COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Report No. 23

SEISMIC REFLECTION SURVEY AT ROMA, QUEENSLAND, 1952-53

By

L. W. WILLIAMS

☆

Issued Under The Authority Of Senator the Hon. W. H. Spooner, M.M.,
Minister For National Development
1955

LIST OF REPORTS

1. Preliminary Report on the Geophysical Survey of the Collie Coal Basin - N. G. Chamberlain, 1948.
2. Observations on the Stratigraphy and Palaeontology of Devonian, Western Portion of Kimberley Division, Western Australia - Curt Teichert, 1949.
3. Preliminary Report on Geology and Coal Resources of Oaklands-Coorabin Coalfield, New South Wales - E. K. Sturmfels, 1950.
4. Geology of the Nerrima Dome, Kimberley Division, Western Australia - D. J. Guppy, J. O. Cuthbert and A. W. Linder, 1950.
5. Observations of Terrestrial Magnetism at Heard, Kerguelen and Macquarie Islands, 1947-1948. (Carried out in co-operation with the Australian National Research Expedition, 1947-1948). - N. G. Chamberlain, 1952.
6. Geology of the New Occidental, New Cobar and Chesney Mines, Cobar, New South Wales - C. J. Sullivan, 1951.
7. Mount Chalmers Copper and Gold Mine, Queensland - N. H. Fisher and H. B. Owen, 1952.
8. Geological and Geophysical Surveys, Ashford Coalfield, New South Wales - H. B. Owen and L. W. Williams.
9. The Mineral Deposits and Mining Industry of Papua and New Guinea - P. B. Nye and N. H. Fisher.
10. Geological Reconnaissance, South-Western portion of Northern Territory - G. F. Joklik.
11. The Nelson Bore, South-Western Victoria; micro-palaeontology and stratigraphical succession - I. Crespin.
12. Stratigraphy and micro-palaeontology of the Marine Tertiary rocks between Adelaide and Aldinga, South Australia - I. Crespin.
13. Geology of Dampier Land - R. O. Brunnschweiller.
14. A Provisional Isogonic Map of Australia and New Guinea Showing Predicted Values for the Epoch 1955·5 - F. W. Wood and I. B. Everingham, 1953.
15. Progress Report on the Stratigraphy and Structure of the Carnarvon Basin, Western Australia - M. A. Condon.
16. Seismic Reflection Survey at Roma, Queensland - J. C. Dooley.
17. Mount Philp Iron Deposit - E. K. Carter and J. H. Brooks.
18. Petrology and Petrography of Limestones from the Fitzroy Basin, Western Australia - J .E. Glover.
19. Seismic Reflection Survey, Parish of Darriman, Gippsland, Victoria - M. J. Garrett.
20. Review of Activities of the Commonwealth Micropalaeontology Laboratory from 1927 to 1952 - I. Crespin.
21. Magnetic Results from Heard Island, 1952 - L. N. Ingall.
22. Oil in Glauconitic Sandstone at Lakes Entrance - R. F. Thyer and L. C. Noakes.
23. Seismic Reflection Survey at Roma, Queensland, 1952-1953 - L. W. Williams.

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Report No. 23

SEISMIC REFLECTION SURVEY AT ROMA, QUEENSLAND, 1952-53

By

L. W. WILLIAMS

★

Issued Under The Authority Of Senator the Hon. W. H. Spooner, M.M.,
Minister For National Development

1955

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

P. B. NYE - *Director*

J. M. RAYNER - *Deputy Director*

THIS PUBLICATION WAS PREPARED IN THE GEOPHYSICAL SECTION

R. F. THYER - *Chief Geophysicist*

CONTENTS

ILLUSTRATIONS

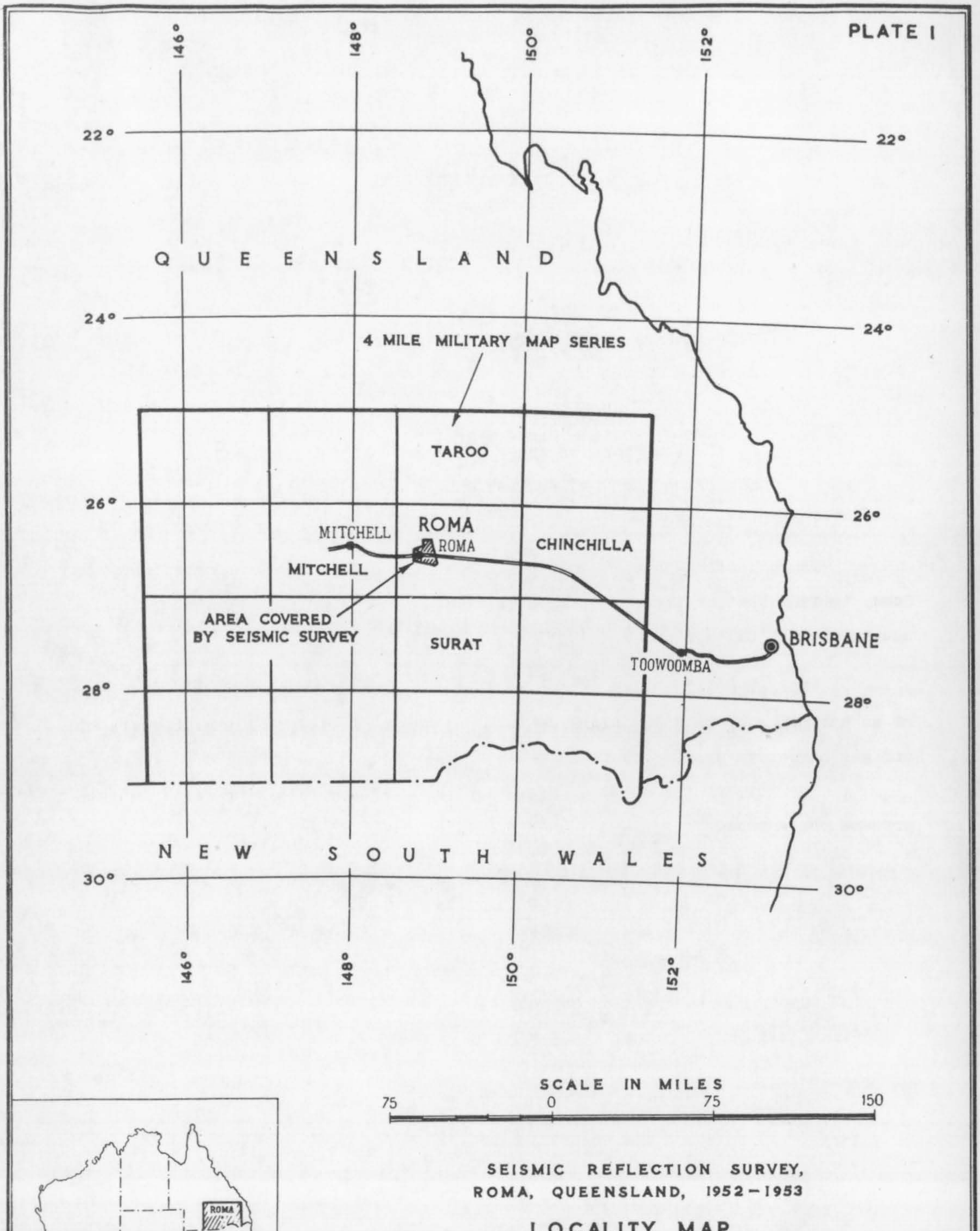


PLATE I

SEISMIC REFLECTION SURVEY,
ROMA, QUEENSLAND, 1952 – 1953

LOCALITY MAP

ABSTRACT

A reflection seismic survey was made in an area north and north-west of Roma, to find whether there are any domal structures associated with the known occurrences of oil and gas.

The general quality of the reflections recorded was poor, and no evidence of an anticline or basement high was found at Hospital Hill or Block 16 where oil and gas have been previously found.

No targets for drilling were found and further seismic work is not at present recommended.

INTRODUCTION

Natural gas was first discovered at Roma in 1900, whilst drilling for water on Hospital Hill. As a result of the discovery many exploratory deep wells and shallow scout bores have since been drilled by various operating companies. A summary of these drilling activities is given by Dooley (1950).

As a result of a regional geological survey made over a large area north of Roma in 1934-35 by Dr. F. Reeves, on behalf of Oil Search Ltd., two prospective oil structures were located and drilled. Although gas was encountered, there were only slight showings of oil.

In 1939, Shell Development (Queensland) Pty. Ltd., initiated a programme of aerial, geological and geophysical reconnaissance. Between July 1940 and May 1942 more than 1,000 gravity observations were made at 3 to 5 mile intervals along 5,500 miles of traverse, covering approximately 192,000 sq. miles.

Gravity and magnetic surveys of the area were made during 1947 and 1948 (Dooley, 1950) by the Bureau of Mineral Resources, Geology and Geophysics. These surveys consisted partly of regional reconnaissance work and partly of a semi-detailed survey in the Roma-Mt.Bassett-Blythdale area.

The gravity survey showed two areas of residual gravity which may be due to structures within the sediments and which may be suitable for oil accumulation. To test these areas a reflection seismic survey was made by the Bureau during 1949 and 1950. A preliminary report describing this work (Dooley, 1951) was forwarded to Associated Australian Oilfields, N.L. in May 1951. Subsequently, a site was selected and drilled by Associated Australian Oilfields, N.L. (Bore No.A.A.O.1) and a gas horizon was encountered. However, the formation proved too impermeable to yield an appreciable supply of gas and the bore was abandoned.

It is well known that the beds at Roma in which oil and gas have been found are not uniformly distributed over the areas previously tested by drilling and a change in character of the reservoir beds between A.A.O.No.1 Bore and both Hospital Hill and Block 16 was apparent. This raised a new set of problems which prompted the company to forward a request dated 17/7/51, and supported by the Queensland Department of Mines in their letter No.51/648 dated 27/7/51, for further seismic work to be done in the area around Roma.

The specific problems and work set for the new seismic investigation were:-

(a) To investigate and determine whether there is an association of domal structure with the known occurrences of gas and oil at Hospital Hill and Block 16.

(b) To connect Hospital Hill and Block 16 by a seismic traverse to determine if the two areas are structurally related.

(c) If the answer to (a) is in the affirmative, to follow up any untested indications of domal structure in the earlier geophysical work.

Should the answer to (a) be in the negative it would then be assumed that the gas and oil traps at Hospital Hill and Block 16 are stratigraphic in nature and outside the scope of geophysical mapping. The mode of further investigation would then be by systematic test drilling by the company.

Field operations began in November 1952, and ended in March 1953.

GEOLOGY

The existing bores in the area covered by the present survey encountered sediments of Cretaceous (Roma series), Jurassic (Walloon series), Upper Triassic (Bundamba series) and Middle Triassic (Ipswich series) age. At Hospital Hill the Ipswich series lies directly on metamorphic basement, but at Block 16 there is some doubt whether it lies on granite basement or on granite wash overlying basement. There is an unconformity between the Bundamba and Ipswich series.

At Hospital Hill, the oil and gas accumulations which have been encountered occur in coarse-grained sandstone and grit at the base of the Bundamba sandstone (lowest member of the Bundamba series). At Block 16 they occur in the lower part of the Moolayember shale (Ipswich series).

None of the bores near Roma have penetrated sediments likely to contain source beds of oil.

A comprehensive account of the geology of the Roma district is given by Reeves (1947).

FIELD WORK AND EQUIPMENT

The reflection method of seismic prospecting was used. In this method a shot hole is drilled and an explosive charge detonated electrically at the bottom of the hole. The shock wave set up travels through the strata and energy is reflected back to the surface from elastic discontinuities normally associated with stratigraphic interfaces. The reflected wave is picked up at the surface by electromagnetic detecting instruments (geophones) and transmitted as an electrical impulse to the recording equipment, where the impulses and the instant of detonation are photographically recorded. By superimposing timing lines on the record it is possible to calculate the depth of the reflecting interface from the time taken for the wave to travel from the shot point to the interface and back to the geophone.

The recording equipment used was a Swedish ABEM 24-channel reflection seismograph mounted on a Ford 4 x 4 truck. Automatic volume control was incorporated in the equipment.

A Conrad drill was used for the shot-holes and two water-tenders worked in conjunction with the drill. Other vehicles were a shooting truck (used in conjunction with the recording truck), a Land Rover used by the surveying party and one truck used as a general purpose and party leader's vehicle.

The surveying was done by officers of the Department of Interior, Brisbane.

The traverse lines were laid out with shot points a quarter of a mile apart and eleven geophone stations at intervals of 110 feet between shot points. A technique of split-spreads was used for recording. Twelve geophones were placed along the traverse in each direction from the shot point at 110 feet intervals, except for the furthest interval which was 220 feet. This meant that when recording from a particular shot point geophones were not placed at the adjacent shot points.

Shot holes were normally drilled to a depth of approximately 70 feet.

During the latter part of the survey it was found necessary to operate the drill for two shifts per day to meet the requirements of the recording operations.

Multiple geophones were used on selected parts of some traverses but no improvement in the quality of reflections was observed.

Much time was lost due to breakdowns of equipment and vehicles. On occasional days, rain delayed or prevented work, and during February field work was impossible for a week after heavy rain.

REDUCTION OF RESULTS

As the quality of the reflections was, in general, too poor for continuous correlation methods to be applied, the dip of each reflector had to be calculated and a phantom horizon drawn later.

The reflection times were first corrected for elevation and weathering. The correction for elevation of each geophone was calculated by dividing the difference between the elevation of the geophone and the datum (taken as 1,000 feet above M.S.L.) by the sub-weathering velocity, taken as constant over the area. This calculation gave the elevation correction in seconds.

The value of the weathering correction at each shot point was calculated from the uphole time. The weathering corrections at the geophone stations were obtained by using the weathering correction at the shot point and the arrival times of the first refracted waves at the geophones. This method was found to be applicable whether one, two, or three-layer weathering was present and obviated the necessity for a special treatment in different cases.

The reflections picked were assigned a grade under the system suggested by Gaby (1947). The line giving the best fit to the observed times at the geophones plotted against distance was determined by the method of least squares. The gradient of this line multiplied by the length of ten geophone intervals (1,100 feet) was adopted as the observed step-out of the reflection. This step-out consists of 3 parts - the first due to elevation and weathering effects, the second due to dip of the reflector and the third due to the length of the geophone spread. This last part is referred to as the normal step-out or spread correction and represents the step-out for a horizontal reflector.

The velocity distribution was determined from the observed data by means of a commonly used analytical technique known as the "$t\Delta t$" method. (Dix, 1952, p.125). The observed step-out was plotted against the observed reflection time (taken as the reflection time at the shot point) for all reflections with grade better than RP. A mean curve was drawn through the assemblage of points. It was assumed that sufficient points were plotted for the effects of elevation, weathering and dip to cancel out over the area. The mean curve therefore represents an empirically determined relation between the spread correction Δt and the reflection time t and by using this curve and the known theoretical relation between Δt and t, length of spread and average velocity down to the reflector, a velocity distribution curve was calculated and drawn.

From the velocity distribution curve another curve was derived giving the depth of a reflector from the reflection time.

The corrected step-out obtained by applying the elevation, weathering and spread corrections to the observed step-out represents the effect due to the dip of the reflector. The dip of the reflector is a function of the corrected step-out, the velocity and length of spread, and, by using the curves previously established, a set of curves was drawn giving the dip of the reflector from the observed reflection time and corrected step-out.

From the curves which had been drawn, the dip and depth of every reflector were then determined.

Using these dips and depths each reflector was plotted on a cross-section, the reflector being "migrated" in accordance with the dip.

If a line is drawn through the centre of a conformable zone on the cross-section and follows the mean dip of the reflections, this line is called a phantom horizon.

On the spread correction curve it was apparent that the reflections fell mainly into two groups, each group corresponding to a zone approximately 800 feet thick. A phantom horizon was drawn through each zone, with shot point 515 as the starting point for each phantom horizon. The depth of the centre of the upper zone was taken as 2,200 feet and that of the lower zone as 4,000 feet.

The phantom horizon was built up by calculating the mean dip of the reflections within the zone at points along the traverse. These points were taken every 500 feet where there were sufficient reflections, but where reflections were scarce, the points were up to 4,000 feet apart. The mean dip was first calculated at the starting point for the phantom horizon and a line with this dip was drawn from the starting point to half way between the starting point and the next point at which a dip calculation was to be made. The zone was then extended to this calculation point by eye and the mean dip calculated. A line with this dip was then drawn from the end of the previous line to half way between the last calculation point and the next. The zone was then carried on so that the line was always at the centre of it. If the calculated zone differed from the zone drawn by eye sufficiently to include or exclude extra reflections, then the mean dip had to be re-calculated. In this way the phantom horizon was built up over the area.

Because the quality of the reflections was, in general, poor, it was found that large misclosure errors occurred around closed loops and the phantom horizon was therefore revised. In this revision reflections with dips contrary to the general trend were discarded and some reflections outside the zone were included to carry the phantom horizon across areas of poor and no reflections.

After the phantom horizons had been drawn, errors were distributed around the closed loops using a graphical method of least squares adjustment (Smith, 1951). The distribution of errors was extended to cover results of the previous seismic survey, as some of the traverses from that survey formed sides of the loops observed during the later work.

DISCUSSION OF RESULTS

The discussion of results is divided into two parts:-

(a) Cross-sections along traverses.

(b) Contour maps of upper and lower phantom horizons.

(a) Cross-sections along traverses. (Plates 2 to 9).

Traverse A1. (Plate 2).

This traverse crosses Hospital Hill slightly west of the existing bores and continues north towards the aerodrome. There are two bends on the traverse (east at SP506 and west of north at SP508) to keep it away from the runways on the aerodrome.

Between SP619 and SP615 there are no deep reflections and the shallow reflections are very poor. Passing over Hospital Hill (SP501) there is slight evidence of a syncline in the lower phantom horizon. The reflections in both zones improve at SP503 and from SP508 to SP515 are fair.

The main feature on this traverse is a reversal of dip on the lower phantom horizon between SP510 and SP511. There is south dip from SP508 to this point and north dip from here to between SP512 and SP513. The change in elevation of the phantom horizon is approximately 80 feet. There is only poor evidence of a slight reversal of dip on the upper phantom horizon at SP510.

Along the rest of this traverse there is reasonable conformity between the two phantom horizons.

Traverse B1. (Plate 3).

The reflections shown in the cross-section of traverse B1 include both the results of this survey and those of the previous seismic survey (Dooley, 1954).

In both zones the reflections are poor from SP515 to SP548 and very poor from SP549 to SP563.

The upper and lower phantom horizons are conformable from SP515 to SP555, but they converge to SP560 and then diverge to the end of the traverse.

Traverse C1. (Plate 4).

There are two bends on this traverse - to the north-west at SP592 and to the east at SP595.

There is a large variation in the quality of the reflections along the traverse. In both zones the reflections are poor from SP523 to SP525 and very poor from SP525 to SP528. From SP528 to SP531 there are very poor reflections in the upper zone and no reflections in the lower zone. From SP531 to SP595 the reflections in the upper zone are poor and those in the lower zone very poor. From SP595 to SP598 the quality improves, with fair reflections in the upper zone and poor reflections in the lower. From SP598 to the end of the traverse (SP602) the reflections in both zones are very poor.

On the lower horizon there is west dip from SP596 to SP599 and east dip from SP599 to between SP600 and SP601. The change in elevation of the horizon is approximately 80 feet. Over this distance there is steady west dip on the upper phantom horizon.

There is also a reversal of dip on the lower phantom horizon at about SP529, but this is not reliable, as the phantom horizon has here been carried across an area of no reflections.

Traverse H1. (Plate 5).

From SP532 to SP536 there are practically no reflections in either zone. For the remainder of the traverse (SP536-SP577) the reflections in the upper zone are very poor. In the lower zone the reflections from SP536 to SP537 are very poor, from SP537 to SP539 poor, from SP539 to SP540 very poor, and from SP540 to SP577 there are no reflections.

Over the area of practically no reflections from SP532 to SP536 the upper and lower phantom horizons diverge, but from there to the end of the traverse they are reasonably conformable.

Traverse 2. (Plate 6).

The reflections on this traverse are very poor, except at SP542 where they are poor in both zones.

Along the western half of this traverse there are two distinct lower reflecting bands. At SP541 these are at approximately 3,350 feet and 4,100 feet below datum. (Datum is 1,000 feet above M.S.L.). This is the closest shot point to bore A.A.O.2, in which the top of the petroliferous zone is 3,382 feet below datum and the top of the granite wash is 3,510 feet below datum (Wiebenga, 1955). It is possible that the shallower of the two reflections comes from the top of the petroliferous zone.

Although the quality of the deeper reflections is not good, the reflections are sufficiently consistent to be considered real. Also, there is little evidence to suggest that they are multiple reflections.

If the basement is considered to be granite, it is unlikely that reflections would come from within the basement and this band of deeper reflections must be considered as coming from the surface of the granite or above. The average velocity used in the calculation of the depth of 4,100 feet is 9,250 ft/sec. To give a depth of 3,510 feet an average velocity of 7,900 ft/sec. would have to be used. As sub-weathering velocities of over 9,000 ft/sec. are not uncommon and a large percentage of sub-weathering velocities are over 8,000 ft/sec., it would be expected that the average velocity to a depth of 4,000 feet would be at least 9,250 ft/sec. This means that a granite basement is unlikely to be shallower than 4,100 feet, and, if the granite wash lies directly on a granite basement, approximately 600 feet of granite wash would be present.

Another possibility is that the granite wash is overlying sediments and not granite. If this were so, the reflections could be coming from within the sediments and no information is available as to the thickness of the granite wash.

The lower phantom horizon as drawn is controlled mainly by the lower of the two deep reflecting bands and shows west dip along almost its entire length. The upper phantom horizon shows slight east dip.

Traverse 3. (Plate 7).

On this traverse there are very few reflections and those that are present are very poor. No attempt was made to carry phantom horizons along the traverse.

Traverse 4. (Plate 8).

Between SP576 and SP574 there is almost a complete absence of reflections in both zones. From SP574 to SP571 there are poor reflections in both zones. There are poor reflections in the upper zone between SP571 and SP569 and very poor reflections in the lower. From SP568 to SP563 the reflections are very poor in both zones.

Along most of the traverse the lower phantom horizon is below the deepest reflections.

The south-east dip on the upper phantom horizon from SP569 to SP563 is not duplicated on the lower phantom horizon which has slight south-east dip and then north-west dip.

Traverse 5. (Plates 3 and 9).

This traverse was not in the original plan for the survey, but was included to investigate a possible extension to the west of the reversal of dip found on the lower phantom horizon along traverse A1 near SP510.

There are several bends in the traverse, as it was laid around the western side of the aerodrome and joined traverse A1 at SP506 and SP515.

The reflections deteriorate in quality and disappear going west from both SP506 and SP515. In both zones there are a few reflections of very poor quality between SP604 and SP614. In the lower zone there are no reflections between SP608 and SP613. The reflection at SP608 shows north dip and at SP613 east dip. These dips were used to carry the phantom horizon across the area where there were no reflections and gave a reversal of dip which cannot be considered reliable.

Traverse 6. (Plate 9).

This traverse gave a tie from SP508 to the previous seismic survey.

In both zones there are poor to fair quality reflections along the whole traverse.

The phantom horizons are reasonably conformable.

General.

On several of the traverses slight evidence of faulting has been found. This evidence consists of dips greater than normal in some places and lack of reflections in others. Although the evidence on any one traverse is very slight, it builds up into an overall pattern which is considered worthy of mention.

The evidence suggests two faults - the first striking approximately east through SP132 and 525 in the upper zone and SP130 and 522 in the lower zone, the second striking approximately north-west through SP530 and 574 in the upper zone and SP527 and 572 in the lower zone.

Evidence for the first fault is obtained from traverses B1, C1, C and F. On traverse B1 there is a band of reflections with steeper than normal west dips (approx. 8°-10°) from SP522 in the lower zone to SP555 in the upper zone. On traverse C1 there are no reflections between SP525 and SP526 in the upper zone and in the lower zone there is a reflection near SP524 showing 9° of south dip. On traverse C there is a reflection showing 10° of south dip near SP64 in the lower zone, but the upper zone is apparently undisturbed. On traverse F there is a reflection with 8° of south-east dip in the upper zone at SP132 and in the lower zone the quality of the reflections changes suddenly around SP130. All these factors are consistent with a fault striking east and dipping south.

The steeper than normal west dips between SP555 and SP561 suggest that there is a zone of faulting rather than a single fault plane.

Evidence for the second fault is obtained from traverses 4, 2, C and C1. On traverse 4 there are reflections showing 6°-8° south-east dip in the lower zone between SP573 and SP572, and in the upper zone there are no reflections west of that recorded between SP574 and SP575. On traverse 2 there are reflections with steep east dip (approximately 15°) in the upper zone at SP542 and in the lower zone at SP544. On traverse C, in the upper zone at SP58, there is a reflection with 7° of south-east dip. In the lower zone the reflections are rather confused around SP58 and SP59 but show mainly north-west dip. On traverse C1 there is a reflection with 5° of south dip at SP530 in the upper zone and a reflection with 8° of south dip in the lower zone at SP527.

Most of this evidence is consistent with a fault striking north-east and dipping south-east, but the reflections in the lower zone near SP59 on traverse C would have to be assumed to be coming from the bedding planes which have been disturbed by the faulting.

It is emphasised that this evidence for faulting cannot be considered conclusive.

(b) Contour maps of upper and lower phantom horizons.

The results of the previous seismic survey (Dooley, 1954) have been combined with those of this survey to arrive at the contour maps. The contours of the previous survey have been modified in accordance with the distribution of errors described in the section dealing with reduction of results.

There are two main features on the upper phantom horizon (Plate 10). The first is a trough crossing traverse 6 near SP644 and crossing traverse B1 near SP521. The second is a ridge crossing traverse B1 near SP550 and striking north-north-east to where it splits into two on traverse C1 at SP600 and SP602. The seismic survey did not extend far enough north to show whether or not there is closure on this ridge.

The lower phantom horizon (Plate 11) shows a similar trough to that on the upper phantom horizon. The lower phantom horizon also has a ridge extending from traverse B1 to the northern part of traverse C1, but its shape differs considerably from that on the upper phantom horizon. On the lower phantom horizon the highest point on traverse B1 is at SP560. The ridge trends north-west, crosses the intersection of traverses C1 and H1 and then trends north-north-east to cross traverse C1 near SP598. The lower phantom horizon also shows a trough striking north-west from SP568 on traverse 4 and crossing traverse 2 at SP541. From SP541 there is a sharp gradient up to the ridge mentioned above.

In the area covered by this survey it is noticeable that the contours of the upper phantom horizon conform more closely than those of the lower phantom horizon with the contours of residual gravity (Dooley, 1950). Because of this it appears that the residual gravity highs are associated with high features in the sediments and not neccesarily with corresponding high features in the basement, the surface of which is included in the zone for the lower phantom horizon.

It is interesting to note that there appears to be some relation between the quality of the reflections and the residual gravity pattern. The best quality reflections were recorded along traverse A1 from SP508 to SP515, along traverse B1 from SP515 to SP520 and along traverse 6 from SP508 to SP648. This area corresponds with a large gravity low. It is also noticeable that gravity high axes cut the seismic traverses around SP530, 576, 607, 544 and 553. At all these points the reflections are either very poor or non-existent. The dips in the Roma area are too small to cause loss of reflections along high ridges, but it is possible that some shattering has taken place which is causing dispersion of energy.

This correlation also applies to the results from the previous seismic survey (Dooley, 1954), except that over the more southerly of the two high closures good and fair reflections were recorded.

It was found that in general the misclosures around loops on the upper phantom horizon were smaller than on the lower phantom horizon and that the average misclosure was smaller on the upper than on the lower phantom horizon. There does not appear to be any obvious relationship between quality of reflection and size of misclosure. It follows that the upper phantom horizon is probably more reliable than the lower.

The unconformity between the Bundamba and Ipswich series, which is the only known unconformity within the section above basement, was shown by the geological and electrical logs to be at a depth of approximately 3,000 feet below datum in A.A.O.2 (Block 16), (Wiebenga, 1953). In a private communication Mr. W.D. Mott, geological consultant to Associated Australian Oilfields N.L., gives the depth at Hospital Hill as approximately 3,260 feet. As the depths below datum of the phantom horizons are approximately 3,800 feet and 1,950 feet at Block 16 and 4,000 feet and 2,250 feet at Hospital Hill, it is probable that this unconformity does not fall within either zone used for calculating the phantom horizons. It may be, however, that the surface of the basement is not conformable with the sediments immediately overlying it. As the lower zone includes the surface of the basement, it is possible that this zone does include an unconformity and this would decrease the reliability of the phantom horizon drawn through it.

CONCLUSIONS AND RECOMMENDATIONS

The seismic survey has not shown any anticlinal structure at Hospital Hill or Block 16 that could be regarded as responsible for the accumulation of oil or gas. There is a possible domal structure north-west of Block 16, but the survey did not extend far enough north to show whether or not there is closure at the northern end.

It has been shown that there is a possibility of faults with small throws occurring in the area and one of these may separate the Hospital Hill and Block 16 areas.

Generally speaking, the quality of the reflections recorded was poor, and, as the accumulations of gas and oil do not appear to be associated with structural features, it is not recommended that further seismic work be done at this stage. Associated Australian Oilfields' current drilling programme may yield further information on the mode of accumulation of oil and gas at Hospital Hill and Block 16 and the need for further seismic work should be periodically reviewed in the light of fresh evidence.

A small high closure is shown on the lower phantom horizon near SP560 on traverse B1. As this closure is small and the quality of the reflections is not good, it is considered that there is not sufficient evidence for it to be recommended as a drilling target.

REFERENCES

Dix, C. Hewitt, 1952 - SEISMIC PROSPECTING FOR OIL, Harper & Brothers, New York.

Dooley, J.C., 1950 - Gravity & Magnetic Reconnaissances, Roma District, Queensland, Bur.Min.Res.Geol and Geophys.,Bull.No.18.

Dooley, J.C., 1951 - Preliminary Report on Seismic Survey at Roma, Queensland, Bur.Min. Res.Geol. and Geophys.,Rec.1951,No.23.

Dooley, J.C., 1954 - Seismic Reflection Survey at Roma, Queensland, Bur.Min.Res.Geol. and Geophys.,Rep.No.16.

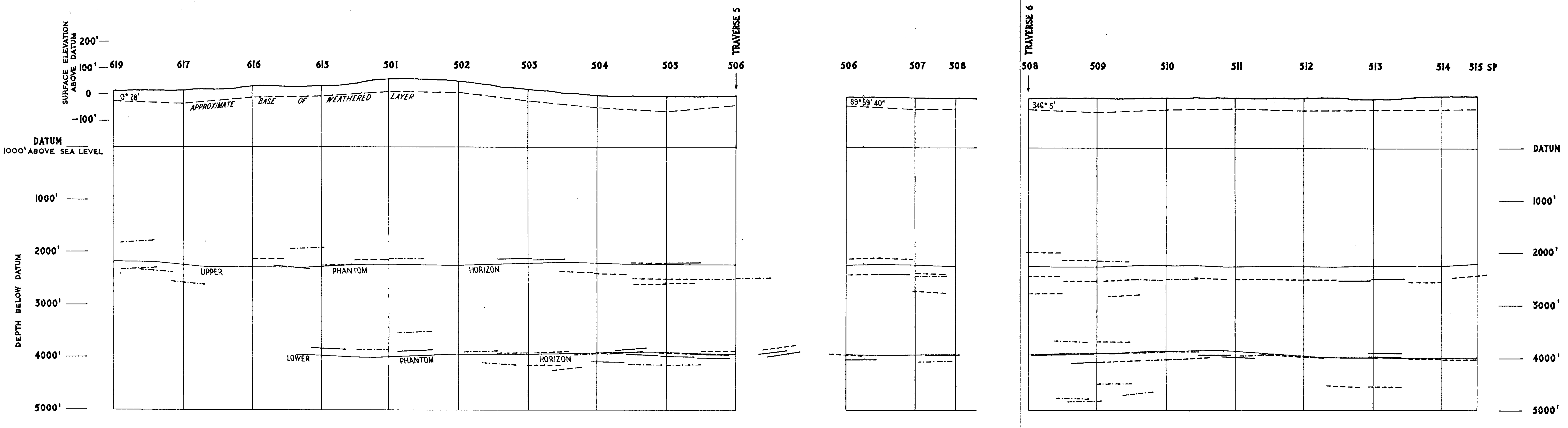
Gaby, Phil. P., 1947 - Grading System for Seismic Reflections and Correlations, Geophysics, XII(4),590-617.

Reeves, F., 1947. - Geology of the Roma District, Queensland, Australia, Bull. of Amer. Ass. of Petroleum Geologists, 31(8),1341-1371.

Smith, A.E., 1951 - Graphic Adjustment by Least Squares, Geophysics, XVI(2),222-227.

Wiebenga, W.A., 1953 - Electrical Logging of Associated Australian Oilfields N.L. No.2 Bore at Roma, Queensland, Bur.Min.Res.Geol. and Geophys.,Rec. 1953,No.65.

Wiebenga, W.A., 1955 - Electrical Logging of Associated Australian Oilfields N.L. No.3 Bore at Roma, Queensland, Bur.Min.Res.Geol. and Geophys.(Record in preparation).



LEGEND

ACCURACY OF REFLECTIONS

GOOD

FAIR

POOR

VERY POOR

HORIZONTAL SCALE

1500 0 1500 3000 4500 FEET

GEOPHYSICIST

SEISMIC REFLECTION SURVEY AT

ROMA, QUEENSLAND, 1952-53

CROSS SECTION SHOWING

REFLECTIONS AND PHANTOM HORIZONS

TRAVERSE A1

Geophysical Section, Bureau of Mineral Resources, Geology & Geophysics.

G38-64

PLATE 3

LEGEND

ACCURACY OF REFLECTIONS

- GOOD
- FAIR
- POOR
- VERY POOR

HORIZONTAL SCALE

1500 0 1500 3000 4500 FEET

NOTE: Cross section of Traverse B1 combines results of present survey and those of Dooley (1954).

SEISMIC REFLECTION SURVEY AT

ROMA, QUEENSLAND, 1952—53

CROSS SECTION SHOWING

REFLECTIONS AND PHANTOM HORIZONS

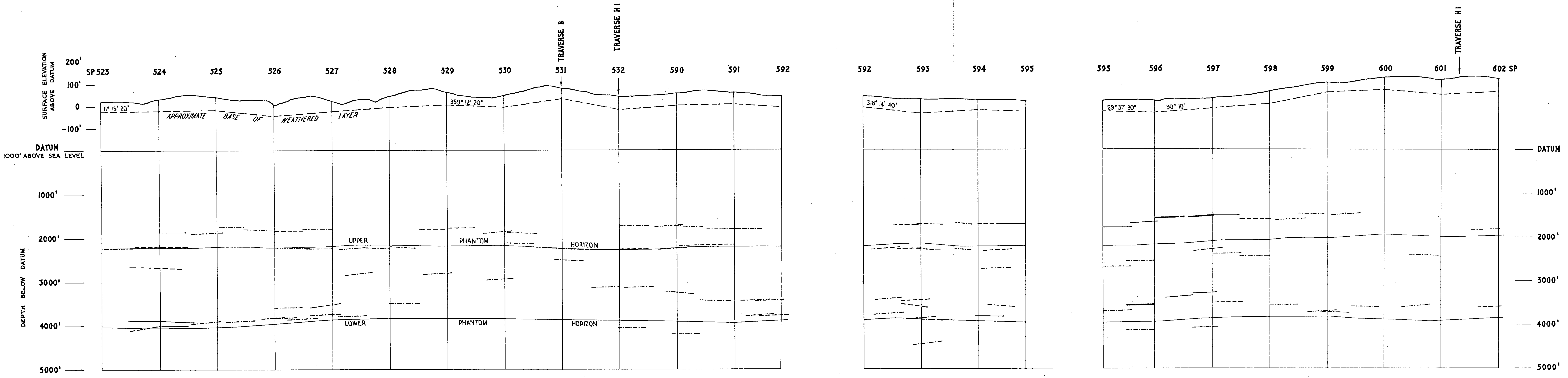
TRAVERSES 5 & B1

GEOPHYSICIST

Geophysical Section, Bureau of Mineral Resources, Geology & Geophysics.

G38-65

PLATE 4



LEGEND

ACCURACY OF REFLECTIONS

GOOD

FAIR

POOR

VERY POOR

HORIZONTAL SCALE

1500 0 1500 3000 4500 FEET

GEOPHYSICIST

SEISMIC REFLECTION SURVEY AT

ROMA, QUEENSLAND, 1952-53

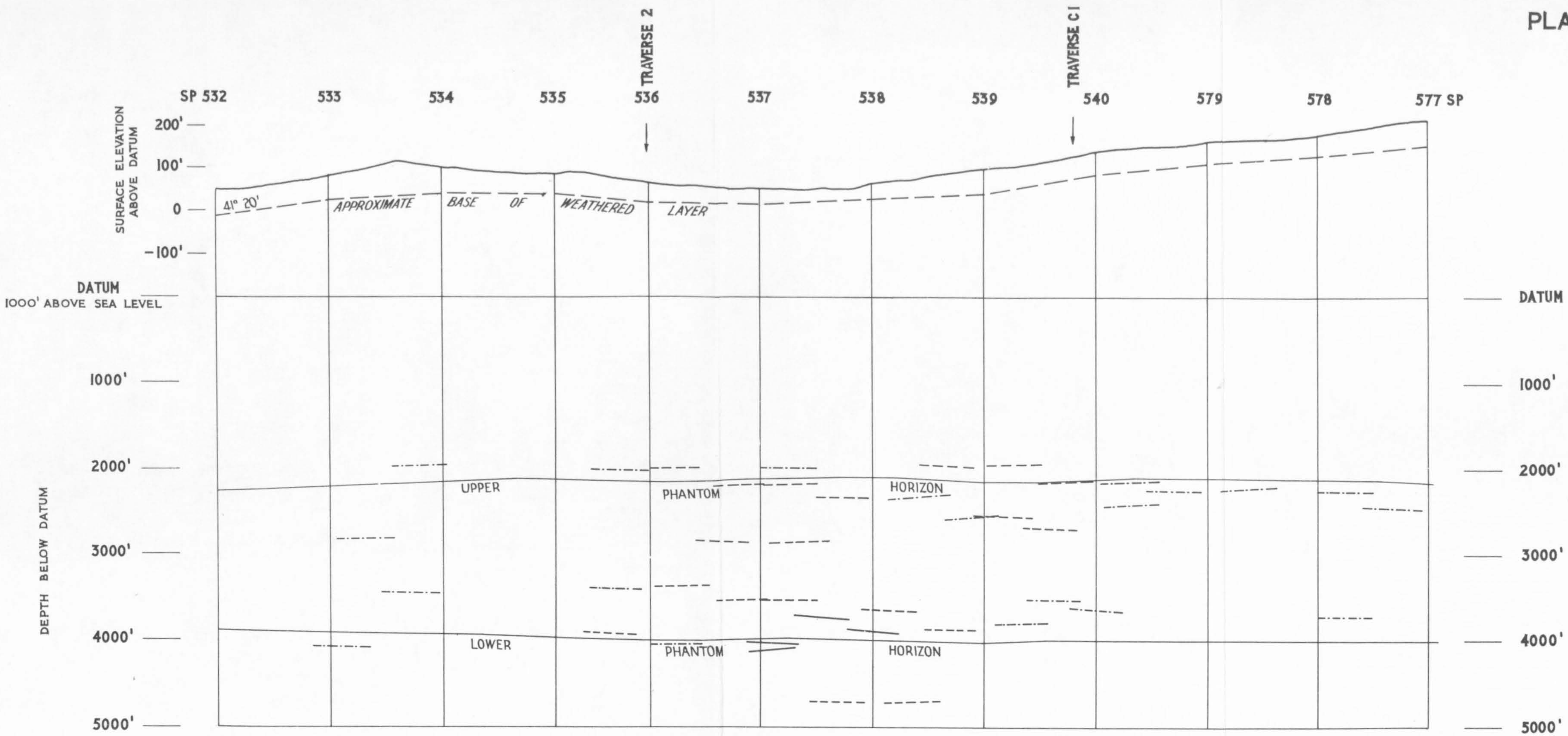
CROSS SECTION SHOWING

REFLECTIONS AND PHANTOM HORIZONS

TRAVERSE C1

Geophysical Section, Bureau of Mineral Resources, Geology & Geophysics. G38-66

PLATE 5



SEISMIC REFLECTION SURVEY AT

ROMA, QUEENSLAND, 1952–53

CROSS SECTION SHOWING

REFLECTIONS AND PHANTOM HORIZONS

TRAVERSE H1

LEGEND

ACCURACY OF REFLECTIONS

- GOOD
- FAIR
- POOR
- VERY POOR

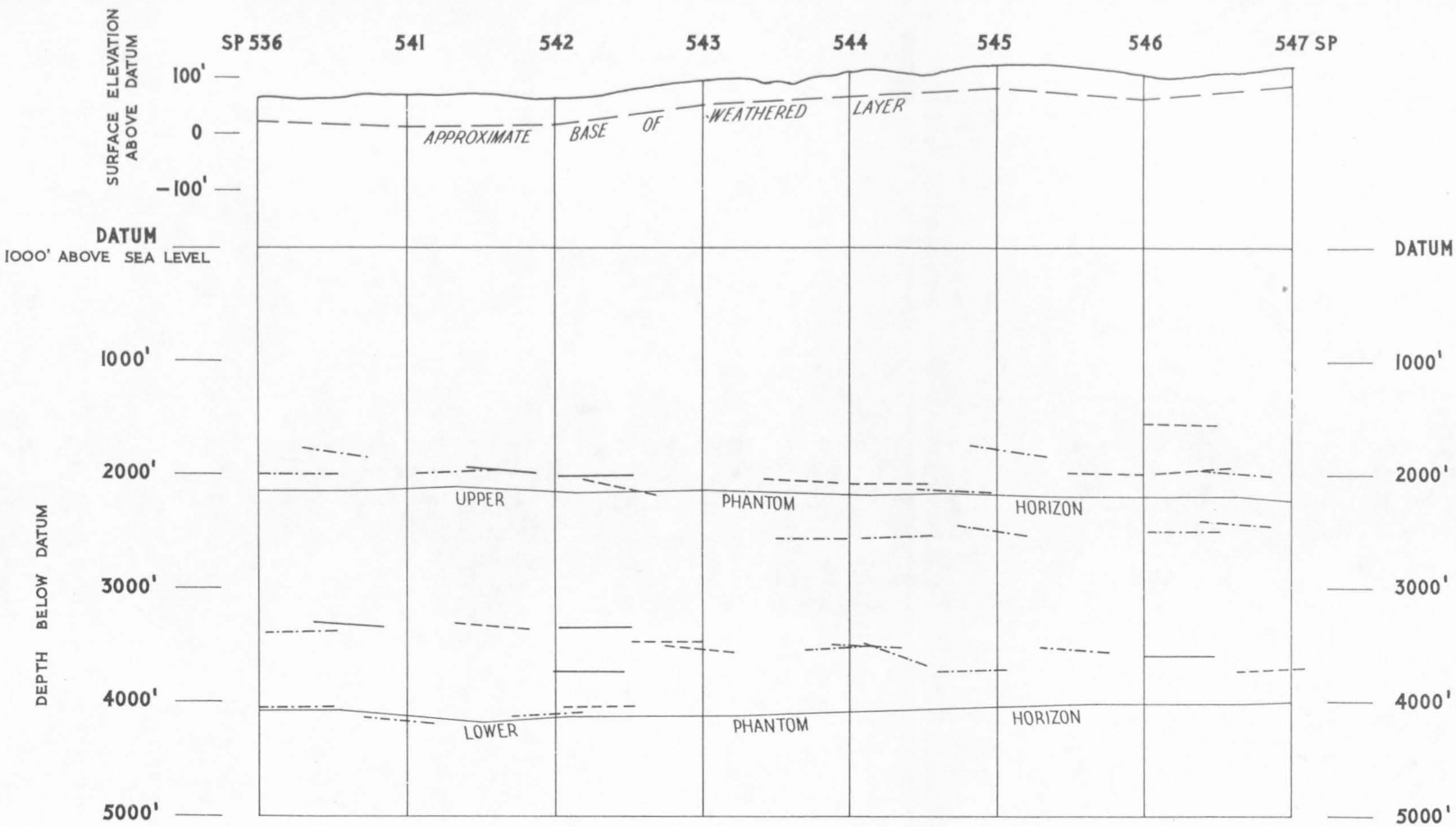
HORIZONTAL SCALE

1500 0 1500 3000 FEET

L. W. Williams
GEOPHYSICIST

Geophysical Section, Bureau of Mineral Resources, Geology & Geophysics G38-67

PLATE 6



HORIZONTAL SCALE

1500 0 1500 3000 FEET

SEISMIC REFLECTION SURVEY AT

ROMA, QUEENSLAND, 1952-53

CROSS SECTION SHOWING

REFLECTIONS AND PHANTOM HORIZONS

TRAVERSE 2

LEGEND

ACCURACY OF REFLECTIONS

- GOOD
- FAIR
- POOR
- VERY POOR

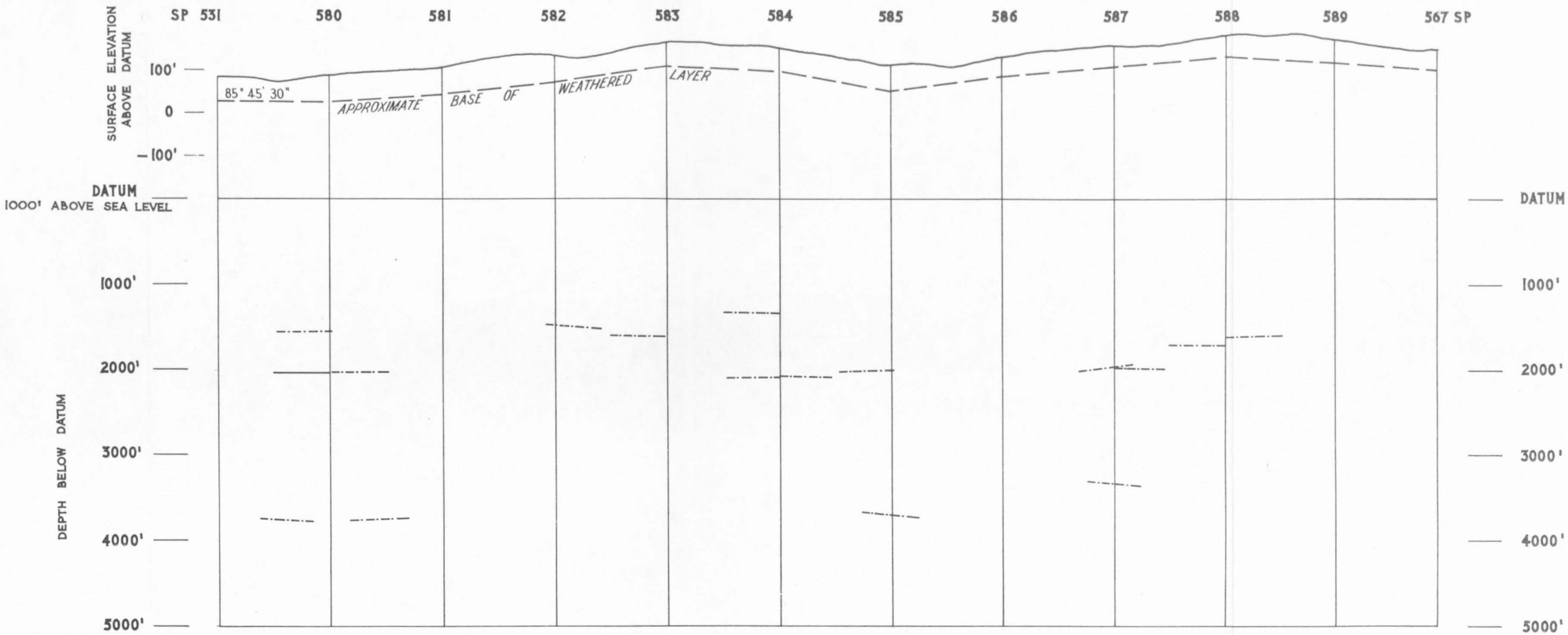
L. W. Williams

GEOPHYSICIST

Geophysical Section, Bureau of Mineral Resources, Geology & Geophysics

G38-68

PLATE 7



SEISMIC REFLECTION SURVEY AT

ROMA, QUEENSLAND, 1952-53

CROSS SECTION SHOWING

REFLECTIONS AND PHANTOM HORIZONS

TRAVERSE 3

LEGEND

ACCURACY OF REFLECTIONS

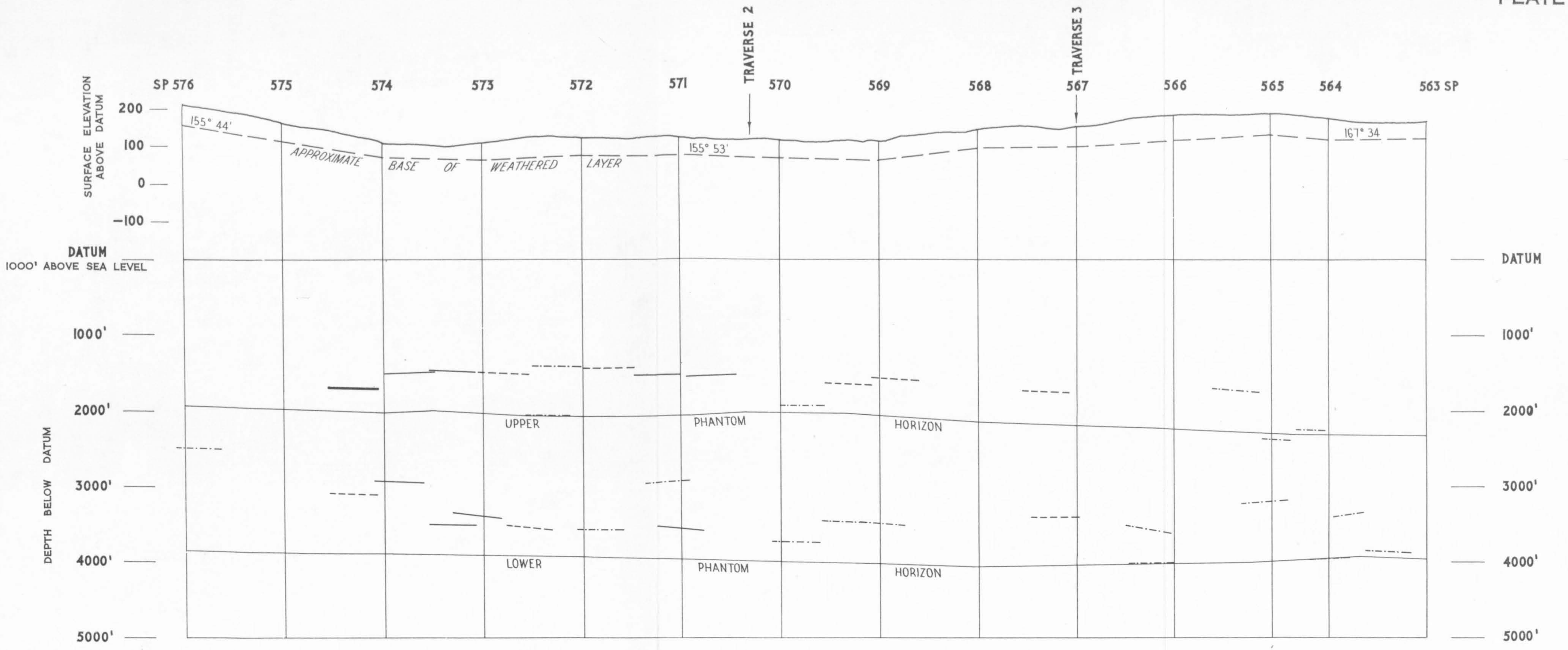
- GOOD
- FAIR
- POOR
- VERY POOR

HORIZONTAL SCALE

1500 0 1500 3000 4500 FEET

L.W. Williams
GEOPHYSICIST

Geophysical Section, Bureau of Mineral Resources, Geology & Geophysics. G38-69



LEGEND

ACCURACY OF REFLECTIONS

GOOD
FAIR
POOR
VERY POOR

HORIZONTAL SCALE

1500 0 1500 3000 4500 FEET

[signature]
GEOPHYSICIST

SEISMIC REFLECTION SURVEY AT

ROMA, QUEENSLAND, 1952 – 53

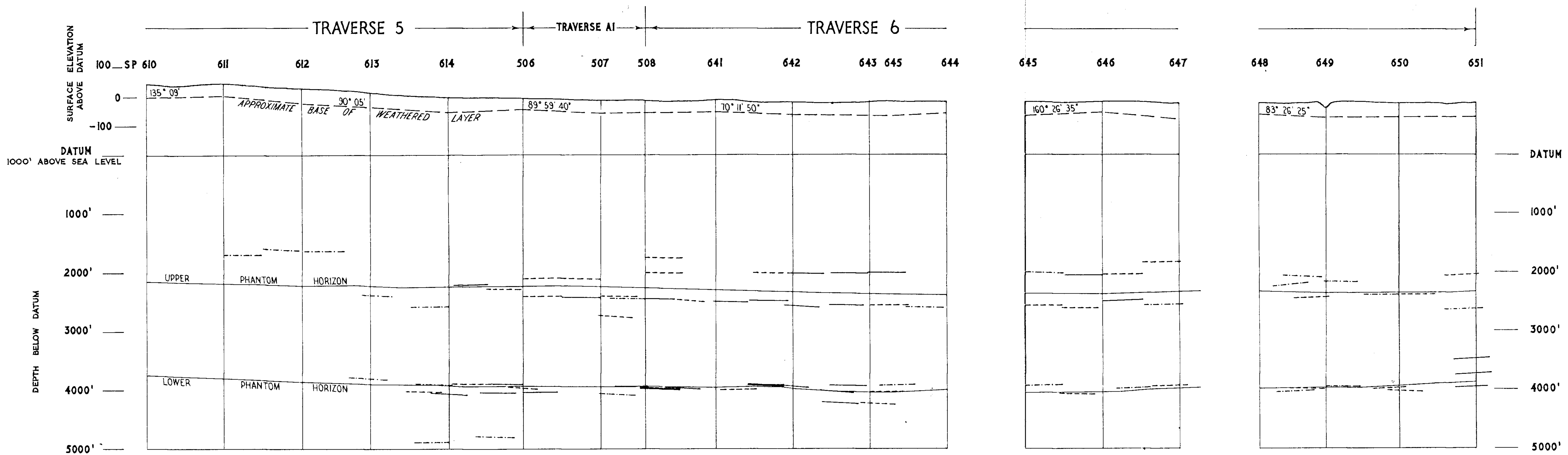
CROSS SECTION SHOWING

REFLECTIONS AND PHANTOM HORIZONS

TRAVERSE 4

Geophysical Section, Bureau of Mineral Resources, Geology & Geophysics.

G38-70



LEGEND

ACCURACY OF REFLECTIONS

- GOOD
- FAIR
- POOR
- VERY POOR

HORIZONTAL SCALE

1500 0 1500 3000 4500 FEET

GEOPHYSICIST

SEISMIC REFLECTION SURVEY AT

ROMA, QUEENSLAND, 1952 – 53

CROSS SECTION SHOWING

REFLECTIONS AND PHANTOM HORIZONS

TRAVERSES 5 & 6

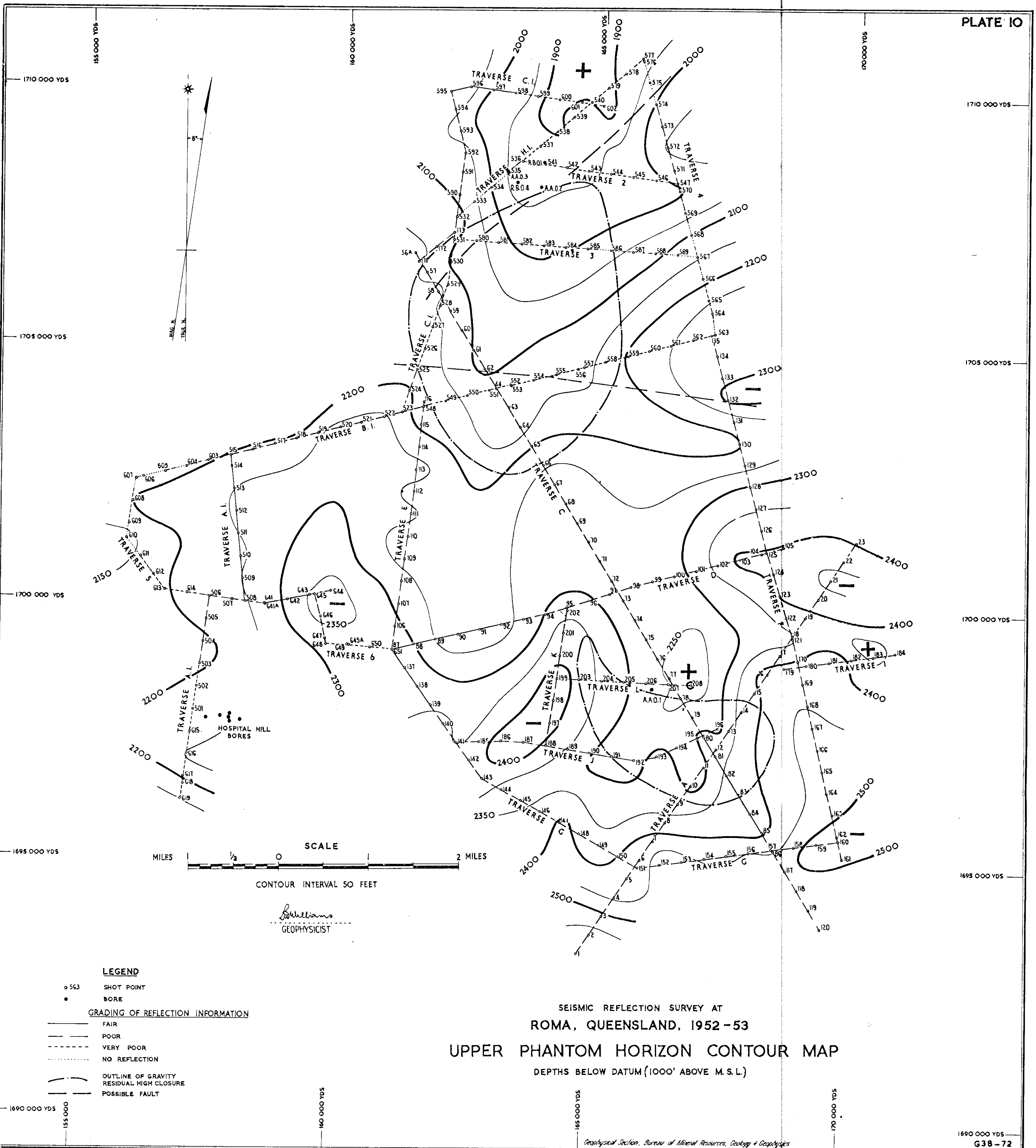


PLATE 10
SEISMIC REFLECTION SURVEY AT
ROMA, QUEENSLAND, 1952-53
UPPER PHANTOM HORIZON CONTOUR MAP
DEPTHS BELOW DATUM (1000' ABOVE M.S.L.)
SCALE
MILES 1 1/2 0 1 2 MILES
CONTOUR INTERVAL 50 FEET
GEOPHYSICIST
LEGEND
563 SHOT POINT
BORE
GRADING OF REFLECTION INFORMATION
FAIR
POOR
VERY POOR
NO REFLECTION
OUTLINE OF GRAVITY RESIDUAL HIGH CLOSURE
POSSIBLE FAULT
HOSPITAL HILL BORES
TRAVERSE C.I.
TRAVERSE H.I.
TRAVERSE 2
TRAVERSE 3
TRAVERSE 4
TRAVERSE B.I.
TRAVERSE A.I.
TRAVERSE S
TRAVERSE E
TRAVERSE C
TRAVERSE D
TRAVERSE 6
TRAVERSE K
TRAVERSE L
TRAVERSE J
TRAVERSE A
TRAVERSE G
TRAVERSE F
TRAVERSE 1
A.A.O.1
A.A.O.2
A.A.O.3
R.B.O.1
R.B.O.4
MAG. N.
TRUE N.
1710 000 YDS
1705 000 YDS
1700 000 YDS
1695 000 YDS
1690 000 YDS
155 000 YDS
160 000 YDS
165 000 YDS
170 000 YDS
Geophysical Section, Bureau of Mineral Resources, Geology & Geophysics
G38-72

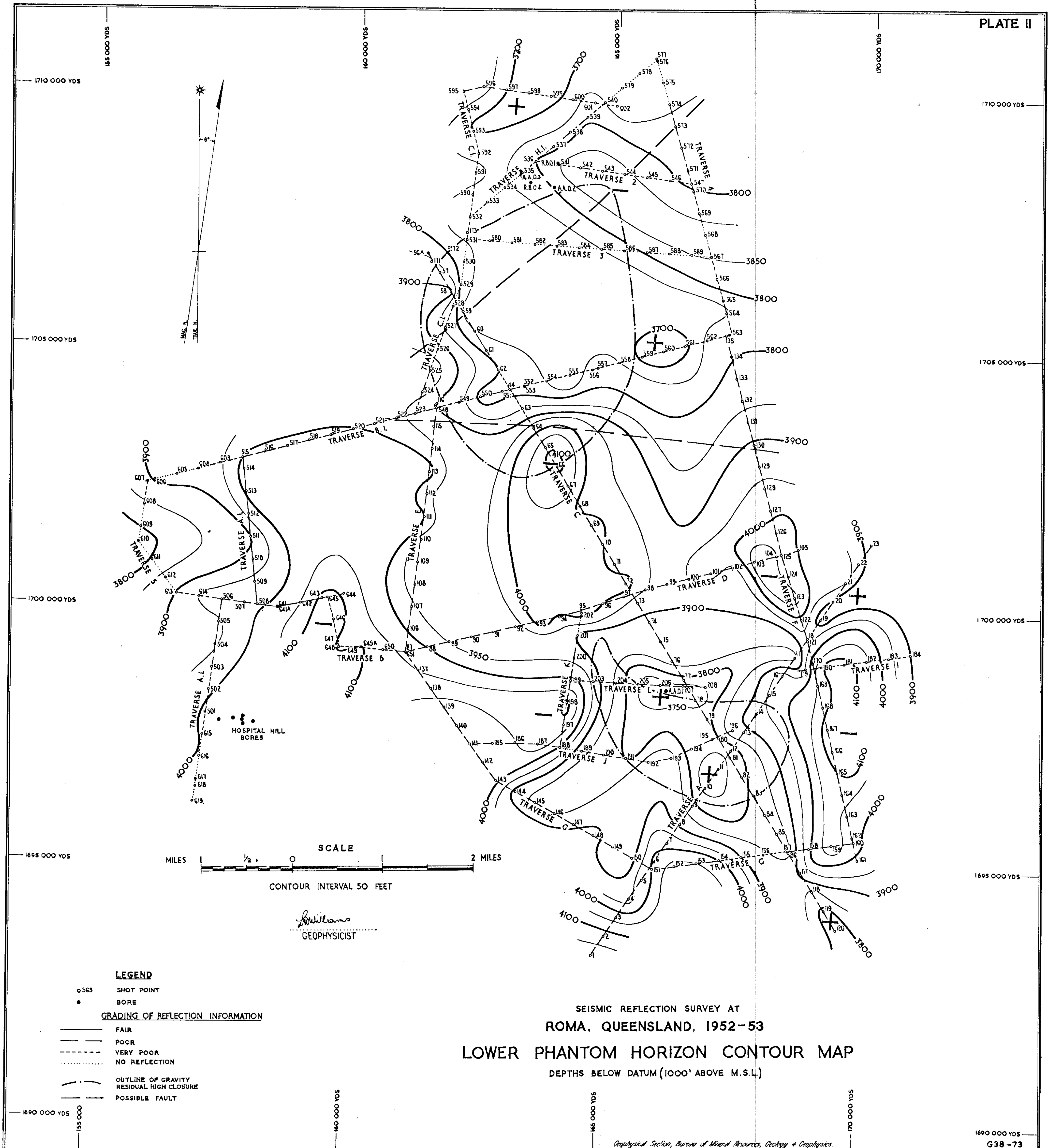


PLATE II
SEISMIC REFLECTION SURVEY AT
ROMA, QUEENSLAND, 1952-53
LOWER PHANTOM HORIZON CONTOUR MAP
DEPTHS BELOW DATUM (1000' ABOVE M.S.L.)
SCALE
MILES 1 1/2 0 1 2 MILES
CONTOUR INTERVAL 50 FEET
GEOPHYSICIST
LEGEND
SHOT POINT
BORE
GRADING OF REFLECTION INFORMATION
FAIR
POOR
VERY POOR
NO REFLECTION
OUTLINE OF GRAVITY RESIDUAL HIGH CLOSURE
POSSIBLE FAULT
HOSPITAL HILL BORES
TRAVERSE A
TRAVERSE A.I.
TRAVERSE B.I.
TRAVERSE C
TRAVERSE C.I.
TRAVERSE D
TRAVERSE E
TRAVERSE F
TRAVERSE G
TRAVERSE H.I.
TRAVERSE I
TRAVERSE J
TRAVERSE K
TRAVERSE L
TRAVERSE 2
TRAVERSE 3
TRAVERSE 5
TRAVERSE 6
MAG. N.
TRUE N.
155 000 YDS
160 000 YDS
165 000 YDS
170 000 YDS
1710 000 YDS
1705 000 YDS
1700 000 YDS
1695 000 YDS
1690 000 YDS
Geophysical Section, Bureau of Mineral Resources, Geology & Geophysics.
G38-73