

Expertest Seismic Services



VELOCITY SURVEY

CBM93-004

NORTHERN TERRITORY

for

CENTRAL PETROLEUM

recorded by

SGS EXPERTEST Pty. Ltd.

processed by



Brisbane, Australia

21-1-2010

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SUMMARY

Expertest Pty Ltd conducted a velocity survey for Central Petroleum at the CBM93-004 well site. This survey was conducted on 2 January 2010 and was subsequently processed by Velseis Processing Pty Ltd in Brisbane, Australia.

The results of the survey were used to calibrate the sonic log.

The energy source used was an Air Gun.

GENERAL INFORMATION

Name of Well : CBM93-004

Coordinates : Latitude 24° 52' 10.92 S
: Longitude 135° 50' 59.64 E

Wireline Logging : Weatherford

Weather : Fine

Operational Base : Brisbane

Operator : Don Blick

Shooter : Unknown

Client Representative: Graham McClung

EQUIPMENT

Downhole Tool

FM Monoline slimhole probe

Sensors:

6 HIS 4.5Hz, 215 ohm, high temperature (300^o F)
detectors, connected in series – parallel.
Frequency response, 8 – 300 Hz, within 3 dB

Preamplifier:

48 dB fixed gain.
Frequency response, 8 – 200 Hz, within 3dB

Reference Geophone:

Mark Products L1, 4.5 Hz

Recording Instrument

System ID, VDLS 16 Recording system

Windows based high resolution seismic acquisition system

Computer	: Pentium™ portable computer
Resolution	: A/D conversion, 16 bit
Dynamic Range	: 96 dB
Total Gain	: 134.dB
Data Channels	: 8 maximum
Display	: A4 inkjet printer, 300 DPI

RECORDING

Energy Source : 150 cubic inch Airgun

Shot Location : Mud Pit

D Shot Depth : 1.5 metres

Mud Pit Shot Offset : 35 metres

Recording Geometry : see Figure 1 "Shot Location Sketch"

Shots were recorded to hard disk and emailed to Brisbane for processing. Print outs of the shots used are included with this report.

The sample rate was 500 uSec across the entire survey.

Channel Allocation


Channel 1 : Auxiliary ch.1, surface channel


Channel 2 : Auxiliary ch.2, surface channel

Channel 3 : Time Break Confirmation

Channel 4 : Downhole Geophone

EXPERTTEST Pty. Ltd.		
Seismic Services: - Location Sketch		
CLIENT :	WELL NAME :	DATE :
Central Petroleum	CBM93-004	2-1-2010

WELLHEAD



D

Dist. : 35m

Brg. : 35

Elev. : 183.5m

Comments : No A, B or C shot locations taken.

Figure 1. Shot Location Sketch

PROCESSING

Elevation Data

Elevation of KB : 186.0 m above sea level

Elevation of Ground : 185.0 m above sea level

Elevation of Datum : 0.0 m above sea level

Depth Surveyed : 978.0 m below KB

Depth of Casing : 500 m below KB

Sonic Log Interval : 5 to 980.8 m below KB

Shot Location Data

Shot A : Elevation	N/A	Offset	Units metres
Shot B : Elevation	N/A	Offset	Units metres
Shot C : Elevation	N/A	Offset	Units metres
Shot D : Elevation	183.5	Offset 35	Units metres

Instrument Delay : 6.5 Msec

Surface Velocity : 620 m/sec

Recorded Data

Number of shots recorded : 24

Number of shots processed : 18

Number of levels recorded : 21

Data Quality : Good

Noise Levels : Low

Correction for Instrument Delay and Shot Offset

The first arrival times from the auxiliary surface channels were used to calculate pit fatigue corrections, which were then applied to the times recorded for the downhole channel. The corrections applied are shown in Table 1.

Table 2 shows the corrections for instrument delay and shot offset. The one-way vertical datum to geophone times (T_{gd}) shown in Table 2 were used to calibrate the sonic log. The corrected times (T_{corr}) shown in Table 2 are the recorded times plus any corrections for pit fatigue. The one-way vertical surface to geophone times (T_{vert}) in Table 2 have been obtained by:-

- Subtraction of the instrument delay from the corrected first arrival time
- Geometric corrections to give vertical times, and correct for shot offset

The one-way vertical geophone to datum time (T_{gd}) was then obtained by adding the surface to datum time of 126.3 msec from T_{vert} and applying the shot static correction to correct for the depth of the shot below ground level at the wellhead using a correction velocity of 620 m/sec. The one-way vertical geophone to datum times were used to plot the Time – Depth Curve, Figure 2.

Calibration of Sonic Log – Method

Sonic times were adjusted to checkshot times using a polynomial derived least squares fit correction to the sonic transient times (Table 3). The section of sonic log inside casing was excluded from the calibration.

Differences between the shot and sonic times occur as the sonic tool measures the local velocity characteristics of the formation with a relatively high frequency signal, whereas the downhole geophone records the bulk velocity with a signal of significantly lower frequency.

Calibration of Sonic Log – Results

The hole was cased above 500m below KB. Sonic data above this depth were removed so as not to introduce erroneous results into the sonic calibration table.

The discrepancies between shot and sonic interval velocities were generally small. The total sonic drift over the well was 11.0 msec.

The calibrated sonic times were then used to calculate the Average, Interval and RMS velocities and to plot the velocity curves. Table 4 shows the velocities calculated from the calibrated sonic times, and these velocities are plotted in Figure 3.

Trace Playouts

Figure 4A is a shot order plot of all raw data traces used.

Figure 4B is a plot of the auxiliary surface channels 1 & 2.

Table 1 Corrections for Pit Fatigue

Shot #	First break Ch 1	First break Ch 2	Ch 1 Correction	Ch 2 Correction	Correction, msec
1	18.50	60.00	2.48	0.36	1.50
2	22.50	60.50	-0.80	-0.94	-1.00
3	24.00	59.00	-1.56	-0.09	-1.00
4	24.00	57.50	-0.83	0.89	0.00
5	25.00	57.50	-1.09	0.50	-0.50
6	25.50	58.50	-0.85	-0.78	-1.00
7	25.50	57.00	-0.12	0.53	0.00
8	25.50	57.00	0.60	0.44	0.50
9	26.00	58.00	0.80	-0.58	0.00
10	26.50	57.50	0.97	-0.04	0.50
11	26.50	59.00	1.62	-1.45	0.00
12	26.50	57.50	2.24	0.17	1.00
13	29.00	57.50	0.33	0.33	0.50
14	31.50	58.00	-1.63	-0.01	-1.00
15	31.50	57.50	-1.13	0.66	0.00
16	31.50	59.00	-0.68	-0.68	-0.50
17	32.50	56.50	-1.29	1.95	0.50
18	32.00	58.50	-0.45	0.04	0.00
19	32.00	59.00	-0.18	-0.41	-0.50
20	31.50	59.50	0.52	-0.92	0.00
21	31.50	58.00	0.65	0.49	0.50
22	31.50	60.00	0.69	-1.68	-0.50
23	32.00	57.00	0.16	1.05	0.50
24	32.50	57.50	-0.46	0.18	0.00

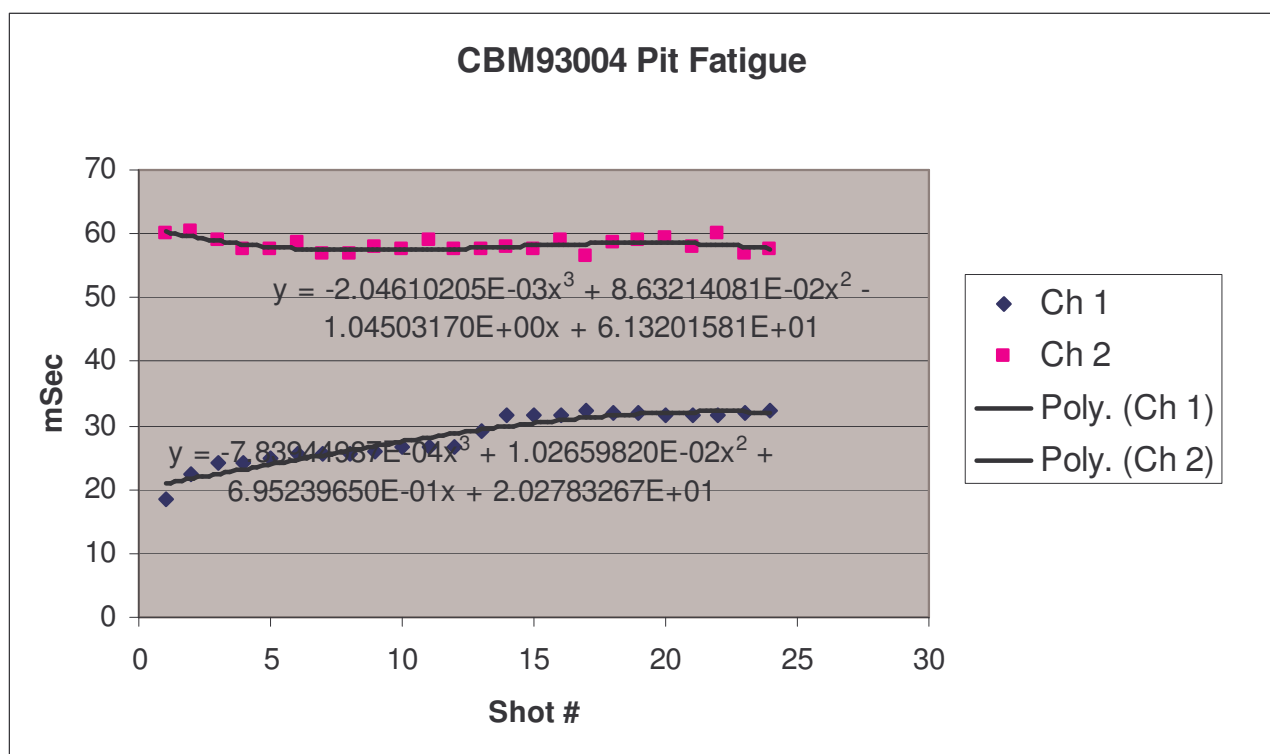


Table 2 Corrections for Shot Offset

Instrument
delay: 6.50
Surface
velocity: 620.00

Time to datum: 126.30

WELL: CBM93004 CLIENT: CENTRAL PETROLEUM Time to Datum : 126.30 mSec

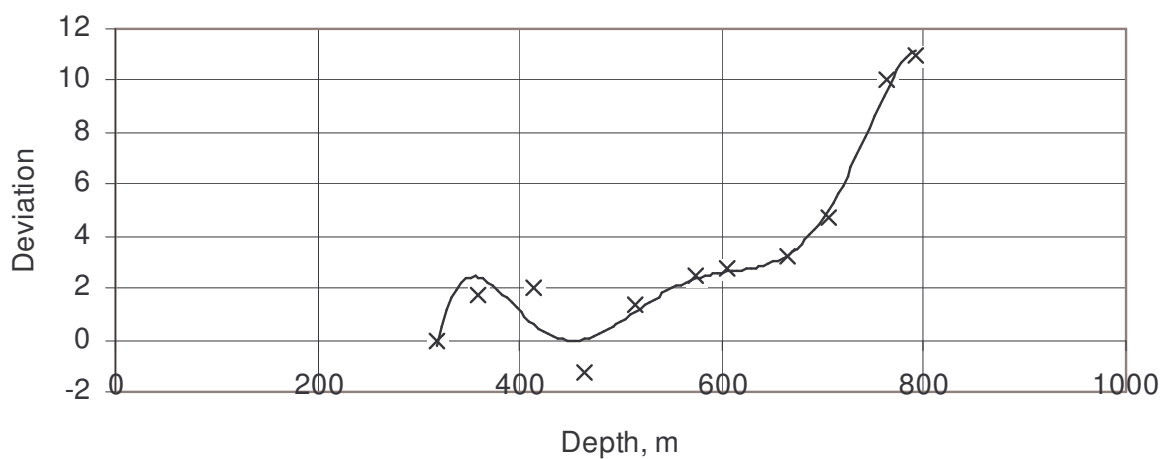
shot #	shot		geophone depth		T(rec)	T(corr)	T(vert)	T(gd)	T(gd) Average	Check shot	interval	Velocities		
	location	depth	kb	datum						distance	time	Average	Interval	RMS
21	D	1.50	186.0	0.0	125.5	126.0	126.3	0.0	0.0	0.0	0.0			
20	D	1.50	200.0	14.0	134.0	134.0	134.5	8.2	8.2	14.0	8.2	1715.7	1715.7	1715.7
19	D	1.50	240.0	54.0	153.5	153.0	153.9	27.6	27.6	40.0	19.4	1960.0	2062.8	1966.4
18	D	1.50	300.0	114.0	186.0	186.0	187.2	60.9	60.9	60.0	33.3	1872.3	1799.9	1877.1
17	D	1.50	350.0	164.0	210.5	211.0	212.4	86.1	86.1	50.0	25.2	1905.1	1984.1	1909.0
16	D	1.50	406.0	220.0	241.0	240.5	242.0	115.7	115.7	56.0	29.7	1900.8	1888.4	1903.8
15	D	1.50	450.0	264.0	258.5	258.5	260.2	133.8	133.8	44.0	18.1	1972.4	2429.8	1983.1
14	D	1.50	505.0	319.0	277.0	276.0	277.8	151.5	151.5	55.0	17.6	2106.1	3122.2	2146.9
13	D	1.50	545.0	359.0	293.5	294.0	295.8	169.5	169.5	40.0	18.1	2117.7	2215.5	2154.3
12	D	1.50	600.0	414.0	316.0	317.0	318.9	192.6	192.6	55.0	23.1	2149.7	2384.6	2183.1
11	D	1.50	650.0	464.0	335.0	335.0	336.9	210.6	210.6	50.0	18.1	2202.8	2769.7	2239.4
10	D	1.50	700.0	514.0	358.5	359.0	361.0	234.7	234.7	50.0	24.0	2190.3	2080.2	2223.7
9	D	1.50	760.0	574.0	385.0	385.0	387.0	260.7	260.7	60.0	26.0	2201.7	2304.2	2231.8
8	D	1.50	792.0	606.0	399.5	400.0	402.0	275.7	275.7	32.0	15.0	2197.8	2130.9	2226.5
7	D	1.50	850.0	664.0	421.5	421.5	423.6	297.3	297.3	58.0	21.5	2233.7	2693.6	2263.5
6	D	1.50	892.0	706.0	438.5	437.5	439.6	313.3	313.3	42.0	16.0	2253.6	2621.7	2283.2
5	D	1.50	950.0	764.0	463.0	462.5	464.6	338.3	338.3	58.0	25.0	2258.3	2317.9	2285.8
4	D	1.50	978.0	792.0	473.0	473.0	475.1	348.8	348.8	28.0	10.5	2270.5	2663.9	2298.1

Table 3 Checkshot/Sonic Deviation

Depth m(datum)	T(Sonic) datum, mSec	T(Checkshot) datum, mSec	Deviation Shot-Sonic	Sonic Interval mSec	Shot Interval mSec	Interval Correction mSec	Cumulated Correction
319.0	278.3	278.3	0.0				0.0
359.0	294.1	295.8	1.7	15.8	17.6	1.7	1.7
414.0	316.9	318.9	2.0	22.8	23.1	0.3	2.0
464.0	337.7	336.4	-1.3	20.8	17.6	-3.3	-1.3
514.0	359.1	360.5	1.4	21.4	24.0	2.6	1.4
574.0	384.0	386.5	2.5	24.9	26.0	1.1	2.5
606.0	398.8	401.5	2.8	14.7	15.0	0.3	2.8
664.0	420.3	423.6	3.3	21.6	22.0	0.5	3.3
706.0	435.4	440.1	4.7	15.1	16.5	1.4	4.7
764.0	455.0	465.1	10.1	19.6	25.0	5.4	10.1
792.0	464.6	475.6	11.0	9.6	10.5	1.0	11.0

$$y = -1.47279929E-13x^6 + 5.00662227E-10x^5 - 6.96648836E-07x^4 + 5.07473496E-04x^3 - 2.03887009E-01x^2 + 4.27897325E+01x - 3.66049809E+03$$

Polynomial deviation



× Deviation — Poly. (Deviation)

Table 4 Calibrated Time – Depth Curve Values

Depth m(datum)	T(sonic) datum, msec	Velocities		
		Interval	Average	RMS
319.0	278.1	0	0	0
320	278.7	1709	1148	1709
325	281.5	1736	1154	1731
330	284.1	1954	1162	1829
335	286.5	2108	1169	1912
340	288.8	2148	1177	1966
345	290.9	2380	1186	2039
350	292.9	2563	1195	2116
355	294.8	2550	1204	2171
360	297.0	2259	1212	2182
365	299.5	2034	1219	2165
370	301.9	2080	1226	2157
375	304.0	2320	1233	2171
380	306.1	2424	1241	2190
385	308.0	2711	1250	2226
390	309.5	3326	1260	2291
395	311.0	3182	1270	2341
400	313.0	2518	1278	2352
405	314.6	3167	1287	2393
410	316.2	3151	1297	2429
415	317.8	3090	1306	2459
420	319.3	3303	1315	2495
425	320.8	3254	1325	2526
430	323.0	2279	1331	2515
435	325.5	2072	1337	2494
440	327.5	2506	1344	2495
445	329.0	3203	1353	2519
450	330.7	2971	1361	2535
455	333.1	2045	1366	2515
460	335.7	1971	1370	2494
465	338.2	1953	1375	2473
470	340.5	2226	1380	2465
475	342.2	2922	1388	2478
480	344.1	2561	1395	2481
485	346.7	1940	1399	2462
490	348.8	2385	1405	2460
495	351.3	2031	1409	2447
500	353.9	1904	1413	2430
505	355.8	2629	1419	2435
510	358.1	2230	1424	2430
515	360.7	1887	1428	2414
520	363.4	1875	1431	2399
525	365.2	2753	1438	2407
530	367.4	2226	1442	2403
535	369.6	2348	1448	2401
540	372.1	1964	1451	2391
545	374.0	2710	1457	2397
550	375.7	2836	1464	2406
555	377.8	2388	1469	2405
560	380.4	1914	1472	2394

Depth m(datum)	T(sonic) datum, msec	Velocities		
		Interval	Average	RMS
565.00	383.0	1926	1475	2384
570.00	385.0	2472	1480	2385
575.00	386.8	2820	1487	2393
580.00	389.3	1979	1490	2385
585.00	391.9	1982	1493	2376
590.00	394.4	1999	1496	2369
595.00	396.3	2528	1501	2372
600.00	398.4	2462	1506	2373
605.00	400.9	1989	1509	2366
610.00	403.0	2345	1514	2366
615.00	404.6	3175	1520	2377
620.00	406.2	3087	1526	2388
625.00	407.9	3053	1532	2397
630.00	409.4	3145	1539	2408
635.00	411.6	2364	1543	2407
640.00	414.0	2076	1546	2401
645.00	415.7	2868	1552	2408
650.00	417.5	2774	1557	2413
655.00	420.0	2038	1560	2407
660.00	422.0	2478	1564	2408
665.00	423.9	2609	1569	2411
670.00	425.6	2988	1574	2418
675.00	427.5	2588	1579	2420
680.00	429.3	2741	1584	2425
685.00	431.4	2420	1588	2424
690.00	433.4	2464	1592	2425
695.00	435.9	1989	1594	2419
700.00	437.8	2664	1599	2422
705.00	439.9	2363	1603	2421
710.00	442.1	2262	1606	2419
715.00	444.1	2555	1610	2420
720.00	446.0	2634	1614	2423
725.00	447.9	2600	1619	2425
730.00	449.9	2546	1623	2427
735.00	451.9	2493	1627	2427
740.00	454.0	2330	1630	2426
745.00	456.1	2399	1633	2426
750.00	458.5	2055	1636	2421
755.00	460.6	2403	1639	2421
760.00	463.0	2097	1641	2417
765.00	465.2	2339	1645	2416
770.00	467.1	2554	1648	2418
775.00	469.2	2422	1652	2418
780.00	471.5	2134	1654	2414
785.00	473.3	2742	1658	2418
790.00	475.1	2862	1663	2422

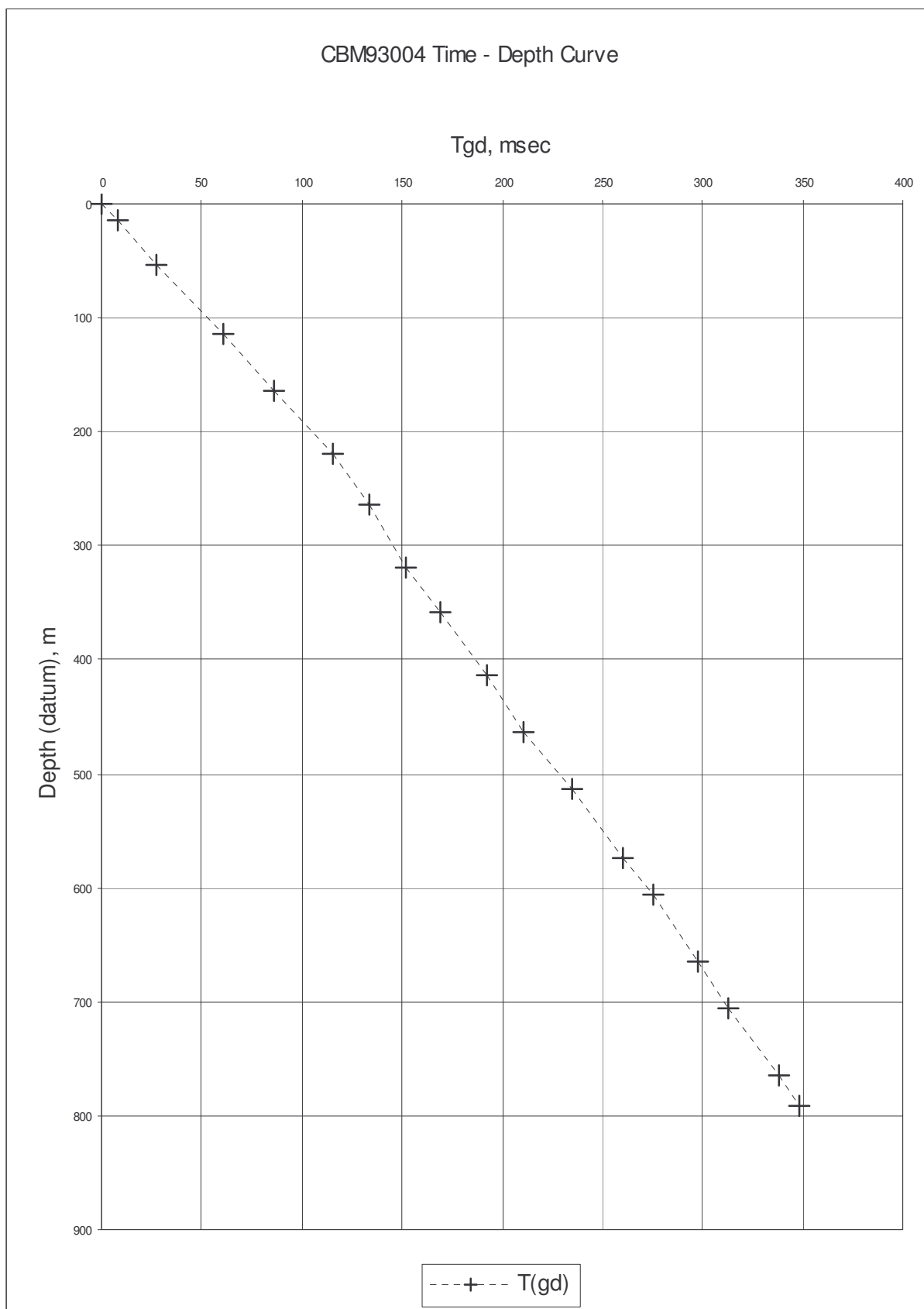
Figure 2. Time – Depth Curve

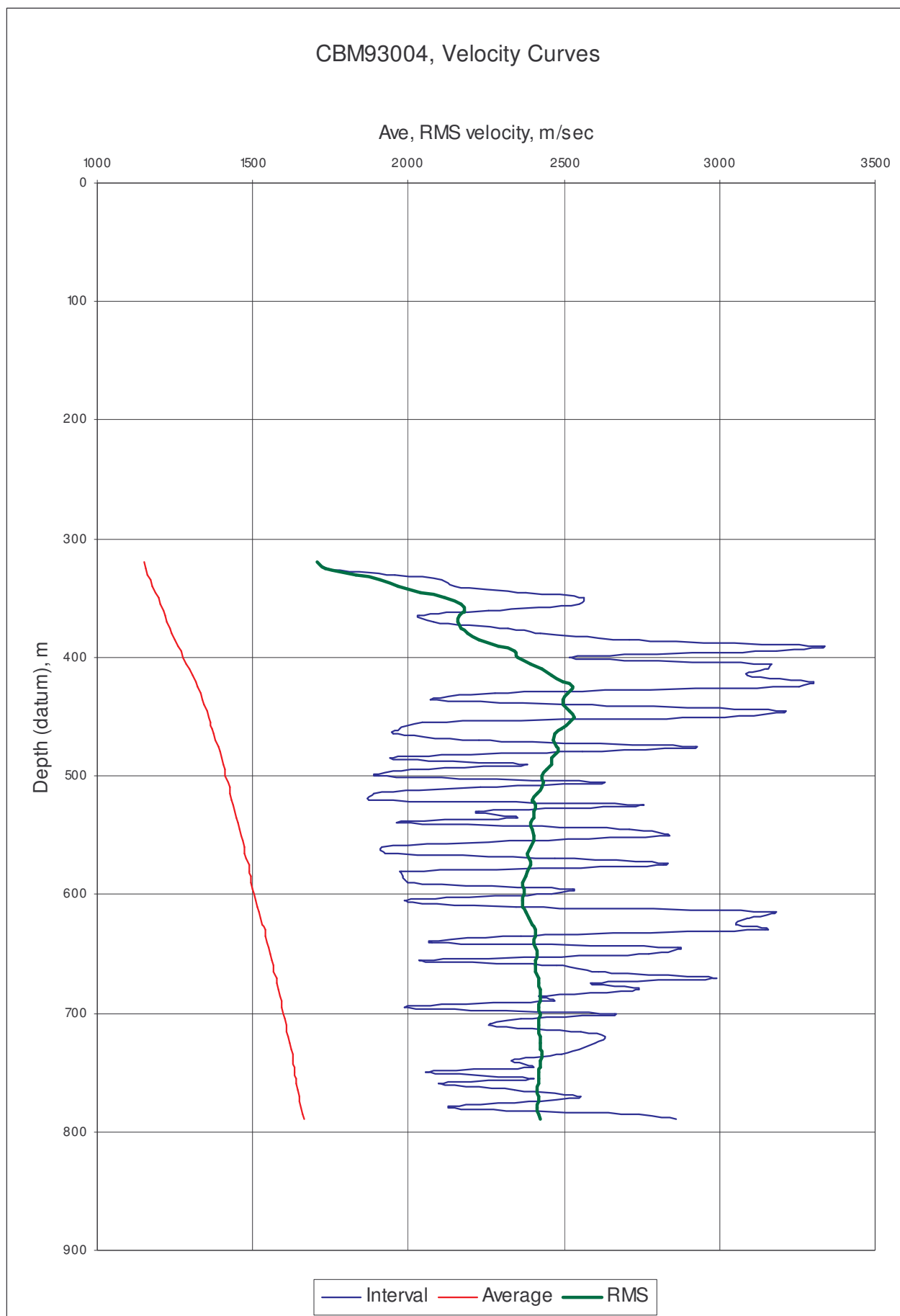
Figure 3. Interval, Average and RMS velocity curves

Figure 4. Trace Playouts