Data Reprocessing Report

(Activity Completion Date: November 19th 2004)

for

ESSO Australia Pty Ltd

Area: Tuskfish 3D VIC/L20 Production Cube

WG Contract Number: J2669

Client Project Number: #61561

Date: January 2005

Level 5, 256 St Georges Terrace, Perth, Western Australia 6000, Australia

Report Authors
Alison Keighley
Mohammed Norozi

TABLE OF CONTENTS

1.0Introduction

This report details the 2003/4 data processed by WesternGeco for the Tuskfish 3D Production Cube. This volume is a subset of the 3D Exploration Cube marine seismic survey conducted over licensed acreage in the Blackback Field and adjacent open acreage, in block VIC/L20, Gippsland Basin, offshore Victoria, Australia and also processed by WesternGeco in 2003/4.

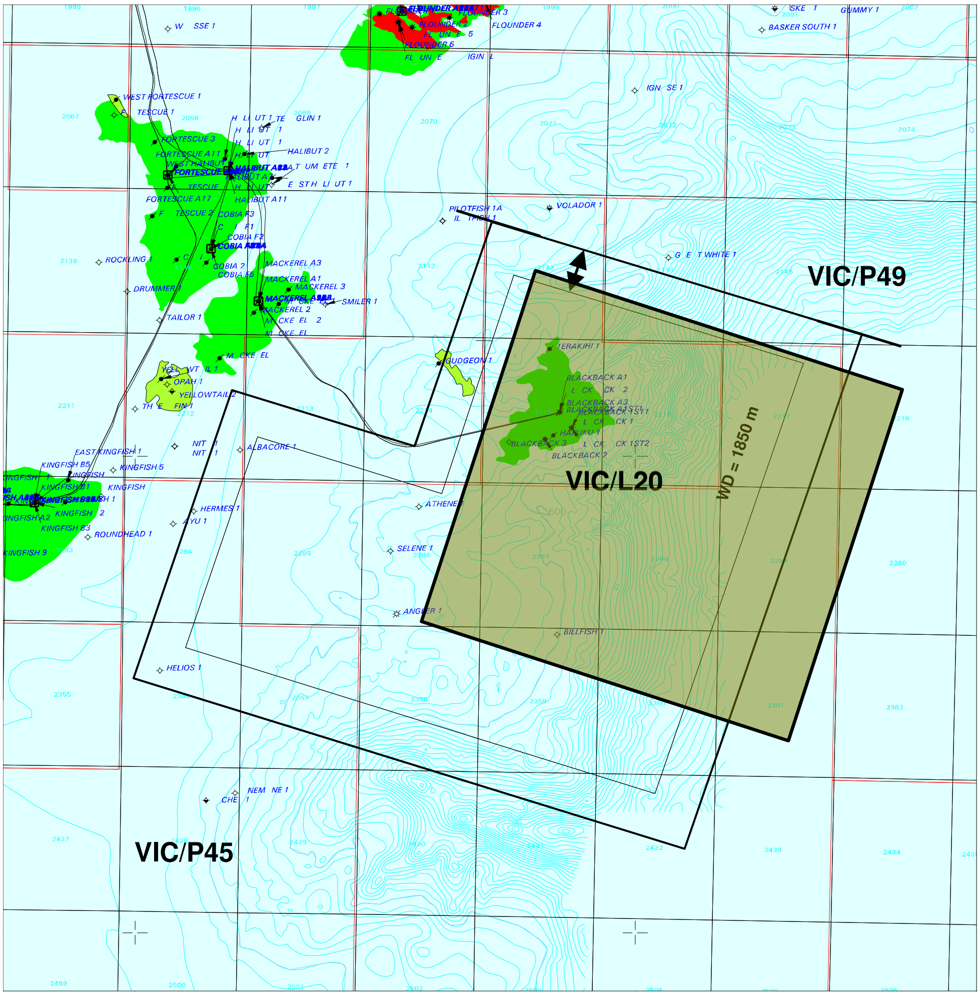
The Production Cube area was defined from the northern extent of the Exploration cube to the southern extent of line inline 1888. The eastern edge was the same as the Exploration Cube and the western edge was truncated to SP 2622 (for lines shot 107 degrees) and SP 2489 (for lines shot 287 degrees). This Production Cube data set was essentially processed through the same flow as the Exploration Cube except for the addition of 2D SRME and some adjusted processing parameters, decided from experience and hindsight gained from processing the Exploration Cube and some additional confirmation testing. The Production Cube time processing stopped after weighted least squares radon and binning/regularisation and was then processed through full pre-stack depth migration.

Section 1.1 shows the subset Production Cube area (shaded area) as well as the full Exploration Cube region.

The full fold processed production cube area was approximately 530 sq. km. The data was acquired between January 2003 and April 2003. Pre-processed data tapes were provided to WesternGeco for in-house processing at their Perth processing centre.
Acquisition parameters are listed in **Section 1.3**. Field tapes are listed in **Appendix 8.1** and the processing range for the lines contributing to the Production Cube are listed in **Appendix 8.2**.

The Exploration Cube had already been processed through several stages by the time the Production Cube processing started. The Exploration Cube's receiver SWATT (swell noise attenuation) data was used as the starting point for the Production Cube processing. Initial velocities had also been interpreted on the Exploration Cube and the Production Processing Cube used this field for amplitude compensation (geometric spreading). For completeness this report includes part of the Exploration Cube processing report up to this stage of processing (see **Section 4**).

1.1 Survey Area



Tuskfish 3D survey map with the shaded region indicating the production cube processing area. The larger rectangular region defines the boundries of the exploration cube.

The bathymetry contours show the E-W trending channels cutting deep into the water bottom.

1.2 Processing Objectives

The data will be used for more accurate interpretation of the Blackback reservoir. The data will also be used to explore the deeper potential in structures beneath the existing reservoir and to explore the follow-up potential on soon to be gazetted acreage in the Angler area. The survey is expected to accelerate the evaluation of exploration potential adjacent to the Mackerel platform early enough to impact facilities rationalisation planning

Producing fields in the Gippsland basin consist of shallow structures at the Top of Latrobe group. The depths of the structures vary between approximately 1.0 and 2.5 seconds (TWT). Maximum structural dips do not exceed 20 degrees. The fields in this area have previously been covered by a regional 2D grid and by small-localised 3D surveys.

Beneath the existing Top of Latrobe accumulations there are also smaller and more complex intra-Latrobe and Golden Beach traps. These deeper structures lie in a series of tilted fault blocks and are often overlain and sealed by volcanics. Depths of these structures vary between 3.0 and 5.0 seconds (TWT), with structural dips of up to 30 degrees.

The primary objectives of the survey are to:

- Aid in the identification of potential infill drilling programs within existing producing fields
- Delineate existing static resources
- Identify and firm up any commercial near-field wildcat potential
- Identify deeper intra-Latrobe and Golden Beach exploration potential

Key to achieving these objectives will be the regional mapping and attribute analysis of stratigraphic markers between the existing field areas, with emphasis on:

- Attribute analysis to resolve regional depositional patterns
- Accurate mapping of the WNW-ESE trending structural grain
- Map distribution of key sealing units

Accurate positioning of faults and identification flat spots and other DHI's are critical requirements. Identification of gas and oil water contacts within existing fields may allow reservoir depletion to be mapped.

Primary Target Description	Top Latrobe	Intra-Latrobe
Depth range (ft)	10,800 - 11,700	10,100 - 13,200
Two-way time range (s)	1.0-2.5	3.0-5.0
Maximum structural dip (degrees)	20	30
Estimated recoverable bandwidth (Hz)	40 Hz	40 Hz
Average Interval Velocity (m/s)	3500 (3200 - 4000)	3500 (3200 - 4000)
Desired vertical resolution (m)	23	33

Desired horizontal resolution (m)	70	377
Minimum Significant Fault Throw (m)		10
Maximum Significant Fault Throw (m)		500

1.3 Acquisition Parameters

General Information	
Operating Company:	ESSO Australia Pty. Ltd.
Vessel(s):	Western Monarch
Location:	Tuskfish, Gippsland Basin
Type of Survey:	3D Marine streamer survey
Line heading:	108 degrees
Desired start date:	January 2003

Survey Area Options	**1**	**2**	**3**
Nominal Full Fold Coverage Area	530 sq. km		
Receiver line length:	~30 to 35 km		

3D Acquisition Geometry	
Geometry Type	Inline swath

Cable Parameters	
Type of cable	Thomson Marconi Sentry Solid Streamer
Number of streamers	8
Cable separation	100 m
Active cable length (each nominal)	5 km per cable
No. Of channels (per cable)	400
Group interval	12.5 m
Group Sensitivity	197.3 dB re 1v/uPa
Type Geophones	N/A
Type Hydrophones	Thomson Marconi Sonar Seismic hydrophone

Recording Parameters	
Instrument type	I/O MSX
Record length	6.5 secs

Sample rate	2 milliseconds
Recording filter: Hi-cut	¾ Nyquist
Recording filter: Lo-cut	Out (2 Hz)
Tape format	SEGD rev (2) 8058
Recording media	IBM 3590 compatible
Dual recording required?	Yes

Source Parameters	
Source type	Sleeve Airgun array
Number of sources	2
Source separation	50 m
Volume per source	300 cu in. TBC
Primary Pulse to Bubble Pulse Ratio	13.0
Spectral Energy (minimum)	(Re: 1 micro-Pascal/Hz at 1 meter): 208 dB at 7 Hz rising to 210 dB at a centre frequency between 50-60 Hz with less than +/- 2 dB ripple across the spectrum
Source depth	7 m +/- 0.5 m (TBC)
Source pressure	2000 psi (TBC)
Shot to shot interval	18.75 m
Allowable source drop out specifications	< 10% 0-peak change < 15% P:B change > 0.998 correlation coefficient

Binning Requirements	
Bin Size	12.5 x 25 m
Nominal bin fold after duplicate offset rejection (4 azimuth quadrants)	66 less missing near-offsets due to cable separation. Even offset distribution preferred.

Infill	
Estimated / actual Infill	25 % / 18%

1.4 Geodetic Parameters

Geodetic Parameters During Data Acquisition	
Spheroid	GRS 80
Semi-Major Axis	6378137.0
Reciprocal of Flattening	298.257222101
Datum	GDA 94
Projection	UTM Zone 55S (CM 147^{0}E)

2.0Testing (Time Pre-Processing)

For testing purposes 2 lines were selected based on their suitability to demonstrate correct parameter selection. Initial acquisition line tests on the Tuskfish 3D dataset were performed on lines 1504J and 1248J in the northern portion of the survey. These lines were shot in opposite directions and chosen to demonstrate the difference of shooting direction against dip.

As per the client's instructions the testing and resulting production stages followed a Controlled Amplitude / Controlled Phase (CA/CP) approach in the processing of the data. The processing flows preserved the relative spatial and temporal amplitude variations of the recorded primary wavefield and treated the amplitude and phase of the recorded wavelet in a deterministic sense. Only those processes, which were designed to alter amplitude and phase in a deterministic manner, were permitted.
The majority of testing had been performed on the exploration cube. SRME, AMO tests and extra linear noise removal and amplitude clipping tests were run on the production cube to improve the final results but the other processes just had confirmation tests run. See **Appendix 8.6** for further information on tests run.

The majority of tests were ftp'd to Esso as QCViewer files for review in Melbourne. Each set of tests sent had a test log assigned which listed the test numbers and a brief description of the test. These were e-mailed as word documents and can be found in **Appendix 8.7**. The AMO test data was ftp'd in SEG-Y format and some of the amplitude clipping test results were e-mailed as attached gifs.

To maintain the agreed delivery date the testing was performed concurrently with the production stages.

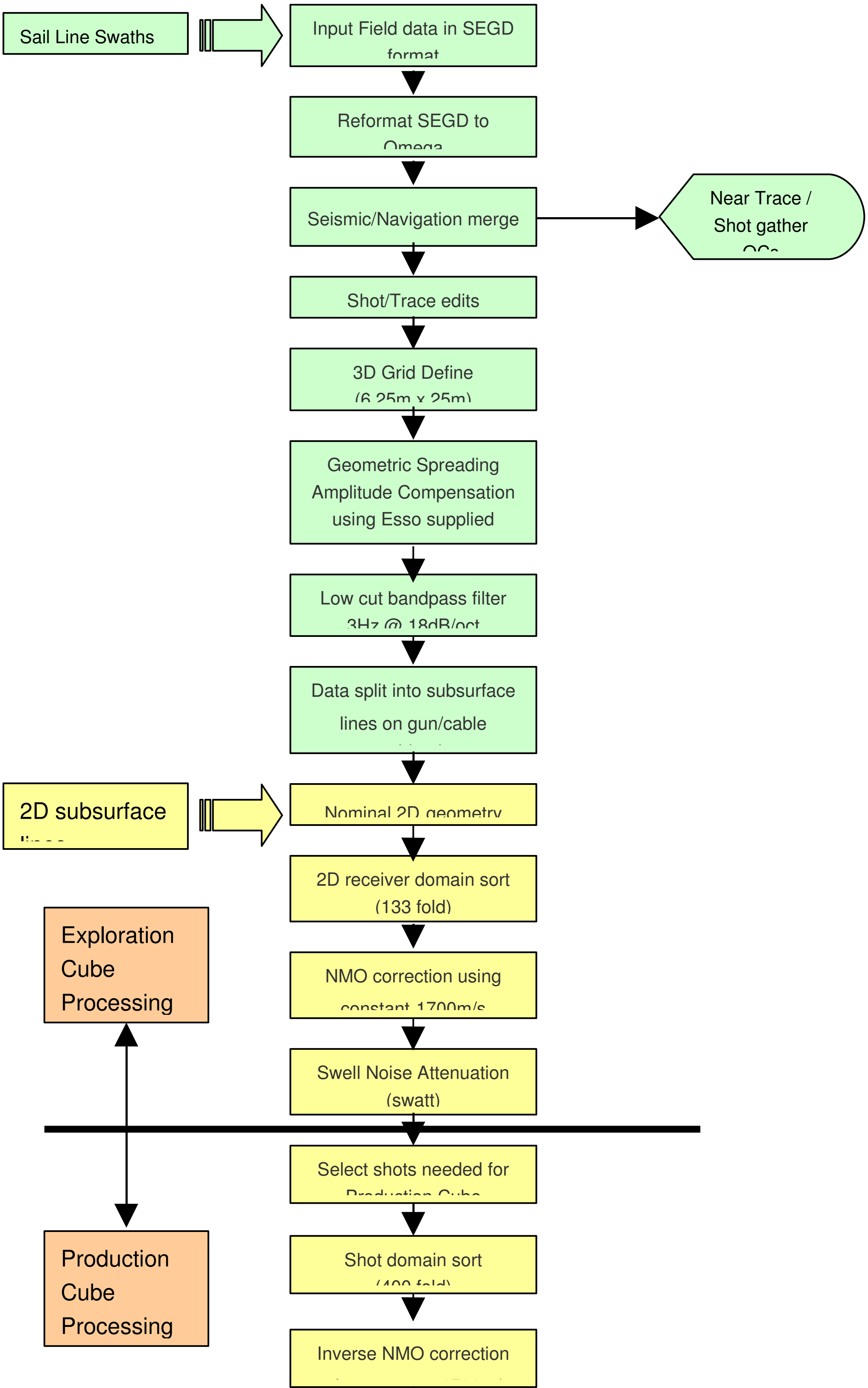
3.0Testing (Depth Processing)

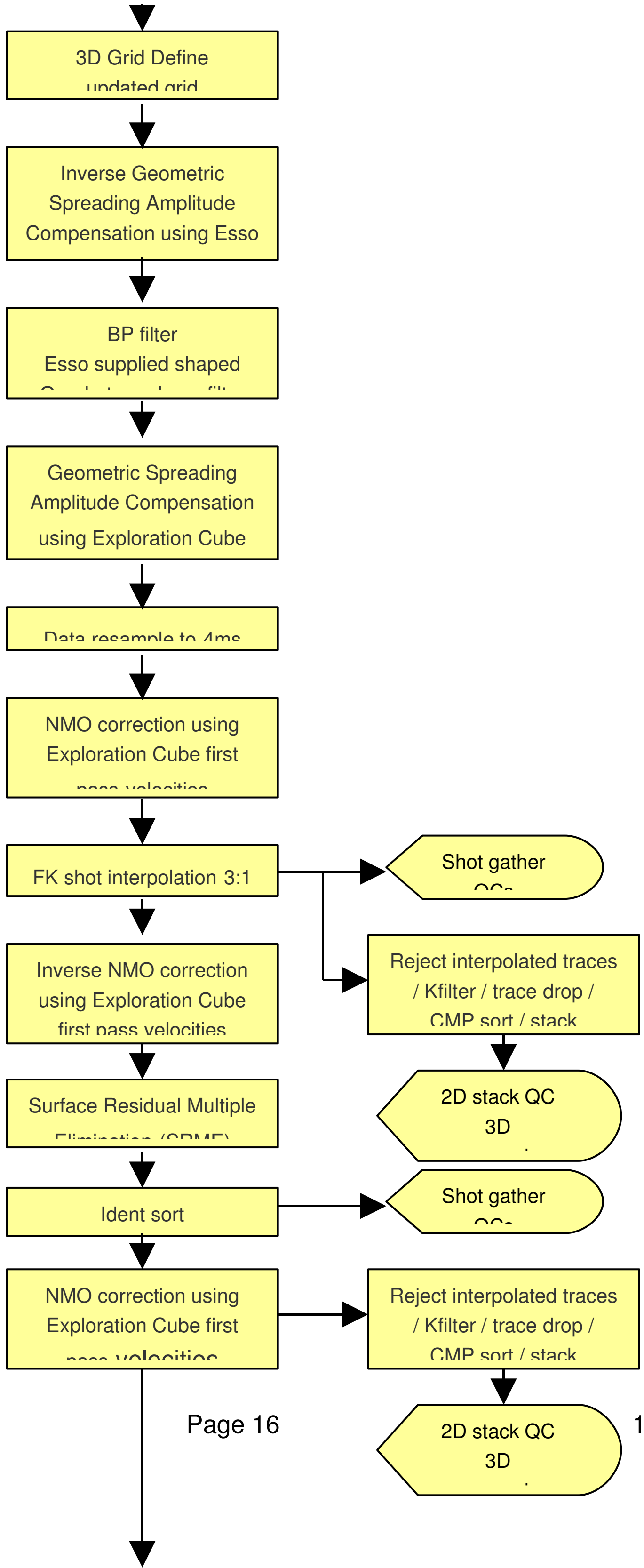
For testing purposes 2 lines, 1248 and 1510 were selected based on their suitability to demonstrate correct parameter selection for the final imaging. Line 1248 passes directly through the Blackback production field, which was the prime imaging target through the processing. Line 1510 is positioned over a secondary, deeper, target at around 5-6 km in depth.

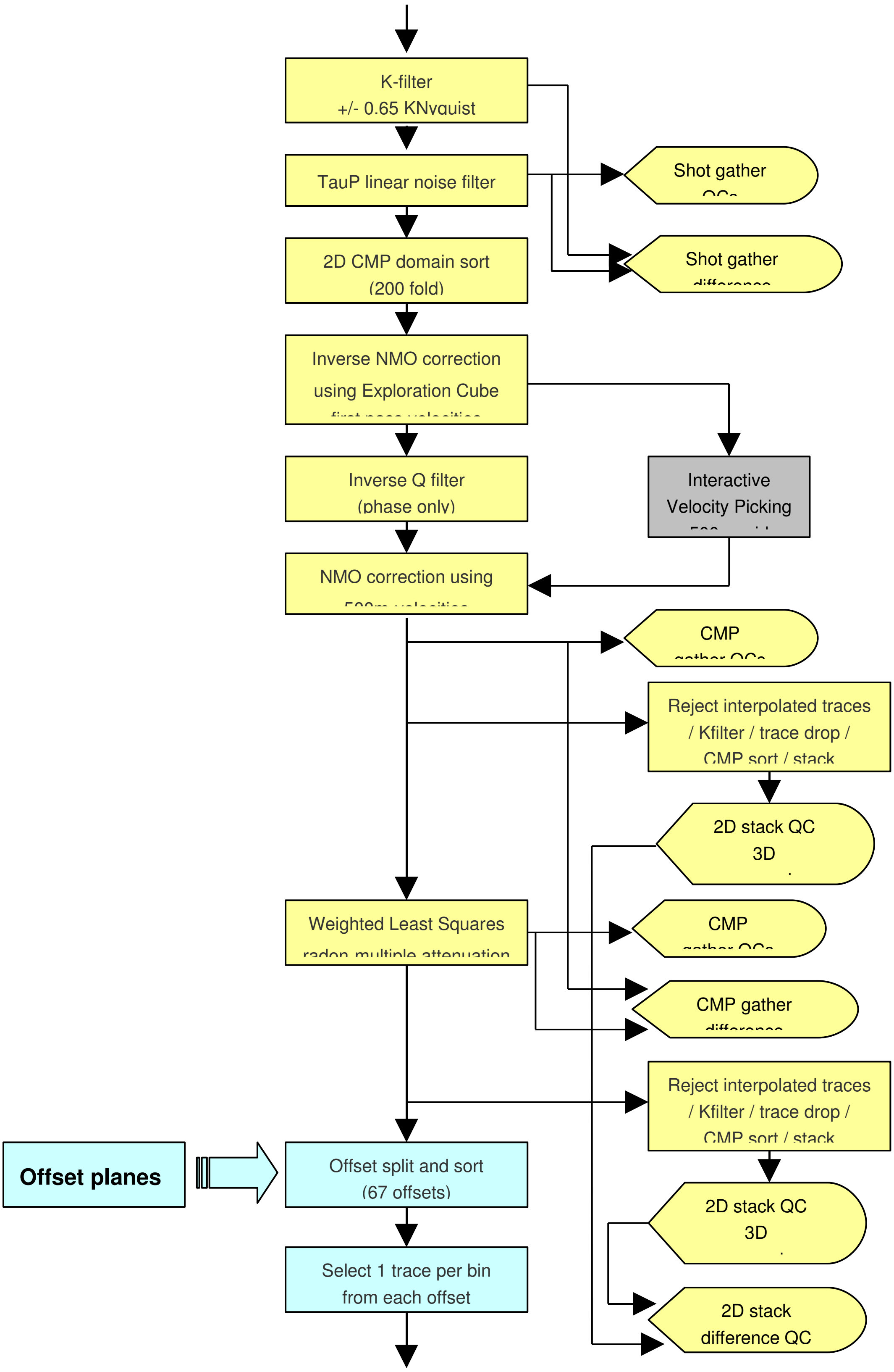
The majority of the testing effort in the depth imaging process was given to producing as accurate a velocity model as possible. During each iteration of the velocity model, tests were run on the tomography parameters, controlling the wavelength of the solution, the velocity damping which controls the rate of change of the vertical velocity, and the picking of the residual moveout on the CIP gathers.

After 3 iterations of the velocity model updating, it was agreed during the mid-project review meeting that running targeted xline migrations during the velocity model building process would be advantageous, as the water bottom depth was very variable in this direction. From this point on, at least one set of targeted xline migrations were output at each tomographic update.

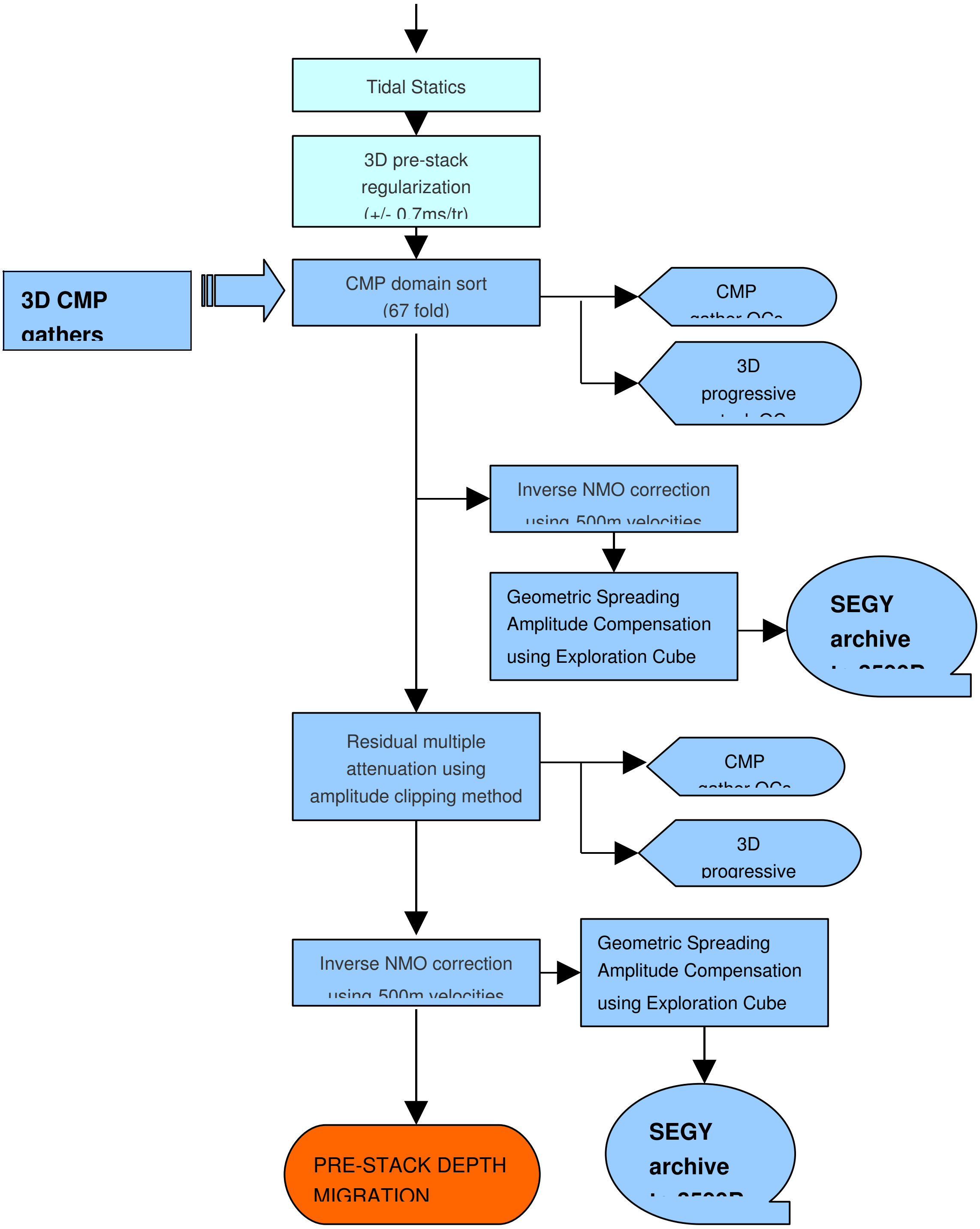
4.0Time Pre-Processing Flow Diagram




3D Grid Define
updated grid
Inverse Geometric
Spreading Amplitude
Compensation using Esso
BP filter
Esso supplied shaped
Geometric Spreading
Amplitude Compensation
using Exploration Cube
Data resample to 4ms
NMO correction using
Exploration Cube first
FK shot interpolation 3:1
Shot gather
Inverse NMO correction
using Exploration Cube
first pass velocities
Reject interpolated traces
/ Kfilter / trace drop /
CMP sort / stack
Surface Residual Multiple
2D stack QC
3D
Ident sort
Shot gather
NMO correction using
Exploration Cube first
velocities
Reject interpolated traces
/ Kfilter / trace drop /
CMP sort / stack
2D stack QC
3D



K-filter
+/- 0.65 KNyquist
TauP linear noise filter
Shot gather
Shot gather
2D CMP domain sort
(200 fold)
Inverse NMO correction
using Exploration Cube
Interactive
Velocity Picking
Inverse Q filter
(phase only)
NMO correction using
CMP
Reject interpolated traces
/ Kfilter / trace drop /
CMP sort / stack
2D stack QC
3D
Weighted Least Squares
CMP
CMP gather
Reject interpolated traces
/ Kfilter / trace drop /
CMP sort / stack
Offset planes
Offset split and sort
(67 offsets)
2D stack QC
3D
Select 1 trace per bin
from each offset
2D stack
difference QC


Tidal Statics
3D pre-stack regularization (+/- 0.7ms/tr)
3D CMP gathers
CMP domain sort (67 fold)
CMP
3D progressive
Inverse NMO correction
Geometric Spreading Amplitude Compensation using Exploration Cube
SEGY archive
Residual multiple attenuation using amplitude clipping method
CMP
3D progressive
Inverse NMO correction
Geometric Spreading Amplitude Compensation using Exploration Cube
PRE-STACK DEPTH MIGRATION
SEGY archive

5.0Time Pre-Processing Sequence (Exploration Cube)

Details of the pre-migration processing flow, in the order that they were applied, are described below. Steps 4.1 through to 4.4 were performed onboard the acquisition vessel and the output data was subsequently shipped to the processing facilities of WesternGeco's Perth office.

5.1 Polarity

Recording polarity was maintained throughout the processing sequence.

5.2 Reformat SEGD to OMEGA

The basic function of the tape transcription process was to reformat field tape data to WG Omega format. The 2 ms 3200 trace demultiplexed data, in SEG-D format, was converted to WG Omega format. Full word, 32 bit floating point data at hydrophone amplitude was maintained.

5.3 Seismic / Navigation Merge

Header information provided by the source/receiver location UKOOA datasets was merged with the seismic data.

5.4 Shot / Trace Data Edit

Records and traces flagged as bad in the observer's logs were edited from the processing sequence

5.5 3D Grid Define

A 6.25 m X 25 m grid was applied to the data using the navigation x-y coordinates

5.6 Geometric Spreading Amplitude Compensation

Time-variant trace scaling functions were applied to the data to compensate for the decay in amplitude resulting from the propagation of a seismic wave from a point source in a layered medium. The functions were calculated from formulae based on the equation:

where V is the rms velocity associated with a reflection arriving at the two-way traveltime, T, associated with shot-to-receiver offset, x.

V_1 (the first velocity in the velocity function) is used as a normalisation factor.

The velocity and traveltime information was varied spatially using a smoothed velocity field.

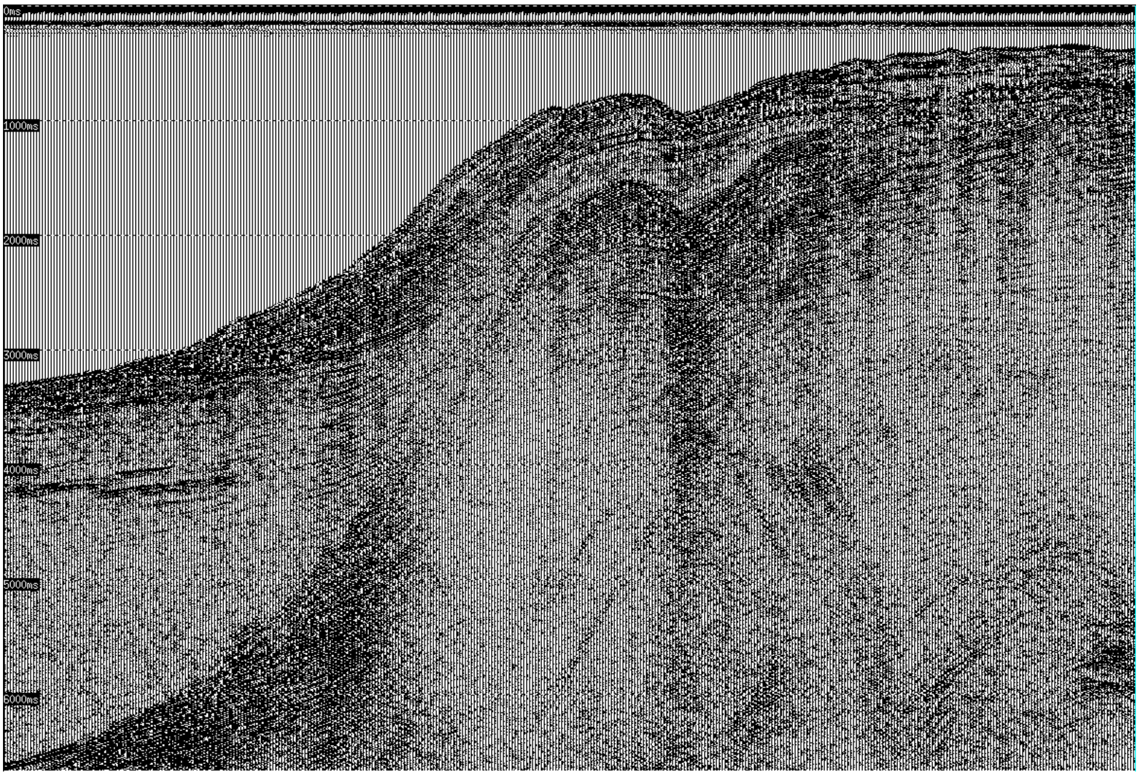
Parameter values:

Example function:

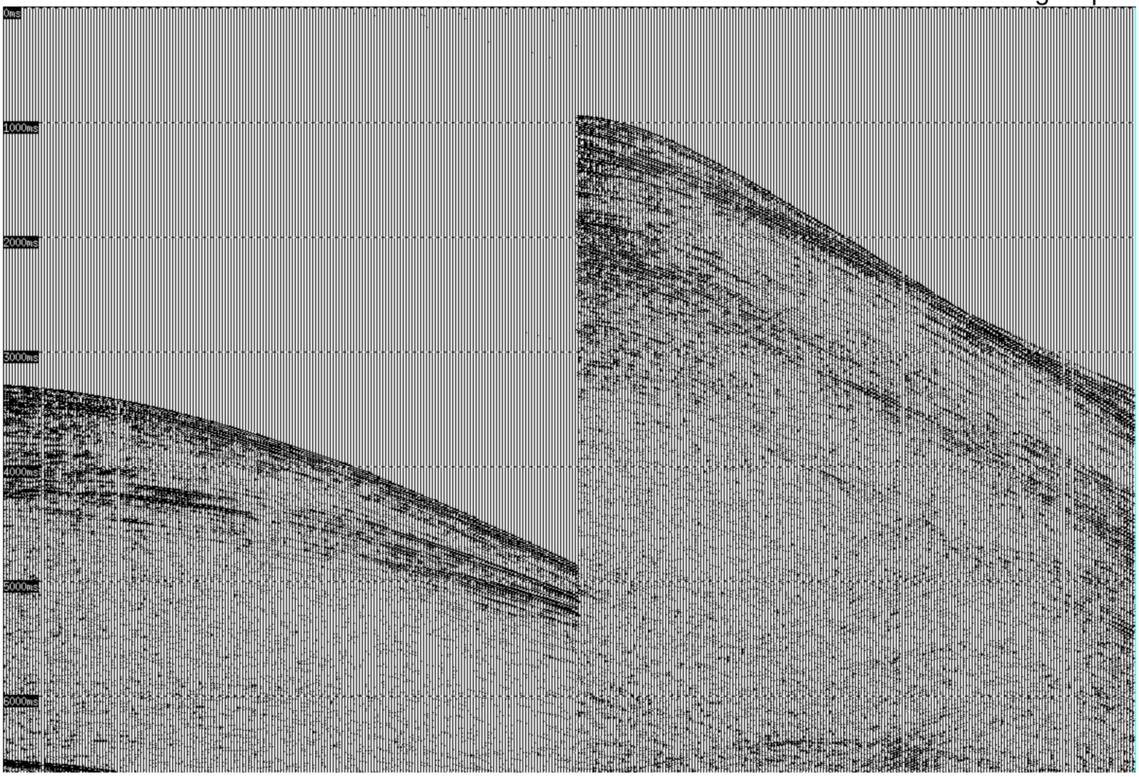
Two-way Traveltimes (ms)	RMS Velocities (m/s)
0	1500
200	2280
400	2459
600	2466
800	2461
1000	2505
1200	2585
1400	2773
1600	3165
1800	3564
2000	3862
2200	4077
2400	4217
2600	4309
2800	4368
3000	4442
3200	4524
3400	4583
3600	4618
3800	4646
4000	4672
4200	4695
4400	4715
4600	4734
4800	4751
5000	4767
5200	4782
5400	4795
5600	4808
5800	4819
6000	4830
6200	4840

6400	4849
6600	4858
6800	4867
7000	4874
7200	4881
7400	4888
7600	4895
7800	4902

Velocity field smoothed over 3 km
Source of velocity field: ESSO regional velocities



Example Near trace gather – geometric spreading gain applied.



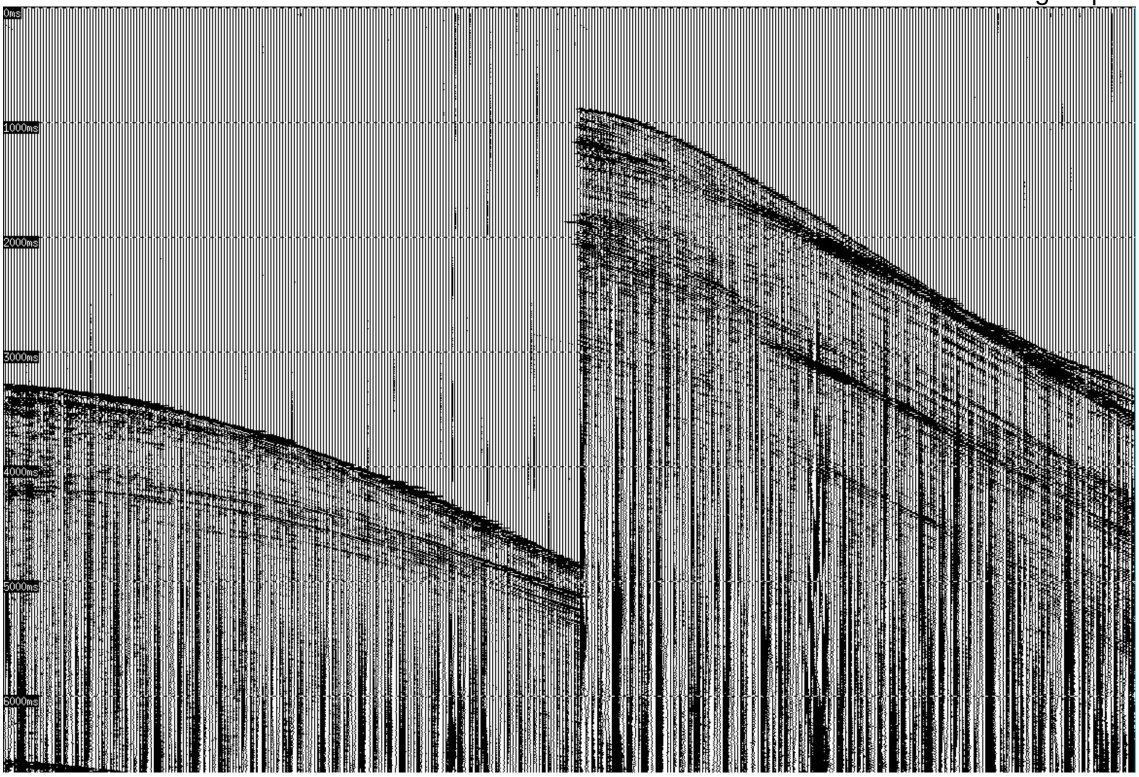
Example shot records – geometric spreading gain applied.

5.7 Low Cut Band-Pass Filter

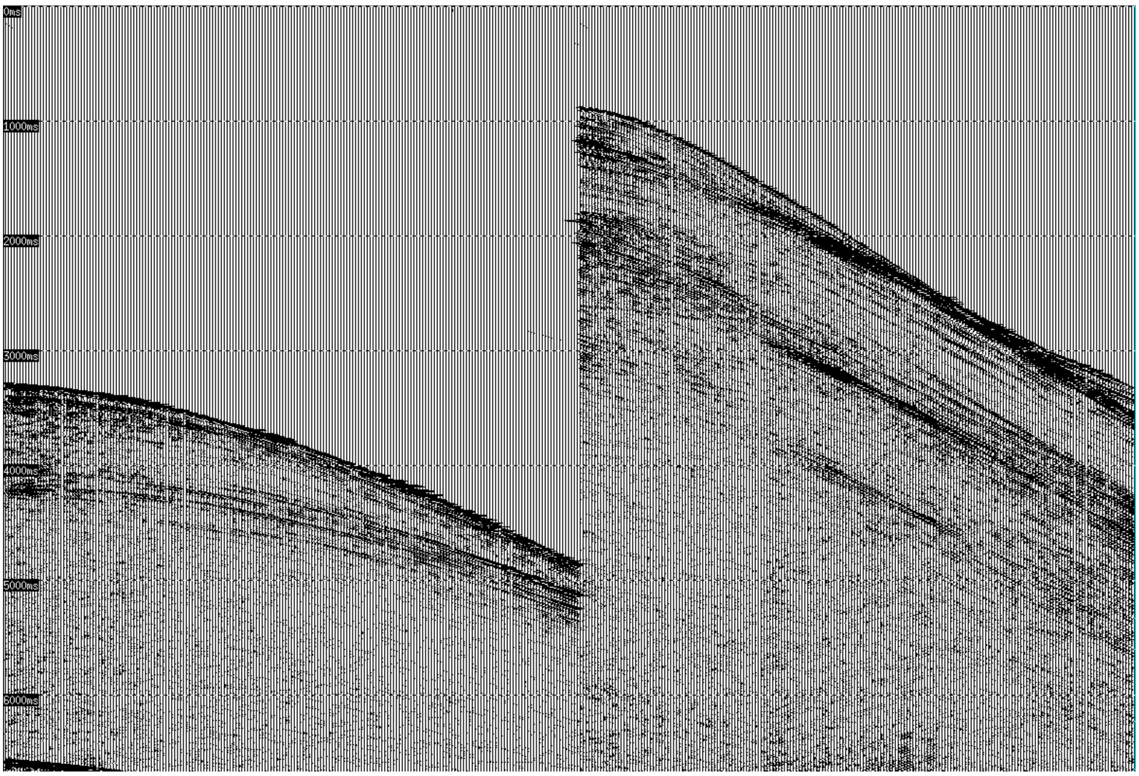
A band-pass filter was described by low- and high-cut frequencies and associated dB/octave cutoff slopes. The specified cutoff frequencies are located at the half-power (-3 dB in amplitude) response points and the slopes at these frequencies are equal to the respective dB/octave values. The slope is an approximate cosine squared function in the amplitude domain. The filter was normalised so that output amplitudes were the same as input amplitudes for frequency components within the passband.

Parameter values:

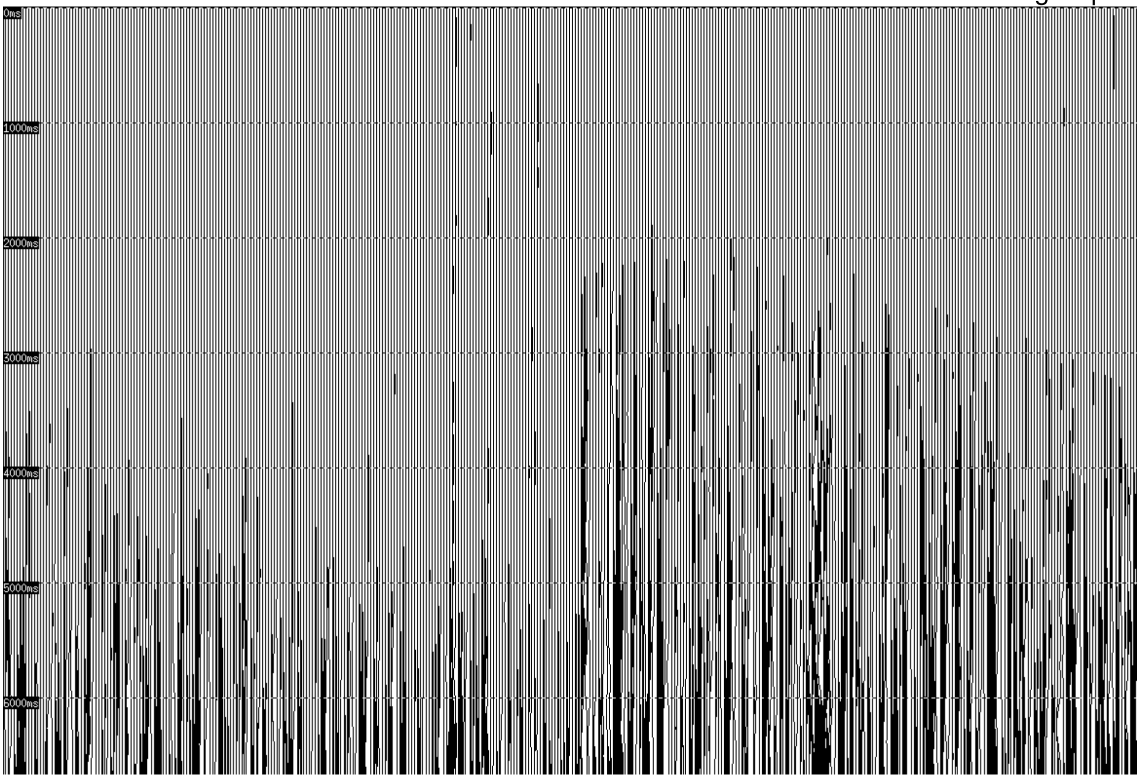
Phase	: Zero
Low-cut Frequency	: 3 Hz
Low-cut Slope	: 18 dB/octave
High-cut Frequency	: Open
High-cut Slope	: N/A



Example Shot records, no low cut filter applied



Example shot records with low cut filter applied (3Hz, 18dB/oct)



Example shot records difference display (+/- low cut filter application)

5.8 Data Split

The acquired swaths of sail line data were split into gun and cable combinations that create individual subsurface lines.

5.9 Nominal 2D Geometry

2D nominal geometry was applied to the subsurface lines assuming simple inline source to detector distances.

5.10 2D Receiver Domain Sort

The 2D subsurface lines were sorted from source gathers to 2D common receiver gathers.

Parameter values:

Input Domain	: Source
Input Fold	: 400

Output Domain	: Receiver
Output Fold	: 133

5.11 NMO Correction

Hyperbolic moveout was applied to the data using a constant velocity of 1700 m/s. This corrected the reflection events to their zero offset position by:

where:

t is the traveltime at offset *X*

is the zero offset traveltime

X is the absolute value of the source-to-detector offset distance

V is the moveout velocity (constant 1700 m/s)

As the input trace samples were moveout corrected, they were stretched across a longer output time, so distorting the original data. The effect of this distortion was limited by limiting the amount of moveout compensation applied to the data according to a limiting stretch value, that is (where this value is represented by the variable N) the output interval was restricted to stretching N/100 times the input interval when the output interval exceeded N% of the input interval.

Parameter values:
Mute:
Limiting Stretch Value : 150

5.12 First Pass Velocity Analysis

Velocity analysis was performed using **WesternGeco**'s Interactive Velocity Processing (IVP) package. At regular intervals across the survey CMP gather data were selected. From this data Multi-Velocity Function (MVF) stacks and velocity semblance values were computed. For each velocity location, MVF data, semblances and gathers are displayed interactively allowing stacking velocities to be interpreted.

The velocities were then qc'ed by the client to check the validity of the picks and any necessary changes made before the velocity field is output. This first pass velocity was picked by the exploration cube processing team inhouse.

Parameter Values:

Analysis Spacing	: 1000 m X 1000 m
Number of CMPs per Analysis (MVF Stack)	: 15
Number of CMPs per Analysis (Semblance Display)	: 6

5.13 Swell Noise Attenuation (SWATT)

Swell noise is caused by data acquisition in rough sea conditions, particularly when the cables are being towed at a relatively shallow depth. SWATT aims to attenuate this noise by transforming the processing gather into the frequency domain and applying a spatial median filter. Frequency bands that deviate from the median amplitude by a specified threshold are either zeroed, or replaced by good frequency bands interpolated from neighbouring traces.

Parameter values:

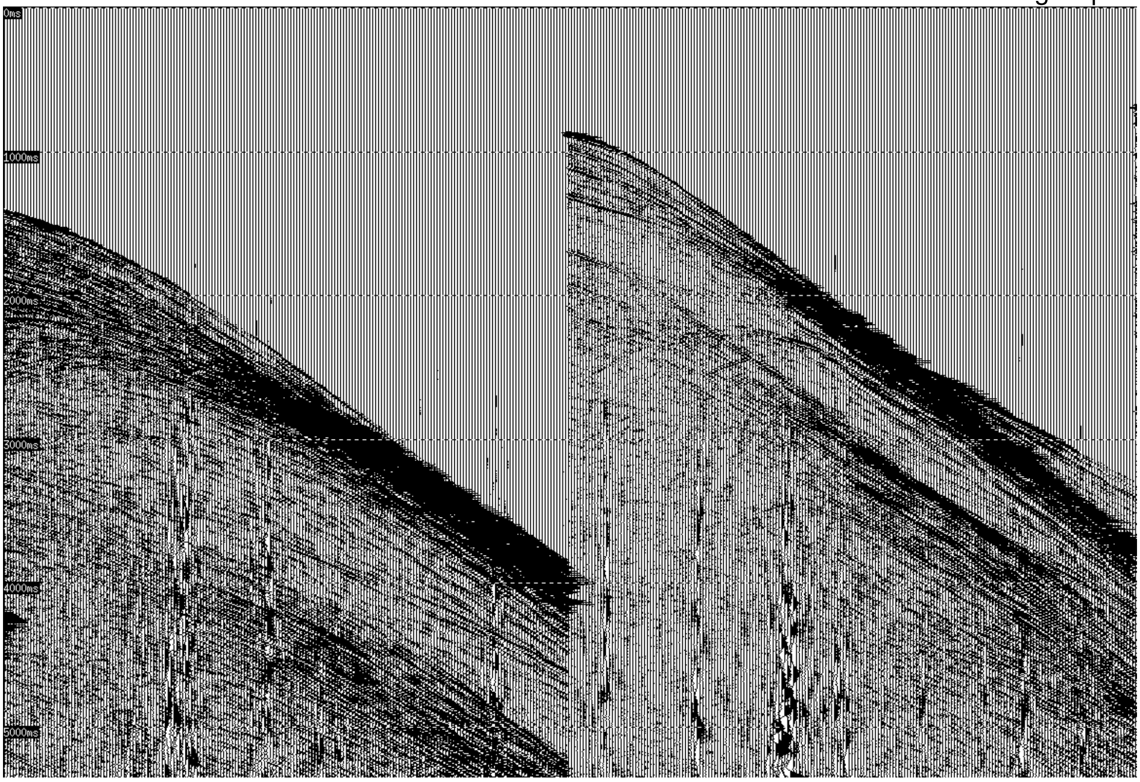
Processing Domain	: Receiver
Width of Spatial Median Filter	: 11 Traces
Frequency Range Processed	: 0 to 10 Hz
Width of Frequency Bands to Process	: 5 Hz

Threshold Values:

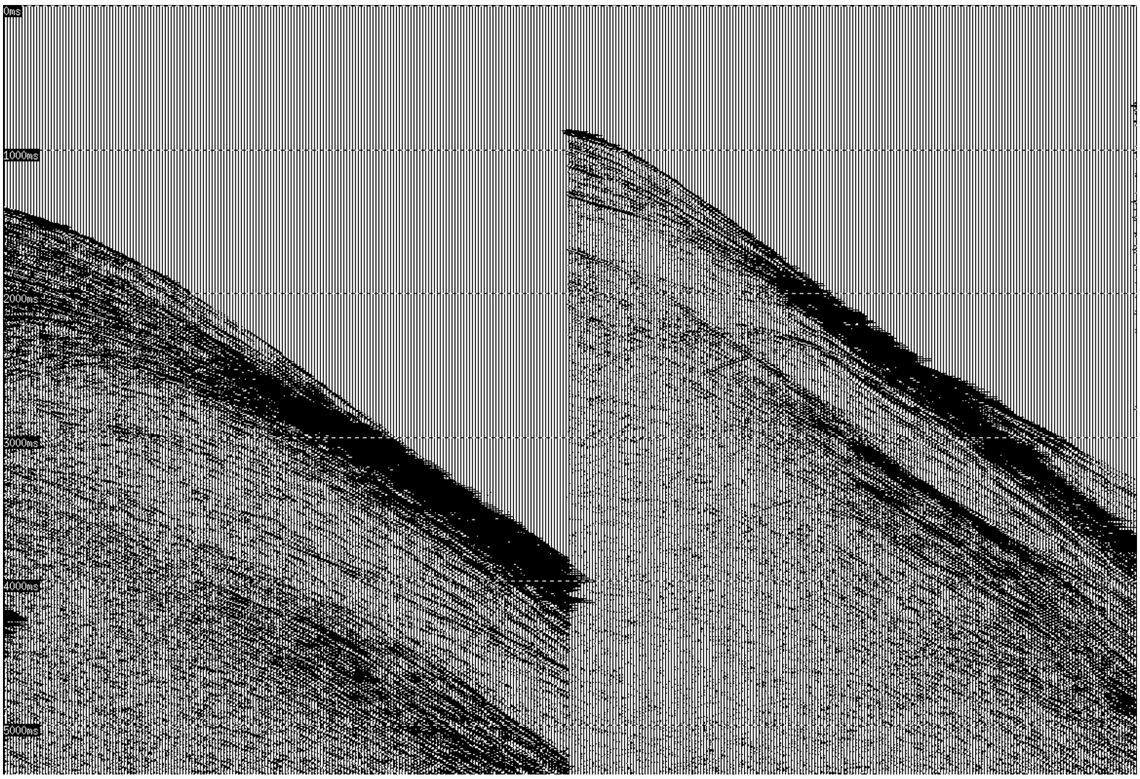
Time (ms)	Threshold (%)
2	400
6656	400

Processing Window:

Offset (m)	Start Time (ms)	Stop Time (ms)
0	2	6656
5220	2	6656



Example shot records before swell noise attenuation (swatt)



Example shot records after swell noise attenuation (swatt)

6.0Time Pre-Processing Sequence (Production Cube)

6.1 SWATT Shot gathers for Esso

A request was received from Esso for Omega format SWATT shot gathers to be sent to their office in Houston for lines 1242-1252 and lines 2323-2333. 10 sail lines either side of the midpoints of these ranges were delivered (ie 1168A-1328A and 2256C-2352C). The Exploration Cube swatt receiver gathers (all subsurface lines) were input and the data was sorted to shot domain. INMO using 1700m/s (see Section 5.4) and inverse geometric spreading (see Section 5.5) were then applied prior to output. As well as the data, copies of the Observers Logs and the Exploration Cube velocity field were required. See **Appendix 8.8.1** for further information.

6.2 Production cube trace select

Swatt receiver gathers were input to the production cube processing. Esso had supplied the full fold extents that were required for the production cube (see **Section 1.0** Introduction for more detail). The shot point ranges were calculated for each sail line and the data was selected on shot point number on input so only data that contributed to the area was processed further.

6.3 Shot Domain Sort

The 2D subsurface lines were sorted from 2D common receiver gathers to source gathers.

Parameter values:

Input Domain	: Receiver
Input Fold	: 133
Output Domain	: Source
Output Fold	: 400

6.4 Inverse NMO Correction

Inverse hyperbolic moveout was applied to the data using a constant velocity of 1700 m/s. This adjusted the zero offset reflection events to the times appropriate for data recorded at a defined, non-zero offset:

where:

t is the traveltime at offset *X*

is the zero offset traveltime

X is the absolute value of the source-to-detector offset distance

V is the moveout velocity

Parameter values:

Mute:
Limiting Stretch Value : 150

6.5 Inverse Geometric Spreading Amplitude Compensation

The Geometric Spreading applied in step 4.6 was removed with the inverse function derived from the same client supplied RMS velocities.

6.6 Deterministic Signature Deconvolution (Quadrature Dephase)

A quadrature phase source signature obtained from ESSO was applied to the data via Deterministic Signature Deconvolution. The signature derived and used for the Exploration Cube had raised some issues concerning the “bubble”. ESSO managed to minimize the energy through shaping and after further testing decided to use this new shaped signature for the Production Cube processing. See **Appendix 8.4** for filter coefficients.

The conversion to minimum phase of the source signature embedded within the seismic dataset is often a prerequisite to the application of spiking or predictive deconvolution. Alternatively, converting the source signature to zero phase can be performed as the first stage in the process of converting the recorded seismic data to zero phase, particularly when long-gapped or no predictive deconvolution is being applied. The objective of ‘Deterministic Signature Deconvolution’ is to obtain an operator that will convert the recorded or modelled far field source signature to its minimum or zero phase equivalent, or to another target wavelet, in this case a quadrature phase wavelet.

In the conventional marine acquisition case, the far field source signature is assumed to be an accurate measure of the down-going source wavelet produced by the airgun array. The source signature can be determined either by measuring the far-field airgun response, or by generating a synthetic signature using known source and array parameters; however, by the time the seismic signal is recorded, the source wavelet has undergone phase and amplitude distortions. Some contributing factors to the distortion of the source wavelet are:

- Source and receiver ghosting

- Earth attenuation, Q
- Hydrophone impulse response
- Recording instrument impulse response

Often, supplied far field source signatures have a number of the above components ‘built-in’. If, however, these components have not been applied but are known or can be determined, then it is possible to apply them to the signature during the signature deconvolution procedure. Commonly, the earth attenuation, Q, is not compensated for during deterministic signature deconvolution, as it is time variant in nature. Processes applied later in the processing sequence, such as predictive deconvolution and inverse Q compensation may be designed to accommodate for this.

An additional process that may be included in the deterministic signature deconvolution procedure is the removal of the airgun bubble pulse. Dependent on the airgun array parameters, the bubble pulse may be observed at some lag-time away from the main energy of the source signature (usually of the order of 100 ms). The bubble pulse has the effect of introducing a ‘ripple’ in the low frequencies of the source signature's amplitude spectrum. The application of a ‘gapped’ deconvolution (using predictive distances of the order of 30 ms to 60 ms) to the conditioned signature has the effect of removing the bubble pulse energy without altering the main energy of the signature, and in turn a smoother amplitude spectrum is achieved.

Where the seismic data has had its sampling interval changed from its recorded interval, the conditioned signature is also resampled to the same interval using the same resampling parameters. Likewise, any other wavelet shaping processes that have been applied to the seismic data are also applied to the conditioned signature.

Having conditioned the recorded or modelled far field source, the resultant wavelet is assumed to be a reasonable measure of the wavelet contained within the near offset, shallow seismic data. Knowing the desired output target wavelet (minimum or zero phase equivalent or some other target wavelet), an operator is derived that will convert the conditioned signature to the appropriate target wavelet. This operator is then applied to the recorded seismic data.

Parameter values:

Far-field Signature	: Determined by ESSO
Desired Output Wavelet :	Quadrature Phase

Coefficients of Signature Deconvolution Operator:

Number of Coefficients	: 401
Sample Index of Time-zero of Operator	: 201
Sample Interval	: 2 ms

6.7 Geometric Spreading Amplitude Compensation

Geometric spreading was re-applied to the data to as described in section 4.6 but using the first pass 1km field picked from the Exploration Cube.

The velocity and traveltime information was varied spatially using a smoothed velocity field.

Parameter values:
Example function:

Two-way Traveltimes (ms)	RMS Velocities (m/s)
0	1500
737	1502
913	1618
1130	1845
1306	2031
1549	2265
1766	2422
1955	2544
2368	2747
2754	2889
3171	3011
4220	3273
5007	3493
5869	3705
6695	3925

Velocity field smoothed over 3 km
Source of velocity field: First pass 1km 3D velocity field (picked from Exploration Cube)

6.8 Data Resample

The data were resampled and an anti-alias filter was applied.

Parameter values:

Input Trace Length	: 6656ms
Output Trace Length	: 6656ms
Input Sampling Interval	: 2ms
Output Sampling Interval	: 4ms
Antialias Filter:	
Phase	: Zero

Cutoff Frequency	: 100Hz
Cutoff Slope	: 36dB/octave

6.9 NMO Correction

Hyperbolic moveout was applied to the data using the first pass 3D velocity field picked from the Exploration Cube data as described in section 4.11.

Parameter values:

Mute:
Limiting Stretch Value : 200

6.10 Pre-stack Shot Interpolation (2.5 D)

Input 2D source gathers are read and stored in the form of a cube where the x direction is receiver station number, the y direction is shot station number and the third direction is time. Interpolated shot gathers are then created by a '2.5 D' interpolation.

The cube of data is windowed in all 3 directions to create sub-volumes within which the interpolation takes place. These sub-volumes are overlapped to allow for blending of the interpolation results. This is done in order to conform to the premise of the algorithm that seismic events are linear or planar within each sub-volume.
NMO is also applied prior to interpolation to further conform to this assumption

In the '2.5 D' method, interpolation is then only carried out in the shot (or common detector) direction, after Fourier transform to the f-x-Ky domain. The operator used is then an average for all the receivers in the time-space window, which should produce more reliable operators than a simple 2D receiver domain interpolator.

Parameter values:

Input source spacing	: 37.5 m
Output source spacing	: 12.5 m
Time window length	: 512 ms
Time overlap	: 256 ms
Maximum dip	: 40 ms/trace
Window width in the detector direction	: 20 traces
Window width in the source direction	: 20 traces

Window overlap in the detector direction	: 6 traces
Window overlap in the source direction	: 6 traces

6.11 Inverse NMO Correction

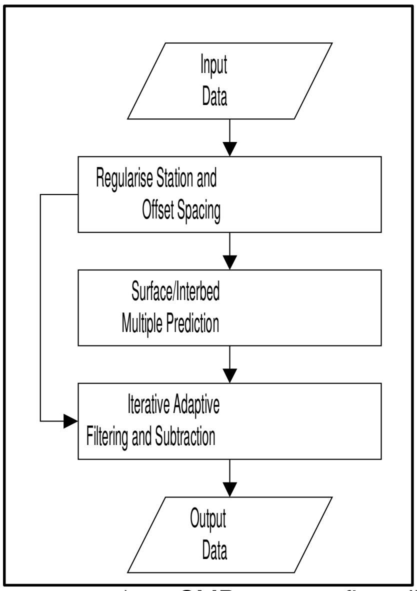
Inverse Hyperbolic moveout was applied to the data using the first pass 3D velocity field picked from the Exploration Cube data as described in section 5.4.

Parameter values:

Mute:
Limiting Stretch Value : 200

6.12 Surface Residual Multiple Elimination (SRME)

By definition, the raypath for every surface multiple includes a downward reflection at the surface, and can therefore be decomposed into an event which is not a surface multiple, and a lower order surface multiple by breaking the raypath at the downward reflection point nearest to the source. Combination of these two events using a Kirchhoff integral operator provides an accurate prediction of the surface multiple without requiring a velocity or structural model. This approach can be extended to allow prediction of interbed multiples by supplying pick times for the primary event that generates the multiples to be predicted.
The prediction can be done entirely from the multiple contaminated data themselves, though it is necessary to iterate the process as a consequence of not having an initial multiple-free dataset. It is also necessary to deconvolve the source wavelet from the predicted multiples after each iteration and hence an estimate of the source wavelet is required.



The algorithm requires that the input data have uniform station spacing and uniform offset distribution down to zero offset. Therefore it is often necessary to pre-condition the data to achieve this prior to running SMP (surface multiple prediction). The prediction can be done in 2-D or 1-D, with the 2-D results being theoretically more accurate in the presence of inline dip. However the 1-D results suffer less from end-of-line effects, and pose less stringent geometrical constraints, requiring only that the offset distribution within each gather be regular.

Once the multiple model has been generated, an adaptive matching filter is applied to the model to improve the match with multiples corresponding to those predicted by the SMP process (see SMP process flow diagram).

Parameter values:

Modelling mode : 1-D
Predict surface multiples : Yes
Predict interbed multiples: No

Minimum frequency : 0 Hz
Maximum frequency : 90 Hz

Station interval : 12.5 m
Source signature : Supplied Esso shaped quadrature phase signature modified by filters used during processing

6.13 Adaptive Filter and Subtract

In many situations we have noise contaminated data and attempt to make an estimate of the noise those data contain. However, the noise estimate contains small amplitude, timing or phase errors, which may be slowly time and/or space variant. Filtering the noise to improve the match with the input data before subtracting it can greatly improve the noise attenuation.
Given two time series, it is possible to construct a filter that makes the best possible match, in a least-squares sense, between the two series. The adaptive filtering process generates a series of time- and spatially-varying matching filters that adapt as the characteristics of the time series change. It is often necessary to iterate though the matching process using progressively smaller windows to arrive at the optimum match.

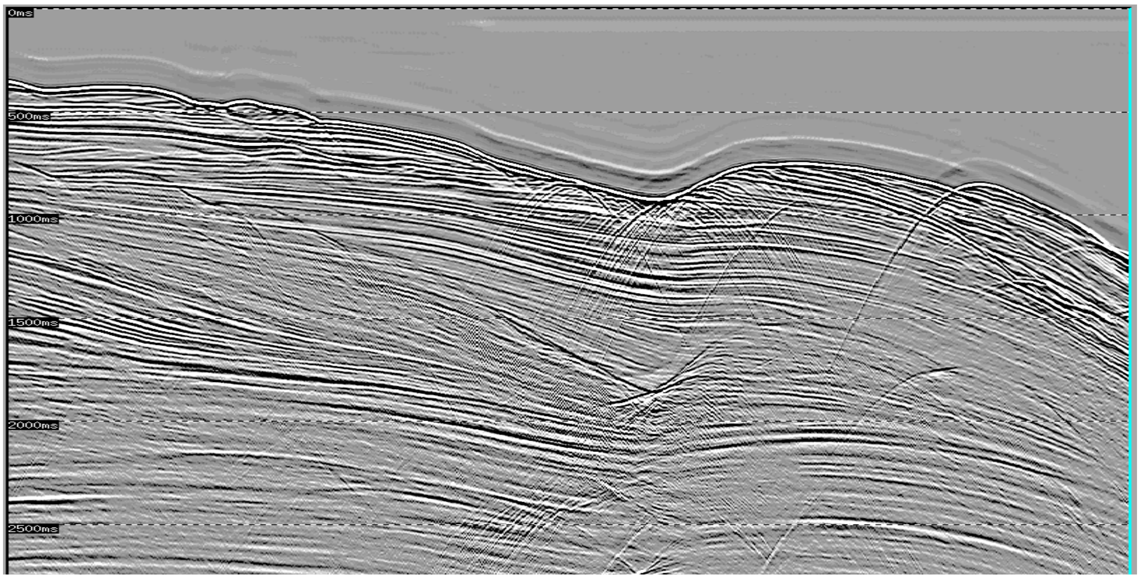
Parameter Values:

Number of iterations : 1

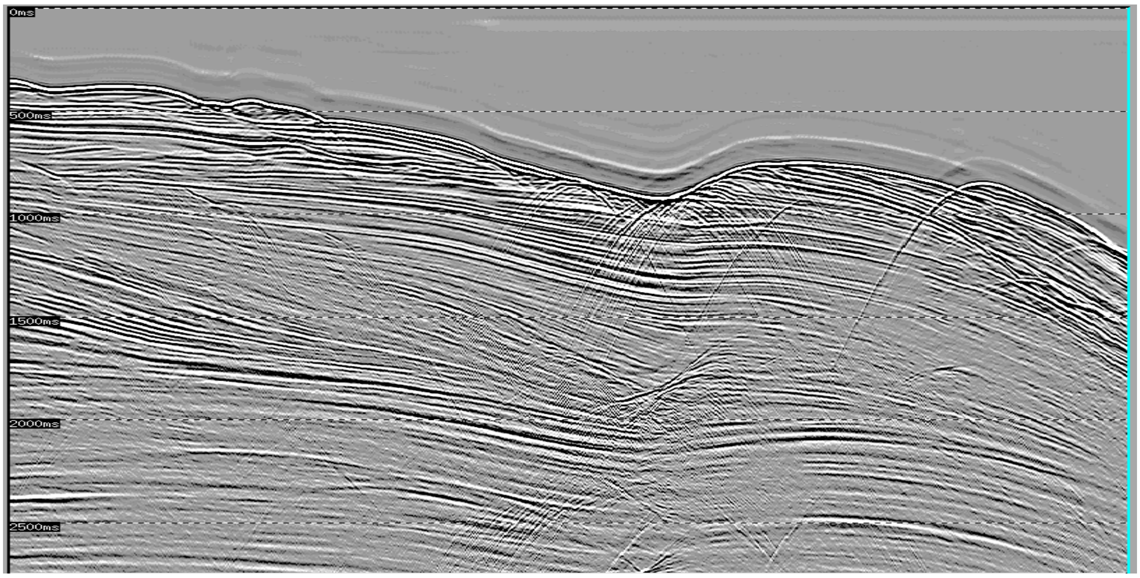
	Design Window Length (ms)
	Design Window Width (traces)
	Match Filter Length (no. of samples)
Iteration 1	256

720
31

The data were sorted into 'supershots' just for the subtraction process. The design window width of 720 traces equates to using 10 offsets from 72 shots.



Example stack without SRME applied



Example stack with SRME applied

6.14 NMO Correction

Hyperbolic moveout was applied to the data using the first pass 3D velocity field picked from the Exploration Cube data as described in section 4.11.

Parameter values:

Mute:
Limiting Stretch Value : 200

6.15 K-Filter

A seismic section such as a shot gather, CMP gather or stack section is a two-dimensional array of samples representing the amplitude of the seismic signal as a function of reflection time (t) and trace position (x). A Fourier transform can be used to convert trace position to the spatial frequency or wavenumber (k) domain. The filter can then pass a specified range of wavenumbers and a taper also applied to the filter boundaries to smooth the transition between the pass and the reject regions.

Later in the processing sequence, due to the application of K-filtering, the shot records can be reduced in size by dropping alternate traces (however for this survey a decision was made to keep all traces until the binning stage). Consequently, the k-filter was chosen to act as an anti-aliasing filter in the wavenumber domain, attenuating energy that would otherwise have become aliased when the trace separation was doubled by the dropping of alternate traces.

For convenience, the k-filter was implemented in the f-k domain. A 2-D Fourier transform was used to convert trace position to the wavenumber domain and reflection time to the frequency (f) domain. After implementation of the k-filter the data were inverse Fourier transformed back to the t-x domain. The input data is NMO corrected source gathers.

Prior to the f-k transform, a data dependent scaling was applied to the data (AGC). This has the effect of reducing the impact on the transform of high amplitude events, particularly at the edges of the gather. After transformation back to the t-x domain the inverse of the scaling was applied, so largely preserving relative amplitudes.

Parameter values:

Input Shot Records	: 400 traces
High Wavenumber Cutoff	: +/-0.65 of k-Nyquist (relative to input trace separation)
Taper	: 0.1 of k-Nyquist (centred on the high wavenumber cutoff)
AGC	: 120 ms

6.16 Tau-p Linear Noise Filter

To eliminate linear noise within the data, the NMO corrected source gathers were transformed into the Tau-p domain where unwanted linear noise was removed by muting. The resulting signal only Tau-p gathers were then subtracted from the original Tau-p gathers to produce noise only Tau-p gathers which were then transformed back to the T-X domain. The noise only T-X gathers were subtracted from the original input gathers to result in noise filtered NMO corrected gathers.
This convoluted description of double subtraction (in the Tau-p and then the T-X domain) is based on the principal of only modelling the unwanted signal and not allowing the primary signal to be transformed into Tau-p space. This is due to the imperfection of the radon transform that will never return 100% of Tau-p transformed data back to T-X space.

During processing of the Exploration Cube, the linear noise filter used a single mute in the taup domain to remove the noise. After processing it was noted that the results differed depending on the shooting direction and lines shot in one direction still had some residual linear noise energy. The data for the Exploration Cube was then sorted to receiver domain and the process repeated to remove the remainder of the noise. To avoid having to do this extra processing on the Production Cube, 2 symmetrical mutes were applied in the taup domain after a larger moveout range had been transformed to remove the noise from the shot gathers. Test results had shown that this method gave comparable or better results to the 2 pass method used for the Exploration Cube.

The Tau-p transform was as follows:

Parameter values:

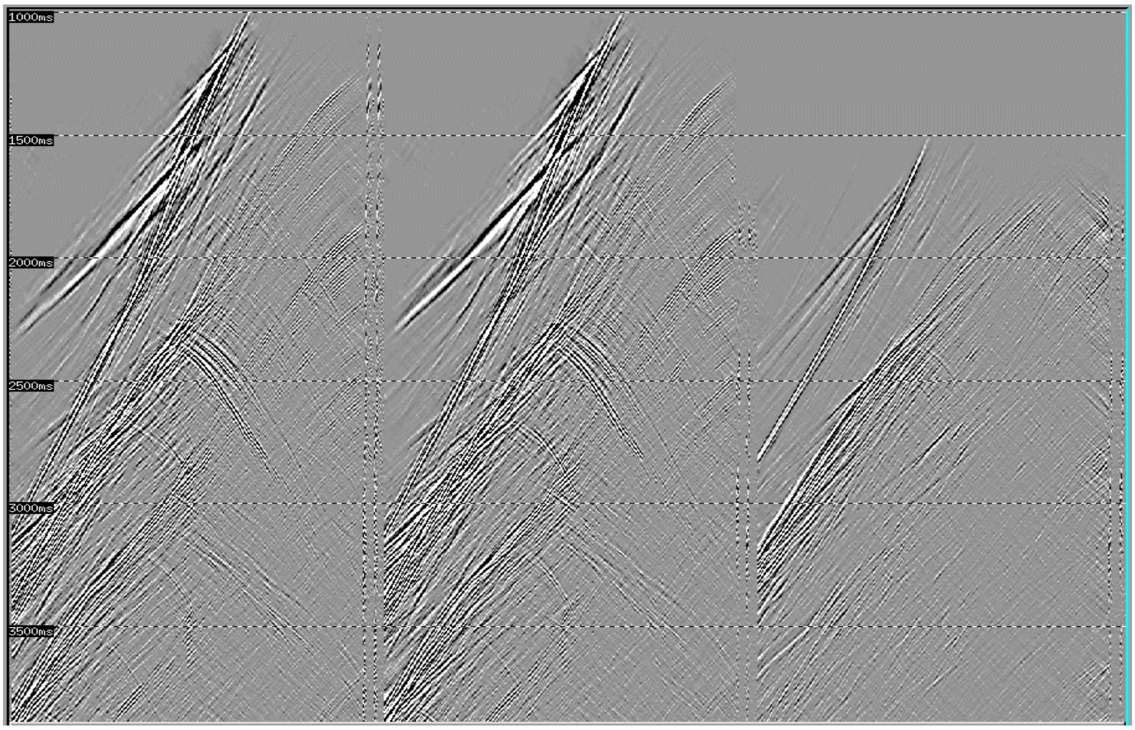
Method	: Linear Noise Modelling
Number of p-traces	: 480
Transform Type	: Linear
Reference Offset	: 5184 m
Moveout at Reference Offset – Lower Limit	: -3000 ms
Moveout at Reference Offset – Upper Limit	: 4000 ms
Maximum Frequency	: 125 Hz

Taper Zone Length: 64ms (prior to the mute times detailed below)

Water Bottom Time (ms)	P Trace (delta-t ms) MUTE #1	P Trace (delta-t ms) MUTE #2	Mute Time (ms)
300-500	560	-560	6500
	620	-620	6000
	740	-740	5000
	860	-860	4000
	990	-990	3000
	1110	-1110	2000
	1230	-1230	1000
	1360	-1360	500
	2900	-2900	4

	4000	-3000	4
1200	840	-840	6500
	870	-870	6000
	940	-940	5000
	1050	-1050	4000
	1220	-1220	3000
	1400	-1400	2000
	1550	-1550	1000
	2320	-2320	500
	2900	-2900	4
	4000	-3000	4
1800	1000	-1000	6500
	1050	-1050	6000
	1150	-1150	5000
	1260	-1260	4000
	1430	-1430	3000
	1860	-1860	2000
	2450	-2450	1000
	2770	-2770	500
	3120	-2980	4
	4000	-3000	4
3200	1550	-1000	6500
	1600	-1100	6000
	1700	-1300	5000
	1800	-1500	4000
	2000	-2000	3000
	2200	-2220	2000
	2650	-2280	1000
	3000	-2600	500
	3300	-2980	4
	4000	-3000	4

Note: Mute times were interpolated between the specified P-traces.
Mute times were interpolated between the specified water bottom times and extrapolated larger than the last time and smaller than the first time.



Example shots showing difference between data
before and after application of tau-p linear noise filter.

6.17 2D CMP Sort

The data volume was sorted from 2D shot gathers to 2D common midpoint gathers.

Parameter values:

Input Domain	: Source
Input Fold	: 400
Output Domain	: CMP
Output Fold	: 201 (due to shot interpolation)

6.18 Inverse NMO Correction

Inverse hyperbolic moveout was applied to the data using the first pass 1km Exploration Cube 3D velocity field as described in section 5.4.

Parameter values:

Mute:
Limiting Stretch Value : 200

6.19 500m Velocity Analysis

Velocity analysis was performed using **WesternGeco**'s Interactive Velocity Processing (IVP) package. At regular intervals across the survey CMP gather data were selected. The interpolated traces were rejected, as were alternate gathers to output 67 fold CMP gathers on a 12.5m CMP interval. From this data Multi-Velocity Function (MVF) stacks and velocity semblance values were computed. For each velocity location, MVF data, semblances and gathers are displayed interactively allowing stacking velocities to be interpreted.

The velocities were then qc'd by the client to check the validity of the picks and any necessary changes made before the velocity field is output. This first pass velocity was picked by the production cube processing team inhouse.

Parameter Values:

Analysis Spacing	: 500m X 500m
Number of CMPs per Analysis (MVF Stack)	: 15
Number of CMPs per Analysis (Semblance Display)	: 6

The velocity field was archived to 3590B and exabyte tape as SEGY-Y format traces on a 100m grid. See **Appendix 8.8.4** for further details.

6.20 Inverse Q-Filter

To compensate for the earth Q-filter, that is, attenuation of higher frequencies and the frequency dependent variation of propagation velocity, a time-variant compensation was applied using an algorithm based on the Futterman frequency-constant Q model of earth attenuation.

Parameter values:

Compensation Type	: Phase Only
Q Value	: 100
Central Frequency	: 35 Hz
Start Application	: Water Bottom Time
Source of Q Value	: ESSO

6.21 NMO Correction

Hyperbolic moveout was applied to the data using the Production Cube's 500m 3D velocity field.

Parameter values:

Mute:
Limiting Stretch Value : unlimited

6.22 Weighted Least Squares Radon Multiple Attenuation

Radon Multiple Attenuation is principally a modelling and subtraction process. CMP gathers are transformed to the Radon (tau-p) domain, unwanted coherent noise is isolated in this domain, transformed back to the time-offset (t-x) domain, and then subtracted from the original data. The transform separates events according to moveout (or velocity), and hence multiple energy can be isolated in the tau-p domain (by means of a mute) provided it has a different velocity to that of the primaries.

Effective separation of coherent signal (primaries) and noise (multiples) requires that both are adequately focused in the Radon domain. Conventionally this is achieved in two steps. For a parabolic Radon transform, the first step is to condition coherent signal and noise events such that their moveout is approximately parabolic, and their amplitude and phase are approximately constant across all offsets. The second step is to apply a geometry compensation filter during the transform, which attempts to reduce artefacts caused by the input gather geometry. A least-squares geometry compensation filter requires the moveout range for the transform to be adequate to model all coherent events. The transform minimises the difference between the input and the forward and reverse transformed data (the residual) and if a significant amount of coherent energy lies outside the modelled moveout range, artefacts will result.

Weighted Least-Squares Radon transforms seek to improve the focusing of events in the Radon domain over that provided by the conventional transform. Prior information (derived from the data themselves) is used to create weights that improve the sparseness of the transform domain whilst still modelling all of the data. Improved focusing in the Radon domain improves identification and separation of signal and noise trends, with reduced artefact levels. For multiple attenuation, improved focusing allows the Radon domain mute to be moved closer to the primary events than with the conventional transform, and primary and multiple events with very little moveout discrimination can be separated.

Weighted Least-Squares Radon transforms can also reduce artefacts caused by data aliasing. Aliased input data lead to dispersed energy in the transform when a conventional transform is used. The weights for the weighted transform are derived in such a way that they are only significant in the correct (un-aliased) parts of the transform domain. Consequently high frequencies that would be free to alias in the conventional transform tend to model in the correct part of the weighted transform domain. This improved handling of aliased data may be sufficient to remove or reduce the level of interpolation that would be required by a conventional transform.

In Radon Multiple Attenuation, an estimate of the stacking velocity field, V_s is required.

CMP gather data are conditioned prior to the transform. Typically the gathers are moveout corrected with velocity $V_{s,}$ which ideally results in flattened primary reflections and under corrected multiples. For convenience we refer to over-corrected data as having negative dip (decreasing time with increasing offset), under-corrected data as having positive dip (increasing time with increasing offset) and flat data as having no discernible change in time with offset. The amplitudes may also be preconditioned, for example by using a reversible AGC.

The data are then transformed into the tau-p (Radon) domain using a parabolic Radon transform. After hyperbolic normal-moveout (or higher-order moveout correction), residual moveout has an approximately parabolic shape and hence a parabolic Radon transform is appropriate.

The range of moveouts to transform, measured in ms at a reference offset (X_{ref}), is chosen to cover the range of both primary and multiple energy.

Following this, a curve is defined based on moveout to separate the tau-p domain into 2 areas representing primary and multiple energy and the primary energy is zeroed whilst the multiple energy is preserved. The boundary between the zeroed and preserved regions is tapered in the p direction.

Inverse tau-p transform and removal of the pre-transform conditioning produces a model of the multiple energy. This is subtracted from the original data to produce the multiple-attenuated output.

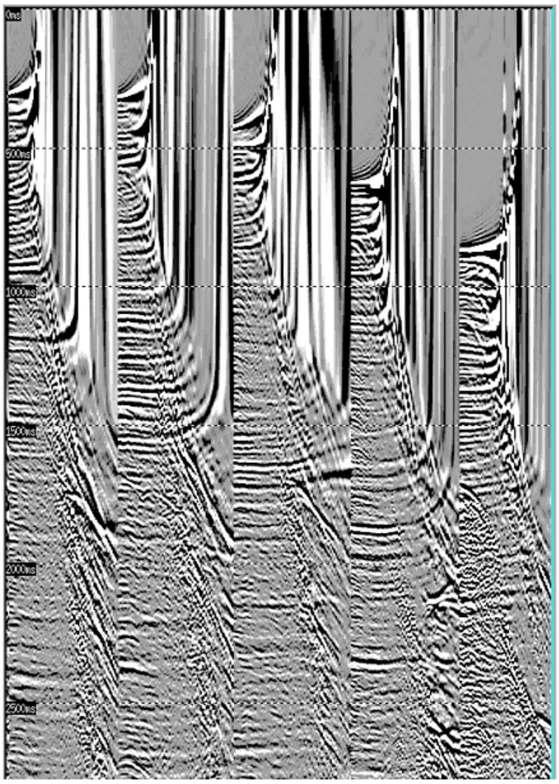
To preserve energy at the water bottom, the multiple energy model was muted about WB*1.5 prior to subtraction.

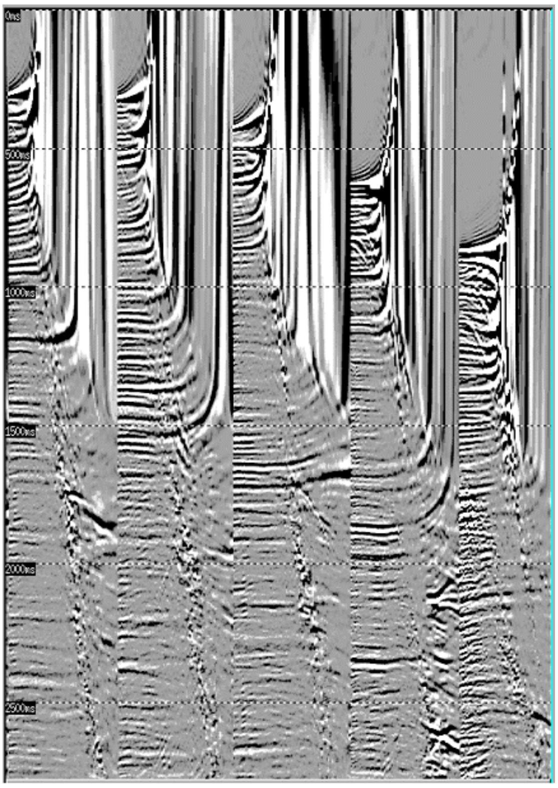
Parameter values:

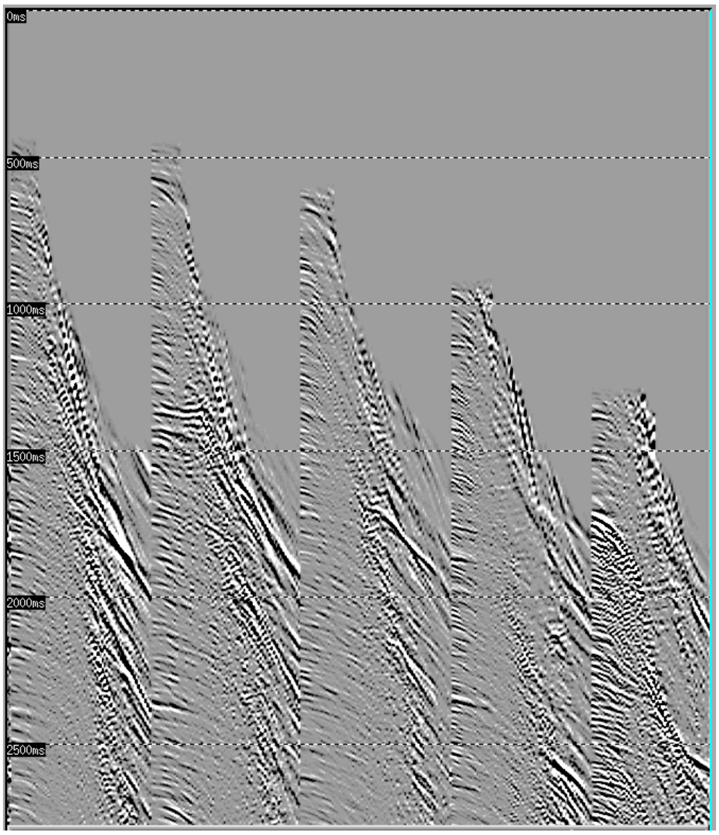
Pre-transform conditioning	: NMO with primary velocity, 500ms AGC
Reference offset(X_{ref})	: 5200m
Moveouts (Δt) at the reference offset (X_{ref}):	
Minimum moveout (i.e. for the first p-trace)	: -1500ms
Maximum moveout (i.e. for the last p-trace)	: 3500ms
Number of p-traces generated	: 468
Frequency range of multiple model	: 0-125 Hertz

Minimum moveout defining primary energy : -1500ms
Maximum moveout defining primary energy : 225ms

Note: Moveouts used in making intermediate p-traces were linearly interpolated between the minimum and maximum moveouts.


Example CMP gathers, no radon demultiple applied


Example CMP gathers, radon demultiple applied



Example cmp gathers showing difference between data before and after application of radon demultiple.

6.23 Offset Split

The weighted least-squares radon CMP gathers were split into 67 offset/CMP ordered gather data sets.

6.24 3D Grid Define

A 6.25 m X 25 m grid was applied to the data using the navigation x-y coordinates
See **Appendix 8.3** for grid details.

6.25 Trace decimation

One trace per CMP was selected for each offset based on the closest trace to the bin centre. Traces were weighted away from the bin centre if it was from a CMP gather with less than 100 fold (SRME doesn't work in taper zones), if it was an interpolated trace or if it was from a CMP that contained more than 10 dead traces.

6.26 Tidal Statics Application

WesternGeco supplied a tidal height predictions table for the survey location. Static corrections were calculated from these tide prediction table with 1500 m/sec water velocity and were updated into the trace headers and applied. The tidal static corrections for the survey were found to be less than 0.5ms.

6.27 3D Prestack Regularisation

This process is a seismic interpolation and regularisation tool for prestack 3D data that are irregularly sampled in space. It provides an improved method of regularising 3D fold of coverage relative to the conventional flex binning approach of copy and move employed to fill gaps in coverage. The process also allows for the prestack regularisation of traces to move them (via interpolation) to their respective cell-centre positions.

In partial regularisation, the original data remain unaltered and traces are only interpolated to fill empty cells. Such partial regularisation can be useful prior to Prestack Time or Depth Migration where irregular subsurface fold can result in undesired amplitude variations.

Each interpolated output trace was calculated from a cluster of nearby input traces using adaptive interpolation. An optional dip map was computed to guide the interpolation and thus enable it to handle steeply dipping events. At each sample, the data were scanned over a range of dips to determine the local dominant dip. The dip-search was accomplished by computing the unnormalised semblance (correlation) between nearby traces for the range of dips of interest; peaks in the semblance indicate local dominant dips.

The interpolated trace was then constructed by a weighted sum of input traces along the local dominant dip for each output sample.

The interpolation process was performed on common offset planes using a time-space (t-x) sinc interpolation that adapted to the local input cluster density and dominant dip.

Limits were set for the maximum number of traces in an output cell. To accomplish this, redundancy editing was applied prior to the pre-stack regularisation and the trace closest to the cell centre was kept (see section 5.24).

After pre-stack regularisation any trace that is interpolated more that 150m is rejected.

Parameter Values:

Operation Mode	: Infill holes / Trace Regularisation
Maximum no. of traces in output cell	: 1 (per offset plane)
Sinc Interpolation length (inline x crossline)	: 5 x 5
Number of Dip Scans	: 11
Dip Range	: +/-0.7ms/trace
Correlation Width	: 31 traces
Correlation Length	: 50ms

6.28 Data Decimation

The data volume was decimated by selecting alternate CMPs.

6.29 3D Grid Define

A 12.5m X 25m grid was applied to the data using the navigation x-y coordinates.
See **Appendix 8.3** for grid information.

6.30 3D CMP Sort

The data volume was sorted from 67 offset gathers to 3D common midpoint gathers.

Parameter values:

Input Domain	: Offset
Input Fold	: variable, 1 trace per bin over whole area
Output Domain	: CMP
Output Fold	: 67 nominal

6.31 SEG-Y Archive

The pre-stack regularised CMP gathers were archived onto 10 Gb 3590B cartridge tapes for delivery to the client. Prior to archiving, inverse NMO correction using the Production Cube's 500m 3D velocity field and inverse geometric spreading amplitude compensation using the inverse function derived from the Exploration Cube's first pass 3D velocity field were applied. See **Appendix 8.8.3** for tape numbers and contents.

6.32 Residual multiple energy removal

Due to the nature of the variable water bottom in this survey there were a number of instances where high amplitude multiple energy could not be removed by regular methods of attenuation. This was a particular problem where the rugose seabed caused a focusing effect of the water column ray paths beneath the channels. These high amplitude events would cause major problems in the future with any planned prestack migration processes. Hence the only alternative was to remove these high amplitude events from the gathers by trace clipping the data.

The criterion for clipping these high amplitude events was a combination of three variables. The first was the peak absolute amplitude (PAA) of the entire trace that was automatically derived for all traces in the data volume. The second was the predicted multiple arrival time that in this case was 2 times the water bottom time stored in the data headers. This value was used as a start time for the clipping process. The third variable was a data sample threshold clipping value. Any data sample that was greater than this value was clipped to a background level. The combination of these three parameters was able to successfully selectively reduce the problem high amplitude multiple beneath the seabed channels.

The clipping processing on the Exploration Cube was run over the whole area, not just the areas where there were multiple problems. Because of this there was a possibility that primary energy had been attenuated. The Exploration Cube parameters had been chosen to remove the multiple energy under the channels, and as such were too high to remove the lower amplitude multiple energy in the deep water.

For the Production Cube processing, Esso required the residual water bottom multiple energy in the deep water to be removed, and also that this technique was only applied to data that had residual multiple problems to avoid damaging primary energy. To do this the channels and deep water areas were defined by separate polygons and the process was only applied to data that was encompassed by these polygons. Different parameters had to be applied to the channel areas and the deep water area in order that the multiple energy could be distinguished and attenuated. See **Appendix 8.5** for more information on the polygons chosen.

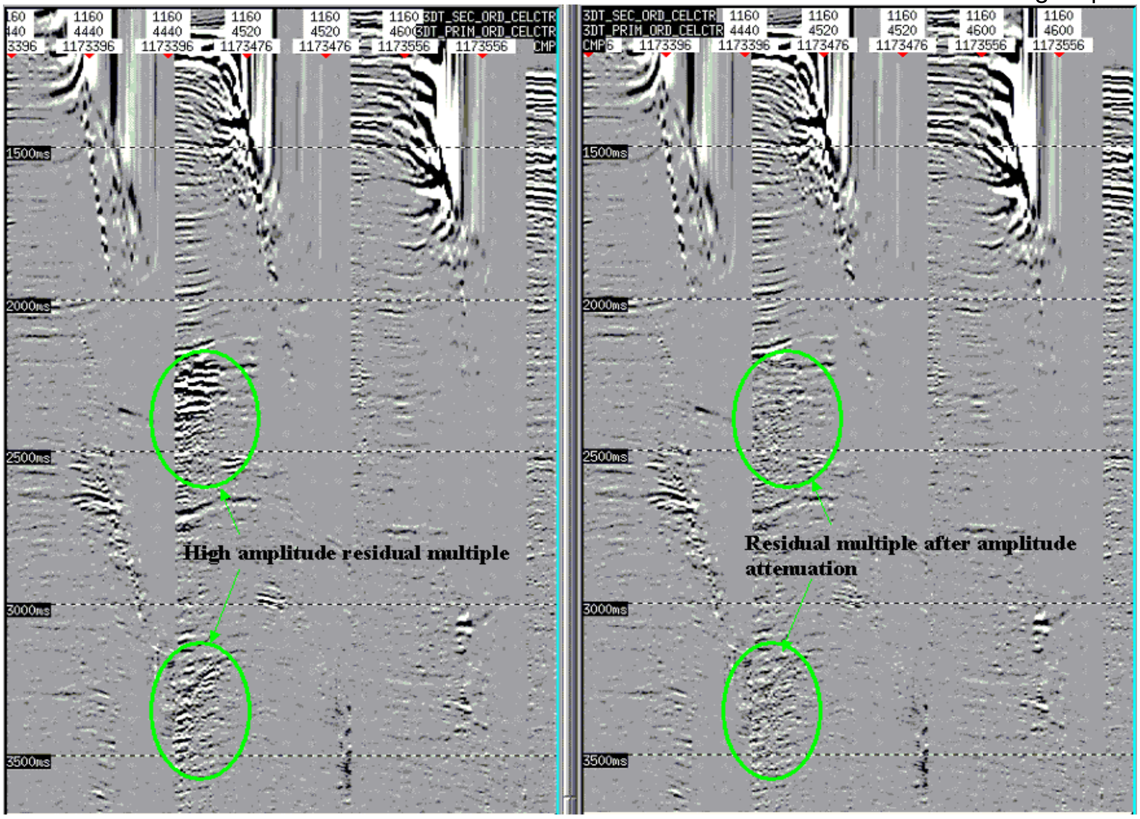
Parameter values:

Channels:

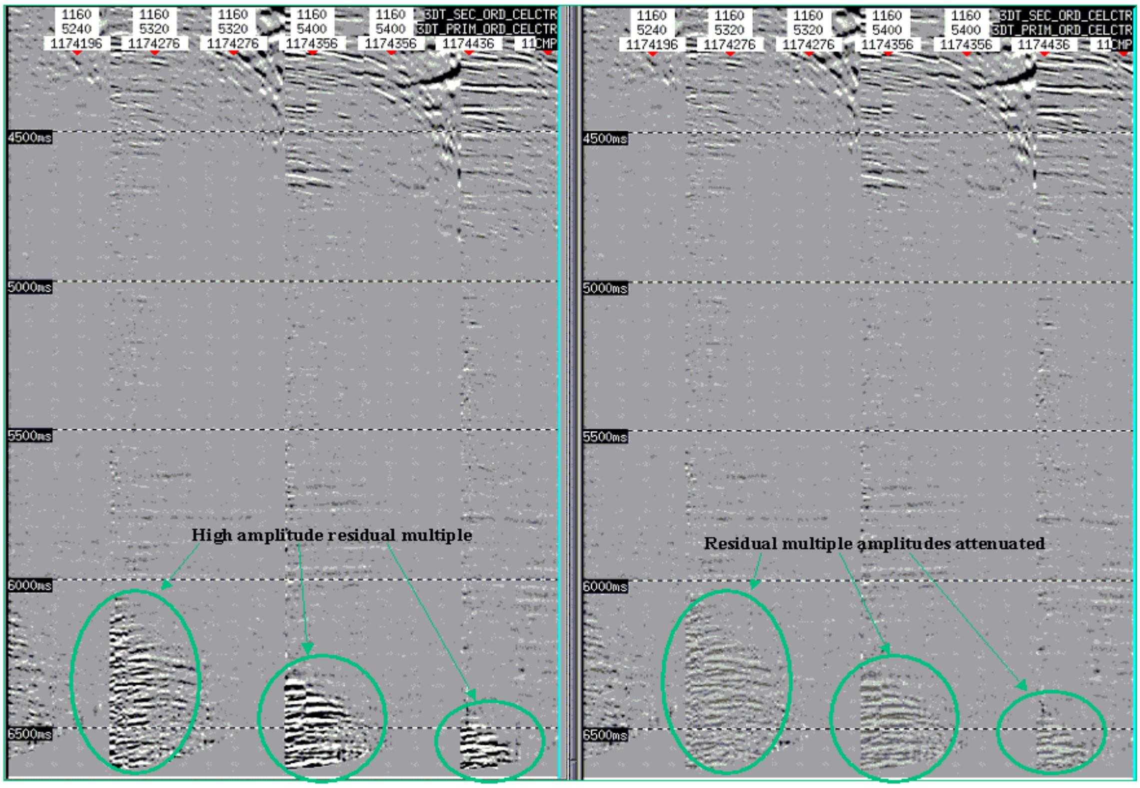
Peak Absolute Amplitude	: 10
Clipping Start Time	: 2 X Water bottom time
Clipping Threshold	: 6 millivolts
Background Level	: 2 millivolts

Deep water:

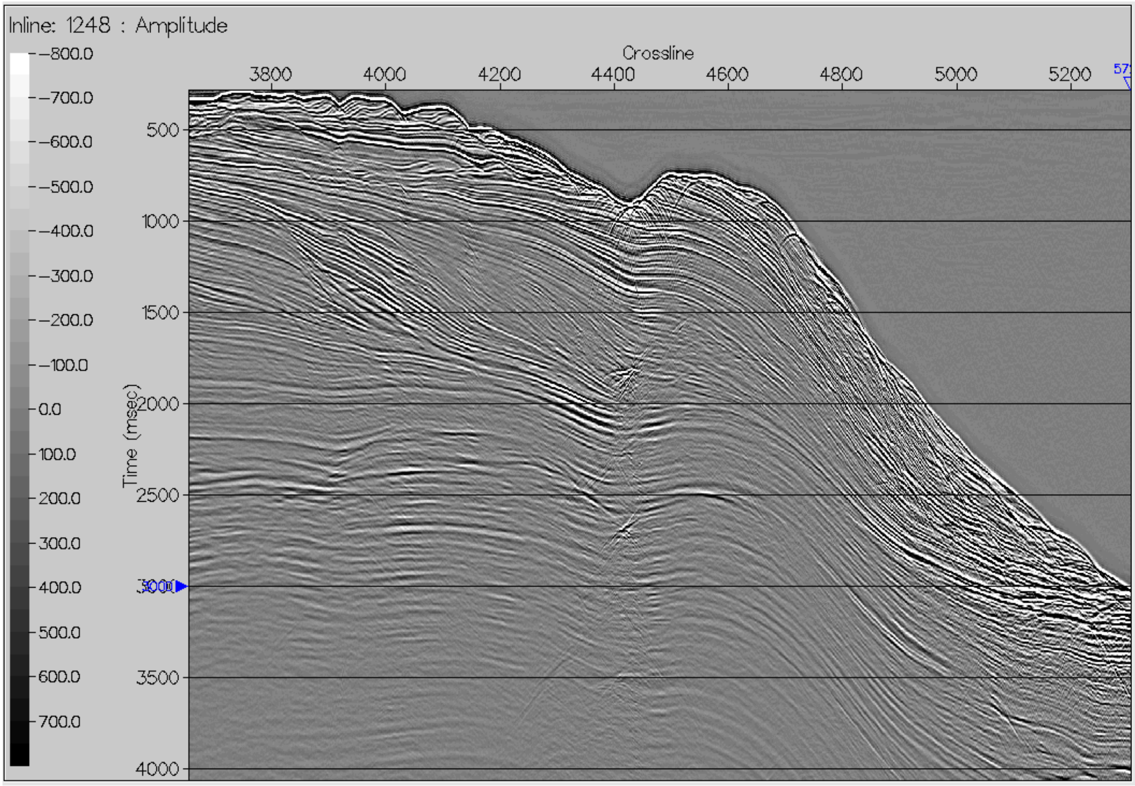
Peak Absolute Amplitude	: 10
Clipping Start Time	: 2 X Water bottom time
Clipping Threshold	: 3 millivolts
Background Level	: 2.4 millivolts



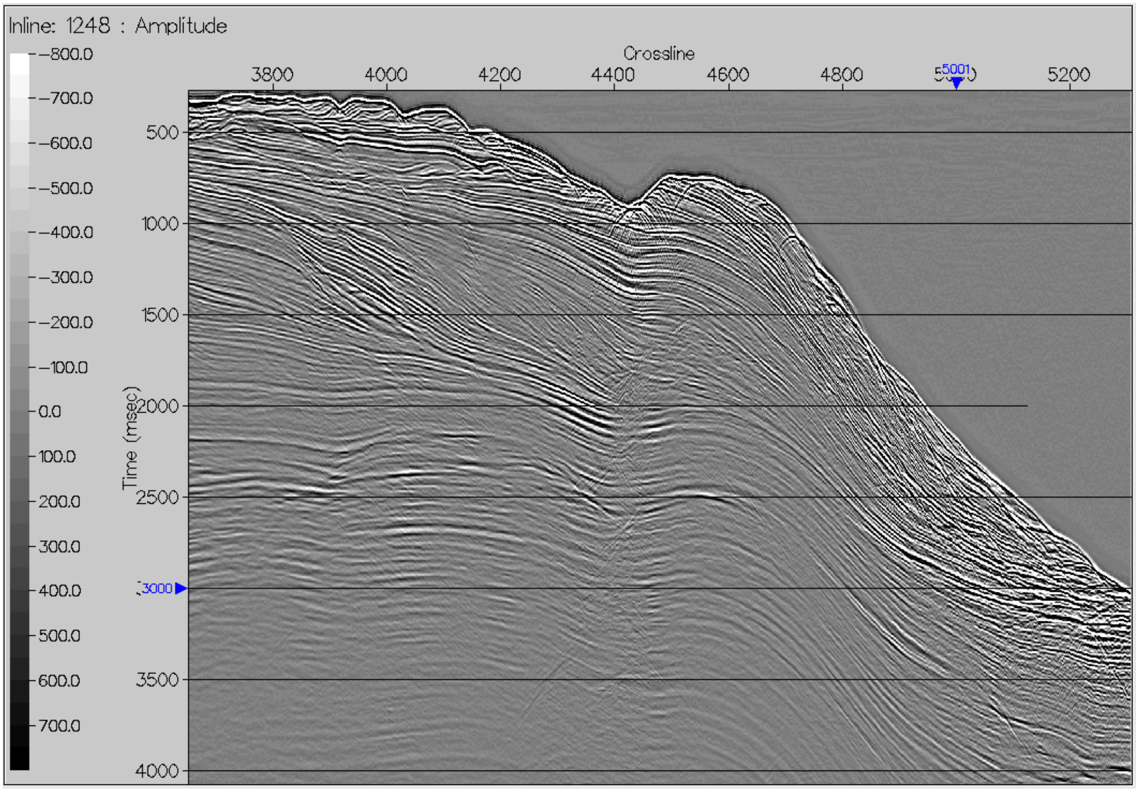
Example CMP gather showing effect of amplitude
attenuation on residual multiple energy under canyon



Example CMP gather showing effect of amplitude
attenuation on residual multiple energy under shelf in deep water



Example stack showing residual multiple under WB canyon prior to amplitude clipping



Example stack showing results of amplitude clipping on residual multiple under WB canyon

6.33 Inverse NMO Correction

Inverse hyperbolic moveout was applied to the data using the Production Cube's 500m 3D velocity field.

Parameter values:

Mute:
Limiting Stretch Value : unlimited

The amplitude clipped data with inverse NMO correction applied were written to internal disk packs and passed on to the depth migration group for further processing.

6.34 Inverse Geometric Spreading Amplitude Compensation

The Geometric Spreading applied in section 5.7 was removed with the inverse function derived from the same 1km field picked from the Exploration Cube.

6.35 SEG-Y Archive

The data were archived onto 10 Gb 3590B cartridge tapes for delivery to the client.
See **Appendix 8.8.2** for tape numbers and contents.

7.0Pre-Stack Depth Migration

*7.1.1 **Pre-stack Depth Migration -** Methodology (Overview)*

This chapter describes the methodology used, and the results obtained, from the velocity model building and the 3D Pre-stack Depth Migration of the Tuskfish 3D marine seismic survey (see Figure 1) conducted over licensed acreage in the Blackback Field and adjacent open acreage, in block VIC/L20, Gippsland Basin, offshore Victoria, Australia.

1 - WesternGeco's layer based velocity update was used to determine the lateral and vertical varying water velocities.

2 - WesternGeco's 3D Cip-Tomography (ZTOMO) was used for the velocity updating.
The methodology adopted for the velocity model building and depth migrations is illustrated in Figure 2. Basically it shows the steps involved for updating depth interval velocity model. This process is repeated until the gathers are flat starting from large scale length and reducing to a smaller scale length to make sure that all the gathers are flat. The aim is to resolve the features with larger scale wavelength first before moving into the structures with smaller scale wavelengths.

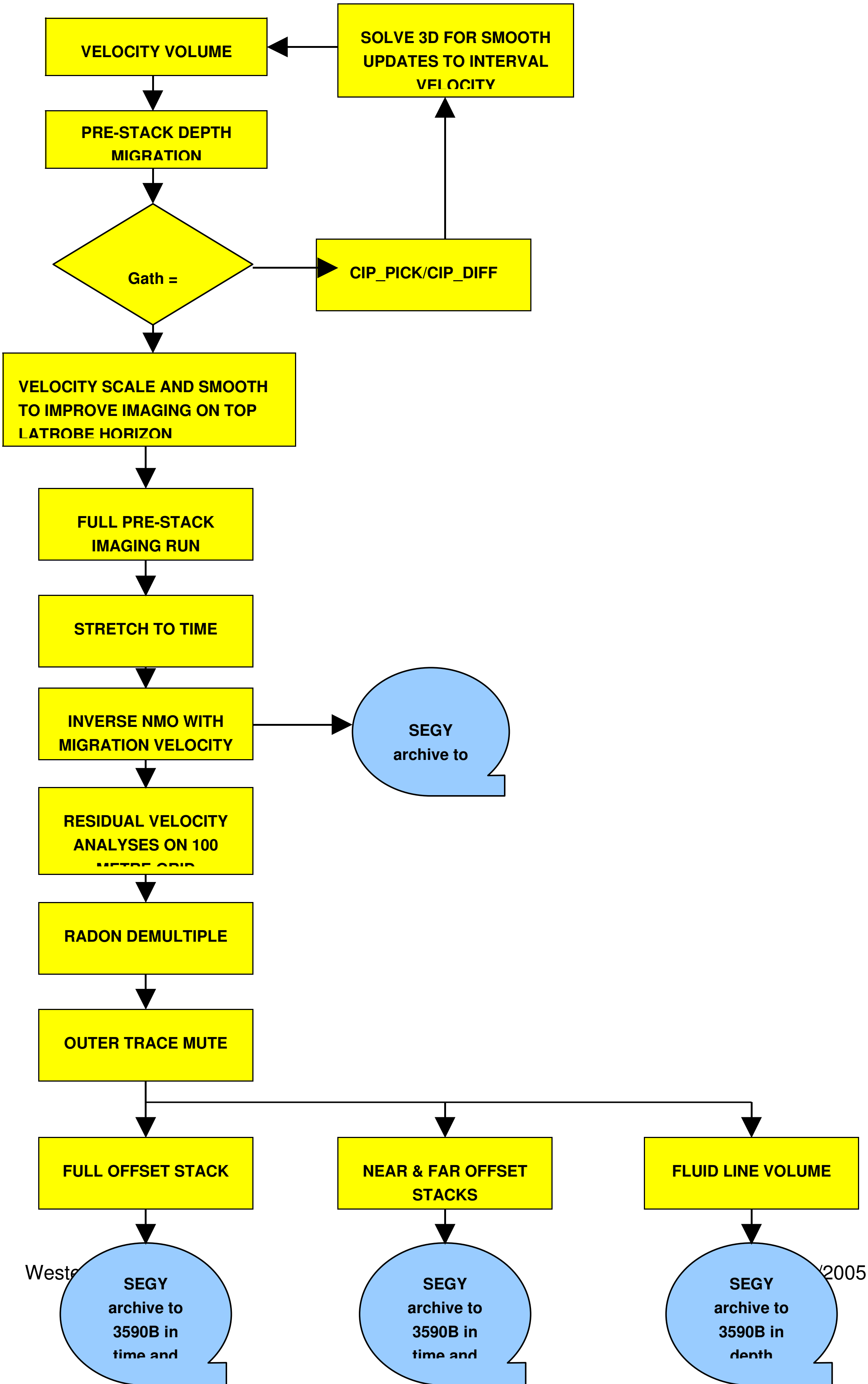
A smoothed version of the High Density Velocity Analysis (HDVA) volume was used as the initial interval velocity field for pre-stack depth migration work. This velocity volume was produced from previously pre-stack depth migration work conducted by WesternGeco using Hybrid Method.

3 – The final velocity model update consisted of a vertical stretch based on previous TOL interpretation and a smoothing of the stretched velocity field to smooth out any high frequency changes/jumps

4 - WesternGeco's Omega Seismic Processing System was used for the final depth migration.

5 - After the final migration of the final velocity model, subsequent processing will be done to correct the residual velocity errors left in the model plus multiple attenuation to further improve the data. Residual velocity picking will be done first by depth to time conversion, applying inverse NMO and analyzing any velocity errors using Automatic Velocity Picker (AVP) module. The final depth migrated stack is converted to time and the post stack processing sequence is applied including final time variant filter and time variant scaling.

Figure 2. Block diagram of velocity model building including Grid Tomography workflow .



8.0Water Bottom Horizon

Due to the nature of the water bottom structure in this survey (water bottom layer is fluctuating from 100m at shallow to 2500m at deeper part) it is essential to have an accurate and dense water bottom picks. For start, previously picked water bottom horizon with a constant velocity of 1500m/s was used to migrate this layer at selected locations (100m x 100m grid) into depth. When gathers were examined it was noticed that a constant velocity of 1500m/s has not flattened the gathers everywhere at the water bottom level. It was noticed that as water bottom increases with depth water velocity is decreasing in magnitude. This suggested that a constant value of 1500m/s could not be an accurate re-presentation of water bottom velocity in this area. The following steps were taken to update water bottom velocity:

1)- Selected depth gathers (100m x 100m grid) were converted to time and inverse NMO'd.
2)- Non-NMO gathers in time put into WesterGeco's Interactive Velocity Analysis (Inva) software.
3)- Velocities were picked for water bottom layer.
4)- Picked velocities were smoothed with a smoothing operator of 5km.

Figure 3 shows water velocity after interpolation and smoothing option.
Selected gathers (100m x 100m) were again migrated with the above updated variable water velocity. This has been done for two reasons first to make sure the picked updated water bottom velocity field is accurate enough to flatten this horizon everywhere and secondly to re-pick this horizon again in depth. The newly re-picked water bottom horizon in depth will be critical to the outcome of this project and eventually the accuracy of Cip-Tomography (ZTOMO) update will depend on it. For Cip-Tomography (ZTOMO) to work, it is essential to have an accurate re-presentation of water bottom. This then will divide the entire velocity model into two separate regions, one is the water layer and the next is the sediment layer.
Figure 4 shows re-picked water bottom horizon in depth after gridding and interpolation.

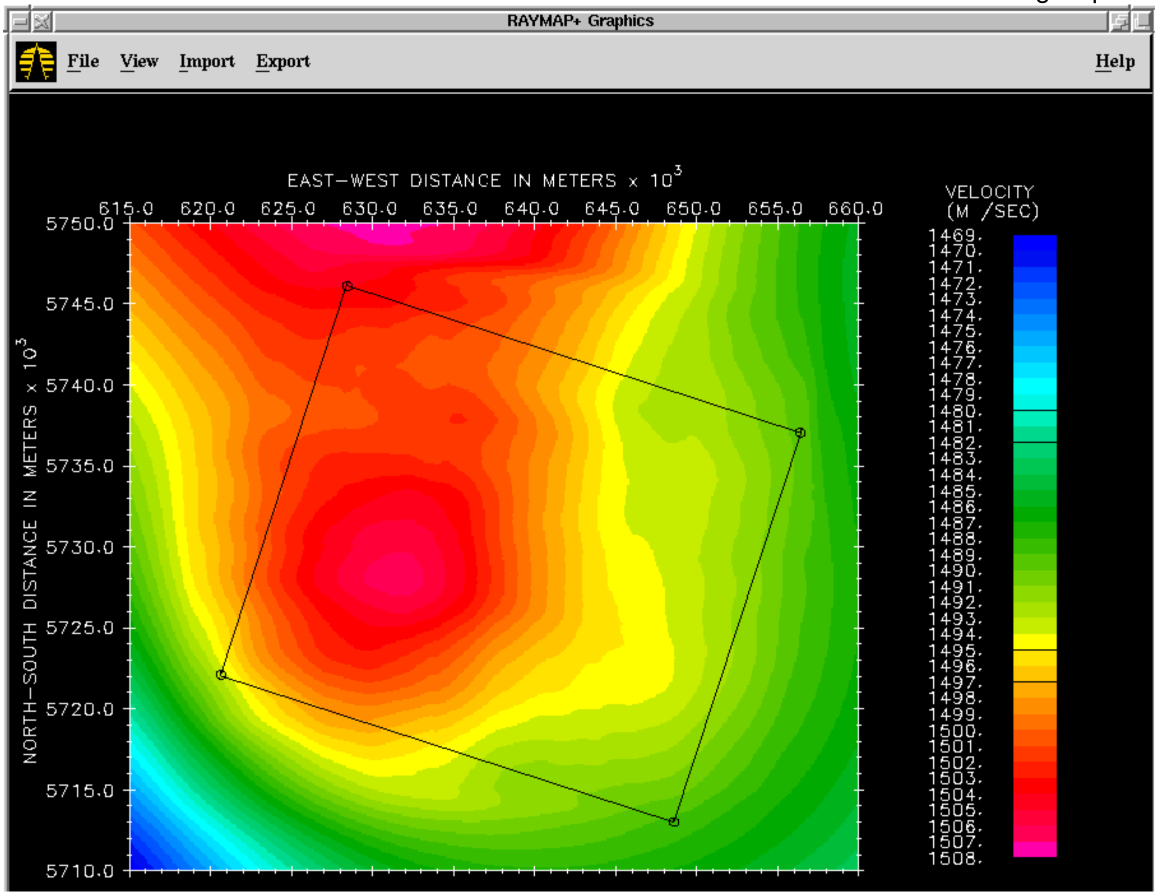


Figure 3. Map view of final water bottom velocity field. Black rectangle shows survey area.

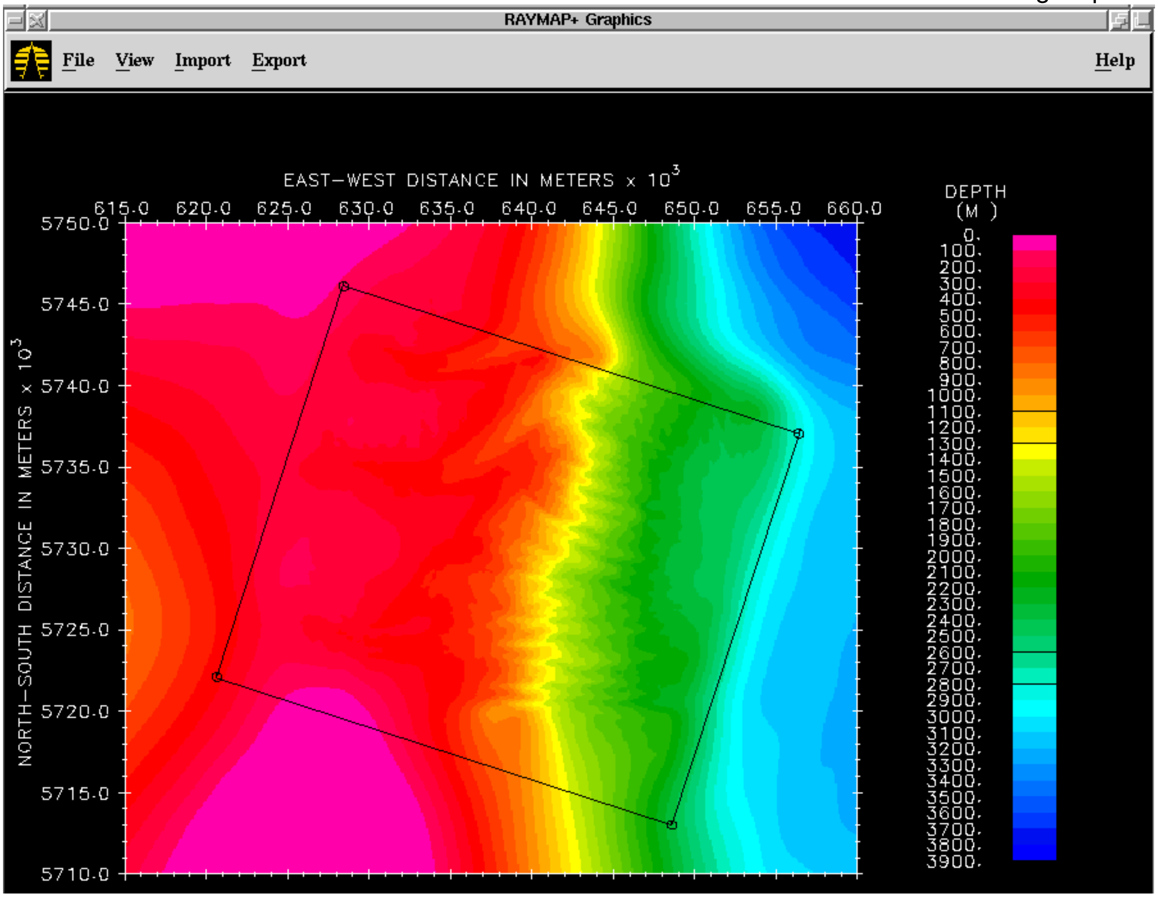


Figure4. Map view of final water bottom horizon in depth. Black rectangle shows survey area.

Initial Depth Interval Velocity Model

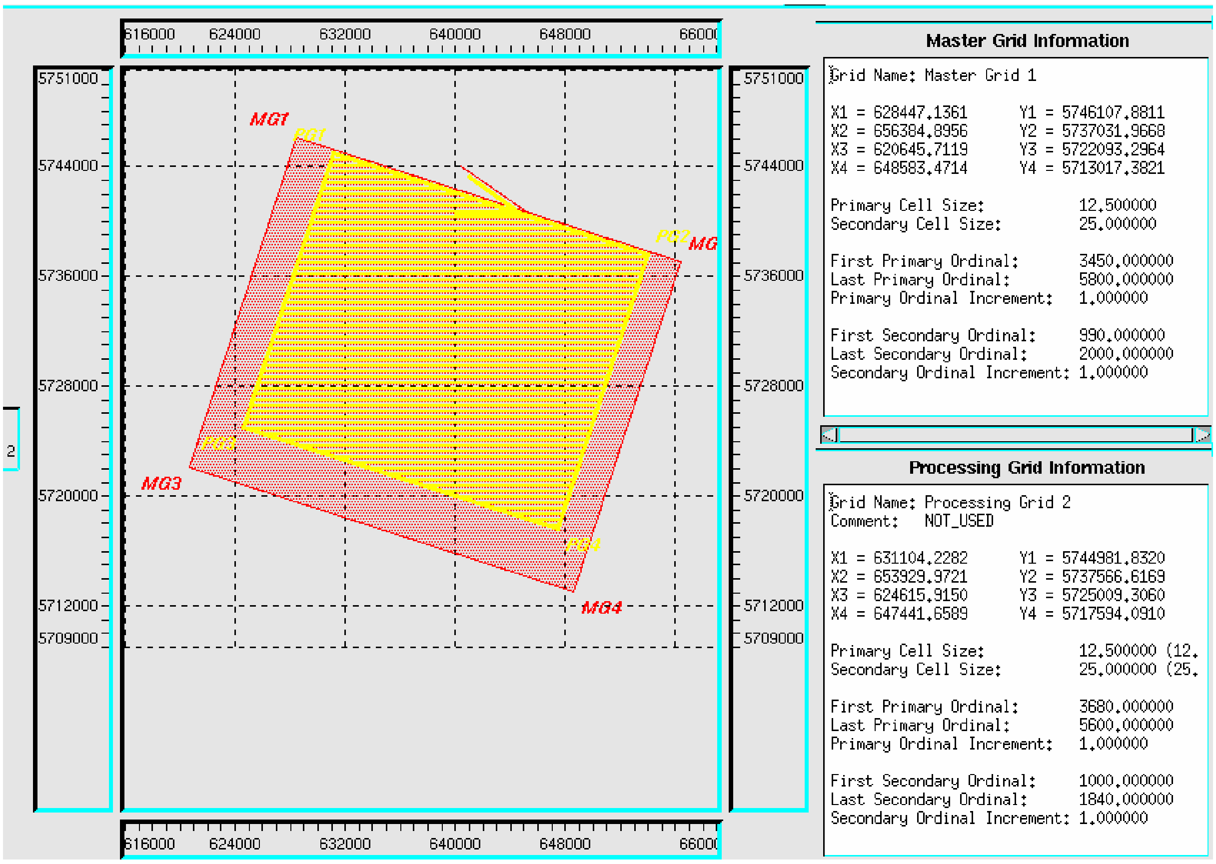
Previously processed HDVA velocity field was used as the initial depth interval velocity model. But before using this velocity field the following modifications were applied to it (This velocity is in rms two-way time).

1)- Poly-select to delete high velocity areas below channels.
2)- Application of a 5km smoothing operator.
2)- Velocities were clipped below 1800m/s to 1800m/s.
3)- insertion of re-picked /smoothed (5km smoothing operator) version of water bottom velocities into the model.
4)- Final initial model in depth interval velocity format.

The above initial depth velocity model was built on a 100m x 100m x 100m in x, y and z direction.

Figure 5 shows velocity grid (Red rectangle) and output grid (yellow rectangle). Figure 6 shows depth interval velocity display along inline 1250 respectively.

Figure 5. Velocity (red rectangle) and output grids (yellow rectangle).



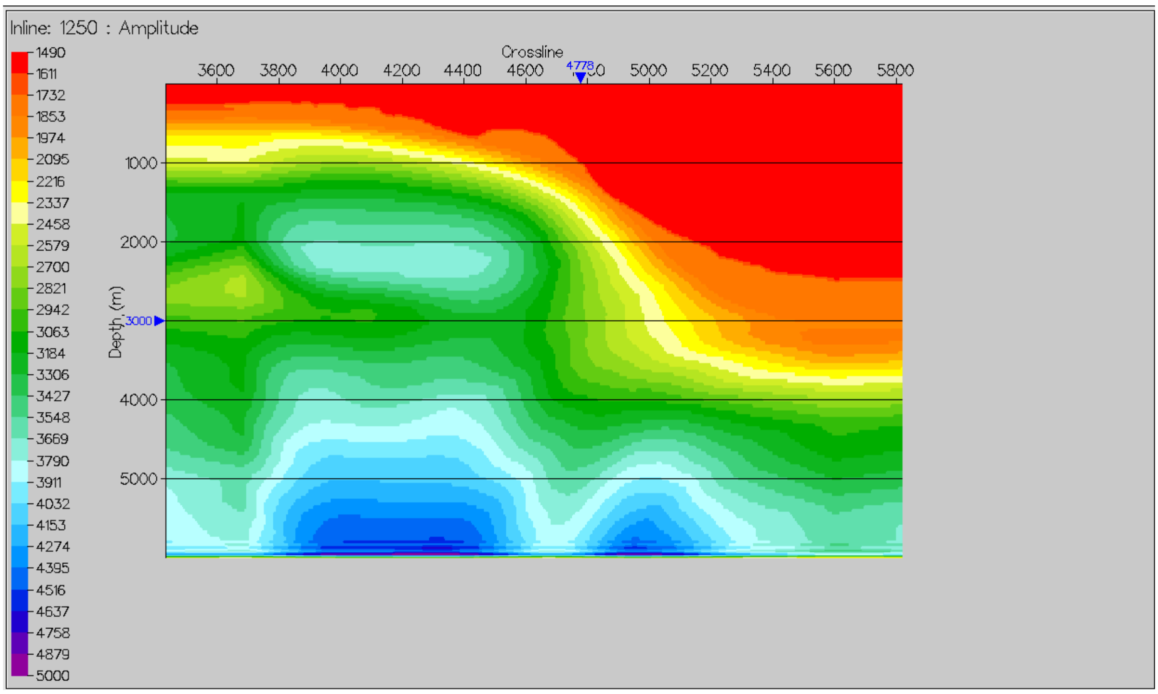


Figure 7. Initial depth interval velocity model along in line 1250.

9.0Method of updating Depth-Velocity Model with Grid Tomography

There are a variety of velocity update methods available. These methods include Vertical Update, Coherency Inversion and Tomography.
For the purpose of this project WesternGeco's 3D linear Cip-Tomography (ZTOMO) method was used.

It was explained as how the initial depth interval velocity model with the inclusion of variable water bottom velocity was generated. The task was then to depth migrate selected gathers (gathers were selected on a 500m x 500m grid. That is every 20^{th} in line and every 40^{th} cross line) and run CIP Tomography to update the model. The following iterative steps were taken for each update.

1)- Depth migrate selected gathers.
2)- Run CIP-PICK.
3)- Run CIP_DIFF.
4)- Run ZTOMO.
5)- Select a best model.
6)- Rebuild an updated depth interval velocity mode.
7)- Migrate again.

Before going any further it is essential to state what parameters we used in CIP-PICK module what factors are important in ZTOMO job itself.

Step 2: Common Image Point Picker (CIP-PICK)

CIP-PICK is a module that automatically picks the residual moveout on migrated depth gathers. It first defines the key events in the gather based on highest semblance values. Once the events are identified, it performs various parabolic and linear scans and the curve with the maximum semblance is retained at each depth event. A moveout correction is then applied to the event and this is followed by a trim static correction to remove any non-linear or non-parabolic residual moveout. The outputs from CIP-PICK are:

1)- A table of residual picks which will be input to CIP-DIFF tomography equation generator.
2)- Synthetic gathers, which show the events that CIP-PICK has identified.
3)- Input gathers which have be corrected according to the residual picks determined from the identified events.

Allowing low multiple velocity trends or bad picks to be forward for the linear equations will not give correct result and may be extremely hard to remove it.

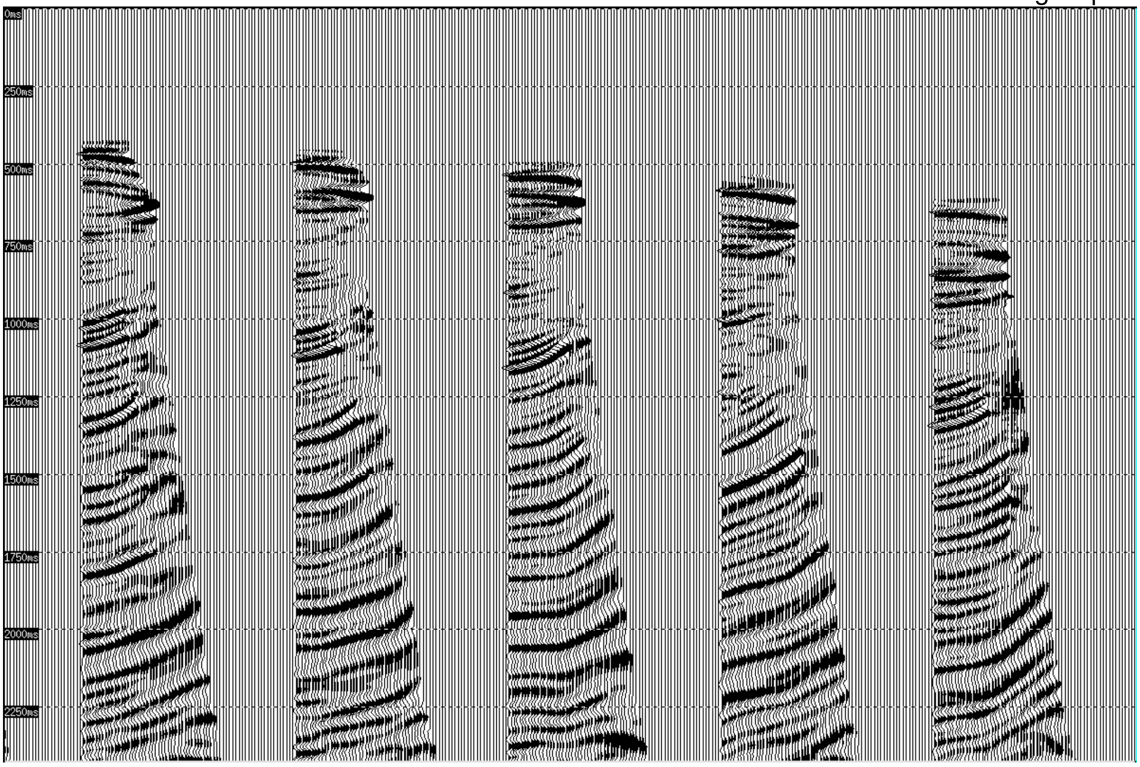


FIGURE 8. Migrated gathers after target migration with the picked water velocity model.

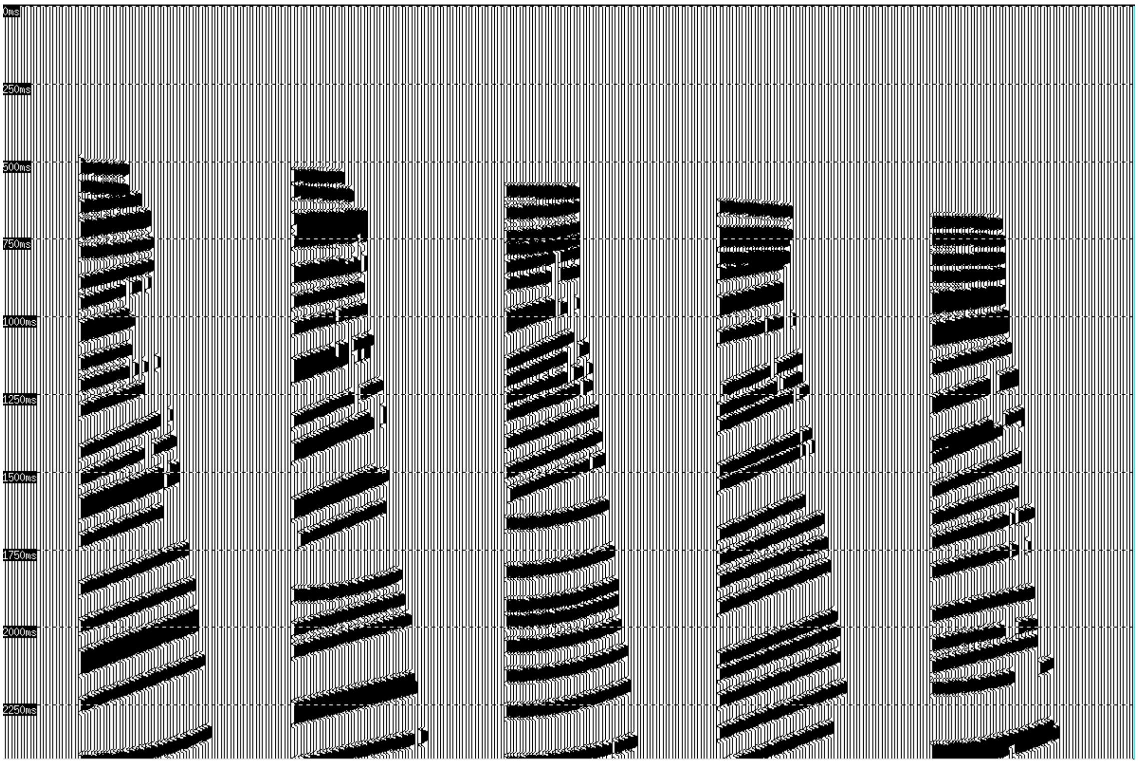


Figure 9. Synthetic gather from the CIP pick routine showing picked residual moveout.

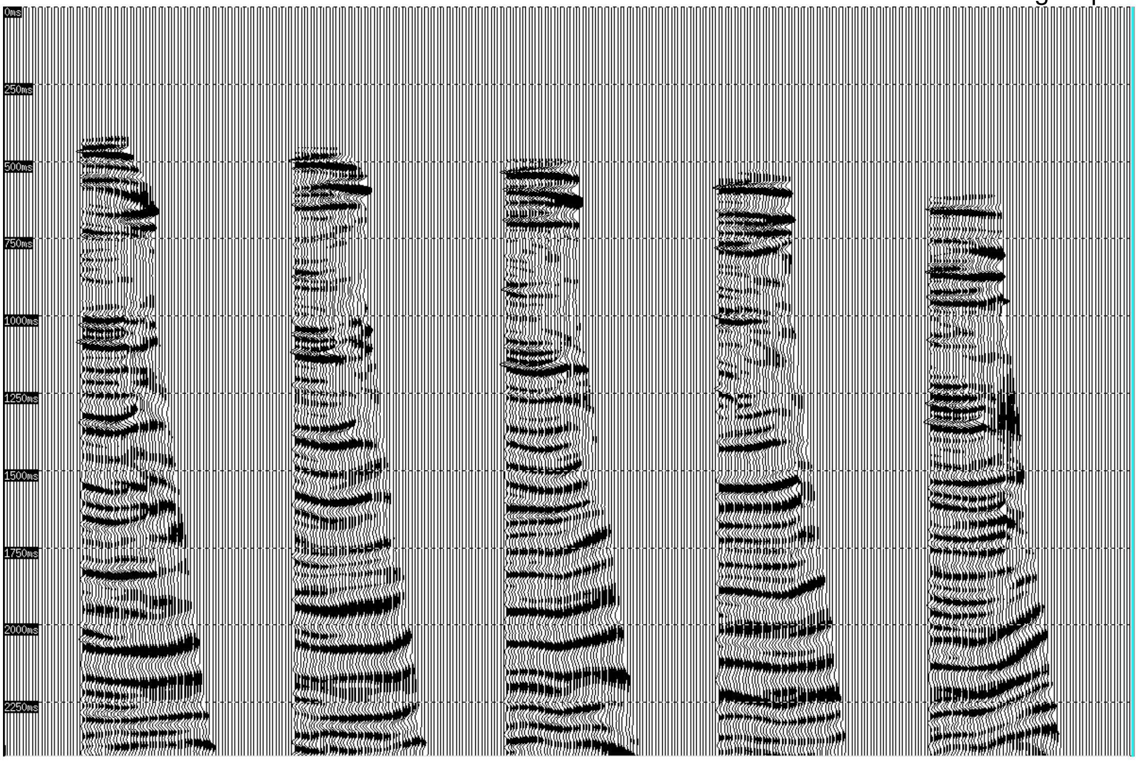


FIGURE 10. Gathers after flattening in the CIP PICK routine

CIP-PICK parameters:

The theory behind CIP-PICK has been explained in previous sections and will not be repeated here. The main parameters for CIP-PICK are as follow:

Parameter values:

Start Gate	: water bottom
End Gate	: 10000m
Event Separation (input)	: 10m (shallow) to 150m (deep)
Event Separation (output)	: 4 x input values
Maximum Picks Per Gather	: 40
Semblance Window Length	: 180
Tim Static (Cross-correlation Window Length)	: 200
Tim Static (Min. Cross-correlation Peak)	: 0.15
Min. and Max. Far Offset Alpha (this is a minimum and maximum value of parabolic coefficient alpha to scan at each depth	: -400 to +100
Cip Grid	: 500m x 500m

Note: An open mute was applied to the input gathers to exclude far offset noise.

Step 3: CIPTomo Equation Builder (CIP-DIFF)

CIP-DIFF generates the differential tomographic equations for CIPTOMO (which are then solved in the next step by the ZTOMO solver to give a velocity update for the model).

It uses raytracing of the computational model, together with the residual moveout picks from the CIP-PICK.

Step 4: CIP-Tomography (ZTOMO) - overview

ZTOMO is the name given to the tomographic equations solver. The basic depth-domain seismic tomography problem is described by the system of equations $\boldsymbol{L}\Delta\boldsymbol{v} = \Delta\boldsymbol{z}$. The matrix $\boldsymbol{L}$ contains geometry and background-velocity dependent terms that relate changes in event depth to changes in velocity. $\boldsymbol{L}$ is calculated in Ciptomo Equation Builder (Cip-Diff) with ray-tracing. $\Delta\boldsymbol{v}$ is the velocity update vector to be solved for. $\Delta\boldsymbol{z}$ is a vector of depth errors picked from migrated Common Image Point (CIP) gathers by Common Image Point Picker (CIP_PICK).
Seismic tomography problems are undetermined due to angular aperture limits and spatial under-sampling of the velocity field. Many velocity updates will flatten the CIP gathers, many $\Delta\boldsymbol{v}$ vectors will solve $\boldsymbol{L}\Delta\boldsymbol{v} = \Delta\boldsymbol{z}$. We choose to constrain the problem to flatten the CIP gathers with the smoothest possible velocity update. We choose scale length x, y and z for a 3D triangle smoothing operator S that we believe characterizes the smoothness of a reasonable velocity update. We define an uncorrelated (unsmooth) velocity update $\Delta\boldsymbol{v}$ by equation $\boldsymbol{S}\Delta\boldsymbol{v} = \Delta\boldsymbol{v}$. We solve $\boldsymbol{LS}\Delta\boldsymbol{v} = \Delta\boldsymbol{z}$ for $\Delta\boldsymbol{v}$ using iteratively re-weighting least squares.

Re-weighted least square allows us to use more robust data misfit function than ***L2*** norm: this helps us to automatically reject inconsistent or bad picks. Because preconditioning with $\boldsymbol{S}$ and minimization of the length $\Delta\boldsymbol{v}$ force our solver to find the smoothest parts of the solution first, we are able to speed up the inversion process by terminating the iterative solver before convergence.

For each nonlinear re-migration / re-raytracing iteration we choose a minimum scale length to include in the velocity update. We solve linearized system $\boldsymbol{L}\Delta\boldsymbol{v} = \Delta\boldsymbol{z}$ for the largest possible scale length and then iteratively reduce the scale lengths to produce rougher and rougher updates until our minimum scale length is reached. We sum the updates and add them to our starting model for the next non-linear iteration. For each non-linear iteration, we stop decreasing the scale length when the objective function is reduced by 10% to 50%, and the velocities are changed by about 10% to 20%. We avoid drastic updates because we do not want to violate the linear, fixed ray-path assumptions of our tomography equations. Long scale lengths tolerate more aggressive updates than do short scale lengths.

ZTOMO Parameters:

The theory behind ZTOMO standalone code was explained earlier. Here, some of the critical parameters will be explained more closely. Testing these parameters is essential for making a valid decision as which run of ZTOMO is more useful.

Scale Length: Starting from the largest scale length (typically a cable length but not always) into the smallest scale length (data dependent).
The largest scale length update will be a velocity update that solves for the long wavelength features of the velocity model. The next shortest scale length update produced will be a velocity update that solves for the long wavelength features but also for the shorter wavelengths as well. This is an iterative process until we reach to a maximum shortest wavelength feature in the velocity model we wish to update.
Wavelength can be thought of as a type of smoothing applied to the update with a greater degree of smoothing being applied to the larger wavelength update a less to the smaller wavelength update. For this project we used 5 updates in total, starting from a scale length of 7500m to 1000m covering the largest and smallest wavelength feature in the depth interval velocity model.

Damping Factor: Within each LSQR problem, we usually choose to minimize the sum of the ***L2*** norm of the residual depth errors and damp times the ***L2*** norm of the uncorrelated model length. This strategy is called damped least squares. It penalizes large $\Delta \boldsymbol{v}$ and consequently roughness. Damp is determined by trial and error. The larger the input data set, the greater the number of equations and the larger the ***L2*** norm of the residual depth errors, the larger we need to make damp. For this project damping factors ranging from 0.125 to 1 have been used.

As it was mentioned above 5 iterations of ZTOMO have been used and within each run different values of damping factor was tested to come up with the best possible solution. In most cases gathers migrated with different updated models to select the best possible solution.
Below is a summary of what have been used to test and update the model using ZTOMO.

ZTOMO Run	Scale Length (m)	Damping Factor	Selected Update
Run-1	7.5km 5km 7.5km 5km	1 1 0.75 0.75	5km with damping factor of 1
Run-2	6km 5km	0.25 0.25	6km with damping factor of 0.25
Run-3	4km 3km	0.125 0.25	4km with damping factor of 0.125

	3km 2km	0.125 0.125	
Run-4	3km 2km 2km 1km	0.25 0.25 0.125 0.25	2 km with damping factor of 0.125
Run-4	1km 1km 1km 500m	0.5 0.25 0.125 0.125	1km with damping factor of 0.125

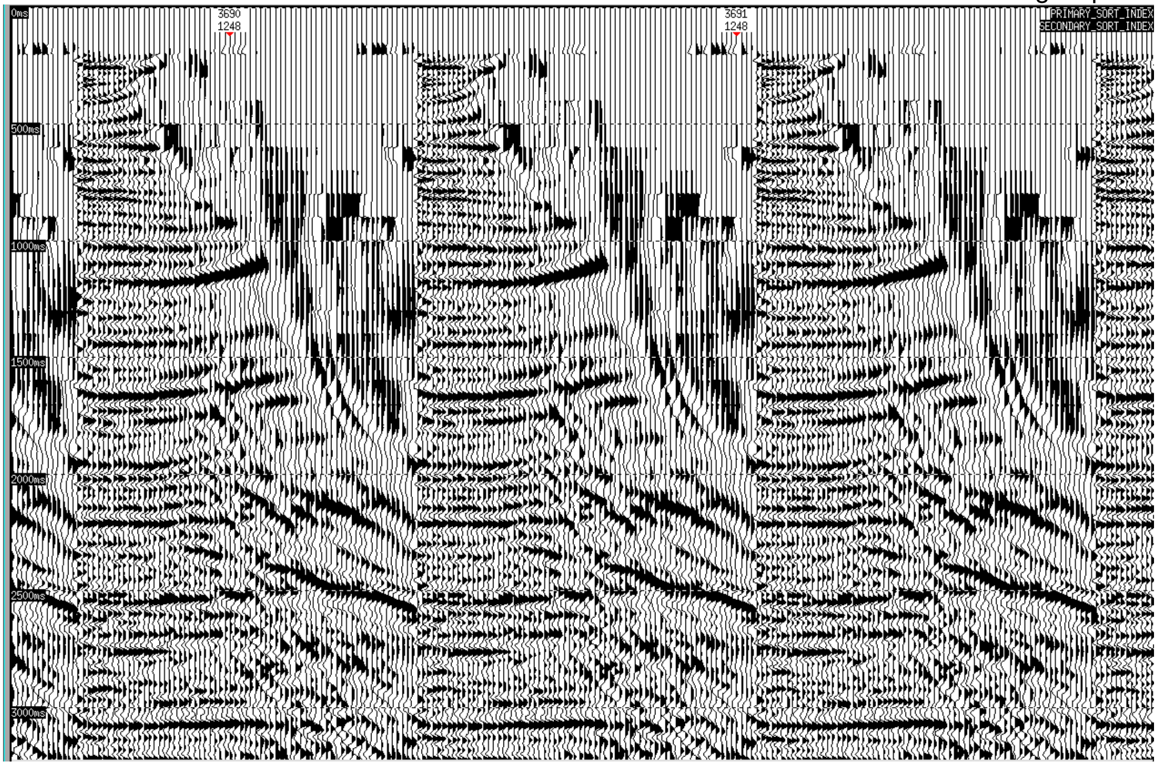
It is essential to explain a couple of points about the above table. As it was mentioned earlier on in this report we normally start with a large scale length and move into a smaller scale lengths update.

The reason for moving from 5km update to a 6km update (see Run-1 and Run-2 above) was because the initial model in Run-1 had been extended only to 4km and consequently the gathers were migrated to that depth but for Run-2 update we blended back into this model what we had from HDVA velocity model and extend the model to 10km. That is why we went back to 6km update to make sure we have not missed anything after the model extension into 10km.

Figure 8 (8a to 8c) shows example gathers after third run of tomograhic update along inline 1248 along different points in the line. Figure 9 (9a to 9c) shows same gathers as figure 8 but after the fifth run of tomographic update. This shows the relative flatness of gathers from one update to the next.

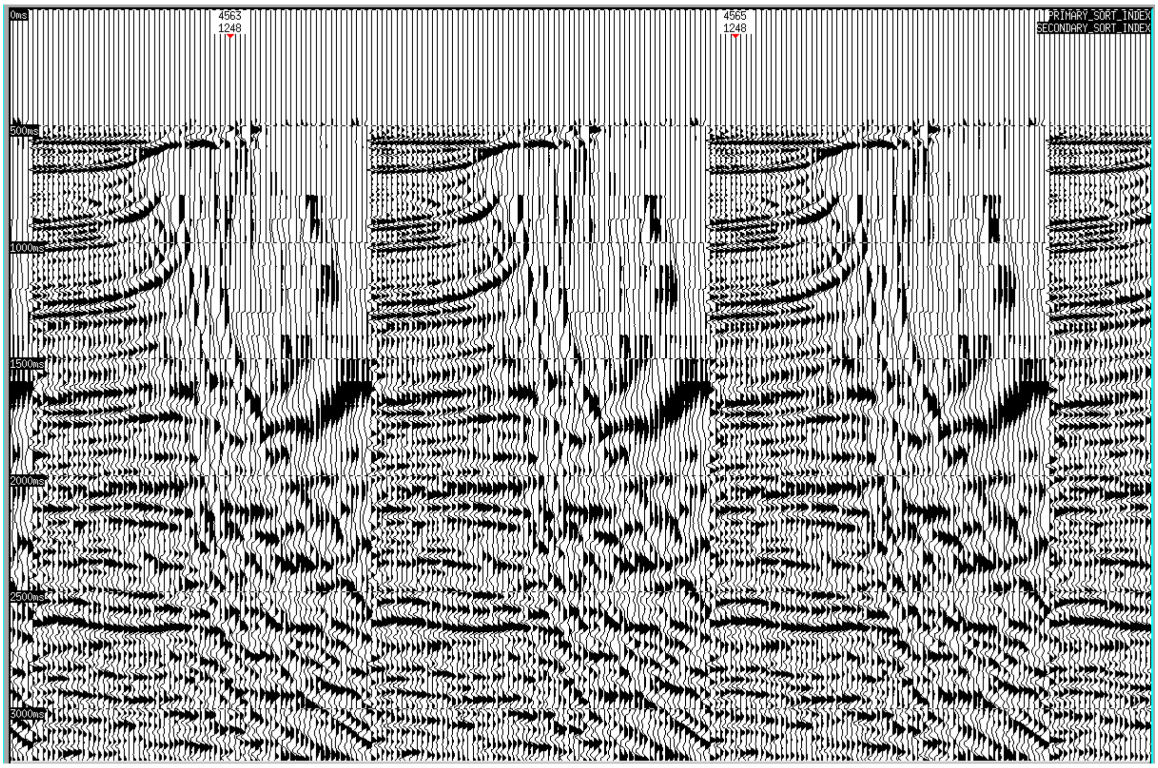
Figure 10 and 11 show final depth interval velocity model with the fifth run of ZTOMO update along inline 1248 and xline 4546.

Figure 12 and 13 show seismic sections along in line 1250 and cross line 4543 with the above mentioned update.

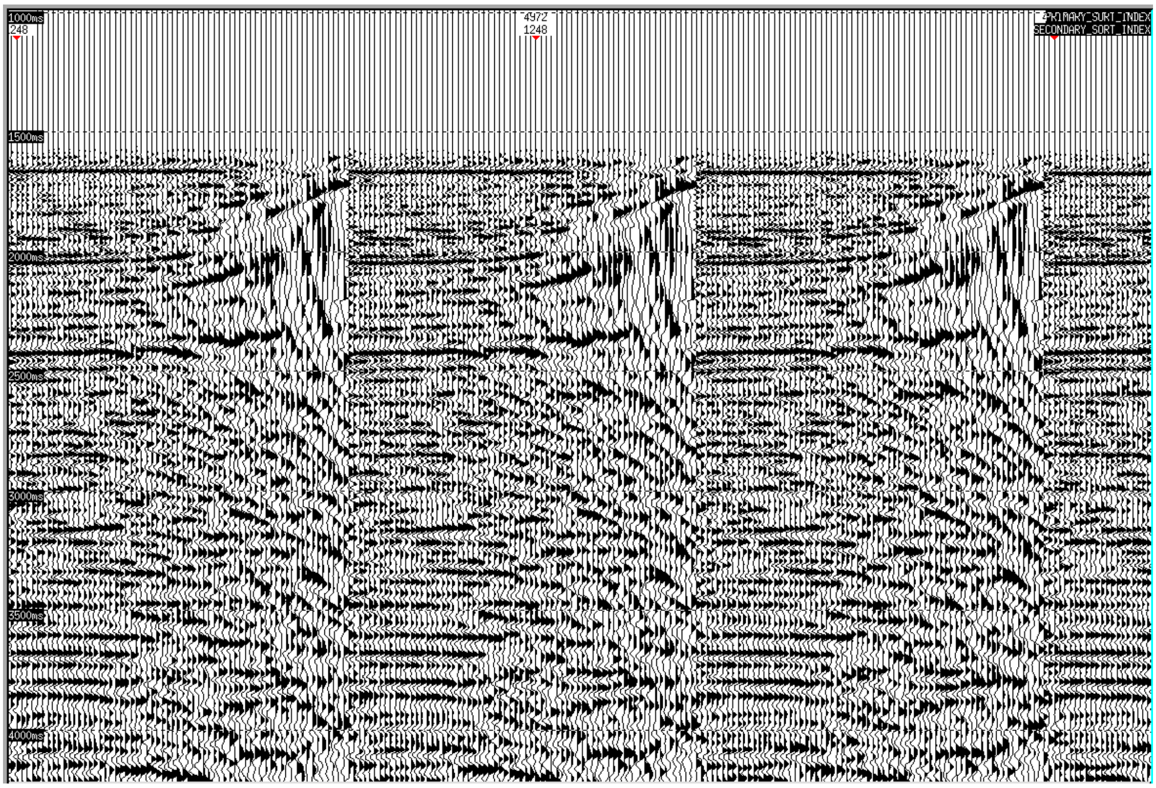


(a)

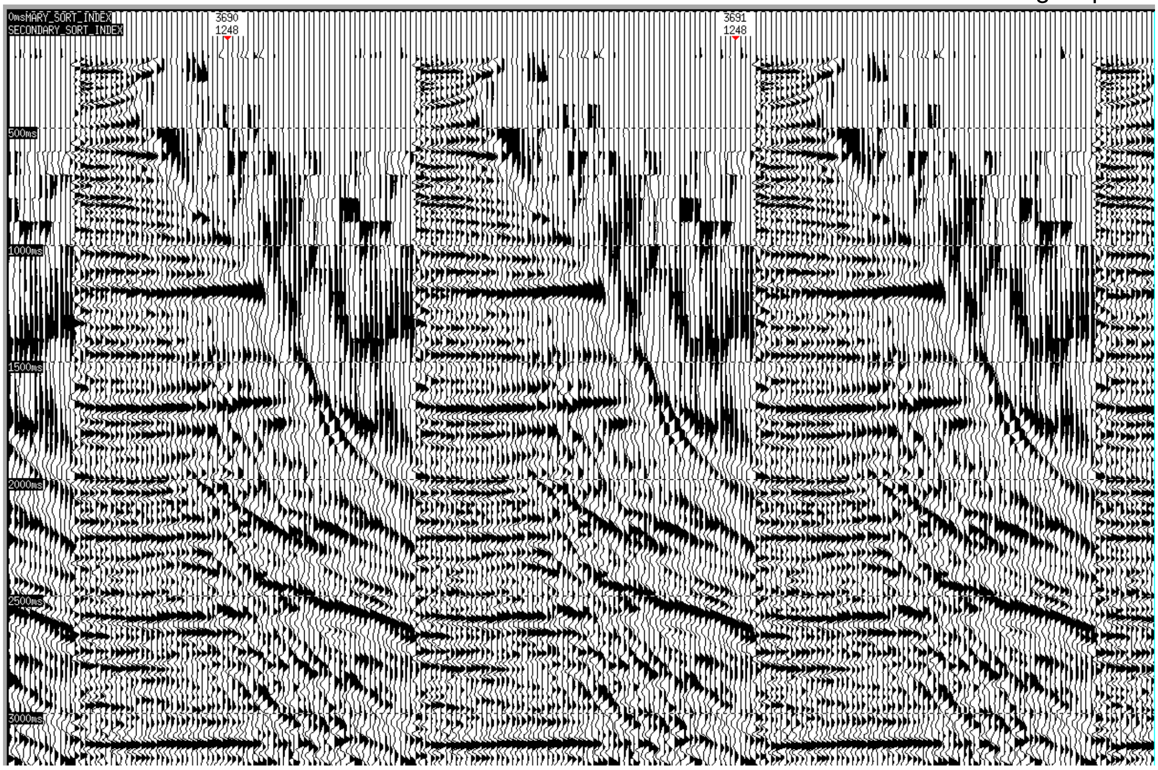
Figure 8 (8a to 8b). Selected gathers along in line 1248 after third run of tomographic update.



(b)

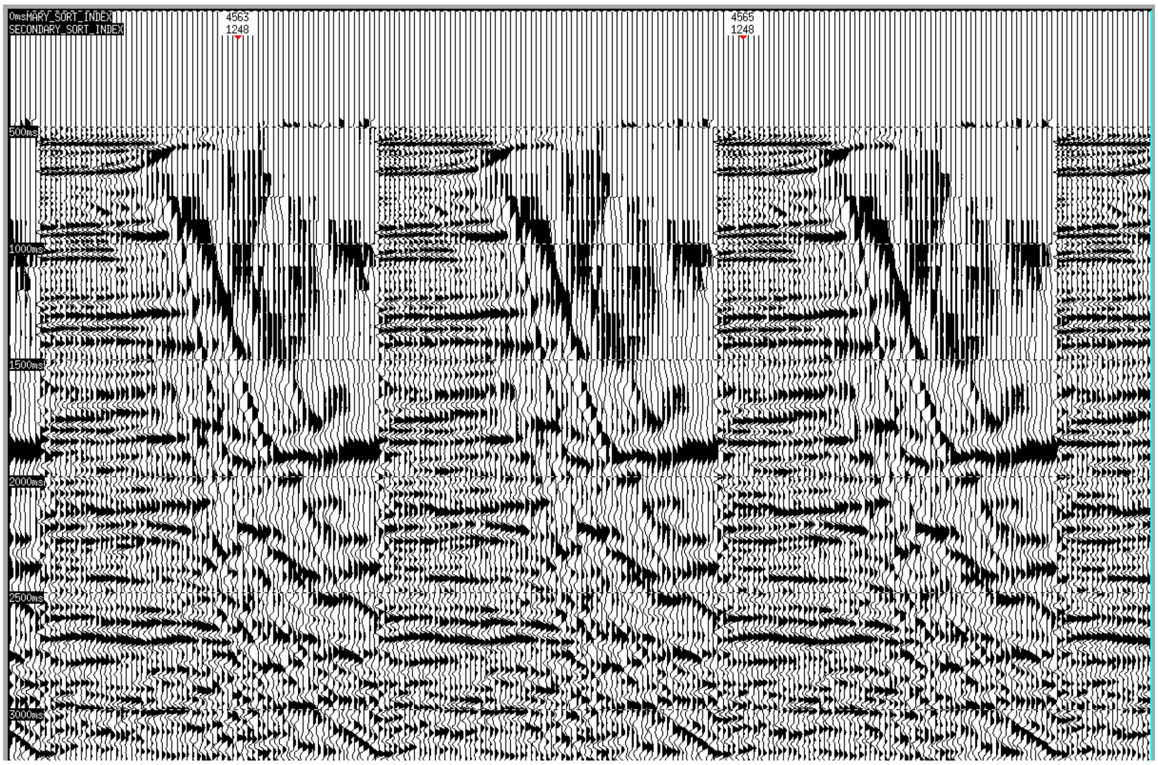

1000ms
248
4972
1248
PRIMARY_SORT_INDEX
SECONDARY_SORT_INDEX
1500ms
2000ms
2500ms
3000ms
3500ms
4000ms

(c)

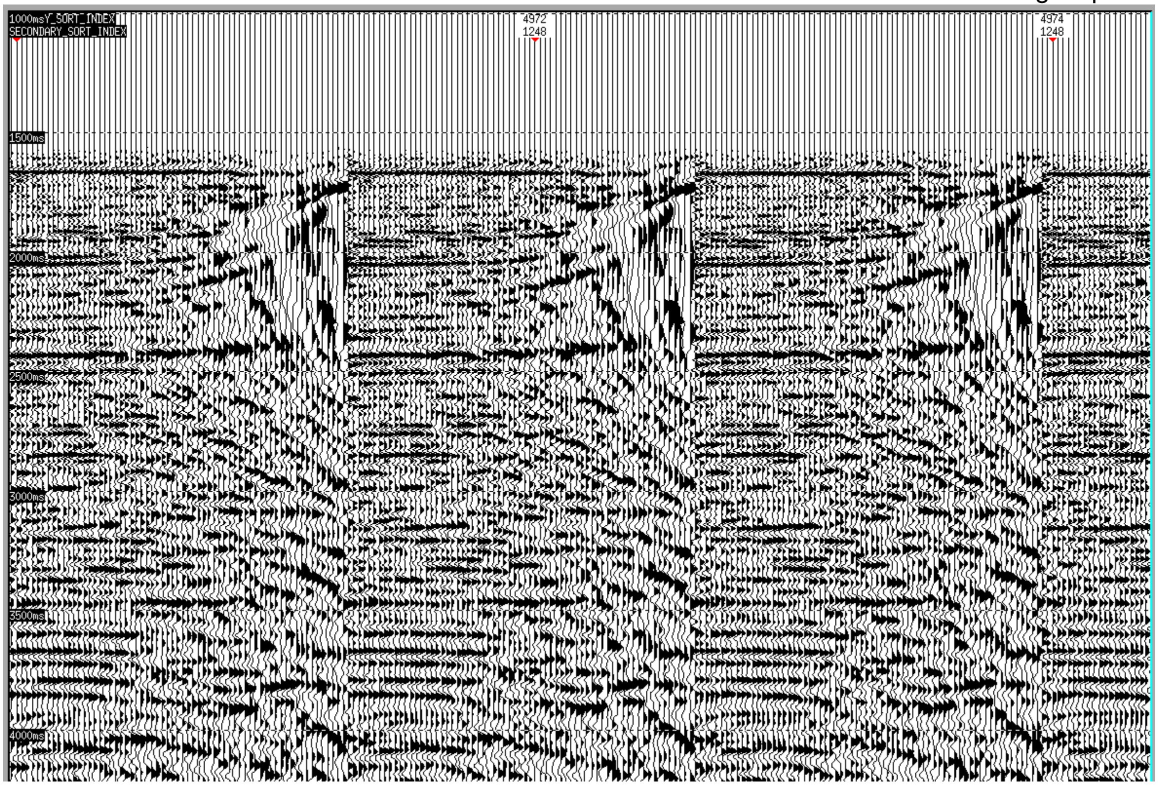


(a)

Figure 9 (9a to 9b). Selected gathers along in line 1248 after fifth run of tomographic update.



(b)



(c)

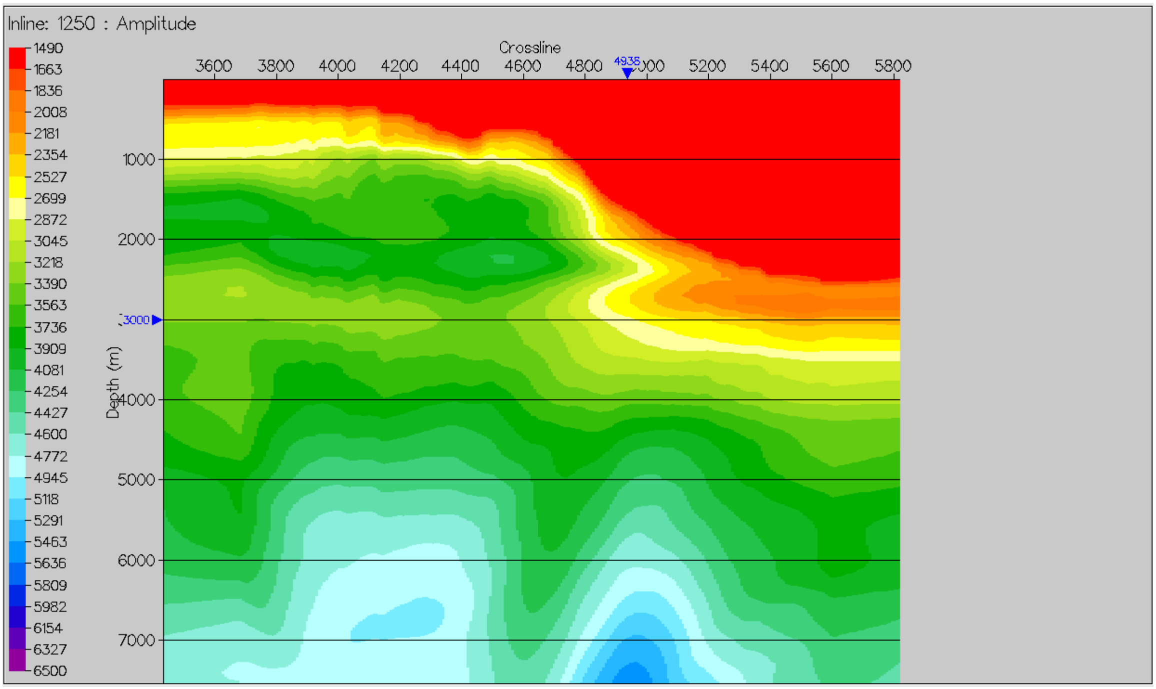


Figure 10. Depth velocity model along in line 1248 with the fifth and final ZTOMO update.

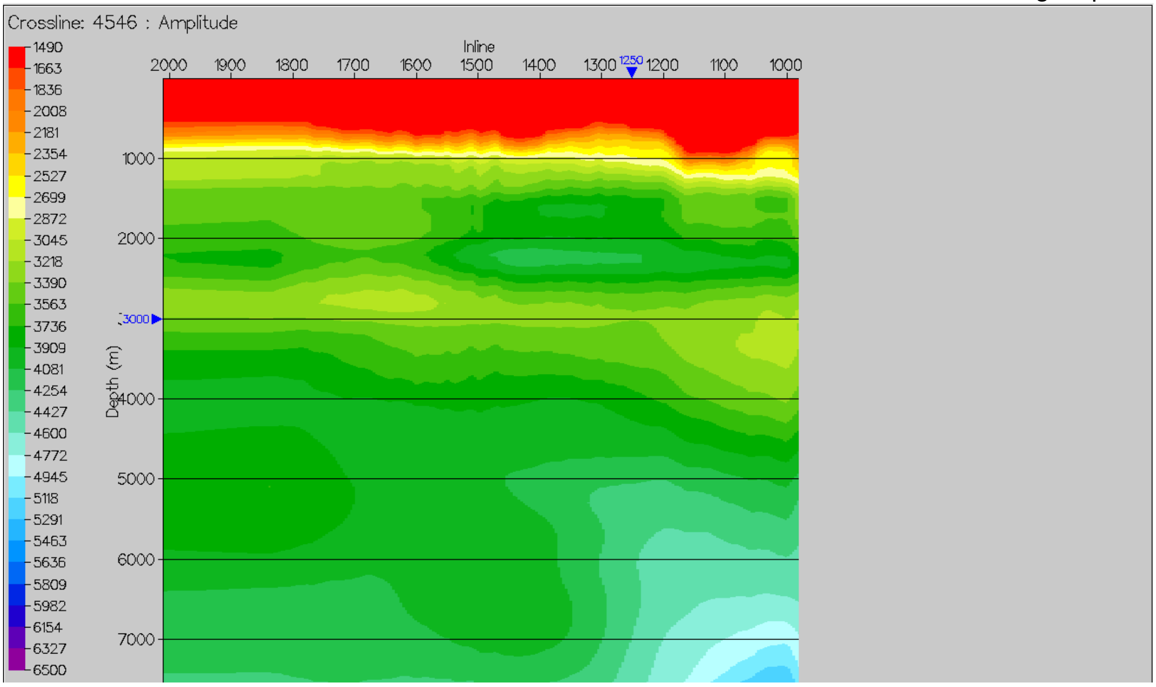


Figure 11. Depth velocity model along in line 4546 with the fifth and final ZTOMO update.

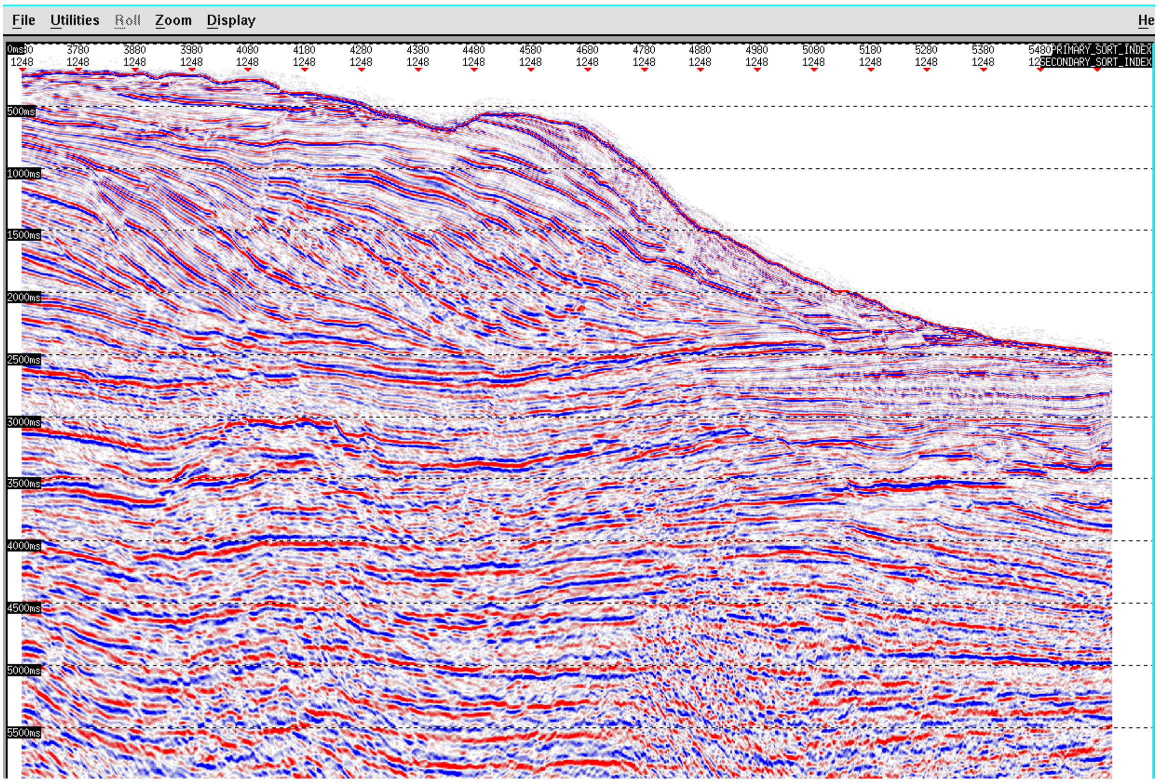


Figure 12. Seismic depth section along in line 1250 with the fifth and final ZTOMO update.

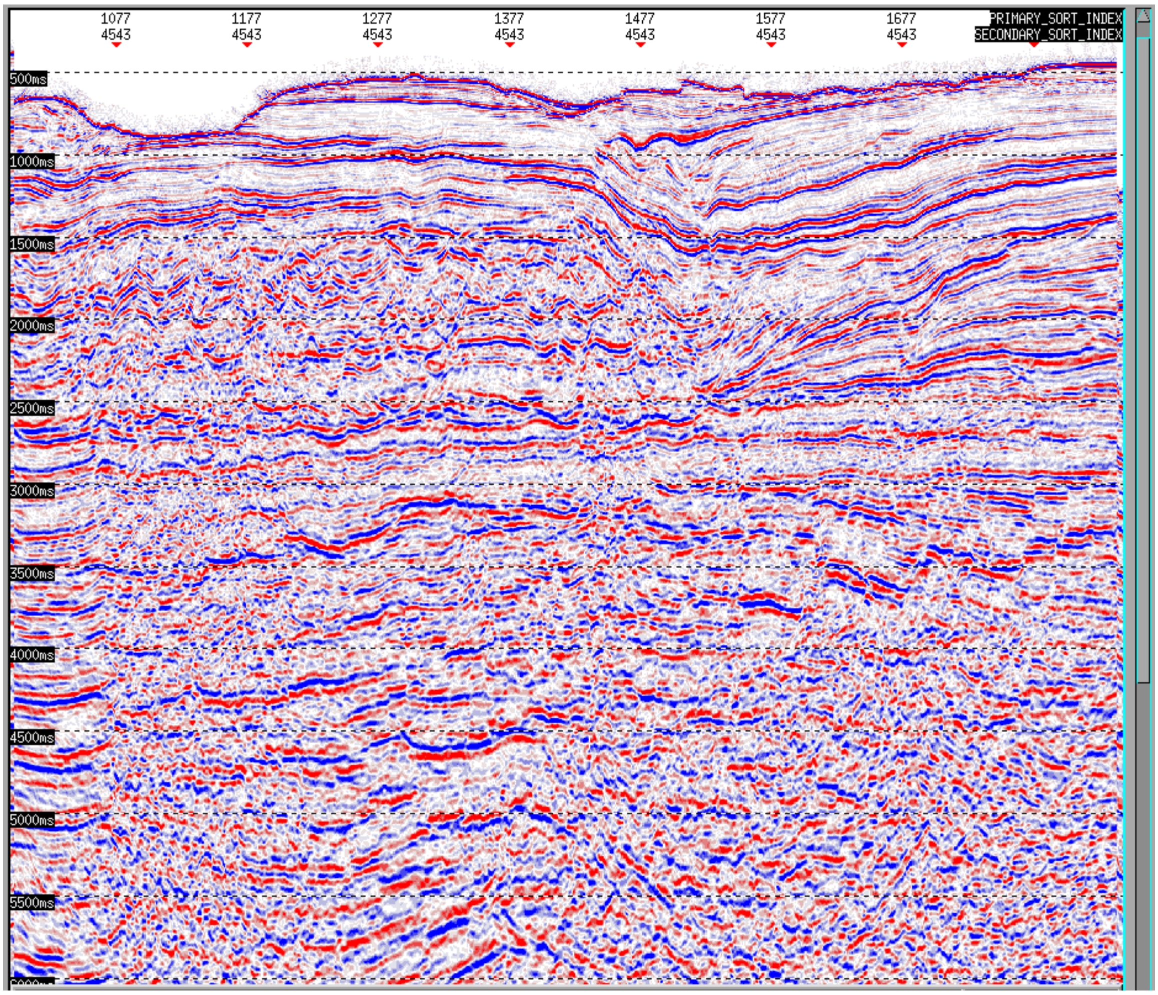


Figure 13. Seismic depth section along in line 4543 with the fifth and final ZTOMO update.

Velocity Smoothing Of The Final velocity Model

Although migrated gathers with final update (that is ZTOMO, Run 05) exhibited reasonable flatness from top to bottom but stack sections viewed in cross line direction especially where the water bottom has short wavelengths with rapid fluctuations showed that the structures below water bottom to a considerable depth mimic water bottom structure. This was also evident from the final velocity model viewed in cross line direction . For this reason it was decided with the request of the client to further smooth the final velocity model, depth migrate and re-stack the data in cross line direction to make sure the result is acceptable.
Client devised the smoothing method/application and here is a brief description of the method used:

1)- Final depth velocity model resulted in ZTOMO, Run-5 was read into Paradigm's Geodepth program and conversion to average velocity versus time was made, from this an average velocity map to Lake Entrance Formation (LEF) was made and the depth map was made by multiplying with the time grid. This map was then smoothed using a 2400 x 2400 operator.

2)- Velocity functions for the model converted to time depth functions and also extracted.

3)- A routine was run to shift time depth curves from the unsmoothed LEF map to the smooth one, This involved a percentage stretch factor which was only applied to the LEF to water bottom section. Below LEF horizon the time depth curves were shifted up or down through the whole volume as calculated.

4)- These corrected time depth curves were read back into Geodepth and new model was made.

Above-mentioned smoothed depth interval velocity model was used for final volume depth migration.

Figure 14 and 15 show final depth velocity model without and with the application of smoothing respectively.
Figure 16 and 17 show seismic stack sections without and with smoothed depth velocity model.

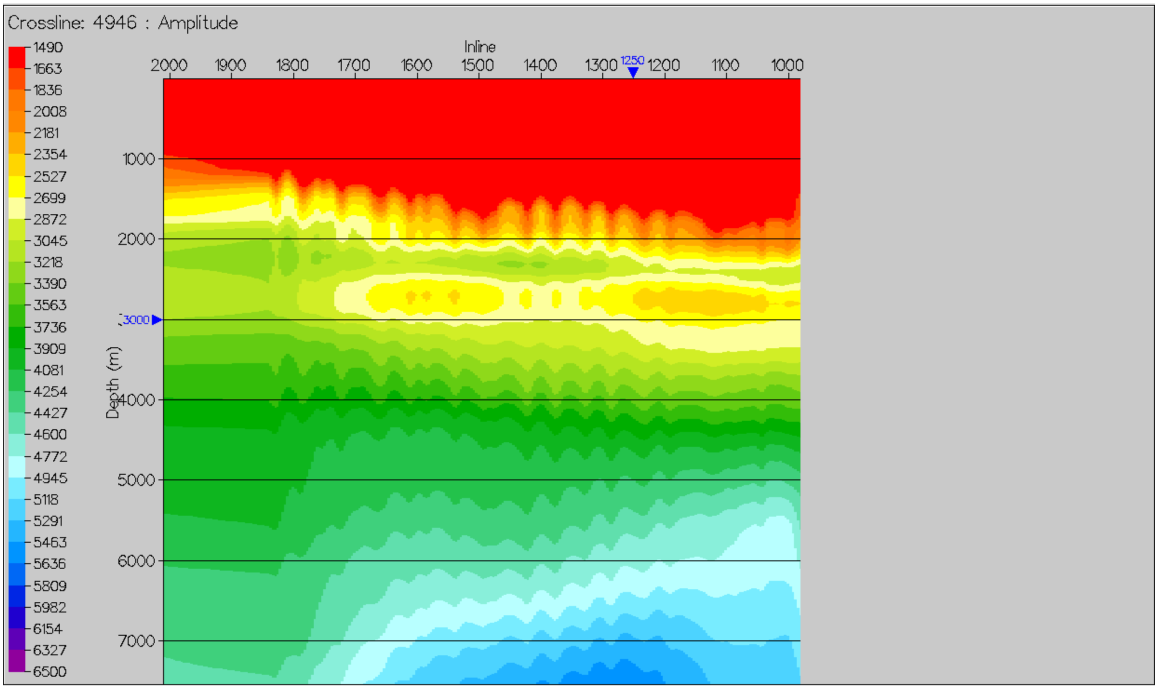


Figure 14. Depth velocity model along cross line 4946 with the fifth and final ZTOMO update.

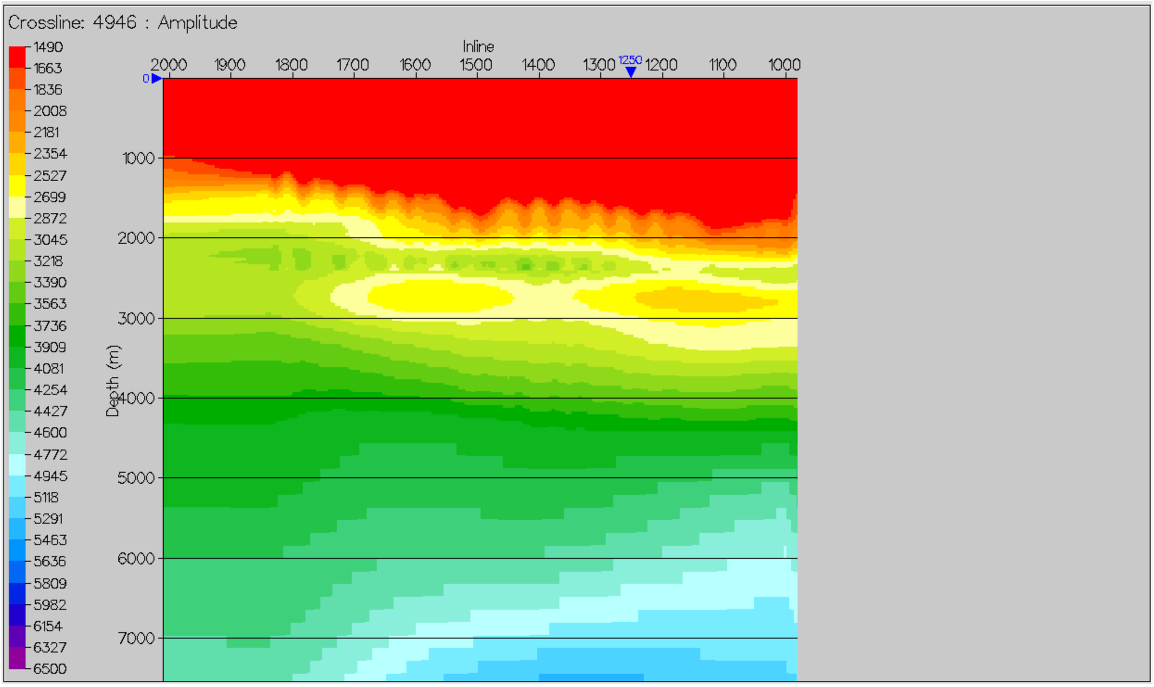


Figure 15. Depth velocity model along cross line 4946 with the application of smoothing on top the fifth and final ZTOMO update.

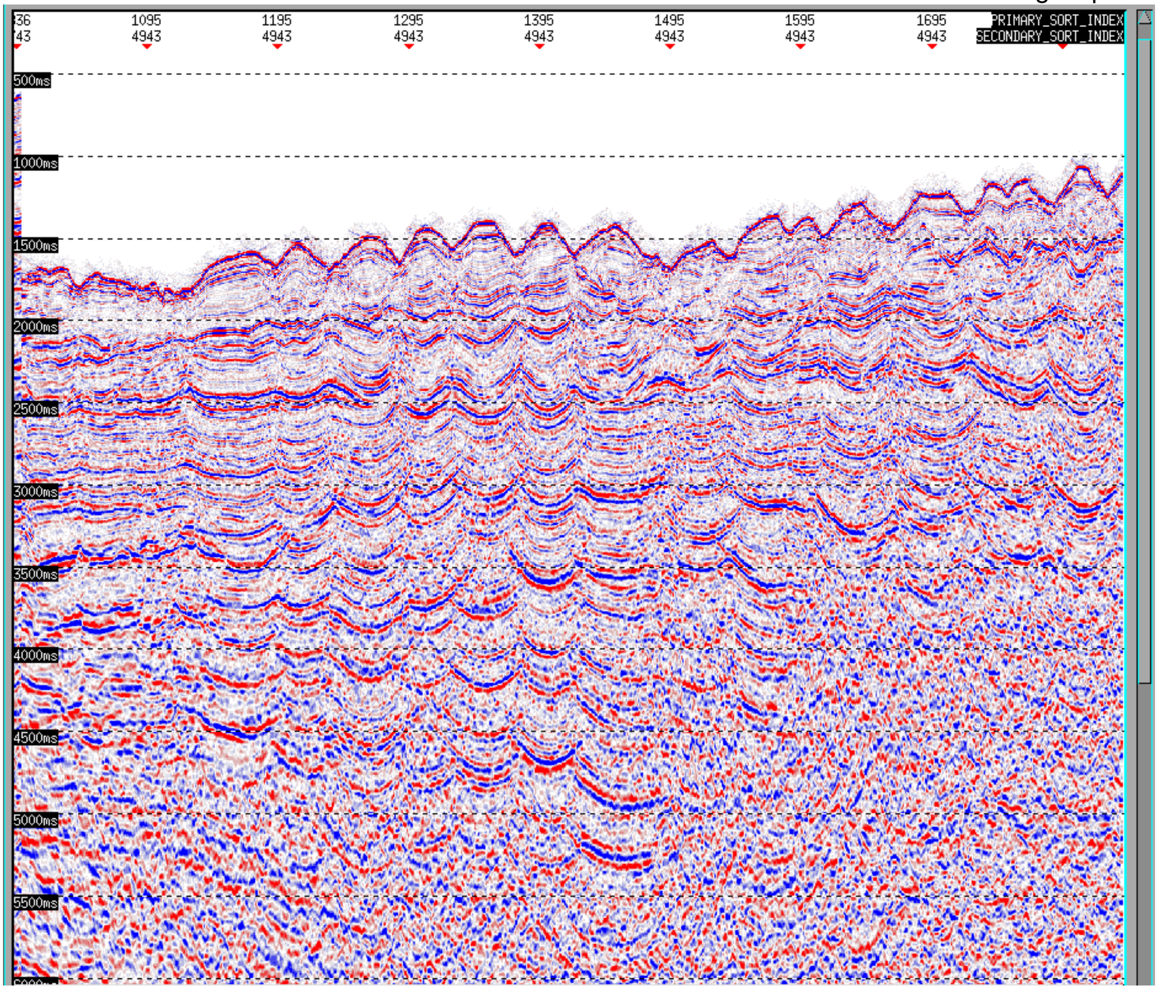


Figure 16. Seismic depth section along cross line 4943 with the fifth and final ZTOMO update.

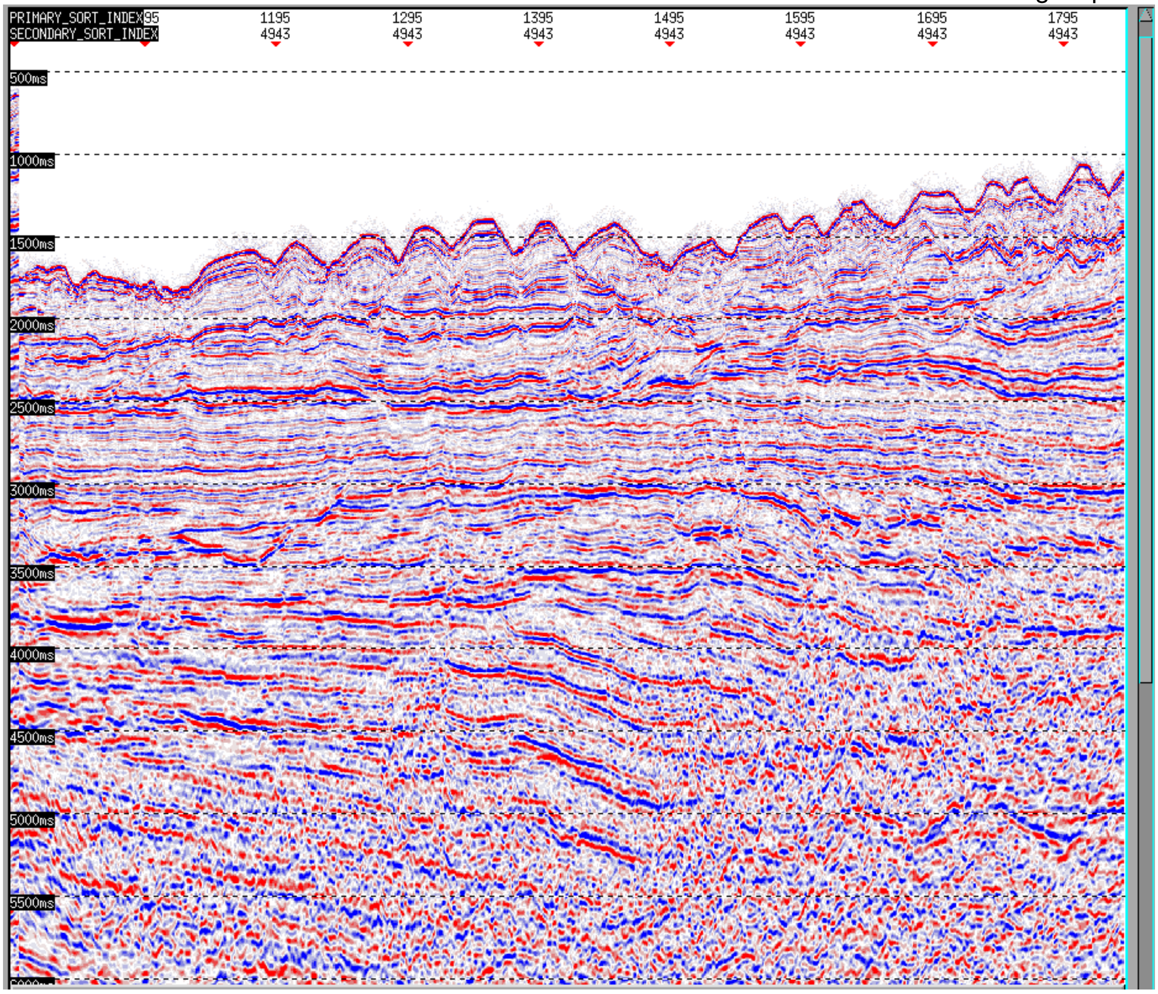


Figure 17. Seismic depth section along cross line 4943 with the application of smoothing on top of the ffith and final run of ZTOMO update.

9.1 3D Pre-stack Depth Migration (PrSDM)

The final migration run in WesternGeco's Omega seismic processing system was a Kirchhoff algorithm with anti-alias filtered operators. The travel timetable was computed using a Wave-front method.

It should be noted that variable depth step was used in PrSDM.

The following is a table that shows depth and depth step values used in depth migration:

Depth (m)	Depth step (m)

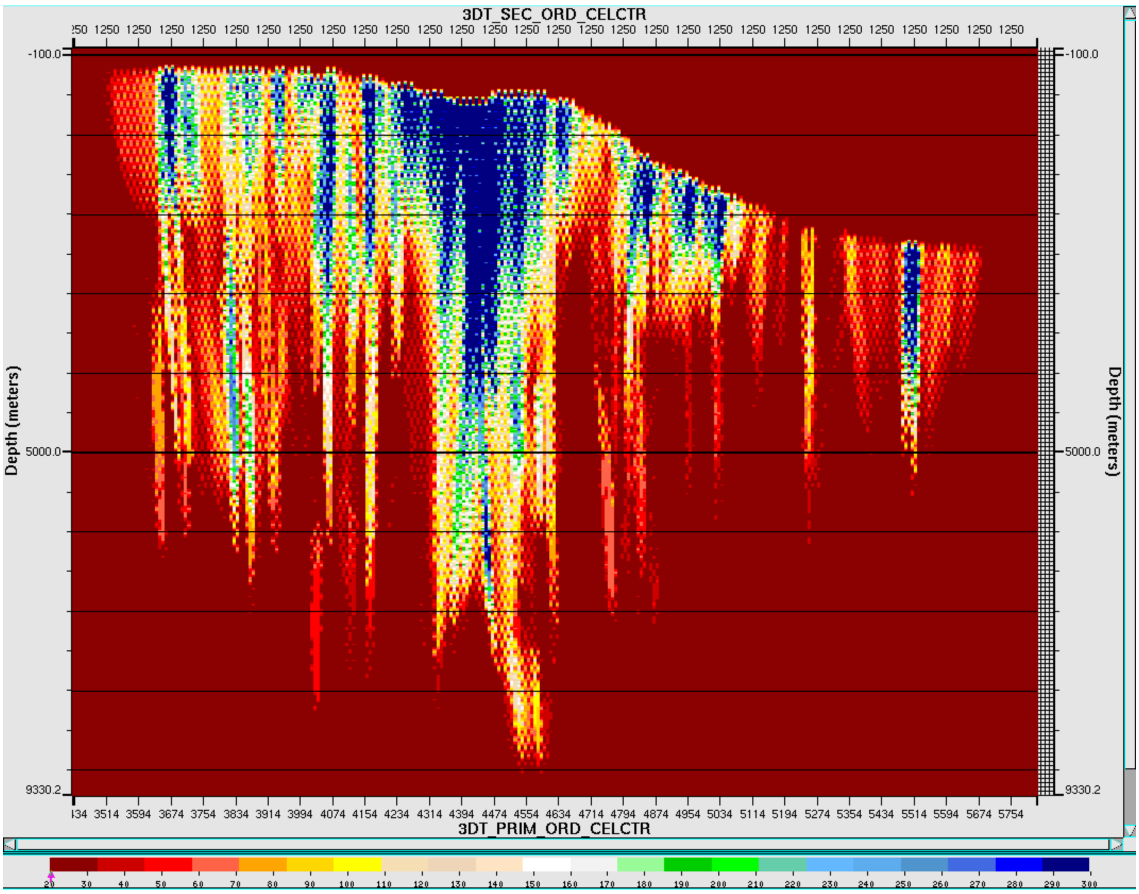
0	5
2000	5
4000	10
8000	15
10000	20

-

Geometrical spreading was removed prior to migration and Time Variant Filter was applied before migration. The filter values are tabulated below.

After running some migration tests in the crossline direction, the final migration was run with a 4 km half aperture, and with a maximum dip angle of 90 degrees. These parameters were sufficient to image the steeply dipping faults the data. Within the migration, the data was protected by an anti alias filter. The filter applied within the migration is variable with the depth of the data and the offset of the migrated trace.

Out of the final iteration of the grid tomography, it was possible to create a qc volume that illustrates the residual error in the velocity model. This was created and provided as a deliverable product, however it should be used with care as it was not created with the final velocity model used in the final migration run. An example of the output is shown below.



Time Variant Filter (Pre-Migration)

A zero-phase TVF (Time Variant Filter) was applied to the data. The filter pass-bands were described by low- and high-cut frequencies and associated dB/octave cutoff slopes. The specified cutoff frequencies are located at the half-power (-3 dB in amplitude) response points and the slopes at these frequencies are equal to the respective dB/octave values. The slope is an approximate cosine squared function in the amplitude domain. The filters were normalized so that the output amplitudes were the same as the input amplitudes for frequency components within the pass-band.

Parameter values:

Filter Centre Time (ms)	Low-cut Frequency (Hz)	Low-cut Slope (dB/octave)	High-cut Frequency (Hz)	High-cut Slope (dB/octave)
0	Open	Not Used	80	72
1000	Open	Not Used	70	72
2000	Open	Not Used	50	72
4000	Open	Not Used	40	72
6000	Open	Not Used	40	72

Note: The times are those at the centre of the filter where the full effect of the filter is attained. The first filter was applied from the beginning of the trace to the first filter centre time. Intermediate filters were linearly tapered and blended with the preceding and succeeding filter between the filter centre times.
The last filter was applied from the last filter centre time to the end of the data.
All filter times are relative to the water bottom time of the data.

9.1.1 Travel Timetable

The 3D Travel time Generator Omega Seismic Function module computes travel times from user-specified shot locations to each depth point in the output space.

The primary input to this module is a 3D-velocity model read from a velocity-input file. Then it is stored in memory as a 3D gridded velocity model.
The output space is a 3D volume specified by travel time grid parameter set. The shot locations for which travel times are generated are specified by the Shot grid parameter set.
For this project, the Velocity grid, Shot grid and travel time grid were all defined as a 100m by 100m x 50m grid in x, y and z directions respectively.
The travel timetable was computed using a Wave-front construction method – for a full description please refer to the reference listed in the appendix. This method generates a fan of rays through the velocity model and interpolates travel time onto a regular grid.

Post Migration Processing

The final depth to time converted data was passed through the production post stack processing sequence. Following is the post migration processing applied to this data:

1)- Conversion of image gathers from depth to time.

2)- Automatic Velocity Picker application for residual moveout analysis.

3)- Inverse NMO depth to time gathers then NMO the gathers with velocities from Automatic Velocity Picker (AVP).

4)- Application of Radon Demultiple.

5)- Outer trace Mute.

6)- Stack

7)- Time Variant Filter (TVF).

8)- Gain (two different products were produced. One with RAAC and the other with AGC)

9)- Time to Depth Conversion.

9.1.2 Automatic Velocity Picking

The Automatic Velocity Picker generated time-velocity picks from input coherence tables plus additional velocity information that was used to determine the starting velocity functions for the iterative velocity picking algorithm. It was also used for constraining the final interval velocity models and for deleting unacceptable RMS velocities from the computations.

The automatic velocity picking algorithm is based upon the work of J.L Toldi (1985). A significant feature of Toldi's technique is that velocities are picked under the constraint of a realistic interval velocity model, ensuring that picked RMS velocities do not imply unrealistic interval velocity functions. The algorithm works best for horizontally stratified geology, with mild lateral velocity variations.

Toldi's method also performs automatic stacking velocity analysis by finding the observed stacking velocity that maximizes the data semblance. The resultant algorithm simultaneously maximizes the semblance and minimizes the stacking velocity differences.

In order to prevent unrealistic picking of RMS velocity values, the following constraints, or penalty functions, were included to guide the autopicking algorithm:

Temporal smoothness weighting to reduce the effect of rapid fluctuations in interval velocity.
Deviation tolerance from the initial model.
Weight accorded to surrounding velocity functions.
Maximum and minimum allowable interval velocity.

Parameter values:

Temporal Smoothness	: 0 (disabled)
Initial Model Derivation	: 0.75
Blend Factor	: 1 (disabled)
Interval Velocity Range Limits	: 1000-8000m/s
Near Surface Velocity	: 1500m/s

Velocity Interpolation

The raw auto-picked velocities were gridded to a regular spatial and temporal grid prior to smoothing

Parameter values:

Output Velocity Field Grid Size	: 100m x 100m
Output temporal sample interval	: 20ms

Velocity Field Smoothing

Spatial smoothing was performed using a 3D Cosine Bell smoothing operator and can be applied to either the RMS or interval velocities, or both.

Parameter values:

Velocity type smoothed : RMS
Temporal smoothing filter shape : Cosine
Temporal smoothing filter length : 4 samples (125m, 200m, 375m and 500m radius at 40ms, 3500ms, 4500ms and 7000ms respectively)
Spatial Filter Decay Rate : 1 (where 0 represents a running average and 1 represents a linear weighting function from 0 to 1)

9.1.3 Weighted Least Squares Radon Multiple Attenuation

Radon Multiple Attenuation is principally a subtraction process. Unwanted coherent noise is isolated in the Tau-p domain, inverse transformed to the x-t domain, and then subtracted from the original data. Multiple energy can be isolated in the Tau-p domain because events with different velocities map to different parts of the domain.

In Radon Multiple Attenuation, three velocity fields are required:

- An estimate of the stacking velocity field, V_s.
- A velocity representing the dominant train of multiples of interest, V_d.
- A maximum velocity for multiple attenuation, V_m. This can be the same as V_d but is more usually a percentage of V_s and lies between V_d and V_s.

CMP gather data are first NMO corrected with velocity V_d so that the primary reflections are over corrected while the multiples are broadly flat or under corrected after the NMO. For convenience we refer to over corrected data as having negative dip (decreasing time with increasing offset), under corrected data has positive dip (increasing time with increasing offset) and 'flat' means no change in time with increasing offset.

The data are then transformed into the Tau-p domain using a parabolic radon transform. After hyperbolic normal-moveout, residual NMO has an approximately parabolic shape and hence a parabolic radon transform is appropriate in these circumstances.

The range of moveouts to transform, measured in ms at a reference-offset value, was chosen to cover the range of both primary and multiple energies. Following this, parts of Tau-p space representing primary energy were zeroed.

To further refine the construction of the model of the multiple energy, parts of Tau-p space representing primary energy were zeroed based on a knowledge of the velocity, V_d, used in the NMO and the multiple velocity, V_m. For this purpose ‘primary energy’ is assumed to be any data with a velocity faster than V_m. This allows for time-variance in the multiple velocity field that is not achieved by limiting the range of p-traces. V_m does not need to be the actual velocity of the multiples but rather a velocity that is as fast or faster than multiples of interest while being slower than the primary velocity.

Inverse Tau-p transform and inverse NMO produces a model of the multiple energies. This was subtracted from the original data to produce the multiple attenuated out-put.

Weighted Least Squares Radon transform seeks to improve the focusing of events in the Radon domain over that provided by the conventional transform. This improved resolution is achieved by including prior information about desirable characteristics of the model into the transform. The prior information usually takes the form of weights in the model domain, chosen to improve the sparseness of the model whilst still modelling all of the data. Improved focusing in the Radon domain improves identification and separation of signal and noise trends, with reduced artefact levels.

Weighted transforms can also be made to reduce aliasing effects by imposing a slow frequency dependence onto the prior information (weights). This improved handling of aliased data may be sufficient to remove or reduce the level of interpolation that would be required by a conventional transform.

When the Weighted Least Squares Radon transform is used for multiple attenuation (using parabolic or pseudo-hyperbolic moveout functions) the Radon domain mute may be moved closer to the primary events, allowing separation of primary and multiple events with very little moveout discrimination.

Parameter values:

Frequency range of multiple model : 0-125 Hertz
Multiple Velocity (V_m) : 100% of the primary velocity field

Number of p-traces generated : 468

Moveouts () at the reference offset ():
Minimum moveout (i.e. for the first p-trace) : -500 ms
Maximum moveout (i.e. for the last p-trace) : +1000 ms

Note: Moveouts used in making intermediate p-traces were linearly interpolated between the minimum and maximum moveouts.

Figures 18 and 19 show final depth stack migration in depth domain along inline 1248 before the application of residual velocity analysis/Radon Demultile and after the application of these two processing sequences.

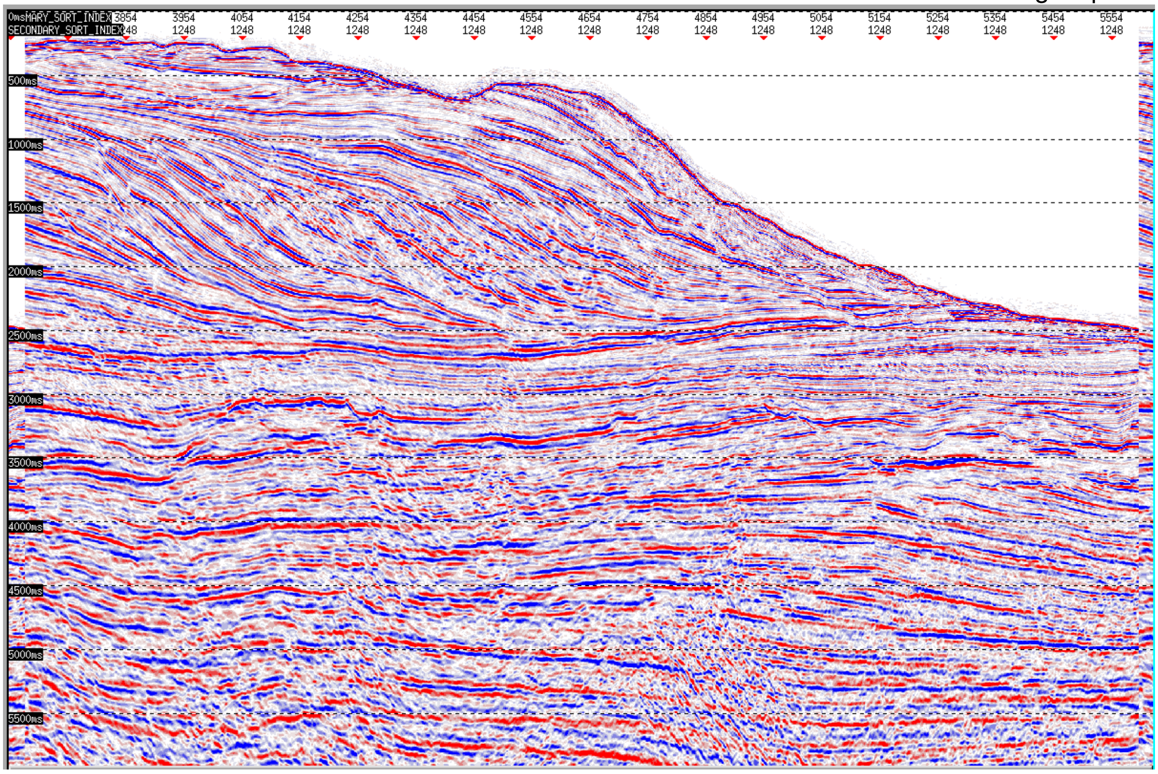
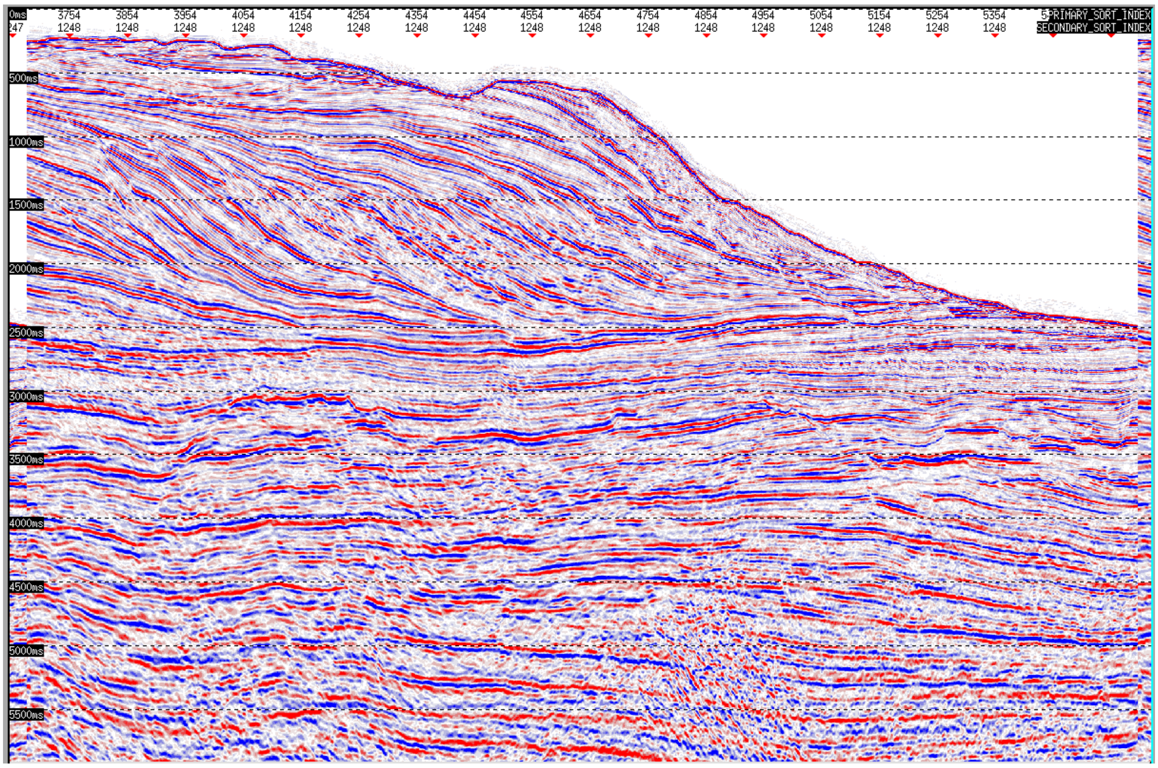


Figure 18. Seismic depth section in along in line 1248 without the application of residual velocity analysis and multiple attenuations.



9.1.4

Figure 19. Seismic depth section in along in line 1248 with the application of residual velocity analysis and multiple attenuations.

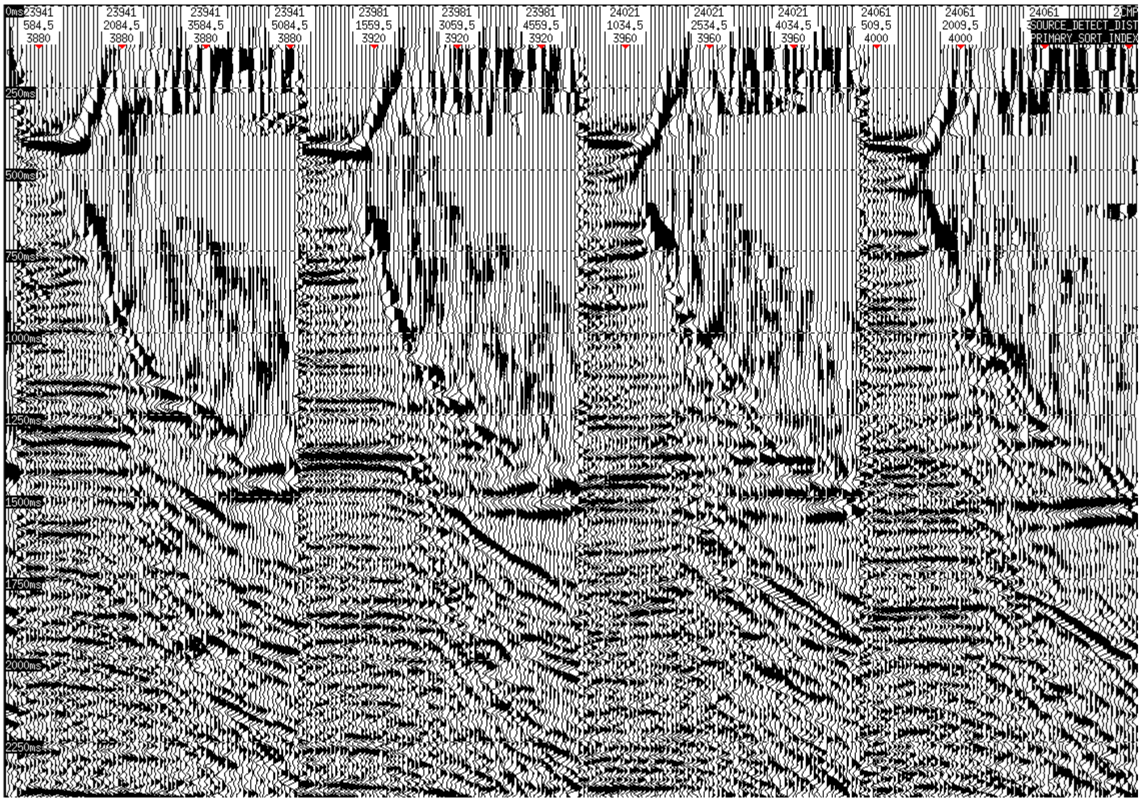


Figure 20. Seismic gathers along in line 1248 with no residual moveout applied

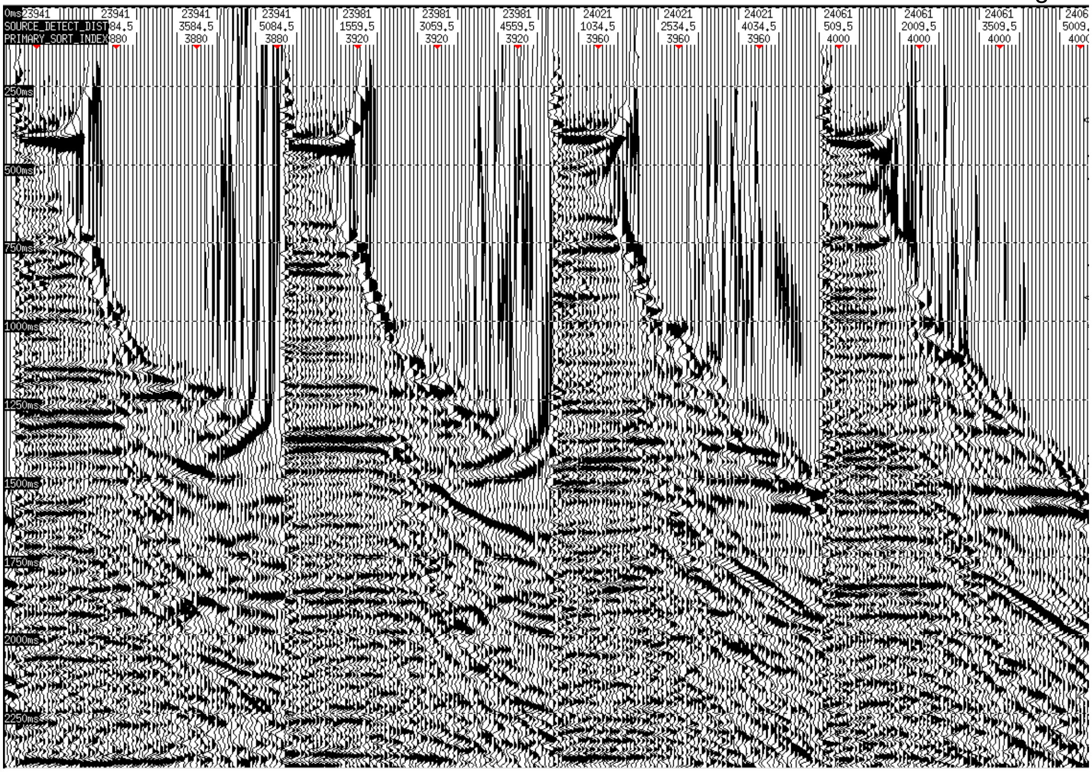


Figure 21. Seismic gathers along in line 1248 with residual moveout applied with the DVA velocity field

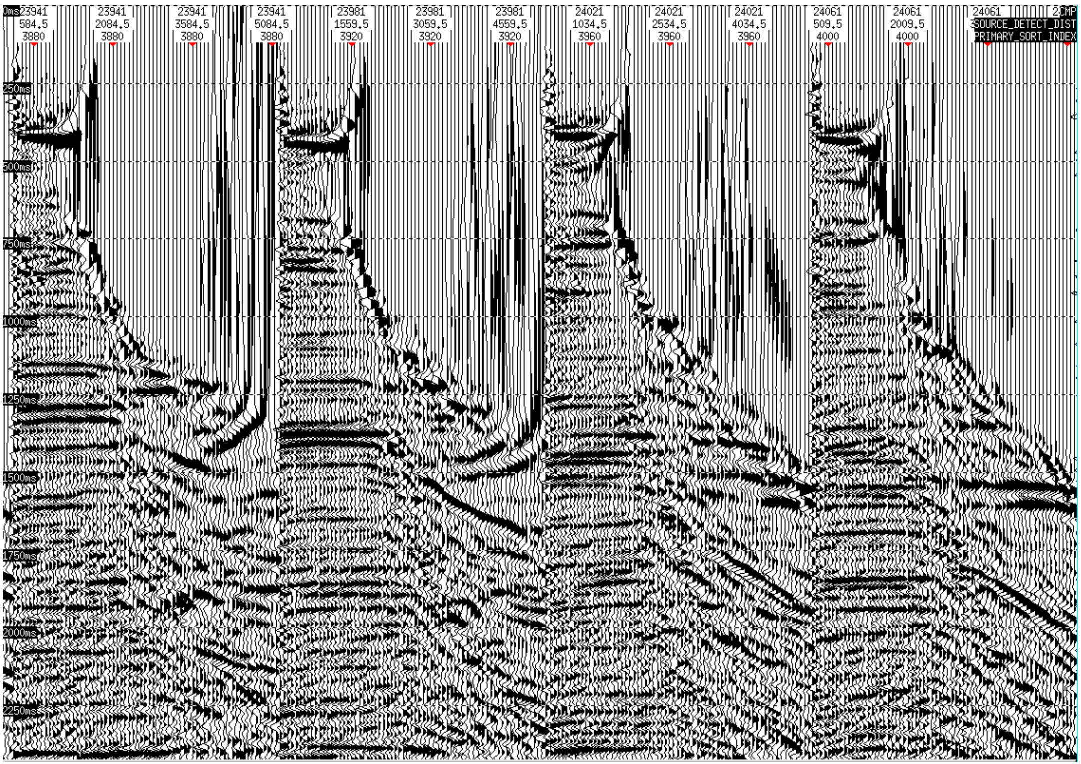


Figure 21. Seismic gathers along in line 1248 with residual moveout applied (with the DVA velocity field) and radon demultiple.

9.1.5 Outer Trace Mute

A spatially variant outer (long offset) trace mute was applied to the data in order to suppress direct arrivals, refractions and wide angle reflections. The mute was designed to vary with the water bottom time and allow up to approximately 30 – 40 degrees of reflection angle.

The data were tapered from zero to full amplitude over a taper zone.

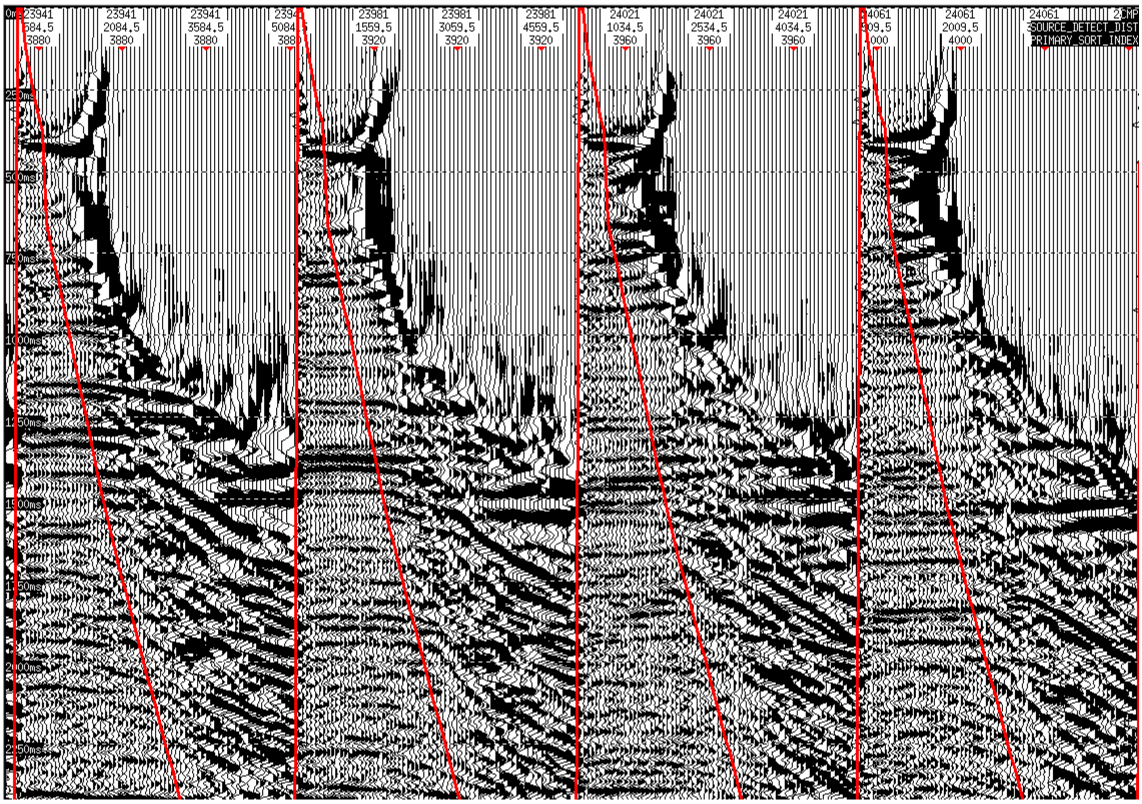


Figure 22. Seismic gathers along in line 1248 with the stack mute shown in red,

Parameter values:

Taper Zone Length : 24 ms (starting from the mute times detailed below)

Water Bottom Time (ms)	Constant Mute Maximum Offset (m)	Source-to-Detector Offset (m)	Mute Time (ms)
250	350	418 590	260 500

		1790 5180	1490 3540
755	700	750 2205 5174	756 1995 4178
2090	1550	1638 5180	2100 4900
3250	2650	2740 5147	3250 5714

Note: Mute times were interpolated between the specified offsets and extrapolated for offsets larger than the last offset specified.
Mute times were interpolated between the specified water bottom times and extrapolated larger than the last time and smaller than the first time.

Time Variant Filter (Post Migration)

A zero-phase TVF (Time Variant Filter) was applied to the data. The filter pass-bands were described by low- and high-cut frequencies and associated dB/octave cutoff slopes. The specified cutoff frequencies are located at the half-power (-3 dB in amplitude) response points and the slopes at these frequencies are equal to the respective dB/octave values. The slope is an approximate cosine squared function in the amplitude domain. The filters were normalised so that the output amplitudes were the same as the input amplitudes for frequency components within the pass-band.

Parameter values:

Filter Centre Time (ms)	Low-cut Frequency (Hz)	Low-cut Slope (dB/octave)	High-cut Frequency (Hz)	High-cut Slope (dB/octave)
0	Open	Not Used	80	72
1000	Open	Not Used	70	72
2000	Open	Not Used	60	72
4000	Open	Not Used	50	72
6000	Open	Not Used	40	72

Note: The times are those at the centre of the filter where the full effect of the filter is attained. The first filter was applied from the beginning of the trace to the first filter centre time. Intermediate filters were linearly tapered and blended with the preceding and succeeding filter between the filter centre times.
The last filter was applied from the last filter centre time to the end of the data.
All filter times are relative to the water bottom time of the data.

Residual Amplitude Analysis/Compensation (RAAC)

Where true-amplitude information needs to be retained in the data, the application of data dependent scaling is undesirable; yet the failure to apply scaling can result in data which is difficult to display due to the range of amplitudes (dynamic range) present. The RAAC process uses statistical means to retain anomalous amplitude information, such as bright spots, while allowing the data to be scaled.

The analysis step of RAAC computes, for each trace, the amplitudes of multiple windows using a rms-amplitude criterion. The Residual Amplitude Compensation (RAC) value of each window is then the reciprocal of this computed amplitude. The centre of each time window defines the position of its associated RAC value. Knowing the X-Y location and time of each RAC value allows both spatial and temporal smoothing to be applied to the RAC values.

The application step of RAAC takes the smoothed RAC values, interpolates to every sample, and applies the resulting scalars to the input traces.

Parameter values:

Analysis Window Start : Start Time(The first analysis window began at the first live sample/The first analysis window began at the trace start time (the RAC value corresponding to this start time was applied to all data from the start time to the first sample))
Window Length : 400 (One-tenth of the maximum reflection time/Not Applicable)
Window Advance : 200 (Half the window length/Not Applicable)
Amplitude Analysis Type : rms
Note: If the amount of live data within a window is not equal to at least one-half the window advance, then the RAC value for the previous window is used.
Temporal Smoothing at Top of Data : 3
Temporal Smoothing at Bottom of Data : 3
Spatial Smoothing Width : Not Applied)

10.0Instantaneous Gain

The Instantaneous Gain Seismic Function Module in its basic format applies gain to a trace by moving down the trace, sample by sample, calculating a multiplier at each step. Each multiplier is based on some measure of amplitudes in a window centered on the sample. Specifying the moment of distribution used, controls the amplitude measure.

Parameter values:

Type	: AGC
Output RMS Amplitude	: 2000rms
Window Length	: 500ms
Window Start Time	: Water bottom two-way time

10.1 QC procedure for depth migration processing

At all stages the CIP (Common Image Points) gathers (time and depth) and stack sections (time and depth) of selected lines (every 10th in line and 4th cross line) were examined and compared with hybrid depth migrated data. In addition to the above lines tests were carried over two other lines, that is inline 1248 and 1510 to make sure velocity model and processing parameters are optimum.

10.1.1 Depth Migration result

The following two figures show a comparison between the full pre-stack depth migration and the previous migration on the Exploration cube.

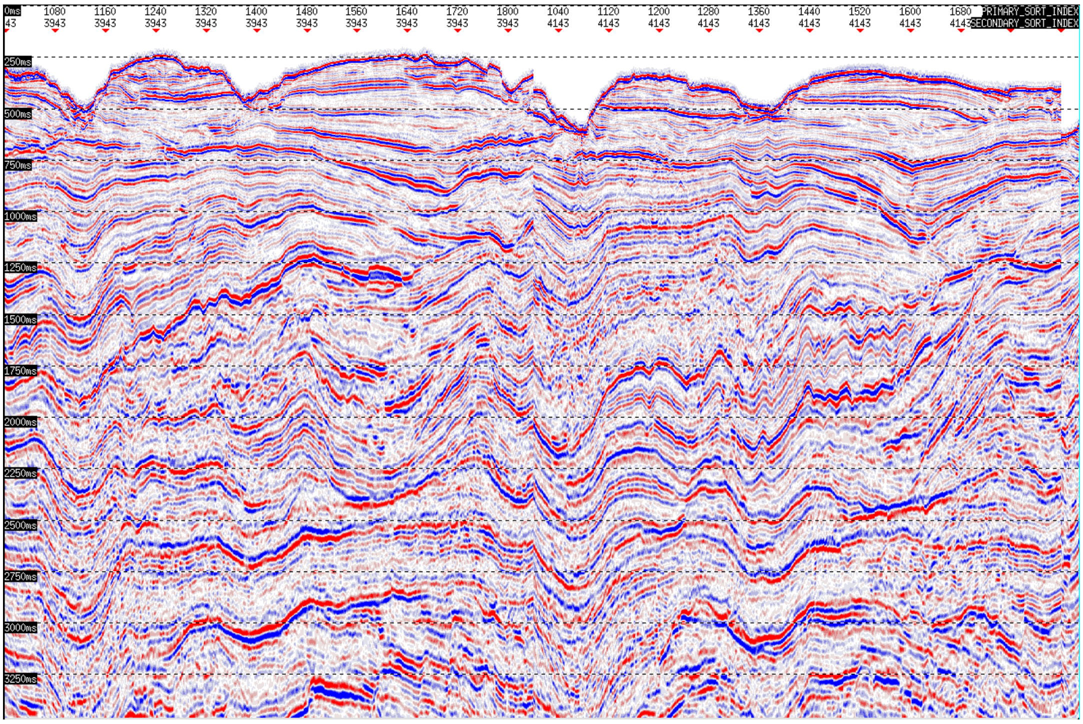


Figure 20. Crosslines 3943 and 4143 from the Exploration cube

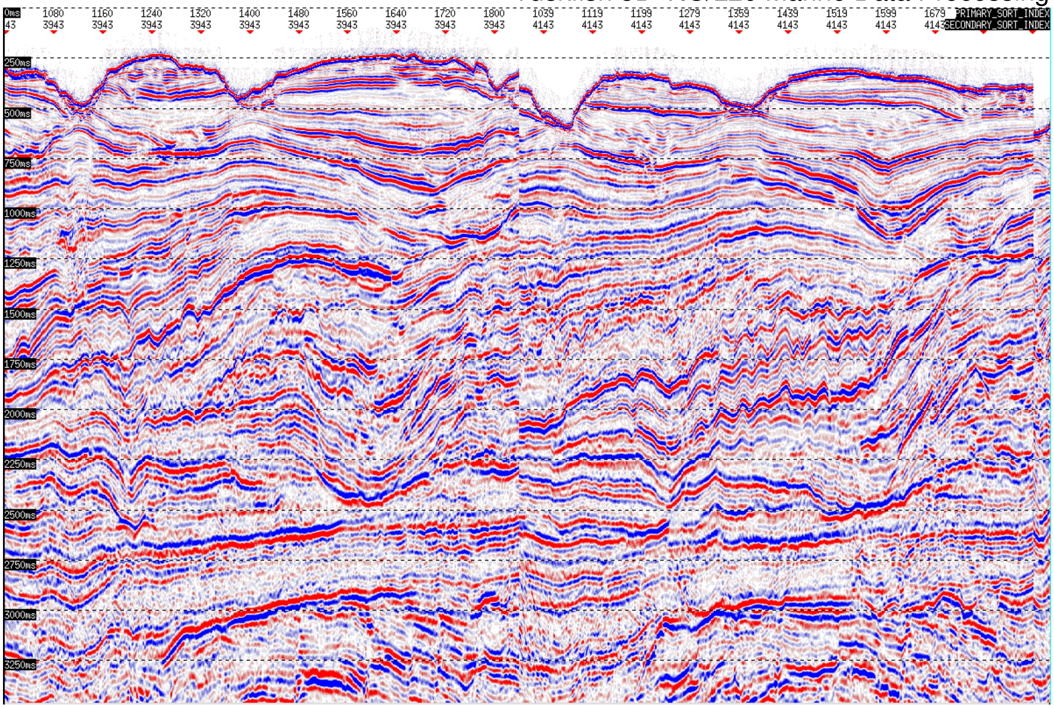


Figure 21. Crosslines 3943 and 4143 from the Production cube

10.1.2 Final products (Depth Migration) SEG-Y Archive

The following final seismic data volume were archived onto 10Gb 3590B cartridge tape for delivery to the client. See tape lists in Section 12.10.

1)- Final raw migrated depth volume.
2)- Final gained (RAAC) migrated depth volume.
3)- Final gained (AGC) migrated depth volume.
4)- Final raw migrated depth to time volume.
5)- Final gained (RAAC) migrated depth to time volume.
6)- Final gained (AGC) migrated depth to time volume.

Velocity Archive

The following velocity files were archived into CD:

1)- Final migrated depth interval velocity.
2)- Final migrated two-way time interval velocity.
3)- Final residual velocity in two-way time rms velocity format.

Support Data

1) Bin Center Tape
2) Illumination Cube
3) Picked Water-bottom depth (100m x 100m grid)
4) Final Processing Report (6 hard copies and 6 copies on CD-ROM in MS-Word format)

11.0Personnel

Name (WesternGeco)	**Title**	**Email**
Lawrence Cho	Centre Manager	kcho@perth.westerngeco.slb.com
Paul Tredgett	Processing Supervisor	ptredgett@perth.westerngeco.slb.com
Bjorn Muller	Area Geophysicist (Exploration Cube processing and pre-stack depth migration processing on Production Cube)	muller3@perth.westerngeco.slb.com
Richard Bisley	Area Geophysicist (Production Cube time processing)	rbisley@perth.westerngeco.slb.com
Peter Griffin	Senior Geophysicist (Project Leader, Exploration Cube)	pgriffin1@melbourne.westerngeco.slb.com
Ryan Taylor-Walshe	Senior Geophysicist (Exploration Cube)	walshe1@perth.westerngeco.slb.com
Alison Keighley	Senior Geophysicist (Project Leader, Production Cube)	akeighley@perth.westerngeco.slb.com
Ken Jayan	Junior Geophysicist (Production Cube)	kjayan@perth.westerngeco.slb.com
Mohammed Norozi	Senior Geophysicist (Depth processing)	mnorozi@perth.westerngeco.slb.com

Name (Client)	**Title**	**Email**
John Hefti	Senior Exploration Geophysicist	John.Hefti@exxonmobil.com
Erik Neumann		Erik.Neumann@exxonmobil.com
John Moore		John.F.Moore@exxonmobil.com

12.0Appendices

12.1 Field Tape Listing

The following listing shows all field data acquired for the project:

Line Name	Tape No.	Line Name	Tape No.	Line Name	Tape No.	Line Name	Tape No.
G03A1440A001	W60213	G03A1552X056	W60541	G03A1872A108	W60879	G03A2000K149	W61212
G03A1440A001	W60214	G03A1552X056	W60542	G03A1872A108	W60880	G03A2000K149	W61213
G03A1440A001	W60215	G03A1008J057	W60543	G03A1872A108	W60881	G03A1792J150	W61214
G03A1440A001	W60216	G03A1008J057	W60544	G03A1840C109	W60882	G03A1792J150	W61215
G03A1440A001	W60217	G03A1008J057	W60545	G03A1872B110	W60883	G03A1792J150	W61216
G03A1440A001	W60218	G03A1056C058	W60546	G03A1872B110	W60884	G03A1792J150	W61217
G03A1440A001	W60219	G03A1568A059	W60547	G03A1872B110	W60885	G03A1792J150	W61218
G03A1440A001	W60220	G03A1312B060	W60548	G03A1872B110	W60886	G03A1792J150	W61219
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G03A1136A002	W60222	G03A1008B061	W60550	G03A1872B110	W60888	G03A1792J150	W61221
G03A1136A002	W60223	G03A1008K062	W60551	G03A1632A111	W60889	G03A1792J150	W61222
G03A1136A002	W60224	G03A1008K062	W60552	G03A1632A111	W60890	G03A1856J151	W61223
G03A1136A002	W60225	G03A1008K062	W60553	G03A1632A111	W60891	G03A1856J151	W61224
G03A1136A002	W60226	G03A1008K062	W60554	G03A1632A111	W60892	G03A1856J151	W61225
G03A1136A002	W60227	G03A1040B063	W60555	G03A1632A111	W60893	G03A1856J151	W61226
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G03A1456A003	W60232	G03A1312J064	W60560	G03A1888A112	W60898	G03A1792K152	W61231
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G03A1152A004	W60236	G03A1312C066	W60564	G03A1888A112	W60902	G03A1792K152	W61235
G03A1152A004	W60237	G03A1312C066	W60565	G03A1888A112	W60903	G03A1792K152	W61236
G03A1152A004	W60238	G03A1312C066	W60566	G03A1888A112	W60904	G03A1792K152	W61237
G03A1152A004	W60239	G03A1312C066	W60567	G03A1888A112	W60905	G03A1792K152	W61238
G03A1152A004	W60240	G03A1312K067	W60568	G03A1888A112	W60906	G03A1792K152	W61239
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G03A1184A008	W60263	G03A1568B069	W60591	G03A1664A115	W60930	G03A1968K158	W61262
Line Name	**Tape No.**	**Line Name**	**Tape No.**	**Line Name**	**Tape No.**	**Line Name**	**Tape No.**
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G03A1488B014	W60303	G03A1296J075	W60630	G03A1920J120	W60969	G03A2048A164	W61302
G03A1488B014	W60304	G03A1296J075	W60631	G03A1920J120	W60970	G03A2048A164	W61303
G03A1216A015	W60305	G03A1296J075	W60632	G03A1920J120	W60971	G03A2048A164	W61304

G03A1216A015	W60306	G03A1152B076	W60633	G03A1920J120	W60972	G03A2048A164	W61305
G03A1216A015	W60307	G03A1152B076	W60634	G03A1920J120	W60973	G03A2048A164	W61306
G03A1216A015	W60308	G03A1152B076	W60635	G03A1920J120	W60974	G03A2224I165	W61308
G03A1216A015	W60309	G03A1152B076	W60636	G03A1920J120	W60975	G03A2224I165	W61309
G03A1216A015	W60310	G03A1152B076	W60637	G03A1920J120	W60976	G03A2224I165	W61310
G03A1216A015	W60311	G03A1536J077	W60638	G03A1696A121	W60977	G03A2224I165	W61311
G03A1216A015	W60312	G03A1536J077	W60639	G03A1696A121	W60978	G03A2224I165	W61312
G03A1408B016	W60313	G03A1216J078	W60640	G03A1696A121	W60979	G03A2224I165	W61313
G03A1408B016	W60314	G03A1216J078	W60641	G03A1696A121	W60980	G03A2224I165	W61314
G03A1408B016	W60315	G03A2352A079	W60642	G03A1696A121	W60981	G03A2224I165	W61315
G03A1408B016	W60316	G03A2352A079	W60642	G03A1696A121	W60982	G03A2224I165	W61316
G03A1408B016	W60317	G03A2160A080	W60643	G03A1696A121	W60983	G03A2048J166	W61317
G03A1408B016	W60318	G03A2160A080	W60644	G03A1696A121	W60984	G03A2048J166	W61318
G03A1408B016	W60319	G03A2160A080	W60645	G03A1696A121	W60985	G03A2048J166	W61319
G03A1232A017	W60320	G03A2160A080	W60646	G03A1936A122	W60986	G03A2048J166	W61320
G03A1232A017	W60321	G03A2160A080	W60647	G03A1936A122	W60987	G03A2048J166	W61321
G03A1232A017	W60322	G03A2160A080	W60649	G03A1936A122	W60988	G03A2048J166	W61322
G03A1232A017	W60323	G03A2160A080	W60650	G03A1936A122	W60989	G03A2048J166	W61323
G03A1232B018	W60324	G03A2160A080	W60651	G03A1936A122	W60990	G03A2048J166	W61324
G03A1232B018	W60325	G03A2160A080	W60652	G03A1936A122	W60991	G03A2048J166	W61325
G03A1232B018	W60326	G03A2352B081	W60653	G03A1936A122	W60992	G03A2048J166	W61326
G03A1232B018	W60327	G03A2352B081	W60654	G03A1712A123	W60993	G03A2208A167	W61327
G03A1232B018	W60328	G03A2352B081	W60655	G03A1712A123	W60994	G03A2336B168	W61330
G03A1232B018	W60329	G03A2352B081	W60656	G03A1712A123	W60995	G03A2048K169	W61331
Line Name	**Tape No.**	**Line Name**	**Tape No.**	**Line Name**	**Tape No.**	**Line Name**	**Tape No.**
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G03A1504A019	W60332	G03A2352B081	W60659	G03A1712A123	W60998	G03A2048K169	W61334
G03A1504A019	W60333	G03A2352B081	W60660	G03A1712A123	W60999	G03A2048K169	W61335
G03A1504A019	W60334	G03A2352B081	W60661	G03A1936B124	W61000	G03A2048K169	W61336
G03A1504A019	W60335	G03A2144A082	W60662	G03A1936B124	W61001	G03A2048K169	W61337
G03A1504A019	W60336	G03A2144A082	W60663	G03A1936B124	W61002	G03A2048K169	W61338
G03A1120B020	W60337	G03A2144A082	W60664	G03A1936B124	W61003	G03A2208B170	W61339
G03A1120B020	W60338	G03A2144A082	W60665	G03A1936B124	W61004	G03A2208B170	W61340
G03A1120B020	W60339	G03A2144A082	W60666	G03A1936B124	W61005	G03A2208B170	W61341
G03A1120B020	W60340	G03A2144A082	W60667	G03A1936B124	W61006	G03A2208B170	W61342
G03A1120B020	W60341	G03A2336A083	W60668	G03A1936B124	W61007	G03A2208B170	W61343
G03A1120B020	W60342	G03A2336A083	W60669	G03A1936B124	W61008	G03A2208B170	W61344
G03A1120B020	W60343	G03A2336A083	W60670	G03A1936B124	W61009	G03A2208B170	W61345
G03A1392A021	W60344	G03A2336A083	W60671	G03A1712B125	W61010	G03A2208B170	W61346
G03A1392A021	W60345	G03A2336A083	W60672	G03A1712B125	W61011	G03A2208B170	W61347
G03A1392A021	W60346	G03A2336A083	W60673	G03A1712B125	W61012	G03A2032A171	W61348
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G03A1392A021	W60349	G03A2320A084	W60676	G03A1712B125	W61015	G03A2032A171	W61351
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G03A1248A022	W60352	G03A2144B085	W60679	G03A1712B125	W61018	G03A2032A171	W61354
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G03A1248A022	W60354	G03A2144B085	W60681	G03A1952A126	W61020	G03A2032A171	W61356
G03A1248A022	W60355	G03A2144B085	W60682	G03A1952A126	W61021	G03A2032A171	W61357
G03A1248A022	W60356	G03A2144B085	W60683	G03A1952A126	W61023	G03A2208I172	W61358
G03A1248A022	W60357	G03A2144B085	W60684	G03A1952A126	W61024	G03A2208I172	W61359

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G03A1504J023	W60359	G03A2144B085	W60686	G03A1952A126	W61026	G03A2208J173	W61361
G03A1504J023	W60360	G03A2144B085	W60687	G03A1952A126	W61027	G03A2208J173	W61362
G03A1504J023	W60361	G03A2144B085	W60688	G03A1952A126	W61028	G03A2208J173	W61363
G03A1504J023	W60362	G03A2320B086	W60689	G03A1952A126	W61029	G03A2032I174	W61364
G03A1504J023	W60363	G03A2320B086	W60690	G03A1712J127	W61030	G03A2032I174	W61365
G03A1504J023	W60364	G03A2320B086	W60691	G03A1712J127	W61032	G03A2032I174	W61366
G03A1104A024	W60365	G03A2320B086	W60692	G03A1712J127	W61033	G03A2032I174	W61367
G03A1104A024	W60366	G03A2320B086	W60693	G03A1712J127	W61034	G03A2032I174	W61368
G03A1104A024	W60367	G03A2320B086	W60694	G03A1712J127	W61035	G03A2032I174	W61369
G03A1104A024	W60368	G03A2320B086	W60695	G03A1712J127	W61036	G03A2032I174	W61370
G03A1104A024	W60369	G03A2320B086	W60696	G03A1712J127	W61037	G03A2032I174	W61371
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G03A1104A024	W60371	G03A2160B087	W60698	G03A1712J127	W61039	G03A2240J175	W61373
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G03A1376A025	W60375	G03A2160B087	W60702	G03A1968A128	W61043	G03A2144J176	W61377
G03A1376A025	W60376	G03A2160B087	W60703	G03A1968A128	W61044	G03A2144J176	W61378
G03A1376A025	W60377	G03A2160B087	W60704	G03A1968A128	W61045	G03A2272K177	W61379
G03A1376A025	W60378	G03A2160B087	W60705	G03A1968A128	W61046	G03A2272K177	W61380
G03A1104J026	W60379	G03A2160B087	W60706	G03A1968A128	W61047	G03A2272K177	W61381
G03A1104J026	W60380	G03A2320J088	W60707	G03A1968A128	W61048	G03A2032K178	W61382
G03A1104K027	W60381	G03A2320J088	W60708	G03A1728A129	W61049	G03A2032K178	W61383
G03A1104K027	W60382	G03A2320J088	W60709	G03A1728A129	W61050	G03A2032K178	W61384
G03A1104K027	W60383	G03A2320J088	W60710	G03A1728A129	W61051	G03A2032K178	W61385
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G03A1456B028	W60386	G03A2320J088	W60713	G03A1728A129	W61054	G03A2192A179	W61388
G03A1104L029	W60387	G03A2320J088	W60714	G03A1728A129	W61055	G03A2192A179	W61389
G03A1104L029	W60388	G03A2320J088	W60715	G03A1728A129	W61056	G03A2192A179	W61390
G03A1104L029	W60389	G03A2144C089	W60716	G03A1728A129	W61058	G03A2192A179	W61391
G03A1104M030	W60390	G03A2144C089	W60717	G03A1968J130	W61060	G03A2192A179	W61392
G03A1104M030	W60391	G03A2144C089	W60719	G03A1968J130	W61061	G03A2192A179	W61393
G03A1104M030	W60392	G03A2144C089	W60720	G03A1968J130	W61062	G03A2192A179	W61394
G03A1520A031	W60393	G03A2144C089	W60721	G03A1968J130	W61063	G03A2192A179	W61395
Line Name	**Tape No.**	**Line Name**	**Tape No.**	**Line Name**	**Tape No.**	**Line Name**	**Tape No.**
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G03A1520A031	W60396	G03A2144C089	W60724	G03A1968J130	W61066	G03A2032L180	W61398
G03A1520A031	W60397	G03A2144C089	W60725	G03A1968J130	W61067	G03A2032L180	W61399
G03A1520A031	W60398	G03A2304A090	W60726	G03A1744A131	W61068	G03A2032L180	W61400
G03A1248J032	W60399	G03A2304A090	W60727	G03A1744A131	W61069	G03A2032L180	W61401
G03A1248J032	W60400	G03A2304A090	W60728	G03A1744A131	W61070	G03A2032L180	W61402
G03A1248J032	W60401	G03A2304A090	W60729	G03A1744A131	W61071	G03A2032L180	W61403
G03A1248J032	W60402	G03A2304A090	W60730	G03A1744A131	W61072	G03A2032L180	W61404
G03A1248J032	W60403	G03A2304A090	W60731	G03A1744A131	W61073	G03A2192J181	W61405
G03A1248J032	W60404	G03A2304A090	W60732	G03A1744A131	W61074	G03A2032M182	W61406
G03A1248J032	W60405	G03A2304A090	W60733	G03A1744A131	W61076	G03A2032M182	W61407
G03A1360A033	W60406	G03A2304A090	W60734	G03A1744A131	W61077	G03A2032M182	W61408
G03A1360A033	W60407	G03A2128A091	W60735	G03A1984A132	W61078	G03A2032M182	W61409
G03A1360A033	W60408	G03A2128A091	W60736	G03A1984A132	W61079	G03A2032M182	W61410
G03A1360A033	W60409	G03A2128A091	W60737	G03A1984A132	W61080	G03A2032M182	W61411
G03A1360A033	W60410	G03A2128A091	W60738	G03A1984A132	W61081	G03A2032M182	W61412

G03A1360A033	W60411	G03A2128A091	W60739	G03A1984A132	W61082	G03A2032M182	W61413
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G03A1104N034	W60413	G03A2128A091	W60741	G03A1984A132	W61084	G03A2192K183	W61415
G03A1104N034	W60414	G03A2128A091	W60742	G03A1984A132	W61085	G03A2192K183	W61416
G03A1104N034	W60415	G03A2128A091	W60743	G03A1984A132	W61086	G03A2192K183	W61417
G03A1360J035	W60416	G03A2288A092	W60744	G03A1744X133	W61087	G03A2192K183	W61418
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G03A1360J035	W60418	G03A2288A092	W60746	G03A1744X133	W61089	G03A2192K183	W61420
G03A1360J035	W60419	G03A2288A092	W60747	G03A1744X133	W61090	G03A2192K183	W61421
G03A1360J035	W60420	G03A2288A092	W60748	G03A1744X133	W61091	G03A2016A184	W61422
G03A1360J035	W60421	G03A2288A092	W60749	G03A1744X133	W61092	G03A2016A184	W61423
G03A1360J035	W60422	G03A2288A092	W60750	G03A1744X133	W61093	G03A2016A184	W61424
G03A1360J035	W60423	G03A2288A092	W60751	G03A1744X133	W61094	G03A2016A184	W61425
G03A1088A036	W60424	G03A2288A092	W60753	G03A1744X133	W61095	G03A2016A184	W61426
G03A1088A036	W60425	G03A2112A093	W60754	G03A1824A134	W61096	G03A2016A184	W61427
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G03A1088A036	W60429	G03A2112A093	W60758	G03A1824A134	W61100	G03A2016A184	W61431
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G03A1360K037	W60434	G03A2112A093	W60763	G03A1344J135	W61105	G03A2192X185	W61436
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G03A1072A038	W60437	G03A2272A094	W60766	G03A1344J135	W61108	G03A2192X185	W61439
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G03A1072B039	W60440	G03A2272A094	W60770	G03A1808A136	W61111	G03A2016J186	W61442
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G03A1344A040	W60444	G03A2112X095	W60774	G03A1808A136	W61115	G03A2016J186	W61446
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G03A1344A040	W60447	G03A2112X095	W60778	G03A1808A136	W61118	G03A2016J186	W61449
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G03A1104O041	W60449	G03A2112X095	W60780	G03A1440J137	W61120	G03A2192Y187	W61451
G03A1104O041	W60450	G03A2112X095	W60782	G03A1440J137	W61121	G03A2192Y187	W61452
G03A1104O041	W60451	G03A2112X095	W60783	G03A1440J137	W61122	G03A2192Y187	W61453
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G03A1072C042	W60453	G03A2112X095	W60785	G03A1440J137	W61124	G03A2192Y187	W61455
G03A1072C042	W60454	G03A2112X095	W60786	G03A2000A138	W61125	G03A2192Y187	W61456
G03A1072C042	W60455	G03A2272J096	W60787	G03A2000A138	W61126	G03A2192Y187	W61457
G03A1520B043	W60456	G03A2272J096	W60788	G03A2000A138	W61127	G03A2192Y187	W61458
G03A1520B043	W60457	G03A2272J096	W60789	G03A2000B139	W61128	G03A2192Y187	W61459
G03A1520B043	W60458	G03A2272J096	W60790	G03A2000B139	W61129	G03A2192Y187	W61460
Line Name	**Tape No.**	**Line Name**	**Tape No.**	**Line Name**	**Tape No.**	**Line Name**	**Tape No.**
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G03A1056A044	W60461	G03A2272J096	W60794	G03A2000B139	W61132	G03A2160J188	W61463
G03A1056A044	W60462	G03A2096A097	W60795	G03A2000B139	W61133	G03A2160J188	W61464
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G03A1328A046	W60467	G03A2096A097	W60800	G03A1760A140	W61138	G03A2192L191	W61469
G03A1328A046	W60468	G03A2096A097	W60801	G03A1760A140	W61139	G03A2192L191	W61470
G03A1328A046	W60469	G03A2096A097	W60802	G03A1760A140	W61140	G03A2192L191	W61471
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G03A1328A046	W60471	G03A2256A098	W60804	G03A1760A140	W61142	G03A2176J192	W61473
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G03A1040A047	W60479	G03A2256A098	W60812	G03A2000J141	W61150	G03A2224J193	W61481
G03A1040A047	W60480	G03A2080A099	W60813	G03A2000J141	W61151	G03A2224J193	W61482
G03A1040A047	W60481	G03A2080A099	W60814	G03A2000J141	W61152	G03A2224J193	W61483
G03A1536A048	W60482	G03A2080A099	W60815	G03A1776A142	W61153	G03A2240C194	W61484
G03A1536A048	W60483	G03A2080A099	W60816	G03A1776A142	W61154	G03A2192Z195	W61485
G03A1536A048	W60484	G03A2080A099	W60817	G03A1776A142	W61156	G03A2176K196	W61486
G03A1536A048	W60485	G03A2080A099	W60818	G03A1776A142	W61157	G03A2176K196	W61487
G03A1536A048	W60486	G03A2080A099	W60820	G03A1776A142	W61158	G03A2176K196	W61488
G03A1536A048	W60487	G03A2080A099	W60821	G03A1776A142	W61159	G03A2176K196	W61489
G03A1536A048	W60488	G03A2080A099	W60822	G03A1776A142	W61160	G03A2176K196	W61490
G03A1040J049	W60489	G03A2240A100	W60823	G03A1776A142	W61161	G03A2176K196	W61491
G03A1040J049	W60490	G03A2240A100	W60824	G03A2000X143	W61162	G03A2240K197	W61492
G03A1040J049	W60491	G03A2240A100	W60825	G03A2000X143	W61163	G03A2240K197	W61493
G03A1040J049	W60492	G03A2240A100	W60826	G03A2000X143	W61164	G03A2192L198	W61494
G03A1040J049	W60493	G03A2240A100	W60827	G03A1904B144	W61165	G03A2192L198	W61495
G03A1040J049	W60494	G03A2064A101	W60828	G03A1904B144	W61166	G03A2192L198	W61496
G03A1040J049	W60495	G03A2064A101	W60829	G03A1904B144	W61167	G03A2192L198	W61497
G03A1312A050	W60496	G03A2064A101	W60830	G03A1904B144	W61168	G03A2176L199	W61498
G03A1312A050	W60497	G03A2064A101	W60832	G03A1776J145	W61169	G03A2176L199	W61499
G03A1312A050	W60498	G03A2064A101	W60833	G03A1776J145	W61170	G03A2176L199	W61500
G03A1312A050	W60499	G03A2064A101	W60834	G03A1776J145	W61171	G03A2176L199	W61501
G03A1312A050	W60500	G03A2064A101	W60835	G03A1776J145	W61172	G03A2176L199	W61502
G03A1312A050	W60501	G03A2064A101	W60836	G03A1776J145	W61173	G03A2176L199	W61503
G03A1312A050	W60502	G03A2064A101	W60837	G03A1776J145	W61174	G03A2176L199	W61504
G03A1024A051	W60503	G03A1840A102	W60838	G03A1776J145	W61175	G03A2176L199	W61505
G03A1024A051	W60504	G03A1840A102	W60840	G03A1776J145	W61176	G03A2336C200	W61506
G03A1024A051	W60505	G03A1840A102	W60841	G03A1776J145	W61177	G03A2336C200	W61507
G03A1024A051	W60506	G03A1840A102	W60842	G03A2000Y146	W61178	G03A2240D201	W61508
G03A1024A051	W60507	G03A1840A102	W60843	G03A2000Y146	W61179	G03A2240D201	W61509
G03A1024A051	W60508	G03A1840A102	W60844	G03A2000Y146	W61180	G03A2176M202	W61510
G03A1024A051	W60509	G03A1584J103	W60845	G03A2000Y146	W61181	G03A2176M202	W61511
G03A1488J052	W60510	G03A1584J103	W60846	G03A2000Y146	W61182	G03A2176M202	W61512
G03A1488J052	W60511	G03A1840B104	W60847	G03A2000Y146	W61183	G03A2176M202	W61513
G03A1488J052	W60512	G03A1840B104	W60848	G03A2000Y146	W61184	G03A2176M202	W61514
G03A1488J052	W60513	G03A1840B104	W60849	G03A2000Y146	W61185	G03A2176M202	W61515
G03A1008A053	W60514	G03A1600A105	W60850	G03A2000Y146	W61186	G03A1904J203	W61516
G03A1008A053	W60515	G03A1600A105	W60851	G03A1808J147	W61187	G03A1904J203	W61517
G03A1008A053	W60516	G03A1600A105	W60852	G03A1808J147	W61188	G03A1920J204	W61518
G03A1008A053	W60517	G03A1600A105	W60853	G03A1808J147	W61189	G03A1744J205	W61519
G03A1008A053	W60518	G03A1600A105	W60854	G03A1808J147	W61190	G03A1744J205	W61520

G03A1008A053	W60519	G03A1600A105	W60855	G03A1808J147	W61191	G03A2000L206	W61521
G03A1008A053	W60520	G03A1600A105	W60856	G03A1808J147	W61192	G03A2000L206	W61522
G03A1008A053	W60521	G03A1600A105	W60857	G03A1808J147	W61193	G03A2000L206	W61523
G03A1552A054	W60522	G03A1600A105	W60858	G03A1808J147	W61194	G03A2000M207	W61524
G03A1552A054	W60523	G03A1856A106	W60859	G03A1808J147	W61195	G03A2000M207	W61525
Line Name	**Tape No.**	**Line Name**	**Tape No.**	**Line Name**	**Tape No.**	**Line Name**	**Tape No.**
G03A1552A054	W60524	G03A1856A106	W60860	G03A1792A148	W61196	G03A2000M207	W61526
G03A1552A054	W60525	G03A1856A106	W60861	G03A1792A148	W61197	G03A2000M207	W61527
G03A1552A054	W60526	G03A1856A106	W60862	G03A1792A148	W61198	G03A2000M207	W61528
G03A1552A054	W60527	G03A1856A106	W60863	G03A1792A148	W61199	G03A2000N208	W61529
G03A1552A054	W60528	G03A1856A106	W60864	G03A1792A148	W61200	G03A2000N208	W61530
G03A1264A055	W60529	G03A1856A106	W60866	G03A1792A148	W61201	G03A2032B209	W61531
G03A1264A055	W60530	G03A1856A106	W60867	G03A1792A148	W61202	G03A2000P210	W61532
G03A1264A055	W60531	G03A1856A106	W60868	G03A1792A148	W61203	G03A2000P210	W61533
G03A1264A055	W60532	G03A1616A107	W60869	G03A1792A148	W61204	G03A2176N211	W61534
G03A1264A055	W60533	G03A1616A107	W60871	G03A2000K149	W61205	G03A2176N211	W61535
G03A1264A055	W60534	G03A1616A107	W60872	G03A2000K149	W61206	G03A2176N211	W61536
G03A1264A055	W60535	G03A1616A107	W60873	G03A2000K149	W61207	G03A2176N211	W61537
G03A1552X056	W60536	G03A1616A107	W60874	G03A2000K149	W61208	G03A2176N211	W61538
G03A1552X056	W60537	G03A1616A107	W60875	G03A2000K149	W61209	G03A2176N211	W61539
G03A1552X056	W60538	G03A1616A107	W60876	G03A2000K149	W61210	G03A2240E212	W61540
G03A1552X056	W60539	G03A1616A107	W60877	G03A2000K149	W61211	G03A2240E212	W61541
G03A1552X056	W60540	G03A1616A107	W60878				

12.2 Lines Processed for Production Cube

LINE NAME	SEQUENCE	SPMIN	SPMAX	# SHOTPOINT	KM	Dirn.
G03A1008A053	053	2489	3778	1290	24.19	287
G03A1008B061	061	3769	3886	118	2.21	287
G03A1008C065	065	2555	3120	566	10.61	287
G03A1008J057	057	3288	3886	599	11.23	287
G03A1008K062	062	2489	3297	809	15.17	287
G03A1008M068	068	2489	3300	812	15.23	287
G03A1024A051	051	2489	3886	1398	26.21	287
G03A1040A047	047	2765	3886	1122	21.04	287
G03A1040B063	063	2489	2774	286	5.36	287
G03A1040J049	049	2489	3886	1398	26.21	287
G03A1056A044	044	3293	3885	593	11.12	287
G03A1056B045	045	2622	3302	681	12.77	287
G03A1056C058	058	2489	2633	145	2.72	287
G03A1072A038	038	3409	3854	446	8.36	287
G03A1072B039	039	2489	3050	562	10.54	287
G03A1072C042	042	3041	3886	846	15.86	287
G03A1088A036	036	2489	3886	1398	26.21	287
G03A1104A024	024	2489	3886	1398	26.21	287
G03A1104L029	029	3424	3886	463	8.68	287
G03A1104M030	030	2489	2930	442	8.29	287
G03A1104O041	041	2921	3433	513	9.62	287

G03A1120B020	020	2489	3886	1398	26.21	287
G03A1136A002	002	2489	3886	1398	26.21	287
G03A1152A004	004	2489	3855	1367	25.63	287
G03A1152B076	076	2980	3886	907	17.01	287
G03A1168A006	006	2489	3886	1398	26.21	287
G03A1184A008	008	2489	3886	1398	26.21	287
G03A1200A012	012	3400	3886	487	9.13	287
G03A1200B013	013	2489	3410	922	17.29	287
G03A1216A015	015	2489	3886	1398	26.21	287
G03A1216J078	078	3450	3850	401	7.52	287
LINE NAME	**SEQUENCE**	**SPMIN**	**SPMAX**	**# SHOTPOINT**	**KM**	**Dirn.**
G03A1232A017	017	3447	3886	440	8.25	287
G03A1232B018	018	2489	3456	968	18.15	287
G03A1248A022	022	2489	3886	1398	26.21	287
G03A1248J032	032	2489	3886	1398	26.21	287
G03A1264A055	055	2489	3886	1398	26.21	287
G03A1264X070	070	3315	3886	572	10.73	287
G03A1264Y071	071	2489	3324	836	15.68	287
G03A1280A073	073	2489	3886	1398	26.21	287
G03A1296A074	074	2622	4019	1398	26.21	107
G03A1296J075	075	2622	4019	1398	26.21	107
G03A1312A050	050	2870	3700	831	15.58	107
G03A1312B060	060	3691	4019	329	6.17	107
G03A1312C066	066	2622	2879	258	4.84	107
G03A1312J064	064	2622	3287	666	12.49	107
G03A1312K067	067	3278	4019	742	13.91	107
G03A1328A046	046	2622	4019	1398	26.21	107
G03A1344A040	040	2622	4019	1398	26.21	107
G03A1344J135	135	2622	4019	1398	26.21	107
G03A1360A033	033	2622	4019	1398	26.21	107
G03A1360J035	035	2646	4019	1374	25.76	107
G03A1360K037	037	2622	3705	1084	20.33	107
G03A1376A025	025	2622	4019	1398	26.21	107
G03A1392A021	021	2622	4019	1398	26.21	107
G03A1408B016	016	2622	4019	1398	26.21	107
G03A1424A007	007	2622	4019	1398	26.21	107
G03A1440A001	001	2622	4019	1398	26.21	107
G03A1440J137	137	2622	4019	1398	26.21	107
G03A1456A003	003	2622	3743	1122	21.04	107
G03A1456B028	028	3390	4019	630	11.81	107
G03A1472A005	005	2622	4019	1398	26.21	107
G03A1488A009	009	2622	3400	779	14.61	107
G03A1488B014	014	3391	4019	629	11.79	107
G03A1488J052	052	2688	4019	1332	24.98	107
G03A1504A019	019	2622	4019	1398	26.21	107
G03A1504J023	023	2622	4019	1398	26.21	107
G03A1520A031	031	2622	4019	1398	26.21	107
G03A1520B043	043	3293	3728	436	8.18	107
G03A1536A048	048	2622	4019	1398	26.21	107
G03A1536J077	077	2655	3040	386	7.24	107
G03A1552A054	054	2622	4019	1398	26.21	107
G03A1552X056	056	2622	4019	1398	26.21	107

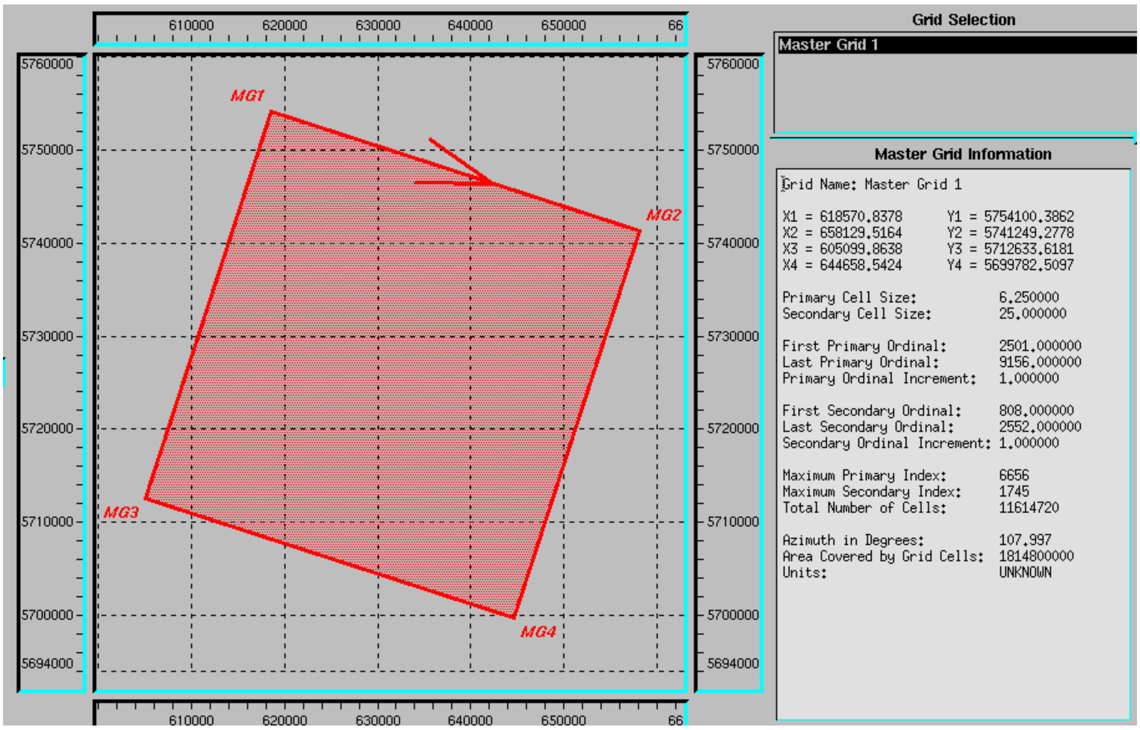
G03A1568B069	069	2622	4019	1398	26.21	107
G03A1584A072	072	2622	4019	1398	26.21	107
G03A1584J103	103	2770	3150	381	7.14	107
G03A1600A105	105	2622	4019	1398	26.21	107
G03A1616A107	107	2622	4019	1398	26.21	107
G03A1632A111	111	2622	4019	1398	26.21	107
G03A1648A113	113	2622	4019	1398	26.21	107
G03A1664A115	115	2622	4019	1398	26.21	107
G03A1680A117	117	2622	4019	1398	26.21	107
G03A1680X119	119	2622	4019	1398	26.21	107
G03A1696A121	121	2622	4018	1397	26.19	107
LINE NAME	**SEQUENCE**	**SPMIN**	**SPMAX**	**# SHOTPOINT**	**KM**	**Dirn.**
G03A1696B157	157	2622	2980	359	6.73	107
G03A1712B125	125	2622	4019	1398	26.21	107
G03A1712J127	127	2622	4019	1398	26.21	107
G03A1728A129	129	2622	4019	1398	26.21	107
G03A1744A131	131	2622	4019	1398	26.21	107
G03A1744X133	133	2622	4019	1398	26.21	107
G03A1760A140	140	2622	4019	1398	26.21	107
G03A1776A142	142	2622	4019	1398	26.21	107
G03A1776J145	145	2622	4019	1398	26.21	107
G03A1792A148	148	2622	4019	1398	26.21	107
G03A1792B160	160	2622	2831	210	3.94	107
G03A1792J150	150	2622	4019	1398	26.21	107
G03A1792K152	152	2822	4019	1198	22.46	107
G03A1808A136	136	2489	3886	1398	26.21	287
G03A1808J147	147	2489	3886	1398	26.21	287
G03A1808K153	153	2489	3886	1398	26.21	287
G03A1808L156	156	2489	2690	202	3.79	287
G03A1824A134	134	2489	3886	1398	26.21	287
G03A1840A102	102	2489	3885	1397	26.19	287
G03A1840C109	109	2489	3756	1268	23.78	287
G03A1856A106	106	2489	3886	1398	26.21	287
G03A1856J151	151	2489	3886	1398	26.21	287
G03A1872A108	108	2489	3886	1398	26.21	287
G03A1872B110	110	2489	3211	723	13.56	287
G03A1888A112	112	2489	3886	1398	26.21	287
G03A1888X114	114	2489	3886	1398	26.21	287
G03A1904A116	116	2489	3886	1398	26.21	287
G03A1904B144	144	2489	2831	343	6.43	287
G03A1904J203	203	2489	3563	1075	20.16	287
G03A1920A118	118	2489	3886	1398	26.21	287
G03A1920J120	120	2489	3886	1398	26.21	287
G03A1936B124	124	2489	3886	1398	26.21	287
G03A1952A126	126	2489	3886	1398	26.21	287
G03A1968A128	128	2489	3886	1398	26.21	287
G03A1968B190	190	2489	3195	707	13.26	287
G03A1968J130	130	2489	3886	1398	26.21	287
G03A1968K158	158	2489	3195	707	13.26	287

12.3 Grid Definition

The following table defines the parameters for the 6.25m X 25m survey grid:

Master Grid Boundary 6.25m x 12.5m

X-coordinates	Y-coordinates	Crossline	Inline
618570.84	5754100.39	2501	808
658129.52	5741249.28	9156	808
605099.86	5712633.62	2501	2552
644658.54	5699782.51	9156	2552

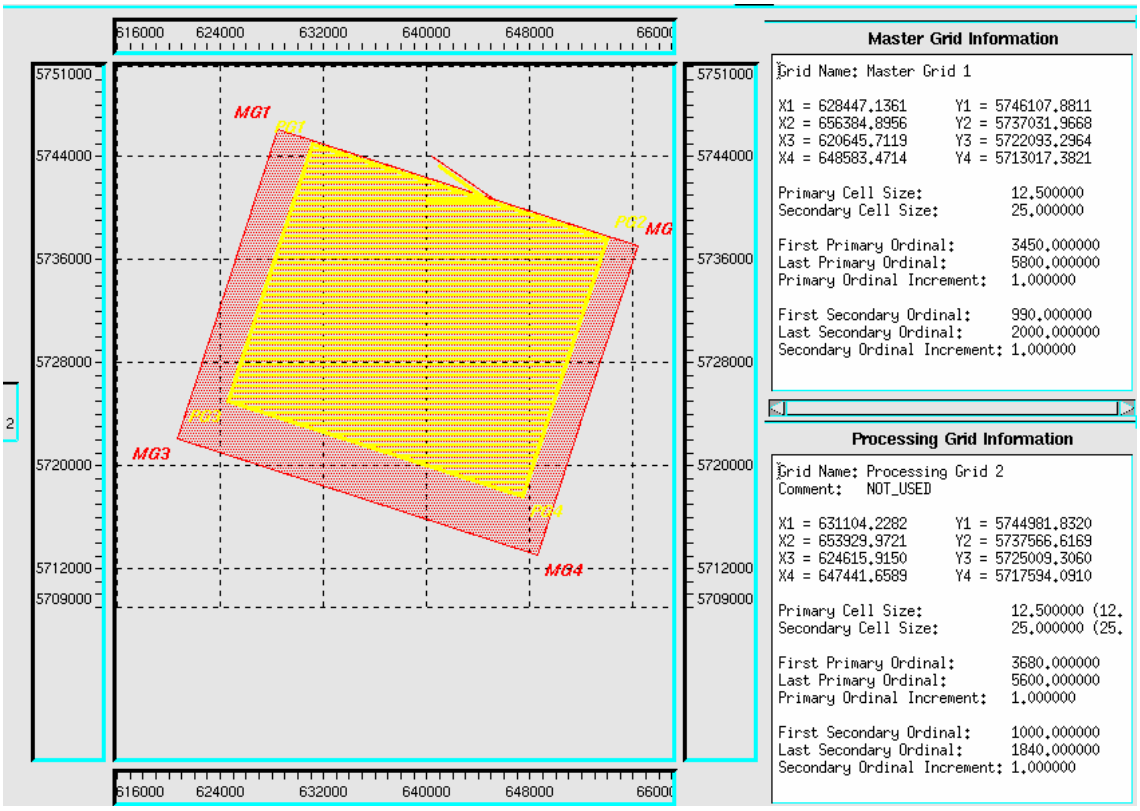


6.25m X 25m 3D grid definition.

The following table defines the parameters for the 12.5m X 25m survey grid:

Master Grid Boundary 12.5m x 12.5m

X-coordinates	Y-coordinates	Crossline	Inline
618570.8378	5754100.3862	2501	808
658123.5722	5741251.2089	5828	808
605099.8638	5712633.6181	2501	2552
644652.5982	5699784.4407	5828	2552



12.5m X 25m 3D grid definition.

12.4 Signatures/Wavelets

Time coefficients for the Quadrature Wavelet filter, derived from the far field signature supplied by ESSO are as follows:

```
*TIME_DOMAIN
  ZERO_INDEX = 201
  SCALE_FACTOR = 1
  WV_SAMPLINT = 2
  SCALING = 'NORMALIZED'
 <  COEFFS
    0.00576312
   -0.00551881
   -0.00480158
    0.00231105
    0.00887899
    0.00155292
   -0.00246496
    -0.0081692
   -0.00031042
    0.00775821
    0.00362452
    -0.0018493
   -0.00794082
   -0.00419393
    0.00655161
     0.0054027
  -0.000952027
   -0.00655121
   -0.00768982
    0.00481506
    0.00634006
   0.000976742
   -0.00557369
   -0.00881349
    0.00115015
     0.0081119
    0.00213311
   -0.00333332
    -0.0094994
   -0.00206219
    0.00849496
    0.00429588
   -0.00143491
   -0.00893446
   -0.00512563
    0.00744235
    0.00748593
  -9.20642e-05
    -0.0065228
   -0.00881152
    0.00632433
    0.00916132
    0.00344326
    -0.0052742
   -0.00946182
    0.00165373
```

0.0121635
0.00538848
-0.00131064
-0.0104835
-0.00196426
0.0117235
0.00914297
0.00154175
-0.00846225
-0.00625195
0.0097338
0.012104
0.00408165
-0.004595
-0.00988186
0.00732017
0.0125389
0.00800317
-0.00262008
-0.00886206
0.00127506
0.015284
0.00782068
0.0022304
-0.0103013
-0.000986313
0.0131928
0.011806
0.00189745
-0.00757947
-0.00708331
0.0130842
0.0135753
0.00397871
-0.0077447
-0.0118761
0.0086337
0.0163985
0.00670797
-0.00780842
-0.0164245
-0.000804254
0.0187469
0.00861924
-0.00362891
-0.0225417
-0.0104203
0.0124511
0.0139145
-0.00232622
-0.0203755
-0.0249017
0.0046966
0.0117933
0.00260362
-0.0181007
-0.031176
-0.00943674
0.00795603
0.0021483
-0.0135709

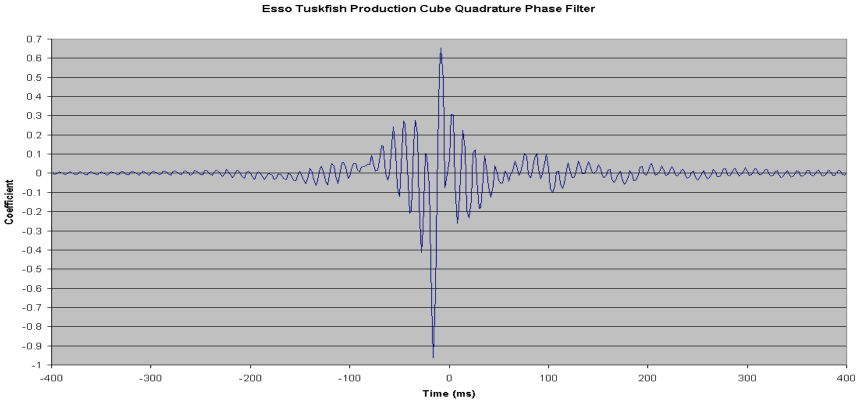
-0.0324111
-0.0210769
0.00203511
-0.00329235
-0.0109031
-0.0328613
-0.0251794
-0.00440911
-0.00461158
-0.0182668
-0.0299273
-0.0335605
-0.000955353
-0.00460044
-0.0201104
-0.0380093
-0.0388409
-0.00529067
0.0110065
-0.0166201
-0.0406876
-0.0532011
-0.0144214
0.0246418
0.0047299
-0.0311574
-0.0645811
-0.0344382
0.0267721
0.0345223
-0.00402184
-0.0512319
-0.0598423
0.0173142
0.0510981
0.0371534
-0.0154887
-0.0554563
-0.010525
0.054185
0.0558931
0.0325921
-0.0268642
-0.0182726
0.0315907
0.0519156
0.0523148
0.017554
0.00760549
0.0338571
0.0344899
0.0400249
0.0469707
0.0446236
0.0927898
0.0427474
0.0119854
0.017686
0.0619013
0.144151
0.141182

0.00201464
-0.0370628
-0.00583298
0.15226
0.241316
0.111277
-0.0737884
-0.121589
0.039011
0.274348
0.253553
0.0297943
-0.207436
-0.197771
0.147953
0.275061
0.205833
-0.166503
-0.411799
-0.291482
0.102744
0.0856338
-0.0648278
-0.673776
-0.963318
-0.629183
-0.081362
0.543171
0.654475
0.487147
-0.0755327
-0.00493351
0.073436
0.306064
0.305285
-0.0606405
-0.262589
-0.182325
0.0577428
0.223688
0.124029
-0.193622
-0.233522
-0.14017
0.107991
0.121215
-0.0402127
-0.185313
-0.181186
-0.0256262
0.0898637
0.00307486
-0.0694876
-0.12601
-0.0647212
0.0400442
0.00440313
-0.0396915
-0.0552611
-0.0502841
0.0117464

0.000374062
-0.0409536
-0.00759491
0.0127151
0.0640162
0.0388236
-0.0115512
0.00426296
0.0546427
0.102557
0.0890852
-0.00697083
-0.0247905
0.0121346
0.0773038
0.104129
0.0212752
-0.0289916
-0.00212006
0.0544873
0.0995682
0.0270678
-0.0788423
-0.100693
-0.0661675
0.00861281
0.0103974
-0.0550383
-0.0774874
-0.0503311
0.0173795
0.0535785
0.00564155
-0.0238658
-0.0201179
0.0221354
0.0635523
0.0317973
-0.00190769
-0.00185164
0.0203466
0.0592866
0.0403052
0.000390921
-0.000594991
0.0121145
0.0436534
0.0322894
-0.0145004
-0.0244573
-0.011122
0.0170029
0.0202552
-0.0280244
-0.0472931
-0.0354673
-0.00609417
0.0120969
-0.026821
-0.0575662
-0.0479304

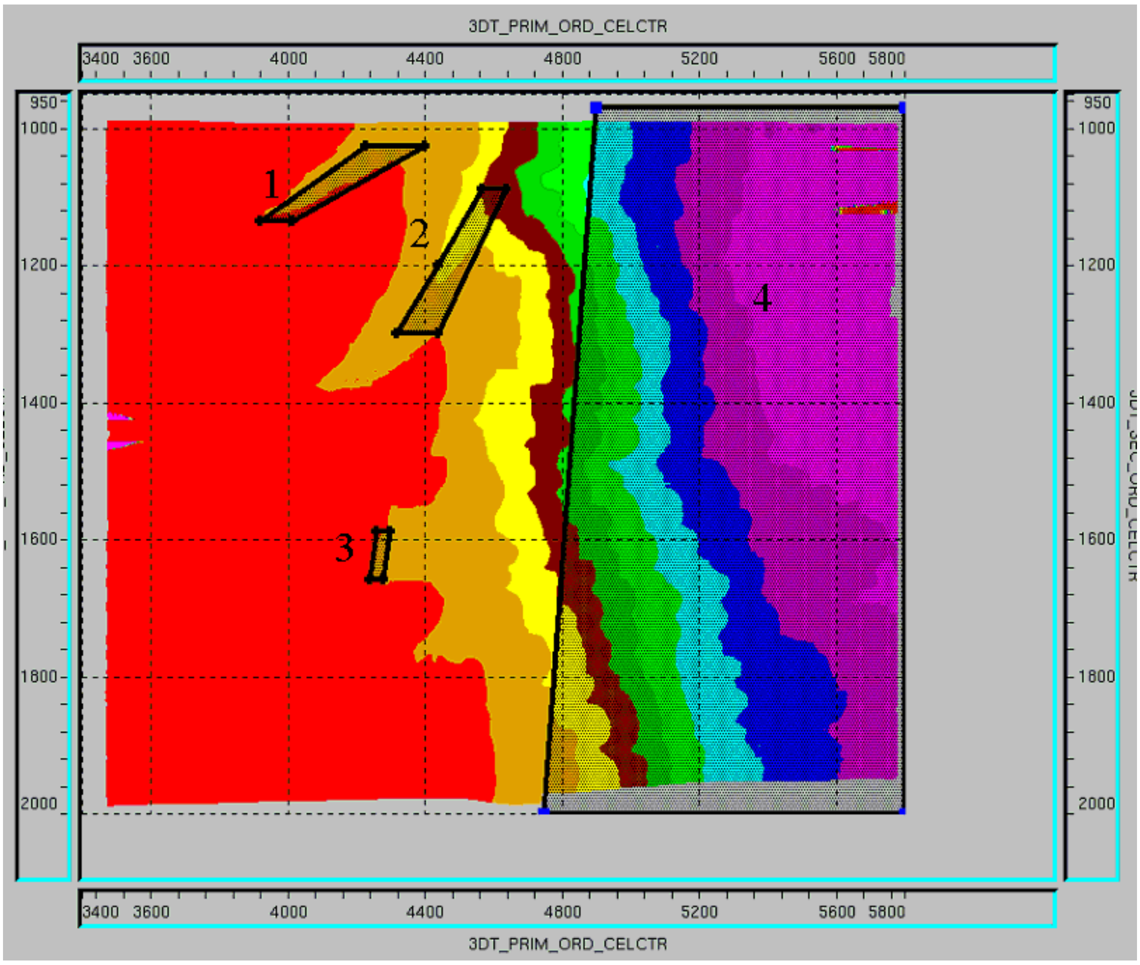
-0.0190448
0.0153007
-0.00382795
-0.0392671
-0.0347764
-0.00870969
0.0325058
0.034254
-0.00215004
-0.00939731
0.00603234
0.0385324
0.0495956
0.0119352
-0.0102509
-0.00563357
0.0173241
0.0384319
0.0126723
-0.0122351
-0.00864035
0.00969008
0.0352172
0.0198703
-0.011739
-0.0146198
-0.00306902
0.0207304
0.0161577
-0.0178953
-0.0266006
-0.0174534
0.00497872
0.0119217
-0.0187964
-0.0341753
-0.0260625
-0.00521155
0.0123771
-0.00970334
-0.030678
-0.0243249
-0.00550489
0.0192623
0.00807345
-0.0172714
-0.0171064
-0.00202666
0.0223604
0.0225076
-0.00643511
-0.0131504
-0.00399038
0.0185831
0.0271463
0.00216997
-0.0127958
-0.00581092
0.0119256
0.029053
0.0101773

-0.00953876
-0.00685249
0.00732364
0.0272634
0.0172587
-0.0068551
-0.00927879
0.00122657
0.0200708
0.0195165
-0.00759274
-0.0152827
-0.00986655
0.00796897
0.0137406
-0.00855694
-0.0234514
-0.0169211
-0.00235047
0.0138325
-0.00292384
-0.0195292
-0.0170631
-0.00274222
0.0153194
0.00850652
-0.0133531
-0.014305
-0.00443666
0.0141836
0.014964
-0.00781934
-0.014479
-0.00786073
0.00930789
0.0167934
-0.00218027
-0.0154831
-0.00979356
0.00337422
0.0181987
0.00380366
-0.0123296
-0.010571
0.000996558
0.0180128
0.0111208
-0.00717438
-0.0119448
0.00271372



Graphical representation of Quadrature Phase Filter supplied by Esso

12.5 Polygons for residual multiple amplitude attenuation (Time Pre-Processing)



Polygons outlined in black define areas where residual multiple energy was attenuated.
(NB colour scale denotes Water Bottom two-way time)

Polygon definitions:

Polygon	Inline	Crossline	Polygon	Inline	Crossline
1	1028	4230	**3**	1590	4260
	1028	4400		1590	4300
	1137	4016		1660	4280
	1137	3920		1660	4240
	1028	4230		1590	4260
2	1090	4570	**4**	970	4900
	1200	4440		2000	4750
	1300	4320		2000	5800
	1300	4440		970	5800
	1090	4640		970	4900

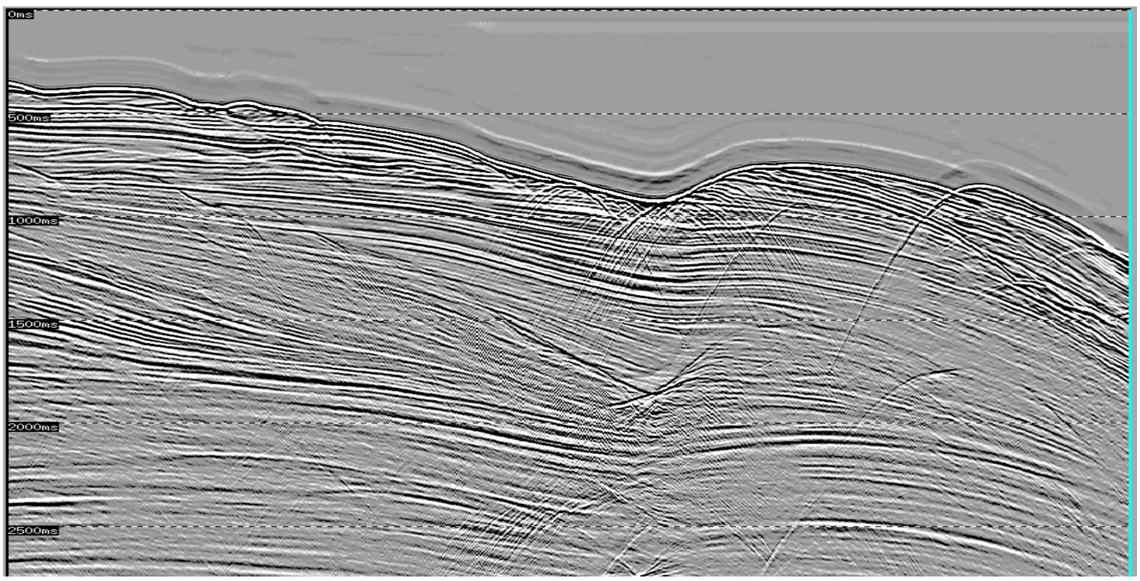
1090	4570	

12.6 Testing Summary (Time Pre- Processing)

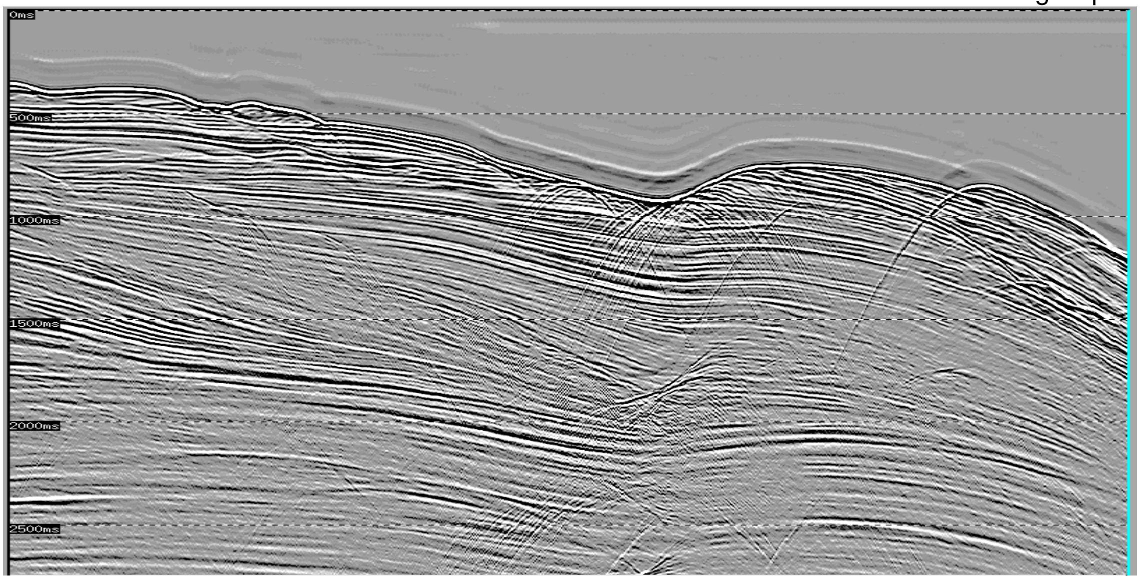
All processes were run in a controlled amplitude / controlled phase method (CA/CP).
Test displays (Omega Qcviewer format) were ftp'd to BHP. Each set was sent with a test log that listed test numbers and a brief description (see **Appendix 8.7**).
A limited number of tests were run on the Production Cube. Most decisions had been made on the Exploration Cube so the tests were mainly run to confirm parameter selection, except for SRME and AMO as these processes had not been tested previously.

12.6.1 Surface Residual Multiple Elimination (SRME)

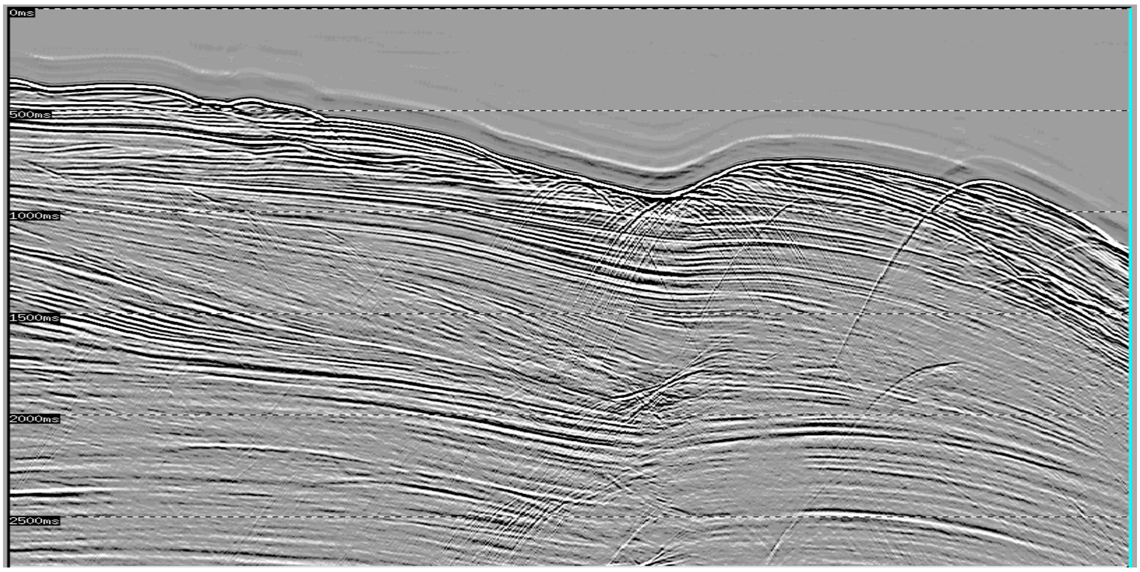
The 2D SRME testing was run on an inner and outer cable for test lines 1248J (shot up-dip) and 1504J (shot down-dip). CMP gathers, stack sections and difference displays were generated for QC.
To make sure the 2D SRME was a necessary processing stage, tests were run with and without the application of weighted least squares radon and tau-p decon. A comparison was also made to the Exploration cube test line that had tau-p decon, linear noise attenuation and weighted least squares radon applied. Some results from the production cube without and with SRME processing are displayed below (note these tests were run on data with the original Exploration cube Quadrature phase designature applied before the new shaped wavelet was provided by Esso). The client chose to apply SRME to the data. Application of tau-p deconvolution is not recommended after SRME, so this Exploration Cube stage of production was not applied to the Production cube.



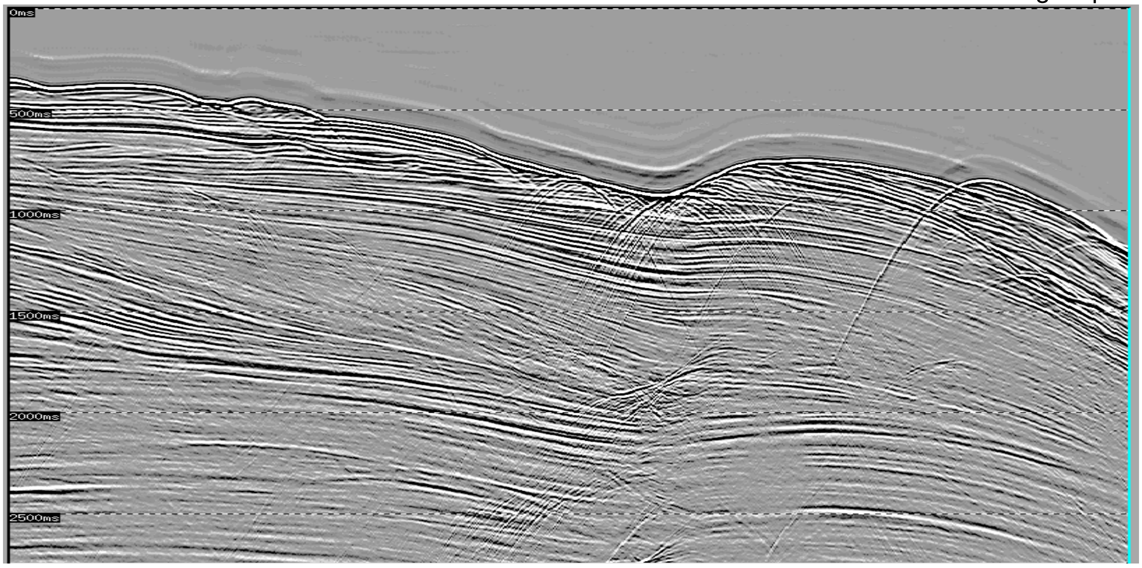
Example stack, data input to SRME tests



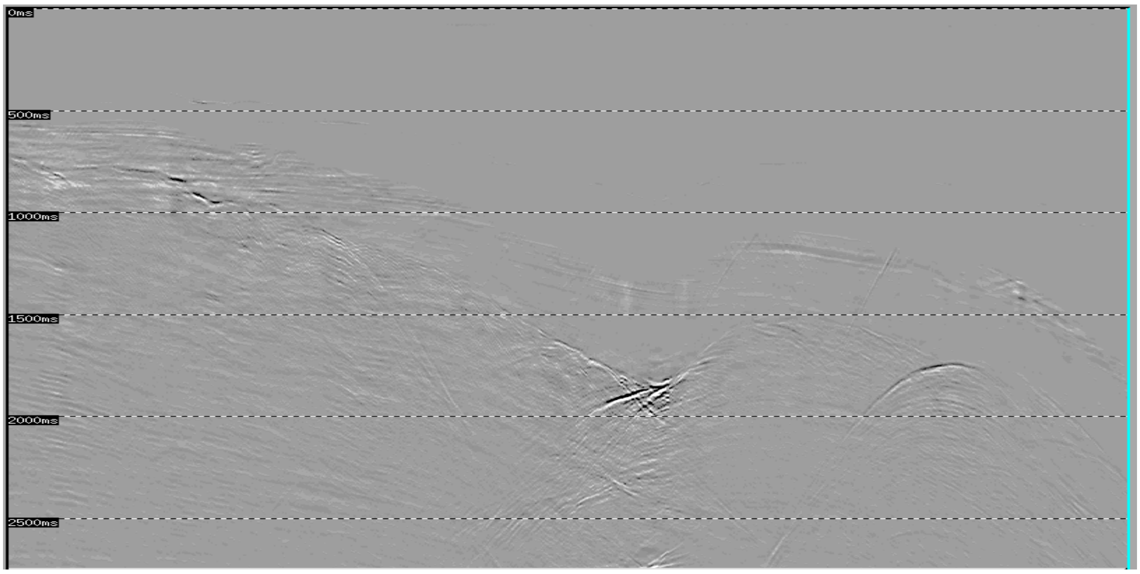
Example stack, SRME applied



Example stack, WLS Radon applied



Example stack, SRME and WLS Radon applied



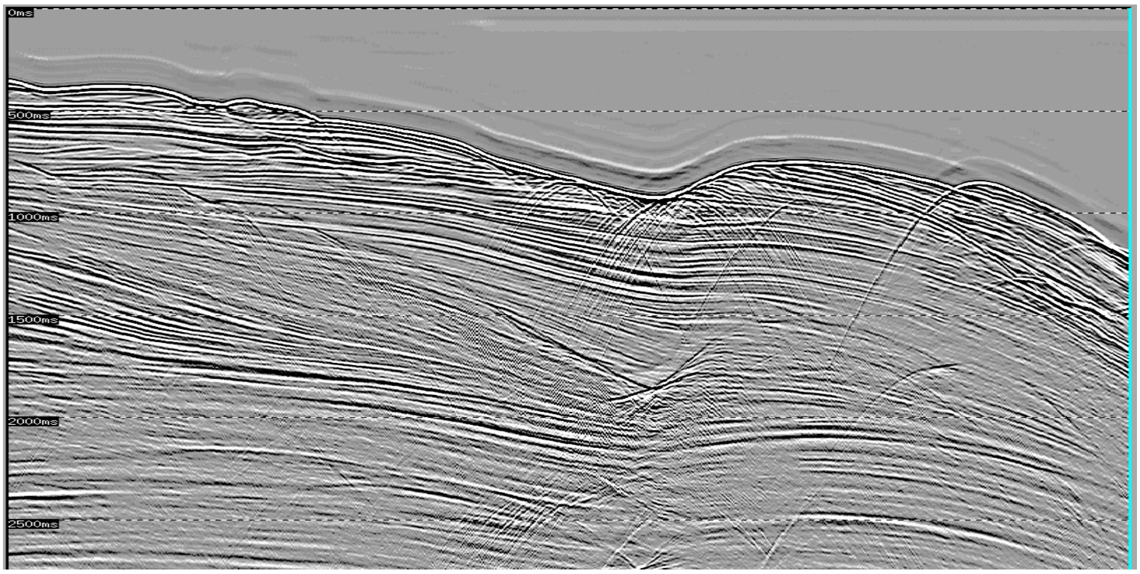
Example difference stack showing the effect of SRME application
(ie SRME+WLS Radon stack minus WLS Radon stack)

Note: in production a mute was applied to the SRME model to remove data above WB*1.8 prior to subtracting it from the data in order to preserve the shallow data.

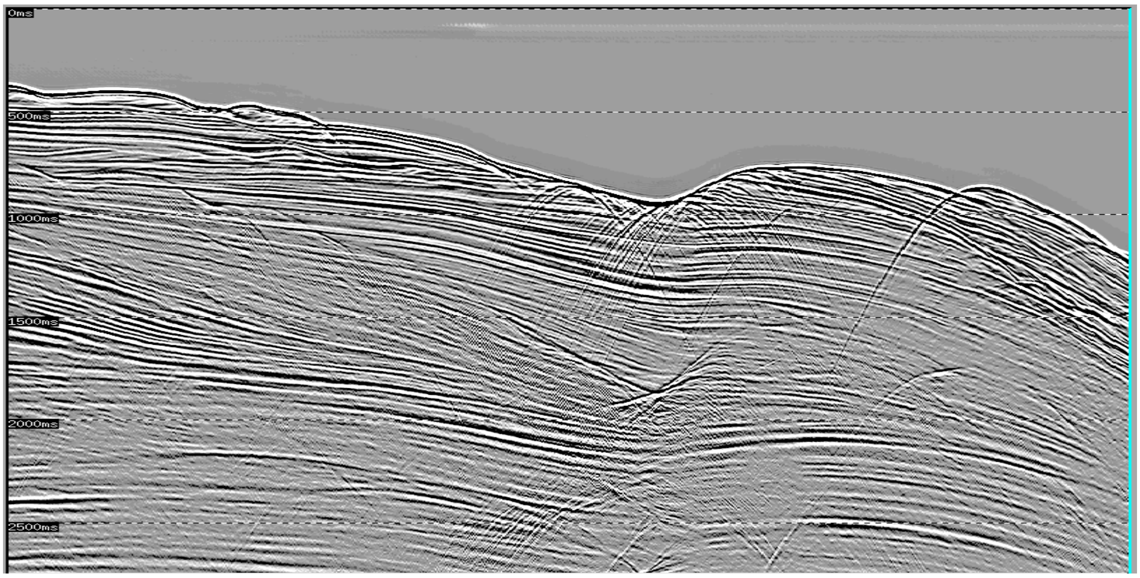
12.6.2 Quadrature Dephase

The quadrature phase source signature obtained from ESSO and used in the Exploration Cube processing was initially applied prior to running the SRME tests. The SRME tests were repeated on data that had statistical designature applied and also on data with another Esso supplied quadrature phase source signature applied, this time shaped to remove some of the 'bubble' energy that could be seen.

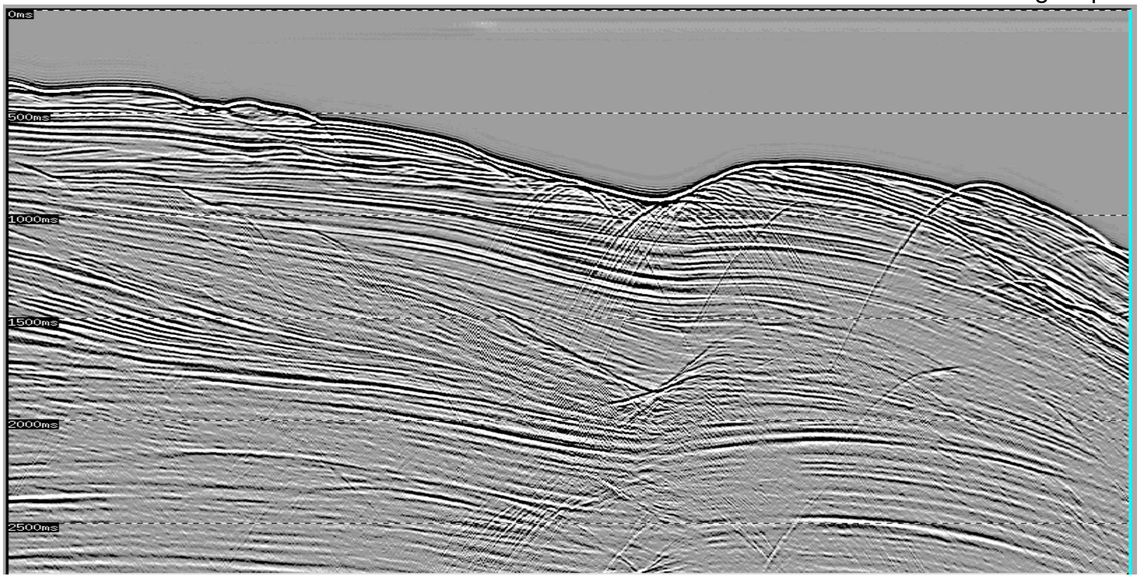
The client chose in preference to applying the shaped quadrature phase wavelet to the data.



Example stack, Quadrature phase designature applied (as per Exploration Cube)



Example stack, Statistical designature applied

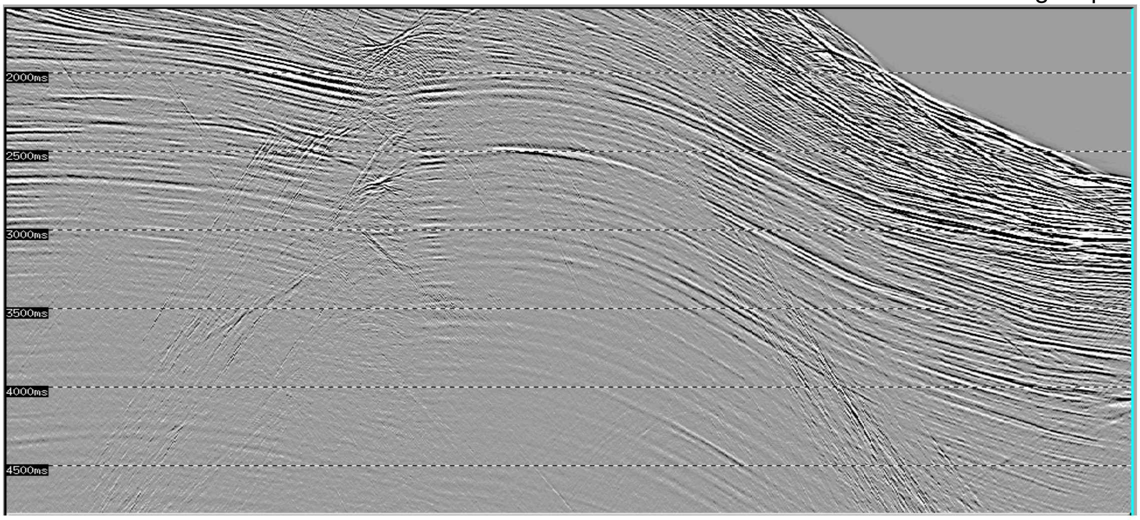


Example stack, Shaped Quadrature phase designature applied (to remove bubble energy)

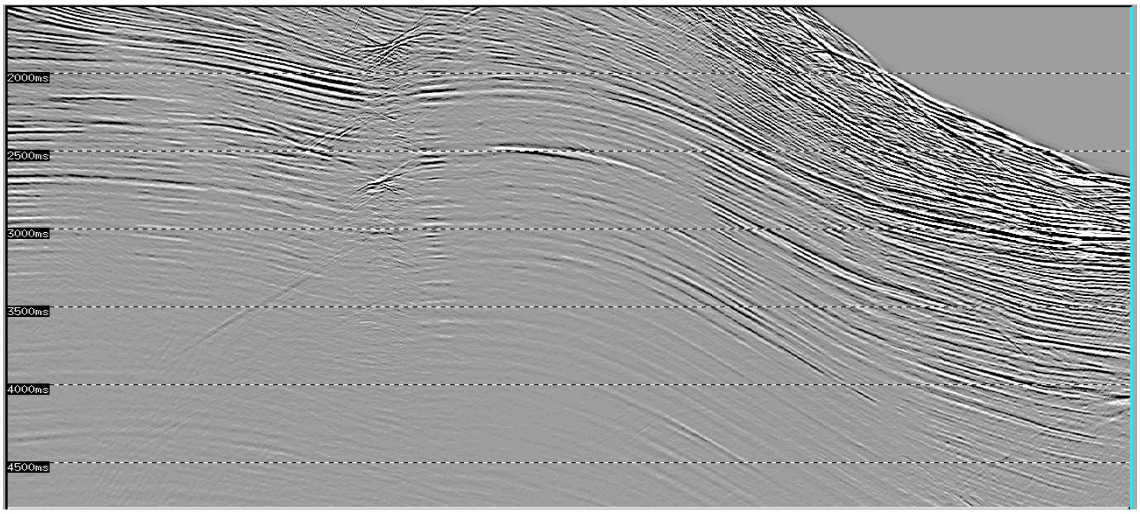
12.6.3 Tau-P Linear Noise Attenuation

During processing of the Exploration Cube the linear noise filter was applied in both the shot and receiver domain to remove the noise on lines shot up-dip and down-dip. To avoid having to do the extra processing involved in sorting to receiver domain and applying an extra pass of the process, tests were carried out to see if the same results could be achieved on the Production Cube using 2 symmetrical mutes applied in the shot domain. The testing showed that the 2 mute method in the shot domain left in some noise that the 2 pass method removed, however after radon demultiple most of this noise is removed. Based on these results the client made the decision to use the 2 symmetrical tau-p mutes applied in the shot domain to remove the majority of the linear noise.

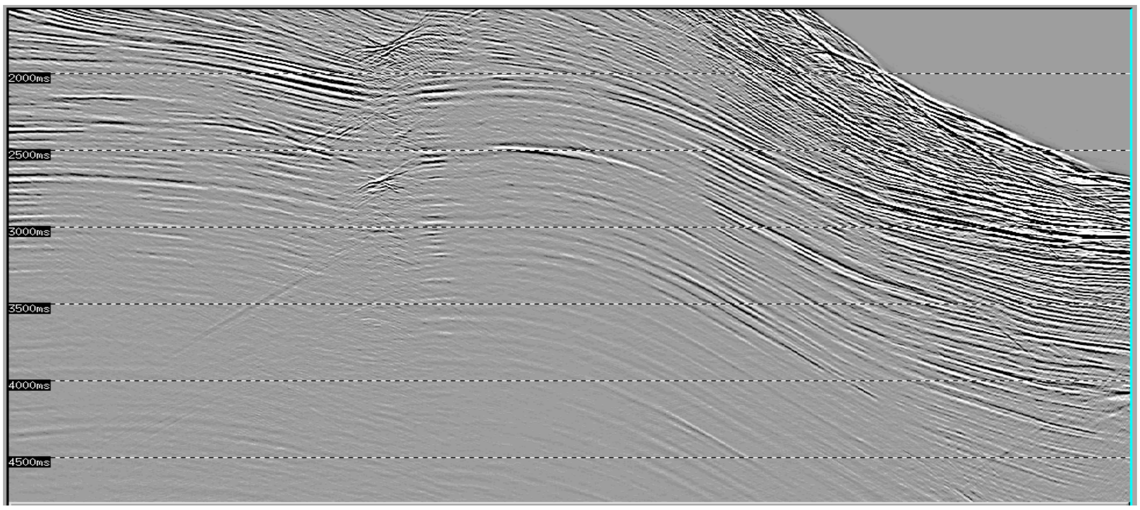
Other tests were run to see if using a different velocity field prior to the tau-p noise attenuation gave better results than using the Exploration Cube first pass velocities. The Exploration Cube's DMO and pre-stack time migration velocity fields were tested but the first pass velocity field gave the best result.



Stack of line 1248J, ssl8. No tau-p linear noise attenuation applied.

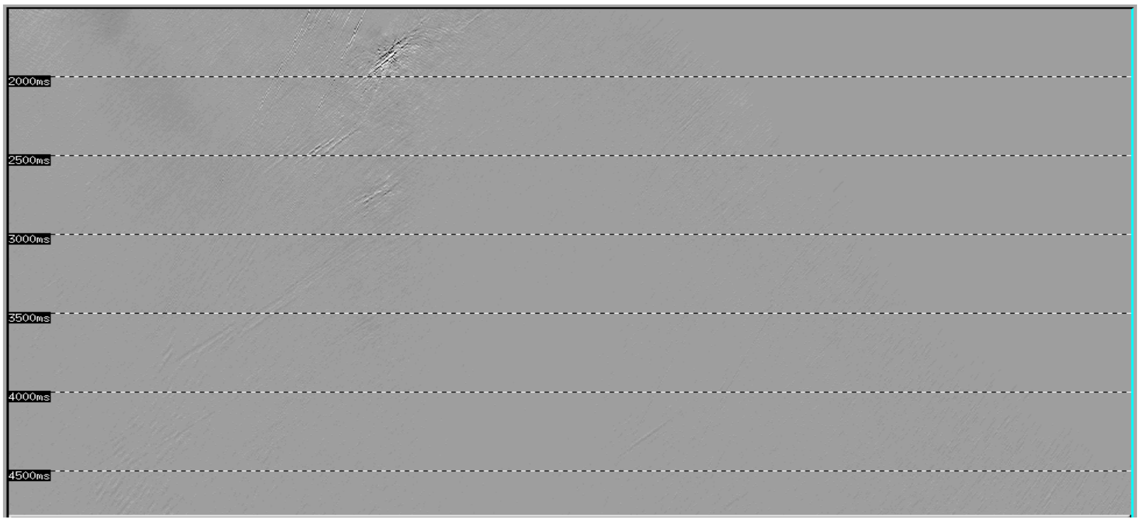


Stack of line 1248J, ssl8. Tau-p linear noise attenuation applied in shot and receiver domains (as per Exploration Cube)

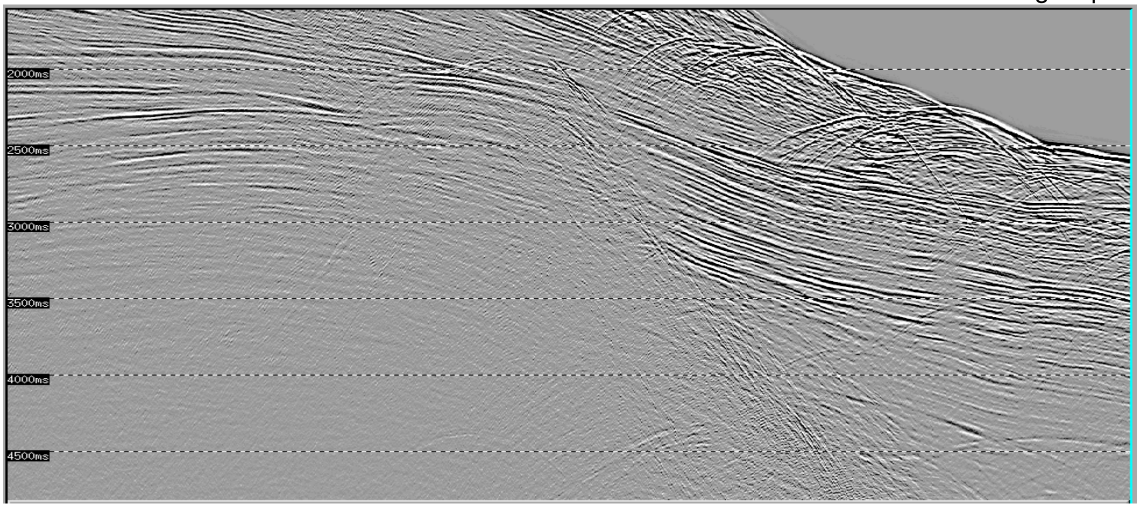


Stack of line 1248J, ssl8. Tau-p linear noise attenuation applied in shot domain only using 2 symmetrical tau-p mutes

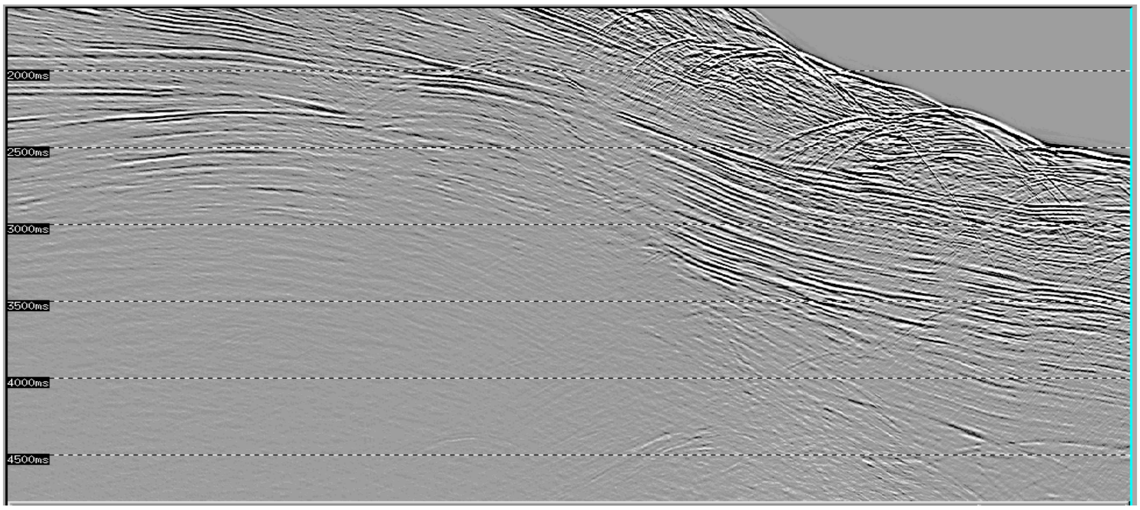
Stack of line 1248J, ssl8. Difference between applying tau-p linear noise attenuation in shot and receiver domain vs shot domain only using 2 mutes



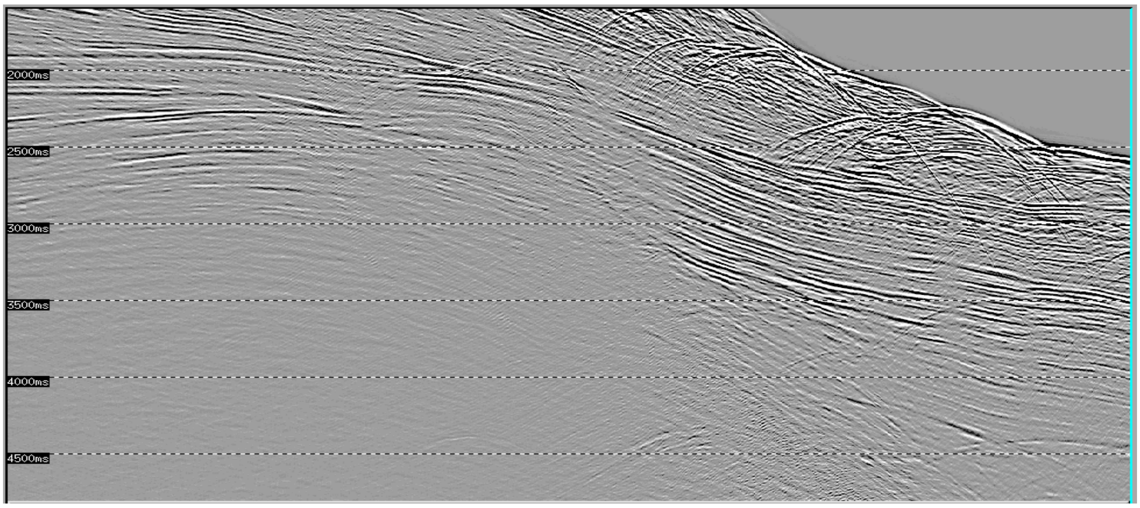
Stack of line 1248J, ssl8. Difference between applying tau-p linear noise attenuation in shot and receiver domain vs shot domain only using 2 mutes, each followed by radon demultiple



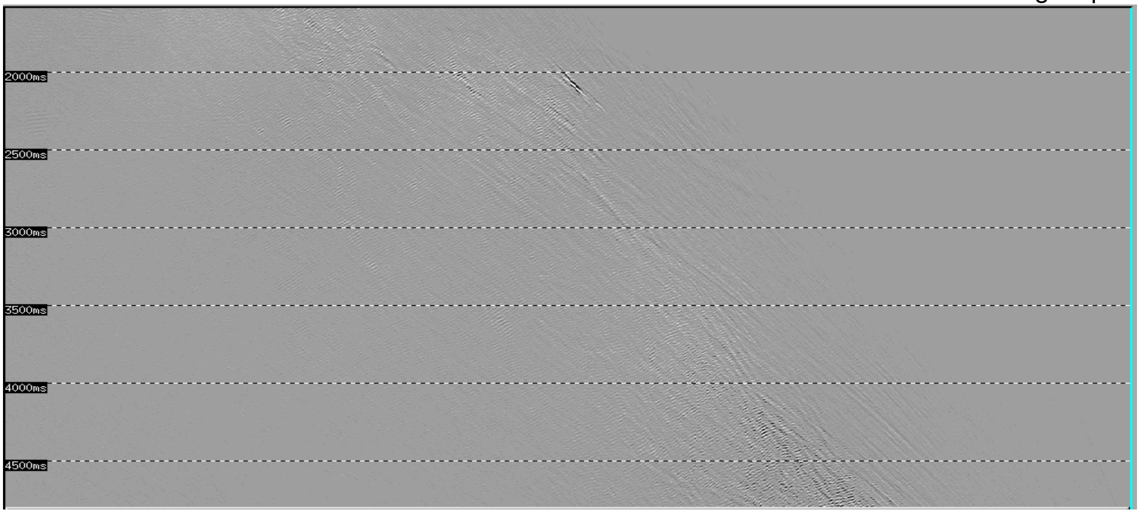
Stack of line 1504J, ssl8. No tau-p linear noise attenuation applied.



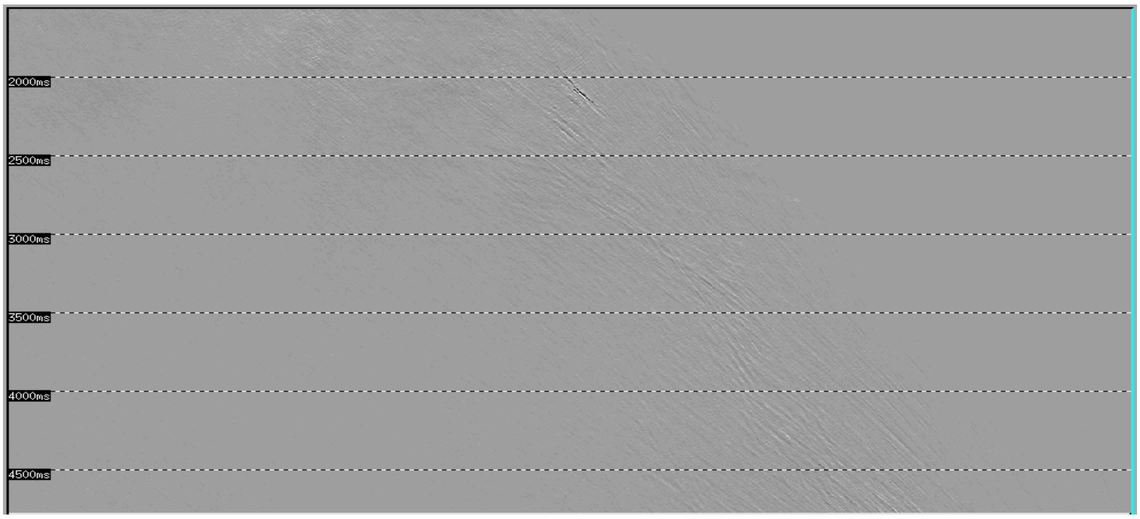
Stack of line 1504J, ssl8. Tau-p linear noise attenuation applied in shot and receiver domains (as per Exploration Cube)



Stack of line 1504J, ssl8. Tau-p linear noise attenuation applied in shot domain only using 2 symmetrical tau-p mutes



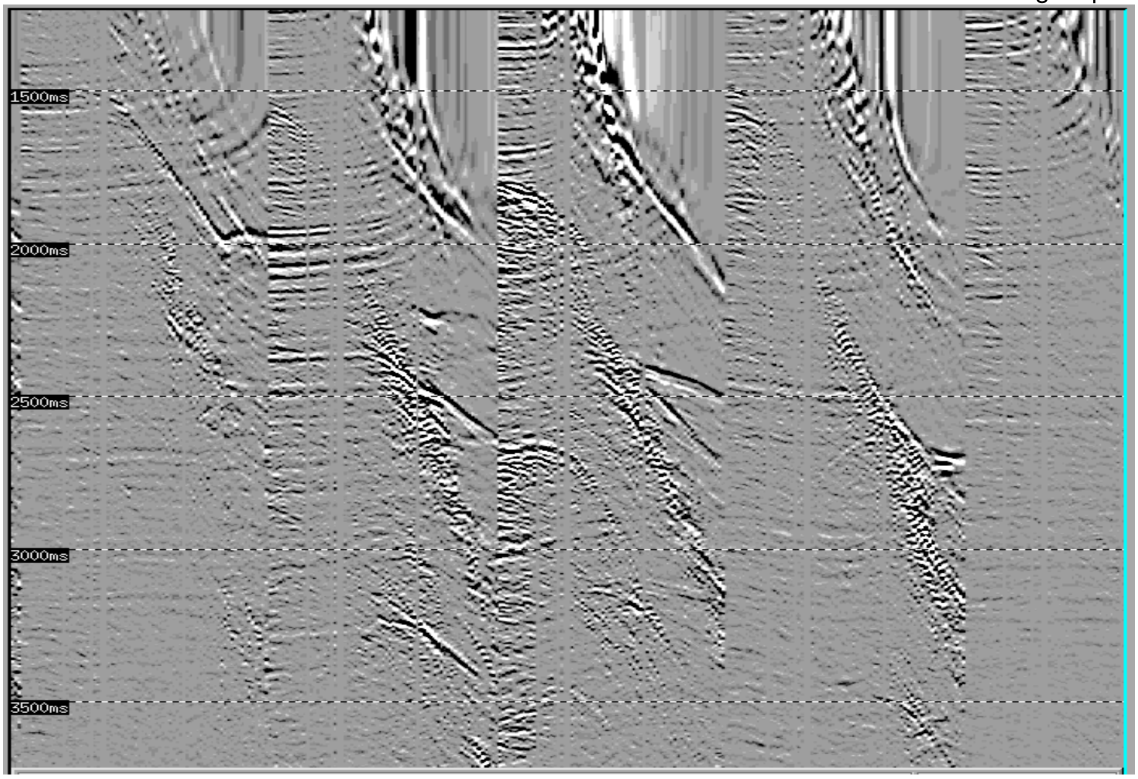
Stack of line 1504J, ssl8. Difference between applying tau-p linear noise attenuation in shot and receiver domain vs shot domain only using 2 mutes



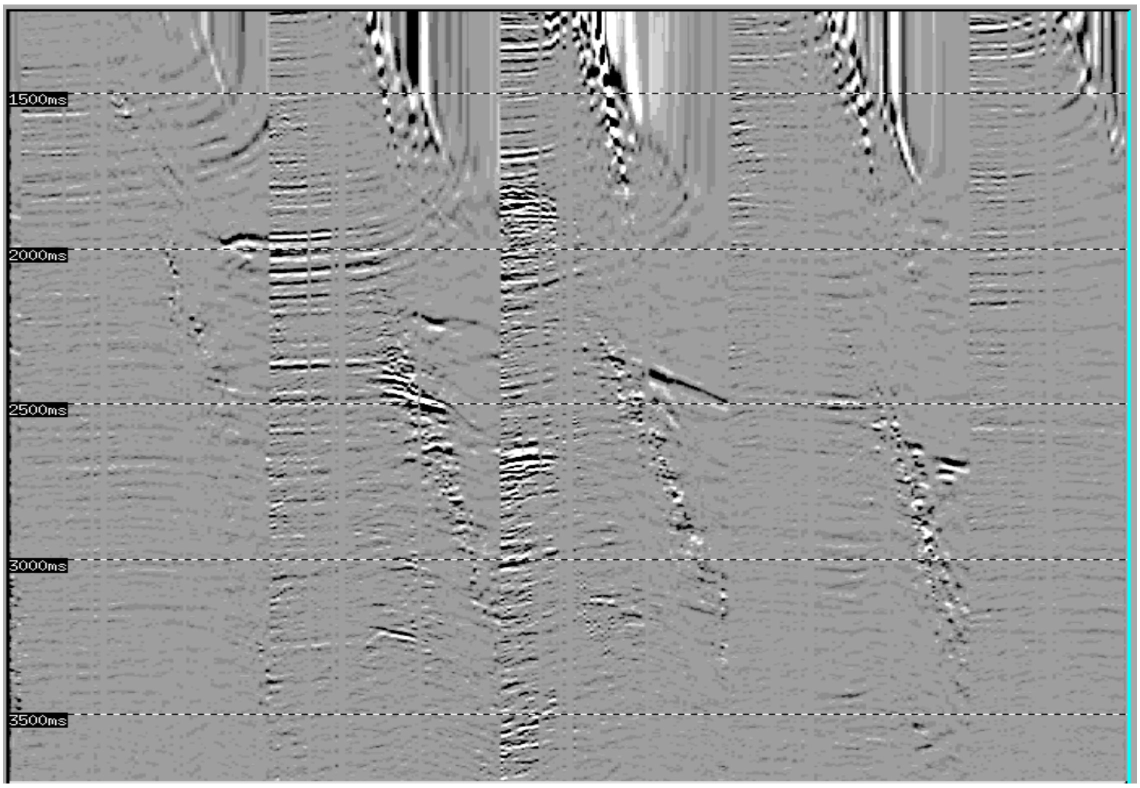
Stack of line 1504J, ssl8. Difference between applying tau-p linear noise attenuation in shot and receiver domain vs shot domain only using 2 mutes, each followed by radon demultiple

12.6.4 Weighted least squares radon demultiple

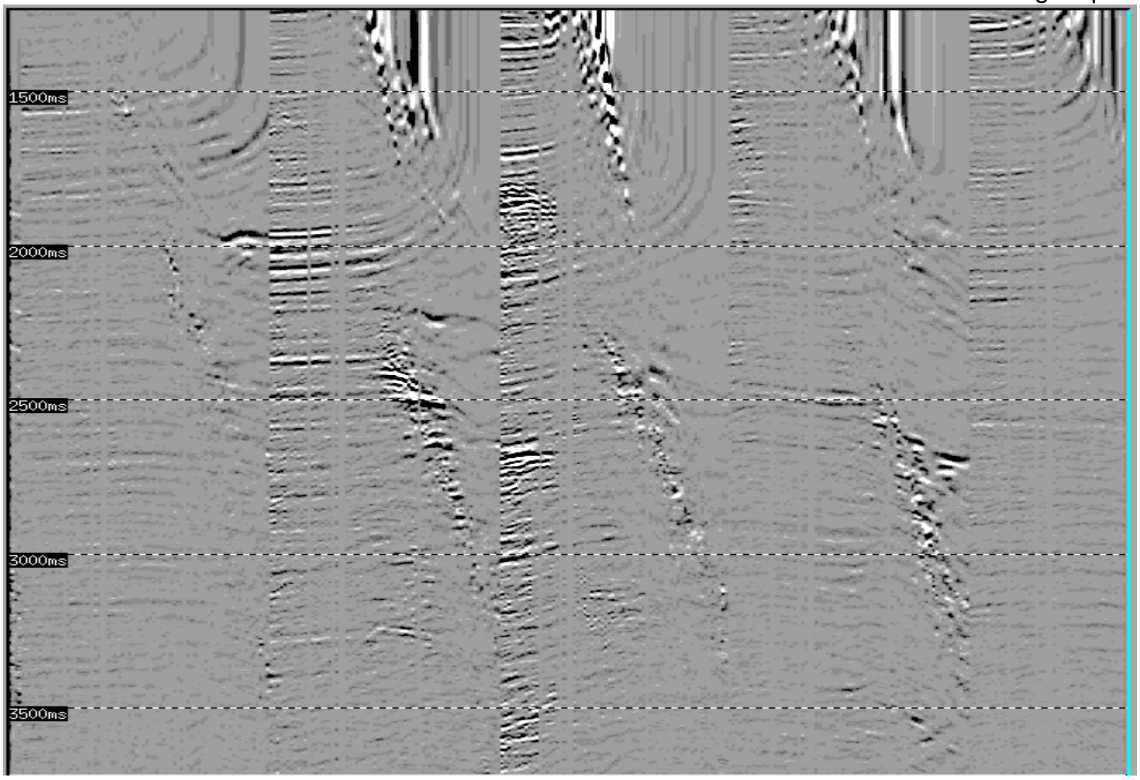
The radon parameters were tested on the Production Cube because SRME had been applied and there was not as much multiple to remove as there had been on the Exploration Cube. Interactive tests had been run in-house prior to devising a new set of parameters to apply to the data for sending to Esso. Because the SRME had removed quite a lot of the multiple it was decided to pick another round of velocity analysis prior to radon after the taup linear noise filter had been applied. Testing was limited to comparing the parameters and velocities from the Exploration Cube to revised parameters and new velocities from the Production Cube. Based on the results the client made the decision to use the Exploration Cube processing parameters but the new velocity field, picked on the tau-p linear filtered data on the Production Cube. Results of the AMO testing had not been seen at this stage so it was decided to keep all the traces and not decimate to a 12.5m CMP interval before radon application.



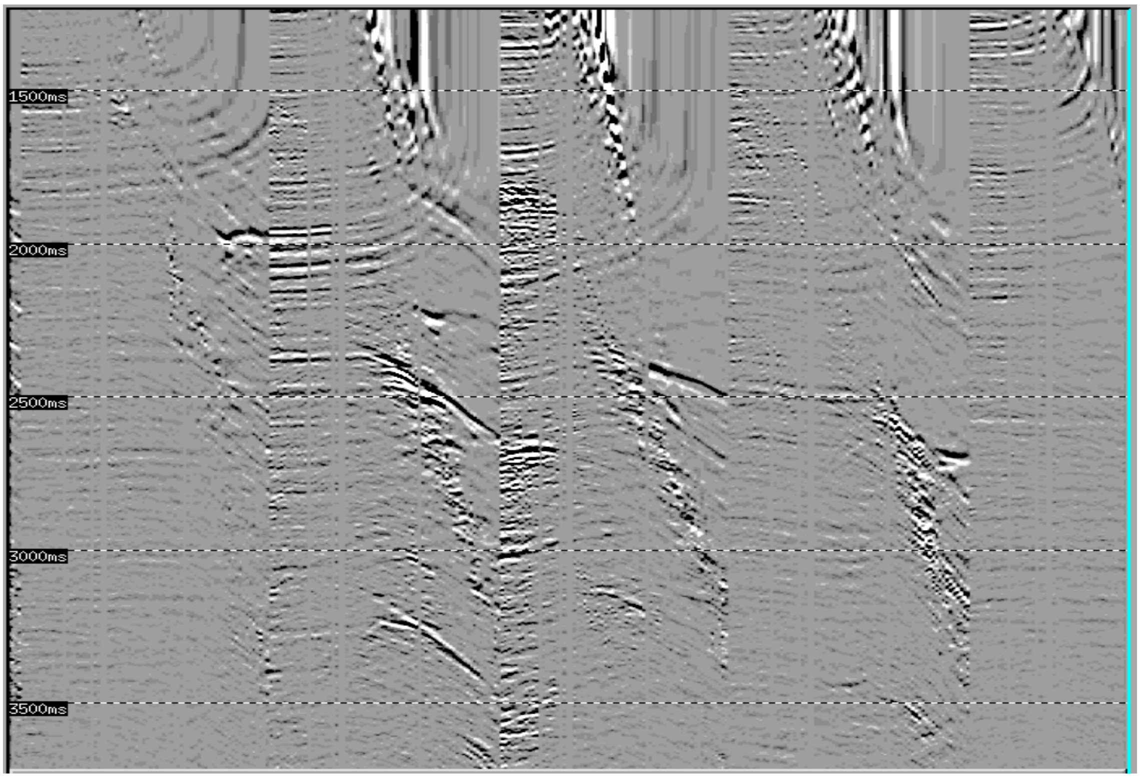
Example CMP gathers, no radon demultiple applied



Example CMP gathers, radon demultiple applied using Exploration Cube parameters and velocities



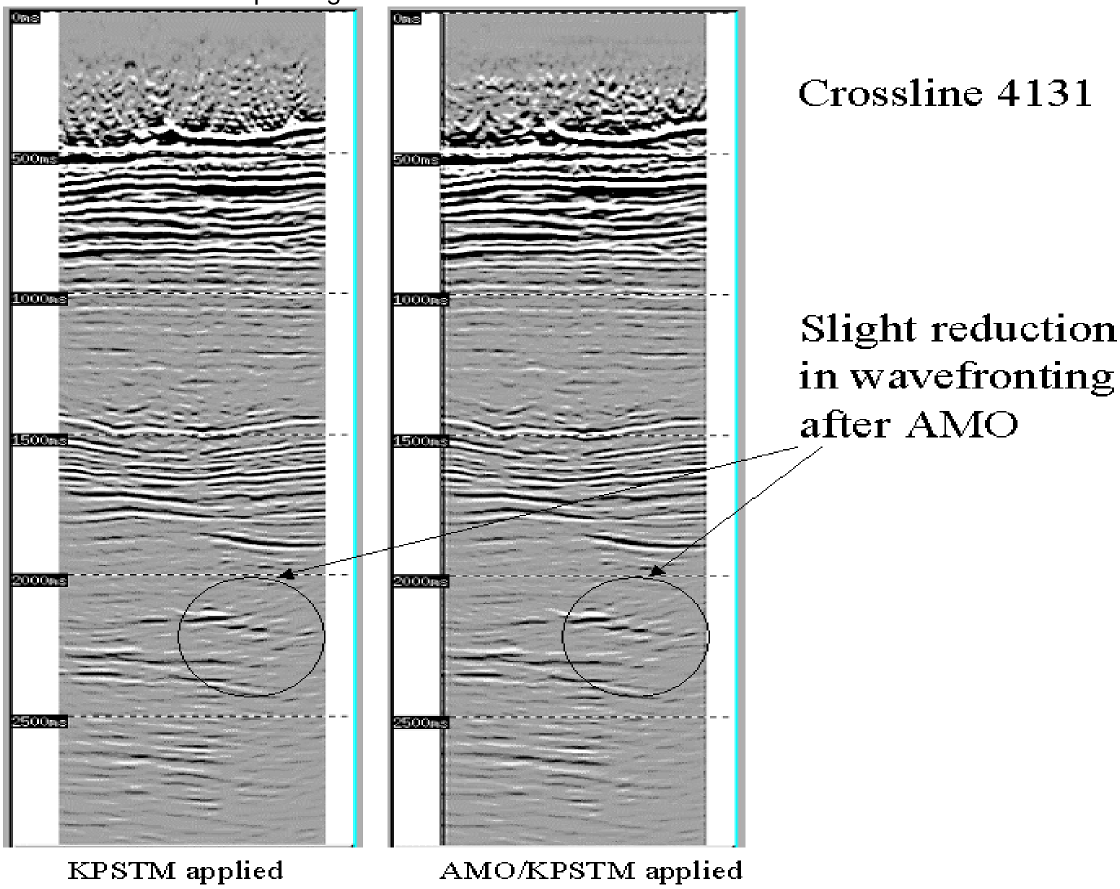
Example CMP gathers, radon demultiple applied using
new parameters and Exploration Cube velocities



Example CMP gathers, radon demultiple applied using
new parameters and Production Cube velocities

12.6.5 Azimuthal Moveout (AMO)

AMO was tested to try to remove the azimuth differences caused by flip-flop shooting.
Cubes of test data were looked at using Omega software in WesternGeco's office and SEG-Y datasets were sent to Esso.
The tests output the following datasets for comparison, run on a single offset plane (approx 1000m):
Pre-stack regularisation / KPSTM
Pre-stack regularisation / AMO
Pre-stack regularisation / AMO / KPSTM
Crossline 4131 showed the typical result of running AMO. The AMO helped to remove the azimuth differences caused by the flip-flop shooting but was unable to improve the areas of larger differences between swaths. The KPSTM after AMO showed a slight decrease in the migration wavefronting, but it was felt that the depth migration would remove this anyway. A decision was made by the client not to apply AMO and to decimate the data to a 12.5m CMP interval before the depth migration.



12.6.6 Pre-Stack regularisation (FIRE)

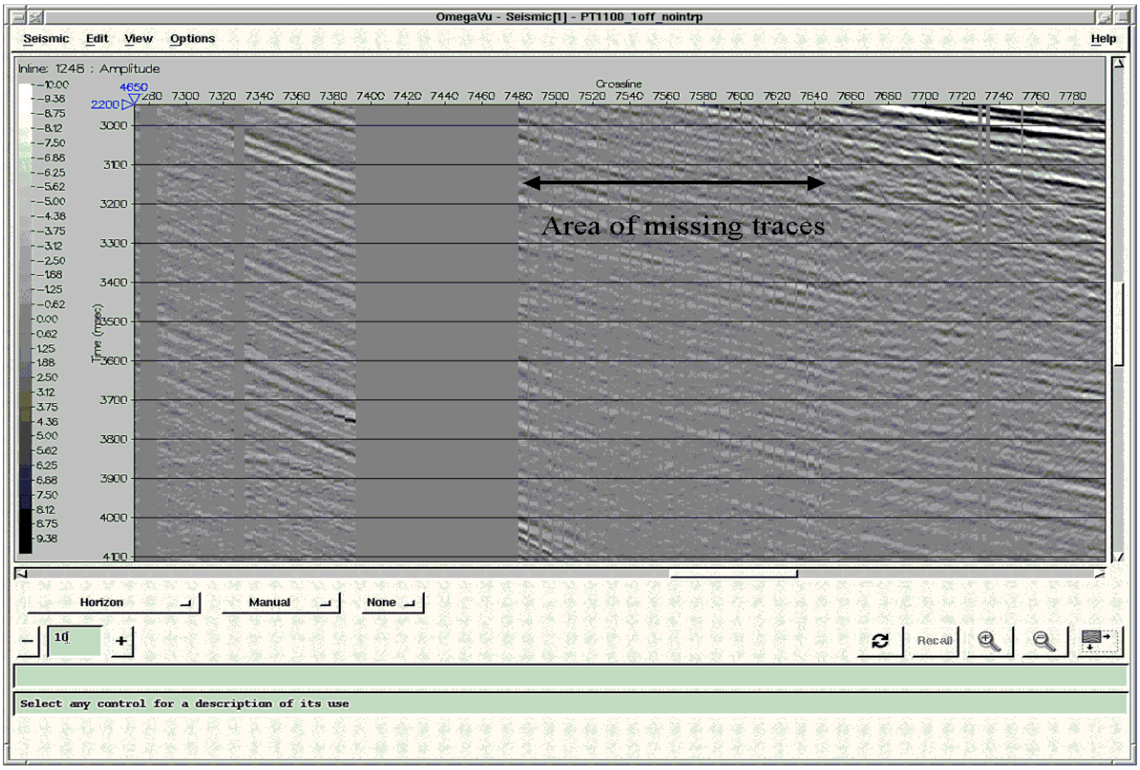
Confirmation testing of the Exploration Cube's prestack regularisation (FIRE) parameters were run on the Production Cube radon data. Other tests were run to see if better results could be obtained by keeping all the shot interpolated traces as input to the FIRE process, rather than removing them and letting the FIRE process interpolate in the extra missing traces. Tests included applying FIRE to the following data:

a) Original traces only

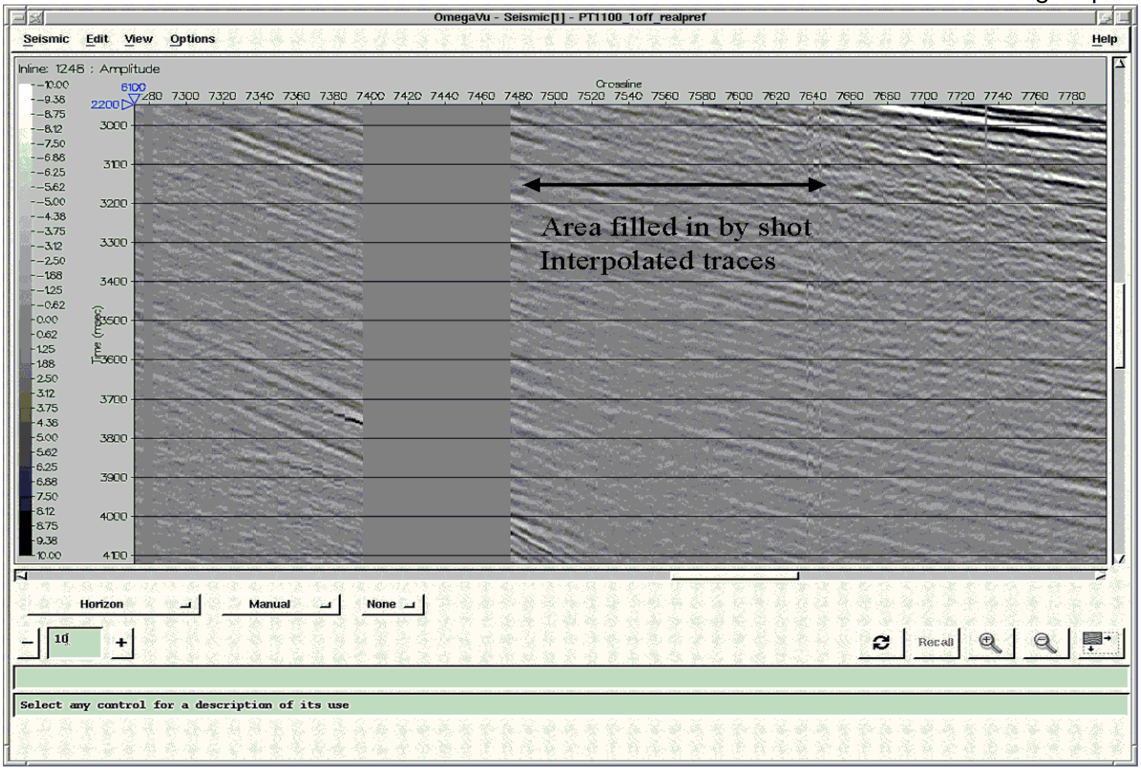
b) All traces input, no weighting applied

c) All traces input, original traces weighted higher so were used in preference to shot interpolated traces and those traces coming from low fold CMPs.

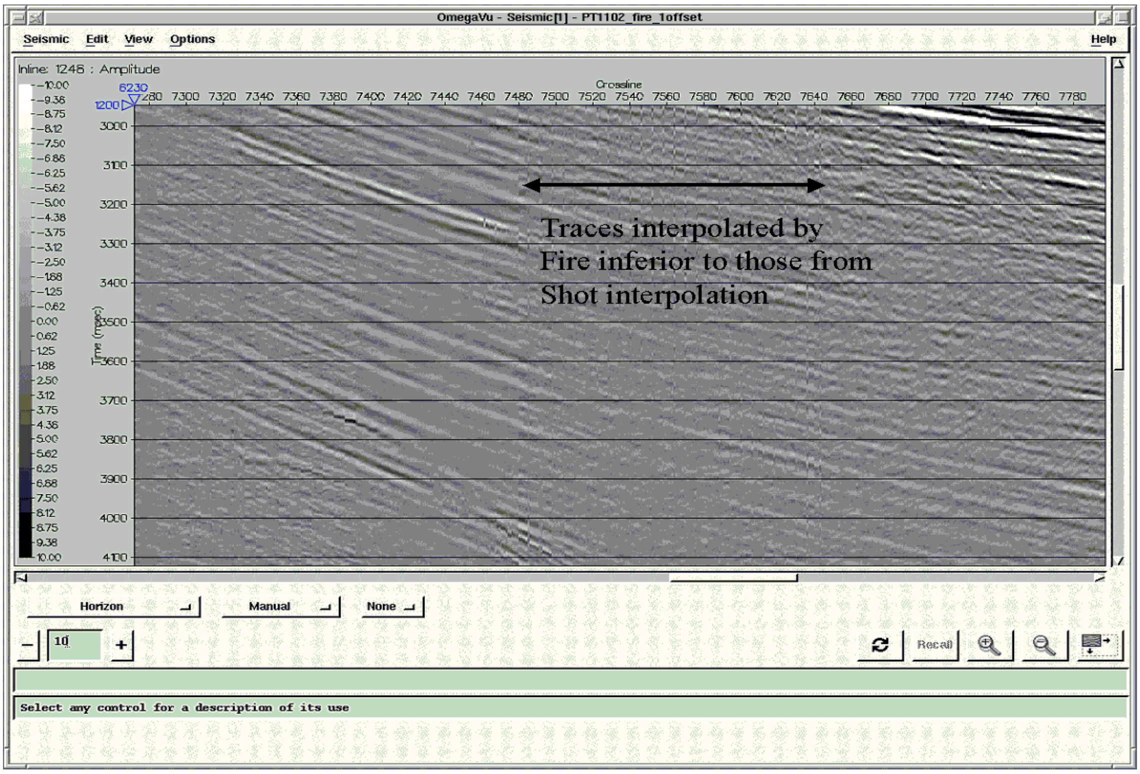
The examples below show the results on a single offset plane of including the shot interpolated traces rather than letting FIRE interpolate all the missing traces. Based on the results, the decision was taken to use option c) above as input to the FIRE production ie keep all the shot interpolated traces but weight the original traces so they are used preferentially.



Original traces only, No FIRE applied (to show the missing traces)



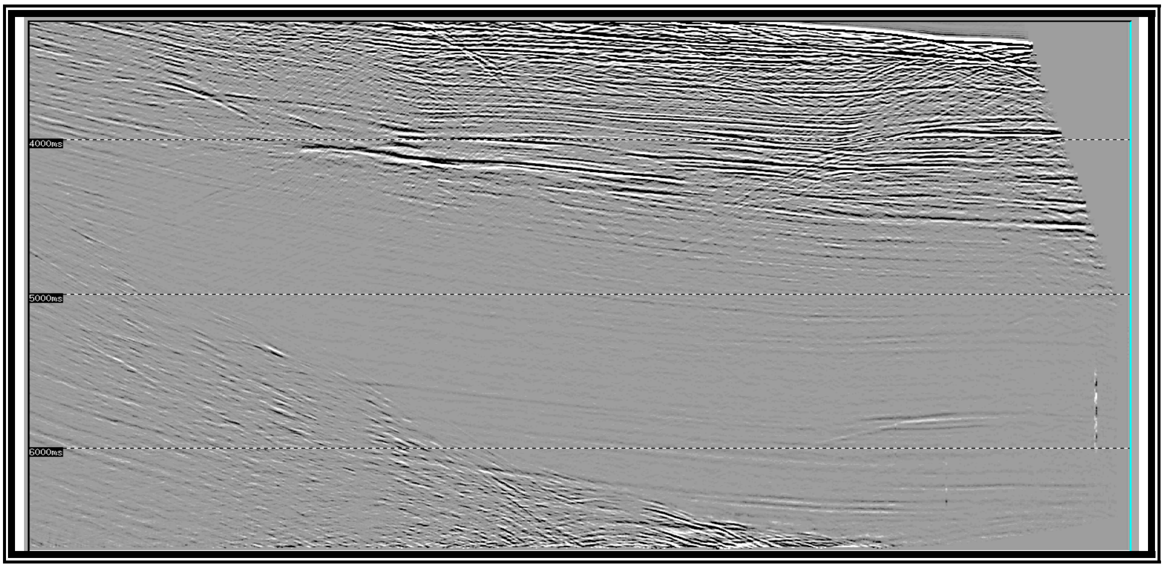
All traces included, No FIRE applied (to show the holes filled in by shot interpolated traces)



Original traces only, FIRE applied (to show areas where the FIRE traces look inferior to the traces from the shot interpolation)

12.6.7 Residual Multiple Attenuation

After the application of the quadrature phase designature using the shaped wavelet and SRME, the Production cube dataset was of a different amplitude level to the Exploration cube and the residual multiples were weaker. Esso had requested that the residual multiple coming from the shelf in the deep water also be attenuated so the parameters used for the amplitude clipping on the Exploration Cube were not optimal for application on the Production cube. Several tests were run to obtain optimal attenuation on the residual multiple in selected areas of the production cube, namely under the canyons and in the deep water. As well as testing the Exploration Cube amplitude clipping method, primal tests were also run to see if it gave a better result. Some of the test results are shown below. Esso had some good results from another survey using CMP ZAP and requested it be tested on this dataset. The results from the tests were poor in comparison and are not included. Some of the test results were sent to Esso as gif attachments to e-mail rather than Qcviewer files.

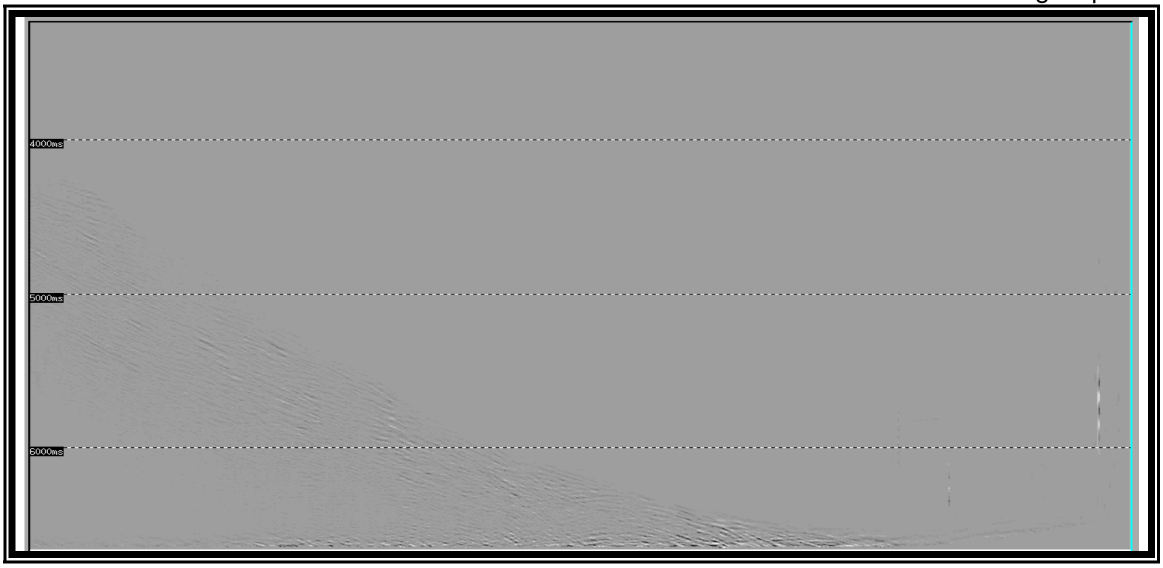


Example FIRE stack, no pre-stack residual multiple attenuation applied

Example FIRE stack, amplitude clipping applied

Example FIRE stack, primal applied

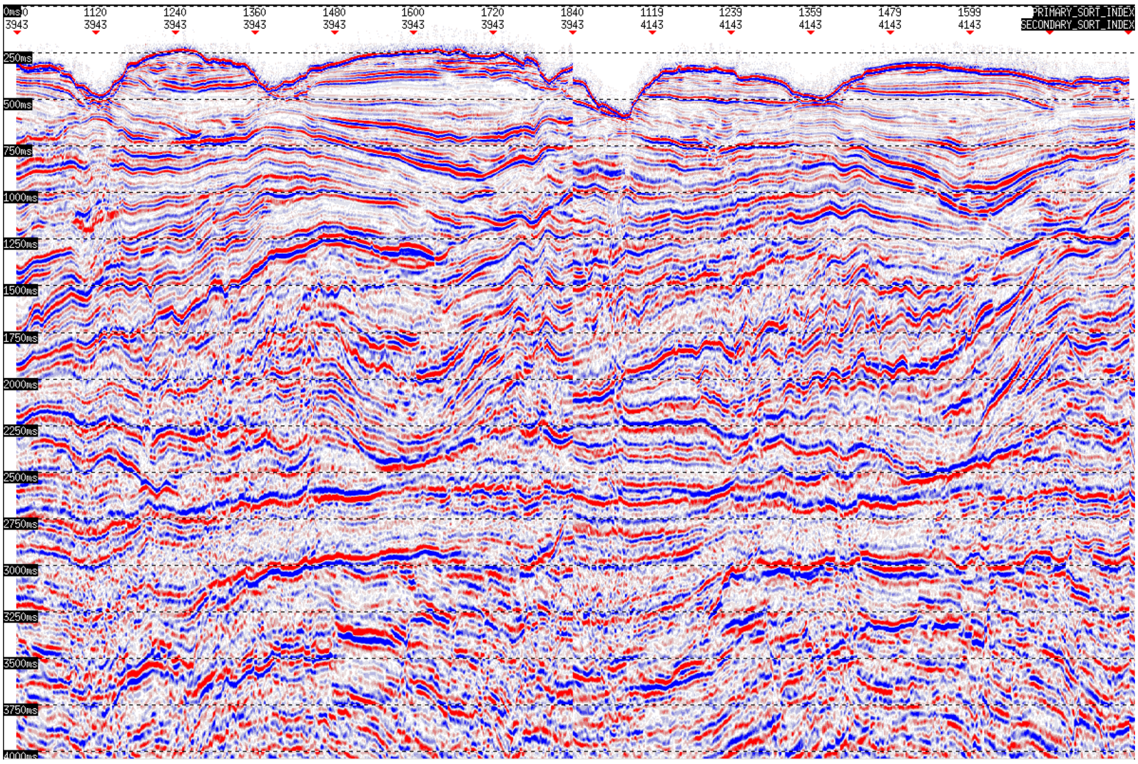
Example FIRE stack, primal and amplitude clipping applied


4000ms
5000ms
6000ms

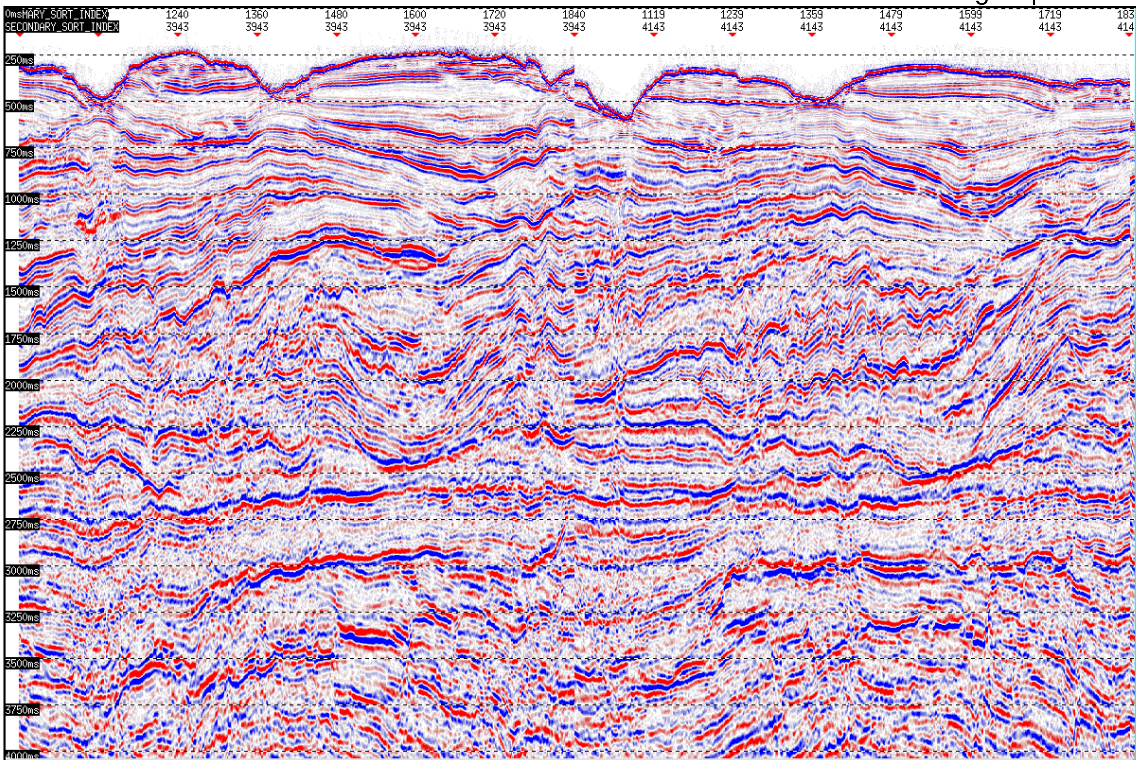
12.7 Testing Summary (Depth Processing)

Migration Aperture size

An important aim of the imaging was to fully image the steeply dipping faults present in the data. These are best seen in the crossline direction because of their orientation. It was decided to target migrate 6 crosslines with half aperture sizes of 4 and 5 km. When these were completed, the results were to be reviewed and a decision made as to whether any larger aperture sizes would need to be run. The crossline data tests can be seen below:



Crosslines 3943 and 4143 migrated with a 4 km half aperture

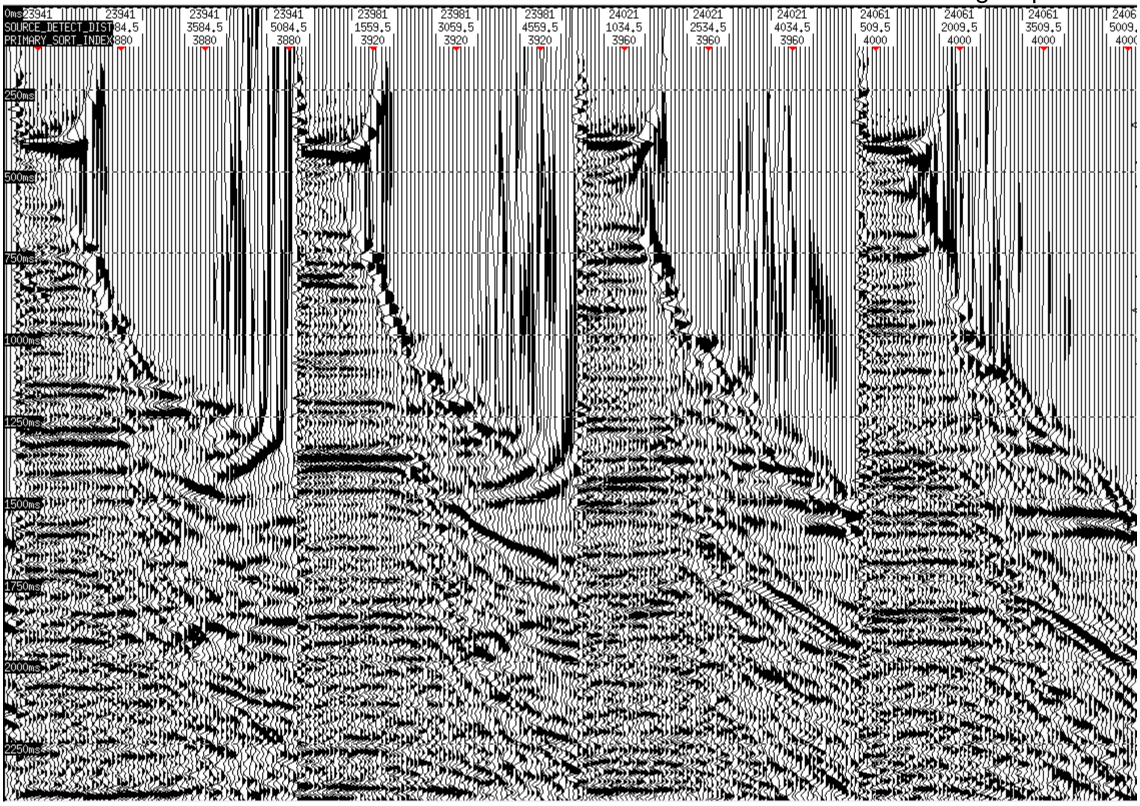

Crosslines 3943 and 4143 migrated with a 5 km half aperture

When the two above results were compared, a decision was made to run the final migration with a 4 km half aperture. No further tests were run.

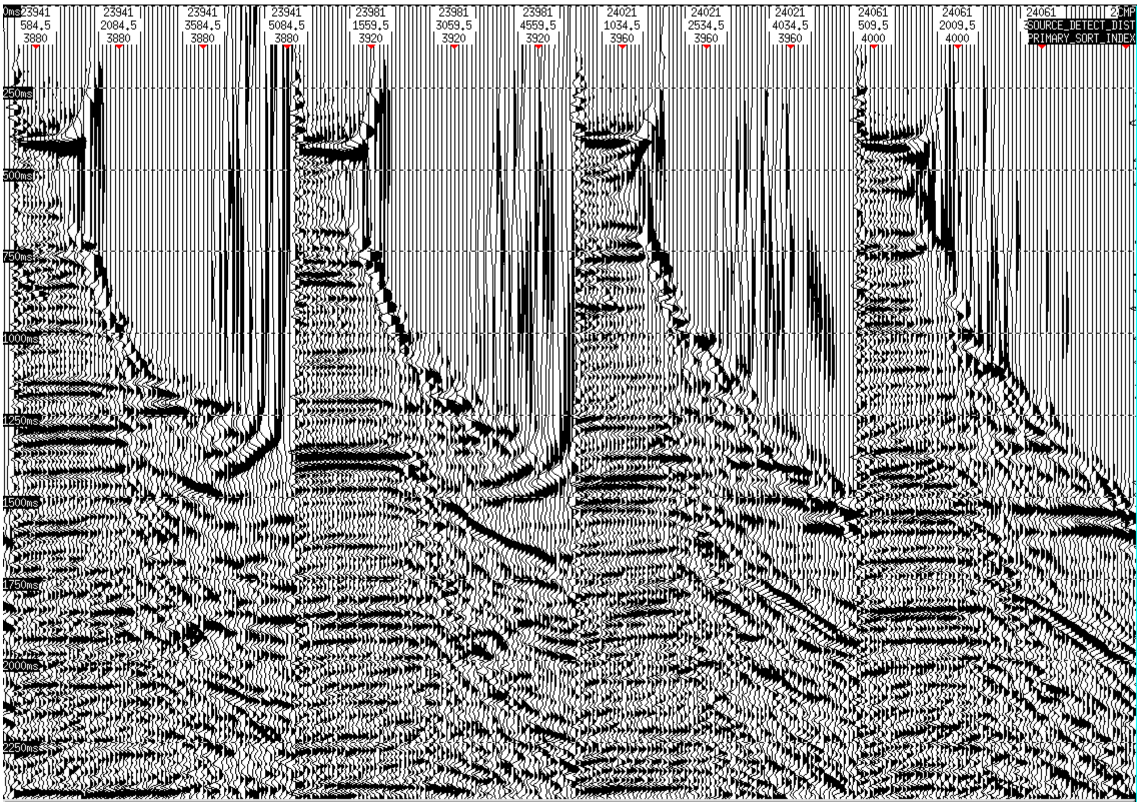
Radon Demultiple

Post migration there was still multiple energy present in the data (see below for example). The radon demultiple applied during the pre-processing was not a harsh demultiple, as with the imperfect velocity field then available, to run the radon with cuts to o close to zero dip could have harmed primary energy. Post migration, a harsh radon demultiple is much safer as the velocity field used is more accurate.

The two displays below show example cmp gathers with and without the radon demultiple applied.



Gather data prior to radon demultiple.



Gathers after radon demultiple

Random Noise Attenuation

A trial was performed on the migrated stack data to see if the level of random noise could be reduced with the use of an FX deconvolution. Trials were run using a 2d and a 3d algorithm, but the process had no visible effect on the data, and it was decided not to apply the process.

Mute tests

Mute trials were run on the test line 1248. The inside mute tests were targeted at trying to mute out some of the dipping noise that could be seen on the migrated image at depth, as it was observed that the far offset stack had less dipping noise than the near offset stack. The noise can be seen in the image below between xlines 4800 and 5200, between 5 and 7 km depth. The trials showed that approximately 50% of the live data would need to be muted, and this was not suitable for the final full stack volume, and no inside mute was applied to the data.

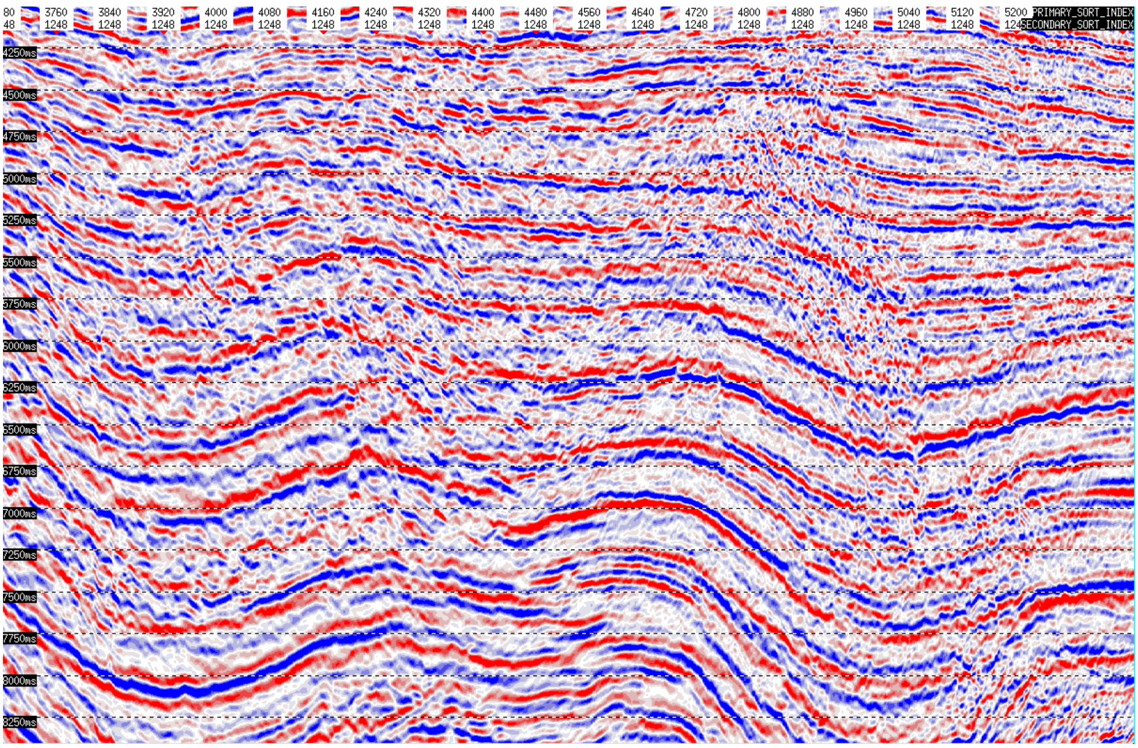


Image showing the dipping noise present in the final image.

Time Variant Filtering (TVF)

Filter trials were run pre and post migration. The pre-migration trials were designed to remove unwanted noise from the gather data prior to imaging. Whilst wanting to remove as much noise as possible, it was a requirement that no primary signal energy be removed during this process. The pre-migration data were filtered in a 'brick-wall' fashion, in steps of 10 hertz. The following panels were output:

0-10 hertz
10-20 hertz
20-30 hertz
30-40 hertz
40-50 hertz
50-60 hertz
60-70 hertz
70-80 hertz
80-90 hertz.

A filter was chosen, and the test line data were NMO stacked with and without the filter applied pre-stack. A difference section between the two datasets was produced, and when no primary could be seen on the difference section, the filter was approved for use. The filter parameters are described in the production flow section.

A similar method was used to design the post migration filter, with "brick-wall" displays created on the final migrated image. A filter was chosen, and the data displayed with and without the post stack filter applied. The filter parameters are described in the production flow section.

Time Variant Scaling

A final archive dataset was required balanced top to bottom, but with spatial amplitudes relatively preserved (no trace by trace scaling). A series of exponential gains were tested, but the resultant image strength was not consistent across the data section because of the variability in the water depth. A spatially variant Residual Amplitude Correction (RAAC) function was designed to balance the data in time. Every stack trace was analysed, and a gain function calculated and output on a 1km grid. Varying time window sizes were trialled, and it was found that a 400 msec time window was optimal.

12.8 Testing Logs (Time Processing)

TEST LOG #1	**Date: 21st July 2003**	**Testing Phase: SRME (surface multiple prediction and removal)**
Test Lines: L1248J, subsurface line 1 (outer cable) L1248J, subsurface line 8 (inner cable) L1504J, subsurface line 8 (inner cable) L1504J, subsurface line 15 (outer cable)	Notes: L1248J was shot down dip L1504J was shot up dip	Comments: To cut down the number of tests to ftp, only the stacks have been supplied for each test line. The shot and CMP gathers have only been supplied for the 2 test lines recorded by one of the inner cables.
DISPLAY / TEST NO.	**DESCRIPTION**	**COMMENT / RECOMMENDATION** Recommendations are in **bold**
Input date (no SRME or hires radon applied) PT02_00cr_L1248J_ssl8.qcv PT02_00cr_L1504J_ssl8.qcv	 NMO corrected CMP gathers, interpolated traces removed	Input data has had receiver domain swatt, designature (using Esso's filter) and 4ms time resample applied. The data has been 1:3 shot interpolated for application of the demultiple processes, the interpolated traces being dropped prior to stacking. To display the outer trace mute applied for stacking turn on the graph
PT02_00cr_alltrc_L1248J_ssl8.qcv PT02_00cr_alltrc_L1504J_ssl8.qcv PT02_00ar_L1248J_ssl8.qcv PT02_00ar_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces displayed Shot gathers, showing dead and missing traces	
PT02_00ar_alltrc_L1248J_ssl8.qcv PT02_00ar_alltrc_L1504J_ssl8.qcv	Shot gathers, dead and missing traces filled in	
PT02_00er_L1248J_ssl1.qcv PT02_00er_L1248J_ssl8.qcv PT02_00er_L1504J_ssl8.qcv PT02_00er_L1504J_ssl15.qcv **SRME applied**	Stack	To display the locations of the shot and CMP gathers turn on the intersections in QCviewer (toggle switch in the display options) SRME parameters: Predicting surface multiples, 0-90Hz using a user defined wavelet (derived from the Esso supplied designature wavelet). Single pass of least squares subtraction in supershot domain, using a window length of 256ms and a width of 720 traces (ie 72 shots x 10 offsets), and an adaptive filter length of 124ms.
PT02_27cr_alltrc_L1248J_ssl8.qcv PT02_24cr_alltrc_L1504J_ssl8.qcv PT02_27ar_alltrc_L1248J_ssl8.qcv PT02_24ar_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces displayed Shot gathers, dead and missing traces filled in	
PT02_27er_L1248J_ssl1.qcv PT02_27er_L1248J_ssl8.qcv PT02_24er_L1504J_ssl8.qcv PT02_24er_L1504J_ssl15.qcv	Stack	
Hi-res Radon applied		Hi-res radon parameters: Signal moveout range –1500ms to 225ms, window length 500ms applied from WB*1.5 (best testing parameters from the exploration cube)
PT03_01cr_alltrc_L1248J_ssl8.qcv PT03_01cr_alltrc_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces displayed	
PT03_01ar_alltrc_L1248J_ssl8.qcv PT03_01ar_alltrc_L1248J_ssl8.qcv	Shot gathers, dead and missing traces filled in	
PT03_01er_L1248J_ssl1.qcv PT03_01er_L1248J_ssl8.qcv PT03_01er_L1504J_ssl8.qcv PT03_01er_L1504J_ssl15.qcv	Stack	
SRME and Hi-res Radon applied		
PT03_03cr_L1248J_ssl8.qcv PT03_03cr_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces removed	
PT03_03cr_alltrc_L1248J_ssl8.qcv PT03_03cr_alltrc_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces displayed	
PT03_03ar_alltrc_L1248J_ssl8.qcv PT03_03ar_alltrc_L1248J_ssl8.qcv	Shot gathers, dead and missing traces filled in	
PT03_03er_L1248J_ssl1.qcv PT03_03er_L1248J_ssl8.qcv PT03_03er_L1504J_ssl8.qcv PT03_03er_L1504J_ssl15.qcv	Stack	

SRME Model		
PT02_26er_L1248J_ssl1.qcv PT02_26er_L1248J_ssl8.qcv PT02_23er_L1504J_ssl8.qcv PT02_23er_L1504J_ssl15.qcv **Difference Stacks**	Stack	
PT02_28ehr_L1248J_ssl1.qcv PT02_28ehr_L1248J_ssl8.qcv PT02_25ehr_L1504J_ssl8.qcv PT02_25ehr_L1504J_ssl15.qcv	Stack difference between input data and SRME	
PT03_01ehr_L1248J_ssl1.qcv PT03_01ehr_L1248J_ssl8.qcv PT03_01ehr_L1504J_ssl8.qcv PT03_01ehr_L1504J_ssl15.qcv PT03_03ehr_L1248J_ssl1.qcv PT03_03ehr_L1248J_ssl8.qcv PT03_03ehr_L1504J_ssl8.qcv PT03_03ehr_L1504J_ssl15.qcv	Stack difference between input data and hi-res radon Stack difference between input data and SRME/hi-res radon	
PT03_04ehr_L1248J_ssl1.qcv PT03_04ehr_L1248J_ssl8.qcv PT03_04ehr_L1504J_ssl8.qcv PT03_04ehr_L1504J_ssl15.qcv	Stack difference between hi-res radon and SRME/hi-res radon	

TEST LOG #2	**Date: 29th July 2003**	**Testing Phase: SRME (surface multiple prediction and removal) after application of statistical designature filter**
Test Line: L1248J, subsurface line 1 (outer cable)	Notes: L1248J was shot down dip	Comments:
DISPLAY / TEST NO. **Input date (no SRME applied)**	**DESCRIPTION**	**COMMENT / RECOMMENDATION** Input data has had receiver domain swatt, **statistical designature**, and 4ms time resample applied. The data has been 1:3 shot interpolated for application of the SMRE, the interpolated traces being dropped prior to stacking.
PT04_00cr_L1248J_ssl1.qcv PT04_00cr_alltrc_L1248J_ssl1.qcv	NMO corrected CMP gathers, interpolated traces removed NMO corrected CMP gathers, interpolated traces displayed	To display the outer trace mute applied for stacking turn on the graph
PT04_00er_L1248J_ssl1.qcv	Stack	
SRME applied PT04_04cr_L1248J_ssl1.qcv	 NMO corrected CMP gathers, interpolated traces removed	SRME parameters: Predicting surface multiples, 0-90Hz using a user defined wavelet (derived from the Esso supplied designature wavelet). Single pass of least squares subtraction in supershot domain, using a window length of 256ms and a width of 720 traces (ie 72 shots x 10 offsets), and an adaptive filter length of 124ms.
PT04_04cr_alltrc_L1248J_ssl1.qcv	NMO corrected CMP gathers, interpolated traces displayed	
PT04_04er_L1248J_ssl1.qcv	Stack	
SRME Model		
PT04_03er_L1248J_ssl1.qcv	Stack	
Difference Stacks		
PT04_04ehr_L1248J_ssl1.qcv	Stack difference between input data and SRME	

TEST LOG #3	Date: 8th August 2003	Testing Phase: SRME (surface multiple prediction and removal) + taup decon + weighted least squares radon
Test Lines: L1248J, subsurface line 8 (inner cable) L1504J, subsurface line 8 (inner cable)	Notes: L1248J was shot down dip L1504J was shot up dip	Comments:
DISPLAY / TEST NO.	**DESCRIPTION**	**COMMENT / RECOMMENDATION** Recommendations are in **bold**
Input data (SRME applied)		Input data test displays were sent on 21st July, test numbers: PT02_27*_L1248J_ssl8.qcv PT02_24*_L1504J_ssl8.qcv
Comparison data (SRME and Hi-res Radon applied) ie no taup decon applied		Comparison test displays were sent on 21st July, test numbers: PT03_03*_L1248J_ssl8.qcv PT03_03*_L1504J_ssl8.qcv
Comparison data (from exploration cube production taup decon, 2 x taup linear noise removals and hi-res radon applied, line 1248J)		Display sent previously, test number: Radon_stack_1248J.qcv Note: tidal statics have been applied to this dataset
Taup decon applied to SRME data		Taup decon parameters: as per exploration cube production.
PT05_03cr_alltrc_L1248J_ssl8.qcv PT05_03cr_alltrc_L1504J_ssl8.qcv PT05_03er_L1248J_ssl8.qcv PT05_03er_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces displayed Stack	
Taup decon and Hi-res Radon applied to SRME data		Taup decon parameters as per exploration cube production. Hi-res radon parameters: as previous production cube tests and exploration cube production parameters
PT05_03cr_radon_alltrc_L1248J_ssl8.qcv PT05_03cr_radon_alltrc_L1504J_ssl8.qcv PT05_03er_radon_L1248J_ssl8.qcv PT05_03er_radon_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces displayed Stack	
Difference Stacks		
PT05_04ehr_L1248J_ssl8.qcv PT05_04ehr_L1504J_ssl8.qcv	Stack difference between SRME and SRME/taup decon	
PT05_05ehr_L1248J_ssl8.qcv	Stack difference between SRME/hi-res radon and SRME/taup decon/hi-res radon	
PT05_06ehr_L1248J_ssl8.qcv	Stack difference between SRME/taup decon and SRME/taup decon/hi-res radon	

TEST LOG #4	Date: 8th August 2003	Testing Phase: SRME (surface multiple prediction and removal) after application of shaped designature filter
Test Line: L1248J, subsurface line 1 (outer cable)	Notes: L1248J was shot down dip	Comments:
DISPLAY / TEST NO. **Input date (no SRME applied)**	**DESCRIPTION**	**COMMENT / RECOMMENDATION** Input data has had receiver domain swatt, **designature filter (shaped wavelet to remove 'bubble')**, and 4ms time resample applied. The data has been 1:3 shot interpolated for application of the SMRE, the interpolated traces being dropped prior to stacking.
PT04_06cr_L1248J_ssl1.qcv	NMO corrected CMP gathers, interpolated traces removed	To display the outer trace mute applied for stacking turn on the graph
PT04_06cr_alltrc_L1248J_ssl1.qcv	NMO corrected CMP gathers, interpolated traces displayed	
PT04_06er_L1248J_ssl1.qcv	Stack	
SRME applied		SRME parameters: Predicting surface multiples, 0-90Hz using a user defined wavelet (derived from the new Esso supplied shaped designature wavelet). Single pass of least squares subtraction in supershot domain, using a window length of 256ms and a width of 720 traces (ie 72 shots x 10 offsets), and an adaptive filter length of 124ms.
PT04_10cr_L1248J_ssl1.qcv	NMO corrected CMP gathers, interpolated traces removed	
PT04_10cr_alltrc_L1248J_ssl1.qcv	NMO corrected CMP gathers, interpolated traces displayed	
PT04_10er_L1248J_ssl1.qcv	Stack	
SRME Model		
PT04_09er_L1248J_ssl1.qcv	Stack	
Difference Stacks		
PT04_10ehr_L1248J_ssl1.qcv	Stack difference between input data and SRME	

TEST LOG #5	**Date: 2nd October 2003**	**Testing Phase: Taup-P Linear Noise Attenuation in shot domain**
Test Lines: L1248J, subsurface line 8 (inner cable) L1504J, subsurface line 8 *inner cable)	Notes: L1248J was shot down dip L1504J was shot up dip	Comments:
DISPLAY / TEST NO.	**DESCRIPTION**	**COMMENT / RECOMMENDATION**
Input date (no taup linear noise attenuation applied)		Input data is production SRME data, sorted back to shotpoint domain. The data was 1:3 shot interpolated for the application of the SRME, the interpolated traces being dropped prior to producing QC stacks and displays.
PT06_01cr_L1248J_ssl8.qcv PT06_01cr_L1504J_ssl8.qcv PT06_01ar_alltrc_L1248J_ssl8.qcv PT06_01ar_alltrc_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces removed NMO corrected shot gathers	To display the outer trace mute applied for stacking turn on the graph
PT06_01ar_alltrc_noNMO_L1248J_ssl8.qcv PT06_01ar_alltrc_noNMO_L1504J_ssl8.qcv	Shot gathers, no NMO	
PT06_01er_L1248J_ssl8.qcv PT06_01er_L1504J_ssl8.qcv	Stack	
Taup linear noise attenuation applied		TauP linear noise attenuation parameters: as per exploration cube production parameters: Shot domain TauP linear noise attenuation (No alternate trace drop) NMO Forward linear transform of –2000 to 4000 ms of moveout Mute direct arrival linear energy (WB twt dependent mute) Start mute at 1.7 times water bottom reflection Mute taper of 400 msec Subtract noise from Input gather Inverse NMO
PT06_04cr_L1248J_ssl8.qcv PT06_04cr_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces removed	
PT06_04ar_alltrc_L1248J_ssl8.qcv PT06_04ar_alltrc_L1504J_ssl8.qcv	NMO corrected shot gathers	
PT06_04ar_alltrc_noNMO_L1248J_ssl8.qcv PT06_04ar_alltrc_noNMO_L1504J_ssl8.qcv	Shot gathers, no NMO	
PT06_04er_L1248J_ssl8.qcv PT06_04er_L1504J_ssl8.qcv	Stack	
Difference Stacks		
PT06_04ehr_L1248J_ssl8.qcv PT06_04ehr_L1248J_ssl8.qcv	Stack difference between input data and application of taup noise attenuation	

Shot Displays		
PT06_03ar_TaupLnr_L1248J_ssl8_sp2914_OM182.qcv PT06_03ar_TaupLnr_L1248J_ssl8_sp3338_OM182.qcv PT06_03ar_TaupLnr_L1248J_ssl8_sp3550_OM182.qcv PT06_03ar_TaupLnr_L1504J_ssl8_sp2729_OM182.qcv PT06_03ar_TaupLnr_L1504J_ssl8_sp3365_OM182.qcv PT06_03ar_TaupLnr_L1504J_ssl8_sp3577_OM182.qcv	QC displays of individual shot records at different water depths	QC plots showing: Input SRME data / Output taup linear noise attenuated data / Model / Taup transform / muted taup transform

TEST LOG #6	**Date: 17th October 2003**	**Testing Phase: Taup-P Linear Noise Attenuation in shot domain**
Test Lines: L1248J, subsurface line 8 (inner cable) L1504J, subsurface line 8 (inner cable)	Notes: L1248J was shot down dip L1504J was shot up dip	Comments:
DISPLAY / TEST NO.	**DESCRIPTION**	**COMMENT / RECOMMENDATION**
Taup linear noise attenuation applied		TauP linear noise attenuation parameters: as per exploration cube production parameters, except for addition of AGC, wrapped around the taup transform: Shot domain TauP linear noise attenuation (No alternate trace drop) NMO AGC 300ms windows Forward linear transform of –2000 to 4000 ms of moveout Mute direct arrival linear energy (WB twt dependent mute) Inverse AGC Start mute at 1.7 times water bottom reflection Mute taper of 400 msec Subtract noise from Input gather Inverse NMO
PT06_05cr_L1248J_ssl8.qcv PT06_05cr_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces removed	
PT06_05ar_alltrc_L1248J_ssl8.qcv PT06_05ar_alltrc_L1504J_ssl8.qcv	NMO corrected shot gathers	
PT06_05ar_alltrc_noNMO_L1248J_ssl8.qcv PT06_05ar_alltrc_noNMO_L1504J_ssl8.qcv	Shot gathers, no NMO	
PT06_05er_L1248J_ssl8.qcv PT06_05er_L1504J_ssl8.qcv	Stack	
Difference Stacks		
PT06_05ehr_L1248J_ssl8.qcv PT06_05ehr_L1248J_ssl8.qcv	Stack difference between input data and application of taup noise attenuation	
Shot Displays		
PT06_05ar_TaupLnr_L1248J_ssl8_sp2914_OM182.qcv PT06_05ar_TaupLnr_L1248J_ssl8_sp3338_OM182.qcv PT06_05ar_TaupLnr_L1248J_ssl8_sp3550_OM182.qcv PT06_05ar_TaupLnr_L1504J_ssl8_sp2729_OM182.qcv PT06_05ar_TaupLnr_L1504J_ssl8_sp3365_OM182.qcv PT06_05ar_TaupLnr_L1504J_ssl8_sp3577_OM182.qcv	QC displays of individual shot records at different water depths	QC plots showing: Input SRME data / Output taup linear noise attenuated data / Model / Taup transform / muted taup transform

TEST LOG #7	**28th October 2003**	**Testing Phase: Tau-P Linear Noise Attenuation**
Test Lines: L1248J, subsurface line 8 (inner cable) L1504J, subsurface line 8 (inner cable)	Notes: L1248J was shot down dip L1504J was shot up dip	Comments:
DISPLAY / TEST NO.	DESCRIPTION	COMMENT / RECOMMENDATION **These tests are to see if the same result of the 2 passes of taup noise attenuation on the exploration cube processing (in the shot and receiver domains) can be obtained by a single pass applied in the shot domain using 2 taup mutes.**
Taup linear noise attenuation applied in the shot domain, using 2 mutes in taup domain to remove linear noise dipping in both directions.		TauP linear noise attenuation parameters: Shot domain TauP linear noise attenuation (No alternate trace drop) NMO AGC 300ms windows Forward linear transform of –4000 to 4000 ms of moveout Mute linear energy (WB twt dependent mute) by using 2 symmetrical mutes (first one same as the expl cube) Inverse AGC Start mute at 1.7 times water bottom reflection, mute taper of 400 msec Subtract noise from Input gather Inverse NMO
PT06_13er_L1248J_ssl8.qcv PT06_13er_L1504J_ssl8.qcv	Stack	
Taup linear noise attenuation applied in the shot domain, followed by application in the receiver domain.		TauP linear noise attenuation parameters: as per exploration cube (except for application of wraparound AGC)
PT07_02er_L1248J_ssl8.qcv PT07_02er_L1504J_ssl8.qcv	Stack	
Difference Stacks PT07_02ehr_L1248J_ssl8.qcv PT07_02ehr_L1504J_ssl8.qcv	Stack difference between PT06_13 and PT07_02	
Shot Displays		
PT06_13ar_TaupLnr_L1248J_ssl8_sp2914_OM182.qcv PT06_13ar_TaupLnr_L1248J_ssl8_sp3338_OM182.qcv PT06_13ar_TaupLnr_L1248J_ssl8_sp3550_OM182.qcv PT06_13ar_TaupLnr_L1504J_ssl8_sp2729_OM182.qcv PT06_13ar_TaupLnr_L1504J_ssl8_sp3365_OM182.qcv PT06_13ar_TaupLnr_L1504J_ssl8_sp3577_OM182.qcv	QC displays of individual shot records at different water depths	QC plots showing: Input SRME data / Output taup linear noise attenuated data (2 mutes) / Model / Taup transform / muted taup transform (2 mutes)

1 pass Taup linear noise attenuation (2 mutes), followed by application of radon.		Weighted Least Squares Radon using same parameters as for test PT03_03 (see testlog from 21st July 2003)
PT06_15er_L1248J_ssl8.qcv PT06_15er_L1504J_ssl8.qcv	Stack	
2 pass Taup linear noise attenuation, followed by application of radon.		Weighted Least Squares Radon using same parameters as for test PT03_03 (see testlog from 21st July 2003)
PT07_03er_L1248J_ssl8.qcv PT07_03er_L1504J_ssl8.qcv	Stack	
Difference Stacks		
PT07_03ehr_L1248J_ssl8.qcv PT07_03ehr_L1504J_ssl8.qcv	Stack difference between PT06_15 and PT07_03	

TEST LOG #8	**29th October 2003**	**Testing Phase: Tau-P Linear Noise Attenuation**
Test Lines: L1248J, subsurface line 8 (inner cable) L1504J, subsurface line 8 (inner cable)	Notes: L1248J was shot down dip L1504J was shot up dip	Comments:
DISPLAY / TEST NO.	DESCRIPTION	COMMENT / RECOMMENDATION **These tests are to see if the same result of the 2 passes of taup noise attenuation on the exploration cube processing (in the shot and receiver domains) can be obtained by a single pass applied in the shot domain using 2 taup mutes.**
Taup linear noise attenuation applied in the shot domain, using 2 mutes in taup domain to remove linear noise dipping in both directions.		TauP linear noise attenuation parameters: Shot domain TauP linear noise attenuation (No alternate trace drop) NMO AGC 300ms windows Forward linear transform of –4000 to 4000 ms of moveout Mute linear energy (WB twt dependent mute) by using 2 symmetrical mutes (first one same as the expl cube) Inverse AGC Start mute at 1.7 times water bottom reflection, mute taper of 400 msec Subtract noise from Input gather Inverse NMO
PT06_13cr_L1248J_ssl8.qcv PT06_13cr_L1504J_ssl8.qcv PT06_13ar_alltrc_L1248J_ssl8.qcv PT06_13ar_alltrc_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces removed NMO corrected shot gathers	
PT06_13ar_alltrc_noNMO_L1248J_ssl8.qcv PT06_13ar_alltrc_noNMO_L1504J_ssl8.qcv	Shot gathers, no NMO	
PT06_13br_L1248J_ssl8.qcv PT06_13br_L1504J_ssl8.qcv	NMO corrected receiver gathers	
Taup linear noise attenuation applied in the shot domain, followed by application in the receiver domain.		TauP linear noise attenuation parameters: as per exploration cube (except for application of wraparound AGC)
PT07_00br_L1248J_ssl8.qcv PT07_00br_L1504J_ssl8.qcv	NMO corrected receiver gathers	Input to test: taup linear noise attenuation applied in shot domain ie equivalent to test PT06_05 (see testlog sent 17th Oct).
PT07_02cr_L1248J_ssl8.qcv PT07_02cr_L1504J_ssl8.qcv PT07_02ar_alltrc_L1248J_ssl8.qcv PT07_02ar_alltrc_L1504J_ssl8.qcv PT07_02ar_alltrc_noNMO_L1248J_ssl8.qcv PT07_02ar_alltrc_noNMO_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces removed NMO corrected shot gathers Shot gathers, no NMO	
PT07_02br_L1248J_ssl8.qcv PT07_02br_L1504J_ssl8.qcv	NMO corrected receiver gathers	

1 pass Taup linear noise attenuation (2 mutes), followed by application of radon.		Weighted Least Squares Radon using same parameters as for test PT03_03 (see testlog from 21st July 2003)
PT06_15cr_L1248J_ssl8.qcv PT06_15cr_L1504J_ssl8.qcv PT06_15ar_alltrc_L1248J_ssl8.qcv PT06_15ar_alltrc_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces removed NMO corrected shot gathers	
PT06_15ar_alltrc_noNMO_L1248J_ssl8.qcv PT06_15ar_alltrc_noNMO_L1504J_ssl8.qcv	Shot gathers, no NMO	
PT06_15br_L1248J_ssl8.qcv PT06_15br_L1504J_ssl8.qcv	NMO corrected receiver gathers	
2 pass Taup linear noise attenuation, followed by application of radon.		Weighted Least Squares Radon using same parameters as for test PT03_03 (see testlog from 21st July 2003)
PT07_03cr_L1248J_ssl8.qcv PT07_03cr_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces removed	
PT07_03ar_alltrc_L1248J_ssl8.qcv PT07_03ar_alltrc_L1504J_ssl8.qcv	NMO corrected shot gathers	
PT07_03ar_alltrc_noNMO_L1248J_ssl8.qcv PT07_03ar_alltrc_noNMO_L1504J_ssl8.qcv	Shot gathers, no NMO	
PT07_03br_L1248J_ssl8.qcv PT07_03br_L1504J_ssl8.qcv	NMO corrected receiver gathers	

TEST LOG #9	**30th October 2003**	**Testing Phase: Different velocity fields**
Test Lines: L1248J, subsurface line 8 (inner cable) L1504J, subsurface line 8 (inner cable)	Notes: L1248J was shot down dip L1504J was shot up dip	Comments:
DISPLAY / TEST NO.	DESCRIPTION	COMMENT / RECOMMENDATION
		These tests are to see if a better result can be obtained by using either the DMO or migration velocity field for NMO in the taup linear filter job.
Taup linear noise attenuation applied in the shot domain, using 2 mutes in taup domain to remove linear noise dipping in both directions.		TauP linear noise attenuation parameters: Shot domain TauP linear noise attenuation (No alternate trace drop) NMO AGC 300ms windows Forward linear transform of –4000 to 4000 ms of moveout Mute linear energy (WB twt dependent mute) by using 2 symmetrical mutes (first one same as the expl cube) Inverse AGC Start mute at 1.7 times water bottom reflection, mute taper of 400 msec Subtract noise from Input gather Inverse NMO
PT06_16cr_L1248J_ssl8.qcv PT06_16cr_L1504J_ssl8.qcv PT06_17cr_L1248J_ssl8.qcv PT06_17cr_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces removed NMO corrected CMP gathers, interpolated traces removed	NMO correction (reapplied after taup) using DMO velocity field NMO correction (reapplied after taup) using KPSTM velocity field
NB: COMPARE TO TEST NUMBERS PT06_13cr_L1248J_ssl8.qcv PT06_13cr_L1504J_ssl8.qcv		NMO corrected gathers using initial NMO velocity field, tests sent 29th October.

TEST LOG #10	**4th November 2003**	**Testing Phase: Tau-P Linear Noise Attenuation in shot domain**
Test Lines: L1248J, subsurface line 8 (inner cable) L1504J, subsurface line 8 (inner cable)	Notes: L1248J was shot down dip L1504J was shot up dip	Comments:
DISPLAY / TEST NO.	**DESCRIPTION**	**COMMENT / RECOMMENDATION**
No Taup linear noise attenuation applied		
PT06_01cr2_L1248J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces removed	CMPs 2736250-2736350 inc 10 (over area where the taup filter is removing primary data around 5-5.5 seconds).
Taup linear noise attenuation applied		TauP linear noise attenuation parameters: as per exploration cube production parameters, except for addition of AGC, wrapped around the taup transform: Shot domain TauP linear noise attenuation (No alternate trace drop) NMO AGC 300ms windows Forward linear transform of –2000 to 4000 ms of moveout Mute direct arrival linear energy (WB twt dependent mute) Inverse AGC Start mute at 1.7 times water bottom reflection Mute taper of 400 msec Subtract noise from Input gather Inverse NMO
PT06_05cr2_L1248J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces removed	CMPs 2736250-2736350 inc 10 (over area where the taup filter is removing primary data around 5-5.5 seconds).
Shot Displays		
PT06_18ar_TaupLnr_L1248J_ssl8_sp3338_OM182.qcv	QC display of shot record on SP 3338	QC plots showing: Input SRME data / Output taup linear noise attenuated data / Model / Taup transform / muted taup transform NB: taup mute relaxed Compare to test: PT06_05ar_TaupLnr_L1248J_ssl8_sp3338_OM182.qcv

TEST LOG #11	**6th November 2003**	**Testing Phase: Tau-P Linear Noise Attenuation**
Test Lines: L1248J, subsurface line 8 (inner cable) L1504J, subsurface line 8 (inner cable) **DISPLAY / TEST NO.**	Notes: L1248J was shot down dip L1504J was shot up dip **DESCRIPTION**	Comments: **COMMENT / RECOMMENDATION** **These tests are to see if the same result of the 2 passes of taup noise attenuation on the exploration cube processing (in the shot and receiver domains) can be obtained by a single pass applied in the shot domain using 2 taup mutes. Mutes changed from test PT06_13 to stop attenuation of primary data on line 1248J in shelf area at around 5-5.5 secs.**
Taup linear noise attenuation applied in the shot domain, using 2 mutes in taup domain to remove linear noise dipping in both directions. Mutes made less severe over shelf area and more severe in deep water. Application start time changed to WB*1.7 for WB<2500 and a constant 4250ms for WB>2500ms.		TauP linear noise attenuation parameters: Shot domain TauP linear noise attenuation (No alternate trace drop) NMO AGC 300ms windows Forward linear transform of –3000 to 4000 ms of moveout Mute linear energy (WB twt dependent mute) by using 2 symmetrical mutes Inverse AGC Start mute at 1.7 times water bottom reflection for WB<2500ms, constant 4250ms for WB>2500ms, taper of 400 msec Subtract noise from Input gather Inverse NMO
PT06_22er_L1248J_ssl8.qcv PT06_22er_L1504J_ssl8.qcv	Stack	
PT06_22cr_L1248J_ssl8.qcv PT06_22cr_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces removed	
PT06_22ar_alltrc_L1248J_ssl8.qcv PT06_22ar_alltrc_L1504J_ssl8.qcv	NMO corrected shot gathers	
PT06_22ar_alltrc_noNMO_L1248J_ssl8.qcv PT06_22ar_alltrc_noNMO_L1504J_ssl8.qcv PT06_22br_L1248J_ssl8.qcv PT06_22br_L1504J_ssl8.qcv	Shot gathers, no NMO NMO corrected receiver gathers	
Difference Stacks		
PT06_22ehr2_L1248J_ssl8.qcv PT06_22ehr2_L1504J_ssl8.qcv PT06_22ehr_L1248J_ssl8.qcv PT06_22ehr_L1504J_ssl8.qcv	Stack difference between PT06_22 and PT06_01 Stack difference between PT06_22 and PT06_13	Ie 1 pass taup (new mutes) vs SRME stack (no taup filter) Ie 1 pass taup filter, new mutes vs old mutes
PT07_02ehr2_L1248J_ssl8.qcv PT07_02ehr2_L1504J_ssl8.qcv	Stack difference between PT06_22 and PT07_02	Ie 1 pass taup filter (new mutes) vs 2 pass taup filter
PT07_02ehr3_L1248J_ssl8.qcv PT07_02ehr3_L1504J_ssl8.qcv	Stack difference between PT06_01 and PT07_02	Ie 2 pass taup filter (exploration cube parameters) vs SRME stack (no taup filter)

Shot Displays		
PT06_22ar_TaupLnr_L1248J_ssl8_sp2914_OM182.qcv PT06_22ar_TaupLnr_L1248J_ssl8_sp3338_OM182.qcv PT06_22ar_TaupLnr_L1248J_ssl8_sp3550_OM182.qcv PT06_22ar_TaupLnr_L1504J_ssl8_sp2729_OM182.qcv PT06_22ar_TaupLnr_L1504J_ssl8_sp3365_OM182.qcv PT06_22ar_TaupLnr_L1504J_ssl8_sp3577_OM182.qcv	QC displays of individual shot records at different water depths	QC plots showing: Input SRME data / Output taup linear noise attenuated data (2 mutes) / Model / Taup transform / muted taup transform (2 mutes) Compare to tests PT06_13 (see testlog from 28st October 2003).

TEST LOG #12	**10th November 2003**	**Testing Phase: Tau-P Linear Noise Attenuation**
Test Lines: L1504J, subsurface line 8 (inner cable) **DISPLAY / TEST NO.**	Notes: L1504J was shot up dip **DESCRIPTION**	Comments: **COMMENT / RECOMMENDATION**
		These tests are to demonstrate the effect of radon on the aliased multiple that can be seen on the stack after taup linear noise attenuation (single pass applied in the shot domain using 2 taup mutes).
1 pass Taup linear noise attenuation (2 amended mutes), followed by application of radon.		Taup linear noise attenuation parameters as per test PT06_22 (see testlog from 6th November 2003) Weighted Least Squares Radon using exploration cube parameters, as for test PT03_03 (see testlog from 21st July 2003)
PT06_23er_L1504J_ssl8.qcv	Stack	Compare to test PT06_22, no radon applied (see testlog from 6th November 2003).
PT06_23cr_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces removed	Compare to test PT06_22, no radon applied (see testlog from 6th November 2003).
Difference Stacks		
PT06_23ehr2_L1504J_ssl8.qcv	Stack difference between PT06_23 and PT06_22	Ie 1 pass taup (new mutes) with and without radon applied

TEST LOG #13	**8th December 2003**	**Testing Phase: Azimuthal Moveout**
Test Swath: Inlines 1208-1288 **DATASET TEST NO.**	Notes: SEG-Y DATASETS **DESCRIPTION**	Comments: **COMMENT / RECOMMENDATION**
KPSTM applied		
PT0802_KPSTM_off6_il1208-1288_SEGY_xl4300-4500	KPSTM applied	Input data: Exploration Cube pre-stack regularised single offset plane (approx 1000m) SEGY: inline range 1408-1488, crossline range 4300-4500, time range 0-3000ms
AMO and KPSTM applied		
PT0804_AMO2_KPSTM_off6_il1208-1288_SEGY_xl4300-4500	AMO/KPSTM applied	Input data: Exploration Cube pre-stack regularised single offset plane (approx 1000m) SEGY: inline range 1408-1488, crossline range 4300-4500, time range 0-3000ms.
SEGY TRACE HEADERS:		
Bytes 9-12 Bytes 21-24 Bytes 17-20 Bytes 37-40 Bytes 73-76 Bytes 77-80	Inline number Crossline number CMP Offset X coordinate midpt Y coordinate midpt	

TEST LOG #14	**9th December 2003**	**Testing Phase: Azimuthal Moveout**
Test Swath: Inlines 1208-1288 **DATASET TEST NO.**	Notes: SEG-Y DATASETS **DESCRIPTION**	Comments: **COMMENT / RECOMMENDATION**
INPUT data		
PT0800_INPUT_off6_il1208-1288_SEGY_xl4300-4500	Input data	Input data: Exploration Cube pre-stack regularised single offset plane (approx 1000m) SEGY: inline range 1408-1488, crossline range 4300-4500, time range 0-3000ms
KPSTM applied		
PT0801_KPSTM_off6_il1208-1288_SEGY_xl4300-4500	KPSTM applied	Input data: Exploration Cube pre-stack regularised single offset plane (approx 1000m) KPSTM applied SEGY: inline range 1408-1488, crossline range 4300-4500, time range 0-3000ms
AMO applied		
PT0803_AMO2_off6_il1208-1288_SEGY_xl4300-4500	AMO applied	Input data: Exploration Cube pre-stack regularised single offset plane (approx 1000m) AMO applied SEGY: inline range 1408-1488, crossline range 4300-4500, time range 0-3000ms
AMO and KPSTM applied		
PT0804_AMO2_KPSTM_off6_il1208-1288_SEGY_xl4300-4500	AMO/KPSTM applied	Input data: Exploration Cube pre-stack regularised single offset plane (approx 1000m) AMO/KPSTM applied SEGY: inline range 1408-1488, crossline range 4300-4500, time range 0-3000ms.
SEGY TRACE HEADERS:		
Bytes 9-12 Bytes 21-24 Bytes 17-20 Bytes 37-40 Bytes 73-76 Bytes 77-80	Inline number Crossline number CMP Offset X coordinate midpt Y coordinate midpt	

TEST LOG #15	16th December 2003	Testing Phase: Radon Demultiplet
Test Lines: L1248J, subsurface line 8 (inner cable) L1504J, subsurface line 8 (inner cable)	Notes: L1248J was shot down dip L1504J was shot up dip	Comments:
DISPLAY / TEST NO. **Production taup linear filtered data was used as the input to the radon demultiple testing**	**DESCRIPTION**	**COMMENT / RECOMMENDATION**
Input data (no radon demultiple)		
PT10_00er_L1248J_ssl8.qcv PT10_00er_L1504J_ssl8.qcv	Stack	No radon demultiple applied
PT10_00cr_L1248J_ssl8.qcv PT10_00cr_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces removed	No radon demultiple applied
Radon demultiple applied – old parameters, old velocities		
PT10_01er_L1248J_ssl8.qcv PT10_01er_L1504J_ssl8.qcv	Stack	Radon demultiple using parameters as per exploration cube: model moveout range –1500ms to 3500ms, reject moveout range 225ms-3500ms, 468 p-traces. Velocities used for radon demultiple and NMO/stack: exploration cube 1km first pass velocity field
PT10_01cr_L1248J_ssl8.qcv PT10_01cr_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces removed	
Radon demultiple applied – old parameters, new velocities		
PT10_04er_L1248J_ssl8.qcv PT10_04er_L1504J_ssl8.qcv	Stack	Radon demultiple using parameters as per exploration cube: model moveout range –1500ms to 3500ms, reject moveout range 225ms-3500ms, 468 p-traces. Velocities used for radon demultiple: new 500m grid, picked on taup filtered data Velocities used for NMO/stack: exploration cube 1km first pass velocity field
PT10_04cr_L1248J_ssl8.qcv PT10_04cr_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces removed	
Radon demultiple applied – new parameters, new velocities		
PT10_19er_L1248J_ssl8.qcv PT10_19er_L1504J_ssl8.qcv	Stack	Radon demultiple: model moveout range –1500ms to 2000ms, reject moveout range 500ms-2000ms, 468 p-traces. Velocities used for radon demultiple: new 500m grid, picked on taup filtered data Velocities used for NMO/stack: exploration cube 1km first pass velocity field
PT10_19cr_L1248J_ssl8.qcv PT10_19cr_L1504J_ssl8.qcv	NMO corrected CMP gathers, interpolated traces removed	
Difference Displays		
PT10_01ehr_L1248J_ssl8.qcv PT10_01ehr_L1504J_ssl8.qcv	Stack difference between PT10_00 and PT10_01	Ie exploration cube radon parameters vs taup filtered stack (no radon demultiple)
PT10_01chr_L1248J_ssl8.qcv PT10_01chr_L1504J_ssl8.qcv	CMP difference between PT10_00 and PT10_01	Ie exploration cube radon parameters vs taup filtered cmps (no radon demultiple)
PT10_04ehr_L1248J_ssl8.qcv PT10_04ehr_L1504J_ssl8.qcv PT10_04chr_L1248J_ssl8.qcv PT10_04chr_L1504J_ssl8.qcv	Stack difference between PT10_00 and PT10_04 CMP difference between PT10_00 and PT10_04	Ie exploration cube radon parameters but using new velocity field vs taup filtered stack (no radon demultiple) Ie exploration cube radon parameters but using new velocity field vs taup filtered cmps (no radon demultiple)
PT10_19ehr_L1248J_ssl8.qcv PT10_19ehr_L1504J_ssl8.qcv	Stack difference between PT10_00 and PT10_19	Ie revised radon parameters vs taup filtered stack (no radon demultiple)
PT10_19chr_L1248J_ssl8.qcv PT10_19chr_L1504J_ssl8.qcv	CMP difference between PT10_00 and PT10_19	Ie revised radon parameters vs taup filtered cmps (no radon demultiple)

TEST LOG #16	22nd December 2003	Testing Phase: Azimuthal Moveout
Test Swath: Inlines 1208-1288	Notes: SEG-Y DATASETS	Comments:
DATASET TEST NO.	**DESCRIPTION**	**COMMENT / RECOMMENDATION**
INPUT data		
PT0800_INPUT_NMO_off6_il1208-1288_SEGY_xl4300-4500	Input data	Input data: Exploration Cube pre-stack regularised single offset plane (approx 1000m) SEGY: inline range 1408-1488, crossline range 4300-4500, time range 0-3000ms NMO applied
KPSTM applied		
PT0807_KPSTM_off6_il1208-1288_SEGY_xl4300-4500	KPSTM applied	Input data: Exploration Cube pre-stack regularised single offset plane (approx 1000m) KPSTM applied SEGY: inline range 1408-1488, crossline range 4300-4500, time range 0-3000ms No pre-migration filtering applied. Data bulk scaled prior to SEG-Y to match amplitudes to input data.
AMO and KPSTM applied		
PT0808_AMO_KPSTM_off6_il1208-1288_SEGY_xl4300-4500	AMO/KPSTM applied	Input data: Exploration Cube pre-stack regularised single offset plane (approx 1000m) AMO/KPSTM applied SEGY: inline range 1408-1488, crossline range 4300-4500, time range 0-3000ms. No pre-migration filtering applied. Data bulk scaled prior to SEG-Y to match amplitudes to input data.
SEGY TRACE HEADERS:		
Bytes 9-12 Bytes 21-24 Bytes 17-20 Bytes 37-40 Bytes 73-76 Bytes 77-80	Inline number Crossline number CMP Offset X coordinate midpt Y coordinate midpt	

TEST LOG #17	22nd January 2004	Testing Phase: Azimuthal Moveout
Test Swath: Inlines 1208-1288 **DISPLAY / TEST NO.**	**DESCRIPTION**	Comments: **COMMENT / RECOMMENDATION**
Production pre-stack regularized offset (approx 1000m) was input to the AMO testing		The test results were looked at during the meeting in the Perth processing office, using OmegaVu.
Input data (no AMO)		
PT1108_fire_1000m	Offset gather	Pre-stack regularization applied.
AMO applied		
PT0815_AMO1000m	Offset gather	Pre-stack regularization / AMO applied
Migrated data (no AMO)		
PT1109_KPSTM_1000m	Offset gather	Pre-stack regularization / KPSTM applied
Migrated data (AMO applied)	Offset gather	Pre-stack regularization / AMO/ KPSTM applied
PT0816_KPSTM_1000m		

TEST LOG #18	22nd January 2004	Testing Phase: Pre-Stack Regularization
Test Swath: Inlines 1208-1288 **DISPLAY / TEST NO.**	**DESCRIPTION**	Comments: **COMMENT / RECOMMENDATION**
Production radon offset (approx 1000m) was input to the pre-stack regularization testing		The test results were looked at during the meeting in the Perth processing office, using OmegaVu.
Input data (no pre-stack regularization)		
PT1100_1off_nointerp	Offset gather	Radon offset gather, original traces only input (ie exclude shot interpolation traces), select 1 trace per bin (NB use to find holes that pre-stack regularization should fill)
Input data (no pre-stack regularization)		
PT1100_1off_realpref	Offset gather	Radon offset gather, all traces input (interpolated and low fold CMP traces weighted so original traces are used preferentially), select 1 trace per bin (NB comparison to PT1102_fire_1offset shows that the shot interpolated /low fold CMP traces are generally better than those created by the pre-stack regularization process)
Pre-stack regularized data		
PT1102_fire_1offset	Offset gather	Pre-stack regularized offset, using original traces only as input to pre-stack regularization (NB comparison to PT1100_1off_realpref shows that the traces created by the pre-stack regularization process are more noisy than those from the shot interpolation/low fold CMPs)
		Recommendation: Use all traces as input to pre-stack regularization, but weight the shot interpolated traces and those from low fold CMP gathers so that the original traces are used preferentially.

TEST LOG #19	27th January 2004	Testing Phase: Residual multiple high amplitude clipping
Test Line: L1248J, subsurface line 8 (inner cable) **DISPLAY / TEST NO.**	Notes: L1248J was shot down dip **DESCRIPTION**	Comments: **COMMENT / RECOMMENDATION**
Production radon demultiple CMP gathers were used as input to the testing		
Input data (no amplitude clipping)		
PT12_00er_InputStk_L1248J_ssl8.qcv	Stack	No amplitude clipping applied
Amplitude clipping applied		
PT12_05er_AMPCLIP_L1248J_ssl8.qcv	Stack	Using the same method as for the exploration cube. Amplitudes higher than a certain RMS value get clipped from WB*2 to a specified value. The clipping was run as 2 passes, the first pass using a higher clipping limit for multiple under the canyon, the second pass using lower limit to remove multiple energy under the shelf and into the deep water. NB: Parameters used were for a first-look at the process to see if it worked. Amplitude levels need testing further.
Difference Display		
PT12_05ehr_AMPCLIP_L1248J_ssl8.qcv	Stack difference between PT12_00 and PT12_05	Ie showing data removed by amplitude clipping

TEST LOG #20	10th February 2004	Testing Phase: Residual multiple high amplitude clipping
Test Lines: Inline 1100, 1200, 1251, 1300, 1350 **DISPLAY / TEST NO.**	**DESCRIPTION**	Comments: **COMMENT / RECOMMENDATION**
Production pre-stack regularized CMP gathers were used as input to the testing **Input data (no amplitude clipping)**		
PT12_00er_FIRESTK_IL1100.qcv PT12_00er_FIRESTK_IL1200.qcv PT12_00er_FIRESTK_IL1251.qcv PT12_00er_FIRESTK_IL1300.qcv PT12_00er_FIRESTK_IL1350.qcv	Stack	No amplitude clipping applied
Amplitude clipping applied		
PT12_09er_AMPCLIPSTK_IL1100.qcv PT12_09er_AMPCLIPSTK_IL1200.qcv PT12_06er_AMPCLIPSTK_IL1251.qcv PT12_09er_AMPCLIPSTK_IL1300.qcv PT12_09er_AMPCLIPSTK_IL1350.qcv	Stack	Using the same method as for the exploration cube. Amplitudes higher than a certain RMS value get clipped from WB*2 to a specified value. The clipping was run as 2 passes, the first pass using a higher clipping limit for multiple under the canyon, the second pass using lower limit to remove multiple energy under the shelf and into the deep water.
Difference Display		
PT12_09ehr_DIFFSTK_IL1100.qcv PT12_09ehr_DIFFSTK_IL1200.qcv PT12_06ehr_DIFFSTK_IL1251.qcv PT12_09ehr_DIFFSTK_IL1300.qcv PT12_09ehr_DIFFSTK_IL1350.qcv	Stack differences	Ie showing data removed by amplitude clipping

TEST LOG #21	17th February 2004	Testing Phase: Residual multiple high amplitude clipping
Test Lines: Inline 1100 **DISPLAY / TEST NO.**	**DESCRIPTION**	Comments: **COMMENT / RECOMMENDATION**
Production pre-stack regularized CMP gathers were used as input to the testing		
Amplitude clipping applied		
PT12_12er_AMPCLIPSTK_IL1100.qcv	Stack	As per test PT12_09er, but amplitude clipping applied in shelf area from xline 4730 (test PT12_09er was applied from xline 4900).
Difference Display		
PT12_12ehr_DIFFSTK_IL1100.qcv	Stack differences	Ie showing data removed by amplitude clipping

TEST LOG #22	25th February 2004	Testing Phase: Residual multiple high amplitude clipping (shelf area)
Test Lines: Inline 1251, xline 4500-5799 **DISPLAY / TEST NO.**	**DESCRIPTION**	Comments: **COMMENT / RECOMMENDATION**
Production pre-stack regularized CMP gathers were used as input to the testing		
No amplitude clipping applied		
PT16_05er_noclipped_psdm_stack_IL1251.qcv PT16_05cr_noclipped_psdm_cmps_IL1251.qcv	Stack CMP gathers, every 80th xline	Depth migration of deep water area, residual multiple amplitudes not clipped Depth migration of deep water area, residual multiple amplitudes not clipped
Amplitude clipping applied		
PT16_05er_clipped_psdm_stack_IL1251.qcv	Stack	Depth migration of deep water area, residual multiple amplitudes clipped
PT16_05cr_clipped_psdm_cmps_IL1251.qcv	CMP gathers, every 80th xline	Depth migration of deep water area, residual multiple amplitudes clipped

TEST LOG #23	4th March 2004	Testing Phase: Residual multiple high amplitude clipping (shelf area)
Test Lines: Inline 1251, xline 4500-5799		Comments:
DISPLAY / TEST NO.	**DESCRIPTION**	**COMMENT / RECOMMENDATION**
Production pre-stack regularized CMP gathers, amplitude clipping applied, were used as input to this test		
Amplitude clipping applied		
PT16_13er_clipped_pgpsdm_stack2_IL1251.qcv	Stack	Depth migration of deep water area, residual multiple amplitudes clipped, data scaled down from 5.5 seconds before migration
PT16_13cr_clipped_pgpsdm_cmps2_IL1251.qcv	CMP gathers, every 80th xline	Depth migration of deep water area, residual multiple amplitudes clipped, data scaled down from 5.5 seconds before migration

TEST LOG #24	11th March 2004	Testing Phase: Residual multiple high amplitude clipping (shelf area)
Test Lines: Inline 1251, xline 4500-5799		Comments:
DISPLAY / TEST NO.	**DESCRIPTION**	**COMMENT / RECOMMENDATION**
Production pre-stack regularized CMP gathers were used as input to this test		
No residual multiple attenuation		
PT18_01dr_FIRE_stk_IL1251.qcv	Stack	Input data, no primal or amplitude clipping applied
Residual multiple attenuation using amplitude clipping		
PT18_13dr_AMPCLIP_stk_IL1251.qcv	Stack	Amplitude clipping parameters same as those sent before on test PT12
Residual multiple attenuation using primal		
PT18_20dr_PRIM_stk_IL1251.qcv	Stack	Paul to send you some information regarding this process
Residual multiple attenuation using amplitude clipping and primal		
PT18_18dr_PRIM_AMPCLIP_stk_IL1251.qcv	Stack	
Difference display		
PT18_19dhr_PRIM_AMPCLIP_stk_IL1251.qcv	Difference Stack Primal/ampclip vs ampclip	Shows the effect of the primal processing

TEST LOG #25	17th March 2004	Testing Phase: Residual multiple attenuation (shelf area) using CMP ZAP
Test Lines: Inline 1251, xline 4500-5799		Comments:
DISPLAY / TEST NO.	**DESCRIPTION**	**COMMENT / RECOMMENDATION**
Production pre-stack regularized CMP gathers were used as input to this test		Compare the CMP ZAP stack test to the following:
		Input data, no amplitude attenuation: PT18_01dr_FIRE_stk_IL1251 (sent 11th March) Amplitude clipping: PT12_06er_AMPCLIPSTK_IL1251 (sent 10th February)
		Primal: PT18_20dr_PRIM_stk_IL1251 (sent 11th March)
Residual multiple attenuation using CMP ZAP PT20_05er_CMPZAP_stk_IL1251.qcv	Stack	CMP ZAP applied
Difference display		
PT20_05ehr_CMPZAP_diff_stk_IL1251.qcv	Difference Stack CMP ZAP vs none	Shows the effect of the CMP ZAP processing

12.9 Final Products (Time Processing)

All archive products were sent to ExxonMobil Exploration Company

12.9.1 Swatt Shot Gather Datasets for Esso

The swatt shot gather data requested by Esso (see section 5.1) were sent to the following address:

ExxonMobil Exploration Company
Geophysical Processing
233 Benmar St.
Houston, TX 77060, USA
Attn: Erik Neumann

LINE NO.	SEQ	SPMIN	SPMAX	DIRN	TAPE NUMBERS	NO. TAPES
1168A	006	3886	2489	287	Q02487-Q02492	6
1184A	008	3886	2489	287	Q02494-Q02499	6
1200A	012	3886	3400	287	Q02501-Q02502	2
1200B	013	3410	2489	287	Q02504-Q02507	4
1216A	015	3886	2489	287	Q02509-Q02514	6
1216J	078	3850	3450	287	Q02516-Q02517	2
1232A	017	3886	3447	287	Q02519-Q02520	2
1232B	018	3456	2489	287	Q02522-Q02525	4
1248A	022	3886	2489	287	Q02527-Q02532	6
1248J	032	3886	2489	287	Q02534-Q02539	6
1264A	055	3886	2489	287	Q02541-Q02546	6
1264X	070	3886	3315	287	Q02548-Q02550	3
1264Y	071	3324	2489	287	Q02552-Q02555	4
1280A	073	3886	2489	287	Q02556-Q02561	6
1296A	074	4019	2622	107	Q02563-Q02568	6
1296J	075	4019	2622	107	Q02570-Q02575	6
1312A	050	3700	2870	107	Q02577-Q02580	4
1312B	060	4019	3691	107	Q02582-Q02583	2
1312C	066	2879	2622	107	Q02585	1
1312J	064	3287	2622	107	Q02587-Q02589	3
1312K	067	4019	3278	107	Q02591-Q02593	3
1328A	046	4019	2622	107	Q02596-Q02601	6
					Total tapes:	**94**

Date sent: 12/12/03
Transmittal reference number: TRANS1-121203

LINE NO.	SEQ	SPMIN	SPMAX	DIRN	TAPE NUMBERS	NO. TAPES
2256A	98	3886	1868	287	Q02602-Q02608	7
2272A	94	3886	1868	287	Q02738-Q02744	7
2272J	96	3886	1868	287	Q02745-Q02749	5
2272K	177	3042	2432	287	Q02756-Q02757	2
2288A	92	3886	1868	287	Q02758-Q02763, Q02765	7
2304A	90	3886	1868	287	Q02767-Q02773	7
2320B	86	3886	1868	287	Q02775-Q02781	7
2320J	88	3886	1868	287	Q02783-Q02789	7
2336A	83	3886	1868	287	Q02791-Q02796	6
2336C	200	2952	2607	287	Q02609-Q02610	2
2352B	81	3786	1868	287	Q02799-Q02805	7
2352C	189	3886	3781	287	Q02611	1
					Total tapes:	**65**

Date sent: 29/12/03

Transmittal reference number: EXXON2-291203

Media	Format	Description	Contents
CD-rom	VELF text	Exploration Cube First pass velocity field (1km grid)	Inlines 1008-2328 inc 40, Crosslines 2760-8840 inc 160
CD-rom	HTML	Observers logs and event logs	Sail lines: 1168A-1328A, 2256A-2352C

Date sent: 12/12/03

Transmittal reference number: TRANS1-121203

12.9.2 Gather Datasets (residual multiple energy removed)

CMP gathers after the amplitude clipping had been applied (ie input to depth migration) were SEG-Y'd to 3590B tapes for archive (see Section 5.35).

Example EBCDIC header:

```
*** SEGY EBCDIC HEADER ***

C01 CLIENT: Esso Australia Pty Ltd SURVEY: Tuskfish 3D VIC/L20, Gippsland Basin
C02 PRODUCTION CUBE.  CONTRACTOR : WesternGeco, Perth  DATE  : 9 July 2004
C03 INLINES: 994 - 1000. CLIENT TAPE NAME: EDPC2.#61561.IL994-1000.YFKOBMKK
C04 ACQUISITION PARAMETERS :
C05 SOURCE: 2 source arrays, 18.75m shot interval, 50m separation, 7m depth,
C06 source type sleeve airgun array, 300cu.in per source, 2000psi.
C07 RECEIVERS: 8/7 cables, 5km length, 400 recv/cable, 12.5m recv interval,
C08 100m separation, nominal NTO 222m. Sample rate 2ms, max reflect time 6500ms.
C09 NAVIGATION: UTM zone 55S, geodetic datum GDA-94, spheroid GRS-80, units m.
C10 Binning origin (E,N)  616254.95,  5755063.02  / (Xline,Inline) 2301, 800,
C11 azimuth 107.997 degrees, Xline/Inline interval 12.5m/25m.
C12 Full processing data extent: inlines 994-1990, xlines 3474-5784
C13 ---------------------------------------------------------------------------
C14 PROCESS : CMP GATHERS INPUT TO PRE-STACK DEPTH MIGRATION
C15 ---------------------------------------------------------------------------
C16 PROCESSING SEQUENCE :
C17 CONVERSION - 8015 SEGD to WGC Internal Omega format. NAVIGATION P190 Merge.
C18 EDITS . GEO SPREADING using Esso supplied velocity field. LOW CUT FILTER -
C19 3Hz, 18dB/oct. SSL split. NOMINAL 2D GEOMETRY. SORT - 2D receivers.
C20 SWATT using wraparound NMO 1700m/s. SORT - shot. INVERSE geom spreading.
C21 DETERMINISTIC DESIGNATURE - Quadrature phase filter supplied by ESSO.
C22 GEO SPREADING using Exploration Cube first pass vels. RESAMPLE  2 to 4ms.
C23 NMO using Exploration Cube first pass vels. 3:1 SHOT INTERPOLATION. SRME.
C24 K-FILTER +/- 0.65 KNyq. TAU-P linear noise filter. INVERSE Q. INVERSE NMO.
C25 VELOCITY ANALYSIS - 500m grid. NMO - using 500m grid velocities.
C26 LEAST SQUARES RADON.  SORT - offset. PRE-STACK REGULARISATION.
C27 SORT - cmp. AMPLITUDE CLIPPING - attenuate high amplitude residual multiple
C28 energy under canyons and in deep water. INVERSE NMO - using 500m grid
C29 velocities. INVERSE GEO SPREADING - using Exploration Cube first pass vels.
C30
C31
C32
C33
C34 HEADER LITERAL BYTE LOCATIONS:
C35 INLINE: 9-12  CROSSLINE: 17-20  CMP (BIN): 21-24  OFFSET: 37-40
C36 SOURCE XCOORD: 73-76  SOURCE YCOORD: 77-80
C37 RECVR XCOORD:  81-84  RECVR YCOORD:  85-88
C38 BIN CENTRE XCOORD: 181-184 BIN CENTRE YCOORD: 185-188
C39 WATER DEPTH AT MIDPT: 61-64  WATER BOTTOM TWT AT MIDPT: 65-68
C40
```

REEL	INLINE		CMP		No. Traces	No. Lines	Tape Name
NUMBER	MIN	MAX	Min	Max			(ESSO naming convention)
Q04033	994	1000	619999	642251	675708	7	EDPC2.#61561.IL994-1000.YFKOBMKK
Q04034	1001	1007	643292	665546	988224	7	EDPC2.#61561.IL1001-1007.YFKOBMKK
Q04035	1008	1016	666587	695498	1271209	9	EDPC2.#61561.IL1008-1016.YFKOBMKK
Q04036	1017	1025	696540	725450	1271415	9	EDPC2.#61561.IL1017-1025.YFKOBMKK
Q04037	1026	1034	726487	755387	1269491	9	EDPC2.#61561.IL1026-1034.YFKOBMKK
Q04038	1035	1043	756444	785354	1272218	9	EDPC2.#61561.IL1035-1043.YFKOBMKK
Q04039	1044	1053	786394	818633	1414994	10	EDPC2.#61561.IL1044-1053.YFKOBMKK
Q04040	1054	1062	819674	848586	1272753	9	EDPC2.#61561.IL1054-1062.YFKOBMKK
Q04041	1063	1071	849626	878539	1272342	9	EDPC2.#61561.IL1063-1071.YFKOBMKK
Q04042	1072	1080	879578	908491	1271864	9	EDPC2.#61561.IL1072-1080.YFKOBMKK
Q04043	1081	1089	909532	938441	1271642	9	EDPC2.#61561.IL1081-1089.YFKOBMKK
Q04044	1090	1098	939483	968388	1267854	9	EDPC2.#61561.IL1090-1098.YFKOBMKK
Q04045	1099	1107	969435	998328	1265698	9	EDPC2.#61561.IL1099-1107.YFKOBMKK
Q04046	1108	1116	999386	1028281	1262297	9	EDPC2.#61561.IL1108-1116.YFKOBMKK
Q04047	1117	1125	1029336	1058233	1261607	9	EDPC2.#61561.IL1117-1125.YFKOBMKK
Q04048	1126	1134	1059288	1088191	1261142	9	EDPC2.#61561.IL1126-1134.YFKOBMKK
Q04049	1135	1143	1089244	1118142	1259913	9	EDPC2.#61561.IL1135-1143.YFKOBMKK
Q04050	1144	1152	1119195	1148092	1260169	9	EDPC2.#61561.IL1144-1152.YFKOBMKK
Q04051	1153	1161	1149148	1178047	1259809	9	EDPC2.#61561.IL1153-1161.YFKOBMKK
Q04052	1162	1170	1179100	1207997	1258983	9	EDPC2.#61561.IL1162-1170.YFKOBMKK
Q04053	1171	1180	1209052	1241274	1399142	10	EDPC2.#61561.IL1171-1180.YFKOBMKK
Q04054	1181	1190	1242332	1274557	1398082	10	EDPC2.#61561.IL1181-1190.YFKOBMKK
Q04055	1191	1200	1275612	1307841	1400687	10	EDPC2.#61561.IL1191-1200.YFKOBMKK
Q04056	1201	1210	1308891	1341115	1400883	10	EDPC2.#61561.IL1201-1210.YFKOBMKK
Q04057	1211	1220	1342171	1374399	1401646	10	EDPC2.#61561.IL1211-1220.YFKOBMKK
Q04058	1221	1230	1375451	1407675	1401834	10	EDPC2.#61561.IL1221-1230.YFKOBMKK
Q04059	1231	1240	1408728	1440952	1400570	10	EDPC2.#61561.IL1231-1240.YFKOBMKK
Q04060	1241	1250	1442011	1474232	1401438	10	EDPC2.#61561.IL1241-1250.YFKOBMKK
Q04061	1251	1260	1475292	1507512	1400611	10	EDPC2.#61561.IL1251-1260.YFKOBMKK
Q04062	1261	1270	1508572	1540792	1399614	10	EDPC2.#61561.IL1261-1270.YFKOBMKK
Q04063	1271	1280	1541849	1574089	1404547	10	EDPC2.#61561.IL1271-1280.YFKOBMKK
Q04064	1281	1290	1575129	1607371	1433264	10	EDPC2.#61561.IL1281-1290.YFKOBMKK
Q04065	1291	1300	1608410	1640651	1449078	10	EDPC2.#61561.IL1291-1300.YFKOBMKK
Q04066	1301	1310	1641692	1673930	1416442	10	EDPC2.#61561.IL1301-1310.YFKOBMKK
Q04067	1311	1320	1674971	1707210	1411372	10	EDPC2.#61561.IL1311-1320.YFKOBMKK
Q04068	1321	1330	1708251	1740490	1410970	10	EDPC2.#61561.IL1321-1330.YFKOBMKK
Q04069	1331	1339	1741532	1770441	1271087	9	EDPC2.#61561.IL1331-1339.YFKOBMKK
Q04070	1340	1348	1771484	1800394	1269585	9	EDPC2.#61561.IL1340-1348.YFKOBMKK
Q04071	1349	1357	1801436	1830346	1270453	9	EDPC2.#61561.IL1349-1357.YFKOBMKK
Q04072	1358	1366	1831388	1860297	1270527	9	EDPC2.#61561.IL1358-1366.YFKOBMKK
Q04073	1367	1375	1861340	1890249	1270012	9	EDPC2.#61561.IL1367-1375.YFKOBMKK
Q04074	1376	1384	1891291	1920201	1270235	9	EDPC2.#61561.IL1376-1384.YFKOBMKK

REEL	INLINE		CMP		No. Traces	No. Lines	Tape Name
NUMBER	MIN	MAX	Min	Max			(ESSO naming convention)
Q04075	1385	1393	1921244	1950153	1270091	9	EDPC2.#61561.IL1385-1393.YFKOBMKK
Q04076	1394	1402	1951195	1980105	1269931	9	EDPC2.#61561.IL1394-1402.YFKOBMKK
Q04077	1403	1411	1981149	2010058	1270245	9	EDPC2.#61561.IL1403-1411.YFKOBMKK
Q04078	1412	1420	2011100	2040011	1270425	9	EDPC2.#61561.IL1412-1420.YFKOBMKK
Q04079	1421	1430	2041079	2073289	1404012	10	EDPC2.#61561.IL1421-1430.YFKOBMKK
Q04080	1431	1440	2074420	2106569	1383705	10	EDPC2.#61561.IL1431-1440.YFKOBMKK
Q04081	1441	1450	2107759	2139850	1363910	10	EDPC2.#61561.IL1441-1450.YFKOBMKK
Q04082	1451	1460	2141067	2173129	1371869	10	EDPC2.#61561.IL1451-1460.YFKOBMKK
Q04083	1461	1470	2174267	2206409	1401992	10	EDPC2.#61561.IL1461-1470.YFKOBMKK
Q04084	1471	1480	2207470	2239691	1413083	10	EDPC2.#61561.IL1471-1480.YFKOBMKK
Q04085	1481	1490	2240733	2272970	1412387	10	EDPC2.#61561.IL1481-1490.YFKOBMKK
Q04086	1491	1500	2274013	2306250	1410706	10	EDPC2.#61561.IL1491-1500.YFKOBMKK
Q04087	1501	1508	2307294	2332874	1129111	8	EDPC2.#61561.IL1501-1508.YFKOBMKK
Q04088	1509	1516	2333915	2359498	1129378	8	EDPC2.#61561.IL1509-1516.YFKOBMKK
Q04089	1517	1524	2360539	2386123	1129640	8	EDPC2.#61561.IL1517-1524.YFKOBMKK
Q04090	1525	1532	2387164	2412747	1130479	8	EDPC2.#61561.IL1525-1532.YFKOBMKK
Q04091	1533	1540	2413788	2439369	1130830	8	EDPC2.#61561.IL1533-1540.YFKOBMKK
Q04092	1541	1548	2440411	2465994	1130341	8	EDPC2.#61561.IL1541-1548.YFKOBMKK
Q04136	1549	1556	2467036	2492618	1129387	8	EDPC2.#61561.IL1549-1556.YFKOBMKK
Q04137	1557	1564	2493660	2519241	1128995	8	EDPC2.#61561.IL1557-1564.YFKOBMKK
Q04138	1565	1572	2520284	2545864	1128579	8	EDPC2.#61561.IL1565-1572.YFKOBMKK
Q04139	1573	1580	2546909	2572491	1128436	8	EDPC2.#61561.IL1573-1580.YFKOBMKK
Q04140	1581	1589	2573535	2602443	1270745	9	EDPC2.#61561.IL1581-1589.YFKOBMKK
Q04141	1590	1598	2603486	2632395	1272176	9	EDPC2.#61561.IL1590-1598.YFKOBMKK
Q04142	1599	1607	2633436	2662347	1272546	9	EDPC2.#61561.IL1599-1607.YFKOBMKK
Q04143	1608	1616	2663386	2692301	1272612	9	EDPC2.#61561.IL1608-1616.YFKOBMKK
Q04144	1617	1625	2693338	2722253	1272918	9	EDPC2.#61561.IL1617-1625.YFKOBMKK
Q04145	1626	1634	2723292	2752206	1273117	9	EDPC2.#61561.IL1626-1634.YFKOBMKK
Q04146	1635	1643	2753243	2782157	1272580	9	EDPC2.#61561.IL1635-1643.YFKOBMKK
Q04147	1644	1652	2783195	2812107	1272117	9	EDPC2.#61561.IL1644-1652.YFKOBMKK
Q04148	1653	1661	2813148	2842059	1271354	9	EDPC2.#61561.IL1653-1661.YFKOBMKK
Q04149	1662	1670	2843099	2872011	1271349	9	EDPC2.#61561.IL1662-1670.YFKOBMKK
Q04150	1671	1678	2873051	2898634	1129444	8	EDPC2.#61561.IL1671-1678.YFKOBMKK
Q04151	1679	1686	2899677	2925258	1129383	8	EDPC2.#61561.IL1679-1686.YFKOBMKK
Q04152	1687	1694	2926301	2951882	1129850	8	EDPC2.#61561.IL1687-1694.YFKOBMKK
Q04153	1695	1702	2952922	2978507	1130012	8	EDPC2.#61561.IL1695-1702.YFKOBMKK
Q04154	1703	1710	2979546	3005130	1130162	8	EDPC2.#61561.IL1703-1710.YFKOBMKK
Q04155	1711	1718	3006173	3031755	1130014	8	EDPC2.#61561.IL1711-1718.YFKOBMKK
Q04156	1719	1726	3032797	3058378	1130356	8	EDPC2.#61561.IL1719-1726.YFKOBMKK
Q04157	1727	1734	3059419	3085003	1130807	8	EDPC2.#61561.IL1727-1734.YFKOBMKK
Q04158	1735	1742	3086043	3111626	1130189	8	EDPC2.#61561.IL1735-1742.YFKOBMKK
Q04159	1743	1750	3112666	3138250	1129988	8	EDPC2.#61561.IL1743-1750.YFKOBMKK
Q04160	1751	1758	3139290	3164875	1130130	8	EDPC2.#61561.IL1751-1758.YFKOBMKK
Q04161	1759	1766	3165916	3191497	1129678	8	EDPC2.#61561.IL1759-1766.YFKOBMKK
Q04162	1767	1774	3192538	3218121	1129956	8	EDPC2.#61561.IL1767-1774.YFKOBMKK

REEL NUMBER	INLINE MIN	INLINE MAX	CMP Min	CMP Max	No. Traces	No. Lines	Tape Name (ESSO naming convention)
Q04163	1775	1782	3219162	3244745	1129317	8	EDPC2.#61561.IL1775-1782.YFKOBMKK
Q04164	1783	1790	3245788	3271376	1153035	8	EDPC2.#61561.IL1783-1790.YFKOBMKK
Q04165	1791	1798	3272408	3298000	1181421	8	EDPC2.#61561.IL1791-1798.YFKOBMKK
Q04166	1799	1806	3299030	3324619	1147448	8	EDPC2.#61561.IL1799-1806.YFKOBMKK
Q04167	1807	1814	3325659	3351243	1130388	8	EDPC2.#61561.IL1807-1814.YFKOBMKK
Q04168	1815	1822	3352281	3377866	1131312	8	EDPC2.#61561.IL1815-1822.YFKOBMKK
Q04169	1823	1830	3378905	3404492	1131314	8	EDPC2.#61561.IL1823-1830.YFKOBMKK
Q04170	1831	1839	3405528	3434444	1274234	9	EDPC2.#61561.IL1831-1839.YFKOBMKK
Q04171	1840	1848	3435482	3464392	1273960	9	EDPC2.#61561.IL1840-1848.YFKOBMKK
Q04172	1849	1857	3465434	3494346	1271704	9	EDPC2.#61561.IL1849-1857.YFKOBMKK
Q04173	1858	1866	3495385	3524298	1273195	9	EDPC2.#61561.IL1858-1866.YFKOBMKK
Q04174	1867	1875	3525337	3554250	1273487	9	EDPC2.#61561.IL1867-1875.YFKOBMKK
Q04175	1876	1884	3555290	3584202	1272610	9	EDPC2.#61561.IL1876-1884.YFKOBMKK
Q04176	1885	1893	3585241	3614152	1272002	9	EDPC2.#61561.IL1885-1893.YFKOBMKK
Q04177	1894	1902	3615194	3644106	1271576	9	EDPC2.#61561.IL1894-1902.YFKOBMKK
Q04178	1903	1911	3645146	3674058	1271433	9	EDPC2.#61561.IL1903-1911.YFKOBMKK
Q04179	1912	1920	3675098	3704010	1272153	9	EDPC2.#61561.IL1912-1920.YFKOBMKK
Q04180	1921	1928	3705052	3730636	1131265	8	EDPC2.#61561.IL1921-1928.YFKOBMKK
Q04181	1929	1936	3731674	3757260	1130992	8	EDPC2.#61561.IL1929-1936.YFKOBMKK
Q04182	1937	1944	3758298	3783881	1130187	8	EDPC2.#61561.IL1937-1944.YFKOBMKK
Q04183	1945	1952	3784923	3810369	1081953	8	EDPC2.#61561.IL1945-1952.YFKOBMKK
Q04184	1953	1960	3811545	3836459	832348	8	EDPC2.#61561.IL1953-1960.YFKOBMKK
Q04185	1961	1968	3838170	3862881	683694	8	EDPC2.#61561.IL1961-1968.YFKOBMKK
Q04186	1969	1976	3864794	3889340	581175	8	EDPC2.#61561.IL1969-1976.YFKOBMKK
Q04187	1977	1984	3891418	3915963	369720	8	EDPC2.#61561.IL1977-1984.YFKOBMKK
Q04188	1985	1990	3918045	3934737	54763	6	EDPC2.#61561.IL1985-1990.YFKOBMKK
				Total:	137437112	997	

12.9.3 Gather Datasets (residual multiple energy not removed)

CMP gathers before the amplitude clipping had been applied were SEG-Y'd to 3590B tapes for archive (see Section 5.31).

Example EBCDIC header:

```
*** SEGY EBCDIC HEADER ***

C01 CLIENT: Esso Australia Pty Ltd SURVEY: Tuskfish 3D VIC/L20, Gippsland Basin
C02 PRODUCTION CUBE.  CONTRACTOR : WesternGeco, Perth  DATE  : 12 July 2004
C03 INLINES: 1001 - 1007. CLIENT TAPE NAME: EDPC2.#61561.IL1001-1007.YFKOBMK
C04 ACQUISITION PARAMETERS :
C05 SOURCE: 2 source arrays, 18.75m shot interval, 50m separation, 7m depth,
C06 source type sleeve airgun array, 300cu.in per source, 2000psi.
C07 RECEIVERS: 8/7 cables, 5km length, 400 recv/cable, 12.5m recv interval,
C08 100m separation, nominal NTO 222m. Sample rate 2ms, max reflect time 6500ms.
C09 NAVIGATION: UTM zone 55S, geodetic datum GDA-94, spheroid GRS-80, units m.
C10 Binning origin (E,N)  616254.95,  5755063.02  / (Xline,Inline) 2301, 800,
C11 azimuth 107.997 degrees, Xline/Inline interval 12.5m/25m.
C12 Full processing data extent: inlines 994-1990, xlines 3474-5784
C13 ----------------------------------------------------------------------------
C14 PROCESS : RADON DEMULTIPLE REGULARISED / BINNED CMP GATHERS
C15 ----------------------------------------------------------------------------
C16 PROCESSING SEQUENCE :
C17 CONVERSION - 8015 SEGD to WGC Internal Omega format. NAVIGATION P190 Merge.
C18 EDITS . GEO SPREADING using Esso supplied velocity field. LOW CUT FILTER -
C19 3Hz, 18dB/oct. SSL split. NOMINAL 2D GEOMETRY. SORT - 2D receivers.
C20 SWATT using wraparound NMO 1700m/s. SORT - shot. INVERSE geom spreading.
C21 DETERMINISTIC DESIGNATURE - Quadrature phase filter supplied by ESSO.
C22 GEO SPREADING using Exploration Cube first pass vels. RESAMPLE  2 to 4ms.
C23 NMO using Exploration Cube first pass vels. 3:1 SHOT INTERPOLATION. SRME.
C24 K-FILTER +/- 0.65 KNyq. TAU-P linear noise filter. INVERSE Q. INVERSE NMO.
C25 VELOCITY ANALYSIS - 500m grid. NMO - using 500m grid velocities.
C26 LEAST SQUARES RADON.  SORT - offset. PRE-STACK REGULARISATION.
C27 SORT - cmp. INVERSE NMO - using 500m grid velocities. INVERSE GEO
C28 SPREADING - using Exploration Cube first pass vels.
C29
C30
C31
C32
C33
C34 HEADER LITERAL BYTE LOCATIONS:
C35 INLINE: 9-12  CROSSLINE: 17-20  CMP (BIN): 21-24  OFFSET: 37-40
C36 SOURCE XCOORD: 73-76  SOURCE YCOORD: 77-80
C37 RECVR XCOORD:  81-84  RECVR YCOORD:  85-88
C38 BIN CENTRE XCOORD: 181-184 BIN CENTRE YCOORD: 185-188
C39 WATER DEPTH AT MIDPT: 61-64  WATER BOTTOM TWT AT MIDPT: 65-68
C40
```

REEL	INLINE		CMP		No. Traces	No. Lines	Tape Name
NUMER	MIN	MAX	Min	Max			(ESSO naming convention)
Q04214	994	1000	619999	642251	675708	7	EDPC2.#61561.IL994-1000.YFKOBMK
Q04215	1001	1007	643292	665546	988224	7	EDPC2.#61561.IL1001-1007.YFKOBMK
Q04216	1008	1016	666587	695498	1271209	9	EDPC2.#61561.IL1008-1016.YFKOBMK
Q04217	1017	1025	696540	725450	1271415	9	EDPC2.#61561.IL1017-1025.YFKOBMK
Q04218	1026	1034	726487	755387	1269491	9	EDPC2.#61561.IL1026-1034.YFKOBMK
Q04219	1035	1043	756444	785354	1272218	9	EDPC2.#61561.IL1035-1043.YFKOBMK
Q04220	1044	1053	786394	818633	1414994	10	EDPC2.#61561.IL1044-1053.YFKOBMK
Q04221	1054	1062	819674	848586	1272753	9	EDPC2.#61561.IL1054-1062.YFKOBMK
Q04222	1063	1071	849626	878539	1272342	9	EDPC2.#61561.IL1063-1071.YFKOBMK
Q04223	1072	1080	879578	908491	1271864	9	EDPC2.#61561.IL1072-1080.YFKOBMK
Q04224	1081	1089	909532	938441	1271642	9	EDPC2.#61561.IL1081-1089.YFKOBMK
Q04225	1090	1098	939483	968388	1267854	9	EDPC2.#61561.IL1090-1098.YFKOBMK
Q04226	1099	1107	969435	998328	1265698	9	EDPC2.#61561.IL1099-1107.YFKOBMK

REEL NUMER	INLINE MIN	INLINE MAX	CMP Min	CMP Max	No. Traces	No. Lines	Tape Name (ESSO naming convention)
Q04227	1108	1116	999386	1028281	1262297	9	EDPC2.#61561.IL1108-1116.YFKOBMK
Q04228	1117	1125	1029336	1058233	1261607	9	EDPC2.#61561.IL1117-1125.YFKOBMK
Q04229	1126	1134	1059288	1088191	1261142	9	EDPC2.#61561.IL1126-1134.YFKOBMK
Q04230	1135	1143	1089244	1118142	1259913	9	EDPC2.#61561.IL1135-1143.YFKOBMK
Q04231	1144	1152	1119195	1148092	1260169	9	EDPC2.#61561.IL1144-1152.YFKOBMK
Q04232	1153	1161	1149148	1178047	1259809	9	EDPC2.#61561.IL1153-1161.YFKOBMK
Q04233	1162	1170	1179100	1207997	1258983	9	EDPC2.#61561.IL1162-1170.YFKOBMK
Q04234	1171	1180	1209052	1241274	1399142	10	EDPC2.#61561.IL1171-1180.YFKOBMK
Q04235	1181	1190	1242332	1274557	1398082	10	EDPC2.#61561.IL1181-1190.YFKOBMK
Q04236	1191	1200	1275612	1307841	1400687	10	EDPC2.#61561.IL1191-1200.YFKOBMK
Q04237	1201	1210	1308891	1341115	1400883	10	EDPC2.#61561.IL1201-1210.YFKOBMK
Q04238	1211	1220	1342171	1374399	1401646	10	EDPC2.#61561.IL1211-1220.YFKOBMK
Q04239	1221	1230	1375451	1407675	1401834	10	EDPC2.#61561.IL1221-1230.YFKOBMK
Q04240	1231	1240	1408728	1440952	1400570	10	EDPC2.#61561.IL1231-1240.YFKOBMK
Q04241	1241	1250	1442011	1474232	1401438	10	EDPC2.#61561.IL1241-1250.YFKOBMK
Q04242	1251	1260	1475292	1507512	1400611	10	EDPC2.#61561.IL1251-1260.YFKOBMK
Q04243	1261	1270	1508572	1540792	1399614	10	EDPC2.#61561.IL1261-1270.YFKOBMK
Q04244	1271	1280	1541849	1574089	1404547	10	EDPC2.#61561.IL1271-1280.YFKOBMK
Q04245	1281	1290	1575129	1607371	1433264	10	EDPC2.#61561.IL1281-1290.YFKOBMK
Q04246	1291	1300	1608410	1640651	1449078	10	EDPC2.#61561.IL1291-1300.YFKOBMK
Q04247	1301	1310	1641692	1673930	1416442	10	EDPC2.#61561.IL1301-1310.YFKOBMK
Q04248	1311	1320	1674971	1707210	1411372	10	EDPC2.#61561.IL1311-1320.YFKOBMK
Q04249	1321	1330	1708251	1740490	1410970	10	EDPC2.#61561.IL1321-1330.YFKOBMK
Q04250	1331	1339	1741532	1770441	1271087	9	EDPC2.#61561.IL1331-1339.YFKOBMK
Q04251	1340	1348	1771484	1800394	1269585	9	EDPC2.#61561.IL1340-1348.YFKOBMK
Q04252	1349	1357	1801436	1830346	1270453	9	EDPC2.#61561.IL1349-1357.YFKOBMK
Q04253	1358	1366	1831388	1860297	1270527	9	EDPC2.#61561.IL1358-1366.YFKOBMK
Q04254	1367	1375	1861340	1890249	1270012	9	EDPC2.#61561.IL1367-1375.YFKOBMK
Q04255	1376	1384	1891291	1920201	1270235	9	EDPC2.#61561.IL1376-1384.YFKOBMK
Q04256	1385	1393	1921244	1950153	1270091	9	EDPC2.#61561.IL1385-1393.YFKOBMK
Q04257	1394	1402	1951195	1980105	1269931	9	EDPC2.#61561.IL1394-1402.YFKOBMK
Q04258	1403	1411	1981149	2010058	1270245	9	EDPC2.#61561.IL1403-1411.YFKOBMK
Q04259	1412	1420	2011100	2040011	1270425	9	EDPC2.#61561.IL1412-1420.YFKOBMK
Q04260	1421	1430	2041079	2073289	1404012	10	EDPC2.#61561.IL1421-1430.YFKOBMK
Q04261	1431	1440	2074420	2106569	1383705	10	EDPC2.#61561.IL1431-1440.YFKOBMK
Q04262	1441	1450	2107759	2139850	1363910	10	EDPC2.#61561.IL1441-1450.YFKOBMK
Q04263	1451	1460	2141067	2173129	1371869	10	EDPC2.#61561.IL1451-1460.YFKOBMK
Q04264	1461	1470	2174267	2206409	1401992	10	EDPC2.#61561.IL1461-1470.YFKOBMK
Q04265	1471	1480	2207470	2239691	1413083	10	EDPC2.#61561.IL1471-1480.YFKOBMK
Q04266	1481	1490	2240733	2272970	1412387	10	EDPC2.#61561.IL1481-1490.YFKOBMK
Q04267	1491	1500	2274013	2306250	1410706	10	EDPC2.#61561.IL1491-1500.YFKOBMK
Q04268	1501	1508	2307294	2332874	1129111	8	EDPC2.#61561.IL1501-1508.YFKOBMK
Q04269	1509	1516	2333915	2359498	1129378	8	EDPC2.#61561.IL1509-1516.YFKOBMK
Q04270	1517	1524	2360539	2386123	1129640	8	EDPC2.#61561.IL1517-1524.YFKOBMK
Q04271	1525	1532	2387164	2412747	1130479	8	EDPC2.#61561.IL1525-1532.YFKOBMK

Q04272	1533	1540	2413788	2439369	1130830	8	EDPC2.#61561.IL1533-1540.YFKOBMK
Q04273	1541	1548	2440411	2465994	1130341	8	EDPC2.#61561.IL1541-1548.YFKOBMK
REEL	**INLINE**		**CMP**		**No. Traces**	**No. Lines**	**Tape Name**
NUMER	**MIN**	**MAX**	**Min**	**Max**			**(ESSO naming convention)**
Q04274	1549	1556	2467036	2492618	1129387	8	EDPC2.#61561.IL1549-1556.YFKOBMK
Q04275	1557	1564	2493660	2519241	1128995	8	EDPC2.#61561.IL1557-1564.YFKOBMK
Q04276	1565	1572	2520284	2545864	1128579	8	EDPC2.#61561.IL1565-1572.YFKOBMK
Q04277	1573	1580	2546909	2572491	1128436	8	EDPC2.#61561.IL1573-1580.YFKOBMK
Q04278	1581	1589	2573535	2602443	1270745	9	EDPC2.#61561.IL1581-1589.YFKOBMK
Q04279	1590	1598	2603486	2632395	1272176	9	EDPC2.#61561.IL1590-1598.YFKOBMK
Q04280	1599	1607	2633436	2662347	1272546	9	EDPC2.#61561.IL1599-1607.YFKOBMK
Q04281	1608	1616	2663386	2692301	1272612	9	EDPC2.#61561.IL1608-1616.YFKOBMK
Q04282	1617	1625	2693338	2722253	1272918	9	EDPC2.#61561.IL1617-1625.YFKOBMK
Q04283	1626	1634	2723292	2752206	1273117	9	EDPC2.#61561.IL1626-1634.YFKOBMK
Q04284	1635	1643	2753243	2782157	1272580	9	EDPC2.#61561.IL1635-1643.YFKOBMK
Q04285	1644	1652	2783195	2812107	1272117	9	EDPC2.#61561.IL1644-1652.YFKOBMK
Q04286	1653	1661	2813148	2842059	1271354	9	EDPC2.#61561.IL1653-1661.YFKOBMK
Q04287	1662	1670	2843099	2872011	1271349	9	EDPC2.#61561.IL1662-1670.YFKOBMK
Q04288	1671	1678	2873051	2898634	1129444	8	EDPC2.#61561.IL1671-1678.YFKOBMK
Q04289	1679	1686	2899677	2925258	1129383	8	EDPC2.#61561.IL1679-1686.YFKOBMK
Q04290	1687	1694	2926301	2951882	1129850	8	EDPC2.#61561.IL1687-1694.YFKOBMK
Q04291	1695	1702	2952922	2978507	1130012	8	EDPC2.#61561.IL1695-1702.YFKOBMK
Q04292	1703	1710	2979546	3005130	1130162	8	EDPC2.#61561.IL1703-1710.YFKOBMK
Q04293	1711	1718	3006173	3031755	1130014	8	EDPC2.#61561.IL1711-1718.YFKOBMK
Q04294	1719	1726	3032797	3058378	1130356	8	EDPC2.#61561.IL1719-1726.YFKOBMK
Q04295	1727	1734	3059419	3085003	1130807	8	EDPC2.#61561.IL1727-1734.YFKOBMK
Q04296	1735	1742	3086043	3111626	1130189	8	EDPC2.#61561.IL1735-1742.YFKOBMK
Q04297	1743	1750	3112666	3138250	1129988	8	EDPC2.#61561.IL1743-1750.YFKOBMK
Q04298	1751	1758	3139290	3164875	1130130	8	EDPC2.#61561.IL1751-1758.YFKOBMK
Q04299	1759	1766	3165916	3191497	1129678	8	EDPC2.#61561.IL1759-1766.YFKOBMK
Q04300	1767	1774	3192538	3218121	1129956	8	EDPC2.#61561.IL1767-1774.YFKOBMK
Q04301	1775	1782	3219162	3244745	1129317	8	EDPC2.#61561.IL1775-1782.YFKOBMK
Q04302	1783	1790	3245788	3271376	1153035	8	EDPC2.#61561.IL1783-1790.YFKOBMK
Q04303	1791	1798	3272408	3298000	1181421	8	EDPC2.#61561.IL1791-1798.YFKOBMK
Q04304	1799	1806	3299030	3324619	1147448	8	EDPC2.#61561.IL1799-1806.YFKOBMK
Q04305	1807	1814	3325659	3351243	1130388	8	EDPC2.#61561.IL1807-1814.YFKOBMK
Q04306	1815	1822	3352281	3377866	1131312	8	EDPC2.#61561.IL1815-1822.YFKOBMK
Q04307	1823	1830	3378905	3404492	1131314	8	EDPC2.#61561.IL1823-1830.YFKOBMK
Q04308	1831	1839	3405528	3434444	1274234	9	EDPC2.#61561.IL1831-1839.YFKOBMK
Q04309	1840	1848	3435482	3464392	1273960	9	EDPC2.#61561.IL1840-1848.YFKOBMK
Q04310	1849	1857	3465434	3494346	1271704	9	EDPC2.#61561.IL1849-1857.YFKOBMK
Q04311	1858	1866	3495385	3524298	1273195	9	EDPC2.#61561.IL1858-1866.YFKOBMK
Q04312	1867	1875	3525337	3554250	1273487	9	EDPC2.#61561.IL1867-1875.YFKOBMK
Q04313	1876	1884	3555290	3584202	1272610	9	EDPC2.#61561.IL1876-1884.YFKOBMK
Q04314	1885	1893	3585241	3614152	1272002	9	EDPC2.#61561.IL1885-1893.YFKOBMK
Q04315	1894	1902	3615194	3644106	1271576	9	EDPC2.#61561.IL1894-1902.YFKOBMK
Q04316	1903	1911	3645146	3674058	1271433	9	EDPC2.#61561.IL1903-1911.YFKOBMK

REEL NUMER	INLINE MIN	INLINE MAX	CMP MIN	CMP MAX	No. Traces	No. Lines	Tape Name (ESSO naming convention)
Q04317	1912	1920	3675098	3704010	1272153	9	EDPC2.#61561.IL1912-1920.YFKOBMK
Q04318	1921	1928	3705052	3730636	1131265	8	EDPC2.#61561.IL1921-1928.YFKOBMK
Q04319	1929	1936	3731674	3757260	1130992	8	EDPC2.#61561.IL1929-1936.YFKOBMK
Q04320	1937	1944	3758298	3783881	1130187	8	EDPC2.#61561.IL1937-1944.YFKOBMK
Q04321	1945	1952	3784923	3810369	1081953	8	EDPC2.#61561.IL1945-1952.YFKOBMK
Q04322	1953	1960	3811545	3836459	832348	8	EDPC2.#61561.IL1953-1960.YFKOBMK
Q04323	1961	1968	3838170	3862881	683694	8	EDPC2.#61561.IL1961-1968.YFKOBMK
Q04324	1969	1976	3864794	3889340	581175	8	EDPC2.#61561.IL1969-1976.YFKOBMK
Q04325	1977	1984	3891418	3915963	369720	8	EDPC2.#61561.IL1977-1984.YFKOBMK
Q04326	1985	1990	3918045	3934737	54763	6	EDPC2.#61561.IL1985-1990.YFKOBMK
				Total:	137437112	997	

12.9.4 Velocity Datasets

The following velocity archive products were produced for ESSO of the 500m velocity field picked from the tau-p linear noise filtered data, sampled to a 100m grid at a 20ms sample interval:

Tape Number	Media / Format	Description	Data Range
Q04	3590B / SEGY	Seismic velocity traces stacking velocities	Inlines 992-1996, inc 4 Xlines 4447-9067, inc 16 Time 4-6600ms, inc 20ms
X	8MM / SEGY	Seismic velocity traces stacking velocities	Inlines 992-1996, inc 4 Xlines 4447-9067, inc 16 Time 4-6600ms, inc 20ms

12.10Final Products (Depth Processing)

12.10.1 Final Processing Report

6 hard copies of the final processing report and 6 copies on CD-ROM in MSword format were provided.

12.10.2 Gather Datasets (depth migrated CMPs after Radon demultiple)

CMP gathers after Radon Demultiple had been applied were SEG-Y'd to 3590B tapes for archive (see Section 5.31).

Example EBCDIC header:

```
*** SEGY EBCDIC HEADER ***

C 1 CLIENT EXXONMOBIL             COMPANY                         CREW NO
C 2 LINE    1055.00 AREA GIPPSLAND BASIN
C 3 REEL NO Q04731    DAY-START OF REEL     YEAR      OBSERVER
C 4 INSTRUMENT  MFG             MODEL            SERIAL NO
C 5 DATA TRACES/RECORD   210  AUXILIARY TRACES/RECORD       0 CDP FOLD    67
C 6 SAMPLE INTERVAL  4.00   SAMPLES/TRACE  1751 BITS/IN      BYTES/SAMPLE  4
C 7 RECORDING FORMAT        FORMAT THIS REEL SEG-Y  MEASUREMENT SYSTEM METERS
C 8 SAMPLE CODE FLOATING PT
C 9 TUSKFISH 3D - KIRCHHOFF PSDM CMP GATHERS
C10 DATE:  NOVEMBER 2004
C11
C12
C13
C14
C15
C16
C17
C18
C19
C20
C21
C22
C23
C24
C25
C26
C27
C28
C29
C30
C31
C32
C33 HEADERS LITERALS:
C34 INLINE : BYTE 9-12 (INT)
C35 CROSSLINE : BYTE 17-20 (INT)
C36 CMP (BIN) : BYTE 21-24 (INT)
C37 SOURCE-DETECT DISTANCE : BYTE 37-40 (FLPT)
C38 WATER BOTTOM : BYTE 57-60 (FLPT)
C39
C40
```

REEL	INLINE		XLINE		No. Traces	No. Lines
NUMER	MIN	MAX	MIN	MAX		
Q04726	1000	1010	3680	5600	1415777	11
Q04727	1011	1021	3680	5600	1415777	11
Q04728	1022	1032	3680	5600	1415777	11
Q04729	1033	1043	3680	5600	1415777	11
Q04730	1044	1054	3680	5600	1415777	11
Q04731	1055	1065	3680	5600	1415777	11
Q04732	1066	1076	3680	5600	1415777	11
Q04733	1077	1087	3680	5600	1415777	11
Q04734	1088	1098	3680	5600	1415777	11
Q04735	1099	1109	3680	5600	1415777	11
Q04736	1110	1120	3680	5600	1415777	11
Q04737	1121	1131	3680	5600	1415777	11
Q04738	1132	1142	3680	5600	1415777	11
Q04739	1143	1153	3680	5600	1415777	11
Q04740	1154	1164	3680	5600	1415777	11
Q04741	1165	1175	3680	5600	1415777	11
Q04742	1176	1186	3680	5600	1415777	11
Q04743	1187	1197	3680	5600	1415777	11
Q04744	1198	1208	3680	5600	1415777	11
Q04745	1209	1219	3680	5600	1415777	11
Q04746	1220	1230	3680	5600	1415777	11
Q04747	1231	1241	3680	5600	1415777	11
Q04748	1242	1252	3680	5600	1415777	11
Q04749	1253	1263	3680	5600	1415777	11
Q04750	1264	1274	3680	5600	1415777	11
Q04751	1275	1285	3680	5600	1415777	11
Q04752	1286	1296	3680	5600	1415777	11
Q04753	1297	1307	3680	5600	1415777	11
Q04754	1308	1318	3680	5600	1415777	11
Q04755	1319	1329	3680	5600	1415777	11
Q04756	1330	1340	3680	5600	1415777	11
Q04757	1341	1351	3680	5600	1415777	11
Q04758	1352	1362	3680	5600	1415777	11
Q04759	1363	1373	3680	5600	1415777	11
Q04760	1374	1384	3680	5600	1415777	11
Q04761	1385	1395	3680	5600	1415777	11
Q04762	1396	1406	3680	5600	1415777	11
Q04763	1407	1417	3680	5600	1415777	11
Q04764	1418	1428	3680	5600	1415777	11
Q04765	1429	1439	3680	5600	1415777	11
Q04766	1440	1450	3680	5600	1415777	11
Q04767	1451	1461	3680	5600	1415777	11
Q04768	1462	1472	3680	5600	1415777	11
Q04769	1473	1483	3680	5600	1415777	11

REEL	INLINE		XLINE		No. Traces	No. Lines
NUMER	MIN	MAX	MIN	MAX		
Q04770	1484	1494	3680	5600	1415777	11
Q04771	1495	1505	3680	5600	1415777	11
Q04772	1506	1516	3680	5600	1415777	11
Q04773	1517	1527	3680	5600	1415777	11
Q04774	1528	1538	3680	5600	1415777	11
Q04775	1539	1549	3680	5600	1415777	11
Q04776	1550	1560	3680	5600	1415777	11
Q04777	1561	1571	3680	5600	1415777	11
Q04778	1572	1582	3680	5600	1415777	11
Q04779	1583	1593	3680	5600	1415777	11
Q04780	1594	1604	3680	5600	1415777	11
Q04781	1605	1615	3680	5600	1415777	11
Q04782	1616	1626	3680	5600	1415777	11
Q04783	1627	1637	3680	5600	1415777	11
Q04784	1638	1648	3680	5600	1415777	11
Q04785	1649	1659	3680	5600	1415777	11
Q04786	1660	1670	3680	5600	1415777	11
Q04787	1671	1681	3680	5600	1415777	11
Q04788	1682	1692	3680	5600	1415777	11
Q04789	1693	1703	3680	5600	1415777	11
Q04790	1704	1714	3680	5600	1415777	11
Q04791	1715	1725	3680	5600	1415777	11
Q04792	1726	1736	3680	5600	1415777	11
Q04793	1737	1747	3680	5600	1415777	11
Q04794	1748	1758	3680	5600	1415777	11
Q04795	1759	1769	3680	5600	1415777	11
Q04796	1770	1780	3680	5600	1415777	11
Q04797	1781	1791	3680	5600	1415777	11
Q04798	1792	1802	3680	5600	1415777	11
Q04799	1803	1813	3680	5600	1415777	11
Q04800	1814	1824	3680	5600	1415777	11
Q04801	1825	1835	3680	5600	1415777	11
Q04802	1836	1840	3680	5600	643535	5
				Total:	107,599,059	841

12.10.3 Stack data

Raw Segy stack data in time

REEL	INLINE		XLINE		No. Traces	No. Lines
NUMER	MIN	MAX	MIN	MAX		
Q04807	1000	1677	3680	5600	1302438	678
Q04808	1678	1840	3680	5600	313123	163

Raw Segy stack data in depth

REEL	INLINE		XLINE		No. Traces	No. Lines
NUMER	MIN	MAX	MIN	MAX		
Q04807	1000	1595	3680	5600	1144916	596
Q04808	1596	1840	3680	5600	470645	245

AGC Segy stack data in time

REEL	INLINE		XLINE		No. Traces	No. Lines
NUMER	MIN	MAX	MIN	MAX		
Q04697	1000	1677	3680	5600	1302438	678
Q04698	1678	1840	3680	5600	313123	163

AGC Segy stack data in depth

REEL	INLINE		XLINE		No. Traces	No. Lines
NUMER	MIN	MAX	MIN	MAX		
Q04699	1000	1595	3680	5600	1144916	596
Q04700	1596	1840	3680	5600	470645	245

RAAC Segy stack data in time

REEL	INLINE		XLINE		No. Traces	No. Lines
NUMER	MIN	MAX	MIN	MAX		
Q04695	1000	1677	3680	5600	1302438	678
Q04696	1678	1840	3680	5600	313123	163

RAAC Segy stack data in depth

REEL	INLINE		XLINE		No. Traces	No. Lines
NUMER	MIN	MAX	MIN	MAX		
Q04918	1000	1595	3680	5600	1144916	596
Q04919	1596	1840	3680	5600	470645	245

Raw FAR Segy stack data in time

REEL	INLINE		XLINE		No. Traces	No. Lines
NUMER	MIN	MAX	MIN	MAX		
Q04581	1000	1677	3680	5600	1302438	678
Q04582	1678	1840	3680	5600	313123	163

Raw FAR Segy stack data in depth

REEL	INLINE		XLINE		No. Traces	No. Lines
NUMER	MIN	MAX	MIN	MAX		
Q04817	1000	1595	3680	5600	1144916	596
Q04818	1596	1840	3680	5600	470645	245

Raw NEAR Segy stack data in time

REEL	INLINE		XLINE		No. Traces	No. Lines
NUMER	MIN	MAX	MIN	MAX		
Q04821	1000	1677	3680	5600	1302438	678
Q04822	1678	1840	3680	5600	313123	163

Raw NEAR Segy stack data in depth

REEL	INLINE		XLINE		No. Traces	No. Lines
NUMER	MIN	MAX	MIN	MAX		
Q04819	1000	1595	3680	5600	1144916	596
Q04820	1596	1840	3680	5600	470645	245

Raw FAR Segy stack data in time

REEL	INLINE		XLINE		No. Traces	No. Lines
NUMER	MIN	MAX	MIN	MAX		
Q04695	1000	1677	3680	5600	1302438	678
Q04696	1678	1840	3680	5600	313123	163

Fluid Line data in depth

REEL	INLINE		XLINE		No. Traces	No. Lines
NUMER	MIN	MAX	MIN	MAX		
Q04960	1000	1595	3680	5600	1144916	596
Q04961	1596	1840	3680	5600	470645	245

UKOOA Stack bin centre tape

REEL	INLINE		XLINE		No. Traces	No. Lines
NUMER	MIN	MAX	MIN	MAX		
Q04725	1000	1840	3680	5600	1615381	841

APPENDIX A – References

DEPTH IMAGING

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