SEISMIC DATA PROCESSING REPORT

FOR NEXUS ENERGY

Location : Offshore Victoria, Shallow Water
Survey   : VIC P39 2D Processing
Prospect : Gippsland Basin
Date   : March 2005

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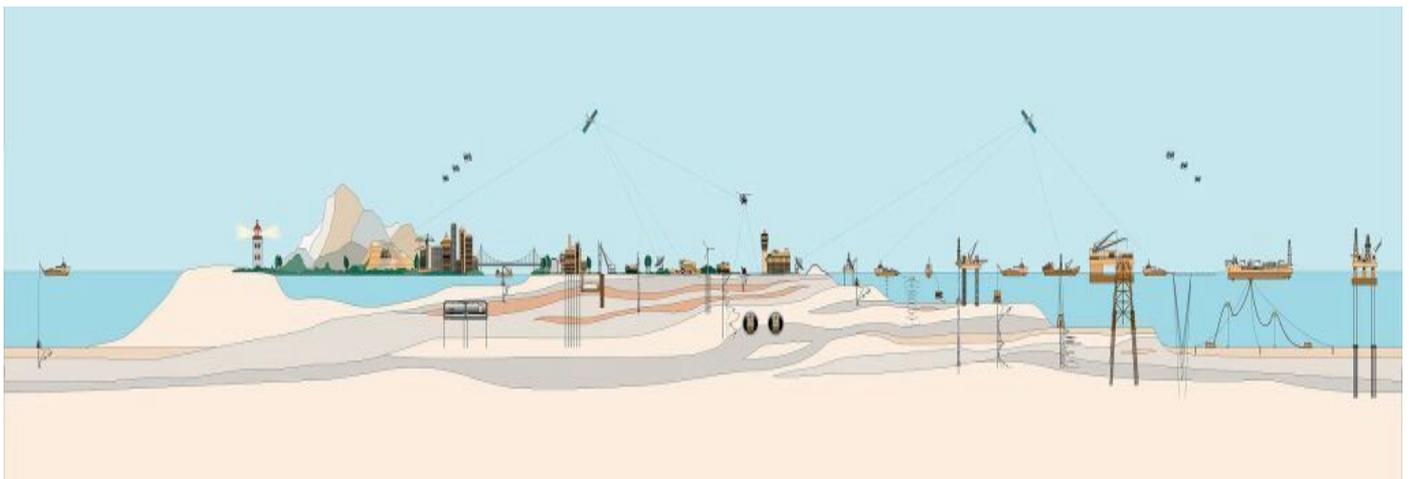
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1 INTRODUCTION

New 2D Marine Reflection Seismic Data acquisition was conducted in Gippsland Basin Permit Vic/P39 during February 2005 for Nexus Energy. The data comprised 15 lines totalling 281.2 cdp km and was processed by Fugro Seismic Imaging between February and March, 2005. Extensive testing preceded the actual processing sequence, with special regard to preserving true relative amplitude of the data as much as possible. All processing parameters that were applied were done so with respect to the changing water bottom.

1.1 PERSONNEL

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Simon Stewart   Marine 2D Manager
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Nexus Energy
Philip M Smith   Exploration Manager

Makaira Geotechnical Pty Ltd
John Cant   Consultant

2   LOCATION MAPS

2.1   GENERAL PROJECT LOCATION

2.2 LINE MAP

VIC P39 GIPSLAND BASIN
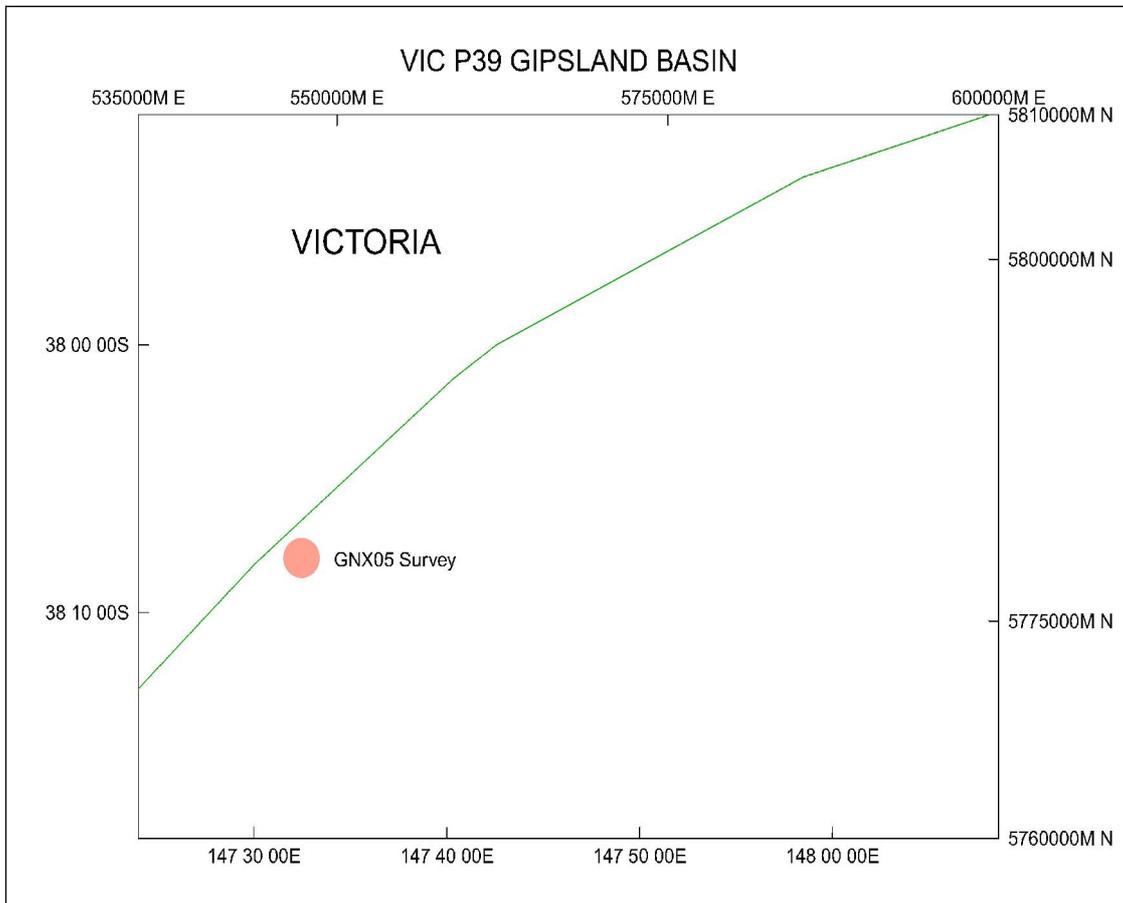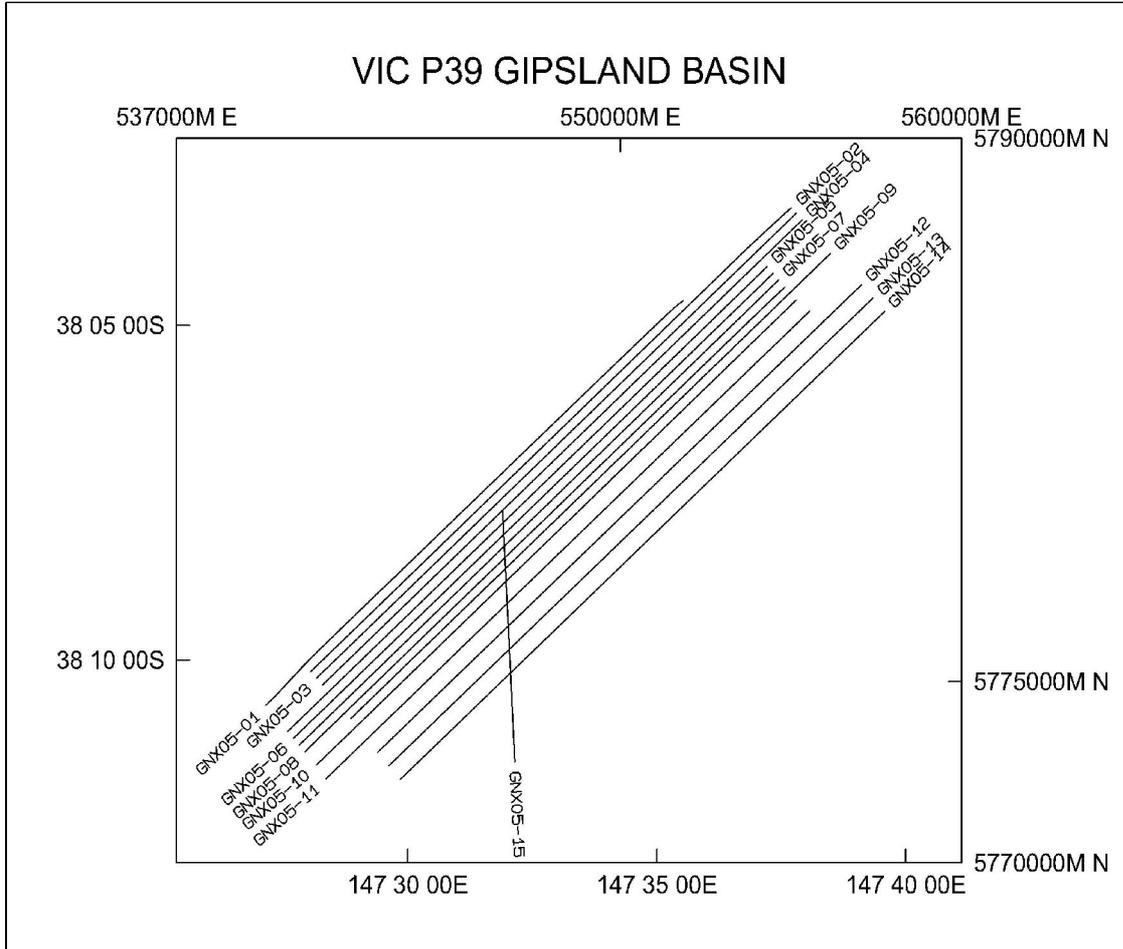
3 PARAMETER TESTING

Testing was performed on line GNX05-01, which ran parallel to the shoreline and was closest to it, in order to determine the optimal processing parameters. This line was characterised by a higher level of noise, probably due to its proximity to shore. The established processing sequence was then used for the remaining lines of the project.

Please refer to the table below for a list of the tests performed.

Description	Format
Raw displays	Shot
Gain recovery	Shot
Low cut filter	Shot
Swell noise attenuation	Shot
Despiking	Shot
F-K filter (shot domain, various cuts, with and without FX interpolation)	Shot
F-K filter with NMO (shot domain, various cuts)	Shot
F-K filter (receiver domain, various cuts, with and without FX interpolation)	Receiver
F-K filter with NMO (receiver domain, various cuts)	Receiver
F-K filter (shot and receiver domain)	Shot and Receiver
Tau-P linear noise removal	Shot/Stack
Tau-P deconvolution	Shot/Stack
Predictive deconvolution (before stack)	Gather/Stack
F-K demultiple	Gather/Stack
Radon demultiple – various cut-off ranges	Gather/Stack
Scaling before PSTM	Gather/Stack
Pre stack migration velocity field smoothing	Velocity profile
SRME (Surface Related Multiple Attenuation)	Gather/Stack
dB gain testing prestack	Gather/Stack
Stack mutes (outer and inner trace)	Gather/Stack
Residual radon demultiple	Gather/Stack
Predictive deconvolution after stack	Stack
dB gain testing poststack	Stack
Q filter compensation	Stack
Post stack scaling	Stack
Bandpass filter	Stack

Parameter tests were presented as paper displays, or sent by email or ftp for evaluation on screen.

4 COMMENTS & CONCLUSION

The VIC P39 2D processing began in February 2005 and was completed by April 2005. All the lines in the survey were in relatively shallow water, with mostly flat uniform water bottom. The data for this processing phase consisted of 281.2 km in fifteen lines all in the same vintage.

With the exception of line GNX05-01, all data was of consistent quality. Line GNX05-01 contained a higher level of noise, possibly due to its proximity to shore.

There was no well control in this acquisition, and as a result we could not tie the data to any well information, therefore no phase matching was done.

SRME (Surface Related Multiple Attenuation) was tested extensively but was not used in the processing sequence because it did not offer significant benefits.

Overall there was a marked improvement in data quality throughout the processing sequence, especially in the resolution of deeper dipping structures below the 1.3 s mark. This has been documented in Section 7 – Examples of Data Quality.

All processing parameters have been detailed in Section 5 – Processing Description.

5   PROCESSING SEQUENCE

5.1   FINAL PSTM SEQUENCE (FILTERED & SCALED)

TRANSCRIPTION
|
GAIN RECOVERY (t²)
|
LOW CUT FILTER
|
RANDOM SPIKE ATTENUATION
|
TAU-P DECONVOLUTION
|
CDP GATHER
|
FIRST PASS VELOCITY ANALYSIS (2 km interval)
|
REVERSE T SQUARED GAIN
|
APPLY TRANSMISSION LOSS
|
SPHERICAL DIVERGENCE (URSIN) WITH dB GAIN
|
TRACE REGULARISATION AND F-X INTERPOLATION
|
MULTIPLE ATTENUATION (RADON DEMULTIPLE)
|
SECOND PASS (PSTM) VELOCITY ANALYSIS (1 km interval)
|
KIRCHHOFF PRE-STACK TIME MIGRATION
|
THIRD PASS VELOCITY ANALYSIS (1 km interval)
|
NMO CORRECTION – FINAL VELOCITIES
|
OUTER TRACE MUTE / INNER TRACE MUTE
|
PRE-STACK AGC SCALING
|
CDP STACK
|
GUN & CABLE STATIC CORRECTIONS
|
BAND PASS FILTER
|
AGC SCALING
|
ARCHIVE

5.2   FINAL PSTM SEQUENCE (TRUE RELATIVE AMPLITUDE)

TRANSCRIPTION
|
GAIN RECOVERY (t²)
|
LOW CUT FILTER
|
RANDOM SPIKE ATTENUATION
|
TAU-P DECONVOLUTION
|
CDP GATHER
|
FIRST PASS VELOCITY ANALYSIS (2 km interval)
|
REVERSE T SQUARED GAIN
|
APPLY TRANSMISSION LOSS
|
SPHERICAL DIVERGENCE (URSIN) WITH dB GAIN
|
TRACE REGULARISATION AND F-X INTERPOLATION
|
MULTIPLE ATTENUATION (RADON DEMULTIPLE)
|
SECOND PASS (PSTM) VELOCITY ANALYSIS (1 km interval)
|
KIRCHHOFF PRE-STACK TIME MIGRATION
|
THIRD PASS VELOCITY ANALYSIS (1 km interval)
|
NMO CORRECTION – FINAL VELOCITIES
|
OUTER TRACE MUTE / INNER TRACE MUTE
|
CDP STACK
|
CONSTANT SCALER (1E6)
|
GUN & CABLE STATIC CORRECTIONS
|
ARCHIVE

5.3   PSTM NEAR AND FAR OFFSET STACKS SEQUENCE (TRUE RELATIVE AMPLITUDE)

TRANSCRIPTION
|
GAIN RECOVERY (t²)
|
LOW CUT FILTER
|
RANDOM SPIKE ATTENUATION
|
TAU-P DECONVOLUTION
|
CDP GATHER
|
FIRST PASS VELOCITY ANALYSIS (2 km interval)
|
REVERSE T SQUARED GAIN
|
APPLY TRANSMISSION LOSS
|
SPHERICAL DIVERGENCE (URSIN) WITH dB GAIN
|
TRACE REGULARISATION AND F-X INTERPOLATION
|
MULTIPLE ATTENUATION (RADON DEMULTIPLE)
|
SECOND PASS (PSTM) VELOCITY ANALYSIS (1 km interval)
|
KIRCHHOFF PRE-STACK TIME MIGRATION
|
THIRD PASS VELOCITY ANALYSIS (0.5 km interval)
|
NMO CORRECTION – FINAL VELOCITIES
|
NEAR AND FAR OFFSET OUTER MUTE / NEAR AND FAR OFFSET INNER TRACE MUTE
|
CDP STACK
|
CONSTANT SCALER (1E6)
|
GUN & CABLE STATIC CORRECTIONS
|
ARCHIVE

5.4   FINAL TRUE RELATIVE AMPLITUDE PSTM GATHERS WITH RADON DEMULTIPLE

TRANSCRIPTION
|
GAIN RECOVERY (t²)
|
LOW CUT FILTER
|
RANDOM SPIKE ATTENUATION
|
TAU-P DECONVOLUTION
|
CDP GATHER
|
FIRST PASS VELOCITY ANALYSIS (2 km interval)
|
REVERSE T SQUARED GAIN
|
APPLY TRANSMISSION LOSS
|
SPHERICAL DIVERGENCE (URSIN) WITH dB GAIN
|
TRACE REGULARISATION AND F-X INTERPOLATION
|
MULTIPLE ATTENUATION (RADON DEMULTIPLE)
|
SECOND PASS (PSTM) VELOCITY ANALYSIS (1 km interval)
|
KIRCHHOFF PRE-STACK TIME MIGRATION
|
THIRD PASS VELOCITY ANALYSIS (1 km interval)
|
NMO CORRECTION
|
CONSTANT SCALER (1E6)
|
GUN & CABLE STATIC CORRECTIONS
|
ARCHIVE

6   PROCESSING DESCRIPTION

6.1   TRANSCRIPTION

Field data were converted to Fugro Seismic Imaging internal format for processing. Fugro Seismic Imaging internal processing format is trace sequential, with samples in 32 bit IEEE floating point. At intermediate processing stages the data is stored on disk in sixteen-bit integer with a gain ranging scalar for each trace. When reading the format shot records, strategic header values related to acquisition were preserved (where available).

6.2   GAIN RECOVERY

A gain function was applied to the data set to compensate for inelastic attenuation and spherical divergence.

A t^2 gain function was applied where t = two way travel time in milliseconds.

6.3   RANDOM SPIKE ATTENUATION

Despike was applied to remove any anomalous high energy amplitudes which could be the source of noise in the pre stack migration. Amplitudes were measured in a matrix of time windows of 100 ms length. The matrix was composed of seven consecutive time windows across 11 adjacent traces in a shot gather. The amplitude of the centre window is compared to the rest of the matrix and the centre window is defined as containing a spike if the peak to median ratio is greater than 15, or if the centre window median value exhibits more than 8.0 units of standard deviation from the average median. Spike affected windows are scaled to the 0.1 x the mean of the matrix.

Despike was not performed in the shallow parts of the shot record or near the first breaks, as shown in the following table:

Primary Key	Despike start (at near offset)	Despike start (at 3100m offset)
Seafloor twt = 50ms	400ms	3500ms

6.4   LOW-CUT FILTER

A low-cut filter of 3 Hz with a 12 dB/Octave slope was applied to the shot records to attenuate low frequency noise present in the data.

6.5   TAU-P DECONVOLUTION

The data was transformed to the Tau-P domain using the linear transform. The parameter used are as follows:

Parameter	Value
Modeled range	-1000 – +3100 ms
Delta T	6 ms
Reference offset	3103 m

Predicitive deconvolution was performed in Tau-P space to target water layer reverberation. The design window for the deconvolution consisted of a single window designed over the first 2600ms of the data, with a 200ms operator (240ms total) and a gap length of 40ms. Application of the deconvolution was to the whole trace length.

6.6   TAU-P LINEAR NOISE REMOVAL

While in Tau-P space linear noise may be removed by the application of scaling or muting sections of the transformed data that represent the noise energy. Careful design can preserve the long offset primary data from being attenuated. For these data the following mutes were applied.

Parameters used in the Tau-P linear noise removal are summarised in the following table:

Water Bottom Time: 100 ms	
Delta T	Mute time in Tau-P domain (ms)
-1000	0 to 11210
-750	3100 to 11210
-700	6600 to 11210
-650	11200 to 11210
950	11200 to 11210
955	6600 to 11210
980	5600 to 11210
1070	4600 to 11210
1300	3100 to 11210
1830	0 to 11210
3100	0 to 11210

6.7   CDP GATHER

Shot records were sorted into common depth point gathers with a nominal fold as follows:

Vintage	Nominal Fold
GNX05	80

No trace summation was performed, resulting in a native CDP interval of 6.25m.

6.8   FIRST PASS VELOCITY ANALYSIS

First pass velocities (2km interval) were determined using Fugro Seismic Imaging Pty Ltd "MGIVA" interactive velocity analysis program. Each velocity analysis comprised a semblance display, a CDP stacked panel repeated 14 times with a suite of velocity functions, and a central CDP gather. The suite of functions were generated using 0%, +/-4 %, +/-8%, +/-13%, +/-19 %, +/-25%, and +/-32%, and +40% increments from a central velocity function. The central function was a final velocity derived from the previously processed data.

A mild F-K multiple attenuation was applied to enhance the primary energy of the data before the analyses using the following percentages of the brute velocity function: -8% at 0ms, -10% at 800ms, -12% at 2500, -18% at 4500 and -20% at 6000ms. This was applied for the purpose of the analysis only.

$$\sqrt{\frac{T0 \times V^4}{V0^2} + \left(2 \times \left(\frac{V}{V0}\right)^2 - 1\right) \times X^2 + \frac{X^4 \times \left(\frac{1}{V0^2} - \frac{1}{V^2}\right)}{t0^2}}$$

The velocity analysis incorporated a map of all velocity locations, and the semblance display included functions from proximate lines. This enabled the velocities to be picked with knowledge of areal velocity trends. Velocity QC can be performed more effectively when discordant velocities can be recognised on the map.

6.9   TRACE REGULARISATION AND F-X INTERPOLATION

All data underwent regularisation of traces followed by F-X interpolation (in the CDP gather domain) prior to multiple attenuation. with a window length of 1000ms. This process was employed in order to achieve better performance of the radon multiple attenuation algorithm by reducing the potential for aliasing.

A 3:1 F-X interpolation was performed along common offsets before demultiple. After demultiple, the interpolated traces were dropped from the processing stream.

6.10   MULTIPLE ATTENUATION (RADON)

Radon demultiple was used to attenuate a strong multiple train evident especially around 2.1s as well as other multiples present in the data.

Radon demultiple, using 100% final velocities derived in the first pass of velocity analysis, was applied in the deeper portion of data, starting at 550ms with a taper of 200ms, for a full-on application at 750ms. Move-outs greater than those listed below were modelled and subtracted from the data.Attenuation of multiples was achieved by modelling and subtraction using a least squares, parabolic Radon transform.

Normal moveout corrections were performed using the first pass velocities, and the CDP gathers transformed into the parabolic Tau-P domain. The segment of the Tau-P domain corresponding to primary reflections is muted, leaving the multiple energy to be transformed back into the T-X domain and subtracted from the original CDP gather.

The Radon demultiple parameters were:

Reference offset	3103 m
Frequency range	3-110 Hz
Minimum p	-800 *ms (parabolic moveout)*
Maximum p	3200 *ms (parabolic moveout)*
Delta-t	8 ms
Number of p traces	500p
Demultiple start time	550 ms, 100% at 750 ms

The Radon demultiple application times at the reference offset of 3103m were:

Time (ms)	*Moveout Cut-off Delta-t (ms)*
0	170
1000	170
1800	120
2000	100
4000	80

6.11 PRE STACK MIGRATION (VELOCITY ANALYSIS)

Full pre stack Kirchhoff time migration was used to migrate target lines for velocity analysis. The migration algorithm was used in straight ray mode, with a 3125m half aperture. The velocity field was constructed by smoothing the first pass velocities. Apertures were muted with a 50% stretch mute to avoid operator aliasing. Migration was performed on 80 summed offset planes.

The migration generates fully corrected CDP gathers on each line. The migration velocity field is then used to 'remove' the NMO corrections before velocity analysis.

6.12 SECOND PASS VELOCITY ANALYSIS

The second pass of velocities were picked at 1km intervals on first pass PSTM gathers using Fugro Seismic Imaging Pty Ltd "MGIVA" interactive velocity analysis program. Each velocity analysis comprised a semblance display, a CDP stacked panel repeated 14 times with a suite of velocity functions, and a central CDP gather. The suite of functions were generated using 0%, +/-4%, +/-8%, +/-13%, +/-19 %, +/-25% , +/-32 % and +40% increments from a central velocity function. The first pass of velocities were used as the central function for this suite of velocity variant functions.

Velocity interpretation is performed on the pre-computed stack suite, or on a colour contoured semblance display. Semblance interpretation is assisted with markers illustrating the position of potential water layer peg-leg multiples, and with an interval velocity curve.These final velocities were archived to CD-ROM media as ASCII text in Western Geophysical's 3D velocity format.

6.13 FINAL PRE-STACK TIME MIGRATION

Kirchhoff prestack time migration was applied using a maximum half aperture of 700 traces (4375 m). Anti-aliasing protection was applied by pre-filtering the data within the migration scan depending upon the local migration operator dip. Smoothed 100% second pass velocities at 1 km were used in the migration. Migration was performed on all offset planes.

6.14 REVERSE GAIN RECOVERY

Backed off t^2 scaling that was applied at the start of processing.

6.15 SPHERICAL DIVERGENCE (URSIN & GAIN)

Spherical divergence and dB gain were used to produce the true relative amplitude gathers and full, near, and far stacks. For scaled stacks the prestack AGC scaling described in 6.19 was used.

With the previously applied t^2 gain function removed, it was then replaced with an offset and velocity dependent spherical divergence approximation as described by Bjorn Ursin (GEOPHYSICS Vol.55 No.4, pp492-496 1990).Where T0 is the two way travel time, V is the RMS velocity at T0, and V0 is the velocity in the first layer. Although this method is applicable to uncorrected data as a moveout tracking divergence correction, for algorithmic ease it is applied to NMO corrected CDP gathers.

6.16 APPLY TRANSMISSION LOSS

An 8 dB/sec scaler was applied to compensate for transmission loss. This scaler was held constant after 2 seconds. The data was also scaled with a constant scaler of 1 000 000, to bring amplitude values within a reasonable range.

6.17 THIRD PASS VELOCITY ANALYSIS

The third pass of velocities were picked at 1 km intervals on second pass PSTM gathers using Fugro Seismic Imaging Pty Ltd "MGIVA" interactive velocity analysis program. Each velocity analysis comprised a semblance display, a CDP stacked panel repeated 14 times with a suite of velocity functions, and a central CDP gather.
The suite of functions were generated using 0%, +/-4 %, +/-8%, +/-13%, +/-19 %, +/-25% , +/-32 % and +/40% increments from a central velocity function. The second pass of velocities were used as the central function for this suite of velocity variant functions.The MGIVA velocity analysis is a 'map driven' package, where the user can instantly see modifications to the velocity field in map or section view. Neighbouring velocity functions or superimposed on the current location for easy recognition of velocity trends.
Velocity interpretation is performed on the pre-computed stack suite, or on a colour contoured semblance display. Semblance interpretation is assisted with markers illustrating the position of potential water layer peg-leg multiples, and with an interval velocity curve.
These final velocities were archived to CD-ROM media as ASCII text in Western Geophysical's 3D velocity format.

6.18 NMO CORRECTION

Fourth order NMO corrections were applied using the final picked 1 km PSTM velocity functions.

6.19 PRE-STACK SCALING (USED FOR SCALED PSTM)

A dual window, time variant AGC method was used for post stack scaling. The negative effects normally associated with AGC are avoided by employing two different length windows to determine the amplitude model (using the minimum of the two mean amplitudes determined at each sample), then conditioning the model by a weighted mix with the amplitude model derived from a single window per trace.

Window lengths of 1200 ms and 400 ms were defined with equalization applied at 60%, with only the long window applied after 2500ms. Scaling was applied to the final filtered and scaled full migration in addition to the filtered and scaled near and far near and far offset stacks.

For gathers, raw near and far offset migration and raw final full fold migration, a dB/second scalar preserving true amplitudes replaced the dual agc as described in 6.15.

6.20 OUTER TRACE MUTE

A post NMO outer trace mute was applied to remove any coherent noise on the outer traces and to reduce contamination from the effect of NMO stretch on the far offsets. Muting parameters were spatially varied according to seafloor two way time.

Outer trace mute used for producing stacks:

Water Bottom Time: 100ms	
Offset (m)	Application times (ms)
220	0
460	500
1150	900
2310	1500
3410	2000

6.21 INNER TRACE MUTE

A post NMO inner trace mute was applied to help remove remnant multiple energy still apparent on the inner traces following the demultiple.

Inner trace mute used for producing stacks:

Water Bottom Time: 100 ms	
Offset (m)	Application times (ms)
0	900 – tmax
100	1000 – tmax
300	1200 – tmax
750	1700 – tmax
800	5000 – tmax

6.22 COMMON DEPTH POINT STACK

For the full fold stack with dual AGC the traces within each common depth point gather were summed using 1/root(N) stack compensation. For the raw migrated stack and raw near and far offset stacks the traces were summed using 1/N stack compensation.

6.23 STATICS

A static compensation for gun and cable depths was applied. The static value applied was calculated using average gun and cable depths supplied in the observers reports (7ms).

6.24 BAND PASS FILTER

Unwanted noise that lay outside the frequency range of the desired reflection data was attenuated by the application of a series of zero phase time variant filters. These filters employed cosine squared tapers between the limiting frequency pairs.

General parameter summary:

Water Bottom Time: 100 ms	
Application time (ms)	Frequency limits (Hz)
0	6 / 12 – 90 / 110
300	5 / 10 – 85 / 110
3000	4 / 8 – 76 / 100
1500	2 / 4 – 60 / 80
3000	2 / 4 – 40 / 55
5000	2 / 4 – 35 / 45

6.25 NEAR AND FAR OFFSET STACKS

Angle stacks, stacks generated after restricting input to a portion of the gather corresponding to a particular range of incident angles, were produced for lithology and fluid predictions. The near and far offset of incidence calculations were performed using Walden's method, and considered a smoothed version of the the third pass velocities with ETA corrections applied. Using a milder version of the full inner trace mute (as specified in the following table) and 120% of the outer trace mutes (as specified in the following table), the remaining 'live' data was split 50% / 50% to produce near and far near and far offset stacks on both the raw and the filtered/scaled PSTM data.

Outer trace mute used for producing near and far offset stacks:

Water Bottom Time: 100ms	
Offset (m)	*Application times (ms)*
220	0
460	500
12600	900
2520	1500
3720	2000

Inner trace mute used for producing near and far offset stacks:

| Water Bottom Time: 100 ms	
Offset (m)	*Application times (ms)*
0	1200 – tmax
100	1300 – tmax
300	1600 – tmax
750	2100 – tmax
800	5000 – tmax

7   EXAMPLES OF DATA QUALITY

7.1   LINE GNX05-01

BRUTE STACK
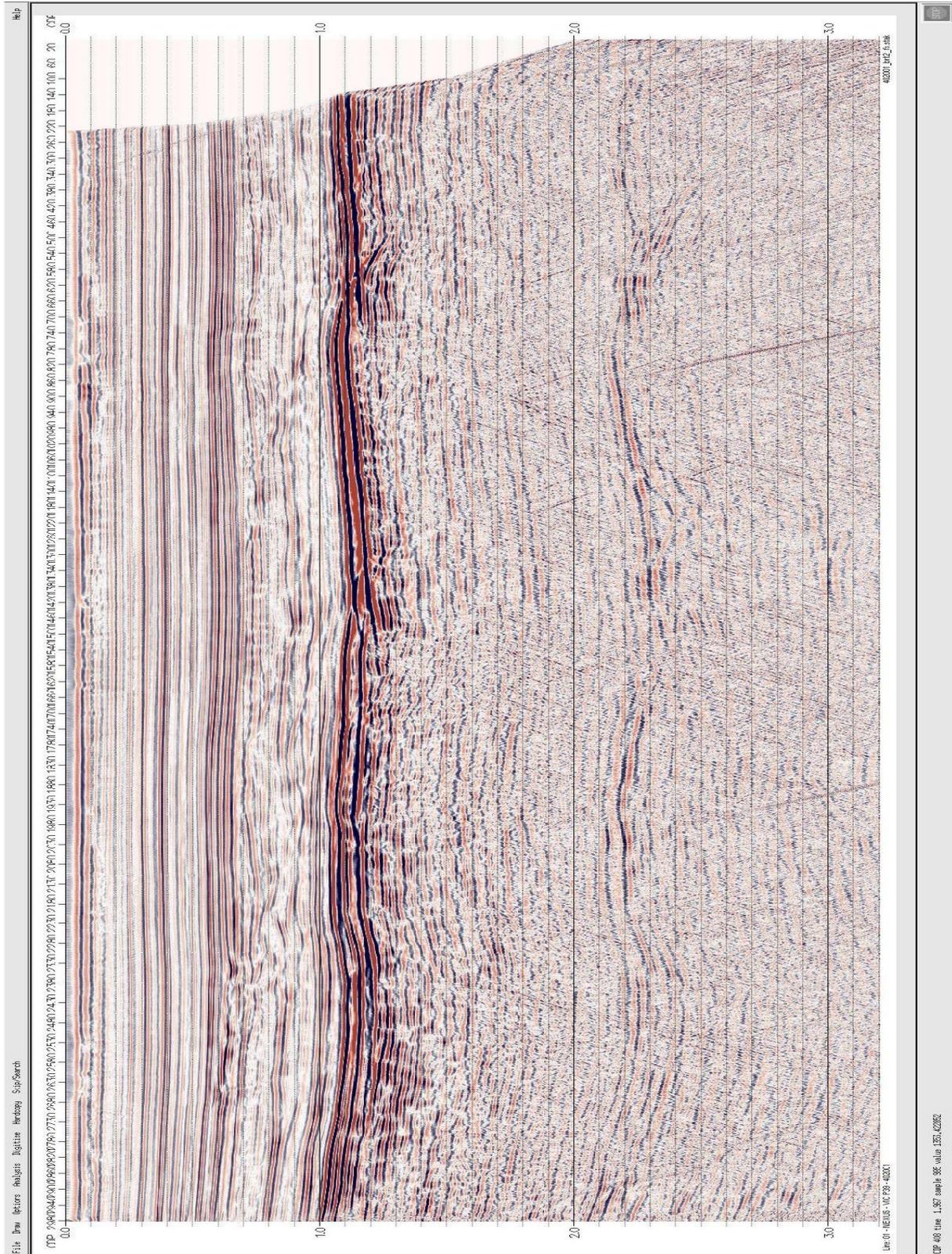
TAUP DECONVOLUTION STACK
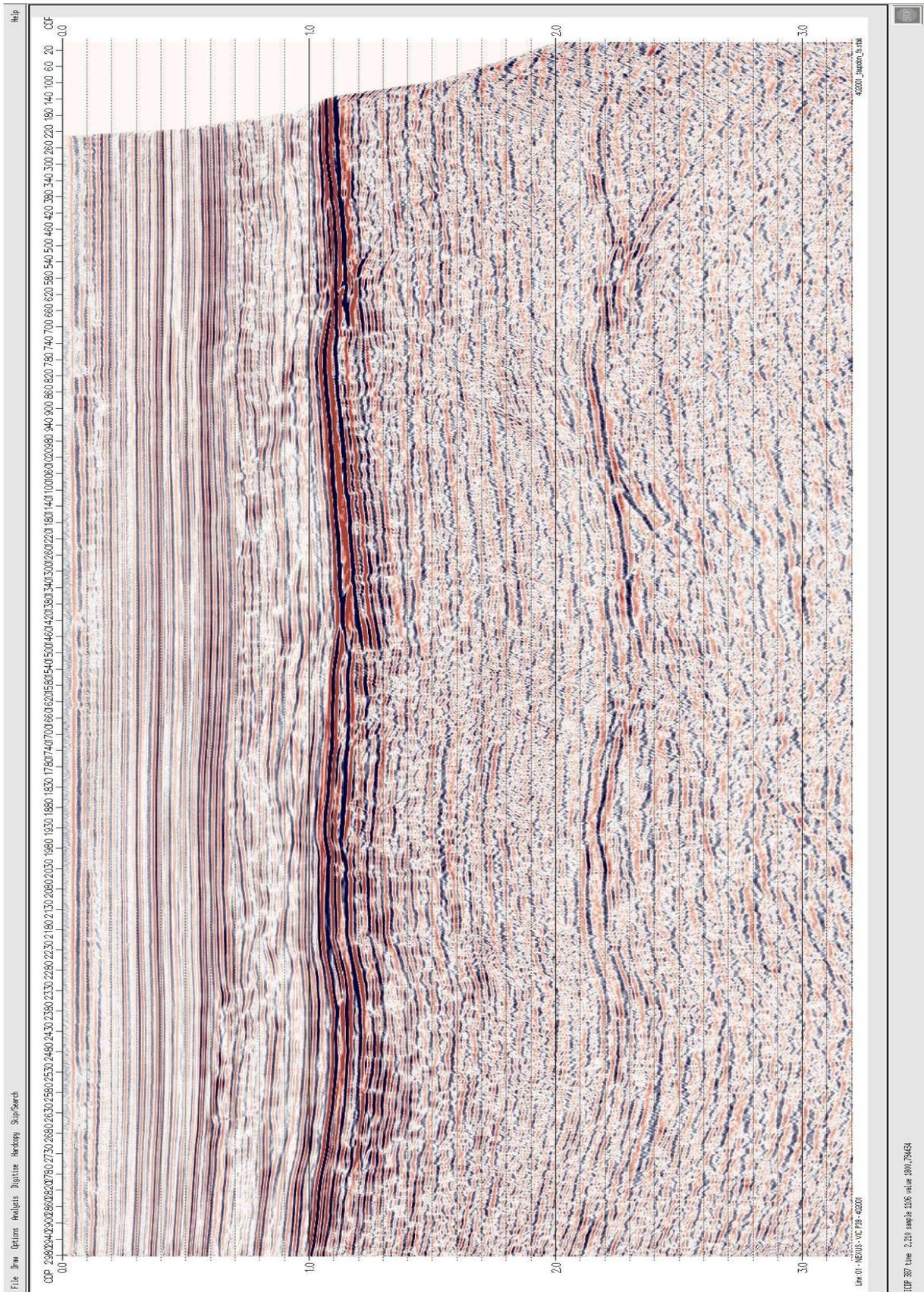
RADON DEMULTIPLE STACK
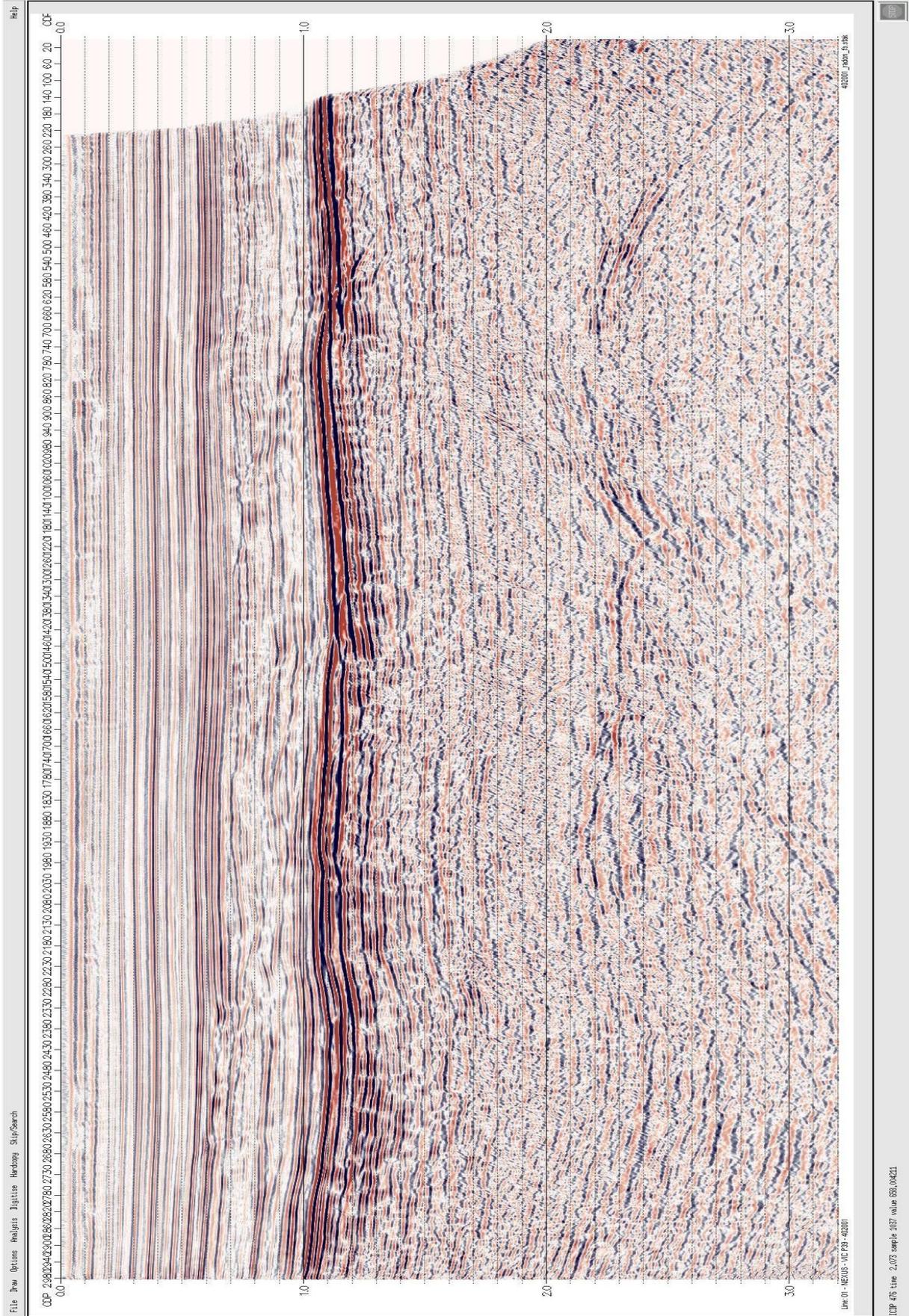
FINAL PRESTACK TIME MIGRATION
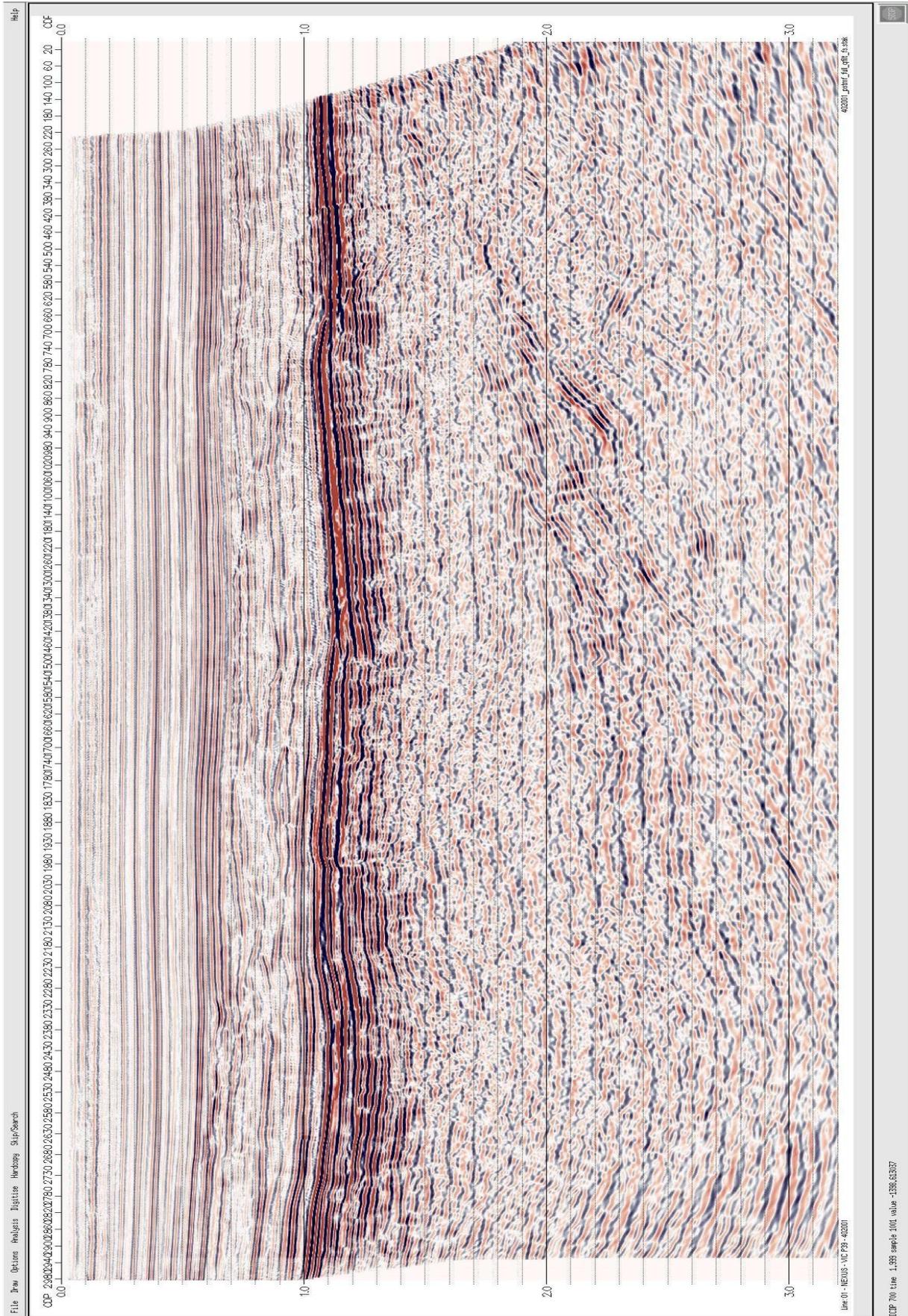
7.2 LINE GNX05-14

BRUTE STACK
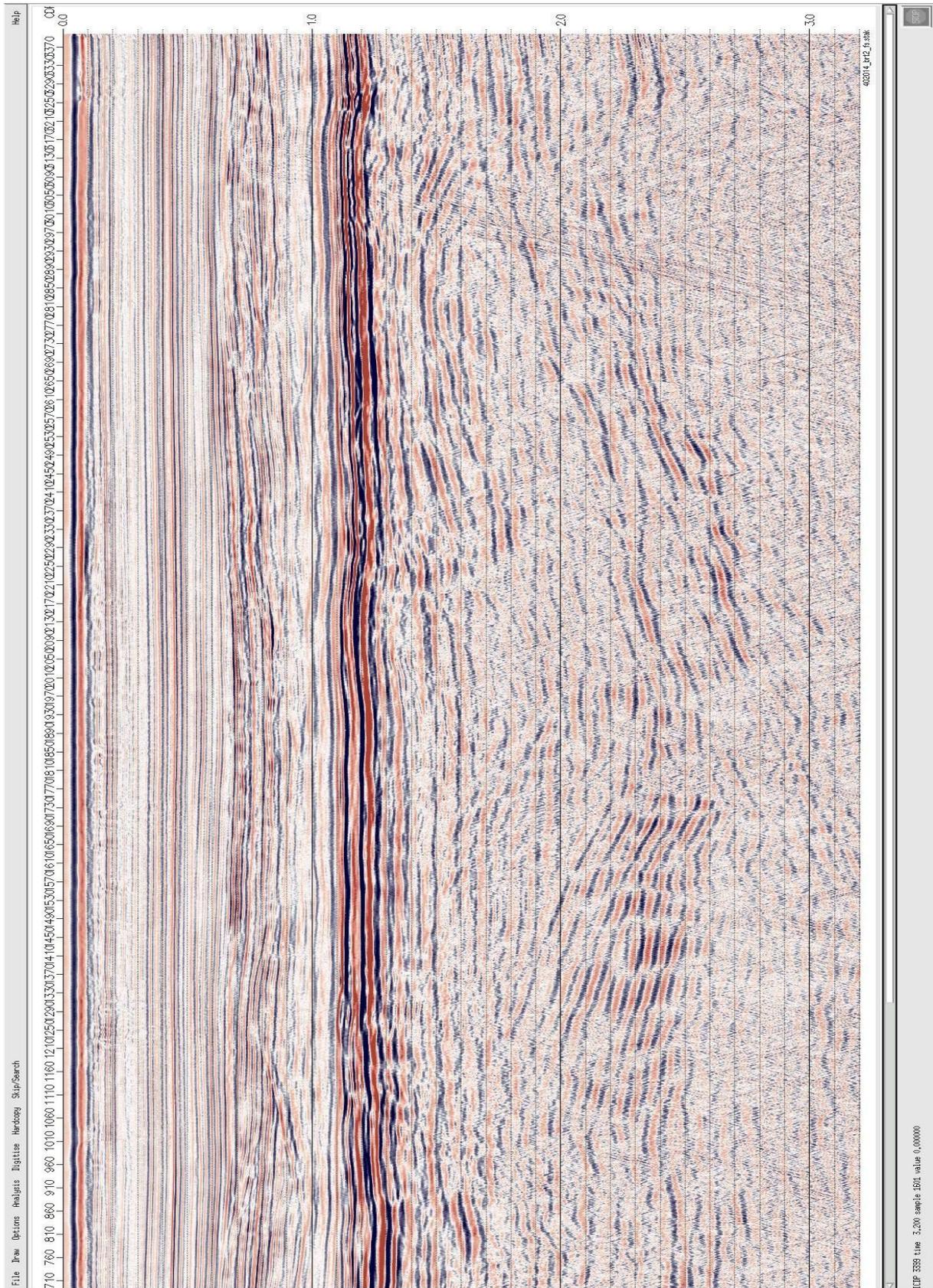
TAUP DECONVOLUTION STACK
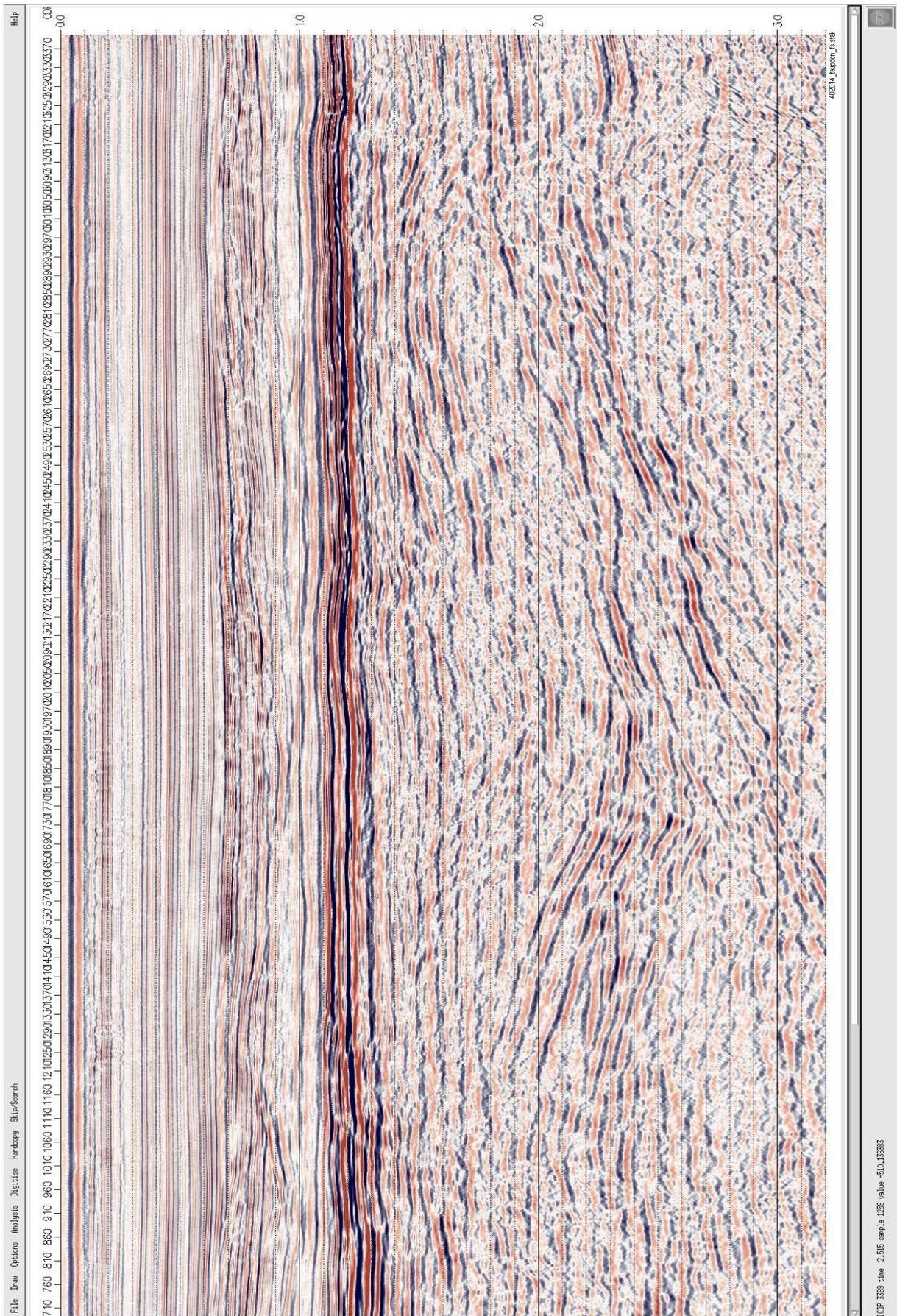
RADON DEMULTIPLE STACK
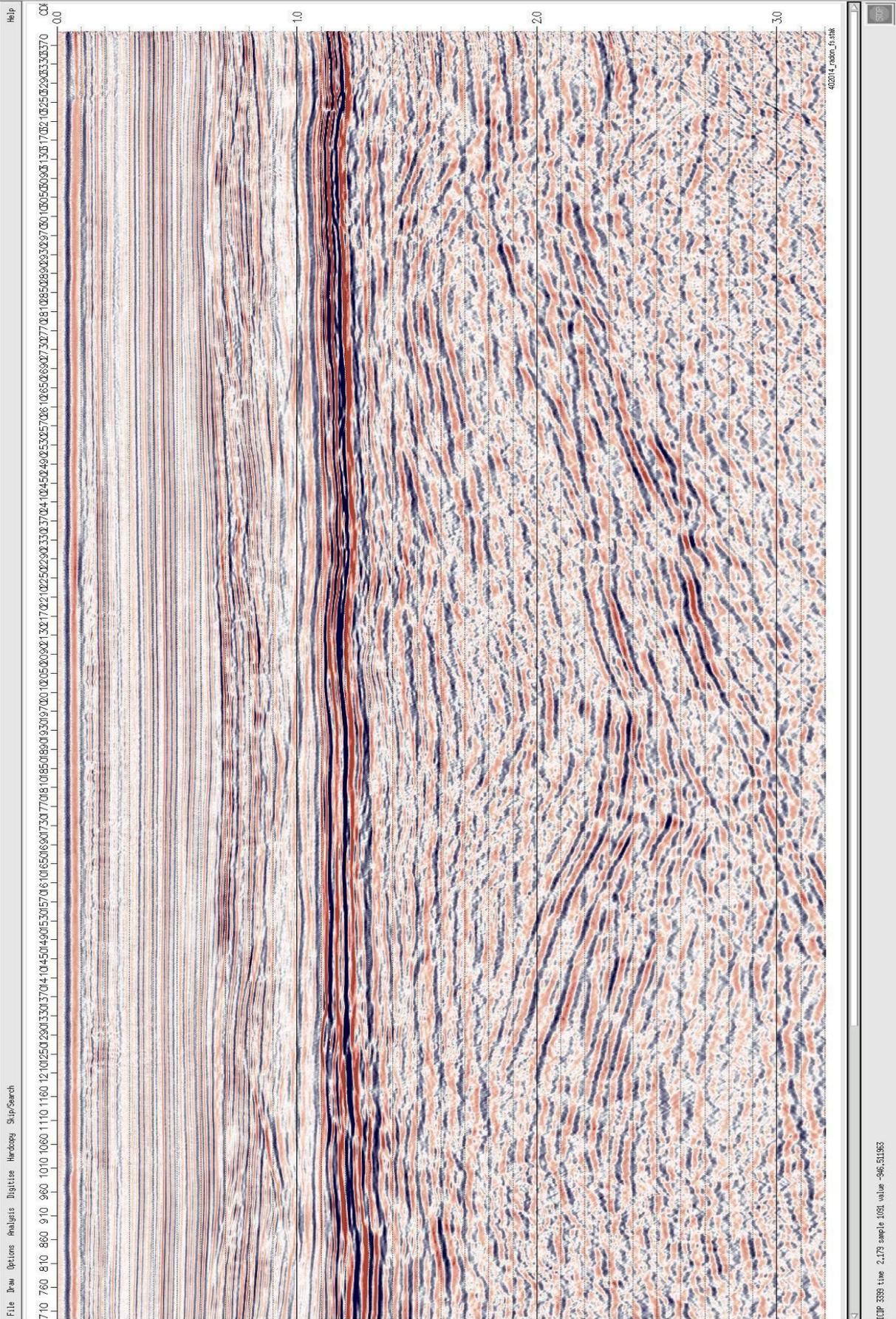
FINAL PRESTACK TIME MIGRATION
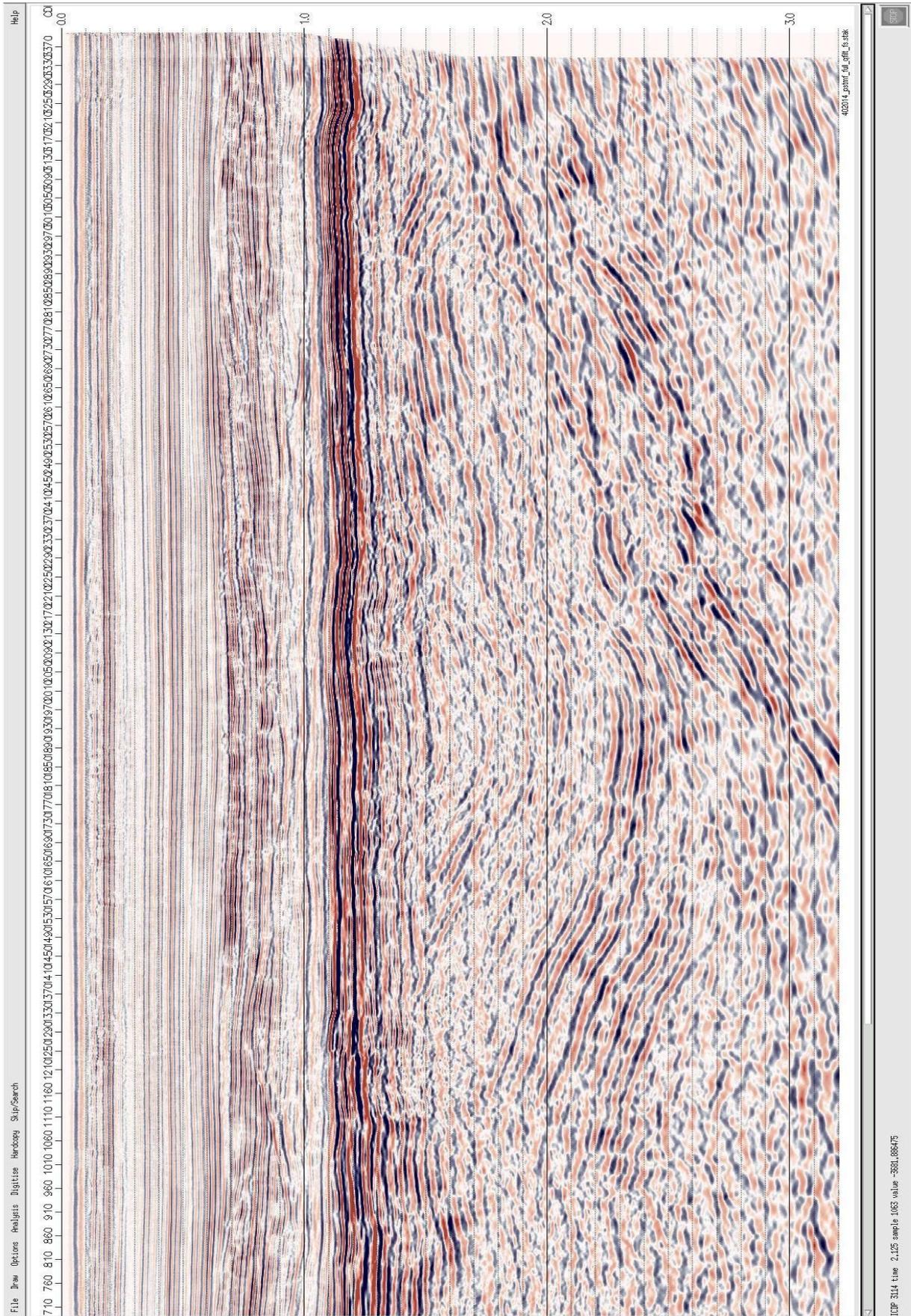
7.3 CDP GATHER WITH ANNOTATED INNER AND OUTER STACKING MUTES
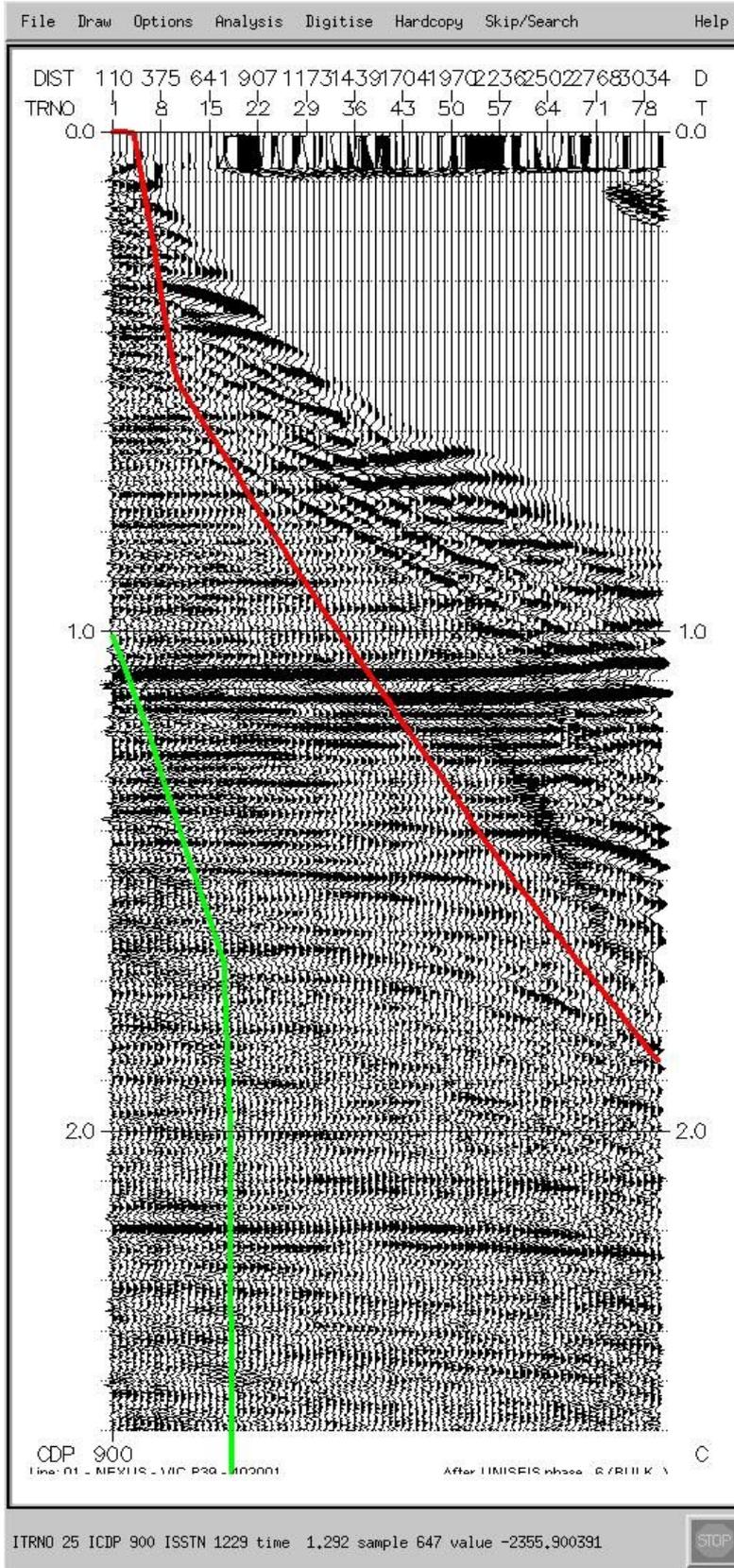
7.4 CDP GATHER WITH ANNOTATED INNER AND OUTER STACKING MUTES USED FOR NEAR AND FAR STACKS
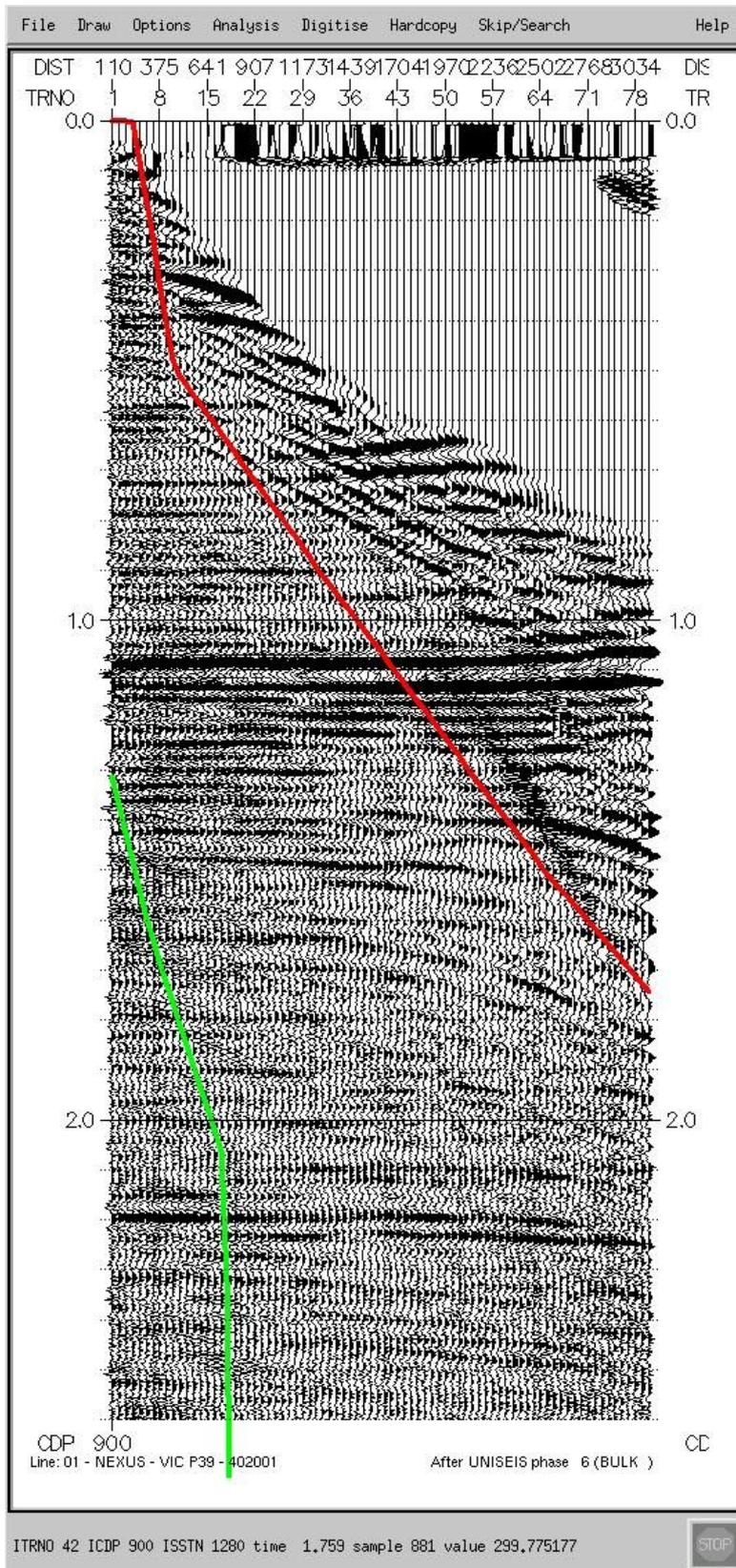
7.5 CDP GATHER WITH INNER AND OUTER ANGLE STACKING MUTES AND ANGLES

ANGLES ANNOTATED BY COLOUR IN FIVE DEGREE INCREMENTS
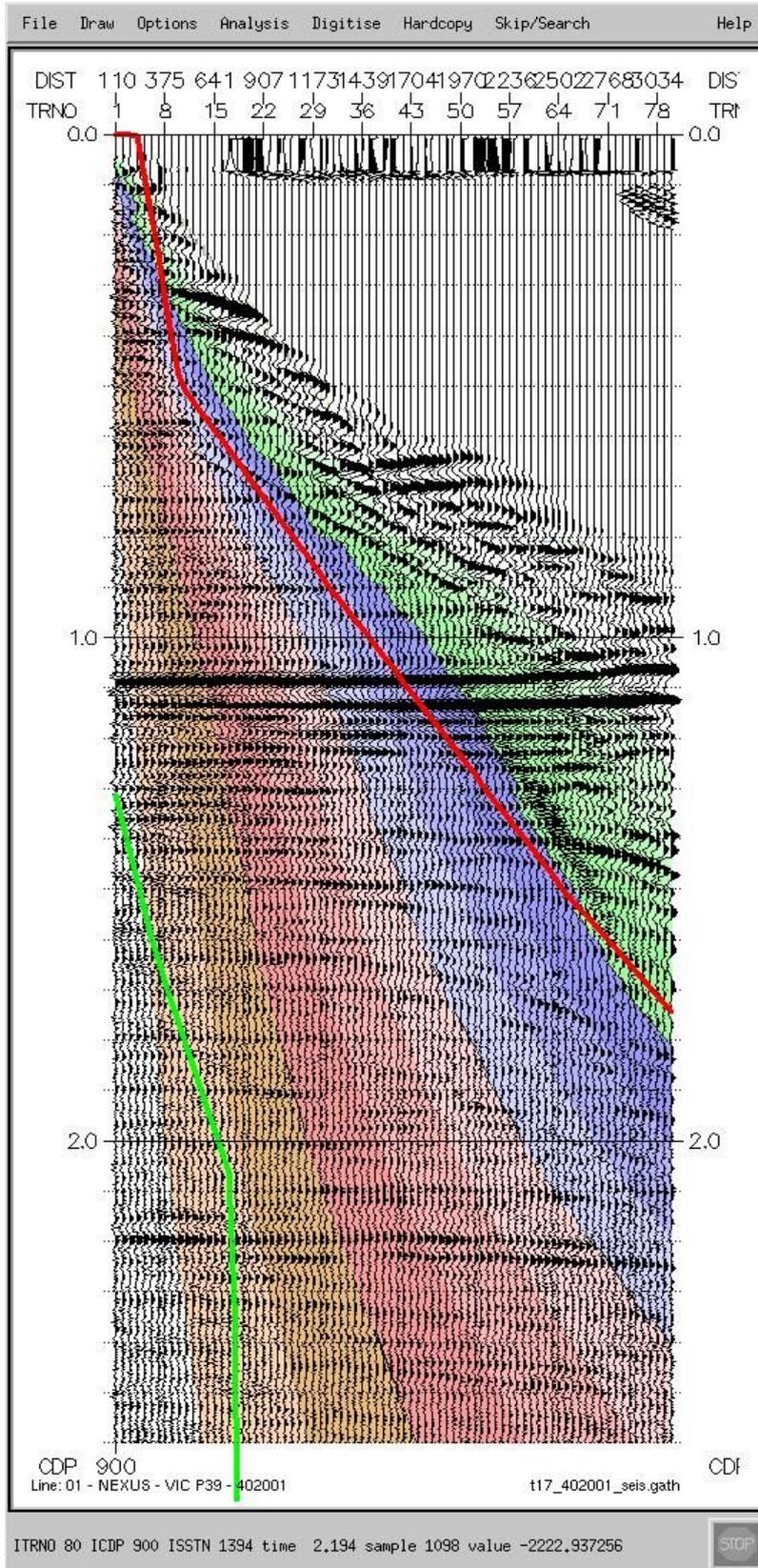
8 APPENDICES

## 8.1 LINE LISTING

Test lines have been highlighted in red.

Line Name	SP Range	SP Interval	CDP Range	Length (km)
GNX05-01	**981-1895**	**18.75**	**1-2982**	**17.156**
GNX05-02	981-2026	18.75	1-3375	19.613
GNX05-03	981-2026	18.75	1-3375	19.613
GNX05-04	981-2026	18.75	1-3375	19.613
GNX05-05	981-2026	18.75	1-3375	19.613
GNX05-06	981-2026	18.75	1-3375	19.613
GNX05-07	981-2026	18.75	1-3375	19.613
GNX05-08	981-2026	18.75	1-3375	19.613
GNX05-09	981-2026	18.75	1-3375	19.613
GNX05-10	981-2026	18.75	1-3375	19.613
GNX05-11	981-2034	18.75	1-3399	19.762
GNX05-12	981-2034	18.75	1-3399	19.762
GNX05-13	981-2034	18.75	1-3399	19.762
GNX05-14	981-2034	18.75	1-3399	19.762
GNX05-15	981-1434	18.75	1-1599	8.512

8.2 ACQUISITION PARAMETERS

GNX05	
DESCRIPTION	*DETAILS*
Data recorded by:	MULTIWAVE
Date recorded:	February 2005
Vessel:	M/V Pacific Titan
General:	
Field CMP Interval	6.25 m
Nominal Fold	80
Recording Format:	SEG-D 8058
Seismic source:	
Type:	Airguns
Volume:	3040 cubic inches
Pressure:	2000 psi +/- 10%
Depth:	6m +/- 1.0 m
Shot interval:	18.75 m
Gun Delay	50 ms
Recording system:	
Format:	SEG-D 8058
Record length:	6000 ms
Sample interval:	2 ms
Number of Channels:	240
Near Channel:	1
Recording Delay:	50 ms
Low Cut Filter:	Out
High Cut Filter:	200 Hz, 370 dB/octave
Receivers:	
Centre near group to centre far group:	3000 m
Streamer depth:	7m +/- 1.0 m
Number of groups:	240
Group interval:	12.5 m
Centre source to center near group:	110 m
Number of Streamers:	1

8.3 DELIVERABLES

Item	Format	Media	Tape Number
Final Processing Report Final Stacking Velocities (PSTM) at 1 km Intervals CMP Coordinates (Original)	PDF Western ASCII	CD	402FR020CD
True Relative Amplitude NMO Corrected PreSTM Gathers with Radon Demultiple (Original)	SEGY SEGY SEGY SEGY SEGY SEGY SEGY SEGY SEGY SEGY SEGY SEGY SEGY SEGY SEGY	DVD DVD DVD DVD DVD DVD DVD DVD DVD DVD DVD DVD DVD DVD DVD	402PG005DVD 402PG006DVD 402PG007DVD 402PG008DVD 402PG009DVD 402PG010DVD 402PG011DVD 402PG012DVD 402PG013DVD 402PG014DVD 402PG015DVD 402PG016DVD 402PG017DVD 402PG018DVD 402PG019DVD
Final Full Filtered Scaled by Automatic Gain Control PreSTM Stacks with Inverse Q Filtering (Original)	SEGY	DVD	402FF001DVD
Filtered True Relative Amplitude Full PreSTM Stacks (Original)	SEGY	DVD	402FF002DVD
Filtered Scaled by Automatic Gain Control Near/Far PreSTM Stacks (Original)	SEGY	DVD	402FF003DVD
Filtered True Relative Amplitude Near/Far PreSTM Stacks (Original)	SEGY	DVD	402FF004DVD
Final Processing Report (Original)	Paper Copy		

8.4   SEGY HEADER INFORMATION (SAMPLE LINE N90-004)

FINAL PSTM STACK (FULL) WITH INVERSE Q FILTER APPLIED FILTERED AND SCALED BY AUTOMATIC GAIN CONTROL

```
C01 CLIENT        : NEXUS ENERGY   SURVEY : GNX05
C02 LINE          : GNX05-01
C03 AREA          : OFFSHORE VICTORIA, AUSTRALIA
C04 DATASET       : FINAL FILTERED SCALED PSTM STACK (FULL)
C05               WITH INVERSE Q FILTER APPLIED
C06 ACQUIRED BY   : MULTIWAVE    VESSEL: M/V PACIFIC TITAN
C07 ACQ. YEAR     : 2005       DATE PROCESSED : MARCH 2005
C08 SHOT INTERVAL : 18.75 m      GRP INTERVAL  : 12.5 m
C09 CABLE LENGTH  : 3000 m       GRPS PER CABLE : 240
C10 MIN OFFSET    : 110 m        MAX OFFSET    : 3110 m
C11 DATUM OF REF  :              PROJECTION    :
C12 COORDINATE UNITS: METRES     VERTICAL DATUM : MEAN SEA LEVEL
C13 SRATE (micro s) : 2000       MAX TIME (ms) : 6000
C14 DIRECTION     : 227 DEGREES
C15
C16 PROCESSING SEQUENCE: BY FUGRO SEISMIC IMAGING
C17 REFORMAT / GAIN RECOVERY (T SQUARED) / LOWCUT FILTER (4Hz)
C18 TRACE EDITS / DESPIKE / LOW CUT FILTER 3 HZ - 12DB PER OCTAVE
C19 TAU-P DECONVOLUTION 40MS GAP WITH TAUP MUTE APPLIED FOR LINEAR NOISE
ATTENTUATION
C20 CDP SORT / 2KM VELOCITY ANALYSIS
C21 DEMULTIPLE (RADON) FROM 550MS RAMPED TO FULL APPLICATION AT 750MS
C22 DROP INTERPOLATED TRACES / 1KM VELOCITY ANALYSIS (PSTM1)
C23 REMOVE GAIN (TxT) / APPLY URSIN / 2ND PASS PSTM WITH ANTI-ALIAS
C24 NMO (4TH ORDER) USING FINAL 1 KM PSTM VELS
C25 OUTER MUTE / PRE-STACK SCALING / INNER MUTE / STACK
C26 INVERSE Q FILTERING
C27 GUN & CABLE DEPTH CORRECTION BY 9 ms
C28 BANDPASS FILTER / POST-STACK SCALING / ARCHIVE
C29 TRACE HEADER DEFINITION
C30    ITEM      BYTES     FORMAT
C31    SHOTPOINT  017 - 020  INTEGER
C32    CDP       021 - 024  INTEGER
C33    Easting    193 - 196  INTEGER
C34    Northing   197 - 200  INTEGER
C35
C36 SP/CDP RELATIONSHIP: CDP 240 = SP 981
C37               CDP 540 = SP 1081
C38 SP RANGE       : SP 981 TO SP 1895
C39 CDP RANGE      : CDP 1 TO CDP 2982
C40 END OF EBCDIC HEADER
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FINAL TRUE RELATIVE AMPLITUDE PSTM STACK (FULL)

```
C01 CLIENT        : NEXUS ENERGY   SURVEY : GNX05
C02 LINE          : GNX05-01
C03 AREA          : OFFSHORE VICTORIA, AUSTRALIA
C04 DATASET       : FINAL FILTERED true relative amplitude PSTM STACK (FULL)
C05
C06 ACQUIRED BY   : MULTIWAVE    VESSEL: M/V PACIFIC TITAN
C07 ACQ. YEAR     : 2005       DATE PROCESSED : MARCH 2005
C08 SHOT INTERVAL : 18.75 m      GRP INTERVAL  : 12.5 m
C09 CABLE LENGTH  : 3000 m       GRPS PER CABLE : 240
C10 MIN OFFSET    : 110 m        MAX OFFSET    : 3110 m
```

C11 DATUM OF REF   :   PROJECTION   :
C12 COORDINATE UNITS: METRES   VERTICAL DATUM : MEAN SEA LEVEL
C13 SRATE (micro s) : 2000   MAX TIME (ms) : 6000
C14 DIRECTION   : 227 DEGREES
C15
C16 PROCESSING SEQUENCE: BY FUGRO SEISMIC IMAGING
C17 REFORMAT / GAIN RECOVERY (T SQUARED) / LOWCUT FILTER (4Hz)
C18 TRACE EDITS / DESPIKE / LOW CUT FILTER 3 HZ - 12DB PER OCTAVE
C19 TAU-P DECONVOLUTION 40MS GAP WITH TAUP MUTE APPLIED FOR LINEAR NOISE
ATTENTUATION
C20 CDP SORT / 2KM VELOCITY ANALYSIS
C21 DEMULTIPLE (RADON) FROM 550MS RAMPED TO FULL APPLICATION AT 750MS
C22 DROP INTERPOLATED TRACES / 1KM VELOCITY ANALYSIS (PSTM1)
C23 REMOVE GAIN (TxT) / APPLY URSIN / 2ND PASS PSTM WITH ANTI-ALIAS
C24 NMO (4TH ORDER) USING FINAL 1 KM PSTM VELS
C25 PRE-STACK dB GAIN / OUTER MUTE / INNER MUTE / STACK
C26 GUN & CABLE DEPTH CORRECTION BY 9 ms
C27 BANDPASS FILTER / POST-STACK GAIN / ARCHIVE
C28
C29 TRACE HEADER DEFINITION
C30   ITEM   BYTES   FORMAT
C31   SHOTPOINT   017 - 020   INTEGER
C32   CDP   021 - 024   INTEGER
C33   Easting   193 - 196   INTEGER
C34   Northing   197 - 200   INTEGER
C35
C36 SP/CDP RELATIONSHIP: CDP 240 = SP 981
C37   CDP 540 = SP 1081
C38 SP RANGE   : SP 981 TO SP 1895
C39 CDP RANGE   : CDP 1 TO CDP 2982
C40 END OF EBCDIC HEADER

FINAL FILTERED TRUE RELATIVE AMPLITUDE PSTM NEAR AND FAR OFFSET STACKS (NEAR AND FAR)

C01 CLIENT   : NEXUS ENERGY   SURVEY : GNX05
C02 LINE   : GNX05-01
C03 AREA   : OFFSHORE VICTORIA, AUSTRALIA
C04 DATASET   : FINAL FILTERED TRUE AMPLITUDE PSTM STACK (NEAR)
C05
C06 ACQUIRED BY   : MULTIWAVE   VESSEL: M/V PACIFIC TITAN
C07 ACQ. YEAR   : 2005   DATE PROCESSED : MARCH 2005
C08 SHOT INTERVAL : 18.75 m   GRP INTERVAL : 12.5 m
C09 CABLE LENGTH : 3000 m   GRPS PER CABLE : 240
C10 MIN OFFSET   : 110 m   MAX OFFSET   : 3110 m
C11 DATUM OF REF   :   PROJECTION   :
C12 COORDINATE UNITS: METRES   VERTICAL DATUM : MEAN SEA LEVEL
C13 SRATE (micro s) : 2000   MAX TIME (ms) : 6000
C14 DIRECTION   : 227 DEGREES
C15
C16 PROCESSING SEQUENCE: BY FUGRO SEISMIC IMAGING
C17 REFORMAT / GAIN RECOVERY (T SQUARED) / LOWCUT FILTER (4Hz)
C18 TRACE EDITS / DESPIKE / LOW CUT FILTER 3 HZ - 12DB PER OCTAVE
C19 TAU-P DECONVOLUTION 40MS GAP WITH TAUP MUTE APPLIED FOR LINEAR NOISE
ATTENTUATION
C20 CDP SORT / 2KM VELOCITY ANALYSIS
C21 DEMULTIPLE (RADON) FROM 550MS RAMPED TO FULL APPLICATION AT 750MS
C22 DROP INTERPOLATED TRACES / 1KM VELOCITY ANALYSIS (PSTM1)
C23 REMOVE GAIN (TxT) / APPLY URSIN / 2ND PASS PSTM WITH ANTI-ALIAS
C24 NMO (4TH ORDER) USING FINAL 1 KM PSTM VELS
C25 PRE-STACK dB GAIN / OUTER MUTE / INNER MUTE / STACK (INNER 50%)
C26 GUN & CABLE DEPTH CORRECTION BY 9 ms

C27 BANDPASS FILTER / POST-STACK GAIN / ARCHIVE
C28
C29 TRACE HEADER DEFINITION
C30   ITEM   BYTES   FORMAT
C31   SHOTPOINT 017 - 020   INTEGER
C32   CDP   021 - 024   INTEGER
C33   Easting   193 - 196   INTEGER
C34   Northing   197 - 200   INTEGER
C35
C36 SP/CDP RELATIONSHIP: CDP 240 = SP 981
C37   CDP 540 = SP 1081
C38 SP RANGE   : SP 981 TO SP 1895
C39 CDP RANGE   : CDP 1 TO CDP 2982
C40 END OF EBCDIC HEADER

FINAL STM NEAR AND FAR OFFSET STACKS (NEAR AND FAR) FILTERED AND SCALED BY AUTOMATIC GAIN CONTROL

C01 CLIENT   : NEXUS ENERGY   SURVEY : GNX05
C02 LINE   : GNX05-01
C03 AREA   : OFFSHORE VICTORIA, AUSTRALIA
C04 DATASET   : FINAL FILTERED SCALED PSTM STACK (NEAR)
C05
C06 ACQUIRED BY   : MULTIWAVE   VESSEL: M/V PACIFIC TITAN
C07 ACQ. YEAR   : 2005   DATE PROCESSED : MARCH 2005
C08 SHOT INTERVAL : 18.75 m   GRP INTERVAL : 12.5 m
C09 CABLE LENGTH : 3000 m   GRPS PER CABLE : 240
C10 MIN OFFSET   : 110 m   MAX OFFSET   : 3110 m
C11 DATUM OF REF :   PROJECTION   :
C12 COORDINATE UNITS: METRES   VERTICAL DATUM : MEAN SEA LEVEL
C13 SRATE (micro s) : 2000   MAX TIME (ms) : 6000
C14 DIRECTION   : 227 DEGREES
C15
C16 PROCESSING SEQUENCE: BY FUGRO SEISMIC IMAGING
C17 REFORMAT / GAIN RECOVERY (T SQUARED) / LOWCUT FILTER (4Hz)
C18 TRACE EDITS / DESPIKE / LOW CUT FILTER 3 HZ - 12DB PER OCTAVE
C19 TAU-P DECONVOLUTION 40MS GAP WITH TAUP MUTE APPLIED FOR LINEAR NOISE ATTENTUATION
C20 CDP SORT / 2KM VELOCITY ANALYSIS
C21 DEMULTIPLE (RADON) FROM 550MS RAMPED TO FULL APPLICATION AT 750MS
C22 DROP INTERPOLATED TRACES / 1KM VELOCITY ANALYSIS (PSTM1)
C23 REMOVE GAIN (TxT) / APPLY URSIN / 2ND PASS PSTM WITH ANTI-ALIAS
C24 NMO (4TH ORDER) USING FINAL 1 KM PSTM VELS
C25 OUTER MUTE / PRE-STACK SCALING / INNER MUTE / STACK (INNER 50%)
C26
C27 GUN & CABLE DEPTH CORRECTION BY 9 ms
C28 BANDPASS FILTER / POST-STACK SCALING / ARCHIVE
C29 TRACE HEADER DEFINITION
C30   ITEM   BYTES   FORMAT
C31   SHOTPOINT 017 - 020   INTEGER
C32   CDP   021 - 024   INTEGER
C33   Easting   193 - 196   INTEGER
C34   Northing   197 - 200   INTEGER
C35
C36 SP/CDP RELATIONSHIP: CDP 240 = SP 981
C37   CDP 540 = SP 1081
C38 SP RANGE   : SP 981 TO SP 1895
C39 CDP RANGE   : CDP 1 TO CDP 2982
C40 END OF EBCDIC HEADER

TRUE RELATIVE AMPLITUDE PSTM GATHERS, WITH RESIDUAL RADON DEMULTIPLE

```
C01 CLIENT       : NEXUS ENERGY   SURVEY : GNX05
C02 LINE         : GNX05-01
C03 AREA         : OFFSHORE VICTORIA, AUSTRALIA
C04 DATASET      : FINAL NMO CORRECTED TRUE AMPLITUDE PSTM GATHERS
C05        PART A         CDP RANGE: 1-2000
C06 ACQUIRED BY  : MULTIWAVE    VESSEL: M/V PACIFIC TITAN
C07 ACQ. YEAR    : 2005       DATE PROCESSED : MARCH 2005
C08 SHOT INTERVAL  : 18.75 m    GRP INTERVAL  : 12.5 m
C09 CABLE LENGTH   : 3000 m     GRPS PER CABLE : 240
C10 MIN OFFSET   : 110 m      MAX OFFSET   : 3110 m
C11 DATUM OF REF   :          PROJECTION   :
C12 COORDINATE UNITS: METRES      VERTICAL DATUM : MEAN SEA LEVEL
C13 SRATE (micro s) : 2000      MAX TIME (ms)  : 6000
C14 DIRECTION    : 227 DEGREES
C15
C16 PROCESSING SEQUENCE: BY FUGRO SEISMIC IMAGING
C17 REFORMAT / GAIN RECOVERY (T SQUARED) / LOWCUT FILTER (4Hz)
C18 TRACE EDITS / DESPIKE / LOW CUT FILTER 3 HZ - 12DB PER OCTAVE
C19 TAU-P DECONVOLUTION 40MS GAP WITH TAUP MUTE APPLIED FOR LINEAR NOISE
ATTENTUATION
C20 CDP SORT / 2KM VELOCITY ANALYSIS
C21 DEMULTIPLE (RADON) FROM 550MS RAMPED TO FULL APPLICATION AT 750MS
C22 DROP INTERPOLATED TRACES / 1KM VELOCITY ANALYSIS (PSTM1)
C23 REMOVE GAIN (TxT) / APPLY URSIN / 2ND PASS PSTM WITH ANTI-ALIAS
C24 NMO (4TH ORDER) USING FINAL 1 KM PSTM VELS
C25 PRE-STACK dB GAIN
C26 GUN & CABLE DEPTH CORRECTION BY 9 ms
C27 ARCHIVE
C28
C29 TRACE HEADER DEFINITION
C30   ITEM       BYTES    FORMAT
C31   SHOTPOINT  017 - 020  INTEGER
C32   CDP        021 - 024  INTEGER
C33   Easting    193 - 196  INTEGER
C34   Northing   197 - 200  INTEGER
C35
C36 SP/CDP RELATIONSHIP: CDP 240 = SP 981
C37            CDP 540 = SP 1081
C38 SP RANGE       : SP 981 TO SP 1895
C39 TOTAL CDP RANGE   : CDP 1 TO CDP 2982  THIS FILE: CDP 1 TO CDP 2000
C40 END OF EBCDIC HEADER
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8.5   SEGY TRACE HEADERS (STACK)

Type	Offset	Description
I32	0	Trace number within line.
I32	4	Trace number within reel.
I32	8	Sequential record number.
I32	8	Original field record number.
I32	12	Trace number.
I32	16	Shot point number.
I32	20	CDP number.
I32	24	Trace no. within the CDP.
I16	28	Trace identification code.
I16	30	No. of summed traces.
I16	32	Total number of traces in CDP.
I16	34	Data use 1=production, 2=test.
I32	36	Trace offset (integer).
I32	40	Elevation at receiver.
I32	44	Elevation at source.
I32	60	Water depth at source.
I32	64	Water depth at receiver.
I16	68	Scaler to be applied to elevations
I16	70	Scaler to be applied to coordinates
I32	72	Source easting.
I32	76	Source northing.
I32	80	Receiver easting.
I32	84	Receiver northing.
I16	88	Coordinate units (m/arc)
I16	98	Source static correction.
I16	100	Receiver static correction.
I16	102	Total static applied.
I16	108	Delay recording time (ms).
I16	110	Mute time start.
I16	112	Mute time end.
I16	114	No. of samples.
I16	116	Samp interval in microseconds.
I16	156	Year of recording
I16	158	Julian day number (1-366)
I16	160	Hour of day (24 hour clock)
I16	162	Minute of hour
I16	164	Second of minute
I16	166	Time base code 1.local,2.gmt,3.?
I16	180	Seqn record no. (pre-stack only)
I32	180	3D Line number.
I32	184	CDP no. within 3D line.
I32	188	2D shotpoint number (Maersk)
I32	192	Easting of CDP.
I32	196	Northing of CDP.
I16	200	Scaler to be applied to SPNO.