T/17P part-II

108001

OPERATIONS REPORT
MARINE SEISMIC SURVEY
OTWAY BASIN
OBV - 81 TAS (T.17/P)

FOR

VAN DIEMEN'S LAND RESOURCES N.L.
151-155 Dorcas Street,
STH MELBOURNE,
VIC 3205

CLIENT REPRESENTATIVE: J. NEEDMAN

BY

GEOPHYSICAL SERVICES INTERNATIONAL
P.O. BOX 106, NORTH RYDE N.S.W. 2113

PARTY 2931 : M/V "EUGENE McDERMOTT 11"

RECORDING DATES : 1st February - 2nd February 1981

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

SECTION I

INTRODUCTION

A Marine Seismic Survey was conducted by Geophysical Services Incorporated using the M/V "Eugene McDermott II" in the Otway Basin area offshore Victoria, for Van Diemens Land Resources N.L., between February 1 and February 2, 1981.

The survey consisted of 146.05 kilometres of 48 fold reflection coverage utilizing a 2400 metre streamer under continuous tow in conjunction with a Pneumatic Acoustic Energy Source (AIRGUNS). Operations were generally conducted 24 hours a day.

Recordings were made using one set of DFSV instruments with two tape transports. Records were made on 12.7 mm magnetic tape in 9 track 1600 BPI Seg. B. digital format (see Section II Instruments).

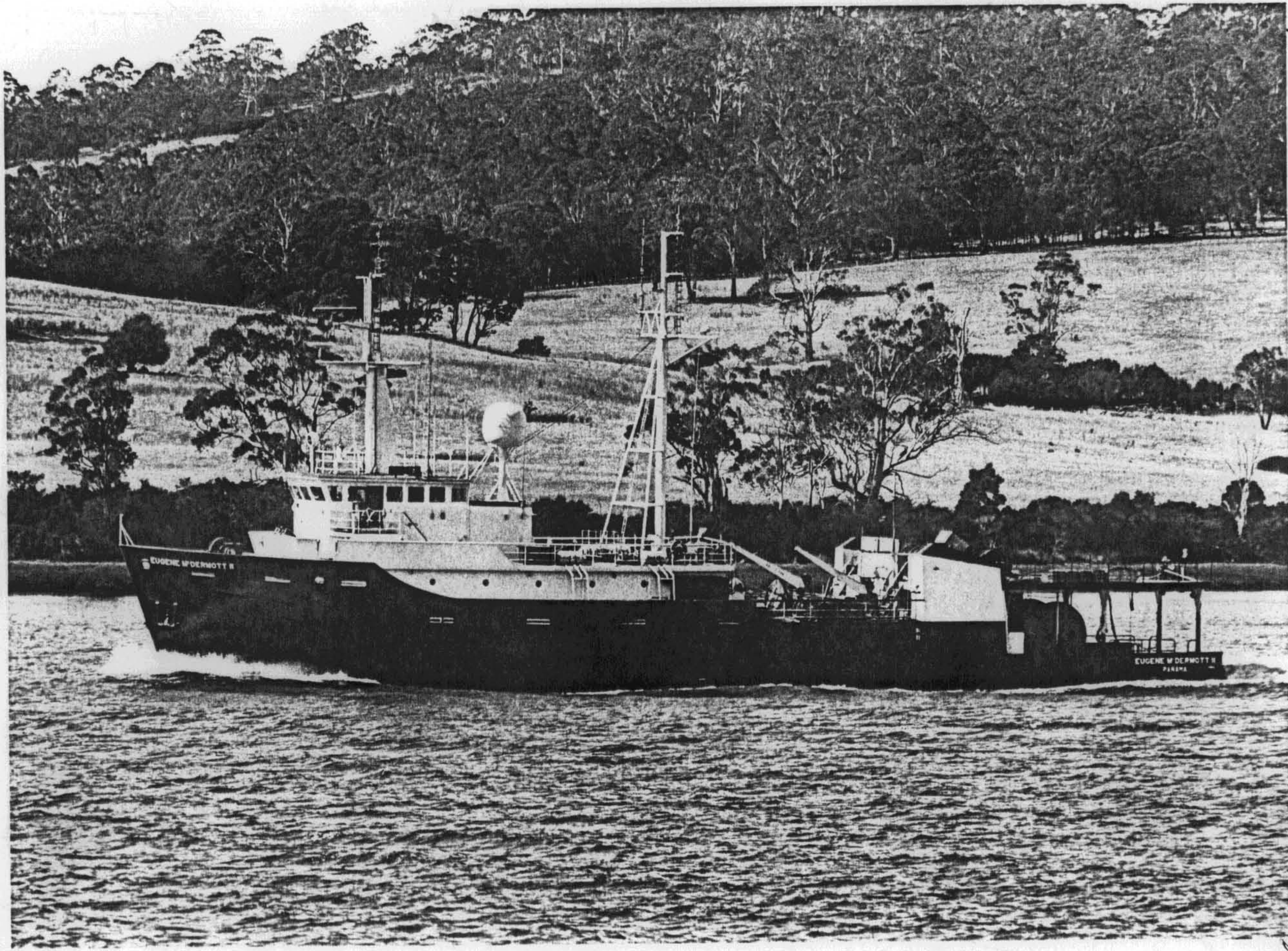
The ships location was determined by Maxiran, a precise radio location system, owned and operated by O.N.I (See Section II - Survey).

108005

SURVEY VESSEL

M.V. "EUGENE McDERMOTT II"

Flag	Panama
Homeport	Panama
Trade	Foreign Going-Seismic Exploration
Owners	Geophysical Service Inc.
Call Sign	HO 9376
Length	52.73 metres L.O.A.
Breadth	12.19 metres
Depth	4.27 metres
Draft	3.05-3.24 metres
Official Number	7062 - PEXT - 1
Gross Tonnage	929.89 tonnes
Net Tonnage	249.09 tonnes
Engine Power	2 x 839.25 HP engines



108006

SECTION I

B. KEY PERSONNEL

February 1 - February 2, 1981

Client Representative	J. Needham	
Party Manager	C. Orr	
Vessel Controller	A. Welfare	
Jr. Geophysicist	I. Johnson	
Instrument Engineers	J. Hennessey	
	D. Kenny	
Junior Observers	W. Lloyd	
	D. Bell	
Survey Operators	A.Cairns, F. Hemmings	CMS II
	D. Taylor, A. Hennessey	ONI
Compressor Mechanics	W. Jenkins (Dallas)	
	J. Simmons	
Airgun Mechanics	P. Harris	
	P. Stephanovich	
	W. Karoll	
	D. Mercadante	
	M. Clark	
	P. Ferrier	

SECTION I

B. KEY PERSONNEL (Contd.)

Captain	M. Gusterson
First Mate	G. Nilsen
Boat Manager	J. Stanton
Administrator	L. Williams

SECTION 11

A. INSTRUMENTS

One Texas Instruments DFS V system consisting of two analog modules, a control module and two ½ inch tape transports was used for this survey. Recordings were made in SEG. B format (see Plate 2A, B, C) at 1600 BPI.

Prior to beginning the survey, on January 27th a full calibration and set of instrument tests as recommended by Texas Instruments were performed on the DFS V instruments by onboard G.S.I. personnel. These tests, recorded on both magnetic tape and paper camera records, were couriered to the G.S.I. processing centre in Sydney for immediate analysis by their TIMAP system. The instrument tests included, converter linearity, dynamic range determination. equivalent input noise, gain accuracy, harmonic distortion, crossfeed and skew. All tests met with both Texas Instruments and client standards.

The DFS V instruments were calibrated for 96 channel, 4 ms sampling rate with a 128HZ @ 72db/octave high-cut filter and a 8HZ @ 18db/octave low-cut filter.

Instrument tests were performed each day and the results examined in analog form onboard. These tests consisted of: dynamic range determination, amplifier noise, automatic gain control, tape speed and skew checks.

SECTION 11

A. INSTRUMENTS (contd.)

Tapes recorded on each transport were frequently replayed on the other transport as a confirmation of readability.

Throughout the survey, an EOF fault has been registering on the Status display. Initial investigation by replaying tapes proved the indication to be false and, as this had no detrimental affect on production or quality of data. Determination and rectification of the fault was, therefore deferred until the end of the survey.

SECTION II

A. INSTRUMENTS (contd.)

Instrument Details

Recording System	:	DFS V Serial Number 306
Tape Transports	:	Two, T.I. DFS V 10 inch, 9 track
Tape Format	:	SEG B, phase encoded 1600 BPI
Tape Speed	:	39.68 ips
No. Words/Data Scan	:	127
No. Words/Header	:	114 (+16 from extender header)
Channels Seismic	:	1 - 96
Waterbreaks	:	Aux. channel 1+2
Recording method	:	IFP
Sample Period	:	4 ms
Record Length	:	5 seconds
Gain Control Mode	:	P.G.C.
Gain Constant	:	24 db
Final Gain	:	108 db
Dynamic Range (referred to input noise)	:	84 db
Filters		
High-cut	:	128HZ @ 72 db / octave
Low-cut	:	8 HZ @ 18 db / octave

SECTION 11

B. ANCILLARY EQUIPMENT

SERVO PROFILER

Manufacturer	EPC Labs Inc.
Model	4600 Graphic Recorder
Serial Number	371
Source	Trace number 94
Record Length	4 seconds
Gain Mode	AGC
Filters	
High-cut	128 HZ @ 72 db / octave
Low-cut	8 HZ @ 18 db / octave

NOTE:

The graphic recorder input is from the analog reproduce section of the DFS V.

The profiler was marked approximately every kilometre along all lines.

No malfunctions of this unit occured during the survey.

SECTION II

B. ANCILLARY EQUIPMENT (cont.)

FATHOMETER

Manufacturer	:	Simrad
Model	:	EA
Conversion Frequency	:	1478 m/sec
Operating Frequency	:	38 kHz
Transducer relating to Maxiran Antenna (see Antenna Positions Plate 7	:	6.6 m fwd and 1.1 m to stbd
Instrument correction for draft	:	3.7 m
Scale	:	On Chart Paper
Calibrated	:	14 February 1980 at Launceston, Tasmania

The Simrad Model EA has both a paper and digital output. The display chart scale is completely adjustable to suit depth and rate of depth changes.

The scale selected is automatically written on the proper display by the unit. Plate No. 8 shows scale ranges.

The digital output was interfaced with the GSI CMS II System for automatic logging on magnetic tape at every shotpoint.

SECTION II

B. ANCILLARY EQUIPMENT (cont.)

FATHOMETER (cont.)

The analog chart was marked approximately every kilometre along all lines.

No problems occurred with the Fathometer during this survey.

SECTION II

B. ANCILLARY EQUIPMENT (contd.)

CAMERA

Manufacturer	:	S.I.E.
Model	:	10C
Number of Channels	:	64
Polarity	:	GSI Normal Positive Pressure = Downbreak

The Camera worked well throughout the survey.

SECTION II

C. STREAMER

A G.S.I. Manufactured, 2400 metre streamer was utilized during this survey. This consisted of 48, 50 metre "live" sections, connected together with quick-coupling plugs. Each "live" section consisted of two independent 25 metre length groups (see plate number 4).

Generally there were seven nylon stretch sections located between group 96 and the vessel. These were used to attenuate the ships generated noise. There were five nylon stretch sections connected after group one, these sections were connected to the tailbuoy by 115 metres of nylon rope.

Each "live" group contained 15 acceleration cancelling hydrophones, which were connected in parallel to produce one group. These hydrophones are used to reduce the low frequency noise which is caused predominantly by boat noise propagated along the streamer, tailbuoy noise and cable strumming.

Six depth transducer sections were positioned along the streamer at regular intervals. They were calibrated to the required streamer depth of 40 feet before the streamer was reeled into the sea.

SECTION II

C. STREAMER (contd.)

Each transducer section contains a single hydrophone which is used as a waterbreak detector. Waterbreak returns from detector number six, located between group 96 and the first front end stretch, and detector number five, located between groups 81 and 80 were recorded on both magnetic tape and camera records. The time measurement of the return was also recorded on the CMS tape and printer logs.

Waterbreak number six was used to determine the streamer offset, (centre of group 96 to the centre of airgun array). The offset was determined manually by the time measurement explained on plate number 6.

The offset was also calculated by the CMS. The CMS streamer offset sensor fires a single airgun between the DFS records. The sensor then measures the arrival time of waterbreaks number six and five and uses this time to calculate the offset value which was recorded on both CMS tape and printed logs.

The streamer offset would change during the line by $\pm$ one or two metres, a result of varying sea states and currents which caused slight variations in the stretched length of the nylon rope sections.

Due to ship speed changes made to maintain airgun operating pressure, on occasions, as noted on all observer logs and reports, the offset had to be changed between

SECTION 11

C. STREAMER (contd.)

lines, in order to maintain correct streamer ballast.

The average offset used during this survey was 200 metres, the offset vaired between a maximum of 209 metres to a minimum of 188 metres.

Tailbuoy bearings were checked and logged at regular intervals to ensure that feathering angle did not exceed the specified limits.

The streamer depth control was maintained by proper ballasting and the use of remote controlled "Cole" depth controllers. No problems were encountered with streamer ballasting throughout the survey, the streamer was controlled to ride 40 feet $\pm$ 5 feet.

The average streamer noise during this survey was 7 microvolts. No consistently noisy traces were observed but prop noise was evident on the near traces whenever shooting with or into the swells.

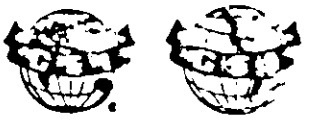
No streamer failure time occured during this survey.

SECTION II

C. STREAMER (cont.)

STREAMER DETAILS

Length Centre to Centre	:	2395 metres
Number of groups	:	96
Group Interval	:	25 metres
Live Section Length	:	50 metres
Number of Hydrophones/group	:	15
Hydrophone Interval	:	1.67 metres
Hydrophone Type	:	T.I. - A.C.H.
Number of Nylon Stretch Sections in Front End	:	7
Tail End	:	5
Skin Type	:	Tropical
Location of Depth Transducers	:	Between Groups; 2/3, 20/21, 40/41, 60/61, 80/81, 96/FE.
Source of Waterbreaks	:	In Depth Transducers sections between Groups: 80/81, 96/FE
Location of Control Fins	:	On all Depth Transducers
Near Group	:	Number 96
Streamer Sensitivity	:	5.15 uv/u bar



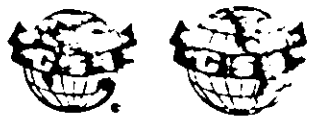
SECTION II

D. ENERGY SOURCE

An Electro-Pneumatic Acoustic Energy Source known as "Airguns" was used for reflection work. The Airgun has basically two moving parts, the shuttle and solenoid. Compressed air is supplied to this unit at a pressure of 13789 kPa (2000 psi). The shuttle is forced to close on initial application of pressure. Compressed air fills the reservoir chamber through a central orifice in the shuttle. To discharge the gun an electrical current activates the solenoid and retracts a plunger, thus enabling compressed air to pass through a port hole to the underside of a flange at the shuttle. The pressure difference above and below the shuttle then thrusts it open. The air from the chamber then escapes through four port holes near the centre of the gun and expands rapidly through the water, producing a single bubble and resultant shock wave. The air bubble collapses in a manner similar to that caused by explosives with one notable exception in that its period is controlled and is placed in the desired seismic frequency band.

The energy source used by M/V "McDERMOTT II" was a tuned airgun array of 2000 cubic inches total capacity, designed for deep penetration and good resolution. This array has a broadband frequency output that extends below the normal low frequency band for seismic energy source.

Good primary to bubble ratio is obtained by using a wide variety of airgun barrel sizes.



SECTION II

D. ENERGY SOURCE (cont.)

Attached, Plate 5, is the diagram showing gun utilization and spacings.

Average pressure obtained from the array is 55 bars at 1 metre, with an average primary-to-bubble ratio of 8:1 at the designed operating depth of 21 feet. Normal operating pressure 2000 psi, with a minimum allowable pressure of 1600 psi.

The array includes 4 low pressure open-ended air lines so that the depth of the array could be monitored at all times by means of static air pressure measurements.

TIGER, the Texas Instruments Automatic Airgun Controller, monitors the firing of each airgun in the array. Individual gun firing times are continuously controlled to give phasing within + or -1 millisecond for maximum pulse amplitude and front to back ratio.

The TIGER also performs a quality control function, by indicating with individual gun L.E.D. (light emitting diode) displays, the status of a gun if not operating correctly, either no fire or self fire. This is also logged on printer and magnetic tape, along with changes to the total gun array status (on/off line). TIGER operates in conjunction with the CMS-11 (Configurable Marine System) that is onboard the M/V "McDERMOTT II".

SECTION 11

D. ENERGY SOURCE (Cont.)

The guns were maintained by the GSI personnel on line changes, so that throughout the survey the gun array was up to specifications. No malfunctions outside the range normally encountered, were experienced.

The "McDERMOTT" uses a combination of three Le Roi screw compressor combination with three Norwalk reciprocating compressor.

The Le Roi machines output a low pressure (150 psi) air to the Norwalks which then increase this to the working pressure of 2000 psi.

The system is designed so that any two Le Roi and any two Norwalk machines need to be running at one time to maintain ample working pressure at a shooting speed of 5 knots.

However this newly designed Norwalk system has been plagued with troubles and because of this only two machines have been able to be kept running, and on occasions this has been reduced to one Norwalk machine. When this was the case the shooting speed was kept down to a maximum of 4.5 knots. This speed resulted in an approximate shotpoint time interval of 12 seconds, which was enough time for the single Norwalk to maintain 1800 + psi.

SECTION 11

D. ENERGY SOURCE (contd.)

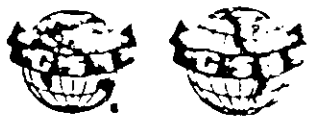
The airguns performed well throughout the survey and no down time was attributable to energy source or related equipment. No defects beyond the scope normally experienced occured during the period of the survey.

SECTION II

D. ENERGY SOURCE (cont.)

2000 CUBIC INCH - AIRGUN ARRAY

Operating Volume	:	2000 cubic inches
Total Spare Volume	:	520 cubic inches
Operating Pressure	:	1800 - 2000 psi
Operating Depth	:	6 $\pm$ 0.5 M
Timing Control	:	TIGER Serial Number 7
Firing Delay	:	51.2 msec
Compressors	:	3-Type - LeRoi Screw 3-Type - Norwalk Reciprocating
Distance from Maxiran antenna to Array Centre (Refer to Antenna Positions Plate 7	:	51.1 metres
Distance from stern of vessel to Array Centre	:	25.7 metres.



SECTION II

E. SURVEY

The prime navigation system used was Maxiran, a precise range/range system owned and operated by Offshore Navigation Inc. (O.N.I.).

The Maxiran equipment was calibrated onshore before the start of the survey. The accuracy of the survey net was verified at sea by baseline crossings and three way fixes.

O.N.I. will submit a separate full report.

The Maxiran mobile monitor was interfaced to G.S.I.'s Configural Marine System II (CMS II). The CMS II System consisted of a Texas Instruments 980B computer, a system co-ordinator, TIGER Airgun Controller, automatic data logger, satellite receiver, two Houston Instruments trackplotters (one each located in instrument room and bridge) and two Digi-Data, 800 bpi, ½ inch tape transports. The CMS II function was survey control and navigation data recording. It used the input Maxiran raw ranges to calculate, by two or three way fixes the vessels velocity and position.

Shotpoint positioning was done in the "distance" mode with the CMS II triggering the DFS V instruments and also the TIGER unit to fire the airguns at every 25 metres of travel along the preplotted survey lines. Occasional changes to "time" mode were made when real time shotpoints became displaced with respect to the pre-plotted shotpoint.

SECTION 11

E. SURVEY (cont.)

The CMS 11 satellite navigation system was utilized as an onboard Q.C. check of the Maxiran positioning, this satellite data was also recorded on the CMS Magnetic tape.

Three way fixes were manually calculated at the start and end of every line, using a TI-59 calculator and "Three-Way Fix by Iteration" programme.

During the survey, the CMS doppler sonar was used as a velocity source and the system gyro provided Azimuth information.

The only CMS related malfunction that occured was a CMS idle which occured during line OBV81-02. As a result, pre plotted shotpoint numbers were in error by 1 (one) from SP103 to the end of line.

SECTION 111

OPERATIONS

A. OPERATION DISCUSSION

The weather conditions were fine throughout the survey with sea states of 2 - 3. As a result, data collected was maintained at a high standard.

This was achieved by R.A.W. data being monitored on board during production and any risk of deviation from specifications being brought to the immediate attention of the on-board client representative.

SECTION 111

B. OPERATION SUMMARY

February 1st

McDermott arrives at prospect area.

Line 3 - complete
Line 6 - complete

February 2nd

Line 8 - complete
Line 4 - complete
Line 2 - complete
Line 1 - complete

Prospect complete, Streamer brought onboard and ship heads for port.

DATE	LINE	DIR	SP RANGE	TOT S.P.	CHARGEABLE KM	COMMENTS	DAILY TOTAL
1st Feb	OBV81-03	215°	0001 - 0672	672	16.8	Complete	16.8
2nd Feb	OBV81-06	311°	0001 - 0585	585	14.625	Complete	
	OBV81-06	317°	0001 - 0631	631	15.775	Complete	
	OBV81-04	135°	0001 - 1871	1871	46.775	Complete	
	OBV81-02	314°	0001 - 0731	731	18.275	Complete	
	OBV81-01	218°	0001 - 1352	1352	33.8	Complete	129.25

SECTION 111

D. STATISTICS

Prospect	:	Otway Basin - OBV81 TAS(T.17/P)
Operation Period	:	1st February - 2nd February'81
Number of Lines	:	6
Total Production	:	146.05
Field Tapes Used	:	52
Production Shotpoints	:	5842
Unusable shot percentage of total shot points	:	1.84
Seismic Data shipped to	:	GSI - Sydney
Navigation Data shipped to	:	GSI - Dallas

SECTION 111

E. PERMITTING

The Marine Operations Centre, Canberra, was advised as to the ship's location throughout the survey to enable the necessary navigation warning to mariners to be issued.

SECTION 111

F. FIELD TAPE INVENTORY

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
1 FEBRUARY	157251	OBV81-3	001 - 117
	157252		118 - 246
	157253		247 - 349
	157254		350 - 479
	157255		480 - 561
	157256		562 - 672
	157257	OBV81-6	001 - 125
	157258		126 - 254
	157259		255 - 383
	157260		384 - 511
	157261		512 - 585
	157262	OBV81-8	001 - 125
	157263		126 - 254
	157264		255 - 383
	157265		384 - 416
	157266		417 - 545
	157267		546 - 595
	157268		596 - 631
	157269	OBV81-4	001 - 124

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
1 FEB	157270	OBV81-4	125 - 252
	157271		253 - 374
	157272		375 - 502
	157273		503 - 596
	157274		597 - 725
	157275		726 - 854
	157276		855 - 982
	157277		983 - 1016
	157278		1017 - 1145
	157279		1146 - 1190
	157280		1191 - 1319
	157281	OBV81-4	1320 - 1449
	157282		1450 - 1578
	157283		1579 - 1707
	157284		1708 - 1835
	157285		1836 - 1871
2 FEB	157286	OBV81-2	001 - 125
	157287		126 - 254
	157288		255 - 382
	157289		383 - 511
	157290		512 - 640
	157291		641 - 731
	157292	OBV81-1	001 - 125
	157293		126 - 255
	157294		256 - 384
	157295		385 - 513
	157296		514 - 642
3 FEB	157297		643 - 772
	157298		773 - 902
	157299		903 - 1030
	157300		1031 - 1157
	157301		1158 - 1287
	157302		1288 - 1352

PLATE 1 LOCATION OF PROSPECT

108034

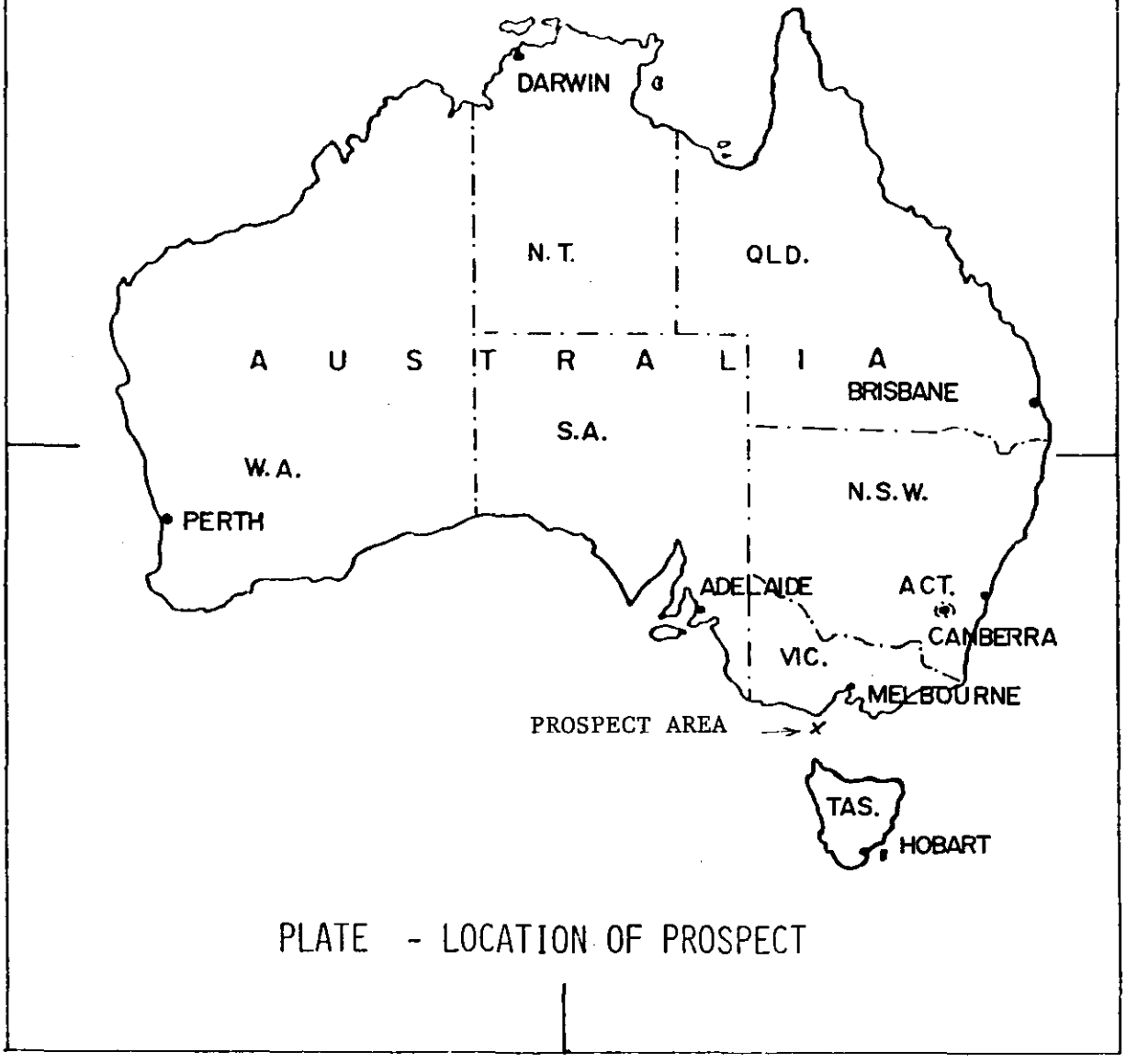


PLATE - LOCATION OF PROSPECT

5 cm

GSI-709

PLATE 2A SEG B FORMAT

108035

HEADER BLOCK

BIT NUMBER (SCHEMATIC)	TYPICAL PACKED BCD VALUE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	24 + 2n										36 + 2n (NOTE 3)			
	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
	0	F_1	F_3	Y_1	Y_3	K_1	K_3	K_5	K_7	K_9	K_{11}	B_1	B_3	0	M_3	M_5	M_7	R_1	J	LC_1	LS	0	0	S_1	A	0	0	0	0	0	0	0	1	0	D	0	D	0	D	0	0
	1	F_1	F_3	Y_1	Y_3	K_1	K_3	K_5	K_7	K_9	K_{11}	B_1	B_3	0	M_3	M_5	M_7	R_1	J	LC_1	LS	0	0	S_1	A	0	0	0	0	0	0	0	0	0	D	0	D	0	D	0	0
	2	F_1	F_3	Y_1	Y_3	K_1	K_3	K_5	K_7	K_9	K_{11}	B_1	B_3	0	M_3	M_5	M_7	R_1	J	LC_1	LS	0	0	S_1	A	1	0	1	0	1	0	1	0	1	0	D	0	D	0	D	0	0
	3	F_1	F_3	Y_1	Y_3	K_1	K_3	K_5	K_7	K_9	K_{11}	B_1	B_3	1	M_3	M_5	M_7	R_1	J	LC_1	LS	0	0	S_1	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	F_2	F_4	Y_2	Y_4	K_2	K_4	K_6	K_8	K_{10}	K_{12}	B_2	I	0	M_4	M_6	M_8	R_2	Z	LC_2	0	0	0	S_2	0	GC	GW	GC	GW	GC	GW	GC	GW	0	0	0	0	0	0	0	0
	5	F_2	F_4	Y_2	Y_4	K_2	K_4	K_6	K_8	K_{10}	K_{12}	B_2	I	1	M_4	M_6	M_8	R_2	Z	LC_2	0	0	0	S_2	0	GC	GW	GC	GW	GC	GW	GC	GW	0	0	0	0	0	0	0	0
	6	F_2	F_4	Y_2	Y_4	K_2	K_4	K_6	K_8	K_{10}	K_{12}	B_2	I	0	M_4	M_6	M_8	R_2	Z	LC_2	0	0	0	S_2	0	GC	GW	GC	GW	GC	GW	GC	GW	0	0	0	0	0	0	0	0
	7	F_2	F_4	Y_2	Y_4	K_2	K_4	K_6	K_8	K_{10}	K_{12}	B_2	I	1	M_4	M_6	M_8	R_2	Z	LC_2	0	0	0	S_2	0	GC	GW	GC	GW	GC	GW	GC	GW	0	0	0	0	0	0	0	0

FILE NUMBER | FORMAT CODE | GENERAL CONSTANTS | BYTES/SCAN (B) SAMPLE INTERVAL (I) | TEXAS INSTRUMENTS IDENTIFICATION (15) | INSTRUMENT SERIAL NUMBER | RECORD LENGTH (R) GAIN MODE (J) RECORD TYPE (Z) | LOW-CUT FILTER | RESERVED FOR HIGH-CUT FILTER | NOTCH FILTER (S) ALIAS FILTER (A) | SEIS CHANNEL 1 FIXED & EARLY GAIN (NOTE 1) (F) (E) | SEIS CHANNEL 2 GAIN | SEIS CHANNEL n-1 GAIN | SEIS CHANNEL n GAIN | AUXILIARY CHANNEL 1 TIMING COUNTER (NOTE 1) | AUXILIARY CHANNEL 2 (NOTE 1) | AUXILIARY CHANNEL 3 (NOTE 1) | AUXILIARY CHANNEL 4 (NOTE 1) | AUXILIARY CHANNEL 5 (NOTE 1) | ZERO DATA 2 BYTES

DATA BLOCK

BIT NUMBER (SCHEMATIC)	TYPICAL DATA VALUE	SYNC GROUP (NOTE 6)		AUX 1		AUX 2		AUX 3		AUX 4		AUX 5		GAIN 1-4		SEIS 1		SEIS 2		SEIS 3		SEIS 4		GAIN 5-8		SEIS 5		SEIS n		SYNC GROUP		AUX 1		SEIS n		SYNC GROUP		SEIS n	
P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
0	S	W_1	W_3	W_5	W_7	T_1	T_8	Q_S	Q_8	Q_S	Q_8	Q_S	Q_8	Q_S	Q_8	G_1	G_3	Q_S	Q_8	Q_S	Q_8	Q_S	Q_8	Q_S	Q_8	G_5	G_7	Q_S	Q_8	Q_S	Q_8	W_1	W_3	W_5	W_7	T_1	T_8	Q_S	Q_8	W_1	W_3	W_5	W_7	Q_S	Q_8
1	2^{13}	W_1	W_3	W_5	W_7	T_2	T_9	Q_1	Q_9	Q_1	Q_9	Q_1	Q_9	Q_1	Q_9	G_1	G_3	Q_1	Q_9	Q_1	Q_9	Q_1	Q_9	Q_1	Q_9	G_5	G_7	Q_1	Q_9	Q_1	Q_9	W_1	W_3	W_5	W_7	T_2	T_9	Q_1	Q_9	W_1	W_3	W_5	W_7	Q_1	Q_9
2	2^{12}	W_1	W_3	W_5	W_7	T_3	T_{10}	Q_2	Q_{10}	Q_2	Q_{10}	Q_2	Q_{10}	Q_2	Q_{10}	G_1	G_3	Q_2	Q_{10}	Q_2	Q_{10}	Q_2	Q_{10}	Q_2	Q_{10}	G_5	G_7	Q_2	Q_{10}	Q_2	Q_{10}	W_1	W_3	W_5	W_7	T_3	T_{10}	Q_2	Q_{10}	W_1	W_3	W_5	W_7	Q_2	Q_{10}
3	2^{11}	W_2	W_4	W_6	W_8	T_4	T_{11}	Q_3	Q_{11}	Q_3	Q_{11}	Q_3	Q_{11}	Q_3	Q_{11}	G_1	G_3	Q_3	Q_{11}	Q_3	Q_{11}	Q_3	Q_{11}	Q_3	Q_{11}	G_5	G_7	Q_3	Q_{11}	Q_3	Q_{11}	W_2	W_4	W_6	W_8	T_4	T_{11}	Q_3	Q_{11}	W_2	W_4	W_6	W_8	Q_3	Q_{11}
4	2^{10}	W_2	W_4	W_6	W_8	T_5	T_{12}	Q_4	Q_{12}	Q_4	Q_{12}	Q_4	Q_{12}	Q_4	Q_{12}	G_2	G_4	Q_4	Q_{12}	Q_4	Q_{12}	Q_4	Q_{12}	Q_4	Q_{12}	G_6	G_8	Q_4	Q_{12}	Q_4	Q_{12}	W_2	W_4	W_6	W_8	T_5	T_{12}	Q_4	Q_{12}	W_2	W_4	W_6	W_8	Q_4	Q_{12}
5	2^9	W_2	W_4	W_6	W_8	T_6	T_{13}	Q_5	Q_{13}	Q_5	Q_{13}	Q_5	Q_{13}	Q_5	Q_{13}	G_2	G_4	Q_5	Q_{13}	Q_5	Q_{13}	Q_5	Q_{13}	Q_5	Q_{13}	G_6	G_8	Q_5	Q_{13}	Q_5	Q_{13}	W_2	W_4	W_6	W_8	T_6	T_{13}	Q_5	Q_{13}	W_2	W_4	W_6	W_8	Q_5	Q_{13}
6	2^8	0	0	0	0	T_7	T_{14}	Q_6	Q_{14}	Q_6	Q_{14}	Q_6	Q_{14}	Q_6	Q_{14}	G_2	G_4	Q_6	Q_{14}	Q_6	Q_{14}	Q_6	Q_{14}	Q_6	Q_{14}	G_6	G_8	Q_6	Q_{14}	Q_6	Q_{14}	CH	CH	CH	CH	T_7	T_{14}	Q_6	Q_{14}	CH	CH	CH	CH	Q_6	Q_{14}
7	2^7	1	1	1	1	0	0	Q_7	0	Q_7	0	Q_7	0	Q_7	0	G_2	G_4	Q_7	0	Q_7	0	Q_7	0	Q_7	0	G_6	G_8	Q_7	0	Q_7	0	1	1	1	1	0	0	Q_7	0	1	1	1	1	Q_7	0

FIRST DATA SCAN | SECOND DATA SCAN | LAST DATA SCAN

LEGEND

F_1-F_4 File number - 4 BCD digits

Y_1-Y_4 Format Code - 4 BCD digits 0200 for SEG–B (with no header extension)

K_1-K_{12} General constants entered from panel switches - 12 BCD digits

B_1-B_3 Bytes per multiplexer scan in data block - 3 BCD digits. Bytes per scan = 2.5 x no. of channels +14

M_1-M_6 Instrument serial number - 6 BCD digits.

R_1,R_2 Record length in multiples of 1.024 seconds. 00 if manual stop is selected.

J Amplifier gain control mode -1001 is recorded to designate floating point gain control system.

LC_1,LC_2 Low-cut filter frequency (Hz) - 2 BCD digits. 00 (out), 03, 05, 08, 12, 18, or 27.
NOTE: 03 is actually 3.56Hz.
05 is actually 5.33Hz.

LS Low-cut filter slope in multiples of 6 dB/octave - 1 BCD digit. Normally 3, (18dB octave) for DFS-V.

S_1,S_2 Notch (rejection) filter frequency - 2 BCD digits. 00 (out) 50, or 60 (for 60 or 16 2/3).

A Alias filter frequency:
1 - 256Hz 4 - 64Hz
2 - 128Hz 8 - 32Hz

D Channel identification code:

BIT 0	1	2	TYPE CHANNEL
0	0	0	Unused channel
1	0	0	Waterbreak channel
0	1	0	Timebreak channel
0	0	1	Seis channel
0	1	1	Uphold channel
1	0	1	Time counter
1	1	1	Other

Z Record type:
8 - normal shot 4
2 - test record 1
} Not used

W_N Ones recorded for normal field timebreak recording. Zeros record if system operated from internal timebreak.

T_1-T_{14} 14 bit binary timing word

T_{14} - 1 millisecond

T_1 - 8,192 seconds

Q_N Digitized output of A/D converter

Q_s - sign (note 4)

Q_1 - 4096 millivolts

Q_{14} - 0.50 millivolt

G_N Binary gain code for channel N. Least significant bit (6dB) is always 0 for quaternary coded IFP gain.

P Vertical (byte) parity. Bit P is one if bits 0 - 7 of the same byte contains an even number of ones.

CH Number of channels. Bit 6 of the four sync group bytes, indicates number of seismic data channels.

BYTE	1	2	3	4
24 CH	0	0	0	0
36 CH	0	1	0	0
48 CH	0	0	0	1
Other	1	1	1	1

See B, bytes per scan.

No. of data channels =

$$\frac{\text{Bytes per scan-14}}{2.5}$$

Format conforms to the SEG standard specific values shown, such as filter settings, etc, are those of the DFS–V.

I Sample interval recorded according to the following table:

BIT 4	5	6	7	SAMPLE INTERVAL
0	0	0	1	1 millisecond
0	0	1	0	2 milliseconds
0	1	0	0	4 milliseconds
1	0	0	0	8 milliseconds
1	0	0	1	0.5 milliseconds
1	0	1	0	1 millisecond
1	1	0	0	2 milliseconds

All zeros for other sample intervals

GC Gain constant (fixed gain) recorded as a 4 - bit binary code. The most significant bit has a gain value of 2^3 (48dB): the least significant bit has a gain value of 2^1 (6dB). The least significant bit is recorded as a zero for the DFS–V.

GW Gain word recorded as a 4-bit binary code. 0000 is recorded when operating in floating point gain control. When operating in manual gain control, the most significant bit has a gain value of 2 (48dB) and the least significant bit has a gain value of 2^1 (6dB). The least significant bit is recorded as a zero for the DFS–V.

NOTES

1 - Auxiliary channel identification code assignments are as follows unless otherwise specified:
AUX 1 will always be the timing counter.

28 or 60 Seis channels	Number of seis Channels other than 28 or 60
AUX 2 unused •	AUX 2 uphole
AUX 3 unused •	AUX 3 timebreak
AUX 4 uphold	AUX 4 unused
AUX 5 timebreak	AUX 5 unused

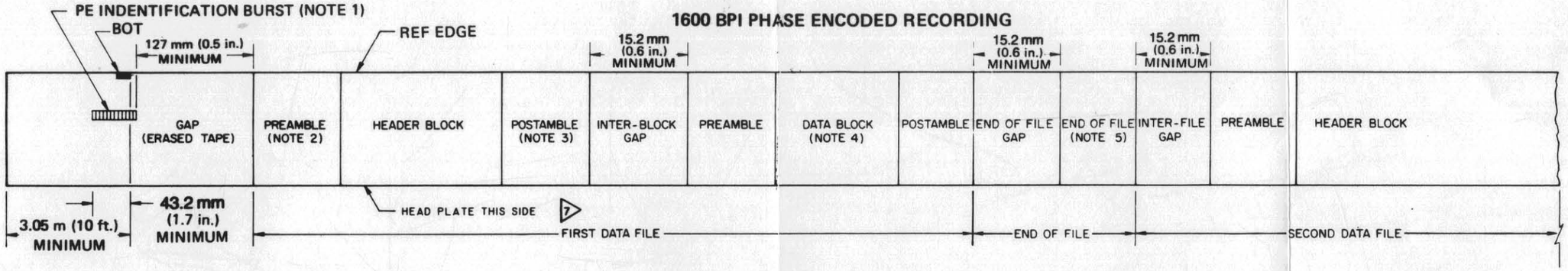
• These AUX channels are not available for data and will always be recorded as zero in the data record.

2 - Additional externally supplied digital data may be recorded in the header block following byte 36+2n.

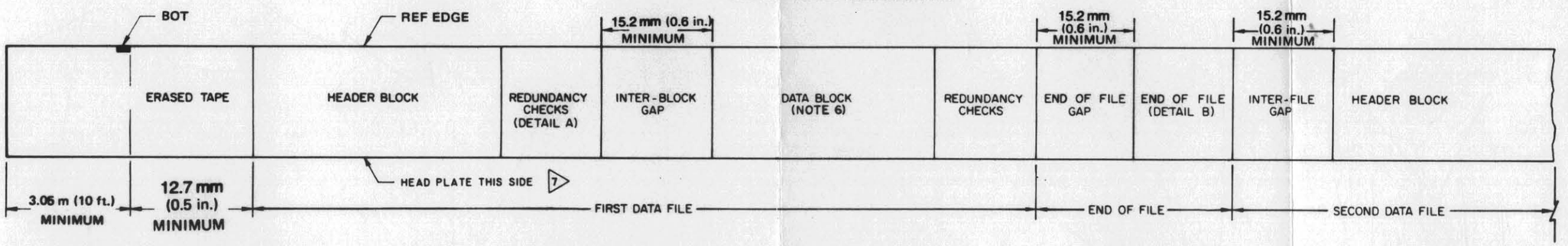
3 - Negative values are recorded in 1's complement code (standard) or 2's complement (optional).

5 cm

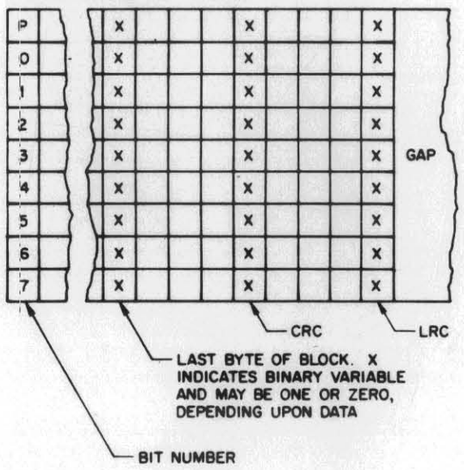
1600 BPI PHASE ENCODED RECORDING



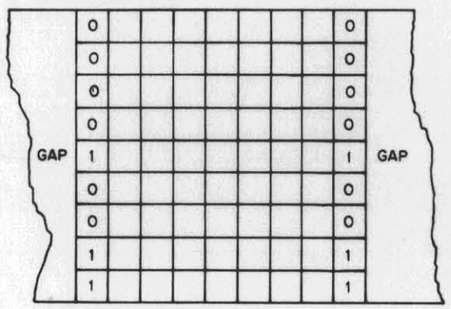
800 BPI NRZI RECORDING



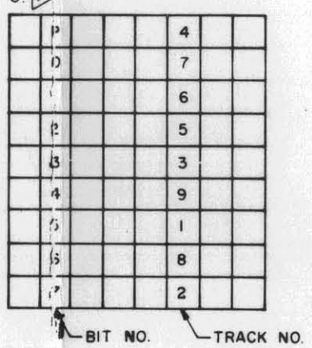
A NRZI REDUNDANCY CHECKS



B. NRZI END OF FILE



C. 7



NOTES

1 - PE identification burst consists of 1600 flux reversals per inch in track P, all other tracks dc erased.

2 - Preamble consists of forty characters with 0-bits in all tracks followed by one character with 1-bits in all tracks. (Includes the parity track).

3 - Postamble consists of one character with 1-bits in all tracks followed by forty characters with 0-bits in all tracks. (Includes the parity track.)

4 - Synchronous recording, inter-block gap is extended until timebreak is received. Data is stored in a buffer memory while the preamble is being written. First start of scan is written immediately after the preamble.

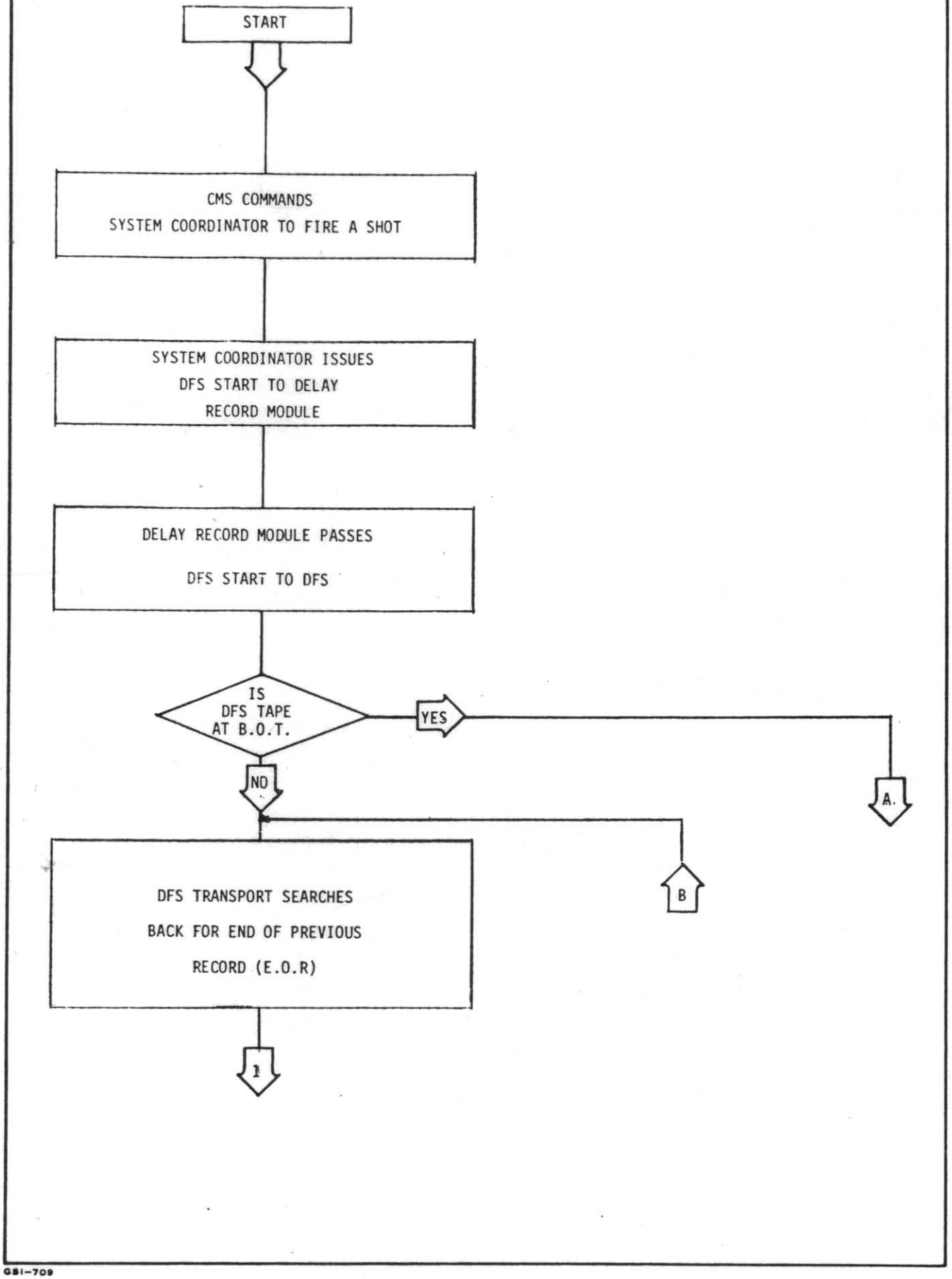
5 - PE end of file consists of 80 flux reversals at 3200 FCI in bits P, 0, 2, 5, 6, and 7. Bits 1, 3, and 4 are dc-erased.

6 - Synchronous data recording: inter-block gap is erased until timebreak. First start of scan is then written.

7 Order and location of tracks on tape, direction of magnetization and all other applicable specifications in accordance with IBM file S360-19, form A22-6862-4. The track number for each bit is shown in detail C. Track numbers are the same for 800 BPI NRZI and 1600 BPI PE. Tracks are numbered consecutively with track 1 the maximum distance from the head plate and track 9 adjacent to the head plate. See C below.

PLATE 3A DFS $\overline{V}$ RECORDING SEQUENCE

108038



GSI-709

PLATE 3B DFS $\overline{V}$ RECORDING SEQUENCE

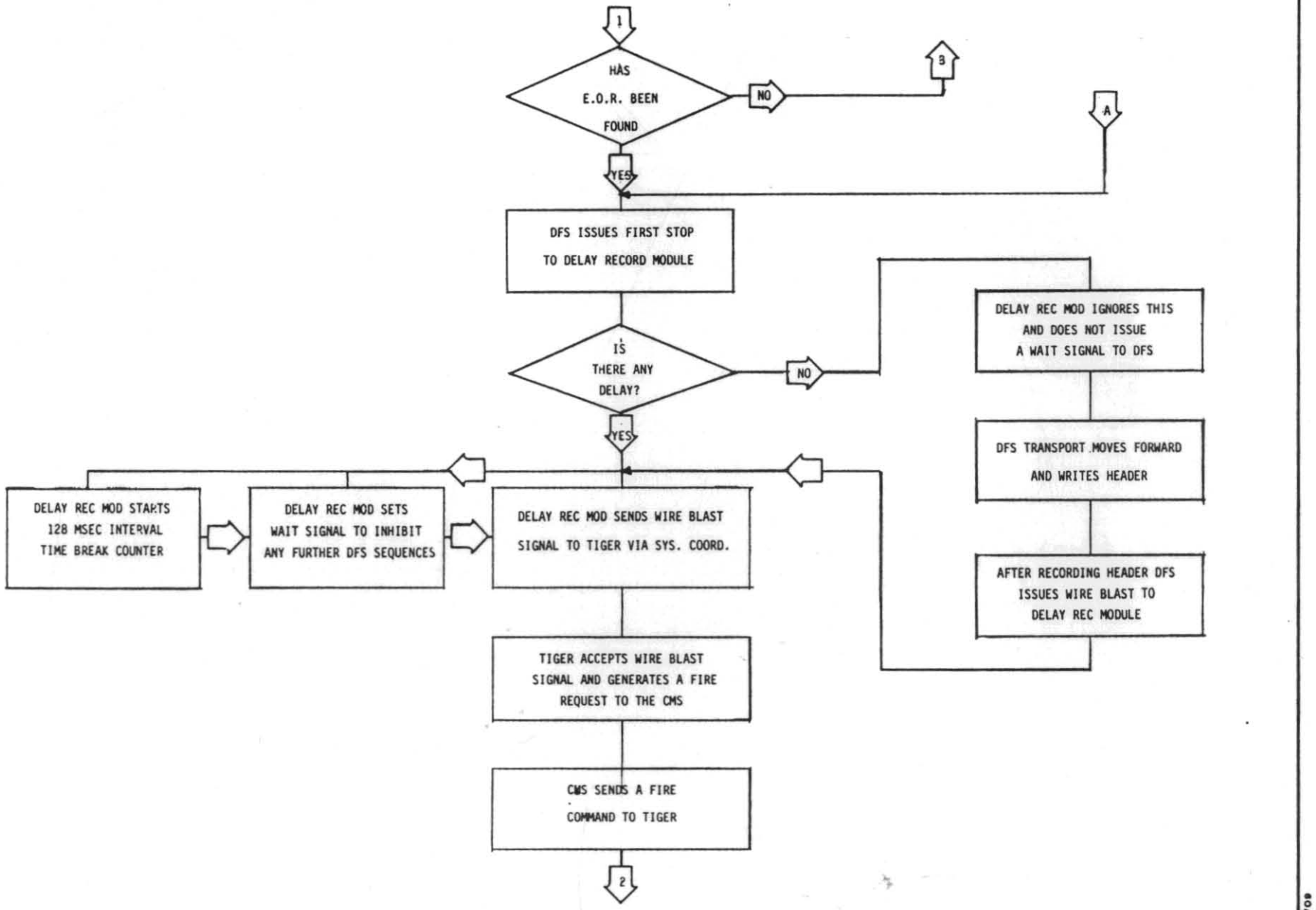
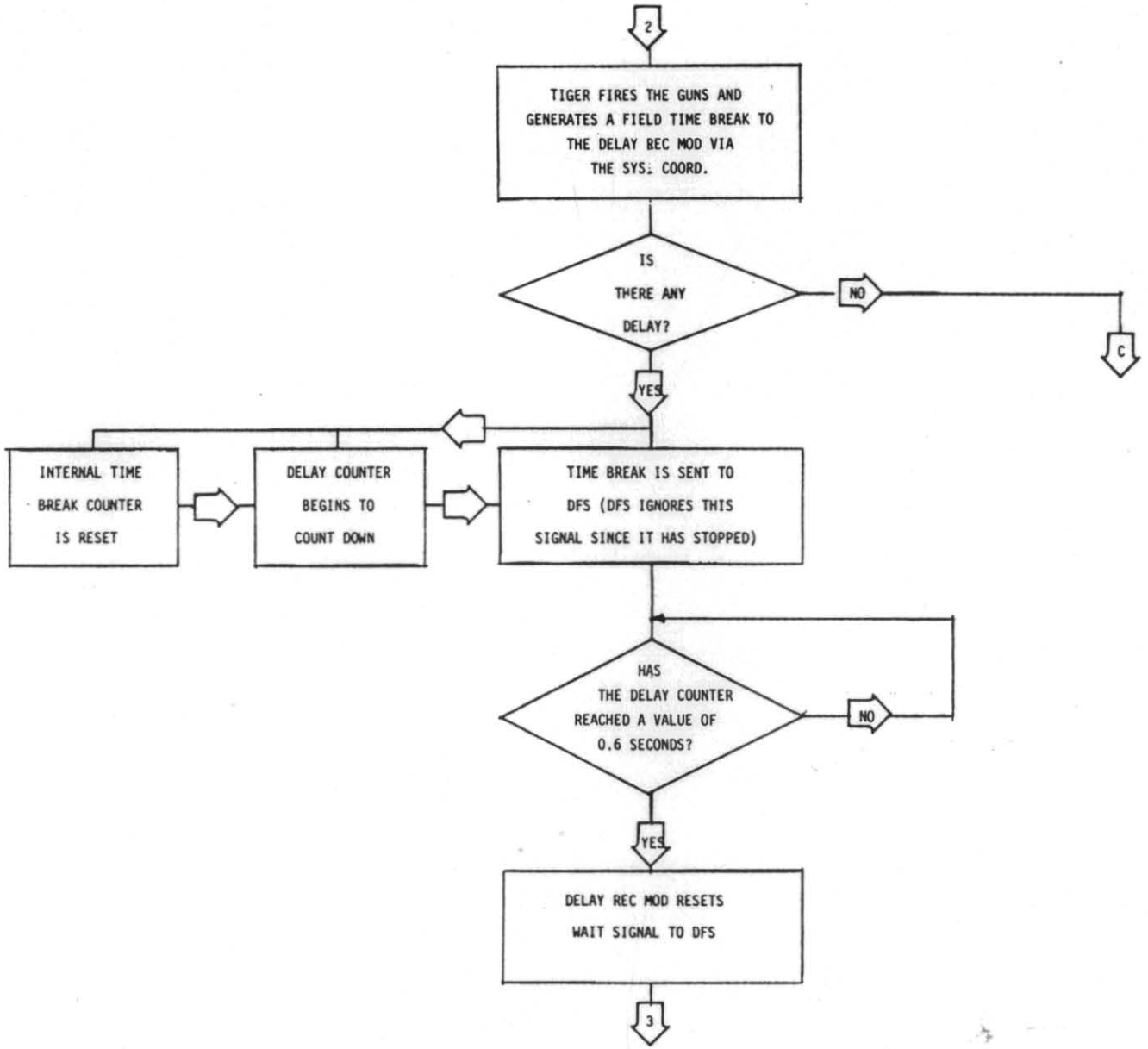


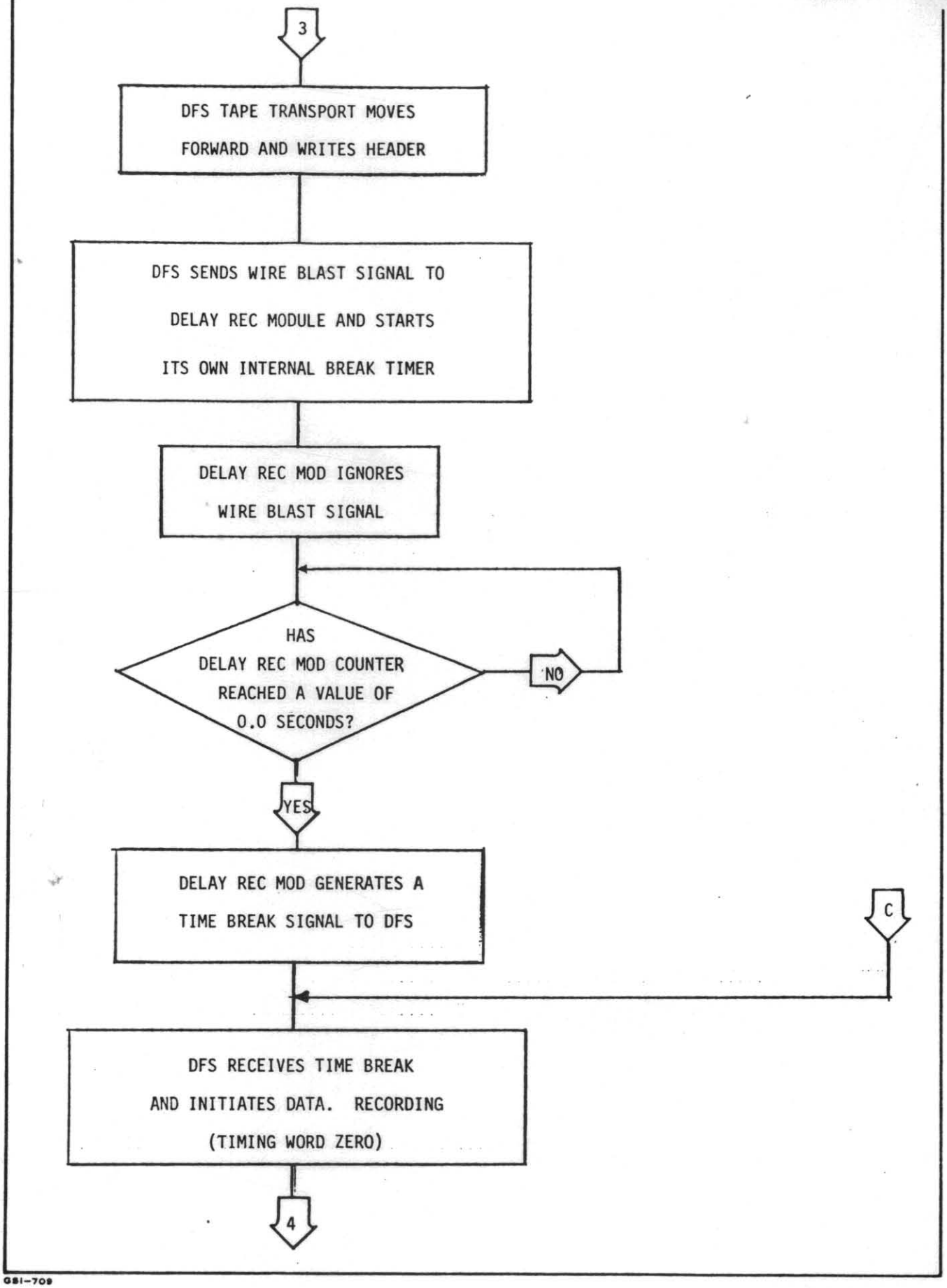
PLATE 3C DFS $\overline{V}$ RECORDING SEQUENCE



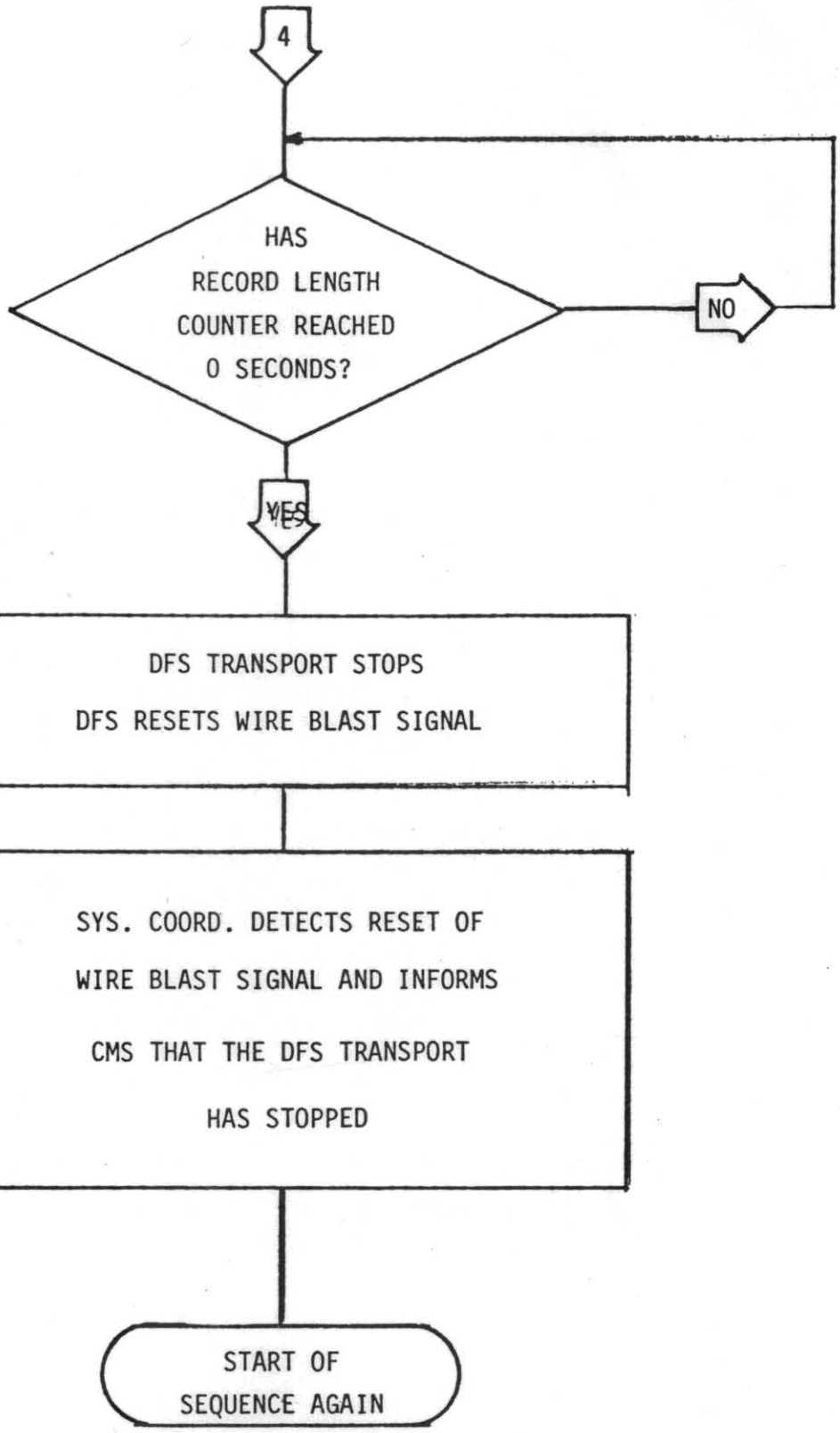
GSI-709

PLATE 3D DFS V RECORDING SEQUENCE

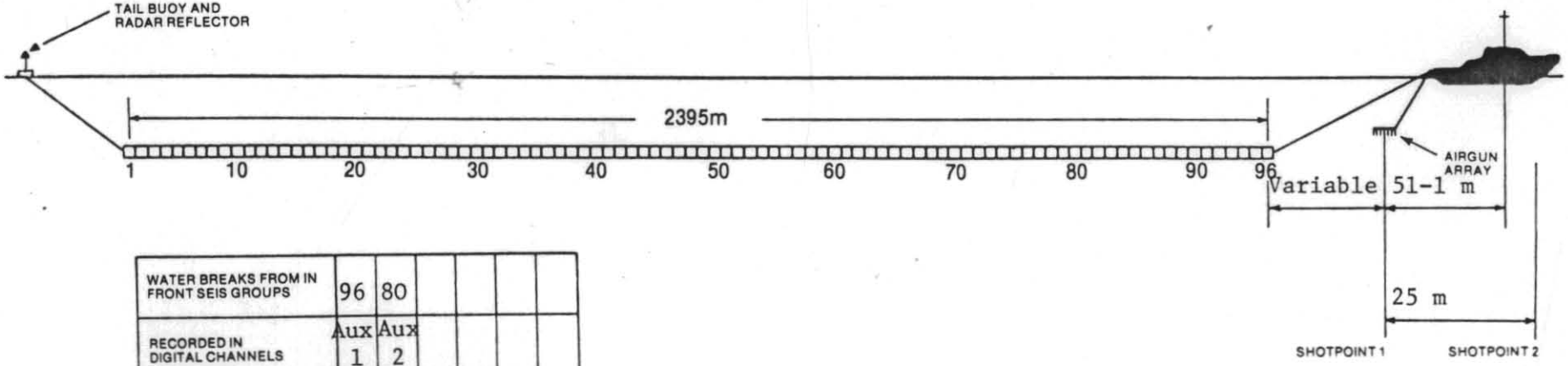
108041



GSI-709


4
HAS
RECORD LENGTH
COUNTER REACHED
0 SECONDS?
NO
YES
DFS TRANSPORT STOPS
DFS RESETS WIRE BLAST SIGNAL
SYS. COORD. DETECTS RESET OF
WIRE BLAST SIGNAL AND INFORMS
CMS THAT THE DFS TRANSPORT
HAS STOPPED
START OF
SEQUENCE AGAIN

GSI-709

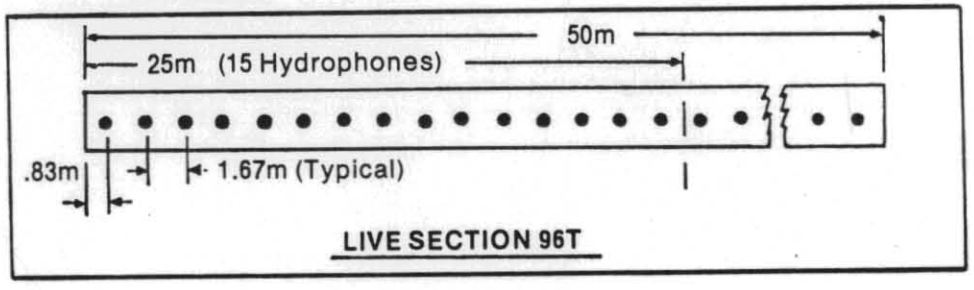


WATER BREAKS FROM IN FRONT SEIS GROUPS	96	80				
RECORDED IN DIGITAL CHANNELS	Aux 1	Aux 2				
DISPLAYED ON SEISMOGRAPH TRACES	61	62				

DEPTH TRANSDUCER NUMBERS	1	2	3	4	5	6
AT/NEAR SEIS GROUP NUMBERS	2 / 3	20 / 21	40 / 41	60 / 61	80 / 81	96 / FF
DEPTH CONTROLLER AT SEIS GROUP NUMBERS	1	1	1	1	1	1

NYLON STRETCH	7 (Front) + 5 (Rear)
PIG SECTIONS	None

6 TRANSDUCER SECTIONS 4M LONG



LIVE SECTION 96T

MARINE CABLE DIAGRAM

2400 METRES

(OFFEND SPREAD — 96 GROUPS)

G.S.I. PARTY: 2931

SHIP: M.V. Eugene McDermott II

CLIENT: Vandiemen's Land Resources N.L.

AREA: Otway Basin

DATE: 1st & 2nd February 1981.

5 cm

PLATE 4 STREAMER CONFIGURATION

108043

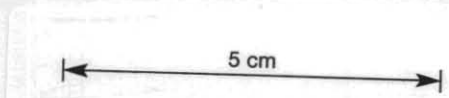


PLATE 5 AIRGUN ARRAY

108044

STERN OF VESSEL

2000 Cu In TUNED AIR GUN ARRAY

PORT STRING

GUN No.	SIZE (Cu in)	SEPARATION (In)
1.	120	●
		18
2.	120	●
		18
3. (spare)	120	O
		65
4.	100	●
		18
5.	100	●
		18
6. (spare)	100	O
		62
7.	80	●
		18
8.	80	●
		18
9. (spare)	80	O
		65
10.	120	●
		65
11.	100	●
		62
12.	80	●
		58
13.	40	●
		51
14.	40	●
		51
15.	40	●
		51
16.	40	●
		51
17.	20	●
		41
18.	20	●

TOTAL LENGTH 60ft 10 in

STARBOARD STRING

GUN No.	SIZE (Cu in)	SEPARATION (in)
19.	120	●
		18
20.	120	●
		18
21.	120	●
		18
22. (spare)	120	O
		65
23.	100	●
		18
24. (spare)	100	O
		62
25.	100	●
		62
26.	80	●
		58
27.	40	●
		51
28.	40	●
		51
29.	40	●
		51
30.	40	●
		51
31.	20	●
		41
32.	20	●
		41
33.	20	●
		41
34.	20	●
		41
35.	10	●
		33.
36.	10	●

TOTAL LENGTH 60ft

GSI-709

PLATE 6

OFFSET DETERMINATION (EXAMPLE ONLY)

PHYSICAL MEASUREMENT

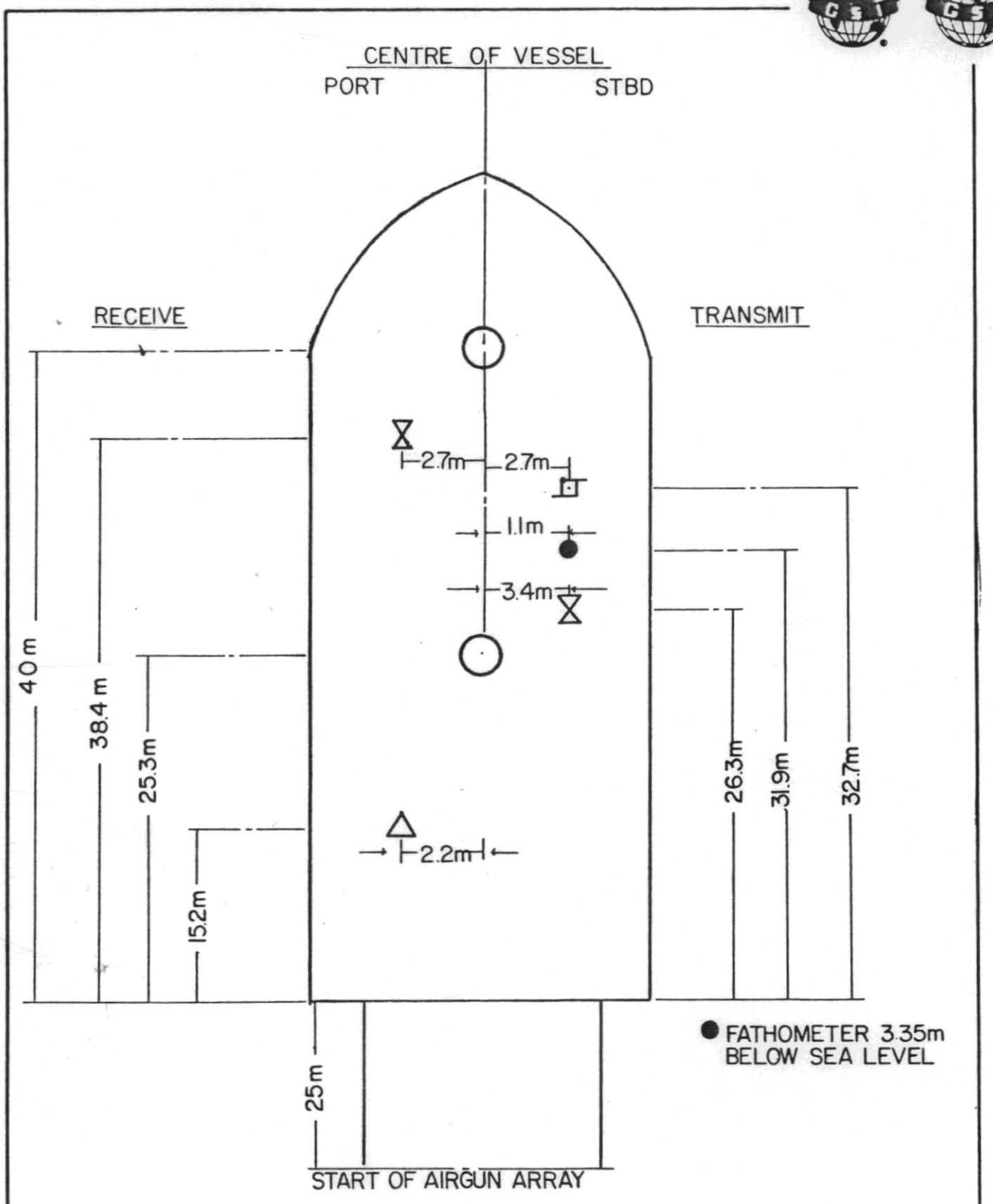
1.	Length of stretch sections with 9% stretch factor (4 x 50m)	:	200 metres + 18 metres = 218 metres
2.	Distance two bracket to stern	:	+2.0 metres
3.	Total length of Transducer sections in front of #96	:	2 metres
4.	Distance from boat to near group centre (1+2+3+12.5 metres)	:	238.5 metres
5.	Distance from boat to centre of source	:	24.1 metres
6.	Offset (5-4)	:	214.4 metres

TIME MEASUREMENT

As computed by the CMS-11 computer ADL, STS Systems. Typically 210 - 214 metres (computed on all lines).

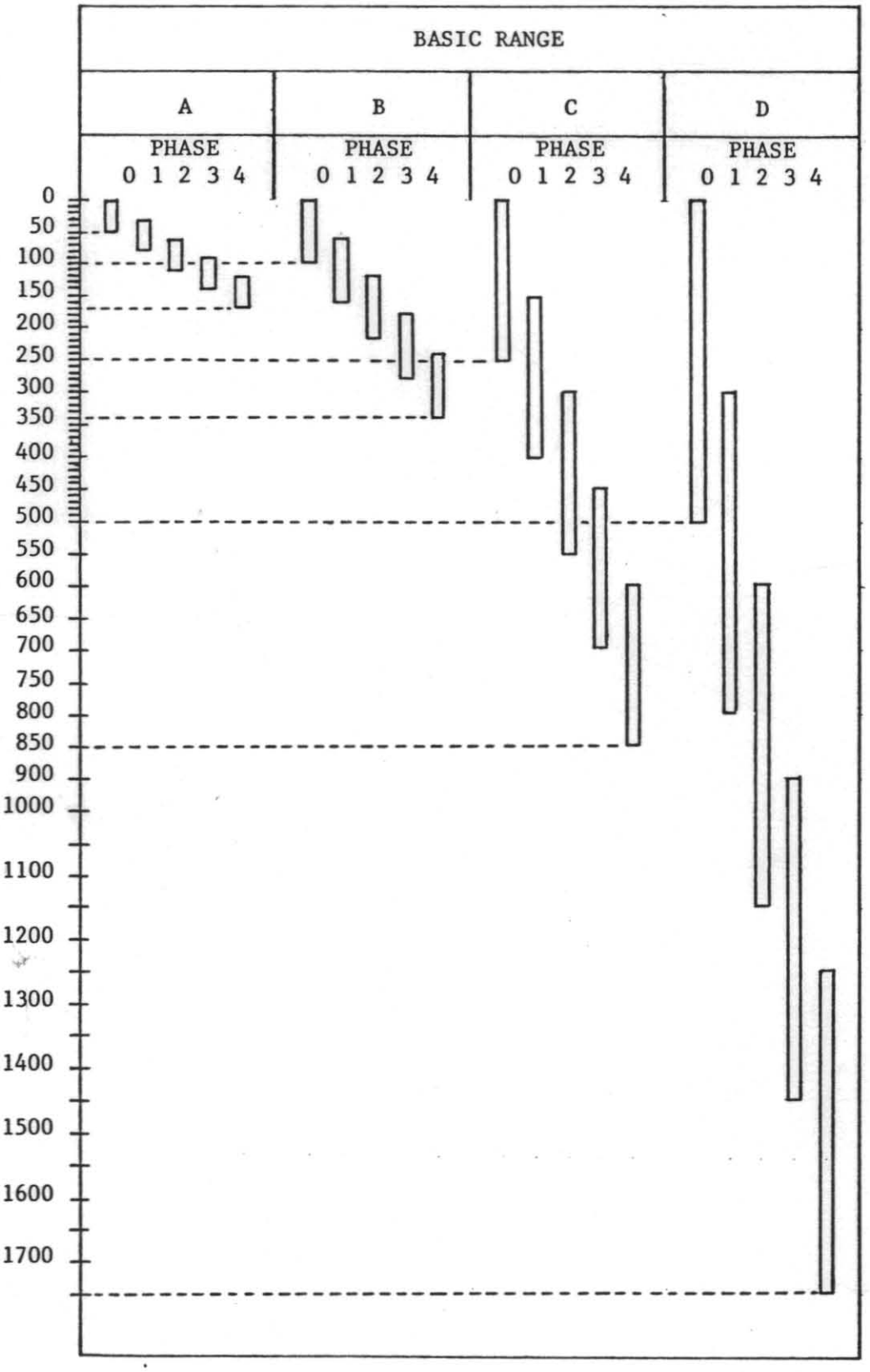
5 cm

PLATE 7 ANTENNA POSITIONS



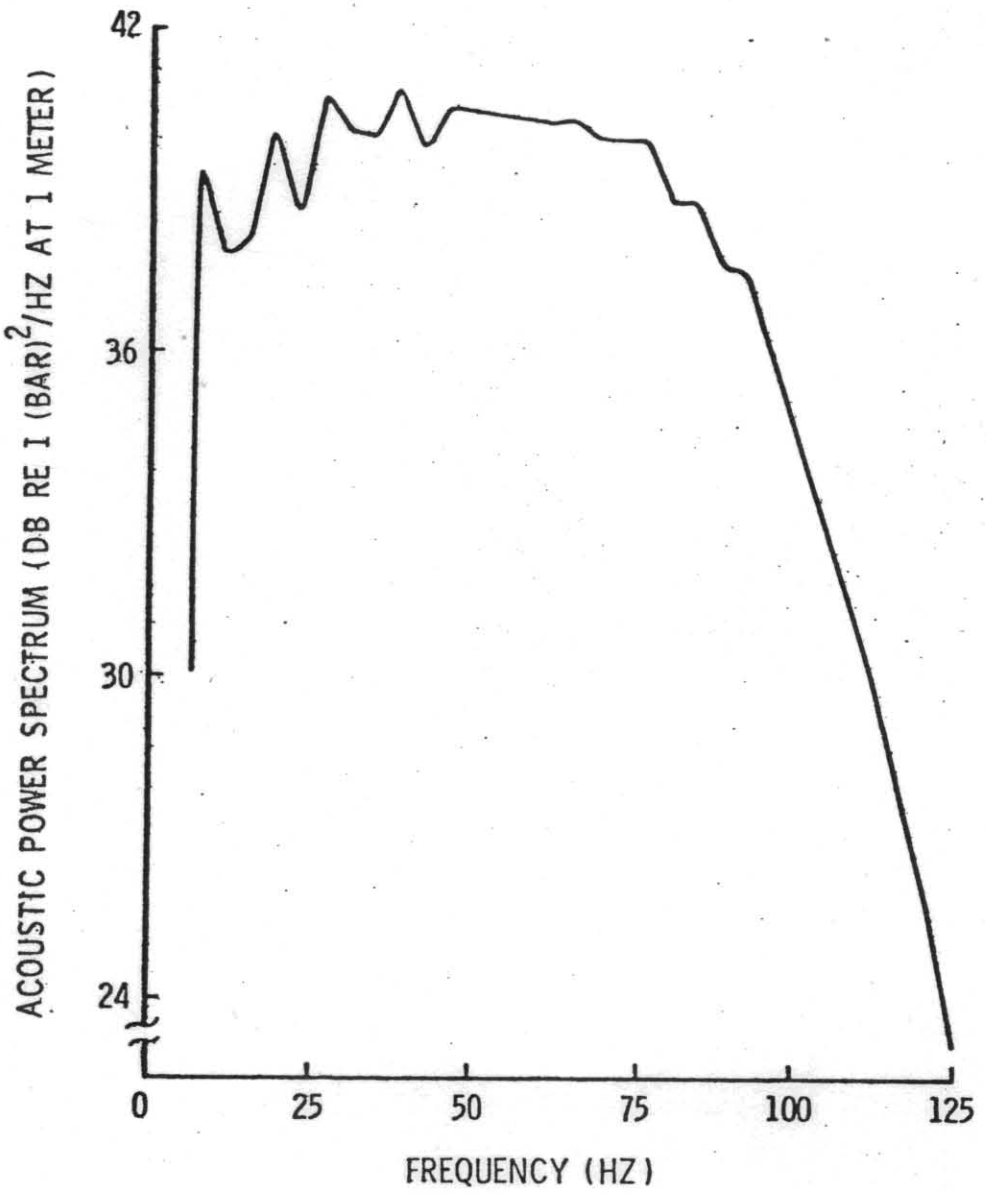
GSI-709

SIMRAD MODEL EA FATHOMETER SCALE



5 cm

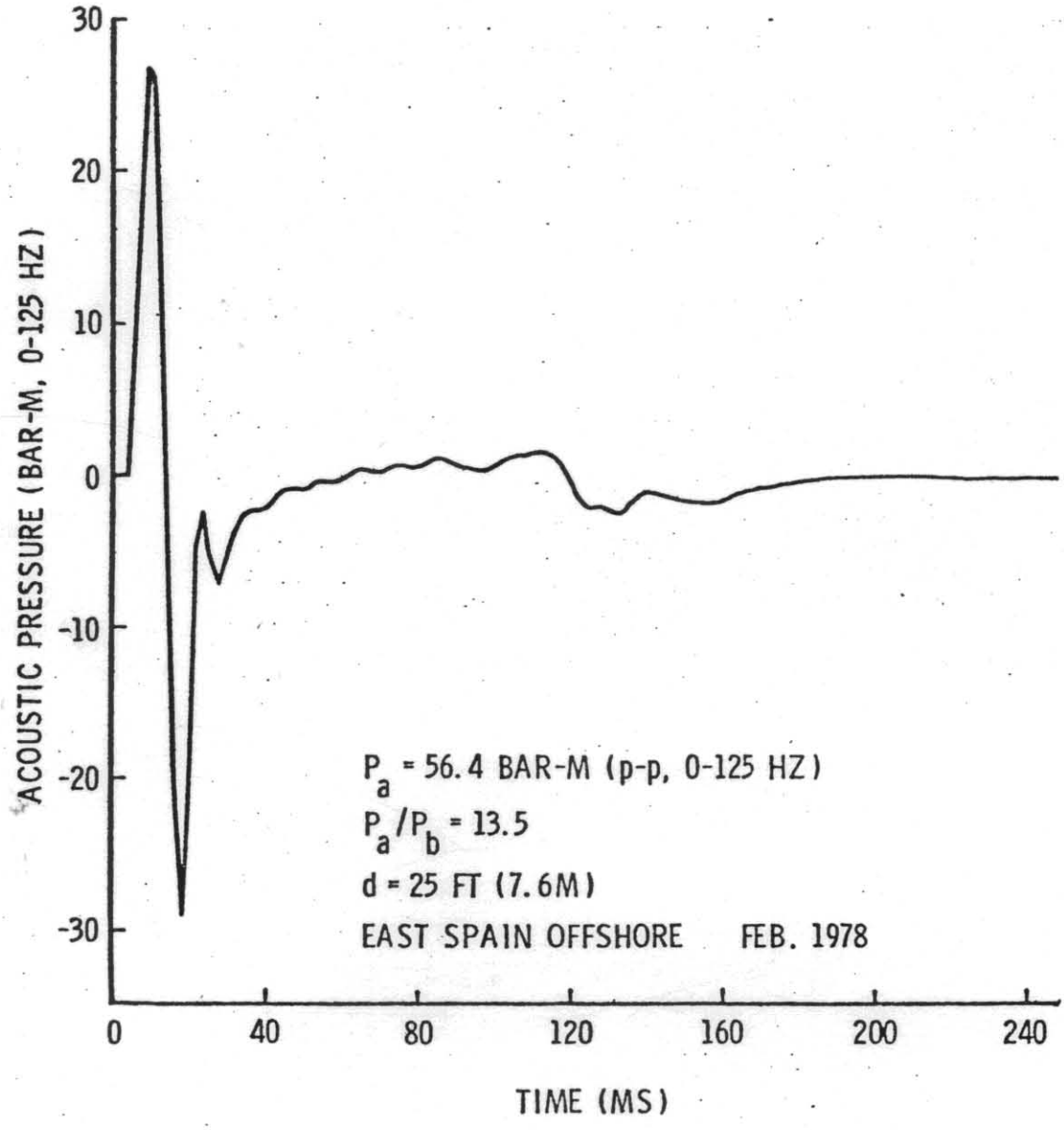
GSI-709



Power spectrum of 2000 cu. in. tuned air gun array

5 cm

GSI-709



Farfield signature of 2000 cu. in. tuned air gun array

5 cm

GSI-709

108050

DATA PROCESSING REPORT

SURVEY:- BASS BASIN

TAS T17P

COMPANY:- VAN DIEMAN'S LAND RESOURCES

COMPANY ADDRESS:- 17,QUEENSBRIDGE STR.,
S.MELBOURNE.

BY

GEOPHYSICAL SERVICE INTERNATIONAL
UNIT D, 8 BYFIELD STREET,
NORTH RYDE. N.S.W. 2113

PARTY 6854

C. WILKINS

DATE:DECEMBER,1981

TABLE OF CONTENTS

SECTION I.

INTRODUCTION

A seismic reflection survey was conducted by the M/V Eugene Mcdermott II in the Bass Basin off the South coast of Victoria Australia (see Plate I) between 1st February 1981 and 2nd February 1981

The survey covered approximately 150Km using the following shooting parameters:-

-	Streamer configuration	- 2400m cable with 96 groups equally spaced.
-	Group length	- 25m (15 hydrophones at 1.67 spacing)
-	Shot interval	- 25m (48 fold)
-	Record length	- 5 secs
-	Sample period	- 4 ms
-	Cable depth	- 11m average
-	Filter settings	- High cut and slope 128hz @ 72db/oct
		- Low cut and slope 8 hz @ 18db/oct
-	Navigation	- Maxiran by O.N.I.
		Geonav by GSI
-	Airguns	- 2000 cu.in. operating at 2000 p.s.i. (-51ms delay)
-	Recording	- DFS V, 9track, 96tr, 127 chnl,SEG B

Processing was carried out in G.S.I.'s Sydney office on TIMAP* 980 computers.

* Trademark of Texas Instruments.

SECTION II

EXPERIMENTAL WORK

Field data was received in February soon after which analytical work commenced. The standard suite of tests as listed below were conducted on Line OBV81-3, SP Range 325-375

PREPROCESSING TESTS:

- True Amplitude Recovery Test on 1 field record with 3 recovery rates 2,4,6 db/sec
- F-K noise analysis on 1 record with TAR only applied
- " + PDR applied
- " + PDR + VEF applied
- Deconvolution pre stack test

  Comparison over a 100 depthpoints between.

  A. Designature VEF applied
  B. designature no VEF applied
  C. Whitening Deconvolution VEF applied
  D. Gapped Deconvolution VEF applied

- Cable Configuration test

  Not run. Decision based on results of OMQ cable test.

- Demult Test comparing stacked data with and without it.

  Not run. Decision based on results of OMQ demult test.

POST PROCESSING TESTS

- Post Stack Deconvolution comparison over 100 Depthpoints between
  - A. No deconvolution
  - B. Gapped deconvolution
  - C. Spiking deconvolution
- Filter Analyses over 50 depthpoints
- Scaling test with 3 sets of parameters over 100 depthpoints.
  - A. 500 ms gates 50% overlap
  - B. 1000 ms gates 50% overlap
  - C. 2000 ms gates 50% overlap
  - D. No Scaling

SECTION III

PRODUCTION PROCESSING

TAR	Inelastic attenuation parameter (exponential factor)	6 db/sec
	T2 (cut off time for) = 3.5 secs.	
STATIC	- 51 ms airgun delay	
PDR	TDR (start time of ramp at offset zero)	-125 msec
	LDR (length of ramp at offset zero)	86 msec
	VDR (velocity used in computation of ramp times with increasing offset)	1190 m/sec
	KPR (percentage offset factor for increasing ramp length)	6%
CDP	Gather 96 trace 48 fold	
TVD	Pre stack gapped deconvolution	
	start time of first gate	=200 msec
	No. of gates	=2
	Velocity used to change start time with increasing offset (VDG)	=1250m/sec
	Gap length	=24 msec
	No. of filter points	=50
TVS	Gate length	3000 msec
	No gates	1

Start time at zero offset 300 msec
Velocity used to compute start times with increasing offset 1250 m/sec

VELSCANS 11 Depthpoint Velocity Analyses to determine the stacking function (1 per 3.0km)

NMO Normal Moveout application using stacking functions derived from velscans above and application of shot and receiver statics.

RAMP First break suppression application
Ramp on

Time (secs.)	Offset (metres)
0	280
1.1	1124
1.4	1724
2.45	2624

TVD Deconvolution Post Stack

Start time of the first gate	= 300 msec
Maximum time of the last gate	=4800 msec
Number of gates with 50% overlap	= 3
Operator	= 26 points with 32 msec gap

TVF Time Variant Filtering

All lines were filtered with the following passband

Time(secs)	Passband(hz)
0.0	10-60
1.5	10-60
2.0	10-40
5.0	10-40

TVS Time Variant Scaling

The lines were scaled with 3 x 2000msec gates using 50% overlap unity scalers.

DISPLAY

Horiz. Scale	24 trace / inch	(1:11811)
Vert. Scale	10cm/sec	
Mode	VA/WT	20% Bias

TAPES Field tapes and raw stack tapes were shipped to Geomagnetics together with the observers logs. Paper field monitors were destroyed at client request.

COMMENTS

This survey was exploratory and thus the client decided against the use of Velocity Filtering. Analysing the final sections it can be seen that they have a fairly low signal to noise ratio. A much better product could be obtained with the use of Velocity Filtering. This should definitely be considered if the data is reprocessed some time in the future in a more detailed study

Respectfully submitted.

Cherry Wilkins
Processing Party Chief

APPENDIX A

PROCESS DESCRIPTIONS

TRUE AMPLITUDE RECOVERY(TAR)

The TAR process is applied to digital field records to produce output records on which relative amplitudes of reflections on each trace are approximately true and traces evenly modulated. This consists of removing the gain imposed on the field record during recording and correcting for inelastic attenuation and spherical divergence losses.

VELOCITY FILTERING (VEF)

Velocity filtering is a multichannel process. Multichannel filtering is a two-dimensional frequency-wavenumber filtering operation that can be used to discriminate against specified velocities on pre-stacked data or against specified dips on stacked data.

Velocity filtering processes transform the data from the space time (X-T) domain to the frequency-wavenumber (F-K, where K = reciprocal of wavelength) domain where the filter is applied. After filter application the process transforms back to the X-T domain for further conventional process applications.

The apparent velocity of noise must be adequately separated from the primary signal for the process to be effective. Examples of noise alignment that can be removed are hard bottom refraction, mud roll and cable jerk. These types of noise alignments have a velocity slower than primary signal or have a dip opposite from the primary.

A window of primary dip zones to keep is specified and dips outside this window are rejected.

A linear event in the X-T domain (implying constant velocity) appear as a linear event in the F-K domain where lines of constant velocity pass through the origin. Thus, a multitude of noise events, with the same velocity, at various times on the input record join on the F-K plane into a single event. In general seismic reflections (signal) have higher apparent velocities than noise propagating horizontally in a direct path from source to receiver; therefore, recorded signal appears in a different region of the F-K plane from the noise.

This provides the basis for signal-to-noise enhancement used in velocity filtering. The process is analogous to muting in X-T.

Aliasing both in the frequency and wavenumber axes can be predicted from the time sampling period and the spatial sampling (or group interval) of the input data. Spatial sampling determines, to a large extent, the effectiveness of the process. Velocity filtering attenuates some portions of alaised events. However, when alaised noise overlays signal, velocity filtering loses its discriminating power.

DESIGNATURE (DESIG 1*)

Designature is a a generic name for processes which attempt to replace an arbitrary source wavelet convolved with the reflection sequence with a shorter wavelet of improved resolving capability.

* Trademark of Texas Instruments Inc

DESIG 1 is the particular designature process in the current VELFILT program and provides an alternative to conventional pre-CDP stack deconvolution (TVD). DESIG 1 is a multichannel process, like VELFILT that can use the entire record to estimate the wavelet, whereas TVD is a single channel process that only uses a portion of a trace to design an operator. While TVD is time and offset-variant DESIG 1 is not time-variant.

DESIG 1 can better account for the source and receiver ghosts found in marine data than TVD can.

Once the signal-to-noise ratio of the primary events is improved by velocity filtering, designature is applied in the common source point domain. Designature estimates the source wavelet from the seismic traces and attempts to collapse it to a zero phase pulse. The source domain is chosen since all traces originate from the same source.

PREDECONVOLUTION RAMP (PDR)

PDR is the process whereby first arrival unwanted noise at the front end of seismic records is removed. This is applied prior to deconvolution design.

VELOCITY ANALYSIS

As part of any velocity analysis routine, static corrections to compensate for shot and cable depth, and multiplexor delays are applied.

DISCRETE (VELSCAN)

GSI's VELSCAN Velocity Module is a discrete Velocity Analysis mode making use of advanced picking logic to generate events as functions of time, amplitude, moveout and dip. The event picking proceeds in the following manner:

- NMO corrections corresponding to a series of moveout functions are applied to a set of depth point traces. For each moveout function, the NMO-corrected traces are stacked. The resulting traces consist of amplitudes as functions of time and moveout.

- Identical operations are applied to adjacent depth points, adding the dimension of space.

- Dip is applied and for each value of dip, the traces are stacked across depth points. The result is a set of amplitudes as functions of time, moveout and dip.

- An event is located by searching for an amplitude extremum in the time, moveout and dip domains. An extremum may be either a maximum or minimum; that is, both peaks and troughs are picked. The event attributes of time, amplitude, moveout and dip are assigned to the centre depth point.

NORMAL MOVEOUT CORRECTIONS (NMO)

Reflection arrival times at the surface, from a horizontal reflecting interface, increase with offset from seismic source in a predictable manner known as the normal moveout effect. NMO at a a given location is a function of offset, depth to the reflector and the velocity of the medium between the reflector and the surface.

NMO corrections remove the NMO increase in reflection times with offset (or spread geometry) and reduce all reflection times to the value they would have if source and receiver were coincident.

NMO corrections involve some stretching of the data. This is greatest at early record times but decreases with increasing record time. In order to avoid gross distortion at early record times ramps are applied to zero out the early part of the traces where NMO is excessive and to phase in the NMO corrections gradually.

COMMON DEPTH POINT STACK (CDP)

The common depth-point stack is the summation of all the traces with a common depth point into one stacked output trace for each depth point. This summation is performed after the application of NMO and static corrections to each of the individual traces. If these corrections are appropriate then trace signals will reinforce whilst random noise will fail to reinforce. The improvement in signal-to-noise (S/N) ratio of a stacked trace compared to the input traces is theoretically equal to the square root of N, where N is the number of traces summed together. Thus, if the fold of stack is 48 fold, then the improvement is approximately 7.

In addition to improving the S/N ratio, stacking can also attenuate or suppress undesired reflection events such as multiple reflections. This is because an appropriately applied NMO correction will only partially correct multiple reflections so that they will not reinforce when summed but will suffer destructive interference to some degree.

In practice, the early live portion of the NMO output traces have more distortion than is acceptable. For this and possibly other reasons, a ramp function is applied to the input traces before summation. Each trace may have up to three ramps applied to it to accept or reject portions of the input trace as desired. Quite commonly short offset traces are rejected at depth to improve multiple attenuation.

To accommodate the varying summation, or fold, implicit in this ramping a recovery scaler is applied to normalise the energy output level to that of the full fold stack.

TIME VARIANT FILTERING (TVF)

Filtering is commonly applied in a time variant manner to take account of the higher frequency content of the shallow seismic signal and the lower frequency content at depth when rejecting unwanted frequencies, or noise.

By appropriate filter design, unwanted frequencies may be attenuated, or removed, the most common application is the band-pass filter which discriminates against the high and low frequency spectrum of the input trace where no significant signal energy is present.

TIME VARIANT SCALING (TVS)

Time Variant Scaling (TVS) produces amplitude equalisation in a time variant manner down the seismic trace as well as from trace to trace. Up to twenty time gates with variable overlap can be used to compute time variant scalers for each gate to raise all gates to the same energy level.

Scalers computed for each gate are applied at the gate centre, with linear interpolation between gate centres.

Gate amplitudes are measured for a set of continuous gates on each trace and scalers are computed for each gate to make the amplitude constant or proportional to the amplitudes. The scalers are applied in a continuously time-variant manner.

TIME VARIANT DECONVOLUTION (TVD)

The purpose of TVD is to take reverberating series of wavelets and reduce them to the time domain spike and this implies normalising the frequency spectrum. At the same time TVD is desireable to collapse and stabilise wavelet shapes from broad or variable input wavelets.

TVD is accomplished by the application of one or more filters designed from individual data trace autocorrelation functions.

Gapped TVD is the process of deconvolution without total spectral whitening. This differs from Spike TVD which gives total spectral whitening. This means the frequency spectrum in gapped deconvolution will show that the high frequency noise area is not amplified

MIXING

This involves combining energy from adjacent trace of the same record. In a 2 on 1 MIX, traces are summed as follows:-

Input trace	Output trace
1	
2	1
3	
4	2
etc.	etc.

Some noise cancellation is achieved by mixing.

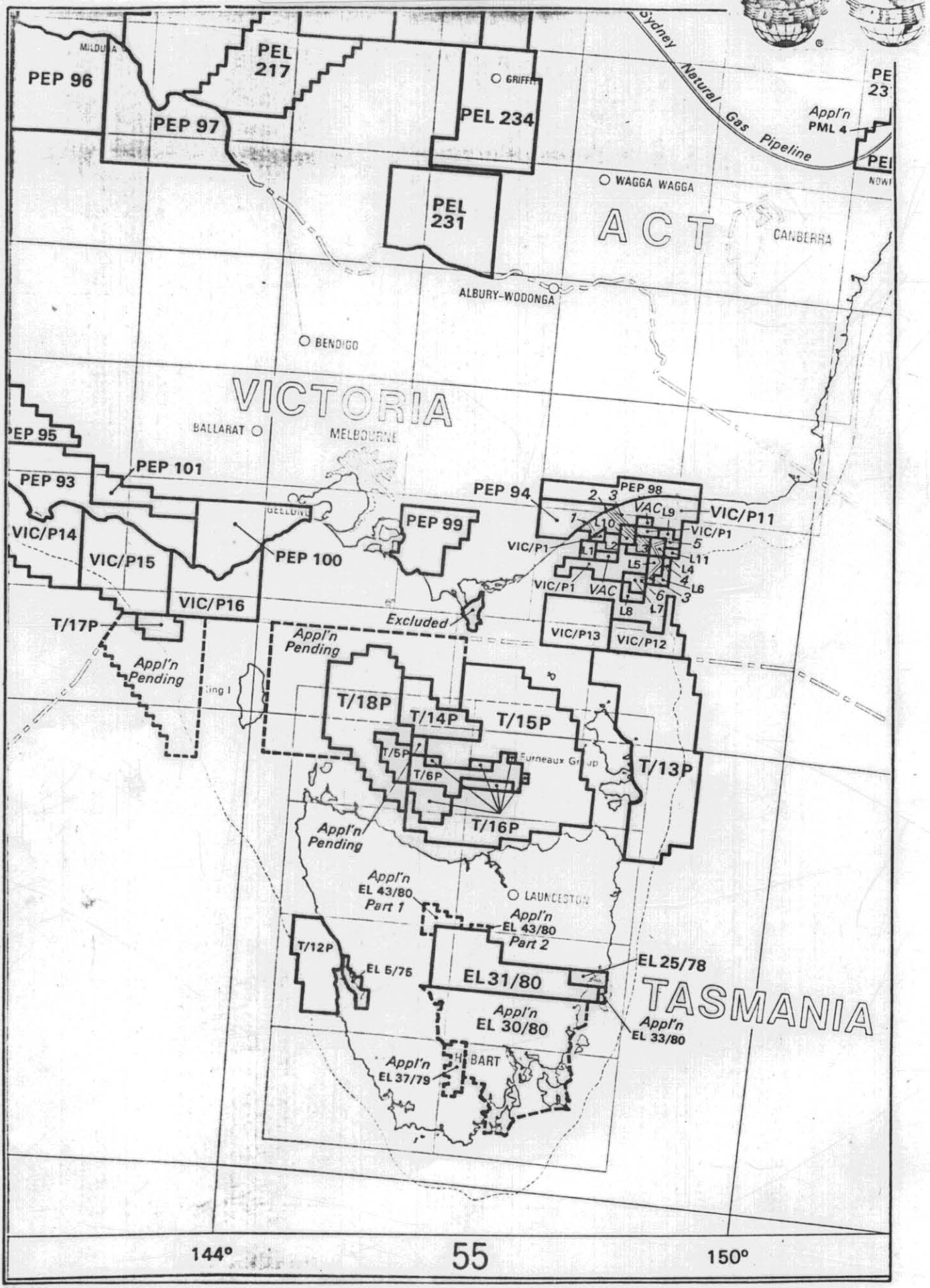
RESAMPLE

This process changes the input field sample period to a larger sample period, say 2ms to 4ms, for processing. Anti-alias filters are applied prior to the resampling.

APPENDIX B

RAW STACK TAPE LOG FOR BASS BASIN TAS T17P (prsn 21020)

LINE OBV81-	SP RANGE	TAPE
1A	1-1300	1850
1B	1289-2798	1870
02	1-1556	1876
03	1-1438	182
4A	1-900	2197
4B	1889-3836	2181
06	1-1264	2267
08	1-1356	1881



GSI-709

PLATE I

PROCESSING FLOW DIAGRAM

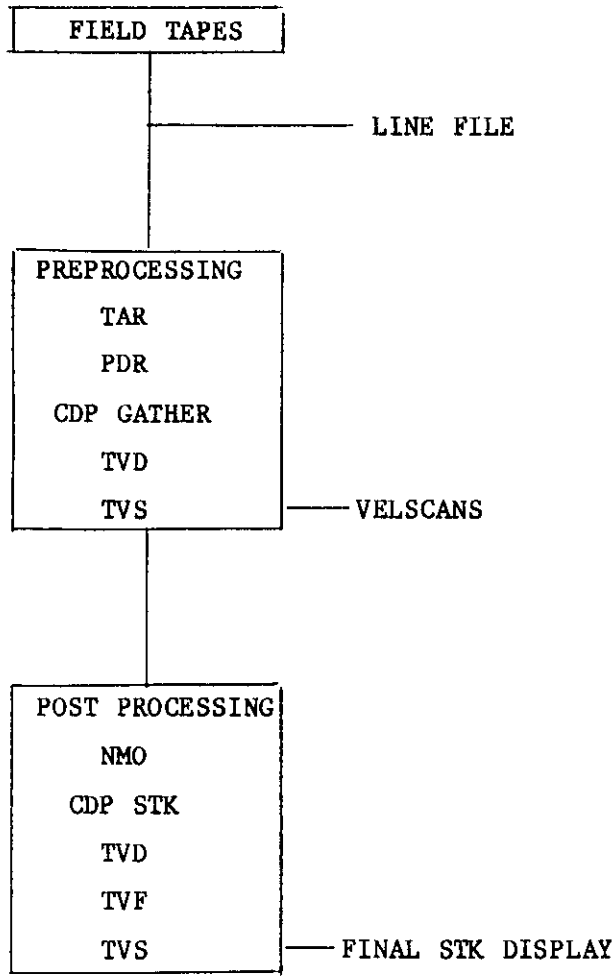


PLATE II