Envelope No. 9671

SA00 SEISMIC SURVEY
ACQUISITION AND PROCESSING REPORT

BECKLER 3D
GOYDER/MILLUNA 3D
FLY LAKE 3D
COWRALLI/HACKETT 3D
SWAN LAKE 3D
CASCADE

Submitted by

Santos Ltd

June 2001

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PRIMARY INDUSTRIES AND RESOURCES SA

SA00 SEISMIC SURVEY
COOPER BASIN REGION
SOUTH AUSTRALIA

ACQUISITION AND PROCESSING REPORT

Compiled by: K.R. Seedsman
Santos Ltd.
June 2001

LIST OF CONTENTS

1 INTRODUCTION

1.1 GENERAL

In the year 2000 Santos Ltd, as operator of petroleum exploration and development in numerous production licence areas in the Cooper/Eromanga Basins in the north-east of South Australia, carried out approximately 167 kilometres of conventional vibroseis reflection profiling ("2D") and 641 square kilometres of "3D" coverage, as the SA00 Seismic Survey.

A contract was awarded to Schlumberger Oilfield Australia Pty Ltd (Party 1161) for the acquisition of the survey and also of a similar survey in adjacent parts of south-west Queensland (the SQ00 Seismic Survey). Sub-contractor for line preparation was Denham and O'Keeffe Pty Ltd.

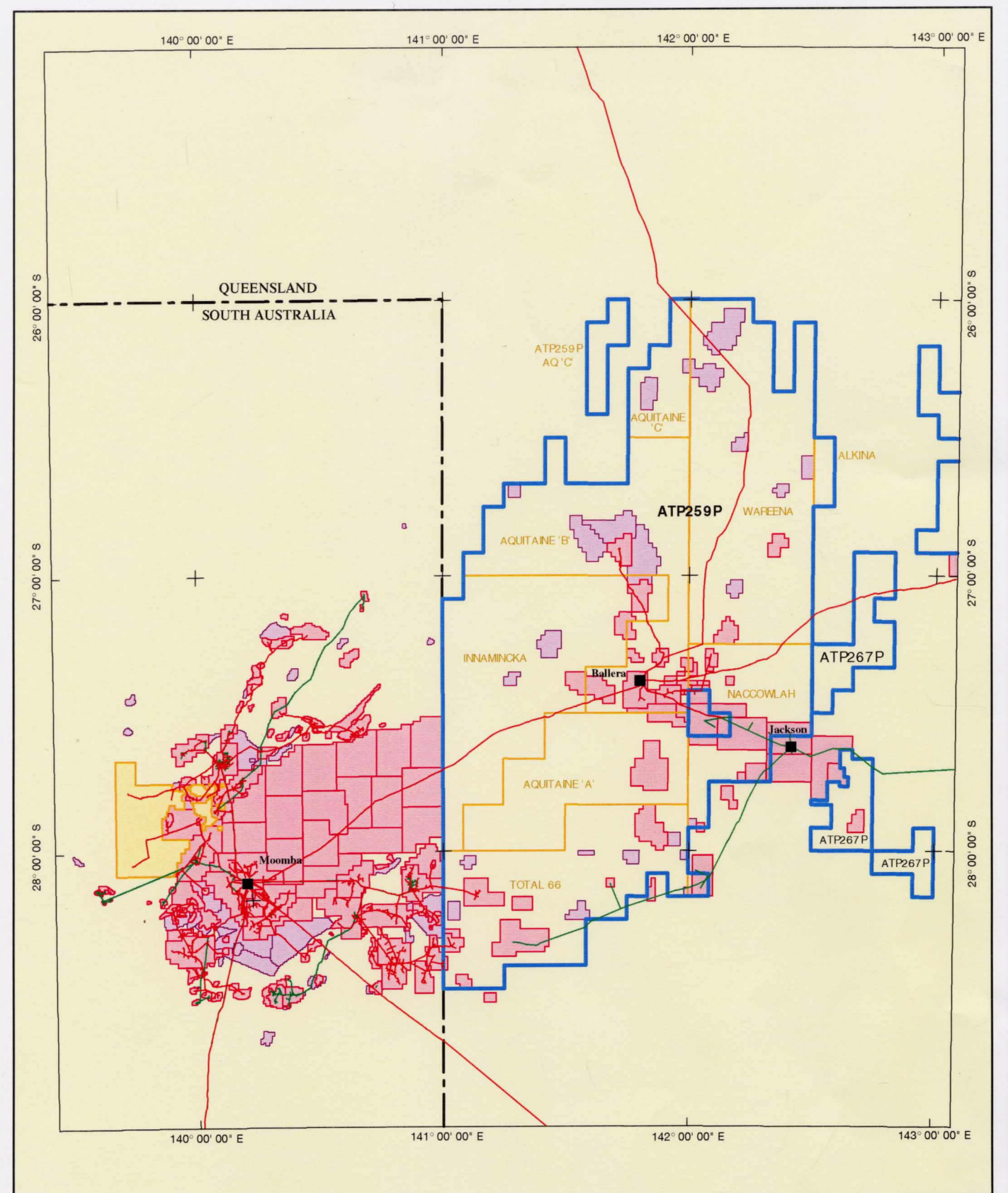
Santos Ltd contracted John Allen, Bruce Beer and Mike Walcott to supervise field operations, in alternating periods. Section 4 below, describing field operations, is drawn from their reports.

Most of the processing of the seismic data was carried out by Western Geophysical Australia in their centre in Adelaide. However, the Cowralli/Hackett/Tindilpie project was processed by CGG in their Perth processing centre.

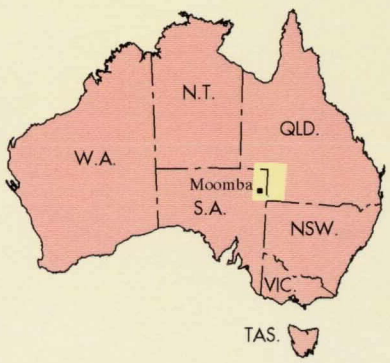
This report describes the SA00 Seismic Survey recorded in January, February, May, June and August 2000.

The survey covered parts or all of the following licences:

Project	Licences
Beckler	PPL 96, 97, 141
Goyder/Milluna	PPL 135, 139
Fly Lake	PPL 18
Cowralli/Hackett/Tindilpie	PPL 6, 91, 95, 140
Swan Lake	PPL 6, 17, 35, 91, 101, 107, 140
	PPLA Davren North
	PELA CO-00-G
Cascade	PEL 105, 106



LOCATION MAP



LEGEND

- A.T.P.
- P.P.L & P.L.
- P.P.L.A. & P.L.A.
- Block
- P.E.L. offer

NORTHEAST SOUTH AUSTRALIA
SOUTHWEST QUEENSLAND

SANTOS PERMITS

LOCATION MAP

0 kilometres 80

UTM, ANS, CM 141 00 00 E
Mapsheet datum: "AGD84"

Santos Ltd ABN 80 007 550 923

Santos
South Australia Business Unit

Author:	K. Seedsman
Drafted:	T.D./ D.R.O.
Original Scale:	1 : 2,150,000
Contour Interval:	N/A
Datum:	M.S.L.
Date:	July 1999
Revised Date:	October 2000
File Number:	COOPER 311

Figure 1

1.2 TIMETABLE OF MAIN EVENTS

10 December 1999	:	Line preparation commenced (Beckler 3D programme).
16 December 1999	:	Line preparation suspended (for Christmas/New Year break).
13 January 2000	:	Line preparation resumed (Goyder/Milluna 3D).
30 January 2000	:	Recording commenced (Beckler).
3 February 2000	:	Fly Lake line preparation completed, operations suspended for surveys elsewhere.
7 February 2000	:	Goyder/Milluna recording commenced.
8 February 2000	:	Data processing commenced (Beckler).
11 - 15 February 2000	:	Recording crew on weather standby.
21 February 2000	:	Fly Lake recording commenced.
28 February 2000	:	Fly Lake recording completed, operations suspended for surveys elsewhere.
28 February 2000	:	Goyder/Milluna data processing commenced.
16 March 2000	:	Fly Lake data processing commenced.
9 May 2000	:	Line preparation resumed (Cowralli/Hackett/Tindilpie/ Nephrite programme).
26 May 2000	:	Recording resumed (Cowralli etc. programme).
13 June 2000	:	Swan Lake 3D (Phase 1) line preparation completed. Operations suspended for work in Queensland.
19 June 2000	:	Swan Lake 3D (Phase 1) recording completed. Operations suspended for work in Queensland.
27 July 2000	:	Line preparation resumed (Cascade programme).
4 August 2000	:	Cascade line preparation completed - personnel and equipment returned to Queensland.
7 August 2000	:	Recording resumed (Cascade).
27 August 2000	:	Swan Lake recording completed. Operations suspended for recording in Queensland.
14 November 2000	:	Data processing completed.

2 SUMMARY

2.1 SA00 SEISMIC SURVEY

Programme: 14 x 2D lines
5 x 3D grids

Total Km: 167.40
Total Sq Km: 641.35

Contractors

Recording & Surveying	:	Schlumberger Oilfield Australia Pty Ltd
Line Preparation	:	Denham & O'Keefe Earthmoving
Data Processing	:	Western Geophysical, CGG

Normal Recording Parameters

2D Vibroseis, 120 channel, 60 fold, 37.5m GI,
2 sweeps/VP, 3 second linear upsweep,
5-90 Hz, 4 second listen.

3D Vibroseis, 768 or 1152 channel, 24 fold, 40m or 50m GI,
1 or 2 sweeps/VP, 3 or 6 second linear upsweep, 5-90 Hz, 3 or 4 second listen.
80m or 100m vibrator point interval (113m or 141m on zig zag source lines).

2.1.1 SA00 3D SEISMIC SURVEY

Programme: 5 x 3D grids Total Sq Km: 641.35

Prospect/Area:	Recorded:
Beckler	30 January - 5 February 2000
Goyder/Milluna	7 February - 19 February
Fly Lake	21 February - 28 February
Cowralli/Hackett/Tindilpie/Nephrite	26 May - 11 June
Swan Lake	8 June - 19 June, 19 August - 27 August

Recording Parameters

Vibroseis, 768 or 1152 channel, 24 fold, 40m or 50m GI, 2 sweeps/VP, 3 second linear upsweep, 5 - 90 Hz, 4 second listen.

Permitting

Pastoral Holdings	:	Gidgealpa	Innamincka	Merty Merty
Dates Permitted	:	13/9/99	13/9/99	14/9/99
		12/1/00	7/12/99	7/12/99
		19/5/00	4/2/00	
		Waukatanna		
		28/2/00		

Environmental

Terrain Types	:	Sand dunes and inter-dunal flats, Strzelecki Creek and floodplain.
Main Concerns	:	Minimal cutting of dunes, minimal disturbance of vegetation.

2.1.2 SA00 2D SEISMIC SURVEY

Programme: 14 x 2D lines Total Km: 167.4

Prospect/Area: Cascade Recorded: 7 August - 16 August 2000

Recording Parameters

Vibroseis (3 vibrators), 120 channels, 60 fold, 37.5m GI, 2 sweeps/VP,
3 second linear upsweep, 5 - 90 Hz, 4 second listen.

Permitting

Pastoral Holdings	:	Innamincka
Date Permitted	:	4/7/00

Environmental

Terrain Types	:	Gibber plains and low hills, sand dunes, sandy clay flats.
Main Concerns	:	No blade work on gibbers. Minimal cutting on dunes and flats. Minimal disturbance to vegetation.

3 SURVEY SCOPE AND OBJECTIVES

3.1 SA00 3D SEISMIC SURVEY

3.1.1 BECKLER

The Beckler structure is an early, elongate, north-south anticline with more than 600 acres of areal closure mapped to the LCC, and between 80 feet and 220 feet of vertical closure through the Permian section. Two or three smaller, independent, four-way closures appear to exist off the northern, basinward, end of the main structure, albeit in an area of sparse, poor quality 2D seismic coverage. A stratigraphic play is recognised beyond the south west area of critical spill, whereby basal Permian section is interpreted to onlap basement toward Dullingari. The existing 2D seismic grid is of insufficient quality and coverage to accurately predict crestal areas, structural features, critical spill, reservoir depth or sand thickness. Substantial misties also occur within this mixed-vintage data set. Recent 3D grids have yielded demonstrable benefits in these areas (eg. Cabernet Field 3D).

To facilitate further development/evaluation of the Beckler Field and local environs, it was proposed to acquire approximately 48 sq km of fully-migrated 3D seismic data over the area. Including the migration aperture properly to accommodate localised dips and taper-on to achieve at least half fold data, the total survey area was 71.68 sq km.

Receiver Lines	Stations	Km	Lines	Total Km
00-ER1208/1432	1608 - 1807	7.96	29	230.84

Source Lines	Stations	Km	Lines	Total Km
00-ES5212/5428	1608 - 1806	11.314	28	316.792

3.1.2 GOYDER/MILLUNA

The Goyder Field is a liquids-rich, Permian (Epsilon, Patchawarra) gas field located in a structurally-complex terraced area between the Allunga Trough and the Nappacoongee-Murteree Horst.

The Milluna structure is an elongate, north-west-trending anticline with two crestal lobes, the more south-westerly of which, located several kilometres north-east of the Goyder Field, was tested by Milluna 1, which produced gas.

The existing 2D seismic grids over these adjacent fields were of insufficient quality and extent to determine crestal areas, structural features, reservoir depths or sand thicknesses with sufficient accuracy for development purposes. Substantial misties exist within these mixed-vintage data sets.

To facilitate further development/evaluation of the Goyder and Milluna Fields, it was proposed to acquire approximately 48 sq km of fully-migrated 3D seismic over the area. Including the migration aperture properly to accommodate localised dips, and taper on to achieve at least half fold data, the total survey area was 86.63 sq km.

Receiver Lines	Stations	Km	Lines	Total Km
00-GR1000/1112	1008-1175	6.68	15	100.200
00-GR1120/1160	1000-1175	7.00	6	42.000
00-GR1168/1328	1008-1151	6.04	21	126.840
00-GR1336/1344	1008-1087	3.48	2	6.960
			44	276.000

Source Lines	Stations	Km	Lines	Total Km
00-GS5004/5116	1008-1174	9.504	15	142.560
00-GS5124/5156	1000-1174	9.956	5	49.780
00-GS5164/5324	1000-1150	8.598	21	180.558
00-GS5332/5340	1000-1086	4.978	2	9.956
			43	382.854

3.1.3 FLY LAKE

The Fly Lake-Brolga Field presently produces from thirteen wells, disposed as seven wells at Fly Lake Southwest (FL1, FL3, FL5, FL6, FL7, FL8, FL9), two wells at Fly Lake Northeast (FL2, FL4) and four wells at Brolga (BR1, BR2, BR3, BR4). Fly Lake 1 was drilled in 1971, with Fly Lake 9 and Brolga 4 being the last wells drilled on the field in 1994. Mingana 1 was drilled as an exploration well within the Fly Lake-Brolga PPL in 1984 and Grey 1 was drilled in 1991, some 1 km to the south east of the PPL. Both wells were plugged and abandoned, although Mingana has untested log pay.

The field was covered by a grid of 2D seismic lines of several vintages. The most important of these were the 1980 development grid (80-FB1 to 80-FB28) and the 1991 infill grid. The latter largely reduced the coverage of the Fly Lake Southwest culmination and Brolga to a ½ x ½ km grid spacing, with Fly Lake Northeast at 1 x ½ km grid (grading to 1 x 1 km on the flanks). Whilst these data were generally of good quality for their age, they were typically of low frequency (dominant frequencies averaging 25 hz for both survey sets in the target range).

Fly Lake was considered to be underdrilled relative to potential resource. Utilising a reasonably conservative 1 km diameter circular drainage area, there are potentially four development drilling opportunities associated with the NE structure, with the further possibility of one to the east of Fly Lake 9 on the SW culmination.

The 3D seismic programme was focussed on either highgrading these potential opportunities into optimally-located development wells or, conversely, avoiding the drilling of non-optimised locations based on the current 2D data set. It was envisaged that the 3D seismic programme would not only provide a clearer structural picture of the targeted locations, but through utilising additional post-interpretation techniques such as inversion, seismic trace and multi-variate analyses, a clearer understanding of reservoir distribution might be obtained.

Receiver Lines	Stations	Km	Lines	Total Km
00-FR1000/1104	1000-1199	9.95	14	139.30
00-FR1112/1144	1024-1199	8.75	5	43.75
00-FR1152/1208	1048-1199	7.55	8	60.40
00-FR1216/1232	1056-1199	7.15	3	21.45
00-FR1240/1280	1056-1183	6.35	6	38.10
			36	303.00

Source Lines	Stations	Km	Lines	Total Km
00-FS5004/5100	1000-1198	14.152	13	183.846
00-FS5108/5140	1024-1198	12.445	5	62.225
00-FS5148/5204	1048-1198	10.748	8	85.984
00-FS5212/5228	1056-1198	10.182	3	30.546
00-FS5236/5276	1056-1182	9.051	6	54.306
			35	416.907

Surface area covered 117.92 sq km

3.1.4 COWRALLI-HACKETT-TINDILPIE-NEPHRITE

Tindilpie 1, the first well in this area, was drilled in 1970, with Hackett 1 and Vatore East 1 the last wells drilled within the 3D project area, in 1997. Nephrite 1 (1 mmcfd), Nephrite South 1 (6 mmcfd) and the Cowralli 1, 2 and 3 (3 mmcfd) were the only currently producing wells in the area. The Tindilpie, Vatore, Vatore East and Hackett fields had not been brought into production at the time of the survey.

The objectives of this survey were:

- determination of the cause of discrepancies between mapped reserves and performance based reserves, by improving resolution of trapping to verify compartmentalisation of the fields;
- recognition of potential unaccessed field compartments;
- optimisation of well locations to improve production performance. It was expected that this would reduce the number of development wells required;
- anticipated cost savings achieved by reducing the number of uncommercial wells;
- potential identification of high net pay reservoir trends in the Patchawarra Formation, as intersected in the Kanawana Field (immediately to the north).
- detailed evaluation of the remaining eight prospects and leads for future exploration drilling;
- providing a tie with the Merrimelia 3D data set, possibly enabling improved structural interpretation across the major bounding fault, and attribute mapping.

Receiver Lines	Stations	Km	Total
00-AR1000/1032	1560-1743	9.150	45.750
00-AR1040/1072	1544-1743	9.950	49.750
00-AR1080/1096	1504-1751	12.350	37.050
00-AR1104/1152	1504-1775	13.550	94.850
00-AR1160/1224	1432-1775	17.150	154.350
00-AR1232/1256	1432-1655	11.150	44.60
00-AR1264	1432-1599	8.350	8.350
00-AR1272/1336	1524-1599	3.750	33.750
00-AR1344/1400	1524-1591	3.350	26.800
			495.250

Source Lines	Stations	Km	Total
00-AS5004/5036	1560-1742	13.011	65.055
00-AS5044/5076	1544-1742	14.142	70.710
00-AS5084/5100	1504-1750	17.536	52.608
00-AS5108/5156	1504-1774	19.233	134.631
00-AS5164/5220	1432-1774	24.324	194.592
00-AS5228/5252	1432-1654	15.839	63.356
00-AS5260/5268	1432-1598	11.879	23.758
00-AS5276/5332	1528-1598	5.091	40.728
00-AS5340/5396	1528-1590	4.525	36.200
			681.638

Surface area covered : 194.08 sq km

3.1.5 SWAN LAKE

Two fields were known within the survey area:

1. The Swan Lake Field itself comprised four wells drilled between 1986 and 1999.
2. Davren 1 and Davren 2 both discovered gas but neither was on-stream at the time of the survey.

The southern flank of the Merrimelia-Innamincka Ridge in the Swan Lake area has good prospectivity with many play-types occurring. There were a number of prospects and leads identified prior to the survey and it was intended that the proposed seismic grid would address these as well as other issues, as follows:

- identification of potential appraisal/development opportunities in the Swan Lake and Davren Fields;
- imaging of faults flanking the MEI Ridge south of the Merrimelia Field and interpretation of fault block compartmentalisation;
- interpretation of downthrown Patchawarra and Tirrawarra closures on the flanks of the MEI Ridge;
- interpretation of Toolachee, Epsilon and Patchawarra onlap plays against the MEI Ridge;
- potential imaging of natural fractures associated with the left lateral strike-slip offset zone between the Gidgealpa and Merrimelia Highs;
- identification of potential closures associated with the natural fracture play.

The grid was designed to be fully azimuthal, ie. cross-line offsets the same as in-line offsets, and to facilitate this 1,152 recording channels were employed for 12 receiver lines of 96 groups on each.

Receiver Lines	Stations	Km	Lines	Total Km
00-BR1272/1424	1308 - 1523	10.75	20	215.00
00-BR1432/1512	1308 - 1515	10.35	11	113.85
00-BR1520/1560	1332 - 1515	9.15	6	54.90
00-BR1568/1608	1332 - 1507	8.75	6	52.50
			43	436.25

Source Lines	Stations	Km	Lines	Total Km
00-BS5308/5324	1272 - 1510	12.00	3	36.00
00-BS5332/5508	1272 - 1606	16.80	23	386.40
00-BS5516	1272 - 1558	14.40	1	14.40
00-BS5524	1272 - 1422	7.60	1	7.60
			28	444.40

Surface area covered : 171.04 sq km.

3.1.6 RAVEN/MOONANGA/JACK LAKE

It had been intended to carry out a 3D survey of 172 sq km in this area and line preparation commenced early in December. However, operations were suspended some days later and the programme was deferred until the year 2001.

3.2 SA00 2D SEISMIC SURVEY

3.2.1 CASCADE

In the area immediately to the south-east of the Packsaddle gas field, on the southern flank of the Merrimelia-Innamincka Ridge, the seismic grid existing prior to 2000 consisted mainly of 1978 and 1981 2D lines of poor to moderate data quality and of approximate spacing of 2 km x 3.5 km.

A programme of fourteen 2D lines was recorded in this area to allow more-detailed interpretation of several pinchout plays within the Permian sequence onlapping the ridge, and the Kirby structural prospect.

Lines	Stations	Km
00-JPH	200 – 732	19.95
00-JPJ	200 – 728	19.80
00-JPK	200 – 544	12.90
00-JPL	200 – 552	13.20
00-JPM	200 – 520	12.00
00-JPN	200 – 476	10.35
00-JPP	200 – 440	9.00
00-JPQ	200 – 440	9.00
00-JPR	201 - 433	8.70
00-JPS	200 – 476	10.35
00-JPT	200 – 400	7.50
00-JPW	200 – 360	6.00
00-JPX	200 – 376	6.60
00-JPY	200 – 788	22.05
		167.40

4 DATA ACQUISITION

4.1 PERMITTING

4.1.1 GENERAL

The programmes comprising the SA00 Seismic Survey were located on portions of five pastoral properties. The managers of these stations were initially advised of forthcoming seismic operations by letters, with attached maps etc. Personal visits, and/or telephone contacts, by Santos field representatives, were made before, during the course of, and after, field operations.

4.1.2 SPECIFIC CONTACTS

4.1.2.1 LETTERS

Santos Ltd sent letters and maps describing particular seismic operations, and associated "Notices of Intended Entry upon Land", to station managers as follows:

Station	Seismic Programme	Date
Gidgealpa	Goyder/Milluna	13/9/99, 9/12/99
	Fly Lake	13/9/99, 4/2/00
	Cowralli/Hackett/Tindilpie	12/1/00
	Swan Lake	19/5/00
	Raven/Moonanga/Jack Lake	31/10/00
Innamincka	Beckler	13/9/99, 7/12/99
	Fly Lake	13/9/99, 4/2/00
	Cascade	4/7/00
Merty Merty	Goyder/Milluna	13/9/99, 7/12/99
Nappamerrie	Beckler	7/12/99
Waukatanna	Cowralli/Hackett/Tindilpie	28/2/00
	Raven/Moonanga/Jack Lake	31/10/00

4.1.2.2 PERSONAL VISITS

Field representatives of Santos Ltd visited station managers to discuss and obtain approval for various aspects of operations including timeframe, procedures, fences, gates, roads, campsites, water supply etc. as follows:

Station	Visit Date
Gidgealpa	25 January, 26 January, 24 February, 29 February
Innamincka	14 November '99, 12 December '99, 4 February '00, 15 February, 26 July
Merty Merty	6 January, 13 January, 22 January, 17 February
Nappamerrie	12 December '99

4.1.2.3 TELEPHONE CALLS

In addition to the above contacts, Santos representatives held further discussions with station managers by telephone or radio, as follows:

Station	Date
Gidgealpa	4 February, 19 February, 28 April, 9 June, 10 June, 20 June, 7 December
Innamincka	22 January, 31 January, 4 February, 14 February, 29 February.
Merty Merty	10 February, 12 February
Waukatanna	1 March, 10 April, 28 April, 10 December

4.2 LOGISTICS AND COMMUNICATIONS

The prime contractor, Schlumberger Oilfield Australia, provided a self-contained, air-conditioned, mobile camp, as listed in Appendix III, to house the field management, recording, surveying and maintenance personnel. The line-preparation party provided its own camp facilities.

Senior management of Schlumberger was located in Brisbane, with expediting, warehousing and repair facilities. Food, fuel, spare parts and other supplies were purchased through the Brisbane office, and delivered to the field by commercial carrier.

Twenty-four-hour telephone and facsimile communications were available to the prime contractors and Santos field representatives by means of Iterra or Optus portable satellite systems. In-field communications were facilitated by the use of radios, with one frequency common to all parties.

Royal Flying Doctor Service radio frequencies were fitted to all SSB radios for use in case of medical emergency etc, but fortunately were not required.

4.3 SURVEYING

4.3.1 EQUIPMENT

1 Trimble 4000 SSE GPS receiver
4 Trimble 4000 SSI GPS receivers
2 Trimble 4400 GPS receivers
4 Trimble DSM GPS receivers
5 Trimble NT200 GPS display units
Desktop and Notebook computers
Laser printer
SSB, VHF, UHF radios

4.3.2 GENERAL

The Schlumberger survey group consisted of five to nine personnel including one or two senior surveyors, a quality, health, safety and environment adviser sometimes also acting as the dozer pointer, and assistant surveyors and utility personnel.

4.3.3 SURVEY DATUM

GPS field survey data were collected on the World Geodetic System 1984 (WGS84) datum. They were then downloaded into Trimble Navigation's "Trimmap" software for conversion to the appropriate Australian datum. WGS84 co-ordinates were converted to the Australian Geodetic Datum 1984 (AGD84) and output in Australian Map Grid (AMG84) Zone 54 co-ordinates. Ellipsoidal heights were converted to the Australian Height Datum (AHD) using the OSU91A geoid separation model.

4.3.3.1 WGS84

Datum	World Geodetic System 1984
Spheroid	WGS84
Semi-Major Axis	6 378 137.0
Inverse Flattening	298.257
Unit of Measure	International Metre

4.3.3.2 AGD84

Datum	Australian Geodetic Datum 1984
Spheroid	Australian National Spheroid
Semi-Major Axis	6 378 160.0
Inverse Flattening	298.25
Unit of Measure	International Metre

4.3.3.3 TRANSFORMATION - WGS84 TO AHD84

Translations:	ΔX : 116.00m	ΔY : 50.47m	ΔZ : -141.69m
Rotations:	ϕx : 0.230"	ϕy : 0.390"	ϕz : 0.344"
Scale:	s : -0.0983ppm		

4.3.3.4 AMG ZONE 54

Projection:	AMG Zone 54
Latitude of origin:	0°
Central Meridian (CM):	141°E
Scale Factor at CM:	0.9996
False Easting:	500 000
False Northing:	10 000 000
Unit of Measure:	International Metre

4.3.4 CONTROL STATIONS

Project	Station	Easting	Northing	Elevation	Remarks
Beckler 3D	BM DULL 47	489 111.61	6 890 389.56	85.60	Dullingari #47
Goyder/Milluna 3D	BMS-MUD 4	455 401.215	6 869 149.441	46.183	Mudlalee #3
Fly Lake 3D	BM FLY 9	396 987.93	6 942 580.12	29.38	Fly Lake #9
Cowralli/Hackett 3D	BM HACKETT 1	397 886.44	6 913 852.99	31.82	Hackett #1
Swan Lake 3D	BM HACKETT 1	397 886.44	6 913 852.99	31.82	Hackett #1
Cascade 2D	BM BAU 2	490 843.12	6 958 331.63	101.67	Bauhinia #2

4.3.5 DATA PROCESSING AND QUALITY CONTROL

Survey data were collected in the field using the RTK (Real Time Kinematic) method of GPS surveying. The field data were collected in WGS84 format, then downloaded straight into Trimble Navigation's software where datum transformations and geoid separations were applied to obtain AMG Zone 54 co-ordinates and AHD heights. The data were then exported to a text file for editing and quality control checks.

Once the exported text file was edited a series of checks were performed to verify the integrity of the data:

- The base co-ordinates and elevation were checked against the correct data.
- A chaining check, which computes bearing and distance between the station setout co-ordinates and the design co-ordinates. Any points outside tolerance were flagged, checked and moved to the correct position.
- Check shots to other stations in the prospect were computed.
- PM listings were edited and checked.
- Ties to old PMs were checked against Santos-supplied data.
- Files were checked for duplicate stations and gaps

Once the checks were complete the data files were converted to a format suitable to the IMS system. All data were checked against design in the IMS system and any queries sent back to survey for clarification.

At the end of the survey all data files were checked against the IMS database for any discrepancies.

Once the checks were complete the data files were converted to a format suitable for Santos. These files, along with an offset listing and a copy of the Permanent Markers file, were then written to disk and sent to Santos Ltd.

Schlumberger software called "Gecosurv" was used to manage processing tasks, perform checks on data files and format data. Backups were made at regular intervals during processing to safeguard against loss of data due to system failure or file damage.

4.3.6 PERMANENT MARKS

Permanent markers, consisting of star pickets with stamped aluminium tags attached, were placed at all corners of 3D grids, and at the ends and at various intervals along 2D lines. Locations are listed in Appendix II.

4.4 LINE PREPARATION

4.4.1 EQUIPMENT

Line preparation was carried out by Denham and O'Keeffe Pty. Ltd., who supplied as required up to ten personnel, and the following equipment:

1 Caterpillar D7 Bulldozer
3 Caterpillar D6R Bulldozers
2 Caterpillar Challenger (rubber-track) Bulldozers
2 Caterpillar 130G Graders
2 Caterpillar 12G Graders
Support vehicles
Self-contained camp

4.4.2 OPERATIONS

The line-preparation crews faced a variety of terrains such as sand dunes/ interdunal flats, creek channels, flood plains, crabhole flats, gibber plains and rises and dissected tablelands.

Modern line-preparation requires extreme care to avoid unacceptable environmental disturbance such as felling of trees, obstruction of creek channels, removal of rootstock, etc. With a large number of detours the work was completed with minimum disturbance to the environment. The line positioning was accomplished using a Trimble DSM GPS unit coupled with a Trimble NT200 display unit in each dozer and a 4000 SSI GPS receiver on a base station with known co-ordinates. This system obviates the need for line of sight and time consuming ranging, thereby leading to greater line preparation efficiency. The system also allows the operator to weave easily, thus avoiding vegetation and significantly reducing line visibility.

Heavy rollers were used to prepare lines over gibber plains and rises. Sometimes merely walking bulldozers along lines without bladework sufficed in these terrains. Ramps and detours to protect pipelines and other production installations were frequently necessary.

Including 3D receiver lines, orthogonal and zig-zag source lines, and 2D lines, a total of 4,159 km of line were prepared for the survey. (An additional 745 km of line were prepared at Raven/Moonanga but this project was deferred.)

4.5 RECORDING

4.5.1 EQUIPMENT

Schlumberger supplied and operated a complete I/O System 2 Digital Telemetric Vibroseis Recording System, including, as required

5	Mertz M26 Vibrators
1	I/O Line Interface Module
1	I/O System Control Module
1	I/O System Interface Module
1	I/O Correlator Stacker Module
2	I/O Operator Console Module - Future 486
1	Oyo DFM 480 Digital Camera
2	Fujitsu 3490 tape decks
1	Pelton Vibra Sig QC computer
10	Pelton Advance 5 Vibrator Control Units
1	Pelton Advance 5 Encoder Sweep Generator
1764	Geophone strings, double-ended with 12 x SM4, 10 Hz phones @ 3.5 metre spacing, 6 series x 2 parallel (480 strings for 2D operations)

294 I/O Remote Signal Conditioners (121 for 2D operations)

441 MRX Batteries (184 for 2D operations)

294 Line cables (85 for 2D operations)

15 Advance line tap cables (3 for 2D operations)

15 Advance line tap boxes (3 for 2D operations)

15 Near MRX cables (2 for 2D operations)

with adequate support including battery chargers, test equipment, radios etc.

4.5.2 GENERAL

The SA00 Seismic Survey consisted of 167 km of conventional "2D" lines and five "3D" grids involving 1,798 km of zig-zag source line and 498 km of orthogonal source line. The survey required 67 recording-crew-days, 10 for 2D operations and 57 for 3D.

4.5.3 RECORDING PARAMETERS

4.5.3.1 3D PROGRAMMES, GROUP 1

Programme: Beckler
Goyder/Milluna

Lines: 00-ES5212 ⇨ 5428, 00-ER1208 ⇨ 1432
00-GS5004 ⇨ 5340, 00-GR1000 ⇨ 1344

Instrumentation

Instruments	:	I/O System 2
No. Channels	:	768 (8 lines of 96)
Tape Format	:	SEGD, 8058 IEEE Demultiplexed, 3490E Cartridge. Noise edited summed uncorrelated and correlated outputs
Filters	:	Hi-cut 103 Hz, 288 dB/Octave Lo-cut 5.5 Hz, 12 dB/Octave
Sample Rate	:	4 ms
Record Length	:	7 sec (3 sec sweep, 4 sec listen)

Source Data

Vibrators	:	3 x Mertz M26
Electronics	:	Pelton Advance 2
Sweep Frequency	:	5-90 Hz
Sweep Length	:	3 seconds
Sweep Function	:	Linear Upsweep
No. Sweeps/VP	:	2
Source Array	:	3 Vibs in line, P-P 18.85m standing (ie no move-up)

Receiver Data

Manuf/Model/Res freq.	:	Sensor SM4 10 Hz
No./String	:	12
Connection	:	Series/Parallel

Spread Parameters

Receiver Line Interval	:	320 m
Receiver Group Interval	:	40 m
Receiver Array	:	12 phones, in-line, 3.3m element spacing (no overlap)
Source Line Configuration	:	Zig-zag
VP Interval	:	113.1m (equivalent to 80m orthogonal interval)

4.5.3.2 3D PROGRAMMES, GROUP 2

Programme: Fly Lake
Cowralli/Hackett/Tindilpie/
Nephrite

Lines: 00-FS5004 ⇨ 5276, 00-FR1000 ⇨ 1280
00-AS5004 ⇨ 5396, 00-AR1000 ⇨ 1400

Instrumentation

Instruments	:	I/O System 2
No. Channels	:	768 (8 lines of 96)
Tape Format	:	SEGD, 8058 IEEE Demultiplexed, 3490E Cartridge. Noise edited summed uncorrelated and correlated outputs
Filters	:	Hi-cut 103 Hz, 288 dB/Octave Lo-cut 5.5 Hz, 12 dB/Octave
Sample Rate	:	4 ms
Record Length	:	7 sec (3 sec sweep, 4 sec listen)

Source Data

Vibrators	:	3 x Mertz M26
Electronics	:	Pelton Advance 2
Sweep Frequency	:	5-90 Hz
Sweep Length	:	3 seconds
Sweep Function	:	Linear Upsweep
No. Sweeps/VP	:	2
Source Array	:	3 Vibs in line, P-P 23.57m standing (ie no move-up)

Receiver Data

Manuf/Model/Res freq.	:	Sensor SM4 10 Hz
No./String	:	12
Connection	:	Series/Parallel

Spread Parameters

Receiver Line Interval	:	400 m
Receiver Group Interval	:	50 m
Receiver Array	:	12 phones, in-line, 4.17m element spacing (no overlap)
Source Line Configuration	:	Zig-zag
VP Interval	:	141.4m (equivalent to 100m orthogonal)

4.5.3.3 3D PROGRAMMES, GROUP 3

Programme: Swan Lake Lines: 00-BS5308 ⇨ 5524, 00-BR1272 ⇨ 1608

Instrumentation

Instruments	:	I/O System 2
No. Channels	:	1152 (12 lines of 96)
Tape Format	:	SEGD, 8058 IEEE Demultiplexed, 3490E Cartridge. Noise edited summed uncorrelated and correlated outputs
Filters	:	Hi-cut 103 Hz, 288 dB/Octave Lo-cut 5.5 Hz, 12 dB/Octave
Sample Rate	:	4 ms
Record Length	:	7 sec (3 sec sweep, 4 sec listen)

Source Data

Vibrators	:	3 x Mertz M26
Electronics	:	Pelton Advance 2
Sweep Frequency	:	5-90 Hz
Sweep Length	:	3 seconds
Sweep Function	:	Linear Upsweep
No. Sweeps/VP	:	2
Source Array	:	3 Vibs in line, P-P 16.7m standing (ie no move-up)

Receiver Data

Manuf/Model/Res freq.	:	Sensor SM4 10 Hz
No./String	:	12
Connection	:	Series/Parallel

Spread Parameters

Receiver Line Interval	:	400 m
Receiver Group Interval	:	50 m
Receiver Array	:	12 phones, in-line, 4.17m element spacing (no overlap)
Source Line Configuration	:	Orthogonal to receiver lines
Source Line Interval	:	400m
VP Interval	:	50m

4.5.3.4 2D PROGRAMME

Programme: Cascade Lines: 00-JPH ⇨ JPY

Instrumentation

Instruments	:	I/O System 2
No. Channels	:	120 (124 including centre gap)
Tape Format	:	SEGD, 8058 IEEE Demultiplexed, 3490E Cartridge. Dual-recorded, noise-edited uncorrelated sum and correlated sum
Filters	:	Hi-cut 103 Hz, 288 dB/Octave Lo-cut 5.5 Hz, 12 dB/Octave
Sample Rate	:	4 ms
Record Length	:	7 sec (3 sec sweep, 4 sec listen)

Source Data

Vibrators	:	3 x Mertz M26
Electronics	:	Pelton Advance 2
Sweep Frequency	:	5-90 Hz
Sweep Length	:	3 seconds
Sweep Function	:	Linear Upsweep
No. Sweeps/VP	:	2 (standing)
Source Array	:	3 Vibs in line, P-P 12.5m, MU zero

Receiver Data

Manuf/Model/Res freq.	:	Sensor SM4 10 Hz
No./String	:	12
Connection	:	Series/Parallel

Spread Parameters

Receiver Group Interval	:	37.5m
Receiver Location	:	Centred on stations
Receiver Array	:	12 phones, in-line, 3.1m element spacing (no overlap)
VP Interval	:	37.5m
VP Location	:	Symmetrical between stations
Spread Geometry	:	2306.25m - 18.75m - 0 - 18.75m - 2306.25m
Multiplicity	:	62 fold (60 fold processed)

4.5.4 OPERATIONAL PROCEDURE

4.5.4.1 QUALITY CONTROL

Prior to the commencement of the survey, and at approximate monthly intervals thereafter, a comprehensive set of tests was run on the recording instruments, remote signal conditioners, geophones, cables, etc. An abbreviated set of tests and checks was conducted each day before the start of production recording.

"Hardwire similarities" and "remote nest tests" were run at weekly intervals on all vibrators, and "radio similarities" were run daily. The Pelton Vibra Sig QC package provided continuous monitoring of individual vibrator performance during production operations.

A dedicated oscilloscope allowed the geophone spread to be monitored in real time during operations. Camera monitor records were produced frequently, generally from every tenth vibrator point.

Good line discipline in respect to geophone plants and spacing, and vibrator spacing, contributed to the high quality of seismic data recorded.

4.5.4.2 NORMAL PRODUCTION RECORDING

Most of the SA00 Seismic Survey field operation days recorded 3D coverage through 768 channels in eight parallel receiver lines 320m apart, of ninety-six geophone groups each.

Schlumberger used a line crew of thirty-one to thirty-nine to lay and move the geophones, cables and remote signal conditioner boxes. A line boss had responsibility for coordinating the line crew, and trouble-shooting the spread under the direction of the observer.

For 40m group intervals, geophones were laid along the line at intervals of approximately 3.3m so that there was also an interval of 3.3m between the last geophone of one group and the first geophone of the next. The line crew generally used eight, specially fitted, Toyota geophone and cable trucks, and a line boss' vehicle.

The energy source was three Mertz vibrators in line, nominally 18.85m apart pad-to-pad, sweeping twice per vibrator point. Each sweep was a 5 to 90 Hz linear upsweep, of three seconds duration.

Source lines were arranged in zig-zag fashion between adjacent receiver lines, making angles of 45° to these lines. Each diagonal segment contained four vibrator points spaced 113.1m apart and positioned such that each point was on the perpendicular to the mid-point between stations on the confining receiver lines.

For the Fly Lake, Cowralli and Swan Lake grids, receiver line interval was 400 metres, with group intervals 50 metres and individual geophone intervals 4.2m. Vibrator point intervals were 141.4m with pad-to-pad distances 23.6m.

Single, uncorrelated sweeps were recorded through the I/O System 2 instruments, summed and written to tape, followed by the correlated, noise-edited sum. Data format was SEGD with a tape density of 37871 bpi.

Further details of source and spread layouts and parameters are given in sections 4.5.3.1 and 4.5.3.2 and Appendix VII.

4.5.4.3 2D SURVEY

The Cascade programme recorded standard, 62 fold, split-spread, reflection profiling from 124 channels of data. As in 3D operations, the energy source consisted of three vibrators. Receiver-group and vibrator-point intervals were 37.5m.

Schlumberger reduced its line crew to eighteen to twenty-one people, and used five geophone and cable trucks, for 2D operations.

4.5.5 PRODUCTION

Production details are given in Appendix 1. The average production rate for 2D recording was 3.29 km per recording hour, or 1.69 km per chargeable hour. For the 2,297 km of recorded source line (mainly zig-zag) in the 3D surveys, average production was 7.56 km per recording hour, and 4.09 km per chargeable hour, which included 40 hours of standby time due to rain.

Total source-line length recorded for the whole SA00 survey was 2,468 km, on 67 recording days. (Several of these recording "days" were of only a few hours duration, because of the onset of rain etc.)

4.6 WEATHERING SURVEY

4.6.1 GENERAL

No new weathering data were acquired in the year 2000 in the areas of seismic recording operations. Processing of SA00 data used weathering data acquired in previous years in the areas concerned.

4.7 ENVIRONMENTAL CONSIDERATIONS

4.7.1 GENERAL

As operator, Santos Ltd. has, for a number of years, been committed to planning and conducting seismic operations in such a way that environmental disturbance is avoided or minimised, and affected areas can rehabilitate naturally in a reasonable time frame. These objectives have most recently been set out and discussed in the publications "Code of Environmental Practice, Seismic Operations", and "Environmental Procedures for Seismic Exploration in the Cooper Basin, South Australia (PEL's 5 & 6) and Queensland (ATP259P)" Santos Ltd., 1997.

The commitment has normally included the distribution of copies of the above to all contractors' personnel, and continual pressure by Santos Ltd. field representatives on these personnel to conform to the principles and requirements of the Code and Procedures.

Compliance with the Aboriginal Heritage Act has also been stressed, and during the year, the strategy to ensure meticulous adherence to standard Santos procedures relating to Cultural Heritage Management and Environmental Sensitivity was reinforced by special training of key personnel, and daily meetings to re-iterate key issues and procedures.

With occasional, minor exceptions, the crews worked extremely well to complete the survey efficiently under the stringent environmental restrictions applied.

Directives and guidelines issued to field personnel, relating to protection of the environment and cultural heritage, pastoral relations etc, are included in Appendix VIII.

4.7.2 ENVIRONMENT RECOVERY MONITORING

A method of systematically monitoring future recovery of areas affected by field operations was originated in each programme area.

At least two monitoring points, in differing types of terrain if present, were selected at intersections of lines, in each area. Where possible, intersections close to existing permanent roads or tracks were selected so that they might be readily found and re-occupied in the future with minimal adverse environmental effect. Tagged monuments (star droppers) identifying each monitor point were installed. A total of eighteen such "environmental monitoring points" was established within areas of SA00 seismic operations.

One to six photographs were taken at each point, in the directions of the intersecting lines, before line preparation, and again as soon as possible after completion of survey operations.

All such sets of photographs will be re-taken at intervals over a number of years, to build an historical photographic record, and allow future assessment, of natural rehabilitation and revegetation of ground occupied during the seismic surveys.

5.0 DATA PROCESSING

5.1 GENERAL

Most of the data processing was performed by Western Geophysical in their centre in Adelaide, with a small amount by Compagnie General de Geophysique in Perth.

Dependent upon local target depths, either three or four seconds of data were recorded in the field, at a sample rate of 4 milliseconds. In processing, the data were reduced to a datum at mean sea level. Surface elevations in the areas of operation ranged from 21 metres to 214 metres above datum. Depths of weathering ranged from 6 to 76 metres.

Exploration and production targets in the region occur in the geological interval between the top of the Upper Jurassic Namur Formation and the base of the Permian sequence. In the seismic data recorded in this survey, the top of the Namur Formation varies from about 1.0 seconds to 1.7 seconds below datum, with the base of the Permian ranging from about 1.3 seconds to about 2.6 seconds reduced time.

Data processing effectively commenced on 10 February 2000 with the supply by Santos of the first batch of static corrections to Western. Processing was completed on 14 November, when Santos approved the archiving on digital tape of the final batch of data.

Area-by-area processing reports are given in Appendix VI.

The basic sequences, and the major parameters shown below, have been developed over a number of years, during which a large amount of similarly-acquired data from the region has been processed.

5.2 WESTERN 2D PROCESSING STREAM AND TYPICAL PARAMETERS

The major processes and typical parameters applied in processing 2D data by Western Geophysical Australia were:

1.	Correlation	- Zero phase
2.	Sample Rate	- 4 ms
3.	Amplitude Recovery	- Alpha = 4 db/s,T2 = 3.0s
4.	Trace Edit	- Automatic
5.	Conversion	- Zero to minimum phase
6.	Deconvolution	- Spiking, 120ms operator
7.	Scaling -	- Time-variant, 500 ms gates, 10% overlap
8.	Brute stack	
9.	Residual static analysis	- Surface consistent, 1 x 1400 ms gate, 10-50 Hz DGF
10.	Residual statics	
11.	Preliminary stack	
12.	Velocity analysis	- 15 CDP "Velscan" - surface referenced
13.	NMO, mute and static corrections	
14.	CDP trim static analysis	- 1 x 2200 ms gate, 10-80 Hz DGF
15.	Stack	- Data processed -100 to +4000 ms
16.	Migration	- Finite difference or F-K, 100% smoothed datum-referenced velocities
17.	Spectral whitening	- 10-80 Hz
18.	Deconvolution	- F-X 25% addback
19.	Filtering	- 10-80 HZ bandpass
20.	Trace scaling	- Single window equalisation

5.3 WESTERN 3D PROCESSING STREAM AND TYPICAL PARAMETERS

1. Correlation - Zero phase
2. Sample Rate - 4 ms/Resample from 2 ms to 4 ms
3. Amplitude Recovery - "TAR", Alpha = 4 db/s, T2 = 3.0s
4. Trace Edit - Automatic
5. Conversion - Zero to minimum phase
6. Deconvolution - Spiking, 120 ms/200 ms operator
7. Spectral whitening - Time variant. Target 5-90 Hz (optional)
8. Scaling - Time variant, 500 ms gates, 10% overlap
9. Brute stack
10. Residual static analysis -surface consistent 1 x 800/1000 ms gate, 10-55 Hz DGF
11. Preliminary stack
12. Velocity analysis - 9 x 3 CMP cells - surface referenced
13. NMO, mute and static corrections - Applied four times before stack
14. CDP trim static analysis - 1 x 1800 ms gate, 10-75 Hz DGF
15. Trim Stack
16. DMO - Dip move-out correction.
17. Stack - Final stack, data processed -100 to +4000 ms
18. Interpolation - 1:2 cross line interpolation to square CDP bins
19. Migration - Modified residual, 100% smoothed datum-referenced velocities
20. Spectral whitening - 10-80 Hz
21. Filtering - Time-variant bandpass, 10 - 80 Hz
22. Trace scaling - Single window equalisation

5.4 CGG 3D PROCESSING STREAM AND TYPICAL PARAMETERS

1.	Correlation	- Zero phase
2.	Sample Rate	- 4 ms
3.	Amplitude Recovery	- Spherical Divergence Correction = VVT
4.	Trace Edit	- Automatic
5.	Phase Conversion	- Zero to minimum phase
6.	Deconvolution	- Surface Consistent Spike/200 ms operator
7.	Brute Stack	- With scaling (500 ms windows, 50% overlap)
8.	Residual Statics	- 3D surface consistent, 1900 ms gate
9.	Preliminary Stack	- With scaling
10.	Velocity Analysis	- Surface referenced, 0.5 km x 0.5 km grid
11.	NMO, mute and static corrections	- Applied four times before stack
12.	CDP trim static analysis	- 900 ms window
13.	Flex binning	- Eliptical (50m & 25m axes)
14.	Scale	- 500 ms windows, 50% overlaps
15.	DMO	- 65° dip limit Kirchoff 3D dip moveout correction
16.	Stack	- Final stack, data processed 0 to 4000 ms
17.	Interpolation	- 1:2 cross line interpolation to square cdp bins
18.	Migration	- 3D finite difference, 95% smoothed stacking velocities
19.	Spectral Whitening	- 8 - 80 Hz
20.	Filter	- 10 - 80 Hz, 0 to 4000 ms
21.	Scale	- Single 2000 ms window equalisation

~ APPENDIX I ~

RECORDING PRODUCTION STATISTICS

JANUARY						VIBROSEIS RECORDING PRODUCTION															
83A032/84B032						SA00 - BECKLER 3D															
						CHARGE HOUR ANALYSIS															
DATE	PROSPECT	CHNL	GI	SWATH	KM	REC	R/M	S/M	DET	WOS	P/M	T/MOVE	EXP	SPRD	S/BY	L.BON	TOTAL	TRAV	STNS LD	STNS P/U	CONFIG
30-Jan	Beckler	768	40	1	7.36000	1.80			0.50						0.30		2.60	0.20	1,800		Zig-Zag
31-Jan	Beckler	768	40	1 - 6	38.40000	8.70	0.40		0.70					0.50	0.30		10.60	0.60	400	490	Zig-Zag
KM/REC HR		4.20																			
KM/CHG HR		3.47																			
STNS LAID/CHG HR		166.67																			
MONTHLY TOTAL					45.76000	10.50	0.40		1.20					0.50	0.60		13.20	0.80	2,200	490	
PROJECT TOTAL					45.76000	10.50	0.40		1.20					0.50	0.60		13.20	0.80	2,200	490	
Brought Forward																					

FEBRUARY						VIBROSEIS RECORDING PRODUCTION																
83A032/84B032						SA00 - BECKLER 3D																
						CHARGE HOUR ANALYSIS																
DATE	PROSPECT	CHNL	GI	SWATH	KM	REC	R/M	S/M	DET	WOS	P/M	T/MOVE	EXP	SPRD	S/BY	L.BON	TOTAL	TRAV	STNS LD	STNS P/U	CONFIG	
01-Feb	Beckler	768	40	6 - 11	42.24000	9.40	0.30		0.30					0.10	1.20		11.30	0.50	1,000	1,020	Zig-Zag	
02-Feb	Beckler	768	40	12 - 16	37.28000	8.00			1.10					0.70	0.70		10.50	0.70	896	890	Zig-Zag	
03-Feb	Beckler	768	40	16 - 20	34.72000	8.30	0.30		0.90						1.40		10.90	0.70	904	938	Zig-Zag	
04-Feb	Beckler	768	40	21 - 24	32.00000	6.70			1.00						0.30		8.00	0.70	800	752	Zig-Zag	
05-Feb	Beckler	768	40	25 - 28	32.00000	6.70			1.00		2.64				0.60		10.94	0.30		1,310	Zig-Zag	
																			504	400	Zig-Zag	
PROJECT TOTAL																						
KM/REC HR		4.43																				
KM/CHG HR		3.45																				
STNS LAID/CHG HR		97.22																				
FEBRUARY																						
KM/REC HR		4.49																				
KM/CHG HR		3.45																				
STNS LAID/CHG HR		79.47																				
MONTHLY TOTAL					178.24000	39.10	0.60		4.30		2.64			0.80	4.20		51.64	2.90	4,104	5310		
PROJECT TOTAL					224.00000	49.60	1.00		5.50		2.64			1.30	4.80		64.84	3.70	6,304	5,800		
Brought Forward					45.76000	10.50	0.40		1.20					0.50	0.60		13.20	0.80	2,200	490		

FEBRUARY						VIBROSEIS RECORDING PRODUCTION															
83A016						SA00 - GOYDER/MILLUNA 3D															
											CHARGE HOUR ANALYSIS										
DATE	PROSPECT	CHNL	GI	SWATH	KM	REC	R/M	S/M	DET	WOS	P/M	T/MOVE	EXP	SPRD	S/BY	L.BON	TOTAL	TRAV	STNS LD	STNS P/U	CONFIG
06-Feb	Goyder/Milluna	768	40								1.54				0.60		2.14		504	400	Zig-Zag
07-Feb	Goyder/Milluna	768	40	1 - 3	19.20000	4.20	0.30		1.00						0.30		5.80	0.30	1,176		Zig-Zag
08-Feb	Goyder/Milluna	768	40	3 - 8	34.56000	6.70	0.50	0.10	4.00						0.30		11.60	0.60	672	757	Zig-Zag
09-Feb	Goyder/Milluna	768	40	9 - 14	40.32000	8.00	0.40	0.30	2.40						0.50		11.60	0.60	872	755	Zig-Zag
10-Feb	Goyder/Milluna	768	40	15 - 21	43.92000	9.00		0.70	0.90						0.30	0.50	11.40	0.70	1,264	1,360	Zig-Zag
11-Feb	Goyder/Milluna	768	40												8.00		8.00				Zig-Zag
12-Feb	Goyder/Milluna	768	40												8.00		8.00				Zig-Zag
13-Feb	Goyder/Milluna	768	40												8.00		8.00				Zig-Zag
14-Feb	Goyder/Milluna	768	40												8.00		8.00				Zig-Zag
15-Feb	Goyder/Milluna	768	40												8.00		8.00				Zig-Zag
16-Feb	Goyder/Milluna	768	40	21 - 27	36.40000	8.90	0.30		1.40						0.30		10.90	0.70	922	1,008	Zig-Zag
17-Feb	Goyder/Milluna	768	40	27 - 34	43.84000	8.70	0.50		1.60						0.30		11.10	0.70	1,131	1,064	Zig-Zag
18-Feb	Goyder/Milluna	768	40	34 - 41	45.44000	9.00			2.00						0.30		11.30	0.60	413	1,113	Zig-Zag
19-Feb	Goyder/Milluna	768	40	42 - 43	7.04000	1.40					1.54				0.30		3.24	0.30		887	Zig-Zag
KM/REC HR		4.68																			
KM/CHG HR		2.27																			
STNS LAID/CHG HR		58.40																			
MONTHLY TOTAL					270.72000	55.90	2.00	1.10	13.30		3.08				43.20	0.50	119.08	4.50	6,954	7344	
PROJECT TOTAL					270.72000	55.90	2.00	1.10	13.30		3.08				43.20	0.50	119.08	4.50	6,954	7,344	
Brought Forward																					

FEBRUARY						VIBROSEIS RECORDING PRODUCTION															
83A020						SA00 - FLY LAKE 3D															
						CHARGE HOUR ANALYSIS															
DATE	PROSPECT	CHNL	GI	SWATH	KM	REC	R/M	S/M	DET	WOS	P/M	T/MOVE	EXP	SPRD	S/BY	L.BON	TOTAL	TRAV	STNS LD	STNS P/U	CONFIG
20-Feb	Fly Lake	768	50								3.08						3.08				
21-Feb	Fly Lake	768	50	1 - 3	23.60000	4.10			0.60						0.30		5.00	0.60	1,200		Zig-Zag
22-Feb	Fly Lake	768	50	3 - 7	46.40000	8.60	0.30		1.80						0.30		11.00	1.00	600	727	Zig-Zag
23-Feb	Fly Lake	768	50	8 - 12	44.00000	7.90			2.40						0.30		10.60	0.70	909	873	Zig-Zag
24-Feb	Fly Lake	768	50	12 - 16	42.40000	7.60		0.40	2.80						0.30		11.10	0.60	827	924	Zig-Zag
25-Feb	Fly Lake	768	50	17 - 22	44.90000	7.90	0.80	0.10	3.30						0.30		12.40	0.70	699	980	Zig-Zag
26-Feb	Fly Lake	768	50	22 - 28	47.90000	8.50	0.40		2.90						0.30		12.10	0.40	715	936	Zig-Zag
27-Feb	Fly Lake	768	50	29 - 35	38.30000	6.50		0.40	2.90						0.30		10.10	0.40	455	804	Zig-Zag
28-Feb	Fly Lake	768	50	33 - 35	7.30000	1.30		0.30	2.00						0.30		3.90	0.20			Zig-Zag
KM/REC HR		5.47																			
KM/CHG HR		3.72																			
STNS LAID/CHG HR		68.18																			
MONTHLY TOTAL					294.80000	52.40	1.50	1.20	18.70		3.08				2.40		79.28	4.60	5,405	5244	
PROJECT TOTAL					294.80000	52.40	1.50	1.20	18.70		3.08				2.40		79.28	4.60	5,405	5,244	
Brought Forward																					

MAY

83A018/84B018

VIBROSEIS RECORDING PRODUCTION

SA00 - COWRALLI/HACKETT/TINDILPIE 3D

CHARGE HOUR ANALYSIS

DATE	PROSPECT	CHNL	GI	SWATH	KM	REC	R/M	S/M	DET	WOS	P/M	T/MOVE	EXP	SPRD	S/BY	L.BON	TOTAL	TRAV	STNS LD	STNS P/U	CONFIG
26-May	Cowralli	768	50	1 - 4	8.00000	1.40	0.60	0.20	0.30						1.90		4.40	0.30	1,242	180	Zig-Zag
27-May	Cowralli	768	50	5 - 9	34.20000	5.70		0.40	3.60						0.50		10.20	0.50	414	392	Zig-Zag
28-May	Cowralli	768	50	9 - 13	32.40000	5.90	0.50	0.40	2.30	0.90					0.30		10.30	0.50	828	923	Zig-Zag
29-May	Cowralli	768	50	13 - 17	33.10000	6.30		0.40	1.80						0.30		8.80	0.50	840	852	Zig-Zag
30-May	Cowralli	768	50	17 - 22	36.00000	6.90	0.70	0.50	2.10						0.60		10.80	0.50	855	976	Zig-Zag
31-May	Cowralli	768	50	22 - 26	25.90000	5.00		0.50	1.50					1.20	0.60		8.80	0.50			Zig-Zag
KM/REC HR		5.14																			
KM/CHG HR		3.18																			
STNS LAID/CHG HR		78.41																			
MONTHLY TOTAL					169.60000	31.20	1.80	2.40	11.60	0.90				1.20	4.20		53.30	2.80	4,179	3323	
PROJECT TOTAL					169.60000	31.20	1.80	2.40	11.60	0.90				1.20	4.20		53.30	2.80	4,179	3,323	
Brought Forward																					

JUNE					VIBROSEIS RECORDING PRODUCTION																
83A018/84B018					SA00 - COWRALLI/HACKETT/TINDILPIE 3D																
									CHARGE HOUR ANALYSIS												
DATE	PROSPECT	CHNL	GI	SWATH	KM	REC	R/M	S/M	DET	WOS	P/M	T/MOVE	EXP	SPRD	S/BY	L.BON	TOTAL	TRAV	STNS LD	STNS P/U	CONFIG
01-Jun	Cowralli	768	50	26 - 31	36.40000	6.10		0.50	2.10						0.30		9.00	0.60	760	492	Zig-Zag
02-Jun	Cowralli	768	50	32 - 33	8.30000	1.50	1.20	0.10	0.10						0.30		3.20	0.50	640	486	Zig-Zag
03-Jun	Cowralli	768	50	33 - 45	46.90000	8.20	1.20	0.60	0.70						0.30		11.00	0.50	524	803	Zig-Zag
04-Jun	Cowralli	768	50	46 - 51	31.20000	5.50	0.60	0.30	1.20						0.30		7.90	0.80	964	1,102	Zig-Zag
05-Jun	Cowralli	768	50	51 - 56	39.20000	6.70	0.80	0.20	1.30						0.30		9.30	0.50	1,113	795	Zig-Zag
06-Jun	Cowralli	768	50	56 - 60	40.30000	6.80	0.60	0.10	1.60						0.30		9.40	0.50	1,054	1,011	Zig-Zag
07-Jun	Cowralli	768	50	60 - 65	40.70000	7.40		0.20	1.20						0.30		9.10	0.70	787	1,068	Zig-Zag
08-Jun	Cowralli	768	50	65 - 68	22.60000	3.70		0.20	1.10						0.30		5.30	0.30	948	757	Zig-Zag
09-Jun	Cowralli	768	50	69 - 74	22.80000	3.60		0.70	0.80								5.10		888	813	Zig-Zag
10-Jun	Cowralli	768	50	75 - 79	15.80000	2.50		0.10	0.40			0.10			0.30		3.40	0.40	608	792	Zig-Zag
11-Jun	Cowralli	768	50	79 - 82	11.40000	1.90			1.40			0.10			0.30		3.70	0.40	864	780	Zig-Zag
KM/REC HR		5.41																			
KM/CHG HR		4.13																			
STNS LAID/CHG HR		109.82																			
MONTHLY TOTAL					315.60000	53.90	4.40	3.00	11.90			0.20			3.00		76.40	5.20	8,390	8407	
PROJECT TOTAL					485.20000	85.10	6.20	5.40	23.50	0.90	0.80	0.20		1.20	7.20		130.50	8.00	12,569	11,730	
Brought Forward					169.60000	31.20	1.80	2.40	11.60	0.90	0.80			1.20	4.20		54.10	2.80	4,179	3,323	

JUNE						VIBROSEIS RECORDING PRODUCTION															
84B650							SA00 - SWAN LAKE 3D														
										CHARGE HOUR ANALYSIS										
DATE	PROSPECT	CHNL	GI	SWATH	KM	REC	R/M	S/M	DET	WOS	P/M	T/MOVE	EXP	SPRD	S/BY	L.BON	TOTAL	TRAV	STNS LD	STNS P/U	CONFIG
08-Jun	Swan Lake	96	50	67 - 68	3.20000	0.30	1.20		0.30			0.40		2.20			4.40	0.40			Ortho
09-Jun	Swan Lake	96	50	68 - 75	14.80000	1.90	0.70	0.20				1.40		0.90	0.30		5.40	0.70			Ortho
10-Jun	Swan Lake	96	50	76 - 79	8.00000	1.10			0.10			0.80		1.80			3.80	0.30			Ortho
11-Jun	Swan Lake	96	50	80 - 92	23.20000	3.60		0.10	0.60			2.00					6.30	0.30			Ortho
12-Jun	Swan Lake	96	50	93 - 101	32.40000	3.80	0.70		0.70			3.10		1.20	0.30		9.80	0.70	808	552	Ortho
13-Jun	Swan Lake	96	50	102 - 108	25.20000	3.20	0.90		1.10	1.50		2.90			0.30	0.60	10.50	0.70	1,120	1,032	Ortho
14-Jun	Swan Lake	96	50	109 - 116	26.40000	2.90	0.80		0.30	1.50		2.80			0.30		8.60	0.50	900	960	Ortho
15-Jun	Swan Lake	96	50	116 - 121	23.20000	2.70	0.80		0.20			1.90		0.70	0.30	0.40	7.00	0.50	1,029	1,168	Ortho
16-Jun	Swan Lake	96	50	121 - 123	12.80000	1.30			0.70			1.10			0.30	1.50	4.90	0.50	499	100	Ortho
17-Jun	Swan Lake	96	50	123 - 129	32.00000	3.80	0.40		0.50			2.40			0.30		7.40	0.80	608	760	Ortho
18-Jun	Swan Lake	96	50	129 - 137	42.80000	4.40			0.70			4.20			0.30	0.40	10.00	0.70	1,064	1,216	Ortho
19-Jun	Swan Lake	96	50	137 - 144	44.40000	5.20	0.40		0.60			1.80			0.30		8.30	1.10	152	1,368	Ortho
KM/REC HR		7.19																			
KM/CHG HR		3.34																			
STNS LAID/CHG HR		71.53																			
MONTHLY TOTAL					288.40000	34.20	5.90	0.30	5.80	3.00		24.80		6.80	2.70	2.90	86.40	7.20	6,180	7156	
PROJECT TOTAL					288.40000	34.20	5.90	0.30	5.80	3.00		24.80		6.80	2.70	2.90	86.40	7.20	6,180	7,156	
Brought Forward																					

AUGUST					VIBROSEIS RECORDING PRODUCTION															
84A650						SA00 - CASCADE 2D														
												CHARGE HOUR ANALYSIS								
DATE	PROSPECT	CHNL	GI	LINE	STATIONS	KM	REC	R/M	L/M	DET	F DET	P/M	EXP	TRAV	SPRD	S/BY	TOTAL	TRAV	K/R.HR	K/C.HR
04-Aug	Cascade	124	37.5									4.80					4.80			
07-Aug	Cascade	124	37.5	JPS	200 - 340	5.25000	2.10			1.70		2.80		0.50	0.90	0.60	8.60	0.80		
08-Aug	Cascade	124	37.5	JPS	340 - 476	5.10000														
08-Aug	Cascade	124	37.5	JPR	433 - 201	8.70000	4.00	0.40	0.80	0.40				0.50		0.30	6.40	1.30		
09-Aug	Cascade	124	37.5	JPQ	200 - 440	9.00000														
09-Aug	Cascade	124	37.5	JPP	440 - 200	9.00000														
09-Aug	Cascade	124	37.5	JPN	200 - 400	7.50000	7.70		1.60	0.40				0.50		0.30	10.50	0.80		
10-Aug	Cascade	124	37.5	JPN	400 - 476	2.85000														
10-Aug	Cascade	124	37.5	JPM	520 - 200	12.00000														
10-Aug	Cascade	124	37.5	JPL	200 - 319	4.46250	5.90	1.50	2.10	0.90					0.30	0.30	11.00	0.50		
11-Aug	Cascade	124	37.5	JPL	319 - 552	8.73750														
11-Aug	Cascade	124	37.5	JPK	544 - 255	10.83750	6.80	0.80	1.00	1.50						0.30	10.40	0.70		
12-Aug	Cascade	124	37.5	JPK	255 - 200	2.06250														
12-Aug	Cascade	124	37.5	JPJ	200 - 630	16.12500	5.70	2.00	0.80	0.90						0.30	9.70	0.70		
13-Aug	Cascade	124	37.5	JPJ	630 - 728	3.67500														
13-Aug	Cascade	124	37.5	JPH	732 - 410	12.07500	4.60	1.50	0.80	2.10			0.30			0.90	10.20	0.70		
14-Aug	Cascade	124	37.5	JPH	410 - 200	7.87500														
14-Aug	Cascade	124	37.5	JPY	200 - 427	8.51250	4.50	2.00	0.80	1.90						0.30	9.50	0.80		
15-Aug	Cascade	124	37.5	JPY	427 - 788	13.53750														
15-Aug	Cascade	124	37.5	JPX	376 - 200	6.60000														
15-Aug	Cascade	124	37.5	JPW	200 - 225	0.93750	5.80	1.50	1.80	1.20				0.40		0.30	11.00	0.80		
16-Aug	Cascade	124	37.5	JPW	225 - 360	5.06250														
16-Aug	Cascade	124	37.5	JPT	400 - 200	7.50000	3.80		1.60	1.10				0.30		0.30	7.10	0.70		
MONTHLY TOTAL						167.40000	50.90	9.70	11.30	12.10		7.60	0.30	2.20	1.20	3.90	99.20	7.80	2.76	1.69
PROJECT TOTAL						167.40000	50.90	9.70	11.30	12.10		7.60	0.30	2.20	1.20	3.90	99.20	7.80	2.76	1.69
Brought Forward																				

AUGUST						VIBROSEIS RECORDING PRODUCTION															
84B650						SA00 - SWAN LAKE 3D															
						CHARGE HOUR ANALYSIS															
DATE	PROSPECT	CHNL	GI	SWATH	KM	REC	R/M	S/M	DET	WOS	P/M	T/MOVE	EXP	SPRD	S/BY	L.BON	TOTAL	TRAV	STNS LD	STNS P/U	CONFIG
16-Aug	Swan Lake	96	50								0.90						0.90				Ortho
17-Aug	Swan Lake	96	50								5.10				0.30		5.40				Ortho
18-Aug	Swan Lake	96	50												0.30		0.30		820		Ortho
19-Aug	Swan Lake	96	50	160 - 157.	12.80000	1.50		0.20	0.40			1.10			0.30		3.50	0.50	720		Ortho
20-Aug	Swan Lake	96	50	156 - 153	11.30000	1.40		0.20	0.40			1.40		0.60	7.80		11.80	0.50	206	235	Ortho
21-Aug	Swan Lake	96	50	153 - 146	23.50000	2.70	0.80	0.40	3.30			2.70			0.30		10.20	0.50	489	655	Ortho
22-Aug	Swan Lake	96	50	146-140, 162-165	40.40000	5.30		0.10	0.40			4.30			0.30		10.40	0.50	776	759	Ortho
23-Aug	Swan Lake	96	50	166 - 171	12.00000	1.70	1.00		0.30			1.00			0.30	1.80	6.10	0.50	679	768	Ortho
24-Aug	Swan Lake	96	50	172 - 179	16.00000	2.00			0.30			1.50		0.40	0.30	1.70	6.20	0.70	704	720	Ortho
25-Aug	Swan Lake	96	50	180 - 186	24.00000	3.60	1.60	0.20	1.40			2.40		1.40	0.30		10.90	0.50	548	360	Ortho
26-Aug	Swan Lake	96	50	187 - 192	26.00000	2.60		0.20	0.10			2.50		0.50	0.30		6.20	0.30	420	720	Ortho
27-Aug	Swan Lake	96	50	193 - 202	44.00000	5.80	0.90	0.20	1.00			2.00			0.30		10.20	0.40	512	512	Ortho
28-Aug	Swan Lake	96	50																	1,536	Ortho
KM/REC HR		6.80																			
KM/CHG HR		2.56																			
STNS LAID/CHG HR		71.55																			
MONTHLY TOTAL					210.00000	26.60	4.30	1.50	7.60		6.00	18.90		2.90	10.80	3.50	82.10	4.40	5,874	6265	
PROJECT TOTAL					498.40000	60.80	10.20	1.80	13.40	3.00	6.00	43.70		9.70	13.50	6.40	168.50	11.60	12,054	13,421	
Brought Forward					288.40000	34.20	5.90	0.30	5.80	3.00		24.80		6.80	2.70	2.90	86.40	7.20	6,180	7,156	

~ APPENDIX II ~

PERMANENT MARKS

~ APPENDIX II ~

PERMANENT MARKS

The following is a list of Permanent Markers placed for the Beckler 3D Seismic Survey.

Line	Stn	Easting	Northing	RL
00-ER1208	12081608	491 689.86	6893 996.33	80.02
00-ER1208	12081807	499 649.64	6893 993.87	88.58
00-ER1432	14321608	491 688.15	6902 958.01	84.00
00-ER1432	14321807	499 648.94	6902 956.07	85.42

The following is a list of Permanent Markers placed for the Goyder / Milluna 3D Seismic Survey.

Line	Stn	Easting	Northing	RL
00-GR1000	10001008	440 083.08	6 860 644.18	34.61
00-GR1000	10001175	444 807.14	6 855 921.22	41.71
00-GR1120	11201000	443 252.36	6 864 265.95	37.58
00-GR1120	11201008	443 480.71	6 864 042.53	35.28
00-GR1160	11601151	448 658.71	6 861 130.34	42.58
00-GR1160	11601175	449 334.66	6 860 449.22	46.80
00-GR1328	13281087	451 594.25	6 867 686.37	42.66
00-GR1328	13281151	453 408.02	6 865 879.49	47.06
00-GR1344	13441000	449 588.96	6 870 602.58	34.46
00-GR1344	13441087	452 047.98	6 868 139.79	44.66

The following is a list of Permanent Markers placed for the Fly Lake NE 3D Seismic Survey.

Line	Stn	Easting	Northing	RL
00-FR1000	10001000	389 115.66	6 944 894.72	27.80
00-FR1000	10001199	394 989.35	6 936 863.47	33.23
00-FR1104	11041000	393 315.99	6 947 969.51	34.81
00-FR1104	11041024	394 017.52	6 946 995.49	31.50
00-FR1144	11441024	395 634.08	6 948 179.75	33.10
00-FR1144	11441048	396 338.85	6 947 206.79	28.94
00-FR1208	12081048	398 925.45	6 949 101.21	30.15
00-FR1208	12081056	399 159.11	6 948 775.48	30.02
00-FR1112	11121024	394 342.53	6 947 233.47	33.02
00-FR1232	12321183	403 878.65	6 944 360.93	34.23
00-FR1232	12321199	404 352.47	6 943 716.33	58.55
00-FR1280	12801056	402 067.90	6 950 904.01	29.86
00-FR1280	12801183	405 816.47	6 945 775.54	32.68

The following is a list of Permanent Markers placed for the Cowralli / Hackett / Tindilpie 3D Seismic Survey.

Line	Stn	Easting	Northing	RL
00-AR1000	10001560	391 265.10	6 905 673.96	26.41
00-AR1000	10001743	384 893.40	6 912 239.77	25.03
00-AR1040	10401544	393 256.55	6 906 493.78	25.82
00-AR1040	10401560	392 705.33	6 907 071.92	48.70
00-AR1080	10801504	396 082.35	6 906 447.90	29.74
00-AR1080	10801544	394 692.79	6 907 886.98	28.00
00-AR1080	10801743	387 762.21	6 915 025.38	31.15
00-AR1080	10801751	387 483.64	6 915 312.68	31.40
00-AR1104	11041751	388 345.30	6 916 148.91	39.56
00-AR1104	11041775	387 507.73	6 917 004.41	35.08
00-AR1160	11601432	401 463.33	6 906 654.19	32.20
00-AR1160	11601504	398 957.00	6 909 238.56	32.06
00-AR1224	12241655	395 990.15	6 916 880.05	30.28
00-AR1224	12241775	391 810.46	6 921 185.27	26.80
00-AR1256	12561599	399 092.71	6 915 989.78	28.31
00-AR1256	12561655	397 141.04	6 917 997.93	26.90
00-AR1272	12721432	405 483.05	6 910 556.49	32.92
00-AR1272	12721523	402 314.77	6 913 822.78	40.25
00-AR1336	13361591	402 244.08	6 918 491.96	32.28
00-AR1336	13361599	401 964.04	6 918 778.12	43.69
00-AR1400	14001524	406 869.49	6 918 313.09	40.29
00-AR1400	14001591	404 538.24	6 920 719.01	32.25

The following is a list of Permanent Markers placed for the Swan Lake 3D Seismic Survey.

Line	Stn	Easting	Northing	RL
00-BR1272	12721308	409799.53	6906106.91	32.87
00-BR1272	12721523	402314.77	6913822.78	40.25
00-BR1472	14721308	416975.92	6913072.41	42.06
00-BR1480	14801515	410052.82	6920776.68	34.04
00-BR1512	15121308	418409.79	6914464.57	36.16
00-BR1512	15121332	417571.58	6915323.13	35.82
00-BR1560	15601508	413166.62	6923311.95	35.19
00-BR1560	15601515	412924.63	6923564.37	34.80
00-BR1608	16081332	421022.44	6918673.13	43.48
00-BR1608	16081507	414921.51	6924945.43	35.84

The following is a list of Permanent Markers placed during the Cascade 2D Survey:

Line	Station	Easting	Northing	Elev.	Comments
00-JPH	200	477165.82	6954391.94	121.03	EOL
00-JPH	366	480376.50	6949059.41	126.17	BEND
00-JPH	485	482768.36	6945291.57	100.68	BEND
00-JPH	588	484124.78	6941674.23	96.74	BEND
00-JPH	664	485224.57	6939045.35	115.87	BEND
00-JPH	732	486276.69	6936721.05	52.30	EOL
00-JPJ	200	480823.61	6955193.44	154.55	EOL
00-JPJ	280	482054.63	6952458.12	147.12	
00-JPJ	353	483177.81	6949961.26	159.21	BND X 00-JPY
00-JPJ	429	484433.12	6947402.49	126.58	BEND
00-JPJ	505	485329.21	6944697.71	104.05	
00-JPJ	587	486292.91	6941776.54	82.44	BEND
00-JPJ	616	486803.50	6940816.67	115.25	BEND
00-JPJ	669	487741.24	6939064.57	78.14	BEND
00-JPJ	728	488526.97	6936996.40	55.41	EOL
00-JPK	200	481922.97	6955496.26	150.20	EOL
00-JPK	250	482633.39	6953761.10	163.32	
00-JPK	337	483869.50	6950741.79	137.04	BEND
00-JPK	358	484265.62	6950061.21	145.06	BEND
00-JPK	370	484430.52	6949642.14	146.88	BEND
00-JPK	405	484810.13	6948385.91	120.19	BEND
00-JPK	502	486190.40	6945020.42	132.67	BEND
00-JPK	532	486626.92	6943989.75	116.21	BEND
00-JPK	544	486801.81	6943575.18	99.64	EOL
00-JPL	200	483180.45	6955886.13	137.31	EOL
00-JPL	283	484298.48	6952981.09	154.18	BEND
00-JPL	350	485199.04	6950636.24	123.92	BND X 00-JPY
00-JPL	393	485688.26	6949099.71	159.02	BEND
00-JPL	454	486482.72	6946954.49	129.83	BEND
00-JPL	473	486741.16	6946290.79	121.30	BEND
00-JPL	492	487023.53	6945636.64	124.86	BEND
00-JPL	508	487325.95	6945118.60	130.20	BEND
00-JPL	526	487648.19	6944529.72	155.42	BEND
00-JPL	539	487739.53	6944053.25	133.38	BEND
00-JPL	548	487870.47	6943743.71	150.79	BEND
00-JPL	552	487955.44	6943620.16	153.18	EOL
00-JPM	200	484450.56	6955718.07	139.54	EOL

Line	Station	Easting	Northing	Elev.	Comments
00-JPM	237	485074.78	6954479.06	147.83	BEND
00-JPM	291	485834.56	6952601.91	133.78	BEND
00-JPM	336	486468.05	6951035.48	115.46	X 00-JPY
00-JPM	417	487599.82	6948218.45	156.68	BEND
00-JPM	486	488464.95	6945779.97	125.66	
00-JPM	506	488728.42	6945080.11	162.23	
00-JPM	520	488947.95	6944603.33	162.18	EOL
00-JPN	200	485663.48	6955359.68	148.07	EOL
00-JPN	276	486753.43	6952726.93	149.74	BEND
00-JPN	316	487366.51	6951358.21	107.22	BEND
00-JPN	375	488252.78	6949331.67	121.58	
00-JPN	445	489311.74	6946928.87	180.16	BEND
00-JPN	476	489688.50	6945828.63	171.23	EOL
00-JPP	200	487045.69	6955877.76	128.41	EOL
00-JPP	250	487791.67	6954156.83	132.36	
00-JPP	318	488806.71	6951816.88	104.94	BND X 00-JPY
00-JPP	380	489757.42	6949695.02	150.23	BEND
00-JPP	440	490621.59	6947617.90	123.64	EOL
00-JPQ	200	488516.42	6956358.85	97.66	EOL
00-JPQ	253	489278.96	6954524.34	116.39	
00-JPQ	318	490205.77	6952271.36	101.11	X 00-JPY
00-JPQ	326	490321.00	6951994.65	99.72	BEND
00-JPQ	385	491124.14	6949945.15	110.66	
00-JPQ	440	491868.08	6948032.72	132.48	EOL
00-JPR	200	490056.65	6956714.74	94.84	EOL
00-JPR	224	490386.86	6955877.59	100.49	BEND
00-JPR	304	491492.18	6953089.35	91.04	BEND
00-JPR	351	492097.61	6951433.81	115.16	BEND
00-JPR	384	492460.05	6950250.86	150.29	BEND
00-JPR	430	493129.24	6948659.82	146.15	EOL
00-JPS	200	490387.96	6959444.01	102.45	EOL
00-JPS	299	491859.68	6956035.93	85.25	
00-JPS	381	493087.12	6953215.96	89.26	X 00-JPY
00-JPS	464	494334.57	6950363.59	130.04	X 78-JBQ
00-JPS	476	494511.28	6949950.54	167.51	EOL
00-JPT	200	492996.14	6957011.64	97.80	EOL
00-JPT	232	493481.77	6955914.11	84.07	BEND
00-JPT	336	494829.39	6952253.30	106.19	BEND
00-JPT	376	495481.96	6950903.64	144.22	BEND
00-JPT	400	495885.59	6950099.70	112.58	EOL
00-JPW	200	495203.41	6957443.96	83.74	EOL
00-JPW	232	495606.31	6956314.37	95.00	BEND
00-JPW	287	496354.00	6954392.49	76.99	X 00-JPY

Line	Station	Easting	Northing	Elev.	Comments
00-JPW	360	497360.59	6951846.55	71.88	EOL
00-JPX	202	497013.89	6958266.64	83.53	EOL
00-JPX	232	497380.12	6957202.73	86.78	BEND
00-JPX	264	497665.13	6956037.10	100.34	BEND
00-JPX	295	497925.49	6954904.14	111.37	X 00-JPY
00-JPX	318	498118.29	6954063.31	96.91	BEND
00-JPX	355	498599.33	6952762.32	144.54	BEND
00-JPX	376	498904.64	6952036.40	127.72	EOL
00-JPY	200	478430.02	6948376.26	109.26	EOL
00-JPY	333	483164.48	6949945.28	158.61	X 00-JPJ
00-JPY	360	484127.62	6950259.07	142.45	X 00-JPK
00-JPY	390	485192.54	6950617.03	124.58	
00-JPY	452	487400.11	6951345.58	106.85	X 00-JPN
00-JPY	570	491600.05	6952739.60	97.15	X 00-JPR
00-JPY	646	494305.87	6953634.59	97.01	X 00-JPT
00-JPY	668	495089.05	6953893.97	90.25	BEND
00-JPY	738	497556.58	6954789.87	109.29	BEND
00-JPY	788	499353.58	6955325.21	157.19	EOL

~ APPENDIX III ~

VEHICULAR EQUIPMENT LIST

APPENDIX III
VEHICULAR EQUIPMENT LIST

CAMP

Toyota 4x4 (Wagons) (3)	Party Chief, HS&E Officer, Ambulance
Mitsubishi Canter 4x4 (3)	RTS, Batteries, Rubbish
International Paystar 6x6 (7)	Water (3), Generator/Fuel, Mechanic, Tyres/Flat Deck, General Purpose
Hino 4x4 (2)	Supply
Kenworth 6x6	Fuel Haulage
Trailers/Vans (20)	Accommodation (9), Kitchen, Dining, Shower, Laundry, Office, Client Representative, Cable/Geophone Repair, Mechanic's Workshop/ Vibrator Spares, Stores, Fuel, Chemical Toilets

RECORDING CREW

Toyota 4x4 (Trucks) (10-12)	Line Boss, Line Crew (8-12), Depegging/Spare
Toyota 4x4 (Wagons) (3-6)	Line Crew (2-4), Vibrator Operators etc
Hino 4x4	Recording Truck
Mertz (5)	Vibrator Trucks
International Paystar 6x6	Vibrator Maintenance
Kenworth	Spread Haulage
Trailer	Spread

SURVEY CREW

Toyota 4x4 Trucks (4-5)	Surveyors (3), Dozer Pointer, QHSEA Personnel
Toyota 4x4 Wagon	
Hino 4x4	General Purpose/Stores
International Paystar 6x6	Water/Fuel/Generator
Trailers/Vans (2)	Accommodation/Office, Shower/Laundry

LINE PREPARATION CREW

Caterpillar D6R Bulldozers (3)	
Caterpillar 70C (Challenger) Bulldozer	
Caterpillar 12G Grader (2)	
Nissan 4x4 Trucks (3)	General Purpose
Kenworth (2)	Prime Movers
Allison (2)	Dozer Floats
Trailers (7)	Accommodation/Kitchen/Shower/Office (2), Workshop/Generator, Water, Fuel, Utility/Storage

~ APPENDIX IV ~

PERSONNEL LIST

APPENDIX IV

PERSONNEL LIST

Schlumberger Oilfield Australia	Party Chief
	Assistant Party Chief/ Administrator
	Health, Safety & Environment Officer (1-2)
	Medic
	Mechanics (1-2)
	IMS Operators (3D operations) (1 – 2)
	Instrument Engineers (1 – 2)
	Vibrator Technicians (1-2)
	Technicians (Cable, geophone repair etc) (1 – 2)
	Cooks (2)
	Camp Attendants (1 – 2)
	Supply Drivers (2 - 3)
	GPS Survey Crew (3 - 10)
	Observers (2 - 3)
	Vibrator Operators (4-7)
	Line Crew (16-35)
Denham & O'Keeffe Earth Moving Contractors	Supervisor/Camp Manager
	Operators (3 - 7)
	Mechanic
	Cook

~ APPENDIX V ~

DATA PROCESSING HISTORY

Module : EST00053
DB : PROD
User : EXPPAG

SANTOS Limited
Seismic Tracking Database System
Processing Report

Date : 31-JAN-2001
Time : 10:29
Page : 1

Processed Line	Joint Vent	Area Name	Acq	Pro	Santos Staff	Station	Statn Int	Line Length	Fld	No Chns	Acq Date	Data Proc	Stat Proc	Brute Rec	Prelim Stack	Prelim App	Final Stack	CGM App	Mig Rec	Tape Arc	CGM Rec	To GQS
00-BECK3D	SAU	BECKLER 3D	GEC	WGC	EXPSRB		40.00	224.000	24	768	050200	080200	100200	280200	280200	070400	110500	240500	220500	220500	060600	050600
00-COW3D	SAU	COWRALLI/HACKETT/TIN	GEC	CGG	EXPMIH		50.00	485.200	24	768	110600	300600	300600	230800	050900	070900	061000	311000	141100	141100	241100	161100
00-FLY3D	SAU	FLYLAKE 3D	GEC	WGC	EXPPAG		50.00	294.800	24	768	280200	160300	160300	300300	300300	050400	280400	190500	170500	170500	260500	230500
00-GOYD3D	SAU	GOYDER/MILLUNA 3D	GEC	WGC	EXPMIH		40.00	270.720	24	768	190200	220200	250200	230300	230300	270300	200400	030500	080500	080500	190500	090500
00-JPH	SAU	CASCADE	GEC	WGC	EXPMIH	200-732	37.50	19.950	60	124	140800	180800	040900	220900	210900	041000	131000	081100	241000	151100	151100	161100
00-JPJ	SAU	CASCADE	GEC	WGC	EXPMIH	200-728	37.50	19.800	60	124	130800	180800	040900	220900	210900	271000	301000	081100	301000	151100	151100	161100
00-JPK	SAU	CASCADE	GEC	WGC	EXPMIH	200-544	37.50	12.900	60	124	120800	180800	040900	220900	210900	041000	191000	081100	241000	151100	151100	161100
00-JPL	SAU	CASCADE	GEC	WGC	EXPMIH	200-552	37.50	13.200	60	124	110800	150800	040900	220900	210900	041000	191000	081100	241000	151100	151100	161100
00-JPM	SAU	CASCADE	GEC	WGC	EXPMIH	200-520	37.50	12.000	60	124	100800	150800	040900	220900	210900	041000	191000	081100	241000	151100	151100	161100
00-JPN	SAU	CASCADE	GEC	WGC	EXPMIH	200-476	37.50	10.350	60	124	100800	150800	040900	220900	210900	041000	191000	081100	241000	151100	151100	161100
00-JPP	SAU	CASCADE	GEC	WGC	EXPMIH	200-440	37.50	9.000	60	124	090800	150800	040900	220900	210900	191000	231000	081100	241000	151100	151100	161100
00-JPQ	SAU	CASCADE	GEC	WGC	EXPMIH	200-440	37.50	9.000	60	124	090800	150800	040900	220900	210900	191000	231000	081100	241000	151100	151100	161100
00-JPR	SAU	CASCADE	GEC	WGC	EXPMIH	201-433	37.50	8.700	60	124	080800	150800	040900	220900	210900	051000	191000	081100	241000	151100	151100	161100
00-JPS	SAU	CASCADE	GEC	WGC	EXPMIH	200-476	37.50	10.350	60	124	080800	150800	040900	220900	210900	191000	231000	091100	241000	151100	151100	161100
00-JPT	SAU	CASCADE	GEC	WGC	EXPMIH	200-400	37.50	7.500	60	124	160800	180800	040900	220900	210900	051000	191000	091100	241000	151100	151100	161100
00-JPW	SAU	CASCADE	GEC	WGC	EXPMIH	200-360	37.50	6.000	60	124	160800	180800	040900	220900	210900	051000	191000	091100	241000	151100	151100	161100
00-JPX	SAU	CASCADE	GEC	WGC	EXPMIH	200-376	37.50	6.600	60	124	150800	180800	040900	220900	210900	191000	231000	091100	241000	151100	151100	161100
00-JPY	SAU	CASCADE	GEC	WGC	EXPMIH	200-788	37.50	22.050	60	124	150800	180800	040900	220900	210900	201000	231000	091100	241000	151100	151100	161100
00-SWAN3D	SAU	SWAN LAKE 3D	GEC	WGC	EXPSRB		50.00	444.400	36	96	270800	040900	060900	270900	270900	290900	251000	011100	281100			011200
00-SWAN3D OVERLAP	SAU	SWAN LAKE 3D OVERLAP	GEC	CGG	EXPMIH		50.00	146.400	36	96	270800	300600	300600	230800	050900	070900	061000	311000	141100	141100	241100	161100
Total Kilometers											2033	2033	2033	2033	2033	2033	2033	2033	2033	1589	1589	2033
Backlog												0	0	0	0	0	0	0	0	444	444	0
Stage Backlog													0	0	0	0	0	0	0	444	444	-444
Total Lines											20	20	20	20	20	20	20	20	20	19	19	20
Backlog												0	0	0	0	0	0	0	0	1	1	0
Stage Backlog													0	0	0	0	0	0	0	1	1	-1

~ APPENDIX VI ~

DATA PROCESSING REPORTS

SAU -BECKLER 3D 2000 S.A. 3D S.S.

Processed Line	Acq.	Pro.	Station	Station Int.	Fld	Acq. Date	Stat Proc.	Prelim. Stack	Prelim. Appr.	Final Stack	CGM App.	Migr. Rec.	Tape Arch.	To GQS
00-BECK3D	GEC	WGC	-	40.00	24	050200	100200	280200	070400	110500	240500	220500	060600	050600
Total Kilometers						224.0	224.0	224.0	224.0	224.0	224.0	224.0	224.0	224.0

Notes:

SURFACE CONDITIONS

Sand dunes with large inter-dunal flats.

STATICS

No new upholes were acquired. Upholes were within 3/4 quarters of a spread length of each other. The uphole model consisted of 3 distinct layers: i) Near surface, 2-5m thick, 400-600 m/s ,interpolated as surface following, ii) Intermediate layer, interpolated linearly of approx 900-1000 m/s, iii) sub-weathering layer to sea level at 1900-2000 m/s.

ARCHIVE TAPES

SEGY Mx875,871. CGM FDX 174. SEGY gath FMX 892, 891.

VARIATIONS TO STANDARD SEQUENCE

No pre-stack testing was undertaken, the Dullingari 3d pre stack parameters were used.
Pre stack processing parameters were : Decon 120ms operator, 500ms scaler with 10% overlap between gates and spatial dealising DMO.
Both residual statics and trim statics were computed and applied.
Final post stack parameters were: Trace interpolation (cross-line direction), F/d migration with 97.5% smoothed velocities, Spectral balance 10-80hz, Filter 10-80hz and whole trace 2000ms scaling.

DATA ANALYSIS

Data was acquired with 768 channels (8 lines 96 channels) .
Qc of the prelim stack, DMO , and migration stack was performed on the ProMAX.
Selected 2d lines and well synthetics were compared with the appropriate 3d inline at each processing stage.
The frequency content of the 3d data compared with the 2d '96 data. No phase or time shift was observed between the 2d and 3d.
It was necessary to merge the two 3d volumes pre stack, with consistent residual and trim statics run over the two volumes.
A velocity file covering both volumes was generated. The data was then stacked and interpolated to a 20 by 20m grid.
It was observed that the portion of Dullingari reprocessed had better continuity and frequency content than the original processing.
The project was considered a success.

SAU –GOYDER/MILLUNA 3D 2000 S.A. 3D S.S.

Processed Line	Acq.	Pro.	Station	Station Int.	Fld	Acq. Date	Stat Proc.	Prelim. Stack	Prelim. Appr.	Final Stack	CGM App.	Migr. Rec.	Tape Arch.	To GQS
00–GOYD3D	GEC	WGC	–	40.00	24	190200	250200	230300	270300	200400	030500	080500	120500	090500
Total Kilometers						270.7	270.7	270.7	270.7	270.7	270.7	270.7	270.7	270.7

Notes: SURFACE CONDITIONS

Terrain – Sand dunes and floodplain of Strzelecki Creek.

STATICS

No new upholes were drilled. Weathering model designed from existing upholes.
Interpolation: 1st layer – 100% weighting relative to surface.
2nd/3rd layers – 0% weighting relative to datum.
Correction velocity: 2000m/s. Datum: 0m AHD.

ARCHIVE TAPES

SEGY: MX–861 & 865
CGM: FDX–171
GATHERS: FMX–884, 885, 886

COMMENTS

Final volume has imaged the data better than the 2D. Faults along the edges of the 3D have changed location with the superior 3D processing and migration.

VARIATIONS TO STANDARD SEQUENCE

Trials: DBS (chose Spike 120ms), gain (500ms windows),
Spectral Whitening (8–90Hz), Filter (10–80Hz),
Scale (single window), Migration (100%).
Observations: 3D dataset is superior to the 2D seismic although structures are of small relief except for the faults along the edges of the 3D volume.
Fault definition is greatly enhanced without degredation to the bandwidth.
Volume ties very well with the wells and underlying 2D seismic.

DATA ANALYSIS

QC was performed using ProMax & Hampson–Russell.
Each stage compared, tied with wells, tied & matched with 2D lines.
Frequency/Power Spectra were compared between stages of processing and with 2D data. 3D bandwidth superior to 2D at low and high end of spectra.
Detailed results are presented in the 3D Processing Record.

SAU -COWRALLI/HACKETT/TIND 3D 2000 S.A. 3D S.S.

Processed Line	Acq.	Pro.	Station	Station Int.	Fld	Acq. Date	Stat Proc.	Prelim. Stack	Prelim. Appr.	Final Stack	CGM App.	Migr. Rec.	Tape Arch.	To GQS
00-COW3D	GEC	CGG	-	50.00	24	110600	300600	050900	070900	061000	311000	141100	100101	161100
						485.2	485.2	485.2	485.2	485.2	485.2	485.2	485.2	485.2

T[redacted]ilometers

Notes: SURFACE CONDITIONS
Terrain – Sand dunes and floodplain of Cooper Creek.

STATICS
No new upholes were drilled. Weathering model designed from existing upholes.
Interpolation: 1st layer – 100% weighting relative to surface.
2nd/3rd layers – 0% weighting relative to datum.
Correction velocity: 2000m/s. Datum: 0m AHD.

ARCHIVE TAPES
SEGY: E1111, E1112, E1113, MX-919
CGM: E1114
GATHERS: X14632 – X14639

COMMENTS
Data set processed by CGG (Perth).
A very good improvement upon previous 2D data. Overlap between the zig-zag Cowralli and orthogonal Swan Lake is seamless.
The two 3Ds were subsequently merged after interpolation, matched & migrated as one volume.

VARIATIONS TO STANDARD SEQUENCE
Trials: Gain (VVT), DBS (Surface consistent Spike 200ms), Scale (500ms windows), DAS (none), Spectral Whitening (10-80Hz), Filter (10-80Hz), Scale (single window), Migration (95%).
Observations: 3D dataset has better fault and pinchout definition/resolution.
Volume ties well with the wells and underlying 2D seismic.
Volume overlap zone was matched with the Swan Lake 3D & merged after trace interpolation by Western. Subsequent fully merged volume migrated and post stack processed.

DATA ANALYSIS
QC was performed using ProMax & Hampson-Russell.
Each stage compared, tied with wells, tied & matched with 2D lines.
Frequency/Power Spectra were compared between stages of processing and with 2D data. 3D bandwidth superior to 2D at low and high end of spectra.
Detailed results are presented in the 3D Processing Record.

SAU -FLYLAKE 3D 2000 S.A. 3D S.S.

Processed Line	Acq.	Pro.	Station	Station Int.	Fld	Acq. Date	Stat Proc.	Prelim. Stack	Prelim. Appr.	Final Stack	CGM App.	Migr. Rec.	Tape Arch.	To GQS
00-FLY3D	GEC	WGC	-	50.00	24	280200	160300	300300	050400	280400	190500	170500	170500	230500
Total Kilometers						294.8	294.8	294.8	294.8	294.8	294.8	294.8	294.8	294.8

Notes: SURFACE CONDITIONS
Crahhole flat and 20m dunes

STATICS
Upholes on 1976-1997 lines interpreted with shallow near surface layer following surface. Flat base of weathering, 10-30m. Hole depth 25-48m.

ARCHIVE TAPES
SEGY: MX-869
CGM: FDX-173

PROCESSING SEQUENCE
Spherical divergence and 4dB/sec gain
DBS Surface Consistent 200ms spike
500ms scaling windows with 10% overlap
Residual statics using single regional velocity
First round velocity analysis 9x3 cells
Trim statics window 500-2300ms 32ms max shift, 9x9 smash, 10-45Hz filter
Second round velocity analysis, with DMO
Spatial dealias DMO with progressive stack, 24 fold
Cross line interpolation to give 25m x 25m bins.
Migration 3D Stolt followed by residual FD. 100% smoothed velocities
Spectral whitening 5-85Hz, 8 filters, 300ms windows
Filter 5-90Hz
Single window scale 400-2400ms

SAU -SWAN LAKE 3D 2000 S.A. 3D S.S.

Processed Line	Acq.	Pro.	Station	Station Int.	Fld	Acq. Date	Stat Proc.	Prelim. Stack	Prelim. Appr.	Final Stack	CGM App.	Migr. Rec.	Tape Arch.	To GQS
00-SWAN3D	GEC	WGC	-	50.00	36	270800	060900	270900	290900	251000	011100	281100	050601	011200
Total Kilometers						444.4	444.4	444.4	444.4	444.4	444.4	444.4	444.4	444.4

Notes:

SURFACE CONDITIONS

Consists of north south trending sand dunes, with interdunal clay flats. The central area is mainly flood plain

STATICS

No new upholes were required. Upholes were within 3/4 quarters of a spread length of each other. The uphole model consisted of 3 distinct layers: i) Near surface, unconsolidated,2-5m thick, 250-500 m/s ,interpolated linearly between upholes, ii) Intermediate layer, lower interface interpolated as base of weathering, occurs between 15 and 25m above SL at 600 to 1200m/s, iii) Sub weathering layer, to sea level at 1800-2000m/s.

ARCHIVE TAPES

SEGY MX910,911,915,918,919,920,1008,1009. CGM FDX 182, SEGY Gath FMX 906,907,908.
No phase shift has been applied to these volumes.

VARIATIONS TO STANDARD SEQUENCE

A full set of pre-processing tests were undertaken.
Pre stack processing parameters were : Surface consistent Decon, 120ms operator followed by a 6-90hz spec white, 500ms scaler
with 10% overlap between gates and spatial dealising DMO.
Both residual statics and trim statics were computed and applied.
Final post stack parameters were: Trace interpolation (cross-line direction)
F/d migration with 98% smoothed velocities, Spectral balance 10-80hz, Filter 10-80hz
and whole trace 2000ms scaling.

DATA ANALYSIS

Data was acquired with 1152 channels (12 lines 96 channels) to evaluate amplitude anisotropy with azimuth.
This report only covers the processing of the conventional 8 line 96 channel volume.
Qc of the prelim stack, DMO , and migration stack was performed on the ProMAX.
Selected 2d lines and well synthetics were compared with the appropriate
3d inline at each processing stage. Phase analysis showed the data to be approx -45 degrees to zero phase.
The frequency content of the 3d data compared with the 2d '97 data was superior at the high frequecy end.
The 2d and 3d tied. No phase shift required.
Project was considered a success.

SAU -SWAN LAKE 3D OVERLAP 2000 S.A. 3D S.S.

Processed Line	Acq.	Pro.	Station	Station Int.	Fld	Acq. Date	Stat Proc.	Prelim. Stack	Prelim. Appr.	Final Stack	CGM App.	Migr. Rec.	Tape Arch.	To GQS
00-SWAN3D OVI	GEC	CGG	-	50.00	36	270800	300600	050900	070900	061000	311000	141100	141100	161100
Total Kilometers						146.4	146.4	146.4	146.4	146.4	146.4	146.4	146.4	146.4

Notes: SURFACE CONDITIONS
Terrain - Sand dunes and floodplain of Cooper Creek.

STATICS
No new upholes were drilled. Weathering model designed from existing upholes.
Interpolation: 1st layer - 100% weighting relative to surface.
2nd/3rd layers - 0% weighting relative to datum.
Correction velocity: 2000m/s. Datum: 0m AHD.

ARCHIVE TAPES
SEGY: E1111, E1112, E1113, MX-919
CGM: E1114
GATHERS: X14632 - X14639

COMMENTS
Data set processed by CGG (Perth).
A very good improvement upon previous 2D data. Overlap between the zig-zag Cowralli and orthogonal Swan Lake is seamless.
The two 3Ds were subsequently merged after interpolation, matched & migrated as one volume.

VARIATIONS TO STANDARD SEQUENCE
Trials: Gain (VVT), DBS (Surface consistent Spike 200ms), Scale (500ms windows), DAS (none), Spectral Whitening (10-80Hz), Filter (10-80Hz), Scale (single window), Migration (95%).
Observations: 3D dataset has better fault and pinchout definition/resolution.
Volume ties well with the wells and underlying 2D seismic.
Volume overlap zone was matched with the Swan Lake 3D & merged after trace interpolation by Western. Subsequent fully merged volume migrated and post stack processed.

DATA ANALYSIS
QC was performed using ProMax & Hampson-Russell.
Each stage compared, tied with wells, tied & matched with 2D lines.
Frequency/Power Spectra were compared between stages of processing and with 2D data. 3D bandwidth superior to 2D at low and high end of spectra.
Detailed results are presented in the 3D Processing Record.

SAU -CASCADE 2000 SOUTH AUSTRALIA S.S.

Processed Line	Acq.	Pro.	Station	Station Int.	Fld	Acq. Date	Stat Proc.	Prelim. Stack	Prelim. Appr.	Final Stack	CGM App.	Migr. Rec.	Tape Arch.	To GQS
00-JPH	GEC	WGC	200-732	37.50	60	140800	040900	210900	041000	131000	081100	241000	151100	161100
00-JPJ	GEC	WGC	200-728	37.50	60	130800	040900	210900	271000	301000	081100	301000	151100	161100
00-JPK	GEC	WGC	200-544	37.50	60	120800	040900	210900	041000	191000	081100	241000	151100	161100
00-JPL	GEC	WGC	200-552	37.50	60	110800	040900	210900	041000	191000	081100	241000	151100	161100
00-JPM	GEC	WGC	200-520	37.50	60	100800	040900	210900	041000	191000	081100	241000	151100	161100
00-JPN	GEC	WGC	200-476	37.50	60	100800	040900	210900	041000	191000	081100	241000	151100	161100
00-JPP	GEC	WGC	200-440	37.50	60	090800	040900	210900	191000	231000	081100	241000	151100	161100
00-JPQ	GEC	WGC	200-440	37.50	60	090800	040900	210900	191000	231000	081100	241000	151100	161100
00-JPR	GEC	WGC	201-433	37.50	60	080800	040900	210900	051000	191000	081100	241000	151100	161100
00-JPS	GEC	WGC	200-476	37.50	60	080800	040900	210900	191000	231000	091100	241000	151100	161100
00-JPT	GEC	WGC	200-400	37.50	60	160800	040900	210900	051000	191000	091100	241000	151100	161100
00-JPW	GEC	WGC	200-360	37.50	60	160800	040900	210900	051000	191000	091100	241000	151100	161100
00-JPX	GEC	WGC	200-376	37.50	60	150800	040900	210900	191000	231000	091100	241000	151100	161100
00-JPY	GEC	WGC	200-788	37.50	60	150800	040900	210900	201000	231000	091100	241000	151100	161100
Total Kilometers						167.4	167.4	167.4	167.4	167.4	167.4	167.4	167.4	167.4

Notes: SURFACE CONDITIONS
Terrain – gibber plains & tableland.

STATICS
No new upholes were drilled. Weathering model designed from existing upholes.
Dummy upholes generated from intersecting line static and residual.
Interpolation: 1st layer – 100% weighting relative to the surface.
2nd layer – 50% weighting relative to the surface.
3rd layer – 0% weighting relative to the surface.
Correction velocity: 2000m/s Datum: 0m AHD.

ARCHIVE TAPES
SEGY: MX-907
CGM: FDX-181

DATA ANALYSIS
Tomography static method (tied to DUHs) utilised to refine the field static.
Reduced the residual static response and improved the stack response of this noisy data.
f-x Decon with 25% feedback.

COMMENTS
Final stacks tie very well. Stack response is very good.
Static modeling and tomography were very successful considering there were very few real upholes on the lines.
Strike line (JPY) was difficult to migrate satisfactorally everywhere.

~ APPENDIX VII ~

3D SOURCE AND SPREAD LAYOUTS

APPENDIX VII
3D SOURCE AND SPREAD LAYOUTS

1. Line naming conventions

1.1 Beckler

Receiver lines	00-ER1208 to 00-ER1432 incrementing by 8
Source lines	00-ES5212 to 00-ES5428 incrementing by 8

1.2 Goyder/Milluna

Receiver lines	00-GR1000 to 00-GR1344 incrementing by 8
Source lines	00-GS5004 to 00-GS5340 incrementing by 8

1.3 Fly Lake

Receiver lines	00-FR1000 to 00-FR1250 incrementing by 8
Source lines	00-FS5004 to 00-FS5276 incrementing by 8

1.4 Cowralli/Hackett/Tindilpie

Receiver lines	00-AR1000 to 00-AR1400 incrementing by 8
Source lines	00-AS5004 to 00-AS5396 incrementing by 8

1.5 Swan Lake

Receiver lines	00-BR1272 to 00-BR1608 incrementing by 8
Source lines	00-BS5308 to 00-BS5524 incrementing by 8

2. Definitions

Patch	–	All live receivers for source position
Swath	–	All the source positions between any two receiver lines
Panel	–	Defined by the number of source positions able to be recorded in a swath before a cross line roll is required.

3. Patch layout

Each patch will consist of eight receiver lines of 96 channels when fully rolled on. The standard source position for each swath will be 4 VPs falling between the fourth and fifth receiver lines of each eight line patch.

4. Roll on/Roll off

The standard position for the source line will be between receivers 48/49.

The first and last source lines will shoot into a patch of 5 receiver lines. The first and last source positions on each line will shoot into 48 channels per receiver line.

A normal roll on/roll off will occur until the 96 split is achieved.

5. Boundary steps/Patch definition

Where the boundaries of the surface coverage step in the number of live traces for each receiver line should be maximised up to the standard 96, ie. the number of live traces should not be restricted to the shortest line of the patch but each line in the patch should use all available spread.

6. Source position offset/recoveries

Where a source position needs to be offset because of terrain, pipelines or structures, the offset should be parallel to the receiver line direction and in multiples of 40 metres.

In line offsets should not exceed 14 metres and only be used in excess of 7 metres where a perpendicular offset is not practical. All offsets should be clearly noted on the observers' logs and surveyed for accurate XYZ positions.

Source position tolerance in the orthogonal direction is ±20% of the group interval (±8m). This will enable the line to weave and thus "break line of sight". However, all receiver and source positions must be surveyed to an accuracy of ±1m in the horizontal direction.

7. Receiver Rollalong

The receivers roll along at 2 stations for every source line increment such that the source is between channels 48 and 49 for each receiver line.

NOTE: Whilst the source is within Cowralli/Hackett/Tindilpie 3D (CHT 3D), the receivers roll along 2 stations for every source position, such that the source is between channels 48 and 49 for each receiver line.

Transiting between the two 3Ds should proceed as follows:

i) Source positions within CHT 3D should have 8 receiver lines live irrespective of whether some of the receiver locations are within Swan Lake 3D (SL 3D).

ii) Source positions within SL 3D grid should have 12 receiver lines live within the limits of the SL 3D grid (other than when rolling onto the SL3D) but ned have only 8 receiver lines live within the limits of the CHT 3D grid (other than when rolling off the NE end of CHT 3D).

For example:

Source Line	VP Location	Receiver Lines Live in CHT 3D	Receiver Lines Live in SL 3D
5268	1500	1240 - 1296	1272 - 1296
5500	1272	1248 - 1304	1272 - 1320
5500	1320	1296 - 1352	1280 - 1368

8. Transition between Cowralli/Hackett/Tindilpie 3D (CHT 3D) and Swan Lake 3D (SW 3D)

There are two acquisition differences between CHT 3D and SL 3D, namely: i) Zig Zag source versus Orthogonal (to receiver line) source, and ii) 768 live channels (8 x 96) versus 1152 live channels (12 x 96).

9. Receiver Lines

Receiver position tolerance in the orthogonal direction is ±20% of the group interval (±8m). This will enable the line to weave and thus "break line of sight". However, all receiver and source positions must be surveyed to an accuracy of ±1m in the horizontal direction.

10. Recording Panels

The Beckler and Goyder/Milluna Seismic Surveys will be recorded as single panels.

The Fly Lake, Cowralli/Hackett/Tindilpie and Swan Lake Surveys will each be recorded as two panels.

11. Administration Details

- Duplicate cartridge tapes should be produced for each day's recording (A and B tapes). Acknowledgement of receipt of the A tapes is required before the B cartridge tapes are sent from the field.

- Two copies of the SPS file associated with the cartridge field tape should be sent to Santos.

- On completion of the project, SPS files for the complete program should be output on exabyte cassette. Two copies of the tape will be required.

~ APPENDIX VIII ~

GUIDELINES FOR ENVIRONMENT AND CULTURAL HERITAGE PROTECTION AND PASTORAL RELATIONS

APPENDIX VIII

A. STANDARD PRACTICE FOR LINE PREPARATION AND SURVEY CREWS

1. Restrict lines to one blade width.
2. Move as little earth and vegetation as possible.
3. Roll or mark lines only in silcrete and gibber plain areas - no blading.
4. Walk across claypans and consolidated flat open ground.
5. Avoid steep cuts and fills which may cause erosion or landslide problems.
6. Cut sand dunes to the minimum depth required for safe access and operation.
7. Push sand to side of cut, not to bottom of dune.
8. Avoid or reduce to a minimum the formation of windrows.
9. Avoid destruction of isolated trees or stands of vegetation.
10. Avoid unnecessary blockage of creeks and channels.
11. Include erosion control features such as spur drains on sloping terrain.
12. Conceal lines from public roads or tracks by cutting 50 metres short on either side or placing a dogleg to reduce line of sight in vegetated areas.
13. Offset crossings at drainage channels to avoid the removal of trees and vegetation.
14. Avoid sites of natural, historical, heritage, aboriginal and archaeological significance, known or discovered.
15. Stop and report all discoveries to supervisor.
16. All work is to be carried out with due regard to safety and consideration/protection of the environment.

B. ADDITIONAL REQUIREMENTS OF FIELD PERSONNEL

(a) Excessive cutting on sand rises/dunes and the creation of windrows on vegetated flats and flood flats must be avoided. There is to be as little disturbance as possible to the Cooper Creek/Wilson River systems and surrounding floodplains - extreme care to be taken.

(b) Minimal cutting and disturbance to vegetation is required. No cutting is to occur in gibber hills or flats. Water courses are not to be blocked or water holes disturbed. Vehicle traffic should be confined to the cleared seismic line. No unnecessary detours or short cuts are to be created.

(c) All metal pin flags must be removed after recording.

(d) Drill cuttings should be returned to holes or spread out and not left in a mound. Holes should be properly reinstated so that subsidence does not occur.

(e) No litter should be left at camp sites, upholes or on seismic lines.

(f) Lines intersecting roads or tracks should be concealed with doglegs.

(g) All gates and fences are to be reconstructed to their original condition and care taken not to disturb cattle.

(h) Extremely careful measures must be taken for the protection of aboriginal sites and artefacts. These sites/artefacts are to be flagged off and vehicle access/traffic avoided.

C. GUIDELINES FOR COMPLIANCE WITH ABORIGINAL HERITAGE ACT IN SA AND QUEENSLAND CULTURAL RECORD ACT 1987

There are three main points under the Aboriginal Heritage Act and Queensland Cultural Record Act 1987 relevant to field personnel or seismic crews.

1. No aboriginal site or object can be disturbed, interfered with or damaged.

2. All discoveries of aboriginal sites or objects must be reported to the Minister.

3. No aboriginal artefacts can be collected.

Each one of these points carries a $50,000 fine for the company or a $10,000 fine or 6 months imprisonment for the individual.

Santos Procedure for Aboriginal Site Avoidance

- A record of all known sites is kept in Adelaide office - this is updated regularly. All seismic programme maps are checked against these maps before being sent to the field. Appropriate changes are made to the programme if the proposed lines cross a known site.

- While recognising that archaeological sites can be found throughout the Cooper Basin, there are some areas where it is more predictable that sites of archaeological significance will be found - for example the low, pale dunes adjacent and parallel to water courses. When a seismic programme is planned to cross one of these areas this will be highlighted in the field instructions to the crew to pay extra attention to any scatters etc. See general rules outlined below.

  Santos will endeavour to identify as many types of predictable areas as possible.

General Rules

- Avoid all areas which are obviously different from the surrounding area - this mostly applies to the presence of rocks.

  - rocks on a sand dune are out of place, therefore avoid

  - piles of rocks on clay pans should be avoided

- Take extra care in dunes or sandy rises on the edges of waterholes or isolated dunes in the floodplain area where there is a high possibility of "rock scatter" being found.

- Avoid regular arrangements of rocks - something obviously moved by man.

- If in doubt leave the blade up - this is in line with normal environmental procedures.

- Rebury any skeletons uncovered in dune cuts, record the location and move the line away from the site.

- Remember to record any sites suspected of archaeological significance and report the location to the bird dog. The bird dog will record the location by shot point number and refer information to Environmental Officer for ultimate recording by the Heritage Branch.

- Major sites of archaeological significance, such as quarries, caves, art sites occur in locations/situations which normal environmental techniques will avoid anyway.

Potential Sites of Archaeological Significance

- Dunefield margins - the first couple of dunes particularly adjacent to floodplain/alluvial areas but also stone/gibber areas.
- Dunes/sandy rises adjacent waterholes
- Isolated dunes in floodplains
- Dunes adjacent claypans likely to hold water for a time
- Outcroppings of stone in both dissected tablelands and in dune fields.
- The sites in dunes will occur on deflated clay flanks.
- Water course margins within gibber/tableland regions.

D. SANTOS' CULTURAL HERITAGE MANAGEMENT STRATEGY

The following is a summary of the strategy in place to ensure meticulous adherence to standard Santos procedures relating to Cultural Heritage Management and Environmental Sensitivity. In summary, this will be achieved by:

- *Inductions of all personnel (Category B).*
- *Cultural Heritage training (Category A) of those personnel involved in the placement and preparation of seismic lines and any activities requiring off-line activity (eg. camp site location, recording truck placement, vibrator offsets).*
- *Daily toolbox meetings prior to work commencement to re-iterate key issues and procedures.*
- *Occasional presence on the crew of Adelaide or Brisbane environmental staff.*
- Permanent presence on line preparation crew by Geco Environmental & Cultural Heritage Adviser.

Detailed steps in the above strategy are as follows:

1. A full and comprehensive Environmental and Culture Heritage Training course (Category A) for those members of the crew that have involvement in the placement of seismic lines, camp locations, recording truck, drill rig or vibrator positions. This to include:
   - *Dozer operators, grader operators, survey supervisors, surveyors, seismologist, bird-dog, party manager, HSE adviser, ECH adviser, line boss, vibrator guide and observer.*
   - *An attendance sheet will be prepared for each course and subsequent personnel load charts will indicate the personnel who have attended. Any personnel who have not attended the training will NOT be allowed to fill the above job positions.*
2. This training will be undertaken by Allan Lance and a representative of either the QNTBU or SABU Environmental Team. This training will be valid for a 12-month period.
3. The training should utilise the necessary documentation and visual aids in the classroom (slides, overheads, videos, maps and handbooks) and then be followed up with some demonstration of principles and practice in the field.
4. ALL other members of the crew will be inducted (Category B) before they commence work in the QLD licence area. These inductions will primarily involve cultural heritage issues but will also cover pastoral relations and health/safety. Personnel qualified to give these inductions will be the Party Manager, QHSE Adviser, ECH Adviser and Client Representative. QNTBU Environmental staff will participate in these inductions when available. Inductions will be valid for a 12-month period.
5. ALL crew will be issued with appropriate documentation and handbooks, posters, etc.
6. Constant supervision/overview of the line preparation operation and subsequent field operations will be maintained by Environmental Department staff (QNTBU) with occasional field visits.
7. Any identified or suspected sites of archaeological or cultural heritage significance will be noted, identified, flagged, avoided and reported as per Santos procedures.
   - *"Environmental Report Form - Seismic" to be completed for each site in our usual manner (Site Identification).*

E. CODE OF CONDUCT FOR SEISMIC CREW PASTORAL RELATIONS

1. ALWAYS BEAR IN MIND YOU ARE ON SOMEONE ELSE'S PROPERTY. TREAT LANDHOLDERS AND THEIR FAMILIES WITH COURTESY. OBEY ALL LANDHOLDER SIGNS.

2. WHEN IN QUEENSLAND, ENSURE YOU CAN ALWAYS PRODUCE YOUR RIGHT OF ENTRY FORMS.

3. ALWAYS REVIEW THE "LANDHOLDER NOTIFICATION, PERMISSION AND CHECKLIST" FORM FOR THE PROPERTY YOU ARE WORKING ON TO ENSURE YOU ARE AWARE OF ANY RESTRICTIONS OR SPECIFIC REQUIREMENTS. ENSURE THIS FORM IS DISPLAYED ON THE CREW ENVIRONMENTAL NOTICE BOARD.

4. ALWAYS LEAVE GATES AS THEY ARE FOUND. (IF YOU COME ACROSS AN OPEN GATE REPORT IT TO THE LANDHOLDER VIA THE BIRD-DOG OR CREW MANAGEMENT.) LIKEWISE REPORT ANY DAMAGED GATES OR FENCES.

5. DO NOT LAY DOWN FENCES UNLESS YOU HAVE SPECIFIC PERMISSION FROM THE LANDHOLDER TO DO SO. IF SO ENSURE THEY ARE LAID DOWN AND PINNED TO MINIMISE DAMAGE TO THE WIRES.

6. REMOVE WATER ONLY FROM THOSE LOCATIONS AGREED TO BY THE LANDHOLDER.

7. NEVER SET UP CAMP CLOSER THAN ONE KM TO A STOCK WATERING POINT.

8. MINIMISE OR AVOID ALL DISTURBANCES TO STOCK.

9. STAY WITHIN SPEED LIMITS AT ALL TIMES AND, IN PARTICULAR, MINIMISE CREATION OF DUST CLOUDS ON STATION TRACKS NEAR HOMESTEADS. LOOK OUT FOR CHILDREN AND ANIMALS IN VICINITY OF HOMESTEADS.

10. MINIMISE OR AVOID CUTTING UP TRACKS OR RIVER CROSSINGS FOLLOWING WET WEATHER. IF UNAVOIDABLE, INFORM LANDHOLDER AND INSTIGATE PLANS TO RECTIFY DAMAGE.

11. DO NOT STRAY FROM WORK AREAS AND KEEP OFF-LINE ACTIVITY TO A MINIMUM (NO SHORTCUTS!).

12. RESTORE ALL DISTURBED AREAS AS NEAR AS POSSIBLE TO THEIR ORIGINAL STATE AND REMOVE ALL RUBBISH AND PIN FLAGS. PAY PARTICULAR ATTENTION TO TREATMENT OF FUEL AND OIL SPILLS.

****

NB. Non-adherence to any of the above rules will result in disciplinary action and may possibly lead to termination of employment or contract.

SA 00 SEISMIC SURVEY

400000M E
450000M E
500000M E
7000000M N
6950000M N
6900000M N
6850000M N
27 00 00 S
27 30 00 S
28 00 00 S
28 30 00 S
28 42 00 S
139 30 00 E
140 00 00 E
140 30 00 E
141 01 00 E

CLIFTON HILLS
KANOWANA
INNAMINCKA
GIDGEALPA
WAUKATANA
LAKE HOPE
STRZELECKI REGIONAL RESERVE
STRZELECKI REGIONAL RESERVE
MERTY MERTY
BOLLARDS LAGOON

PPL 77
PPL 76
PPL 121
PPL 158
1981 Cuttapirrie
PPL 136)
Moondie
PPL 156
Red Sprigg
1996 Reg Sprigg
PPL 123
PPL 142
Lamdina
PPL 167
Moollon
Charo
PPL 152
PPL 131
1997 Pondrinie Extn
1995 Pondrinie
PPL 164
PPL 132
PPL 133
PPL 106
Callabonna
1994 Moorari/Woolkina
Quartpot
Scrubby Creek
1998 Merrimelia Round 1
PPL 33
PPL 98
2000 Fly Lake
Moorari-Woolkina
Pirraminta/Haloragis
1998 Merrimelia Round 2
PPL 20
PPL 105
PPL 104
PPL 103
PPL 102
Innamincka
PPL 112
1993 Merrimelia/Meranji
Andree-Lalepie
PPL 154
PPL 80
PPL 160
Kanowana South
PPL 101
PPL 110
PPL 111
PPL 109
2000 Swan Lake
2000 Cowralli/Hackett/Tindilpie
PPL 140
Davieri North
PPL 108
PPL 116
CO99 G
PPL 66
PPL 107
PPL 114
PPL 115
PPL 137
PPL 150
1992 Gidgealpa
PPL 6
1995 Moomba North Flank
PPL 113
2000 Beckler
PPL 97(PPL 141)
Wilpinnie South
PPL 7
Moomba
1997 Dullingari/Burke
PPL 117
PPL 15
PPL 12
Greater Kirralee
PPL 8
1995 Moomba/Big Lake
PPL 143
PPL 9
PPL 53
PPL 37
1992 Lake Hope
PPL 45
PPL 46
PPL 54
Greater Caladan
PPL 22
PPL 24
Boongala/Kerna Ridge
PPL 71
PPL 74
PPL 73
PPL 78
Greater Allambi
PPL 58
1998 Barina/Farina
PPL 84
PPL 126
Bauhas-Allunga
2000 Goyder/Milluna
PPL 139
1997 Toolachee Field
PPL 14
PPL 13
PPL 37
PPL 163
PPL 82
Fortanna
Yalcumma
PPL 135
Kerinna
PPL 88
PPL 130
PPL 129
PPL 159
PPL 86
PPL 34
1998 Cabernet
PPL 138
1994 Calamia
PPL 36
PPL 35
PPL 39
PPL 23
PPL 25
1992 Dirkala
PPL 31
Kobari

1: 500000
0 10 20 30 40 50
KILOMETRES

UNIVERSAL TRANSVERSE MERCATOR PROJECTION
AUSTRALIAN NATIONAL SPHEROID
CENTRAL MERIDIAN 141 00 00 E
Mapsheet datum: "AGD84"

Santos

SA00 SEISMIC SURVEY
SOUTH AUSTRALIA

LOCATION MAP

Date : April 2, 2001	Author : Andrew White	ENCL 1
Datum : AGD 84		