

GIPPSLAND 2D



2D Time Reprocessing report

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

For: **BHP PETROLEUM PTY. LTD**

Area: **VIC/P45**

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CAUTION

This data/map does not use GDA94 – coordinates shown may be more than 200 metres different to those now commonly in use

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1 Introduction

1.1 Scope of report

This report describes the 3D time reprocessing of seismic data by COMPAGNIE GENERALE DE GEOPHYSIQUE (CGG) for the period between May 24th 2001 and February 28th 2002.

The processing agreement is referenced by CGG project number 501P1BQ.

The input data for this project came from 9 Vintages were listed bellows:

1. GF88C
2. GF91A
3. G92A
4. G88A
5. GS88A
6. G85A
7. GP81A
8. GE81A
9. G80A

The lines seismic for each vintage are listed in Part of Annexes

1.2 Layout of report

The report is divided into sections detailing data acquisition, data processing, conclusions and annexes.

1.3 Processing Logistics

Processing was carried out at CGG's data processing centres in PERTH (AUSTRALIA). Project management, velocity analysis and parameter testing was co-ordinated from PERTH. All client interactions were performed in PERTH.

Processing was carried out according to a sequence framework provided by BHP Petroleum PTY LTD. The BHP Petroleum PTY LTD gave authorisation for all processing steps and parameters used.

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2 Data acquisition

- The following text is a summary of information provided from the data acquisition report. The seismic data were acquitted with the following parameters:

❖ **Vintage GF88C**

Survey	:	GF88C-2D
Location	:	Vic/P45, Offshore Gippsland Basin, Victoria
Survey carried out by	:	
Vessel	:	
Date	:	
Number of traces per shotpoint	:	240
Stacking fold	:	60 (acquisition)
Type of operation	:	Single vessel operation
Type of energy source	:	Airguns
Shotpoint interval	:	25 meters
Volume source	:	2180 cubic inches
Air pressure	:	1800 psi
Source depth	:	6 meters
Cable length	:	3000 meters
Number of groups	:	240
Group interval	:	12.5 meters
Cable depth	:	10 meters
Centre of energy source to centre of near group	:	103 meters
Type Instruments	:	FCS III
Tape format	:	SEG-D, 9-track
Filters:		
▪ Low cut	:	8 Hz, 18 dB/Oct
▪ High cut	:	180 Hz, 72 dB/Oct
Record length	:	6.0 seconds
Sample interval	:	2 milliseconds
Gun delay	:	-51.2 milliseconds
Primary positioning system	:	
Secondary positioning system	:	

- ◆ *Polarity: for minimum phase data, « normal polarity » is defined as:
Compression = Negative number = Onset of white trough.*

❖ **Vintage GF91A**

Survey	:	GF91A-2D
Location	:	Vic/P45, Offshore Gippsland Basin, Victoria
Survey carried out by	:	
Vessel	:	
Date	:	
Number of traces per shotpoint	:	240
Stacking fold	:	60 (acquisition)
Type of operation	:	Single vessel operation
Type of energy source	:	Airguns
Shotpoint interval	:	25 meters
Volume source	:	2180 cubic inches
Air pressure	:	2000 psi
Source depth	:	6 meters
Cable length	:	3000 meters
Number of groups	:	240
Group interval	:	12.5 meters
Cable depth	:	10 meters
Centre of energy source to centre of near group	:	151 meters
Type Instruments	:	FCS III
Tape format	:	SEG-D, IBM3480
Filters:		
▪ Low cut	:	8 Hz, 18 dB/Oct
▪ High cut	:	180 Hz, 72 dB/Oct
Record length	:	6.0 seconds
Sample interval	:	2 milliseconds
Gun delay	:	-51.2 milliseconds
Primary positioning system	:	
Secondary positioning system	:	

- ◆ *Polarity: for minimum phase data, « normal polarity » is defined as:
Compression = Negative number = Onset of white trough.*

❖ **Vintage G92A**

Survey	:	G92A-2D
Location	:	Vic/P45, Offshore Gippsland Basin, Victoria
Survey carried out by	:	
Vessel	:	M/V 'PACIFIC Titan'
Date	:	
Number of traces per shotpoint	:	300
Stacking fold	:	75 (acquisition)
Type of operation	:	Single vessel operation
Type of energy source	:	Airguns
Shotpoint interval	:	25 meters
Volume source	:	2580 cubic inches
Air pressure	:	2000 psi
Source depth	:	5 meters
Cable length	:	3750 meters
Number of groups	:	300
Group interval	:	12.5 meters
Cable depth	:	6 meters
Centre of energy source to centre of near group	:	139 meters
Type Instruments	:	FCS III
Tape format	:	SEG-D, IBM3480
Filters:		
▪ Low cut	:	8 Hz, 18 dB/Oct
▪ High cut	:	180 Hz, 72 dB/Oct
Record length	:	6.0 seconds
Sample interval	:	2 milliseconds
Gun delay	:	-51.2 milliseconds
Primary positioning system	:	
Secondary positioning system	:	

- ♦ *Polarity: for minimum phase data, « normal polarity » is defined as:
Compression = Negative number = Onset of white trough.*

❖ **Vintage GP81A**

Survey	:	GP81A-2D
Location	:	Vic/P45, Offshore Gippsland Basin, Victoria
Survey carried out by	:	
Vessel	:	M/V 'Western Endeavour'
Date	:	
Number of traces per shotpoint	:	96
Stacking fold	:	48 (acquisition)
Type of operation	:	Single vessel operation
Type of energy source	:	Airguns
Shotpoint interval	:	25 meters
Volume source	:	cubic inches
Air pressure	:	psi
Source depth	:	10 meters
Cable length	:	2400 meters
Number of groups	:	96
Group interval	:	25 meters
Cable depth	:	6 meters
Centre of energy source to centre of near group	:	224 meters
Type Instruments	:	DFS V
Tape format	:	SEG-B, 9-track
Filters:		
▪ Low cut	:	8 Hz, 18 dB/Oct
▪ High cut	:	180 Hz, 72 dB/Oct
Record length	:	6.0 seconds
Sample interval	:	2 milliseconds
Gun delay	:	0 milliseconds
Primary positioning system	:	
Secondary positioning system	:	

- ◆ *Polarity: for minimum phase data, « normal polarity » is defined as:
Compression = Negative number = Onset of white trough.*

❖ **Vintage G80A**

Survey	:	G80A-2D
Location	:	Vic/P45, Offshore Gippsland Basin, Victoria
Survey carried out by	:	
Vessel	:	M/V ' Eugene Mc Dermott II'
Date	:	
Number of traces per shotpoint	:	96
Stacking fold	:	48 (acquisition)
Type of operation	:	Single vessel operation
Type of energy source	:	Airguns
Shotpoint interval	:	25 meters
Volume source	:	1450 cubic inches
Air pressure	:	2000 psi
Source depth	:	8 meters
Cable length	:	2395 meters
Number of groups	:	96
Group interval	:	25 meters
Cable depth	:	12 meters
Centre of energy source to centre of near group	:	250 meters
Type Instruments	:	DFS V
Tape format	:	SEG-B, 9-track
Filters:		
▪ Low cut	:	8 Hz, 18 dB/Oct
▪ High cut	:	128 Hz, 72 dB/Oct
Record length	:	5.0 seconds
Sample interval	:	4 milliseconds
Gun delay	:	-51.2 milliseconds
Primary positioning system	:	
Secondary positioning system	:	

- ◆ *Polarity: for minimum phase data, « normal polarity » is defined as:
Compression = Negative number = Onset of white trough.*

◆ **Vintage GE81A**

Survey	:	GE81A-2D
Location	:	Vic/P45, Offshore Gippsland Basin, Victoria
Survey carried out by	:	
Vessel	:	M/V 'Eugene Mc Dermott II'
Date	:	
Number of traces per shotpoint	:	96
Stacking fold	:	48 (acquisition)
Type of operation	:	Single vessel operation
Type of energy source	:	Airguns
Shotpoint interval	:	25 meters
Volume source	:	2000 cubic inches
Air pressure	:	2000 psi
Source depth	:	6 meters
Cable length	:	2395 meters
Number of groups	:	96
Group interval	:	25 meters
Cable depth	:	12 meters
Centre of energy source to centre of near group	:	208 meters
Type Instruments	:	DFS V
Tape format	:	SEG-B, 9-track
Filters:		
▪ Low cut	:	8 Hz, 18 dB/Oct
▪ High cut	:	90 Hz, 72 dB/Oct
Record length	:	4.0 seconds
Sample interval	:	2 milliseconds
Gun delay	:	-51.2 milliseconds
Primary positioning system	:	
Secondary positioning system	:	

- ◆ *Polarity: for minimum phase data, « normal polarity » is defined as:
Compression = Negative number = Onset of white trough.*

❖ **Vintage G85A**

Survey	:	G85A-2D
Location	:	Vic/P45, Offshore Gippsland Basin, Victoria
Survey carried out by	:	
Vessel	:	M/V ' Eugene Mc Dermott II'
Date	:	
Number of traces per shotpoint	:	192
Stacking fold	:	48 (acquisition)
Type of operation	:	Single vessel operation
Type of energy source	:	Airguns
Shotpoint interval	:	30 meters
Volume source	:	4075 cubic inches
Air pressure	:	1900 psi
Source depth	:	7 meters
Cable length	:	2865 meters
Number of groups	:	192
Group interval	:	15 meters
Cable depth	:	13 meters
Centre of energy source to centre of near group	:	205 meters
Type Instruments	:	TSR
Tape format	:	SEG-D, 9-track
Filters:		
▪ Low cut	:	8 Hz, 18 dB/Oct
▪ High cut	:	90 Hz, 72 dB/Oct
Record length	:	4.0 seconds
Sample interval	:	4 milliseconds
Gun delay	:	-51.2 milliseconds
Primary positioning system	:	
Secondary positioning system	:	

- ◆ *Polarity: for minimum phase data, « normal polarity » is defined as:
Compression = Negative number = Onset of white trough.*

❖ **Vintage G88A**

Survey	:	G88A-2D
Location	:	Vic/P45, Offshore Gippsland Basin, Victoria
Survey carried out by	:	
Vessel	:	
Date	:	
Number of traces per shotpoint	:	300
Stacking fold	:	75 (acquisition)
Type of operation	:	Single vessel operation
Type of energy source	:	Airguns
Shotpoint interval	:	25 meters
Volume source	:	2180 cubic inches
Air pressure	:	1800 psi
Source depth	:	5 meters
Cable length	:	3900 meters
Number of groups	:	300
Group interval	:	12.5 meters
Cable depth	:	10 meters
Centre of energy source to centre of near group	:	102 meters
Type Instruments	:	FCS III
Tape format	:	SEG-D, 9-track
Filters:		
▪ Low cut	:	8 Hz, 18 dB/Oct
▪ High cut	:	180 Hz, 72 dB/Oct
Record length	:	4.0 seconds
Sample interval	:	2 milliseconds
Gun delay	:	-51.2 milliseconds
Primary positioning system	:	
Secondary positioning system	:	

♦ *Polarity: for minimum phase data, « normal polarity » is defined as:
Compression = Negative number = Onset of white trough.*

❖ **Vintage GS88A**

Survey	:	GS88A-2D
Location	:	Vic/P45, Offshore Gippsland Basin, Victoria
Survey carried out by	:	
Vessel	:	
Date	:	
Number of traces per shotpoint	:	300
Stacking fold	:	75 (acquisition)
Type of operation	:	Single vessel operation
Type of energy source	:	Airguns
Shotpoint interval	:	25 meters
Volume source	:	2180 cubic inches
Air pressure	:	1800 psi
Source depth	:	5 meters
Cable length	:	3900 meters
Number of groups	:	300
Group interval	:	12.5 meters
Cable depth	:	10 meters
Centre of energy source to centre of near group	:	125 meters
Type Instruments	:	FCS III
Tape format	:	SEG-D, 9-track
Filters:		
▪ Low cut	:	8 Hz, 18 dB/Oct
▪ High cut	:	180 Hz, 72 dB/Oct
Record length	:	6.0 seconds
Sample interval	:	2 milliseconds
Gun delay	:	-51.2 milliseconds
Primary positioning system	:	
Secondary positioning system	:	

- ◆ *Polarity: for minimum phase data, « normal polarity » is defined as:
Compression = Negative number = Onset of white trough.*

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3 Processing sequences

- ☐ Vintage GF88C were processed with the following parameters:

Processing length	: 6.0 seconds
Processing sample rate	: 4 milliseconds
Nominal stacking fold	: 60
Datum plane	: Mean sea level

- ☐ Vintage GF91A were processed with the following parameters:

Processing length	: 6.0 seconds
Processing sample rate	: 4 milliseconds
Nominal stacking fold	: 60
Datum plane	: Mean sea level

- ☐ Vintage G92A were processed with the following parameters:

Processing length	: 6.0 seconds
Processing sample rate	: 4 milliseconds
Nominal stacking fold	: 75
Datum plane	: Mean sea level

- ☐ VintageGS88A were processed with the following parameters:

Processing length	: 6.0 seconds
Processing sample rate	: 4 milliseconds
Nominal stacking fold	: 75
Datum plane	: Mean sca level

- ☐ Vintage GP81A were processed with the following parameters:

Processing length	: 5.0 seconds
Processing sample rate	: 4 milliseconds
Nominal stacking fold	: 48
Datum plane	: Mean sea level

- ☐ Vintage G80A were processed with the following parameters:

Processing length	: 5.0 seconds
Processing sample rate	: 4 milliseconds
Nominal stacking fold	: 48
Datum plane	: Mean sea level

- ☐ Vintage GE81A were processed with the following parameters:

Processing length	: 4.0 seconds
Processing sample rate	: 4 milliseconds
Nominal stacking fold	: 48
Datum plane	: Mean sea level

- ☐ Vintage G85A were processed with the following parameters:

Processing length	: 4.0 seconds
Processing sample rate	: 4 milliseconds
Nominal stacking fold	: 48
Datum plane	: Mean sea level

- ☐ Vintage G88A were processed with the following parameters:

Processing length	: 4.0 seconds
Processing sample rate	: 4 milliseconds
Nominal stacking fold	: 75
Datum plane	: Mean sea level

3.1 Final 2D Time Reprocessing sequence - flow chart

3.1.1 General Processing Flows

- ◆ **1. Pre -stack processing**
 - Reformat and Navigation Merge
 - Anti Alias Filter using Butterworth Filter and Resample to 4ms
 - Remove Gun delay
 - Amplitude Recovery
 - Automatic Trace Editing
 - Normal move out using regional BHP Velocities fields
 - Shot domain FK velocity filtering
 - Trace Adjacent Summation
 - Remove Normal move out
 - 1st Velocity Analysis every 2 Km grid
- ◆ **2. Intermediate Pre-stack processing**
 - Normal move out using 1st velocity fields
 - Trace interpolation in CDP domain
 - Remove Normal move out
 - Normal move out using selected percentage of 1st velocity fields
 - Radon multiple Attenuation
 - Original trace selection from interpolated traces
 - Remove Normal move out
 - Shot Average Wavelet Shaping Decon with removable 1000 ms AGC
 - Amplitude Vs Offset correction
- ◆ **3. Migration**
 - Kirchhoff PSTM:
 - PSTM velocity Analysis 1Km grid
 - Full PSTM
 - High Density Velocity Analysis 25m grid
- ◆ **4. Final Stack**
 - Inner and Outer Trace Mute
 - Stack (Full, Near and Far)
 - Gun and Cable statics correction
 - Zero phase-ing to mach Archer 3D well
 - Residual Exponential Gain Correction
- ◆ **5. Post Processing**
 - Spectral Balancing using BHP methodology

3.1.2 Detail Processing Flows for Vintage GF88C

- **Pre-stack Processing:**
 - **REFORMATING AND NAVIGATION MERGE:**
 - Transcription from SEG D into CGG Format,
 - Labelling and Geometry updating
 - Seismic and Navigation Merge
 - **ANTI ALIAS FILTER 100HZ/144DB AND RESAMPLE TO 4MS**
 - **REMOVE GUN DELAY -51.2 MS**
 - **AMPLITUDE RECOVERY:**
 - V*V*T Spherical Divergence Correction with 3 DB/SEC applied to 4 Second
 - **AUTOMATIC EDITING:**

- Statistical Trace Editing of Noisy and bad traces
- NMO USING VELOCITY SUPPLIED BY BHP
- FK VELOCITY FILTERING
 - Band Pass Mode, Starting Time calculation is Water Bottom, Taper is 400 ms,
 - Zone velocity preserve is -3000 m/s to 3000 m/s,
 - Zone tapering is -200000 m/s to -3000m/s and 3000m/s to 200000 m/s, Attenuation parameter is 30dB,
- ADJACENT TRACE SUMMATION (2:1)
- REMOVE NMO
- 1ST VELOCITY ANALYSIS EVERY 2 KM
- **Intermediate Pre-stack Processing:**
 - NMO USING 1ST VELOCITY FIELDS
 - F-X TRACE INTERPOLATION (CDP DOMAIN)
 - REMOVE NMO
 - NMO USING SCALING OF 1ST VELOCITY FIELDS:

Time (ms)	:	0	200	800	2000	5000	6000
Percentage (%)	:	85	85	92	90	88	88
 - RADON MULTIPLE ATTENUATION:
 - Application start time is 200 ms from Water Bottom Reference with length of tapering is 300 ms,
 - Transforms Range are DTMIN: -192ms to DTMAX: 2496ms with Parabola step (DDT) 16ms,
 - Primary Models are DTMIN: -192ms to DTCUT: 112 ms.
 - Interleave 2 with overlap 1
 - REMOVE NMO
 - SHOT AVERAGE WAVELET SHAPING DECON WITH REMOVABLE 1000 MS AGC
 - Operator computation window : 300 ms to -3500 ms, Operator length: 240 ms
 - Number of consecutive traces used for the calculation of operators: 120
 - NMO USING 1ST VELOCITY FIELDS
 - AMPLITUDE VERSUS OFFSET CORRECTION
 - REMOVE NMO
- **Migration:**
 - PSTM VELOCITY ANALYSIS:
 - Aperture 4000 m and dip 50 degree
 - 100% Smoothing 1st Velocity Field
 - PSTM VELOCITY PICK:
 - PSTM Velocity grid 1 KM
 - Analysis PSTM Velocity range: 90% - 110%
 - FINAL PSTM:
 - Aperture 4000 m and dip 50 degree
 - 100% Smoothing PSTM Velocity Fields
 - HIGH DENSITY VELOCITY ANALYSIS (25 m)
- **Final Stack:**
 - NMO USING PSTM VELOCITY FIELDS
 - INNER AND OUTER MUTES
 - FINAL STACK AND ANGLE STACK
 - Near & Far by 50% split in the middle of muted data
 - GUN AND CABLE STATICS CORRECTION -10.6 MS
 - ZERO PHASE-ING TO MACH ARCHER 3D WELL
 - RESIDUAL EXPONENTIAL GAIN CORRECTION
- **Post Processing:**
 - SPECTRAL BALANCING

3.1.3 Detail Processing Flows for Vintage GF91A

- **Pre-stack Processing:**
 - REFORMATING AND NAVIGATION MERGE:
 - Transcription from SEG2 into CGG Format,

- Labelling and Geometry updating
 - Seismic and Navigation Merge
 - ANTI ALIAS FILTER 100HZ/144DB AND RESAMPLE TO 4MS
 - REMOVE GUN DELAY -51.2 MS
 - AMPLITUDE RECOVERY:
 - V*V*T Spherical Divergence Correction with 3 DB/SEC applied to 4 Second
 - AUTOMATIC EDITING:
 - Statistical Trace Editing of Noisy and bad traces
 - NMO USING VELOCITY SUPPLIED BY BHP
 - FK VELOCITY FILTERING
 - Band Pass Mode, Starting Time calculation is Water Bottom, Taper is 400 ms,
 - Zone velocity preserve is -3000 m/s to 3000 m/s,
 - Zone tapering is -200000 m/s to -3000m/s and 3000m/s to 200000 m/s, Attenuation parameter is 30dB,
 - ADJACENT TRACE SUMMATION (2:1)
 - REMOVE NMO
 - 1ST VELOCITY ANALYSIS EVERY 2 KM
- **Intermediate Pre-stack Processing:**
- NMO USING 1ST VELOCITY FIELDS
 - F-X TRACE INTERPOLATION (CDP DOMAIN)
 - REMOVE NMO
 - NMO USING SCALING OF 1ST VELOCITY FIELDS:

Time (ms) :	0	200	800	2000	5000	6000
Percentage (%):	85	85	92	90	88	88
 - RADON MULTIPLE ATTENUATION:
 - Application start time is 200 ms from Water Bottom Reference with length of tapering is 300 ms,
 - Transforms Range are DTMIN: -192ms to DTMAX: 2496ms with Parabola step (DDT) 16ms,
 - Primary Models are DTMIN: -192ms to DTCUT: 112 ms.
 - Interleave 2 with overlap 1
 - REMOVE NMO
 - SHOT AVERAGE WAVELET SHAPING DECON WITH REMOVABLE 1000 MS AGC
 - Operator computation window : 300 ms to -3500 ms, Operator length: 240 ms
 - Number of consecutive traces used for the calculation of operators: 120
 - NMO USING 1ST VELOCITY FIELDS
 - AMPLITUDE VERSUS OFFSET CORRECTION
 - REMOVE NMO
- **Migration:**
- PSTM VELOCITY ANALYSIS:
 - Aperture 4000 m and dip 50 degree
 - 100% Smoothing 1st Velocity Field
 - PSTM VELOCITY PICK:
 - PSTM Velocity grid 1 KM
 - Analysis PSTM Velocity range: 90% - 110%
 - FINAL PSTM:
 - Aperture 4000 m and dip 50 degree
 - 100% Smoothing PSTM Velocity Fields
 - HIGH DENSITY VELOCITY ANALYSIS (25 m)
- **Final Stack:**
- NMO USING PSTM VELOCITY FIELDS
 - INNER AND OUTER MUTES
 - FINAL STACK AND ANGLE STACK
 - Near & Far by 50% split in the middle of muted data
 - GUN AND CABLE STATICS CORRECTION -10.6 MS
 - ZERO PHASE-ING TO MACH ARCHER 3D WELL
 - RESIDUAL EXPONENTIAL GAIN CORRECTION
- **Post Processing:**
- SPECTRAL BALANCING

3.1.4 Detail Processing Flows for Vintage G92A

- **Pre-stack Processing:**
 - REFORMATING AND NAVIGATION MERGE:
 - Transcription from SEG-D into CGG Format,
 - Labelling and Geometry updating
 - Seismic and Navigation Merge
 - ANTI ALIAS FILTER 100HZ/144DB AND RESAMPLE TO 4MS
 - REMOVE GUN DELAY -51.2 MS
 - AMPLITUDE RECOVERY:
 - V*V*T Spherical Divergence Correction with 3 DB/SEC applied to 4 Second
 - AUTOMATIC EDITING:
 - Statistical Trace Editing of Noisy and bad traces
 - NMO USING VELOCITY SUPPLIED BY BHP
 - FK VELOCITY FILTERING
 - Band Pass Mode, Starting Time calculation is Water Bottom, Taper is 400 ms,
 - Zone velocity preserve is -3000 m/s to 3000 m/s,
 - Zone tapering is -200000 m/s to -3000m/s and 3000m/s to 200000 m/s, Attenuation parameter is 30dB,
 - ADJACENT TRACE SUMMATION (2:1)
 - REMOVE NMO
 - 1ST VELOCITY ANALYSIS EVERY 2 KM
- **Intermediate Pre-stack Processing:**
 - NMO USING 1ST VELOCITY FIELDS
 - F-X TRACE INTERPOLATION (CDP DOMAIN)
 - REMOVE NMO
 - NMO USING SCALING OF 1ST VELOCITY FIELDS:

Time (ms)	0	200	800	2000	5000	6000
Percentage (%)	85	85	92	90	88	88
 - RADON MULTIPLE ATTENUATION:
 - Application start time is 200 ms from Water Bottom Reference with length of tapering is 300 ms,
 - Transforms Range are DTMIN: -192ms to DTMAX: 2496ms with Parabola step (DDT) 16ms,
 - Primary Models are DTMIN: -192ms to DTCUT: 112 ms.
 - Interleave 2 with overlap 1
 - REMOVE NMO
 - SHOT AVERAGE WAVELET SHAPING DECON WITH REMOVABLE 1000 MS AGC
 - Operator computation window : 300 ms to -3500 ms, Operator length: 240 ms
 - Number of consecutive traces used for the calculation of operators: 150
 - NMO USING 1ST VELOCITY FIELDS
 - AMPLITUDE VERSUS OFFSET CORRECTION
 - REMOVE NMO
- **Migration:**
 - PSTM VELOCITY ANALYSIS:
 - Aperture 4000 m and dip 50 degree
 - 100% Smoothing 1st Velocity Field
 - PSTM VELOCITY PICK:
 - PSTM Velocity grid 1 KM
 - Analysis PSTM Velocity range: 90% - 110%
 - FINAL PSTM:
 - Aperture 4000 m and dip 50 degree
 - 100% Smoothing PSTM Velocity Fields
 - HIGH DENSITY VELOCITY ANALYSIS (25 m)
- **Final Stack:**
 - NMO USING PSTM VELOCITY FIELDS
 - INNER AND OUTER MUTES
 - FINAL STACK AND ANGLE STACK
 - Near & Far by 50% split in the middle of muted data
 - GUN AND CABLE STATICS CORRECTION -7.3 MS

- ZERO PHASE-ING TO MACH ARCHER 3D WELL
- RESIDUAL EXPONENTIAL GAIN CORRECTION
- ADDITIONAL RESIDUAL EXPONENTIAL GAIN CORRECTION
 - To mach Vintage GF88C
- ❑ **Post Processing:**
 - SPECTRAL BALANCING

3.1.5 Detail Processing Flows for Vintage G88A

- ❑ **Pre-stack Processing:**
 - REFORMATING AND NAVIGATION MERGE:
 - Transcription from SEG D into CGG Format,
 - Labelling and Geometry updating
 - Seismic and Navigation Merge
 - ANTI ALIAS FILTER 100HZ/144DB AND RESAMPLE TO 4MS
 - REMOVE GUN DELAY -51.2 MS
 - AMPLITUDE RECOVERY:
 - V*V*T Spherical Divergence Correction with 3 DB/SEC applied to 4 Second
 - AUTOMATIC EDITING:
 - Statistical Trace Editing of Noisy and bad traces
 - NMO USING VELOCITY SUPPLIED BY BHP
 - FK VELOCITY FILTERING
 - Band Pass Mode, Starting Time calculation is Water Bottom, Taper is 400 ms,
 - Zone velocity preserve is -3000 m/s to 3000 m/s,
 - Zone tapering is -200000 m/s to -3000m/s and 3000m/s to 200000 m/s, Attenuation parameter is 30dB,
 - ADJACENT TRACE SUMMATION (2:1)
 - REMOVE NMO
 - 1ST VELOCITY ANALYSIS EVERY 2 KM
- ❑ **Intermediate Pre-stack Processing:**
 - NMO USING 1ST VELOCITY FIELDS
 - F-X TRACE INTERPOLATION (CDP DOMAIN)
 - REMOVE NMO
 - NMO USING SCALING OF 1ST VELOCITY FIELDS:

Time (ms)	:	0	200	800	2000	5000	6000
Percentage (%)	:	85	85	92	90	88	88
 - RADON MULTIPLE ATTENUATION:
 - Application start time is 200 ms from Water Bottom Reference with length of tapering is 300 ms,
 - Transforms Range are DTMIN: -192ms to DTMAX: 2496ms with Parabola step (DDT) 16ms,
 - Primary Models are DTMIN: -192ms to DTCUT: 112 ms.
 - Interleave 2 with overlap 1
 - REMOVE NMO
 - SHOT AVERAGE WAVELET SHAPING DECON WITH REMOVABLE 1000 MS AGC
 - Operator computation window : 300 ms to -3500 ms, Operator length: 240 ms
 - Number of consecutive traces used for the calculation of operators: 150
 - NMO USING 1ST VELOCITY FIELDS
 - AMPLITUDE VERSUS OFFSET CORRECTION
 - REMOVE NMO
- ❑ **Migration:**
 - PSTM VELOCITY ANALYSIS:
 - Aperture 4000 m and dip 50 degree
 - 100% Smoothing 1st Velocity Field
 - PSTM VELOCITY PICK:
 - PSTM Velocity grid 1 KM
 - Analuysis PSTM Velocity range: 90% - 110%
 - FINAL PSTM:

- Aperture 4000 m and dip 50 degree
- 100% Smoothing PSTM Velocity Fields
- HIGH DENSITY VELOCITY ANALYSIS (25 m)
- **Final Stack:**
 - NMO USING PSTM VELOCITY FIELDS
 - INNER AND OUTER MUTES
 - FINAL STACK AND ANGLE STACK
 - Near & Far by 50% split in the middle of muted data
 - GUN AND CABLE STATICS CORRECTION -10 MS
 - ZERO PHASE-ING TO MACH ARCHER 3D WELL
 - RESIDUAL EXPONENTIAL GAIN CORRECTION
 - ADDITIONAL RESIDUAL EXPONENTIAL GAIN CORRECTION
 - To mach Vintage G92A
 - TIME SHIFT CORRECTION 4 MS
 - To mach Vintage G92A
- **Post Processing:**
 - SPECTRAL BALANCING

3.1.6 Detail Processing Flows for Vintage GS88A

- **Pre-stack Processing:**
 - REFORMATING AND NAVIGATION MERGE:
 - Transcription from SEG2 into CGG Format,
 - Labelling and Geometry updating
 - Seismic and Navigation Merge
 - ANTI ALIAS FILTER 100HZ/144DB AND RESAMPLE TO 4MS
 - REMOVE GUN DELAY -51.2 MS
 - AMPLITUDE RECOVERY:
 - V*V*T Spherical Divergence Correction with 3 DB/SEC applied to 4 Second
 - AUTOMATIC EDITING:
 - Statistical Trace Editing of Noisy and bad traces
 - NMO USING VELOCITY SUPPLIED BY BHP
 - FK VELOCITY FILTERING
 - Band Pass Mode, Starting Time calculation is Water Bottom, Taper is 400 ms,
 - Zone velocity preserve is -3000 m/s to 3000 m/s,
 - Zone tapering is -200000 m/s to -3000m/s and 3000m/s to 200000 m/s, Attenuation parameter is 30dB,
 - ADJACENT TRACE SUMMATION (2:1)
 - REMOVE NMO
 - 1ST VELOCITY ANALYSIS EVERY 2 KM
- **Intermediate Pre-stack Processing:**
 - NMO USING 1ST VELOCITY FIELDS
 - F-X TRACE INTERPOLATION (CDP DOMAIN)
 - REMOVE NMO
 - NMO USING SCALING OF 1ST VELOCITY FIELDS:

Time (ms)	:	0	200	800	2000	5000	6000
Percentage (%)	:	85	85	92	90	88	88
 - RADON MULTIPLE ATTENUATION:
 - Application start time is 200 ms from Water Bottom Reference with length of tapering is 300 ms,
 - Transforms Range are DTMIN: -192ms to DTMAX: 2496ms with Parabola step (DDT) 16ms,
 - Primary Models are DTMIN: -192ms to DTCUT: 112 ms.
 - Interleave 2 with overlap 1
 - REMOVE NMO
 - SHOT AVERAGE WAVELET SHAPING DECON WITH REMOVABLE 1000 MS AGC
 - Operator computation window : 300 ms to -3500 ms, Operator length: 240 ms
 - Number of consecutive traces used for the calculation of operators: 150
 - NMO USING 1ST VELOCITY FIELDS

- AMPLITUDE VERSUS OFFSET CORRECTION
- REMOVE NMO
- **Migration:**
 - PSTM VELOCITY ANALYSIS:
 - Aperture 4000 m and dip 50 degree
 - 100% Smoothing 1st Velocity Field
 - PSTM VELOCITY PICK:
 - PSTM Velocity grid 1 KM
 - Analysis PSTM Velocity range: 90% - 110%
 - FINAL PSTM:
 - Aperture 4000 m and dip 50 degree
 - 100% Smoothing PSTM Velocity Fields
 - HIGH DENSITY VELOCITY ANALYSIS (25 m)
- **Final Stack:**
 - NMO USING PSTM VELOCITY FIELDS
 - INNER AND OUTER MUTES
 - FINAL STACK AND ANGLE STACK
 - Near & Far by 50% split in the middle of muted data
 - GUN AND CABLE STATICS CORRECTION -10 MS
 - ZERO PHASE-ING TO MACH ARCHER 3D WELL
 - RESIDUAL EXPONENTIAL GAIN CORRECTION
- **Post Processing:**
 - SPECTRAL BALANCING

3.1.7 Detail Processing Flows for Vintage G85A

- **Pre-stack Processing:**
 - REFORMATING AND NAVIGATION MERGE:
 - Transcription from SEG2 into CGG Format,
 - Labelling and Geometry updating
 - Seismic and Navigation Merge
 - ANTI ALIAS FILTER 100HZ/144DB
 - REMOVE GUN DELAY -51.2 MS
 - AMPLITUDE RECOVERY:
 - V*V*T Spherical Divergence Correction with 3 DB/SEC applied to 4 Second
 - AUTOMATIC EDITING:
 - Statistical Trace Editing of Noisy and bad traces
 - NMO USING VELOCITY SUPPLIED BY BHP
 - FK VELOCITY FILTERING
 - Band Pass Mode, Starting Time calculation is Water Bottom, Taper is 400 ms,
 - Zone velocity preserve is -3000 m/s to 3000 m/s,
 - Zone tapering is -200000 m/s to -3000m/s and 3000m/s to 200000 m/s, Attenuation parameter is 30dB,
 - ADJACENT TRACE SUMMATION (2:1)
 - REMOVE NMO
 - 1ST VELOCITY ANALYSIS EVERY 2 KM
- **Intermediate Pre-stack Processing:**
 - NMO USING 1ST VELOCITY FIELDS
 - F-X TRACE INTERPOLATION (CDP DOMAIN)
 - REMOVE NMO
 - NMO USING SCALING OF 1ST VELOCITY FIELDS:

Time (ms)	:	0	200	800	2000	5000	6000
Percentage (%)	:	85	85	92	90	88	88
 - RADON MULTIPLE ATTENUATION:
 - Application start time is 200 ms from Water Bottom Reference with length of tapering is 300 ms,
 - Transforms Range are DTMIN: -192ms to DTMAX: 2496ms with Parabola step (DDT) 16ms,

- Primary Models are DTMIN: -192ms to DTCUT: 112 ms.
- Interleave 2 with overlap 1
- REMOVE NMO
- SHOT AVERAGE WAVELET SHAPING DECON WITH REMOVABLE 1000 MS AGC
 - Operator computation window : 300 ms to -3500 ms, Operator length: 240 ms
 - Number of consecutive traces used for the calculation of operators: 96
- NMO USING 1ST VELOCITY FIELDS
- AMPLITUDE VERSUS OFFSET CORRECTION
- REMOVE NMO

- **Migration:**
 - PSTM VELOCITY ANALYSIS:
 - Aperture 4000 m and dip 50 degree
 - 100% Smoothing 1st Velocity Field
 - PSTM VELOCITY PICK:
 - PSTM Velocity grid 1 KM
 - Analysis PSTM Velocity range: 90% - 110%
 - FINAL PSTM:
 - Aperture 4000 m and dip 50 degree
 - 100% Smoothing PSTM Velocity Fields
 - HIGH DENSITY VELOCITY ANALYSIS (25 m)

- **Final Stack:**
 - NMO USING PSTM VELOCITY FIELDS
 - INNER AND OUTER MUTES
 - FINAL STACK AND ANGLE STACK
 - Near & Far by 50% split in the middle of muted data
 - GUN AND CABLE STATICS CORRECTION -13.3 MS
 - ZERO PHASE-ING TO MACH ARCHER 3D WELL
 - RESIDUAL EXPONENTIAL GAIN CORRECTION
 - TIME SHIFT CORRECTION 8 MS
 - To mach Vintage GF91A
 - ADDITIONAL RESIDUAL EXPONENTIAL GAIN CORRECTION
 - To mach Vintage GF91A

- **Post Processing:**
 - SPECTRAL BALANCING

3.1.8 Detail Processing Flows for Vintage GE81A

- **Pre-stack Processing:**
 - REFORMATING AND NAVIGATION MERGE:
 - Transcription from SEG2 into CGG Format,
 - Labelling and Geometry updating
 - Seismic and Navigation Merge
 - ANTI ALIAS FILTER 100HZ/144DB AND RESAMPLE TO 4MS
 - REMOVE GUN DELAY -51.2 MS
 - AMPLITUDE RECOVERY:
 - V*V*T Spherical Divergence Correction with 3 DB/SEC applied to 4 Second
 - AUTOMATIC EDITING:
 - Statistical Trace Editing of Noisy and bad traces
 - NMO USING VELOCITY SUPPLIED BY BHP
 - FK VELOCITY FILTERING
 - Band Pass Mode, Starting Time calculation is Water Bottom, Taper is 400 ms,
 - Zone velocity preserve is -3000 m/s to 3000 m/s,
 - Zone tapering is -200000 m/s to -3000m/s and 3000m/s to 200000 m/s, Attenuation parameter is 30dB,
 - ADJACENT TRACE SUMMATION (2:1)
 - REMOVE NMO
 - 1ST VELOCITY ANALYSIS EVERY 2 KM

- ❑ **Intermediate Pre-stack Processing:**
 - NMO USING 1ST VELOCITY FIELDS
 - F-X TRACE INTERPOLATION (CDP DOMAIN)
 - REMOVE NMO
 - NMO USING SCALING OF 1ST VELOCITY FIELDS:

Time (ms)	:	0	200	800	2000	5000	6000
Percentage (%)	:	85	85	92	90	88	88
 - RADON MULTIPLE ATTENUATION:
 - Application start time is 200 ms from Water Bottom Reference with length of tapering is 300 ms,
 - Transforms Range are DTMIN: -192ms to DTMAX: 2496ms with Parabola step (DDT) 16ms,
 - Primary Models are DTMIN: -192ms to DTCUT: 112 ms.
 - Interleave 2 with overlap 1
 - REMOVE NMO
 - SHOT AVERAGE WAVELET SHAPING DECON WITH REMOVABLE 1000 MS AGC
 - Operator computation window : 300 ms to -3500 ms, Operator length: 240 ms
 - Number of consecutive traces used for the calculation of operators: 48
 - NMO USING 1ST VELOCITY FIELDS
 - AMPLITUDE VERSUS OFFSET CORRECTION
 - REMOVE NMO
- ❑ **Migration:**
 - PSTM VELOCITY ANALYSIS:
 - Aperture 4000 m and dip 50 degree
 - 100% Smoothing 1st Velocity Field
 - PSTM VELOCITY PICK:
 - PSTM Velocity grid 1 KM
 - Analysis PSTM Velocity range: 90% - 110%
 - FINAL PSTM:
 - Aperture 4000 m and dip 50 degree
 - 100% Smoothing PSTM Velocity Fields
 - HIGH DENSITY VELOCITY ANALYSIS (25 m)
- ❑ **Final Stack:**
 - NMO USING PSTM VELOCITY FIELDS
 - INNER AND OUTER MUTES
 - FINAL STACK AND ANGLE STACK
 - Near & Far by 50% split in the middle of muted data
 - GUN AND CABLE STATICS CORRECTION -12 MS
 - ZERO PHASE-ING TO MACH ARCHER 3D WELL
 - RESIDUAL EXPONENTIAL GAIN CORRECTION
- ❑ **Post Processing:**
 - SPECTRAL BALANCING

3.1.9 Detail Processing Flows for Vintage GP81A

- ❑ **Pre-stack Processing:**
 - REFORMATING AND NAVIGATION MERGE:
 - Transcription from SEG2 into CGG Format,
 - Labelling and Geometry updating
 - Seismic and Navigation Merge
 - ANTI ALIAS FILTER 100HZ/144DB AND RESAMPLE TO 4MS
 - AMPLITUDE RECOVERY:
 - V*V*T Spherical Divergence Correction with 3 DB/SEC applied to 4 Second
 - AUTOMATIC EDITING:
 - Statistical Trace Editing of Noisy and bad traces
 - NMO USING VELOCITY SUPPLIED BY BHP
 - FK VELOCITY FILTERING
 - Band Pass Mode, Starting Time calculation is Water Bottom, Taper is 400 ms,

- Zone velocity preserve is –3000 m/s to 3000 m/s,
- Zone tapering is –200000 m/s to –3000m/s and 3000m/s to 200000 m/s, Attenuation parameter is 30dB,
- ADJACENT TRACE SUMMATION (2:1)
- REMOVE NMO
- 1ST VELOCITY ANALYSIS EVERY 2 KM

- **Intermediate Pre-stack Processing:**
 - NMO USING 1ST VELOCITY FIELDS
 - F-X TRACE INTERPOLATION (CDP DOMAIN)
 - REMOVE NMO
 - NMO USING SCALING OF 1ST VELOCITY FIELDS:

Time (ms)	:	0	200	800	2000	5000	6000
Percentage (%)	:	85	85	92	90	88	88
 - RADON MULTIPLE ATTENUATION:
 - Application start time is 200 ms from Water Bottom Reference with length of tapering is 300 ms,
 - Transforms Range are DTMIN: –192ms to DTMAX: 2496ms with Parabola step (DDT) 16ms,
 - Primary Models are DTMIN: –192ms to DTCUT: 112 ms.
 - Interleave 2 with overlap 1
 - REMOVE NMO
 - SHOT AVERAGE WAVELET SHAPING DECON WITH REMOVABLE 1000 MS AGC
 - Operator computation window : 300 ms to –3500 ms, Operator length: 240 ms
 - Number of consecutive traces used for the calculation of operators: 48
 - NMO USING 1ST VELOCITY FIELDS
 - AMPLITUDE VERSUS OFFSET CORRECTION
 - REMOVE NMO

- **Migration:**
 - PSTM VELOCITY ANALYSIS:
 - Aperture 4000 m and dip 50 degree
 - 100% Smoothing 1st Velocity Field
 - PSTM VELOCITY PICK:
 - PSTM Velocity grid 1 KM
 - Analysis PSTM Velocity range: 90% - 110%
 - FINAL PSTM:
 - Aperture 4000 m and dip 50 degree
 - 100% Smoothing PSTM Velocity Fields
 - HIGH DENSITY VELOCITY ANALYSIS (25 m)

- **Final Stack:**
 - NMO USING PSTM VELOCITY FIELDS
 - INNER AND OUTER MUTES
 - FINAL STACK AND ANGLE STACK
 - Near & Far by 50% split in the middle of muted data
 - GUN AND CABLE STATICS CORRECTION –10.3 MS
 - ZERO PHASE-ING TO MACH ARCHER 3D WELL
 - RESIDUAL EXPONENTIAL GAIN CORRECTION
 - TIME SHIFT CORRECTION 4 MS
 - To mach Vintage GF91A and GF88C

- **Post Processing:**
 - SPECTRAL BALANCING

3.1.10 Detail Processing Flows for Vintage G80A

- **Pre-stack Processing:**
 - REFORMATING AND NAVIGATION MERGE:
 - Transcription from SEG2 into CGG Format,
 - Labelling and Geometry updating
 - Seismic and Navigation Merge

- ANTI ALIAS FILTER 100HZ/144DB
- REMOVE GUN DELAY -51.2 MS
- AMPLITUDE RECOVERY:
 - V*V*T Spherical Divergence Correction with 3 DB/SEC applied to 4 Second
- AUTOMATIC EDITING:
 - Statistical Trace Editing of Noisy and bad traces
- NMO USING VELOCITY SUPPLIED BY BHP
- FK VELOCITY FILTERING
 - Band Pass Mode, Starting Time calculation is Water Bottom, Taper is 400 ms,
 - Zone velocity preserve is -3000 m/s to 3000 m/s,
 - Zone tapering is -200000 m/s to -3000m/s and 3000m/s to 200000 m/s, Attenuation parameter is 30dB,
- ADJACENT TRACE SUMMATION (2:1)
- REMOVE NMO
- 1ST VELOCITY ANALYSIS EVERY 2 KM
- **Intermediate Pre-stack Processing:**
 - NMO USING 1ST VELOCITY FIELDS
 - F-X TRACE INTERPOLATION (CDP DOMAIN)
 - REMOVE NMO
 - NMO USING SCALING OF 1ST VELOCITY FIELDS:

Time (ms)	:	0	200	800	2000	5000	6000
Percentage (%)	:	85	85	92	90	88	88
 - RADON MULTIPLE ATTENUATION:
 - Application start time is 200 ms from Water Bottom Reference with length of tapering is 300 ms,
 - Transforms Range are DTMIN: -192ms to DTMAX: 2496ms with Parabola step (DDT) 16ms,
 - Primary Models are DTMIN: -192ms to DTCUT: 112 ms.
 - Interleave 2 with overlap 1
 - REMOVE NMO
 - SHOT AVERAGE WAVELET SHAPING DECON WITH REMOVABLE 1000 MS AGC
 - Operator computation window : 300 ms to -3500 ms, Operator length: 240 ms
 - Number of consecutive traces used for the calculation of operators: 48
 - NMO USING 1ST VELOCITY FIELDS
 - AMPLITUDE VERSUS OFFSET CORRECTION
 - REMOVE NMO
- **Migration:**
 - PSTM VELOCITY ANALYSIS:
 - Aperture 4000 m and dip 50 degree
 - 100% Smoothing 1st Velocity Field
 - PSTM VELOCITY PICK:
 - PSTM Velocity grid 1 KM
 - Analysis PSTM Velocity range: 90% - 110%
 - FINAL PSTM:
 - Aperture 4000 m and dip 50 degree
 - 100% Smoothing PSTM Velocity Fields
 - HIGH DENSITY VELOCITY ANALYSIS (25 m)
- **Final Stack:**
 - NMO USING PSTM VELOCITY FIELDS
 - INNER AND OUTER MUTES
 - FINAL STACK AND ANGLE STACK
 - Near & Far by 50% split in the middle of muted data
 - GUN AND CABLE STATICS CORRECTION -13.3 MS
 - ZERO PHASE-ING TO MACH ARCHER 3D WELL
 - RESIDUAL EXPONENTIAL GAIN CORRECTION
- **Post Processing:**
 - SPECTRAL BALANCING

3.2 Pre-stack processing

3.2.1 Reformatting and Navigation Merge

The first step was to transfer the data into CGG's internal format, labeling and editing being carried out according to field documents (observer logs), and updating the processing data base.

The CGG header derived from SEG-D or SEG-Y seismic data external header information such file numbering and range of traces. Base on the external header information, a seismic data was 2D geometrid and merged with the XY coordinate.

The following QCs were carried out:

- Control of parity errors on records causing a loss of trace.
- Control of the continuity of shotpoint numbering and geophone numbering.
- Identification of spike.
- Control of the amplitude of the swell noise for each trace of four shots for each line.

3.2.2 Amplitude Recovery

The loss of amplitude as a function of time is a result of several factors such as geometrical spreading of the wave front, absorption of the signal and conversion into S-waves.

Compensation is necessary to see the deeper data and to balance the primaries relatively to the multiples.

The gains recovery was done as a function of TxV^2 and as a function of T only, where V is a regional velocity function.

3.2.3 Statistical data editing

A Various statistical measures were used to detect and remove different types of seismic noise. A complete gather is read and divided into small window. For each window from each trace various statistics are computed to detect if noise is present. The statistics for each window are compared with average model statistics computed from nearby traces and nearby windows. Windows whose statistics lie outside the range of the model statistics are edited, by either scaling or by interpolation across anomalous samples.

3.2.4 FK Velocity Filtering

F-K Velocity Filter was performed on common shot gathers NMO corrected using BHP velocity supplied. The parameters were defined from ARCHER 3D processing flows. The F-K Velocity filter parameters are:

Band Pass mode, Starting time for filter calculation is water bottom reference, Taper is 400ms, attenuation parameter is 30dB, Zone velocity preserve is -3000 to 3000m/s, Zone Tapering is -200000m/s to -3000m/s and 3000m/s to 200000m/s.

3.2.5 Trace Adjacent Summation

Trace adjacent summation was performed to increase signal to noise ratio before stack.

3.2.6 1st Velocity Analysis

BHP provided reference function for 1st pass velocity analysis. The 1st pass velocities analysis were output in a grid 2000m and were picked using CGG's interactive velocity picking package, VELCOM. Velocity picking was done by CGG and quality controlled by BHP representative. QCs Stack and CMP-gathers with reference velocity fields and 1st velocity fields were displayed on paper plots

3.2.7 F-X Trace Interpolation

Traces Interpolation was carried out by the FXINT module. The program performing regular interpolation in the F-X domain (Frequency-X spatial). This interpolation generates a fixed number of traces between two consecutive input traces that are regularly distributed within the interval.

Input traces are CDP sorted with trace interval 50m. The implementation of F-X interpolation will provide traces with interval 25m and consequently double the fold.

3.2.8 Radon Multiple Attenuation

Multiple attenuation based on a velocities were performed using the CGG module MATRD. The parameters were defined from ARCHER 3D processing flows. Input data are interpolated traces and NMO corrected using selected percentages from 1st velocity fields. The QC's were produced on both CMP gather and Stack displays.

The parameters are:

Application start time is 1.1 of Water Bottom Reference with length of tapering is 300 ms, Transforms Range are DTMIN: -192ms to DTMAX: 2496ms with Parabola step (DDT) 16ms, Primary Models are DTMIN: -160ms to DTCUT: 112ms and time start are 300ms to 6000ms. Interleave 2, overlap 1

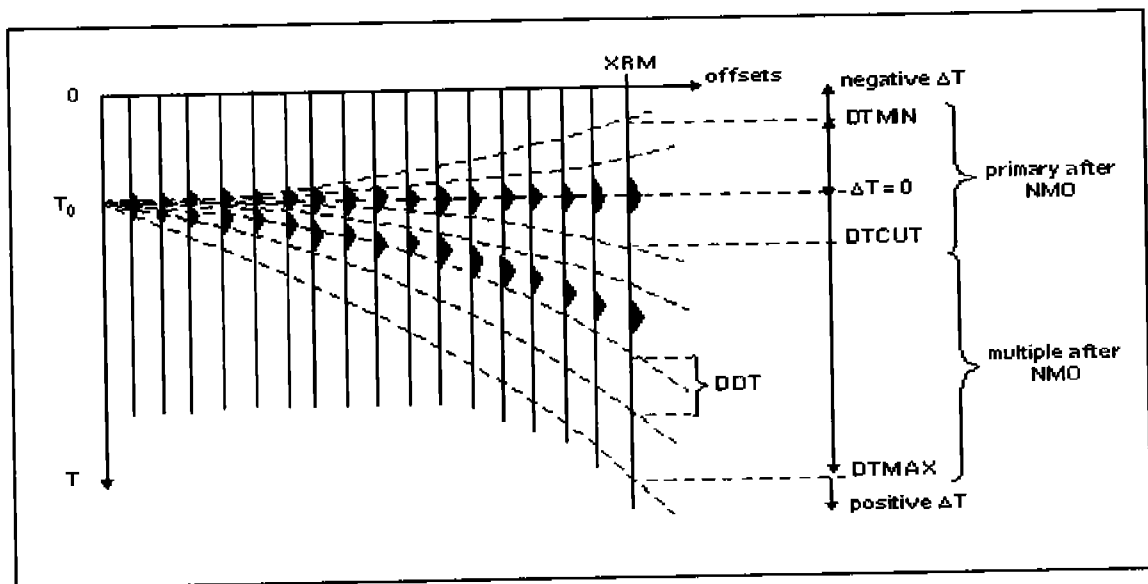


Figure 2. Hyperbolic Demultiple Diagrams

3.2.9 Shot Average Wavelet Shaping Decon

Shot Average Wavelet Shaping Decon is performed using CGG module DECB. The program estimates the signal wave-let which is assumed to be minimum phase.

The module performs the following operations:

- 1) Multichannel spectral estimation: The windows are taken into account on single traces and computation average energy spectrum relative to these windows. The wavelet phase is calculated by a Hilbert transform of the amplitude spectrum logarithm. The windows selection is 300 MS to - 3500 MS
- 2) Wavelet calculation: The phase spectrum was calculates by a Hilbert transform of the amplitude spectrum logarithm. In the time domain, wave-let was calculated by a reverse Fourier transforms.
- 3) Deconvolution operator calculation: A first operator is calculated to de-convolve the wavelet truncated to width estimate wavelet. A filter with a width given in data is calculated to reduce the noise amplified by the previous operator. This filter is merely the residual wavelet after deconvolution. The deconvolution operator applied to traces is the result of the convolution of the

whitening operator and filter. The operator Length is defined 240 ms, and the number traces is used for operator calculation is 120

The Shot Average Wavelet Shaping Decon is associated with removable 1000 ms AGC.

3.2.10 Surfaces Consistent Amplitude vs Offset Correction

Surfaces consistent amplitude vs offset correction was performed using CGG module AMPOF. The parameters were defined based on ARCHER 3D processing flows. The calculation was performed in each line basis. The purposes are to correct high frequency amplitude variation due to acquisition footprint and geology variation.

3.3 Pre-stack Time processing

3.3.1 Kirchhoff Migration

A Kirchhoff time migration for pre-stack 2D data was performed with a CGG module TIKIM. The TIKIM parameters were defined from ARCHER 3D processing flows.

▪ PSTM Velocity Analysis.

The PSTM velocity analysis was performed in 1 km grid with scanning velocity migration range from 90% up to 110%. The PSTM velocity analysis was picked using CGG interactive package VELCOM. Velocity picking was done by CGG, and QC'd by BHP representative. QCs Stack and CMP-gathers with reference velocity and PSTM velocity picked were displayed on paper plots.

▪ Full PSTM.

The PSTM velocity fields were used to migrate the seismic data set.

3.3.2 High Density Velocity Analysis

Automatic raw velocity picks were done using the CGG Geovector modules INVEL on 25-m grid intervals. The INVEL module generates stacking-velocities from non-NMO corrected CDP gathers by a process of automatic velocity analysis and picking. Stacking velocities are generated by a velocity scan at each input CDP gather. The scan is centred on input control velocity field and is within limits set by the user-supplied search constraints. The derived velocities are saved into velocity libraries.

3.4 STACK

3.4.1 Mutes

The Parameter Mutes of the 9th Vintages were defined:

□ Vintage GF88C

▪ Outer Mutes

WT. BTM	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset
4	4	100	4	259	162	260	786	872	1294	1650	1996	2800	2200	3100
150	100	100	100	259	162	260	786	932	1294	1708	1996	2800	2200	3100
350	325	100	325	259	360	260	753	950	1300	1700	2000	2550	2350	3100
450	425	100	425	259	460	260	753	950	1300	1650	2000	2550	2400	3100
750	725	100	725	259	760	260	1300	1550	2000	2550	2420	3100		
950	925	100	925	459	960	460	1300	1350	2000	2500	2460	3100		
1150	1125	100	1125	559	1160	560	1300	1100	2000	2209	2500	3100		
1350	1325	100	1325	659	2000	2059	2800	3100						
1650	1625	100	1625	759	2000	1759	3000	3100						
1950	1925	100	1925	859	3200	3100								

▪ Inner Mutes

WT. BTM	Time	Offset	Time	Offset	Time	Offset
4	1000	10	2000	300	5000	450
150	1000	10	2000	300	5000	450
350	1200	10	2100	300	5000	450
450	1300	10	2200	300	5000	450
750	1450	10	2300	300	5000	450
950	1650	10	2400	359	6000	459
1150	1850	10	2500	359	6000	459
1350	2050	10	2700	359	6000	459
1650	2450	10	3100	359	6000	459
1950	2650	10	3300	359	6000	459

□ Vintage GF91A

▪ Outer Mutes

WT. BTM	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset
4	4	157	4	290	162	307	686	872	1194	1650	1896	2800	2100	3107
150	100	157	100	290	162	307	686	932	1194	1708	1896	2800	2100	3107
350	325	157	325	290	360	307	653	950	1200	1700	1900	2550	2250	3107
450	425	157	425	290	460	307	653	950	1200	1650	1900	2550	2300	3107
750	725	157	725	290	760	307	1200	1550	1900	2550	2320	3107		

▪ Inner Mutes

WT. BTM	Time	Offset	Time	Offset	Time	Offset
4	1000	10	2000	300	5000	450
150	1000	10	2000	300	5000	450
350	1200	10	2100	300	5000	450
450	1300	10	2200	300	5000	450
750	1450	10	2300	300	5000	450

□ Vintage G92A

▪ Outer Mutes

WT. BTM	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset
4	4	145	4	345	162	357	686	872	1194	1650	1896	2800	2100	3107	3000	3900
150	100	145	100	345	162	357	686	932	1194	1708	1896	2800	2100	3107	3000	3900
350	325	145	325	345	360	357	653	950	1200	1700	1900	2550	2250	3107	3000	3900
450	425	145	425	345	460	357	653	950	1200	1650	1900	2550	2300	3107	3000	3900
750	725	145	725	345	760	357	1200	1550	1900	2550	2320	3107	3000	3900		

▪ Inner Mutes

WT. BTM	Time	Offset	Time	Offset	Time	Offset
4	1000	10	2000	300	5000	450
150	1000	10	2000	300	5000	450
350	1200	10	2100	300	5000	450
450	1300	10	2200	300	5000	450
750	1450	10	2300	300	5000	450

□ Vintage GS88A

▪ Outer Mutes

WT. BTM	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset
4	4	108	4	308	786	872	1294	1558	1996	2600	2400	3100	3000	3900
150	100	108	100	308	786	932	1294	1558	1996	2600	2400	3100	3000	3900
350	325	108	325	308	753	900	1300	1550	2000	2350	2500	3100	3000	3900
450	425	108	425	308	753	850	1300	1400	2000	2350	2500	3100	3000	3900
750	725	108	725	308	1300	1400	2000	2350	2600	3100	3000	3900		

▪ Inner Mutes

WT. BTM	Time	Offset	Time	Offset	Time	Offset
4	1000	10	2000	300	5000	450
150	1000	10	2000	300	5000	450
350	1200	10	2100	300	5000	450
450	1300	10	2200	300	5000	450
750	1450	10	2300	300	5000	450

□ Vintage G88A

▪ Outer Mutes

WT. BTM	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset
4	4	108	4	308	162	317	686	872	1194	1558	1896	2600	2200	3100	2700	3900
150	100	108	100	308	162	317	686	872	1194	1558	1896	2600	2200	3100	2700	3900
350	325	108	325	308	360	317	653	900	1200	1550	1900	2350	2350	3100	2700	3900
450	425	108	425	308	460	317	653	850	1200	1400	1900	2350	2400	3100	2700	3900
750	725	108	725	308	760	317	1200	1400	1900	2350	2420	3100	2700	3900		

▪ Inner Mutes

WT. BTM	Time	Offset	Time	Offset	Time	Offset
4	1000	10	2000	300	5000	450
150	1000	10	2000	300	5000	450
350	1200	10	2100	300	5000	450
450	1300	10	2200	300	5000	450
750	1450	10	2300	300	5000	450

□ Vintage G85A

▪ Outer Mutes

WT. BTM	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset
4	4	212	4	312	162	322	786	872	1344	1650	2096	2800	2550	3100
150	100	212	100	312	162	322	786	932	1344	1708	2096	2800	2550	3100
350	325	212	325	312	360	322	753	950	1350	1700	2100	2550	2600	3100
450	425	212	425	312	460	322	753	950	1350	1650	2100	2550	2650	3100
750	725	212	725	312	760	322	1350	1550	2100	2550	2670	3100		

▪ Inner Mutes

WT. BTM	Time	Offset	Time	Offset	Time	Offset
4	1000	10	2000	300	5000	450
150	1000	10	2000	300	5000	450
350	1200	10	2100	300	5000	450
450	1300	10	2200	300	5000	450
750	1450	10	2300	300	5000	450

□ Vintage GP81A

▪ Outer Mutes

WT. BTM	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset
4	4	236	4	346	162	357	686	872	1294	1650	2096	2800
150	100	236	100	346	162	357	686	932	1294	1708	2096	2800
350	325	236	325	346	360	357	653	950	1300	1700	2100	2550
450	425	236	425	346	460	357	653	950	1300	1650	2100	2550
750	725	236	725	346	760	357	1300	1550	2100	2550	2420	3107

▪ **Inner Mutes**

WT. BTM	Time	Offset	Time	Offset	Time	Offset
4	1000	10	2000	300	5000	450
150	1000	10	2000	300	5000	450
350	1200	10	2100	300	5000	450
450	1300	10	2200	300	5000	450
750	1450	10	2300	300	5000	450

□ **Vintage GE81A**

▪ **Outer Mutes**

WT. BTM	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset
4	4	220	4	380	162	397	686	872	1294	1650	2096	2800	2200	3157
150	100	220	100	380	162	397	686	932	1294	1708	2096	2800	2200	3157
350	325	220	325	380	360	397	653	950	1300	1700	2100	2550	2350	3157
450	425	220	425	380	460	397	653	950	1300	1650	2100	2550	2400	3157
750	725	220	725	380	760	397	1300	1550	2100	2550	2420	3157		

▪ **Inner Mutes**

WT. BTM	Time	Offset	Time	Offset	Time	Offset
4	1000	10	2000	300	5000	450
150	1000	10	2000	300	5000	450
350	1200	10	2100	300	5000	450
450	1300	10	2200	300	5000	450
750	1450	10	2300	300	5000	450

□ **Vintage G80A**

▪ **Outer Mutes**

WT. BTM	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset
4	4	262	4	462	162	472	686	872	1194	1650	1896	2800	2100	3157
150	100	262	100	462	162	472	686	932	1194	1708	1896	2800	2100	3157
350	325	262	325	462	360	472	653	950	1200	1700	1900	2550	2250	3157
450	425	262	425	462	460	472	653	950	1200	1650	1900	2550	2300	3157
750	725	262	725	462	760	472	1200	1550	1900	2550	2320	3157		

▪ **Inner Mutes**

WT. BTM	Time	Offset	Time	Offset	Time	Offset
4	1000	10	2000	300	5000	450
150	1000	10	2000	300	5000	450
350	1200	10	2100	300	5000	450
450	1300	10	2200	300	5000	450
750	1450	10	2300	300	5000	450

3.4.2 Stack

▪ **Full offset Stack:**

Full offset Stack was performed using CGG module STAPA or (Preserved Amplitude Trace Stack). Input traces are NMO corrected using PSTM velocity fields and muted using inner and outer trace mute as specified above. In STAPA module, to keep stack is preserved, all valid traces are selected, and at a given time of the stack trace, its weighting coefficient is equal with its stack fold. The results are verified on stack displays.

▪ **Near offset Stack and Far offset Stack:**

Near and far offset Stack was performed using CGG module STAPA with PS option (Partial Stack). The partial stack is generated for times within two percentages of the range lying in the interval

between two mute functions. Input traces are NMO corrected using PSTM velocity field and muted using inner and outer trace mute as specified above.

3.4.3 Residual Exponential Gain correction

Residual exponential gain correction was applied to balance the seismic data. Residual gain correction are defined:

Time (ms)	0	1000	2000	3000	6000
Amplitude Adjustment (dB)	0	3	6	9	9

3.4.4 Zero Phase

The Seismic data was zero-phased to match with the Archer 3D data and Archer well data. The test were done using lines test GF88C-61B and GF91A-39. The Zero phase filter was defined:

Sample Interval (SI): 4 ms

Shift of the operator 1st sample relative to the trace 1st sample: - 250 ms

Sample	Ampl.	Ampl.	Ampl.	Ampl.	Ampl.	Ampl.	Ampl.	Ampl.	Ampl.	Ampl.
1	14	-11	15	-12	16	-14	17	-15	18	-16
11	19	-18	21	-19	22	-20	23	-22	24	-23
21	25	-25	26	-26	28	-27	29	-29	30	-30
31	31	-31	32	-33	33	-34	34	-35	36	-37
41	37	-38	38	-39	39	-41	40	-42	41	-43
51	42	-45	44	-46	45	-48	46	-49	47	-50
61	48	-52	49	-53	50	-55	51	-56	53	-58
71	54	-59	55	-61	56	-62	57	-64	58	-65
81	59	-67	60	-68	61	-70	62	-72	63	-73
91	64	-75	65	-77	66	-78	67	-80	68	-82
101	69	-84	70	-86	71	-87	72	-89	73	-91
111	73	-94	74	-96	75	-98	76	-100	76	-102
121	77	-105	77	-107	78	-110	78	-112	79	-115
131	79	-118	79	-121	79	-124	79	-127	79	-130
141	79	-133	79	-137	79	-141	78	-144	77	-148
151	77	-153	75	-157	74	-162	73	-167	71	-172
161	69	-177	67	-183	64	-189	61	-195	58	-202
171	54	-209	50	-216	46	-224	41	-232	35	-240
181	29	-249	22	-259	15	-270	7	-281	-3	-294
191	-12	-307	-23	-322	-34	-338	-46	-355	-58	-373
201	-71	-395	-83	-419	-97	-445	-124	-537	-195	-575
221	-287	-551	-249	-423	-232	-406	-347	-431	-400	-331
231	-385	-266	-513	-337	-698	-336	-771	-250	-890	-280
241	-1148	-327	-1339	-220	-1474	-125	-1779	-130	-2190	-26
251	-2608	178	-3326	289	-4704	459	-7388	1047	-16232	4365
261	100000	-2668	12493	-1148	6725	-694	4608	-560	3406	-495
271	2742	-314	2376	-192	2011	-190	1715	-98	1599	43
281	1453	36	1211	7	1081	99	1019	129	837	54
291	671	94	655	204	599	198	459	208	439	356
301	479	442	402	481	310	439	257	432	220	425
311	191	419	167	413	144	406	124	398	106	390
321	90	382	74	373	60	364	48	356	36	347
331	25	338	16	329	8	321	0	313	-7	304
341	-12	296	-18	288	-23	280	-27	272	-31	264
351	-35	256	-38	249	-41	242	-43	235	-46	228
361	-48	221	-49	215	-51	208	-52	202	-53	196
371	-54	190	-55	185	-55	179	-56	174	-56	168
381	-56	163	-57	159	-57	154	-57	149	-56	145

391	-56	140	-56	136	-55	132	-55	128	-54	124
401	-54	120	-53	116	-52	113	-52	109	-51	106
411	-50	102	-49	99	-48	96	-47	93	-47	90
421	-46	87	-45	84	-44	81	-43	78	-41	76
431	-40	73	-39	70	-38	68	-37	65	-36	63
441	-35	61	-34	58	-33	56	-31	54	-30	52
451	-29	49	-28	47	-27	45	-26	43	-24	41
461	-23	39	-22	37	-21	35	-20	33	-18	32
471	-17	30	-16	28	-15	26	-14	24	-12	23
481	-11	21	-10	19	-9	18	-8	16	-6	14
491	-5	13	-4	11	-3	10	-2	8	-1	7
501	1	5	2	4	3	2	4	1	5	-1

3.4.5 Additional Residual Exponential Gain correction

□ Vintage G92A

Additional residual exponential gain correction was performed in the seismic data to balance with the vintage GF88C. Residual gain correction was defined:

Time (ms)	0	6000
Amplitude Adjustment (dB)	6	6

□ Vintage G85A

Additional residual exponential gain correction was performed in the seismic data to balance with the vintage GF91A. Residual gain correction was defined:

Time (ms)	0	6000
Amplitude Adjustment (dB)	12	12

□ Vintage G88A

Additional residual exponential gain correction was performed in the seismic data to balance with the vintage G92A. Residual gain correction was defined:

Time (ms)	0	6000
Amplitude Adjustment (dB)	3	6

3.5 POST PROCESSING

3.5.1 Spectral Balancing

In order to improve the resolution in the target, a spectral balancing was performed using BHP supplied filter. The filters were defined:

Filter 1.

Time (ms)	Band Pass Filter
0000 - 0800	04, 11, 19, 28
0804 - 2000	04, 10, 17, 25
2004 - 2800	04, 09, 15, 22

2804 - 3600	04, 08, 13, 19
3604 - 4400	04, 07, 11, 16
4404 - 5000	04, 06, 09, 13
5004 - 5800	04, 05, 07, 10

Filter 2.

Time (ms)	Band Pass Filter
0000 - 0800	11, 19, 28, 38
0804 - 2000	10, 17, 25, 34
2004 - 2800	09, 15, 22, 30
2804 - 3600	08, 13, 19, 26
3604 - 4400	07, 11, 16, 22
4404 - 5000	06, 09, 13, 18
5004 - 5800	05, 07, 10, 14

Filter 3.

Time (ms)	Band Pass Filter
0000 - 0800	19, 28, 38, 49
0804 - 2000	17, 25, 34, 44
2004 - 2800	15, 22, 30, 39
2804 - 3600	13, 19, 26, 34
3604 - 4400	11, 16, 22, 29
4404 - 5000	09, 13, 18, 24
5004 - 5800	07, 10, 14, 19

Filter 4.

Time (ms)	Band Pass Filter
0000 - 0800	28, 38, 49, 61
0804 - 2000	25, 34, 44, 55
2004 - 2800	22, 30, 39, 49
2804 - 3600	19, 26, 34, 43
3604 - 4400	16, 22, 29, 37
4404 - 5000	13, 18, 24, 31
5004 - 5800	10, 14, 19, 25

Filter 5.

Time (ms)	Band Pass Filter
0000 - 0800	38, 49, 61, 74
0804 - 2000	34, 44, 55, 67
2004 - 2800	30, 39, 49, 60
2804 - 3600	26, 34, 43, 53
3604 - 4400	22, 29, 37, 46
4404 - 5000	18, 24, 31, 39
5004 - 5800	14, 19, 25, 32

Filter 6.

Time (ms)	Band Pass Filter
0000 - 0800	49, 61, 74, 88
0804 - 2000	44, 55, 67, 80
2004 - 2800	39, 49, 60, 72
2804 - 3600	34, 43, 53, 64
3604 - 4400	29, 37, 46, 56
4404 - 5000	24, 31, 39, 48
5004 - 5800	19, 25, 32, 40

Filter 7.

Time (ms)	Band Pass Filter
0000 - 0800	61, 74, 88, 103

0804 - 2000	55, 67, 80, 94
2004 - 2800	49, 60, 72, 85
2804 - 3600	43, 53, 64, 76
3604 - 4400	37, 46, 56, 67
4404 - 5000	31, 39, 48, 58
5004 - 5800	25, 32, 40, 49

3.6 Final product

3.6.1 SEG-Y:

- **Raw PSTM Stack**
 - Segy of Raw Full Offset Stack (Zero phase)
 - Segy of Raw Near Offset Stack (Zero phase)
 - Segy Raw Far Offset Stack (Zero phase)
- **Final PSTM Stack**
 - Segy of Full Offset Stack (Spectral balancing)
- **PSTM Gather**

3.6.2 Velocity

- **Conventional Velocity fields**
 - 1st Pass Velocity fields (Western Format)
 - PSTM Velocity fields (Western Format)
- **High Density Velocity fields**
 - PSTM Velocity fields (Western Format)

- 1 Introduction**
- 2 Data acquisition**
- 3 Processing sequence**
- 4 Conclusion**
- 5 Annexes**

4 Conclusion and Recommendation

4.1 Specifics Problems

Several specific problems were discovered early in the processing such as:

- Missing observer reports (except GF88C)
 - No guidance to identify trace to be edited and missing file or Shot
 - Difficulties to identify File and Shot relationship
 - Difficulties to identify offset specification
 - Difficulties to identify with and without gun delay
 - Difficulties to identify Length of data recorded
- Difficulties to identify data for each line of each vintage.
 - Not enough information correspondence with multiple files on the data supplied.
 - Not recorded Julian time and day
 - Difficulties to identify Length of data recorded
- Some Vintages were supplied with not accurate near offset information
- Some Vintages were supplied without gun delay information.
- Velocity reference not fully supplied for entire the area
- Static shifts and parity errors due to 9 track transcription

The problems were mentioned above would bring some consequences such as:

- Some Vintages were supplied with not accurate near offset information
 - ✓ Data not tied with the lines crossing from the other vintages
 - ✓ Revised and repeat all the processing flows from beginning was performed due to:
 - Correct Geometry
 - Correct Velocity picked and FK-Velocity filtering,
 - Correct Radon Demultiple and Migration
 - ❖ Vintage G85A, GE81A and G80A
- Some Vintages were supplied without gun delay information.
 - ✓ Data not tied with the lines crossing from the other vintages
 - ✓ Revised and repeat all the processing flows from beginning was performed due to:
 - Correct Geometry
 - Correct Velocity picked and FK-Velocity filtering,
 - Correct Radon Demultiple and Migration
 - ❖ Vintage GP81, G88A and GS88A
- Some Vintages were not supplied with an accurate velocity fields or Velocity not fully supplied.
 - ✓ Revised and repeat the processing flows from FK-Velocity filtering and Velocity picked

4.2 Conclusion

The conclusion and key components of the 2D Time reprocessing were:

- ✓ Improvement in S/N after removing over corrected multiple energy with Parabolic Radon Demultiple
- ✓ Full Kirchhoff pre-stack time migration with temporal and spatial migration velocity field analysis:
 - It certainly helps to remove conflicting dips and allows for more accurate picking during the velocity analysis.
 - It has created an enhanced migration image

4.3 Recommendations for further works

- ❖ New multiple technology using deconvolution in the Tau-P domain is recommended in effort better multiple suppression
- ❖ Additional anti multiple after PSTM is also recommended in relevancy to attenuate short period multiple.
- ❖ AVO analysis and PSDM could be investigated to take into account lateral velocity variations and complex ray path imaging.

1 Introduction

2 Data acquisition

3 Processing sequence

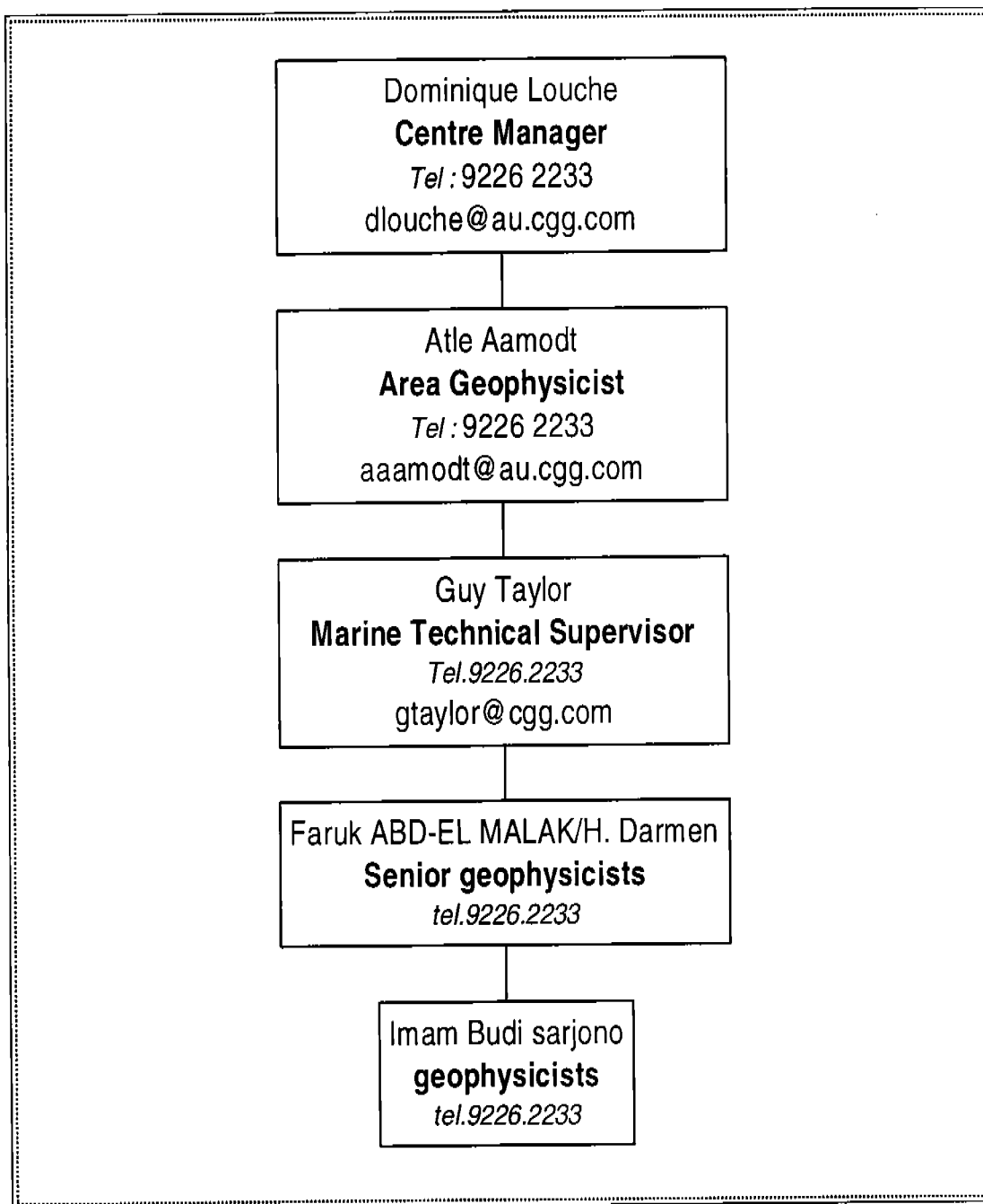
4 Conclusion

5 Annexes

5 Annexes

5.1 CGG personnel

The following personnel were involved with the processing of the survey:



5.2 Final Documents and Tapes

5.2.1 PSTM STACK

□ FINAL MIGRATED STACK (FULL OFFSET)

VINTAGE	Tape Number	File Number
GF88C	GF88C02	1 – 49
GF91A	GF91A02	1 – 43
GP81A	GP81A02	1 – 10
G85A	GP81A02	11 – 28
G88A	GP81A01	29 – 36
GS88A	GP81A01	37 – 40
G92A	GP81A01	41 – 50
GE81A	GE81A01	1 – 13
G80A	GE81A01	14 – 22
	G80A001	28 – 31

□ RAW MIGRATED STACK (FULL OFFSET)

VINTAGE	Tape Number	File Number
GF88C	GF88C01	1 – 49
GF91A	GF91A01	1 – 43
GP81A	GP81A01	1 – 10
G85A	GP81A01	11 – 28
	G80A001	5 – 22
G88A	GP81A01	29 – 36
	G80A001	23 – 27
GS88A	GP81A01	37 – 40
G92A	GP81A01	41 – 50
GE81A	GE81A01	1 – 13
G80A	GE81A01	14 – 22
	G80A001	1 – 4

□ RAW MIGRATED ANGLE STACK (NEAR TO MIDDLE OFFSET)

VINTAGE	Tape Number	File Number
G80A	GF88C03	1 – 13
G85A	GF88C03	14 – 31
G88A	GF88C03	32 – 39
GE81A	GF88C03	40 – 52
GF88C	GF88C03	53 – 101
GF91A	GF88C03	102 – 144
G92A	GF88C03	145 – 154
GP81A	GF88C03	155 – 164
GS88A	GF88C03	165 – 168

❑ **RAW MIGRATED ANGLE STACK (MIDLE TO FAR OFFSET)**

VINTAGE	Tape Number	File Number
G80A	GF88C04	1 – 13
G85A	GF88C04	14 – 31
G88A	GF88C04	32 – 39
GE81A	GF88C04	40 – 52
GF88C	GF88C04	53 – 101
GF91A	GF88C04	102 – 144
G92A	GF88C04	145 – 154
GP81A	GF88C04	155 – 164
GS88A	GF88C04	165 – 168

5.2.2 PSTM GATHERS

VINTAGE	Tape Number	File Number
GG88C	OW0410	1 – 10
	OW0411	1 – 11
	OW0412	1 – 11
	OW0413	1 – 16
GF91A	OW0414	1 – 12
	OW0415	1 – 10
	OW0416	1 – 14
	OW0417	1 – 7
G92A	OW0418	1 – 6
	OW0419	1 – 4
GS88A	OW0481	1 – 4
G88A	OW0482	1 – 8
G85A	OW0483	1 – 18
GP81A	OW0484	1 – 10
GE81A	OW0485	1 – 13
G80A	OW0486	1 – 13

5.2.3 VELOCITY

PROCESSING	Format	Tape Number
1 st Velocity Fields	Western	CD-01
Migration Velocity Fields	Western	CD-01
HD Velocity Fields (PSTM)	Western	CD-01

5.2.4 LINE LIST

□ Vintage GF88C

- Total Lines, Shots and Kms had to be processed

NO.	Line name	SP Int.	First SP	Last SP	Total SP	Km
1	GF88 C-1A	25	101	537	437	12.4250
2	GF88 C-2	25	101	549	449	12.7250
3	GF88 C-3M	25	101	698	598	16.4500
4	GF88 C-4	25	101	779	679	18.4750
5	GF88 C-6	25	101	783	683	18.5750
6	GF88 C-7M	25	101	1260	1160	30.5000
7	GF88 C-8	25	101	839	739	19.9750
8	GF88 C-10	25	101	763	663	18.0750
9	GF88 C-11M	25	101	1355	1255	32.8750
10	GF88 C-12M	25	101	1407	1307	34.1750
11	GF88 C-14A	25	101	1407	1307	34.1750
12	GF88 C-16A	25	774	1247	474	13.3500
13	GF88 C-16B	25	14	774	761	20.5250
14	GF88 C-18A	25	101	586	486	13.6500
15	GF88 C-18B	25	101	429	329	9.7250
16	GF88 C-19	25	101	1352	1252	32.8000
17	GF88 C-20	25	401	703	303	9.0750
18	GF88 C-21	25	101	687	587	16.1750
19	GF88 C-22	25	101	399	299	8.9750
20	GF88 C-23	25	101	689	589	16.2250
21	GF88 C-24M	25	101	800	700	19.0000
22	GF88 C-25M	25	101	689	589	16.2250
23	GF88 C-26	25	101	814	714	19.3500
24	GF88 C-27	25	101	564	464	13.1000
25	GF88 C-28	25	101	800	700	19.0000
26	GF88 C-29B	25	101	544	444	12.6000
27	GF88 C-31	25	101	696	596	16.4000
28	GF88 C-33	25	101	798	698	18.9500
29	GF88 C-34M	25	101	611	511	14.2750
30	GF88 C-35	25	101	921	821	22.0250
31	GF88 C-36	25	101	650	550	15.2500
32	GF88 C-37	25	101	836	736	19.9000
33	GF88 C-37A	25	1001	2097	1097	28.9250
34	GF88 C-38	25	101	703	603	16.5750
35	GF88 C-39	25	101	356	256	7.9000
36	GF88 C-40	25	101	479	379	10.9750
37	GF88 C-40A	25	344	550	207	6.6750
38	GF88 C-41	25	101	238	138	4.9500

39	GF88 C-42	25	101	605	505	14.1250
40	GF88 C-43	25	101	362	262	8.0500
41	GF88 C-44	25	100	593	494	13.8500
42	GF88 C-46	25	101	395	295	8.8750
43	GF88 C-49A	25	101	570	470	13.2500
44	GF88 C-51	25	101	356	256	7.9000
45	GF88 C-53	25	101	823	723	19.5750
46	GF88 C-61A	25	101	377	277	8.4250
47	GF88 C-61B	25	601	1070	470	13.2500
48	GF88 C-75	25	101	793	693	18.8250
49	GF88 C-75A	25	101	315	215	6.8750
50	GF88 C-83	25	101	763	663	18.0750

Total Shot = 29883.0000

Total KM = 809.6500

- **Total Lines, Shots and Kms Do not to be processed**

▪ **Due to:**

- **Diffraction Multiple**
- **Depth Water**

NO.	Line name	SP Int.	First SP	Last SP	Total SP	Km
1	GF88 C-20	25	101	400	300	7.5000
2	GF88 C-22	25	400	977	578	14.4500
3	GF88 C-24M	25	801	1710	910	22.7500
4	GF88 C-28	25	801	1711	911	22.7750
5	GF88 C-30	25	101	509	409	11.7250
6	GF88 C-32A	25	101	438	338	9.9500
7	GF88 C-89M	25	101	953	853	22.8250
8	GF88 C-91	25	101	955	855	22.8750
9	GF88 C-93	25	101	619	519	14.4750
10	GF88 C-95	25	101	560	460	13.0000
11	GF88 C-97	25	101	475	375	10.8750

Total Shot = 6508.0000

Total KM = 165.7000

□ **Vintage GF91A**

• **Total Lines, Shots and Kms had to be processed**

NO.	Line name	SP Int.	First SP	Last SP	Total SP	Km
1	GF91 A-1	25	2001	2598	598	16.4500
2	GF91 A-2	25	2001	2468	468	13.2000
3	GF91 A-3	25	2001	2498	498	13.9500
4	GF91 A-4	25	2001	2682	682	18.5500
5	GF91 A-5	25	2001	2509	509	14.2250
6	GF91 A-6	25	2001	2740	740	20.0000
7	GF91 A-7	25	2001	2670	670	18.2500
8	GF91 A-8	25	2001	2740	740	20.0000
9	GF91 A-9A	25	2001	2580	580	16.0000
10	GF91 A-10	25	2001	2741	741	20.0250
11	GF91 A-12	25	2001	2742	742	20.0500
12	GF91 A-14	25	2001	2743	743	20.0750
13	GF91 A-15	25	2001	3291	1291	33.7750
14	GF91 A-16	25	2001	2671	671	18.2750
15	GF91 A-17	25	2001	3250	1250	32.7500
16	GF91 A-17A	25	2561	3111	551	15.2750
17	GF91 A-18	25	2001	2744	744	20.1000
18	GF91 A-19	25	2001	3252	1252	32.8000
19	GF91 A-19B	25	2741	2981	241	7.5250
20	GF91 A-20	25	2001	2460	460	13.0000
21	GF91 A-21	25	2001	2576	576	15.9000
22	GF91 A-22	25	2001	2459	459	12.9750
23	GF91 A-23	25	2001	2874	874	23.3500
24	GF91 A-24	25	2001	2451	451	12.7750
25	GF91 A-25	25	2001	2418	418	11.9500
26	GF91 A-26	25	2001	2417	417	11.9250
27	GF91 A-28	25	2001	2416	416	11.9000
28	GF91 A-29A	25	2001	2422	422	12.0500
29	GF91 A-30	25	2001	2417	417	11.9250
30	GF91 A-31	25	2001	2422	422	12.0500
31	GF91 A-32	25	2001	2421	421	12.0250
32	GF91 A-33	25	2001	2577	577	15.9250
33	GF91 A-34	25	2001	2420	420	12.0000
34	GF91 A-35	25	2001	2590	590	16.2500
35	GF91 A-36	25	2001	2421	421	12.0250
36	GF91 A-37	25	2001	3219	1219	31.9750
37	GF91 A-38	25	2001	2422	422	12.0500
38	GF91 A-39	25	2001	2651	651	17.7750
39	GF91 A-40	25	2001	2423	423	12.0750
40	GF91 A-41A	25	2001	2740	740	20.0000
41	GF91 A-42	25	2001	2377	377	10.9250
42	GF91 A-44	25	2001	2313	313	9.3250
43	GF91 A-46	25	2001	2314	314	9.3500

Total Shot = 25931		
Total KM = 712.7750		

□ Vintage G92A

- Total Lines, Shots and Kms had to be processed

NO.	Line name	SP Int.	First SP	Last SP	Total SP	Km
1	G92A-3012	25	2001	2705	705	19.5000
2	G92A-3013	25	2001	3170	1170	31.1250
3	G92A-3020	25	2001	2593	593	16.7000
4	G92A-3021	25	2001	2819	819	22.3500
5	G92A-3022	25	2001	2733	733	20.2000
6	G92A-3023	25	2001	3306	1306	34.5250
7	G92A-3073	25	2001	3253	1253	33.2000
8	G92A-3074A	25	2001	3135	1135	30.2500
9	G92A-3076B	25	1900	2800	901	24.4000
10	G92A-3080	25	2001	3906	1906	49.5250
Total Shot = 10521						
Total KM = 281.7750						

- Total Lines, Shots and Kms Do not to be processed

- Due to:
 - Diffraction Multiple
 - Depth Water

NO.	Line name	SP Int.	First SP	Last SP	Total SP	Km
1	G92A-3041B	25	2001	2754	754	20.7250
2	G92A-3050	25	2001	4091	2091	54.1500
3	G92A-3067	25	2001	2651	651	18.1500
4	G92A-3068	25	2001	2517	517	14.8000
5	G92A-3068A	25	3838	2421	1418	37.3250
6	G92A-3076M	25	2718	4577	1860	48.3750
7	G92A-3401	25	2001	2556	556	15.7750
8	G92A-3403	25	1001	2139	1139	30.3500

9	G92A-3405	25	2001	2701	701	19.4000
10	G92A-3406	25	2001	2797	797	21.8000
11	G92A-3407	25	2001	2832	832	22.6750
12	G92A-3408	25	2001	2557	557	15.8000
				Total Shot	=	11873
				Total KM	=	319.3250

□ **Vintage G88A**

• **Total Lines, Shots and Kms had to be processed**

NO.	Line name	SP Int.	First SP	Last SP	Total SP	Km
1	G88A-9147	25	2001	2317	317	9.8000
2	G88A-9148	25	2240	1924	317	9.8000
3	G88A-9149	25	2240	1925	316	9.7750
4	G88A-9150	25	2001	2357	357	10.8000
5	G88A-9151	25	2001	2319	319	9.8500
6	G88A-9154	25	2380	1924	457	13.3000
7	G88A-9155	25	2001	2515	515	14.7500
8	G88A-9156	25	2001	2475	475	13.7500
				Total Shot	=	3073
				Total KM	=	91.8250

• **Total Lines, Shots and Kms Do not to be processed**

▪ **Due to:**

- Shotpoints not complete (Missing sp: 2128 – 2217)

NO.	Line name	SP Int.	First SP	Last SP	Total SP	Km
1	G88A-9153	25	2342	1924	419	12.3500
				Total Shot	=	419
				Total KM	=	12.35

□ Vintage GS88A

- Total Lines, Shots and Kms had to be processed

NO.	Line name	SP Int.	First SP	Last SP	Total SP	Km
1	GS88A-1	25	101	203	103	4.4500
2	GS88A-1A	25	204	589	386	11.5250
3	GS88A-3	25	101	228	128	5.0750
4	GS88A-3A	25	229	588	360	10.8750
5	GS88A-5	25	770	121	650	18.1250
6	GS88A-5A	25	120	24	97	4.3000
7	GS88A-7	25	765	23	743	20.4500
Total Shot =						2467
Total KM =						74.8000

□ Vintage GS88A

- Total Lines, Shots and Kms had to be processed

NO.	Line name	SP Int.	First SP	Last SP	Total SP	Km
1	G85A-8063	30	2205	1950	256	9.1200
2	G85A-8064	30	2001	2207	207	7.6500
3	G85A-8065	30	2001	2207	207	7.6500
4	G85A-8066	30	2001	2240	240	8.6400
5	G85A-8067	30	2198	1951	248	8.8800
6	G85A-8068	30	2222	1948	275	9.6900
7	G85A-8069	30	2001	2250	250	8.9400
8	G85A-8070A	30	2172	1948	225	8.1900
9	G85A-8071	30	2145	1947	199	7.4100
10	G85A-8072	30	2001	2314	314	10.8600
11	G85A-8073	30	2001	2323	323	11.1300
12	G85A-8074	30	2001	2309	309	10.7100
13	G85A-8075	30	2001	2313	313	10.8300
14	G85A-8077	30	2322	1950	373	12.6300
15	G85A-8078	30	2130	1942	189	7.1100
16	G85A-8079	30	2001	2223	223	8.1300
17	G85A-8080	30	2172	1950	223	8.1300
18	G85A-8081	30	2001	2223	223	8.1300

Total Shot = 4597
Total KM = 163.8300

□ Vintage GE81A

- Total Lines, Shots and Kms had to be processed

NO.	Line name	SP Int.	First SP	Last SP	Total SP	Km
1	GE81A-5080	25	2440	1936	505	13.8250
2	GE81A-5081	25	2000	2351	352	10.0000
3	GE81A-5082	25	2000	2577	578	15.6500
4	GE81A-5083	25	2356	1939	418	11.6500
5	GE81A-5084	25	2353	1940	414	11.5500
6	GE81A-5085	25	2000	2459	460	12.7000
7	GE81A-5086	25	2376	1940	437	12.1250
8	GE81A-5087	25	2000	2824	825	21.8250
9	GE81A-5088	25	2000	2735	736	19.6000
10	GE81A-5089	25	2681	1940	742	19.7500
11	GE81A-5090	25	2000	2261	262	7.7500
12	GE81A-5090A	25	2262	2615	354	10.0500
13	GE81A-5091	25	2000	2673	674	18.0500
14	GE81A-5092	25	3074	1938	1137	29.6250
Total Shot = 7894 Total KM = 214.1500						

□ Vintage GP81A

- Total Lines, Shots and Kms had to be processed

NO.	Line name	SP Int.	First SP	Last SP	Total SP	Km
1	GP81A-1	25	1	736	736	19.6000
2	GP81A-2	25	1	901	901	23.7250
3	GP81 A-3	25	1	500	500	13.7000
4	GP81 A-4	25	1	929	929	24.4250
5	GP81 A-7	25	1	499	499	13.6750

6	GP81 A-8	25	1	840	840	22.2000
7	GP81 A-9	25	1	737	737	19.6250
8	GP81 A-11	25	1	499	499	13.6750
9	GP81 A-12	25	1	901	901	23.7250
10	GP81 A-13	25	1	580	580	15.7000
				Total Shot =	7122	
				Total KM =	190.0500	

□ **Vintage G80A**

- **Total Lines, Shots and Kms had to be processed**

NO.	Line name	SP Int.	First SP	Last SP	Total SP	Km
1	G80A-4139	25	2389	1945	445	12.3250
2	G80A-4140	25	2001	2405	405	11.3250
3	G80A-4140A	25	2406	2446	41	2.2250
4	G80A-4141	25	2001	2525	525	14.3250
5	G80A-4142	25	2407	1946	462	12.7500
6	G80A-4143	25	2001	2314	314	9.0500
7	G80A-4144	25	2592	1946	647	17.3750
8	G80A-4145	25	2314	1987	328	9.4000
9	G80A-4145A	25	2131	2007	125	4.3250
10	G80A-4146	25	2305	1944	362	10.2500
11	G80A-4147	25	2595	2287	309	8.9250
12	G80A-4148	25	2758	2676	83	3.2750
13	G80A-4148A	25	2001	2640	640	17.2000
14	G80A-4149	25	2001	2564	564	15.3000
15	G80A-4150	25	2001	2488	488	13.4000
16	G80A-4150A	25	2371	2777	407	11.3750
17	G80A-4150B	25	2701	2928	228	6.9000
18	G80A-4151	25	2563	1944	620	16.7000
				Total Shot =	6993	
				Total KM =	196.4250	