COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

PETROLEUM SEARCH SUBSIDY ACTS

Publication No. 34

SOUTH ROMA SEISMIC SURVEY, QUEENSLAND, 1959

BY

ASSOCIATED AUSTRALIAN OILFIELDS N.L.

Issued under the Authority of Senator the Hon. W. H. Spooner,
Minister for National Development

1962

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

Minister: SENATOR THE HON. W. H. SPOONER, M.M.

Secretary: H. G. RAGGATT, C.B.E.

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Director: J. M. RAYNER.

This Report was prepared for publication in the Geophysical Branch

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FOREWORD

In 1959 the Commonwealth Government enacted the Petroleum Search Subsidy Act 1959. This Act enables companies that drill for new stratigraphic information, or carry out geophysical or bore-hole surveys in search of petroleum, to be subsidized for the cost of the operation, provided the operation is approved by the Minister for National Development.

The Bureau of Mineral Resources, Geology and Geophysics is required, on behalf of the Department of National Development, to examine the applications, maintain surveillance of the operations and in due course publish the results.

A seismic survey was carried out under the Petroleum Search Subsidy Act 1959 in the South Roma area of Queensland by Associated Australian Oilfields N.L. This Publication deals with that survey and contains information furnished on behalf of Associated Australian Oilfields N.L. and edited in the Geophysical Branch of the Bureau of Mineral Resources. The final report was written by Mr. W.E. Hightower, Supervisor, Austral Geo Prospectors Pty Ltd. The methods of carrying out the seismic survey and the results obtained are presented in detail.

CONTENTS

ILLUSTRATIONS

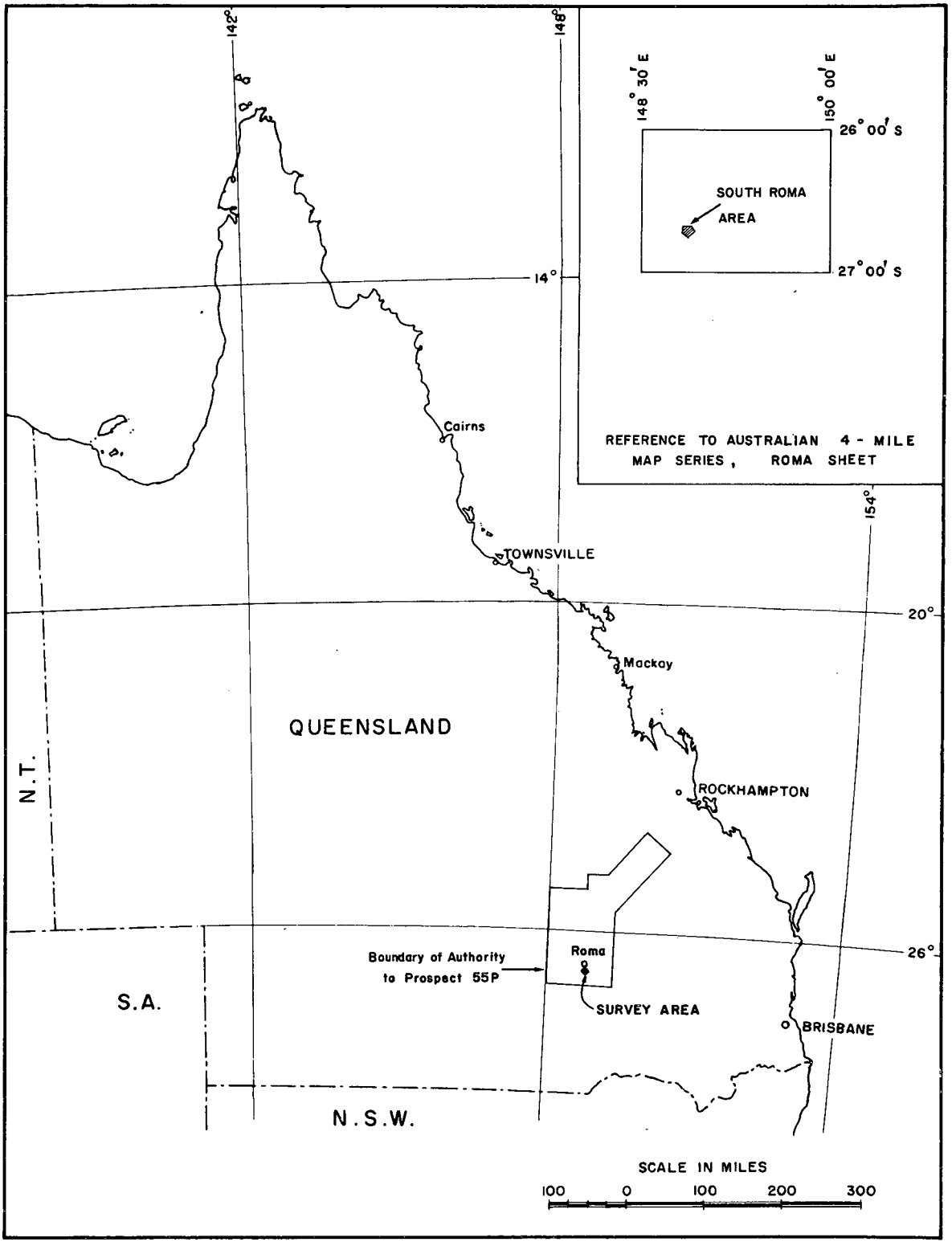


Fig. I. LOCALITY MAP

ABSTRACT

A reflection seismic survey was conducted in late 1959 on Authority to Prospect 55P by Austral Geo Prospectors Pty Ltd for Associated Australian Oilfields N.L. (A.A.O.) through A.A.O.'s management affiliate, Mines Administration Pty Ltd, in an area south of Roma, Queensland.

The primary purpose of the survey was to determine the subsurface conditions producing the gravity maximum mapped by the Bureau of Mineral Resources in 1947-1948.

No structural features worth drilling were found by the survey, but significant information regarding the geology of the area was obtained. A summary of the conclusions, using data from both the East Roma area (A.A.O., in preparation) and the South Roma area, is given below.

(a) The Cretaceous or Upper Jurassic strata thicken toward the south.

(b) The Lower Triassic or Permian strata become thinner toward the south and, in spite of the thickening of the formations near the surface, basement should be encountered at depths equivalent to those of the central portion of the East Roma area.

1. INTRODUCTION

A reflection seismic survey was conducted in late 1959 on Authority to Prospect 55P under the direction of Mines Administration Pty Ltd for Associated Australian Oilfields N.L. (A.A.O.) by Austral Geo Prospectors Pty Ltd. The area covered by the survey (see Figure 1) lies approximately 14 miles south of the town of Roma, Queensland, and it is known as the South Roma area in this report.

The terrain over this area is gently rolling. The area is timber-covered except for land that has been cleared for agricultural purposes. Some of the seismic lines followed dirt roads and tracks. The rest were laid across fields and sometimes this entailed the use of a bulldozer.

The primary purpose of this survey was to determine the subsurface conditions producing the gravity maximum which was mapped by the Bureau of Mineral Resources in 1947-48.

2. GEOLOGY AND PREVIOUS EXPLORATION

Numerous bores have been drilled in the general Roma area, although none has been drilled in the area covered by the South Roma survey. Information from bores in the general area indicate the following geological sequence: (1)

CRETACEOUS	Roma Formation	mudstone, shale, limestone streaks	350 ft
JURASSIC	Blythesdale Group	sandstone, shale	1050 ft
	Walloon Coal Measures	shale, sandstone, thin coal beds	1450 ft
TRIASSIC	Bundamba Group	sandstone	550 ft
	Moolayember Formation	mudstone, shale, sandstone	750 ft
PERMIAN		shale, sandstone	550 ft
AGE UNKNOWN	Timbury Hills Formation	shale, siltstone	?
	Granite	granite wash and fresh unweathered granite	?

Footnote by Bureau of Mineral Resources:

(1) Recent palaeontological evidence, especially from microfloral studies, has shown that the Transition "beds" of the Blythesdale Group are Cretaceous and the remaining units of the Group are Jurassic: the evidence also shows that the Bundamba Group is of Jurassic age and the Moolayember Formation is Jurassic as well as Triassic in age.

The Warooby Bore, located approximately 14 miles to the north of the prospect area, penetrated both weathered and fresh granite immediately below the base of the Moolayember Formation. A.A.O. Timbury Hills No. 2 Bore, 3 1/2 miles west of the Warooby Bore, penetrated 557 feet of the Timbury Hills Formation without encountering granite. Permian sedimentary rocks were not present in either of these bores.

The A.A.O. Pickanjinnie No. 1 Well, located approximately 30 miles to the northeast (near Wallumbilla), drilled through 650 feet of Permian rocks before encountering the Timbury Hills Formation.

All bores drilled to date in the general Roma area (Hospital Hill, Block 16, Warooby, Wallumbilla, Timbury Hills, Pickanjinnie, etc,) have penetrated Cretaceous, Jurassic, and Triassic rocks similar in sequence to the stratigraphy tabulated above. The lower pre-Triassic rocks present the main variation in the geological sequence over the general area. Information from bores suggests that basement knobs exist in portions of the area and that pre-Triassic sedimentary rocks have been eroded from these basement structures. Pre-Triassic sedimentary rocks have been found over anticlinal features as well as in the synclines within the areas of thicker sedimentation. Before the results of the survey were known, it was believed that the sedimentary section increased in depth from Roma toward the south and that Permian sedimentary rocks were probably present in the South Roma area.

Bores in the Roma area have revealed three potential oil and gas producing sandstones in the Moolayember [(2)] Formation. The Hospital Hill Sandstone has tested up to 5,700,000 cu. ft of gas per day; the Links Sandstone (15-20 feet below the Hospital Hill Sandstone) up to 1,000,000 cu. ft per day and the Showground Sandstone (near the base of the Moolayember Formation) has produced shows of both oil and gas. Shows of oil and gas have also been reported from the Permian rocks.

The only geophysical work conducted in the South Roma area prior to 1959 was a gravity and magnetic survey (Dooley, 1950) made by the Bureau of Mineral Resources in 1947-48. A gravity "high" (closure of 2 mgal) disclosed by the gravity survey in the South Roma area was not supported by the results of the magnetic survey. The gravity survey showed a regional maximum approximately 6 miles in width with a localized high value obtained from one station near the centre of the large regional "high".

3. METHODS OF OPERATION AND INTERPRETATION

Field Procedures

The entire survey was conducted using the continuous profile method. The complex subsurface geology revealed by other seismic surveys in the general area indicated that a detailed survey was necessary to obtain an accurate map of the subsurface.

Other items of field procedure are outlined in statistical form in Appendix I to this report.

Footnote by the Bureau of Mineral Resources.

[(2)] New microfloral evidence points to the fact that the Hospital Hill Sandstone, the Links Sandstone, and the Showground Sandstone may not be members of the Moolayember Formation as shown in outcrop.

Progress Maps

Progress maps were used for preliminary evaluation of seismic data. Refinements were made in computations before calculating the data for the maps which accompany this report. In no instance have these adjustments resulted in any significant change in the original interpretation. The refinements are discussed in the following paragraphs.

Elevation Velocity

The progress results were originally calculated using an elevation velocity of 10,000 ft/sec. Average horizontal velocities disclosed by refracted energy from the base of the weathered zone indicated that an elevation velocity of 10,000 ft/sec was too high. This conclusion was confirmed by the velocity survey taken in the Timbury Hills No. 2 Bore. Data shown on the accompanying maps have been recomputed at an elevation velocity of 8,000 ft/sec. The elevation change over the prospect area was relatively small (see Plate 1) and the differences in the results computed by the two methods were not sufficient to change the interpretation of the local structure to any significant degree.

Velocity Functions

The results were plotted on field maps as functions of time. Velocity functions for use in the time-depth conversion of data for the final maps were calculated for use on the East Roma area (A.A.O., P.S.S.A. Pub. No. 35, in preparation) using information obtained from the velocity survey of the Timbury Hills No. 2 Bore. The survey in the Timbury Hills No. 2 Bore disclosed some very abrupt changes in velocity. No simple relationship of average velocity and depth seemed possible. A fairly simple approach to depth computations could be made provided relationships were restricted to depth, time, and interval velocities.

Checks of various velocity functions against control points (bore tests in the East Rome area) resulted in selection of the following conversion formulae:-

(i) $D_1 = 4630T_1 - 1324$

(ii) $D_2 = D_1 + 5710\ (T_2 - T_1)$

(iii) $D_3 = D_2 + 7280\ (T_3 - T_2)$

where

D_1 is the depth below sea level of "Zone A - Within Walloon Coal Measures".

D_2 is the depth below sea level of "Zone B - Upper Moolayember".

D_3 is the depth below sea level of the top of the "Near Basement" formations.

T_1, T_2 and T_3 are the corrected two-way travel times of the Zone A, Zone B, and "Near Basement" formations, respectively, from a datum plane 1,000 feet above sea-level.

4630, 5710 and 7280 represent one half of the interval velocity between the datum plane and Zone A; Zone A and Zone B; and Zone B and "Near Basement", respectively.

1324 represents a total correction for distance of the datum plane above sea-level (1000 feet), the correction necessary to adjust the reflection picked on the record to the first impulse of reflected energy, and the intercept on the 'D' or depth axis at a datum of 1000 feet above sea level given by the linear function of formula (i).

Preliminary information from a velocity survey taken in the Pickanjinnie No. 1 Well by the seismic crew of the Bureau of Mineral Resources indicated that formulae (i) and (ii) are reasonably accurate for the East Roma area, but that the interval velocity (twice the value 7,280 ft/sec) used in formula (iii) may be too high. Undoubtedly, lateral variations in velocity will exist over the general Roma area because of the rapid changes in the geology. Several test bores and velocity surveys will probably be required before an accurate set of velocity functions can be devised which are applicable to the whole area. In the absence of positive information, the formulae listed above were accepted for use in the South Roma area.

Weathered Layer Corrections

The progress results were calculated using observed up-hole times on the assumption that all shot-holes penetrated the complete surface weathered layer and that there was single-layer weathering. In preparation of final data, graphs of refracted energy (time against distance) were examined for all shot-points. Original corrections were modified to fit the weathered layer conditions where necessary. Changes in the corrections were of minor nature and caused no appreciable change in the contour configuration.

4. INTERPRETATION OF RESULTS

Results of the survey are summarized by the maps at the back of this report.

The following information has been filed in the Bureau of Mineral Resources, Geology and Geophysics, and is available for future reference :-

1. Complete set of record sections

2. Complete set of cross-sections

Surface Elevations

Surface elevations (see Plate 1) were contoured without reference to drainage so that a direct comparison could be made between surface elevations and subsurface data.

The survey was made across a ridge separating Bungil Creek and Blyth Creek. The elevations varied from 885 feet to 1,056 feet above sea level. There was no general conformity between the relief of the surface and the subsurface. This indicated that any

influence of the overburden on average velocities was small compared with the effect of the subsurface features.

Zone A - Within Walloon Coal Measures

A very pronounced band of reflected energy from a source in the Upper and Middle Jurassic strata appears on all the records. The individual events of the reflecting band all appear, phase, and disappear at various locations over the prospect area. The map submitted was based on the actual reflections picked from records using 85 percent of the shotpoints. The remaining points have an "estimated" (E) or phantom position determined by the configuration of the nearest energy pulse or reflection.

The reflecting horizon called Zone A was tentatively identified as having a source in a Jurassic formation approximately equivalent to that mapped over the East Roma area under the same name.

All the local structural features shown by the deeper horizons are reflected by Zone A to some degree; on the other hand, the conclusions reached in the East Roma and the South Roma areas regarding regional dip and interval thickness between the mapping zones are in complete disagreement.

The results did not reveal any structural feature that showed significant dip in all directions. General, and relatively strong, south-westerly dip is shown over the whole of the area. The interpretation contours suggest that a major ridge trends from north-west to south-east and either passes through, or lies just beyond, the eastern edge of the survey. The presence of this ridge at some point east of the survey seems likely because the results of the East Roma survey revealed a strong easterly dip. It would seem probable that a similar dip may occur to the east of the South Roma survey.

A system of north-east to south-west cross folding on a major north-west to south-east trend was suggested by the contours at two locations: i.e. along the southern edge of the survey, and across the north of the central portion of the area.

No evidence of faulting was observed at the Zone A level.

Comparison of the computed depths of the East Roma and South Roma survey suggests that approximately 500 feet of southerly dip exists on the Triassic formations between the East Roma area and the South Roma area. This increase in thickness is expected to occur primarily within the Cretaceous strata.

Zone B - Upper Moolayember

The mapping reflection designated "Zone B - Upper Moolayember" has a source in the Triassic rocks. The reflection is a consistent event over the whole area and it is of good quality. It is assumed to be identical to the event mapped under the same name over the East Roma area. On the basis of this assumption, Zone B could be considered as being somewhat conformable to the Hospital Hill Sandstone, and it is probable that a fair check of the depth of the Hospital Hill Sandstone would be obtained by adding 350 feet to the computed depth of Zone B.

The structure displayed by Zone B in the South Roma area is not nearly so complex as that of the East Roma area. There is evidence of faulting at the Zone B level in the extreme south-west of the survey between Shot-points 32 and 33 (Plate 3). At Shot-points 15 and 16 (Plate 3) in the north-west of the survey this horizon appears to be disturbed where it lies over a deeper fault. The Zone B shows considerable dip but it is not believed to be faulted.

Zone B (and the Hospital Hill Sandstone) is expected to lie at a deeper level in the South Roma area than that encountered at any of the bore locations within the East Roma area (other than the Wallumbilla Bore).

Near Basement

The reflections from which the horizon designated "Near Basement" was mapped were consistent and of good quality over the whole South Roma area. They are considered to be the equivalent of the reflections, (plotted over the East Roma area,) whose source was the "Near top of Timbury Hills Formation" horizon. (Associated Australian Oilfields N.L., 1962).

Faulting at "Near Basement" level is more intense than at the level of Zone B, but still far less severe than that observed in the East Roma area. Structural features occupied a position similar to those shown by the other two horizons; however, north reversal of regional dip occurred in each instance with faulting at "Near Basement" level instead of the northerly dip displayed by both Zone A and Zone B.

The interval between Zone B and the "Near Basement" reflection appears to have thinned markedly towards the south and between the East Roma and South Roma areas. "Basement" should be encountered at a shallower depth in the South Roma area than that encountered in any of the bores located east of the town of Blythdale in the East Roma area. The calculated intervals over the high points of structure in the South Roma area are less than 500 feet. If the interval velocity used in the formula (iii) is too high, the interval may be less than 400 ft. From these values and conclusions drawn from East Roma data, one would expect the Hospital Hill Sandstone to lie within 200 feet or less of basement, and the Permian rocks may be entirely absent.

In the analysis of data recorded in the East Roma area, a Permian or pre-Permian age fold lying from north-west to south-east was postulated to cross the East Roma area in the vicinity of the Warooby Bore. Were this postulated trend extended toward the south-east, it should pass near the eastern edge of the South Roma Prospect. By this reasoning one arrives at the conclusion that the South Roma area occupies a position on the south-western flank, but near the crest, of a granite ridge.

Interval Maps

No regional trends of interval thickening were noted within the area of the survey. The small extent of lateral coverage and the general conformity of structural features between levels make it impossible to indicate any regional variations in structure. The axes of folding north-east to south-west seem to be reflected to a greater degree than the major north-west to south-east trend postulated at the eastern edge of the survey.

In general, the "Zone A to Zone B" interval data conform to "Zone B" structure.

"Zone B" topographical "lows" are represented by interval thickening and "highs" by interval thinning. Some lateral shifting of features between the structural map and the interval map is noted, but no pattern is recognized. Similar comments may be made concerning the "Zone B to Near Basement" intervals and their relationships to the "Near Basement" structure.

Cross-Sections

A sample cross-section is shown as Plate 7. Data are left as corrected time because the time-depth conversion functions used do not lend themselves to depth conversion of all events. Extra heavy lines are used to outline the mapping horizons.

5. CONCLUSIONS

General conclusions regarding the geology of the South Roma area can be summarized as follows:-

(a) The Cretaceous or Upper Jurassic formations are probably approximately 500 feet thicker in the South Roma area than in the East Roma area.

(b) Regional southerly dip of approximately 500 feet can be postulated for the 14-mile distance between the East Roma and South Roma areas on both Zone A and Zone B.

(c) The Lower Triassic or Permian strata thin toward the south between the East Roma and South Roma areas.

(d) Points of highest structure appear to be located at Shot-point No. 49 and at Shot-point No. 60.

No recommendations for a drill test can be made on the basis of seismic data included in this report. Some general evaluation of the oil and gas potentials of the South Roma area should be obtained by the drilling programme in the East Roma area. The important formations (Lower Triassic and Permian) of the South Roma area should be roughly equivalent to those of the Warooby and Block 16 areas of the East Roma Survey. The intensity of faulting or fracturing is roughly equivalent to that of the Block 16 area.

An additional seismic programme (tabulated in the order of considered importance) is recommended as follows:-

(a) A single traverse from the South Roma area (Shot-point No. 49 as the starting point) could be laid to the north-east to tie with the Pickanjinnie area of the East Roma survey. This would determine the position of the granite ridge postulated to be just east of the South Roma area, and would investigate the probable southward limit of the intensively fractured or faulted belt disclosed by the seismic data recorded in the East Roma area.

(b) If any bores in the Warooby or Block 16 areas have commercial shows of oil or gas then it would be worthwhile making a seismic survey along the crest of the granite ridge.

ACKNOWLEDGEMENTS

Interpretations made, and conclusions drawn from results of a modern seismic exploration programme are never the product of a single effort. The author is indebted to a number of persons. Each has made a material contribution towards the contents of this report. Their contributions include the assembly of information, the interpretation of seismic data, and the derivation of the conclusions from the final data. A few of the persons who have assisted the author in this exploration effort are : D.M. Traves of Mines Administration Pty Ltd and H.S. Eshelman and H.M. Thralls of Geo Prospectors, Inc., Tulsa, U.S.A.

REFERENCES

ASSOCIATED AUSTRALIAN OIL-FIELDS N.L.	1962	East Roma Seismic Survey, Queensland, 1960. P.S.S.A. Pub. No. 35. (In Preparation)
DOOLEY, J.C.	1950	Gravity and magnetic reconnaissance Roma district, Queensland, Bur. Min. Resour. Aust. Bull. 18.

APPENDIX I

FIELD PROCEDURE

Type Geophones Used	SIE S16; 18 c/s
Number per Trace	3
Connection	Series
Spacing in Group	15 ft
Type Amplifiers	Century (Modified)
Number of Channels	24
Normal Filter Setting	32-78 c/s
Mixed or Unmixed	Mixed and Unmixed
Spreads Used	Straddle; 1,320 ft
Method Used	Continuous profiling
Distance from Shot-point to Close Geophone Stations	150 ft
Relation of Far Geophone Stations to Interlocking Shot-points	At interlocking shot-points
Normal Dynamite Charge	20 lb.
Normal Hole Depth	30 ft into blue shale; approximately 70 ft deep
Difficulties	Blind holes; sand and gravel holes; loss of drilling fluid through ground cracks near surface; boulders in holes.

APPENDIX II

CALCULATION AND INTERPRETATION METHODS

Well Ties	None
Type Correction Used	Normal up-hole correction; two-layer weathering correction where applicable.

APPENDIX II (Contd)

Interlock Ties	Datum-to-datum
Elevation Datum	+ 1,000 ft above sea level
Weathered Layer Velocity	2,500 ft/sec est.
Elevation Velocity	8,000 ft/sec
Horizontal Velocity	9,000 ft/sec
Horizons Mapped	
Horizon	Zone A (Within Walloon Coal Measures)
Depth below Sea Level	$D_1 = 4630\ T_1 - 1324$
Time Range	0.523 to 0.585 sec
Horizon	Zone B (Upper Moolayember)
Depth below Sea Level	$D_2 = D_1 + 5710\ (T_2 - T_1)$
Time Range	0.807 to 0.864 sec
Horizon	Near Basement
Depth below Sea Level	$D_3 = D_2 + 7280\ (T_3 - T_2)$
Time Range	0.869 to 0.936 sec
Intervals Mapped	
Horizons	Zone A to Zone B
Time Range	0.266 to 0.293 sec
Horizons	Zone B to Near Basement
Time Range	0.056 to 0.093 sec.

APPENDIX III

LOCATION, PERSONNEL, AND EQUIPMENT

Crew Headquarters	Roma, Queensland
Party Chief	W.E. Hightower
Observer	G.W. Pippin
Party Manager & Driller	G.P. Hughes
Surveyors	D.P. Kenyon A.M. Wilson

APPENDIX III (Contd)

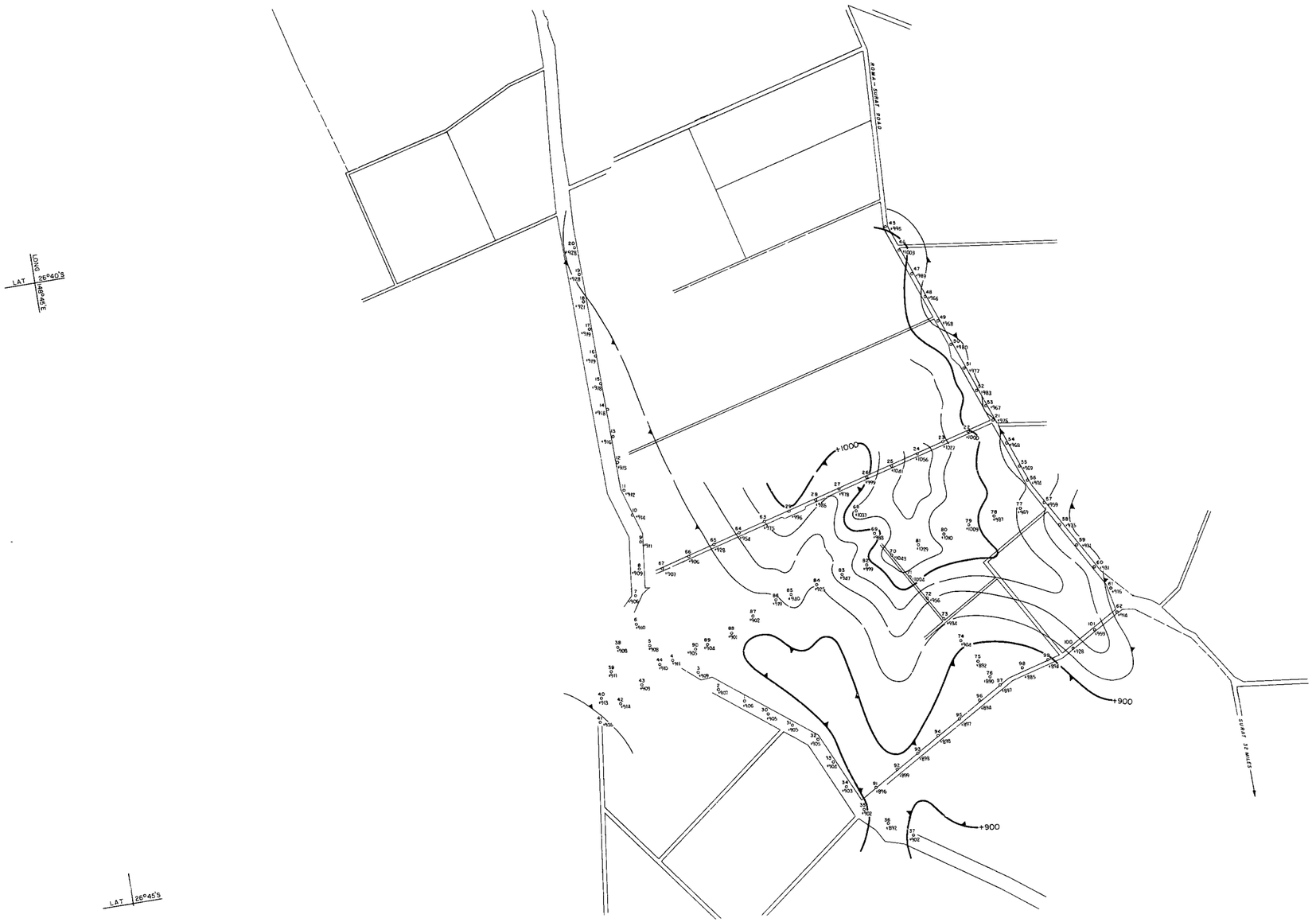
Recording Unit	One 24-trace Century recording unit, amplifiers modified to Geo Prospectors, Inc. specifications; filter frequency range of 20 to 120 c/s. Recording instruments mounted on F-600 Ford truck. Shooting truck (F-600 Ford) included water-tank, storage compartments for explosives, etc.
Drill Unit	One Mayhew-1000 drill mounted on F-600 Ford truck; one F-600 Ford water truck with 1000-gal tank and vacuum water lift.
Survey Unit	Plane table and alidade used for surveying; F-100 Ford pick-up used as survey vehicle.

APPENDIX IV

STATISTICS

Starting Date	5th August, 1959
Completion Date	26th November, 1959
Recording Time	
Drive to and from Field	20.0 hr
Field	164.0 hr
Move	10.0 hr
Holidays	0.0 hr
Lost due to Weather	4.0 hr
Lost due to Equipment Breakdown	0.0 hr
Holes Shot	127 holes
Miles of Traverse	30 miles
Number of Drills Used	1
Drill Time	
Drive to and from Field	20.0 hr
Field	190.0 hr
Move	10.0 hr
Holidays	0.0 hr
Lost due to Weather	0.0 hr
Lost due to Equipment Breakdown	0.0 hr
Holes Drilled	121 holes
Total Footage	9,100 ft
Bits Used	Twelve 4 1/2-in. inserted 3-blade bits Two 4 1/4-in. rock bits
Mud Used	15 sacks
Bran Used	6 sacks

PLATE I



REFLECTION SEISMOGRAPH SURVEY
OF THE
SOUTH ROMA AREA
QUEENSLAND

ELEVATION MAP
FOR
MINAD
BY

Austral
Geo Prospectors, Inc.
Brisbane, Queensland

0 1 2
MILES

Ve = f/s Vo = f/s
C.I. 25 ft SEISMIC DATUM MAP DATUM Sea Level
DATE Sept 6, 1960 INTERPRETATION BY

PLATE 2

REFLECTION SEISMOGRAPH SURVEY
OF THE
SOUTH ROMA AREA
QUEENSLAND

ZONE A (WITHIN WALLOON COAL MEASURES)
FOR
MINAD
BY

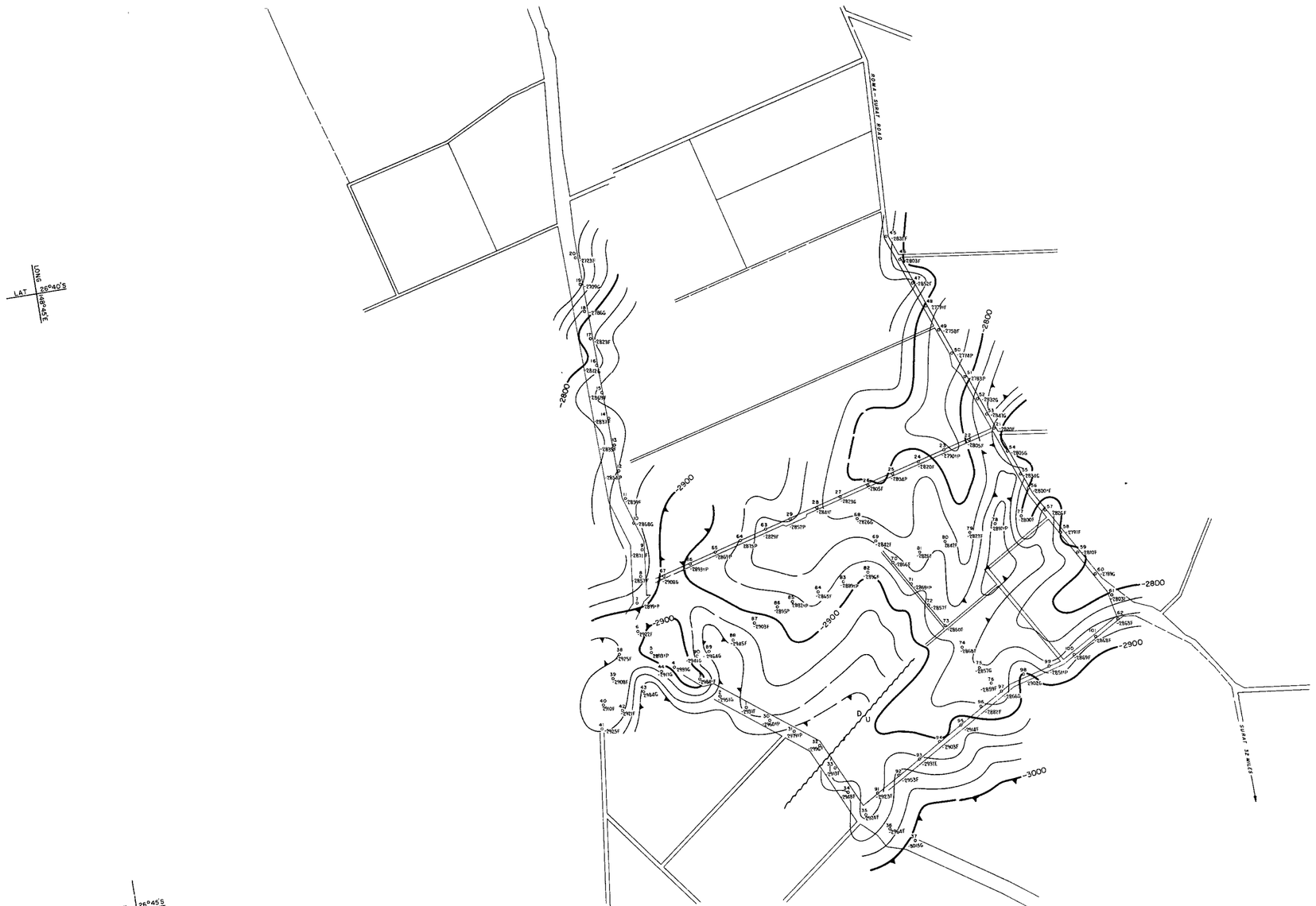
Austral
Geo Prospectors, Inc.
Brisbane, Queensland

0 1 2
MILES

Ve = 8000 f/s Va = f/s
C I 25ft SEISMIC DATUM +1000ft MAP DATUM Sea Level
DATE Sept 6, 1960 INTERPRETATION BY

$D_1 = 4630\ T_1 - 1324$

PLATE 3



REFLECTION SEISMOGRAPH SURVEY
OF THE
SOUTH ROMA AREA
QUEENSLAND

ZONE B (UPPER MOOLAYEMBER)
FOR
MINAD
BY

Austral
Geo Prospectors, Inc.
Brisbane, Queensland

0 1 2
MILES

Ve = 8000 f/s Va = f/s
CI 25 ft SEISMIC DATUM +1000ft MAP DATUM Sea Level
DATE Sept 6, 1960 INTERPRETATION BY

$D_2 = D_1 + 5710 (T_2 - T_1)^2$

PLATE 4

REFLECTION SEISMOGRAPH SURVEY
OF THE
SOUTH ROMA AREA
QUEENSLAND

NEAR BASEMENT
FOR
MINAD
BY

Austral
Geo Prospectors, Inc.
Brisbane, Queensland

0 1 2
MILES

Ve = 8000 f/s Va = f/s
CI 50 ft SEISMIC DATUM: +1000 ft MAP DATUM Sea Level
DATE Sept. 6, 1960 INTERPRETATION BY

$D_3 = D_2 + 7280\,(T_3 - T_2)$

PLATE 5

REFLECTION SEISMOGRAPH SURVEY
OF THE
SOUTH ROMA AREA
QUEENSLAND

INTERVAL: ZONE A TO ZONE B
FOR
MINAD
BY

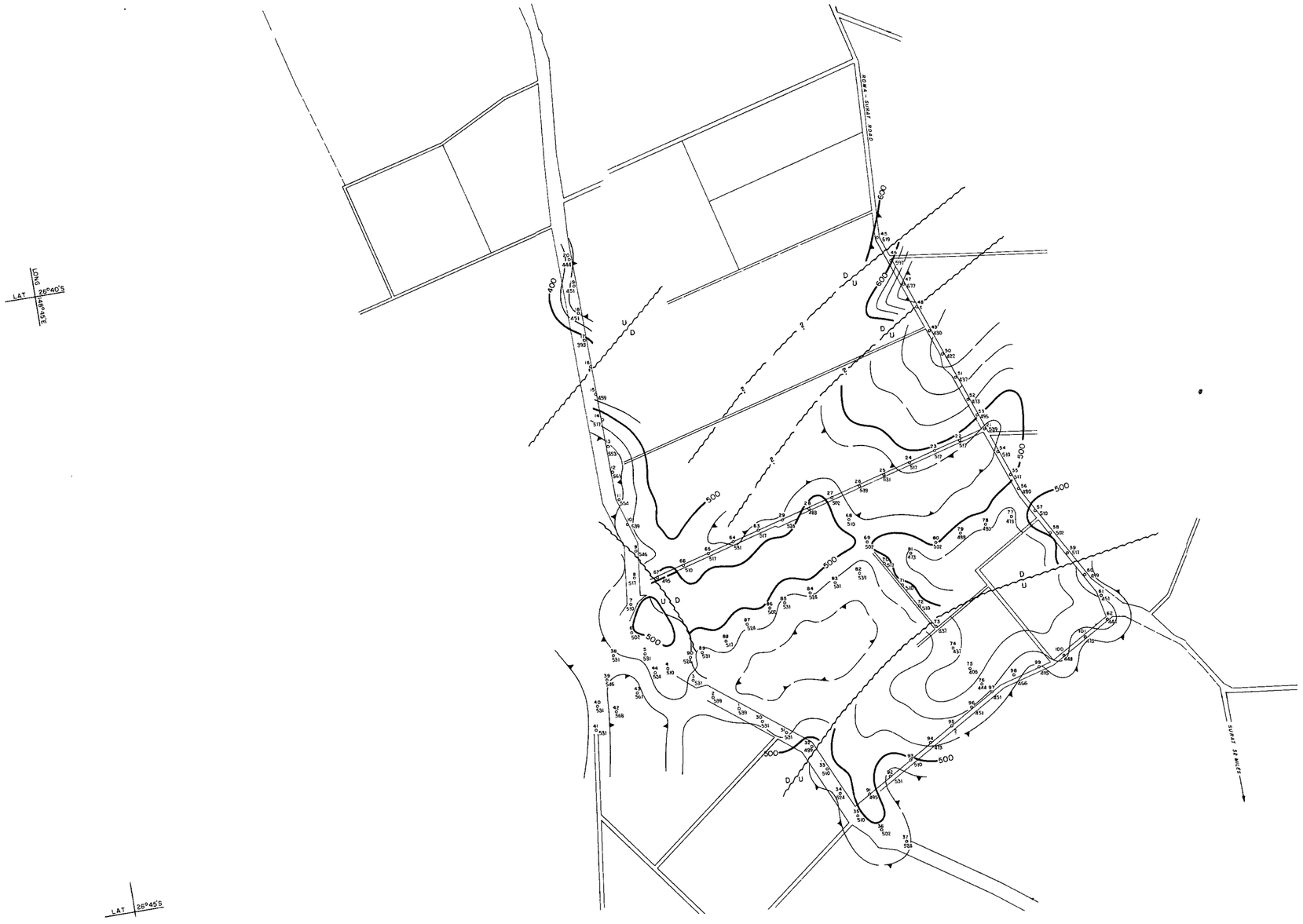
Austral
Geo Prospectors, Inc.
Brisbane, Queensland

0 1 2
MILES

Ve = f/s Va = f/s
CI 25 ft SEISMIC DATUM MAP DATUM Sea Level
DATE Sept 6, 1960 INTERPRETATION BY

$d_1 = D_2 - D_1$

PLATE 6



REFLECTION SEISMOGRAPH SURVEY
OF THE
SOUTH ROMA AREA
QUEENSLAND

INTERVAL ZONE B TO BASEMENT
FOR
MINAD
BY

Austral
Geo Prospectors, Inc.

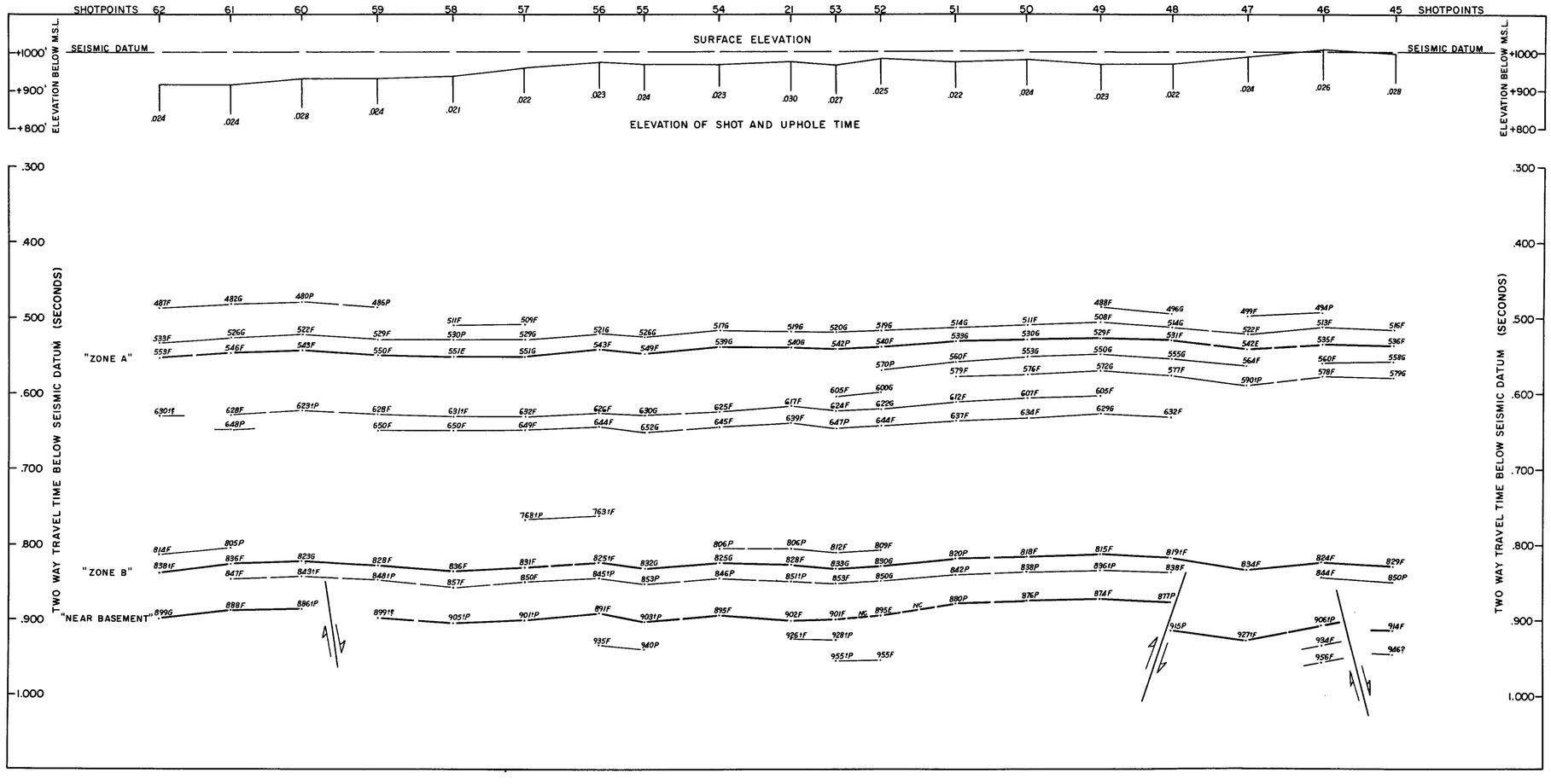
Brisbane, Queensland

0 1 2
MILES

Ve = f/s Vo = f/s
CI 25ft. SEISMIC DATUM MAP DATUM Sea Level
DATE Sept 6, 1960 INTERPRETATION BY

$d_2 = D_3 - D_2$

PLATE 7



LEGEND

CONTINUITY GRADE

- Good or Fair (Reliable)
- Poor (Probable)
- Questionable (Possible)
- NC — No Continuity

Mapping Horizon is shown by heavier line

HORIZONTAL SCALE IN FEET

1000 0 1000 2000 3000 4000

REFLECTION SEISMOGRAPH SURVEY OF THE

SOUTH ROMA AREA

QUEENSLAND

SAMPLE CROSS SECTION

NORTHWEST–SOUTHEAST TRAVERSE

FOR

MINAD

BY

Austral Geo Prospectors, Inc.

Brisbane, Queensland