

<b>SECTION 1 - INTRODUCTION</b> .....	<b>2</b>
1.1 OBJECTIVES .....	3
1.2 ACQUISITION PARAMETERS .....	3
1.3 LOCATION MAP.....	4
1.4 SURVEY CO-ORDINATES (CENTRE OF SOURCE) .....	5
1.5 PROGRAMME MAP .....	6
<b>SECTION 2 - SYNOPSIS</b> .....	<b>7</b>
2.1 OVERVIEW.....	8
2.2 PRODUCTION .....	9
2.3 TECHNICAL SUMMARY .....	13
2.4 SAFETY SUMMARY .....	19
2.5 CONCLUSIONS AND RECOMMENDATIONS .....	22
<b>SECTION 3 - NAVIGATION</b> .....	<b>23</b>
3.1 NAVIGATION HARDWARE AND SOFTWARE.....	24
3.2 SURFACE POSITIONING.....	26
3.3 NAVIGATION PROCESSING .....	27
3.4 NAVIGATION SUMMARY .....	28
<b>SECTION 4 - ENVIRONMENT</b> .....	<b>29</b>
4.1 WEATHER .....	30
4.2 TIDES, CURRENT AND FEATHER .....	30
4.3 NAVIGATION HAZARDS.....	30
4.4 INTERFERENCE .....	30
4.5 ENVIRONMENTAL .....	31
<b>SECTION 5 - INSTRUMENT TESTS</b> .....	<b>34</b>
5.1 INSTRUMENT TESTS .....	35
<b>SECTION 6 - PERSONNEL &amp; SAFETY</b> .....	<b>37</b>
6.1 PERSONNEL LIST .....	38
6.2 VESSEL SAFETY .....	39
6.3 SAFETY DRILLS AND MEETINGS .....	40
6.4 SAFETY INCIDENTS .....	40
<b>SECTION 7 - DIARY</b> .....	<b>41</b>
7.1 DIARY .....	42
<b>SECTION 8 - MEASUREMENTS</b> .....	<b>44</b>
8.1 OFFSETS.....	45
8.2 STREAMER GEOMETRY .....	46
8.3 STREAMER CONFIGURATION .....	47
8.4 SOURCE CONFIGURATION .....	48
<b>SECTION 9 - APPENDICES</b> .....	<b>49</b>
9.1 MGC CONVENTIONS AND TERMINOLOGY .....	50
9.2 LINE AND SHOT POINT NUMBER CONVENTION.....	51
9.3 DESCRIPTION OF LINE LOG CONTENTS.....	52
9.4 LINE LOGS.....	53

# Section 1 - Introduction

## 1.1 OBJECTIVES

To carry out a high resolution 2D seismic survey over Sole Field in Retention Lease for Petroleum Vic/RL3, Gippsland Basin, off shore Victoria. The survey was acquired on behalf of Santos Ltd. by the seismic survey vessel *S/V Polar Duke*.

The following is a summary of the survey parameters:

Survey type	: 2D
Client	: <b>Santos Ltd.</b>
Survey name	: <b>GS02 2D MSS</b>
Survey parameters	
Shotpoint Interval	: 18.75 m
Source	: 3500 in <sup>3</sup> . sleeve guns
No. Of Groups	: 168
Fold	: 56
Positioning	
Primary	: Fugro Starfix MRDGPS SPOT & Dual Frequency
Secondary	: Fugro Starfix MRDGPS
Problems	: Pipeline survey coincident with seismic survey.
Water depth	: 110 to 130m
Number of lines	: 24
Survey surface area:	n/a
Full fold sail line km	: 194.125 km
Port of supply	: Melbourne, Victoria
Contractor	: Multiwave Geophysical Company ASA (MGC)
Vessel	: S/V Polar Duke
Client representation	: <b>Enquest Pty. Limited</b>

## 1.2 ACQUISITION PARAMETERS

Recording System	: Syntrak 960-24 Bit
Number of Channels	: 168
Record Length	: 4000ms
Sample Interval	: 2ms
Low Cut Filter	: 3Hz at 6 db/octave
High Cut Filter	: 206Hz at 276 dB/Oct
Tape Format	: SEG-D 8048
Digital Filter Delay	: off
Energy Source Type	: VS-X Sleeve Airgun array
Total Capacity	: 3500 cubic inches
Number of Arrays	: 1
Number of sub-arrays	: 4
Array Length	: 11.5 m
Array Width	: 25.0 m
Total Number of Guns	: 26
Capacity of each Sub-Array	: 1750 in <sup>3</sup>

Typical Output	: 114.6 bar/metres peak to peak (at 5 metres)
Primary / bubble ratio	: 21.4 (full array, at 5 metres)
Pressure	: 2000psi +/- 10%
Depth	: 5.0 metres +/- 1.0 metres
Firing Delay from Time Zero	: 0ms
Shot Interval	: 18.75 metres
Group Length	: 12.5 metres
Group Interval	: 12.5 metres
Group Sensitivity	: 20v/ bar
Hydrophones per Group	: 16 in parallel connection (8 per 6.25m base group)
Streamer depth	: 6.0 metres +/- 1.0 metres
Typical Noise	: 1.5 to 4.0 microbars
Offset (In-line)	: 75.0 m
Navigation Ref.-Cent. Source	: 89.83 m
Primary Navigation	: Fugro Starfix MRDGPS SPOT & Duel Frequency
Secondary Navigation	: Fugro Starfix MRDGPS
Integrated Navigation System	: SPECTRA
Echo Sounder	: Simrad EA-500 12Khz

### 1.3 LOCATION MAP

Survey Centre: 38 07 00 S 149 01 00 E

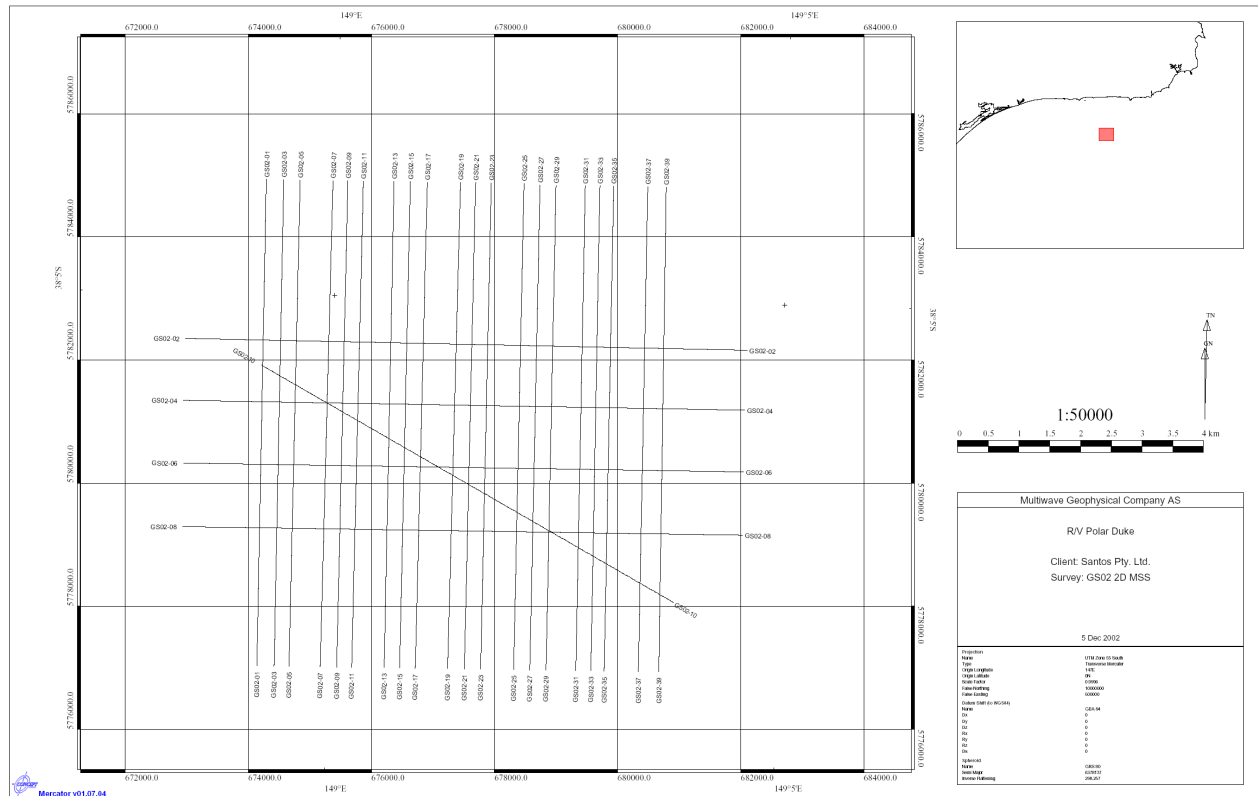
#### GS02 2D SURVEY AREA – Vic/RL3



**1.4 SURVEY CO-ORDINATES (CENTRE OF SOURCE)**

LINE #	SP	LATITUDE	LONGITUDE	EASTING	NORTHING
GS02-01	1001	38 08 14.71S	148 59 13.37E	674139.7	5777072.6
GS02-01	1486	38 03 19.77S	148 59 12.63E	674316.2	5786164.6
GS02-02	1001	38 05 24.04S	148 58 22.79E	673020.2	5782359.9
GS02-02	1552	38 05 23.61S	149 05 26.75E	683349.0	5782147.0
GS02-03	1001	38 08 14.61S	148 59 24.13E	674401.7	5777070.2
GS02-03	1486	38 03 19.72S	148 59 23.76E	674587.7	5786160.2
GS02-04	1001	38 05 57.12S	148 58 22.03E	672980.0	5781340.5
GS02-04	1552	38 05 56.00S	149 05 26.14E	683311.5	5781149.0
GS02-05	1001	38 08 14.68S	148 59 34.38E	674651.4	5777062.7
GS02-05	1486	38 03 19.73S	148 59 35.25E	674867.7	5786153.8
GS02-06	1504	38 06 28.13S	149 04 47.46E	682347.3	5780179.7
GS02-06	937	38 06 29.95S	148 57 31.12E	671718.6	5780354.7
GS02-07	1001	38 08 14.48S	148 59 54.95E	675152.3	5777057.9
GS02-07	1486	38 03 19.64S	148 59 57.33E	675405.9	5786145.3
GS02-08	1486	38 07 01.35S	149 04 33.93E	681994.7	5779162.9
GS02-08	937	38 07 03.56S	148 57 31.16E	671697.6	5779318.8
GS02-09	1001	38 08 14.54S	149 00 06.48E	675433.0	5777050.2
GS02-09	1486	38 03 19.62S	149 00 06.96E	675640.7	5786140.7
GS02-10	1413	38 07 37.38S	149 03 49.01E	680876.1	5778076.8
GS02-10	937	38 05 17.96S	148 58 27.97E	673150.4	5782544.5
GS02-11	1001	38 08 14.46S	149 00 15.89E	675662.0	5777047.4
GS02-11	1486	38 03 19.55S	149 00 17.06E	675886.9	5786137.5
GS02-13	1001	38 08 14.26S	149 00 38.03E	676201.1	5777042.1
GS02-13	1486	38 03 19.34S	149 00 37.64E	676388.7	5786133.1
GS02-15	1001	38 08 14.15S	149 00 47.76E	676438.1	5777040.4
GS02-15	1486	38 03 19.17S	149 00 47.68E	676633.3	5786133.2
GS02-17	1001	38 08 14.32S	149 00 58.43E	676697.7	5777029.4
GS02-17	1486	38 03 19.40S	149 00 59.79E	676928.5	5786119.7
GS02-19	1422	38 04 00.28S	149 01 22.46E	677453.7	5784847.5
GS02-19	937	38 08 55.25S	149 01 19.58E	677185.3	5775756.4
GS02-21	1422	38 04 00.26S	149 01 31.78E	677680.7	5784843.3
GS02-21	937	38 08 55.32S	149 01 30.65E	677454.6	5775748.4
GS02-23	1422	38 04 00.16S	149 01 42.41E	677939.8	5784840.8
GS02-23	937	38 08 55.14S	149 01 41.95E	677729.9	5775748.0
GS02-25	1422	38 04 00.09S	149 02 04.15E	678469.7	5784831.4
GS02-25	937	38 08 55.08S	149 02 04.05E	678267.7	5775738.0
GS02-29	1421	38 04 00.77S	149 02 25.85E	678998.1	5784798.6
GS02-29	937	38 08 55.15S	149 02 26.21E	678807.2	5775724.2
GS02-31	1421	38 04 00.71S	149 02 44.96E	679463.8	5784790.2
GS02-31	937	38 08 55.09S	149 02 45.65E	679280.5	5775715.6
GS02-33	1421	38 04 00.63S	149 02 54.25E	679690.1	5784787.7
GS02-33	937	38 08 54.89S	149 02 55.90E	679530.2	5775716.1
GS02-35	1421	38 04 00.61S	149 03 03.72E	679920.9	5784783.3
GS02-35	937	38 08 54.99S	149 03 04.35E	679735.8	5775708.6
GS02-37	1421	38 04 00.59S	149 03 25.80E	680459.1	5784772.1
GS02-37	937	38 08 54.94S	149 03 27.02E	680287.8	5775697.9
GS02-39	1421	38 04 00.35S	149 03 38.83E	680776.9	5784772.2
GS02-39	937	38 08 54.67S	149 03 41.37E	680637.2	5775698.4

## 1.5 PROGRAMME MAP



# Section 2 - Synopsis

## 2.1 OVERVIEW

The survey consisted of 25 pre-plotted lines with a total of 202.0 kilometres full fold coverage in Retention Lease for Petroleum Vic/RL3, located off the Victorian coast. All lines were acquired to completion, except that line GS02-27 was removed from the programme at Santos' request, prior to arrival in the survey area. A final total of 223.29375 kilometres of surface coverage, equivalent to 194.49375 full fold kilometres, were recorded.

After completing the GBS02 2D MSS, the Polar Duke retrieved the airgun arrays and commenced streamer reconfiguration to 2100 metres during the transit from Exploration Permit for Petroleum Vic/P41. Upon completion of the reconfiguration, a set of monthly tests was conducted and acquisition commenced on line GS02-19-001 at 1802hrs on January 5<sup>th</sup>, 2003.

Production continued through January 5<sup>th</sup> and into January 6<sup>th</sup> in good weather conditions. Due to the 18.75 metre shotpoint interval, it was necessary to reduce the vessel speed to under 4 knots to allow sufficient time for the compressors to cycle. Low manifold pressures were experienced on a number of occasions when the vessel speed increased due to currents. Details were noted in Observers Logs but brute stack processing indicated no impact on data quality and production continued.

On January 6<sup>th</sup>, a high feather angle (11.5 degrees) due to currents was experienced at the commencement of line GS02-03-004. The feather angle decreased throughout the line and the line was completed. During the following line, GS02-23-005, a number of misfires necessitated the disabling of Guns S2-1 and S1-1 at SP 1098 and the line was completed with a total gun volume of 3080 cu in. Following airgun repairs during the following line change, acquisition continued through to midnight without further incident.

During January 7<sup>th</sup>, numerous gun timing errors during line GS02-11-012 resulted in Gun S1-3 being disabled and the line completed with a total gun volume of 3400 cu in. Gun timing errors continued on to line GS02-33-013 and Gun S1-3 was again disabled. During the following line change, the gun was replaced and production continued until an air leak on Gun S2-1 during line GS02-35-015 required the vessel to circle for repairs. Line GS02-35-016 was completed without further incident. Weather conditions began to deteriorate during the late afternoon and, prior to the commencement of line GS02-37-018, the streamer was lowered to 7.0 metres to reduce swell noise and to aid in streamer depth control.

Weather conditions continued to deteriorate on January 8<sup>th</sup> and the streamer was lowered to 8.0 metres. Line GS02-08-023 was acquired with numerous data extraction and parity errors caused by the constant pounding of 2.5 to 3.0 metre swells. Swell noise of 5 – 35  $\mu$ bar was affecting up to 10% of traces but brute stack processing confirmed acceptable data quality. Following completion of the line under manual steering, the vessel commenced a line change to line GS02-04-024 but sea conditions were unsuitable and the vessel was standing by for weather from 1230hrs.



Soon after, a series of large swells caught the vessel abeam and the streamer became entangled with the starboard outer gun string. Following several unsuccessful attempts to separate the equipment, the decision was made to find shelter behind Cape Howe and a slow transit commenced.

Upon arrival near Green Cape on January 9<sup>th</sup>, the in-water equipment was retrieved without significant damage and the vessel returned to the survey area. On arrival, weather conditions were still unsuitable for seismic acquisition and the vessel remained on weather standby for the remainder of the day.

Early on January 10<sup>th</sup>, weather conditions began to improve and the streamer was redeployed with acquisition commencing on line GS02-06-024 at 0320hrs. Due to the presence of large swells, the streamer was lowered to 10.0 metres for the remaining two lines of the survey. The final line, GS02-04-025, was acquired with swell noise (5 - 20  $\mu$ bar) affecting 5% of traces and the GS02 2D MSS was completed at 0922hrs on January 10<sup>th</sup>. All in-water equipment was then retrieved and the vessel demobilized to Eden, NSW. The vessel arrived in Eden Harbour at 1900hrs and seismic data and personnel were ferried ashore by a local vessel. The *Polar Duke* departed Eden for New Zealand at 2130hrs.

## 2.2 PRODUCTION

### Survey Production by Line

Seq	Line	Dir	FCSP	LCSP	KM	KMFF
001	GS02-19-001	180	1422	937	9.11250	7.91250
002	GS02-01-002	000	1001	1486	9.11250	7.91250
003	GS02-21-003	180	1422	937	9.11250	7.91250
004	GS02-03-004	360	1001	1486	9.11250	7.91250
005	GS02-23-005	180	1422	937	9.11250	7.91250
006	GS02-05-006	000	1001	1486	9.11250	7.91250
007	GS02-25-007	180	1422	937	9.11250	7.91250
008	GS02-07-008	000	1001	1486	9.11250	7.91250
009	GS02-29-009	180	1421	937	9.09375	7.89375
010	GS02-09-010	000	1001	1486	9.11250	7.91250
011	GS02-31-011	180	1421	937	9.09375	7.89375
012	GS02-11-012	000	1001	1486	9.11250	7.91250
013	GS02-33-013	180	1421	937	9.09375	7.89375
014	GS02-13-014	359	1001	1486	9.11250	7.91250
016	GS02-35-016	180	1421	937	9.09375	7.89375
017	GS02-15-017	000	1001	1486	9.11250	7.91250
018	GS02-37-018	180	1421	937	9.09375	7.89375
019	GS02-17-019	000	1001	1486	9.11250	7.91250
020	GS02-39-020	180	1421	1209	3.99375	3.99375
020	GS02-39-020	180	1208	937	5.10000	3.90000
021	GS02-10-021	299	1413	937	8.94375	7.74375
022	GS02-02-022	090	1001	1552	10.35000	9.15000

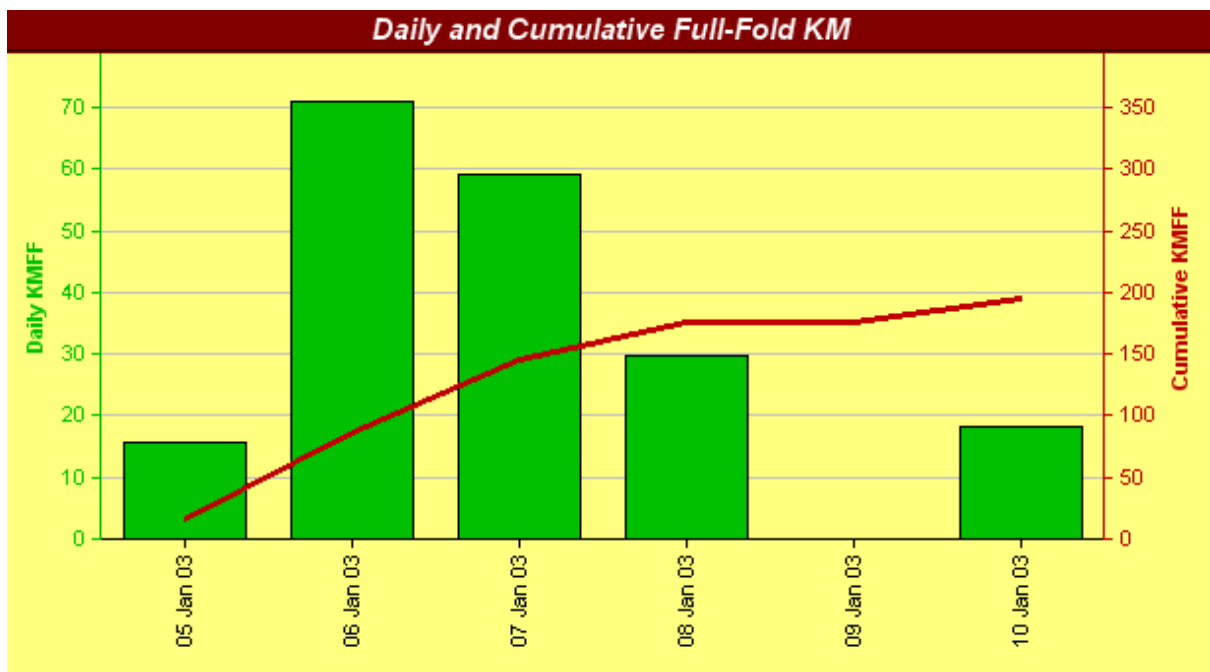
023	GS02-08-023	270	1486	937	10.31250	9.11250
024	GS02-06-024	270	1486	937	10.31250	9.11250
025	GS02-04-025	090	1001	1552	10.35000	9.15000

## STATISTICAL SUMMARY

### Production Statistics

#### Total Survey Production

KM	KMFF
223.29375	194.49375



#### Survey Production by Date

Date	KM	KMFF
05 Jan 03	18.22500	15.82500
06 Jan 03	81.97500	71.17500
07 Jan 03	67.72500	59.32500
08 Jan 03	34.70625	29.90625
10 Jan 03	20.66250	18.26250

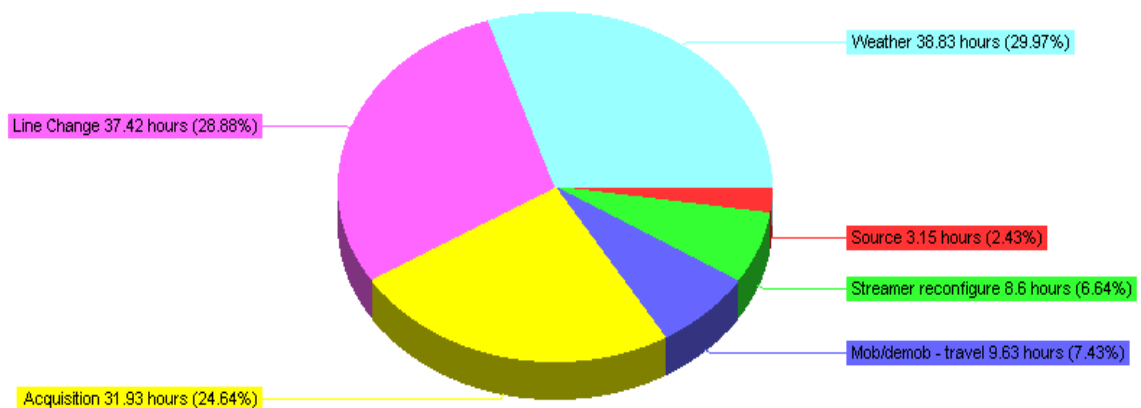
## Timing Statistics

### Total Survey Hours

Code	Description	Total Standby	Total Contractor	Total Hours
01	Acquisition		31.93	31.93
02	Line Change		37.42	37.42
10	Weather	38.83		38.83
22	Streamer reconfigure	8.60		8.60
30	Source		3.15	3.15
51	Mob/demob - travel		9.63	9.63

**Total survey time: 129.57 hours**

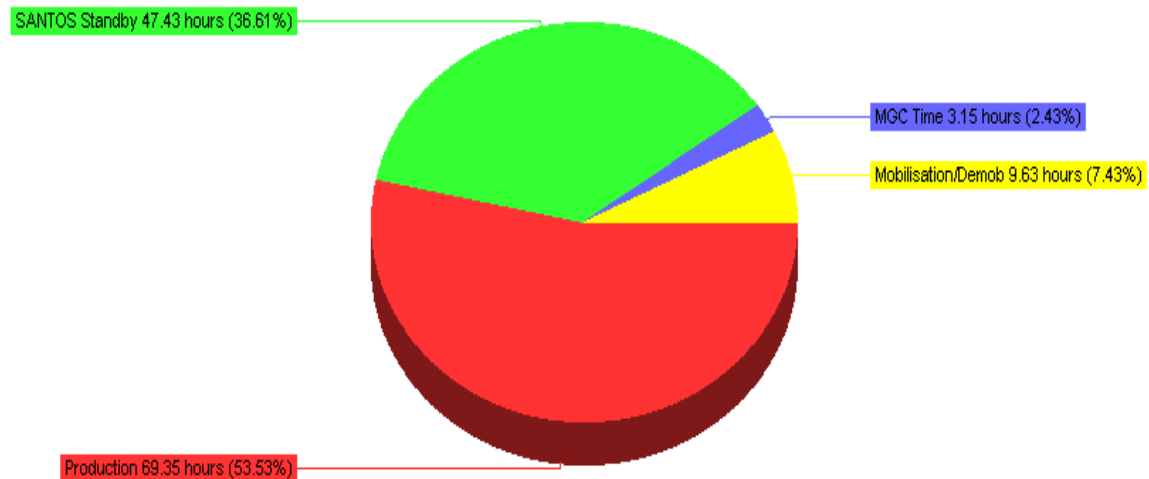
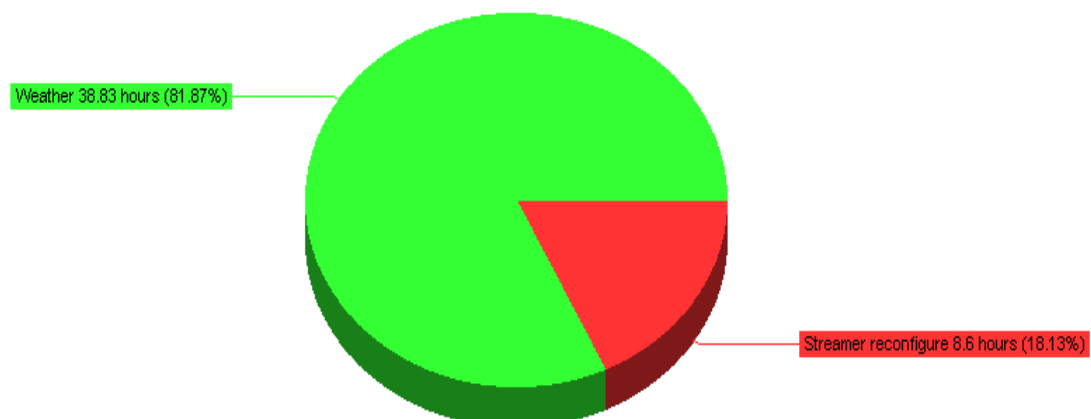
### GS02 2D - Timing between 05 Jan 03 and 10 Jan 03

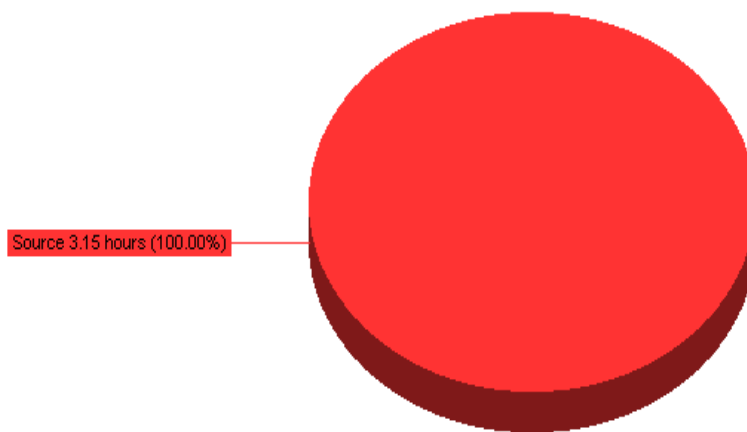


### Category Timing

Category	Hours
SANTOS Standby Time	47.43
MGC Time	3.15
Production Time	69.35
Mob/Demob Time	9.63

**Total survey time = 129.57 hours**

***GS02 2D - Category Timing between 05 Jan 03 and 10 Jan 03 (Total = 129.57 hours)******GS02 2D - Standby Time***

*GS02 2D - Contractor Time***2.3 TECHNICAL SUMMARY**

The following is a brief description of individual equipment performance throughout the survey:

**SYNTRAK 960-24****General Description**

The SYNTRAK 960-24 Multiple Streamer Telemetry System (MSTS,) acquires, processes, and records sampled data with a choice of 0.5-, 1-, 2-, or 4-millisecond sample rates.

Mouse control and pull-down menus form a graphical interface. Graphical presentation of pertinent data and status allows monitoring of system performance.

The QC Graphics WorkStation gives additional real-time quality control and off-line data viewing features to verify proper system operation.

A streamer system consists of seismic sensors, interconnecting cable segments, and Data-Acquisition Modules in the water and the Multiple Streamer Telemetry Processor (MSTP), Multiple Streamer Recording System (MSRS), and System Controller on the seismic vessel. The system also includes associated components such as cable levellers and tail buoys.

**Basic Operation**

In synchronisation with the Navigation System and Gun Controller system, the MSTP sends commands to each Data Acquisition Module in the streamer through a signal path called the passive telemetry rail. Upon receiving a command to acquire data, each module begins sampling seismic data from associated groups of 12 hydrophones.

Each module digitises and filters that data, then enters it onto a second signal path called the active telemetry rail for transmission to the vessel. Data enters the MSTP Streamer Interface (SI) boards under control of the System Controller. Each SI board processes data by checking data validity, converting serial data into a parallel data stream, and then digitally filtering it. Processed data goes to the MSRS Data-Collector boards. System initialisation, control signals, and data for analysis also go between the MSTP and the System Controller Data-Collector board output goes into MSRS memory. The MSRS System Processor (SP) boards, the VME Bus Interface (VBI), and the three SCSI-II boards then combine to prepare stored data for plotting, magnetic tape storage, or hard disk storage. Data and system status also transfers between the MSRS and the System Controller.

## **SOURCE AND SOURCE CONTROLLER**

Four gun strings were deployed; two strings either side of the streamer. The combined volume totalled the survey specification of 3500 in<sup>3</sup>. MGC supplied the drop out specification for the gun arrays.

Gun performance was good overall but accounted for all contractor down time. This was due to an air leak on 7<sup>th</sup> January that resulted in the vessel circling whilst repairs were made.

A total of **3.15 hours** of technical downtime was attributed to source problems during the survey.

Depth control of gun arrays was good. There were 4 sensors mounted on each sub-array, which proved reliable throughout the survey.

Four compressors were available to supply air to the guns. Only two were used, and generally had sufficient capacity to maintain air pressure at 2000psi. However, currents affected vessel speed on a number of occasions which resulted in low manifold pressures. Brute stack processing indicated data quality was not compromised and no downtime was incurred.

## **SYNTRON GCS-90:**

The Syntron GCS-90 Marine Seismic Source Controller was used during this project for the control and monitoring of the source array, and to ensure that the original design performance of the array was achieved, or exceeded, under operational conditions. The system was configured to control twenty six individual airguns, using four eight-channel Fire Control Boards.

The SPECTRA INS issued cycle start pulses to the GCS-90 Cycle Control Board at each calculated shot point location. Fire commands, with an output resolution of 0.1 millisecond, were then issued to the four Fire Control Boards, which initiated firing by activating the Solenoid Power Supplies. Each of these provided 16 channels of high voltage output, with individually controllable gain, to fire the individual airguns.

A feedback mechanism is invoked during each firing cycle to ensure that each airgun in the array fires within a discrete time window. This mechanism is based on the use of Shuttle Motion Detectors, which are installed in each airgun and produce electromagnetic impulses in response to shuttle motion when the airguns fire. At each shot, multiplexed shuttle motion response data were transmitted to the GCS-90 Fire Control Boards, where they were precisely

digitised and the resulting waveforms used to compare individual airgun discharge times with the fire command time. The time differences were used to calculate updated trigger times based on airgun discharge history. The result is a multiple-airgun array with optimally synchronised waveforms, producing repeatable acoustic output with a high-energy yield in the most useful seismic frequencies.

The high-resolution digitisation of the shuttle motion waveforms enabled precise timing information to be generated, and the source array to be dynamically tuned at each shot. The windowing function of the system was used to exclude pre-cursor spikes and source firing cross-feed from the digitised firing sensor waveforms, improving the accuracy of the timing information. Any misfires, auto-fires or delta-timing errors falling outside the specified limits were flagged by the system and visual alarms displayed on the monitors.

An embedded computer system was used to record and display, on a colour graphics work station, the individual airgun firing times at each shot, for monitoring and analysis of system performance. The system also output the source data to the recording system for inclusion in the seismic headers at each shot and hard copy reports of the shot statistics were produced at the end of each line.

### **SOURCE DEPTH MONITORING SYSTEM**

The GCS-90 Gun Depth Transducer System for this project comprised twelve pressure sensitive devices enclosed in stainless-steel modules and mounted on each source array, at the head, at the centre and one at the tail of each sub-array. The output signals from each device is frequency modulated proportional to pressure (ie. depth) variations and are transmitted back to the Gun Depth Monitor Card of the GCS-90, where they were recorded and displayed. The transducer output is compensated for temperature and pressure and is accurate to one decimeter, with a resolution of one centimeter. A depth range from zero to forty meters of seawater can be measured by the system.

### **STREAMER**

Seismic data were acquired during this survey using the Syntrak 960-24 RDA Digital Streamer, manufactured by Syntron, Inc.

---

#### **GENERAL**

---

Type	Syntrak 960-24 RDA 1 Digital Streamer
Flotation Material	Isopar M (200 litres/active section)
Skin Material	TPU alloy, 4mm wall
Strength Member	2 X 12 strand Vectran braid
Breaking Tension	10,000 kg.
Operating Tension	Up to 30Kn (6744lbf)

Section Length	74.4 metres
Section Diameter	64mm (2.51 in.)
Streamer Length	4050m
Section Configuration	6 seismic channels.
Seismic Group Interval	12.5 m

---

**ACOUSTIC**


---

Group length	12.5 m.
Group Type	Centre-weighted array
Sensor Type	Benthos RDA Hydrophone
Sensors per Group	16 in parallel connection
Group Sensitivity (Charge)	-148.6 dB re 1nC/μPa +/- 0.5dB
Group Sensitivity (Voltage)	-197.3 dB re 1V/μPa +/- 0.5dB
Group Capacitance (Nominal)	0.016 μF @ 22°C

---

**INTERFACE**


---

Data Telemetry	Twin axial pair
System Compatibility	MSX24 module and recorder (Input/Output, Inc.)
Communication Coils	Single Syntron TR990 @ 6.1m from head. Single Syntron TR990 @ 68.6 m from head.

---

**ENVIRONMENTAL**


---

Operating Depth (typical)	5 to 15 metres
Operating Temperature Range	0°C to +48°C (32°F to 120°F)
Storage/Transport Temperature	-40°C to +70°C (-40°F to 158°F)

The streamer was configured to 2100 metres prior to commencement of the GS02 2D Marine Seismic Survey. Daily tests were carried out prior to survey start and then on a daily basis.

No technical downtime was attributed to streamer problems during the survey.



**VESSEL**

The S/V Polar Duke was built in 1983 as a multi purpose survey and expedition vessel with reinforced hull for navigation in ice. The DNV Sealer class corresponds to requirements according to ICE 03 for machinery and ICE 05 for the hull. The vessel was mainly built for Artic and Antarctic expeditions, oceanography and base support.

She was rebuilt to seismic in 1998. Source and streamer handling procedures are carried out on the same main deck level, with the streamer handling area central between the gun runways. Back deck work areas are adequate for streamer deployment and retrieval but are open at the stern. Inertia type safety lines are used during all back deck work but a raised grating type deck would improve safety.

The vessel holds full DNV classifications and conforms to all IAGC and E&P Forum guidelines and requirements for Health, Safety and the Environment. Cabin space is at a premium, with most crew having to share a cabin. The vessel has a 3-bed hospital with bathroom. The day room and messing facilities were ample. A separate smoking lounge is provided. However, all enclosed areas of the vessel became smoke free on 11<sup>th</sup> December. The food aboard was excellent and plentiful.

No technical downtime was attributed to vessel problems during the survey.

**VESSEL SPECIFICATIONS**

Name :	S/V Polar Duke
Owner :	POLAR DUKE AS
Operator:	Rieber Shipping AS
Port of Registry :	Bergen, Norway
Date Built :	1983
IMO Number :	8200838
Radio Call Sign :	LACS4

**CLASSIFICATIONS**

Flag :	Norwegian
Class Certificate :	DnV + 1Aa-E0-HELDK-Sealer
Designation :	Survey Vessel

**DIMENSIONS**

Length :	66.65 meters
Beam :	13.00 meters
Draft :	5.80 meters
GRT :	1646 tonnes (gross registered tonnage)

NRT : 494 tonnes (net registered tonnage)

### **MACHINERY**

Main Engines : 2 x MAK 6M 453aK 1650 kW/2250bhp each @ 600 rpm.

Propulsion : 1 x Hjelset RKT 260/R500 /90

Bow Thruster: 1 x 425kW/570bhp

Stern Thruster: 1 x 425kW/570bhp

Generators: 1 x E.C.C. 1640kVA shaft generator

1 x Stamford MC 334C – 112.5 kVA aux generator

1 x Stamford MC 534C - 305 kVA aux. generator

### **CAPACITIES**

Fuel Oil Capacity : 1000 cubic metres

Lubricating Oil Capacity: 5 tonnes

Cable Oil Capacity: 55.0 cubic metres

Fresh Water Capacity: 125 cubic metres

Water Maker : 1 x Alfa Lavel, 1 x Atlas 7-8 cubic metres a day

Fuel Consumption : 10 tonnes per day (average)

Endurance : 60 days

Cruising Speed Range: 16,000 nautical miles

### **BRIDGE EQUIPMENT**

Auto Pilot : Anschutz NP2010 Basic Type AP01-S01

Gyrocompass : Anschutz st4

Anschutz st20

Remote Control : Stern Control Station

Echo Sounder : Simrad ED 161 T3003E (1000m max sounding)

Furuno Video Sounder FCV271 (2000m max sounding)

Radars : Furuno FR 2115, 3cm band

Raytheon M34 ARPA, 10cm band

### **COMMUNICATIONS EQUIPMENT**

GMDSS Radio equip.: 1 x Skanti TRP 8750, main unit.

1 x Skanti Dsc 9000 Controller-Receiver for MF/HF.

1 x Skanti PC 9000 personal computer

1 x Skanti, Printer, Prc 9000, printer

2 x Sailor compact WHF, DSC RM 2042.

VHF Radios	:	1 x Sailor RT 143
		1 x Sailor RT 144
		3 x Tron GMDSS Emergency.
Watch Receiver	:	1 x Skanti WR 6000
Satellite Com.	:	1 x Nerasat B
		1 x Skanti Inmarsat -C Scan Sat-CGTM
Aeronautical VHF	:	1 x Skanti King KY 195 b tso
Radio Beacon	:	1 x SAC SS 800 A, 410 kHz
UHF Handsets	:	5 x Motorola Radius GP300
Lifeboat Radio	:	2 x Skanti TRP 1
<b>VHF Emergency</b>		
Bearing Transm.	:	1 x Cospar/Sarsat Newcom NC 250
		2 x Jotron TRON 1K for Lifeboats

## 2.4 SAFETY SUMMARY

The vessel fully adheres to the health and safety requirements as set out by SOLAS. All machinery and seismic equipment is maintained on a computerised planned maintenance system. HSE audit recommendations are implemented through the IMGC-QHSE System which highlights deficiencies identified during audits and sets target dates for the completion of work along with whom or which department is responsible. Regular cross audits are held to improve and bring to attention any problems in operations or work practises.

All emergency exits and routes to exits are adequately marked. Deck areas and walkways have recently been repainted and covered with a non-slip coating. A fully integrated alarm system is in place and is tested on a regular basis. Flashing lights are fitted to alert personnel when equipment on the gun deck is either being pressurised or test fired. Fire fighting equipment is positioned at all necessary locations about the vessel. The streamer reel is covered by a foam deluge system. The main streamer reel is fitted with a 'save-all' with drainage to the waste kerosene tank. Most lifting equipment on the gun deck consists of stainless steel chains and shackles. Lifting points on deck heads were not used unless they had been rated. All certification is current. More than adequate abandonment equipment is carried on board.

Emergency procedures are laid down and prominently displayed about the vessel. Vessel plans showing emergency escape routes along with the location of all emergency equipment are also prominently displayed. Emergency fire/boat and man-overboard drills are held on a weekly basis. Current policy, hazards, near misses and topics arising are dealt with during the HSE meetings held for all crew. Procedures for handling trailing gear during deployment and recovery were clearly laid down and followed closely. Procedures are under constant review as both the equipment and therefore the handling techniques change. Procedures are also in place for two-boat operations, helicopter operations and at-sea personnel transfers. Safety 'toolbox' meetings were held with all personnel involved prior to any operation. A Permit to Work system was in place for all hot work (burning, welding, and cutting), confined space entry, work aloft, and work on high-pressure systems and electrical systems.

Comprehensive first aid and medical supplies are carried onboard. Search and rescue is controlled through the Rescue Coordination Centre of AusSAR in Canberra.

All personnel have completed an offshore survival course, which covers survival at sea, fire fighting, first aid and helicopter underwater escape training. The Master, Chief Officer and some senior seismic personnel have undertaken advanced first aid and HSE management courses. Due to the remoteness of the survey operations, a medic was also onboard the vessel during the survey.

The waste management system in place onboard consisted of all food waste being separated prior to incineration. All glass and metal were separated for disposal ashore. Dirty oil, PVC and plastic refuse was also stored separately for disposal onshore.

The standard of accommodation was adequate. The general housekeeping was considered to be adequate.

Upon arrival on the vessel all new crew including temporary personal, such as field support, were given a vessel Induction / Familiarisation Tour covering information on the following:

**Bridge and Deck:**

- Location of line throwing appliances
- Location of portable VHF and UHF
- Information about telephone and intercom system
- MOB alarm and procedure
- First Aid Kit
- Fire Pump Start
- Release of life buoys from bridge wings
- Emergency plan
- Safety plan
- Emergency Signals
- Location of pyrotechnics
- Location of radar transponders and how to use
- Information concerning smoke detectors
- Location of 'free-float'
- Function of P.T.W (permit to work)

- Danger in vicinity of radar mast
- Awareness of ships movement (rolling and pitching)

**Forecastle Shelter Deck**

- Fire hose stations
- Location of M.O.B. boat
- Location of Life boats
- Fire Station 1
- Fire Station 2
- Fire Plans
- Where to start foam pump
- Launching procedures for life rafts
- Location of survival suits
- Location of lifejackets
- Brief instruction on launching procedure for lifeboats
- Forecastle escape hatch

**Gun Deck:**

- Alarms (M.O.B. / Gun / Compressors)
- M.O.B. alarm releases
- Halogen Room
- Portable foam branch and Foam container
- Emergency exits, marking of primary and secondary escape routes
- Remote closing of watertight doors
- Emergency escape hatch from engine room

As an overall conclusion on attitude, the level of HSE awareness on board from all crew was exceptionally high. Drills were well planned with adequate attention paid to drill and safety meeting reports.

## 2.5 CONCLUSIONS AND RECOMMENDATIONS

The following are areas where it was considered that there is room for improvement with equipment, technique or procedure.

- Streamer deck is open with a flat smooth deck; although there are inertia safety lines, the possibility of being washed off in rough conditions is high. A raised grating would allow the crew to keep their footing while the water could drain away. Alternatively some form of gate between the goal posts could be employed.
- Strain gauge fitted to streamer to give an indication of the tension on the streamer.
- Sewage system to be installed as soon as possible.
- Man over board life raft with a Dan Buoy on the stern of the vessel.
- A greater sense of urgency in in-water equipment deployment and retrieval would reduce the amount of lost time due to these activities. This may have been due to the inexperience of the seismic crew (as the vessel is relatively new in terms of seismic capability).

# Section 3 - Navigation

### 3.1 NAVIGATION HARDWARE AND SOFTWARE

System	Hardware (Type and Serial No.)	Software version
CONCEPT	Spectra Integrated Navigation Sys.	9.8.03
FGPS	SeisPos navigation processing sys	10.80/11.00
External Header	General Header	Syntron v2
Acoustic System	None	
TS-meter	SD204	Minisoft 200W
Echo sounders	Simrad EA-500 12Khz	
	Furuno FCN-271	
Gravity sensor	Fugro LCT	
Current Meter	None	

#### SYSTEM TIMING (SST – System Start)

Spectra issued closures to the recording/source firing system 628 milliseconds before the predicted time of peak pressure. All Spectra system positions are at the time of predicted peak pressure.

#### SURVEY POSITIONING METHOD USED

This 2D survey was carried out using MGC standard mode of operation for Single Streamer and single source surveys.

Fugro Starfix+ interfaced to the Spectra System provided primary vessel positioning.

The two sources of corrections were transmitted to and received onboard the vessel by independent means thereby providing a high degree of redundancy to ensure continuous vessel positioning.

**System 1:** Trimble 4000SSi receiver  
 RTCM Delivery System: Fugro SPOT and Dual-Frequency Starfix+ via Fugro Starfix+ system.  
 Computation Software: Fugro MRGPS version 2.4.09

**System 2:** Trimble 4000SSi receiver  
 RTCM Delivery System: Inmarsat  
 Computation Software: Fugro MRGPS version 2.4.09

Source positioning is carried out using gyro-stepback from the NRP to the stern and first compass rotation-stepback from the stern to the centre of the array.

Streamer positioning is carried out using gyro-stepback from the NRP to the stern, first compass rotation-stepback from the stern to the head of the streamer and compass data from head to tail of the streamer. The compass elements are housed in DigiCOURSE 5011 Depth Controllers mounted on the outside of the cable at intervals of 300 meters. Each compass is accurate to 0.5°.



All stepback values, gyro data and compass data are input to the INS, either manually or through the RTNU, and the source positions and the cable positions and shapes are calculated dynamically and displayed in real-time.

Ten DigiCourse Series 5011 combined streamer depth control and magnetic compass units modelled the streamer shape. Least squares condition equations for each streamer assuming circular arcs between compasses and relating the tracking nodes, compasses, tension corrected distances between compasses, rotation bias and scale were used to compute scale, rotation and individual compass corrections. The streamer shape was then computed by the circular arc method.

## 3.2 SURFACE POSITIONING

### VESSEL NAVIGATION

**Primary:** Starfix Dual Frequency Stations  
RTCM Delivery System: Fugro SPOT and Dual-Frequency Starfix+ via Fugro Starfix+ system.

Brisbane, Broome, Bathurst, Melbourne, Dunedin.

**Secondary:** Fugro Starfix: Premier Dual Frequency Stations  
RTCM Delivery System: Inmarsat B and SPOT AP Sat

Melbourne, Bathurst, Auckland, Kalgoorlie, Dunedin

**Tertiary:** N/A

**Back Up System:** N/A

### STREAMER AND SOURCE POSITIONING

#### STREAMER COMPASSES

Ten Series 5011 Digibird combined magnetic compass and streamer depth controllers were attached to the streamer.

Compass Sampling Rate = 1 per shot

Averaging constant = 20 seconds

Prior to the start of the survey, all compasses had been field verified within the last 12 months. In addition, compass performance was monitored on a line-to-line basis throughout the acquisition phase of the survey.

#### GYRO-COMPASSES

The gyrocompasses used during the survey were :

Primary Gyro - Anshutz Kiel Type: 110-310 (S/N 3974)  
Secondary Gyro -Anshutz Kiel Type: 110-310 (S/N 5185)

The gyro correction values as computed during the mobilisation calibrations were as follows:

Primary Gyro -0.9°  
Secondary Gyro -1.8°  
Ships Gyro - N/A (uses the same value as Spectra – ie. Prime Gyro)

## VELOCITY OF SOUND IN WATER

The following type of TS-meter has been used to determine the speed of sound in water.

### SAIV A/S

STD/CTD Velocity Profiler Model SD204, S/N 406 is programmed to measure data at one-metre intervals. The probe is allowed to free fall and is then recovered. Speed of sound and depth are computed by the program, which decodes the stored information from the probe. The raw data is entered into a spreadsheet where the Medwin formula is used to calculate velocity. **Velocity calculated at 1521.5 m/s**

## ECHO SOUNDER

Primary Echosounder: Simrad Model EA500 12KHz  
Secondary Echosounder: Furuno Model FCN-271

The echosounders speed of sound was set to 1522 m/s. A draught correction of ZERO was entered in both Echosounders..

### EchoSounder Verification

The Primary Echosounder, Simrad EA-500 12khz, was installed and tested by qualified technicians on January 15<sup>th</sup>, 2002 whilst the vessel was in Singapore.

A lead-line verification was carried out on the Secondary Furuno FCN-271 Echosounder while alongside East Arm Wharf in Darwin in December 2001. Two tests were carried out at one-hour intervals:

Test 1 : 18.5m / 18.0m	Echosounder reading of 12.1m
Test 2 : 18.2m / 18.0m	Echosounder reading of 12.1m

Average lead-line distance = 18.17m

All depths recorded are based on the position of the Fathometer's transducer on the vessel's Hull. Depths are NOT draught corrected and all depths should have 5.65m added to the depth to give the true water depth from the surface.

## 3.3 NAVIGATION PROCESSING

### THE SPECTRA ACQUISITION SYSTEM

Spectra is an Integrated Navigation System (INS) specifically designed by Concept Systems Limited (CSL) for a marine seismic survey environment. The modular design approach allows the system to benefit from innovations in navigational techniques by ease of upgrade. New modules (Nodes) can be added without altering the existing system.

The Spectra platform is based on an expandable network of UNIX workstations with a dedicated real time navigational sensor acquisition system (RTNU). Any configuration can be catered for, from 2D single cable to multi-vessel, multi-streamer/source 3D. Direct data logging can be made to UKOOA P1/90 and P2/91/4 formats. A full suite of quality control features providing alarm and audit facilities to UKOOA guidelines are provided. This is integrated with extensive on-line graphical analysis and end of line reporting facilities.

### **RTNU ( Real Time Navigation Unit )**

The Real Time Navigation Unit (RTNU) is a VME chassis system, which performs data acquisition, validation and time stamping for output to Spectra. Time is provided via a dedicated GPS receiver configured as a system time reference unit. The real time multiprocessing sub-system consists of multiple high performance single board computers (SBCs) communicating over a 32-bit VME bus and running the OS9 real time operating system. Sensor data acquisition is via Intelligent Communication Controllers (ICCs).

The RTNU is a physically separate node on the network and communicates with the rest of the Spectra system via Ethernet TCP/IP. It interfaces with an external trigger input/output unit (the Closure Unit), providing multiple trigger input/output to the seismic recording system and other vessel sensors.

## **3.4 NAVIGATION SUMMARY**

The navigation for GS02 2D MSS generally ran smoothly. Cross currents in the survey area resulted in large feather angles on a number of occasions. Feather angles on lines GS02-03-004, GS02-33-013 and GS02-04-025 exceeded 11 degrees for short periods of time, but were usually less than 5 degrees. During rough weather on line GS02-08-023, the vessel was offline up to 37 metres as the Robtrak steering system could not keep the vessel online and manual steering was necessary. Due to a malfunction in the power supply to the tailbuoy, no active tailbuoy was available between Sequences 005 and 023. However, due to the short streamer length and adequate compass data during these sequences, it was not considered operationally necessary to retrieve the streamer for repairs. During poor weather on 9<sup>th</sup> January, the vessel sailed behind Cape Howe for shelter. The streamer was retrieved and the tailbuoy repaired. No further problems were encountered.

No technical downtime was attributed to navigation problems during the survey.

### **ECHO SOUNDER**

Echo Sounder data was generally good throughout the prospect.

# Section 4 - Environment

## 4.1 WEATHER

Two web sites were used to source weather information during the course of the survey:

[www.bom.gov.au](http://www.bom.gov.au)

[www.buoyweather.com](http://www.buoyweather.com)

## 4.2 TIDES, CURRENT AND FEATHER

Tidal currents over the survey area had an impact on the seismic operations. Feather angles exceeded 11 degrees during lines GS02-03-004, GS02-33-013 and GS02-04-025 but were generally less than 5 degrees.

Tidal information was available from The Australian National Tide Charts.

Throughout much the survey, a strong SW swell from 1.0 to 3.0 meters prevailed, with winds varying from the SW (10 - 25 knots) to NE (2 – 15 knots).

In addition to the above information it was possible to access data about local environmental conditions from buoyweather.com virtual buoy. The forecast information was reported daily with a 4 day forecast. The vessel also had weather fax which prints a synoptic chart twice daily. Wind direction and weather charts were available on [www.bom.gov.au](http://www.bom.gov.au)

A total of **38.83 hours** of standby was attributed to poor weather conditions during the survey.

## 4.3 NAVIGATION HAZARDS

The survey was conducted in open water with water depths ranging from 110 metres to 130 metres. No topographical obstructions were reported.

## 4.4 INTERFERENCE

Although the seismic vessel M/V Western Monarch was working around 20 nm to the south of the survey area, there was no seismic interference during acquisition of the GS02 2D survey. Some minor seismic interference could be seen on noise strips during the final line change but was very low in amplitude.

The vessel Bluefin was conducting a pipeline route survey within the survey area but, through close radio communications, caused no interference to the survey.

## 4.5 ENVIRONMENTAL

### **Safety Case and Environmental Assessment – GS02 2D Seismic Survey**

The following outlines steps taken to minimise any adverse effect on the environment caused by S/V Polar Duke during seismic survey operations from 5<sup>th</sup> January, 2003 in the Vic/RL3 retention lease.

### **Garbage and Garbage Management**

Garbage includes all kinds of food, domestic and operational waste generated during normal operation of the vessel and liable to be disposed of periodically.

S/V Polar Duke garbage is grouped into the following categories:

1. Dry refuse
2. Glass, metal, bottles, crockery, etc
3. Food waste
4. Oily waste, rags, filters etc.

### **Entries in the Garbage Record Book**

Entries in the Garbage Record Book are made on each of the following occasions:

- a) When garbage is discharged to reception facilities ashore
- b) Accidental or other exceptional discharges of garbage.

The following information is recorded in the garbage book on all the occasions listed above:

1. Date and time of discharge
2. Position of ship (Latitude & longitude)
3. Category of garbage discharged
4. Estimated amount discharged for each category in cubic metres
5. Signature of Officer in charge of operation

Prior to the start of this survey, all garbage in categories 1 to 3 was discharged to reception facilities in Cairns, Australia.

Whilst on the survey, all garbage was incinerated. On average 0.15 m<sup>3</sup> waste was burnt each day. All dry waste other than bottles, plastics and tin cans was also burnt.

All other non-combustible materials, including plastics, tin cans and bottles are stored in drums for disposal ashore.

**Waste Oil Management**

Engineers on board the Polar Duke keep a register of all waste oil products

On average, approximately 0.3 cubic metres of sludge oil was produced a day during the survey.

**Sewage**

Sewage treatment system on the Polar Duke was not operable. Sewage was macerated only before discharged over the side. All sewage was kept in sullage tanks until the vessel was in open water to comply with the MARPOL guidelines of discharge in open water greater than 12 Nm from any coast.

**Safety Hazard Register**

A comprehensive register of chemicals and other hazardous materials is kept on board and includes safety data sheets for all hazardous materials used on board Pacific Sword. Safety data sheets for particular chemicals were posted at all places these chemicals were kept. All hazardous materials are stored and handled in accordance with the prescribed legislation.

**Oil Spill Contingency Plan**

The Shipboard Oil Pollution Emergency Plan (SOPEP) was available to be put into effect in the event of any oil spill incident during the survey. No oil or oil products were discharged into the sea during this survey

Adequate oil spill response equipment is carried on board the Polar Duke. An oil spill kit comprising the following was available:

- ◆ Absorbent pads
- ◆ Good supply of absorbent granules
- ◆ Emulsifier
- ◆ Protective equipment
- ◆ Waste containers

**Emissions**

Only minimal amounts of sooty particles were emitted from the vessel.

**Lithium Battery Safety Kit**

Lithium batteries were used to power some of the in-sea electronic equipment. Exhausted batteries were kept in a separate container for proper disposal ashore. A lithium battery safety kit was available to deal with any problem batteries. Graphite powder fire extinguishers were also available in case any of the batteries ignited.



**Incident Reporting**

The incident reporting was performed via Multiwave Geophysical Company Observation Cards. (Similar to STOP cards) Responsibility lies with the Party Manager onboard.

Client Notification of Incident Report: Responsibility lies with the Client Representative onboard.

There were no incidents involving environmental damage during this survey.

**Cetacean Reporting**

No standby time was attributed to whale activity during the survey.

Numerous pods of dolphins were observed in the vicinity of the survey. As previously witnessed on several other surveys, seismic activity did not seem to have any marked effect on them. However, the acoustic energy source was gradually brought up to maximum capacity to give sufficient notice to any marine life that might have been in the area.

A number of fur seals were also sighted.

**Fishing Activity**

Prior to the commencement of operations, notices were placed in local Lakes Entrance and Bega newspapers to indicate seismic operations would be taking place in the area. Little fishing activity was evident in the survey area. Good cooperation was maintained between the Polar Duke and any local fishermen with the Polar Duke in regular radio contact to discuss shooting plans. This allowed the fishermen to keep clear of the proposed lines. No problems were encountered during communications with local fishing vessels.

No standby time was attributed to fishing activities during the survey.

**Coral Reefs**

No physical damage was caused to any reefs in the survey area.

**Conclusion**

The S/V Polar Duke and associated operations had no detrimental impact on the local environment during the seismic survey. No equipment was lost nor were there any accidental discharges of toxic material into the sea. There is plenty of signage spread through the vessel warning the crew that it is illegal to throw anything into the sea from the vessel. All waste material from day to day maintenance was stored onboard for correct disposal ashore.

The only discharges into the sea were small quantities of sewage waste, which fell within MARPOL guidelines.

# **Section 5 - Instrument Tests**

## 5.1 INSTRUMENT TESTS

A set of instrument tests was performed prior to job start on 05/01/03 and once again upon job completion on 10/01/03 with a less comprehensive set of daily tests between these dates. No daily tests were performed on 09/01/03 due to the streamer being aboard the vessel in bad weather. A semi-monthly set of tests were run if any part of the recording system was altered (ie. Module changes, Section changes etc.) The daily tests were performed with a 12 db preamp setting only while the monthly test is conducted with preamp settings of 12,24, 36 and 48db.

- DCR**     **DCO/Noise/Range:** Performs three tests. DC offset checks the value of the residual voltage remaining across the amplifier's output terminal when the input voltage is zero. Internal Noise Test checks the value of the internal noise level in the module with inputs grounded. Dynamic Range Test checks the ratio of the maximum to the minimum signal input power levels over which the amplifier can operate.
- CGA**     **Channel Gain Accuracy** introduces a known square wave into the amplifier and compares the sampled output signal with the known input.
- HD**     **Harmonic Distortion** test measures amplitude versus frequency characteristics and checks for any undesired harmonics introduced by the modules.
- CMR**     **Common Mode Rejection** test provides synthesised sine waves to both inputs of the preamplifier and measures the rejection of this common signal by the amplifier. The amplitude of the sine wave is 0.8 full scale.
- IR**     **Impulse Response** test measures the response of the system to the low-cut and high-cut as well as the mid-band pass.
- CIO**     **Crosstalk Isolation** (Odd Channels are grounded) test measures the noise appearing in one signal path as the result of coupling from other signal paths.
- CIE**     **Crosstalk Isolation** (Even Channels are grounded) – same as above.
- HL**     **Hydrophone Leakage** test measures the electrical resistance in the hydrophones.
- RMS**     Checks the noise levels in streamer channels.

**TEST RESULTS**

Date	DCR	CGA	HD	CMR	IR	CIO	CIE	HL	RMS	COMMENTS
05 Jan 03	OK	OK	OK	OK	OK	OK	OK	OK	OK	
06 Jan 03	OK	OK	OK	OK	OK	OK	OK	OK	OK	
07 Jan 03	OK	OK	OK	OK	OK	OK	OK	OK	OK	
08 Jan 03	OK	OK	OK	OK	OK	OK	OK	OK	OK	

**End of job test**

Date	DCR	CGA	HD	CMR	IR	CIO	CIE	HL	RMS	COMMENTS
10 Jan 03	OK	OK	OK	OK	OK	OK	OK	OK	OK	

**Instrument summary**

The recording instruments suffered no technical down time during the survey.

Full System tests were carried out and recorded to tape at the start and finish of the contract. Further tests were carried out daily when the opportunity arose, to verify continued system performance. The tests showed that the Syntrak system was stable and well in specification throughout the contract. At the beginning of the job there was one bad hydrophone group in the streamer, with hydrophone leakage. A number of other channels became noisy during periods of bad weather but improved as weather conditions eased.

The tailbouy power module was turned off during Sequence 005 as it was causing data extraction errors. The tailbouy remained inactive until it was repaired prior to Sequence 024. However, due to the short streamer length and small feather angles, it was not considered to be a major problem during the seismic acquisition.

# **Section 6 - Personnel & Safety**

## 6.1 PERSONNEL LIST

### Marine Crew

1	Master	Peter Brandal
2	Captain/supernumerary	David Gunter
3	1 <sup>st</sup> Mate	Karl Dukes
4	2 <sup>nd</sup> Mate	Robert Johnson
5	Chief Engineer	Gerard Patton
6	1 <sup>st</sup> Engineer	Phillip Carter
7	2 <sup>nd</sup> Engineer	Sanjiv Rathee
8	IR	Phillip Edwards
9	IR	Terence Woods
10	IR	Geoffrey McCaw
11	IR	Russell Mitchell
12	Chief Cook	Gary Shaw
13	Cook	Frank Brophy
14	Steward	John Milligan
15	2 <sup>nd</sup> Steward	James Best
16	Supernumerary	Anders Fosse

### Seismic Crew

17	Party Chief	John Hennessey
18	Senior Observer	Bjorn-Erik Melum
19	Observer	Justin Herrit
20	Observer	Nigel Sharp
21	Observer	Roar Nygaard
22	Senior Navigator	Leif Saeternes
23	Navigator	Alan Allen
24	Seismic Processing	Adam Gerbarski
25	Senior Gun Mechanic	Gary Herrit
26	Gun Mechanic	David Noseworthy
27	Gun Mechanic	Markus Rahm
28	Gun Mechanic	Arturo Casimiro

### Contractors

29	Whale Observer	Stephen Beaton
30	Whale Observer	Bret Ryan
31	Medic	Vie Gilchrist
32	Client Representative	Gary McWilliam

## 6.2 VESSEL SAFETY

### Safety Equipment:

Life Boats	: 2 x 50 man lifeboats.
Life rafts	: 4 x 20 man
	: 1 x 4 man (for MOB mounted on stern)
Work boat	: 6 metre fibreglass launch with inboard diesel.
Emergency radios	: 4 x Icom IC-GM 1500E
	: 3 x Navico-GMDSS
EPIRBS	: 1 x Kannad 406 FH
Portable EPIRBS	: 2 x Graseby Nova
Signalling flares	: Adequate
Life jackets	: 50 (in cabins and float-free boxes)
Survival suits	: 41
Safety lines	: Provided where necessary
Work flotation vests	: Provided where necessary
Safety shoes	: Provided where necessary
Eye protection equipment	: Provided where necessary
Hearing protection equipment	: Provided where necessary
Medical equipment	: First aid stations throughout ship
Fire pumps	: 2 x main 50 cubic metres/hour @ 60m head
	: 1 x auxiliary 37 cubic metres/hour @ 60 m head
Fire suits	: 2
Flame Proof Suits	: 2
Fire blankets	: 2
Resuscitators	: 2
Foam drench equipment	: AFFF in streamer reel area
Engine room,	: Halon
Compressor room	: Halon
Streamer reel fire system	: AFFF
Streamer spares fire system	: AFFF portable.
Paint store fire system	: Halon
Instrument room	: Foam and CO2 Extinguishers
Extinguishers - water	: 5 x distributed around the vessel
- foam	: 4 x around the vessel
	: 2 x Foam Monitors.
-AFFF	: 7 x distributed around the vessel
- CO2	: 8 x distributed around the vessel
- Powder	: 26 x distributed around the vessel
- metal powder	: 2 x PyroMet in appropriate areas
Equipment drawings	: Where necessary
Hazard area labelling	: Where necessary

### 6.3 SAFETY DRILLS AND MEETINGS

The following safety drills and meetings were held during the survey, indicating an overall commitment to HSE procedures.

#### All times Local Time

#### **MAN OVERBOARD DRILL ON 5<sup>TH</sup> JANUARY, 2003**

1300hrs MOB Drill, including launch (to water level only) and retrieval of rescue craft.

#### **CREW SAFETY MEETING ON 6<sup>TH</sup> JANUARY, 2003**

1100hrs Safety Meeting for all crew members.

#### **WORK BOAT AND FRC ACTIVITY**

The work-boat was not used during this survey.

Date	Time in	Time out	Work boat/FRC	Work carried out

### 6.4 SAFETY INCIDENTS

There were no reportable incidents during this survey.



# Section 7 - Diary

## 7.1 DIARY

### All Times Local Summer time (GMT +11 hrs.)

#### January 5th 2003

09:26 **SB** Retrieving guns during transit to GS02 2D MSS, Vic/RL3.  
10:30 **SB** Reconfigure streamer to 2100 metres during transit to GS02 2D MSS, Vic/RL3.  
18:02 **PR** Recording on line GS02-19-001. Line complete.  
19:18 **PR** Line change to line GS02-01-002.  
21:03 **PR** Recording on line GS02-01-002. Line complete.  
22:19 **PR** Line change to line GS02-21-003.

#### January 6th 2003

00:00 **PR** Continue line change to line GS02-21-003.  
00:02 **PR** Recording on line GS02-21-003. Line complete.  
01:19 **PR** Line change to line GS02-03-004.  
03:12 **PR** Recording on line GS02-03-004. High feather (-11.5deg) at SOL due to currents. Line complete.  
04:29 **PR** Line change to line GS02-23-005.  
06:29 **PR** Recording on line GS02-23-005. Line complete.  
07:47 **PR** Line change to line GS02-05-006.  
09:07 **PR** Recording on line GS02-05-006. Line complete.  
10:25 **PR** Line change to line GS02-25-007.  
11:49 **PR** Recording on line GS02-25-007. Line complete.  
13:07 **PR** Line change to line GS02-07-008.  
14:29 **PR** Recording on line GS02-07-008. Line complete.  
15:46 **PR** Line change to line GS02-29-009.  
17:10 **PR** Recording on line GS02-29-009. Line complete.  
18:26 **PR** Line change to line GS02-09-010.  
19:49 **PR** Recording on line GS02-09-010. Line complete.  
21:07 **PR** Line change to line GS02-31-011.  
22:25 **PR** Recording on line GS02-31-011. Line complete.  
23:42 **PR** Line change to line GS02-11-012.

#### January 7th 2003

00:00 **PR** Continue line change to line GS02-11-012.  
01:06 **PR** Recording on line GS02-11-012. Numerous gun timing errors on Gun S1-3. Line complete.  
02:23 **PR** Line change to line GS02-33-013.  
04:02 **PR** Recording on line GS02-33-013. Numerous timing errors on Gun S1-3. Line complete.  
05:19 **PR** Line change to line GS02-13-014. Gun S1-3 repaired during line change.  
06:53 **PR** Recording on line GS02-13-014. Line complete.  
08:09 **PR** Line change to line GS02-35-015.  
09:31 **DT** Recording on line GS02-35-015. Line aborted due to air leak on Gun S2-1. Line incomplete. DO NOT PROCESS.  
10:02 **DT** Repairing air leak on Gun S2-1. Circling to line GS02-35-016.  
12:40 **PR** Recording on line GS02-35-016. Line complete.  
13:58 **PR** Line change to line GS02-15-017.  
15:18 **PR** Recording on line GS02-15-017. Line complete.  
16:36 **PR** Line change to line GS02-37-018.

17:55 **PR** Recording on line GS02-37-018. Line complete.  
19:11 **PR** Line change to line GS02-17-019.  
20:42 **PR** Recording on line GS02-17-019. Line complete.  
22:03 **PR** Line change to line GS02-39-020.  
23:25 **PR** Recording on line GS02-39-020.

**January 8th 2003**

00:00 **PR** Continue recording on line GS02-39-020. Line complete.  
00:42 **PR** Line change to line GS02-10-021.  
02:38 **PR** Recording on line GS02-10-021. Line complete.  
03:54 **PR** Line change to line GS02-02-022.  
05:37 **PR** Recording on line GS02-02-022  
07:06 **PR** Line change to line GS02-08-023.  
08:43 **PR** Recording on line GS02-08-023. Numerous streamer telemetry errors due to deteriorating sea conditions. Line complete.  
10:31 **PR** Line change to line GS02-04-024.  
12:30 **SB** Standing by due to adverse weather conditions. Streamer entangled with Stbd outer gun string.

**January 9th 2003**

00:00 **SB** Standing by due to poor weather conditions.

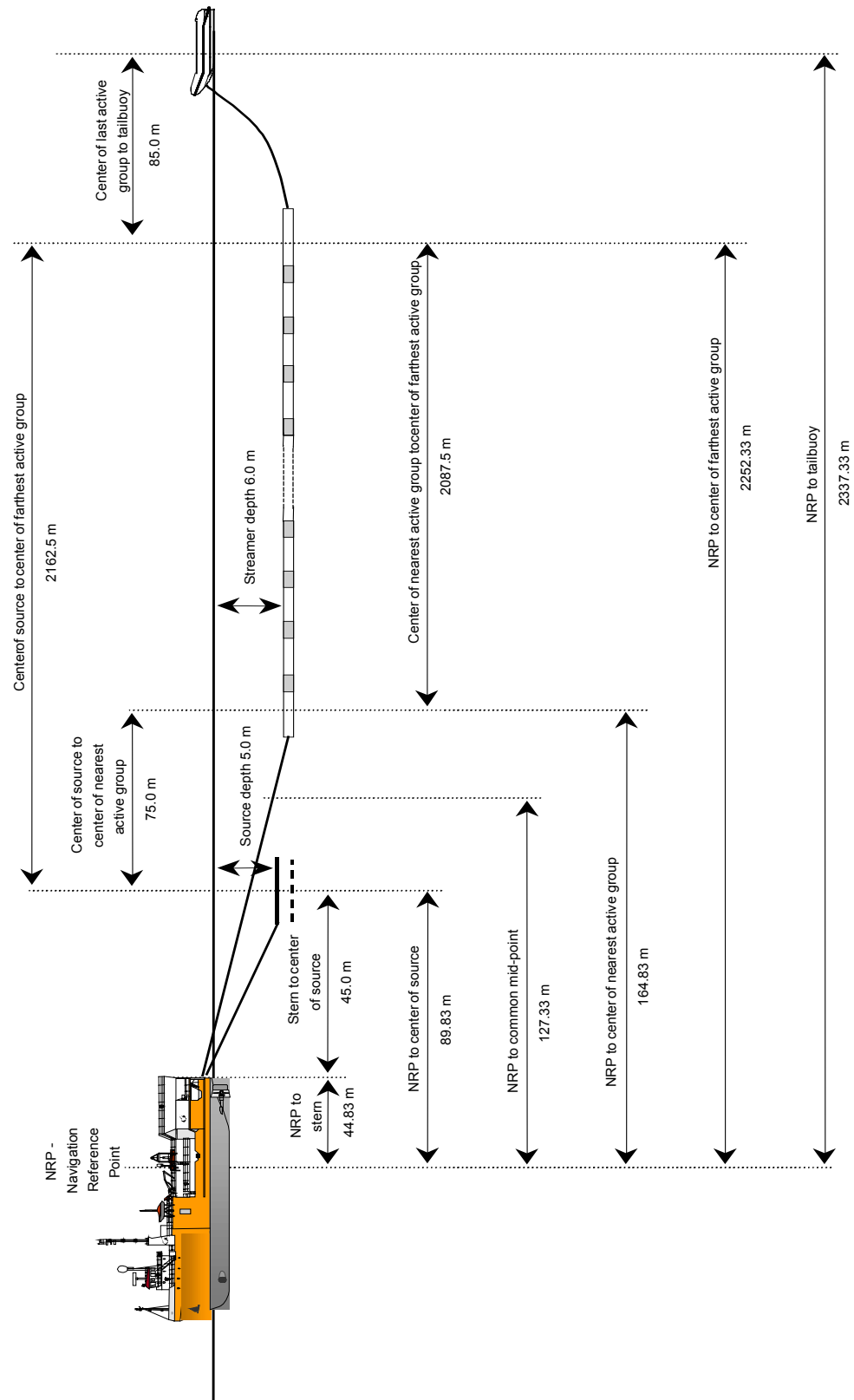
**January 10th 2003**

00:00 **SB** Continuing to stand by waiting on weather conditions to improve.  
03:20 **PR** Recording on line GS02-06-024. Line complete.  
04:47 **PR** Line change to line GS02-04-025.  
07:54 **PR** Recording on line GS02-04-025. Line complete.  
09:22 **MO** Retrieve airguns and streamer and transit to Eden, N.S.W.

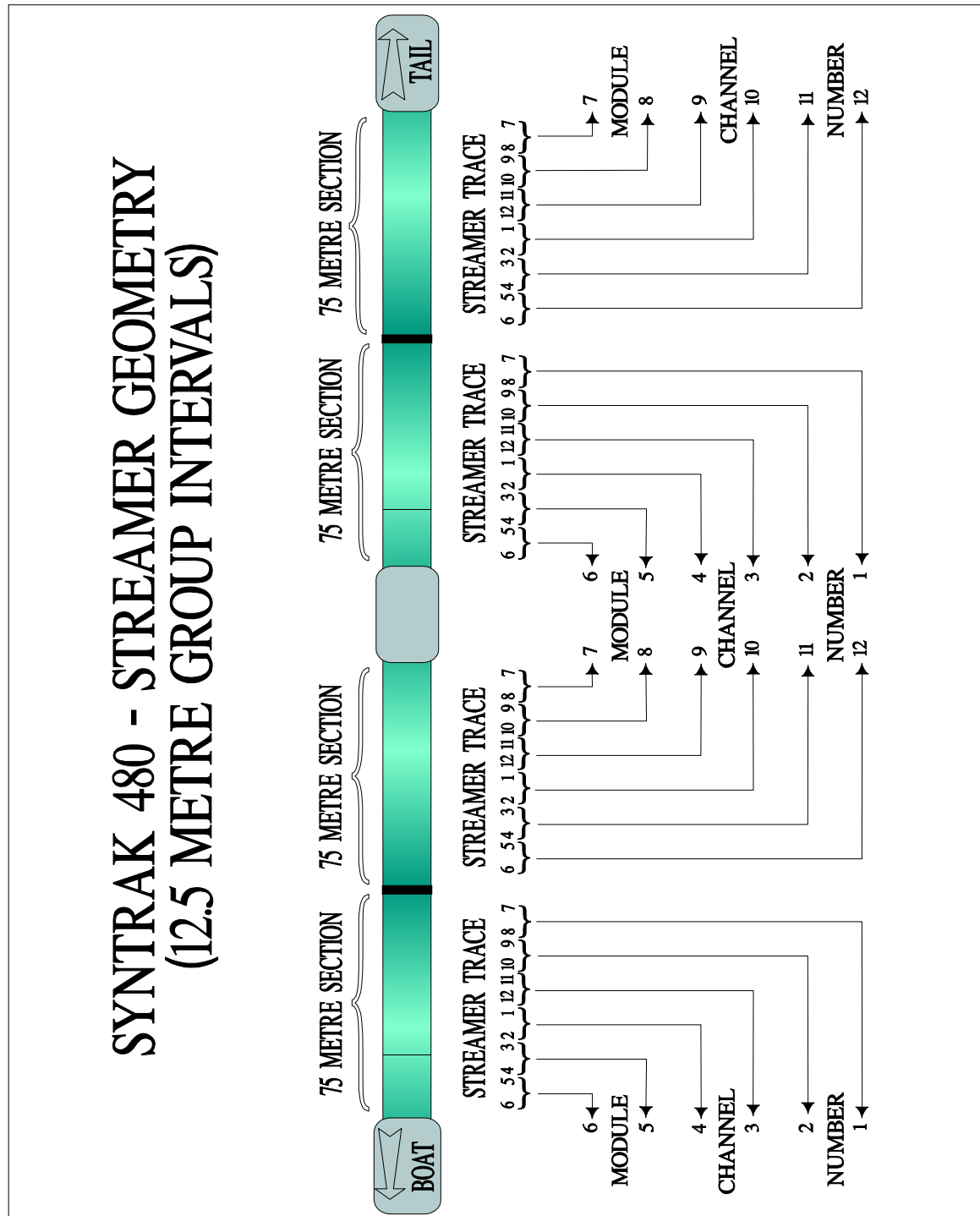
# Section 8 - Measurements

## 8.1 OFFSETS

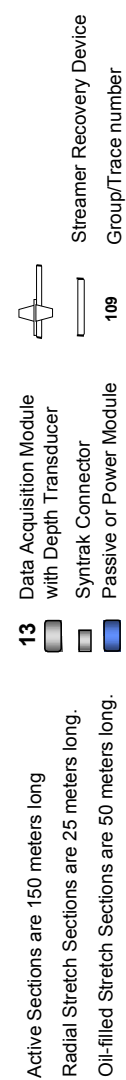
## Offset Diagram



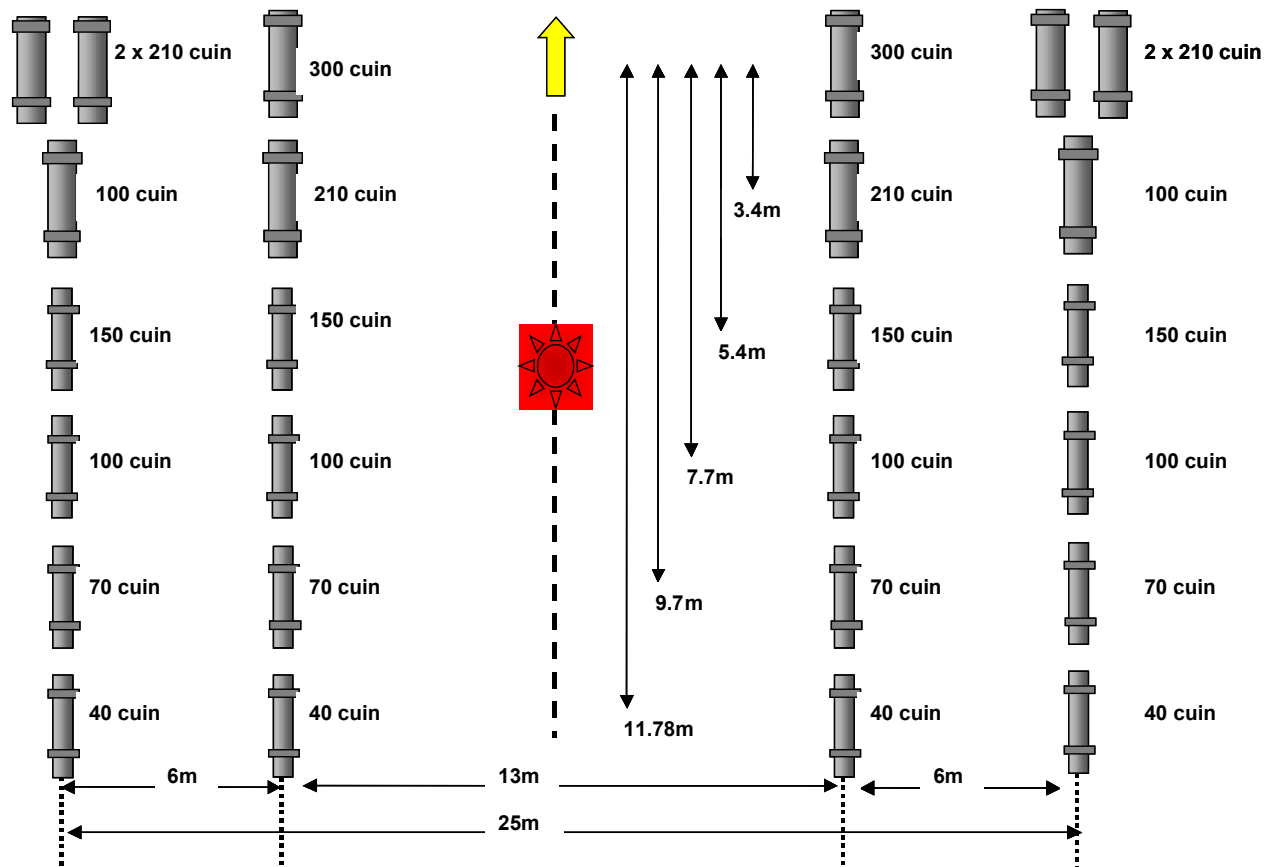
## 8.2 STREAMER GEOMETRY



# SYNTRAK 960-24 RDA Digital Streamer



## 8.4 SOURCE CONFIGURATION





# Section 9 - Appendices

## 9.1 MGC CONVENTIONS AND TERMINOLOGY

### Glossary:

Active	: 75m active streamer section (56 used in streamer)
BCU	: Bird Compass Unit, Digicourse series depth / compass unit
Module	: Streamer electronics module
dGPS	: Differential Global Positioning System. Primary and secondary satellite navigation systems.
MOB	: Man overboard boat. A fast rescue craft designed for emergencies.
960-24 RDA	: Digital streamer system
Inmarsat B	: Telecom satellite communication system
DNP	: Do Not Process. Data acquired but not accepted.
rGPS	: Relative GPS system used for positioning source and tailbuoys
RU	: Remote unit commonly known as either a bird or compass unit
SPU	: Source Positioning Unit. rGPS units situated on sub-arrays
Skyfix	: Thales (Racal) RTCM delivery system
Syntrak 960	: Data acquisition, streamer interface and recording system
SPECTRA	: Online Navigation QC System
Promax	: seismic processing system
GCS90	: Digital energy source timing system

## 9.2 LINE AND SHOT POINT NUMBER CONVENTION

**Line/Job prefix** : **GS02-**

**Sail Line Format** : Sail line numbers had the format GS02-xx-zzz, where:

GS	= Gippsland Basin, Santos Ltd identifier
02	= Year of approval of seismic acquisition
xx	= Sail line number
zzz	= Sequence number

**Shot Point numbers** : incremented from W to E and decrement from E to W.  
Decrement from N to S and incremented from S to N.

### 9.3 DESCRIPTION OF LINE LOG CONTENTS

The following provides details of the data recorded for each line in the Line Logs. All items appear on the individual page Line Log summaries found in the following section of this report.

#### Line Statistics

Seq.	: Sequence number of line (Order in which lines were shot)
Sail Line	: Client specified line number
Date	: Date on which line was started
Dir.	: Nominal line heading
Start Time	: Time of start of line, local time
End Time	: Time of end of line, local time.
SOL	: Start of line column heading
EOL	: End of line column heading
FCSP	: First Chargeable Shotpoint
LCSP	: Last Chargeable Shotpoint
KM	: Total kilometres recorded
KMFF	: Total kilometres full fold
CMP	: n/a
SQKMFF	: n/a
Vessel Speed	: Vessels speed in knots at the start and end of the line.

#### Environment

Wind Speed	: Average wind speed in knots
Wind Dir.	: Average direction of wind
Water Depth	: Water depth below the transducer at the start and end of line
Swell	: Average swell height at the Start and End of line.
Sea State	: Sea conditions ie. slight, moderate or rough at BOL/EOL

#### Streamers

SOL noise	: Ambient RMS streamer noise calculated at start of line
EOL noise	: Ambient RMS streamer noise calculated at end of line
Bad Channels	: The number of defective channels on the streamer. These can be classed as bad for several reasons, dead, noisy, spiking, leaking etc.
Feather	: The angle the streamer deviates off the line heading, negative numbers indicate port, positive numbers indicate starboard

#### Summary

Status	: Whether line complete or incomplete
Comments	: General summary of line quality and any particular aspect of the line, which may require special attention.
Bad Records	: The number of bad shots or records on the line.

## 9.4 LINE LOGS

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria						S/V POLAR DUKE	
Date	January 5th 2003	Status	COM		Sail line: GS02-19-001	DIR: 180	Seq: 001
		SOL	EOL		Start time	18:02	End time 19:18
Streamer noise (ubar)	6	6			FCSP	1422	LCSP 937
Vessel speed (knots)	3.9	3.9			KM	9.1125	KMFF 7.9125
Water depth (m)	116	125					
Wind Dir	WSW	SW			Feather (min)	-1.2	Feather (max) -3.3
Wind speed (knots)	2	5			Bad channels	1	
Swell (m)	0.5	0.5			Bad records	13	
Sea state	Smooth	Smooth					
Comments: Streamer set at 6.0 metres. Due to the 18.75 metre shotpoint interval, vessel speed has had to be reduced to allow sufficient cycle time for the compressors between shots. Low manifold pressures were experienced on a number of occasions due to vessel speed. Line complete.							

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria						S/V POLAR DUKE	
Date	January 5th 2003	Status	COM		Sail line: GS02-01-002	DIR: 000	Seq: 002
		SOL	EOL		Start time	21:03	End time 22:19
Streamer noise (ubar)	6	5			FCSP	1001	LCSP 1486
Vessel speed (knots)	3.9	3.9			KM	9.1125	KMFF 7.9125
Water depth (m)	121	114					
Wind Dir	SW	ENE			Feather (min)	-0.9	Feather (max) -6.0
Wind speed (knots)	5	5			Bad channels	1	
Swell (m)	0.5	0.5			Bad records	2	
Sea state	Smooth	Smooth					
Comments: Streamer set at 6.0 metres. Low manifold pressures experienced on SPs 1438 and 1439 due to vessel speed. Line complete.							

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria						S/V POLAR DUKE	
Date	January 6th 2003	Status	COM		Sail line: GS02-21-003	DIR: 180	Seq: 003
		SOL	EOL		Start time	00:02	End time 01:19
Streamer noise (ubar)	6	6			FCSP	1422	LCSP 937
Vessel speed (knots)	3.8	3.8			KM	9.1125	KMFF 7.9125
Water depth (m)	118	128					
Wind Dir	ESE	ESE			Feather (min)	2.2	Feather (max) 9.8
Wind speed (knots)	10	10			Bad channels	0	
Swell (m)	0.5	0.5			Bad records	1	
Sea state	Slight	Slight					
Comments: Streamer set at 6.0 metres. High feather (9.8deg) at EOL due to currents. Line complete.							

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 6th 2003	Status	COM		Sail line: GS02-03-004		DIR: 360	Seq: 004
		SOL	EOL		Start time	03:12	End time	04:29
Streamer noise (ubar)	7	5			FCSP	1001	LCSP	1486
Vessel speed (knots)	3.8	3.8			KM	9.1125	KMFF	7.9125
Water depth (m)	121	114						
Wind Dir	NNE	NNE			Feather (min)	-4.7	Feather (max)	-11.5
Wind speed (knots)	15	15			Bad channels		1	
Swell (m)	1.0	1.0			Bad records		6	
Sea state	Slight	Slight						
Comments: Streamer set at 6.0 metres. High feather (-11.5deg) at SOL due to currents. Some autofiring on Gun S1-3. Line complete.								

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 6th 2003	Status	COM		Sail line: GS02-23-005		DIR: 180	Seq: 005
		SOL	EOL		Start time	06:29	End time	07:47
Streamer noise (ubar)	6	6			FCSP	1422	LCSP	937
Vessel speed (knots)	3.8	3.8			KM	9.1125	KMFF	7.9125
Water depth (m)	117	126						
Wind Dir	ENE	ENE			Feather (min)	3.0	Feather (max)	5.8
Wind speed (knots)	10	10			Bad channels		1	
Swell (m)	0.5	0.5			Bad records		6	
Sea state	Slight	Slight						
Comments: Streamer set at 6.0 metres. SPs 1128, 1123, 1103, 1095, 1091, 1090 Misfires on Gun S2-2. Guns S2-1 and 1-1 disabled at SP 1098. EOL Gun volume 3080 cu. in. Line complete.								

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 6th 2003	Status	COM		Sail line: GS02-05-006		DIR: 000	Seq: 006
		SOL	EOL		Start time	09:07	End time	10:25
Streamer noise (ubar)	5	5			FCSP	1001	LCSP	1486
Vessel speed (knots)	3.8	3.8			KM	9.1125	KMFF	7.9125
Water depth (m)	122	116						
Wind Dir	ESE	ESE			Feather (min)	-1.2	Feather (max)	-5.9
Wind speed (knots)	6	6			Bad channels		1	
Swell (m)	1.0	1.0			Bad records		1	
Sea state	Slight	Slight						
Comments: Streamer set at 6.0 metres. SP 1406 Low manifold pressure (1780 psi) due to vessel speed. Line complete.								

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 6th 2003	Status	COM		Sail line: GS02-25-007		DIR: 180	Seq: 007
		SOL	EOL		Start time	11:49	End time	13:07
Streamer noise (ubar)	6	5			FCSP	1422	LCSP	937
Vessel speed (knots)	3.8	3.8			KM	9.1125	KMFF	7.9125
Water depth (m)	119	127						
Wind Dir	ESE	ESE			Feather (min)	0.2	Feather (max)	8.9
Wind speed (knots)	2	2			Bad channels		1	
Swell (m)	0.5	0.5			Bad records		5	
Sea state	Smooth	Smooth						
Comments: Streamer set at 6.0 metres. SPs 1412, 1370, 1362, 1262, 1212 Low manifold pressure due to vessel speed. Line complete.								

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 6th 2003	Status	COM		Sail line: GS02-07-008		DIR: 000	Seq: 008
		SOL	EOL		Start time	14:29	End time	15:46
Streamer noise (ubar)	4	4			FCSP	1001	LCSP	1486
Vessel speed (knots)	3.8	3.8			KM	9.1125	KMFF	7.9125
Water depth (m)	122							
Wind Dir	ESE	ESE			Feather (min)	-5.8	Feather (max)	
Wind speed (knots)	2	2			Bad channels		2	
Swell (m)	1.0	1.0			Bad records		1	
Sea state	Smooth	Smooth						
Comments: Streamer set at 6.0 metres. SP 1472 Streamer extraction error. Line complete.								

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 6th 2003	Status	COM		Sail line: GS02-29-009		DIR: 180	Seq: 009
		SOL	EOL		Start time	17:10	End time	18:26
Streamer noise (ubar)	6	6			FCSP	1421	LCSP	937
Vessel speed (knots)	3.9	3.9			KM	9.09375	KMFF	7.89375
Water depth (m)	117	126						
Wind Dir	ESE	ESE			Feather (min)	3.9	Feather (max)	4.5
Wind speed (knots)	2	2			Bad channels		1	
Swell (m)	1.0	1.0			Bad records		1	
Sea state	Smooth	Smooth						
Comments: Streamer set at 6.0 metres. SP 1181 Low manifold pressure due to vessel speed. Line complete.								

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 6th 2003	Status	COM		Sail line: GS02-09-010		DIR: 000	Seq: 010
		SOL	EOL		Start time	19:49	End time	21:07
Streamer noise (ubar)		7	6		FCSP	1001	LCSP	1486
Vessel speed (knots)		3.8	3.8		KM	9.1125	KMFF	7.9125
Water depth (m)		122	114					
Wind Dir		NE	NE		Feather (min)	-3.3	Feather (max)	-4.2
Wind speed (knots)		1	1		Bad channels		0	
Swell (m)		1.0	1.0		Bad records		0	
Sea state		Slight	Slight					
Comments: Streamer set at 6.0 metres. Line complete.								

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 6th 2003	Status	COM		Sail line: GS02-31-011		DIR: 180	Seq: 011
		SOL	EOL		Start time	22:25	End time	23:42
Streamer noise (ubar)		6	6		FCSP	1421	LCSP	937
Vessel speed (knots)		3.8	3.8		KM	9.09375	KMFF	7.89375
Water depth (m)		118	128					
Wind Dir		SE	SE		Feather (min)	3.1	Feather (max)	10.0
Wind speed (knots)		1	1		Bad channels		0	
Swell (m)		1.0	1.0		Bad records		0	
Sea state		Slight	Slight					
Comments: Streamer set at 6.0 metres. Line complete.								

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 7th 2003	Status	COM		Sail line: GS02-11-012		DIR: 000	Seq: 012
		SOL	EOL		Start time	01:06	End time	02:23
Streamer noise (ubar)	6	6			FCSP	1001	LCSP	1486
Vessel speed (knots)	3.8	3.8			KM	9.1125	KMFF	7.9125
Water depth (m)	123	116						
Wind Dir	NE	NE			Feather (min)	-7.1	Feather (max)	-10.0
Wind speed (knots)	15	15			Bad channels		0	
Swell (m)	1.0	1.0			Bad records		16	
Sea state	Moderate	Moderate						
Comments: Streamer set at 6.0 metres. SPs 1007, 1020, 1025, 1035, 1059, 1083, 1094, 1121, 1131, 1161, 1180, 1202, 1210, 1243, 1251, 1255 Timing errors on Gun S1-3. SP 1260 Gun S1-3 disabled. EOL gun volume 3400 cu. in. Line complete.								



GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 7th 2003	Status	COM		Sail line: GS02-33-013		DIR: 180	Seq: 013
		SOL	EOL		Start time	04:02	End time	05:19
Streamer noise (ubar)	5	5			FCSP	1421	LCSP	937
Vessel speed (knots)	3.8	3.8			KM	9.09375	KMFF	7.89375
Water depth (m)	119	128						
Wind Dir	NE	NE			Feather (min)	6.0	Feather (max)	9.7
Wind speed (knots)	5	5			Bad channels		0	
Swell (m)	0.5	0.5			Bad records		12	
Sea state	Smooth	Smooth						
Comments: Streamer set at 6.0 metres. SPs 1421, 1415, 1413, 1401, 1390, 1389, 1370, 1361, 1343, 1318, 1312, 1305 Timing errors on Gun S1-3. SP 1304 Gun S1-3 disabled. EOL gun volume 3400 cu. in. Line complete.								

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 7th 2003	Status	COM		Sail line: GS02-13-014		DIR: 359	Seq: 014
		SOL	EOL		Start time	06:53	End time	08:09
Streamer noise (ubar)		6	6		FCSP	1001	LCSP	1486
Vessel speed (knots)		3.9	3.9		KM	9.1125	KMFF	7.9125
Water depth (m)		124	115					
Wind Dir		NE	NE		Feather (min)	-2.2	Feather (max)	-2.5
Wind speed (knots)		15	15		Bad channels		1	
Swell (m)		1.0	1.0		Bad records		0	
Sea state		Moderate	Moderate					
Comments: Streamer set at 6.0 metres. Line complete.								

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 7th 2003	Status	COM		Sail line: GS02-35-016		DIR: 180	Seq: 016
		SOL	EOL		Start time	12:40	End time	13:58
Streamer noise (ubar)		5	5		FCSP	1421	LCSP	937
Vessel speed (knots)		3.8	3.8		KM	9.09375	KMFF	7.89375
Water depth (m)		118	128					
Wind Dir		E	E		Feather (min)	1.1	Feather (max)	5.6
Wind speed (knots)		8	8		Bad channels		1	
Swell (m)		0.5	0.5		Bad records		3	
Sea state		Slight	Slight					
Comments: Streamer set at 6.0 metres. SPs 1346, 1314 Autofire error on Gun S2-5. Line complete.								

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 7th 2003	Status	COM		Sail line: GS02-15-017		DIR: 000	Seq: 017
		SOL	EOL		Start time	15:18	End time	16:36
Streamer noise (ubar)		8	8		FCSP	1001	LCSP	1486
Vessel speed (knots)		3.8	3.8		KM	9.1125	KMFF	7.9125
Water depth (m)		124	116					
Wind Dir		E	NE		Feather (min)	-6.7	Feather (max)	-9.3
Wind speed (knots)		8	20		Bad channels		1	
Swell (m)		0.5	1.0		Bad records		4	
Sea state		Slight	Moderate					
Comments: Streamer set at 6.0 metres. SPs 1022, 1023, 1025, 1026 Timing error on Gun P4-3. Line complete.								

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 7th 2003	Status	COM		Sail line: GS02-37-018		DIR: 180	Seq: 018
		SOL	EOL		Start time	17:55	End time	19:11
Streamer noise (ubar)	6	10			FCSP	1421	LCSP	937
Vessel speed (knots)	3.9	3.9			KM	9.09375	KMFF	7.89375
Water depth (m)	119	127						
Wind Dir	ENE	ENE			Feather (min)	6.3	Feather (max)	10.2
Wind speed (knots)	10	10			Bad channels		1	
Swell (m)	1.0	1.0			Bad records		2	
Sea state	Slight	Slight						
Comments: Streamer set at 7.0 metres to reduce swell noise and to aid in streamer depth control. SPs 1313, 1260 Low manifold pressure due to fluctuations in vessel speed. Line complete.								

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 7th 2003	Status	COM		Sail line: GS02-17-019		DIR: 000	Seq: 019
		SOL	EOL		Start time	20:42	End time	22:03
Streamer noise (ubar)		10	6		FCSP	1001	LCSP	1486
Vessel speed (knots)		3.6	3.6		KM	9.1125	KMFF	7.9125
Water depth (m)		119	127					
Wind Dir		NE	NE		Feather (min)	-3.1	Feather (max)	-6.0
Wind speed (knots)		15	15		Bad channels		0	
Swell (m)		1.0	1.0		Bad records		0	
Sea state		Moderate	Moderate					
Comments: Streamer set at 7.0 metres to reduce swell noise and to aid in streamer depth control. Line complete.								

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 7th 2003	Status	COM		Sail line: GS02-39-020		DIR: 180	Seq: 020
		SOL	EOL		Start time	23:25	End time	00:42
Streamer noise (ubar)	6	6			FCSP	1421	LCSP	937
Vessel speed (knots)	3.8	3.8			KM	9.09375	KMFF	7.89375
Water depth (m)	119	129						
Wind Dir	NE	NE			Feather (min)	0.3	Feather (max)	1.7
Wind speed (knots)	15	15			Bad channels	0		
Swell (m)	1.5	1.5			Bad records	0		
Sea state	Rough	Rough						
Comments: Streamer set at 7.0 metres to reduce swell noise and to aid in streamer depth control. Line complete.								

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 8th 2003	Status	COM		Sail line: GS02-10-021		DIR: 299	Seq: 021
		SOL	EOL		Start time	02:38	End time	03:54
Streamer noise (ubar)	10	10			FCSP	1413	LCSP	937
Vessel speed (knots)	3.8	3.8			KM	8.94375	KMFF	7.74375
Water depth (m)	127	116						
Wind Dir	NW	NW			Feather (min)	1.5	Feather (max)	-5.8
Wind speed (knots)	25	25			Bad channels	0		
Swell (m)	1.5	1.5			Bad records	1		
Sea state	Rough	Rough						
Comments: Streamer set at 7.0 metres to reduce swell noise and to aid in streamer depth control. SP 1328 Timing error on Gun S2-2. Line complete.								

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 8th 2003	Status	COM		Sail line: GS02-02-022		DIR: 090	Seq: 022
		SOL	EOL		Start time	05:37	End time	07:06
Streamer noise (ubar)	10	10			FCSP	1001	LCSP	1552
Vessel speed (knots)	3.8	3.8			KM	10.35	KMFF	9.15
Water depth (m)	116	124						
Wind Dir	W	W			Feather (min)	-2.0	Feather (max)	-5.7
Wind speed (knots)	15	15			Bad channels	0		
Swell (m)	1.0	1.0			Bad records	0		
Sea state	Moderate	Moderate						
Comments: Streamer set at 7.0 metres to reduce swell noise and to aid in streamer depth control. Line complete.								

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 8th 2003	Status	COM		Sail line: GS02-08-023		DIR: 270	Seq: 023
		SOL	EOL		Start time	08:43	End time	10:31
Streamer noise (ubar)	18	23			FCSP	1486	LCSP	937
Vessel speed (knots)	3.1	3.1			KM	10.3125	KMFF	9.1125
Water depth (m)	127	119						
Wind Dir	SW	SW			Feather (min)	5.0	Feather (max)	6.7
Wind speed (knots)	25	25			Bad channels		0	
Swell (m)	2.5	3.0			Bad records		27	
Sea state	Rough	Rough						
<b>Comments:</b> Streamer set at 8.0 metres to reduce swell noise and to aid in streamer depth control. Swell noise 5 - 35 ubar affecting 5 - 10% of traces. SPs 1426, 1425, 1290, 1263, 1262, 1209, 1205, 1971, 1884, 1183, 997, 991, 990, 966 Data extraction errors. SPs 1443, 1383, 1379, 1295, 1291, 1281, 1271, 1247, 1222, 1098, 1027, 996, 965 Parity errors. SPs 1474, 1188 Timing errors on Gun S1-6. Processed brute indicates acceptable data quality. Line complete.								

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 10th 2003	Status	COM		Sail line: GS02-06-024		DIR: 270	Seq: 024
		SOL	EOL		Start time	03:20	End time	04:47
Streamer noise (ubar)	10	8			FCSP	1486	LCSP	937
Vessel speed (knots)	3.8	3.8			KM	10.3125	KMFF	9.1125
Water depth (m)	126	118						
Wind Dir	SW	SW			Feather (min)	-0.6	Feather (max)	-1.2
Wind speed (knots)	15	15			Bad channels		3	
Swell (m)	2.5	2.5			Bad records		14	
Sea state	Rough	Rough						
Comments: Streamer set at 10.0 metres to reduce swell noise and to aid in streamer depth control. Swell noise 5 - 20 ubar affecting 5% of traces. SPs 1201, 1200, 1037, 1018 Data extraction errors. SPs 1406, 1356, 1205, 1051 Low manifold pressure due to vessel speed. SPs 996, 992, 972, 971, 970 Miss fire on Gun P3-6. SP 969 Gun P3-6 disabled due to miss fire errors. New volume 3460 cu in. Line complete.								

GS02 2D Survey: Vic/RL3, GIPPSLAND BASIN, Victoria							S/V POLAR DUKE	
Date	January 10th 2003	Status	COM		Sail line: GS02-04-025		DIR: 090	Seq: 025
		SOL	EOL		Start time	07:54	End time	09:22
Streamer noise (ubar)	5	7			FCSP	1001	LCSP	1552
Vessel speed (knots)	3.8	3.8			KM	10.35	KMFF	9.15
Water depth (m)	118	124						
Wind Dir	WSW	WSW			Feather (min)	3.0	Feather (max)	11.0
Wind speed (knots)	5	5			Bad channels		3	
Swell (m)	1.5	1.5			Bad records		7	
Sea state	Moderate	Moderate						
Comments: Streamer set at 10.0 metres to reduce swell noise and to aid in streamer depth control. Some minor SI visible on noise strip (~6 ubar from Western Monarch). Swell noise 5 - 20 ubar affecting 5% of traces. SPs 1112, 1526 Data extraction errors. SPs 1445, 1506, 1525, 1526, 1545 Parity errors. Line complete.								