SIMON Petroleum Technology

Simon-Horizon Australia Pty Ltd

SEISMIC DATA PROCESSING REPORT

FOR

PACIFIC OIL AND GAS PTY. LTD.

1990 SCARLET HILL SEISMIC SURVEY
McARTHUR BASIN

1990 ELSEY SEISMIC SURVEY
McARTHUR BASIN

LOCATION : NORTHERN TERRITORY
COMPILED BY : SIMON-HORIZON AUSTRALIA PTY. LTD.

OCTOBER 1991

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1. INTRODUCTION

The Field Survey was undertaken by GEOSYSTEMS PTY LTD in August 1990

The lines recorded in the whole survey comprised of :

Mcarthur basin

SH90-100	40.0 km
SH90-102	46.4 km
SH90-103	100.0 km
SH90-105	30.0 km
SH90-107	20.0 km
SH90-109	10.0 km
EL90-201	60.0 km

For a total of 306.4 kilometres.

Processing was conducted by Simon-Horizon Australia, at their Perth office. Final filming was completed by July 1990.

2. FIELD SURVEY INFORMATION

ACQUISITION PARAMETERS - Scarlet Hill / Elsey

Source	Vibroseis
Source pattern	4 Vibrators in line 36m (12m Pad to Pad) stacked array
Sweep Frequency	7 Varisweeps per VP 10 - 30 Hz 20 - 66 Hz 12 - 48 Hz 13 - 52 Hz 24 - 66 Hz 10 - 36 Hz 28 - 66 Hz
Sweep Emphasis	linear - 250 msec taper
Sweep Length	6.0 Seconds
VP Interval	45 metres
Number of data channels	500
Spread configuration offsets	3742.5-7.5-X-7.5-3742.5 m
Group interval	15 m
Geophone configuration	6 geophones in line with 2.5m spacing over 12.5m
Geophone type	MARK L21A (10 Hz)
Recording instrument	GEOCOR IV (16 SIGN-BIT)
Record length	4 seconds (correlated)
Sample period	2 msec
Tape format	Geosystems (correlated) 1600 bpi
COVERAGE	8333 %
Polarity	Upward movement of geophone recorded with negative value on tape.

FIELD DATA SUPPORT MATERIAL

The following support information was provided

a) Observers Reports.
b) Vibrator Parameter Reports.
c) Receiver Parameter Reports.
d) Elevations listing.
e) Intersection Diagrams.
g) Uphole plots.

DATA PROCESSING PARAMETERS

1) DEMULTIPLEX	Transcribe Geosystems format field tapes to HORIZON'S internal format Resample from 2 to 4 msec sample period.
2) GAIN RECOVERY	0.0t + 10.0Log(t) (Scarlet Hill) 1.0t + 10.0Log(t) (Elsey)
3) DISPLAY	Display of shot records for quality control monitoring and for edit of noise contaminated traces.
4) TRACE SUMMING	Receiver array simulation. 1:2:1 trace weights. No trace summing for Elsey.
5) LINE GEOMETRY CREATION	
6) FK FILTER	Lozenge type FK filter applied to attenuate ground roll.
7) CDP SORT	Reorder traces from common shot record gathers into common depth point gathers.
8) DECONVOLUTION	Predictive Deconvolution. 20 msec gap 120 msec operator, 1% white noise. Design windows (Scarlet Hill) 200-2100 msec @ near offset 1100-2600 msec @ far offset Design windows (Elsey) 100-1500 1400-3200 msec @ near offset 1100-2500 1800-3200 msec @ far offset
9) STATICS - (1)	The mean datum static is calculated for each CDP, and the relative static (the difference between the CDP mean static and the individual traces' total static) applied.

10) RESIDUAL STATICS	Surface consistent solution where the maximum allowable shift was +/- 20 msec. NMO corrections were performed using velocities chosen from preliminary CVS velocity analyses performed at 2.0 Km intervals Kmintervals.
11) DIP MOVEOUT	Kirchoff summation implementation on 31 equal migration offset ranges.
12) VELOCITY ANALYSES	CVS velocity analyses were performed over 21 cdp's at approximately 1.0 Km intervals. The velocity functions are referenced to surface.
13) NMO CORRECTIONS	
14) MUTE	Each line has its own mute/mutes.
15) SCALING	800msec AGC.
16) STATICS - (2)	The cdp mean static was applied, correcting from floating datum to datum. DATUM: 200 m above sea level. New time origin of -200 msec.
17) RESIDUAL STATICS	A CDP trim solution calculated on a 7 trace pilot with a maximum allowable shift of +/- 12 msec.
18) STACK	CDP stack using a square root compensation.

19) ZERO PHASE	1 Operator averaged over 11 traces:	
DECONVOLUTION	Design	Desired output
(Scarlet Hill)	0 - 1500 msec	12 - 48 Hz
(Elsey)	0 - 1500 msec	12 - 60 Hz
20) BAND-PASS FILTER	12 - 45 Hz	-200 to 1000 msec
(Scarlet Hill)	10 - 45 Hz	1300 to 1700 msec
	10 - 40 Hz	2000 to 2800 msec
(Elsey)	14 - 55 Hz	-200 to 700 msec
	12 - 50 Hz	1200 msec
	10 - 50 Hz	1700 msec
	10 - 45 Hz	2700 msec
21) SCALING	800 msec fixed length window	
22) TAU-P FILTER	Time variant dip and coherency filter. 70% of original data (Scarlet Hill) 75% of original data (Elsey)	
23) MIGRATION	Wave equation migration using 95% of smoothed stacking velocities - second order Finite Difference solution.	

NOTE : Q-DECON AND F-X PREDICTIVE NOISE REDUCTION WERE USED INSTEAD OF ZERO PHASE DECON FOR LINES SH90-100 AND SH90-103

4. DATA PROCESSING TESTS

Mute tests were conducted on each line

SH90-107	FK TRIALS
SH90-107	DECON BEFORE STACK TRIALS
SH90-107	PRE-STACK FILTER TRIALS
SH90-107	SPECTRAL WHITENING TRIALS
SH90-107	POST SPECTRAL WHITENING FILTER TRIALS
SH90-107	MIGRATION TRIALS OF 100% TO 85% VELOCITIES
SH90-103	DAS TRIALS
SH90-103	MULTI-CHANNEL RANDOM NOISE ATTENUATION BY SIGNAL PREDICTION.
SH90-103	QDECON - INVERSE-Q COMPENSATION.

5. STATICS COMPUTATION

Refraction breaks were picked by hand from the production breaks and statics derived using the Gardner/Layat method (see below). Breaks were picked in both the forward and reverse directions, and intercept times converted to one way statics. The refraction statics were compared with the uphole statics and differences computed at each uphole location.

A difference profile was then produced by linear interpolation. Final uphole "calibrated" statics were derived by combining the difference and refraction profiles.

GARDNER/LAYAT WEATHERING STATICS METHOD

The weathering statics method used has its development in the procedures established by Gardner and Layat. Trace by trace shot and receiver corrections are derived by establishing a continuous intercept curve from refraction breaks picked from the acquired data.

Intercept time is essentially the difference between the actual travel time of the refracted wave and the time if the wave had travelled a straight line between shot and receiver at the subweathering velocity, or $I = T - X/Vm$. With the redundancy in multi-fold coverage, intercept curves are developed which are the accumulated differences of the variations in time between traces encountering the velocity marker at the base of marker velocity, as described in the above equation. These curves are possible errors in the estimation of the marker velocity.

Intercept times are reduced to one way statics by the equation $S = K1$, where $K = 1/2 \cos 0 (Vw/Vc-1)$, resulting in a profile which gives a static at every surface position.

Details on the theoretical background for the method may be found in the paper "Modified Gardner Delay Time and Constant Distance Correlation Interpretation" by C. Layat, printed in the S.E.G. publication "Seismic Refraction Prospecting".

6. FINAL DISPLAY

Final display were produced on films using a GEOSPACE 6400 plotter.

DISPLAY SCALES
Scarlet Hill / Elsey

FINAL STACK	1:25000	42.33 tr/in and	5.0 in/sec
MIGRATED STACK	1:12500	21.16 tr/in and	5.0 in/sec
	1:25000	42.33 tr/in and	5.0 in/sec
	1:50000	84.66 tr/in and	5.0 in/sec

APPENDIX A

LIST OF FIELD TAPES

LINE	TAPES	VP RANGE
SH90-100	90A200 - 90A235	100 - 2767
SH90-102	90A063 - 90A108	100 - 3196
SH90-103	90A109 - 90A199	6769 - 100
SH90-105	90A033 - 90A062	2101 - 100
SH90-107	90A002 - 90A022	1435 - 100
SH90-109	90A023 - 90A032	100 - 769
EL90-201	90A236 - 90A289	4099 - 100

APPENDIX B

PURCHASE TAPES

Two archive tapes were produced containing the Raw Stacks and the Migration Stacks. There is a description block separating each data set which contains the line number and a description of the data which follows.

All tapes were produced in SEGY 32 bit IBM Floating Point format.

The time of first sample is -200 msec.

Reel number MC-100 - Raw Stack Archive of lines:

SH90-100,102,103,105,107,109
EL90-201 and 89-203

Reel number MC-200 - Migrated Stack Archive of lines:

SH90-100,102,103,105,107,109
EL90-201 and 89-203

A velocity tape was created for Mcarthur Basin.

APPENDIX C

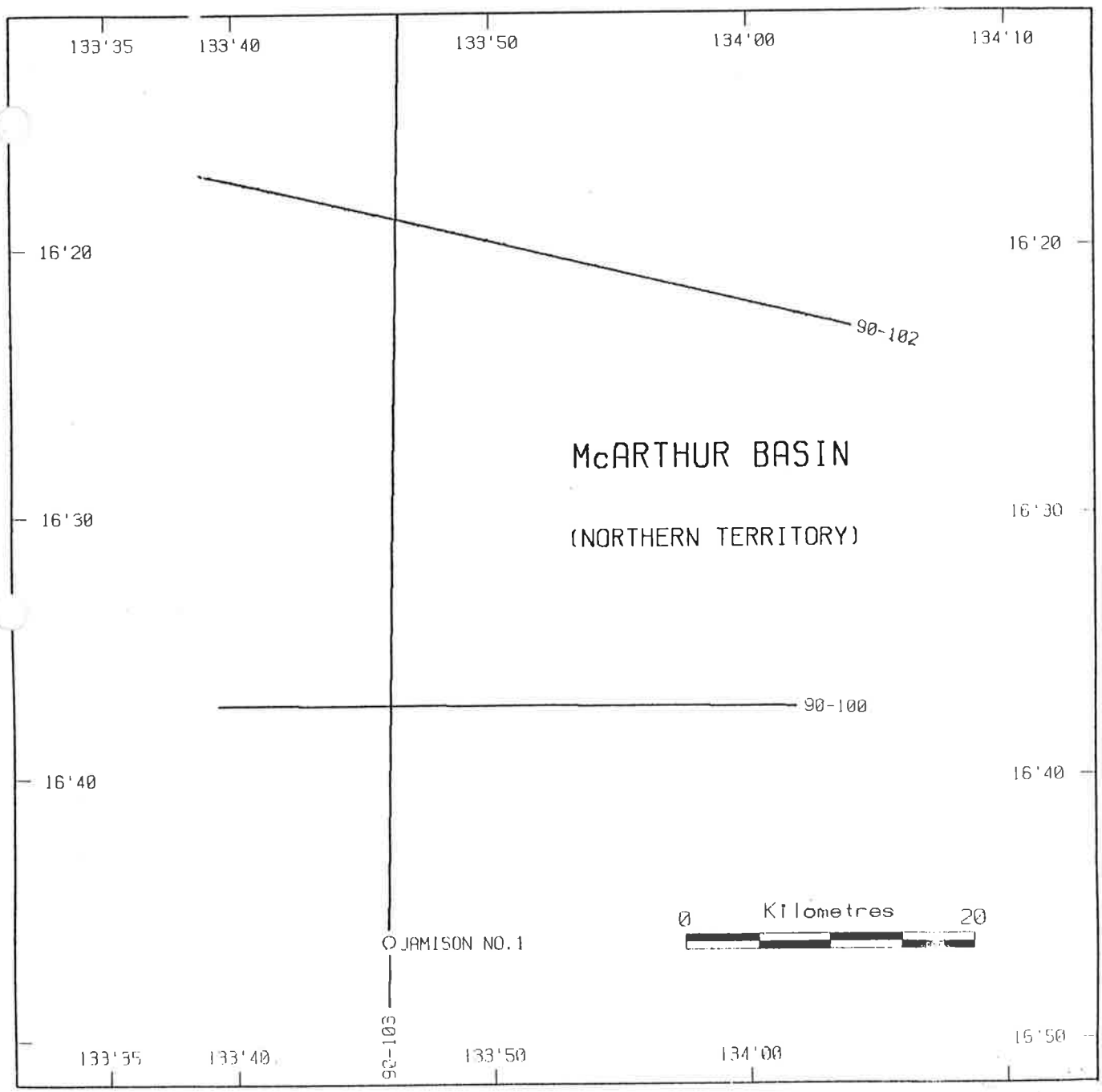
DATA DISPOSAL

DATA	DISPOSAL	DATE
Field Tapes	Encom Technology 24 Queen Parade, North Fitzroy, Victoria 3065	29/07/91
Archive Tapes	Pacific Oil And Gas 826 Whitehorse Road Boxhill Victoria 3128	04/06/91
Film Display	Pacific Oil And Gas 826 Whitehorse Road Boxhill Victoria 3128	01/10/91
Shot Record Display	Pacific Oil And Gas 826 Whitehorse Road Boxhill Victoria 3128	01/10/91
Observer's Logs Uphole Plots	Pacific Oil And Gas 826 Whitehorse Road Boxhill Victoria 3128	01/10/91

NOTE: Velocity analyses diplays were destroyed after the velocity tape was created

APPENDIX D

LINE LOCATION MAP



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APPENDIX D

LINE LOCATION MAP