Seismic Data Processing Report

carried out by: **Compagnie Générale de Géophysique**

for : ***ORIGIN ENERGY RESOURCES LTD.***

Area : ***T/18P, BASS BASIN, TASMANIA***

Survey : ***SHELDUCK 2D***

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1. Introduction

1.1. Scope of report

This report describes the processing of seismic data by COMPAGNIE GENERALE DE GEOPHYSIQUE (CGG) for the period between July 2nd 2001 and December 6th 2001 for Origin Energy Resources Limited.

The reprocessing was carried out by CGG at its data processing centres in MASSY (FRANCE) and PERTH (AUSTRALIA). All production work was carried out in Massy. Client interaction, project management, and parameter testing were performed in Perth.

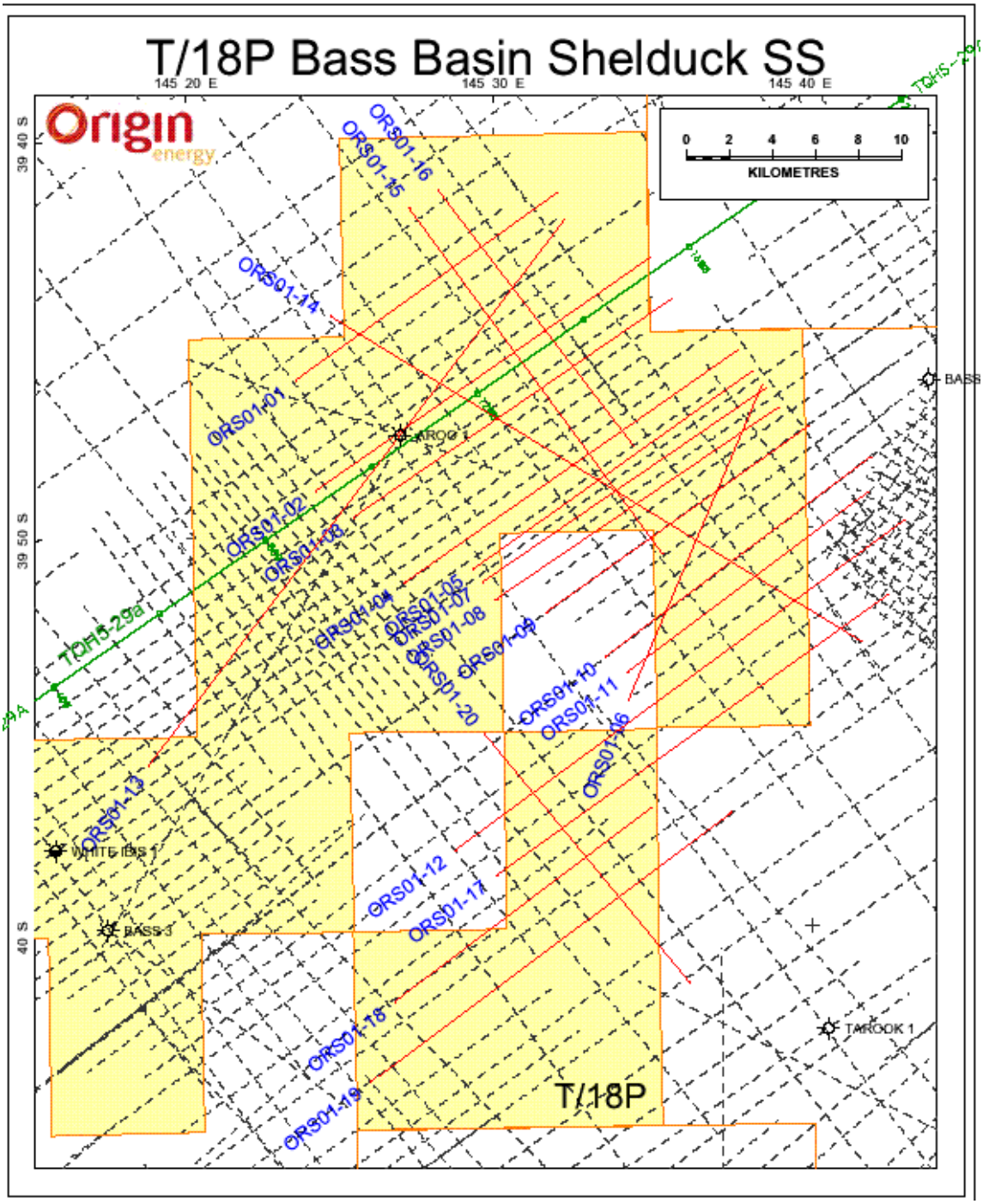
The processing agreement is referenced by CGG project number 5671/501P1BS.

1.2. Purpose and objectives of processing

The purpose of processing was to infill the existing seismic grid with additional 2D data to help delineate a number of structural leads. Specific processing goals were to provide high quality sections for interpretation through high frequency preservation, effective multiple removal and preserve amplitudes to acknowledge AVO effects. The main zones of interest were in the time range 2 to 2.5sec in the low areas and 1.5 to 2 sec over the higher areas.

1.3. Location

The area of interest for Origin Energy Resources Limited was exploration permit T/18P, located in the Bass Basin approximately midway between The North coast of Tasmania and the Southern coast of Victoria, Australia.



2. Data acquisition

2.1. Data acquisition parameters

2.1.1.Survey Details

The 20 lines of 2D seismic data totalling 424.18 km was acquired with the following parameters:

Survey	: Shelduck 2D
Location	: Bass Basin . Tasmania
Survey carried out by	: Fugro-Geoteam
Vessel	M/V Geo Arctic
Acquisition period	: 4 June to 9 June 2001
Shot interval	: 18.75 metres
Receiver interval	: 12.5 metres
Number of traces per shot point	: 368
Nominal stacking fold	: 123
Water Depth	: 63 meters shallowest to 81 meters deepest

2.1.2.Energy source

Sources	: Sodera G Air Gun Array
Number of Arrays	: 1
Number of sub-Arrays	: 4
Gun Depth	: 5 meters
Volume	: 2860 cu.in
Pressure	: 2000 psi
Shot Point Interval	: 18.75 meters

2.1.3.Receiver spread

Number of Streamers	: 1
Near trace offset	: 150 meters
Near channel number	: 1
Number of groups (channels)	: 368
Group Interval	: 12.5 meters
Streamer Depth	: 7.5 meters , 10 m for line ORS01-15A
Streamer Length	: 4600 meters

2.1.4.Instruments

Recording System	: I/O MSX Seismic Recording System
Recording format	: SEG-D 8058, 3590 cartridges
Record length	: 5120 milliseconds
Sample Interval	: 2 milliseconds
Record Filter	
Low cut	: 4Hz – 12 dB/oct
High cut	: 206Hz, - 264 dB/oct

2.1.5.Line identification

All lines are prefixed with ORS01.
Lines ORS01-13 (SP2033-SP2707) and ORS01-13A (SP869-SP2032) were merged and processed as line ORS01-13 (SP 869-2707). Lines ORS01-06A and ORS01-15A are renamed as ORS01-06 and ORS01-15 for processing.

2.1.6.Navigation/Positioning

Reference Datum	: WGS 84
UTM Zone	: 55 Southern Orientated
Primary Positioning System	: Star fix Plus DGPS

3. Processing sequence

3.1. Parameters

20 lines of 2D seismic data totalling 424.14 kms have been processed with the following parameters:

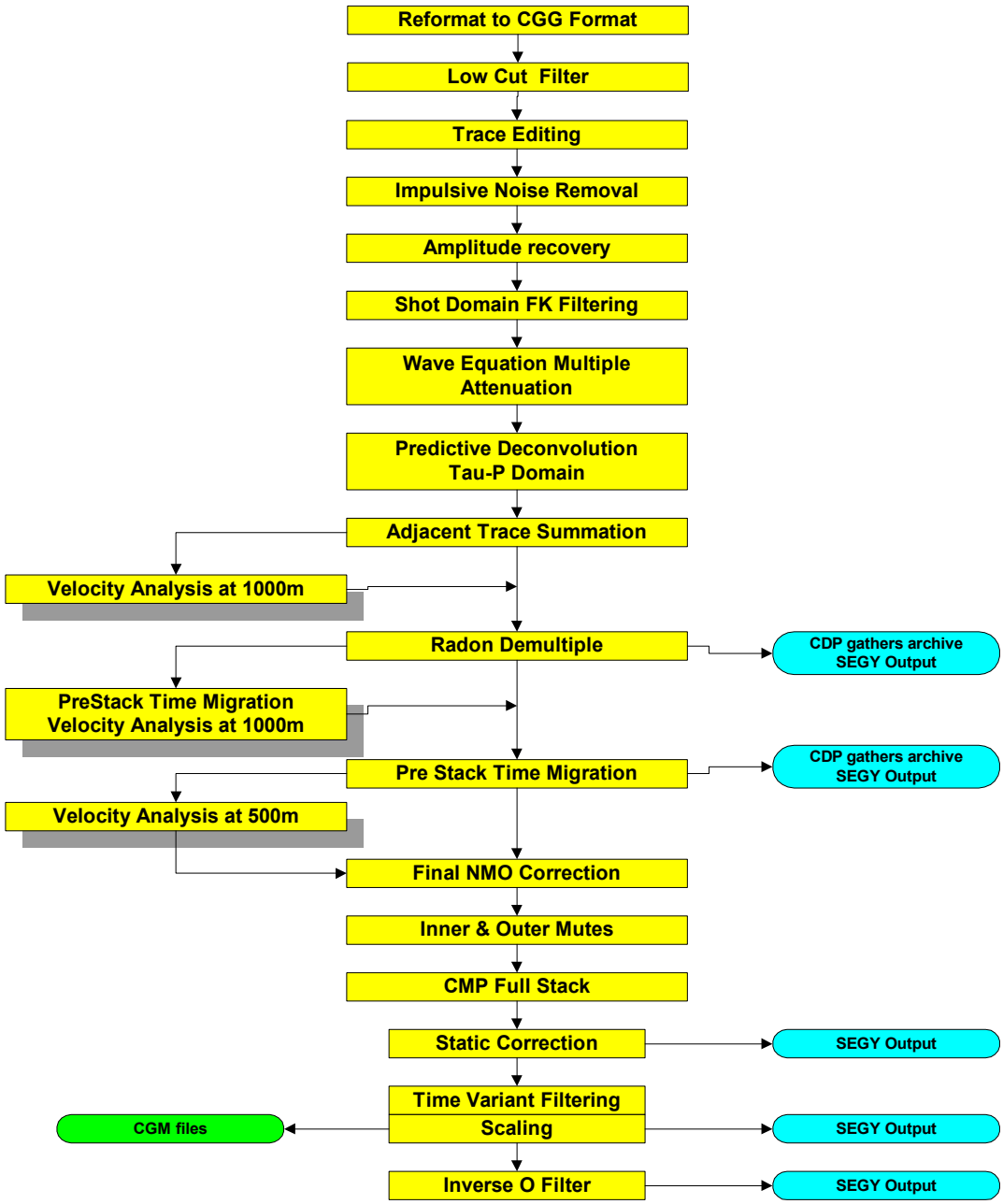
Processing length	: 5.12 seconds
Processing sample rate	: 2 milliseconds
Resampling	: none
Maximum stacking fold	: 123
Datum plane	: 0 meters above mean sea level

Since the seabed is flat and featureless with water depths varying very little over the entire area, the processing parameters such as design windows, application times, mutes time were not water bottom referenced.

- ***Origin Energy Resources Limited representative Mr. Nigel Fisher was involved at each step of the testing. The next step was only undertaken when the Origin Energy representative had approved the decision taken relating to the current test.***

3.2. Final processing sequence

3.2.1.Flow chart



3.2.2.Details

- 1. REFORMAT :SEG-D TO CGG INTERNAL FORMAT
  : 2D GEOMETRY AND TRACE HEADER UPDATE
- 2. FILTER :LOW CUT FILTER 5HZ, 18DB/OCT
- 3. TRACE EDITING :MANUAL TRACE EDIT FROM OBS LOGS
  :STATISTICAL EDIT OF NOISY TRACES
  :IMPULSIVE NOISE REMOVAL
- 4. AMPLITUDE RECOVERY
  :SPHERICAL DIVERGENCE CORRECTION
  TV**2 (T= TWT, V= REGIONAL VELOCITY)
  :EXPONENTIAL GAIN CORRECTION 2DB/S
- 5. NORMAL MOVEOUT CORRECTION
  :NMO USING REGIONAL VELOCITIES
- 6. MUTE :MILD OUTSIDE MUTE
- 7. FK-FILTER :PERFORMED IN SHOT DOMAIN
  :60DB ATTENUATION OVER +/- 0-2300M/S
  :0DB ATTENUATION AT +/- 5000M/S
  :COSINE TAPER, START 200MS
  :AGC 200MS, REMOVED AFTER FILTERING
- 8. REMOVE NORMAL MOVEOUT CORRECTION
- 9. WEMA :WAVE EQUATION MULTIPLE ATTENUATION
  :SHOT DOMAIN
  :MODEL AND SUBTRACTION OF WB MULTIPLE
- 10.PREDICTIVE DECONVOLUTION :TAU-P DOMAIN
  :P TRACES NUMBER.....443
  : *DESIGN WINDOWS*: *OP.LENGTH*: *GAP*: *APPLICATION*:
  1W: 0-1600 MS 200 MS 16 MS 0-1400 MS
  2W: 800-2800 MS 400 MS 32 MS 800-2800 MS
  3W: 1600-4900 MS 400 MS 48 MS 2000-5000 MS
  :MILD TAU-P DOMAIN MUTE
- 11.ADJACENT TRACE SUM :DIFFERENTIAL NMO
  :SUM TO ODD TRACE POSITION FOR ODD NUMBERED SHOTS
  :SUM TO EVEN TRACE NUMBER FOR EVEN NUMBERED SHOTS
  :OUTPUT 184 CHANNELS PER STREAMER
  :GEOMETRY UPDATE: 25 M RECIEVER INTERVAL
- 12.FIRST PASS VELOCITY ANALYSIS :EACH 1000 M
  :ORIGIN ENERGY VELOCITY QC
- 13.CDP SORT AND NORMAL MOVEOUT CORRECTION
- 14.HIGH RESOLUTION RADON DEMULTIPLE:
  : P RANGE.....: -480 / 2992MS
  : P INCREMENT.....: 16MS
  : P TRACES NUM.....: 217
  : DIFFERENTIAL NMO.....: 96MS TIME INVARIANT
  : RESIDUAL NOISE REMOVED....: 60 PER CENT
  : MAXIMUM FREQUENCY……..150 HZ
  : START TIME.....: 400MS + 200MS TAPER
- 15.SECOND PASS MIGRATION VELOCITY ANALYSIS :EACH 1000 M
  :KIRCHHOFF PRE-STACK MIGRATION FOR VA
  :ORIGIN ENERGY VELOCITY QC
- 16.KIRCHHOFF PRE-STACK MIGRATION
  :VELOCITY USING SECOND PASS PSTM VELOCITY ANALYSIS
  :OPERATOR VELOCITY SMOOTH 5 KM
  :BIN 37.5M; APERTURE 5000M; DIP LIMITED 80 DEGREES
  :VISCOSITY FACTOR 0
  : MAXIMUM FREQUENCY……..130 HZ
- 17.THIRD (FINAL) PASS VELOCITY ANALYSIS :EACH 500 M
  :ORIGIN ENERGY VELOCITY PICKING
- 18.NORMAL MOVEOUT CORRECTION
  :NMO USING ORIGIN ENERGY SUPPLIED VELOCITIES
- 19.TRACE MUTING :INSIDE AND OUTSIDE
- 20.CMP STACK :123* CDP FOLD
- 21.STATIC SHIFT :+8MS GUN AND CABLE STATIC CORRECTION
- 22.FILTER :TIME VARIANT HIGH CUT BUTTERWORTH FILTER
  : 0-1.0 SEC 100 HZ
  :1.6-2.2 SEC 70 HZ
  :2.5-5.1 SEC 40 HZ
- 23.SCALING : 800 MS AGC
- 24.INVERSE Q FILTER

3.3. Pre-Stack Processing

3.3.1. Pre Stack Processing Tests

Tests and parameters verifications were applied to line ORS01- 13/13A.

Low Cut Filter: Tests consisted of 3,4,5,6 Hz cutoffs with slopes of 12dB/oct. All tests had a high end of 100 Hz 144dB/Oct
***Selected Parameters*:** 5Hz 18dB/Oct

Amplitude recovery:
Spherical Divergence Correction: Spherical Divergence correction was applied using the regional RMS velocities. They were derived after analysing available velocities from this area supplied by Origin Energy: Yolla 3D survey (western corner), line BSB96-103, velocity around the Aroo1 well, velocity analysis of line ORS01-13/13A and stacking velocities from "Geo-Arctic" on-board QC processing.

Time ms	Velocity m/s
100	1500
300	1720
500	2050
700	2200
1000	2250
1500	2400
2000	2680
2500	3030
3000	3350
3500	3800
4000	4050
4500	4350
5000	4600

In additional to Spherical Divergence correction the exponential Gain correction was tested.
Selected Parameters: Spherical Divergence CorrectionTV^2
and Exponential Gain correction 2dB/sec

Impulsive Noise Removal: Swell noise existed in the data and was removed by an impulsive noise removal technique. The swell noise was detected due to its unusual energy level.

FK Filtering: FK filter tests were carried out in the SP domain and Receiver domain. Tests in the SP domain consisted of rejecting velocities in the ranges of ± 1500m/s, ± 1750m/s, ± 2000m/s, ± 2300m/s, ± 2500m/s and ± 3000m/s with NMO protection. FK filtering in the SP domain effectively removed linear noise in the SP gather and subsequent stack upto a filter of ± 2300m/s. Beyond ± 2000ms the FK filtering attenuated diffractions in the data.
Selected Parameters:

NMO applied prior to FK Filter using regional velocity
FK filter in the SP domain
Full application at 200ms + 300ms taper
AGC wrap = 200ms
60dB attenuation over ± 2300m/s
Ramp off to 0dB attenuation at ± 5000m/s
Cosine taper used to ramp off FK Filter

Anti-Multiple on Shot records : Prior to Deconvolution two methods of demultiple implemented in the shot domain were tested:

- Wave Equation Multiple attenuation. (WEMA) This method uses the wave equation to design a model of the multiples and then subtracts this model from the data. Note: the adaptation of amplitudes during the subtraction makes this method unacceptable for true preserved amplitude processing.
- Surface Multiple Attenuation technique (SMA) For input traces were computed and then subtracted the surface related multiples for each input trace satisfying the 1D geology approximation model.

Selected Method : WEMA.

This method in combination with Tau-P deconvolution significantly helped attenuate water bottom multiple energy in the data.

Deconvolution before Stack (DBS): Water bottom multiples are a known problem in marine processing. Various predictive deconvolution tests were performed. The following deconvolution parameters were tested on non-NMO corrected full 368-channel shots record before trace summation (368 traces per shot), with final decisions for deconvolution made from examining stacked sections and autocorrelation function display.

The predictive deconvolution were tested in Time and in Tau-P domains with various computing windows (gates):

1 gate : 0-3.0 secs, operators length 240ms, predictive distance (gap) 24 ms ;
2 gates : 0-2.8, 2.0 - 5.0 secs, operators 200/400ms: gaps 16/24, 24/32, 32/48 and 24/48 ms ;
3 gates : 0-2.0, 0.9-2.8, 2.0-5.0 operators lengths 200/200/400 gaps16/24/32 and 24/32/48 .

Selected DBS method: Predictive Deconvolution in Tau-P domain, 3 computing windows.

Within the Tau-p domain Primary and Multiple have a more regular periodicity. This allows a deconvolution operator to work more efficiently than would occur in the t-x domain.

Selected Parameters:

- ✓ ***Tau-P transform: P trace number: 443***
- ✓ ***Deconvolution Parameters:***

	1st	2nd	3rd
WINDOW:			
COMPUTING:	***0-1600,***	***800-2800,***	***1600-4900 ms***
APPLICATION:	***0-1400,***	***800-2800,***	***2000-5000 ms***
Operator Lengths:	***200,***	***400,***	***400 ms***
Predictive distance :	***16,***	***32,***	***48 ms***

- ✓ ***Mild mute applied in Tau-P domain***
- ✓ ***Tau-P transform inverse***

Trace summation:

The conventional adjacent trace summation within shot gather is not correct with geometry acquired Shelduck survey.

In order to create 12.5 m cdp interval and to save 123 cdp fold two different scheme were tested for trace summation :

1. Trace sum in the Shot domain:
   partial stack 2:1 trace sum for odd shots with 150m offset for first channel, 25m trace interval, and then partial stack 2:1 trace sum for even shots with 162.5 m offset for first channel, 25m trace interval.
2. Trace sum in the CDP domain:
   merging of adjacent cdps to get 246 traces per cdp gather, and then trace sum 2:1 of adjacent traces in the cdp gather domain.

For both way of trace summation the geometry is:

	SP interval, m	Traces per SP	Receiver interval, m	Maximum CDP fold	CDP Interval, m
Before trace sum	18.75	368	12.5	123	6.25
After trace sum	18.75	184	25	123	12.5

Selected method: trace summation 2:1 in Shot Domain and geometry update.

Demultiple:

Radon Demultiple tests included:

- Radon Demultiple standard (non high resolution),
- Radon Demultiple High Resolution, in the frequency domain,
- Radon Demultiple High Resolution, in the time domain.

The industrial state-of-the-art velocity based method is the parabolic Radon filtering of NMO corrected CDPs. Although simple and efficient enough for most cases, standard implementations of this method suffer from several drawbacks:

- medium focusing in tau-p domain,
- edge effects (limited aperture),
- sensitivity to spatial aliasing, resulting in amplitude inaccuracies (mainly on near-offset traces)
- inability to attenuate very slow (aliased) multiples.

CGG has developed a high resolution Radon decomposition: by introducing a sparseness constraint we improve the focusing in the tau-q domain, and by using low frequency information to drive high frequency components of the decomposition we solve the aliasing problem. This algorithm proved to better preserve primary amplitudes and attenuate multiple energy.

Selected demultiple method: Radon Demultiple High Resolution, in the frequency domain.
Selected Parameters:

P range: -480/2992 ms
P increment: 16 ms
P trace number: 217
Differential NMO: 96 ms time invariant
Residual noise removed: 60%
Start time: 400ms +200 ms tape.

This data is archived in SEG-Y format.

Migration/DMO:
Two migration methods were tested:

I. DMO/ PreSTM/PostSTM method includes the following data processing sequence:

1. NMO correction
2. DMO (Dip Moveout), 90 degrees dip limited operator, transforms data to zero offset
3. Sorting of data in iso-offset
4. Pre Stack Time Migration (PSTM) using Interval velocity function.
   Stolt cascaded migration algorithm:
   This migration is a mixture of a phase-shift migration and a Stolt constant velocity migration.
5. SORTING of data in CMP , reverse NMO
6. VELOCITY ANALYSIS (The seismic events are more or less well positioned after migration but are no longer submitted to velocity conflicts)
7. STACK with new velocities NMO corrected CDP.
8. DEMIGRATION of stack with the same velocity as for migration in order to return to zero offset.
9. Final Post Stack FX MIGRATION of the demigration result.

II. Kirchhoff Pre Stack Migration method includes the following data processing sequence:

1. NMO using smoothed velocity field
2. Kirchhoff PSTM for Velocity analysis
3. Reverse NMO
4. VELOCITY ANALYSIS
5. NMO using smoothed velocity
6. Final Kirchhoff PSTM and reverse NMO
7. Final NMO
8. STACK of PSTM data .

Selected migration method: Kirchhoff Pre Stack Time Migration.
Migration velocity: Smoothed 100% velocity using second pass PSTM Velocity analysis, smooth operator 5 kms
Selected Parameters for PSTM:
Bin size (offset increment): 37.5 m
Migration Dip Limited: 80 degrees
Migration Aperture: 5000 m
Viscosity factor : 0

This data is archived in SEG-Y format.

Mutes:
The external mute applied was similar to the mute applied in the original processing sequence. An inner mute was trialed in order to further remove multiple energy.
Selected Parameters:

	Outer Mute				**Inner Mute**			
Time , ms	20	100	1700	4000	2100	2300	2700	5000
Offset, m	150	300	1950	4700	150	500	1000	1100

3.4. Post PSTM Stack Processing

Pre-Stack Time Migrated data were stacked using Final 3rd pass velocity analysis for 4th order NMO correction.

This data is referred to as Raw Migration and is output in SEG-Y.

3.4.1.Post Migration Tests

Time Variant Filtering: The test showed that no need low cut filter in post migration processing.

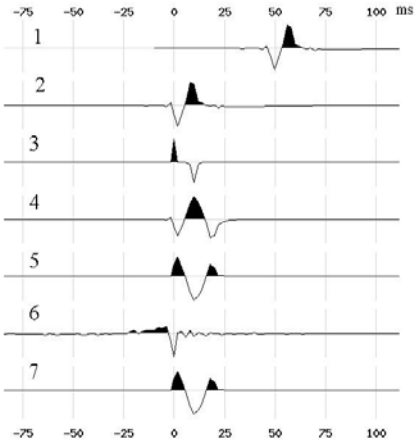
Selected Parameters: The high frequency Time Variant Butterworth filter:
T=0ms-1000ms 100Hz, 72 dB/Oct
T=1600-2200ms 70Hz, 72 dB/Oct
T=2500-5120ms 40Hz, 48 dB/Oct

Trace Scaling: The following were tested:
Time variant amplitude scaling
Time variant Exponential gain correction
Expanding Window AGC
AGC 800 ms window length

Selected Parameters: 800 ms Window Length AGC (for full stacks only)

The data after post migration processing is referred to as Filtered/Scaled Migration and is output in SEG-Y format. Also CGM files were created and archived on CD, the full processing sequence and acquisition parameters are provided on the side labels.

Zero Phase filter:
There are 7 wavelets displayed the steps taken in creating a zero phase conversion filter from the far field signature supplied from Origin Energy.



Wavelet 1 - the far field signature after resampling to 2ms and applying the same low cut anti swell noise filter that was applied in processing. Note that the source Farfield supplied already contains the source ghost, instrument response, field anti-alias filter and hydrophone response.

Wavelet 2 - wavelet 1 shifted by -46ms so that the first significant sample is at time 0.
Wavelet 3 - this wavelet when convolved with the far field simulates the effect of the receiver ghost calculated using a receiver depth of 7.5m and an uncertainty of 1m.
Wavelet 4 - the convolution of wavelets 2 and 3. This is the deterministically calculated recorded wavelet which includes all 'phase changing filters' apart from the earth filter.
Wavelet 5 - the negative phase only equivalent of wavelet 4, ie the operator to convert wavelet 4 to zero phase. This is the operator that applied to the data.
Wavelet 6 - the convolution of wavelet 4 with wavelet 5 by least squares shaping - this is the operator applied to the data to convert to minimum phase. This is the resulting zero phased wavelet.
Wavelet 7 the convolution of 4 and 6 for QC the result.

Selected Parameters:

****Do not apply any phase adjustment to the data.***

****Apply inverse Q Filter on Filtered/Scaled Migration, time variant Q values :***

Time ms	***2***	***2000***	***3000***	***4000***	***5200***
Q	***136***	***150***	***180***	***300***	***300***

This data is referred to as Migration with Q Filter and is output in SEG-Y format.

3.5. Velocities

Velocity analysis was carried out using CGG's new package "ChonoVista" with "GeoVel" interactive velocity picking and QC application. GeoVel provides:
velocity spectra, interval velocity, central CMP, picked NMO and re-stacking applied on the fly, mini stacks, automatic picking adjustment, interval and RMS iso-velocity sections, velocity time slices, flexible navigation and window linking, and other.

For velocity QC by Origin Energy, CGG produced SEG-Y data of CDPs gathers on Exabyte tapes for first and final velocity analysis. 15 CDPs were provided for each velocity analysis location: each 1000m for first and each 500m for final analysis. These data were sent to Origin Energy's representative. Time slices also were generated for QC of velocity field.

Three stages of velocity analysis were performed during the processing sequence.

The *first (initial)* pass of velocity analysis was undertaken at 1km intervals along each line before demultiple. A representative carried out velocity QC using ProMax software and approval.

The *second* stage of velocity analysis was carried out after PreSTM at 1000m intervals along each line, with the first pass velocity field being used as the reference function. A representative carried out velocity QC at CGG Perth Processing Centre.

The *third and final* stage of velocity analysis was carried out by Origin Energy representative after Final PreSTM at 500m intervals along each line, with the second pass velocity field being used as the guide function. ProMax software was used at this stage. Total number of location for final velocity analysis is 830.

The initial and final velocities are archived on CD for Origin Energy Ltd. (Refer section 5.3.3).

4. Conclusions

4.1. Conclusions And Recommendations For Further Work

The processing achieved satisfactory results, with the final data quality considered to be good to excellent. Some multiple energy remains in the data, particularly below 2.5 seconds. This is worst where the coal seams in the overlying section (1.5-2.0 sec) are strongly developed. Future advances in de-multiple technology may be capable by improving the data

It is recommended that AVO processing be considered as a tool to assist the interpretation of the data.

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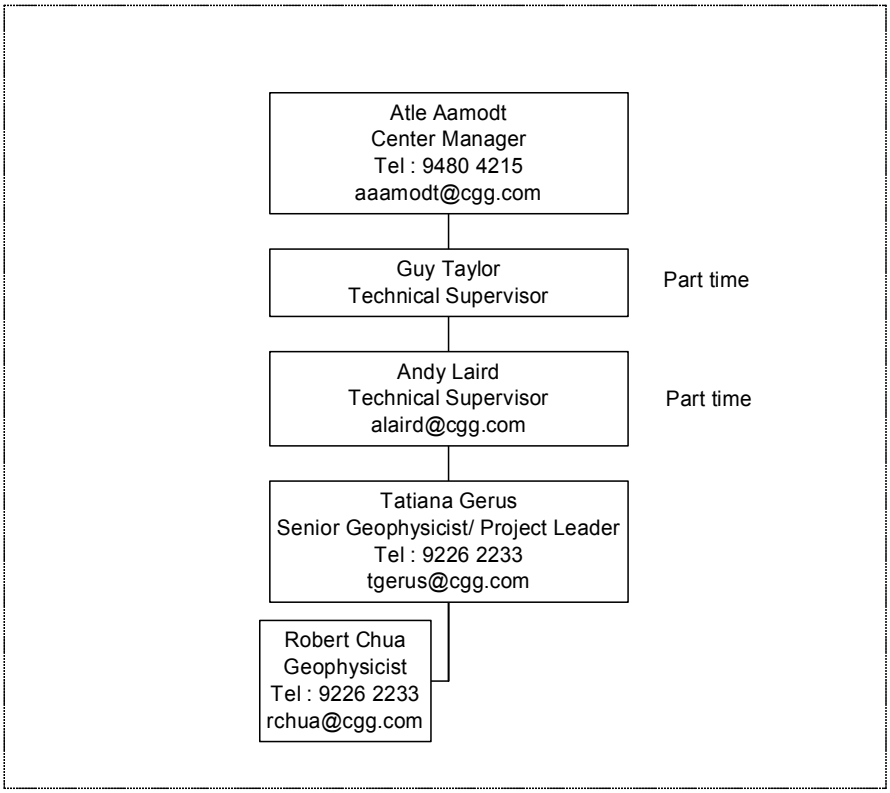
5.1. List of lines processed

Line name	Field SEQ #	Shooting Direction	First Shotpoint	Last Shotpoint	First CDP	Last CDP	km
ORS01-01	9	235	870	1802	2	1582	17.48
ORS01-02	8	56	1000	2144	1	1899	21.45
ORS01-03	1	56	1000	2091	1	1819	20.46
ORS01-04	7	236	870	2014	2	1900	21.45
ORS01-05	10	56	1000	1984	1	1659	18.45
ORS01-06	22	24	1000	1984	1	1659	18.45
ORS01-07	12	56	1000	1985	1	1660	18.47
ORS01-08	6	57	1000	1986	1	1662	18.49
ORS01-09	11	236	870	1801	2	1580	17.46
ORS01-10	5	234	870	1828	2	1621	17.96
ORS01-11	13	234	870	1748	2	1501	16.46
ORS01-12	4	55	1000	2518	1	2460	28.46
ORS01-13	02+03	217	870	2706	3	2940	34.43
ORS01-14	23	302	870	2548	2	2701	31.46
ORS01-15	21	145	1000	2198	3	1980	22.46
ORS01-16	18	324	870	1801	2	1580	17.46
ORS01-17	14	55	1000	2331	1	2179	24.96
ORS01-18	15	234	870	1802	2	1582	17.48
ORS01-19	16	54.2	1000	2250	1	2058	23.44
ORS01-20	17	321	870	1800	2	1579	17.44
					Total Kms		**424.14**

Lines ORS01-01, ORS01-04, ORS01-09, ORS01-10, ORS01-11, ORS01-13, ORS01-14, ORS01-16, ORS01-18 and ORS01-20 were acquired with decreasing shot point number direction, these lines were ended at shot point number 870. However first CDP number is related to smallest shot point number for all lines, thus cdp number increases with increasing shot point number.

5.2. Overall production

5.2.1.CGG personnel



5.2.2.Client supervision and information

Nigel Fisher for Origin Energy Resources Ltd supervised the processing of the data. Decisions for processing parameters were made by Nigel Fisher after consultations with CGG representatives.

The zero phase filtering tests were supervised by Mr. Randall Taylor, Origin Energy.

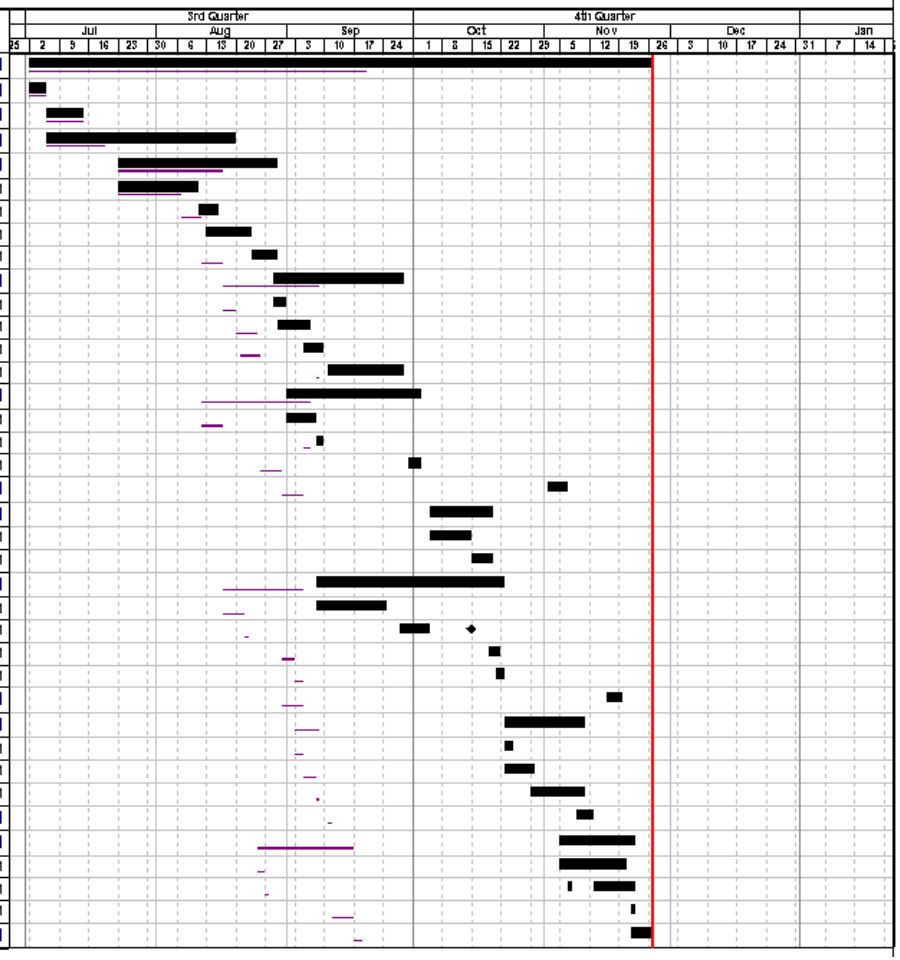
Progress reports were sent to the client by e-mail.

5.2.3.Project schedule

Processing Centre **Marine**

Project : Shelduck	Country : Australia	Project Leader : T.Gerus	As Of Date Of : 26/11/01
Client : ORIGIN ENERGY	Area : Bass Basin	Processing group : PERTH	5671 501p1bs

Task Name	% Complete	Schedule Start	Schedule Finish
Shelduck 2D Project Following	**100%**	**02/07/01**	**26/11/01**
RECEPTION OF DATA	**100%**	**02/07/01**	**05/07/01**
REFORMAT	**100%**	**06/07/01**	**14/07/01**
PRE-PROCESSING on SHOTS (PHASE 1: FK FILTER)	**100%**	**06/07/01**	**19/08/01**
PRE-PROCESSING on SHOTS (PHASE 2)	**100%**	**23/07/01**	**29/08/01**
Deconvolution test	100%	23/07/01	10/08/01
Client decision on Deconvolution test	100%	11/08/01	15/08/01
SMA and Trace Summation Testing	100%	13/08/01	23/08/01
Production PrePro2	100%	24/08/01	29/08/01
1st PASS VELOCITY ANALYSIS (1km)	**100%**	**29/08/01**	**28/09/01**
Production	100%	29/08/01	31/08/01
Picking	100%	30/08/01	06/09/01
Brute stack & QC	100%	05/09/01	09/09/01
Client QC and Approval of Velocities	100%	11/09/01	28/09/01
CDP-GATHER PROCESSING (PHASE 3)	**100%**	**01/09/01**	**02/10/01**
Radon Demultiple test	100%	01/09/01	07/09/01
Client decision on demultiple test	100%	08/09/01	09/09/01
Production demultiple	100%	30/09/01	02/10/01
ARHIVE CDP on EXA	**100%**	**02/11/01**	**06/11/01**
PreSTM for 2d PASS VELOCITY ANALYSIS (1km)	**100%**	**05/10/01**	**19/10/01**
Production and Picking	100%	05/10/01	14/10/01
QC of Velocities by client	100%	15/10/01	19/10/01
Pre STACK TIME MIGRATION	**100%**	**08/09/01**	**22/10/01**
Testing	100%	08/09/01	24/09/01
Client Approval	100%	28/09/01	14/10/01
Production	100%	19/10/01	21/10/01
Preliminary Stack	100%	21/10/01	22/10/01
ARHIVE CDP on EXA	**100%**	**16/11/01**	**19/11/01**
FINAL PASS VELOCITY ANALYSIS (0.5 km)	**100%**	**23/10/01**	**10/11/01**
Production	100%	23/10/01	24/10/01
Sending data to client	100%	23/10/01	29/10/01
Picking by client	100%	29/10/01	10/11/01
STACK	**100%**	**09/11/01**	**12/11/01**
POST STACK	**100%**	**05/11/01**	**22/11/01**
Testing	100%	05/11/01	20/11/01
Client Approval	100%	07/11/01	22/11/01
Production	100%	22/11/01	22/11/01
FINAL PRODUCTS	**100%**	**22/11/01**	**26/11/01**



5.3. Final documents and tapes

5.3.1. Phase correction operators

Zero phase filters operators:

A. Deterministic method:

Time sample increment: 2 ms:

(79,426,853,1316,566,
4434,5119,1620,197,8140,4207,2733,4832,-2053,-5584,
555,12748,-18441,-15632,-5227,-1663,-20579,-8769,
-36702,-25648,-30542,33716,-70526,-93050,19569,
32900,45925,72183,99623,-9204,39697,-140058,24874,
100000,-60436,211,-25602,22277,-3777,8360,3304,
-39310,2806,35509,-16432,-13934,-7149,6093,1998,
-3087,6848,-25989,3966,15434,95,-17277,1257,2427,
4052,-4216,5584,-12874,700,7826,1072,-5284,-939,
1266,-246,-133,-3,-75)

B. Statistical method:

1.Operator of Minimum phase conversion :

Time sample increment: 2 ms:

(-775,-723,-4574,-6484,
-912,2026,-9926,-6649,5126,-7374,8296,12625,9016,
-3974,27636,52950,8534,35533,55052,48993,55467,
85394,76658,100000,-102212,-304987,19546,28809,
-49985,55618,-45910,21367,4748,-33432,20764,7861,
-1018,-20764,10930,2462,-4788,3443,-1832,-5031,
-2455,8563,-3160,-3574,753,314,48)

2. Zero phase filter:

Number os samples: 301,

Time sample increment: 2 ms:

(-0.00051,-0.00191,-0.00068, 0.00027, 0.00180,
0.00118,-0.00072, 0.00008, 0.00072, 0.00173,
0.00177, 0.00370, 0.00172,-0.00164,-0.00159,
0.00051, 0.00086,-0.00046,-0.00168,-0.00036,
0.00111, 0.00152, 0.00148, 0.00048,-0.00047,
0.00054, 0.00155, 0.00089, 0.00047, 0.00061,
0.00008,-0.00076,-0.00110,-0.00055,-0.00150,
-0.00330,-0.00273, 0.00004, 0.00114, 0.00183,
0.00331, 0.00247,-0.00008,-0.00249,-0.00394,
-0.00137, 0.00082, 0.00175, 0.00138, 0.00472,
0.00112, 0.00131,-0.00050, 0.00057,-0.00229,
-0.00103,-0.00312, 0.00046,-0.00020,-0.00201,
-0.00335,-0.00193,-0.00214,-0.00067, 0.00158,
0.00197, 0.00237, 0.00285, 0.00160, 0.00243,
0.00333, 0.00212, 0.00291, 0.00508, 0.00361,
0.00136, 0.00258, 0.00337, 0.00183, 0.00045,
-0.00008, 0.00083, 0.00226, 0.00362, 0.00624,
0.00873, 0.00597, 0.00068, 0.00032, 0.00398,
0.00395, 0.00076, 0.00000, 0.00041, 0.00031,
0.00258, 0.00267, 0.00091,-0.00256,-0.00198,

-0.00033, 0.00632,-0.00650, 0.00639,-0.01069,
0.00137,-0.00148, 0.00324, 0.00478, 0.00333,
0.00063, 0.00220, 0.00301, 0.00104,-0.00080,
0.00009, 0.00303, 0.00667, 0.00882, 0.00811,
0.00535, 0.00543, 0.01053, 0.01717, 0.02011,
0.01694, 0.00881, 0.00591, 0.01327, 0.02121,
0.02377, 0.02032, 0.01340, 0.00818, 0.00357,
-0.00331,-0.01468,-0.03882,-0.07002,-0.07386,
-0.06146,-0.10158,-0.18442,-0.21779,-0.15782,
-0.02566, 0.12572, 0.23467, 0.25501, 0.17640,
0.07927,-0.63486, 0.47637, 0.12054,-0.04766,
-0.03073, 0.03995, 0.08347, 0.07777, 0.04300,
0.01327, 0.01878, 0.05608, 0.06445, 0.02754,
0.01221, 0.03782, 0.05602, 0.04682, 0.02890,
0.01925, 0.02225, 0.03172, 0.03479, 0.02865,
0.02049, 0.01604, 0.01939, 0.02460, 0.02409,
0.02051, 0.01732, 0.01576, 0.01525, 0.01378,
0.01004, 0.00684, 0.00661, 0.00851, 0.00929,
0.00840, 0.00642, 0.00295,-0.00027, 0.00204,
0.00427, 0.00378,-0.00246, 0.00443,-0.00899,
0.00844,-0.00361, 0.00484, 0.00109,-0.00043,
0.00019, 0.00249, 0.00135,-0.00181,-0.00559,
-0.00494,-0.00340,-0.00234, 0.00093, 0.00240,
-0.00090,-0.00247, 0.00091, 0.00312, 0.00051,
-0.00120, 0.00032, 0.00166, 0.00142, 0.00070,
-0.00012,-0.00006,-0.00121,-0.00422,-0.00470,
-0.00340,-0.00408,-0.00382,-0.00139,-0.00181,
-0.00421,-0.00378,-0.00342,-0.00262,-0.00067,
-0.00051,-0.00134,-0.00077,-0.00300,-0.00397,
-0.00414,-0.00266,-0.00577,-0.00140,-0.00075,
0.00288, 0.00010,-0.00135,-0.00557,-0.00363,
-0.00642,-0.00505,-0.00258,-0.00103,-0.00220,
-0.00183,-0.00149,-0.00116,-0.00100,-0.00199,
-0.00180,-0.00093,-0.00195,-0.00226,-0.00084,
-0.00016,-0.00164,-0.00280,-0.00290,-0.00209,
-0.00147,-0.00085, 0.00009, 0.00021, 0.00009,
0.00125, 0.00150, 0.00045,-0.00030,-0.00083,
-0.00145, 0.00025, 0.00200, 0.00165,-0.00114,
-0.00248, 0.00014, 0.00299, 0.00090, 0.00035,
-0.00036,-0.00012,-0.00113, 0.00027, 0.00119,
0.00036)

5.3.2. Final Tape products

5.3.2.1.Stacked Data

The final products consisted of section data for the following datasets:

1. Raw Migration,
2. Migration with post-processing (Filtered/Scaled),
3. Migration with post-processing and Q Filter,

for each processed line on 8 mm Exabyte tapes in SEG-Y format.

The following table summarises the tape contents for each line provided to Origin Energy Ltd.

Line Number	First CDP	Last CDP	First SP	Last SP	1.MIGRATION Raw		2.MIGRATION Filtered/Scaled		3.MIGRATION with Q Filter	
					Tape No	File No	Tape No	File No	Tape No	File No
ORS01-01	2	1582	871	1802	17620	1	17621	1	17622	1
ORS01-02	1	1899	1000	2143	17620	2	17621	2	17622	2
ORS01-03	1	1819	1000	2090	17620	3	17621	3	17622	3
ORS01-04	2	1899	871	2014	17620	4	17621	4	17622	4
ORS01-05	1	1659	1000	1983	17620	5	17621	5	17622	5
ORS01-06	1	1659	1000	1983	17620	6	17621	6	17622	6
ORS01-07	1	1662	1000	1984	17620	7	17621	7	17622	7
ORS01-08	1	1662	1000	1985	17620	8	17621	8	17622	8
ORS01-09	2	1580	871	1801	17620	9	17621	9	17622	9
ORS01-10	2	1621	871	1828	17620	10	17621	10	17622	10
ORS01-11	2	1501	871	1748	17620	11	17621	11	17622	11
ORS01-12	1	2460	1000	2517	17620	12	17621	12	17622	12
ORS01-13	3	2940	870	2706	17620	13	17621	13	17622	13
ORS01-14	2	2701	871	2548	17620	14	17621	14	17622	14
ORS01-15	3	1980	1000	2197	17620	15	17621	15	17622	15
ORS01-16	2	1580	871	1801	17620	16	17621	16	17622	16
ORS01-17	1	2179	1000	2330	17620	17	17621	17	17622	17
ORS01-18	2	1582	871	1802	17620	18	17621	18	17622	18
ORS01-19	1	2058	1000	2249	17620	19	17621	19	17622	19
ORS01-20	2	1579	871	1800	17620	20	17621	20	17622	20

The processing sequence and navigation coordinates are available in the tapes and traces headers

CDP Gathers

The following two sort of pre Stack data were archived on 8 mm Exabyte tapes in SEG-Y format with 5120 ms Record length/2 ms Sample rate:

1. CDP gathers after demultiple (pre-PSTM) , NMO uncorrected and unscaled.
   The following table indicates contents of each of the tapes provided to Origin Energy Ltd

Tape Number	Line Number	CDP Range
X17287	ORS01-13	3-1692
X17288	ORS01-13	1692-2940
X17289	ORS01-01	2-1582
X17290	ORS01-02	1-1691
X17291	ORS01-02	1691-1899
X17292	ORS01-03	1-1702
X17293	ORS01-03	1702-1819
X17294	ORS01-04	2-1692
X17295	ORS01-04	1692-1900
X17296	ORS01-05	1-1659
X17297	ORS01-06	1-1659
X17298	ORS01-07	1-1660
X17299	ORS01-08	1-1662
X17300	ORS01-09	2-1580
X17301	ORS01-10	2-1621
X17302	ORS01-11	2-1501
X17303	ORS01-12	1-1691
X17304	ORS01-12	1691-2460
X17305	ORS01-14	2-1692
X17306	ORS01-14	1692-2701
X17307	ORS01-15	3-1692
X17308	ORS01-15	1692-1980
X17309	ORS01-16	2-1580
X17310	ORS01-17	1-1691
X17311	ORS01-17	1691-2179
X17312	ORS01-18	2-1582
X17313	ORS01-19	1-1691
X17314	ORS01-19	1691-2058
X17315	ORS01-20	2-1579

2. CDP gathers after Pre Stack Time Migration , NMO uncorrected and unscaled.
The following table indicates contents of each of the tapes provided to Origin Energy Ltd.:

Number	Tape X Number	Line Number	First CDP	Last CDP	First SP	Last SP	Part
1	X17316	ORS01-01	2	1582	871	1802	1 of 1
2	X17317	ORS01-02	1	1595	1000	2061	1 of 2
3	X17318	ORS01-02	1595	1899	1941	2143	2 of 2
4	X17319	ORS01-03	1	1595	1000	2090	1 of 2
5	X17320	ORS01-03	1595	1819	1941	2090	2 of 2
6	X17321	ORS01-04	2	1596	871	2014	1 of 2
7	X17322	ORS01-04	1596	1899	1812	2014	2 of 2
8	X17323	ORS01-05	1	1594	1000	1983	1 of 2
9	X17328	ORS01-05	1595	1659	1941	1983	2 of 2
10	X17324	ORS01-06	1	1594	1000	1983	1 of 2
11	X17329	ORS01-06	1595	1659	1941	1983	2 of 2
12	X17325	ORS01-07	1	1594	1000	1984	1 of 2
13	X17330	ORS01-07	1595	1662	1941	1984	2 of 2
14	X17326	ORS01-08	1	1594	1000	1985	1 of 2
15	X17327	ORS01-08	1595	1662	1941	1985	2 of 2
16	X17331	ORS01-09	2	1580	871	1801	1 of 1
17	X17332	ORS01-10	2	1596	871	1828	1 of 2
18	X17333	ORS01-10	1596	1621	1812	1828	2 of 2
19	X17334	ORS01-11	2	1501	871	1748	1 of 1
20	X17335	ORS01-12	1	1595	1000	2061	1 of 2
21	X17336	ORS01-12	1595	2460	1941	2517	2 of 2
22	X17606	ORS01-13	3	1597	870	1933	1 of 2
23	X17607	ORS01-13	1597	2940	1811	2706	2 of 2
24	X17608	ORS01-14	2	1596	871	1933	1 of 2
25	X17609	ORS01-14	1596	2701	1812	2548	2 of 2
26	X17610	ORS01-15	3	1597	1000	2197	1 of 2
27	X17611	ORS01-15	1597	1980	1943	2197	2 of 2
28	X17612	ORS01-16	2	1580	871	1801	1 of 1
29	X17613	ORS01-17	1	1595	1000	2061	1 of 2
30	X17614	ORS01-17	1595	2179	1941	2330	2 of 2
31	X17615	ORS01-18	2	1582	871	1802	1 of 1
32	X17616	ORS01-19	1	1595	1000	2061	1 of 2
33	X17617	ORS01-19	1595	2058	1941	2249	2 of 2
34	X17618	ORS01-20	2	1579	871	1800	1 of 1

5.3.3. Products on Compact Disk (CD)

- ✓ Final Velocities in ASCII ProMax format for each line (20 files)
- ✓ Initial Velocities in ASCII ProMax format for each line (20 files)
- ✓ CGM files for each line (20 files)
- ✓ Processing Report (1 file)