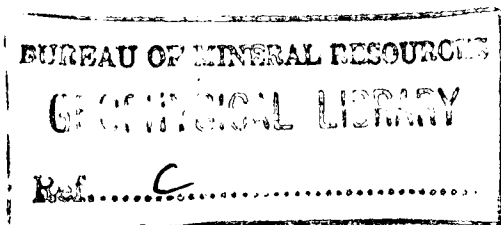


1963/6
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COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS



501539

RECORD No. 1963/6



ALICE SPRINGS (FARM AREA)

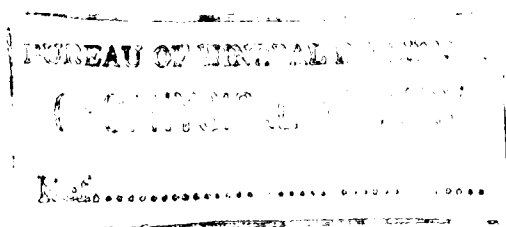
SEISMIC REFRACTION SURVEY, NT 1961

by

F.J. Moss

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SUMMARY

This Record describes a seismic refraction survey made during 1961 in the Farm Area, Alice Springs, NT. Good refraction breaks were obtained only along the east-west Traverse K; the refraction breaks along the north-south traverses were very poor.

Velocities indicated in the overburden are interpreted in terms of particular geological formations within the Mesozoic and Recent sediments. Results along additional east-west traverses would be needed before a similar interpretation could be applied to the bedrock velocities.

1. INTRODUCTION

Seismic refraction traverses were shot in the Farm Area, Alice Springs, NT during the periods 29th August to 1st September and 24th November to 1st December 1961.

The object of the survey was to assist in the search for underground water by determining the thickness of the Mesozoic to Recent sediments overlying basement of steeply-dipping Palaeozoic and Proterozoic sediments having a roughly easterly strike.

North-south traverses were surveyed to obtain the required information on basement depths. The refraction profiling techniques described by Dyson and Wiebenga (1957) were used in this recent work.

2. RESULTS

Traverse G

Plates 1 and 2 show the location of this traverse and Plate 5 shows the refraction profile.

Five miles of continuous refraction profiling were shot. Geophones were laid at 110-ft intervals along $\frac{1}{2}$ -mile spreads that were shot from the centre, both ends, and $\frac{1}{2}$ mile beyond each end and in line with the traverse. This method of operation was used to give (a) information on refractors within the Mesozoic to Recent sediments and, (b) a continuous coverage of the basement profile. Charges ranged from 10 lb for the centre shot to 100 lb for the shots at $\frac{1}{2}$ -mile offset distance; most of the shot-holes were about 60 ft deep. Generally the refraction breaks were very poor, being mainly of the 'rolling type'.

The results over this traverse are summarised below:

| <u>Spread</u> | <u>Basement depth (ft)</u> | <u>Basement Velocity (ft/sec)</u> |
|----------------------|---------------------------------|-----------------------------------|
| Shot-points 30 to 20 | 300 to 400 | 9100 -12,400 |
| " 20 to 18 | 400 at Shot-point 20 | 10,500 |
| | 900 at Shot-point 18 | |
| " 18 to 10 | 900 at Shot-point 18 | 12,400 |
| | 600 at Shot-points 11 and 10 | |

The results were difficult to interpret, particularly between Shot-points 18 and 16. A dashed line indicates the uncertainty of the bedrock profile over this portion of the traverse.

Traverse J

Plates 1 and 3 show the location of this traverse and Plate 6 shows the refraction profile.

Three miles of continuous refraction profiling were shot. One-mile spreads were used in order to cover the ground more quickly. The charge sizes and hole depths used were similar to those used on Traverse G, and 'rolling type' refraction breaks were again recorded.

A 8400-ft/sec refractor was recorded under Shot-points 17 to 14 at about 600-ft depth. It is most probable that this refractor lies within the Mesozoic sediments, and that the 10,300-ft/sec refractor recorded at a depth of about 1500 ft below Shot-point 16 is a basement (pre-Mesozoic) refractor.

Insufficient time was available to extend the programme to map the profile of the 10,300-ft/sec refractor. However, since it was not recorded elsewhere along this traverse, it could be absent or it could be deeper.

Traverses K and XY (Shot-points 7860 to 5220)

Plates 1 and 4 show the location of these traverses and Plate 7 shows the refraction profiles.

Traverse K, a $\frac{1}{2}$ -mile cross spread at Shot-point 6540 on Traverse XY, was shot at both ends, to give information on the depths and velocities in the east-west direction of the refractors, previously recorded below Traverse XY. Results were good.

A shot at Shot-point 5220 gave additional information on Traverse XY from Shot-points 7860 to 5220 to supplement the results obtained on this line by Dyson and Wiebenga (1957). The records along Traverse XY were poor; however, results on this traverse are in accordance with those on Traverse K.

Seismic results indicated that the Palaeozoic or Proterozoic basement under Traverse K has a 3 degrees component of dip to the east.

3. INTERPRETATION

A study of Plates 5, 6, and 7 shows that despite some scattered results, the refractor velocities tend to fall into more-or-less well-defined groups:

a velocity of about 2000 ft/sec appears on all cross-sections; and can be interpreted as being produced by the same geological formation (namely weathered sediments) on all traverses,

a velocity of 4500 ft/sec (with scattered values between 3400 and 5200 ft/sec) appears on all cross-sections and may represent the top of the unconsolidated subweathering material,

a velocity of about 7000 ft/sec, (with scattered values between 5600 and 7800 ft/sec) appears on all cross-sections, and may represent one refractor (possibly Mesozoic) under all traverses,

a velocity of 8400 ft/sec occurs on one cross-section only (Traverse J) and has been interpreted as arising from a deeper Mesozoic bed,

a velocity of about 10,400 ft/sec occurs on all cross-sections, and is interpreted as arising from a Palaeozoic refractor, probably part of an ancient weathered surface that forms the basement material for the subsequent Mesozoic deposition.

The basement refractor velocity of nominally 10,400 feet per second is shown on Traverse G to range between 9200 and 12,400 ft/sec. The range in basement velocity is interpreted as evidence that the basement is not a uniform material but is made up of the buried outcrops of many pre-Mesozoic strata.

The survey was not adequate to allow basement refractor velocities to be interpreted in terms of particular geological formations. To evaluate true velocities it is considered necessary that east-west traverses along the strike should also be recorded. Adequate tie-lines should be recorded to establish that similar velocities on Traverses G, J, and K do in fact represent the same refractors.

It is considered that the refractor depth values given in this report are accurate within about 15 percent.

4. REFERENCE

- | | | |
|-----------------------------------|------|--|
| DYSON, D.F. and WIEBENGA, W.A. | 1957 | Final report on geophysical investigations of underground water, Alice Springs, NT 1956. <u>Bur. Min. Resour. Aust. Rec.</u> 1957/89 (unpubl.) |
|-----------------------------------|------|--|

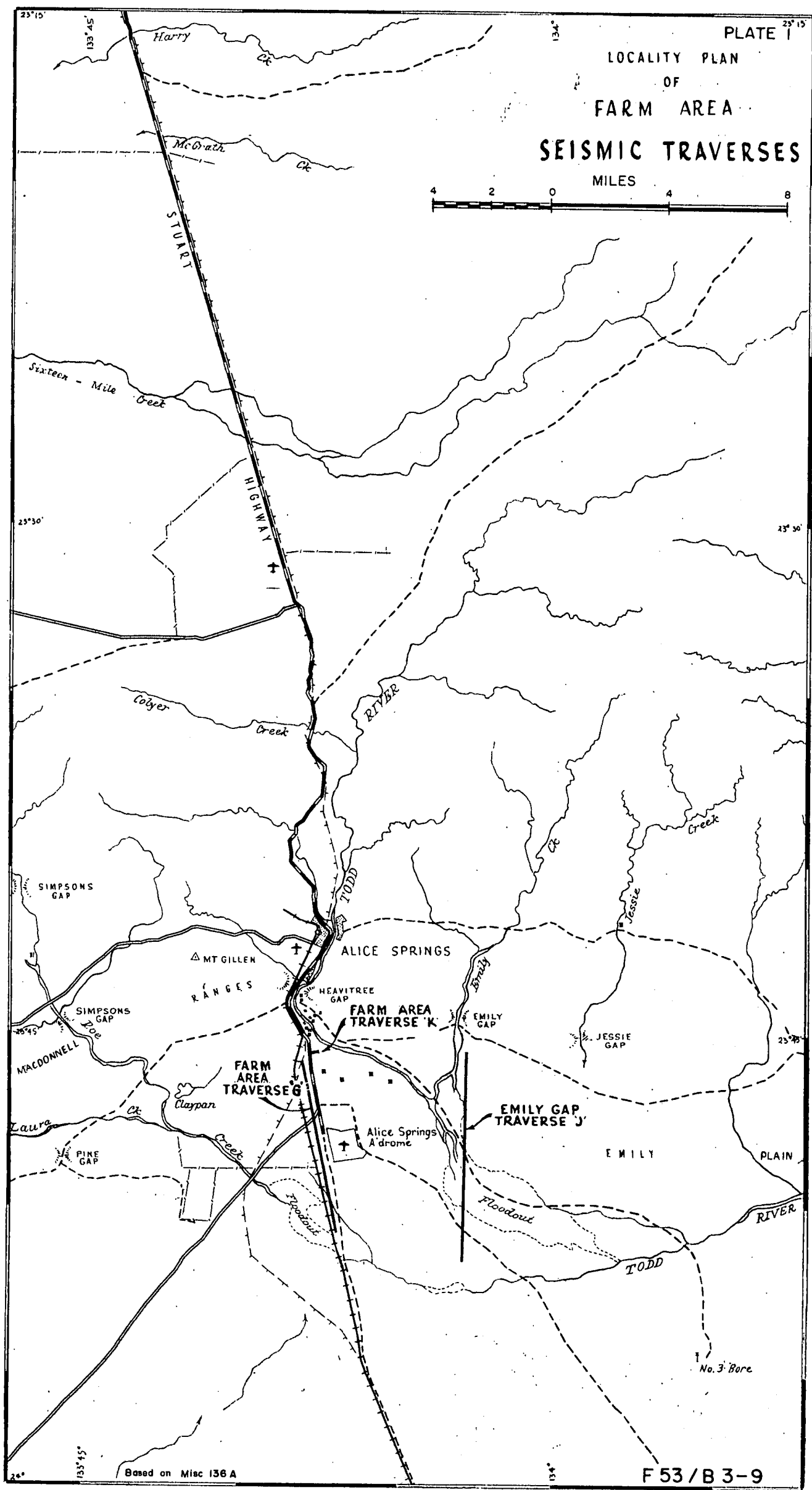
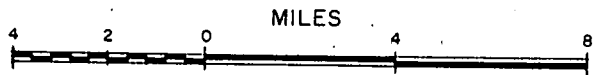


PLATE I
LOCALITY PLAN
OF
FARM AREA
SEISMIC TRAVERSES



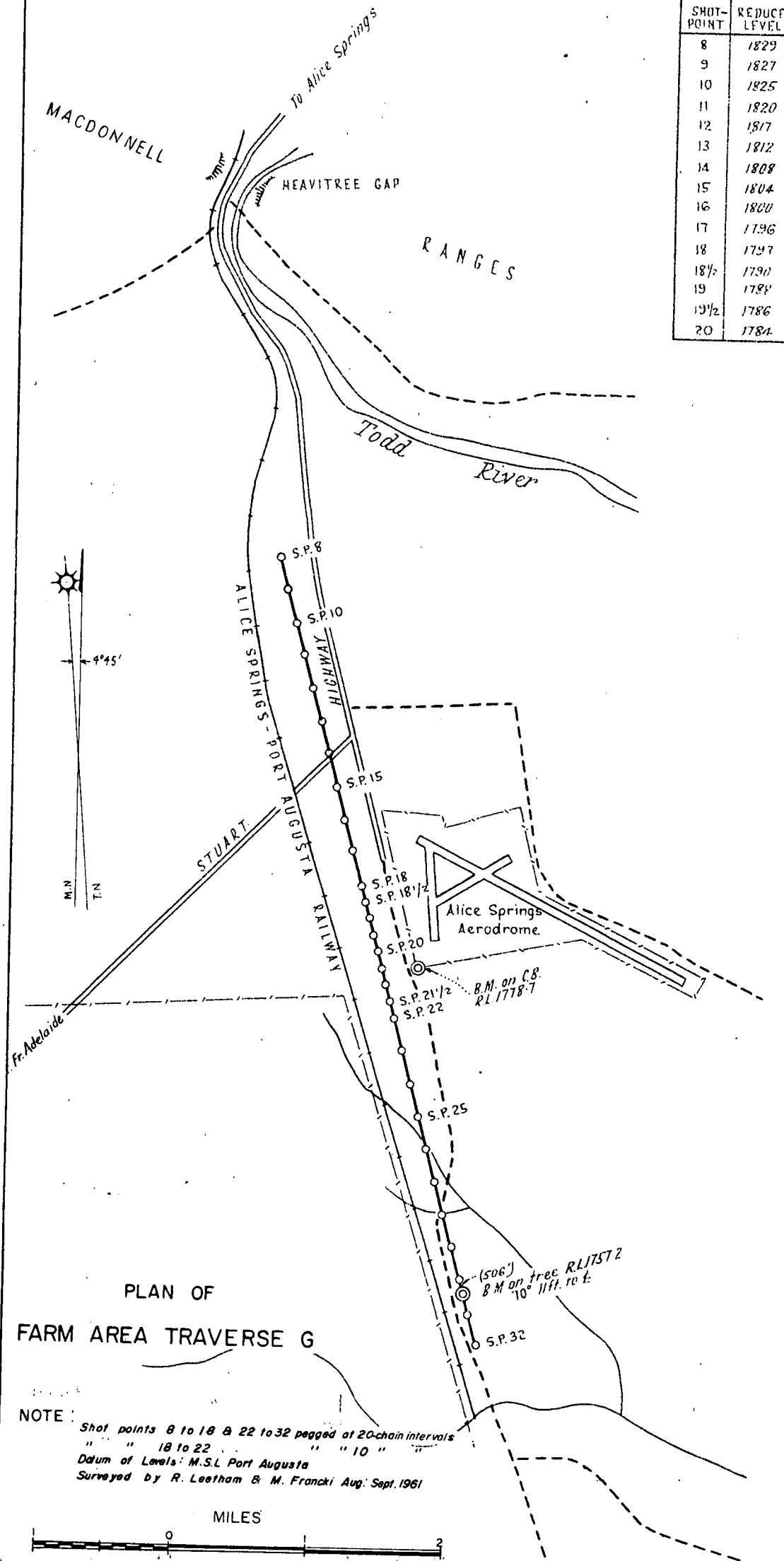
Based on Misc 136 A

F 53/B 3-9

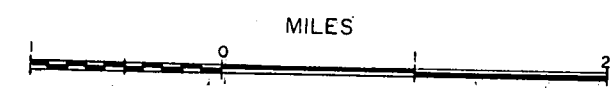
TO ACCOMPANY RECORD NO. 1963/6

REF. TO SHOT-POINTS

| SHOT-POINT | REDUCED LEVEL | SHOT-POINT | REDUCED LEVEL |
|------------|---------------|------------|---------------|
| 8 | 1829 | 20 1/2 | 1785 |
| 9 | 1827 | 21 | 1787 |
| 10 | 1825 | 21 1/2 | 1780 |
| 11 | 1820 | 22 | 1778 |
| 12 | 1817 | 23 | 1775 |
| 13 | 1812 | 24 | 1771 |
| 14 | 1808 | 25 | 1769 |
| 15 | 1804 | 26 | 1766 |
| 16 | 1800 | 27 | 1761 |
| 17 | 1796 | 28 | 1759 |
| 18 | 1797 | 29 | 1760 |
| 18 1/2 | 1790 | 30 | 1758 |
| 19 | 1788 | 31 | 1752 |
| 19 1/2 | 1786 | 32 | 1752 |
| 20 | 1784 | | |



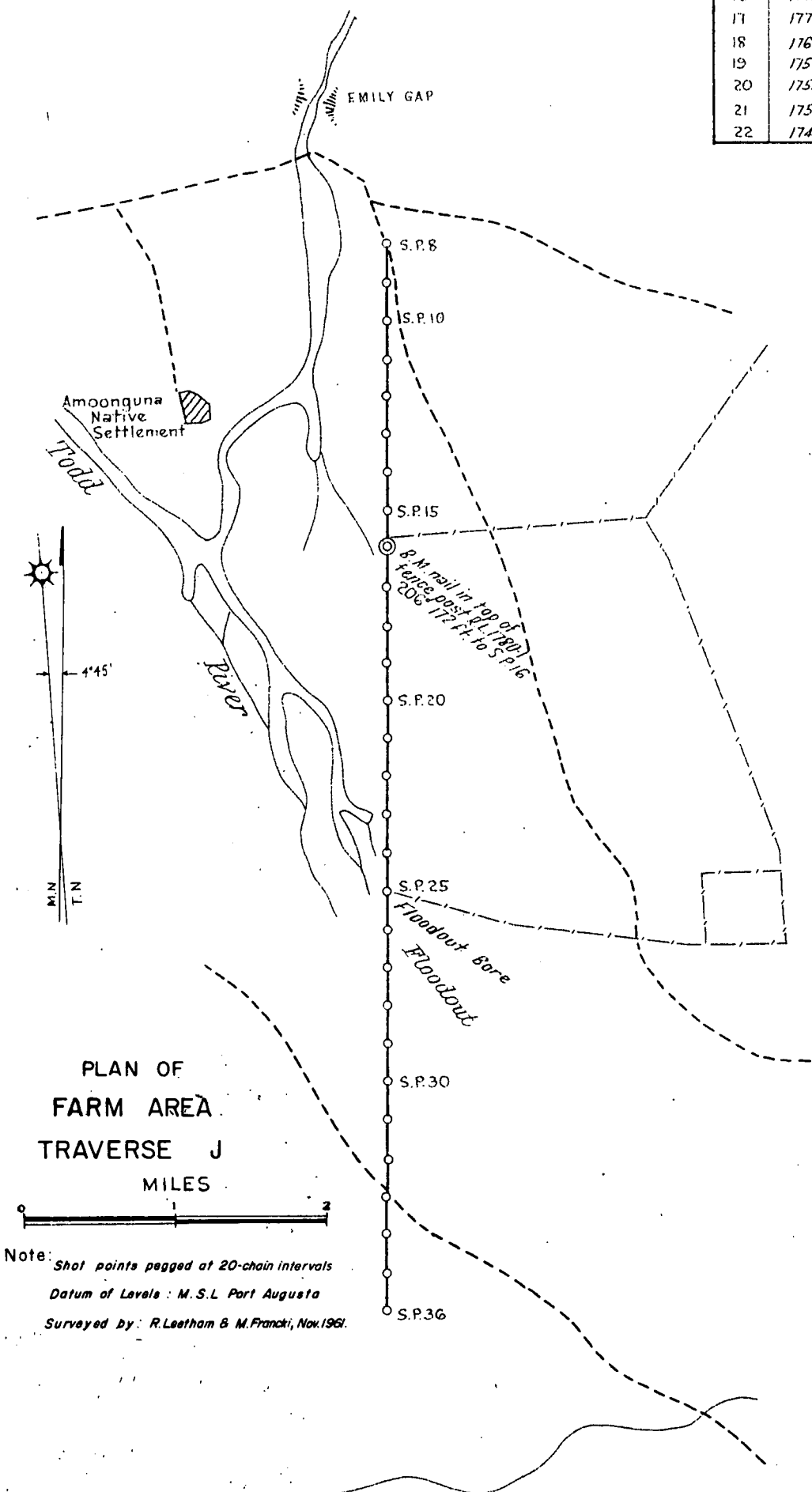
NOTE: Shot points 8 to 18 & 22 to 32 pegged at 20-chain intervals
" " 18 to 22 " " 10 " "
Datum of Levels: M.S.L. Port Augusta
Surveyed by R. Leatham & M. Francki Aug. Sept. 1961



Based on Misc. 136 Sh. 2.

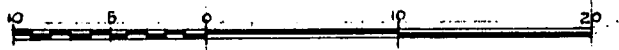
REF. TO SHOT-POINTS

| SHOT-POINT | REDUCED LEVEL | SHOT-POINT | REDUCED LEVEL |
|------------|---------------|------------|---------------|
| 8 | 1810 | 23 | 1744. |
| 9 | 1807 | 24 | 1741 |
| 10 | 1805 | 25 | 1741 |
| 11 | 1801 | 26 | 1738 |
| 12 | 1795 | 27 | 1736 |
| 13 | 1789 | 28 | 1733 |
| 14 | 1783 | 29 | 1728 |
| 15 | 1779 | 30 | 1728 |
| 16 | 1775 | 31 | 1727 |
| 17 | 1771 | 32 | 1724. |
| 18 | 1766 | 33 | 1721 |
| 19 | 1759 | 34 | 1724. |
| 20 | 1755 | 35 | 1720 |
| 21 | 1750 | 36 | 1719 |
| 22 | 1748 | | |

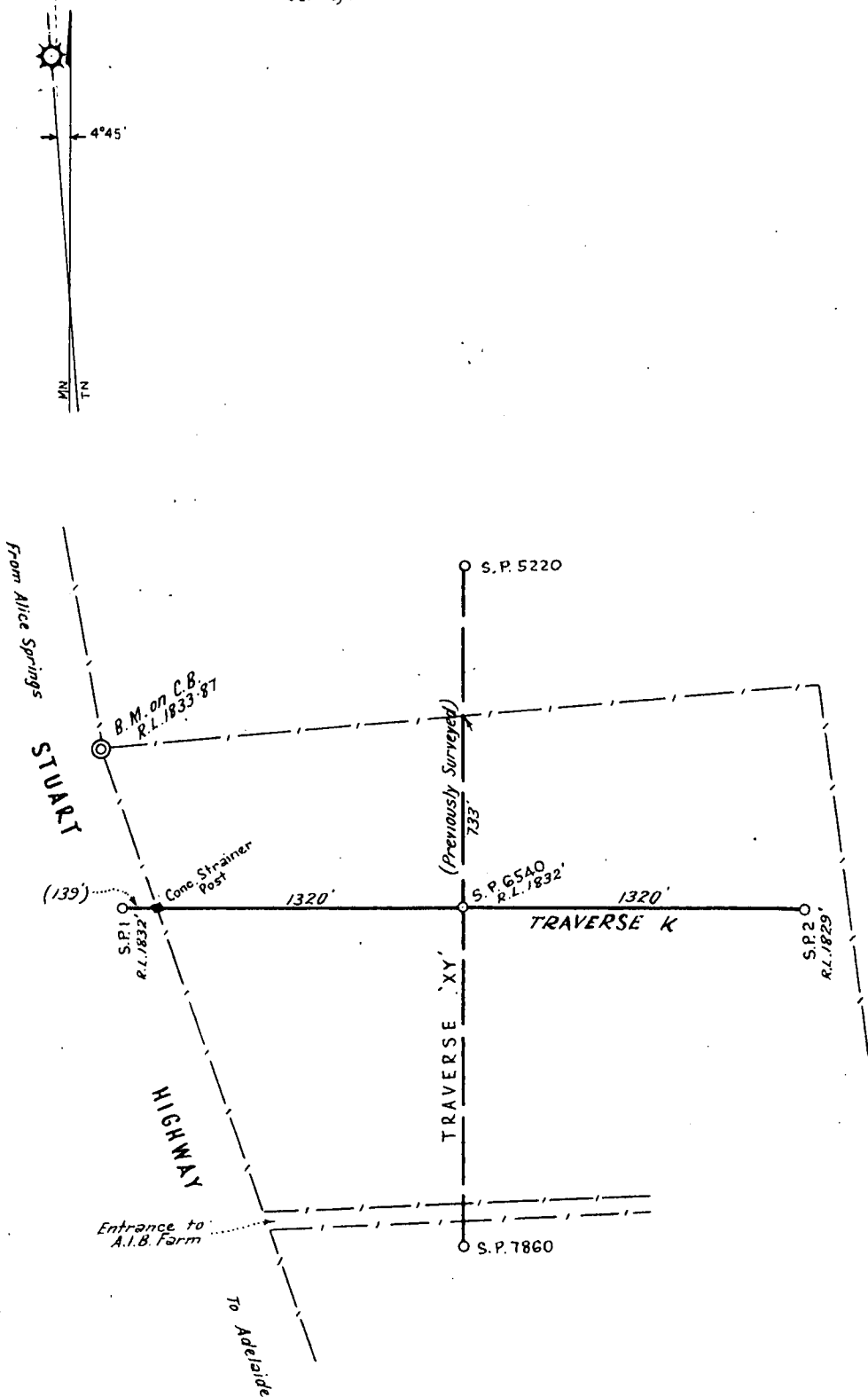


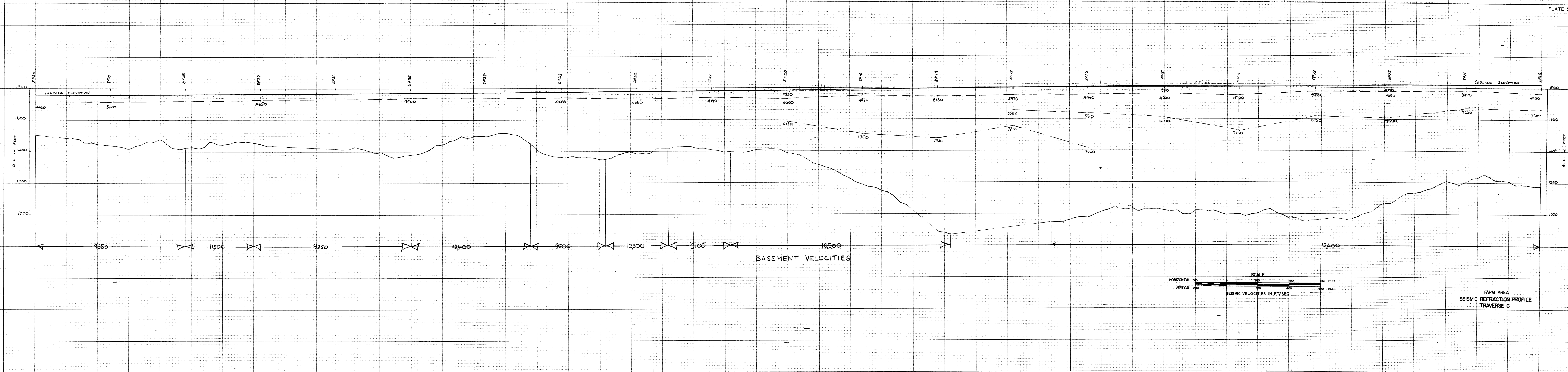
Based on Misc. 136 Sh. 3

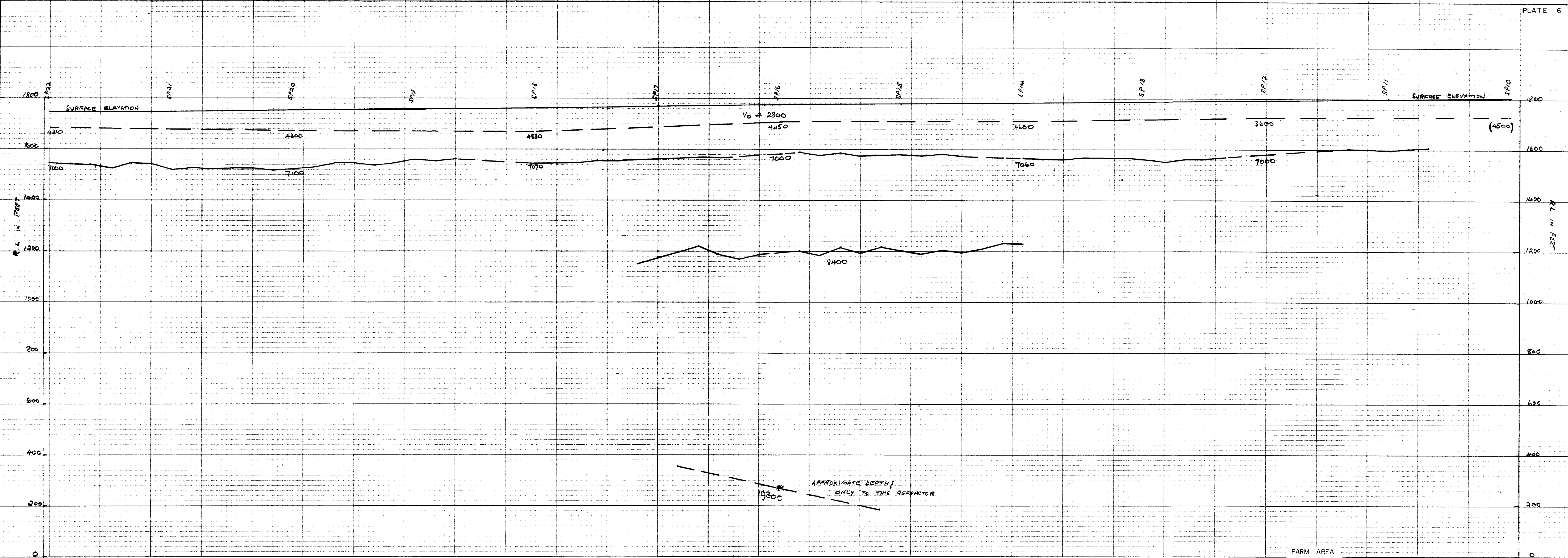
Plan of
FARM AREA TRAVERSE 'K' AND XY
CHAINS



NOTE:
Datum of Levels: M.S.L. Port Augusta.
Surveyed: R Leetham & M Francki. Nov. 1961



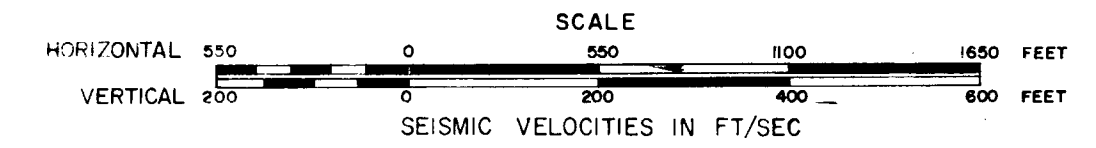


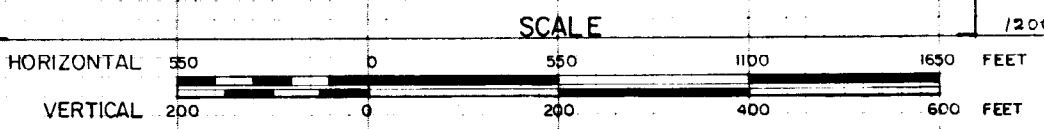
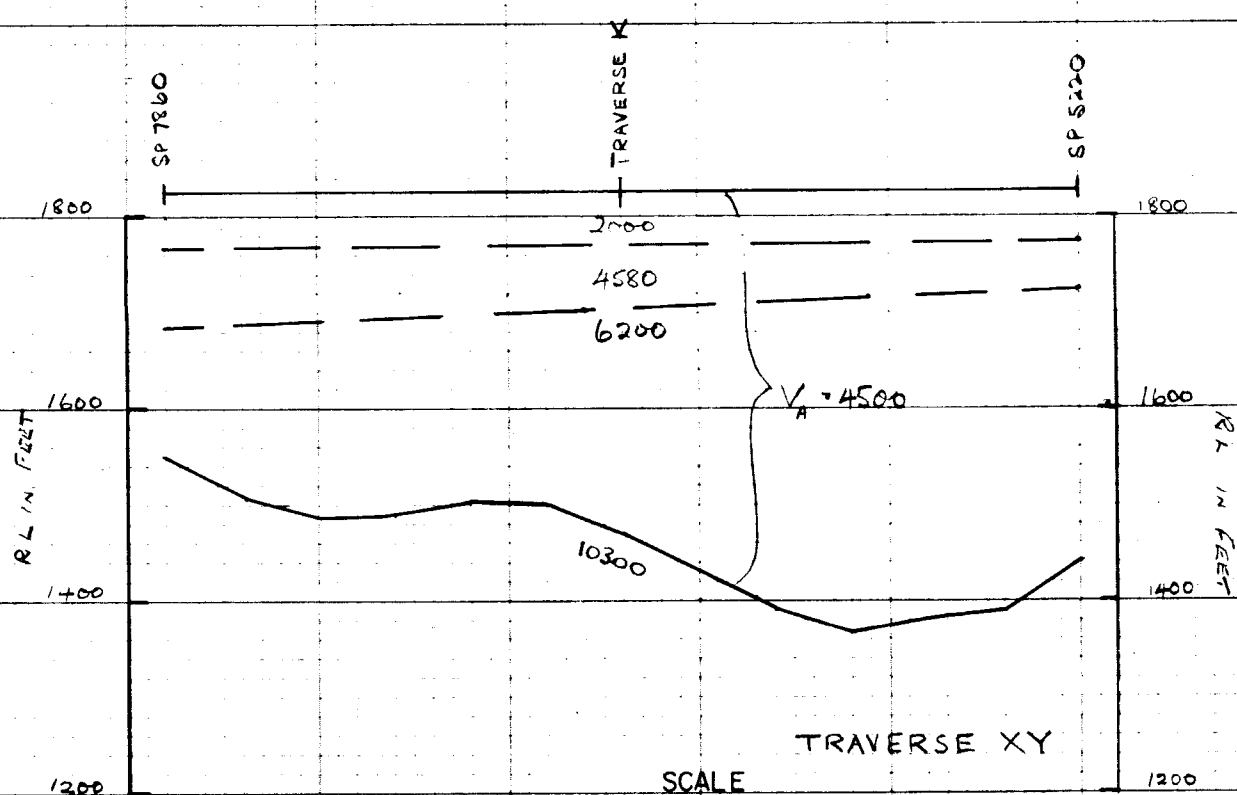
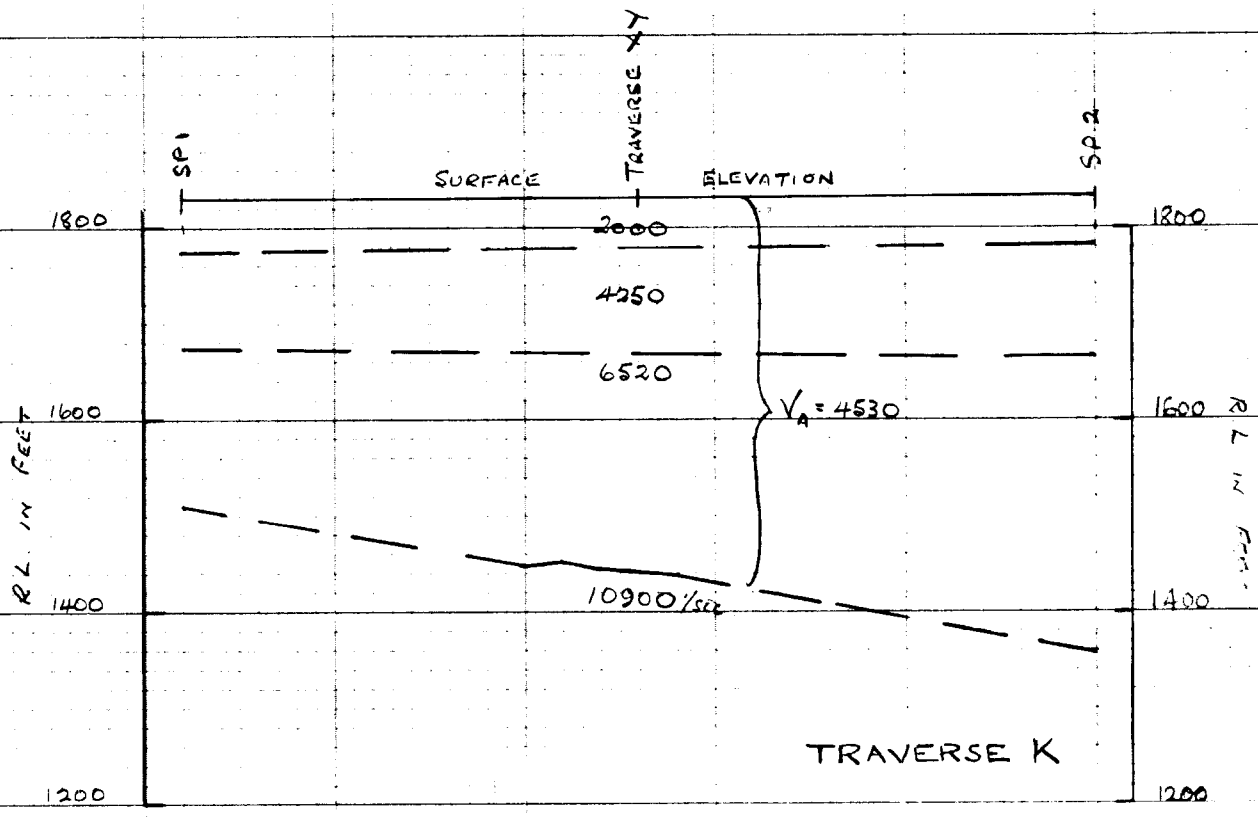


FARM AREA

SEISMIC REFRACTION PROFILE

TRAVERSE J





FARM AREA
SEISMIC REFRACTION PROFILES
TRAVERSES K & XY (SHOT-POINTS 5220 to 7860).
Seismic Velocities in ft/sec