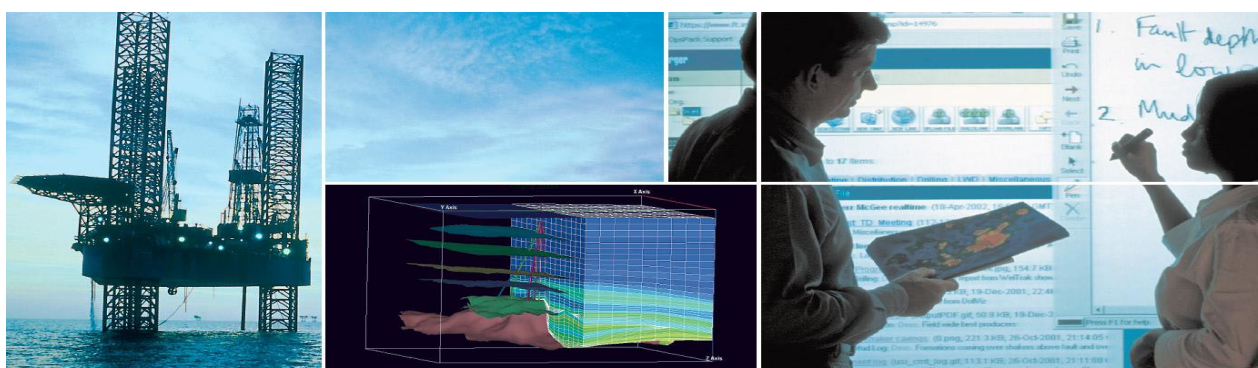


## Data & Consulting Services | Driven by Data

Survey type: Rig Source Checkshot Survey  
Company: Origin Energy Resources Ltd  
Well: Rockhopper-1  
Field: Rockhopper  
Country: Australia  
Date: 4-Jan-2010

Checkshot QC Report prepared by DCS, Perth

This QC report contains Time-Depth information and QC plots of  
Field Data after Time picking and QC by the DCS processing center.



## Introduction

A borehole seismic survey was recorded in a deviated (max 43.5 deg) offshore well Rockhopper-1 on 4 January 2010. This survey included Rig Source VSP / Checkshot measurements from 2614.6 m MD DF to 294.1 m MD DF. It was not possible to descend to the planned TD of 3489 m MD DF. The data were acquired using a 4 shuttle (15.12 m spacing) VSI downhole Tool.

A Delta G-Gun (3x150 cu. inch) array was deployed from the Rig (Kan Tan IV) with an azimuth of 048 degrees with reference to North. The offset of gun was fixed 51 m from the wellhead. The guns were submerged from a buoy 5 meters below the tide level and fired at 1910 psi using N2 bottles. A calibrated Near Field (NF) reference hydrophone was deployed 1.25 meters below the center of the gun cluster. Schlumberger's Trisor Gun controller was used for the tuning and firing of the gun cluster. Complete field results are reported in the separate Acquisition Survey Report.

## QC Results

This Quick-look report comments on the quality of the acquired data and presents QC displays of the acquired data as well as a re-picked Time-Depth listing after QC by the DCS processing centre. The down going and repeating check shot levels have been kept, but are not used for velocity calculations.

Data quality is considered to be good. This dataset was acquired as a checkshot survey with 3 shots per tool setting and variable level spacing (45.36 m long VSI-4 array moving up 100 m). The top levels of the survey (above 1059.5 m MD DF) are affected by casing ringing noise. The Time-Depth relationship up to 1014.1 m MD DF is estimated using the X, Y and rotated 3C component data, above this no accurate Time-Depth information can be picked. A Gamma Ray log was run for depth correlation and the VSP is within 1 m on depth with the reference GR log.

Seismic Reference Datum (SRD) for the vertical Time-Depth information in this report is LAT. The average tide level during the VSP survey was around MSL, 1.6 m above LAT and a bulk correction has been applied to the data. Survey geometry corrections and a static shift to correct the data to SRD were applied. This correction was done with a surface velocity of 1524 m/s.

The various QC displays present the stacked X, Y and Z component data as well as a TT aligned display of the Z component. The NF hydrophone sensor and Trisor QC displays show that the source signature / Gun pressure were stable.

## Further Processing Recommendations

Even though the checkshot spacing is variable and only 3 shots per level were acquired, the good data quality combined with the fact that a VSI-4 was used allows this data to be processed as a VSP dataset to obtain a Corridor Stack. Due to the look-ahead capability of borehole seismic deeper reflectors well below the deepest recorded checkshot level can be distinguished on this data.

Our recommendation is to proceed with either QC VSP processing or Full VSP processing to combine the VSP results with sonic calibration, synthetic seismogram generation and surface seismic to obtain a three way tie.

<b>Company</b>	<b>Origin Energy Resources Ltd</b>
<b>Well</b>	<b>Rockhopper-1</b>
<b>Field</b>	<b>Rockhopper</b>
<b>Country</b>	Australia
<b>State</b>	TAS
<b>Logging Date</b>	4-Jan-2010
<b>Run Number</b>	5
<b>Service Order</b>	
<b>Well Head (Latitude)</b>	39° 47' 34.18" S
<b>Well Head (Longitude)</b>	145° 26' 21.47" E
<b>Well Head (X Coordinate)</b>	366374.1 UTM
<b>Well Head (Y Coordinate)</b>	5594071.5 UTM
<b>Total Depth - Driller</b>	3522.0 m
<b>Total Depth - Logger</b>	
<b>Maximum Hole Deviation</b>	43.5 deg
<b>Azimuth of Maximum Deviation</b>	256.2 deg
<b>Program Version</b>	17C0-154
<b>Bit Size</b>	8.500 in
<b>Recorded by</b>	O. Mazharullah/P.Guzman
<b>Witnessed by</b>	D. Archer/B. Richards

Elevation Information	
Permanent Datum	LAT
Elevation Permanent Datum	0.0 m
Above Permanent Datum	26.0 m
Drilling Measured From	DF
Derrick Floor	26.0 m
Ground Level	-74.3 m
Kelly Bush	
Log Measured From	DF
Elevation Log Zero	26.0 m

<b>Water Velocity</b>	1524.0 m/s
<b>Seismic Reference Datum</b>	LAT (0.0 m)

[illegible]

## Borehole Seismic Source Information

Engineer: Omar Mazharullah/Wichien Nimmolrat/Patricia Monserrat Jara Guzman  
 Well Name: Rockhopper-1 Date: 04-Jan-2010  
 Rig: Kan Tan IV

<Geometrical Coordinates> Longitude: 145 26' 21.47" E Latitude: 39 47' 34.818" S  
 <UTM Coordinates> Easting: 336,374.124 E Northing: 5,594,071.5 N

Permanent Datum: LAT  
 Log Measured From: DF

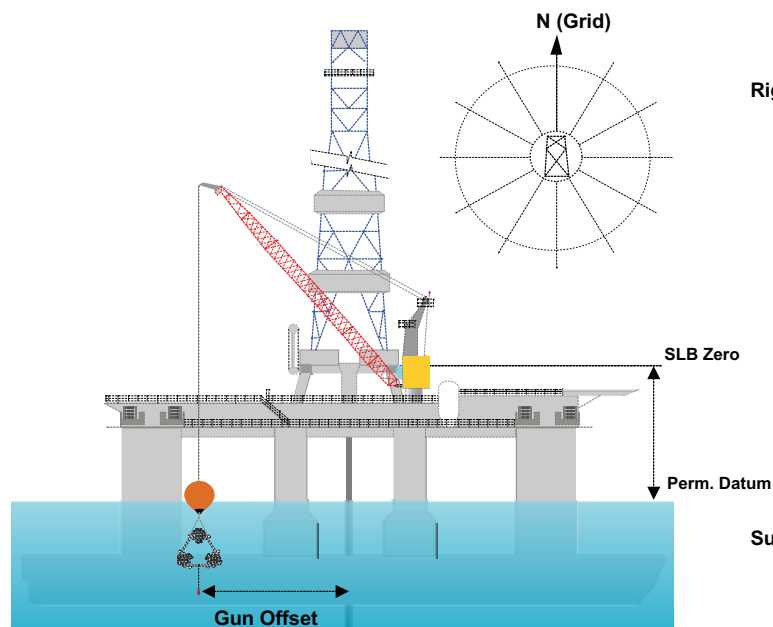
Elev. 26.0

Unit : m

SRD (Seismic Reference Datum): LAT  
 Water Depth: 74.3

Elev. 0.0

from SLB zero: 26.0(SRDS)



RIG Heading: 318.0 deg  
 Rig Crane used: ☐ Port side ☒ Starboard side  
 Rig Crane azimuth (from Rig Heading): 90.0 deg

Gun Azimuth (Grid North): 48.0 deg (GAZI)

Hy1 Azimuth (Grid North): 48.0 deg

Hy2 Azimuth (Grid North): 48.0 deg

Hy3 Azimuth (Grid North): deg

Gun Offset: 51.0 (GOFF)

Hydrophone-1 Offset: 51.0

Hydrophone-2 Offset:

Hydrophone-3 Offset:

Surface Velocity: 1524 m/s (SVEL)

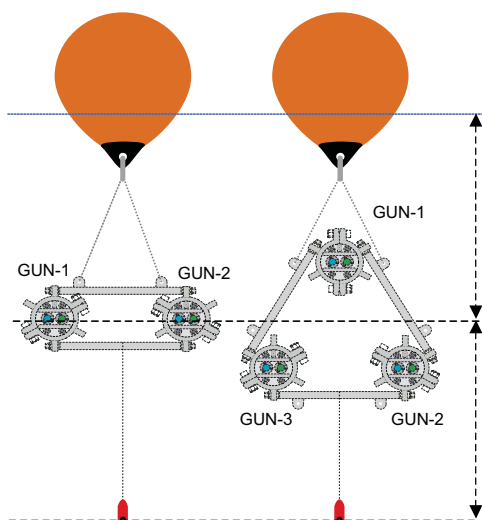
Cluster Gun Type:

☐ WSGC-P90☒ WSGC-T90

Gun Type:

☒ WSG-G150 (G-Gun 150cu.inch)  
☐ WSG-G250 (G-Gun 250cu.inch)

GUN-1 sn: 773101  
 GUN-2 sn: 451182  
 GUN-3 sn: 451105



Gun Depth from Local Tide 5.0

Gun Depth from SLB 29.4 (GDSZ)

Hydrophone 1 Type: MP-24L3 (10Hz)

Hydrophone 2 Type: MP-24L3 (10Hz)

Hydrophone 3 Type: none

Hy 1 Depth from Gun 1.3 Hy 1 Depth from LT 6.3

Hy 1 Depth from SLB zero 30.7

Hy 2 Depth from Gun Hy 2 Depth from LT

Hy 2 Depth from SLB zero

Hy 3 Depth from Gun Hy 3 Depth from LT

Hy 3 Depth from SLB zero

Air Gun Firing Pressure: 1910 psi

Accumulator Pressure (Inlet pressure): 2400 psi

Source of Air supply: N2 Gas Bottle Racks

Air Controller (Regulator) Type: WAP-SS01

sn: V180001

Sea Condition

Moderate

Sea Condition: 0.2

Low Tide Level: 2.7

High Tide Level:

Tide Table available:

☒ Yes

Wave Height: 2.5  
 at 21:30 04/jan/10  
 at 15:20 04/jan/10

Main survey started at 16:20 04/jan/10  
 ended at 19:30 04/jan/10

HSE

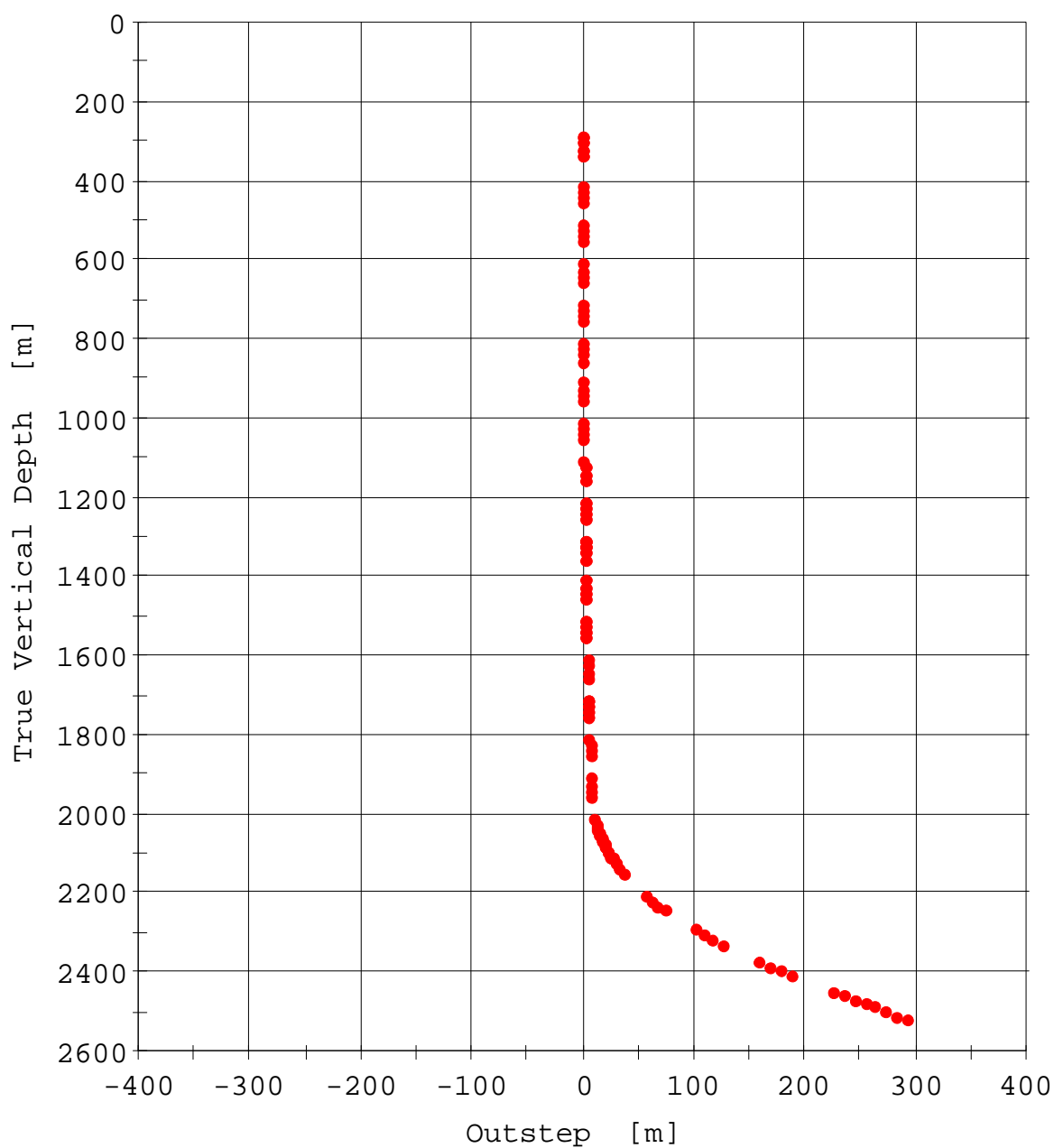
Safe Distance: 0.0

Observation of Marine Mammals

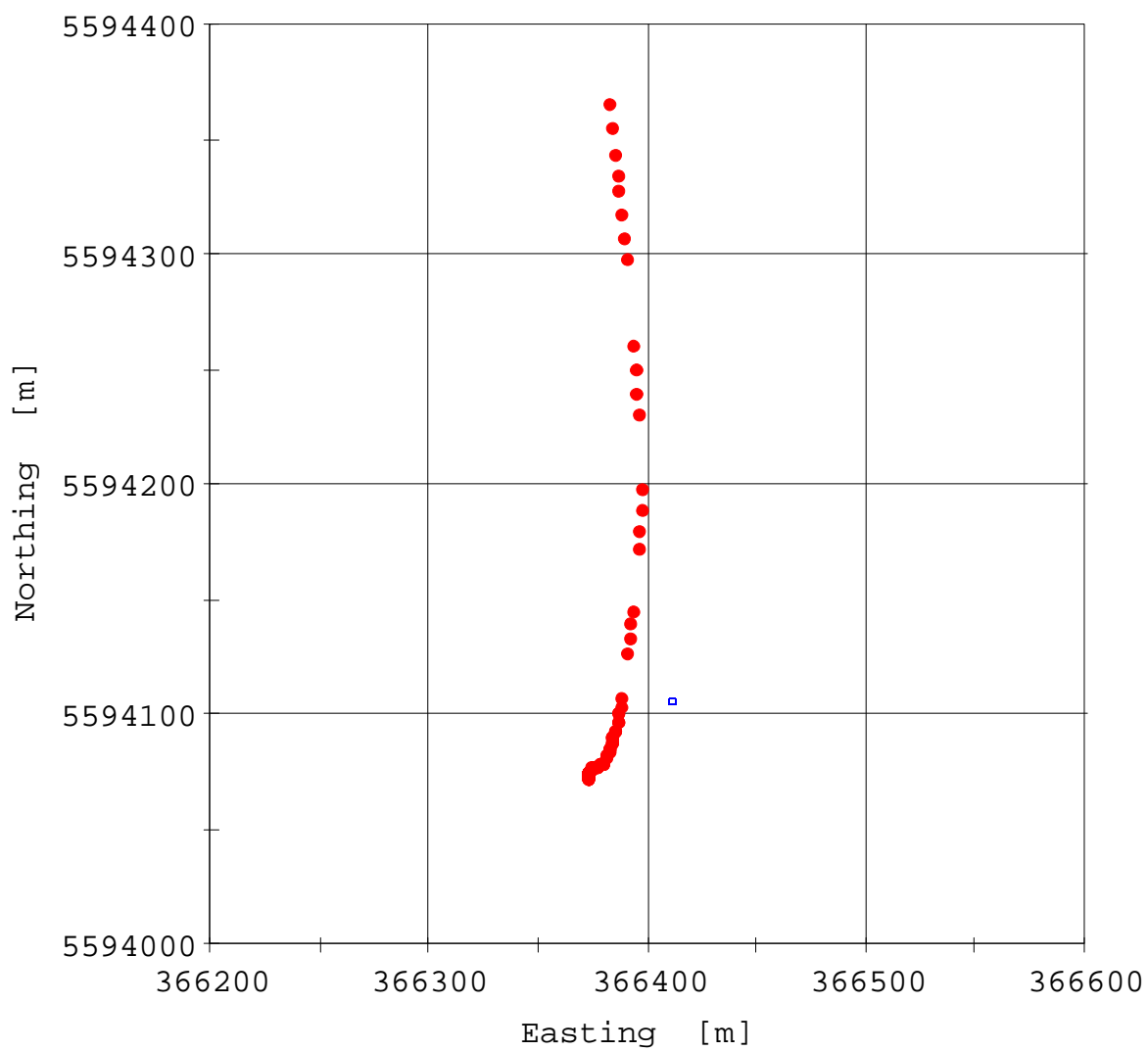
Marine Mammals sighted in 30 minutes before the survey

Soft-Start implemented:

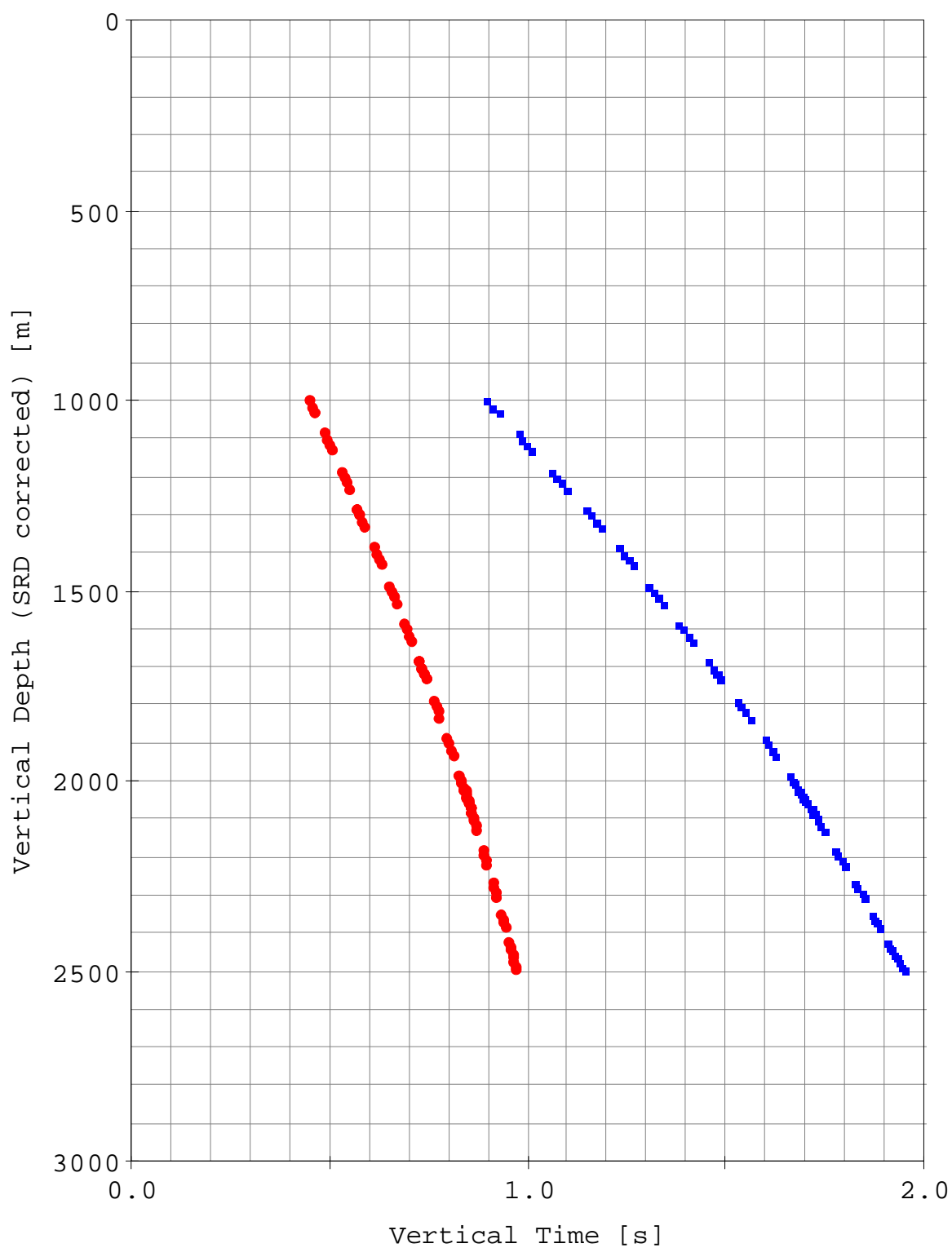
☒ Yes☐ No☒ Yes☐ No

**Well Profile**

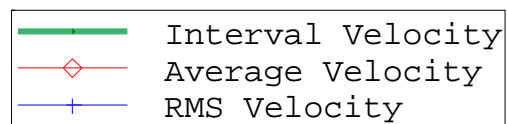
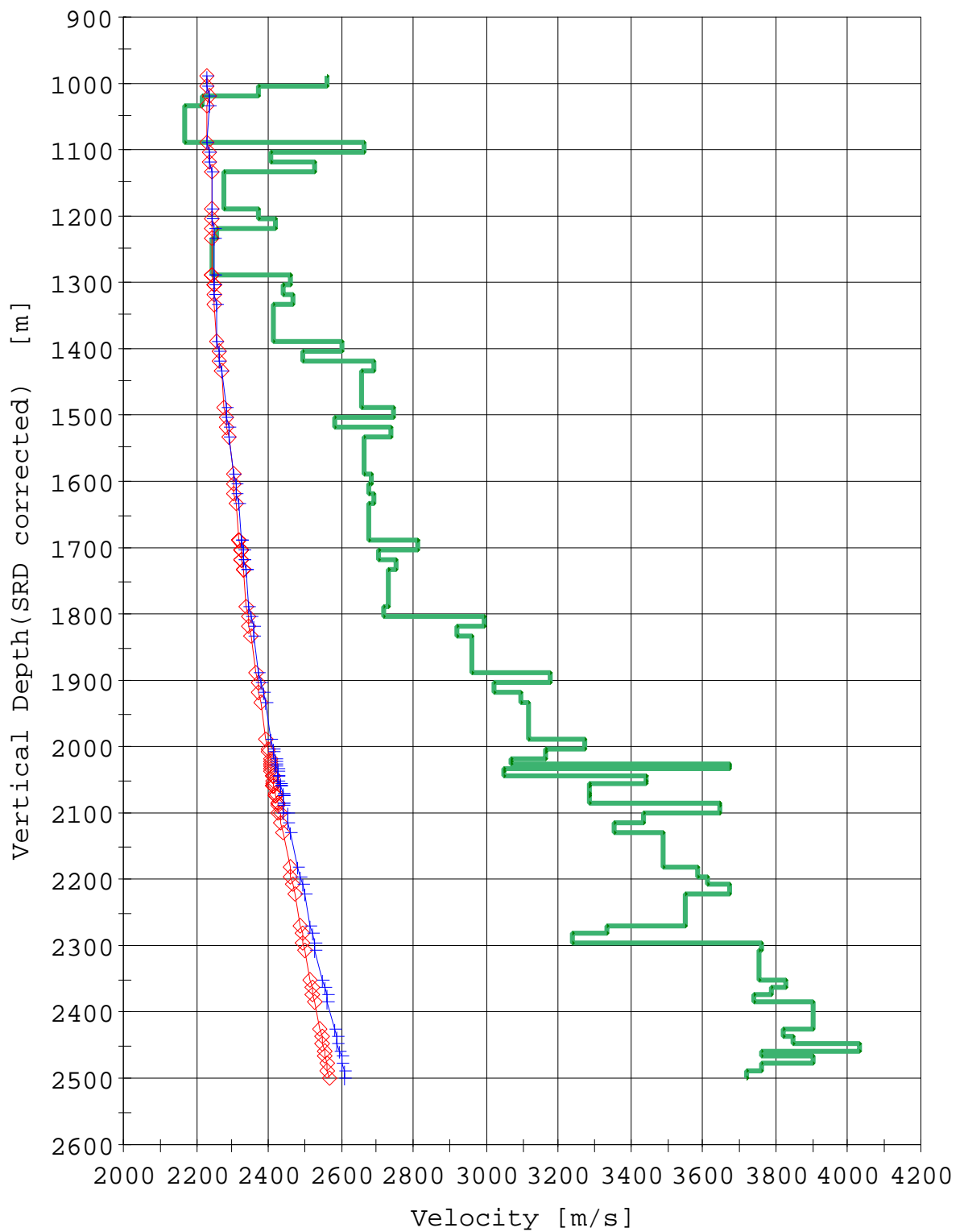
Receiver Position

**Geometry Information (X-Y)**

● Receiver Position  
□ Source Position

**Time Depth Plot**

• One-way Vertical Time  
■ Two-way Vertical Time

**Velocity Plot Page**



**Stack Summary Listing (1/5) from VSI\_005\_Rockhopper 1\_geo\_wavefield\_z.ldb**

Stack Number	Measured Depth [m]	True Vertical Depth [m]	Measured Time [s]	One-way Vertical Time [s]	Two-way Vertical Time [s]	Interval Velocity [m/s]	Average Velocity [m/s]	RMS Velocity [m/s]
	0	0	0	0	0			
40	294.1	268.1	0.0898	0.0904	0.1809			
11	294.2	268.2	0.0907	0.0913	0.1826			
40	309.3	283.3	0.0925	0.0932	0.1864			
11	309.3	283.3	0.0936	0.0943	0.1887			
40	324.4	298.4	0.0955	0.0963	0.1927			
11	324.4	298.4	0.0968	0.0976	0.1951			
40	339.5	313.5	0.0986	0.0996	0.1991			
11	339.5	313.5	0.0997	0.1006	0.2013			
39	414.1	388.1	0.1131	0.1143	0.2286			
39	429.2	403.2	0.1160	0.1173	0.2346			
39	444.3	418.3	0.1189	0.1203	0.2405			
39	459.5	433.4	0.1219	0.1233	0.2466			
38	514.1	488.1	0.1321	0.1336	0.2672			
38	529.2	503.2	0.1350	0.1366	0.2732			
38	544.3	518.3	0.1380	0.1396	0.2791			
38	559.5	533.5	0.1409	0.1425	0.2850			
37	614.1	588.1	0.1513	0.1530	0.3060			
37	629.3	603.3	0.1540	0.1557	0.3115			
37	644.4	618.4	0.1570	0.1587	0.3175			
37	659.5	633.5	0.1599	0.1616	0.3233			
36	714.1	688.1	0.1698	0.1716	0.3432			
36	729.3	703.2	0.1728	0.1746	0.3492			
36	744.4	718.4	0.1756	0.1774	0.3548			
36	759.5	733.5	0.1782	0.1800	0.3600			
35	814.1	788.1	0.1891	0.1909	0.3818			
35	829.2	803.2	0.1919	0.1938	0.3875			
35	844.3	818.3	0.1948	0.1967	0.3934			
35	859.5	833.5	0.1977	0.1996	0.3992			
34	914.1	888.1	0.2080	0.2099	0.4199			
34	929.3	903.3	0.2109	0.2128	0.4255			

**Stack Summary Listing (2/5) from VSI\_005\_Rockhopper 1\_geo\_wavefield\_z.1df**

Stack Number	Measured Depth [m]	True Vertical Depth [m]	Measured Time [s]	One-way Vertical Time [s]	Two-way Vertical Time [s]	Interval Velocity [m/s]	Average Velocity [m/s]	RMS Velocity [m/s]
34	944.4	918.4	0.2137	0.2156	0.4312			
34	959.5	933.5	0.2161	0.2180	0.4360			
33	1014.1	988.1	0.4420	0.4436	0.8873		2227.3	2227.3
33	1029.3	1003.3	0.4479	0.4495	0.8991	2559.9	2231.7	2232.0
33	1044.4	1018.4	0.4542	0.4559	0.9118	2373.5	2233.7	2234.1
33	1059.5	1033.5	0.4611	0.4627	0.9255	2216.6	2233.4	2233.8
32	1114.1	1088.1	0.4862	0.4879	0.9759	2168.1	2230.1	2230.5
32	1129.2	1103.2	0.4919	0.4936	0.9872	2660.1	2235.0	2235.9
32	1144.4	1118.3	0.4982	0.4999	0.9998	2408.0	2237.2	2238.1
32	1159.5	1133.5	0.5041	0.5059	1.0117	2528.6	2240.6	2241.8
31	1214.1	1188.1	0.5281	0.5298	1.0597	2280.2	2242.4	2243.5
31	1229.2	1203.2	0.5344	0.5362	1.0724	2370.1	2243.9	2245.1
31	1244.4	1218.3	0.5407	0.5425	1.0849	2418.3	2246.0	2247.2
31	1259.5	1233.5	0.5474	0.5492	1.0983	2256.5	2246.1	2247.3
30	1314.1	1288.1	0.5717	0.5735	1.1470	2246.0	2246.1	2247.2
2	1314.2	1288.2	0.5708	0.5726	1.1452	2463.5	2246.1	2247.2
30	1329.3	1303.2	0.5778	0.5796	1.1593	2463.5	2248.4	2249.6
2	1329.3	1303.3	0.5769	0.5788	1.1575	2440.1	2248.4	2249.6
30	1344.4	1318.4	0.5840	0.5858	1.1717	2440.1	2250.4	2251.7
30	1359.5	1333.5	0.5901	0.5920	1.1839	2465.9	2252.6	2254.0
29	1414.1	1388.1	0.6128	0.6146	1.2292	2411.1	2258.5	2260.0
29	1429.2	1403.2	0.6186	0.6204	1.2409	2605.1	2261.7	2263.5
29	1444.4	1418.4	0.6246	0.6265	1.2530	2494.6	2264.0	2265.8
29	1459.5	1433.5	0.6302	0.6321	1.2642	2689.4	2267.8	2270.0
28	1514.1	1488.1	0.6508	0.6527	1.3054	2656.4	2280.0	2283.1
28	1529.3	1503.2	0.6563	0.6582	1.3164	2742.1	2283.9	2287.4
28	1544.4	1518.4	0.6621	0.6640	1.3281	2584.3	2286.5	2290.1
28	1559.5	1533.5	0.6677	0.6696	1.3391	2738.6	2290.3	2294.2
27	1614.0	1588.0	0.6881	0.6900	1.3801	2662.9	2301.3	2306.0
27	1629.1	1603.1	0.6937	0.6957	1.3913	2685.2	2304.4	2309.3
27	1644.3	1618.2	0.6994	0.7013	1.4027	2674.8	2307.4	2312.5
						2691.7		

**Stack Summary Listing (3/5) from VSI\_005\_Rockhopper 1\_geo\_wavefield\_z.1df**

Stack Number	Measured Depth [m]	True Vertical Depth [m]	Measured Time [s]	One-way Vertical Time [s]	Two-way Vertical Time [s]	Interval Velocity [m/s]	Average Velocity [m/s]	RMS Velocity [m/s]
27	1659.4	1633.4	0.7050	0.7069	1.4139		2310.5	2315.7
						2676.3		
26	1714.1	1688.1	0.7254	0.7274	1.4548		2320.7	2326.6
						2812.0		
5	1714.2	1688.1	0.7251	0.7271	1.4542		2320.7	2326.6
						2812.0		
3	1714.2	1688.1	0.7249	0.7269	1.4537		2320.7	2326.6
						2812.0		
26	1729.2	1703.2	0.7308	0.7328	1.4655		2324.3	2330.6
						2703.9		
3	1729.3	1703.3	0.7304	0.7324	1.4647		2324.3	2330.6
						2703.9		
5	1729.3	1703.3	0.7307	0.7327	1.4654		2324.3	2330.6
						2703.9		
26	1744.3	1718.3	0.7364	0.7384	1.4767		2327.2	2333.6
						2754.4		
5	1744.4	1718.4	0.7362	0.7382	1.4764		2327.2	2333.6
						2754.4		
26	1759.5	1733.4	0.7419	0.7438	1.4877		2330.4	2337.0
						2728.0		
5	1759.5	1733.5	0.7418	0.7438	1.4875		2330.4	2337.0
						2728.0		
25	1814.1	1788.1	0.7619	0.7639	1.5278		2340.8	2348.1
						2715.8		
25	1829.2	1803.2	0.7674	0.7694	1.5389		2343.5	2351.0
						2993.2		
25	1844.4	1818.3	0.7725	0.7745	1.5490		2347.7	2355.7
						2923.8		
25	1859.5	1833.4	0.7777	0.7797	1.5593		2351.6	2359.9
						2961.2		
24	1914.1	1888.1	0.7961	0.7981	1.5962		2365.7	2375.5
						3180.7		
24	1929.2	1903.2	0.8008	0.8029	1.6057		2370.5	2381.1
						3019.3		
24	1944.4	1918.3	0.8058	0.8079	1.6157		2374.5	2385.6
						3098.2		
24	1959.5	1933.4	0.8107	0.8128	1.6255		2378.9	2390.5
						3114.5		
23	2014.1	1988.0	0.8282	0.8303	1.6605		2394.4	2408.0
						3269.4		
23	2029.2	2003.0	0.8328	0.8349	1.6697		2399.2	2413.6
						3162.0		
6	2034.7	2008.4	0.8340	0.8361	1.6722		2399.2	2413.6
						3162.0		
23	2044.4	2018.0	0.8375	0.8396	1.6792		2403.5	2418.5
						3072.0		
6	2049.8	2023.4	0.8387	0.8408	1.6815		2403.5	2418.5
						3072.0		
22	2054.2	2027.7	0.8407	0.8428	1.6856		2406.0	2421.3
						3669.5		
13	2054.9	2028.5	0.8419	0.8440	1.6880		2406.0	2421.3
						3669.5		
23	2059.5	2033.0	0.8421	0.8442	1.6884		2408.2	2424.0
						3052.1		
6	2064.9	2038.4	0.8433	0.8454	1.6909		2408.2	2424.0
						3052.1		
22	2069.3	2042.7	0.8453	0.8474	1.6948		2410.6	2426.6
						3438.6		
13	2070.0	2043.4	0.8466	0.8487	1.6974		2410.6	2426.6
						3438.6		
21	2070.1	2043.5	0.8458	0.8479	1.6958		2410.6	2426.6
						3438.6		

**Stack Summary Listing (4/5) from VSI\_005\_Rockhopper 1\_geo\_wavefield\_z.1df**

Stack Number	Measured Depth [m]	True Vertical Depth [m]	Measured Time [s]	One-way Vertical Time [s]	Two-way Vertical Time [s]	Interval Velocity [m/s]	Average Velocity [m/s]	RMS Velocity [m/s]
6	2080.0	2053.3	0.8477	0.8498	1.6997		2410.6	2426.6
						3438.6		
20	2084.1	2057.3	0.8495	0.8516	1.7033		2415.7	2432.7
						3283.5		
22	2084.4	2057.5	0.8505	0.8527	1.7053		2415.7	2432.7
						3283.5		
13	2085.1	2058.3	0.8510	0.8531	1.7062		2415.7	2432.7
						3283.5		
21	2085.2	2058.4	0.8501	0.8523	1.7045		2415.7	2432.7
						3283.5		
20	2099.2	2072.1	0.8540	0.8561	1.7123		2420.3	2438.0
						3289.4		
22	2099.5	2072.4	0.8544	0.8566	1.7131		2420.3	2438.0
						3289.4		
13	2100.2	2073.1	0.8555	0.8577	1.7154		2420.3	2438.0
						3289.4		
21	2100.4	2073.2	0.8545	0.8566	1.7133		2420.3	2438.0
						3289.4		
19	2114.1	2086.6	0.8584	0.8606	1.7211		2424.7	2443.1
						3644.9		
20	2114.4	2086.8	0.8583	0.8604	1.7208		2424.7	2443.1
						3644.9		
21	2115.5	2087.9	0.8587	0.8608	1.7216		2424.7	2443.1
						3644.9		
19	2129.2	2101.3	0.8626	0.8648	1.7296		2424.7	2443.1
						3644.9		
20	2129.5	2101.5	0.8625	0.8646	1.7293		2430.5	2450.2
						3435.7		
19	2144.4	2115.9	0.8667	0.8688	1.7377		2435.3	2455.8
						3356.0		
19	2159.5	2130.4	0.8710	0.8732	1.7463		2439.9	2461.1
						3486.9		
18	2214.1	2181.6	0.8857	0.8878	1.7756		2457.2	2481.5
						3585.5		
18	2229.2	2195.4	0.8896	0.8917	1.7834		2462.1	2487.4
						3609.9		
18	2244.4	2209.3	0.8934	0.8955	1.7910		2467.0	2493.2
						3674.6		
18	2259.5	2222.8	0.8971	0.8992	1.7984		2472.0	2499.2
						3548.0		
17	2314.1	2270.2	0.9108	0.9126	1.8251		2487.7	2517.7
						3330.8		
17	2329.2	2282.9	0.9147	0.9164	1.8328		2491.2	2521.7
						3242.1		
17	2344.4	2295.4	0.9186	0.9202	1.8405		2494.4	2525.1
						3761.7		
17	2359.5	2307.8	0.9220	0.9235	1.8471		2498.9	2530.6
						3753.1		
16	2414.1	2351.2	0.9342	0.9351	1.8702		2514.4	2549.3
						3825.1		
16	2429.2	2362.8	0.9374	0.9381	1.8763		2518.6	2554.4
						3787.3		
16	2444.4	2374.2	0.9407	0.9411	1.8823		2522.7	2559.3
						3736.5		
16	2459.5	2385.5	0.9439	0.9442	1.8883		2526.6	2563.9
						3899.9		
15	2514.1	2425.5	0.9552	0.9544	1.9088		2541.3	2582.0
						3819.4		
15	2529.2	2436.5	0.9584	0.9573	1.9146		2545.2	2586.6
						3846.6		
15	2544.3	2447.6	0.9616	0.9602	1.9204		2549.1	2591.3
						4031.3		

**Stack Summary Listing (5/5) from VSI\_005\_Rockhopper 1\_geo\_wavefield.z.1df**

Stack Number	Measured Depth [m]	True Vertical Depth [m]	Measured Time [s]	One-way Vertical Time [s]	Two-way Vertical Time [s]	Interval Velocity [m/s]	Average Velocity [m/s]	RMS Velocity [m/s]
15	2559.4	2458.6	0.9646	0.9629	1.9258		2553.3	2596.5
						3757.6		
14	2569.2	2465.8	0.9668	0.9648	1.9296		2555.7	2599.3
						3900.2		
14	2584.4	2476.8	0.9699	0.9677	1.9353		2559.6	2604.1
						3758.3		
14	2599.5	2487.9	0.9733	0.9706	1.9412		2563.3	2608.4
						3722.2		
14	2614.6	2499.0	0.9766	0.9736	1.9471		2566.8	2612.5

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## Checkshot QC Displays

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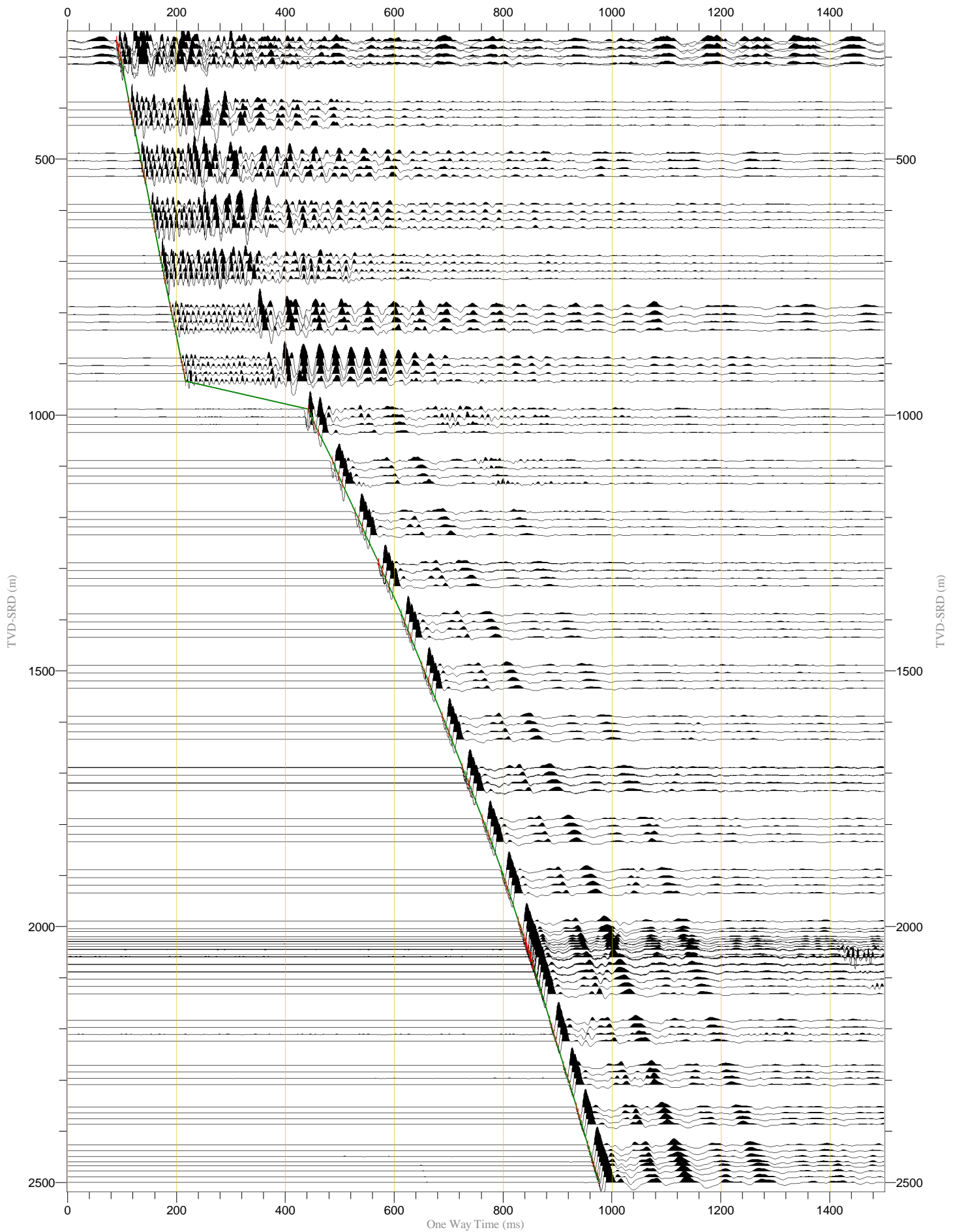
Raw Stack (Z)

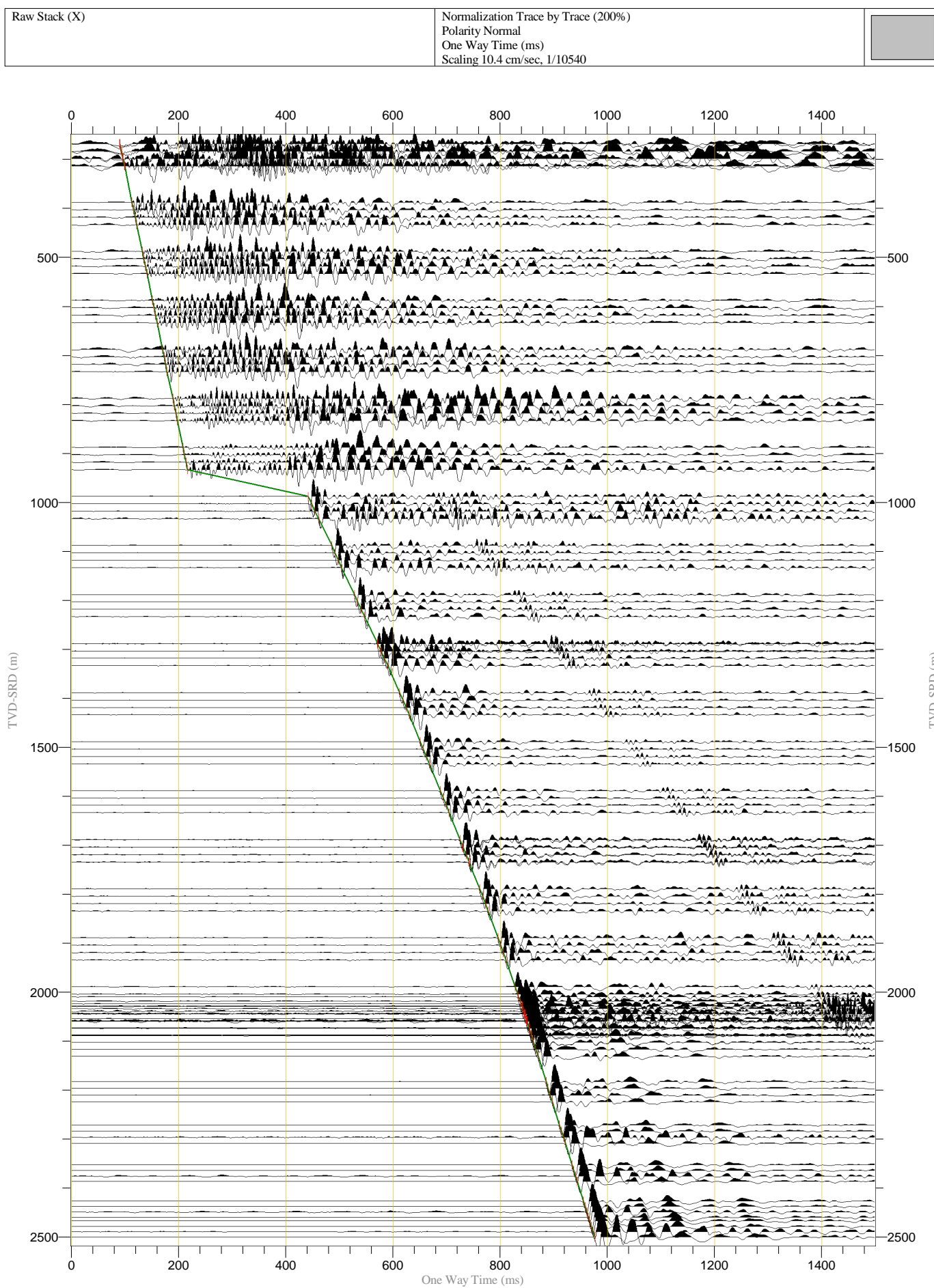
Normalization Trace by Trace (200%)

Polarity Normal

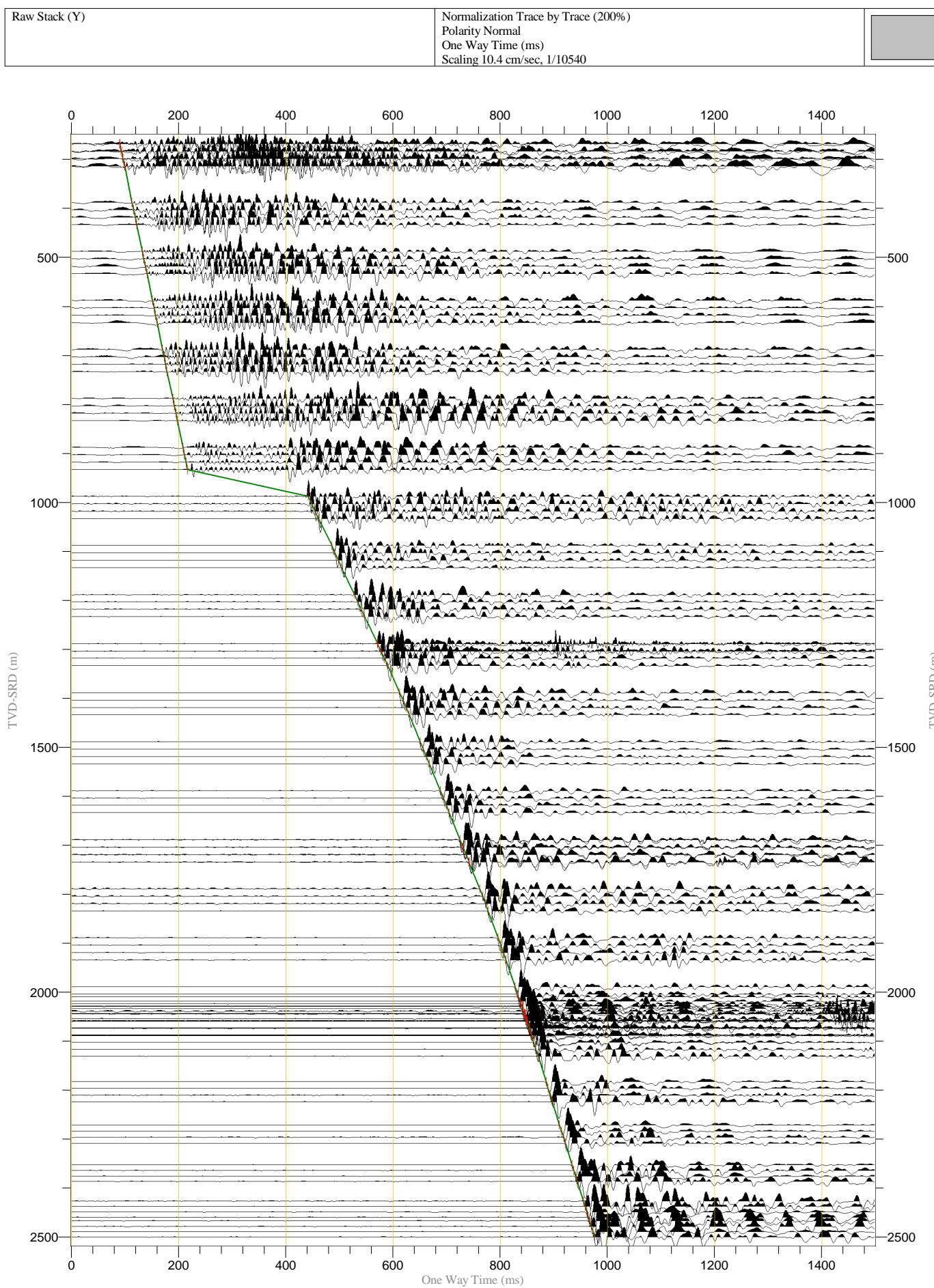
One Way Time (ms)

Scaling 11.0 cm/sec, 1/9640









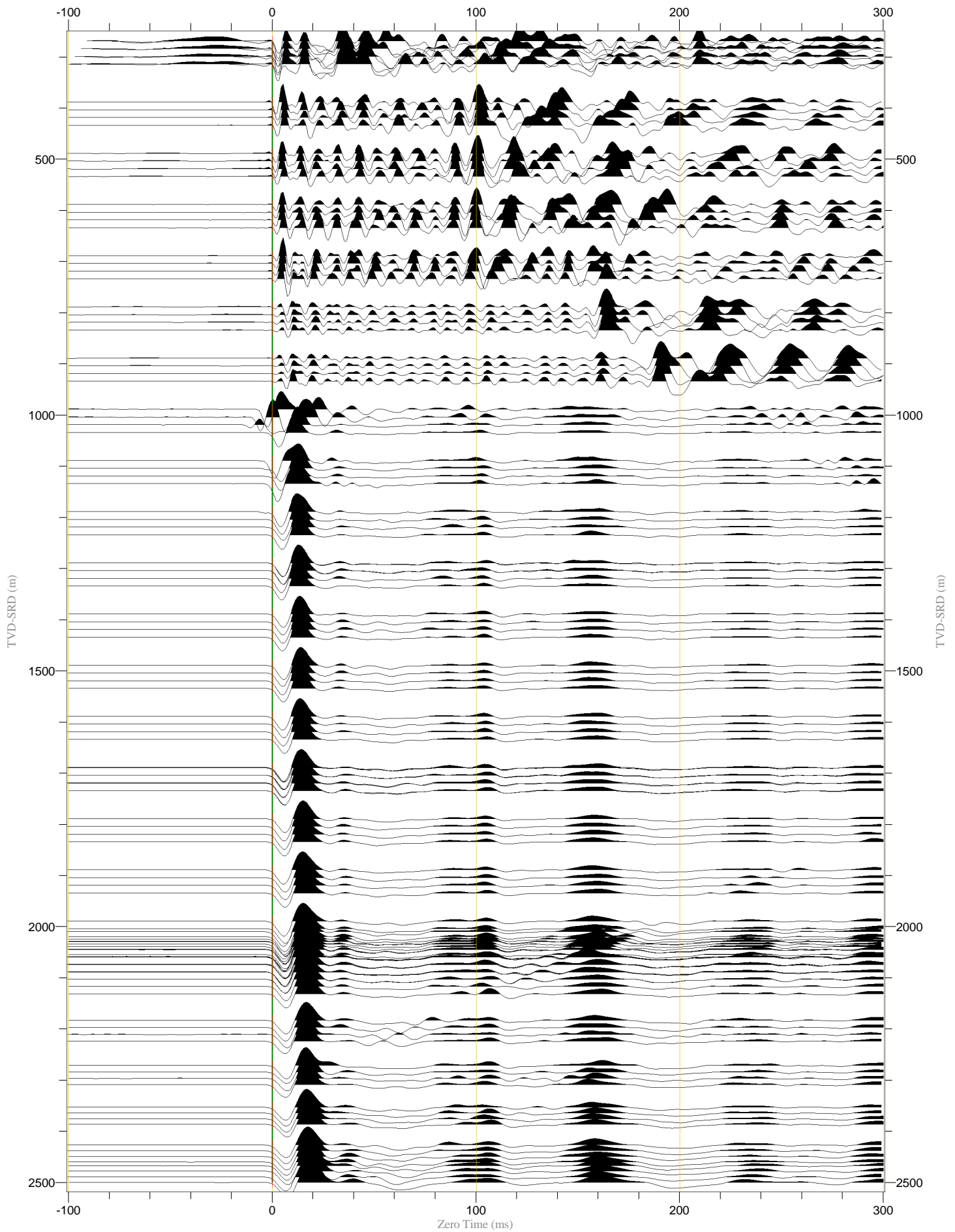
Raw Stack (Z) (Magnified)

Normalization Trace by Trace (200%)

Polarity Normal

Zero Time (ms)

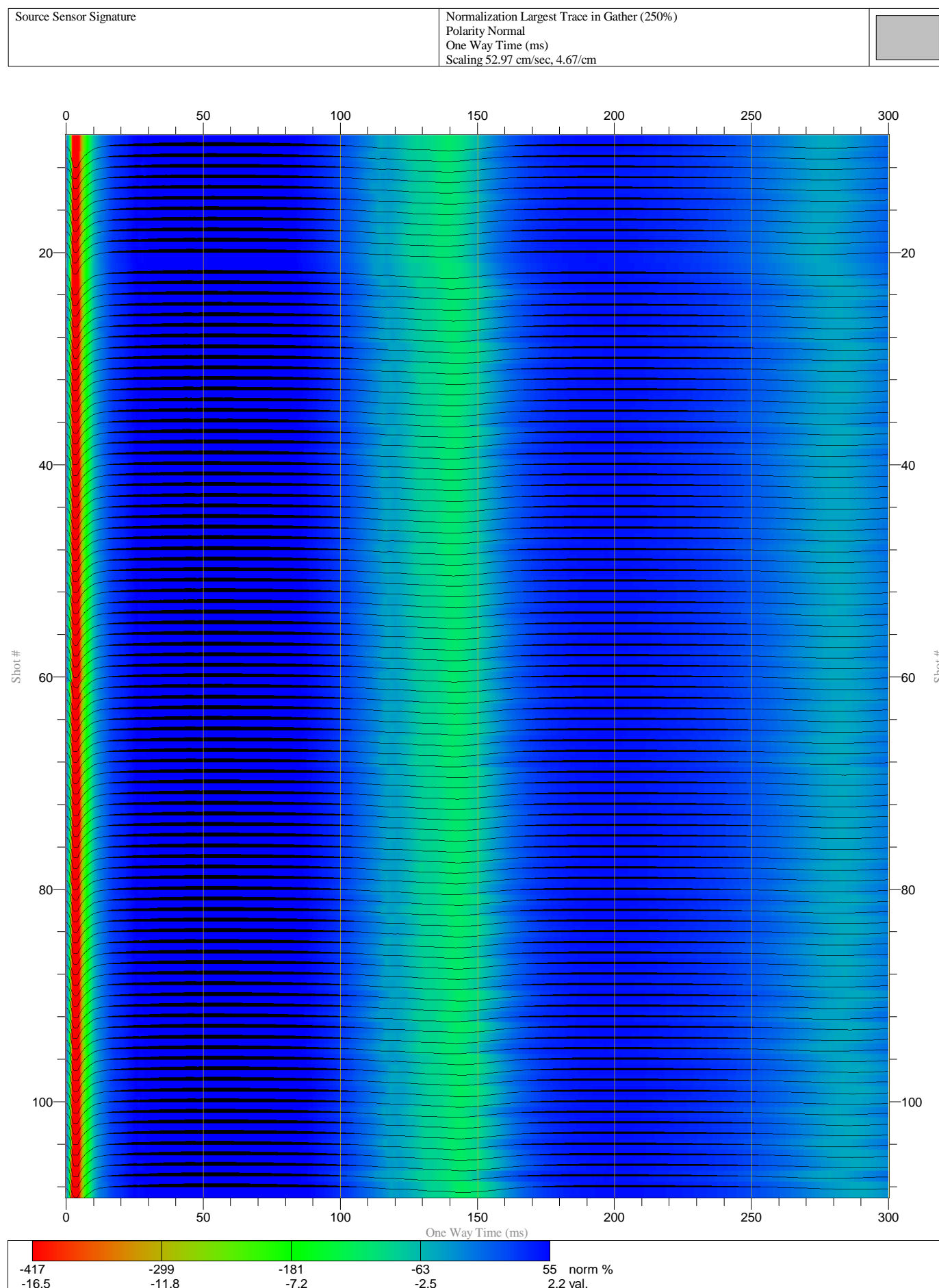
Scaling 41.3 cm/sec, 1/9640



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## Source Signature QC Displays

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## TRISOR QC Gun Pressure Display

