SEISMIC DATA PROCESSING REPORT

for

Santos Limited

Survey:	SOSN06C 2D Processing
Location:	T33/P, Sorell Basin
Date:	October 2006

Fugro Seismic Imaging Pty Ltd
69 Outram Street
WEST PERTH WA 6005
Tel: +61 (0)8 9322 2490
Fax: + 61 (0)8 9481 6721
Email: info@fugro-fsi.com.au

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1 Introduction

The 2006 T33/P 2D Seismic Survey was recorded by Multiwave in the period 31st May to the 4th June 2006. A total of 500.25 Km of seismic data was acquired. The survey is located in the Sorell Basin, offshore from western Tasmania. The data is contained within the T33/P block.

Processing commenced in June 2006 and the final PSTM stacks and depth scaled stacks were ftp'd to Santos in September 2006. The remaining deliverables including angle stack, final PSTM gather and velocity archives were delivered in October 2006.

All processing was undertaken at the Fugro Seismic Imaging office in Perth, Western Australia.

1.1 Personnel

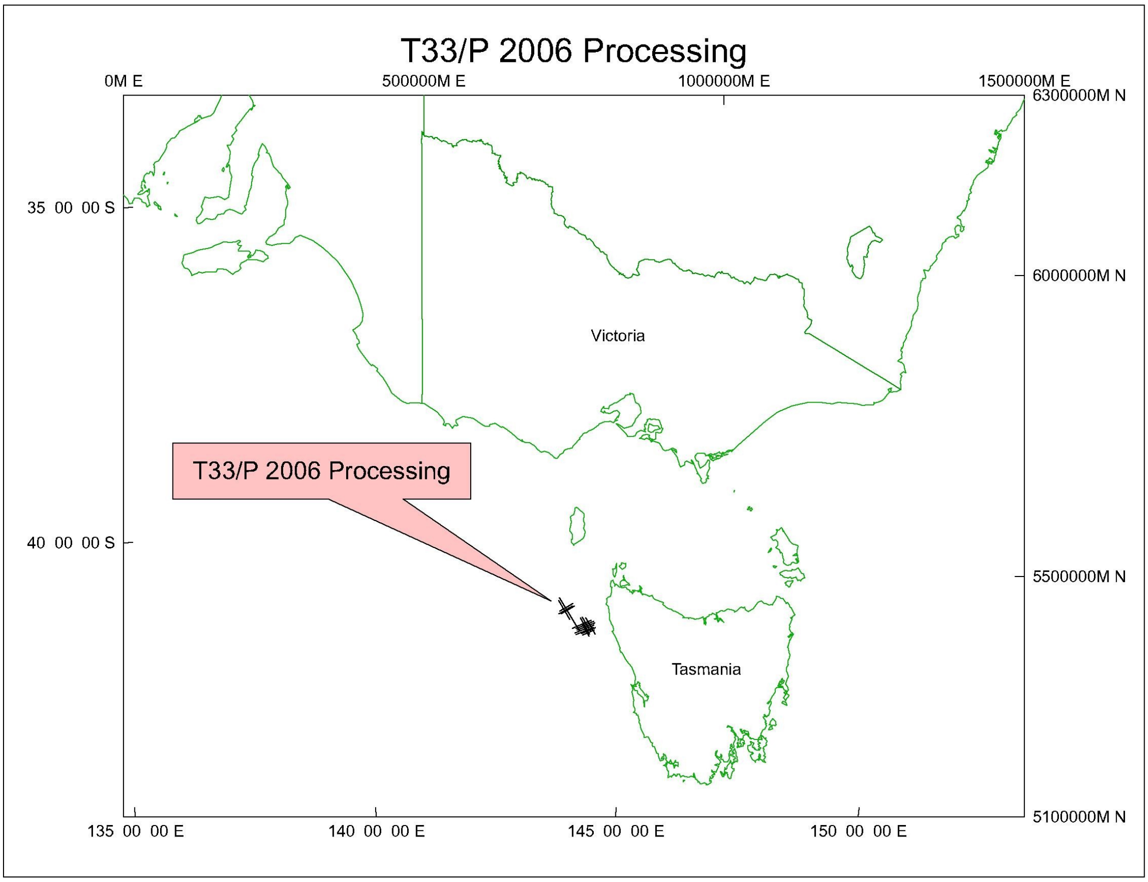
Fugro Seismic Imaging Pty Ltd

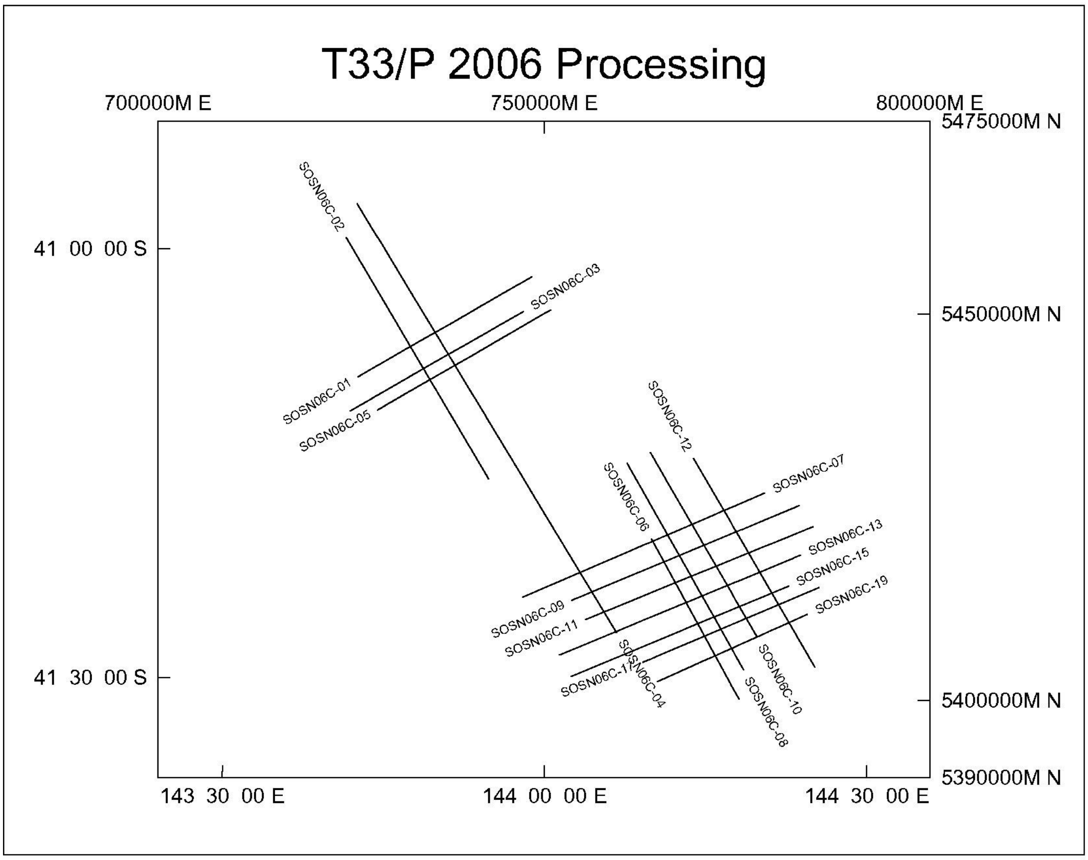
Simon Stewart	2D Marine Manager
Paul Phythian	Senior Geophysicist

Santos Limited

Stuart Brew	Senior Staff Geophysicist

1.2 Location Map





1.3 Line Listing

Line Name	*First SP*	*Last SP*	*Length (Km)*
SOSN06C-01	1001	2038	25.950
SOSN06C-02	1001	2451	36.275
SOSN06C-03	1001	2035	25.875
SOSN06C-04	1001	3598	64.950
SOSN06C-05	1001	2035	25.875
SOSN06C-06	1001	1947	23.675
SOSN06C-07	1001	2364	34.100
SOSN06C-08	1001	2227	30.675
SOSN06C-09	1001	2277	31.925
SOSN06C-10	1001	2104	27.600
SOSN06C-11	1001	2273	31.825
SOSN06C-12	1001	2249	31.225
SOSN06C-13	1001	2350	33.750
SOSN06C-15	1001	2221	30.525
SOSN06C-17	1001	1991	24.775
SOSN06C-19	1001	1850	21.250

TOTAL LENGTH:	**500.25 KM**

2 Acquisition Parameters

DESCRIPTION	***DETAILS***
Data recorded by:	Multi-wave
Date recorded:	2006
Vessel:	Pacific Titan
***General**:*	
Field CMP Interval	6.25 m
Nominal Fold	120
Recording Format:	SEG-D rev 1, 3590
***Seismic source**:*	
Type	Airgun Array
Volume	3040 cu.in.
Pressure:	2000 psi
Depth:	5 m
Shot interval:	25 m
Gun Delay	0 ms
***Recording system**:*	
Type:	SEAL
Record length:	6000 ms
Sample interval:	2 ms
Number of Channels:	480
Near Channel:	1
Recording Delay:	0 ms
Low Cut Filter:	OUT
High Cut Filter:	200 Hz @ 370 dB/octave
Polarity:	First break is negative
***Receivers**:*	
Centre near group to centre far group:	5987.5 m
Streamer depth:	7 m
Number of groups:	480
Group interval:	12.5 m
Centre source to centre near group:	130 m
Number of Streamers:	1

3 Parameter Testing

A processing parameter test sequence was performed on line SOSN06C-11. Throughout the project test results were conveyed to Santos as digital “SEGY” files or as screen captures contained in powerpoint files. The following table lists aspects of seismic processing subject to parameter review, or examined to confirm that no adverse effect resulted.

3.1 Low cut frequency filter

Tested low cut filters of Out, 3Hz, 4Hz, 5Hz and 6Hz on example shot records.

Production Decision: Apply 4Hz low-cut filter.

3.2 Spherical spreading compensation

Tested example shots with and without t^2 spherical divergence.

Production Decision: Apply t^2 spherical divergence.

3.3 Swell noise attenuation

Tested example shots with the FSI trace specific swell noise attenuation.

Production Decision: Apply trace specific swell noise attenuation.

3.4 Linear noise attenuation in shot domain

Tested Shot F-K, Shot and Receiver F-K and Linear Tau-P Noise Removal.

Production Decision: Apply shot and receiver F-K.

3.5 Tau-P Deconvolution

While in the Tau-P domain ran confirmation test of deconvolution.

Production Decision: Apply Tau-P deconvolution with gap of WB-40ms, operator length WB+260ms.

3.6 SRME

Confirmation test of data with and without SRME.

Production Decision: Apply SRME.

3.7 Hi-Resolution radon multiple attenuation

Confirmation test using previous radon parameters from that area.

Production Decision: Apply hi resolution radon demultiple.

3.8 Straight Ray v Curved Ray PSTM

Compared straight ray PSTM with curved ray PSTM.

Production Decision: Run straight ray PSTM.

3.9 Residual Hi-Resolution radon multiple attenuation

Confirmation test of previous residual radon parameters.

Production Decision: Apply hi resolution radon demultiple to all archives.

3.10 Zero phasing

Compared stacks with and without statistical zero phasing.

Production Decision: Zero phase data using a statistically derived operator.

3.11 Angle stacks

Various angle mutes were applied and displayed using gathers and stacks. This included coloured overlays on gather displays to see where the incident angles would sit on specific data.

Production Decision: Produce Full, Near and Far angle stacks. Full is 0-45 degrees, Near is 0-22.5 degrees and Far is 22.5-45 degrees.

3.12 Inelastic attenuation compensation

Various gain functions, relative to the water bottom, were tested to compensate for inelastic attenuation through the earth.

Production Decision: Apply a gain of 6dB per second to 2 seconds, then held constant to T-max.

3.13 Bandpass filtering

Tested a suite of bandpass filter panels.

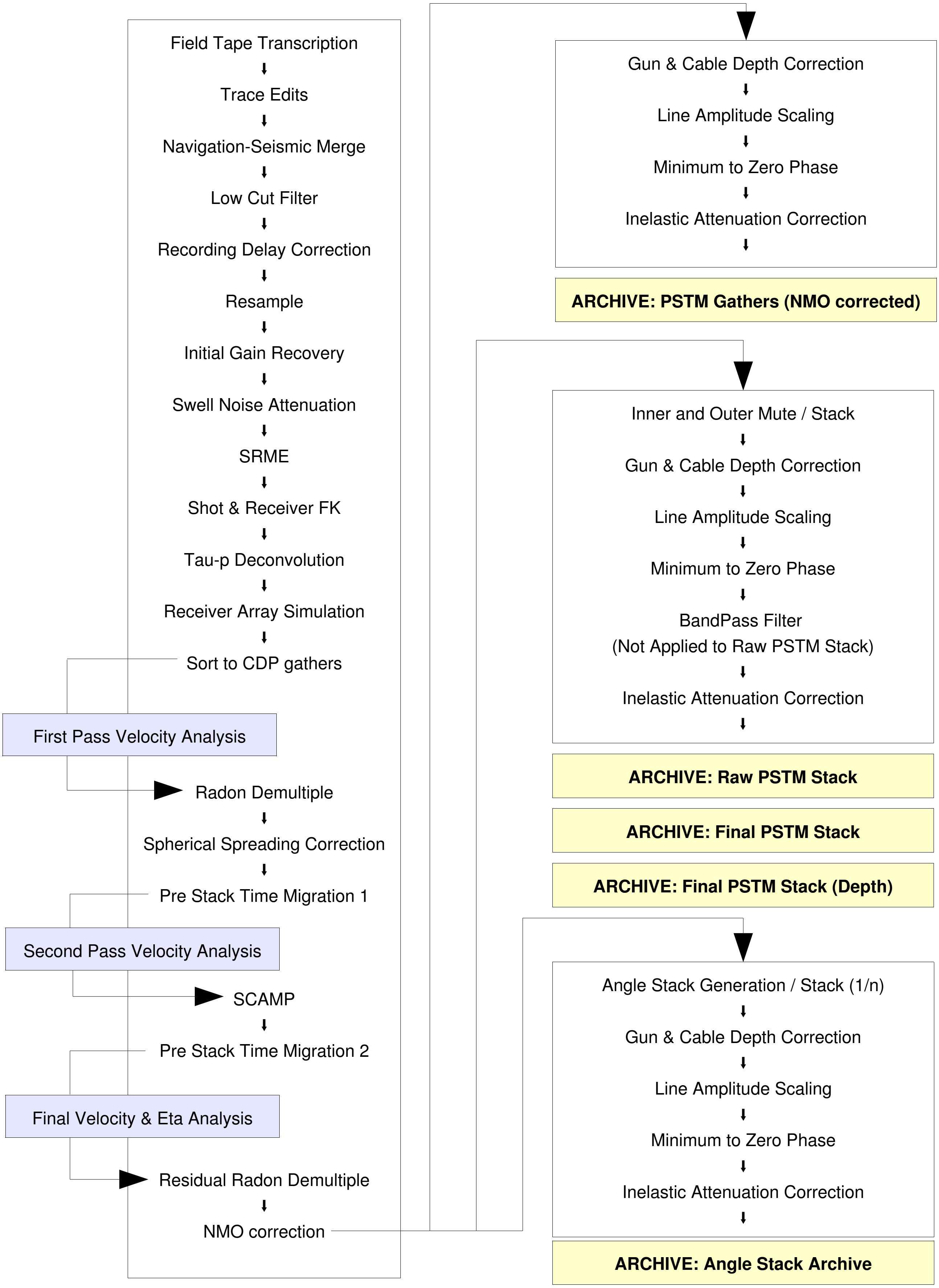
Production Decision: Apply band pass filter.

3.14 Line amplitude scalars

A line by line scalar was computed to balance all data to the one average amplitude.

Production Decision: Apply the amplitude balancing to each line.

4 Processing Sequence Diagram



5 Processing Description

5.1 Transcription

The supplied field tapes were copied directly to disk, without transcription from SEGD format. The practice of preserving a pristine field tape image ensures that the field tapes need only be read once in a processing project. The field tape images are later converted to Fugro Seismic Imaging internal format - trace sequential with samples in 32 bit IEEE floating point.

5.2 Trace Edits

The RMS amplitude was determined in a window from each channel, of every shot in the survey. When the RMS amplitude values are plotted on an axis of SP and channel for each line, noisy channels and bad traces can be detected.

5.3 Navigation-Seismic Merge

The seismic trace headers were updated with easting and northing values from the supplied navigation files. Where available, the acquisition time in the navigation files and seismic headers were compared to ensure a correct match (with a tolerance of 4 seconds).

Navigation Parameters	
Geodetic Datum:	GDA 94
Projection type:	UTM South
Projection Zone:	54
Longitude of CM:	141 0 0.000E

Shots and channels are selected for editing using the RMS amplitude plots in conjunction with the observers log notes of bad and noisy traces.

5.4 Low Cut Filter

A zero phase low-cut filter (3 Hz at 6 dB/Octave) was applied to the shot records.

5.5 Recording Delay

A -50 ms shift was applied to the shot records to compensate for a system recording delay.

5.6 Re sample

The data was re sampled in the frequency domain - from 2ms to 4ms sample period. Prior to re sample, a zero phase high cut filter was applied : 110 Hz at 72dB/Octave.

5.7 Gain Recovery

A t^2 gain function was applied to the data set to compensate for spherical divergence losses.

5.8 Swell Noise Attenuation

Swell noise attenuation is achieved by shaping the amplitude spectra of selected "swell noise affected" traces.

Analysis and attenuation are performed in the FX domain, processing one source position at a time. For analysis, the amplitude spectra are normalised, considering only the higher frequency range which is less influenced by swell noise. After normalisation the swell noise traces are recognised by their relatively high amplitude, low frequency component. The shallow portion of each shot record is muted before analysis, removing the high amplitude shallow reflections and direct arrivals.

The user nominates a frequency range for analysis, and for spectral scaling. Typically this frequency range is from 0 to 30 Hz. Scalars are calculated to shape the spectra of individual swell noise affected traces to the mean of the non swell noise affected traces. The scalars are fully applied from 0 to one half the defined frequency range, after which the scalars are tapered to zero application at the maximum defined frequency. No modification is made to other traces.

The mechanism of swell noise recognition is not influenced by change in source energy, or by systematic variation in trace amplitude levels. Shots not affected by swell noise will not present any traces for swell noise attenuation.

The swell noise attenuation is monitored by recording the number of channels flagged as being affected by swell noise.

5.9 SRME

SRME or **S**urface **R**elated **M**ultiple **E**limination uses the geometry of shot recording to estimate all possible multiples that can be generated by the surface. It was developed by the Delphi Consortium at TUDelft in the Netherlands. One order of surface related multiples is predicted using auto-convolutions of input data. The predicted multiple energy is then removed from the input gathers by a process of cascaded adaptive subtraction.

Prior to forming the multiple estimate, it is necessary to interpolate new shots such that the shotpoint interval is equal to the group interval. The recorded data is then extrapolated to zero offset, before constructing the multiple estimate by a series of convolutions and summation.

A mute was applied to the input shot records prior to remove direct arrival energy. Before adaptive subtraction, the modelled multiples were NMO corrected and any energy above the first seafloor multiple removed by muting.

SRME Parameters	
Group interval	12.5m
SP interval (after interpolation)	12.5m
Adaptive subtraction – 1	Shot domain 21 filter traces 240 trace move up 500 ms window 30 ms filter

5.10 Multi Channel Filter (Shot and Receiver Domain)

A symmetrical "velocity" filter was designed in the F-K domain to preserve the primary reflection signal and to discriminate against coherent dipping noise trains. The filter employs a cosine-squared taper from k = 0 to the velocity intercept at each frequency. Filtering was applied in both the short and receiver domains. The input data was conditioned with a 300ms AGC, and the scalars preserved for removal subsequent to the application of the F-K filter. A cut off velocity of +/- 2000 m/sec was used for both the shot and receiver F-K in the filter design and NMO was applied before and removed after the filter.

5.11 Tau-P Deconvolution

The data was transformed into the Tau-P domain using the linear transform. Transform limits of -2500ms to 4200ms at an increment of 10ms (671 ptraces) were used. Predictive deconvolution was performed in Tau-P space to target water layer reverberations. Design windows varied according to the water bottom. A WB+260ms operator with a gap length varied by WB-40ms. Application of the Tau-P deconvolution varied according to the apparent seafloor slope. In areas of steep slope the deconvolution was only applied for water bottom times of less than 400ms and tapered off at 600ms.

5.12 Receiver Array Simulation

A 2:1 trace decimation was applied to the data after performing array simulation using a trace mix on NMO corrected shot records with first pass velocity function.

Trace Summation Parameters			
Input Traces	***Input Trace Interval***	***Output Traces***	**Output Trace Interval**
480	*12.5m*	*240*	25m

Trace Mix Parameters	
Time (ms)	**Trace Mix**
0	0-1-2-1-0
3000	1-2-3-2-1
8000	1-2-3-2-1

5.13 CDP Gather

The pre-processed shot records were sorted into common depth point gathers.

CDP Gather Parameters	
SP interval:	25 m
Group interval:	25 m
Number of channels:	240
CDP interval:	12.5 m
CDP fold:	120

5.14 First Pass Velocity Analysis

First pass velocities (1km interval) were determined using the Fugro Seismic Imaging Pty. Ltd. “MGIVA” interactive velocity analysis program. Each velocity analysis comprised a semblance display, a CDP stacked panel repeated 15 times with a suite of velocity functions, and a central CDP gather. The suite of functions were generated using 0%, +/-3%, +/-6%, +/-9%, +/-12%, +/-15% and +/-20% increments from a central velocity function. The central function was a final velocity derived from the previously processed data.

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 are apparent on the map.

The first pass velocities were picked and the QC performed by Fugro Seismic Imaging.

5.15 Radon Multiple Attenuation (Hi Resolution Radon)

Attenuation of multiples was achieved by modelling and subtraction using a least squares, parabolic radon transform. Normal move out 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 Hi-resolution radon option was invoked, where the resolution of the radon transform is improved by adding weighting terms to the least squares solution, thus minimising the residual error. To further reduce the potential for aliasing, the radon transform was performed on 240 fold gathers formed by F-X interpolation of new shots in the common offset domain. After demultiple, the interpolated traces were dropped from the processing stream. A mild t-x mute was applied immediately before the radon transform to remove NMO stretch noise from the shallow zone of longer offsets.

Radon Transform Parameters	
Reference offset	6105m
Frequency range	4-90 Hz
Minimum p	-1000 *(parabolic delta-t, at reference offset)*
Maximum p	+3500 *(parabolic delta-t, at reference offset)*
No. of p traces	451

Multiple Modelling Parameters		
Seafloor twt	***Time***	***Primary p range (muted)***
100 ms	0	-1000 – 200
	1000	-1000 – 200
	2000	-1000 – 75
	8000	-1000 – 50
1000 ms	0	-1000 – 200
	2000	-1000 – 200
	3000	-1000 – 75
	8000	-1000 – 50

2000 ms	0	-1000 – 200
	3000	-1000 – 200
	4000	-1000 – 75
	8000	-1000 – 50
4500 ms	0	-1000 – 200
	5500	-1000 – 200
	6000	-1000 – 75
	8000	-1000 – 50

Multiple removal was achieved by subtracting the modelled multiples from the original (NMO corrected) gather. Application of demultiple in the shallow regions was controlled by tapering the amplitudes of the multiple model.

Demultiple Application Times		
Seafloor twt	***Time(ms)***	***% application***
100 ms	0	0%
	800	0%
	860 - 8000	100%
1000 ms	0	0%
	1300	0%
	1360 - 8000	100%
2000 ms	0	0%
	2200	0%
	2260 - 8000	100%
4500 ms	0	0%
	4700	0%
	4760 - 8000	100%

F-K Demultiple was then applied to the shallow data where the Radon Demultiple doesn't work as effectively due to the low fold. The velocities used for the process were a reduced version of the first pass velocities, -6% at 0ms, -6% at 800ms, -10% at 3500ms and -15% at 800ms.

The application of the F-K Demultiple is defined in the following table.

F-K Demultiple Application Times		
WB Time (ms)	**F-K Fully On**	***F-K Fully Off***
100	0 – 800 ms	*1200 – 8000 ms*
1000	0 – 1300 ms	*1600 – 8000 ms*
2000	0 – 2200 ms	*2400 – 8000 ms*
4500	0 – 4700 ms	*4900 – 8000 ms*

5.16 Spherical Divergence

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).

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

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.

5.17 Pre-stack Migration (Velocity Analysis)

Full pre stack Kirchhoff time migration was used to migrate lines for velocity analysis. The migration algorithm was used in straight ray mode, with a 7,500 m half aperture. The velocity field was constructed by smoothing the first pass velocities. Migration was performed on 120 offset planes.

5.18 Second Pass Velocity Analysis

A second pass velocity analysis was conducted on the pre-stack migration data. Analysis was performed at 1km intervals using the Fugro Seismic Imaging Pty. Ltd. “MGIVA” interactive velocity analysis program. Each velocity analysis comprised a semblance display, a CDP stacked panel repeated 15 times with a suite of velocity functions, and a central CDP gather. The suite of functions were generated using 0%, +/-2%, +/-4%, +/-8%, +/-12%, +/-16%, +/-20% and +/-24% increments from a central velocity function. The central function was the velocity derived from the first pass analysis.
The second pass velocities were picked by Fugro Seismic Imaging, and the QC performed by Fugro Seismic Imaging.

5.19 Surface Consistent Amplitude Recovery

The amplitude of any trace is affected by various factors, including the shot strength, response and coupling of the receivers, trace offsets and the geology. Surface Consistent Amplitude Recovery (SCAMP) is designed to analyse amplitudes in a surface consistent manner. It estimates the amplitude variations due to various components and computes weighting levels for each component, using the Gauss-Seidel iterative method. The components selected to resolve extraneous amplitude variations were the shot strength and receiver response (virtual receiver location). The Gauss-Seidel iterations were performed on all lines simultaneously, providing a survey consistent solution.

5.20 Final Pre-stack Time Migration

The final Kirchhoff pre-stack time migration was performed using a maximum half aperture of 600 traces (7500m), invoking the straight ray algorithm. Anti-aliasing protection was applied by pre-filtering the data within the migration scan depending upon the local migration operator dip. The velocity field was constructed by smoothing the second pass velocities.

5.21 Third Pass Velocity Analysis

The third pass velocity analysis was conducted on the final pre-stack migration data. Analysis was performed at 0.5 km intervals using the Fugro Seismic Imaging Pty. Ltd. “MGIVA” interactive velocity analysis program. Each velocity analysis comprised a semblance display, a CDP stacked panel repeated 15 times with a suite of velocity functions, and a central CDP gather. The suite of functions were generated using 0%, +/-2%, +/-4%, +/-8%, +/-12%, +/-16%, +/-20% and +/-24% increments from a central velocity function. The central function was the velocity derived from the second pass analysis.
The final pass velocities were picked and the QC performed by Fugro Seismic Imaging.

These final velocities were archived to CD-ROM media as ASCII text in Western Geophysical's velocity format.

5.22 Radon Multiple Attenuation (Residual Demultiple)

The initial demultiple was performed in a lenient fashion because the preliminary velocity field did not permit fine discrimination between primary and multiple energy. Most seafloor multiple energy was removed, but inter-bed multiples and seafloor multiples with residual move out of less than 200ms were remnant in the final migrated gathers. Attenuation of these remnant multiples was achieved by modelling and subtraction using a least squares, parabolic Radon transform. Normal move out corrections were performed using the final 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 Hi-resolution radon option was invoked, where the resolution of the radon transform is improved by adding weighting terms to the least squares solution , minimising the residual error. A mild t-x mute was applied immediately before the radon transform to remove NMO stretch noise from the shallow zone of longer offsets.

Radon Transform Parameters	
Reference offset	7293m
Frequency range	4-100 Hz
Minimum p	-1000 *(parabolic delta-t, at reference offset)*
Maximum p	+3500 *(parabolic delta-t, at reference offset)*
No. of p traces	451

Multiple Modelling Parameters		
Seafloor twt	***Time***	***Primary p range (muted)***
0 ms	0	-1000 – 250
	1000	-1000 – 175
	2000	-1000 – 125
	8192	-1000 – 75
1000 ms	0	-1000 – 250
	2000	-1000 – 175
	3000	-1000 – 125
	8192	-1000 – 75

4000 ms	0	-1000 – 250
	5000	-1000 – 175
	6000	-1000 – 125
	8192	-1000 – 75
5000 ms	0	-1000 – 250
	6000	-1000 – 175
	7000	-1000 – 125
	8192	-1000 – 75

Multiple removal was achieved by subtracting the modelled multiples from the original (NMO corrected) gather. Application of demultiple in the shallow regions was controlled by tapering the amplitudes of the multiple model.

Demultiple Application Times		
Seafloor twt	**Time(ms)**	**% application**
100 ms	0	0%
	500	0%
	560 - 8000	100%
500 ms	0	0%
	1000	0%
	1060 - 8000	100%
1000 ms	0	0%
	1500	0%
	1560 - 8000	100%
2000 ms	0	0%
	2500	0%
	2560 - 8000	100%
4000 ms	0	0%
	4500	0%
	4560 - 8000	100%

5.23 NMO Correction

Dix fourth order NMO corrections were applied using the final picked 0.5km PSTM velocity and eta functions.

5.24 Raw PSTM Gather Archive (SEGY)

The final PSTM gathers were archived in SEGY format and placed on 40 Gb DLT tape. This data had all post migration processing applied including gun and cable correction, line amplitude scaling, zero phasing and inelastic attenuation correction. Note that the band pass filter (5.30) was not applied to this dataset.

5.25 Angle Stack Generation

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 angle of incidence calculations were performed using Walden's method, and considered a smoothed version of the the third pass velocities. The full angle stack was for angle 0 to 45 degrees, the near angle stack was for angles 0 to 22.5 degrees and the far angle stack for angles 22.5 to 45 degrees. The angle stacks employed 1/(N) stack fold compensation where N represents the number of traces contributing to the stack, calculated at each sample. The inner trace mute (5.28) was applied prior to the angle restrictions.

5.26 PSTM Angle Stack Archive (SEGY)

The final PSTM angle stacks were archived in SEGY format and placed on DVD. This data had all post migration processing applied including gun and cable correction, line amplitude scaling, zero phasing and inelastic attenuation correction. Note that the band pass filter (5.30) was not applied to this dataset.

5.27 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 Mute Parameters		
Seafloor twt	***Offset (m)***	***Application times (ms)***
100 ms	127	0
	327	50
	427	300
	1027	1000
	6100	4300
200 ms	127	0
	427	150
	527	350
	1127	1050
	6100	4350
1000 ms	127	0
	927	900
	1027	1400
	1227	2000
	6100	4450
1500 ms	127	0
	1027	1400
	1177	1950
	1427	2300
	6100	4800

Outer Mute Parameters		
2000 ms	127	0
	1077	1900
	1427	2800
	1777	3200
	6100	5400
2400 ms	127	0
	1127	2300
	1327	3200
	2527	3900
	6100	5900

5.28 Inner Trace Mute

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

Inner Mute Parameters		
Seafloor twt	***Offset (m)***	***Application times (ms)***
100 ms	127	600 - 8000
	827	2000 - 8000
200 ms	127	700 - 8000
	827	2100 - 8000
1000 ms	127	2000 - 8000
	827	2800 - 8000
1500 ms	127	2500 - 8000
	827	3400 - 8000
2000 ms	127	2900 - 8000
	827	3900 - 8000
2400 ms	127	3100 - 8000
	827	4000 - 8000

5.29 Stack

The traces within each common depth point gather were summed. The final stacks employed 1/Root(N) stack fold compensation where N represents the number of traces contributing to the stack, calculated at each sample.

5.30 Gun and Cable Static Corrections

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, converted to a time shift using a water velocity of 1500 m/s.

5.31 Line Amplitude Scaling

An average scalar was calculated per line to match all lines to the same average amplitude. This was calculated over a window from 300 ms to 8000 ms.

5.32 Minimum to Zero Phase

The data was converted from notional minimum phase data to zero phase, using the Weiner-Levinson double inversion method to derive an operator based on the amplitude spectrum from an area typical of each survey. Deviations from the minimum phase input assumption will produce deviations from true zero phase output.

5.33 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 band pass filters.

Bandpass Filter Parameters		
Seafloor twt	***Time(ms)***	***Frequency (Hz/dB/oct)***
100 ms	100	10/18 – 110/72
	1000	8/18 – 85/72
	2000	6/12 – 60/60
	3000	4/12 – 40/48
	4000	4/12 – 30/36
2000 ms	2000	10/18 – 110/72
	3000	8/18 – 85/72
	4000	6/12 – 60/60
	5000	4/12 – 40/48
	6000	4/12 – 30/36
4000 ms	4000	10/18 – 110/72
	5000	8/18 – 85/72
	6000	6/12 – 60/60
	7000	4/12 – 40/48
	8000	4/12 – 30/36

5.34 Inelastic Attenuation Correction

A dB gain was applied to compensate for the inelastic attenuation caused by the earth. The main aim was to balance out the amplitudes down through the seismic section. The gain function used was 6dB per second to 2 seconds, then held constant to T-max.

5.35 Raw PSTM Stack Archive (SEGY)

The raw PSTM stacks were archived in SEGY format. This data was archived to DVD. Note that the band pass filter (5.30) was not applied to this dataset.

5.36 Final PSTM Stack Archive (SEGY)

The final PSTM stacks were archived in SEGY format and were initially sent to Santos via ftp. This data was also archived to DVD.

5.37 Final Depth Converted PSTM Stack Archive (SEGY)

The final PSTM stacks were converted to depth using a smoothed version of the final 0.5km velocities. This data was archived in SEGY format and was also initially sent to Santos via ftp. It was then also archived to DVD.

5.38 Example sections throughout flow

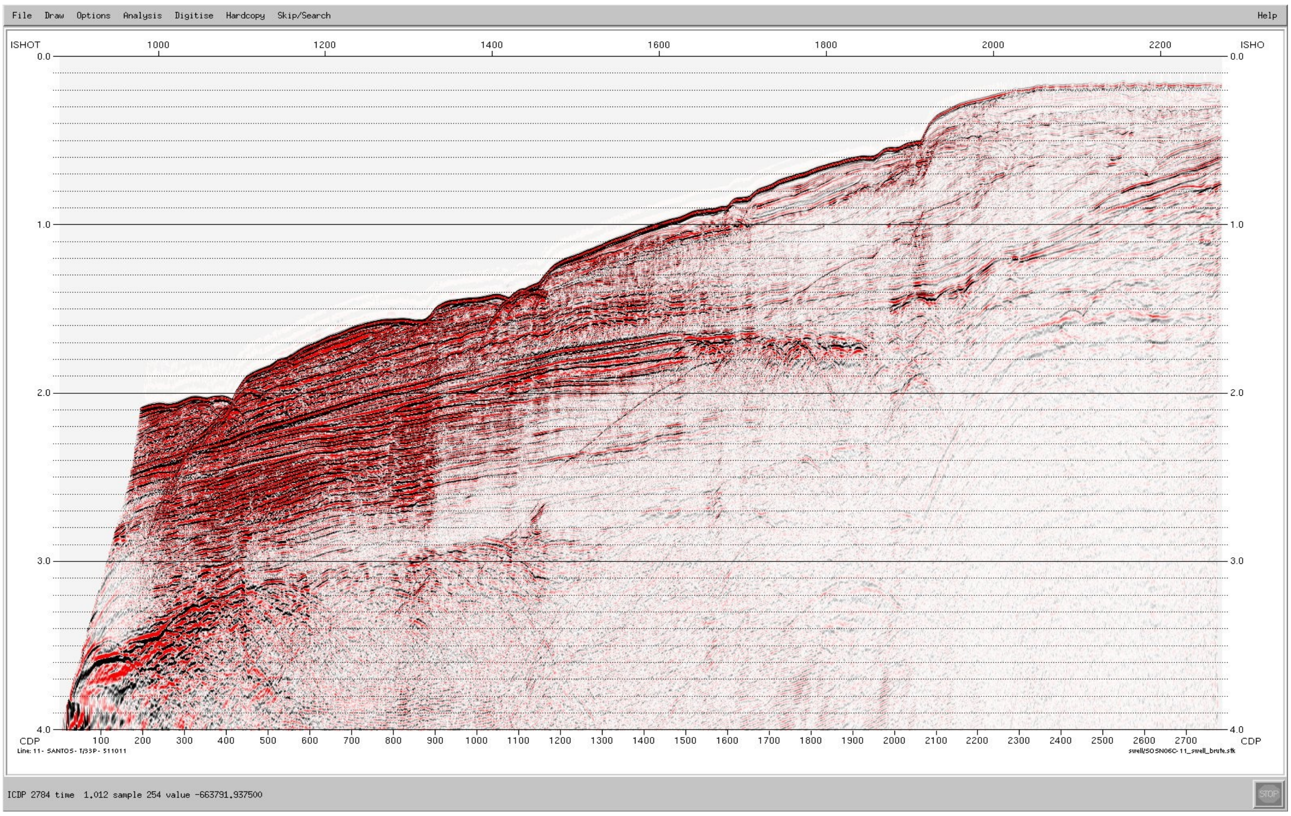


Figure 5.38.1 Initial brute stack for line SOSN06C-11.

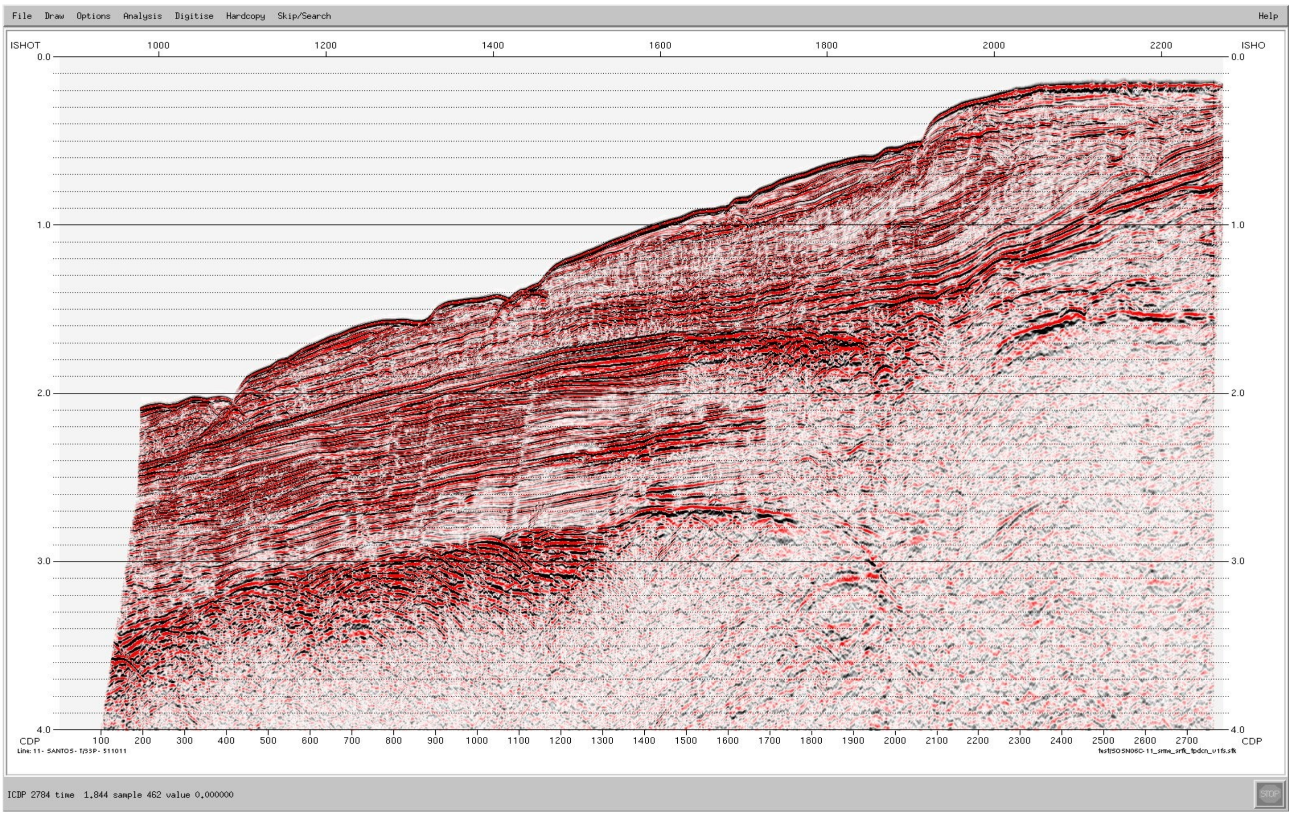


Figure 5.38.2 Pre processing stack for line SOSN06C-11.

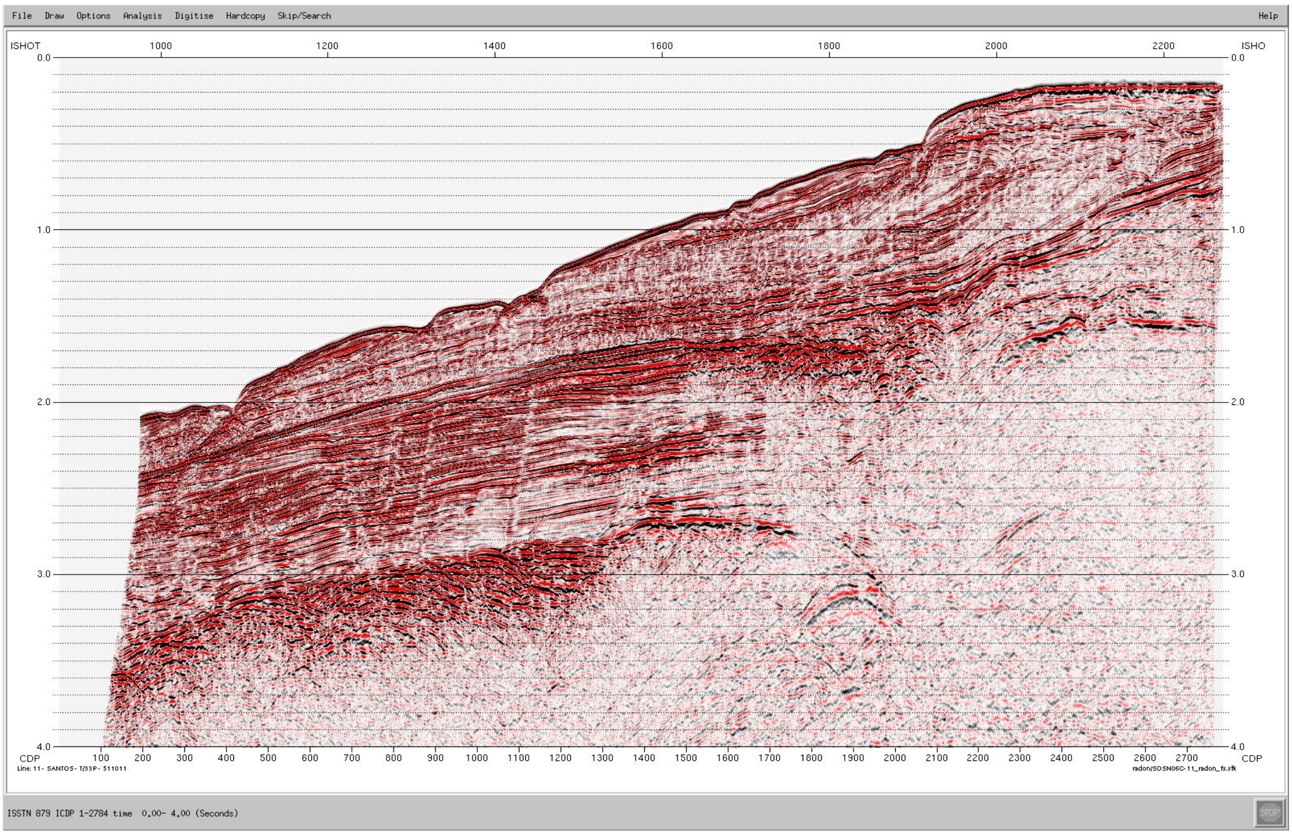


Figure 5.38.3 Radon demultiple stack for line SOSN06C-11.

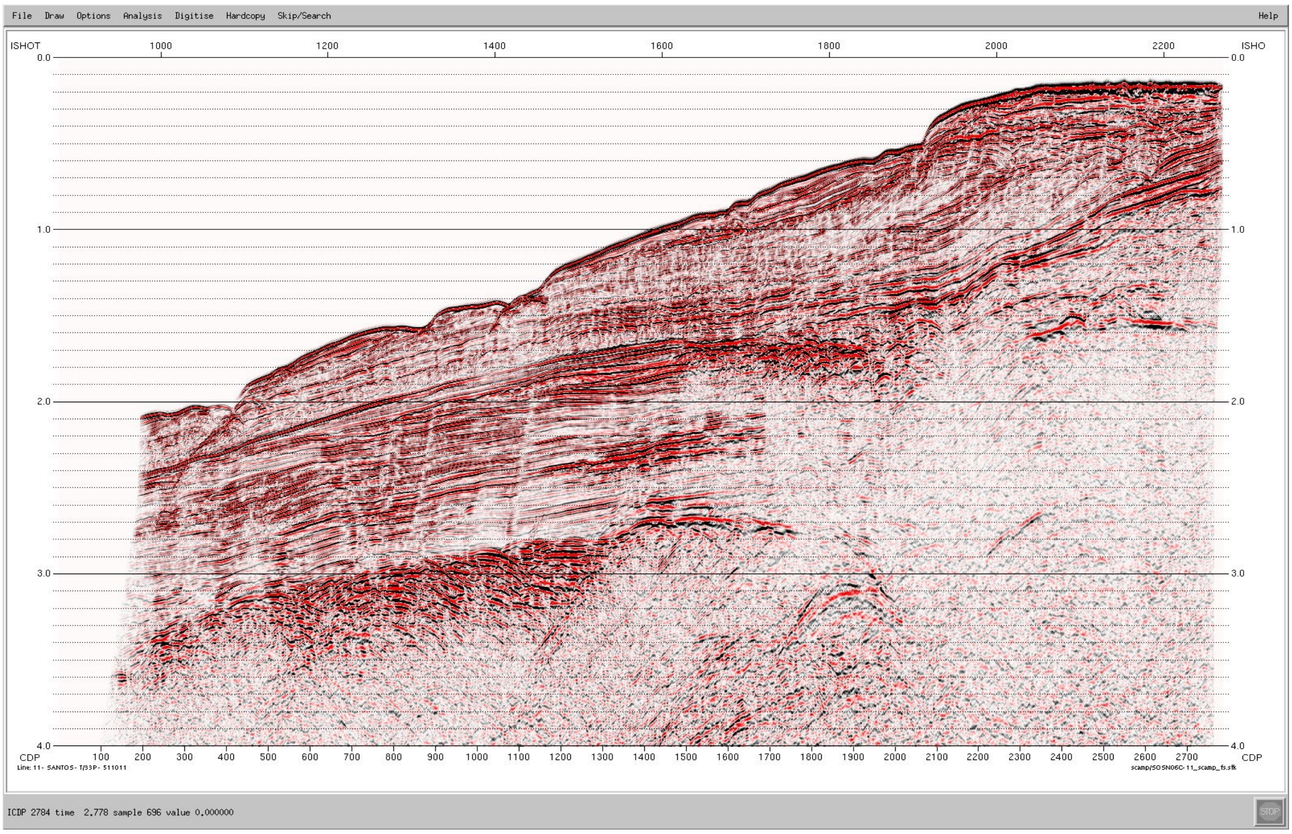


Figure 5.38.4 SCAMP stack for line SOSN06C-11.

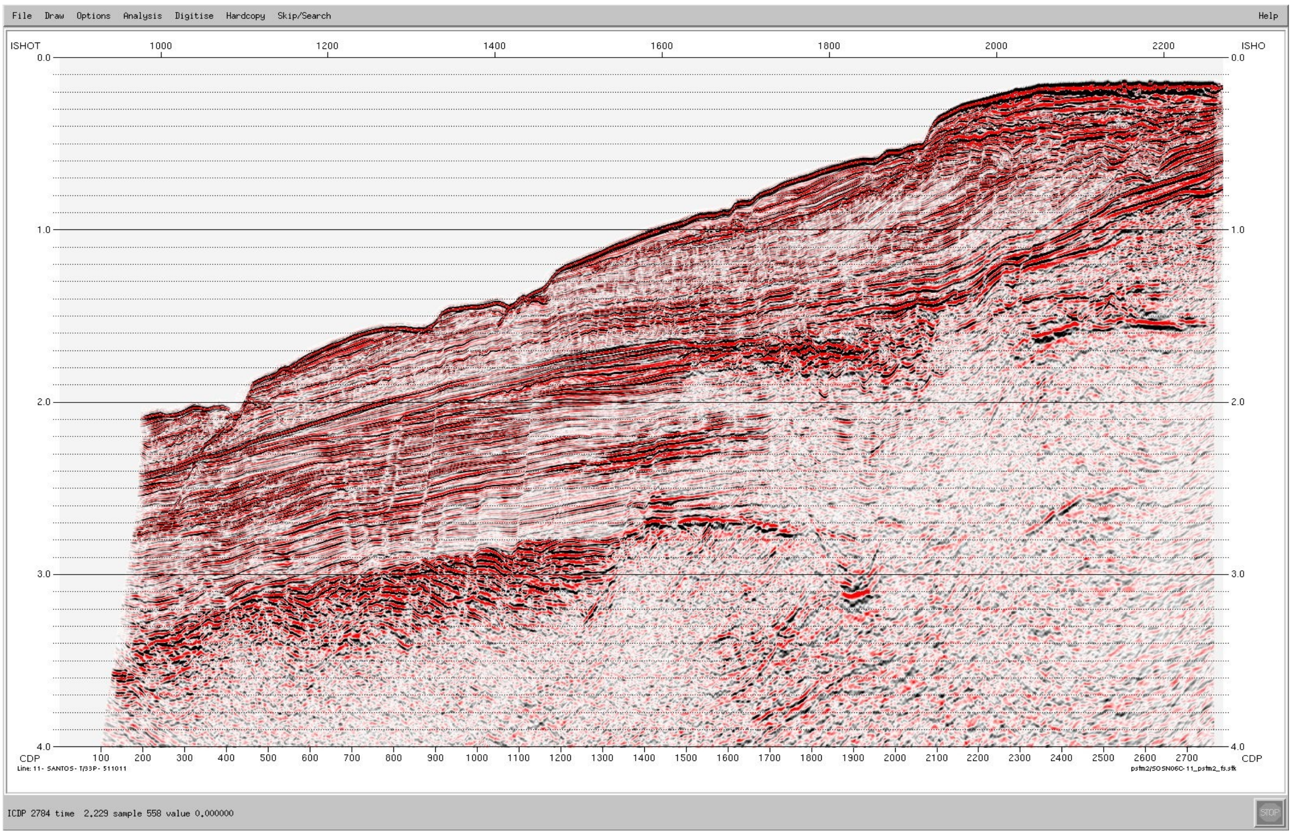


Figure 5.38.5 Raw PSTM stack for line SOSN06C-11.

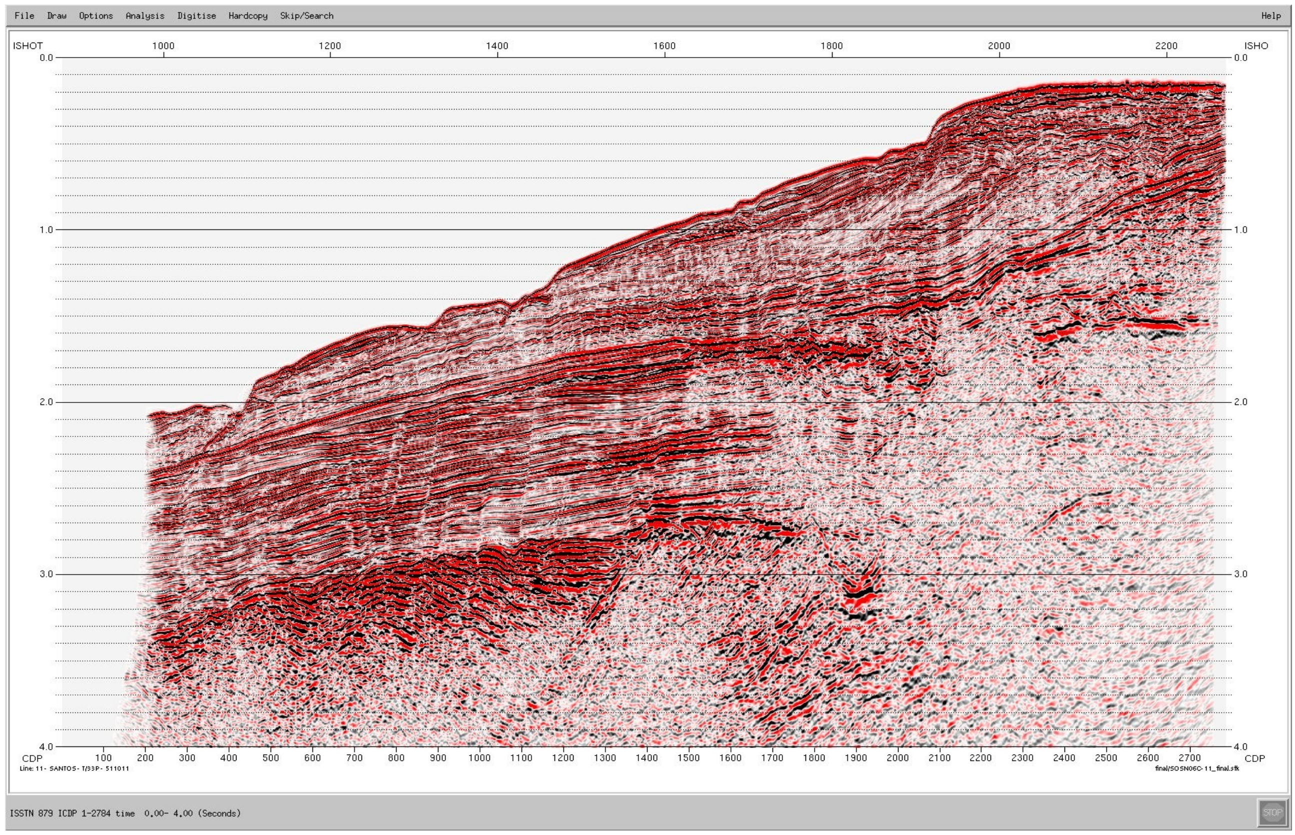


Figure 5.38.6 Residual radon demultiple stack for line SOSN06C-11.

5.39 Example final sections (SOSN06C-11)

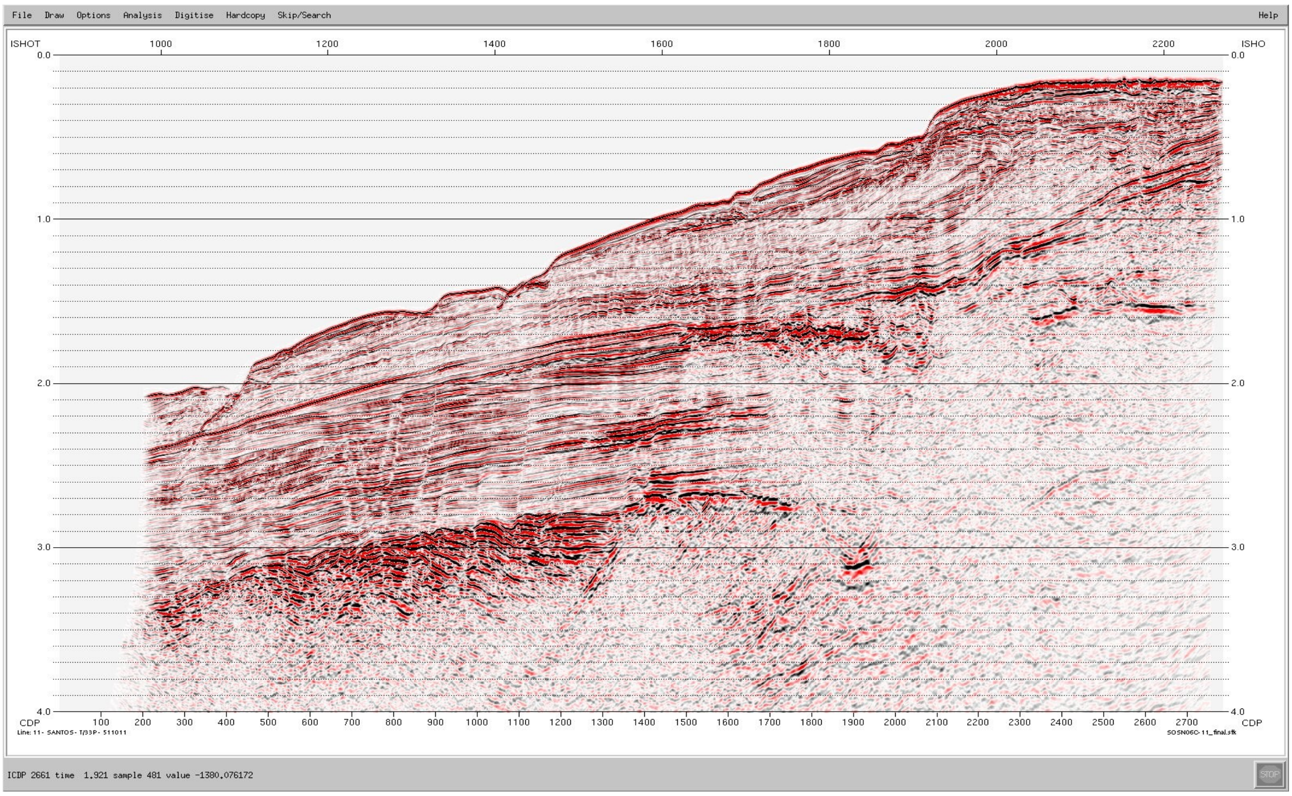


Figure 5.39.1 Structural stack for line SOSN06C-11.

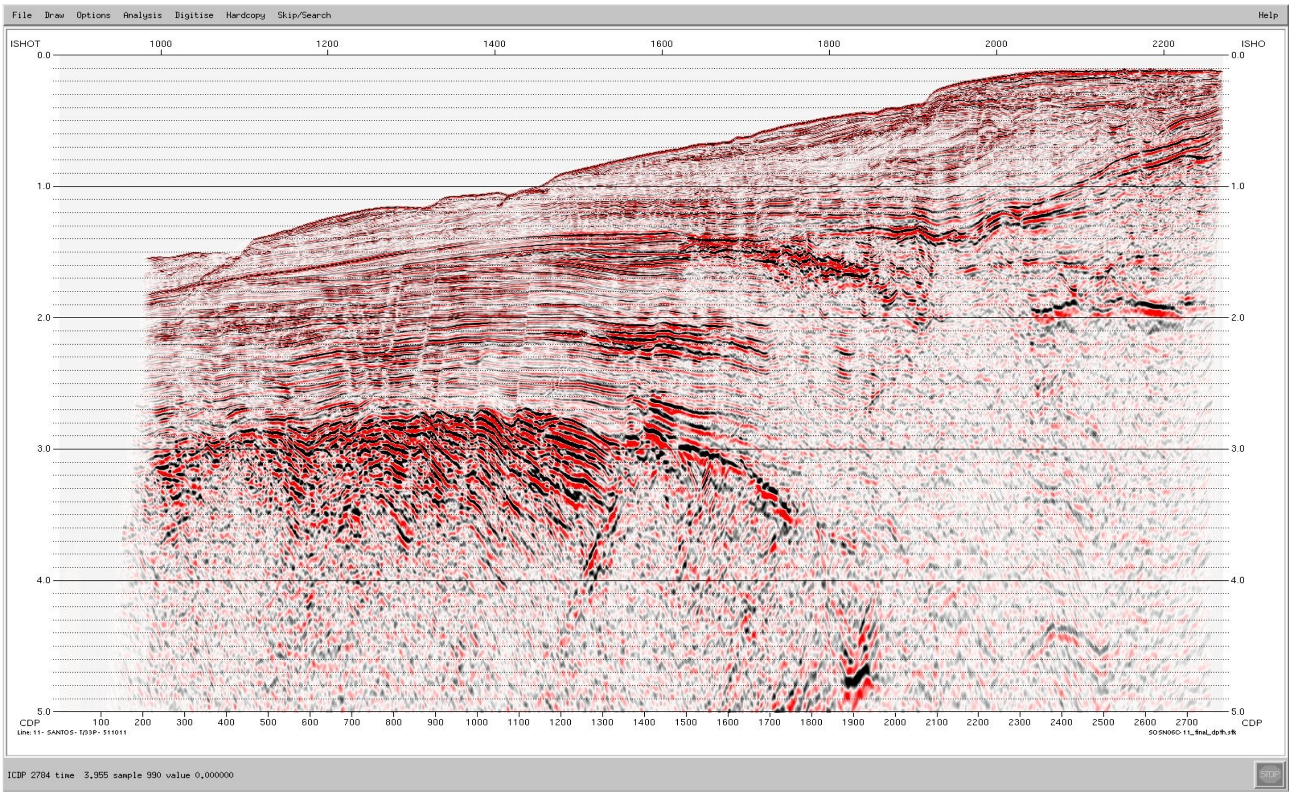


Figure 5.39.2 Structural stack (converted to depth) for line SOSN06C-11.

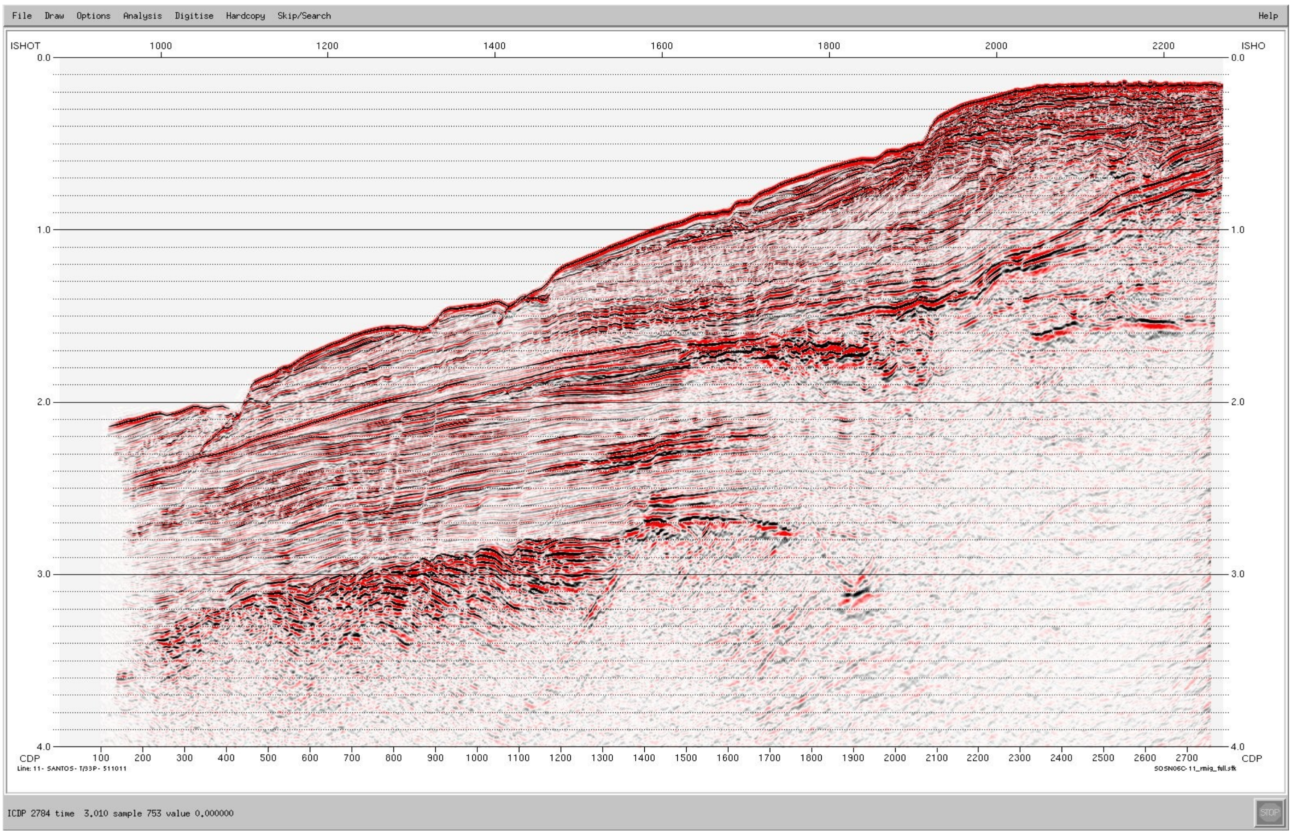


Figure 5.39.3 Angle stack (full) for line SOSN06C-11.

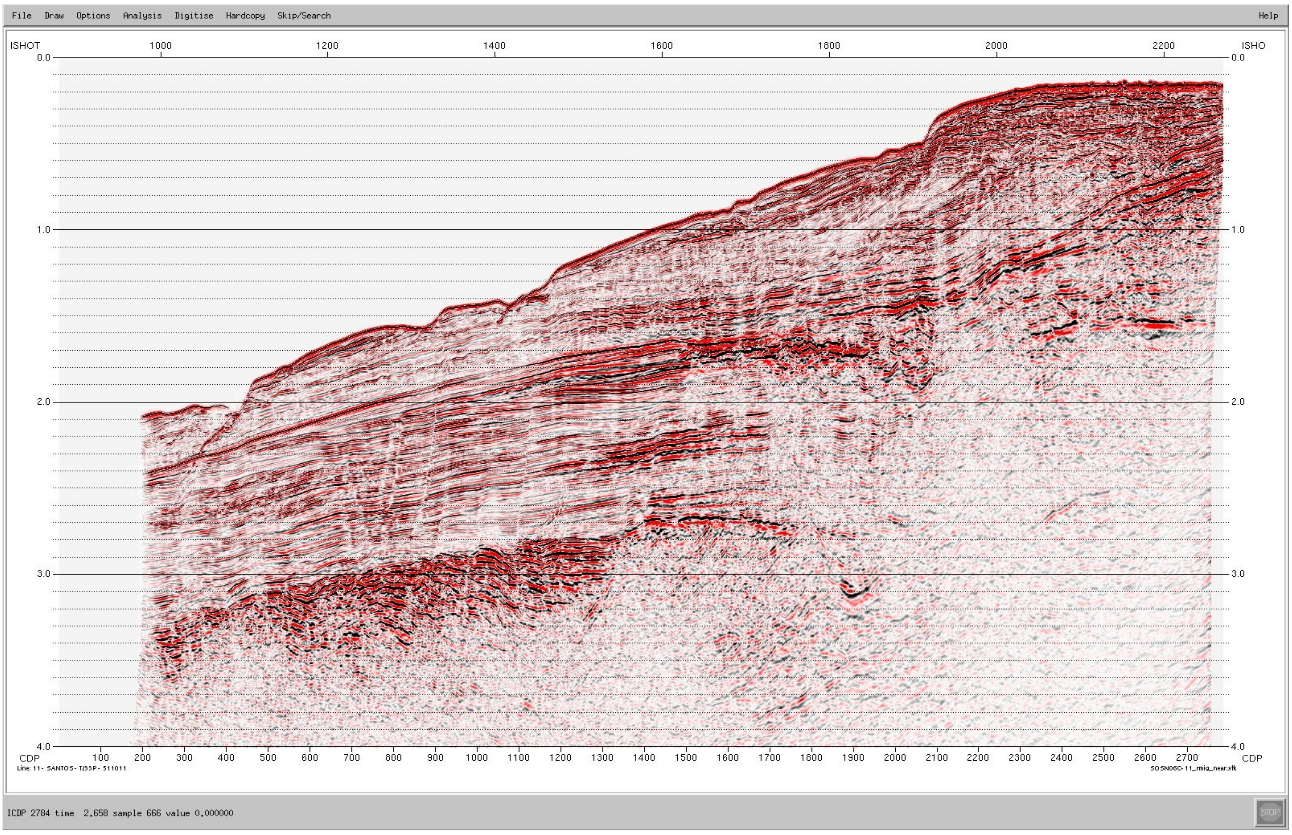


Figure 5.39.4 Angle stack (near) for line SOSN06C-11.

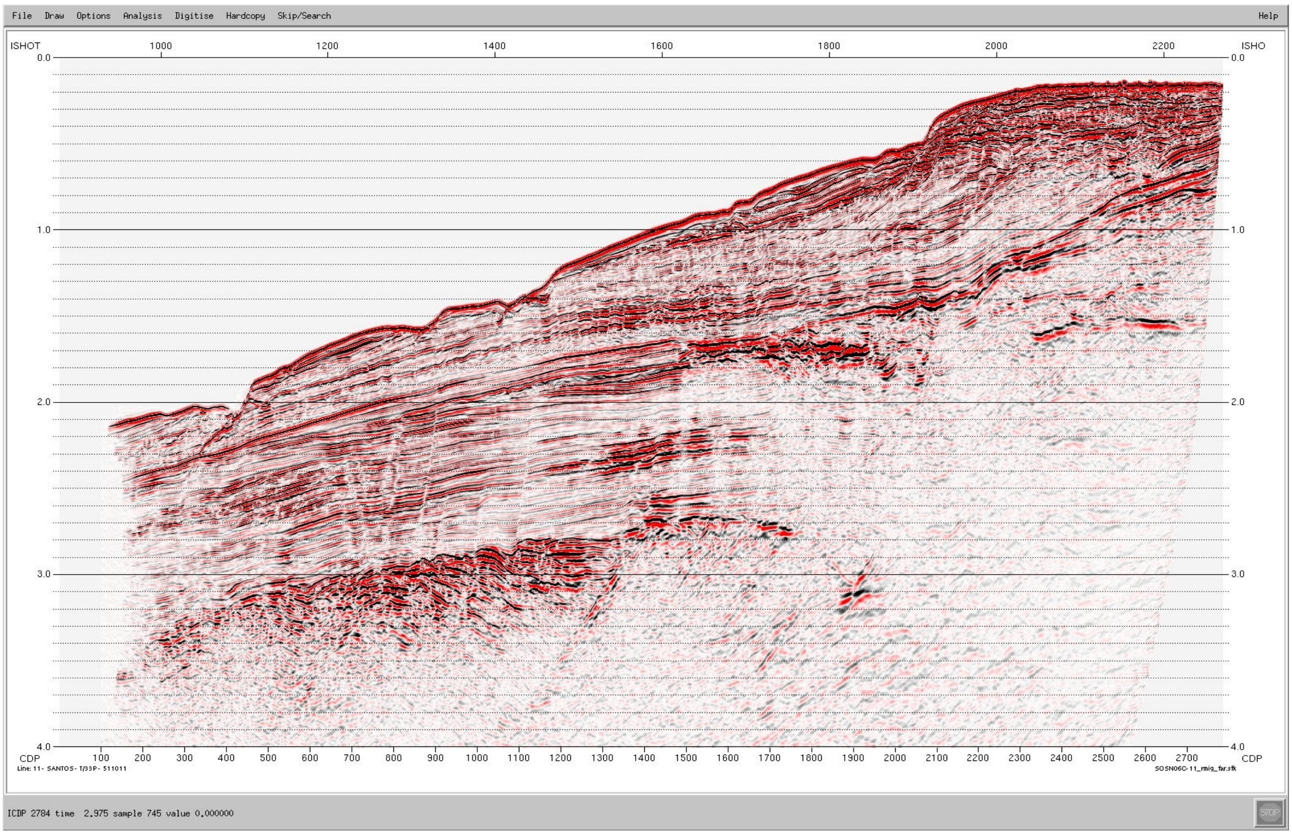


Figure 5.39.5 Angle stack (far) for line SOSN06C-11.

5.40 Example final gather (SOSN06C-11)

The final mutes for the structural stack are marked as green (inner mute) and red (outer mute). Incident angle displays have colour gradations of 5°, with browns representing 0-15°, pinks 15-30°, blues 30-45°, and green 45-60°.

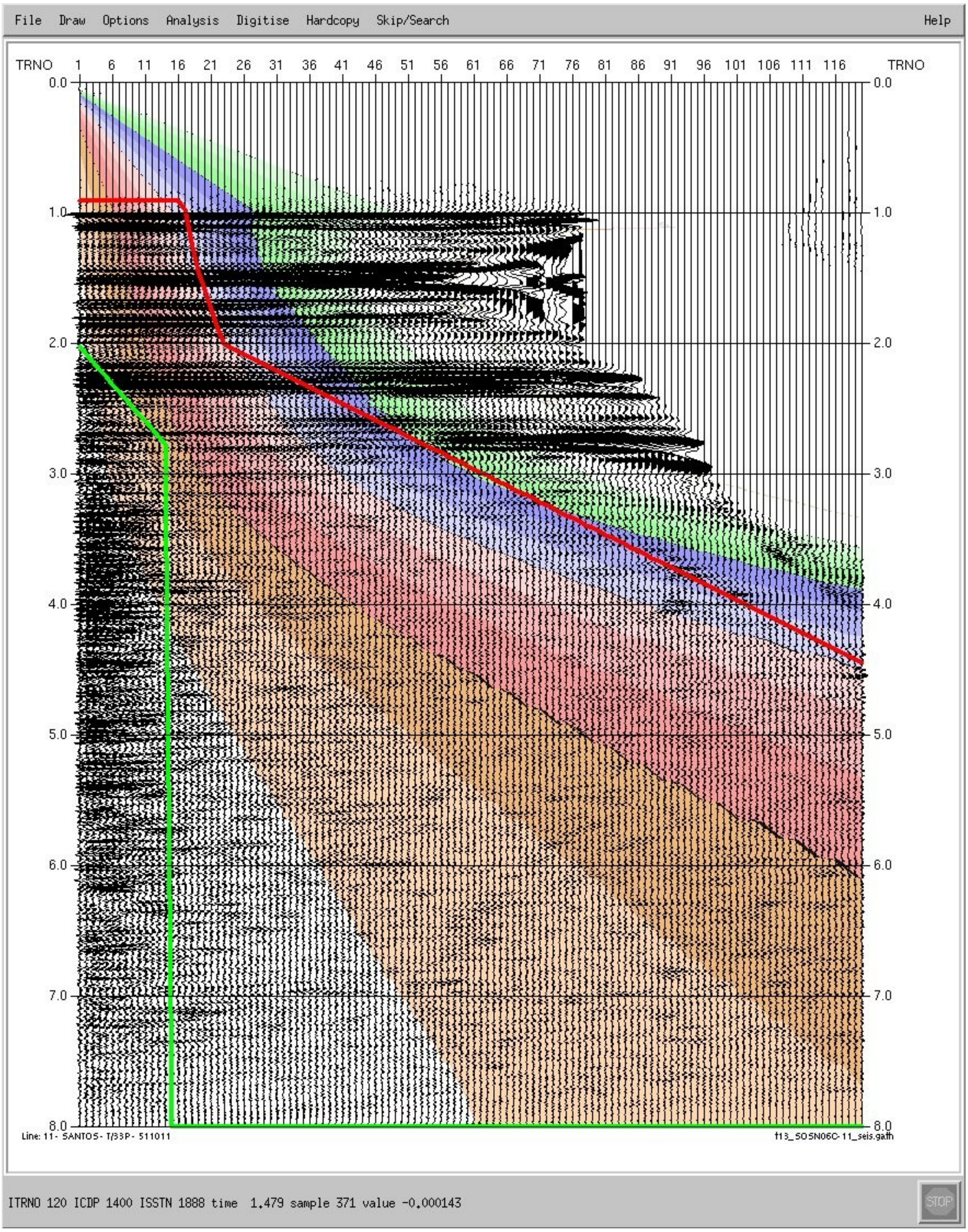
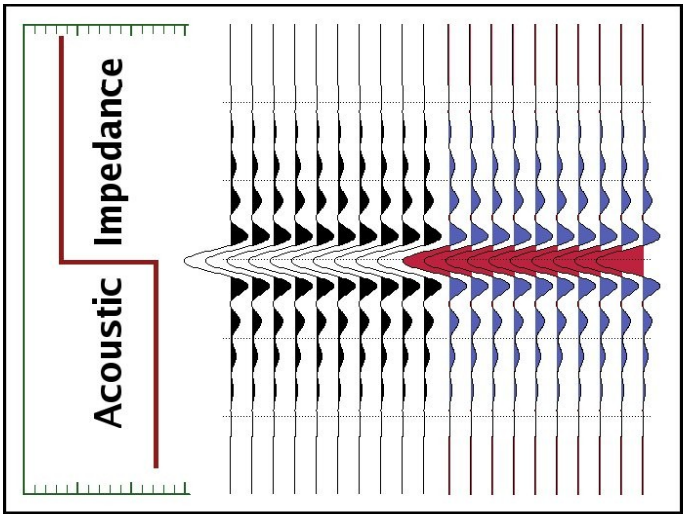


Figure 5.40.1 Final PSTM gather with angles overlayed for line SOSN06C-11.

6 Polarity Statement

The final desired polarity was SEG reverse (or SEG negative), where an increase in acoustic impedance is represented by a negative number on tape, and white trough on display.

Figure 6.1 Desired polarity diagram. An acoustic impedance increase is represented by a trough.



7 Archive Listing

Tape Number	***Media***	***Description***
511FS001DVD	DVD	Final Filtered Stack (Copy 1); Format: SEGY
511FS002DVD	DVD	Final Filtered Stack (Copy 2); Format: SEGY
511FS003DVD	DVD	Final Filtered Stack (Copy 3); Format: SEGY
511FS004DVD	DVD	Final Filtered Stack (Copy 4); Format: SEGY
511DS005DVD	DVD	Depth Converted Final Filtered Stack (Copy 1); Format: SEGY
511DS006DVD	DVD	Depth Converted Final Filtered Stack (Copy 2); Format: SEGY
511DS007DVD	DVD	Depth Converted Final Filtered Stack (Copy 3); Format: SEGY
511DS008DVD	DVD	Depth Converted Final Filtered Stack (Copy 4); Format: SEGY
511RS009DVD	DVD	Raw Final Stack (Copy 1); Format: SEGY
511AS010DVD	DVD	Angle Stack (Copy 1); Format: SEGY
511FG011L	DLT	Final PSTM Gathers (Copy 1); Format: SEGY
511WV012CD	CD	Final Velocities and Etas (Copy 1); Format: Western
511WV013CD	CD	Final Velocities and Etas (Copy 2); Format: Western
511WV014CD	CD	Final Velocities and Etas (Copy 3); Format: Western
511WV015CD	CD	Final Velocities and Etas (Copy 4); Format: Western
511SC016CD	CD	CMP Shotpoint Coordinates (Copy 1); Format: Ascii
511SC017CD	CD	CMP Shotpoint Coordinates (Copy 2); Format: Ascii
511SC018CD	CD	CMP Shotpoint Coordinates (Copy 3); Format: Ascii
511SC019CD	CD	CMP Shotpoint Coordinates (Copy 4); Format: Ascii

Tape Number	***Media***	***Description***
511PR020CD	CD	Processing Report (Copy 1); Format: PDF
511PR021CD	CD	Processing Report (Copy 2); Format: PDF
511PR022CD	CD	Processing Report (Copy 3); Format: PDF
511PR023CD	CD	Processing Report (Copy 4); Format: PDF

8 SEGY Header Information

8.1 SEGY EBCDIC Line Header Information

Typical SEGY EBCDIC line header (From Structural Stack, Line SOSN06C-11)

```
C 1 SANTOS LTD
C 2 LINE NAME: SOSN06C-01
C 3 FINAL PSTM STACK (Full)
C 4
C 5 ACQUISITION PARAMETERS:  DATE SHOT: JUNE 2005    DIR: 58 DEGREES
C 6 ACQUIRED BY: Multiwave   VESSEL: M/V Pacific Titan    TMAX: 8.0s
C 7 SAMPLE PERIOD: 2msec     SHOT INTERVAL: 25m    GROUP INT: 12.5m
C 8 NO. OF GROUPS: 480
C 9
C10 DATA PROCESSED BY FUGRO SEISMIC IMAGING DURING JULY 2006
C11 PROC. SEQUENCE:
C12 TRANSCRIPTION / LOW CUT 4/12dB / -50ms bulk shift / RESAMPLE
C13 T SQUARED GAIN/SWELL ATTENUATION/SRME/SHOT + RECEIVER FK +/- 2000M/S
C14 TAU-P DECONVOLUTION / NMO / ADJACENT TRACE SUM (12.5m to 25m Group)
C15 REVNMO/CDP SORT/INTERP SHOTS TO 12.5M / RADON DEMULTIPLE / FK DEMULTIPLE
C16 SCAMP/PSTM1/ 2ND PASS VELOCITIES / PSTM2 / 3RD PASS VELOCITIES / NMO+ETA
C17 RESIDUAL RADON / OUTER MUTE / INNER MUTE / STACK / GUN+CABLE CORRECTION
C18 MINIMUM TO ZERO PHASE / RANNA / BANDPASS FILTER / DB SCALING
C19 LINE AMPLITUDE SCALAR
C20
C21
C22
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 1001
C37 CDP POSITION         CDP 640 = SP 1201
C38 SP RANGE  : 1001 TO 2038
C39 CDP RANGE : 1 TO 2314
C40 END OF EBCDIC HEADER
```

8.2 SEGY Trace Header Definition

Location of strategic values in the SEGY trace header.

DESCRIPTION	*TYPE*	*BYTE*
Trace number within line.	I32	1-4
Trace number within reel.	I32	5-8
SEAFLOOR Two Way Time	I32	9- 12
Trace number.	I32	13- 16
Shot point number.	I32	17- 20
CDP number.	I32	21- 24
Trace offset (integer).	I32	37- 40
Scaler to be applied to coordinates	I16	71- 72
Coordinate units (m/arc)	I16	89- 90
No. of samples.	I16	115-116
amp interval in microseconds.	I16	117-118
Year of recording	I16	157-158
Julian day number (1-366)	I16	159-160
Hour of day (24 hour clock)	I16	161-162
Minute of hour	I16	162-163
Second of minute	I16	165-166
Easting of CDP.	I32	193-196
Northing of CDP.	I32	197-200

9 Data Disposition

Data	*Date sent*	*Destination*
26 x 3590 cartridges containing field data. Tape # 1 - 26	Oct 2006	Santos Limited Level 29, 91 King William Street ADELAIDE SA 5000 Attn: Stuart Brew
1 x CD containing Observers Logs		
1 x DVD containing Navigation Data		
1 x 3590, 1 x DVD containing QC Deliverables		
Paper sections containing Brute Stacks		

10 Appendix

10.1 SP-CDP Relationships

Shot point to CDP relationship, using the cdp position as reference.

Line	CDP	Shotpoint	
SOSN06C-01	1	881.5	(first CDP)
SOSN06C-01	2314	2038	(last CDP)
SOSN06C-02	1	881.5	(first CDP)
SOSN06C-02	3140	2451	(last CDP)
SOSN06C-03	1	881.5	(first CDP)
SOSN06C-03	2308	2035	(last CDP)
SOSN06C-04	1	881.5	(first CDP)
SOSN06C-04	5434	3598	(last CDP)
SOSN06C-05	1	881.5	(first CDP)
SOSN06C-05	2308	2035	(last CDP)
SOSN06C-06	1	881.5	(first CDP)
SOSN06C-06	2132	1947	(last CDP)
SOSN06C-07	1	881.5	(first CDP)
SOSN06C-07	2966	2364	(last CDP)
SOSN06C-08	1	881.5	(first CDP)
SOSN06C-08	2692	2227	(last CDP)
SOSN06C-09	1	881.5	(first CDP)
SOSN06C-09	2792	2277	(last CDP)
SOSN06C-10	1	881.5	(first CDP)
SOSN06C-10	2446	2104	(last CDP)
SOSN06C-11	1	881.5	(first CDP)
SOSN06C-11	2784	2273	(last CDP)
SOSN06C-12	1	881.5	(first CDP)
SOSN06C-12	2736	2249	(last CDP)
SOSN06C-13	1	881.5	(first CDP)
SOSN06C-13	2938	2350	(last CDP)
SOSN06C-15	1	881.5	(first CDP)
SOSN06C-15	2680	2221	(last CDP)
SOSN06C-17	1	881.5	(first CDP)
SOSN06C-17	2220	1991	(last CDP)
SOSN06C-19	1	881.5	(first CDP)
SOSN06C-19	1938	1850	(last CDP)