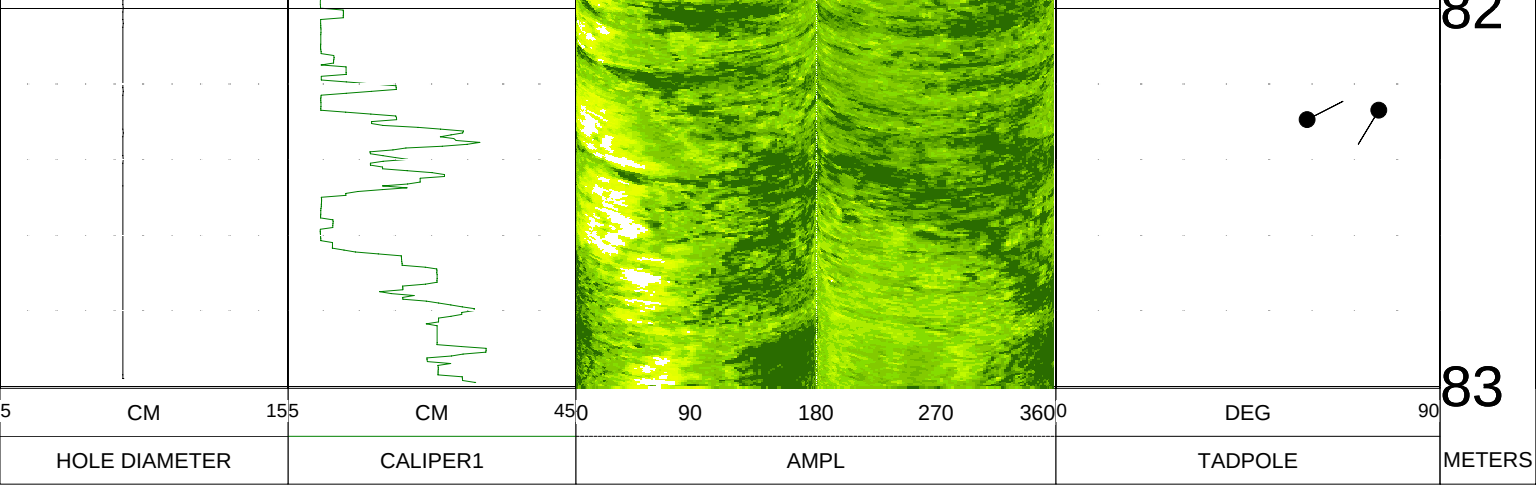

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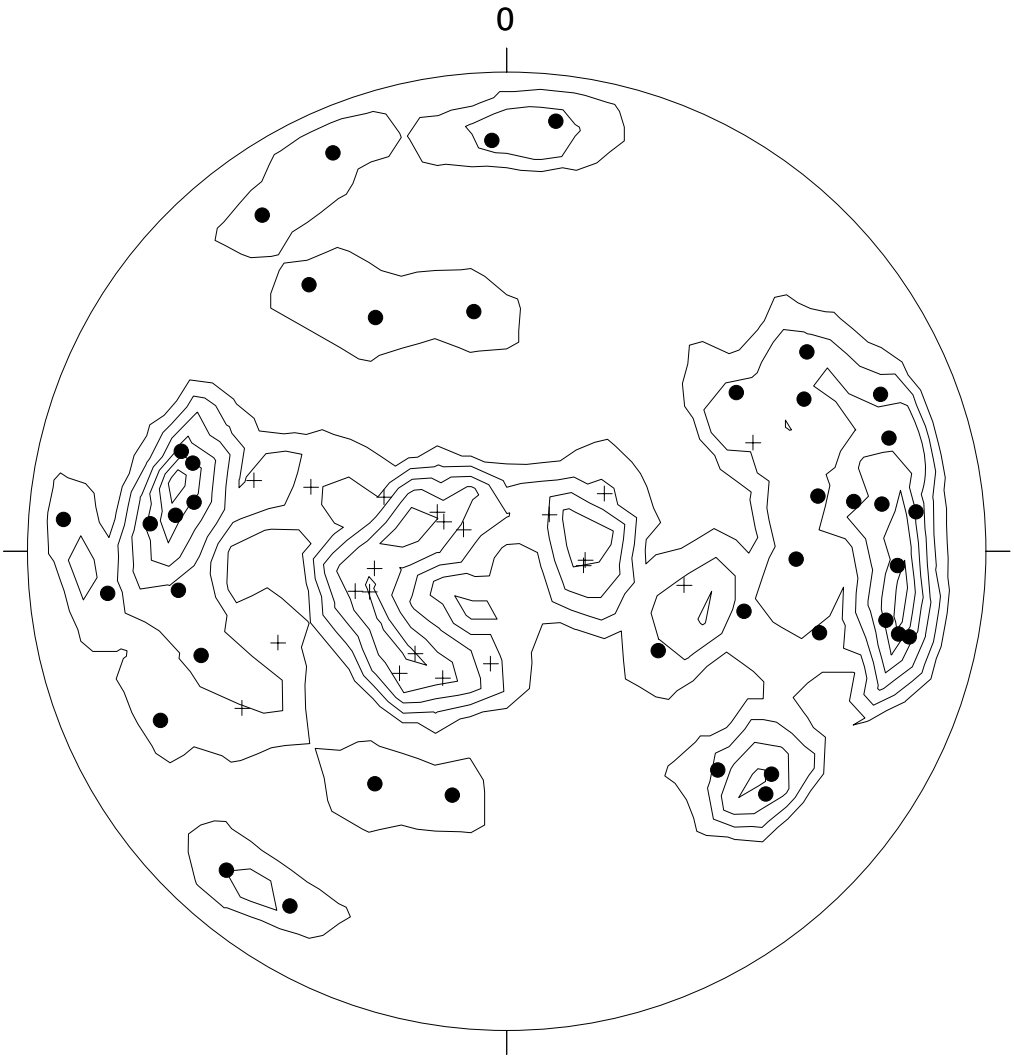

60
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75
76


77
78
79
80
81


82
83
5
CM
155
CM
450
90
180
270
360
0
DEG
90
HOLE DIAMETER
CALIPER1
AMPL
TADPOLE
METERS



LA 710 Tunnel, boring Z3 B2

+ n=21 (P)
• n=41 (P)

Stereonet contour plot of poles to planes,
Both bedding and fractures

n=62
max. dens.= 6.72 (at 282/ 30)
min. dens.=0.00
Contours at every integer between
1 and 6, inclusive:
(Multiples of random distribution)

Apparent bedding denoted as cross
Apparent fractures denoted as solid circle
Plotted on upper hemisphere



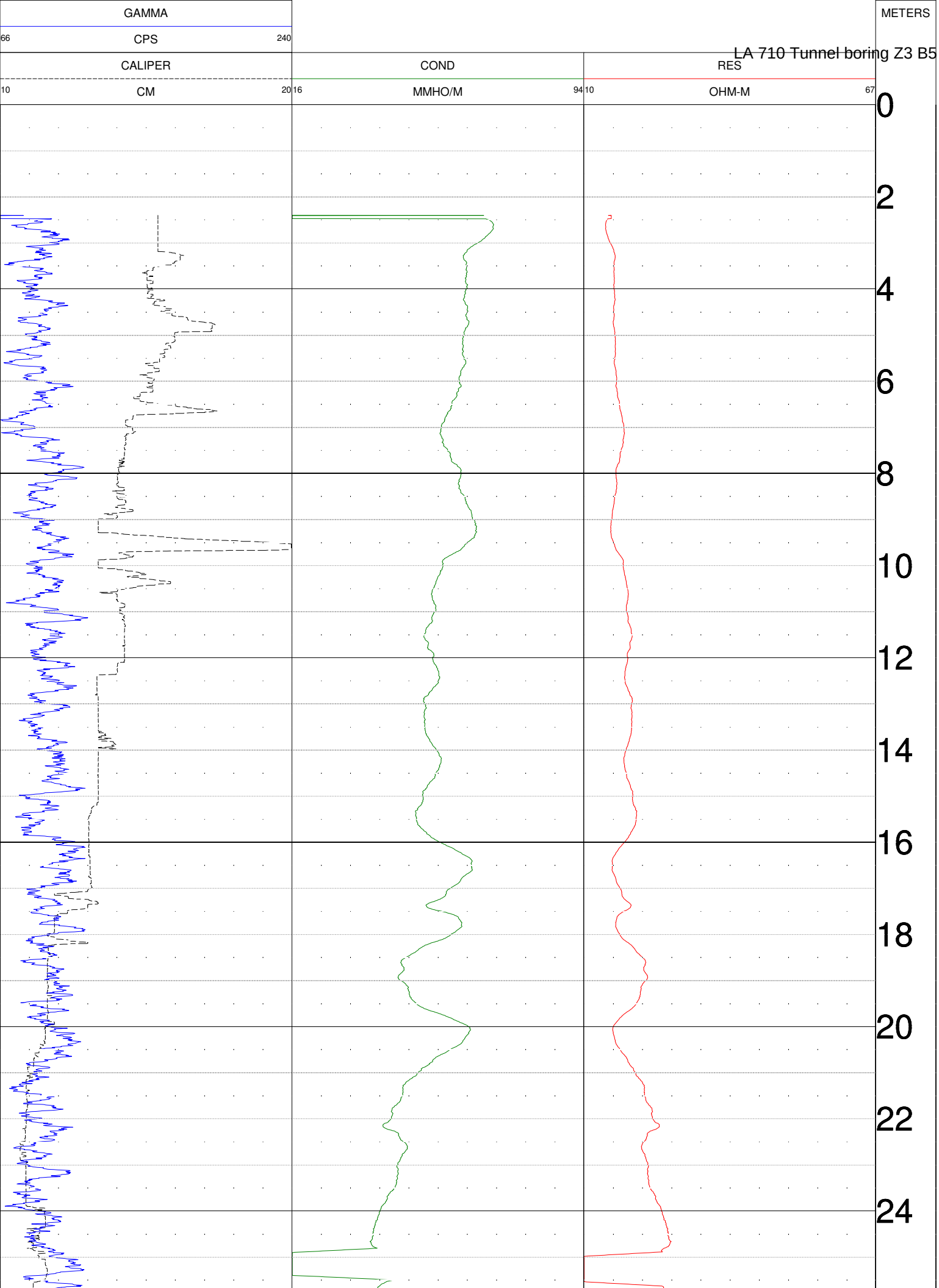
LA 710 Tunnel boring Z3 B5

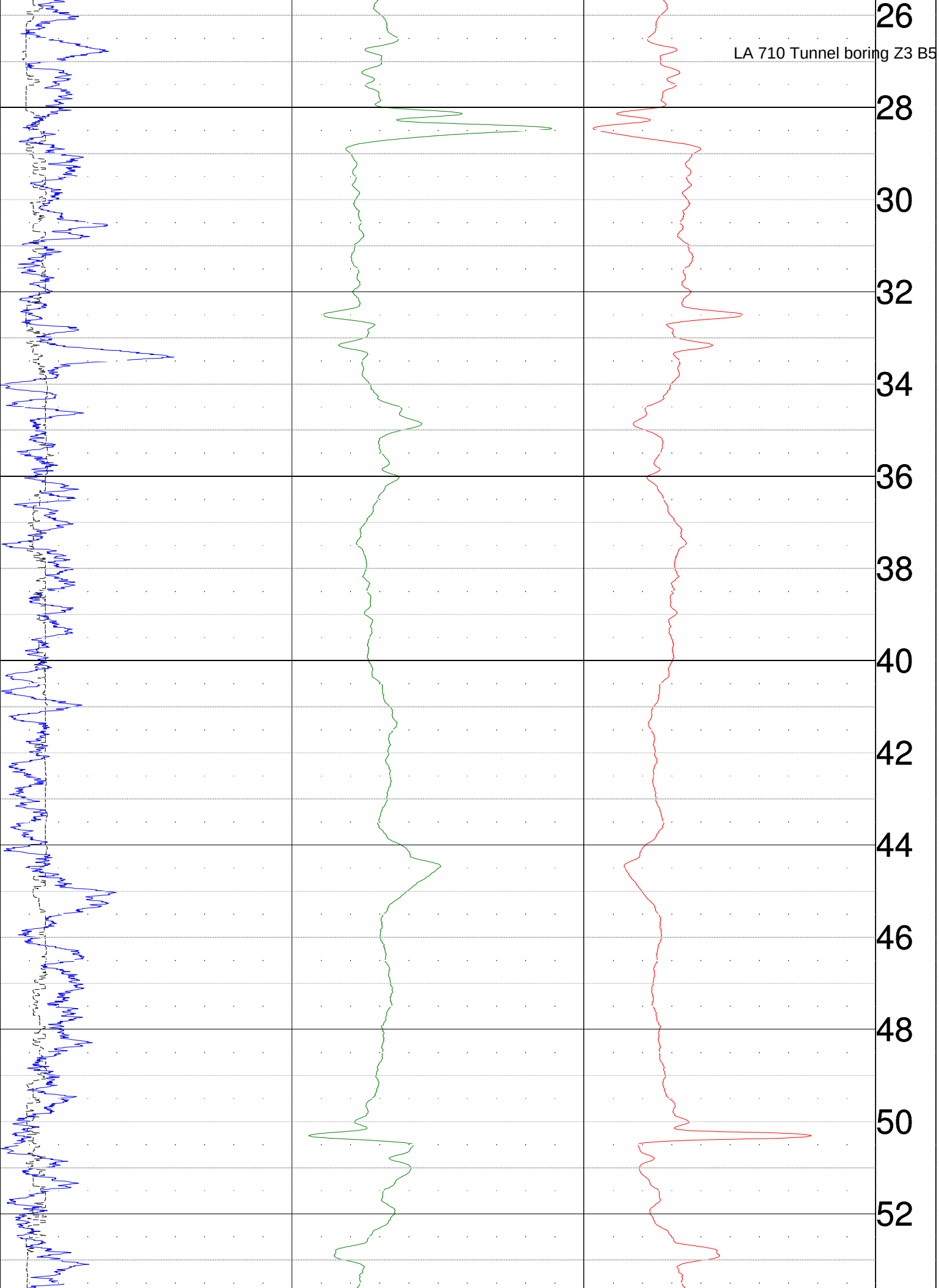
COMPANY	: CALTRANS				
WELL	: Z3 B5				
LOCATION/FIELD	: LA 710 TUNNEL				
COUNTY	: LA				
LOCATION	: CA				
SECTION	: None	TOWNSHIP	: None	RANGE	: None
DATE	: 4/29/09	PERMANENT DATUM	: NONE		
DEPTH DRILLER	: 121.92M			KB	: NA
LOG BOTTOM	: 121.8	LOG MEASURED FROM:	GL	DF	: NA
LOG TOP	: 2.4	DRL MEASURED FROM:	GL	GL	: NA
CASING DIAMETER	: n/a	LOGGING UNIT	: 7311		
CASING TYPE	: n/a	FIELD OFFICE	: 7311		
CASING THICKNESS:	N/A	RECORDED BY	: DH/DL		
BIT SIZE	: 10.2cm	BOREHOLE FLUID	: 0	FILE	: PROCESSE
MAGNETIC DECL.	: 12.85	RM	: 0	TYPE	: 9065A
MATRIX DENSITY	: 2.71	RM TEMPERATURE	: 0	LGDATE	: 4/29/09.
NEUTRON MATRIX	: Dolomit	MATRIX DELTA T	: 140		
				THRESH:	2500

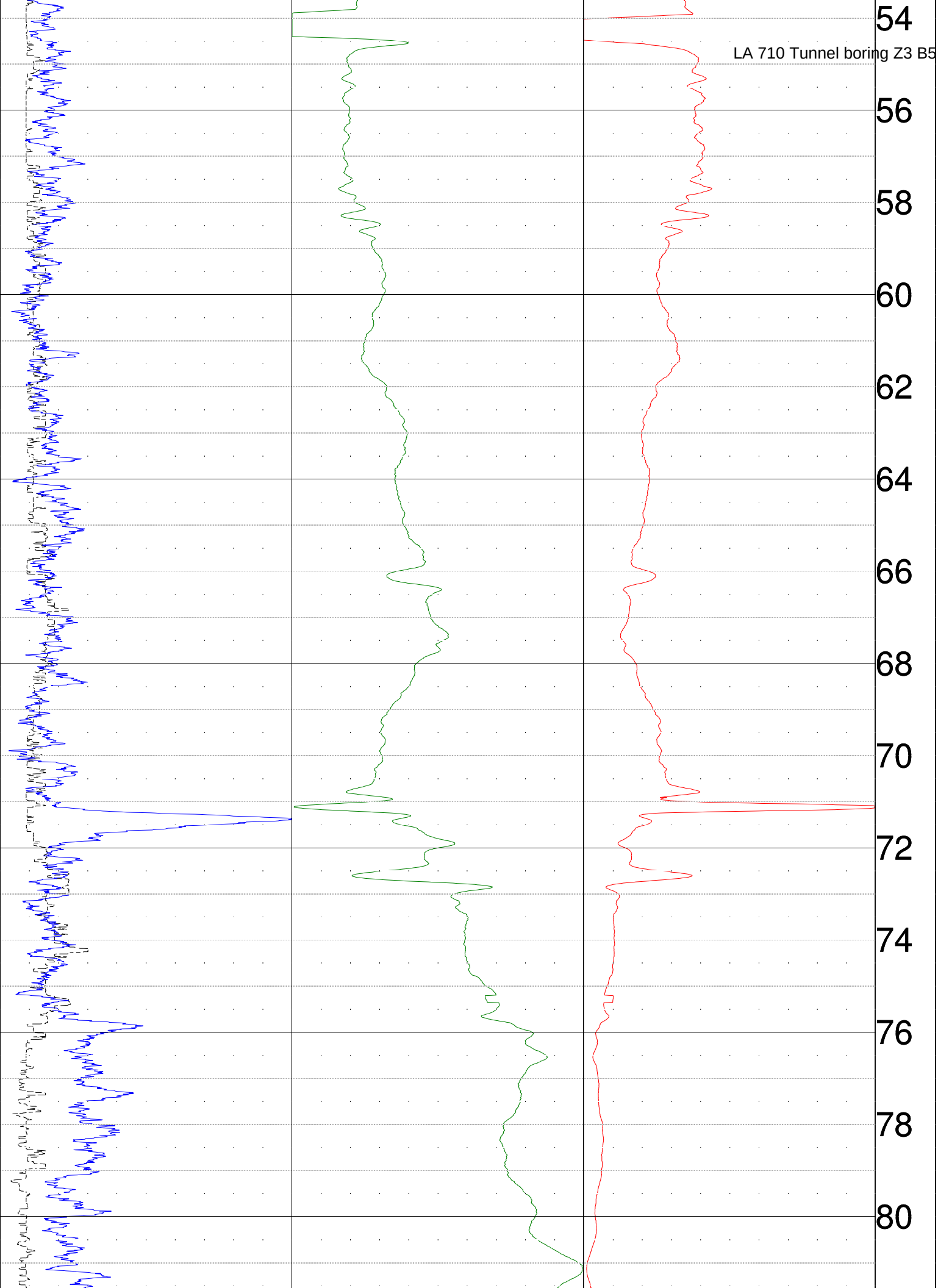
OTHER SERVICES:
IND-CAL
AC TEL
PSLOG

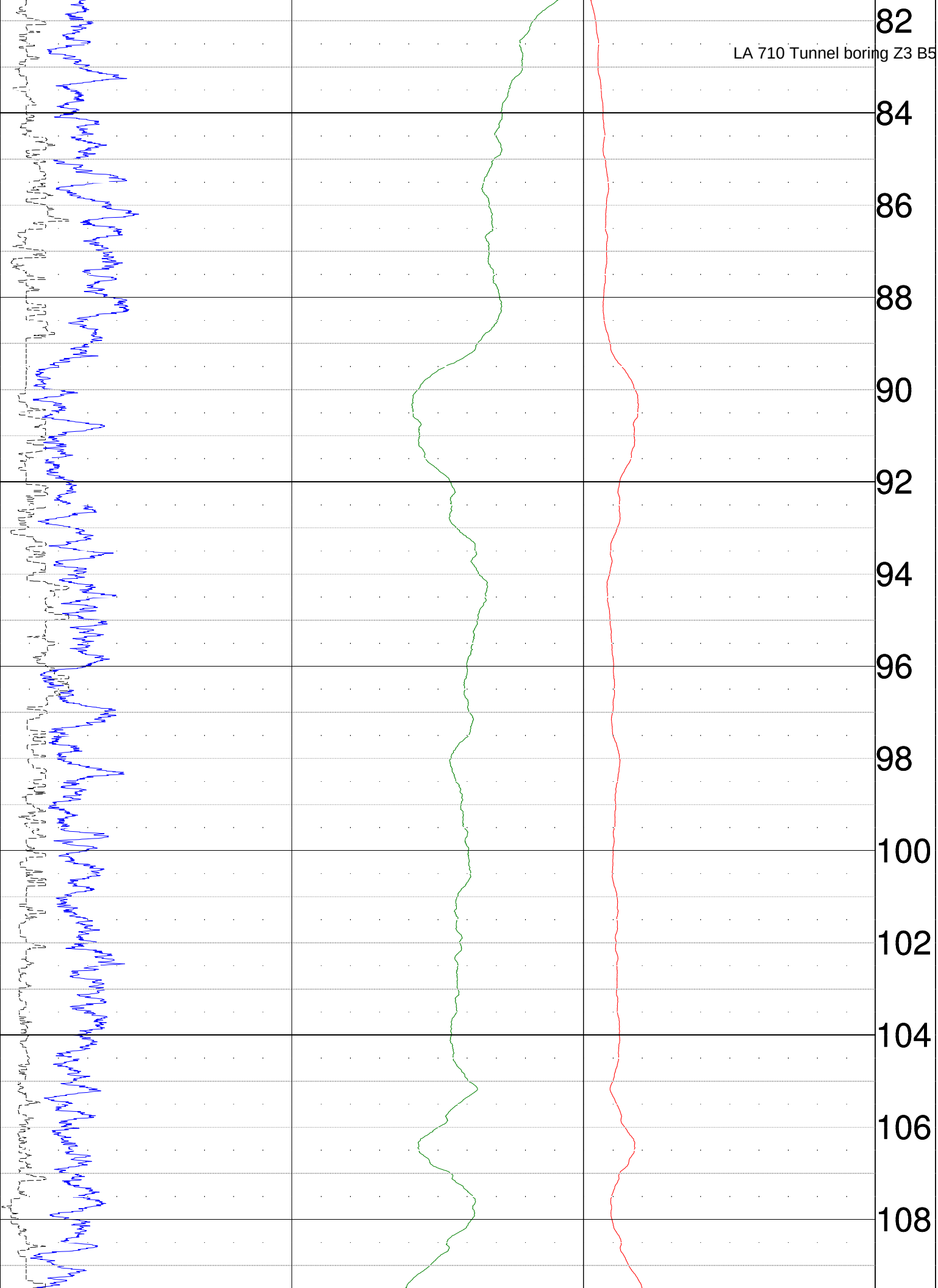
LOG DEPTH IN METERS, CALIPER DIAMETER IN CM
EA: 07-187900. GL ELEVATION ESTIMATED FROM HANDHELD GPS 143.9M

ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS


GAMMA
66
CPS
240
CALIPER
10
CM
20
COND
16
MMHO/M
94
RES
10
OHM-M
67
METERS
LA 710 Tunnel boring Z3 B5
0
2
4
6
8
10
12
14
16
18
20
22
24


LA 710 Tunnel boring Z3 B5
26
28
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32
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LA 710 Tunnel boring Z3 B5
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80


LA 710 Tunnel boring Z3 B5
82
84
86
88
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96
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100
102
104
106
108

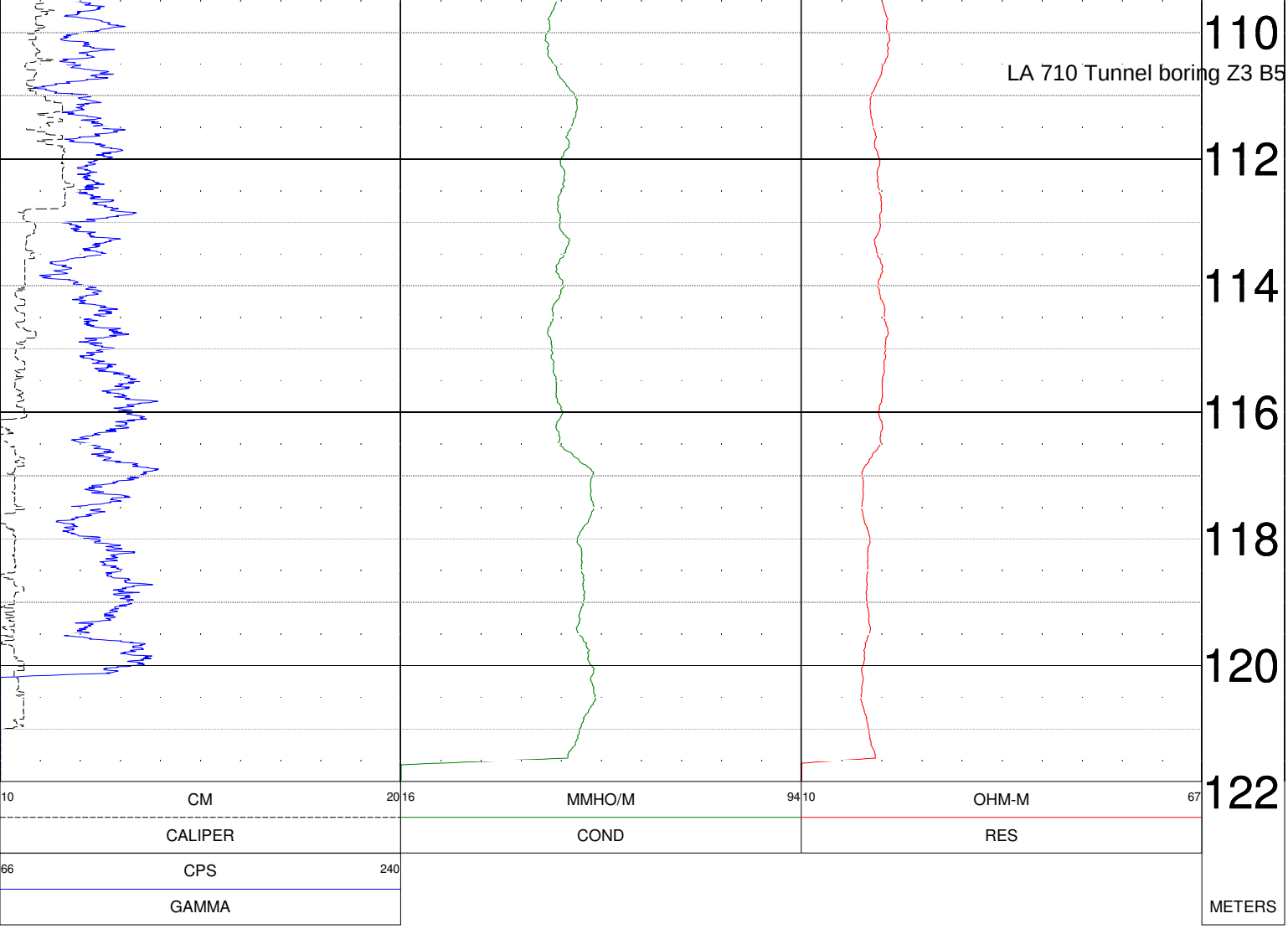

LA 710 Tunnel boring Z3 B5
110
112
114
116
118
120
122
10
CM
20
CALIPER
66
CPS
240
GAMMA
16
MMHO/M
94
COND
10
OHM-M
67
RES
METERS

Table 2. LA 710 Tunnel
Boring Z3 B5
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
Not Provided	2.5	8.2		NA	391	1282	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3	9.8	207	678	465	1526	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3.5	11.5	269	882	752	2467	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4	13.1	368	1206	1031	3382	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4.5	14.8	314	1032	1333	4374	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4.9	16.1	318	1045	1639	5378	0.48	1.96	122.33	0.199	0.588	5.001	4151	12290	104455
	5.5	18.0	370	1215	1754	5756	0.48	2.04	127.35	0.280	0.826	5.906	5844	17261	123344
	6	19.7	347	1139	1786	5859	0.48	2.06	128.62	0.248	0.735	6.238	5188	15359	130291
	6.5	21.3	327	1072	1818	5965	0.48	2.08	129.88	0.222	0.659	6.581	4640	13767	137455
	7	23.0	314	1032	1852	6076	0.49	2.10	131.15	0.208	0.617	6.927	4339	12888	144681
	7.5	24.6	305	1000	1852	6076	0.49	2.10	131.15	0.195	0.580	6.944	4078	12121	145028
	7.5	24.6		NA	1887	6190	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8	26.2		NA	1887	6190	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8.4	27.6		NA	1835	6020	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9	29.5		NA	1887	6190	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9.5	31.2		NA	1942	6371	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10	32.8	323	1058	1923	6309	0.49	2.14	133.69	0.223	0.662	7.623	4654	13828	159205
	10.5	34.4	316	1038	2174	7132	0.49	2.26	141.40	0.227	0.676	10.402	4737	14109	217241
	11	36.1	286	937	2000	6562	0.49	2.18	136.25	0.178	0.531	8.492	3721	11085	177368
	11.5	37.7	289	948	1724	5657	0.49	2.02	126.09	0.169	0.501	5.779	3524	10469	120703
	12	39.4	291	954	1754	5756	0.49	2.04	127.35	0.172	0.512	6.049	3600	10700	126336
	13.5	44.3	352	1155	2000	6562	0.48	2.18	136.25	0.271	0.803	8.369	5651	16774	174794
	14	45.9	352	1155	2000	6562	0.48	2.18	136.25	0.271	0.803	8.369	5651	16774	174794
	14.5	47.6	370	1215	2083	6835	0.48	2.22	138.82	0.305	0.905	9.245	6371	18904	193075
	15	49.2	355	1163	1961	6433	0.48	2.16	134.97	0.272	0.806	7.950	5678	16842	166033
	16	52.5	316	1038	1923	6309	0.49	2.14	133.69	0.214	0.637	7.634	4479	13313	159439
	16.4	53.8	313	1025	1887	6190	0.49	2.12	132.42	0.207	0.616	7.275	4326	12857	151943
	17	55.8	318	1045	1887	6190	0.49	2.12	132.42	0.215	0.639	7.264	4493	13348	151720
	17.5	57.4	357	1172	1887	6190	0.48	2.12	132.42	0.271	0.802	7.191	5651	16742	150177
	17.9	58.7	385	1262	1961	6433	0.48	2.16	134.97	0.320	0.947	7.886	6680	19772	164697
	18.5	60.7	385	1262	1961	6433	0.48	2.16	134.97	0.320	0.947	7.886	6680	19772	164697
	19	62.3	385	1262	1961	6433	0.48	2.16	134.97	0.320	0.947	7.886	6680	19772	164697
	19.5	64.0	376	1233	2041	6696	0.48	2.20	137.53	0.311	0.923	8.760	6503	19280	182964
	20	65.6	394	1292	2000	6562	0.48	2.18	136.25	0.338	1.001	8.279	7065	20911	172909
	20.5	67.3	382	1252	2083	6835	0.48	2.22	138.82	0.324	0.961	9.219	6766	20062	192548
	21	68.9	347	1139	1923	6309	0.48	2.14	133.69	0.258	0.766	7.576	5392	15996	158221
	21.5	70.5	333	1094	1887	6190	0.48	2.12	132.42	0.236	0.699	7.237	4922	14608	151148

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B5
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	22	72.2	338	1108	1961	6433	0.48	2.16	134.97	0.247	0.733	7.983	5154	15303	166732
	22.3	73.2	338	1108	2000	6562	0.49	2.18	136.25	0.249	0.740	8.398	5203	15455	175393
	22.9	75.1	365	1197	2083	6835	0.48	2.22	138.82	0.296	0.879	9.256	6186	18362	193321
	23.4	76.8	373	1224	2000	6562	0.48	2.18	136.25	0.304	0.901	8.325	6346	18810	173868
	24	78.7	352	1155	2041	6696	0.48	2.20	137.53	0.273	0.811	8.811	5705	16939	184029
	24.5	80.4	415	1361	2041	6696	0.48	2.20	137.53	0.379	1.122	8.670	7922	23424	181072
	25	82.0	431	1414	2128	6981	0.48	2.24	140.11	0.417	1.233	9.604	8709	25753	200578
	25.5	83.7	467	1533	2174	7132	0.48	2.26	141.40	0.495	1.460	10.045	10329	30488	209785
	26	85.3	510	1674	2326	7630	0.47	2.33	145.29	0.606	1.787	11.779	12653	37319	246012
	26.5	86.9	532	1745	2222	7291	0.47	2.29	142.69	0.647	1.901	10.425	13507	39699	217733
	27	88.6	493	1616	2128	6981	0.47	2.24	140.11	0.545	1.603	9.434	11374	33479	197023
	27.5	90.2	575	1886	2326	7630	0.47	2.33	145.29	0.769	2.256	11.562	16055	47120	241476
	27.9	91.5	565	1854	2439	8002	0.47	2.37	147.90	0.756	2.226	13.085	15794	46486	273290
	28.4	93.2	535	1754	2632	8634	0.48	2.43	151.84	0.696	2.057	15.916	14526	42953	332413
	29	95.1	685	2247	2703	8867	0.47	2.45	153.16	1.151	3.374	16.386	24038	70463	342227
	29.5	96.8	565	1854	2564	8412	0.47	2.41	150.52	0.770	2.270	14.826	16074	47401	309649
	30	98.4	521	1709	2381	7812	0.47	2.35	146.59	0.637	1.879	12.462	13304	39243	260283
	30.5	100.1	559	1833	2273	7456	0.47	2.31	143.99	0.720	2.113	10.954	15034	44136	228776
	31	101.7	613	2013	2439	8002	0.47	2.37	147.90	0.892	2.615	12.905	18623	54612	269518
	31.5	103.3	595	1953	2128	6981	0.46	2.24	140.11	0.795	2.318	9.100	16607	48412	190046
	32	105.0	571	1875	2381	7812	0.47	2.35	146.59	0.767	2.253	12.289	16014	47063	256669
	32.5	106.6	621	2038	2326	7630	0.46	2.33	145.29	0.898	2.625	11.390	18752	54815	237880
	33	108.3	500	1640	2326	7630	0.48	2.33	145.29	0.582	1.717	11.811	12152	35866	246680
	33.5	109.9	450	1478	2326	7630	0.48	2.33	145.29	0.472	1.398	11.957	9863	29203	249732
	33.9	111.2	518	1700	2273	7456	0.47	2.31	143.99	0.619	1.824	11.088	12932	38088	231578
	34.4	112.9	588	1930	2381	7812	0.47	2.35	146.59	0.813	2.385	12.228	16970	49806	255395
	34.9	114.5	565	1854	2326	7630	0.47	2.33	145.29	0.743	2.182	11.596	15515	45572	242196
	35.5	116.5	719	2360	2381	7812	0.45	2.35	146.59	1.215	3.524	11.691	25383	73599	244177
	36	118.1	641	2103	2381	7812	0.46	2.35	146.59	0.965	2.819	12.025	20152	58882	251151
	36.5	119.8	649	2130	2326	7630	0.46	2.33	145.29	0.981	2.861	11.278	20495	59753	235555
	37	121.4	719	2360	2326	7630	0.45	2.33	145.29	1.205	3.486	10.981	25158	72810	229338
	37.5	123.0	775	2543	2381	7812	0.44	2.35	146.59	1.411	4.066	11.430	29471	84919	238726
	38	124.7	746	2448	2564	8412	0.45	2.41	150.52	1.343	3.904	14.062	28045	81539	293686
	38.5	126.3	758	2485	2564	8412	0.45	2.41	150.52	1.384	4.019	14.007	28901	83939	292544
	39	128.0	694	2278	2439	8002	0.46	2.37	147.90	1.143	3.327	12.570	23862	69481	262533
	39.5	129.6	602	1976	2326	7630	0.46	2.33	145.29	0.845	2.473	11.461	17639	51649	239363
	40	131.2	535	1754	2500	8202	0.48	2.39	149.21	0.683	2.018	14.027	14275	42140	292955

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B5
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	40	131.2	595	1953	2500	8202	0.47	2.39	149.21	0.847	2.490	13.809	17686	51996	288407
	40.5	132.9	581	1907	2381	7812	0.47	2.35	146.59	0.794	2.331	12.254	16578	48681	255919
	41	134.5	581	1907	2273	7456	0.46	2.31	143.99	0.780	2.284	10.874	16283	47709	227111
	41.5	136.2	546	1793	2273	7456	0.47	2.31	143.99	0.689	2.024	10.995	14384	42271	229643
	42	137.8	515	1691	2273	7456	0.47	2.31	143.99	0.613	1.805	11.097	12799	37704	231756
	42.5	139.4	541	1773	2273	7456	0.47	2.31	143.99	0.674	1.981	11.015	14075	41381	230055
	43	141.1	532	1745	2564	8412	0.48	2.41	150.52	0.682	2.016	14.943	14248	42103	312083
	43.3	142.1	529	1736	2564	8412	0.48	2.41	150.52	0.675	1.995	14.952	14097	41665	312284
	44	144.4	629	2063	2273	7456	0.46	2.31	143.99	0.912	2.661	10.697	19055	55584	223415
	44.5	146.0	847	2780	2439	8002	0.43	2.37	147.90	1.701	4.871	11.825	35536	101728	246968
	45	147.6	775	2543	2381	7812	0.44	2.35	146.59	1.411	4.066	11.430	29471	84919	238727
	45.5	149.3	719	2360	2381	7812	0.45	2.35	146.59	1.215	3.524	11.691	25383	73599	244177
	46	150.9	704	2310	2500	8202	0.46	2.39	149.21	1.185	3.454	13.358	24756	72134	278980
	46.5	152.6	676	2217	2500	8202	0.46	2.39	149.21	1.091	3.188	13.483	22790	66573	281602
	47	154.2	704	2310	2381	7812	0.45	2.35	146.59	1.165	3.382	11.759	24322	70634	245592
	47.5	155.8	752	2467	2500	8202	0.45	2.39	149.21	1.351	3.919	13.137	28220	81853	274362
	48	157.5	800	2625	2564	8412	0.45	2.41	150.52	1.543	4.463	13.795	32229	93210	288109
	48.5	159.1	862	2828	2632	8634	0.44	2.43	151.84	1.808	5.205	14.433	37751	108714	301448
	49	160.8	752	2467	2564	8412	0.45	2.41	150.52	1.363	3.961	14.035	28468	82726	293123
	49.5	162.4	671	2202	2500	8202	0.46	2.39	149.21	1.077	3.146	13.503	22485	65708	282009
	50	164.0	735	2412	2632	8634	0.46	2.43	151.84	1.315	3.834	15.090	27464	80066	315163
	50	164.0	901	2956	2703	8867	0.44	2.45	153.16	1.991	5.725	15.266	41586	119561	318827
	50.5	165.7	806	2646	2703	8867	0.45	2.45	153.16	1.596	4.631	15.793	33324	96714	329845
	51	167.3	714	2343	2500	8202	0.46	2.39	149.21	1.219	3.550	13.312	25468	74142	278030
	51.5	169.0	714	2343	2439	8002	0.45	2.37	147.90	1.209	3.513	12.482	25245	73367	260689
	52	170.6	662	2173	2439	8002	0.46	2.37	147.90	1.039	3.034	12.708	21701	63375	265415
	52.5	172.2	671	2202	2632	8634	0.47	2.43	151.84	1.096	3.210	15.383	22881	67050	321276
	53	173.9	1064	3490	2857	9374	0.42	2.50	155.80	2.824	8.019	16.607	58990	167476	346845
	53.5	175.5	1020	3348	2703	8867	0.42	2.45	153.16	2.554	7.239	14.515	53351	151184	303142
	54	177.2	926	3038	2632	8634	0.43	2.43	151.84	2.085	5.961	14.063	43551	124498	293714
	54.5	178.8	909	2983	2857	9374	0.44	2.50	155.80	2.063	5.955	17.623	43077	124380	368062
	55	180.4	1064	3490	2857	9374	0.42	2.50	155.80	2.824	8.019	16.607	58990	167476	346845
	55.5	182.1	980	3215	2857	9374	0.43	2.50	155.80	2.397	6.871	17.177	50060	143504	358753
	56	183.7	926	3038	2778	9113	0.44	2.47	154.48	2.121	6.099	16.265	44308	127385	339693
	56.4	185.0	943	3095	2857	9374	0.44	2.50	155.80	2.221	6.392	17.412	46390	133493	363646
	57	187.0	990	3248	2941	9650	0.44	2.52	157.13	2.467	7.087	18.483	51532	148010	386030
	57.5	188.6	855	2804	2857	9374	0.45	2.50	155.80	1.823	5.290	17.942	38077	110489	374731

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Table 2. LA 710 Tunnel
Boring Z3 B5
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	58	190.3	901	2956	2703	8867	0.44	2.45	153.16	1.991	5.725	15.266	41586	119561	318827
	58.5	191.9	1351	4434	2778	9113	0.34	2.47	154.48	4.519	12.155	13.068	94377	253869	272934
	59	193.6	1163	3815	2857	9374	0.40	2.50	155.80	3.374	9.453	15.874	70476	197437	331533
	59.5	195.2	1149	3771	2632	8634	0.38	2.43	151.84	3.213	8.883	12.559	67112	185515	262299
	60	196.9	962	3155	2857	9374	0.44	2.50	155.80	2.307	6.628	17.297	48191	138419	361245
	60.5	198.5	794	2604	2778	9113	0.46	2.47	154.48	1.559	4.537	17.015	32553	94764	355366
	61	200.1	826	2711	2500	8202	0.44	2.39	149.21	1.632	4.697	12.762	34095	98101	266529
	61.5	201.8	1136	3728	2941	9650	0.41	2.52	157.13	3.250	9.180	17.440	67882	191735	364230
	62	203.4	1020	3348	3030	9942	0.44	2.54	158.46	2.643	7.591	19.785	55199	158538	413207
	62.5	205.1	971	3185	2500	8202	0.41	2.39	149.21	2.253	6.359	11.934	47053	132801	249252
	63	206.7	694	2278	2439	8002	0.46	2.37	147.90	1.143	3.327	12.570	23862	69481	262533
	63.5	208.3	775	2543	2564	8412	0.45	2.41	150.52	1.449	4.201	13.920	30261	87739	290732
	64	210.0	855	2804	2564	8412	0.44	2.41	150.52	1.761	5.064	13.504	36787	105762	282031
	64.5	211.6	840	2757	2439	8002	0.43	2.37	147.90	1.673	4.794	11.863	34941	100117	247760
	65	213.3	813	2667	2439	8002	0.44	2.37	147.90	1.566	4.502	12.006	32705	94028	250741
	65	213.3	730	2395	2500	8202	0.45	2.39	149.21	1.273	3.702	13.240	26596	77310	276527
	65.5	214.9	769	2524	2564	8412	0.45	2.41	150.52	1.427	4.139	13.950	29797	86445	291349
	65.5	214.9	758	2485	2500	8202	0.45	2.39	149.21	1.372	3.977	13.109	28649	83050	273790
	66	216.5	787	2583	2632	8634	0.45	2.43	151.84	1.508	4.376	14.833	31494	91386	309789
	66	216.5	787	2583	2564	8412	0.45	2.41	150.52	1.495	4.329	13.859	31222	90414	289451
	66.5	218.2	820	2689	2632	8634	0.45	2.43	151.84	1.634	4.727	14.665	34129	98720	306277
	66.5	218.2	671	2202	2564	8412	0.46	2.41	150.52	1.086	3.178	14.404	22682	66379	300837
	67	219.8	667	2187	2632	8634	0.47	2.43	151.84	1.081	3.169	15.402	22577	66181	321680
	67	219.8	885	2903	3030	9942	0.45	2.54	158.46	1.988	5.778	20.658	41517	120680	431450
	67.5	221.5	621	2038	2632	8634	0.47	2.43	151.84	0.938	2.760	15.592	19597	57635	325654
	67.5	221.5	840	2757	2857	9374	0.45	2.50	155.80	1.762	5.120	18.023	36808	106938	376423
	68	223.1	1075	3528	2632	8634	0.40	2.43	151.84	2.812	7.873	13.094	58732	164425	273472
	68	223.1	629	2063	2632	8634	0.47	2.43	151.84	0.962	2.828	15.561	20093	59062	324991
	68.5	224.7	800	2625	2703	8867	0.45	2.45	153.16	1.570	4.560	15.827	32793	95229	330553
	68.5	224.7		NA	2500	8202	NA	NA	NA	NA	NA	NA	NA	NA	NA
	69	226.4	787	2583	2632	8634	0.45	2.43	151.84	1.508	4.376	14.833	31494	91386	309789
	69	226.4	909	2983	2703	8867	0.44	2.45	153.16	2.028	5.824	15.217	42346	121635	317816
	69.5	228.0	917	3010	2778	9113	0.44	2.47	154.48	2.083	5.993	16.316	43499	125170	340773
	69.5	228.0	794	2604	2632	8634	0.45	2.43	151.84	1.532	4.443	14.801	31996	92788	309120
	70	229.7	901	2956	2703	8867	0.44	2.45	153.16	1.991	5.725	15.266	41586	119561	318829
	70	229.7	1042	3418	2857	9374	0.42	2.50	155.80	2.708	7.709	16.762	56558	161004	350090
	70.4	231.0	990	3248	2857	9374	0.43	2.50	155.80	2.447	7.006	17.111	51097	146317	357371

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Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B5
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	70.5	231.3	1136	3728	2857	9374	0.41	2.50	155.80	3.223	9.063	16.076	67309	189278	335756
	70.9	232.6	926	3038	2703	8867	0.43	2.45	153.16	2.103	6.030	15.116	43929	125945	315704
	71	232.9	1075	3528	2778	9113	0.41	2.47	154.48	2.861	8.079	15.279	59753	168728	319099
	71.3	233.9	980	3217	2857	9374	0.43	2.50	155.80	2.399	6.876	17.175	50100	143613	358701
	71.5	234.6	1075	3528	2857	9374	0.42	2.50	155.80	2.886	8.181	16.526	60266	170853	345146
	71.8	235.6	1075	3528	2857	9374	0.42	2.50	155.80	2.886	8.181	16.526	60266	170853	345145
	72	236.2	1149	3771	2778	9113	0.40	2.47	154.48	3.269	9.132	14.734	68279	190731	307732
	72.3	237.2	1099	3605	2326	7630	0.36	2.33	145.29	2.810	7.623	8.840	58697	159217	184619
	72.5	237.9	1176	3860	2857	9374	0.40	2.50	155.80	3.454	9.658	15.767	72144	201701	329308
	72.9	239.2	1075	3528	3125	10253	0.43	2.56	159.79	2.959	8.481	21.051	61810	177129	439650
	73	239.5	1149	3771	3125	10253	0.42	2.56	159.79	3.382	9.616	20.488	70629	200838	427891
	73.4	240.8	980	3217	3030	9942	0.44	2.54	158.46	2.440	7.034	20.056	50955	146907	418867
	73.5	241.1	1053	3454	3125	10253	0.44	2.56	159.79	2.836	8.146	21.215	59235	170123	443084
	74	242.8	901	2956	3030	9942	0.45	2.54	158.46	2.060	5.981	20.562	43027	124908	429437
	74	242.8	813	2667	2439	8002	0.44	2.37	147.90	1.566	4.502	12.006	32705	94028	250742
	74.4	244.1	855	2804	2703	8867	0.44	2.45	153.16	1.792	5.177	15.531	37430	108132	324370
	74.5	244.4	833	2734	2778	9113	0.45	2.47	154.48	1.718	4.985	16.802	35889	104118	350917
	75	246.1	926	3038	2703	8867	0.43	2.45	153.16	2.103	6.030	15.116	43929	125945	315705
	75	246.1	1099	3605	2857	9374	0.41	2.50	155.80	3.014	8.518	16.355	62944	177904	341575
	75.4	247.4	1075	3528	2857	9374	0.42	2.50	155.80	2.886	8.181	16.526	60266	170852	345145
	75.5	247.7	1000	3281	3030	9942	0.44	2.54	158.46	2.538	7.305	19.924	53013	152561	416122
	76	249.3	901	2956	2778	9113	0.44	2.47	154.48	2.008	5.789	16.416	41945	120905	342843
	76	249.3	901	2956	3030	9942	0.45	2.54	158.46	2.060	5.981	20.562	43027	124908	429435
	76.5	251.0	952	3125	2857	9374	0.44	2.50	155.80	2.264	6.508	17.355	47278	135924	362463
	76.5	251.0	893	2929	3030	9942	0.45	2.54	158.46	2.024	5.878	20.610	42262	122767	430455
	77	252.6	840	2757	2857	9374	0.45	2.50	155.80	1.762	5.120	18.023	36808	106938	376422
	77	252.6	935	3066	2941	9650	0.44	2.52	157.13	2.198	6.348	18.842	45915	132588	393520
	77.5	254.3	826	2711	2632	8634	0.45	2.43	151.84	1.661	4.802	14.629	34695	100289	305522
	77.5	254.3	901	2956	2857	9374	0.44	2.50	155.80	2.026	5.853	17.672	42305	122244	369093
	78	255.9	893	2929	2632	8634	0.43	2.43	151.84	1.939	5.565	14.258	40495	116218	297788
	78	255.9	752	2467	2500	8202	0.45	2.39	149.21	1.351	3.919	13.137	28220	81853	274362
	78.4	257.2	800	2625	2500	8202	0.44	2.39	149.21	1.530	4.415	12.899	31948	92198	269392
	78.5	257.5	787	2583	2500	8202	0.44	2.39	149.21	1.482	4.282	12.962	30949	89440	270723
	79	259.2	820	2689	2564	8412	0.44	2.41	150.52	1.620	4.675	13.692	33833	97648	285969
	79	259.2	813	2667	2500	8202	0.44	2.39	149.21	1.580	4.553	12.832	32995	95083	267995
	79.5	260.8	813	2667	2703	8867	0.45	2.45	153.16	1.622	4.703	15.758	33868	98234	329120
	79.5	260.8	806	2646	2632	8634	0.45	2.43	151.84	1.582	4.582	14.734	33037	95686	307733

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B5
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	80	262.5	781	2563	2632	8634	0.45	2.43	151.84	1.484	4.310	14.864	31004	90016	310443
	80	262.5	769	2524	2381	7812	0.44	2.35	146.59	1.389	4.006	11.459	29020	83677	239329
	80.5	264.1	769	2524	2632	8634	0.45	2.43	151.84	1.439	4.183	14.925	30058	87365	311705
	81	265.7	840	2757	2632	8634	0.44	2.43	151.84	1.718	4.958	14.553	35871	103541	303953
	81.5	267.4	847	2780	2632	8634	0.44	2.43	151.84	1.747	5.038	14.514	36482	105225	303139
	82	269.0	862	2828	2500	8202	0.43	2.39	149.21	1.776	5.089	12.570	37097	106286	262525
	82.5	270.7	870	2853	2632	8634	0.44	2.43	151.84	1.839	5.292	14.391	38410	110522	300568
	83	272.3	833	2734	2632	8634	0.44	2.43	151.84	1.689	4.879	14.591	35276	101896	304747
	83.5	274.0	870	2853	2703	8867	0.44	2.45	153.16	1.855	5.351	15.447	38744	111757	322618
	84	275.6	840	2757	2632	8634	0.44	2.43	151.84	1.718	4.958	14.553	35871	103541	303953
	84.5	277.2	826	2711	2564	8412	0.44	2.41	150.52	1.647	4.750	13.657	34395	99197	285221
	85	278.9	855	2804	2439	8002	0.43	2.37	147.90	1.731	4.950	11.786	36146	103377	246154
	85.5	280.5	862	2828	2439	8002	0.43	2.37	147.90	1.761	5.031	11.746	36772	105066	245319
	86	282.2	952	3125	2564	8412	0.42	2.41	150.52	2.187	6.211	12.936	45676	129717	270180
	86.5	283.8	971	3185	2941	9650	0.44	2.52	157.13	2.372	6.827	18.610	49550	142592	388672
	87	285.4	980	3217	2857	9374	0.43	2.50	155.80	2.399	6.876	17.175	50100	143613	358701
	87.4	286.7	980	3217	2632	8634	0.42	2.43	151.84	2.338	6.637	13.726	48825	138606	286682
	88	288.7	926	3038	2632	8634	0.43	2.43	151.84	2.085	5.961	14.063	43551	124498	293714
	88.5	290.4	794	2604	2326	7630	0.43	2.33	145.29	1.466	4.205	10.632	30617	87814	222060
	89	292.0	877	2878	2632	8634	0.44	2.43	151.84	1.872	5.381	14.348	39087	112375	299666
	89.5	293.6	806	2646	3125	10253	0.46	2.56	159.79	1.665	4.875	22.777	34768	101823	475706
	90	295.3	980	3217	3030	9942	0.44	2.54	158.46	2.440	7.034	20.056	50955	146907	418867
	90.5	296.9	1064	3490	2564	8412	0.40	2.41	150.52	2.729	7.619	12.214	56991	159123	255094
	91	298.6	1136	3728	2703	8867	0.39	2.45	153.16	3.168	8.824	13.697	66165	184288	286056
	91.5	300.2	1250	4101	2857	9374	0.38	2.50	155.80	3.900	10.776	15.174	81443	225051	316909
	92	301.8	1190	3906	2632	8634	0.37	2.43	151.84	3.447	9.454	12.248	71992	197451	255793
	92.5	303.5	1250	4101	2381	7812	0.31	2.35	146.59	3.669	9.611	8.420	76630	200731	175848
	93	305.1	1111	3645	2941	9650	0.42	2.52	157.13	3.107	8.805	17.630	64899	183892	368208
	93.5	306.8	980	3217	3030	9942	0.44	2.54	158.46	2.440	7.034	20.055	50955	146907	418865
	94	308.4	1020	3348	2632	8634	0.41	2.43	151.84	2.532	7.149	13.467	52892	149316	281259
	94.5	310.0	980	3217	3333	10936	0.45	2.60	162.47	2.501	7.268	25.582	52244	151786	534285
	95	311.7	962	3155	2857	9374	0.44	2.50	155.80	2.307	6.628	17.297	48191	138419	361245
	95.5	313.3	909	2983	2703	8867	0.44	2.45	153.16	2.028	5.824	15.217	42346	121635	317816
	96	315.0	1000	3281	2778	9113	0.43	2.47	154.48	2.474	7.055	15.794	51681	147347	329862
	96.4	316.3	943	3095	2857	9374	0.44	2.50	155.80	2.221	6.392	17.412	46390	133493	363647
	97	318.2	943	3095	2703	8867	0.43	2.45	153.16	2.183	6.247	15.009	45602	130479	313474
	97.5	319.9	847	2780	2564	8412	0.44	2.41	150.52	1.732	4.983	13.543	36166	104062	282858

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B5
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	98	321.5	909	2983	2564	8412	0.43	2.41	150.52	1.993	5.692	13.195	41618	118869	275590
	98.5	323.2	1042	3418	2857	9374	0.42	2.50	155.80	2.708	7.709	16.762	56558	161004	350090
	99	324.8	980	3217	2857	9374	0.43	2.50	155.80	2.399	6.876	17.175	50100	143613	358701
	99.4	326.1	943	3095	2778	9113	0.43	2.47	154.48	2.202	6.320	16.157	45996	131990	337444
	100	328.1	943	3095	2632	8634	0.43	2.43	151.84	2.165	6.175	13.957	45210	128962	291504
	100.5	329.7	962	3155	2703	8867	0.43	2.45	153.16	2.268	6.476	14.896	47373	135253	311113
	101	331.4	1020	3348	2778	9113	0.42	2.47	154.48	2.577	7.328	15.658	53812	153040	327021
	101.5	333.0	1020	3348	2778	9113	0.42	2.47	154.48	2.577	7.328	15.658	53812	153040	327021
	102	334.6	1020	3348	2703	8867	0.42	2.45	153.16	2.554	7.239	14.515	53351	151184	303142
	102.5	336.3	1087	3566	2632	8634	0.40	2.43	151.84	2.874	8.030	13.012	60016	167702	271761
	103	337.9	1042	3418	2857	9374	0.42	2.50	155.80	2.708	7.709	16.762	56558	161004	350090
	103.5	339.6	1000	3281	2778	9113	0.43	2.47	154.48	2.474	7.055	15.794	51681	147347	329862
	104	341.2	1136	3728	2857	9374	0.41	2.50	155.80	3.223	9.063	16.076	67309	189278	335756
	104.5	342.8	1163	3815	2778	9113	0.39	2.47	154.48	3.346	9.326	14.632	69876	194783	305601
	105	344.5	1087	3566	3030	9942	0.43	2.54	158.46	2.999	8.554	19.310	62634	178652	403295
	105.5	346.1	980	3217	3125	10253	0.45	2.56	159.79	2.460	7.112	21.716	51384	148542	453553
	106	347.8	1136	3728	2778	9113	0.40	2.47	154.48	3.195	8.944	14.833	66736	186796	309788
	106.5	349.4	1163	3815	3226	10583	0.43	2.58	161.13	3.490	9.948	22.205	72886	207774	463762
	107	351.0	1111	3645	3226	10583	0.43	2.58	161.13	3.187	9.131	22.610	66551	190696	472208
	107.5	352.7	1111	3645	3030	9942	0.42	2.54	158.46	3.134	8.915	19.130	65450	186182	399540
	108	354.3	1064	3490	2703	8867	0.41	2.45	153.16	2.777	7.820	14.219	57988	163333	296959
	108.5	356.0	1000	3281	3226	10583	0.45	2.58	161.13	2.581	7.469	23.417	53907	155989	489068
	109	357.6	820	2689	2632	8634	0.45	2.43	151.84	1.634	4.727	14.665	34129	98720	306278
	109.5	359.3	893	2929	2632	8634	0.43	2.43	151.84	1.939	5.565	14.258	40495	116218	297788
	110	360.9	1136	3728	2703	8867	0.39	2.45	153.16	3.168	8.824	13.697	66165	184288	286056
	110.5	362.5	962	3155	2703	8867	0.43	2.45	153.16	2.268	6.476	14.896	47373	135254	311113
	111	364.2	962	3155	2500	8202	0.41	2.39	149.21	2.210	6.246	11.992	46152	130444	250452
	111.5	365.8	926	3038	2564	8412	0.43	2.41	150.52	2.067	5.891	13.096	43173	123046	273516
	112	367.5	1000	3281	2857	9374	0.43	2.50	155.80	2.496	7.139	17.046	52124	149095	356002
	112.5	369.1	1042	3418	2857	9374	0.42	2.50	155.80	2.708	7.709	16.762	56558	161004	350089
	113	370.7	943	3095	2500	8202	0.42	2.39	149.21	2.127	6.028	12.102	44427	125904	252753
	113.5	372.4	962	3155	2500	8202	0.41	2.39	149.21	2.210	6.246	11.992	46152	130444	250452
	113.9	373.7	1020	3348	2703	8867	0.42	2.45	153.16	2.554	7.239	14.515	53351	151184	303142
	114.5	375.7	1087	3566	2941	9650	0.42	2.52	157.13	2.974	8.451	17.808	62108	176498	371929
	115	377.3	1136	3728	2632	8634	0.39	2.43	151.84	3.141	8.702	12.656	65596	181752	264322
	115.5	378.9	1111	3645	2632	8634	0.39	2.43	151.84	3.003	8.357	12.840	62713	174533	268165
	116	380.6	1111	3645	2857	9374	0.41	2.50	155.80	3.081	8.694	16.265	64350	181585	339699

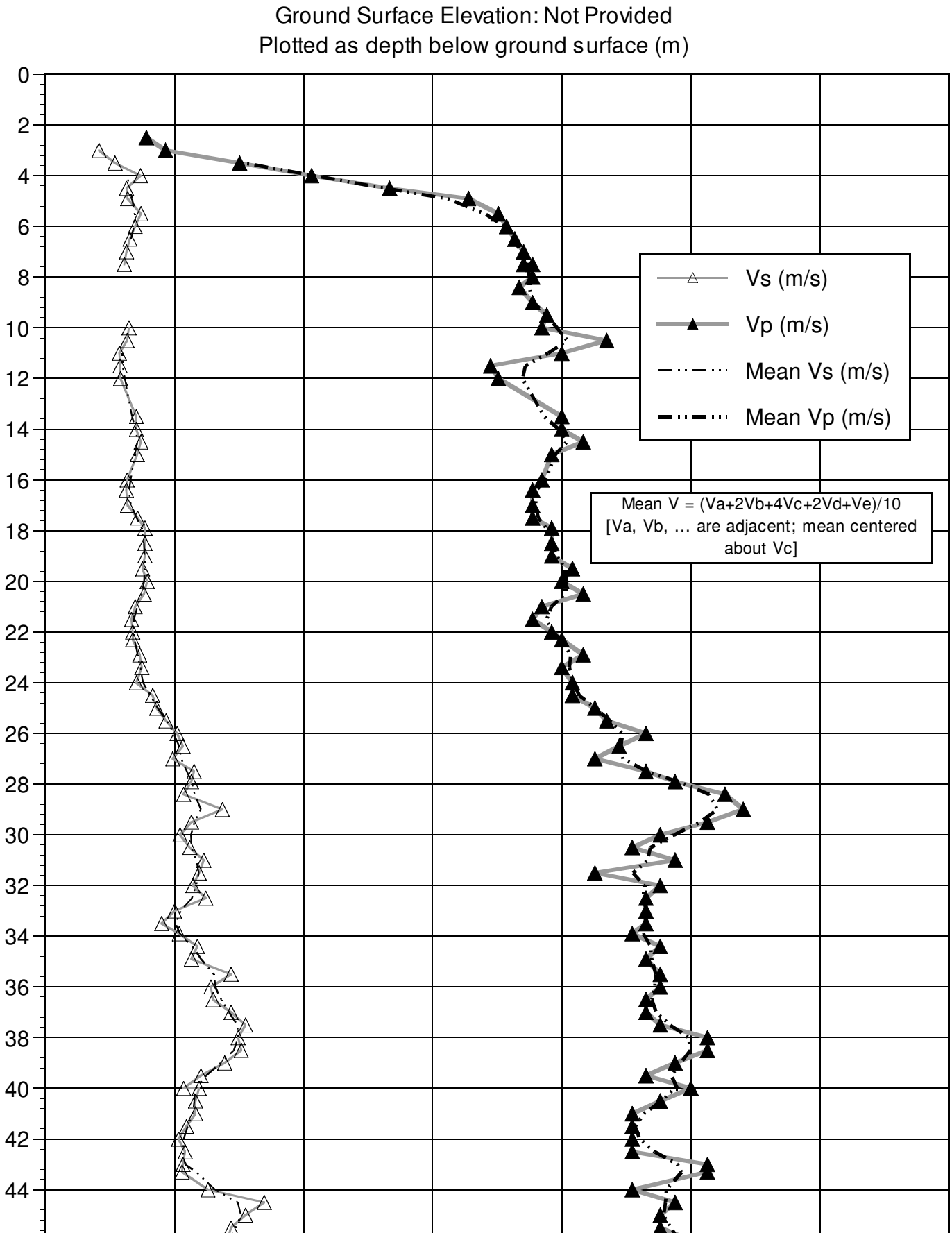
γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

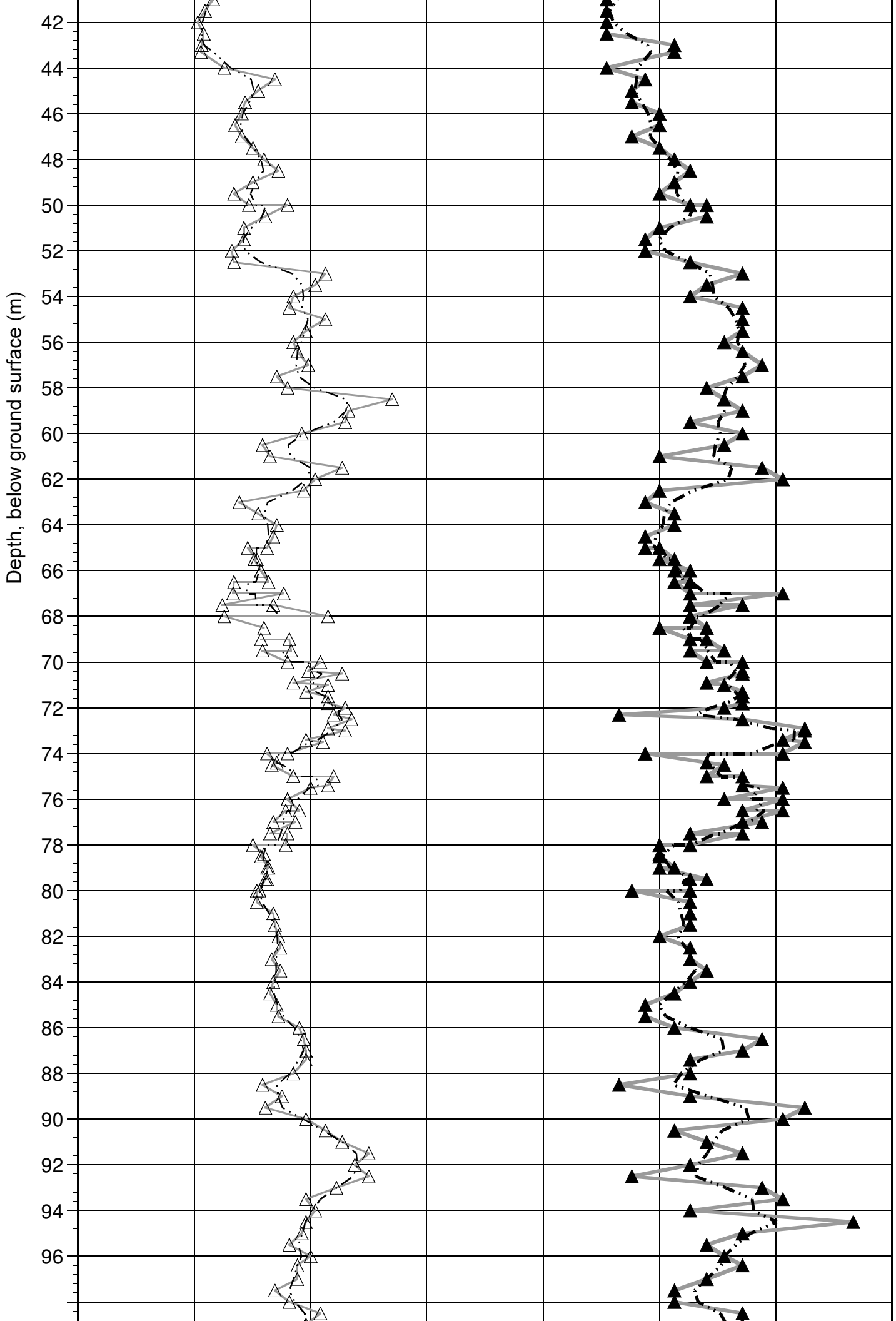
Table 2. LA 710 Tunnel
Boring Z3 B5
PS Suspension Log Data Summary

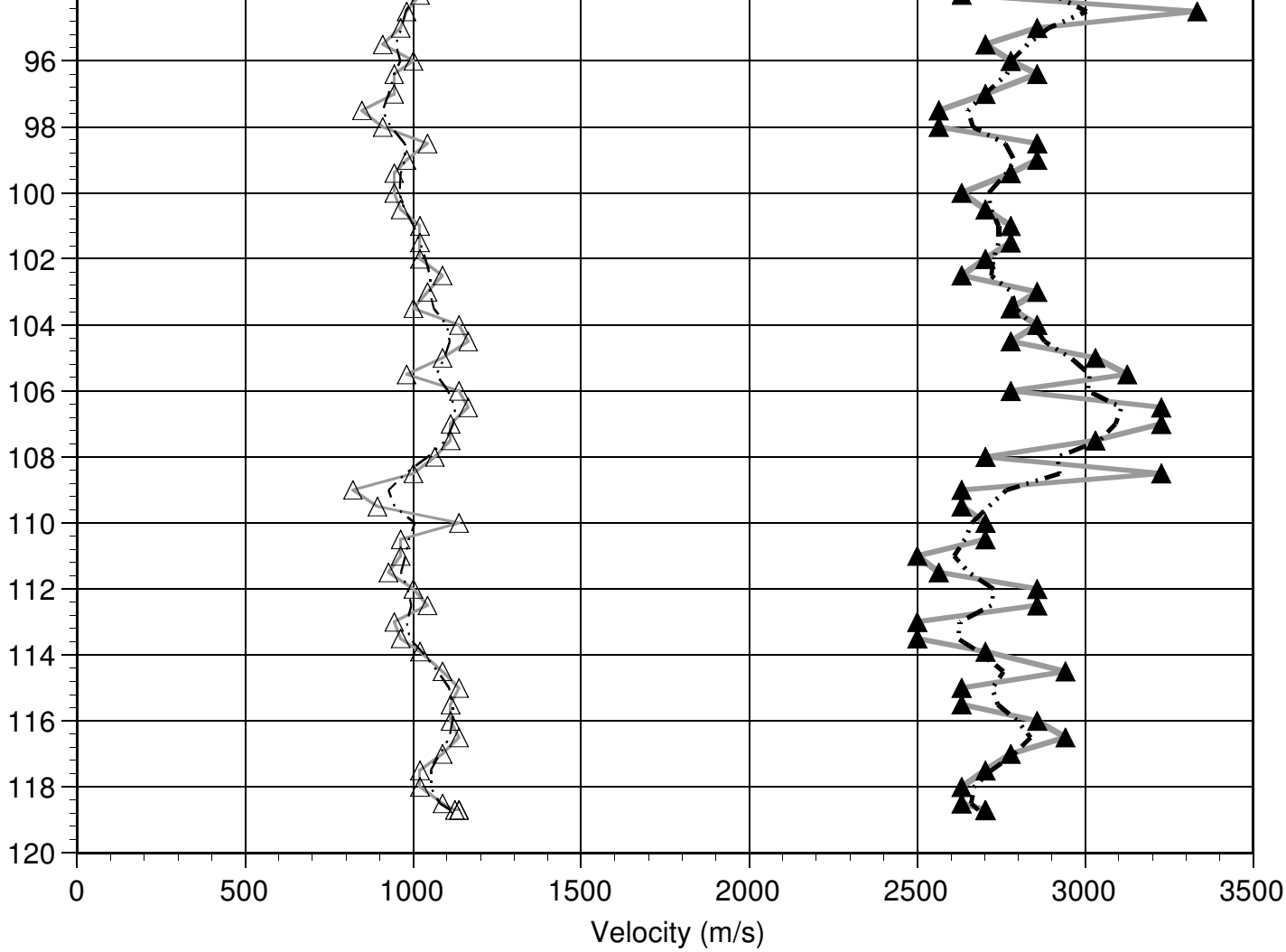
Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	116.5	382.2	1136	3728	2941	9650	0.41	2.52	157.13	3.250	9.180	17.440	67882	191735	364231
	117	383.9	1087	3566	2778	9113	0.41	2.47	154.48	2.924	8.242	15.195	61059	172138	317357
	117.5	385.5	1020	3348	2703	8867	0.42	2.45	153.16	2.554	7.239	14.515	53351	151185	303142
	118	387.1	1020	3348	2632	8634	0.41	2.43	151.84	2.532	7.149	13.467	52892	149316	281259
	118.5	388.8	1087	3566	2632	8634	0.40	2.43	151.84	2.874	8.030	13.012	60016	167702	271761
	118.7	389.4	1124	3686	2703	8867	0.40	2.45	153.16	3.097	8.645	13.791	64687	180545	288028
	118.7	389.4	1136	3728	2703	8867	0.39	2.45	153.16	3.168	8.824	13.696	66165	184287	286055
	118.7	389.4	1136	3728	2703	8867	0.39	2.45	153.16	3.168	8.824	13.697	66165	184288	286056

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Figure 1. LA 710 Tunnel
Boring Z3 B5
Downhole Interval Velocities




Depth, below ground surface (m)
42
44
46
48
50
52
54
56
58
60
62
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66
68
70
72
74
76
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82
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96

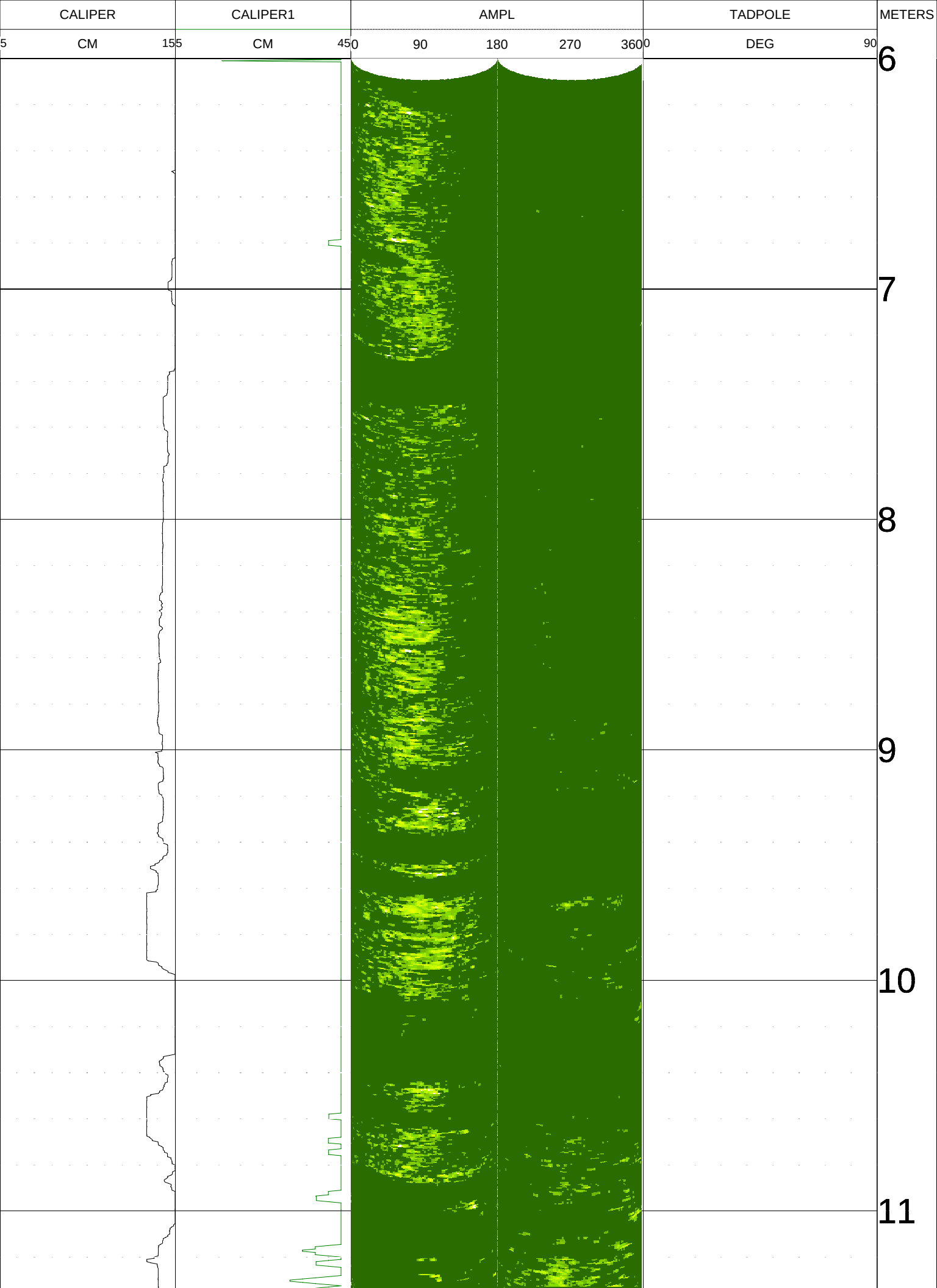

96
98
100
102
104
106
108
110
112
114
116
118
120
0
500
1000
1500
2000
2500
3000
3500
Velocity (m/s)

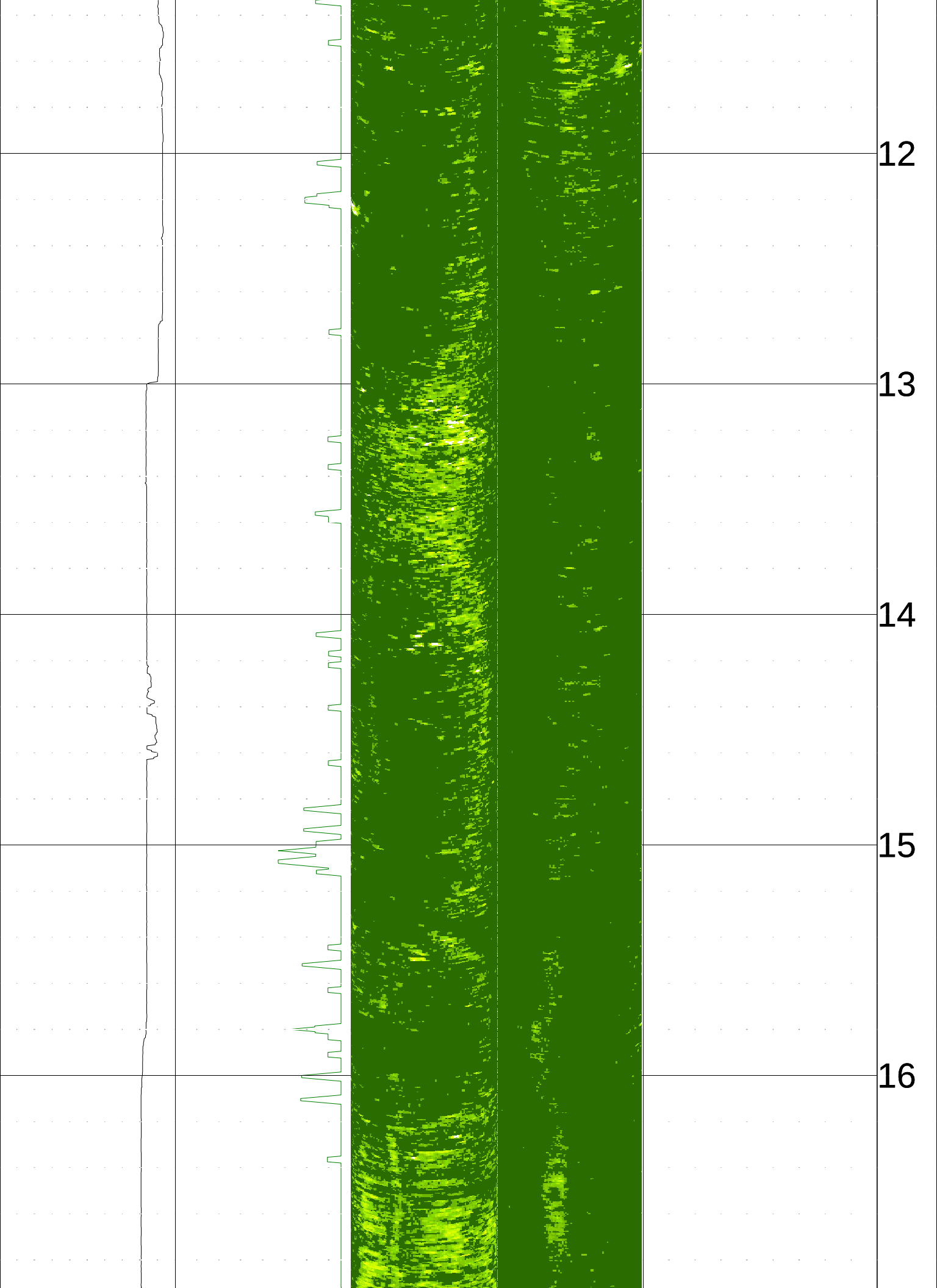
California Department of Transportation
Geophysical Services

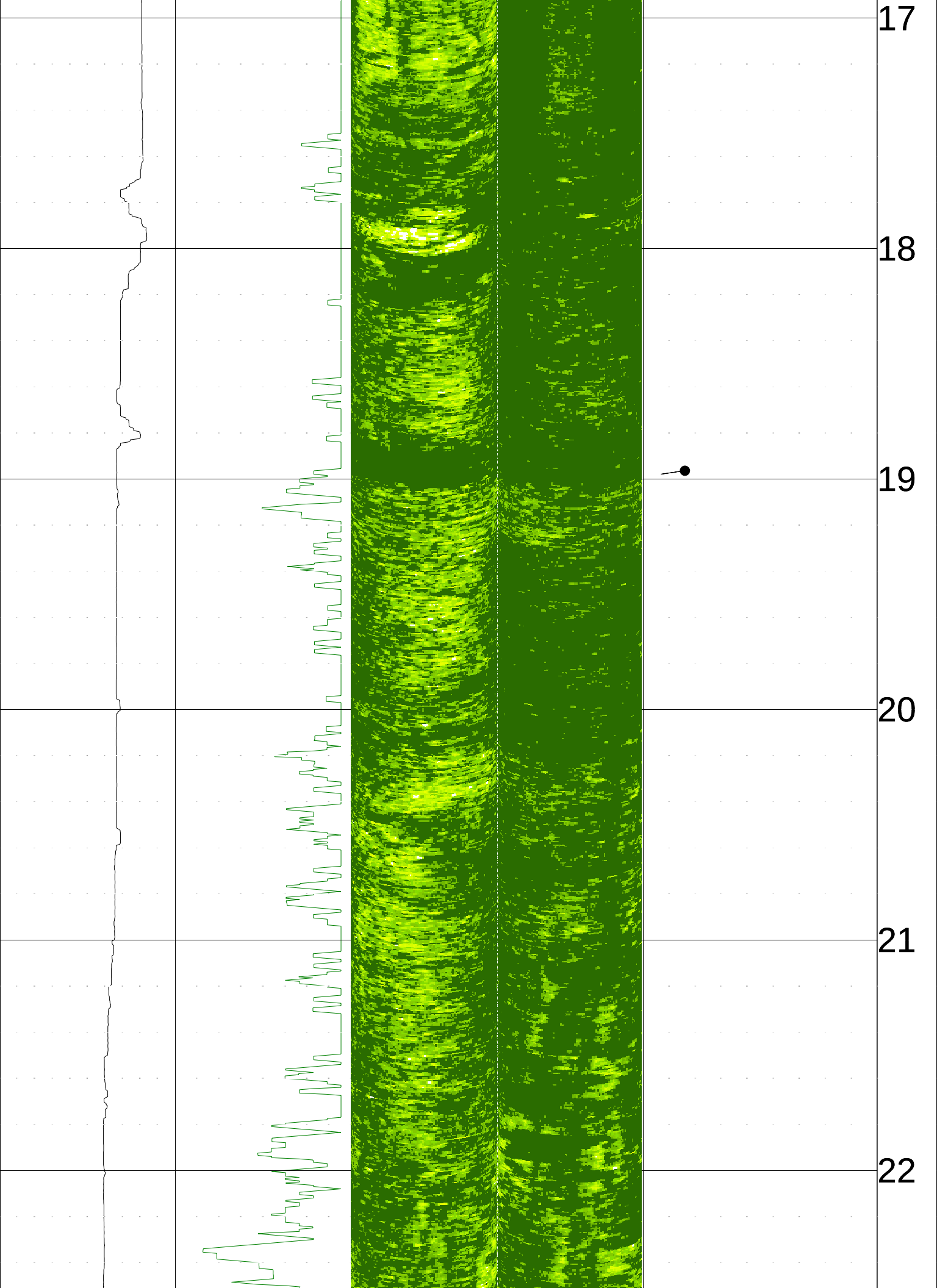
Z3 B5.

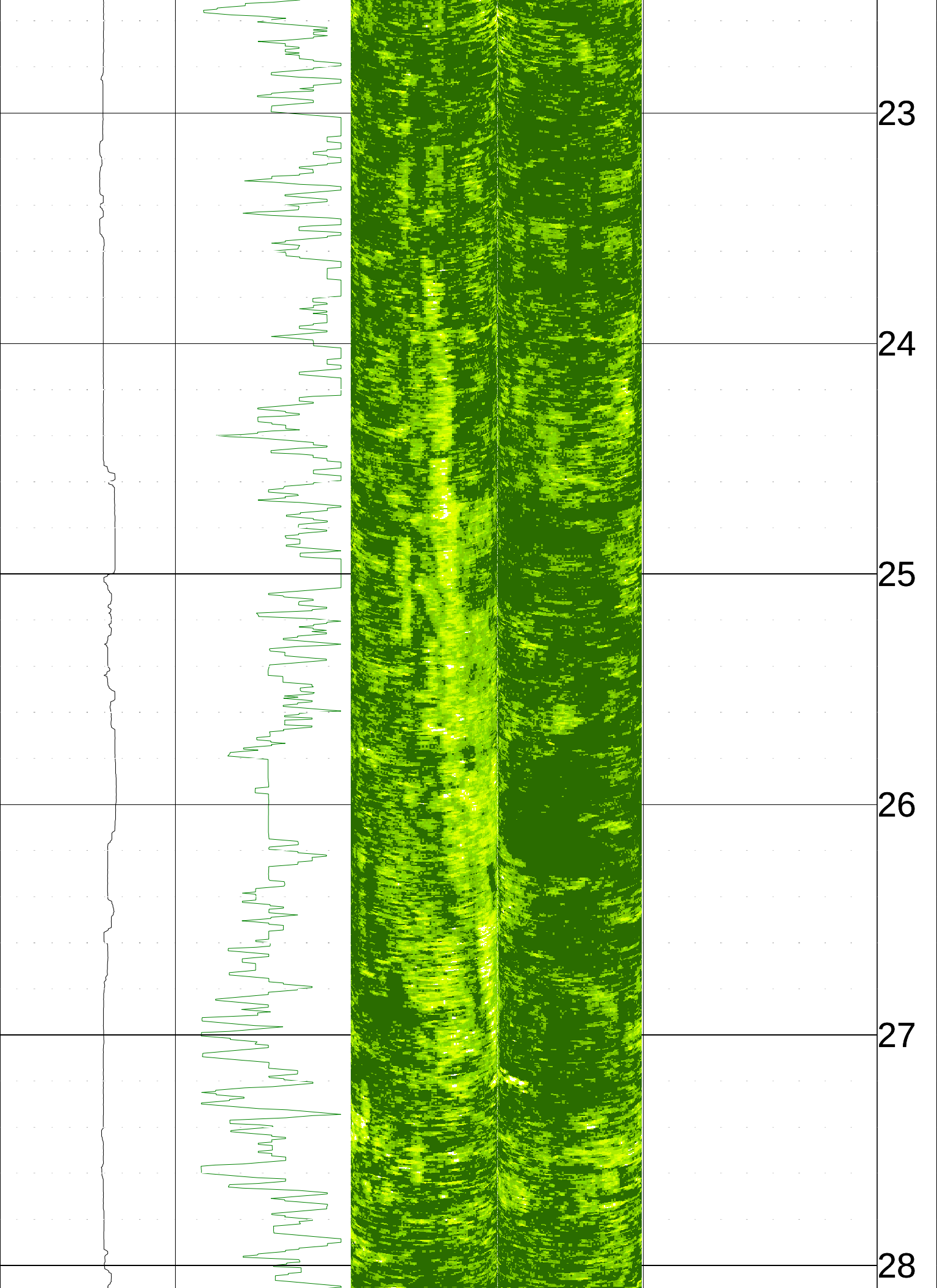
COMPANY	: Caltrans	OTHER SERVICES:	
WELL	: Z3 B5.		
FIELD	: LA-710 Tunnel.		
COUNTY	: LA		
STATE	: CA		
LOCATION	:		
SECTION	: None		
TOWNSHIP	: None		
RANGE	: None		
API NO.	:		
UNIQUE WELL ID.	:		
PERMANENT DATUM	: None	ELEVATION KB	: NA
LOG MEASURED FROM	: GL	ELEVATION DF	: NA
DRL MEASURED FROM	: GL	ELEVATION GL	: 143.86
DATE	: 04/28/09	RIG NUMBER	:
DEPTH DRILLER	: 121.92m	LOGGER TD	:
BIT SIZE	: 10.2cm.	ARRIVAL TIME	:
LOG TOP	: 4.14	DEPARTURE TIME	:
LOG BOTTOM	: 122.17	CIRC STOPPED	: 4/14 AM
CASING OD	:		
CASING BOTTOM	: n/a		
CASING TYPE	: n/a		
BOREHOLE FLUID	: 0		
RM TEMPERATURE	: 0		
MUD RES	: 0		
MUD WEIGHT	:		
WITNESSED BY	:		
RECORDED BY	: DH/DL		
REMARKS 1	: Ind, PS, CAL, AT		
REMARKS 2	: EA: 07-187900		

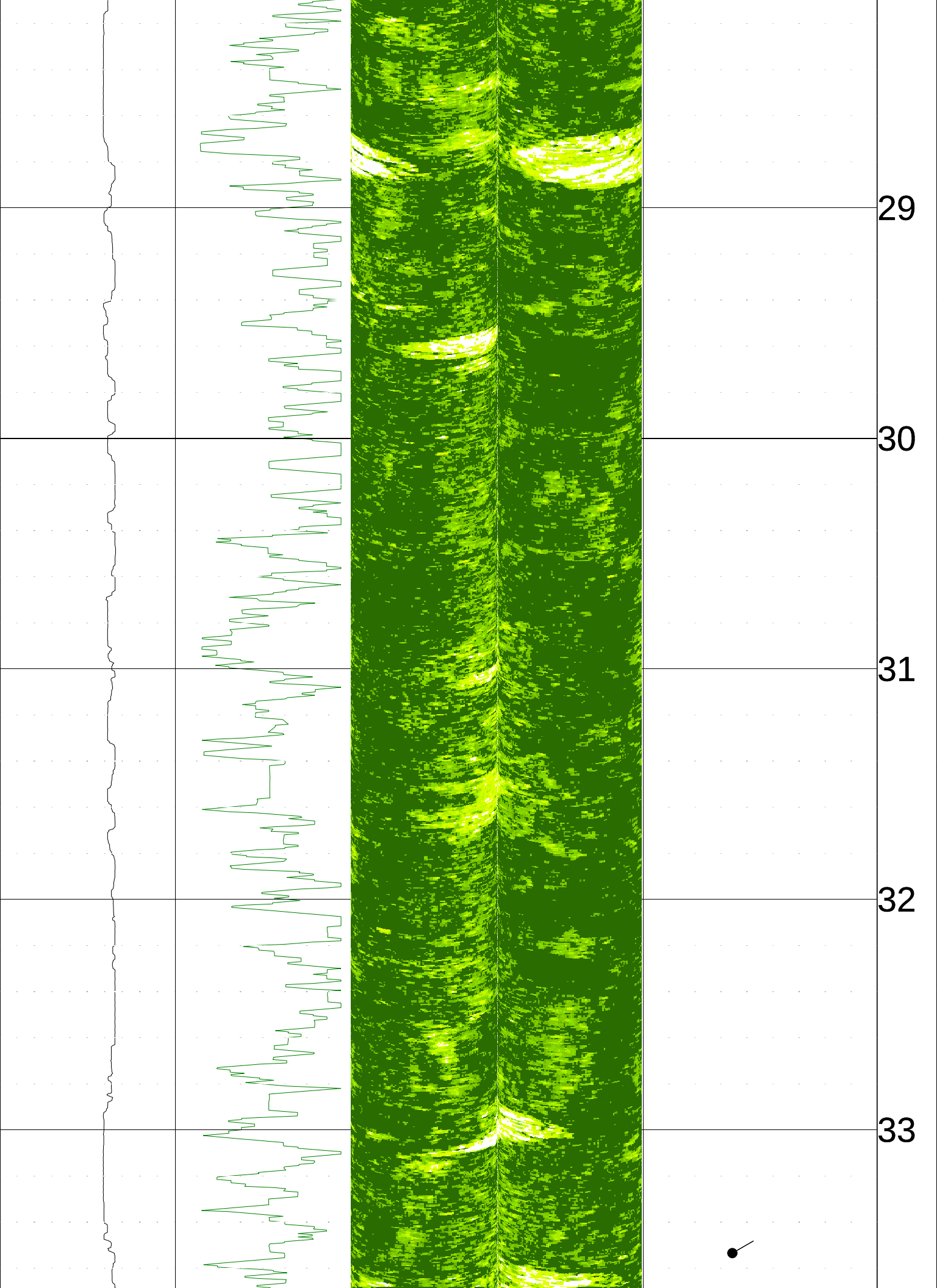
ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS

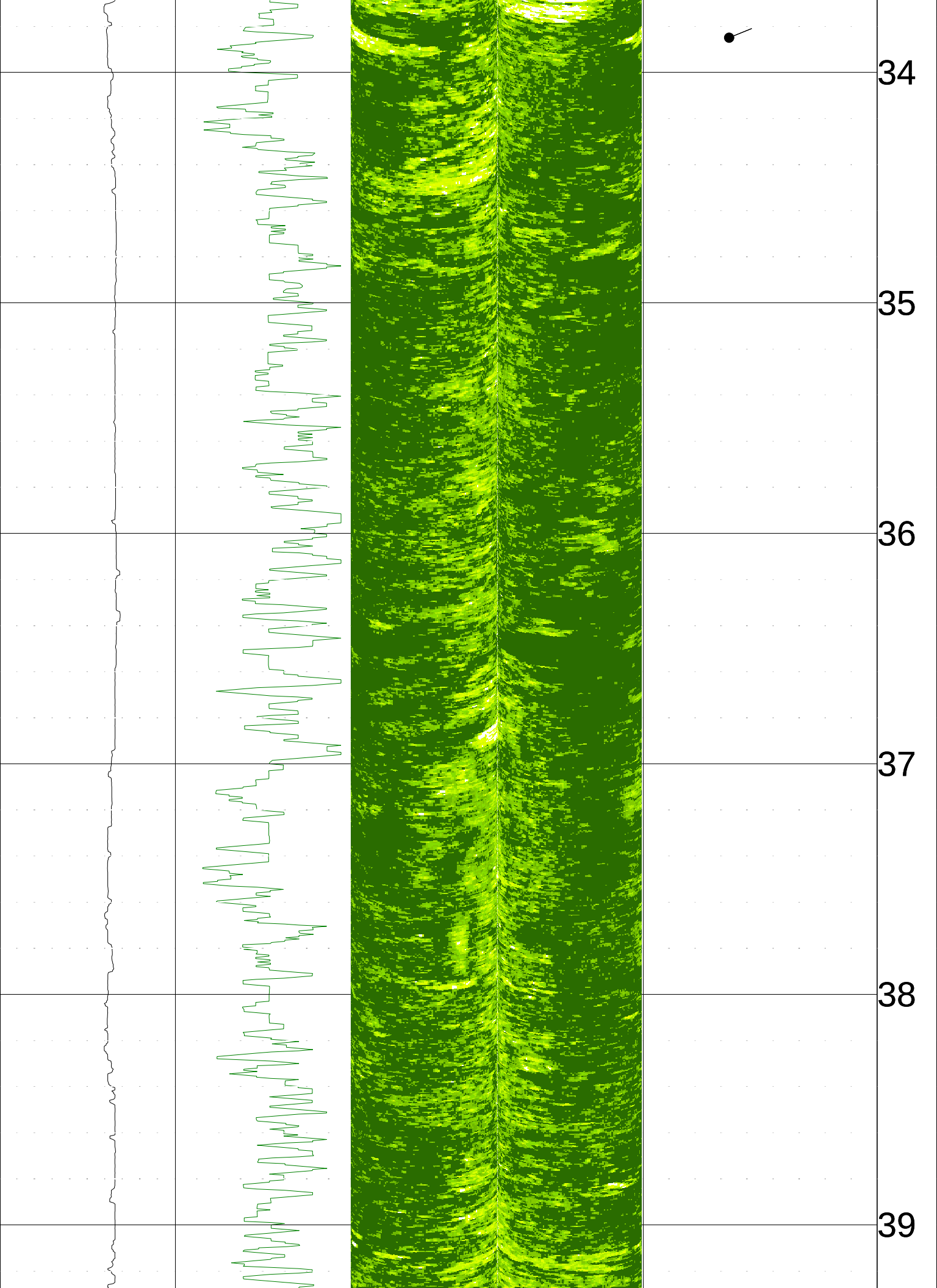

CALIPER
CALIPER1
AMPL
TADPOLE
METERS
5
CM
15
5
CM
45
0
90
180
270
360
0
DEG
90
6
7
8
9
10
11

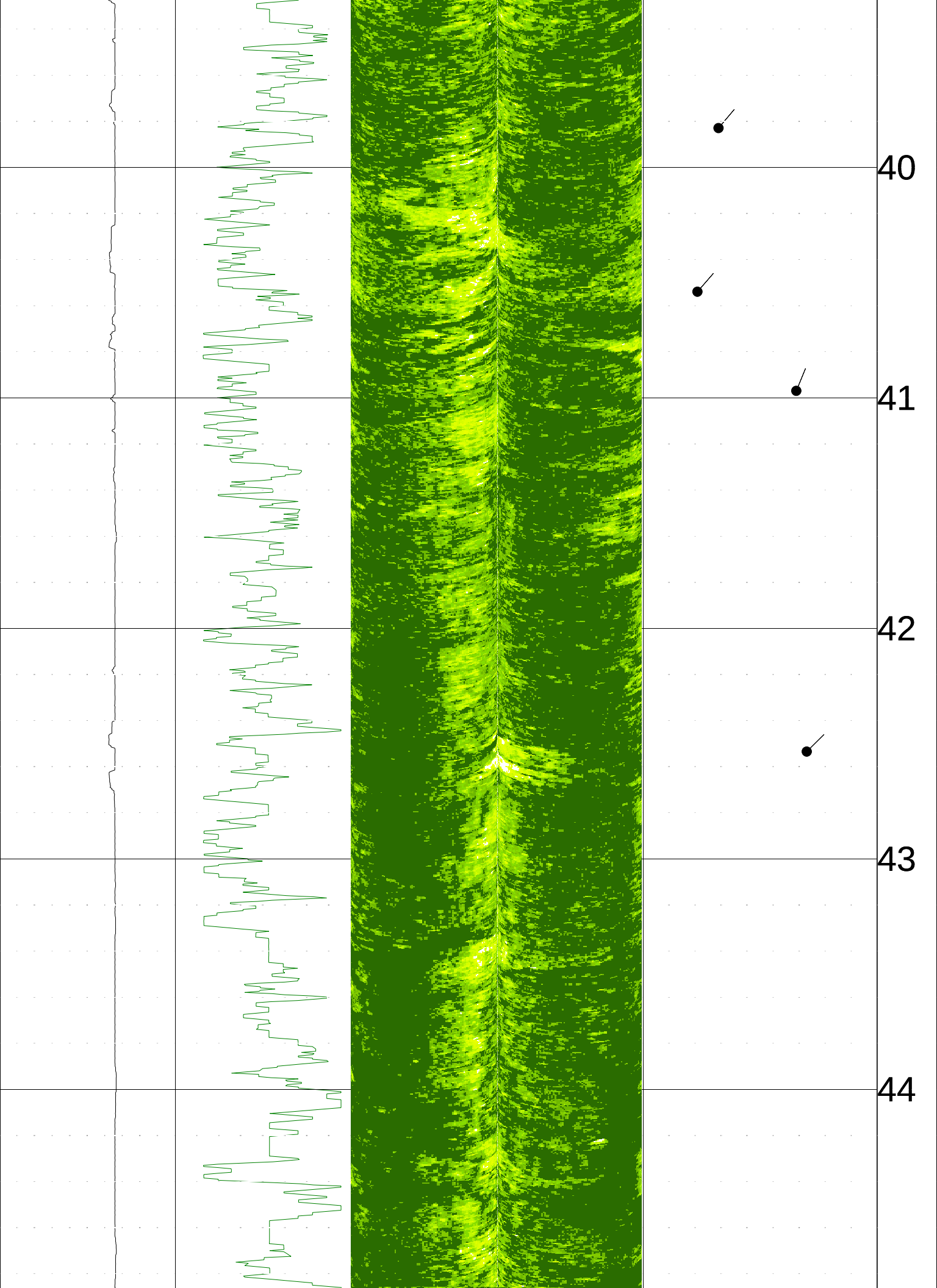

12
13
14
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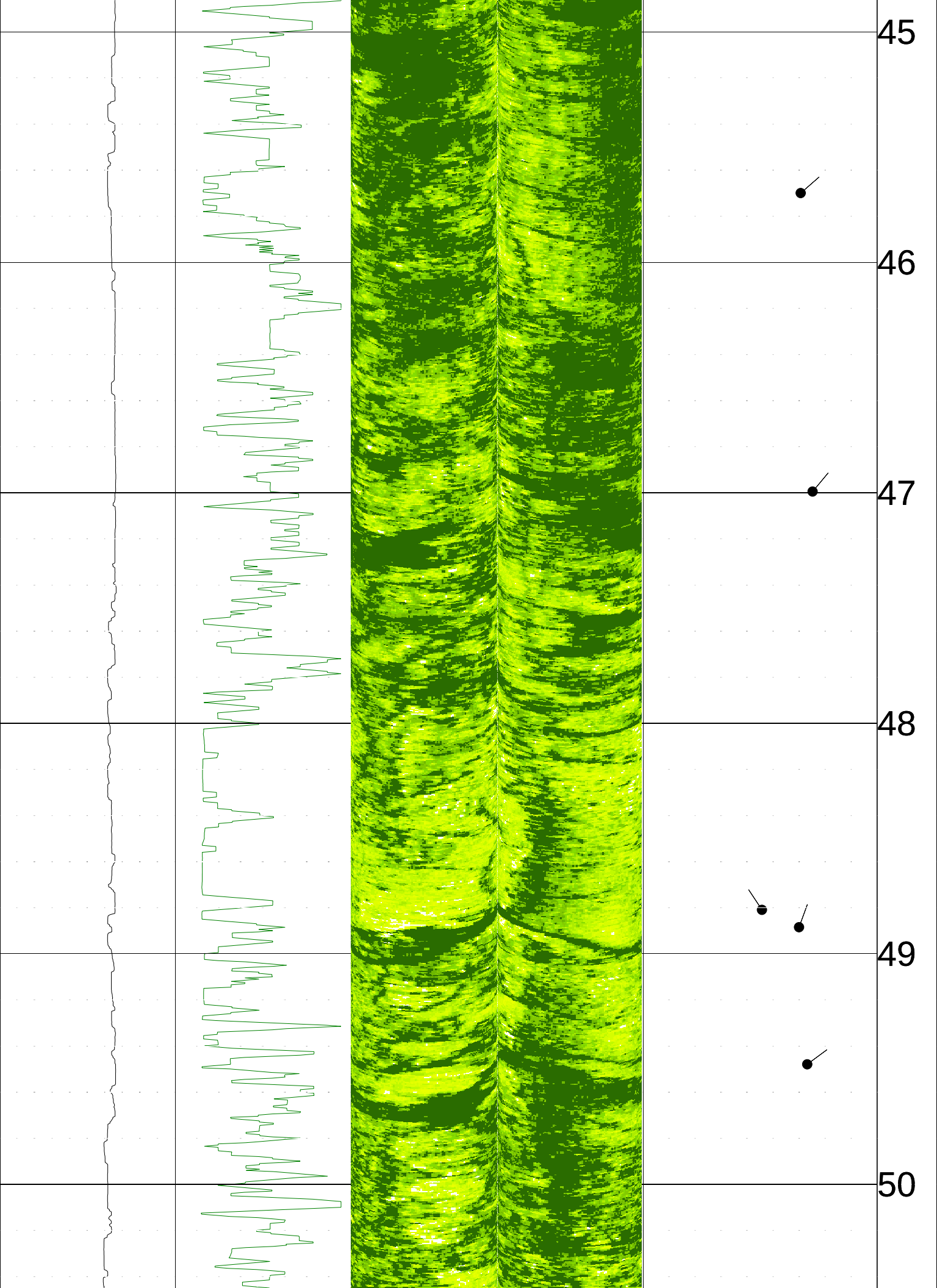

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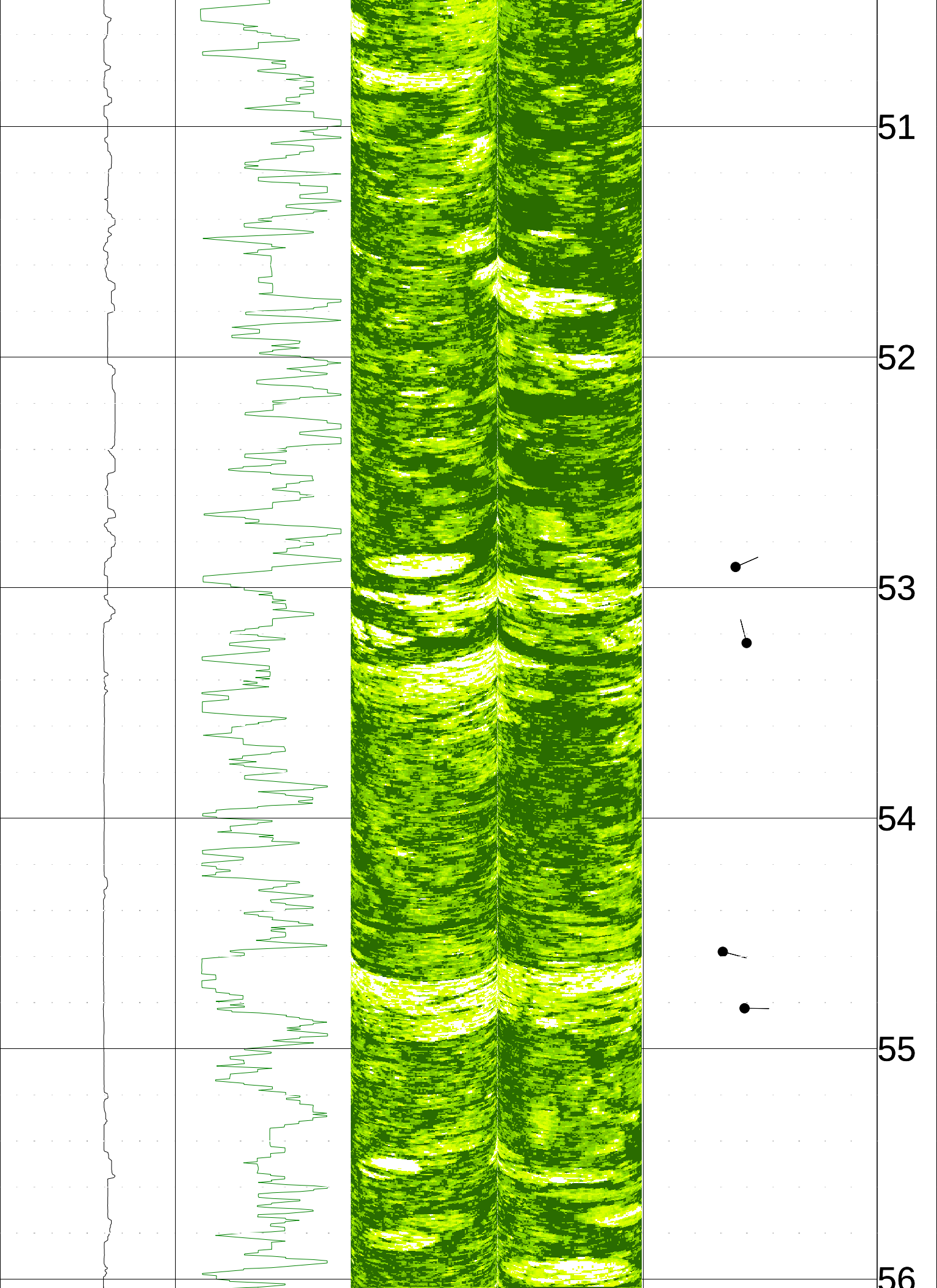

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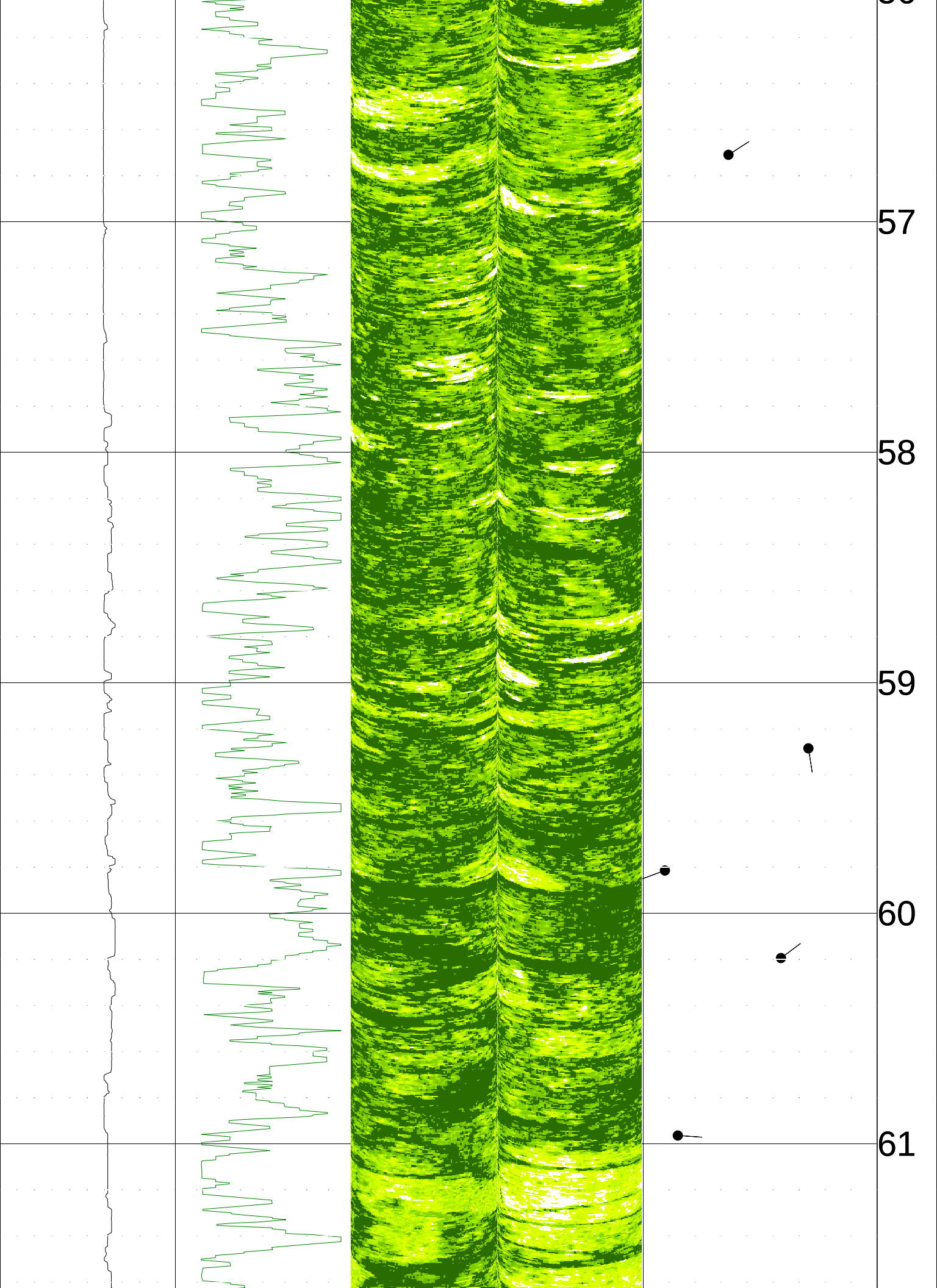

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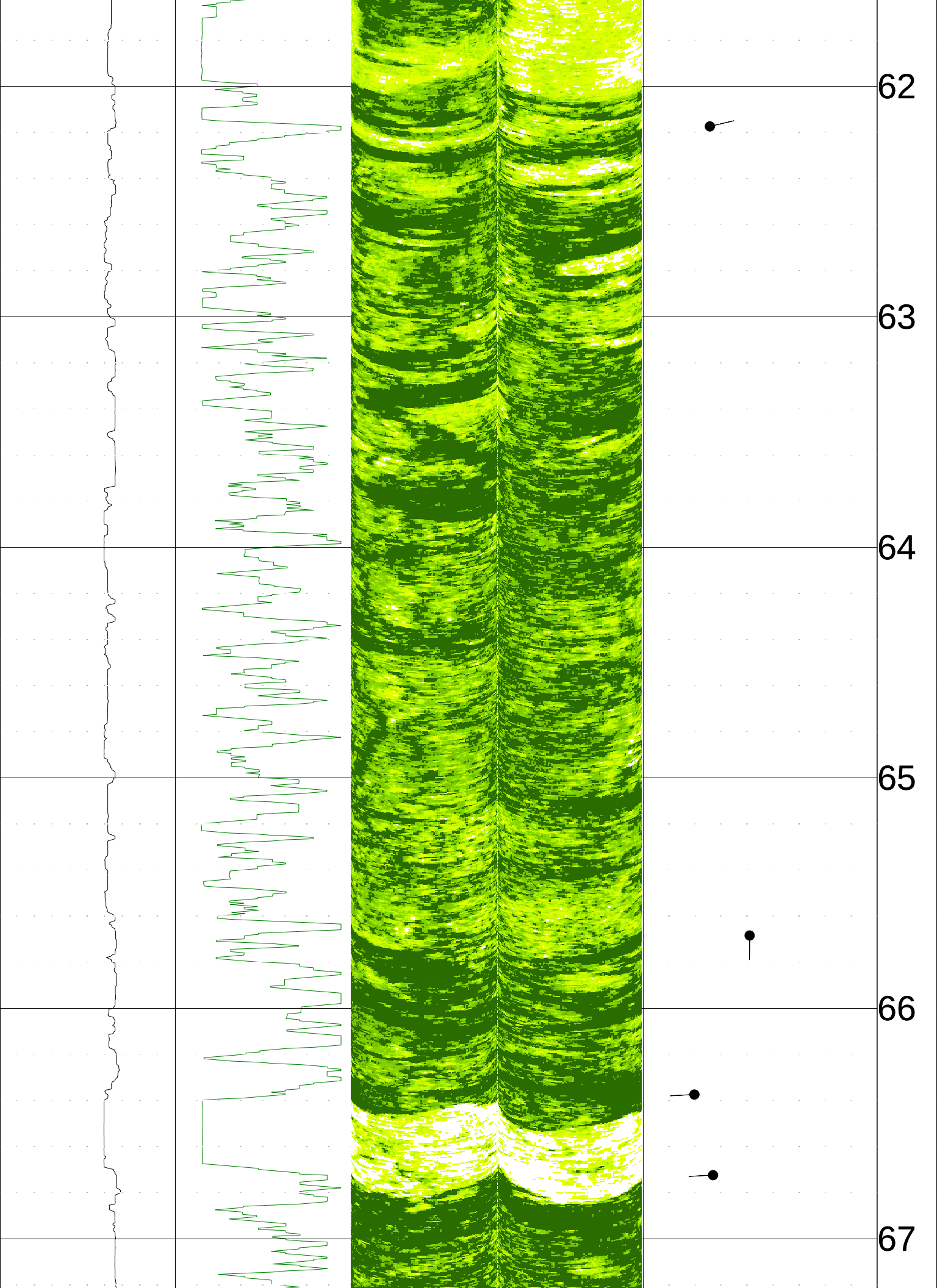

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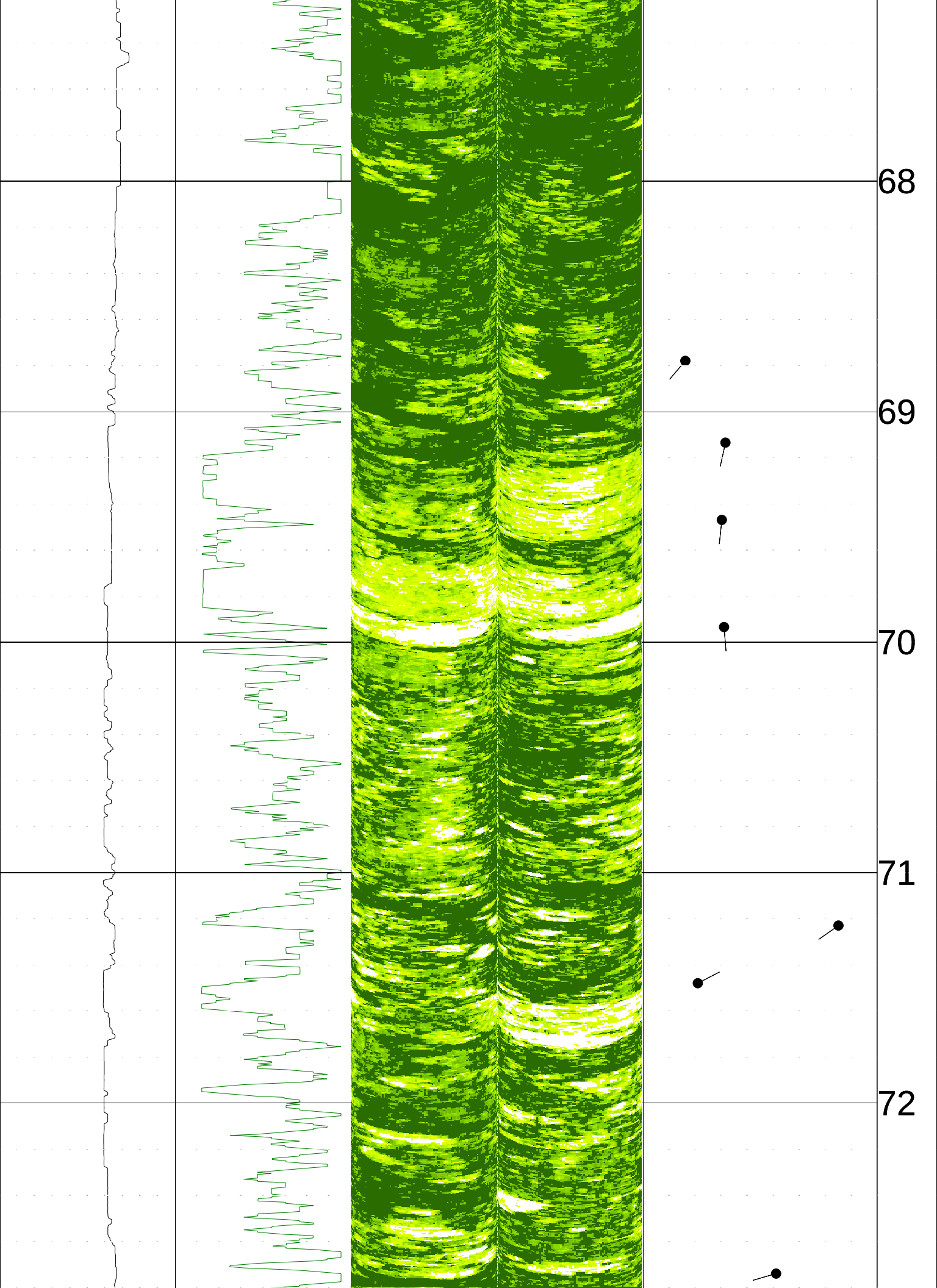

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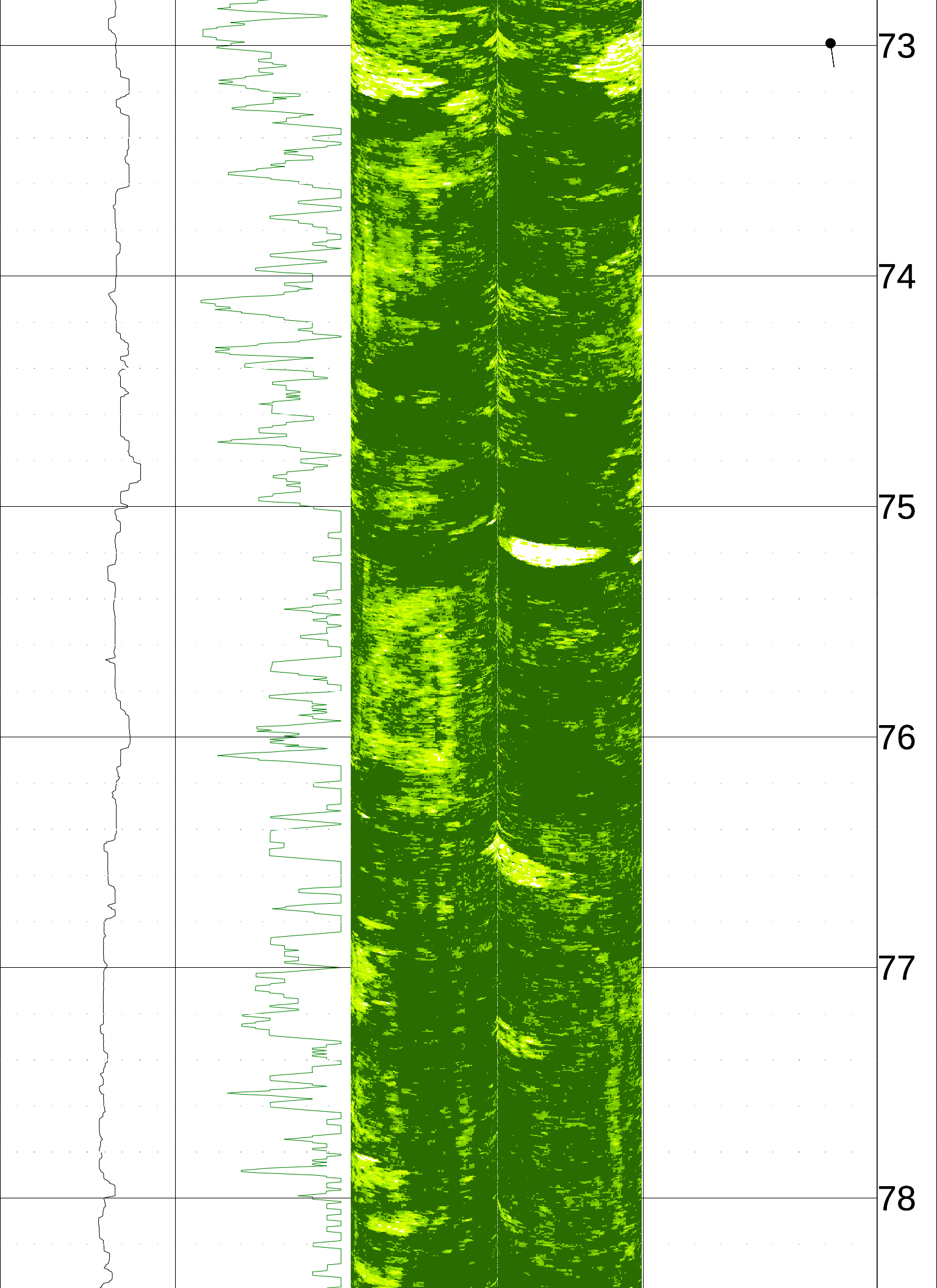

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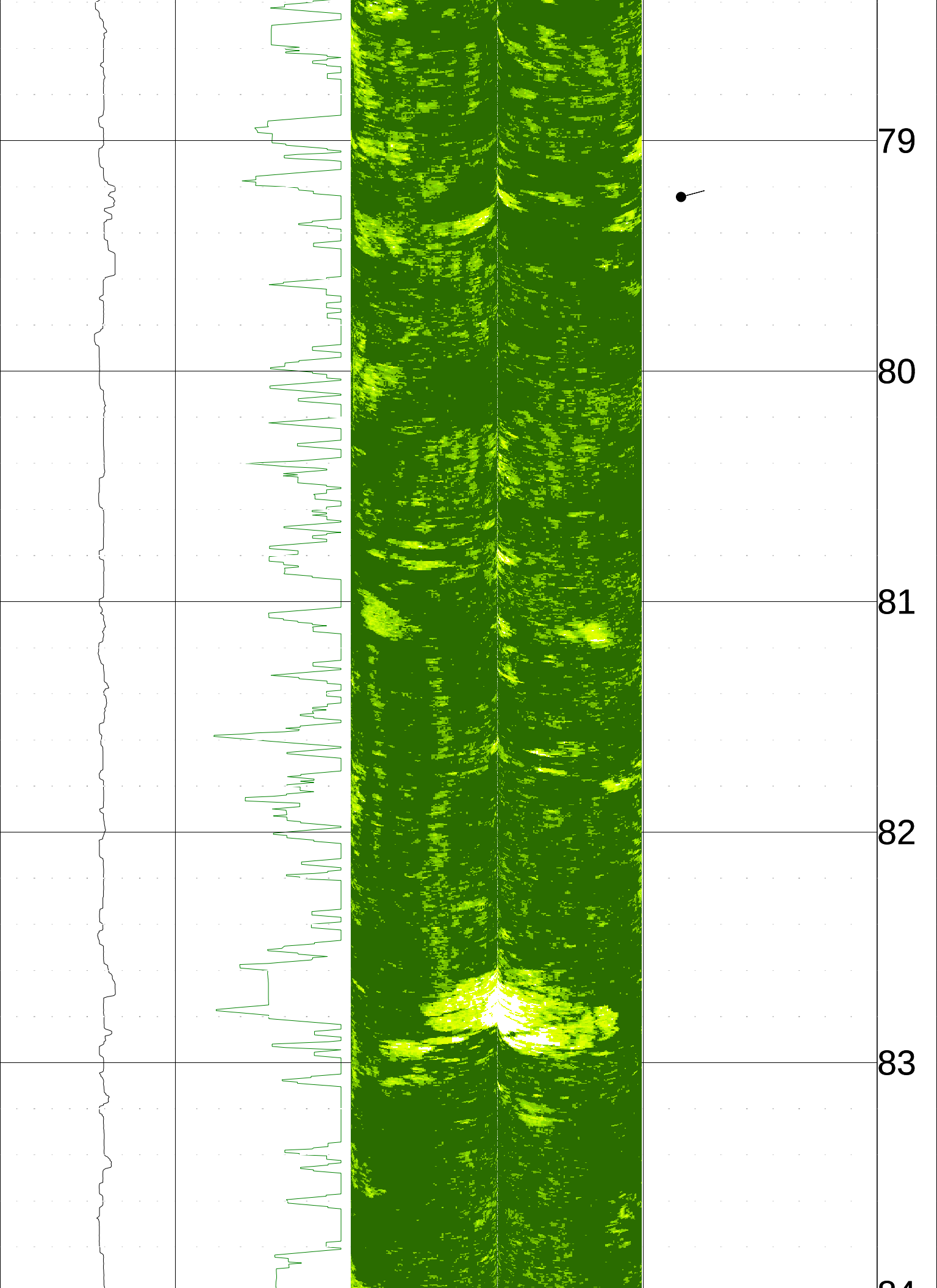

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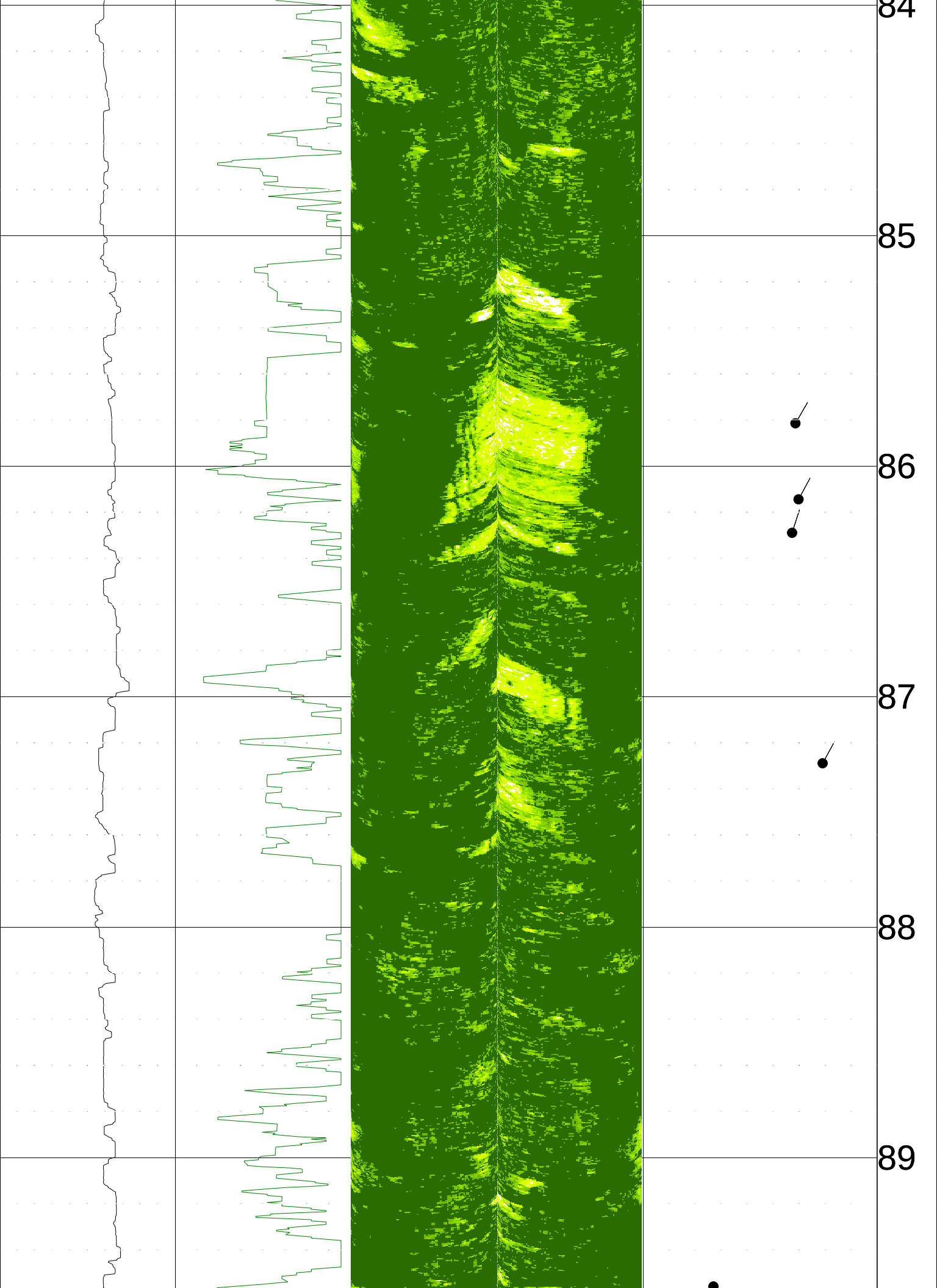

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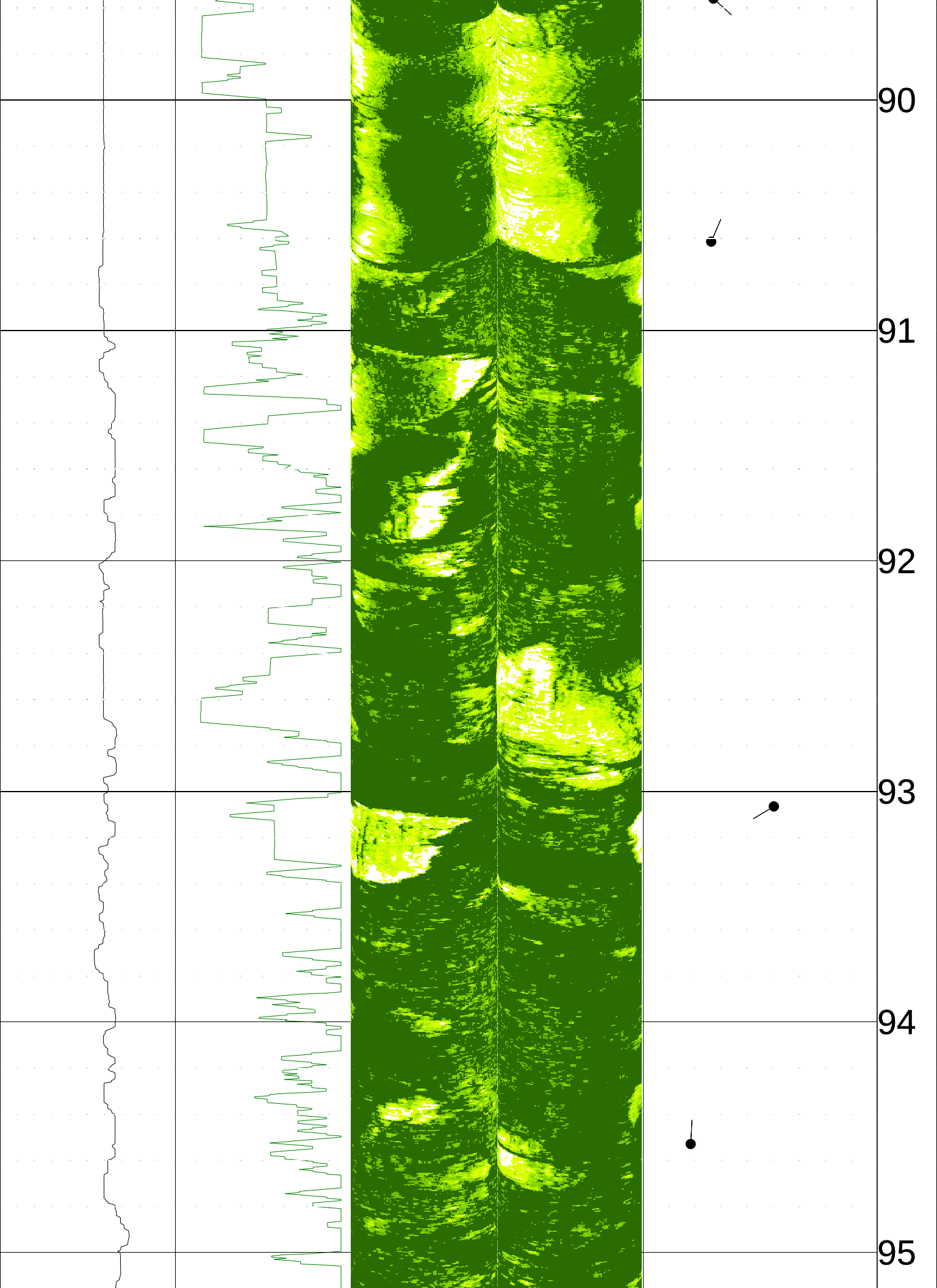

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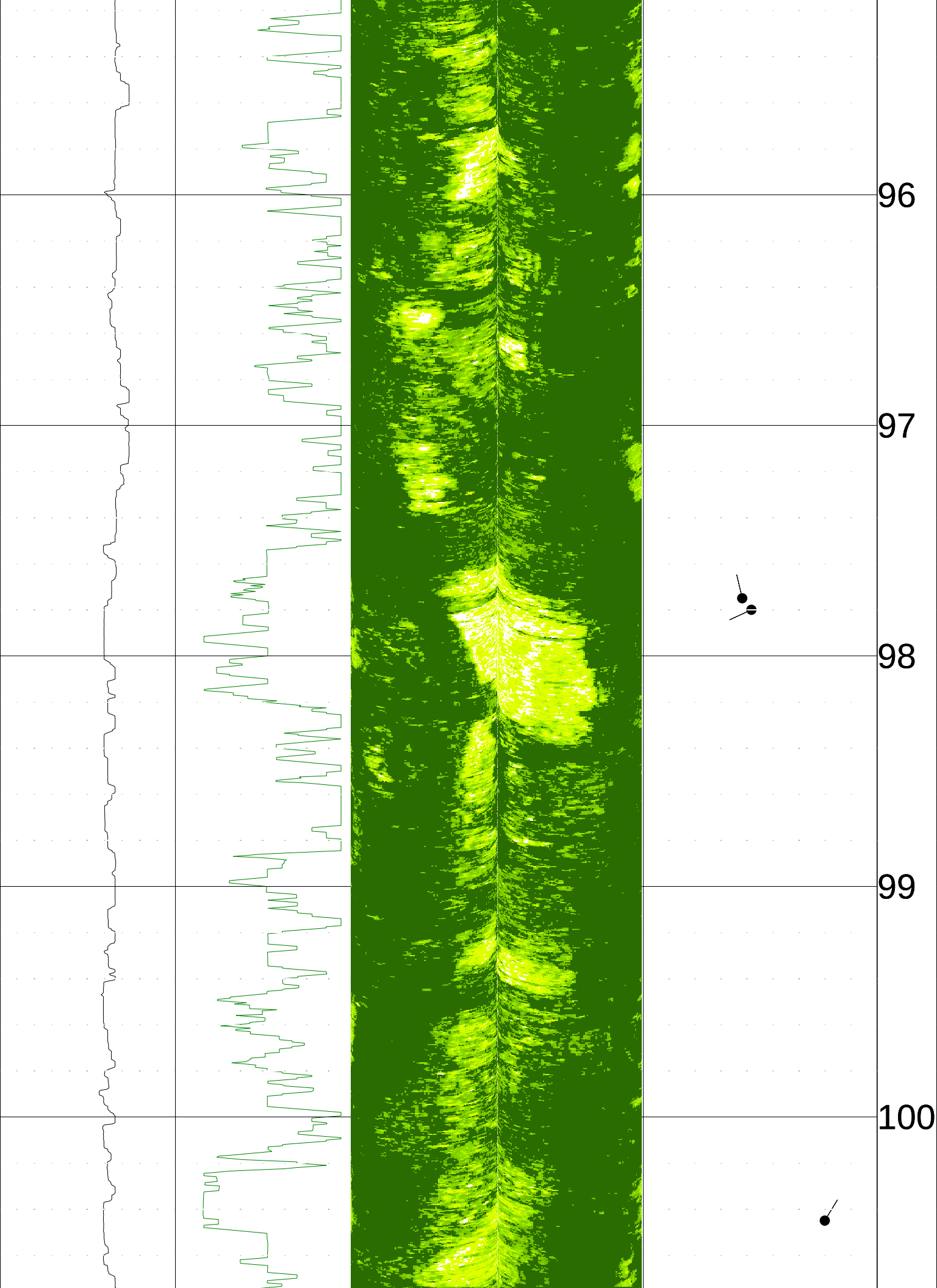

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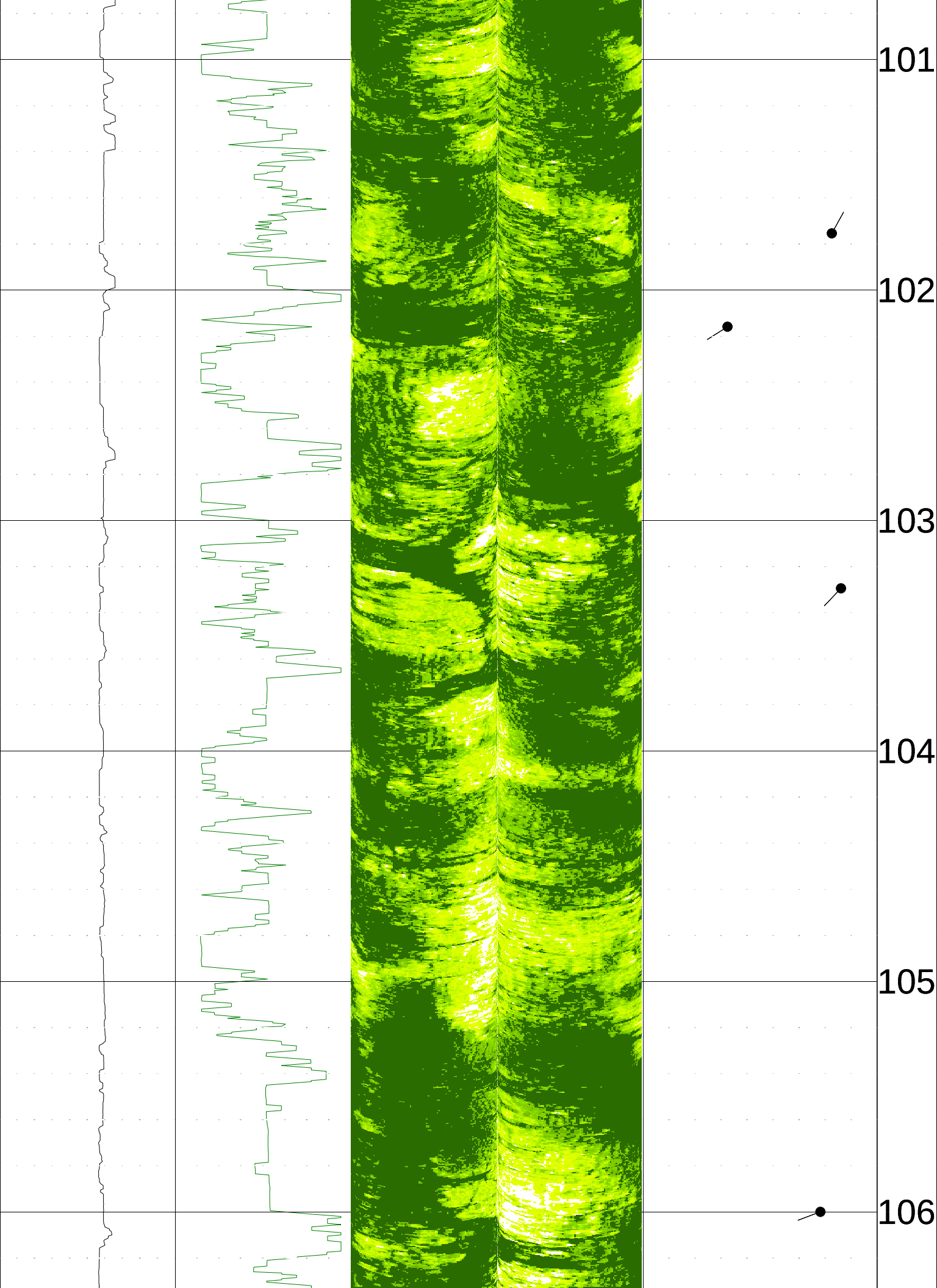

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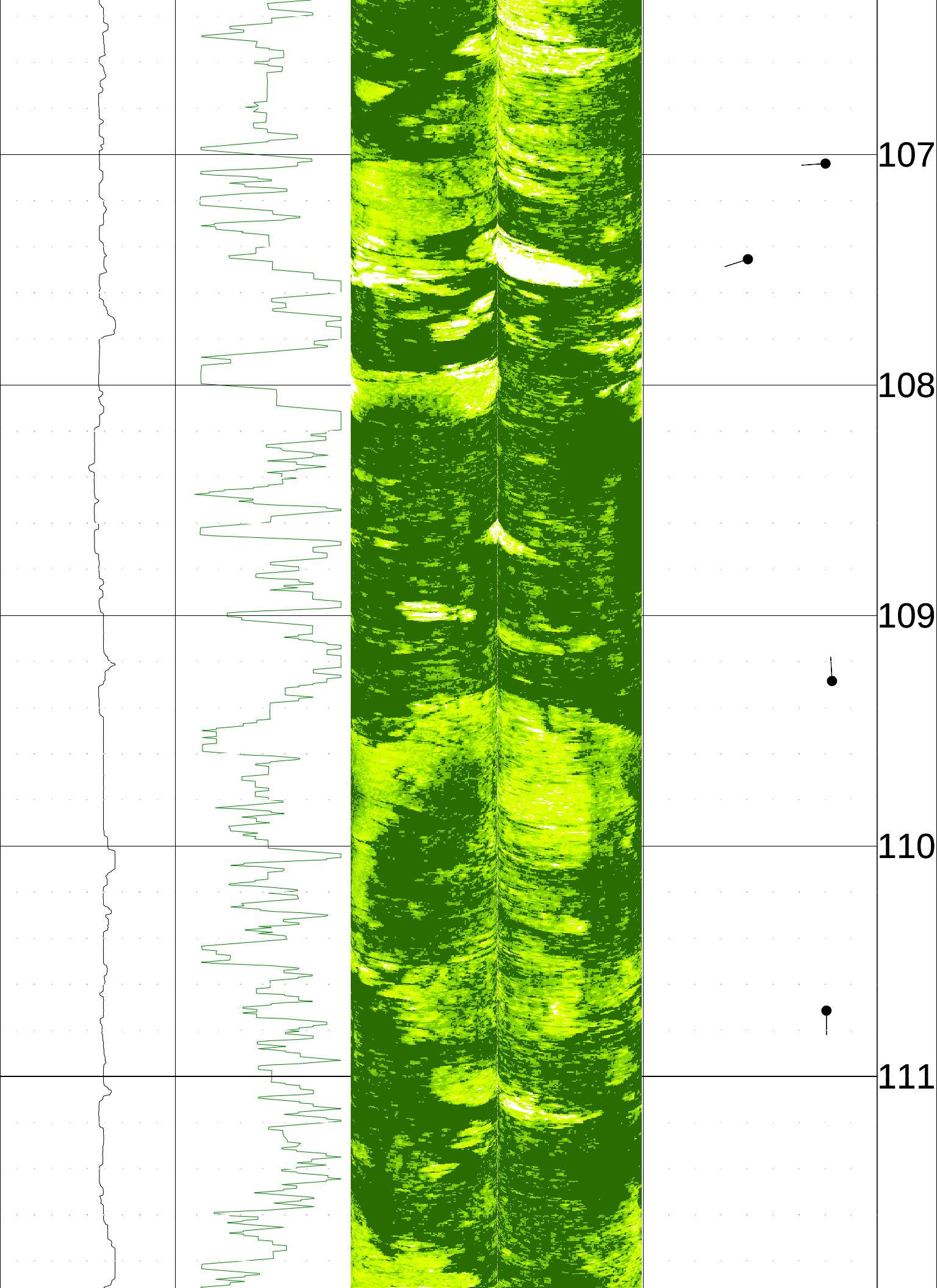

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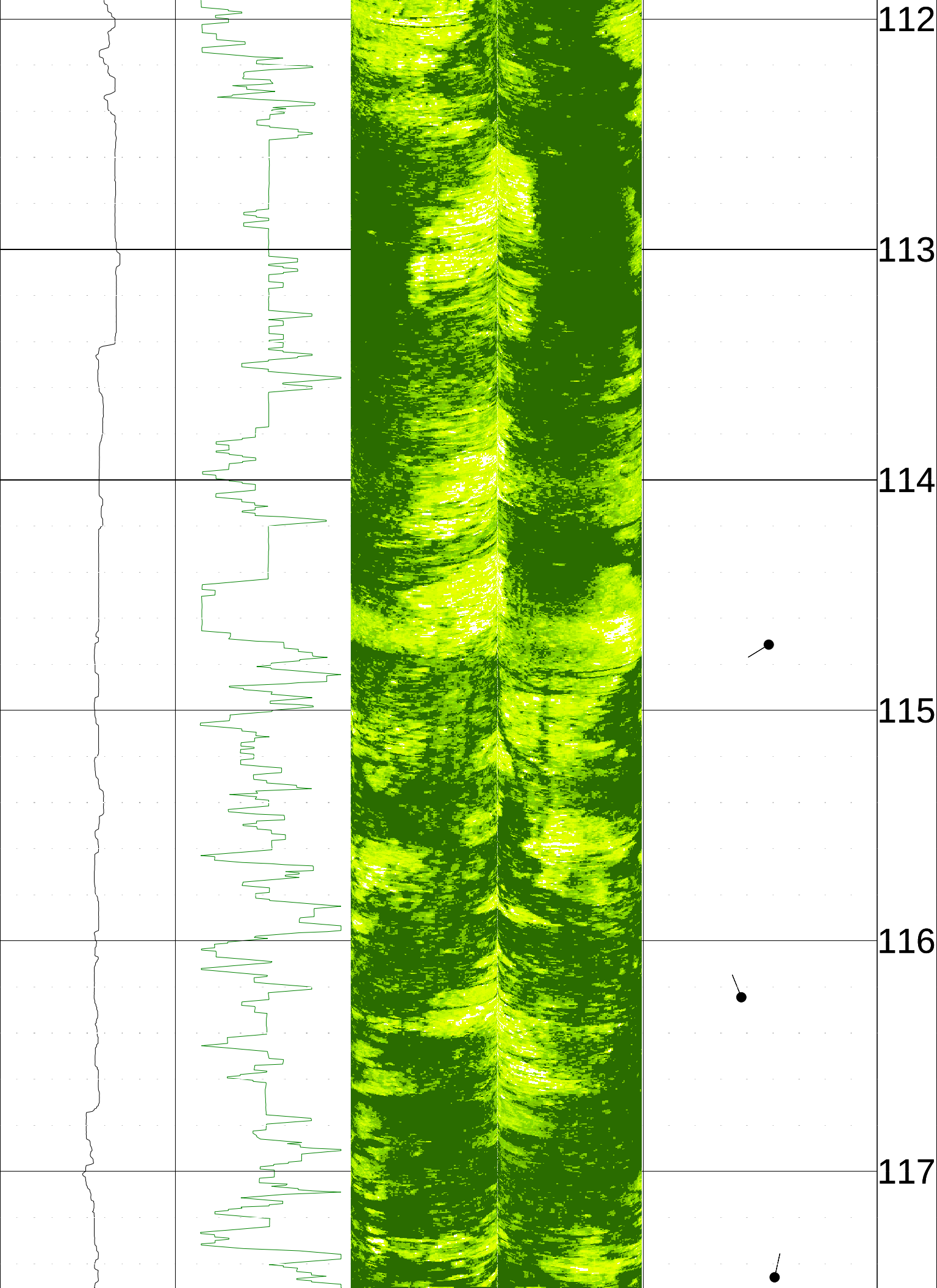

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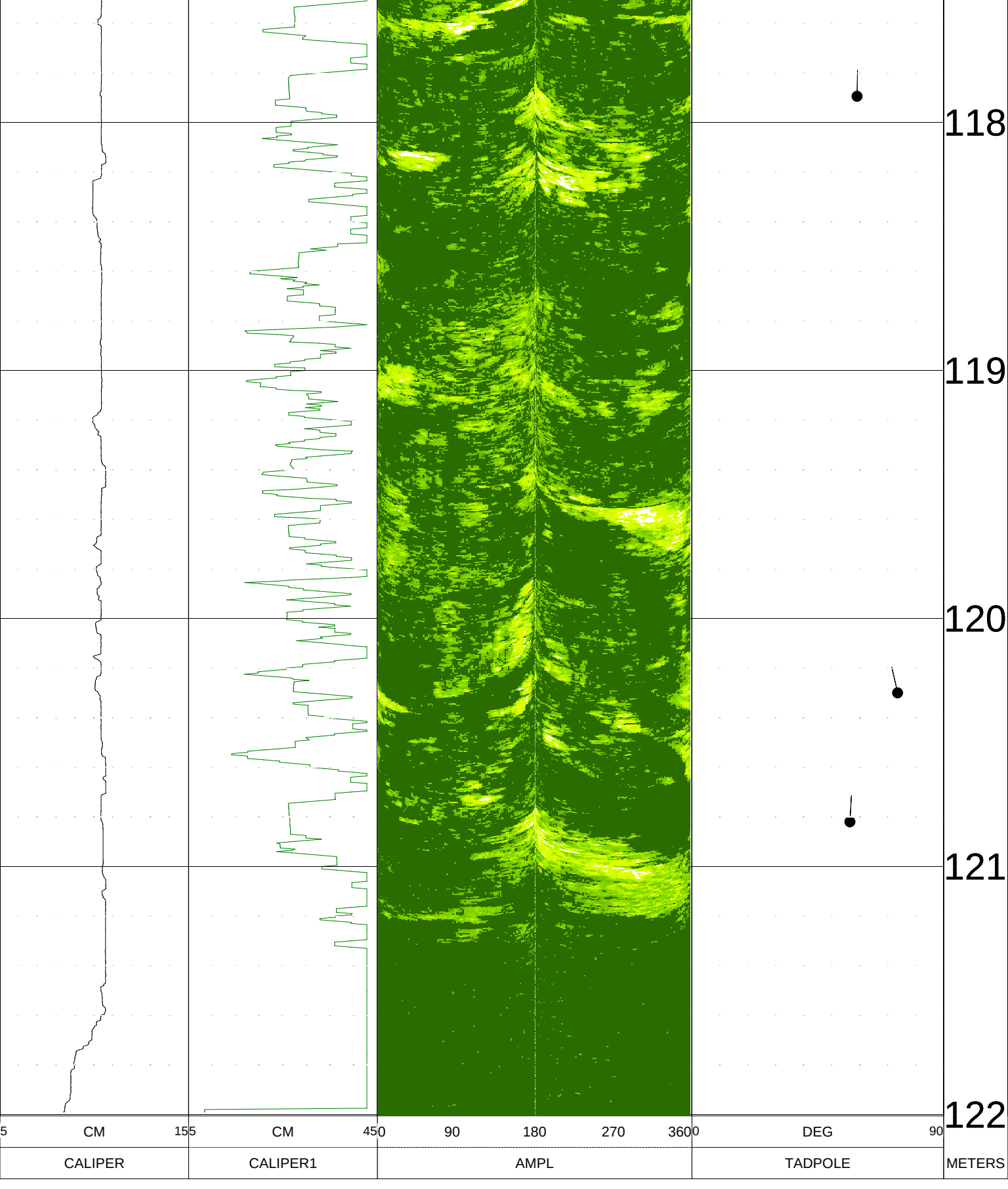

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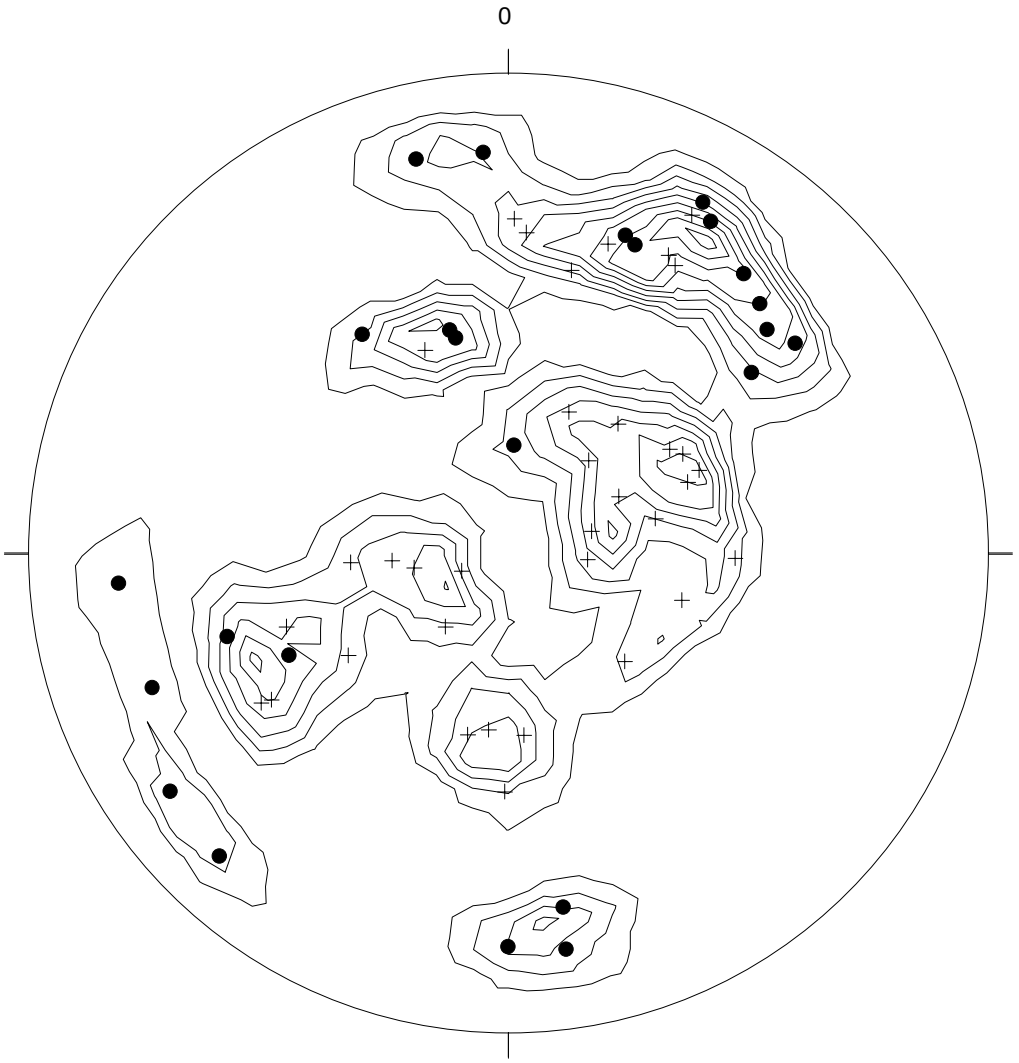

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110
111


112
113
114
115
116
117


118
119
120
121
122
5
CM
15
5
CM
45
0
90
180
270
360
0
DEG
90
CALIPER
CALIPER1
AMPL
TADPOLE
METERS



LA 710 Tunnel, boring Z3 B5

+ n=35 (P)
• n=24 (P)

Stereonet contour plot of poles to planes,
Both bedding and fractures

n=59
max. dens.=9.69 (at 33/ 24)
min. dens.=0.00
Contours at every integer between
1 and 9, inclusive:
(Multiples of random distribution)

Apparent bedding denoted as cross
Apparent fractures denoted as solid circle
Plotted on upper hemisphere

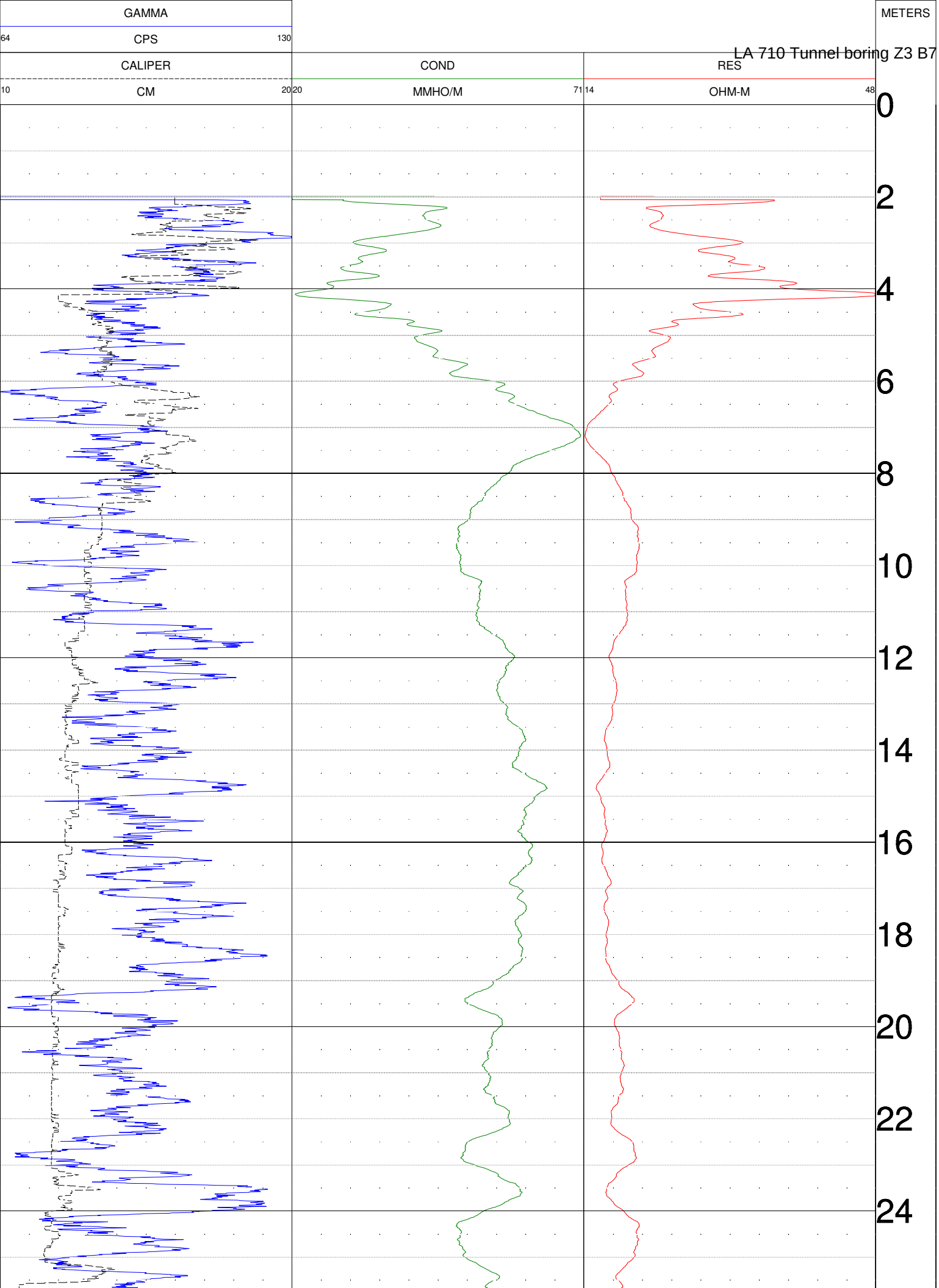


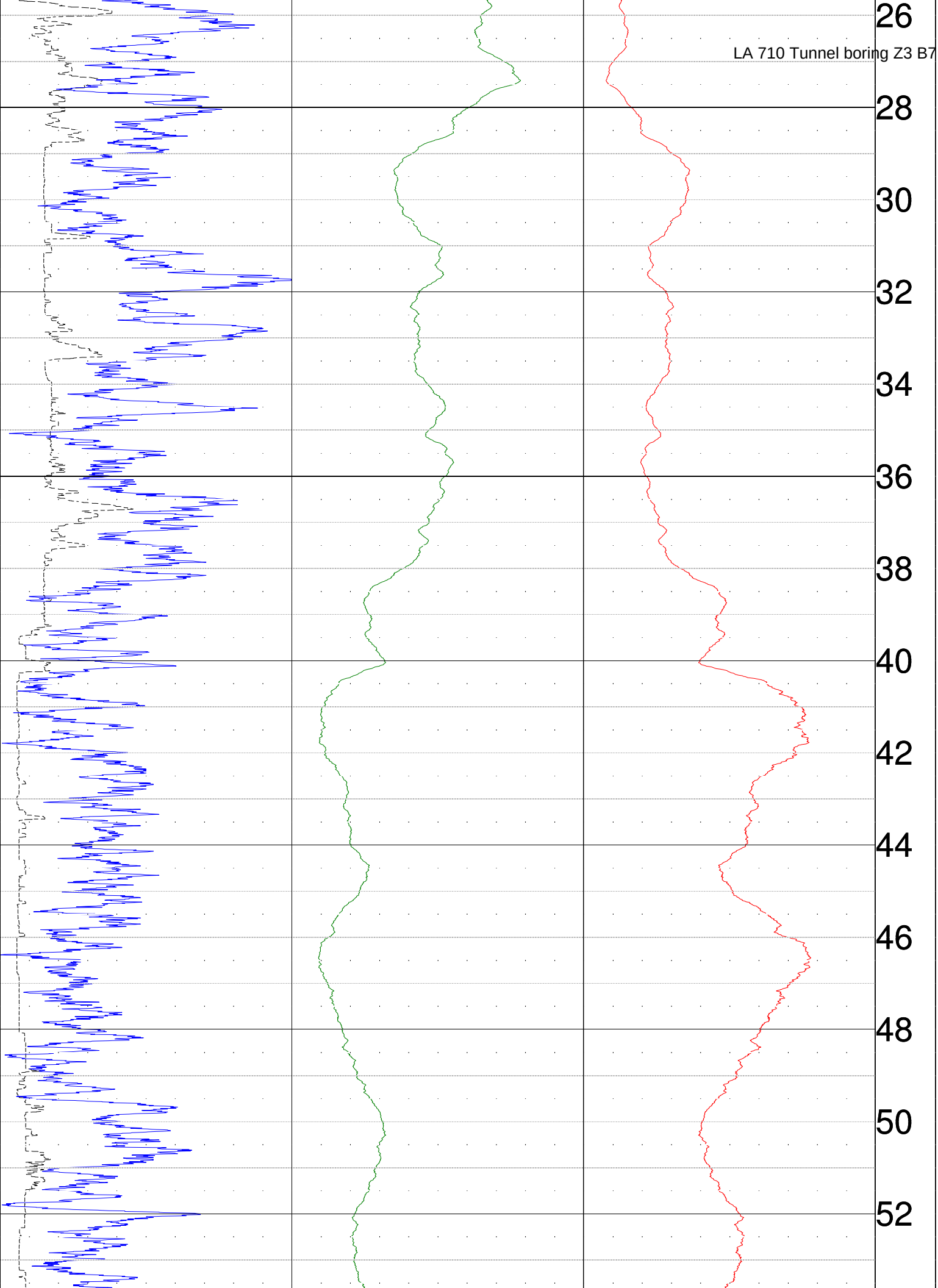
LA 710 Tunnel boring Z3 B7

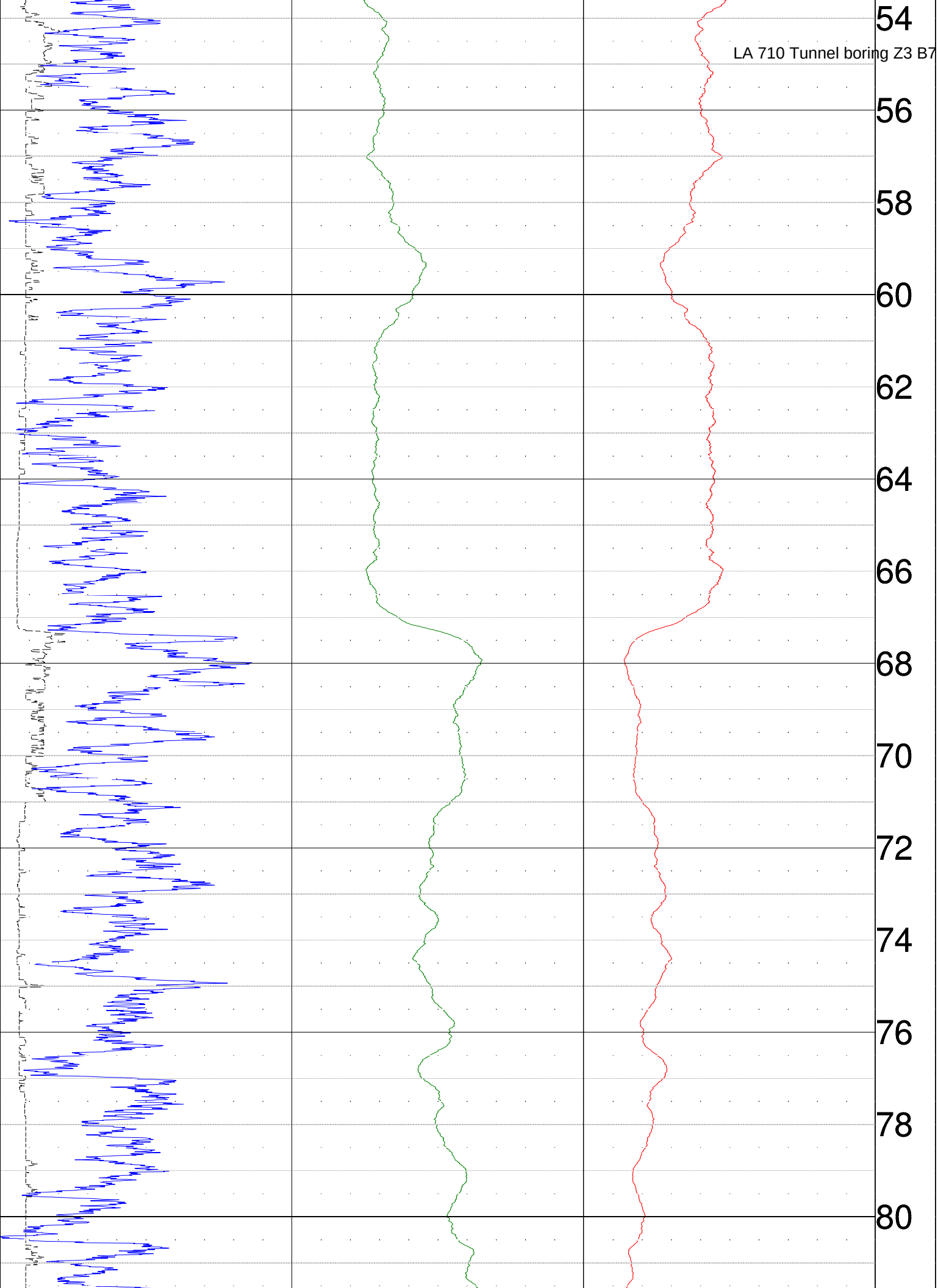
COMPANY	: CALTRANS			OTHER SERVICES:	
WELL	: Z3 B7			IND-CAL	
LOCATION/FIELD	: LA 710 TUNNEL			AC TEL	
COUNTY	: LA			PSLOG	
LOCATION	: CA				
SECTION	: None	TOWNSHIP	: None	RANGE	: None
DATE	: 2/13/09	PERMANENT DATUM	: None		
DEPTH DRILLER	: 236.64M			KB	: NA
LOG BOTTOM	: 99.1	LOG MEASURED FROM:	GL	DF	: NA
LOG TOP	: 1.9	DRL MEASURED FROM:	GL	GL	: NA
CASING DIAMETER	: N/A	LOGGING UNIT	: 7311		
CASING TYPE	: none	FIELD OFFICE	: 7311		
CASING THICKNESS:	0	RECORDED BY	: DH/DG		
BIT SIZE	: 10.16CM	BOREHOLE FLUID	: 0	FILE	: PROCESSE
MAGNETIC DECL.	: 12.85	RM	: 0	TYPE	: 9065A
MATRIX DENSITY	: 2.71	RM TEMPERATURE	: 0	LGDATE	: 2/13/09.
NEUTRON MATRIX	: DOLOMITE	MATRIX DELTA T	: 140		
				THRESH:	2500

LOG DEPTH IN METERS, CALIPER DIAMETER IN CM
EA: 07-187900. GL ELEVATION ESTIMATED FROM HANDHELD GPS 236.6M

ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS


GAMMA
64
CPS
130
CALIPER
10
CM
20
COND
20
MMHO/M
71
RES
14
OHM-M
48
METERS
LA 710 Tunnel boring Z3 B7
0
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6
8
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LA 710 Tunnel boring Z3 B7
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LA 710 Tunnel boring Z3 B7
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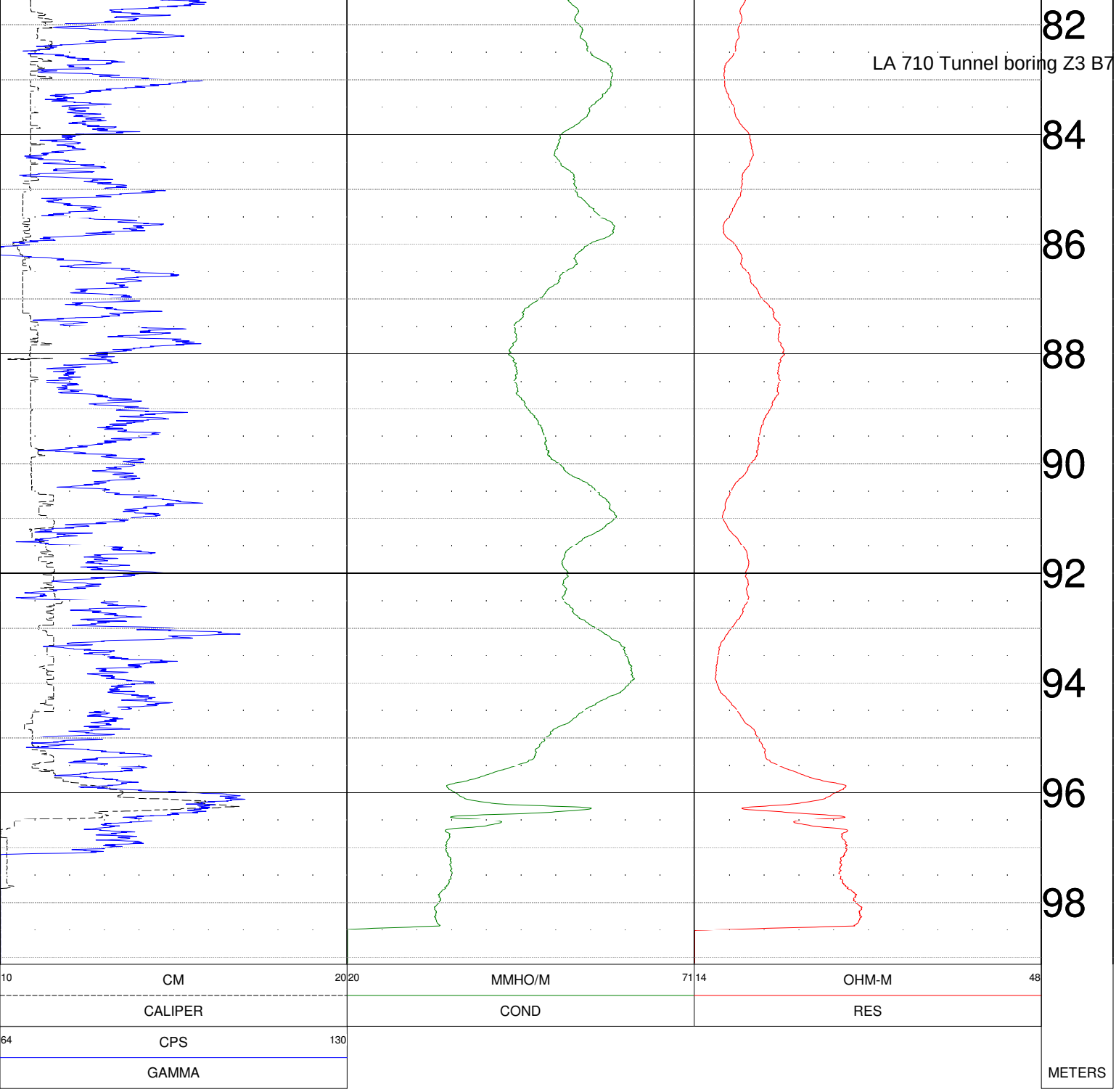

LA 710 Tunnel boring Z3 B7
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CM
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CALIPER
64
CPS
130
GAMMA
20
MMHO/M
71
COND
14
OHM-M
48
RES
METERS

Table 2. LA 710 Tunnel
Boring Z3 B7
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
Not Provided	1.5	4.9	225	739		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2	6.6	242	792		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2.4	7.9	282	927		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2.9	9.5	251	824		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3.4	11.2	236	774		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3.9	12.8	217	713		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4.5	14.8	292	959		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5	16.4	259	850		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5.5	18.0	301	988		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5.9	19.4	321	1052		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6.5	21.3	298	976		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7	23.0	323	1058	1562	5126	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7.5	24.6	327	1072	1923	6309	0.49	2.14	133.69	0.229	0.679	7.615	4777	14188	159042
	8	26.2	342	1124	1923	6309	0.48	2.14	133.69	0.251	0.745	7.585	5246	15565	158417
	8.5	27.9	413	1356	1852	6076	0.47	2.10	131.15	0.359	1.057	6.726	7492	22083	140477
	9	29.5	427	1402	1923	6309	0.47	2.14	133.69	0.391	1.153	7.398	8168	24081	154520
	9.5	31.2	385	1262	2000	6562	0.48	2.18	136.25	0.323	0.956	8.300	6743	19970	173339
	10	32.8	424	1390	2000	6562	0.48	2.18	136.25	0.392	1.157	8.208	8184	24168	171417
	10.5	34.4	474	1555	2000	6562	0.47	2.18	136.25	0.490	1.441	8.076	10238	30106	168678
	11	36.1	488	1600	1923	6309	0.47	2.14	133.69	0.510	1.494	7.241	10643	31197	151220
	11.5	37.7	476	1562	1923	6309	0.47	2.14	133.69	0.486	1.425	7.272	10142	29764	151888
	12	39.4	495	1624	1923	6309	0.46	2.14	133.69	0.525	1.537	7.220	10961	32106	150796
	12.5	41.0	481	1577	1923	6309	0.47	2.14	133.69	0.495	1.452	7.260	10338	30325	151627
	13	42.7	476	1562	1923	6309	0.47	2.14	133.69	0.486	1.425	7.272	10142	29764	151888
	13.6	44.6	529	1736	1923	6309	0.46	2.14	133.69	0.600	1.749	7.121	12521	36538	148716
	14	45.9	503	1649	1923	6309	0.46	2.14	133.69	0.541	1.583	7.199	11294	33056	150352
	14.5	47.6	478	1570	2000	6562	0.47	2.18	136.25	0.500	1.469	8.064	10435	30672	168416
	15	49.2	415	1361	2000	6562	0.48	2.18	136.25	0.376	1.110	8.229	7848	23191	171865
	15.4	50.5	444	1458	2000	6562	0.47	2.18	136.25	0.431	1.271	8.155	9004	26544	170324
	15.9	52.2	394	1292	2000	6562	0.48	2.18	136.25	0.338	1.001	8.279	7065	20911	172909
	16.4	53.8	336	1101	2083	6835	0.49	2.22	138.82	0.250	0.745	9.317	5230	15550	194596
	17	55.8	324	1062	2083	6835	0.49	2.22	138.82	0.233	0.693	9.341	4864	14472	195084
	17.5	57.4	483	1585	2000	6562	0.47	2.18	136.25	0.509	1.496	8.051	10638	31255	168146
	18.5	60.7	383	1257	2000	6562	0.48	2.18	136.25	0.320	0.949	8.303	6691	19819	173408
	18.5	60.7	388	1272	2083	6835	0.48	2.22	138.82	0.334	0.990	9.206	6977	20681	192267
	18.5	60.7	532	1745	2000	6562	0.46	2.18	136.25	0.618	1.806	7.907	12897	37709	165134
	18.5	60.7	493	1616	2000	6562	0.47	2.18	136.25	0.530	1.555	8.024	11061	32469	167581

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B7
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	19	62.3	437	1433	2000	6562	0.47	2.18	136.25	0.416	1.228	8.175	8692	25641	170740
	19.5	64.0	493	1616	2174	7132	0.47	2.26	141.40	0.550	1.619	9.971	11479	33816	208252
	20	65.6	606	1988	2273	7456	0.46	2.31	143.99	0.847	2.477	10.784	17694	51727	225229
	20.6	67.6	465	1526	2174	7132	0.48	2.26	141.40	0.490	1.446	10.051	10234	30210	209912
	21.1	69.2	403	1323	2174	7132	0.48	2.26	141.40	0.368	1.092	10.213	7691	22800	213302
	21.5	70.5	424	1390	2174	7132	0.48	2.26	141.40	0.407	1.204	10.162	8493	25145	212233
	22	72.2	439	1439	2083	6835	0.48	2.22	138.82	0.428	1.263	9.081	8934	26387	189657
	22.5	73.8	415	1361	2174	7132	0.48	2.26	141.40	0.390	1.155	10.184	8145	24126	212698
	23	75.5	450	1478	2273	7456	0.48	2.31	143.99	0.468	1.385	11.290	9774	28923	235789
	23.5	77.1	485	1593	2273	7456	0.48	2.31	143.99	0.544	1.605	11.189	11352	33512	233686
	24	78.7	403	1323	2273	7456	0.48	2.31	143.99	0.375	1.113	11.414	7832	23242	238378
	24.5	80.4	382	1252	2273	7456	0.49	2.31	143.99	0.336	0.998	11.466	7018	20849	239465
	25	82.0	435	1426	2273	7456	0.48	2.31	143.99	0.436	1.291	11.332	9106	26973	236680
	25.5	83.7	459	1505	2381	7812	0.48	2.35	146.59	0.494	1.463	12.653	10320	30561	264262
	25.9	85.0	459	1505	2273	7456	0.48	2.31	143.99	0.485	1.435	11.267	10136	29979	235306
	26.5	86.9	467	1533	2174	7132	0.48	2.26	141.40	0.495	1.460	10.045	10329	30488	209785
	26.9	88.3	472	1548	2381	7812	0.48	2.35	146.59	0.522	1.546	12.615	10912	32290	263473
	27.5	90.2	435	1426	2273	7456	0.48	2.31	143.99	0.436	1.291	11.332	9106	26973	236680
	28	91.9	403	1323	2273	7456	0.48	2.31	143.99	0.375	1.113	11.414	7832	23242	238379
	28.6	93.8	450	1478	2174	7132	0.48	2.26	141.40	0.460	1.358	10.091	9598	28365	210760
	29.1	95.5	446	1465	2273	7456	0.48	2.31	143.99	0.460	1.361	11.301	9601	28416	236021
	29.6	97.1	442	1452	2381	7812	0.48	2.35	146.59	0.460	1.363	12.699	9602	28462	265220
	29.9	98.1	500	1640	2273	7456	0.47	2.31	143.99	0.577	1.701	11.145	12043	35516	232765
	30	98.4	481	1577	2381	7812	0.48	2.35	146.59	0.543	1.605	12.588	11336	33525	262908
	30.4	99.7	485	1593	2381	7812	0.48	2.35	146.59	0.553	1.636	12.574	11557	34170	262613
	30.5	100.1	588	1930	2381	7812	0.47	2.35	146.59	0.813	2.385	12.228	16970	49807	255396
	31	101.7	426	1396	2273	7456	0.48	2.31	143.99	0.418	1.238	11.357	8723	25852	237192
	31	101.7	459	1505	2273	7456	0.48	2.31	143.99	0.485	1.435	11.267	10136	29979	235307
	31.4	103.0	403	1323	2381	7812	0.49	2.35	146.59	0.382	1.134	12.803	7974	23686	267390
	31.5	103.3	459	1505	2273	7456	0.48	2.31	143.99	0.485	1.435	11.267	10136	29979	235306
	31.9	104.7	490	1608	2273	7456	0.48	2.31	143.99	0.554	1.636	11.175	11575	34161	233388
	32	105.0	435	1426	2273	7456	0.48	2.31	143.99	0.436	1.291	11.332	9106	26973	236680
	32.5	106.6	490	1608	2381	7812	0.48	2.35	146.59	0.564	1.668	12.560	11785	34832	262309
	32.5	106.6	515	1691	2273	7456	0.47	2.31	143.99	0.613	1.805	11.097	12799	37704	231756
	33	108.3	532	1745	2381	7812	0.47	2.35	146.59	0.664	1.958	12.426	13876	40899	259520
	33	108.3	538	1764	2500	8202	0.48	2.39	149.21	0.691	2.039	14.017	14429	42587	292750
	33.5	109.9	610	2001	2500	8202	0.47	2.39	149.21	0.889	2.610	13.753	18560	54505	287242

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B7
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	33.5	109.9	633	2076	2632	8634	0.47	2.43	151.84	0.974	2.863	15.544	20348	59795	324651
	34	111.5	746	2448	2500	8202	0.45	2.39	149.21	1.331	3.863	13.163	27800	80681	274922
	34.1	111.9		NA	2381	7812	NA	NA	NA	NA	NA	NA	NA	NA	NA
	34.3	112.5	735	2412	2632	8634	0.46	2.43	151.84	1.315	3.834	15.090	27464	80066	315164
	34.6	113.5		NA	2273	7456	NA	NA	NA	NA	NA	NA	NA	NA	NA
	35	114.8	617	2025	2381	7812	0.46	2.35	146.59	0.895	2.620	12.119	18687	54715	253105
	35.1	115.2	680	2232	2381	7812	0.46	2.35	146.59	1.087	3.163	11.863	22696	66069	247761
	35.5	116.5	595	1953	2381	7812	0.47	2.35	146.59	0.832	2.440	12.202	17376	50971	254853
	35.6	116.8	629	2063	2381	7812	0.46	2.35	146.59	0.929	2.717	12.073	19399	56742	252156
	36	118.1	595	1953	2381	7812	0.47	2.35	146.59	0.832	2.441	12.203	17376	50971	254854
	36	118.1	658	2158	2500	8202	0.46	2.39	149.21	1.035	3.027	13.559	21606	63210	283181
	36.5	119.8	610	2001	2381	7812	0.46	2.35	146.59	0.873	2.558	12.148	18234	53423	253710
	36.8	120.7	621	2038	2500	8202	0.47	2.39	149.21	0.922	2.706	13.709	19258	56506	286311
	37	121.4	676	2217	2381	7812	0.46	2.35	146.59	1.072	3.122	11.882	22390	65209	248169
	37.2	122.0	606	1988	2500	8202	0.47	2.39	149.21	0.878	2.579	13.768	18335	53861	287541
	37.5	123.0	621	2038	2381	7812	0.46	2.35	146.59	0.906	2.652	12.104	18920	55379	252795
	37.6	123.4	649	2130	2273	7456	0.46	2.31	143.99	0.973	2.831	10.617	20312	59130	221739
	38	124.7	581	1907	2381	7812	0.47	2.35	146.59	0.794	2.331	12.254	16578	48681	255919
	38.1	125.0	602	1976	2381	7812	0.47	2.35	146.59	0.852	2.498	12.176	17798	52176	254292
	38.5	126.3	571	1875	2381	7812	0.47	2.35	146.59	0.767	2.253	12.290	16014	47063	256670
	38.7	127.0	704	2310	2500	8202	0.46	2.39	149.21	1.185	3.454	13.358	24756	72134	278980
	39	128.0	699	2294	2500	8202	0.46	2.39	149.21	1.169	3.407	13.380	24411	71161	279441
	39.1	128.3	699	2294	2500	8202	0.46	2.39	149.21	1.169	3.407	13.380	24411	71161	279441
	39.4	129.3	893	2929	2632	8634	0.43	2.43	151.84	1.939	5.565	14.258	40495	116218	297788
	39.6	129.9	763	2504	2500	8202	0.45	2.39	149.21	1.393	4.035	13.081	29088	84274	273205
	40	131.2	621	2038	2500	8202	0.47	2.39	149.21	0.922	2.706	13.709	19258	56506	286311
	40	131.2	730	2395	2632	8634	0.46	2.43	151.84	1.296	3.780	15.116	27064	78938	315697
	40.5	132.9	690	2263	2381	7812	0.45	2.35	146.59	1.117	3.248	11.823	23326	67842	246920
	40.6	133.2	568	1864	2500	8202	0.47	2.39	149.21	0.772	2.273	13.909	16115	47468	290502
	41	134.5	719	2360	2381	7812	0.45	2.35	146.59	1.215	3.524	11.691	25383	73599	244177
	41.1	134.8	952	3125	2381	7812	0.40	2.35	146.59	2.130	5.984	10.472	44483	124977	218711
	41.4	135.8	725	2377	2500	8202	0.45	2.39	149.21	1.255	3.650	13.265	26212	76232	277039
	41.9	137.5		NA	2500	8202	NA	NA	NA	NA	NA	NA	NA	NA	NA
	42	137.8	781	2563	2632	8634	0.45	2.43	151.84	1.485	4.310	14.864	31004	90016	310444
	42.5	139.4	714	2343	2632	8634	0.46	2.43	151.84	1.241	3.624	15.189	25917	75690	317227
	42.5	139.4	676	2217	2500	8202	0.46	2.39	149.21	1.091	3.188	13.483	22790	66573	281603
	43	141.1	704	2310	2632	8634	0.46	2.43	151.84	1.206	3.526	15.235	25192	73633	318194

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B7
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	43	141.1	758	2485	2500	8202	0.45	2.39	149.21	1.372	3.977	13.109	28649	83050	273790
	43.5	142.7		NA	2778	9113	NA	NA	NA	NA	NA	NA	NA	NA	NA
	43.5	142.7	794	2604	2500	8202	0.44	2.39	149.21	1.505	4.348	12.931	31443	90804	270066
	44	144.4	826	2711	2778	9113	0.45	2.47	154.48	1.690	4.906	16.840	35299	102468	351705
	44.2	145.0		NA	2632	8634	NA	NA	NA	NA	NA	NA	NA	NA	NA
	44.5	146.0	735	2412	2632	8634	0.46	2.43	151.84	1.315	3.834	15.090	27464	80066	315163
	44.7	146.7	714	2343	2632	8634	0.46	2.43	151.84	1.241	3.624	15.189	25917	75690	317227
	45	147.6	541	1773	2632	8634	0.48	2.43	151.84	0.711	2.101	15.896	14842	43873	331992
	45.1	148.0	704	2310	2500	8202	0.46	2.39	149.21	1.185	3.454	13.358	24756	72134	278981
	45.7	149.9	862	2828	2778	9113	0.45	2.47	154.48	1.839	5.321	16.641	38407	111128	347562
	46.2	151.6	885	2903	2941	9650	0.45	2.52	157.13	1.971	5.717	19.145	41168	119407	399850
	46.7	153.2	1190	3906	3125	10253	0.42	2.56	159.79	3.628	10.267	20.160	75764	214431	421046
	47.2	154.9	1389	4557	3333	10936	0.39	2.60	162.47	5.020	14.006	22.223	104851	292526	464143
	47.7	156.5	1149	3771	2632	8634	0.38	2.43	151.84	3.213	8.883	12.559	67112	185515	262300
	48.2	158.1	962	3155	2941	9650	0.44	2.52	157.13	2.327	6.703	18.670	48602	139990	389938
	48.7	159.8	813	2667	2778	9113	0.45	2.47	154.48	1.636	4.754	16.913	34160	99279	353225
	49.2	161.4	746	2448	2632	8634	0.46	2.43	151.84	1.355	3.945	15.037	28290	82396	314062
	49.7	163.1	725	2377	2381	7812	0.45	2.35	146.59	1.233	3.573	11.668	25752	74629	243685
	50.2	164.7	613	2013	2500	8202	0.47	2.39	149.21	0.900	2.641	13.739	18788	55160	286938
	50.7	166.3	662	2173	2500	8202	0.46	2.39	149.21	1.048	3.066	13.541	21893	64027	282798
	51.1	167.7	704	2310	2273	7456	0.45	2.31	143.99	1.144	3.310	10.389	23890	69133	216969
	51.7	169.6	455	1491	2381	7812	0.48	2.35	146.59	0.485	1.437	12.665	10133	30015	264511
	52.2	171.3	649	2130	2273	7456	0.46	2.31	143.99	0.973	2.831	10.617	20312	59130	221739
	52.7	172.9	699	2294	2273	7456	0.45	2.31	143.99	1.128	3.266	10.410	23557	68208	217412
	53.2	174.5	980	3217	2941	9650	0.44	2.52	157.13	2.419	6.955	18.548	50527	145264	387370
	53.7	176.2	1136	3728	2632	8634	0.39	2.43	151.84	3.141	8.702	12.656	65596	181752	264322
	54.2	177.8	813	2667	2632	8634	0.45	2.43	151.84	1.608	4.653	14.700	33576	97186	307015
	54.7	179.5	625	2051	2632	8634	0.47	2.43	151.84	0.950	2.793	15.577	19843	58342	325326
	55.1	180.8	515	1691	2500	8202	0.48	2.39	149.21	0.635	1.877	14.091	13263	39201	294304
	55.6	182.4	476	1562	2500	8202	0.48	2.39	149.21	0.542	1.606	14.216	11319	33532	296897
	56.1	184.1	510	1674	2632	8634	0.48	2.43	151.84	0.633	1.875	15.999	13223	39152	334152
	56.6	185.7	538	1764	2500	8202	0.48	2.39	149.21	0.691	2.039	14.017	14429	42587	292750
	57.1	187.3	676	2217	2500	8202	0.46	2.39	149.21	1.091	3.188	13.483	22790	66573	281603
	57.6	189.0	529	1736	2381	7812	0.47	2.35	146.59	0.657	1.938	12.435	13729	40475	259716
	57.6	189.0	565	1854	2500	8202	0.47	2.39	149.21	0.763	2.248	13.921	15934	46943	290744
	58.1	190.6	535	1754	2500	8202	0.48	2.39	149.21	0.683	2.018	14.027	14275	42140	292956
	58.6	192.3	543	1783	2500	8202	0.48	2.39	149.21	0.706	2.083	13.997	14744	43501	292330

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Boring Z3 B7
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	59.1	193.9	633	2076	2500	8202	0.47	2.39	149.21	0.957	2.807	13.662	19996	58619	285327
	59.6	195.5	617	2025	2632	8634	0.47	2.43	151.84	0.927	2.726	15.608	19356	56940	325975
	60.1	197.2	694	2278	2632	8634	0.46	2.43	151.84	1.173	3.431	15.280	24497	71658	319120
	60.6	198.8	621	2038	2500	8202	0.47	2.39	149.21	0.922	2.706	13.709	19258	56506	286311
	61.1	200.5	694	2278	2632	8634	0.46	2.43	151.84	1.173	3.431	15.280	24497	71658	319120
	61.6	202.1	870	2853	2778	9113	0.45	2.47	154.48	1.871	5.410	16.599	39078	112988	346666
	62.1	203.7	877	2878	2941	9650	0.45	2.52	157.13	1.937	5.621	19.191	40449	117399	400807
	62.6	205.4	935	3066	2778	9113	0.44	2.47	154.48	2.161	6.208	16.212	45140	129657	338583
	63.1	207.0	980	3217	2778	9113	0.43	2.47	154.48	2.378	6.797	15.922	49674	141953	332538
	63.6	208.7	885	2903	2500	8202	0.43	2.39	149.21	1.872	5.347	12.442	39093	111680	259865
	64.1	210.3	820	2689	2778	9113	0.45	2.47	154.48	1.663	4.829	16.877	34722	100855	352475
	65.1	213.6	775	2543	2632	8634	0.45	2.43	151.84	1.462	4.246	14.895	30525	88676	311081
	65.6	215.2	735	2412	2632	8634	0.46	2.43	151.84	1.315	3.834	15.090	27464	80066	315164
	66.1	216.9	893	2929	2778	9113	0.44	2.47	154.48	1.973	5.691	16.463	41199	118851	343838
	66.1	216.9	820	2689	2778	9113	0.45	2.47	154.48	1.663	4.829	16.877	34722	100855	352475
	66.6	218.5	917	3010	2778	9113	0.44	2.47	154.48	2.083	5.993	16.316	43499	125170	340773
	67.1	220.1	909	2983	3125	10253	0.45	2.56	159.79	2.115	6.151	22.176	44181	128459	463157
	67.6	221.8	926	3038	2941	9650	0.44	2.52	157.13	2.158	6.236	18.896	45069	130248	394649
	67.6	221.8	800	2625	2941	9650	0.46	2.52	157.13	1.611	4.704	19.625	33643	98243	409883
	68.1	223.4	714	2343	2500	8202	0.46	2.39	149.21	1.219	3.550	13.312	25468	74142	278031
	68.5	224.7	741	2430	2500	8202	0.45	2.39	149.21	1.311	3.808	13.190	27390	79534	275469
	69.1	226.7	794	2604	2632	8634	0.45	2.43	151.84	1.532	4.443	14.801	31996	92788	309121
	69.6	228.3	775	2543	2778	9113	0.46	2.47	154.48	1.487	4.335	17.111	31056	90546	357363
	70.1	230.0	735	2412	2632	8634	0.46	2.43	151.84	1.315	3.834	15.090	27464	80066	315164
	70.6	231.6	870	2853	2632	8634	0.44	2.43	151.84	1.839	5.292	14.391	38410	110522	300568
	71.1	233.3	752	2467	2632	8634	0.46	2.43	151.84	1.375	4.003	15.010	28717	83598	313493
	71.6	234.9	532	1745	2778	9113	0.48	2.47	154.48	0.700	2.074	18.160	14622	43310	379274
	72.1	236.5	870	2853	2941	9650	0.45	2.52	157.13	1.903	5.527	19.236	39749	115439	401741
	72.6	238.2	943	3095	2941	9650	0.44	2.52	157.13	2.240	6.463	18.786	46785	134990	392359
	73.1	239.8	952	3125	2778	9113	0.43	2.47	154.48	2.244	6.434	16.101	46876	134383	336269
	73.6	241.5	909	2983	2778	9113	0.44	2.47	154.48	2.045	5.890	16.367	42711	123010	341823
	74.1	243.1	952	3125	2778	9113	0.43	2.47	154.48	2.244	6.434	16.101	46876	134383	336270
	74.6	244.8	980	3217	2941	9650	0.44	2.52	157.13	2.419	6.955	18.548	50527	145264	387372
	75.1	246.4	769	2524	3125	10253	0.47	2.56	159.79	1.515	4.446	22.977	31633	92858	479888
	75.1	246.4	806	2646	3125	10253	0.46	2.56	159.79	1.665	4.875	22.777	34768	101824	475706
	75.6	248.0	813	2667	2632	8634	0.45	2.43	151.84	1.608	4.653	14.700	33576	97186	307014
	76.1	249.7	800	2625	2778	9113	0.45	2.47	154.48	1.584	4.608	16.982	33076	96235	354669

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Shaded cells denote questionable data.

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Boring Z3 B7
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	76.6	251.3	806	2646	3125	10253	0.46	2.56	159.79	1.665	4.875	22.777	34768	101824	475708
	77.1	253.0	840	2757	2778	9113	0.45	2.47	154.48	1.747	5.066	16.763	36495	105809	350110
	77.5	254.3	971	3185	2941	9650	0.44	2.52	157.13	2.372	6.827	18.610	49550	142592	388672
	78	255.9	962	3155	2941	9650	0.44	2.52	157.13	2.327	6.703	18.670	48602	139990	389937
	78.5	257.5	1020	3348	2941	9650	0.43	2.52	157.13	2.621	7.504	18.279	54735	156716	381759
	79	259.2	862	2828	2778	9113	0.45	2.47	154.48	1.839	5.321	16.641	38407	111128	347562
	79.5	260.8	806	2646	2778	9113	0.45	2.47	154.48	1.609	4.680	16.948	33611	97740	353956
	80	262.5	862	2828	2941	9650	0.45	2.52	157.13	1.871	5.436	19.279	39067	113528	402652
	80.5	264.1	826	2711	2778	9113	0.45	2.47	154.48	1.690	4.906	16.840	35299	102468	351705
	81	265.7	769	2524	2778	9113	0.46	2.47	154.48	1.464	4.271	17.141	30580	89201	357996
	81.5	267.4	741	2430	2778	9113	0.46	2.47	154.48	1.358	3.969	17.283	28357	82900	360962
	82	269.0	641	2103	2632	8634	0.47	2.43	151.84	0.999	2.935	15.511	20873	61303	323951
	82.5	270.7	637	2090	2500	8202	0.47	2.39	149.21	0.970	2.842	13.645	20252	59349	284986
	83	272.3	719	2360	2632	8634	0.46	2.43	151.84	1.259	3.675	15.165	26291	76750	316727
	83.5	274.0	787	2583	2778	9113	0.46	2.47	154.48	1.534	4.469	17.048	32042	93326	356048
	84	275.6	699	2294	2500	8202	0.46	2.39	149.21	1.169	3.407	13.380	24411	71161	279441
	84.5	277.2	621	2038	2778	9113	0.47	2.47	154.48	0.955	2.814	17.820	19938	58764	372186
	85	278.9	439	1439	2778	9113	0.49	2.47	154.48	0.476	1.416	18.459	9942	29571	385516
	85.5	280.5	385	1262	2500	8202	0.49	2.39	149.21	0.354	1.052	14.467	7384	21974	302143
	86	282.2	543	1783	2381	7812	0.47	2.35	146.59	0.694	2.043	12.387	14486	42661	258707
	86.5	283.8	735	2412	2778	9113	0.46	2.47	154.48	1.338	3.913	17.310	27942	81719	361516
	87	285.4	602	1976	2778	9113	0.48	2.47	154.48	0.898	2.650	17.896	18755	55339	373763
	87.5	287.1	680	2232	2778	9113	0.47	2.47	154.48	1.145	3.362	17.567	23916	70223	366883
	87.5	287.1	676	2217	2941	9650	0.47	2.52	157.13	1.149	3.383	20.241	23999	70661	422742
	88	288.7	526	1727	2632	8634	0.48	2.43	151.84	0.674	1.993	15.945	14071	41628	333021
	88.5	290.4	578	1896	2632	8634	0.47	2.43	151.84	0.813	2.397	15.760	16973	50058	329153
	89	292.0	481	1577	2632	8634	0.48	2.43	151.84	0.562	1.667	16.094	11741	34818	336127
	89.5	293.6	455	1491	2632	8634	0.48	2.43	151.84	0.503	1.492	16.174	10495	31163	337789
	90	295.3	483	1585	2500	8202	0.48	2.39	149.21	0.558	1.652	14.194	11650	34497	296455
	90	295.3	483	1585	2632	8634	0.48	2.43	151.84	0.568	1.683	16.087	11855	35151	335976
	90.5	296.9	465	1526	2500	8202	0.48	2.39	149.21	0.517	1.533	14.249	10799	32010	297590
	91	298.6	730	2395	2381	7812	0.45	2.35	146.59	1.251	3.624	11.644	26130	75679	243182
	91.5	300.2	526	1727	2381	7812	0.47	2.35	146.59	0.650	1.918	12.445	13585	40058	259908
	92	301.8	625	2051	2500	8202	0.47	2.39	149.21	0.934	2.739	13.693	19499	57198	285989
	92.5	303.5	602	1976	2381	7812	0.47	2.35	146.59	0.852	2.498	12.176	17798	52176	254291
	92.5	303.5	602	1976	2381	7812	0.47	2.35	146.59	0.852	2.498	12.176	17798	52176	254291
	93	305.1	592	1941	2273	7456	0.46	2.31	143.99	0.808	2.364	10.837	16866	49373	226334

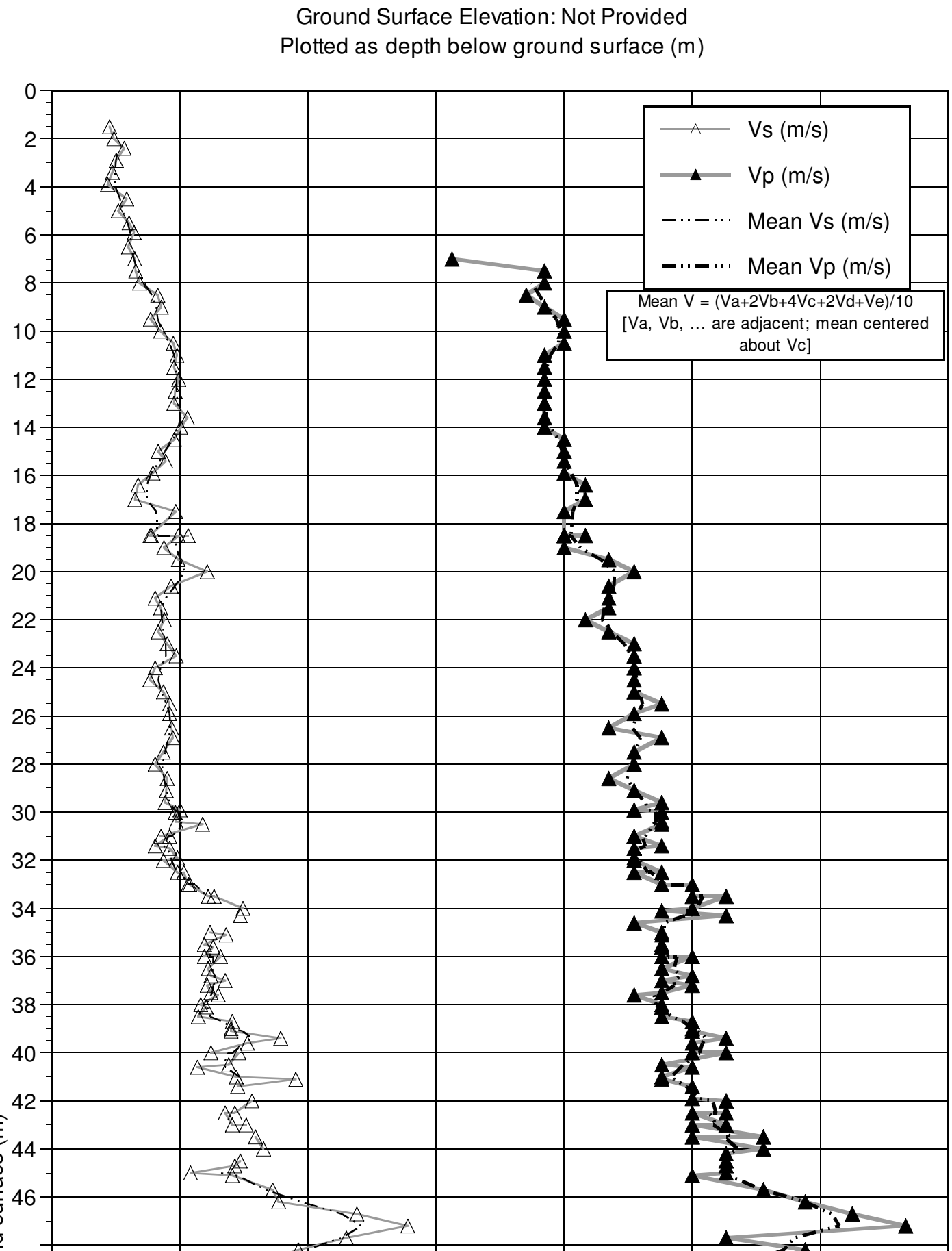
γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

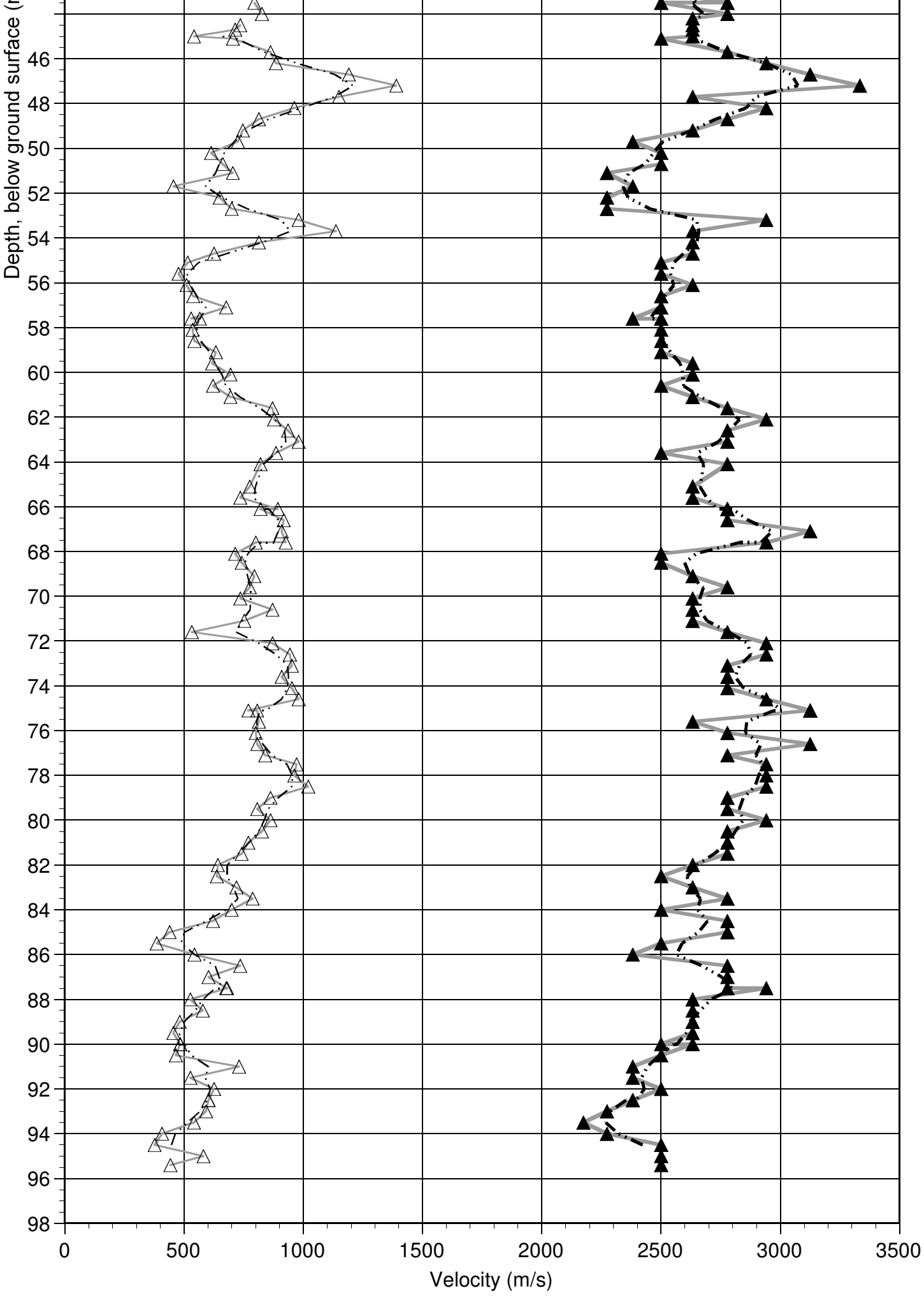
Table 2. LA 710 Tunnel
Boring Z3 B7
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	93.5	306.8	541	1773	2174	7132	0.47	2.26	141.40	0.662	1.942	9.822	13822	40554	205128
	94	308.4	407	1334	2273	7456	0.48	2.31	143.99	0.381	1.131	11.406	7960	23617	238208
	94.5	310.0	376	1233	2500	8202	0.49	2.39	149.21	0.338	1.006	14.488	7055	21002	302582
	95	311.7	581	1907	2500	8202	0.47	2.39	149.21	0.808	2.378	13.861	16873	49655	289491
	95.4	313.0	442	1452	2500	8202	0.48	2.39	149.21	0.468	1.389	14.314	9773	29004	298957

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Figure 1. LA 710 Tunnel
Boring Z3 B7
Downhole Interval Velocities



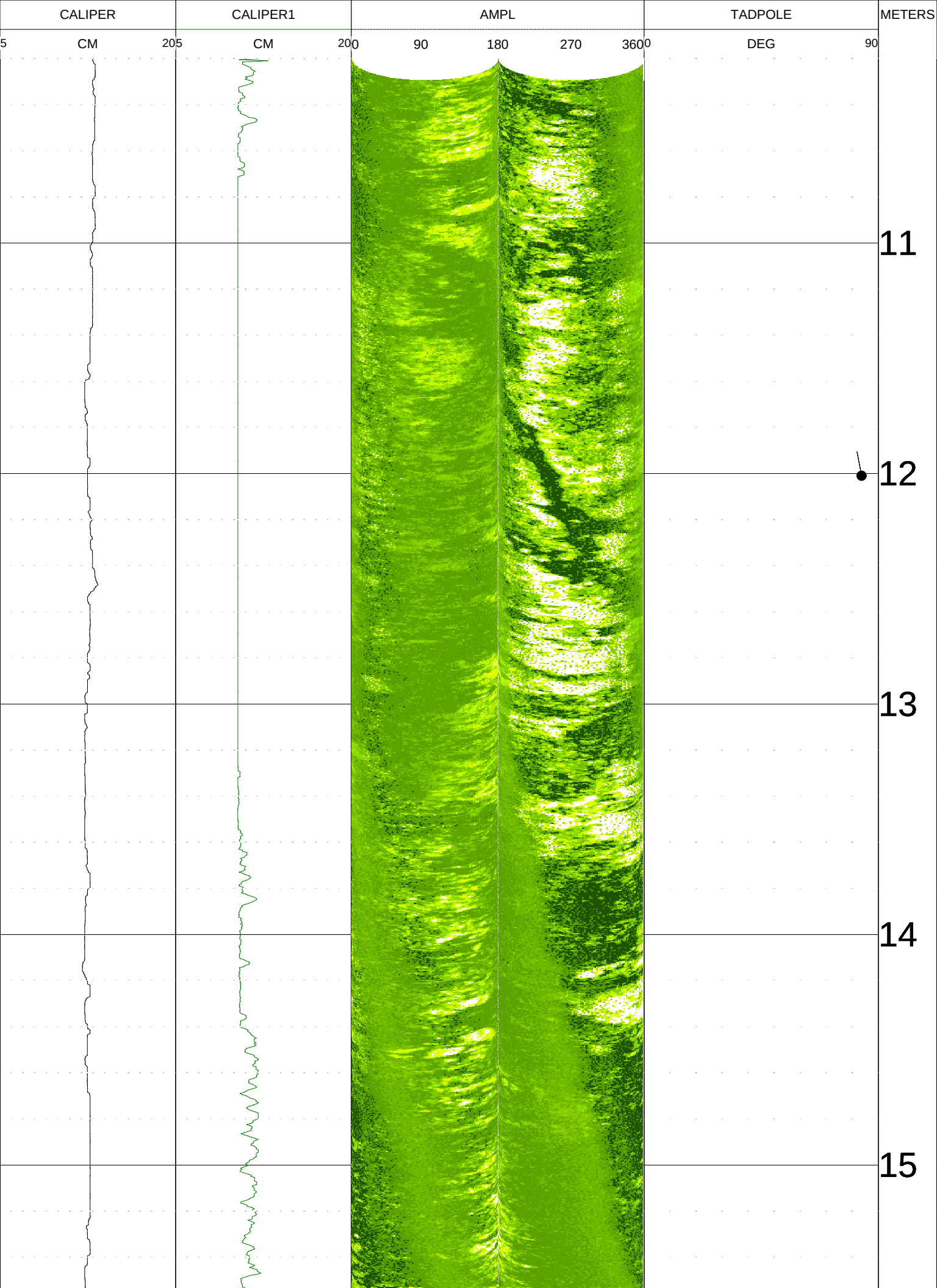

Depth, below ground surface (m
46
48
50
52
54
56
58
60
62
64
66
68
70
72
74
76
78
80
82
84
86
88
90
92
94
96
98
0
500
1000
1500
2000
2500
3000
3500
Velocity (m/s)

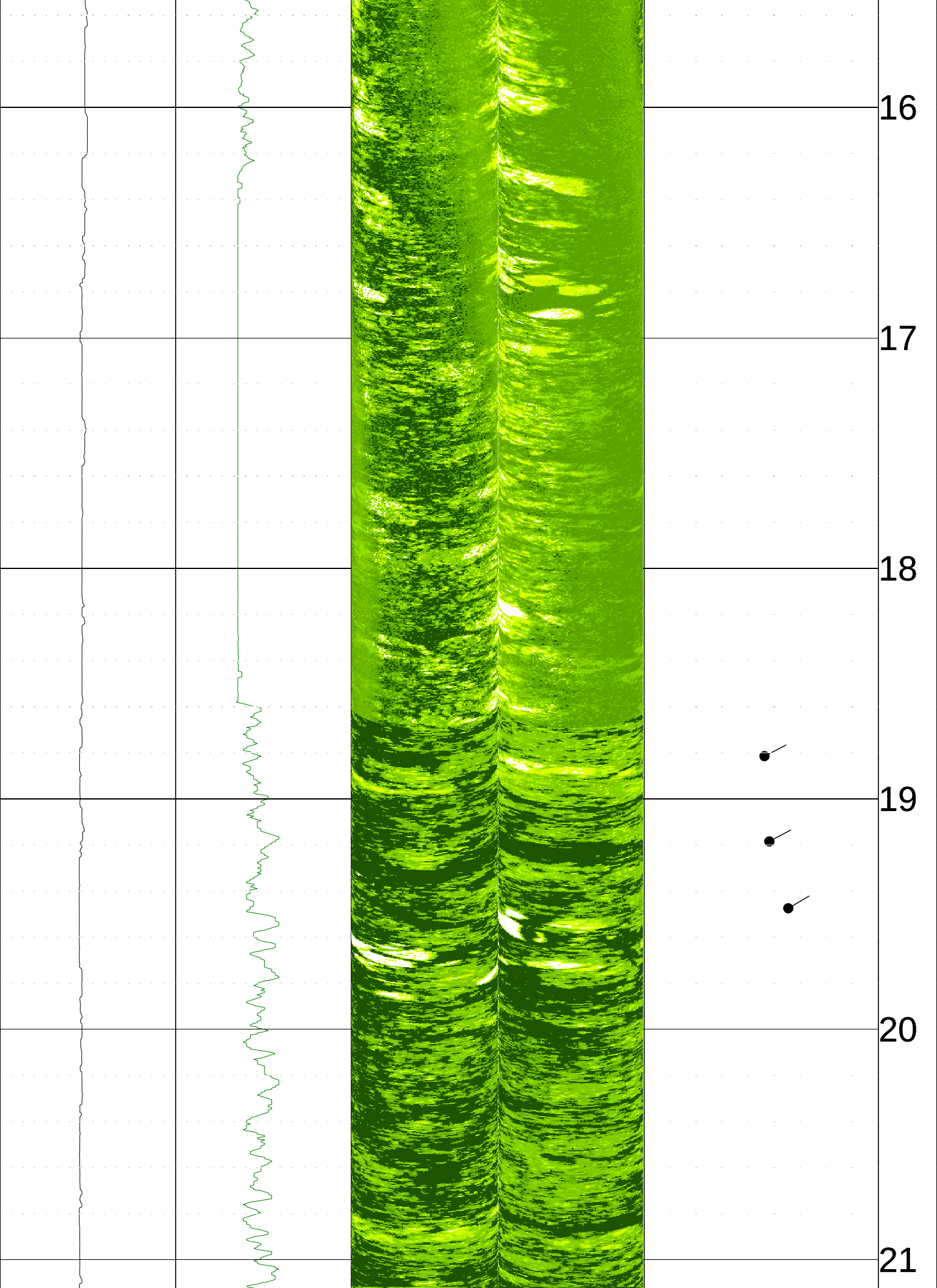
California Department of Transportation
Geophysical Services

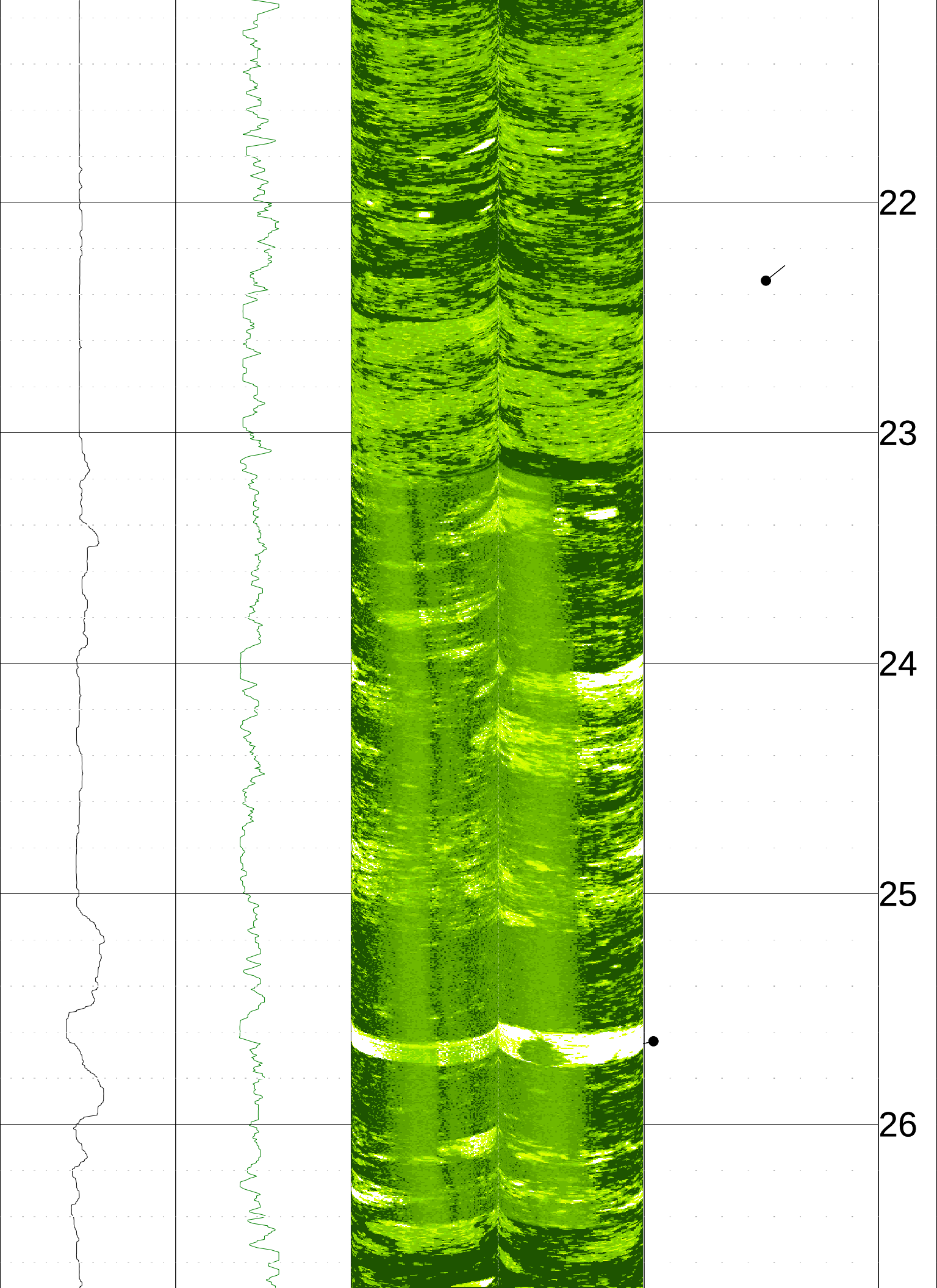
07-187900 Z3 B7.

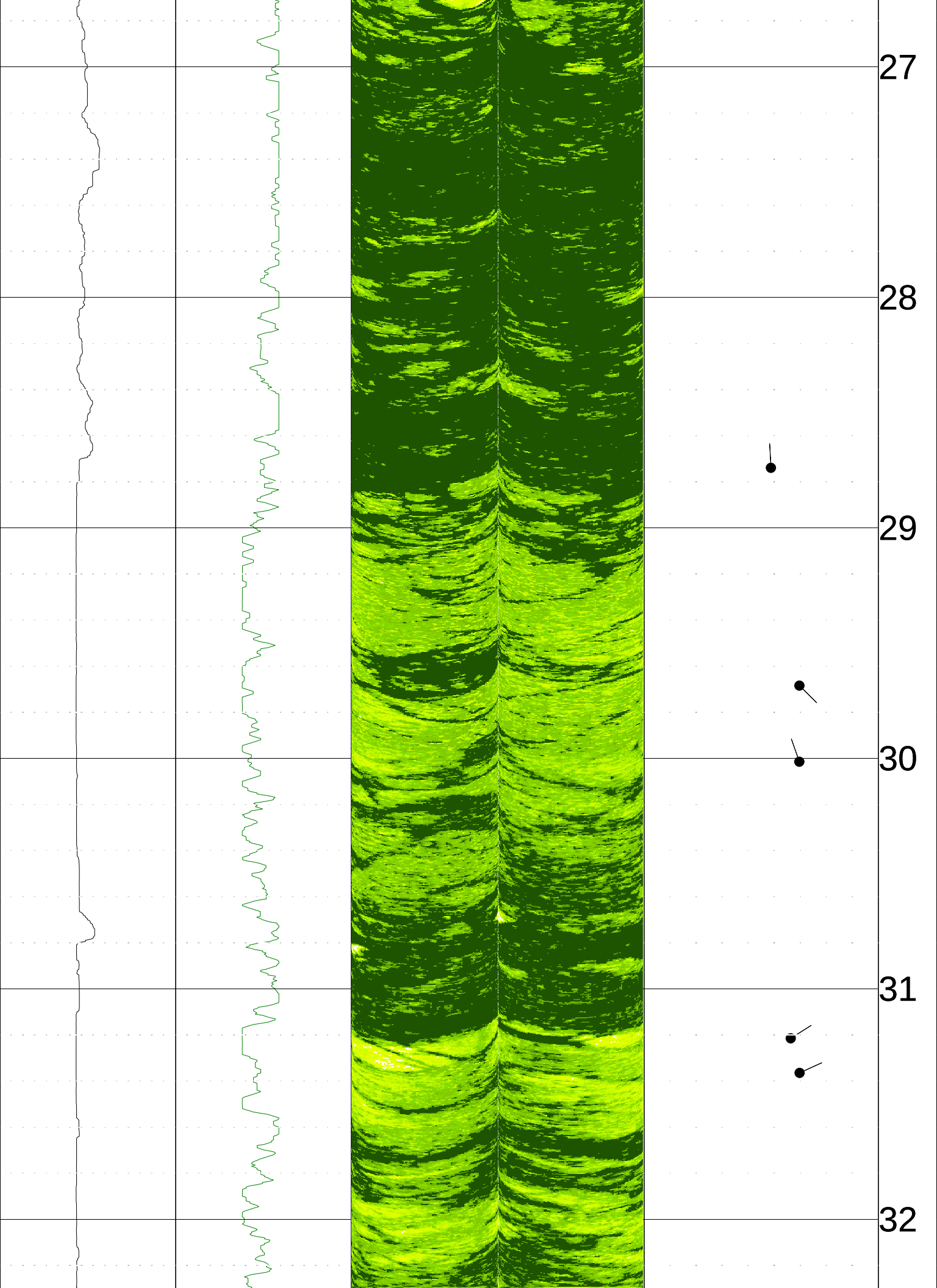
COMPANY	: Caltrans	OTHER SERVICES:	
WELL	: 07-187900 Z3 B7.		IND-CAL.
FIELD	: LA 710 TUNNEL.		AC TEL.
COUNTY	: LA		PSLOG.
STATE	: CA		
LOCATION	:		
SECTION	: None		
TOWNSHIP	: None		
RANGE	: None		
API NO.	:		
UNIQUE WELL ID.	:		
PERMANENT DATUM	: None	ELEVATION KB	: NA
LOG MEASURED FROM	: GL	ELEVATION DF	: NA
DRL MEASURED FROM	: GL	ELEVATION GL	: 0
DATE	: 02/12/09	RIG NUMBER	:
DEPTH DRILLER	: 236.64m	LOGGER TD	:
BIT SIZE	: 10.16.	ARRIVAL TIME	:
LOG TOP	: 4.00	DEPARTURE TIME	:
LOG BOTTOM	: 99.00	CIRC STOPPED	: AM
CASING OD	:		
CASING BOTTOM	: NA		
CASING TYPE	: none		
BOREHOLE FLUID	: 0		
RM TEMPERATURE	: 0		
MUD RES	: 0		
MUD WEIGHT	:		
WITNESSED BY	:		
RECORDED BY	: DH/DG		
REMARKS 1	:		
REMARKS 2	: EA: 07-187900		

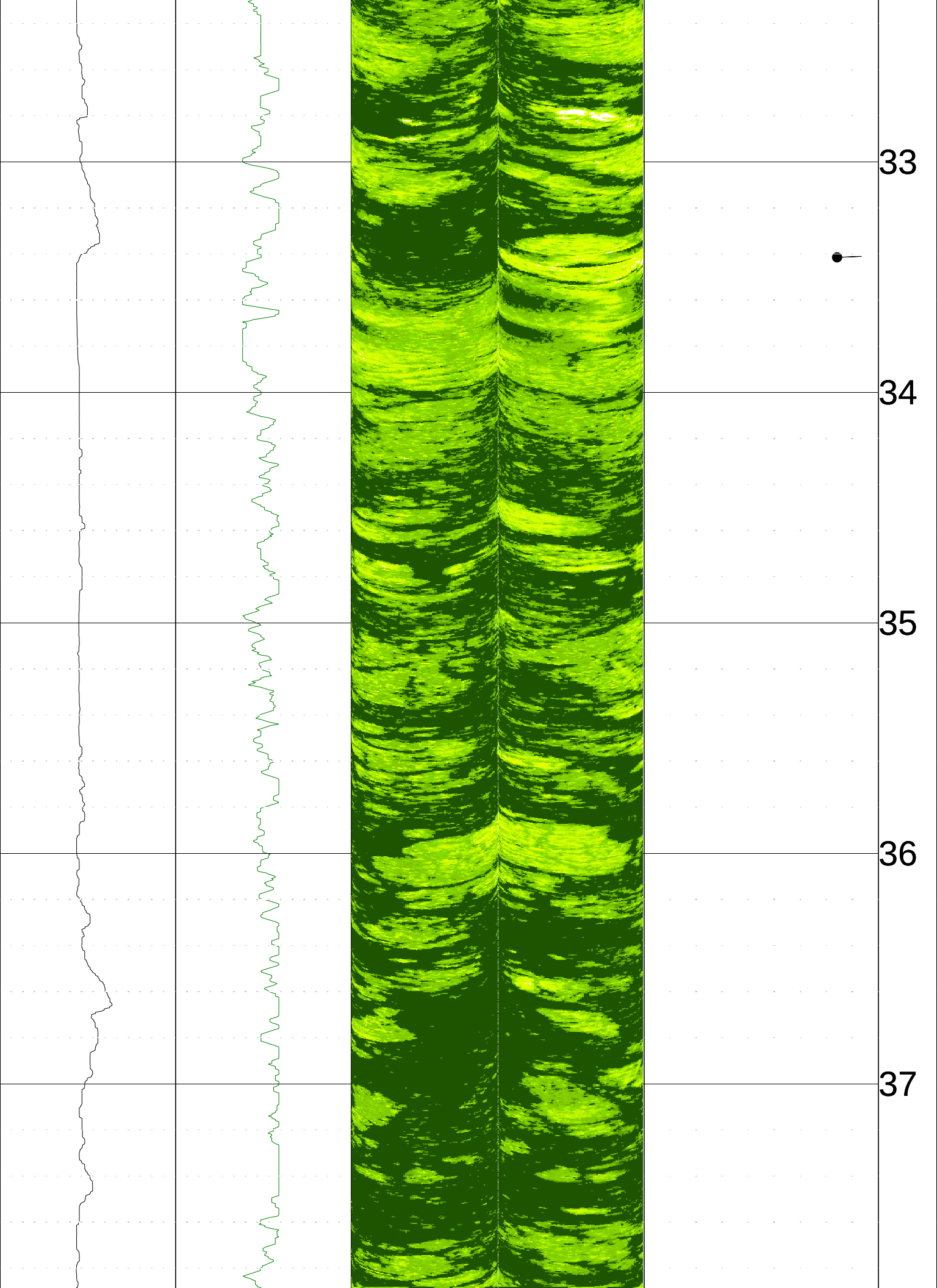
ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS

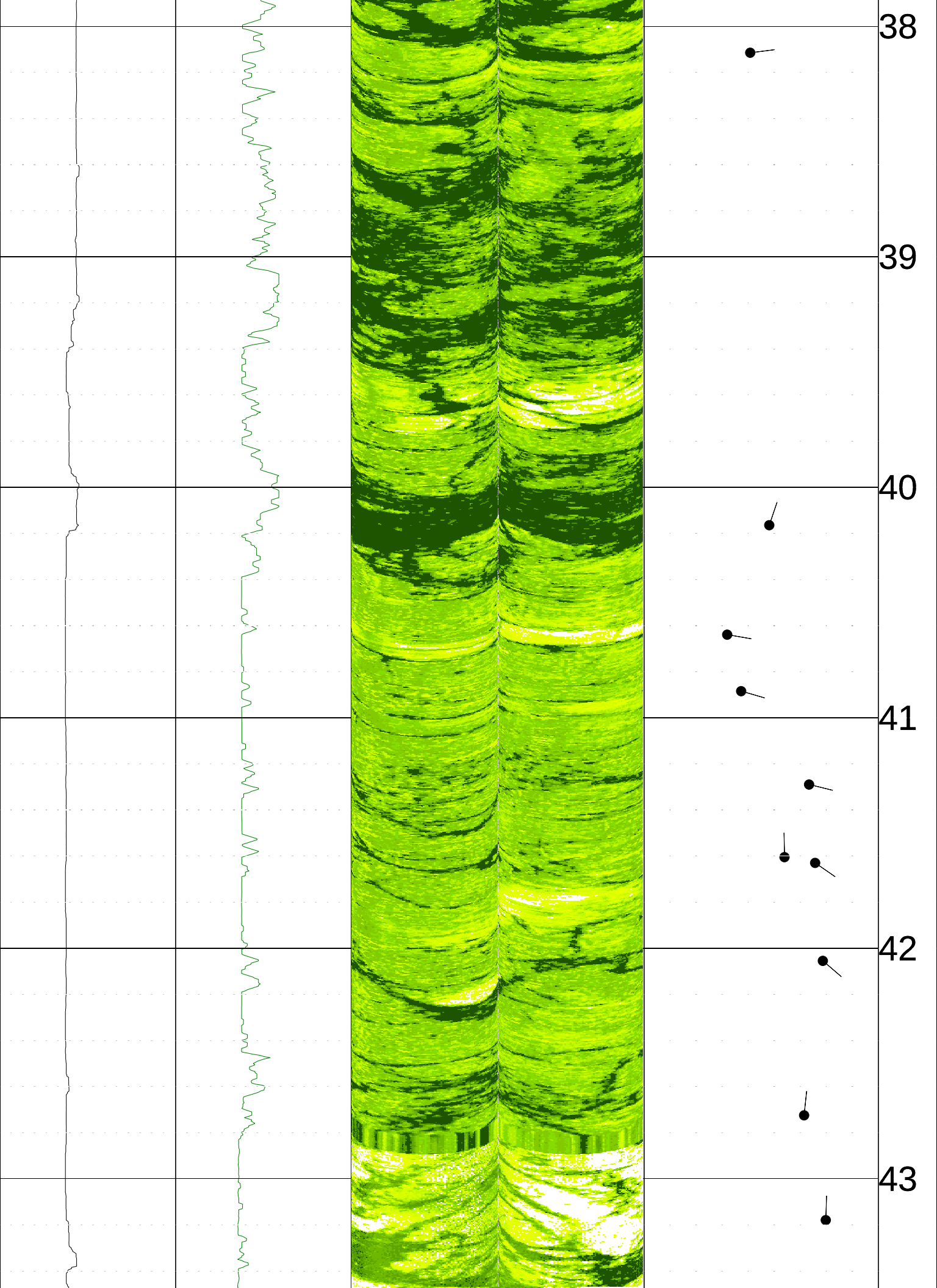

CALIPER
CALIPER1
AMPL
TADPOLE
METERS
5
CM
20
5
CM
20
0
90
180
270
360
0
DEG
90
11
12
13
14
15

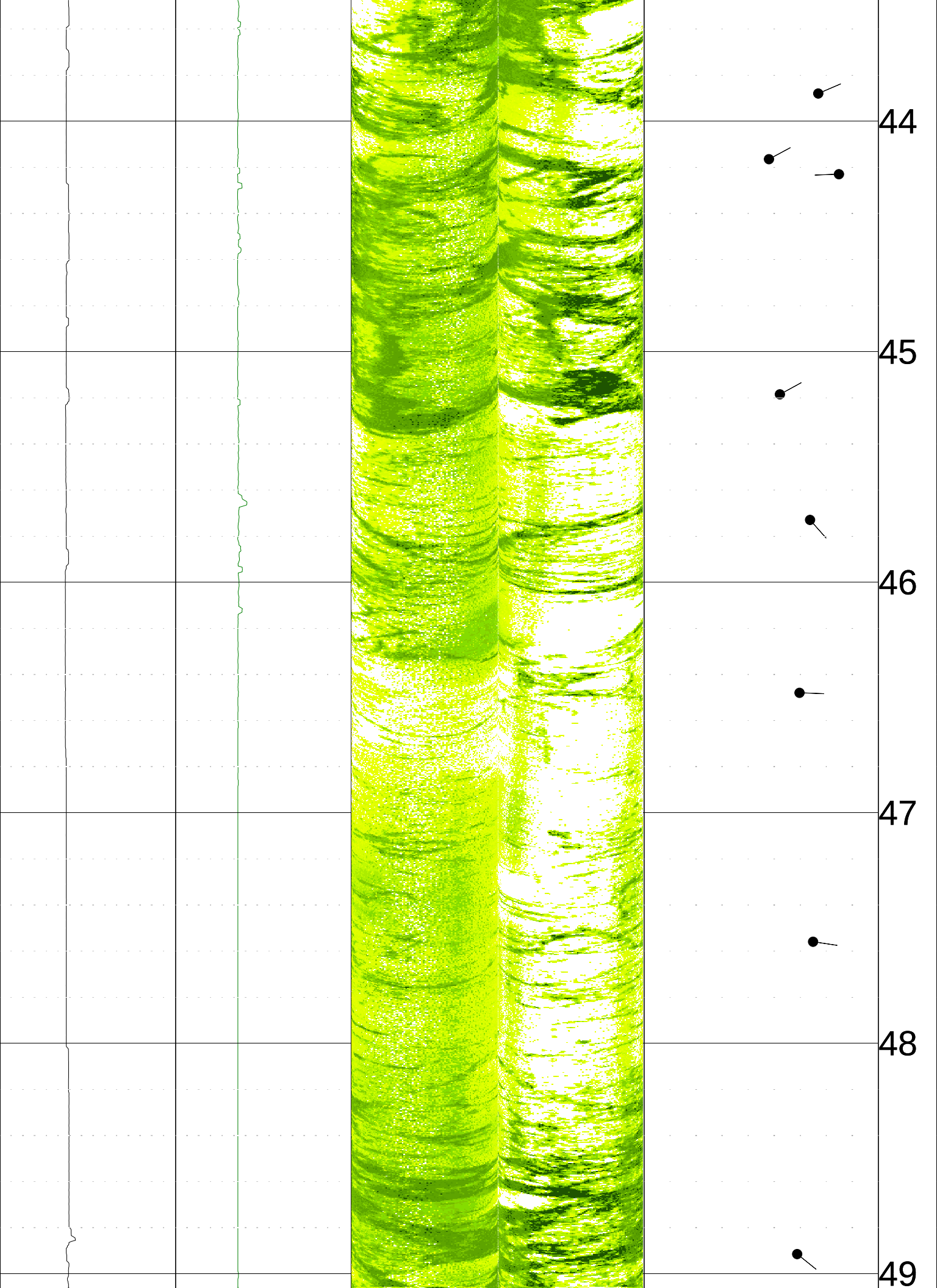

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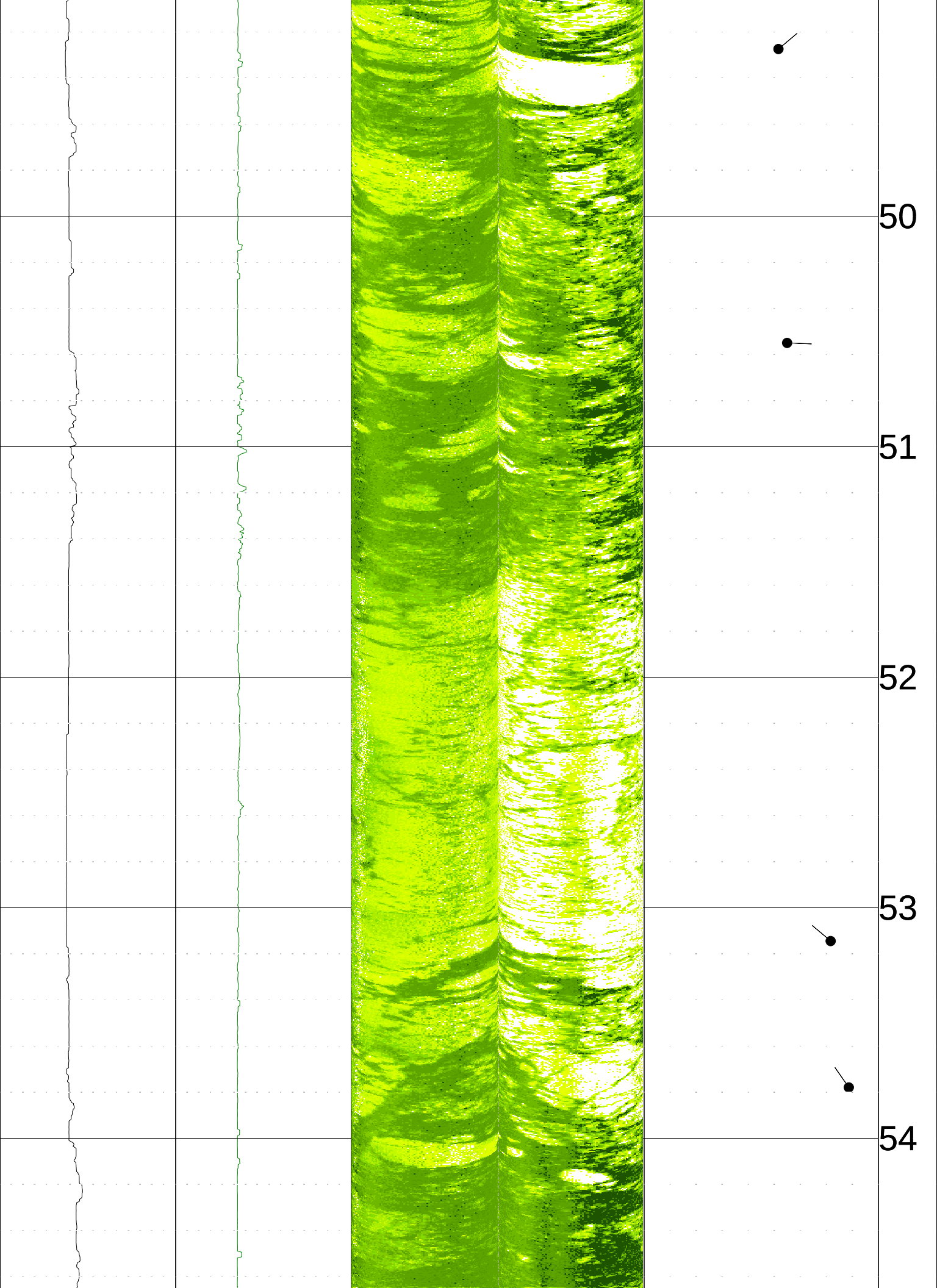

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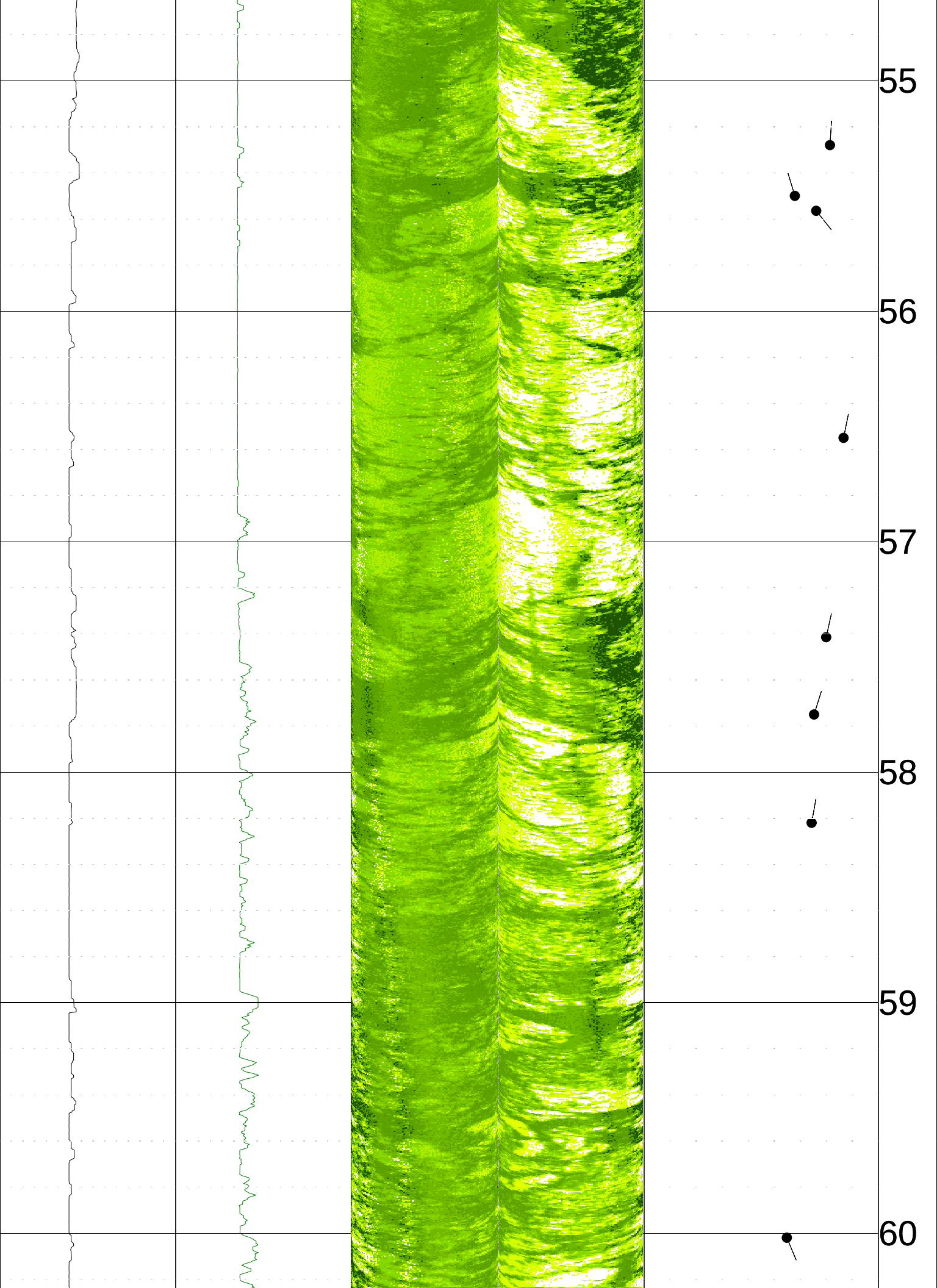

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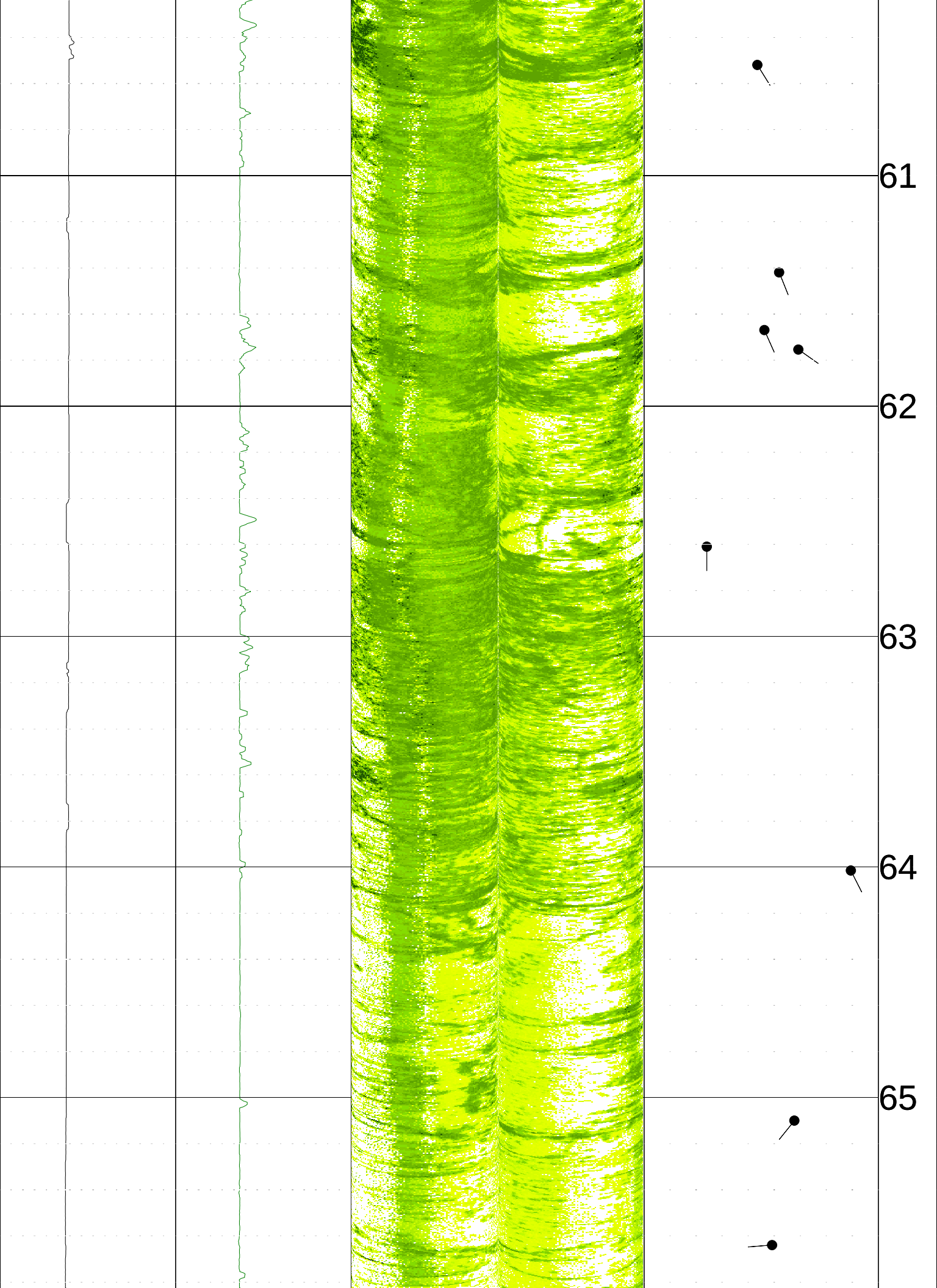

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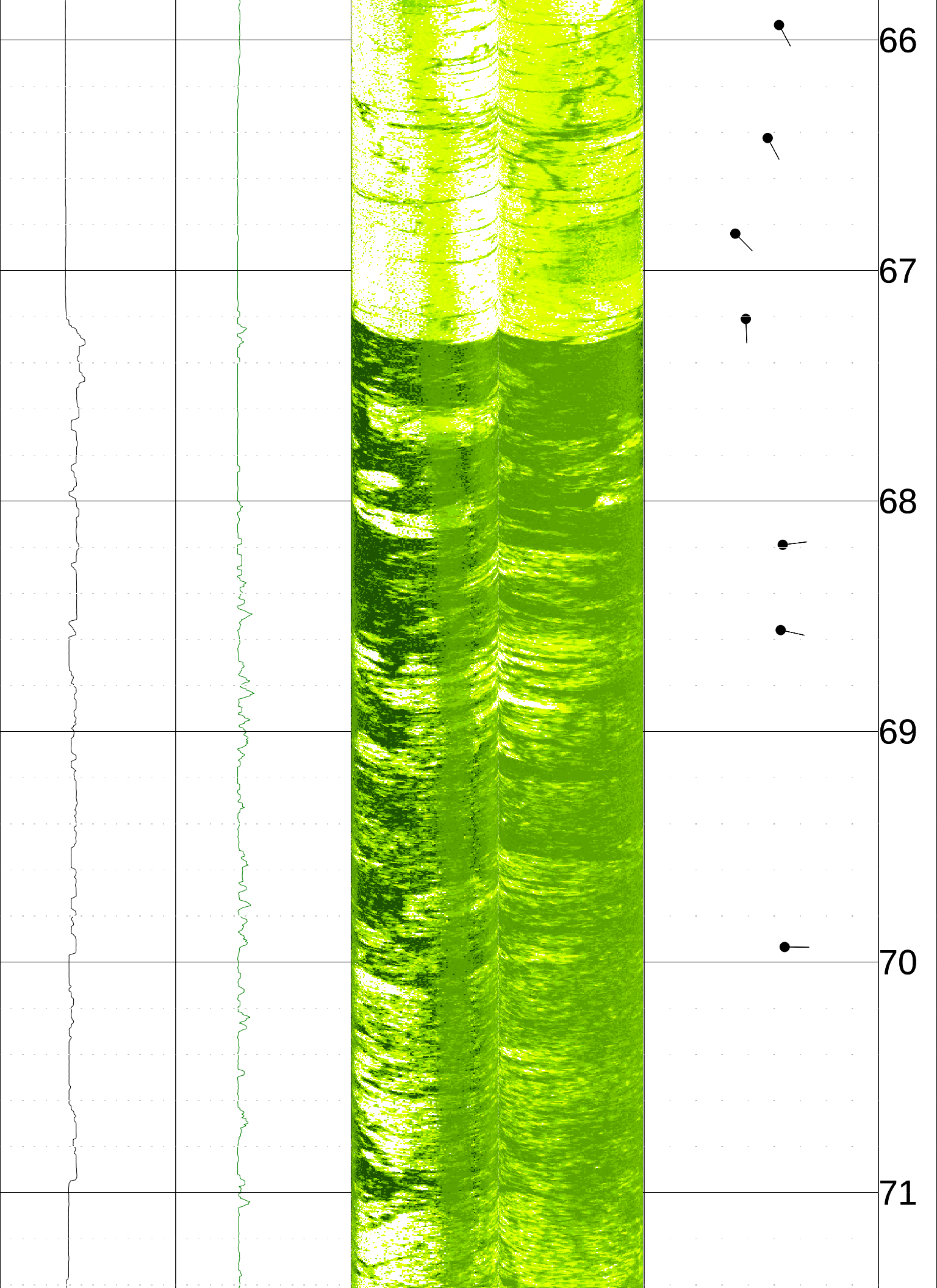

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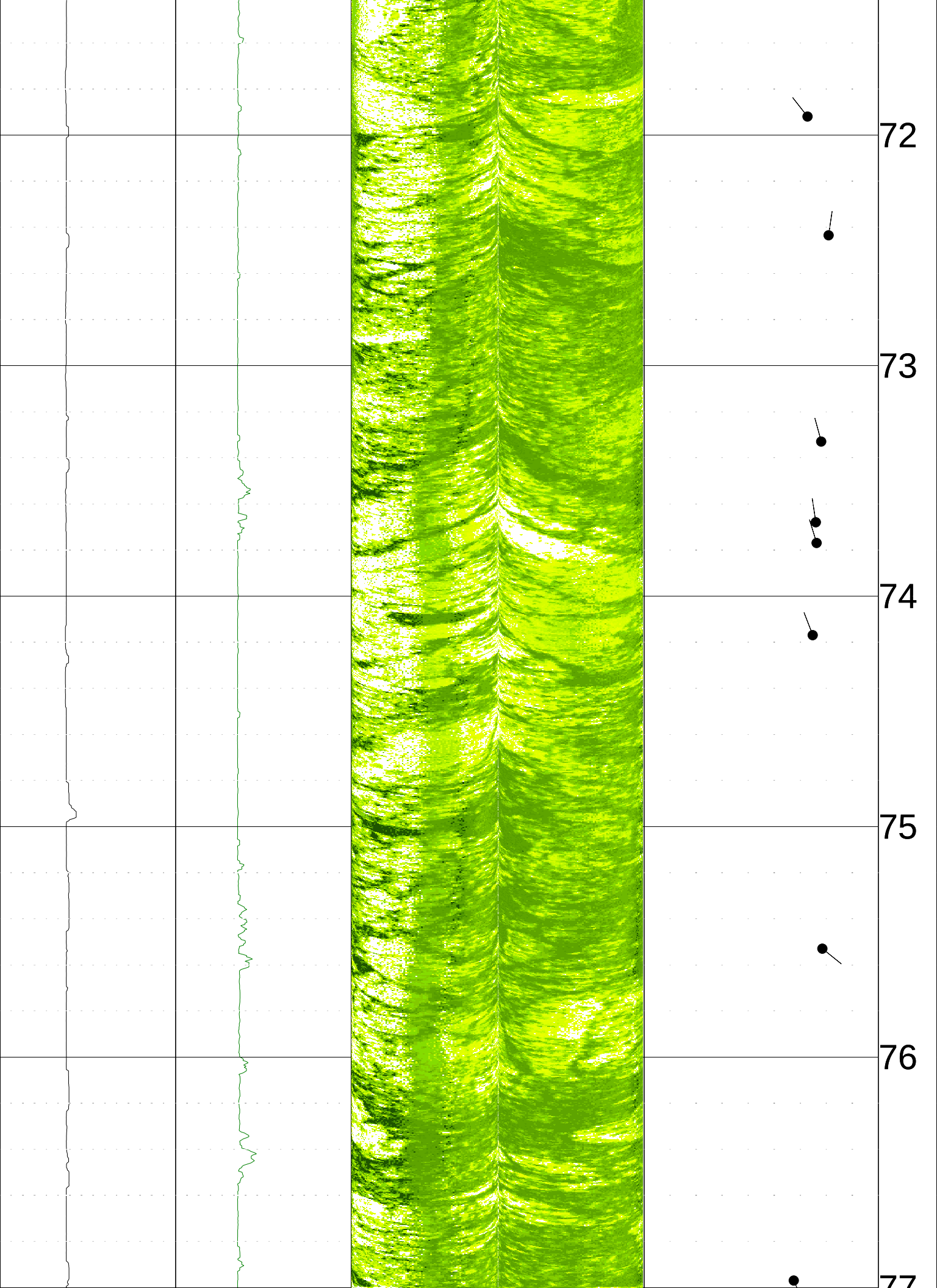

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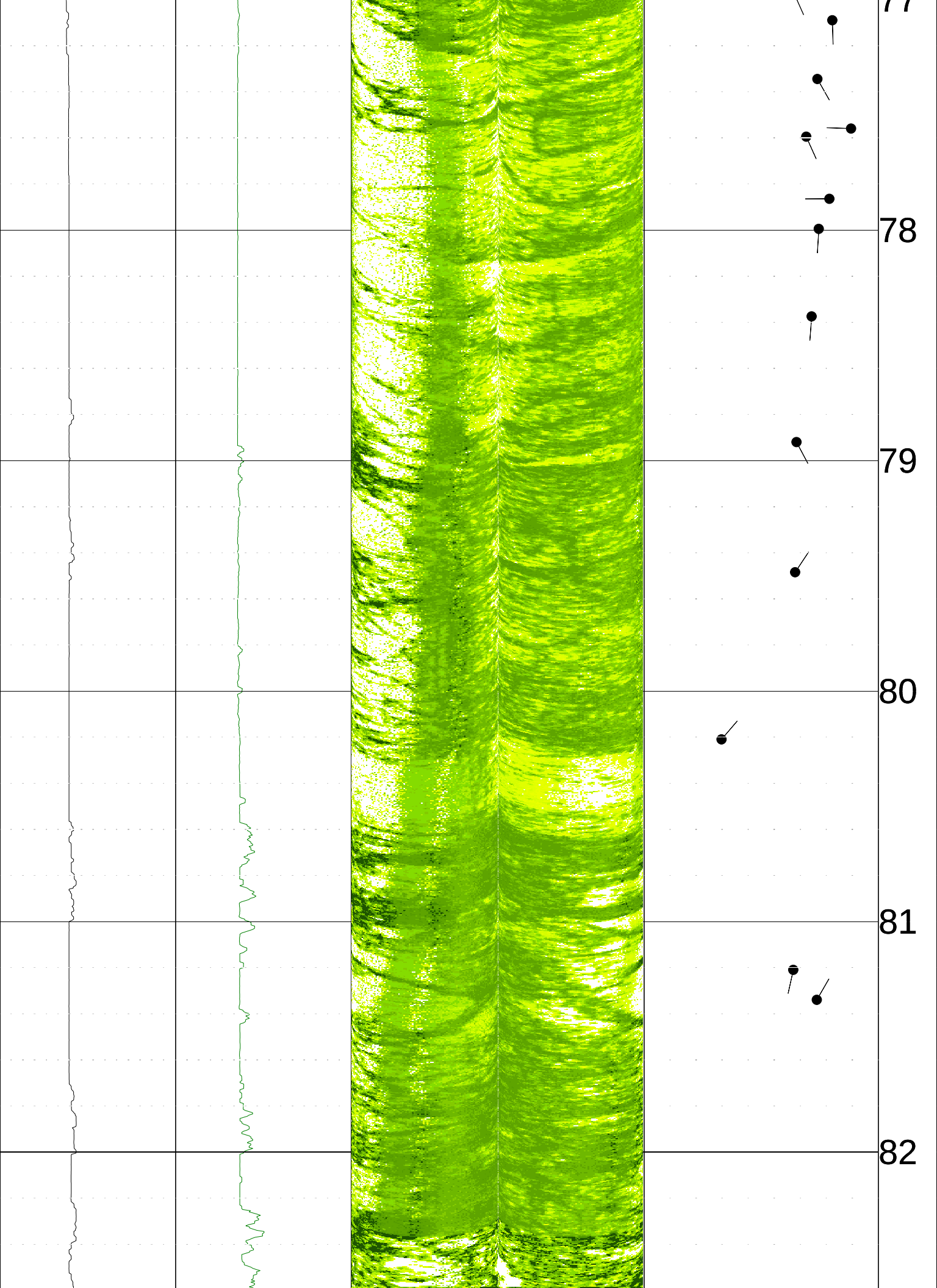

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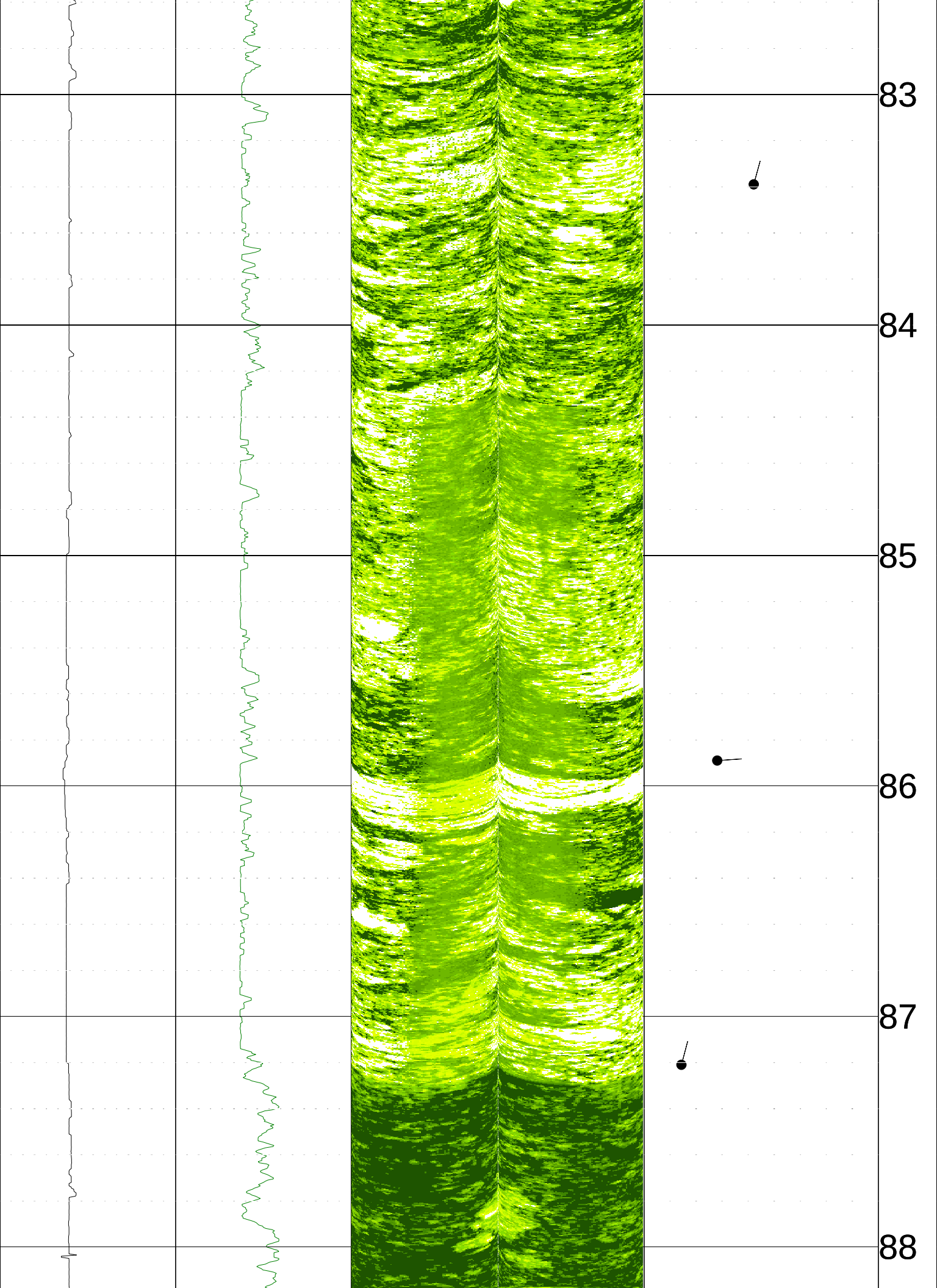

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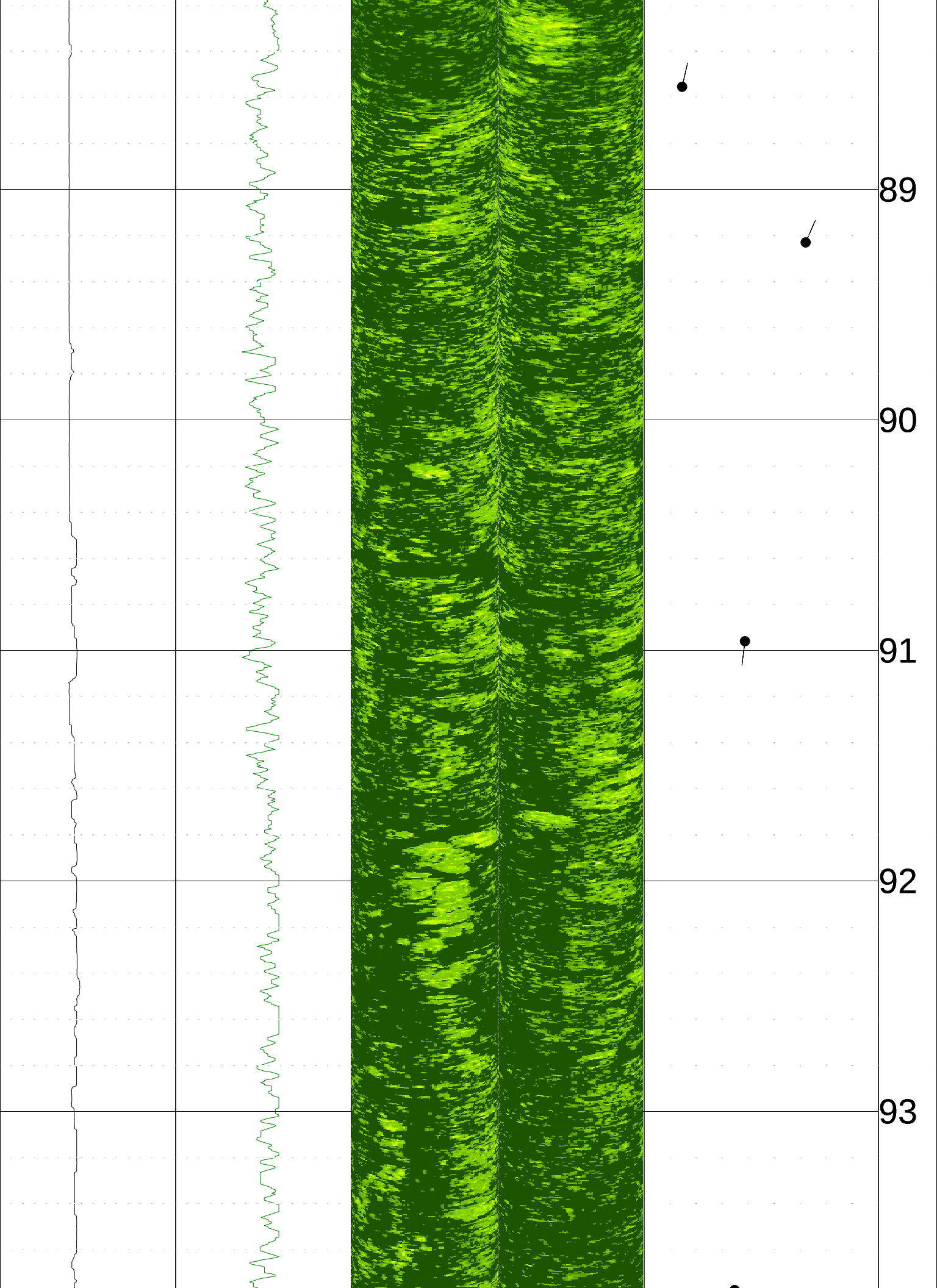

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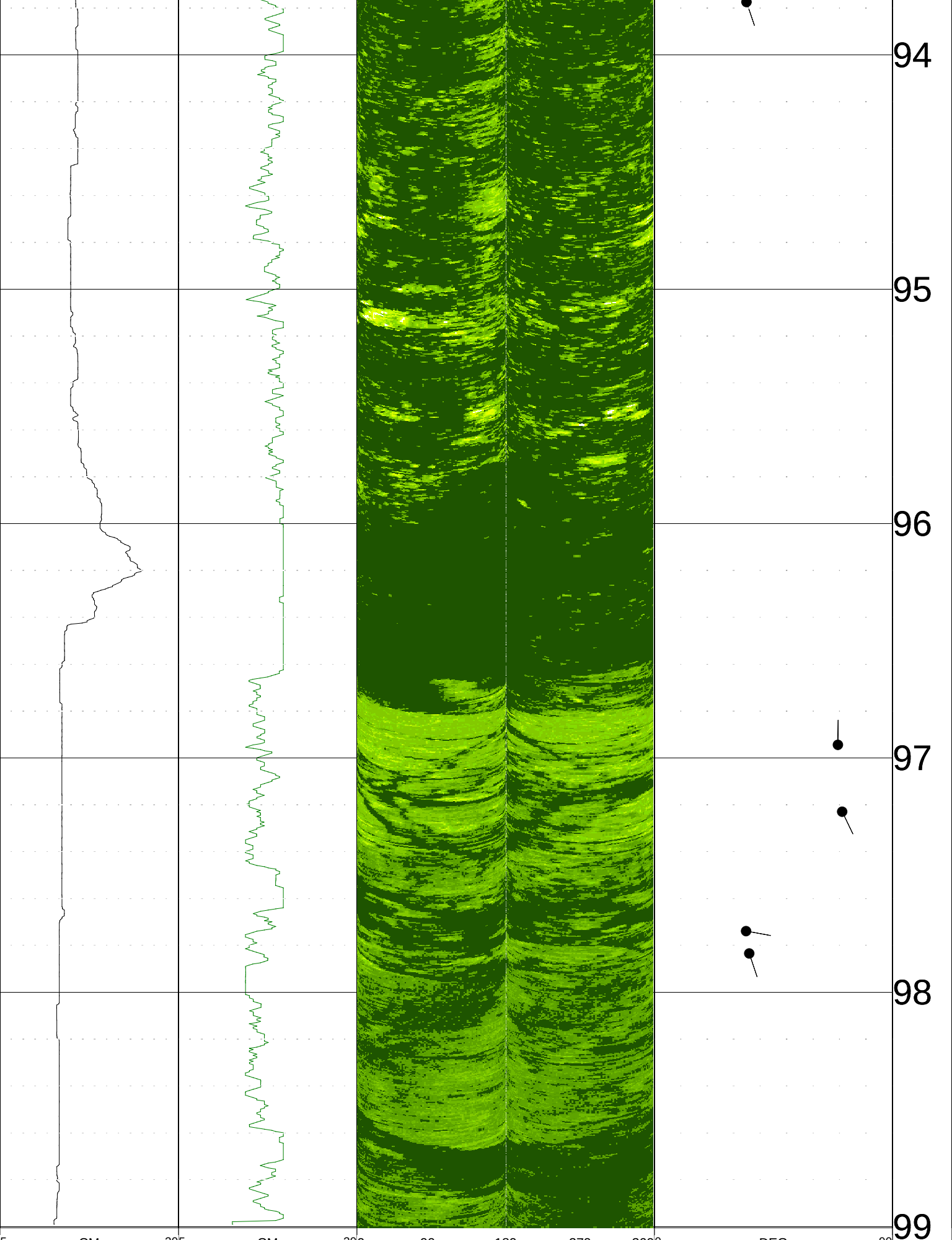

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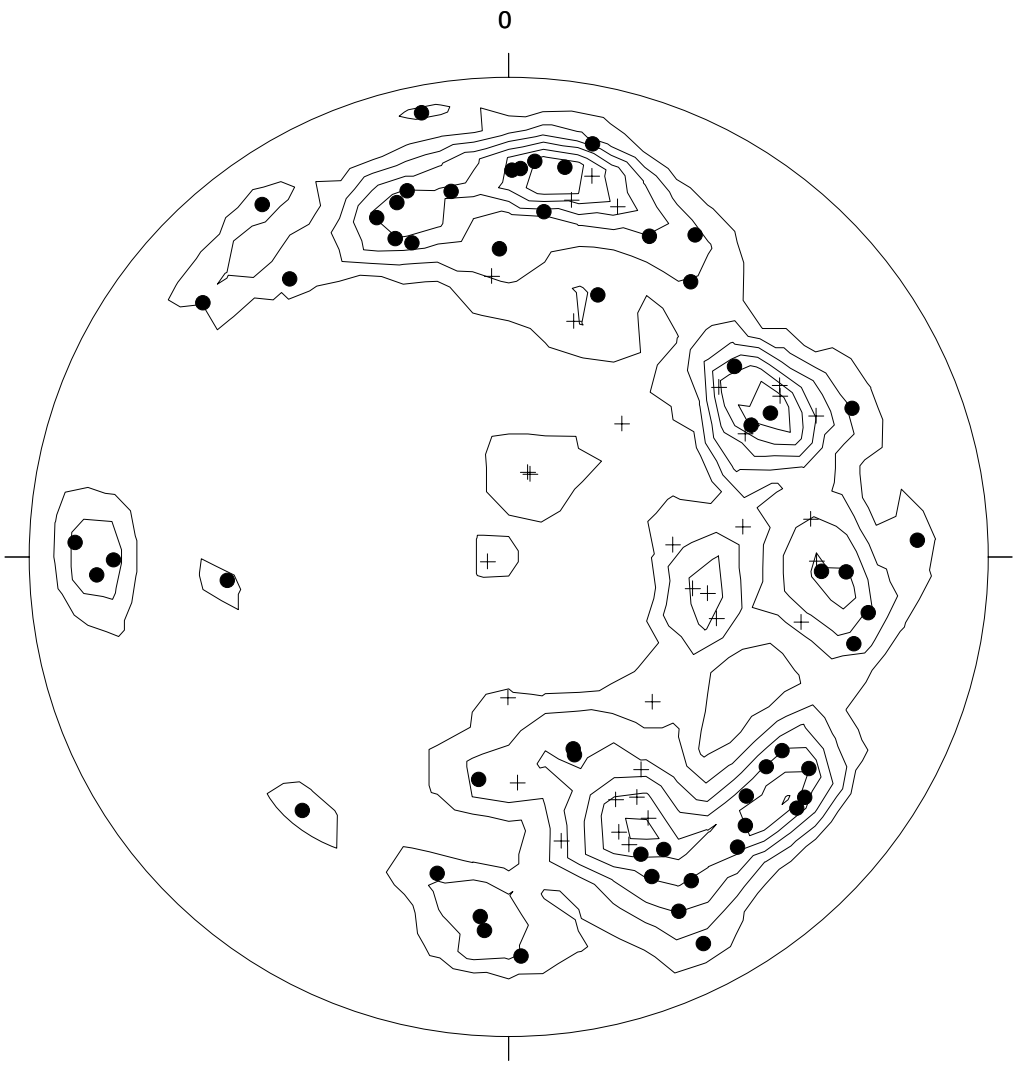

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99
5
CM
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5
CM
20
0
90
180
270
360
0
DEG
90
CALIPER
CALIPER1
AMPL
TADPOLE
METERS



LA 710 Tunnel, boring Z3 B7

• n=56 (P)
+ n=33 (P)

Stereonet contour plot of poles to planes,
Both bedding and fractures

n=89
max. dens.=7.00 (at 60/ 36)
min. dens.=0.00
Contours at every integer between
1 and 6, inclusive:
(Multiples of random distribution)

Apparent bedding denoted as cross
Apparent fractures denoted as solid circle
Plotted on upper hemisphere



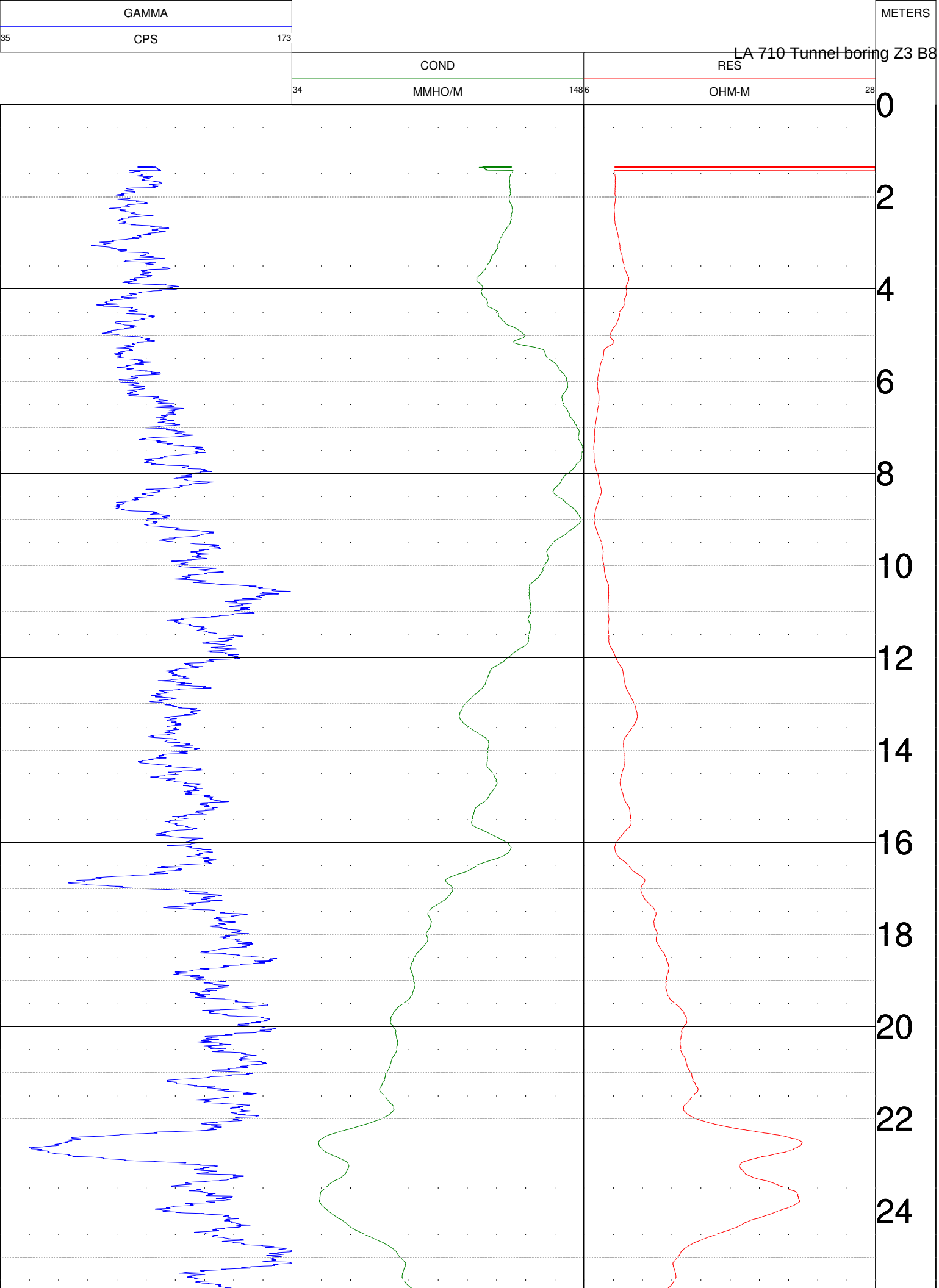
LA 710 Tunnel boring Z3 B8

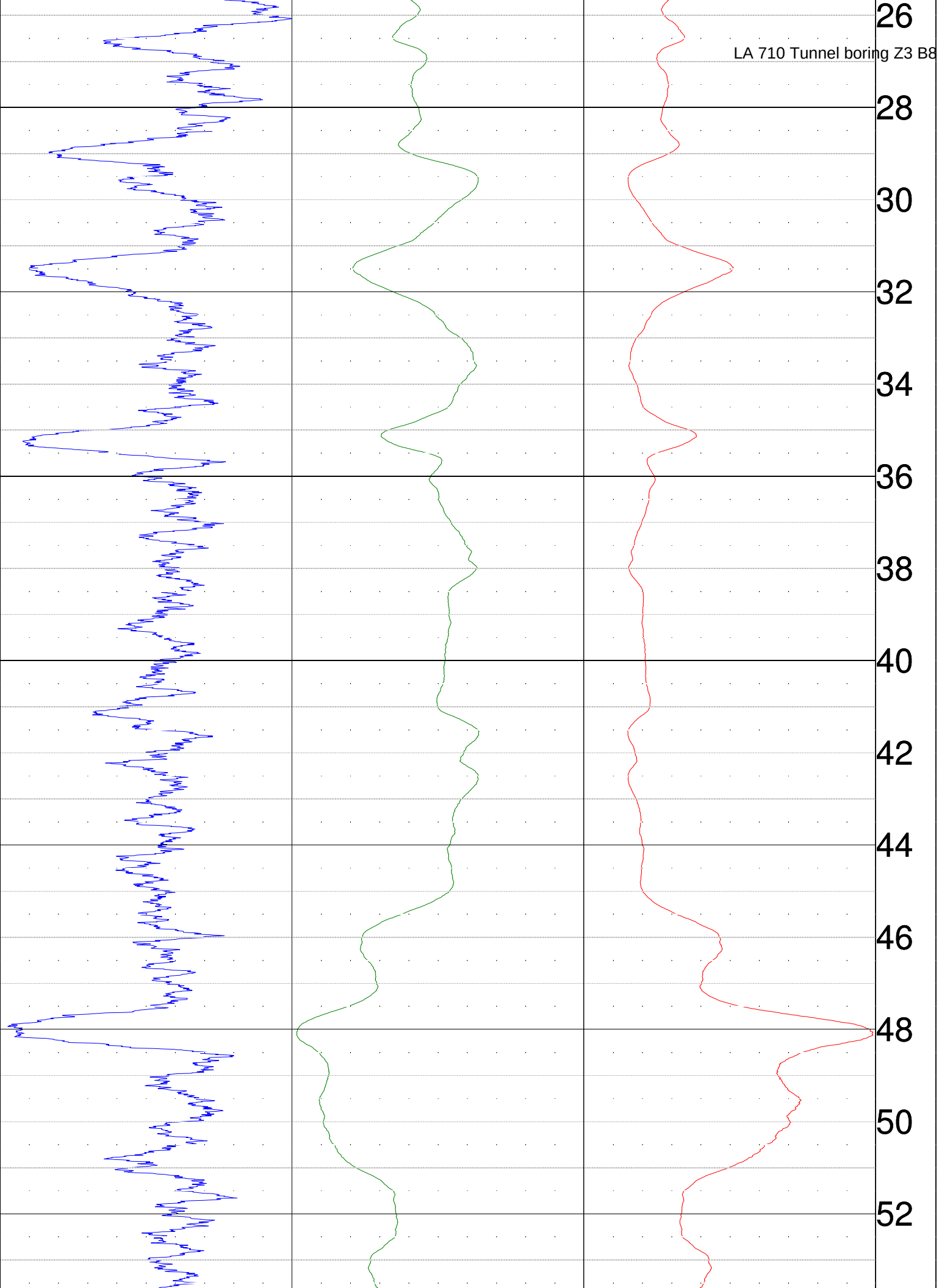
COMPANY	: CALTRANS				
WELL	: Z3 B8				
LOCATION/FIELD	: LA 710 TUNNEL				
COUNTY	: LA				
LOCATION	: CA				
SECTION	: None	TOWNSHIP	: None	RANGE	: None
DATE	: 3/18/09	PERMANENT DATUM	: None		
DEPTH DRILLER	: 83.82M			KB	: NA
LOG BOTTOM	: 83.4	LOG MEASURED FROM:	GL	DF	: NA
LOG TOP	: 1.3	DRL MEASURED FROM:	GL	GL	: NA
CASING DIAMETER	: N/A	LOGGING UNIT	: 7311		
CASING TYPE	: N/A	FIELD OFFICE	: 7311		
CASING THICKNESS:	N/A	RECORDED BY	: DH/DG		
BIT SIZE	: 10.5CM	BOREHOLE FLUID	: 0	FILE	: ORIGINA
MAGNETIC DECL.	: 12.85	RM	: 0	TYPE	: 9511C
MATRIX DENSITY	: 2.71	RM TEMPERATURE	: 0	LGDATE	: 3/18/09.
NEUTRON MATRIX	: DOLOMITE	MATRIX DELTA T	: 140		
				THRESH:	2500

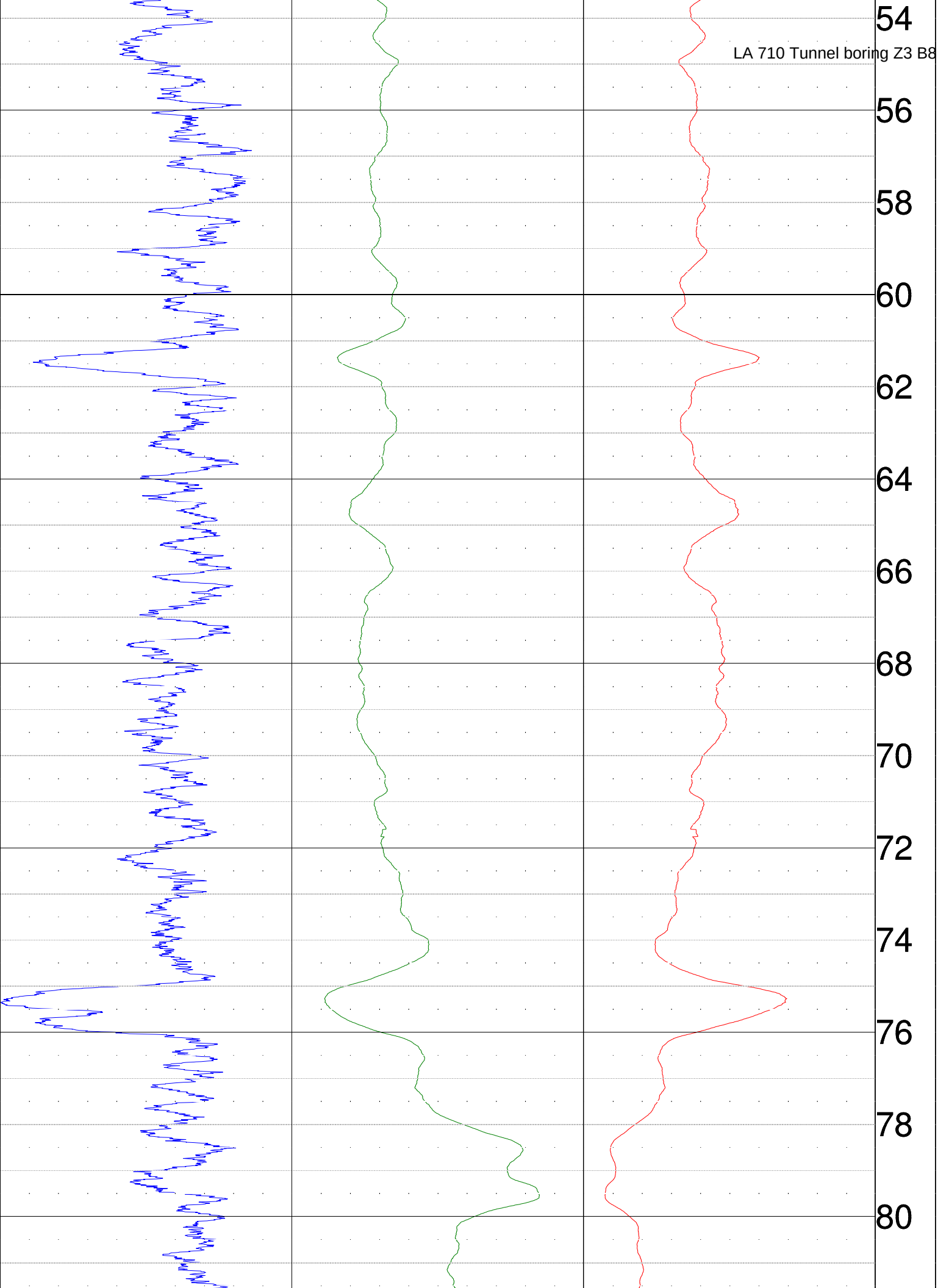
OTHER SERVICES:
INDUCT
AC TEL
PS LOG

CALIPER TOOL FAILED AT SITE, NO CALTRANS CALIPER LOG
EA: 07-187900. GL ELEVATION ESTIMATED FROM HANDHELD GPS 172.8M

ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS


GAMMA
35
CPS
173
LA 710 Tunnel boring Z3 B8
COND
34
MMHO/M
148
RES
6
OHM-M
28
METERS
0
2
4
6
8
10
12
14
16
18
20
22
24


LA 710 Tunnel boring Z3 B8
26
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42
44
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LA 710 Tunnel boring Z3 B8
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80

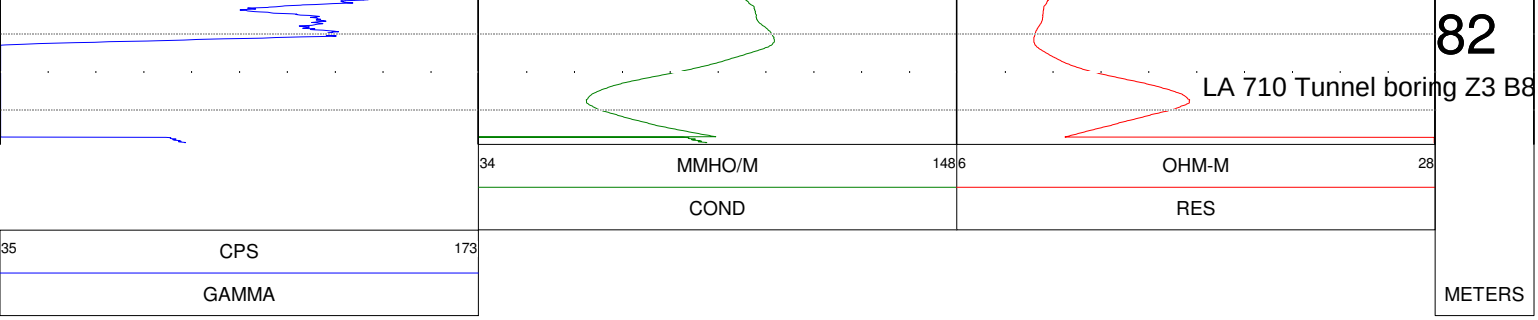

82
LA 710 Tunnel boring Z3 B8
34
MMHO/M
148
6
OHM-M
28
COND
RES
35
CPS
173
GAMMA
METERS

Table 2. LA 710 Tunnel
Boring Z3 B8
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
Not Provided	1.5	4.9	189	619		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2	6.6	168	551		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2.4	7.9	165	542		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2.4	7.9	164	538		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2.4	7.9	167	549		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3	9.8	166	543		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3.5	11.5	195	641		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4.1	13.5	235	770		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4.6	15.1	244	800		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5.1	16.7	255	837		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5.1	16.7	251	824		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5.6	18.4	250	820	515	1691	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6.1	20.0	282	927	649	2130	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6.6	21.7	331	1086	1136	3728	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7.1	23.3	355	1163	1316	4317	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7.6	24.9	417	1367	1316	4317	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8.1	26.6	476	1562	1515	4971	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8.5	27.9	296	971	1250	4101	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9	29.5	239	785	1220	4001	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9.6	31.5	352	1155	1515	4971	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10.1	33.1	385	1262	1786	5859	0.48	2.06	128.62	0.305	0.899	6.163	6365	18786	128721
	11	36.1	373	1224	1667	5468	0.47	1.98	123.58	0.276	0.812	5.131	5756	16966	107173
	11.5	37.7	357	1172	1667	5468	0.48	1.98	123.58	0.253	0.745	5.162	5274	15567	107817
	12.5	41.0	431	1414	1786	5859	0.47	2.06	128.62	0.383	1.125	6.059	7994	23488	126549
	13	42.7	455	1491	1786	5859	0.47	2.06	128.62	0.426	1.248	6.002	8890	26055	125354
	13.5	44.3	455	1491	1786	5859	0.47	2.06	128.62	0.426	1.248	6.002	8890	26055	125354
	14	45.9	455	1491	1786	5859	0.47	2.06	128.62	0.426	1.248	6.002	8890	26055	125354
	14.5	47.6	450	1478	1786	5859	0.47	2.06	128.62	0.418	1.226	6.012	8731	25599	125567
	15	49.2	450	1478	1852	6076	0.47	2.10	131.15	0.426	1.252	6.636	8903	26148	138596
	15.5	50.9	450	1478	1786	5859	0.47	2.06	128.62	0.418	1.226	6.012	8731	25599	125567
	16	52.5	439	1439	1786	5859	0.47	2.06	128.62	0.396	1.164	6.041	8277	24300	126172
	16.5	54.1	521	1709	2083	6835	0.47	2.22	138.82	0.603	1.769	8.847	12598	36954	184772
	17	55.8	641	2103	2174	7132	0.45	2.26	141.40	0.931	2.703	9.463	19438	56463	197640
	17.5	57.4	658	2158	2083	6835	0.44	2.22	138.82	0.962	2.781	8.368	20101	58077	174768
	17.5	57.4	658	2158	2083	6835	0.44	2.22	138.82	0.962	2.781	8.368	20101	58077	174768
	18	59.1	685	2247	2083	6835	0.44	2.22	138.82	1.043	3.003	8.260	21787	62721	172520
	18.5	60.7	714	2343	2174	7132	0.44	2.26	141.40	1.156	3.327	9.163	24135	69484	191377

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B8
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	19	62.3	735	2412	2083	6835	0.43	2.22	138.82	1.202	3.436	8.048	25109	71754	168091
	19.5	64.0	735	2412	2174	7132	0.44	2.26	141.40	1.225	3.516	9.071	25576	73423	189456
	20	65.6	781	2563	2273	7456	0.43	2.31	143.99	1.408	4.035	10.037	29402	84266	209620
	20	65.6	676	2217	2174	7132	0.45	2.26	141.40	1.034	2.992	9.325	21596	62480	194763
	20	65.6	735	2412	2174	7132	0.44	2.26	141.40	1.225	3.516	9.071	25576	73423	189457
	20	65.6	746	2448	2174	7132	0.43	2.26	141.40	1.261	3.616	9.022	26345	75515	188431
	20	65.6	746	2448	2174	7132	0.43	2.26	141.40	1.261	3.616	9.022	26345	75515	188431
	20.5	67.3	746	2448	2174	7132	0.43	2.26	141.40	1.261	3.616	9.022	26345	75515	188431
	21	68.9	704	2310	2174	7132	0.44	2.26	141.40	1.123	3.238	9.206	23460	67629	192277
	21.5	70.5	735	2412	2273	7456	0.44	2.31	143.99	1.247	3.595	10.251	26044	75089	214096
	22	72.2	806	2646	2632	8634	0.45	2.43	151.84	1.582	4.582	14.734	33037	95686	307733
	22.4	73.5	746	2448	2941	9650	0.47	2.52	157.13	1.402	4.109	19.904	29276	85814	415705
	23	75.5	704	2310	2273	7456	0.45	2.31	143.99	1.143	3.308	10.390	23875	69090	216988
	23.5	77.1	685	2247	2273	7456	0.45	2.31	143.99	1.082	3.139	10.471	22603	65552	218684
	24	78.7	676	2217	2500	8202	0.46	2.39	149.21	1.091	3.188	13.483	22790	66573	281602
	24.5	80.4	893	2929	2381	7812	0.42	2.35	146.59	1.872	5.310	10.816	39097	110893	225892
	25	82.0	769	2524	2273	7456	0.44	2.31	143.99	1.365	3.918	10.094	28504	81824	210816
	25.5	83.7	806	2646	2273	7456	0.43	2.31	143.99	1.500	4.284	9.914	31329	89475	207050
	25.9	85.0	725	2377	2381	7812	0.45	2.35	146.59	1.233	3.573	11.668	25752	74629	243685
	26.4	86.6	704	2310	2273	7456	0.45	2.31	143.99	1.144	3.310	10.389	23890	69133	216968
	26.9	88.3	641	2103	2174	7132	0.45	2.26	141.40	0.931	2.704	9.463	19438	56463	197640
	27.4	89.9	667	2187	2174	7132	0.45	2.26	141.40	1.007	2.915	9.362	21024	60890	195525
	28	91.9	685	2247	2083	6835	0.44	2.22	138.82	1.043	3.003	8.260	21787	62721	172520
	28.5	93.5	735	2412	2083	6835	0.43	2.22	138.82	1.202	3.436	8.048	25109	71754	168091
	29	95.1	735	2412	2273	7456	0.44	2.31	143.99	1.247	3.595	10.251	26044	75089	214096
	29.5	96.8	541	1773	2000	6562	0.46	2.18	136.25	0.638	1.863	7.880	13318	38906	164572
	30	98.4	513	1682	2000	6562	0.46	2.18	136.25	0.574	1.682	7.965	11987	35119	166346
	30	98.4	532	1745	2083	6835	0.47	2.22	138.82	0.629	1.844	8.812	13140	38503	184049
	30	98.4	549	1803	2000	6562	0.46	2.18	136.25	0.659	1.923	7.852	13761	40160	163981
	30.5	100.1	549	1803	2083	6835	0.46	2.22	138.82	0.671	1.964	8.756	14021	41013	182875
	31	101.7	833	2734	2381	7812	0.43	2.35	146.59	1.631	4.664	11.138	34058	97418	232611
	31.5	103.3	893	2929	2941	9650	0.45	2.52	157.13	2.007	5.816	19.098	41907	121467	398865
	32	105.0	833	2734	2381	7812	0.43	2.35	146.59	1.631	4.664	11.138	34058	97418	232611
	32.5	106.6	826	2711	2222	7291	0.42	2.29	142.69	1.561	4.433	9.206	32606	92583	192268
	32.5	106.6	893	2929	2273	7456	0.41	2.31	143.99	1.839	5.181	9.462	38402	108198	197619
	32.9	107.9	752	2467	2222	7291	0.44	2.29	142.69	1.292	3.709	9.565	26987	77473	199759
	33.5	109.9	633	2076	2128	6981	0.45	2.24	140.11	0.899	2.610	8.961	18776	54505	187155

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B8
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	34	111.5	676	2217	2174	7132	0.45	2.26	141.40	1.034	2.992	9.325	21596	62480	194762
	34.5	113.2	813	2667	2439	8002	0.44	2.37	147.90	1.566	4.502	12.006	32705	94028	250742
	35	114.8	885	2903	2857	9374	0.45	2.50	155.80	1.955	5.656	17.767	40821	118130	371073
	35.5	116.5	840	2757	2632	8634	0.44	2.43	151.84	1.718	4.958	14.554	35871	103541	303955
	36	118.1	769	2524	2326	7630	0.44	2.33	145.29	1.377	3.962	10.751	28762	82751	224534
	36.5	119.8	813	2667	2222	7291	0.42	2.29	142.69	1.511	4.299	9.273	31554	89785	193671
	37	121.4	741	2430	2000	6562	0.42	2.18	136.25	1.198	3.402	7.133	25011	71056	148981
	37.5	123.0	680	2232	2128	6981	0.44	2.24	140.11	1.039	2.998	8.775	21691	62604	183268
	38	124.7	662	2173	2128	6981	0.45	2.24	140.11	0.984	2.847	8.847	20557	59467	184780
	38.5	126.3	730	2395	2222	7291	0.44	2.29	142.69	1.218	3.506	9.664	25434	73227	201830
	39	128.0	781	2563	2174	7132	0.43	2.26	141.40	1.382	3.942	8.861	28873	82336	185061
	39.5	129.6	775	2543	2174	7132	0.43	2.26	141.40	1.361	3.885	8.889	28427	81139	185656
	39.9	130.9	763	2504	2222	7291	0.43	2.29	142.69	1.332	3.818	9.512	27818	79731	198652
	40.4	132.5	800	2625	2273	7456	0.43	2.31	143.99	1.476	4.220	9.946	30830	88130	207715
	40.9	134.2	826	2711	2326	7630	0.43	2.33	145.29	1.590	4.539	10.467	33199	94799	218616
	41.4	135.8	781	2563	2222	7291	0.43	2.29	142.69	1.395	3.989	9.427	29137	83301	196893
	42	137.8	763	2504	2273	7456	0.44	2.31	143.99	1.344	3.861	10.122	28071	80642	211394
	42.5	139.4	794	2604	2273	7456	0.43	2.31	143.99	1.453	4.157	9.977	30343	86814	208365
	43	141.1	826	2711	2273	7456	0.42	2.31	143.99	1.575	4.486	9.813	32902	93692	204952
	43.5	142.7	877	2878	2381	7812	0.42	2.35	146.59	1.807	5.137	10.903	37737	107284	227705
	44	144.4	813	2667	2273	7456	0.43	2.31	143.99	1.525	4.350	9.881	31841	90850	206367
	44.5	146.0	820	2689	2222	7291	0.42	2.29	142.69	1.536	4.365	9.240	32073	91169	192978
	45	147.6	813	2667	2273	7456	0.43	2.31	143.99	1.525	4.350	9.881	31841	90850	206367
	45.5	149.3	962	3155	2439	8002	0.41	2.37	147.90	2.190	6.168	11.173	45747	128823	233353
	46	150.9	1099	3605	2500	8202	0.38	2.39	149.21	2.886	7.968	11.090	60280	166405	231615
	46.5	152.6	1220	4001	2500	8202	0.34	2.39	149.21	3.555	9.554	10.199	74239	199535	213003
	47	154.2	935	3066	2778	9113	0.44	2.47	154.48	2.161	6.208	16.212	45140	129658	338583
	47.4	155.5	1053	3454	3030	9942	0.43	2.54	158.46	2.813	8.052	19.559	58740	168160	408486
	48.1	157.8	1053	3454	2857	9374	0.42	2.50	155.80	2.765	7.862	16.686	57755	164194	348494
	48.5	159.1	962	3155	2439	8002	0.41	2.37	147.90	2.190	6.168	11.173	45747	128823	233352
	49	160.8	962	3155	2500	8202	0.41	2.39	149.21	2.210	6.246	11.992	46152	130444	250453
	49.4	162.1	926	3038	2564	8412	0.43	2.41	150.52	2.067	5.891	13.096	43173	123046	273516
	50	164.0	952	3125	2564	8412	0.42	2.41	150.52	2.187	6.211	12.936	45676	129717	270180
	50	164.0	926	3038	2564	8412	0.43	2.41	150.52	2.067	5.891	13.096	43173	123046	273515
	50	164.0	917	3010	2564	8412	0.43	2.41	150.52	2.029	5.790	13.146	42385	120931	274567
	50.5	165.7	1042	3418	2703	8867	0.41	2.45	153.16	2.662	7.522	14.371	55597	157092	300146
	50.6	166.0	1020	3348	2703	8867	0.42	2.45	153.16	2.554	7.239	14.515	53351	151184	303142

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Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B8
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	51	167.3	980	3217	2326	7630	0.39	2.33	145.29	2.237	6.227	9.604	46719	130061	200590
	51.1	167.7	1042	3418	2703	8867	0.41	2.45	153.16	2.662	7.522	14.371	55597	157092	300147
	51.5	169.0	917	3010	2381	7812	0.41	2.35	146.59	1.976	5.585	10.677	41278	116638	222983
	51.6	169.3	943	3095	2326	7630	0.40	2.33	145.29	2.071	5.806	9.825	43260	121259	205202
	52	170.6	901	2956	2439	8002	0.42	2.37	147.90	1.923	5.465	11.530	40159	114133	240804
	52.1	170.9	893	2929	2326	7630	0.41	2.33	145.29	1.855	5.245	10.113	38749	109548	211217
	52.5	172.2	862	2828	2273	7456	0.42	2.31	143.99	1.714	4.854	9.628	35800	101382	201089
	52.5	172.2	990	3248	2500	8202	0.41	2.39	149.21	2.343	6.593	11.814	48935	137701	246742
	53	173.9	1010	3314	2500	8202	0.40	2.39	149.21	2.439	6.840	11.687	50932	142858	244080
	53.1	174.2	1000	3281	2439	8002	0.40	2.37	147.90	2.369	6.629	10.935	49480	138442	228375
	53.5	175.5	943	3095	2439	8002	0.41	2.37	147.90	2.109	5.955	11.282	44037	124364	235633
	53.6	175.9	980	3217	2381	7812	0.40	2.35	146.59	2.257	6.310	10.302	47139	131792	215170
	54	177.2	893	2929	2381	7812	0.42	2.35	146.59	1.872	5.310	10.816	39097	110893	225893
	54.1	177.5	893	2929	2439	8002	0.42	2.37	147.90	1.889	5.374	11.575	39445	112232	241755
	54.3	178.1	855	2804	2381	7812	0.43	2.35	146.59	1.715	4.892	11.025	35827	102180	230253
	54.6	179.1	862	2828	2326	7630	0.42	2.33	145.29	1.730	4.913	10.281	36123	102614	214719
	55	180.4	893	2929	2326	7630	0.41	2.33	145.29	1.855	5.245	10.113	38749	109548	211217
	55.1	180.8	847	2780	2174	7132	0.41	2.26	141.40	1.627	4.589	8.535	33974	95833	178259
	55.4	181.8	917	3010	2381	7812	0.41	2.35	146.59	1.976	5.585	10.677	41278	116638	222983
	55.6	182.4	893	2929	2326	7630	0.41	2.33	145.29	1.855	5.245	10.113	38749	109548	211216
	55.9	183.4	909	2983	2273	7456	0.40	2.31	143.99	1.906	5.355	9.372	39811	111851	195740
	56	183.7	980	3217	2326	7630	0.39	2.33	145.29	2.237	6.227	9.604	46719	130061	200590
	56.4	185.0	885	2903	2222	7291	0.41	2.29	142.69	1.790	5.033	8.901	37386	105111	185894
	56.6	185.7	833	2734	2222	7291	0.42	2.29	142.69	1.587	4.502	9.171	33151	94029	191541
	56.9	186.7	794	2604	2273	7456	0.43	2.31	143.99	1.453	4.157	9.977	30343	86814	208365
	57.1	187.3	735	2412	2273	7456	0.44	2.31	143.99	1.247	3.595	10.251	26044	75089	214096
	57.4	188.3	855	2804	2326	7630	0.42	2.33	145.29	1.700	4.835	10.320	35508	100979	215538
	57.6	189.0	820	2689	2326	7630	0.43	2.33	145.29	1.564	4.469	10.502	32657	93339	219339
	58	190.3	962	3155	2381	7812	0.40	2.35	146.59	2.171	6.090	10.417	45343	127193	217564
	58	190.3	909	2983	2500	8202	0.42	2.39	149.21	1.975	5.625	12.304	41255	117478	256983
	58.5	191.9	980	3217	2439	8002	0.40	2.37	147.90	2.277	6.393	11.057	47559	133511	230937
	58.5	191.9	1010	3314	2381	7812	0.39	2.35	146.59	2.396	6.662	10.117	50039	139133	211303
	59	193.6	1020	3348	2500	8202	0.40	2.39	149.21	2.489	6.968	11.620	51976	145539	242687
	59	193.6	1031	3382	2500	8202	0.40	2.39	149.21	2.540	7.100	11.551	53054	148291	241250
	59.4	194.9	1042	3418	2439	8002	0.39	2.37	147.90	2.571	7.139	10.666	53689	149090	222763
	59.4	194.9	1053	3454	2439	8002	0.39	2.37	147.90	2.625	7.274	10.593	54825	151927	221248
	59.9	196.5	1031	3382	2381	7812	0.38	2.35	146.59	2.496	6.911	9.984	52123	144343	208524

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B8
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	59.9	196.5	1020	3348	2381	7812	0.39	2.35	146.59	2.445	6.785	10.052	51065	141706	209935
	60.1	197.2	1031	3382	2439	8002	0.39	2.37	147.90	2.518	7.006	10.736	52588	146325	224231
	60.4	198.2	990	3248	2381	7812	0.40	2.35	146.59	2.302	6.425	10.243	48077	134178	213919
	60.6	198.8	980	3217	2381	7812	0.40	2.35	146.59	2.257	6.310	10.302	47139	131792	215170
	61	200.1	862	2828	2632	8634	0.44	2.43	151.84	1.808	5.205	14.433	37751	108714	301448
	61	200.1	952	3125	2703	8867	0.43	2.45	153.16	2.225	6.360	14.954	46475	132835	312311
	61.5	201.8	1010	3314	2778	9113	0.42	2.47	154.48	2.525	7.189	15.727	52730	150155	328463
	61.5	201.8	909	2983	2857	9374	0.44	2.50	155.80	2.063	5.955	17.623	43077	124380	368062
	62	203.4	1087	3566	2564	8412	0.39	2.41	150.52	2.849	7.922	12.054	59496	165454	251752
	62.1	203.7	1064	3490	2632	8634	0.40	2.43	151.84	2.753	7.720	13.173	57489	161237	275130
	62.5	205.1	1000	3281	2381	7812	0.39	2.35	146.59	2.348	6.542	10.181	49043	136625	212631
	62.6	205.4	1000	3281	2439	8002	0.40	2.37	147.90	2.369	6.629	10.935	49480	138442	228375
	63	206.7	935	3066	2326	7630	0.40	2.33	145.29	2.033	5.707	9.877	42455	119188	206275
	63.1	207.0	926	3038	2381	7812	0.41	2.35	146.59	2.013	5.681	10.628	42046	118647	221959
	63.5	208.3	917	3010	2326	7630	0.41	2.33	145.29	1.959	5.516	9.975	40911	115194	208334
	63.6	208.7	909	2983	2381	7812	0.41	2.35	146.59	1.941	5.491	10.724	40531	114677	223979
	64	210.0	820	2689	2326	7630	0.43	2.33	145.29	1.564	4.469	10.502	32657	93339	219339
	64.1	210.3	833	2734	2222	7291	0.42	2.29	142.69	1.587	4.502	9.171	33151	94029	191541
	64.5	211.6	885	2903	2439	8002	0.42	2.37	147.90	1.855	5.285	11.620	38750	110376	242682
	64.6	211.9	926	3038	2381	7812	0.41	2.35	146.59	2.013	5.681	10.628	42046	118647	221959
	65	213.3	1075	3528	2564	8412	0.39	2.41	150.52	2.788	7.768	12.135	58223	162246	253448
	65.1	213.6	1111	3645	2632	8634	0.39	2.43	151.84	3.003	8.357	12.840	62713	174533	268166
	65.1	213.6	1087	3566	2632	8634	0.40	2.43	151.84	2.874	8.030	13.012	60016	167702	271761
	65.1	213.6	1087	3566	2632	8634	0.40	2.43	151.84	2.874	8.030	13.012	60016	167702	271762
	65.1	213.6	1087	3566	2632	8634	0.40	2.43	151.84	2.874	8.030	13.012	60016	167702	271761
	65.5	214.9	1111	3645	2632	8634	0.39	2.43	151.84	3.003	8.357	12.840	62713	174533	268165
	66.1	216.9	1020	3348	2632	8634	0.41	2.43	151.84	2.532	7.149	13.467	52892	149316	281259
	66.5	218.2	1000	3281	2564	8412	0.41	2.41	150.52	2.411	6.801	12.637	50357	142038	263937
	67	219.8	1020	3348	2941	9650	0.43	2.52	157.13	2.621	7.504	18.279	54735	156716	381759
	67.5	221.5	1111	3645	2439	8002	0.37	2.37	147.90	2.925	8.009	10.194	61087	167262	212900
	68	223.1	1205	3953	2564	8412	0.36	2.41	150.52	3.500	9.508	11.186	73098	198582	233616
	68.5	224.7	1235	4050	2703	8867	0.37	2.45	153.16	3.739	10.232	12.935	78096	213695	270150
	69	226.4	1299	4261	2326	7630	0.27	2.33	145.29	3.925	9.997	7.353	81982	208792	153574
	69.5	228.0	1351	4434	2703	8867	0.33	2.45	153.16	4.480	11.947	11.947	93569	249518	249518
	70	229.7	1282	4206	2703	8867	0.35	2.45	153.16	4.032	10.926	12.544	84218	228203	261986
	70.5	231.3	1220	4001	2703	8867	0.37	2.45	153.16	3.649	10.013	13.056	76202	209126	272674
	71	232.9	1250	4101	2632	8634	0.35	2.43	151.84	3.800	10.294	11.776	79371	214987	245954

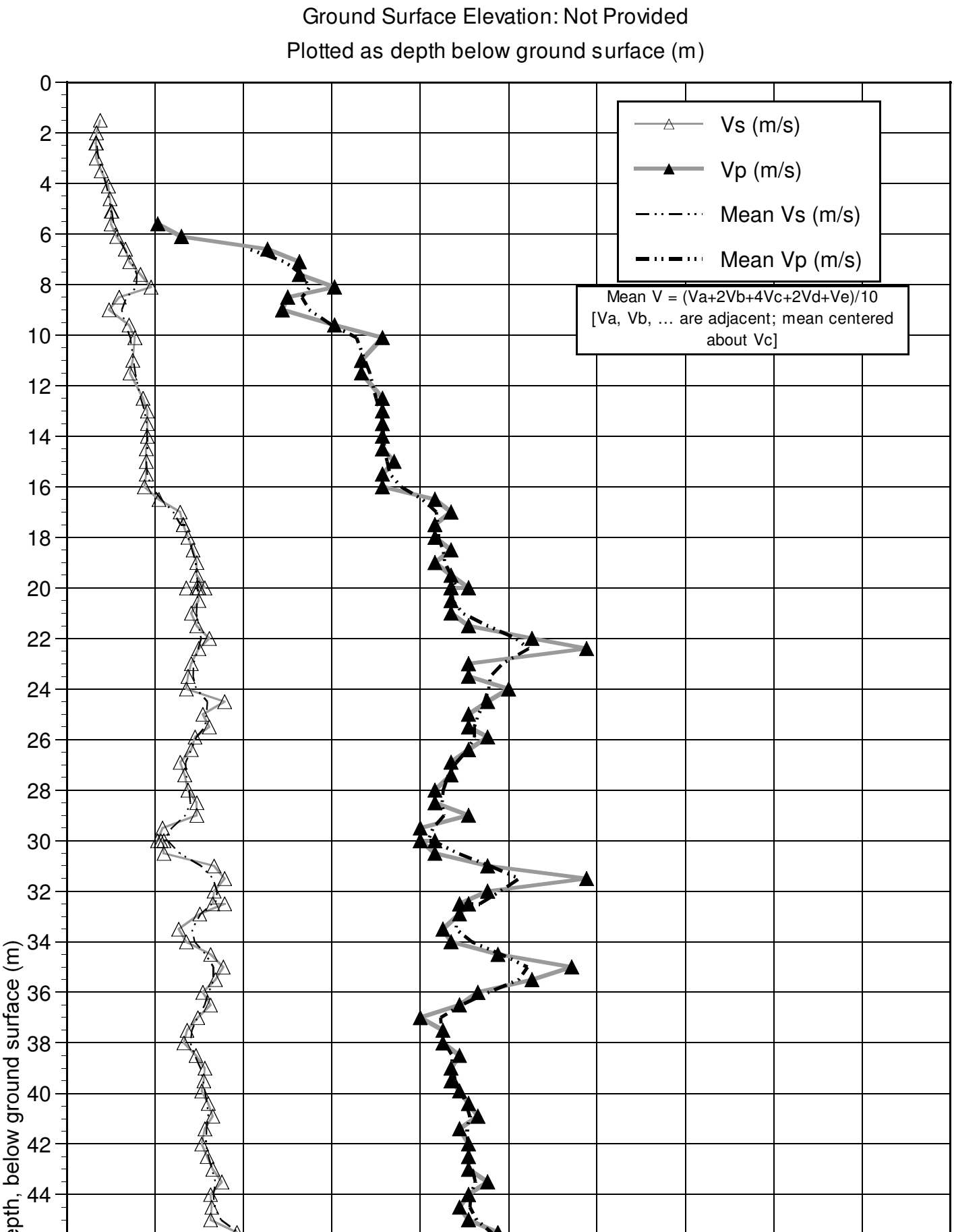
γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

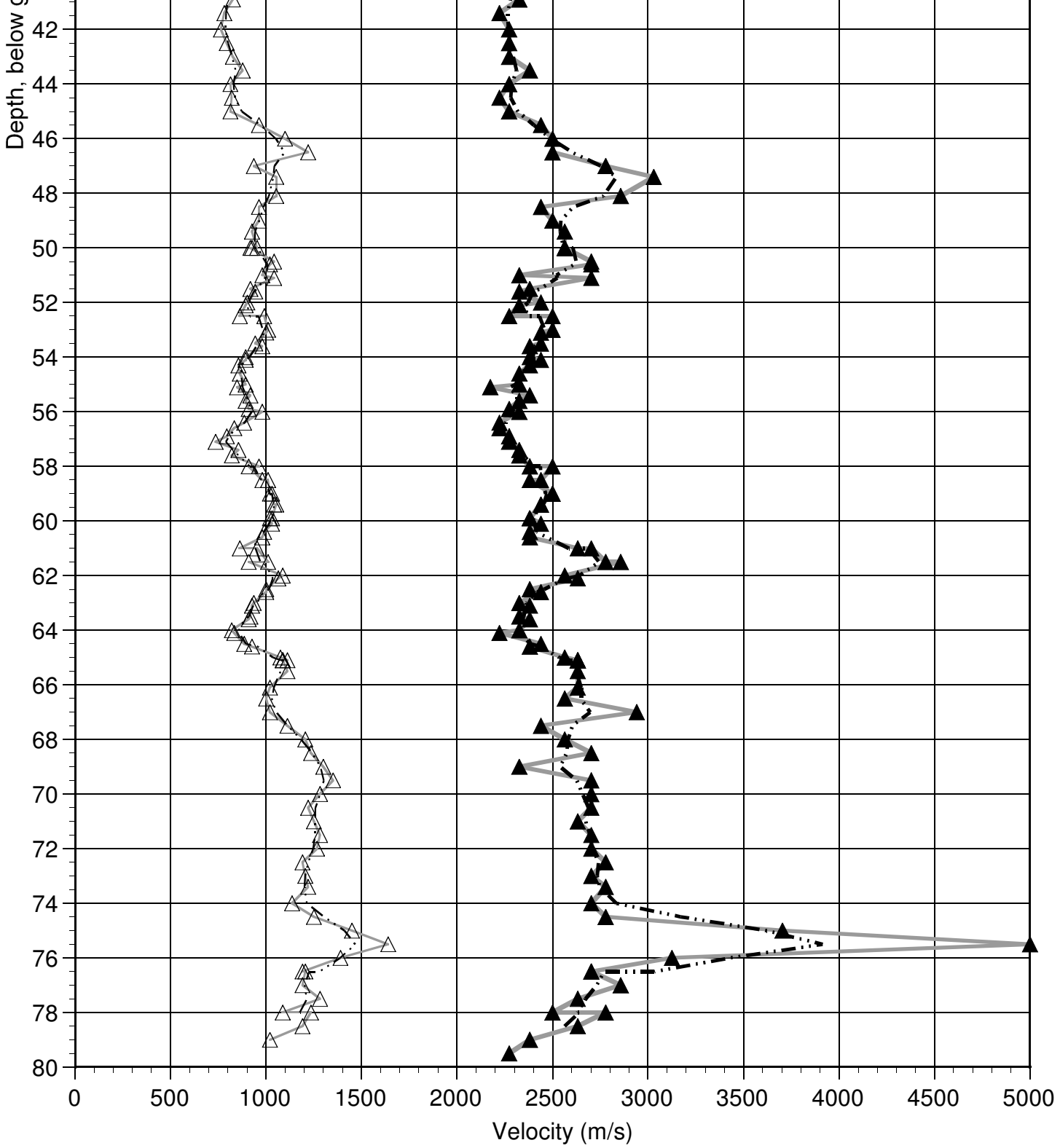
Table 2. LA 710 Tunnel
Boring Z3 B8
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	71.5	234.6	1282	4206	2703	8867	0.35	2.45	153.16	4.032	10.926	12.544	84218	228202	261986
	72	236.2	1266	4153	2703	8867	0.36	2.45	153.16	3.931	10.688	12.679	82100	223230	264811
	72.5	237.9	1190	3906	2778	9113	0.39	2.47	154.48	3.507	9.732	14.417	73244	203251	301112
	73	239.5	1205	3953	2703	8867	0.38	2.45	153.16	3.561	9.800	13.172	74377	204686	275107
	73.4	240.8	1220	4001	2778	9113	0.38	2.47	154.48	3.680	10.162	14.187	76860	212229	296291
	74	242.8	1136	3728	2703	8867	0.39	2.45	153.16	3.168	8.824	13.697	66165	184288	286056
	74.5	244.4	1250	4101	2778	9113	0.37	2.47	154.48	3.866	10.617	13.938	80751	221749	291103
	75	246.1	1449	4755	3704	12151	0.41	2.67	166.51	5.602	15.794	29.118	117005	329859	608136
	75.5	247.7	1639	5378	5000	16404	0.44	2.82	176.04	7.578	21.822	60.394	158277	455768	1261342
	76	249.3	1389	4557	3125	10253	0.38	2.56	159.79	4.938	13.597	18.413	103124	283987	384565
	76.5	251.0	1190	3906	2703	8867	0.38	2.45	153.16	3.477	9.594	13.285	72617	200370	277454
	76.5	251.0	1205	3953	2703	8867	0.38	2.45	153.16	3.561	9.800	13.172	74377	204686	275107
	77	252.6	1190	3906	2857	9374	0.39	2.50	155.80	3.537	9.868	15.657	73872	206095	327005
	77.5	254.3	1282	4206	2632	8634	0.34	2.43	151.84	3.998	10.749	11.513	83493	224496	240459
	78	255.9	1087	3566	2500	8202	0.38	2.39	149.21	2.824	7.813	11.173	58977	163183	233353
	78	255.9	1235	4050	2778	9113	0.38	2.47	154.48	3.772	10.386	14.065	78769	216919	293745
	78.5	257.5	1190	3906	2632	8634	0.37	2.43	151.84	3.447	9.454	12.248	71992	197451	255793
	79	259.2	1020	3348	2381	7812	0.39	2.35	146.59	2.445	6.785	10.052	51065	141706	209934
	79.5	260.8		NA	2273	7456	NA	NA	NA	NA	NA	NA	NA	NA	NA

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Figure 1. LA 710 Tunnel
Boring Z3 B8
Downhole Interval Velocities



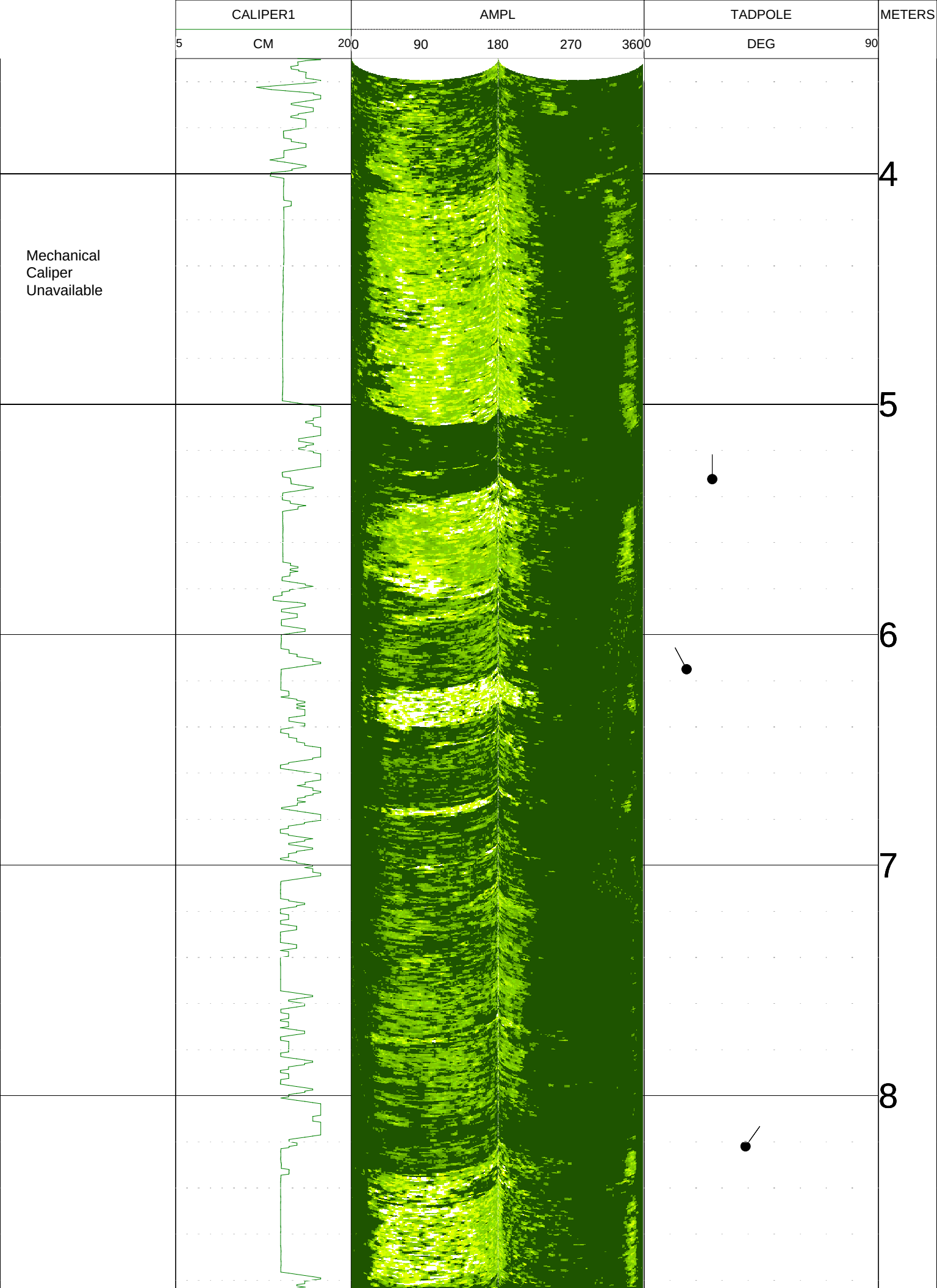

Depth, below g
42
44
46
48
50
52
54
56
58
60
62
64
66
68
70
72
74
76
78
80
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
Velocity (m/s)

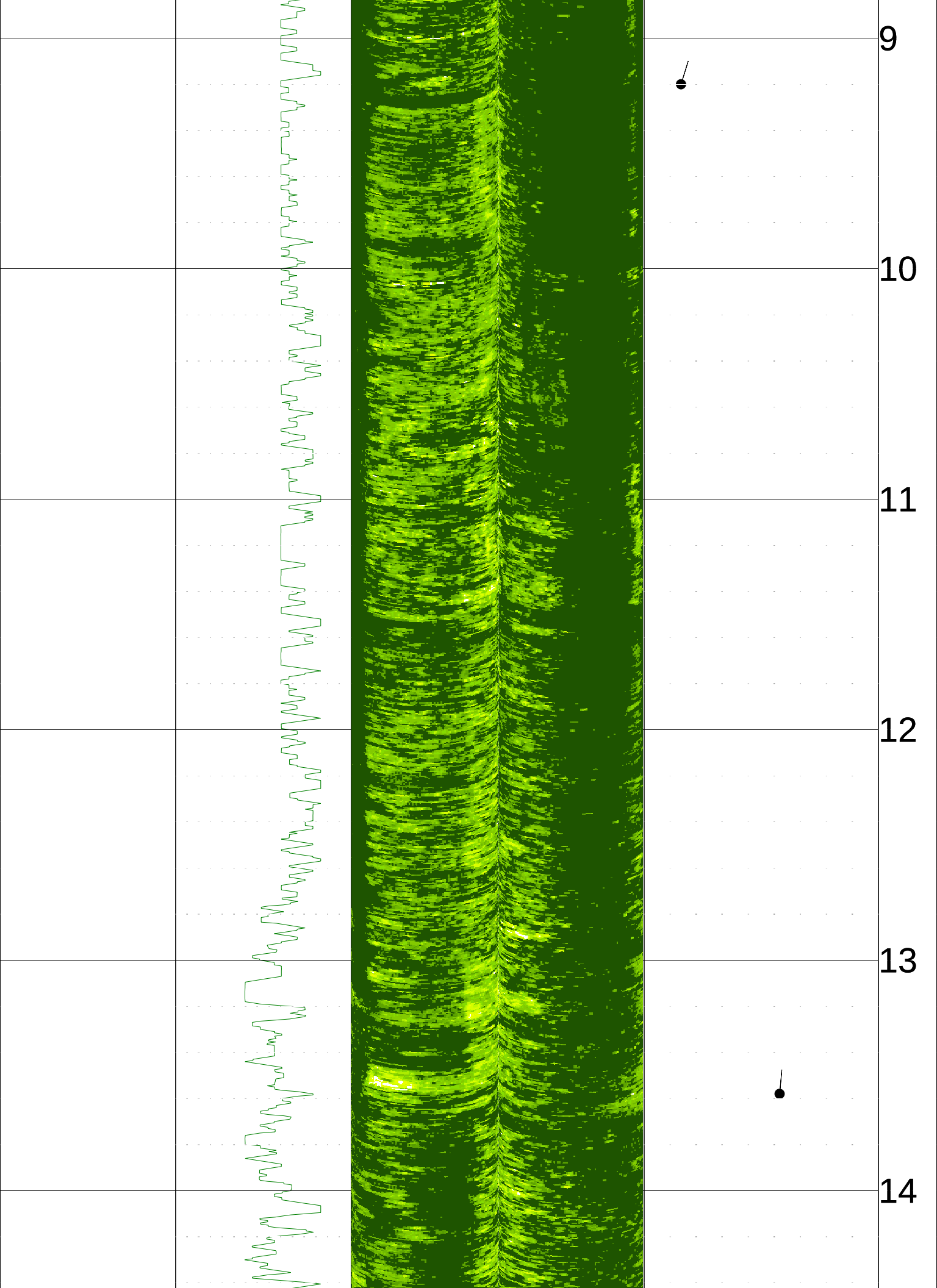


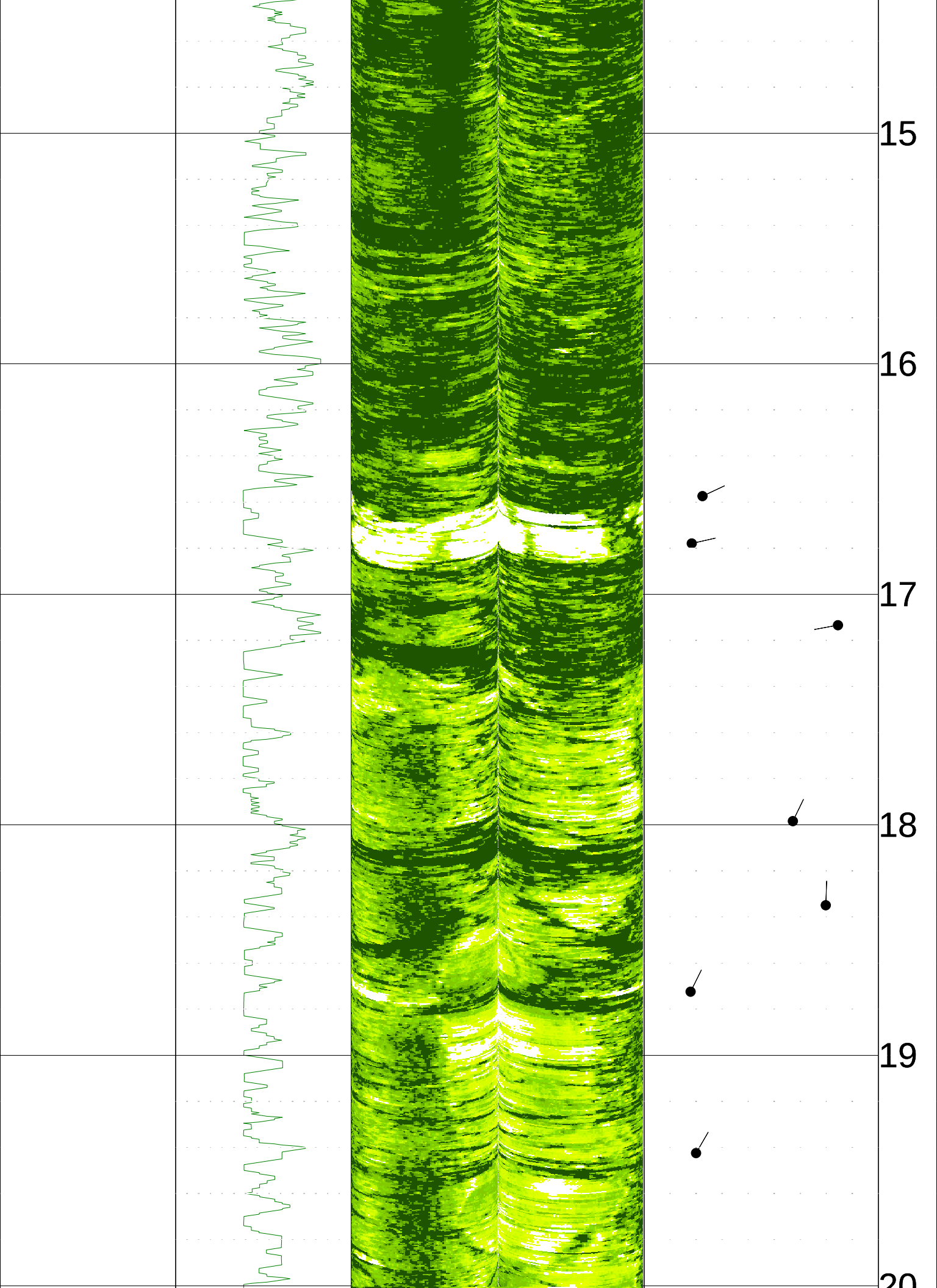
07-187900 Z3 B8..

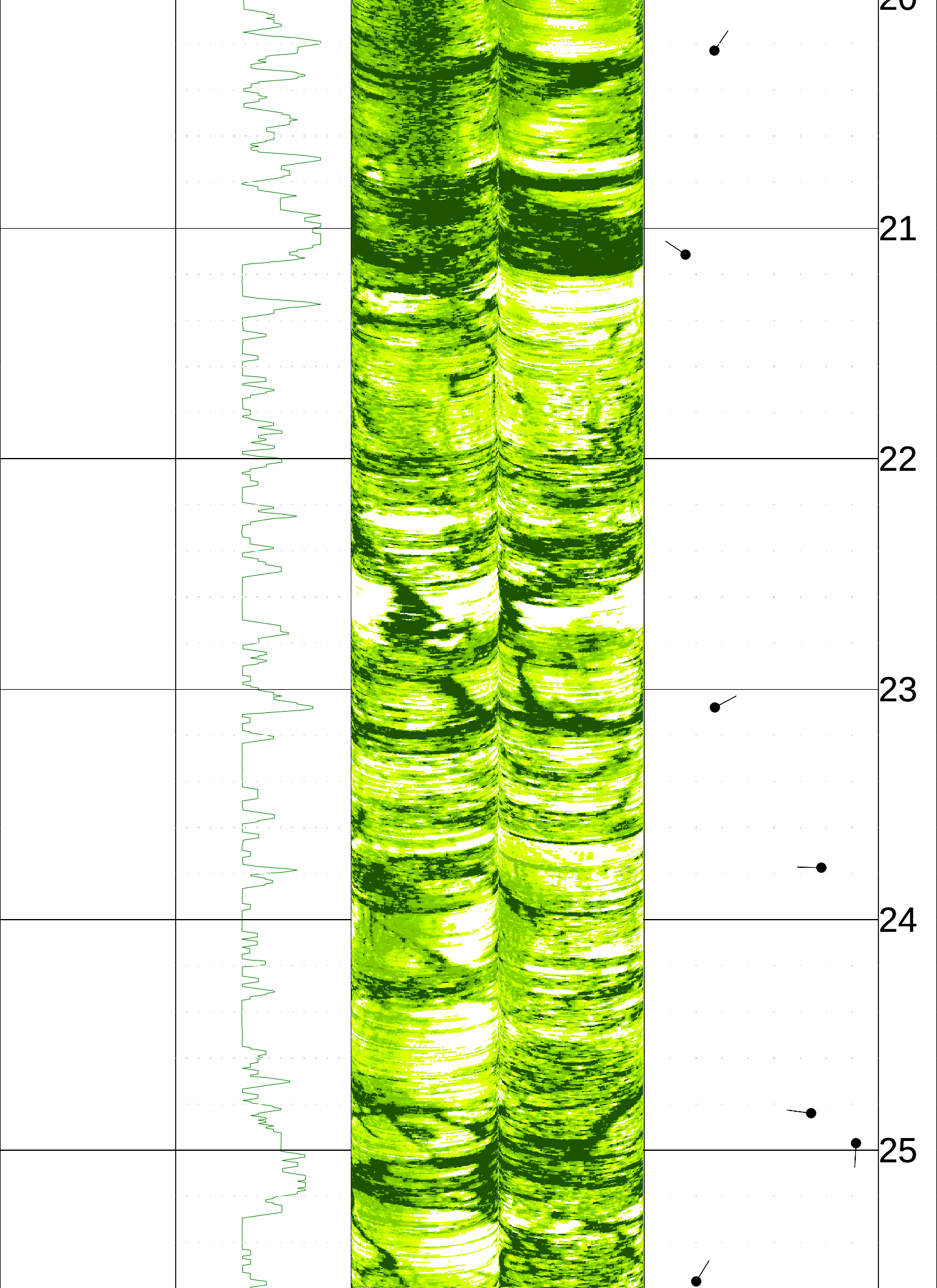
COMPANY	: Caltrans		OTHER SERVICES:
WELL	: 07-187900 Z3 B8..		
FIELD	: LA Co.		
COUNTY	: LA		
STATE	: CA		
LOCATION	:		
SECTION	: None		
TOWNSHIP	: None		
RANGE	: None		
API NO.	:		
UNIQUE WELL ID.	:		
PERMANENT DATUM	: None	ELEVATION KB	: NA
LOG MEASURED FROM	: GL	ELEVATION DF	: NA
DRL MEASURED FROM	: GL	ELEVATION GL	: 172.8m.
DATE	: 03/19/09	RIG NUMBER	:
DEPTH DRILLER	: 83.82m.	LOGGER TD	:
BIT SIZE	: 10.5cm.	ARRIVAL TIME	:
LOG TOP	: 3.11	DEPARTURE TIME	:
LOG BOTTOM	: 83.80	CIRC STOPPED	: 3/18 PM
CASING OD	:		
CASING BOTTOM	: N/A		
CASING TYPE	: N/A		
BOREHOLE FLUID	: 0		
RM TEMPERATURE	: 0		
MUD RES	: 0		
MUD WEIGHT	:		
WITNESSED BY	:		
RECORDED BY	: DH/DG		
REMARKS 1	: IND, Acoustic Tel, PSLog, CAL		
REMARKS 2	: EA: 07-187900		

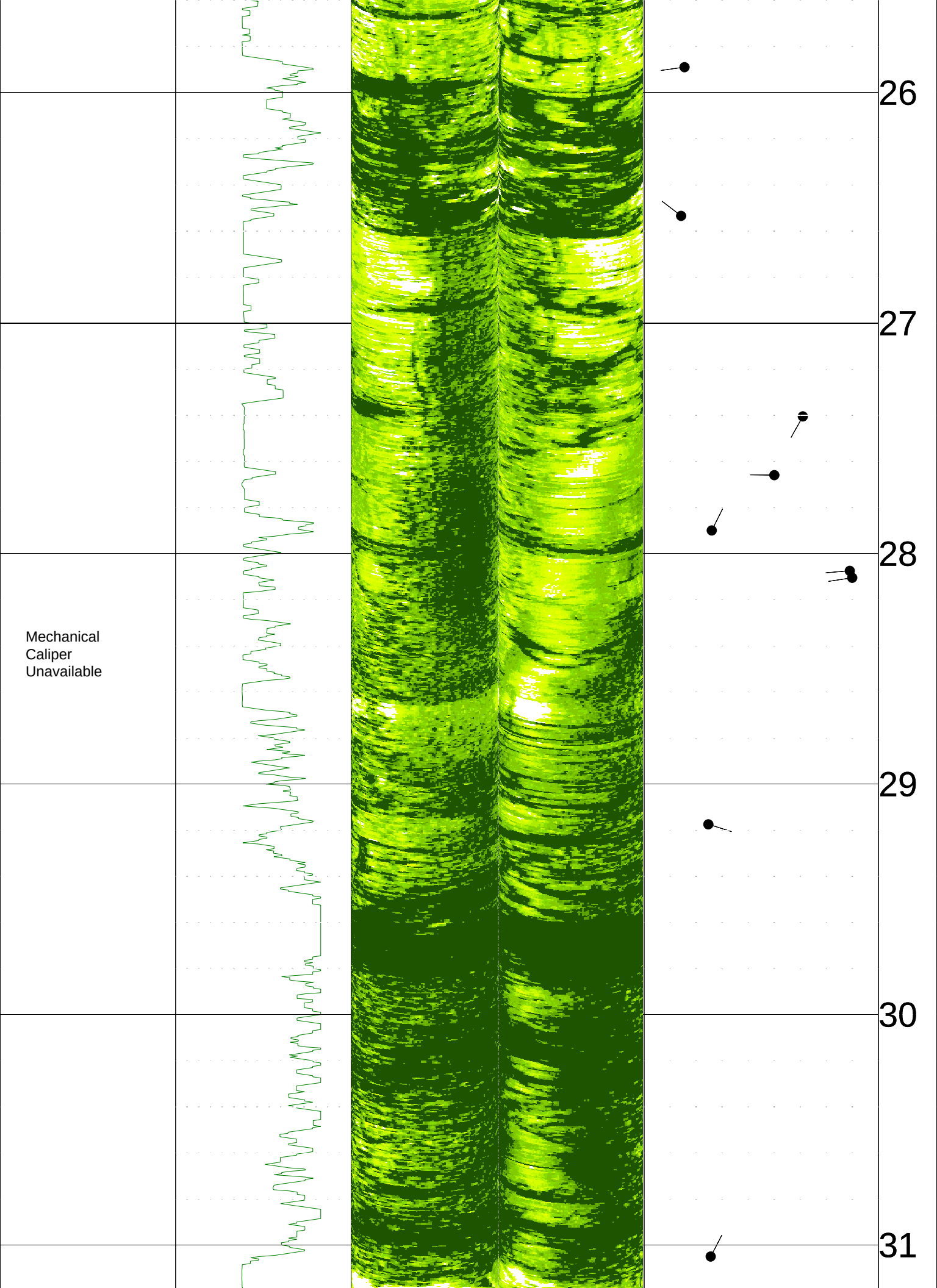
ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONSS

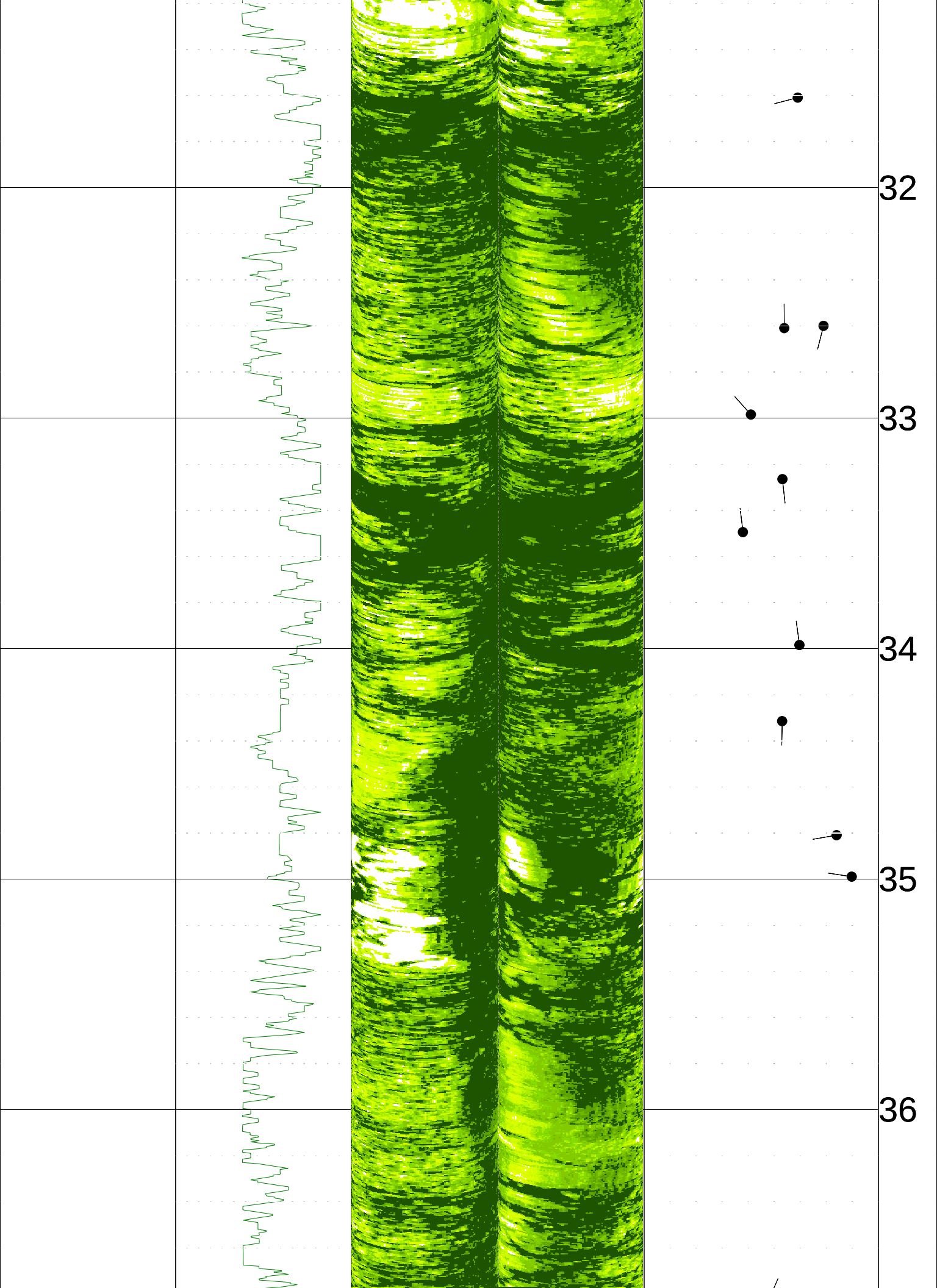

CALIPER1
AMPL
TADPOLE
METERS
5
CM
20
0
90
180
270
360
0
DEG
90
Mechanical
Caliper
Unavailable
4
5
6
7
8

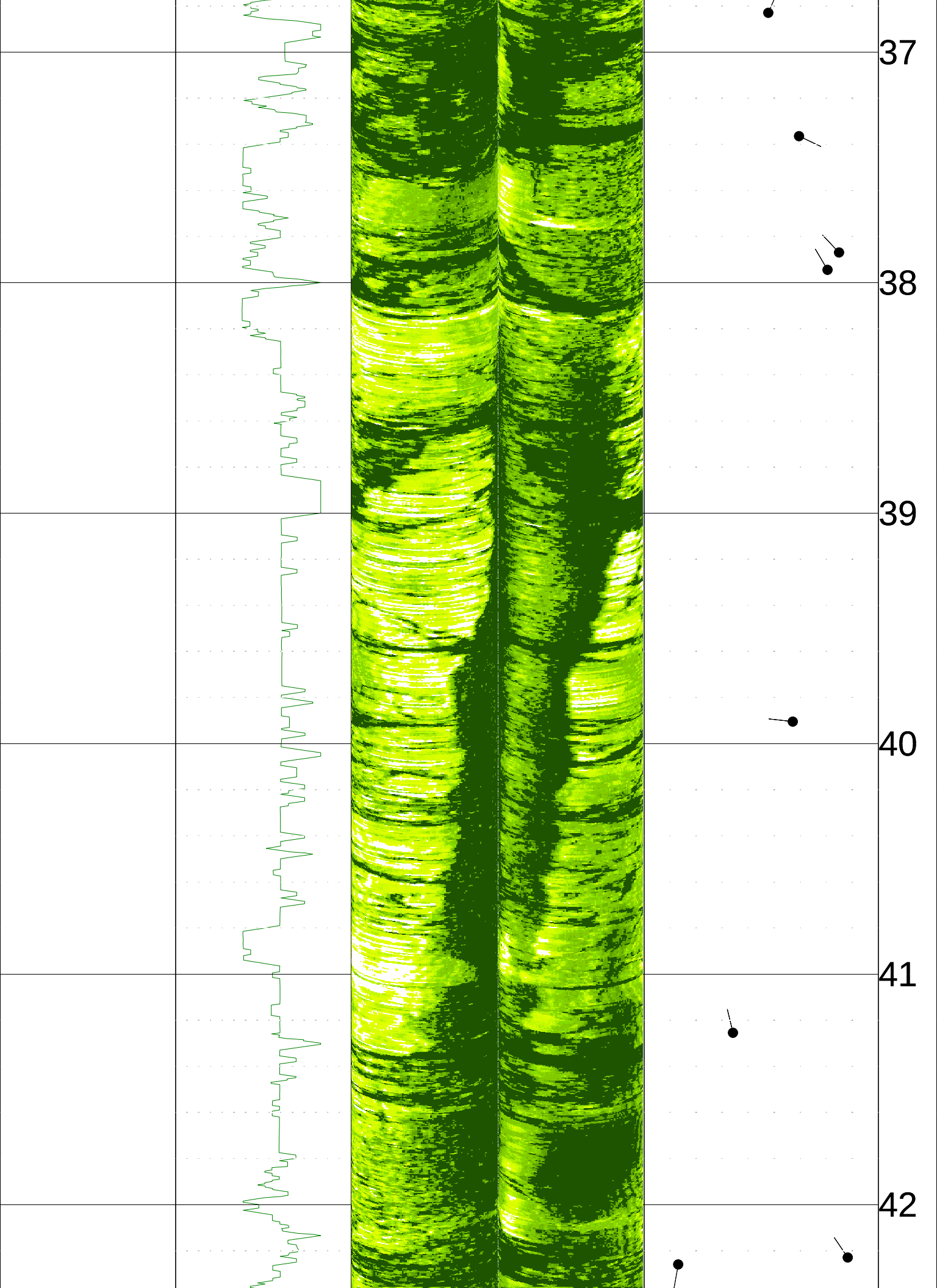

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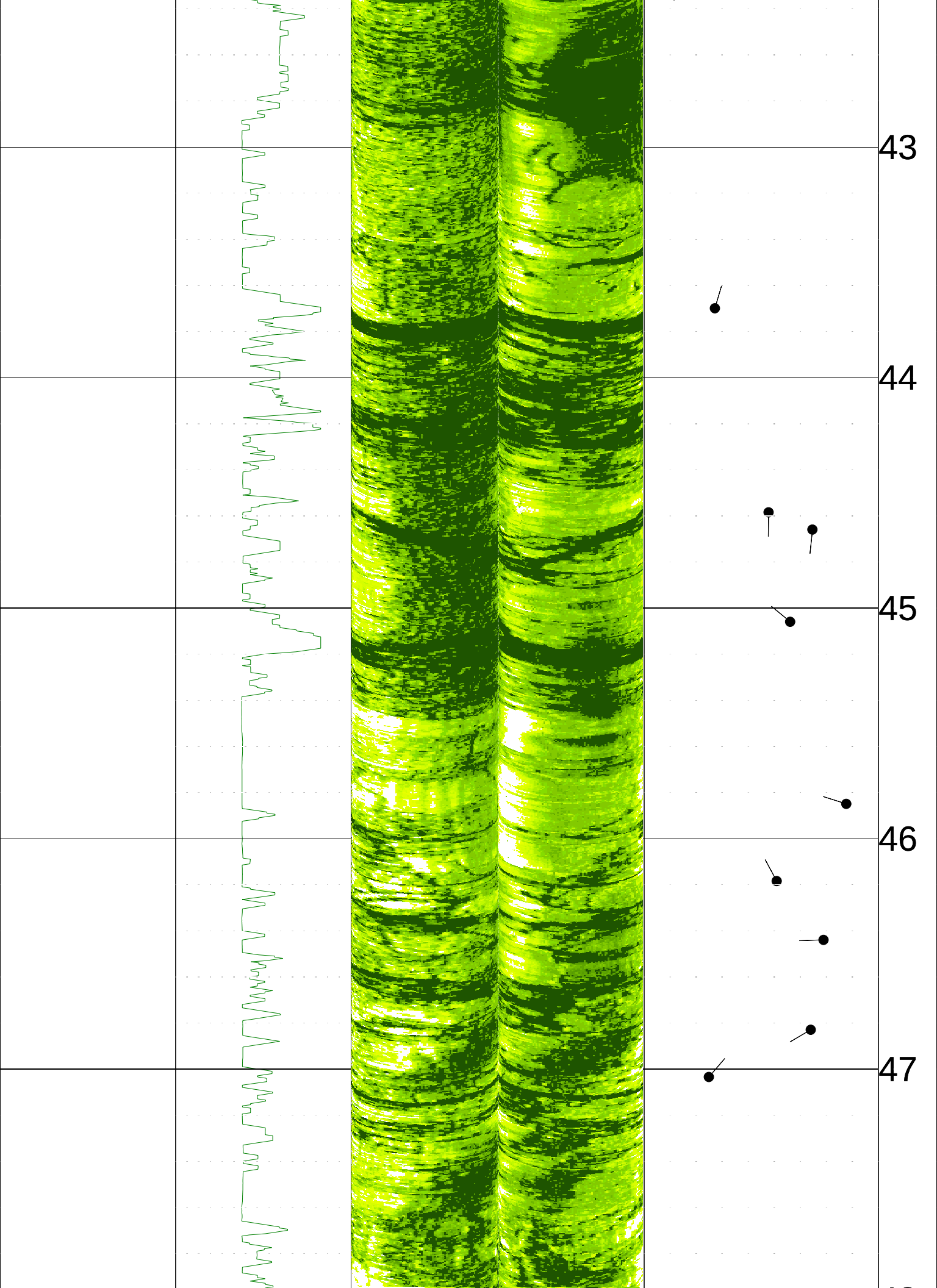

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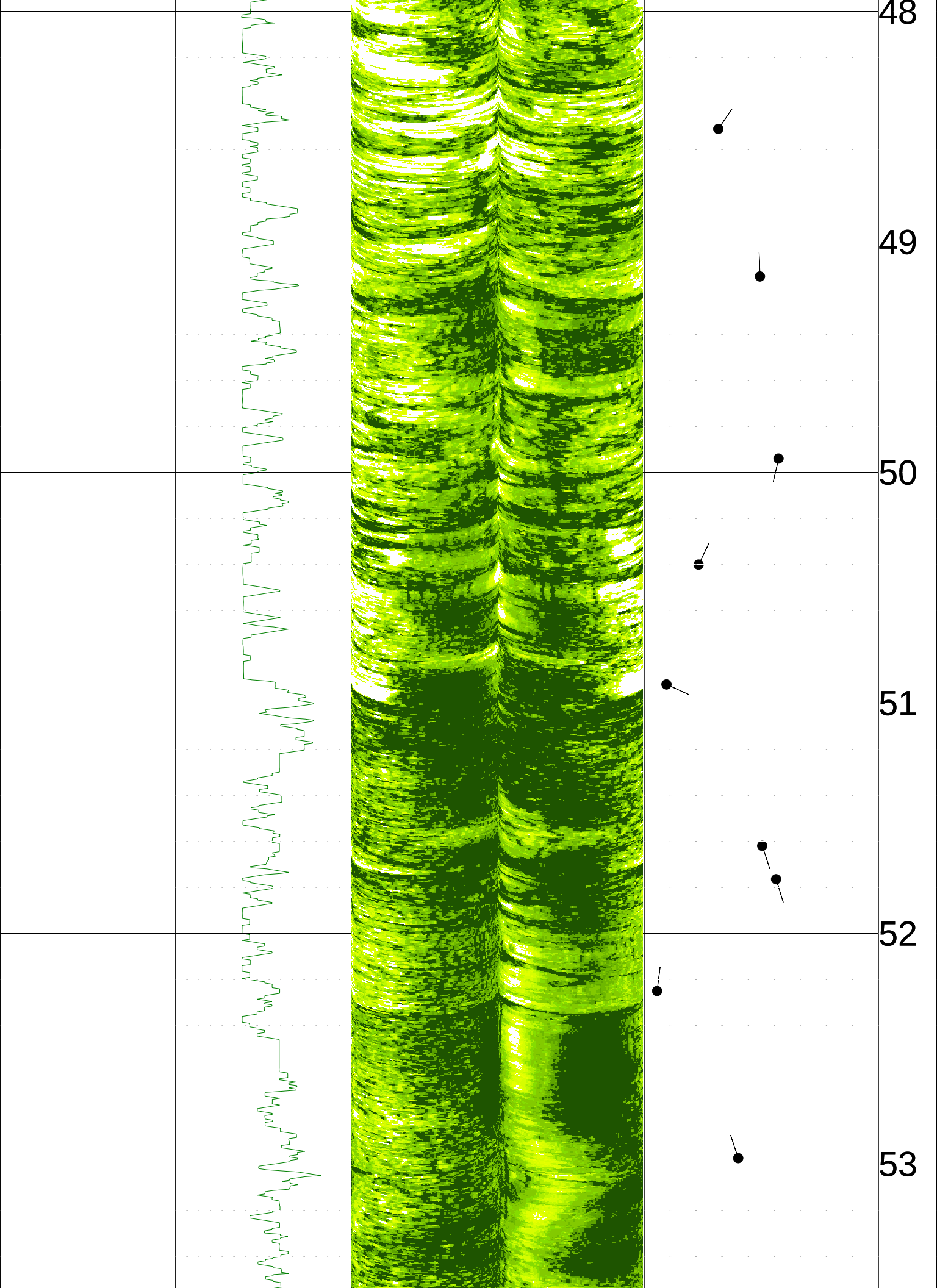

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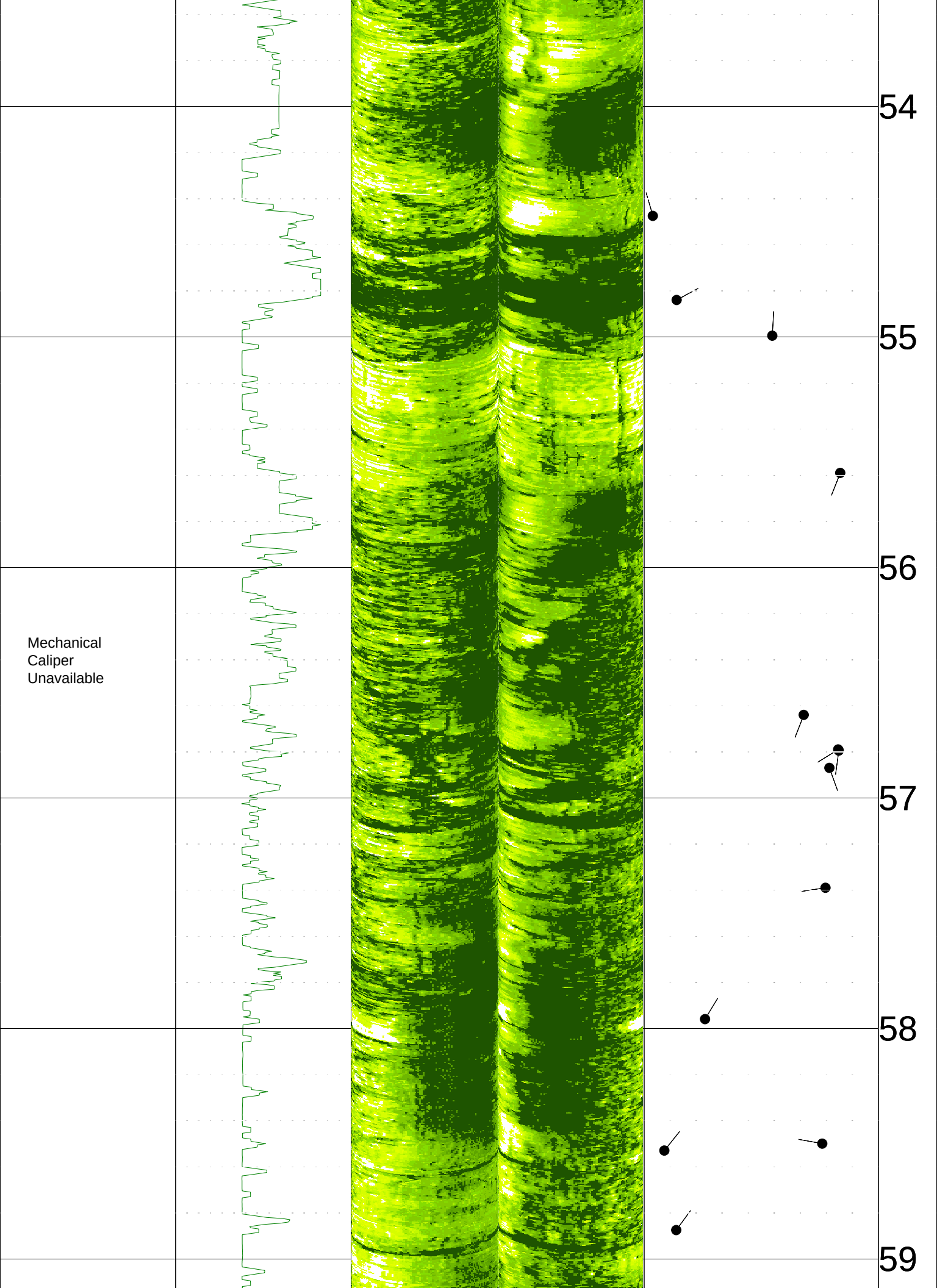

Mechanical
Caliper
Unavailable
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27
28
29
30
31

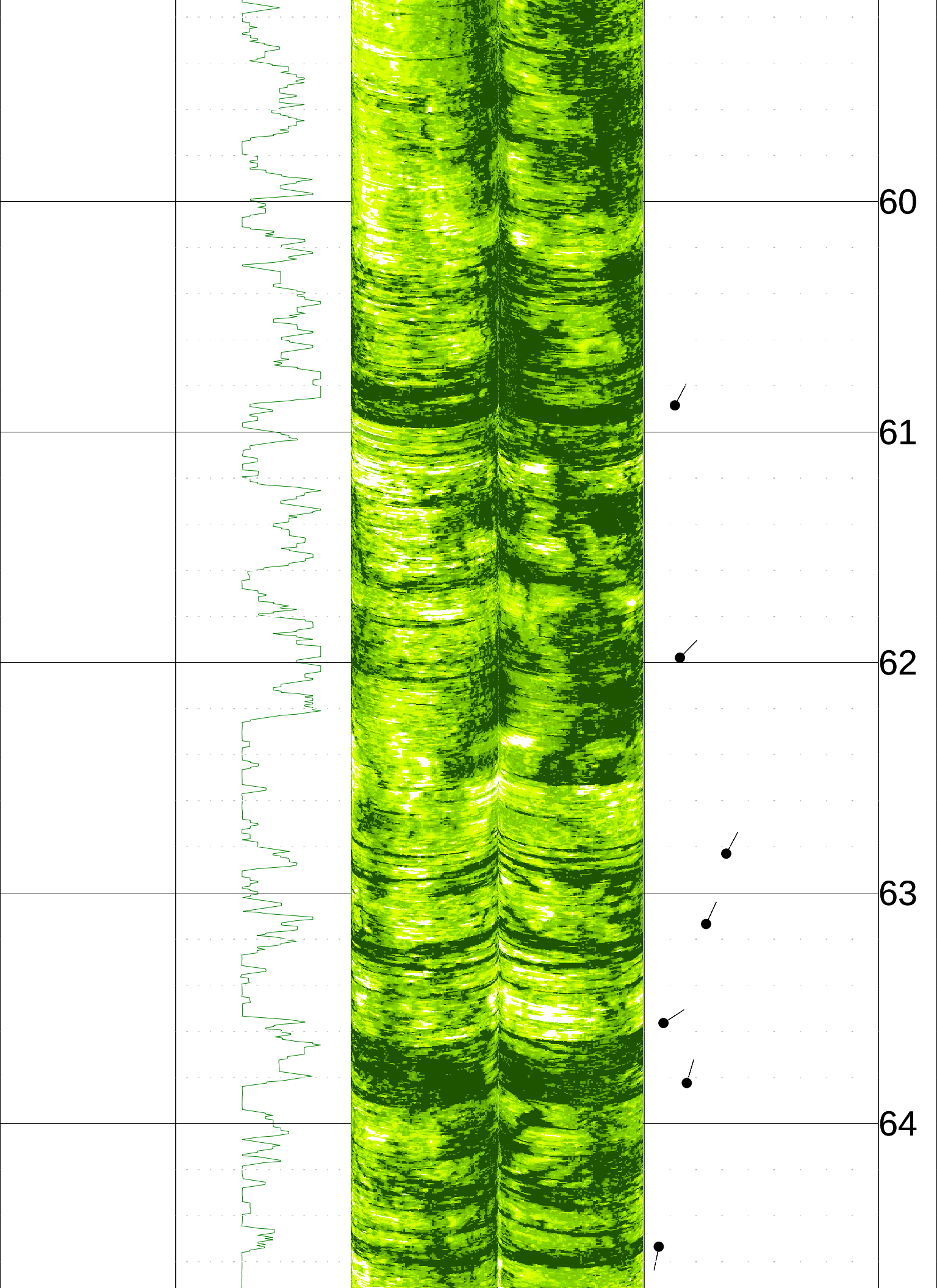

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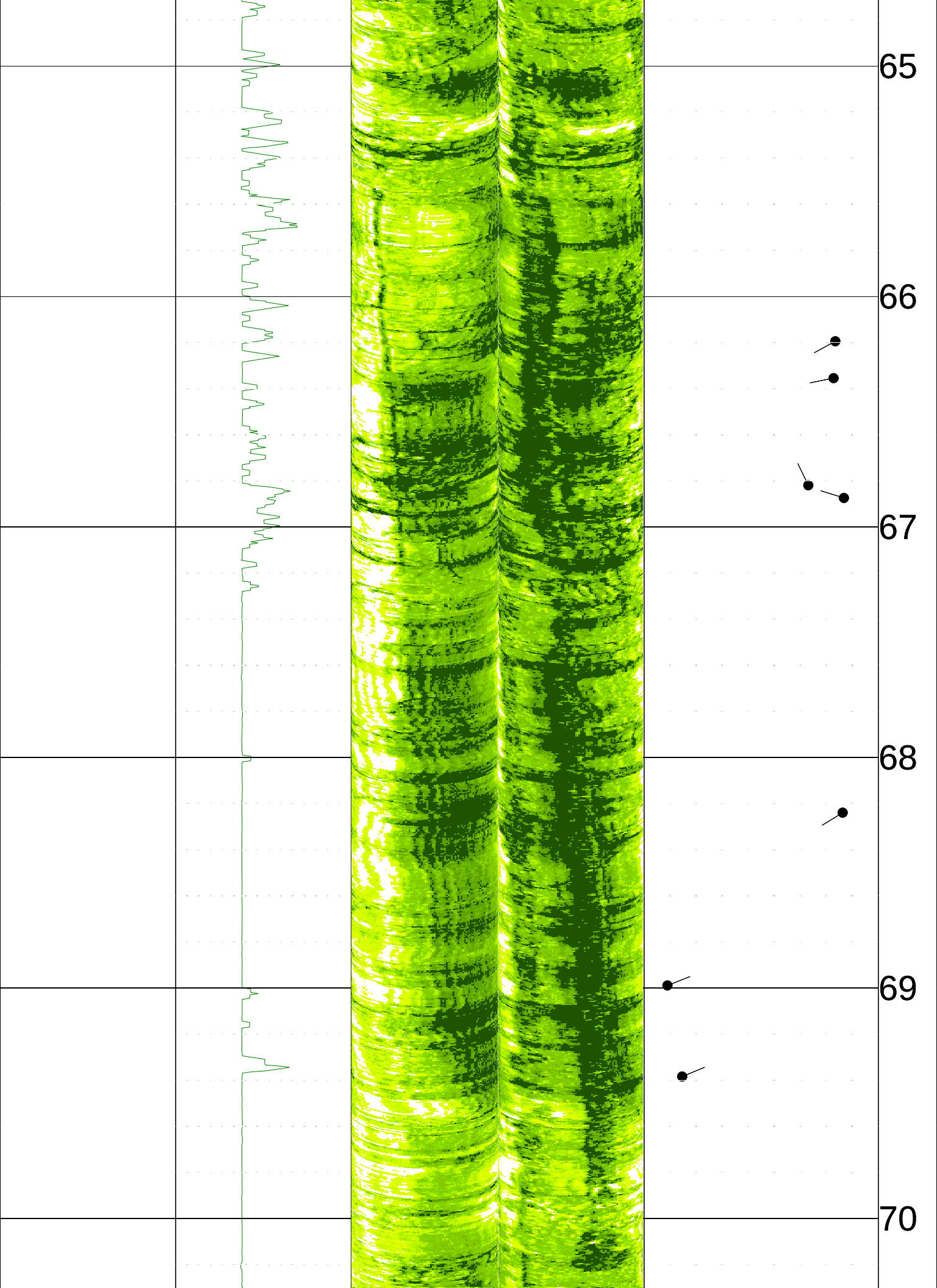

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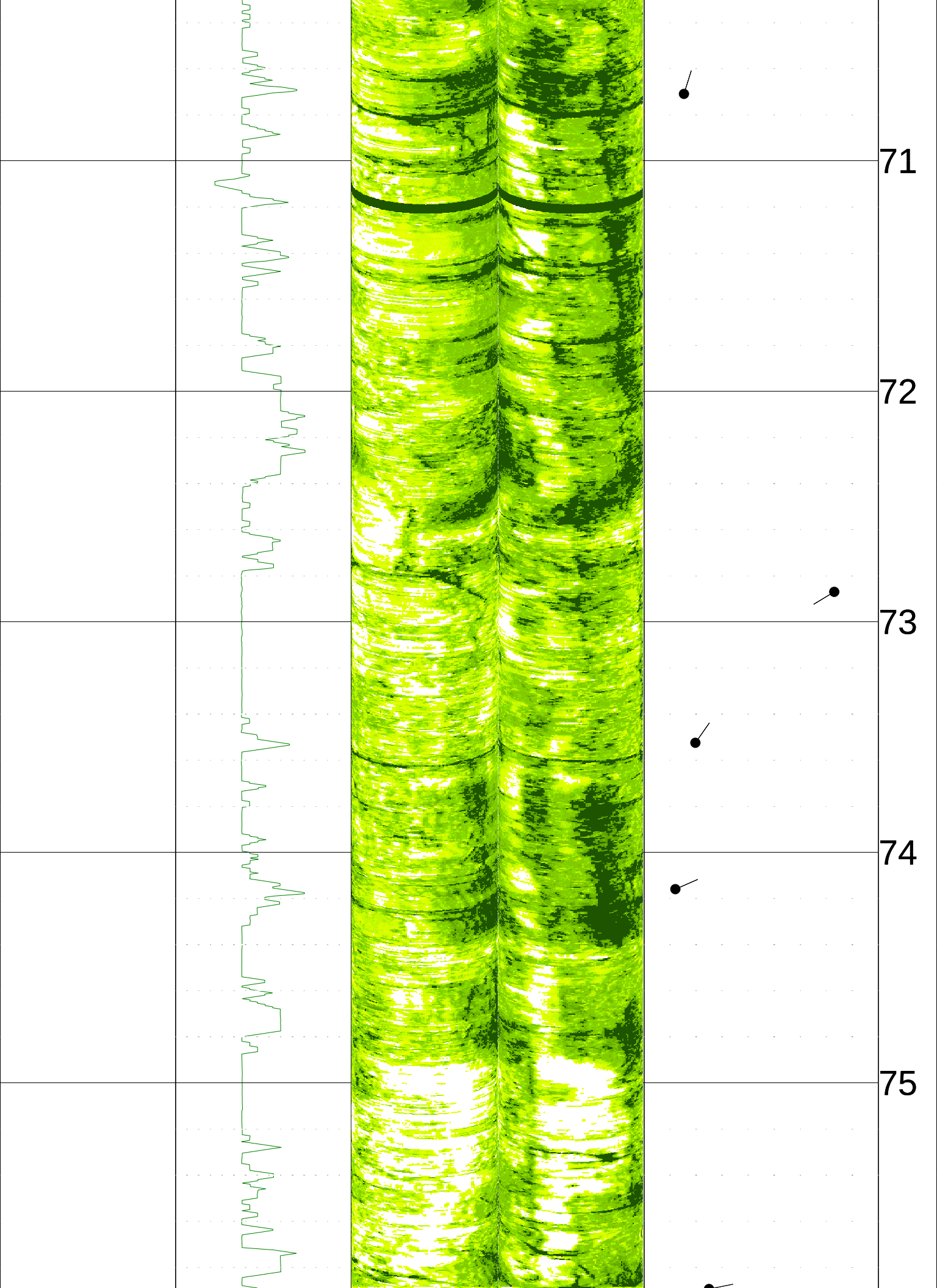

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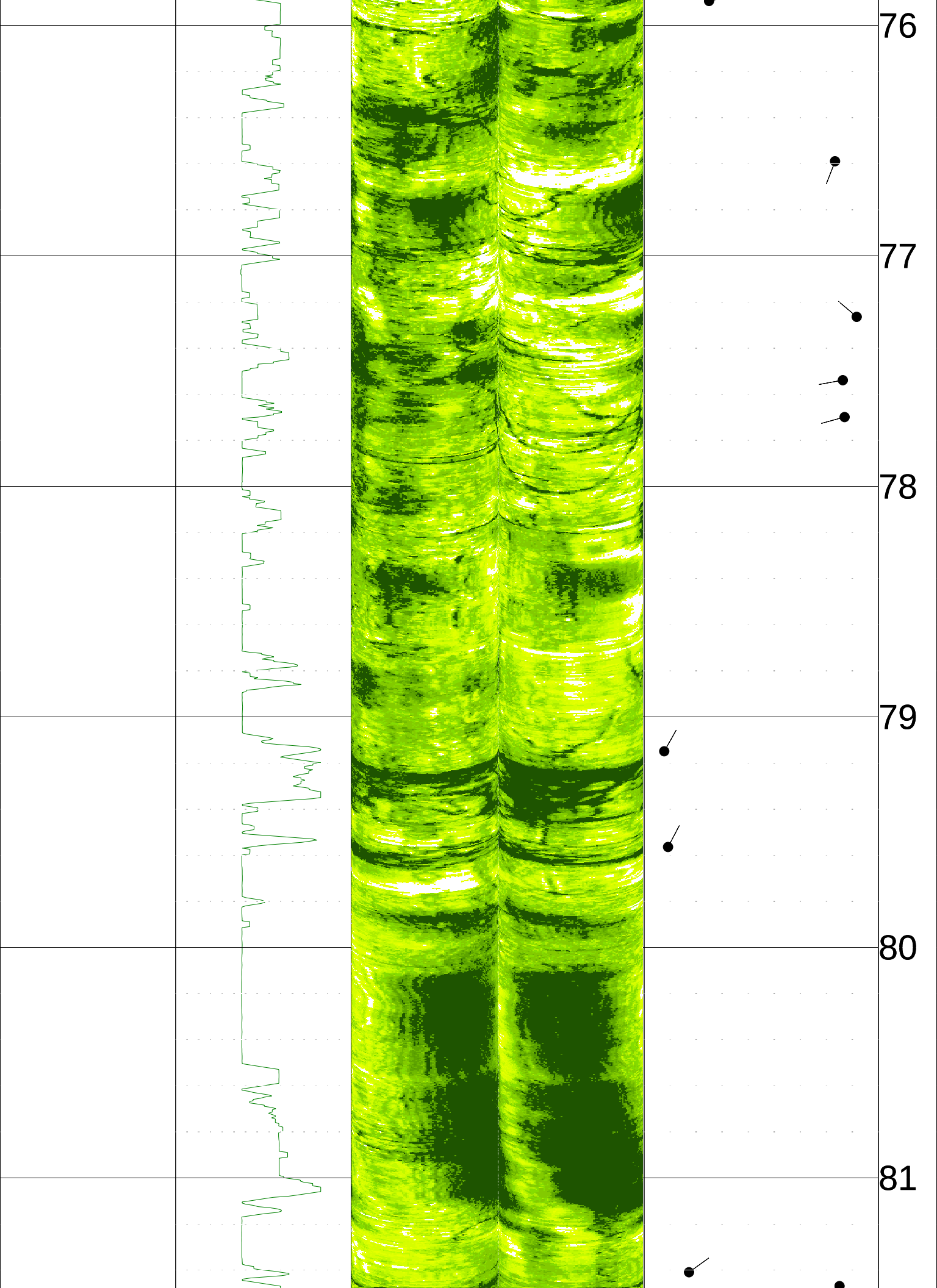

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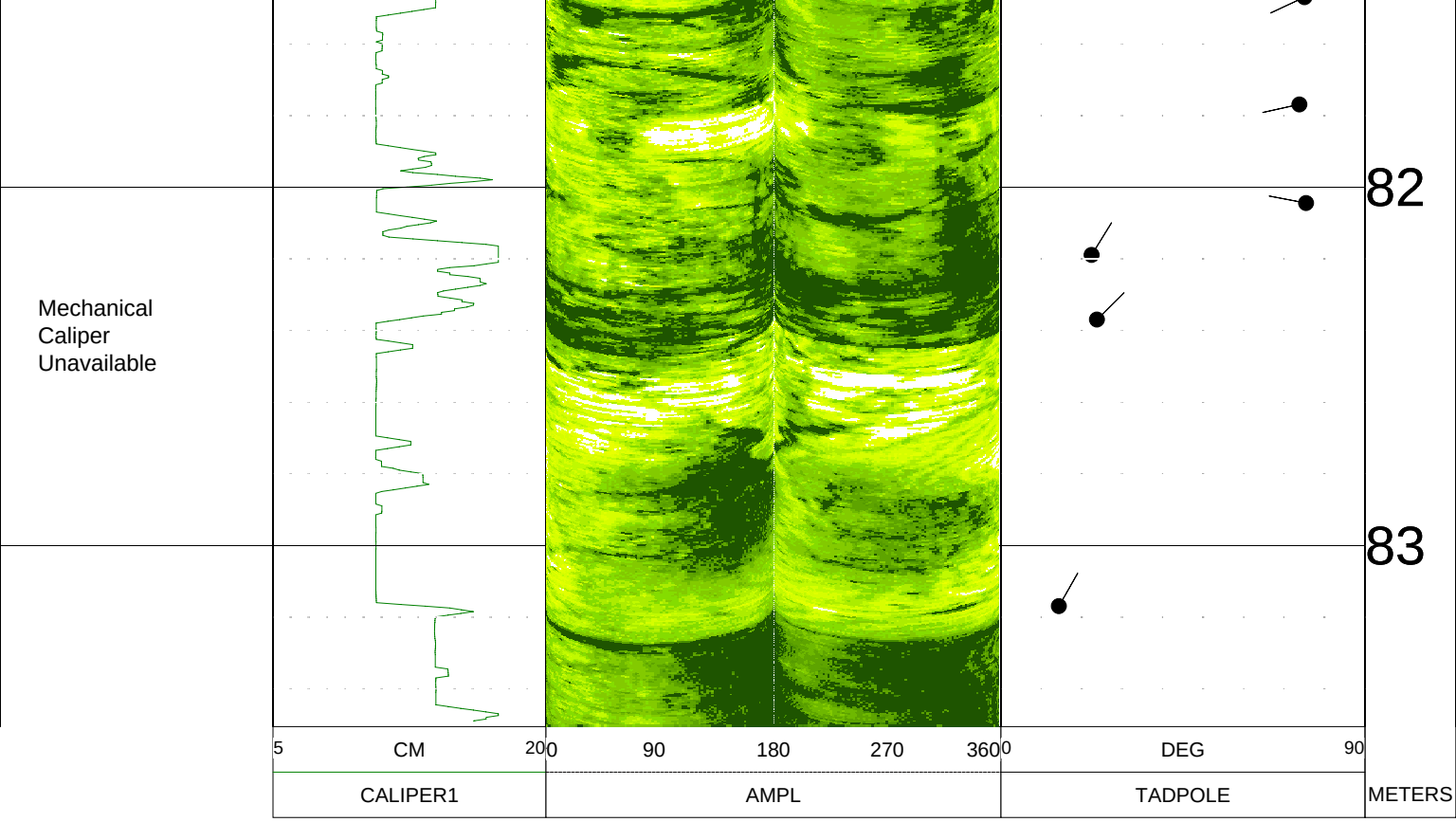

Mechanical
Caliper
Unavailable
54
55
56
57
58
59

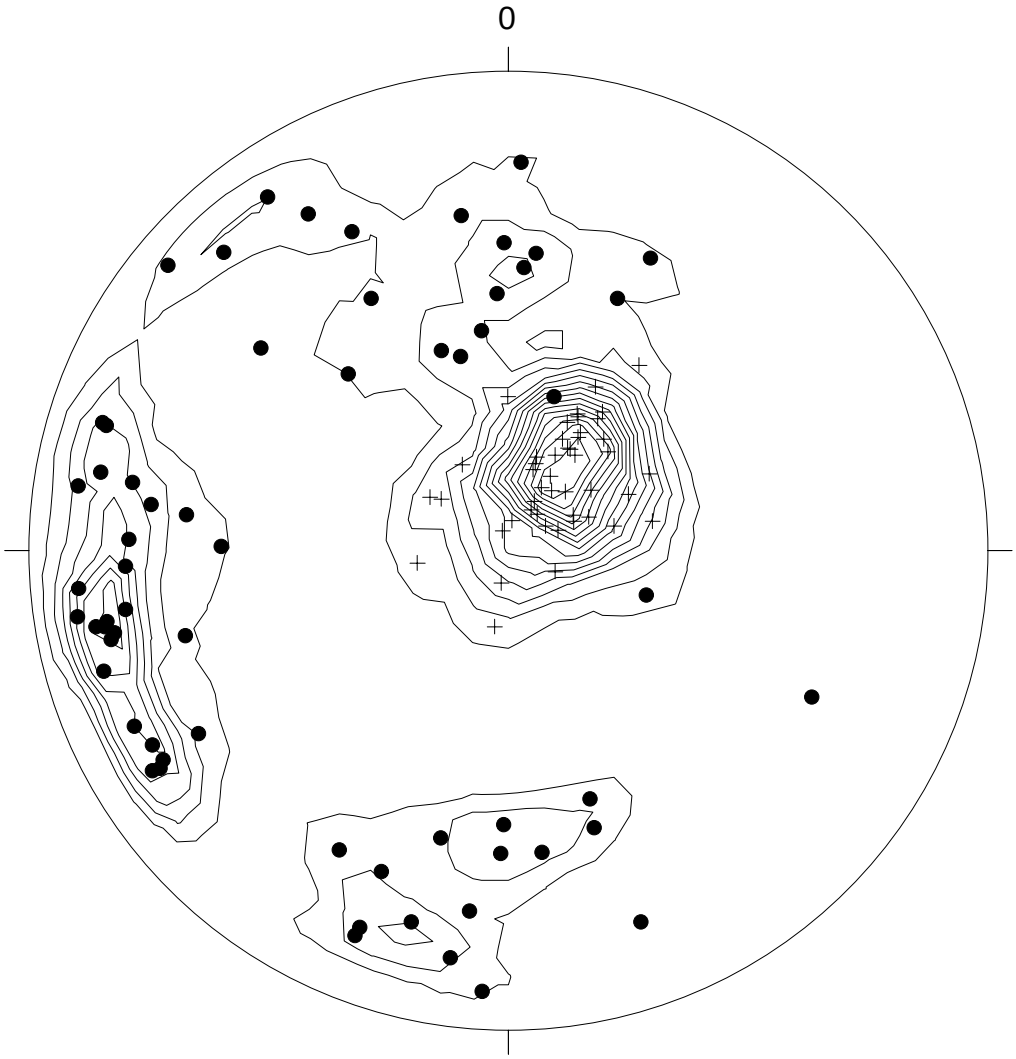

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61
62
63
64


65
66
67
68
69
70


71
72
73
74
75


76
77
78
79
80
81


Mechanical
Caliper
Unavailable
82
83
5
CM
20
0
90
180
270
360
0
DEG
90
CALIPER1
AMPL
TADPOLE
METERS



LA 710 Tunnel, boring Z3 B8

+ n=46 (P)
• n=63 (P)

Stereonet contour plot of poles to planes,
Both bedding and fractures

n=109
max. dens.= 16.05 (at 40/ 72)
min. dens.=0.00
Contours at every integer between
1 and 15, inclusive:
(Multiples of random distribution)

Apparent bedding denoted as cross
Apparent fractures denoted as solid circle
Plotted on upper hemisphere



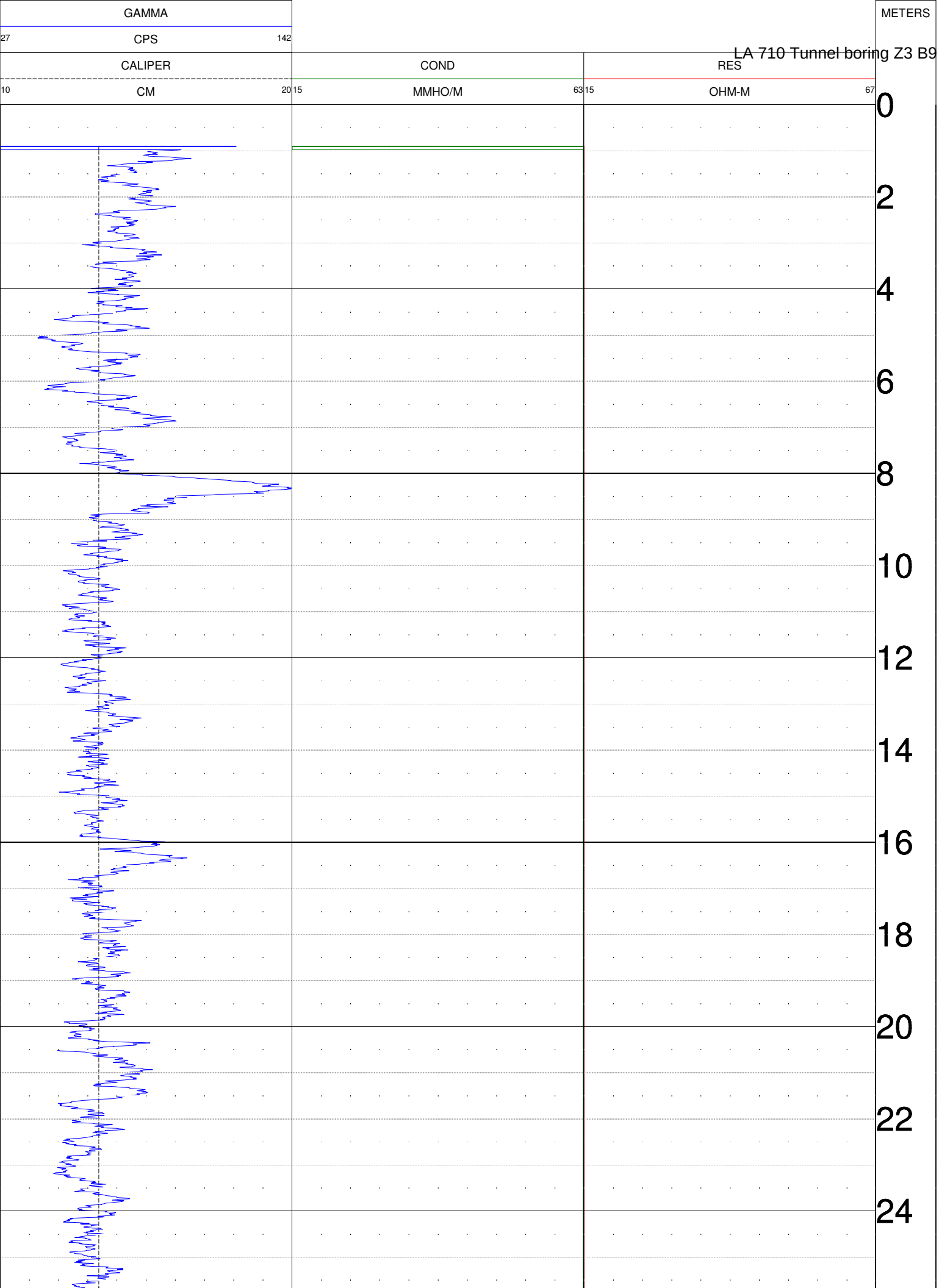
LA 710 Tunnel boring Z3 B9

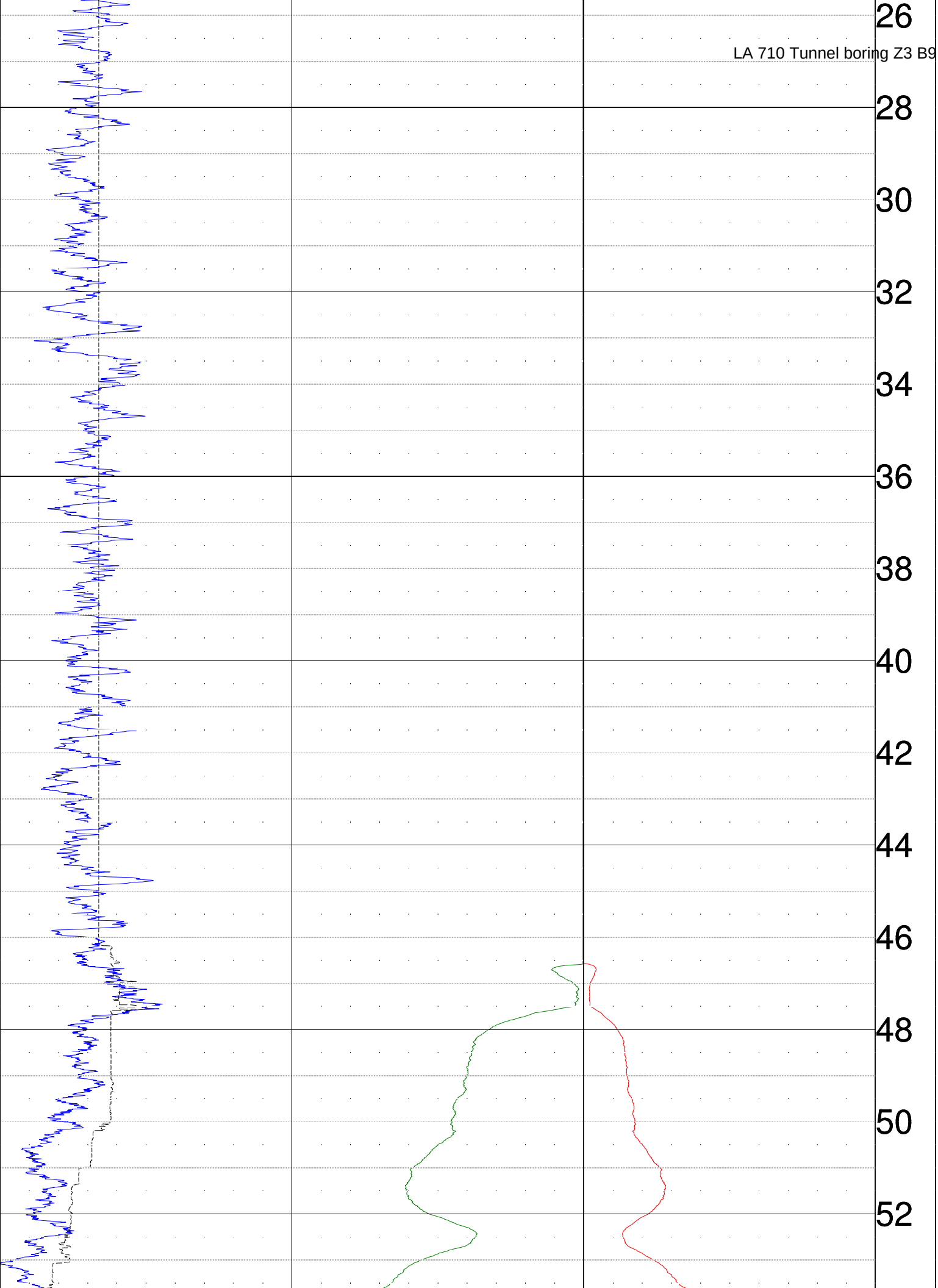
COMPANY	: CALTRANS				
WELL	: Z3 B9				
LOCATION/FIELD	: LA-710 TUNNEL				
COUNTY	: LA				
LOCATION	: CA				
SECTION	: None	TOWNSHIP	: None	RANGE	: None
DATE	: 4/09/09	PERMANENT DATUM	: None		
DEPTH DRILLER	: 99.44m			KB	: NA
LOG BOTTOM	: 91.9	LOG MEASURED FROM:	GL	DF	: NA
LOG TOP	: 0.9	DRL MEASURED FROM:	GL	GL	: NA
CASING DIAMETER	: 9.4	LOGGING UNIT	: 7311		
CASING TYPE	: Steel	FIELD OFFICE	: 7311		
CASING THICKNESS:	N/A	RECORDED BY	: DH/DG		
BIT SIZE	: 9.4cm	BOREHOLE FLUID	: 0	FILE	: PROCESSE
MAGNETIC DECL.	: 12.85	RM	: 0	TYPE	: 9065A
MATRIX DENSITY	: 2.71	RM TEMPERATURE	: 0	LGDATE	: 4/09/09.
NEUTRON MATRIX	: DOLOMITE	MATRIX DELTA T	: 140		
				THRESH:	2500

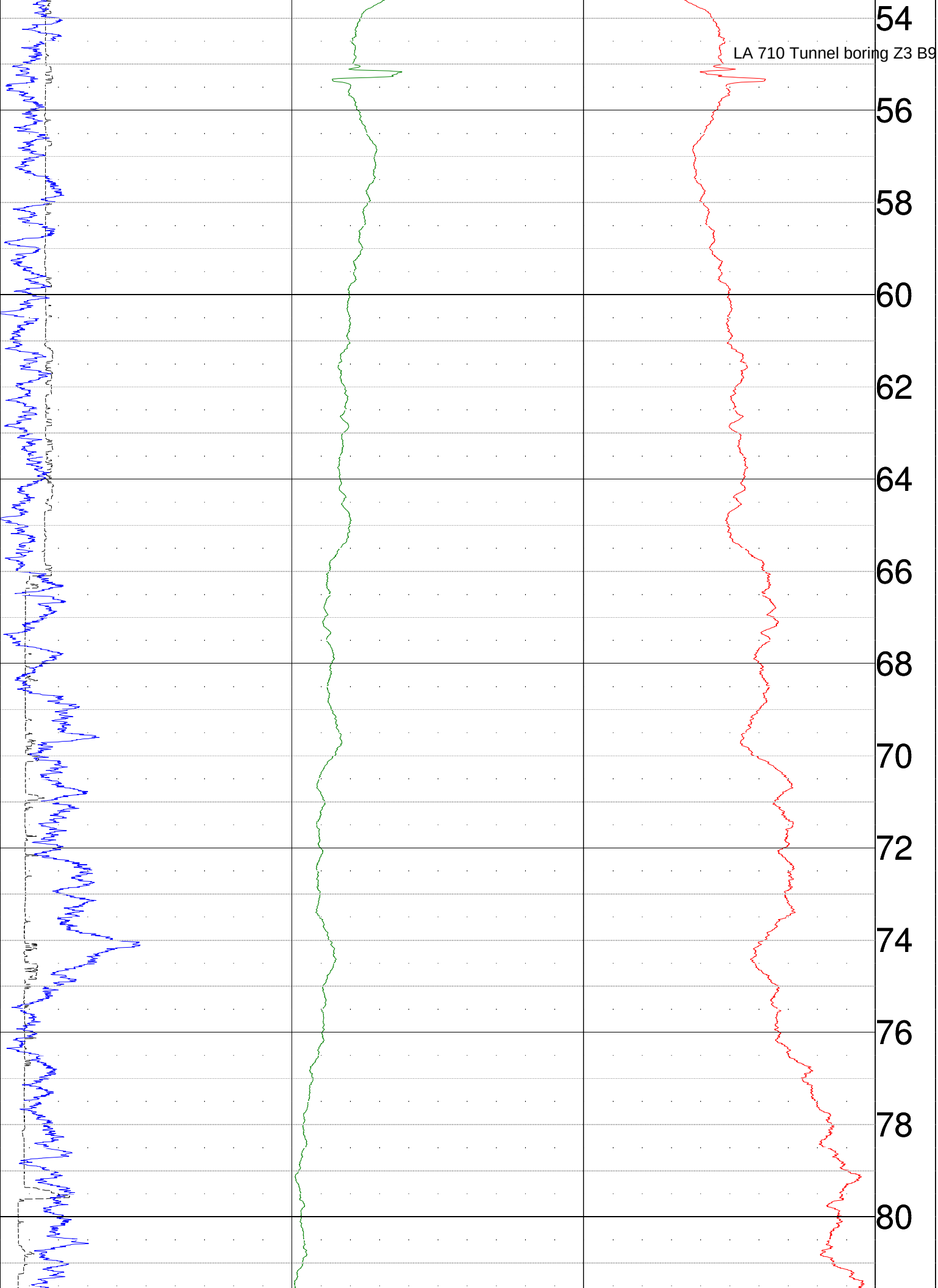
OTHER SERVICES:
IND-CAL
AC TEL
PSLOG

STEEL CASING INSTALLED TO ~46M DEPTH DUE TO UNSTABLE MATERIAL
EA: 07-187900. GL ELEVATION ESTIMATED FROM HANDHELD GPS 189.9M

ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS


GAMMA
27
CPS
142
CALIPER
10
CM
20
COND
15
MMHO/M
63
RES
15
OHM-M
67
METERS
LA 710 Tunnel boring Z3 B9
0
2
4
6
8
10
12
14
16
18
20
22
24


LA 710 Tunnel boring Z3 B9
26
28
30
32
34
36
38
40
42
44
46
48
50
52


LA 710 Tunnel boring Z3 B9
54
56
58
60
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78
80

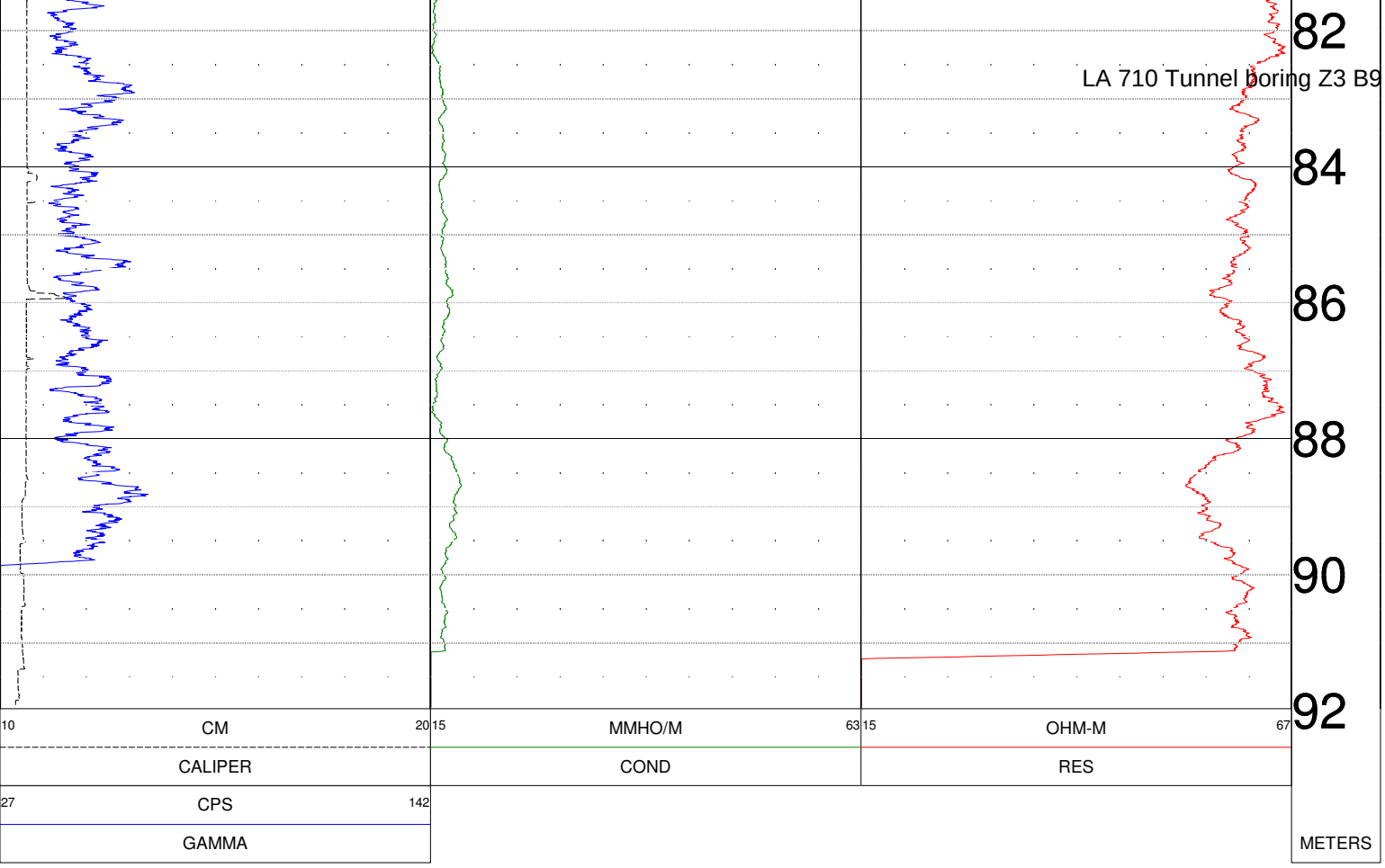

LA 710 Tunnel boring Z3 B9
82
84
86
88
90
92
10
CM
20
15
MMHO/M
63
15
OHM-M
67
CALIPER
COND
RES
27
CPS
142
GAMMA
METERS

Table 2. LA 710 Tunnel
Boring Z3 B9
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
Not Provided	44.1	144.7	472	1548	2000	6562	0.47	2.18	136.25	0.486	1.428	8.083	10142	29829	168807
	44.6	146.3	495	1624	2000	6562	0.47	2.18	136.25	0.535	1.570	8.017	11171	32784	167435
	45.1	148.0	526	1727	1923	6309	0.46	2.14	133.69	0.593	1.732	7.129	12390	36166	148891
	45.5	149.3	524	1718	1852	6076	0.46	2.10	131.15	0.576	1.678	6.437	12027	35036	134430
	46	150.9	662	2173	1923	6309	0.43	2.14	133.69	0.939	2.691	6.668	19616	56210	139256
	46.5	152.6	521	1709	2000	6562	0.46	2.18	136.25	0.592	1.733	7.941	12365	36195	165843
	47	154.2	495	1624	2000	6562	0.47	2.18	136.25	0.535	1.570	8.017	11171	32784	167435
	47.5	155.8	526	1727	2083	6835	0.47	2.22	138.82	0.616	1.806	8.830	12865	37717	184416
	48.5	159.1	568	1864	2083	6835	0.46	2.22	138.82	0.718	2.096	8.694	14993	43774	181579
	49	160.8	606	1988	2083	6835	0.45	2.22	138.82	0.817	2.375	8.562	17058	49598	178825
	49.5	162.4	610	2001	2174	7132	0.46	2.26	141.40	0.842	2.454	9.581	17588	51262	200107
	50	164.0	602	1976	2273	7456	0.46	2.31	143.99	0.837	2.448	10.798	17481	51123	225513
	50.5	165.7	658	2158	2381	7812	0.46	2.35	146.59	1.016	2.965	11.957	21227	61927	249719
	51.1	167.7	719	2360	2500	8202	0.45	2.39	149.21	1.237	3.599	13.289	25836	75176	277540
	51.5	169.0	741	2430	2381	7812	0.45	2.35	146.59	1.288	3.727	11.594	26910	77846	242142
	52.1	170.9	769	2524	2273	7456	0.44	2.31	143.99	1.365	3.918	10.094	28504	81824	210816
	52.5	172.2	617	2025	2273	7456	0.46	2.31	143.99	0.879	2.567	10.742	18355	53604	224348
	53	173.9	602	1976	2174	7132	0.46	2.26	141.40	0.822	2.397	9.608	17167	50072	200668
	53.5	175.5	709	2327	2381	7812	0.45	2.35	146.59	1.181	3.428	11.737	24668	71603	245130
	54	177.2	730	2395	2500	8202	0.45	2.39	149.21	1.273	3.702	13.240	26596	77310	276527
	54.6	179.1	870	2853	2632	8634	0.44	2.43	151.84	1.839	5.292	14.391	38410	110522	300568
	55	180.4	833	2734	2500	8202	0.44	2.39	149.21	1.660	4.772	12.725	34665	99663	265768
	55.1	180.8	833	2734	2500	8202	0.44	2.39	149.21	1.660	4.772	12.725	34665	99663	265768
	55.5	182.1	794	2604	2778	9113	0.46	2.47	154.48	1.559	4.537	17.015	32553	94764	355368
	55.5	182.1	800	2625	2500	8202	0.44	2.39	149.21	1.530	4.415	12.899	31948	92198	269392
	56	183.7	763	2504	2500	8202	0.45	2.39	149.21	1.393	4.035	13.081	29088	84274	273205
	56	183.7	758	2485	2381	7812	0.44	2.35	146.59	1.348	3.891	11.515	28147	81270	240492
	56.5	185.4	741	2430	2381	7812	0.45	2.35	146.59	1.288	3.727	11.594	26910	77846	242142
	56.5	185.4	758	2485	2381	7812	0.44	2.35	146.59	1.348	3.891	11.515	28147	81270	240492
	57	187.0	800	2625	2500	8202	0.44	2.39	149.21	1.530	4.415	12.899	31948	92198	269392
	57	187.0	787	2583	2500	8202	0.44	2.39	149.21	1.482	4.282	12.962	30949	89440	270723
	57.4	188.3	877	2878	2778	9113	0.44	2.47	154.48	1.904	5.501	16.555	39767	114895	345748
	57.6	189.0	885	2903	2632	8634	0.44	2.43	151.84	1.905	5.471	14.304	39782	114273	298739
	57.9	190.0	935	3066	2632	8634	0.43	2.43	151.84	2.124	6.067	14.011	44368	126701	292624
	58.1	190.6	909	2983	2500	8202	0.42	2.39	149.21	1.975	5.625	12.304	41255	117478	256982
	58.5	191.9	990	3248	2632	8634	0.42	2.43	151.84	2.384	6.760	13.664	49796	141178	285387
	58.6	192.3	943	3095	2500	8202	0.42	2.39	149.21	2.127	6.028	12.102	44427	125904	252752

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B9
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	59	193.6	1010	3314	2632	8634	0.41	2.43	151.84	2.482	7.016	13.535	51829	146531	282677
	59.1	193.9	1020	3348	2500	8202	0.40	2.39	149.21	2.489	6.968	11.620	51976	145539	242687
	59.6	195.5	971	3185	2778	9113	0.43	2.47	154.48	2.332	6.673	15.983	48714	139363	333818
	59.6	195.5	893	2929	2778	9113	0.44	2.47	154.48	1.973	5.691	16.463	41199	118851	343838
	60	196.9	943	3095	2778	9113	0.43	2.47	154.48	2.202	6.320	16.157	45996	131990	337444
	60.1	197.2	1020	3348	2778	9113	0.42	2.47	154.48	2.577	7.328	15.658	53812	153040	327021
	60.5	198.5	1053	3454	2778	9113	0.42	2.47	154.48	2.742	7.766	15.438	57264	162189	322419
	60.5	198.5	1111	3645	2778	9113	0.40	2.47	154.48	3.055	8.583	15.020	63803	179257	313699
	61	200.1	1064	3490	2500	8202	0.39	2.39	149.21	2.705	7.517	11.332	56494	156990	236663
	61.1	200.5	1075	3528	2941	9650	0.42	2.52	157.13	2.910	8.281	17.893	60779	172961	373702
	61.5	201.8	1042	3418	2778	9113	0.42	2.47	154.48	2.685	7.616	15.513	56077	159055	324000
	61.5	201.8	1075	3528	2778	9113	0.41	2.47	154.48	2.861	8.079	15.279	59753	168728	319100
	61.9	203.1	935	3066	2632	8634	0.43	2.43	151.84	2.124	6.067	14.011	44368	126701	292624
	62.1	203.7	1042	3418	2941	9650	0.43	2.52	157.13	2.731	7.802	18.132	57040	162939	378688
	62.4	204.7	980	3217	2941	9650	0.44	2.52	157.13	2.419	6.955	18.548	50527	145264	387371
	62.5	205.1	1099	3605	3333	10936	0.44	2.60	162.47	3.143	9.045	24.727	65638	188911	516427
	62.9	206.4	1087	3566	2778	9113	0.41	2.47	154.48	2.924	8.242	15.195	61059	172138	317357
	63.1	207.0	1075	3528	2778	9113	0.41	2.47	154.48	2.861	8.079	15.279	59753	168728	319100
	63.4	208.0	1000	3281	2632	8634	0.42	2.43	151.84	2.432	6.886	13.601	50797	143819	284052
	63.6	208.7	1190	3906	2632	8634	0.37	2.43	151.84	3.447	9.454	12.248	71992	197451	255794
	64	210.0	1136	3728	2941	9650	0.41	2.52	157.13	3.250	9.180	17.440	67882	191735	364231
	64	210.0	1299	4261	2941	9650	0.38	2.52	157.13	4.245	11.707	16.113	88662	244513	336523
	64.5	211.6	1031	3382	2941	9650	0.43	2.52	157.13	2.675	7.651	18.206	55870	159784	380246
	64.5	211.6	1064	3490	2778	9113	0.41	2.47	154.48	2.800	7.920	15.359	58489	165413	320786
	65	213.3	980	3217	2778	9113	0.43	2.47	154.48	2.378	6.797	15.922	49674	141953	332538
	65.1	213.6	962	3155	2941	9650	0.44	2.52	157.13	2.327	6.703	18.670	48602	139990	389937
	65.5	214.9	885	2903	2632	8634	0.44	2.43	151.84	1.905	5.471	14.304	39782	114273	298739
	66	216.5	1124	3686	2632	8634	0.39	2.43	151.84	3.071	8.527	12.749	64130	178092	266275
	66.7	218.8	1163	3815	3125	10253	0.42	2.56	159.79	3.461	9.826	20.382	72281	205229	425688
	67.2	220.5	1429	4687	3571	11717	0.40	2.65	165.16	5.399	15.169	26.546	112764	316814	554424
	67.6	221.8	1471	4825	3333	10936	0.38	2.60	162.47	5.628	15.525	21.413	117550	324240	447210
	68.1	223.4	1220	4001	3333	10936	0.42	2.60	162.47	3.871	11.013	23.756	80837	230019	496162
	68.6	225.1	1042	3418	3333	10936	0.45	2.60	162.47	2.824	8.166	25.152	58979	170554	525306
	69	226.4	1000	3281	3333	10936	0.45	2.60	162.47	2.603	7.550	25.447	54355	157689	531471
	69.4	227.7	962	3155	3125	10253	0.45	2.56	159.79	2.367	6.852	21.841	49426	143110	456162
	70	229.7	980	3217	3125	10253	0.45	2.56	159.79	2.460	7.112	21.716	51383	148541	453552
	70.9	232.6	1176	3860	2778	9113	0.39	2.47	154.48	3.425	9.526	14.527	71530	198955	303396

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B9
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	70.9	232.6	893	2929	2632	8634	0.43	2.43	151.84	1.939	5.565	14.258	40495	116218	297788
	71.5	234.6	775	2543	2941	9650	0.46	2.52	157.13	1.513	4.425	19.756	31589	92410	412620
	72	236.2	901	2956	3125	10253	0.45	2.56	159.79	2.077	6.044	22.227	43389	126234	464212
	72.5	237.9	676	2217	2941	9650	0.47	2.52	157.13	1.149	3.383	20.241	23999	70661	422742
	73	239.5	847	2780	2941	9650	0.45	2.52	157.13	1.808	5.259	19.363	37753	109842	404401
	73.5	241.1	990	3248	3125	10253	0.44	2.56	159.79	2.509	7.248	21.651	52406	151370	452189
	74	242.8	901	2956	2778	9113	0.44	2.47	154.48	2.008	5.789	16.416	41945	120905	342843
	74.5	244.4	917	3010	2632	8634	0.43	2.43	151.84	2.047	5.858	14.114	42755	122350	294775
	75	246.1	1124	3686	3125	10253	0.43	2.56	159.79	3.231	9.215	20.688	67491	192452	432076
	75.5	247.7	1099	3605	3125	10253	0.43	2.56	159.79	3.091	8.837	20.875	64557	184561	435988
	76	249.3	1316	4317	3125	10253	0.39	2.56	159.79	4.432	12.340	19.088	92554	257718	398658
	76.5	251.0	1449	4755	3333	10936	0.38	2.60	162.47	5.466	15.125	21.629	114167	315888	451720
	77	252.6	1538	5047	3571	11717	0.39	2.65	165.16	6.262	17.359	25.396	130780	362543	530403
	77.5	254.3	1250	4101	3125	10253	0.40	2.56	159.79	3.999	11.237	19.664	83530	234680	410690
	78.1	256.2	990	3248	2778	9113	0.43	2.47	154.48	2.426	6.924	15.859	50662	144614	331220
	78.6	257.9		NA	3125	10253	NA	NA	NA	NA	NA	NA	NA	NA	NA
	79.1	259.5	1031	3382	3571	11717	0.45	2.65	165.16	2.812	8.180	29.996	58727	170843	626474
	79.6	261.2	909	2983	2941	9650	0.45	2.52	157.13	2.080	6.021	19.000	43445	125745	396813
	80	262.5	667	2187	2941	9650	0.47	2.52	157.13	1.119	3.295	20.282	23364	68825	423588
	80.5	264.1	847	2780	2778	9113	0.45	2.47	154.48	1.777	5.149	16.724	37116	107539	349281
	81	265.7	758	2485	2632	8634	0.45	2.43	151.84	1.396	4.062	14.982	29154	84827	312910
	81.5	267.4	719	2360	3125	10253	0.47	2.56	159.79	1.325	3.900	23.230	27669	81459	485171
	82	269.0	952	3125	3571	11717	0.46	2.65	165.16	2.400	7.015	30.546	50118	146516	637953
	82.5	270.7	1493	4897	3571	11717	0.39	2.65	165.16	5.894	16.434	25.887	123089	343220	540658
	83.1	272.6	1471	4825	3571	11717	0.40	2.65	165.16	5.722	15.996	26.116	119495	334089	545450
	83.6	274.3	1408	4621	3333	10936	0.39	2.60	162.47	5.163	14.366	22.033	107826	300042	460175
	84.1	275.9	1099	3605	3125	10253	0.43	2.56	159.79	3.091	8.837	20.875	64557	184561	435988
	84.6	277.6	990	3248	3125	10253	0.44	2.56	159.79	2.509	7.248	21.651	52406	151370	452189
	85.1	279.2	1274	4179	2857	9374	0.38	2.50	155.80	4.050	11.145	14.973	84586	232770	312720
	85.1	279.2	1250	4101	2941	9650	0.39	2.52	157.13	3.933	10.931	16.529	82137	228306	345223
	85.6	280.8	1136	3728	3226	10583	0.43	2.58	161.13	3.333	9.527	22.414	69611	198970	468129
	86.1	282.5	1053	3454	3125	10253	0.44	2.56	159.79	2.836	8.146	21.215	59235	170123	443084
	86.6	284.1	930	3052	3125	10253	0.45	2.56	159.79	2.215	6.430	22.043	46260	134283	460385
	87.1	285.8	1170	3837	3571	11717	0.44	2.65	165.16	3.619	10.422	28.920	75585	217675	603999
	87.5	287.1	1399	4589	3846	12619	0.42	2.69	167.86	5.260	14.978	32.764	109851	312813	684276
	87.5	287.1	1408	4621	3846	12619	0.42	2.69	167.86	5.334	15.176	32.664	111403	316957	682206
	88	288.7	1220	4001	4167	13670	0.45	2.73	170.58	4.064	11.810	42.019	84870	246658	877575

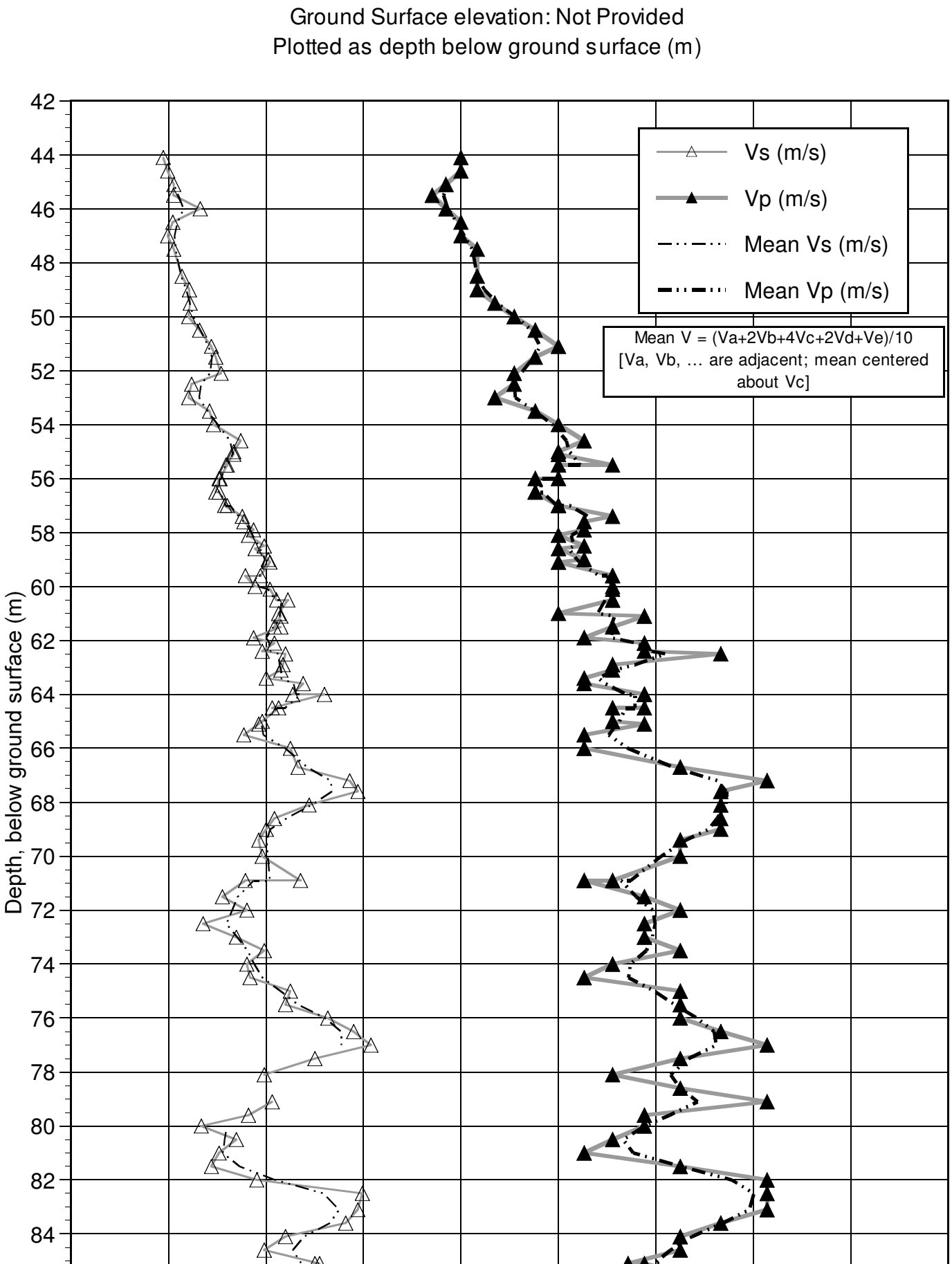
γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

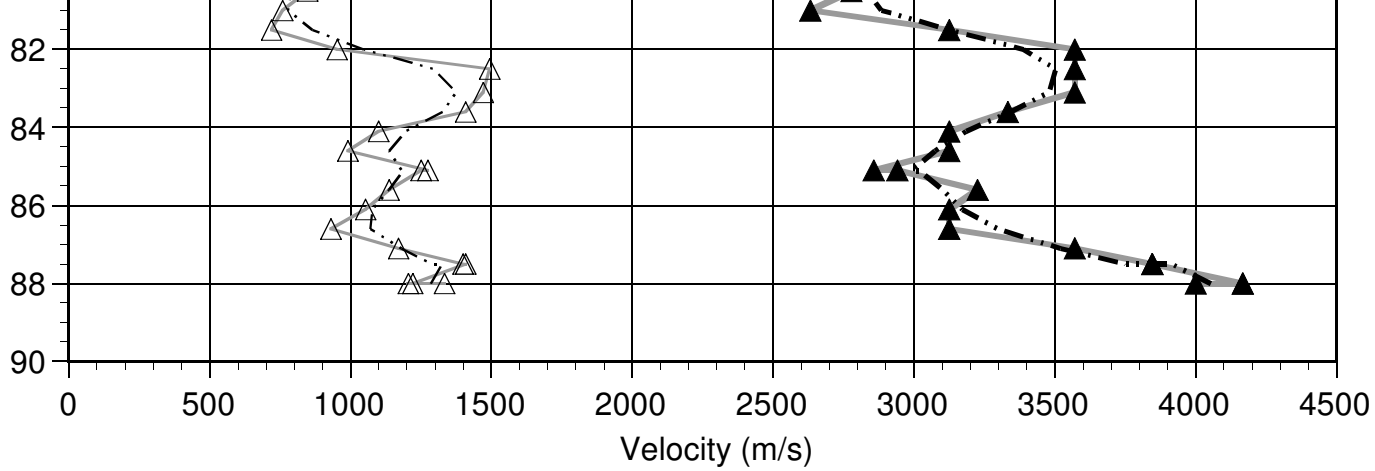
Table 2. LA 710 Tunnel
Boring Z3 B9
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	88	288.7	1205	3953	4167	13670	0.45	2.73	170.58	3.966	11.537	42.149	82837	240953	880285
	88	288.7	1333	4374	4000	13123	0.44	2.71	169.22	4.819	13.854	36.945	100643	289350	771599

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Figure 1. LA 710 Tunnel
Boring Z3 B9
Downhole Interval Velocities



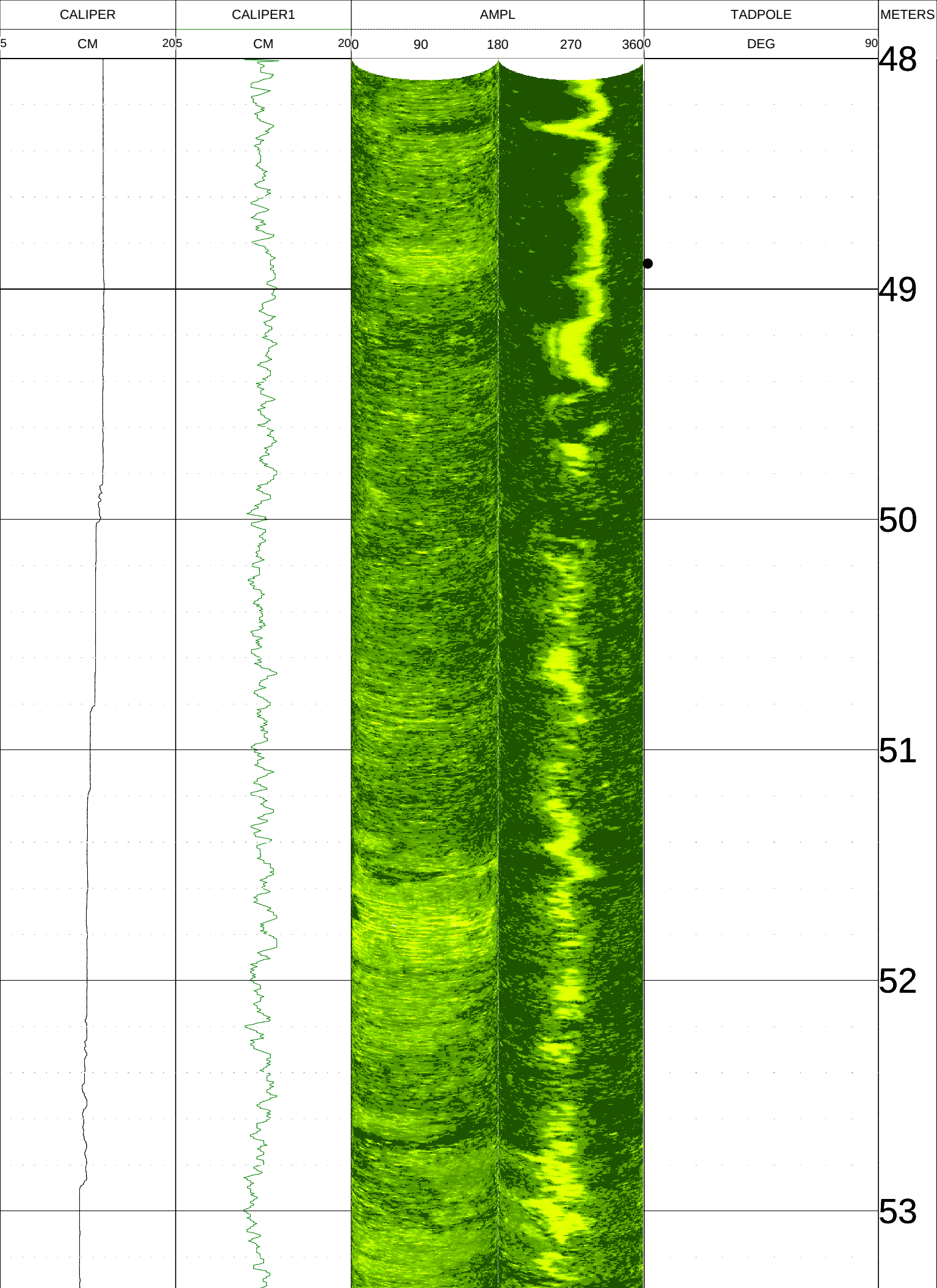

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84
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Velocity (m/s)

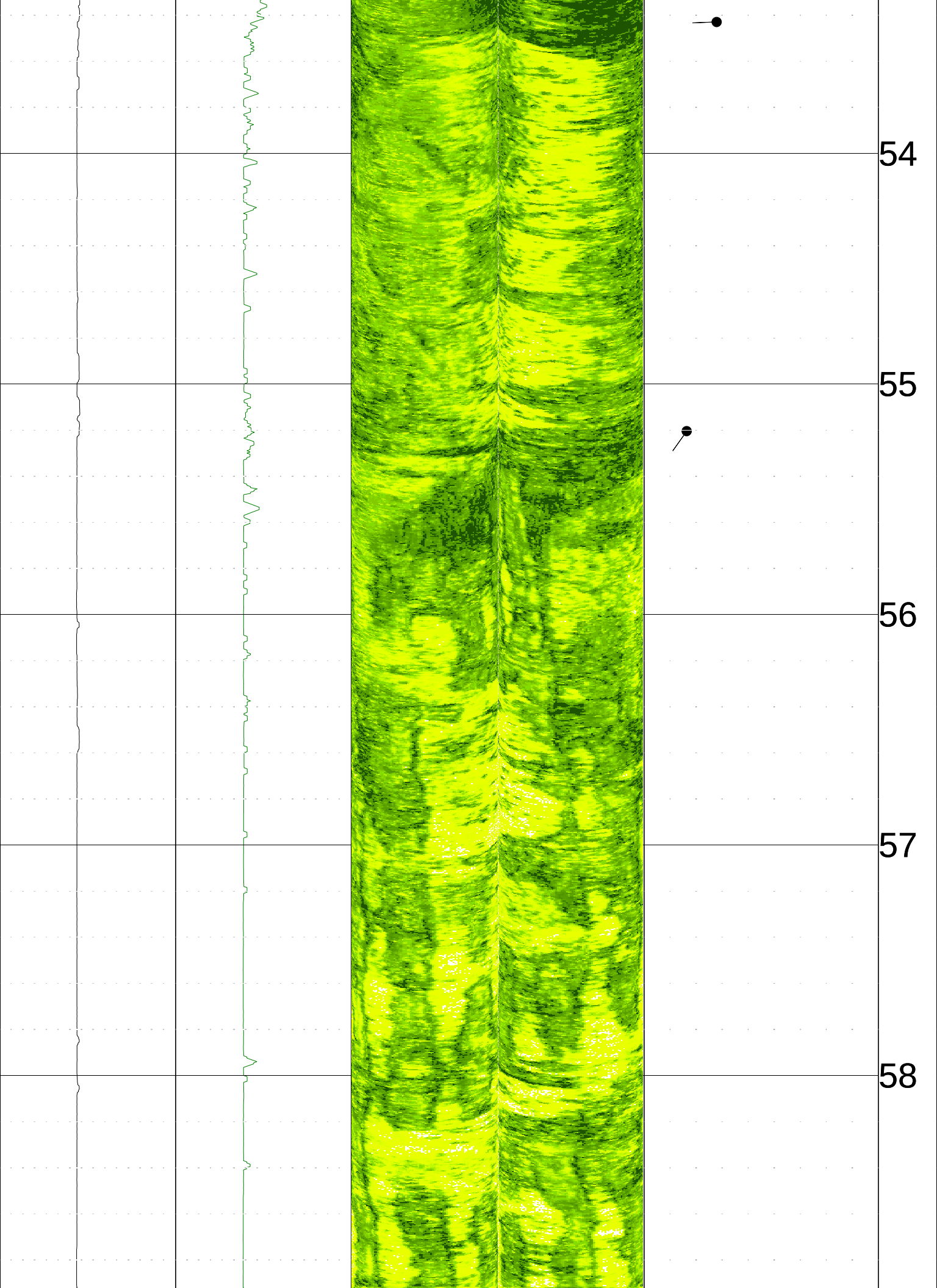


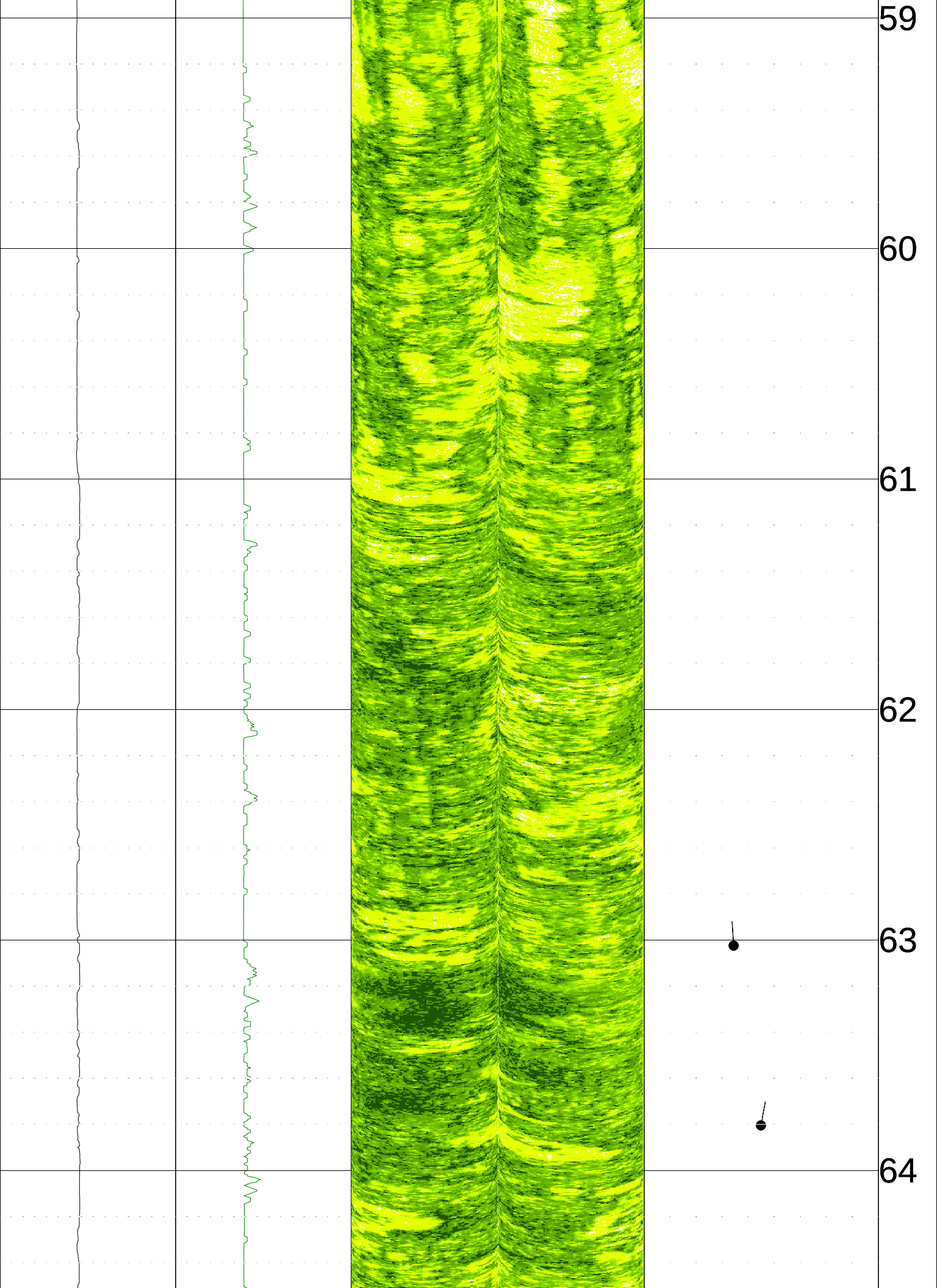
Z3 B9

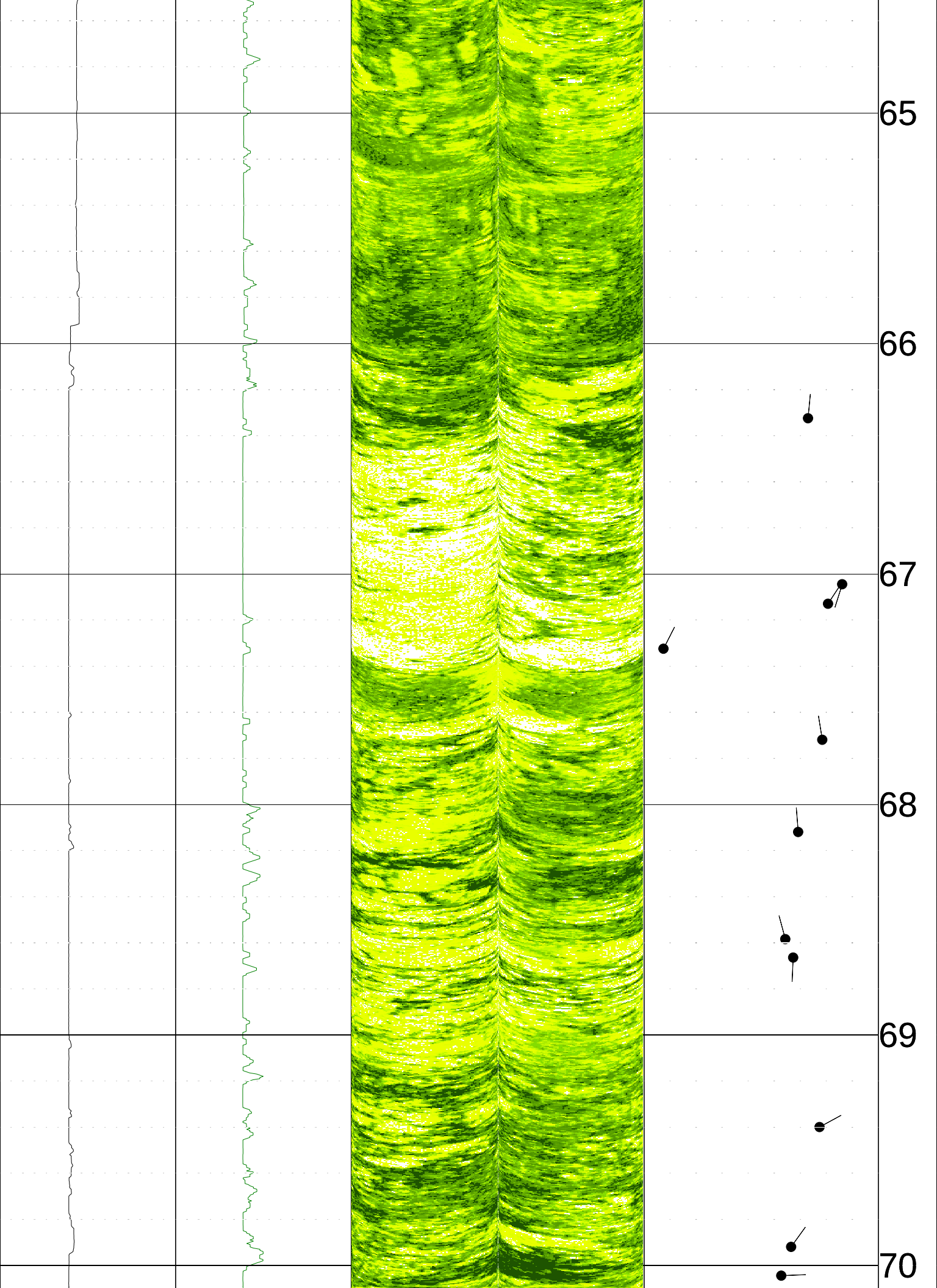
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WELL	: Z3 B9		IND-CAL.
FIELD	: LA 710 TUNNEL.		AC TEL.
COUNTY	: LA		PSLOG.
STATE	: CA		
LOCATION	:		
SECTION	: None		
TOWNSHIP	: None		
RANGE	: None		
API NO.	:		
UNIQUE WELL ID.	:		
PERMANENT DATUM	: None	ELEVATION KB	: NA
LOG MEASURED FROM	: GL	ELEVATION DF	: NA
DRL MEASURED FROM	: GL	ELEVATION GL	: 189.9m.
DATE	: 4/09/09.	RIG NUMBER	:
DEPTH DRILLER	: 99.44m.	LOGGER TD	:
BIT SIZE	: 9.4cm.	ARRIVAL TIME	:
LOG TOP	: 47.89	DEPARTURE TIME	:
LOG BOTTOM	: 91.84	CIRC STOPPED	: 4/9 AM
CASING OD	:		
CASING BOTTOM	: ~46.4m.		
CASING TYPE	: Steel		
BOREHOLE FLUID	: 0		
RM TEMPERATURE	: 0		
MUD RES	: 0		
MUD WEIGHT	:		
WITNESSED BY	:		
RECORDED BY	: DH/DG		
REMARKS 1	:		
REMARKS 2	: EA: 07-187900		

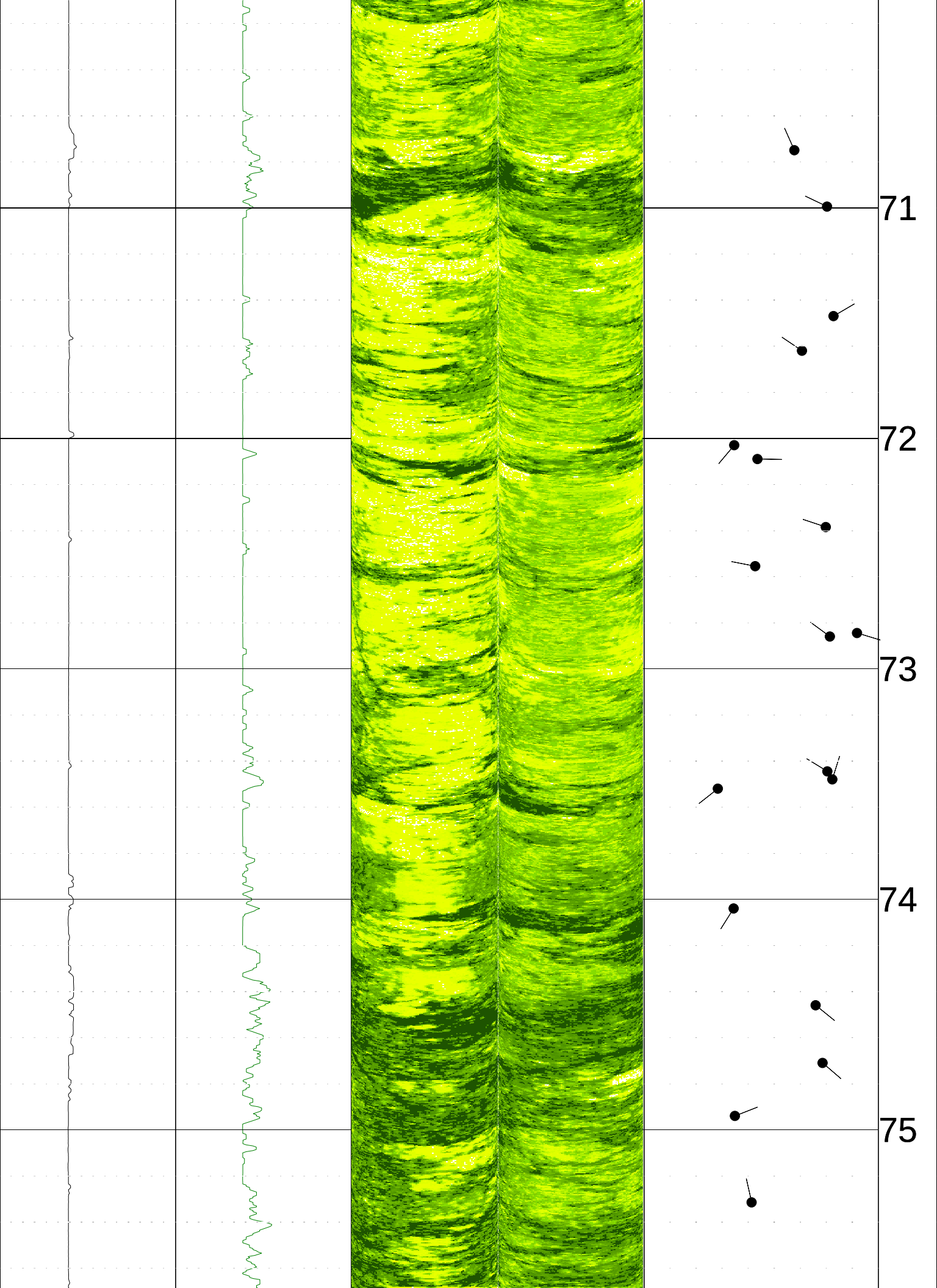
ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS

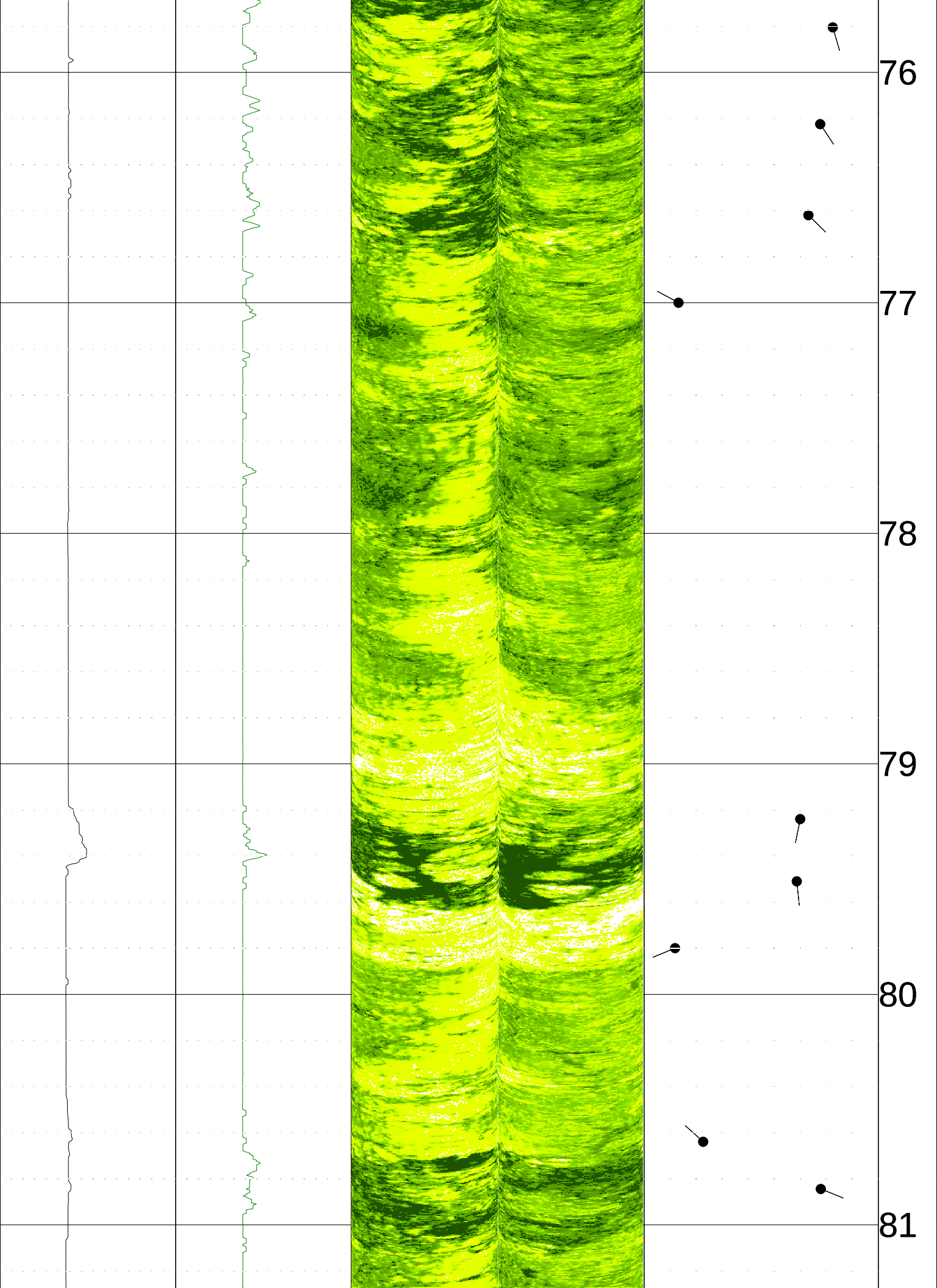

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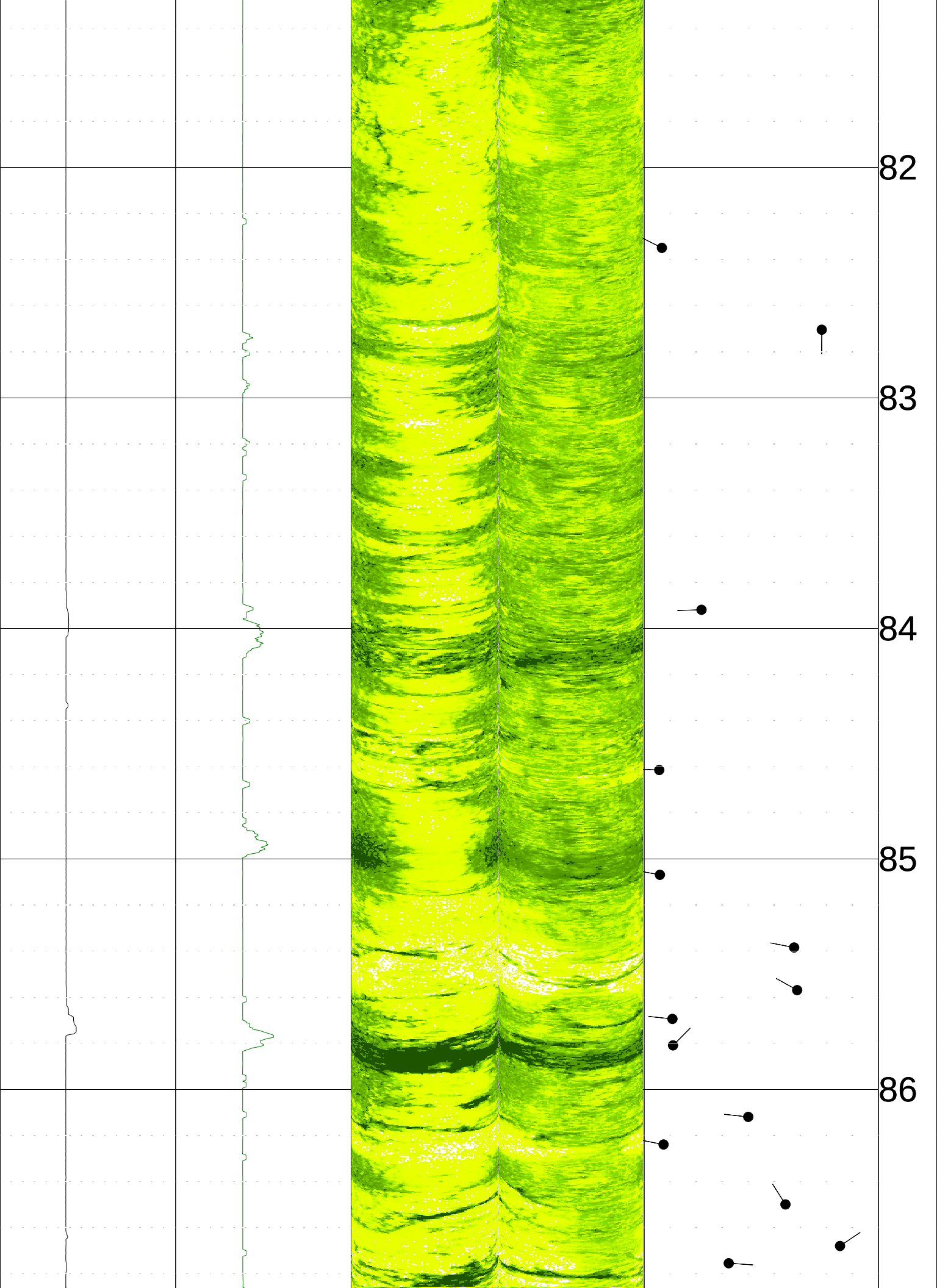

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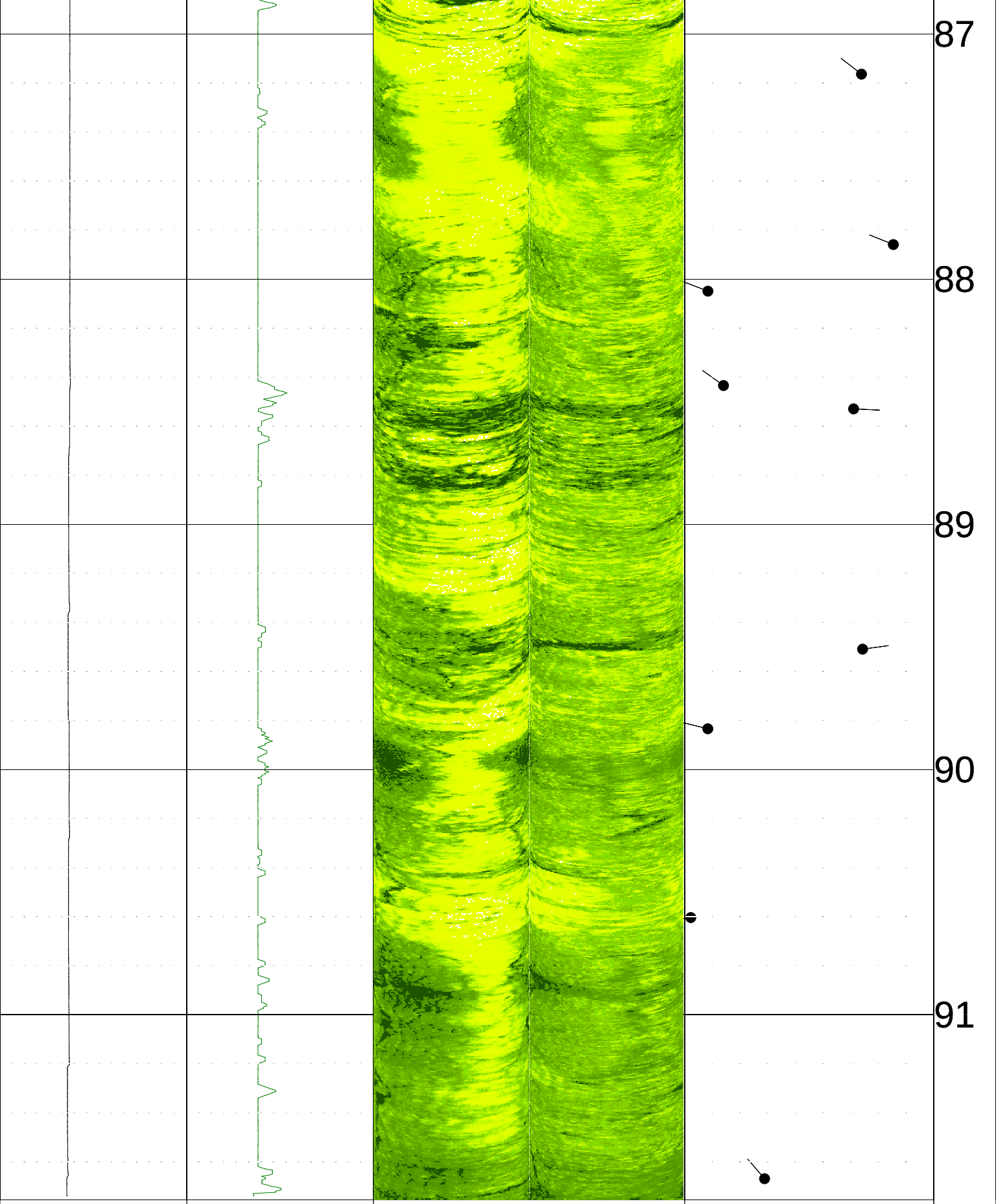

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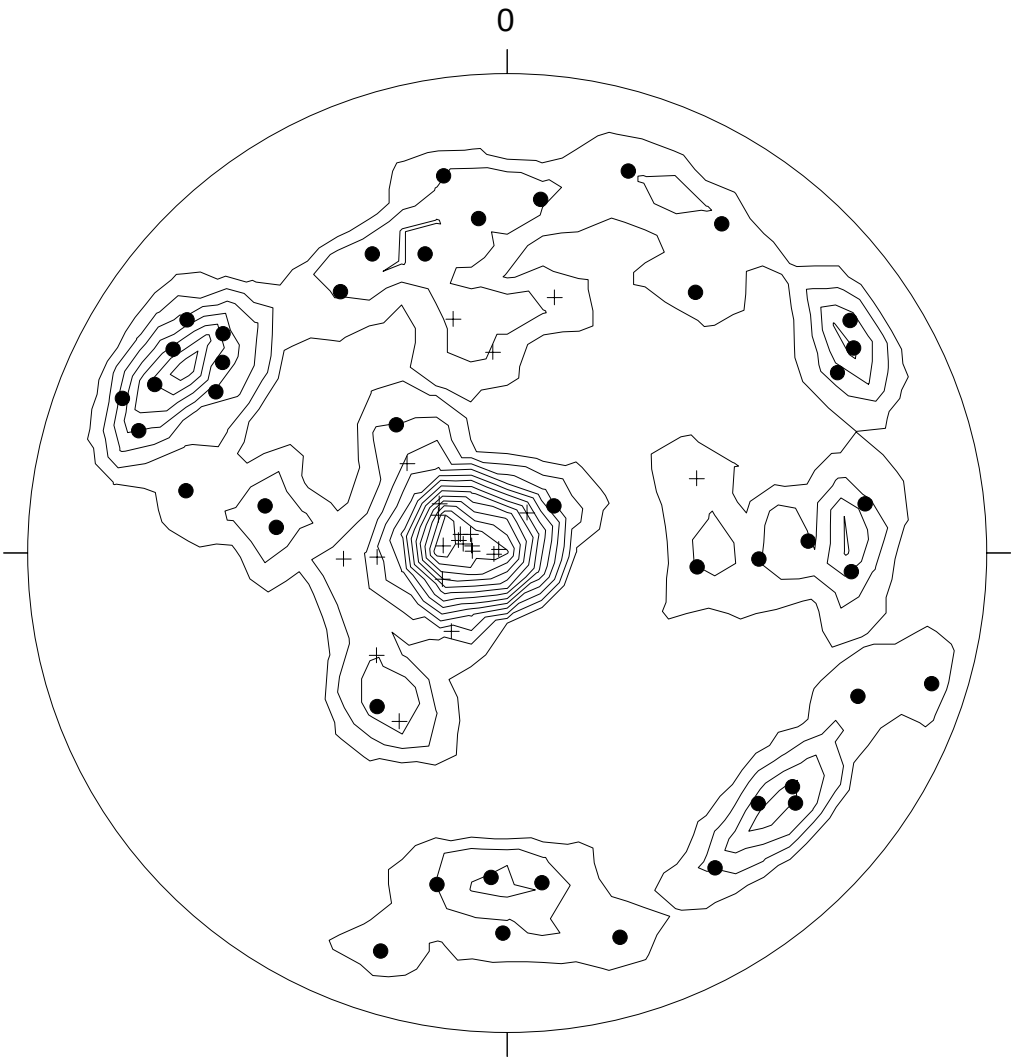

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81


82
83
84
85
86


87
88
89
90
91
5
CM
20
5
CM
20
0
90
180
270
360
0
DEG
90
CALIPER
CALIPER1
AMPL
TADPOLE
METERS



LA 710 Tunnel, boring Z3 B9

+ n=23 (P)
• n=43 (P)

Stereonet contour plot of poles to planes,
Both bedding and fractures

n=66
max. dens.= 13.48 (at 270/ 78)
min. dens.=0.00
Contours at every integer between
1 and 13, inclusive:
(Multiples of random distribution)

Apparent bedding denoted as cross
Apparent fractures denoted as solid circle
Plotted on upper hemisphere



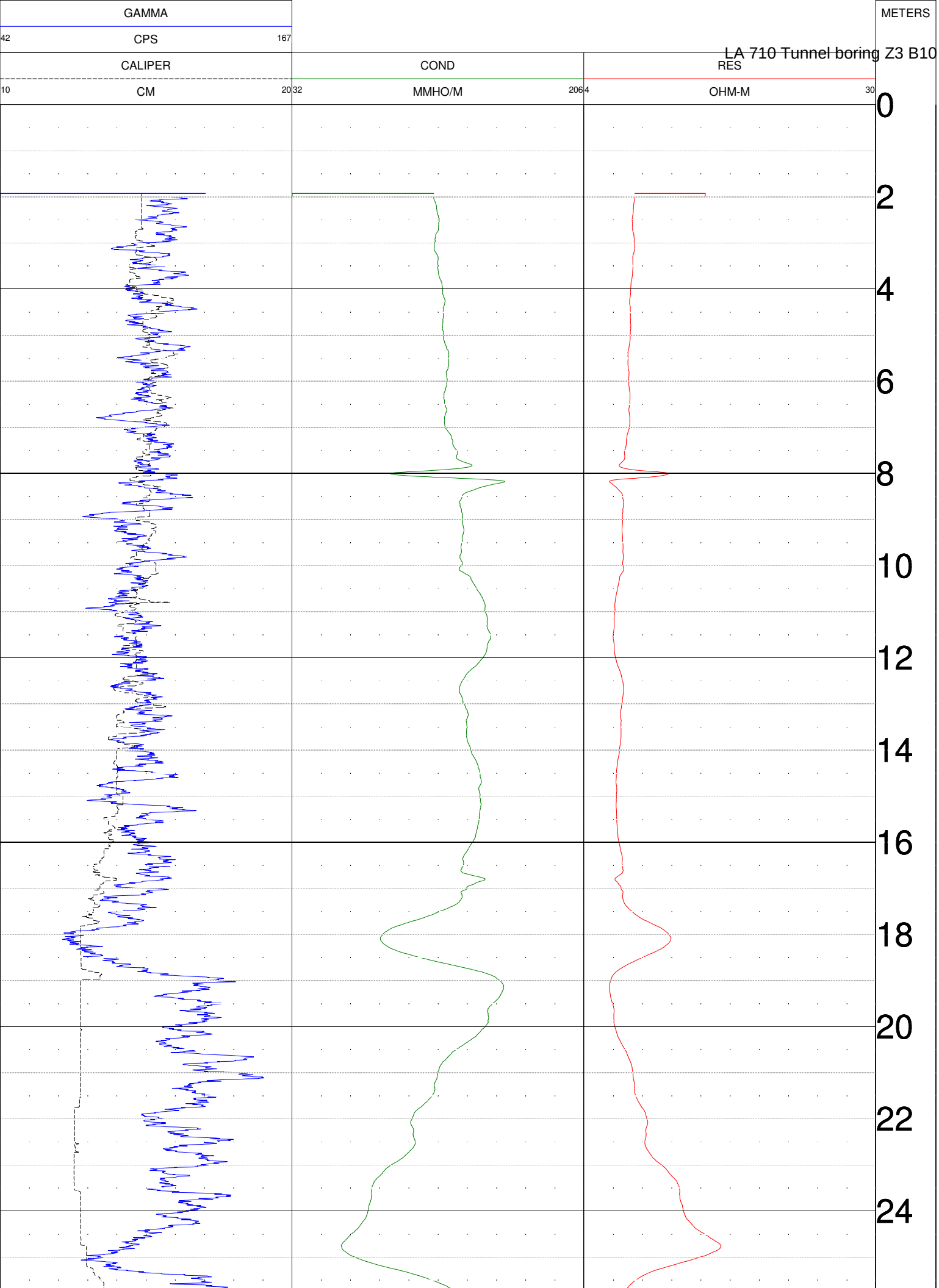
LA 710 Tunnel boring Z3 B10

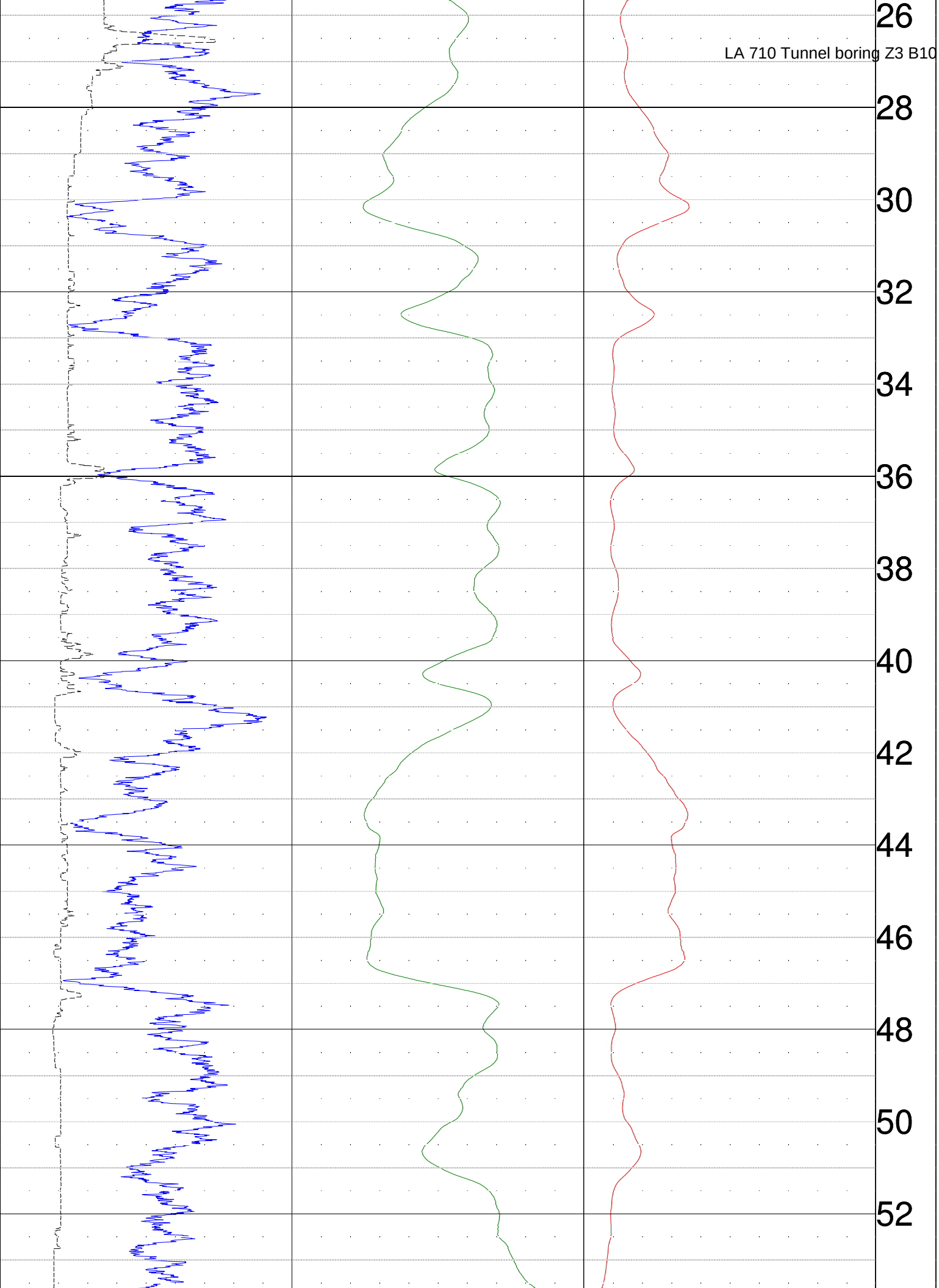
COMPANY	: CALTRANS				
WELL	: Z3 B10				
LOCATION/FIELD	: LA 710 TUNNEL				
COUNTY	: LA				
LOCATION	: CA				
SECTION	: None	TOWNSHIP	: None	RANGE	: None
DATE	: 3/05/09	PERMANENT DATUM	: NONE		
DEPTH DRILLER	: 114.3M			KB	: NA
LOG BOTTOM	: 114.8	LOG MEASURED FROM:	GL	DF	: NA
LOG TOP	: 1.9	DRL MEASURED FROM:	GL	GL	: NA
CASING DIAMETER	: N/A	LOGGING UNIT	: 7311		
CASING TYPE	: N/A	FIELD OFFICE	: 7311		
CASING THICKNESS:	0	RECORDED BY	: DH/DG		
BIT SIZE	: 10.00CM	BOREHOLE FLUID	: 0	FILE	: PROCESSE
MAGNETIC DECL.	: 12.85	RM	: 0	TYPE	: 9065A
MATRIX DENSITY	: 2.71	RM TEMPERATURE	: 0	LGDATE	: 3/05/09.
NEUTRON MATRIX	: DOLOMITE	MATRIX DELTA T	: 140		
				THRESH:	2500

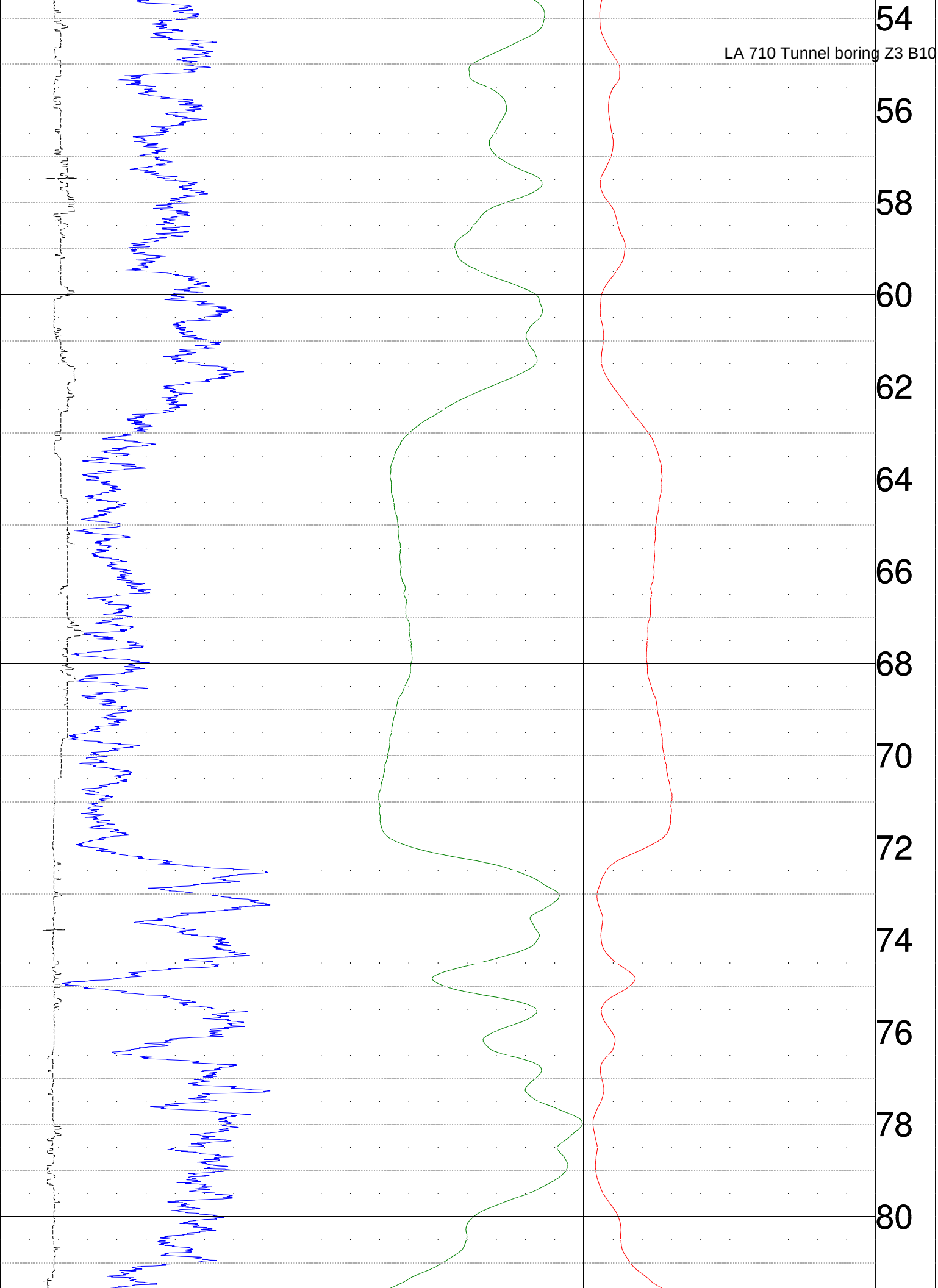
OTHER SERVICES:
IND-CAL
AC TEL
PSLOG

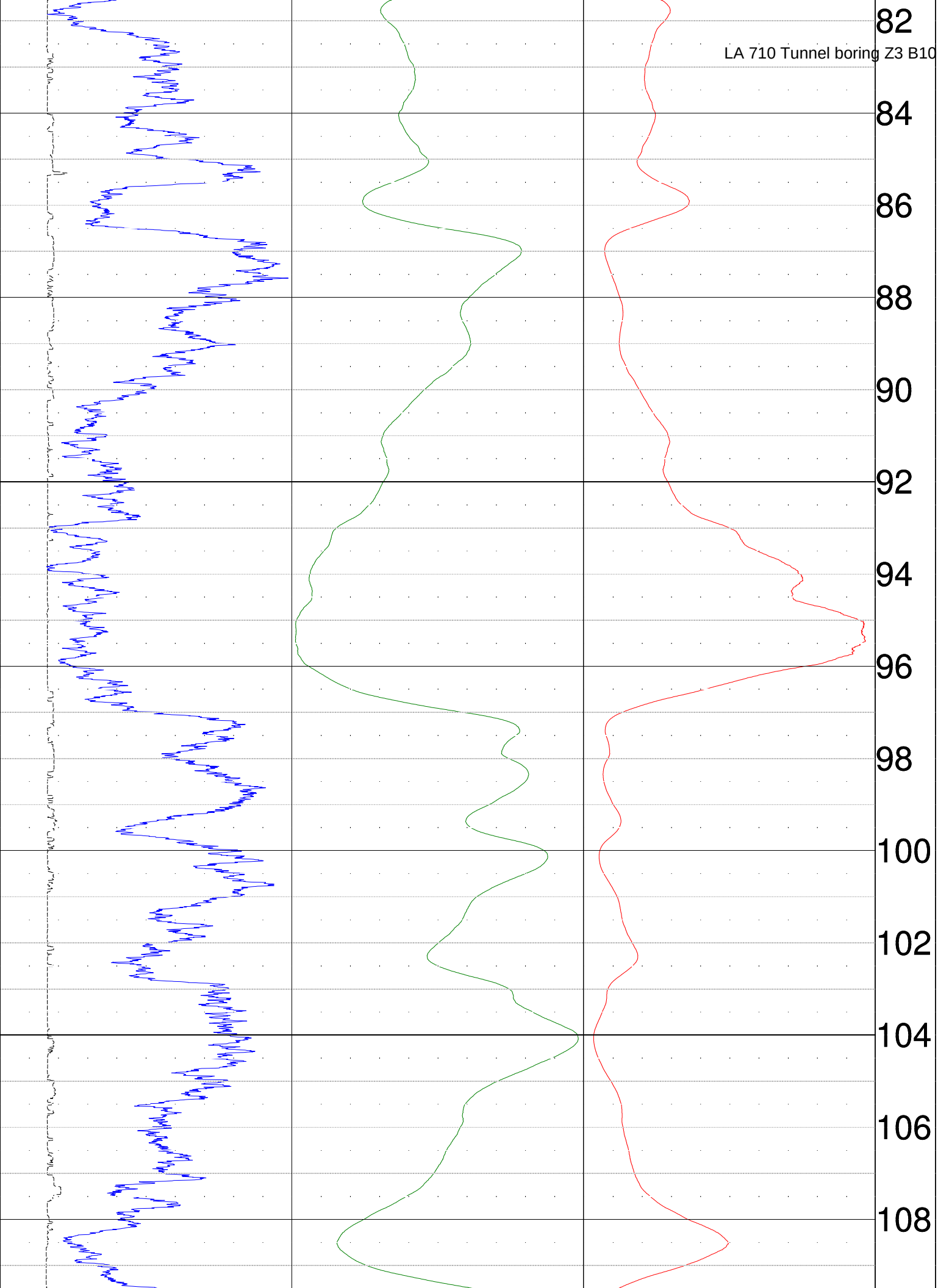
LOG DEPTH IN METERS, CALIPER DIAMETER IN CM
EA: 07-187900. GL ELEVATION ESTIMATED FROM HANDHELD GPS 195.1M

ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS


GAMMA
42
CPS
167
CALIPER
10
CM
20
COND
32
MMHO/M
2064
RES
4
OHM-M
30
METERS
LA 710 Tunnel boring Z3 B10
0
2
4
6
8
10
12
14
16
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22
24


LA 710 Tunnel boring Z3 B10
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LA 710 Tunnel boring Z3 B10
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LA 710 Tunnel boring Z3 B10
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108

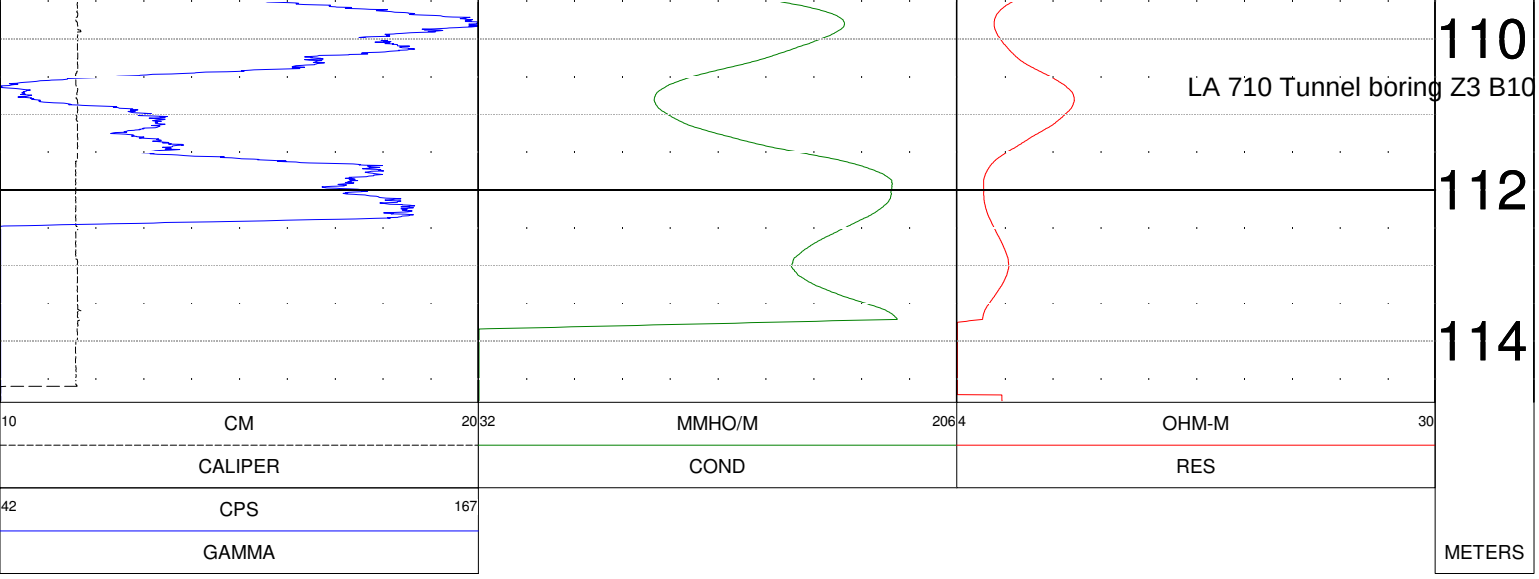

LA 710 Tunnel boring Z3 B10
110
112
114
10
CM
20
32
MMHO/M
206
4
OHM-M
30
CALIPER
COND
RES
42
CPS
167
GAMMA
METERS

Table 2. LA 710 Tunnel
Boring Z3 B10
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
Not Provided	1.4	4.6	189	621		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2	6.6	183	601	417	1367	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2.5	8.2	192	631	446	1465	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3	9.8	202	664	476	1562	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3.5	11.5	214	701	595	1953	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4	13.1	215	704	562	1843	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4.5	14.8	207	678	581	1907	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5	16.4	219	719	625	2051	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5.5	18.0	237	777	694	2278	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6	19.7	231	759	694	2278	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6.5	21.3	238	781	704	2310	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7	23.0	239	785	704	2310	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7.5	24.6	236	774	694	2278	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8	26.2	242	792	676	2217	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8.5	27.9	253	828	781	2563	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9	29.5	254	833	806	2646	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9.6	31.5	235	770	568	1864	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9.9	32.5	248	812	633	2076	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10	32.8	244	800	538	1764	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10.4	34.1	278	911	746	2448	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10.5	34.4	278	911	758	2485	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10.9	35.8	276	906	694	2278	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11	36.1	275	901	820	2689	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11.5	37.7	245	804	617	2025	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11.6	38.1	243	796	610	2001	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12	39.4	226	742	685	2247	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12.1	39.7	230	756	758	2485	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12.5	41.0	233	763	694	2278	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12.6	41.3	233	763	556	1823	NA	NA	NA	NA	NA	NA	NA	NA	NA
	13	42.7	217	713	490	1608	NA	NA	NA	NA	NA	NA	NA	NA	NA
	13	42.7	211	692	521	1709	NA	NA	NA	NA	NA	NA	NA	NA	NA
	13.5	44.3	198	648	463	1519	NA	NA	NA	NA	NA	NA	NA	NA	NA
	13.5	44.3	195	638	427	1402	NA	NA	NA	NA	NA	NA	NA	NA	NA
	14	45.9	193	633	481	1577	NA	NA	NA	NA	NA	NA	NA	NA	NA
	14	45.9	193	633	490	1608	NA	NA	NA	NA	NA	NA	NA	NA	NA
	14.5	47.6	195	641	463	1519	NA	NA	NA	NA	NA	NA	NA	NA	NA
	14.5	47.6	198	648	543	1783	NA	NA	NA	NA	NA	NA	NA	NA	NA

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B10
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	15	49.2	205	672	658	2158	NA	NA	NA	NA	NA	NA	NA	NA	NA
	15	49.2	207	681	521	1709	NA	NA	NA	NA	NA	NA	NA	NA	NA
	15.5	50.9	218	716	617	2025	NA	NA	NA	NA	NA	NA	NA	NA	NA
	15.5	50.9	222	729	714	2343	NA	NA	NA	NA	NA	NA	NA	NA	NA
	16	52.5	230	756	658	2158	NA	NA	NA	NA	NA	NA	NA	NA	NA
	16	52.5	231	759	658	2158	NA	NA	NA	NA	NA	NA	NA	NA	NA
	16.4	53.8	243	796	735	2412	NA	NA	NA	NA	NA	NA	NA	NA	NA
	16.5	54.1	246	808	735	2412	NA	NA	NA	NA	NA	NA	NA	NA	NA
	16.9	55.4	249	816	625	2051	NA	NA	NA	NA	NA	NA	NA	NA	NA
	17	55.8	248	812	794	2604	NA	NA	NA	NA	NA	NA	NA	NA	NA
	17.4	57.1	235	770	676	2217	NA	NA	NA	NA	NA	NA	NA	NA	NA
	17.5	57.4	238	781	704	2310	NA	NA	NA	NA	NA	NA	NA	NA	NA
	17.9	58.7	272	892	794	2604	NA	NA	NA	NA	NA	NA	NA	NA	NA
	18	59.1	272	892	847	2780	NA	NA	NA	NA	NA	NA	NA	NA	NA
	18.3	60.0	296	971	1136	3728	NA	NA	NA	NA	NA	NA	NA	NA	NA
	18.5	60.7	292	959	1220	4001	NA	NA	NA	NA	NA	NA	NA	NA	NA
	19	62.3	279	916	1429	4687	NA	NA	NA	NA	NA	NA	NA	NA	NA
	19	62.3	255	837	1351	4434	NA	NA	NA	NA	NA	NA	NA	NA	NA
	19.5	64.0	323	1058	1667	5468	0.48	1.98	123.58	0.206	0.610	5.224	4302	12740	109112
	19.5	64.0	316	1038	1563	5126	NA	NA	NA	NA	NA	NA	NA	NA	NA
	20	65.6	336	1101	1724	5657	0.48	2.02	126.09	0.227	0.673	5.701	4750	14064	119067
	20	65.6	388	1272	1724	5657	0.47	2.02	126.09	0.303	0.894	5.600	6338	18675	116951
	20.4	66.9	376	1233	1724	5657	0.48	2.02	126.09	0.285	0.842	5.624	5962	17588	117452
	20.5	67.3	455	1491	1852	6076	0.47	2.10	131.15	0.434	1.274	6.626	9065	26615	138379
	20.9	68.6	524	1718	2000	6562	0.46	2.18	136.25	0.598	1.751	7.932	12495	36565	165670
	21	68.9	500	1640	1923	6309	0.46	2.14	133.69	0.535	1.567	7.206	11182	32735	150502
	21.5	70.5	538	1764	2000	6562	0.46	2.18	136.25	0.631	1.843	7.889	13176	38501	164762
	21.6	70.9	500	1640	2000	6562	0.47	2.18	136.25	0.546	1.601	8.003	11396	33427	167135
	22	72.2	699	2294	2174	7132	0.44	2.26	141.40	1.108	3.195	9.227	23133	66729	192714
	22	72.2	649	2130	2083	6835	0.45	2.22	138.82	0.938	2.712	8.401	19582	56640	175460
	22.5	73.8	685	2247	2174	7132	0.44	2.26	141.40	1.063	3.071	9.287	22192	64131	193968
	22.5	73.8	787	2583	2273	7456	0.43	2.31	143.99	1.430	4.095	10.007	29867	85526	208999
	23	75.5	610	2001	2273	7456	0.46	2.31	143.99	0.858	2.506	10.770	17910	52342	224941
	23.1	75.8	617	2025	2083	6835	0.45	2.22	138.82	0.847	2.460	8.522	17696	51385	177974
	23.5	77.1	610	2001	2174	7132	0.46	2.26	141.40	0.842	2.454	9.581	17588	51262	200107
	23.6	77.4	585	1919	2174	7132	0.46	2.26	141.40	0.775	2.263	9.671	16178	47271	201987
	24	78.7	649	2130	2000	6562	0.44	2.18	136.25	0.920	2.652	7.503	19220	55396	156703

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B10
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	24	78.7	730	2395	2000	6562	0.42	2.18	136.25	1.163	3.310	7.180	24286	69126	149948
	24.5	80.4	694	2278	2174	7132	0.44	2.26	141.40	1.092	3.153	9.248	22813	65846	193140
	24.5	80.4	694	2278	2174	7132	0.44	2.26	141.40	1.092	3.153	9.248	22813	65846	193140
	25	82.0	685	2247	2500	8202	0.46	2.39	149.21	1.121	3.273	13.443	23418	68354	280764
	25	82.0	704	2310	2273	7456	0.45	2.31	143.99	1.144	3.310	10.389	23890	69133	216968
	25.5	83.7	649	2130	2000	6562	0.44	2.18	136.25	0.920	2.652	7.503	19220	55396	156703
	26	85.3	472	1548	2083	6835	0.47	2.22	138.82	0.495	1.458	8.992	10333	30441	187792
	26	85.3	581	1907	2000	6562	0.45	2.18	136.25	0.738	2.145	7.746	15408	44801	161786
	26.4	86.6	329	1079	1923	6309	0.48	2.14	133.69	0.232	0.688	7.611	4840	14373	158958
	26.5	86.9	337	1105	1923	6309	0.48	2.14	133.69	0.243	0.721	7.596	5071	15051	158650
	27	88.6	336	1101	1852	6076	0.48	2.10	131.15	0.237	0.702	6.889	4941	14654	143878
	27	88.6	336	1101	1786	5859	0.48	2.06	128.62	0.232	0.687	6.260	4845	14359	130747
	27.5	90.2	424	1390	1923	6309	0.47	2.14	133.69	0.385	1.134	7.407	8031	23682	154704
	27.5	90.2	444	1458	1923	6309	0.47	2.14	133.69	0.423	1.245	7.356	8835	26006	153631
	28	91.9	546	1793	2083	6835	0.46	2.22	138.82	0.664	1.943	8.766	13868	40579	183079
	28	91.9	602	1976	2000	6562	0.45	2.18	136.25	0.792	2.297	7.674	16542	47975	160274
	28	91.9	518	1700	2083	6835	0.47	2.22	138.82	0.597	1.752	8.855	12468	36582	184945
	28.5	93.5	671	2202	2083	6835	0.44	2.22	138.82	1.002	2.889	8.316	20919	60334	173678
	28.5	93.5	629	2063	2083	6835	0.45	2.22	138.82	0.880	2.551	8.478	18370	53268	177076
	29	95.1	578	1896	2174	7132	0.46	2.26	141.40	0.757	2.213	9.695	15806	46214	202483
	29	95.1	658	2158	2083	6835	0.44	2.22	138.82	0.962	2.781	8.368	20101	58077	174768
	29.5	96.8	552	1813	2083	6835	0.46	2.22	138.82	0.679	1.985	8.746	14176	41455	182668
	30	98.4	610	2001	2273	7456	0.46	2.31	143.99	0.858	2.506	10.770	17910	52342	224941
	30	98.4	633	2076	2083	6835	0.45	2.22	138.82	0.891	2.582	8.464	18603	53919	176765
	30	98.4	568	1864	2381	7812	0.47	2.35	146.59	0.758	2.228	12.301	15833	46542	256912
	30.5	100.1	676	2217	2381	7812	0.46	2.35	146.59	1.072	3.122	11.882	22390	65209	248169
	31.5	103.3	543	1783	2083	6835	0.46	2.22	138.82	0.657	1.922	8.776	13717	40151	183279
	31.5	103.3	532	1745	2174	7132	0.47	2.26	141.40	0.641	1.882	9.850	13384	39300	205712
	32	105.0	526	1727	2000	6562	0.46	2.18	136.25	0.605	1.769	7.924	12627	36941	165494
	32.5	106.6	676	2217	2174	7132	0.45	2.26	141.40	1.034	2.992	9.325	21596	62480	194762
	33	108.3	350	1147	2174	7132	0.49	2.26	141.40	0.277	0.823	10.335	5783	17196	215846
	33.5	109.9	427	1402	1923	6309	0.47	2.14	133.69	0.391	1.153	7.398	8168	24081	154520
	34	111.5	403	1323	2000	6562	0.48	2.18	136.25	0.355	1.050	8.257	7411	21920	172448
	34.5	113.2	446	1465	2083	6835	0.48	2.22	138.82	0.443	1.308	9.060	9256	27322	189228
	35	114.8	549	1803	2000	6562	0.46	2.18	136.25	0.659	1.923	7.852	13761	40160	163981
	35.5	116.5	500	1640	2000	6562	0.47	2.18	136.25	0.546	1.601	8.003	11396	33427	167135
	36	118.1	568	1864	2000	6562	0.46	2.18	136.25	0.705	2.052	7.791	14715	42854	162709

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B10
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	36.5	119.8	521	1709	2174	7132	0.47	2.26	141.40	0.614	1.806	9.885	12832	37715	206448
	37	121.4	588	1930	2174	7132	0.46	2.26	141.40	0.784	2.289	9.659	16368	47812	201733
	37.5	123.0	595	1953	2174	7132	0.46	2.26	141.40	0.802	2.342	9.634	16760	48923	201210
	38.1	125.0	588	1930	1923	6309	0.45	2.14	133.69	0.741	2.147	6.932	15476	44832	144775
	38.5	126.3	625	2051	2083	6835	0.45	2.22	138.82	0.869	2.520	8.493	18141	52630	177381
	39	128.0	476	1562	1852	6076	0.46	2.10	131.15	0.476	1.395	6.569	9949	29143	137200
	39.5	129.6	495	1624	2083	6835	0.47	2.22	138.82	0.545	1.602	8.925	11382	33464	186394
	40	131.2	490	1608	2174	7132	0.47	2.26	141.40	0.544	1.604	9.978	11367	33492	208401
	40.5	132.9	485	1593	2174	7132	0.47	2.26	141.40	0.534	1.573	9.992	11147	32857	208694
	40.9	134.2	532	1745	2000	6562	0.46	2.18	136.25	0.618	1.806	7.907	12897	37709	165134
	41.5	136.2	610	2001	2174	7132	0.46	2.26	141.40	0.842	2.454	9.581	17588	51262	200107
	41.9	137.5	649	2130	2381	7812	0.46	2.35	146.59	0.990	2.891	11.992	20679	60376	250450
	42.9	140.7	588	1930	2273	7456	0.46	2.31	143.99	0.798	2.337	10.850	16668	48809	226597
	43.3	142.1	633	2076	2273	7456	0.46	2.31	143.99	0.924	2.694	10.682	19297	56267	223093
	43.8	143.7	556	1823	2083	6835	0.46	2.22	138.82	0.686	2.006	8.736	14334	41904	182457
	44.4	145.7	500	1640	2000	6562	0.47	2.18	136.25	0.546	1.601	8.003	11396	33427	167135
	45.4	149.0	521	1709	2174	7132	0.47	2.26	141.40	0.614	1.806	9.885	12832	37715	206448
	45.4	149.0	526	1727	2083	6835	0.47	2.22	138.82	0.616	1.806	8.830	12865	37717	184416
	45.8	150.3	521	1709	2083	6835	0.47	2.22	138.82	0.603	1.769	8.847	12598	36954	184772
	46.4	152.2	490	1608	2500	8202	0.48	2.39	149.21	0.574	1.700	14.172	11995	35505	295995
	46.9	153.9	505	1657	2000	6562	0.47	2.18	136.25	0.557	1.632	7.988	11627	34089	166827
	47.5	155.8	481	1577	2174	7132	0.47	2.26	141.40	0.524	1.544	10.006	10934	32240	208979
	48	157.5	625	2051	2174	7132	0.45	2.26	141.40	0.885	2.575	9.524	18478	53770	198919
	48.5	159.1	676	2217	2174	7132	0.45	2.26	141.40	1.034	2.992	9.325	21596	62480	194762
	49	160.8	704	2310	2381	7812	0.45	2.35	146.59	1.165	3.382	11.759	24322	70634	245592
	49.5	162.4	862	2828	2273	7456	0.42	2.31	143.99	1.714	4.854	9.628	35800	101382	201089
	50	164.0	781	2563	2174	7132	0.43	2.26	141.40	1.382	3.942	8.861	28873	82336	185061
	50.5	165.7	806	2646	2381	7812	0.44	2.35	146.59	1.527	4.384	11.276	31896	91554	235494
	51	167.3	806	2646	2273	7456	0.43	2.31	143.99	1.500	4.284	9.914	31329	89475	207049
	51.5	169.0	633	2076	2174	7132	0.45	2.26	141.40	0.907	2.638	9.494	18949	55093	198292
	52	170.6	833	2734	2273	7456	0.42	2.31	143.99	1.602	4.556	9.778	33453	95162	204218
	52.5	172.2	893	2929	2273	7456	0.41	2.31	143.99	1.839	5.181	9.462	38402	108198	197618
	53	173.9	980	3217	2381	7812	0.40	2.35	146.59	2.257	6.310	10.302	47139	131792	215170
	53.5	175.5	649	2130	2174	7132	0.45	2.26	141.40	0.955	2.772	9.431	19946	57885	196962
	54	177.2	431	1414	2083	6835	0.48	2.22	138.82	0.413	1.221	9.100	8628	25499	190065
	54.5	178.8	481	1577	2000	6562	0.47	2.18	136.25	0.504	1.482	8.057	10536	30961	168282
	55	180.4	704	2310	2273	7456	0.45	2.31	143.99	1.144	3.310	10.389	23890	69133	216968

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B10
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	55.5	182.1	685	2247	2381	7812	0.45	2.35	146.59	1.102	3.205	11.843	23008	66947	247345
	56	183.7	575	1886	2174	7132	0.46	2.26	141.40	0.748	2.188	9.707	15625	45699	202725
	56.2	184.4	649	2130	2174	7132	0.45	2.26	141.40	0.955	2.772	9.431	19946	57885	196962
	56.5	185.4	714	2343	2381	7812	0.45	2.35	146.59	1.198	3.476	11.714	25022	72591	244659
	57	187.0	667	2187	2083	6835	0.44	2.22	138.82	0.988	2.852	8.334	20641	59567	174048
	57.5	188.6	485	1593	2083	6835	0.47	2.22	138.82	0.524	1.542	8.953	10944	32203	186977
	58	190.3	476	1562	2083	6835	0.47	2.22	138.82	0.504	1.485	8.979	10531	31012	187528
	58.5	191.9	413	1356	2273	7456	0.48	2.31	143.99	0.394	1.168	11.389	8225	24395	237854
	59	193.6	649	2130	2174	7132	0.45	2.26	141.40	0.955	2.772	9.431	19946	57885	196962
	59.5	195.2	714	2343	2273	7456	0.45	2.31	143.99	1.177	3.401	10.345	24577	71039	216051
	60	196.9	588	1930	2174	7132	0.46	2.26	141.40	0.784	2.289	9.659	16368	47812	201733
	60	196.9	581	1907	2174	7132	0.46	2.26	141.40	0.766	2.238	9.683	15990	46738	202237
	60	196.9	610	2001	2273	7456	0.46	2.31	143.99	0.858	2.506	10.770	17910	52342	224941
	60	196.9	610	2001	2174	7132	0.46	2.26	141.40	0.842	2.454	9.581	17588	51262	200107
	60.5	198.5	610	2001	2273	7456	0.46	2.31	143.99	0.858	2.506	10.770	17910	52342	224941
	61	200.1	610	2001	2174	7132	0.46	2.26	141.40	0.842	2.454	9.581	17588	51262	200107
	61.5	201.8	526	1727	2083	6835	0.47	2.22	138.82	0.616	1.806	8.830	12865	37717	184416
	62	203.4	450	1478	2083	6835	0.48	2.22	138.82	0.451	1.331	9.050	9423	27808	189005
	62.5	205.1	476	1562	2381	7812	0.48	2.35	146.59	0.532	1.575	12.602	11121	32899	263194
	62.5	205.1	455	1491	2381	7812	0.48	2.35	146.59	0.485	1.437	12.665	10133	30015	264512
	62.5	205.1	495	1624	2381	7812	0.48	2.35	146.59	0.575	1.700	12.545	12019	35514	261996
	63	206.7		NA	2778	9113	NA	NA	NA	NA	NA	NA	NA	NA	NA
	63.5	208.3	595	1953	2273	7456	0.46	2.31	143.99	0.817	2.391	10.824	17068	49946	226065
	64	210.0	532	1745	2174	7132	0.47	2.26	141.40	0.641	1.882	9.850	13384	39300	205712
	64.5	211.6	521	1709	2000	6562	0.46	2.18	136.25	0.592	1.733	7.941	12365	36195	165843
	65	213.3	510	1674	2083	6835	0.47	2.22	138.82	0.579	1.700	8.879	12089	35496	185450
	65.5	214.9	500	1640	2174	7132	0.47	2.26	141.40	0.566	1.667	9.949	11826	34818	207789
	66	216.5	500	1640	2083	6835	0.47	2.22	138.82	0.556	1.634	8.910	11610	34122	186089
	66.5	218.2	641	2103	2381	7812	0.46	2.35	146.59	0.965	2.819	12.025	20152	58882	251151
	67	219.8	610	2001	2381	7812	0.46	2.35	146.59	0.873	2.558	12.148	18234	53423	253710
	67.4	221.1	549	1803	2273	7456	0.47	2.31	143.99	0.696	2.046	10.985	14543	42726	229431
	68	223.1	472	1548	2083	6835	0.47	2.22	138.82	0.495	1.458	8.992	10333	30441	187792
	68.5	224.7	549	1803	2174	7132	0.47	2.26	141.40	0.684	2.005	9.792	14281	41869	204516
	69	226.4	641	2103	2273	7456	0.46	2.31	143.99	0.948	2.761	10.650	19794	57673	222429
	69.4	227.7	532	1745	2273	7456	0.47	2.31	143.99	0.653	1.920	11.044	13629	40098	230649
	70	229.7	562	1843	2381	7812	0.47	2.35	146.59	0.741	2.180	12.324	15479	45524	257383
	70.4	231.0	610	2001	2381	7812	0.46	2.35	146.59	0.873	2.558	12.148	18234	53423	253709

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B10
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	71	232.9	649	2130	2381	7812	0.46	2.35	146.59	0.990	2.891	11.992	20679	60376	250449
	71.5	234.6	641	2103	2632	8634	0.47	2.43	151.84	0.999	2.935	15.511	20873	61303	323951
	71.9	235.9	893	2929	2500	8202	0.43	2.39	149.21	1.905	5.438	12.398	39794	113565	258929
	72.4	237.5	877	2878	2778	9113	0.44	2.47	154.48	1.904	5.501	16.555	39767	114895	345749
	72.9	239.2	769	2524	2273	7456	0.44	2.31	143.99	1.365	3.918	10.094	28504	81824	210816
	73.4	240.8	694	2278	2500	8202	0.46	2.39	149.21	1.153	3.362	13.401	24073	70207	279891
	74	242.8	877	2878	2273	7456	0.41	2.31	143.99	1.775	5.014	9.547	37067	104712	199399
	74.4	244.1	862	2828	2632	8634	0.44	2.43	151.84	1.808	5.205	14.433	37751	108714	301448
	75	246.1	769	2524	2632	8634	0.45	2.43	151.84	1.439	4.183	14.925	30058	87365	311705
	75.5	247.7	1190	3906	2381	7812	0.33	2.35	146.59	3.328	8.875	8.875	69505	185348	185348
	76	249.3	943	3095	2778	9113	0.43	2.47	154.48	2.202	6.320	16.157	45996	131990	337442
	76.5	251.0	794	2604	2500	8202	0.44	2.39	149.21	1.505	4.348	12.931	31443	90804	270065
	77	252.6	794	2604	2381	7812	0.44	2.35	146.59	1.479	4.252	11.340	30891	88812	236833
	77.5	254.3	980	3217	2381	7812	0.40	2.35	146.59	2.257	6.310	10.302	47139	131792	215170
	77.9	255.6	806	2646	2273	7456	0.43	2.31	143.99	1.500	4.284	9.914	31329	89475	207049
	78.5	257.5	806	2646	2174	7132	0.42	2.26	141.40	1.473	4.184	8.740	30765	87386	182537
	78.9	258.9	435	1426	2083	6835	0.48	2.22	138.82	0.420	1.242	9.091	8779	25938	189864
	79.4	260.5	568	1864	2381	7812	0.47	2.35	146.59	0.758	2.228	12.301	15833	46542	256911
	79.9	262.1	588	1930	2083	6835	0.46	2.22	138.82	0.769	2.242	8.625	16070	46817	180143
	79.9	262.1	595	1953	2083	6835	0.46	2.22	138.82	0.788	2.294	8.601	16455	47901	179630
	79.9	262.1	588	1930	2083	6835	0.46	2.22	138.82	0.769	2.242	8.625	16070	46817	180143
	80.5	264.1	649	2130	2381	7812	0.46	2.35	146.59	0.990	2.891	11.992	20679	60376	250449
	81	265.7	649	2130	2632	8634	0.47	2.43	151.84	1.026	3.010	15.476	21419	62868	323223
	81.4	267.1	575	1886	3125	10253	0.48	2.56	159.79	0.845	2.507	23.869	17657	52354	498520
	81.9	268.7	794	2604	2941	9650	0.46	2.52	157.13	1.585	4.632	19.659	33112	96734	410592
	82.5	270.7	694	2278	2381	7812	0.45	2.35	146.59	1.132	3.292	11.802	23651	68754	246486
	83	272.3	602	1976	2273	7456	0.46	2.31	143.99	0.837	2.448	10.798	17481	51123	225513
	83.5	274.0	617	2025	2500	8202	0.47	2.39	149.21	0.911	2.673	13.724	19021	55827	286627
	84	275.6	602	1976	2500	8202	0.47	2.39	149.21	0.867	2.549	13.782	18115	53229	287835
	84.5	277.2	568	1864	2381	7812	0.47	2.35	146.59	0.758	2.228	12.301	15833	46542	256911
	85	278.9	676	2217	2273	7456	0.45	2.31	143.99	1.053	3.057	10.510	21992	63844	219498
	85.4	280.2	610	2001	2273	7456	0.46	2.31	143.99	0.858	2.506	10.770	17910	52342	224941
	85.9	281.8	556	1823	2273	7456	0.47	2.31	143.99	0.712	2.090	10.965	14868	43659	228998
	86.4	283.5	500	1640	2174	7132	0.47	2.26	141.40	0.566	1.667	9.949	11826	34818	207789
	86.9	285.1	833	2734	2174	7132	0.41	2.26	141.40	1.573	4.448	8.607	32850	92893	179757
	87.5	287.1	943	3095	2174	7132	0.38	2.26	141.40	2.016	5.580	8.016	42101	116535	167423
	87.9	288.4	714	2343	2273	7456	0.45	2.31	143.99	1.177	3.401	10.345	24577	71039	216051

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Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B10
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	88.4	290.0	893	2929	2273	7456	0.41	2.31	143.99	1.839	5.181	9.462	38402	108198	197618
	88.9	291.7	877	2878	2381	7812	0.42	2.35	146.59	1.807	5.137	10.903	37737	107284	227705
	89.4	293.3	704	2310	2273	7456	0.45	2.31	143.99	1.144	3.310	10.389	23890	69133	216968
	90	295.3	625	2051	2273	7456	0.46	2.31	143.99	0.901	2.629	10.712	18817	54912	223732
	90.4	296.6	625	2051	2273	7456	0.46	2.31	143.99	0.901	2.629	10.712	18817	54912	223732
	90.9	298.2	735	2412	2500	8202	0.45	2.39	149.21	1.292	3.754	13.215	26989	78410	276004
	91.5	300.2	658	2158	2500	8202	0.46	2.39	149.21	1.035	3.027	13.559	21606	63210	283181
	92	301.8	625	2051	2273	7456	0.46	2.31	143.99	0.901	2.629	10.712	18817	54912	223732
	92.5	303.5	575	1886	2500	8202	0.47	2.39	149.21	0.789	2.324	13.886	16488	48543	290005
	93.1	305.4	617	2025	2632	8634	0.47	2.43	151.84	0.927	2.726	15.608	19356	56940	325974
	93.5	306.8	714	2343	2941	9650	0.47	2.52	157.13	1.284	3.772	20.061	26820	78780	418979
	94	308.4	1786	5859	3125	10253	0.26	2.56	159.79	8.162	20.529	14.114	170470	428758	294772
	94.5	310.0	1064	3490	3333	10936	0.44	2.60	162.47	2.945	8.502	24.990	61515	177570	521924
	95	311.7	1064	3490	2941	9650	0.42	2.52	157.13	2.849	8.117	17.975	59493	169524	375415
	95.5	313.3	1020	3348	3333	10936	0.45	2.60	162.47	2.710	7.849	25.304	56596	163936	528481
	96	315.0	1282	4206	2941	9650	0.38	2.52	157.13	4.137	11.441	16.257	86403	238942	339536
	96.5	316.6	877	2878	2632	8634	0.44	2.43	151.84	1.872	5.381	14.348	39087	112375	299666
	97	318.2	714	2343	2273	7456	0.45	2.31	143.99	1.177	3.401	10.345	24577	71039	216052
	97.5	319.9	694	2278	2273	7456	0.45	2.31	143.99	1.112	3.222	10.431	23231	67301	217847
	98	321.5	725	2377	2273	7456	0.44	2.31	143.99	1.211	3.496	10.299	25295	73022	215095
	98.5	323.2	658	2158	2174	7132	0.45	2.26	141.40	0.980	2.842	9.397	20475	59360	196258
	99	324.8	685	2247	2083	6835	0.44	2.22	138.82	1.043	3.003	8.260	21787	62721	172520
	99.5	326.4	847	2780	2174	7132	0.41	2.26	141.40	1.627	4.589	8.535	33974	95833	178259
	100	328.1	781	2563	2381	7812	0.44	2.35	146.59	1.433	4.127	11.401	29933	86189	238110
	100.5	329.7	758	2485	2273	7456	0.44	2.31	143.99	1.324	3.806	10.149	27647	79485	211959
	101	331.4	862	2828	2500	8202	0.43	2.39	149.21	1.776	5.089	12.570	37097	106286	262525
	101.5	333.0	1087	3566	2500	8202	0.38	2.39	149.21	2.824	7.813	11.173	58977	163183	233352
	102	334.6	1163	3815	2273	7456	0.32	2.31	143.99	3.119	8.250	7.756	65132	172302	161978
	102.6	336.6	581	1907	2273	7456	0.46	2.31	143.99	0.780	2.284	10.874	16283	47709	227111
	103	337.9	617	2025	2174	7132	0.46	2.26	141.40	0.863	2.513	9.553	18025	52494	199524
	103.5	339.6	862	2828	2381	7812	0.42	2.35	146.59	1.745	4.972	10.985	36447	103842	229425
	104	341.2	685	2247	2273	7456	0.45	2.31	143.99	1.082	3.138	10.471	22599	65539	218690
	104.5	342.8	725	2377	2000	6562	0.42	2.18	136.25	1.146	3.265	7.202	23935	68189	150416
	105	344.5	685	2247	2273	7456	0.45	2.31	143.99	1.082	3.138	10.471	22599	65539	218690
	105.5	346.1	676	2217	2381	7812	0.46	2.35	146.59	1.072	3.122	11.882	22390	65209	248169
	106.5	349.4	704	2310	2381	7812	0.45	2.35	146.59	1.165	3.382	11.759	24322	70635	245593
	106.5	349.4	735	2412	2381	7812	0.45	2.35	146.59	1.270	3.675	11.619	26515	76751	242667

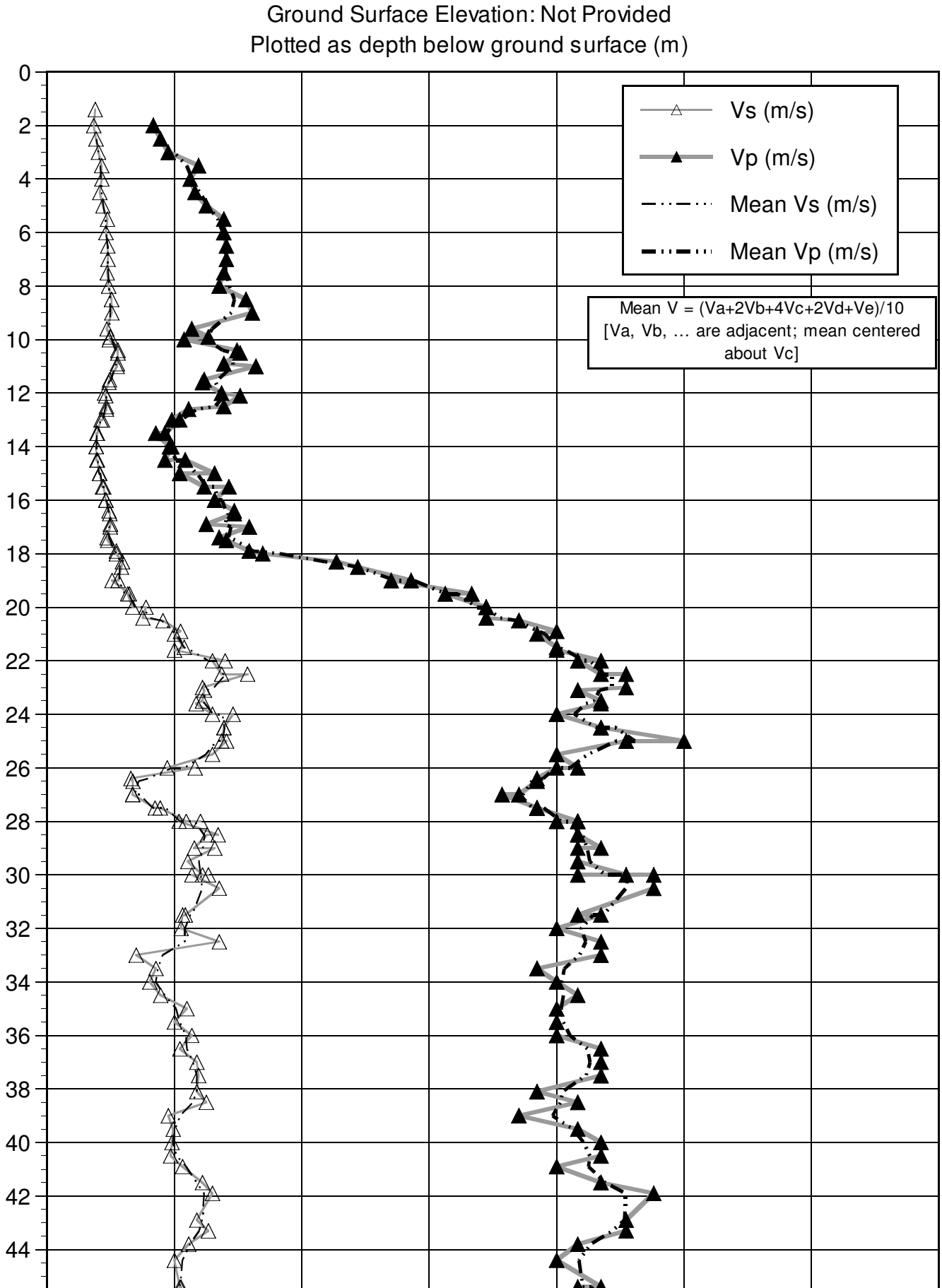
γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

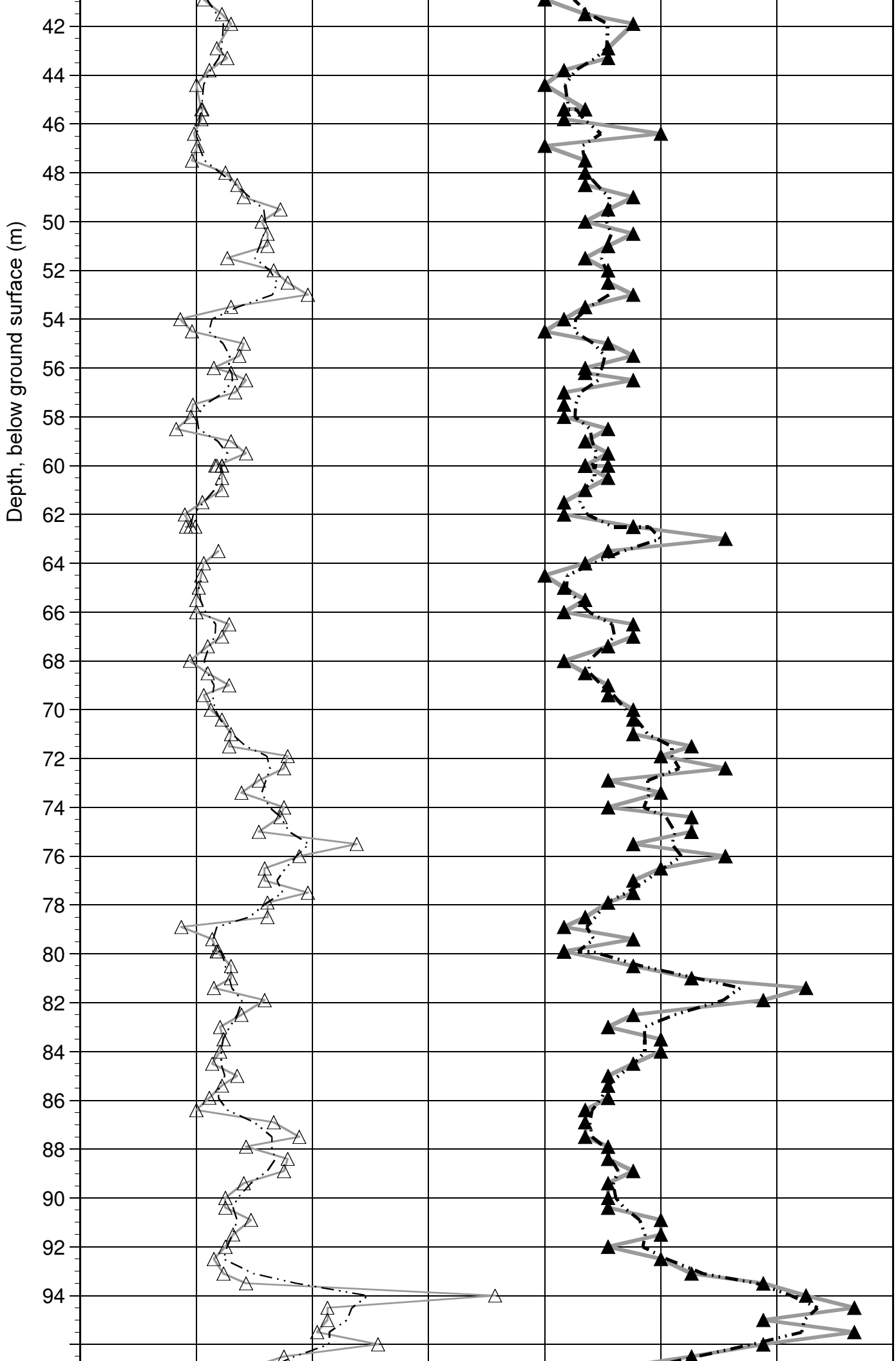
Table 2. LA 710 Tunnel
Boring Z3 B10
PS Suspension Log Data Summary

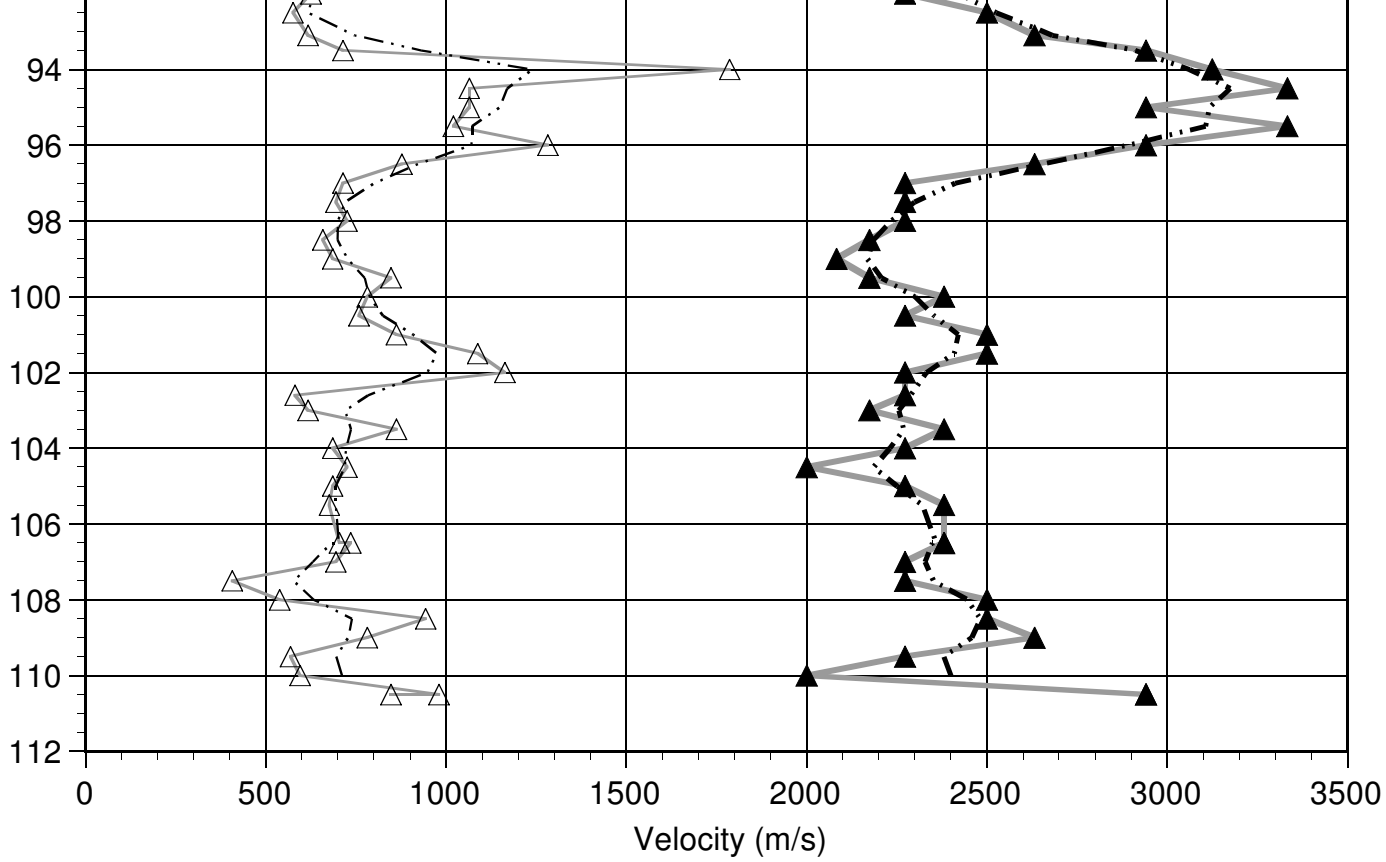
Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	107	351.0	694	2278	2273	7456	0.45	2.31	143.99	1.112	3.222	10.431	23231	67301	217847
	107.5	352.7	407	1334	2273	7456	0.48	2.31	143.99	0.381	1.131	11.406	7960	23617	238208
	108	354.3	538	1764	2500	8202	0.48	2.39	149.21	0.691	2.039	14.017	14429	42587	292750
	108.5	356.0	943	3095	2500	8202	0.42	2.39	149.21	2.127	6.028	12.102	44427	125904	252752
	109	357.6	781	2563	2632	8634	0.45	2.43	151.84	1.484	4.310	14.864	31004	90016	310443
	109.5	359.3	568	1864	2273	7456	0.47	2.31	143.99	0.745	2.184	10.921	15551	45617	228086
	110	360.9	595	1953	2000	6562	0.45	2.18	136.25	0.773	2.245	7.699	16150	46881	160796
	110.5	362.5	980	3217	2941	9650	0.44	2.52	157.13	2.419	6.955	18.548	50527	145264	387372
	110.5	362.5	847	2780	2941	9650	0.45	2.52	157.13	1.808	5.259	19.363	37753	109842	404401

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Figure 1. LA 710 Tunnel
Boring Z3 B10
Downhole Interval Velocities




Depth, below ground surface (m)
42
44
46
48
50
52
54
56
58
60
62
64
66
68
70
72
74
76
78
80
82
84
86
88
90
92
94


94
96
98
100
102
104
106
108
110
112
0
500
1000
1500
2000
2500
3000
3500
Velocity (m/s)

California Department of Transportation
Geophysical Services

07-187900 Z3 B10

COMPANY	:	CALTRANS.
WELL	:	07-187900 Z3 B10
FIELD	:	LA 710 TUNNEL.
COUNTY	:	LA
STATE	:	CA

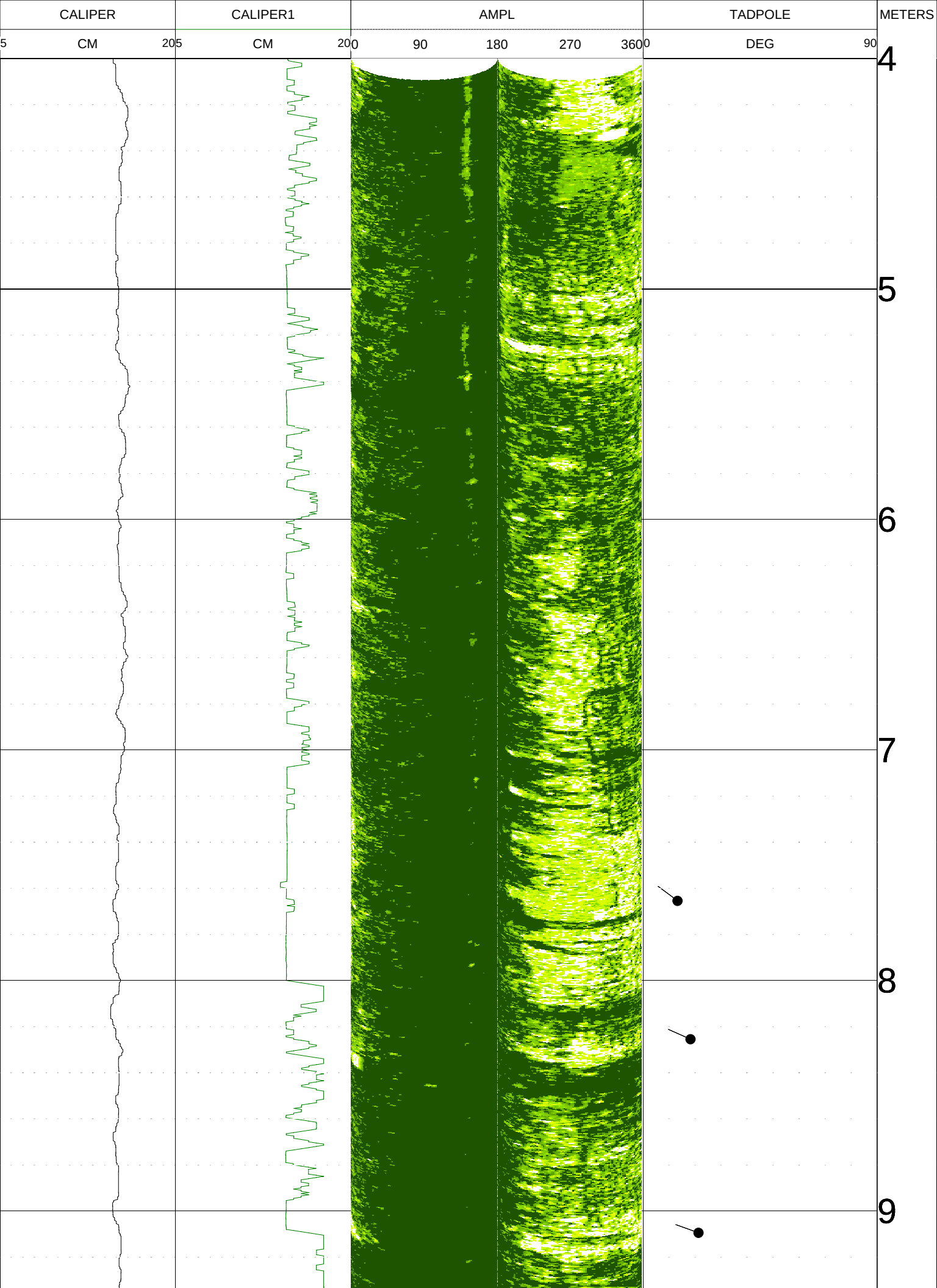
OTHER SERVICES:
IND-CAL.
AC TEL.
PSLOG.

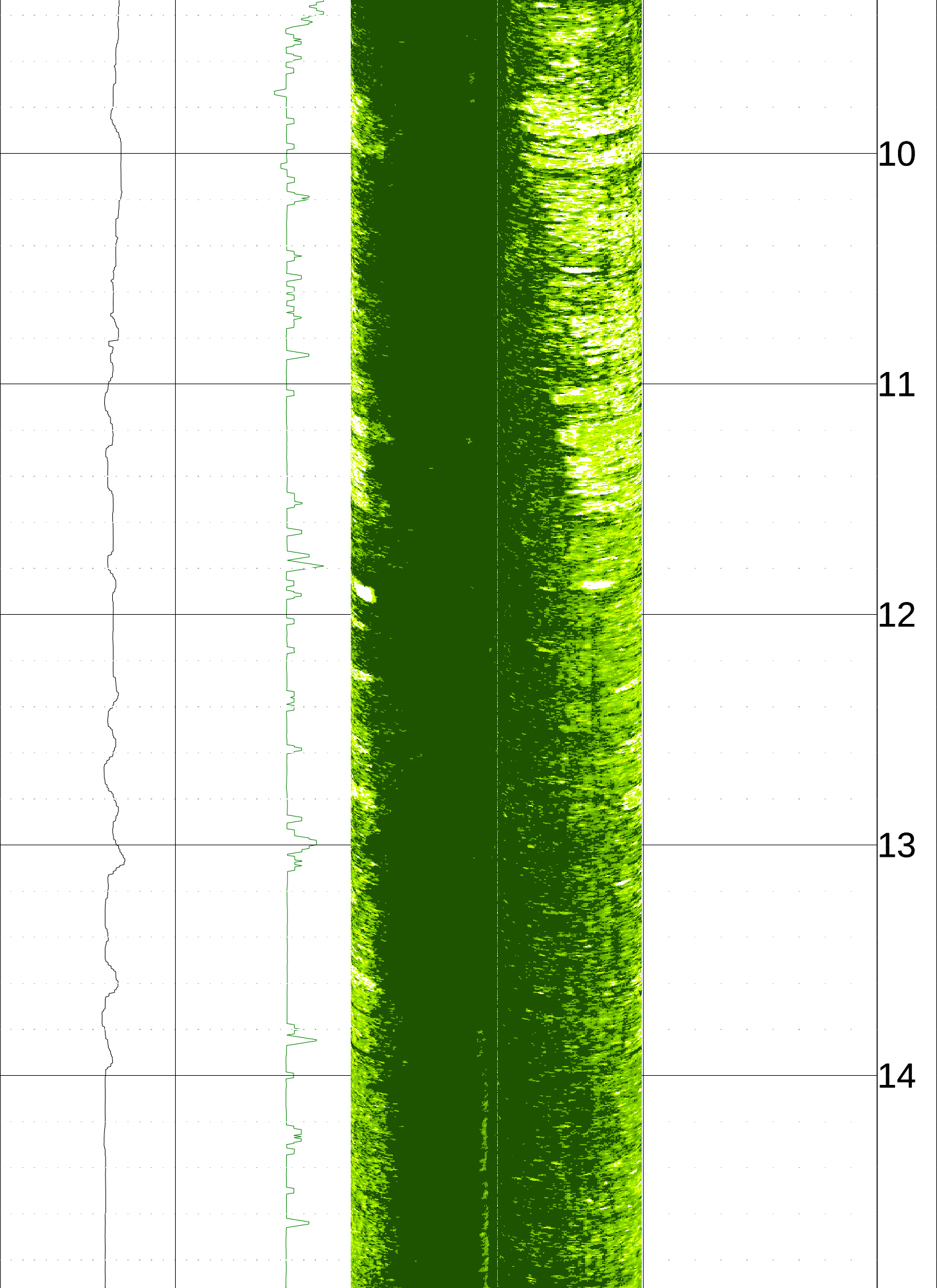
LOCATION	:	
SECTION	:	None
TOWNSHIP	:	None
RANGE	:	None
API NO.	:	
UNIQUE WELL ID.	:	

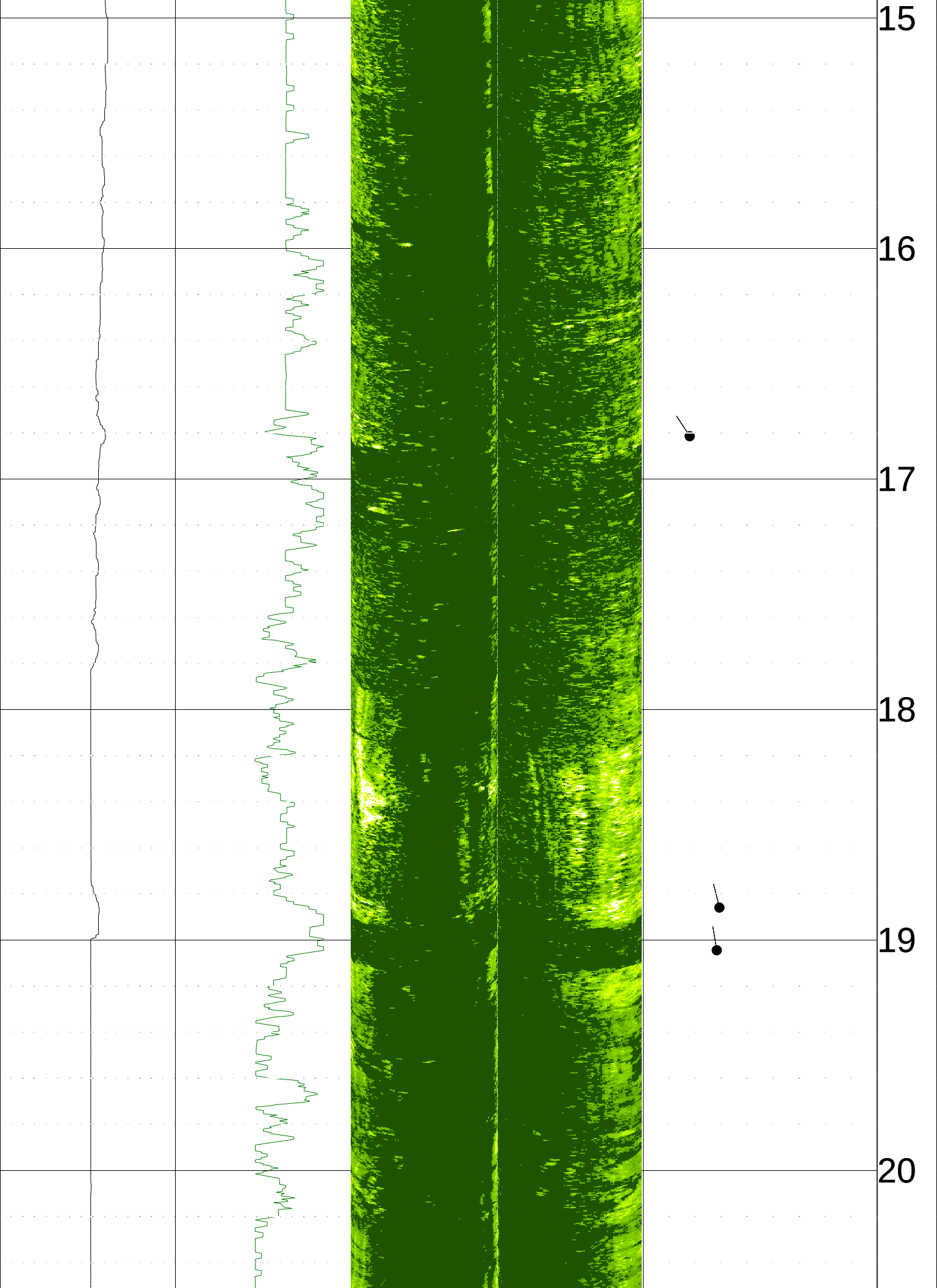
PERMANENT DATUM	:	None	ELEVATION KB	:	NA
LOG MEASURED FROM:		GL	ELEVATION DF	:	NA
DRL MEASURED FROM	:	GL	ELEVATION GL	:	195.07.

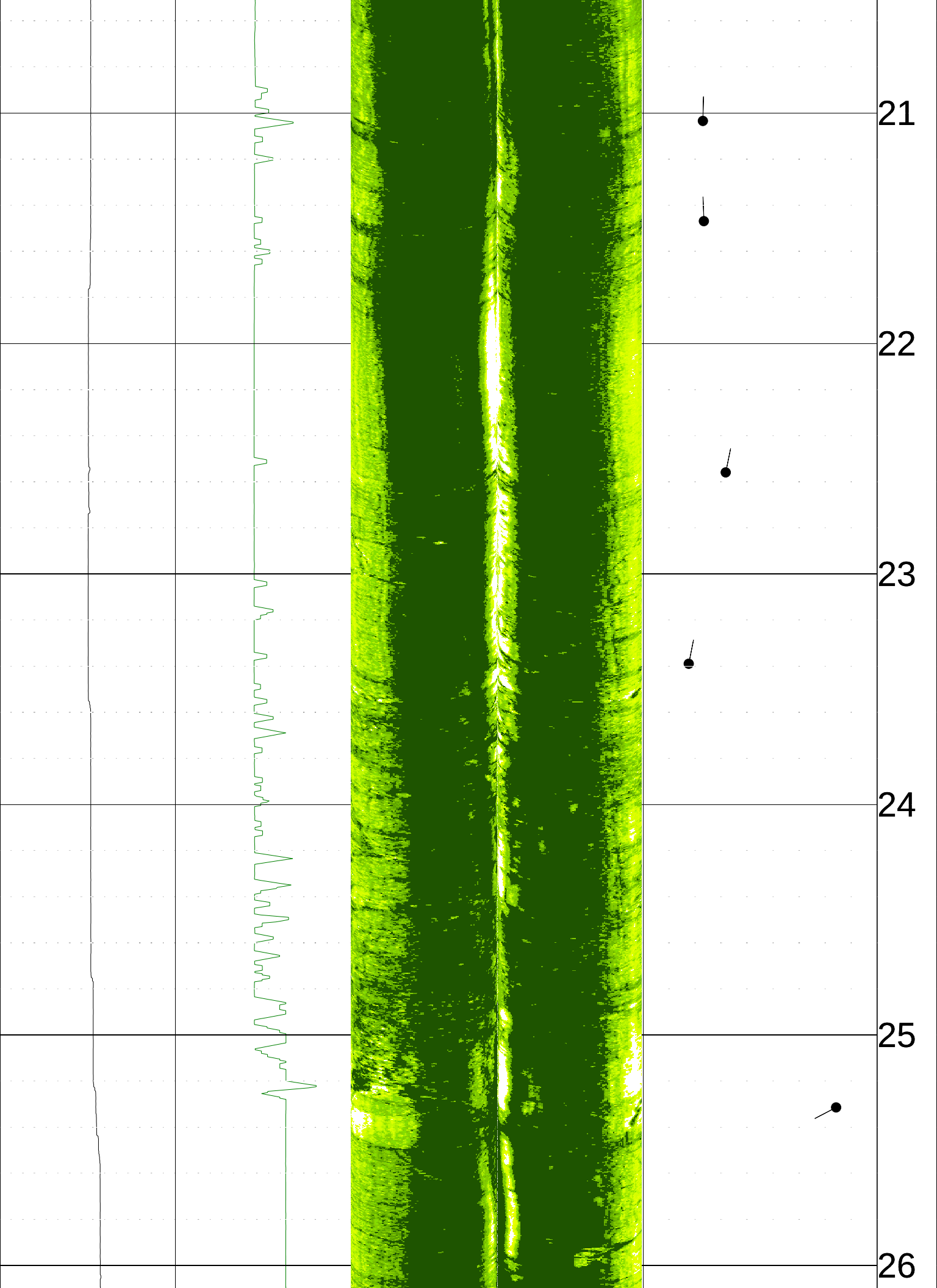
DATE	:	3/05/09	RIG NUMBER	:	
DEPTH DRILLER	:	114.3.	LOGGER TD	:	
BIT SIZE	:	10.00cm	ARRIVAL TIME	:	
LOG TOP	:	3.79	DEPARTURE TIME:		
LOG BOTTOM	:	114.63	CIRC STOPPED	:	3/5 AM
CASING OD	:				
CASING BOTTOM	:	N/A			
CASING TYPE	:	N/A			
BOREHOLE FLUID	:	0			
RM TEMPERATURE	:	0			
MUD RES	:	0			
MUD WEIGHT	:				
WITNESSED BY	:				
RECORDED BY	:	DH/DG			
REMARKS 1	:				
REMARKS 2	:	EA: 07-187900			

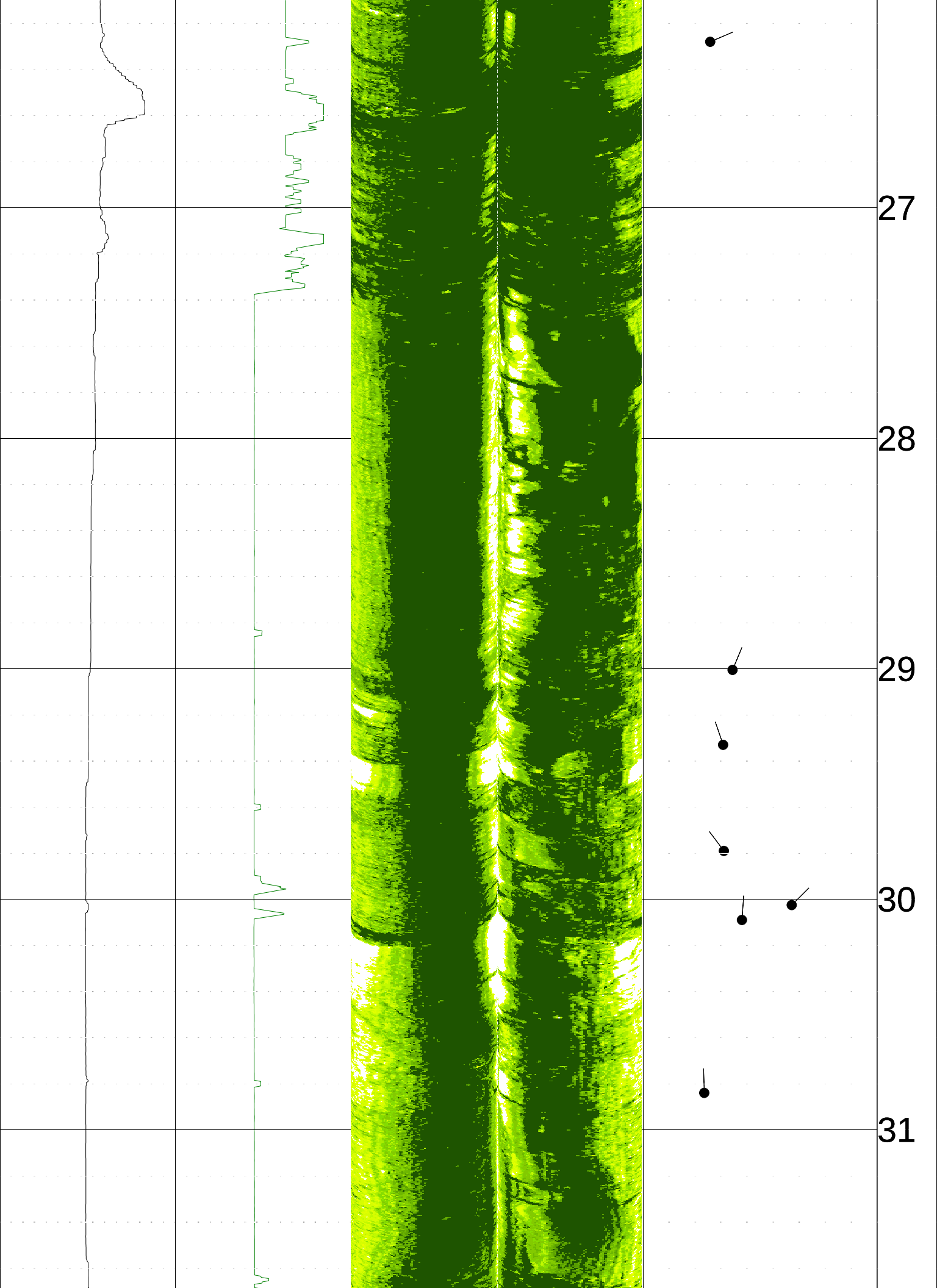
ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS

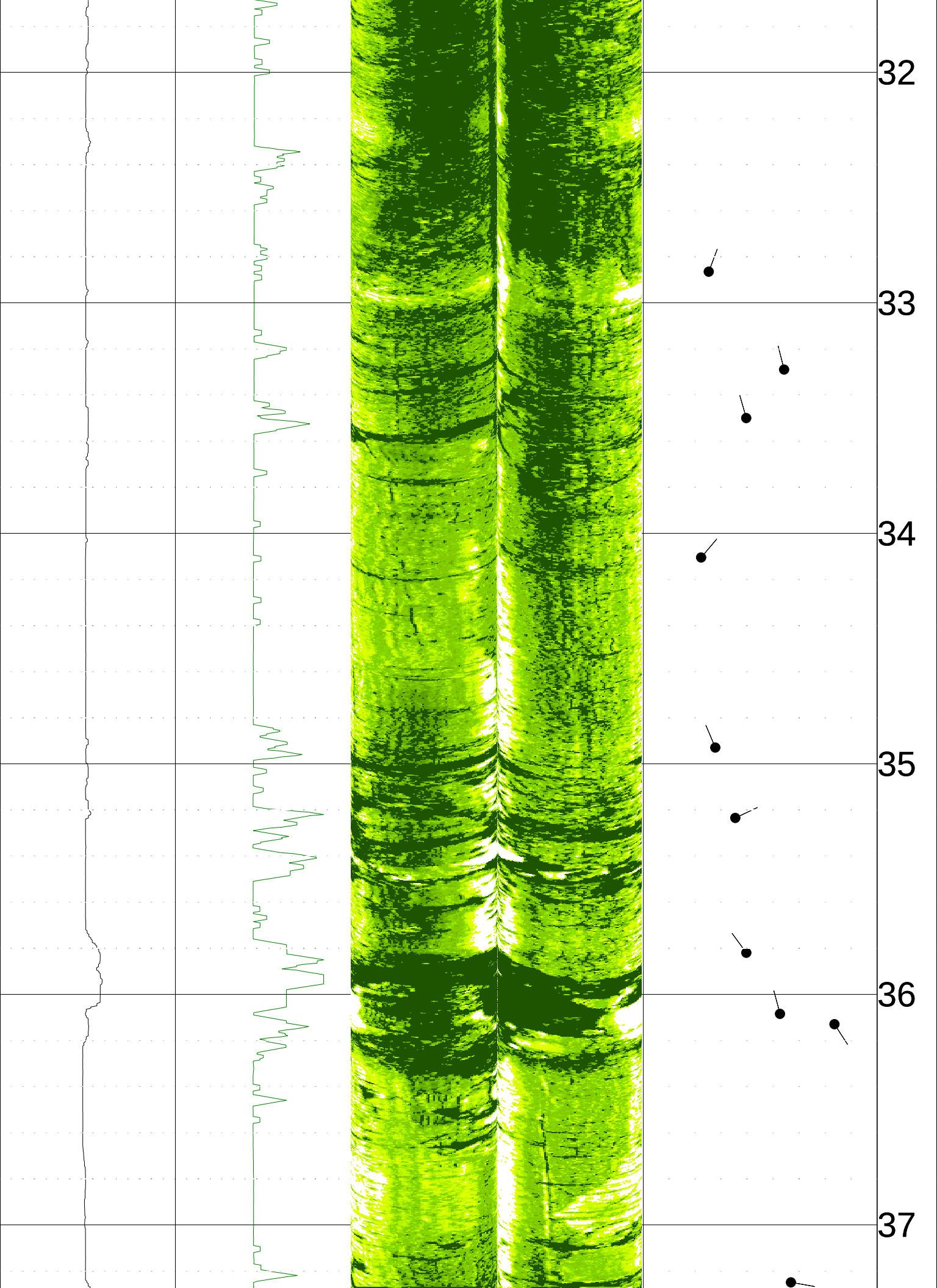

CALIPER
CALIPER1
AMPL
TADPOLE
METERS
5
CM
20
5
CM
20
0
90
180
270
360
0
DEG
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4
5
6
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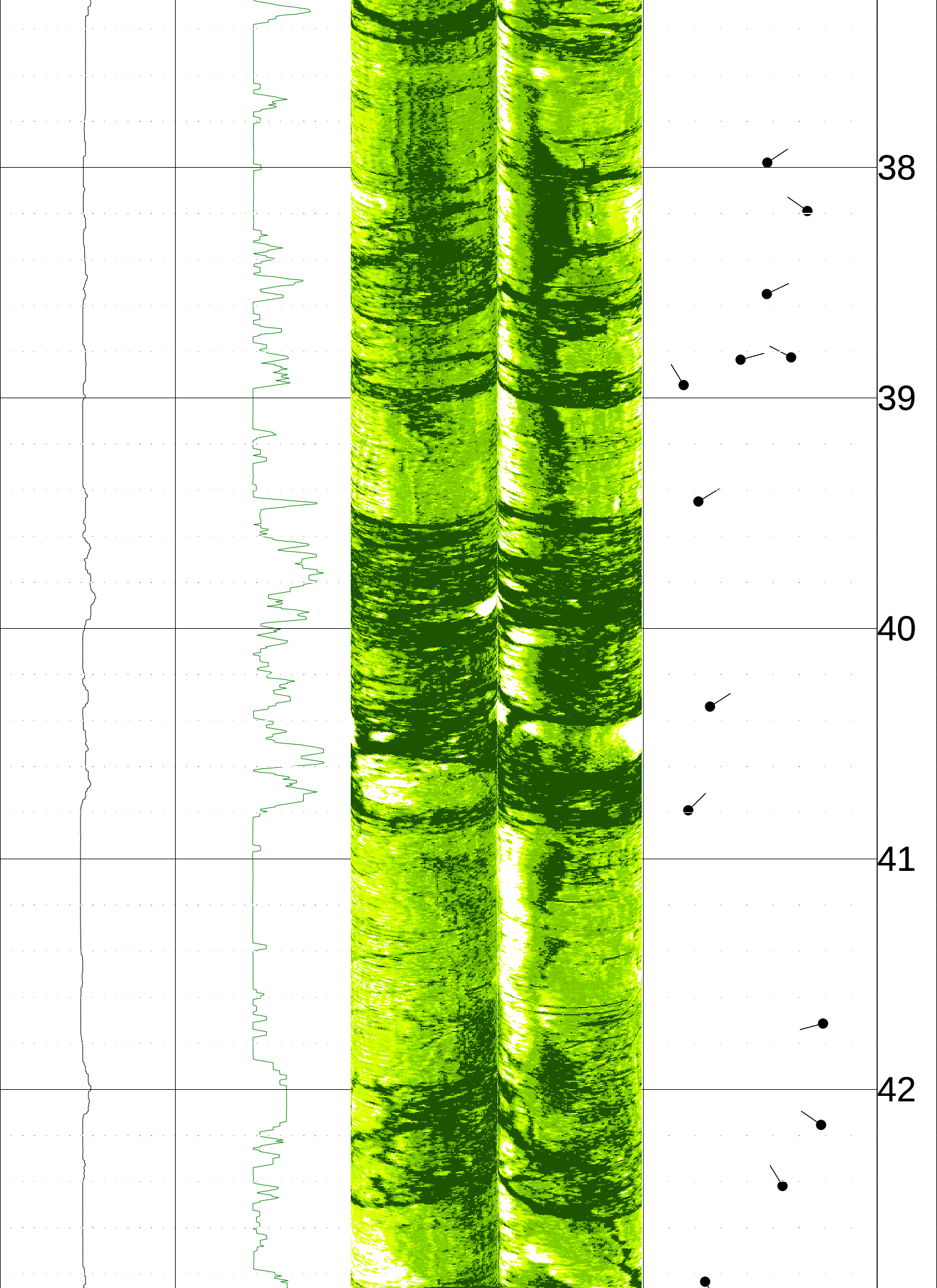

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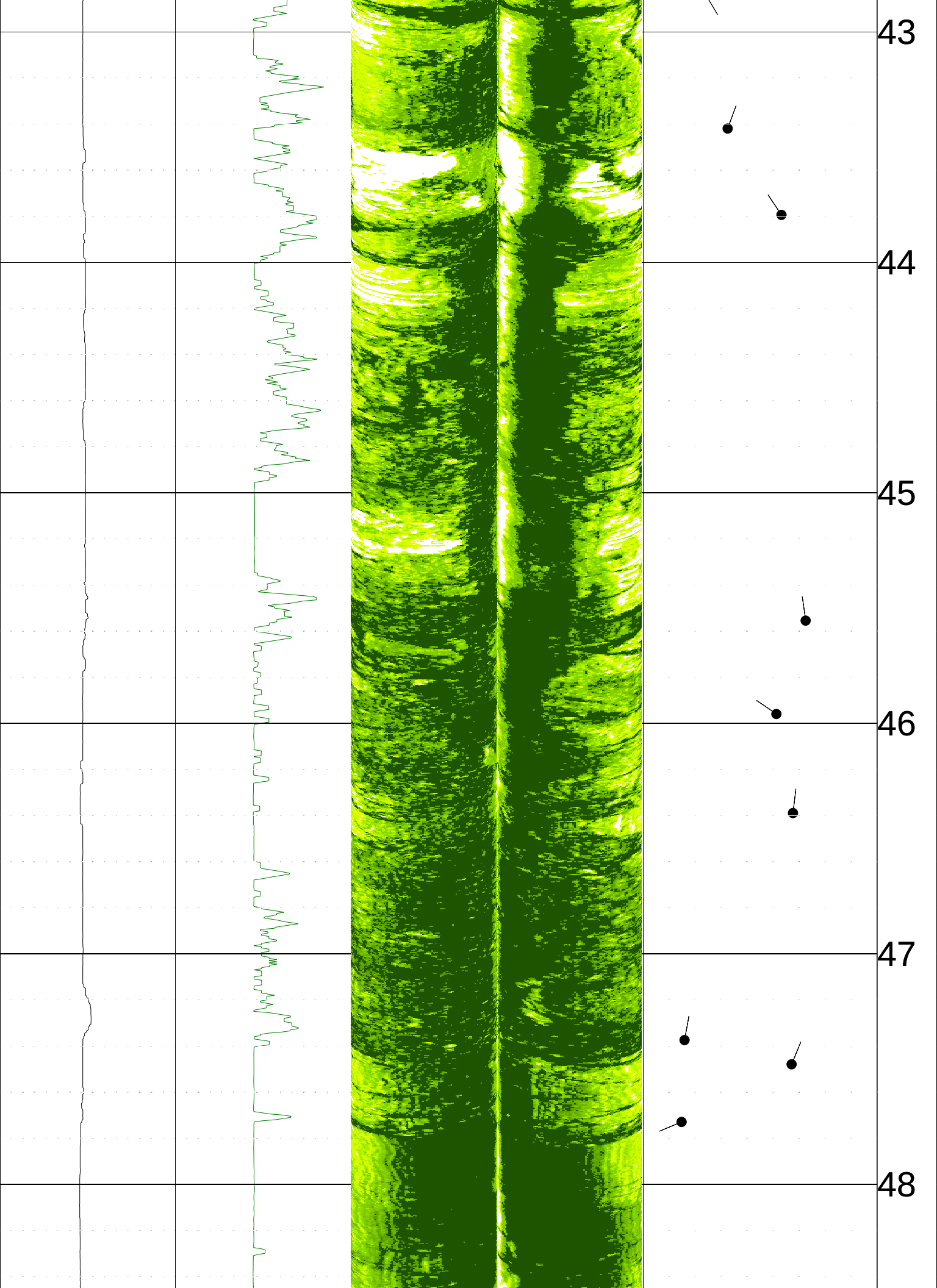

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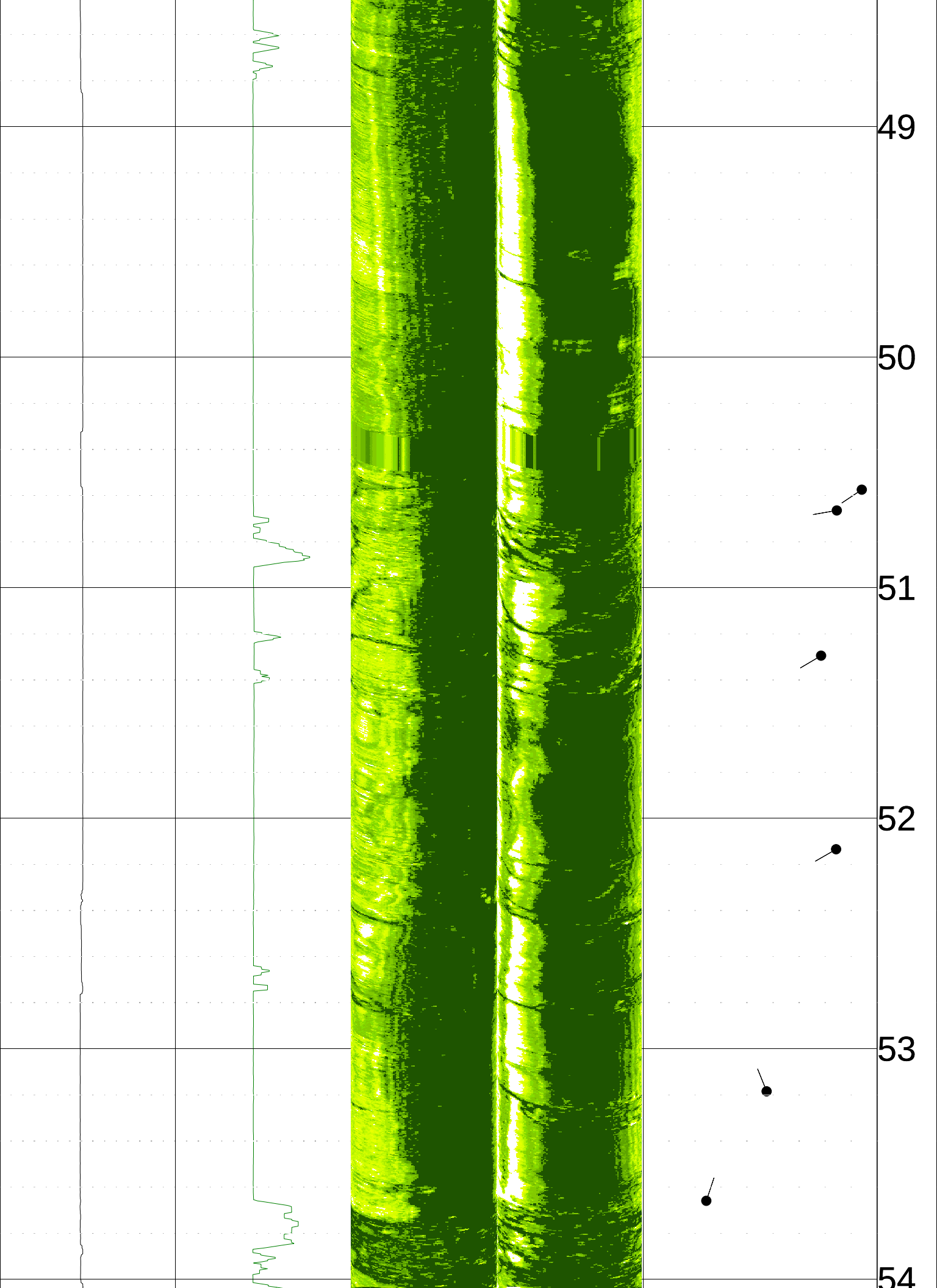

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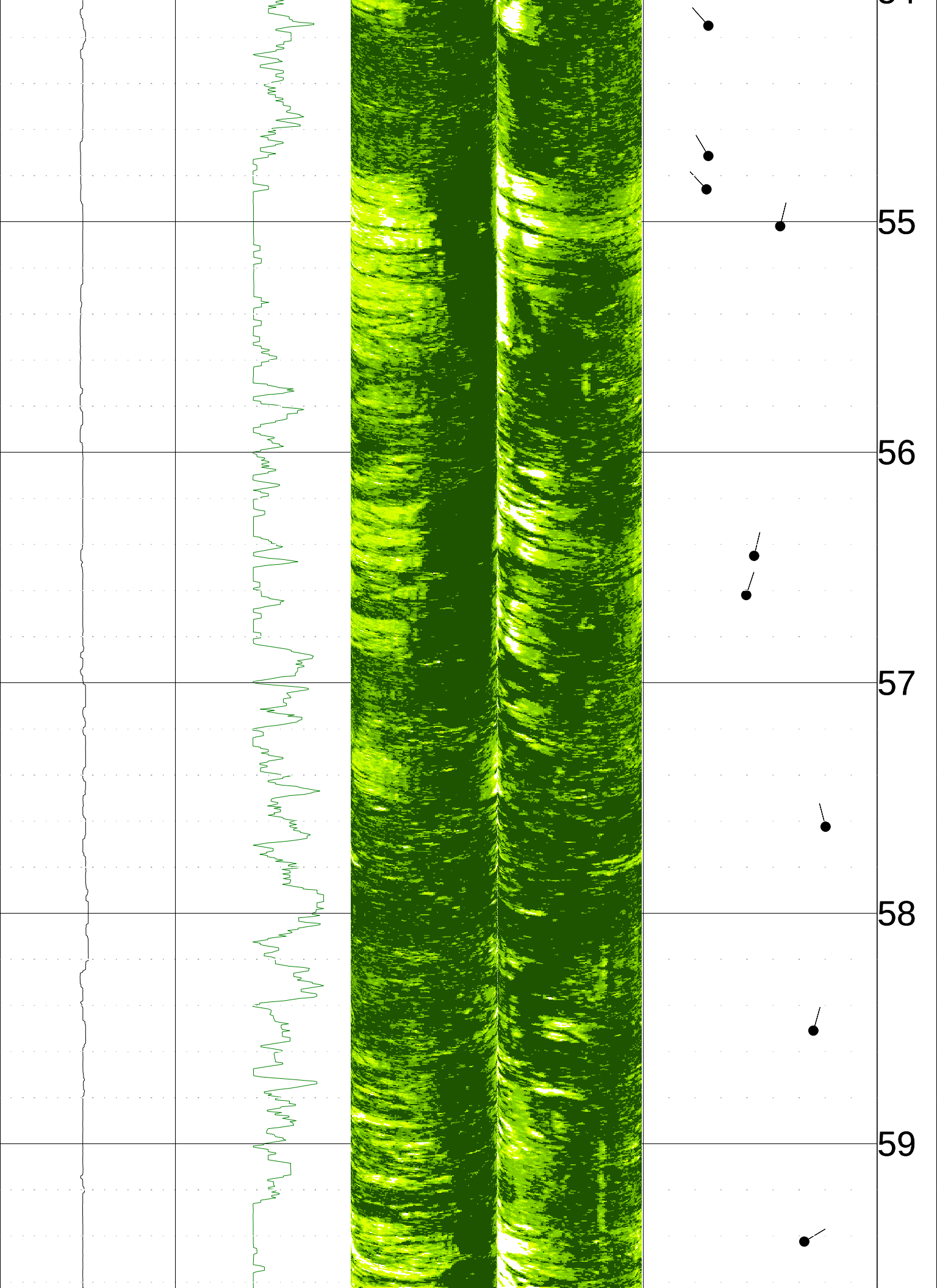

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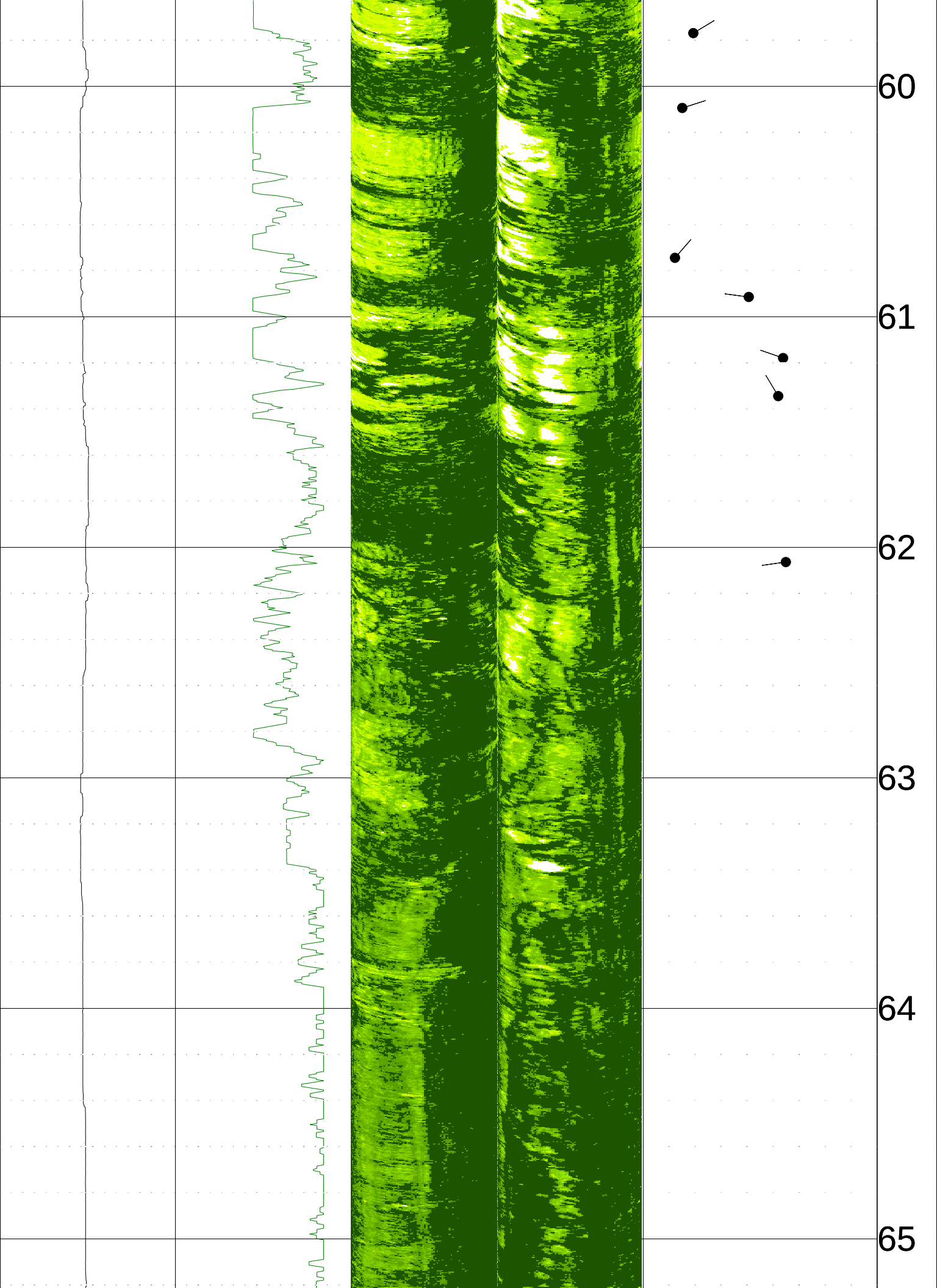

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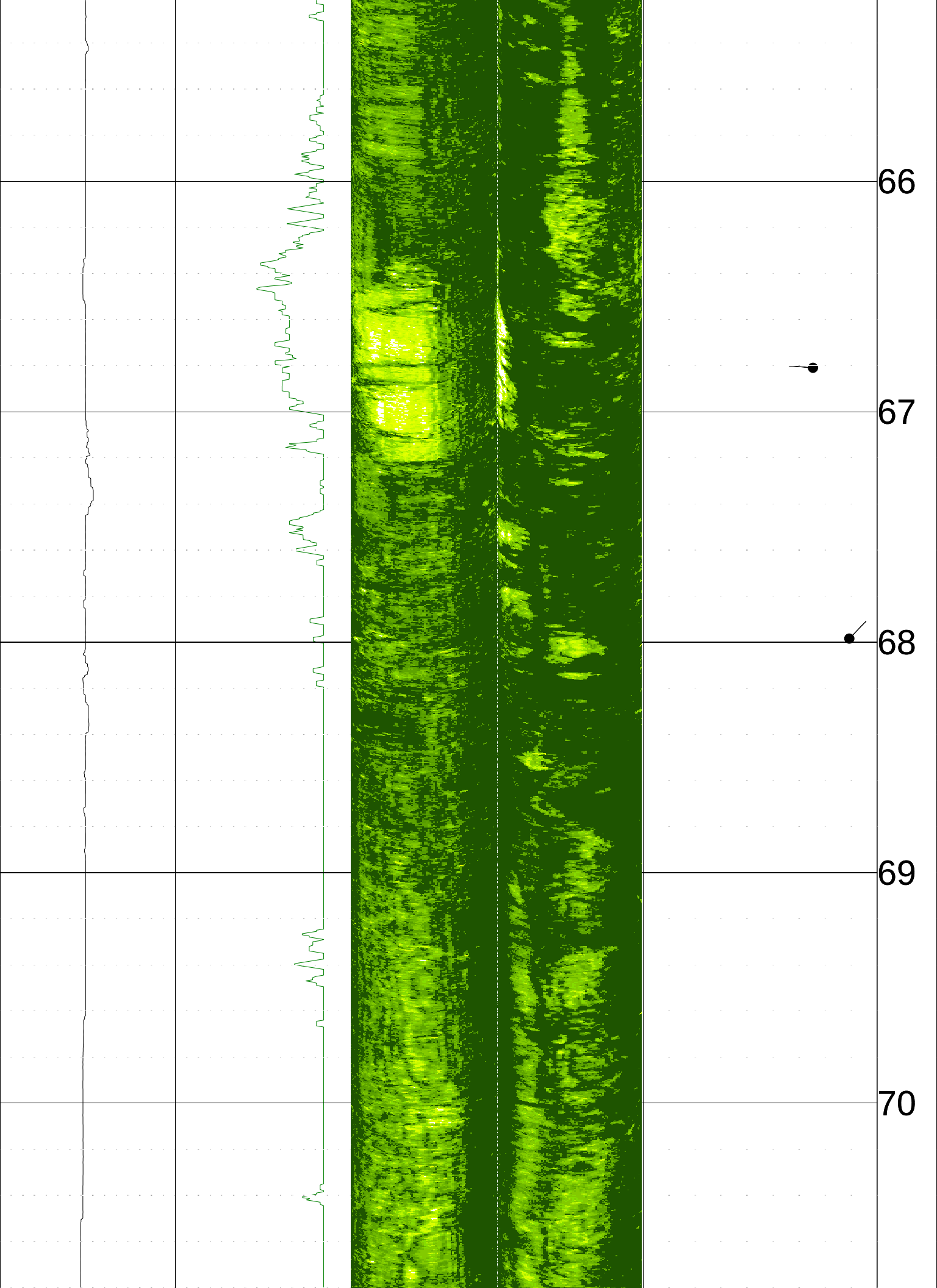

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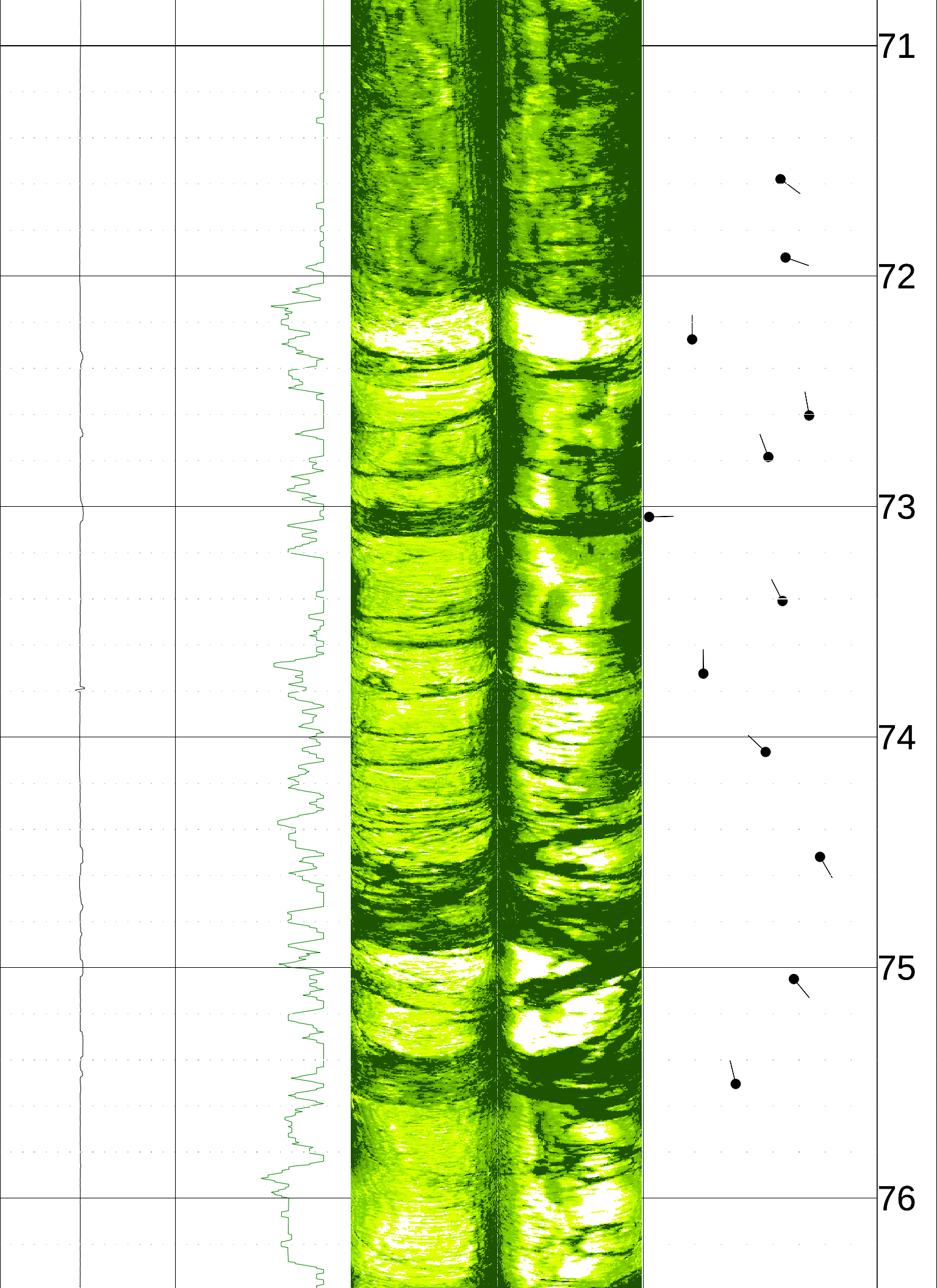

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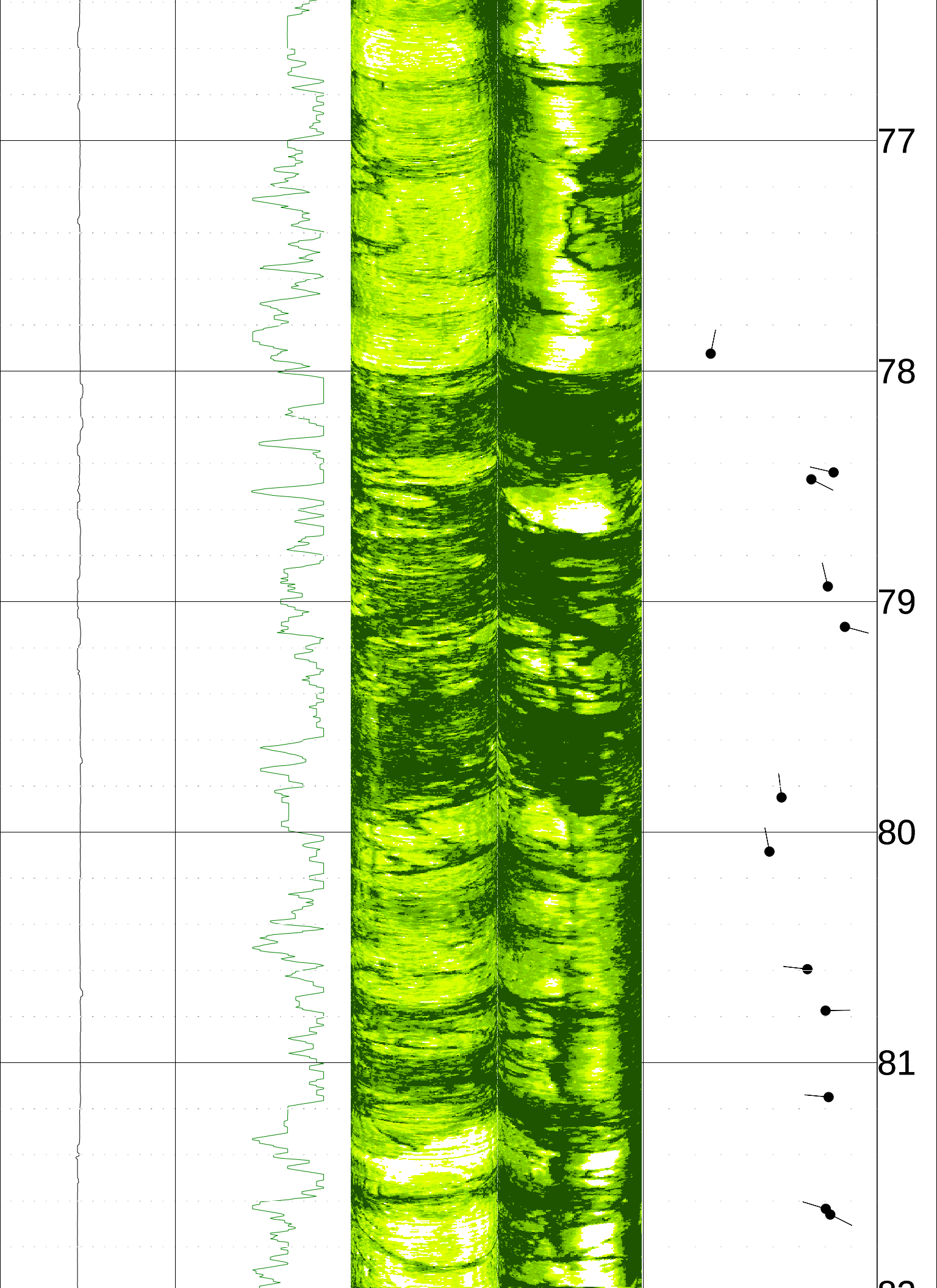

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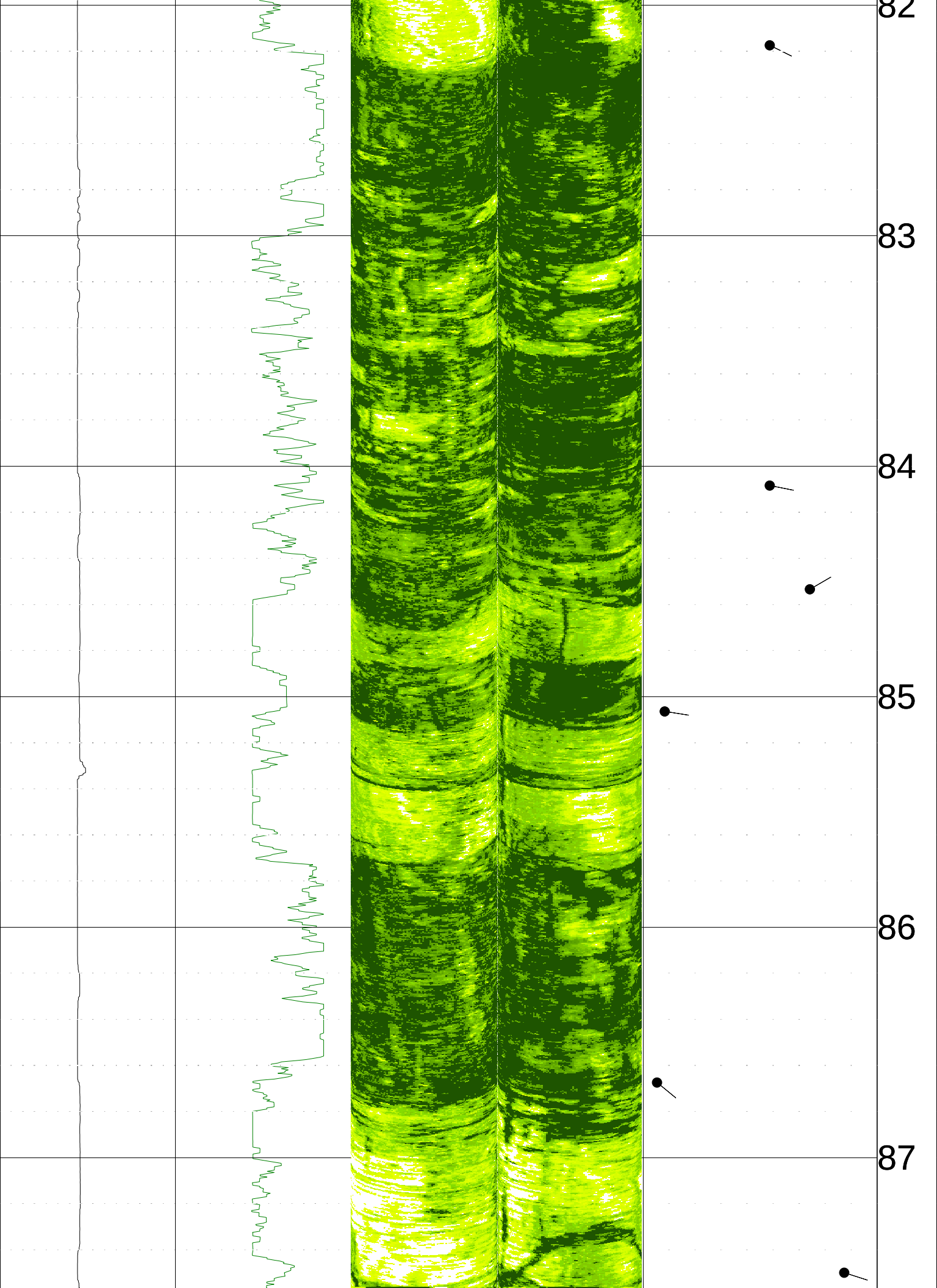

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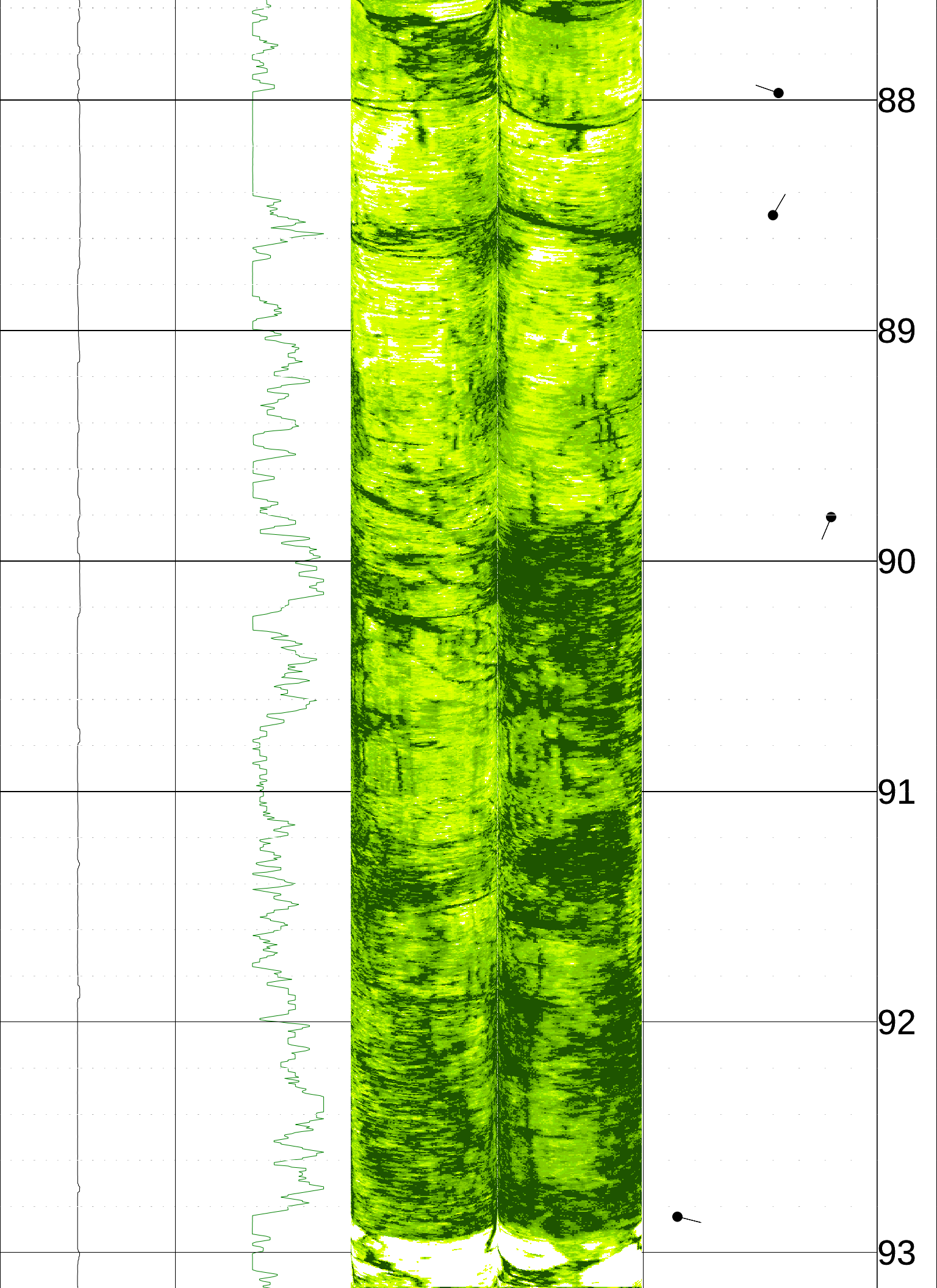

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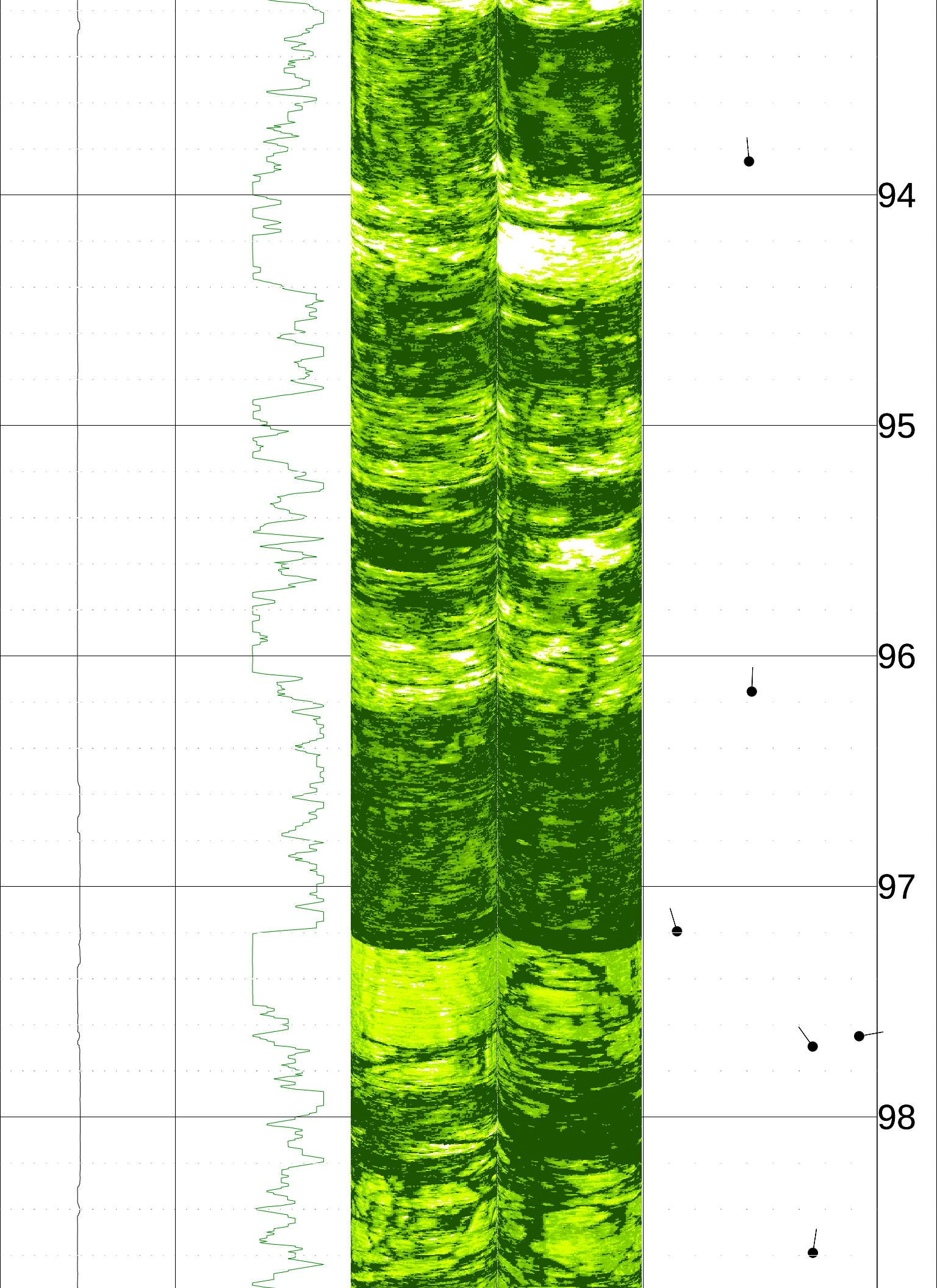

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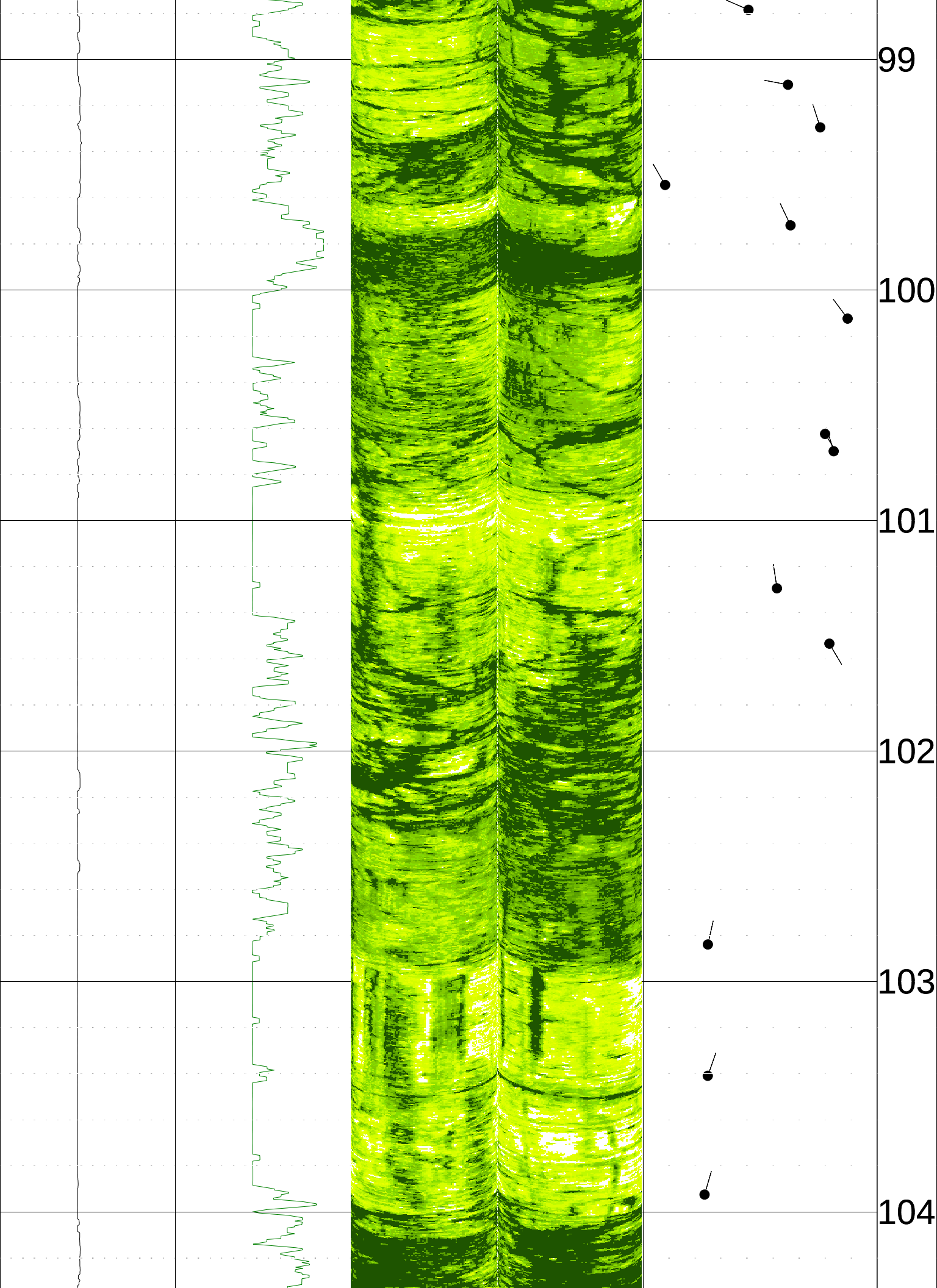

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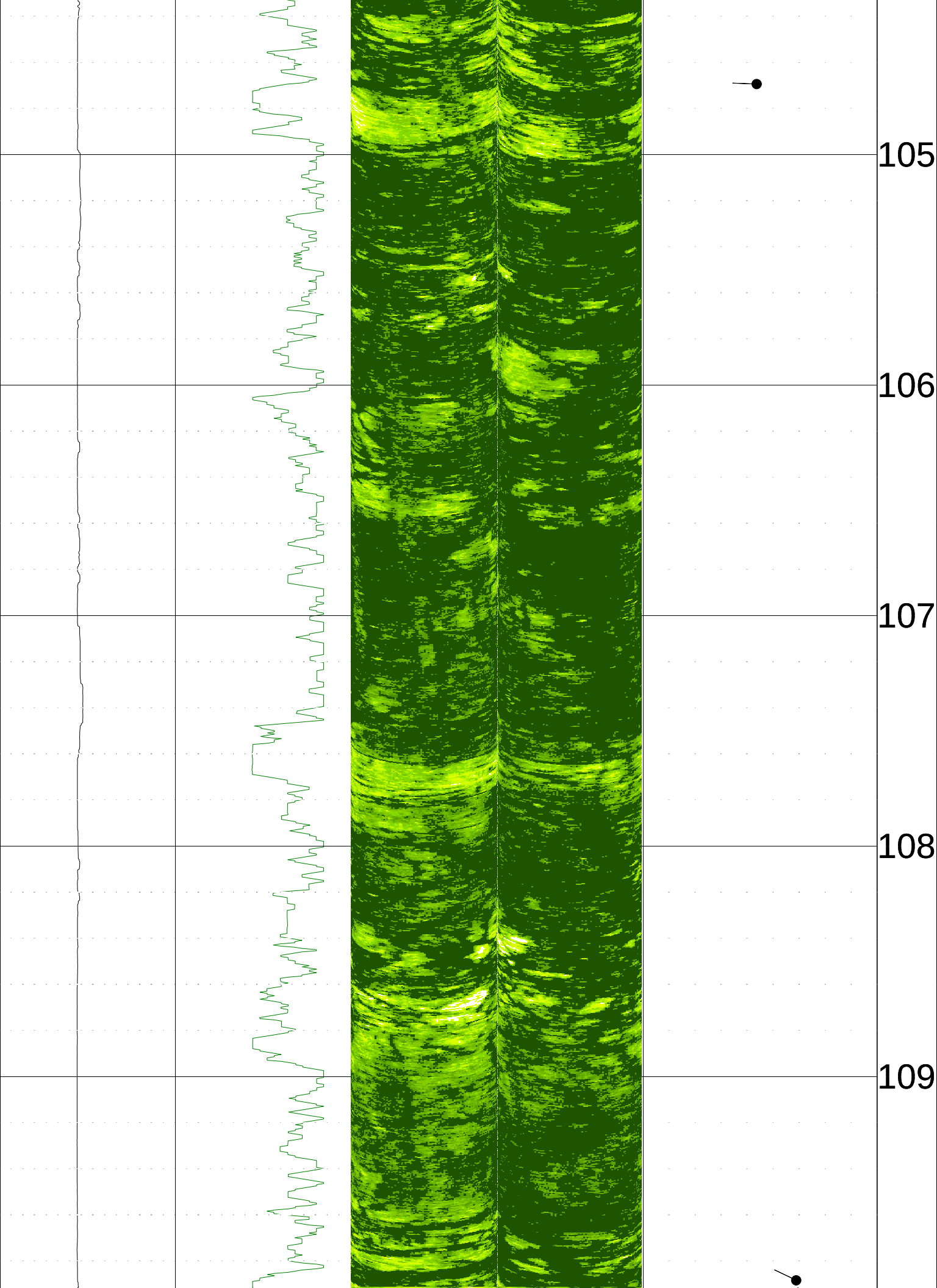

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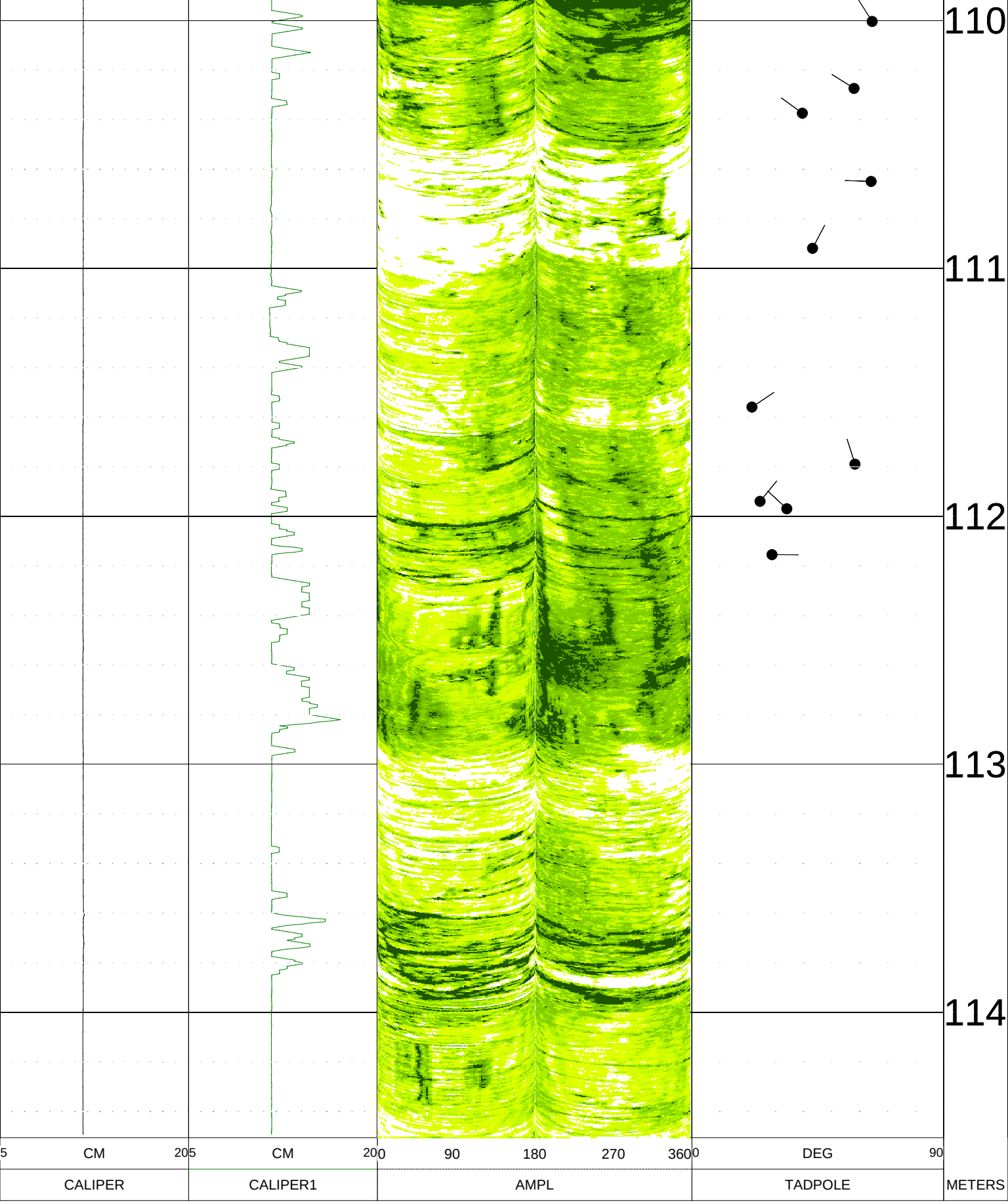

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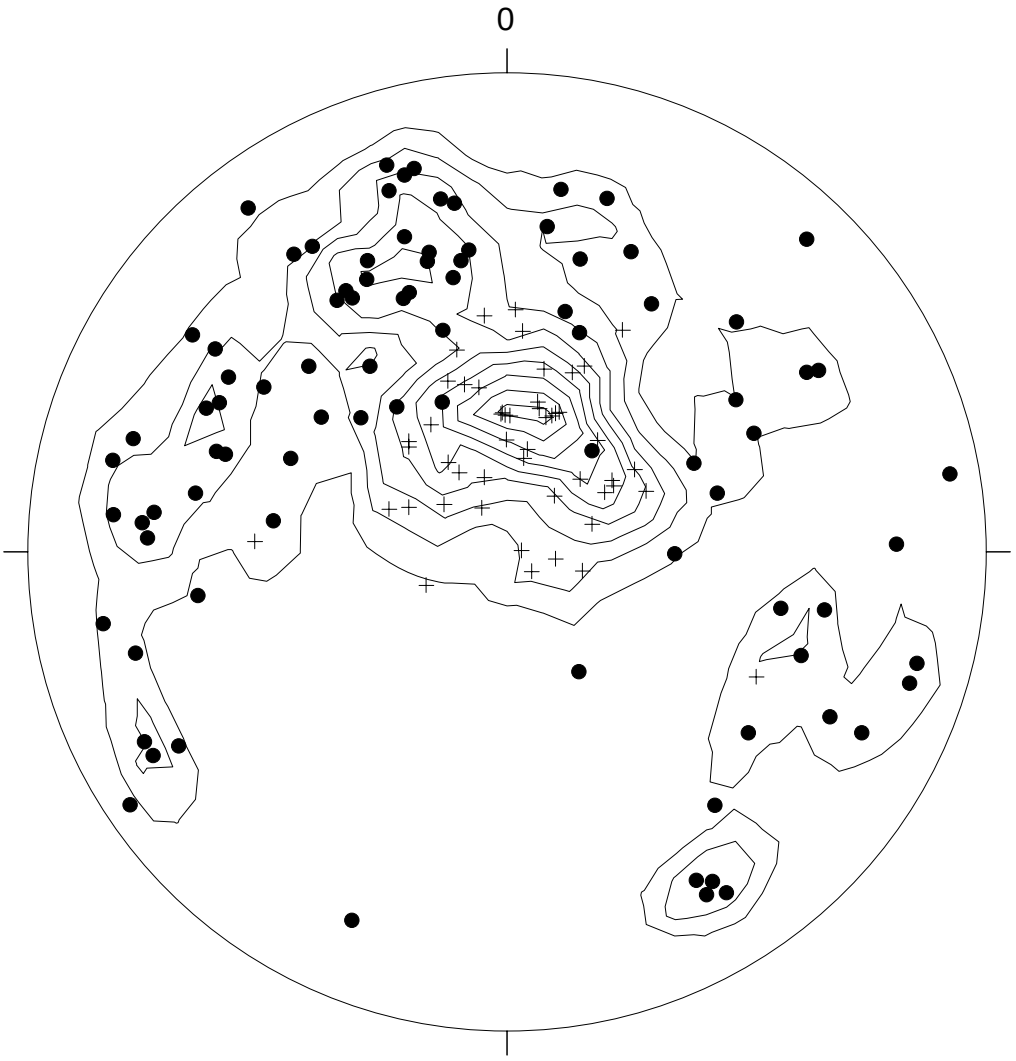

88
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99
100
101
102
103
104


105
106
107
108
109


110
111
112
113
114
5
CM
20
5
CM
20
0
90
180
270
360
0
DEG
90
CALIPER
CALIPER1
AMPL
TADPOLE
METERS



LA 710 Tunnel, boring Z3 B10

+ n=50 (P)
• n=88 (P)

Stereonet contour plot of poles to planes,
Both bedding and fractures

n=138
max. dens.= 9.52 (at 15/ 66)
min. dens.=0.00
Contours at every integer between
1 and 9, inclusive:
(Multiples of random distribution)

Apparent bedding denoted as cross
Apparent fractures denoted as solid circle
Plotted on upper hemisphere



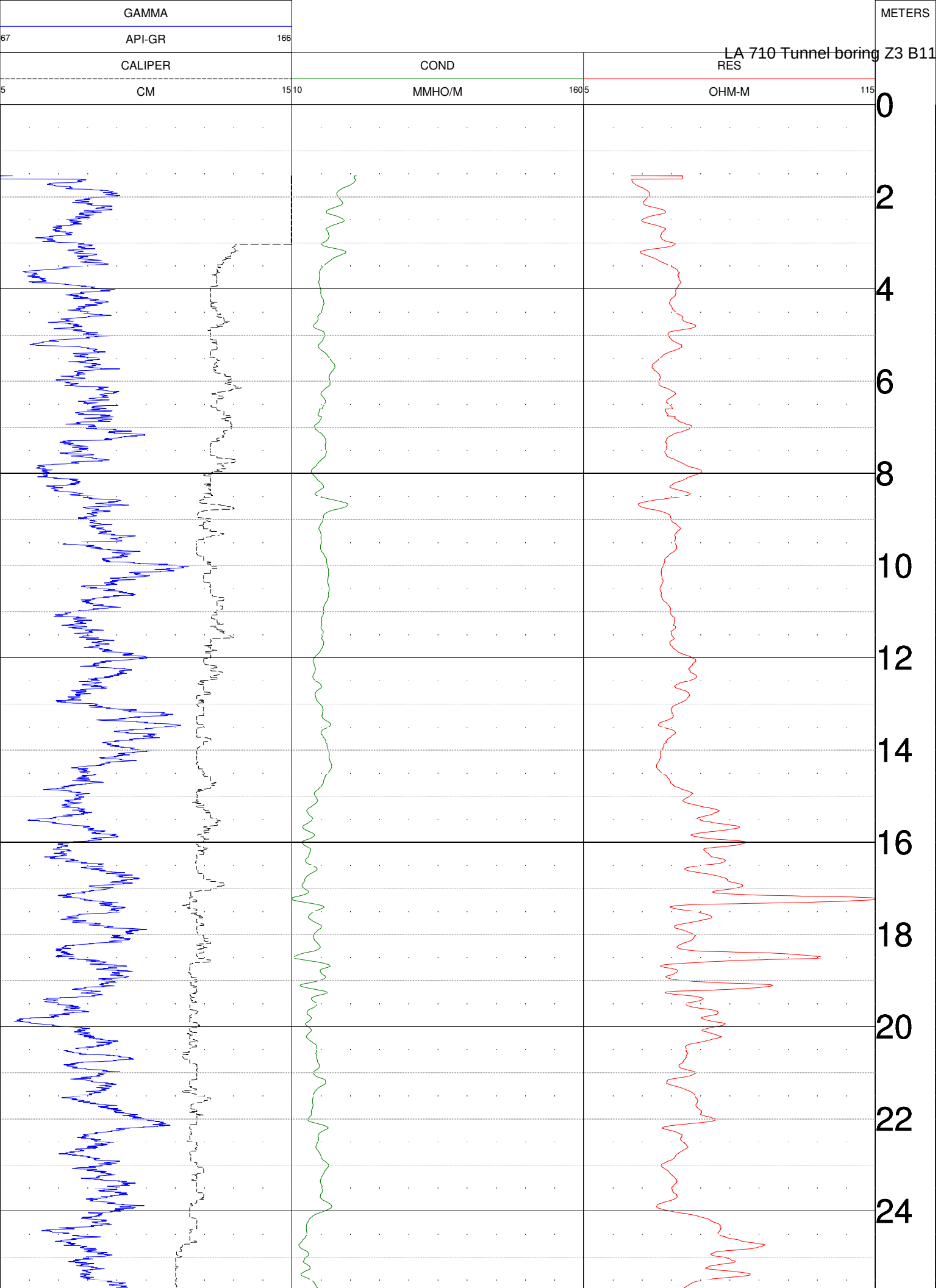
LA 710 Tunnel boring Z3 B11

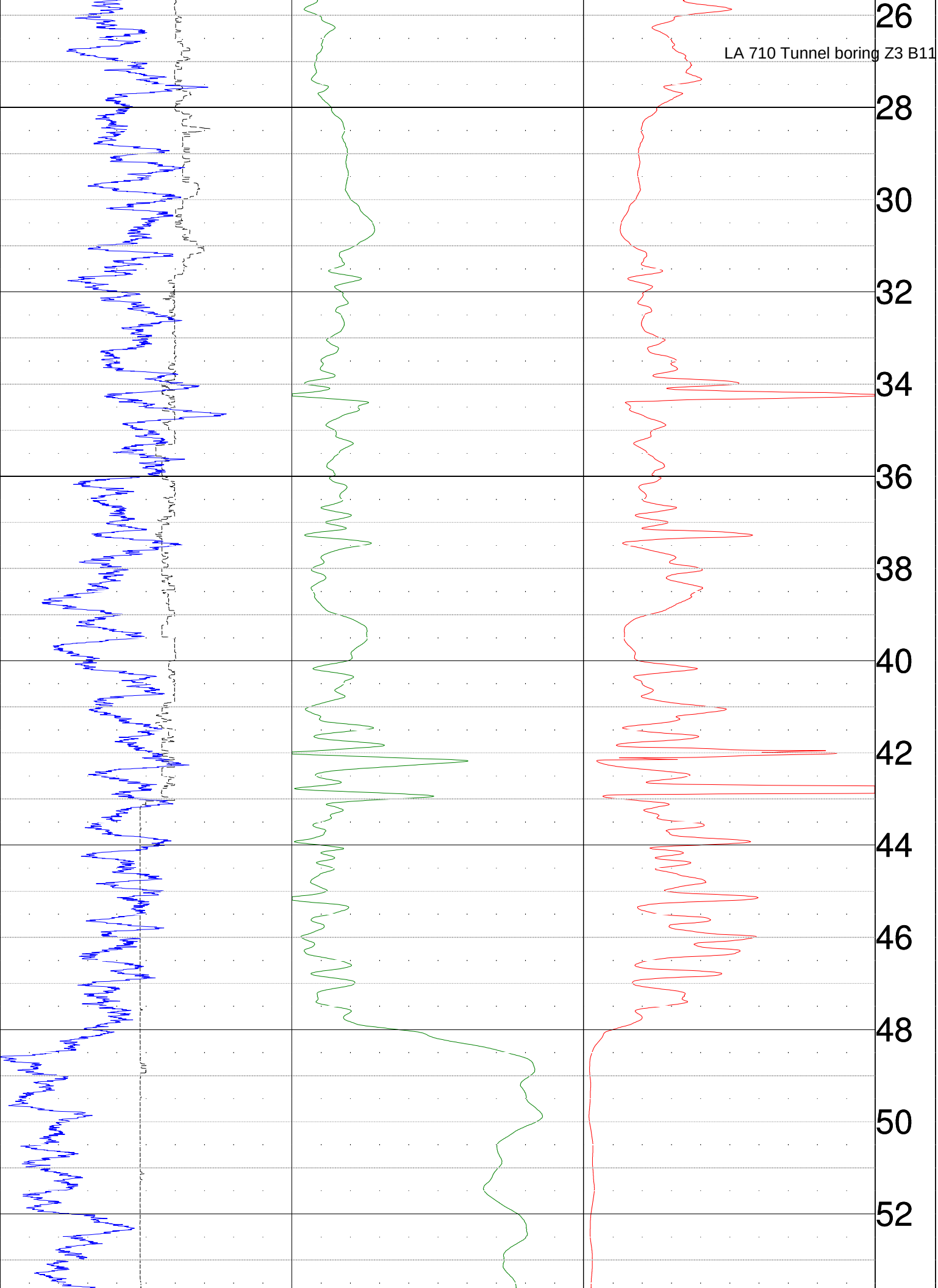
COMPANY	: CALTRANS			OTHER SERVICES:	
WELL	: Z3 B11			IND-CAL	
LOCATION/FIELD	: LA 710 TUNNEL			AC TEL	
COUNTY	: LA			PS LOG	
LOCATION	: CA				
SECTION	: None	TOWNSHIP	: None	RANGE	: None
DATE	: 1/21/09	PERMANENT DATUM	: None		
DEPTH DRILLER	: 83.82M			KB	: NA
LOG BOTTOM	: 83.7	LOG MEASURED FROM:	GL	DF	: NA
LOG TOP	: 1.5	DRL MEASURED FROM:	GL	GL	: NA
CASING DIAMETER	: N/A	LOGGING UNIT	: 7311		
CASING TYPE	: none	FIELD OFFICE	: 7311		
CASING THICKNESS:	0	RECORDED BY	: DH/DL		
BIT SIZE	: 9.8CM	BOREHOLE FLUID	: 0	FILE	: PROCESSE
MAGNETIC DECL.	: 12.85	RM	: 0	TYPE	: 9065A
MATRIX DENSITY	: 2.71	RM TEMPERATURE	: 0	LGDATE	: 1/21/09.
NEUTRON MATRIX	: Dolomite	MATRIX DELTA T	: 140		
				THRESH:	2500

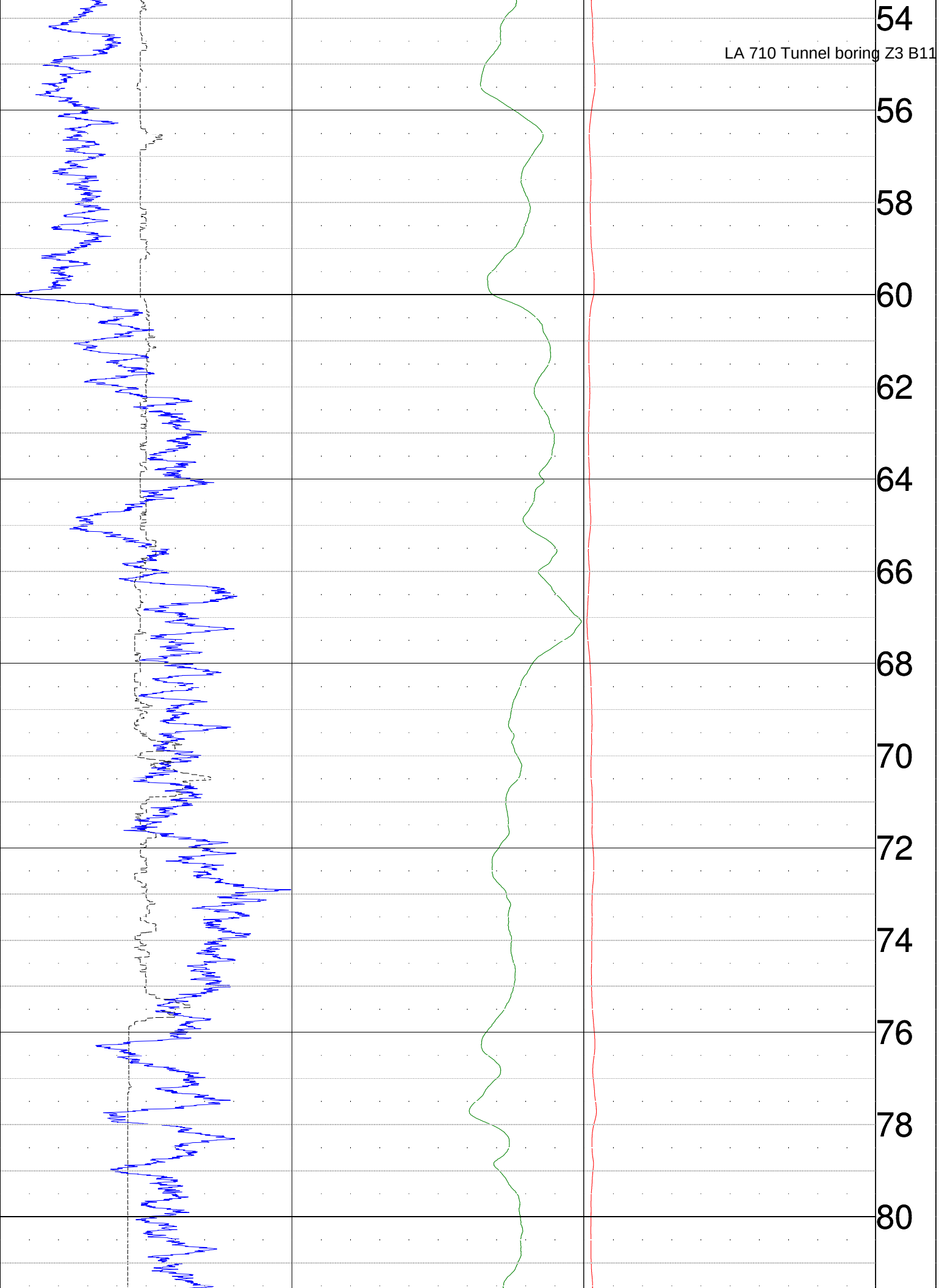
NAT. GAMMA MEASURED AS API UNITS, NOT CPS

EA: 07-187900. GROUND LEVEL ELEVATION NOT ESTIMATE

ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS


GAMMA
67
API-GR
166
CALIPER
5
CM
15
COND
10
MMHO/M
160
RES
5
OHM-M
115
METERS
LA 710 Tunnel boring Z3 B11
0
2
4
6
8
10
12
14
16
18
20
22
24


LA 710 Tunnel boring Z3 B11
26
28
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LA 710 Tunnel boring Z3 B11
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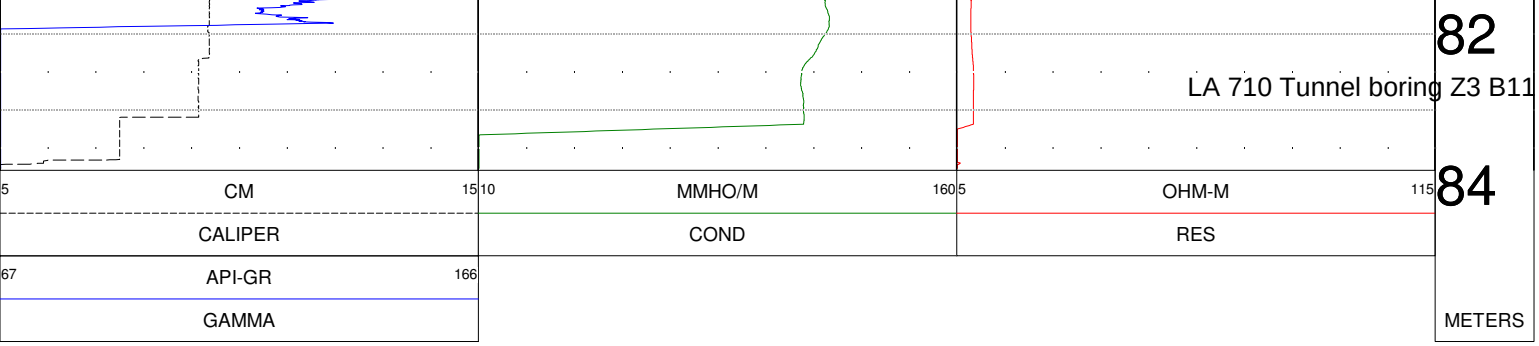

82
LA 710 Tunnel boring Z3 B11
84
5
CM
15
10
MMHO/M
160
5
OHM-M
115
CALIPER
COND
RES
67
API-GR
166
GAMMA
METERS

Table 2. LA 710 Tunnel
Boring Z3 B11
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
Not Provided	3.5	11.5		NA	481	1577	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4	13.1	253	828	556	1823	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4.5	14.8	301	988	649	2130	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5	16.4	340	1116	704	2310	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5.5	18.0	379	1243	694	2278	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5.9	19.4	376	1233	633	2076	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6.4	21.0	360	1180	556	1823	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7	23.0	316	1038	556	1823	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7.5	24.6	316	1038	571	1875	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8	26.2	307	1006	524	1718	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8.5	27.9	316	1038	585	1919	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9	29.5	382	1252	730	2395	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9.5	31.2	410	1345	685	2247	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9.9	32.5	397	1302	676	2217	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10	32.8	382	1252	641	2103	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10.4	34.1	376	1233	625	2051	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10.5	34.4	362	1189	602	1976	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11	36.1	368	1206	595	1953	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11	36.1	355	1163	617	2025	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11.5	37.7	336	1101	581	1907	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11.5	37.7	355	1163	641	2103	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12	39.4	329	1079	568	1864	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12	39.4	340	1116	606	1988	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12.5	41.0	355	1163	641	2103	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12.5	41.0	329	1079	575	1886	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12.9	42.3	350	1147	599	1965	NA	NA	NA	NA	NA	NA	NA	NA	NA
	13	42.7	397	1302	725	2377	NA	NA	NA	NA	NA	NA	NA	NA	NA
	13.4	44.0	397	1302	704	2310	NA	NA	NA	NA	NA	NA	NA	NA	NA
	13.5	44.3	413	1356	794	2604	NA	NA	NA	NA	NA	NA	NA	NA	NA
	13.9	45.6	410	1345	763	2504	NA	NA	NA	NA	NA	NA	NA	NA	NA
	14	45.9	424	1390	833	2734	NA	NA	NA	NA	NA	NA	NA	NA	NA
	14.4	47.2	417	1367	781	2563	NA	NA	NA	NA	NA	NA	NA	NA	NA
	14.4	47.2	424	1390	885	2903	NA	NA	NA	NA	NA	NA	NA	NA	NA
	14.4	47.2	420	1379	877	2878	NA	NA	NA	NA	NA	NA	NA	NA	NA
	14.9	48.9	427	1402	781	2563	NA	NA	NA	NA	NA	NA	NA	NA	NA
	15	49.2	397	1302	746	2448	NA	NA	NA	NA	NA	NA	NA	NA	NA
	15.5	50.9	394	1292	735	2412	NA	NA	NA	NA	NA	NA	NA	NA	NA

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B11
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	15.5	50.9	397	1302	680	2232	NA	NA	NA	NA	NA	NA	NA	NA	NA
	16	52.5	376	1233	781	2563	NA	NA	NA	NA	NA	NA	NA	NA	NA
	16	52.5	417	1367	794	2604	NA	NA	NA	NA	NA	NA	NA	NA	NA
	16.5	54.1	391	1282	781	2563	NA	NA	NA	NA	NA	NA	NA	NA	NA
	16.5	54.1	417	1367	725	2377	NA	NA	NA	NA	NA	NA	NA	NA	NA
	17	55.8	407	1334	735	2412	NA	NA	NA	NA	NA	NA	NA	NA	NA
	17	55.8	413	1356	775	2543	NA	NA	NA	NA	NA	NA	NA	NA	NA
	17.5	57.4	400	1312	746	2448	NA	NA	NA	NA	NA	NA	NA	NA	NA
	17.5	57.4	397	1302	690	2263	NA	NA	NA	NA	NA	NA	NA	NA	NA
	17.5	57.4	392	1287	685	2247	NA	NA	NA	NA	NA	NA	NA	NA	NA
	18	59.1	420	1379	758	2485	NA	NA	NA	NA	NA	NA	NA	NA	NA
	18	59.1	388	1272	704	2310	NA	NA	NA	NA	NA	NA	NA	NA	NA
	18.5	60.7	435	1426	847	2780	NA	NA	NA	NA	NA	NA	NA	NA	NA
	18.5	60.7	417	1367	671	2202	NA	NA	NA	NA	NA	NA	NA	NA	NA
	18.9	62.0	424	1390	806	2646	NA	NA	NA	NA	NA	NA	NA	NA	NA
	18.9	62.0	439	1439	840	2757	NA	NA	NA	NA	NA	NA	NA	NA	NA
	19.4	63.6	424	1390	787	2583	NA	NA	NA	NA	NA	NA	NA	NA	NA
	19.5	64.0	439	1439	781	2563	NA	NA	NA	NA	NA	NA	NA	NA	NA
	19.9	65.3	413	1356	735	2412	NA	NA	NA	NA	NA	NA	NA	NA	NA
	20	65.6	446	1465	769	2524	NA	NA	NA	NA	NA	NA	NA	NA	NA
	20.5	67.3	435	1426	758	2485	NA	NA	NA	NA	NA	NA	NA	NA	NA
	20.8	68.2	521	1709	962	3155	NA	NA	NA	NA	NA	NA	NA	NA	NA
	21	68.9	495	1624	901	2956	NA	NA	NA	NA	NA	NA	NA	NA	NA
	21.5	70.5	568	1864	1020	3348	NA	NA	NA	NA	NA	NA	NA	NA	NA
	22	72.2	581	1907	990	3248	NA	NA	NA	NA	NA	NA	NA	NA	NA
	22.5	73.8	526	1727	917	3010	NA	NA	NA	NA	NA	NA	NA	NA	NA
	23	75.5	500	1640	893	2929	NA	NA	NA	NA	NA	NA	NA	NA	NA
	24	78.7	472	1548	847	2780	NA	NA	NA	NA	NA	NA	NA	NA	NA
	24.5	80.4	490	1608	893	2929	NA	NA	NA	NA	NA	NA	NA	NA	NA
	25	82.0	476	1562	758	2485	NA	NA	NA	NA	NA	NA	NA	NA	NA
	25.5	83.7	459	1505	855	2804	NA	NA	NA	NA	NA	NA	NA	NA	NA
	26	85.3	472	1548	990	3248	NA	NA	NA	NA	NA	NA	NA	NA	NA
	26.5	86.9	515	1691	926	3038	NA	NA	NA	NA	NA	NA	NA	NA	NA
	27	88.6	543	1783	926	3038	NA	NA	NA	NA	NA	NA	NA	NA	NA
	27.5	90.2	521	1709	901	2956	NA	NA	NA	NA	NA	NA	NA	NA	NA
	28	91.9	505	1657	847	2780	NA	NA	NA	NA	NA	NA	NA	NA	NA
	28.5	93.5	476	1562	855	2804	NA	NA	NA	NA	NA	NA	NA	NA	NA

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B11
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	29	95.1	485	1593	741	2430	NA	NA	NA	NA	NA	NA	NA	NA	NA
	29.5	96.8	500	1640	840	2757	NA	NA	NA	NA	NA	NA	NA	NA	NA
	30	98.4	510	1674	833	2734	NA	NA	NA	NA	NA	NA	NA	NA	NA
	30.5	100.1	485	1593	806	2646	NA	NA	NA	NA	NA	NA	NA	NA	NA
	31	101.7	463	1519	1020	3348	NA	NA	NA	NA	NA	NA	NA	NA	NA
	31.5	103.3	485	1593	781	2563	NA	NA	NA	NA	NA	NA	NA	NA	NA
	32	105.0	581	1907	980	3217	NA	NA	NA	NA	NA	NA	NA	NA	NA
	32.5	106.6	625	2051	1053	3454	NA	NA	NA	NA	NA	NA	NA	NA	NA
	33	108.3	595	1953	1042	3418	NA	NA	NA	NA	NA	NA	NA	NA	NA
	33.4	109.6	581	1907	1075	3528	NA	NA	NA	NA	NA	NA	NA	NA	NA
	34	111.5	562	1843	1099	3605	NA	NA	NA	NA	NA	NA	NA	NA	NA
	34.4	112.9	617	2025	1149	3771	NA	NA	NA	NA	NA	NA	NA	NA	NA
	35	114.8	694	2278	1220	4001	NA	NA	NA	NA	NA	NA	NA	NA	NA
	35.5	116.5	667	2187	1190	3906	NA	NA	NA	NA	NA	NA	NA	NA	NA
	36	118.1	658	2158	1149	3771	NA	NA	NA	NA	NA	NA	NA	NA	NA
	36.5	119.8	667	2187	1190	3906	NA	NA	NA	NA	NA	NA	NA	NA	NA
	37	121.4	633	2076	1064	3490	NA	NA	NA	NA	NA	NA	NA	NA	NA
	37.5	123.0	625	2051	1042	3418	NA	NA	NA	NA	NA	NA	NA	NA	NA
	38	124.7	658	2158	1136	3728	NA	NA	NA	NA	NA	NA	NA	NA	NA
	38.5	126.3	658	2158	1149	3771	NA	NA	NA	NA	NA	NA	NA	NA	NA
	39	128.0	704	2310	1190	3906	NA	NA	NA	NA	NA	NA	NA	NA	NA
	39.5	129.6	735	2412	1316	4317	NA	NA	NA	NA	NA	NA	NA	NA	NA
	40	131.2	610	2001	1064	3490	NA	NA	NA	NA	NA	NA	NA	NA	NA
	40.5	132.9	532	1745	962	3155	NA	NA	NA	NA	NA	NA	NA	NA	NA
	41	134.5	526	1727	917	3010	NA	NA	NA	NA	NA	NA	NA	NA	NA
	41.5	136.2	495	1624	893	2929	NA	NA	NA	NA	NA	NA	NA	NA	NA
	42	137.8	490	1608	1099	3605	NA	NA	NA	NA	NA	NA	NA	NA	NA
	42.5	139.4	543	1783	1220	4001	NA	NA	NA	NA	NA	NA	NA	NA	NA
	43	141.1	581	1907	1149	3771	NA	NA	NA	NA	NA	NA	NA	NA	NA
	43.5	142.7	575	1886	1053	3454	NA	NA	NA	NA	NA	NA	NA	NA	NA
	44	144.4	575	1886	1000	3281	NA	NA	NA	NA	NA	NA	NA	NA	NA
	44.5	146.0	617	2025	1176	3860	NA	NA	NA	NA	NA	NA	NA	NA	NA
	45	147.6	602	1976	1220	4001	NA	NA	NA	NA	NA	NA	NA	NA	NA
	45.5	149.3	625	2051	1250	4101	NA	NA	NA	NA	NA	NA	NA	NA	NA
	46	150.9	625	2051	1205	3953	NA	NA	NA	NA	NA	NA	NA	NA	NA
	46.5	152.6	595	1953	1149	3771	NA	NA	NA	NA	NA	NA	NA	NA	NA
	47	154.2	562	1843	1111	3645	NA	NA	NA	NA	NA	NA	NA	NA	NA

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Table 2. LA 710 Tunnel
Boring Z3 B11
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	47.5	155.8	581	1907	1220	4001	NA	NA	NA	NA	NA	NA	NA	NA	NA
	48	157.5	538	1764	1099	3605	NA	NA	NA	NA	NA	NA	NA	NA	NA
	48.4	158.8	581	1907	1020	3348	NA	NA	NA	NA	NA	NA	NA	NA	NA
	48.9	160.4	595	1953	1136	3728	NA	NA	NA	NA	NA	NA	NA	NA	NA
	49.5	162.4	610	2001	1099	3605	NA	NA	NA	NA	NA	NA	NA	NA	NA
	50	164.0	595	1953	1163	3815	NA	NA	NA	NA	NA	NA	NA	NA	NA
	50.5	165.7	610	2001	1333	4374	NA	NA	NA	NA	NA	NA	NA	NA	NA
	51	167.3	463	1519	1613	5292	0.46	1.94	121.09	0.416	1.210	4.492	8683	25268	93807
	51.5	169.0	407	1334	1754	5756	0.47	2.04	127.35	0.337	0.992	5.829	7040	20722	121749
	52.1	170.9	476	1562	1786	5859	0.46	2.06	128.62	0.467	1.366	5.947	9757	28524	124199
	52.5	172.2	476	1562	1754	5756	0.46	2.04	127.35	0.463	1.351	5.662	9661	28215	118254
	53	173.9	442	1452	1786	5859	0.47	2.06	128.62	0.403	1.184	6.032	8424	24722	125975
	53.5	175.5	420	1379	1786	5859	0.47	2.06	128.62	0.364	1.070	6.085	7596	22344	127080
	53.9	176.8	413	1356	1724	5657	0.47	2.02	126.09	0.345	1.014	5.544	7203	21171	115797
	54.5	178.8	435	1426	1695	5561	0.46	2.00	124.84	0.378	1.107	5.241	7895	23129	109452
	55	180.4	435	1426	1786	5859	0.47	2.06	128.62	0.389	1.144	6.050	8134	23889	126363
	55.5	182.1	442	1452	1852	6076	0.47	2.10	131.15	0.411	1.209	6.656	8590	25251	139012
	56	183.7	467	1533	1852	6076	0.47	2.10	131.15	0.459	1.345	6.593	9581	28091	137692
	56.5	185.4	427	1402	1852	6076	0.47	2.10	131.15	0.384	1.129	6.693	8013	23588	139782
	57	187.0	521	1709	1887	6190	0.46	2.12	132.42	0.575	1.679	6.784	12017	35061	141688
	57.4	188.3	526	1727	1887	6190	0.46	2.12	132.42	0.588	1.713	6.768	12272	35780	141349
	58	190.3	526	1727	1961	6433	0.46	2.16	134.97	0.599	1.750	7.514	12508	36553	156926
	58.5	191.9	526	1727	1887	6190	0.46	2.12	132.42	0.588	1.713	6.768	12272	35780	141348
	59	193.6	463	1519	1852	6076	0.47	2.10	131.15	0.450	1.321	6.604	9404	27585	137927
	60	196.9	500	1640	1818	5965	0.46	2.08	129.88	0.520	1.518	6.184	10863	31700	129158
	60.5	198.5	549	1803	1923	6309	0.46	2.14	133.69	0.647	1.882	7.058	13503	39309	147407
	61.5	201.8	463	1519	1818	5965	0.47	2.08	129.88	0.446	1.307	6.283	9313	27294	131224
	62	203.4	485	1593	1923	6309	0.47	2.14	133.69	0.505	1.480	7.247	10540	30902	151358
	62	203.4	485	1593	1923	6309	0.47	2.14	133.69	0.505	1.480	7.247	10540	30902	151358
	62.5	205.1	459	1505	1923	6309	0.47	2.14	133.69	0.451	1.325	7.319	9412	27667	152862
	63	206.7	385	1262	1786	5859	0.48	2.06	128.62	0.305	0.899	6.163	6365	18786	128721
	63.5	208.3	455	1491	1786	5859	0.47	2.06	128.62	0.426	1.248	6.002	8890	26055	125354
	64	210.0	459	1505	1961	6433	0.47	2.16	134.97	0.455	1.338	7.706	9501	27954	160935
	64.5	211.6	532	1745	1923	6309	0.46	2.14	133.69	0.606	1.768	7.112	12655	36916	148538
	65	213.3	455	1491	1818	5965	0.47	2.08	129.88	0.430	1.261	6.305	8978	26334	131671
	65.5	214.9	446	1465	1786	5859	0.47	2.06	128.62	0.411	1.204	6.022	8576	25155	125774
	66	216.5	431	1414	1818	5965	0.47	2.08	129.88	0.387	1.137	6.362	8073	23738	132878

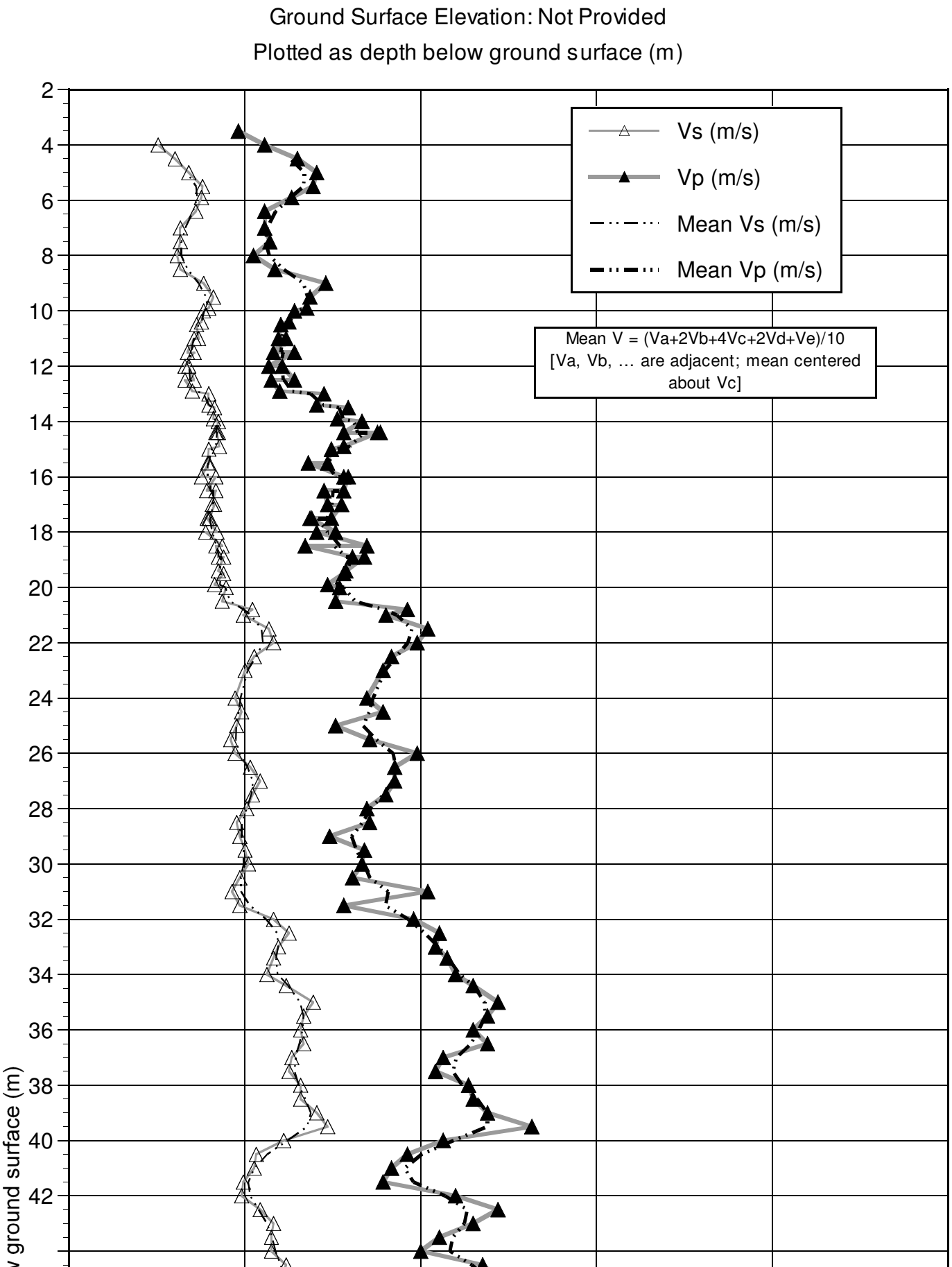
γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

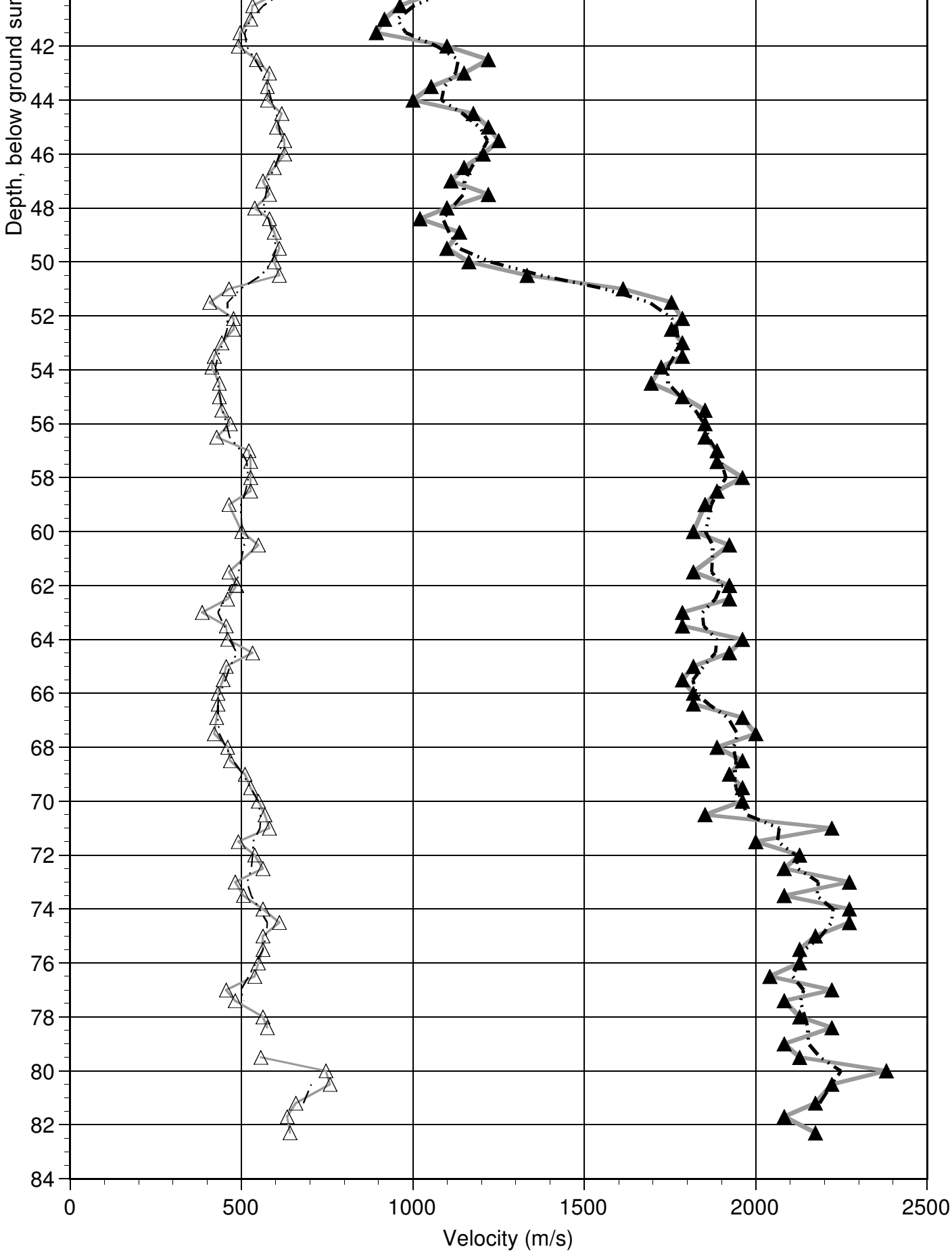
Table 2. LA 710 Tunnel
Boring Z3 B11
PS Suspension Log Data Summary

Top of Hole Elevation (m)	Depth (m)	Depth (ft)	Vs (m/s)	Vs (ft/s)	Vp (m/s)	Vp (ft/s)	γ	ρ(Vp) (g/cc)	ρ(Vp) (lb/ft^3)	G (GPa)	E (GPa)	K (GPa)	G ($10^3 lb/ft^2$)	E ($10^3 lb/ft^2$)	K ($10^3 lb/ft^2$)
	66.4	217.8	431	1414	1818	5965	0.47	2.08	129.88	0.387	1.137	6.362	8073	23738	132878
	66.9	219.5	427	1402	1961	6433	0.48	2.16	134.97	0.395	1.165	7.786	8246	24328	162608
	67.5	221.5	420	1379	2000	6562	0.48	2.18	136.25	0.385	1.138	8.216	8047	23770	171600
	68	223.1	459	1505	1887	6190	0.47	2.12	132.42	0.446	1.311	6.956	9322	27380	145282
	68.5	224.7	467	1533	1961	6433	0.47	2.16	134.97	0.472	1.388	7.683	9860	28986	160457
	69	226.4	510	1674	1923	6309	0.46	2.14	133.69	0.557	1.630	7.177	11643	34047	149887
	69.5	228.0	526	1727	1961	6433	0.46	2.16	134.97	0.599	1.750	7.514	12508	36553	156926
	70	229.7	549	1803	1961	6433	0.46	2.16	134.97	0.653	1.902	7.442	13632	39734	155427
	70.5	231.3	568	1864	1852	6076	0.45	2.10	131.15	0.678	1.964	6.300	14164	41021	131580
	71	232.9	581	1907	2222	7291	0.46	2.29	142.69	0.773	2.261	10.257	16136	47223	214227
	71.5	234.6	490	1608	2000	6562	0.47	2.18	136.25	0.524	1.540	8.031	10953	32159	167725
	72	236.2	538	1764	2128	6981	0.47	2.24	140.11	0.649	1.902	9.295	13549	39722	194125
	72.5	237.9	562	1843	2083	6835	0.46	2.22	138.82	0.702	2.050	8.715	14658	42824	182026
	73	239.5	481	1577	2273	7456	0.48	2.31	143.99	0.533	1.574	11.203	11134	32882	233976
	73.5	241.1	505	1657	2083	6835	0.47	2.22	138.82	0.567	1.666	8.895	11846	34799	185774
	74	242.8	562	1843	2273	7456	0.47	2.31	143.99	0.728	2.137	10.943	15204	44622	228550
	74.5	244.4	610	2001	2273	7456	0.46	2.31	143.99	0.858	2.506	10.770	17910	52342	224941
	75	246.1	562	1843	2174	7132	0.46	2.26	141.40	0.715	2.093	9.751	14930	43722	203650
	75.5	247.7	562	1843	2128	6981	0.46	2.24	140.11	0.708	2.072	9.215	14794	43273	192464
	76	249.3	549	1803	2128	6981	0.46	2.24	140.11	0.678	1.984	9.256	14151	41441	193321
	76.5	251.0	538	1764	2041	6696	0.46	2.20	137.53	0.637	1.863	8.327	13300	38907	173902
	77	252.6	455	1491	2222	7291	0.48	2.29	142.69	0.472	1.396	10.658	9863	29159	222591
	77.4	253.9	481	1577	2083	6835	0.47	2.22	138.82	0.514	1.513	8.966	10734	31599	187257
	78	255.9	562	1843	2128	6981	0.46	2.24	140.11	0.708	2.072	9.215	14794	43273	192465
	78.4	257.2	575	1886	2222	7291	0.46	2.29	142.69	0.755	2.211	10.281	15768	46172	214719
	79	259.2		NA	2083	6835	NA	NA	NA	NA	NA	NA	NA	NA	NA
	79.5	260.8	556	1823	2128	6981	0.46	2.24	140.11	0.693	2.027	9.236	14467	42342	192901
	80	262.5	746	2448	2381	7812	0.45	2.35	146.59	1.308	3.781	11.568	27313	78963	241604
	80.5	264.1	758	2485	2222	7291	0.43	2.29	142.69	1.312	3.763	9.538	27398	78590	199212
	81.2	266.4	658	2158	2174	7132	0.45	2.26	141.40	0.980	2.842	9.397	20475	59360	196258
	81.7	268.0	633	2076	2083	6835	0.45	2.22	138.82	0.891	2.582	8.464	18603	53919	176765
	82.3	270.0	641	2103	2174	7132	0.45	2.26	141.40	0.931	2.703	9.463	19438	56463	197640

γ = Poisson's Ratio ρ(Vp) = Vp-derived density G = Shear Modulus E = Young's Modulus K = Bulk Modulus
Shaded cells denote questionable data.

Figure 1. LA 710 Tunnel
Boring Z3 B11
Downhole Interval Velocities




Depth, below ground surface
42
44
46
48
50
52
54
56
58
60
62
64
66
68
70
72
74
76
78
80
82
84
0
500
1000
1500
2000
2500
Velocity (m/s)



Z3B11

COMPANY	: CALTRANS.	OTHER SERVICES:
WELL	: Z3B11	IND-CAL.
FIELD	: LA 710 TUNNEL.	AC TEL.
COUNTY	: LA	PSLOG
STATE	: CA	

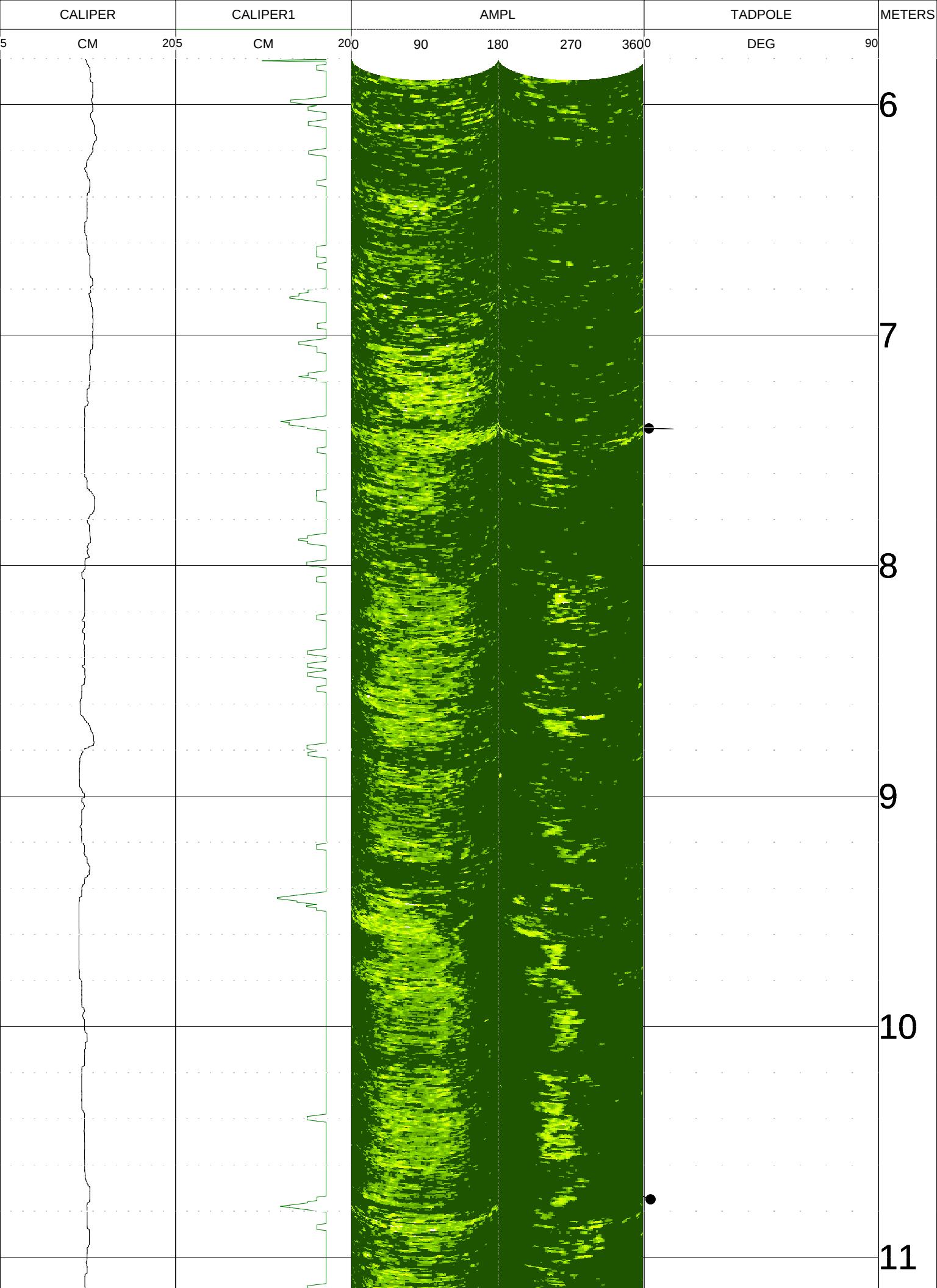
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SECTION	: None
TOWNSHIP	: None
RANGE	: None
API NO.	:
UNIQUE WELL ID.	:

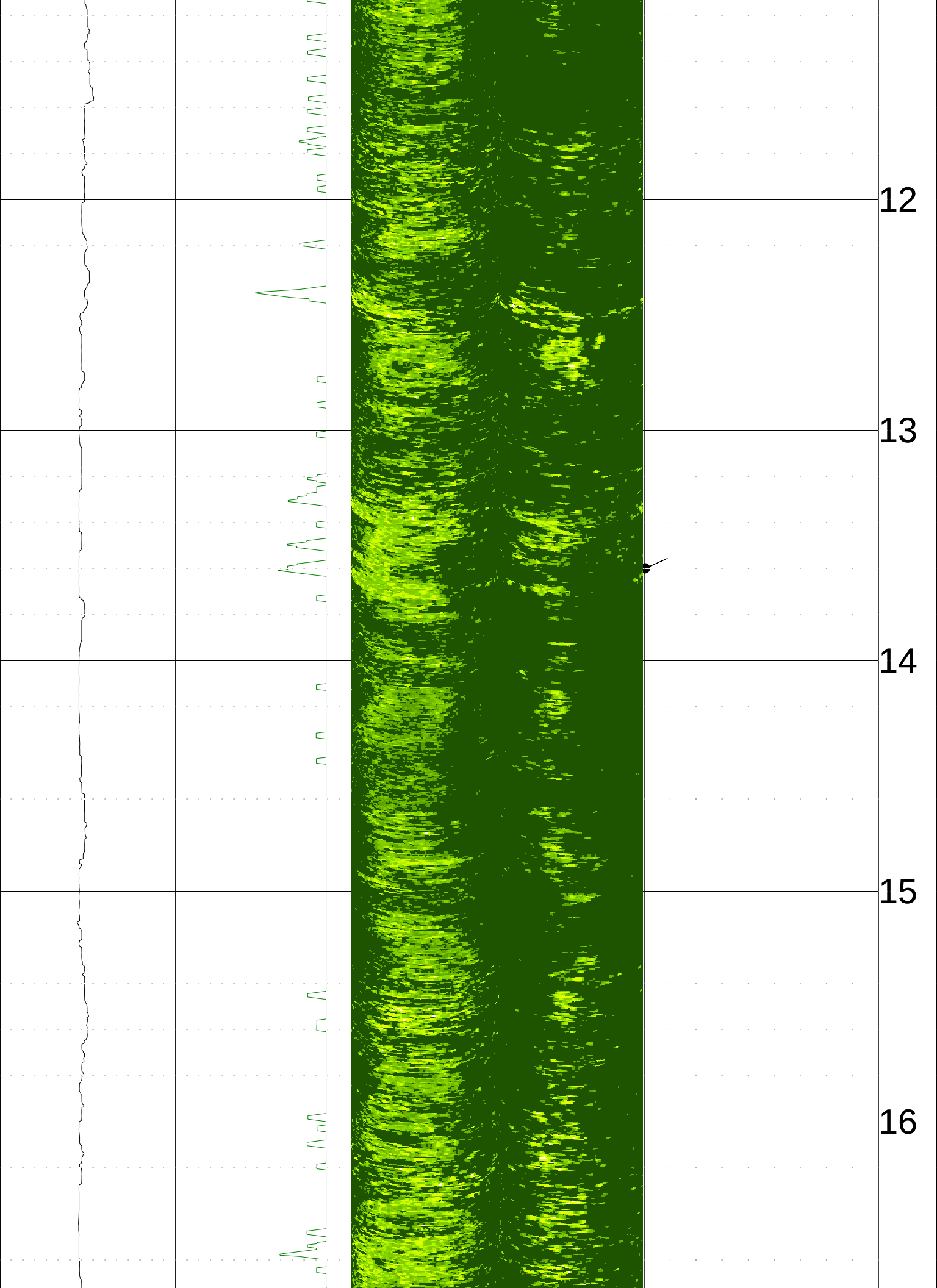
PERMANENT DATUM	: None	ELEVATION KB	: NA
LOG MEASURED FROM	: GL	ELEVATION DF	: NA
DRL MEASURED FROM	: GL	ELEVATION GL	: 0

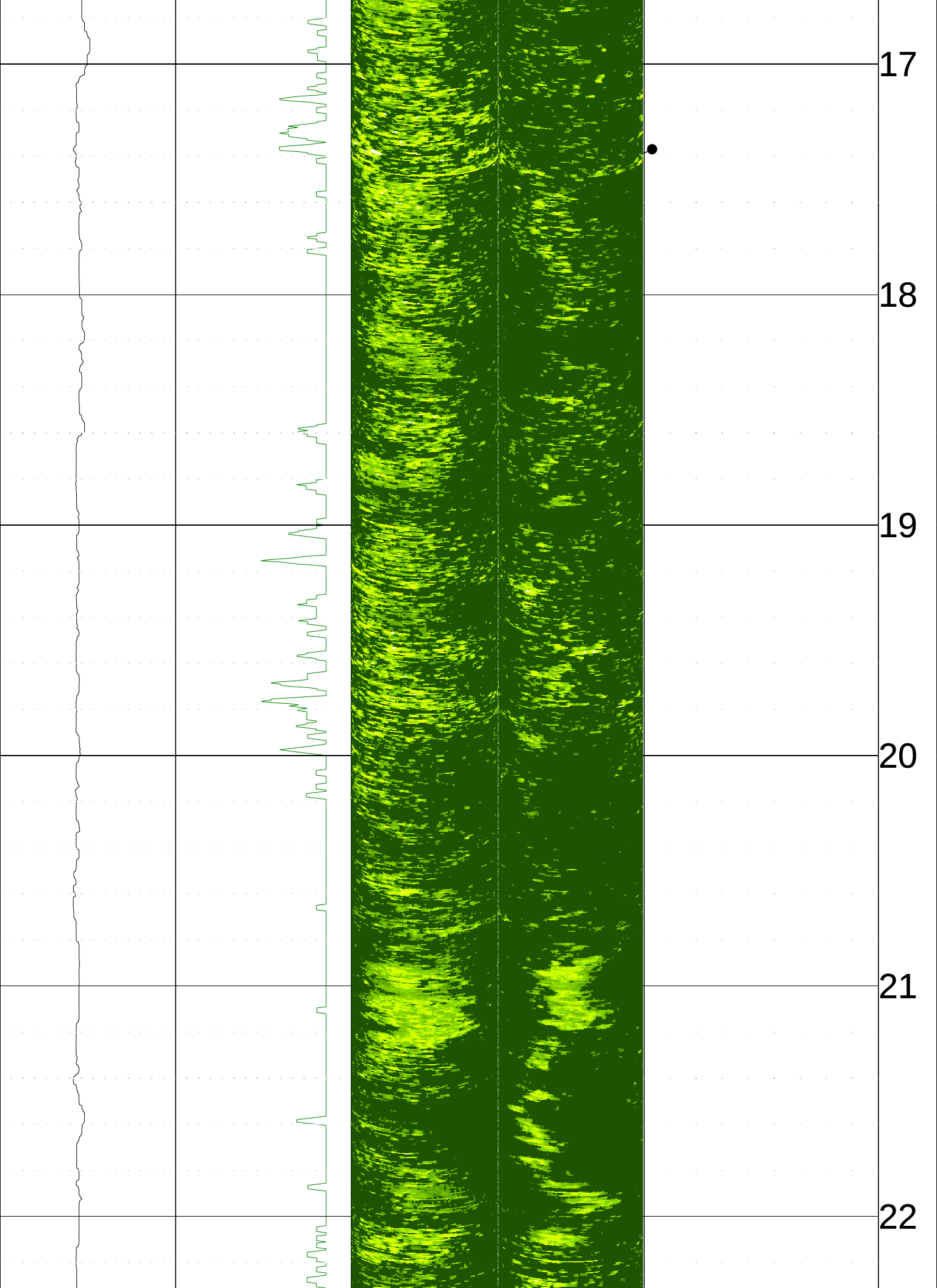
DATE	: 1/21/09	RIG NUMBER	:
DEPTH DRILLER	: 275	LOGGER TD	:
BIT SIZE	: 98	ARRIVAL TIME	:
LOG TOP	: 4.50	DEPARTURE TIME	:
LOG BOTTOM	: 83.50	CIRC STOPPED	: 0930

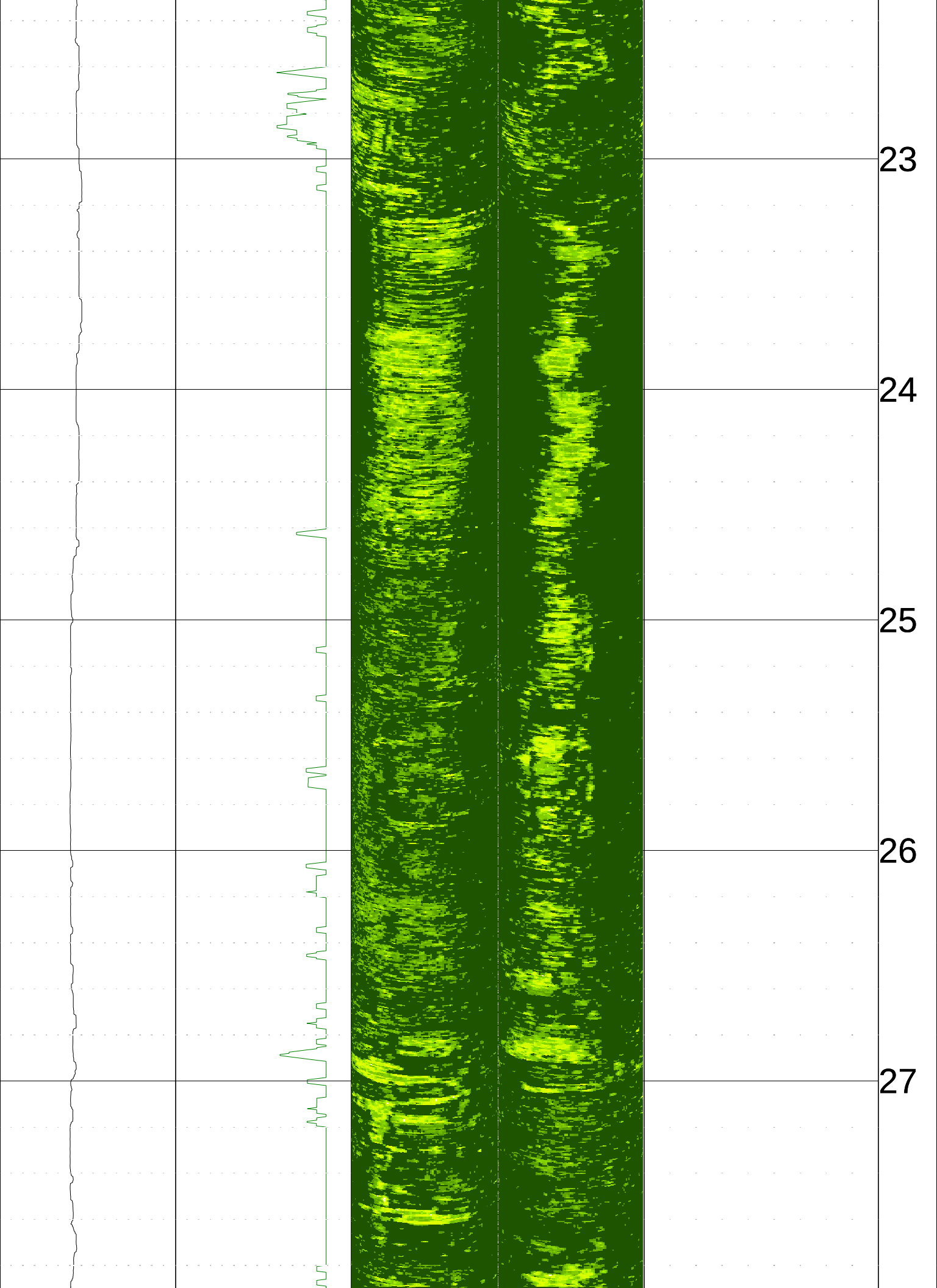
CASING OD	:
CASING BOTTOM	: NA
CASING TYPE	: none
BOREHOLE FLUID	: 0
RM TEMPERATURE	: 0
MUD RES	: 0
MUD WEIGHT	:
WITNESSED BY	:
RECORDED BY	: DH/DL
REMARKS 1	:
REMARKS 2	: EA: 07-187900

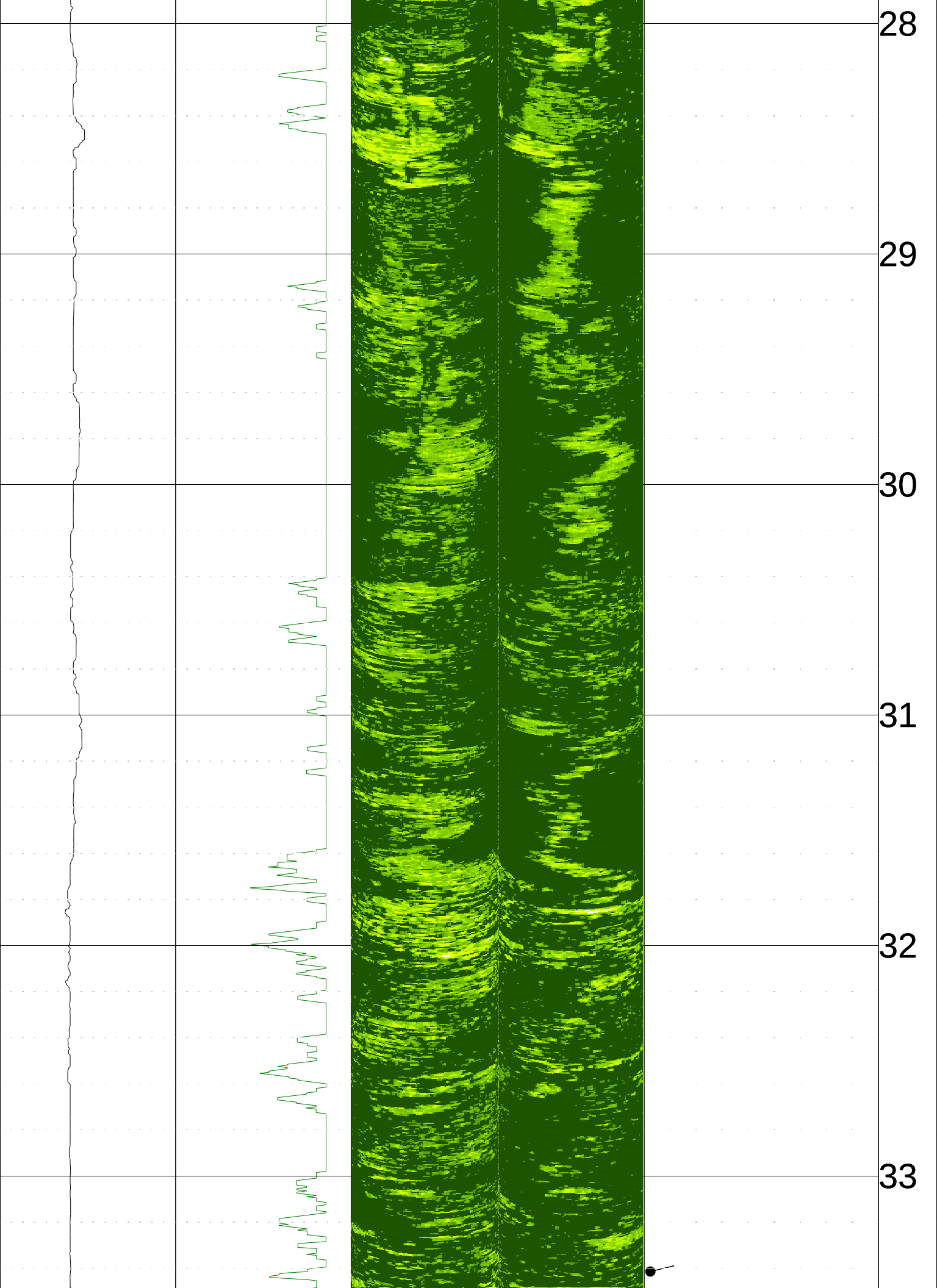
ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS

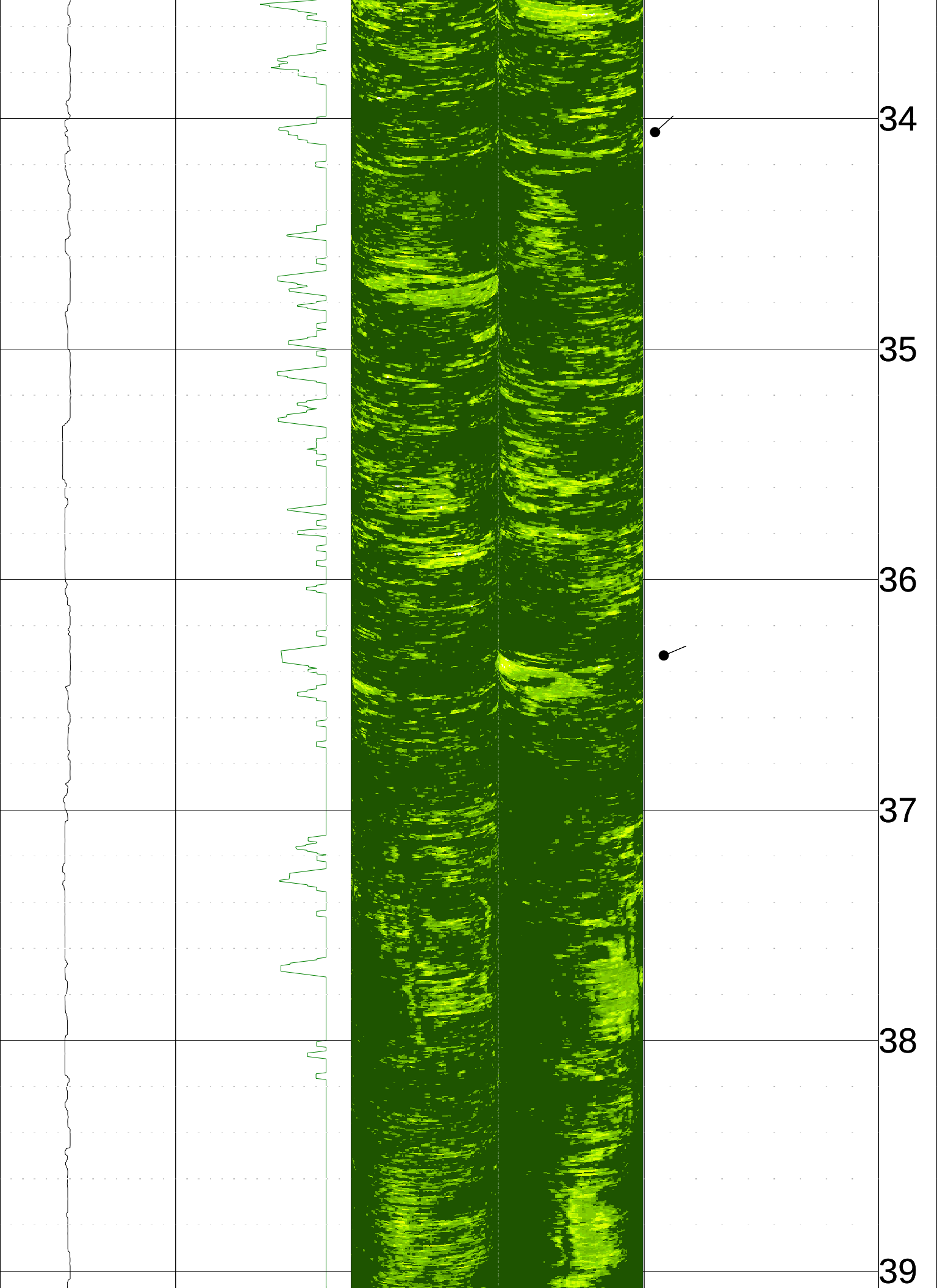

CALIPER
CALIPER1
AMPL
TADPOLE
METERS
5
CM
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CM
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180
270
360
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DEG
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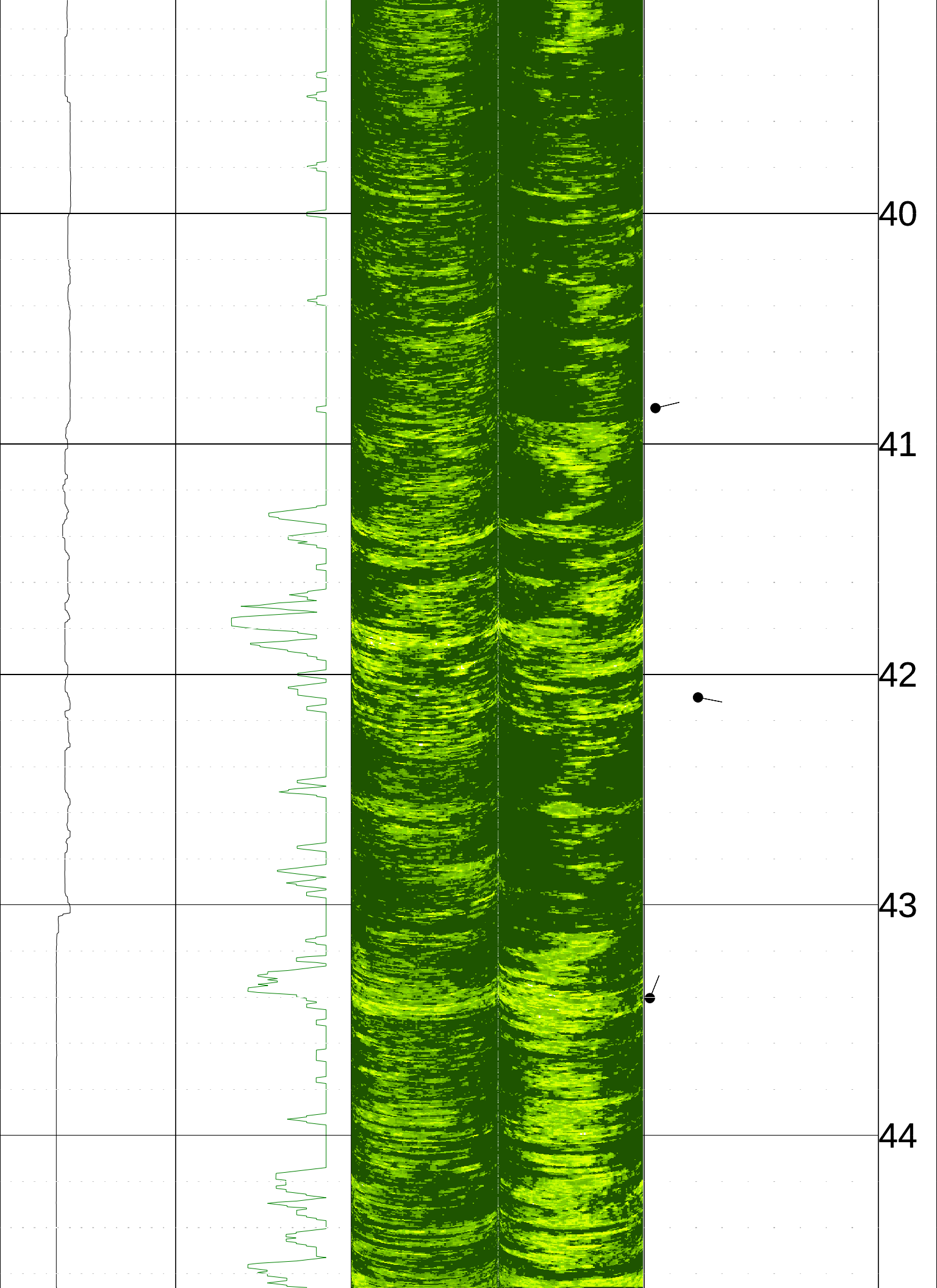

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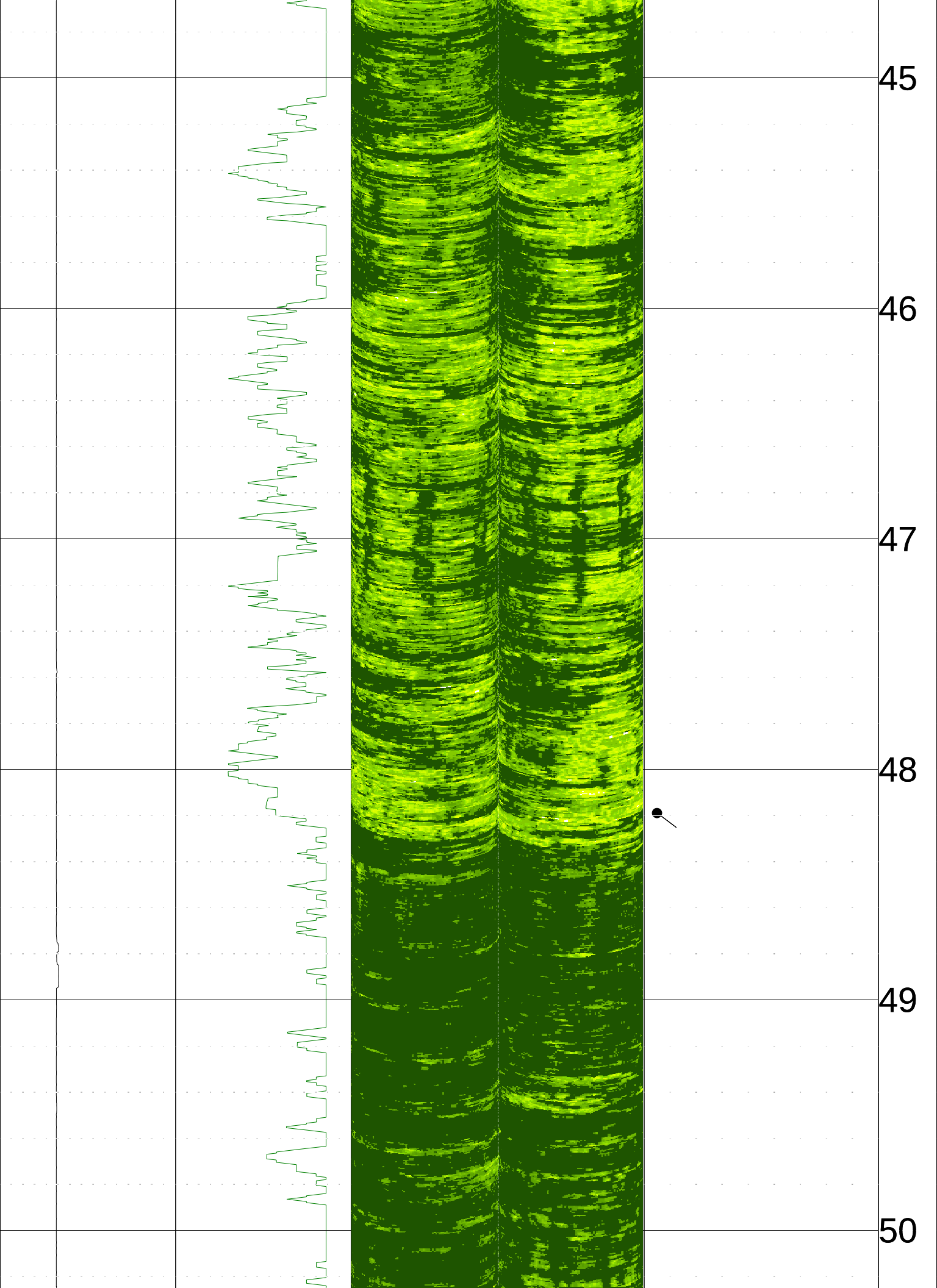

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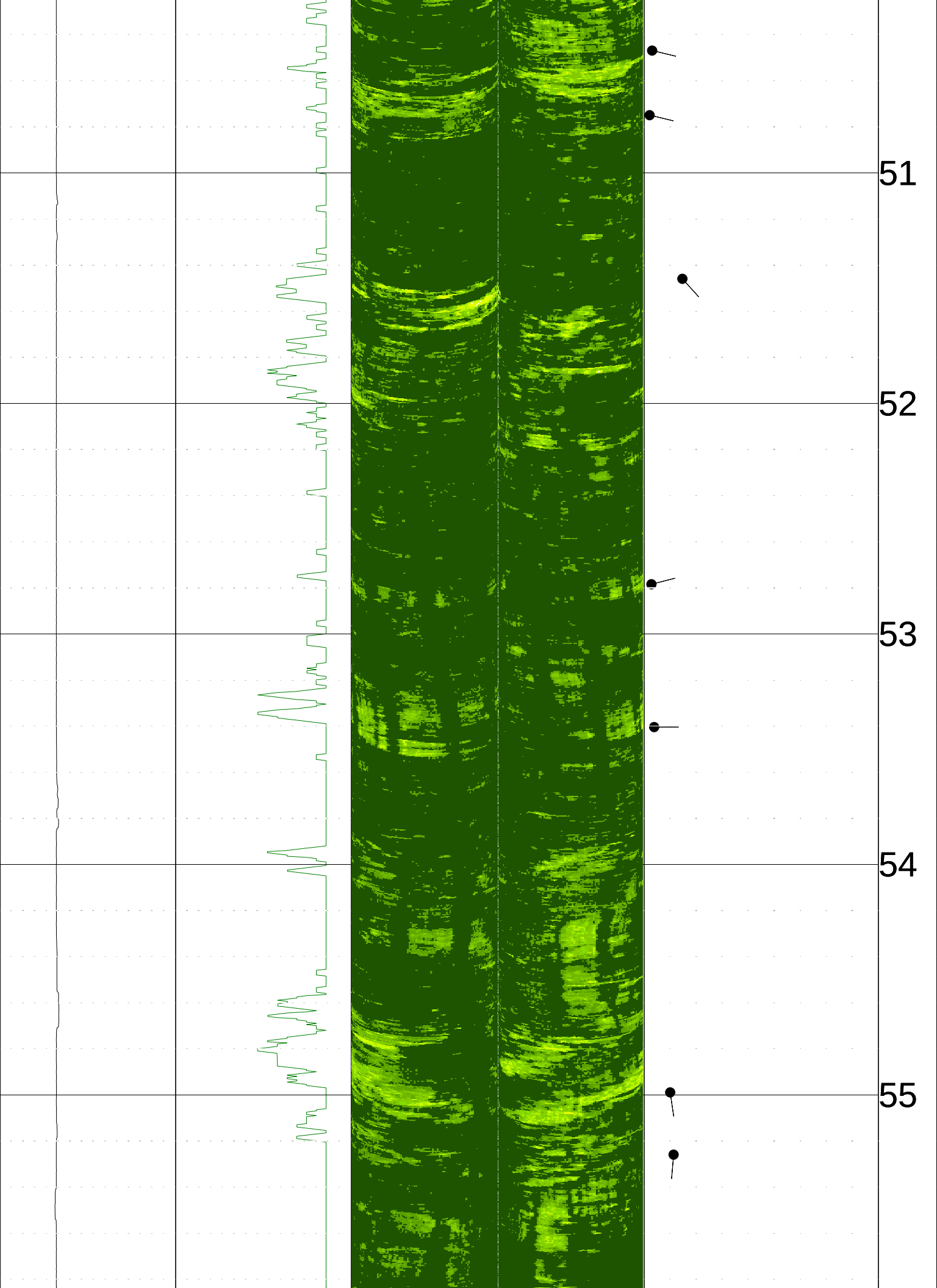

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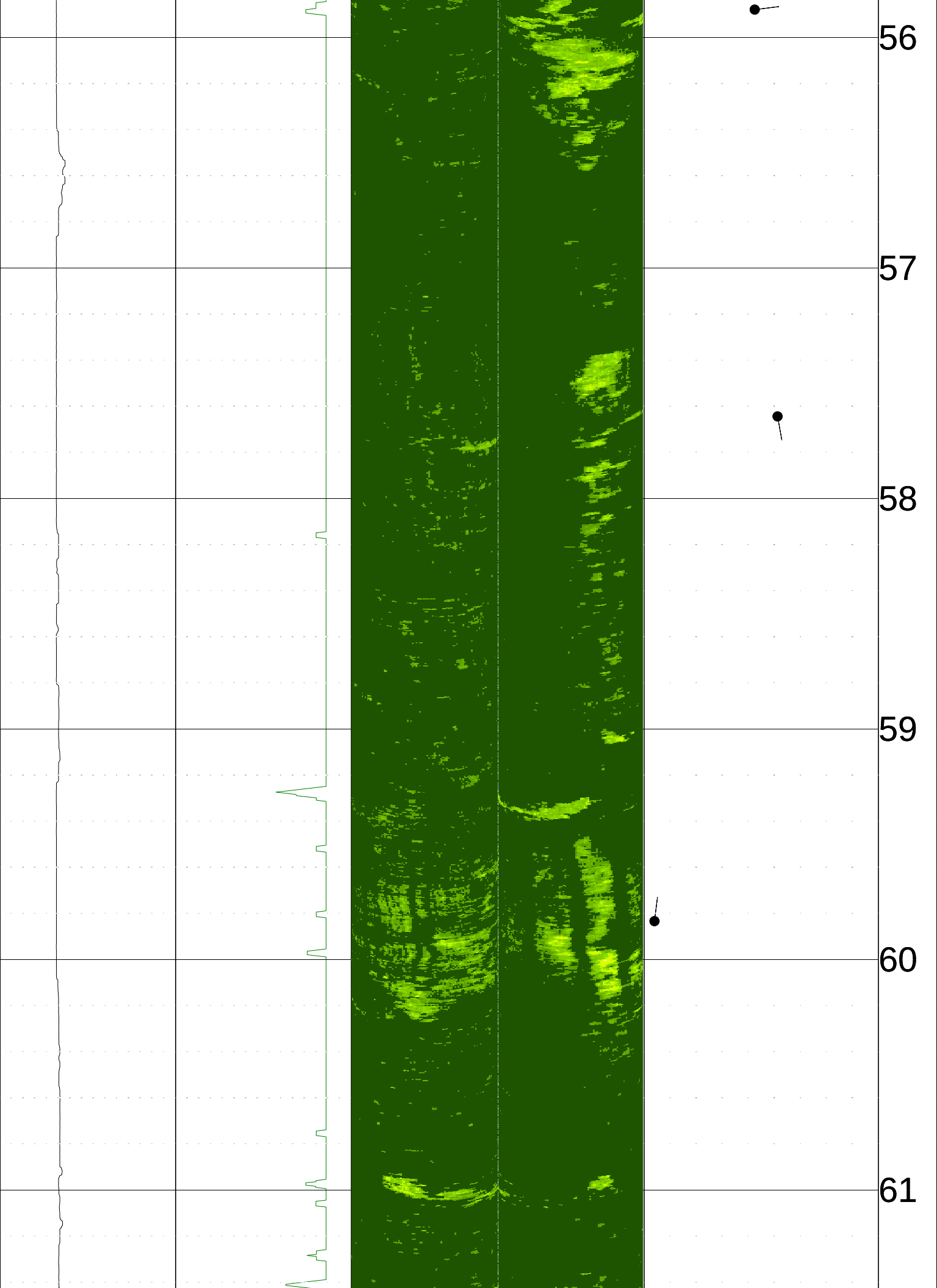

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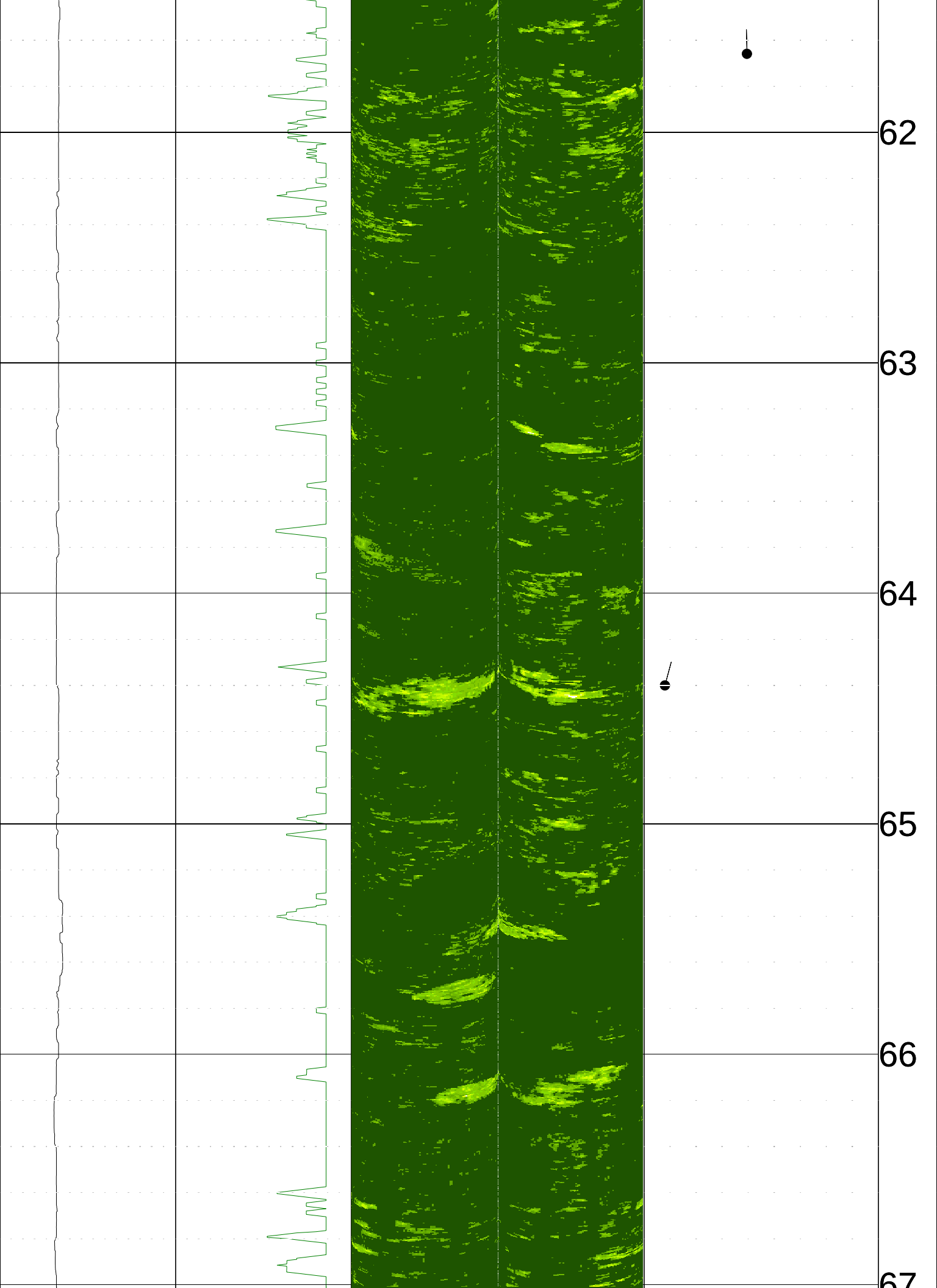

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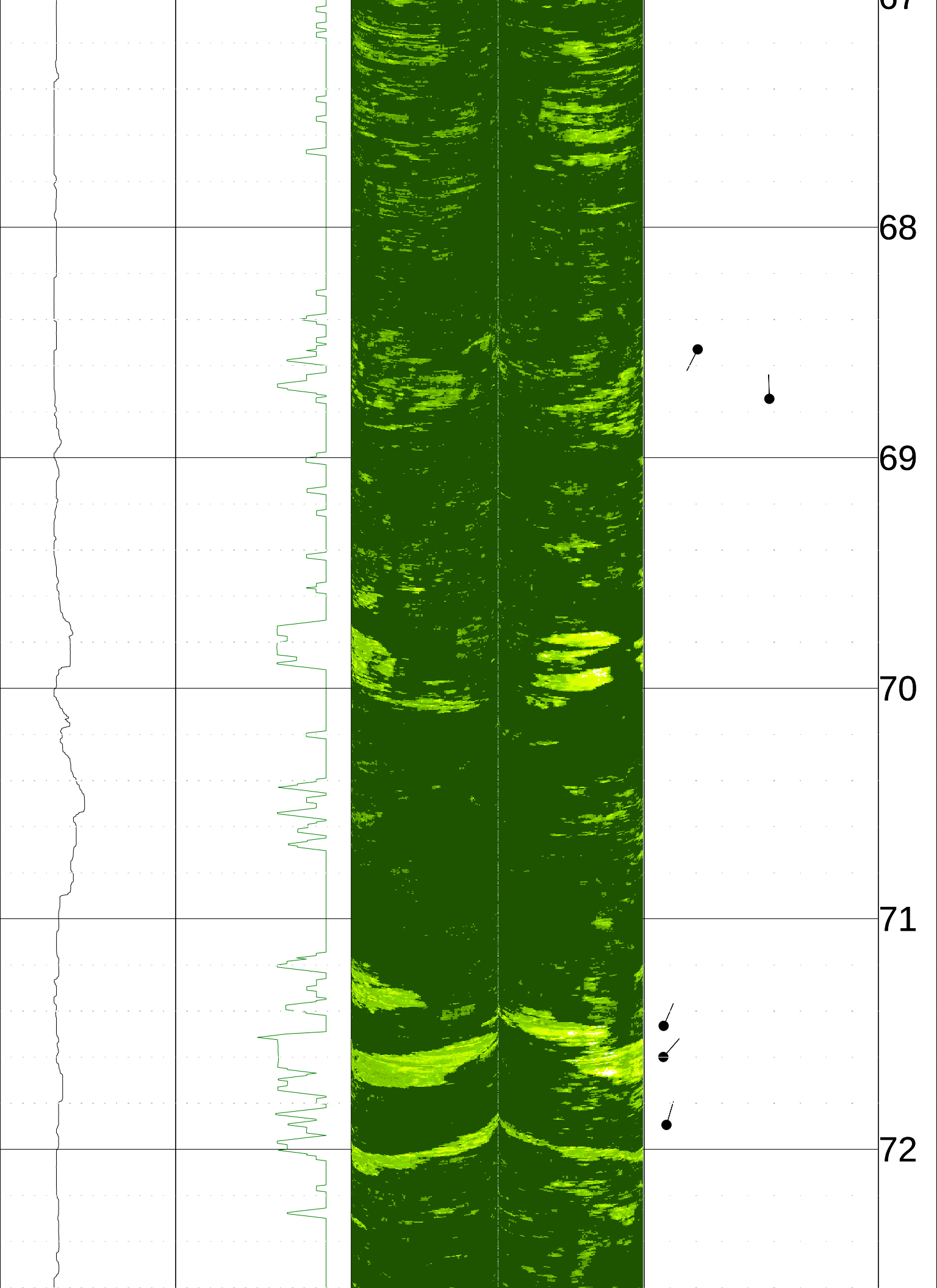

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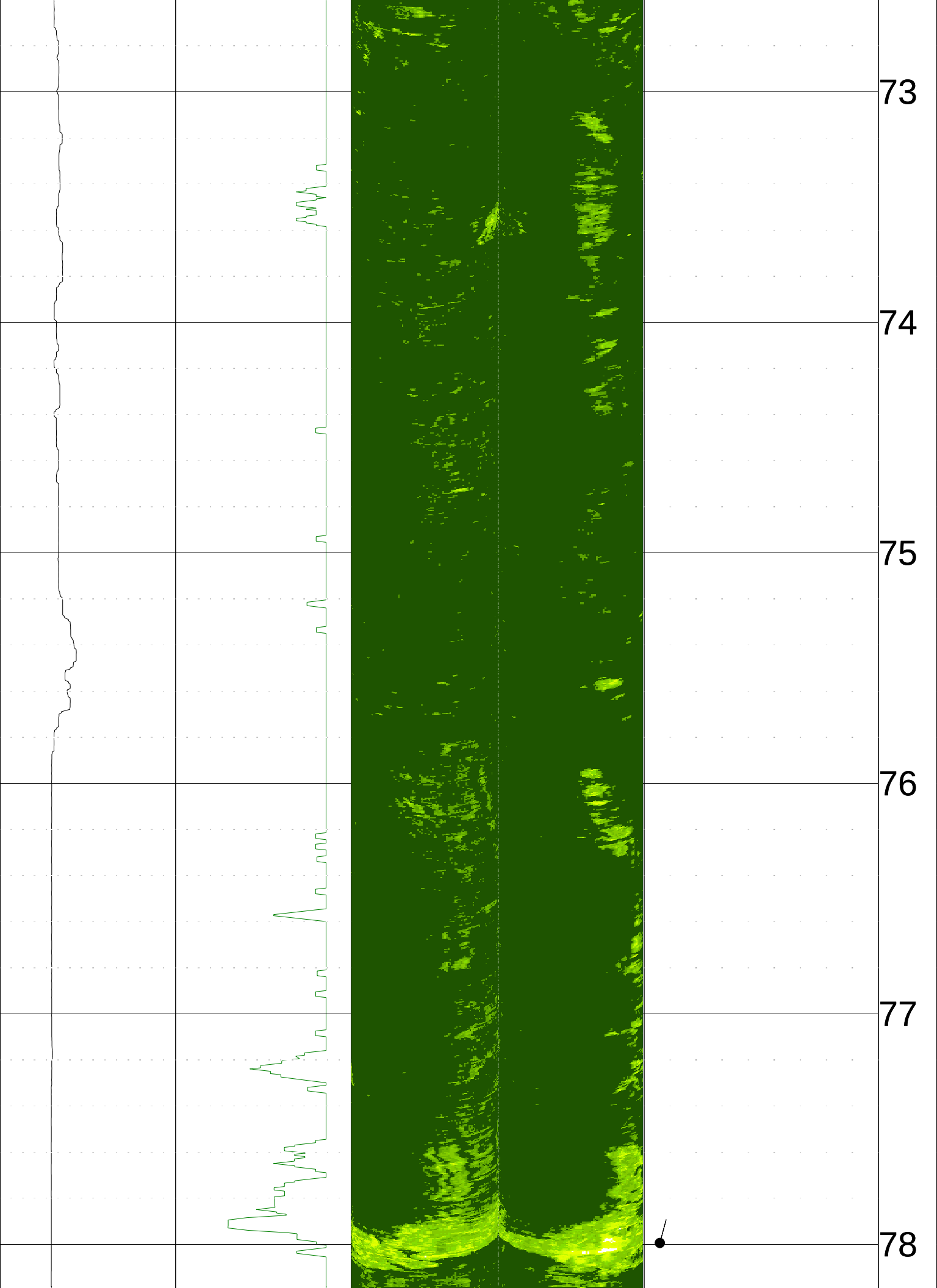

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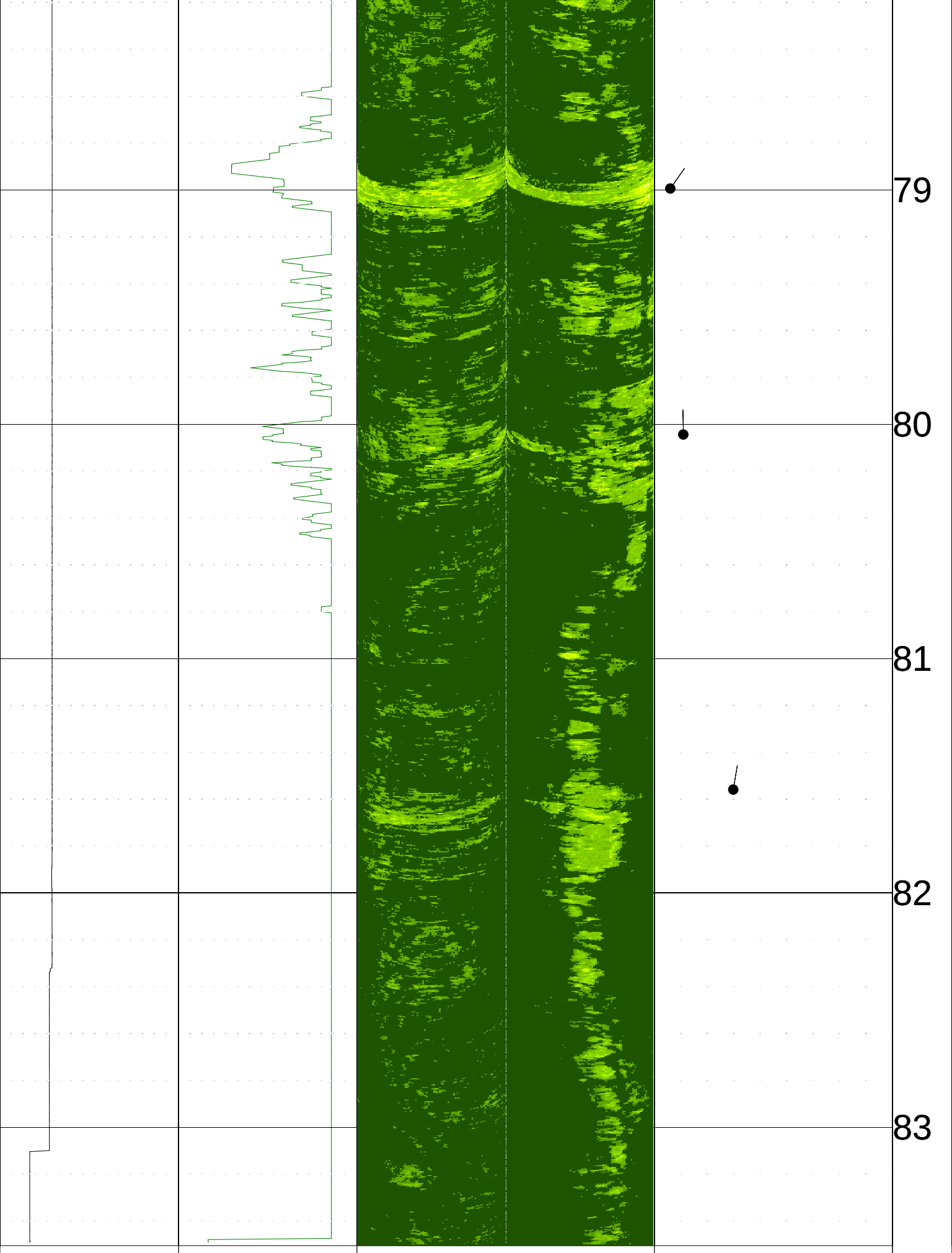

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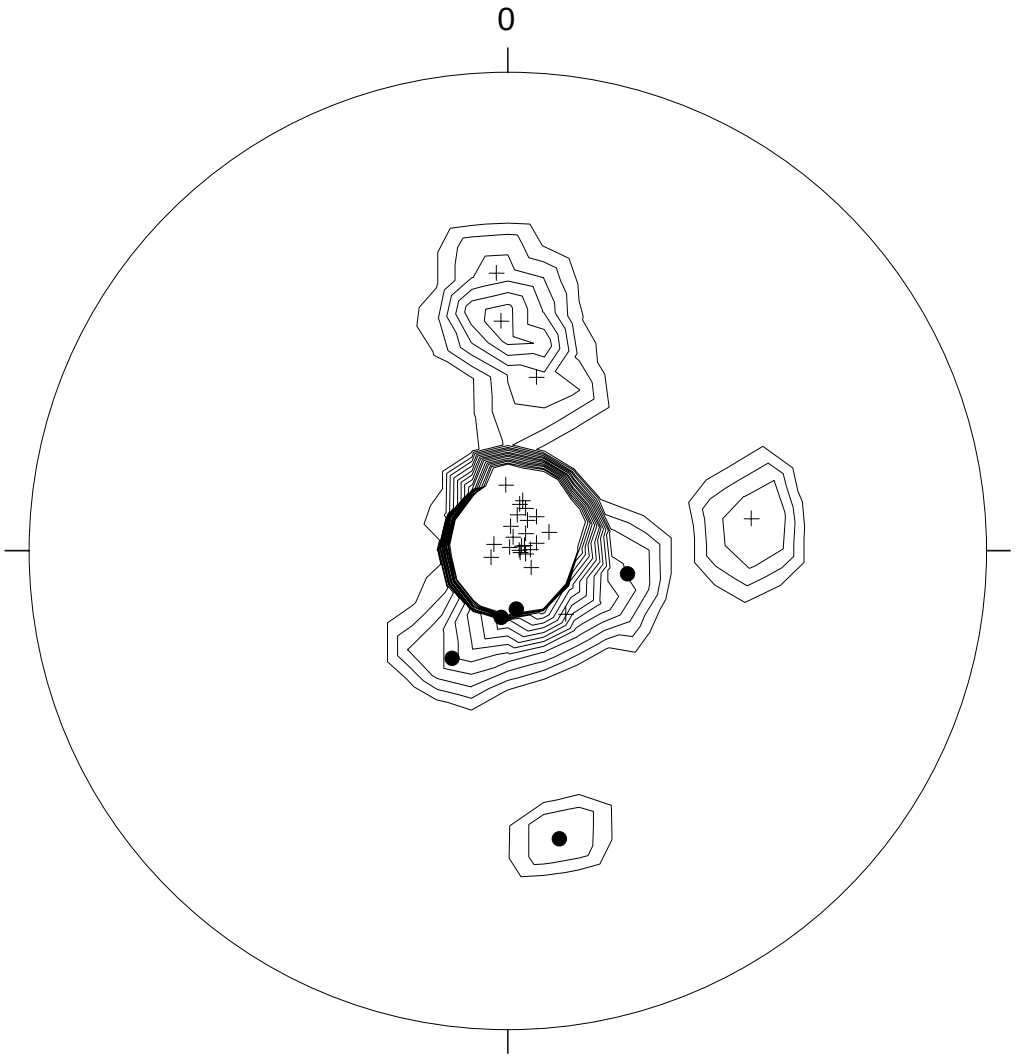

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5
CM
20
0
90
180
270
360
0
DEG
90
CALIPER
CALIPER1
AMPL
TADPOLE
METERS



+ n=27 (P)
• n=5 (P)

LA 710 Tunnel, boring Z3 B11

Stereonet contour plot of poles to planes,
Both bedding and fractures

n=32
max. dens.= 77.95 (at 180/ 90)
min. dens.=0.00
Contours at every integer between
1 and 15, inclusive:
(Multiples of random distribution)

Apparent bedding denoted as cross
Apparent fractures denoted as solid circle
Plotted on upper hemisphere