Seismic Survey Report

VELOCITY DETERMINATION

HEATHFIELD No.1 WELL

P.E.P. 26, VICTORIA

Submitted to

Enclosure 1 of W.C.R.

Velocity Survey

PLANET EXPLORATION COMPANY PTY. LTD.

Heathfield - 1

by

Mines Administration Pty. Ltd.

FINAL REPORT

on the

VELOCITY DETERMINATION SURVEY

HEATHFIELD NO. 1 WELL

P. E. P. 26, Victoria

Submitted to

PLANET EXPLORATION COMPANY PTY. LTD.

by

NAMCO INTERNATIONAL INCORPORATED

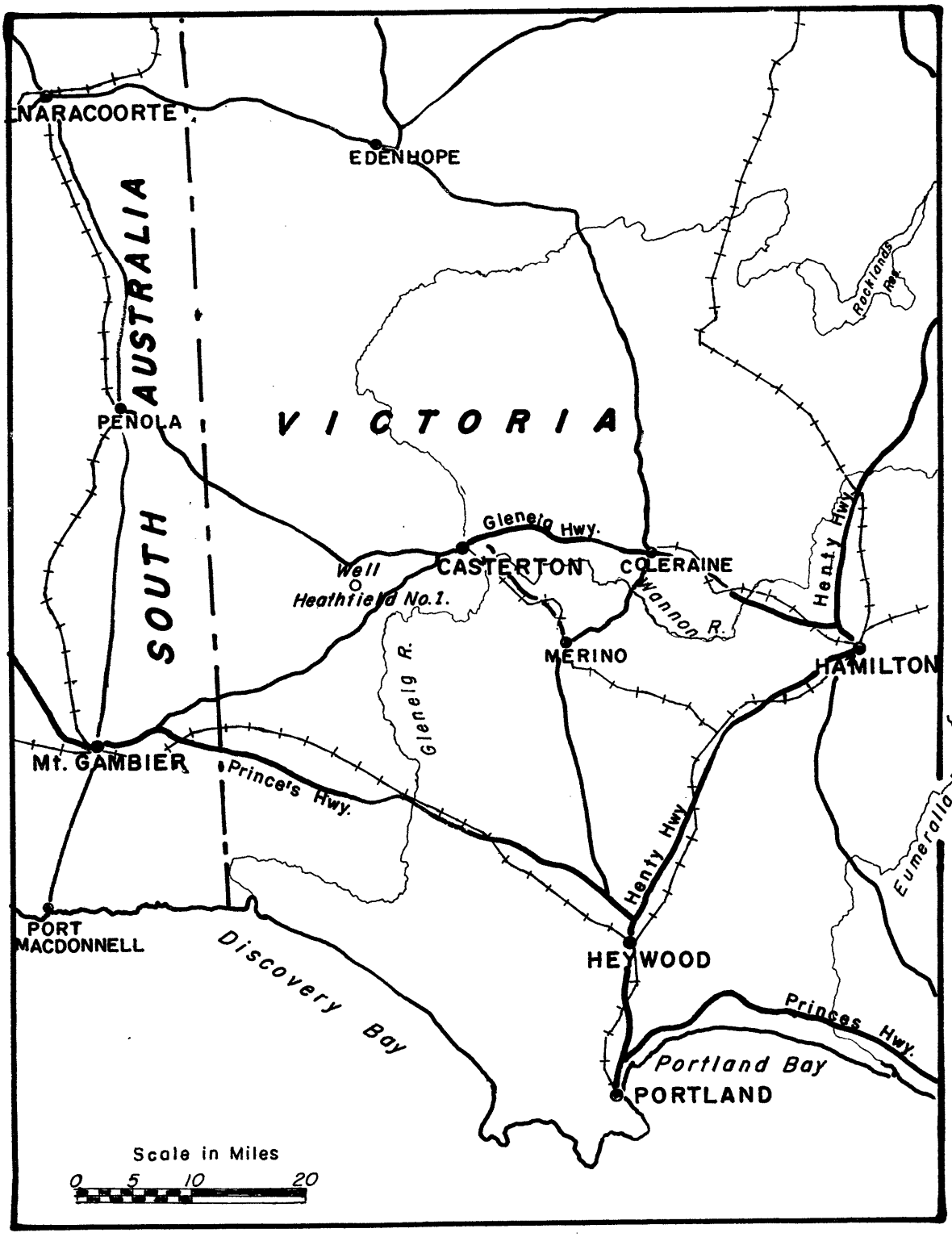
C O N T E N T S

A B S T R A C T

A seismic velocity determination survey was conducted on 22 and 23, April, 1964 for Planet Exploration Company Pty. Ltd. of Sydney, New South Wales in their Heathfield No.1 well located in P.E.P. 26 near Casterton, Victoria.

The survey was made by Namco International Incorporated of Dallas, Texas with Australian headquarters at Adelaide, South Australia.

The results of the survey are considered reliable and indicate a gradual increase in seismic velocity with depth to a maximum average of 9100 feet per second at total depth.



LOCATION PLAN

1. INTRODUCTION

A well velocity determination survey was conducted for Planet Exploration Company Pty. Ltd. with registered office at 2 O'Connell Street, Sydney, in their Heathfield No.1 well located near Casterton, Victoria, in Petroleum Exploration Permit 26. Refer to Location Map, frontispiece.

The survey was conducted on 22 and 23, April, 1964 by Namco International Incorporated of Dallas, Texas with Australian headquarters at 15 Franklin Street, Adelaide, South Australia. Statistical data for the project is summarised in Appendix III.

2. PROCEDURE

Seismic times from shot position to the well geophone were recorded using National Geophysical Company instruments in conjunction with the equipment of Schlumberger (Seaco) Inc. The well geophone was provided by the Department of National Development, Bureau of Mineral Resources, Geology and Geophysics.

National Geophysical Company 26AA amplifiers and pre-amplifiers with a National 4F ascillograph were used in the recording procedure. The electric wave filters of the amplifiers were

adjusted to attenuate seismic frequencies below 3.1 cycles per second and above 140 cycles per second at 50% response, with a maximum response in a broad band at about 20 cycles per second. After the initial shot, maximum gain was used on Trace 6, while Traces 5 and 4 were recorded with gain reduced by 6 and 12 decibels, respectively. The composition of each time-depth recording was as follows:

Trace 1 : Time break

Trace 2 : Up-hole time

Trace 3 : Reference geophone (at rig)

Trace 4 : Well geophone - Low gain, No A.G.C.

Trace 5 : Well Geophone - Medium gain, No A.G.C.

Trace 6 : Well Geophone - High gain, No A.G.C.

Trace 7 : Well Geophone - With A.G.C., CH-CH reflection filter (Low Cutoff 24 - High Cutoff 58)

Time breaks and up-hole times were transmitted to the recording truck from the shot point by FM radio. Well geophone and reference linkage to the recording unit was by cable.

Shot points were drilled at diametrically opposed positions, with offset distances of 500 and 1000 feet on either side of the well. Refer to Velocity Determination Layout, Figure 1.

Sixteen shots were recorded with the well geophone at depths from 1200 to 7500 feet. In positioning the geophone the last movement was always upwards. In order to reduce the effects of dip and hole deviation on the data, shots were taken on either side of the well before moving the detector.

A reflection spread was laid out and recorded between the two near offset shot points. Twelve seismometers per trace were distributed between the station pegs so that no ground overlap was involved. Charges were fired in holes at either end of the cable to obtain a completely reversed reflection spread. Reproduction of the reflection recordings is presented as Enclosure II.

3. RESULTS

The results of the survey are considered reliable, subject to the quality of data indicated in the grade column of the velocity determination sheet, Figure 2. Most of the breaks are strong and sharp, but a few were weak and may be subject to question. A change in polarity occurs oh several of the breaks, with no apparent electronic reason.

A comparison was made in the field between the recorded seismic times and the transit times defined by sonic logs, and a reasonable agreement was noted.

The raw observed times have been corrected to a reference plane at 130 feet above sea level, with due consideration to the angularity of travel path. Plotted curves of time-versus-depth, velocity-versus-depth and interval velocity appear on Enclosure I.

Enclosure II displays the seismograms obtained from a reflection spread shot with reverse coverage across the well. The data has been computed to a velocity reference plane 130 feet above sea level. Good quality reflections are observed from shallow horizons, but there appears to be a definite decrease in the quantity and quality of information with depth. The poor energy return of deep reflections may be related with the problem of propagating energy to the deep geophone positions in the velocity survey. Approximate depths of reflectors have been marked on the records. These were computed using the velocity distribution established by this survey after correcting times for empirically established filter delay of 0.030 seconds.

4. CONCLUSIONS

A reliable determination of seismic wave velocities at the Heathfield No.1 location has been achieved by this survey. Assuming a linear increase of velocity with depth, the data from the survey may be generalized to yield an instantaneous velocity function of:

$$V_i = 6000 + ,981Z$$

The rather large acceleration factor is probably the result of contrast in velocity between the deeper sediments and those above 3066 feet, sub-datum. It is doubtful that the acceleration factor persists with depth, and therefore it should not be used in extrapolation of data beyond control.

The results are consistent with the type of section penetrated by the well. Shallow velocity contrasts produce good reflections, but at the same time reduce energy available for penetration to depth. The thick clastic section at depth provides few interfaces with high coefficients of reflection. Future seismic surveys in the area should incorporate techniques for improving the response to the weaker deep reflections.

NAMCO INTERNATIONAL INCORPORATED

H. E. Bowman - Geophysicist

W. J. Harkey - Supervisor

April 1964

APPENDIX I.

PERSONNEL

Party Chief	H. E. Bowman
Chief Computer	B. Humphrey
Observer	D. E. Rathje
Drillers	P. J. Scott J. Dwan
Shooters	J. Lane C. Austin
Surveyor	G. W. Cozby

The total complement of the field crew during actual shooting operations was eight men. Surveying had been done in advance.

Technical and administrative supervision was provided by Mr W. Jarrott Harkey.

APPENDIX II.

EQUIPMENT

RECORDING:

1 International Model 160 4-wheel-drive recording truck, complete with instrument cab, cable reel, radio tower and antenna.

2. International Model 160 4-wheel-drive cable trucks, complete with seismometer racks, cable reels and communication radio antennae.

1 Complete set of 24 channel National Geophysical Company 26 AA seismic instruments and pre-amplifiers.

480 Electro-tech EVS type geophones in strings of six.

2 - 1800 foot swing-trace type 12-channel reflection cables.

3 Complete sets of shooting equipment including multi-hole blasters, firing harnesses and explosives storage equipment.

3 Complete sets of radio communication equipment modified for transmitting time break and uphole signals.

1 Techno tape recorder and field playback unit.

1 Texas Instrument Company 3 phase well seismometer.

DRILLING

2 Heavy duty Mayhew 1000 combination air-water rig mounted on an International Model 190 6-wheel-drive trucks, complete with 667 CFM air compressor and 5 x 6 Gardner-Denver mud pump.

1 International Model 190 6-wheel-drive water truck with 1200 gallon flat-type tank and stake body. This unit is equipped with explosives compartments, radio tower and can serve as an auxilliary shooting vehicle.

1 Bedford J-4 water truck with 1000 gallon flat-type tank and stake body.

SURVEYING

1 Land Rover truck

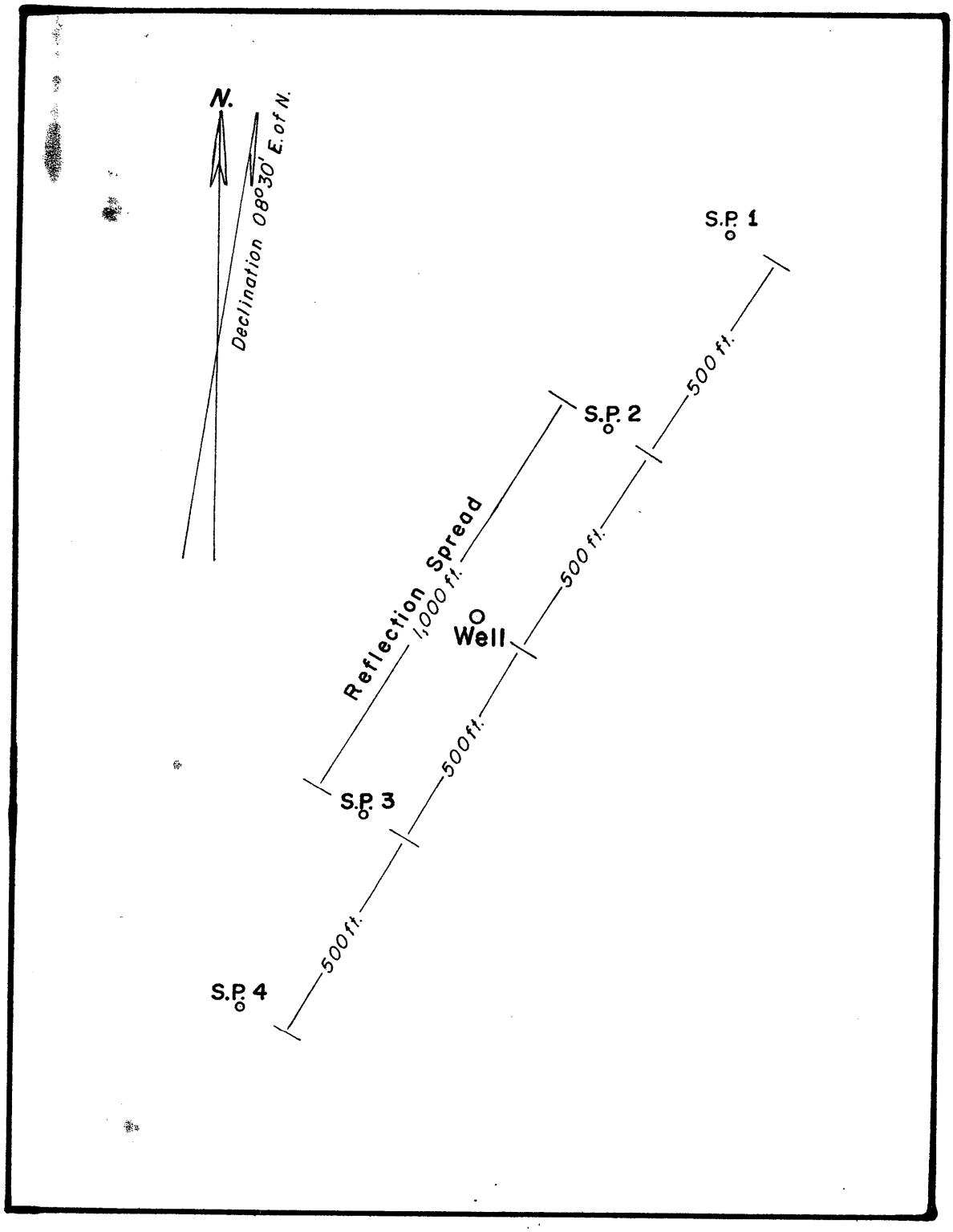
1 Complete set of surveying equipment and instruments

1 Complete set of Office equipment

APPENDIX III.

STATISTICAL SUMMARY

Commencement time (Depart Penola)	1:15 PM, April 22, 1964
Completion time (Arrive Penola)	8:15 AM, April 23, 1964
Well seismometer in hole	12.05 AM, April 23, 1964
Well seismometer out of hole	4.35 AM, April 23, 1964
Total hours set-up and survey, including reflections	8.3
Total hours driving time	2.0
Total hours standby time	6.5
Shots recorded by well geophone	16
Shots for reflection spread	2
Total pounds dynamite used	375
Total detonators used	31
Number holes drilled, four groups	12
Total hours drilling time	16
Total hours driving time, drill	4
Drilling mud used, pounds	250
Drilling bran used, pounds	960
Insert bits used	2



VELOCITY DETERMINATION LAYOUT

FIG. 1

PE905822

This is an enclosure indicator page.
The enclosure PE905822 is enclosed within the container PE905819 at this location in this document.

The enclosure PE905822 has the following characteristics:

ITEM_BARCODE	= PE905822
CONTAINER_BARCODE	= PE905819
NAME	= Shot Hole Information Sheet for Heathfeild-1
BASIN	= OTWAY BASIN
PERMIT	= PEP/26
TYPE	= WELL
SUBTYPE	= VELOCITY_CHART
DESCRIPTION	= Shot Hole Information Data Sheet (from enclosure 6 of WCR--Seismic Velocity Survey) for Heathfeild-1
REMARKS	=
DATE_CREATED	= 30/04/64
DATE_RECEIVED	=
W_NO	= W483
WELL_NAME	= HEATHFEILD-1
CONTRACTOR	=
CLIENT_OP_CO	= PLANET EXPLORATION CO. PTY. LTD.

(Inserted by DNRE - Vic Govt Mines Dept)

PE905820

This is an enclosure indicator page.
The enclosure PE905820 is enclosed within the container PE905819 at this location in this document.

The enclosure PE905820 has the following characteristics:

ITEM_BARCODE	= PE905820
CONTAINER_BARCODE	= PE905819
NAME	= Velocity Determination Graph for Heathfeild-1
BASIN	= OTWAY BASIN
PERMIT	= PEP/26
TYPE	= WELL
SUBTYPE	= VELOCITY_CHART
DESCRIPTION	= Velocity Determination Graph (from enclosure 6 of WCR--Velocity Survey Report) for Heathfeild-1
REMARKS	=
DATE_CREATED	= 25/04/64
DATE_RECEIVED	=
W_NO	= W483
WELL_NAME	= HEATHFEILD-1
CONTRACTOR	= NAMCO INT. INC
CLIENT_OP_CO	= PLANET EXPLORATION CO. PTY. LTD.

(Inserted by DNRE - Vic Govt Mines Dept)

PE905821

This is an enclosure indicator page.
The enclosure PE905821 is enclosed within the container PE905819 at this location in this document.

The enclosure PE905821 has the following characteristics:

ITEM_BARCODE	= PE905821
CONTAINER_BARCODE	= PE905819
NAME	= Velocity Survey Shot Data for Heathfeild-1
BASIN	= OTWAY BASIN
PERMIT	= PEP/26
TYPE	= WELL
SUBTYPE	= VELOCITY_CHART
DESCRIPTION	= Velocity Survey Shot Data (from enclosure 6 of WCR--Seismic Velocity Survey) for Heathfeild-1
REMARKS	=
DATE_CREATED	=
DATE_RECEIVED	=
W_NO	= W483
WELL_NAME	= HEATHFEILD-1
CONTRACTOR	=
CLIENT_OP_CO	=

(Inserted by DNRE - Vic Govt Mines Dept)